The Nautical Almanac 2025

TheNauticalAlmanac.com

The Nautical Almanac

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fair winds, clear skies & following seas
TheNauticalAlmanac.com

Acknowledgment and Credits

Dr. Enno Rodegerdts

The Nautical Almanac *Daily Pages* and Sun Almanacs found on our site were originally created from PyAlmanac written by the great Norwegian sailor Enno Rodegerdts. PyAlmanac used PyEphem to generate the almanacs and LaTex provided the final formatting. Visit Dr. Rodegerdts site and learn of his voyages at https://sv-inua.net/

Without his work TheNauticalAlmanac.com wouldn't exist

Andrew Bauer

Mr. Bauer has taken the initial work of Dr. Rodegerdts and improved it to the excellence found in the following Daily Pages. Attending foremost to the accuracy of data and then formatting Mr. Bauer created SkyAlmanac which draws from Brandon Rhodes work *Ephem* and *Skyfield* and provides a clear arrangement of figures required for celestial navigation. He has also created the separate *Declination of the Sun and Planets* and *Local Mean Time of Meridian Passage* you'll find near the end of this almanac.

His work was determined, tireless and efficient. In our mutual writing across many lines of longitude he has always been pleasant, friendly and most affable.

As he has said, *"The art of celestial navigation should be promoted, not discouraged, even in the modern day".*

To both of these men we all owe a large debt of gratitude and thanks

Disclaimer and Warning

Prior to use verify the accuracy of The Nautical Almanac or data you download from our site. They SHOULD NOT and MUST NOT be relied upon for celestial navigation work of any sorts or any purpose whatsoever. You use them at your own risk or peril.

Errors & Corrections

Contact us if you find any significant errors and describe the correction that should be made.

freely ye received, freely give

2025

January

wk	Su	M	Tu	W	Th	F	Sa
1				1	2	3	4
2	5	6	7	8	9	10	11
3	12	13	14	15	16	17	18
4	19	20	21	22	23	24	25
5	26	27	28	29	30	31	

February

wk	Su	M	Tu	W	Th	F	Sa
5							1
6	2	3	4	5	6	7	8
7	9	10	11	12	13	14	15
8	16	17	18	19	20	21	22
9	23	24	25	26	27	28	

March

wk	Su	M	Tu	W	Th	F	Sa
9							1
10	2	3	4	5	6	7	8
11	9	10	11	12	13	14	15
12	16	17	18	19	20	21	22
13	23	24	25	26	27	28	29
14	30	31					

April

wk	Su	M	Tu	W	Th	F	Sa
14			1	2	3	4	5
15	6	7	8	9	10	11	12
16	13	14	15	16	17	18	19
17	20	21	22	23	24	25	26
18	27	28	29	30			

May

wk	Su	M	Tu	W	Th	F	Sa
18					1	2	3
19	4	5	6	7	8	9	10
20	11	12	13	14	15	16	17
21	18	19	20	21	22	23	24
22	25	26	27	28	29	30	31

June

wk	Su	M	Tu	W	Th	F	Sa
23	1	2	3	4	5	6	7
24	8	9	10	11	12	13	14
25	15	16	17	18	19	20	21
26	22	23	24	25	26	27	28
27	29	30					

July

wk	Su	M	Tu	W	Th	F	Sa
27			1	2	3	4	5
28	6	7	8	9	10	11	12
29	13	14	15	16	17	18	19
30	20	21	22	23	24	25	26
31	27	28	29	30	31		

August

wk	Su	M	Tu	W	Th	F	Sa
31						1	2
32	3	4	5	6	7	8	9
33	10	11	12	13	14	15	16
34	17	18	19	20	21	22	23
35	24	25	26	27	28	29	30
36	31						

September

wk	Su	M	Tu	W	Th	F	Sa
36		1	2	3	4	5	6
37	7	8	9	10	11	12	13
38	14	15	16	17	18	19	20
39	21	22	23	24	25	26	27
40	28	29	30				

October

wk	Su	M	Tu	W	Th	F	Sa
40				1	2	3	4
41	5	6	7	8	9	10	11
42	12	13	14	15	16	17	18
43	19	20	21	22	23	24	25
44	26	27	28	29	30	31	

November

wk	Su	M	Tu	W	Th	F	Sa
44							1
45	2	3	4	5	6	7	8
46	9	10	11	12	13	14	15
47	16	17	18	19	20	21	22
48	23	24	25	26	27	28	29
49	30						

December

wk	Su	M	Tu	W	Th	F	Sa
49		1	2	3	4	5	6
50	7	8	9	10	11	12	13
51	14	15	16	17	18	19	20
52	21	22	23	24	25	26	27
1	28	29	30	31			

2025

Day of Week, Week Number, Day of Year, Remaining Days of Year

Day of Month	1 January			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	1	364	1
2	Thu	2	363	
3	Fri	3	362	
4	Sat	4	361	
5	Sun	5	360	2
6	Mon	6	359	
7	Tue	7	358	
8	Wed	8	357	
9	Thu	9	356	
10	Fri	10	355	
11	Sat	11	354	
12	Sun	12	353	3
13	Mon	13	352	
14	Tue	14	351	
15	Wed	15	350	
16	Thu	16	349	
17	Fri	17	348	
18	Sat	18	347	
19	Sun	19	346	4
20	Mon	20	345	
21	Tue	21	344	
22	Wed	22	343	
23	Thu	23	342	
24	Fri	24	341	
25	Sat	25	340	
26	Sun	26	339	5
27	Mon	27	338	
28	Tue	28	337	
29	Wed	29	336	
30	Thu	30	335	
31	Fri	31	334	

Day of Month	2 February			
	Day of Week	Day of Year	Days remaining	Week number
1	Sat	32	333	5
2	Sun	33	332	6
3	Mon	34	331	
4	Tue	35	330	
5	Wed	36	329	
6	Thu	37	328	
7	Fri	38	327	
8	Sat	39	326	
9	Sun	40	325	7
10	Mon	41	324	
11	Tue	42	323	
12	Wed	43	322	
13	Thu	44	321	
14	Fri	45	320	
15	Sat	46	319	
16	Sun	47	318	8
17	Mon	48	317	
18	Tue	49	316	
19	Wed	50	315	
20	Thu	51	314	
21	Fri	52	313	
22	Sat	53	312	
23	Sun	54	311	9
24	Mon	55	310	
25	Tue	56	309	
26	Wed	57	308	
27	Thu	58	307	
28	Fri	59	306	

Day of Month	3 March			
	Day of Week	Day of Year	Days remaining	Week number
1	Sat	60	305	9
2	Sun	61	304	10
3	Mon	62	303	
4	Tue	63	302	
5	Wed	64	301	
6	Thu	65	300	
7	Fri	66	299	
8	Sat	67	298	
9	Sun	68	297	11
10	Mon	69	296	
11	Tue	70	295	
12	Wed	71	294	
13	Thu	72	293	
14	Fri	73	292	
15	Sat	74	291	
16	Sun	75	290	12
17	Mon	76	289	
18	Tue	77	288	
19	Wed	78	287	
20	Thu	79	286	
21	Fri	80	285	
22	Sat	81	284	
23	Sun	82	283	13
24	Mon	83	282	
25	Tue	84	281	
26	Wed	85	280	
27	Thu	86	279	
28	Fri	87	278	
29	Sat	88	277	
30	Sun	89	276	14
31	Mon	90	275	

Day of Month	4 April			
	Day of Week	Day of Year	Days remaining	Week number
1	Tue	91	274	14
2	Wed	92	273	
3	Thu	93	272	
4	Fri	94	271	
5	Sat	95	270	
6	Sun	96	269	15
7	Mon	97	268	
8	Tue	98	267	
9	Wed	99	266	
10	Thu	100	265	
11	Fri	101	264	
12	Sat	102	263	
13	Sun	103	262	16
14	Mon	104	261	
15	Tue	105	260	
16	Wed	106	259	
17	Thu	107	258	
18	Fri	108	257	
19	Sat	109	256	
20	Sun	110	255	17
21	Mon	111	254	
22	Tue	112	253	
23	Wed	113	252	
24	Thu	114	251	
25	Fri	115	250	
26	Sat	116	249	
27	Sun	117	248	18
28	Mon	118	247	
29	Tue	119	246	
30	Wed	120	245	

Day of Month	5 May			
	Day of Week	Day of Year	Days remaining	Week number
1	Thu	121	244	18
2	Fri	122	243	
3	Sat	123	242	
4	Sun	124	241	19
5	Mon	125	240	
6	Tue	126	239	
7	Wed	127	238	
8	Thu	128	237	
9	Fri	129	236	
10	Sat	130	235	
11	Sun	131	234	20
12	Mon	132	233	
13	Tue	133	232	
14	Wed	134	231	
15	Thu	135	230	
16	Fri	136	229	
17	Sat	137	228	
18	Sun	138	227	21
19	Mon	139	226	
20	Tue	140	225	
21	Wed	141	224	
22	Thu	142	223	
23	Fri	143	222	
24	Sat	144	221	
25	Sun	145	220	22
26	Mon	146	219	
27	Tue	147	218	
28	Wed	148	217	
29	Thu	149	216	
30	Fri	150	215	
31	Sat	151	214	

Day of Month	6 June			
	Day of Week	Day of Year	Days remaining	Week number
1	Sun	152	213	23
2	Mon	153	212	
3	Tue	154	211	
4	Wed	155	210	
5	Thu	156	209	
6	Fri	157	208	
7	Sat	158	207	
8	Sun	159	206	24
9	Mon	160	205	
10	Tue	161	204	
11	Wed	162	203	
12	Thu	163	202	
13	Fri	164	201	
14	Sat	165	200	
15	Sun	166	199	25
16	Mon	167	198	
17	Tue	168	197	
18	Wed	169	196	
19	Thu	170	195	
20	Fri	171	194	
21	Sat	172	193	
22	Sun	173	192	26
23	Mon	174	191	
24	Tue	175	190	
25	Wed	176	189	
26	Thu	177	188	
27	Fri	178	187	
28	Sat	179	186	
29	Sun	180	185	27
30	Mon	181	184	

Day of Week, Week Number, Day of Year, Remaining Days of Year

Day of Month	7 July			
	Day of Week	Day of Year	Days remaining	Week number
1	Tue	182	183	27
2	Wed	183	182	
3	Thu	184	181	
4	Fri	185	180	
5	Sat	186	179	
6	Sun	187	178	28
7	Mon	188	177	
8	Tue	189	176	
9	Wed	190	175	
10	Thu	191	174	
11	Fri	192	173	
12	Sat	193	172	
13	Sun	194	171	29
14	Mon	195	170	
15	Tue	196	169	
16	Wed	197	168	
17	Thu	198	167	
18	Fri	199	166	
19	Sat	200	165	
20	Sun	201	164	30
21	Mon	202	163	
22	Tue	203	162	
23	Wed	204	161	
24	Thu	205	160	
25	Fri	206	159	
26	Sat	207	158	
27	Sun	208	157	31
28	Mon	209	156	
29	Tue	210	155	
30	Wed	211	154	
31	Thu	212	153	

Day of Month	8 August			
	Day of Week	Day of Year	Days remaining	Week number
1	Fri	213	152	31
2	Sat	214	151	
3	Sun	215	150	32
4	Mon	216	149	
5	Tue	217	148	
6	Wed	218	147	
7	Thu	219	146	
8	Fri	220	145	
9	Sat	221	144	
10	Sun	222	143	33
11	Mon	223	142	
12	Tue	224	141	
13	Wed	225	140	
14	Thu	226	139	
15	Fri	227	138	
16	Sat	228	137	
17	Sun	229	136	34
18	Mon	230	135	
19	Tue	231	134	
20	Wed	232	133	
21	Thu	233	132	
22	Fri	234	131	
23	Sat	235	130	
24	Sun	236	129	35
25	Mon	237	128	
26	Tue	238	127	
27	Wed	239	126	
28	Thu	240	125	
29	Fri	241	124	
30	Sat	242	123	
31	Sun	243	122	36

Day of Month	9 September			
	Day of Week	Day of Year	Days remaining	Week number
1	Mon	244	121	36
2	Tue	245	120	
3	Wed	246	119	
4	Thu	247	118	
5	Fri	248	117	
6	Sat	249	116	
7	Sun	250	115	37
8	Mon	251	114	
9	Tue	252	113	
10	Wed	253	112	
11	Thu	254	111	
12	Fri	255	110	
13	Sat	256	109	
14	Sun	257	108	38
15	Mon	258	107	
16	Tue	259	106	
17	Wed	260	105	
18	Thu	261	104	
19	Fri	262	103	
20	Sat	263	102	
21	Sun	264	101	39
22	Mon	265	100	
23	Tue	266	99	
24	Wed	267	98	
25	Thu	268	97	
26	Fri	269	96	
27	Sat	270	95	
28	Sun	271	94	40
29	Mon	272	93	
30	Tue	273	92	

Day of Month	10 October			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	274	91	40
2	Thu	275	90	
3	Fri	276	89	
4	Sat	277	88	
5	Sun	278	87	41
6	Mon	279	86	
7	Tue	280	85	
8	Wed	281	84	
9	Thu	282	83	
10	Fri	283	82	
11	Sat	284	81	
12	Sun	285	80	42
13	Mon	286	79	
14	Tue	287	78	
15	Wed	288	77	
16	Thu	289	76	
17	Fri	290	75	
18	Sat	291	74	
19	Sun	292	73	43
20	Mon	293	72	
21	Tue	294	71	
22	Wed	295	70	
23	Thu	296	69	
24	Fri	297	68	
25	Sat	298	67	
26	Sun	299	66	44
27	Mon	300	65	
28	Tue	301	64	
29	Wed	302	63	
30	Thu	303	62	
31	Fri	304	61	

Day of Month	11 November			
	Day of Week	Day of Year	Days remaining	Week number
1	Sat	305	60	44
2	Sun	306	59	45
3	Mon	307	58	
4	Tue	308	57	
5	Wed	309	56	
6	Thu	310	55	
7	Fri	311	54	
8	Sat	312	53	
9	Sun	313	52	46
10	Mon	314	51	
11	Tue	315	50	
12	Wed	316	49	
13	Thu	317	48	
14	Fri	318	47	
15	Sat	319	46	
16	Sun	320	45	47
17	Mon	321	44	
18	Tue	322	43	
19	Wed	323	42	
20	Thu	324	41	
21	Fri	325	40	
22	Sat	326	39	
23	Sun	327	38	48
24	Mon	328	37	
25	Tue	329	36	
26	Wed	330	35	
27	Thu	331	34	
28	Fri	332	33	
29	Sat	333	32	
30	Sun	334	31	49

Day of Month	12 December			
	Day of Week	Day of Year	Days remaining	Week number
1	Mon	335	30	49
2	Tue	336	29	
3	Wed	337	28	
4	Thu	338	27	
5	Fri	339	26	
6	Sat	340	25	
7	Sun	341	24	50
8	Mon	342	23	
9	Tue	343	22	
10	Wed	344	21	
11	Thu	345	20	
12	Fri	346	19	
13	Sat	347	18	
14	Sun	348	17	51
15	Mon	349	16	
16	Tue	350	15	
17	Wed	351	14	
18	Thu	352	13	
19	Fri	353	12	
20	Sat	354	11	
21	Sun	355	10	52
22	Mon	356	9	
23	Tue	357	8	
24	Wed	358	7	
25	Thu	359	6	
26	Fri	360	5	
27	Sat	361	4	
28	Sun	362	3	1
29	Mon	363	2	
30	Tue	364	1	
31	Wed	365	0	

Thirty days hath September, April, June, and November; February has twenty-eight alone, All the rest have thirty-one,
Excepting leap-year, that's the time when February's days are twenty-nine.

Useful Information

Time Signals- by telephone

WWV 303-499-7111 **WWVH** 808-335-4363

CHU **English:** 613-745-1576 (CHU provides only Eastern time announcements)
French: 613-745-9426

Time signals- by Radio

WWV (Fort Collins, Colorado)	2.5, 5, 10, 15, 20 MHz (male voice)
WWVH (Kauai, Hawaii)	2.5, 5, 10, 15 MHz (female voice)
CHU (Ottawa, Canada)	3330, 7850, and 14,670 kHz (USB)

Bowditch *2019- The American Practical Navigator*

https://TheNauticalAlmanac.com/2019_Bowditch-_American_Practical_Navigator.html

Organized in a convenient and useful manner. Download the Chapters, Parts or Tables you want or the entire work.

The Terrestrial Almanac Annual calendar and day planner for the entire year.

https://TheNauticalAlmanac.com/TerrestrialAlmanac.html

Pub. No. 249 Download individual Latitudes or Volumes

Epoch 2020 https://www.thenauticalalmanac.com/Pub_No_249_Epoch_2020.html

Epoch 2025 https://www.thenauticalalmanac.com/Pub_No_249_Epoch_2025.html

Pub. No. 229 Download individual Volumes covering a range of Latitudes

https://TheNauticalAlmanac.com/Pub. No. 229.html

Sight Reduction Forms & Methods

https://www.TheNauticalAlmanac.com/Methods.html

Celestial Navigation

useful Formulas

About Calculators

The Casio *fx-300ES Plus* is an inexpensive calculator at about 11 USD. It features *natural input* so you enter a formula just as it would be written on paper. Entering degrees, minutes and seconds is very simple. The Casio *fx-300ES Plus* has 9 memory locations and you can review many of the previous entries you make using a special key on the calculator.

Determine Hc using a calculator

The formula

Hc = asin[sin(**Declination**)*sin(**Latitude**) + cos(**Latitude**)*cos(**Declination**)*cos(**LHA**)]

As it would be entered into the Casio calculator Note- Sin^{-1} is the arc-sin key

Sin^{-1}(Sin(**Ap Latitude**) x Sin(**Declination**) + Cos(**Ap Latitude)** x Cos(**Declination**) x Cos(**LHA**)

Declination is the declination of the Celestial body you're observing. When the heavenly body's declination is *Contrary name* to your Ap Latitude enter a negative sign before it.

Latitude "The AP latitude is chosen to be the nearest whole degree in latitude to the DR latitude." *from Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310* Consider this to be where you are, think you are or where you would like to determine Hc for. Typically, you'll be using an *Assumed position Latitude* or *Ap Latitude* as it's called. *See Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310*

About LHA determination

Assumed Position longitude (***a* λ**) "The AP longitude is that nearest the DR longitude resulting in a whole degree of LHA for the observed body." *From Bowditch 2019 Vol. 1 Chapter 19 section 1902 p. 310*

In Western Longitudes *see Bowditch 2019 Vol. 1 Chapter 19 section 1905 p. 313*

LHA is the Local Hour Angle derived by subtracting your Assumed Longitude (***a* λ**) whole degree value from the whole degree ***GHA*** (Greenwich Hour Angle) value. If GHA is less than the ***a* λ** than the add 360° to it then subtract the ***a* λ.** *Ignore the arc minutes* of GHA and ***a* λ.**

Example when GHA is less than ***a* λ** **GHA**= 43° 25.2' ***a* λ**= W 55° 15.1'

360° + 43° = 403° Then....403° – 55° = 348° (LHA)

In Eastern Longitudes *see Bowditch 2019 Vol. 1 Chapter 19 section 1905 p. 313*

LHA**, in **Eastern Longitudes, is determined by adding the entire GHA figure (degrees and minutes) to the whole degree figure of the Assumed longitude (***a* λ**) *plus* the amount of arc minutes required to get to the next degree of the GHA. If the resulting LHA figure is greater than 360° then subtract 360° from the figure to obtain the LHA.

Example- **GHA**= 58° 01.2' ***a* λ**= E 9° 10.1' (ignore the 10.1')

Step 1- *get GHA degree difference;* 59° - 58° 01.2' = 0° 58.8'

Step 2- add *a* λ degrees to *difference* found in step 1; 9° + 0°58.8' = 9° 58.8' *a* λ

Step 3- *get LHA;* 58° 01.2 + 9° 58.8' = 68° (LHA)

Why would you want to determine Hc using a calculator?

It's faster than looking up in Pub. No. 249 and Pub. No. 229, highly accurate and you don't need a lot of printed out pages of Latitudes from Pub. No. 249 and Pub. No. 229. Pub. No. 249 Vol. 2 & 3 don't cover any declination greater than 29 degrees so you'd have to use Pub. No. 229 which is extremely large.

Celestial Navigation

Determine Z

Z = acos[(sin(**Declination**) – sin(**Ap Latitude)** x sin(**Hc**)) ÷ (cos(**Ap Latitude**) x cos(**Hc**))]

As it would be entered into the Casio calculator... Note- Cos^{-1} is the arc-cosine key

Cos^{-1}((Sin(**Declination**) – Sin(**AP Latitude**) x Sin(**Hc**)) ÷ (Cos(**AP Latitude**) x Cos(**Hc**)

If the heavenly body's declination is *Contrary name* to the Ap Latitude enter a negative sign before it.

To obtain Zn see the rules below for Northern and Southern latitudes.

Determine Z independent of Hc

$$Z = \tan^{-1}\left(\frac{\sin \mathrm{LHA}}{(\cos \mathrm{L} \tan \mathrm{d}) - (\sin \mathrm{L} \cos \mathrm{LHA})}\right)$$

"L" is latitude and "*d"* is declination. When the heavenly body's declination is *Contrary name* to your Ap Latitude enter a negative sign before it.

As it would be entered into the Casio calculator... Note- $\tan^{-1}$ is the arc-tangent key

Z = $\tan^{-1}$ ((sin (**LHA**) ÷ (cos(**AP latitude**) x tan(**declination**) – (sin(**AP latitude**) x cos(**LHA**))

The sign convention used in the calculation of this azimuth formula is as follows:
from *Bowditch Chapter 22 CALCULATIONS AND CONVERSIONS, page 331*

1) If latitude and declination are of contrary name, declination is treated as a negative quantity;
2) If the local hour angle is greater than 180°, it is treated as a negative quantity. If the azimuth angle as calculated is negative, add 180° to obtain the desired value.

To obtain Zn apply the following rules

In Northern Latitudes	**In Southern Latitudes**
LHA greater than 180°....Zn=Z	LHA greater than 180°....Zn= 180° – Z
LHA less than 180°.....Zn=360° – Z	LHA less than 180°.....Zn= 180° + Z

Determine Refraction 0.96 ÷ Tan of (Ha)
Gives good results down to about 8° from the horizon but not less.

Refraction (good overall formula from 90° to below 8° from the horizon)

$$R_0 = \cot\left(H_a + \frac{7.31}{H_a + 4.4}\right)$$

As it would be entered into the Casio calculator...

1 ÷ Tan((Ha + (7.31 ÷ (Ha + 4.4))

Both refraction formulas use the standard pressure and temperature of;

1010 mb 10° C
29.83 in 53° F

Determine Dip using feet 0.97 x (Square Root of *He* (Height of Eye) in feet)

Determine Dip using meters 1.76 x (Square Root of *He* (Height of eye) in meters)

Rules to Calculate Latitude using the Sun- *Noon-Sight*

1- Latitude and declination *Same name* but latitude is greater than declination:

Latitude= (90° – Ho) + declination

2- Latitude and declination *Same name* but declination greater than latitude:

Latitude= Declination – (90° – Ho)

3- Latitude and declination *Contrary name*:

Latitude= (90° – Ho) – Declination

To get AP longitude (needed for plotting the LOP)

In Western longitudes

Combine the DR Longitude figure with only the minutes (of arc) of the total GHA figure. The Ap λ figure will be used when plotting the LOP on the UPS.

In Eastern longitudes

In Eastern longitudes the Ap λ is determined as follows;

DR longitude + (0°60' *minus* GHA minutes of arc)

Example- E 075° + (0°60' – 0° 02')= 75° 58' Ap longitude

fair winds...clear skies and following seas
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Formula Sheet added to NA.odt

Explanation of The Nautical Almanac *Daily Pages*

<table>
<tr><td>1</td><td>Date and Time based on GMT/UT</td></tr>
<tr><td>2</td><td>Mer. pass- meridian passage of Aries at the Prime Meridian- Greenwich- 0°. Time figure is GMT/UT.</td></tr>
<tr><td>3</td><td>
Planet or Moon GHA v value and planet or Moon declination d value.

v- “The change in hour angle arising from v of the body at the time of the sight observation is accounted for with the v correction.” Source- Bowditch 2017, Chapter 19- Sight Reduction p. 313. The planet’s v is positive unless preceeded by a minus sign which is sometimes the case with Venus. The sign of the Moon’s v is positive.

d- “The change in declination of the body at the time of the sight observation is accounted for with the d correction.” Source- Bowditch 2017, Chapter 19- Sight Reduction p. 313. The sign of the Moon or planet’s d correction is determined by the declination trend- positive if successive declination values increase and negative if they decrease.

Corrections for both v and d are found in the Increments and Corrections pages of The Nautical Almanac.

To find the correction for either v or d enter the Increments and Corrections pages for the minutes in time of the observation and find the value in the v and d corr. columns Find the v, or d, value in the left side of one of the three columns. To the right of that value is the v, or d, correction. Be sure to add or subtract the values depending upon the sign of the value as mentioned above.

Example for v & d correction- June 10, 2020 GMT- 21:19:10 Body- Moon

GHA= 247° 20.6’ v = 12.1’
GHA increment 4° 34.4’
v- correction for 12.1’ + 0° 03.9’
GHA= 251° 58.9’

Dec= S 17° 43.8’ d= 8.9’
d- correction for 8.9’ – 0° 02.9’
dec= S 17° 40.9’

declination trend is decreasing so the sign of d correction is negative
</td></tr>
<tr><td>4</td><td>m- is the magnitude or brightness of the planet.

A bright planet will have a minus sign beside the figure. A fainter planet will have no sign beside its magnitude figure.</td></tr>
<tr><td>5</td><td>Stars- SHA, Sidereal Hour Angle, and Declination. 59 stars are listed.

Typically, only 57 stars are used for navigational purposes in both Northern and Southern Hemispheres. Here you’ll also find Polaris and Scheat. In the Northern Hemisphere Polaris is often used for determination of latitude.</td></tr>
<tr><td>6</td><td>Mer. pass- planet meridian passage time at the Prime Meridian- Greenwich- 0°. Time figure is GMT/UT.</td></tr>
<tr><td>7</td><td>SHA- planet SHA.

Planet SHA is calculated by subtracting Aries GHA from planet GHA. If planet GHA figure is less than Aries GHA, add 360° to planet GHA and then subtract Aries GHA.</td></tr>
<tr><td>8</td><td>Horizontal parallax- for Venus and Mars.

Horizontal parallax is the angle subtended by half the Earth’s diameter as viewed from the planet in minutes of arc.</td></tr>
<tr><td>9</td><td>SD- Semi-diameter of the Sun in minutes of arc.

One half of the angular width of the Sun as observed on earth.</td></tr>
<tr><td>10</td><td>d- the daily average change, per hour, in the Sun’s declination in minutes of arc.</td></tr>
</table>

11	**SD**- Semi-diameter of the Moon in minutes of arc. Semi-diameter is one half of the angular width of the Moon, as observed on earth.
12	**HP**- the angle between two lines, one from the center of the Moon to the center of the Earth, the other from the center of the Moon to the edge of the Earth. This angle is about 56', but it changes slightly from day to day as the distance to the Moon changes along its elliptical path around the Earth. *Source- starpath.com*
13	**Sun- Eqn. of Time**- Basically the Equation of Time (EoT) is the difference between clock time and time seen on a sundial. This is comparing "clock time", as a mechanical measurement of time, and the sundial being time determined by the position of the Sun at any given moment. The figures listed are for 00^h and 12^h. Using the EoT you can get fairly accurate determination of when Meridian Passage (Local Apparent Noon) occurs at your position. Unshaded EoT values are subtracted from 12:00 to get Meridian Passage. Shaded EoT values are added to 12:00 to get Meridian Passage. An Equation of Time chart (as a curve) is provided in each almanac on TheNauticalAlmanac.com **Example**- Meridian Passage on May 30, 2020 equals 12:00 – EoT of 2 minutes 21 seconds MP= 11:57:39 *Local Apparent Noon* **Example**- Meridian Passage on August 25, 2020 equals 12:00 + EoT of 1 minute 59 seconds MP= 12:01:59 *Local Apparent Noon*
14	**Sun- Mer. Pass** just to the right of the **Eqn. of Time** is the approximate GMT/UT when the Sun crosses The Prime Meridian (at Greenwich) for that specific date.
15	**Moon- Mer. Pass**- is the approximate GMT/UT when the Moon crosses The Prime Meridian (at Greenwich) or the 180° line of longitude. **Upper** means the GMT/UT when the Moon crosses The Prime Meridian (Greenwich). **Lower** means the GMT/UT when the Moon crosses the 180° line of longitude.
16	**Moon- Age**- this is the number of days past a new Moon. Typically, there are 29 days in a lunar month. Moon- %- the amount of the Moon's illumination. 100% would be a full moon. 49% would be about ½ of the Moon is illuminated. A 3 day range percentage is provided but only one graphic for the phase.
17* see notes at bottom	**(morning) Twilight- Naut.**- the approximate GMT/UT when morning Nautical Twilight begins. Nautical twilight is the time when the center of the sun is 12° below the horizon and the horizon is visible enough to be used for marine sextant observations. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(morning) Twilight- Civil-** the approximate GMT/UT of morning civil twilight starts when the geometric center of the sun is 6° below the horizon. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* *see* notes *at bottom*	**Sunrise**- the approximate GMT/UT when the Sun is 0° 50' (semi-diameter plus refraction) below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.

17* see notes at bottom	**Sunset**- the approximate GMT/UT when the Sun is 0° 50' (semi-diameter plus refraction) below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(evening) Twilight- Civil-** the approximate GMT/UT of evening civil twilight that ends when the geometric center of the sun is 6° below the horizon. First locate your approximate Latitude in the **Lat**. column and then follow across horizontally to the right to find the time.
17* see notes at bottom	**(evening) Twilight- Naut.**- the approximate GMT/UT of when evening Nautical Twilight ends. Nautical twilight is the time when the center of the sun is 12° below the horizon and the horizon is no longer visible enough to be used for sextant observations. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time.
18* see notes at bottom	**Moonrise**- the approximate GMT/UT when the Moon is about 0° 05' to 0° 10' below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time under the specific day.
18* see notes at bottom	**Moonset**- the approximate GMT/UT when the Moon is about 0° 05' to 0° 10' below the horizon. First locate your approximate Latitude in the Lat. column and then follow across horizontally to the right to find the time under the specific day.

* Note-

▭ means the Sun or Moon remains continuously above the horizon on that day.

–:– can also mean twilight lasts all night

▬ means the Sun or Moon remains continuously below the horizon on that day.

–:– means Moon does not rise or set on that day but may have risen or set the previous day or following day.

* **Note**- Time of Sunrise, Sunset, Moonrise, Moonset and twilight is based on GMT/UT of the event at 0° (Greenwich) and can be condsidered as approximate LMT (Local Mean Time) with a tolerance of +/- 30 minutes depending on where you are within a time zone.

January 01, 02 ,03 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°32.5	181°58.1	S23°38.5	318°04.0	N18°45.1	131°37.2	S13°36.5	275°29.9	N00°18.5
1	115°35.0	196°57.1	38.4	333°06.8	45.4	146°39.2	36.4	290°32.3	18.5
2	130°37.4	211°56.1	38.3	348°09.6	45.6	161°41.2	36.2	305°34.7	18.5
3	145°39.9	226°55.1	·· 38.2	3°12.4	·· 45.8	176°43.2	·· 36.0	320°37.1	·· 18.5
4	160°42.4	241°54.2	38.1	18°15.2	46.0	191°45.1	35.8	335°39.5	18.5
5	175°44.8	256°53.2	38.0	33°18.1	46.2	206°47.1	35.7	350°41.9	18.5
6	190°47.3	271°52.2	S23°37.9	48°20.9	N18°46.5	221°49.1	S13°35.5	5°44.3	N00°18.5
7	205°49.8	286°51.3	37.8	63°23.7	46.7	236°51.1	35.3	20°46.7	18.5
8	220°52.2	301°50.3	37.7	78°26.5	46.9	251°53.0	35.1	35°49.2	18.5
9	235°54.7	316°49.3	·· 37.6	93°29.4	·· 47.1	266°55.0	·· 35.0	50°51.6	·· 18.4
10	250°57.2	331°48.4	37.5	108°32.2	47.3	281°57.0	34.8	65°54.0	18.4
11	265°59.6	346°47.4	37.4	123°35.0	47.6	296°59.0	34.6	80°56.4	18.4
12	281°02.1	1°46.4	S23°37.3	138°37.9	N18°47.8	312°00.9	S13°34.4	95°58.8	N00°18.4
13	296°04.5	16°45.5	37.2	153°40.7	48.0	327°02.9	34.3	111°01.2	18.4
14	311°07.0	31°44.5	37.1	168°43.5	48.2	342°04.9	34.1	126°03.6	18.4
15	326°09.5	46°43.5	·· 37.0	183°46.4	·· 48.5	357°06.8	·· 33.9	141°06.0	·· 18.4
16	341°11.9	61°42.6	36.9	198°49.2	48.7	12°08.8	33.7	156°08.4	18.4
17	356°14.4	76°41.6	36.8	213°52.0	48.9	27°10.8	33.6	171°10.8	18.4
18	11°16.9	91°40.6	S23°36.7	228°54.9	N18°49.1	42°12.8	S13°33.4	186°13.2	N00°18.3
19	26°19.3	106°39.6	36.5	243°57.7	49.4	57°14.7	33.2	201°15.7	18.3
20	41°21.8	121°38.7	36.4	259°00.6	49.6	72°16.7	33.0	216°18.1	18.3
21	56°24.3	136°37.7	·· 36.3	274°03.4	·· 49.8	87°18.7	·· 32.9	231°20.5	·· 18.3
22	71°26.7	151°36.7	36.2	289°06.3	50.0	102°20.7	32.7	246°22.9	18.3
23	86°29.2	166°35.8	36.1	304°09.1	50.3	117°22.6	32.5	261°25.3	18.3
Mer.pass.:17:14		v-1.0 d0.1 m-3.8		v2.8 d0.2 m-0.7		v2.0 d0.2 m-2.0		v2.4 d-0.0 m0.9	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	101°31.7	181°34.8	S23°36.0	319°12.0	N18°50.5	132°24.6	S13°32.3	276°27.7	N00°18.3
1	116°34.1	196°33.8	35.8	334°14.8	50.7	147°26.6	32.2	291°30.1	18.3
2	131°36.6	211°32.9	35.7	349°17.7	51.0	162°28.6	32.0	306°32.5	18.3
3	146°39.0	226°31.9	·· 35.6	4°20.5	·· 51.2	177°30.5	·· 31.8	321°34.9	·· 18.3
4	161°41.5	241°30.9	35.5	19°23.4	51.4	192°32.5	31.6	336°37.3	18.2
5	176°44.0	256°30.0	35.3	34°26.2	51.6	207°34.5	31.5	351°39.8	18.2
6	191°46.4	271°29.0	S23°35.2	49°29.1	N18°51.9	222°36.4	S13°31.3	6°42.2	N00°18.2
7	206°48.9	286°28.0	35.1	64°31.9	52.1	237°38.4	31.1	21°44.6	18.2
8	221°51.4	301°27.1	34.9	79°34.8	52.3	252°40.4	30.9	36°47.0	18.2
9	236°53.8	316°26.1	·· 34.8	94°37.7	·· 52.6	267°42.4	·· 30.8	51°49.4	·· 18.2
10	251°56.3	331°25.1	34.7	109°40.5	52.8	282°44.3	30.6	66°51.8	18.2
11	266°58.8	346°24.2	34.5	124°43.4	53.0	297°46.3	30.4	81°54.2	18.2
12	282°01.2	1°23.2	S23°34.4	139°46.3	N18°53.3	312°48.3	S13°30.2	96°56.6	N00°18.2
13	297°03.7	16°22.2	34.3	154°49.1	53.5	327°50.2	30.1	111°59.1	18.2
14	312°06.1	31°21.3	34.1	169°52.0	53.7	342°52.2	29.9	127°01.5	18.2
15	327°08.6	46°20.3	·· 34.0	184°54.9	·· 54.0	357°54.2	·· 29.7	142°03.9	·· 18.1
16	342°11.1	61°19.3	33.8	199°57.7	54.2	12°56.2	29.5	157°06.3	18.1
17	357°13.5	76°18.4	33.7	215°00.6	54.4	27°58.1	29.3	172°08.7	18.1
18	12°16.0	91°17.4	S23°33.6	230°03.5	N18°54.7	43°00.1	S13°29.2	187°11.1	N00°18.1
19	27°18.5	106°16.5	33.4	245°06.4	54.9	58°02.1	29.0	202°13.5	18.1
20	42°20.9	121°15.5	33.3	260°09.3	55.1	73°04.0	28.8	217°16.0	18.1
21	57°23.4	136°14.5	·· 33.1	275°12.1	·· 55.4	88°06.0	·· 28.6	232°18.4	·· 18.1
22	72°25.9	151°13.6	33.0	290°15.0	55.6	103°08.0	28.5	247°20.8	18.1
23	87°28.3	166°12.6	32.8	305°17.9	55.9	118°09.9	28.3	262°23.2	18.1
Mer.pass.:17:11		v-1.0 d0.1 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	102°30.8	181°11.6	S23°32.7	320°20.8	N18°56.1	133°11.9	S13°28.1	277°25.6	N00°18.1
1	117°33.3	196°10.7	32.5	335°23.7	56.3	148°13.9	27.9	292°28.0	18.1
2	132°35.7	211°09.7	32.4	350°26.6	56.6	163°15.9	27.8	307°30.4	18.1
3	147°38.2	226°08.7	·· 32.2	5°29.4	·· 56.8	178°17.8	·· 27.6	322°32.9	·· 18.0
4	162°40.6	241°07.8	32.0	20°32.3	57.0	193°19.8	27.4	337°35.3	18.0
5	177°43.1	256°06.8	31.9	35°35.2	57.3	208°21.8	27.2	352°37.7	18.0
6	192°45.6	271°05.8	S23°31.7	50°38.1	N18°57.5	223°23.7	S13°27.0	7°40.1	N00°18.0
7	207°48.0	286°04.9	31.6	65°41.0	57.8	238°25.7	26.9	22°42.5	18.0
8	222°50.5	301°03.9	31.4	80°43.9	58.0	253°27.7	26.7	37°44.9	18.0
9	237°53.0	316°03.0	·· 31.2	95°46.8	·· 58.2	268°29.6	·· 26.5	52°47.4	·· 18.0
10	252°55.4	331°02.0	31.1	110°49.7	58.5	283°31.6	26.3	67°49.8	18.0
11	267°57.9	346°01.0	30.9	125°52.6	58.7	298°33.6	26.2	82°52.2	18.0
12	283°00.4	1°00.1	S23°30.7	140°55.5	N18°59.0	313°35.5	S13°26.0	97°54.6	N00°18.0
13	298°02.8	15°59.1	30.6	155°58.4	59.2	328°37.5	25.8	112°57.0	18.0
14	313°05.3	30°58.1	30.4	171°01.3	59.5	343°39.5	25.6	127°59.4	18.0
15	328°07.8	45°57.2	·· 30.2	186°04.2	·· 59.7	358°41.4	·· 25.4	143°01.9	·· 18.0
16	343°10.2	60°56.2	30.1	201°07.1	18°59.9	13°43.4	25.3	158°04.3	17.9
17	358°12.7	75°55.3	29.9	216°10.0	19°00.2	28°45.4	25.1	173°06.7	17.9
18	13°15.1	90°54.3	S23°29.7	231°13.0	N19°00.4	43°47.3	S13°24.9	188°09.1	N00°17.9
19	28°17.6	105°53.3	29.5	246°15.9	00.7	58°49.3	24.7	203°11.5	17.9
20	43°20.1	120°52.4	29.4	261°18.8	00.9	73°51.3	24.6	218°13.9	17.9
21	58°22.5	135°51.4	·· 29.2	276°21.7	·· 01.2	88°53.3	·· 24.4	233°16.4	·· 17.9
22	73°25.0	150°50.4	29.0	291°24.6	01.4	103°55.2	24.2	248°18.8	17.9
23	88°27.5	165°49.5	28.8	306°27.5	01.7	118°57.2	24.0	263°21.2	17.9
Mer.pass.:17:07		v-1.0 d0.2 m-3.8		v2.9 d0.2 m-0.8		v2.0 d0.2 m-1.9		v2.4 d-0.0 m0.9	

Stars	SHA	Dec
Alpheratz	357°46.2	29°09.0
Ankaa	353°18.1	-42°15.2
Schedar	349°43.6	56°35.9
Diphda	348°58.3	-17°55.9
Achernar	335°28.3	-57°11.3
Hamal	328°03.5	23°30.8
Polaris	318°47.1	89°18.8
Akamar	315°19.9	-40°16.0
Menkar	314°17.5	4°07.8
Mirfak	308°43.7	49°54.0
Aldebaran	290°52.0	16°31.9
Rigel	281°14.1	-8°11.4
Capella	280°37.8	46°00.6
Bellatrix	278°34.4	6°21.5
Elnath	278°15.5	28°37.0
Alnilam	275°48.6	-1°11.7
Betelgeuse	271°03.7	7°24.5
Canopus	263°56.7	-52°42.1
Sirius	258°35.5	-16°43.6
Adara	255°14.1	-28°59.2
Procyon	245°01.9	5°12.0
Pollux	243°30.3	28°00.0
Avior	234°18.6	-59°32.4
Suhail	222°54.0	-43°28.3
Miaplacidus	221°39.7	-69°45.4
Alphard	217°58.3	-8°42.2
Regulus	207°45.9	11°54.9
Dubhe	193°54.2	61°41.4
Denebola	182°36.0	14°30.8
Gienah	175°54.9	-17°35.9
Acrux	173°12.3	-63°09.1
Gacrux	172°03.9	-57°10.0
Alioth	166°22.8	55°53.9
Spica	158°34.0	-11°12.9
Alcaid	153°00.9	49°15.4
Hadar	148°51.9	-60°25.1
Menkent	148°10.8	-36°25.1
Arcturus	145°58.0	19°07.9
Rigil Kent.	139°55.6	-60°52.4
Zubenelg.	137°08.4	-16°05.0
Kochab	137°20.2	74°06.5
Alphecca	126°13.4	26°40.7
Antares	112°29.7	-26°27.2
Atria	107°34.4	-69°02.6
Sabik	102°15.8	-15°44.3
Shaula	96°25.8	-37°06.6
Rasalhague	96°09.1	12°33.1
Eltanin	90°47.8	51°29.2
Kaus Aust.	83°47.5	-34°22.8
Vega	80°41.1	38°47.5
Nunki	76°01.8	-26°17.1
Altair	62°11.1	8°53.7
Peacock	53°23.6	-56°42.2
Deneb	49°33.7	45°19.1
Enif	33°49.9	9°55.4
Alnair	27°47.1	-46°54.8
Fomalhaut	15°26.9	-29°34.2
Scheat	13°56.1	28°08.4
Markab	13°41.0	15°15.7

Jan 01 Fri	SHA	Mer.pass
Venus	81°25.5	11:53
Mars	217°31.4	02:47
Jupiter	31°04.7	15:12
Saturn	174°57.4	05:37

Jan 02 Sat	SHA	Mer.pass
Venus	80°03.2	11:54
Mars	217°40.3	02:43
Jupiter	30°53.0	15:08
Saturn	174°56.1	05:33

Jan 03 Sun	SHA	Mer.pass
Venus	78°40.8	11:56
Mars	217°50.0	02:38
Jupiter	30°41.1	15:05
Saturn	174°54.8	05:29

Horizontal parallax	
Venus:	0.1
Mars:	0.2

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2020 January 01 to Jan. 03

h	Sun		Moon				
Wed	GHA	Dec	GHA	v	Dec	d	HP
0	179° 13.7	S23° 03.5	110° 56.9	15.3′	S09° 58.5	10.7′	54.3′
1	194° 13.4	03.3	125° 31.3	15.4′	09° 47.8	10.7′	54.3′
2	209° 13.1	03.1	140° 05.7	15.4′	09° 37.1	10.7′	54.3′
3	224° 12.8	·· 03.0	154° 40.1	15.5′	09° 26.3	10.8′	54.3′
4	239° 12.5	02.8	169° 14.6	15.5′	09° 15.5	10.8′	54.3′
5	254° 12.2	02.6	183° 49.1	15.5′	09° 04.7	10.8′	54.2′
6	269° 11.9	S23° 02.4	198° 23.6	15.6′	S08° 53.8	10.9′	54.2′
7	284° 11.6	02.2	212° 58.2	15.6′	08° 42.9	10.9′	54.2′
8	299° 11.3	02.0	227° 32.8	15.6′	08° 32.0	10.9′	54.2′
9	314° 11.0	·· 01.8	242° 07.5	15.7′	08° 21.0	11.0′	54.2′
10	329° 10.7	01.6	256° 42.2	15.7′	08° 10.0	11.0′	54.2′
11	344° 10.4	01.4	271° 16.9	15.7′	07° 59.0	11.0′	54.2′
12	359° 10.1	S23° 01.2	285° 51.7	15.8′	S07° 48.0	11.1′	54.2′
13	14° 09.8	01.0	300° 26.4	15.8′	07° 36.9	11.1′	54.2′
14	29° 09.5	00.8	315° 01.2	15.8′	07° 25.8	11.1′	54.2′
15	44° 09.2	·· 00.6	329° 36.1	15.9′	07° 14.7	11.1′	54.2′
16	59° 08.9	00.4	344° 10.9	15.9′	07° 03.5	11.2′	54.2′
17	74° 08.6	00.2	358° 45.8	15.9′	06° 52.3	11.2′	54.2′
18	89° 08.3	S23° 00.0	13° 20.7	15.9′	S06° 41.1	11.2′	54.2′
19	104° 08.0	22° 59.7	27° 55.7	16.0′	06° 29.9	11.2′	54.2′
20	119° 07.7	59.5	42° 30.7	16.0′	06° 18.7	11.3′	54.2′
21	134° 07.5	·· 59.3	57° 05.6	16.0′	06° 07.4	11.3′	54.2′
22	149° 07.2	59.1	71° 40.6	16.0′	05° 56.1	11.3′	54.2′
23	164° 06.9	58.9	86° 15.7	16.0′	05° 44.8	11.3′	54.2′
	SD.=16.3	d=0.2	S.D.=14.8				

Thu	GHA	Dec	GHA	v	Dec	d	HP
0	179° 06.6	S22° 58.7	100° 50.7	16.1′	S05° 33.4	11.3′	54.2′
1	194° 06.3	58.5	115° 25.8	16.1′	05° 22.1	11.4′	54.2′
2	209° 06.0	58.3	130° 00.9	16.1′	05° 10.7	11.4′	54.2′
3	224° 05.7	·· 58.1	144° 36.0	16.1′	04° 59.3	11.4′	54.2′
4	239° 05.4	57.9	159° 11.1	16.1′	04° 47.9	11.4′	54.2′
5	254° 05.1	57.6	173° 46.3	16.1′	04° 36.5	11.4′	54.2′
6	269° 04.8	S22° 57.4	188° 21.4	16.2′	S04° 25.0	11.5′	54.2′
7	284° 04.5	57.2	202° 56.6	16.2′	04° 13.5	11.5′	54.2′
8	299° 04.2	57.0	217° 31.7	16.2′	04° 02.1	11.5′	54.2′
9	314° 03.9	·· 56.8	232° 06.9	16.2′	03° 50.6	11.5′	54.2′
10	329° 03.6	56.6	246° 42.1	16.2′	03° 39.0	11.5′	54.2′
11	344° 03.3	56.3	261° 17.3	16.2′	03° 27.5	11.5′	54.2′
12	359° 03.0	S22° 56.1	275° 52.6	16.2′	S03° 16.0	11.5′	54.2′
13	14° 02.8	55.9	290° 27.8	16.2′	03° 04.4	11.6′	54.2′
14	29° 02.5	55.7	305° 03.0	16.2′	02° 52.8	11.6′	54.2′
15	44° 02.2	·· 55.5	319° 38.3	16.2′	02° 41.3	11.6′	54.2′
16	59° 01.9	55.2	334° 13.5	16.2′	02° 29.7	11.6′	54.2′
17	74° 01.6	55.0	348° 48.8	16.3′	02° 18.1	11.6′	54.2′
18	89° 01.3	S22° 54.8	3° 24.0	16.3′	S02° 06.5	11.6′	54.2′
19	104° 01.0	54.6	17° 59.3	16.3′	01° 54.8	11.6′	54.2′
20	119° 00.7	54.3	32° 34.5	16.3′	01° 43.2	11.6′	54.2′
21	134° 00.4	·· 54.1	47° 09.8	16.3′	01° 31.6	11.6′	54.2′
22	149° 00.1	53.9	61° 45.0	16.3′	01° 19.9	11.7′	54.2′
23	163° 59.8	53.7	76° 20.3	16.3′	01° 08.2	11.7′	54.3′
	SD.=16.3	d=0.2	S.D.=14.8				

Fri	GHA	Dec	GHA	v	Dec	d	HP
0	178° 59.5	S22° 53.4	90° 55.5	16.2′	S00° 56.6	11.7′	54.3′
1	193° 59.3	53.2	105° 30.8	16.2′	00° 44.9	11.7′	54.3′
2	208° 59.0	53.0	120° 06.0	16.2′	00° 33.2	11.7′	54.3′
3	223° 58.7	·· 52.7	134° 41.3	16.2′	00° 21.5	11.7′	54.3′
4	238° 58.4	52.5	149° 16.5	16.2′	S00° 09.9	11.7′	54.3′
5	253° 58.1	52.3	163° 51.7	16.2′	N00° 01.8	11.7′	54.3′
6	268° 57.8	S22° 52.0	178° 26.9	16.2′	N00° 13.5	11.7′	54.3′
7	283° 57.5	51.8	193° 02.1	16.2′	00° 25.2	11.7′	54.3′
8	298° 57.2	51.6	207° 37.3	16.2′	00° 36.9	11.7′	54.3′
9	313° 56.9	·· 51.3	222° 12.5	16.2′	00° 48.6	11.7′	54.3′
10	328° 56.6	51.1	236° 47.7	16.2′	01° 00.3	11.7′	54.3′
11	343° 56.4	50.8	251° 22.8	16.1′	01° 12.0	11.7′	54.4′
12	358° 56.1	S22° 50.6	265° 58.0	16.1′	N01° 23.7	11.7′	54.4′
13	13° 55.8	50.4	280° 33.1	16.1′	01° 35.4	11.7′	54.4′
14	28° 55.5	50.1	295° 08.2	16.1′	01° 47.1	11.7′	54.4′
15	43° 55.2	·· 49.9	309° 43.3	16.1′	01° 58.8	11.7′	54.4′
16	58° 54.9	49.6	324° 18.4	16.1′	02° 10.5	11.7′	54.4′
17	73° 54.6	49.4	338° 53.4	16.0′	02° 22.2	11.7′	54.4′
18	88° 54.3	S22° 49.2	353° 28.4	16.0′	N02° 33.9	11.7′	54.4′
19	103° 54.0	48.9	8° 03.5	16.0′	02° 45.6	11.7′	54.4′
20	118° 53.8	48.7	22° 38.4	16.0′	02° 57.3	11.7′	54.5′
21	133° 53.5	·· 48.4	37° 13.4	16.0′	03° 09.0	11.7′	54.5′
22	148° 53.2	48.2	51° 48.4	15.9′	03° 20.6	11.7′	54.5′
23	163° 52.9	47.9	66° 23.3	15.9′	03° 32.3	11.7′	54.5′
	SD.=16.3	d=0.2	S.D.=14.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:23	10:41	▬	▬	13:27	15:45
N 70°	08:05	09:49	▬	▬	14:19	16:03
68°	07:50	09:16	▬	▬	14:52	16:18
66°	07:37	08:53	10:27	13:41	15:15	16:31
64°	07:26	08:34	09:49	14:19	15:34	16:41
62°	07:17	08:18	09:23	14:45	15:49	16:51
60°	07:09	08:05	09:02	15:06	16:02	16:59
N 58°	07:02	07:54	08:45	15:23	16:14	17:06
56°	06:56	07:44	08:31	15:37	16:24	17:12
54°	06:50	07:35	08:19	15:49	16:32	17:18
52°	06:44	07:28	08:08	16:00	16:40	17:24
50°	06:39	07:20	07:58	16:09	16:47	17:29
45°	06:28	07:05	07:38	16:29	17:03	17:40
N 40°	06:18	06:52	07:22	16:46	17:16	17:50
35°	06:08	06:40	07:08	17:00	17:28	17:59
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:11	06:35	17:32	17:56	18:24
N 10°	05:28	05:54	06:17	17:50	18:13	18:40
0°	05:11	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:24	18:43	19:08	19:37
30°	04:02	04:35	05:03	19:05	19:32	20:05
35°	03:44	04:20	04:50	19:17	19:47	20:23
40°	03:21	04:03	04:35	19:32	20:05	20:46
45°	02:52	03:41	04:18	19:50	20:27	21:15
S 50°	02:08	03:12	03:56	20:11	20:55	21:59
52°	01:42	02:57	03:45	20:22	21:10	22:24
54°	01:02	02:40	03:33	20:34	21:27	23:03
56°	▭	02:19	03:20	20:47	21:48	▭
58°	▭	01:51	03:03	21:04	22:15	▭
S 60°	▭	01:08	02:44	21:23	22:58	▭

18

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	12:37	12:18	12:00	21:58	23:43	–:–
N 70°	12:26	12:13	12:02	22:06	23:44	–:–
68°	12:17	12:10	12:03	22:14	23:45	–:–
66°	12:09	12:07	12:04	22:20	23:46	–:–
64°	12:02	12:04	12:05	22:25	23:47	–:–
62°	11:57	12:02	12:06	22:29	23:48	–:–
60°	11:52	12:00	12:07	22:33	23:49	–:–
N 58°	11:48	11:58	12:08	22:36	23:49	–:–
56°	11:44	11:56	12:08	22:39	23:50	–:–
54°	11:40	11:55	12:09	22:42	23:50	–:–
52°	11:37	11:54	12:10	22:44	23:51	–:–
50°	11:34	11:52	12:10	22:46	23:51	–:–
45°	11:28	11:50	12:11	22:51	23:52	–:–
N 40°	11:23	11:48	12:12	22:55	23:52	–:–
35°	11:18	11:46	12:13	22:58	23:53	–:–
30°	11:14	11:44	12:14	23:01	23:54	–:–
20°	11:07	11:41	12:15	23:06	23:54	–:–
N 10°	11:01	11:39	12:16	23:11	23:55	–:–
0°	10:55	11:36	12:17	23:15	23:56	–:–
S 10°	10:49	11:34	12:18	23:19	23:57	–:–
20°	10:43	11:31	12:19	23:24	23:57	–:–
30°	10:36	11:28	12:20	23:29	23:58	–:–
35°	10:32	11:26	12:21	23:31	23:59	–:–
40°	10:27	11:25	12:22	23:35	23:59	–:–
45°	10:21	11:22	12:23	23:38	–:–	00:00
S 50°	10:15	11:20	12:24	23:43	–:–	00:00
52°	10:12	11:18	12:25	23:45	–:–	00:01
54°	10:08	11:17	12:25	23:47	–:–	00:01
56°	10:05	11:15	12:26	23:49	–:–	00:01
58°	10:01	11:14	12:27	23:52	–:–	00:02
S 60°	09:56	11:12	12:28	23:55	–:–	00:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 6-8 34-53%
01	03:05	03:20	12:03	17:05	04:44	
02	03:34	03:48	12:04	17:46	05:26	
03	04:02	04:16	12:04	18:27	06:06	

1

2020 January 01 to Jan. 03

9 10 3 11 3 12 13 14 15 16

file date- June 16 2020

Information in the data page footers

Information pertaining to the IERS EOP data has been added to the odd data page footers if using MiKTeX or TeX Live (2020 or later). The International Earth Rotation Service (IERS) provides accurate data (updated weekly) on the Earth Orientation Parameters (EOP).

Earth's speed of rotation is not constant, i.e. the day length fluctuates.[1] This is due to *internal torques* caused by relative movements and mass redistribution of Earth's core, mantle, oceans, atmosphere, and cryosphere. This has an immediate impact on the GHA values of all celestial objects.

The IERS monitors and measures several parameters taking the actual speed of Earth's rotation into account. Their measured data begins on 2nd Januaray 1973. Predictive data begins following the last day of (obtained) data and extends about 360 days into the future. (The IERS results are published with a delay of about 18-hours between the date of publication and the last available date with measured EOP.[2]) These Nautical Almanac daily pages take the (measured or predicted) UT1-UTC values into account providing highly accurate navigational data especially if the predictions are fairly recent.

As long as either measured or predicted data is available the footer will show:
IERS Earth Orientation data as of dd-mmm-yyyy
This indicates that IERS EOP data is in use - older dates are measured; newer dates are predictions.

If the final date of IERS prediction data is on the current data page, the footer shows:
IERS Earth Orientation predictions end dd-mmm-yyyy

Pages with dates beyond the final date of IERS prediction data have the following footer:
No IERS EOP prediction data available
Skyfield then defaults to using the ΔT and leap second files that ship with Skyfield internally.

The footers mentioned are only displayed as long as **'useIERS = True'** is set in *config.py* to enable use of IERS EOP data.

Brief historical overview

The story begins with the XEphem astronomical library, which is declared 'end of life' by its author, Elwood Charles Downey, as no further updates are planned. He generously gave permission for use of XEphem code in Ephem (also known as Pyephem), an astronomical library authored by Brandon Rhodes. Enno Rodegerdts (https://sv-inua.net/) created the original Nautical Almanac 'daily pages' in Pyalmanac using Python 2 and LaTeX. After contacting him I obtained permission for its future enhancement and maintenance. Pyalmanac uses Ephem.

Meanwhile Brandon Rhodes was working on a far more sophisticated astronomical library, Skyfield. This was 'state of the art' and clearly surpassed the 'Jean Meeus'-based Pyephem/Ephem. Skyfield uses NASA's NAIF (Navigation and Ancillary Information Facility) SPICE algorithms. The results agree with those from the HORIZONS System (*operated by NASA JPL (Jet Propulsion Laboratory) SSD (Solar System Dynamics) group, not by NAIF*). This in turn implies that celestial positions calculated by Skyfield agree with those generated by the United States Naval Observatory and their *Astronomical Almanac* to within 0.0005 arcseconds (half a milliarcsecond).

Pyephem was then in 'maintenance mode'. Clearly Pyalmanac needed adaptation to use Skyfield, and thus SFalmanac was born. However its performance was poor regarding the calculation of 'events' such as: sunrise, sunset, moonrise, moonset, civil twilight start/end and nautical twilight start/end. An interim (faster) solution was required.

A hybrid application, originally named Skyalmanac, was developed using Ephem to calculate 'events' and Skyfield for the rest. This was indeed much faster at the cost of poorer 'event time' data. It took a while to find a better solution: multiprocessing, which was built into SFalmanac. This now could compare to the execution times in Pyalmanac but with improved data.

New functionality was added to SFalmanac, e.g. lunar phase as a graphic; Lunar Distance tables and charts. The original Skyalmanac is deprecated and has now been replaced with the latest SFalmanac code, so Skyalmanac and SFalmanac are now identical apart from the name. Since April 2019 http://thenauticalalmanac.com has been publishing Celestial Navigation related material with software provided here.

[1] https://en.wikipedia.org/wiki/Day_length_fluctuations
[2] https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html

January 01, 02, 03 UT (Wed., Thu., Fri.)

DUT1 = UT1-UTC = +0.1849 sec ΔT = TT-UT1 = +68.9991 sec

2025 January 01 to Jan. 03 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°54.0	130°30.3	S13°35.2	335°46.4	N23°32.7	29°01.0	N21°47.2	114°23.0	S07°55.0
1	115°56.4	145°30.2	34.1	350°49.7	33.0	44°03.8	47.2	129°25.3	54.9
2	130°58.9	160°30.2	33.0	5°53.1	33.3	59°06.5	47.2	144°27.6	54.8
3	146°01.4	175°30.1	·· 31.9	20°56.4	·· 33.5	74°09.3	·· 47.2	159°29.9	·· 54.8
4	161°03.8	190°30.0	30.8	35°59.7	33.8	89°12.0	47.1	174°32.2	54.7
5	176°06.3	205°30.0	29.7	51°03.0	34.1	104°14.8	47.1	189°34.4	54.6
6	191°08.8	220°29.9	S13°28.6	66°06.3	N23°34.4	119°17.5	N21°47.1	204°36.7	S07°54.5
7	206°11.2	235°29.9	27.5	81°09.6	34.6	134°20.3	47.1	219°39.0	54.5
8	221°13.7	250°29.8	26.4	96°13.0	34.9	149°23.0	47.0	234°41.3	54.4
9	236°16.2	265°29.7	·· 25.4	111°16.3	·· 35.2	164°25.8	·· 47.0	249°43.6	·· 54.3
10	251°18.6	280°29.7	24.3	126°19.6	35.5	179°28.5	47.0	264°45.9	54.2
11	266°21.1	295°29.6	23.2	141°22.9	35.7	194°31.3	47.0	279°48.2	54.1
12	281°23.5	310°29.6	S13°22.1	156°26.2	N23°36.0	209°34.0	N21°46.9	294°50.5	S07°54.1
13	296°26.0	325°29.5	21.0	171°29.6	36.3	224°36.8	46.9	309°52.8	54.0
14	311°28.5	340°29.5	19.9	186°32.9	36.6	239°39.5	46.9	324°55.0	53.9
15	326°30.9	355°29.4	·· 18.8	201°36.2	·· 36.8	254°42.3	·· 46.9	339°57.3	·· 53.8
16	341°33.4	10°29.4	17.7	216°39.5	37.1	269°45.0	46.9	354°59.6	53.7
17	356°35.9	25°29.3	16.6	231°42.9	37.4	284°47.7	46.8	10°01.9	53.7
18	11°38.3	40°29.3	S13°15.5	246°46.2	N23°37.7	299°50.5	N21°46.8	25°04.2	S07°53.6
19	26°40.8	55°29.2	14.4	261°49.5	37.9	314°53.2	46.8	40°06.5	53.5
20	41°43.3	70°29.2	13.3	276°52.9	38.2	329°56.0	46.8	55°08.8	53.4
21	56°45.7	85°29.1	·· 12.2	291°56.2	·· 38.5	344°58.7	·· 46.7	70°11.1	·· 53.4
22	71°48.2	100°29.1	11.1	306°59.5	38.8	0°01.5	46.7	85°13.4	53.3
23	86°50.7	115°29.1	10.0	322°02.9	39.0	15°04.2	46.7	100°15.6	53.2
Mer.pass. 17:14		ν -0.1′	d 1.1′	m -4.45	ν 3.3′	d 0.3′	m -1.21	ν 2.7′	d -0.0′ m -2.74	ν 2.3′	d 0.1′ m 1.05
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	101°53.1	130°29.0	S13°08.9	337°06.2	N23°39.3	30°07.0	N21°46.7	115°17.9	S07°53.1
1	116°55.6	145°29.0	07.8	352°09.6	39.6	45°09.7	46.6	130°20.2	53.0
2	131°58.0	160°28.9	06.7	7°12.9	39.9	60°12.4	46.6	145°22.5	53.0
3	147°00.5	175°28.9	·· 05.6	22°16.2	·· 40.1	75°15.2	·· 46.6	160°24.8	·· 52.9
4	162°03.0	190°28.9	04.5	37°19.6	40.4	90°17.9	46.6	175°27.1	52.8
5	177°05.4	205°28.8	03.4	52°22.9	40.7	105°20.7	46.5	190°29.4	52.7
6	192°07.9	220°28.8	S13°02.3	67°26.3	N23°41.0	120°23.4	N21°46.5	205°31.6	S07°52.6
7	207°10.4	235°28.7	01.2	82°29.6	41.3	135°26.2	46.5	220°33.9	52.6
8	222°12.8	250°28.7	13°00.1	97°33.0	41.5	150°28.9	46.5	235°36.2	52.5
9	237°15.3	265°28.7	12°59.0	112°36.3	·· 41.8	165°31.6	·· 46.4	250°38.5	·· 52.4
10	252°17.8	280°28.6	57.9	127°39.7	42.1	180°34.4	46.4	265°40.8	52.3
11	267°20.2	295°28.6	56.8	142°43.0	42.4	195°37.1	46.4	280°43.1	52.2
12	282°22.7	310°28.6	S12°55.7	157°46.4	N23°42.6	210°39.9	N21°46.4	295°45.4	S07°52.2
13	297°25.2	325°28.6	54.5	172°49.7	42.9	225°42.6	46.3	310°47.7	52.1
14	312°27.6	340°28.5	53.4	187°53.1	43.2	240°45.3	46.3	325°49.9	52.0
15	327°30.1	355°28.5	·· 52.3	202°56.4	·· 43.5	255°48.1	·· 46.3	340°52.2	·· 51.9
16	342°32.5	10°28.5	51.2	217°59.8	43.7	270°50.8	46.3	355°54.5	51.8
17	357°35.0	25°28.4	50.1	233°03.1	44.0	285°53.6	46.3	10°56.8	51.8
18	12°37.5	40°28.4	S12°49.0	248°06.5	N23°44.3	300°56.3	N21°46.2	25°59.1	S07°51.7
19	27°39.9	55°28.4	47.9	263°09.8	44.6	315°59.0	46.2	41°01.4	51.6
20	42°42.4	70°28.4	46.8	278°13.2	44.8	331°01.8	46.2	56°03.6	51.5
21	57°44.9	85°28.3	·· 45.7	293°16.6	·· 45.1	346°04.5	·· 46.2	71°05.9	·· 51.4
22	72°47.3	100°28.3	44.6	308°19.9	45.4	1°07.2	46.1	86°08.2	51.4
23	87°49.8	115°28.3	43.5	323°23.3	45.7	16°10.0	46.1	101°10.5	51.3
Mer.pass. 17:10		ν -0.0′	d 1.1′	m -4.46	ν 3.3′	d 0.3′	m -1.24	ν 2.7′	d -0.0′ m -2.74	ν 2.3′	d 0.1′ m 1.06
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	102°52.3	130°28.3	S12°42.4	338°26.6	N23°45.9	31°12.7	N21°46.1	116°12.8	S07°51.2
1	117°54.7	145°28.3	41.2	353°30.0	46.2	46°15.5	46.1	131°15.1	51.1
2	132°57.2	160°28.3	40.1	8°33.4	46.5	61°18.2	46.0	146°17.4	51.0
3	147°59.6	175°28.2	·· 39.0	23°36.7	·· 46.8	76°20.9	·· 46.0	161°19.6	·· 50.9
4	163°02.1	190°28.2	37.9	38°40.1	47.1	91°23.7	46.0	176°21.9	50.9
5	178°04.6	205°28.2	36.8	53°43.5	47.3	106°26.4	46.0	191°24.2	50.8
6	193°07.0	220°28.2	S12°35.7	68°46.8	N23°47.6	121°29.1	N21°45.9	206°26.5	S07°50.7
7	208°09.5	235°28.2	34.6	83°50.2	47.9	136°31.9	45.9	221°28.8	50.6
8	223°12.0	250°28.2	33.5	98°53.6	48.2	151°34.6	45.9	236°31.1	50.5
9	238°14.4	265°28.2	·· 32.3	113°57.0	·· 48.4	166°37.3	·· 45.9	251°33.3	·· 50.5
10	253°16.9	280°28.1	31.2	129°00.3	48.7	181°40.1	45.9	266°35.6	50.4
11	268°19.4	295°28.1	30.1	144°03.7	49.0	196°42.8	45.8	281°37.9	50.3
12	283°21.8	310°28.1	S12°29.0	159°07.1	N23°49.3	211°45.5	N21°45.8	296°40.2	S07°50.2
13	298°24.3	325°28.1	27.9	174°10.5	49.5	226°48.3	45.8	311°42.5	50.1
14	313°26.8	340°28.1	26.8	189°13.8	49.8	241°51.0	45.8	326°44.8	50.1
15	328°29.2	355°28.1	·· 25.7	204°17.2	·· 50.1	256°53.7	·· 45.7	341°47.0	·· 50.0
16	343°31.7	10°28.1	24.5	219°20.6	50.4	271°56.5	45.7	356°49.3	49.9
17	358°34.1	25°28.1	23.4	234°24.0	50.6	286°59.2	45.7	11°51.6	49.8
18	13°36.6	40°28.1	S12°22.3	249°27.4	N23°50.9	302°01.9	N21°45.7	26°53.9	S07°49.7
19	28°39.1	55°28.1	21.2	264°30.8	51.2	317°04.7	45.6	41°56.2	49.6
20	43°41.5	70°28.1	20.1	279°34.1	51.5	332°07.4	45.6	56°58.4	49.6
21	58°44.0	85°28.1	·· 19.0	294°37.5	·· 51.7	347°10.1	·· 45.6	72°00.7	·· 49.5
22	73°46.5	100°28.1	17.8	309°40.9	52.0	2°12.9	45.6	87°03.0	49.4
23	88°48.9	115°28.1	16.7	324°44.3	52.3	17°15.6	45.6	102°05.3	49.3
Mer.pass. 17:06		ν -0.0′	d 1.1′	m -4.47	ν 3.4′	d 0.3′	m -1.26	ν 2.7′	d -0.0′ m -2.73	ν 2.3′	d 0.1′ m 1.06

Stars

	SHA	Dec
Alpheratz	357°34.8	29°13.9
Ankaa	353°07.2	-42°10.4
Schedar	349°31.1	56°40.7
Diphda	348°47.3	-17°51.1
Achernar	335°20.0	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°44.0	89°22.4
Acamar	315°11.5	-40°12.4
Menkar	314°06.0	4°11.3
Mirfak	308°27.9	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.4	46°01.4
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.7
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.8	-52°42.5
Sirius	258°25.9	-16°45.0
Adhara	255°05.5	-29°00.3
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.2
Suhail	222°46.0	-43°31.9
Miaplacidus	221°37.5	-69°48.9
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°36.7
Denebola	182°24.9	14°25.8
Gienah	175°43.6	-17°40.8
Acrux	173°00.1	-63°14.0
Gacrux	171°51.7	-57°14.9
Alioth	166°13.0	55°49.1
Spica	158°22.4	-11°17.5
Alkaid	152°52.1	49°11.0
Hadar	148°36.3	-60°29.3
Menkent	147°57.8	-36°29.4
Arcturus	145°48.1	19°03.0
Rigil Kent.	139°40.7	-60°56.1
Kochab	137°20.4	74°02.8
Zuben'ubi	136°56.2	-16°08.7
Alphecca	126°04.0	26°37.7
Antares	112°16.2	-26°29.2
Atria	107°10.9	-69°04.2
Sabik	102°03.1	-15°45.4
Shaula	96°10.8	-37°07.3
Rasalhague	95°58.9	12°32.4
Eltanin	90°42.7	51°29.0
Kaus Aust.	83°32.9	-34°22.4
Vega	80°33.7	38°48.3
Nunki	75°48.2	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.4
Deneb	49°26.2	45°22.2
Enif	33°39.1	9°59.4
Al Na'ir	27°33.2	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 01 Wed	SHA	Mer.pass
Venus	29°36.3	15:18
Mars	234°52.5	01:37
Jupiter	288°07.1	22:00
Saturn	13°29.0	16:20

Jan 02 Thu	SHA	Mer.pass
Venus	28°35.9	15:18
Mars	235°13.1	01:31
Jupiter	288°13.8	21:56
Saturn	13°24.8	16:16

Jan 03 Fri	SHA	Mer.pass
Venus	27°36.0	15:18
Mars	235°34.4	01:26
Jupiter	288°20.5	21:51
Saturn	13°20.5	16:13

Horizontal parallax	
Venus:	0.2
Mars:	0.2

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.4	S22°59.9	164°13.2	7.1′	S25°51.6	7.2′	57.4′
1	194°08.1	59.7	178°39.2	7.1′	25°44.4	7.3′	57.4′
2	209°07.8	59.5	193°05.4	7.2′	25°37.1	7.6′	57.4′
3	224°07.5	·· 59.3	207°31.6	7.2′	25°29.5	7.6′	57.4′
4	239°07.2	59.1	221°57.8	7.3′	25°21.9	7.9′	57.5′
5	254°06.9	58.8	236°24.1	7.3′	25°14.0	7.9′	57.5′
6	269°06.6	S22°58.6	250°50.5	7.4′	S25°06.1	8.2′	57.5′
7	284°06.3	58.4	265°16.9	7.5′	24°57.9	8.2′	57.5′
8	299°06.0	58.2	279°43.3	7.5′	24°49.7	8.5′	57.5′
9	314°05.7	·· 58.0	294°09.8	7.6′	24°41.2	8.6′	57.6′
10	329°05.4	57.8	308°36.4	7.6′	24°32.6	8.7′	57.6′
11	344°05.1	57.6	323°03.0	7.7′	24°23.9	8.9′	57.6′
12	359°04.8	S22°57.4	337°29.7	7.8′	S24°15.0	9.0′	57.6′
13	14°04.5	57.1	351°56.5	7.8′	24°06.0	9.1′	57.6′
14	29°04.2	56.9	6°23.3	7.9′	23°56.9	9.3′	57.7′
15	44°03.9	·· 56.7	20°50.2	7.9′	23°47.6	9.5′	57.7′
16	59°03.7	56.5	35°17.1	8.0′	23°38.1	9.6′	57.7′
17	74°03.4	56.3	49°44.1	8.1′	23°28.5	9.7′	57.7′
18	89°03.1	S22°56.0	64°11.2	8.1′	S23°18.8	9.9′	57.7′
19	104°02.8	55.8	78°38.3	8.2′	23°08.9	10.0′	57.8′
20	119°02.5	55.6	93°05.5	8.3′	22°58.9	10.1′	57.8′
21	134°02.2	·· 55.4	107°32.8	8.3′	22°48.8	10.3′	57.8′
22	149°01.9	55.2	122°00.1	8.4′	22°38.5	10.4′	57.8′
23	164°01.6	54.9	136°27.5	8.5′	22°28.1	10.5′	57.8′
	SD = 16.3′	d = 0.2′	SD = 15.6′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°01.3	S22°54.7	150°55.0	8.5′	S22°17.6	10.7′	57.8′
1	194°01.0	54.5	165°22.5	8.6′	22°06.9	10.8′	57.9′
2	209°00.7	54.3	179°50.1	8.7′	21°56.1	11.0′	57.9′
3	224°00.4	·· 54.0	194°17.8	8.7′	21°45.1	11.0′	57.9′
4	239°00.1	53.8	208°45.5	8.8′	21°34.1	11.2′	57.9′
5	253°59.9	53.6	223°13.3	8.9′	21°22.9	11.3′	57.9′
6	268°59.6	S22°53.3	237°41.2	9.0′	S21°11.6	11.4′	58.0′
7	283°59.3	53.1	252°09.2	9.0′	21°00.2	11.6′	58.0′
8	298°59.0	52.9	266°37.2	9.1′	20°48.6	11.7′	58.0′
9	313°58.7	·· 52.6	281°05.3	9.2′	20°36.9	11.8′	58.0′
10	328°58.4	52.4	295°33.4	9.2′	20°25.1	11.9′	58.0′
11	343°58.1	52.2	310°01.7	9.3′	20°13.2	12.0′	58.0′
12	358°57.8	S22°51.9	324°30.0	9.4′	S20°01.2	12.2′	58.1′
13	13°57.5	51.7	338°58.3	9.4′	19°49.0	12.2′	58.1′
14	28°57.2	51.5	353°26.8	9.5′	19°36.8	12.4′	58.1′
15	43°56.9	·· 51.2	7°55.3	9.6′	19°24.4	12.5′	58.1′
16	58°56.7	51.0	22°23.9	9.7′	19°11.9	12.6′	58.1′
17	73°56.4	50.8	36°52.5	9.7′	18°59.3	12.7′	58.1′
18	88°56.1	S22°50.5	51°21.3	9.8′	S18°46.6	12.8′	58.2′
19	103°55.8	50.3	65°50.0	9.9′	18°33.8	12.9′	58.2′
20	118°55.5	50.0	80°18.9	9.9′	18°20.9	13.1′	58.2′
21	133°55.2	·· 49.8	94°47.8	10.0′	18°07.8	13.1′	58.2′
22	148°54.9	49.5	109°16.8	10.1′	17°54.7	13.2′	58.2′
23	163°54.6	49.3	123°45.9	10.1′	17°41.5	13.3′	58.2′
	SD = 16.3′	d = 0.2′	SD = 15.8′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.3	S22°49.1	138°15.0	10.2′	S17°28.2	13.5′	58.3′
1	193°54.1	48.8	152°44.2	10.3′	17°14.7	13.5′	58.3′
2	208°53.8	48.6	167°13.5	10.3′	17°01.2	13.6′	58.3′
3	223°53.5	·· 48.3	181°42.8	10.4′	16°47.6	13.7′	58.3′
4	238°53.2	48.1	196°12.2	10.5′	16°33.9	13.8′	58.3′
5	253°52.9	47.8	210°41.7	10.5′	16°20.1	13.9′	58.3′
6	268°52.6	S22°47.6	225°11.2	10.6′	S16°06.2	14.0′	58.3′
7	283°52.3	47.3	239°40.8	10.7′	15°52.2	14.1′	58.4′
8	298°52.0	47.1	254°10.4	10.7′	15°38.1	14.1′	58.4′
9	313°51.8	·· 46.8	268°40.1	10.8′	15°24.0	14.3′	58.4′
10	328°51.5	46.6	283°09.9	10.8′	15°09.7	14.3′	58.4′
11	343°51.2	46.3	297°39.8	10.9′	14°55.4	14.4′	58.4′
12	358°50.9	S22°46.1	312°09.6	11.0′	S14°41.0	14.5′	58.4′
13	13°50.6	45.8	326°39.6	11.0′	14°26.5	14.6′	58.4′
14	28°50.3	45.6	341°09.6	11.1′	14°11.9	14.7′	58.5′
15	43°50.0	·· 45.3	355°39.7	11.1′	13°57.2	14.7′	58.5′
16	58°49.7	45.0	10°09.8	11.2′	13°42.5	14.8′	58.5′
17	73°49.5	44.8	24°40.0	11.2′	13°27.7	14.9′	58.5′
18	88°49.2	S22°44.5	39°10.2	11.3′	S13°12.8	15.0′	58.5′
19	103°48.9	44.3	53°40.5	11.3′	12°57.8	15.0′	58.5′
20	118°48.6	44.0	68°10.9	11.4′	12°42.8	15.1′	58.5′
21	133°48.3	·· 43.7	82°41.3	11.4′	12°27.7	15.2′	58.5′
22	148°48.0	43.5	97°11.7	11.5′	12°12.5	15.2′	58.6′
23	163°47.8	43.2	111°42.2	11.5′	11°57.3	15.3′	58.6′
	SD = 16.3′	d = 0.2′	SD = 15.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:23	10:39	▬	▬	13:30	15:46
N 70°	08:04	09:47	▬	▬	14:21	16:05
68°	07:49	09:16	▬	▬	14:53	16:20
66°	07:37	08:52	10:25	13:43	15:17	16:32
64°	07:26	08:33	09:48	14:20	15:35	16:42
62°	07:17	08:18	09:22	14:47	15:50	16:52
60°	07:09	08:05	09:02	15:07	16:03	17:00
N 58°	07:02	07:54	08:45	15:24	16:15	17:07
56°	06:55	07:44	08:31	15:38	16:24	17:13
54°	06:50	07:35	08:19	15:50	16:33	17:19
52°	06:44	07:27	08:08	16:01	16:41	17:24
50°	06:39	07:20	07:58	16:10	16:48	17:29
45°	06:28	07:05	07:38	16:30	17:04	17:41
N 40°	06:18	06:52	07:22	16:46	17:17	17:51
35°	06:09	06:40	07:08	17:00	17:28	18:00
30°	06:00	06:30	06:56	17:12	17:38	18:08
20°	05:44	06:12	06:36	17:33	17:57	18:24
N 10°	05:28	05:55	06:17	17:51	18:14	18:40
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	04:53	05:20	05:43	18:25	18:48	19:15
20°	04:31	05:00	05:25	18:43	19:08	19:37
30°	04:03	04:36	05:03	19:05	19:32	20:05
35°	03:45	04:21	04:51	19:18	19:47	20:23
40°	03:22	04:03	04:36	19:32	20:05	20:46
45°	02:53	03:41	04:18	19:50	20:26	21:15
S 50°	02:09	03:13	03:57	20:11	20:55	21:58
52°	01:43	02:58	03:46	20:22	21:10	22:24
54°	01:04	02:41	03:34	20:34	21:27	23:02
56°	–:–	02:20	03:20	20:47	21:47	–:–
58°	–:–	01:52	03:04	21:03	22:15	–:–
S 60°	–:–	01:10	02:45	21:22	22:56	–:–

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	▬	12:47	▬	▬	18:17
N 70°	▬	13:51	12:17	▬	15:25	18:45
68°	▬	12:41	11:55	▬	16:33	19:05
66°	▬	12:04	11:38	▬	17:09	19:21
64°	12:03	11:38	11:23	15:16	17:34	19:34
62°	11:24	11:17	11:11	15:55	17:54	19:44
60°	10:57	11:00	11:01	16:21	18:09	19:54
N 58°	10:35	10:46	10:52	16:42	18:23	20:02
56°	10:18	10:33	10:43	16:59	18:34	20:09
54°	10:03	10:22	10:36	17:14	18:44	20:15
52°	09:50	10:13	10:30	17:26	18:53	20:20
50°	09:38	10:04	10:24	17:37	19:01	20:25
45°	09:14	09:46	10:11	18:00	19:18	20:36
N 40°	08:55	09:31	10:01	18:19	19:32	20:45
35°	08:39	09:18	09:52	18:34	19:44	20:53
30°	08:25	09:07	09:44	18:47	19:54	20:59
20°	08:01	08:47	09:30	19:09	20:11	21:11
N 10°	07:40	08:30	09:18	19:29	20:26	21:20
0°	07:20	08:15	09:06	19:47	20:40	21:30
S 10°	07:01	07:59	08:55	20:04	20:53	21:39
20°	06:40	07:42	08:42	20:23	21:08	21:48
30°	06:15	07:22	08:28	20:45	21:24	21:59
35°	06:01	07:10	08:20	20:58	21:34	22:05
40°	05:44	06:57	08:10	21:12	21:45	22:13
45°	05:24	06:41	07:59	21:29	21:57	22:21
S 50°	04:59	06:21	07:46	21:50	22:13	22:30
52°	04:46	06:12	07:39	22:00	22:20	22:35
54°	04:32	06:01	07:32	22:11	22:28	22:40
56°	04:16	05:50	07:24	22:24	22:36	22:45
58°	03:56	05:36	07:15	22:38	22:46	22:51
S 60°	03:31	05:19	07:05	22:56	22:58	22:58

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 2-4 1-11%
01	03:27	03:41	12:04	13:33	01:06	
02	03:55	04:09	12:04	14:27	02:01	
03	04:23	04:36	12:05	15:18	02:53	

No IERS EOP prediction data available

January 04, 05, 06 UT (Sat., Sun., Mon.)

DUT1 = UT1-UTC = +0.1856 sec ΔT = TT-UT1 = +68.9984 sec

2025 January 04 to Jan. 06 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	103°51.4	130°28.1	S12°15.6	339°47.7	N23°52.6	32°18.3	N21°45.5	117°07.6	S07°49.2
1	118°53.9	145°28.1	14.5	354°51.1	52.8	47°21.1	45.5	132°09.9	49.2
2	133°56.3	160°28.1	13.4	9°54.5	53.1	62°23.8	45.5	147°12.1	49.1
3	148°58.8	175°28.1	·· 12.2	24°57.9	·· 53.4	77°26.5	·· 45.5	162°14.4	·· 49.0
4	164°01.3	190°28.1	11.1	40°01.2	53.7	92°29.2	45.4	177°16.7	48.9
5	179°03.7	205°28.1	10.0	55°04.6	53.9	107°32.0	45.4	192°19.0	48.8
6	194°06.2	220°28.2	S12°08.9	70°08.0	N23°54.2	122°34.7	N21°45.4	207°21.3	S07°48.7
7	209°08.6	235°28.2	07.8	85°11.4	54.5	137°37.4	45.4	222°23.5	48.7
8	224°11.1	250°28.2	06.6	100°14.8	54.8	152°40.2	45.3	237°25.8	48.6
9	239°13.6	265°28.2	·· 05.5	115°18.2	·· 55.1	167°42.9	·· 45.3	252°28.1	·· 48.5
10	254°16.0	280°28.2	04.4	130°21.6	55.3	182°45.6	45.3	267°30.4	48.4
11	269°18.5	295°28.2	03.3	145°25.0	55.6	197°48.3	45.3	282°32.7	48.3
12	284°21.0	310°28.2	S12°02.1	160°28.4	N23°55.9	212°51.1	N21°45.3	297°34.9	S07°48.3
13	299°23.4	325°28.3	12°01.0	175°31.8	56.2	227°53.8	45.2	312°37.2	48.2
14	314°25.9	340°28.3	11°59.9	190°35.2	56.4	242°56.5	45.2	327°39.5	48.1
15	329°28.4	355°28.3	·· 58.8	205°38.6	·· 56.7	257°59.2	·· 45.2	342°41.8	·· 48.0
16	344°30.8	10°28.3	57.6	220°42.0	57.0	273°02.0	45.2	357°44.1	47.9
17	359°33.3	25°28.3	56.5	235°45.4	57.3	288°04.7	45.1	12°46.3	47.8
18	14°35.7	40°28.3	S11°55.4	250°48.8	N23°57.5	303°07.4	N21°45.1	27°48.6	S07°47.8
19	29°38.2	55°28.4	54.3	265°52.2	57.8	318°10.1	45.1	42°50.9	47.7
20	44°40.7	70°28.4	53.1	280°55.7	58.1	333°12.9	45.1	57°53.2	47.6
21	59°43.1	85°28.4	·· 52.0	295°59.1	·· 58.4	348°15.6	·· 45.1	72°55.5	·· 47.5
22	74°45.6	100°28.4	50.9	311°02.5	58.6	3°18.3	45.0	87°57.7	47.4
23	89°48.1	115°28.5	49.8	326°05.9	58.9	18°21.0	45.0	103°00.0	47.3
Mer.pass.	17:02	ν 0.0′	d 1.1′	m -4.48	ν 3.4′	d 0.3′	m -1.28	ν 2.7′	d -0.0′ m -2.72	ν 2.3′	d 0.1′ m 1.06

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	104°50.5	130°28.5	S11°48.6	341°09.3	N23°59.2	33°23.8	N21°45.0	118°02.3	S07°47.3
1	119°53.0	145°28.5	47.5	356°12.7	59.5	48°26.5	45.0	133°04.6	47.2
2	134°55.5	160°28.6	46.4	11°16.1	23°59.7	63°29.2	44.9	148°06.8	47.1
3	149°57.9	175°28.6	·· 45.2	26°19.5	24°00.0	78°31.9	·· 44.9	163°09.1	·· 47.0
4	165°00.4	190°28.6	44.1	41°22.9	00.3	93°34.7	44.9	178°11.4	46.9
5	180°02.9	205°28.6	43.0	56°26.4	00.5	108°37.4	44.9	193°13.7	46.8
6	195°05.3	220°28.7	S11°41.9	71°29.8	N24°00.8	123°40.1	N21°44.9	208°16.0	S07°46.8
7	210°07.8	235°28.7	40.7	86°33.2	01.1	138°42.8	44.8	223°18.2	46.7
8	225°10.2	250°28.7	39.6	101°36.6	01.4	153°45.5	44.8	238°20.5	46.6
9	240°12.7	265°28.8	·· 38.5	116°40.0	·· 01.6	168°48.3	·· 44.8	253°22.8	·· 46.5
10	255°15.2	280°28.8	37.3	131°43.5	01.9	183°51.0	44.8	268°25.1	46.4
11	270°17.6	295°28.9	36.2	146°46.9	02.2	198°53.7	44.8	283°27.3	46.3
12	285°20.1	310°28.9	S11°35.1	161°50.3	N24°02.5	213°56.4	N21°44.7	298°29.6	S07°46.3
13	300°22.6	325°28.9	33.9	176°53.7	02.7	228°59.1	44.7	313°31.9	46.2
14	315°25.0	340°29.0	32.8	191°57.1	03.0	244°01.9	44.7	328°34.2	46.1
15	330°27.5	355°29.0	·· 31.7	207°00.6	·· 03.3	259°04.6	·· 44.7	343°36.4	·· 46.0
16	345°30.0	10°29.1	30.5	222°04.0	03.6	274°07.3	44.6	358°38.7	45.9
17	0°32.4	25°29.1	29.4	237°07.4	03.8	289°10.0	44.6	13°41.0	45.8
18	15°34.9	40°29.2	S11°28.3	252°10.8	N24°04.1	304°12.7	N21°44.6	28°43.3	S07°45.8
19	30°37.4	55°29.2	27.1	267°14.3	04.4	319°15.5	44.6	43°45.6	45.7
20	45°39.8	70°29.2	26.0	282°17.7	04.7	334°18.2	44.6	58°47.8	45.6
21	60°42.3	85°29.3	·· 24.9	297°21.1	·· 04.9	349°20.9	·· 44.5	73°50.1	·· 45.5
22	75°44.7	100°29.3	23.7	312°24.6	05.2	4°23.6	44.5	88°52.4	45.4
23	90°47.2	115°29.4	22.6	327°28.0	05.5	19°26.3	44.5	103°54.7	45.3
Mer.pass.	16:58	ν 0.0′	d 1.1′	m -4.48	ν 3.4′	d 0.3′	m -1.30	ν 2.7′	d -0.0′ m -2.72	ν 2.3′	d 0.1′ m 1.06

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	105°49.7	130°29.4	S11°21.5	342°31.4	N24°05.8	34°29.0	N21°44.5	118°56.9	S07°45.2
1	120°52.1	145°29.5	20.3	357°34.9	06.0	49°31.8	44.4	133°59.2	45.2
2	135°54.6	160°29.5	19.2	12°38.3	06.3	64°34.5	44.4	149°01.5	45.1
3	150°57.1	175°29.6	·· 18.1	27°41.7	·· 06.6	79°37.2	·· 44.4	164°03.8	·· 45.0
4	165°59.5	190°29.7	16.9	42°45.2	06.8	94°39.9	44.4	179°06.0	44.9
5	181°02.0	205°29.7	15.8	57°48.6	07.1	109°42.6	44.4	194°08.3	44.8
6	196°04.5	220°29.8	S11°14.6	72°52.0	N24°07.4	124°45.3	N21°44.3	209°10.6	S07°44.7
7	211°06.9	235°29.8	13.5	87°55.5	07.7	139°48.0	44.3	224°12.9	44.7
8	226°09.4	250°29.9	12.4	102°58.9	07.9	154°50.8	44.3	239°15.1	44.6
9	241°11.8	265°29.9	·· 11.2	118°02.4	·· 08.2	169°53.5	·· 44.3	254°17.4	·· 44.5
10	256°14.3	280°30.0	10.1	133°05.8	08.5	184°56.2	44.3	269°19.7	44.4
11	271°16.8	295°30.1	08.9	148°09.2	08.7	199°58.9	44.2	284°22.0	44.3
12	286°19.2	310°30.1	S11°07.8	163°12.7	N24°09.0	215°01.6	N21°44.2	299°24.2	S07°44.2
13	301°21.7	325°30.2	06.7	178°16.1	09.3	230°04.3	44.2	314°26.5	44.1
14	316°24.2	340°30.3	05.5	193°19.6	09.6	245°07.0	44.2	329°28.8	44.1
15	331°26.6	355°30.3	·· 04.4	208°23.0	·· 09.8	260°09.7	·· 44.2	344°31.0	·· 44.0
16	346°29.1	10°30.4	03.2	223°26.5	10.1	275°12.5	44.1	359°33.3	43.9
17	1°31.6	25°30.5	02.1	238°29.9	10.4	290°15.2	44.1	14°35.6	43.8
18	16°34.0	40°30.5	S11°01.0	253°33.4	N24°10.6	305°17.9	N21°44.1	29°37.9	S07°43.7
19	31°36.5	55°30.6	10°59.8	268°36.8	10.9	320°20.6	44.1	44°40.1	43.6
20	46°39.0	70°30.7	58.7	283°40.2	11.2	335°23.3	44.0	59°42.4	43.6
21	61°41.4	85°30.7	·· 57.5	298°43.7	·· 11.5	350°26.0	·· 44.0	74°44.7	·· 43.5
22	76°43.9	100°30.8	56.4	313°47.1	11.7	5°28.7	44.0	89°47.0	43.4
23	91°46.3	115°30.9	55.3	328°50.6	12.0	20°31.4	44.0	104°49.2	43.3
Mer.pass.	16:54	ν 0.1′	d 1.1′	m -4.49	ν 3.4′	d 0.3′	m -1.32	ν 2.7′	d -0.0′ m -2.71	ν 2.3′	d 0.1′ m 1.07

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.2	-42°10.4
Schedar	349°31.1	56°40.7
Diphda	348°47.3	-17°51.1
Achernar	335°20.0	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°45.3	89°22.5
Acamar	315°11.5	-40°12.4
Menkar	314°06.0	4°11.3
Mirfak	308°27.9	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.4	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.7
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.8	-52°42.5
Sirius	258°25.9	-16°45.0
Adhara	255°05.5	-29°00.3
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.2
Suhail	222°45.9	-43°31.9
Miaplacidus	221°37.5	-69°49.0
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°36.7
Denebola	182°24.9	14°25.8
Gienah	175°43.5	-17°40.8
Acrux	173°00.1	-63°14.0
Gacrux	171°51.6	-57°14.9
Alioth	166°12.9	55°49.1
Spica	158°22.4	-11°17.5
Alkaid	152°52.1	49°11.0
Hadar	148°36.3	-60°29.3
Menkent	147°57.8	-36°29.4
Arcturus	145°48.0	19°03.0
Rigil Kent.	139°40.6	-60°56.1
Kochab	137°20.4	74°02.8
Zuben'ubi	136°56.2	-16°08.7
Alphecca	126°04.0	26°37.6
Antares	112°16.2	-26°29.2
Atria	107°10.9	-69°04.2
Sabik	102°03.1	-15°45.4
Shaula	96°10.8	-37°07.3
Rasalhague	95°58.9	12°32.4
Eltanin	90°42.7	51°29.0
Kaus Aust.	83°32.9	-34°22.4
Vega	80°33.7	38°48.3
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.4
Deneb	49°26.3	45°22.2
Enif	33°39.1	9°59.4
Al Na'ir	27°33.2	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 04 Sat	SHA	Mer.pass
Venus	26°36.7	15:18
Mars	235°56.3	01:21
Jupiter	288°26.9	21:47
Saturn	13°16.2	16:09

Jan 05 Sun	SHA	Mer.pass
Venus	25°38.0	15:18
Mars	236°18.8	01:15
Jupiter	288°33.2	21:42
Saturn	13°11.8	16:05

Jan 06 Mon	SHA	Mer.pass
Venus	24°39.8	15:18
Mars	236°41.8	01:10
Jupiter	288°39.4	21:38
Saturn	13°07.3	16:02

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.5	S22°43.0	126°12.8	11.6′	S11°42.0	15.4′	58.6′
1	193°47.2	42.7	140°43.4	11.6′	11°26.6	15.4′	58.6′
2	208°46.9	42.4	155°14.0	11.7′	11°11.2	15.5′	58.6′
3	223°46.6	·· 42.2	169°44.7	11.7′	10°55.7	15.5′	58.6′
4	238°46.3	41.9	184°15.4	11.8′	10°40.2	15.6′	58.6′
5	253°46.0	41.6	198°46.2	11.8′	10°24.6	15.7′	58.6′
6	268°45.8	S22°41.4	213°17.0	11.9′	S10°08.9	15.7′	58.7′
7	283°45.5	41.1	227°47.9	11.9′	09°53.2	15.8′	58.7′
8	298°45.2	40.8	242°18.8	11.9′	09°37.4	15.8′	58.7′
9	313°44.9	·· 40.6	256°49.8	12.0′	09°21.6	15.9′	58.7′
10	328°44.6	40.3	271°20.7	12.0′	09°05.7	15.9′	58.7′
11	343°44.4	40.0	285°51.8	12.1′	08°49.8	16.0′	58.7′
12	358°44.1	S22°39.7	300°22.8	12.1′	S08°33.8	16.0′	58.7′
13	13°43.8	39.5	314°53.9	12.1′	08°17.8	16.0′	58.7′
14	28°43.5	39.2	329°25.0	12.2′	08°01.8	16.2′	58.7′
15	43°43.2	·· 38.9	343°56.2	12.2′	07°45.6	16.1′	58.7′
16	58°42.9	38.6	358°27.4	12.2′	07°29.5	16.2′	58.8′
17	73°42.7	38.4	12°58.6	12.3′	07°13.3	16.2′	58.8′
18	88°42.4	S22°38.1	27°29.9	12.3′	S06°57.1	16.3′	58.8′
19	103°42.1	37.8	42°01.2	12.3′	06°40.8	16.3′	58.8′
20	118°41.8	37.5	56°32.5	12.3′	06°24.5	16.4′	58.8′
21	133°41.5	·· 37.3	71°03.8	12.4′	06°08.1	16.3′	58.8′
22	148°41.3	37.0	85°35.2	12.4′	05°51.8	16.5′	58.8′
23	163°41.0	36.7	100°06.5	12.4′	05°35.3	16.4′	58.8′
	SD = 16.3′	d = 0.3′	SD = 16.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.7	S22°36.4	114°37.9	12.4′	S05°18.9	16.5′	58.8′
1	193°40.4	36.1	129°09.4	12.4′	05°02.4	16.5′	58.8′
2	208°40.1	35.8	143°40.8	12.5′	04°45.9	16.5′	58.8′
3	223°39.9	·· 35.6	158°12.3	12.5′	04°29.4	16.6′	58.9′
4	238°39.6	35.3	172°43.7	12.5′	04°12.8	16.5′	58.9′
5	253°39.3	35.0	187°15.2	12.5′	03°56.3	16.6′	58.9′
6	268°39.0	S22°34.7	201°46.7	12.5′	S03°39.7	16.7′	58.9′
7	283°38.8	34.4	216°18.2	12.5′	03°23.0	16.6′	58.9′
8	298°38.5	34.1	230°49.8	12.5′	03°06.4	16.7′	58.9′
9	313°38.2	·· 33.8	245°21.3	12.5′	02°49.7	16.7′	58.9′
10	328°37.9	33.5	259°52.9	12.6′	02°33.0	16.7′	58.9′
11	343°37.6	33.3	274°24.4	12.6′	02°16.3	16.7′	58.9′
12	358°37.4	S22°33.0	288°56.0	12.6′	S01°59.6	16.7′	58.9′
13	13°37.1	32.7	303°27.5	12.6′	01°42.9	16.7′	58.9′
14	28°36.8	32.4	317°59.1	12.6′	01°26.2	16.8′	58.9′
15	43°36.5	·· 32.1	332°30.7	12.6′	01°09.4	16.7′	58.9′
16	58°36.3	31.8	347°02.2	12.6′	00°52.7	16.8′	59.0′
17	73°36.0	31.5	1°33.8	12.6′	00°35.9	16.8′	59.0′
18	88°35.7	S22°31.2	16°05.4	12.6′	S00°19.1	16.7′	59.0′
19	103°35.4	30.9	30°36.9	12.6′	S00°02.4	16.8′	59.0′
20	118°35.2	30.6	45°08.5	12.5′	N00°14.4	16.8′	59.0′
21	133°34.9	·· 30.3	59°40.0	12.5′	00°31.2	16.8′	59.0′
22	148°34.6	30.0	74°11.6	12.5′	00°48.0	16.7′	59.0′
23	163°34.3	29.7	88°43.1	12.5′	01°04.7	16.8′	59.0′
	SD = 16.3′	d = 0.3′	SD = 16.0′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.1	S22°29.4	103°14.6	12.5′	N01°21.5	16.8′	59.0′
1	193°33.8	29.1	117°46.1	12.5′	01°38.3	16.8′	59.0′
2	208°33.5	28.8	132°17.6	12.5′	01°55.1	16.7′	59.0′
3	223°33.2	·· 28.5	146°49.1	12.5′	02°11.8	16.8′	59.0′
4	238°33.0	28.2	161°20.5	12.4′	02°28.6	16.7′	59.0′
5	253°32.7	27.9	175°52.0	12.4′	02°45.3	16.8′	59.0′
6	268°32.4	S22°27.6	190°23.4	12.4′	N03°02.1	16.7′	59.0′
7	283°32.1	27.3	204°54.8	12.4′	03°18.8	16.7′	59.0′
8	298°31.9	27.0	219°26.2	12.4′	03°35.5	16.7′	59.1′
9	313°31.6	·· 26.7	233°57.5	12.3′	03°52.2	16.6′	59.1′
10	328°31.3	26.4	248°28.9	12.3′	04°08.8	16.7′	59.1′
11	343°31.0	26.1	263°00.2	12.3′	04°25.5	16.6′	59.1′
12	358°30.8	S22°25.7	277°31.5	12.2′	N04°42.1	16.7′	59.1′
13	13°30.5	25.4	292°02.7	12.2′	04°58.8	16.6′	59.1′
14	28°30.2	25.1	306°33.9	12.2′	05°15.4	16.5′	59.1′
15	43°30.0	·· 24.8	321°05.1	12.2′	05°31.9	16.6′	59.1′
16	58°29.7	24.5	335°36.3	12.1′	05°48.5	16.5′	59.1′
17	73°29.4	24.2	350°07.4	12.1′	06°05.0	16.5′	59.1′
18	88°29.1	S22°23.9	4°38.5	12.0′	N06°21.5	16.5′	59.1′
19	103°28.9	23.6	19°09.5	12.0′	06°38.0	16.4′	59.1′
20	118°28.6	23.2	33°40.5	12.0′	06°54.4	16.4′	59.1′
21	133°28.3	·· 22.9	48°11.5	11.9′	07°10.8	16.3′	59.1′
22	148°28.1	22.6	62°42.4	11.9′	07°27.1	16.4′	59.1′
23	163°27.8	22.3	77°13.3	11.8′	07°43.5	16.3′	59.1′
	SD = 16.3′	d = 0.3′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:19	10:29	▬	▬	13:43	15:53
N 70°	08:01	09:42	▬	▬	14:29	16:10
68°	07:47	09:12	11:27	12:44	15:00	16:25
66°	07:35	08:49	10:19	13:52	15:22	16:37
64°	07:25	08:31	09:44	14:27	15:40	16:47
62°	07:16	08:16	09:19	14:52	15:55	16:56
60°	07:08	08:04	08:59	15:12	16:08	17:03
N 58°	07:01	07:53	08:43	15:28	16:19	17:10
56°	06:55	07:43	08:30	15:42	16:28	17:17
54°	06:49	07:35	08:18	15:54	16:37	17:22
52°	06:44	07:27	08:07	16:04	16:44	17:28
50°	06:39	07:20	07:58	16:13	16:51	17:32
45°	06:28	07:05	07:38	16:33	17:07	17:43
N 40°	06:18	06:52	07:22	16:49	17:19	17:53
35°	06:09	06:41	07:09	17:03	17:31	18:02
30°	06:01	06:31	06:57	17:14	17:41	18:10
20°	05:45	06:12	06:36	17:35	17:59	18:26
N 10°	05:30	05:56	06:19	17:53	18:15	18:41
0°	05:13	05:39	06:02	18:09	18:32	18:58
S 10°	04:55	05:22	05:45	18:26	18:49	19:16
20°	04:33	05:02	05:27	18:44	19:09	19:38
30°	04:05	04:38	05:06	19:05	19:32	20:05
35°	03:47	04:24	04:53	19:18	19:47	20:23
40°	03:25	04:06	04:39	19:32	20:04	20:45
45°	02:56	03:45	04:21	19:49	20:26	21:14
S 50°	02:14	03:16	04:00	20:11	20:54	21:56
52°	01:49	03:02	03:50	20:21	21:08	22:20
54°	01:14	02:46	03:38	20:32	21:24	22:55
56°	–:–	02:25	03:25	20:46	21:45	–:–
58°	–:–	01:59	03:09	21:01	22:10	–:–
S 60°	–:–	01:20	02:50	21:20	22:48	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	11:51	11:12	10:35	20:56	23:18	·· ··
N 70°	11:39	11:09	10:41	21:06	23:17	·· ··
68°	11:28	11:06	10:46	21:13	23:15	·· ··
66°	11:20	11:04	10:50	21:20	23:14	·· ··
64°	11:12	11:02	10:53	21:25	23:14	·· ··
62°	11:06	11:01	10:56	21:30	23:13	·· ··
60°	11:00	10:59	10:58	21:34	23:12	·· ··
N 58°	10:55	10:58	11:01	21:37	23:12	·· ··
56°	10:51	10:57	11:03	21:40	23:11	·· ··
54°	10:47	10:56	11:05	21:43	23:11	·· ··
52°	10:43	10:55	11:06	21:46	23:10	·· ··
50°	10:40	10:54	11:08	21:48	23:10	·· ··
45°	10:33	10:52	11:11	21:53	23:09	·· ··
N 40°	10:27	10:51	11:14	21:57	23:08	·· ··
35°	10:21	10:49	11:17	22:00	23:08	·· ··
30°	10:17	10:48	11:19	22:04	23:07	·· ··
20°	10:09	10:46	11:23	22:09	23:06	·· ··
N 10°	10:02	10:44	11:26	22:13	23:05	23:58
0°	09:55	10:42	11:30	22:18	23:05	23:52
S 10°	09:48	10:41	11:33	22:22	23:04	23:46
20°	09:41	10:39	11:36	22:26	23:03	23:40
30°	09:33	10:37	11:41	22:31	23:02	23:33
35°	09:28	10:36	11:43	22:34	23:01	23:29
40°	09:23	10:34	11:46	22:37	23:01	23:25
45°	09:16	10:33	11:49	22:41	23:00	23:19
S 50°	09:09	10:31	11:53	22:45	22:59	23:13
52°	09:05	10:30	11:55	22:47	22:59	23:10
54°	09:01	10:29	11:57	22:49	22:58	23:07
56°	08:57	10:28	11:59	22:52	22:58	23:04
58°	08:52	10:27	12:01	22:54	22:57	23:00
S 60°	08:47	10:26	12:04	22:57	22:56	22:56

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 5-7 19-39%
04	04:50	05:04	12:05	16:06	03:42	
05	05:17	05:31	12:06	16:54	04:30	
06	05:44	05:57	12:06	17:41	05:17	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1864 sec ΔT = TT-UT1 = +68.9976 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	106°48.8	130°31.0	S10°54.1	343°54.1	N24°12.3	35°34.1	N21°44.0	119°51.5	S07°43.2
1	121°51.3	145°31.0	53.0	358°57.5	12.5	50°36.8	43.9	134°53.8	43.1
2	136°53.7	160°31.1	51.8	14°01.0	12.8	65°39.6	43.9	149°56.0	43.0
3	151°56.2	175°31.2	·· 50.7	29°04.4	·· 13.1	80°42.3	·· 43.9	164°58.3	·· 43.0
4	166°58.7	190°31.3	49.5	44°07.9	13.4	95°45.0	43.9	180°00.6	42.9
5	182°01.1	205°31.3	48.4	59°11.3	13.6	110°47.7	43.9	195°02.9	42.8
6	197°03.6	220°31.4	S10°47.3	74°14.8	N24°13.9	125°50.4	N21°43.8	210°05.1	S07°42.7
7	212°06.1	235°31.5	46.1	89°18.2	14.2	140°53.1	43.8	225°07.4	42.6
8	227°08.5	250°31.6	45.0	104°21.7	14.4	155°55.8	43.8	240°09.7	42.5
9	242°11.0	265°31.7	·· 43.8	119°25.2	·· 14.7	170°58.5	·· 43.8	255°11.9	·· 42.4
10	257°13.5	280°31.7	42.7	134°28.6	15.0	186°01.2	43.8	270°14.2	42.4
11	272°15.9	295°31.8	41.5	149°32.1	15.2	201°03.9	43.7	285°16.5	42.3
12	287°18.4	310°31.9	S10°40.4	164°35.5	N24°15.5	216°06.6	N21°43.7	300°18.8	S07°42.2
13	302°20.8	325°32.0	39.2	179°39.0	15.8	231°09.3	43.7	315°21.0	42.1
14	317°23.3	340°32.1	38.1	194°42.5	16.1	246°12.0	43.7	330°23.3	42.0
15	332°25.8	355°32.2	·· 36.9	209°45.9	·· 16.3	261°14.7	·· 43.7	345°25.6	·· 41.9
16	347°28.2	10°32.3	35.8	224°49.4	16.6	276°17.4	43.6	0°27.8	41.8
17	2°30.7	25°32.4	34.6	239°52.8	16.9	291°20.1	43.6	15°30.1	41.8
18	17°33.2	40°32.5	S10°33.5	254°56.3	N24°17.1	306°22.8	N21°43.6	30°32.4	S07°41.7
19	32°35.6	55°32.6	32.3	269°59.8	17.4	321°25.5	43.6	45°34.7	41.6
20	47°38.1	70°32.6	31.2	285°03.2	17.7	336°28.3	43.6	60°36.9	41.5
21	62°40.6	85°32.7	·· 30.0	300°06.7	·· 17.9	351°31.0	·· 43.5	75°39.2	·· 41.4
22	77°43.0	100°32.8	28.9	315°10.2	18.2	6°33.7	43.5	90°41.5	41.3
23	92°45.5	115°32.9	27.7	330°13.6	18.5	21°36.4	43.5	105°43.7	41.2
Mer.pass. 16:50		ν 0.1′ d 1.1′ m -4.50		ν 3.5′ d 0.3′ m -1.34		ν 2.7′ d -0.0′ m -2.71		ν 2.3′ d 0.1′ m 1.07	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	107°47.9	130°33.0	S10°26.6	345°17.1	N24°18.7	36°39.1	N21°43.5	120°46.0	S07°41.1
1	122°50.4	145°33.1	25.4	0°20.6	19.0	51°41.8	43.5	135°48.3	41.1
2	137°52.9	160°33.2	24.3	15°24.1	19.3	66°44.5	43.4	150°50.5	41.0
3	152°55.3	175°33.3	·· 23.1	30°27.5	·· 19.5	81°47.2	·· 43.4	165°52.8	·· 40.9
4	167°57.8	190°33.4	22.0	45°31.0	19.8	96°49.9	43.4	180°55.1	40.8
5	183°00.3	205°33.5	20.8	60°34.5	20.1	111°52.6	43.4	195°57.4	40.7
6	198°02.7	220°33.6	S10°19.7	75°37.9	N24°20.3	126°55.3	N21°43.4	210°59.6	S07°40.6
7	213°05.2	235°33.7	18.5	90°41.4	20.6	141°58.0	43.3	226°01.9	40.5
8	228°07.7	250°33.9	17.4	105°44.9	20.9	157°00.7	43.3	241°04.2	40.5
9	243°10.1	265°34.0	·· 16.2	120°48.4	·· 21.1	172°03.4	·· 43.3	256°06.4	·· 40.4
10	258°12.6	280°34.1	15.1	135°51.8	21.4	187°06.1	43.3	271°08.7	40.3
11	273°15.1	295°34.2	13.9	150°55.3	21.7	202°08.8	43.3	286°11.0	40.2
12	288°17.5	310°34.3	S10°12.8	165°58.8	N24°21.9	217°11.5	N21°43.2	301°13.2	S07°40.1
13	303°20.0	325°34.4	11.6	181°02.3	22.2	232°14.2	43.2	316°15.5	40.0
14	318°22.4	340°34.5	10.5	196°05.8	22.5	247°16.8	43.2	331°17.8	39.9
15	333°24.9	355°34.6	·· 09.3	211°09.2	·· 22.7	262°19.5	·· 43.2	346°20.0	·· 39.8
16	348°27.4	10°34.7	08.2	226°12.7	23.0	277°22.2	43.2	1°22.3	39.8
17	3°29.8	25°34.9	07.0	241°16.2	23.3	292°24.9	43.1	16°24.6	39.7
18	18°32.3	40°35.0	S10°05.9	256°19.7	N24°23.5	307°27.6	N21°43.1	31°26.8	S07°39.6
19	33°34.8	55°35.1	04.7	271°23.2	23.8	322°30.3	43.1	46°29.1	39.5
20	48°37.2	70°35.2	03.6	286°26.6	24.1	337°33.0	43.1	61°31.4	39.4
21	63°39.7	85°35.3	·· 02.4	301°30.1	·· 24.3	352°35.7	·· 43.1	76°33.6	·· 39.3
22	78°42.2	100°35.4	01.2	316°33.6	24.6	7°38.4	43.1	91°35.9	39.2
23	93°44.6	115°35.6	00.1	331°37.1	24.9	22°41.1	43.0	106°38.2	39.1
Mer.pass. 16:46		ν 0.1′ d 1.1′ m -4.51		ν 3.5′ d 0.3′ m -1.36		ν 2.7′ d -0.0′ m -2.70		ν 2.3′ d 0.1′ m 1.07	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	108°47.1	130°35.7	S09°58.9	346°40.6	N24°25.1	37°43.8	N21°43.0	121°40.4	S07°39.1
1	123°49.6	145°35.8	57.8	1°44.1	25.4	52°46.5	43.0	136°42.7	39.0
2	138°52.0	160°35.9	56.6	16°47.5	25.6	67°49.2	43.0	151°45.0	38.9
3	153°54.5	175°36.1	·· 55.5	31°51.0	·· 25.9	82°51.9	·· 43.0	166°47.2	·· 38.8
4	168°56.9	190°36.2	54.3	46°54.5	26.2	97°54.6	42.9	181°49.5	38.7
5	183°59.4	205°36.3	53.2	61°58.0	26.4	112°57.3	42.9	196°51.8	38.6
6	199°01.9	220°36.4	S09°52.0	77°01.5	N24°26.7	128°00.0	N21°42.9	211°54.0	S07°38.5
7	214°04.3	235°36.6	50.8	92°05.0	27.0	143°02.7	42.9	226°56.3	38.4
8	229°06.8	250°36.7	49.7	107°08.5	27.2	158°05.3	42.9	241°58.6	38.4
9	244°09.3	265°36.8	·· 48.5	122°12.0	·· 27.5	173°08.0	·· 42.8	257°00.8	·· 38.3
10	259°11.7	280°37.0	47.4	137°15.5	27.7	188°10.7	42.8	272°03.1	38.2
11	274°14.2	295°37.1	46.2	152°18.9	28.0	203°13.4	42.8	287°05.4	38.1
12	289°16.7	310°37.2	S09°45.0	167°22.4	N24°28.3	218°16.1	N21°42.8	302°07.6	S07°38.0
13	304°19.1	325°37.4	43.9	182°25.9	28.5	233°18.8	42.8	317°09.9	37.9
14	319°21.6	340°37.5	42.7	197°29.4	28.8	248°21.5	42.7	332°12.2	37.8
15	334°24.1	355°37.6	·· 41.6	212°32.9	·· 29.1	263°24.2	·· 42.7	347°14.4	·· 37.7
16	349°26.5	10°37.8	40.4	227°36.4	29.3	278°26.9	42.7	2°16.7	37.6
17	4°29.0	25°37.9	39.3	242°39.9	29.6	293°29.6	42.7	17°19.0	37.6
18	19°31.4	40°38.1	S09°38.1	257°43.4	N24°29.8	308°32.2	N21°42.7	32°21.2	S07°37.5
19	34°33.9	55°38.2	36.9	272°46.9	30.1	323°34.9	42.7	47°23.5	37.4
20	49°36.4	70°38.4	35.8	287°50.4	30.4	338°37.6	42.6	62°25.8	37.3
21	64°38.8	85°38.5	·· 34.6	302°53.9	·· 30.6	353°40.3	·· 42.6	77°28.0	·· 37.2
22	79°41.3	100°38.6	33.5	317°57.4	30.9	8°43.0	42.6	92°30.3	37.1
23	94°43.8	115°38.8	32.3	333°00.9	31.1	23°45.7	42.6	107°32.5	37.0
Mer.pass. 16:42		ν 0.1′ d 1.2′ m -4.52		ν 3.5′ d 0.3′ m -1.37		ν 2.7′ d -0.0′ m -2.69		ν 2.3′ d 0.1′ m 1.07	

Stars	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.2	-42°10.4
Schedar	349°31.1	56°40.7
Diphda	348°47.3	-17°51.1
Achernar	335°20.1	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°46.5	89°22.5
Acamar	315°11.5	-40°12.5
Menkar	314°06.0	4°11.3
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.7
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.8	-52°42.5
Sirius	258°25.9	-16°45.0
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.2
Suhail	222°45.9	-43°31.9
Miaplacidus	221°37.5	-69°49.0
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.6	61°36.7
Denebola	182°24.8	14°25.8
Gienah	175°43.5	-17°40.8
Acrux	173°00.0	-63°14.0
Gacrux	171°51.6	-57°14.9
Alioth	166°12.9	55°49.1
Spica	158°22.3	-11°17.5
Alkaid	152°52.1	49°11.0
Hadar	148°36.2	-60°29.4
Menkent	147°57.7	-36°29.4
Arcturus	145°48.0	19°03.0
Rigil Kent.	139°40.6	-60°56.1
Kochab	137°20.3	74°02.8
Zuben'ubi	136°56.2	-16°08.7
Alphecca	126°04.0	26°37.6
Antares	112°16.1	-26°29.2
Atria	107°10.9	-69°04.2
Sabik	102°03.1	-15°45.4
Shaula	96°10.8	-37°07.3
Rasalhague	95°58.9	12°32.4
Eltanin	90°42.7	51°29.0
Kaus Aust.	83°32.9	-34°22.4
Vega	80°33.7	38°48.3
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.4
Deneb	49°26.3	45°22.2
Enif	33°39.1	9°59.4
Al Na'ir	27°33.2	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 07 Tue	SHA	Mer.pass
Venus	23°42.1	15:18
Mars	237°05.2	01:04
Jupiter	288°45.3	21:34
Saturn	13°02.7	15:58

Jan 08 Wed	SHA	Mer.pass
Venus	22°45.1	15:18
Mars	237°29.2	00:59
Jupiter	288°51.1	21:30
Saturn	12°58.1	15:55

Jan 09 Thu	SHA	Mer.pass
Venus	21°48.6	15:17
Mars	237°53.5	00:53
Jupiter	288°56.7	21:25
Saturn	12°53.4	15:51

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.5	S22°22.0	91°44.1	11.8′	N07°59.8	16.2′	59.1′
1	193°27.3	21.6	106°14.9	11.7′	08°16.0	16.2′	59.1′
2	208°27.0	21.3	120°45.7	11.7′	08°32.2	16.2′	59.1′
3	223°26.7	·· 21.0	135°16.4	11.6′	08°48.4	16.1′	59.1′
4	238°26.4	20.7	149°47.0	11.6′	09°04.5	16.1′	59.1′
5	253°26.2	20.4	164°17.6	11.5′	09°20.6	16.1′	59.1′
6	268°25.9	S22°20.0	178°48.2	11.5′	N09°36.7	16.0′	59.1′
7	283°25.6	19.7	193°18.7	11.4′	09°52.7	15.9′	59.1′
8	298°25.4	19.4	207°49.1	11.4′	10°08.6	15.9′	59.1′
9	313°25.1	·· 19.1	222°19.5	11.3′	10°24.5	15.8′	59.1′
10	328°24.8	18.7	236°49.8	11.3′	10°40.3	15.8′	59.1′
11	343°24.6	18.4	251°20.1	11.2′	10°56.1	15.7′	59.1′
12	358°24.3	S22°18.1	265°50.3	11.1′	N11°11.8	15.7′	59.1′
13	13°24.0	17.8	280°20.4	11.1′	11°27.5	15.6′	59.1′
14	28°23.8	17.4	294°50.5	11.0′	11°43.1	15.6′	59.1′
15	43°23.5	·· 17.1	309°20.5	11.0′	11°58.7	15.5′	59.1′
16	58°23.2	16.8	323°50.5	10.9′	12°14.2	15.4′	59.2′
17	73°23.0	16.4	338°20.4	10.8′	12°29.6	15.4′	59.2′
18	88°22.7	S22°16.1	352°50.2	10.8′	N12°45.0	15.3′	59.2′
19	103°22.4	15.8	7°20.0	10.7′	13°00.3	15.2′	59.2′
20	118°22.2	15.4	21°49.7	10.6′	13°15.5	15.2′	59.2′
21	133°21.9	·· 15.1	36°19.3	10.5′	13°30.7	15.1′	59.2′
22	148°21.7	14.8	50°48.8	10.5′	13°45.8	15.0′	59.2′
23	163°21.4	14.4	65°18.3	10.4′	14°00.8	15.0′	59.2′
	SD = 16.3′	d = 0.3′		SD = 16.1′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.1	S22°14.1	79°47.7	10.3′	N14°15.8	14.8′	59.2′
1	193°20.9	13.8	94°17.0	10.3′	14°30.6	14.8′	59.2′
2	208°20.6	13.4	108°46.3	10.2′	14°45.4	14.7′	59.2′
3	223°20.3	·· 13.1	123°15.5	10.1′	15°00.1	14.7′	59.2′
4	238°20.1	12.7	137°44.6	10.0′	15°14.8	14.5′	59.2′
5	253°19.8	12.4	152°13.6	9.9′	15°29.3	14.5′	59.2′
6	268°19.5	S22°12.0	166°42.5	9.9′	N15°43.8	14.4′	59.2′
7	283°19.3	11.7	181°11.4	9.8′	15°58.2	14.3′	59.2′
8	298°19.0	11.4	195°40.2	9.7′	16°12.5	14.2′	59.2′
9	313°18.8	·· 11.0	210°08.9	9.6′	16°26.7	14.1′	59.1′
10	328°18.5	10.7	224°37.5	9.5′	16°40.8	14.0′	59.1′
11	343°18.2	10.3	239°06.0	9.5′	16°54.8	14.0′	59.1′
12	358°18.0	S22°10.0	253°34.5	9.4′	N17°08.8	13.8′	59.1′
13	13°17.7	09.6	268°02.9	9.3′	17°22.6	13.7′	59.1′
14	28°17.5	09.3	282°31.1	9.2′	17°36.3	13.7′	59.1′
15	43°17.2	·· 08.9	296°59.3	9.1′	17°50.0	13.5′	59.1′
16	58°16.9	08.6	311°27.4	9.0′	18°03.5	13.5′	59.1′
17	73°16.7	08.2	325°55.5	8.9′	18°17.0	13.3′	59.1′
18	88°16.4	S22°07.9	340°23.4	8.8′	N18°30.3	13.2′	59.1′
19	103°16.2	07.5	354°51.2	8.8′	18°43.5	13.1′	59.1′
20	118°15.9	07.2	9°19.0	8.7′	18°56.6	13.1′	59.1′
21	133°15.6	·· 06.8	23°46.7	8.6′	19°09.7	12.9′	59.1′
22	148°15.4	06.5	38°14.3	8.5′	19°22.6	12.8′	59.1′
23	163°15.1	06.1	52°41.7	8.4′	19°35.4	12.6′	59.1′
	SD = 16.3′	d = 0.3′		SD = 16.1′			

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°14.9	S22°05.8	67°09.1	8.3′	N19°48.0	12.6′	59.1′
1	193°14.6	05.4	81°36.4	8.2′	20°00.6	12.5′	59.1′
2	208°14.3	05.1	96°03.7	8.1′	20°13.1	12.3′	59.1′
3	223°14.1	·· 04.7	110°30.8	8.0′	20°25.4	12.2′	59.1′
4	238°13.8	04.3	124°57.8	7.9′	20°37.6	12.1′	59.1′
5	253°13.6	04.0	139°24.8	7.8′	20°49.7	11.9′	59.1′
6	268°13.3	S22°03.6	153°51.6	7.8′	N21°01.6	11.9′	59.1′
7	283°13.1	03.3	168°18.4	7.7′	21°13.5	11.7′	59.1′
8	298°12.8	02.9	182°45.0	7.6′	21°25.2	11.6′	59.1′
9	313°12.5	·· 02.5	197°11.6	7.5′	21°36.8	11.4′	59.1′
10	328°12.3	02.2	211°38.1	7.4′	21°48.2	11.3′	59.1′
11	343°12.0	01.8	226°04.5	7.3′	21°59.5	11.2′	59.1′
12	358°11.8	S22°01.5	240°30.8	7.2′	N22°10.7	11.1′	59.1′
13	13°11.5	01.1	254°57.0	7.1′	22°21.8	10.9′	59.1′
14	28°11.3	00.7	269°23.1	7.0′	22°32.7	10.8′	59.0′
15	43°11.0	·· 00.4	283°49.1	6.9′	22°43.5	10.6′	59.0′
16	58°10.8	22°00.0	298°15.0	6.8′	22°54.1	10.5′	59.0′
17	73°10.5	21°59.6	312°40.9	6.8′	23°04.6	10.4′	59.0′
18	88°10.2	S21°59.2	327°06.6	6.7′	N23°15.0	10.2′	59.0′
19	103°10.0	58.9	341°32.3	6.6′	23°25.2	10.0′	59.0′
20	118°09.7	58.5	355°57.9	6.5′	23°35.2	10.0′	59.0′
21	133°09.5	·· 58.1	10°23.4	6.4′	23°45.2	9.7′	59.0′
22	148°09.2	57.8	24°48.8	6.3′	23°54.9	9.6′	59.0′
23	163°09.0	57.4	39°14.1	6.2′	24°04.5	9.5′	59.0′
	SD = 16.3′	d = 0.4′		SD = 16.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:14	10:18	▬	▬	13:56	16:00
N 70°	07:57	09:36	▬	▬	14:39	16:17
68°	07:44	09:07	11:08	13:07	15:07	16:31
66°	07:32	08:45	10:12	14:02	15:29	16:42
64°	07:22	08:28	09:39	14:35	15:46	16:52
62°	07:14	08:14	09:15	14:59	16:00	17:00
60°	07:06	08:02	08:57	15:17	16:12	17:08
N 58°	07:00	07:51	08:41	15:33	16:23	17:14
56°	06:54	07:42	08:28	15:46	16:32	17:20
54°	06:48	07:33	08:16	15:58	16:40	17:26
52°	06:43	07:26	08:06	16:08	16:48	17:31
50°	06:38	07:19	07:57	16:17	16:55	17:36
45°	06:27	07:04	07:37	16:36	17:10	17:46
N 40°	06:18	06:52	07:22	16:52	17:22	17:56
35°	06:09	06:41	07:09	17:05	17:33	18:04
30°	06:01	06:31	06:57	17:17	17:43	18:12
20°	05:46	06:13	06:37	17:37	18:00	18:28
N 10°	05:31	05:57	06:20	17:54	18:17	18:43
0°	05:15	05:41	06:03	18:10	18:33	18:59
S 10°	04:57	05:24	05:47	18:27	18:50	19:17
20°	04:35	05:04	05:29	18:45	19:09	19:38
30°	04:08	04:41	05:08	19:05	19:33	20:05
35°	03:50	04:26	04:56	19:18	19:47	20:23
40°	03:29	04:09	04:42	19:32	20:04	20:44
45°	03:00	03:48	04:25	19:48	20:25	21:12
S 50°	02:20	03:21	04:04	20:09	20:52	21:53
52°	01:56	03:07	03:54	20:19	21:06	22:16
54°	01:23	02:51	03:42	20:30	21:22	22:48
56°	–:–	02:31	03:29	20:43	21:41	–:–
58°	–:–	02:06	03:14	20:58	22:06	–:–
S 60°	–:–	01:31	02:56	21:16	22:40	–:–

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	09:53	08:44	▭	01:43	04:39	▭
N 70°	10:10	09:25	▭	01:30	04:00	▭
68°	10:23	09:53	08:46	01:19	03:34	06:33
66°	10:34	10:14	09:42	01:10	03:14	05:38
64°	10:43	10:31	10:15	01:03	02:58	05:06
62°	10:51	10:46	10:40	00:57	02:45	04:42
60°	10:58	10:58	11:00	00:52	02:34	04:23
N 58°	11:04	11:08	11:16	00:47	02:25	04:07
56°	11:09	11:18	11:30	00:43	02:17	03:54
54°	11:14	11:26	11:42	00:39	02:09	03:43
52°	11:19	11:33	11:53	00:35	02:03	03:33
50°	11:23	11:40	12:03	00:32	01:57	03:24
45°	11:31	11:55	12:23	00:26	01:44	03:05
N 40°	11:39	12:07	12:40	00:20	01:34	02:49
35°	11:45	12:17	12:54	00:16	01:25	02:36
30°	11:51	12:26	13:06	00:11	01:17	02:25
20°	12:01	12:42	13:27	00:04	01:04	02:06
N 10°	12:10	12:56	13:46	·· ··	00:52	01:50
0°	12:18	13:09	14:03	·· ··	00:42	01:34
S 10°	12:26	13:22	14:21	·· ··	00:31	01:19
20°	12:35	13:36	14:40	·· ··	00:19	01:02
30°	12:46	13:53	15:02	·· ··	00:06	00:44
35°	12:52	14:02	15:14	23:59	·· ··	00:33
40°	12:59	14:13	15:29	23:51	·· ··	00:21
45°	13:07	14:26	15:47	23:41	·· ··	00:06
S 50°	13:16	14:42	16:10	23:29	23:48	·· ··
52°	13:21	14:50	16:20	23:23	23:40	·· ··
54°	13:26	14:58	16:33	23:17	23:31	23:51
56°	13:32	15:08	16:47	23:11	23:21	23:36
58°	13:38	15:19	17:03	23:03	23:09	23:19
S 60°	13:45	15:31	17:23	22:55	22:55	22:58

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 50-72%
07	06:10	06:23	12:06	18:30	06:05	
08	06:36	06:48	12:07	19:21	06:55	
09	07:01	07:13	12:07	20:17	07:49	

No IERS EOP prediction data available

January 10, 11, 12 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	109°46.2	130°38.9	S09°31.1	348°04.4	N24°31.4	38°48.4	N21°42.6	122°34.8	S07°36.9
1	124°48.7	145°39.1	30.0	3°07.9	31.7	53°51.1	42.5	137°37.1	36.8
2	139°51.2	160°39.2	28.8	18°11.4	31.9	68°53.7	42.5	152°39.3	36.8
3	154°53.6	175°39.4	·· 27.6	33°14.9	·· 32.2	83°56.4	·· 42.5	167°41.6	·· 36.7
4	169°56.1	190°39.5	26.5	48°18.4	32.4	98°59.1	42.5	182°43.9	36.6
5	184°58.5	205°39.7	25.3	63°21.9	32.7	114°01.8	42.5	197°46.1	36.5
6	200°01.0	220°39.8	S09°24.2	78°25.4	N24°33.0	129°04.5	N21°42.5	212°48.4	S07°36.4
7	215°03.5	235°40.0	23.0	93°28.9	33.2	144°07.2	42.4	227°50.7	36.3
8	230°05.9	250°40.1	21.8	108°32.4	33.5	159°09.8	42.4	242°52.9	36.2
9	245°08.4	265°40.3	·· 20.7	123°35.9	·· 33.7	174°12.5	·· 42.4	257°55.2	·· 36.1
10	260°10.9	280°40.5	19.5	138°39.4	34.0	189°15.2	42.4	272°57.4	36.0
11	275°13.3	295°40.6	18.3	153°42.9	34.2	204°17.9	42.4	287°59.7	36.0
12	290°15.8	310°40.8	S09°17.2	168°46.4	N24°34.5	219°20.6	N21°42.3	303°02.0	S07°35.9
13	305°18.3	325°40.9	16.0	183°49.9	34.8	234°23.3	42.3	318°04.2	35.8
14	320°20.7	340°41.1	14.9	198°53.4	35.0	249°25.9	42.3	333°06.5	35.7
15	335°23.2	355°41.3	·· 13.7	213°56.9	·· 35.3	264°28.6	·· 42.3	348°08.8	·· 35.6
16	350°25.7	10°41.4	12.5	229°00.4	35.5	279°31.3	42.3	3°11.0	35.5
17	5°28.1	25°41.6	11.4	244°03.9	35.8	294°34.0	42.3	18°13.3	35.4
18	20°30.6	40°41.8	S09°10.2	259°07.4	N24°36.0	309°36.7	N21°42.2	33°15.5	S07°35.3
19	35°33.0	55°41.9	09.0	274°11.0	36.3	324°39.3	42.2	48°17.8	35.2
20	50°35.5	70°42.1	07.9	289°14.5	36.6	339°42.0	42.2	63°20.1	35.2
21	65°38.0	85°42.3	·· 06.7	304°18.0	·· 36.8	354°44.7	·· 42.2	78°22.3	·· 35.1
22	80°40.4	100°42.4	05.5	319°21.5	37.1	9°47.4	42.2	93°24.6	35.0
23	95°42.9	115°42.6	04.4	334°25.0	37.3	24°50.1	42.2	108°26.9	34.9
Mer.pass. 16:38		ν 0.1′ d 1.2′	m -4.53	ν 3.5′ d 0.3′	m -1.39	ν 2.7′ d -0.0′	m -2.69	ν 2.3′ d 0.1′	m 1.08

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	110°45.4	130°42.8	S09°03.2	349°28.5	N24°37.6	39°52.7	N21°42.1	123°29.1	S07°34.8
1	125°47.8	145°42.9	02.0	4°32.0	37.8	54°55.4	42.1	138°31.4	34.7
2	140°50.3	160°43.1	09°00.9	19°35.5	38.1	69°58.1	42.1	153°33.6	34.6
3	155°52.8	175°43.3	08°59.7	34°39.0	·· 38.3	85°00.8	·· 42.1	168°35.9	·· 34.5
4	170°55.2	190°43.5	58.5	49°42.5	38.6	100°03.5	42.1	183°38.2	34.4
5	185°57.7	205°43.6	57.4	64°46.1	38.9	115°06.1	42.1	198°40.4	34.3
6	201°00.2	220°43.8	S08°56.2	79°49.6	N24°39.1	130°08.8	N21°42.0	213°42.7	S07°34.3
7	216°02.6	235°44.0	55.0	94°53.1	39.4	145°11.5	42.0	228°44.9	34.2
8	231°05.1	250°44.2	53.9	109°56.6	39.6	160°14.2	42.0	243°47.2	34.1
9	246°07.5	265°44.4	·· 52.7	125°00.1	·· 39.9	175°16.8	·· 42.0	258°49.5	·· 34.0
10	261°10.0	280°44.5	51.5	140°03.6	40.1	190°19.5	42.0	273°51.7	33.9
11	276°12.5	295°44.7	50.4	155°07.1	40.4	205°22.2	42.0	288°54.0	33.8
12	291°14.9	310°44.9	S08°49.2	170°10.7	N24°40.6	220°24.9	N21°41.9	303°56.2	S07°33.7
13	306°17.4	325°45.1	48.0	185°14.2	40.9	235°27.5	41.9	318°58.5	33.6
14	321°19.9	340°45.3	46.9	200°17.7	41.1	250°30.2	41.9	334°00.8	33.5
15	336°22.3	355°45.5	·· 45.7	215°21.2	·· 41.4	265°32.9	·· 41.9	349°03.0	·· 33.4
16	351°24.8	10°45.6	44.5	230°24.7	41.6	280°35.6	41.9	4°05.3	33.3
17	6°27.3	25°45.8	43.4	245°28.2	41.9	295°38.2	41.9	19°07.5	33.3
18	21°29.7	40°46.0	S08°42.2	260°31.8	N24°42.1	310°40.9	N21°41.8	34°09.8	S07°33.2
19	36°32.2	55°46.2	41.0	275°35.3	42.4	325°43.6	41.8	49°12.1	33.1
20	51°34.7	70°46.4	39.8	290°38.8	42.6	340°46.2	41.8	64°14.3	33.0
21	66°37.1	85°46.6	·· 38.7	305°42.3	·· 42.9	355°48.9	·· 41.8	79°16.6	·· 32.9
22	81°39.6	100°46.8	37.5	320°45.8	43.1	10°51.6	41.8	94°18.8	32.8
23	96°42.0	115°47.0	36.3	335°49.3	43.4	25°54.3	41.8	109°21.1	32.7
Mer.pass. 16:34		ν 0.2′ d 1.2′	m -4.54	ν 3.5′ d 0.3′	m -1.41	ν 2.7′ d -0.0′	m -2.68	ν 2.3′ d 0.1′	m 1.08

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	111°44.5	130°47.2	S08°35.2	350°52.9	N24°43.6	40°56.9	N21°41.7	124°23.4	S07°32.6
1	126°47.0	145°47.4	34.0	5°56.4	43.9	55°59.6	41.7	139°25.6	32.5
2	141°49.4	160°47.6	32.8	20°59.9	44.1	71°02.3	41.7	154°27.9	32.4
3	156°51.9	175°47.8	·· 31.7	36°03.4	·· 44.4	86°04.9	·· 41.7	169°30.1	·· 32.3
4	171°54.4	190°48.0	30.5	51°06.9	44.6	101°07.6	41.7	184°32.4	32.3
5	186°56.8	205°48.2	29.3	66°10.5	44.9	116°10.3	41.7	199°34.6	32.2
6	201°59.3	220°48.4	S08°28.1	81°14.0	N24°45.1	131°12.9	N21°41.6	214°36.9	S07°32.1
7	217°01.8	235°48.6	27.0	96°17.5	45.4	146°15.6	41.6	229°39.2	32.0
8	232°04.2	250°48.8	25.8	111°21.0	45.6	161°18.3	41.6	244°41.4	31.9
9	247°06.7	265°49.0	·· 24.6	126°24.6	·· 45.9	176°21.0	·· 41.6	259°43.7	·· 31.8
10	262°09.2	280°49.2	23.5	141°28.1	46.1	191°23.6	41.6	274°45.9	31.7
11	277°11.6	295°49.4	22.3	156°31.6	46.4	206°26.3	41.6	289°48.2	31.6
12	292°14.1	310°49.6	S08°21.1	171°35.1	N24°46.6	221°29.0	N21°41.5	304°50.4	S07°31.5
13	307°16.5	325°49.8	19.9	186°38.7	46.9	236°31.6	41.5	319°52.7	31.4
14	322°19.0	340°50.0	18.8	201°42.2	47.1	251°34.3	41.5	334°55.0	31.3
15	337°21.5	355°50.3	·· 17.6	216°45.7	·· 47.4	266°37.0	·· 41.5	349°57.2	·· 31.3
16	352°23.9	10°50.5	16.4	231°49.2	47.6	281°39.6	41.5	4°59.5	31.2
17	7°26.4	25°50.7	15.3	246°52.8	47.8	296°42.3	41.5	20°01.7	31.1
18	22°28.9	40°50.9	S08°14.1	261°56.3	N24°48.1	311°44.9	N21°41.4	35°04.0	S07°31.0
19	37°31.3	55°51.1	12.9	276°59.8	48.3	326°47.6	41.4	50°06.2	30.9
20	52°33.8	70°51.3	11.7	292°03.3	48.6	341°50.3	41.4	65°08.5	30.8
21	67°36.3	85°51.6	·· 10.6	307°06.9	·· 48.8	356°52.9	·· 41.4	80°10.8	·· 30.7
22	82°38.7	100°51.8	09.4	322°10.4	49.1	11°55.6	41.4	95°13.0	30.6
23	97°41.2	115°52.0	08.2	337°13.9	49.3	26°58.3	41.4	110°15.3	30.5
Mer.pass. 16:30		ν 0.2′ d 1.2′	m -4.55	ν 3.5′ d 0.2′	m -1.42	ν 2.7′ d -0.0′	m -2.67	ν 2.3′ d 0.1′	m 1.08

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.2	-42°10.4
Schedar	349°31.1	56°40.7
Diphda	348°47.3	-17°51.1
Achernar	335°20.1	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°47.5	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.3
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.4	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.7
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.8	-52°42.6
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.3
Suhail	222°45.9	-43°31.9
Miaplacidus	221°37.5	-69°49.0
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.6	61°36.7
Denebola	182°24.8	14°25.8
Gienah	175°43.5	-17°40.8
Acrux	173°00.0	-63°14.0
Gacrux	171°51.5	-57°14.9
Alioth	166°12.9	55°49.1
Spica	158°22.3	-11°17.5
Alkaid	152°52.1	49°11.0
Hadar	148°36.2	-60°29.4
Menkent	147°57.7	-36°29.4
Arcturus	145°48.0	19°02.9
Rigil Kent.	139°40.5	-60°56.1
Kochab	137°20.2	74°02.8
Zuben'ubi	136°56.2	-16°08.7
Alphecca	126°03.9	26°37.6
Antares	112°16.1	-26°29.2
Atria	107°10.8	-69°04.2
Sabik	102°03.1	-15°45.4
Shaula	96°10.7	-37°07.3
Rasalhague	95°58.9	12°32.4
Eltanin	90°42.7	51°28.9
Kaus Aust.	83°32.9	-34°22.4
Vega	80°33.6	38°48.3
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.4
Deneb	49°26.3	45°22.2
Enif	33°39.1	9°59.4
Al Na'ir	27°33.2	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 10 Fri	SHA	Mer.pass
Venus	20°52.7	15:17
Mars	238°18.2	00:48
Jupiter	289°02.1	21:21
Saturn	12°48.6	15:47

Jan 11 Sat	SHA	Mer.pass
Venus	19°57.4	15:17
Mars	238°43.1	00:42
Jupiter	289°07.4	21:17
Saturn	12°43.7	15:44

Jan 12 Sun	SHA	Mer.pass
Venus	19°02.7	15:17
Mars	239°08.4	00:36
Jupiter	289°12.4	21:12
Saturn	12°38.8	15:40

Horizontal parallax	
Venus:	0.2
Mars:	0.2

2025 January 10 to Jan. 12 UT

Sun and Moon

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°08.7	S21°57.0	53°39.3	6.1′	N24°14.0	9.3′	59.0′
1	193°08.5	56.6	68°04.5	6.1′	24°23.3	9.2′	59.0′
2	208°08.2	56.3	82°29.5	6.0′	24°32.5	9.0′	59.0′
3	223°08.0	·· 55.9	96°54.5	5.9′	24°41.5	8.8′	59.0′
4	238°07.7	55.5	111°19.4	5.8′	24°50.3	8.7′	58.9′
5	253°07.5	55.1	125°44.2	5.7′	24°59.0	8.5′	58.9′
6	268°07.2	S21°54.8	140°09.0	5.7′	N25°07.5	8.4′	58.9′
7	283°07.0	54.4	154°33.6	5.6′	25°15.9	8.2′	58.9′
8	298°06.7	54.0	168°58.2	5.5′	25°24.1	8.0′	58.9′
9	313°06.5	·· 53.6	183°22.7	5.4′	25°32.1	7.9′	58.9′
10	328°06.2	53.3	197°47.1	5.4′	25°40.0	7.7′	58.9′
11	343°06.0	52.9	212°11.5	5.3′	25°47.7	7.5′	58.9′
12	358°05.7	S21°52.5	226°35.8	5.2′	N25°55.2	7.4′	58.9′
13	13°05.5	52.1	241°00.0	5.1′	26°02.6	7.2′	58.9′
14	28°05.2	51.7	255°24.1	5.1′	26°09.8	7.0′	58.9′
15	43°05.0	·· 51.3	269°48.2	5.0′	26°16.8	6.9′	58.8′
16	58°04.7	51.0	284°12.2	4.9′	26°23.7	6.7′	58.8′
17	73°04.5	50.6	298°36.1	4.9′	26°30.4	6.5′	58.8′
18	88°04.2	S21°50.2	313°00.0	4.8′	N26°36.9	6.3′	58.8′
19	103°04.0	49.8	327°23.8	4.8′	26°43.2	6.1′	58.8′
20	118°03.7	49.4	341°47.6	4.7′	26°49.3	6.0′	58.8′
21	133°03.5	·· 49.0	356°11.3	4.7′	26°55.3	5.8′	58.8′
22	148°03.2	48.6	10°35.0	4.6′	27°01.1	5.6′	58.8′
23	163°03.0	48.2	24°58.6	4.5′	27°06.7	5.4′	58.8′
	SD = 16.3′	d = 0.4′	SD = 16.1′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°02.8	S21°47.8	39°22.1	4.5′	N27°12.1	5.3′	58.7′
1	193°02.5	47.5	53°45.6	4.5′	27°17.4	5.1′	58.7′
2	208°02.3	47.1	68°09.1	4.4′	27°22.5	4.8′	58.7′
3	223°02.0	·· 46.7	82°32.5	4.4′	27°27.3	4.7′	58.7′
4	238°01.8	46.3	96°55.8	4.3′	27°32.0	4.6′	58.7′
5	253°01.5	45.9	111°19.2	4.3′	27°36.6	4.3′	58.7′
6	268°01.3	S21°45.5	125°42.4	4.3′	N27°40.9	4.1′	58.7′
7	283°01.0	45.1	140°05.7	4.2′	27°45.0	4.0′	58.7′
8	298°00.8	44.7	154°28.9	4.2′	27°49.0	3.8′	58.6′
9	313°00.5	·· 44.3	168°52.1	4.2′	27°52.8	3.6′	58.6′
10	328°00.3	43.9	183°15.3	4.1′	27°56.4	3.4′	58.6′
11	343°00.1	43.5	197°38.4	4.1′	27°59.8	3.2′	58.6′
12	357°59.8	S21°43.1	212°01.5	4.1′	N28°03.0	3.0′	58.6′
13	12°59.6	42.7	226°24.6	4.1′	28°06.0	2.8′	58.6′
14	27°59.3	42.3	240°47.7	4.1′	28°08.8	2.7′	58.6′
15	42°59.1	·· 41.9	255°10.7	4.0′	28°11.5	2.4′	58.5′
16	57°58.8	41.5	269°33.8	4.0′	28°13.9	2.3′	58.5′
17	72°58.6	41.1	283°56.8	4.0′	28°16.2	2.0′	58.5′
18	87°58.4	S21°40.7	298°19.8	4.0′	N28°18.2	1.9′	58.5′
19	102°58.1	40.3	312°42.8	4.0′	28°20.1	1.7′	58.5′
20	117°57.9	39.9	327°05.8	4.0′	28°21.8	1.5′	58.5′
21	132°57.6	·· 39.5	341°28.8	4.0′	28°23.3	1.3′	58.4′
22	147°57.4	39.1	355°51.9	4.0′	28°24.6	1.1′	58.4′
23	162°57.2	38.7	10°14.9	4.0′	28°25.7	1.0′	58.4′
	SD = 16.3′	d = 0.4′	SD = 16.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°56.9	S21°38.2	24°37.9	4.0′	N28°26.7	0.7′	58.4′
1	192°56.7	37.8	39°00.9	4.1′	28°27.4	0.5′	58.4′
2	207°56.4	37.4	53°24.0	4.1′	28°27.9	0.4′	58.4′
3	222°56.2	·· 37.0	67°47.1	4.1′	28°28.3	0.2′	58.3′
4	237°56.0	36.6	82°10.2	4.1′	28°28.5	0.0′	58.3′
5	252°55.7	36.2	96°33.3	4.1′	28°28.5	0.3′	58.3′
6	267°55.5	S21°35.8	110°56.4	4.2′	N28°28.2	0.4′	58.3′
7	282°55.3	35.4	125°19.5	4.2′	28°27.8	0.5′	58.3′
8	297°55.0	35.0	139°42.7	4.2′	28°27.3	0.8′	58.2′
9	312°54.8	·· 34.5	154°05.9	4.2′	28°26.5	1.0′	58.2′
10	327°54.5	34.1	168°29.2	4.3′	28°25.5	1.1′	58.2′
11	342°54.3	33.7	182°52.5	4.3′	28°24.4	1.4′	58.2′
12	357°54.1	S21°33.3	197°15.8	4.4′	N28°23.0	1.5′	58.2′
13	12°53.8	32.9	211°39.2	4.4′	28°21.5	1.7′	58.2′
14	27°53.6	32.5	226°02.6	4.5′	28°19.8	1.9′	58.1′
15	42°53.4	·· 32.0	240°26.0	4.5′	28°17.9	2.1′	58.1′
16	57°53.1	31.6	254°49.5	4.6′	28°15.8	2.2′	58.1′
17	72°52.9	31.2	269°13.1	4.6′	28°13.6	2.5′	58.1′
18	87°52.7	S21°30.8	283°36.7	4.7′	N28°11.1	2.6′	58.1′
19	102°52.4	30.4	298°00.4	4.7′	28°08.5	2.8′	58.0′
20	117°52.2	29.9	312°24.1	4.8′	28°05.7	3.0′	58.0′
21	132°51.9	·· 29.5	326°47.9	4.9′	28°02.7	3.1′	58.0′
22	147°51.7	29.1	341°11.7	4.9′	27°59.6	3.4′	58.0′
23	162°51.5	28.7	355°35.7	5.0′	27°56.2	3.5′	58.0′
	SD = 16.3′	d = 0.4′	SD = 15.9′				

Twilight, Sunrise, Sunset

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:09	10:06	▬	▬	14:10	16:08
N 70°	07:53	09:28	▬	▬	14:49	16:24
68°	07:40	09:01	10:51	13:25	15:15	16:37
66°	07:29	08:41	10:04	14:13	15:36	16:48
64°	07:20	08:24	09:34	14:43	15:52	16:57
62°	07:11	08:11	09:11	15:05	16:06	17:05
60°	07:04	07:59	08:53	15:24	16:17	17:12
N 58°	06:58	07:49	08:38	15:39	16:28	17:19
56°	06:52	07:40	08:25	15:51	16:37	17:24
54°	06:47	07:32	08:14	16:02	16:45	17:30
52°	06:42	07:24	08:04	16:12	16:52	17:35
50°	06:37	07:18	07:55	16:21	16:59	17:39
45°	06:27	07:03	07:36	16:40	17:13	17:49
N 40°	06:18	06:51	07:21	16:55	17:25	17:59
35°	06:09	06:41	07:08	17:08	17:36	18:07
30°	06:01	06:31	06:57	17:19	17:45	18:15
20°	05:47	06:14	06:37	17:39	18:02	18:30
N 10°	05:32	05:58	06:20	17:56	18:18	18:44
0°	05:16	05:42	06:04	18:12	18:34	19:00
S 10°	04:59	05:25	05:48	18:28	18:51	19:17
20°	04:38	05:06	05:31	18:45	19:09	19:38
30°	04:11	04:43	05:10	19:05	19:32	20:05
35°	03:54	04:29	04:58	19:17	19:46	20:22
40°	03:32	04:13	04:45	19:31	20:03	20:43
45°	03:05	03:52	04:28	19:47	20:23	21:10
S 50°	02:26	03:25	04:08	20:08	20:50	21:49
52°	02:04	03:12	03:58	20:17	21:03	22:11
54°	01:33	02:56	03:47	20:28	21:18	22:40
56°	00:35	02:38	03:35	20:40	21:37	23:33
58°	–:–	02:14	03:20	20:55	22:00	–:–
S 60°	–:–	01:42	03:03	21:12	22:31	–:–

Moonrise, Moonset

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	▭	▭	▭	▭	▭	▭
64°	09:38	▭	▭	07:43	▭	▭
62°	10:33	10:16	▭	06:48	09:12	▭
60°	11:06	11:25	12:18	06:16	08:03	09:20
N 58°	11:31	12:00	12:57	05:52	07:28	08:41
56°	11:51	12:26	13:24	05:32	07:03	08:14
54°	12:07	12:46	13:45	05:16	06:43	07:52
52°	12:22	13:03	14:03	05:02	06:26	07:34
50°	12:34	13:18	14:18	04:50	06:11	07:19
45°	13:00	13:48	14:48	04:25	05:42	06:48
N 40°	13:21	14:11	15:12	04:05	05:19	06:25
35°	13:38	14:31	15:32	03:49	05:00	06:05
30°	13:53	14:47	15:49	03:35	04:43	05:48
20°	14:19	15:16	16:17	03:11	04:16	05:19
N 10°	14:41	15:40	16:41	02:50	03:52	04:55
0°	15:02	16:03	17:04	02:31	03:30	04:32
S 10°	15:22	16:25	17:27	02:11	03:08	04:09
20°	15:45	16:50	17:51	01:51	02:45	03:44
30°	16:11	17:18	18:19	01:27	02:18	03:16
35°	16:27	17:35	18:36	01:13	02:02	02:59
40°	16:45	17:55	18:55	00:57	01:43	02:39
45°	17:07	18:19	19:19	00:38	01:20	02:15
S 50°	17:35	18:50	19:49	00:15	00:52	01:43
52°	17:48	19:05	20:04	00:03	00:38	01:28
54°	18:04	19:24	20:22	·· ··	00:21	01:10
56°	18:23	19:46	20:43	·· ··	00:02	00:48
58°	18:46	20:14	21:09	23:39	·· ··	00:19
S 60°	19:17	20:55	21:46	23:07	23:38	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 11-13 82-95%
10	07:25	07:37	12:08	21:16	08:46	
11	07:49	08:01	12:08	22:17	09:46	
12	08:12	08:24	12:08	23:18	10:48	

No IERS EOP prediction data available

January 13, 14, 15 UT (Mon., Tue., Wed.)

DUT1 = UT1-UTC = +0.1878 sec ΔT = TT-UT1 = +68.9962 sec

2025 January 13 to Jan. 15 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	112°43.7	130°52.2	S08°07.0	352°17.4	N24°49.6	42°00.9	N21°41.4	125°17.5	S07°30.4
1	127°46.1	145°52.4	05.9	7°21.0	49.8	57°03.6	41.3	140°19.8	30.3
2	142°48.6	160°52.7	04.7	22°24.5	50.0	72°06.3	41.3	155°22.0	30.2
3	157°51.0	175°52.9	·· 03.5	37°28.0	·· 50.3	87°08.9	·· 41.3	170°24.3	·· 30.1
4	172°53.5	190°53.1	02.3	52°31.6	50.5	102°11.6	41.3	185°26.6	30.1
5	187°56.0	205°53.3	01.2	67°35.1	50.8	117°14.2	41.3	200°28.8	30.0
6	202°58.4	220°53.6	S08°00.0	82°38.6	N24°51.0	132°16.9	N21°41.3	215°31.1	S07°29.9
7	218°00.9	235°53.8	07°58.8	97°42.1	51.3	147°19.6	41.2	230°33.3	29.8
8	233°03.4	250°54.0	57.7	112°45.7	51.5	162°22.2	41.2	245°35.6	29.7
9	248°05.8	265°54.3	·· 56.5	127°49.2	·· 51.7	177°24.9	·· 41.2	260°37.8	·· 29.6
10	263°08.3	280°54.5	55.3	142°52.7	52.0	192°27.5	41.2	275°40.1	29.5
11	278°10.8	295°54.7	54.1	157°56.3	52.2	207°30.2	41.2	290°42.3	29.4
12	293°13.2	310°55.0	S07°53.0	172°59.8	N24°52.5	222°32.9	N21°41.2	305°44.6	S07°29.3
13	308°15.7	325°55.2	51.8	188°03.3	52.7	237°35.5	41.2	320°46.8	29.2
14	323°18.2	340°55.4	50.6	203°06.8	52.9	252°38.2	41.1	335°49.1	29.1
15	338°20.6	355°55.7	·· 49.4	218°10.4	·· 53.2	267°40.8	·· 41.1	350°51.4	·· 29.0
16	353°23.1	10°55.9	48.2	233°13.9	53.4	282°43.5	41.1	5°53.6	28.9
17	8°25.5	25°56.1	47.1	248°17.4	53.7	297°46.1	41.1	20°55.9	28.9
18	23°28.0	40°56.4	S07°45.9	263°21.0	N24°53.9	312°48.8	N21°41.1	35°58.1	S07°28.8
19	38°30.5	55°56.6	44.7	278°24.5	54.1	327°51.5	41.1	51°00.4	28.7
20	53°32.9	70°56.9	43.5	293°28.0	54.4	342°54.1	41.0	66°02.6	28.6
21	68°35.4	85°57.1	·· 42.4	308°31.6	·· 54.6	357°56.8	·· 41.0	81°04.9	·· 28.5
22	83°37.9	100°57.4	41.2	323°35.1	54.9	12°59.4	41.0	96°07.1	28.4
23	98°40.3	115°57.6	40.0	338°38.6	55.1	28°02.1	41.0	111°09.4	28.3
Mer.pass. 16:26		ν 0.2′ d 1.2′ m -4.56		ν 3.5′ d 0.2′ m -1.43		ν 2.7′ d -0.0′ m -2.67		ν 2.3′ d 0.1′ m 1.08	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	113°42.8	130°57.8	S07°38.8	353°42.2	N24°55.3	43°04.7	N21°41.0	126°11.6	S07°28.2
1	128°45.3	145°58.1	37.7	8°45.7	55.6	58°07.4	41.0	141°13.9	28.1
2	143°47.7	160°58.3	36.5	23°49.2	55.8	73°10.0	41.0	156°16.1	28.0
3	158°50.2	175°58.6	·· 35.3	38°52.8	·· 56.0	88°12.7	·· 40.9	171°18.4	·· 27.9
4	173°52.7	190°58.8	34.1	53°56.3	56.3	103°15.4	40.9	186°20.7	27.8
5	188°55.1	205°59.1	33.0	68°59.8	56.5	118°18.0	40.9	201°22.9	27.7
6	203°57.6	220°59.4	S07°31.8	84°03.4	N24°56.8	133°20.7	N21°40.9	216°25.2	S07°27.6
7	219°00.0	235°59.6	30.6	99°06.9	57.0	148°23.3	40.9	231°27.4	27.6
8	234°02.5	250°59.9	29.4	114°10.4	57.2	163°26.0	40.9	246°29.7	27.5
9	249°05.0	266°00.1	·· 28.2	129°14.0	·· 57.5	178°28.6	·· 40.9	261°31.9	·· 27.4
10	264°07.4	281°00.4	27.1	144°17.5	57.7	193°31.3	40.8	276°34.2	27.3
11	279°09.9	296°00.6	25.9	159°21.0	57.9	208°33.9	40.8	291°36.4	27.2
12	294°12.4	311°00.9	S07°24.7	174°24.6	N24°58.2	223°36.6	N21°40.8	306°38.7	S07°27.1
13	309°14.8	326°01.2	23.5	189°28.1	58.4	238°39.2	40.8	321°40.9	27.0
14	324°17.3	341°01.4	22.4	204°31.6	58.6	253°41.9	40.8	336°43.2	26.9
15	339°19.8	356°01.7	·· 21.2	219°35.2	·· 58.9	268°44.5	·· 40.8	351°45.4	·· 26.8
16	354°22.2	11°01.9	20.0	234°38.7	59.1	283°47.2	40.8	6°47.7	26.7
17	9°24.7	26°02.2	18.8	249°42.3	59.3	298°49.8	40.7	21°49.9	26.6
18	24°27.1	41°02.5	S07°17.6	264°45.8	N24°59.6	313°52.5	N21°40.7	36°52.2	S07°26.5
19	39°29.6	56°02.7	16.5	279°49.3	24°59.8	328°55.1	40.7	51°54.4	26.4
20	54°32.1	71°03.0	15.3	294°52.9	25°00.0	343°57.8	40.7	66°56.7	26.3
21	69°34.5	86°03.3	·· 14.1	309°56.4	·· 00.3	359°00.4	·· 40.7	81°58.9	·· 26.2
22	84°37.0	101°03.5	12.9	324°59.9	00.5	14°03.1	40.7	97°01.2	26.1
23	99°39.5	116°03.8	11.8	340°03.5	00.7	29°05.7	40.7	112°03.4	26.1
Mer.pass. 16:22		ν 0.2′ d 1.2′ m -4.57		ν 3.5′ d 0.2′ m -1.44		ν 2.7′ d -0.0′ m -2.66		ν 2.3′ d 0.1′ m 1.09	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	114°41.9	131°04.1	S07°10.6	355°07.0	N25°01.0	44°08.3	N21°40.7	127°05.7	S07°26.0
1	129°44.4	146°04.4	09.4	10°10.5	01.2	59°11.0	40.6	142°07.9	25.9
2	144°46.9	161°04.6	08.2	25°14.1	01.4	74°13.6	40.6	157°10.2	25.8
3	159°49.3	176°04.9	·· 07.0	40°17.6	·· 01.6	89°16.3	·· 40.6	172°12.4	·· 25.7
4	174°51.8	191°05.2	05.9	55°21.1	01.9	104°18.9	40.6	187°14.7	25.6
5	189°54.3	206°05.5	04.7	70°24.7	02.1	119°21.6	40.6	202°16.9	25.5
6	204°56.7	221°05.8	S07°03.5	85°28.2	N25°02.3	134°24.2	N21°40.6	217°19.2	S07°25.4
7	219°59.2	236°06.0	02.3	100°31.8	02.6	149°26.9	40.6	232°21.4	25.3
8	235°01.6	251°06.3	01.1	115°35.3	02.8	164°29.5	40.5	247°23.7	25.2
9	250°04.1	266°06.6	07°00.0	130°38.8	·· 03.0	179°32.2	·· 40.5	262°25.9	·· 25.1
10	265°06.6	281°06.9	06°58.8	145°42.4	03.2	194°34.8	40.5	277°28.2	25.0
11	280°09.0	296°07.2	57.6	160°45.9	03.5	209°37.4	40.5	292°30.4	24.9
12	295°11.5	311°07.4	S06°56.4	175°49.4	N25°03.7	224°40.1	N21°40.5	307°32.7	S07°24.8
13	310°14.0	326°07.7	55.2	190°53.0	03.9	239°42.7	40.5	322°34.9	24.7
14	325°16.4	341°08.0	54.1	205°56.5	04.2	254°45.4	40.5	337°37.2	24.6
15	340°18.9	356°08.3	·· 52.9	221°00.1	·· 04.4	269°48.0	·· 40.5	352°39.4	·· 24.5
16	355°21.4	11°08.6	51.7	236°03.6	04.6	284°50.6	40.4	7°41.7	24.5
17	10°23.8	26°08.9	50.5	251°07.1	04.8	299°53.3	40.4	22°43.9	24.4
18	25°26.3	41°09.2	S06°49.3	266°10.7	N25°05.1	314°55.9	N21°40.4	37°46.2	S07°24.3
19	40°28.8	56°09.5	48.2	281°14.2	05.3	329°58.6	40.4	52°48.4	24.2
20	55°31.2	71°09.8	47.0	296°17.7	05.5	345°01.2	40.4	67°50.7	24.1
21	70°33.7	86°10.1	·· 45.8	311°21.3	·· 05.7	0°03.8	·· 40.4	82°52.9	·· 24.0
22	85°36.1	101°10.4	44.6	326°24.8	06.0	15°06.5	40.4	97°55.2	23.9
23	100°38.6	116°10.7	43.4	341°28.4	06.2	30°09.1	40.4	112°57.4	23.8
Mer.pass. 16:19		ν 0.3′ d 1.2′ m -4.58		ν 3.5′ d 0.2′ m -1.45		ν 2.6′ d -0.0′ m -2.65		ν 2.3′ d 0.1′ m 1.09	

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.2	-42°10.4
Schedar	349°31.2	56°40.7
Diphda	348°47.3	-17°51.1
Achernar	335°20.1	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°48.5	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.3
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.4	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.7
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.7	7°24.7
Canopus	263°51.8	-52°42.6
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.3
Suhail	222°45.9	-43°31.9
Miaplacidus	221°37.4	-69°49.0
Alphard	217°47.4	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.5	61°36.7
Denebola	182°24.8	14°25.8
Gienah	175°43.5	-17°40.8
Acrux	172°59.9	-63°14.0
Gacrux	171°51.5	-57°15.0
Alioth	166°12.8	55°49.1
Spica	158°22.3	-11°17.5
Alkaid	152°52.0	49°11.0
Hadar	148°36.1	-60°29.4
Menkent	147°57.7	-36°29.4
Arcturus	145°48.0	19°02.9
Rigil Kent.	139°40.5	-60°56.1
Kochab	137°20.2	74°02.8
Zuben'ubi	136°56.1	-16°08.7
Alphecca	126°03.9	26°37.6
Antares	112°16.1	-26°29.2
Atria	107°10.7	-69°04.1
Sabik	102°03.0	-15°45.4
Shaula	96°10.7	-37°07.3
Rasalhague	95°58.8	12°32.4
Eltanin	90°42.7	51°28.9
Kaus Aust.	83°32.9	-34°22.4
Vega	80°33.6	38°48.3
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.4
Deneb	49°26.3	45°22.2
Enif	33°39.1	9°59.4
Al Na'ir	27°33.2	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 13 Mon	SHA	Mer.pass
Venus	18°08.6	15:16
Mars	239°33.8	00:31
Jupiter	289°17.3	21:08
Saturn	12°33.9	15:36

Jan 14 Tue	SHA	Mer.pass
Venus	17°15.1	15:16
Mars	239°59.4	00:25
Jupiter	289°21.9	21:04
Saturn	12°28.8	15:33

Jan 15 Wed	SHA	Mer.pass
Venus	16°22.2	15:15
Mars	240°25.1	00:19
Jupiter	289°26.4	21:00
Saturn	12°23.8	15:29

Horizontal parallax	
Venus:	0.2
Mars:	0.2

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.2	S21°28.2	9°59.6	5.1′	N27°52.7	3.7′	57.9′
1	192°51.0	27.8	24°23.7	5.1′	27°49.0	3.8′	57.9′
2	207°50.8	27.4	38°47.8	5.2′	27°45.2	4.1′	57.9′
3	222°50.5	·· 27.0	53°12.0	5.3′	27°41.1	4.2′	57.9′
4	237°50.3	26.5	67°36.3	5.4′	27°36.9	4.4′	57.8′
5	252°50.1	26.1	82°00.6	5.4′	27°32.5	4.5′	57.8′
6	267°49.9	S21°25.7	96°25.1	5.5′	N27°28.0	4.7′	57.8′
7	282°49.6	25.2	110°49.6	5.6′	27°23.3	4.9′	57.8′
8	297°49.4	24.8	125°14.2	5.7′	27°18.4	5.1′	57.8′
9	312°49.2	·· 24.4	139°38.9	5.8′	27°13.3	5.2′	57.7′
10	327°48.9	23.9	154°03.6	5.9′	27°08.1	5.4′	57.7′
11	342°48.7	23.5	168°28.5	5.9′	27°02.7	5.5′	57.7′
12	357°48.5	S21°23.1	182°53.4	6.0′	N26°57.2	5.7′	57.7′
13	12°48.2	22.6	197°18.5	6.1′	26°51.5	5.9′	57.6′
14	27°48.0	22.2	211°43.6	6.2′	26°45.6	6.0′	57.6′
15	42°47.8	·· 21.8	226°08.8	6.3′	26°39.6	6.2′	57.6′
16	57°47.6	21.3	240°34.2	6.4′	26°33.4	6.3′	57.6′
17	72°47.3	20.9	254°59.6	6.5′	26°27.1	6.5′	57.5′
18	87°47.1	S21°20.5	269°25.1	6.6′	N26°20.6	6.7′	57.5′
19	102°46.9	20.0	283°50.7	6.7′	26°13.9	6.7′	57.5′
20	117°46.6	19.6	298°16.4	6.8′	26°07.2	7.0′	57.5′
21	132°46.4	·· 19.1	312°42.3	6.9′	26°00.2	7.1′	57.5′
22	147°46.2	18.7	327°08.2	7.0′	25°53.1	7.2′	57.4′
23	162°46.0	18.2	341°34.2	7.1′	25°45.9	7.4′	57.4′
	SD = 16.3′	d = 0.4′	SD = 15.8′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°45.7	S21°17.8	356°00.4	7.2′	N25°38.5	7.5′	57.4′
1	192°45.5	17.4	10°26.6	7.4′	25°31.0	7.7′	57.4′
2	207°45.3	16.9	24°53.0	7.5′	25°23.3	7.8′	57.3′
3	222°45.1	·· 16.5	39°19.4	7.6′	25°15.5	7.9′	57.3′
4	237°44.8	16.0	53°46.0	7.7′	25°07.6	8.1′	57.3′
5	252°44.6	15.6	68°12.7	7.8′	24°59.5	8.2′	57.3′
6	267°44.4	S21°15.1	82°39.5	7.9′	N24°51.3	8.4′	57.2′
7	282°44.2	14.7	97°06.4	8.0′	24°42.9	8.5′	57.2′
8	297°43.9	14.2	111°33.4	8.1′	24°34.4	8.6′	57.2′
9	312°43.7	·· 13.8	126°00.5	8.2′	24°25.8	8.7′	57.2′
10	327°43.5	13.3	140°27.8	8.4′	24°17.1	8.9′	57.1′
11	342°43.3	12.9	154°55.1	8.5′	24°08.2	9.0′	57.1′
12	357°43.0	S21°12.4	169°22.6	8.6′	N23°59.2	9.1′	57.1′
13	12°42.8	12.0	183°50.1	8.7′	23°50.1	9.3′	57.1′
14	27°42.6	11.5	198°17.8	8.8′	23°40.8	9.3′	57.0′
15	42°42.4	·· 11.1	212°45.7	8.9′	23°31.5	9.5′	57.0′
16	57°42.1	10.6	227°13.6	9.0′	23°22.0	9.6′	57.0′
17	72°41.9	10.2	241°41.6	9.2′	23°12.4	9.7′	57.0′
18	87°41.7	S21°09.7	256°09.8	9.3′	N23°02.7	9.9′	56.9′
19	102°41.5	09.3	270°38.0	9.4′	22°52.8	9.9′	56.9′
20	117°41.3	08.8	285°06.4	9.5′	22°42.9	10.1′	56.9′
21	132°41.0	·· 08.3	299°34.9	9.6′	22°32.8	10.1′	56.8′
22	147°40.8	07.9	314°03.5	9.7′	22°22.7	10.3′	56.8′
23	162°40.6	07.4	328°32.3	9.8′	22°12.4	10.4′	56.8′
	SD = 16.3′	d = 0.4′	SD = 15.6′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°40.4	S21°07.0	343°01.1	10.0′	N22°02.0	10.5′	56.8′
1	192°40.2	06.5	357°30.1	10.1′	21°51.5	10.6′	56.7′
2	207°39.9	06.0	11°59.1	10.2′	21°40.9	10.6′	56.7′
3	222°39.7	·· 05.6	26°28.3	10.3′	21°30.3	10.8′	56.7′
4	237°39.5	05.1	40°57.6	10.4′	21°19.5	10.9′	56.7′
5	252°39.3	04.7	55°27.0	10.5′	21°08.6	11.0′	56.6′
6	267°39.1	S21°04.2	69°56.6	10.6′	N20°57.6	11.1′	56.6′
7	282°38.8	03.7	84°26.2	10.8′	20°46.5	11.1′	56.6′
8	297°38.6	03.3	98°56.0	10.9′	20°35.4	11.3′	56.6′
9	312°38.4	·· 02.8	113°25.8	11.0′	20°24.1	11.3′	56.5′
10	327°38.2	02.3	127°55.8	11.1′	20°12.8	11.5′	56.5′
11	342°38.0	01.9	142°25.9	11.2′	20°01.3	11.5′	56.5′
12	357°37.8	S21°01.4	156°56.1	11.3′	N19°49.8	11.6′	56.5′
13	12°37.5	00.9	171°26.4	11.4′	19°38.2	11.7′	56.4′
14	27°37.3	00.5	185°56.8	11.5′	19°26.5	11.8′	56.4′
15	42°37.1	21°00.0	200°27.4	11.6′	19°14.7	11.8′	56.4′
16	57°36.9	20°59.5	214°58.0	11.7′	19°02.9	12.0′	56.3′
17	72°36.7	59.0	229°28.7	11.9′	18°50.9	12.0′	56.3′
18	87°36.5	S20°58.6	243°59.6	12.0′	N18°38.9	12.1′	56.3′
19	102°36.3	58.1	258°30.6	12.1′	18°26.8	12.1′	56.3′
20	117°36.0	57.6	273°01.6	12.2′	18°14.7	12.3′	56.2′
21	132°35.8	·· 57.2	287°32.8	12.3′	18°02.4	12.3′	56.2′
22	147°35.6	56.7	302°04.1	12.4′	17°50.1	12.4′	56.2′
23	162°35.4	56.2	316°35.4	12.5′	17°37.7	12.4′	56.2′
	SD = 16.3′	d = 0.5′	SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:02	09:55	▬	▬	14:25	16:17
N 70°	07:47	09:20	▬	▬	14:59	16:32
68°	07:35	08:55	10:36	13:42	15:24	16:44
66°	07:25	08:36	09:55	14:24	15:43	16:54
64°	07:16	08:20	09:27	14:52	15:59	17:03
62°	07:08	08:07	09:06	15:13	16:12	17:10
60°	07:02	07:56	08:49	15:30	16:23	17:17
N 58°	06:56	07:46	08:34	15:44	16:33	17:23
56°	06:50	07:37	08:22	15:57	16:41	17:29
54°	06:45	07:30	08:11	16:07	16:49	17:34
52°	06:40	07:23	08:02	16:17	16:56	17:39
50°	06:36	07:16	07:53	16:25	17:02	17:43
45°	06:26	07:02	07:35	16:43	17:16	17:53
N 40°	06:17	06:51	07:20	16:58	17:28	18:01
35°	06:09	06:40	07:08	17:11	17:38	18:09
30°	06:01	06:31	06:57	17:22	17:48	18:17
20°	05:47	06:14	06:38	17:41	18:04	18:31
N 10°	05:33	05:59	06:21	17:57	18:20	18:46
0°	05:17	05:43	06:05	18:13	18:35	19:01
S 10°	05:00	05:27	05:50	18:29	18:51	19:18
20°	04:40	05:09	05:33	18:45	19:10	19:38
30°	04:14	04:46	05:13	19:05	19:32	20:04
35°	03:57	04:32	05:01	19:17	19:45	20:21
40°	03:36	04:16	04:48	19:30	20:02	20:41
45°	03:10	03:56	04:32	19:46	20:21	21:08
S 50°	02:32	03:30	04:12	20:05	20:47	21:45
52°	02:11	03:17	04:03	20:15	21:00	22:05
54°	01:44	03:03	03:52	20:25	21:14	22:32
56°	00:59	02:45	03:40	20:37	21:32	23:14
58°	–:–	02:23	03:26	20:51	21:54	–:–
S 60°	–:–	01:53	03:10	21:07	22:22	–:–

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	14:46	▭	▭	12:44
68°	▭	▭	15:46	▭	▭	11:43
66°	▭	13:28	16:20	▭	12:14	11:08
64°	▭	14:37	16:45	▭	11:04	10:42
62°	13:06	15:12	17:04	10:37	10:28	10:22
60°	13:51	15:37	17:20	09:51	10:02	10:05
N 58°	14:21	15:57	17:33	09:21	09:41	09:51
56°	14:44	16:14	17:44	08:59	09:24	09:39
54°	15:02	16:28	17:54	08:40	09:10	09:29
52°	15:18	16:40	18:03	08:24	08:57	09:19
50°	15:31	16:51	18:11	08:10	08:46	09:11
45°	15:59	17:13	18:27	07:42	08:22	08:53
N 40°	16:20	17:31	18:41	07:20	08:03	08:38
35°	16:38	17:46	18:52	07:01	07:47	08:25
30°	16:54	17:59	19:02	06:45	07:34	08:14
20°	17:20	18:21	19:19	06:18	07:10	07:55
N 10°	17:42	18:40	19:34	05:55	06:49	07:38
0°	18:03	18:58	19:48	05:33	06:30	07:22
S 10°	18:24	19:16	20:02	05:11	06:10	07:07
20°	18:46	19:34	20:16	04:47	05:49	06:50
30°	19:12	19:56	20:33	04:19	05:25	06:30
35°	19:27	20:09	20:43	04:03	05:11	06:18
40°	19:44	20:23	20:54	03:44	04:54	06:05
45°	20:05	20:40	21:07	03:21	04:34	05:49
S 50°	20:32	21:01	21:22	02:51	04:08	05:29
52°	20:45	21:11	21:30	02:36	03:56	05:20
54°	20:59	21:22	21:38	02:19	03:42	05:09
56°	21:16	21:35	21:47	01:58	03:25	04:57
58°	21:37	21:50	21:57	01:32	03:05	04:43
S 60°	22:02	22:07	22:08	00:55	02:40	04:26

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 14-16 99-99%
13	08:35	08:46	12:09	–:–	11:48	
14	08:57	09:08	12:09	00:17	12:44	
15	09:18	09:29	12:09	01:10	13:35	

No IERS EOP prediction data available

January 16, 17, 18 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.1886 sec ΔT = TT-UT1 = +68.9954 sec

2025 January 16 to Jan. 18 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	115°41.1	131°11.0	S06°42.3	356°31.9	N25°06.4	45°11.8	N21°40.3	127°59.7	S07°23.7
1	130°43.5	146°11.3	41.1	11°35.4	06.6	60°14.4	40.3	143°01.9	23.6
2	145°46.0	161°11.6	39.9	26°39.0	06.8	75°17.0	40.3	158°04.2	23.5
3	160°48.5	176°11.9	·· 38.7	41°42.5	·· 07.1	90°19.7	·· 40.3	173°06.4	·· 23.4
4	175°50.9	191°12.2	37.5	56°46.0	07.3	105°22.3	40.3	188°08.7	23.3
5	190°53.4	206°12.5	36.3	71°49.6	07.5	120°24.9	40.3	203°10.9	23.2
6	205°55.9	221°12.8	S06°35.2	86°53.1	N25°07.7	135°27.6	N21°40.3	218°13.2	S07°23.1
7	220°58.3	236°13.1	34.0	101°56.7	08.0	150°30.2	40.3	233°15.4	23.0
8	236°00.8	251°13.4	32.8	117°00.2	08.2	165°32.9	40.2	248°17.7	22.9
9	251°03.3	266°13.7	·· 31.6	132°03.7	·· 08.4	180°35.5	·· 40.2	263°19.9	·· 22.8
10	266°05.7	281°14.0	30.4	147°07.3	08.6	195°38.1	40.2	278°22.2	22.7
11	281°08.2	296°14.3	29.3	162°10.8	08.8	210°40.8	40.2	293°24.4	22.6
12	296°10.6	311°14.6	S06°28.1	177°14.3	N25°09.1	225°43.4	N21°40.2	308°26.7	S07°22.5
13	311°13.1	326°14.9	26.9	192°17.9	09.3	240°46.0	40.2	323°28.9	22.5
14	326°15.6	341°15.3	25.7	207°21.4	09.5	255°48.7	40.2	338°31.1	22.4
15	341°18.0	356°15.6	·· 24.5	222°25.0	·· 09.7	270°51.3	·· 40.2	353°33.4	·· 22.3
16	356°20.5	11°15.9	23.4	237°28.5	09.9	285°53.9	40.1	8°35.6	22.2
17	11°23.0	26°16.2	22.2	252°32.0	10.2	300°56.6	40.1	23°37.9	22.1
18	26°25.4	41°16.5	S06°21.0	267°35.6	N25°10.4	315°59.2	N21°40.1	38°40.1	S07°22.0
19	41°27.9	56°16.8	19.8	282°39.1	10.6	331°01.8	40.1	53°42.4	21.9
20	56°30.4	71°17.2	18.6	297°42.6	10.8	346°04.5	40.1	68°44.6	21.8
21	71°32.8	86°17.5	·· 17.4	312°46.2	·· 11.0	1°07.1	·· 40.1	83°46.9	·· 21.7
22	86°35.3	101°17.8	16.3	327°49.7	11.2	16°09.7	40.1	98°49.1	21.6
23	101°37.7	116°18.1	15.1	342°53.3	11.5	31°12.3	40.1	113°51.4	21.5
Mer.pass. 16:15		ν 0.3′	d 1.2′	m -4.59	ν 3.5′	d 0.2′	m -1.45	ν 2.6′	d -0.0′ m -2.65	ν 2.2′	d 0.1′ m 1.09

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	116°40.2	131°18.5	S06°13.9	357°56.8	N25°11.7	46°15.0	N21°40.0	128°53.6	S07°21.4
1	131°42.7	146°18.8	12.7	13°00.3	11.9	61°17.6	40.0	143°55.9	21.3
2	146°45.1	161°19.1	11.5	28°03.9	12.1	76°20.2	40.0	158°58.1	21.2
3	161°47.6	176°19.4	·· 10.4	43°07.4	·· 12.3	91°22.9	·· 40.0	174°00.3	·· 21.1
4	176°50.1	191°19.8	09.2	58°10.9	12.5	106°25.5	40.0	189°02.6	21.0
5	191°52.5	206°20.1	08.0	73°14.5	12.7	121°28.1	40.0	204°04.8	20.9
6	206°55.0	221°20.4	S06°06.8	88°18.0	N25°13.0	136°30.7	N21°40.0	219°07.1	S07°20.8
7	221°57.5	236°20.8	05.6	103°21.5	13.2	151°33.4	40.0	234°09.3	20.7
8	236°59.9	251°21.1	04.4	118°25.1	13.4	166°36.0	40.0	249°11.6	20.6
9	252°02.4	266°21.4	·· 03.3	133°28.6	·· 13.6	181°38.6	·· 39.9	264°13.8	·· 20.5
10	267°04.9	281°21.8	02.1	148°32.2	13.8	196°41.3	39.9	279°16.1	20.4
11	282°07.3	296°22.1	06°00.9	163°35.7	14.0	211°43.9	39.9	294°18.3	20.3
12	297°09.8	311°22.4	S05°59.7	178°39.2	N25°14.2	226°46.5	N21°39.9	309°20.6	S07°20.2
13	312°12.2	326°22.8	58.5	193°42.8	14.5	241°49.1	39.9	324°22.8	20.2
14	327°14.7	341°23.1	57.3	208°46.3	14.7	256°51.8	39.9	339°25.0	20.1
15	342°17.2	356°23.5	·· 56.2	223°49.8	·· 14.9	271°54.4	·· 39.9	354°27.3	·· 20.0
16	357°19.6	11°23.8	55.0	238°53.4	15.1	286°57.0	39.9	9°29.5	19.9
17	12°22.1	26°24.1	53.8	253°56.9	15.3	301°59.6	39.9	24°31.8	19.8
18	27°24.6	41°24.5	S05°52.6	269°00.4	N25°15.5	317°02.3	N21°39.8	39°34.0	S07°19.7
19	42°27.0	56°24.8	51.4	284°04.0	15.7	332°04.9	39.8	54°36.3	19.6
20	57°29.5	71°25.2	50.3	299°07.5	15.9	347°07.5	39.8	69°38.5	19.5
21	72°32.0	86°25.5	·· 49.1	314°11.0	·· 16.1	2°10.1	·· 39.8	84°40.7	·· 19.4
22	87°34.4	101°25.9	47.9	329°14.6	16.3	17°12.7	39.8	99°43.0	19.3
23	102°36.9	116°26.2	46.7	344°18.1	16.5	32°15.4	39.8	114°45.2	19.2
Mer.pass. 16:11		ν 0.3′	d 1.2′	m -4.60	ν 3.5′	d 0.2′	m -1.44	ν 2.6′	d -0.0′ m -2.64	ν 2.2′	d 0.1′ m 1.09

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	117°39.4	131°26.6	S05°45.5	359°21.6	N25°16.8	47°18.0	N21°39.8	129°47.5	S07°19.1
1	132°41.8	146°26.9	44.3	14°25.2	17.0	62°20.6	39.8	144°49.7	19.0
2	147°44.3	161°27.3	43.2	29°28.7	17.2	77°23.2	39.8	159°52.0	18.9
3	162°46.7	176°27.6	·· 42.0	44°32.2	·· 17.4	92°25.9	·· 39.7	174°54.2	·· 18.8
4	177°49.2	191°28.0	40.8	59°35.8	17.6	107°28.5	39.7	189°56.5	18.7
5	192°51.7	206°28.4	39.6	74°39.3	17.8	122°31.1	39.7	204°58.7	18.6
6	207°54.1	221°28.7	S05°38.4	89°42.8	N25°18.0	137°33.7	N21°39.7	220°00.9	S07°18.5
7	222°56.6	236°29.1	37.2	104°46.4	18.2	152°36.3	39.7	235°03.2	18.4
8	237°59.1	251°29.4	36.1	119°49.9	18.4	167°38.9	39.7	250°05.4	18.3
9	253°01.5	266°29.8	·· 34.9	134°53.4	·· 18.6	182°41.6	·· 39.7	265°07.7	·· 18.2
10	268°04.0	281°30.2	33.7	149°57.0	18.8	197°44.2	39.7	280°09.9	18.1
11	283°06.5	296°30.5	32.5	165°00.5	19.0	212°46.8	39.7	295°12.2	18.0
12	298°08.9	311°30.9	S05°31.3	180°04.0	N25°19.2	227°49.4	N21°39.7	310°14.4	S07°17.9
13	313°11.4	326°31.3	30.1	195°07.6	19.4	242°52.0	39.6	325°16.6	17.8
14	328°13.8	341°31.6	29.0	210°11.1	19.6	257°54.7	39.6	340°18.9	17.7
15	343°16.3	356°32.0	·· 27.8	225°14.6	·· 19.8	272°57.3	·· 39.6	355°21.1	·· 17.6
16	358°18.8	11°32.4	26.6	240°18.2	20.0	287°59.9	39.6	10°23.4	17.5
17	13°21.2	26°32.7	25.4	255°21.7	20.2	303°02.5	39.6	25°25.6	17.4
18	28°23.7	41°33.1	S05°24.2	270°25.2	N25°20.4	318°05.1	N21°39.6	40°27.8	S07°17.3
19	43°26.2	56°33.5	23.0	285°28.7	20.6	333°07.7	39.6	55°30.1	17.2
20	58°28.6	71°33.9	21.9	300°32.3	20.8	348°10.3	39.6	70°32.3	17.1
21	73°31.1	86°34.2	·· 20.7	315°35.8	·· 21.0	3°13.0	·· 39.6	85°34.6	·· 17.0
22	88°33.6	101°34.6	19.5	330°39.3	21.2	18°15.6	39.6	100°36.8	16.9
23	103°36.0	116°35.0	18.3	345°42.9	21.4	33°18.2	39.5	115°39.1	16.8
Mer.pass. 16:07		ν 0.4′	d 1.2′	m -4.61	ν 3.5′	d 0.2′	m -1.42	ν 2.6′	d -0.0′ m -2.63	ν 2.2′	d 0.1′ m 1.09

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.2	-42°10.4
Schedar	349°31.2	56°40.7
Diphda	348°47.3	-17°51.1
Achernar	335°20.1	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°50.0	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.3
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.4	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.7	7°24.7
Canopus	263°51.9	-52°42.6
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.3
Suhail	222°45.9	-43°31.9
Miaplacidus	221°37.4	-69°49.0
Alphard	217°47.4	-8°46.1
Regulus	207°34.1	11°50.6
Dubhe	193°40.5	61°36.7
Denebola	182°24.8	14°25.8
Gienah	175°43.4	-17°40.8
Acrux	172°59.9	-63°14.0
Gacrux	171°51.5	-57°15.0
Alioth	166°12.8	55°49.1
Spica	158°22.3	-11°17.5
Alkaid	152°52.0	49°11.0
Hadar	148°36.1	-60°29.4
Menkent	147°57.6	-36°29.5
Arcturus	145°47.9	19°02.9
Rigil Kent.	139°40.4	-60°56.1
Kochab	137°20.1	74°02.7
Zuben'ubi	136°56.1	-16°08.7
Alphecca	126°03.9	26°37.6
Antares	112°16.1	-26°29.2
Atria	107°10.7	-69°04.1
Sabik	102°03.0	-15°45.4
Shaula	96°10.7	-37°07.3
Rasalhague	95°58.8	12°32.4
Eltanin	90°42.7	51°28.9
Kaus Aust.	83°32.9	-34°22.4
Vega	80°33.6	38°48.2
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.4
Deneb	49°26.3	45°22.2
Enif	33°39.1	9°59.3
Al Na'ir	27°33.2	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 16 Thu	SHA	Mer.pass
Venus	15°29.9	15:15
Mars	240°50.8	00:14
Jupiter	289°30.7	20:56
Saturn	12°18.6	15:26

Jan 17 Fri	SHA	Mer.pass
Venus	14°38.2	15:14
Mars	241°16.6	00:08
Jupiter	289°34.8	20:51
Saturn	12°13.4	15:22

Jan 18 Sat	SHA	Mer.pass
Venus	13°47.2	15:14
Mars	241°42.3	00:03
Jupiter	289°38.6	20:47
Saturn	12°08.1	15:19

Horizontal parallax	
Venus:	0.2
Mars:	0.2

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°35.2	S20°55.7	331°06.9	12.6′	N17°25.3	12.5′	56.1′
1	192°35.0	55.3	345°38.5	12.7′	17°12.8	12.6′	56.1′
2	207°34.8	54.8	0°10.2	12.8′	17°00.2	12.6′	56.1′
3	222°34.6	·· 54.3	14°41.9	12.9′	16°47.6	12.8′	56.1′
4	237°34.3	53.8	29°13.8	13.0′	16°34.8	12.7′	56.0′
5	252°34.1	53.3	43°45.8	13.1′	16°22.1	12.9′	56.0′
6	267°33.9	S20°52.9	58°17.9	13.2′	N16°09.2	12.8′	56.0′
7	282°33.7	52.4	72°50.0	13.3′	15°56.4	13.0′	56.0′
8	297°33.5	51.9	87°22.3	13.4′	15°43.4	13.0′	55.9′
9	312°33.3	·· 51.4	101°54.6	13.4′	15°30.4	13.1′	55.9′
10	327°33.1	50.9	116°27.1	13.5′	15°17.3	13.1′	55.9′
11	342°32.9	50.4	130°59.6	13.6′	15°04.2	13.1′	55.9′
12	357°32.7	S20°50.0	145°32.3	13.7′	N14°51.1	13.3′	55.8′
13	12°32.5	49.5	160°05.0	13.8′	14°37.8	13.2′	55.8′
14	27°32.2	49.0	174°37.8	13.9′	14°24.6	13.4′	55.8′
15	42°32.0	·· 48.5	189°10.7	14.0′	14°11.2	13.3′	55.8′
16	57°31.8	48.0	203°43.7	14.1′	13°57.9	13.4′	55.7′
17	72°31.6	47.5	218°16.8	14.2′	13°44.5	13.5′	55.7′
18	87°31.4	S20°47.0	232°49.9	14.2′	N13°31.0	13.5′	55.7′
19	102°31.2	46.5	247°23.2	14.3′	13°17.5	13.5′	55.7′
20	117°31.0	46.1	261°56.5	14.4′	13°04.0	13.6′	55.6′
21	132°30.8	·· 45.6	276°29.9	14.5′	12°50.4	13.6′	55.6′
22	147°30.6	45.1	291°03.4	14.6′	12°36.8	13.7′	55.6′
23	162°30.4	44.6	305°36.9	14.6′	12°23.1	13.7′	55.6′
	SD = 16.3′	d = 0.5′	SD = 15.3′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°30.2	S20°44.1	320°10.6	14.7′	N12°09.4	13.7′	55.5′
1	192°30.0	43.6	334°44.3	14.8′	11°55.7	13.8′	55.5′
2	207°29.8	43.1	349°18.1	14.9′	11°41.9	13.8′	55.5′
3	222°29.6	·· 42.6	3°51.9	14.9′	11°28.1	13.9′	55.5′
4	237°29.4	42.1	18°25.9	15.0′	11°14.2	13.9′	55.4′
5	252°29.1	41.6	32°59.9	15.1′	11°00.3	13.9′	55.4′
6	267°28.9	S20°41.1	47°34.0	15.2′	N10°46.4	13.9′	55.4′
7	282°28.7	40.6	62°08.1	15.2′	10°32.5	14.0′	55.4′
8	297°28.5	40.1	76°42.4	15.3′	10°18.5	14.0′	55.4′
9	312°28.3	·· 39.6	91°16.7	15.4′	10°04.5	14.0′	55.3′
10	327°28.1	39.1	105°51.0	15.4′	09°50.5	14.0′	55.3′
11	342°27.9	38.6	120°25.4	15.5′	09°36.5	14.1′	55.3′
12	357°27.7	S20°38.1	134°59.9	15.6′	N09°22.4	14.1′	55.3′
13	12°27.5	37.6	149°34.5	15.6′	09°08.3	14.1′	55.2′
14	27°27.3	37.1	164°09.1	15.7′	08°54.2	14.2′	55.2′
15	42°27.1	·· 36.6	178°43.8	15.7′	08°40.0	14.1′	55.2′
16	57°26.9	36.1	193°18.5	15.8′	08°25.9	14.2′	55.2′
17	72°26.7	35.6	207°53.3	15.8′	08°11.7	14.2′	55.2′
18	87°26.5	S20°35.1	222°28.1	15.9′	N07°57.5	14.2′	55.1′
19	102°26.3	34.6	237°03.0	16.0′	07°43.3	14.3′	55.1′
20	117°26.1	34.1	251°38.0	16.0′	07°29.0	14.2′	55.1′
21	132°25.9	·· 33.6	266°13.0	16.1′	07°14.8	14.3′	55.1′
22	147°25.7	33.1	280°48.1	16.1′	07°00.5	14.3′	55.0′
23	162°25.5	32.6	295°23.2	16.2′	06°46.2	14.3′	55.0′
	SD = 16.3′	d = 0.5′	SD = 15.1′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.3	S20°32.1	309°58.4	16.2′	N06°31.9	14.3′	55.0′
1	192°25.1	31.5	324°33.6	16.3′	06°17.6	14.3′	55.0′
2	207°24.9	31.0	339°08.8	16.3′	06°03.3	14.4′	55.0′
3	222°24.7	·· 30.5	353°44.1	16.4′	05°48.9	14.3′	54.9′
4	237°24.5	30.0	8°19.5	16.4′	05°34.6	14.4′	54.9′
5	252°24.3	29.5	22°54.9	16.4′	05°20.2	14.4′	54.9′
6	267°24.1	S20°29.0	37°30.3	16.5′	N05°05.8	14.3′	54.9′
7	282°23.9	28.5	52°05.8	16.5′	04°51.5	14.4′	54.9′
8	297°23.8	28.0	66°41.3	16.6′	04°37.1	14.4′	54.9′
9	312°23.6	·· 27.4	81°16.9	16.6′	04°22.7	14.4′	54.8′
10	327°23.4	26.9	95°52.5	16.6′	04°08.3	14.4′	54.8′
11	342°23.2	26.4	110°28.1	16.7′	03°53.9	14.4′	54.8′
12	357°23.0	S20°25.9	125°03.8	16.7′	N03°39.5	14.4′	54.8′
13	12°22.8	25.4	139°39.5	16.7′	03°25.1	14.4′	54.8′
14	27°22.6	24.9	154°15.2	16.8′	03°10.7	14.4′	54.7′
15	42°22.4	·· 24.3	168°51.0	16.8′	02°56.3	14.4′	54.7′
16	57°22.2	23.8	183°26.8	16.8′	02°41.9	14.4′	54.7′
17	72°22.0	23.3	198°02.6	16.9′	02°27.5	14.4′	54.7′
18	87°21.8	S20°22.8	212°38.5	16.9′	N02°13.1	14.4′	54.7′
19	102°21.6	22.3	227°14.4	16.9′	01°58.7	14.4′	54.7′
20	117°21.4	21.7	241°50.3	16.9′	01°44.3	14.4′	54.6′
21	132°21.2	·· 21.2	256°26.2	17.0′	01°29.9	14.4′	54.6′
22	147°21.0	20.7	271°02.1	17.0′	01°15.5	14.4′	54.6′
23	162°20.9	20.2	285°38.1	17.0′	01°01.1	14.4′	54.6′
	SD = 16.2′	d = 0.5′	SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:55	09:42	▬	▬	14:39	16:26
N 70°	07:41	09:11	11:37	12:44	15:10	16:40
68°	07:30	08:48	10:22	13:59	15:33	16:51
66°	07:20	08:30	09:46	14:35	15:51	17:01
64°	07:12	08:15	09:20	15:01	16:06	17:09
62°	07:05	08:03	09:00	15:21	16:18	17:16
60°	06:58	07:52	08:44	15:37	16:29	17:23
N 58°	06:53	07:43	08:30	15:51	16:38	17:28
56°	06:47	07:34	08:19	16:02	16:46	17:33
54°	06:43	07:27	08:08	16:13	16:54	17:38
52°	06:38	07:20	07:59	16:22	17:00	17:43
50°	06:34	07:14	07:51	16:30	17:07	17:47
45°	06:25	07:01	07:33	16:47	17:20	17:56
N 40°	06:16	06:49	07:19	17:02	17:31	18:04
35°	06:08	06:39	07:07	17:14	17:41	18:12
30°	06:01	06:30	06:56	17:24	17:50	18:19
20°	05:47	06:14	06:38	17:43	18:06	18:33
N 10°	05:33	05:59	06:22	17:59	18:21	18:47
0°	05:19	05:44	06:07	18:14	18:36	19:02
S 10°	05:02	05:29	05:51	18:29	18:52	19:18
20°	04:42	05:11	05:35	18:45	19:09	19:38
30°	04:17	04:49	05:15	19:05	19:31	20:03
35°	04:00	04:36	05:04	19:16	19:44	20:19
40°	03:40	04:20	04:51	19:29	20:00	20:39
45°	03:15	04:00	04:36	19:44	20:19	21:04
S 50°	02:39	03:36	04:17	20:03	20:44	21:40
52°	02:19	03:23	04:08	20:12	20:56	21:59
54°	01:54	03:09	03:58	20:22	21:10	22:24
56°	01:16	02:52	03:46	20:33	21:27	22:59
58°	–:–	02:31	03:33	20:46	21:47	–:–
S 60°	–:–	02:04	03:17	21:02	22:13	–:–

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	17:15	19:38	21:40	11:54	11:02	10:26
N 70°	17:44	19:49	21:42	11:24	10:48	10:21
68°	18:04	19:59	21:43	11:02	10:37	10:17
66°	18:21	20:06	21:44	10:44	10:27	10:13
64°	18:34	20:13	21:46	10:29	10:19	10:10
62°	18:45	20:18	21:46	10:17	10:12	10:07
60°	18:54	20:23	21:47	10:06	10:06	10:05
N 58°	19:03	20:27	21:48	09:57	10:00	10:02
56°	19:10	20:31	21:48	09:49	09:55	10:00
54°	19:16	20:34	21:49	09:42	09:51	09:59
52°	19:22	20:37	21:50	09:35	09:47	09:57
50°	19:27	20:40	21:50	09:29	09:44	09:56
45°	19:38	20:46	21:51	09:16	09:36	09:52
N 40°	19:47	20:51	21:52	09:06	09:29	09:50
35°	19:55	20:55	21:53	08:57	09:23	09:47
30°	20:02	20:59	21:53	08:48	09:18	09:45
20°	20:14	21:05	21:54	08:34	09:09	09:42
N 10°	20:24	21:11	21:55	08:22	09:02	09:38
0°	20:34	21:16	21:56	08:10	08:54	09:35
S 10°	20:43	21:21	21:57	07:59	08:47	09:32
20°	20:53	21:27	21:58	07:46	08:39	09:29
30°	21:05	21:33	21:59	07:31	08:30	09:25
35°	21:11	21:37	22:00	07:23	08:24	09:23
40°	21:19	21:41	22:01	07:13	08:18	09:20
45°	21:28	21:45	22:01	07:02	08:11	09:18
S 50°	21:38	21:51	22:02	06:48	08:03	09:14
52°	21:43	21:54	22:03	06:41	07:59	09:12
54°	21:48	21:56	22:03	06:34	07:54	09:11
56°	21:54	22:00	22:04	06:26	07:49	09:09
58°	22:01	22:03	22:05	06:16	07:44	09:06
S 60°	22:08	22:07	22:05	06:06	07:38	09:04

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 17-19 95-83%
16	09:39	09:49	12:10	01:59	14:22	
17	09:59	10:09	12:10	02:44	15:05	
18	10:19	10:28	12:10	03:26	15:46	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1893 sec ΔT = TT-UT1 = +68.9947 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	118°38.5	131°35.4	S05°17.1	0°46.4	N25°21.6	48°20.8	N21°39.5	130°41.3	S07°16.7
1	133°41.0	146°35.7	16.0	15°49.9	21.8	63°23.4	39.5	145°43.5	16.7
2	148°43.4	161°36.1	14.8	30°53.4	22.0	78°26.0	39.5	160°45.8	16.6
3	163°45.9	176°36.5	·· 13.6	45°57.0	·· 22.2	93°28.6	·· 39.5	175°48.0	·· 16.5
4	178°48.3	191°36.9	12.4	61°00.5	22.4	108°31.2	39.5	190°50.3	16.4
5	193°50.8	206°37.3	11.2	76°04.0	22.6	123°33.9	39.5	205°52.5	16.3
6	208°53.3	221°37.7	S05°10.0	91°07.6	N25°22.8	138°36.5	N21°39.5	220°54.7	S07°16.2
7	223°55.7	236°38.0	08.9	106°11.1	23.0	153°39.1	39.5	235°57.0	16.1
8	238°58.2	251°38.4	07.7	121°14.6	23.2	168°41.7	39.5	250°59.2	16.0
9	254°00.7	266°38.8	·· 06.5	136°18.1	·· 23.4	183°44.3	·· 39.5	266°01.5	·· 15.9
10	269°03.1	281°39.2	05.3	151°21.7	23.6	198°46.9	39.4	281°03.7	15.8
11	284°05.6	296°39.6	04.1	166°25.2	23.8	213°49.5	39.4	296°05.9	15.7
12	299°08.1	311°40.0	S05°02.9	181°28.7	N25°24.0	228°52.1	N21°39.4	311°08.2	S07°15.6
13	314°10.5	326°40.4	01.8	196°32.2	24.2	243°54.7	39.4	326°10.4	15.5
14	329°13.0	341°40.8	05°00.6	211°35.8	24.4	258°57.3	39.4	341°12.7	15.4
15	344°15.4	356°41.2	04°59.4	226°39.3	·· 24.6	274°00.0	·· 39.4	356°14.9	·· 15.3
16	359°17.9	11°41.6	58.2	241°42.8	24.8	289°02.6	39.4	11°17.1	15.2
17	14°20.4	26°42.0	57.0	256°46.3	25.0	304°05.2	39.4	26°19.4	15.1
18	29°22.8	41°42.4	S04°55.8	271°49.9	N25°25.2	319°07.8	N21°39.4	41°21.6	S07°15.0
19	44°25.3	56°42.8	54.7	286°53.4	25.4	334°10.4	39.4	56°23.9	14.9
20	59°27.8	71°43.2	53.5	301°56.9	25.6	349°13.0	39.4	71°26.1	14.8
21	74°30.2	86°43.6	·· 52.3	317°00.4	·· 25.8	4°15.6	·· 39.3	86°28.3	·· 14.7
22	89°32.7	101°44.0	51.1	332°03.9	25.9	19°18.2	39.3	101°30.6	14.6
23	104°35.2	116°44.4	49.9	347°07.5	26.1	34°20.8	39.3	116°32.8	14.5
Mer.pass.	16:03	ν 0.4′	d 1.2′	m -4.62	ν 3.5′	d 0.2′	m -1.41	ν 2.6′	d -0.0′ m -2.62	ν 2.2′	d 0.1′ m 1.09
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	119°37.6	131°44.8	S04°48.8	2°11.0	N25°26.3	49°23.4	N21°39.3	131°35.1	S07°14.4
1	134°40.1	146°45.2	47.6	17°14.5	26.5	64°26.0	39.3	146°37.3	14.3
2	149°42.6	161°45.6	46.4	32°18.0	26.7	79°28.6	39.3	161°39.5	14.2
3	164°45.0	176°46.0	·· 45.2	47°21.6	·· 26.9	94°31.2	·· 39.3	176°41.8	·· 14.1
4	179°47.5	191°46.4	44.0	62°25.1	27.1	109°33.8	39.3	191°44.0	14.0
5	194°49.9	206°46.8	42.8	77°28.6	27.3	124°36.4	39.3	206°46.2	13.9
6	209°52.4	221°47.3	S04°41.7	92°32.1	N25°27.5	139°39.0	N21°39.3	221°48.5	S07°13.8
7	224°54.9	236°47.7	40.5	107°35.6	27.7	154°41.6	39.3	236°50.7	13.7
8	239°57.3	251°48.1	39.3	122°39.1	27.8	169°44.2	39.2	251°53.0	13.6
9	254°59.8	266°48.5	·· 38.1	137°42.7	·· 28.0	184°46.8	·· 39.2	266°55.2	·· 13.5
10	270°02.3	281°48.9	36.9	152°46.2	28.2	199°49.4	39.2	281°57.4	13.4
11	285°04.7	296°49.3	35.8	167°49.7	28.4	214°52.0	39.2	296°59.7	13.3
12	300°07.2	311°49.8	S04°34.6	182°53.2	N25°28.6	229°54.6	N21°39.2	312°01.9	S07°13.2
13	315°09.7	326°50.2	33.4	197°56.7	28.8	244°57.2	39.2	327°04.1	13.1
14	330°12.1	341°50.6	32.2	213°00.3	29.0	259°59.8	39.2	342°06.4	13.0
15	345°14.6	356°51.0	·· 31.0	228°03.8	·· 29.1	275°02.4	·· 39.2	357°08.6	·· 12.9
16	0°17.1	11°51.5	29.8	243°07.3	29.3	290°05.0	39.2	12°10.9	12.8
17	15°19.5	26°51.9	28.7	258°10.8	29.5	305°07.6	39.2	27°13.1	12.7
18	30°22.0	41°52.3	S04°27.5	273°14.3	N25°29.7	320°10.2	N21°39.2	42°15.3	S07°12.6
19	45°24.4	56°52.7	26.3	288°17.8	29.9	335°12.8	39.2	57°17.6	12.5
20	60°26.9	71°53.2	25.1	303°21.3	30.1	350°15.4	39.2	72°19.8	12.4
21	75°29.4	86°53.6	·· 23.9	318°24.9	·· 30.3	5°18.0	·· 39.1	87°22.0	·· 12.3
22	90°31.8	101°54.0	22.8	333°28.4	30.4	20°20.6	39.1	102°24.3	12.2
23	105°34.3	116°54.5	21.6	348°31.9	30.6	35°23.2	39.1	117°26.5	12.1
Mer.pass.	15:59	ν 0.4′	d 1.2′	m -4.63	ν 3.5′	d 0.2′	m -1.39	ν 2.6′	d -0.0′ m -2.62	ν 2.2′	d 0.1′ m 1.10
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	120°36.8	131°54.9	S04°20.4	3°35.4	N25°30.8	50°25.8	N21°39.1	132°28.8	S07°12.0
1	135°39.2	146°55.3	19.2	18°38.9	31.0	65°28.4	39.1	147°31.0	11.9
2	150°41.7	161°55.8	18.0	33°42.4	31.2	80°31.0	39.1	162°33.2	11.8
3	165°44.2	176°56.2	·· 16.9	48°45.9	·· 31.3	95°33.6	·· 39.1	177°35.5	·· 11.7
4	180°46.6	191°56.6	15.7	63°49.4	31.5	110°36.2	39.1	192°37.7	11.6
5	195°49.1	206°57.1	14.5	78°52.9	31.7	125°38.8	39.1	207°39.9	11.5
6	210°51.5	221°57.5	S04°13.3	93°56.5	N25°31.9	140°41.4	N21°39.1	222°42.2	S07°11.4
7	225°54.0	236°58.0	12.1	109°00.0	32.1	155°44.0	39.1	237°44.4	11.3
8	240°56.5	251°58.4	10.9	124°03.5	32.2	170°46.6	39.1	252°46.6	11.2
9	255°58.9	266°58.9	·· 09.8	139°07.0	·· 32.4	185°49.1	·· 39.1	267°48.9	·· 11.1
10	271°01.4	281°59.3	08.6	154°10.5	32.6	200°51.7	39.0	282°51.1	11.0
11	286°03.9	296°59.7	07.4	169°14.0	32.8	215°54.3	39.0	297°53.3	10.9
12	301°06.3	312°00.2	S04°06.2	184°17.5	N25°33.0	230°56.9	N21°39.0	312°55.6	S07°10.8
13	316°08.8	327°00.6	05.0	199°21.0	33.1	245°59.5	39.0	327°57.8	10.7
14	331°11.3	342°01.1	03.9	214°24.5	33.3	261°02.1	39.0	343°00.1	10.6
15	346°13.7	357°01.5	·· 02.7	229°28.0	·· 33.5	276°04.7	·· 39.0	358°02.3	·· 10.5
16	1°16.2	12°02.0	01.5	244°31.5	33.7	291°07.3	39.0	13°04.5	10.4
17	16°18.7	27°02.5	04°00.3	259°35.0	33.8	306°09.9	39.0	28°06.8	10.3
18	31°21.1	42°02.9	S03°59.1	274°38.5	N25°34.0	321°12.5	N21°39.0	43°09.0	S07°10.2
19	46°23.6	57°03.4	58.0	289°42.0	34.2	336°15.0	39.0	58°11.2	10.1
20	61°26.0	72°03.8	56.8	304°45.5	34.4	351°17.6	39.0	73°13.5	10.0
21	76°28.5	87°04.3	·· 55.6	319°49.0	·· 34.5	6°20.2	·· 39.0	88°15.7	·· 09.9
22	91°31.0	102°04.7	54.4	334°52.5	34.7	21°22.8	39.0	103°17.9	09.8
23	106°33.4	117°05.2	53.3	349°56.0	34.9	36°25.4	39.0	118°20.2	09.7
Mer.pass.	15:55	ν 0.4′	d 1.2′	m -4.64	ν 3.5′	d 0.2′	m -1.36	ν 2.6′	d -0.0′ m -2.61	ν 2.2′	d 0.1′ m 1.10

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.2	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.2	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°51.5	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.3
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.3	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.7	7°24.7
Canopus	263°51.9	-52°42.6
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.3
Suhail	222°45.9	-43°32.0
Miaplacidus	221°37.4	-69°49.1
Alphard	217°47.4	-8°46.1
Regulus	207°34.1	11°50.6
Dubhe	193°40.5	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.4	-17°40.8
Acrux	172°59.8	-63°14.0
Gacrux	171°51.4	-57°15.0
Alioth	166°12.8	55°49.1
Spica	158°22.2	-11°17.5
Alkaid	152°51.9	49°11.0
Hadar	148°36.0	-60°29.4
Menkent	147°57.6	-36°29.5
Arcturus	145°47.9	19°02.9
Rigil Kent.	139°40.4	-60°56.1
Kochab	137°20.1	74°02.7
Zuben'ubi	136°56.1	-16°08.7
Alphecca	126°03.9	26°37.6
Antares	112°16.0	-26°29.2
Atria	107°10.7	-69°04.1
Sabik	102°03.0	-15°45.4
Shaula	96°10.7	-37°07.3
Rasalhague	95°58.8	12°32.4
Eltanin	90°42.6	51°28.9
Kaus Aust.	83°32.8	-34°22.4
Vega	80°33.6	38°48.2
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.3
Deneb	49°26.3	45°22.1
Enif	33°39.1	9°59.3
Al Na'ir	27°33.3	-46°50.6
Fomalhaut	15°14.7	-29°29.6
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 19 Sun	SHA	Mer.pass
Venus	12°56.9	15:13
Mars	242°07.9	23:51
Jupiter	289°42.3	20:43
Saturn	12°02.8	15:15

Jan 20 Mon	SHA	Mer.pass
Venus	12°07.2	15:13
Mars	242°33.4	23:46
Jupiter	289°45.8	20:39
Saturn	11°57.4	15:11

Jan 21 Tue	SHA	Mer.pass
Venus	11°18.1	15:12
Mars	242°58.6	23:40
Jupiter	289°49.0	20:35
Saturn	11°52.0	15:08

Horizontal parallax	
Venus:	0.2
Mars:	0.2

	Sun			Moon				
h								
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	177°20.7	S20°19.6		300°14.1	17.0′	N00°46.7	14.4′	54.6′
1	192°20.5	19.1		314°50.1	17.0′	00°32.3	14.3′	54.6′
2	207°20.3	18.6		329°26.2	17.1′	00°18.0	14.4′	54.6′
3	222°20.1	·· 18.1		344°02.2	17.1′	N00°03.6	14.4′	54.5′
4	237°19.9	17.5		358°38.3	17.1′	S00°10.8	14.3′	54.5′
5	252°19.7	17.0		13°14.4	17.1′	00°25.1	14.3′	54.5′
6	267°19.5	S20°16.5		27°50.5	17.1′	S00°39.4	14.4′	54.5′
7	282°19.3	15.9		42°26.6	17.1′	00°53.8	14.3′	54.5′
8	297°19.1	15.4		57°02.7	17.1′	01°08.1	14.3′	54.5′
9	312°19.0	·· 14.9		71°38.9	17.1′	01°22.4	14.3′	54.5′
10	327°18.8	14.3		86°15.0	17.2′	01°36.7	14.3′	54.4′
11	342°18.6	13.8		100°51.2	17.2′	01°51.0	14.2′	54.4′
12	357°18.4	S20°13.3		115°27.3	17.2′	S02°05.2	14.3′	54.4′
13	12°18.2	12.7		130°03.5	17.2′	02°19.5	14.2′	54.4′
14	27°18.0	12.2		144°39.6	17.2′	02°33.7	14.2′	54.4′
15	42°17.8	·· 11.7		159°15.8	17.2′	02°47.9	14.2′	54.4′
16	57°17.6	11.1		173°52.0	17.2′	03°02.1	14.2′	54.4′
17	72°17.5	10.6		188°28.2	17.2′	03°16.3	14.2′	54.4′
18	87°17.3	S20°10.1		203°04.3	17.2′	S03°30.5	14.1′	54.4′
19	102°17.1	09.5		217°40.5	17.2′	03°44.6	14.2′	54.3′
20	117°16.9	09.0		232°16.7	17.2′	03°58.8	14.1′	54.3′
21	132°16.7	·· 08.4		246°52.8	17.2′	04°12.9	14.1′	54.3′
22	147°16.5	07.9		261°29.0	17.2′	04°27.0	14.1′	54.3′
23	162°16.4	07.4		276°05.1	17.1′	04°41.1	14.0′	54.3′
	SD = 16.2′	d = 0.5′		SD = 14.9′				
Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	177°16.2	S20°06.8		290°41.3	17.1′	S04°55.1	14.0′	54.3′
1	192°16.0	06.3		305°17.4	17.1′	05°09.1	14.0′	54.3′
2	207°15.8	05.7		319°53.6	17.1′	05°23.1	14.0′	54.3′
3	222°15.6	·· 05.2		334°29.7	17.1′	05°37.1	14.0′	54.3′
4	237°15.4	04.7		349°05.8	17.1′	05°51.1	13.9′	54.3′
5	252°15.3	04.1		3°41.9	17.1′	06°05.0	13.9′	54.3′
6	267°15.1	S20°03.6		18°17.9	17.1′	S06°18.9	13.9′	54.3′
7	282°14.9	03.0		32°54.0	17.0′	06°32.8	13.8′	54.2′
8	297°14.7	02.5		47°30.0	17.0′	06°46.6	13.9′	54.2′
9	312°14.5	·· 01.9		62°06.1	17.0′	07°00.5	13.7′	54.2′
10	327°14.4	01.4		76°42.1	17.0′	07°14.2	13.8′	54.2′
11	342°14.2	00.8		91°18.1	17.0′	07°28.0	13.8′	54.2′
12	357°14.0	S20°00.3		105°54.0	16.9′	S07°41.8	13.7′	54.2′
13	12°13.8	19°59.7		120°30.0	16.9′	07°55.5	13.6′	54.2′
14	27°13.6	59.2		135°05.9	16.9′	08°09.1	13.7′	54.2′
15	42°13.5	·· 58.6		149°41.8	16.9′	08°22.8	13.6′	54.2′
16	57°13.3	58.1		164°17.7	16.8′	08°36.4	13.6′	54.2′
17	72°13.1	57.5		178°53.5	16.8′	08°50.0	13.5′	54.2′
18	87°12.9	S19°57.0		193°29.3	16.8′	S09°03.5	13.5′	54.2′
19	102°12.7	56.4		208°05.1	16.8′	09°17.0	13.5′	54.2′
20	117°12.6	55.9		222°40.9	16.7′	09°30.5	13.4′	54.2′
21	132°12.4	·· 55.3		237°16.6	16.7′	09°43.9	13.5′	54.2′
22	147°12.2	54.8		251°52.3	16.7′	09°57.4	13.3′	54.2′
23	162°12.0	54.2		266°28.0	16.6′	10°10.7	13.3′	54.2′
	SD = 16.2′	d = 0.5′		SD = 14.8′				
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	177°11.9	S19°53.6		281°03.6	16.6′	S10°24.0	13.3′	54.2′
1	192°11.7	53.1		295°39.2	16.6′	10°37.3	13.3′	54.2′
2	207°11.5	52.5		310°14.7	16.5′	10°50.6	13.2′	54.2′
3	222°11.3	·· 52.0		324°50.2	16.5′	11°03.8	13.2′	54.2′
4	237°11.2	51.4		339°25.7	16.4′	11°17.0	13.1′	54.2′
5	252°11.0	50.8		354°01.1	16.4′	11°30.1	13.1′	54.2′
6	267°10.8	S19°50.3		8°36.5	16.3′	S11°43.2	13.0′	54.2′
7	282°10.6	49.7		23°11.9	16.3′	11°56.2	13.1′	54.2′
8	297°10.5	49.2		37°47.2	16.3′	12°09.3	12.9′	54.2′
9	312°10.3	·· 48.6		52°22.4	16.2′	12°22.2	12.9′	54.2′
10	327°10.1	48.0		66°57.7	16.2′	12°35.1	12.9′	54.2′
11	342°10.0	47.5		81°32.8	16.1′	12°48.0	12.8′	54.2′
12	357°09.8	S19°46.9		96°08.0	16.1′	S13°00.8	12.8′	54.2′
13	12°09.6	46.3		110°43.0	16.0′	13°13.6	12.7′	54.2′
14	27°09.4	45.8		125°18.0	16.0′	13°26.3	12.7′	54.2′
15	42°09.3	·· 45.2		139°53.0	15.9′	13°39.0	12.6′	54.2′
16	57°09.1	44.6		154°27.9	15.9′	13°51.6	12.6′	54.2′
17	72°08.9	44.1		169°02.8	15.8′	14°04.2	12.5′	54.2′
18	87°08.8	S19°43.5		183°37.6	15.8′	S14°16.7	12.5′	54.2′
19	102°08.6	42.9		198°12.4	15.7′	14°29.2	12.5′	54.2′
20	117°08.4	42.4		212°47.1	15.6′	14°41.7	12.3′	54.2′
21	132°08.3	·· 41.8		227°21.7	15.6′	14°54.0	12.3′	54.2′
22	147°08.1	41.2		241°56.3	15.5′	15°06.3	12.3′	54.2′
23	162°07.9	40.7		256°30.8	15.5′	15°18.6	12.2′	54.2′
	SD = 16.2′	d = 0.6′		SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:47	09:30	▬	▬	14:54	16:36
N 70°	07:34	09:01	11:03	13:21	15:22	16:49
68°	07:24	08:40	10:09	14:14	15:43	16:59
66°	07:15	08:23	09:36	14:47	16:00	17:08
64°	07:07	08:09	09:13	15:10	16:13	17:16
62°	07:01	07:58	08:54	15:29	16:25	17:22
60°	06:55	07:48	08:39	15:44	16:35	17:28
N 58°	06:49	07:39	08:26	15:57	16:44	17:33
56°	06:44	07:31	08:15	16:08	16:52	17:38
54°	06:40	07:24	08:05	16:18	16:59	17:43
52°	06:36	07:18	07:56	16:27	17:05	17:47
50°	06:32	07:12	07:48	16:35	17:11	17:51
45°	06:23	06:59	07:31	16:51	17:24	18:00
N 40°	06:15	06:48	07:17	17:05	17:34	18:07
35°	06:08	06:39	07:06	17:17	17:44	18:15
30°	06:01	06:30	06:55	17:27	17:52	18:22
20°	05:47	06:14	06:38	17:45	18:08	18:35
N 10°	05:34	06:00	06:22	18:00	18:22	18:48
0°	05:20	05:45	06:07	18:15	18:37	19:02
S 10°	05:04	05:30	05:53	18:29	18:52	19:18
20°	04:44	05:13	05:37	18:45	19:09	19:37
30°	04:20	04:52	05:18	19:04	19:30	20:02
35°	04:04	04:39	05:07	19:14	19:43	20:18
40°	03:45	04:24	04:55	19:27	19:58	20:37
45°	03:20	04:05	04:40	19:42	20:16	21:01
S 50°	02:46	03:41	04:22	20:00	20:40	21:35
52°	02:27	03:29	04:13	20:08	20:52	21:53
54°	02:04	03:16	04:03	20:18	21:05	22:15
56°	01:32	03:00	03:52	20:29	21:21	22:46
58°	–:–	02:40	03:39	20:41	21:40	23:52
S 60°	–:–	02:15	03:24	20:56	22:04	–:–

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	23:38	·· ··	01:44	09:54	09:21	08:40
N 70°	23:31	·· ··	01:25	09:56	09:31	09:01
68°	23:25	·· ··	01:10	09:58	09:39	09:18
66°	23:20	·· ··	00:58	10:00	09:46	09:31
64°	23:16	·· ··	00:48	10:01	09:52	09:42
62°	23:13	·· ··	00:40	10:02	09:57	09:52
60°	23:10	·· ··	00:32	10:03	10:02	10:00
N 58°	23:07	·· ··	00:26	10:04	10:06	10:08
56°	23:04	·· ··	00:21	10:05	10:09	10:14
54°	23:02	·· ··	00:16	10:06	10:12	10:20
52°	23:00	·· ··	00:11	10:06	10:15	10:25
50°	22:59	·· ··	00:07	10:07	10:18	10:30
45°	22:55	23:59	·· ··	10:08	10:24	10:41
N 40°	22:52	23:51	·· ··	10:09	10:29	10:49
35°	22:49	23:45	·· ··	10:10	10:33	10:57
30°	22:46	23:40	·· ··	10:11	10:37	11:03
20°	22:42	23:31	·· ··	10:13	10:43	11:15
N 10°	22:39	23:22	·· ··	10:14	10:49	11:25
0°	22:35	23:15	23:56	10:15	10:54	11:34
S 10°	22:32	23:07	23:44	10:16	11:00	11:44
20°	22:29	23:00	23:32	10:18	11:06	11:54
30°	22:25	22:51	23:18	10:19	11:12	12:06
35°	22:22	22:45	23:10	10:20	11:16	12:13
40°	22:20	22:40	23:01	10:21	11:20	12:21
45°	22:17	22:33	22:51	10:22	11:25	12:30
S 50°	22:13	22:25	22:38	10:23	11:32	12:41
52°	22:12	22:21	22:32	10:24	11:34	12:46
54°	22:10	22:17	22:26	10:24	11:38	12:52
56°	22:08	22:13	22:19	10:25	11:41	12:58
58°	22:06	22:08	22:11	10:26	11:45	13:05
S 60°	22:04	22:02	22:02	10:27	11:49	13:13

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 20-22 76-58%
19	10:37	10:46	12:11	04:06	16:25	
20	10:55	11:04	12:11	04:45	17:05	
21	11:13	11:21	12:11	05:25	17:45	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1900 sec ΔT = TT-UT1 = +68.9940 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	121°35.9	132°05.7	S03°52.1	4°59.5	N25°35.1	51°28.0	N21°39.0	133°22.4	S07°09.6
1	136°38.4	147°06.1	50.9	20°03.0	35.2	66°30.6	38.9	148°24.6	09.5
2	151°40.8	162°06.6	49.7	35°06.5	35.4	81°33.2	38.9	163°26.9	09.4
3	166°43.3	177°07.1	·· 48.5	50°10.0	·· 35.6	96°35.7	·· 38.9	178°29.1	·· 09.3
4	181°45.8	192°07.5	47.4	65°13.5	35.7	111°38.3	38.9	193°31.3	09.2
5	196°48.2	207°08.0	46.2	80°17.0	35.9	126°40.9	38.9	208°33.6	09.1
6	211°50.7	222°08.5	S03°45.0	95°20.5	N25°36.1	141°43.5	N21°38.9	223°35.8	S07°09.0
7	226°53.2	237°08.9	43.8	110°24.0	36.3	156°46.1	38.9	238°38.0	08.9
8	241°55.6	252°09.4	42.6	125°27.5	36.4	171°48.7	38.9	253°40.3	08.8
9	256°58.1	267°09.9	·· 41.5	140°31.0	·· 36.6	186°51.2	·· 38.9	268°42.5	·· 08.7
10	272°00.5	282°10.4	40.3	155°34.5	36.8	201°53.8	38.9	283°44.7	08.6
11	287°03.0	297°10.8	39.1	170°38.0	36.9	216°56.4	38.9	298°47.0	08.5
12	302°05.5	312°11.3	S03°37.9	185°41.5	N25°37.1	231°59.0	N21°38.9	313°49.2	S07°08.4
13	317°07.9	327°11.8	36.7	200°45.0	37.3	247°01.6	38.9	328°51.4	08.3
14	332°10.4	342°12.3	35.6	215°48.5	37.4	262°04.2	38.9	343°53.7	08.2
15	347°12.9	357°12.8	·· 34.4	230°52.0	·· 37.6	277°06.7	·· 38.9	358°55.9	·· 08.1
16	2°15.3	12°13.2	33.2	245°55.5	37.8	292°09.3	38.9	13°58.1	08.0
17	17°17.8	27°13.7	32.0	260°59.0	37.9	307°11.9	38.9	29°00.4	07.9
18	32°20.3	42°14.2	S03°30.9	276°02.5	N25°38.1	322°14.5	N21°38.8	44°02.6	S07°07.8
19	47°22.7	57°14.7	29.7	291°05.9	38.3	337°17.1	38.8	59°04.8	07.7
20	62°25.2	72°15.2	28.5	306°09.4	38.4	352°19.6	38.8	74°07.1	07.6
21	77°27.6	87°15.7	·· 27.3	321°12.9	·· 38.6	7°22.2	·· 38.8	89°09.3	·· 07.5
22	92°30.1	102°16.2	26.2	336°16.4	38.8	22°24.8	38.8	104°11.5	07.4
23	107°32.6	117°16.6	25.0	351°19.9	38.9	37°27.4	38.8	119°13.8	07.3
Mer.pass.	15:51	ν 0.5′	d 1.2′	m -4.65	ν 3.5′	d 0.2′	m -1.34	ν 2.6′	d -0.0′ m -2.60	ν 2.2′	d 0.1′ m 1.10
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	122°35.0	132°17.1	S03°23.8	6°23.4	N25°39.1	52°30.0	N21°38.8	134°16.0	S07°07.2
1	137°37.5	147°17.6	22.6	21°26.9	39.3	67°32.5	38.8	149°18.2	07.1
2	152°40.0	162°18.1	21.4	36°30.4	39.4	82°35.1	38.8	164°20.5	07.0
3	167°42.4	177°18.6	·· 20.3	51°33.8	·· 39.6	97°37.7	·· 38.8	179°22.7	·· 06.9
4	182°44.9	192°19.1	19.1	66°37.3	39.8	112°40.3	38.8	194°24.9	06.8
5	197°47.4	207°19.6	17.9	81°40.8	39.9	127°42.8	38.8	209°27.1	06.7
6	212°49.8	222°20.1	S03°16.7	96°44.3	N25°40.1	142°45.4	N21°38.8	224°29.4	S07°06.6
7	227°52.3	237°20.6	15.6	111°47.8	40.2	157°48.0	38.8	239°31.6	06.5
8	242°54.8	252°21.1	14.4	126°51.3	40.4	172°50.6	38.8	254°33.8	06.4
9	257°57.2	267°21.6	·· 13.2	141°54.7	·· 40.6	187°53.1	·· 38.8	269°36.1	·· 06.3
10	272°59.7	282°22.1	12.0	156°58.2	40.7	202°55.7	38.8	284°38.3	06.2
11	288°02.1	297°22.6	10.9	172°01.7	40.9	217°58.3	38.8	299°40.5	06.1
12	303°04.6	312°23.1	S03°09.7	187°05.2	N25°41.0	233°00.9	N21°38.8	314°42.8	S07°06.0
13	318°07.1	327°23.6	08.5	202°08.7	41.2	248°03.4	38.7	329°45.0	05.9
14	333°09.5	342°24.2	07.3	217°12.1	41.4	263°06.0	38.7	344°47.2	05.8
15	348°12.0	357°24.7	·· 06.2	232°15.6	·· 41.5	278°08.6	·· 38.7	359°49.5	·· 05.7
16	3°14.5	12°25.2	05.0	247°19.1	41.7	293°11.2	38.7	14°51.7	05.5
17	18°16.9	27°25.7	03.8	262°22.6	41.8	308°13.7	38.7	29°53.9	05.4
18	33°19.4	42°26.2	S03°02.6	277°26.0	N25°42.0	323°16.3	N21°38.7	44°56.1	S07°05.3
19	48°21.9	57°26.7	01.5	292°29.5	42.1	338°18.9	38.7	59°58.4	05.2
20	63°24.3	72°27.2	03°00.3	307°33.0	42.3	353°21.4	38.7	75°00.6	05.1
21	78°26.8	87°27.8	02°59.1	322°36.5	·· 42.5	8°24.0	·· 38.7	90°02.8	·· 05.0
22	93°29.3	102°28.3	57.9	337°39.9	42.6	23°26.6	38.7	105°05.1	04.9
23	108°31.7	117°28.8	56.8	352°43.4	42.8	38°29.2	38.7	120°07.3	04.8
Mer.pass.	15:47	ν 0.5′	d 1.2′	m -4.66	ν 3.5′	d 0.2′	m -1.32	ν 2.6′	d -0.0′ m -2.59	ν 2.2′	d 0.1′ m 1.10
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	123°34.2	132°29.3	S02°55.6	7°46.9	N25°42.9	53°31.7	N21°38.7	135°09.5	S07°04.7
1	138°36.6	147°29.8	54.4	22°50.3	43.1	68°34.3	38.7	150°11.8	04.6
2	153°39.1	162°30.4	53.2	37°53.8	43.2	83°36.9	38.7	165°14.0	04.5
3	168°41.6	177°30.9	·· 52.1	52°57.3	·· 43.4	98°39.4	·· 38.7	180°16.2	·· 04.4
4	183°44.0	192°31.4	50.9	68°00.8	43.5	113°42.0	38.7	195°18.4	04.3
5	198°46.5	207°31.9	49.7	83°04.2	43.7	128°44.6	38.7	210°20.7	04.2
6	213°49.0	222°32.5	S02°48.5	98°07.7	N25°43.8	143°47.1	N21°38.7	225°22.9	S07°04.1
7	228°51.4	237°33.0	47.4	113°11.2	44.0	158°49.7	38.7	240°25.1	04.0
8	243°53.9	252°33.5	46.2	128°14.6	44.1	173°52.3	38.7	255°27.4	03.9
9	258°56.4	267°34.1	·· 45.0	143°18.1	·· 44.3	188°54.8	·· 38.7	270°29.6	·· 03.8
10	273°58.8	282°34.6	43.9	158°21.6	44.4	203°57.4	38.7	285°31.8	03.7
11	289°01.3	297°35.1	42.7	173°25.0	44.6	219°00.0	38.7	300°34.1	03.6
12	304°03.8	312°35.7	S02°41.5	188°28.5	N25°44.7	234°02.5	N21°38.6	315°36.3	S07°03.5
13	319°06.2	327°36.2	40.3	203°31.9	44.9	249°05.1	38.6	330°38.5	03.4
14	334°08.7	342°36.7	39.2	218°35.4	45.0	264°07.7	38.6	345°40.7	03.3
15	349°11.1	357°37.3	·· 38.0	233°38.9	·· 45.2	279°10.2	·· 38.6	0°43.0	·· 03.2
16	4°13.6	12°37.8	36.8	248°42.3	45.3	294°12.8	38.6	15°45.2	03.1
17	19°16.1	27°38.4	35.7	263°45.8	45.5	309°15.3	38.6	30°47.4	03.0
18	34°18.5	42°38.9	S02°34.5	278°49.2	N25°45.6	324°17.9	N21°38.6	45°49.6	S07°02.9
19	49°21.0	57°39.5	33.3	293°52.7	45.8	339°20.5	38.6	60°51.9	02.8
20	64°23.5	72°40.0	32.1	308°56.2	45.9	354°23.0	38.6	75°54.1	02.7
21	79°25.9	87°40.6	·· 31.0	323°59.6	·· 46.1	9°25.6	·· 38.6	90°56.3	·· 02.6
22	94°28.4	102°41.1	29.8	339°03.1	46.2	24°28.2	38.6	105°58.6	02.5
23	109°30.9	117°41.7	28.6	354°06.5	46.4	39°30.7	38.6	121°00.8	02.4
Mer.pass.	15:43	ν 0.5′	d 1.2′	m -4.67	ν 3.5′	d 0.2′	m -1.29	ν 2.6′	d -0.0′ m -2.58	ν 2.2′	d 0.1′ m 1.10

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.2	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.2	-57°06.9
Hamal	327°51.1	23°34.9
Polaris	313°52.8	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.3
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.9	-52°42.6
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.3
Suhail	222°45.9	-43°32.0
Miaplacidus	221°37.4	-69°49.1
Alphard	217°47.4	-8°46.1
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.4	-17°40.9
Acrux	172°59.8	-63°14.0
Gacrux	171°51.4	-57°15.0
Alioth	166°12.7	55°49.1
Spica	158°22.2	-11°17.6
Alkaid	152°51.9	49°11.0
Hadar	148°36.0	-60°29.4
Menkent	147°57.6	-36°29.5
Arcturus	145°47.9	19°02.9
Rigil Kent.	139°40.4	-60°56.1
Kochab	137°20.0	74°02.7
Zuben'ubi	136°56.0	-16°08.8
Alphecca	126°03.8	26°37.6
Antares	112°16.0	-26°29.2
Atria	107°10.6	-69°04.1
Sabik	102°03.0	-15°45.4
Shaula	96°10.6	-37°07.3
Rasalhague	95°58.8	12°32.4
Eltanin	90°42.6	51°28.9
Kaus Aust.	83°32.8	-34°22.3
Vega	80°33.6	38°48.2
Nunki	75°48.1	-26°16.0
Altair	62°00.3	8°56.0
Peacock	53°06.3	-56°39.3
Deneb	49°26.3	45°22.1
Enif	33°39.1	9°59.3
Al Na'ir	27°33.3	-46°50.6
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 22 Wed	SHA	Mer.pass
Venus	10°29.8	15:11
Mars	243°23.6	23:35
Jupiter	289°52.1	20:31
Saturn	11°46.5	15:04

Jan 23 Thu	SHA	Mer.pass
Venus	9°42.1	15:10
Mars	243°48.3	23:29
Jupiter	289°54.9	20:26
Saturn	11°40.9	15:01

Jan 24 Fri	SHA	Mer.pass
Venus	8°55.1	15:10
Mars	244°12.7	23:23
Jupiter	289°57.5	20:22
Saturn	11°35.3	14:57

Horizontal parallax	
Venus:	0.3
Mars:	0.2

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°07.7	S19°40.1	271°05.3	15.4′	S15°30.8	12.2′	54.2′
1	192°07.6	39.5	285°39.7	15.3′	15°43.0	12.1′	54.2′
2	207°07.4	38.9	300°14.0	15.3′	15°55.1	12.0′	54.2′
3	222°07.2	·· 38.4	314°48.3	15.2′	16°07.1	12.0′	54.2′
4	237°07.1	37.8	329°22.5	15.1′	16°19.1	11.9′	54.3′
5	252°06.9	37.2	343°56.7	15.1′	16°31.0	11.9′	54.3′
6	267°06.7	S19°36.6	358°30.8	15.0′	S16°42.9	11.8′	54.3′
7	282°06.6	36.1	13°04.8	14.9′	16°54.7	11.7′	54.3′
8	297°06.4	35.5	27°38.7	14.9′	17°06.4	11.7′	54.3′
9	312°06.2	·· 34.9	42°12.6	14.8′	17°18.1	11.6′	54.3′
10	327°06.1	34.3	56°46.4	14.7′	17°29.7	11.5′	54.3′
11	342°05.9	33.7	71°20.1	14.7′	17°41.2	11.5′	54.3′
12	357°05.8	S19°33.2	85°53.8	14.6′	S17°52.7	11.4′	54.3′
13	12°05.6	32.6	100°27.4	14.5′	18°04.1	11.4′	54.3′
14	27°05.4	32.0	115°00.9	14.4′	18°15.5	11.3′	54.3′
15	42°05.3	·· 31.4	129°34.4	14.4′	18°26.8	11.2′	54.4′
16	57°05.1	30.8	144°07.7	14.3′	18°38.0	11.1′	54.4′
17	72°04.9	30.3	158°41.0	14.2′	18°49.1	11.1′	54.4′
18	87°04.8	S19°29.7	173°14.2	14.1′	S19°00.2	11.0′	54.4′
19	102°04.6	29.1	187°47.4	14.1′	19°11.2	10.9′	54.4′
20	117°04.5	28.5	202°20.4	14.0′	19°22.1	10.9′	54.4′
21	132°04.3	·· 27.9	216°53.4	13.9′	19°33.0	10.7′	54.4′
22	147°04.1	27.3	231°26.3	13.8′	19°43.7	10.7′	54.4′
23	162°04.0	26.7	245°59.1	13.7′	19°54.4	10.6′	54.4′
	SD = 16.2′	d = 0.6′	SD = 14.8′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°03.8	S19°26.2	260°31.9	13.7′	S20°05.0	10.6′	54.5′
1	192°03.7	25.6	275°04.5	13.6′	20°15.6	10.5′	54.5′
2	207°03.5	25.0	289°37.1	13.5′	20°26.1	10.3′	54.5′
3	222°03.3	·· 24.4	304°09.6	13.4′	20°36.4	10.3′	54.5′
4	237°03.2	23.8	318°42.0	13.3′	20°46.7	10.3′	54.5′
5	252°03.0	23.2	333°14.3	13.2′	20°57.0	10.1′	54.5′
6	267°02.9	S19°22.6	347°46.5	13.1′	S21°07.1	10.1′	54.5′
7	282°02.7	22.0	2°18.7	13.1′	21°17.2	9.9′	54.6′
8	297°02.5	21.4	16°50.7	13.0′	21°27.1	9.9′	54.6′
9	312°02.4	·· 20.8	31°22.7	12.9′	21°37.0	9.8′	54.6′
10	327°02.2	20.3	45°54.6	12.8′	21°46.8	9.7′	54.6′
11	342°02.1	19.7	60°26.4	12.7′	21°56.5	9.7′	54.6′
12	357°01.9	S19°19.1	74°58.1	12.6′	S22°06.2	9.5′	54.6′
13	12°01.8	18.5	89°29.7	12.5′	22°15.7	9.4′	54.7′
14	27°01.6	17.9	104°01.2	12.4′	22°25.1	9.4′	54.7′
15	42°01.5	·· 17.3	118°32.6	12.3′	22°34.5	9.2′	54.7′
16	57°01.3	16.7	133°04.0	12.2′	22°43.7	9.2′	54.7′
17	72°01.1	16.1	147°35.2	12.2′	22°52.9	9.1′	54.7′
18	87°01.0	S19°15.5	162°06.4	12.1′	S23°02.0	8.9′	54.7′
19	102°00.8	14.9	176°37.4	12.0′	23°10.9	8.9′	54.8′
20	117°00.7	14.3	191°08.4	11.9′	23°19.8	8.8′	54.8′
21	132°00.5	·· 13.7	205°39.3	11.8′	23°28.6	8.7′	54.8′
22	147°00.4	13.1	220°10.1	11.7′	23°37.3	8.5′	54.8′
23	162°00.2	12.5	234°40.8	11.6′	23°45.8	8.5′	54.8′
	SD = 16.2′	d = 0.6′	SD = 14.9′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°00.1	S19°11.9	249°11.4	11.5′	S23°54.3	8.4′	54.9′
1	191°59.9	11.3	263°41.9	11.4′	24°02.7	8.2′	54.9′
2	206°59.8	10.7	278°12.3	11.3′	24°10.9	8.2′	54.9′
3	221°59.6	·· 10.1	292°42.6	11.2′	24°19.1	8.0′	54.9′
4	236°59.5	09.5	307°12.8	11.1′	24°27.1	8.0′	54.9′
5	251°59.3	08.9	321°42.9	11.0′	24°35.1	7.8′	55.0′
6	266°59.2	S19°08.2	336°12.9	10.9′	S24°42.9	7.7′	55.0′
7	281°59.0	07.6	350°42.9	10.8′	24°50.6	7.6′	55.0′
8	296°58.9	07.0	5°12.7	10.7′	24°58.2	7.5′	55.0′
9	311°58.7	·· 06.4	19°42.5	10.6′	25°05.7	7.4′	55.0′
10	326°58.6	05.8	34°12.1	10.6′	25°13.1	7.3′	55.1′
11	341°58.4	05.2	48°41.7	10.5′	25°20.4	7.1′	55.1′
12	356°58.3	S19°04.6	63°11.1	10.4′	S25°27.5	7.1′	55.1′
13	11°58.1	04.0	77°40.5	10.3′	25°34.6	6.9′	55.1′
14	26°58.0	03.4	92°09.7	10.2′	25°41.5	6.8′	55.2′
15	41°57.8	·· 02.8	106°38.9	10.1′	25°48.3	6.7′	55.2′
16	56°57.7	02.2	121°08.0	10.0′	25°55.0	6.5′	55.2′
17	71°57.5	01.5	135°37.0	9.9′	26°01.5	6.5′	55.2′
18	86°57.4	S19°00.9	150°05.9	9.8′	S26°08.0	6.3′	55.2′
19	101°57.2	19°00.3	164°34.7	9.7′	26°14.3	6.2′	55.3′
20	116°57.1	18°59.7	179°03.4	9.6′	26°20.5	6.0′	55.3′
21	131°57.0	·· 59.1	193°32.0	9.5′	26°26.5	5.9′	55.3′
22	146°56.8	58.5	208°00.5	9.4′	26°32.4	5.8′	55.3′
23	161°56.7	57.9	222°29.0	9.3′	26°38.2	5.7′	55.4′
	SD = 16.2′	d = 0.6′	SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:38	09:17	▬	▬	15:08	16:47
N 70°	07:27	08:51	10:39	13:46	15:33	16:58
68°	07:17	08:32	09:55	14:29	15:53	17:08
66°	07:09	08:16	09:26	14:58	16:08	17:16
64°	07:02	08:03	09:05	15:20	16:21	17:22
62°	06:56	07:52	08:47	15:37	16:32	17:29
60°	06:51	07:43	08:33	15:51	16:42	17:34
N 58°	06:46	07:35	08:21	16:04	16:50	17:39
56°	06:41	07:27	08:10	16:14	16:57	17:43
54°	06:37	07:21	08:01	16:24	17:04	17:48
52°	06:33	07:14	07:52	16:32	17:10	17:51
50°	06:29	07:09	07:45	16:39	17:15	17:55
45°	06:21	06:57	07:29	16:55	17:27	18:03
N 40°	06:14	06:46	07:16	17:08	17:38	18:11
35°	06:07	06:37	07:04	17:20	17:47	18:17
30°	06:00	06:29	06:55	17:30	17:55	18:24
20°	05:47	06:14	06:37	17:46	18:10	18:37
N 10°	05:35	06:00	06:22	18:01	18:24	18:49
0°	05:21	05:46	06:08	18:15	18:37	19:03
S 10°	05:05	05:32	05:54	18:30	18:52	19:18
20°	04:47	05:15	05:39	18:45	19:09	19:37
30°	04:23	04:54	05:21	19:03	19:29	20:00
35°	04:08	04:42	05:10	19:13	19:41	20:15
40°	03:49	04:27	04:58	19:25	19:56	20:34
45°	03:25	04:09	04:44	19:39	20:13	20:57
S 50°	02:53	03:47	04:27	19:56	20:36	21:29
52°	02:36	03:35	04:18	20:05	20:47	21:46
54°	02:14	03:23	04:09	20:14	21:00	22:07
56°	01:46	03:07	03:58	20:24	21:15	22:34
58°	00:57	02:49	03:46	20:36	21:32	23:18
S 60°	–:–	02:27	03:32	20:50	21:54	–:–

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	04:26	▬	▬	07:24	▬	▬
N 70°	03:36	▬	▬	08:16	▬	▬
68°	03:05	05:42	▬	08:48	07:43	▬
66°	02:43	04:45	▬	09:12	08:41	▬
64°	02:25	04:12	06:23	09:31	09:15	08:43
62°	02:10	03:48	05:35	09:47	09:40	09:32
60°	01:58	03:29	05:04	10:00	10:00	10:03
N 58°	01:48	03:13	04:42	10:11	10:16	10:27
56°	01:39	03:00	04:23	10:21	10:30	10:46
54°	01:31	02:48	04:07	10:30	10:43	11:02
52°	01:24	02:38	03:54	10:37	10:53	11:15
50°	01:17	02:29	03:42	10:44	11:03	11:27
45°	01:03	02:10	03:18	11:00	11:23	11:53
N 40°	00:52	01:55	02:59	11:12	11:39	12:13
35°	00:43	01:42	02:43	11:23	11:53	12:30
30°	00:34	01:31	02:29	11:32	12:06	12:44
20°	00:20	01:11	02:05	11:49	12:26	13:09
N 10°	00:07	00:55	01:45	12:03	12:45	13:30
0°	·· ··	00:39	01:27	12:17	13:02	13:51
S 10°	·· ··	00:24	01:08	12:30	13:19	14:11
20°	·· ··	00:08	00:48	12:44	13:37	14:32
30°	23:49	·· ··	00:25	13:01	13:58	14:58
35°	23:39	·· ··	00:12	13:11	14:11	15:12
40°	23:26	23:56	·· ··	13:22	14:25	15:30
45°	23:12	23:38	·· ··	13:35	14:43	15:51
S 50°	22:54	23:16	23:45	13:51	15:04	16:17
52°	22:46	23:05	23:32	13:59	15:14	16:30
54°	22:37	22:53	23:17	14:08	15:26	16:45
56°	22:27	22:39	22:59	14:17	15:39	17:02
58°	22:15	22:23	22:38	14:28	15:55	17:23
S 60°	22:02	22:04	22:10	14:41	16:13	17:50

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 49-30%
22	11:29	11:37	12:12	06:06	18:28	
23	11:45	11:52	12:12	06:50	19:14	
24	12:00	12:07	12:12	07:38	20:04	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1908 sec ΔT = TT-UT1 = +68.9932 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	124°33.3	132°42.2	S02°27.5	9°10.0	N25°46.5	54°33.3	N21°38.6	136°03.0	S07°02.3
1	139°35.8	147°42.8	26.3	24°13.4	46.6	69°35.8	38.6	151°05.2	02.2
2	154°38.2	162°43.3	25.1	39°16.9	46.8	84°38.4	38.6	166°07.5	02.1
3	169°40.7	177°43.9	·· 23.9	54°20.3	·· 46.9	99°41.0	·· 38.6	181°09.7	·· 02.0
4	184°43.2	192°44.4	22.8	69°23.8	47.1	114°43.5	38.6	196°11.9	01.9
5	199°45.6	207°45.0	21.6	84°27.2	47.2	129°46.1	38.6	211°14.2	01.7
6	214°48.1	222°45.5	S02°20.4	99°30.7	N25°47.4	144°48.6	N21°38.6	226°16.4	S07°01.6
7	229°50.6	237°46.1	19.3	114°34.1	47.5	159°51.2	38.6	241°18.6	01.5
8	244°53.0	252°46.7	18.1	129°37.6	47.6	174°53.7	38.6	256°20.8	01.4
9	259°55.5	267°47.2	·· 16.9	144°41.0	·· 47.8	189°56.3	·· 38.6	271°23.1	·· 01.3
10	274°58.0	282°47.8	15.8	159°44.5	47.9	204°58.9	38.6	286°25.3	01.2
11	290°00.4	297°48.4	14.6	174°47.9	48.1	220°01.4	38.6	301°27.5	01.1
12	305°02.9	312°48.9	S02°13.4	189°51.4	N25°48.2	235°04.0	N21°38.6	316°29.7	S07°01.0
13	320°05.4	327°49.5	12.3	204°54.8	48.4	250°06.5	38.6	331°32.0	00.9
14	335°07.8	342°50.1	11.1	219°58.2	48.5	265°09.1	38.6	346°34.2	00.8
15	350°10.3	357°50.6	·· 09.9	235°01.7	·· 48.6	280°11.6	·· 38.6	1°36.4	·· 00.7
16	5°12.7	12°51.2	08.8	250°05.1	48.8	295°14.2	38.6	16°38.6	00.6
17	20°15.2	27°51.8	07.6	265°08.6	48.9	310°16.7	38.6	31°40.9	00.5
18	35°17.7	42°52.4	S02°06.4	280°12.0	N25°49.0	325°19.3	N21°38.6	46°43.1	S07°00.4
19	50°20.1	57°52.9	05.3	295°15.4	49.2	340°21.8	38.6	61°45.3	00.3
20	65°22.6	72°53.5	04.1	310°18.9	49.3	355°24.4	38.6	76°47.6	00.2
21	80°25.1	87°54.1	·· 02.9	325°22.3	·· 49.5	10°27.0	·· 38.6	91°49.8	·· 00.1
22	95°27.5	102°54.7	01.8	340°25.8	49.6	25°29.5	38.5	106°52.0	07°00.0
23	110°30.0	117°55.3	00.6	355°29.2	49.7	40°32.1	38.5	121°54.2	06°59.9
Mer.pass. 15:39		ν 0.6′	d 1.2′	m -4.68	ν 3.5′	d 0.1′	m -1.27	ν 2.6′	d -0.0′ m -2.58	ν 2.2′	d 0.1′ m 1.10

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	125°32.5	132°55.8	S01°59.4	10°32.6	N25°49.9	55°34.6	N21°38.5	136°56.5	S06°59.8
1	140°34.9	147°56.4	58.3	25°36.1	50.0	70°37.2	38.5	151°58.7	59.7
2	155°37.4	162°57.0	57.1	40°39.5	50.1	85°39.7	38.5	167°00.9	59.6
3	170°39.9	177°57.6	·· 55.9	55°42.9	·· 50.3	100°42.3	·· 38.5	182°03.1	·· 59.5
4	185°42.3	192°58.2	54.8	70°46.4	50.4	115°44.8	38.5	197°05.4	59.4
5	200°44.8	207°58.8	53.6	85°49.8	50.5	130°47.4	38.5	212°07.6	59.3
6	215°47.2	222°59.4	S01°52.4	100°53.2	N25°50.7	145°49.9	N21°38.5	227°09.8	S06°59.2
7	230°49.7	238°00.0	51.3	115°56.6	50.8	160°52.5	38.5	242°12.0	59.0
8	245°52.2	253°00.6	50.1	131°00.1	50.9	175°55.0	38.5	257°14.3	58.9
9	260°54.6	268°01.2	·· 48.9	146°03.5	·· 51.1	190°57.6	·· 38.5	272°16.5	·· 58.8
10	275°57.1	283°01.7	47.8	161°06.9	51.2	206°00.1	38.5	287°18.7	58.7
11	290°59.6	298°02.3	46.6	176°10.3	51.3	221°02.6	38.5	302°20.9	58.6
12	306°02.0	313°02.9	S01°45.4	191°13.8	N25°51.5	236°05.2	N21°38.5	317°23.2	S06°58.5
13	321°04.5	328°03.5	44.3	206°17.2	51.6	251°07.7	38.5	332°25.4	58.4
14	336°07.0	343°04.1	43.1	221°20.6	51.7	266°10.3	38.5	347°27.6	58.3
15	351°09.4	358°04.7	·· 42.0	236°24.0	·· 51.9	281°12.8	·· 38.5	2°29.8	·· 58.2
16	6°11.9	13°05.4	40.8	251°27.5	52.0	296°15.4	38.5	17°32.0	58.1
17	21°14.4	28°06.0	39.6	266°30.9	52.1	311°17.9	38.5	32°34.3	58.0
18	36°16.8	43°06.6	S01°38.5	281°34.3	N25°52.2	326°20.5	N21°38.5	47°36.5	S06°57.9
19	51°19.3	58°07.2	37.3	296°37.7	52.4	341°23.0	38.5	62°38.7	57.8
20	66°21.7	73°07.8	36.1	311°41.1	52.5	356°25.6	38.5	77°40.9	57.7
21	81°24.2	88°08.4	·· 35.0	326°44.5	·· 52.6	11°28.1	·· 38.5	92°43.2	·· 57.6
22	96°26.7	103°09.0	33.8	341°48.0	52.7	26°30.6	38.5	107°45.4	57.5
23	111°29.1	118°09.6	32.7	356°51.4	52.9	41°33.2	38.5	122°47.6	57.4
Mer.pass. 15:35		ν 0.6′	d 1.2′	m -4.69	ν 3.4′	d 0.1′	m -1.24	ν 2.6′	d -0.0′ m -2.57	ν 2.2′	d 0.1′ m 1.10

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	126°31.6	133°10.2	S01°31.5	11°54.8	N25°53.0	56°35.7	N21°38.5	137°49.8	S06°57.3
1	141°34.1	148°10.9	30.3	26°58.2	53.1	71°38.3	38.5	152°52.1	57.2
2	156°36.5	163°11.5	29.2	42°01.6	53.2	86°40.8	38.5	167°54.3	57.1
3	171°39.0	178°12.1	·· 28.0	57°05.0	·· 53.4	101°43.3	·· 38.5	182°56.5	·· 57.0
4	186°41.5	193°12.7	26.9	72°08.4	53.5	116°45.9	38.5	197°58.7	56.9
5	201°43.9	208°13.3	25.7	87°11.8	53.6	131°48.4	38.5	213°01.0	56.7
6	216°46.4	223°14.0	S01°24.5	102°15.2	N25°53.7	146°51.0	N21°38.5	228°03.2	S06°56.6
7	231°48.9	238°14.6	23.4	117°18.6	53.9	161°53.5	38.5	243°05.4	56.5
8	246°51.3	253°15.2	22.2	132°22.1	54.0	176°56.0	38.5	258°07.6	56.4
9	261°53.8	268°15.8	·· 21.1	147°25.5	·· 54.1	191°58.6	·· 38.5	273°09.8	·· 56.3
10	276°56.2	283°16.5	19.9	162°28.9	54.2	207°01.1	38.5	288°12.1	56.2
11	291°58.7	298°17.1	18.7	177°32.3	54.4	222°03.7	38.5	303°14.3	56.1
12	307°01.2	313°17.7	S01°17.6	192°35.7	N25°54.5	237°06.2	N21°38.5	318°16.5	S06°56.0
13	322°03.6	328°18.4	16.4	207°39.1	54.6	252°08.7	38.5	333°18.7	55.9
14	337°06.1	343°19.0	15.3	222°42.5	54.7	267°11.3	38.5	348°21.0	55.8
15	352°08.6	358°19.6	·· 14.1	237°45.9	·· 54.8	282°13.8	·· 38.5	3°23.2	·· 55.7
16	7°11.0	13°20.3	13.0	252°49.3	55.0	297°16.3	38.5	18°25.4	55.6
17	22°13.5	28°20.9	11.8	267°52.7	55.1	312°18.9	38.5	33°27.6	55.5
18	37°16.0	43°21.5	S01°10.6	282°56.1	N25°55.2	327°21.4	N21°38.5	48°29.8	S06°55.4
19	52°18.4	58°22.2	09.5	297°59.5	55.3	342°24.0	38.5	63°32.1	55.3
20	67°20.9	73°22.8	08.3	313°02.8	55.4	357°26.5	38.5	78°34.3	55.2
21	82°23.4	88°23.5	·· 07.2	328°06.2	·· 55.6	12°29.0	·· 38.5	93°36.5	·· 55.1
22	97°25.8	103°24.1	06.0	343°09.6	55.7	27°31.6	38.5	108°38.7	55.0
23	112°28.3	118°24.8	04.9	358°13.0	55.8	42°34.1	38.5	123°41.0	54.9
Mer.pass. 15:31		ν 0.6′	d 1.2′	m -4.70	ν 3.4′	d 0.1′	m -1.21	ν 2.5′	d -0.0′ m -2.56	ν 2.2′	d 0.1′ m 1.11

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.2	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.2	-57°06.9
Hamal	327°51.2	23°34.9
Polaris	313°54.0	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.2
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.9	-52°42.6
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.4
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.4
Suhail	222°45.8	-43°32.0
Miaplacidus	221°37.4	-69°49.1
Alphard	217°47.4	-8°46.1
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.4	-17°40.9
Acrux	172°59.8	-63°14.1
Gacrux	171°51.4	-57°15.0
Alioth	166°12.7	55°49.1
Spica	158°22.2	-11°17.6
Alkaid	152°51.9	49°10.9
Hadar	148°35.9	-60°29.4
Menkent	147°57.6	-36°29.5
Arcturus	145°47.9	19°02.9
Rigil Kent.	139°40.3	-60°56.1
Kochab	137°19.9	74°02.7
Zuben'ubi	136°56.0	-16°08.8
Alphecca	126°03.8	26°37.6
Antares	112°16.0	-26°29.2
Atria	107°10.6	-69°04.1
Sabik	102°03.0	-15°45.4
Shaula	96°10.6	-37°07.3
Rasalhague	95°58.8	12°32.3
Eltanin	90°42.6	51°28.9
Kaus Aust.	83°32.8	-34°22.3
Vega	80°33.6	38°48.2
Nunki	75°48.0	-26°16.0
Altair	62°00.2	8°56.0
Peacock	53°06.2	-56°39.3
Deneb	49°26.3	45°22.1
Enif	33°39.1	9°59.3
Al Na'ir	27°33.3	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 25 Sat	SHA	Mer.pass
Venus	8°08.9	15:09
Mars	244°36.7	23:18
Jupiter	290°00.0	20:18
Saturn	11°29.7	14:54

Jan 26 Sun	SHA	Mer.pass
Venus	7°23.4	15:08
Mars	245°00.2	23:13
Jupiter	290°02.1	20:14
Saturn	11°24.0	14:50

Jan 27 Mon	SHA	Mer.pass
Venus	6°38.6	15:07
Mars	245°23.2	23:07
Jupiter	290°04.1	20:10
Saturn	11°18.2	14:46

Horizontal parallax	
Venus:	0.3
Mars:	0.2

	Sun			Moon				
h								
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	176°56.5	S18°57.2		236°57.3	9.3′	S26°43.9	5.6′	55.4′
1	191°56.4	56.6		251°25.5	9.2′	26°49.5	5.4′	55.4′
2	206°56.2	56.0		265°53.7	9.1′	26°54.9	5.2′	55.4′
3	221°56.1	·· 55.4		280°21.8	9.0′	27°00.1	5.2′	55.5′
4	236°55.9	54.8		294°49.8	8.9′	27°05.3	5.0′	55.5′
5	251°55.8	54.1		309°17.7	8.8′	27°10.3	4.8′	55.5′
6	266°55.7	S18°53.5		323°45.5	8.7′	S27°15.1	4.8′	55.5′
7	281°55.5	52.9		338°13.2	8.6′	27°19.9	4.6′	55.6′
8	296°55.4	52.3		352°40.8	8.6′	27°24.5	4.4′	55.6′
9	311°55.2	·· 51.7		7°08.4	8.5′	27°28.9	4.3′	55.6′
10	326°55.1	51.0		21°35.9	8.4′	27°33.2	4.2′	55.7′
11	341°55.0	50.4		36°03.3	8.3′	27°37.4	4.0′	55.7′
12	356°54.8	S18°49.8		50°30.6	8.2′	S27°41.4	3.9′	55.7′
13	11°54.7	49.2		64°57.8	8.2′	27°45.3	3.7′	55.7′
14	26°54.5	48.5		79°25.0	8.1′	27°49.0	3.6′	55.8′
15	41°54.4	·· 47.9		93°52.0	8.0′	27°52.6	3.5′	55.8′
16	56°54.3	47.3		108°19.0	7.9′	27°56.1	3.3′	55.8′
17	71°54.1	46.7		122°45.9	7.8′	27°59.4	3.1′	55.8′
18	86°54.0	S18°46.0		137°12.8	7.8′	S28°02.5	3.0′	55.9′
19	101°53.8	45.4		151°39.6	7.7′	28°05.5	2.8′	55.9′
20	116°53.7	44.8		166°06.3	7.6′	28°08.3	2.7′	55.9′
21	131°53.6	·· 44.1		180°32.9	7.6′	28°11.0	2.6′	56.0′
22	146°53.4	43.5		194°59.5	7.5′	28°13.6	2.3′	56.0′
23	161°53.3	42.9		209°26.0	7.4′	28°15.9	2.3′	56.0′
	SD = 16.2′	d = 0.6′		SD = 15.1′				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	176°53.2	S18°42.2		223°52.4	7.4′	S28°18.2	2.0′	56.0′
1	191°53.0	41.6		238°18.7	7.3′	28°20.2	2.0′	56.1′
2	206°52.9	41.0		252°45.0	7.2′	28°22.2	1.7′	56.1′
3	221°52.8	·· 40.4		267°11.3	7.2′	28°23.9	1.6′	56.1′
4	236°52.6	39.7		281°37.5	7.1′	28°25.5	1.4′	56.2′
5	251°52.5	39.1		296°03.6	7.1′	28°26.9	1.3′	56.2′
6	266°52.4	S18°38.4		310°29.6	7.0′	S28°28.2	1.1′	56.2′
7	281°52.2	37.8		324°55.7	7.0′	28°29.3	1.0′	56.3′
8	296°52.1	37.2		339°21.6	6.9′	28°30.3	0.8′	56.3′
9	311°52.0	·· 36.5		353°47.5	6.9′	28°31.1	0.6′	56.3′
10	326°51.8	35.9		8°13.4	6.8′	28°31.7	0.5′	56.3′
11	341°51.7	35.3		22°39.2	6.8′	28°32.2	0.3′	56.4′
12	356°51.6	S18°34.6		37°04.9	6.7′	S28°32.5	0.1′	56.4′
13	11°51.4	34.0		51°30.6	6.7′	28°32.6	0.0′	56.4′
14	26°51.3	33.3		65°56.3	6.6′	28°32.6	0.2′	56.5′
15	41°51.2	·· 32.7		80°21.9	6.6′	28°32.4	0.3′	56.5′
16	56°51.0	32.1		94°47.5	6.5′	28°32.1	0.6′	56.5′
17	71°50.9	31.4		109°13.1	6.5′	28°31.5	0.7′	56.6′
18	86°50.8	S18°30.8		123°38.6	6.5′	S28°30.8	0.8′	56.6′
19	101°50.6	30.1		138°04.1	6.4′	28°30.0	1.0′	56.6′
20	116°50.5	29.5		152°29.5	6.4′	28°29.0	1.2′	56.6′
21	131°50.4	·· 28.9		166°54.9	6.4′	28°27.8	1.4′	56.7′
22	146°50.3	28.2		181°20.3	6.4′	28°26.4	1.5′	56.7′
23	161°50.1	27.6		195°45.7	6.3′	28°24.9	1.7′	56.7′
	SD = 16.2′	d = 0.6′		SD = 15.3′				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	176°50.0	S18°26.9		210°11.0	6.3′	S28°23.2	1.9′	56.8′
1	191°49.9	26.3		224°36.3	6.3′	28°21.3	2.1′	56.8′
2	206°49.8	25.6		239°01.6	6.3′	28°19.2	2.2′	56.8′
3	221°49.6	·· 25.0		253°26.9	6.3′	28°17.0	2.4′	56.9′
4	236°49.5	24.3		267°52.2	6.2′	28°14.6	2.5′	56.9′
5	251°49.4	23.7		282°17.4	6.2′	28°12.1	2.8′	56.9′
6	266°49.2	S18°23.0		296°42.7	6.2′	S28°09.3	2.9′	57.0′
7	281°49.1	22.4		311°07.9	6.2′	28°06.4	3.0′	57.0′
8	296°49.0	21.7		325°33.1	6.2′	28°03.4	3.3′	57.0′
9	311°48.9	·· 21.1		339°58.3	6.2′	28°00.1	3.4′	57.0′
10	326°48.8	20.4		354°23.5	6.2′	27°56.7	3.6′	57.1′
11	341°48.6	19.8		8°48.7	6.2′	27°53.1	3.8′	57.1′
12	356°48.5	S18°19.1		23°13.9	6.2′	S27°49.3	3.9′	57.1′
13	11°48.4	18.5		37°39.2	6.2′	27°45.4	4.1′	57.2′
14	26°48.3	17.8		52°04.4	6.2′	27°41.3	4.3′	57.2′
15	41°48.1	·· 17.2		66°29.6	6.2′	27°37.0	4.4′	57.2′
16	56°48.0	16.5		80°54.8	6.2′	27°32.6	4.6′	57.3′
17	71°47.9	15.9		95°20.0	6.2′	27°28.0	4.8′	57.3′
18	86°47.8	S18°15.2		109°45.3	6.3′	S27°23.2	5.0′	57.3′
19	101°47.6	14.5		124°10.5	6.3′	27°18.2	5.1′	57.3′
20	116°47.5	13.9		138°35.8	6.3′	27°13.1	5.3′	57.4′
21	131°47.4	·· 13.2		153°01.1	6.3′	27°07.8	5.5′	57.4′
22	146°47.3	12.6		167°26.4	6.3′	27°02.3	5.6′	57.4′
23	161°47.2	11.9		181°51.7	6.3′	26°56.7	5.8′	57.5′
	SD = 16.2′	d = 0.6′		SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:29	09:04	11:33	12:53	15:23	16:58
N 70°	07:19	08:41	10:19	14:07	15:45	17:08
68°	07:10	08:23	09:42	14:44	16:03	17:16
66°	07:03	08:09	09:16	15:10	16:17	17:23
64°	06:57	07:57	08:56	15:30	16:29	17:30
62°	06:51	07:47	08:40	15:46	16:39	17:35
60°	06:46	07:38	08:27	15:59	16:48	17:40
N 58°	06:41	07:30	08:15	16:11	16:56	17:45
56°	06:37	07:23	08:05	16:21	17:03	17:49
54°	06:33	07:17	07:56	16:29	17:09	17:52
52°	06:30	07:11	07:48	16:37	17:15	17:56
50°	06:26	07:06	07:41	16:44	17:20	17:59
45°	06:19	06:54	07:26	17:00	17:31	18:07
N 40°	06:12	06:44	07:13	17:12	17:41	18:14
35°	06:05	06:36	07:03	17:23	17:50	18:20
30°	05:59	06:28	06:53	17:32	17:57	18:26
20°	05:47	06:14	06:37	17:48	18:12	18:38
N 10°	05:35	06:00	06:23	18:03	18:25	18:50
0°	05:22	05:47	06:09	18:16	18:38	19:03
S 10°	05:07	05:33	05:55	18:30	18:52	19:18
20°	04:49	05:17	05:41	18:44	19:08	19:36
30°	04:26	04:57	05:23	19:01	19:27	19:59
35°	04:11	04:45	05:13	19:11	19:39	20:13
40°	03:54	04:31	05:02	19:23	19:53	20:31
45°	03:31	04:14	04:48	19:36	20:10	20:53
S 50°	03:00	03:52	04:32	19:53	20:32	21:23
52°	02:44	03:42	04:24	20:00	20:42	21:39
54°	02:24	03:30	04:15	20:09	20:54	21:58
56°	01:59	03:15	04:05	20:19	21:08	22:23
58°	01:21	02:58	03:54	20:30	21:24	22:58
S 60°	–:–	02:38	03:40	20:43	21:45	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	07:41	▬	▬	09:14	▬	▬
60°	06:42	08:07	08:51	10:13	10:44	12:00
N 58°	06:09	07:24	08:14	10:46	11:26	12:37
56°	05:45	06:56	07:48	11:11	11:55	13:03
54°	05:25	06:34	07:27	11:31	12:17	13:23
52°	05:09	06:16	07:10	11:48	12:35	13:41
50°	04:54	06:00	06:55	12:02	12:51	13:56
45°	04:26	05:29	06:24	12:31	13:22	14:25
N 40°	04:03	05:05	06:01	12:54	13:46	14:49
35°	03:45	04:45	05:41	13:13	14:06	15:08
30°	03:29	04:28	05:25	13:30	14:23	15:24
20°	03:02	03:59	04:56	13:57	14:52	15:52
N 10°	02:39	03:35	04:32	14:21	15:17	16:15
0°	02:18	03:12	04:09	14:43	15:39	16:37
S 10°	01:56	02:49	03:47	15:06	16:02	16:59
20°	01:33	02:25	03:23	15:30	16:27	17:22
30°	01:07	01:57	02:54	15:57	16:55	17:50
35°	00:52	01:40	02:37	16:14	17:12	18:05
40°	00:34	01:21	02:18	16:33	17:32	18:24
45°	00:12	00:57	01:54	16:56	17:56	18:46
S 50°	·· ··	00:27	01:24	17:26	18:27	19:14
52°	·· ··	00:12	01:08	17:41	18:42	19:28
54°	23:54	·· ··	00:51	17:58	19:00	19:44
56°	23:33	·· ··	00:29	18:19	19:21	20:03
58°	23:07	·· ··	00:02	18:46	19:49	20:26
S 60°	22:30	23:23	·· ··	19:22	20:28	20:56

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 26-28 22-8%
25	12:14	12:21	12:12	08:30	20:58	
26	12:27	12:34	12:13	09:26	21:54	
27	12:40	12:46	12:13	10:23	22:52	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1915 sec ΔT = TT-UT1 = +68.9925 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	127°30.7	133°25.4	S01°03.7	13°16.4	N25°55.9	57°36.6	N21°38.5	138°43.2	S06°54.7
1	142°33.2	148°26.1	02.6	28°19.8	56.0	72°39.2	38.5	153°45.4	54.6
2	157°35.7	163°26.7	01.4	43°23.2	56.1	87°41.7	38.5	168°47.6	54.5
3	172°38.1	178°27.4	01°00.2	58°26.6	·· 56.2	102°44.2	·· 38.5	183°49.8	·· 54.4
4	187°40.6	193°28.0	00°59.1	73°30.0	56.4	117°46.8	38.5	198°52.1	54.3
5	202°43.1	208°28.7	57.9	88°33.3	56.5	132°49.3	38.5	213°54.3	54.2
6	217°45.5	223°29.3	S00°56.8	103°36.7	N25°56.6	147°51.8	N21°38.5	228°56.5	S06°54.1
7	232°48.0	238°30.0	55.6	118°40.1	56.7	162°54.3	38.5	243°58.7	54.0
8	247°50.5	253°30.6	54.5	133°43.5	56.8	177°56.9	38.5	259°00.9	53.9
9	262°52.9	268°31.3	·· 53.3	148°46.9	·· 56.9	192°59.4	·· 38.5	274°03.2	·· 53.8
10	277°55.4	283°32.0	52.2	163°50.3	57.0	208°01.9	38.5	289°05.4	53.7
11	292°57.9	298°32.6	51.0	178°53.6	57.2	223°04.5	38.5	304°07.6	53.6
12	308°00.3	313°33.3	S00°49.9	193°57.0	N25°57.3	238°07.0	N21°38.5	319°09.8	S06°53.5
13	323°02.8	328°33.9	48.7	209°00.4	57.4	253°09.5	38.5	334°12.0	53.4
14	338°05.2	343°34.6	47.6	224°03.8	57.5	268°12.1	38.5	349°14.3	53.3
15	353°07.7	358°35.3	·· 46.4	239°07.1	·· 57.6	283°14.6	·· 38.5	4°16.5	·· 53.2
16	8°10.2	13°36.0	45.3	254°10.5	57.7	298°17.1	38.5	19°18.7	53.1
17	23°12.6	28°36.6	44.1	269°13.9	57.8	313°19.6	38.5	34°20.9	52.9
18	38°15.1	43°37.3	S00°43.0	284°17.3	N25°57.9	328°22.2	N21°38.5	49°23.2	S06°52.8
19	53°17.6	58°38.0	41.8	299°20.6	58.0	343°24.7	38.5	64°25.4	52.7
20	68°20.0	73°38.7	40.7	314°24.0	58.1	358°27.2	38.5	79°27.6	52.6
21	83°22.5	88°39.3	·· 39.5	329°27.4	·· 58.3	13°29.7	·· 38.5	94°29.8	·· 52.5
22	98°25.0	103°40.0	38.4	344°30.7	58.4	28°32.3	38.5	109°32.0	52.4
23	113°27.4	118°40.7	37.2	359°34.1	58.5	43°34.8	38.5	124°34.2	52.3
Mer.pass.	15:27	ν 0.6′	d 1.2′	m -4.71	ν 3.4′	d 0.1′	m -1.19	ν 2.5′	d 0.0′ m -2.55	ν 2.2′	d 0.1′ m 1.11
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	128°29.9	133°41.4	S00°36.1	14°37.5	N25°58.6	58°37.3	N21°38.5	139°36.5	S06°52.2
1	143°32.3	148°42.1	34.9	29°40.8	58.7	73°39.8	38.5	154°38.7	52.1
2	158°34.8	163°42.7	33.8	44°44.2	58.8	88°42.4	38.5	169°40.9	52.0
3	173°37.3	178°43.4	·· 32.6	59°47.6	·· 58.9	103°44.9	·· 38.5	184°43.1	·· 51.9
4	188°39.7	193°44.1	31.5	74°50.9	59.0	118°47.4	38.5	199°45.3	51.8
5	203°42.2	208°44.8	30.3	89°54.3	59.1	133°49.9	38.5	214°47.6	51.7
6	218°44.7	223°45.5	S00°29.2	104°57.6	N25°59.2	148°52.4	N21°38.5	229°49.8	S06°51.6
7	233°47.1	238°46.2	28.0	120°01.0	59.3	163°55.0	38.5	244°52.0	51.5
8	248°49.6	253°46.9	26.9	135°04.3	59.4	178°57.5	38.5	259°54.2	51.3
9	263°52.1	268°47.6	·· 25.7	150°07.7	·· 59.5	194°00.0	·· 38.5	274°56.4	·· 51.2
10	278°54.5	283°48.3	24.6	165°11.1	59.6	209°02.5	38.5	289°58.7	51.1
11	293°57.0	298°49.0	23.4	180°14.4	59.7	224°05.1	38.5	305°00.9	51.0
12	308°59.5	313°49.7	S00°22.3	195°17.8	N25°59.8	239°07.6	N21°38.5	320°03.1	S06°50.9
13	324°01.9	328°50.4	21.2	210°21.1	25°59.9	254°10.1	38.6	335°05.3	50.8
14	339°04.4	343°51.1	20.0	225°24.5	26°00.0	269°12.6	38.6	350°07.5	50.7
15	354°06.8	358°51.8	·· 18.9	240°27.8	·· 00.1	284°15.1	·· 38.6	5°09.8	·· 50.6
16	9°09.3	13°52.5	17.7	255°31.2	00.2	299°17.6	38.6	20°12.0	50.5
17	24°11.8	28°53.2	16.6	270°34.5	00.3	314°20.2	38.6	35°14.2	50.4
18	39°14.2	43°53.9	S00°15.4	285°37.9	N26°00.4	329°22.7	N21°38.6	50°16.4	S06°50.3
19	54°16.7	58°54.6	14.3	300°41.2	00.5	344°25.2	38.6	65°18.6	50.2
20	69°19.2	73°55.3	13.1	315°44.5	00.6	359°27.7	38.6	80°20.8	50.1
21	84°21.6	88°56.0	·· 12.0	330°47.9	·· 00.7	14°30.2	·· 38.6	95°23.1	·· 50.0
22	99°24.1	103°56.7	10.9	345°51.2	00.8	29°32.7	38.6	110°25.3	49.9
23	114°26.6	118°57.4	09.7	0°54.6	00.9	44°35.3	38.6	125°27.5	49.7
Mer.pass.	15:23	ν 0.7′	d 1.1′	m -4.72	ν 3.4′	d 0.1′	m -1.16	ν 2.5′	d 0.0′ m -2.54	ν 2.2′	d 0.1′ m 1.11
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	129°29.0	133°58.2	S00°08.6	15°57.9	N26°01.0	59°37.8	N21°38.6	140°29.7	S06°49.6
1	144°31.5	148°58.9	07.4	31°01.2	01.1	74°40.3	38.6	155°31.9	49.5
2	159°34.0	163°59.6	06.3	46°04.6	01.2	89°42.8	38.6	170°34.1	49.4
3	174°36.4	179°00.3	·· 05.1	61°07.9	·· 01.3	104°45.3	·· 38.6	185°36.4	·· 49.3
4	189°38.9	194°01.0	04.0	76°11.2	01.4	119°47.8	38.6	200°38.6	49.2
5	204°41.3	209°01.8	02.9	91°14.6	01.5	134°50.3	38.6	215°40.8	49.1
6	219°43.8	224°02.5	S00°01.7	106°17.9	N26°01.6	149°52.9	N21°38.6	230°43.0	S06°49.0
7	234°46.3	239°03.2	S00°00.6	121°21.2	01.7	164°55.4	38.6	245°45.2	48.9
8	249°48.7	254°03.9	N00°00.5	136°24.6	01.8	179°57.9	38.6	260°47.5	48.8
9	264°51.2	269°04.7	·· 01.7	151°27.9	·· 01.9	195°00.4	·· 38.6	275°49.7	·· 48.7
10	279°53.7	284°05.4	02.8	166°31.2	02.0	210°02.9	38.6	290°51.9	48.6
11	294°56.1	299°06.1	04.0	181°34.6	02.1	225°05.4	38.6	305°54.1	48.5
12	309°58.6	314°06.9	N00°05.1	196°37.9	N26°02.2	240°07.9	N21°38.6	320°56.3	S06°48.4
13	325°01.1	329°07.6	06.2	211°41.2	02.3	255°10.4	38.6	335°58.5	48.2
14	340°03.5	344°08.3	07.4	226°44.5	02.3	270°12.9	38.6	351°00.8	48.1
15	355°06.0	359°09.1	·· 08.5	241°47.9	·· 02.4	285°15.5	·· 38.6	6°03.0	·· 48.0
16	10°08.5	14°09.8	09.7	256°51.2	02.5	300°18.0	38.6	21°05.2	47.9
17	25°10.9	29°10.6	10.8	271°54.5	02.6	315°20.5	38.6	36°07.4	47.8
18	40°13.4	44°11.3	N00°11.9	286°57.8	N26°02.7	330°23.0	N21°38.6	51°09.6	S06°47.7
19	55°15.8	59°12.0	13.1	302°01.1	02.8	345°25.5	38.6	66°11.8	47.6
20	70°18.3	74°12.8	14.2	317°04.4	02.9	0°28.0	38.6	81°14.0	47.5
21	85°20.8	89°13.5	·· 15.3	332°07.8	·· 03.0	15°30.5	·· 38.6	96°16.3	·· 47.4
22	100°23.2	104°14.3	16.5	347°11.1	03.1	30°33.0	38.6	111°18.5	47.3
23	115°25.7	119°15.0	17.6	2°14.4	03.2	45°35.5	38.7	126°20.7	47.2
Mer.pass.	15:20	ν 0.7′	d 1.1′	m -4.73	ν 3.3′	d 0.1′	m -1.13	ν 2.5′	d 0.0′ m -2.54	ν 2.2′	d 0.1′ m 1.11

Stars	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.3	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.2	-57°06.9
Hamal	327°51.2	23°34.9
Polaris	313°55.3	89°22.5
Acamar	315°11.6	-40°12.5
Menkar	314°06.0	4°11.2
Mirfak	308°28.0	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.9	-52°42.7
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.5
Procyon	244°50.4	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.4
Suhail	222°45.8	-43°32.0
Miaplacidus	221°37.4	-69°49.1
Alphard	217°47.4	-8°46.1
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°40.9
Acrux	172°59.7	-63°14.1
Gacrux	171°51.3	-57°15.0
Alioth	166°12.7	55°49.1
Spica	158°22.2	-11°17.6
Alkaid	152°51.8	49°10.9
Hadar	148°35.9	-60°29.4
Menkent	147°57.5	-36°29.5
Arcturus	145°47.8	19°02.9
Rigil Kent.	139°40.3	-60°56.1
Kochab	137°19.9	74°02.7
Zuben'ubi	136°56.0	-16°08.8
Alphecca	126°03.8	26°37.6
Antares	112°16.0	-26°29.2
Atria	107°10.5	-69°04.1
Sabik	102°02.9	-15°45.4
Shaula	96°10.6	-37°07.3
Rasalhague	95°58.7	12°32.3
Eltanin	90°42.6	51°28.8
Kaus Aust.	83°32.8	-34°22.3
Vega	80°33.6	38°48.2
Nunki	75°48.0	-26°16.0
Altair	62°00.2	8°56.0
Peacock	53°06.2	-56°39.3
Deneb	49°26.2	45°22.1
Enif	33°39.1	9°59.3
Al Na'ir	27°33.3	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.4	28°13.2
Markab	13°30.1	15°20.4

Jan 28 Tue	SHA	Mer.pass
Venus	5°54.7	15:06
Mars	245°45.7	23:02
Jupiter	290°05.9	20:06
Saturn	11°12.4	14:43

Jan 29 Wed	SHA	Mer.pass
Venus	5°11.5	15:05
Mars	246°07.6	22:56
Jupiter	290°07.4	20:02
Saturn	11°06.6	14:39

Jan 30 Thu	SHA	Mer.pass
Venus	4°29.1	15:03
Mars	246°28.9	22:51
Jupiter	290°08.8	19:58
Saturn	11°00.7	14:36

Horizontal parallax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°47.0	S18°11.3	196°17.1	6.4′	S26°50.9	6.0′	57.5′
1	191°46.9	10.6	210°42.4	6.4′	26°44.9	6.1′	57.5′
2	206°46.8	09.9	225°07.8	6.4′	26°38.8	6.3′	57.6′
3	221°46.7	·· 09.3	239°33.3	6.5′	26°32.5	6.5′	57.6′
4	236°46.6	08.6	253°58.7	6.5′	26°26.0	6.6′	57.6′
5	251°46.5	08.0	268°24.2	6.5′	26°19.4	6.8′	57.6′
6	266°46.3	S18°07.3	282°49.7	6.5′	S26°12.6	7.0′	57.7′
7	281°46.2	06.6	297°15.2	6.6′	26°05.6	7.1′	57.7′
8	296°46.1	06.0	311°40.8	6.6′	25°58.5	7.3′	57.7′
9	311°46.0	·· 05.3	326°06.4	6.7′	25°51.2	7.5′	57.8′
10	326°45.9	04.6	340°32.1	6.7′	25°43.7	7.6′	57.8′
11	341°45.8	04.0	354°57.8	6.7′	25°36.1	7.8′	57.8′
12	356°45.6	S18°03.3	9°23.5	6.8′	S25°28.3	7.9′	57.9′
13	11°45.5	02.6	23°49.3	6.8′	25°20.4	8.1′	57.9′
14	26°45.4	02.0	38°15.1	6.9′	25°12.3	8.3′	57.9′
15	41°45.3	·· 01.3	52°41.0	6.9′	25°04.0	8.4′	57.9′
16	56°45.2	00.6	67°06.9	7.0′	24°55.6	8.6′	58.0′
17	71°45.1	18°00.0	81°32.9	7.0′	24°47.0	8.7′	58.0′
18	86°45.0	S17°59.3	95°58.9	7.1′	S24°38.3	8.9′	58.0′
19	101°44.9	58.6	110°24.9	7.1′	24°29.4	9.1′	58.1′
20	116°44.7	58.0	124°51.0	7.2′	24°20.3	9.2′	58.1′
21	131°44.6	·· 57.3	139°17.2	7.2′	24°11.1	9.3′	58.1′
22	146°44.5	56.6	153°43.4	7.3′	24°01.8	9.5′	58.1′
23	161°44.4	55.9	168°09.7	7.3′	23°52.3	9.7′	58.2′
	SD = 16.2′	d = 0.7′	SD = 15.7′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°44.3	S17°55.3	182°36.0	7.4′	S23°42.6	9.8′	58.2′
1	191°44.2	54.6	197°02.4	7.4′	23°32.8	9.9′	58.2′
2	206°44.1	53.9	211°28.8	7.5′	23°22.9	10.1′	58.2′
3	221°44.0	·· 53.2	225°55.3	7.5′	23°12.8	10.3′	58.3′
4	236°43.9	52.6	240°21.9	7.6′	23°02.5	10.4′	58.3′
5	251°43.7	51.9	254°48.5	7.7′	22°52.1	10.5′	58.3′
6	266°43.6	S17°51.2	269°15.1	7.7′	S22°41.6	10.7′	58.3′
7	281°43.5	50.5	283°41.9	7.8′	22°30.9	10.8′	58.4′
8	296°43.4	49.9	298°08.6	7.8′	22°20.1	11.0′	58.4′
9	311°43.3	·· 49.2	312°35.5	7.9′	22°09.1	11.1′	58.4′
10	326°43.2	48.5	327°02.4	8.0′	21°58.0	11.2′	58.4′
11	341°43.1	47.8	341°29.4	8.0′	21°46.8	11.3′	58.5′
12	356°43.0	S17°47.1	355°56.4	8.1′	S21°35.5	11.6′	58.5′
13	11°42.9	46.5	10°23.5	8.2′	21°23.9	11.6′	58.5′
14	26°42.8	45.8	24°50.7	8.2′	21°12.3	11.8′	58.5′
15	41°42.7	·· 45.1	39°17.9	8.3′	21°00.5	11.9′	58.6′
16	56°42.6	44.4	53°45.2	8.4′	20°48.6	12.0′	58.6′
17	71°42.5	43.7	68°12.6	8.4′	20°36.6	12.1′	58.6′
18	86°42.4	S17°43.1	82°40.0	8.5′	S20°24.5	12.3′	58.6′
19	101°42.3	42.4	97°07.5	8.6′	20°12.2	12.4′	58.7′
20	116°42.2	41.7	111°35.0	8.6′	19°59.8	12.6′	58.7′
21	131°42.0	·· 41.0	126°02.7	8.7′	19°47.2	12.6′	58.7′
22	146°41.9	40.3	140°30.3	8.8′	19°34.6	12.8′	58.7′
23	161°41.8	39.6	154°58.1	8.8′	19°21.8	12.9′	58.8′
	SD = 16.2′	d = 0.7′	SD = 15.9′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.7	S17°38.9	169°25.9	8.9′	S19°08.9	13.0′	58.8′
1	191°41.6	38.3	183°53.8	8.9′	18°55.9	13.1′	58.8′
2	206°41.5	37.6	198°21.7	9.0′	18°42.8	13.2′	58.8′
3	221°41.4	·· 36.9	212°49.7	9.1′	18°29.6	13.4′	58.8′
4	236°41.3	36.2	227°17.8	9.1′	18°16.2	13.5′	58.9′
5	251°41.2	35.5	241°46.0	9.2′	18°02.7	13.5′	58.9′
6	266°41.1	S17°34.8	256°14.2	9.3′	S17°49.2	13.7′	58.9′
7	281°41.0	34.1	270°42.4	9.3′	17°35.5	13.8′	58.9′
8	296°40.9	33.4	285°10.8	9.4′	17°21.7	13.9′	58.9′
9	311°40.8	·· 32.8	299°39.2	9.5′	17°07.8	14.0′	59.0′
10	326°40.7	32.1	314°07.6	9.5′	16°53.8	14.1′	59.0′
11	341°40.6	31.4	328°36.2	9.6′	16°39.7	14.2′	59.0′
12	356°40.5	S17°30.7	343°04.8	9.7′	S16°25.5	14.3′	59.0′
13	11°40.4	30.0	357°33.4	9.7′	16°11.2	14.4′	59.0′
14	26°40.3	29.3	12°02.1	9.8′	15°56.8	14.5′	59.1′
15	41°40.2	·· 28.6	26°30.9	9.8′	15°42.3	14.6′	59.1′
16	56°40.1	27.9	40°59.8	9.9′	15°27.7	14.7′	59.1′
17	71°40.1	27.2	55°28.7	10.0′	15°13.0	14.8′	59.1′
18	86°40.0	S17°26.5	69°57.6	10.0′	S14°58.2	14.8′	59.1′
19	101°39.9	25.8	84°26.6	10.1′	14°43.4	15.0′	59.1′
20	116°39.8	25.1	98°55.7	10.1′	14°28.4	15.0′	59.2′
21	131°39.7	·· 24.4	113°24.9	10.2′	14°13.4	15.2′	59.2′
22	146°39.6	23.7	127°54.1	10.3′	13°58.2	15.2′	59.2′
23	161°39.5	23.0	142°23.3	10.3′	13°43.0	15.3′	59.2′
	SD = 16.2′	d = 0.7′	SD = 16.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:19	08:51	10:53	13:35	15:37	17:09
N 70°	07:10	08:30	10:01	14:27	15:57	17:18
68°	07:02	08:14	09:29	14:58	16:13	17:25
66°	06:56	08:01	09:06	15:21	16:27	17:31
64°	06:50	07:50	08:48	15:39	16:37	17:37
62°	06:45	07:40	08:33	15:54	16:47	17:42
60°	06:41	07:32	08:20	16:07	16:55	17:46
N 58°	06:37	07:25	08:09	16:18	17:02	17:50
56°	06:33	07:18	08:00	16:27	17:09	17:54
54°	06:30	07:12	07:52	16:35	17:14	17:57
52°	06:26	07:07	07:44	16:43	17:20	18:01
50°	06:23	07:02	07:37	16:49	17:25	18:04
45°	06:16	06:51	07:23	17:04	17:35	18:11
N 40°	06:10	06:42	07:11	17:16	17:44	18:17
35°	06:04	06:34	07:01	17:26	17:53	18:23
30°	05:58	06:27	06:52	17:35	18:00	18:29
20°	05:47	06:13	06:36	17:50	18:13	18:40
N 10°	05:35	06:01	06:23	18:04	18:26	18:51
0°	05:23	05:48	06:10	18:17	18:38	19:04
S 10°	05:08	05:34	05:57	18:30	18:52	19:18
20°	04:51	05:19	05:42	18:44	19:07	19:35
30°	04:29	05:00	05:26	19:00	19:26	19:57
35°	04:15	04:49	05:17	19:09	19:37	20:10
40°	03:58	04:35	05:06	19:20	19:50	20:27
45°	03:36	04:19	04:53	19:33	20:06	20:49
S 50°	03:07	03:58	04:37	19:48	20:27	21:17
52°	02:52	03:48	04:29	19:56	20:37	21:32
54°	02:34	03:37	04:21	20:04	20:48	21:49
56°	02:12	03:23	04:12	20:13	21:01	22:12
58°	01:40	03:08	04:01	20:24	21:16	22:42
S 60°	00:31	02:49	03:49	20:36	21:35	23:37

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	▬	▬	11:35	▬	▬	15:12
N 70°	▬	▬	10:50	▬	▬	15:55
68°	▬	11:42	10:20	▬	13:10	16:23
66°	▬	10:34	09:58	▬	14:17	16:44
64°	10:46	09:58	09:40	12:06	14:52	17:01
62°	09:41	09:31	09:25	13:11	15:17	17:15
60°	09:06	09:11	09:12	13:45	15:37	17:26
N 58°	08:40	08:54	09:01	14:10	15:53	17:36
56°	08:20	08:39	08:51	14:30	16:07	17:45
54°	08:03	08:27	08:43	14:47	16:19	17:52
52°	07:49	08:16	08:35	15:01	16:29	17:59
50°	07:36	08:06	08:28	15:13	16:38	18:05
45°	07:09	07:45	08:13	15:39	16:58	18:18
N 40°	06:49	07:28	08:01	15:59	17:13	18:29
35°	06:31	07:14	07:50	16:16	17:27	18:38
30°	06:16	07:01	07:41	16:30	17:38	18:46
20°	05:50	06:40	07:25	16:54	17:57	19:00
N 10°	05:28	06:21	07:11	17:15	18:14	19:11
0°	05:07	06:04	06:58	17:34	18:30	19:22
S 10°	04:46	05:46	06:44	17:54	18:45	19:33
20°	04:24	05:27	06:30	18:14	19:02	19:45
30°	03:58	05:05	06:14	18:38	19:20	19:58
35°	03:43	04:52	06:04	18:52	19:31	20:05
40°	03:25	04:38	05:53	19:08	19:44	20:14
45°	03:03	04:20	05:40	19:26	19:58	20:24
S 50°	02:36	03:58	05:24	19:50	20:16	20:35
52°	02:22	03:47	05:16	20:01	20:24	20:41
54°	02:06	03:35	05:08	20:14	20:33	20:47
56°	01:48	03:21	04:59	20:28	20:43	20:53
58°	01:25	03:05	04:48	20:45	20:55	21:01
S 60°	00:56	02:45	04:35	21:05	21:08	21:09

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 29-1 3-0%
28	12:52	12:57	12:13	11:21	23:49	
29	13:03	13:08	12:13	12:17	–:–	
30	13:13	13:18	12:13	13:10	00:44	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1922 sec ΔT = TT-UT1 = +68.9918 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	130°28.2	134°15.8	N00°18.7	17°17.7	N26°03.2	60°38.0	N21°38.7	141°22.9	S06°47.1
1	145°30.6	149°16.5	19.9	32°21.0	03.3	75°40.5	38.7	156°25.1	47.0
2	160°33.1	164°17.3	21.0	47°24.3	03.4	90°43.0	38.7	171°27.3	46.8
3	175°35.6	179°18.0	·· 22.1	62°27.6	·· 03.5	105°45.5	·· 38.7	186°29.6	·· 46.7
4	190°38.0	194°18.8	23.3	77°30.9	03.6	120°48.0	38.7	201°31.8	46.6
5	205°40.5	209°19.6	24.4	92°34.2	03.7	135°50.5	38.7	216°34.0	46.5
6	220°42.9	224°20.3	N00°25.5	107°37.5	N26°03.8	150°53.0	N21°38.7	231°36.2	S06°46.4
7	235°45.4	239°21.1	26.7	122°40.8	03.9	165°55.6	38.7	246°38.4	46.3
8	250°47.9	254°21.9	27.8	137°44.1	03.9	180°58.1	38.7	261°40.6	46.2
9	265°50.3	269°22.6	·· 28.9	152°47.4	·· 04.0	196°00.6	·· 38.7	276°42.9	·· 46.1
10	280°52.8	284°23.4	30.1	167°50.7	04.1	211°03.1	38.7	291°45.1	46.0
11	295°55.3	299°24.2	31.2	182°54.0	04.2	226°05.6	38.7	306°47.3	45.9
12	310°57.7	314°24.9	N00°32.3	197°57.3	N26°04.3	241°08.1	N21°38.7	321°49.5	S06°45.8
13	326°00.2	329°25.7	33.4	213°00.6	04.4	256°10.6	38.7	336°51.7	45.7
14	341°02.7	344°26.5	34.6	228°03.9	04.4	271°13.1	38.7	351°53.9	45.5
15	356°05.1	359°27.2	·· 35.7	243°07.2	·· 04.5	286°15.6	·· 38.7	6°56.1	·· 45.4
16	11°07.6	14°28.0	36.8	258°10.5	04.6	301°18.1	38.7	21°58.4	45.3
17	26°10.1	29°28.8	38.0	273°13.8	04.7	316°20.6	38.7	37°00.6	45.2
18	41°12.5	44°29.6	N00°39.1	288°17.1	N26°04.8	331°23.1	N21°38.7	52°02.8	S06°45.1
19	56°15.0	59°30.4	40.2	303°20.4	04.9	346°25.6	38.7	67°05.0	45.0
20	71°17.4	74°31.1	41.3	318°23.7	04.9	1°28.1	38.7	82°07.2	44.9
21	86°19.9	89°31.9	·· 42.5	333°27.0	·· 05.0	16°30.6	·· 38.7	97°09.4	·· 44.8
22	101°22.4	104°32.7	43.6	348°30.2	05.1	31°33.1	38.7	112°11.6	44.7
23	116°24.8	119°33.5	44.7	3°33.5	05.2	46°35.6	38.8	127°13.9	44.6
Mer.pass.	15:16	ν 0.8′	d 1.1′	m -4.74	ν 3.3′	d 0.1′	m -1.10	ν 2.5′	d 0.0′ m -2.53	ν 2.2′	d 0.1′ m 1.11

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	131°27.3	134°34.3	N00°45.8	18°36.8	N26°05.2	61°38.0	N21°38.8	142°16.1	S06°44.5
1	146°29.8	149°35.1	47.0	33°40.1	05.3	76°40.5	38.8	157°18.3	44.4
2	161°32.2	164°35.9	48.1	48°43.4	05.4	91°43.0	38.8	172°20.5	44.2
3	176°34.7	179°36.7	·· 49.2	63°46.6	·· 05.5	106°45.5	·· 38.8	187°22.7	·· 44.1
4	191°37.2	194°37.5	50.3	78°49.9	05.6	121°48.0	38.8	202°24.9	44.0
5	206°39.6	209°38.3	51.5	93°53.2	05.6	136°50.5	38.8	217°27.1	43.9
6	221°42.1	224°39.1	N00°52.6	108°56.5	N26°05.7	151°53.0	N21°38.8	232°29.4	S06°43.8
7	236°44.5	239°39.9	53.7	123°59.7	05.8	166°55.5	38.8	247°31.6	43.7
8	251°47.0	254°40.7	54.8	139°03.0	05.9	181°58.0	38.8	262°33.8	43.6
9	266°49.5	269°41.5	·· 55.9	154°06.3	·· 05.9	197°00.5	·· 38.8	277°36.0	·· 43.5
10	281°51.9	284°42.3	57.1	169°09.6	06.0	212°03.0	38.8	292°38.2	43.4
11	296°54.4	299°43.1	58.2	184°12.8	06.1	227°05.5	38.8	307°40.4	43.3
12	311°56.9	314°43.9	N00°59.3	199°16.1	N26°06.2	242°08.0	N21°38.8	322°42.6	S06°43.2
13	326°59.3	329°44.7	01°00.4	214°19.4	06.2	257°10.5	38.8	337°44.8	43.1
14	342°01.8	344°45.5	01.6	229°22.6	06.3	272°13.0	38.8	352°47.1	42.9
15	357°04.3	359°46.3	·· 02.7	244°25.9	·· 06.4	287°15.5	·· 38.8	7°49.3	·· 42.8
16	12°06.7	14°47.1	03.8	259°29.1	06.5	302°17.9	38.8	22°51.5	42.7
17	27°09.2	29°47.9	04.9	274°32.4	06.5	317°20.4	38.8	37°53.7	42.6
18	42°11.7	44°48.8	N01°06.0	289°35.7	N26°06.6	332°22.9	N21°38.9	52°55.9	S06°42.5
19	57°14.1	59°49.6	07.1	304°38.9	06.7	347°25.4	38.9	67°58.1	42.4
20	72°16.6	74°50.4	08.3	319°42.2	06.7	2°27.9	38.9	83°00.3	42.3
21	87°19.0	89°51.2	·· 09.4	334°45.4	·· 06.8	17°30.4	·· 38.9	98°02.5	·· 42.2
22	102°21.5	104°52.0	10.5	349°48.7	06.9	32°32.9	38.9	113°04.8	42.1
23	117°24.0	119°52.9	11.6	4°51.9	07.0	47°35.4	38.9	128°07.0	42.0
Mer.pass.	15:12	ν 0.8′	d 1.1′	m -4.75	ν 3.3′	d 0.1′	m -1.07	ν 2.5′	d 0.0′ m -2.52	ν 2.2′	d 0.1′ m 1.11

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	132°26.4	134°53.7	N01°12.7	19°55.2	N26°07.0	62°37.9	N21°38.9	143°09.2	S06°41.9
1	147°28.9	149°54.5	13.8	34°58.4	07.1	77°40.3	38.9	158°11.4	41.7
2	162°31.4	164°55.4	15.0	50°01.7	07.2	92°42.8	38.9	173°13.6	41.6
3	177°33.8	179°56.2	·· 16.1	65°04.9	·· 07.2	107°45.3	·· 38.9	188°15.8	·· 41.5
4	192°36.3	194°57.0	17.2	80°08.2	07.3	122°47.8	38.9	203°18.0	41.4
5	207°38.8	209°57.9	18.3	95°11.4	07.4	137°50.3	38.9	218°20.2	41.3
6	222°41.2	224°58.7	N01°19.4	110°14.7	N26°07.4	152°52.8	N21°38.9	233°22.5	S06°41.2
7	237°43.7	239°59.5	20.5	125°17.9	07.5	167°55.3	38.9	248°24.7	41.1
8	252°46.2	255°00.4	21.6	140°21.2	07.6	182°57.7	38.9	263°26.9	41.0
9	267°48.6	270°01.2	·· 22.8	155°24.4	·· 07.6	198°00.2	·· 38.9	278°29.1	·· 40.9
10	282°51.1	285°02.1	23.9	170°27.6	07.7	213°02.7	39.0	293°31.3	40.8
11	297°53.5	300°02.9	25.0	185°30.9	07.8	228°05.2	39.0	308°33.5	40.6
12	312°56.0	315°03.7	N01°26.1	200°34.1	N26°07.8	243°07.7	N21°39.0	323°35.7	S06°40.5
13	327°58.5	330°04.6	27.2	215°37.3	07.9	258°10.2	39.0	338°37.9	40.4
14	343°00.9	345°05.4	28.3	230°40.6	08.0	273°12.6	39.0	353°40.1	40.3
15	358°03.4	0°06.3	·· 29.4	245°43.8	·· 08.0	288°15.1	·· 39.0	8°42.4	·· 40.2
16	13°05.9	15°07.2	30.5	260°47.0	08.1	303°17.6	39.0	23°44.6	40.1
17	28°08.3	30°08.0	31.6	275°50.3	08.2	318°20.1	39.0	38°46.8	40.0
18	43°10.8	45°08.9	N01°32.7	290°53.5	N26°08.2	333°22.6	N21°39.0	53°49.0	S06°39.9
19	58°13.3	60°09.7	33.8	305°56.7	08.3	348°25.0	39.0	68°51.2	39.8
20	73°15.7	75°10.6	35.0	321°00.0	08.3	3°27.5	39.0	83°53.4	39.7
21	88°18.2	90°11.4	·· 36.1	336°03.2	·· 08.4	18°30.0	·· 39.0	98°55.6	·· 39.6
22	103°20.6	105°12.3	37.2	351°06.4	08.5	33°32.5	39.0	113°57.8	39.4
23	118°23.1	120°13.2	38.3	6°09.6	08.5	48°35.0	39.0	129°00.0	39.3
Mer.pass.	15:08	ν 0.8′	d 1.1′	m -4.76	ν 3.3′	d 0.1′	m -1.05	ν 2.5′	d 0.0′ m -2.51	ν 2.2′	d 0.1′ m 1.11

Stars	SHA	Dec
Alpheratz	357°34.9	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.3	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.3	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	313°57.0	89°22.5
Acamar	315°11.7	-40°12.5
Menkar	314°06.0	4°11.2
Mirfak	308°28.1	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.4
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.9	-52°42.7
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.5
Procyon	244°50.4	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.4
Suhail	222°45.8	-43°32.0
Miaplacidus	221°37.4	-69°49.1
Alphard	217°47.4	-8°46.1
Regulus	207°34.1	11°50.6
Dubhe	193°40.3	61°36.7
Denebola	182°24.6	14°25.8
Gienah	175°43.3	-17°40.9
Acrux	172°59.7	-63°14.1
Gacrux	171°51.3	-57°15.0
Alioth	166°12.6	55°49.1
Spica	158°22.1	-11°17.6
Alkaid	152°51.8	49°10.9
Hadar	148°35.8	-60°29.4
Menkent	147°57.5	-36°29.5
Arcturus	145°47.8	19°02.9
Rigil Kent.	139°40.2	-60°56.1
Kochab	137°19.8	74°02.7
Zuben'ubi	136°56.0	-16°08.8
Alphecca	126°03.8	26°37.5
Antares	112°15.9	-26°29.2
Atria	107°10.4	-69°04.1
Sabik	102°02.9	-15°45.4
Shaula	96°10.6	-37°07.3
Rasalhague	95°58.7	12°32.3
Eltanin	90°42.6	51°28.8
Kaus Aust.	83°32.8	-34°22.3
Vega	80°33.5	38°48.2
Nunki	75°48.0	-26°16.0
Altair	62°00.2	8°55.9
Peacock	53°06.2	-56°39.3
Deneb	49°26.2	45°22.1
Enif	33°39.1	9°59.3
Al Na'ir	27°33.2	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.4

Jan 31 Fri	SHA	Mer.pass
Venus	3°47.6	15:02
Mars	246°49.5	22:46
Jupiter	290°09.9	19:54
Saturn	10°54.8	14:32

Feb 01 Sat	SHA	Mer.pass
Venus	3°07.0	15:01
Mars	247°09.5	22:41
Jupiter	290°10.7	19:50
Saturn	10°48.8	14:29

Feb 02 Sun	SHA	Mer.pass
Venus	2°27.3	15:00
Mars	247°28.8	22:35
Jupiter	290°11.4	19:46
Saturn	10°42.7	14:25

Horizontal parallax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°39.4	S17°22.3	156°52.6	10.4′	S13°27.7	15.3′	59.2′
1	191°39.3	21.6	171°22.0	10.4′	13°12.4	15.5′	59.2′
2	206°39.2	20.9	185°51.4	10.5′	12°56.9	15.5′	59.3′
3	221°39.1	·· 20.2	200°20.9	10.5′	12°41.4	15.6′	59.3′
4	236°39.0	19.5	214°50.4	10.6′	12°25.8	15.7′	59.3′
5	251°38.9	18.8	229°20.0	10.6′	12°10.1	15.7′	59.3′
6	266°38.8	S17°18.1	243°49.6	10.7′	S11°54.4	15.8′	59.3′
7	281°38.7	17.4	258°19.3	10.7′	11°38.6	15.9′	59.3′
8	296°38.7	16.7	272°49.0	10.8′	11°22.7	15.9′	59.3′
9	311°38.6	·· 16.0	287°18.8	10.8′	11°06.8	16.0′	59.3′
10	326°38.5	15.3	301°48.6	10.9′	10°50.8	16.1′	59.4′
11	341°38.4	14.6	316°18.5	10.9′	10°34.7	16.1′	59.4′
12	356°38.3	S17°13.9	330°48.4	11.0′	S10°18.6	16.2′	59.4′
13	11°38.2	13.2	345°18.4	11.0′	10°02.4	16.3′	59.4′
14	26°38.1	12.5	359°48.4	11.1′	09°46.1	16.3′	59.4′
15	41°38.0	·· 11.8	14°18.5	11.1′	09°29.8	16.4′	59.4′
16	56°37.9	11.1	28°48.6	11.1′	09°13.4	16.4′	59.4′
17	71°37.9	10.4	43°18.7	11.2′	08°57.0	16.4′	59.4′
18	86°37.8	S17°09.6	57°48.9	11.2′	S08°40.6	16.6′	59.4′
19	101°37.7	08.9	72°19.1	11.3′	08°24.0	16.5′	59.5′
20	116°37.6	08.2	86°49.4	11.3′	08°07.5	16.6′	59.5′
21	131°37.5	·· 07.5	101°19.7	11.3′	07°50.9	16.7′	59.5′
22	146°37.4	06.8	115°50.0	11.4′	07°34.2	16.7′	59.5′
23	161°37.3	06.1	130°20.3	11.4′	07°17.5	16.7′	59.5′
	SD = 16.2′	d = 0.7′	SD = 16.2′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.2	S17°05.4	144°50.7	11.4′	S07°00.8	16.8′	59.5′
1	191°37.2	04.7	159°21.2	11.5′	06°44.0	16.8′	59.5′
2	206°37.1	04.0	173°51.6	11.5′	06°27.2	16.9′	59.5′
3	221°37.0	·· 03.2	188°22.1	11.5′	06°10.3	16.9′	59.5′
4	236°36.9	02.5	202°52.6	11.5′	05°53.4	16.9′	59.5′
5	251°36.8	01.8	217°23.2	11.6′	05°36.5	16.9′	59.5′
6	266°36.7	S17°01.1	231°53.8	11.6′	S05°19.6	17.0′	59.5′
7	281°36.7	17°00.4	246°24.4	11.6′	05°02.6	17.0′	59.5′
8	296°36.6	16°59.7	260°55.0	11.6′	04°45.6	17.1′	59.5′
9	311°36.5	·· 59.0	275°25.6	11.7′	04°28.5	17.0′	59.6′
10	326°36.4	58.2	289°56.3	11.7′	04°11.5	17.1′	59.6′
11	341°36.3	57.5	304°27.0	11.7′	03°54.4	17.1′	59.6′
12	356°36.3	S16°56.8	318°57.7	11.7′	S03°37.3	17.2′	59.6′
13	11°36.2	56.1	333°28.4	11.7′	03°20.1	17.1′	59.6′
14	26°36.1	55.4	347°59.2	11.8′	03°03.0	17.2′	59.6′
15	41°36.0	·· 54.6	2°29.9	11.8′	02°45.8	17.1′	59.6′
16	56°35.9	53.9	17°00.7	11.8′	02°28.7	17.2′	59.6′
17	71°35.9	53.2	31°31.5	11.8′	02°11.5	17.2′	59.6′
18	86°35.8	S16°52.5	46°02.3	11.8′	S01°54.3	17.2′	59.6′
19	101°35.7	51.8	60°33.1	11.8′	01°37.1	17.3′	59.6′
20	116°35.6	51.0	75°03.9	11.8′	01°19.8	17.2′	59.6′
21	131°35.5	·· 50.3	89°34.7	11.8′	01°02.6	17.2′	59.6′
22	146°35.5	49.6	104°05.6	11.8′	00°45.4	17.2′	59.6′
23	161°35.4	48.9	118°36.4	11.8′	00°28.2	17.3′	59.6′
	SD = 16.2′	d = 0.7′	SD = 16.2′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.3	S16°48.2	133°07.3	11.8′	S00°10.9	17.2′	59.6′
1	191°35.2	47.4	147°38.1	11.8′	N00°06.3	17.3′	59.6′
2	206°35.2	46.7	162°08.9	11.8′	00°23.6	17.2′	59.6′
3	221°35.1	·· 46.0	176°39.8	11.8′	00°40.8	17.2′	59.6′
4	236°35.0	45.2	191°10.6	11.8′	00°58.0	17.2′	59.6′
5	251°34.9	44.5	205°41.5	11.8′	01°15.2	17.2′	59.6′
6	266°34.9	S16°43.8	220°12.3	11.8′	N01°32.4	17.3′	59.6′
7	281°34.8	43.1	234°43.2	11.8′	01°49.7	17.1′	59.6′
8	296°34.7	42.3	249°14.0	11.8′	02°06.8	17.2′	59.6′
9	311°34.6	·· 41.6	263°44.8	11.8′	02°24.0	17.2′	59.6′
10	326°34.6	40.9	278°15.6	11.8′	02°41.2	17.1′	59.6′
11	341°34.5	40.2	292°46.4	11.8′	02°58.3	17.2′	59.6′
12	356°34.4	S16°39.4	307°17.2	11.8′	N03°15.5	17.1′	59.6′
13	11°34.4	38.7	321°48.0	11.8′	03°32.6	17.1′	59.6′
14	26°34.3	38.0	336°18.7	11.7′	03°49.7	17.1′	59.6′
15	41°34.2	·· 37.2	350°49.5	11.7′	04°06.8	17.0′	59.6′
16	56°34.1	36.5	5°20.2	11.7′	04°23.8	17.0′	59.6′
17	71°34.1	35.8	19°50.9	11.7′	04°40.8	17.0′	59.6′
18	86°34.0	S16°35.0	34°21.6	11.7′	N04°57.8	17.0′	59.6′
19	101°33.9	34.3	48°52.3	11.6′	05°14.8	16.9′	59.6′
20	116°33.9	33.6	63°22.9	11.6′	05°31.7	16.9′	59.6′
21	131°33.8	·· 32.8	77°53.6	11.6′	05°48.6	16.9′	59.6′
22	146°33.7	32.1	92°24.2	11.6′	06°05.5	16.8′	59.5′
23	161°33.7	31.4	106°54.7	11.5′	06°22.3	16.8′	59.5′
	SD = 16.2′	d = 0.7′	SD = 16.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:09	08:37	10:25	14:03	15:51	17:20
N 70°	07:01	08:19	09:44	14:44	16:10	17:28
68°	06:54	08:04	09:16	15:12	16:24	17:34
66°	06:49	07:52	08:55	15:33	16:36	17:40
64°	06:44	07:42	08:39	15:49	16:46	17:45
62°	06:39	07:34	08:25	16:03	16:54	17:49
60°	06:35	07:26	08:13	16:15	17:02	17:53
N 58°	06:32	07:19	08:03	16:25	17:09	17:56
56°	06:28	07:13	07:54	16:33	17:15	18:00
54°	06:25	07:08	07:47	16:41	17:20	18:03
52°	06:22	07:03	07:40	16:48	17:25	18:05
50°	06:20	06:58	07:33	16:55	17:29	18:08
45°	06:13	06:48	07:20	17:08	17:39	18:15
N 40°	06:07	06:40	07:08	17:19	17:48	18:20
35°	06:02	06:32	06:59	17:29	17:55	18:26
30°	05:57	06:25	06:50	17:37	18:02	18:31
20°	05:46	06:12	06:35	17:52	18:15	18:41
N 10°	05:35	06:00	06:22	18:05	18:27	18:52
0°	05:23	05:48	06:10	18:17	18:39	19:04
S 10°	05:10	05:36	05:58	18:29	18:51	19:17
20°	04:53	05:21	05:44	18:43	19:06	19:33
30°	04:32	05:03	05:29	18:58	19:24	19:54
35°	04:19	04:52	05:20	19:07	19:34	20:08
40°	04:03	04:39	05:09	19:17	19:47	20:24
45°	03:42	04:24	04:57	19:29	20:02	20:44
S 50°	03:15	04:04	04:42	19:44	20:22	21:11
52°	03:01	03:55	04:35	19:51	20:31	21:25
54°	02:44	03:44	04:27	19:59	20:42	21:41
56°	02:23	03:31	04:18	20:07	20:54	22:01
58°	01:56	03:17	04:08	20:17	21:08	22:27
S 60°	01:13	02:59	03:57	20:28	21:25	23:07

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	10:19	09:35	08:57	18:16	20:46	23:12
N 70°	10:02	09:29	09:00	18:30	20:47	23:02
68°	09:48	09:24	09:03	18:42	20:49	22:54
66°	09:37	09:20	09:05	18:51	20:50	22:48
64°	09:27	09:17	09:07	18:59	20:51	22:43
62°	09:19	09:13	09:08	19:05	20:52	22:38
60°	09:12	09:11	09:10	19:11	20:53	22:34
N 58°	09:05	09:08	09:11	19:16	20:53	22:30
56°	09:00	09:06	09:12	19:20	20:54	22:27
54°	08:55	09:04	09:13	19:24	20:55	22:25
52°	08:50	09:02	09:14	19:28	20:55	22:22
50°	08:46	09:01	09:15	19:31	20:55	22:20
45°	08:37	08:57	09:16	19:38	20:56	22:15
N 40°	08:29	08:54	09:18	19:44	20:57	22:11
35°	08:22	08:51	09:19	19:48	20:58	22:07
30°	08:17	08:49	09:21	19:53	20:58	22:04
20°	08:06	08:45	09:23	20:00	20:59	21:59
N 10°	07:57	08:42	09:25	20:07	21:00	21:54
0°	07:49	08:38	09:26	20:12	21:01	21:49
S 10°	07:41	08:35	09:28	20:18	21:02	21:45
20°	07:31	08:31	09:30	20:25	21:03	21:40
30°	07:21	08:27	09:33	20:32	21:03	21:35
35°	07:15	08:25	09:34	20:36	21:04	21:32
40°	07:08	08:22	09:36	20:40	21:04	21:28
45°	07:00	08:19	09:37	20:45	21:05	21:25
S 50°	06:50	08:15	09:40	20:51	21:06	21:20
52°	06:46	08:14	09:41	20:54	21:06	21:18
54°	06:41	08:12	09:42	20:57	21:06	21:15
56°	06:35	08:10	09:43	21:01	21:07	21:13
58°	06:29	08:07	09:44	21:04	21:07	21:10
S 60°	06:22	08:05	09:46	21:09	21:08	21:07

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 2-4 3-15%
31	13:22	13:27	12:13	14:01	01:36	
01	13:31	13:35	12:14	14:50	02:25	
02	13:39	13:42	12:14	15:38	03:14	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1930 sec ΔT = TT-UT1 = +68.9910 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	133°25.6	135°14.0	N01°39.4	21°12.8	N26°08.6	63°37.4	N21°39.1	144°02.3	S06°39.2
1	148°28.0	150°14.9	40.5	36°16.1	08.7	78°39.9	39.1	159°04.5	39.1
2	163°30.5	165°15.8	41.6	51°19.3	08.7	93°42.4	39.1	174°06.7	39.0
3	178°33.0	180°16.6	·· 42.7	66°22.5	·· 08.8	108°44.9	·· 39.1	189°08.9	·· 38.9
4	193°35.4	195°17.5	43.8	81°25.7	08.8	123°47.4	39.1	204°11.1	38.8
5	208°37.9	210°18.4	44.9	96°28.9	08.9	138°49.8	39.1	219°13.3	38.7
6	223°40.4	225°19.3	N01°46.0	111°32.1	N26°09.0	153°52.3	N21°39.1	234°15.5	S06°38.6
7	238°42.8	240°20.2	47.1	126°35.3	09.0	168°54.8	39.1	249°17.7	38.5
8	253°45.3	255°21.0	48.2	141°38.6	09.1	183°57.3	39.1	264°19.9	38.3
9	268°47.8	270°21.9	·· 49.3	156°41.8	·· 09.1	198°59.7	·· 39.1	279°22.1	·· 38.2
10	283°50.2	285°22.8	50.4	171°45.0	09.2	214°02.2	39.1	294°24.4	38.1
11	298°52.7	300°23.7	51.5	186°48.2	09.2	229°04.7	39.1	309°26.6	38.0
12	313°55.1	315°24.6	N01°52.6	201°51.4	N26°09.3	244°07.2	N21°39.1	324°28.8	S06°37.9
13	328°57.6	330°25.5	53.7	216°54.6	09.4	259°09.6	39.1	339°31.0	37.8
14	344°00.1	345°26.3	54.8	231°57.8	09.4	274°12.1	39.2	354°33.2	37.7
15	359°02.5	0°27.2	·· 55.9	247°01.0	·· 09.5	289°14.6	·· 39.2	9°35.4	·· 37.6
16	14°05.0	15°28.1	57.0	262°04.2	09.5	304°17.0	39.2	24°37.6	37.5
17	29°07.5	30°29.0	58.1	277°07.4	09.6	319°19.5	39.2	39°39.8	37.4
18	44°09.9	45°29.9	N01°59.2	292°10.6	N26°09.6	334°22.0	N21°39.2	54°42.0	S06°37.2
19	59°12.4	60°30.8	02°00.3	307°13.8	09.7	349°24.5	39.2	69°44.2	37.1
20	74°14.9	75°31.7	01.4	322°17.0	09.7	4°26.9	39.2	84°46.4	37.0
21	89°17.3	90°32.6	·· 02.5	337°20.2	·· 09.8	19°29.4	·· 39.2	99°48.7	·· 36.9
22	104°19.8	105°33.5	03.6	352°23.3	09.8	34°31.9	39.2	114°50.9	36.8
23	119°22.2	120°34.4	04.7	7°26.5	09.9	49°34.3	39.2	129°53.1	36.7
Mer.pass.	15:04	ν 0.9′	d 1.1′	m -4.77	ν 3.2′	d 0.1′	m -1.02	ν 2.5′	d 0.0′ m -2.50	ν 2.2′	d 0.1′ m 1.11

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	134°24.7	135°35.3	N02°05.8	22°29.7	N26°09.9	64°36.8	N21°39.2	144°55.3	S06°36.6
1	149°27.2	150°36.3	06.9	37°32.9	10.0	79°39.3	39.2	159°57.5	36.5
2	164°29.6	165°37.2	08.0	52°36.1	10.1	94°41.7	39.3	174°59.7	36.4
3	179°32.1	180°38.1	·· 09.1	67°39.3	·· 10.1	109°44.2	·· 39.3	190°01.9	·· 36.2
4	194°34.6	195°39.0	10.1	82°42.5	10.2	124°46.7	39.3	205°04.1	36.1
5	209°37.0	210°39.9	11.2	97°45.6	10.2	139°49.2	39.3	220°06.3	36.0
6	224°39.5	225°40.8	N02°12.3	112°48.8	N26°10.3	154°51.6	N21°39.3	235°08.5	S06°35.9
7	239°42.0	240°41.7	13.4	127°52.0	10.3	169°54.1	39.3	250°10.7	35.8
8	254°44.4	255°42.7	14.5	142°55.2	10.4	184°56.6	39.3	265°13.0	35.7
9	269°46.9	270°43.6	·· 15.6	157°58.3	·· 10.4	199°59.0	·· 39.3	280°15.2	·· 35.6
10	284°49.4	285°44.5	16.7	173°01.5	10.4	215°01.5	39.3	295°17.4	35.5
11	299°51.8	300°45.4	17.8	188°04.7	10.5	230°03.9	39.3	310°19.6	35.4
12	314°54.3	315°46.4	N02°18.9	203°07.9	N26°10.5	245°06.4	N21°39.3	325°21.8	S06°35.3
13	329°56.7	330°47.3	20.0	218°11.0	10.6	260°08.9	39.3	340°24.0	35.1
14	344°59.2	345°48.2	21.0	233°14.2	10.6	275°11.3	39.4	355°26.2	35.0
15	0°01.7	0°49.2	·· 22.1	248°17.4	·· 10.7	290°13.8	·· 39.4	10°28.4	·· 34.9
16	15°04.1	15°50.1	23.2	263°20.5	10.7	305°16.3	39.4	25°30.6	34.8
17	30°06.6	30°51.0	24.3	278°23.7	10.8	320°18.7	39.4	40°32.8	34.7
18	45°09.1	45°52.0	N02°25.4	293°26.9	N26°10.8	335°21.2	N21°39.4	55°35.0	S06°34.6
19	60°11.5	60°52.9	26.5	308°30.0	10.9	350°23.7	39.4	70°37.2	34.5
20	75°14.0	75°53.9	27.6	323°33.2	10.9	5°26.1	39.4	85°39.4	34.4
21	90°16.5	90°54.8	·· 28.6	338°36.3	·· 11.0	20°28.6	·· 39.4	100°41.7	·· 34.3
22	105°18.9	105°55.8	29.7	353°39.5	11.0	35°31.0	39.4	115°43.9	34.1
23	120°21.4	120°56.7	30.8	8°42.7	11.0	50°33.5	39.4	130°46.1	34.0
Mer.pass.	15:00	ν 0.9′	d 1.1′	m -4.78	ν 3.2′	d 0.1′	m -0.99	ν 2.5′	d 0.0′ m -2.50	ν 2.2′	d 0.1′ m 1.11

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	135°23.9	135°57.7	N02°31.9	23°45.8	N26°11.1	65°36.0	N21°39.5	145°48.3	S06°33.9
1	150°26.3	150°58.6	33.0	38°49.0	11.1	80°38.4	39.5	160°50.5	33.8
2	165°28.8	165°59.6	34.0	53°52.1	11.2	95°40.9	39.5	175°52.7	33.7
3	180°31.2	181°00.5	·· 35.1	68°55.3	·· 11.2	110°43.3	·· 39.5	190°54.9	·· 33.6
4	195°33.7	196°01.5	36.2	83°58.4	11.3	125°45.8	39.5	205°57.1	33.5
5	210°36.2	211°02.4	37.3	99°01.6	11.3	140°48.3	39.5	220°59.3	33.4
6	225°38.6	226°03.4	N02°38.4	114°04.7	N26°11.3	155°50.7	N21°39.5	236°01.5	S06°33.3
7	240°41.1	241°04.4	39.4	129°07.9	11.4	170°53.2	39.5	251°03.7	33.1
8	255°43.6	256°05.3	40.5	144°11.0	11.4	185°55.6	39.5	266°05.9	33.0
9	270°46.0	271°06.3	·· 41.6	159°14.1	·· 11.5	200°58.1	·· 39.5	281°08.1	·· 32.9
10	285°48.5	286°07.3	42.7	174°17.3	11.5	216°00.5	39.5	296°10.3	32.8
11	300°51.0	301°08.2	43.8	189°20.4	11.6	231°03.0	39.6	311°12.6	32.7
12	315°53.4	316°09.2	N02°44.8	204°23.6	N26°11.6	246°05.5	N21°39.6	326°14.8	S06°32.6
13	330°55.9	331°10.2	45.9	219°26.7	11.6	261°07.9	39.6	341°17.0	32.5
14	345°58.4	346°11.1	47.0	234°29.8	11.7	276°10.4	39.6	356°19.2	32.4
15	1°00.8	1°12.1	·· 48.1	249°33.0	·· 11.7	291°12.8	·· 39.6	11°21.4	·· 32.3
16	16°03.3	16°13.1	49.1	264°36.1	11.7	306°15.3	39.6	26°23.6	32.1
17	31°05.7	31°14.1	50.2	279°39.2	11.8	321°17.7	39.6	41°25.8	32.0
18	46°08.2	46°15.1	N02°51.3	294°42.3	N26°11.8	336°20.2	N21°39.6	56°28.0	S06°31.9
19	61°10.7	61°16.1	52.3	309°45.5	11.9	351°22.6	39.6	71°30.2	31.8
20	76°13.1	76°17.0	53.4	324°48.6	11.9	6°25.1	39.7	86°32.4	31.7
21	91°15.6	91°18.0	·· 54.5	339°51.7	·· 11.9	21°27.5	·· 39.7	101°34.6	·· 31.6
22	106°18.1	106°19.0	55.6	354°54.8	12.0	36°30.0	39.7	116°36.8	31.5
23	121°20.5	121°20.0	56.6	9°58.0	12.0	51°32.4	39.7	131°39.0	31.4
Mer.pass.	14:56	ν 1.0′	d 1.1′	m -4.79	ν 3.2′	d 0.0′	m -0.96	ν 2.5′	d 0.0′ m -2.49	ν 2.2′	d 0.1′ m 1.11

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.3	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.3	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	313°58.5	89°22.5
Acamar	315°11.7	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.1	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.5
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.9	-52°42.7
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.5
Procyon	244°50.4	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.4
Suhail	222°45.8	-43°32.0
Miaplacidus	221°37.4	-69°49.2
Alphard	217°47.4	-8°46.1
Regulus	207°34.0	11°50.6
Dubhe	193°40.3	61°36.7
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°40.9
Acrux	172°59.6	-63°14.1
Gacrux	171°51.3	-57°15.1
Alioth	166°12.6	55°49.1
Spica	158°22.1	-11°17.6
Alkaid	152°51.8	49°10.9
Hadar	148°35.8	-60°29.4
Menkent	147°57.5	-36°29.5
Arcturus	145°47.8	19°02.9
Rigil Kent.	139°40.2	-60°56.1
Kochab	137°19.7	74°02.7
Zuben'ubi	136°55.9	-16°08.8
Alphecca	126°03.7	26°37.5
Antares	112°15.9	-26°29.2
Atria	107°10.4	-69°04.1
Sabik	102°02.9	-15°45.4
Shaula	96°10.5	-37°07.3
Rasalhague	95°58.7	12°32.3
Eltanin	90°42.5	51°28.8
Kaus Aust.	83°32.7	-34°22.3
Vega	80°33.5	38°48.2
Nunki	75°48.0	-26°16.0
Altair	62°00.2	8°55.9
Peacock	53°06.2	-56°39.3
Deneb	49°26.2	45°22.1
Enif	33°39.1	9°59.3
Al Na'ir	27°33.3	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.4

Feb 03 Mon	SHA	Mer.pass
Venus	1°48.5	14:58
Mars	247°47.3	22:30
Jupiter	290°11.9	19:42
Saturn	10°36.7	14:22

Feb 04 Tue	SHA	Mer.pass
Venus	1°10.6	14:57
Mars	248°05.0	22:25
Jupiter	290°12.1	19:38
Saturn	10°30.6	14:18

Feb 05 Wed	SHA	Mer.pass
Venus	0°33.8	14:55
Mars	248°22.0	22:20
Jupiter	290°12.1	19:34
Saturn	10°24.4	14:15

Horizontal parallax	
Venus:	0.3
Mars:	0.2

		Sun			Moon			
h	GHA	Dec	GHA	ν	Dec	d	HP
Mon							
0	176°33.6	S16°30.6	121°25.3	11.5′	N06°39.1	16.8′	59.5′
1	191°33.5	29.9	135°55.8	11.5′	06°55.9	16.7′	59.5′
2	206°33.4	29.1	150°26.3	11.5′	07°12.6	16.7′	59.5′
3	221°33.4	·· 28.4	164°56.8	11.4′	07°29.3	16.6′	59.5′
4	236°33.3	27.7	179°27.2	11.4′	07°45.9	16.6′	59.5′
5	251°33.3	26.9	193°57.6	11.4′	08°02.5	16.6′	59.5′
6	266°33.2	S16°26.2	208°27.9	11.3′	N08°19.1	16.5′	59.5′
7	281°33.1	25.5	222°58.2	11.3′	08°35.6	16.4′	59.5′
8	296°33.1	24.7	237°28.5	11.2′	08°52.0	16.4′	59.5′
9	311°33.0	·· 24.0	251°58.8	11.2′	09°08.4	16.4′	59.5′
10	326°32.9	23.2	266°29.0	11.2′	09°24.8	16.3′	59.5′
11	341°32.9	22.5	280°59.1	11.1′	09°41.1	16.2′	59.5′
12	356°32.8	S16°21.7	295°29.3	11.1′	N09°57.3	16.2′	59.5′
13	11°32.7	21.0	309°59.3	11.0′	10°13.5	16.1′	59.4′
14	26°32.7	20.3	324°29.4	11.0′	10°29.6	16.1′	59.4′
15	41°32.6	·· 19.5	338°59.4	10.9′	10°45.7	16.0′	59.4′
16	56°32.5	18.8	353°29.3	10.9′	11°01.7	15.9′	59.4′
17	71°32.5	18.0	7°59.2	10.8′	11°17.6	15.9′	59.4′
18	86°32.4	S16°17.3	22°29.1	10.8′	N11°33.5	15.8′	59.4′
19	101°32.4	16.5	36°58.8	10.7′	11°49.3	15.8′	59.4′
20	116°32.3	15.8	51°28.6	10.7′	12°05.1	15.6′	59.4′
21	131°32.2	·· 15.0	65°58.3	10.6′	12°20.7	15.6′	59.4′
22	146°32.2	14.3	80°27.9	10.6′	12°36.3	15.6′	59.4′
23	161°32.1	13.6	94°57.5	10.5′	12°51.9	15.4′	59.4′
	SD = 16.2′	d = 0.7′	SD = 16.2′				
Tue							
0	176°32.1	S16°12.8	109°27.0	10.5′	N13°07.3	15.4′	59.4′
1	191°32.0	12.1	123°56.5	10.4′	13°22.7	15.3′	59.3′
2	206°31.9	11.3	138°25.9	10.4′	13°38.0	15.2′	59.3′
3	221°31.9	·· 10.6	152°55.3	10.3′	13°53.2	15.2′	59.3′
4	236°31.8	09.8	167°24.6	10.2′	14°08.4	15.0′	59.3′
5	251°31.8	09.1	181°53.8	10.2′	14°23.4	15.0′	59.3′
6	266°31.7	S16°08.3	196°23.0	10.1′	N14°38.4	14.9′	59.3′
7	281°31.7	07.6	210°52.1	10.0′	14°53.3	14.8′	59.3′
8	296°31.6	06.8	225°21.1	10.0′	15°08.1	14.7′	59.3′
9	311°31.5	·· 06.1	239°50.1	9.9′	15°22.8	14.6′	59.3′
10	326°31.5	05.3	254°19.1	9.9′	15°37.4	14.6′	59.2′
11	341°31.4	04.5	268°47.9	9.8′	15°52.0	14.4′	59.2′
12	356°31.4	S16°03.8	283°16.7	9.7′	N16°06.4	14.4′	59.2′
13	11°31.3	03.0	297°45.4	9.7′	16°20.8	14.2′	59.2′
14	26°31.3	02.3	312°14.1	9.6′	16°35.0	14.2′	59.2′
15	41°31.2	·· 01.5	326°42.7	9.5′	16°49.2	14.1′	59.2′
16	56°31.2	00.8	341°11.2	9.4′	17°03.3	13.9′	59.2′
17	71°31.1	16°00.0	355°39.6	9.4′	17°17.2	13.9′	59.2′
18	86°31.1	S15°59.3	10°08.0	9.3′	N17°31.1	13.7′	59.2′
19	101°31.0	58.5	24°36.3	9.2′	17°44.8	13.7′	59.1′
20	116°31.0	57.7	39°04.5	9.2′	17°58.5	13.5′	59.1′
21	131°30.9	·· 57.0	53°32.7	9.1′	18°12.0	13.5′	59.1′
22	146°30.9	56.2	68°00.8	9.0′	18°25.5	13.3′	59.1′
23	161°30.8	55.5	82°28.8	8.9′	18°38.8	13.2′	59.1′
	SD = 16.2′	d = 0.7′	SD = 16.2′				
Wed							
0	176°30.8	S15°54.7	96°56.7	8.9′	N18°52.0	13.1′	59.1′
1	191°30.7	54.0	111°24.6	8.8′	19°05.1	13.0′	59.1′
2	206°30.7	53.2	125°52.3	8.7′	19°18.1	12.9′	59.0′
3	221°30.6	·· 52.4	140°20.1	8.6′	19°31.0	12.7′	59.0′
4	236°30.6	51.7	154°47.7	8.6′	19°43.7	12.7′	59.0′
5	251°30.5	50.9	169°15.2	8.5′	19°56.4	12.5′	59.0′
6	266°30.5	S15°50.1	183°42.7	8.4′	N20°08.9	12.4′	59.0′
7	281°30.4	49.4	198°10.1	8.3′	20°21.3	12.3′	59.0′
8	296°30.4	48.6	212°37.5	8.3′	20°33.6	12.1′	59.0′
9	311°30.3	·· 47.9	227°04.7	8.2′	20°45.7	12.0′	59.0′
10	326°30.3	47.1	241°31.9	8.1′	20°57.7	11.9′	58.9′
11	341°30.2	46.3	255°59.0	8.0′	21°09.6	11.8′	58.9′
12	356°30.2	S15°45.6	270°26.0	7.9′	N21°21.4	11.6′	58.9′
13	11°30.1	44.8	284°52.9	7.9′	21°33.0	11.5′	58.9′
14	26°30.1	44.0	299°19.8	7.8′	21°44.5	11.4′	58.9′
15	41°30.0	·· 43.3	313°46.6	7.7′	21°55.9	11.3′	58.9′
16	56°30.0	42.5	328°13.3	7.6′	22°07.2	11.1′	58.9′
17	71°29.9	41.7	342°39.9	7.6′	22°18.3	10.9′	58.8′
18	86°29.9	S15°41.0	357°06.5	7.5′	N22°29.2	10.9′	58.8′
19	101°29.9	40.2	11°33.0	7.4′	22°40.1	10.7′	58.8′
20	116°29.8	39.4	25°59.4	7.3′	22°50.8	10.5′	58.8′
21	131°29.8	·· 38.7	40°25.7	7.2′	23°01.3	10.4′	58.8′
22	146°29.7	37.9	54°51.9	7.2′	23°11.7	10.3′	58.8′
23	161°29.7	37.1	69°18.1	7.1′	23°22.0	10.1′	58.7′
	SD = 16.2′	d = 0.8′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:58	08:24	10:02	14:27	16:06	17:32
N 70°	06:51	08:07	09:28	15:01	16:22	17:38
68°	06:46	07:54	09:03	15:26	16:35	17:44
66°	06:41	07:44	08:45	15:44	16:45	17:48
64°	06:37	07:34	08:29	15:59	16:54	17:52
62°	06:33	07:27	08:17	16:12	17:02	17:56
60°	06:30	07:20	08:06	16:23	17:09	17:59
N 58°	06:26	07:14	07:57	16:32	17:15	18:02
56°	06:23	07:08	07:49	16:40	17:21	18:05
54°	06:21	07:03	07:41	16:47	17:26	18:08
52°	06:18	06:58	07:35	16:54	17:30	18:10
50°	06:16	06:54	07:29	17:00	17:34	18:13
45°	06:10	06:45	07:16	17:12	17:43	18:18
N 40°	06:05	06:37	07:05	17:23	17:51	18:24
35°	06:00	06:30	06:56	17:32	17:58	18:28
30°	05:55	06:23	06:48	17:40	18:05	18:33
20°	05:45	06:11	06:34	17:54	18:17	18:43
N 10°	05:35	06:00	06:22	18:06	18:28	18:53
0°	05:24	05:49	06:10	18:17	18:39	19:04
S 10°	05:11	05:37	05:59	18:29	18:51	19:17
20°	04:55	05:23	05:46	18:42	19:05	19:32
30°	04:35	05:06	05:31	18:56	19:22	19:52
35°	04:22	04:55	05:23	19:04	19:32	20:05
40°	04:07	04:43	05:13	19:14	19:44	20:20
45°	03:48	04:29	05:01	19:26	19:58	20:39
S 50°	03:22	04:10	04:47	19:39	20:17	21:04
52°	03:09	04:01	04:41	19:46	20:25	21:17
54°	02:53	03:51	04:33	19:53	20:35	21:32
56°	02:35	03:39	04:25	20:01	20:47	21:50
58°	02:11	03:26	04:16	20:10	21:00	22:13
S 60°	01:36	03:10	04:05	20:21	21:16	22:46

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	08:17	07:19	▭	·· ··	01:56	▭
N 70°	08:30	07:50	05:55	·· ··	01:28	05:13
68°	08:40	08:12	07:23	·· ··	01:07	03:46
66°	08:49	08:30	08:03	·· ··	00:51	03:08
64°	08:57	08:45	08:30	·· ··	00:38	02:41
62°	09:03	08:58	08:52	·· ··	00:27	02:21
60°	09:09	09:08	09:09	·· ··	00:17	02:05
N 58°	09:14	09:18	09:24	·· ··	00:09	01:51
56°	09:18	09:26	09:37	·· ··	00:02	01:39
54°	09:22	09:33	09:48	23:56	·· ··	01:29
52°	09:26	09:40	09:58	23:50	·· ··	01:20
50°	09:29	09:46	10:06	23:45	·· ··	01:11
45°	09:36	09:59	10:25	23:34	·· ··	00:54
N 40°	09:43	10:09	10:41	23:25	·· ··	00:40
35°	09:48	10:19	10:54	23:17	·· ··	00:28
30°	09:53	10:27	11:05	23:10	·· ··	00:18
20°	10:01	10:41	11:25	22:59	·· ··	00:00
N 10°	10:08	10:54	11:43	22:48	23:45	·· ··
0°	10:15	11:06	11:59	22:39	23:31	·· ··
S 10°	10:22	11:18	12:15	22:29	23:16	·· ··
20°	10:30	11:30	12:33	22:19	23:01	23:47
30°	10:38	11:45	12:54	22:08	22:44	23:25
35°	10:44	11:54	13:06	22:01	22:34	23:12
40°	10:49	12:04	13:20	21:54	22:23	22:57
45°	10:56	12:16	13:36	21:45	22:09	22:39
S 50°	11:04	12:30	13:57	21:35	21:53	22:17
52°	11:08	12:37	14:07	21:30	21:46	22:06
54°	11:12	12:44	14:18	21:25	21:37	21:55
56°	11:17	12:53	14:31	21:19	21:28	21:41
58°	11:22	13:02	14:46	21:13	21:18	21:25
S 60°	11:28	13:13	15:04	21:06	21:05	21:07

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 5-7 24-46%
03	13:46	13:49	12:14	16:27	04:02	
04	13:52	13:54	12:14	17:18	04:52	
05	13:57	13:59	12:14	18:12	05:45	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1937 sec ΔT = TT-UT1 = +68.9903 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	136°23.0	136°21.0	N02°57.7	25°01.1	N26°12.0	66°34.9	N21°39.7	146°41.2	S06°31.2
1	151°25.5	151°22.0	58.8	40°04.2	12.1	81°37.3	39.7	161°43.4	31.1
2	166°27.9	166°23.0	02°59.8	55°07.3	12.1	96°39.8	39.7	176°45.6	31.0
3	181°30.4	181°24.0	03°00.9	70°10.4	·· 12.1	111°42.2	·· 39.7	191°47.8	·· 30.9
4	196°32.8	196°25.0	02.0	85°13.6	12.2	126°44.7	39.7	206°50.1	30.8
5	211°35.3	211°26.0	03.0	100°16.7	12.2	141°47.1	39.7	221°52.3	30.7
6	226°37.8	226°27.0	N03°04.1	115°19.8	N26°12.2	156°49.6	N21°39.8	236°54.5	S06°30.6
7	241°40.2	241°28.0	05.2	130°22.9	12.3	171°52.0	39.8	251°56.7	30.5
8	256°42.7	256°29.0	06.2	145°26.0	12.3	186°54.5	39.8	266°58.9	30.4
9	271°45.2	271°30.0	·· 07.3	160°29.1	·· 12.3	201°56.9	·· 39.8	282°01.1	·· 30.2
10	286°47.6	286°31.0	08.4	175°32.2	12.4	216°59.4	39.8	297°03.3	30.1
11	301°50.1	301°32.1	09.4	190°35.3	12.4	232°01.8	39.8	312°05.5	30.0
12	316°52.6	316°33.1	N03°10.5	205°38.4	N26°12.4	247°04.3	N21°39.8	327°07.7	S06°29.9
13	331°55.0	331°34.1	11.5	220°41.5	12.5	262°06.7	39.8	342°09.9	29.8
14	346°57.5	346°35.1	12.6	235°44.6	12.5	277°09.2	39.8	357°12.1	29.7
15	2°00.0	1°36.1	·· 13.7	250°47.7	·· 12.5	292°11.6	·· 39.9	12°14.3	·· 29.6
16	17°02.4	16°37.2	14.7	265°50.8	12.6	307°14.1	39.9	27°16.5	29.5
17	32°04.9	31°38.2	15.8	280°53.9	12.6	322°16.5	39.9	42°18.7	29.3
18	47°07.3	46°39.2	N03°16.8	295°57.0	N26°12.6	337°18.9	N21°39.9	57°20.9	S06°29.2
19	62°09.8	61°40.2	17.9	311°00.1	12.6	352°21.4	39.9	72°23.1	29.1
20	77°12.3	76°41.3	19.0	326°03.2	12.7	7°23.8	39.9	87°25.3	29.0
21	92°14.7	91°42.3	·· 20.0	341°06.3	·· 12.7	22°26.3	·· 39.9	102°27.5	·· 28.9
22	107°17.2	106°43.3	21.1	356°09.4	12.7	37°28.7	39.9	117°29.7	28.8
23	122°19.7	121°44.4	22.1	11°12.5	12.8	52°31.2	40.0	132°31.9	28.7
Mer.pass.	14:52	ν 1.0′	d 1.1′	m -4.79	ν 3.1′	d 0.0′	m -0.93	ν 2.5′	d 0.0′	m -2.48	ν 2.2′	d 0.1′	m 1.11

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	137°22.1	136°45.4	N03°23.2	26°15.5	N26°12.8	67°33.6	N21°40.0	147°34.2	S06°28.6
1	152°24.6	151°46.5	24.2	41°18.6	12.8	82°36.0	40.0	162°36.4	28.4
2	167°27.1	166°47.5	25.3	56°21.7	12.8	97°38.5	40.0	177°38.6	28.3
3	182°29.5	181°48.6	·· 26.3	71°24.8	·· 12.9	112°40.9	·· 40.0	192°40.8	·· 28.2
4	197°32.0	196°49.6	27.4	86°27.9	12.9	127°43.4	40.0	207°43.0	28.1
5	212°34.5	211°50.7	28.5	101°31.0	12.9	142°45.8	40.0	222°45.2	28.0
6	227°36.9	226°51.7	N03°29.5	116°34.0	N26°12.9	157°48.2	N21°40.0	237°47.4	S06°27.9
7	242°39.4	241°52.8	30.6	131°37.1	13.0	172°50.7	40.0	252°49.6	27.8
8	257°41.8	256°53.8	31.6	146°40.2	13.0	187°53.1	40.1	267°51.8	27.7
9	272°44.3	271°54.9	·· 32.7	161°43.3	·· 13.0	202°55.6	·· 40.1	282°54.0	·· 27.5
10	287°46.8	286°55.9	33.7	176°46.3	13.0	217°58.0	40.1	297°56.2	27.4
11	302°49.2	301°57.0	34.8	191°49.4	13.1	233°00.4	40.1	312°58.4	27.3
12	317°51.7	316°58.1	N03°35.8	206°52.5	N26°13.1	248°02.9	N21°40.1	328°00.6	S06°27.2
13	332°54.2	331°59.1	36.8	221°55.5	13.1	263°05.3	40.1	343°02.8	27.1
14	347°56.6	347°00.2	37.9	236°58.6	13.1	278°07.8	40.1	358°05.0	27.0
15	2°59.1	2°01.3	·· 38.9	252°01.7	·· 13.2	293°10.2	·· 40.1	13°07.2	·· 26.9
16	18°01.6	17°02.3	40.0	267°04.7	13.2	308°12.6	40.2	28°09.4	26.8
17	33°04.0	32°03.4	41.0	282°07.8	13.2	323°15.1	40.2	43°11.6	26.6
18	48°06.5	47°04.5	N03°42.1	297°10.8	N26°13.2	338°17.5	N21°40.2	58°13.8	S06°26.5
19	63°09.0	62°05.5	43.1	312°13.9	13.2	353°19.9	40.2	73°16.0	26.4
20	78°11.4	77°06.6	44.2	327°17.0	13.3	8°22.4	40.2	88°18.2	26.3
21	93°13.9	92°07.7	·· 45.2	342°20.0	·· 13.3	23°24.8	·· 40.2	103°20.4	·· 26.2
22	108°16.3	107°08.8	46.2	357°23.1	13.3	38°27.2	40.2	118°22.6	26.1
23	123°18.8	122°09.9	47.3	12°26.1	13.3	53°29.7	40.2	133°24.8	26.0
Mer.pass.	14:48	ν 1.0′	d 1.1′	m -4.80	ν 3.1′	d 0.0′	m -0.90	ν 2.4′	d 0.0′	m -2.47	ν 2.2′	d 0.1′	m 1.12

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	138°21.3	137°11.0	N03°48.3	27°29.2	N26°13.3	68°32.1	N21°40.3	148°27.0	S06°25.9
1	153°23.7	152°12.1	49.4	42°32.2	13.4	83°34.5	40.3	163°29.2	25.7
2	168°26.2	167°13.1	50.4	57°35.3	13.4	98°37.0	40.3	178°31.4	25.6
3	183°28.7	182°14.2	·· 51.4	72°38.3	·· 13.4	113°39.4	·· 40.3	193°33.6	·· 25.5
4	198°31.1	197°15.3	52.5	87°41.3	13.4	128°41.8	40.3	208°35.8	25.4
5	213°33.6	212°16.4	53.5	102°44.4	13.4	143°44.3	40.3	223°38.0	25.3
6	228°36.1	227°17.5	N03°54.6	117°47.4	N26°13.5	158°46.7	N21°40.3	238°40.2	S06°25.2
7	243°38.5	242°18.6	55.6	132°50.5	13.5	173°49.1	40.4	253°42.5	25.1
8	258°41.0	257°19.7	56.6	147°53.5	13.5	188°51.5	40.4	268°44.7	25.0
9	273°43.5	272°20.8	·· 57.7	162°56.6	·· 13.5	203°54.0	·· 40.4	283°46.9	·· 24.8
10	288°45.9	287°21.9	58.7	177°59.6	13.5	218°56.4	40.4	298°49.1	24.7
11	303°48.4	302°23.1	03°59.7	193°02.6	13.5	233°58.8	40.4	313°51.3	24.6
12	318°50.8	317°24.2	N04°00.8	208°05.7	N26°13.6	249°01.3	N21°40.4	328°53.5	S06°24.5
13	333°53.3	332°25.3	01.8	223°08.7	13.6	264°03.7	40.4	343°55.7	24.4
14	348°55.8	347°26.4	02.8	238°11.7	13.6	279°06.1	40.4	358°57.9	24.3
15	3°58.2	2°27.5	·· 03.9	253°14.7	·· 13.6	294°08.5	·· 40.5	14°00.1	·· 24.2
16	19°00.7	17°28.6	04.9	268°17.8	13.6	309°11.0	40.5	29°02.3	24.0
17	34°03.2	32°29.7	05.9	283°20.8	13.6	324°13.4	40.5	44°04.5	23.9
18	49°05.6	47°30.9	N04°06.9	298°23.8	N26°13.6	339°15.8	N21°40.5	59°06.7	S06°23.8
19	64°08.1	62°32.0	08.0	313°26.8	13.7	354°18.3	40.5	74°08.9	23.7
20	79°10.6	77°33.1	09.0	328°29.9	13.7	9°20.7	40.5	89°11.1	23.6
21	94°13.0	92°34.3	·· 10.0	343°32.9	·· 13.7	24°23.1	·· 40.5	104°13.3	·· 23.5
22	109°15.5	107°35.4	11.0	358°35.9	13.7	39°25.5	40.6	119°15.5	23.4
23	124°17.9	122°36.5	12.1	13°38.9	13.7	54°28.0	40.6	134°17.7	23.3
Mer.pass.	14:44	ν 1.1′	d 1.0′	m -4.81	ν 3.0′	d 0.0′	m -0.87	ν 2.4′	d 0.0′	m -2.46	ν 2.2′	d 0.1′	m 1.12

Stars	SHA	Dec
Alpheratz	357°35.0	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.3	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.3	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	313°59.8	89°22.5
Acamar	315°11.7	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.1	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.5
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°51.9	-52°42.7
Sirius	258°25.9	-16°45.1
Adhara	255°05.5	-29°00.5
Procyon	244°50.4	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.4
Suhail	222°45.8	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°47.4	-8°46.1
Regulus	207°34.0	11°50.6
Dubhe	193°40.3	61°36.7
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°40.9
Acrux	172°59.6	-63°14.1
Gacrux	171°51.2	-57°15.1
Alioth	166°12.6	55°49.1
Spica	158°22.1	-11°17.6
Alkaid	152°51.8	49°10.9
Hadar	148°35.8	-60°29.4
Menkent	147°57.4	-36°29.5
Arcturus	145°47.8	19°02.9
Rigil Kent.	139°40.1	-60°56.1
Kochab	137°19.7	74°02.7
Zuben'ubi	136°55.9	-16°08.8
Alphecca	126°03.7	26°37.5
Antares	112°15.9	-26°29.2
Atria	107°10.3	-69°04.1
Sabik	102°02.9	-15°45.4
Shaula	96°10.5	-37°07.3
Rasalhague	95°58.7	12°32.3
Eltanin	90°42.5	51°28.8
Kaus Aust.	83°32.7	-34°22.3
Vega	80°33.5	38°48.2
Nunki	75°48.0	-26°16.0
Altair	62°00.2	8°55.9
Peacock	53°06.2	-56°39.3
Deneb	49°26.2	45°22.1
Enif	33°39.0	9°59.3
Al Na'ir	27°33.3	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.4

Feb 06 Thu	SHA	Mer.pass
Venus	359°58.0	14:54
Mars	248°38.1	22:15
Jupiter	290°11.9	19:30
Saturn	10°18.2	14:11

Feb 07 Fri	SHA	Mer.pass
Venus	359°23.3	14:52
Mars	248°53.4	22:10
Jupiter	290°11.5	19:27
Saturn	10°12.0	14:08

Feb 08 Sat	SHA	Mer.pass
Venus	358°49.7	14:50
Mars	249°07.9	22:06
Jupiter	290°10.8	19:23
Saturn	10°05.8	14:04

Horizontal parallax	
Venus:	0.3
Mars:	0.2

	Sun		Moon				
h							
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.6	S15°36.3	83°44.2	7.0′	N23°32.1	10.0′	58.7′
1	191°29.6	35.6	98°10.2	6.9′	23°42.1	9.8′	58.7′
2	206°29.6	34.8	112°36.2	6.9′	23°51.9	9.7′	58.7′
3	221°29.5	·· 34.0	127°02.1	6.8′	24°01.6	9.5′	58.7′
4	236°29.5	33.3	141°27.9	6.7′	24°11.1	9.4′	58.7′
5	251°29.4	32.5	155°53.6	6.7′	24°20.5	9.2′	58.7′
6	266°29.4	S15°31.7	170°19.3	6.6′	N24°29.7	9.1′	58.6′
7	281°29.4	30.9	184°44.8	6.5′	24°38.8	8.9′	58.6′
8	296°29.3	30.2	199°10.4	6.4′	24°47.7	8.8′	58.6′
9	311°29.3	·· 29.4	213°35.8	6.4′	24°56.5	8.6′	58.6′
10	326°29.2	28.6	228°01.2	6.3′	25°05.1	8.4′	58.6′
11	341°29.2	27.8	242°26.5	6.2′	25°13.5	8.3′	58.6′
12	356°29.2	S15°27.1	256°51.7	6.2′	N25°21.8	8.1′	58.5′
13	11°29.1	26.3	271°16.9	6.1′	25°29.9	8.0′	58.5′
14	26°29.1	25.5	285°42.0	6.1′	25°37.9	7.8′	58.5′
15	41°29.1	·· 24.7	300°07.1	6.0′	25°45.7	7.6′	58.5′
16	56°29.0	24.0	314°32.1	5.9′	25°53.3	7.5′	58.5′
17	71°29.0	23.2	328°57.0	5.9′	26°00.8	7.3′	58.5′
18	86°29.0	S15°22.4	343°21.9	5.8′	N26°08.1	7.2′	58.4′
19	101°28.9	21.6	357°46.7	5.8′	26°15.3	6.9′	58.4′
20	116°28.9	20.8	12°11.5	5.7′	26°22.2	6.8′	58.4′
21	131°28.9	·· 20.1	26°36.2	5.6′	26°29.0	6.7′	58.4′
22	146°28.8	19.3	41°00.8	5.6′	26°35.7	6.4′	58.4′
23	161°28.8	18.5	55°25.4	5.5′	26°42.1	6.3′	58.4′
	SD = 16.2′	d = 0.8′	SD = 16.0′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.7	S15°17.7	69°50.0	5.5′	N26°48.4	6.2′	58.3′
1	191°28.7	16.9	84°14.4	5.4′	26°54.6	5.9′	58.3′
2	206°28.7	16.2	98°38.9	5.4′	27°00.5	5.8′	58.3′
3	221°28.7	·· 15.4	113°03.3	5.4′	27°06.3	5.6′	58.3′
4	236°28.6	14.6	127°27.6	5.3′	27°11.9	5.4′	58.3′
5	251°28.6	13.8	141°52.0	5.3′	27°17.3	5.3′	58.3′
6	266°28.6	S15°13.0	156°16.2	5.2′	N27°22.6	5.0′	58.2′
7	281°28.5	12.2	170°40.5	5.2′	27°27.6	4.9′	58.2′
8	296°28.5	11.4	185°04.7	5.2′	27°32.5	4.8′	58.2′
9	311°28.5	·· 10.7	199°28.8	5.1′	27°37.3	4.5′	58.2′
10	326°28.4	09.9	213°52.9	5.1′	27°41.8	4.4′	58.2′
11	341°28.4	09.1	228°17.0	5.1′	27°46.2	4.1′	58.2′
12	356°28.4	S15°08.3	242°41.1	5.0′	N27°50.3	4.0′	58.1′
13	11°28.3	07.5	257°05.1	5.0′	27°54.3	3.9′	58.1′
14	26°28.3	06.7	271°29.1	5.0′	27°58.2	3.6′	58.1′
15	41°28.3	·· 05.9	285°53.1	5.0′	28°01.8	3.5′	58.1′
16	56°28.3	05.2	300°17.1	4.9′	28°05.3	3.3′	58.1′
17	71°28.2	04.4	314°41.0	4.9′	28°08.6	3.1′	58.1′
18	86°28.2	S15°03.6	329°04.9	4.9′	N28°11.7	2.9′	58.0′
19	101°28.2	02.8	343°28.9	4.9′	28°14.6	2.7′	58.0′
20	116°28.2	02.0	357°52.8	4.9′	28°17.3	2.6′	58.0′
21	131°28.1	·· 01.2	12°16.6	4.9′	28°19.9	2.3′	58.0′
22	146°28.1	15°00.4	26°40.5	4.9′	28°22.2	2.2′	58.0′
23	161°28.1	14°59.6	41°04.4	4.9′	28°24.4	2.0′	58.0′
	SD = 16.2′	d = 0.8′	SD = 15.9′				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.1	S14°58.8	55°28.2	4.9′	N28°26.4	1.9′	57.9′
1	191°28.0	58.0	69°52.1	4.9′	28°28.3	1.6′	57.9′
2	206°28.0	57.2	84°16.0	4.9′	28°29.9	1.5′	57.9′
3	221°28.0	·· 56.4	98°39.8	4.9′	28°31.4	1.2′	57.9′
4	236°28.0	55.7	113°03.7	4.9′	28°32.6	1.1′	57.9′
5	251°27.9	54.9	127°27.6	4.9′	28°33.7	1.0′	57.8′
6	266°27.9	S14°54.1	141°51.5	4.9′	N28°34.7	0.7′	57.8′
7	281°27.9	53.3	156°15.4	4.9′	28°35.4	0.5′	57.8′
8	296°27.9	52.5	170°39.3	4.9′	28°35.9	0.4′	57.8′
9	311°27.8	·· 51.7	185°03.2	4.9′	28°36.3	0.2′	57.8′
10	326°27.8	50.9	199°27.1	5.0′	28°36.5	0.0′	57.8′
11	341°27.8	50.1	213°51.1	5.0′	28°36.5	0.2′	57.7′
12	356°27.8	S14°49.3	228°15.1	5.0′	N28°36.3	0.4′	57.7′
13	11°27.8	48.5	242°39.1	5.0′	28°35.9	0.5′	57.7′
14	26°27.7	47.7	257°03.1	5.1′	28°35.4	0.7′	57.7′
15	41°27.7	·· 46.9	271°27.2	5.1′	28°34.7	0.9′	57.7′
16	56°27.7	46.1	285°51.3	5.1′	28°33.8	1.1′	57.6′
17	71°27.7	45.3	300°15.4	5.2′	28°32.7	1.3′	57.6′
18	86°27.7	S14°44.5	314°39.6	5.2′	N28°31.4	1.4′	57.6′
19	101°27.6	43.7	329°03.8	5.2′	28°30.0	1.6′	57.6′
20	116°27.6	42.9	343°28.0	5.3′	28°28.4	1.8′	57.6′
21	131°27.6	·· 42.1	357°52.3	5.3′	28°26.6	2.0′	57.5′
22	146°27.6	41.3	12°16.7	5.4′	28°24.6	2.1′	57.5′
23	161°27.6	40.5	26°41.0	5.4′	28°22.5	2.4′	57.5′
	SD = 16.2′	d = 0.8′	SD = 15.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:46	08:10	09:41	14:48	16:20	17:44
N 70°	06:41	07:56	09:12	15:17	16:34	17:49
68°	06:37	07:44	08:51	15:39	16:45	17:53
66°	06:33	07:35	08:34	15:56	16:55	17:57
64°	06:29	07:26	08:20	16:09	17:03	18:00
62°	06:26	07:19	08:08	16:21	17:10	18:03
60°	06:23	07:13	07:59	16:31	17:16	18:06
N 58°	06:21	07:07	07:50	16:39	17:22	18:09
56°	06:18	07:02	07:42	16:47	17:27	18:11
54°	06:16	06:58	07:36	16:53	17:31	18:13
52°	06:14	06:54	07:30	16:59	17:35	18:15
50°	06:12	06:50	07:24	17:05	17:39	18:17
45°	06:07	06:41	07:12	17:17	17:47	18:22
N 40°	06:02	06:34	07:02	17:26	17:55	18:27
35°	05:57	06:27	06:54	17:35	18:01	18:31
30°	05:53	06:21	06:46	17:42	18:07	18:36
20°	05:44	06:10	06:33	17:55	18:18	18:44
N 10°	05:35	06:00	06:22	18:07	18:28	18:54
0°	05:24	05:49	06:11	18:18	18:39	19:04
S 10°	05:12	05:38	06:00	18:28	18:50	19:16
20°	04:57	05:25	05:48	18:40	19:03	19:30
30°	04:38	05:09	05:34	18:54	19:19	19:49
35°	04:26	04:59	05:26	19:02	19:29	20:01
40°	04:11	04:47	05:17	19:11	19:40	20:16
45°	03:53	04:33	05:06	19:22	19:54	20:34
S 50°	03:29	04:16	04:53	19:34	20:11	20:58
52°	03:17	04:08	04:46	19:41	20:19	21:10
54°	03:02	03:58	04:40	19:47	20:29	21:23
56°	02:45	03:47	04:32	19:55	20:39	21:40
58°	02:24	03:35	04:23	20:03	20:51	22:01
S 60°	01:55	03:20	04:14	20:13	21:06	22:28

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°						
N 70°						
68°						
66°						
64°	08:02			05:05		
62°	08:44	08:30		04:24	06:41	
60°	09:13	09:25	10:02	03:56	05:46	07:15
N 58°	09:35	09:58	10:43	03:35	05:14	06:34
56°	09:54	10:22	11:11	03:17	04:50	06:06
54°	10:09	10:42	11:33	03:02	04:30	05:45
52°	10:22	10:59	11:51	02:49	04:14	05:27
50°	10:34	11:13	12:06	02:38	04:00	05:11
45°	10:59	11:42	12:37	02:14	03:31	04:40
N 40°	11:19	12:05	13:01	01:56	03:09	04:16
35°	11:35	12:24	13:21	01:40	02:51	03:56
30°	11:49	12:40	13:38	01:26	02:35	03:39
20°	12:14	13:08	14:07	01:04	02:08	03:11
N 10°	12:35	13:32	14:32	00:44	01:45	02:46
0°	12:55	13:54	14:55	00:25	01:23	02:23
S 10°	13:15	14:17	15:18	00:07	01:02	02:00
20°	13:37	14:41	15:42	·· ··	00:39	01:36
30°	14:02	15:09	16:11	·· ··	00:12	01:07
35°	14:17	15:26	16:28	23:57	·· ··	00:50
40°	14:35	15:46	16:48	23:39	·· ··	00:30
45°	14:56	16:09	17:12	23:17	·· ··	00:06
S 50°	15:22	16:40	17:43	22:49	23:35	·· ··
52°	15:35	16:55	17:59	22:36	23:20	·· ··
54°	15:50	17:13	18:17	22:21	23:02	·· ··
56°	16:08	17:35	18:39	22:03	22:40	23:41
58°	16:30	18:02	19:08	21:41	22:12	23:12
S 60°	16:57	18:42	19:49	21:13	21:32	22:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 57-78%
06	14:01	14:03	12:14	19:09	06:40	
07	14:05	14:06	12:14	20:09	07:39	
08	14:08	14:09	12:14	21:09	08:39	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1944 sec ΔT = TT-UT1 = +68.9896 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	139°20.4	137°37.7	N04°13.1	28°41.9	N26°13.7	69°30.4	N21°40.6	149°19.9	S06°23.1
1	154°22.9	152°38.8	14.1	43°44.9	13.7	84°32.8	40.6	164°22.1	23.0
2	169°25.3	167°39.9	15.1	58°48.0	13.7	99°35.2	40.6	179°24.3	22.9
3	184°27.8	182°41.1	·· 16.2	73°51.0	·· 13.8	114°37.6	·· 40.6	194°26.5	·· 22.8
4	199°30.3	197°42.2	17.2	88°54.0	13.8	129°40.1	40.6	209°28.7	22.7
5	214°32.7	212°43.4	18.2	103°57.0	13.8	144°42.5	40.7	224°30.9	22.6
6	229°35.2	227°44.5	N04°19.2	119°00.0	N26°13.8	159°44.9	N21°40.7	239°33.1	S06°22.5
7	244°37.7	242°45.7	20.3	134°03.0	13.8	174°47.3	40.7	254°35.3	22.3
8	259°40.1	257°46.8	21.3	149°06.0	13.8	189°49.8	40.7	269°37.5	22.2
9	274°42.6	272°48.0	·· 22.3	164°09.0	·· 13.8	204°52.2	·· 40.7	284°39.7	·· 22.1
10	289°45.1	287°49.1	23.3	179°12.0	13.8	219°54.6	40.7	299°41.9	22.0
11	304°47.5	302°50.3	24.3	194°15.0	13.8	234°57.0	40.7	314°44.1	21.9
12	319°50.0	317°51.4	N04°25.3	209°18.0	N26°13.8	249°59.4	N21°40.8	329°46.3	S06°21.8
13	334°52.4	332°52.6	26.4	224°21.0	13.9	265°01.9	40.8	344°48.5	21.7
14	349°54.9	347°53.8	27.4	239°24.0	13.9	280°04.3	40.8	359°50.7	21.6
15	4°57.4	2°54.9	·· 28.4	254°27.0	·· 13.9	295°06.7	·· 40.8	14°52.9	·· 21.4
16	19°59.8	17°56.1	29.4	269°30.0	13.9	310°09.1	40.8	29°55.1	21.3
17	35°02.3	32°57.3	30.4	284°33.0	13.9	325°11.5	40.8	44°57.3	21.2
18	50°04.8	47°58.5	N04°31.4	299°35.9	N26°13.9	340°13.9	N21°40.8	59°59.5	S06°21.1
19	65°07.2	62°59.6	32.4	314°38.9	13.9	355°16.4	40.9	75°01.7	21.0
20	80°09.7	78°00.8	33.4	329°41.9	13.9	10°18.8	40.9	90°03.9	20.9
21	95°12.2	93°02.0	·· 34.5	344°44.9	·· 13.9	25°21.2	·· 40.9	105°06.1	·· 20.8
22	110°14.6	108°03.2	35.5	359°47.9	13.9	40°23.6	40.9	120°08.3	20.6
23	125°17.1	123°04.4	36.5	14°50.9	13.9	55°26.0	40.9	135°10.5	20.5
Mer.pass.	14:40	ν 1.1′	d 1.0′	m -4.82	ν 3.0′	d 0.0′	m -0.84	ν 2.4′	d 0.0′ m -2.46	ν 2.2′	d 0.1′ m 1.12

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	140°19.6	138°05.5	N04°37.5	29°53.8	N26°13.9	70°28.4	N21°40.9	150°12.7	S06°20.4
1	155°22.0	153°06.7	38.5	44°56.8	13.9	85°30.9	40.9	165°14.9	20.3
2	170°24.5	168°07.9	39.5	59°59.8	13.9	100°33.3	41.0	180°17.1	20.2
3	185°26.9	183°09.1	·· 40.5	75°02.8	·· 13.9	115°35.7	·· 41.0	195°19.3	·· 20.1
4	200°29.4	198°10.3	41.5	90°05.7	13.9	130°38.1	41.0	210°21.5	20.0
5	215°31.9	213°11.5	42.5	105°08.7	13.9	145°40.5	41.0	225°23.7	19.8
6	230°34.3	228°12.7	N04°43.5	120°11.7	N26°13.9	160°42.9	N21°41.0	240°25.9	S06°19.7
7	245°36.8	243°13.9	44.5	135°14.7	14.0	175°45.3	41.0	255°28.1	19.6
8	260°39.3	258°15.1	45.5	150°17.6	14.0	190°47.8	41.1	270°30.3	19.5
9	275°41.7	273°16.3	·· 46.5	165°20.6	·· 14.0	205°50.2	·· 41.1	285°32.5	·· 19.4
10	290°44.2	288°17.5	47.5	180°23.6	14.0	220°52.6	41.1	300°34.7	19.3
11	305°46.7	303°18.7	48.5	195°26.5	14.0	235°55.0	41.1	315°36.9	19.2
12	320°49.1	318°19.9	N04°49.5	210°29.5	N26°14.0	250°57.4	N21°41.1	330°39.1	S06°19.0
13	335°51.6	333°21.2	50.5	225°32.4	14.0	265°59.8	41.1	345°41.3	18.9
14	350°54.1	348°22.4	51.5	240°35.4	14.0	281°02.2	41.2	0°43.5	18.8
15	5°56.5	3°23.6	·· 52.5	255°38.3	·· 14.0	296°04.6	·· 41.2	15°45.7	·· 18.7
16	20°59.0	18°24.8	53.5	270°41.3	14.0	311°07.0	41.2	30°47.9	18.6
17	36°01.4	33°26.0	54.5	285°44.3	14.0	326°09.4	41.2	45°50.1	18.5
18	51°03.9	48°27.3	N04°55.5	300°47.2	N26°14.0	341°11.9	N21°41.2	60°52.3	S06°18.4
19	66°06.4	63°28.5	56.5	315°50.2	14.0	356°14.3	41.2	75°54.5	18.2
20	81°08.8	78°29.7	57.5	330°53.1	14.0	11°16.7	41.2	90°56.7	18.1
21	96°11.3	93°31.0	·· 58.5	345°56.1	·· 14.0	26°19.1	·· 41.3	105°58.9	·· 18.0
22	111°13.8	108°32.2	04°59.5	0°59.0	14.0	41°21.5	41.3	121°01.1	17.9
23	126°16.2	123°33.4	05°00.4	16°01.9	14.0	56°23.9	41.3	136°03.3	17.8
Mer.pass.	14:36	ν 1.2′	d 1.0′	m -4.82	ν 3.0′	d 0.0′	m -0.81	ν 2.4′	d 0.0′ m -2.45	ν 2.2′	d 0.1′ m 1.12

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	141°18.7	138°34.7	N05°01.4	31°04.9	N26°14.0	71°26.3	N21°41.3	151°05.5	S06°17.7
1	156°21.2	153°35.9	02.4	46°07.8	14.0	86°28.7	41.3	166°07.7	17.6
2	171°23.6	168°37.2	03.4	61°10.8	14.0	101°31.1	41.3	181°09.9	17.4
3	186°26.1	183°38.4	·· 04.4	76°13.7	·· 13.9	116°33.5	·· 41.4	196°12.1	·· 17.3
4	201°28.6	198°39.7	05.4	91°16.6	13.9	131°35.9	41.4	211°14.3	17.2
5	216°31.0	213°40.9	06.4	106°19.6	13.9	146°38.3	41.4	226°16.5	17.1
6	231°33.5	228°42.2	N05°07.4	121°22.5	N26°13.9	161°40.7	N21°41.4	241°18.7	S06°17.0
7	246°35.9	243°43.4	08.3	136°25.5	13.9	176°43.1	41.4	256°20.9	16.9
8	261°38.4	258°44.7	09.3	151°28.4	13.9	191°45.5	41.4	271°23.1	16.8
9	276°40.9	273°45.9	·· 10.3	166°31.3	·· 13.9	206°47.9	·· 41.5	286°25.3	·· 16.6
10	291°43.3	288°47.2	11.3	181°34.2	13.9	221°50.3	41.5	301°27.5	16.5
11	306°45.8	303°48.4	12.3	196°37.2	13.9	236°52.7	41.5	316°29.7	16.4
12	321°48.3	318°49.7	N05°13.3	211°40.1	N26°13.9	251°55.1	N21°41.5	331°31.9	S06°16.3
13	336°50.7	333°51.0	14.2	226°43.0	13.9	266°57.5	41.5	346°34.1	16.2
14	351°53.2	348°52.3	15.2	241°45.9	13.9	281°59.9	41.5	1°36.3	16.1
15	6°55.7	3°53.5	·· 16.2	256°48.9	·· 13.9	297°02.3	·· 41.6	16°38.5	·· 16.0
16	21°58.1	18°54.8	17.2	271°51.8	13.9	312°04.7	41.6	31°40.6	15.8
17	37°00.6	33°56.1	18.1	286°54.7	13.9	327°07.1	41.6	46°42.8	15.7
18	52°03.0	48°57.4	N05°19.1	301°57.6	N26°13.9	342°09.5	N21°41.6	61°45.0	S06°15.6
19	67°05.5	63°58.6	20.1	317°00.5	13.9	357°11.9	41.6	76°47.2	15.5
20	82°08.0	78°59.9	21.1	332°03.4	13.9	12°14.3	41.6	91°49.4	15.4
21	97°10.4	94°01.2	·· 22.0	347°06.3	·· 13.8	27°16.7	·· 41.7	106°51.6	·· 15.3
22	112°12.9	109°02.5	23.0	2°09.3	13.8	42°19.1	41.7	121°53.8	15.2
23	127°15.4	124°03.8	24.0	17°12.2	13.8	57°21.5	41.7	136°56.0	15.0
Mer.pass.	14:32	ν 1.2′	d 1.0′	m -4.83	ν 2.9′	d -0.0′	m -0.79	ν 2.4′	d 0.0′ m -2.44	ν 2.2′	d 0.1′ m 1.12

Stars	SHA	Dec
Alpheratz	357°35.0	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.3	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.3	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	314°01.1	89°22.5
Acamar	315°11.7	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.1	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.5
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.5	28°37.8
Alnilam	275°37.4	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°25.9	-16°45.2
Adhara	255°05.5	-29°00.5
Procyon	244°50.4	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.5
Suhail	222°45.8	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°47.3	-8°46.1
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°36.7
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°40.9
Acrux	172°59.6	-63°14.1
Gacrux	171°51.2	-57°15.1
Alioth	166°12.5	55°49.1
Spica	158°22.1	-11°17.6
Alkaid	152°51.7	49°10.9
Hadar	148°35.7	-60°29.4
Menkent	147°57.4	-36°29.5
Arcturus	145°47.7	19°02.9
Rigil Kent.	139°40.1	-60°56.1
Kochab	137°19.6	74°02.7
Zuben'ubi	136°55.9	-16°08.8
Alphecca	126°03.7	26°37.5
Antares	112°15.8	-26°29.2
Atria	107°10.2	-69°04.1
Sabik	102°02.8	-15°45.4
Shaula	96°10.5	-37°07.3
Rasalhague	95°58.7	12°32.3
Eltanin	90°42.5	51°28.8
Kaus Aust.	83°32.7	-34°22.3
Vega	80°33.5	38°48.1
Nunki	75°47.9	-26°16.0
Altair	62°00.2	8°55.9
Peacock	53°06.1	-56°39.3
Deneb	49°26.2	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.4

Feb 09 Sun	SHA	Mer.pass
Venus	358°17.2	14:48
Mars	249°21.5	22:01
Jupiter	290°10.0	19:19
Saturn	9°59.5	14:01

Feb 10 Mon	SHA	Mer.pass
Venus	357°46.0	14:46
Mars	249°34.3	21:56
Jupiter	290°08.9	19:15
Saturn	9°53.1	13:57

Feb 11 Tue	SHA	Mer.pass
Venus	357°16.0	14:44
Mars	249°46.2	21:51
Jupiter	290°07.6	19:11
Saturn	9°46.8	13:54

Horizontal parallax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.6	S14°39.7	41°05.5	5.5′	N28°20.1	2.5′	57.5′
1	191°27.5	38.9	55°29.9	5.5′	28°17.6	2.6′	57.5′
2	206°27.5	38.1	69°54.5	5.6′	28°15.0	2.9′	57.5′
3	221°27.5	·· 37.3	84°19.0	5.6′	28°12.1	3.0′	57.4′
4	236°27.5	36.5	98°43.7	5.7′	28°09.1	3.2′	57.4′
5	251°27.5	35.7	113°08.4	5.8′	28°05.9	3.3′	57.4′
6	266°27.5	S14°34.9	127°33.1	5.8′	N28°02.6	3.5′	57.4′
7	281°27.5	34.1	141°58.0	5.9′	27°59.1	3.7′	57.4′
8	296°27.4	33.3	156°22.9	6.0′	27°55.4	3.9′	57.3′
9	311°27.4	·· 32.4	170°47.8	6.0′	27°51.5	4.0′	57.3′
10	326°27.4	31.6	185°12.8	6.1′	27°47.5	4.2′	57.3′
11	341°27.4	30.8	199°37.9	6.2′	27°43.3	4.4′	57.3′
12	356°27.4	S14°30.0	214°03.1	6.2′	N27°38.9	4.5′	57.3′
13	11°27.4	29.2	228°28.3	6.3′	27°34.4	4.7′	57.2′
14	26°27.4	28.4	242°53.6	6.4′	27°29.7	4.8′	57.2′
15	41°27.4	·· 27.6	257°19.0	6.5′	27°24.9	5.0′	57.2′
16	56°27.3	26.8	271°44.5	6.5′	27°19.9	5.2′	57.2′
17	71°27.3	26.0	286°10.0	6.6′	27°14.7	5.3′	57.2′
18	86°27.3	S14°25.2	300°35.6	6.7′	N27°09.4	5.5′	57.1′
19	101°27.3	24.4	315°01.3	6.8′	27°03.9	5.7′	57.1′
20	116°27.3	23.6	329°27.1	6.9′	26°58.2	5.7′	57.1′
21	131°27.3	·· 22.7	343°53.0	7.0′	26°52.5	6.0′	57.1′
22	146°27.3	21.9	358°18.9	7.0′	26°46.5	6.1′	57.1′
23	161°27.3	21.1	12°45.0	7.1′	26°40.4	6.2′	57.0′
	SD = 16.2′	d = 0.8′	SD = 15.7′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.3	S14°20.3	27°11.1	7.2′	N26°34.2	6.4′	57.0′
1	191°27.3	19.5	41°37.3	7.3′	26°27.8	6.6′	57.0′
2	206°27.2	18.7	56°03.6	7.4′	26°21.2	6.7′	57.0′
3	221°27.2	·· 17.9	70°30.0	7.5′	26°14.5	6.8′	57.0′
4	236°27.2	17.1	84°56.5	7.6′	26°07.7	7.0′	57.0′
5	251°27.2	16.2	99°23.1	7.7′	26°00.7	7.1′	56.9′
6	266°27.2	S14°15.4	113°49.8	7.8′	N25°53.6	7.3′	56.9′
7	281°27.2	14.6	128°16.5	7.9′	25°46.3	7.4′	56.9′
8	296°27.2	13.8	142°43.4	8.0′	25°38.9	7.5′	56.9′
9	311°27.2	·· 13.0	157°10.4	8.1′	25°31.4	7.7′	56.9′
10	326°27.2	12.2	171°37.5	8.2′	25°23.7	7.8′	56.8′
11	341°27.2	11.3	186°04.6	8.3′	25°15.9	8.0′	56.8′
12	356°27.2	S14°10.5	200°31.9	8.4′	N25°07.9	8.1′	56.8′
13	11°27.2	09.7	214°59.2	8.5′	24°59.8	8.2′	56.8′
14	26°27.2	08.9	229°26.7	8.6′	24°51.6	8.4′	56.8′
15	41°27.2	·· 08.1	243°54.3	8.7′	24°43.2	8.4′	56.7′
16	56°27.2	07.3	258°21.9	8.8′	24°34.8	8.6′	56.7′
17	71°27.2	06.4	272°49.7	8.9′	24°26.2	8.8′	56.7′
18	86°27.2	S14°05.6	287°17.6	9.0′	N24°17.4	8.8′	56.7′
19	101°27.2	04.8	301°45.5	9.1′	24°08.6	9.0′	56.7′
20	116°27.2	04.0	316°13.6	9.2′	23°59.6	9.1′	56.6′
21	131°27.2	·· 03.1	330°41.8	9.3′	23°50.5	9.2′	56.6′
22	146°27.2	02.3	345°10.1	9.4′	23°41.3	9.4′	56.6′
23	161°27.2	01.5	359°38.5	9.5′	23°31.9	9.4′	56.6′
	SD = 16.2′	d = 0.8′	SD = 15.6′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.2	S14°00.7	14°07.0	9.6′	N23°22.5	9.6′	56.5′
1	191°27.2	13°59.9	28°35.5	9.7′	23°12.9	9.7′	56.5′
2	206°27.2	59.0	43°04.2	9.8′	23°03.2	9.8′	56.5′
3	221°27.2	·· 58.2	57°33.0	9.9′	22°53.4	9.9′	56.5′
4	236°27.2	57.4	72°01.9	10.0′	22°43.5	10.0′	56.5′
5	251°27.2	56.6	86°31.0	10.1′	22°33.5	10.2′	56.4′
6	266°27.2	S13°55.7	101°00.1	10.2′	N22°23.3	10.2′	56.4′
7	281°27.2	54.9	115°29.3	10.3′	22°13.1	10.4′	56.4′
8	296°27.2	54.1	129°58.6	10.4′	22°02.7	10.4′	56.4′
9	311°27.2	·· 53.3	144°28.0	10.5′	21°52.3	10.6′	56.4′
10	326°27.2	52.4	158°57.6	10.6′	21°41.7	10.6′	56.3′
11	341°27.2	51.6	173°27.2	10.7′	21°31.1	10.8′	56.3′
12	356°27.2	S13°50.8	187°56.9	10.8′	N21°20.3	10.8′	56.3′
13	11°27.2	50.0	202°26.8	10.9′	21°09.5	11.0′	56.3′
14	26°27.2	49.1	216°56.7	11.0′	20°58.5	11.0′	56.3′
15	41°27.2	·· 48.3	231°26.7	11.1′	20°47.5	11.1′	56.2′
16	56°27.2	47.5	245°56.9	11.2′	20°36.4	11.3′	56.2′
17	71°27.2	46.6	260°27.1	11.3′	20°25.1	11.3′	56.2′
18	86°27.2	S13°45.8	274°57.5	11.4′	N20°13.8	11.4′	56.2′
19	101°27.2	45.0	289°27.9	11.5′	20°02.4	11.5′	56.2′
20	116°27.2	44.2	303°58.5	11.6′	19°50.9	11.6′	56.1′
21	131°27.2	·· 43.3	318°29.1	11.7′	19°39.3	11.6′	56.1′
22	146°27.2	42.5	332°59.9	11.8′	19°27.7	11.8′	56.1′
23	161°27.2	41.7	347°30.7	11.9′	19°15.9	11.8′	56.1′
	SD = 16.2′	d = 0.8′	SD = 15.4′				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:34	07:56	09:22	15:08	16:34	17:56
N 70°	06:30	07:44	08:57	15:33	16:46	18:00
68°	06:27	07:34	08:38	15:52	16:56	18:03
66°	06:24	07:25	08:23	16:07	17:04	18:06
64°	06:21	07:18	08:10	16:19	17:12	18:08
62°	06:19	07:12	08:00	16:30	17:18	18:11
60°	06:17	07:06	07:51	16:38	17:23	18:13
N 58°	06:15	07:01	07:43	16:46	17:28	18:15
56°	06:13	06:56	07:36	16:53	17:33	18:17
54°	06:11	06:52	07:30	16:59	17:37	18:19
52°	06:09	06:49	07:24	17:05	17:40	18:20
50°	06:07	06:45	07:19	17:10	17:44	18:22
45°	06:03	06:37	07:08	17:21	17:52	18:26
N 40°	05:59	06:31	06:59	17:30	17:58	18:30
35°	05:55	06:25	06:51	17:38	18:04	18:34
30°	05:51	06:19	06:44	17:45	18:09	18:38
20°	05:43	06:09	06:32	17:57	18:20	18:46
N 10°	05:34	05:59	06:21	18:08	18:29	18:54
0°	05:25	05:49	06:11	18:18	18:39	19:04
S 10°	05:13	05:39	06:00	18:28	18:50	19:15
20°	04:59	05:26	05:49	18:39	19:02	19:29
30°	04:41	05:11	05:36	18:51	19:17	19:47
35°	04:30	05:02	05:29	18:59	19:26	19:58
40°	04:16	04:51	05:20	19:07	19:36	20:12
45°	03:59	04:38	05:10	19:17	19:49	20:29
S 50°	03:36	04:22	04:58	19:29	20:05	20:51
52°	03:25	04:14	04:52	19:35	20:13	21:02
54°	03:11	04:05	04:46	19:41	20:22	21:15
56°	02:56	03:55	04:39	19:48	20:31	21:30
58°	02:37	03:44	04:31	19:56	20:43	21:48
S 60°	02:12	03:30	04:22	20:05	20:56	22:12

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°						
N 70°						
68°			12:38			10:33
66°			13:34			09:36
64°		11:44	14:07		09:37	09:02
62°	10:20	12:35	14:31	09:02	08:44	08:37
60°	11:24	13:07	14:50	07:58	08:12	08:17
N 58°	11:58	13:30	15:06	07:24	07:48	08:00
56°	12:23	13:49	15:19	06:58	07:29	07:46
54°	12:43	14:05	15:31	06:38	07:12	07:34
52°	13:00	14:19	15:41	06:21	06:58	07:24
50°	13:14	14:31	15:50	06:06	06:46	07:14
45°	13:43	14:55	16:09	05:37	06:20	06:54
N 40°	14:06	15:15	16:24	05:14	06:00	06:37
35°	14:25	15:31	16:37	04:54	05:43	06:23
30°	14:41	15:45	16:49	04:38	05:28	06:11
20°	15:08	16:09	17:08	04:10	05:03	05:50
N 10°	15:32	16:30	17:25	03:46	04:41	05:31
0°	15:53	16:49	17:40	03:23	04:20	05:14
S 10°	16:15	17:08	17:55	03:00	04:00	04:56
20°	16:38	17:28	18:12	02:36	03:38	04:38
30°	17:05	17:52	18:31	02:08	03:12	04:16
35°	17:21	18:05	18:42	01:51	02:56	04:03
40°	17:40	18:21	18:54	01:31	02:38	03:48
45°	18:02	18:40	19:09	01:07	02:17	03:31
S 50°	18:30	19:03	19:26	00:36	01:49	03:08
52°	18:44	19:14	19:35	00:21	01:36	02:58
54°	19:00	19:27	19:44	00:03	01:20	02:46
56°	19:19	19:41	19:54	·· ··	01:02	02:32
58°	19:42	19:58	20:06	·· ··	00:39	02:16
S 60°	20:12	20:18	20:20	·· ··	00:10	01:56

Day	Sun		Mer.	Moon		
	Eqn.of Time			Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	11-13
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	86-97%
09	14:10	14:10	12:14	22:07	09:38	
10	14:11	14:11	12:14	23:01	10:35	
11	14:11	14:11	12:14	23:52	11:27	

No IERS EOP prediction data available

February 12, 13, 14 UT (Wed., Thu., Fri.)

DUT1 = UT1-UTC = +0.1952 sec ΔT = TT-UT1 = +68.9888 sec

2025 February 12 to Feb. 14 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	142°17.8	139°05.1	N05°25.0	32°15.1	N26°13.8	72°23.9	N21°41.7	151°58.2	S06°14.9
1	157°20.3	154°06.4	25.9	47°18.0	13.8	87°26.3	41.7	167°00.4	14.8
2	172°22.8	169°07.7	26.9	62°20.9	13.8	102°28.7	41.8	182°02.6	14.7
3	187°25.2	184°09.0	·· 27.9	77°23.8	·· 13.8	117°31.1	·· 41.8	197°04.8	·· 14.6
4	202°27.7	199°10.3	28.8	92°26.7	13.8	132°33.5	41.8	212°07.0	14.5
5	217°30.2	214°11.6	29.8	107°29.6	13.8	147°35.9	41.8	227°09.2	14.3
6	232°32.6	229°12.9	N05°30.8	122°32.5	N26°13.8	162°38.3	N21°41.8	242°11.4	S06°14.2
7	247°35.1	244°14.2	31.7	137°35.4	13.8	177°40.7	41.8	257°13.6	14.1
8	262°37.5	259°15.5	32.7	152°38.3	13.7	192°43.1	41.9	272°15.8	14.0
9	277°40.0	274°16.8	·· 33.7	167°41.2	·· 13.7	207°45.5	·· 41.9	287°18.0	·· 13.9
10	292°42.5	289°18.1	34.6	182°44.1	13.7	222°47.9	41.9	302°20.2	13.8
11	307°44.9	304°19.5	35.6	197°46.9	13.7	237°50.3	41.9	317°22.4	13.7
12	322°47.4	319°20.8	N05°36.5	212°49.8	N26°13.7	252°52.7	N21°41.9	332°24.6	S06°13.5
13	337°49.9	334°22.1	37.5	227°52.7	13.7	267°55.1	41.9	347°26.8	13.4
14	352°52.3	349°23.4	38.5	242°55.6	13.7	282°57.5	42.0	2°29.0	13.3
15	7°54.8	4°24.8	·· 39.4	257°58.5	·· 13.7	297°59.9	·· 42.0	17°31.2	·· 13.2
16	22°57.3	19°26.1	40.4	273°01.4	13.6	313°02.2	42.0	32°33.4	13.1
17	37°59.7	34°27.4	41.3	288°04.3	13.6	328°04.6	42.0	47°35.6	13.0
18	53°02.2	49°28.8	N05°42.3	303°07.1	N26°13.6	343°07.0	N21°42.0	62°37.8	S06°12.9
19	68°04.7	64°30.1	43.2	318°10.0	13.6	358°09.4	42.1	77°40.0	12.7
20	83°07.1	79°31.4	44.2	333°12.9	13.6	13°11.8	42.1	92°42.2	12.6
21	98°09.6	94°32.8	·· 45.1	348°15.8	·· 13.6	28°14.2	·· 42.1	107°44.4	·· 12.5
22	113°12.0	109°34.1	46.1	3°18.6	13.6	43°16.6	42.1	122°46.6	12.4
23	128°14.5	124°35.5	47.0	18°21.5	13.5	58°19.0	42.1	137°48.8	12.3
Mer.pass.	14:28	ν 1.3′	d 1.0′	m -4.84	ν 2.9′	d -0.0′	m -0.76	ν 2.4′	d 0.0′ m -2.43	ν 2.2′	d 0.1′ m 1.12
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	143°17.0	139°36.8	N05°48.0	33°24.4	N26°13.5	73°21.4	N21°42.1	152°50.9	S06°12.2
1	158°19.4	154°38.2	48.9	48°27.3	13.5	88°23.7	42.2	167°53.1	12.0
2	173°21.9	169°39.5	49.9	63°30.1	13.5	103°26.1	42.2	182°55.3	11.9
3	188°24.4	184°40.9	·· 50.8	78°33.0	·· 13.5	118°28.5	·· 42.2	197°57.5	·· 11.8
4	203°26.8	199°42.3	51.8	93°35.8	13.5	133°30.9	42.2	212°59.7	11.7
5	218°29.3	214°43.6	52.7	108°38.7	13.4	148°33.3	42.2	228°01.9	11.6
6	233°31.8	229°45.0	N05°53.7	123°41.6	N26°13.4	163°35.7	N21°42.3	243°04.1	S06°11.5
7	248°34.2	244°46.3	54.6	138°44.4	13.4	178°38.1	42.3	258°06.3	11.4
8	263°36.7	259°47.7	55.6	153°47.3	13.4	193°40.5	42.3	273°08.5	11.2
9	278°39.1	274°49.1	·· 56.5	168°50.1	·· 13.4	208°42.8	·· 42.3	288°10.7	·· 11.1
10	293°41.6	289°50.5	57.5	183°53.0	13.4	223°45.2	42.3	303°12.9	11.0
11	308°44.1	304°51.8	58.4	198°55.9	13.3	238°47.6	42.4	318°15.1	10.9
12	323°46.5	319°53.2	N05°59.3	213°58.7	N26°13.3	253°50.0	N21°42.4	333°17.3	S06°10.8
13	338°49.0	334°54.6	06°00.3	229°01.6	13.3	268°52.4	42.4	348°19.5	10.7
14	353°51.5	349°56.0	01.2	244°04.4	13.3	283°54.8	42.4	3°21.7	10.5
15	8°53.9	4°57.4	·· 02.2	259°07.3	·· 13.3	298°57.1	·· 42.4	18°23.9	·· 10.4
16	23°56.4	19°58.8	03.1	274°10.1	13.2	313°59.5	42.4	33°26.1	10.3
17	38°58.9	35°00.1	04.0	289°12.9	13.2	329°01.9	42.5	48°28.3	10.2
18	54°01.3	50°01.5	N06°05.0	304°15.8	N26°13.2	344°04.3	N21°42.5	63°30.5	S06°10.1
19	69°03.8	65°02.9	05.9	319°18.6	13.2	359°06.7	42.5	78°32.7	10.0
20	84°06.3	80°04.3	06.8	334°21.5	13.2	14°09.1	42.5	93°34.9	09.9
21	99°08.7	95°05.7	·· 07.8	349°24.3	·· 13.1	29°11.4	·· 42.5	108°37.1	·· 09.7
22	114°11.2	110°07.1	08.7	4°27.1	13.1	44°13.8	42.6	123°39.2	09.6
23	129°13.6	125°08.5	09.6	19°30.0	13.1	59°16.2	42.6	138°41.4	09.5
Mer.pass.	14:25	ν 1.4′	d 0.9′	m -4.84	ν 2.9′	d -0.0′	m -0.73	ν 2.4′	d 0.0′ m -2.42	ν 2.2′	d 0.1′ m 1.12
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	144°16.1	140°09.9	N06°10.5	34°32.8	N26°13.1	74°18.6	N21°42.6	153°43.6	S06°09.4
1	159°18.6	155°11.4	11.5	49°35.7	13.1	89°21.0	42.6	168°45.8	09.3
2	174°21.0	170°12.8	12.4	64°38.5	13.0	104°23.3	42.6	183°48.0	09.2
3	189°23.5	185°14.2	·· 13.3	79°41.3	·· 13.0	119°25.7	·· 42.7	198°50.2	·· 09.0
4	204°26.0	200°15.6	14.3	94°44.1	13.0	134°28.1	42.7	213°52.4	08.9
5	219°28.4	215°17.0	15.2	109°47.0	13.0	149°30.5	42.7	228°54.6	08.8
6	234°30.9	230°18.4	N06°16.1	124°49.8	N26°12.9	164°32.8	N21°42.7	243°56.8	S06°08.7
7	249°33.4	245°19.9	17.0	139°52.6	12.9	179°35.2	42.7	258°59.0	08.6
8	264°35.8	260°21.3	17.9	154°55.4	12.9	194°37.6	42.8	274°01.2	08.5
9	279°38.3	275°22.7	·· 18.9	169°58.3	·· 12.9	209°40.0	·· 42.8	289°03.4	·· 08.3
10	294°40.8	290°24.2	19.8	185°01.1	12.8	224°42.4	42.8	304°05.6	08.2
11	309°43.2	305°25.6	20.7	200°03.9	12.8	239°44.7	42.8	319°07.8	08.1
12	324°45.7	320°27.0	N06°21.6	215°06.7	N26°12.8	254°47.1	N21°42.8	334°10.0	S06°08.0
13	339°48.1	335°28.5	22.5	230°09.5	12.8	269°49.5	42.9	349°12.2	07.9
14	354°50.6	350°29.9	23.5	245°12.3	12.7	284°51.9	42.9	4°14.4	07.8
15	9°53.1	5°31.4	·· 24.4	260°15.2	·· 12.7	299°54.2	·· 42.9	19°16.6	·· 07.7
16	24°55.5	20°32.8	25.3	275°18.0	12.7	314°56.6	42.9	34°18.8	07.5
17	39°58.0	35°34.3	26.2	290°20.8	12.7	329°59.0	42.9	49°20.9	07.4
18	55°00.5	50°35.7	N06°27.1	305°23.6	N26°12.6	345°01.4	N21°43.0	64°23.1	S06°07.3
19	70°02.9	65°37.2	28.0	320°26.4	12.6	0°03.7	43.0	79°25.3	07.2
20	85°05.4	80°38.6	28.9	335°29.2	12.6	15°06.1	43.0	94°27.5	07.1
21	100°07.9	95°40.1	·· 29.8	350°32.0	·· 12.6	30°08.5	·· 43.0	109°29.7	·· 07.0
22	115°10.3	110°41.6	30.8	5°34.8	12.5	45°10.8	43.0	124°31.9	06.8
23	130°12.8	125°43.0	31.7	20°37.6	12.5	60°13.2	43.1	139°34.1	06.7
Mer.pass.	14:21	ν 1.4′	d 0.9′	m -4.85	ν 2.8′	d -0.0′	m -0.70	ν 2.4′	d 0.0′ m -2.42	ν 2.2′	d 0.1′ m 1.12

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.4	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.3	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	314°02.6	89°22.5
Acamar	315°11.7	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.1	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.5
Capella	280°21.5	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°25.9	-16°45.2
Adhara	255°05.5	-29°00.5
Procyon	244°50.4	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.5
Suhail	222°45.8	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°47.3	-8°46.1
Regulus	207°34.0	11°50.5
Dubhe	193°40.2	61°36.8
Denebola	182°24.6	14°25.7
Gienah	175°43.2	-17°40.9
Acrux	172°59.5	-63°14.2
Gacrux	171°51.2	-57°15.1
Alioth	166°12.5	55°49.1
Spica	158°22.0	-11°17.6
Alkaid	152°51.7	49°10.9
Hadar	148°35.7	-60°29.4
Menkent	147°57.4	-36°29.5
Arcturus	145°47.7	19°02.9
Rigil Kent.	139°40.0	-60°56.1
Kochab	137°19.5	74°02.7
Zuben'ubi	136°55.9	-16°08.8
Alphecca	126°03.7	26°37.5
Antares	112°15.8	-26°29.2
Atria	107°10.2	-69°04.1
Sabik	102°02.8	-15°45.4
Shaula	96°10.5	-37°07.3
Rasalhague	95°58.6	12°32.3
Eltanin	90°42.5	51°28.8
Kaus Aust.	83°32.7	-34°22.3
Vega	80°33.5	38°48.1
Nunki	75°47.9	-26°16.0
Altair	62°00.2	8°55.9
Peacock	53°06.1	-56°39.2
Deneb	49°26.2	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.4

Feb 12 Wed	SHA	Mer.pass
Venus	356°47.3	14:42
Mars	249°57.2	21:47
Jupiter	290°06.1	19:07
Saturn	9°40.4	13:50

Feb 13 Thu	SHA	Mer.pass
Venus	356°19.9	14:40
Mars	250°07.4	21:42
Jupiter	290°04.4	19:04
Saturn	9°34.0	13:47

Feb 14 Fri	SHA	Mer.pass
Venus	355°53.8	14:38
Mars	250°16.7	21:38
Jupiter	290°02.5	19:00
Saturn	9°27.5	13:43

Horizontal parallax	
Venus:	0.3
Mars:	0.2

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.3	S13°40.8	2°01.7	12.0′	N19°04.1	11.9′	56.1′
1	191°27.3	40.0	16°32.7	12.1′	18°52.2	12.0′	56.0′
2	206°27.3	39.2	31°03.8	12.2′	18°40.2	12.1′	56.0′
3	221°27.3	·· 38.3	45°35.1	12.3′	18°28.1	12.1′	56.0′
4	236°27.3	37.5	60°06.4	12.4′	18°16.0	12.3′	56.0′
5	251°27.3	36.7	74°37.8	12.5′	18°03.7	12.3′	56.0′
6	266°27.3	S13°35.8	89°09.3	12.6′	N17°51.4	12.3′	55.9′
7	281°27.3	35.0	103°41.0	12.7′	17°39.1	12.5′	55.9′
8	296°27.3	34.2	118°12.7	12.8′	17°26.6	12.5′	55.9′
9	311°27.3	·· 33.3	132°44.5	12.9′	17°14.1	12.6′	55.9′
10	326°27.3	32.5	147°16.3	13.0′	17°01.5	12.6′	55.9′
11	341°27.4	31.7	161°48.3	13.1′	16°48.9	12.7′	55.8′
12	356°27.4	S13°30.8	176°20.4	13.2′	N16°36.2	12.8′	55.8′
13	11°27.4	30.0	190°52.6	13.2′	16°23.4	12.8′	55.8′
14	26°27.4	29.2	205°24.8	13.3′	16°10.6	12.9′	55.8′
15	41°27.4	·· 28.3	219°57.1	13.4′	15°57.7	13.0′	55.8′
16	56°27.4	27.5	234°29.6	13.5′	15°44.7	13.0′	55.7′
17	71°27.4	26.6	249°02.1	13.6′	15°31.7	13.1′	55.7′
18	86°27.4	S13°25.8	263°34.7	13.7′	N15°18.6	13.1′	55.7′
19	101°27.5	25.0	278°07.3	13.8′	15°05.5	13.2′	55.7′
20	116°27.5	24.1	292°40.1	13.8′	14°52.3	13.2′	55.7′
21	131°27.5	·· 23.3	307°12.9	13.9′	14°39.1	13.3′	55.6′
22	146°27.5	22.4	321°45.9	14.0′	14°25.8	13.4′	55.6′
23	161°27.5	21.6	336°18.9	14.1′	14°12.4	13.4′	55.6′
	SD = 16.2′	d = 0.8′	SD = 15.3′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.5	S13°20.8	350°52.0	14.2′	N13°59.0	13.4′	55.6′
1	191°27.6	19.9	5°25.1	14.2′	13°45.6	13.5′	55.6′
2	206°27.6	19.1	19°58.4	14.3′	13°32.1	13.6′	55.5′
3	221°27.6	·· 18.2	34°31.7	14.4′	13°18.5	13.6′	55.5′
4	236°27.6	17.4	49°05.1	14.5′	13°04.9	13.6′	55.5′
5	251°27.6	16.6	63°38.5	14.5′	12°51.3	13.7′	55.5′
6	266°27.6	S13°15.7	78°12.1	14.6′	N12°37.6	13.7′	55.5′
7	281°27.7	14.9	92°45.7	14.7′	12°23.9	13.8′	55.4′
8	296°27.7	14.0	107°19.4	14.8′	12°10.1	13.8′	55.4′
9	311°27.7	·· 13.2	121°53.1	14.8′	11°56.3	13.8′	55.4′
10	326°27.7	12.3	136°26.9	14.9′	11°42.5	13.9′	55.4′
11	341°27.7	11.5	151°00.8	15.0′	11°28.6	13.9′	55.4′
12	356°27.7	S13°10.6	165°34.8	15.0′	N11°14.7	13.9′	55.3′
13	11°27.8	09.8	180°08.8	15.1′	11°00.8	14.0′	55.3′
14	26°27.8	08.9	194°42.9	15.2′	10°46.8	14.0′	55.3′
15	41°27.8	·· 08.1	209°17.1	15.2′	10°32.8	14.1′	55.3′
16	56°27.8	07.3	223°51.3	15.3′	10°18.7	14.0′	55.3′
17	71°27.8	06.4	238°25.6	15.3′	10°04.7	14.1′	55.2′
18	86°27.9	S13°05.6	252°59.9	15.4′	N09°50.6	14.2′	55.2′
19	101°27.9	04.7	267°34.3	15.5′	09°36.4	14.1′	55.2′
20	116°27.9	03.9	282°08.8	15.5′	09°22.3	14.2′	55.2′
21	131°27.9	·· 03.0	296°43.3	15.6′	09°08.1	14.3′	55.2′
22	146°28.0	02.2	311°17.9	15.6′	08°53.8	14.2′	55.2′
23	161°28.0	01.3	325°52.5	15.7′	08°39.6	14.3′	55.1′
	SD = 16.2′	d = 0.8′	SD = 15.2′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.0	S13°00.5	340°27.2	15.7′	N08°25.3	14.2′	55.1′
1	191°28.0	12°59.6	355°02.0	15.8′	08°11.1	14.3′	55.1′
2	206°28.1	58.8	9°36.8	15.8′	07°56.8	14.4′	55.1′
3	221°28.1	·· 57.9	24°11.6	15.9′	07°42.4	14.3′	55.1′
4	236°28.1	57.1	38°46.5	15.9′	07°28.1	14.4′	55.0′
5	251°28.1	56.2	53°21.5	16.0′	07°13.7	14.4′	55.0′
6	266°28.1	S12°55.4	67°56.5	16.0′	N06°59.3	14.4′	55.0′
7	281°28.2	54.5	82°31.5	16.1′	06°44.9	14.4′	55.0′
8	296°28.2	53.7	97°06.6	16.1′	06°30.5	14.4′	55.0′
9	311°28.2	·· 52.8	111°41.7	16.2′	06°16.1	14.5′	55.0′
10	326°28.3	51.9	126°16.9	16.2′	06°01.6	14.4′	54.9′
11	341°28.3	51.1	140°52.1	16.3′	05°47.2	14.5′	54.9′
12	356°28.3	S12°50.2	155°27.4	16.3′	N05°32.7	14.5′	54.9′
13	11°28.3	49.4	170°02.7	16.3′	05°18.2	14.5′	54.9′
14	26°28.4	48.5	184°38.1	16.4′	05°03.7	14.5′	54.9′
15	41°28.4	·· 47.7	199°13.4	16.4′	04°49.2	14.5′	54.9′
16	56°28.4	46.8	213°48.9	16.5′	04°34.7	14.5′	54.8′
17	71°28.4	46.0	228°24.3	16.5′	04°20.2	14.5′	54.8′
18	86°28.5	S12°45.1	242°59.8	16.5′	N04°05.7	14.5′	54.8′
19	101°28.5	44.3	257°35.3	16.6′	03°51.2	14.6′	54.8′
20	116°28.5	43.4	272°10.9	16.6′	03°36.6	14.5′	54.8′
21	131°28.6	·· 42.5	286°46.5	16.6′	03°22.1	14.6′	54.8′
22	146°28.6	41.7	301°22.1	16.7′	03°07.5	14.5′	54.7′
23	161°28.6	40.8	315°57.8	16.7′	02°53.0	14.5′	54.7′
	SD = 16.2′	d = 0.9′	SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:22	07:43	09:04	15:26	16:47	18:08
N 70°	06:19	07:32	08:42	15:48	16:58	18:11
68°	06:17	07:23	08:25	16:04	17:07	18:13
66°	06:15	07:16	08:12	16:18	17:14	18:15
64°	06:13	07:09	08:01	16:29	17:20	18:16
62°	06:11	07:04	07:51	16:38	17:26	18:18
60°	06:10	06:59	07:43	16:46	17:31	18:20
N 58°	06:08	06:54	07:36	16:54	17:35	18:21
56°	06:07	06:50	07:29	17:00	17:39	18:23
54°	06:05	06:47	07:24	17:05	17:42	18:24
52°	06:04	06:43	07:18	17:11	17:46	18:25
50°	06:02	06:40	07:14	17:15	17:49	18:27
45°	05:59	06:33	07:04	17:25	17:56	18:30
N 40°	05:56	06:27	06:55	17:34	18:02	18:33
35°	05:52	06:22	06:48	17:41	18:07	18:37
30°	05:49	06:17	06:41	17:47	18:12	18:40
20°	05:42	06:08	06:30	17:58	18:21	18:47
N 10°	05:34	05:59	06:20	18:08	18:30	18:55
0°	05:25	05:50	06:11	18:18	18:39	19:03
S 10°	05:14	05:40	06:01	18:27	18:49	19:14
20°	05:01	05:28	05:51	18:37	19:00	19:27
30°	04:44	05:14	05:39	18:49	19:14	19:44
35°	04:33	05:05	05:32	18:56	19:22	19:54
40°	04:20	04:55	05:24	19:04	19:32	20:07
45°	04:04	04:43	05:15	19:13	19:44	20:23
S 50°	03:43	04:28	05:03	19:24	19:59	20:44
52°	03:32	04:20	04:58	19:29	20:07	20:54
54°	03:20	04:12	04:52	19:35	20:15	21:06
56°	03:06	04:03	04:46	19:41	20:24	21:20
58°	02:49	03:52	04:38	19:48	20:34	21:37
S 60°	02:27	03:40	04:30	19:56	20:46	21:58

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	14:10	16:55	19:03	10:44	09:32	08:51
N 70°	14:55	17:12	19:09	09:58	09:13	08:43
68°	15:24	17:25	19:13	09:27	08:57	08:36
66°	15:45	17:36	19:17	09:04	08:45	08:30
64°	16:02	17:45	19:20	08:46	08:34	08:25
62°	16:16	17:52	19:23	08:31	08:25	08:20
60°	16:28	17:59	19:25	08:18	08:18	08:16
N 58°	16:38	18:05	19:27	08:07	08:11	08:13
56°	16:47	18:10	19:29	07:57	08:04	08:10
54°	16:54	18:14	19:31	07:49	07:59	08:07
52°	17:01	18:18	19:32	07:41	07:54	08:05
50°	17:08	18:22	19:33	07:34	07:49	08:02
45°	17:21	18:30	19:36	07:19	07:40	07:57
N 40°	17:32	18:37	19:39	07:07	07:31	07:53
35°	17:41	18:42	19:41	06:56	07:24	07:49
30°	17:49	18:47	19:43	06:47	07:18	07:46
20°	18:03	18:56	19:46	06:31	07:07	07:40
N 10°	18:16	19:03	19:49	06:16	06:57	07:35
0°	18:27	19:10	19:51	06:03	06:48	07:30
S 10°	18:38	19:17	19:54	05:50	06:39	07:25
20°	18:50	19:25	19:57	05:35	06:29	07:20
30°	19:04	19:33	20:00	05:18	06:18	07:14
35°	19:12	19:38	20:02	05:08	06:11	07:11
40°	19:21	19:44	20:04	04:57	06:03	07:07
45°	19:31	19:50	20:06	04:44	05:55	07:02
S 50°	19:44	19:57	20:09	04:28	05:44	06:57
52°	19:49	20:01	20:10	04:20	05:39	06:54
54°	19:56	20:05	20:12	04:11	05:33	06:51
56°	20:03	20:09	20:13	04:02	05:27	06:48
58°	20:11	20:13	20:15	03:50	05:20	06:45
S 60°	20:20	20:19	20:17	03:38	05:12	06:41

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 14-16 100-98%
12	14:11	14:11	12:14	–:–	12:15	
13	14:10	14:09	12:14	00:38	12:59	
14	14:08	14:07	12:14	01:20	13:41	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1959 sec ΔT = TT-UT1 = +68.9881 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	145°15.2	140°44.5	N06°32.6	35°40.4	N26°12.5	75°15.6	N21°43.1	154°36.3	S06°06.6
1	160°17.7	155°46.0	33.5	50°43.2	12.5	90°18.0	43.1	169°38.5	06.5
2	175°20.2	170°47.4	34.4	65°46.0	12.4	105°20.3	43.1	184°40.7	06.4
3	190°22.6	185°48.9	·· 35.3	80°48.8	·· 12.4	120°22.7	·· 43.1	199°42.9	·· 06.3
4	205°25.1	200°50.4	36.2	95°51.6	12.4	135°25.1	43.2	214°45.1	06.1
5	220°27.6	215°51.9	37.1	110°54.4	12.3	150°27.4	43.2	229°47.3	06.0
6	235°30.0	230°53.4	N06°38.0	125°57.1	N26°12.3	165°29.8	N21°43.2	244°49.5	S06°05.9
7	250°32.5	245°54.8	38.9	140°59.9	12.3	180°32.2	43.2	259°51.7	05.8
8	265°35.0	260°56.3	39.8	156°02.7	12.2	195°34.5	43.2	274°53.9	05.7
9	280°37.4	275°57.8	·· 40.7	171°05.5	·· 12.2	210°36.9	·· 43.3	289°56.0	·· 05.6
10	295°39.9	290°59.3	41.6	186°08.3	12.2	225°39.3	43.3	304°58.2	05.4
11	310°42.4	306°00.8	42.5	201°11.1	12.2	240°41.6	43.3	320°00.4	05.3
12	325°44.8	321°02.3	N06°43.4	216°13.8	N26°12.1	255°44.0	N21°43.3	335°02.6	S06°05.2
13	340°47.3	336°03.8	44.3	231°16.6	12.1	270°46.4	43.4	350°04.8	05.1
14	355°49.7	351°05.3	45.2	246°19.4	12.1	285°48.7	43.4	5°07.0	05.0
15	10°52.2	6°06.8	·· 46.1	261°22.2	·· 12.0	300°51.1	·· 43.4	20°09.2	·· 04.9
16	25°54.7	21°08.3	46.9	276°24.9	12.0	315°53.5	43.4	35°11.4	04.7
17	40°57.1	36°09.9	47.8	291°27.7	12.0	330°55.8	43.4	50°13.6	04.6
18	55°59.6	51°11.4	N06°48.7	306°30.5	N26°11.9	345°58.2	N21°43.5	65°15.8	S06°04.5
19	71°02.1	66°12.9	49.6	321°33.3	11.9	1°00.6	43.5	80°18.0	04.4
20	86°04.5	81°14.4	50.5	336°36.0	11.9	16°02.9	43.5	95°20.2	04.3
21	101°07.0	96°15.9	·· 51.4	351°38.8	·· 11.8	31°05.3	·· 43.5	110°22.4	·· 04.2
22	116°09.5	111°17.5	52.3	6°41.6	11.8	46°07.7	43.5	125°24.6	04.0
23	131°11.9	126°19.0	53.2	21°44.3	11.8	61°10.0	43.6	140°26.7	03.9
Mer.pass.	14:17	ν 1.5′	d 0.9′	m -4.85	ν 2.8′	d -0.0′	m -0.67	ν 2.4′	d 0.0′ m -2.41	ν 2.2′	d 0.1′ m 1.12

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	146°14.4	141°20.5	N06°54.0	36°47.1	N26°11.7	76°12.4	N21°43.6	155°28.9	S06°03.8
1	161°16.8	156°22.1	54.9	51°49.8	11.7	91°14.7	43.6	170°31.1	03.7
2	176°19.3	171°23.6	55.8	66°52.6	11.7	106°17.1	43.6	185°33.3	03.6
3	191°21.8	186°25.1	·· 56.7	81°55.4	·· 11.6	121°19.5	·· 43.7	200°35.5	·· 03.5
4	206°24.2	201°26.7	57.6	96°58.1	11.6	136°21.8	43.7	215°37.7	03.3
5	221°26.7	216°28.2	58.4	112°00.9	11.6	151°24.2	43.7	230°39.9	03.2
6	236°29.2	231°29.8	N06°59.3	127°03.6	N26°11.5	166°26.5	N21°43.7	245°42.1	S06°03.1
7	251°31.6	246°31.3	07°00.2	142°06.4	11.5	181°28.9	43.7	260°44.3	03.0
8	266°34.1	261°32.9	01.1	157°09.1	11.5	196°31.3	43.8	275°46.5	02.9
9	281°36.6	276°34.4	·· 01.9	172°11.9	·· 11.4	211°33.6	·· 43.8	290°48.7	·· 02.8
10	296°39.0	291°36.0	02.8	187°14.6	11.4	226°36.0	43.8	305°50.9	02.6
11	311°41.5	306°37.5	03.7	202°17.4	11.4	241°38.3	43.8	320°53.1	02.5
12	326°44.0	321°39.1	N07°04.6	217°20.1	N26°11.3	256°40.7	N21°43.8	335°55.2	S06°02.4
13	341°46.4	336°40.7	05.4	232°22.8	11.3	271°43.1	43.9	350°57.4	02.3
14	356°48.9	351°42.2	06.3	247°25.6	11.2	286°45.4	43.9	5°59.6	02.2
15	11°51.3	6°43.8	·· 07.2	262°28.3	·· 11.2	301°47.8	·· 43.9	21°01.8	·· 02.1
16	26°53.8	21°45.4	08.0	277°31.1	11.2	316°50.1	43.9	36°04.0	01.9
17	41°56.3	36°47.0	08.9	292°33.8	11.1	331°52.5	44.0	51°06.2	01.8
18	56°58.7	51°48.5	N07°09.8	307°36.5	N26°11.1	346°54.8	N21°44.0	66°08.4	S06°01.7
19	72°01.2	66°50.1	10.6	322°39.3	11.1	1°57.2	44.0	81°10.6	01.6
20	87°03.7	81°51.7	11.5	337°42.0	11.0	16°59.6	44.0	96°12.8	01.5
21	102°06.1	96°53.3	·· 12.3	352°44.7	·· 11.0	32°01.9	·· 44.0	111°15.0	·· 01.4
22	117°08.6	111°54.9	13.2	7°47.5	10.9	47°04.3	44.1	126°17.2	01.2
23	132°11.1	126°56.5	14.1	22°50.2	10.9	62°06.6	44.1	141°19.4	01.1
Mer.pass.	14:13	ν 1.5′	d 0.9′	m -4.85	ν 2.8′	d -0.0′	m -0.64	ν 2.4′	d 0.0′ m -2.40	ν 2.2′	d 0.1′ m 1.12

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	147°13.5	141°58.1	N07°14.9	37°52.9	N26°10.9	77°09.0	N21°44.1	156°21.5	S06°01.0
1	162°16.0	156°59.7	15.8	52°55.6	10.8	92°11.3	44.1	171°23.7	00.9
2	177°18.4	172°01.3	16.6	67°58.4	10.8	107°13.7	44.2	186°25.9	00.8
3	192°20.9	187°02.9	·· 17.5	83°01.1	·· 10.7	122°16.0	·· 44.2	201°28.1	·· 00.7
4	207°23.4	202°04.5	18.3	98°03.8	10.7	137°18.4	44.2	216°30.3	00.5
5	222°25.8	217°06.1	19.2	113°06.5	10.7	152°20.7	44.2	231°32.5	00.4
6	237°28.3	232°07.7	N07°20.0	128°09.2	N26°10.6	167°23.1	N21°44.3	246°34.7	S06°00.3
7	252°30.8	247°09.3	20.9	143°11.9	10.6	182°25.4	44.3	261°36.9	00.2
8	267°33.2	262°10.9	21.7	158°14.7	10.5	197°27.8	44.3	276°39.1	00.1
9	282°35.7	277°12.6	·· 22.6	173°17.4	·· 10.5	212°30.1	·· 44.3	291°41.3	06°00.0
10	297°38.2	292°14.2	23.4	188°20.1	10.5	227°32.5	44.3	306°43.5	05°59.8
11	312°40.6	307°15.8	24.3	203°22.8	10.4	242°34.8	44.4	321°45.7	59.7
12	327°43.1	322°17.4	N07°25.1	218°25.5	N26°10.4	257°37.2	N21°44.4	336°47.8	S05°59.6
13	342°45.6	337°19.1	26.0	233°28.2	10.3	272°39.5	44.4	351°50.0	59.5
14	357°48.0	352°20.7	26.8	248°30.9	10.3	287°41.9	44.4	6°52.2	59.4
15	12°50.5	7°22.3	·· 27.7	263°33.6	·· 10.2	302°44.2	·· 44.5	21°54.4	·· 59.3
16	27°52.9	22°24.0	28.5	278°36.3	10.2	317°46.6	44.5	36°56.6	59.1
17	42°55.4	37°25.6	29.3	293°39.0	10.2	332°48.9	44.5	51°58.8	59.0
18	57°57.9	52°27.3	N07°30.2	308°41.7	N26°10.1	347°51.3	N21°44.5	67°01.0	S05°58.9
19	73°00.3	67°28.9	31.0	323°44.4	10.1	2°53.6	44.6	82°03.2	58.8
20	88°02.8	82°30.6	31.8	338°47.1	10.0	17°56.0	44.6	97°05.4	58.7
21	103°05.3	97°32.2	·· 32.7	353°49.8	·· 10.0	32°58.3	·· 44.6	112°07.6	·· 58.6
22	118°07.7	112°33.9	33.5	8°52.5	09.9	48°00.7	44.6	127°09.7	58.4
23	133°10.2	127°35.5	34.3	23°55.2	09.9	63°03.0	44.6	142°11.9	58.3
Mer.pass.	14:09	ν 1.6′	d 0.9′	m -4.86	ν 2.7′	d -0.0′	m -0.61	ν 2.4′	d 0.0′ m -2.39	ν 2.2′	d 0.1′ m 1.12

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.8
Ankaa	353°07.3	-42°10.4
Schedar	349°31.4	56°40.7
Diphda	348°47.4	-17°51.1
Achernar	335°20.4	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	314°04.3	89°22.5
Acamar	315°11.8	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.2	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.6	-8°10.5
Capella	280°21.6	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°25.9	-16°45.2
Adhara	255°05.5	-29°00.5
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.5
Suhail	222°45.8	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°47.3	-8°46.1
Regulus	207°34.0	11°50.5
Dubhe	193°40.2	61°36.8
Denebola	182°24.6	14°25.7
Gienah	175°43.2	-17°40.9
Acrux	172°59.5	-63°14.2
Gacrux	171°51.1	-57°15.1
Alioth	166°12.5	55°49.1
Spica	158°22.0	-11°17.6
Alkaid	152°51.7	49°10.9
Hadar	148°35.6	-60°29.5
Menkent	147°57.4	-36°29.5
Arcturus	145°47.7	19°02.8
Rigil Kent.	139°40.0	-60°56.2
Kochab	137°19.5	74°02.7
Zuben'ubi	136°55.8	-16°08.8
Alphecca	126°03.6	26°37.5
Antares	112°15.8	-26°29.2
Atria	107°10.1	-69°04.1
Sabik	102°02.8	-15°45.4
Shaula	96°10.4	-37°07.3
Rasalhague	95°58.6	12°32.3
Eltanin	90°42.4	51°28.8
Kaus Aust.	83°32.6	-34°22.3
Vega	80°33.4	38°48.1
Nunki	75°47.9	-26°16.0
Altair	62°00.2	8°55.9
Peacock	53°06.1	-56°39.2
Deneb	49°26.2	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.3

Feb 15 Sat	SHA	Mer.pass
Venus	355°29.2	14:36
Mars	250°25.1	21:33
Jupiter	290°00.3	18:56
Saturn	9°21.1	13:40

Feb 16 Sun	SHA	Mer.pass
Venus	355°06.1	14:33
Mars	250°32.7	21:29
Jupiter	289°58.0	18:52
Saturn	9°14.6	13:36

Feb 17 Mon	SHA	Mer.pass
Venus	354°44.5	14:31
Mars	250°39.4	21:25
Jupiter	289°55.5	18:48
Saturn	9°08.0	13:33

Horizontal parallax	
Venus:	0.4
Mars:	0.2

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.7	S12°40.0	330°33.5	16.7′	N02°38.5	14.6′	54.7′
1	191°28.7	39.1	345°09.2	16.7′	02°23.9	14.5′	54.7′
2	206°28.7	38.2	359°44.9	16.8′	02°09.4	14.6′	54.7′
3	221°28.7	·· 37.4	14°20.7	16.8′	01°54.8	14.5′	54.7′
4	236°28.8	36.5	28°56.4	16.8′	01°40.3	14.6′	54.7′
5	251°28.8	35.7	43°32.3	16.8′	01°25.7	14.5′	54.6′
6	266°28.8	S12°34.8	58°08.1	16.9′	N01°11.2	14.5′	54.6′
7	281°28.9	33.9	72°43.9	16.9′	00°56.7	14.5′	54.6′
8	296°28.9	33.1	87°19.8	16.9′	00°42.2	14.6′	54.6′
9	311°28.9	·· 32.2	101°55.7	16.9′	00°27.6	14.5′	54.6′
10	326°29.0	31.4	116°31.6	16.9′	N00°13.1	14.5′	54.6′
11	341°29.0	30.5	131°07.5	16.9′	S00°01.4	14.5′	54.6′
12	356°29.0	S12°29.6	145°43.5	17.0′	S00°15.9	14.5′	54.5′
13	11°29.1	28.8	160°19.4	17.0′	00°30.4	14.4′	54.5′
14	26°29.1	27.9	174°55.4	17.0′	00°44.8	14.5′	54.5′
15	41°29.2	·· 27.0	189°31.4	17.0′	00°59.3	14.5′	54.5′
16	56°29.2	26.2	204°07.4	17.0′	01°13.8	14.4′	54.5′
17	71°29.2	25.3	218°43.4	17.0′	01°28.2	14.4′	54.5′
18	86°29.3	S12°24.5	233°19.4	17.0′	S01°42.6	14.4′	54.5′
19	101°29.3	23.6	247°55.4	17.0′	01°57.0	14.4′	54.5′
20	116°29.3	22.7	262°31.4	17.0′	02°11.4	14.4′	54.4′
21	131°29.4	·· 21.9	277°07.5	17.0′	02°25.8	14.4′	54.4′
22	146°29.4	21.0	291°43.5	17.0′	02°40.2	14.4′	54.4′
23	161°29.4	20.1	306°19.5	17.0′	02°54.6	14.3′	54.4′
	SD = 16.2′	d = 0.9′	SD = 14.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.5	S12°19.3	320°55.6	17.0′	S03°08.9	14.3′	54.4′
1	191°29.5	18.4	335°31.6	17.0′	03°23.2	14.3′	54.4′
2	206°29.6	17.5	350°07.7	17.0′	03°37.5	14.3′	54.4′
3	221°29.6	·· 16.7	4°43.7	17.0′	03°51.8	14.2′	54.4′
4	236°29.6	15.8	19°19.8	17.0′	04°06.0	14.3′	54.3′
5	251°29.7	14.9	33°55.8	17.0′	04°20.3	14.2′	54.3′
6	266°29.7	S12°14.0	48°31.8	17.0′	S04°34.5	14.2′	54.3′
7	281°29.8	13.2	63°07.9	17.0′	04°48.7	14.2′	54.3′
8	296°29.8	12.3	77°43.9	17.0′	05°02.9	14.1′	54.3′
9	311°29.8	·· 11.4	92°19.9	17.0′	05°17.0	14.1′	54.3′
10	326°29.9	10.6	106°55.9	17.0′	05°31.1	14.1′	54.3′
11	341°29.9	09.7	121°31.9	17.0′	05°45.2	14.1′	54.3′
12	356°30.0	S12°08.8	136°07.9	17.0′	S05°59.3	14.0′	54.3′
13	11°30.0	08.0	150°43.9	17.0′	06°13.3	14.0′	54.3′
14	26°30.0	07.1	165°19.8	17.0′	06°27.3	14.0′	54.3′
15	41°30.1	·· 06.2	179°55.8	16.9′	06°41.3	14.0′	54.2′
16	56°30.1	05.3	194°31.7	16.9′	06°55.3	13.9′	54.2′
17	71°30.2	04.5	209°07.6	16.9′	07°09.2	13.9′	54.2′
18	86°30.2	S12°03.6	223°43.6	16.9′	S07°23.1	13.9′	54.2′
19	101°30.3	02.7	238°19.4	16.9′	07°37.0	13.8′	54.2′
20	116°30.3	01.8	252°55.3	16.8′	07°50.8	13.8′	54.2′
21	131°30.4	·· 01.0	267°31.2	16.8′	08°04.6	13.8′	54.2′
22	146°30.4	12°00.1	282°07.0	16.8′	08°18.4	13.7′	54.2′
23	161°30.4	11°59.2	296°42.8	16.8′	08°32.1	13.7′	54.2′
	SD = 16.2′	d = 0.9′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.5	S11°58.3	311°18.6	16.8′	S08°45.8	13.7′	54.2′
1	191°30.5	57.5	325°54.3	16.7′	08°59.5	13.6′	54.2′
2	206°30.6	56.6	340°30.1	16.7′	09°13.1	13.6′	54.2′
3	221°30.6	·· 55.7	355°05.8	16.7′	09°26.7	13.5′	54.2′
4	236°30.7	54.8	9°41.5	16.7′	09°40.2	13.5′	54.2′
5	251°30.7	54.0	24°17.1	16.6′	09°53.7	13.5′	54.1′
6	266°30.8	S11°53.1	38°52.7	16.6′	S10°07.2	13.4′	54.1′
7	281°30.8	52.2	53°28.3	16.6′	10°20.6	13.4′	54.1′
8	296°30.9	51.3	68°03.9	16.5′	10°34.0	13.4′	54.1′
9	311°30.9	·· 50.5	82°39.4	16.5′	10°47.4	13.3′	54.1′
10	326°31.0	49.6	97°14.9	16.5′	11°00.7	13.3′	54.1′
11	341°31.0	48.7	111°50.4	16.4′	11°14.0	13.2′	54.1′
12	356°31.1	S11°47.8	126°25.8	16.4′	S11°27.2	13.2′	54.1′
13	11°31.1	46.9	141°01.2	16.4′	11°40.4	13.1′	54.1′
14	26°31.2	46.1	155°36.5	16.3′	11°53.5	13.1′	54.1′
15	41°31.2	·· 45.2	170°11.9	16.3′	12°06.6	13.0′	54.1′
16	56°31.3	44.3	184°47.1	16.2′	12°19.6	13.0′	54.1′
17	71°31.3	43.4	199°22.4	16.2′	12°32.6	13.0′	54.1′
18	86°31.4	S11°42.5	213°57.6	16.2′	S12°45.6	12.9′	54.1′
19	101°31.4	41.7	228°32.7	16.1′	12°58.5	12.8′	54.1′
20	116°31.5	40.8	243°07.8	16.1′	13°11.3	12.8′	54.1′
21	131°31.5	·· 39.9	257°42.9	16.0′	13°24.1	12.8′	54.1′
22	146°31.6	39.0	272°17.9	16.0′	13°36.9	12.7′	54.1′
23	161°31.6	38.1	286°52.9	15.9′	13°49.6	12.6′	54.1′
	SD = 16.2′	d = 0.9′	SD = 14.8′				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	06:09	07:29	08:46	15:43	17:01	18:21
N 70°	06:08	07:20	08:28	16:02	17:10	18:22
68°	06:07	07:12	08:13	16:17	17:17	18:23
66°	06:06	07:06	08:01	16:28	17:24	18:24
64°	06:05	07:00	07:51	16:38	17:29	18:25
62°	06:04	06:55	07:42	16:47	17:34	18:26
60°	06:03	06:51	07:35	16:54	17:38	18:27
N 58°	06:02	06:47	07:28	17:01	17:42	18:28
56°	06:01	06:44	07:22	17:06	17:45	18:29
54°	05:59	06:41	07:17	17:12	17:48	18:30
52°	05:58	06:38	07:13	17:16	17:51	18:30
50°	05:57	06:35	07:08	17:20	17:54	18:31
45°	05:55	06:29	06:59	17:30	18:00	18:34
N 40°	05:52	06:24	06:51	17:37	18:05	18:37
35°	05:49	06:19	06:45	17:44	18:10	18:39
30°	05:46	06:14	06:39	17:50	18:14	18:42
20°	05:40	06:06	06:28	18:00	18:22	18:48
N 10°	05:33	05:58	06:19	18:09	18:30	18:55
0°	05:25	05:49	06:11	18:17	18:39	19:03
S 10°	05:15	05:40	06:02	18:26	18:48	19:13
20°	05:03	05:30	05:52	18:35	18:58	19:25
30°	04:47	05:16	05:41	18:46	19:11	19:40
35°	04:37	05:08	05:35	18:53	19:19	19:50
40°	04:24	04:59	05:28	19:00	19:28	20:03
45°	04:09	04:48	05:19	19:08	19:39	20:18
S 50°	03:49	04:33	05:09	19:18	19:53	20:37
52°	03:40	04:27	05:04	19:23	20:00	20:47
54°	03:28	04:19	04:58	19:28	20:07	20:58
56°	03:15	04:10	04:52	19:34	20:16	21:10
58°	03:00	04:01	04:46	19:41	20:25	21:25
S 60°	02:41	03:49	04:38	19:48	20:36	21:44

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	21:03	23:05	·· ··	08:18	07:45	07:08
N 70°	20:59	22:51	·· ··	08:17	07:52	07:24
68°	20:56	22:40	·· ··	08:16	07:58	07:37
66°	20:54	22:31	·· ··	08:16	08:02	07:48
64°	20:52	22:23	23:58	08:15	08:06	07:57
62°	20:50	22:17	23:46	08:15	08:10	08:05
60°	20:48	22:11	23:36	08:15	08:13	08:12
N 58°	20:47	22:07	23:27	08:14	08:16	08:18
56°	20:46	22:02	23:20	08:14	08:18	08:23
54°	20:45	21:58	23:13	08:14	08:21	08:28
52°	20:44	21:55	23:07	08:14	08:23	08:32
50°	20:43	21:52	23:01	08:14	08:25	08:36
45°	20:41	21:45	22:50	08:13	08:29	08:45
N 40°	20:39	21:39	22:40	08:13	08:32	08:52
35°	20:38	21:34	22:32	08:12	08:35	08:58
30°	20:37	21:30	22:24	08:12	08:38	09:04
20°	20:35	21:23	22:12	08:12	08:42	09:13
N 10°	20:33	21:17	22:01	08:11	08:46	09:22
0°	20:31	21:11	21:51	08:11	08:50	09:30
S 10°	20:29	21:05	21:41	08:10	08:54	09:38
20°	20:28	20:58	21:30	08:10	08:58	09:46
30°	20:26	20:51	21:18	08:09	09:03	09:56
35°	20:25	20:47	21:11	08:09	09:05	10:02
40°	20:23	20:43	21:04	08:08	09:08	10:08
45°	20:22	20:38	20:54	08:08	09:12	10:16
S 50°	20:20	20:31	20:44	08:07	09:16	10:25
52°	20:19	20:28	20:39	08:07	09:18	10:29
54°	20:19	20:25	20:33	08:06	09:20	10:34
56°	20:18	20:22	20:27	08:06	09:23	10:39
58°	20:17	20:18	20:20	08:06	09:25	10:45
S 60°	20:15	20:14	20:12	08:05	09:28	10:52

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	94-82%
15	14:05	14:04	12:14	02:01	14:21	
16	14:02	14:00	12:14	02:41	15:00	
17	13:58	13:56	12:14	03:20	15:40	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1966 sec ΔT = TT-UT1 = +68.9874 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	148°12.7	142°37.2	N07°35.2	38°57.9	N26°09.9	78°05.4	N21°44.7	157°14.1	S05°58.2
1	163°15.1	157°38.9	36.0	54°00.6	09.8	93°07.7	44.7	172°16.3	58.1
2	178°17.6	172°40.5	36.8	69°03.2	09.8	108°10.0	44.7	187°18.5	58.0
3	193°20.1	187°42.2	·· 37.7	84°05.9	·· 09.7	123°12.4	·· 44.7	202°20.7	·· 57.8
4	208°22.5	202°43.9	38.5	99°08.6	09.7	138°14.7	44.8	217°22.9	57.7
5	223°25.0	217°45.6	39.3	114°11.3	09.6	153°17.1	44.8	232°25.1	57.6
6	238°27.4	232°47.2	N07°40.1	129°14.0	N26°09.6	168°19.4	N21°44.8	247°27.3	S05°57.5
7	253°29.9	247°48.9	41.0	144°16.6	09.5	183°21.8	44.8	262°29.5	57.4
8	268°32.4	262°50.6	41.8	159°19.3	09.5	198°24.1	44.9	277°31.7	57.3
9	283°34.8	277°52.3	·· 42.6	174°22.0	·· 09.4	213°26.4	·· 44.9	292°33.8	·· 57.1
10	298°37.3	292°54.0	43.4	189°24.7	09.4	228°28.8	44.9	307°36.0	57.0
11	313°39.8	307°55.7	44.3	204°27.3	09.3	243°31.1	44.9	322°38.2	56.9
12	328°42.2	322°57.4	N07°45.1	219°30.0	N26°09.3	258°33.5	N21°45.0	337°40.4	S05°56.8
13	343°44.7	337°59.1	45.9	234°32.7	09.2	273°35.8	45.0	352°42.6	56.7
14	358°47.2	353°00.8	46.7	249°35.4	09.2	288°38.2	45.0	7°44.8	56.6
15	13°49.6	8°02.5	·· 47.5	264°38.0	·· 09.2	303°40.5	·· 45.0	22°47.0	·· 56.4
16	28°52.1	23°04.2	48.3	279°40.7	09.1	318°42.8	45.1	37°49.2	56.3
17	43°54.5	38°05.9	49.1	294°43.4	09.1	333°45.2	45.1	52°51.4	56.2
18	58°57.0	53°07.6	N07°50.0	309°46.0	N26°09.0	348°47.5	N21°45.1	67°53.6	S05°56.1
19	73°59.5	68°09.3	50.8	324°48.7	09.0	3°49.8	45.1	82°55.7	56.0
20	89°01.9	83°11.0	51.6	339°51.3	08.9	18°52.2	45.2	97°57.9	55.9
21	104°04.4	98°12.8	·· 52.4	354°54.0	·· 08.9	33°54.5	·· 45.2	113°00.1	·· 55.7
22	119°06.9	113°14.5	53.2	9°56.7	08.8	48°56.9	45.2	128°02.3	55.6
23	134°09.3	128°16.2	54.0	24°59.3	08.8	63°59.2	45.2	143°04.5	55.5
Mer.pass.	14:05	ν 1.7′	d 0.8′	m -4.86	ν 2.7′	d -0.0′	m -0.58	ν 2.3′	d 0.0′	m -2.38	ν 2.2′	d 0.1′	m 1.12

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	149°11.8	143°18.0	N07°54.8	40°02.0	N26°08.7	79°01.5	N21°45.2	158°06.7	S05°55.4
1	164°14.3	158°19.7	55.6	55°04.6	08.7	94°03.9	45.3	173°08.9	55.3
2	179°16.7	173°21.4	56.4	70°07.3	08.6	109°06.2	45.3	188°11.1	55.1
3	194°19.2	188°23.2	·· 57.2	85°09.9	·· 08.6	124°08.5	·· 45.3	203°13.3	·· 55.0
4	209°21.7	203°24.9	58.0	100°12.6	08.5	139°10.9	45.3	218°15.4	54.9
5	224°24.1	218°26.7	58.8	115°15.2	08.5	154°13.2	45.4	233°17.6	54.8
6	239°26.6	233°28.4	N07°59.6	130°17.8	N26°08.4	169°15.5	N21°45.4	248°19.8	S05°54.7
7	254°29.0	248°30.2	08°00.4	145°20.5	08.4	184°17.9	45.4	263°22.0	54.6
8	269°31.5	263°31.9	01.2	160°23.1	08.3	199°20.2	45.4	278°24.2	54.4
9	284°34.0	278°33.7	·· 02.0	175°25.8	·· 08.3	214°22.5	·· 45.5	293°26.4	·· 54.3
10	299°36.4	293°35.4	02.8	190°28.4	08.2	229°24.9	45.5	308°28.6	54.2
11	314°38.9	308°37.2	03.6	205°31.0	08.1	244°27.2	45.5	323°30.8	54.1
12	329°41.4	323°39.0	N08°04.3	220°33.7	N26°08.1	259°29.5	N21°45.5	338°33.0	S05°54.0
13	344°43.8	338°40.7	05.1	235°36.3	08.0	274°31.9	45.6	353°35.1	53.8
14	359°46.3	353°42.5	05.9	250°39.0	08.0	289°34.2	45.6	8°37.3	53.7
15	14°48.8	8°44.3	·· 06.7	265°41.6	·· 07.9	304°36.5	·· 45.6	23°39.5	·· 53.6
16	29°51.2	23°46.1	07.5	280°44.2	07.9	319°38.9	45.6	38°41.7	53.5
17	44°53.7	38°47.8	08.3	295°46.8	07.8	334°41.2	45.7	53°43.9	53.4
18	59°56.2	53°49.6	N08°09.1	310°49.5	N26°07.8	349°43.5	N21°45.7	68°46.1	S05°53.3
19	74°58.6	68°51.4	09.8	325°52.1	07.7	4°45.9	45.7	83°48.3	53.1
20	90°01.1	83°53.2	10.6	340°54.7	07.7	19°48.2	45.7	98°50.5	53.0
21	105°03.5	98°55.0	·· 11.4	355°57.3	·· 07.6	34°50.5	·· 45.8	113°52.7	·· 52.9
22	120°06.0	113°56.8	12.2	11°00.0	07.6	49°52.9	45.8	128°54.8	52.8
23	135°08.5	128°58.6	12.9	26°02.6	07.5	64°55.2	45.8	143°57.0	52.7
Mer.pass.	14:01	ν 1.7′	d 0.8′	m -4.86	ν 2.7′	d -0.1′	m -0.56	ν 2.3′	d 0.0′	m -2.38	ν 2.2′	d 0.1′	m 1.12

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	150°10.9	144°00.4	N08°13.7	41°05.2	N26°07.4	79°57.5	N21°45.9	158°59.2	S05°52.6
1	165°13.4	159°02.2	14.5	56°07.8	07.4	94°59.8	45.9	174°01.4	52.4
2	180°15.9	174°04.0	15.3	71°10.4	07.3	110°02.2	45.9	189°03.6	52.3
3	195°18.3	189°05.8	·· 16.0	86°13.0	·· 07.3	125°04.5	·· 45.9	204°05.8	·· 52.2
4	210°20.8	204°07.6	16.8	101°15.7	07.2	140°06.8	46.0	219°08.0	52.1
5	225°23.3	219°09.5	17.6	116°18.3	07.2	155°09.1	46.0	234°10.2	52.0
6	240°25.7	234°11.3	N08°18.3	131°20.9	N26°07.1	170°11.5	N21°46.0	249°12.4	S05°51.8
7	255°28.2	249°13.1	19.1	146°23.5	07.1	185°13.8	46.0	264°14.5	51.7
8	270°30.6	264°14.9	19.9	161°26.1	07.0	200°16.1	46.1	279°16.7	51.6
9	285°33.1	279°16.8	·· 20.6	176°28.7	·· 06.9	215°18.4	·· 46.1	294°18.9	·· 51.5
10	300°35.6	294°18.6	21.4	191°31.3	06.9	230°20.8	46.1	309°21.1	51.4
11	315°38.0	309°20.4	22.2	206°33.9	06.8	245°23.1	46.1	324°23.3	51.3
12	330°40.5	324°22.3	N08°22.9	221°36.5	N26°06.8	260°25.4	N21°46.2	339°25.5	S05°51.1
13	345°43.0	339°24.1	23.7	236°39.1	06.7	275°27.7	46.2	354°27.7	51.0
14	0°45.4	354°26.0	24.4	251°41.7	06.7	290°30.1	46.2	9°29.9	50.9
15	15°47.9	9°27.8	·· 25.2	266°44.3	·· 06.6	305°32.4	·· 46.2	24°32.0	·· 50.8
16	30°50.4	24°29.7	25.9	281°46.9	06.5	320°34.7	46.3	39°34.2	50.7
17	45°52.8	39°31.5	26.7	296°49.5	06.5	335°37.0	46.3	54°36.4	50.5
18	60°55.3	54°33.4	N08°27.4	311°52.1	N26°06.4	350°39.4	N21°46.3	69°38.6	S05°50.4
19	75°57.8	69°35.2	28.2	326°54.7	06.4	5°41.7	46.3	84°40.8	50.3
20	91°00.2	84°37.1	28.9	341°57.2	06.3	20°44.0	46.4	99°43.0	50.2
21	106°02.7	99°39.0	·· 29.7	356°59.8	·· 06.2	35°46.3	·· 46.4	114°45.2	·· 50.1
22	121°05.1	114°40.8	30.4	12°02.4	06.2	50°48.6	46.4	129°47.4	50.0
23	136°07.6	129°42.7	31.2	27°05.0	06.1	65°51.0	46.5	144°49.6	49.8
Mer.pass.	13:57	ν 1.8′	d 0.8′	m -4.86	ν 2.6′	d -0.1′	m -0.53	ν 2.3′	d 0.0′	m -2.37	ν 2.2′	d 0.1′	m 1.12

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.4
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.4	-57°06.8
Hamal	327°51.2	23°34.9
Polaris	314°05.7	89°22.5
Acamar	315°11.8	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.2	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.6	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°25.9	-16°45.2
Adhara	255°05.5	-29°00.5
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.1	-59°35.5
Suhail	222°45.8	-43°32.1
Miaplacidus	221°37.4	-69°49.3
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.2	61°36.8
Denebola	182°24.6	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	172°59.5	-63°14.2
Gacrux	171°51.1	-57°15.1
Alioth	166°12.4	55°49.1
Spica	158°22.0	-11°17.6
Alkaid	152°51.6	49°10.9
Hadar	148°35.6	-60°29.5
Menkent	147°57.3	-36°29.6
Arcturus	145°47.7	19°02.8
Rigil Kent.	139°40.0	-60°56.2
Kochab	137°19.4	74°02.7
Zuben'ubi	136°55.8	-16°08.8
Alphecca	126°03.6	26°37.5
Antares	112°15.8	-26°29.2
Atria	107°10.1	-69°04.1
Sabik	102°02.8	-15°45.4
Shaula	96°10.4	-37°07.3
Rasalhague	95°58.6	12°32.3
Eltanin	90°42.4	51°28.8
Kaus Aust.	83°32.6	-34°22.3
Vega	80°33.4	38°48.1
Nunki	75°47.9	-26°16.0
Altair	62°00.1	8°55.9
Peacock	53°06.1	-56°39.2
Deneb	49°26.2	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.5
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.3

Feb 18 Tue	SHA	Mer.pass
Venus	354°24.5	14:28
Mars	250°45.2	21:20
Jupiter	289°52.7	18:45
Saturn	9°01.5	13:29

Feb 19 Wed	SHA	Mer.pass
Venus	354°06.2	14:25
Mars	250°50.2	21:16
Jupiter	289°49.7	18:41
Saturn	8°54.9	13:26

Feb 20 Thu	SHA	Mer.pass
Venus	353°49.5	14:22
Mars	250°54.3	21:12
Jupiter	289°46.6	18:37
Saturn	8°48.3	13:22

Horizontal parallax	
Venus:	0.4
Mars:	0.2

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°31.7	S11°37.3	301°27.8	15.9′	S14°02.2	12.6′	54.1′
1	191°31.7	36.4	316°02.7	15.8′	14°14.8	12.6′	54.1′
2	206°31.8	35.5	330°37.5	15.8′	14°27.4	12.5′	54.1′
3	221°31.8	·· 34.6	345°12.3	15.7′	14°39.9	12.4′	54.1′
4	236°31.9	33.7	359°47.0	15.7′	14°52.3	12.4′	54.1′
5	251°31.9	32.8	14°21.7	15.6′	15°04.7	12.3′	54.1′
6	266°32.0	S11°31.9	28°56.3	15.6′	S15°17.0	12.2′	54.1′
7	281°32.0	31.1	43°30.9	15.5′	15°29.2	12.2′	54.1′
8	296°32.1	30.2	58°05.4	15.5′	15°41.4	12.2′	54.1′
9	311°32.1	·· 29.3	72°39.9	15.4′	15°53.6	12.1′	54.1′
10	326°32.2	28.4	87°14.3	15.3′	16°05.7	12.0′	54.1′
11	341°32.3	27.5	101°48.6	15.3′	16°17.7	11.9′	54.1′
12	356°32.3	S11°26.6	116°22.9	15.2′	S16°29.6	11.9′	54.1′
13	11°32.4	25.7	130°57.1	15.2′	16°41.5	11.9′	54.1′
14	26°32.4	24.9	145°31.3	15.1′	16°53.4	11.7′	54.1′
15	41°32.5	·· 24.0	160°05.4	15.0′	17°05.1	11.7′	54.1′
16	56°32.5	23.1	174°39.5	15.0′	17°16.8	11.7′	54.1′
17	71°32.6	22.2	189°13.5	14.9′	17°28.5	11.5′	54.1′
18	86°32.7	S11°21.3	203°47.4	14.9′	S17°40.0	11.5′	54.1′
19	101°32.7	20.4	218°21.2	14.8′	17°51.5	11.5′	54.1′
20	116°32.8	19.5	232°55.0	14.7′	18°03.0	11.3′	54.1′
21	131°32.8	·· 18.6	247°28.8	14.7′	18°14.3	11.3′	54.1′
22	146°32.9	17.7	262°02.4	14.6′	18°25.6	11.3′	54.2′
23	161°32.9	16.9	276°36.0	14.5′	18°36.9	11.1′	54.2′
	SD = 16.2′	d = 0.9′	SD = 14.8′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.0	S11°16.0	291°09.5	14.5′	S18°48.0	11.1′	54.2′
1	191°33.1	15.1	305°43.0	14.4′	18°59.1	11.0′	54.2′
2	206°33.1	14.2	320°16.4	14.3′	19°10.1	11.0′	54.2′
3	221°33.2	·· 13.3	334°49.7	14.2′	19°21.1	10.8′	54.2′
4	236°33.2	12.4	349°22.9	14.2′	19°31.9	10.8′	54.2′
5	251°33.3	11.5	3°56.1	14.1′	19°42.7	10.7′	54.2′
6	266°33.4	S11°10.6	18°29.2	14.0′	S19°53.4	10.6′	54.2′
7	281°33.4	09.7	33°02.2	14.0′	20°04.0	10.6′	54.2′
8	296°33.5	08.8	47°35.2	13.9′	20°14.6	10.5′	54.2′
9	311°33.5	·· 07.9	62°08.0	13.8′	20°25.1	10.3′	54.2′
10	326°33.6	07.0	76°40.8	13.7′	20°35.4	10.4′	54.2′
11	341°33.7	06.2	91°13.6	13.6′	20°45.8	10.2′	54.3′
12	356°33.7	S11°05.3	105°46.2	13.6′	S20°56.0	10.1′	54.3′
13	11°33.8	04.4	120°18.8	13.5′	21°06.1	10.1′	54.3′
14	26°33.9	03.5	134°51.3	13.4′	21°16.2	10.0′	54.3′
15	41°33.9	·· 02.6	149°23.7	13.3′	21°26.2	9.9′	54.3′
16	56°34.0	01.7	163°56.0	13.3′	21°36.1	9.8′	54.3′
17	71°34.1	11°00.8	178°28.3	13.2′	21°45.9	9.7′	54.3′
18	86°34.1	S10°59.9	193°00.5	13.1′	S21°55.6	9.6′	54.3′
19	101°34.2	59.0	207°32.6	13.0′	22°05.2	9.5′	54.3′
20	116°34.2	58.1	222°04.6	12.9′	22°14.7	9.5′	54.4′
21	131°34.3	·· 57.2	236°36.5	12.8′	22°24.2	9.3′	54.4′
22	146°34.4	56.3	251°08.4	12.8′	22°33.5	9.3′	54.4′
23	161°34.4	55.4	265°40.1	12.7′	22°42.8	9.2′	54.4′
	SD = 16.2′	d = 0.9′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°34.5	S10°54.5	280°11.8	12.6′	S22°52.0	9.0′	54.4′
1	191°34.6	53.6	294°43.4	12.5′	23°01.0	9.0′	54.4′
2	206°34.6	52.7	309°14.9	12.4′	23°10.0	8.9′	54.4′
3	221°34.7	·· 51.8	323°46.4	12.3′	23°18.9	8.8′	54.4′
4	236°34.8	50.9	338°17.7	12.3′	23°27.7	8.7′	54.5′
5	251°34.8	50.0	352°49.0	12.2′	23°36.4	8.5′	54.5′
6	266°34.9	S10°49.1	7°20.1	12.1′	S23°44.9	8.5′	54.5′
7	281°35.0	48.2	21°51.2	12.0′	23°53.4	8.4′	54.5′
8	296°35.0	47.3	36°22.2	11.9′	24°01.8	8.3′	54.5′
9	311°35.1	·· 46.4	50°53.2	11.8′	24°10.1	8.2′	54.5′
10	326°35.2	45.5	65°24.0	11.7′	24°18.3	8.0′	54.6′
11	341°35.3	44.6	79°54.7	11.7′	24°26.3	8.0′	54.6′
12	356°35.3	S10°43.7	94°25.4	11.6′	S24°34.3	7.9′	54.6′
13	11°35.4	42.8	108°56.0	11.5′	24°42.2	7.7′	54.6′
14	26°35.5	41.9	123°26.5	11.4′	24°49.9	7.7′	54.6′
15	41°35.5	·· 41.0	137°56.9	11.3′	24°57.6	7.5′	54.6′
16	56°35.6	40.1	152°27.2	11.2′	25°05.1	7.4′	54.7′
17	71°35.7	39.2	166°57.4	11.1′	25°12.5	7.3′	54.7′
18	86°35.7	S10°38.3	181°27.5	11.1′	S25°19.8	7.2′	54.7′
19	101°35.8	37.4	195°57.6	11.0′	25°27.0	7.1′	54.7′
20	116°35.9	36.5	210°27.5	10.9′	25°34.1	7.0′	54.7′
21	131°36.0	·· 35.6	224°57.4	10.8′	25°41.1	6.8′	54.8′
22	146°36.0	34.7	239°27.2	10.7′	25°47.9	6.8′	54.8′
23	161°36.1	33.8	253°56.9	10.6′	25°54.7	6.6′	54.8′
	SD = 16.2′	d = 0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:56	07:15	08:29	16:00	17:15	18:34
N 70°	05:56	07:07	08:13	16:16	17:22	18:33
68°	05:56	07:01	08:00	16:29	17:28	18:33
66°	05:56	06:56	07:50	16:39	17:33	18:33
64°	05:56	06:51	07:41	16:48	17:38	18:33
62°	05:55	06:47	07:33	16:56	17:42	18:33
60°	05:55	06:43	07:26	17:02	17:45	18:34
N 58°	05:55	06:40	07:21	17:08	17:48	18:34
56°	05:54	06:37	07:15	17:13	17:51	18:35
54°	05:53	06:35	07:11	17:18	17:54	18:35
52°	05:53	06:32	07:07	17:22	17:56	18:36
50°	05:52	06:30	07:03	17:26	17:59	18:36
45°	05:50	06:25	06:54	17:34	18:04	18:38
N 40°	05:48	06:20	06:47	17:41	18:08	18:40
35°	05:46	06:16	06:41	17:47	18:12	18:42
30°	05:44	06:12	06:36	17:52	18:16	18:44
20°	05:38	06:04	06:27	18:01	18:23	18:49
N 10°	05:32	05:57	06:18	18:09	18:31	18:55
0°	05:25	05:49	06:10	18:17	18:38	19:03
S 10°	05:16	05:41	06:02	18:25	18:46	19:11
20°	05:05	05:31	05:54	18:34	18:56	19:23
30°	04:50	05:19	05:44	18:43	19:08	19:37
35°	04:40	05:11	05:38	18:49	19:15	19:47
40°	04:29	05:03	05:31	18:56	19:24	19:58
45°	04:14	04:52	05:23	19:03	19:34	20:12
S 50°	03:56	04:39	05:14	19:13	19:47	20:30
52°	03:47	04:33	05:09	19:17	19:53	20:39
54°	03:37	04:26	05:05	19:22	20:00	20:49
56°	03:25	04:18	04:59	19:27	20:08	21:01
58°	03:10	04:09	04:53	19:33	20:17	21:14
S 60°	02:53	03:59	04:46	19:39	20:27	21:31

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	01:26	▬	▬	06:12	▬	▬
N 70°	00:54	03:55	▬	06:46	05:15	▬
68°	00:31	02:42	▬	07:11	06:28	▬
66°	00:13	02:06	04:48	07:30	07:06	05:59
64°	·· ··	01:41	03:38	07:46	07:32	07:09
62°	·· ··	01:21	03:03	07:59	07:53	07:45
60°	·· ··	01:05	02:38	08:10	08:10	08:11
N 58°	·· ··	00:51	02:18	08:20	08:24	08:32
56°	·· ··	00:39	02:02	08:29	08:37	08:49
54°	·· ··	00:29	01:48	08:36	08:47	09:03
52°	·· ··	00:20	01:35	08:43	08:57	09:16
50°	·· ··	00:12	01:25	08:49	09:06	09:27
45°	23:55	·· ··	01:02	09:03	09:24	09:50
N 40°	23:42	·· ··	00:45	09:14	09:39	10:09
35°	23:30	·· ··	00:30	09:23	09:52	10:25
30°	23:20	·· ··	00:17	09:32	10:03	10:38
20°	23:02	23:55	·· ··	09:46	10:22	11:02
N 10°	22:47	23:36	·· ··	09:59	10:39	11:22
0°	22:33	23:18	·· ··	10:11	10:55	11:41
S 10°	22:19	23:01	23:46	10:23	11:10	12:00
20°	22:04	22:42	23:25	10:36	11:27	12:21
30°	21:48	22:21	23:00	10:51	11:47	12:45
35°	21:38	22:09	22:45	11:00	11:59	12:59
40°	21:27	21:54	22:28	11:09	12:12	13:15
45°	21:14	21:37	22:07	11:21	12:28	13:35
S 50°	20:58	21:17	21:42	11:35	12:47	13:59
52°	20:51	21:07	21:30	11:42	12:56	14:11
54°	20:43	20:56	21:16	11:49	13:07	14:25
56°	20:34	20:44	20:59	11:58	13:18	14:41
58°	20:23	20:29	20:40	12:07	13:32	15:00
S 60°	20:12	20:12	20:16	12:18	13:48	15:23

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 20-22 75-57%
18	13:53	13:51	12:14	04:01	16:22	
19	13:48	13:45	12:14	04:44	17:06	
20	13:42	13:39	12:14	05:30	17:54	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1973 sec ΔT = TT-UT1 = +68.9867 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	151°10.1	144°44.6	N08°31.9	42°07.6	N26°06.1	80°53.3	N21°46.5	159°51.7	S05°49.7
1	166°12.5	159°46.5	32.7	57°10.2	06.0	95°55.6	46.5	174°53.9	49.6
2	181°15.0	174°48.3	33.4	72°12.7	05.9	110°57.9	46.5	189°56.1	49.5
3	196°17.5	189°50.2	·· 34.2	87°15.3	·· 05.9	126°00.2	·· 46.6	204°58.3	·· 49.4
4	211°19.9	204°52.1	34.9	102°17.9	05.8	141°02.6	46.6	220°00.5	49.2
5	226°22.4	219°54.0	35.6	117°20.5	05.8	156°04.9	46.6	235°02.7	49.1
6	241°24.9	234°55.9	N08°36.4	132°23.1	N26°05.7	171°07.2	N21°46.6	250°04.9	S05°49.0
7	256°27.3	249°57.8	37.1	147°25.6	05.6	186°09.5	46.7	265°07.1	48.9
8	271°29.8	264°59.7	37.8	162°28.2	05.6	201°11.8	46.7	280°09.2	48.8
9	286°32.3	280°01.6	·· 38.6	177°30.8	·· 05.5	216°14.1	·· 46.7	295°11.4	·· 48.6
10	301°34.7	295°03.5	39.3	192°33.3	05.5	231°16.5	46.7	310°13.6	48.5
11	316°37.2	310°05.4	40.0	207°35.9	05.4	246°18.8	46.8	325°15.8	48.4
12	331°39.6	325°07.3	N08°40.8	222°38.5	N26°05.3	261°21.1	N21°46.8	340°18.0	S05°48.3
13	346°42.1	340°09.3	41.5	237°41.0	05.3	276°23.4	46.8	355°20.2	48.2
14	1°44.6	355°11.2	42.2	252°43.6	05.2	291°25.7	46.9	10°22.4	48.1
15	16°47.0	10°13.1	·· 42.9	267°46.2	·· 05.1	306°28.0	·· 46.9	25°24.5	·· 47.9
16	31°49.5	25°15.0	43.6	282°48.7	05.1	321°30.3	46.9	40°26.7	47.8
17	46°52.0	40°17.0	44.4	297°51.3	05.0	336°32.7	46.9	55°28.9	47.7
18	61°54.4	55°18.9	N08°45.1	312°53.8	N26°05.0	351°35.0	N21°47.0	70°31.1	S05°47.6
19	76°56.9	70°20.8	45.8	327°56.4	04.9	6°37.3	47.0	85°33.3	47.5
20	91°59.4	85°22.8	46.5	342°58.9	04.8	21°39.6	47.0	100°35.5	47.3
21	107°01.8	100°24.7	·· 47.2	358°01.5	·· 04.8	36°41.9	·· 47.0	115°37.7	·· 47.2
22	122°04.3	115°26.7	48.0	13°04.0	04.7	51°44.2	47.1	130°39.9	47.1
23	137°06.7	130°28.6	48.7	28°06.6	04.6	66°46.5	47.1	145°42.0	47.0
Mer.pass.	13:53	ν 1.9′	d 0.7′	m -4.85	ν 2.6′	d -0.1′	m -0.50	ν 2.3′	d 0.0′ m -2.36	ν 2.2′	d 0.1′ m 1.12

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	152°09.2	145°30.6	N08°49.4	43°09.1	N26°04.6	81°48.8	N21°47.1	160°44.2	S05°46.9
1	167°11.7	160°32.5	50.1	58°11.7	04.5	96°51.2	47.2	175°46.4	46.7
2	182°14.1	175°34.5	50.8	73°14.2	04.4	111°53.5	47.2	190°48.6	46.6
3	197°16.6	190°36.4	·· 51.5	88°16.8	·· 04.4	126°55.8	·· 47.2	205°50.8	·· 46.5
4	212°19.1	205°38.4	52.2	103°19.3	04.3	141°58.1	47.2	220°53.0	46.4
5	227°21.5	220°40.4	52.9	118°21.8	04.2	157°00.4	47.3	235°55.2	46.3
6	242°24.0	235°42.3	N08°53.6	133°24.4	N26°04.2	172°02.7	N21°47.3	250°57.4	S05°46.2
7	257°26.5	250°44.3	54.3	148°26.9	04.1	187°05.0	47.3	265°59.5	46.0
8	272°28.9	265°46.3	55.0	163°29.5	04.0	202°07.3	47.3	281°01.7	45.9
9	287°31.4	280°48.3	·· 55.7	178°32.0	·· 04.0	217°09.6	·· 47.4	296°03.9	·· 45.8
10	302°33.9	295°50.3	56.4	193°34.5	03.9	232°11.9	47.4	311°06.1	45.7
11	317°36.3	310°52.2	57.1	208°37.1	03.8	247°14.3	47.4	326°08.3	45.6
12	332°38.8	325°54.2	N08°57.8	223°39.6	N26°03.8	262°16.6	N21°47.5	341°10.5	S05°45.4
13	347°41.2	340°56.2	58.5	238°42.1	03.7	277°18.9	47.5	356°12.7	45.3
14	2°43.7	355°58.2	59.2	253°44.6	03.6	292°21.2	47.5	11°14.8	45.2
15	17°46.2	11°00.2	08°59.9	268°47.2	·· 03.6	307°23.5	·· 47.5	26°17.0	·· 45.1
16	32°48.6	26°02.2	09°00.6	283°49.7	03.5	322°25.8	47.6	41°19.2	45.0
17	47°51.1	41°04.2	01.3	298°52.2	03.4	337°28.1	47.6	56°21.4	44.8
18	62°53.6	56°06.2	N09°01.9	313°54.7	N26°03.4	352°30.4	N21°47.6	71°23.6	S05°44.7
19	77°56.0	71°08.3	02.6	328°57.3	03.3	7°32.7	47.7	86°25.8	44.6
20	92°58.5	86°10.3	03.3	343°59.8	03.2	22°35.0	47.7	101°28.0	44.5
21	108°01.0	101°12.3	·· 04.0	359°02.3	·· 03.2	37°37.3	·· 47.7	116°30.1	·· 44.4
22	123°03.4	116°14.3	04.7	14°04.8	03.1	52°39.6	47.7	131°32.3	44.3
23	138°05.9	131°16.3	05.3	29°07.3	03.0	67°41.9	47.8	146°34.5	44.1
Mer.pass.	13:49	ν 2.0′	d 0.7′	m -4.85	ν 2.5′	d -0.1′	m -0.47	ν 2.3′	d 0.0′ m -2.35	ν 2.2′	d 0.1′ m 1.12

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	153°08.4	146°18.4	N09°06.0	44°09.8	N26°03.0	82°44.2	N21°47.8	161°36.7	S05°44.0
1	168°10.8	161°20.4	06.7	59°12.3	02.9	97°46.5	47.8	176°38.9	43.9
2	183°13.3	176°22.4	07.4	74°14.9	02.8	112°48.8	47.9	191°41.1	43.8
3	198°15.7	191°24.5	·· 08.0	89°17.4	·· 02.8	127°51.1	·· 47.9	206°43.3	·· 43.7
4	213°18.2	206°26.5	08.7	104°19.9	02.7	142°53.4	47.9	221°45.4	43.5
5	228°20.7	221°28.6	09.4	119°22.4	02.6	157°55.7	47.9	236°47.6	43.4
6	243°23.1	236°30.6	N09°10.1	134°24.9	N26°02.5	172°58.0	N21°48.0	251°49.8	S05°43.3
7	258°25.6	251°32.7	10.7	149°27.4	02.5	188°00.3	48.0	266°52.0	43.2
8	273°28.1	266°34.7	11.4	164°29.9	02.4	203°02.6	48.0	281°54.2	43.1
9	288°30.5	281°36.8	·· 12.1	179°32.4	·· 02.3	218°04.9	·· 48.1	296°56.4	·· 42.9
10	303°33.0	296°38.9	12.7	194°34.9	02.3	233°07.2	48.1	311°58.6	42.8
11	318°35.5	311°40.9	13.4	209°37.4	02.2	248°09.5	48.1	327°00.7	42.7
12	333°37.9	326°43.0	N09°14.0	224°39.9	N26°02.1	263°11.8	N21°48.1	342°02.9	S05°42.6
13	348°40.4	341°45.1	14.7	239°42.4	02.0	278°14.1	48.2	357°05.1	42.5
14	3°42.9	356°47.1	15.3	254°44.9	02.0	293°16.4	48.2	12°07.3	42.3
15	18°45.3	11°49.2	·· 16.0	269°47.4	·· 01.9	308°18.7	·· 48.2	27°09.5	·· 42.2
16	33°47.8	26°51.3	16.7	284°49.8	01.8	323°21.0	48.3	42°11.7	42.1
17	48°50.2	41°53.4	17.3	299°52.3	01.8	338°23.3	48.3	57°13.9	42.0
18	63°52.7	56°55.5	N09°18.0	314°54.8	N26°01.7	353°25.6	N21°48.3	72°16.0	S05°41.9
19	78°55.2	71°57.6	18.6	329°57.3	01.6	8°27.9	48.3	87°18.2	41.8
20	93°57.6	86°59.7	19.3	344°59.8	01.5	23°30.2	48.4	102°20.4	41.6
21	109°00.1	102°01.8	·· 19.9	0°02.3	·· 01.5	38°32.5	·· 48.4	117°22.6	·· 41.5
22	124°02.6	117°03.9	20.5	15°04.8	01.4	53°34.8	48.4	132°24.8	41.4
23	139°05.0	132°06.0	21.2	30°07.2	01.3	68°37.1	48.5	147°27.0	41.3
Mer.pass.	13:45	ν 2.0′	d 0.7′	m -4.85	ν 2.5′	d -0.1′	m -0.44	ν 2.3′	d 0.0′ m -2.34	ν 2.2′	d 0.1′ m 1.12

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.4
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.4	-57°06.8
Hamal	327°51.3	23°34.9
Polaris	314°07.0	89°22.5
Acamar	315°11.8	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.2	49°57.2
Aldebaran	290°39.4	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.6	46°01.5
Bellatrix	278°22.6	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.0	-52°42.7
Sirius	258°25.9	-16°45.2
Adhara	255°05.5	-29°00.5
Procyon	244°50.5	5°09.6
Pollux	243°16.9	27°57.9
Avior	234°14.2	-59°35.5
Suhail	222°45.8	-43°32.1
Miaplacidus	221°37.4	-69°49.3
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.2	61°36.8
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	172°59.5	-63°14.2
Gacrux	171°51.1	-57°15.2
Alioth	166°12.4	55°49.1
Spica	158°22.0	-11°17.6
Alkaid	152°51.6	49°10.9
Hadar	148°35.6	-60°29.5
Menkent	147°57.3	-36°29.6
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°39.9	-60°56.2
Kochab	137°19.4	74°02.7
Zuben'ubi	136°55.8	-16°08.8
Alphecca	126°03.6	26°37.5
Antares	112°15.7	-26°29.3
Atria	107°10.0	-69°04.1
Sabik	102°02.8	-15°45.4
Shaula	96°10.4	-37°07.2
Rasalhague	95°58.6	12°32.3
Eltanin	90°42.4	51°28.8
Kaus Aust.	83°32.6	-34°22.3
Vega	80°33.4	38°48.1
Nunki	75°47.9	-26°15.9
Altair	62°00.1	8°55.9
Peacock	53°06.1	-56°39.2
Deneb	49°26.2	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.4
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.3

Feb 21 Fri	SHA	Mer.pass
Venus	353°34.5	14:19
Mars	250°57.5	21:08
Jupiter	289°43.2	18:34
Saturn	8°41.7	13:19

Feb 22 Sat	SHA	Mer.pass
Venus	353°21.3	14:16
Mars	250°59.9	21:04
Jupiter	289°39.6	18:30
Saturn	8°35.0	13:15

Feb 23 Sun	SHA	Mer.pass
Venus	353°10.0	14:13
Mars	251°01.5	21:00
Jupiter	289°35.9	18:26
Saturn	8°28.3	13:12

Horizontal parallax	
Venus:	0.4
Mars:	0.2

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°36.2	S10°32.9	268°26.5	10.5′	S26°01.3	6.5′	54.8′
1	191°36.2	32.0	282°56.1	10.4′	26°07.8	6.4′	54.8′
2	206°36.3	31.1	297°25.5	10.4′	26°14.2	6.2′	54.9′
3	221°36.4	·· 30.2	311°54.9	10.3′	26°20.4	6.2′	54.9′
4	236°36.5	29.2	326°24.1	10.2′	26°26.6	6.0′	54.9′
5	251°36.5	28.3	340°53.3	10.1′	26°32.6	5.9′	54.9′
6	266°36.6	S10°27.4	355°22.4	10.0′	S26°38.5	5.7′	54.9′
7	281°36.7	26.5	9°51.5	9.9′	26°44.2	5.7′	55.0′
8	296°36.8	25.6	24°20.4	9.9′	26°49.9	5.5′	55.0′
9	311°36.8	·· 24.7	38°49.2	9.8′	26°55.4	5.4′	55.0′
10	326°36.9	23.8	53°18.0	9.7′	27°00.8	5.2′	55.0′
11	341°37.0	22.9	67°46.7	9.6′	27°06.0	5.1′	55.1′
12	356°37.1	S10°22.0	82°15.3	9.5′	S27°11.1	5.0′	55.1′
13	11°37.1	21.1	96°43.8	9.4′	27°16.1	4.9′	55.1′
14	26°37.2	20.2	111°12.3	9.4′	27°21.0	4.7′	55.1′
15	41°37.3	·· 19.3	125°40.6	9.3′	27°25.7	4.6′	55.2′
16	56°37.4	18.4	140°08.9	9.2′	27°30.3	4.4′	55.2′
17	71°37.4	17.4	154°37.1	9.1′	27°34.7	4.4′	55.2′
18	86°37.5	S10°16.5	169°05.2	9.0′	S27°39.1	4.1′	55.2′
19	101°37.6	15.6	183°33.3	9.0′	27°43.2	4.1′	55.3′
20	116°37.7	14.7	198°01.2	8.9′	27°47.3	3.9′	55.3′
21	131°37.8	·· 13.8	212°29.1	8.8′	27°51.2	3.8′	55.3′
22	146°37.8	12.9	226°57.0	8.7′	27°55.0	3.6′	55.3′
23	161°37.9	12.0	241°24.7	8.7′	27°58.6	3.5′	55.4′
	SD = 16.2′	d = 0.9′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°38.0	S10°11.1	255°52.4	8.6′	S28°02.1	3.3′	55.4′
1	191°38.1	10.2	270°20.0	8.5′	28°05.4	3.2′	55.4′
2	206°38.2	09.2	284°47.5	8.5′	28°08.6	3.0′	55.4′
3	221°38.2	·· 08.3	299°14.9	8.4′	28°11.6	2.9′	55.5′
4	236°38.3	07.4	313°42.3	8.3′	28°14.5	2.8′	55.5′
5	251°38.4	06.5	328°09.7	8.3′	28°17.3	2.6′	55.5′
6	266°38.5	S10°05.6	342°36.9	8.2′	S28°19.9	2.5′	55.6′
7	281°38.6	04.7	357°04.1	8.1′	28°22.4	2.3′	55.6′
8	296°38.6	03.8	11°31.2	8.1′	28°24.7	2.1′	55.6′
9	311°38.7	·· 02.9	25°58.3	8.0′	28°26.8	2.0′	55.6′
10	326°38.8	01.9	40°25.3	7.9′	28°28.8	1.9′	55.7′
11	341°38.9	01.0	54°52.2	7.9′	28°30.7	1.7′	55.7′
12	356°39.0	S10°00.1	69°19.1	7.8′	S28°32.4	1.6′	55.7′
13	11°39.0	09°59.2	83°45.9	7.8′	28°34.0	1.4′	55.8′
14	26°39.1	58.3	98°12.6	7.7′	28°35.4	1.2′	55.8′
15	41°39.2	·· 57.4	112°39.3	7.6′	28°36.6	1.1′	55.8′
16	56°39.3	56.5	127°06.0	7.6′	28°37.7	0.9′	55.9′
17	71°39.4	55.5	141°32.6	7.5′	28°38.6	0.8′	55.9′
18	86°39.5	S09°54.6	155°59.1	7.5′	S28°39.4	0.6′	55.9′
19	101°39.5	53.7	170°25.6	7.4′	28°40.0	0.5′	56.0′
20	116°39.6	52.8	184°52.0	7.4′	28°40.5	0.3′	56.0′
21	131°39.7	·· 51.9	199°18.4	7.3′	28°40.8	0.1′	56.0′
22	146°39.8	51.0	213°44.8	7.3′	28°40.9	0.0′	56.0′
23	161°39.9	50.0	228°11.1	7.3′	28°40.9	0.2′	56.1′
	SD = 16.2′	d = 0.9′	SD = 15.1′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°40.0	S09°49.1	242°37.3	7.2′	S28°40.7	0.3′	56.1′
1	191°40.1	48.2	257°03.6	7.2′	28°40.4	0.5′	56.1′
2	206°40.1	47.3	271°29.7	7.1′	28°39.9	0.7′	56.2′
3	221°40.2	·· 46.4	285°55.9	7.1′	28°39.2	0.8′	56.2′
4	236°40.3	45.4	300°22.0	7.1′	28°38.4	1.0′	56.2′
5	251°40.4	44.5	314°48.0	7.0′	28°37.4	1.1′	56.3′
6	266°40.5	S09°43.6	329°14.1	7.0′	S28°36.3	1.3′	56.3′
7	281°40.6	42.7	343°40.1	7.0′	28°35.0	1.5′	56.3′
8	296°40.7	41.8	358°06.1	6.9′	28°33.5	1.7′	56.4′
9	311°40.7	·· 40.8	12°32.0	6.9′	28°31.8	1.8′	56.4′
10	326°40.8	39.9	26°57.9	6.9′	28°30.0	1.9′	56.4′
11	341°40.9	39.0	41°23.8	6.9′	28°28.1	2.2′	56.5′
12	356°41.0	S09°38.1	55°49.7	6.8′	S28°25.9	2.3′	56.5′
13	11°41.1	37.2	70°15.5	6.8′	28°23.6	2.5′	56.5′
14	26°41.2	36.2	84°41.4	6.8′	28°21.1	2.6′	56.6′
15	41°41.3	·· 35.3	99°07.2	6.8′	28°18.5	2.8′	56.6′
16	56°41.4	34.4	113°33.0	6.8′	28°15.7	3.0′	56.7′
17	71°41.5	33.5	127°58.7	6.8′	28°12.7	3.1′	56.7′
18	86°41.5	S09°32.5	142°24.5	6.8′	S28°09.6	3.3′	56.7′
19	101°41.6	31.6	156°50.3	6.7′	28°06.3	3.5′	56.8′
20	116°41.7	30.7	171°16.0	6.7′	28°02.8	3.7′	56.8′
21	131°41.8	·· 29.8	185°41.7	6.7′	27°59.1	3.8′	56.8′
22	146°41.9	28.9	200°07.5	6.7′	27°55.3	4.0′	56.9′
23	161°42.0	27.9	214°33.2	6.7′	27°51.3	4.1′	56.9′
	SD = 16.2′	d = 0.9′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:42	07:00	08:13	16:16	17:28	18:47
N 70°	05:44	06:54	07:59	16:29	17:34	18:45
68°	05:45	06:49	07:48	16:41	17:39	18:44
66°	05:46	06:45	07:38	16:50	17:43	18:43
64°	05:47	06:42	07:31	16:57	17:47	18:42
62°	05:47	06:38	07:24	17:04	17:50	18:41
60°	05:47	06:35	07:18	17:10	17:53	18:41
N 58°	05:47	06:33	07:13	17:15	17:55	18:41
56°	05:47	06:30	07:08	17:19	17:57	18:41
54°	05:47	06:28	07:04	17:24	18:00	18:41
52°	05:47	06:26	07:00	17:27	18:02	18:41
50°	05:47	06:24	06:57	17:31	18:03	18:41
45°	05:46	06:20	06:50	17:38	18:08	18:42
N 40°	05:44	06:16	06:43	17:44	18:12	18:43
35°	05:43	06:12	06:38	17:49	18:15	18:44
30°	05:41	06:09	06:33	17:54	18:18	18:46
20°	05:37	06:02	06:25	18:02	18:25	18:50
N 10°	05:31	05:56	06:17	18:10	18:31	18:56
0°	05:25	05:49	06:10	18:17	18:38	19:02
S 10°	05:17	05:41	06:03	18:24	18:45	19:10
20°	05:06	05:32	05:55	18:32	18:54	19:20
30°	04:52	05:21	05:46	18:40	19:05	19:34
35°	04:43	05:14	05:41	18:46	19:12	19:43
40°	04:33	05:06	05:35	18:51	19:20	19:53
45°	04:19	04:57	05:28	18:58	19:29	20:06
S 50°	04:02	04:45	05:19	19:07	19:41	20:23
52°	03:54	04:39	05:15	19:11	19:46	20:31
54°	03:44	04:33	05:11	19:15	19:53	20:40
56°	03:34	04:25	05:06	19:20	20:00	20:51
58°	03:21	04:17	05:00	19:25	20:08	21:04
S 60°	03:05	04:08	04:54	19:31	20:17	21:19

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	04:59	▬	▬	07:32	▬	▬
60°	04:15	05:48	06:51	08:16	08:34	09:27
N 58°	03:46	05:07	06:08	08:46	09:14	10:09
56°	03:24	04:40	05:40	09:08	09:42	10:38
54°	03:05	04:18	05:18	09:27	10:04	11:00
52°	02:50	04:00	04:59	09:43	10:22	11:18
50°	02:37	03:45	04:44	09:56	10:37	11:34
45°	02:10	03:14	04:12	10:24	11:08	12:05
N 40°	01:48	02:50	03:48	10:46	11:32	12:29
35°	01:30	02:31	03:28	11:04	11:52	12:49
30°	01:15	02:14	03:11	11:20	12:09	13:06
20°	00:49	01:46	02:42	11:47	12:38	13:34
N 10°	00:27	01:22	02:17	12:10	13:02	13:59
0°	00:07	00:59	01:54	12:32	13:25	14:22
S 10°	·· ··	00:37	01:31	12:53	13:48	14:44
20°	·· ··	00:13	01:07	13:16	14:13	15:08
30°	23:45	·· ··	00:38	13:43	14:41	15:37
35°	23:29	·· ··	00:21	13:59	14:58	15:53
40°	23:09	·· ··	00:01	14:18	15:18	16:13
45°	22:46	23:37	·· ··	14:41	15:42	16:36
S 50°	22:17	23:06	·· ··	15:10	16:13	17:06
52°	22:03	22:50	23:55	15:24	16:29	17:21
54°	21:46	22:32	23:38	15:40	16:47	17:38
56°	21:26	22:10	23:18	16:00	17:09	17:59
58°	21:01	21:42	22:52	16:25	17:37	18:25
S 60°	20:27	21:01	22:17	16:58	18:19	19:00

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 47-28%
21	13:35	13:32	12:14	06:19	18:45	
22	13:28	13:24	12:13	07:12	19:40	
23	13:20	13:16	12:13	08:08	20:36	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1981 sec ΔT = TT-UT1 = +68.9859 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	154°07.5	147°08.1	N09°21.8	45°09.7	N26°01.2	83°39.4	N21°48.5	162°29.2	S05°41.2
1	169°10.0	162°10.2	22.5	60°12.2	01.2	98°41.7	48.5	177°31.3	41.0
2	184°12.4	177°12.3	23.1	75°14.7	01.1	113°44.0	48.6	192°33.5	40.9
3	199°14.9	192°14.4	·· 23.7	90°17.1	·· 01.0	128°46.3	·· 48.6	207°35.7	·· 40.8
4	214°17.4	207°16.6	24.4	105°19.6	00.9	143°48.6	48.6	222°37.9	40.7
5	229°19.8	222°18.7	25.0	120°22.1	00.9	158°50.9	48.6	237°40.1	40.6
6	244°22.3	237°20.8	N09°25.6	135°24.6	N26°00.8	173°53.1	N21°48.7	252°42.3	S05°40.4
7	259°24.7	252°23.0	26.3	150°27.0	00.7	188°55.4	48.7	267°44.5	40.3
8	274°27.2	267°25.1	26.9	165°29.5	00.6	203°57.7	48.7	282°46.6	40.2
9	289°29.7	282°27.2	·· 27.5	180°32.0	·· 00.6	219°00.0	·· 48.8	297°48.8	·· 40.1
10	304°32.1	297°29.4	28.2	195°34.4	00.5	234°02.3	48.8	312°51.0	40.0
11	319°34.6	312°31.5	28.8	210°36.9	00.4	249°04.6	48.8	327°53.2	39.8
12	334°37.1	327°33.7	N09°29.4	225°39.3	N26°00.3	264°06.9	N21°48.8	342°55.4	S05°39.7
13	349°39.5	342°35.8	30.0	240°41.8	00.3	279°09.2	48.9	357°57.6	39.6
14	4°42.0	357°38.0	30.6	255°44.3	00.2	294°11.5	48.9	12°59.7	39.5
15	19°44.5	12°40.1	·· 31.3	270°46.7	·· 00.1	309°13.8	·· 48.9	28°01.9	·· 39.4
16	34°46.9	27°42.3	31.9	285°49.2	00.0	324°16.1	49.0	43°04.1	39.2
17	49°49.4	42°44.5	32.5	300°51.6	26°00.0	339°18.3	49.0	58°06.3	39.1
18	64°51.8	57°46.7	N09°33.1	315°54.1	N25°59.9	354°20.6	N21°49.0	73°08.5	S05°39.0
19	79°54.3	72°48.8	33.7	330°56.5	59.8	9°22.9	49.1	88°10.7	38.9
20	94°56.8	87°51.0	34.3	345°59.0	59.7	24°25.2	49.1	103°12.9	38.8
21	109°59.2	102°53.2	·· 34.9	1°01.4	·· 59.7	39°27.5	·· 49.1	118°15.0	·· 38.7
22	125°01.7	117°55.4	35.5	16°03.9	59.6	54°29.8	49.2	133°17.2	38.5
23	140°04.2	132°57.6	36.1	31°06.3	59.5	69°32.1	49.2	148°19.4	38.4
Mer.pass.	13:41	ν 2.1′	d 0.6′	m -4.84	ν 2.5′	d -0.1′	m -0.42	ν 2.3′	d 0.0′ m -2.34	ν 2.2′	d 0.1′ m 1.12

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	155°06.6	147°59.8	N09°36.8	46°08.8	N25°59.4	84°34.4	N21°49.2	163°21.6	S05°38.3
1	170°09.1	163°01.9	37.4	61°11.2	59.3	99°36.6	49.2	178°23.8	38.2
2	185°11.6	178°04.1	38.0	76°13.7	59.3	114°38.9	49.3	193°26.0	38.1
3	200°14.0	193°06.3	·· 38.6	91°16.1	·· 59.2	129°41.2	·· 49.3	208°28.1	·· 37.9
4	215°16.5	208°08.6	39.1	106°18.5	59.1	144°43.5	49.3	223°30.3	37.8
5	230°19.0	223°10.8	39.7	121°21.0	59.0	159°45.8	49.4	238°32.5	37.7
6	245°21.4	238°13.0	N09°40.3	136°23.4	N25°58.9	174°48.1	N21°49.4	253°34.7	S05°37.6
7	260°23.9	253°15.2	40.9	151°25.8	58.9	189°50.4	49.4	268°36.9	37.5
8	275°26.3	268°17.4	41.5	166°28.3	58.8	204°52.6	49.5	283°39.1	37.3
9	290°28.8	283°19.6	·· 42.1	181°30.7	·· 58.7	219°54.9	·· 49.5	298°41.2	·· 37.2
10	305°31.3	298°21.9	42.7	196°33.1	58.6	234°57.2	49.5	313°43.4	37.1
11	320°33.7	313°24.1	43.3	211°35.6	58.6	249°59.5	49.5	328°45.6	37.0
12	335°36.2	328°26.3	N09°43.9	226°38.0	N25°58.5	265°01.8	N21°49.6	343°47.8	S05°36.9
13	350°38.7	343°28.6	44.4	241°40.4	58.4	280°04.1	49.6	358°50.0	36.7
14	5°41.1	358°30.8	45.0	256°42.9	58.3	295°06.3	49.6	13°52.2	36.6
15	20°43.6	13°33.0	·· 45.6	271°45.3	·· 58.2	310°08.6	·· 49.7	28°54.4	·· 36.5
16	35°46.1	28°35.3	46.2	286°47.7	58.1	325°10.9	49.7	43°56.5	36.4
17	50°48.5	43°37.5	46.8	301°50.1	58.1	340°13.2	49.7	58°58.7	36.3
18	65°51.0	58°39.8	N09°47.3	316°52.5	N25°58.0	355°15.5	N21°49.8	74°00.9	S05°36.1
19	80°53.5	73°42.1	47.9	331°55.0	57.9	10°17.7	49.8	89°03.1	36.0
20	95°55.9	88°44.3	48.5	346°57.4	57.8	25°20.0	49.8	104°05.3	35.9
21	110°58.4	103°46.6	·· 49.0	1°59.8	·· 57.7	40°22.3	·· 49.9	119°07.5	·· 35.8
22	126°00.8	118°48.9	49.6	17°02.2	57.7	55°24.6	49.9	134°09.6	35.7
23	141°03.3	133°51.1	50.2	32°04.6	57.6	70°26.9	49.9	149°11.8	35.5
Mer.pass.	13:37	ν 2.2′	d 0.6′	m -4.83	ν 2.4′	d -0.1′	m -0.39	ν 2.3′	d 0.0′ m -2.33	ν 2.2′	d 0.1′ m 1.11

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	156°05.8	148°53.4	N09°50.7	47°07.0	N25°57.5	85°29.1	N21°50.0	164°14.0	S05°35.4
1	171°08.2	163°55.7	51.3	62°09.4	57.4	100°31.4	50.0	179°16.2	35.3
2	186°10.7	178°58.0	51.9	77°11.8	57.3	115°33.7	50.0	194°18.4	35.2
3	201°13.2	194°00.3	·· 52.4	92°14.2	·· 57.2	130°36.0	·· 50.0	209°20.6	·· 35.1
4	216°15.6	209°02.5	53.0	107°16.7	57.2	145°38.2	50.1	224°22.7	34.9
5	231°18.1	224°04.8	53.5	122°19.1	57.1	160°40.5	50.1	239°24.9	34.8
6	246°20.6	239°07.1	N09°54.1	137°21.5	N25°57.0	175°42.8	N21°50.1	254°27.1	S05°34.7
7	261°23.0	254°09.4	54.6	152°23.9	56.9	190°45.1	50.2	269°29.3	34.6
8	276°25.5	269°11.7	55.2	167°26.3	56.8	205°47.3	50.2	284°31.5	34.5
9	291°28.0	284°14.1	·· 55.7	182°28.7	·· 56.7	220°49.6	·· 50.2	299°33.7	·· 34.3
10	306°30.4	299°16.4	56.3	197°31.1	56.7	235°51.9	50.3	314°35.8	34.2
11	321°32.9	314°18.7	56.8	212°33.5	56.6	250°54.2	50.3	329°38.0	34.1
12	336°35.3	329°21.0	N09°57.4	227°35.8	N25°56.5	265°56.4	N21°50.3	344°40.2	S05°34.0
13	351°37.8	344°23.3	57.9	242°38.2	56.4	280°58.7	50.4	359°42.4	33.9
14	6°40.3	359°25.6	58.5	257°40.6	56.3	296°01.0	50.4	14°44.6	33.7
15	21°42.7	14°28.0	·· 59.0	272°43.0	·· 56.2	311°03.3	·· 50.4	29°46.8	·· 33.6
16	36°45.2	29°30.3	09°59.5	287°45.4	56.2	326°05.5	50.5	44°48.9	33.5
17	51°47.7	44°32.6	10°00.1	302°47.8	56.1	341°07.8	50.5	59°51.1	33.4
18	66°50.1	59°35.0	N10°00.6	317°50.2	N25°56.0	356°10.1	N21°50.5	74°53.3	S05°33.3
19	81°52.6	74°37.3	01.1	332°52.6	55.9	11°12.4	50.6	89°55.5	33.1
20	96°55.1	89°39.7	01.7	347°55.0	55.8	26°14.6	50.6	104°57.7	33.0
21	111°57.5	104°42.0	·· 02.2	2°57.3	·· 55.7	41°16.9	·· 50.6	119°59.9	·· 32.9
22	127°00.0	119°44.4	02.7	17°59.7	55.6	56°19.2	50.6	135°02.0	32.8
23	142°02.4	134°46.7	03.2	33°02.1	55.6	71°21.4	50.7	150°04.2	32.7
Mer.pass.	13:33	ν 2.3′	d 0.6′	m -4.82	ν 2.4′	d -0.1′	m -0.36	ν 2.3′	d 0.0′ m -2.32	ν 2.2′	d 0.1′ m 1.11

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.4	-57°06.8
Hamal	327°51.3	23°34.9
Polaris	314°08.3	89°22.5
Acamar	315°11.8	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.2	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.6	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.1	-52°42.8
Sirius	258°25.9	-16°45.2
Adhara	255°05.5	-29°00.5
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.2	-59°35.5
Suhail	222°45.8	-43°32.2
Miaplacidus	221°37.4	-69°49.3
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.2	61°36.8
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	172°59.4	-63°14.2
Gacrux	171°51.1	-57°15.2
Alioth	166°12.4	55°49.1
Spica	158°22.0	-11°17.7
Alkaid	152°51.6	49°10.9
Hadar	148°35.5	-60°29.5
Menkent	147°57.3	-36°29.6
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°39.9	-60°56.2
Kochab	137°19.3	74°02.7
Zuben'ubi	136°55.8	-16°08.8
Alphecca	126°03.6	26°37.5
Antares	112°15.7	-26°29.3
Atria	107°10.0	-69°04.1
Sabik	102°02.7	-15°45.4
Shaula	96°10.3	-37°07.3
Rasalhague	95°58.5	12°32.3
Eltanin	90°42.3	51°28.7
Kaus Aust.	83°32.6	-34°22.3
Vega	80°33.4	38°48.1
Nunki	75°47.8	-26°15.9
Altair	62°00.1	8°55.9
Peacock	53°06.0	-56°39.2
Deneb	49°26.2	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.4
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.3

Feb 24 Mon	SHA	Mer.pass
Venus	353°00.6	14:09
Mars	251°02.2	20:56
Jupiter	289°31.9	18:23
Saturn	8°21.7	13:08

Feb 25 Tue	SHA	Mer.pass
Venus	352°53.1	14:06
Mars	251°02.1	20:52
Jupiter	289°27.7	18:19
Saturn	8°15.0	13:05

Feb 26 Wed	SHA	Mer.pass
Venus	352°47.6	14:02
Mars	251°01.2	20:48
Jupiter	289°23.4	18:15
Saturn	8°08.2	13:01

Horizontal parallax	
Venus:	0.4
Mars:	0.2

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°42.1	S09°27.0	228°58.9	6.7′	S27°47.2	4.3′	56.9′
1	191°42.2	26.1	243°24.6	6.7′	27°42.9	4.5′	57.0′
2	206°42.3	25.2	257°50.3	6.7′	27°38.4	4.7′	57.0′
3	221°42.4	·· 24.2	272°16.0	6.7′	27°33.7	4.8′	57.0′
4	236°42.5	23.3	286°41.8	6.7′	27°28.9	5.0′	57.1′
5	251°42.6	22.4	301°07.5	6.7′	27°23.9	5.1′	57.1′
6	266°42.6	S09°21.5	315°33.2	6.7′	S27°18.8	5.3′	57.2′
7	281°42.7	20.5	329°59.0	6.8′	27°13.5	5.5′	57.2′
8	296°42.8	19.6	344°24.7	6.8′	27°08.0	5.7′	57.2′
9	311°42.9	·· 18.7	358°50.5	6.8′	27°02.3	5.8′	57.3′
10	326°43.0	17.8	13°16.2	6.8′	26°56.5	6.0′	57.3′
11	341°43.1	16.8	27°42.0	6.8′	26°50.5	6.2′	57.3′
12	356°43.2	S09°15.9	42°07.8	6.8′	S26°44.3	6.3′	57.4′
13	11°43.3	15.0	56°33.7	6.8′	26°38.0	6.5′	57.4′
14	26°43.4	14.0	70°59.5	6.9′	26°31.5	6.6′	57.4′
15	41°43.5	·· 13.1	85°25.4	6.9′	26°24.9	6.8′	57.5′
16	56°43.6	12.2	99°51.2	6.9′	26°18.1	7.0′	57.5′
17	71°43.7	11.3	114°17.1	6.9′	26°11.1	7.1′	57.6′
18	86°43.8	S09°10.3	128°43.1	7.0′	S26°04.0	7.3′	57.6′
19	101°43.9	09.4	143°09.0	7.0′	25°56.7	7.5′	57.6′
20	116°44.0	08.5	157°35.0	7.0′	25°49.2	7.6′	57.7′
21	131°44.1	·· 07.5	172°01.0	7.0′	25°41.6	7.8′	57.7′
22	146°44.2	06.6	186°27.0	7.1′	25°33.8	8.0′	57.7′
23	161°44.3	05.7	200°53.1	7.1′	25°25.8	8.1′	57.8′
	SD = 16.2′	d = 0.9′	SD = 15.5′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°44.4	S09°04.8	215°19.2	7.1′	S25°17.7	8.3′	57.8′
1	191°44.5	03.8	229°45.3	7.2′	25°09.4	8.4′	57.9′
2	206°44.6	02.9	244°11.5	7.2′	25°01.0	8.6′	57.9′
3	221°44.7	·· 02.0	258°37.7	7.2′	24°52.4	8.7′	57.9′
4	236°44.8	01.0	273°03.9	7.3′	24°43.7	8.9′	58.0′
5	251°44.9	09°00.1	287°30.2	7.3′	24°34.8	9.1′	58.0′
6	266°45.0	S08°59.2	301°56.5	7.3′	S24°25.7	9.2′	58.0′
7	281°45.0	58.2	316°22.9	7.4′	24°16.5	9.4′	58.1′
8	296°45.1	57.3	330°49.3	7.4′	24°07.1	9.5′	58.1′
9	311°45.2	·· 56.4	345°15.7	7.5′	23°57.6	9.7′	58.1′
10	326°45.3	55.4	359°42.2	7.5′	23°47.9	9.8′	58.2′
11	341°45.4	54.5	14°08.7	7.6′	23°38.1	10.0′	58.2′
12	356°45.5	S08°53.6	28°35.2	7.6′	S23°28.1	10.1′	58.3′
13	11°45.6	52.6	43°01.8	7.6′	23°18.0	10.3′	58.3′
14	26°45.7	51.7	57°28.5	7.7′	23°07.7	10.4′	58.3′
15	41°45.9	·· 50.8	71°55.2	7.7′	22°57.3	10.6′	58.4′
16	56°46.0	49.8	86°21.9	7.8′	22°46.7	10.7′	58.4′
17	71°46.1	48.9	100°48.7	7.8′	22°36.0	10.9′	58.4′
18	86°46.2	S08°48.0	115°15.5	7.9′	S22°25.1	11.0′	58.5′
19	101°46.3	47.0	129°42.4	7.9′	22°14.1	11.2′	58.5′
20	116°46.4	46.1	144°09.3	8.0′	22°02.9	11.3′	58.5′
21	131°46.5	·· 45.2	158°36.3	8.0′	21°51.6	11.4′	58.6′
22	146°46.6	44.2	173°03.3	8.1′	21°40.2	11.6′	58.6′
23	161°46.7	43.3	187°30.4	8.1′	21°28.6	11.7′	58.6′
	SD = 16.2′	d = 0.9′	SD = 15.8′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°46.8	S08°42.4	201°57.6	8.2′	S21°16.9	11.8′	58.7′
1	191°46.9	41.4	216°24.7	8.2′	21°05.1	12.0′	58.7′
2	206°47.0	40.5	230°52.0	8.3′	20°53.1	12.2′	58.7′
3	221°47.1	·· 39.6	245°19.2	8.3′	20°40.9	12.2′	58.8′
4	236°47.2	38.6	259°46.6	8.4′	20°28.7	12.4′	58.8′
5	251°47.3	37.7	274°14.0	8.4′	20°16.3	12.5′	58.8′
6	266°47.4	S08°36.7	288°41.4	8.5′	S20°03.8	12.7′	58.9′
7	281°47.5	35.8	303°08.9	8.5′	19°51.1	12.8′	58.9′
8	296°47.6	34.9	317°36.4	8.6′	19°38.3	12.9′	58.9′
9	311°47.7	·· 33.9	332°04.0	8.6′	19°25.4	13.0′	59.0′
10	326°47.8	33.0	346°31.6	8.7′	19°12.4	13.2′	59.0′
11	341°47.9	32.1	0°59.3	8.7′	18°59.2	13.2′	59.0′
12	356°48.0	S08°31.1	15°27.1	8.8′	S18°46.0	13.4′	59.1′
13	11°48.1	30.2	29°54.9	8.9′	18°32.6	13.6′	59.1′
14	26°48.2	29.2	44°22.7	8.9′	18°19.0	13.6′	59.1′
15	41°48.3	·· 28.3	58°50.6	9.0′	18°05.4	13.8′	59.2′
16	56°48.5	27.4	73°18.6	9.0′	17°51.6	13.8′	59.2′
17	71°48.6	26.4	87°46.6	9.1′	17°37.8	14.0′	59.2′
18	86°48.7	S08°25.5	102°14.7	9.1′	S17°23.8	14.1′	59.3′
19	101°48.8	24.5	116°42.8	9.2′	17°09.7	14.3′	59.3′
20	116°48.9	23.6	131°10.9	9.2′	16°55.4	14.3′	59.3′
21	131°49.0	·· 22.7	145°39.1	9.3′	16°41.1	14.4′	59.4′
22	146°49.1	21.7	160°07.4	9.3′	16°26.7	14.6′	59.4′
23	161°49.2	20.8	174°35.7	9.4′	16°12.1	14.6′	59.4′
	SD = 16.1′	d = 0.9′	SD = 16.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:28	06:46	07:57	16:31	17:42	19:00
N 70°	05:31	06:42	07:45	16:43	17:46	18:57
68°	05:34	06:38	07:35	16:52	17:50	18:54
66°	05:36	06:35	07:27	17:00	17:53	18:52
64°	05:37	06:32	07:20	17:07	17:55	18:50
62°	05:38	06:29	07:15	17:13	17:58	18:49
60°	05:39	06:27	07:09	17:18	18:00	18:48
N 58°	05:40	06:25	07:05	17:22	18:02	18:47
56°	05:40	06:23	07:01	17:26	18:04	18:47
54°	05:41	06:22	06:57	17:30	18:05	18:46
52°	05:41	06:20	06:54	17:33	18:07	18:46
50°	05:41	06:18	06:51	17:36	18:08	18:46
45°	05:41	06:15	06:45	17:42	18:12	18:46
N 40°	05:40	06:12	06:39	17:47	18:15	18:46
35°	05:39	06:09	06:34	17:52	18:18	18:47
30°	05:38	06:06	06:30	17:56	18:20	18:48
20°	05:35	06:00	06:23	18:04	18:26	18:52
N 10°	05:30	05:55	06:16	18:10	18:31	18:56
0°	05:24	05:49	06:10	18:16	18:37	19:01
S 10°	05:17	05:42	06:03	18:23	18:44	19:09
20°	05:08	05:34	05:56	18:29	18:52	19:18
30°	04:55	05:24	05:48	18:37	19:02	19:30
35°	04:47	05:17	05:43	18:42	19:08	19:38
40°	04:37	05:10	05:38	18:47	19:15	19:48
45°	04:24	05:01	05:32	18:53	19:24	20:00
S 50°	04:09	04:50	05:24	19:01	19:34	20:16
52°	04:01	04:45	05:21	19:04	19:40	20:23
54°	03:52	04:39	05:17	19:08	19:45	20:32
56°	03:42	04:33	05:12	19:12	19:52	20:42
58°	03:30	04:25	05:08	19:17	19:59	20:53
S 60°	03:17	04:17	05:02	19:22	20:07	21:07

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	09:54	▬	▬	12:20
68°	▬	▬	08:58	▬	▬	13:14
66°	▬	09:48	08:25	▬	10:29	13:47
64°	▬	08:26	08:00	▬	11:50	14:10
62°	08:05	07:49	07:40	10:12	12:27	14:29
60°	07:15	07:22	07:24	11:02	12:53	14:44
N 58°	06:43	07:01	07:10	11:33	13:13	14:57
56°	06:20	06:44	06:58	11:56	13:30	15:08
54°	06:00	06:29	06:48	12:15	13:44	15:18
52°	05:44	06:16	06:38	12:31	13:56	15:26
50°	05:30	06:05	06:30	12:45	14:07	15:34
45°	05:01	05:41	06:12	13:13	14:30	15:50
N 40°	04:39	05:22	05:57	13:35	14:48	16:03
35°	04:20	05:06	05:45	13:53	15:03	16:14
30°	04:04	04:52	05:34	14:09	15:16	16:24
20°	03:37	04:28	05:15	14:35	15:38	16:41
N 10°	03:13	04:07	04:59	14:58	15:57	16:55
0°	02:51	03:48	04:43	15:18	16:14	17:09
S 10°	02:29	03:28	04:27	15:39	16:32	17:22
20°	02:06	03:08	04:11	16:01	16:51	17:36
30°	01:38	02:43	03:51	16:27	17:12	17:52
35°	01:22	02:29	03:40	16:42	17:24	18:01
40°	01:03	02:12	03:27	16:59	17:39	18:11
45°	00:40	01:53	03:12	17:20	17:55	18:24
S 50°	00:10	01:27	02:52	17:46	18:16	18:38
52°	·· ··	01:15	02:43	17:59	18:26	18:45
54°	·· ··	01:01	02:33	18:13	18:37	18:52
56°	·· ··	00:45	02:21	18:30	18:49	19:01
58°	·· ··	00:25	02:08	18:50	19:03	19:10
S 60°	·· ··	00:01	01:52	19:15	19:20	19:21

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 26-28 19-6%
24	13:12	13:07	12:13	09:05	21:33	
25	13:03	12:58	12:13	10:01	22:29	
26	12:53	12:48	12:13	10:56	23:22	

No IERS EOP prediction data available

February 27, 28, 01 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.1988 sec ΔT = TT-UT1 = +68.9852 sec

2025 February 27 to Mar. 01 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	157°04.9	149°49.1	N10°03.8	48°04.5	N25°55.5	86°23.7	N21°50.7	165°06.4	S05°32.5
1	172°07.4	164°51.5	04.3	63°06.8	55.4	101°26.0	50.7	180°08.6	32.4
2	187°09.8	179°53.8	04.8	78°09.2	55.3	116°28.3	50.8	195°10.8	32.3
3	202°12.3	194°56.2	·· 05.3	93°11.6	·· 55.2	131°30.5	·· 50.8	210°13.0	·· 32.2
4	217°14.8	209°58.6	05.8	108°14.0	55.1	146°32.8	50.8	225°15.1	32.1
5	232°17.2	225°01.0	06.3	123°16.3	55.0	161°35.1	50.9	240°17.3	31.9
6	247°19.7	240°03.3	N10°06.9	138°18.7	N25°55.0	176°37.3	N21°50.9	255°19.5	S05°31.8
7	262°22.2	255°05.7	07.4	153°21.1	54.9	191°39.6	50.9	270°21.7	31.7
8	277°24.6	270°08.1	07.9	168°23.4	54.8	206°41.9	51.0	285°23.9	31.6
9	292°27.1	285°10.5	·· 08.4	183°25.8	·· 54.7	221°44.1	·· 51.0	300°26.1	·· 31.5
10	307°29.6	300°12.9	08.9	198°28.2	54.6	236°46.4	51.0	315°28.2	31.3
11	322°32.0	315°15.3	09.4	213°30.5	54.5	251°48.7	51.1	330°30.4	31.2
12	337°34.5	330°17.7	N10°09.9	228°32.9	N25°54.4	266°50.9	N21°51.1	345°32.6	S05°31.1
13	352°36.9	345°20.1	10.4	243°35.3	54.3	281°53.2	51.1	0°34.8	31.0
14	7°39.4	0°22.6	10.9	258°37.6	54.2	296°55.5	51.2	15°37.0	30.9
15	22°41.9	15°25.0	·· 11.4	273°40.0	·· 54.2	311°57.7	·· 51.2	30°39.2	·· 30.7
16	37°44.3	30°27.4	11.9	288°42.3	54.1	327°00.0	51.2	45°41.3	30.6
17	52°46.8	45°29.8	12.4	303°44.7	54.0	342°02.3	51.3	60°43.5	30.5
18	67°49.3	60°32.2	N10°12.9	318°47.0	N25°53.9	357°04.5	N21°51.3	75°45.7	S05°30.4
19	82°51.7	75°34.7	13.3	333°49.4	53.8	12°06.8	51.3	90°47.9	30.3
20	97°54.2	90°37.1	13.8	348°51.7	53.7	27°09.0	51.4	105°50.1	30.1
21	112°56.7	105°39.5	·· 14.3	3°54.1	·· 53.6	42°11.3	·· 51.4	120°52.2	·· 30.0
22	127°59.1	120°42.0	14.8	18°56.4	53.5	57°13.6	51.4	135°54.4	29.9
23	143°01.6	135°44.4	15.3	33°58.8	53.4	72°15.8	51.5	150°56.6	29.8
Mer.pass.	13:29	ν 2.4′	d 0.5′	m -4.81	ν 2.4′	d -0.1′	m -0.33	ν 2.3′	d 0.0′	m -2.31	ν 2.2′	d 0.1′	m 1.11

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	158°04.1	150°46.9	N10°15.8	49°01.1	N25°53.3	87°18.1	N21°51.5	165°58.8	S05°29.7
1	173°06.5	165°49.3	16.2	64°03.5	53.3	102°20.4	51.5	181°01.0	29.5
2	188°09.0	180°51.8	16.7	79°05.8	53.2	117°22.6	51.6	196°03.2	29.4
3	203°11.4	195°54.3	·· 17.2	94°08.2	·· 53.1	132°24.9	·· 51.6	211°05.3	·· 29.3
4	218°13.9	210°56.7	17.7	109°10.5	53.0	147°27.1	51.6	226°07.5	29.2
5	233°16.4	225°59.2	18.1	124°12.8	52.9	162°29.4	51.7	241°09.7	29.1
6	248°18.8	241°01.7	N10°18.6	139°15.2	N25°52.8	177°31.7	N21°51.7	256°11.9	S05°28.9
7	263°21.3	256°04.1	19.1	154°17.5	52.7	192°33.9	51.7	271°14.1	28.8
8	278°23.8	271°06.6	19.5	169°19.8	52.6	207°36.2	51.8	286°16.3	28.7
9	293°26.2	286°09.1	·· 20.0	184°22.2	·· 52.5	222°38.4	·· 51.8	301°18.4	·· 28.6
10	308°28.7	301°11.6	20.4	199°24.5	52.4	237°40.7	51.8	316°20.6	28.5
11	323°31.2	316°14.1	20.9	214°26.8	52.3	252°43.0	51.9	331°22.8	28.3
12	338°33.6	331°16.6	N10°21.4	229°29.2	N25°52.3	267°45.2	N21°51.9	346°25.0	S05°28.2
13	353°36.1	346°19.1	21.8	244°31.5	52.2	282°47.5	51.9	1°27.2	28.1
14	8°38.5	1°21.6	22.3	259°33.8	52.1	297°49.7	52.0	16°29.3	28.0
15	23°41.0	16°24.1	·· 22.7	274°36.1	·· 52.0	312°52.0	·· 52.0	31°31.5	·· 27.9
16	38°43.5	31°26.6	23.2	289°38.5	51.9	327°54.2	52.0	46°33.7	27.7
17	53°45.9	46°29.1	23.6	304°40.8	51.8	342°56.5	52.1	61°35.9	27.6
18	68°48.4	61°31.6	N10°24.1	319°43.1	N25°51.7	357°58.8	N21°52.1	76°38.1	S05°27.5
19	83°50.9	76°34.1	24.5	334°45.4	51.6	13°01.0	52.1	91°40.3	27.4
20	98°53.3	91°36.6	24.9	349°47.7	51.5	28°03.3	52.2	106°42.4	27.3
21	113°55.8	106°39.2	·· 25.4	4°50.1	·· 51.4	43°05.5	·· 52.2	121°44.6	·· 27.1
22	128°58.3	121°41.7	25.8	19°52.4	51.3	58°07.8	52.2	136°46.8	27.0
23	144°00.7	136°44.2	26.3	34°54.7	51.2	73°10.0	52.3	151°49.0	26.9
Mer.pass.	13:26	ν 2.5′	d 0.5′	m -4.80	ν 2.3′	d -0.1′	m -0.31	ν 2.3′	d 0.0′	m -2.31	ν 2.2′	d 0.1′	m 1.11

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	159°03.2	151°46.8	N10°26.7	49°57.0	N25°51.1	88°12.3	N21°52.3	166°51.2	S05°26.8
1	174°05.7	166°49.3	27.1	64°59.3	51.0	103°14.5	52.3	181°53.4	26.7
2	189°08.1	181°51.9	27.5	80°01.6	50.9	118°16.8	52.4	196°55.5	26.5
3	204°10.6	196°54.4	·· 28.0	95°03.9	·· 50.8	133°19.1	·· 52.4	211°57.7	·· 26.4
4	219°13.0	211°57.0	28.4	110°06.2	50.8	148°21.3	52.4	226°59.9	26.3
5	234°15.5	226°59.5	28.8	125°08.5	50.7	163°23.6	52.5	242°02.1	26.2
6	249°18.0	242°02.1	N10°29.2	140°10.9	N25°50.6	178°25.8	N21°52.5	257°04.3	S05°26.1
7	264°20.4	257°04.7	29.7	155°13.2	50.5	193°28.1	52.5	272°06.4	25.9
8	279°22.9	272°07.2	30.1	170°15.5	50.4	208°30.3	52.6	287°08.6	25.8
9	294°25.4	287°09.8	·· 30.5	185°17.8	·· 50.3	223°32.6	·· 52.6	302°10.8	·· 25.7
10	309°27.8	302°12.4	30.9	200°20.1	50.2	238°34.8	52.6	317°13.0	25.6
11	324°30.3	317°14.9	31.3	215°22.4	50.1	253°37.1	52.7	332°15.2	25.5
12	339°32.8	332°17.5	N10°31.7	230°24.7	N25°50.0	268°39.3	N21°52.7	347°17.4	S05°25.3
13	354°35.2	347°20.1	32.1	245°26.9	49.9	283°41.6	52.7	2°19.5	25.2
14	9°37.7	2°22.7	32.5	260°29.2	49.8	298°43.8	52.8	17°21.7	25.1
15	24°40.1	17°25.3	·· 32.9	275°31.5	·· 49.7	313°46.1	·· 52.8	32°23.9	·· 25.0
16	39°42.6	32°27.9	33.3	290°33.8	49.6	328°48.3	52.8	47°26.1	24.9
17	54°45.1	47°30.5	33.7	305°36.1	49.5	343°50.6	52.9	62°28.3	24.7
18	69°47.5	62°33.1	N10°34.1	320°38.4	N25°49.4	358°52.8	N21°52.9	77°30.4	S05°24.6
19	84°50.0	77°35.7	34.5	335°40.7	49.3	13°55.1	52.9	92°32.6	24.5
20	99°52.5	92°38.3	34.9	350°43.0	49.2	28°57.3	53.0	107°34.8	24.4
21	114°54.9	107°41.0	·· 35.3	5°45.3	·· 49.1	43°59.6	·· 53.0	122°37.0	·· 24.3
22	129°57.4	122°43.6	35.7	20°47.5	49.0	59°01.8	53.0	137°39.2	24.1
23	144°59.9	137°46.2	36.1	35°49.8	48.9	74°04.1	53.1	152°41.4	24.0
Mer.pass.	13:22	ν 2.5′	d 0.4′	m -4.78	ν 2.3′	d -0.1′	m -0.28	ν 2.3′	d 0.0′	m -2.30	ν 2.2′	d 0.1′	m 1.11

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.4	-57°06.8
Hamal	327°51.3	23°34.9
Polaris	314°09.8	89°22.5
Acamar	315°11.8	-40°12.5
Menkar	314°06.1	4°11.2
Mirfak	308°28.2	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.6	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.1	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.2	-59°35.5
Suhail	222°45.8	-43°32.2
Miaplacidus	221°37.5	-69°49.3
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.8
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	172°59.4	-63°14.2
Gacrux	171°51.1	-57°15.2
Alioth	166°12.4	55°49.1
Spica	158°21.9	-11°17.7
Alkaid	152°51.6	49°11.0
Hadar	148°35.5	-60°29.5
Menkent	147°57.3	-36°29.6
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°39.8	-60°56.2
Kochab	137°19.2	74°02.7
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.5
Antares	112°15.7	-26°29.3
Atria	107°09.9	-69°04.1
Sabik	102°02.7	-15°45.4
Shaula	96°10.3	-37°07.3
Rasalhague	95°58.5	12°32.3
Eltanin	90°42.3	51°28.7
Kaus Aust.	83°32.5	-34°22.3
Vega	80°33.4	38°48.1
Nunki	75°47.8	-26°15.9
Altair	62°00.1	8°55.9
Peacock	53°06.0	-56°39.2
Deneb	49°26.1	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.4
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.3

Feb 27 Thu	SHA	Mer.pass
Venus	352°44.2	13:58
Mars	250°59.6	20:44
Jupiter	289°18.8	18:12
Saturn	8°01.5	12:58

Feb 28 Fri	SHA	Mer.pass
Venus	352°42.8	13:55
Mars	250°57.1	20:41
Jupiter	289°14.0	18:08
Saturn	7°54.7	12:54

Mar 01 Sat	SHA	Mer.pass
Venus	352°43.6	13:51
Mars	250°53.8	20:37
Jupiter	289°09.1	18:04
Saturn	7°48.0	12:51

Horizontal parallax	
Venus:	0.4
Mars:	0.2

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.3	S08°19.8	189°04.1	9.4′	S15°57.5	14.8′	59.4′
1	191°49.4	18.9	203°32.5	9.5′	15°42.7	14.8′	59.5′
2	206°49.5	18.0	218°00.9	9.5′	15°27.9	15.0′	59.5′
3	221°49.6	·· 17.0	232°29.4	9.6′	15°12.9	15.0′	59.5′
4	236°49.8	16.1	246°58.0	9.6′	14°57.9	15.2′	59.6′
5	251°49.9	15.1	261°26.6	9.6′	14°42.7	15.2′	59.6′
6	266°50.0	S08°14.2	275°55.2	9.7′	S14°27.5	15.4′	59.6′
7	281°50.1	13.3	290°23.9	9.7′	14°12.1	15.4′	59.6′
8	296°50.2	12.3	304°52.7	9.8′	13°56.7	15.6′	59.7′
9	311°50.3	·· 11.4	319°21.5	9.8′	13°41.1	15.6′	59.7′
10	326°50.4	10.4	333°50.3	9.9′	13°25.5	15.7′	59.7′
11	341°50.5	09.5	348°19.2	9.9′	13°09.8	15.8′	59.7′
12	356°50.6	S08°08.5	2°48.1	10.0′	S12°54.0	15.9′	59.8′
13	11°50.8	07.6	17°17.0	10.0′	12°38.1	15.9′	59.8′
14	26°50.9	06.7	31°46.0	10.0′	12°22.2	16.1′	59.8′
15	41°51.0	·· 05.7	46°15.1	10.1′	12°06.1	16.1′	59.8′
16	56°51.1	04.8	60°44.2	10.1′	11°50.0	16.2′	59.9′
17	71°51.2	03.8	75°13.3	10.2′	11°33.8	16.3′	59.9′
18	86°51.3	S08°02.9	89°42.4	10.2′	S11°17.5	16.3′	59.9′
19	101°51.4	01.9	104°11.6	10.2′	11°01.2	16.5′	59.9′
20	116°51.5	01.0	118°40.9	10.3′	10°44.7	16.5′	60.0′
21	131°51.7	08°00.0	133°10.1	10.3′	10°28.2	16.5′	60.0′
22	146°51.8	07°59.1	147°39.4	10.3′	10°11.7	16.7′	60.0′
23	161°51.9	58.1	162°08.8	10.4′	09°55.0	16.7′	60.0′
	SD = 16.1′	d = 0.9′	SD = 16.2′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°52.0	S07°57.2	176°38.1	10.4′	S09°38.3	16.7′	60.0′
1	191°52.1	56.3	191°07.5	10.4′	09°21.6	16.8′	60.1′
2	206°52.2	55.3	205°37.0	10.5′	09°04.8	16.9′	60.1′
3	221°52.3	·· 54.4	220°06.4	10.5′	08°47.9	17.0′	60.1′
4	236°52.5	53.4	234°35.9	10.5′	08°30.9	17.0′	60.1′
5	251°52.6	52.5	249°05.4	10.5′	08°13.9	17.0′	60.1′
6	266°52.7	S07°51.5	263°35.0	10.6′	S07°56.9	17.1′	60.1′
7	281°52.8	50.6	278°04.6	10.6′	07°39.8	17.2′	60.2′
8	296°52.9	49.6	292°34.2	10.6′	07°22.6	17.2′	60.2′
9	311°53.0	·· 48.7	307°03.8	10.6′	07°05.4	17.3′	60.2′
10	326°53.2	47.7	321°33.4	10.7′	06°48.1	17.3′	60.2′
11	341°53.3	46.8	336°03.1	10.7′	06°30.8	17.3′	60.2′
12	356°53.4	S07°45.8	350°32.8	10.7′	S06°13.5	17.4′	60.2′
13	11°53.5	44.9	5°02.5	10.7′	05°56.1	17.5′	60.3′
14	26°53.6	43.9	19°32.3	10.7′	05°38.6	17.4′	60.3′
15	41°53.7	·· 43.0	34°02.0	10.8′	05°21.2	17.5′	60.3′
16	56°53.9	42.0	48°31.8	10.8′	05°03.7	17.6′	60.3′
17	71°54.0	41.1	63°01.6	10.8′	04°46.1	17.5′	60.3′
18	86°54.1	S07°40.1	77°31.3	10.8′	S04°28.6	17.7′	60.3′
19	101°54.2	39.2	92°01.2	10.8′	04°10.9	17.6′	60.3′
20	116°54.3	38.2	106°31.0	10.8′	03°53.3	17.6′	60.4′
21	131°54.5	·· 37.3	121°00.8	10.8′	03°35.7	17.7′	60.4′
22	146°54.6	36.3	135°30.7	10.9′	03°18.0	17.7′	60.4′
23	161°54.7	35.4	150°00.5	10.9′	03°00.3	17.8′	60.4′
	SD = 16.1′	d = 0.9′	SD = 16.4′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°54.8	S07°34.4	164°30.4	10.9′	S02°42.5	17.7′	60.4′
1	191°54.9	33.5	179°00.2	10.9′	02°24.8	17.8′	60.4′
2	206°55.1	32.5	193°30.1	10.9′	02°07.0	17.8′	60.4′
3	221°55.2	·· 31.6	208°00.0	10.9′	01°49.2	17.8′	60.4′
4	236°55.3	30.6	222°29.9	10.9′	01°31.4	17.8′	60.4′
5	251°55.4	29.7	236°59.8	10.9′	01°13.6	17.8′	60.4′
6	266°55.5	S07°28.7	251°29.6	10.9′	S00°55.8	17.9′	60.4′
7	281°55.7	27.8	265°59.5	10.9′	00°37.9	17.8′	60.5′
8	296°55.8	26.8	280°29.4	10.9′	00°20.1	17.9′	60.5′
9	311°55.9	·· 25.9	294°59.3	10.9′	N00°02.2	17.8′	60.5′
10	326°56.0	24.9	309°29.1	10.9′	N00°15.6	17.8′	60.5′
11	341°56.1	24.0	323°59.0	10.9′	00°33.4	17.9′	60.5′
12	356°56.3	S07°23.0	338°28.9	10.9′	N00°51.3	17.8′	60.5′
13	11°56.4	22.1	352°58.7	10.8′	01°09.1	17.9′	60.5′
14	26°56.5	21.1	7°28.6	10.8′	01°27.0	17.8′	60.5′
15	41°56.6	·· 20.2	21°58.4	10.8′	01°44.8	17.8′	60.5′
16	56°56.8	19.2	36°28.2	10.8′	02°02.6	17.9′	60.5′
17	71°56.9	18.3	50°58.0	10.8′	02°20.5	17.8′	60.5′
18	86°57.0	S07°17.3	65°27.8	10.8′	N02°38.3	17.7′	60.5′
19	101°57.1	16.3	79°57.6	10.8′	02°56.0	17.8′	60.5′
20	116°57.3	15.4	94°27.3	10.7′	03°13.8	17.8′	60.5′
21	131°57.4	·· 14.4	108°57.1	10.7′	03°31.6	17.7′	60.5′
22	146°57.5	13.5	123°26.8	10.7′	03°49.3	17.7′	60.5′
23	161°57.6	12.5	137°56.5	10.7′	04°07.0	17.7′	60.5′
	SD = 16.1′	d = 1.0′	SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:14	06:32	07:41	16:46	17:56	19:14
N 70°	05:18	06:29	07:31	16:56	17:58	19:09
68°	05:22	06:26	07:23	17:04	18:01	19:05
66°	05:25	06:24	07:16	17:10	18:02	19:02
64°	05:27	06:22	07:10	17:16	18:04	18:59
62°	05:29	06:20	07:05	17:21	18:06	18:57
60°	05:31	06:19	07:01	17:25	18:07	18:55
N 58°	05:32	06:17	06:57	17:29	18:09	18:54
56°	05:33	06:16	06:54	17:32	18:10	18:53
54°	05:34	06:15	06:50	17:35	18:11	18:52
52°	05:35	06:14	06:48	17:38	18:12	18:51
50°	05:35	06:13	06:45	17:41	18:13	18:51
45°	05:36	06:10	06:39	17:46	18:16	18:50
N 40°	05:36	06:07	06:35	17:51	18:18	18:49
35°	05:36	06:05	06:31	17:55	18:20	18:50
30°	05:35	06:03	06:27	17:58	18:22	18:50
20°	05:33	05:58	06:20	18:05	18:27	18:53
N 10°	05:29	05:53	06:15	18:10	18:32	18:56
0°	05:24	05:48	06:09	18:16	18:37	19:01
S 10°	05:18	05:42	06:03	18:21	18:42	19:07
20°	05:09	05:35	05:57	18:27	18:49	19:16
30°	04:57	05:26	05:50	18:34	18:58	19:27
35°	04:50	05:20	05:46	18:38	19:04	19:34
40°	04:41	05:14	05:41	18:43	19:10	19:43
45°	04:29	05:06	05:36	18:48	19:18	19:54
S 50°	04:15	04:56	05:29	18:55	19:28	20:09
52°	04:08	04:51	05:26	18:58	19:33	20:16
54°	04:00	04:46	05:23	19:01	19:38	20:23
56°	03:50	04:40	05:19	19:04	19:44	20:32
58°	03:40	04:33	05:15	19:09	19:50	20:43
S 60°	03:27	04:25	05:10	19:13	19:58	20:55

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	09:00	08:06	07:25	15:08	17:51	20:22
N 70°	08:34	07:55	07:24	15:31	17:58	20:17
68°	08:14	07:47	07:24	15:49	18:04	20:14
66°	07:58	07:39	07:23	16:03	18:08	20:10
64°	07:45	07:33	07:23	16:15	18:12	20:08
62°	07:33	07:28	07:22	16:25	18:16	20:06
60°	07:24	07:23	07:22	16:33	18:19	20:04
N 58°	07:15	07:19	07:21	16:40	18:21	20:02
56°	07:08	07:15	07:21	16:46	18:24	20:00
54°	07:01	07:12	07:21	16:52	18:26	19:59
52°	06:55	07:09	07:21	16:57	18:27	19:58
50°	06:50	07:06	07:20	17:02	18:29	19:56
45°	06:38	07:00	07:20	17:12	18:33	19:54
N 40°	06:28	06:54	07:19	17:20	18:36	19:52
35°	06:19	06:50	07:19	17:27	18:38	19:50
30°	06:12	06:46	07:19	17:33	18:41	19:48
20°	05:58	06:39	07:18	17:43	18:44	19:46
N 10°	05:47	06:33	07:18	17:52	18:48	19:43
0°	05:36	06:27	07:17	18:01	18:51	19:41
S 10°	05:25	06:21	07:17	18:09	18:54	19:39
20°	05:14	06:15	07:16	18:18	18:57	19:36
30°	05:00	06:08	07:16	18:28	19:01	19:33
35°	04:52	06:04	07:16	18:33	19:03	19:32
40°	04:43	06:00	07:16	18:40	19:05	19:30
45°	04:33	05:54	07:15	18:47	19:08	19:28
S 50°	04:20	05:48	07:15	18:56	19:11	19:25
52°	04:14	05:45	07:15	19:00	19:12	19:24
54°	04:07	05:41	07:15	19:04	19:14	19:23
56°	04:00	05:38	07:14	19:09	19:16	19:22
58°	03:52	05:34	07:14	19:15	19:18	19:20
S 60°	03:42	05:29	07:14	19:21	19:20	19:18

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 29-1 2-1%
27	12:43	12:37	12:13	11:48	–:–	
28	12:32	12:26	12:12	12:39	00:14	
01	12:21	12:15	12:12	13:29	01:04	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.1995 sec ΔT = TT-UT1 = +68.9845 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	160°02.3	152°48.8	N10°36.5	50°52.1	N25°48.8	89°06.3	N21°53.1	167°43.5	S05°23.9
1	175°04.8	167°51.5	36.9	65°54.4	48.7	104°08.5	53.1	182°45.7	23.8
2	190°07.3	182°54.1	37.3	80°56.7	48.6	119°10.8	53.2	197°47.9	23.7
3	205°09.7	197°56.7	·· 37.6	95°58.9	·· 48.5	134°13.0	·· 53.2	212°50.1	·· 23.5
4	220°12.2	212°59.4	38.0	111°01.2	48.4	149°15.3	53.2	227°52.3	23.4
5	235°14.6	228°02.0	38.4	126°03.5	48.3	164°17.5	53.3	242°54.4	23.3
6	250°17.1	243°04.7	N10°38.8	141°05.8	N25°48.2	179°19.8	N21°53.3	257°56.6	S05°23.2
7	265°19.6	258°07.3	39.1	156°08.0	48.1	194°22.0	53.3	272°58.8	23.1
8	280°22.0	273°10.0	39.5	171°10.3	48.0	209°24.3	53.4	288°01.0	22.9
9	295°24.5	288°12.7	·· 39.9	186°12.6	·· 47.9	224°26.5	·· 53.4	303°03.2	·· 22.8
10	310°27.0	303°15.3	40.2	201°14.9	47.8	239°28.7	53.5	318°05.3	22.7
11	325°29.4	318°18.0	40.6	216°17.1	47.7	254°31.0	53.5	333°07.5	22.6
12	340°31.9	333°20.7	N10°41.0	231°19.4	N25°47.6	269°33.2	N21°53.5	348°09.7	S05°22.5
13	355°34.4	348°23.3	41.3	246°21.6	47.5	284°35.5	53.6	3°11.9	22.3
14	10°36.8	3°26.0	41.7	261°23.9	47.4	299°37.7	53.6	18°14.1	22.2
15	25°39.3	18°28.7	·· 42.0	276°26.2	·· 47.3	314°40.0	·· 53.6	33°16.3	·· 22.1
16	40°41.7	33°31.4	42.4	291°28.4	47.2	329°42.2	53.7	48°18.4	22.0
17	55°44.2	48°34.1	42.7	306°30.7	47.1	344°44.4	53.7	63°20.6	21.9
18	70°46.7	63°36.8	N10°43.1	321°32.9	N25°47.0	359°46.7	N21°53.7	78°22.8	S05°21.7
19	85°49.1	78°39.5	43.4	336°35.2	46.9	14°48.9	53.8	93°25.0	21.6
20	100°51.6	93°42.2	43.8	351°37.5	46.8	29°51.2	53.8	108°27.2	21.5
21	115°54.1	108°44.9	·· 44.1	6°39.7	·· 46.7	44°53.4	·· 53.8	123°29.3	·· 21.4
22	130°56.5	123°47.6	44.5	21°42.0	46.6	59°55.6	53.9	138°31.5	21.3
23	145°59.0	138°50.3	44.8	36°44.2	46.5	74°57.9	53.9	153°33.7	21.1
Mer.pass.	13:18	ν 2.6′	d 0.4′	m -4.76	ν 2.3′	d -0.1′	m -0.25	ν 2.2′	d 0.0′ m -2.29	ν 2.2′	d 0.1′ m 1.11

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	161°01.5	153°53.1	N10°45.1	51°46.5	N25°46.4	90°00.1	N21°53.9	168°35.9	S05°21.0
1	176°03.9	168°55.8	45.5	66°48.7	46.3	105°02.4	54.0	183°38.1	20.9
2	191°06.4	183°58.5	45.8	81°51.0	46.2	120°04.6	54.0	198°40.2	20.8
3	206°08.9	199°01.2	·· 46.1	96°53.2	·· 46.1	135°06.8	·· 54.0	213°42.4	·· 20.6
4	221°11.3	214°04.0	46.4	111°55.5	46.0	150°09.1	54.1	228°44.6	20.5
5	236°13.8	229°06.7	46.8	126°57.7	45.9	165°11.3	54.1	243°46.8	20.4
6	251°16.2	244°09.5	N10°47.1	141°59.9	N25°45.8	180°13.5	N21°54.2	258°49.0	S05°20.3
7	266°18.7	259°12.2	47.4	157°02.2	45.7	195°15.8	54.2	273°51.1	20.2
8	281°21.2	274°15.0	47.7	172°04.4	45.6	210°18.0	54.2	288°53.3	20.0
9	296°23.6	289°17.7	·· 48.1	187°06.7	·· 45.5	225°20.2	·· 54.3	303°55.5	·· 19.9
10	311°26.1	304°20.5	48.4	202°08.9	45.4	240°22.5	54.3	318°57.7	19.8
11	326°28.6	319°23.2	48.7	217°11.1	45.3	255°24.7	54.3	333°59.9	19.7
12	341°31.0	334°26.0	N10°49.0	232°13.4	N25°45.2	270°27.0	N21°54.4	349°02.1	S05°19.6
13	356°33.5	349°28.8	49.3	247°15.6	45.1	285°29.2	54.4	4°04.2	19.4
14	11°36.0	4°31.5	49.6	262°17.8	45.0	300°31.4	54.4	19°06.4	19.3
15	26°38.4	19°34.3	·· 49.9	277°20.1	·· 44.9	315°33.7	·· 54.5	34°08.6	·· 19.2
16	41°40.9	34°37.1	50.2	292°22.3	44.8	330°35.9	54.5	49°10.8	19.1
17	56°43.4	49°39.9	50.5	307°24.5	44.7	345°38.1	54.5	64°13.0	19.0
18	71°45.8	64°42.7	N10°50.8	322°26.7	N25°44.6	0°40.4	N21°54.6	79°15.1	S05°18.8
19	86°48.3	79°45.5	51.1	337°29.0	44.4	15°42.6	54.6	94°17.3	18.7
20	101°50.7	94°48.3	51.4	352°31.2	44.3	30°44.8	54.7	109°19.5	18.6
21	116°53.2	109°51.1	·· 51.7	7°33.4	·· 44.2	45°47.0	·· 54.7	124°21.7	·· 18.5
22	131°55.7	124°53.9	52.0	22°35.6	44.1	60°49.3	54.7	139°23.9	18.4
23	146°58.1	139°56.7	52.3	37°37.9	44.0	75°51.5	54.8	154°26.0	18.2
Mer.pass.	13:14	ν 2.7′	d 0.3′	m -4.74	ν 2.2′	d -0.1′	m -0.23	ν 2.2′	d 0.0′ m -2.29	ν 2.2′	d 0.1′ m 1.11

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162°00.6	154°59.5	N10°52.5	52°40.1	N25°43.9	90°53.7	N21°54.8	169°28.2	S05°18.1
1	177°03.1	170°02.3	52.8	67°42.3	43.8	105°56.0	54.8	184°30.4	18.0
2	192°05.5	185°05.1	53.1	82°44.5	43.7	120°58.2	54.9	199°32.6	17.9
3	207°08.0	200°07.9	·· 53.4	97°46.7	·· 43.6	136°00.4	·· 54.9	214°34.8	·· 17.8
4	222°10.5	215°10.8	53.7	112°48.9	43.5	151°02.7	54.9	229°36.9	17.6
5	237°12.9	230°13.6	53.9	127°51.2	43.4	166°04.9	55.0	244°39.1	17.5
6	252°15.4	245°16.4	N10°54.2	142°53.4	N25°43.3	181°07.1	N21°55.0	259°41.3	S05°17.4
7	267°17.8	260°19.3	54.5	157°55.6	43.2	196°09.4	55.1	274°43.5	17.3
8	282°20.3	275°22.1	54.7	172°57.8	43.1	211°11.6	55.1	289°45.7	17.2
9	297°22.8	290°25.0	·· 55.0	188°00.0	·· 43.0	226°13.8	·· 55.1	304°47.8	·· 17.0
10	312°25.2	305°27.8	55.3	203°02.2	42.9	241°16.0	55.2	319°50.0	16.9
11	327°27.7	320°30.7	55.5	218°04.4	42.7	256°18.3	55.2	334°52.2	16.8
12	342°30.2	335°33.5	N10°55.8	233°06.6	N25°42.6	271°20.5	N21°55.2	349°54.4	S05°16.7
13	357°32.6	350°36.4	56.0	248°08.8	42.5	286°22.7	55.3	4°56.6	16.6
14	12°35.1	5°39.2	56.3	263°11.0	42.4	301°24.9	55.3	19°58.8	16.4
15	27°37.6	20°42.1	·· 56.5	278°13.2	·· 42.3	316°27.2	·· 55.3	35°00.9	·· 16.3
16	42°40.0	35°45.0	56.8	293°15.4	42.2	331°29.4	55.4	50°03.1	16.2
17	57°42.5	50°47.9	57.0	308°17.6	42.1	346°31.6	55.4	65°05.3	16.1
18	72°45.0	65°50.7	N10°57.3	323°19.8	N25°42.0	1°33.8	N21°55.5	80°07.5	S05°15.9
19	87°47.4	80°53.6	57.5	338°22.0	41.9	16°36.1	55.5	95°09.7	15.8
20	102°49.9	95°56.5	57.7	353°24.2	41.8	31°38.3	55.5	110°11.8	15.7
21	117°52.3	110°59.4	·· 58.0	8°26.4	·· 41.7	46°40.5	·· 55.6	125°14.0	·· 15.6
22	132°54.8	126°02.3	58.2	23°28.6	41.6	61°42.7	55.6	140°16.2	15.5
23	147°57.3	141°05.2	58.5	38°30.8	41.4	76°45.0	55.6	155°18.4	15.3
Mer.pass.	13:10	ν 2.8′	d 0.3′	m -4.72	ν 2.2′	d -0.1′	m -0.20	ν 2.2′	d 0.0′ m -2.28	ν 2.2′	d 0.1′ m 1.11

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.5	-57°06.8
Hamal	327°51.3	23°34.9
Polaris	314°11.3	89°22.5
Acamar	315°11.8	-40°12.5
Menkar	314°06.2	4°11.2
Mirfak	308°28.3	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.6	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.6	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.8	7°24.7
Canopus	263°52.1	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.2	-59°35.6
Suhail	222°45.8	-43°32.2
Miaplacidus	221°37.5	-69°49.3
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.8
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	172°59.4	-63°14.3
Gacrux	171°51.0	-57°15.2
Alioth	166°12.3	55°49.2
Spica	158°21.9	-11°17.7
Alkaid	152°51.5	49°11.0
Hadar	148°35.5	-60°29.5
Menkent	147°57.2	-36°29.6
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°39.8	-60°56.2
Kochab	137°19.2	74°02.7
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.5
Antares	112°15.7	-26°29.3
Atria	107°09.8	-69°04.1
Sabik	102°02.7	-15°45.4
Shaula	96°10.3	-37°07.3
Rasalhague	95°58.5	12°32.3
Eltanin	90°42.3	51°28.7
Kaus Aust.	83°32.5	-34°22.3
Vega	80°33.3	38°48.1
Nunki	75°47.8	-26°15.9
Altair	62°00.1	8°55.9
Peacock	53°06.0	-56°39.2
Deneb	49°26.1	45°22.0
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.4
Fomalhaut	15°14.7	-29°29.5
Scheat	13°45.5	28°13.1
Markab	13°30.1	15°20.3

Mar 02 Sun	SHA	Mer.pass
Venus	352°46.5	13:46
Mars	250°49.8	20:33
Jupiter	289°04.0	18:01
Saturn	7°41.2	12:47

Mar 03 Mon	SHA	Mer.pass
Venus	352°51.6	13:42
Mars	250°45.0	20:30
Jupiter	288°58.7	17:57
Saturn	7°34.4	12:44

Mar 04 Tue	SHA	Mer.pass
Venus	352°58.9	13:37
Mars	250°39.5	20:26
Jupiter	288°53.1	17:54
Saturn	7°27.6	12:40

Horizontal parallax	
Venus:	0.4
Mars:	0.2

	Sun			Moon				
h								
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	176°57.8	S07°11.6		152°26.2	10.7′	N04°24.7	17.7′	60.5′
1	191°57.9	10.6		166°55.9	10.6′	04°42.4	17.6′	60.5′
2	206°58.0	09.7		181°25.5	10.6′	05°00.0	17.6′	60.5′
3	221°58.1	·· 08.7		195°55.1	10.6′	05°17.6	17.6′	60.5′
4	236°58.3	07.8		210°24.7	10.6′	05°35.2	17.5′	60.5′
5	251°58.4	06.8		224°54.2	10.5′	05°52.7	17.5′	60.5′
6	266°58.5	S07°05.8		239°23.8	10.5′	N06°10.2	17.5′	60.5′
7	281°58.6	04.9		253°53.3	10.5′	06°27.7	17.4′	60.5′
8	296°58.8	03.9		268°22.7	10.4′	06°45.1	17.4′	60.5′
9	311°58.9	·· 03.0		282°52.2	10.4′	07°02.5	17.4′	60.5′
10	326°59.0	02.0		297°21.6	10.4′	07°19.9	17.3′	60.5′
11	341°59.1	01.1		311°50.9	10.3′	07°37.2	17.2′	60.5′
12	356°59.3	S07°00.1		326°20.3	10.3′	N07°54.4	17.2′	60.5′
13	11°59.4	06°59.1		340°49.6	10.3′	08°11.6	17.2′	60.4′
14	26°59.5	58.2		355°18.8	10.2′	08°28.8	17.1′	60.4′
15	41°59.7	·· 57.2		9°48.0	10.2′	08°45.9	17.0′	60.4′
16	56°59.8	56.3		24°17.2	10.1′	09°02.9	17.0′	60.4′
17	71°59.9	55.3		38°46.3	10.1′	09°19.9	17.0′	60.4′
18	87°00.0	S06°54.4		53°15.4	10.0′	N09°36.9	16.9′	60.4′
19	102°00.2	53.4		67°44.5	10.0′	09°53.8	16.8′	60.4′
20	117°00.3	52.4		82°13.5	10.0′	10°10.6	16.7′	60.4′
21	132°00.4	·· 51.5		96°42.4	9.9′	10°27.3	16.7′	60.4′
22	147°00.6	50.5		111°11.4	9.9′	10°44.0	16.6′	60.4′
23	162°00.7	49.6		125°40.2	9.8′	11°00.6	16.6′	60.4′
	SD = 16.1′	d = 1.0′		SD = 16.5′				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	177°00.8	S06°48.6		140°09.0	9.8′	N11°17.2	16.5′	60.3′
1	192°00.9	47.6		154°37.8	9.7′	11°33.7	16.4′	60.3′
2	207°01.1	46.7		169°06.5	9.7′	11°50.1	16.3′	60.3′
3	222°01.2	·· 45.7		183°35.2	9.6′	12°06.4	16.3′	60.3′
4	237°01.3	44.8		198°03.8	9.6′	12°22.7	16.2′	60.3′
5	252°01.5	43.8		212°32.4	9.5′	12°38.9	16.1′	60.3′
6	267°01.6	S06°42.8		227°00.9	9.4′	N12°55.0	16.0′	60.3′
7	282°01.7	41.9		241°29.3	9.4′	13°11.0	15.9′	60.3′
8	297°01.9	40.9		255°57.7	9.3′	13°26.9	15.9′	60.2′
9	312°02.0	·· 40.0		270°26.0	9.3′	13°42.8	15.7′	60.2′
10	327°02.1	39.0		284°54.3	9.2′	13°58.5	15.7′	60.2′
11	342°02.3	38.0		299°22.5	9.2′	14°14.2	15.6′	60.2′
12	357°02.4	S06°37.1		313°50.7	9.1′	N14°29.8	15.5′	60.2′
13	12°02.5	36.1		328°18.8	9.0′	14°45.3	15.4′	60.2′
14	27°02.7	35.2		342°46.8	9.0′	15°00.7	15.3′	60.2′
15	42°02.8	·· 34.2		357°14.8	8.9′	15°16.0	15.2′	60.1′
16	57°02.9	33.2		11°42.7	8.9′	15°31.2	15.1′	60.1′
17	72°03.1	32.3		26°10.6	8.8′	15°46.3	15.0′	60.1′
18	87°03.2	S06°31.3		40°38.4	8.7′	N16°01.3	15.0′	60.1′
19	102°03.3	30.4		55°06.1	8.7′	16°16.3	14.8′	60.1′
20	117°03.5	29.4		69°33.7	8.6′	16°31.1	14.7′	60.1′
21	132°03.6	·· 28.4		84°01.3	8.5′	16°45.8	14.5′	60.0′
22	147°03.7	27.5		98°28.9	8.5′	17°00.3	14.5′	60.0′
23	162°03.9	26.5		112°56.3	8.4′	17°14.8	14.4′	60.0′
	SD = 16.1′	d = 1.0′		SD = 16.5′				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	177°04.0	S06°25.5		127°23.7	8.3′	N17°29.2	14.2′	60.0′
1	192°04.1	24.6		141°51.0	8.3′	17°43.4	14.2′	60.0′
2	207°04.3	23.6		156°18.3	8.2′	17°57.6	14.0′	59.9′
3	222°04.4	·· 22.7		170°45.5	8.1′	18°11.6	13.9′	59.9′
4	237°04.5	21.7		185°12.6	8.1′	18°25.5	13.8′	59.9′
5	252°04.7	20.7		199°39.7	8.0′	18°39.3	13.7′	59.9′
6	267°04.8	S06°19.8		214°06.6	7.9′	N18°53.0	13.5′	59.9′
7	282°05.0	18.8		228°33.6	7.8′	19°06.5	13.4′	59.8′
8	297°05.1	17.8		243°00.4	7.8′	19°19.9	13.3′	59.8′
9	312°05.2	·· 16.9		257°27.2	7.7′	19°33.2	13.2′	59.8′
10	327°05.4	15.9		271°53.9	7.6′	19°46.4	13.0′	59.8′
11	342°05.5	14.9		286°20.5	7.6′	19°59.4	12.9′	59.8′
12	357°05.6	S06°14.0		300°47.1	7.5′	N20°12.3	12.8′	59.7′
13	12°05.8	13.0		315°13.6	7.4′	20°25.1	12.7′	59.7′
14	27°05.9	12.0		329°40.0	7.4′	20°37.8	12.5′	59.7′
15	42°06.1	·· 11.1		344°06.4	7.3′	20°50.3	12.3′	59.7′
16	57°06.2	10.1		358°32.6	7.2′	21°02.6	12.3′	59.6′
17	72°06.3	09.2		12°58.9	7.1′	21°14.9	12.1′	59.6′
18	87°06.5	S06°08.2		27°25.0	7.1′	N21°27.0	11.9′	59.6′
19	102°06.6	07.2		41°51.1	7.0′	21°38.9	11.8′	59.6′
20	117°06.8	06.3		56°17.1	6.9′	21°50.7	11.7′	59.6′
21	132°06.9	·· 05.3		70°43.0	6.9′	22°02.4	11.5′	59.5′
22	147°07.0	04.3		85°08.9	6.8′	22°13.9	11.4′	59.5′
23	162°07.2	03.4		99°34.7	6.7′	22°25.3	11.2′	59.5′
	SD = 16.1′	d = 1.0′		SD = 16.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:59	06:17	07:25	17:01	18:09	19:28
N 70°	05:05	06:15	07:17	17:09	18:10	19:21
68°	05:10	06:14	07:10	17:15	18:11	19:16
66°	05:14	06:13	07:05	17:21	18:12	19:12
64°	05:17	06:12	07:00	17:25	18:13	19:08
62°	05:20	06:11	06:56	17:29	18:14	19:05
60°	05:22	06:10	06:52	17:33	18:15	19:03
N 58°	05:24	06:10	06:49	17:36	18:15	19:01
56°	05:26	06:09	06:46	17:39	18:16	18:59
54°	05:27	06:08	06:43	17:41	18:17	18:58
52°	05:28	06:07	06:41	17:44	18:17	18:56
50°	05:29	06:07	06:39	17:46	18:18	18:55
45°	05:31	06:05	06:34	17:50	18:20	18:54
N 40°	05:32	06:03	06:30	17:54	18:21	18:53
35°	05:32	06:01	06:27	17:58	18:23	18:52
30°	05:32	06:00	06:24	18:01	18:25	18:52
20°	05:30	05:56	06:18	18:06	18:28	18:54
N 10°	05:28	05:52	06:13	18:11	18:32	18:56
0°	05:24	05:48	06:09	18:15	18:36	19:00
S 10°	05:18	05:43	06:04	18:20	18:41	19:06
20°	05:10	05:36	05:59	18:25	18:47	19:13
30°	05:00	05:28	05:52	18:31	18:55	19:23
35°	04:53	05:23	05:49	18:34	19:00	19:30
40°	04:44	05:17	05:45	18:38	19:06	19:38
45°	04:34	05:10	05:40	18:43	19:13	19:49
S 50°	04:21	05:01	05:34	18:48	19:21	20:02
52°	04:14	04:57	05:32	18:51	19:26	20:08
54°	04:07	04:52	05:29	18:54	19:30	20:15
56°	03:59	04:47	05:26	18:57	19:35	20:23
58°	03:49	04:41	05:22	19:00	19:41	20:33
S 60°	03:38	04:34	05:18	19:04	19:48	20:44

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	06:46	05:56		23:02		
N 70°	06:54	06:18	05:13	22:43	·· ··	01:40
68°	07:01	06:35	05:56	22:28	·· ··	00:59
66°	07:07	06:49	06:25	22:16	·· ··	00:31
64°	07:12	07:01	06:47	22:06	·· ··	00:10
62°	07:17	07:11	07:05	21:57	23:54	·· ··
60°	07:21	07:20	07:20	21:50	23:40	·· ··
N 58°	07:24	07:27	07:33	21:43	23:28	·· ··
56°	07:27	07:34	07:44	21:38	23:18	·· ··
54°	07:30	07:40	07:54	21:33	23:09	·· ··
52°	07:32	07:46	08:02	21:28	23:01	·· ··
50°	07:35	07:51	08:10	21:24	22:54	·· ··
45°	07:40	08:02	08:27	21:16	22:38	·· ··
N 40°	07:44	08:11	08:41	21:08	22:26	23:44
35°	07:48	08:19	08:53	21:02	22:15	23:29
30°	07:51	08:26	09:04	20:57	22:06	23:17
20°	07:57	08:38	09:22	20:47	21:51	22:55
N 10°	08:02	08:49	09:38	20:39	21:37	22:37
0°	08:07	08:59	09:53	20:32	21:24	22:19
S 10°	08:12	09:09	10:08	20:24	21:11	22:02
20°	08:18	09:20	10:24	20:16	20:58	21:44
30°	08:24	09:33	10:43	20:07	20:43	21:23
35°	08:28	09:40	10:54	20:01	20:34	21:11
40°	08:32	09:49	11:07	19:55	20:24	20:57
45°	08:37	09:59	11:22	19:49	20:12	20:40
S 50°	08:42	10:11	11:41	19:40	19:58	20:20
52°	08:45	10:17	11:50	19:37	19:51	20:10
54°	08:48	10:23	12:00	19:33	19:44	20:00
56°	08:51	10:30	12:11	19:28	19:36	19:47
58°	08:55	10:38	12:24	19:23	19:27	19:33
S 60°	08:59	10:47	12:40	19:17	19:17	19:17

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 2-4 5-21%
02	12:09	12:03	12:12	14:19	01:54	
03	11:57	11:50	12:12	15:11	02:45	
04	11:44	11:37	12:12	16:06	03:38	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2002 sec ΔT = TT-UT1 = +68.9838 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162°59.7	156°08.1	N10°58.7	53°33.0	N25°41.3	91°47.2	N21°55.7	170°20.6	S05°15.2
1	178°02.2	171°11.0	58.9	68°35.2	41.2	106°49.4	55.7	185°22.7	15.1
2	193°04.7	186°13.9	59.1	83°37.3	41.1	121°51.6	55.7	200°24.9	15.0
3	208°07.1	201°16.8	·· 59.4	98°39.5	·· 41.0	136°53.9	·· 55.8	215°27.1	·· 14.9
4	223°09.6	216°19.8	59.6	113°41.7	40.9	151°56.1	55.8	230°29.3	14.7
5	238°12.1	231°22.7	10°59.8	128°43.9	40.8	166°58.3	55.9	245°31.5	14.6
6	253°14.5	246°25.6	N11°00.0	143°46.1	N25°40.7	182°00.5	N21°55.9	260°33.6	S05°14.5
7	268°17.0	261°28.5	00.2	158°48.3	40.6	197°02.7	55.9	275°35.8	14.4
8	283°19.5	276°31.5	00.4	173°50.4	40.5	212°05.0	56.0	290°38.0	14.3
9	298°21.9	291°34.4	·· 00.6	188°52.6	·· 40.3	227°07.2	·· 56.0	305°40.2	·· 14.1
10	313°24.4	306°37.4	00.9	203°54.8	40.2	242°09.4	56.0	320°42.4	14.0
11	328°26.8	321°40.3	01.1	218°57.0	40.1	257°11.6	56.1	335°44.5	13.9
12	343°29.3	336°43.2	N11°01.3	233°59.1	N25°40.0	272°13.8	N21°56.1	350°46.7	S05°13.8
13	358°31.8	351°46.2	01.5	249°01.3	39.9	287°16.1	56.2	5°48.9	13.7
14	13°34.2	6°49.2	01.7	264°03.5	39.8	302°18.3	56.2	20°51.1	13.5
15	28°36.7	21°52.1	·· 01.9	279°05.7	·· 39.7	317°20.5	·· 56.2	35°53.3	·· 13.4
16	43°39.2	36°55.1	02.0	294°07.8	39.6	332°22.7	56.3	50°55.4	13.3
17	58°41.6	51°58.1	02.2	309°10.0	39.5	347°24.9	56.3	65°57.6	13.2
18	73°44.1	67°01.0	N11°02.4	324°12.2	N25°39.3	2°27.2	N21°56.3	80°59.8	S05°13.1
19	88°46.6	82°04.0	02.6	339°14.3	39.2	17°29.4	56.4	96°02.0	12.9
20	103°49.0	97°07.0	02.8	354°16.5	39.1	32°31.6	56.4	111°04.2	12.8
21	118°51.5	112°10.0	·· 03.0	9°18.7	·· 39.0	47°33.8	·· 56.4	126°06.3	·· 12.7
22	133°53.9	127°12.9	03.2	24°20.8	38.9	62°36.0	56.5	141°08.5	12.6
23	148°56.4	142°15.9	03.3	39°23.0	38.8	77°38.2	56.5	156°10.7	12.4
Mer.pass.	13:06	ν 2.9′	d 0.2′	m -4.69	ν 2.2′	d -0.1′	m -0.17	ν 2.2′	d 0.0′ m -2.27	ν 2.2′	d 0.1′ m 1.11
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	163°58.9	157°18.9	N11°03.5	54°25.1	N25°38.7	92°40.5	N21°56.6	171°12.9	S05°12.3
1	179°01.3	172°21.9	03.7	69°27.3	38.6	107°42.7	56.6	186°15.1	12.2
2	194°03.8	187°24.9	03.8	84°29.5	38.4	122°44.9	56.6	201°17.2	12.1
3	209°06.3	202°27.9	·· 04.0	99°31.6	·· 38.3	137°47.1	·· 56.7	216°19.4	·· 12.0
4	224°08.7	217°31.0	04.2	114°33.8	38.2	152°49.3	56.7	231°21.6	11.8
5	239°11.2	232°34.0	04.3	129°35.9	38.1	167°51.5	56.7	246°23.8	11.7
6	254°13.7	247°37.0	N11°04.5	144°38.1	N25°38.0	182°53.7	N21°56.8	261°26.0	S05°11.6
7	269°16.1	262°40.0	04.7	159°40.2	37.9	197°56.0	56.8	276°28.1	11.5
8	284°18.6	277°43.0	04.8	174°42.4	37.8	212°58.2	56.9	291°30.3	11.4
9	299°21.1	292°46.1	·· 05.0	189°44.5	·· 37.6	228°00.4	·· 56.9	306°32.5	·· 11.2
10	314°23.5	307°49.1	05.1	204°46.7	37.5	243°02.6	56.9	321°34.7	11.1
11	329°26.0	322°52.1	05.3	219°48.8	37.4	258°04.8	57.0	336°36.9	11.0
12	344°28.4	337°55.2	N11°05.4	234°51.0	N25°37.3	273°07.0	N21°57.0	351°39.0	S05°10.9
13	359°30.9	352°58.2	05.6	249°53.1	37.2	288°09.2	57.0	6°41.2	10.8
14	14°33.4	8°01.3	05.7	264°55.2	37.1	303°11.4	57.1	21°43.4	10.6
15	29°35.8	23°04.3	·· 05.8	279°57.4	·· 37.0	318°13.6	·· 57.1	36°45.6	·· 10.5
16	44°38.3	38°07.4	06.0	294°59.5	36.8	333°15.9	57.2	51°47.8	10.4
17	59°40.8	53°10.4	06.1	310°01.7	36.7	348°18.1	57.2	66°49.9	10.3
18	74°43.2	68°13.5	N11°06.2	325°03.8	N25°36.6	3°20.3	N21°57.2	81°52.1	S05°10.2
19	89°45.7	83°16.6	06.4	340°05.9	36.5	18°22.5	57.3	96°54.3	10.0
20	104°48.2	98°19.6	06.5	355°08.1	36.4	33°24.7	57.3	111°56.5	09.9
21	119°50.6	113°22.7	·· 06.6	10°10.2	·· 36.3	48°26.9	·· 57.4	126°58.7	·· 09.8
22	134°53.1	128°25.8	06.7	25°12.4	36.1	63°29.1	57.4	142°00.8	09.7
23	149°55.6	143°28.9	06.9	40°14.5	36.0	78°31.3	57.4	157°03.0	09.6
Mer.pass.	13:02	ν 3.0′	d 0.2′	m -4.66	ν 2.2′	d -0.1′	m -0.15	ν 2.2′	d 0.0′ m -2.26	ν 2.2′	d 0.1′ m 1.11
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	164°58.0	158°31.9	N11°07.0	55°16.6	N25°35.9	93°33.5	N21°57.5	172°05.2	S05°09.4
1	180°00.5	173°35.0	07.1	70°18.7	35.8	108°35.7	57.5	187°07.4	09.3
2	195°02.9	188°38.1	07.2	85°20.9	35.7	123°38.0	57.5	202°09.6	09.2
3	210°05.4	203°41.2	·· 07.3	100°23.0	·· 35.6	138°40.2	·· 57.6	217°11.7	·· 09.1
4	225°07.9	218°44.3	07.4	115°25.1	35.4	153°42.4	57.6	232°13.9	08.9
5	240°10.3	233°47.4	07.5	130°27.3	35.3	168°44.6	57.7	247°16.1	08.8
6	255°12.8	248°50.5	N11°07.6	145°29.4	N25°35.2	183°46.8	N21°57.7	262°18.3	S05°08.7
7	270°15.3	263°53.6	07.7	160°31.5	35.1	198°49.0	57.7	277°20.5	08.6
8	285°17.7	278°56.8	07.8	175°33.6	35.0	213°51.2	57.8	292°22.6	08.5
9	300°20.2	293°59.9	·· 07.9	190°35.7	·· 34.9	228°53.4	·· 57.8	307°24.8	·· 08.3
10	315°22.7	309°03.0	08.0	205°37.9	34.7	243°55.6	57.8	322°27.0	08.2
11	330°25.1	324°06.1	08.1	220°40.0	34.6	258°57.8	57.9	337°29.2	08.1
12	345°27.6	339°09.3	N11°08.2	235°42.1	N25°34.5	274°00.0	N21°57.9	352°31.4	S05°08.0
13	0°30.1	354°12.4	08.3	250°44.2	34.4	289°02.2	58.0	7°33.5	07.9
14	15°32.5	9°15.5	08.3	265°46.3	34.3	304°04.4	58.0	22°35.7	07.7
15	30°35.0	24°18.7	·· 08.4	280°48.4	·· 34.1	319°06.6	·· 58.0	37°37.9	·· 07.6
16	45°37.4	39°21.8	08.5	295°50.6	34.0	334°08.8	58.1	52°40.1	07.5
17	60°39.9	54°25.0	08.6	310°52.7	33.9	349°11.0	58.1	67°42.2	07.4
18	75°42.4	69°28.1	N11°08.7	325°54.8	N25°33.8	4°13.2	N21°58.2	82°44.4	S05°07.3
19	90°44.8	84°31.3	08.7	340°56.9	33.7	19°15.4	58.2	97°46.6	07.1
20	105°47.3	99°34.4	08.8	355°59.0	33.5	34°17.6	58.2	112°48.8	07.0
21	120°49.8	114°37.6	·· 08.9	11°01.1	·· 33.4	49°19.8	·· 58.3	127°51.0	·· 06.9
22	135°52.2	129°40.8	08.9	26°03.2	33.3	64°22.0	58.3	142°53.1	06.8
23	150°54.7	144°43.9	09.0	41°05.3	33.2	79°24.2	58.3	157°55.3	06.7
Mer.pass.	12:58	ν 3.1′	d 0.1′	m -4.63	ν 2.1′	d -0.1′	m -0.12	ν 2.2′	d 0.0′ m -2.26	ν 2.2′	d 0.1′ m 1.11

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.5	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°12.4	89°22.5
Acamar	315°11.9	-40°12.5
Menkar	314°06.2	4°11.2
Mirfak	308°28.3	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.7	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.1	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.2	-59°35.6
Suhail	222°45.9	-43°32.2
Miaplacidus	221°37.5	-69°49.3
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.8
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	172°59.4	-63°14.3
Gacrux	171°51.0	-57°15.2
Alioth	166°12.3	55°49.2
Spica	158°21.9	-11°17.7
Alkaid	152°51.5	49°11.0
Hadar	148°35.4	-60°29.5
Menkent	147°57.2	-36°29.6
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°39.8	-60°56.2
Kochab	137°19.1	74°02.7
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.5
Antares	112°15.6	-26°29.3
Atria	107°09.8	-69°04.1
Sabik	102°02.7	-15°45.4
Shaula	96°10.3	-37°07.3
Rasalhague	95°58.5	12°32.3
Eltanin	90°42.3	51°28.7
Kaus Aust.	83°32.5	-34°22.3
Vega	80°33.3	38°48.1
Nunki	75°47.8	-26°15.9
Altair	62°00.1	8°55.9
Peacock	53°05.9	-56°39.2
Deneb	49°26.1	45°21.9
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.4
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 05 Wed	SHA	Mer.pass
Venus	353°08.4	13:33
Mars	250°33.2	20:23
Jupiter	288°47.5	17:50
Saturn	7°20.8	12:37

Mar 06 Thu	SHA	Mer.pass
Venus	353°20.1	13:28
Mars	250°26.3	20:19
Jupiter	288°41.6	17:47
Saturn	7°14.0	12:33

Mar 07 Fri	SHA	Mer.pass
Venus	353°33.9	13:23
Mars	250°18.6	20:16
Jupiter	288°35.5	17:43
Saturn	7°07.2	12:30

Horizontal parallax	
Venus:	0.5
Mars:	0.2

	Sun		Moon				
h Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°07.3	S06°02.4	114°00.4	6.7′	N22°36.5	11.1′	59.5′
1	192°07.4	01.4	128°26.1	6.6′	22°47.6	10.9′	59.4′
2	207°07.6	06°00.5	142°51.7	6.5′	22°58.5	10.8′	59.4′
3	222°07.7	05°59.5	157°17.2	6.5′	23°09.3	10.6′	59.4′
4	237°07.9	58.5	171°42.7	6.4′	23°19.9	10.5′	59.4′
5	252°08.0	57.6	186°08.1	6.3′	23°30.4	10.3′	59.3′
6	267°08.2	S05°56.6	200°33.4	6.3′	N23°40.7	10.2′	59.3′
7	282°08.3	55.6	214°58.7	6.2′	23°50.9	10.0′	59.3′
8	297°08.4	54.7	229°23.9	6.1′	24°00.9	9.8′	59.3′
9	312°08.6	·· 53.7	243°49.0	6.1′	24°10.7	9.7′	59.2′
10	327°08.7	52.7	258°14.1	6.0′	24°20.4	9.5′	59.2′
11	342°08.9	51.8	272°39.1	6.0′	24°29.9	9.4′	59.2′
12	357°09.0	S05°50.8	287°04.1	5.9′	N24°39.3	9.2′	59.2′
13	12°09.1	49.8	301°29.0	5.8′	24°48.5	9.0′	59.1′
14	27°09.3	48.8	315°53.8	5.8′	24°57.5	8.8′	59.1′
15	42°09.4	·· 47.9	330°18.6	5.7′	25°06.3	8.7′	59.1′
16	57°09.6	46.9	344°43.4	5.7′	25°15.0	8.6′	59.1′
17	72°09.7	45.9	359°08.0	5.6′	25°23.6	8.3′	59.0′
18	87°09.9	S05°45.0	13°32.7	5.6′	N25°31.9	8.2′	59.0′
19	102°10.0	44.0	27°57.2	5.5′	25°40.1	8.0′	59.0′
20	117°10.1	43.0	42°21.8	5.5′	25°48.1	7.9′	58.9′
21	132°10.3	·· 42.1	56°46.2	5.4′	25°56.0	7.6′	58.9′
22	147°10.4	41.1	71°10.7	5.4′	26°03.6	7.5′	58.9′
23	162°10.6	40.1	85°35.0	5.3′	26°11.1	7.4′	58.9′
	SD = 16.1′	d = 1.0′	SD = 16.2′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°10.7	S05°39.2	99°59.4	5.3′	N26°18.5	7.1′	58.8′
1	192°10.9	38.2	114°23.7	5.2′	26°25.6	7.0′	58.8′
2	207°11.0	37.2	128°47.9	5.2′	26°32.6	6.8′	58.8′
3	222°11.2	·· 36.2	143°12.1	5.2′	26°39.4	6.6′	58.8′
4	237°11.3	35.3	157°36.3	5.1′	26°46.0	6.4′	58.7′
5	252°11.4	34.3	172°00.4	5.1′	26°52.4	6.3′	58.7′
6	267°11.6	S05°33.3	186°24.5	5.1′	N26°58.7	6.1′	58.7′
7	282°11.7	32.4	200°48.6	5.0′	27°04.8	5.9′	58.7′
8	297°11.9	31.4	215°12.6	5.0′	27°10.7	5.7′	58.6′
9	312°12.0	·· 30.4	229°36.6	5.0′	27°16.4	5.6′	58.6′
10	327°12.2	29.5	244°00.5	4.9′	27°22.0	5.3′	58.6′
11	342°12.3	28.5	258°24.5	4.9′	27°27.3	5.2′	58.5′
12	357°12.5	S05°27.5	272°48.4	4.9′	N27°32.5	5.0′	58.5′
13	12°12.6	26.5	287°12.3	4.9′	27°37.5	4.8′	58.5′
14	27°12.8	25.6	301°36.2	4.8′	27°42.3	4.7′	58.5′
15	42°12.9	·· 24.6	316°00.0	4.8′	27°47.0	4.4′	58.4′
16	57°13.1	23.6	330°23.8	4.8′	27°51.4	4.3′	58.4′
17	72°13.2	22.7	344°47.7	4.8′	27°55.7	4.1′	58.4′
18	87°13.4	S05°21.7	359°11.5	4.8′	N27°59.8	3.9′	58.4′
19	102°13.5	20.7	13°35.2	4.8′	28°03.7	3.7′	58.3′
20	117°13.7	19.7	27°59.0	4.8′	28°07.4	3.5′	58.3′
21	132°13.8	·· 18.8	42°22.8	4.8′	28°10.9	3.4′	58.3′
22	147°14.0	17.8	56°46.6	4.8′	28°14.3	3.1′	58.2′
23	162°14.1	16.8	71°10.3	4.8′	28°17.4	3.0′	58.2′
	SD = 16.1′	d = 1.0′	SD = 16.0′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°14.2	S05°15.9	85°34.1	4.8′	N28°20.4	2.8′	58.2′
1	192°14.4	14.9	99°57.9	4.8′	28°23.2	2.6′	58.2′
2	207°14.5	13.9	114°21.6	4.8′	28°25.8	2.4′	58.1′
3	222°14.7	·· 12.9	128°45.4	4.8′	28°28.2	2.3′	58.1′
4	237°14.8	12.0	143°09.2	4.8′	28°30.5	2.0′	58.1′
5	252°15.0	11.0	157°33.0	4.8′	28°32.5	1.9′	58.1′
6	267°15.1	S05°10.0	171°56.8	4.8′	N28°34.4	1.7′	58.0′
7	282°15.3	09.0	186°20.6	4.8′	28°36.1	1.5′	58.0′
8	297°15.4	08.1	200°44.4	4.8′	28°37.6	1.3′	58.0′
9	312°15.6	·· 07.1	215°08.3	4.9′	28°38.9	1.1′	57.9′
10	327°15.7	06.1	229°32.1	4.9′	28°40.0	1.0′	57.9′
11	342°15.9	05.1	243°56.0	4.9′	28°41.0	0.7′	57.9′
12	357°16.0	S05°04.2	258°19.9	4.9′	N28°41.7	0.6′	57.9′
13	12°16.2	03.2	272°43.9	5.0′	28°42.3	0.4′	57.8′
14	27°16.4	02.2	287°07.9	5.0′	28°42.7	0.3′	57.8′
15	42°16.5	·· 01.2	301°31.9	5.0′	28°43.0	0.0′	57.8′
16	57°16.7	05°00.3	315°55.9	5.1′	28°43.0	0.1′	57.8′
17	72°16.8	04°59.3	330°20.0	5.1′	28°42.9	0.4′	57.7′
18	87°17.0	S04°58.3	344°44.1	5.1′	N28°42.5	0.5′	57.7′
19	102°17.1	57.4	359°08.2	5.2′	28°42.0	0.6′	57.7′
20	117°17.3	56.4	13°32.4	5.2′	28°41.4	0.9′	57.6′
21	132°17.4	·· 55.4	27°56.6	5.3′	28°40.5	1.0′	57.6′
22	147°17.6	54.4	42°20.9	5.3′	28°39.5	1.3′	57.6′
23	162°17.7	53.5	56°45.2	5.4′	28°38.2	1.3′	57.6′
	SD = 16.1′	d = 1.0′	SD = 15.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:43	06:02	07:09	17:15	18:23	19:42
N 70°	04:51	06:02	07:03	17:21	18:22	19:34
68°	04:58	06:02	06:58	17:26	18:22	19:27
66°	05:03	06:02	06:53	17:31	18:22	19:22
64°	05:07	06:02	06:49	17:34	18:22	19:17
62°	05:11	06:02	06:46	17:38	18:22	19:13
60°	05:14	06:02	06:43	17:40	18:22	19:10
N 58°	05:16	06:01	06:41	17:43	18:22	19:08
56°	05:18	06:01	06:38	17:45	18:22	19:05
54°	05:20	06:01	06:36	17:47	18:22	19:03
52°	05:22	06:01	06:34	17:49	18:23	19:02
50°	05:23	06:00	06:33	17:51	18:23	19:00
45°	05:26	05:59	06:29	17:54	18:24	18:58
N 40°	05:27	05:59	06:26	17:57	18:24	18:56
35°	05:28	05:57	06:23	18:00	18:25	18:55
30°	05:29	05:56	06:20	18:03	18:26	18:54
20°	05:28	05:54	06:16	18:07	18:29	18:54
N 10°	05:26	05:51	06:12	18:11	18:32	18:56
0°	05:23	05:47	06:08	18:14	18:35	18:59
S 10°	05:18	05:43	06:04	18:18	18:39	19:04
20°	05:11	05:37	06:00	18:22	18:45	19:10
30°	05:02	05:30	05:54	18:27	18:51	19:20
35°	04:56	05:26	05:52	18:30	18:56	19:26
40°	04:48	05:21	05:48	18:34	19:01	19:33
45°	04:39	05:14	05:44	18:37	19:07	19:43
S 50°	04:26	05:06	05:39	18:42	19:15	19:54
52°	04:21	05:03	05:37	18:44	19:19	20:00
54°	04:14	04:58	05:35	18:46	19:23	20:07
56°	04:06	04:54	05:32	18:49	19:27	20:14
58°	03:58	04:48	05:29	18:52	19:32	20:23
S 60°	03:47	04:42	05:26	18:55	19:38	20:33

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°						
68°						
66°	05:29			03:24		
64°	06:24			02:30		
62°	06:58	06:46		01:58	04:13	
60°	07:22	07:31	07:57	01:34	03:28	05:08
N 58°	07:42	08:00	08:37	01:15	02:59	04:28
56°	07:59	08:23	09:05	00:59	02:36	04:00
54°	08:13	08:42	09:27	00:45	02:18	03:38
52°	08:25	08:58	09:45	00:34	02:03	03:20
50°	08:36	09:12	10:00	00:23	01:49	03:05
45°	08:59	09:40	10:32	00:01	01:22	02:34
N 40°	09:18	10:02	10:56	·· ··	01:00	02:10
35°	09:33	10:21	11:16	·· ··	00:42	01:50
30°	09:47	10:36	11:33	·· ··	00:27	01:34
20°	10:10	11:04	12:01	·· ··	00:01	01:05
N 10°	10:31	11:27	12:26	23:38	·· ··	00:41
0°	10:50	11:49	12:49	23:18	·· ··	00:18
S 10°	11:09	12:11	13:12	22:57	23:55	·· ··
20°	11:30	12:35	13:37	22:35	23:31	·· ··
30°	11:54	13:02	14:06	22:09	23:02	·· ··
35°	12:08	13:19	14:23	21:54	22:45	23:44
40°	12:25	13:38	14:44	21:37	22:26	23:24
45°	12:44	14:01	15:08	21:16	22:02	23:00
S 50°	13:10	14:31	15:40	20:50	21:32	22:28
52°	13:22	14:46	15:56	20:37	21:16	22:12
54°	13:36	15:04	16:14	20:23	20:59	21:54
56°	13:52	15:25	16:37	20:06	20:38	21:31
58°	14:12	15:51	17:06	19:46	20:11	21:02
S 60°	14:36	16:29	17:51	19:21	19:33	20:17

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 5-7 31-53%
05	11:31	11:24	12:11	17:04	04:34	
06	11:17	11:10	12:11	18:03	05:33	
07	11:03	10:56	12:11	19:04	06:34	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2010 sec ΔT = TT-UT1 = +68.9830 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	165°57.2	159°47.1	N11°09.0	56°07.4	N25°33.1	94°26.4	N21°58.4	172°57.5	S05°06.5
1	180°59.6	174°50.3	09.1	71°09.5	32.9	109°28.6	58.4	187°59.7	06.4
2	196°02.1	189°53.5	09.1	86°11.6	32.8	124°30.8	58.5	203°01.9	06.3
3	211°04.6	204°56.6	·· 09.2	101°13.7	·· 32.7	139°33.0	·· 58.5	218°04.0	·· 06.2
4	226°07.0	219°59.8	09.2	116°15.8	32.6	154°35.2	58.5	233°06.2	06.1
5	241°09.5	235°03.0	09.3	131°17.9	32.5	169°37.4	58.6	248°08.4	05.9
6	256°11.9	250°06.2	N11°09.3	146°20.0	N25°32.3	184°39.6	N21°58.6	263°10.6	S05°05.8
7	271°14.4	265°09.4	09.4	161°22.1	32.2	199°41.8	58.7	278°12.8	05.7
8	286°16.9	280°12.6	09.4	176°24.2	32.1	214°44.0	58.7	293°14.9	05.6
9	301°19.3	295°15.8	·· 09.4	191°26.3	·· 32.0	229°46.2	·· 58.7	308°17.1	·· 05.4
10	316°21.8	310°19.0	09.5	206°28.4	31.9	244°48.4	58.8	323°19.3	05.3
11	331°24.3	325°22.3	09.5	221°30.5	31.7	259°50.6	58.8	338°21.5	05.2
12	346°26.7	340°25.5	N11°09.5	236°32.6	N25°31.6	274°52.8	N21°58.9	353°23.7	S05°05.1
13	1°29.2	355°28.7	09.6	251°34.6	31.5	289°55.0	58.9	8°25.8	05.0
14	16°31.7	10°31.9	09.6	266°36.7	31.4	304°57.2	58.9	23°28.0	04.8
15	31°34.1	25°35.1	·· 09.6	281°38.8	·· 31.3	319°59.4	·· 59.0	38°30.2	·· 04.7
16	46°36.6	40°38.4	09.6	296°40.9	31.1	335°01.6	59.0	53°32.4	04.6
17	61°39.0	55°41.6	09.6	311°43.0	31.0	350°03.8	59.1	68°34.6	04.5
18	76°41.5	70°44.8	N11°09.6	326°45.1	N25°30.9	5°06.0	N21°59.1	83°36.7	S05°04.4
19	91°44.0	85°48.1	09.6	341°47.1	30.8	20°08.2	59.1	98°38.9	04.2
20	106°46.4	100°51.3	09.7	356°49.2	30.6	35°10.4	59.2	113°41.1	04.1
21	121°48.9	115°54.6	·· 09.7	11°51.3	·· 30.5	50°12.6	·· 59.2	128°43.3	·· 04.0
22	136°51.4	130°57.8	09.7	26°53.4	30.4	65°14.8	59.2	143°45.5	03.9
23	151°53.8	146°01.1	09.7	41°55.5	30.3	80°17.0	59.3	158°47.6	03.8
Mer.pass. 12:54		ν 3.2′ d 0.1′	m -4.59	ν 2.1′ d -0.1′	m -0.10	ν 2.2′ d 0.0′	m -2.25	ν 2.2′ d 0.1′	m 1.10

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	166°56.3	161°04.4	N11°09.7	56°57.5	N25°30.1	95°19.2	N21°59.3	173°49.8	S05°03.6
1	181°58.8	176°07.6	09.7	71°59.6	30.0	110°21.4	59.4	188°52.0	03.5
2	197°01.2	191°10.9	09.6	87°01.7	29.9	125°23.6	59.4	203°54.2	03.4
3	212°03.7	206°14.2	·· 09.6	102°03.8	·· 29.8	140°25.7	·· 59.4	218°56.4	·· 03.3
4	227°06.2	221°17.4	09.6	117°05.8	29.7	155°27.9	59.5	233°58.5	03.2
5	242°08.6	236°20.7	09.6	132°07.9	29.5	170°30.1	59.5	249°00.7	03.0
6	257°11.1	251°24.0	N11°09.6	147°10.0	N25°29.4	185°32.3	N21°59.6	264°02.9	S05°02.9
7	272°13.5	266°27.3	09.6	162°12.0	29.3	200°34.5	59.6	279°05.1	02.8
8	287°16.0	281°30.6	09.5	177°14.1	29.2	215°36.7	59.6	294°07.2	02.7
9	302°18.5	296°33.9	·· 09.5	192°16.2	·· 29.0	230°38.9	·· 59.7	309°09.4	·· 02.6
10	317°20.9	311°37.2	09.5	207°18.2	28.9	245°41.1	59.7	324°11.6	02.4
11	332°23.4	326°40.4	09.5	222°20.3	28.8	260°43.3	59.8	339°13.8	02.3
12	347°25.9	341°43.8	N11°09.4	237°22.4	N25°28.7	275°45.5	N21°59.8	354°16.0	S05°02.2
13	2°28.3	356°47.1	09.4	252°24.4	28.5	290°47.7	59.8	9°18.1	02.1
14	17°30.8	11°50.4	09.3	267°26.5	28.4	305°49.8	59.9	24°20.3	01.9
15	32°33.3	26°53.7	·· 09.3	282°28.5	·· 28.3	320°52.0	21°59.9	39°22.5	·· 01.8
16	47°35.7	41°57.0	09.3	297°30.6	28.2	335°54.2	22°00.0	54°24.7	01.7
17	62°38.2	57°00.3	09.2	312°32.7	28.0	350°56.4	00.0	69°26.9	01.6
18	77°40.7	72°03.6	N11°09.2	327°34.7	N25°27.9	5°58.6	N22°00.0	84°29.0	S05°01.5
19	92°43.1	87°07.0	09.1	342°36.8	27.8	21°00.8	00.1	99°31.2	01.3
20	107°45.6	102°10.3	09.1	357°38.8	27.6	36°03.0	00.1	114°33.4	01.2
21	122°48.0	117°13.6	·· 09.0	12°40.9	·· 27.5	51°05.2	·· 00.2	129°35.6	·· 01.1
22	137°50.5	132°17.0	08.9	27°42.9	27.4	66°07.4	00.2	144°37.8	01.0
23	152°53.0	147°20.3	08.9	42°45.0	27.3	81°09.5	00.2	159°39.9	00.9
Mer.pass. 12:50		ν 3.3′ d -0.0′	m -4.55	ν 2.1′ d -0.1′	m -0.07	ν 2.2′ d 0.0′	m -2.24	ν 2.2′ d 0.1′	m 1.10

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	167°55.4	162°23.6	N11°08.8	57°47.0	N25°27.1	96°11.7	N22°00.3	174°42.1	S05°00.7
1	182°57.9	177°27.0	08.7	72°49.1	27.0	111°13.9	00.3	189°44.3	00.6
2	198°00.4	192°30.3	08.7	87°51.1	26.9	126°16.1	00.4	204°46.5	00.5
3	213°02.8	207°33.7	·· 08.6	102°53.2	·· 26.8	141°18.3	·· 00.4	219°48.7	·· 00.4
4	228°05.3	222°37.1	08.5	117°55.2	26.6	156°20.5	00.4	234°50.8	00.3
5	243°07.8	237°40.4	08.4	132°57.2	26.5	171°22.7	00.5	249°53.0	00.1
6	258°10.2	252°43.8	N11°08.4	147°59.3	N25°26.4	186°24.8	N22°00.5	264°55.2	S05°00.0
7	273°12.7	267°47.1	08.3	163°01.3	26.2	201°27.0	00.6	279°57.4	04°59.9
8	288°15.2	282°50.5	08.2	178°03.4	26.1	216°29.2	00.6	294°59.5	59.8
9	303°17.6	297°53.9	·· 08.1	193°05.4	·· 26.0	231°31.4	·· 00.6	310°01.7	·· 59.7
10	318°20.1	312°57.3	08.0	208°07.4	25.9	246°33.6	00.7	325°03.9	59.5
11	333°22.5	328°00.6	07.9	223°09.5	25.7	261°35.8	00.7	340°06.1	59.4
12	348°25.0	343°04.0	N11°07.8	238°11.5	N25°25.6	276°37.9	N22°00.8	355°08.3	S04°59.3
13	3°27.5	358°07.4	07.7	253°13.6	25.5	291°40.1	00.8	10°10.4	59.2
14	18°29.9	13°10.8	07.6	268°15.6	25.3	306°42.3	00.8	25°12.6	59.1
15	33°32.4	28°14.2	·· 07.5	283°17.6	·· 25.2	321°44.5	·· 00.9	40°14.8	·· 58.9
16	48°34.9	43°17.6	07.4	298°19.6	25.1	336°46.7	00.9	55°17.0	58.8
17	63°37.3	58°21.0	07.3	313°21.7	25.0	351°48.9	01.0	70°19.2	58.7
18	78°39.8	73°24.4	N11°07.2	328°23.7	N25°24.8	6°51.0	N22°01.0	85°21.3	S04°58.6
19	93°42.3	88°27.8	07.1	343°25.7	24.7	21°53.2	01.0	100°23.5	58.4
20	108°44.7	103°31.2	07.0	358°27.8	24.6	36°55.4	01.1	115°25.7	58.3
21	123°47.2	118°34.6	·· 06.8	13°29.8	·· 24.4	51°57.6	·· 01.1	130°27.9	·· 58.2
22	138°49.6	133°38.1	06.7	28°31.8	24.3	66°59.8	01.2	145°30.1	58.1
23	153°52.1	148°41.5	06.6	43°33.8	24.2	82°01.9	01.2	160°32.2	58.0
Mer.pass. 12:46		ν 3.3′ d -0.1′	m -4.50	ν 2.0′ d -0.1′	m -0.05	ν 2.2′ d 0.0′	m -2.24	ν 2.2′ d 0.1′	m 1.10

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.4	56°40.6
Diphda	348°47.4	-17°51.1
Achernar	335°20.5	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°13.5	89°22.5
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.3	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.7	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.5	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.2	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.2	-59°35.6
Suhail	222°45.9	-43°32.2
Miaplacidus	221°37.5	-69°49.4
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.8
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.0
Acrux	172°59.3	-63°14.3
Gacrux	171°51.0	-57°15.2
Alioth	166°12.3	55°49.2
Spica	158°21.9	-11°17.7
Alkaid	152°51.5	49°11.0
Hadar	148°35.4	-60°29.6
Menkent	147°57.2	-36°29.6
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.7	-60°56.2
Kochab	137°19.1	74°02.7
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.5
Antares	112°15.6	-26°29.3
Atria	107°09.7	-69°04.1
Sabik	102°02.6	-15°45.4
Shaula	96°10.2	-37°07.3
Rasalhague	95°58.5	12°32.3
Eltanin	90°42.2	51°28.7
Kaus Aust.	83°32.4	-34°22.3
Vega	80°33.3	38°48.1
Nunki	75°47.7	-26°15.9
Altair	62°00.0	8°55.9
Peacock	53°05.9	-56°39.1
Deneb	49°26.1	45°21.9
Enif	33°39.0	9°59.3
Al Na'ir	27°33.2	-46°50.4
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 08 Sat	SHA	Mer.pass
Venus	353°49.9	13:18
Mars	250°10.3	20:13
Jupiter	288°29.3	17:40
Saturn	7°00.3	12:26

Mar 09 Sun	SHA	Mer.pass
Venus	354°08.1	13:13
Mars	250°01.2	20:09
Jupiter	288°22.9	17:36
Saturn	6°53.5	12:23

Mar 10 Mon	SHA	Mer.pass
Venus	354°28.2	13:07
Mars	249°51.6	20:06
Jupiter	288°16.3	17:33
Saturn	6°46.7	12:19

Horizontal parallax	
Venus:	0.5
Mars:	0.2

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.9	S04°52.5	71°09.6	5.4′	N28°36.9	1.6′	57.5′
1	192°18.0	51.5	85°34.0	5.5′	28°35.3	1.8′	57.5′
2	207°18.2	50.5	99°58.5	5.5′	28°33.5	1.9′	57.5′
3	222°18.3	·· 49.6	114°23.0	5.6′	28°31.6	2.1′	57.5′
4	237°18.5	48.6	128°47.6	5.6′	28°29.5	2.2′	57.4′
5	252°18.6	47.6	143°12.2	5.7′	28°27.3	2.5′	57.4′
6	267°18.8	S04°46.6	157°37.0	5.8′	N28°24.8	2.6′	57.4′
7	282°19.0	45.6	172°01.7	5.8′	28°22.2	2.7′	57.4′
8	297°19.1	44.7	186°26.6	5.9′	28°19.5	3.0′	57.3′
9	312°19.3	·· 43.7	200°51.5	6.0′	28°16.5	3.1′	57.3′
10	327°19.4	42.7	215°16.4	6.0′	28°13.4	3.3′	57.3′
11	342°19.6	41.7	229°41.4	6.1′	28°10.1	3.4′	57.3′
12	357°19.7	S04°40.8	244°06.6	6.2′	N28°06.7	3.6′	57.2′
13	12°19.9	39.8	258°31.7	6.3′	28°03.1	3.8′	57.2′
14	27°20.0	38.8	272°57.0	6.3′	27°59.3	4.0′	57.2′
15	42°20.2	·· 37.8	287°22.3	6.4′	27°55.3	4.1′	57.2′
16	57°20.3	36.9	301°47.7	6.5′	27°51.2	4.2′	57.1′
17	72°20.5	35.9	316°13.2	6.6′	27°47.0	4.5′	57.1′
18	87°20.7	S04°34.9	330°38.7	6.6′	N27°42.5	4.5′	57.1′
19	102°20.8	33.9	345°04.4	6.7′	27°38.0	4.8′	57.1′
20	117°21.0	33.0	359°30.1	6.8′	27°33.2	4.9′	57.0′
21	132°21.1	·· 32.0	13°55.9	6.9′	27°28.3	5.0′	57.0′
22	147°21.3	31.0	28°21.8	7.0′	27°23.3	5.3′	57.0′
23	162°21.4	30.0	42°47.8	7.1′	27°18.0	5.3′	57.0′
	SD = 16.1′	d = 1.0′	SD = 15.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°21.6	S04°29.0	57°13.8	7.2′	N27°12.7	5.5′	56.9′
1	192°21.8	28.1	71°40.0	7.2′	27°07.2	5.7′	56.9′
2	207°21.9	27.1	86°06.2	7.3′	27°01.5	5.8′	56.9′
3	222°22.1	·· 26.1	100°32.6	7.4′	26°55.7	6.0′	56.9′
4	237°22.2	25.1	114°59.0	7.5′	26°49.7	6.1′	56.8′
5	252°22.4	24.2	129°25.5	7.6′	26°43.6	6.2′	56.8′
6	267°22.5	S04°23.2	143°52.1	7.7′	N26°37.4	6.4′	56.8′
7	282°22.7	22.2	158°18.8	7.8′	26°31.0	6.6′	56.8′
8	297°22.9	21.2	172°45.6	7.9′	26°24.4	6.7′	56.7′
9	312°23.0	·· 20.2	187°12.5	8.0′	26°17.7	6.8′	56.7′
10	327°23.2	19.3	201°39.5	8.1′	26°10.9	7.0′	56.7′
11	342°23.3	18.3	216°06.6	8.2′	26°03.9	7.1′	56.7′
12	357°23.5	S04°17.3	230°33.7	8.3′	N25°56.8	7.2′	56.6′
13	12°23.7	16.3	245°01.0	8.4′	25°49.6	7.4′	56.6′
14	27°23.8	15.3	259°28.4	8.5′	25°42.2	7.5′	56.6′
15	42°24.0	·· 14.4	273°55.9	8.6′	25°34.7	7.6′	56.6′
16	57°24.1	13.4	288°23.5	8.7′	25°27.1	7.8′	56.5′
17	72°24.3	12.4	302°51.1	8.8′	25°19.3	7.9′	56.5′
18	87°24.5	S04°11.4	317°18.9	8.9′	N25°11.4	8.1′	56.5′
19	102°24.6	10.4	331°46.8	9.0′	25°03.3	8.1′	56.5′
20	117°24.8	09.5	346°14.8	9.1′	24°55.2	8.3′	56.5′
21	132°24.9	·· 08.5	0°42.9	9.2′	24°46.9	8.4′	56.4′
22	147°25.1	07.5	15°11.0	9.3′	24°38.5	8.5′	56.4′
23	162°25.3	06.5	29°39.3	9.4′	24°30.0	8.7′	56.4′
	SD = 16.1′	d = 1.0′	SD = 15.5′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.4	S04°05.6	44°07.7	9.5′	N24°21.3	8.8′	56.4′
1	192°25.6	04.6	58°36.2	9.6′	24°12.5	8.9′	56.3′
2	207°25.7	03.6	73°04.8	9.7′	24°03.6	9.0′	56.3′
3	222°25.9	·· 02.6	87°33.5	9.8′	23°54.6	9.1′	56.3′
4	237°26.1	01.6	102°02.3	9.9′	23°45.5	9.3′	56.3′
5	252°26.2	04°00.7	116°31.2	10.0′	23°36.2	9.3′	56.3′
6	267°26.4	S03°59.7	131°00.2	10.1′	N23°26.9	9.5′	56.2′
7	282°26.5	58.7	145°29.3	10.2′	23°17.4	9.6′	56.2′
8	297°26.7	57.7	159°58.5	10.3′	23°07.8	9.6′	56.2′
9	312°26.9	·· 56.7	174°27.8	10.4′	22°58.2	9.8′	56.2′
10	327°27.0	55.7	188°57.2	10.5′	22°48.4	9.9′	56.1′
11	342°27.2	54.8	203°26.8	10.6′	22°38.5	10.1′	56.1′
12	357°27.4	S03°53.8	217°56.4	10.7′	N22°28.4	10.1′	56.1′
13	12°27.5	52.8	232°26.1	10.8′	22°18.3	10.2′	56.1′
14	27°27.7	51.8	246°55.9	10.9′	22°08.1	10.3′	56.1′
15	42°27.8	·· 50.8	261°25.8	11.0′	21°57.8	10.4′	56.0′
16	57°28.0	49.9	275°55.9	11.1′	21°47.4	10.5′	56.0′
17	72°28.2	48.9	290°26.0	11.2′	21°36.9	10.6′	56.0′
18	87°28.3	S03°47.9	304°56.2	11.3′	N21°26.3	10.7′	56.0′
19	102°28.5	46.9	319°26.5	11.4′	21°15.6	10.8′	56.0′
20	117°28.7	45.9	333°57.0	11.5′	21°04.8	10.9′	55.9′
21	132°28.8	·· 45.0	348°27.5	11.6′	20°53.9	11.0′	55.9′
22	147°29.0	44.0	2°58.1	11.7′	20°42.9	11.1′	55.9′
23	162°29.2	43.0	17°28.8	11.8′	20°31.8	11.1′	55.9′
	SD = 16.1′	d = 1.0′	SD = 15.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:27	05:47	06:54	17:29	18:37	19:57
N 70°	04:37	05:49	06:49	17:34	18:35	19:47
68°	04:45	05:50	06:45	17:38	18:33	19:39
66°	04:51	05:51	06:42	17:41	18:32	19:32
64°	04:56	05:52	06:39	17:43	18:31	19:26
62°	05:01	05:52	06:36	17:46	18:30	19:22
60°	05:05	05:53	06:34	17:48	18:29	19:18
N 58°	05:08	05:53	06:32	17:50	18:29	19:15
56°	05:11	05:54	06:31	17:51	18:28	19:12
54°	05:13	05:54	06:29	17:53	18:28	19:09
52°	05:15	05:54	06:28	17:54	18:28	19:07
50°	05:17	05:54	06:26	17:56	18:28	19:05
45°	05:20	05:54	06:23	17:58	18:28	19:02
N 40°	05:23	05:54	06:21	18:01	18:28	18:59
35°	05:24	05:53	06:19	18:03	18:28	18:57
30°	05:25	05:53	06:17	18:05	18:28	18:56
20°	05:26	05:51	06:13	18:08	18:30	18:55
N 10°	05:25	05:49	06:10	18:11	18:32	18:56
0°	05:22	05:46	06:07	18:14	18:34	18:58
S 10°	05:18	05:43	06:04	18:17	18:38	19:02
20°	05:13	05:38	06:01	18:20	18:42	19:08
30°	05:04	05:32	05:56	18:24	18:48	19:16
35°	04:59	05:29	05:54	18:26	18:52	19:21
40°	04:52	05:24	05:51	18:29	18:56	19:28
45°	04:43	05:18	05:48	18:32	19:01	19:37
S 50°	04:32	05:11	05:44	18:36	19:08	19:47
52°	04:27	05:08	05:42	18:37	19:11	19:53
54°	04:21	05:04	05:41	18:39	19:15	19:59
56°	04:14	05:00	05:38	18:41	19:19	20:05
58°	04:06	04:56	05:36	18:44	19:24	20:13
S 60°	03:57	04:50	05:33	18:46	19:29	20:22

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°						
N 70°						
68°						
66°			10:50			08:10
64°			11:36			07:23
62°		10:06	12:06		07:03	06:53
60°	09:05	10:45	12:28	06:05	06:24	06:29
N 58°	09:43	11:12	12:46	05:26	05:56	06:11
56°	10:10	11:33	13:02	04:59	05:35	05:55
54°	10:31	11:50	13:15	04:38	05:17	05:41
52°	10:49	12:05	13:26	04:20	05:02	05:29
50°	11:04	12:18	13:36	04:05	04:48	05:19
45°	11:34	12:44	13:57	03:34	04:21	04:57
N 40°	11:58	13:05	14:14	03:11	04:00	04:39
35°	12:17	13:22	14:28	02:51	03:42	04:24
30°	12:34	13:37	14:40	02:34	03:26	04:10
20°	13:02	14:02	15:01	02:05	03:00	03:48
N 10°	13:26	14:24	15:19	01:41	02:37	03:28
0°	13:48	14:44	15:36	01:18	02:16	03:10
S 10°	14:11	15:04	15:53	00:55	01:54	02:51
20°	14:35	15:26	16:11	00:30	01:31	02:31
30°	15:03	15:51	16:31	00:01	01:04	02:08
35°	15:19	16:05	16:43	·· ··	00:48	01:54
40°	15:38	16:22	16:57	·· ··	00:29	01:38
45°	16:01	16:42	17:13	·· ··	00:07	01:19
S 50°	16:31	17:07	17:32	23:38	·· ··	00:55
52°	16:46	17:19	17:42	23:23	·· ··	00:43
54°	17:02	17:33	17:52	23:07	·· ··	00:30
56°	17:23	17:49	18:04	22:47	·· ··	00:14
58°	17:48	18:08	18:17	22:22	23:56	·· ··
S 60°	18:22	18:31	18:33	21:48	23:34	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 64-83%
08	10:49	10:41	12:11	20:02	07:33	
09	10:34	10:26	12:10	20:57	08:30	
10	10:18	10:11	12:10	21:48	09:23	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2017 sec ΔT = TT-UT1 = +68.9823 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	168°54.6	163°44.9	N11°06.5	58°35.9	N25°24.1	97°04.1	N22°01.2	175°34.4	S04°57.8
1	183°57.0	178°48.3	06.3	73°37.9	23.9	112°06.3	01.3	190°36.6	57.7
2	198°59.5	193°51.7	06.2	88°39.9	23.8	127°08.5	01.3	205°38.8	57.6
3	214°02.0	208°55.2	·· 06.1	103°41.9	·· 23.7	142°10.6	·· 01.4	220°41.0	·· 57.5
4	229°04.4	223°58.6	05.9	118°43.9	23.5	157°12.8	01.4	235°43.1	57.4
5	244°06.9	239°02.1	05.8	133°46.0	23.4	172°15.0	01.4	250°45.3	57.2
6	259°09.4	254°05.5	N11°05.6	148°48.0	N25°23.3	187°17.2	N22°01.5	265°47.5	S04°57.1
7	274°11.8	269°08.9	05.5	163°50.0	23.1	202°19.4	01.5	280°49.7	57.0
8	289°14.3	284°12.4	05.4	178°52.0	23.0	217°21.5	01.6	295°51.8	56.9
9	304°16.8	299°15.8	·· 05.2	193°54.0	·· 22.9	232°23.7	·· 01.6	310°54.0	·· 56.8
10	319°19.2	314°19.3	05.0	208°56.0	22.7	247°25.9	01.7	325°56.2	56.6
11	334°21.7	329°22.8	04.9	223°58.0	22.6	262°28.1	01.7	340°58.4	56.5
12	349°24.1	344°26.2	N11°04.7	239°00.0	N25°22.5	277°30.2	N22°01.7	356°00.6	S04°56.4
13	4°26.6	359°29.7	04.6	254°02.1	22.3	292°32.4	01.8	11°02.7	56.3
14	19°29.1	14°33.2	04.4	269°04.1	22.2	307°34.6	01.8	26°04.9	56.2
15	34°31.5	29°36.6	·· 04.2	284°06.1	·· 22.1	322°36.8	·· 01.9	41°07.1	·· 56.0
16	49°34.0	44°40.1	04.1	299°08.1	21.9	337°38.9	01.9	56°09.3	55.9
17	64°36.5	59°43.6	03.9	314°10.1	21.8	352°41.1	01.9	71°11.5	55.8
18	79°38.9	74°47.1	N11°03.7	329°12.1	N25°21.7	7°43.3	N22°02.0	86°13.6	S04°55.7
19	94°41.4	89°50.5	03.5	344°14.1	21.5	22°45.5	02.0	101°15.8	55.6
20	109°43.9	104°54.0	03.4	359°16.1	21.4	37°47.6	02.1	116°18.0	55.4
21	124°46.3	119°57.5	·· 03.2	14°18.1	·· 21.3	52°49.8	·· 02.1	131°20.2	·· 55.3
22	139°48.8	135°01.0	03.0	29°20.1	21.1	67°52.0	02.1	146°22.4	55.2
23	154°51.3	150°04.5	02.8	44°22.1	21.0	82°54.2	02.2	161°24.5	55.1
Mer.pass.	12:42	ν 3.4′	d -0.1′	m -4.45	ν 2.0′	d -0.1′	m -0.02	ν 2.2′	d 0.0′ m -2.23	ν 2.2′	d 0.1′ m 1.10

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	169°53.7	165°08.0	N11°02.6	59°24.1	N25°20.9	97°56.3	N22°02.2	176°26.7	S04°55.0
1	184°56.2	180°11.5	02.4	74°26.1	20.7	112°58.5	02.3	191°28.9	54.8
2	199°58.6	195°15.0	02.2	89°28.1	20.6	128°00.7	02.3	206°31.1	54.7
3	215°01.1	210°18.5	·· 02.0	104°30.1	·· 20.5	143°02.8	·· 02.3	221°33.3	·· 54.6
4	230°03.6	225°22.0	01.8	119°32.1	20.3	158°05.0	02.4	236°35.4	54.5
5	245°06.0	240°25.5	01.6	134°34.1	20.2	173°07.2	02.4	251°37.6	54.4
6	260°08.5	255°29.0	N11°01.4	149°36.0	N25°20.1	188°09.4	N22°02.5	266°39.8	S04°54.2
7	275°11.0	270°32.6	01.2	164°38.0	19.9	203°11.5	02.5	281°42.0	54.1
8	290°13.4	285°36.1	01.0	179°40.0	19.8	218°13.7	02.6	296°44.1	54.0
9	305°15.9	300°39.6	·· 00.8	194°42.0	·· 19.7	233°15.9	·· 02.6	311°46.3	·· 53.9
10	320°18.4	315°43.1	00.6	209°44.0	19.5	248°18.0	02.6	326°48.5	53.7
11	335°20.8	330°46.7	00.3	224°46.0	19.4	263°20.2	02.7	341°50.7	53.6
12	350°23.3	345°50.2	N11°00.1	239°48.0	N25°19.3	278°22.4	N22°02.7	356°52.9	S04°53.5
13	5°25.7	0°53.7	10°59.9	254°50.0	19.1	293°24.5	02.8	11°55.0	53.4
14	20°28.2	15°57.3	59.7	269°51.9	19.0	308°26.7	02.8	26°57.2	53.3
15	35°30.7	31°00.8	·· 59.4	284°53.9	·· 18.9	323°28.9	·· 02.8	41°59.4	·· 53.1
16	50°33.1	46°04.4	59.2	299°55.9	18.7	338°31.0	02.9	57°01.6	53.0
17	65°35.6	61°07.9	59.0	314°57.9	18.6	353°33.2	02.9	72°03.8	52.9
18	80°38.1	76°11.5	N10°58.7	329°59.9	N25°18.4	8°35.4	N22°03.0	87°05.9	S04°52.8
19	95°40.5	91°15.0	58.5	345°01.8	18.3	23°37.5	03.0	102°08.1	52.7
20	110°43.0	106°18.6	58.3	0°03.8	18.2	38°39.7	03.0	117°10.3	52.5
21	125°45.5	121°22.1	·· 58.0	15°05.8	·· 18.0	53°41.9	·· 03.1	132°12.5	·· 52.4
22	140°47.9	136°25.7	57.8	30°07.8	17.9	68°44.0	03.1	147°14.7	52.3
23	155°50.4	151°29.3	57.5	45°09.7	17.8	83°46.2	03.2	162°16.8	52.2
Mer.pass.	12:38	ν 3.5′	d -0.2′	m -4.40	ν 2.0′	d -0.1′	m 0.00	ν 2.2′	d 0.0′ m -2.22	ν 2.2′	d 0.1′ m 1.10

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	170°52.9	166°32.8	N10°57.3	60°11.7	N25°17.6	98°48.4	N22°03.2	177°19.0	S04°52.1
1	185°55.3	181°36.4	57.0	75°13.7	17.5	113°50.5	03.3	192°21.2	51.9
2	200°57.8	196°40.0	56.7	90°15.6	17.4	128°52.7	03.3	207°23.4	51.8
3	216°00.2	211°43.5	·· 56.5	105°17.6	·· 17.2	143°54.9	·· 03.3	222°25.6	·· 51.7
4	231°02.7	226°47.1	56.2	120°19.6	17.1	158°57.0	03.4	237°27.7	51.6
5	246°05.2	241°50.7	55.9	135°21.6	16.9	173°59.2	03.4	252°29.9	51.5
6	261°07.6	256°54.3	N10°55.7	150°23.5	N25°16.8	189°01.4	N22°03.5	267°32.1	S04°51.3
7	276°10.1	271°57.9	55.4	165°25.5	16.7	204°03.5	03.5	282°34.3	51.2
8	291°12.6	287°01.5	55.1	180°27.4	16.5	219°05.7	03.5	297°36.4	51.1
9	306°15.0	302°05.1	·· 54.9	195°29.4	·· 16.4	234°07.9	·· 03.6	312°38.6	·· 51.0
10	321°17.5	317°08.7	54.6	210°31.4	16.2	249°10.0	03.6	327°40.8	50.9
11	336°20.0	332°12.3	54.3	225°33.3	16.1	264°12.2	03.7	342°43.0	50.7
12	351°22.4	347°15.9	N10°54.0	240°35.3	N25°16.0	279°14.3	N22°03.7	357°45.2	S04°50.6
13	6°24.9	2°19.5	53.7	255°37.3	15.8	294°16.5	03.8	12°47.3	50.5
14	21°27.3	17°23.1	53.4	270°39.2	15.7	309°18.7	03.8	27°49.5	50.4
15	36°29.8	32°26.7	·· 53.1	285°41.2	·· 15.6	324°20.8	·· 03.8	42°51.7	·· 50.3
16	51°32.3	47°30.3	52.8	300°43.1	15.4	339°23.0	03.9	57°53.9	50.1
17	66°34.7	62°33.9	52.5	315°45.1	15.3	354°25.1	03.9	72°56.1	50.0
18	81°37.2	77°37.5	N10°52.2	330°47.0	N25°15.1	9°27.3	N22°04.0	87°58.2	S04°49.9
19	96°39.7	92°41.1	51.9	345°49.0	15.0	24°29.5	04.0	103°00.4	49.8
20	111°42.1	107°44.7	51.6	0°50.9	14.9	39°31.6	04.1	118°02.6	49.7
21	126°44.6	122°48.4	·· 51.3	15°52.9	·· 14.7	54°33.8	·· 04.1	133°04.8	·· 49.5
22	141°47.1	137°52.0	51.0	30°54.8	14.6	69°35.9	04.1	148°07.0	49.4
23	156°49.5	152°55.6	50.7	45°56.8	14.4	84°38.1	04.2	163°09.1	49.3
Mer.pass.	12:34	ν 3.6′	d -0.3′	m -4.34	ν 2.0′	d -0.1′	m 0.03	ν 2.2′	d 0.0′ m -2.22	ν 2.2′	d 0.1′ m 1.11

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.5	56°40.6
Diphda	348°47.4	-17°51.0
Achernar	335°20.5	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°14.8	89°22.5
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.3	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.7	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.6	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.2	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.3	-59°35.6
Suhail	222°45.9	-43°32.2
Miaplacidus	221°37.6	-69°49.4
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.9
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.0
Acrux	172°59.3	-63°14.3
Gacrux	171°51.0	-57°15.3
Alioth	166°12.3	55°49.2
Spica	158°21.9	-11°17.7
Alkaid	152°51.5	49°11.0
Hadar	148°35.4	-60°29.6
Menkent	147°57.2	-36°29.6
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.7	-60°56.2
Kochab	137°19.0	74°02.8
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.6	-26°29.3
Atria	107°09.6	-69°04.1
Sabik	102°02.6	-15°45.4
Shaula	96°10.2	-37°07.3
Rasalhague	95°58.4	12°32.2
Eltanin	90°42.2	51°28.7
Kaus Aust.	83°32.4	-34°22.3
Vega	80°33.3	38°48.1
Nunki	75°47.7	-26°15.9
Altair	62°00.0	8°55.9
Peacock	53°05.9	-56°39.1
Deneb	49°26.1	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.1	-46°50.4
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 11 Tue	SHA	Mer.pass
Venus	354°50.3	13:02
Mars	249°41.3	20:03
Jupiter	288°09.5	17:29
Saturn	6°39.8	12:16

Mar 12 Wed	SHA	Mer.pass
Venus	355°14.3	12:56
Mars	249°30.4	20:00
Jupiter	288°02.6	17:26
Saturn	6°33.0	12:12

Mar 13 Thu	SHA	Mer.pass
Venus	355°40.0	12:51
Mars	249°18.9	19:57
Jupiter	287°55.5	17:22
Saturn	6°26.2	12:09

Horizontal parallax	
Venus:	0.5
Mars:	0.2

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°29.3	S03°42.0	31°59.6	11.9′	N20°20.7	11.3′	55.9′
1	192°29.5	41.0	46°30.6	12.0′	20°09.4	11.3′	55.8′
2	207°29.6	40.0	61°01.6	12.1′	19°58.1	11.5′	55.8′
3	222°29.8	·· 39.1	75°32.7	12.2′	19°46.6	11.5′	55.8′
4	237°30.0	38.1	90°03.9	12.3′	19°35.1	11.5′	55.8′
5	252°30.1	37.1	104°35.2	12.4′	19°23.6	11.7′	55.8′
6	267°30.3	S03°36.1	119°06.5	12.5′	N19°11.9	11.8′	55.7′
7	282°30.5	35.1	133°38.0	12.6′	19°00.1	11.8′	55.7′
8	297°30.6	34.2	148°09.6	12.7′	18°48.3	11.9′	55.7′
9	312°30.8	·· 33.2	162°41.3	12.8′	18°36.4	12.0′	55.7′
10	327°31.0	32.2	177°13.0	12.8′	18°24.4	12.0′	55.7′
11	342°31.1	31.2	191°44.9	12.9′	18°12.4	12.1′	55.6′
12	357°31.3	S03°30.2	206°16.8	13.0′	N18°00.3	12.2′	55.6′
13	12°31.5	29.2	220°48.8	13.1′	17°48.1	12.3′	55.6′
14	27°31.6	28.3	235°20.9	13.2′	17°35.8	12.4′	55.6′
15	42°31.8	·· 27.3	249°53.1	13.3′	17°23.4	12.4′	55.6′
16	57°32.0	26.3	264°25.4	13.4′	17°11.0	12.4′	55.5′
17	72°32.1	25.3	278°57.8	13.5′	16°58.6	12.6′	55.5′
18	87°32.3	S03°24.3	293°30.2	13.5′	N16°46.0	12.6′	55.5′
19	102°32.5	23.3	308°02.8	13.6′	16°33.4	12.6′	55.5′
20	117°32.6	22.4	322°35.4	13.7′	16°20.8	12.8′	55.5′
21	132°32.8	·· 21.4	337°08.1	13.8′	16°08.0	12.8′	55.4′
22	147°33.0	20.4	351°40.9	13.9′	15°55.2	12.8′	55.4′
23	162°33.1	19.4	6°13.8	13.9′	15°42.4	12.9′	55.4′
	SD = 16.1′	d = 1.0′	SD = 15.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°33.3	S03°18.4	20°46.7	14.0′	N15°29.5	13.0′	55.4′
1	192°33.5	17.4	35°19.7	14.1′	15°16.5	13.0′	55.4′
2	207°33.6	16.5	49°52.8	14.2′	15°03.5	13.1′	55.4′
3	222°33.8	·· 15.5	64°26.0	14.3′	14°50.4	13.1′	55.3′
4	237°34.0	14.5	78°59.3	14.3′	14°37.3	13.2′	55.3′
5	252°34.1	13.5	93°32.6	14.4′	14°24.1	13.3′	55.3′
6	267°34.3	S03°12.5	108°06.0	14.5′	N14°10.8	13.3′	55.3′
7	282°34.5	11.5	122°39.5	14.6′	13°57.5	13.3′	55.3′
8	297°34.6	10.6	137°13.1	14.6′	13°44.2	13.4′	55.3′
9	312°34.8	·· 09.6	151°46.7	14.7′	13°30.8	13.4′	55.2′
10	327°35.0	08.6	166°20.4	14.8′	13°17.4	13.5′	55.2′
11	342°35.1	07.6	180°54.1	14.8′	13°03.9	13.5′	55.2′
12	357°35.3	S03°06.6	195°28.0	14.9′	N12°50.4	13.6′	55.2′
13	12°35.5	05.6	210°01.9	15.0′	12°36.8	13.6′	55.2′
14	27°35.7	04.7	224°35.8	15.0′	12°23.2	13.7′	55.1′
15	42°35.8	·· 03.7	239°09.9	15.1′	12°09.5	13.6′	55.1′
16	57°36.0	02.7	253°44.0	15.2′	11°55.9	13.8′	55.1′
17	72°36.2	01.7	268°18.1	15.2′	11°42.1	13.8′	55.1′
18	87°36.3	S03°00.7	282°52.3	15.3′	N11°28.3	13.8′	55.1′
19	102°36.5	02°59.7	297°26.6	15.3′	11°14.5	13.8′	55.1′
20	117°36.7	58.8	312°01.0	15.4′	11°00.7	13.9′	55.1′
21	132°36.8	·· 57.8	326°35.4	15.5′	10°46.8	13.9′	55.0′
22	147°37.0	56.8	341°09.8	15.5′	10°32.9	14.0′	55.0′
23	162°37.2	55.8	355°44.3	15.6′	10°18.9	13.9′	55.0′
	SD = 16.1′	d = 1.0′	SD = 15.1′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°37.4	S02°54.8	10°18.9	15.6′	N10°05.0	14.1′	55.0′
1	192°37.5	53.8	24°53.5	15.7′	09°50.9	14.0′	55.0′
2	207°37.7	52.8	39°28.2	15.7′	09°36.9	14.1′	55.0′
3	222°37.9	·· 51.9	54°03.0	15.8′	09°22.8	14.1′	54.9′
4	237°38.0	50.9	68°37.8	15.8′	09°08.7	14.1′	54.9′
5	252°38.2	49.9	83°12.6	15.9′	08°54.6	14.2′	54.9′
6	267°38.4	S02°48.9	97°47.5	15.9′	N08°40.4	14.2′	54.9′
7	282°38.6	47.9	112°22.4	16.0′	08°26.2	14.2′	54.9′
8	297°38.7	46.9	126°57.4	16.0′	08°12.0	14.2′	54.9′
9	312°38.9	·· 45.9	141°32.4	16.1′	07°57.8	14.3′	54.8′
10	327°39.1	45.0	156°07.5	16.1′	07°43.5	14.2′	54.8′
11	342°39.2	44.0	170°42.6	16.2′	07°29.3	14.3′	54.8′
12	357°39.4	S02°43.0	185°17.8	16.2′	N07°15.0	14.3′	54.8′
13	12°39.6	42.0	199°53.0	16.3′	07°00.7	14.4′	54.8′
14	27°39.8	41.0	214°28.3	16.3′	06°46.3	14.3′	54.8′
15	42°39.9	·· 40.0	229°03.6	16.3′	06°32.0	14.4′	54.8′
16	57°40.1	39.0	243°38.9	16.4′	06°17.6	14.4′	54.7′
17	72°40.3	38.1	258°14.3	16.4′	06°03.2	14.4′	54.7′
18	87°40.4	S02°37.1	272°49.7	16.4′	N05°48.8	14.4′	54.7′
19	102°40.6	36.1	287°25.1	16.5′	05°34.4	14.4′	54.7′
20	117°40.8	35.1	302°00.6	16.5′	05°20.0	14.5′	54.7′
21	132°41.0	·· 34.1	316°36.1	16.5′	05°05.5	14.4′	54.7′
22	147°41.1	33.1	331°11.7	16.6′	04°51.1	14.5′	54.7′
23	162°41.3	32.1	345°47.3	16.6′	04°36.6	14.5′	54.6′
	SD = 16.1′	d = 1.0′	SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:10	05:32	06:38	17:43	18:50	20:13
N 70°	04:22	05:35	06:35	17:46	18:47	20:01
68°	04:31	05:37	06:33	17:49	18:44	19:51
66°	04:39	05:40	06:30	17:51	18:42	19:43
64°	04:46	05:41	06:28	17:52	18:40	19:36
62°	04:51	05:43	06:27	17:54	18:38	19:30
60°	04:55	05:44	06:25	17:55	18:37	19:26
N 58°	04:59	05:45	06:24	17:57	18:36	19:22
56°	05:03	05:46	06:23	17:58	18:35	19:18
54°	05:05	05:47	06:22	17:59	18:34	19:15
52°	05:08	05:47	06:21	18:00	18:33	19:13
50°	05:10	05:48	06:20	18:00	18:33	19:10
45°	05:15	05:49	06:18	18:02	18:31	19:06
N 40°	05:18	05:49	06:16	18:04	18:31	19:02
35°	05:20	05:49	06:15	18:05	18:30	19:00
30°	05:22	05:49	06:13	18:06	18:30	18:58
20°	05:23	05:49	06:11	18:09	18:31	18:56
N 10°	05:23	05:48	06:09	18:11	18:32	18:56
0°	05:22	05:46	06:06	18:13	18:34	18:58
S 10°	05:19	05:43	06:04	18:15	18:36	19:01
20°	05:14	05:39	06:01	18:17	18:40	19:05
30°	05:06	05:34	05:58	18:20	18:44	19:12
35°	05:01	05:31	05:57	18:22	18:47	19:17
40°	04:55	05:27	05:55	18:24	18:51	19:23
45°	04:48	05:23	05:52	18:26	18:56	19:31
S 50°	04:38	05:17	05:49	18:29	19:02	19:40
52°	04:33	05:14	05:48	18:30	19:04	19:45
54°	04:27	05:10	05:46	18:32	19:07	19:50
56°	04:21	05:07	05:45	18:33	19:11	19:56
58°	04:14	05:03	05:43	18:35	19:15	20:03
S 60°	04:06	04:58	05:41	18:37	19:19	20:11

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°		14:15	16:30		08:04	07:17
N 70°	12:05	14:38	16:39	08:38	07:39	07:05
68°	12:47	14:55	16:46	07:55	07:19	06:56
66°	13:15	15:09	16:52	07:26	07:04	06:47
64°	13:36	15:21	16:58	07:04	06:51	06:41
62°	13:53	15:31	17:02	06:46	06:40	06:35
60°	14:07	15:39	17:06	06:31	06:30	06:29
N 58°	14:19	15:46	17:09	06:18	06:22	06:25
56°	14:29	15:52	17:12	06:07	06:15	06:20
54°	14:38	15:58	17:15	05:57	06:08	06:17
52°	14:46	16:03	17:17	05:48	06:02	06:13
50°	14:53	16:08	17:20	05:41	05:57	06:10
45°	15:09	16:18	17:24	05:24	05:45	06:03
N 40°	15:21	16:26	17:28	05:10	05:36	05:58
35°	15:32	16:33	17:32	04:58	05:27	05:53
30°	15:41	16:39	17:35	04:48	05:20	05:48
20°	15:57	16:50	17:40	04:30	05:07	05:41
N 10°	16:11	16:59	17:44	04:14	04:56	05:34
0°	16:23	17:07	17:49	03:59	04:45	05:28
S 10°	16:36	17:16	17:53	03:44	04:34	05:21
20°	16:50	17:25	17:58	03:28	04:23	05:14
30°	17:05	17:35	18:03	03:10	04:09	05:06
35°	17:14	17:41	18:06	02:59	04:01	05:02
40°	17:25	17:48	18:09	02:46	03:53	04:56
45°	17:36	17:56	18:13	02:31	03:42	04:50
S 50°	17:51	18:05	18:17	02:13	03:29	04:43
52°	17:57	18:09	18:19	02:04	03:23	04:39
54°	18:05	18:14	18:22	01:55	03:17	04:35
56°	18:13	18:19	18:24	01:44	03:09	04:31
58°	18:22	18:25	18:27	01:31	03:01	04:26
S 60°	18:33	18:32	18:30	01:16	02:52	04:21

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 11-13 90-98%
11	10:03	09:55	12:10	22:34	10:11	
12	09:47	09:39	12:10	23:18	10:56	
13	09:31	09:22	12:09	23:58	11:38	

No IERS EOP prediction data available

March 14, 15, 16 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2024 sec ΔT = TT-UT1 = +68.9816 sec

2025 March 14 to Mar. 16 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	171°52.0	167°59.3	N10°50.4	60°58.7	N25°14.3	99°40.3	N22°04.2	178°11.3	S04°49.2
1	186°54.5	183°02.9	50.1	76°00.7	14.2	114°42.4	04.3	193°13.5	49.1
2	201°56.9	198°06.5	49.7	91°02.6	14.0	129°44.6	04.3	208°15.7	48.9
3	216°59.4	213°10.2	·· 49.4	106°04.6	·· 13.9	144°46.7	·· 04.3	223°17.9	·· 48.8
4	232°01.8	228°13.8	49.1	121°06.5	13.7	159°48.9	04.4	238°20.0	48.7
5	247°04.3	243°17.5	48.8	136°08.5	13.6	174°51.0	04.4	253°22.2	48.6
6	262°06.8	258°21.1	N10°48.4	151°10.4	N25°13.5	189°53.2	N22°04.5	268°24.4	S04°48.4
7	277°09.2	273°24.7	48.1	166°12.3	13.3	204°55.4	04.5	283°26.6	48.3
8	292°11.7	288°28.4	47.8	181°14.3	13.2	219°57.5	04.6	298°28.7	48.2
9	307°14.2	303°32.1	·· 47.4	196°16.2	·· 13.0	234°59.7	·· 04.6	313°30.9	·· 48.1
10	322°16.6	318°35.7	47.1	211°18.2	12.9	250°01.8	04.6	328°33.1	48.0
11	337°19.1	333°39.4	46.7	226°20.1	12.7	265°04.0	04.7	343°35.3	47.8
12	352°21.6	348°43.0	N10°46.4	241°22.0	N25°12.6	280°06.1	N22°04.7	358°37.5	S04°47.7
13	7°24.0	3°46.7	46.0	256°24.0	12.5	295°08.3	04.8	13°39.6	47.6
14	22°26.5	18°50.4	45.7	271°25.9	12.3	310°10.5	04.8	28°41.8	47.5
15	37°28.9	33°54.0	·· 45.3	286°27.8	·· 12.2	325°12.6	·· 04.9	43°44.0	·· 47.4
16	52°31.4	48°57.7	45.0	301°29.8	12.0	340°14.8	04.9	58°46.2	47.2
17	67°33.9	64°01.4	44.6	316°31.7	11.9	355°16.9	04.9	73°48.4	47.1
18	82°36.3	79°05.0	N10°44.2	331°33.6	N25°11.7	10°19.1	N22°05.0	88°50.5	S04°47.0
19	97°38.8	94°08.7	43.9	346°35.6	11.6	25°21.2	05.0	103°52.7	46.9
20	112°41.3	109°12.4	43.5	1°37.5	11.5	40°23.4	05.1	118°54.9	46.8
21	127°43.7	124°16.1	·· 43.1	16°39.4	·· 11.3	55°25.5	·· 05.1	133°57.1	·· 46.6
22	142°46.2	139°19.8	42.8	31°41.3	11.2	70°27.7	05.2	148°59.3	46.5
23	157°48.7	154°23.4	42.4	46°43.3	11.0	85°29.8	05.2	164°01.4	46.4
Mer.pass.	12:30	ν 3.6′	d -0.3′	m -4.28	ν 1.9′	d -0.1′	m 0.05	ν 2.2′	d 0.0′ m -2.21	ν 2.2′	d 0.1′ m 1.11

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	172°51.1	169°27.1	N10°42.0	61°45.2	N25°10.9	100°32.0	N22°05.2	179°03.6	S04°46.3
1	187°53.6	184°30.8	41.6	76°47.1	10.7	115°34.1	05.3	194°05.8	46.2
2	202°56.1	199°34.5	41.2	91°49.0	10.6	130°36.3	05.3	209°08.0	46.0
3	217°58.5	214°38.2	·· 40.9	106°51.0	·· 10.4	145°38.4	·· 05.4	224°10.2	·· 45.9
4	233°01.0	229°41.9	40.5	121°52.9	10.3	160°40.6	05.4	239°12.3	45.8
5	248°03.4	244°45.6	40.1	136°54.8	10.2	175°42.7	05.4	254°14.5	45.7
6	263°05.9	259°49.3	N10°39.7	151°56.7	N25°10.0	190°44.9	N22°05.5	269°16.7	S04°45.6
7	278°08.4	274°53.0	39.3	166°58.6	09.9	205°47.0	05.5	284°18.9	45.4
8	293°10.8	289°56.7	38.9	182°00.5	09.7	220°49.2	05.6	299°21.1	45.3
9	308°13.3	305°00.4	·· 38.5	197°02.5	·· 09.6	235°51.3	·· 05.6	314°23.2	·· 45.2
10	323°15.8	320°04.1	38.1	212°04.4	09.4	250°53.5	05.7	329°25.4	45.1
11	338°18.2	335°07.8	37.7	227°06.3	09.3	265°55.6	05.7	344°27.6	45.0
12	353°20.7	350°11.6	N10°37.3	242°08.2	N25°09.1	280°57.8	N22°05.7	359°29.8	S04°44.8
13	8°23.2	5°15.3	36.9	257°10.1	09.0	295°59.9	05.8	14°31.9	44.7
14	23°25.6	20°19.0	36.4	272°12.0	08.9	311°02.1	05.8	29°34.1	44.6
15	38°28.1	35°22.7	·· 36.0	287°13.9	·· 08.7	326°04.2	·· 05.9	44°36.3	·· 44.5
16	53°30.5	50°26.4	35.6	302°15.8	08.6	341°06.4	05.9	59°38.5	44.4
17	68°33.0	65°30.2	35.2	317°17.8	08.4	356°08.5	06.0	74°40.7	44.2
18	83°35.5	80°33.9	N10°34.8	332°19.7	N25°08.3	11°10.7	N22°06.0	89°42.8	S04°44.1
19	98°37.9	95°37.6	34.3	347°21.6	08.1	26°12.8	06.0	104°45.0	44.0
20	113°40.4	110°41.3	33.9	2°23.5	08.0	41°15.0	06.1	119°47.2	43.9
21	128°42.9	125°45.1	·· 33.5	17°25.4	·· 07.8	56°17.1	·· 06.1	134°49.4	·· 43.8
22	143°45.3	140°48.8	33.0	32°27.3	07.7	71°19.2	06.2	149°51.6	43.6
23	158°47.8	155°52.5	32.6	47°29.2	07.5	86°21.4	06.2	164°53.7	43.5
Mer.pass.	12:27	ν 3.7′	d -0.4′	m -4.22	ν 1.9′	d -0.1′	m 0.07	ν 2.2′	d 0.0′ m -2.20	ν 2.2′	d 0.1′ m 1.11

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	173°50.3	170°56.3	N10°32.2	62°31.1	N25°07.4	101°23.5	N22°06.3	179°55.9	S04°43.4
1	188°52.7	186°00.0	31.7	77°33.0	07.2	116°25.7	06.3	194°58.1	43.3
2	203°55.2	201°03.8	31.3	92°34.9	07.1	131°27.8	06.3	210°00.3	43.2
3	218°57.7	216°07.5	·· 30.8	107°36.8	·· 06.9	146°30.0	·· 06.4	225°02.5	·· 43.0
4	234°00.1	231°11.3	30.4	122°38.7	06.8	161°32.1	06.4	240°04.6	42.9
5	249°02.6	246°15.0	29.9	137°40.6	06.6	176°34.3	06.5	255°06.8	42.8
6	264°05.0	261°18.7	N10°29.5	152°42.5	N25°06.5	191°36.4	N22°06.5	270°09.0	S04°42.7
7	279°07.5	276°22.5	29.0	167°44.4	06.4	206°38.5	06.6	285°11.2	42.6
8	294°10.0	291°26.3	28.6	182°46.3	06.2	221°40.7	06.6	300°13.4	42.4
9	309°12.4	306°30.0	·· 28.1	197°48.1	·· 06.1	236°42.8	·· 06.6	315°15.5	·· 42.3
10	324°14.9	321°33.8	27.6	212°50.0	05.9	251°45.0	06.7	330°17.7	42.2
11	339°17.4	336°37.5	27.2	227°51.9	05.8	266°47.1	06.7	345°19.9	42.1
12	354°19.8	351°41.3	N10°26.7	242°53.8	N25°05.6	281°49.3	N22°06.8	0°22.1	S04°42.0
13	9°22.3	6°45.0	26.2	257°55.7	05.5	296°51.4	06.8	15°24.3	41.8
14	24°24.8	21°48.8	25.8	272°57.6	05.3	311°53.5	06.9	30°26.4	41.7
15	39°27.2	36°52.6	·· 25.3	287°59.5	·· 05.2	326°55.7	·· 06.9	45°28.6	·· 41.6
16	54°29.7	51°56.3	24.8	303°01.4	05.0	341°57.8	07.0	60°30.8	41.5
17	69°32.2	67°00.1	24.3	318°03.3	04.9	357°00.0	07.0	75°33.0	41.4
18	84°34.6	82°03.9	N10°23.8	333°05.1	N25°04.7	12°02.1	N22°07.0	90°35.1	S04°41.2
19	99°37.1	97°07.6	23.4	348°07.0	04.6	27°04.2	07.1	105°37.3	41.1
20	114°39.5	112°11.4	22.9	3°08.9	04.4	42°06.4	07.1	120°39.5	41.0
21	129°42.0	127°15.2	·· 22.4	18°10.8	·· 04.3	57°08.5	·· 07.2	135°41.7	·· 40.9
22	144°44.5	142°19.0	21.9	33°12.7	04.1	72°10.7	07.2	150°43.9	40.8
23	159°46.9	157°22.7	21.4	48°14.5	04.0	87°12.8	07.3	165°46.0	40.6
Mer.pass.	12:23	ν 3.7′	d -0.4′	m -4.16	ν 1.9′	d -0.1′	m 0.10	ν 2.1′	d 0.0′ m -2.20	ν 2.2′	d 0.1′ m 1.12

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.5	56°40.5
Diphda	348°47.5	-17°51.0
Achernar	335°20.5	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°16.1	89°22.5
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.3	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.7	-8°10.5
Capella	280°21.7	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.6	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.2	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.3	-59°35.6
Suhail	222°45.9	-43°32.2
Miaplacidus	221°37.6	-69°49.4
Alphard	217°47.3	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.9
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.0
Acrux	172°59.3	-63°14.3
Gacrux	171°51.0	-57°15.3
Alioth	166°12.3	55°49.2
Spica	158°21.9	-11°17.7
Alkaid	152°51.5	49°11.0
Hadar	148°35.3	-60°29.6
Menkent	147°57.2	-36°29.6
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.7	-60°56.3
Kochab	137°19.0	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.6	-26°29.3
Atria	107°09.6	-69°04.1
Sabik	102°02.6	-15°45.4
Shaula	96°10.2	-37°07.3
Rasalhague	95°58.4	12°32.2
Eltanin	90°42.2	51°28.7
Kaus Aust.	83°32.4	-34°22.3
Vega	80°33.2	38°48.1
Nunki	75°47.7	-26°15.9
Altair	62°00.0	8°55.9
Peacock	53°05.9	-56°39.1
Deneb	49°26.1	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.1	-46°50.4
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 14 Fri	SHA	Mer.pass
Venus	356°07.3	12:45
Mars	249°06.7	19:54
Jupiter	287°48.3	17:19
Saturn	6°19.3	12:05

Mar 15 Sat	SHA	Mer.pass
Venus	356°36.0	12:39
Mars	248°54.1	19:50
Jupiter	287°40.9	17:15
Saturn	6°12.5	12:02

Mar 16 Sun	SHA	Mer.pass
Venus	357°06.0	12:33
Mars	248°40.8	19:47
Jupiter	287°33.3	17:12
Saturn	6°05.7	11:59

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°41.5	S02°31.2	0°22.9	16.6′	N04°22.1	14.4′	54.6′
1	192°41.7	30.2	14°58.5	16.7′	04°07.7	14.5′	54.6′
2	207°41.8	29.2	29°34.2	16.7′	03°53.2	14.5′	54.6′
3	222°42.0	·· 28.2	44°09.9	16.7′	03°38.7	14.5′	54.6′
4	237°42.2	27.2	58°45.6	16.8′	03°24.2	14.5′	54.6′
5	252°42.4	26.2	73°21.4	16.8′	03°09.7	14.6′	54.6′
6	267°42.5	S02°25.2	87°57.1	16.8′	N02°55.1	14.5′	54.6′
7	282°42.7	24.3	102°33.0	16.8′	02°40.6	14.5′	54.5′
8	297°42.9	23.3	117°08.8	16.8′	02°26.1	14.5′	54.5′
9	312°43.0	·· 22.3	131°44.6	16.9′	02°11.6	14.6′	54.5′
10	327°43.2	21.3	146°20.5	16.9′	01°57.0	14.5′	54.5′
11	342°43.4	20.3	160°56.4	16.9′	01°42.5	14.5′	54.5′
12	357°43.6	S02°19.3	175°32.3	16.9′	N01°28.0	14.5′	54.5′
13	12°43.7	18.3	190°08.2	16.9′	01°13.5	14.5′	54.5′
14	27°43.9	17.4	204°44.2	17.0′	00°59.0	14.6′	54.5′
15	42°44.1	·· 16.4	219°20.1	17.0′	00°44.4	14.5′	54.4′
16	57°44.3	15.4	233°56.1	17.0′	00°29.9	14.5′	54.4′
17	72°44.4	14.4	248°32.1	17.0′	00°15.4	14.5′	54.4′
18	87°44.6	S02°13.4	263°08.1	17.0′	N00°00.9	14.5′	54.4′
19	102°44.8	12.4	277°44.1	17.0′	S00°13.6	14.5′	54.4′
20	117°45.0	11.4	292°20.1	17.0′	00°28.1	14.5′	54.4′
21	132°45.1	·· 10.4	306°56.1	17.0′	00°42.6	14.4′	54.4′
22	147°45.3	09.5	321°32.2	17.0′	00°57.0	14.5′	54.4′
23	162°45.5	08.5	336°08.2	17.1′	01°11.5	14.5′	54.4′
	SD = 16.1′	d = 1.0′	SD = 14.9′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°45.7	S02°07.5	350°44.3	17.1′	S01°26.0	14.4′	54.3′
1	192°45.9	06.5	5°20.3	17.1′	01°40.4	14.4′	54.3′
2	207°46.0	05.5	19°56.4	17.1′	01°54.8	14.5′	54.3′
3	222°46.2	·· 04.5	34°32.4	17.1′	02°09.3	14.4′	54.3′
4	237°46.4	03.5	49°08.5	17.1′	02°23.7	14.4′	54.3′
5	252°46.6	02.6	63°44.6	17.1′	02°38.1	14.3′	54.3′
6	267°46.7	S02°01.6	78°20.6	17.1′	S02°52.4	14.4′	54.3′
7	282°46.9	02°00.6	92°56.7	17.1′	03°06.8	14.3′	54.3′
8	297°47.1	01°59.6	107°32.8	17.1′	03°21.1	14.4′	54.3′
9	312°47.3	·· 58.6	122°08.8	17.1′	03°35.5	14.3′	54.3′
10	327°47.4	57.6	136°44.9	17.1′	03°49.8	14.3′	54.2′
11	342°47.6	56.6	151°21.0	17.1′	04°04.1	14.2′	54.2′
12	357°47.8	S01°55.6	165°57.0	17.0′	S04°18.3	14.3′	54.2′
13	12°48.0	54.7	180°33.1	17.0′	04°32.6	14.2′	54.2′
14	27°48.1	53.7	195°09.1	17.0′	04°46.8	14.2′	54.2′
15	42°48.3	·· 52.7	209°45.1	17.0′	05°01.0	14.2′	54.2′
16	57°48.5	51.7	224°21.1	17.0′	05°15.2	14.2′	54.2′
17	72°48.7	50.7	238°57.1	17.0′	05°29.4	14.1′	54.2′
18	87°48.9	S01°49.7	253°33.1	17.0′	S05°43.5	14.1′	54.2′
19	102°49.0	48.7	268°09.1	17.0′	05°57.6	14.1′	54.2′
20	117°49.2	47.7	282°45.1	17.0′	06°11.7	14.0′	54.2′
21	132°49.4	·· 46.8	297°21.0	16.9′	06°25.7	14.1′	54.2′
22	147°49.6	45.8	311°57.0	16.9′	06°39.8	14.0′	54.1′
23	162°49.7	44.8	326°32.9	16.9′	06°53.8	14.0′	54.1′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°49.9	S01°43.8	341°08.8	16.9′	S07°07.8	13.9′	54.1′
1	192°50.1	42.8	355°44.7	16.9′	07°21.7	13.9′	54.1′
2	207°50.3	41.8	10°20.6	16.8′	07°35.6	13.9′	54.1′
3	222°50.5	·· 40.8	24°56.4	16.8′	07°49.5	13.8′	54.1′
4	237°50.6	39.8	39°32.2	16.8′	08°03.3	13.9′	54.1′
5	252°50.8	38.9	54°08.1	16.8′	08°17.2	13.7′	54.1′
6	267°51.0	S01°37.9	68°43.8	16.8′	S08°30.9	13.8′	54.1′
7	282°51.2	36.9	83°19.6	16.7′	08°44.7	13.7′	54.1′
8	297°51.4	35.9	97°55.3	16.7′	08°58.4	13.7′	54.1′
9	312°51.5	·· 34.9	112°31.0	16.7′	09°12.1	13.6′	54.1′
10	327°51.7	33.9	127°06.7	16.7′	09°25.7	13.6′	54.1′
11	342°51.9	32.9	141°42.4	16.6′	09°39.3	13.6′	54.1′
12	357°52.1	S01°31.9	156°18.0	16.6′	S09°52.9	13.5′	54.1′
13	12°52.2	31.0	170°53.6	16.6′	10°06.4	13.5′	54.1′
14	27°52.4	30.0	185°29.1	16.5′	10°19.9	13.4′	54.0′
15	42°52.6	·· 29.0	200°04.7	16.5′	10°33.3	13.4′	54.0′
16	57°52.8	28.0	214°40.2	16.5′	10°46.7	13.4′	54.0′
17	72°53.0	27.0	229°15.6	16.4′	11°00.1	13.3′	54.0′
18	87°53.1	S01°26.0	243°51.1	16.4′	S11°13.4	13.3′	54.0′
19	102°53.3	25.0	258°26.5	16.4′	11°26.7	13.2′	54.0′
20	117°53.5	24.0	273°01.8	16.3′	11°39.9	13.2′	54.0′
21	132°53.7	·· 23.0	287°37.1	16.3′	11°53.1	13.1′	54.0′
22	147°53.9	22.1	302°12.4	16.2′	12°06.2	13.1′	54.0′
23	162°54.0	21.1	316°47.7	16.2′	12°19.3	13.1′	54.0′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:52	05:16	06:23	17:57	19:05	20:30
N 70°	04:06	05:21	06:21	17:58	18:59	20:15
68°	04:18	05:25	06:20	18:00	18:55	20:03
66°	04:27	05:28	06:19	18:00	18:52	19:53
64°	04:34	05:31	06:18	18:01	18:49	19:46
62°	04:41	05:33	06:17	18:02	18:46	19:39
60°	04:46	05:35	06:16	18:03	18:44	19:33
N 58°	04:51	05:37	06:16	18:03	18:42	19:29
56°	04:54	05:38	06:15	18:04	18:41	19:25
54°	04:58	05:39	06:14	18:04	18:40	19:21
52°	05:01	05:40	06:14	18:05	18:38	19:18
50°	05:04	05:41	06:13	18:05	18:37	19:15
45°	05:09	05:43	06:12	18:06	18:35	19:10
N 40°	05:13	05:44	06:11	18:07	18:34	19:05
35°	05:16	05:45	06:10	18:08	18:33	19:02
30°	05:18	05:46	06:10	18:08	18:32	19:00
20°	05:21	05:46	06:08	18:10	18:32	18:57
N 10°	05:22	05:46	06:07	18:11	18:32	18:56
0°	05:21	05:45	06:06	18:12	18:33	18:57
S 10°	05:19	05:43	06:04	18:13	18:34	18:59
20°	05:15	05:40	06:02	18:15	18:37	19:03
30°	05:08	05:36	06:00	18:17	18:41	19:09
35°	05:04	05:34	05:59	18:18	18:43	19:13
40°	04:59	05:31	05:58	18:19	18:46	19:18
45°	04:52	05:27	05:56	18:21	18:50	19:25
S 50°	04:43	05:22	05:54	18:23	18:55	19:33
52°	04:39	05:19	05:53	18:23	18:57	19:38
54°	04:34	05:16	05:52	18:24	19:00	19:42
56°	04:28	05:13	05:51	18:26	19:03	19:48
58°	04:22	05:10	05:50	18:27	19:06	19:54
S 60°	04:15	05:06	05:48	18:28	19:10	20:01

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	18:31	20:31	22:42	06:42	06:10	05:35
N 70°	18:31	20:21	22:18	06:39	06:14	05:47
68°	18:30	20:13	22:01	06:36	06:17	05:57
66°	18:30	20:07	21:46	06:33	06:20	06:05
64°	18:30	20:01	21:35	06:31	06:22	06:13
62°	18:30	19:57	21:25	06:29	06:24	06:19
60°	18:30	19:53	21:17	06:28	06:26	06:24
N 58°	18:30	19:49	21:09	06:26	06:28	06:29
56°	18:30	19:46	21:03	06:25	06:29	06:33
54°	18:29	19:43	20:57	06:24	06:30	06:37
52°	18:29	19:41	20:52	06:23	06:31	06:41
50°	18:29	19:38	20:48	06:22	06:33	06:44
45°	18:29	19:33	20:38	06:20	06:35	06:51
N 40°	18:29	19:29	20:29	06:18	06:37	06:57
35°	18:29	19:26	20:22	06:16	06:39	07:02
30°	18:29	19:22	20:16	06:15	06:40	07:06
20°	18:29	19:17	20:06	06:12	06:43	07:14
N 10°	18:29	19:12	19:56	06:10	06:45	07:21
0°	18:29	19:08	19:48	06:08	06:48	07:27
S 10°	18:29	19:04	19:39	06:06	06:50	07:34
20°	18:28	18:59	19:30	06:04	06:52	07:40
30°	18:28	18:54	19:20	06:01	06:55	07:48
35°	18:28	18:51	19:14	06:00	06:56	07:53
40°	18:28	18:48	19:08	05:58	06:58	07:58
45°	18:28	18:44	19:00	05:56	07:00	08:04
S 50°	18:28	18:39	18:51	05:53	07:03	08:12
52°	18:28	18:37	18:47	05:52	07:04	08:15
54°	18:28	18:35	18:42	05:51	07:05	08:19
56°	18:28	18:32	18:37	05:50	07:06	08:23
58°	18:28	18:30	18:31	05:48	07:08	08:28
S 60°	18:28	18:26	18:25	05:46	07:10	08:33

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 14-16 100-97%
14	09:14	09:06	12:09	–:–	12:18	
15	08:57	08:49	12:09	00:38	12:58	
16	08:40	08:32	12:09	01:17	13:37	

No IERS EOP prediction data available

March 17, 18, 19 UT (Mon., Tue., Wed.)

DUT1 = UT1-UTC = +0.2031 sec ΔT = TT-UT1 = +68.9809 sec

2025 March 17 to Mar. 19 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	174°49.4	172°26.5	N10°20.9	63°16.4	N25°03.8	102°14.9	N22°07.3	180°48.2	S04°40.5
1	189°51.9	187°30.3	20.4	78°18.3	03.7	117°17.1	07.3	195°50.4	40.4
2	204°54.3	202°34.1	19.9	93°20.2	03.5	132°19.2	07.4	210°52.6	40.3
3	219°56.8	217°37.9	·· 19.4	108°22.1	·· 03.4	147°21.4	·· 07.4	225°54.8	·· 40.2
4	234°59.3	232°41.7	18.9	123°23.9	03.2	162°23.5	07.5	240°56.9	40.0
5	250°01.7	247°45.4	18.4	138°25.8	03.1	177°25.6	07.5	255°59.1	39.9
6	265°04.2	262°49.2	N10°17.9	153°27.7	N25°02.9	192°27.8	N22°07.6	271°01.3	S04°39.8
7	280°06.6	277°53.0	17.3	168°29.5	02.8	207°29.9	07.6	286°03.5	39.7
8	295°09.1	292°56.8	16.8	183°31.4	02.6	222°32.0	07.6	301°05.7	39.6
9	310°11.6	308°00.6	·· 16.3	198°33.3	·· 02.4	237°34.2	·· 07.7	316°07.8	·· 39.4
10	325°14.0	323°04.4	15.8	213°35.2	02.3	252°36.3	07.7	331°10.0	39.3
11	340°16.5	338°08.2	15.3	228°37.0	02.1	267°38.4	07.8	346°12.2	39.2
12	355°19.0	353°12.0	N10°14.7	243°38.9	N25°02.0	282°40.6	N22°07.8	1°14.4	S04°39.1
13	10°21.4	8°15.8	14.2	258°40.8	01.8	297°42.7	07.9	16°16.6	39.0
14	25°23.9	23°19.6	13.7	273°42.6	01.7	312°44.8	07.9	31°18.7	38.8
15	40°26.4	38°23.4	·· 13.1	288°44.5	·· 01.5	327°47.0	·· 07.9	46°20.9	·· 38.7
16	55°28.8	53°27.2	12.6	303°46.4	01.4	342°49.1	08.0	61°23.1	38.6
17	70°31.3	68°31.0	12.1	318°48.2	01.2	357°51.3	08.0	76°25.3	38.5
18	85°33.8	83°34.8	N10°11.5	333°50.1	N25°01.1	12°53.4	N22°08.1	91°27.5	S04°38.4
19	100°36.2	98°38.6	11.0	348°51.9	00.9	27°55.5	08.1	106°29.6	38.2
20	115°38.7	113°42.4	10.4	3°53.8	00.8	42°57.7	08.2	121°31.8	38.1
21	130°41.1	128°46.2	·· 09.9	18°55.7	·· 00.6	57°59.8	·· 08.2	136°34.0	·· 38.0
22	145°43.6	143°50.0	09.3	33°57.5	00.5	73°01.9	08.3	151°36.2	37.9
23	160°46.1	158°53.8	08.8	48°59.4	00.3	88°04.0	08.3	166°38.4	37.8
Mer.pass.	12:19	ν 3.8′	d -0.5′	m -4.09	ν 1.9′	d -0.2′	m 0.12	ν 2.1′	d 0.0′ m -2.19	ν 2.2′	d 0.1′ m 1.12

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	175°48.5	173°57.6	N10°08.2	64°01.2	N25°00.2	103°06.2	N22°08.3	181°40.5	S04°37.6
1	190°51.0	189°01.5	07.7	79°03.1	25°00.0	118°08.3	08.4	196°42.7	37.5
2	205°53.5	204°05.3	07.1	94°04.9	24°59.8	133°10.4	08.4	211°44.9	37.4
3	220°55.9	219°09.1	·· 06.6	109°06.8	·· 59.7	148°12.6	·· 08.5	226°47.1	·· 37.3
4	235°58.4	234°12.9	06.0	124°08.6	59.5	163°14.7	08.5	241°49.3	37.2
5	251°00.9	249°16.7	05.4	139°10.5	59.4	178°16.8	08.6	256°51.4	37.0
6	266°03.3	264°20.5	N10°04.9	154°12.3	N24°59.2	193°19.0	N22°08.6	271°53.6	S04°36.9
7	281°05.8	279°24.4	04.3	169°14.2	59.1	208°21.1	08.6	286°55.8	36.8
8	296°08.2	294°28.2	03.7	184°16.0	58.9	223°23.2	08.7	301°58.0	36.7
9	311°10.7	309°32.0	·· 03.1	199°17.9	·· 58.8	238°25.4	·· 08.7	317°00.2	·· 36.6
10	326°13.2	324°35.8	02.6	214°19.7	58.6	253°27.5	08.8	332°02.3	36.4
11	341°15.6	339°39.7	02.0	229°21.6	58.4	268°29.6	08.8	347°04.5	36.3
12	356°18.1	354°43.5	N10°01.4	244°23.4	N24°58.3	283°31.7	N22°08.9	2°06.7	S04°36.2
13	11°20.6	9°47.3	00.8	259°25.3	58.1	298°33.9	08.9	17°08.9	36.1
14	26°23.0	24°51.1	10°00.2	274°27.1	58.0	313°36.0	09.0	32°11.1	36.0
15	41°25.5	39°55.0	09°59.7	289°29.0	·· 57.8	328°38.1	·· 09.0	47°13.2	·· 35.8
16	56°28.0	54°58.8	59.1	304°30.8	57.7	343°40.3	09.0	62°15.4	35.7
17	71°30.4	70°02.6	58.5	319°32.6	57.5	358°42.4	09.1	77°17.6	35.6
18	86°32.9	85°06.5	N09°57.9	334°34.5	N24°57.4	13°44.5	N22°09.1	92°19.8	S04°35.5
19	101°35.4	100°10.3	57.3	349°36.3	57.2	28°46.6	09.2	107°21.9	35.4
20	116°37.8	115°14.1	56.7	4°38.2	57.0	43°48.8	09.2	122°24.1	35.2
21	131°40.3	130°17.9	·· 56.1	19°40.0	·· 56.9	58°50.9	·· 09.3	137°26.3	·· 35.1
22	146°42.7	145°21.8	55.5	34°41.8	56.7	73°53.0	09.3	152°28.5	35.0
23	161°45.2	160°25.6	54.9	49°43.7	56.6	88°55.1	09.4	167°30.7	34.9
Mer.pass.	12:15	ν 3.8′	d -0.6′	m -4.04	ν 1.9′	d -0.2′	m 0.14	ν 2.1′	d 0.0′ m -2.19	ν 2.2′	d 0.1′ m 1.12

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°47.7	175°29.5	N09°54.3	64°45.5	N24°56.4	103°57.3	N22°09.4	182°32.8	S04°34.8
1	191°50.1	190°33.3	53.7	79°47.3	56.3	118°59.4	09.4	197°35.0	34.6
2	206°52.6	205°37.1	53.0	94°49.2	56.1	134°01.5	09.5	212°37.2	34.5
3	221°55.1	220°41.0	·· 52.4	109°51.0	·· 55.9	149°03.6	·· 09.5	227°39.4	·· 34.4
4	236°57.5	235°44.8	51.8	124°52.8	55.8	164°05.8	09.6	242°41.6	34.3
5	252°00.0	250°48.6	51.2	139°54.7	55.6	179°07.9	09.6	257°43.7	34.2
6	267°02.5	265°52.5	N09°50.6	154°56.5	N24°55.5	194°10.0	N22°09.7	272°45.9	S04°34.0
7	282°04.9	280°56.3	50.0	169°58.3	55.3	209°12.1	09.7	287°48.1	33.9
8	297°07.4	296°00.2	49.3	185°00.2	55.1	224°14.3	09.8	302°50.3	33.8
9	312°09.9	311°04.0	·· 48.7	200°02.0	·· 55.0	239°16.4	·· 09.8	317°52.5	·· 33.7
10	327°12.3	326°07.9	48.1	215°03.8	54.8	254°18.5	09.8	332°54.6	33.6
11	342°14.8	341°11.7	47.4	230°05.6	54.7	269°20.6	09.9	347°56.8	33.4
12	357°17.2	356°15.5	N09°46.8	245°07.5	N24°54.5	284°22.8	N22°09.9	2°59.0	S04°33.3
13	12°19.7	11°19.4	46.2	260°09.3	54.4	299°24.9	10.0	18°01.2	33.2
14	27°22.2	26°23.2	45.5	275°11.1	54.2	314°27.0	10.0	33°03.4	33.1
15	42°24.6	41°27.1	·· 44.9	290°12.9	·· 54.0	329°29.1	·· 10.1	48°05.5	·· 33.0
16	57°27.1	56°30.9	44.3	305°14.7	53.9	344°31.2	10.1	63°07.7	32.9
17	72°29.6	71°34.8	43.6	320°16.6	53.7	359°33.4	10.2	78°09.9	32.7
18	87°32.0	86°38.6	N09°43.0	335°18.4	N24°53.6	14°35.5	N22°10.2	93°12.1	S04°32.6
19	102°34.5	101°42.5	42.3	350°20.2	53.4	29°37.6	10.2	108°14.3	32.5
20	117°37.0	116°46.3	41.7	5°22.0	53.2	44°39.7	10.3	123°16.4	32.4
21	132°39.4	131°50.2	·· 41.0	20°23.8	·· 53.1	59°41.8	·· 10.3	138°18.6	·· 32.3
22	147°41.9	146°54.0	40.4	35°25.7	52.9	74°44.0	10.4	153°20.8	32.1
23	162°44.3	161°57.9	39.7	50°27.5	52.8	89°46.1	10.4	168°23.0	32.0
Mer.pass.	12:11	ν 3.8′	d -0.6′	m -4.13	ν 1.8′	d -0.2′	m 0.17	ν 2.1′	d 0.0′ m -2.18	ν 2.2′	d 0.1′ m 1.13

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.3
Schedar	349°31.5	56°40.5
Diphda	348°47.5	-17°51.0
Achernar	335°20.5	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°17.2	89°22.5
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.3	49°57.2
Aldebaran	290°39.5	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.7	46°01.5
Bellatrix	278°22.7	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.6	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.3	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.6	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°16.9	27°57.9
Avior	234°14.3	-59°35.6
Suhail	222°45.9	-43°32.2
Miaplacidus	221°37.6	-69°49.4
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.9
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.0
Acrux	172°59.3	-63°14.3
Gacrux	171°51.0	-57°15.3
Alioth	166°12.3	55°49.2
Spica	158°21.9	-11°17.7
Alkaid	152°51.4	49°11.0
Hadar	148°35.3	-60°29.6
Menkent	147°57.1	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.7	-60°56.3
Kochab	137°18.9	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.5	-26°29.3
Atria	107°09.5	-69°04.1
Sabik	102°02.6	-15°45.4
Shaula	96°10.1	-37°07.3
Rasalhague	95°58.4	12°32.2
Eltanin	90°42.1	51°28.7
Kaus Aust.	83°32.4	-34°22.3
Vega	80°33.2	38°48.1
Nunki	75°47.7	-26°15.9
Altair	62°00.0	8°55.9
Peacock	53°05.8	-56°39.1
Deneb	49°26.0	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.1	-46°50.3
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 17 Mon	SHA	Mer.pass
Venus	357°37.1	12:27
Mars	248°27.0	19:44
Jupiter	287°25.5	17:09
Saturn	5°58.8	11:55

Mar 18 Tue	SHA	Mer.pass
Venus	358°09.1	12:21
Mars	248°12.7	19:41
Jupiter	287°17.6	17:05
Saturn	5°52.0	11:52

Mar 19 Wed	SHA	Mer.pass
Venus	358°41.8	12:15
Mars	247°57.8	19:39
Jupiter	287°09.6	17:02
Saturn	5°45.2	11:48

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°54.2	S01°20.1	331°22.9	16.2′	S12°32.4	13.0′	54.0′
1	192°54.4	19.1	345°58.0	16.1′	12°45.4	12.9′	54.0′
2	207°54.6	18.1	0°33.2	16.1′	12°58.3	12.9′	54.0′
3	222°54.8	·· 17.1	15°08.3	16.0′	13°11.2	12.9′	54.0′
4	237°54.9	16.1	29°43.3	16.0′	13°24.1	12.8′	54.0′
5	252°55.1	15.1	44°18.3	15.9′	13°36.9	12.7′	54.0′
6	267°55.3	S01°14.2	58°53.2	15.9′	S13°49.6	12.7′	54.0′
7	282°55.5	13.2	73°28.1	15.9′	14°02.3	12.6′	54.0′
8	297°55.7	12.2	88°03.0	15.8′	14°14.9	12.6′	54.0′
9	312°55.8	·· 11.2	102°37.8	15.8′	14°27.5	12.5′	54.0′
10	327°56.0	10.2	117°12.6	15.7′	14°40.0	12.5′	54.0′
11	342°56.2	09.2	131°47.3	15.7′	14°52.5	12.4′	54.0′
12	357°56.4	S01°08.2	146°21.9	15.6′	S15°04.9	12.4′	54.0′
13	12°56.6	07.2	160°56.6	15.6′	15°17.3	12.2′	54.0′
14	27°56.8	06.2	175°31.1	15.5′	15°29.5	12.3′	54.0′
15	42°56.9	·· 05.3	190°05.6	15.5′	15°41.8	12.2′	54.0′
16	57°57.1	04.3	204°40.1	15.4′	15°54.0	12.1′	54.0′
17	72°57.3	03.3	219°14.5	15.3′	16°06.1	12.0′	54.0′
18	87°57.5	S01°02.3	233°48.8	15.3′	S16°18.1	12.0′	54.0′
19	102°57.7	01.3	248°23.1	15.2′	16°30.1	11.9′	54.0′
20	117°57.8	01°00.3	262°57.4	15.2′	16°42.0	11.9′	54.0′
21	132°58.0	00°59.3	277°31.5	15.1′	16°53.9	11.8′	54.0′
22	147°58.2	58.3	292°05.7	15.1′	17°05.7	11.7′	54.0′
23	162°58.4	57.4	306°39.7	15.0′	17°17.4	11.7′	54.0′
	SD = 16.1′	d = 1.0′	SD = 14.7′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°58.6	S00°56.4	321°13.7	14.9′	S17°29.1	11.5′	54.0′
1	192°58.8	55.4	335°47.7	14.9′	17°40.6	11.6′	54.0′
2	207°58.9	54.4	350°21.6	14.8′	17°52.2	11.4′	54.0′
3	222°59.1	·· 53.4	4°55.4	14.8′	18°03.6	11.4′	54.0′
4	237°59.3	52.4	19°29.1	14.7′	18°15.0	11.3′	54.0′
5	252°59.5	51.4	34°02.8	14.6′	18°26.3	11.2′	54.0′
6	267°59.7	S00°50.4	48°36.5	14.6′	S18°37.5	11.2′	54.0′
7	282°59.8	49.4	63°10.0	14.5′	18°48.7	11.1′	54.0′
8	298°00.0	48.5	77°43.5	14.4′	18°59.8	11.0′	54.0′
9	313°00.2	·· 47.5	92°17.0	14.4′	19°10.8	11.0′	54.0′
10	328°00.4	46.5	106°50.4	14.3′	19°21.8	10.8′	54.0′
11	343°00.6	45.5	121°23.7	14.2′	19°32.6	10.8′	54.0′
12	358°00.8	S00°44.5	135°56.9	14.2′	S19°43.4	10.7′	54.0′
13	13°00.9	43.5	150°30.1	14.1′	19°54.1	10.6′	54.0′
14	28°01.1	42.5	165°03.2	14.0′	20°04.7	10.6′	54.0′
15	43°01.3	·· 41.5	179°36.2	14.0′	20°15.3	10.5′	54.0′
16	58°01.5	40.6	194°09.2	13.9′	20°25.8	10.3′	54.0′
17	73°01.7	39.6	208°42.1	13.8′	20°36.1	10.3′	54.0′
18	88°01.9	S00°38.6	223°14.9	13.8′	S20°46.4	10.3′	54.0′
19	103°02.0	37.6	237°47.7	13.7′	20°56.7	10.1′	54.1′
20	118°02.2	36.6	252°20.4	13.6′	21°06.8	10.0′	54.1′
21	133°02.4	·· 35.6	266°53.0	13.5′	21°16.8	10.0′	54.1′
22	148°02.6	34.6	281°25.5	13.5′	21°26.8	9.9′	54.1′
23	163°02.8	33.6	295°58.0	13.4′	21°36.7	9.8′	54.1′
	SD = 16.1′	d = 1.0′	SD = 14.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°03.0	S00°32.6	310°30.4	13.3′	S21°46.5	9.7′	54.1′
1	193°03.1	31.7	325°02.7	13.2′	21°56.2	9.6′	54.1′
2	208°03.3	30.7	339°35.0	13.2′	22°05.8	9.5′	54.1′
3	223°03.5	·· 29.7	354°07.2	13.1′	22°15.3	9.4′	54.1′
4	238°03.7	28.7	8°39.3	13.0′	22°24.7	9.4′	54.1′
5	253°03.9	27.7	23°11.3	13.0′	22°34.1	9.2′	54.1′
6	268°04.1	S00°26.7	37°43.2	12.9′	S22°43.3	9.1′	54.1′
7	283°04.2	25.7	52°15.1	12.8′	22°52.4	9.1′	54.1′
8	298°04.4	24.7	66°46.9	12.7′	23°01.5	8.9′	54.2′
9	313°04.6	·· 23.8	81°18.6	12.6′	23°10.4	8.9′	54.2′
10	328°04.8	22.8	95°50.3	12.6′	23°19.3	8.7′	54.2′
11	343°05.0	21.8	110°21.8	12.5′	23°28.0	8.7′	54.2′
12	358°05.2	S00°20.8	124°53.3	12.4′	S23°36.7	8.6′	54.2′
13	13°05.3	19.8	139°24.8	12.3′	23°45.3	8.4′	54.2′
14	28°05.5	18.8	153°56.1	12.3′	23°53.7	8.4′	54.2′
15	43°05.7	·· 17.8	168°27.4	12.2′	24°02.1	8.2′	54.2′
16	58°05.9	16.8	182°58.5	12.1′	24°10.3	8.2′	54.2′
17	73°06.1	15.8	197°29.7	12.0′	24°18.5	8.0′	54.2′
18	88°06.3	S00°14.9	212°00.7	12.0′	S24°26.5	7.9′	54.3′
19	103°06.5	13.9	226°31.6	11.9′	24°34.4	7.9′	54.3′
20	118°06.6	12.9	241°02.5	11.8′	24°42.3	7.7′	54.3′
21	133°06.8	·· 11.9	255°33.3	11.7′	24°50.0	7.6′	54.3′
22	148°07.0	10.9	270°04.0	11.6′	24°57.6	7.5′	54.3′
23	163°07.2	09.9	284°34.7	11.6′	25°05.1	7.4′	54.3′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:33	05:00	06:08	18:11	19:19	20:47
N 70°	03:50	05:07	06:08	18:11	19:12	20:29
68°	04:03	05:12	06:07	18:10	19:06	20:16
66°	04:14	05:16	06:07	18:10	19:02	20:04
64°	04:23	05:20	06:07	18:10	18:58	19:55
62°	04:30	05:23	06:07	18:10	18:54	19:48
60°	04:36	05:26	06:07	18:10	18:52	19:41
N 58°	04:42	05:28	06:07	18:10	18:49	19:36
56°	04:46	05:30	06:07	18:10	18:47	19:31
54°	04:50	05:32	06:07	18:10	18:45	19:27
52°	04:54	05:33	06:07	18:10	18:44	19:23
50°	04:57	05:35	06:07	18:10	18:42	19:20
45°	05:03	05:37	06:07	18:10	18:39	19:14
N 40°	05:08	05:40	06:06	18:10	18:37	19:09
35°	05:12	05:41	06:06	18:10	18:35	19:05
30°	05:14	05:42	06:06	18:10	18:34	19:02
20°	05:18	05:44	06:06	18:10	18:32	18:58
N 10°	05:20	05:44	06:05	18:11	18:32	18:56
0°	05:20	05:44	06:05	18:11	18:32	18:56
S 10°	05:19	05:43	06:04	18:12	18:33	18:57
20°	05:16	05:41	06:03	18:12	18:34	19:00
30°	05:10	05:38	06:02	18:13	18:37	19:05
35°	05:07	05:36	06:02	18:14	18:39	19:08
40°	05:02	05:34	06:01	18:14	18:41	19:13
45°	04:56	05:31	06:00	18:15	18:44	19:19
S 50°	04:48	05:26	05:59	18:16	18:48	19:26
52°	04:44	05:25	05:58	18:17	18:50	19:30
54°	04:40	05:22	05:58	18:17	18:52	19:34
56°	04:35	05:20	05:57	18:18	18:55	19:39
58°	04:30	05:17	05:56	18:18	18:57	19:45
S 60°	04:23	05:14	05:56	18:19	19:01	19:51

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▬	▬	▬	04:49	▬	▬
N 70°	·· ··	00:41	▬	05:14	04:19	▬
68°	·· ··	00:02	▬	05:34	05:00	▬
66°	23:35	·· ··	01:46	05:49	05:28	04:49
64°	23:14	·· ··	01:04	06:02	05:50	05:31
62°	22:57	·· ··	00:36	06:13	06:07	06:00
60°	22:44	·· ··	00:15	06:23	06:22	06:22
N 58°	22:32	23:58	·· ··	06:31	06:34	06:40
56°	22:22	23:43	·· ··	06:38	06:45	06:55
54°	22:13	23:31	·· ··	06:45	06:55	07:08
52°	22:05	23:20	·· ··	06:51	07:03	07:20
50°	21:58	23:10	·· ··	06:56	07:11	07:30
45°	21:43	22:50	23:56	07:08	07:28	07:52
N 40°	21:31	22:33	23:36	07:17	07:41	08:09
35°	21:20	22:19	23:20	07:26	07:53	08:24
30°	21:11	22:07	23:05	07:33	08:03	08:36
20°	20:56	21:47	22:41	07:46	08:20	08:58
N 10°	20:42	21:30	22:20	07:57	08:36	09:18
0°	20:29	21:13	22:00	08:08	08:50	09:35
S 10°	20:17	20:57	21:41	08:18	09:05	09:53
20°	20:04	20:40	21:20	08:30	09:20	10:13
30°	19:48	20:20	20:56	08:43	09:38	10:35
35°	19:40	20:09	20:42	08:50	09:49	10:48
40°	19:30	19:55	20:26	08:59	10:01	11:04
45°	19:18	19:40	20:07	09:09	10:15	11:22
S 50°	19:04	19:21	19:43	09:21	10:33	11:45
52°	18:58	19:12	19:32	09:27	10:41	11:56
54°	18:51	19:02	19:19	09:34	10:50	12:08
56°	18:43	18:51	19:04	09:41	11:01	12:22
58°	18:34	18:39	18:47	09:49	11:13	12:39
S 60°	18:24	18:24	18:26	09:58	11:27	13:00

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 17-19 93-81%
17	08:23	08:14	12:08	01:58	14:18	
18	08:06	07:57	12:08	02:40	15:02	
19	07:48	07:39	12:08	03:24	15:48	

No IERS EOP prediction data available

March 20, 21, 22 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.2038 sec ΔT = TT-UT1 = +68.9802 sec

2025 March 20 to Mar. 22 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	177°46.8	177°01.7	N09°39.1	65°29.3	N24°52.6	104°48.2	N22°10.5	183°25.2	S04°31.9
1	192°49.3	192°05.6	38.4	80°31.1	52.4	119°50.3	10.5	198°27.3	31.8
2	207°51.7	207°09.4	37.7	95°32.9	52.3	134°52.4	10.6	213°29.5	31.7
3	222°54.2	222°13.3	·· 37.1	110°34.7	·· 52.1	149°54.6	·· 10.6	228°31.7	·· 31.5
4	237°56.7	237°17.1	36.4	125°36.5	51.9	164°56.7	10.6	243°33.9	31.4
5	252°59.1	252°21.0	35.7	140°38.3	51.8	179°58.8	10.7	258°36.1	31.3
6	268°01.6	267°24.8	N09°35.1	155°40.1	N24°51.6	195°00.9	N22°10.7	273°38.2	S04°31.2
7	283°04.1	282°28.7	34.4	170°42.0	51.5	210°03.0	10.8	288°40.4	31.1
8	298°06.5	297°32.5	33.7	185°43.8	51.3	225°05.1	10.8	303°42.6	30.9
9	313°09.0	312°36.4	·· 33.0	200°45.6	·· 51.1	240°07.3	·· 10.9	318°44.8	·· 30.8
10	328°11.5	327°40.2	32.4	215°47.4	51.0	255°09.4	10.9	333°47.0	30.7
11	343°13.9	342°44.1	31.7	230°49.2	50.8	270°11.5	11.0	348°49.2	30.6
12	358°16.4	357°48.0	N09°31.0	245°51.0	N24°50.7	285°13.6	N22°11.0	3°51.3	S04°30.5
13	13°18.8	12°51.8	30.3	260°52.8	50.5	300°15.7	11.0	18°53.5	30.3
14	28°21.3	27°55.7	29.6	275°54.6	50.3	315°17.8	11.1	33°55.7	30.2
15	43°23.8	42°59.5	·· 29.0	290°56.4	·· 50.2	330°20.0	·· 11.1	48°57.9	·· 30.1
16	58°26.2	58°03.4	28.3	305°58.2	50.0	345°22.1	11.2	64°00.1	30.0
17	73°28.7	73°07.2	27.6	321°00.0	49.8	0°24.2	11.2	79°02.2	29.9
18	88°31.2	88°11.1	N09°26.9	336°01.8	N24°49.7	15°26.3	N22°11.3	94°04.4	S04°29.7
19	103°33.6	103°14.9	26.2	351°03.6	49.5	30°28.4	11.3	109°06.6	29.6
20	118°36.1	118°18.8	25.5	6°05.4	49.3	45°30.5	11.4	124°08.8	29.5
21	133°38.6	133°22.7	·· 24.8	21°07.2	·· 49.2	60°32.6	·· 11.4	139°11.0	·· 29.4
22	148°41.0	148°26.5	24.1	36°09.0	49.0	75°34.8	11.4	154°13.1	29.3
23	163°43.5	163°30.4	23.4	51°10.8	48.9	90°36.9	11.5	169°15.3	29.1
Mer.pass. 12:07		ν 3.9′ d -0.7′	m -4.18	ν 1.8′	d -0.2′	m 0.19	ν 2.1′	d 0.0′	m -2.17	ν 2.2′	d 0.1′	m 1.13

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	178°46.0	178°34.2	N09°22.7	66°12.6	N24°48.7	105°39.0	N22°11.5	184°17.5	S04°29.0
1	193°48.4	193°38.1	22.0	81°14.3	48.5	120°41.1	11.6	199°19.7	28.9
2	208°50.9	208°41.9	21.3	96°16.1	48.4	135°43.2	11.6	214°21.9	28.8
3	223°53.3	223°45.8	·· 20.6	111°17.9	·· 48.2	150°45.3	·· 11.7	229°24.0	·· 28.7
4	238°55.8	238°49.6	19.9	126°19.7	48.0	165°47.4	11.7	244°26.2	28.6
5	253°58.3	253°53.5	19.1	141°21.5	47.9	180°49.5	11.8	259°28.4	28.4
6	269°00.7	268°57.4	N09°18.4	156°23.3	N24°47.7	195°51.6	N22°11.8	274°30.6	S04°28.3
7	284°03.2	284°01.2	17.7	171°25.1	47.5	210°53.8	11.8	289°32.8	28.2
8	299°05.7	299°05.1	17.0	186°26.9	47.4	225°55.9	11.9	304°34.9	28.1
9	314°08.1	314°08.9	·· 16.3	201°28.7	·· 47.2	240°58.0	·· 11.9	319°37.1	·· 28.0
10	329°10.6	329°12.8	15.5	216°30.4	47.0	256°00.1	12.0	334°39.3	27.8
11	344°13.1	344°16.6	14.8	231°32.2	46.9	271°02.2	12.0	349°41.5	27.7
12	359°15.5	359°20.5	N09°14.1	246°34.0	N24°46.7	286°04.3	N22°12.1	4°43.7	S04°27.6
13	14°18.0	14°24.3	13.4	261°35.8	46.5	301°06.4	12.1	19°45.8	27.5
14	29°20.5	29°28.2	12.6	276°37.6	46.4	316°08.5	12.2	34°48.0	27.4
15	44°22.9	44°32.1	·· 11.9	291°39.3	·· 46.2	331°10.6	·· 12.2	49°50.2	·· 27.2
16	59°25.4	59°35.9	11.2	306°41.1	46.0	346°12.7	12.3	64°52.4	27.1
17	74°27.8	74°39.8	10.4	321°42.9	45.9	1°14.9	12.3	79°54.6	27.0
18	89°30.3	89°43.6	N09°09.7	336°44.7	N24°45.7	16°17.0	N22°12.3	94°56.7	S04°26.9
19	104°32.8	104°47.5	09.0	351°46.5	45.5	31°19.1	12.4	109°58.9	26.8
20	119°35.2	119°51.3	08.2	6°48.2	45.4	46°21.2	12.4	125°01.1	26.6
21	134°37.7	134°55.2	·· 07.5	21°50.0	·· 45.2	61°23.3	·· 12.5	140°03.3	·· 26.5
22	149°40.2	149°59.0	06.8	36°51.8	45.0	76°25.4	12.5	155°05.5	26.4
23	164°42.6	165°02.9	06.0	51°53.6	44.9	91°27.5	12.6	170°07.7	26.3
Mer.pass. 12:03		ν 3.9′ d -0.7′	m -4.20	ν 1.8′	d -0.2′	m 0.21	ν 2.1′	d 0.0′	m -2.17	ν 2.2′	d 0.1′	m 1.13

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	179°45.1	180°06.7	N09°05.3	66°55.3	N24°44.7	106°29.6	N22°12.6	185°09.8	S04°26.2
1	194°47.6	195°10.6	04.5	81°57.1	44.5	121°31.7	12.7	200°12.0	26.1
2	209°50.0	210°14.4	03.8	96°58.9	44.4	136°33.8	12.7	215°14.2	25.9
3	224°52.5	225°18.3	·· 03.0	112°00.7	·· 44.2	151°35.9	·· 12.7	230°16.4	·· 25.8
4	239°54.9	240°22.1	02.3	127°02.4	44.0	166°38.0	12.8	245°18.6	25.7
5	254°57.4	255°26.0	01.5	142°04.2	43.9	181°40.1	12.8	260°20.7	25.6
6	269°59.9	270°29.8	N09°00.8	157°06.0	N24°43.7	196°42.2	N22°12.9	275°22.9	S04°25.5
7	285°02.3	285°33.7	09°00.0	172°07.7	43.5	211°44.3	12.9	290°25.1	25.3
8	300°04.8	300°37.5	08°59.2	187°09.5	43.4	226°46.4	13.0	305°27.3	25.2
9	315°07.3	315°41.4	·· 58.5	202°11.3	·· 43.2	241°48.6	·· 13.0	320°29.5	·· 25.1
10	330°09.7	330°45.2	57.7	217°13.0	43.0	256°50.7	13.1	335°31.6	25.0
11	345°12.2	345°49.1	57.0	232°14.8	42.8	271°52.8	13.1	350°33.8	24.9
12	0°14.7	0°52.9	N08°56.2	247°16.5	N24°42.7	286°54.9	N22°13.2	5°36.0	S04°24.7
13	15°17.1	15°56.8	55.4	262°18.3	42.5	301°57.0	13.2	20°38.2	24.6
14	30°19.6	31°00.6	54.7	277°20.1	42.3	316°59.1	13.2	35°40.4	24.5
15	45°22.1	46°04.4	·· 53.9	292°21.8	·· 42.2	332°01.2	·· 13.3	50°42.5	·· 24.4
16	60°24.5	61°08.3	53.1	307°23.6	42.0	347°03.3	13.3	65°44.7	24.3
17	75°27.0	76°12.1	52.3	322°25.4	41.8	2°05.4	13.4	80°46.9	24.1
18	90°29.4	91°16.0	N08°51.6	337°27.1	N24°41.7	17°07.5	N22°13.4	95°49.1	S04°24.0
19	105°31.9	106°19.8	50.8	352°28.9	41.5	32°09.6	13.5	110°51.3	23.9
20	120°34.4	121°23.7	50.0	7°30.6	41.3	47°11.7	13.5	125°53.5	23.8
21	135°36.8	136°27.5	·· 49.2	22°32.4	·· 41.1	62°13.8	·· 13.6	140°55.6	·· 23.7
22	150°39.3	151°31.3	48.5	37°34.1	41.0	77°15.9	13.6	155°57.8	23.6
23	165°41.8	166°35.2	47.7	52°35.9	40.8	92°18.0	13.7	171°00.0	23.4
Mer.pass. 11:59		ν 3.9′ d -0.7′	m -4.20	ν 1.8′	d -0.2′	m 0.23	ν 2.1′	d 0.0′	m -2.16	ν 2.2′	d 0.1′	m 1.14

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.2
Schedar	349°31.5	56°40.5
Diphda	348°47.5	-17°51.0
Achernar	335°20.6	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°18.1	89°22.5
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.2
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.7	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.6	-1°11.3
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.3	-52°42.8
Sirius	258°26.0	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.5	5°09.5
Pollux	243°17.0	27°57.9
Avior	234°14.4	-59°35.6
Suhail	222°45.9	-43°32.3
Miaplacidus	221°37.6	-69°49.4
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.9
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.0
Acrux	172°59.3	-63°14.4
Gacrux	171°51.0	-57°15.3
Alioth	166°12.2	55°49.2
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.0
Hadar	148°35.3	-60°29.6
Menkent	147°57.1	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.6	-60°56.3
Kochab	137°18.9	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.5	-26°29.3
Atria	107°09.5	-69°04.1
Sabik	102°02.5	-15°45.4
Shaula	96°10.1	-37°07.3
Rasalhague	95°58.4	12°32.3
Eltanin	90°42.1	51°28.7
Kaus Aust.	83°32.3	-34°22.3
Vega	80°33.2	38°48.1
Nunki	75°47.6	-26°15.9
Altair	62°00.0	8°55.9
Peacock	53°05.8	-56°39.1
Deneb	49°26.0	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.1	-46°50.3
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 20 Thu	SHA	Mer.pass
Venus	359°14.9	12:09
Mars	247°42.5	19:36
Jupiter	287°01.4	16:58
Saturn	5°38.4	11:45

Mar 21 Fri	SHA	Mer.pass
Venus	359°48.3	12:03
Mars	247°26.6	19:33
Jupiter	286°53.0	16:55
Saturn	5°31.5	11:41

Mar 22 Sat	SHA	Mer.pass
Venus	0°21.6	11:56
Mars	247°10.2	19:30
Jupiter	286°44.5	16:52
Saturn	5°24.7	11:38

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	Sun			Moon			
h							
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°07.4	S00°08.9	299°05.2	11.5′	S25°12.5	7.3′	54.3′
1	193°07.6	07.9	313°35.7	11.4′	25°19.8	7.2′	54.3′
2	208°07.7	07.0	328°06.1	11.3′	25°27.0	7.0′	54.4′
3	223°07.9	·· 06.0	342°36.5	11.3′	25°34.0	7.0′	54.4′
4	238°08.1	05.0	357°06.7	11.2′	25°41.0	6.8′	54.4′
5	253°08.3	04.0	11°36.9	11.1′	25°47.8	6.7′	54.4′
6	268°08.5	S00°03.0	26°07.0	11.0′	S25°54.5	6.6′	54.4′
7	283°08.7	02.0	40°37.0	10.9′	26°01.1	6.5′	54.4′
8	298°08.9	01.0	55°07.0	10.9′	26°07.6	6.3′	54.4′
9	313°09.0	S00°00.0	69°36.9	10.8′	26°13.9	6.3′	54.5′
10	328°09.2	N00°01.0	84°06.7	10.7′	26°20.2	6.1′	54.5′
11	343°09.4	01.9	98°36.4	10.6′	26°26.3	6.0′	54.5′
12	358°09.6	N00°02.9	113°06.0	10.6′	S26°32.3	5.9′	54.5′
13	13°09.8	03.9	127°35.6	10.5′	26°38.2	5.7′	54.5′
14	28°10.0	04.9	142°05.1	10.4′	26°43.9	5.6′	54.5′
15	43°10.2	·· 05.9	156°34.5	10.4′	26°49.5	5.5′	54.6′
16	58°10.3	06.9	171°03.9	10.3′	26°55.0	5.4′	54.6′
17	73°10.5	07.9	185°33.2	10.2′	27°00.4	5.3′	54.6′
18	88°10.7	N00°08.9	200°02.4	10.1′	S27°05.7	5.1′	54.6′
19	103°10.9	09.8	214°31.5	10.1′	27°10.8	5.0′	54.6′
20	118°11.1	10.8	229°00.6	10.0′	27°15.8	4.9′	54.7′
21	133°11.3	·· 11.8	243°29.6	9.9′	27°20.7	4.7′	54.7′
22	148°11.5	12.8	257°58.5	9.9′	27°25.4	4.6′	54.7′
23	163°11.6	13.8	272°27.3	9.8′	27°30.0	4.5′	54.7′
	SD = 16.1′	d = 1.0′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°11.8	N00°14.8	286°56.1	9.7′	S27°34.5	4.3′	54.7′
1	193°12.0	15.8	301°24.8	9.7′	27°38.8	4.2′	54.7′
2	208°12.2	16.8	315°53.5	9.6′	27°43.0	4.1′	54.8′
3	223°12.4	·· 17.7	330°22.1	9.5′	27°47.1	3.9′	54.8′
4	238°12.6	18.7	344°50.6	9.5′	27°51.0	3.8′	54.8′
5	253°12.8	19.7	359°19.0	9.4′	27°54.8	3.7′	54.8′
6	268°12.9	N00°20.7	13°47.4	9.3′	S27°58.5	3.5′	54.9′
7	283°13.1	21.7	28°15.8	9.3′	28°02.0	3.4′	54.9′
8	298°13.3	22.7	42°44.0	9.2′	28°05.4	3.2′	54.9′
9	313°13.5	·· 23.7	57°12.2	9.1′	28°08.6	3.2′	54.9′
10	328°13.7	24.7	71°40.4	9.1′	28°11.8	2.9′	54.9′
11	343°13.9	25.6	86°08.5	9.0′	28°14.7	2.8′	55.0′
12	358°14.1	N00°26.6	100°36.5	9.0′	S28°17.5	2.7′	55.0′
13	13°14.2	27.6	115°04.4	8.9′	28°20.2	2.6′	55.0′
14	28°14.4	28.6	129°32.4	8.9′	28°22.8	2.4′	55.0′
15	43°14.6	·· 29.6	144°00.2	8.8′	28°25.2	2.2′	55.1′
16	58°14.8	30.6	158°28.0	8.7′	28°27.4	2.1′	55.1′
17	73°15.0	31.6	172°55.8	8.7′	28°29.5	2.0′	55.1′
18	88°15.2	N00°32.6	187°23.4	8.6′	S28°31.5	1.8′	55.1′
19	103°15.4	33.5	201°51.1	8.6′	28°33.3	1.7′	55.2′
20	118°15.6	34.5	216°18.7	8.5′	28°35.0	1.5′	55.2′
21	133°15.7	·· 35.5	230°46.2	8.5′	28°36.5	1.4′	55.2′
22	148°15.9	36.5	245°13.7	8.4′	28°37.9	1.2′	55.2′
23	163°16.1	37.5	259°41.2	8.4′	28°39.1	1.1′	55.3′
	SD = 16.1′	d = 1.0′	SD = 14.9′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°16.3	N00°38.5	274°08.6	8.4′	S28°40.2	0.9′	55.3′
1	193°16.5	39.5	288°35.9	8.3′	28°41.1	0.8′	55.3′
2	208°16.7	40.4	303°03.3	8.3′	28°41.9	0.6′	55.3′
3	223°16.9	·· 41.4	317°30.5	8.2′	28°42.5	0.5′	55.4′
4	238°17.0	42.4	331°57.8	8.2′	28°43.0	0.3′	55.4′
5	253°17.2	43.4	346°25.0	8.2′	28°43.3	0.2′	55.4′
6	268°17.4	N00°44.4	0°52.1	8.1′	S28°43.5	0.0′	55.4′
7	283°17.6	45.4	15°19.2	8.1′	28°43.5	0.1′	55.5′
8	298°17.8	46.4	29°46.3	8.1′	28°43.4	0.3′	55.5′
9	313°18.0	·· 47.4	44°13.4	8.0′	28°43.1	0.4′	55.5′
10	328°18.2	48.3	58°40.4	8.0′	28°42.7	0.6′	55.6′
11	343°18.4	49.3	73°07.4	8.0′	28°42.1	0.8′	55.6′
12	358°18.5	N00°50.3	87°34.3	7.9′	S28°41.3	0.9′	55.6′
13	13°18.7	51.3	102°01.3	7.9′	28°40.4	1.1′	55.6′
14	28°18.9	52.3	116°28.2	7.9′	28°39.3	1.2′	55.7′
15	43°19.1	·· 53.3	130°55.1	7.9′	28°38.1	1.3′	55.7′
16	58°19.3	54.3	145°21.9	7.8′	28°36.8	1.6′	55.7′
17	73°19.5	55.2	159°48.8	7.8′	28°35.2	1.7′	55.8′
18	88°19.7	N00°56.2	174°15.6	7.8′	S28°33.5	1.8′	55.8′
19	103°19.9	57.2	188°42.4	7.8′	28°31.7	2.0′	55.8′
20	118°20.0	58.2	203°09.1	7.8′	28°29.7	2.2′	55.9′
21	133°20.2	00°59.2	217°35.9	7.7′	28°27.5	2.3′	55.9′
22	148°20.4	01°00.2	232°02.6	7.7′	28°25.2	2.5′	55.9′
23	163°20.6	01.2	246°29.3	7.7′	28°22.7	2.6′	56.0′
	SD = 16.0′	d = 1.0′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:13	04:44	05:52	18:25	19:33	21:06
N 70°	03:33	04:52	05:54	18:23	19:25	20:45
68°	03:49	04:59	05:55	18:21	19:18	20:29
66°	04:01	05:05	05:56	18:20	19:12	20:16
64°	04:11	05:09	05:57	18:19	19:07	20:06
62°	04:19	05:13	05:57	18:18	19:03	19:57
60°	04:26	05:17	05:58	18:17	18:59	19:50
N 58°	04:33	05:19	05:59	18:17	18:56	19:43
56°	04:38	05:22	05:59	18:16	18:53	19:38
54°	04:42	05:24	06:00	18:16	18:51	19:33
52°	04:46	05:26	06:00	18:15	18:49	19:29
50°	04:50	05:28	06:00	18:15	18:47	19:25
45°	04:57	05:32	06:01	18:14	18:43	19:18
N 40°	05:03	05:35	06:02	18:13	18:40	19:12
35°	05:07	05:37	06:02	18:13	18:38	19:07
30°	05:11	05:39	06:02	18:12	18:36	19:04
20°	05:16	05:41	06:03	18:11	18:33	18:59
N 10°	05:18	05:43	06:04	18:11	18:32	18:56
0°	05:19	05:43	06:04	18:10	18:31	18:55
S 10°	05:19	05:43	06:04	18:10	18:31	18:55
20°	05:17	05:42	06:04	18:10	18:32	18:57
30°	05:12	05:40	06:04	18:10	18:33	19:01
35°	05:09	05:39	06:04	18:10	18:35	19:04
40°	05:05	05:37	06:04	18:09	18:36	19:08
45°	05:00	05:35	06:04	18:10	18:39	19:13
S 50°	04:53	05:31	06:04	18:10	18:42	19:20
52°	04:50	05:30	06:04	18:10	18:43	19:23
54°	04:46	05:28	06:03	18:10	18:45	19:26
56°	04:42	05:26	06:03	18:10	18:47	19:31
58°	04:37	05:24	06:03	18:10	18:49	19:35
S 60°	04:31	05:21	06:03	18:10	18:51	19:41

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	03:35	▬	▬	04:39	▬	▬
62°	02:25	▬	▬	05:49	▬	▬
60°	01:50	03:26	04:43	06:25	06:35	07:09
N 58°	01:25	02:49	03:59	06:51	07:12	07:54
56°	01:05	02:23	03:30	07:11	07:38	08:23
54°	00:49	02:03	03:07	07:28	07:59	08:46
52°	00:34	01:46	02:49	07:43	08:16	09:04
50°	00:22	01:31	02:33	07:56	08:31	09:20
45°	·· ··	01:01	02:01	08:22	09:01	09:51
N 40°	·· ··	00:38	01:37	08:43	09:25	10:16
35°	·· ··	00:19	01:17	09:00	09:44	10:36
30°	·· ··	00:03	01:00	09:15	10:01	10:53
20°	23:36	·· ··	00:31	09:41	10:29	11:22
N 10°	23:12	·· ··	00:06	10:03	10:53	11:47
0°	22:50	23:43	·· ··	10:24	11:16	12:10
S 10°	22:29	23:20	·· ··	10:45	11:38	12:33
20°	22:05	22:56	23:51	11:07	12:02	12:57
30°	21:38	22:27	23:23	11:33	12:31	13:26
35°	21:22	22:10	23:06	11:48	12:47	13:43
40°	21:04	21:50	22:46	12:06	13:07	14:03
45°	20:42	21:26	22:23	12:28	13:31	14:27
S 50°	20:14	20:56	21:52	12:55	14:01	14:58
52°	20:00	20:40	21:37	13:09	14:17	15:13
54°	19:44	20:22	21:19	13:24	14:34	15:31
56°	19:25	20:01	20:57	13:43	14:56	15:53
58°	19:02	19:33	20:29	14:05	15:23	16:20
S 60°	18:32	18:53	19:49	14:35	16:03	17:01

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 20-22 73-55%
20	07:30	07:22	12:07	04:12	16:37	
21	07:13	07:04	12:07	05:03	17:29	
22	06:55	06:46	12:07	05:56	18:24	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2046 sec ΔT = TT-UT1 = +68.9794 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	180°44.2	181°39.0	N08°46.9	67°37.6	N24°40.6	107°20.1	N22°13.7	186°02.2	S04°23.3
1	195°46.7	196°42.9	46.1	82°39.4	40.5	122°22.2	13.7	201°04.4	23.2
2	210°49.2	211°46.7	45.3	97°41.1	40.3	137°24.3	13.8	216°06.5	23.1
3	225°51.6	226°50.5	·· 44.5	112°42.9	·· 40.1	152°26.4	·· 13.8	231°08.7	·· 23.0
4	240°54.1	241°54.4	43.7	127°44.6	39.9	167°28.5	13.9	246°10.9	22.8
5	255°56.6	256°58.2	43.0	142°46.4	39.8	182°30.6	13.9	261°13.1	22.7
6	270°59.0	272°02.0	N08°42.2	157°48.1	N24°39.6	197°32.7	N22°14.0	276°15.3	S04°22.6
7	286°01.5	287°05.9	41.4	172°49.9	39.4	212°34.8	14.0	291°17.4	22.5
8	301°03.9	302°09.7	40.6	187°51.6	39.3	227°36.9	14.1	306°19.6	22.4
9	316°06.4	317°13.5	·· 39.8	202°53.4	·· 39.1	242°39.0	·· 14.1	321°21.8	·· 22.2
10	331°08.9	332°17.3	39.0	217°55.1	38.9	257°41.1	14.2	336°24.0	22.1
11	346°11.3	347°21.2	38.2	232°56.9	38.7	272°43.2	14.2	351°26.2	22.0
12	1°13.8	2°25.0	N08°37.4	247°58.6	N24°38.6	287°45.3	N22°14.2	6°28.4	S04°21.9
13	16°16.3	17°28.8	36.6	263°00.4	38.4	302°47.4	14.3	21°30.5	21.8
14	31°18.7	32°32.7	35.8	278°02.1	38.2	317°49.5	14.3	36°32.7	21.7
15	46°21.2	47°36.5	·· 35.0	293°03.8	·· 38.0	332°51.6	·· 14.4	51°34.9	·· 21.5
16	61°23.7	62°40.3	34.2	308°05.6	37.9	347°53.7	14.4	66°37.1	21.4
17	76°26.1	77°44.1	33.4	323°07.3	37.7	2°55.8	14.5	81°39.3	21.3
18	91°28.6	92°47.9	N08°32.6	338°09.1	N24°37.5	17°57.8	N22°14.5	96°41.4	S04°21.2
19	106°31.1	107°51.8	31.7	353°10.8	37.3	32°59.9	14.6	111°43.6	21.1
20	121°33.5	122°55.6	30.9	8°12.5	37.2	48°02.0	14.6	126°45.8	20.9
21	136°36.0	137°59.4	·· 30.1	23°14.3	·· 37.0	63°04.1	·· 14.7	141°48.0	·· 20.8
22	151°38.4	153°03.2	29.3	38°16.0	36.8	78°06.2	14.7	156°50.2	20.7
23	166°40.9	168°07.0	28.5	53°17.8	36.7	93°08.3	14.7	171°52.3	20.6
Mer.pass.	11:55	ν 3.8′	d -0.8′	m -4.20	ν 1.8′	d -0.2′	m 0.25	ν 2.1′	d 0.0′ m -2.16	ν 2.2′	d 0.1′ m 1.14

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	181°43.4	183°10.9	N08°27.7	68°19.5	N24°36.5	108°10.4	N22°14.8	186°54.5	S04°20.5
1	196°45.8	198°14.7	26.9	83°21.2	36.3	123°12.5	14.8	201°56.7	20.3
2	211°48.3	213°18.5	26.0	98°23.0	36.1	138°14.6	14.9	216°58.9	20.2
3	226°50.8	228°22.3	·· 25.2	113°24.7	·· 36.0	153°16.7	·· 14.9	232°01.1	·· 20.1
4	241°53.2	243°26.1	24.4	128°26.4	35.8	168°18.8	15.0	247°03.3	20.0
5	256°55.7	258°29.9	23.6	143°28.1	35.6	183°20.9	15.0	262°05.4	19.9
6	271°58.2	273°33.7	N08°22.8	158°29.9	N24°35.4	198°23.0	N22°15.1	277°07.6	S04°19.8
7	287°00.6	288°37.5	21.9	173°31.6	35.2	213°25.1	15.1	292°09.8	19.6
8	302°03.1	303°41.3	21.1	188°33.3	35.1	228°27.2	15.2	307°12.0	19.5
9	317°05.5	318°45.1	·· 20.3	203°35.1	·· 34.9	243°29.3	·· 15.2	322°14.2	·· 19.4
10	332°08.0	333°48.9	19.5	218°36.8	34.7	258°31.3	15.3	337°16.3	19.3
11	347°10.5	348°52.7	18.6	233°38.5	34.5	273°33.4	15.3	352°18.5	19.2
12	2°12.9	3°56.5	N08°17.8	248°40.2	N24°34.4	288°35.5	N22°15.3	7°20.7	S04°19.0
13	17°15.4	19°00.3	17.0	263°42.0	34.2	303°37.6	15.4	22°22.9	18.9
14	32°17.9	34°04.1	16.1	278°43.7	34.0	318°39.7	15.4	37°25.1	18.8
15	47°20.3	49°07.9	·· 15.3	293°45.4	·· 33.8	333°41.8	·· 15.5	52°27.3	·· 18.7
16	62°22.8	64°11.7	14.5	308°47.1	33.7	348°43.9	15.5	67°29.4	18.6
17	77°25.3	79°15.5	13.6	323°48.9	33.5	3°46.0	15.6	82°31.6	18.5
18	92°27.7	94°19.3	N08°12.8	338°50.6	N24°33.3	18°48.1	N22°15.6	97°33.8	S04°18.3
19	107°30.2	109°23.1	12.0	353°52.3	33.1	33°50.2	15.7	112°36.0	18.2
20	122°32.7	124°26.9	11.1	8°54.0	32.9	48°52.2	15.7	127°38.2	18.1
21	137°35.1	139°30.7	·· 10.3	23°55.7	·· 32.8	63°54.3	·· 15.8	142°40.3	·· 18.0
22	152°37.6	154°34.5	09.4	38°57.4	32.6	78°56.4	15.8	157°42.5	17.9
23	167°40.0	169°38.2	08.6	53°59.2	32.4	93°58.5	15.8	172°44.7	17.7
Mer.pass.	11:51	ν 3.8′	d -0.8′	m -4.20	ν 1.7′	d -0.2′	m 0.28	ν 2.1′	d 0.0′ m -2.15	ν 2.2′	d 0.1′ m 1.15

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	182°42.5	184°42.0	N08°07.8	69°00.9	N24°32.2	109°00.6	N22°15.9	187°46.9	S04°17.6
1	197°45.0	199°45.8	06.9	84°02.6	32.1	124°02.7	15.9	202°49.1	17.5
2	212°47.4	214°49.6	06.1	99°04.3	31.9	139°04.8	16.0	217°51.3	17.4
3	227°49.9	229°53.4	·· 05.2	114°06.0	·· 31.7	154°06.9	·· 16.0	232°53.4	·· 17.3
4	242°52.4	244°57.1	04.4	129°07.7	31.5	169°09.0	16.1	247°55.6	17.2
5	257°54.8	260°00.9	03.5	144°09.4	31.3	184°11.0	16.1	262°57.8	17.0
6	272°57.3	275°04.7	N08°02.7	159°11.2	N24°31.2	199°13.1	N22°16.2	278°00.0	S04°16.9
7	287°59.8	290°08.5	01.8	174°12.9	31.0	214°15.2	16.2	293°02.2	16.8
8	303°02.2	305°12.2	01.0	189°14.6	30.8	229°17.3	16.3	308°04.4	16.7
9	318°04.7	320°16.0	08°00.1	204°16.3	·· 30.6	244°19.4	·· 16.3	323°06.5	·· 16.6
10	333°07.2	335°19.8	07°59.3	219°18.0	30.4	259°21.5	16.4	338°08.7	16.4
11	348°09.6	350°23.5	58.4	234°19.7	30.3	274°23.6	16.4	353°10.9	16.3
12	3°12.1	5°27.3	N07°57.6	249°21.4	N24°30.1	289°25.6	N22°16.4	8°13.1	S04°16.2
13	18°14.5	20°31.1	56.7	264°23.1	29.9	304°27.7	16.5	23°15.3	16.1
14	33°17.0	35°34.8	55.9	279°24.8	29.7	319°29.8	16.5	38°17.4	16.0
15	48°19.5	50°38.6	·· 55.0	294°26.5	·· 29.5	334°31.9	·· 16.6	53°19.6	·· 15.9
16	63°21.9	65°42.3	54.2	309°28.2	29.4	349°34.0	16.6	68°21.8	15.7
17	78°24.4	80°46.1	53.3	324°29.9	29.2	4°36.1	16.7	83°24.0	15.6
18	93°26.9	95°49.8	N07°52.4	339°31.6	N24°29.0	19°38.2	N22°16.7	98°26.2	S04°15.5
19	108°29.3	110°53.6	51.6	354°33.3	28.8	34°40.2	16.8	113°28.4	15.4
20	123°31.8	125°57.3	50.7	9°35.0	28.6	49°42.3	16.8	128°30.5	15.3
21	138°34.3	141°01.1	·· 49.9	24°36.7	·· 28.5	64°44.4	·· 16.9	143°32.7	·· 15.1
22	153°36.7	156°04.8	49.0	39°38.4	28.3	79°46.5	16.9	158°34.9	15.0
23	168°39.2	171°08.6	48.1	54°40.1	28.1	94°48.6	17.0	173°37.1	14.9
Mer.pass.	11:47	ν 3.8′	d -0.8′	m -4.20	ν 1.7′	d -0.2′	m 0.30	ν 2.1′	d 0.0′ m -2.14	ν 2.2′	d 0.1′ m 1.15

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.2
Schedar	349°31.5	56°40.5
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.7
Hamal	327°51.3	23°34.9
Polaris	314°19.0	89°22.4
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.8	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.6	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.3	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°57.9
Avior	234°14.4	-59°35.6
Suhail	222°45.9	-43°32.3
Miaplacidus	221°37.7	-69°49.4
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.9
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.4
Gacrux	171°50.9	-57°15.3
Alioth	166°12.2	55°49.2
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.0
Hadar	148°35.3	-60°29.6
Menkent	147°57.1	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.6	-60°56.3
Kochab	137°18.8	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.5	-26°29.3
Atria	107°09.4	-69°04.1
Sabik	102°02.5	-15°45.4
Shaula	96°10.1	-37°07.3
Rasalhague	95°58.3	12°32.3
Eltanin	90°42.1	51°28.7
Kaus Aust.	83°32.3	-34°22.3
Vega	80°33.2	38°48.1
Nunki	75°47.6	-26°15.9
Altair	61°59.9	8°55.9
Peacock	53°05.8	-56°39.1
Deneb	49°26.0	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.1	-46°50.3
Fomalhaut	15°14.7	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.1	15°20.3

Mar 23 Sun	SHA	Mer.pass
Venus	0°54.8	11:50
Mars	246°53.4	19:27
Jupiter	286°35.9	16:48
Saturn	5°17.9	11:34

Mar 24 Mon	SHA	Mer.pass
Venus	1°27.5	11:44
Mars	246°36.1	19:24
Jupiter	286°27.0	16:45
Saturn	5°11.2	11:31

Mar 25 Tue	SHA	Mer.pass
Venus	1°59.5	11:38
Mars	246°18.4	19:22
Jupiter	286°18.1	16:42
Saturn	5°04.4	11:27

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		178°20.8	N01°02.1	260°56.1	7.7′	S28°20.1	2.8′	56.0′
1		193°21.0	03.1	275°22.8	7.7′	28°17.3	3.0′	56.0′
2		208°21.2	04.1	289°49.5	7.7′	28°14.3	3.1′	56.1′
3		223°21.4	·· 05.1	304°16.1	7.7′	28°11.2	3.3′	56.1′
4		238°21.5	06.1	318°42.8	7.7′	28°07.9	3.4′	56.1′
5		253°21.7	07.1	333°09.5	7.7′	28°04.5	3.6′	56.2′
6		268°21.9	N01°08.1	347°36.1	7.7′	S28°00.9	3.7′	56.2′
7		283°22.1	09.0	2°02.8	7.7′	27°57.2	3.9′	56.2′
8		298°22.3	10.0	16°29.5	7.7′	27°53.3	4.1′	56.3′
9		313°22.5	·· 11.0	30°56.1	7.7′	27°49.2	4.2′	56.3′
10		328°22.7	12.0	45°22.8	7.7′	27°45.0	4.4′	56.3′
11		343°22.9	13.0	59°49.4	7.7′	27°40.6	4.6′	56.4′
12		358°23.0	N01°14.0	74°16.1	7.7′	S27°36.0	4.7′	56.4′
13		13°23.2	15.0	88°42.8	7.7′	27°31.3	4.8′	56.4′
14		28°23.4	15.9	103°09.5	7.7′	27°26.5	5.0′	56.5′
15		43°23.6	·· 16.9	117°36.1	7.7′	27°21.5	5.2′	56.5′
16		58°23.8	17.9	132°02.8	7.7′	27°16.3	5.4′	56.5′
17		73°24.0	18.9	146°29.5	7.7′	27°10.9	5.5′	56.6′
18		88°24.2	N01°19.9	160°56.2	7.7′	S27°05.4	5.6′	56.6′
19		103°24.4	20.9	175°23.0	7.7′	26°59.8	5.8′	56.6′
20		118°24.5	21.9	189°49.7	7.8′	26°54.0	6.0′	56.7′
21		133°24.7	·· 22.8	204°16.5	7.8′	26°48.0	6.1′	56.7′
22		148°24.9	23.8	218°43.2	7.8′	26°41.9	6.3′	56.8′
23		163°25.1	24.8	233°10.0	7.8′	26°35.6	6.4′	56.8′
		SD = 16.0′	d = 1.0′		SD = 15.3′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.3	N01°25.8	247°36.8	7.8′	S26°29.2	6.6′	56.8′
1	193°25.5	26.8	262°03.6	7.8′	26°22.6	6.8′	56.9′
2	208°25.7	27.8	276°30.5	7.9′	26°15.8	6.9′	56.9′
3	223°25.9	·· 28.7	290°57.3	7.9′	26°08.9	7.1′	56.9′
4	238°26.1	29.7	305°24.2	7.9′	26°01.8	7.2′	57.0′
5	253°26.2	30.7	319°51.1	7.9′	25°54.6	7.4′	57.0′
6	268°26.4	N01°31.7	334°18.1	8.0′	S25°47.2	7.5′	57.1′
7	283°26.6	32.7	348°45.0	8.0′	25°39.7	7.7′	57.1′
8	298°26.8	33.7	3°12.0	8.0′	25°32.0	7.8′	57.1′
9	313°27.0	·· 34.7	17°39.0	8.0′	25°24.2	8.0′	57.2′
10	328°27.2	35.6	32°06.1	8.1′	25°16.2	8.1′	57.2′
11	343°27.4	36.6	46°33.1	8.1′	25°08.1	8.3′	57.2′
12	358°27.6	N01°37.6	61°00.2	8.1′	S24°59.8	8.5′	57.3′
13	13°27.7	38.6	75°27.4	8.2′	24°51.3	8.6′	57.3′
14	28°27.9	39.6	89°54.5	8.2′	24°42.7	8.7′	57.4′
15	43°28.1	·· 40.6	104°21.7	8.2′	24°34.0	8.9′	57.4′
16	58°28.3	41.5	118°48.9	8.3′	24°25.1	9.0′	57.4′
17	73°28.5	42.5	133°16.2	8.3′	24°16.1	9.2′	57.5′
18	88°28.7	N01°43.5	147°43.5	8.3′	S24°06.9	9.3′	57.5′
19	103°28.9	44.5	162°10.8	8.4′	23°57.6	9.5′	57.6′
20	118°29.1	45.5	176°38.2	8.4′	23°48.1	9.7′	57.6′
21	133°29.2	·· 46.5	191°05.5	8.4′	23°38.4	9.7′	57.6′
22	148°29.4	47.4	205°33.0	8.5′	23°28.7	9.9′	57.7′
23	163°29.6	48.4	220°00.4	8.5′	23°18.8	10.1′	57.7′
	SD = 16.0′	d = 1.0′		SD = 15.5′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.8	N01°49.4	234°28.0	8.5′	S23°08.7	10.2′	57.8′
1	193°30.0	50.4	248°55.5	8.6′	22°58.5	10.4′	57.8′
2	208°30.2	51.4	263°23.1	8.6′	22°48.1	10.4′	57.8′
3	223°30.4	·· 52.4	277°50.7	8.7′	22°37.7	10.7′	57.9′
4	238°30.6	53.3	292°18.3	8.7′	22°27.0	10.7′	57.9′
5	253°30.8	54.3	306°46.0	8.7′	22°16.3	11.0′	58.0′
6	268°30.9	N01°55.3	321°13.8	8.8′	S22°05.3	11.0′	58.0′
7	283°31.1	56.3	335°41.6	8.8′	21°54.3	11.2′	58.0′
8	298°31.3	57.3	350°09.4	8.9′	21°43.1	11.3′	58.1′
9	313°31.5	·· 58.3	4°37.2	8.9′	21°31.8	11.4′	58.1′
10	328°31.7	01°59.2	19°05.1	8.9′	21°20.4	11.6′	58.2′
11	343°31.9	02°00.2	33°33.0	9.0′	21°08.8	11.8′	58.2′
12	358°32.1	N02°01.2	48°01.0	9.0′	S20°57.0	11.8′	58.2′
13	13°32.3	02.2	62°29.0	9.1′	20°45.2	12.0′	58.3′
14	28°32.4	03.2	76°57.1	9.1′	20°33.2	12.1′	58.3′
15	43°32.6	·· 04.1	91°25.2	9.1′	20°21.1	12.3′	58.4′
16	58°32.8	05.1	105°53.3	9.2′	20°08.8	12.3′	58.4′
17	73°33.0	06.1	120°21.5	9.2′	19°56.5	12.5′	58.4′
18	88°33.2	N02°07.1	134°49.7	9.3′	S19°44.0	12.7′	58.5′
19	103°33.4	08.1	149°18.0	9.3′	19°31.3	12.7′	58.5′
20	118°33.6	09.1	163°46.3	9.3′	19°18.6	12.9′	58.6′
21	133°33.8	·· 10.0	178°14.6	9.4′	19°05.7	13.0′	58.6′
22	148°34.0	11.0	192°43.0	9.4′	18°52.7	13.1′	58.6′
23	163°34.1	12.0	207°11.4	9.5′	18°39.6	13.3′	58.7′
	SD = 16.0′	d = 1.0′		SD = 15.8′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:51	04:27	05:37	18:38	19:49	21:27
N 70°	03:15	04:37	05:40	18:35	19:38	21:02
68°	03:33	04:46	05:42	18:32	19:29	20:43
66°	03:47	04:53	05:44	18:30	19:22	20:28
64°	03:59	04:58	05:46	18:28	19:16	20:16
62°	04:08	05:03	05:48	18:26	19:11	20:06
60°	04:16	05:07	05:49	18:25	19:07	19:58
N 58°	04:23	05:11	05:50	18:23	19:03	19:51
56°	04:29	05:14	05:51	18:22	19:00	19:45
54°	04:34	05:17	05:52	18:21	18:57	19:39
52°	04:39	05:19	05:53	18:20	18:54	19:35
50°	04:43	05:21	05:54	18:20	18:52	19:30
45°	04:51	05:26	05:55	18:18	18:47	19:22
N 40°	04:58	05:30	05:57	18:16	18:43	19:15
35°	05:03	05:33	05:58	18:15	18:40	19:10
30°	05:07	05:35	05:59	18:14	18:38	19:06
20°	05:13	05:38	06:00	18:12	18:34	19:00
N 10°	05:16	05:41	06:02	18:11	18:32	18:56
0°	05:18	05:42	06:03	18:09	18:30	18:54
S 10°	05:19	05:43	06:04	18:08	18:29	18:54
20°	05:17	05:43	06:05	18:07	18:29	18:55
30°	05:14	05:42	06:06	18:06	18:30	18:58
35°	05:12	05:41	06:06	18:05	18:31	19:00
40°	05:09	05:40	06:07	18:05	18:32	19:03
45°	05:04	05:38	06:08	18:04	18:33	19:07
S 50°	04:58	05:36	06:08	18:03	18:35	19:13
52°	04:55	05:35	06:09	18:03	18:36	19:16
54°	04:52	05:34	06:09	18:02	18:37	19:19
56°	04:48	05:32	06:09	18:02	18:39	19:22
58°	04:44	05:31	06:10	18:01	18:40	19:26
S 60°	04:39	05:29	06:10	18:01	18:42	19:31

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	08:09	▬	▬	09:30
66°	▬	▬	06:59	▬	▬	10:39
64°	▬	07:12	06:22	▬	08:32	11:15
62°	▬	06:07	05:56	▬	09:37	11:40
60°	05:20	05:32	05:35	08:27	10:11	12:00
N 58°	04:43	05:06	05:18	09:04	10:36	12:16
56°	04:17	04:46	05:04	09:30	10:56	12:30
54°	03:56	04:29	04:51	09:51	11:12	12:42
52°	03:38	04:15	04:40	10:08	11:26	12:52
50°	03:23	04:02	04:30	10:23	11:39	13:02
45°	02:53	03:36	04:09	10:53	12:04	13:21
N 40°	02:30	03:15	03:53	11:16	12:24	13:37
35°	02:10	02:57	03:38	11:35	12:41	13:50
30°	01:53	02:42	03:26	11:52	12:55	14:02
20°	01:25	02:16	03:04	12:19	13:20	14:21
N 10°	01:01	01:54	02:46	12:43	13:40	14:38
0°	00:38	01:34	02:28	13:05	14:00	14:53
S 10°	00:16	01:13	02:10	13:27	14:19	15:09
20°	·· ··	00:50	01:52	13:50	14:40	15:25
30°	·· ··	00:24	01:30	14:17	15:03	15:44
35°	·· ··	00:09	01:17	14:33	15:17	15:55
40°	23:51	·· ··	01:02	14:51	15:33	16:07
45°	23:29	·· ··	00:44	15:14	15:52	16:22
S 50°	23:02	·· ··	00:22	15:42	16:15	16:40
52°	22:48	·· ··	00:11	15:56	16:26	16:48
54°	22:33	23:59	·· ··	16:12	16:39	16:57
56°	22:15	23:45	·· ··	16:30	16:53	17:08
58°	21:52	23:29	·· ··	16:53	17:10	17:19
S 60°	21:22	23:09	·· ··	17:23	17:31	17:33

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 45-25%
23	06:37	06:28	12:06	06:51	19:19	
24	06:19	06:10	12:06	07:47	20:14	
25	06:01	05:52	12:06	08:41	21:07	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2053 sec ΔT = TT-UT1 = +68.9787 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	183°41.7	186°12.3	N07°47.3	69°41.8	N24°27.9	109°50.6	N22°17.0	188°39.3	S04°14.8
1	198°44.1	201°16.1	46.4	84°43.5	27.7	124°52.7	17.0	203°41.5	14.7
2	213°46.6	216°19.8	45.5	99°45.2	27.5	139°54.8	17.1	218°43.6	14.6
3	228°49.0	231°23.5	·· 44.7	114°46.9	·· 27.4	154°56.9	·· 17.1	233°45.8	·· 14.4
4	243°51.5	246°27.3	43.8	129°48.6	27.2	169°59.0	17.2	248°48.0	14.3
5	258°54.0	261°31.0	42.9	144°50.3	27.0	185°01.1	17.2	263°50.2	14.2
6	273°56.4	276°34.7	N07°42.1	159°52.0	N24°26.8	200°03.1	N22°17.3	278°52.4	S04°14.1
7	288°58.9	291°38.5	41.2	174°53.7	26.6	215°05.2	17.3	293°54.5	14.0
8	304°01.4	306°42.2	40.3	189°55.4	26.4	230°07.3	17.4	308°56.7	13.9
9	319°03.8	321°45.9	·· 39.4	204°57.1	·· 26.3	245°09.4	·· 17.4	323°58.9	·· 13.7
10	334°06.3	336°49.6	38.6	219°58.8	26.1	260°11.5	17.5	339°01.1	13.6
11	349°08.8	351°53.3	37.7	235°00.4	25.9	275°13.5	17.5	354°03.3	13.5
12	4°11.2	6°57.1	N07°36.8	250°02.1	N24°25.7	290°15.6	N22°17.6	9°05.5	S04°13.4
13	19°13.7	22°00.8	36.0	265°03.8	25.5	305°17.7	17.6	24°07.6	13.3
14	34°16.1	37°04.5	35.1	280°05.5	25.3	320°19.8	17.6	39°09.8	13.1
15	49°18.6	52°08.2	·· 34.2	295°07.2	·· 25.2	335°21.9	·· 17.7	54°12.0	·· 13.0
16	64°21.1	67°11.9	33.3	310°08.9	25.0	350°23.9	17.7	69°14.2	12.9
17	79°23.5	82°15.6	32.5	325°10.6	24.8	5°26.0	17.8	84°16.4	12.8
18	94°26.0	97°19.3	N07°31.6	340°12.2	N24°24.6	20°28.1	N22°17.8	99°18.6	S04°12.7
19	109°28.5	112°23.0	30.7	355°13.9	24.4	35°30.2	17.9	114°20.7	12.6
20	124°30.9	127°26.7	29.8	10°15.6	24.2	50°32.2	17.9	129°22.9	12.4
21	139°33.4	142°30.4	·· 28.9	25°17.3	·· 24.1	65°34.3	·· 18.0	144°25.1	·· 12.3
22	154°35.9	157°34.1	28.1	40°19.0	23.9	80°36.4	18.0	159°27.3	12.2
23	169°38.3	172°37.8	27.2	55°20.7	23.7	95°38.5	18.1	174°29.5	12.1
Mer.pass.	11:43	ν 3.7′	d -0.9′	m -4.18	ν 1.7′	d -0.2′	m 0.32	ν 2.1′	d 0.0′ m -2.14	ν 2.2′	d 0.1′ m 1.15
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	184°40.8	187°41.5	N07°26.3	70°22.3	N24°23.5	110°40.6	N22°18.1	189°31.7	S04°12.0
1	199°43.3	202°45.2	25.4	85°24.0	23.3	125°42.6	18.2	204°33.8	11.9
2	214°45.7	217°48.9	24.5	100°25.7	23.1	140°44.7	18.2	219°36.0	11.7
3	229°48.2	232°52.6	·· 23.7	115°27.4	·· 22.9	155°46.8	·· 18.2	234°38.2	·· 11.6
4	244°50.6	247°56.3	22.8	130°29.0	22.8	170°48.9	18.3	249°40.4	11.5
5	259°53.1	263°00.0	21.9	145°30.7	22.6	185°50.9	18.3	264°42.6	11.4
6	274°55.6	278°03.6	N07°21.0	160°32.4	N24°22.4	200°53.0	N22°18.4	279°44.8	S04°11.3
7	289°58.0	293°07.3	20.1	175°34.1	22.2	215°55.1	18.4	294°46.9	11.1
8	305°00.5	308°11.0	19.2	190°35.7	22.0	230°57.2	18.5	309°49.1	11.0
9	320°03.0	323°14.7	·· 18.3	205°37.4	·· 21.8	245°59.2	·· 18.5	324°51.3	·· 10.9
10	335°05.4	338°18.3	17.5	220°39.1	21.6	261°01.3	18.6	339°53.5	10.8
11	350°07.9	353°22.0	16.6	235°40.8	21.4	276°03.4	18.6	354°55.7	10.7
12	5°10.4	8°25.7	N07°15.7	250°42.4	N24°21.3	291°05.4	N22°18.7	9°57.9	S04°10.6
13	20°12.8	23°29.3	14.8	265°44.1	21.1	306°07.5	18.7	25°00.0	10.4
14	35°15.3	38°33.0	13.9	280°45.8	20.9	321°09.6	18.8	40°02.2	10.3
15	50°17.7	53°36.6	·· 13.0	295°47.4	·· 20.7	336°11.7	·· 18.8	55°04.4	·· 10.2
16	65°20.2	68°40.3	12.1	310°49.1	20.5	351°13.7	18.9	70°06.6	10.1
17	80°22.7	83°44.0	11.2	325°50.8	20.3	6°15.8	18.9	85°08.8	10.0
18	95°25.1	98°47.6	N07°10.4	340°52.4	N24°20.1	21°17.9	N22°18.9	100°11.0	S04°09.9
19	110°27.6	113°51.3	09.5	355°54.1	19.9	36°20.0	19.0	115°13.1	09.7
20	125°30.1	128°54.9	08.6	10°55.8	19.8	51°22.0	19.0	130°15.3	09.6
21	140°32.5	143°58.6	·· 07.7	25°57.4	·· 19.6	66°24.1	·· 19.1	145°17.5	·· 09.5
22	155°35.0	159°02.2	06.8	40°59.1	19.4	81°26.2	19.1	160°19.7	09.4
23	170°37.5	174°05.8	05.9	56°00.8	19.2	96°28.2	19.2	175°21.9	09.3
Mer.pass.	11:39	ν 3.7′	d -0.9′	m -4.13	ν 1.7′	d -0.2′	m 0.34	ν 2.1′	d 0.0′ m -2.13	ν 2.2′	d 0.1′ m 1.15
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	185°39.9	189°09.5	N07°05.0	71°02.4	N24°19.0	111°30.3	N22°19.2	190°24.1	S04°09.2
1	200°42.4	204°13.1	04.1	86°04.1	18.8	126°32.4	19.3	205°26.2	09.0
2	215°44.9	219°16.7	03.2	101°05.7	18.6	141°34.5	19.3	220°28.4	08.9
3	230°47.3	234°20.4	·· 02.3	116°07.4	·· 18.4	156°36.5	·· 19.4	235°30.6	·· 08.8
4	245°49.8	249°24.0	01.4	131°09.1	18.2	171°38.6	19.4	250°32.8	08.7
5	260°52.2	264°27.6	07°00.5	146°10.7	18.0	186°40.7	19.5	265°35.0	08.6
6	275°54.7	279°31.2	N06°59.7	161°12.4	N24°17.9	201°42.7	N22°19.5	280°37.2	S04°08.5
7	290°57.2	294°34.9	58.8	176°14.0	17.7	216°44.8	19.5	295°39.3	08.3
8	305°59.6	309°38.5	57.9	191°15.7	17.5	231°46.9	19.6	310°41.5	08.2
9	321°02.1	324°42.1	·· 57.0	206°17.3	·· 17.3	246°48.9	·· 19.6	325°43.7	·· 08.1
10	336°04.6	339°45.7	56.1	221°19.0	17.1	261°51.0	19.7	340°45.9	08.0
11	351°07.0	354°49.3	55.2	236°20.7	16.9	276°53.1	19.7	355°48.1	07.9
12	6°09.5	9°52.9	N06°54.3	251°22.3	N24°16.7	291°55.1	N22°19.8	10°50.3	S04°07.7
13	21°12.0	24°56.5	53.4	266°24.0	16.5	306°57.2	19.8	25°52.5	07.6
14	36°14.4	40°00.1	52.5	281°25.6	16.3	321°59.3	19.9	40°54.6	07.5
15	51°16.9	55°03.7	·· 51.6	296°27.3	·· 16.1	337°01.3	·· 19.9	55°56.8	·· 07.4
16	66°19.3	70°07.3	50.7	311°28.9	15.9	352°03.4	20.0	70°59.0	07.3
17	81°21.8	85°10.9	49.8	326°30.6	15.8	7°05.5	20.0	86°01.2	07.2
18	96°24.3	100°14.5	N06°48.9	341°32.2	N24°15.6	22°07.5	N22°20.1	101°03.4	S04°07.0
19	111°26.7	115°18.1	48.0	356°33.9	15.4	37°09.6	20.1	116°05.6	06.9
20	126°29.2	130°21.7	47.1	11°35.5	15.2	52°11.7	20.2	131°07.7	06.8
21	141°31.7	145°25.2	·· 46.2	26°37.2	·· 15.0	67°13.7	·· 20.2	146°09.9	·· 06.7
22	156°34.1	160°28.8	45.3	41°38.8	14.8	82°15.8	20.2	161°12.1	06.6
23	171°36.6	175°32.4	44.4	56°40.4	14.6	97°17.9	20.3	176°14.3	06.5
Mer.pass.	11:35	ν 3.6′	d -0.9′	m -4.05	ν 1.7′	d -0.2′	m 0.36	ν 2.1′	d 0.0′ m -2.13	ν 2.2′	d 0.1′ m 1.16

Stars	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.2
Schedar	349°31.5	56°40.5
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.6
Hamal	327°51.3	23°34.9
Polaris	314°20.0	89°22.4
Acamar	315°11.9	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.8	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.7	28°37.8
Alnilam	275°37.6	-1°11.2
Betelgeuse	270°51.9	7°24.6
Canopus	263°52.3	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°58.0
Avior	234°14.4	-59°35.7
Suhail	222°45.9	-43°32.3
Miaplacidus	221°37.7	-69°49.4
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.5
Dubhe	193°40.1	61°36.9
Denebola	182°24.4	14°25.7
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.4
Gacrux	171°50.9	-57°15.3
Alioth	166°12.2	55°49.2
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.0
Hadar	148°35.2	-60°29.6
Menkent	147°57.1	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.6	-60°56.3
Kochab	137°18.8	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.5	-26°29.3
Atria	107°09.4	-69°04.1
Sabik	102°02.5	-15°45.4
Shaula	96°10.0	-37°07.3
Rasalhague	95°58.3	12°32.2
Eltanin	90°42.0	51°28.7
Kaus Aust.	83°32.3	-34°22.3
Vega	80°33.1	38°48.0
Nunki	75°47.6	-26°15.9
Altair	61°59.9	8°55.9
Peacock	53°05.7	-56°39.1
Deneb	49°26.0	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.0	-46°50.3
Fomalhaut	15°14.6	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.0	15°20.3

Mar 26 Wed	SHA	Mer.pass
Venus	2°30.7	11:32
Mars	246°00.2	19:19
Jupiter	286°09.0	16:38
Saturn	4°57.6	11:24

Mar 27 Thu	SHA	Mer.pass
Venus	3°00.7	11:26
Mars	245°41.5	19:16
Jupiter	285°59.8	16:35
Saturn	4°50.9	11:20

Mar 28 Fri	SHA	Mer.pass
Venus	3°29.5	11:21
Mars	245°22.5	19:14
Jupiter	285°50.4	16:32
Saturn	4°44.1	11:17

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.3	N02°13.0	221°39.9	9.5′	S18°26.3	13.3′	58.7′
1	193°34.5	14.0	236°08.4	9.5′	18°13.0	13.5′	58.8′
2	208°34.7	14.9	250°36.9	9.6′	17°59.5	13.6′	58.8′
3	223°34.9	·· 15.9	265°05.5	9.6′	17°45.9	13.7′	58.8′
4	238°35.1	16.9	279°34.1	9.7′	17°32.2	13.8′	58.9′
5	253°35.3	17.9	294°02.8	9.7′	17°18.4	14.0′	58.9′
6	268°35.5	N02°18.9	308°31.4	9.7′	S17°04.4	14.0′	58.9′
7	283°35.6	19.9	323°00.2	9.8′	16°50.4	14.2′	59.0′
8	298°35.8	20.8	337°28.9	9.8′	16°36.2	14.3′	59.0′
9	313°36.0	·· 21.8	351°57.7	9.8′	16°21.9	14.4′	59.1′
10	328°36.2	22.8	6°26.6	9.9′	16°07.5	14.5′	59.1′
11	343°36.4	23.8	20°55.5	9.9′	15°53.0	14.6′	59.1′
12	358°36.6	N02°24.8	35°24.4	9.9′	S15°38.4	14.7′	59.2′
13	13°36.8	25.7	49°53.3	10.0′	15°23.7	14.8′	59.2′
14	28°37.0	26.7	64°22.3	10.0′	15°08.9	14.9′	59.3′
15	43°37.2	·· 27.7	78°51.3	10.0′	14°54.0	15.0′	59.3′
16	58°37.3	28.7	93°20.3	10.1′	14°39.0	15.1′	59.3′
17	73°37.5	29.7	107°49.4	10.1′	14°23.9	15.2′	59.4′
18	88°37.7	N02°30.6	122°18.5	10.1′	S14°08.7	15.3′	59.4′
19	103°37.9	31.6	136°47.7	10.2′	13°53.4	15.4′	59.4′
20	118°38.1	32.6	151°16.8	10.2′	13°38.0	15.5′	59.5′
21	133°38.3	·· 33.6	165°46.0	10.2′	13°22.5	15.6′	59.5′
22	148°38.5	34.6	180°15.2	10.3′	13°06.9	15.7′	59.5′
23	163°38.7	35.5	194°44.5	10.3′	12°51.2	15.7′	59.6′
	SD = 16.0′	d = 1.0′	SD = 16.0′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.8	N02°36.5	209°13.8	10.3′	S12°35.5	15.9′	59.6′
1	193°39.0	37.5	223°43.1	10.3′	12°19.6	15.9′	59.7′
2	208°39.2	38.5	238°12.4	10.4′	12°03.7	16.0′	59.7′
3	223°39.4	·· 39.4	252°41.8	10.4′	11°47.7	16.2′	59.7′
4	238°39.6	40.4	267°11.2	10.4′	11°31.5	16.1′	59.8′
5	253°39.8	41.4	281°40.6	10.4′	11°15.4	16.3′	59.8′
6	268°40.0	N02°42.4	296°10.0	10.4′	S10°59.1	16.4′	59.8′
7	283°40.2	43.4	310°39.4	10.5′	10°42.7	16.4′	59.9′
8	298°40.3	44.3	325°08.9	10.5′	10°26.3	16.5′	59.9′
9	313°40.5	·· 45.3	339°38.4	10.5′	10°09.8	16.6′	59.9′
10	328°40.7	46.3	354°07.9	10.5′	09°53.2	16.6′	60.0′
11	343°40.9	47.3	8°37.4	10.5′	09°36.6	16.7′	60.0′
12	358°41.1	N02°48.3	23°07.0	10.6′	S09°19.9	16.8′	60.0′
13	13°41.3	49.2	37°36.5	10.6′	09°03.1	16.9′	60.1′
14	28°41.5	50.2	52°06.1	10.6′	08°46.2	16.9′	60.1′
15	43°41.7	·· 51.2	66°35.7	10.6′	08°29.3	17.0′	60.1′
16	58°41.9	52.2	81°05.3	10.6′	08°12.3	17.0′	60.1′
17	73°42.0	53.1	95°34.9	10.6′	07°55.3	17.1′	60.2′
18	88°42.2	N02°54.1	110°04.5	10.6′	S07°38.2	17.2′	60.2′
19	103°42.4	55.1	124°34.1	10.6′	07°21.0	17.2′	60.2′
20	118°42.6	56.1	139°03.8	10.6′	07°03.8	17.3′	60.3′
21	133°42.8	·· 57.1	153°33.4	10.7′	06°46.5	17.4′	60.3′
22	148°43.0	58.0	168°03.1	10.7′	06°29.1	17.3′	60.3′
23	163°43.2	59.0	182°32.7	10.7′	06°11.8	17.5′	60.4′
	SD = 16.0′	d = 1.0′	SD = 16.3′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.4	N03°00.0	197°02.4	10.7′	S05°54.3	17.5′	60.4′
1	193°43.5	01.0	211°32.1	10.7′	05°36.8	17.5′	60.4′
2	208°43.7	01.9	226°01.7	10.7′	05°19.3	17.6′	60.4′
3	223°43.9	·· 02.9	240°31.4	10.7′	05°01.7	17.6′	60.5′
4	238°44.1	03.9	255°01.1	10.7′	04°44.1	17.7′	60.5′
5	253°44.3	04.9	269°30.7	10.7′	04°26.4	17.7′	60.5′
6	268°44.5	N03°05.8	284°00.4	10.7′	S04°08.7	17.7′	60.5′
7	283°44.7	06.8	298°30.0	10.7′	03°51.0	17.8′	60.6′
8	298°44.9	07.8	312°59.7	10.6′	03°33.2	17.8′	60.6′
9	313°45.0	·· 08.8	327°29.3	10.6′	03°15.4	17.8′	60.6′
10	328°45.2	09.8	341°59.0	10.6′	02°57.6	17.9′	60.6′
11	343°45.4	10.7	356°28.6	10.6′	02°39.7	17.9′	60.7′
12	358°45.6	N03°11.7	10°58.2	10.6′	S02°21.8	17.9′	60.7′
13	13°45.8	12.7	25°27.8	10.6′	02°03.9	18.0′	60.7′
14	28°46.0	13.7	39°57.4	10.6′	01°45.9	18.0′	60.7′
15	43°46.2	·· 14.6	54°27.0	10.6′	01°27.9	18.0′	60.7′
16	58°46.4	15.6	68°56.6	10.6′	01°09.9	18.0′	60.8′
17	73°46.5	16.6	83°26.1	10.5′	00°51.9	18.0′	60.8′
18	88°46.7	N03°17.6	97°55.7	10.5′	S00°33.9	18.1′	60.8′
19	103°46.9	18.5	112°25.2	10.5′	S00°15.8	18.0′	60.8′
20	118°47.1	19.5	126°54.7	10.5′	N00°02.2	18.1′	60.8′
21	133°47.3	·· 20.5	141°24.2	10.5′	00°20.3	18.1′	60.9′
22	148°47.5	21.5	155°53.6	10.4′	00°38.4	18.1′	60.9′
23	163°47.7	22.4	170°23.1	10.4′	00°56.5	18.1′	60.9′
	SD = 16.0′	d = 1.0′	SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:27	04:10	05:21	18:52	20:04	21:51
N 70°	02:56	04:22	05:26	18:47	19:51	21:20
68°	03:17	04:32	05:30	18:43	19:41	20:58
66°	03:33	04:40	05:33	18:40	19:33	20:41
64°	03:46	04:47	05:36	18:37	19:26	20:27
62°	03:57	04:53	05:38	18:34	19:20	20:16
60°	04:06	04:58	05:40	18:32	19:14	20:07
N 58°	04:14	05:02	05:42	18:30	19:10	19:59
56°	04:21	05:06	05:43	18:28	19:06	19:52
54°	04:26	05:09	05:45	18:27	19:03	19:46
52°	04:32	05:12	05:46	18:26	19:00	19:40
50°	04:36	05:15	05:47	18:24	18:57	19:36
45°	04:46	05:20	05:50	18:22	18:51	19:26
N 40°	04:53	05:25	05:52	18:19	18:46	19:19
35°	04:59	05:28	05:54	18:17	18:43	19:13
30°	05:03	05:31	05:55	18:16	18:40	19:08
20°	05:10	05:36	05:58	18:13	18:35	19:01
N 10°	05:15	05:39	06:00	18:11	18:32	18:56
0°	05:17	05:41	06:02	18:09	18:29	18:53
S 10°	05:18	05:43	06:04	18:07	18:28	18:52
20°	05:18	05:44	06:06	18:04	18:26	18:52
30°	05:16	05:44	06:08	18:02	18:26	18:54
35°	05:14	05:44	06:09	18:01	18:26	18:56
40°	05:12	05:43	06:10	18:00	18:27	18:58
45°	05:08	05:42	06:11	17:58	18:27	19:02
S 50°	05:03	05:41	06:13	17:57	18:29	19:06
52°	05:01	05:40	06:14	17:56	18:29	19:08
54°	04:58	05:39	06:15	17:55	18:30	19:11
56°	04:55	05:38	06:15	17:54	18:31	19:14
58°	04:51	05:37	06:16	17:53	18:32	19:18
S 60°	04:47	05:36	06:17	17:52	18:33	19:22

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	08:01	06:43	05:58	11:32	14:40	17:15
N 70°	07:15	06:26	05:52	12:16	14:54	17:16
68°	06:45	06:12	05:47	12:45	15:06	17:17
66°	06:22	06:00	05:43	13:06	15:15	17:18
64°	06:04	05:51	05:40	13:23	15:22	17:19
62°	05:49	05:43	05:37	13:37	15:29	17:20
60°	05:36	05:35	05:34	13:48	15:35	17:20
N 58°	05:25	05:29	05:32	13:58	15:40	17:21
56°	05:15	05:23	05:30	14:07	15:44	17:21
54°	05:07	05:18	05:28	14:15	15:48	17:22
52°	04:59	05:14	05:26	14:22	15:52	17:22
50°	04:52	05:09	05:24	14:28	15:55	17:22
45°	04:37	05:00	05:21	14:41	16:02	17:23
N 40°	04:25	04:52	05:18	14:52	16:07	17:24
35°	04:14	04:46	05:16	15:01	16:12	17:24
30°	04:05	04:40	05:13	15:09	16:17	17:25
20°	03:48	04:30	05:09	15:23	16:24	17:25
N 10°	03:34	04:21	05:06	15:34	16:30	17:26
0°	03:21	04:12	05:03	15:46	16:36	17:26
S 10°	03:08	04:04	04:59	15:56	16:42	17:27
20°	02:53	03:55	04:56	16:08	16:48	17:28
30°	02:37	03:44	04:52	16:21	16:55	17:28
35°	02:27	03:38	04:50	16:29	16:59	17:28
40°	02:16	03:31	04:47	16:37	17:04	17:29
45°	02:03	03:23	04:44	16:47	17:09	17:29
S 50°	01:47	03:13	04:41	16:59	17:15	17:30
52°	01:39	03:09	04:39	17:04	17:18	17:30
54°	01:31	03:04	04:37	17:10	17:21	17:30
56°	01:21	02:58	04:35	17:17	17:24	17:30
58°	01:10	02:52	04:33	17:25	17:28	17:31
S 60°	00:58	02:45	04:30	17:33	17:32	17:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 26-28 16-3%
26	05:43	05:34	12:06	09:33	21:59	
27	05:25	05:16	12:05	10:24	22:49	
28	05:07	04:58	12:05	11:15	23:40	

No IERS EOP prediction data available

March 29, 30, 31 UT (Sat., Sun., Mon.)

DUT1 = UT1-UTC = +0.2060 sec ΔT = TT-UT1 = +68.9780 sec

2025 March 29 to Mar. 31 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	186°39.1	190°36.0	N06°43.5	71°42.1	N24°14.4	112°19.9	N22°20.3	191°16.5	S04°06.3
1	201°41.5	205°39.5	42.6	86°43.7	14.2	127°22.0	20.4	206°18.7	06.2
2	216°44.0	220°43.1	41.7	101°45.4	14.0	142°24.1	20.4	221°20.9	06.1
3	231°46.5	235°46.7	·· 40.8	116°47.0	·· 13.8	157°26.1	·· 20.5	236°23.0	·· 06.0
4	246°48.9	250°50.2	39.9	131°48.7	13.6	172°28.2	20.5	251°25.2	05.9
5	261°51.4	265°53.8	39.0	146°50.3	13.4	187°30.3	20.6	266°27.4	05.8
6	276°53.8	280°57.4	N06°38.1	161°51.9	N24°13.2	202°32.3	N22°20.6	281°29.6	S04°05.6
7	291°56.3	296°00.9	37.2	176°53.6	13.0	217°34.4	20.7	296°31.8	05.5
8	306°58.8	311°04.5	36.3	191°55.2	12.9	232°36.4	20.7	311°34.0	05.4
9	322°01.2	326°08.0	·· 35.4	206°56.9	·· 12.7	247°38.5	·· 20.8	326°36.1	·· 05.3
10	337°03.7	341°11.6	34.5	221°58.5	12.5	262°40.6	20.8	341°38.3	05.2
11	352°06.2	356°15.1	33.6	237°00.1	12.3	277°42.6	20.9	356°40.5	05.1
12	7°08.6	11°18.6	N06°32.8	252°01.8	N24°12.1	292°44.7	N22°20.9	11°42.7	S04°04.9
13	22°11.1	26°22.2	31.9	267°03.4	11.9	307°46.8	20.9	26°44.9	04.8
14	37°13.6	41°25.7	31.0	282°05.1	11.7	322°48.8	21.0	41°47.1	04.7
15	52°16.0	56°29.2	·· 30.1	297°06.7	·· 11.5	337°50.9	·· 21.0	56°49.3	·· 04.6
16	67°18.5	71°32.8	29.2	312°08.3	11.3	352°52.9	21.1	71°51.4	04.5
17	82°21.0	86°36.3	28.3	327°10.0	11.1	7°55.0	21.1	86°53.6	04.4
18	97°23.4	101°39.8	N06°27.4	342°11.6	N24°10.9	22°57.1	N22°21.2	101°55.8	S04°04.2
19	112°25.9	116°43.3	26.5	357°13.2	10.7	37°59.1	21.2	116°58.0	04.1
20	127°28.3	131°46.9	25.6	12°14.8	10.5	53°01.2	21.3	132°00.2	04.0
21	142°30.8	146°50.4	·· 24.7	27°16.5	·· 10.3	68°03.2	·· 21.3	147°02.4	·· 03.9
22	157°33.3	161°53.9	23.8	42°18.1	10.1	83°05.3	21.4	162°04.5	03.8
23	172°35.7	176°57.4	22.9	57°19.7	09.9	98°07.4	21.4	177°06.7	03.7
Mer.pass.	11:32	ν 3.6′	d -0.9′	m -4.06	ν 1.6′	d -0.2′	m 0.38	ν 2.1′	d 0.0′ m -2.12	ν 2.2′	d 0.1′ m 1.16

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	187°38.2	192°00.9	N06°22.0	72°21.4	N24°09.7	113°09.4	N22°21.5	192°08.9	S04°03.5
1	202°40.7	207°04.4	21.1	87°23.0	09.5	128°11.5	21.5	207°11.1	03.4
2	217°43.1	222°07.9	20.2	102°24.6	09.3	143°13.5	21.6	222°13.3	03.3
3	232°45.6	237°11.4	·· 19.3	117°26.2	·· 09.1	158°15.6	·· 21.6	237°15.5	·· 03.2
4	247°48.1	252°14.9	18.4	132°27.9	08.9	173°17.7	21.6	252°17.7	03.1
5	262°50.5	267°18.4	17.5	147°29.5	08.7	188°19.7	21.7	267°19.8	03.0
6	277°53.0	282°21.9	N06°16.6	162°31.1	N24°08.5	203°21.8	N22°21.7	282°22.0	S04°02.9
7	292°55.4	297°25.3	15.7	177°32.7	08.3	218°23.8	21.8	297°24.2	02.7
8	307°57.9	312°28.8	14.8	192°34.4	08.1	233°25.9	21.8	312°26.4	02.6
9	323°00.4	327°32.3	·· 13.9	207°36.0	·· 07.9	248°28.0	·· 21.9	327°28.6	·· 02.5
10	338°02.8	342°35.8	13.0	222°37.6	07.7	263°30.0	21.9	342°30.8	02.4
11	353°05.3	357°39.2	12.1	237°39.2	07.5	278°32.1	22.0	357°33.0	02.3
12	8°07.8	12°42.7	N06°11.2	252°40.9	N24°07.3	293°34.1	N22°22.0	12°35.1	S04°02.2
13	23°10.2	27°46.2	10.3	267°42.5	07.1	308°36.2	22.1	27°37.3	02.0
14	38°12.7	42°49.6	09.4	282°44.1	06.9	323°38.2	22.1	42°39.5	01.9
15	53°15.2	57°53.1	·· 08.5	297°45.7	·· 06.7	338°40.3	·· 22.2	57°41.7	·· 01.8
16	68°17.6	72°56.6	07.6	312°47.3	06.5	353°42.3	22.2	72°43.9	01.7
17	83°20.1	88°00.0	06.7	327°48.9	06.3	8°44.4	22.3	87°46.1	01.6
18	98°22.6	103°03.5	N06°05.8	342°50.6	N24°06.1	23°46.5	N22°22.3	102°48.3	S04°01.5
19	113°25.0	118°06.9	04.9	357°52.2	05.9	38°48.5	22.3	117°50.4	01.3
20	128°27.5	133°10.3	04.0	12°53.8	05.7	53°50.6	22.4	132°52.6	01.2
21	143°29.9	148°13.8	·· 03.1	27°55.4	·· 05.5	68°52.6	·· 22.4	147°54.8	·· 01.1
22	158°32.4	163°17.2	02.3	42°57.0	05.3	83°54.7	22.5	162°57.0	01.0
23	173°34.9	178°20.6	01.4	57°58.6	05.1	98°56.7	22.5	177°59.2	00.9
Mer.pass.	11:28	ν 3.5′	d -0.9′	m -4.12	ν 1.6′	d -0.2′	m 0.40	ν 2.1′	d 0.0′ m -2.12	ν 2.2′	d 0.1′ m 1.16

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	188°37.3	193°24.1	N06°00.5	73°00.2	N24°04.9	113°58.8	N22°22.6	193°01.4	S04°00.8
1	203°39.8	208°27.5	05°59.6	88°01.9	04.7	129°00.8	22.6	208°03.6	00.6
2	218°42.3	223°30.9	58.7	103°03.5	04.5	144°02.9	22.7	223°05.7	00.5
3	233°44.7	238°34.3	·· 57.8	118°05.1	·· 04.3	159°04.9	·· 22.7	238°07.9	·· 00.4
4	248°47.2	253°37.8	56.9	133°06.7	04.1	174°07.0	22.8	253°10.1	00.3
5	263°49.7	268°41.2	56.0	148°08.3	03.9	189°09.0	22.8	268°12.3	00.2
6	278°52.1	283°44.6	N05°55.1	163°09.9	N24°03.7	204°11.1	N22°22.9	283°14.5	S04°00.1
7	293°54.6	298°48.0	54.2	178°11.5	03.5	219°13.2	22.9	298°16.7	03°59.9
8	308°57.0	313°51.4	53.3	193°13.1	03.3	234°15.2	23.0	313°18.9	59.8
9	323°59.5	328°54.8	·· 52.4	208°14.7	·· 03.1	249°17.3	·· 23.0	328°21.0	·· 59.7
10	339°02.0	343°58.2	51.5	223°16.3	02.9	264°19.3	23.0	343°23.2	59.6
11	354°04.4	359°01.6	50.7	238°17.9	02.7	279°21.4	23.1	358°25.4	59.5
12	9°06.9	14°05.0	N05°49.8	253°19.5	N24°02.5	294°23.4	N22°23.1	13°27.6	S03°59.4
13	24°09.4	29°08.4	48.9	268°21.1	02.3	309°25.5	23.2	28°29.8	59.3
14	39°11.8	44°11.8	48.0	283°22.7	02.1	324°27.5	23.2	43°32.0	59.1
15	54°14.3	59°15.1	·· 47.1	298°24.3	·· 01.9	339°29.6	·· 23.3	58°34.2	·· 59.0
16	69°16.8	74°18.5	46.2	313°25.9	01.7	354°31.6	23.3	73°36.3	58.9
17	84°19.2	89°21.9	45.3	328°27.6	01.5	9°33.7	23.4	88°38.5	58.8
18	99°21.7	104°25.3	N05°44.4	343°29.2	N24°01.3	24°35.7	N22°23.4	103°40.7	S03°58.7
19	114°24.2	119°28.6	43.5	358°30.8	01.1	39°37.8	23.5	118°42.9	58.6
20	129°26.6	134°32.0	42.7	13°32.4	00.9	54°39.8	23.5	133°45.1	58.4
21	144°29.1	149°35.3	·· 41.8	28°33.9	·· 00.7	69°41.9	·· 23.6	148°47.3	·· 58.3
22	159°31.5	164°38.7	40.9	43°35.5	00.5	84°43.9	23.6	163°49.5	58.2
23	174°34.0	179°42.1	40.0	58°37.1	00.3	99°46.0	23.7	178°51.7	58.1
Mer.pass.	11:24	ν 3.4′	d -0.9′	m -4.18	ν 1.6′	d -0.2′	m 0.42	ν 2.1′	d 0.0′ m -2.11	ν 2.2′	d 0.1′ m 1.16

Stars

	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.2
Schedar	349°31.5	56°40.5
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.6
Hamal	327°51.3	23°34.9
Polaris	314°21.1	89°22.4
Acamar	315°12.0	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.8	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.6	-1°11.2
Betelgeuse	270°52.0	7°24.6
Canopus	263°52.4	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°58.0
Avior	234°14.4	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°37.8	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.1	61°36.9
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.4
Gacrux	171°50.9	-57°15.4
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.0
Hadar	148°35.2	-60°29.7
Menkent	147°57.1	-36°29.7
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.5	-60°56.3
Kochab	137°18.8	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.4	-26°29.3
Atria	107°09.3	-69°04.2
Sabik	102°02.5	-15°45.4
Shaula	96°10.0	-37°07.3
Rasalhague	95°58.3	12°32.3
Eltanin	90°42.0	51°28.7
Kaus Aust.	83°32.3	-34°22.3
Vega	80°33.1	38°48.0
Nunki	75°47.6	-26°15.9
Altair	61°59.9	8°55.9
Peacock	53°05.7	-56°39.1
Deneb	49°25.9	45°21.9
Enif	33°38.9	9°59.3
Al Na'ir	27°33.0	-46°50.3
Fomalhaut	15°14.6	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.0	15°20.3

Mar 29 Sat	SHA	Mer.pass
Venus	3°56.9	11:15
Mars	245°03.0	19:11
Jupiter	285°40.9	16:28
Saturn	4°37.4	11:13

Mar 30 Sun	SHA	Mer.pass
Venus	4°22.7	11:09
Mars	244°43.2	19:09
Jupiter	285°31.2	16:25
Saturn	4°30.7	11:10

Mar 31 Mon	SHA	Mer.pass
Venus	4°46.7	11:04
Mars	244°22.9	19:06
Jupiter	285°21.4	16:22
Saturn	4°24.0	11:06

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	Sun			Moon				
h								
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	178°47.9	N03°23.4		184°52.5	10.4′	N01°14.6	18.1′	60.9′
1	193°48.0	24.4		199°21.8	10.4′	01°32.7	18.1′	60.9′
2	208°48.2	25.4		213°51.2	10.3′	01°50.8	18.1′	60.9′
3	223°48.4	·· 26.3		228°20.5	10.3′	02°08.9	18.0′	61.0′
4	238°48.6	27.3		242°49.8	10.3′	02°26.9	18.1′	61.0′
5	253°48.8	28.3		257°19.1	10.2′	02°45.0	18.1′	61.0′
6	268°49.0	N03°29.3		271°48.3	10.2′	N03°03.1	18.1′	61.0′
7	283°49.2	30.2		286°17.5	10.2′	03°21.2	18.0′	61.0′
8	298°49.4	31.2		300°46.7	10.1′	03°39.2	18.1′	61.0′
9	313°49.5	·· 32.2		315°15.8	10.1′	03°57.3	18.0′	61.0′
10	328°49.7	33.1		329°44.9	10.1′	04°15.3	18.0′	61.0′
11	343°49.9	34.1		344°14.0	10.0′	04°33.3	18.0′	61.1′
12	358°50.1	N03°35.1		358°43.0	10.0′	N04°51.3	18.0′	61.1′
13	13°50.3	36.1		13°12.0	9.9′	05°09.3	17.9′	61.1′
14	28°50.5	37.0		27°40.9	9.9′	05°27.2	18.0′	61.1′
15	43°50.7	·· 38.0		42°09.8	9.8′	05°45.2	17.9′	61.1′
16	58°50.8	39.0		56°38.6	9.8′	06°03.1	17.8′	61.1′
17	73°51.0	40.0		71°07.4	9.8′	06°20.9	17.9′	61.1′
18	88°51.2	N03°40.9		85°36.2	9.7′	N06°38.8	17.7′	61.1′
19	103°51.4	41.9		100°04.9	9.7′	06°56.5	17.8′	61.1′
20	118°51.6	42.9		114°33.6	9.6′	07°14.3	17.7′	61.1′
21	133°51.8	·· 43.8		129°02.2	9.6′	07°32.0	17.7′	61.1′
22	148°52.0	44.8		143°30.7	9.5′	07°49.7	17.6′	61.1′
23	163°52.2	45.8		157°59.2	9.5′	08°07.3	17.6′	61.1′
	SD = 16.0′	d = 1.0′		SD = 16.6′				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	178°52.3	N03°46.8		172°27.7	9.4′	N08°24.9	17.6′	61.1′
1	193°52.5	47.7		186°56.1	9.3′	08°42.5	17.5′	61.1′
2	208°52.7	48.7		201°24.4	9.3′	09°00.0	17.4′	61.1′
3	223°52.9	·· 49.7		215°52.7	9.2′	09°17.4	17.4′	61.1′
4	238°53.1	50.6		230°20.9	9.2′	09°34.8	17.3′	61.1′
5	253°53.3	51.6		244°49.1	9.1′	09°52.1	17.3′	61.1′
6	268°53.5	N03°52.6		259°17.2	9.1′	N10°09.4	17.2′	61.1′
7	283°53.6	53.6		273°45.3	9.0′	10°26.6	17.2′	61.1′
8	298°53.8	54.5		288°13.3	8.9′	10°43.8	17.1′	61.1′
9	313°54.0	·· 55.5		302°41.2	8.9′	11°00.9	17.0′	61.1′
10	328°54.2	56.5		317°09.1	8.8′	11°17.9	16.9′	61.1′
11	343°54.4	57.4		331°36.9	8.7′	11°34.8	16.9′	61.1′
12	358°54.6	N03°58.4		346°04.6	8.7′	N11°51.7	16.8′	61.1′
13	13°54.8	03°59.4		0°32.3	8.6′	12°08.5	16.7′	61.1′
14	28°55.0	04°00.4		14°59.9	8.5′	12°25.2	16.7′	61.1′
15	43°55.1	·· 01.3		29°27.4	8.5′	12°41.9	16.6′	61.1′
16	58°55.3	02.3		43°54.9	8.4′	12°58.5	16.5′	61.1′
17	73°55.5	03.3		58°22.3	8.3′	13°15.0	16.4′	61.1′
18	88°55.7	N04°04.2		72°49.6	8.3′	N13°31.4	16.3′	61.1′
19	103°55.9	05.2		87°16.8	8.2′	13°47.7	16.2′	61.1′
20	118°56.1	06.2		101°44.0	8.1′	14°03.9	16.1′	61.1′
21	133°56.3	·· 07.1		116°11.1	8.0′	14°20.0	16.1′	61.1′
22	148°56.4	08.1		130°38.2	8.0′	14°36.1	15.9′	61.1′
23	163°56.6	09.1		145°05.1	7.9′	14°52.0	15.9′	61.1′
	SD = 16.0′	d = 1.0′		SD = 16.7′				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	178°56.8	N04°10.0		159°32.0	7.8′	N15°07.9	15.8′	61.1′
1	193°57.0	11.0		173°58.8	7.7′	15°23.7	15.6′	61.0′
2	208°57.2	12.0		188°25.6	7.7′	15°39.3	15.6′	61.0′
3	223°57.4	·· 13.0		202°52.2	7.6′	15°54.9	15.4′	61.0′
4	238°57.6	13.9		217°18.8	7.5′	16°10.3	15.4′	61.0′
5	253°57.7	14.9		231°45.3	7.4′	16°25.7	15.2′	61.0′
6	268°57.9	N04°15.9		246°11.8	7.4′	N16°40.9	15.1′	61.0′
7	283°58.1	16.8		260°38.1	7.3′	16°56.0	15.0′	61.0′
8	298°58.3	17.8		275°04.4	7.2′	17°11.0	14.9′	61.0′
9	313°58.5	·· 18.8		289°30.6	7.1′	17°25.9	14.8′	60.9′
10	328°58.7	19.7		303°56.7	7.0′	17°40.7	14.6′	60.9′
11	343°58.9	20.7		318°22.7	7.0′	17°55.3	14.5′	60.9′
12	358°59.0	N04°21.7		332°48.7	6.9′	N18°09.8	14.5′	60.9′
13	13°59.2	22.6		347°14.6	6.8′	18°24.3	14.2′	60.9′
14	28°59.4	23.6		1°40.4	6.7′	18°38.5	14.2′	60.9′
15	43°59.6	·· 24.6		16°06.1	6.6′	18°52.7	14.0′	60.8′
16	58°59.8	25.5		30°31.7	6.6′	19°06.7	13.9′	60.8′
17	74°00.0	26.5		44°57.3	6.5′	19°20.6	13.8′	60.8′
18	89°00.2	N04°27.5		59°22.8	6.4′	N19°34.4	13.6′	60.8′
19	104°00.3	28.4		73°48.2	6.3′	19°48.0	13.5′	60.8′
20	119°00.5	29.4		88°13.5	6.2′	20°01.5	13.3′	60.7′
21	134°00.7	·· 30.4		102°38.8	6.2′	20°14.8	13.2′	60.7′
22	149°00.9	31.3		117°03.9	6.1′	20°28.0	13.1′	60.7′
23	164°01.1	32.3		131°29.0	6.0′	20°41.1	12.9′	60.7′
	SD = 16.0′	d = 1.0′		SD = 16.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:58	03:52	05:05	19:06	20:20	22:19
N 70°	02:35	04:07	05:12	19:00	20:05	21:40
68°	03:00	04:18	05:17	18:54	19:53	21:13
66°	03:18	04:28	05:21	18:50	19:43	20:54
64°	03:33	04:36	05:25	18:46	19:35	20:38
62°	03:45	04:43	05:28	18:42	19:28	20:26
60°	03:56	04:48	05:31	18:39	19:22	20:15
N 58°	04:04	04:53	05:33	18:37	19:17	20:06
56°	04:12	04:58	05:35	18:35	19:13	19:59
54°	04:18	05:02	05:37	18:33	19:09	19:52
52°	04:24	05:05	05:39	18:31	19:05	19:46
50°	04:29	05:08	05:41	18:29	19:02	19:41
45°	04:40	05:15	05:44	18:25	18:55	19:30
N 40°	04:48	05:20	05:47	18:22	18:50	19:22
35°	04:54	05:24	05:49	18:20	18:45	19:15
30°	05:00	05:28	05:52	18:18	18:42	19:10
20°	05:07	05:33	05:55	18:14	18:36	19:02
N 10°	05:13	05:37	05:58	18:11	18:32	18:56
0°	05:16	05:40	06:01	18:08	18:28	18:52
S 10°	05:18	05:43	06:04	18:05	18:26	18:50
20°	05:19	05:45	06:07	18:02	18:24	18:49
30°	05:18	05:46	06:10	17:59	18:23	18:50
35°	05:17	05:46	06:11	17:57	18:22	18:51
40°	05:15	05:46	06:13	17:55	18:22	18:53
45°	05:12	05:46	06:15	17:53	18:22	18:56
S 50°	05:08	05:46	06:18	17:50	18:22	19:00
52°	05:06	05:45	06:19	17:49	18:22	19:01
54°	05:04	05:45	06:20	17:48	18:23	19:04
56°	05:01	05:44	06:22	17:46	18:23	19:06
58°	04:58	05:44	06:23	17:44	18:23	19:09
S 60°	04:55	05:43	06:25	17:43	18:24	19:12

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	05:18	04:35	03:26	19:50	22:54	▭
N 70°	05:22	04:49	04:03	19:39	22:19	▭
68°	05:25	05:01	04:29	19:31	21:55	·· ··
66°	05:27	05:10	04:50	19:23	21:36	·· ··
64°	05:29	05:19	05:06	19:17	21:22	23:38
62°	05:31	05:26	05:20	19:12	21:09	23:14
60°	05:33	05:32	05:32	19:07	20:59	22:55
N 58°	05:34	05:38	05:42	19:04	20:50	22:40
56°	05:36	05:42	05:51	19:00	20:42	22:26
54°	05:37	05:47	05:59	18:57	20:35	22:15
52°	05:38	05:51	06:06	18:54	20:28	22:05
50°	05:39	05:55	06:13	18:51	20:23	21:56
45°	05:41	06:03	06:27	18:46	20:11	21:37
N 40°	05:43	06:09	06:39	18:41	20:01	21:22
35°	05:45	06:15	06:49	18:37	19:52	21:09
30°	05:46	06:20	06:58	18:34	19:45	20:58
20°	05:49	06:29	07:13	18:28	19:32	20:39
N 10°	05:51	06:38	07:27	18:22	19:21	20:22
0°	05:53	06:45	07:40	18:17	19:11	20:07
S 10°	05:55	06:53	07:53	18:13	19:00	19:51
20°	05:58	07:01	08:07	18:07	18:49	19:35
30°	06:01	07:11	08:23	18:01	18:37	19:16
35°	06:02	07:16	08:32	17:58	18:30	19:06
40°	06:04	07:23	08:43	17:54	18:22	18:53
45°	06:06	07:30	08:56	17:50	18:12	18:39
S 50°	06:09	07:39	09:12	17:44	18:01	18:21
52°	06:10	07:43	09:19	17:42	17:56	18:13
54°	06:11	07:48	09:28	17:39	17:50	18:04
56°	06:13	07:53	09:37	17:36	17:44	17:54
58°	06:15	07:59	09:48	17:33	17:37	17:42
S 60°	06:16	08:06	10:00	17:30	17:29	17:29

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 0-2 0-4%
29	04:49	04:40	12:05	12:05	–:–	
30	04:31	04:22	12:04	12:58	00:31	
31	04:13	04:04	12:04	13:53	01:25	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2067 sec ΔT = TT-UT1 = +68.9773 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	189°36.5	194°45.4	N05°39.1	73°38.7	N24°00.1	114°48.0	N22°23.7	193°53.8	S03°58.0
1	204°38.9	209°48.8	38.2	88°40.3	23°59.9	129°50.1	23.7	208°56.0	57.9
2	219°41.4	224°52.1	37.4	103°41.9	59.7	144°52.1	23.8	223°58.2	57.8
3	234°43.9	239°55.4	·· 36.5	118°43.5	·· 59.5	159°54.1	·· 23.8	239°00.4	·· 57.6
4	249°46.3	254°58.8	35.6	133°45.1	59.3	174°56.2	23.9	254°02.6	57.5
5	264°48.8	270°02.1	34.7	148°46.7	59.1	189°58.2	23.9	269°04.8	57.4
6	279°51.3	285°05.4	N05°33.8	163°48.3	N23°58.8	205°00.3	N22°24.0	284°07.0	S03°57.3
7	294°53.7	300°08.8	32.9	178°49.9	58.6	220°02.3	24.0	299°09.1	57.2
8	309°56.2	315°12.1	32.1	193°51.5	58.4	235°04.4	24.1	314°11.3	57.1
9	324°58.7	330°15.4	·· 31.2	208°53.1	·· 58.2	250°06.4	·· 24.1	329°13.5	·· 56.9
10	340°01.1	345°18.7	30.3	223°54.7	58.0	265°08.5	24.2	344°15.7	56.8
11	355°03.6	0°22.0	29.4	238°56.3	57.8	280°10.5	24.2	359°17.9	56.7
12	10°06.0	15°25.3	N05°28.5	253°57.8	N23°57.6	295°12.6	N22°24.3	14°20.1	S03°56.6
13	25°08.5	30°28.6	27.7	268°59.4	57.4	310°14.6	24.3	29°22.3	56.5
14	40°11.0	45°32.0	26.8	284°01.0	57.2	325°16.7	24.4	44°24.5	56.4
15	55°13.4	60°35.2	·· 25.9	299°02.6	·· 57.0	340°18.7	·· 24.4	59°26.6	·· 56.2
16	70°15.9	75°38.5	25.0	314°04.2	56.8	355°20.7	24.4	74°28.8	56.1
17	85°18.4	90°41.8	24.2	329°05.8	56.6	10°22.8	24.5	89°31.0	56.0
18	100°20.8	105°45.1	N05°23.3	344°07.4	N23°56.4	25°24.8	N22°24.5	104°33.2	S03°55.9
19	115°23.3	120°48.4	22.4	359°09.0	56.2	40°26.9	24.6	119°35.4	55.8
20	130°25.8	135°51.7	21.5	14°10.5	55.9	55°28.9	24.6	134°37.6	55.7
21	145°28.2	150°55.0	·· 20.7	29°12.1	·· 55.7	70°31.0	·· 24.7	149°39.8	·· 55.6
22	160°30.7	165°58.2	19.8	44°13.7	55.5	85°33.0	24.7	164°42.0	55.4
23	175°33.1	181°01.5	18.9	59°15.3	55.3	100°35.1	24.8	179°44.1	55.3
Mer.pass.	11:20	ν 3.3′	d -0.9′	m -4.24	ν 1.6′	d -0.2′	m 0.44	ν 2.0′	d 0.0′ m -2.11	ν 2.2′	d 0.1′ m 1.16

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	190°35.6	196°04.8	N05°18.1	74°16.9	N23°55.1	115°37.1	N22°24.8	194°46.3	S03°55.2
1	205°38.1	211°08.0	17.2	89°18.4	54.9	130°39.1	24.9	209°48.5	55.1
2	220°40.5	226°11.3	16.3	104°20.0	54.7	145°41.2	24.9	224°50.7	55.0
3	235°43.0	241°14.6	·· 15.5	119°21.6	·· 54.5	160°43.2	·· 25.0	239°52.9	·· 54.9
4	250°45.5	256°17.8	14.6	134°23.2	54.3	175°45.3	25.0	254°55.1	54.8
5	265°47.9	271°21.1	13.7	149°24.8	54.1	190°47.3	25.1	269°57.3	54.6
6	280°50.4	286°24.3	N05°12.8	164°26.3	N23°53.9	205°49.4	N22°25.1	284°59.5	S03°54.5
7	295°52.9	301°27.5	12.0	179°27.9	53.7	220°51.4	25.1	300°01.6	54.4
8	310°55.3	316°30.8	11.1	194°29.5	53.4	235°53.4	25.2	315°03.8	54.3
9	325°57.8	331°34.0	·· 10.3	209°31.1	·· 53.2	250°55.5	·· 25.2	330°06.0	·· 54.2
10	341°00.3	346°37.2	09.4	224°32.6	53.0	265°57.5	25.3	345°08.2	54.1
11	356°02.7	1°40.5	08.5	239°34.2	52.8	280°59.6	25.3	0°10.4	53.9
12	11°05.2	16°43.7	N05°07.7	254°35.8	N23°52.6	296°01.6	N22°25.4	15°12.6	S03°53.8
13	26°07.6	31°46.9	06.8	269°37.4	52.4	311°03.6	25.4	30°14.8	53.7
14	41°10.1	46°50.1	05.9	284°38.9	52.2	326°05.7	25.5	45°17.0	53.6
15	56°12.6	61°53.3	·· 05.1	299°40.5	·· 52.0	341°07.7	·· 25.5	60°19.1	·· 53.5
16	71°15.0	76°56.6	04.2	314°42.1	51.8	356°09.8	25.6	75°21.3	53.4
17	86°17.5	91°59.8	03.4	329°43.7	51.5	11°11.8	25.6	90°23.5	53.3
18	101°20.0	107°03.0	N05°02.5	344°45.2	N23°51.3	26°13.8	N22°25.7	105°25.7	S03°53.1
19	116°22.4	122°06.2	01.7	359°46.8	51.1	41°15.9	25.7	120°27.9	53.0
20	131°24.9	137°09.4	05°00.8	14°48.4	50.9	56°17.9	25.8	135°30.1	52.9
21	146°27.4	152°12.5	04°59.9	29°49.9	·· 50.7	71°19.9	·· 25.8	150°32.3	·· 52.8
22	161°29.8	167°15.7	59.1	44°51.5	50.5	86°22.0	25.8	165°34.5	52.7
23	176°32.3	182°18.9	58.2	59°53.1	50.3	101°24.0	25.9	180°36.7	52.6
Mer.pass.	11:16	ν 3.3′	d -0.9′	m -4.30	ν 1.6′	d -0.2′	m 0.46	ν 2.0′	d 0.0′ m -2.10	ν 2.2′	d 0.1′ m 1.16

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	191°34.8	197°22.1	N04°57.4	74°54.6	N23°50.1	116°26.1	N22°25.9	195°38.8	S03°52.5
1	206°37.2	212°25.3	56.5	89°56.2	49.8	131°28.1	26.0	210°41.0	52.3
2	221°39.7	227°28.4	55.7	104°57.8	49.6	146°30.1	26.0	225°43.2	52.2
3	236°42.1	242°31.6	·· 54.8	119°59.3	·· 49.4	161°32.2	·· 26.1	240°45.4	·· 52.1
4	251°44.6	257°34.8	54.0	135°00.9	49.2	176°34.2	26.1	255°47.6	52.0
5	266°47.1	272°37.9	53.1	150°02.5	49.0	191°36.2	26.2	270°49.8	51.9
6	281°49.5	287°41.1	N04°52.3	165°04.0	N23°48.8	206°38.3	N22°26.2	285°52.0	S03°51.8
7	296°52.0	302°44.2	51.4	180°05.6	48.6	221°40.3	26.3	300°54.2	51.7
8	311°54.5	317°47.4	50.6	195°07.1	48.4	236°42.4	26.3	315°56.4	51.5
9	326°56.9	332°50.5	·· 49.7	210°08.7	·· 48.1	251°44.4	·· 26.4	330°58.5	·· 51.4
10	341°59.4	347°53.7	48.9	225°10.3	47.9	266°46.4	26.4	346°00.7	51.3
11	357°01.9	2°56.8	48.1	240°11.8	47.7	281°48.5	26.5	1°02.9	51.2
12	12°04.3	18°00.0	N04°47.2	255°13.4	N23°47.5	296°50.5	N22°26.5	16°05.1	S03°51.1
13	27°06.8	33°03.1	46.4	270°14.9	47.3	311°52.5	26.6	31°07.3	51.0
14	42°09.3	48°06.2	45.5	285°16.5	47.1	326°54.6	26.6	46°09.5	50.9
15	57°11.7	63°09.3	·· 44.7	300°18.1	·· 46.9	341°56.6	·· 26.6	61°11.7	·· 50.7
16	72°14.2	78°12.5	43.9	315°19.6	46.6	356°58.6	26.7	76°13.9	50.6
17	87°16.6	93°15.6	43.0	330°21.2	46.4	12°00.7	26.7	91°16.1	50.5
18	102°19.1	108°18.7	N04°42.2	345°22.7	N23°46.2	27°02.7	N22°26.8	106°18.2	S03°50.4
19	117°21.6	123°21.8	41.3	0°24.3	46.0	42°04.7	26.8	121°20.4	50.3
20	132°24.0	138°24.9	40.5	15°25.8	45.8	57°06.8	26.9	136°22.6	50.2
21	147°26.5	153°28.0	·· 39.7	30°27.4	·· 45.6	72°08.8	·· 26.9	151°24.8	·· 50.1
22	162°29.0	168°31.1	38.8	45°28.9	45.3	87°10.8	27.0	166°27.0	49.9
23	177°31.4	183°34.2	38.0	60°30.5	45.1	102°12.9	27.0	181°29.2	49.8
Mer.pass.	11:12	ν 3.2′	d -0.9′	m -4.35	ν 1.6′	d -0.2′	m 0.48	ν 2.0′	d 0.0′ m -2.10	ν 2.2′	d 0.1′ m 1.16

Stars	SHA	Dec
Alpheratz	357°35.0	29°13.7
Ankaa	353°07.4	-42°10.2
Schedar	349°31.5	56°40.5
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.6
Hamal	327°51.3	23°34.8
Polaris	314°21.6	89°22.4
Acamar	315°12.0	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.8	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.6
Canopus	263°52.4	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°58.0
Avior	234°14.5	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°37.8	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.4
Gacrux	171°50.9	-57°15.4
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.1
Hadar	148°35.2	-60°29.7
Menkent	147°57.1	-36°29.7
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.5	-60°56.3
Kochab	137°18.7	74°02.8
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.4	-26°29.3
Atria	107°09.3	-69°04.2
Sabik	102°02.4	-15°45.4
Shaula	96°10.0	-37°07.3
Rasalhague	95°58.3	12°32.3
Eltanin	90°42.0	51°28.7
Kaus Aust.	83°32.2	-34°22.3
Vega	80°33.1	38°48.1
Nunki	75°47.5	-26°15.9
Altair	61°59.9	8°55.9
Peacock	53°05.7	-56°39.1
Deneb	49°25.9	45°21.9
Enif	33°38.8	9°59.3
Al Na'ir	27°33.0	-46°50.3
Fomalhaut	15°14.6	-29°29.4
Scheat	13°45.4	28°13.0
Markab	13°30.0	15°20.3

Apr 01 Tue	SHA	Mer.pass
Venus	5°08.9	10:59
Mars	244°02.3	19:03
Jupiter	285°11.5	16:19
Saturn	4°17.4	11:03

Apr 02 Wed	SHA	Mer.pass
Venus	5°29.2	10:53
Mars	243°41.3	19:01
Jupiter	285°01.5	16:15
Saturn	4°10.7	10:59

Apr 03 Thu	SHA	Mer.pass
Venus	5°47.3	10:48
Mars	243°19.9	18:58
Jupiter	284°51.3	16:12
Saturn	4°04.1	10:56

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°01.3	N04°33.3	145°54.0	5.9′	N20°54.0	12.8′	60.7′
1	194°01.4	34.2	160°18.9	5.9′	21°06.8	12.6′	60.6′
2	209°01.6	35.2	174°43.8	5.8′	21°19.4	12.5′	60.6′
3	224°01.8	·· 36.1	189°08.6	5.7′	21°31.9	12.3′	60.6′
4	239°02.0	37.1	203°33.3	5.6′	21°44.2	12.2′	60.6′
5	254°02.2	38.1	217°57.9	5.5′	21°56.4	12.0′	60.6′
6	269°02.4	N04°39.0	232°22.4	5.5′	N22°08.4	11.8′	60.5′
7	284°02.6	40.0	246°46.9	5.4′	22°20.2	11.7′	60.5′
8	299°02.7	41.0	261°11.3	5.3′	22°31.9	11.6′	60.5′
9	314°02.9	·· 41.9	275°35.7	5.3′	22°43.5	11.3′	60.5′
10	329°03.1	42.9	289°59.9	5.2′	22°54.8	11.3′	60.4′
11	344°03.3	43.9	304°24.1	5.1′	23°06.1	11.0′	60.4′
12	359°03.5	N04°44.8	318°48.2	5.0′	N23°17.1	10.9′	60.4′
13	14°03.7	45.8	333°12.3	5.0′	23°28.0	10.7′	60.4′
14	29°03.8	46.8	347°36.2	4.9′	23°38.7	10.5′	60.3′
15	44°04.0	·· 47.7	2°00.1	4.8′	23°49.2	10.4′	60.3′
16	59°04.2	48.7	16°24.0	4.8′	23°59.6	10.2′	60.3′
17	74°04.4	49.6	30°47.8	4.7′	24°09.8	10.1′	60.2′
18	89°04.6	N04°50.6	45°11.5	4.7′	N24°19.9	9.8′	60.2′
19	104°04.8	51.6	59°35.1	4.6′	24°29.7	9.7′	60.2′
20	119°05.0	52.5	73°58.7	4.5′	24°39.4	9.5′	60.2′
21	134°05.1	·· 53.5	88°22.2	4.5′	24°48.9	9.3′	60.1′
22	149°05.3	54.5	102°45.7	4.4′	24°58.2	9.2′	60.1′
23	164°05.5	55.4	117°09.1	4.4′	25°07.4	9.0′	60.1′
	SD = 16.0′	d = 1.0′	SD = 16.5′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°05.7	N04°56.4	131°32.5	4.3′	N25°16.4	8.7′	60.0′
1	194°05.9	57.3	145°55.8	4.3′	25°25.1	8.6′	60.0′
2	209°06.1	58.3	160°19.0	4.2′	25°33.7	8.5′	60.0′
3	224°06.2	04°59.3	174°42.2	4.2′	25°42.2	8.2′	60.0′
4	239°06.4	05°00.2	189°05.4	4.1′	25°50.4	8.1′	59.9′
5	254°06.6	01.2	203°28.5	4.1′	25°58.5	7.8′	59.9′
6	269°06.8	N05°02.1	217°51.6	4.0′	N26°06.3	7.7′	59.9′
7	284°07.0	03.1	232°14.6	4.0′	26°14.0	7.5′	59.8′
8	299°07.2	04.1	246°37.6	3.9′	26°21.5	7.3′	59.8′
9	314°07.3	·· 05.0	261°00.5	3.9′	26°28.8	7.1′	59.8′
10	329°07.5	06.0	275°23.4	3.9′	26°35.9	6.9′	59.7′
11	344°07.7	06.9	289°46.3	3.8′	26°42.8	6.7′	59.7′
12	359°07.9	N05°07.9	304°09.1	3.8′	N26°49.5	6.6′	59.7′
13	14°08.1	08.9	318°31.9	3.8′	26°56.1	6.3′	59.6′
14	29°08.3	09.8	332°54.7	3.7′	27°02.4	6.2′	59.6′
15	44°08.4	·· 10.8	347°17.4	3.7′	27°08.6	5.9′	59.6′
16	59°08.6	11.7	1°40.1	3.7′	27°14.5	5.8′	59.5′
17	74°08.8	12.7	16°02.8	3.7′	27°20.3	5.6′	59.5′
18	89°09.0	N05°13.7	30°25.5	3.7′	N27°25.9	5.3′	59.5′
19	104°09.2	14.6	44°48.2	3.6′	27°31.2	5.2′	59.4′
20	119°09.4	15.6	59°10.8	3.6′	27°36.4	5.0′	59.4′
21	134°09.5	·· 16.5	73°33.4	3.6′	27°41.4	4.8′	59.4′
22	149°09.7	17.5	87°56.0	3.6′	27°46.2	4.6′	59.3′
23	164°09.9	18.5	102°18.6	3.6′	27°50.8	4.4′	59.3′
	SD = 16.0′	d = 1.0′	SD = 16.4′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°10.1	N05°19.4	116°41.2	3.6′	N27°55.2	4.1′	59.3′
1	194°10.3	20.4	131°03.8	3.6′	27°59.3	4.0′	59.2′
2	209°10.4	21.3	145°26.4	3.6′	28°03.3	3.8′	59.2′
3	224°10.6	·· 22.3	159°49.0	3.6′	28°07.1	3.7′	59.2′
4	239°10.8	23.2	174°11.6	3.6′	28°10.8	3.4′	59.1′
5	254°11.0	24.2	188°34.2	3.6′	28°14.2	3.2′	59.1′
6	269°11.2	N05°25.2	202°56.8	3.6′	N28°17.4	3.0′	59.1′
7	284°11.4	26.1	217°19.5	3.6′	28°20.4	2.8′	59.0′
8	299°11.5	27.1	231°42.1	3.7′	28°23.2	2.6′	59.0′
9	314°11.7	·· 28.0	246°04.8	3.7′	28°25.8	2.5′	58.9′
10	329°11.9	29.0	260°27.4	3.7′	28°28.3	2.2′	58.9′
11	344°12.1	29.9	274°50.1	3.7′	28°30.5	2.0′	58.9′
12	359°12.3	N05°30.9	289°12.8	3.7′	N28°32.5	1.9′	58.8′
13	14°12.5	31.8	303°35.6	3.8′	28°34.4	1.6′	58.8′
14	29°12.6	32.8	317°58.3	3.8′	28°36.0	1.5′	58.8′
15	44°12.8	·· 33.8	332°21.1	3.8′	28°37.5	1.2′	58.7′
16	59°13.0	34.7	346°44.0	3.9′	28°38.7	1.1′	58.7′
17	74°13.2	35.7	1°06.8	3.9′	28°39.8	0.9′	58.7′
18	89°13.4	N05°36.6	15°29.7	3.9′	N28°40.7	0.6′	58.6′
19	104°13.5	37.6	29°52.7	4.0′	28°41.3	0.5′	58.6′
20	119°13.7	38.5	44°15.7	4.0′	28°41.8	0.3′	58.6′
21	134°13.9	·· 39.5	58°38.7	4.1′	28°42.1	0.1′	58.5′
22	149°14.1	40.4	73°01.8	4.1′	28°42.2	0.1′	58.5′
23	164°14.3	41.4	87°24.9	4.2′	28°42.1	0.2′	58.5′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:22	03:34	04:50	19:20	20:38	23:00
N 70°	02:11	03:51	04:58	19:12	20:20	22:03
68°	02:41	04:04	05:04	19:05	20:05	21:31
66°	03:03	04:15	05:10	18:59	19:54	21:08
64°	03:20	04:24	05:14	18:55	19:45	20:50
62°	03:34	04:32	05:18	18:50	19:37	20:36
60°	03:45	04:39	05:22	18:47	19:30	20:24
N 58°	03:55	04:44	05:25	18:44	19:24	20:14
56°	04:03	04:49	05:28	18:41	19:19	20:06
54°	04:10	04:54	05:30	18:38	19:14	19:59
52°	04:16	04:58	05:32	18:36	19:10	19:52
50°	04:22	05:01	05:34	18:34	19:07	19:46
45°	04:34	05:09	05:39	18:29	18:59	19:34
N 40°	04:43	05:15	05:42	18:25	18:53	19:25
35°	04:50	05:20	05:45	18:22	18:48	19:18
30°	04:56	05:24	05:48	18:19	18:43	19:12
20°	05:05	05:31	05:53	18:15	18:37	19:03
N 10°	05:11	05:36	05:57	18:10	18:32	18:56
0°	05:15	05:39	06:00	18:07	18:27	18:52
S 10°	05:18	05:43	06:04	18:03	18:24	18:49
20°	05:20	05:45	06:07	17:59	18:21	18:47
30°	05:20	05:47	06:11	17:55	18:19	18:47
35°	05:19	05:48	06:14	17:53	18:18	18:47
40°	05:18	05:49	06:16	17:50	18:17	18:48
45°	05:16	05:50	06:19	17:47	18:16	18:50
S 50°	05:13	05:50	06:22	17:44	18:16	18:53
52°	05:11	05:50	06:24	17:42	18:16	18:55
54°	05:09	05:50	06:26	17:40	18:15	18:56
56°	05:07	05:50	06:28	17:38	18:15	18:58
58°	05:05	05:50	06:30	17:36	18:15	19:01
S 60°	05:02	05:50	06:32	17:34	18:15	19:03

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°						
N 70°						
68°	03:19			01:05		
66°	04:15			00:10		
64°	04:49	04:02		·· ··	02:30	
62°	05:13	05:04		·· ··	01:29	
60°	05:33	05:39	05:57	·· ··	00:55	02:47
N 58°	05:50	06:04	06:34	·· ··	00:30	02:11
56°	06:04	06:24	07:00	·· ··	00:10	01:44
54°	06:16	06:41	07:21	23:54	·· ··	01:23
52°	06:27	06:56	07:39	23:40	·· ··	01:06
50°	06:36	07:09	07:54	23:28	·· ··	00:51
45°	06:57	07:35	08:24	23:02	·· ··	00:21
N 40°	07:14	07:56	08:48	22:42	23:58	·· ··
35°	07:28	08:14	09:08	22:25	23:38	·· ··
30°	07:40	08:29	09:25	22:11	23:22	·· ··
20°	08:01	08:55	09:53	21:47	22:54	23:58
N 10°	08:20	09:17	10:18	21:26	22:30	23:33
0°	08:37	09:38	10:41	21:06	22:08	23:10
S 10°	08:55	09:59	11:03	20:47	21:46	22:47
20°	09:14	10:22	11:28	20:26	21:22	22:22
30°	09:36	10:49	11:57	20:02	20:54	21:53
35°	09:49	11:05	12:14	19:48	20:38	21:36
40°	10:04	11:23	12:34	19:32	20:19	21:16
45°	10:22	11:45	12:59	19:12	19:56	20:51
S 50°	10:45	12:14	13:30	18:49	19:27	20:20
52°	10:56	12:28	13:46	18:37	19:12	20:04
54°	11:08	12:44	14:05	18:24	18:56	19:45
56°	11:22	13:03	14:27	18:09	18:36	19:22
58°	11:39	13:28	14:56	17:52	18:12	18:53
S 60°	12:00	14:00	15:41	17:31	17:39	18:09

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 3-5 10-27%
01	03:55	03:46	12:04	14:52	02:22	
02	03:37	03:28	12:03	15:53	03:22	
03	03:20	03:11	12:03	16:55	04:24	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2074 sec ΔT = TT-UT1 = +68.9766 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	192°33.9	198°37.3	N04°37.2	75°32.0	N23°44.9	117°14.9	N22°27.1	196°31.4	S03°49.7
1	207°36.4	213°40.4	36.3	90°33.6	44.7	132°16.9	27.1	211°33.6	49.6
2	222°38.8	228°43.5	35.5	105°35.1	44.5	147°19.0	27.2	226°35.8	49.5
3	237°41.3	243°46.5	·· 34.7	120°36.7	·· 44.3	162°21.0	·· 27.2	241°37.9	·· 49.4
4	252°43.8	258°49.6	33.9	135°38.2	44.0	177°23.0	27.3	256°40.1	49.3
5	267°46.2	273°52.7	33.0	150°39.8	43.8	192°25.1	27.3	271°42.3	49.1
6	282°48.7	288°55.7	N04°32.2	165°41.3	N23°43.6	207°27.1	N22°27.3	286°44.5	S03°49.0
7	297°51.1	303°58.8	31.4	180°42.9	43.4	222°29.1	27.4	301°46.7	48.9
8	312°53.6	319°01.9	30.6	195°44.4	43.2	237°31.2	27.4	316°48.9	48.8
9	327°56.1	334°04.9	·· 29.7	210°46.0	·· 43.0	252°33.2	·· 27.5	331°51.1	·· 48.7
10	342°58.5	349°08.0	28.9	225°47.5	42.7	267°35.2	27.5	346°53.3	48.6
11	358°01.0	4°11.0	28.1	240°49.1	42.5	282°37.2	27.6	1°55.5	48.5
12	13°03.5	19°14.1	N04°27.3	255°50.6	N23°42.3	297°39.3	N22°27.6	16°57.7	S03°48.3
13	28°05.9	34°17.1	26.5	270°52.2	42.1	312°41.3	27.7	31°59.8	48.2
14	43°08.4	49°20.1	25.6	285°53.7	41.9	327°43.3	27.7	47°02.0	48.1
15	58°10.9	64°23.2	·· 24.8	300°55.3	·· 41.6	342°45.4	·· 27.8	62°04.2	·· 48.0
16	73°13.3	79°26.2	24.0	315°56.8	41.4	357°47.4	27.8	77°06.4	47.9
17	88°15.8	94°29.2	23.2	330°58.3	41.2	12°49.4	27.9	92°08.6	47.8
18	103°18.3	109°32.2	N04°22.4	345°59.9	N23°41.0	27°51.5	N22°27.9	107°10.8	S03°47.7
19	118°20.7	124°35.3	21.6	1°01.4	40.8	42°53.5	28.0	122°13.0	47.5
20	133°23.2	139°38.3	20.8	16°03.0	40.6	57°55.5	28.0	137°15.2	47.4
21	148°25.6	154°41.3	·· 20.0	31°04.5	·· 40.3	72°57.5	·· 28.0	152°17.4	·· 47.3
22	163°28.1	169°44.3	19.2	46°06.0	40.1	87°59.6	28.1	167°19.6	47.2
23	178°30.6	184°47.3	18.3	61°07.6	39.9	103°01.6	28.1	182°21.7	47.1
Mer.pass.	11:08	ν 3.1′	d -0.8′	m -4.40	ν 1.6′	d -0.2′	m 0.50	ν 2.0′	d 0.0′ m -2.09	ν 2.2′	d 0.1′ m 1.16

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	193°33.0	199°50.3	N04°17.5	76°09.1	N23°39.7	118°03.6	N22°28.2	197°23.9	S03°47.0
1	208°35.5	214°53.3	16.7	91°10.7	39.5	133°05.6	28.2	212°26.1	46.9
2	223°38.0	229°56.3	15.9	106°12.2	39.2	148°07.7	28.3	227°28.3	46.7
3	238°40.4	244°59.3	·· 15.1	121°13.7	·· 39.0	163°09.7	·· 28.3	242°30.5	·· 46.6
4	253°42.9	260°02.2	14.3	136°15.3	38.8	178°11.7	28.4	257°32.7	46.5
5	268°45.4	275°05.2	13.5	151°16.8	38.6	193°13.8	28.4	272°34.9	46.4
6	283°47.8	290°08.2	N04°12.7	166°18.3	N23°38.3	208°15.8	N22°28.5	287°37.1	S03°46.3
7	298°50.3	305°11.2	11.9	181°19.9	38.1	223°17.8	28.5	302°39.3	46.2
8	313°52.7	320°14.1	11.1	196°21.4	37.9	238°19.8	28.6	317°41.5	46.1
9	328°55.2	335°17.1	·· 10.3	211°22.9	·· 37.7	253°21.9	·· 28.6	332°43.6	·· 46.0
10	343°57.7	350°20.1	09.5	226°24.5	37.5	268°23.9	28.7	347°45.8	45.8
11	359°00.1	5°23.0	08.8	241°26.0	37.2	283°25.9	28.7	2°48.0	45.7
12	14°02.6	20°26.0	N04°08.0	256°27.5	N23°37.0	298°27.9	N22°28.7	17°50.2	S03°45.6
13	29°05.1	35°28.9	07.2	271°29.1	36.8	313°30.0	28.8	32°52.4	45.5
14	44°07.5	50°31.8	06.4	286°30.6	36.6	328°32.0	28.8	47°54.6	45.4
15	59°10.0	65°34.8	·· 05.6	301°32.1	·· 36.3	343°34.0	·· 28.9	62°56.8	·· 45.3
16	74°12.5	80°37.7	04.8	316°33.7	36.1	358°36.0	28.9	77°59.0	45.2
17	89°14.9	95°40.7	04.0	331°35.2	35.9	13°38.1	29.0	93°01.2	45.0
18	104°17.4	110°43.6	N04°03.2	346°36.7	N23°35.7	28°40.1	N22°29.0	108°03.4	S03°44.9
19	119°19.9	125°46.5	02.5	1°38.2	35.5	43°42.1	29.1	123°05.6	44.8
20	134°22.3	140°49.4	01.7	16°39.8	35.2	58°44.1	29.1	138°07.7	44.7
21	149°24.8	155°52.3	·· 00.9	31°41.3	·· 35.0	73°46.2	·· 29.2	153°09.9	·· 44.6
22	164°27.2	170°55.3	04°00.1	46°42.8	34.8	88°48.2	29.2	168°12.1	44.5
23	179°29.7	185°58.2	03°59.3	61°44.3	34.6	103°50.2	29.3	183°14.3	44.4
Mer.pass.	11:04	ν 3.0′	d -0.8′	m -4.45	ν 1.5′	d -0.2′	m 0.52	ν 2.0′	d 0.0′ m -2.09	ν 2.2′	d 0.1′ m 1.16

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	194°32.2	201°01.1	N03°58.6	76°45.9	N23°34.3	118°52.2	N22°29.3	198°16.5	S03°44.3
1	209°34.6	216°04.0	57.8	91°47.4	34.1	133°54.2	29.4	213°18.7	44.1
2	224°37.1	231°06.9	57.0	106°48.9	33.9	148°56.3	29.4	228°20.9	44.0
3	239°39.6	246°09.8	·· 56.2	121°50.4	·· 33.7	163°58.3	·· 29.4	243°23.1	·· 43.9
4	254°42.0	261°12.6	55.5	136°52.0	33.4	179°00.3	29.5	258°25.3	43.8
5	269°44.5	276°15.5	54.7	151°53.5	33.2	194°02.3	29.5	273°27.5	43.7
6	284°47.0	291°18.4	N03°53.9	166°55.0	N23°33.0	209°04.3	N22°29.6	288°29.7	S03°43.6
7	299°49.4	306°21.3	53.1	181°56.5	32.8	224°06.4	29.6	303°31.9	43.5
8	314°51.9	321°24.2	52.4	196°58.0	32.5	239°08.4	29.7	318°34.0	43.4
9	329°54.4	336°27.0	·· 51.6	211°59.6	·· 32.3	254°10.4	·· 29.7	333°36.2	·· 43.2
10	344°56.8	351°29.9	50.8	227°01.1	32.1	269°12.4	29.8	348°38.4	43.1
11	359°59.3	6°32.8	50.1	242°02.6	31.9	284°14.5	29.8	3°40.6	43.0
12	15°01.7	21°35.6	N03°49.3	257°04.1	N23°31.6	299°16.5	N22°29.9	18°42.8	S03°42.9
13	30°04.2	36°38.5	48.6	272°05.6	31.4	314°18.5	29.9	33°45.0	42.8
14	45°06.7	51°41.3	47.8	287°07.2	31.2	329°20.5	30.0	48°47.2	42.7
15	60°09.1	66°44.2	·· 47.0	302°08.7	·· 31.0	344°22.5	·· 30.0	63°49.4	·· 42.6
16	75°11.6	81°47.0	46.3	317°10.2	30.7	359°24.6	30.1	78°51.6	42.4
17	90°14.1	96°49.8	45.5	332°11.7	30.5	14°26.6	30.1	93°53.8	42.3
18	105°16.5	111°52.7	N03°44.8	347°13.2	N23°30.3	29°28.6	N22°30.1	108°56.0	S03°42.2
19	120°19.0	126°55.5	44.0	2°14.7	30.0	44°30.6	30.2	123°58.2	42.1
20	135°21.5	141°58.3	43.3	17°16.2	29.8	59°32.6	30.2	139°00.3	42.0
21	150°23.9	157°01.1	·· 42.5	32°17.8	·· 29.6	74°34.6	·· 30.3	154°02.5	·· 41.9
22	165°26.4	172°04.0	41.8	47°19.3	29.4	89°36.7	30.3	169°04.7	41.8
23	180°28.9	187°06.8	41.0	62°20.8	29.1	104°38.7	30.4	184°06.9	41.7
Mer.pass.	11:00	ν 2.9′	d -0.8′	m -4.49	ν 1.5′	d -0.2′	m 0.54	ν 2.0′	d 0.0′ m -2.08	ν 2.2′	d 0.1′ m 1.17

Stars	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.4	-42°10.2
Schedar	349°31.4	56°40.5
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.6
Hamal	327°51.3	23°34.8
Polaris	314°22.1	89°22.4
Acamar	315°12.0	-40°12.4
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.8	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.6
Canopus	263°52.4	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°58.0
Avior	234°14.5	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°37.8	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.4	14°25.7
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.4
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.1
Hadar	148°35.2	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.5	-60°56.4
Kochab	137°18.7	74°02.8
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.4	-26°29.3
Atria	107°09.2	-69°04.2
Sabik	102°02.4	-15°45.4
Shaula	96°10.0	-37°07.3
Rasalhague	95°58.3	12°32.3
Eltanin	90°41.9	51°28.7
Kaus Aust.	83°32.2	-34°22.3
Vega	80°33.0	38°48.1
Nunki	75°47.5	-26°15.9
Altair	61°59.8	8°55.9
Peacock	53°05.6	-56°39.1
Deneb	49°25.9	45°21.9
Enif	33°38.8	9°59.3
Al Na'ir	27°33.0	-46°50.3
Fomalhaut	15°14.6	-29°29.3
Scheat	13°45.3	28°13.0
Markab	13°30.0	15°20.3

Apr 04 Fri	SHA	Mer.pass
Venus	6°03.4	10:43
Mars	242°58.1	18:56
Jupiter	284°41.0	16:09
Saturn	3°57.5	10:52

Apr 05 Sat	SHA	Mer.pass
Venus	6°17.3	10:39
Mars	242°36.1	18:53
Jupiter	284°30.6	16:06
Saturn	3°50.9	10:49

Apr 06 Sun	SHA	Mer.pass
Venus	6°28.9	10:34
Mars	242°13.7	18:51
Jupiter	284°20.0	16:02
Saturn	3°44.3	10:45

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		179°14.4	N05°42.3	101°48.1	4.2′	N28°41.9	0.5′	58.4′
1		194°14.6	43.3	116°11.3	4.3′	28°41.4	0.7′	58.4′
2		209°14.8	44.3	130°34.6	4.3′	28°40.7	0.8′	58.3′
3		224°15.0	·· 45.2	144°57.9	4.4′	28°39.9	1.0′	58.3′
4		239°15.2	46.2	159°21.3	4.5′	28°38.9	1.2′	58.3′
5		254°15.4	47.1	173°44.8	4.5′	28°37.7	1.4′	58.2′
6		269°15.5	N05°48.1	188°08.4	4.6′	N28°36.3	1.6′	58.2′
7		284°15.7	49.0	202°32.0	4.7′	28°34.7	1.8′	58.2′
8		299°15.9	50.0	216°55.6	4.7′	28°32.9	1.9′	58.1′
9		314°16.1	·· 50.9	231°19.4	4.8′	28°31.0	2.1′	58.1′
10		329°16.3	51.9	245°43.2	4.9′	28°28.9	2.3′	58.1′
11		344°16.4	52.8	260°07.1	5.0′	28°26.6	2.5′	58.0′
12		359°16.6	N05°53.8	274°31.0	5.0′	N28°24.1	2.7′	58.0′
13		14°16.8	54.7	288°55.1	5.1′	28°21.4	2.8′	58.0′
14		29°17.0	55.7	303°19.2	5.2′	28°18.6	3.0′	57.9′
15		44°17.2	·· 56.6	317°43.4	5.3′	28°15.6	3.2′	57.9′
16		59°17.3	57.6	332°07.7	5.4′	28°12.4	3.3′	57.8′
17		74°17.5	58.5	346°32.1	5.5′	28°09.1	3.5′	57.8′
18		89°17.7	N05°59.5	0°56.6	5.6′	N28°05.6	3.7′	57.8′
19		104°17.9	06°00.4	15°21.1	5.6′	28°01.9	3.9′	57.7′
20		119°18.1	01.4	29°45.8	5.7′	27°58.0	4.0′	57.7′
21		134°18.2	·· 02.3	44°10.5	5.8′	27°54.0	4.2′	57.7′
22		149°18.4	03.3	58°35.3	5.9′	27°49.8	4.4′	57.6′
23		164°18.6	04.2	73°00.3	6.0′	27°45.4	4.5′	57.6′
		SD = 16.0′	d = 1.0′	SD = 15.9′				

Sat	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°18.8	N06°05.2	87°25.3	6.1′	N27°40.9	4.7′	57.6′
1		194°19.0	06.1	101°50.4	6.2′	27°36.2	4.8′	57.5′
2		209°19.1	07.1	116°15.6	6.3′	27°31.4	5.0′	57.5′
3		224°19.3	·· 08.0	130°40.9	6.4′	27°26.4	5.2′	57.5′
4		239°19.5	09.0	145°06.3	6.5′	27°21.2	5.3′	57.4′
5		254°19.7	09.9	159°31.9	6.6′	27°15.9	5.4′	57.4′
6		269°19.8	N06°10.9	173°57.5	6.7′	N27°10.5	5.7′	57.4′
7		284°20.0	11.8	188°23.2	6.8′	27°04.8	5.7′	57.3′
8		299°20.2	12.8	202°49.0	6.9′	26°59.1	6.0′	57.3′
9		314°20.4	·· 13.7	217°15.0	7.0′	26°53.1	6.0′	57.3′
10		329°20.6	14.7	231°41.0	7.2′	26°47.1	6.3′	57.2′
11		344°20.7	15.6	246°07.2	7.3′	26°40.8	6.3′	57.2′
12		359°20.9	N06°16.6	260°33.4	7.4′	N26°34.5	6.5′	57.2′
13		14°21.1	17.5	274°59.8	7.5′	26°28.0	6.7′	57.1′
14		29°21.3	18.5	289°26.3	7.6′	26°21.3	6.8′	57.1′
15		44°21.5	·· 19.4	303°52.9	7.7′	26°14.5	6.9′	57.1′
16		59°21.6	20.3	318°19.6	7.8′	26°07.6	7.1′	57.0′
17		74°21.8	21.3	332°46.4	7.9′	26°00.5	7.2′	57.0′
18		89°22.0	N06°22.2	347°13.3	8.0′	N25°53.3	7.4′	57.0′
19		104°22.2	23.2	1°40.4	8.1′	25°45.9	7.5′	56.9′
20		119°22.3	24.1	16°07.5	8.3′	25°38.4	7.6′	56.9′
21		134°22.5	·· 25.1	30°34.8	8.4′	25°30.8	7.7′	56.9′
22		149°22.7	26.0	45°02.1	8.5′	25°23.1	7.9′	56.8′
23		164°22.9	27.0	59°29.6	8.6′	25°15.2	8.0′	56.8′
		SD = 16.0′	d = 0.9′	SD = 15.7′				

Sun	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°23.1	N06°27.9	73°57.2	8.7′	N25°07.2	8.1′	56.8′
1		194°23.2	28.9	88°24.9	8.8′	24°59.1	8.3′	56.7′
2		209°23.4	29.8	102°52.8	8.9′	24°50.8	8.4′	56.7′
3		224°23.6	·· 30.7	117°20.7	9.1′	24°42.4	8.5′	56.7′
4		239°23.8	31.7	131°48.8	9.2′	24°33.9	8.6′	56.7′
5		254°23.9	32.6	146°17.0	9.3′	24°25.3	8.7′	56.6′
6		269°24.1	N06°33.6	160°45.2	9.4′	N24°16.6	8.9′	56.6′
7		284°24.3	34.5	175°13.7	9.5′	24°07.7	9.0′	56.6′
8		299°24.5	35.5	189°42.2	9.6′	23°58.7	9.1′	56.5′
9		314°24.7	·· 36.4	204°10.8	9.7′	23°49.6	9.2′	56.5′
10		329°24.8	37.3	218°39.5	9.9′	23°40.4	9.3′	56.5′
11		344°25.0	38.3	233°08.4	10.0′	23°31.1	9.4′	56.4′
12		359°25.2	N06°39.2	247°37.4	10.1′	N23°21.7	9.6′	56.4′
13		14°25.4	40.2	262°06.5	10.2′	23°12.1	9.6′	56.4′
14		29°25.5	41.1	276°35.7	10.3′	23°02.5	9.8′	56.4′
15		44°25.7	·· 42.1	291°05.0	10.4′	22°52.7	9.8′	56.3′
16		59°25.9	43.0	305°34.4	10.5′	22°42.9	10.0′	56.3′
17		74°26.1	43.9	320°03.9	10.6′	22°32.9	10.0′	56.3′
18		89°26.2	N06°44.9	334°33.6	10.8′	N22°22.9	10.2′	56.2′
19		104°26.4	45.8	349°03.3	10.9′	22°12.7	10.3′	56.2′
20		119°26.6	46.8	3°33.2	11.0′	22°02.4	10.3′	56.2′
21		134°26.8	·· 47.7	18°03.2	11.1′	21°52.1	10.5′	56.2′
22		149°26.9	48.6	32°33.2	11.2′	21°41.6	10.5′	56.1′
23		164°27.1	49.6	47°03.4	11.3′	21°31.1	10.7′	56.1′
		SD = 16.0′	d = 0.9′	SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	03:14	04:34	19:35	20:56	–:–
N 70°	01:43	03:34	04:43	19:25	20:35	22:31
68°	02:21	03:50	04:51	19:16	20:18	21:50
66°	02:47	04:03	04:58	19:09	20:05	21:23
64°	03:06	04:13	05:04	19:03	19:55	21:03
62°	03:21	04:22	05:08	18:58	19:46	20:47
60°	03:34	04:29	05:13	18:54	19:38	20:34
N 58°	03:45	04:36	05:16	18:50	19:31	20:23
56°	03:54	04:41	05:20	18:47	19:25	20:13
54°	04:02	04:46	05:23	18:44	19:20	20:05
52°	04:09	04:51	05:25	18:41	19:16	19:58
50°	04:15	04:55	05:28	18:38	19:12	19:52
45°	04:27	05:03	05:33	18:33	19:03	19:39
N 40°	04:37	05:10	05:37	18:28	18:56	19:29
35°	04:45	05:16	05:41	18:25	18:50	19:21
30°	04:52	05:20	05:44	18:21	18:45	19:14
20°	05:02	05:28	05:50	18:15	18:38	19:04
N 10°	05:09	05:34	05:55	18:10	18:32	18:56
0°	05:14	05:39	05:59	18:06	18:27	18:51
S 10°	05:18	05:43	06:04	18:01	18:23	18:47
20°	05:20	05:46	06:08	17:57	18:19	18:44
30°	05:21	05:49	06:13	17:52	18:16	18:43
35°	05:21	05:51	06:16	17:49	18:14	18:43
40°	05:21	05:52	06:19	17:45	18:13	18:44
45°	05:19	05:53	06:23	17:42	18:11	18:45
S 50°	05:17	05:55	06:27	17:37	18:10	18:47
52°	05:16	05:55	06:29	17:35	18:09	18:48
54°	05:15	05:56	06:31	17:33	18:08	18:49
56°	05:13	05:56	06:34	17:31	18:08	18:51
58°	05:11	05:57	06:36	17:28	18:07	18:52
S 60°	05:09	05:57	06:39	17:25	18:06	18:54

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°						
N 70°						
68°						
66°			07:42			07:11
64°			09:07			05:45
62°		07:38	09:44		05:20	05:07
60°	06:50	08:25	10:10	04:03	04:32	04:41
N 58°	07:31	08:56	10:30	03:23	04:01	04:20
56°	07:59	09:19	10:47	02:55	03:38	04:02
54°	08:21	09:37	11:01	02:33	03:19	03:47
52°	08:39	09:53	11:14	02:15	03:03	03:34
50°	08:54	10:07	11:25	01:59	02:49	03:23
45°	09:25	10:35	11:47	01:28	02:20	02:59
N 40°	09:49	10:56	12:05	01:04	01:58	02:40
35°	10:09	11:14	12:21	00:44	01:39	02:24
30°	10:26	11:30	12:34	00:27	01:23	02:10
20°	10:54	11:56	12:56	·· ··	00:56	01:46
N 10°	11:19	12:19	13:15	·· ··	00:32	01:25
0°	11:42	12:40	13:33	·· ··	00:10	01:06
S 10°	12:05	13:01	13:51	23:48	·· ··	00:46
20°	12:29	13:23	14:10	23:24	·· ··	00:25
30°	12:58	13:49	14:32	22:56	·· ··	00:01
35°	13:14	14:04	14:45	22:40	23:46	·· ··
40°	13:34	14:22	14:59	22:21	23:29	·· ··
45°	13:58	14:43	15:17	21:57	23:09	·· ··
S 50°	14:29	15:10	15:38	21:27	22:43	·· ··
52°	14:44	15:23	15:48	21:12	22:31	23:52
54°	15:02	15:37	15:59	20:54	22:16	23:42
56°	15:23	15:55	16:12	20:33	22:00	23:29
58°	15:50	16:15	16:27	20:06	21:39	23:15
S 60°	16:28	16:42	16:45	19:28	21:14	22:58

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 6-8 38-60%
04	03:02	02:54	12:03	17:56	05:26	
05	02:45	02:36	12:03	18:53	06:25	
06	02:28	02:19	12:02	19:45	07:20	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2082 sec ΔT = TT-UT1 = +68.9758 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	195°31.3	202°09.6	N03°40.3	77°22.3	N23°28.9	119°40.7	N22°30.4	199°09.1	S03°41.5
1	210°33.8	217°12.4	39.5	92°23.8	28.7	134°42.7	30.5	214°11.3	41.4
2	225°36.2	232°15.2	38.8	107°25.3	28.4	149°44.7	30.5	229°13.5	41.3
3	240°38.7	247°18.0	·· 38.1	122°26.8	·· 28.2	164°46.7	·· 30.6	244°15.7	·· 41.2
4	255°41.2	262°20.8	37.3	137°28.3	28.0	179°48.8	30.6	259°17.9	41.1
5	270°43.6	277°23.6	36.6	152°29.8	27.8	194°50.8	30.7	274°20.1	41.0
6	285°46.1	292°26.4	N03°35.8	167°31.4	N23°27.5	209°52.8	N22°30.7	289°22.3	S03°40.9
7	300°48.6	307°29.1	35.1	182°32.9	27.3	224°54.8	30.8	304°24.5	40.8
8	315°51.0	322°31.9	34.4	197°34.4	27.1	239°56.8	30.8	319°26.7	40.6
9	330°53.5	337°34.7	·· 33.6	212°35.9	·· 26.8	254°58.8	·· 30.8	334°28.8	·· 40.5
10	345°56.0	352°37.5	32.9	227°37.4	26.6	270°00.9	30.9	349°31.0	40.4
11	0°58.4	7°40.2	32.2	242°38.9	26.4	285°02.9	30.9	4°33.2	40.3
12	16°00.9	22°43.0	N03°31.4	257°40.4	N23°26.2	300°04.9	N22°31.0	19°35.4	S03°40.2
13	31°03.3	37°45.7	30.7	272°41.9	25.9	315°06.9	31.0	34°37.6	40.1
14	46°05.8	52°48.5	30.0	287°43.4	25.7	330°08.9	31.1	49°39.8	40.0
15	61°08.3	67°51.2	·· 29.3	302°44.9	·· 25.5	345°10.9	·· 31.1	64°42.0	·· 39.9
16	76°10.7	82°54.0	28.5	317°46.4	25.2	0°13.0	31.2	79°44.2	39.8
17	91°13.2	97°56.7	27.8	332°47.9	25.0	15°15.0	31.2	94°46.4	39.6
18	106°15.7	112°59.5	N03°27.1	347°49.4	N23°24.8	30°17.0	N22°31.3	109°48.6	S03°39.5
19	121°18.1	128°02.2	26.4	2°50.9	24.5	45°19.0	31.3	124°50.8	39.4
20	136°20.6	143°04.9	25.7	17°52.4	24.3	60°21.0	31.4	139°53.0	39.3
21	151°23.1	158°07.7	·· 24.9	32°53.9	·· 24.1	75°23.0	·· 31.4	154°55.2	·· 39.2
22	166°25.5	173°10.4	24.2	47°55.4	23.8	90°25.0	31.4	169°57.4	39.1
23	181°28.0	188°13.1	23.5	62°56.9	23.6	105°27.0	31.5	184°59.6	39.0
Mer.pass.	10:56	ν 2.8′	d -0.7′	m -4.53	ν 1.5′	d -0.2′	m 0.55	ν 2.0′	d 0.0′ m -2.08	ν 2.2′	d 0.1′ m 1.17

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	196°30.5	203°15.8	N03°22.8	77°58.4	N23°23.4	120°29.1	N22°31.5	200°01.7	S03°38.9
1	211°32.9	218°18.5	22.1	92°59.9	23.1	135°31.1	31.6	215°03.9	38.7
2	226°35.4	233°21.2	21.4	108°01.4	22.9	150°33.1	31.6	230°06.1	38.6
3	241°37.8	248°23.9	·· 20.7	123°02.9	·· 22.7	165°35.1	·· 31.7	245°08.3	·· 38.5
4	256°40.3	263°26.6	20.0	138°04.4	22.4	180°37.1	31.7	260°10.5	38.4
5	271°42.8	278°29.3	19.3	153°05.9	22.2	195°39.1	31.8	275°12.7	38.3
6	286°45.2	293°32.0	N03°18.6	168°07.4	N23°22.0	210°41.1	N22°31.8	290°14.9	S03°38.2
7	301°47.7	308°34.7	17.9	183°08.9	21.7	225°43.1	31.9	305°17.1	38.1
8	316°50.2	323°37.4	17.2	198°10.4	21.5	240°45.2	31.9	320°19.3	38.0
9	331°52.6	338°40.1	·· 16.5	213°11.9	·· 21.3	255°47.2	·· 32.0	335°21.5	·· 37.8
10	346°55.1	353°42.7	15.8	228°13.4	21.0	270°49.2	32.0	350°23.7	37.7
11	1°57.6	8°45.4	15.1	243°14.9	20.8	285°51.2	32.0	5°25.9	37.6
12	17°00.0	23°48.1	N03°14.4	258°16.4	N23°20.6	300°53.2	N22°32.1	20°28.1	S03°37.5
13	32°02.5	38°50.7	13.7	273°17.9	20.3	315°55.2	32.1	35°30.3	37.4
14	47°04.9	53°53.4	13.0	288°19.3	20.1	330°57.2	32.2	50°32.5	37.3
15	62°07.4	68°56.1	·· 12.3	303°20.8	·· 19.9	345°59.2	·· 32.2	65°34.7	·· 37.2
16	77°09.9	83°58.7	11.6	318°22.3	19.6	1°01.2	32.3	80°36.8	37.1
17	92°12.3	99°01.4	10.9	333°23.8	19.4	16°03.2	32.3	95°39.0	37.0
18	107°14.8	114°04.0	N03°10.2	348°25.3	N23°19.2	31°05.3	N22°32.4	110°41.2	S03°36.8
19	122°17.3	129°06.6	09.6	3°26.8	18.9	46°07.3	32.4	125°43.4	36.7
20	137°19.7	144°09.3	08.9	18°28.3	18.7	61°09.3	32.5	140°45.6	36.6
21	152°22.2	159°11.9	·· 08.2	33°29.8	·· 18.5	76°11.3	·· 32.5	155°47.8	·· 36.5
22	167°24.7	174°14.5	07.5	48°31.3	18.2	91°13.3	32.6	170°50.0	36.4
23	182°27.1	189°17.1	06.8	63°32.7	18.0	106°15.3	32.6	185°52.2	36.3
Mer.pass.	10:52	ν 2.7′	d -0.7′	m -4.56	ν 1.5′	d -0.2′	m 0.57	ν 2.0′	d 0.0′ m -2.07	ν 2.2′	d 0.1′ m 1.17

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	197°29.6	204°19.8	N03°06.2	78°34.2	N23°17.7	121°17.3	N22°32.7	200°54.4	S03°36.2
1	212°32.1	219°22.4	05.5	93°35.7	17.5	136°19.3	32.7	215°56.6	36.1
2	227°34.5	234°25.0	04.8	108°37.2	17.3	151°21.3	32.7	230°58.8	36.0
3	242°37.0	249°27.6	·· 04.1	123°38.7	·· 17.0	166°23.3	·· 32.8	246°01.0	·· 35.8
4	257°39.4	264°30.2	03.5	138°40.2	16.8	181°25.3	32.8	261°03.2	35.7
5	272°41.9	279°32.8	02.8	153°41.7	16.6	196°27.3	32.9	276°05.4	35.6
6	287°44.4	294°35.4	N03°02.1	168°43.1	N23°16.3	211°29.4	N22°32.9	291°07.6	S03°35.5
7	302°46.8	309°38.0	01.5	183°44.6	16.1	226°31.4	33.0	306°09.8	35.4
8	317°49.3	324°40.6	00.8	198°46.1	15.9	241°33.4	33.0	321°12.0	35.3
9	332°51.8	339°43.2	03°00.1	213°47.6	·· 15.6	256°35.4	·· 33.1	336°14.2	·· 35.2
10	347°54.2	354°45.7	02°59.5	228°49.1	15.4	271°37.4	33.1	351°16.3	35.1
11	2°56.7	9°48.3	58.8	243°50.6	15.1	286°39.4	33.2	6°18.5	35.0
12	17°59.2	24°50.9	N02°58.2	258°52.0	N23°14.9	301°41.4	N22°33.2	21°20.7	S03°34.8
13	33°01.6	39°53.5	57.5	273°53.5	14.7	316°43.4	33.3	36°22.9	34.7
14	48°04.1	54°56.0	56.9	288°55.0	14.4	331°45.4	33.3	51°25.1	34.6
15	63°06.6	69°58.6	·· 56.2	303°56.5	·· 14.2	346°47.4	·· 33.3	66°27.3	·· 34.5
16	78°09.0	85°01.1	55.5	318°58.0	13.9	1°49.4	33.4	81°29.5	34.4
17	93°11.5	100°03.7	54.9	333°59.4	13.7	16°51.4	33.4	96°31.7	34.3
18	108°13.9	115°06.2	N02°54.3	349°00.9	N23°13.5	31°53.4	N22°33.5	111°33.9	S03°34.2
19	123°16.4	130°08.8	53.6	4°02.4	13.2	46°55.4	33.5	126°36.1	34.1
20	138°18.9	145°11.3	53.0	19°03.9	13.0	61°57.4	33.6	141°38.3	34.0
21	153°21.3	160°13.9	·· 52.3	34°05.3	·· 12.7	76°59.4	·· 33.6	156°40.5	·· 33.8
22	168°23.8	175°16.4	51.7	49°06.8	12.5	92°01.4	33.7	171°42.7	33.7
23	183°26.3	190°18.9	51.0	64°08.3	12.3	107°03.4	33.7	186°44.9	33.6
Mer.pass.	10:48	ν 2.6′	d -0.7′	m -4.59	ν 1.5′	d -0.2′	m 0.59	ν 2.0′	d 0.0′ m -2.07	ν 2.2′	d 0.1′ m 1.17

Stars	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.2
Schedar	349°31.4	56°40.5
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.6
Hamal	327°51.3	23°34.8
Polaris	314°22.8	89°22.4
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.8	-8°10.5
Capella	280°21.8	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.4	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.7	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°58.0
Avior	234°14.5	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°37.9	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.4	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.4
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.1
Hadar	148°35.2	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.5	-60°56.4
Kochab	137°18.7	74°02.9
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.4	-26°29.3
Atria	107°09.1	-69°04.2
Sabik	102°02.4	-15°45.4
Shaula	96°09.9	-37°07.3
Rasalhague	95°58.2	12°32.3
Eltanin	90°41.9	51°28.7
Kaus Aust.	83°32.2	-34°22.3
Vega	80°33.0	38°48.1
Nunki	75°47.5	-26°15.9
Altair	61°59.8	8°55.9
Peacock	53°05.6	-56°39.0
Deneb	49°25.9	45°21.9
Enif	33°38.8	9°59.3
Al Na'ir	27°33.0	-46°50.2
Fomalhaut	15°14.6	-29°29.3
Scheat	13°45.3	28°13.0
Markab	13°30.0	15°20.3

Apr 07 Mon	SHA	Mer.pass
Venus	6°38.3	10:29
Mars	241°51.0	18:49
Jupiter	284°09.4	15:59
Saturn	3°37.8	10:42

Apr 08 Tue	SHA	Mer.pass
Venus	6°45.4	10:25
Mars	241°28.0	18:46
Jupiter	283°58.6	15:56
Saturn	3°31.3	10:38

Apr 09 Wed	SHA	Mer.pass
Venus	6°50.2	10:21
Mars	241°04.6	18:44
Jupiter	283°47.7	15:53
Saturn	3°24.8	10:35

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	Sun			Moon				
h Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	179°27.3	N06°50.5		61°33.7	11.4′	N21°20.4	10.7′	56.1′
1	194°27.5	51.5		76°04.1	11.5′	21°09.7	10.8′	56.0′
2	209°27.6	52.4		90°34.7	11.6′	20°58.9	10.9′	56.0′
3	224°27.8	·· 53.3		105°05.3	11.7′	20°48.0	11.0′	56.0′
4	239°28.0	54.3		119°36.0	11.8′	20°37.0	11.1′	56.0′
5	254°28.2	55.2		134°06.8	11.9′	20°25.9	11.2′	55.9′
6	269°28.3	N06°56.2		148°37.8	12.0′	N20°14.7	11.2′	55.9′
7	284°28.5	57.1		163°08.8	12.1′	20°03.5	11.4′	55.9′
8	299°28.7	58.0		177°39.9	12.2′	19°52.1	11.4′	55.9′
9	314°28.9	·· 59.0		192°11.2	12.3′	19°40.7	11.5′	55.8′
10	329°29.0	06°59.9		206°42.5	12.4′	19°29.2	11.5′	55.8′
11	344°29.2	07°00.9		221°14.0	12.5′	19°17.7	11.7′	55.8′
12	359°29.4	N07°01.8		235°45.5	12.6′	N19°06.0	11.7′	55.8′
13	14°29.6	02.7		250°17.2	12.7′	18°54.3	11.8′	55.7′
14	29°29.7	03.7		264°48.9	12.8′	18°42.5	11.9′	55.7′
15	44°29.9	·· 04.6		279°20.7	12.9′	18°30.6	12.0′	55.7′
16	59°30.1	05.5		293°52.7	13.0′	18°18.6	12.0′	55.7′
17	74°30.3	06.5		308°24.7	13.1′	18°06.6	12.1′	55.6′
18	89°30.4	N07°07.4		322°56.8	13.2′	N17°54.5	12.1′	55.6′
19	104°30.6	08.3		337°29.0	13.3′	17°42.4	12.3′	55.6′
20	119°30.8	09.3		352°01.3	13.4′	17°30.1	12.2′	55.6′
21	134°31.0	·· 10.2		6°33.7	13.5′	17°17.9	12.4′	55.5′
22	149°31.1	11.2		21°06.2	13.6′	17°05.5	12.4′	55.5′
23	164°31.3	12.1		35°38.8	13.7′	16°53.1	12.5′	55.5′
	SD = 16.0′	d = 0.9′		SD = 15.3′				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	179°31.5	N07°13.0		50°11.4	13.8′	N16°40.6	12.5′	55.5′
1	194°31.7	14.0		64°44.2	13.8′	16°28.1	12.6′	55.4′
2	209°31.8	14.9		79°17.0	13.9′	16°15.5	12.7′	55.4′
3	224°32.0	·· 15.8		93°50.0	14.0′	16°02.8	12.7′	55.4′
4	239°32.2	16.8		108°23.0	14.1′	15°50.1	12.8′	55.4′
5	254°32.3	17.7		122°56.0	14.2′	15°37.3	12.8′	55.4′
6	269°32.5	N07°18.6		137°29.2	14.3′	N15°24.5	12.9′	55.3′
7	284°32.7	19.6		152°02.5	14.3′	15°11.6	13.0′	55.3′
8	299°32.9	20.5		166°35.8	14.4′	14°58.6	13.0′	55.3′
9	314°33.0	·· 21.4		181°09.2	14.5′	14°45.6	13.0′	55.3′
10	329°33.2	22.4		195°42.7	14.6′	14°32.6	13.1′	55.2′
11	344°33.4	23.3		210°16.3	14.6′	14°19.5	13.1′	55.2′
12	359°33.6	N07°24.2		224°49.9	14.7′	N14°06.4	13.2′	55.2′
13	14°33.7	25.2		239°23.6	14.8′	13°53.2	13.3′	55.2′
14	29°33.9	26.1		253°57.4	14.9′	13°39.9	13.3′	55.2′
15	44°34.1	·· 27.0		268°31.3	14.9′	13°26.6	13.3′	55.1′
16	59°34.2	27.9		283°05.2	15.0′	13°13.3	13.4′	55.1′
17	74°34.4	28.9		297°39.2	15.1′	12°59.9	13.4′	55.1′
18	89°34.6	N07°29.8		312°13.3	15.1′	N12°46.5	13.4′	55.1′
19	104°34.8	30.7		326°47.4	15.2′	12°33.1	13.5′	55.1′
20	119°34.9	31.7		341°21.6	15.3′	12°19.6	13.6′	55.0′
21	134°35.1	·· 32.6		355°55.9	15.3′	12°06.0	13.6′	55.0′
22	149°35.3	33.5		10°30.2	15.4′	11°52.4	13.6′	55.0′
23	164°35.4	34.5		25°04.6	15.5′	11°38.8	13.6′	55.0′
	SD = 16.0′	d = 0.9′		SD = 15.1′				

Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	179°35.6	N07°35.4		39°39.1	15.5′	N11°25.2	13.7′	55.0′
1	194°35.8	36.3		54°13.6	15.6′	11°11.5	13.7′	55.0′
2	209°36.0	37.3		68°48.2	15.6′	10°57.8	13.8′	54.9′
3	224°36.1	·· 38.2		83°22.9	15.7′	10°44.0	13.8′	54.9′
4	239°36.3	39.1		97°57.6	15.8′	10°30.2	13.8′	54.9′
5	254°36.5	40.0		112°32.3	15.8′	10°16.4	13.9′	54.9′
6	269°36.6	N07°41.0		127°07.1	15.9′	N10°02.5	13.9′	54.9′
7	284°36.8	41.9		141°42.0	15.9′	09°48.6	13.9′	54.8′
8	299°37.0	42.8		156°16.9	16.0′	09°34.7	13.9′	54.8′
9	314°37.1	·· 43.7		170°51.9	16.0′	09°20.8	14.0′	54.8′
10	329°37.3	44.7		185°26.9	16.1′	09°06.8	14.0′	54.8′
11	344°37.5	45.6		200°02.0	16.1′	08°52.8	14.0′	54.8′
12	359°37.7	N07°46.5		214°37.1	16.2′	N08°38.8	14.1′	54.8′
13	14°37.8	47.5		229°12.3	16.2′	08°24.7	14.0′	54.7′
14	29°38.0	48.4		243°47.5	16.3′	08°10.7	14.1′	54.7′
15	44°38.2	·· 49.3		258°22.8	16.3′	07°56.6	14.1′	54.7′
16	59°38.3	50.2		272°58.1	16.4′	07°42.5	14.2′	54.7′
17	74°38.5	51.2		287°33.5	16.4′	07°28.3	14.1′	54.7′
18	89°38.7	N07°52.1		302°08.9	16.4′	N07°14.2	14.2′	54.7′
19	104°38.8	53.0		316°44.3	16.5′	07°00.0	14.2′	54.6′
20	119°39.0	53.9		331°19.8	16.5′	06°45.8	14.2′	54.6′
21	134°39.2	·· 54.9		345°55.3	16.6′	06°31.6	14.3′	54.6′
22	149°39.3	55.8		0°30.9	16.6′	06°17.3	14.2′	54.6′
23	164°39.5	56.7		15°06.4	16.6′	06°03.1	14.3′	54.6′
	SD = 16.0′	d = 0.9′		SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:53	04:17	19:50	21:16	–:–
N 70°	01:06	03:17	04:29	19:37	20:51	23:14
68°	01:58	03:35	04:39	19:27	20:32	22:12
66°	02:29	03:50	04:46	19:19	20:17	21:39
64°	02:51	04:01	04:53	19:12	20:05	21:16
62°	03:09	04:11	04:59	19:07	19:55	20:58
60°	03:23	04:19	05:04	19:01	19:46	20:43
N 58°	03:34	04:27	05:08	18:57	19:39	20:31
56°	03:45	04:33	05:12	18:53	19:32	20:21
54°	03:53	04:39	05:15	18:49	19:26	20:12
52°	04:01	04:44	05:19	18:46	19:21	20:04
50°	04:08	04:48	05:21	18:43	19:17	19:57
45°	04:21	04:58	05:28	18:37	19:07	19:43
N 40°	04:32	05:05	05:33	18:31	18:59	19:32
35°	04:41	05:11	05:37	18:27	18:53	19:23
30°	04:48	05:17	05:41	18:23	18:47	19:16
20°	04:59	05:25	05:48	18:16	18:39	19:05
N 10°	05:07	05:32	05:53	18:10	18:32	18:56
0°	05:13	05:38	05:58	18:05	18:26	18:50
S 10°	05:18	05:42	06:04	18:00	18:21	18:45
20°	05:21	05:47	06:09	17:54	18:16	18:42
30°	05:23	05:51	06:15	17:48	18:12	18:40
35°	05:24	05:53	06:18	17:45	18:10	18:39
40°	05:24	05:55	06:22	17:41	18:08	18:39
45°	05:23	05:57	06:27	17:36	18:06	18:40
S 50°	05:22	05:59	06:32	17:31	18:03	18:41
52°	05:21	06:00	06:34	17:28	18:02	18:41
54°	05:20	06:01	06:37	17:26	18:01	18:42
56°	05:19	06:02	06:40	17:23	18:00	18:43
58°	05:18	06:03	06:43	17:20	17:59	18:44
S 60°	05:16	06:04	06:46	17:16	17:58	18:46

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▭	11:38	14:01	▭	06:37	05:43
N 70°	09:01	12:08	14:14	07:38	06:05	05:27
68°	10:12	12:31	14:24	06:25	05:41	05:15
66°	10:49	12:48	14:33	05:47	05:22	05:05
64°	11:14	13:02	14:40	05:21	05:07	04:56
62°	11:34	13:13	14:46	05:00	04:54	04:49
60°	11:50	13:23	14:51	04:43	04:43	04:42
N 58°	12:04	13:32	14:55	04:29	04:34	04:36
56°	12:15	13:39	14:59	04:16	04:25	04:31
54°	12:25	13:46	15:03	04:05	04:18	04:27
52°	12:34	13:52	15:06	03:56	04:11	04:23
50°	12:42	13:57	15:09	03:47	04:05	04:19
45°	12:59	14:09	15:16	03:29	03:52	04:10
N 40°	13:13	14:18	15:21	03:14	03:41	04:03
35°	13:25	14:27	15:26	03:01	03:31	03:57
30°	13:35	14:34	15:30	02:49	03:23	03:52
20°	13:53	14:46	15:36	02:30	03:08	03:43
N 10°	14:08	14:57	15:43	02:13	02:56	03:35
0°	14:22	15:07	15:48	01:57	02:44	03:27
S 10°	14:36	15:16	15:54	01:41	02:32	03:19
20°	14:51	15:27	16:00	01:24	02:19	03:11
30°	15:08	15:39	16:07	01:04	02:04	03:01
35°	15:18	15:46	16:11	00:52	01:55	02:55
40°	15:29	15:54	16:15	00:38	01:45	02:49
45°	15:42	16:03	16:20	00:22	01:33	02:41
S 50°	15:58	16:13	16:26	00:02	01:19	02:32
52°	16:06	16:19	16:29	·· ··	01:12	02:28
54°	16:14	16:24	16:32	·· ··	01:04	02:23
56°	16:23	16:30	16:35	·· ··	00:56	02:18
58°	16:33	16:37	16:39	·· ··	00:46	02:12
S 60°	16:45	16:45	16:43	·· ··	00:35	02:06

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 9-11 69-86%
07	02:11	02:02	12:02	20:33	08:10	
08	01:54	01:46	12:02	21:17	08:55	
09	01:38	01:29	12:01	21:58	09:38	

No IERS EOP prediction data available

April 10, 11, 12 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.2089 sec ΔT = TT-UT1 = +68.9751 sec

2025 April 10 to Apr. 12 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	198°28.7	205°21.4	N02°50.4	79°09.8	N23°12.0	122°05.4	N22°33.8	201°47.1	S03°33.5
1	213°31.2	220°24.0	49.8	94°11.2	11.8	137°07.4	33.8	216°49.3	33.4
2	228°33.7	235°26.5	49.1	109°12.7	11.5	152°09.4	33.9	231°51.5	33.3
3	243°36.1	250°29.0	·· 48.5	124°14.2	·· 11.3	167°11.5	·· 33.9	246°53.7	·· 33.2
4	258°38.6	265°31.5	47.9	139°15.7	11.1	182°13.5	33.9	261°55.9	33.1
5	273°41.0	280°34.0	47.2	154°17.1	10.8	197°15.5	34.0	276°58.1	33.0
6	288°43.5	295°36.5	N02°46.6	169°18.6	N23°10.6	212°17.5	N22°34.0	292°00.3	S03°32.8
7	303°46.0	310°39.0	46.0	184°20.1	10.3	227°19.5	34.1	307°02.5	32.7
8	318°48.4	325°41.5	45.3	199°21.5	10.1	242°21.5	34.1	322°04.7	32.6
9	333°50.9	340°44.0	·· 44.7	214°23.0	·· 09.9	257°23.5	·· 34.2	337°06.8	·· 32.5
10	348°53.4	355°46.5	44.1	229°24.5	09.6	272°25.5	34.2	352°09.0	32.4
11	3°55.8	10°49.0	43.5	244°26.0	09.4	287°27.5	34.3	7°11.2	32.3
12	18°58.3	25°51.4	N02°42.9	259°27.4	N23°09.1	302°29.5	N22°34.3	22°13.4	S03°32.2
13	34°00.8	40°53.9	42.2	274°28.9	08.9	317°31.5	34.4	37°15.6	32.1
14	49°03.2	55°56.4	41.6	289°30.4	08.6	332°33.5	34.4	52°17.8	32.0
15	64°05.7	70°58.8	·· 41.0	304°31.8	·· 08.4	347°35.5	·· 34.4	67°20.0	·· 31.9
16	79°08.2	86°01.3	40.4	319°33.3	08.2	2°37.5	34.5	82°22.2	31.7
17	94°10.6	101°03.8	39.8	334°34.8	07.9	17°39.5	34.5	97°24.4	31.6
18	109°13.1	116°06.2	N02°39.2	349°36.2	N23°07.7	32°41.5	N22°34.6	112°26.6	S03°31.5
19	124°15.5	131°08.7	38.6	4°37.7	07.4	47°43.5	34.6	127°28.8	31.4
20	139°18.0	146°11.1	38.0	19°39.2	07.2	62°45.5	34.7	142°31.0	31.3
21	154°20.5	161°13.6	·· 37.4	34°40.6	·· 06.9	77°47.5	·· 34.7	157°33.2	·· 31.2
22	169°22.9	176°16.0	36.8	49°42.1	06.7	92°49.5	34.8	172°35.4	31.1
23	184°25.4	191°18.4	36.2	64°43.6	06.5	107°51.5	34.8	187°37.6	31.0
Mer.pass.	10:44	ν 2.5′	d -0.6′	m -4.62	ν 1.5′	d -0.2′	m 0.61	ν 2.0′	d 0.0′ m -2.06	ν 2.2′	d 0.1′ m 1.17

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	199°27.9	206°20.9	N02°35.6	79°45.0	N23°06.2	122°53.5	N22°34.9	202°39.8	S03°30.9
1	214°30.3	221°23.3	35.0	94°46.5	06.0	137°55.5	34.9	217°42.0	30.7
2	229°32.8	236°25.7	34.4	109°47.9	05.7	152°57.5	35.0	232°44.2	30.6
3	244°35.3	251°28.1	·· 33.8	124°49.4	·· 05.5	167°59.5	·· 35.0	247°46.4	·· 30.5
4	259°37.7	266°30.5	33.2	139°50.9	05.2	183°01.5	35.0	262°48.6	30.4
5	274°40.2	281°33.0	32.6	154°52.3	05.0	198°03.5	35.1	277°50.8	30.3
6	289°42.6	296°35.4	N02°32.0	169°53.8	N23°04.7	213°05.5	N22°35.1	292°53.0	S03°30.2
7	304°45.1	311°37.8	31.4	184°55.2	04.5	228°07.5	35.2	307°55.2	30.1
8	319°47.6	326°40.2	30.8	199°56.7	04.2	243°09.4	35.2	322°57.4	30.0
9	334°50.0	341°42.6	·· 30.2	214°58.2	·· 04.0	258°11.4	·· 35.3	337°59.6	·· 29.9
10	349°52.5	356°45.0	29.7	229°59.6	03.8	273°13.4	35.3	353°01.8	29.8
11	4°55.0	11°47.3	29.1	245°01.1	03.5	288°15.4	35.4	8°04.0	29.6
12	19°57.4	26°49.7	N02°28.5	260°02.5	N23°03.3	303°17.4	N22°35.4	23°06.2	S03°29.5
13	34°59.9	41°52.1	27.9	275°04.0	03.0	318°19.4	35.5	38°08.4	29.4
14	50°02.4	56°54.5	27.4	290°05.5	02.8	333°21.4	35.5	53°10.6	29.3
15	65°04.8	71°56.9	·· 26.8	305°06.9	·· 02.5	348°23.4	·· 35.5	68°12.8	·· 29.2
16	80°07.3	86°59.2	26.2	320°08.4	02.3	3°25.4	35.6	83°15.0	29.1
17	95°09.8	102°01.6	25.6	335°09.8	02.0	18°27.4	35.6	98°17.2	29.0
18	110°12.2	117°04.0	N02°25.1	350°11.3	N23°01.8	33°29.4	N22°35.7	113°19.3	S03°28.9
19	125°14.7	132°06.3	24.5	5°12.7	01.5	48°31.4	35.7	128°21.5	28.8
20	140°17.1	147°08.7	23.9	20°14.2	01.3	63°33.4	35.8	143°23.7	28.7
21	155°19.6	162°11.0	·· 23.4	35°15.6	·· 01.0	78°35.4	·· 35.8	158°25.9	·· 28.6
22	170°22.1	177°13.4	22.8	50°17.1	00.8	93°37.4	35.9	173°28.1	28.4
23	185°24.5	192°15.7	22.2	65°18.5	00.5	108°39.4	35.9	188°30.3	28.3
Mer.pass.	10:40	ν 2.4′	d -0.6′	m -4.65	ν 1.5′	d -0.2′	m 0.63	ν 2.0′	d 0.0′ m -2.06	ν 2.2′	d 0.1′ m 1.17

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	200°27.0	207°18.0	N02°21.7	80°20.0	N23°00.3	123°41.4	N22°36.0	203°32.5	S03°28.2
1	215°29.5	222°20.4	21.1	95°21.4	23°00.0	138°43.4	36.0	218°34.7	28.1
2	230°31.9	237°22.7	20.6	110°22.9	22°59.8	153°45.4	36.1	233°36.9	28.0
3	245°34.4	252°25.0	·· 20.0	125°24.4	·· 59.5	168°47.4	·· 36.1	248°39.1	·· 27.9
4	260°36.9	267°27.4	19.5	140°25.8	59.3	183°49.4	36.1	263°41.3	27.8
5	275°39.3	282°29.7	18.9	155°27.3	59.0	198°51.3	36.2	278°43.5	27.7
6	290°41.8	297°32.0	N02°18.4	170°28.7	N22°58.8	213°53.3	N22°36.2	293°45.7	S03°27.6
7	305°44.2	312°34.3	17.8	185°30.1	58.5	228°55.3	36.3	308°47.9	27.5
8	320°46.7	327°36.6	17.3	200°31.6	58.3	243°57.3	36.3	323°50.1	27.3
9	335°49.2	342°38.9	·· 16.7	215°33.0	·· 58.0	258°59.3	·· 36.4	338°52.3	·· 27.2
10	350°51.6	357°41.2	16.2	230°34.5	57.8	274°01.3	36.4	353°54.5	27.1
11	5°54.1	12°43.5	15.7	245°35.9	57.5	289°03.3	36.5	8°56.7	27.0
12	20°56.6	27°45.8	N02°15.1	260°37.4	N22°57.3	304°05.3	N22°36.5	23°58.9	S03°26.9
13	35°59.0	42°48.1	14.6	275°38.8	57.0	319°07.3	36.6	39°01.1	26.8
14	51°01.5	57°50.4	14.0	290°40.3	56.8	334°09.3	36.6	54°03.3	26.7
15	66°04.0	72°52.7	·· 13.5	305°41.7	·· 56.5	349°11.3	·· 36.6	69°05.5	·· 26.6
16	81°06.4	87°54.9	13.0	320°43.2	56.3	4°13.3	36.7	84°07.7	26.5
17	96°08.9	102°57.2	12.5	335°44.6	56.0	19°15.3	36.7	99°09.9	26.4
18	111°11.4	117°59.5	N02°11.9	350°46.1	N22°55.8	34°17.2	N22°36.8	114°12.1	S03°26.3
19	126°13.8	133°01.8	11.4	5°47.5	55.5	49°19.2	36.8	129°14.3	26.1
20	141°16.3	148°04.0	10.9	20°48.9	55.3	64°21.2	36.9	144°16.5	26.0
21	156°18.7	163°06.3	·· 10.4	35°50.4	·· 55.0	79°23.2	·· 36.9	159°18.7	·· 25.9
22	171°21.2	178°08.5	09.8	50°51.8	54.8	94°25.2	37.0	174°20.9	25.8
23	186°23.7	193°10.8	09.3	65°53.3	54.5	109°27.2	37.0	189°23.1	25.7
Mer.pass.	10:36	ν 2.3′	d -0.6′	m -4.67	ν 1.5′	d -0.2′	m 0.64	ν 2.0′	d 0.0′ m -2.05	ν 2.2′	d 0.1′ m 1.17

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.1
Schedar	349°31.4	56°40.4
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.6
Hamal	327°51.3	23°34.8
Polaris	314°23.5	89°22.4
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.5
Capella	280°21.9	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.5	-52°42.8
Sirius	258°26.1	-16°45.2
Adhara	255°05.8	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.0	27°58.0
Avior	234°14.6	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°37.9	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.4
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.1
Hadar	148°35.1	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.4
Kochab	137°18.6	74°02.9
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.4	-26°29.3
Atria	107°09.1	-69°04.2
Sabik	102°02.4	-15°45.4
Shaula	96°09.9	-37°07.3
Rasalhague	95°58.2	12°32.3
Eltanin	90°41.9	51°28.7
Kaus Aust.	83°32.1	-34°22.3
Vega	80°33.0	38°48.1
Nunki	75°47.5	-26°15.9
Altair	61°59.8	8°55.9
Peacock	53°05.5	-56°39.0
Deneb	49°25.8	45°21.9
Enif	33°38.8	9°59.3
Al Na'ir	27°32.9	-46°50.2
Fomalhaut	15°14.6	-29°29.3
Scheat	13°45.3	28°13.0
Markab	13°30.0	15°20.3

Apr 10 Thu	SHA	Mer.pass
Venus	6°52.7	10:17
Mars	240°41.0	18:42
Jupiter	283°36.7	15:50
Saturn	3°18.4	10:31

Apr 11 Fri	SHA	Mer.pass
Venus	6°53.0	10:13
Mars	240°17.2	18:39
Jupiter	283°25.6	15:46
Saturn	3°11.9	10:28

Apr 12 Sat	SHA	Mer.pass
Venus	6°51.0	10:09
Mars	239°53.0	18:37
Jupiter	283°14.4	15:43
Saturn	3°05.5	10:24

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.7	N07°57.6	29°42.1	16.7′	N05°48.8	14.3′	54.6′
1	194°39.9	58.6	44°17.7	16.7′	05°34.5	14.2′	54.6′
2	209°40.0	07°59.5	58°53.4	16.7′	05°20.3	14.4′	54.5′
3	224°40.2	08°00.4	73°29.2	16.8′	05°05.9	14.3′	54.5′
4	239°40.4	01.3	88°04.9	16.8′	04°51.6	14.3′	54.5′
5	254°40.5	02.2	102°40.7	16.8′	04°37.3	14.3′	54.5′
6	269°40.7	N08°03.2	117°16.5	16.8′	N04°23.0	14.4′	54.5′
7	284°40.9	04.1	131°52.4	16.9′	04°08.6	14.3′	54.5′
8	299°41.0	05.0	146°28.3	16.9′	03°54.3	14.4′	54.5′
9	314°41.2	·· 05.9	161°04.2	16.9′	03°39.9	14.4′	54.5′
10	329°41.4	06.9	175°40.1	17.0′	03°25.5	14.4′	54.4′
11	344°41.5	07.8	190°16.0	17.0′	03°11.1	14.3′	54.4′
12	359°41.7	N08°08.7	204°52.0	17.0′	N02°56.8	14.4′	54.4′
13	14°41.9	09.6	219°28.0	17.0′	02°42.4	14.4′	54.4′
14	29°42.0	10.5	234°04.0	17.0′	02°28.0	14.4′	54.4′
15	44°42.2	·· 11.5	248°40.1	17.1′	02°13.6	14.4′	54.4′
16	59°42.4	12.4	263°16.1	17.1′	01°59.2	14.4′	54.4′
17	74°42.5	13.3	277°52.2	17.1′	01°44.8	14.4′	54.4′
18	89°42.7	N08°14.2	292°28.3	17.1′	N01°30.4	14.4′	54.3′
19	104°42.9	15.1	307°04.4	17.1′	01°16.0	14.4′	54.3′
20	119°43.0	16.1	321°40.5	17.1′	01°01.6	14.4′	54.3′
21	134°43.2	·· 17.0	336°16.6	17.1′	00°47.2	14.4′	54.3′
22	149°43.4	17.9	350°52.8	17.2′	00°32.8	14.4′	54.3′
23	164°43.5	18.8	5°28.9	17.2′	00°18.4	14.4′	54.3′
	SD = 16.0′	d = 0.9′	SD = 14.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.7	N08°19.7	20°05.1	17.2′	N00°04.0	14.4′	54.3′
1	194°43.9	20.7	34°41.2	17.2′	S00°10.4	14.4′	54.3′
2	209°44.0	21.6	49°17.4	17.2′	00°24.8	14.3′	54.3′
3	224°44.2	·· 22.5	63°53.6	17.2′	00°39.1	14.4′	54.2′
4	239°44.4	23.4	78°29.8	17.2′	00°53.5	14.3′	54.2′
5	254°44.5	24.3	93°06.0	17.2′	01°07.8	14.4′	54.2′
6	269°44.7	N08°25.2	107°42.2	17.2′	S01°22.2	14.3′	54.2′
7	284°44.8	26.2	122°18.4	17.2′	01°36.5	14.4′	54.2′
8	299°45.0	27.1	136°54.6	17.2′	01°50.9	14.3′	54.2′
9	314°45.2	·· 28.0	151°30.8	17.2′	02°05.2	14.3′	54.2′
10	329°45.3	28.9	166°07.0	17.2′	02°19.5	14.3′	54.2′
11	344°45.5	29.8	180°43.2	17.2′	02°33.8	14.3′	54.2′
12	359°45.7	N08°30.7	195°19.4	17.2′	S02°48.1	14.2′	54.2′
13	14°45.8	31.7	209°55.6	17.2′	03°02.3	14.3′	54.2′
14	29°46.0	32.6	224°31.8	17.2′	03°16.6	14.2′	54.1′
15	44°46.2	·· 33.5	239°08.0	17.2′	03°30.8	14.2′	54.1′
16	59°46.3	34.4	253°44.2	17.2′	03°45.0	14.3′	54.1′
17	74°46.5	35.3	268°20.3	17.2′	03°59.3	14.1′	54.1′
18	89°46.6	N08°36.2	282°56.5	17.2′	S04°13.4	14.2′	54.1′
19	104°46.8	37.1	297°32.6	17.1′	04°27.6	14.2′	54.1′
20	119°47.0	38.1	312°08.8	17.1′	04°41.8	14.1′	54.1′
21	134°47.1	·· 39.0	326°44.9	17.1′	04°55.9	14.1′	54.1′
22	149°47.3	39.9	341°21.0	17.1′	05°10.0	14.1′	54.1′
23	164°47.5	40.8	355°57.1	17.1′	05°24.1	14.0′	54.1′
	SD = 16.0′	d = 0.9′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°47.6	N08°41.7	10°33.2	17.1′	S05°38.1	14.1′	54.1′
1	194°47.8	42.6	25°09.3	17.1′	05°52.2	14.0′	54.1′
2	209°47.9	43.5	39°45.4	17.0′	06°06.2	14.0′	54.1′
3	224°48.1	·· 44.4	54°21.4	17.0′	06°20.2	14.0′	54.0′
4	239°48.3	45.4	68°57.4	17.0′	06°34.2	13.9′	54.0′
5	254°48.4	46.3	83°33.4	17.0′	06°48.1	13.9′	54.0′
6	269°48.6	N08°47.2	98°09.4	17.0′	S07°02.0	13.9′	54.0′
7	284°48.8	48.1	112°45.4	16.9′	07°15.9	13.9′	54.0′
8	299°48.9	49.0	127°21.3	16.9′	07°29.8	13.8′	54.0′
9	314°49.1	·· 49.9	141°57.3	16.9′	07°43.6	13.8′	54.0′
10	329°49.2	50.8	156°33.1	16.9′	07°57.4	13.8′	54.0′
11	344°49.4	51.7	171°09.0	16.8′	08°11.2	13.7′	54.0′
12	359°49.6	N08°52.6	185°44.9	16.8′	S08°24.9	13.7′	54.0′
13	14°49.7	53.5	200°20.7	16.8′	08°38.6	13.7′	54.0′
14	29°49.9	54.5	214°56.5	16.8′	08°52.3	13.6′	54.0′
15	44°50.0	·· 55.4	229°32.2	16.7′	09°05.9	13.6′	54.0′
16	59°50.2	56.3	244°08.0	16.7′	09°19.5	13.6′	54.0′
17	74°50.4	57.2	258°43.7	16.7′	09°33.1	13.5′	54.0′
18	89°50.5	N08°58.1	273°19.3	16.6′	S09°46.6	13.5′	54.0′
19	104°50.7	59.0	287°55.0	16.6′	10°00.1	13.4′	54.0′
20	119°50.8	08°59.9	302°30.6	16.6′	10°13.5	13.5′	54.0′
21	134°51.0	09°00.8	317°06.1	16.5′	10°27.0	13.3′	54.0′
22	149°51.2	01.7	331°41.7	16.5′	10°40.3	13.4′	53.9′
23	164°51.3	02.6	346°17.2	16.5′	10°53.7	13.3′	53.9′
	SD = 16.0′	d = 0.9′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:31	04:01	20:05	21:38	–:–
N 70°	–:–	02:59	04:15	19:50	21:07	–:–
68°	01:31	03:20	04:26	19:39	20:46	22:40
66°	02:10	03:36	04:35	19:29	20:29	21:58
64°	02:36	03:49	04:42	19:21	20:15	21:30
62°	02:55	04:00	04:49	19:15	20:04	21:10
60°	03:11	04:10	04:55	19:09	19:54	20:53
N 58°	03:24	04:18	05:00	19:04	19:46	20:40
56°	03:35	04:25	05:04	18:59	19:39	20:29
54°	03:45	04:31	05:08	18:55	19:32	20:19
52°	03:53	04:36	05:12	18:51	19:27	20:10
50°	04:00	04:41	05:15	18:48	19:22	20:03
45°	04:15	04:52	05:22	18:41	19:11	19:48
N 40°	04:27	05:00	05:28	18:35	19:02	19:36
35°	04:37	05:07	05:33	18:29	18:55	19:26
30°	04:44	05:13	05:38	18:25	18:49	19:18
20°	04:57	05:23	05:45	18:17	18:39	19:06
N 10°	05:06	05:30	05:52	18:10	18:32	18:56
0°	05:13	05:37	05:58	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:58	18:19	18:44
20°	05:22	05:48	06:10	17:52	18:14	18:40
30°	05:25	05:53	06:17	17:45	18:09	18:37
35°	05:26	05:55	06:21	17:41	18:06	18:36
40°	05:26	05:58	06:25	17:36	18:03	18:35
45°	05:27	06:01	06:30	17:31	18:00	18:34
S 50°	05:26	06:04	06:36	17:25	17:57	18:35
52°	05:26	06:05	06:39	17:22	17:56	18:35
54°	05:26	06:07	06:42	17:19	17:54	18:35
56°	05:25	06:08	06:46	17:15	17:53	18:36
58°	05:24	06:10	06:49	17:11	17:51	18:36
S 60°	05:23	06:11	06:54	17:07	17:49	18:37

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	16:04	18:02	20:07	05:06	04:33	04:00
N 70°	16:07	17:56	19:49	05:00	04:35	04:09
68°	16:09	17:51	19:35	04:55	04:36	04:17
66°	16:11	17:46	19:24	04:50	04:37	04:23
64°	16:12	17:43	19:15	04:47	04:38	04:29
62°	16:14	17:40	19:07	04:44	04:38	04:33
60°	16:15	17:37	19:00	04:41	04:39	04:37
N 58°	16:16	17:35	18:54	04:38	04:40	04:41
56°	16:17	17:33	18:49	04:36	04:40	04:44
54°	16:17	17:31	18:44	04:34	04:41	04:47
52°	16:18	17:29	18:40	04:32	04:41	04:50
50°	16:19	17:28	18:36	04:31	04:42	04:52
45°	16:20	17:24	18:28	04:27	04:42	04:58
N 40°	16:22	17:21	18:21	04:24	04:43	05:02
35°	16:23	17:19	18:15	04:21	04:44	05:06
30°	16:24	17:17	18:10	04:19	04:44	05:10
20°	16:25	17:13	18:02	04:15	04:45	05:16
N 10°	16:27	17:10	17:54	04:11	04:46	05:21
0°	16:28	17:07	17:47	04:07	04:47	05:26
S 10°	16:29	17:04	17:40	04:04	04:48	05:31
20°	16:31	17:01	17:32	04:00	04:48	05:37
30°	16:33	16:58	17:24	03:56	04:49	05:43
35°	16:33	16:56	17:19	03:53	04:50	05:46
40°	16:35	16:54	17:13	03:50	04:51	05:50
45°	16:36	16:51	17:07	03:47	04:51	05:55
S 50°	16:37	16:48	16:59	03:43	04:52	06:01
52°	16:38	16:47	16:56	03:41	04:52	06:03
54°	16:39	16:45	16:52	03:39	04:53	06:06
56°	16:39	16:44	16:48	03:37	04:53	06:09
58°	16:40	16:42	16:43	03:34	04:54	06:13
S 60°	16:41	16:40	16:38	03:31	04:54	06:17

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 12-14 92-99%
10	01:21	01:13	12:01	22:37	10:18	
11	01:05	00:57	12:01	23:17	10:57	
12	00:50	00:42	12:01	23:56	11:36	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2096 sec ΔT = TT-UT1 = +68.9744 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	201°26.1	208°13.0	N02°08.8	80°54.7	N22°54.3	124°29.2	N22°37.1	204°25.3	S03°25.6
1	216°28.6	223°15.3	08.3	95°56.2	54.0	139°31.2	37.1	219°27.5	25.5
2	231°31.1	238°17.5	07.8	110°57.6	53.8	154°33.2	37.1	234°29.7	25.4
3	246°33.5	253°19.7	·· 07.3	125°59.0	·· 53.5	169°35.2	·· 37.2	249°31.9	·· 25.3
4	261°36.0	268°22.0	06.7	141°00.5	53.3	184°37.1	37.2	264°34.1	25.2
5	276°38.5	283°24.2	06.2	156°01.9	53.0	199°39.1	37.3	279°36.3	25.1
6	291°40.9	298°26.4	N02°05.7	171°03.4	N22°52.7	214°41.1	N22°37.3	294°38.5	S03°25.0
7	306°43.4	313°28.7	05.2	186°04.8	52.5	229°43.1	37.4	309°40.7	24.8
8	321°45.9	328°30.9	04.7	201°06.2	52.2	244°45.1	37.4	324°42.9	24.7
9	336°48.3	343°33.1	·· 04.2	216°07.7	·· 52.0	259°47.1	·· 37.5	339°45.1	·· 24.6
10	351°50.8	358°35.3	03.7	231°09.1	51.7	274°49.1	37.5	354°47.3	24.5
11	6°53.2	13°37.5	03.2	246°10.5	51.5	289°51.1	37.5	9°49.5	24.4
12	21°55.7	28°39.7	N02°02.7	261°12.0	N22°51.2	304°53.1	N22°37.6	24°51.7	S03°24.3
13	36°58.2	43°41.9	02.2	276°13.4	51.0	319°55.0	37.6	39°53.9	24.2
14	52°00.6	58°44.1	01.7	291°14.8	50.7	334°57.0	37.7	54°56.1	24.1
15	67°03.1	73°46.3	·· 01.2	306°16.3	·· 50.5	349°59.0	·· 37.7	69°58.3	·· 24.0
16	82°05.6	88°48.5	00.8	321°17.7	50.2	5°01.0	37.8	85°00.5	23.9
17	97°08.0	103°50.7	02°00.3	336°19.1	49.9	20°03.0	37.8	100°02.7	23.8
18	112°10.5	118°52.8	N01°59.8	351°20.6	N22°49.7	35°05.0	N22°37.9	115°04.9	S03°23.6
19	127°13.0	133°55.0	59.3	6°22.0	49.4	50°07.0	37.9	130°07.1	23.5
20	142°15.4	148°57.2	58.8	21°23.4	49.2	65°08.9	38.0	145°09.3	23.4
21	157°17.9	163°59.4	·· 58.3	36°24.9	·· 48.9	80°10.9	·· 38.0	160°11.5	·· 23.3
22	172°20.3	179°01.5	57.9	51°26.3	48.7	95°12.9	38.0	175°13.7	23.2
23	187°22.8	194°03.7	57.4	66°27.7	48.4	110°14.9	38.1	190°15.9	23.1
Mer.pass.	10:33	ν 2.2′	d -0.5′	m -4.69	ν 1.4′	d -0.3′	m 0.66	ν 2.0′	d 0.0′	m -2.05	ν 2.2′	d 0.1′	m 1.17
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	202°25.3	209°05.9	N01°56.9	81°29.2	N22°48.2	125°16.9	N22°38.1	205°18.1	S03°23.0
1	217°27.7	224°08.0	56.4	96°30.6	47.9	140°18.9	38.2	220°20.3	22.9
2	232°30.2	239°10.2	56.0	111°32.0	47.6	155°20.9	38.2	235°22.5	22.8
3	247°32.7	254°12.3	·· 55.5	126°33.5	·· 47.4	170°22.8	·· 38.3	250°24.7	·· 22.7
4	262°35.1	269°14.4	55.0	141°34.9	47.1	185°24.8	38.3	265°26.9	22.6
5	277°37.6	284°16.6	54.6	156°36.3	46.9	200°26.8	38.4	280°29.1	22.5
6	292°40.1	299°18.7	N01°54.1	171°37.7	N22°46.6	215°28.8	N22°38.4	295°31.3	S03°22.3
7	307°42.5	314°20.9	53.6	186°39.2	46.3	230°30.8	38.5	310°33.5	22.2
8	322°45.0	329°23.0	53.2	201°40.6	46.1	245°32.8	38.5	325°35.7	22.1
9	337°47.5	344°25.1	·· 52.7	216°42.0	·· 45.8	260°34.8	·· 38.5	340°37.9	·· 22.0
10	352°49.9	359°27.2	52.2	231°43.5	45.6	275°36.7	38.6	355°40.1	21.9
11	7°52.4	14°29.4	51.8	246°44.9	45.3	290°38.7	38.6	10°42.3	21.8
12	22°54.8	29°31.5	N01°51.3	261°46.3	N22°45.1	305°40.7	N22°38.7	25°44.5	S03°21.7
13	37°57.3	44°33.6	50.9	276°47.7	44.8	320°42.7	38.7	40°46.7	21.6
14	52°59.8	59°35.7	50.4	291°49.2	44.5	335°44.7	38.8	55°48.9	21.5
15	68°02.2	74°37.8	·· 50.0	306°50.6	·· 44.3	350°46.6	·· 38.8	70°51.1	·· 21.4
16	83°04.7	89°39.9	49.5	321°52.0	44.0	5°48.6	38.9	85°53.3	21.3
17	98°07.2	104°42.0	49.1	336°53.4	43.8	20°50.6	38.9	100°55.5	21.2
18	113°09.6	119°44.1	N01°48.6	351°54.8	N22°43.5	35°52.6	N22°38.9	115°57.7	S03°21.1
19	128°12.1	134°46.2	48.2	6°56.3	43.2	50°54.6	39.0	130°59.9	20.9
20	143°14.6	149°48.3	47.8	21°57.7	43.0	65°56.6	39.0	146°02.1	20.8
21	158°17.0	164°50.3	·· 47.3	36°59.1	·· 42.7	80°58.5	·· 39.1	161°04.3	·· 20.7
22	173°19.5	179°52.4	46.9	52°00.5	42.5	96°00.5	39.1	176°06.5	20.6
23	188°21.9	194°54.5	46.5	67°02.0	42.2	111°02.5	39.2	191°08.7	20.5
Mer.pass.	10:29	ν 2.2′	d -0.5′	m -4.70	ν 1.4′	d -0.3′	m 0.68	ν 2.0′	d 0.0′	m -2.05	ν 2.2′	d 0.1′	m 1.17
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	203°24.4	209°56.6	N01°46.0	82°03.4	N22°41.9	126°04.5	N22°39.2	206°10.9	S03°20.4
1	218°26.9	224°58.6	45.6	97°04.8	41.7	141°06.5	39.3	221°13.1	20.3
2	233°29.3	240°00.7	45.2	112°06.2	41.4	156°08.4	39.3	236°15.3	20.2
3	248°31.8	255°02.8	·· 44.7	127°07.6	·· 41.1	171°10.4	·· 39.3	251°17.5	·· 20.1
4	263°34.3	270°04.8	44.3	142°09.1	40.9	186°12.4	39.4	266°19.7	20.0
5	278°36.7	285°06.9	43.9	157°10.5	40.6	201°14.4	39.4	281°21.9	19.9
6	293°39.2	300°08.9	N01°43.5	172°11.9	N22°40.4	216°16.4	N22°39.5	296°24.2	S03°19.8
7	308°41.7	315°11.0	43.0	187°13.3	40.1	231°18.3	39.5	311°26.4	19.7
8	323°44.1	330°13.0	42.6	202°14.7	39.8	246°20.3	39.6	326°28.6	19.5
9	338°46.6	345°15.0	·· 42.2	217°16.1	·· 39.6	261°22.3	·· 39.6	341°30.8	·· 19.4
10	353°49.1	0°17.1	41.8	232°17.6	39.3	276°24.3	39.7	356°33.0	19.3
11	8°51.5	15°19.1	41.4	247°19.0	39.0	291°26.3	39.7	11°35.2	19.2
12	23°54.0	30°21.1	N01°41.0	262°20.4	N22°38.8	306°28.2	N22°39.8	26°37.4	S03°19.1
13	38°56.4	45°23.2	40.6	277°21.8	38.5	321°30.2	39.8	41°39.6	19.0
14	53°58.9	60°25.2	40.1	292°23.2	38.3	336°32.2	39.8	56°41.8	18.9
15	69°01.4	75°27.2	·· 39.7	307°24.6	·· 38.0	351°34.2	·· 39.9	71°44.0	·· 18.8
16	84°03.8	90°29.2	39.3	322°26.0	37.7	6°36.2	39.9	86°46.2	18.7
17	99°06.3	105°31.2	38.9	337°27.5	37.5	21°38.1	40.0	101°48.4	18.6
18	114°08.8	120°33.2	N01°38.5	352°28.9	N22°37.2	36°40.1	N22°40.0	116°50.6	S03°18.5
19	129°11.2	135°35.2	38.1	7°30.3	36.9	51°42.1	40.1	131°52.8	18.4
20	144°13.7	150°37.2	37.7	22°31.7	36.7	66°44.1	40.1	146°55.0	18.3
21	159°16.2	165°39.2	·· 37.3	37°33.1	·· 36.4	81°46.1	·· 40.2	161°57.2	·· 18.2
22	174°18.6	180°41.2	36.9	52°34.5	36.1	96°48.0	40.2	176°59.4	18.1
23	189°21.1	195°43.2	36.5	67°35.9	35.9	111°50.0	40.2	192°01.6	17.9
Mer.pass.	10:25	ν 2.1′	d -0.4′	m -4.72	ν 1.4′	d -0.3′	m 0.70	ν 2.0′	d 0.0′	m -2.04	ν 2.2′	d 0.1′	m 1.17

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.1
Schedar	349°31.4	56°40.4
Diphda	348°47.4	-17°51.0
Achernar	335°20.6	-57°06.5
Hamal	327°51.3	23°34.8
Polaris	314°24.0	89°22.3
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.5
Capella	280°21.9	46°01.5
Bellatrix	278°22.8	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.5	-52°42.8
Sirius	258°26.2	-16°45.2
Adhara	255°05.8	-29°00.6
Procyon	244°50.6	5°09.5
Pollux	243°17.1	27°58.0
Avior	234°14.6	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°38.0	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.4
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.1
Hadar	148°35.1	-60°29.7
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.4
Kochab	137°18.6	74°02.9
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.5
Antares	112°15.3	-26°29.3
Atria	107°09.1	-69°04.2
Sabik	102°02.4	-15°45.4
Shaula	96°09.9	-37°07.3
Rasalhague	95°58.2	12°32.3
Eltanin	90°41.9	51°28.8
Kaus Aust.	83°32.1	-34°22.3
Vega	80°33.0	38°48.1
Nunki	75°47.4	-26°15.9
Altair	61°59.8	8°55.9
Peacock	53°05.5	-56°39.0
Deneb	49°25.8	45°21.9
Enif	33°38.8	9°59.3
Al Na'ir	27°32.9	-46°50.2
Fomalhaut	15°14.6	-29°29.3
Scheat	13°45.3	28°13.0
Markab	13°30.0	15°20.3

Apr 13 Sun	SHA	Mer.pass
Venus	6°46.9	10:06
Mars	239°28.6	18:35
Jupiter	283°03.0	15:40
Saturn	2°59.2	10:21

Apr 14 Mon	SHA	Mer.pass
Venus	6°40.6	10:02
Mars	239°03.9	18:32
Jupiter	282°51.6	15:37
Saturn	2°52.8	10:17

Apr 15 Tue	SHA	Mer.pass
Venus	6°32.1	09:59
Mars	238°39.0	18:30
Jupiter	282°40.1	15:34
Saturn	2°46.5	10:14

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.5	N09°03.5	0°52.6	16.4′	S11°07.0	13.2′	53.9′
1	194°51.6	04.4	15°28.0	16.4′	11°20.2	13.2′	53.9′
2	209°51.8	05.3	30°03.4	16.3′	11°33.4	13.2′	53.9′
3	224°52.0	·· 06.2	44°38.8	16.3′	11°46.6	13.1′	53.9′
4	239°52.1	07.1	59°14.1	16.3′	11°59.7	13.1′	53.9′
5	254°52.3	08.1	73°49.3	16.2′	12°12.8	13.0′	53.9′
6	269°52.4	N09°09.0	88°24.6	16.2′	S12°25.8	13.0′	53.9′
7	284°52.6	09.9	102°59.7	16.1′	12°38.8	12.9′	53.9′
8	299°52.7	10.8	117°34.9	16.1′	12°51.7	12.9′	53.9′
9	314°52.9	·· 11.7	132°10.0	16.0′	13°04.6	12.8′	53.9′
10	329°53.1	12.6	146°45.0	16.0′	13°17.4	12.8′	53.9′
11	344°53.2	13.5	161°20.0	16.0′	13°30.2	12.8′	53.9′
12	359°53.4	N09°14.4	175°55.0	15.9′	S13°43.0	12.6′	53.9′
13	14°53.5	15.3	190°29.9	15.9′	13°55.6	12.7′	53.9′
14	29°53.7	16.2	205°04.7	15.8′	14°08.3	12.5′	53.9′
15	44°53.9	·· 17.1	219°39.5	15.8′	14°20.8	12.6′	53.9′
16	59°54.0	18.0	234°14.3	15.7′	14°33.4	12.4′	53.9′
17	74°54.2	18.9	248°49.0	15.7′	14°45.8	12.4′	53.9′
18	89°54.3	N09°19.8	263°23.7	15.6′	S14°58.2	12.4′	53.9′
19	104°54.5	20.7	277°58.3	15.6′	15°10.6	12.3′	53.9′
20	119°54.6	21.6	292°32.8	15.5′	15°22.9	12.2′	53.9′
21	134°54.8	·· 22.5	307°07.3	15.4′	15°35.1	12.2′	53.9′
22	149°54.9	23.4	321°41.8	15.4′	15°47.3	12.1′	53.9′
23	164°55.1	24.3	336°16.1	15.3′	15°59.4	12.1′	53.9′
	SD = 15.9′	d = 0.9′	SD = 14.7′				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.3	N09°25.2	350°50.5	15.3′	S16°11.5	12.0′	53.9′
1	194°55.4	26.1	5°24.8	15.2′	16°23.5	11.9′	53.9′
2	209°55.6	27.0	19°59.0	15.2′	16°35.4	11.9′	53.9′
3	224°55.7	·· 27.9	34°33.1	15.1′	16°47.3	11.8′	53.9′
4	239°55.9	28.8	49°07.2	15.0′	16°59.1	11.7′	53.9′
5	254°56.0	29.7	63°41.3	15.0′	17°10.8	11.7′	53.9′
6	269°56.2	N09°30.6	78°15.3	14.9′	S17°22.5	11.6′	53.9′
7	284°56.3	31.5	92°49.2	14.9′	17°34.1	11.5′	53.9′
8	299°56.5	32.4	107°23.0	14.8′	17°45.6	11.5′	53.9′
9	314°56.7	·· 33.3	121°56.8	14.7′	17°57.1	11.3′	53.9′
10	329°56.8	34.2	136°30.6	14.7′	18°08.4	11.4′	53.9′
11	344°57.0	35.1	151°04.2	14.6′	18°19.8	11.2′	53.9′
12	359°57.1	N09°36.0	165°37.9	14.5′	S18°31.0	11.2′	53.9′
13	14°57.3	36.9	180°11.4	14.5′	18°42.2	11.1′	53.9′
14	29°57.4	37.8	194°44.9	14.4′	18°53.3	11.0′	53.9′
15	44°57.6	·· 38.7	209°18.3	14.4′	19°04.3	11.0′	53.9′
16	59°57.7	39.6	223°51.6	14.3′	19°15.3	10.8′	53.9′
17	74°57.9	40.5	238°24.9	14.2′	19°26.1	10.8′	53.9′
18	89°58.0	N09°41.3	252°58.1	14.2′	S19°36.9	10.8′	53.9′
19	104°58.2	42.2	267°31.3	14.1′	19°47.7	10.6′	53.9′
20	119°58.3	43.1	282°04.4	14.0′	19°58.3	10.6′	53.9′
21	134°58.5	·· 44.0	296°37.4	13.9′	20°08.9	10.4′	53.9′
22	149°58.6	44.9	311°10.3	13.9′	20°19.3	10.4′	53.9′
23	164°58.8	45.8	325°43.2	13.8′	20°29.7	10.3′	54.0′
	SD = 15.9′	d = 0.9′	SD = 14.7′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.0	N09°46.7	340°16.0	13.7′	S20°40.0	10.3′	54.0′
1	194°59.1	47.6	354°48.8	13.7′	20°50.3	10.1′	54.0′
2	209°59.3	48.5	9°21.4	13.6′	21°00.4	10.1′	54.0′
3	224°59.4	·· 49.4	23°54.0	13.5′	21°10.5	9.9′	54.0′
4	239°59.6	50.3	38°26.6	13.5′	21°20.4	9.9′	54.0′
5	254°59.7	51.2	52°59.0	13.4′	21°30.3	9.8′	54.0′
6	269°59.9	N09°52.1	67°31.4	13.3′	S21°40.1	9.7′	54.0′
7	285°00.0	53.0	82°03.7	13.2′	21°49.8	9.6′	54.0′
8	300°00.2	53.8	96°36.0	13.2′	21°59.4	9.6′	54.0′
9	315°00.3	·· 54.7	111°08.1	13.1′	22°09.0	9.4′	54.0′
10	330°00.5	55.6	125°40.2	13.0′	22°18.4	9.3′	54.0′
11	345°00.6	56.5	140°12.2	13.0′	22°27.7	9.3′	54.0′
12	0°00.8	N09°57.4	154°44.2	12.9′	S22°37.0	9.1′	54.0′
13	15°00.9	58.3	169°16.1	12.8′	22°46.1	9.1′	54.0′
14	30°01.1	09°59.2	183°47.9	12.7′	22°55.2	8.9′	54.0′
15	45°01.2	10°00.1	198°19.6	12.7′	23°04.1	8.9′	54.0′
16	60°01.4	01.0	212°51.3	12.6′	23°13.0	8.8′	54.0′
17	75°01.5	01.9	227°22.8	12.5′	23°21.8	8.6′	54.1′
18	90°01.7	N10°02.7	241°54.4	12.4′	S23°30.4	8.6′	54.1′
19	105°01.8	03.6	256°25.8	12.4′	23°39.0	8.4′	54.1′
20	120°02.0	04.5	270°57.2	12.3′	23°47.4	8.4′	54.1′
21	135°02.1	·· 05.4	285°28.4	12.2′	23°55.8	8.2′	54.1′
22	150°02.3	06.3	299°59.7	12.1′	24°04.0	8.2′	54.1′
23	165°02.4	07.2	314°30.8	12.1′	24°12.2	8.0′	54.1′
	SD = 15.9′	d = 0.9′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:05	03:44	20:21	22:03	–:–
N 70°	–:–	02:40	04:00	20:04	21:26	–:–
68°	00:53	03:04	04:13	19:50	21:00	23:26
66°	01:48	03:23	04:23	19:40	20:41	22:19
64°	02:19	03:37	04:32	19:31	20:26	21:46
62°	02:42	03:50	04:39	19:23	20:13	21:22
60°	02:59	04:00	04:46	19:16	20:02	21:04
N 58°	03:14	04:09	04:52	19:10	19:53	20:49
56°	03:26	04:17	04:57	19:05	19:45	20:37
54°	03:36	04:23	05:01	19:00	19:38	20:26
52°	03:45	04:29	05:05	18:56	19:32	20:17
50°	03:53	04:35	05:09	18:53	19:27	20:09
45°	04:09	04:46	05:17	18:44	19:15	19:52
N 40°	04:22	04:56	05:24	18:38	19:06	19:39
35°	04:32	05:03	05:29	18:32	18:58	19:29
30°	04:41	05:10	05:34	18:27	18:51	19:20
20°	04:54	05:20	05:43	18:18	18:40	19:07
N 10°	05:04	05:29	05:50	18:10	18:32	18:57
0°	05:12	05:36	05:57	18:03	18:24	18:49
S 10°	05:18	05:42	06:04	17:57	18:18	18:43
20°	05:23	05:48	06:11	17:49	18:12	18:37
30°	05:27	05:54	06:19	17:41	18:06	18:33
35°	05:28	05:57	06:23	17:37	18:02	18:32
40°	05:29	06:01	06:28	17:32	17:59	18:30
45°	05:30	06:04	06:34	17:26	17:55	18:29
S 50°	05:31	06:08	06:41	17:19	17:51	18:29
52°	05:31	06:10	06:44	17:15	17:50	18:29
54°	05:31	06:12	06:48	17:12	17:48	18:29
56°	05:31	06:14	06:52	17:08	17:46	18:29
58°	05:30	06:16	06:56	17:03	17:43	18:29
S 60°	05:30	06:18	07:01	16:58	17:41	18:29

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	22:43	▬	▬	03:20	02:10	▬
N 70°	21:59	▬	▬	03:39	02:56	▬
68°	21:30	23:57	▬	03:55	03:26	02:29
66°	21:08	23:08	▬	04:08	03:49	03:20
64°	20:51	22:37	·· ··	04:19	04:07	03:52
62°	20:38	22:14	23:58	04:28	04:22	04:16
60°	20:26	21:56	23:30	04:36	04:35	04:35
N 58°	20:16	21:40	23:07	04:43	04:46	04:51
56°	20:07	21:28	22:49	04:49	04:55	05:04
54°	19:59	21:16	22:34	04:55	05:04	05:16
52°	19:53	21:07	22:21	05:00	05:11	05:27
50°	19:46	20:58	22:10	05:04	05:18	05:36
45°	19:33	20:39	21:46	05:14	05:33	05:56
N 40°	19:22	20:24	21:27	05:23	05:45	06:12
35°	19:13	20:12	21:11	05:30	05:56	06:25
30°	19:05	20:01	20:58	05:36	06:05	06:37
20°	18:51	19:42	20:35	05:47	06:21	06:58
N 10°	18:39	19:26	20:15	05:57	06:35	07:16
0°	18:28	19:11	19:56	06:06	06:48	07:32
S 10°	18:16	18:56	19:38	06:15	07:01	07:49
20°	18:05	18:40	19:19	06:25	07:15	08:07
30°	17:51	18:22	18:56	06:37	07:32	08:28
35°	17:43	18:11	18:43	06:43	07:41	08:40
40°	17:35	17:59	18:28	06:51	07:52	08:55
45°	17:24	17:45	18:10	06:59	08:05	09:11
S 50°	17:12	17:28	17:48	07:10	08:21	09:32
52°	17:07	17:20	17:37	07:15	08:28	09:42
54°	17:00	17:11	17:26	07:20	08:36	09:54
56°	16:53	17:01	17:12	07:26	08:46	10:07
58°	16:46	16:50	16:57	07:33	08:56	10:22
S 60°	16:37	16:37	16:38	07:41	09:08	10:40

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 15-17 100-96%
13	00:34	00:26	12:00	–:–	12:17	
14	00:19	00:12	12:00	00:38	12:59	
15	00:04	00:03	12:00	01:21	13:44	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2103 sec ΔT = TT-UT1 = +68.9737 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	204°23.6	210°45.2	N01°36.2	82°37.3	N22°35.6	126°52.0	N22°40.3	207°03.8	S03°17.8
1	219°26.0	225°47.2	35.8	97°38.8	35.3	141°54.0	40.3	222°06.0	17.7
2	234°28.5	240°49.2	35.4	112°40.2	35.1	156°55.9	40.4	237°08.2	17.6
3	249°30.9	255°51.1	·· 35.0	127°41.6	·· 34.8	171°57.9	·· 40.4	252°10.4	·· 17.5
4	264°33.4	270°53.1	34.6	142°43.0	34.5	186°59.9	40.5	267°12.6	17.4
5	279°35.9	285°55.1	34.2	157°44.4	34.3	202°01.9	40.5	282°14.8	17.3
6	294°38.3	300°57.0	N01°33.9	172°45.8	N22°34.0	217°03.8	N22°40.6	297°17.0	S03°17.2
7	309°40.8	315°59.0	33.5	187°47.2	33.8	232°05.8	40.6	312°19.2	17.1
8	324°43.3	331°01.0	33.1	202°48.6	33.5	247°07.8	40.6	327°21.4	17.0
9	339°45.7	346°02.9	·· 32.7	217°50.0	·· 33.2	262°09.8	·· 40.7	342°23.6	·· 16.9
10	354°48.2	1°04.9	32.3	232°51.4	33.0	277°11.7	40.7	357°25.8	16.8
11	9°50.7	16°06.8	32.0	247°52.8	32.7	292°13.7	40.8	12°28.0	16.7
12	24°53.1	31°08.8	N01°31.6	262°54.2	N22°32.4	307°15.7	N22°40.8	27°30.2	S03°16.6
13	39°55.6	46°10.7	31.2	277°55.6	32.1	322°17.7	40.9	42°32.5	16.4
14	54°58.1	61°12.6	30.9	292°57.0	31.9	337°19.6	40.9	57°34.7	16.3
15	70°00.5	76°14.6	·· 30.5	307°58.5	·· 31.6	352°21.6	·· 41.0	72°36.9	·· 16.2
16	85°03.0	91°16.5	30.1	322°59.9	31.3	7°23.6	41.0	87°39.1	16.1
17	100°05.4	106°18.4	29.8	338°01.3	31.1	22°25.6	41.0	102°41.3	16.0
18	115°07.9	121°20.4	N01°29.4	353°02.7	N22°30.8	37°27.5	N22°41.1	117°43.5	S03°15.9
19	130°10.4	136°22.3	29.1	8°04.1	30.5	52°29.5	41.1	132°45.7	15.8
20	145°12.8	151°24.2	28.7	23°05.5	30.3	67°31.5	41.2	147°47.9	15.7
21	160°15.3	166°26.1	·· 28.4	38°06.9	·· 30.0	82°33.5	·· 41.2	162°50.1	·· 15.6
22	175°17.8	181°28.0	28.0	53°08.3	29.7	97°35.4	41.3	177°52.3	15.5
23	190°20.2	196°29.9	27.7	68°09.7	29.5	112°37.4	41.3	192°54.5	15.4
Mer.pass.	10:21	ν 2.0′	d -0.4′	m -4.73	ν 1.4′	d -0.3′	m 0.71	ν 2.0′	d 0.0′ m -2.04	ν 2.2′	d 0.1′ m 1.17

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	205°22.7	211°31.8	N01°27.3	83°11.1	N22°29.2	127°39.4	N22°41.4	207°56.7	S03°15.3
1	220°25.2	226°33.7	27.0	98°12.5	28.9	142°41.3	41.4	222°58.9	15.2
2	235°27.6	241°35.6	26.6	113°13.9	28.7	157°43.3	41.4	238°01.1	15.1
3	250°30.1	256°37.5	·· 26.3	128°15.3	·· 28.4	172°45.3	·· 41.5	253°03.3	·· 15.0
4	265°32.5	271°39.4	25.9	143°16.7	28.1	187°47.3	41.5	268°05.5	14.9
5	280°35.0	286°41.3	25.6	158°18.1	27.8	202°49.2	41.6	283°07.7	14.7
6	295°37.5	301°43.2	N01°25.3	173°19.5	N22°27.6	217°51.2	N22°41.6	298°09.9	S03°14.6
7	310°39.9	316°45.1	24.9	188°20.9	27.3	232°53.2	41.7	313°12.1	14.5
8	325°42.4	331°46.9	24.6	203°22.3	27.0	247°55.2	41.7	328°14.3	14.4
9	340°44.9	346°48.8	·· 24.3	218°23.7	·· 26.8	262°57.1	·· 41.7	343°16.5	·· 14.3
10	355°47.3	1°50.7	23.9	233°25.1	26.5	277°59.1	41.8	358°18.8	14.2
11	10°49.8	16°52.6	23.6	248°26.5	26.2	293°01.1	41.8	13°21.0	14.1
12	25°52.3	31°54.4	N01°23.3	263°27.9	N22°25.9	308°03.0	N22°41.9	28°23.2	S03°14.0
13	40°54.7	46°56.3	23.0	278°29.2	25.7	323°05.0	41.9	43°25.4	13.9
14	55°57.2	61°58.1	22.6	293°30.6	25.4	338°07.0	42.0	58°27.6	13.8
15	70°59.7	77°00.0	·· 22.3	308°32.0	·· 25.1	353°08.9	·· 42.0	73°29.8	·· 13.7
16	86°02.1	92°01.8	22.0	323°33.4	24.9	8°10.9	42.1	88°32.0	13.6
17	101°04.6	107°03.7	21.7	338°34.8	24.6	23°12.9	42.1	103°34.2	13.5
18	116°07.0	122°05.5	N01°21.4	353°36.2	N22°24.3	38°14.9	N22°42.1	118°36.4	S03°13.4
19	131°09.5	137°07.4	21.0	8°37.6	24.0	53°16.8	42.2	133°38.6	13.3
20	146°12.0	152°09.2	20.7	23°39.0	23.8	68°18.8	42.2	148°40.8	13.2
21	161°14.4	167°11.0	·· 20.4	38°40.4	·· 23.5	83°20.8	·· 42.3	163°43.0	·· 13.1
22	176°16.9	182°12.9	20.1	53°41.8	23.2	98°22.7	42.3	178°45.2	13.0
23	191°19.4	197°14.7	19.8	68°43.2	22.9	113°24.7	42.4	193°47.4	12.8
Mer.pass.	10:17	ν 1.9′	d -0.3′	m -4.74	ν 1.4′	d -0.3′	m 0.73	ν 2.0′	d 0.0′ m -2.03	ν 2.2′	d 0.1′ m 1.17

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	206°21.8	212°16.5	N01°19.5	83°44.6	N22°22.7	128°26.7	N22°42.4	208°49.6	S03°12.7
1	221°24.3	227°18.3	19.2	98°46.0	22.4	143°28.6	42.5	223°51.8	12.6
2	236°26.8	242°20.2	18.9	113°47.4	22.1	158°30.6	42.5	238°54.0	12.5
3	251°29.2	257°22.0	·· 18.6	128°48.7	·· 21.8	173°32.6	·· 42.5	253°56.3	·· 12.4
4	266°31.7	272°23.8	18.3	143°50.1	21.6	188°34.5	42.6	268°58.5	12.3
5	281°34.2	287°25.6	18.0	158°51.5	21.3	203°36.5	42.6	284°00.7	12.2
6	296°36.6	302°27.4	N01°17.7	173°52.9	N22°21.0	218°38.5	N22°42.7	299°02.9	S03°12.1
7	311°39.1	317°29.2	17.4	188°54.3	20.7	233°40.4	42.7	314°05.1	12.0
8	326°41.5	332°31.0	17.1	203°55.7	20.5	248°42.4	42.8	329°07.3	11.9
9	341°44.0	347°32.8	·· 16.8	218°57.1	·· 20.2	263°44.4	·· 42.8	344°09.5	·· 11.8
10	356°46.5	2°34.6	16.5	233°58.5	19.9	278°46.3	42.8	359°11.7	11.7
11	11°48.9	17°36.4	16.2	248°59.9	19.6	293°48.3	42.9	14°13.9	11.6
12	26°51.4	32°38.2	N01°16.0	264°01.2	N22°19.4	308°50.3	N22°42.9	29°16.1	S03°11.5
13	41°53.9	47°39.9	15.7	279°02.6	19.1	323°52.2	43.0	44°18.3	11.4
14	56°56.3	62°41.7	15.4	294°04.0	18.8	338°54.2	43.0	59°20.5	11.3
15	71°58.8	77°43.5	·· 15.1	309°05.4	·· 18.5	353°56.2	·· 43.1	74°22.7	·· 11.2
16	87°01.3	92°45.3	14.8	324°06.8	18.3	8°58.1	43.1	89°24.9	11.1
17	102°03.7	107°47.0	14.6	339°08.2	18.0	24°00.1	43.2	104°27.1	11.0
18	117°06.2	122°48.8	N01°14.3	354°09.6	N22°17.7	39°02.1	N22°43.2	119°29.4	S03°10.8
19	132°08.7	137°50.6	14.0	9°10.9	17.4	54°04.0	43.2	134°31.6	10.7
20	147°11.1	152°52.3	13.7	24°12.3	17.2	69°06.0	43.3	149°33.8	10.6
21	162°13.6	167°54.1	·· 13.5	39°13.7	·· 16.9	84°08.0	·· 43.3	164°36.0	·· 10.5
22	177°16.0	182°55.8	13.2	54°15.1	16.6	99°09.9	43.4	179°38.2	10.4
23	192°18.5	197°57.6	12.9	69°16.5	16.3	114°11.9	43.4	194°40.4	10.3
Mer.pass.	10:13	ν 1.8′	d -0.3′	m -4.74	ν 1.4′	d -0.3′	m 0.74	ν 2.0′	d 0.0′ m -2.03	ν 2.2′	d 0.1′ m 1.17

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.1
Schedar	349°31.4	56°40.4
Diphda	348°47.4	-17°50.9
Achernar	335°20.6	-57°06.5
Hamal	327°51.3	23°34.8
Polaris	314°24.2	89°22.3
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.5
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.5	-52°42.8
Sirius	258°26.2	-16°45.2
Adhara	255°05.8	-29°00.6
Procyon	244°50.7	5°09.5
Pollux	243°17.1	27°58.0
Avior	234°14.6	-59°35.7
Suhail	222°46.0	-43°32.3
Miaplacidus	221°38.0	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.0	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.1
Hadar	148°35.1	-60°29.7
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.4
Kochab	137°18.6	74°02.9
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.0	-69°04.2
Sabik	102°02.3	-15°45.4
Shaula	96°09.9	-37°07.3
Rasalhague	95°58.2	12°32.3
Eltanin	90°41.8	51°28.8
Kaus Aust.	83°32.1	-34°22.3
Vega	80°33.0	38°48.1
Nunki	75°47.4	-26°15.9
Altair	61°59.8	8°55.9
Peacock	53°05.5	-56°39.0
Deneb	49°25.8	45°21.9
Enif	33°38.8	9°59.3
Al Na'ir	27°32.9	-46°50.2
Fomalhaut	15°14.5	-29°29.3
Scheat	13°45.3	28°13.0
Markab	13°29.9	15°20.3

Apr 16 Wed	SHA	Mer.pass
Venus	6°21.7	09:56
Mars	238°13.8	18:28
Jupiter	282°28.4	15:30
Saturn	2°40.3	10:10

Apr 17 Thu	SHA	Mer.pass
Venus	6°09.1	09:53
Mars	237°48.4	18:26
Jupiter	282°16.7	15:27
Saturn	2°34.0	10:07

Apr 18 Fri	SHA	Mer.pass
Venus	5°54.7	09:50
Mars	237°22.7	18:23
Jupiter	282°04.8	15:24
Saturn	2°27.8	10:03

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°02.6	N10°08.1	329°01.9	12.0′	S24°20.2	8.0′	54.1′
1	195°02.7	09.0	343°32.9	11.9′	24°28.2	7.8′	54.1′
2	210°02.8	09.8	358°03.8	11.8′	24°36.0	7.7′	54.1′
3	225°03.0	·· 10.7	12°34.6	11.8′	24°43.7	7.6′	54.1′
4	240°03.1	11.6	27°05.4	11.7′	24°51.3	7.5′	54.1′
5	255°03.3	12.5	41°36.1	11.6′	24°58.8	7.4′	54.1′
6	270°03.4	N10°13.4	56°06.8	11.6′	S25°06.2	7.3′	54.2′
7	285°03.6	14.3	70°37.3	11.5′	25°13.5	7.2′	54.2′
8	300°03.7	15.1	85°07.8	11.4′	25°20.7	7.0′	54.2′
9	315°03.9	·· 16.0	99°38.2	11.3′	25°27.7	7.0′	54.2′
10	330°04.0	16.9	114°08.6	11.3′	25°34.7	6.8′	54.2′
11	345°04.2	17.8	128°38.8	11.2′	25°41.5	6.7′	54.2′
12	0°04.3	N10°18.7	143°09.0	11.1′	S25°48.2	6.6′	54.2′
13	15°04.5	19.6	157°39.2	11.1′	25°54.8	6.5′	54.2′
14	30°04.6	20.4	172°09.2	11.0′	26°01.3	6.3′	54.2′
15	45°04.8	·· 21.3	186°39.2	10.9′	26°07.6	6.2′	54.3′
16	60°04.9	22.2	201°09.1	10.9′	26°13.8	6.2′	54.3′
17	75°05.0	23.1	215°39.0	10.8′	26°20.0	5.9′	54.3′
18	90°05.2	N10°24.0	230°08.8	10.7′	S26°25.9	5.9′	54.3′
19	105°05.3	24.9	244°38.5	10.6′	26°31.8	5.8′	54.3′
20	120°05.5	25.7	259°08.1	10.6′	26°37.6	5.6′	54.3′
21	135°05.6	·· 26.6	273°37.7	10.5′	26°43.2	5.5′	54.3′
22	150°05.8	27.5	288°07.2	10.5′	26°48.7	5.4′	54.3′
23	165°05.9	28.4	302°36.7	10.4′	26°54.1	5.2′	54.4′
	SD = 15.9′	d = 0.9′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°06.1	N10°29.3	317°06.1	10.3′	S26°59.3	5.1′	54.4′
1	195°06.2	30.1	331°35.4	10.3′	27°04.4	5.0′	54.4′
2	210°06.4	31.0	346°04.6	10.2′	27°09.4	4.9′	54.4′
3	225°06.5	·· 31.9	0°33.8	10.1′	27°14.3	4.7′	54.4′
4	240°06.6	32.8	15°03.0	10.1′	27°19.0	4.6′	54.4′
5	255°06.8	33.6	29°32.0	10.0′	27°23.6	4.5′	54.4′
6	270°06.9	N10°34.5	44°01.1	10.0′	S27°28.1	4.3′	54.4′
7	285°07.1	35.4	58°30.0	9.9′	27°32.4	4.2′	54.5′
8	300°07.2	36.3	72°58.9	9.8′	27°36.6	4.1′	54.5′
9	315°07.4	·· 37.2	87°27.7	9.8′	27°40.7	4.0′	54.5′
10	330°07.5	38.0	101°56.5	9.7′	27°44.7	3.8′	54.5′
11	345°07.6	38.9	116°25.2	9.7′	27°48.5	3.6′	54.5′
12	0°07.8	N10°39.8	130°53.9	9.6′	S27°52.1	3.6′	54.5′
13	15°07.9	40.7	145°22.5	9.6′	27°55.7	3.4′	54.6′
14	30°08.1	41.5	159°51.1	9.5′	27°59.1	3.2′	54.6′
15	45°08.2	·· 42.4	174°19.6	9.5′	28°02.3	3.2′	54.6′
16	60°08.3	43.3	188°48.0	9.4′	28°05.5	2.9′	54.6′
17	75°08.5	44.2	203°16.4	9.4′	28°08.4	2.9′	54.6′
18	90°08.6	N10°45.0	217°44.8	9.3′	S28°11.3	2.7′	54.6′
19	105°08.8	45.9	232°13.1	9.3′	28°14.0	2.6′	54.7′
20	120°08.9	46.8	246°41.4	9.2′	28°16.6	2.4′	54.7′
21	135°09.1	·· 47.7	261°09.6	9.2′	28°19.0	2.3′	54.7′
22	150°09.2	48.5	275°37.7	9.1′	28°21.3	2.1′	54.7′
23	165°09.3	49.4	290°05.9	9.1′	28°23.4	2.0′	54.7′
	SD = 15.9′	d = 0.9′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°09.5	N10°50.3	304°34.0	9.0′	S28°25.4	1.9′	54.7′
1	195°09.6	51.1	319°02.0	9.0′	28°27.3	1.7′	54.8′
2	210°09.8	52.0	333°30.0	9.0′	28°29.0	1.5′	54.8′
3	225°09.9	·· 52.9	347°58.0	8.9′	28°30.5	1.5′	54.8′
4	240°10.0	53.8	2°25.9	8.9′	28°32.0	1.3′	54.8′
5	255°10.2	54.6	16°53.8	8.9′	28°33.3	1.1′	54.8′
6	270°10.3	N10°55.5	31°21.6	8.8′	S28°34.4	1.0′	54.9′
7	285°10.4	56.4	45°49.5	8.8′	28°35.4	0.8′	54.9′
8	300°10.6	57.2	60°17.2	8.8′	28°36.2	0.7′	54.9′
9	315°10.7	·· 58.1	74°45.0	8.7′	28°36.9	0.6′	54.9′
10	330°10.9	59.0	89°12.7	8.7′	28°37.5	0.4′	54.9′
11	345°11.0	10°59.8	103°40.4	8.7′	28°37.9	0.2′	55.0′
12	0°11.1	N11°00.7	118°08.1	8.6′	S28°38.1	0.1′	55.0′
13	15°11.3	01.6	132°35.7	8.6′	28°38.2	0.0′	55.0′
14	30°11.4	02.5	147°03.3	8.6′	28°38.2	0.2′	55.0′
15	45°11.6	·· 03.3	161°30.9	8.6′	28°38.0	0.4′	55.0′
16	60°11.7	04.2	175°58.5	8.6′	28°37.6	0.5′	55.1′
17	75°11.8	05.1	190°26.1	8.5′	28°37.1	0.6′	55.1′
18	90°12.0	N11°05.9	204°53.6	8.5′	S28°36.5	0.8′	55.1′
19	105°12.1	06.8	219°21.1	8.5′	28°35.7	0.9′	55.1′
20	120°12.2	07.7	233°48.6	8.5′	28°34.8	1.1′	55.2′
21	135°12.4	·· 08.5	248°16.1	8.5′	28°33.7	1.3′	55.2′
22	150°12.5	09.4	262°43.5	8.5′	28°32.4	1.4′	55.2′
23	165°12.6	10.2	277°11.0	8.4′	28°31.0	1.5′	55.2′
	SD = 15.9′	d = 0.9′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	01:35	03:26	20:37	22:35	–:–
N 70°	–:–	02:19	03:45	20:17	21:46	–:–
68°	–:–	02:47	04:00	20:02	21:16	–:–
66°	01:22	03:09	04:11	19:50	20:54	22:46
64°	02:01	03:25	04:21	19:40	20:37	22:03
62°	02:27	03:39	04:30	19:31	20:23	21:36
60°	02:47	03:50	04:37	19:24	20:11	21:15
N 58°	03:03	04:00	04:43	19:17	20:01	20:59
56°	03:16	04:08	04:49	19:11	19:52	20:45
54°	03:28	04:16	04:54	19:06	19:45	20:33
52°	03:37	04:22	04:59	19:01	19:38	20:23
50°	03:46	04:28	05:03	18:57	19:32	20:15
45°	04:03	04:41	05:12	18:48	19:19	19:57
N 40°	04:17	04:51	05:19	18:41	19:09	19:43
35°	04:28	04:59	05:25	18:34	19:00	19:32
30°	04:37	05:06	05:31	18:29	18:53	19:22
20°	04:51	05:18	05:40	18:19	18:41	19:08
N 10°	05:02	05:27	05:49	18:11	18:32	18:57
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:18	05:42	06:04	17:55	18:17	18:41
20°	05:23	05:49	06:12	17:47	18:10	18:35
30°	05:28	05:56	06:20	17:38	18:02	18:30
35°	05:30	06:00	06:25	17:33	17:59	18:28
40°	05:32	06:04	06:31	17:27	17:55	18:26
45°	05:34	06:08	06:38	17:21	17:50	18:25
S 50°	05:35	06:13	06:46	17:13	17:45	18:23
52°	05:36	06:15	06:49	17:09	17:43	18:22
54°	05:36	06:17	06:53	17:05	17:41	18:22
56°	05:36	06:19	06:58	17:00	17:39	18:22
58°	05:36	06:22	07:03	16:55	17:36	18:21
S 60°	05:37	06:25	07:08	16:50	17:33	18:21

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	00:42	▬	▬	03:23	▬	▬
62°	·· ··	01:58	▬	04:07	03:51	▬
60°	·· ··	01:05	02:30	04:37	04:44	05:08
N 58°	·· ··	00:33	01:48	05:00	05:17	05:50
56°	·· ··	00:09	01:20	05:18	05:41	06:18
54°	23:50	·· ··	00:58	05:34	06:00	06:41
52°	23:34	·· ··	00:40	05:47	06:17	06:59
50°	23:20	·· ··	00:24	05:59	06:31	07:14
45°	22:52	23:53	·· ··	06:24	07:00	07:45
N 40°	22:30	23:29	·· ··	06:43	07:22	08:10
35°	22:11	23:09	·· ··	07:00	07:41	08:30
30°	21:56	22:53	23:47	07:14	07:57	08:47
20°	21:29	22:24	23:18	07:39	08:25	09:15
N 10°	21:07	22:00	22:54	08:00	08:48	09:40
0°	20:45	21:37	22:31	08:20	09:10	10:03
S 10°	20:24	21:15	22:08	08:40	09:32	10:26
20°	20:02	20:50	21:43	09:01	09:56	10:50
30°	19:36	20:22	21:15	09:26	10:23	11:19
35°	19:21	20:05	20:58	09:40	10:40	11:36
40°	19:03	19:46	20:38	09:57	10:59	11:56
45°	18:42	19:23	20:14	10:18	11:22	12:20
S 50°	18:15	18:53	19:43	10:44	11:51	12:51
52°	18:02	18:38	19:28	10:56	12:06	13:06
54°	17:47	18:21	19:10	11:11	12:23	13:24
56°	17:30	18:00	18:48	11:28	12:44	13:46
58°	17:09	17:34	18:20	11:48	13:10	14:14
S 60°	16:43	16:58	17:39	12:14	13:46	14:55

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 18-20 92-79%
16	00:10	00:17	12:00	02:08	14:32	
17	00:24	00:31	11:59	02:58	15:24	
18	00:38	00:45	11:59	03:50	16:17	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2110 sec ΔT = TT-UT1 = +68.9730 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	207°21.0	212°59.3	N01°12.7	84°17.9	N22°16.0	129°13.9	N22°43.5	209°42.6	S03°10.2
1	222°23.4	228°01.1	12.4	99°19.2	15.8	144°15.8	43.5	224°44.8	10.1
2	237°25.9	243°02.8	12.2	114°20.6	15.5	159°17.8	43.5	239°47.0	10.0
3	252°28.4	258°04.5	·· 11.9	129°22.0	·· 15.2	174°19.8	·· 43.6	254°49.2	·· 09.9
4	267°30.8	273°06.3	11.6	144°23.4	14.9	189°21.7	43.6	269°51.4	09.8
5	282°33.3	288°08.0	11.4	159°24.8	14.7	204°23.7	43.7	284°53.6	09.7
6	297°35.8	303°09.7	N01°11.1	174°26.1	N22°14.4	219°25.7	N22°43.7	299°55.8	S03°09.6
7	312°38.2	318°11.5	10.9	189°27.5	14.1	234°27.6	43.8	314°58.1	09.5
8	327°40.7	333°13.2	10.6	204°28.9	13.8	249°29.6	43.8	330°00.3	09.4
9	342°43.1	348°14.9	·· 10.4	219°30.3	·· 13.5	264°31.5	·· 43.8	345°02.5	·· 09.3
10	357°45.6	3°16.6	10.1	234°31.7	13.3	279°33.5	43.9	0°04.7	09.2
11	12°48.1	18°18.3	09.9	249°33.0	13.0	294°35.5	43.9	15°06.9	09.1
12	27°50.5	33°20.0	N01°09.6	264°34.4	N22°12.7	309°37.4	N22°44.0	30°09.1	S03°09.0
13	42°53.0	48°21.7	09.4	279°35.8	12.4	324°39.4	44.0	45°11.3	08.9
14	57°55.5	63°23.4	09.2	294°37.2	12.1	339°41.4	44.1	60°13.5	08.8
15	72°57.9	78°25.1	·· 08.9	309°38.5	·· 11.9	354°43.3	·· 44.1	75°15.7	·· 08.7
16	88°00.4	93°26.8	08.7	324°39.9	11.6	9°45.3	44.2	90°17.9	08.5
17	103°02.9	108°28.5	08.5	339°41.3	11.3	24°47.2	44.2	105°20.1	08.4
18	118°05.3	123°30.2	N01°08.2	354°42.7	N22°11.0	39°49.2	N22°44.2	120°22.4	S03°08.3
19	133°07.8	138°31.9	08.0	9°44.0	10.7	54°51.2	44.3	135°24.6	08.2
20	148°10.3	153°33.6	07.8	24°45.4	10.4	69°53.1	44.3	150°26.8	08.1
21	163°12.7	168°35.3	·· 07.5	39°46.8	·· 10.2	84°55.1	·· 44.4	165°29.0	·· 08.0
22	178°15.2	183°36.9	07.3	54°48.2	09.9	99°57.0	44.4	180°31.2	07.9
23	193°17.6	198°38.6	07.1	69°49.5	09.6	114°59.0	44.5	195°33.4	07.8
Mer.pass. 10:09		ν 1.7′	d -0.3′	m -4.75	ν 1.4′	d -0.3′	m 0.76	ν 2.0′	d 0.0′ m -2.03	ν 2.2′	d 0.1′ m 1.17

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	208°20.1	213°40.3	N01°06.9	84°50.9	N22°09.3	130°01.0	N22°44.5	210°35.6	S03°07.7
1	223°22.6	228°42.0	06.6	99°52.3	09.0	145°02.9	44.5	225°37.8	07.6
2	238°25.0	243°43.6	06.4	114°53.7	08.8	160°04.9	44.6	240°40.0	07.5
3	253°27.5	258°45.3	·· 06.2	129°55.0	·· 08.5	175°06.9	·· 44.6	255°42.2	·· 07.4
4	268°30.0	273°46.9	06.0	144°56.4	08.2	190°08.8	44.7	270°44.4	07.3
5	283°32.4	288°48.6	05.8	159°57.8	07.9	205°10.8	44.7	285°46.7	07.2
6	298°34.9	303°50.3	N01°05.6	174°59.1	N22°07.6	220°12.7	N22°44.8	300°48.9	S03°07.1
7	313°37.4	318°51.9	05.4	190°00.5	07.3	235°14.7	44.8	315°51.1	07.0
8	328°39.8	333°53.6	05.1	205°01.9	07.1	250°16.7	44.8	330°53.3	06.9
9	343°42.3	348°55.2	·· 04.9	220°03.3	·· 06.8	265°18.6	·· 44.9	345°55.5	·· 06.8
10	358°44.8	3°56.8	04.7	235°04.6	06.5	280°20.6	44.9	0°57.7	06.7
11	13°47.2	18°58.5	04.5	250°06.0	06.2	295°22.5	45.0	15°59.9	06.6
12	28°49.7	34°00.1	N01°04.3	265°07.4	N22°05.9	310°24.5	N22°45.0	31°02.1	S03°06.5
13	43°52.1	49°01.7	04.1	280°08.7	05.6	325°26.4	45.1	46°04.3	06.4
14	58°54.6	64°03.4	03.9	295°10.1	05.3	340°28.4	45.1	61°06.5	06.3
15	73°57.1	79°05.0	·· 03.7	310°11.5	·· 05.1	355°30.4	·· 45.1	76°08.8	·· 06.2
16	88°59.5	94°06.6	03.5	325°12.8	04.8	10°32.3	45.2	91°11.0	06.1
17	104°02.0	109°08.2	03.3	340°14.2	04.5	25°34.3	45.2	106°13.2	06.0
18	119°04.5	124°09.9	N01°03.2	355°15.6	N22°04.2	40°36.2	N22°45.3	121°15.4	S03°05.8
19	134°06.9	139°11.5	03.0	10°16.9	03.9	55°38.2	45.3	136°17.6	05.7
20	149°09.4	154°13.1	02.8	25°18.3	03.6	70°40.2	45.4	151°19.8	05.6
21	164°11.9	169°14.7	·· 02.6	40°19.7	·· 03.3	85°42.1	·· 45.4	166°22.0	·· 05.5
22	179°14.3	184°16.3	02.4	55°21.0	03.1	100°44.1	45.4	181°24.2	05.4
23	194°16.8	199°17.9	02.2	70°22.4	02.8	115°46.0	45.5	196°26.4	05.3
Mer.pass. 10:05		ν 1.7′	d -0.2′	m -4.75	ν 1.4′	d -0.3′	m 0.78	ν 2.0′	d 0.0′ m -2.02	ν 2.2′	d 0.1′ m 1.17

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	209°19.3	214°19.5	N01°02.0	85°23.8	N22°02.5	130°48.0	N22°45.5	211°28.6	S03°05.2
1	224°21.7	229°21.1	01.9	100°25.1	02.2	145°49.9	45.6	226°30.9	05.1
2	239°24.2	244°22.7	01.7	115°26.5	01.9	160°51.9	45.6	241°33.1	05.0
3	254°26.6	259°24.3	·· 01.5	130°27.9	·· 01.6	175°53.8	·· 45.7	256°35.3	·· 04.9
4	269°29.1	274°25.9	01.3	145°29.2	01.3	190°55.8	45.7	271°37.5	04.8
5	284°31.6	289°27.4	01.2	160°30.6	01.1	205°57.8	45.7	286°39.7	04.7
6	299°34.0	304°29.0	N01°01.0	175°31.9	N22°00.8	220°59.7	N22°45.8	301°41.9	S03°04.6
7	314°36.5	319°30.6	00.8	190°33.3	00.5	236°01.7	45.8	316°44.1	04.5
8	329°39.0	334°32.2	00.7	205°34.7	22°00.2	251°03.6	45.9	331°46.3	04.4
9	344°41.4	349°33.8	·· 00.5	220°36.0	21°59.9	266°05.6	·· 45.9	346°48.5	·· 04.3
10	359°43.9	4°35.3	00.3	235°37.4	59.6	281°07.5	46.0	1°50.8	04.2
11	14°46.4	19°36.9	00.2	250°38.8	59.3	296°09.5	46.0	16°53.0	04.1
12	29°48.8	34°38.5	N01°00.0	265°40.1	N21°59.0	311°11.4	N22°46.0	31°55.2	S03°04.0
13	44°51.3	49°40.0	00°59.8	280°41.5	58.7	326°13.4	46.1	46°57.4	03.9
14	59°53.7	64°41.6	59.7	295°42.8	58.5	341°15.4	46.1	61°59.6	03.8
15	74°56.2	79°43.1	·· 59.5	310°44.2	·· 58.2	356°17.3	·· 46.2	77°01.8	·· 03.7
16	89°58.7	94°44.7	59.4	325°45.5	57.9	11°19.3	46.2	92°04.0	03.6
17	105°01.1	109°46.2	59.2	340°46.9	57.6	26°21.2	46.3	107°06.2	03.5
18	120°03.6	124°47.8	N00°59.1	355°48.3	N21°57.3	41°23.2	N22°46.3	122°08.5	S03°03.4
19	135°06.1	139°49.3	58.9	10°49.6	57.0	56°25.1	46.3	137°10.7	03.3
20	150°08.5	154°50.9	58.8	25°51.0	56.7	71°27.1	46.4	152°12.9	03.2
21	165°11.0	169°52.4	·· 58.6	40°52.3	·· 56.4	86°29.0	·· 46.4	167°15.1	·· 03.1
22	180°13.5	184°53.9	58.5	55°53.7	56.1	101°31.0	46.5	182°17.3	03.0
23	195°15.9	199°55.5	58.3	70°55.1	55.8	116°32.9	46.5	197°19.5	02.9
Mer.pass. 10:01		ν 1.6′	d -0.2′	m -4.76	ν 1.4′	d -0.3′	m 0.79	ν 2.0′	d 0.0′ m -2.02	ν 2.2′	d 0.1′ m 1.17

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.1
Schedar	349°31.4	56°40.4
Diphda	348°47.4	-17°50.9
Achernar	335°20.6	-57°06.5
Hamal	327°51.3	23°34.8
Polaris	314°24.4	89°22.3
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.2
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.5
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.5	-52°42.8
Sirius	258°26.2	-16°45.2
Adhara	255°05.8	-29°00.6
Procyon	244°50.7	5°09.5
Pollux	243°17.1	27°58.0
Avior	234°14.6	-59°35.7
Suhail	222°46.1	-43°32.3
Miaplacidus	221°38.0	-69°49.5
Alphard	217°47.4	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.2	61°37.0
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.3
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.1
Hadar	148°35.1	-60°29.8
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.4
Kochab	137°18.6	74°02.9
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°08.9	-69°04.2
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°41.8	51°28.8
Kaus Aust.	83°32.1	-34°22.3
Vega	80°32.9	38°48.1
Nunki	75°47.4	-26°15.9
Altair	61°59.7	8°55.9
Peacock	53°05.4	-56°39.0
Deneb	49°25.7	45°21.9
Enif	33°38.7	9°59.3
Al Na'ir	27°32.9	-46°50.2
Fomalhaut	15°14.5	-29°29.3
Scheat	13°45.3	28°13.0
Markab	13°29.9	15°20.3

Apr 19 Sat	SHA	Mer.pass
Venus	5°38.4	09:47
Mars	236°56.9	18:21
Jupiter	281°52.9	15:21
Saturn	2°21.6	10:00

Apr 20 Sun	SHA	Mer.pass
Venus	5°20.2	09:44
Mars	236°30.8	18:19
Jupiter	281°40.9	15:18
Saturn	2°15.5	09:56

Apr 21 Mon	SHA	Mer.pass
Venus	5°00.2	09:42
Mars	236°04.5	18:17
Jupiter	281°28.7	15:15
Saturn	2°09.4	09:53

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°12.8	N11°11.1	291°38.4	8.4′	S28°29.5	1.7′	55.3′
1	195°12.9	12.0	306°05.9	8.4′	28°27.8	1.9′	55.3′
2	210°13.1	12.8	320°33.3	8.4′	28°25.9	2.0′	55.3′
3	225°13.2	·· 13.7	335°00.7	8.4′	28°23.9	2.1′	55.3′
4	240°13.3	14.6	349°28.1	8.4′	28°21.8	2.3′	55.4′
5	255°13.5	15.4	3°55.5	8.4′	28°19.5	2.5′	55.4′
6	270°13.6	N11°16.3	18°22.9	8.4′	S28°17.0	2.6′	55.4′
7	285°13.7	17.2	32°50.3	8.4′	28°14.4	2.7′	55.4′
8	300°13.9	18.0	47°17.7	8.4′	28°11.7	2.9′	55.5′
9	315°14.0	·· 18.9	61°45.1	8.4′	28°08.8	3.1′	55.5′
10	330°14.1	19.7	76°12.5	8.4′	28°05.7	3.2′	55.5′
11	345°14.3	20.6	90°39.9	8.4′	28°02.5	3.4′	55.5′
12	0°14.4	N11°21.5	105°07.3	8.4′	S27°59.1	3.5′	55.6′
13	15°14.5	22.3	119°34.7	8.4′	27°55.6	3.6′	55.6′
14	30°14.7	23.2	134°02.1	8.4′	27°52.0	3.8′	55.6′
15	45°14.8	·· 24.0	148°29.5	8.4′	27°48.2	4.0′	55.6′
16	60°14.9	24.9	162°57.0	8.4′	27°44.2	4.1′	55.7′
17	75°15.1	25.8	177°24.4	8.5′	27°40.1	4.3′	55.7′
18	90°15.2	N11°26.6	191°51.9	8.5′	S27°35.8	4.4′	55.7′
19	105°15.3	27.5	206°19.3	8.5′	27°31.4	4.6′	55.8′
20	120°15.5	28.3	220°46.8	8.5′	27°26.8	4.7′	55.8′
21	135°15.6	·· 29.2	235°14.3	8.5′	27°22.1	4.9′	55.8′
22	150°15.7	30.1	249°41.8	8.5′	27°17.2	5.0′	55.8′
23	165°15.8	30.9	264°09.3	8.5′	27°12.2	5.2′	55.9′
	SD = 15.9′	d = 0.9′	SD = 15.1′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.0	N11°31.8	278°36.9	8.6′	S27°07.0	5.3′	55.9′
1	195°16.1	32.6	293°04.4	8.6′	27°01.7	5.5′	55.9′
2	210°16.2	33.5	307°32.0	8.6′	26°56.2	5.6′	56.0′
3	225°16.4	·· 34.3	321°59.6	8.6′	26°50.6	5.7′	56.0′
4	240°16.5	35.2	336°27.3	8.6′	26°44.9	5.9′	56.0′
5	255°16.6	36.1	350°54.9	8.7′	26°39.0	6.1′	56.0′
6	270°16.8	N11°36.9	5°22.6	8.7′	S26°32.9	6.2′	56.1′
7	285°16.9	37.8	19°50.3	8.7′	26°26.7	6.4′	56.1′
8	300°17.0	38.6	34°18.0	8.7′	26°20.3	6.5′	56.1′
9	315°17.2	·· 39.5	48°45.7	8.8′	26°13.8	6.6′	56.2′
10	330°17.3	40.3	63°13.5	8.8′	26°07.2	6.8′	56.2′
11	345°17.4	41.2	77°41.3	8.8′	26°00.4	6.9′	56.2′
12	0°17.5	N11°42.0	92°09.2	8.9′	S25°53.5	7.1′	56.3′
13	15°17.7	42.9	106°37.0	8.9′	25°46.4	7.3′	56.3′
14	30°17.8	43.7	121°04.9	8.9′	25°39.1	7.3′	56.3′
15	45°17.9	·· 44.6	135°32.8	9.0′	25°31.8	7.5′	56.4′
16	60°18.1	45.4	150°00.8	9.0′	25°24.3	7.7′	56.4′
17	75°18.2	46.3	164°28.8	9.0′	25°16.6	7.8′	56.4′
18	90°18.3	N11°47.1	178°56.8	9.1′	S25°08.8	7.9′	56.5′
19	105°18.4	48.0	193°24.9	9.1′	25°00.9	8.1′	56.5′
20	120°18.6	48.8	207°53.0	9.1′	24°52.8	8.2′	56.5′
21	135°18.7	·· 49.7	222°21.1	9.2′	24°44.6	8.4′	56.6′
22	150°18.8	50.5	236°49.3	9.2′	24°36.2	8.5′	56.6′
23	165°18.9	51.4	251°17.5	9.2′	24°27.7	8.6′	56.6′
	SD = 15.9′	d = 0.9′	SD = 15.2′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°19.1	N11°52.2	265°45.7	9.3′	S24°19.1	8.8′	56.7′
1	195°19.2	53.1	280°14.0	9.3′	24°10.3	8.9′	56.7′
2	210°19.3	53.9	294°42.3	9.3′	24°01.4	9.1′	56.7′
3	225°19.5	·· 54.8	309°10.6	9.4′	23°52.3	9.2′	56.8′
4	240°19.6	55.6	323°39.0	9.4′	23°43.1	9.3′	56.8′
5	255°19.7	56.5	338°07.4	9.5′	23°33.8	9.5′	56.8′
6	270°19.8	N11°57.3	352°35.9	9.5′	S23°24.3	9.6′	56.9′
7	285°20.0	58.2	7°04.4	9.5′	23°14.7	9.7′	56.9′
8	300°20.1	59.0	21°32.9	9.6′	23°05.0	9.9′	56.9′
9	315°20.2	11°59.9	36°01.5	9.6′	22°55.1	9.9′	57.0′
10	330°20.3	12°00.7	50°30.1	9.7′	22°45.2	10.2′	57.0′
11	345°20.5	01.6	64°58.8	9.7′	22°35.0	10.2′	57.1′
12	0°20.6	N12°02.4	79°27.5	9.7′	S22°24.8	10.4′	57.1′
13	15°20.7	03.3	93°56.2	9.8′	22°14.4	10.5′	57.1′
14	30°20.8	04.1	108°25.0	9.8′	22°03.9	10.7′	57.2′
15	45°20.9	·· 04.9	122°53.9	9.9′	21°53.2	10.7′	57.2′
16	60°21.1	05.8	137°22.7	9.9′	21°42.5	10.9′	57.2′
17	75°21.2	06.6	151°51.6	9.9′	21°31.6	11.1′	57.3′
18	90°21.3	N12°07.5	166°20.6	10.0′	S21°20.5	11.1′	57.3′
19	105°21.4	08.3	180°49.5	10.0′	21°09.4	11.3′	57.3′
20	120°21.6	09.2	195°18.6	10.1′	20°58.1	11.4′	57.4′
21	135°21.7	·· 10.0	209°47.6	10.1′	20°46.7	11.5′	57.4′
22	150°21.8	10.8	224°16.7	10.1′	20°35.2	11.7′	57.5′
23	165°21.9	11.7	238°45.9	10.2′	20°23.5	11.7′	57.5′
	SD = 15.9′	d = 0.8′	SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	00:52	03:08	20:54	23:30	–:–
N 70°	–:–	01:55	03:30	20:32	22:09	–:–
68°	–:–	02:30	03:46	20:14	21:33	–:–
66°	00:45	02:54	04:00	20:00	21:07	23:34
64°	01:41	03:13	04:11	19:49	20:48	22:23
62°	02:12	03:28	04:20	19:39	20:32	21:50
60°	02:34	03:40	04:28	19:31	20:19	21:27
N 58°	02:52	03:51	04:35	19:24	20:08	21:08
56°	03:07	04:00	04:42	19:17	19:59	20:53
54°	03:19	04:08	04:47	19:12	19:51	20:41
52°	03:29	04:16	04:52	19:07	19:43	20:30
50°	03:39	04:22	04:57	19:02	19:37	20:20
45°	03:58	04:35	05:07	18:52	19:23	20:01
N 40°	04:12	04:46	05:15	18:44	19:12	19:46
35°	04:24	04:55	05:22	18:37	19:03	19:34
30°	04:34	05:03	05:28	18:30	18:55	19:25
20°	04:49	05:15	05:38	18:20	18:42	19:09
N 10°	05:01	05:26	05:47	18:11	18:32	18:57
0°	05:10	05:34	05:55	18:02	18:23	18:48
S 10°	05:18	05:42	06:04	17:54	18:15	18:40
20°	05:24	05:50	06:12	17:45	18:07	18:33
30°	05:30	05:58	06:22	17:35	17:59	18:27
35°	05:32	06:02	06:28	17:29	17:55	18:25
40°	05:35	06:06	06:34	17:23	17:51	18:22
45°	05:37	06:11	06:41	17:16	17:46	18:20
S 50°	05:39	06:17	06:50	17:07	17:40	18:17
52°	05:40	06:20	06:54	17:03	17:37	18:17
54°	05:41	06:22	06:59	16:58	17:35	18:16
56°	05:42	06:25	07:04	16:53	17:32	18:15
58°	05:42	06:28	07:09	16:48	17:28	18:14
S 60°	05:43	06:32	07:15	16:41	17:25	18:13

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	05:43	▬	▬	07:32
64°	▬	▬	04:44	▬	▬	08:30
62°	▬	04:23	04:10	▬	07:00	09:04
60°	03:21	03:39	03:45	06:09	07:44	09:28
N 58°	02:41	03:10	03:25	06:49	08:12	09:47
56°	02:13	02:48	03:09	07:17	08:35	10:03
54°	01:51	02:29	02:54	07:38	08:53	10:17
52°	01:33	02:14	02:42	07:56	09:08	10:29
50°	01:18	02:00	02:31	08:12	09:21	10:39
45°	00:47	01:32	02:08	08:42	09:48	11:01
N 40°	00:23	01:10	01:50	09:06	10:10	11:18
35°	00:04	00:52	01:34	09:25	10:27	11:33
30°	·· ··	00:36	01:20	09:42	10:42	11:46
20°	·· ··	00:09	00:57	10:10	11:08	12:07
N 10°	23:46	·· ··	00:37	10:34	11:30	12:26
0°	23:25	·· ··	00:18	10:57	11:51	12:43
S 10°	23:03	23:59	·· ··	11:19	12:11	13:00
20°	22:40	23:39	·· ··	11:43	12:33	13:18
30°	22:13	23:15	·· ··	12:11	12:58	13:39
35°	21:57	23:01	·· ··	12:27	13:12	13:51
40°	21:38	22:45	23:56	12:46	13:29	14:05
45°	21:16	22:26	23:41	13:09	13:49	14:22
S 50°	20:47	22:01	23:22	13:39	14:15	14:42
52°	20:33	21:50	23:13	13:53	14:27	14:51
54°	20:16	21:36	23:03	14:10	14:41	15:02
56°	19:57	21:21	22:52	14:30	14:57	15:14
58°	19:32	21:02	22:39	14:54	15:16	15:27
S 60°	18:59	20:39	22:24	15:28	15:39	15:43

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 21-23 70-51%
19	00:51	00:58	11:59	04:44	17:11	
20	01:04	01:10	11:59	05:38	18:04	
21	01:16	01:22	11:59	06:31	18:57	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2117 sec ΔT = TT-UT1 = +68.9723 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	210°18.4	214°57.0	N00°58.2	85°56.4	N21°55.6	131°34.9	N22°46.6	212°21.7	S03°02.8
1	225°20.9	229°58.5	58.1	100°57.8	55.3	146°36.8	46.6	227°23.9	02.7
2	240°23.3	245°00.0	57.9	115°59.1	55.0	161°38.8	46.6	242°26.1	02.6
3	255°25.8	260°01.6	·· 57.8	131°00.5	·· 54.7	176°40.8	·· 46.7	257°28.4	·· 02.5
4	270°28.2	275°03.1	57.6	146°01.8	54.4	191°42.7	46.7	272°30.6	02.4
5	285°30.7	290°04.6	57.5	161°03.2	54.1	206°44.7	46.8	287°32.8	02.3
6	300°33.2	305°06.1	N00°57.4	176°04.5	N21°53.8	221°46.6	N22°46.8	302°35.0	S03°02.2
7	315°35.6	320°07.6	57.3	191°05.9	53.5	236°48.6	46.8	317°37.2	02.0
8	330°38.1	335°09.1	57.1	206°07.2	53.2	251°50.5	46.9	332°39.4	01.9
9	345°40.6	350°10.6	·· 57.0	221°08.6	·· 52.9	266°52.5	·· 46.9	347°41.6	·· 01.8
10	0°43.0	5°12.1	56.9	236°10.0	52.6	281°54.4	47.0	2°43.9	01.7
11	15°45.5	20°13.6	56.7	251°11.3	52.3	296°56.4	47.0	17°46.1	01.6
12	30°48.0	35°15.1	N00°56.6	266°12.7	N21°52.0	311°58.3	N22°47.1	32°48.3	S03°01.5
13	45°50.4	50°16.6	56.5	281°14.0	51.8	327°00.3	47.1	47°50.5	01.4
14	60°52.9	65°18.1	56.4	296°15.4	51.5	342°02.2	47.1	62°52.7	01.3
15	75°55.4	80°19.6	·· 56.3	311°16.7	·· 51.2	357°04.2	·· 47.2	77°54.9	·· 01.2
16	90°57.8	95°21.1	56.2	326°18.1	50.9	12°06.1	47.2	92°57.1	01.1
17	106°00.3	110°22.6	56.0	341°19.4	50.6	27°08.1	47.3	107°59.3	01.0
18	121°02.7	125°24.0	N00°55.9	356°20.8	N21°50.3	42°10.0	N22°47.3	123°01.6	S03°00.9
19	136°05.2	140°25.5	55.8	11°22.1	50.0	57°12.0	47.4	138°03.8	00.8
20	151°07.7	155°27.0	55.7	26°23.5	49.7	72°13.9	47.4	153°06.0	00.7
21	166°10.1	170°28.5	·· 55.6	41°24.8	·· 49.4	87°15.9	·· 47.4	168°08.2	·· 00.6
22	181°12.6	185°29.9	55.5	56°26.2	49.1	102°17.8	47.5	183°10.4	00.5
23	196°15.1	200°31.4	55.4	71°27.5	48.8	117°19.8	47.5	198°12.6	00.4
Mer.pass.	09:57	ν 1.5′	d -0.1′	m -4.76	ν 1.4′	d -0.3′	m 0.81	ν 2.0′	d 0.0′ m -2.01	ν 2.2′	d 0.1′ m 1.17

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	211°17.5	215°32.9	N00°55.3	86°28.9	N21°48.5	132°21.7	N22°47.6	213°14.8	S03°00.3
1	226°20.0	230°34.3	55.2	101°30.2	48.2	147°23.7	47.6	228°17.1	00.2
2	241°22.5	245°35.8	55.1	116°31.5	47.9	162°25.6	47.6	243°19.3	00.1
3	256°24.9	260°37.2	·· 55.0	131°32.9	·· 47.6	177°27.6	·· 47.7	258°21.5	03°00.0
4	271°27.4	275°38.7	54.9	146°34.2	47.3	192°29.5	47.7	273°23.7	02°59.9
5	286°29.9	290°40.1	54.8	161°35.6	47.0	207°31.5	47.8	288°25.9	59.8
6	301°32.3	305°41.6	N00°54.7	176°36.9	N21°46.7	222°33.4	N22°47.8	303°28.1	S02°59.7
7	316°34.8	320°43.0	54.6	191°38.3	46.4	237°35.4	47.9	318°30.3	59.6
8	331°37.2	335°44.5	54.5	206°39.6	46.1	252°37.3	47.9	333°32.6	59.5
9	346°39.7	350°45.9	·· 54.5	221°41.0	·· 45.8	267°39.3	·· 47.9	348°34.8	·· 59.4
10	1°42.2	5°47.3	54.4	236°42.3	45.6	282°41.2	48.0	3°37.0	59.3
11	16°44.6	20°48.8	54.3	251°43.7	45.3	297°43.1	48.0	18°39.2	59.2
12	31°47.1	35°50.2	N00°54.2	266°45.0	N21°45.0	312°45.1	N22°48.1	33°41.4	S02°59.1
13	46°49.6	50°51.6	54.1	281°46.3	44.7	327°47.0	48.1	48°43.6	59.0
14	61°52.0	65°53.0	54.0	296°47.7	44.4	342°49.0	48.1	63°45.8	58.9
15	76°54.5	80°54.5	·· 54.0	311°49.0	·· 44.1	357°50.9	·· 48.2	78°48.1	·· 58.8
16	91°57.0	95°55.9	53.9	326°50.4	43.8	12°52.9	48.2	93°50.3	58.7
17	106°59.4	110°57.3	53.8	341°51.7	43.5	27°54.8	48.3	108°52.5	58.6
18	122°01.9	125°58.7	N00°53.7	356°53.1	N21°43.2	42°56.8	N22°48.3	123°54.7	S02°58.5
19	137°04.3	141°00.1	53.7	11°54.4	42.9	57°58.7	48.4	138°56.9	58.4
20	152°06.8	156°01.5	53.6	26°55.7	42.6	73°00.7	48.4	153°59.1	58.3
21	167°09.3	171°02.9	·· 53.5	41°57.1	·· 42.3	88°02.6	·· 48.4	169°01.4	·· 58.2
22	182°11.7	186°04.3	53.5	56°58.4	42.0	103°04.6	48.5	184°03.6	58.1
23	197°14.2	201°05.7	53.4	71°59.8	41.7	118°06.5	48.5	199°05.8	58.0
Mer.pass.	09:53	ν 1.5′	d -0.1′	m -4.76	ν 1.3′	d -0.3′	m 0.82	ν 1.9′	d 0.0′ m -2.01	ν 2.2′	d 0.1′ m 1.17

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	212°16.7	216°07.1	N00°53.3	87°01.1	N21°41.4	133°08.5	N22°48.6	214°08.0	S02°57.9
1	227°19.1	231°08.5	53.3	102°02.4	41.1	148°10.4	48.6	229°10.2	57.8
2	242°21.6	246°09.9	53.2	117°03.8	40.8	163°12.3	48.6	244°12.4	57.7
3	257°24.1	261°11.3	·· 53.2	132°05.1	·· 40.5	178°14.3	·· 48.7	259°14.6	·· 57.6
4	272°26.5	276°12.7	53.1	147°06.5	40.2	193°16.2	48.7	274°16.9	57.5
5	287°29.0	291°14.1	53.1	162°07.8	39.9	208°18.2	48.8	289°19.1	57.4
6	302°31.5	306°15.5	N00°53.0	177°09.1	N21°39.6	223°20.1	N22°48.8	304°21.3	S02°57.3
7	317°33.9	321°16.9	52.9	192°10.5	39.3	238°22.1	48.9	319°23.5	57.2
8	332°36.4	336°18.2	52.9	207°11.8	39.0	253°24.0	48.9	334°25.7	57.1
9	347°38.8	351°19.6	·· 52.8	222°13.1	·· 38.7	268°26.0	·· 48.9	349°27.9	·· 57.0
10	2°41.3	6°21.0	52.8	237°14.5	38.4	283°27.9	49.0	4°30.2	56.9
11	17°43.8	21°22.3	52.8	252°15.8	38.1	298°29.8	49.0	19°32.4	56.8
12	32°46.2	36°23.7	N00°52.7	267°17.2	N21°37.8	313°31.8	N22°49.1	34°34.6	S02°56.7
13	47°48.7	51°25.1	52.7	282°18.5	37.5	328°33.7	49.1	49°36.8	56.6
14	62°51.2	66°26.4	52.6	297°19.8	37.2	343°35.7	49.1	64°39.0	56.5
15	77°53.6	81°27.8	·· 52.6	312°21.2	·· 36.9	358°37.6	·· 49.2	79°41.2	·· 56.4
16	92°56.1	96°29.2	52.6	327°22.5	36.5	13°39.6	49.2	94°43.5	56.3
17	107°58.6	111°30.5	52.5	342°23.8	36.2	28°41.5	49.3	109°45.7	56.2
18	123°01.0	126°31.9	N00°52.5	357°25.2	N21°35.9	43°43.4	N22°49.3	124°47.9	S02°56.1
19	138°03.5	141°33.2	52.4	12°26.5	35.6	58°45.4	49.3	139°50.1	56.0
20	153°05.9	156°34.6	52.4	27°27.8	35.3	73°47.3	49.4	154°52.3	55.9
21	168°08.4	171°35.9	·· 52.4	42°29.2	·· 35.0	88°49.3	·· 49.4	169°54.5	·· 55.8
22	183°10.9	186°37.2	52.4	57°30.5	34.7	103°51.2	49.5	184°56.8	55.7
23	198°13.3	201°38.6	52.3	72°31.8	34.4	118°53.2	49.5	199°59.0	55.6
Mer.pass.	09:49	ν 1.4′	d -0.1′	m -4.75	ν 1.3′	d -0.3′	m 0.84	ν 1.9′	d 0.0′ m -2.01	ν 2.2′	d 0.1′ m 1.17

Stars	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.1
Schedar	349°31.4	56°40.4
Diphda	348°47.4	-17°50.9
Achernar	335°20.6	-57°06.5
Hamal	327°51.3	23°34.8
Polaris	314°24.7	89°22.3
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.8	28°37.8
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.6	-52°42.8
Sirius	258°26.2	-16°45.2
Adhara	255°05.8	-29°00.6
Procyon	244°50.7	5°09.5
Pollux	243°17.1	27°58.0
Avior	234°14.7	-59°35.7
Suhail	222°46.1	-43°32.3
Miaplacidus	221°38.1	-69°49.5
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.3	61°37.0
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.5
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.4
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.1
Hadar	148°35.1	-60°29.8
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.4
Kochab	137°18.6	74°02.9
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°08.9	-69°04.2
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°41.8	51°28.8
Kaus Aust.	83°32.0	-34°22.3
Vega	80°32.9	38°48.1
Nunki	75°47.4	-26°15.9
Altair	61°59.7	8°55.9
Peacock	53°05.4	-56°39.0
Deneb	49°25.7	45°21.9
Enif	33°38.7	9°59.3
Al Na'ir	27°32.8	-46°50.2
Fomalhaut	15°14.5	-29°29.3
Scheat	13°45.2	28°13.0
Markab	13°29.9	15°20.3

Apr 22 Tue	SHA	Mer.pass
Venus	4°38.6	09:39
Mars	235°38.0	18:15
Jupiter	281°16.5	15:12
Saturn	2°03.3	09:49

Apr 23 Wed	SHA	Mer.pass
Venus	4°15.3	09:37
Mars	235°11.3	18:12
Jupiter	281°04.2	15:09
Saturn	1°57.3	09:46

Apr 24 Thu	SHA	Mer.pass
Venus	3°50.5	09:35
Mars	234°44.4	18:10
Jupiter	280°51.8	15:05
Saturn	1°51.3	09:42

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°22.0	N12°12.5	253°15.1	10.2′	S20°11.8	11.9′	57.5′
1	195°22.2	13.4	267°44.3	10.3′	19°59.9	12.0′	57.6′
2	210°22.3	14.2	282°13.5	10.3′	19°47.9	12.1′	57.6′
3	225°22.4	·· 15.0	296°42.9	10.3′	19°35.8	12.3′	57.6′
4	240°22.5	15.9	311°12.2	10.4′	19°23.5	12.3′	57.7′
5	255°22.7	16.7	325°41.6	10.4′	19°11.2	12.5′	57.7′
6	270°22.8	N12°17.6	340°11.0	10.5′	S18°58.7	12.6′	57.8′
7	285°22.9	18.4	354°40.4	10.5′	18°46.1	12.7′	57.8′
8	300°23.0	19.2	9°09.9	10.5′	18°33.4	12.8′	57.8′
9	315°23.1	·· 20.1	23°39.5	10.6′	18°20.6	12.9′	57.9′
10	330°23.3	20.9	38°09.0	10.6′	18°07.7	13.0′	57.9′
11	345°23.4	21.7	52°38.6	10.6′	17°54.7	13.2′	58.0′
12	0°23.5	N12°22.6	67°08.3	10.7′	S17°41.5	13.2′	58.0′
13	15°23.6	23.4	81°37.9	10.7′	17°28.3	13.4′	58.0′
14	30°23.7	24.3	96°07.6	10.7′	17°14.9	13.5′	58.1′
15	45°23.9	·· 25.1	110°37.4	10.8′	17°01.4	13.5′	58.1′
16	60°24.0	25.9	125°07.2	10.8′	16°47.9	13.7′	58.1′
17	75°24.1	26.8	139°37.0	10.8′	16°34.2	13.8′	58.2′
18	90°24.2	N12°27.6	154°06.8	10.9′	S16°20.4	13.9′	58.2′
19	105°24.3	28.4	168°36.7	10.9′	16°06.5	14.0′	58.3′
20	120°24.4	29.3	183°06.6	10.9′	15°52.5	14.0′	58.3′
21	135°24.6	·· 30.1	197°36.5	11.0′	15°38.5	14.2′	58.3′
22	150°24.7	30.9	212°06.5	11.0′	15°24.3	14.3′	58.4′
23	165°24.8	31.8	226°36.4	11.0′	15°10.0	14.4′	58.4′
	SD = 15.9′	d = 0.8′	SD = 15.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°24.9	N12°32.6	241°06.5	11.0′	S14°55.6	14.5′	58.5′
1	195°25.0	33.4	255°36.5	11.1′	14°41.1	14.5′	58.5′
2	210°25.1	34.3	270°06.6	11.1′	14°26.6	14.7′	58.5′
3	225°25.3	·· 35.1	284°36.7	11.1′	14°11.9	14.8′	58.6′
4	240°25.4	35.9	299°06.8	11.1′	13°57.1	14.8′	58.6′
5	255°25.5	36.8	313°36.9	11.2′	13°42.3	15.0′	58.7′
6	270°25.6	N12°37.6	328°07.1	11.2′	S13°27.3	15.0′	58.7′
7	285°25.7	38.4	342°37.3	11.2′	13°12.3	15.1′	58.7′
8	300°25.8	39.2	357°07.5	11.2′	12°57.2	15.2′	58.8′
9	315°26.0	·· 40.1	11°37.8	11.3′	12°42.0	15.3′	58.8′
10	330°26.1	40.9	26°08.0	11.3′	12°26.7	15.4′	58.9′
11	345°26.2	41.7	40°38.3	11.3′	12°11.3	15.4′	58.9′
12	0°26.3	N12°42.6	55°08.6	11.3′	S11°55.9	15.6′	58.9′
13	15°26.4	43.4	69°38.9	11.3′	11°40.3	15.6′	59.0′
14	30°26.5	44.2	84°09.2	11.3′	11°24.7	15.7′	59.0′
15	45°26.6	·· 45.0	98°39.6	11.4′	11°09.0	15.8′	59.0′
16	60°26.7	45.9	113°09.9	11.4′	10°53.2	15.8′	59.1′
17	75°26.9	46.7	127°40.3	11.4′	10°37.4	16.0′	59.1′
18	90°27.0	N12°47.5	142°10.7	11.4′	S10°21.4	16.0′	59.2′
19	105°27.1	48.3	156°41.0	11.4′	10°05.4	16.0′	59.2′
20	120°27.2	49.2	171°11.4	11.4′	09°49.4	16.2′	59.2′
21	135°27.3	·· 50.0	185°41.9	11.4′	09°33.2	16.2′	59.3′
22	150°27.4	50.8	200°12.3	11.4′	09°17.0	16.3′	59.3′
23	165°27.5	51.6	214°42.7	11.4′	09°00.7	16.4′	59.3′
	SD = 15.9′	d = 0.8′	SD = 15.9′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°27.6	N12°52.5	229°13.1	11.4′	S08°44.3	16.4′	59.4′
1	195°27.8	53.3	243°43.6	11.4′	08°27.9	16.5′	59.4′
2	210°27.9	54.1	258°14.0	11.4′	08°11.4	16.5′	59.5′
3	225°28.0	·· 54.9	272°44.4	11.4′	07°54.9	16.7′	59.5′
4	240°28.1	55.8	287°14.9	11.4′	07°38.2	16.6′	59.5′
5	255°28.2	56.6	301°45.3	11.4′	07°21.6	16.8′	59.6′
6	270°28.3	N12°57.4	316°15.8	11.4′	S07°04.8	16.8′	59.6′
7	285°28.4	58.2	330°46.2	11.4′	06°48.0	16.8′	59.6′
8	300°28.5	59.0	345°16.6	11.4′	06°31.2	16.9′	59.7′
9	315°28.6	12°59.9	359°47.1	11.4′	06°14.3	17.0′	59.7′
10	330°28.8	13°00.7	14°17.5	11.4′	05°57.3	17.0′	59.7′
11	345°28.9	01.5	28°47.9	11.4′	05°40.3	17.0′	59.8′
12	0°29.0	N13°02.3	43°18.3	11.4′	S05°23.3	17.1′	59.8′
13	15°29.1	03.1	57°48.7	11.4′	05°06.2	17.2′	59.9′
14	30°29.2	04.0	72°19.1	11.4′	04°49.0	17.2′	59.9′
15	45°29.3	·· 04.8	86°49.5	11.4′	04°31.8	17.2′	59.9′
16	60°29.4	05.6	101°19.8	11.3′	04°14.6	17.3′	60.0′
17	75°29.5	06.4	115°50.2	11.3′	03°57.3	17.4′	60.0′
18	90°29.6	N13°07.2	130°20.5	11.3′	S03°39.9	17.3′	60.0′
19	105°29.7	08.1	144°50.8	11.3′	03°22.6	17.4′	60.1′
20	120°29.8	08.9	159°21.1	11.3′	03°05.2	17.5′	60.1′
21	135°29.9	·· 09.7	173°51.4	11.3′	02°47.7	17.5′	60.1′
22	150°30.1	10.5	188°21.6	11.2′	02°30.2	17.5′	60.2′
23	165°30.2	11.3	202°51.9	11.2′	02°12.7	17.5′	60.2′
	SD = 15.9′	d = 0.8′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:49	21:12	–:–	–:–
N 70°	–:–	01:27	03:14	20:46	22:39	–:–
68°	–:–	02:11	03:33	20:27	21:51	–:–
66°	–:–	02:39	03:48	20:11	21:22	–:–
64°	01:16	03:00	04:00	19:58	21:00	22:49
62°	01:55	03:17	04:11	19:48	20:42	22:06
60°	02:21	03:31	04:20	19:38	20:28	21:39
N 58°	02:41	03:42	04:28	19:31	20:16	21:19
56°	02:57	03:52	04:34	19:24	20:06	21:02
54°	03:10	04:01	04:40	19:17	19:57	20:48
52°	03:22	04:09	04:46	19:12	19:49	20:37
50°	03:32	04:16	04:51	19:07	19:42	20:27
45°	03:52	04:30	05:02	18:56	19:27	20:06
N 40°	04:07	04:42	05:10	18:47	19:15	19:50
35°	04:20	04:51	05:18	18:39	19:06	19:37
30°	04:30	05:00	05:25	18:32	18:57	19:27
20°	04:47	05:13	05:36	18:21	18:44	19:10
N 10°	04:59	05:24	05:46	18:11	18:32	18:58
0°	05:09	05:34	05:55	18:02	18:23	18:47
S 10°	05:18	05:42	06:04	17:52	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:05	18:31
30°	05:31	06:00	06:24	17:32	17:57	18:25
35°	05:35	06:04	06:30	17:26	17:52	18:21
40°	05:38	06:09	06:37	17:19	17:47	18:18
45°	05:41	06:15	06:45	17:11	17:41	18:15
S 50°	05:43	06:21	06:55	17:01	17:34	18:12
52°	05:45	06:24	06:59	16:56	17:31	18:11
54°	05:46	06:27	07:04	16:52	17:28	18:10
56°	05:47	06:31	07:10	16:46	17:25	18:08
58°	05:48	06:34	07:16	16:40	17:21	18:07
S 60°	05:50	06:38	07:22	16:33	17:17	18:06

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	▬	05:22	04:30	▬	11:32	14:09
N 70°	06:07	04:56	04:19	08:59	11:55	14:17
68°	05:17	04:37	04:10	09:47	12:12	14:23
66°	04:45	04:21	04:03	10:18	12:27	14:28
64°	04:22	04:08	03:56	10:40	12:38	14:32
62°	04:03	03:56	03:51	10:58	12:48	14:35
60°	03:47	03:47	03:46	11:13	12:56	14:38
N 58°	03:33	03:38	03:42	11:25	13:03	14:41
56°	03:22	03:31	03:38	11:36	13:10	14:44
54°	03:12	03:24	03:34	11:45	13:15	14:46
52°	03:03	03:18	03:31	11:54	13:20	14:48
50°	02:54	03:13	03:28	12:01	13:25	14:49
45°	02:37	03:01	03:22	12:17	13:35	14:53
N 40°	02:23	02:51	03:17	12:30	13:43	14:56
35°	02:10	02:43	03:12	12:41	13:50	14:59
30°	02:00	02:35	03:08	12:51	13:56	15:02
20°	01:41	02:22	03:01	13:07	14:06	15:06
N 10°	01:25	02:11	02:55	13:21	14:15	15:09
0°	01:10	02:00	02:49	13:34	14:24	15:12
S 10°	00:55	01:49	02:43	13:47	14:32	15:16
20°	00:38	01:38	02:37	14:01	14:41	15:19
30°	00:19	01:24	02:30	14:17	14:51	15:23
35°	00:08	01:17	02:26	14:26	14:56	15:25
40°	·· ··	01:08	02:21	14:36	15:03	15:28
45°	·· ··	00:58	02:16	14:48	15:10	15:30
S 50°	·· ··	00:45	02:09	15:02	15:19	15:34
52°	·· ··	00:39	02:06	15:09	15:23	15:35
54°	·· ··	00:32	02:03	15:16	15:27	15:37
56°	·· ··	00:25	01:59	15:24	15:32	15:39
58°	·· ··	00:17	01:55	15:34	15:38	15:41
S 60°	·· ··	00:07	01:50	15:44	15:44	15:43

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 24-26 40-20%
22	01:28	01:34	11:58	07:22	19:47	
23	01:40	01:45	11:58	08:12	20:36	
24	01:51	01:56	11:58	09:01	21:25	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2124 sec ΔT = TT-UT1 = +68.9716 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	213°15.8	216°39.9	N00°52.3	87°33.2	N21°34.1	133°55.1	N22°49.6	215°01.2	S02°55.5
1	228°18.3	231°41.3	52.3	102°34.5	33.8	148°57.0	49.6	230°03.4	55.4
2	243°20.7	246°42.6	52.3	117°35.8	33.5	163°59.0	49.6	245°05.6	55.3
3	258°23.2	261°43.9	·· 52.2	132°37.2	·· 33.2	179°00.9	·· 49.7	260°07.9	·· 55.2
4	273°25.7	276°45.2	52.2	147°38.5	32.9	194°02.9	49.7	275°10.1	55.1
5	288°28.1	291°46.6	52.2	162°39.8	32.6	209°04.8	49.8	290°12.3	55.0
6	303°30.6	306°47.9	N00°52.2	177°41.1	N21°32.3	224°06.7	N22°49.8	305°14.5	S02°54.9
7	318°33.1	321°49.2	52.2	192°42.5	32.0	239°08.7	49.8	320°16.7	54.8
8	333°35.5	336°50.5	52.2	207°43.8	31.7	254°10.6	49.9	335°18.9	54.7
9	348°38.0	351°51.8	·· 52.1	222°45.1	·· 31.4	269°12.6	·· 49.9	350°21.2	·· 54.6
10	3°40.4	6°53.1	52.1	237°46.5	31.1	284°14.5	50.0	5°23.4	54.5
11	18°42.9	21°54.5	52.1	252°47.8	30.8	299°16.5	50.0	20°25.6	54.4
12	33°45.4	36°55.8	N00°52.1	267°49.1	N21°30.5	314°18.4	N22°50.0	35°27.8	S02°54.3
13	48°47.8	51°57.1	52.1	282°50.4	30.1	329°20.3	50.1	50°30.0	54.2
14	63°50.3	66°58.4	52.1	297°51.8	29.8	344°22.3	50.1	65°32.3	54.1
15	78°52.8	81°59.7	·· 52.1	312°53.1	·· 29.5	359°24.2	·· 50.2	80°34.5	·· 54.0
16	93°55.2	97°01.0	52.1	327°54.4	29.2	14°26.1	50.2	95°36.7	53.9
17	108°57.7	112°02.3	52.1	342°55.8	28.9	29°28.1	50.2	110°38.9	53.8
18	124°00.2	127°03.5	N00°52.1	357°57.1	N21°28.6	44°30.0	N22°50.3	125°41.1	S02°53.7
19	139°02.6	142°04.8	52.1	12°58.4	28.3	59°32.0	50.3	140°43.3	53.6
20	154°05.1	157°06.1	52.1	27°59.7	28.0	74°33.9	50.4	155°45.6	53.5
21	169°07.5	172°07.4	·· 52.1	43°01.1	·· 27.7	89°35.8	·· 50.4	170°47.8	·· 53.4
22	184°10.0	187°08.7	52.1	58°02.4	27.4	104°37.8	50.4	185°50.0	53.3
23	199°12.5	202°10.0	52.2	73°03.7	27.1	119°39.7	50.5	200°52.2	53.2
Mer.pass.	09:45	ν 1.3′	d -0.0′	m -4.75	ν 1.3′	d -0.3′	m 0.85	ν 1.9′	d 0.0′	m -2.00	ν 2.2′	d 0.1′	m 1.17

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	214°14.9	217°11.2	N00°52.2	88°05.0	N21°26.8	134°41.7	N22°50.5	215°54.4	S02°53.1
1	229°17.4	232°12.5	52.2	103°06.4	26.5	149°43.6	50.6	230°56.7	53.0
2	244°19.9	247°13.8	52.2	118°07.7	26.1	164°45.5	50.6	245°58.9	52.9
3	259°22.3	262°15.1	·· 52.2	133°09.0	·· 25.8	179°47.5	·· 50.6	261°01.1	·· 52.8
4	274°24.8	277°16.3	52.2	148°10.3	25.5	194°49.4	50.7	276°03.3	52.7
5	289°27.3	292°17.6	52.2	163°11.7	25.2	209°51.3	50.7	291°05.5	52.6
6	304°29.7	307°18.9	N00°52.3	178°13.0	N21°24.9	224°53.3	N22°50.8	306°07.8	S02°52.5
7	319°32.2	322°20.1	52.3	193°14.3	24.6	239°55.2	50.8	321°10.0	52.4
8	334°34.7	337°21.4	52.3	208°15.6	24.3	254°57.2	50.9	336°12.2	52.3
9	349°37.1	352°22.6	·· 52.3	223°16.9	·· 24.0	269°59.1	·· 50.9	351°14.4	·· 52.2
10	4°39.6	7°23.9	52.4	238°18.3	23.7	285°01.0	50.9	6°16.6	52.1
11	19°42.0	22°25.1	52.4	253°19.6	23.4	300°03.0	51.0	21°18.9	52.0
12	34°44.5	37°26.4	N00°52.4	268°20.9	N21°23.0	315°04.9	N22°51.0	36°21.1	S02°51.9
13	49°47.0	52°27.6	52.5	283°22.2	22.7	330°06.8	51.1	51°23.3	51.8
14	64°49.4	67°28.9	52.5	298°23.5	22.4	345°08.8	51.1	66°25.5	51.7
15	79°51.9	82°30.1	·· 52.5	313°24.9	·· 22.1	0°10.7	·· 51.1	81°27.7	·· 51.6
16	94°54.4	97°31.4	52.6	328°26.2	21.8	15°12.7	51.2	96°30.0	51.5
17	109°56.8	112°32.6	52.6	343°27.5	21.5	30°14.6	51.2	111°32.2	51.4
18	124°59.3	127°33.8	N00°52.6	358°28.8	N21°21.2	45°16.5	N22°51.3	126°34.4	S02°51.3
19	140°01.8	142°35.1	52.7	13°30.1	20.9	60°18.5	51.3	141°36.6	51.2
20	155°04.2	157°36.3	52.7	28°31.5	20.5	75°20.4	51.3	156°38.8	51.1
21	170°06.7	172°37.5	·· 52.8	43°32.8	·· 20.2	90°22.3	·· 51.4	171°41.1	·· 51.0
22	185°09.2	187°38.7	52.8	58°34.1	19.9	105°24.3	51.4	186°43.3	50.9
23	200°11.6	202°40.0	52.8	73°35.4	19.6	120°26.2	51.5	201°45.5	50.8
Mer.pass.	09:41	ν 1.3′	d 0.0′	m -4.75	ν 1.3′	d -0.3′	m 0.87	ν 1.9′	d 0.0′	m -2.00	ν 2.2′	d 0.1′	m 1.17

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	215°14.1	217°41.2	N00°52.9	88°36.7	N21°19.3	135°28.1	N22°51.5	216°47.7	S02°50.7
1	230°16.5	232°42.4	52.9	103°38.0	19.0	150°30.1	51.5	231°49.9	50.6
2	245°19.0	247°43.6	53.0	118°39.4	18.7	165°32.0	51.6	246°52.2	50.5
3	260°21.5	262°44.8	·· 53.0	133°40.7	·· 18.4	180°33.9	·· 51.6	261°54.4	·· 50.4
4	275°23.9	277°46.0	53.1	148°42.0	18.0	195°35.9	51.7	276°56.6	50.3
5	290°26.4	292°47.3	53.2	163°43.3	17.7	210°37.8	51.7	291°58.8	50.2
6	305°28.9	307°48.5	N00°53.2	178°44.6	N21°17.4	225°39.7	N22°51.7	307°01.1	S02°50.2
7	320°31.3	322°49.7	53.3	193°45.9	17.1	240°41.7	51.8	322°03.3	50.1
8	335°33.8	337°50.9	53.3	208°47.3	16.8	255°43.6	51.8	337°05.5	50.0
9	350°36.3	352°52.1	·· 53.4	223°48.6	·· 16.5	270°45.5	·· 51.9	352°07.7	·· 49.9
10	5°38.7	7°53.3	53.4	238°49.9	16.2	285°47.5	51.9	7°09.9	49.8
11	20°41.2	22°54.5	53.5	253°51.2	15.8	300°49.4	51.9	22°12.2	49.7
12	35°43.6	37°55.7	N00°53.6	268°52.5	N21°15.5	315°51.3	N22°52.0	37°14.4	S02°49.6
13	50°46.1	52°56.8	53.6	283°53.8	15.2	330°53.3	52.0	52°16.6	49.5
14	65°48.6	67°58.0	53.7	298°55.1	14.9	345°55.2	52.0	67°18.8	49.4
15	80°51.0	82°59.2	·· 53.8	313°56.4	·· 14.6	0°57.1	·· 52.1	82°21.0	·· 49.3
16	95°53.5	98°00.4	53.9	328°57.8	14.3	15°59.1	52.1	97°23.3	49.2
17	110°56.0	113°01.6	53.9	343°59.1	13.9	31°01.0	52.2	112°25.5	49.1
18	125°58.4	128°02.8	N00°54.0	359°00.4	N21°13.6	46°02.9	N22°52.2	127°27.7	S02°49.0
19	141°00.9	143°03.9	54.1	14°01.7	13.3	61°04.9	52.2	142°29.9	48.9
20	156°03.4	158°05.1	54.2	29°03.0	13.0	76°06.8	52.3	157°32.2	48.8
21	171°05.8	173°06.3	·· 54.2	44°04.3	·· 12.7	91°08.7	·· 52.3	172°34.4	·· 48.7
22	186°08.3	188°07.5	54.3	59°05.6	12.4	106°10.7	52.4	187°36.6	48.6
23	201°10.8	203°08.6	54.4	74°06.9	12.0	121°12.6	52.4	202°38.8	48.5
Mer.pass.	09:37	ν 1.2′	d 0.0′	m -4.74	ν 1.3′	d -0.3′	m 0.88	ν 1.9′	d 0.0′	m -2.00	ν 2.2′	d 0.1′	m 1.17

Stars

	SHA	Dec
Alpheratz	357°34.9	29°13.6
Ankaa	353°07.3	-42°10.1
Schedar	349°31.3	56°40.4
Diphda	348°47.4	-17°50.9
Achernar	335°20.6	-57°06.5
Hamal	327°51.3	23°34.8
Polaris	314°25.0	89°22.3
Acamar	315°12.0	-40°12.3
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.1
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.6	-52°42.8
Sirius	258°26.2	-16°45.2
Adhara	255°05.8	-29°00.6
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°58.0
Avior	234°14.7	-59°35.7
Suhail	222°46.1	-43°32.3
Miaplacidus	221°38.1	-69°49.5
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.3	61°37.0
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.6
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.4
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.8
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.5
Kochab	137°18.6	74°03.0
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°08.9	-69°04.2
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°41.8	51°28.8
Kaus Aust.	83°32.0	-34°22.3
Vega	80°32.9	38°48.1
Nunki	75°47.3	-26°15.9
Altair	61°59.7	8°55.9
Peacock	53°05.3	-56°39.0
Deneb	49°25.7	45°21.9
Enif	33°38.7	9°59.3
Al Na'ir	27°32.8	-46°50.2
Fomalhaut	15°14.5	-29°29.3
Scheat	13°45.2	28°13.0
Markab	13°29.9	15°20.3

Apr 25 Fri	SHA	Mer.pass
Venus	3°24.1	09:32
Mars	234°17.4	18:08
Jupiter	280°39.3	15:02
Saturn	1°45.4	09:38

Apr 26 Sat	SHA	Mer.pass
Venus	2°56.3	09:30
Mars	233°50.1	18:06
Jupiter	280°26.7	14:59
Saturn	1°39.5	09:35

Apr 27 Sun	SHA	Mer.pass
Venus	2°27.1	09:28
Mars	233°22.6	18:04
Jupiter	280°14.1	14:56
Saturn	1°33.6	09:31

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.3	N13°12.1	217°22.1	11.2′	S01°55.2	17.6′	60.2′
1	195°30.4	12.9	231°52.2	11.2′	01°37.6	17.6′	60.2′
2	210°30.5	13.8	246°22.4	11.1′	01°20.0	17.6′	60.3′
3	225°30.6	·· 14.6	260°52.5	11.1′	01°02.4	17.7′	60.3′
4	240°30.7	15.4	275°22.6	11.1′	00°44.7	17.6′	60.3′
5	255°30.8	16.2	289°52.7	11.0′	00°27.1	17.7′	60.4′
6	270°30.9	N13°17.0	304°22.7	11.0′	S00°09.4	17.8′	60.4′
7	285°31.0	17.8	318°52.7	11.0′	N00°08.4	17.7′	60.4′
8	300°31.1	18.6	333°22.7	10.9′	00°26.1	17.7′	60.5′
9	315°31.2	·· 19.5	347°52.6	10.9′	00°43.8	17.8′	60.5′
10	330°31.3	20.3	2°22.5	10.9′	01°01.6	17.8′	60.5′
11	345°31.4	21.1	16°52.4	10.8′	01°19.4	17.7′	60.5′
12	0°31.5	N13°21.9	31°22.2	10.8′	N01°37.1	17.8′	60.6′
13	15°31.6	22.7	45°52.0	10.7′	01°54.9	17.8′	60.6′
14	30°31.7	23.5	60°21.7	10.7′	02°12.7	17.8′	60.6′
15	45°31.8	·· 24.3	74°51.4	10.6′	02°30.5	17.8′	60.6′
16	60°31.9	25.1	89°21.0	10.6′	02°48.3	17.8′	60.7′
17	75°32.0	25.9	103°50.6	10.5′	03°06.1	17.8′	60.7′
18	90°32.1	N13°26.7	118°20.2	10.5′	N03°23.9	17.8′	60.7′
19	105°32.3	27.5	132°49.7	10.4′	03°41.7	17.8′	60.7′
20	120°32.4	28.4	147°19.1	10.4′	03°59.5	17.8′	60.8′
21	135°32.5	·· 29.2	161°48.5	10.3′	04°17.3	17.8′	60.8′
22	150°32.6	30.0	176°17.9	10.3′	04°35.1	17.8′	60.8′
23	165°32.7	30.8	190°47.2	10.2′	04°52.9	17.7′	60.8′
	SD = 15.9′	d = 0.8′	SD = 16.4′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.8	N13°31.6	205°16.4	10.2′	N05°10.6	17.8′	60.9′
1	195°32.9	32.4	219°45.6	10.1′	05°28.4	17.7′	60.9′
2	210°33.0	33.2	234°14.7	10.1′	05°46.1	17.7′	60.9′
3	225°33.1	·· 34.0	248°43.8	10.0′	06°03.8	17.7′	60.9′
4	240°33.2	34.8	263°12.7	9.9′	06°21.5	17.6′	60.9′
5	255°33.3	35.6	277°41.7	9.9′	06°39.1	17.6′	61.0′
6	270°33.4	N13°36.4	292°10.6	9.8′	N06°56.7	17.6′	61.0′
7	285°33.5	37.2	306°39.4	9.7′	07°14.3	17.6′	61.0′
8	300°33.6	38.0	321°08.1	9.7′	07°31.9	17.6′	61.0′
9	315°33.7	·· 38.8	335°36.8	9.6′	07°49.5	17.5′	61.0′
10	330°33.8	39.6	350°05.4	9.5′	08°07.0	17.4′	61.1′
11	345°33.9	40.4	4°33.9	9.5′	08°24.4	17.5′	61.1′
12	0°34.0	N13°41.2	19°02.4	9.4′	N08°41.9	17.3′	61.1′
13	15°34.1	42.0	33°30.8	9.3′	08°59.2	17.4′	61.1′
14	30°34.2	42.8	47°59.1	9.2′	09°16.6	17.3′	61.1′
15	45°34.3	·· 43.6	62°27.3	9.2′	09°33.9	17.3′	61.1′
16	60°34.4	44.4	76°55.5	9.1′	09°51.2	17.2′	61.2′
17	75°34.5	45.2	91°23.6	9.0′	10°08.4	17.1′	61.2′
18	90°34.5	N13°46.0	105°51.6	8.9′	N10°25.5	17.1′	61.2′
19	105°34.6	46.8	120°19.5	8.9′	10°42.6	17.1′	61.2′
20	120°34.7	47.6	134°47.4	8.8′	10°59.7	16.9′	61.2′
21	135°34.8	·· 48.4	149°15.2	8.7′	11°16.6	17.0′	61.2′
22	150°34.9	49.2	163°42.9	8.6′	11°33.6	16.8′	61.2′
23	165°35.0	50.0	178°10.5	8.5′	11°50.4	16.8′	61.2′
	SD = 15.9′	d = 0.8′	SD = 16.6′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.1	N13°50.8	192°38.0	8.4′	N12°07.2	16.7′	61.2′
1	195°35.2	51.6	207°05.4	8.4′	12°23.9	16.7′	61.3′
2	210°35.3	52.4	221°32.8	8.3′	12°40.6	16.6′	61.3′
3	225°35.4	·· 53.2	236°00.1	8.2′	12°57.2	16.5′	61.3′
4	240°35.5	54.0	250°27.2	8.1′	13°13.7	16.4′	61.3′
5	255°35.6	54.8	264°54.3	8.0′	13°30.1	16.4′	61.3′
6	270°35.7	N13°55.6	279°21.3	7.9′	N13°46.5	16.3′	61.3′
7	285°35.8	56.4	293°48.2	7.8′	14°02.8	16.1′	61.3′
8	300°35.9	57.2	308°15.0	7.7′	14°18.9	16.1′	61.3′
9	315°36.0	·· 58.0	322°41.8	7.6′	14°35.0	16.1′	61.3′
10	330°36.1	58.7	337°08.4	7.5′	14°51.1	15.9′	61.3′
11	345°36.2	13°59.5	351°34.9	7.4′	15°07.0	15.8′	61.3′
12	0°36.3	N14°00.3	6°01.4	7.4′	N15°22.8	15.7′	61.3′
13	15°36.4	01.1	20°27.7	7.3′	15°38.5	15.7′	61.3′
14	30°36.5	01.9	34°54.0	7.2′	15°54.2	15.5′	61.3′
15	45°36.5	·· 02.7	49°20.2	7.1′	16°09.7	15.5′	61.3′
16	60°36.6	03.5	63°46.2	7.0′	16°25.2	15.3′	61.3′
17	75°36.7	04.3	78°12.2	6.9′	16°40.5	15.2′	61.3′
18	90°36.8	N14°05.1	92°38.1	6.8′	N16°55.7	15.1′	61.3′
19	105°36.9	05.9	107°03.8	6.7′	17°10.8	15.0′	61.3′
20	120°37.0	06.6	121°29.5	6.6′	17°25.8	14.9′	61.3′
21	135°37.1	·· 07.4	135°55.1	6.5′	17°40.7	14.8′	61.3′
22	150°37.2	08.2	150°20.6	6.4′	17°55.5	14.6′	61.3′
23	165°37.3	09.0	164°45.9	6.3′	18°10.1	14.5′	61.3′
	SD = 15.9′	d = 0.8′	SD = 16.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:29	21:32	–:–	–:–
N 70°	–:–	00:48	02:58	21:02	23:28	–:–
68°	–:–	01:50	03:19	20:39	22:12	–:–
66°	–:–	02:23	03:36	20:22	21:37	–:–
64°	00:42	02:47	03:50	20:08	21:12	23:32
62°	01:37	03:06	04:01	19:56	20:53	22:25
60°	02:07	03:21	04:11	19:46	20:37	21:52
N 58°	02:29	03:33	04:20	19:37	20:24	21:29
56°	02:47	03:44	04:27	19:30	20:13	21:11
54°	03:01	03:54	04:34	19:23	20:03	20:56
52°	03:14	04:02	04:40	19:17	19:55	20:44
50°	03:24	04:09	04:45	19:11	19:47	20:33
45°	03:46	04:25	04:57	18:59	19:31	20:11
N 40°	04:03	04:38	05:06	18:50	19:19	19:54
35°	04:16	04:48	05:15	18:41	19:08	19:40
30°	04:27	04:57	05:22	18:34	18:59	19:29
20°	04:44	05:11	05:34	18:22	18:45	19:12
N 10°	04:58	05:23	05:45	18:11	18:33	18:58
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:51	18:13	18:38
20°	05:26	05:52	06:14	17:41	18:03	18:30
30°	05:33	06:01	06:26	17:29	17:54	18:22
35°	05:37	06:07	06:33	17:22	17:48	18:18
40°	05:40	06:12	06:40	17:15	17:43	18:15
45°	05:44	06:18	06:49	17:06	17:36	18:11
S 50°	05:48	06:26	06:59	16:55	17:29	18:07
52°	05:49	06:29	07:04	16:51	17:26	18:05
54°	05:51	06:32	07:10	16:45	17:22	18:04
56°	05:52	06:36	07:15	16:39	17:18	18:02
58°	05:54	06:40	07:22	16:32	17:14	18:00
S 60°	05:56	06:45	07:30	16:25	17:09	17:59

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	03:50	03:11	02:21	16:39	19:21	
N 70°	03:49	03:19	02:42	16:35	19:02	22:06
68°	03:48	03:26	03:00	16:31	18:47	21:24
66°	03:47	03:31	03:13	16:28	18:35	20:56
64°	03:46	03:36	03:25	16:26	18:25	20:35
62°	03:46	03:40	03:35	16:24	18:17	20:18
60°	03:45	03:44	03:44	16:22	18:10	20:04
N 58°	03:44	03:47	03:51	16:21	18:04	19:53
56°	03:44	03:50	03:58	16:19	17:58	19:42
54°	03:44	03:53	04:04	16:18	17:54	19:33
52°	03:43	03:55	04:09	16:17	17:49	19:25
50°	03:43	03:58	04:14	16:16	17:45	19:18
45°	03:42	04:03	04:25	16:14	17:37	19:03
N 40°	03:42	04:07	04:34	16:12	17:30	18:50
35°	03:41	04:10	04:42	16:10	17:23	18:40
30°	03:41	04:14	04:49	16:09	17:18	18:31
20°	03:40	04:19	05:01	16:06	17:09	18:15
N 10°	03:39	04:24	05:12	16:04	17:01	18:01
0°	03:38	04:29	05:22	16:02	16:53	17:48
S 10°	03:38	04:34	05:32	16:00	16:46	17:36
20°	03:37	04:39	05:43	15:58	16:38	17:22
30°	03:36	04:45	05:56	15:55	16:29	17:07
35°	03:36	04:48	06:03	15:54	16:24	16:58
40°	03:36	04:52	06:12	15:52	16:18	16:48
45°	03:35	04:57	06:22	15:50	16:11	16:36
S 50°	03:35	05:02	06:34	15:48	16:03	16:22
52°	03:34	05:05	06:39	15:47	16:00	16:15
54°	03:34	05:08	06:46	15:46	15:56	16:08
56°	03:34	05:11	06:53	15:45	15:51	16:00
58°	03:33	05:15	07:01	15:43	15:46	15:51
S 60°	03:33	05:19	07:10	15:42	15:41	15:40

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 27-0 11-1%
25	02:01	02:06	11:58	09:50	22:15	
26	02:11	02:16	11:58	10:41	23:08	
27	02:21	02:25	11:58	11:35	–:–	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2131 sec ΔT = TT-UT1 = +68.9709 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°13.2	218°09.8	N00°54.5	89°08.2	N21°11.7	136°14.5	N22°52.4	217°41.1	S02°48.4
1	231°15.7	233°11.0	54.6	104°09.6	11.4	151°16.5	52.5	232°43.3	48.3
2	246°18.1	248°12.1	54.6	119°10.9	11.1	166°18.4	52.5	247°45.5	48.2
3	261°20.6	263°13.3	·· 54.7	134°12.2	·· 10.8	181°20.3	·· 52.6	262°47.7	·· 48.1
4	276°23.1	278°14.4	54.8	149°13.5	10.5	196°22.3	52.6	277°49.9	48.0
5	291°25.5	293°15.6	54.9	164°14.8	10.1	211°24.2	52.6	292°52.2	47.9
6	306°28.0	308°16.7	N00°55.0	179°16.1	N21°09.8	226°26.1	N22°52.7	307°54.4	S02°47.8
7	321°30.5	323°17.9	55.1	194°17.4	09.5	241°28.0	52.7	322°56.6	47.7
8	336°32.9	338°19.0	55.2	209°18.7	09.2	256°30.0	52.8	337°58.8	47.6
9	351°35.4	353°20.2	·· 55.3	224°20.0	·· 08.9	271°31.9	·· 52.8	353°01.1	·· 47.5
10	6°37.9	8°21.3	55.4	239°21.3	08.5	286°33.8	52.8	8°03.3	47.4
11	21°40.3	23°22.5	55.5	254°22.6	08.2	301°35.8	52.9	23°05.5	47.3
12	36°42.8	38°23.6	N00°55.6	269°23.9	N21°07.9	316°37.7	N22°52.9	38°07.7	S02°47.2
13	51°45.3	53°24.8	55.7	284°25.2	07.6	331°39.6	53.0	53°10.0	47.1
14	66°47.7	68°25.9	55.8	299°26.6	07.3	346°41.6	53.0	68°12.2	47.0
15	81°50.2	83°27.0	·· 55.9	314°27.9	·· 06.9	1°43.5	·· 53.0	83°14.4	·· 46.9
16	96°52.6	98°28.2	56.0	329°29.2	06.6	16°45.4	53.1	98°16.6	46.8
17	111°55.1	113°29.3	56.1	344°30.5	06.3	31°47.3	53.1	113°18.9	46.7
18	126°57.6	128°30.4	N00°56.2	359°31.8	N21°06.0	46°49.3	N22°53.1	128°21.1	S02°46.7
19	142°00.0	143°31.5	56.3	14°33.1	05.7	61°51.2	53.2	143°23.3	46.6
20	157°02.5	158°32.7	56.4	29°34.4	05.3	76°53.1	53.2	158°25.5	46.5
21	172°05.0	173°33.8	·· 56.5	44°35.7	·· 05.0	91°55.1	·· 53.3	173°27.8	·· 46.4
22	187°07.4	188°34.9	56.6	59°37.0	04.7	106°57.0	53.3	188°30.0	46.3
23	202°09.9	203°36.0	56.8	74°38.3	04.4	121°58.9	53.3	203°32.2	46.2
Mer.pass.	09:34	ν 1.2′	d 0.1′	m -4.74	ν 1.3′	d -0.3′	m 0.90	ν 1.9′	d 0.0′ m -1.99	ν 2.2′	d 0.1′ m 1.17

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°12.4	218°37.1	N00°56.9	89°39.6	N21°04.0	137°00.8	N22°53.4	218°34.4	S02°46.1
1	232°14.8	233°38.2	57.0	104°40.9	03.7	152°02.8	53.4	233°36.7	46.0
2	247°17.3	248°39.3	57.1	119°42.2	03.4	167°04.7	53.5	248°38.9	45.9
3	262°19.7	263°40.5	·· 57.2	134°43.5	·· 03.1	182°06.6	·· 53.5	263°41.1	·· 45.8
4	277°22.2	278°41.6	57.4	149°44.8	02.8	197°08.5	53.5	278°43.3	45.7
5	292°24.7	293°42.7	57.5	164°46.1	02.4	212°10.5	53.6	293°45.6	45.6
6	307°27.1	308°43.8	N00°57.6	179°47.4	N21°02.1	227°12.4	N22°53.6	308°47.8	S02°45.5
7	322°29.6	323°44.9	57.7	194°48.7	01.8	242°14.3	53.7	323°50.0	45.4
8	337°32.1	338°46.0	57.9	209°50.0	01.5	257°16.3	53.7	338°52.2	45.3
9	352°34.5	353°47.1	·· 58.0	224°51.3	·· 01.1	272°18.2	·· 53.7	353°54.5	·· 45.2
10	7°37.0	8°48.2	58.1	239°52.6	00.8	287°20.1	53.8	8°56.7	45.1
11	22°39.5	23°49.2	58.2	254°53.9	00.5	302°22.0	53.8	23°58.9	45.0
12	37°41.9	38°50.3	N00°58.4	269°55.2	N21°00.2	317°24.0	N22°53.8	39°01.1	S02°44.9
13	52°44.4	53°51.4	58.5	284°56.5	20°59.8	332°25.9	53.9	54°03.4	44.8
14	67°46.9	68°52.5	58.7	299°57.8	59.5	347°27.8	53.9	69°05.6	44.7
15	82°49.3	83°53.6	·· 58.8	314°59.1	·· 59.2	2°29.7	·· 54.0	84°07.8	·· 44.6
16	97°51.8	98°54.7	58.9	330°00.4	58.9	17°31.7	54.0	99°10.0	44.5
17	112°54.2	113°55.7	59.1	345°01.7	58.5	32°33.6	54.0	114°12.3	44.4
18	127°56.7	128°56.8	N00°59.2	0°03.0	N20°58.2	47°35.5	N22°54.1	129°14.5	S02°44.3
19	142°59.2	143°57.9	59.4	15°04.3	57.9	62°37.4	54.1	144°16.7	44.3
20	158°01.6	158°59.0	59.5	30°05.6	57.6	77°39.4	54.2	159°18.9	44.2
21	173°04.1	174°00.0	·· 59.6	45°06.9	·· 57.2	92°41.3	·· 54.2	174°21.2	·· 44.1
22	188°06.6	189°01.1	59.8	60°08.2	56.9	107°43.2	54.2	189°23.4	44.0
23	203°09.0	204°02.2	59.9	75°09.5	56.6	122°45.1	54.3	204°25.6	43.9
Mer.pass.	09:30	ν 1.1′	d 0.1′	m -4.73	ν 1.3′	d -0.3′	m 0.91	ν 1.9′	d 0.0′ m -1.99	ν 2.2′	d 0.1′ m 1.17

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°11.5	219°03.2	N01°00.1	90°10.8	N20°56.3	137°47.1	N22°54.3	219°27.8	S02°43.8
1	233°14.0	234°04.3	00.2	105°12.1	55.9	152°49.0	54.3	234°30.1	43.7
2	248°16.4	249°05.4	00.4	120°13.4	55.6	167°50.9	54.4	249°32.3	43.6
3	263°18.9	264°06.4	·· 00.5	135°14.7	·· 55.3	182°52.8	·· 54.4	264°34.5	·· 43.5
4	278°21.4	279°07.5	00.7	150°16.0	54.9	197°54.8	54.5	279°36.8	43.4
5	293°23.8	294°08.5	00.9	165°17.3	54.6	212°56.7	54.5	294°39.0	43.3
6	308°26.3	309°09.6	N01°01.0	180°18.5	N20°54.3	227°58.6	N22°54.5	309°41.2	S02°43.2
7	323°28.7	324°10.6	01.2	195°19.8	54.0	243°00.5	54.6	324°43.4	43.1
8	338°31.2	339°11.7	01.3	210°21.1	53.6	258°02.5	54.6	339°45.7	43.0
9	353°33.7	354°12.7	·· 01.5	225°22.4	·· 53.3	273°04.4	·· 54.6	354°47.9	·· 42.9
10	8°36.1	9°13.8	01.7	240°23.7	53.0	288°06.3	54.7	9°50.1	42.8
11	23°38.6	24°14.8	01.8	255°25.0	52.6	303°08.2	54.7	24°52.3	42.7
12	38°41.1	39°15.9	N01°02.0	270°26.3	N20°52.3	318°10.2	N22°54.8	39°54.6	S02°42.6
13	53°43.5	54°16.9	02.1	285°27.6	52.0	333°12.1	54.8	54°56.8	42.5
14	68°46.0	69°17.9	02.3	300°28.9	51.7	348°14.0	54.8	69°59.0	42.4
15	83°48.5	84°19.0	·· 02.5	315°30.2	·· 51.3	3°15.9	·· 54.9	85°01.3	·· 42.4
16	98°50.9	99°20.0	02.7	330°31.5	51.0	18°17.8	54.9	100°03.5	42.3
17	113°53.4	114°21.0	02.8	345°32.8	50.7	33°19.8	55.0	115°05.7	42.2
18	128°55.9	129°22.1	N01°03.0	0°34.1	N20°50.3	48°21.7	N22°55.0	130°07.9	S02°42.1
19	143°58.3	144°23.1	03.2	15°35.3	50.0	63°23.6	55.0	145°10.2	42.0
20	159°00.8	159°24.1	03.4	30°36.6	49.7	78°25.5	55.1	160°12.4	41.9
21	174°03.2	174°25.1	·· 03.5	45°37.9	·· 49.3	93°27.5	·· 55.1	175°14.6	·· 41.8
22	189°05.7	189°26.2	03.7	60°39.2	49.0	108°29.4	55.1	190°16.9	41.7
23	204°08.2	204°27.2	03.9	75°40.5	48.7	123°31.3	55.2	205°19.1	41.6
Mer.pass.	09:26	ν 1.1′	d 0.2′	m -4.72	ν 1.3′	d -0.3′	m 0.92	ν 1.9′	d 0.0′ m -1.99	ν 2.2′	d 0.1′ m 1.17

Stars

	SHA	Dec
Alpheratz	357°34.8	29°13.6
Ankaa	353°07.3	-42°10.0
Schedar	349°31.3	56°40.4
Diphda	348°47.4	-17°50.9
Achernar	335°20.6	-57°06.4
Hamal	327°51.3	23°34.8
Polaris	314°24.9	89°22.3
Acamar	315°12.0	-40°12.2
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.6	-52°42.7
Sirius	258°26.2	-16°45.2
Adhara	255°05.9	-29°00.6
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°58.0
Avior	234°14.7	-59°35.7
Suhail	222°46.1	-43°32.3
Miaplacidus	221°38.2	-69°49.5
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.3	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.6
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.4
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.8
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.4	-60°56.5
Kochab	137°18.6	74°03.0
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.2	-26°29.3
Atria	107°08.8	-69°04.2
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°32.0	-34°22.3
Vega	80°32.9	38°48.1
Nunki	75°47.3	-26°15.9
Altair	61°59.7	8°55.9
Peacock	53°05.3	-56°39.0
Deneb	49°25.7	45°21.9
Enif	33°38.7	9°59.3
Al Na'ir	27°32.8	-46°50.2
Fomalhaut	15°14.5	-29°29.2
Scheat	13°45.2	28°13.0
Markab	13°29.9	15°20.3

Apr 28 Mon	SHA	Mer.pass
Venus	1°56.6	09:27
Mars	232°55.0	18:02
Jupiter	280°01.3	14:53
Saturn	1°27.8	09:28

Apr 29 Tue	SHA	Mer.pass
Venus	1°24.8	09:25
Mars	232°27.2	18:00
Jupiter	279°48.5	14:50
Saturn	1°22.1	09:24

Apr 30 Wed	SHA	Mer.pass
Venus	0°51.7	09:23
Mars	231°59.3	17:58
Jupiter	279°35.6	14:47
Saturn	1°16.3	09:21

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	Sun			Moon				
h								
Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	180°37.4	N14°09.8		179°11.2	6.2′	N18°24.6	14.5′	61.3′
1	195°37.5	10.6		193°36.4	6.1′	18°39.1	14.2′	61.3′
2	210°37.5	11.4		208°01.5	6.0′	18°53.3	14.2′	61.3′
3	225°37.6	·· 12.2		222°26.5	5.9′	19°07.5	14.0′	61.3′
4	240°37.7	12.9		236°51.4	5.8′	19°21.5	13.9′	61.3′
5	255°37.8	13.7		251°16.2	5.7′	19°35.4	13.8′	61.3′
6	270°37.9	N14°14.5		265°40.9	5.6′	N19°49.2	13.6′	61.3′
7	285°38.0	15.3		280°05.4	5.5′	20°02.8	13.5′	61.3′
8	300°38.1	16.1		294°29.9	5.4′	20°16.3	13.3′	61.2′
9	315°38.2	·· 16.9		308°54.3	5.3′	20°29.6	13.2′	61.2′
10	330°38.3	17.6		323°18.6	5.2′	20°42.8	13.0′	61.2′
11	345°38.4	18.4		337°42.8	5.1′	20°55.8	12.9′	61.2′
12	0°38.4	N14°19.2		352°06.9	5.0′	N21°08.7	12.8′	61.2′
13	15°38.5	20.0		6°31.0	4.9′	21°21.5	12.6′	61.2′
14	30°38.6	20.8		20°54.9	4.8′	21°34.1	12.4′	61.2′
15	45°38.7	·· 21.6		35°18.7	4.7′	21°46.5	12.3′	61.2′
16	60°38.8	22.3		49°42.4	4.6′	21°58.8	12.2′	61.2′
17	75°38.9	23.1		64°06.1	4.5′	22°11.0	11.9′	61.1′
18	90°39.0	N14°23.9		78°29.6	4.5′	N22°22.9	11.8′	61.1′
19	105°39.0	24.7		92°53.1	4.4′	22°34.7	11.7′	61.1′
20	120°39.1	25.4		107°16.4	4.3′	22°46.4	11.5′	61.1′
21	135°39.2	·· 26.2		121°39.7	4.2′	22°57.9	11.3′	61.1′
22	150°39.3	27.0		136°02.9	4.1′	23°09.2	11.1′	61.1′
23	165°39.4	27.8		150°26.0	4.0′	23°20.3	11.0′	61.0′
	SD = 15.9′	d = 0.8′		SD = 16.7′				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	180°39.5	N14°28.6		164°49.0	3.9′	N23°31.3	10.8′	61.0′
1	195°39.6	29.3		179°11.9	3.8′	23°42.1	10.6′	61.0′
2	210°39.6	30.1		193°34.8	3.8′	23°52.7	10.5′	61.0′
3	225°39.7	·· 30.9		207°57.5	3.7′	24°03.2	10.2′	61.0′
4	240°39.8	31.7		222°20.2	3.6′	24°13.4	10.1′	61.0′
5	255°39.9	32.4		236°42.8	3.5′	24°23.5	9.9′	60.9′
6	270°40.0	N14°33.2		251°05.3	3.5′	N24°33.4	9.8′	60.9′
7	285°40.1	34.0		265°27.8	3.4′	24°43.2	9.5′	60.9′
8	300°40.2	34.8		279°50.2	3.3′	24°52.7	9.4′	60.9′
9	315°40.2	·· 35.5		294°12.5	3.2′	25°02.1	9.1′	60.8′
10	330°40.3	36.3		308°34.7	3.2′	25°11.2	9.0′	60.8′
11	345°40.4	37.1		322°56.9	3.1′	25°20.2	8.8′	60.8′
12	0°40.5	N14°37.9		337°19.0	3.0′	N25°29.0	8.6′	60.8′
13	15°40.6	38.6		351°41.1	3.0′	25°37.6	8.4′	60.8′
14	30°40.7	39.4		6°03.0	2.9′	25°46.0	8.2′	60.7′
15	45°40.7	·· 40.2		20°25.0	2.9′	25°54.2	8.0′	60.7′
16	60°40.8	40.9		34°46.8	2.8′	26°02.2	7.8′	60.7′
17	75°40.9	41.7		49°08.6	2.8′	26°10.0	7.6′	60.7′
18	90°41.0	N14°42.5		63°30.4	2.7′	N26°17.6	7.4′	60.6′
19	105°41.1	43.2		77°52.1	2.7′	26°25.0	7.3′	60.6′
20	120°41.1	44.0		92°13.8	2.6′	26°32.3	7.0′	60.6′
21	135°41.2	·· 44.8		106°35.4	2.6′	26°39.3	6.8′	60.5′
22	150°41.3	45.5		120°56.9	2.5′	26°46.1	6.6′	60.5′
23	165°41.4	46.3		135°18.5	2.5′	26°52.7	6.4′	60.5′
	SD = 15.9′	d = 0.8′		SD = 16.6′				

Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	180°41.5	N14°47.1		149°40.0	2.5′	N26°59.1	6.2′	60.5′
1	195°41.5	47.8		164°01.4	2.4′	27°05.3	6.0′	60.4′
2	210°41.6	48.6		178°22.9	2.4′	27°11.3	5.8′	60.4′
3	225°41.7	·· 49.4		192°44.3	2.4′	27°17.1	5.6′	60.4′
4	240°41.8	50.1		207°05.6	2.3′	27°22.7	5.4′	60.3′
5	255°41.9	50.9		221°27.0	2.3′	27°28.1	5.2′	60.3′
6	270°41.9	N14°51.7		235°48.3	2.3′	N27°33.3	4.9′	60.3′
7	285°42.0	52.4		250°09.6	2.3′	27°38.2	4.8′	60.2′
8	300°42.1	53.2		264°30.9	2.3′	27°43.0	4.5′	60.2′
9	315°42.2	·· 54.0		278°52.2	2.3′	27°47.5	4.4′	60.2′
10	330°42.2	54.7		293°13.4	2.3′	27°51.9	4.1′	60.2′
11	345°42.3	55.5		307°34.7	2.3′	27°56.0	3.9′	60.1′
12	0°42.4	N14°56.3		321°56.0	2.3′	N27°59.9	3.7′	60.1′
13	15°42.5	57.0		336°17.2	2.3′	28°03.6	3.5′	60.1′
14	30°42.6	57.8		350°38.5	2.3′	28°07.1	3.3′	60.0′
15	45°42.6	·· 58.5		4°59.8	2.3′	28°10.4	3.1′	60.0′
16	60°42.7	14°59.3		19°21.0	2.3′	28°13.5	2.9′	60.0′
17	75°42.8	15°00.1		33°42.3	2.3′	28°16.4	2.7′	59.9′
18	90°42.9	N15°00.8		48°03.6	2.3′	N28°19.1	2.4′	59.9′
19	105°42.9	01.6		62°24.9	2.3′	28°21.5	2.3′	59.8′
20	120°43.0	02.3		76°46.3	2.4′	28°23.8	2.0′	59.8′
21	135°43.1	·· 03.1		91°07.6	2.4′	28°25.8	1.8′	59.8′
22	150°43.2	03.8		105°29.0	2.4′	28°27.6	1.6′	59.7′
23	165°43.2	04.6		119°50.4	2.5′	28°29.2	1.5′	59.7′
	SD = 15.9′	d = 0.8′		SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:07	21:54	–:–	–:–
N 70°	–:–	–:–	02:41	21:18	–:–	–:–
68°	–:–	01:25	03:06	20:52	22:38	–:–
66°	–:–	02:06	03:25	20:33	21:53	–:–
64°	–:–	02:33	03:40	20:17	21:25	–:–
62°	01:15	02:54	03:52	20:04	21:03	22:47
60°	01:52	03:11	04:03	19:53	20:46	22:07
N 58°	02:17	03:25	04:12	19:44	20:32	21:40
56°	02:37	03:36	04:20	19:36	20:20	21:20
54°	02:53	03:47	04:27	19:28	20:10	21:04
52°	03:06	03:55	04:34	19:22	20:00	20:50
50°	03:17	04:03	04:40	19:16	19:52	20:39
45°	03:40	04:20	04:52	19:03	19:35	20:15
N 40°	03:58	04:33	05:02	18:53	19:22	19:58
35°	04:12	04:44	05:11	18:44	19:11	19:43
30°	04:24	04:54	05:19	18:36	19:01	19:32
20°	04:42	05:09	05:32	18:23	18:46	19:13
N 10°	04:56	05:22	05:43	18:11	18:33	18:59
0°	05:08	05:33	05:54	18:01	18:22	18:47
S 10°	05:18	05:43	06:04	17:50	18:12	18:37
20°	05:27	05:53	06:15	17:39	18:02	18:28
30°	05:35	06:03	06:28	17:26	17:51	18:19
35°	05:39	06:09	06:35	17:19	17:45	18:15
40°	05:43	06:15	06:43	17:11	17:39	18:11
45°	05:47	06:22	06:53	17:01	17:32	18:07
S 50°	05:52	06:30	07:04	16:50	17:24	18:02
52°	05:54	06:33	07:09	16:45	17:20	18:00
54°	05:55	06:37	07:15	16:39	17:16	17:58
56°	05:58	06:42	07:21	16:32	17:12	17:56
58°	06:00	06:46	07:29	16:25	17:07	17:54
S 60°	06:02	06:51	07:37	16:17	17:02	17:52

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°						
N 70°	01:36					
68°	02:19					
66°	02:49	01:46		·· ··	00:05	
64°	03:11	02:48		23:04		
62°	03:29	03:23	03:11	22:30	·· ··	00:54
60°	03:44	03:48	04:00	22:05	·· ··	00:06
N 58°	03:57	04:09	04:31	21:46	23:36	·· ··
56°	04:09	04:25	04:54	21:29	23:12	·· ··
54°	04:19	04:40	05:14	21:16	22:54	·· ··
52°	04:27	04:53	05:30	21:04	22:38	23:58
50°	04:35	05:04	05:44	20:53	22:24	23:42
45°	04:53	05:27	06:13	20:31	21:56	23:11
N 40°	05:07	05:46	06:35	20:13	21:34	22:47
35°	05:19	06:02	06:54	19:58	21:16	22:28
30°	05:29	06:16	07:10	19:45	21:00	22:11
20°	05:48	06:40	07:38	19:24	20:34	21:42
N 10°	06:04	07:00	08:01	19:05	20:11	21:17
0°	06:19	07:20	08:24	18:47	19:50	20:55
S 10°	06:34	07:39	08:46	18:30	19:29	20:32
20°	06:51	08:00	09:10	18:11	19:06	20:07
30°	07:10	08:25	09:38	17:50	18:40	19:38
35°	07:21	08:39	09:55	17:37	18:25	19:21
40°	07:34	08:56	10:14	17:23	18:07	19:02
45°	07:49	09:17	10:38	17:06	17:46	18:38
S 50°	08:08	09:42	11:08	16:46	17:19	18:07
52°	08:17	09:55	11:24	16:36	17:06	17:51
54°	08:28	10:09	11:41	16:25	16:51	17:34
56°	08:39	10:26	12:03	16:13	16:34	17:12
58°	08:53	10:46	12:30	15:58	16:13	16:44
S 60°	09:08	11:12	13:09	15:42	15:47	16:05

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 0-7%
28	02:29	02:34	11:57	12:33	00:03	
29	02:38	02:42	11:57	13:35	01:03	
30	02:46	02:50	11:57	14:39	02:07	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2139 sec ΔT = TT-UT1 = +68.9701 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°10.6	219°28.2	N01°04.1	90°41.8	N20°48.4	138°33.2	N22°55.2	220°21.3	S02°41.5
1	234°13.1	234°29.2	04.3	105°43.1	48.0	153°35.1	55.3	235°23.5	41.4
2	249°15.6	249°30.2	04.4	120°44.4	47.7	168°37.1	55.3	250°25.8	41.3
3	264°18.0	264°31.2	·· 04.6	135°45.7	·· 47.4	183°39.0	·· 55.3	265°28.0	·· 41.2
4	279°20.5	279°32.2	04.8	150°47.0	47.0	198°40.9	55.4	280°30.2	41.1
5	294°23.0	294°33.2	05.0	165°48.2	46.7	213°42.8	55.4	295°32.5	41.0
6	309°25.4	309°34.3	N01°05.2	180°49.5	N20°46.4	228°44.8	N22°55.4	310°34.7	S02°40.9
7	324°27.9	324°35.3	05.4	195°50.8	46.0	243°46.7	55.5	325°36.9	40.8
8	339°30.4	339°36.3	05.6	210°52.1	45.7	258°48.6	55.5	340°39.1	40.7
9	354°32.8	354°37.3	·· 05.8	225°53.4	·· 45.4	273°50.5	·· 55.6	355°41.4	·· 40.7
10	9°35.3	9°38.3	06.0	240°54.7	45.0	288°52.4	55.6	10°43.6	40.6
11	24°37.7	24°39.2	06.2	255°56.0	44.7	303°54.4	55.6	25°45.8	40.5
12	39°40.2	39°40.2	N01°06.3	270°57.3	N20°44.4	318°56.3	N22°55.7	40°48.1	S02°40.4
13	54°42.7	54°41.2	06.5	285°58.5	44.0	333°58.2	55.7	55°50.3	40.3
14	69°45.1	69°42.2	06.7	300°59.8	43.7	349°00.1	55.7	70°52.5	40.2
15	84°47.6	84°43.2	·· 06.9	316°01.1	·· 43.4	4°02.0	·· 55.8	85°54.8	·· 40.1
16	99°50.1	99°44.2	07.1	331°02.4	43.0	19°04.0	55.8	100°57.0	40.0
17	114°52.5	114°45.2	07.4	346°03.7	42.7	34°05.9	55.9	115°59.2	39.9
18	129°55.0	129°46.2	N01°07.6	1°05.0	N20°42.4	49°07.8	N22°55.9	131°01.4	S02°39.8
19	144°57.5	144°47.1	07.8	16°06.3	42.0	64°09.7	55.9	146°03.7	39.7
20	159°59.9	159°48.1	08.0	31°07.5	41.7	79°11.6	56.0	161°05.9	39.6
21	175°02.4	174°49.1	·· 08.2	46°08.8	·· 41.4	94°13.5	·· 56.0	176°08.1	·· 39.5
22	190°04.9	189°50.1	08.4	61°10.1	41.0	109°15.5	56.0	191°10.4	39.4
23	205°07.3	204°51.0	08.6	76°11.4	40.7	124°17.4	56.1	206°12.6	39.3
Mer.pass.	09:22	ν 1.0′	d 0.2′	m -4.72	ν 1.3′	d -0.3′	m 0.94	ν 1.9′	d 0.0′	m -1.98	ν 2.2′	d 0.1′	m 1.17
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°09.8	219°52.0	N01°08.8	91°12.7	N20°40.4	139°19.3	N22°56.1	221°14.8	S02°39.2
1	235°12.2	234°53.0	09.0	106°14.0	40.0	154°21.2	56.1	236°17.1	39.2
2	250°14.7	249°54.0	09.2	121°15.2	39.7	169°23.1	56.2	251°19.3	39.1
3	265°17.2	264°54.9	·· 09.5	136°16.5	·· 39.3	184°25.1	·· 56.2	266°21.5	·· 39.0
4	280°19.6	279°55.9	09.7	151°17.8	39.0	199°27.0	56.3	281°23.8	38.9
5	295°22.1	294°56.8	09.9	166°19.1	38.7	214°28.9	56.3	296°26.0	38.8
6	310°24.6	309°57.8	N01°10.1	181°20.4	N20°38.3	229°30.8	N22°56.3	311°28.2	S02°38.7
7	325°27.0	324°58.8	10.3	196°21.6	38.0	244°32.7	56.4	326°30.4	38.6
8	340°29.5	339°59.7	10.6	211°22.9	37.7	259°34.6	56.4	341°32.7	38.5
9	355°32.0	355°00.7	·· 10.8	226°24.2	·· 37.3	274°36.6	·· 56.4	356°34.9	·· 38.4
10	10°34.4	10°01.6	11.0	241°25.5	37.0	289°38.5	56.5	11°37.1	38.3
11	25°36.9	25°02.6	11.2	256°26.8	36.6	304°40.4	56.5	26°39.4	38.2
12	40°39.4	40°03.5	N01°11.5	271°28.0	N20°36.3	319°42.3	N22°56.6	41°41.6	S02°38.1
13	55°41.8	55°04.5	11.7	286°29.3	36.0	334°44.2	56.6	56°43.8	38.0
14	70°44.3	70°05.4	11.9	301°30.6	35.6	349°46.2	56.6	71°46.1	37.9
15	85°46.7	85°06.4	·· 12.2	316°31.9	·· 35.3	4°48.1	·· 56.7	86°48.3	·· 37.9
16	100°49.2	100°07.3	12.4	331°33.2	35.0	19°50.0	56.7	101°50.5	37.8
17	115°51.7	115°08.2	12.6	346°34.4	34.6	34°51.9	56.7	116°52.8	37.7
18	130°54.1	130°09.2	N01°12.9	1°35.7	N20°34.3	49°53.8	N22°56.8	131°55.0	S02°37.6
19	145°56.6	145°10.1	13.1	16°37.0	33.9	64°55.7	56.8	146°57.2	37.5
20	160°59.1	160°11.1	13.3	31°38.3	33.6	79°57.6	56.8	161°59.5	37.4
21	176°01.5	175°12.0	·· 13.6	46°39.6	·· 33.3	94°59.6	·· 56.9	177°01.7	·· 37.3
22	191°04.0	190°12.9	13.8	61°40.8	32.9	110°01.5	56.9	192°03.9	37.2
23	206°06.5	205°13.8	14.0	76°42.1	32.6	125°03.4	57.0	207°06.2	37.1
Mer.pass.	09:18	ν 1.0′	d 0.2′	m -4.71	ν 1.3′	d -0.3′	m 0.95	ν 1.9′	d 0.0′	m -1.98	ν 2.2′	d 0.1′	m 1.17
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°08.9	220°14.8	N01°14.3	91°43.4	N20°32.2	140°05.3	N22°57.0	222°08.4	S02°37.0
1	236°11.4	235°15.7	14.5	106°44.7	31.9	155°07.2	57.0	237°10.6	36.9
2	251°13.8	250°16.6	14.8	121°45.9	31.6	170°09.1	57.1	252°12.9	36.8
3	266°16.3	265°17.5	·· 15.0	136°47.2	·· 31.2	185°11.1	·· 57.1	267°15.1	·· 36.7
4	281°18.8	280°18.5	15.3	151°48.5	30.9	200°13.0	57.1	282°17.3	36.7
5	296°21.2	295°19.4	15.5	166°49.8	30.5	215°14.9	57.2	297°19.6	36.6
6	311°23.7	310°20.3	N01°15.8	181°51.1	N20°30.2	230°16.8	N22°57.2	312°21.8	S02°36.5
7	326°26.2	325°21.2	16.0	196°52.3	29.9	245°18.7	57.2	327°24.0	36.4
8	341°28.6	340°22.1	16.3	211°53.6	29.5	260°20.6	57.3	342°26.3	36.3
9	356°31.1	355°23.0	·· 16.5	226°54.9	·· 29.2	275°22.5	·· 57.3	357°28.5	·· 36.2
10	11°33.6	10°24.0	16.8	241°56.2	28.8	290°24.5	57.4	12°30.7	36.1
11	26°36.0	25°24.9	17.0	256°57.4	28.5	305°26.4	57.4	27°33.0	36.0
12	41°38.5	40°25.8	N01°17.3	271°58.7	N20°28.1	320°28.3	N22°57.4	42°35.2	S02°35.9
13	56°41.0	55°26.7	17.6	287°00.0	27.8	335°30.2	57.5	57°37.4	35.8
14	71°43.4	70°27.6	17.8	302°01.2	27.5	350°32.1	57.5	72°39.7	35.7
15	86°45.9	85°28.5	·· 18.1	317°02.5	·· 27.1	5°34.0	·· 57.5	87°41.9	·· 35.6
16	101°48.3	100°29.4	18.3	332°03.8	26.8	20°35.9	57.6	102°44.1	35.6
17	116°50.8	115°30.3	18.6	347°05.1	26.4	35°37.9	57.6	117°46.4	35.5
18	131°53.3	130°31.2	N01°18.9	2°06.3	N20°26.1	50°39.8	N22°57.6	132°48.6	S02°35.4
19	146°55.7	145°32.1	19.1	17°07.6	25.7	65°41.7	57.7	147°50.8	35.3
20	161°58.2	160°33.0	19.4	32°08.9	25.4	80°43.6	57.7	162°53.1	35.2
21	177°00.7	175°33.8	·· 19.7	47°10.2	·· 25.1	95°45.5	·· 57.8	177°55.3	·· 35.1
22	192°03.1	190°34.7	19.9	62°11.4	24.7	110°47.4	57.8	192°57.5	35.0
23	207°05.6	205°35.6	20.2	77°12.7	24.4	125°49.3	57.8	207°59.8	34.9
Mer.pass.	09:14	ν 0.9′	d 0.2′	m -4.70	ν 1.3′	d -0.3′	m 0.97	ν 1.9′	d 0.0′	m -1.98	ν 2.2′	d 0.1′	m 1.17

Stars	SHA	Dec
Alpheratz	357°34.8	29°13.6
Ankaa	353°07.2	-42°10.0
Schedar	349°31.3	56°40.4
Diphda	348°47.3	-17°50.9
Achernar	335°20.5	-57°06.4
Hamal	327°51.3	23°34.8
Polaris	314°24.6	89°22.3
Acamar	315°12.0	-40°12.2
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.6	-52°42.7
Sirius	258°26.2	-16°45.2
Adhara	255°05.9	-29°00.6
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°58.0
Avior	234°14.8	-59°35.7
Suhail	222°46.1	-43°32.3
Miaplacidus	221°38.2	-69°49.5
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.3	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.6
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.4
Spica	158°21.7	-11°17.7
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.8
Menkent	147°57.0	-36°29.8
Arcturus	145°47.4	19°02.9
Rigil Kent.	139°39.3	-60°56.5
Kochab	137°18.6	74°03.0
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.2	-26°29.3
Atria	107°08.8	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°32.0	-34°22.3
Vega	80°32.8	38°48.1
Nunki	75°47.3	-26°15.9
Altair	61°59.6	8°55.9
Peacock	53°05.3	-56°39.0
Deneb	49°25.6	45°21.9
Enif	33°38.6	9°59.3
Al Na'ir	27°32.7	-46°50.1
Fomalhaut	15°14.4	-29°29.2
Scheat	13°45.2	28°13.0
Markab	13°29.8	15°20.3

May 01 Thu	SHA	Mer.pass
Venus	0°17.6	09:21
Mars	231°31.2	17:56
Jupiter	279°22.6	14:44
Saturn	1°10.7	09:17

May 02 Fri	SHA	Mer.pass
Venus	359°42.2	09:20
Mars	231°02.9	17:54
Jupiter	279°09.5	14:41
Saturn	1°05.1	09:14

May 03 Sat	SHA	Mer.pass
Venus	359°05.9	09:18
Mars	230°34.5	17:52
Jupiter	278°56.4	14:38
Saturn	0°59.5	09:10

Horizontal parallax	
Venus:	0.3
Mars:	0.1

		Sun		Moon				
h								
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.3	N15°05.4	134°11.9	2.5′	N28°30.7	1.2′	59.7′
1	195°43.4	06.1	148°33.4	2.5′	28°31.9	1.0′	59.6′
2	210°43.5	06.9	162°54.9	2.6′	28°32.9	0.8′	59.6′
3	225°43.5	·· 07.6	177°16.5	2.6′	28°33.7	0.6′	59.6′
4	240°43.6	08.4	191°38.1	2.7′	28°34.3	0.3′	59.5′
5	255°43.7	09.1	205°59.8	2.7′	28°34.6	0.2′	59.5′
6	270°43.8	N15°09.9	220°21.5	2.8′	N28°34.8	0.0′	59.5′
7	285°43.8	10.6	234°43.2	2.8′	28°34.8	0.2′	59.4′
8	300°43.9	11.4	249°05.0	2.9′	28°34.6	0.4′	59.4′
9	315°44.0	·· 12.1	263°26.9	2.9′	28°34.2	0.7′	59.3′
10	330°44.0	12.9	277°48.9	3.0′	28°33.5	0.8′	59.3′
11	345°44.1	13.7	292°10.9	3.1′	28°32.7	1.0′	59.3′
12	0°44.2	N15°14.4	306°32.9	3.1′	N28°31.7	1.2′	59.2′
13	15°44.3	15.2	320°55.1	3.2′	28°30.5	1.5′	59.2′
14	30°44.3	15.9	335°17.3	3.3′	28°29.0	1.6′	59.1′
15	45°44.4	·· 16.7	349°39.6	3.4′	28°27.4	1.8′	59.1′
16	60°44.5	17.4	4°01.9	3.4′	28°25.6	2.0′	59.1′
17	75°44.5	18.2	18°24.4	3.5′	28°23.6	2.2′	59.0′
18	90°44.6	N15°18.9	32°46.9	3.6′	N28°21.4	2.3′	59.0′
19	105°44.7	19.6	47°09.5	3.7′	28°19.1	2.6′	59.0′
20	120°44.8	20.4	61°32.2	3.8′	28°16.5	2.8′	58.9′
21	135°44.8	·· 21.1	75°55.0	3.9′	28°13.7	2.9′	58.9′
22	150°44.9	21.9	90°17.8	4.0′	28°10.8	3.2′	58.8′
23	165°45.0	22.6	104°40.8	4.1′	28°07.6	3.3′	58.8′
	SD = 15.9′	d = 0.8′	SD = 16.3′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.0	N15°23.4	119°03.9	4.2′	N28°04.3	3.5′	58.8′
1	195°45.1	24.1	133°27.0	4.3′	28°00.8	3.6′	58.7′
2	210°45.2	24.9	147°50.3	4.4′	27°57.2	3.9′	58.7′
3	225°45.2	·· 25.6	162°13.6	4.5′	27°53.3	4.0′	58.6′
4	240°45.3	26.4	176°37.1	4.6′	27°49.3	4.3′	58.6′
5	255°45.4	27.1	191°00.6	4.7′	27°45.0	4.3′	58.6′
6	270°45.4	N15°27.8	205°24.3	4.8′	N27°40.7	4.6′	58.5′
7	285°45.5	28.6	219°48.1	4.9′	27°36.1	4.7′	58.5′
8	300°45.6	29.3	234°12.0	5.0′	27°31.4	4.9′	58.4′
9	315°45.6	·· 30.1	248°36.0	5.1′	27°26.5	5.1′	58.4′
10	330°45.7	30.8	263°00.1	5.2′	27°21.4	5.3′	58.4′
11	345°45.8	31.6	277°24.3	5.3′	27°16.1	5.4′	58.3′
12	0°45.8	N15°32.3	291°48.7	5.5′	N27°10.7	5.5′	58.3′
13	15°45.9	33.0	306°13.1	5.6′	27°05.2	5.8′	58.2′
14	30°46.0	33.8	320°37.7	5.7′	26°59.4	5.8′	58.2′
15	45°46.0	·· 34.5	335°02.4	5.8′	26°53.6	6.1′	58.2′
16	60°46.1	35.3	349°27.2	5.9′	26°47.5	6.2′	58.1′
17	75°46.2	36.0	3°52.1	6.1′	26°41.3	6.4′	58.1′
18	90°46.2	N15°36.7	18°17.2	6.2′	N26°34.9	6.5′	58.0′
19	105°46.3	37.5	32°42.4	6.3′	26°28.4	6.6′	58.0′
20	120°46.4	38.2	47°07.7	6.4′	26°21.8	6.8′	58.0′
21	135°46.4	·· 38.9	61°33.1	6.6′	26°15.0	7.0′	57.9′
22	150°46.5	39.7	75°58.6	6.7′	26°08.0	7.1′	57.9′
23	165°46.6	40.4	90°24.3	6.8′	26°00.9	7.3′	57.8′
	SD = 15.9′	d = 0.7′	SD = 16.0′				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.6	N15°41.2	104°50.1	6.9′	N25°53.6	7.4′	57.8′
1	195°46.7	41.9	119°16.1	7.1′	25°46.2	7.5′	57.8′
2	210°46.8	42.6	133°42.1	7.2′	25°38.7	7.7′	57.7′
3	225°46.8	·· 43.4	148°08.3	7.3′	25°31.0	7.8′	57.7′
4	240°46.9	44.1	162°34.6	7.4′	25°23.2	8.0′	57.7′
5	255°46.9	44.8	177°01.1	7.6′	25°15.2	8.0′	57.6′
6	270°47.0	N15°45.6	191°27.6	7.7′	N25°07.2	8.3′	57.6′
7	285°47.1	46.3	205°54.3	7.8′	24°58.9	8.3′	57.5′
8	300°47.1	47.0	220°21.2	8.0′	24°50.6	8.5′	57.5′
9	315°47.2	·· 47.7	234°48.1	8.1′	24°42.1	8.6′	57.5′
10	330°47.2	48.5	249°15.2	8.2′	24°33.5	8.7′	57.4′
11	345°47.3	49.2	263°42.5	8.4′	24°24.8	8.9′	57.4′
12	0°47.4	N15°49.9	278°09.8	8.5′	N24°15.9	8.9′	57.3′
13	15°47.4	50.7	292°37.3	8.6′	24°07.0	9.1′	57.3′
14	30°47.5	51.4	307°04.9	8.7′	23°57.9	9.3′	57.3′
15	45°47.5	·· 52.1	321°32.6	8.9′	23°48.6	9.3′	57.2′
16	60°47.6	52.9	336°00.5	9.0′	23°39.3	9.4′	57.2′
17	75°47.7	53.6	350°28.5	9.1′	23°29.9	9.6′	57.2′
18	90°47.7	N15°54.3	4°56.6	9.3′	N23°20.3	9.7′	57.1′
19	105°47.8	55.0	19°24.9	9.4′	23°10.6	9.7′	57.1′
20	120°47.8	55.8	33°53.3	9.5′	23°00.9	9.9′	57.0′
21	135°47.9	·· 56.5	48°21.8	9.6′	22°51.0	10.0′	57.0′
22	150°48.0	57.2	62°50.4	9.8′	22°41.0	10.1′	57.0′
23	165°48.0	57.9	77°19.2	9.9′	22°30.9	10.2′	56.9′
	SD = 15.9′	d = 0.7′	SD = 15.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	01:42	22:20	–:–	–:–
N 70°	–:–	–:–	02:24	21:35	–:–	–:–
68°	–:–	00:52	02:52	21:06	23:16	–:–
66°	–:–	01:48	03:13	20:44	22:12	–:–
64°	–:–	02:20	03:29	20:27	21:38	–:–
62°	00:46	02:43	03:43	20:13	21:14	23:21
60°	01:36	03:01	03:55	20:01	20:55	22:23
N 58°	02:05	03:16	04:05	19:51	20:40	21:52
56°	02:27	03:29	04:13	19:42	20:27	21:30
54°	02:44	03:40	04:21	19:34	20:16	21:12
52°	02:58	03:49	04:28	19:27	20:06	20:58
50°	03:10	03:58	04:34	19:21	19:58	20:45
45°	03:35	04:15	04:48	19:07	19:40	20:20
N 40°	03:53	04:29	04:59	18:56	19:25	20:01
35°	04:08	04:41	05:08	18:46	19:14	19:46
30°	04:21	04:51	05:16	18:38	19:04	19:34
20°	04:40	05:07	05:30	18:24	18:47	19:14
N 10°	04:55	05:20	05:42	18:12	18:34	18:59
0°	05:07	05:32	05:54	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:49	18:11	18:36
20°	05:27	05:54	06:16	17:37	18:00	18:26
30°	05:36	06:05	06:30	17:24	17:49	18:17
35°	05:41	06:11	06:37	17:16	17:42	18:12
40°	05:46	06:18	06:46	17:07	17:36	18:08
45°	05:50	06:25	06:56	16:57	17:28	18:03
S 50°	05:56	06:34	07:08	16:45	17:19	17:58
52°	05:58	06:38	07:14	16:39	17:15	17:55
54°	06:00	06:42	07:20	16:33	17:11	17:53
56°	06:03	06:47	07:27	16:26	17:06	17:50
58°	06:05	06:52	07:35	16:18	17:01	17:48
S 60°	06:08	06:58	07:44	16:09	16:55	17:45

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°						
N 70°						
68°						
66°						
64°			06:26			04:10
62°		04:57	07:15		03:36	03:20
60°	04:37	06:00	07:46	01:45	02:33	02:48
N 58°	05:17	06:34	08:10	01:05	01:59	02:25
56°	05:45	06:59	08:28	00:37	01:34	02:05
54°	06:06	07:19	08:44	00:16	01:13	01:49
52°	06:24	07:36	08:58	·· ··	00:56	01:35
50°	06:40	07:50	09:09	·· ··	00:42	01:23
45°	07:11	08:20	09:34	·· ··	00:12	00:57
N 40°	07:35	08:42	09:53	23:49	·· ··	00:37
35°	07:55	09:01	10:10	23:29	·· ··	00:20
30°	08:12	09:17	10:23	23:13	·· ··	00:05
20°	08:40	09:45	10:47	22:45	23:40	·· ··
N 10°	09:05	10:08	11:08	22:21	23:18	·· ··
0°	09:28	10:30	11:27	21:58	22:58	23:52
S 10°	09:51	10:52	11:46	21:35	22:37	23:35
20°	10:16	11:15	12:06	21:11	22:15	23:16
30°	10:45	11:42	12:29	20:43	21:49	22:54
35°	11:02	11:58	12:43	20:26	21:34	22:42
40°	11:22	12:16	12:59	20:06	21:16	22:27
45°	11:46	12:39	13:17	19:42	20:54	22:09
S 50°	12:17	13:07	13:40	19:11	20:27	21:48
52°	12:33	13:21	13:51	18:55	20:13	21:37
54°	12:51	13:36	14:04	18:37	19:58	21:25
56°	13:13	13:55	14:18	18:15	19:40	21:11
58°	13:42	14:18	14:35	17:47	19:17	20:55
S 60°	14:24	14:48	14:55	17:05	18:47	20:36

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 15-34%
01	02:53	02:57	11:57	15:43	03:11	
02	03:00	03:03	11:57	16:44	04:14	
03	03:06	03:09	11:57	17:39	05:12	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2146 sec ΔT = TT-UT1 = +68.9694 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°08.1	220°36.5	N01°20.5	92°14.0	N20°24.0	140°51.2	N22°57.9	223°02.0	S02°34.8
1	237°10.5	235°37.4	20.7	107°15.2	23.7	155°53.2	57.9	238°04.2	34.7
2	252°13.0	250°38.3	21.0	122°16.5	23.3	170°55.1	57.9	253°06.5	34.6
3	267°15.5	265°39.1	·· 21.3	137°17.8	·· 23.0	185°57.0	·· 58.0	268°08.7	·· 34.5
4	282°17.9	280°40.0	21.6	152°19.1	22.6	200°58.9	58.0	283°11.0	34.5
5	297°20.4	295°40.9	21.9	167°20.3	22.3	216°00.8	58.0	298°13.2	34.4
6	312°22.8	310°41.8	N01°22.1	182°21.6	N20°21.9	231°02.7	N22°58.1	313°15.4	S02°34.3
7	327°25.3	325°42.7	22.4	197°22.9	21.6	246°04.6	58.1	328°17.7	34.2
8	342°27.8	340°43.5	22.7	212°24.1	21.3	261°06.5	58.1	343°19.9	34.1
9	357°30.2	355°44.4	·· 23.0	227°25.4	·· 20.9	276°08.5	·· 58.2	358°22.1	·· 34.0
10	12°32.7	10°45.3	23.3	242°26.7	20.6	291°10.4	58.2	13°24.4	33.9
11	27°35.2	25°46.1	23.5	257°27.9	20.2	306°12.3	58.3	28°26.6	33.8
12	42°37.6	40°47.0	N01°23.8	272°29.2	N20°19.9	321°14.2	N22°58.3	43°28.8	S02°33.7
13	57°40.1	55°47.9	24.1	287°30.5	19.5	336°16.1	58.3	58°31.1	33.6
14	72°42.6	70°48.7	24.4	302°31.8	19.2	351°18.0	58.4	73°33.3	33.5
15	87°45.0	85°49.6	·· 24.7	317°33.0	·· 18.8	6°19.9	·· 58.4	88°35.5	·· 33.5
16	102°47.5	100°50.4	25.0	332°34.3	18.5	21°21.8	58.4	103°37.8	33.4
17	117°50.0	115°51.3	25.3	347°35.6	18.1	36°23.7	58.5	118°40.0	33.3
18	132°52.4	130°52.1	N01°25.6	2°36.8	N20°17.8	51°25.7	N22°58.5	133°42.3	S02°33.2
19	147°54.9	145°53.0	25.9	17°38.1	17.4	66°27.6	58.5	148°44.5	33.1
20	162°57.3	160°53.9	26.2	32°39.4	17.1	81°29.5	58.6	163°46.7	33.0
21	177°59.8	175°54.7	·· 26.5	47°40.6	·· 16.7	96°31.4	·· 58.6	178°49.0	·· 32.9
22	193°02.3	190°55.5	26.8	62°41.9	16.4	111°33.3	58.6	193°51.2	32.8
23	208°04.7	205°56.4	27.1	77°43.2	16.0	126°35.2	58.7	208°53.4	32.7
Mer.pass.	09:10	ν 0.9′	d 0.3′	m -4.69	ν 1.3′	d -0.3′	m 0.98	ν 1.9′	d 0.0′ m -1.97	ν 2.2′	d 0.1′ m 1.17

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°07.2	220°57.2	N01°27.4	92°44.4	N20°15.7	141°37.1	N22°58.7	223°55.7	S02°32.6
1	238°09.7	235°58.1	27.7	107°45.7	15.3	156°39.0	58.7	238°57.9	32.6
2	253°12.1	250°58.9	28.0	122°47.0	15.0	171°40.9	58.8	254°00.2	32.5
3	268°14.6	265°59.8	·· 28.3	137°48.2	·· 14.6	186°42.8	·· 58.8	269°02.4	·· 32.4
4	283°17.1	281°00.6	28.6	152°49.5	14.3	201°44.8	58.9	284°04.6	32.3
5	298°19.5	296°01.4	28.9	167°50.7	13.9	216°46.7	58.9	299°06.9	32.2
6	313°22.0	311°02.3	N01°29.2	182°52.0	N20°13.6	231°48.6	N22°58.9	314°09.1	S02°32.1
7	328°24.4	326°03.1	29.5	197°53.3	13.2	246°50.5	59.0	329°11.3	32.0
8	343°26.9	341°03.9	29.8	212°54.5	12.9	261°52.4	59.0	344°13.6	31.9
9	358°29.4	356°04.8	·· 30.1	227°55.8	·· 12.5	276°54.3	·· 59.0	359°15.8	·· 31.8
10	13°31.8	11°05.6	30.4	242°57.1	12.2	291°56.2	59.1	14°18.1	31.7
11	28°34.3	26°06.4	30.7	257°58.3	11.8	306°58.1	59.1	29°20.3	31.7
12	43°36.8	41°07.3	N01°31.0	272°59.6	N20°11.5	322°00.0	N22°59.1	44°22.5	S02°31.6
13	58°39.2	56°08.1	31.4	288°00.9	11.1	337°01.9	59.2	59°24.8	31.5
14	73°41.7	71°08.9	31.7	303°02.1	10.8	352°03.8	59.2	74°27.0	31.4
15	88°44.2	86°09.7	·· 32.0	318°03.4	·· 10.4	7°05.7	·· 59.2	89°29.2	·· 31.3
16	103°46.6	101°10.5	32.3	333°04.6	10.1	22°07.7	59.3	104°31.5	31.2
17	118°49.1	116°11.4	32.6	348°05.9	09.7	37°09.6	59.3	119°33.7	31.1
18	133°51.6	131°12.2	N01°33.0	3°07.2	N20°09.4	52°11.5	N22°59.3	134°36.0	S02°31.0
19	148°54.0	146°13.0	33.3	18°08.4	09.0	67°13.4	59.4	149°38.2	30.9
20	163°56.5	161°13.8	33.6	33°09.7	08.7	82°15.3	59.4	164°40.4	30.8
21	178°58.9	176°14.6	·· 33.9	48°11.0	·· 08.3	97°17.2	·· 59.4	179°42.7	·· 30.8
22	194°01.4	191°15.4	34.2	63°12.2	08.0	112°19.1	59.5	194°44.9	30.7
23	209°03.9	206°16.2	34.6	78°13.5	07.6	127°21.0	59.5	209°47.2	30.6
Mer.pass.	09:06	ν 0.8′	d 0.3′	m -4.68	ν 1.3′	d -0.3′	m 0.99	ν 1.9′	d 0.0′ m -1.97	ν 2.2′	d 0.1′ m 1.16

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	224°06.3	221°17.0	N01°34.9	93°14.7	N20°07.3	142°22.9	N22°59.5	224°49.4	S02°30.5
1	239°08.8	236°17.8	35.2	108°16.0	06.9	157°24.8	59.6	239°51.6	30.4
2	254°11.3	251°18.6	35.6	123°17.3	06.6	172°26.7	59.6	254°53.9	30.3
3	269°13.7	266°19.4	·· 35.9	138°18.5	·· 06.2	187°28.6	·· 59.7	269°56.1	·· 30.2
4	284°16.2	281°20.2	36.2	153°19.8	05.8	202°30.5	59.7	284°58.4	30.1
5	299°18.7	296°21.0	36.6	168°21.0	05.5	217°32.4	59.7	300°00.6	30.0
6	314°21.1	311°21.8	N01°36.9	183°22.3	N20°05.1	232°34.4	N22°59.8	315°02.8	S02°30.0
7	329°23.6	326°22.6	37.2	198°23.6	04.8	247°36.3	59.8	330°05.1	29.9
8	344°26.1	341°23.4	37.6	213°24.8	04.4	262°38.2	59.8	345°07.3	29.8
9	359°28.5	356°24.2	·· 37.9	228°26.1	·· 04.1	277°40.1	·· 59.9	0°09.6	·· 29.7
10	14°31.0	11°25.0	38.2	243°27.3	03.7	292°42.0	59.9	15°11.8	29.6
11	29°33.4	26°25.8	38.6	258°28.6	03.4	307°43.9	22°59.9	30°14.0	29.5
12	44°35.9	41°26.6	N01°38.9	273°29.8	N20°03.0	322°45.8	N23°00.0	45°16.3	S02°29.4
13	59°38.4	56°27.4	39.3	288°31.1	02.6	337°47.7	00.0	60°18.5	29.3
14	74°40.8	71°28.2	39.6	303°32.4	02.3	352°49.6	00.0	75°20.8	29.2
15	89°43.3	86°28.9	·· 39.9	318°33.6	·· 01.9	7°51.5	·· 00.1	90°23.0	·· 29.2
16	104°45.8	101°29.7	40.3	333°34.9	01.6	22°53.4	00.1	105°25.2	29.1
17	119°48.2	116°30.5	40.6	348°36.1	01.2	37°55.3	00.1	120°27.5	29.0
18	134°50.7	131°31.3	N01°41.0	3°37.4	N20°00.9	52°57.2	N23°00.2	135°29.7	S02°28.9
19	149°53.2	146°32.0	41.3	18°38.6	00.5	67°59.1	00.2	150°32.0	28.8
20	164°55.6	161°32.8	41.7	33°39.9	20°00.2	83°01.0	00.2	165°34.2	28.7
21	179°58.1	176°33.6	·· 42.0	48°41.2	19°59.8	98°02.9	·· 00.3	180°36.4	·· 28.6
22	195°00.5	191°34.4	42.4	63°42.4	59.4	113°04.8	00.3	195°38.7	28.5
23	210°03.0	206°35.1	42.7	78°43.7	59.1	128°06.7	00.3	210°40.9	28.4
Mer.pass.	09:02	ν 0.8′	d 0.3′	m -4.67	ν 1.3′	d -0.4′	m 1.00	ν 1.9′	d 0.0′ m -1.97	ν 2.2′	d 0.1′ m 1.16

Stars	SHA	Dec
Alpheratz	357°34.8	29°13.6
Ankaa	353°07.2	-42°10.0
Schedar	349°31.3	56°40.4
Diphda	348°47.3	-17°50.9
Achernar	335°20.5	-57°06.4
Hamal	327°51.3	23°34.8
Polaris	314°24.5	89°22.2
Acamar	315°12.0	-40°12.2
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.6	-52°42.7
Sirius	258°26.2	-16°45.2
Adhara	255°05.9	-29°00.6
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°58.0
Avior	234°14.8	-59°35.7
Suhail	222°46.1	-43°32.3
Miaplacidus	221°38.3	-69°49.5
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.3	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.6
Gacrux	171°50.9	-57°15.5
Alioth	166°12.2	55°49.4
Spica	158°21.7	-11°17.8
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.8
Menkent	147°56.9	-36°29.8
Arcturus	145°47.3	19°02.9
Rigil Kent.	139°39.3	-60°56.5
Kochab	137°18.6	74°03.0
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.2	-26°29.3
Atria	107°08.7	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.1	12°32.3
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°31.9	-34°22.3
Vega	80°32.8	38°48.1
Nunki	75°47.3	-26°15.9
Altair	61°59.6	8°55.9
Peacock	53°05.2	-56°39.0
Deneb	49°25.6	45°21.9
Enif	33°38.6	9°59.3
Al Na'ir	27°32.7	-46°50.1
Fomalhaut	15°14.4	-29°29.2
Scheat	13°45.2	28°13.0
Markab	13°29.8	15°20.3

May 04 Sun	SHA	Mer.pass
Venus	358°28.4	09:17
Mars	230°05.9	17:50
Jupiter	278°43.2	14:35
Saturn	0°54.0	09:07

May 05 Mon	SHA	Mer.pass
Venus	357°50.0	09:16
Mars	229°37.2	17:48
Jupiter	278°29.9	14:32
Saturn	0°48.5	09:03

May 06 Tue	SHA	Mer.pass
Venus	357°10.7	09:14
Mars	229°08.4	17:46
Jupiter	278°16.6	14:29
Saturn	0°43.1	08:59

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	Sun			Moon				
h								
Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°48.1	N15°58.7	91°48.1	10.0′	N22°20.7	10.3′	56.9′	
1	195°48.1	15°59.4	106°17.1	10.1′	22°10.4	10.4′	56.9′	
2	210°48.2	16°00.1	120°46.2	10.3′	22°00.0	10.5′	56.8′	
3	225°48.3	·· 00.8	135°15.5	10.4′	21°49.5	10.6′	56.8′	
4	240°48.3	01.6	149°44.9	10.5′	21°38.9	10.7′	56.8′	
5	255°48.4	02.3	164°14.4	10.6′	21°28.2	10.8′	56.7′	
6	270°48.4	N16°03.0	178°44.0	10.8′	N21°17.4	10.9′	56.7′	
7	285°48.5	03.7	193°13.8	10.9′	21°06.5	11.0′	56.6′	
8	300°48.5	04.4	207°43.7	11.0′	20°55.5	11.0′	56.6′	
9	315°48.6	·· 05.2	222°13.7	11.1′	20°44.5	11.2′	56.6′	
10	330°48.6	05.9	236°43.8	11.2′	20°33.3	11.2′	56.5′	
11	345°48.7	06.6	251°14.0	11.4′	20°22.1	11.3′	56.5′	
12	0°48.8	N16°07.3	265°44.4	11.5′	N20°10.8	11.4′	56.5′	
13	15°48.8	08.0	280°14.8	11.6′	19°59.4	11.5′	56.4′	
14	30°48.9	08.7	294°45.4	11.7′	19°47.9	11.6′	56.4′	
15	45°48.9	·· 09.5	309°16.1	11.8′	19°36.3	11.6′	56.4′	
16	60°49.0	10.2	323°46.9	11.9′	19°24.7	11.7′	56.3′	
17	75°49.0	10.9	338°17.9	12.0′	19°13.0	11.8′	56.3′	
18	90°49.1	N16°11.6	352°48.9	12.2′	N19°01.2	11.9′	56.3′	
19	105°49.1	12.3	7°20.1	12.3′	18°49.3	11.9′	56.2′	
20	120°49.2	13.0	21°51.3	12.4′	18°37.4	12.0′	56.2′	
21	135°49.2	·· 13.8	36°22.7	12.5′	18°25.4	12.1′	56.2′	
22	150°49.3	14.5	50°54.2	12.6′	18°13.3	12.2′	56.1′	
23	165°49.4	15.2	65°25.7	12.7′	18°01.1	12.2′	56.1′	
	SD = 15.9′	d = 0.7′	SD = 15.5′					

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.4	N16°15.9	79°57.4	12.8′	N17°48.9	12.3′	56.1′
1	195°49.5	16.6	94°29.2	12.9′	17°36.6	12.3′	56.0′
2	210°49.5	17.3	109°01.1	13.0′	17°24.3	12.4′	56.0′
3	225°49.6	·· 18.0	123°33.1	13.1′	17°11.9	12.5′	56.0′
4	240°49.6	18.7	138°05.2	13.2′	16°59.4	12.5′	56.0′
5	255°49.7	19.5	152°37.4	13.3′	16°46.9	12.6′	55.9′
6	270°49.7	N16°20.2	167°09.7	13.4′	N16°34.3	12.7′	55.9′
7	285°49.8	20.9	181°42.1	13.5′	16°21.6	12.7′	55.9′
8	300°49.8	21.6	196°14.6	13.6′	16°08.9	12.8′	55.8′
9	315°49.9	·· 22.3	210°47.2	13.7′	15°56.1	12.8′	55.8′
10	330°49.9	23.0	225°19.9	13.8′	15°43.3	12.9′	55.8′
11	345°50.0	23.7	239°52.7	13.9′	15°30.4	12.9′	55.7′
12	0°50.0	N16°24.4	254°25.6	14.0′	N15°17.5	13.0′	55.7′
13	15°50.1	25.1	268°58.5	14.1′	15°04.5	13.0′	55.7′
14	30°50.1	25.8	283°31.6	14.1′	14°51.5	13.1′	55.7′
15	45°50.2	·· 26.5	298°04.7	14.2′	14°38.4	13.1′	55.6′
16	60°50.2	27.2	312°37.9	14.3′	14°25.3	13.2′	55.6′
17	75°50.3	27.9	327°11.3	14.4′	14°12.1	13.2′	55.6′
18	90°50.3	N16°28.6	341°44.6	14.5′	N13°58.9	13.3′	55.5′
19	105°50.4	29.4	356°18.1	14.6′	13°45.6	13.3′	55.5′
20	120°50.4	30.1	10°51.7	14.6′	13°32.3	13.4′	55.5′
21	135°50.4	·· 30.8	25°25.3	14.7′	13°18.9	13.4′	55.5′
22	150°50.5	31.5	39°59.1	14.8′	13°05.5	13.4′	55.4′
23	165°50.5	32.2	54°32.9	14.9′	12°52.1	13.5′	55.4′
	SD = 15.9′	d = 0.7′	SD = 15.3′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.6	N16°32.9	69°06.7	15.0′	N12°38.6	13.5′	55.4′
1	195°50.6	33.6	83°40.7	15.0′	12°25.1	13.5′	55.4′
2	210°50.7	34.3	98°14.7	15.1′	12°11.6	13.6′	55.3′
3	225°50.7	·· 35.0	112°48.8	15.2′	11°58.0	13.6′	55.3′
4	240°50.8	35.7	127°23.0	15.2′	11°44.4	13.7′	55.3′
5	255°50.8	36.4	141°57.2	15.3′	11°30.7	13.7′	55.3′
6	270°50.9	N16°37.1	156°31.6	15.4′	N11°17.0	13.7′	55.2′
7	285°50.9	37.8	171°05.9	15.5′	11°03.3	13.8′	55.2′
8	300°51.0	38.5	185°40.4	15.5′	10°49.5	13.7′	55.2′
9	315°51.0	·· 39.2	200°14.9	15.6′	10°35.8	13.9′	55.2′
10	330°51.0	39.9	214°49.5	15.6′	10°21.9	13.8′	55.1′
11	345°51.1	40.6	229°24.1	15.7′	10°08.1	13.9′	55.1′
12	0°51.1	N16°41.2	243°58.9	15.8′	N09°54.2	13.9′	55.1′
13	15°51.2	41.9	258°33.6	15.8′	09°40.3	13.9′	55.1′
14	30°51.2	42.6	273°08.4	15.9′	09°26.4	13.9′	55.0′
15	45°51.3	·· 43.3	287°43.3	15.9′	09°12.5	14.0′	55.0′
16	60°51.3	44.0	302°18.3	16.0′	08°58.5	14.0′	55.0′
17	75°51.3	44.7	316°53.3	16.1′	08°44.5	14.0′	55.0′
18	90°51.4	N16°45.4	331°28.3	16.1′	N08°30.5	14.1′	54.9′
19	105°51.4	46.1	346°03.4	16.2′	08°16.4	14.0′	54.9′
20	120°51.5	46.8	0°38.6	16.2′	08°02.4	14.1′	54.9′
21	135°51.5	·· 47.5	15°13.8	16.3′	07°48.3	14.1′	54.9′
22	150°51.6	48.2	29°49.1	16.3′	07°34.2	14.1′	54.9′
23	165°51.6	48.9	44°24.4	16.4′	07°20.1	14.2′	54.8′
	SD = 15.8′	d = 0.7′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	01:11	22:54	–:–	–:–
N 70°	–:–	–:–	02:05	21:54	–:–	–:–
68°	–:–	–:–	02:37	21:20	–:–	–:–
66°	–:–	01:27	03:01	20:55	22:33	–:–
64°	–:–	02:05	03:19	20:36	21:52	–:–
62°	–:–	02:31	03:34	20:21	21:25	–:–
60°	01:17	02:51	03:47	20:08	21:05	22:42
N 58°	01:52	03:07	03:58	19:57	20:48	22:05
56°	02:16	03:21	04:07	19:48	20:34	21:40
54°	02:35	03:33	04:15	19:39	20:22	21:21
52°	02:50	03:43	04:23	19:32	20:12	21:05
50°	03:04	03:52	04:29	19:25	20:03	20:51
45°	03:30	04:11	04:43	19:11	19:44	20:25
N 40°	03:49	04:25	04:55	18:59	19:29	20:05
35°	04:05	04:38	05:05	18:49	19:16	19:49
30°	04:18	04:48	05:14	18:40	19:06	19:36
20°	04:38	05:05	05:28	18:25	18:48	19:16
N 10°	04:54	05:19	05:41	18:12	18:34	19:00
0°	05:07	05:32	05:53	18:00	18:22	18:47
S 10°	05:18	05:43	06:05	17:48	18:10	18:35
20°	05:28	05:55	06:17	17:36	17:59	18:25
30°	05:38	06:07	06:32	17:21	17:46	18:15
35°	05:43	06:13	06:40	17:13	17:40	18:10
40°	05:48	06:21	06:49	17:04	17:32	18:05
45°	05:54	06:29	07:00	16:53	17:24	17:59
S 50°	06:00	06:38	07:13	16:40	17:15	17:53
52°	06:02	06:42	07:19	16:34	17:10	17:51
54°	06:05	06:47	07:26	16:27	17:05	17:48
56°	06:08	06:52	07:33	16:20	17:00	17:45
58°	06:11	06:58	07:41	16:11	16:55	17:42
S 60°	06:14	07:04	07:51	16:02	16:48	17:39

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▭	08:53	11:33	▭	05:17	04:07
N 70°	▭	09:36	11:50	▭	04:32	03:49
68°	07:24	10:04	12:03	05:04	04:02	03:33
66°	08:16	10:25	12:14	04:10	03:40	03:21
64°	08:48	10:42	12:23	03:37	03:22	03:11
62°	09:12	10:55	12:30	03:13	03:07	03:02
60°	09:30	11:07	12:37	02:53	02:54	02:54
N 58°	09:46	11:17	12:42	02:37	02:43	02:47
56°	09:59	11:26	12:47	02:23	02:34	02:41
54°	10:10	11:33	12:52	02:11	02:25	02:36
52°	10:20	11:40	12:56	02:00	02:18	02:31
50°	10:29	11:46	12:59	01:51	02:11	02:26
45°	10:48	11:59	13:07	01:31	01:56	02:17
N 40°	11:03	12:10	13:14	01:14	01:44	02:08
35°	11:16	12:20	13:20	01:01	01:34	02:01
30°	11:27	12:28	13:25	00:48	01:24	01:55
20°	11:46	12:41	13:33	00:27	01:08	01:44
N 10°	12:03	12:53	13:41	00:09	00:54	01:35
0°	12:18	13:05	13:47	·· ··	00:41	01:26
S 10°	12:33	13:16	13:54	·· ··	00:28	01:16
20°	12:50	13:28	14:02	·· ··	00:13	01:07
30°	13:08	13:41	14:10	23:57	·· ··	00:55
35°	13:19	13:49	14:15	23:47	·· ··	00:49
40°	13:31	13:58	14:20	23:36	·· ··	00:41
45°	13:46	14:08	14:27	23:23	·· ··	00:33
S 50°	14:03	14:21	14:34	23:07	·· ··	00:22
52°	14:12	14:26	14:38	22:59	·· ··	00:17
54°	14:21	14:33	14:41	22:50	·· ··	00:11
56°	14:31	14:40	14:45	22:41	·· ··	00:05
58°	14:43	14:47	14:50	22:30	23:58	·· ··
S 60°	14:57	14:56	14:55	22:17	23:51	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 44-64%
04	03:12	03:15	11:57	18:30	06:05	
05	03:18	03:20	11:57	19:15	06:53	
06	03:22	03:25	11:57	19:57	07:37	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2153 sec ΔT = TT-UT1 = +68.9687 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	225°05.5	221°35.9	N01°43.1	93°44.9	N19°58.7	143°08.6	N23°00.4	225°43.2	S02°28.4
1	240°07.9	236°36.7	43.4	108°46.2	58.4	158°10.5	00.4	240°45.4	28.3
2	255°10.4	251°37.4	43.8	123°47.4	58.0	173°12.5	00.4	255°47.6	28.2
3	270°12.9	266°38.2	·· 44.2	138°48.7	·· 57.6	188°14.4	·· 00.5	270°49.9	·· 28.1
4	285°15.3	281°39.0	44.5	153°49.9	57.3	203°16.3	00.5	285°52.1	28.0
5	300°17.8	296°39.7	44.9	168°51.2	56.9	218°18.2	00.5	300°54.4	27.9
6	315°20.3	311°40.5	N01°45.2	183°52.4	N19°56.6	233°20.1	N23°00.6	315°56.6	S02°27.8
7	330°22.7	326°41.2	45.6	198°53.7	56.2	248°22.0	00.6	330°58.9	27.7
8	345°25.2	341°42.0	46.0	213°55.0	55.9	263°23.9	00.6	346°01.1	27.7
9	0°27.7	356°42.8	·· 46.3	228°56.2	·· 55.5	278°25.8	·· 00.7	1°03.3	·· 27.6
10	15°30.1	11°43.5	46.7	243°57.5	55.1	293°27.7	00.7	16°05.6	27.5
11	30°32.6	26°44.3	47.1	258°58.7	54.8	308°29.6	00.7	31°07.8	27.4
12	45°35.0	41°45.0	N01°47.4	274°00.0	N19°54.4	323°31.5	N23°00.8	46°10.1	S02°27.3
13	60°37.5	56°45.8	47.8	289°01.2	54.1	338°33.4	00.8	61°12.3	27.2
14	75°40.0	71°46.5	48.2	304°02.5	53.7	353°35.3	00.8	76°14.6	27.1
15	90°42.4	86°47.3	·· 48.5	319°03.7	·· 53.3	8°37.2	·· 00.9	91°16.8	·· 27.0
16	105°44.9	101°48.0	48.9	334°05.0	53.0	23°39.1	00.9	106°19.0	27.0
17	120°47.4	116°48.7	49.3	349°06.2	52.6	38°41.0	00.9	121°21.3	26.9
18	135°49.8	131°49.5	N01°49.6	4°07.5	N19°52.2	53°42.9	N23°01.0	136°23.5	S02°26.8
19	150°52.3	146°50.2	50.0	19°08.7	51.9	68°44.8	01.0	151°25.8	26.7
20	165°54.8	161°51.0	50.4	34°10.0	51.5	83°46.7	01.0	166°28.0	26.6
21	180°57.2	176°51.7	·· 50.8	49°11.2	·· 51.2	98°48.6	·· 01.1	181°30.3	·· 26.5
22	195°59.7	191°52.4	51.2	64°12.5	50.8	113°50.5	01.1	196°32.5	26.4
23	211°02.1	206°53.2	51.5	79°13.7	50.4	128°52.4	01.1	211°34.7	26.3
Mer.pass.	08:58	ν 0.8′	d 0.4′	m -4.66	ν 1.3′	d -0.4′	m 1.02	ν 1.9′	d 0.0′ m -1.97	ν 2.2′	d 0.1′ m 1.16

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	226°04.6	221°53.9	N01°51.9	94°15.0	N19°50.1	143°54.3	N23°01.2	226°37.0	S02°26.3
1	241°07.1	236°54.6	52.3	109°16.2	49.7	158°56.2	01.2	241°39.2	26.2
2	256°09.5	251°55.4	52.7	124°17.5	49.4	173°58.1	01.2	256°41.5	26.1
3	271°12.0	266°56.1	·· 53.1	139°18.7	·· 49.0	189°00.0	·· 01.3	271°43.7	·· 26.0
4	286°14.5	281°56.8	53.4	154°20.0	48.6	204°01.9	01.3	286°46.0	25.9
5	301°16.9	296°57.6	53.8	169°21.2	48.3	219°03.8	01.3	301°48.2	25.8
6	316°19.4	311°58.3	N01°54.2	184°22.5	N19°47.9	234°05.7	N23°01.4	316°50.5	S02°25.7
7	331°21.9	326°59.0	54.6	199°23.7	47.5	249°07.6	01.4	331°52.7	25.6
8	346°24.3	341°59.7	55.0	214°25.0	47.2	264°09.5	01.4	346°54.9	25.6
9	1°26.8	357°00.4	·· 55.4	229°26.2	·· 46.8	279°11.4	·· 01.5	1°57.2	·· 25.5
10	16°29.3	12°01.2	55.8	244°27.5	46.4	294°13.3	01.5	16°59.4	25.4
11	31°31.7	27°01.9	56.2	259°28.7	46.1	309°15.2	01.5	32°01.7	25.3
12	46°34.2	42°02.6	N01°56.5	274°30.0	N19°45.7	324°17.1	N23°01.6	47°03.9	S02°25.2
13	61°36.6	57°03.3	56.9	289°31.2	45.3	339°19.0	01.6	62°06.2	25.1
14	76°39.1	72°04.0	57.3	304°32.5	45.0	354°20.9	01.6	77°08.4	25.0
15	91°41.6	87°04.7	·· 57.7	319°33.7	·· 44.6	9°22.8	·· 01.7	92°10.7	·· 25.0
16	106°44.0	102°05.4	58.1	334°35.0	44.3	24°24.7	01.7	107°12.9	24.9
17	121°46.5	117°06.2	58.5	349°36.2	43.9	39°26.6	01.7	122°15.1	24.8
18	136°49.0	132°06.9	N01°58.9	4°37.5	N19°43.5	54°28.5	N23°01.8	137°17.4	S02°24.7
19	151°51.4	147°07.6	59.3	19°38.7	43.2	69°30.4	01.8	152°19.6	24.6
20	166°53.9	162°08.3	01°59.7	34°40.0	42.8	84°32.3	01.8	167°21.9	24.5
21	181°56.4	177°09.0	02°00.1	49°41.2	·· 42.4	99°34.2	·· 01.9	182°24.1	·· 24.4
22	196°58.8	192°09.7	00.5	64°42.4	42.1	114°36.1	01.9	197°26.4	24.4
23	212°01.3	207°10.4	00.9	79°43.7	41.7	129°38.0	01.9	212°28.6	24.3
Mer.pass.	08:54	ν 0.7′	d 0.4′	m -4.65	ν 1.3′	d -0.4′	m 1.03	ν 1.9′	d 0.0′ m -1.96	ν 2.2′	d 0.1′ m 1.16

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	227°03.8	222°11.1	N02°01.3	94°44.9	N19°41.3	144°39.9	N23°02.0	227°30.9	S02°24.2
1	242°06.2	237°11.8	01.7	109°46.2	41.0	159°41.8	02.0	242°33.1	24.1
2	257°08.7	252°12.5	02.1	124°47.4	40.6	174°43.7	02.0	257°35.4	24.0
3	272°11.1	267°13.2	·· 02.6	139°48.7	·· 40.2	189°45.6	·· 02.1	272°37.6	·· 23.9
4	287°13.6	282°13.9	03.0	154°49.9	39.9	204°47.5	02.1	287°39.9	23.8
5	302°16.1	297°14.5	03.4	169°51.2	39.5	219°49.4	02.1	302°42.1	23.8
6	317°18.5	312°15.2	N02°03.8	184°52.4	N19°39.1	234°51.3	N23°02.1	317°44.3	S02°23.7
7	332°21.0	327°15.9	04.2	199°53.6	38.8	249°53.2	02.2	332°46.6	23.6
8	347°23.5	342°16.6	04.6	214°54.9	38.4	264°55.1	02.2	347°48.8	23.5
9	2°25.9	357°17.3	·· 05.0	229°56.1	·· 38.0	279°57.0	·· 02.2	2°51.1	·· 23.4
10	17°28.4	12°18.0	05.4	244°57.4	37.6	294°58.9	02.3	17°53.3	23.3
11	32°30.9	27°18.7	05.8	259°58.6	37.3	310°00.8	02.3	32°55.6	23.2
12	47°33.3	42°19.3	N02°06.3	274°59.9	N19°36.9	325°02.7	N23°02.3	47°57.8	S02°23.2
13	62°35.8	57°20.0	06.7	290°01.1	36.5	340°04.6	02.4	63°00.1	23.1
14	77°38.2	72°20.7	07.1	305°02.4	36.2	355°06.5	02.4	78°02.3	23.0
15	92°40.7	87°21.4	·· 07.5	320°03.6	·· 35.8	10°08.4	·· 02.4	93°04.6	·· 22.9
16	107°43.2	102°22.1	07.9	335°04.8	35.4	25°10.3	02.5	108°06.8	22.8
17	122°45.6	117°22.7	08.4	350°06.1	35.1	40°12.2	02.5	123°09.1	22.7
18	137°48.1	132°23.4	N02°08.8	5°07.3	N19°34.7	55°14.1	N23°02.5	138°11.3	S02°22.6
19	152°50.6	147°24.1	09.2	20°08.6	34.3	70°16.0	02.6	153°13.6	22.6
20	167°53.0	162°24.8	09.6	35°09.8	33.9	85°17.9	02.6	168°15.8	22.5
21	182°55.5	177°25.4	·· 10.1	50°11.0	·· 33.6	100°19.8	·· 02.6	183°18.1	·· 22.4
22	197°58.0	192°26.1	10.5	65°12.3	33.2	115°21.7	02.7	198°20.3	22.3
23	213°00.4	207°26.8	10.9	80°13.5	32.8	130°23.6	02.7	213°22.6	22.2
Mer.pass.	08:50	ν 0.7′	d 0.4′	m -4.64	ν 1.2′	d -0.4′	m 1.04	ν 1.9′	d 0.0′ m -1.96	ν 2.2′	d 0.1′ m 1.15

Stars	SHA	Dec
Alpheratz	357°34.8	29°13.6
Ankaa	353°07.2	-42°10.0
Schedar	349°31.2	56°40.4
Diphda	348°47.3	-17°50.9
Achernar	335°20.5	-57°06.4
Hamal	327°51.3	23°34.8
Polaris	314°24.5	89°22.2
Acamar	315°12.0	-40°12.2
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.7	-52°42.7
Sirius	258°26.2	-16°45.2
Adhara	255°05.9	-29°00.5
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°58.0
Avior	234°14.8	-59°35.7
Suhail	222°46.2	-43°32.3
Miaplacidus	221°38.3	-69°49.5
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.3	-63°14.6
Gacrux	171°51.0	-57°15.5
Alioth	166°12.2	55°49.4
Spica	158°21.7	-11°17.8
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.9
Menkent	147°57.0	-36°29.8
Arcturus	145°47.3	19°02.9
Rigil Kent.	139°39.3	-60°56.5
Kochab	137°18.6	74°03.0
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.2	-26°29.3
Atria	107°08.7	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°41.7	51°28.8
Kaus Aust.	83°31.9	-34°22.3
Vega	80°32.8	38°48.1
Nunki	75°47.2	-26°15.9
Altair	61°59.6	8°55.9
Peacock	53°05.2	-56°39.0
Deneb	49°25.6	45°21.9
Enif	33°38.6	9°59.3
Al Na'ir	27°32.7	-46°50.1
Fomalhaut	15°14.4	-29°29.2
Scheat	13°45.1	28°13.0
Markab	13°29.8	15°20.3

May 07 Wed	SHA	Mer.pass
Venus	356°30.4	09:13
Mars	228°39.4	17:44
Jupiter	278°03.2	14:26
Saturn	0°37.7	08:56

May 08 Thu	SHA	Mer.pass
Venus	355°49.3	09:12
Mars	228°10.4	17:42
Jupiter	277°49.7	14:23
Saturn	0°32.4	08:52

May 09 Fri	SHA	Mer.pass
Venus	355°07.3	09:11
Mars	227°41.2	17:40
Jupiter	277°36.2	14:20
Saturn	0°27.1	08:49

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.6	N16°49.6	58°59.7	16.4′	N07°05.9	14.1′	54.8′
1	195°51.7	50.2	73°35.1	16.4′	06°51.8	14.2′	54.8′
2	210°51.7	50.9	88°10.6	16.5′	06°37.6	14.2′	54.8′
3	225°51.8	·· 51.6	102°46.1	16.5′	06°23.4	14.2′	54.8′
4	240°51.8	52.3	117°21.6	16.6′	06°09.2	14.2′	54.7′
5	255°51.8	53.0	131°57.2	16.6′	05°55.0	14.2′	54.7′
6	270°51.9	N16°53.7	146°32.8	16.6′	N05°40.8	14.2′	54.7′
7	285°51.9	54.4	161°08.4	16.7′	05°26.6	14.3′	54.7′
8	300°52.0	55.1	175°44.1	16.7′	05°12.3	14.2′	54.7′
9	315°52.0	·· 55.7	190°19.8	16.8′	04°58.1	14.3′	54.7′
10	330°52.0	56.4	204°55.6	16.8′	04°43.8	14.3′	54.6′
11	345°52.1	57.1	219°31.4	16.8′	04°29.5	14.2′	54.6′
12	0°52.1	N16°57.8	234°07.2	16.9′	N04°15.3	14.3′	54.6′
13	15°52.2	58.5	248°43.1	16.9′	04°01.0	14.3′	54.6′
14	30°52.2	59.2	263°18.9	16.9′	03°46.7	14.3′	54.6′
15	45°52.2	16°59.8	277°54.9	16.9′	03°32.4	14.3′	54.5′
16	60°52.3	17°00.5	292°30.8	17.0′	03°18.1	14.3′	54.5′
17	75°52.3	01.2	307°06.8	17.0′	03°03.8	14.3′	54.5′
18	90°52.3	N17°01.9	321°42.8	17.0′	N02°49.5	14.4′	54.5′
19	105°52.4	02.6	336°18.8	17.0′	02°35.1	14.3′	54.5′
20	120°52.4	03.2	350°54.8	17.1′	02°20.8	14.3′	54.5′
21	135°52.4	·· 03.9	5°30.9	17.1′	02°06.5	14.3′	54.5′
22	150°52.5	04.6	20°07.0	17.1′	01°52.2	14.3′	54.4′
23	165°52.5	05.3	34°43.1	17.1′	01°37.9	14.3′	54.4′
	SD = 15.8′	d = 0.7′	SD = 15.0′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.6	N17°06.0	49°19.2	17.1′	N01°23.6	14.4′	54.4′
1	195°52.6	06.6	63°55.3	17.2′	01°09.2	14.3′	54.4′
2	210°52.6	07.3	78°31.5	17.2′	00°54.9	14.3′	54.4′
3	225°52.7	·· 08.0	93°07.7	17.2′	00°40.6	14.3′	54.4′
4	240°52.7	08.7	107°43.8	17.2′	00°26.3	14.3′	54.3′
5	255°52.7	09.3	122°20.0	17.2′	N00°12.0	14.3′	54.3′
6	270°52.8	N17°10.0	136°56.2	17.2′	S00°02.3	14.3′	54.3′
7	285°52.8	10.7	151°32.5	17.2′	00°16.6	14.3′	54.3′
8	300°52.8	11.4	166°08.7	17.2′	00°30.9	14.2′	54.3′
9	315°52.9	·· 12.0	180°44.9	17.2′	00°45.1	14.3′	54.3′
10	330°52.9	12.7	195°21.2	17.2′	00°59.4	14.3′	54.3′
11	345°52.9	13.4	209°57.4	17.3′	01°13.7	14.2′	54.3′
12	0°53.0	N17°14.1	224°33.7	17.3′	S01°27.9	14.2′	54.2′
13	15°53.0	14.7	239°09.9	17.3′	01°42.1	14.3′	54.2′
14	30°53.0	15.4	253°46.2	17.3′	01°56.4	14.2′	54.2′
15	45°53.1	·· 16.1	268°22.4	17.3′	02°10.6	14.2′	54.2′
16	60°53.1	16.7	282°58.7	17.3′	02°24.8	14.2′	54.2′
17	75°53.1	17.4	297°34.9	17.3′	02°39.0	14.1′	54.2′
18	90°53.1	N17°18.1	312°11.2	17.3′	S02°53.1	14.2′	54.2′
19	105°53.2	18.8	326°47.5	17.2′	03°07.3	14.2′	54.2′
20	120°53.2	19.4	341°23.7	17.2′	03°21.5	14.1′	54.2′
21	135°53.2	·· 20.1	356°00.0	17.2′	03°35.6	14.1′	54.2′
22	150°53.3	20.8	10°36.2	17.2′	03°49.7	14.1′	54.1′
23	165°53.3	21.4	25°12.4	17.2′	04°03.8	14.1′	54.1′
	SD = 15.8′	d = 0.7′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	N17°22.1	39°48.6	17.2′	S04°17.9	14.0′	54.1′
1	195°53.4	22.8	54°24.9	17.2′	04°31.9	14.1′	54.1′
2	210°53.4	23.4	69°01.1	17.2′	04°46.0	14.0′	54.1′
3	225°53.4	·· 24.1	83°37.2	17.2′	05°00.0	14.0′	54.1′
4	240°53.4	24.7	98°13.4	17.2′	05°14.0	14.0′	54.1′
5	255°53.5	25.4	112°49.6	17.1′	05°28.0	13.9′	54.1′
6	270°53.5	N17°26.1	127°25.7	17.1′	S05°41.9	13.9′	54.1′
7	285°53.5	26.7	142°01.9	17.1′	05°55.8	13.9′	54.1′
8	300°53.6	27.4	156°38.0	17.1′	06°09.7	13.9′	54.1′
9	315°53.6	·· 28.1	171°14.1	17.1′	06°23.6	13.9′	54.0′
10	330°53.6	28.7	185°50.2	17.1′	06°37.5	13.8′	54.0′
11	345°53.6	29.4	200°26.2	17.0′	06°51.3	13.8′	54.0′
12	0°53.7	N17°30.0	215°02.3	17.0′	S07°05.1	13.8′	54.0′
13	15°53.7	30.7	229°38.3	17.0′	07°18.9	13.7′	54.0′
14	30°53.7	31.4	244°14.3	17.0′	07°32.6	13.8′	54.0′
15	45°53.7	·· 32.0	258°50.2	16.9′	07°46.4	13.7′	54.0′
16	60°53.8	32.7	273°26.2	16.9′	08°00.1	13.6′	54.0′
17	75°53.8	33.3	288°02.1	16.9′	08°13.7	13.6′	54.0′
18	90°53.8	N17°34.0	302°38.0	16.9′	S08°27.3	13.6′	54.0′
19	105°53.8	34.6	317°13.8	16.8′	08°40.9	13.6′	54.0′
20	120°53.9	35.3	331°49.7	16.8′	08°54.5	13.5′	54.0′
21	135°53.9	·· 36.0	346°25.5	16.8′	09°08.0	13.5′	54.0′
22	150°53.9	36.6	1°01.3	16.7′	09°21.5	13.5′	54.0′
23	165°53.9	37.3	15°37.0	16.7′	09°35.0	13.4′	54.0′
	SD = 15.8′	d = 0.7′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	00:17	–:–	–:–	–:–
N 70°	–:–	–:–	01:45	22:15	–:–	–:–
68°	–:–	–:–	02:23	21:34	–:–	–:–
66°	–:–	01:01	02:49	21:07	23:01	–:–
64°	–:–	01:49	03:09	20:46	22:08	–:–
62°	–:–	02:19	03:25	20:29	21:37	–:–
60°	00:54	02:41	03:39	20:16	21:14	23:07
N 58°	01:38	02:59	03:51	20:04	20:56	22:19
56°	02:05	03:14	04:01	19:54	20:41	21:50
54°	02:26	03:26	04:09	19:45	20:28	21:29
52°	02:43	03:37	04:17	19:37	20:17	21:12
50°	02:57	03:46	04:24	19:30	20:08	20:58
45°	03:24	04:06	04:39	19:14	19:48	20:30
N 40°	03:45	04:22	04:52	19:02	19:32	20:09
35°	04:01	04:35	05:02	18:51	19:19	19:52
30°	04:15	04:46	05:11	18:42	19:08	19:39
20°	04:36	05:04	05:27	18:26	18:50	19:17
N 10°	04:53	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:05	17:47	18:09	18:35
20°	05:29	05:56	06:19	17:34	17:57	18:24
30°	05:40	06:08	06:34	17:19	17:44	18:13
35°	05:45	06:15	06:42	17:10	17:37	18:07
40°	05:51	06:23	06:52	17:01	17:29	18:02
45°	05:57	06:32	07:03	16:49	17:20	17:56
S 50°	06:03	06:42	07:17	16:35	17:10	17:49
52°	06:06	06:47	07:24	16:29	17:05	17:46
54°	06:09	06:52	07:31	16:22	17:00	17:43
56°	06:12	06:57	07:39	16:14	16:55	17:40
58°	06:16	07:04	07:48	16:05	16:49	17:36
S 60°	06:19	07:10	07:58	15:54	16:42	17:33

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	13:39	15:37	17:38	03:28	02:55	02:23
N 70°	13:45	15:34	17:24	03:19	02:54	02:29
68°	13:49	15:31	17:14	03:12	02:53	02:35
66°	13:53	15:29	17:05	03:06	02:53	02:39
64°	13:56	15:27	16:58	03:01	02:52	02:43
62°	13:59	15:25	16:51	02:57	02:52	02:47
60°	14:01	15:24	16:46	02:53	02:51	02:50
N 58°	14:03	15:22	16:41	02:49	02:51	02:53
56°	14:05	15:21	16:37	02:46	02:51	02:55
54°	14:07	15:20	16:33	02:44	02:51	02:57
52°	14:08	15:19	16:30	02:41	02:50	02:59
50°	14:10	15:18	16:27	02:39	02:50	03:01
45°	14:13	15:16	16:20	02:34	02:50	03:05
N 40°	14:15	15:15	16:14	02:30	02:49	03:08
35°	14:17	15:14	16:10	02:26	02:49	03:11
30°	14:19	15:12	16:05	02:23	02:48	03:14
20°	14:22	15:10	15:58	02:17	02:48	03:18
N 10°	14:25	15:09	15:52	02:12	02:47	03:22
0°	14:28	15:07	15:46	02:07	02:47	03:26
S 10°	14:31	15:05	15:40	02:02	02:46	03:30
20°	14:33	15:04	15:34	01:57	02:46	03:34
30°	14:37	15:02	15:27	01:51	02:45	03:38
35°	14:38	15:01	15:24	01:48	02:45	03:41
40°	14:40	15:00	15:19	01:44	02:44	03:44
45°	14:43	14:58	15:14	01:39	02:44	03:47
S 50°	14:46	14:57	15:08	01:34	02:43	03:51
52°	14:47	14:56	15:05	01:31	02:43	03:53
54°	14:48	14:55	15:02	01:28	02:42	03:55
56°	14:50	14:54	14:59	01:25	02:42	03:58
58°	14:52	14:53	14:55	01:22	02:41	04:00
S 60°	14:54	14:52	14:51	01:18	02:41	04:03

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 73-88%
07	03:27	03:28	11:57	20:37	08:18	
08	03:30	03:32	11:56	21:16	08:57	
09	03:33	03:35	11:56	21:56	09:36	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2160 sec ΔT = TT-UT1 = +68.9680 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°02.9	222°27.4	N02°11.3	95°14.8	N19°32.5	145°25.5	N23°02.7	228°24.8	S02°22.1
1	243°05.4	237°28.1	11.8	110°16.0	32.1	160°27.4	02.8	243°27.0	22.0
2	258°07.8	252°28.8	12.2	125°17.3	31.7	175°29.2	02.8	258°29.3	22.0
3	273°10.3	267°29.4	·· 12.6	140°18.5	·· 31.3	190°31.1	·· 02.8	273°31.5	·· 21.9
4	288°12.7	282°30.1	13.1	155°19.7	31.0	205°33.0	02.8	288°33.8	21.8
5	303°15.2	297°30.7	13.5	170°21.0	30.6	220°34.9	02.9	303°36.0	21.7
6	318°17.7	312°31.4	N02°13.9	185°22.2	N19°30.2	235°36.8	N23°02.9	318°38.3	S02°21.6
7	333°20.1	327°32.0	14.4	200°23.4	29.9	250°38.7	02.9	333°40.5	21.5
8	348°22.6	342°32.7	14.8	215°24.7	29.5	265°40.6	03.0	348°42.8	21.5
9	3°25.1	357°33.4	·· 15.2	230°25.9	·· 29.1	280°42.5	·· 03.0	3°45.0	·· 21.4
10	18°27.5	12°34.0	15.7	245°27.2	28.7	295°44.4	03.0	18°47.3	21.3
11	33°30.0	27°34.7	16.1	260°28.4	28.4	310°46.3	03.1	33°49.5	21.2
12	48°32.5	42°35.3	N02°16.6	275°29.6	N19°28.0	325°48.2	N23°03.1	48°51.8	S02°21.1
13	63°34.9	57°36.0	17.0	290°30.9	27.6	340°50.1	03.1	63°54.0	21.0
14	78°37.4	72°36.6	17.4	305°32.1	27.2	355°52.0	03.2	78°56.3	20.9
15	93°39.8	87°37.2	·· 17.9	320°33.4	·· 26.9	10°53.9	·· 03.2	93°58.5	·· 20.9
16	108°42.3	102°37.9	18.3	335°34.6	26.5	25°55.8	03.2	109°00.8	20.8
17	123°44.8	117°38.5	18.8	350°35.8	26.1	40°57.7	03.3	124°03.0	20.7
18	138°47.2	132°39.2	N02°19.2	5°37.1	N19°25.8	55°59.6	N23°03.3	139°05.3	S02°20.6
19	153°49.7	147°39.8	19.7	20°38.3	25.4	71°01.5	03.3	154°07.5	20.5
20	168°52.2	162°40.5	20.1	35°39.5	25.0	86°03.4	03.3	169°09.8	20.4
21	183°54.6	177°41.1	·· 20.6	50°40.8	·· 24.6	101°05.3	·· 03.4	184°12.0	·· 20.4
22	198°57.1	192°41.7	21.0	65°42.0	24.3	116°07.2	03.4	199°14.3	20.3
23	213°59.6	207°42.4	21.5	80°43.3	23.9	131°09.0	03.4	214°16.5	20.2
Mer.pass.	08:46	ν 0.7′	d 0.4′	m -4.63	ν 1.2′	d -0.4′	m 1.05	ν 1.9′	d 0.0′ m -1.96	ν 2.2′	d 0.1′ m 1.15

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	229°02.0	222°43.0	N02°21.9	95°44.5	N19°23.5	146°10.9	N23°03.5	229°18.8	S02°20.1
1	244°04.5	237°43.6	22.4	110°45.7	23.1	161°12.8	03.5	244°21.0	20.0
2	259°07.0	252°44.3	22.8	125°47.0	22.7	176°14.7	03.5	259°23.3	19.9
3	274°09.4	267°44.9	·· 23.3	140°48.2	·· 22.4	191°16.6	·· 03.6	274°25.5	·· 19.9
4	289°11.9	282°45.5	23.7	155°49.4	22.0	206°18.5	03.6	289°27.8	19.8
5	304°14.3	297°46.1	24.2	170°50.7	21.6	221°20.4	03.6	304°30.0	19.7
6	319°16.8	312°46.8	N02°24.6	185°51.9	N19°21.2	236°22.3	N23°03.7	319°32.3	S02°19.6
7	334°19.3	327°47.4	25.1	200°53.1	20.9	251°24.2	03.7	334°34.5	19.5
8	349°21.7	342°48.0	25.6	215°54.4	20.5	266°26.1	03.7	349°36.8	19.4
9	4°24.2	357°48.6	·· 26.0	230°55.6	·· 20.1	281°28.0	·· 03.7	4°39.0	·· 19.4
10	19°26.7	12°49.3	26.5	245°56.8	19.7	296°29.9	03.8	19°41.3	19.3
11	34°29.1	27°49.9	26.9	260°58.1	19.4	311°31.8	03.8	34°43.6	19.2
12	49°31.6	42°50.5	N02°27.4	275°59.3	N19°19.0	326°33.7	N23°03.8	49°45.8	S02°19.1
13	64°34.1	57°51.1	27.9	291°00.5	18.6	341°35.6	03.9	64°48.1	19.0
14	79°36.5	72°51.7	28.3	306°01.8	18.2	356°37.4	03.9	79°50.3	18.9
15	94°39.0	87°52.3	·· 28.8	321°03.0	·· 17.8	11°39.3	·· 03.9	94°52.6	·· 18.9
16	109°41.5	102°53.0	29.3	336°04.3	17.5	26°41.2	04.0	109°54.8	18.8
17	124°43.9	117°53.6	29.7	351°05.5	17.1	41°43.1	04.0	124°57.1	18.7
18	139°46.4	132°54.2	N02°30.2	6°06.7	N19°16.7	56°45.0	N23°04.0	139°59.3	S02°18.6
19	154°48.8	147°54.8	30.7	21°07.9	16.3	71°46.9	04.1	155°01.6	18.5
20	169°51.3	162°55.4	31.1	36°09.2	15.9	86°48.8	04.1	170°03.8	18.4
21	184°53.8	177°56.0	·· 31.6	51°10.4	·· 15.6	101°50.7	·· 04.1	185°06.1	·· 18.4
22	199°56.2	192°56.6	32.1	66°11.6	15.2	116°52.6	04.1	200°08.3	18.3
23	214°58.7	207°57.2	32.5	81°12.9	14.8	131°54.5	04.2	215°10.6	18.2
Mer.pass.	08:42	ν 0.6′	d 0.5′	m -4.62	ν 1.2′	d -0.4′	m 1.07	ν 1.9′	d 0.0′ m -1.96	ν 2.3′	d 0.1′ m 1.15

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230°01.2	222°57.8	N02°33.0	96°14.1	N19°14.4	146°56.4	N23°04.2	230°12.8	S02°18.1
1	245°03.6	237°58.4	33.5	111°15.3	14.0	161°58.3	04.2	245°15.1	18.0
2	260°06.1	252°59.0	34.0	126°16.6	13.7	177°00.1	04.3	260°17.3	17.9
3	275°08.6	267°59.6	·· 34.4	141°17.8	·· 13.3	192°02.0	·· 04.3	275°19.6	·· 17.9
4	290°11.0	283°00.2	34.9	156°19.0	12.9	207°03.9	04.3	290°21.8	17.8
5	305°13.5	298°00.8	35.4	171°20.3	12.5	222°05.8	04.4	305°24.1	17.7
6	320°15.9	313°01.4	N02°35.9	186°21.5	N19°12.1	237°07.7	N23°04.4	320°26.4	S02°17.6
7	335°18.4	328°02.0	36.4	201°22.7	11.8	252°09.6	04.4	335°28.6	17.5
8	350°20.9	343°02.6	36.8	216°24.0	11.4	267°11.5	04.4	350°30.9	17.5
9	5°23.3	358°03.2	·· 37.3	231°25.2	·· 11.0	282°13.4	·· 04.5	5°33.1	·· 17.4
10	20°25.8	13°03.8	37.8	246°26.4	10.6	297°15.3	04.5	20°35.4	17.3
11	35°28.3	28°04.4	38.3	261°27.7	10.2	312°17.2	04.5	35°37.6	17.2
12	50°30.7	43°05.0	N02°38.8	276°28.9	N19°09.9	327°19.1	N23°04.6	50°39.9	S02°17.1
13	65°33.2	58°05.5	39.3	291°30.1	09.5	342°20.9	04.6	65°42.1	17.0
14	80°35.7	73°06.1	39.7	306°31.3	09.1	357°22.8	04.6	80°44.4	17.0
15	95°38.1	88°06.7	·· 40.2	321°32.6	·· 08.7	12°24.7	·· 04.7	95°46.6	·· 16.9
16	110°40.6	103°07.3	40.7	336°33.8	08.3	27°26.6	04.7	110°48.9	16.8
17	125°43.1	118°07.9	41.2	351°35.0	07.9	42°28.5	04.7	125°51.1	16.7
18	140°45.5	133°08.5	N02°41.7	6°36.3	N19°07.6	57°30.4	N23°04.7	140°53.4	S02°16.6
19	155°48.0	148°09.0	42.2	21°37.5	07.2	72°32.3	04.8	155°55.7	16.6
20	170°50.4	163°09.6	42.7	36°38.7	06.8	87°34.2	04.8	170°57.9	16.5
21	185°52.9	178°10.2	·· 43.2	51°39.9	·· 06.4	102°36.1	·· 04.8	186°00.2	·· 16.4
22	200°55.4	193°10.8	43.7	66°41.2	06.0	117°38.0	04.9	201°02.4	16.3
23	215°57.8	208°11.4	44.2	81°42.4	05.6	132°39.8	04.9	216°04.7	16.2
Mer.pass.	08:39	ν 0.6′	d 0.5′	m -4.61	ν 1.2′	d -0.4′	m 1.08	ν 1.9′	d 0.0′ m -1.95	ν 2.3′	d 0.1′ m 1.14

Stars	SHA	Dec
Alpheratz	357°34.8	29°13.6
Ankaa	353°07.2	-42°10.0
Schedar	349°31.2	56°40.4
Diphda	348°47.3	-17°50.9
Achernar	335°20.5	-57°06.4
Hamal	327°51.3	23°34.8
Polaris	314°24.3	89°22.2
Acamar	315°12.0	-40°12.2
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.5
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.8	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.7	-52°42.7
Sirius	258°26.2	-16°45.2
Adhara	255°05.9	-29°00.5
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°14.9	-59°35.7
Suhail	222°46.2	-43°32.3
Miaplacidus	221°38.4	-69°49.6
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.6
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.4
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.9
Menkent	147°57.0	-36°29.8
Arcturus	145°47.3	19°02.9
Rigil Kent.	139°39.3	-60°56.5
Kochab	137°18.6	74°03.0
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.6
Antares	112°15.2	-26°29.3
Atria	107°08.7	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°41.6	51°28.9
Kaus Aust.	83°31.9	-34°22.3
Vega	80°32.8	38°48.2
Nunki	75°47.2	-26°15.9
Altair	61°59.6	8°56.0
Peacock	53°05.1	-56°39.0
Deneb	49°25.5	45°21.9
Enif	33°38.6	9°59.3
Al Na'ir	27°32.7	-46°50.1
Fomalhaut	15°14.4	-29°29.2
Scheat	13°45.1	28°13.0
Markab	13°29.8	15°20.3

May 10 Sat	SHA	Mer.pass
Venus	354°24.5	09:10
Mars	227°11.9	17:38
Jupiter	277°22.6	14:16
Saturn	0°21.9	08:45

May 11 Sun	SHA	Mer.pass
Venus	353°41.0	09:09
Mars	226°42.5	17:36
Jupiter	277°08.9	14:13
Saturn	0°16.8	08:41

May 12 Mon	SHA	Mer.pass
Venus	352°56.7	09:08
Mars	226°12.9	17:34
Jupiter	276°55.2	14:10
Saturn	0°11.7	08:38

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.0	N17°37.9	30°12.7	16.7′	S09°48.4	13.4′	54.0′
1	195°54.0	38.6	44°48.4	16.6′	10°01.8	13.4′	54.0′
2	210°54.0	39.2	59°24.0	16.6′	10°15.2	13.3′	54.0′
3	225°54.0	·· 39.9	73°59.6	16.6′	10°28.5	13.2′	53.9′
4	240°54.1	40.5	88°35.2	16.5′	10°41.7	13.3′	53.9′
5	255°54.1	41.2	103°10.7	16.5′	10°55.0	13.2′	53.9′
6	270°54.1	N17°41.8	117°46.2	16.5′	S11°08.2	13.1′	53.9′
7	285°54.1	42.5	132°21.7	16.4′	11°21.3	13.1′	53.9′
8	300°54.1	43.1	146°57.1	16.4′	11°34.4	13.1′	53.9′
9	315°54.2	·· 43.8	161°32.4	16.3′	11°47.5	13.0′	53.9′
10	330°54.2	44.4	176°07.8	16.3′	12°00.5	13.0′	53.9′
11	345°54.2	45.1	190°43.1	16.2′	12°13.5	12.9′	53.9′
12	0°54.2	N17°45.7	205°18.3	16.2′	S12°26.4	12.9′	53.9′
13	15°54.2	46.4	219°53.5	16.2′	12°39.3	12.9′	53.9′
14	30°54.3	47.0	234°28.6	16.1′	12°52.2	12.8′	53.9′
15	45°54.3	·· 47.7	249°03.7	16.1′	13°05.0	12.7′	53.9′
16	60°54.3	48.3	263°38.8	16.0′	13°17.7	12.7′	53.9′
17	75°54.3	49.0	278°13.8	16.0′	13°30.4	12.7′	53.9′
18	90°54.3	N17°49.6	292°48.8	15.9′	S13°43.1	12.6′	53.9′
19	105°54.4	50.2	307°23.7	15.9′	13°55.7	12.5′	53.9′
20	120°54.4	50.9	321°58.5	15.8′	14°08.2	12.5′	53.9′
21	135°54.4	·· 51.5	336°33.3	15.8′	14°20.7	12.4′	53.9′
22	150°54.4	52.2	351°08.1	15.7′	14°33.1	12.4′	53.9′
23	165°54.4	52.8	5°42.8	15.6′	14°45.5	12.3′	53.9′
	SD = 15.8′	d = 0.7′	SD = 14.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.5	N17°53.5	20°17.5	15.6′	S14°57.8	12.3′	53.9′
1	195°54.5	54.1	34°52.0	15.5′	15°10.1	12.2′	53.9′
2	210°54.5	54.7	49°26.6	15.5′	15°22.3	12.2′	53.9′
3	225°54.5	·· 55.4	64°01.1	15.4′	15°34.5	12.1′	53.9′
4	240°54.5	56.0	78°35.5	15.4′	15°46.6	12.0′	53.9′
5	255°54.5	56.6	93°09.9	15.3′	15°58.6	12.0′	53.9′
6	270°54.6	N17°57.3	107°44.2	15.2′	S16°10.6	11.9′	53.9′
7	285°54.6	57.9	122°18.4	15.2′	16°22.5	11.9′	53.9′
8	300°54.6	58.6	136°52.6	15.1′	16°34.4	11.8′	53.9′
9	315°54.6	·· 59.2	151°26.7	15.1′	16°46.2	11.7′	53.9′
10	330°54.6	17°59.8	166°00.8	15.0′	16°57.9	11.7′	53.9′
11	345°54.6	18°00.5	180°34.8	14.9′	17°09.6	11.6′	53.9′
12	0°54.6	N18°01.1	195°08.7	14.9′	S17°21.2	11.5′	53.9′
13	15°54.7	01.7	209°42.6	14.8′	17°32.7	11.5′	53.9′
14	30°54.7	02.4	224°16.4	14.8′	17°44.2	11.4′	53.9′
15	45°54.7	·· 03.0	238°50.2	14.7′	17°55.6	11.3′	53.9′
16	60°54.7	03.6	253°23.9	14.6′	18°06.9	11.3′	53.9′
17	75°54.7	04.3	267°57.5	14.6′	18°18.2	11.1′	53.9′
18	90°54.7	N18°04.9	282°31.1	14.5′	S18°29.3	11.2′	53.9′
19	105°54.7	05.5	297°04.5	14.4′	18°40.5	11.0′	53.9′
20	120°54.8	06.2	311°38.0	14.4′	18°51.5	11.0′	53.9′
21	135°54.8	·· 06.8	326°11.3	14.3′	19°02.5	10.9′	53.9′
22	150°54.8	07.4	340°44.6	14.2′	19°13.4	10.8′	53.9′
23	165°54.8	08.1	355°17.8	14.1′	19°24.2	10.7′	53.9′
	SD = 15.8′	d = 0.6′	SD = 14.7′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N18°08.7	9°51.0	14.1′	S19°34.9	10.7′	54.0′
1	195°54.8	09.3	24°24.0	14.0′	19°45.6	10.6′	54.0′
2	210°54.8	09.9	38°57.0	13.9′	19°56.2	10.5′	54.0′
3	225°54.8	·· 10.6	53°30.0	13.9′	20°06.7	10.4′	54.0′
4	240°54.8	11.2	68°02.8	13.8′	20°17.1	10.3′	54.0′
5	255°54.9	11.8	82°35.6	13.7′	20°27.4	10.3′	54.0′
6	270°54.9	N18°12.4	97°08.4	13.6′	S20°37.7	10.1′	54.0′
7	285°54.9	13.1	111°41.0	13.6′	20°47.8	10.1′	54.0′
8	300°54.9	13.7	126°13.6	13.5′	20°57.9	10.0′	54.0′
9	315°54.9	·· 14.3	140°46.1	13.4′	21°07.9	10.0′	54.0′
10	330°54.9	14.9	155°18.5	13.4′	21°17.9	9.8′	54.0′
11	345°54.9	15.6	169°50.9	13.3′	21°27.7	9.7′	54.0′
12	0°54.9	N18°16.2	184°23.1	13.2′	S21°37.4	9.7′	54.0′
13	15°54.9	16.8	198°55.4	13.1′	21°47.1	9.6′	54.0′
14	30°54.9	17.4	213°27.5	13.1′	21°56.7	9.4′	54.0′
15	45°55.0	·· 18.1	227°59.5	13.0′	22°06.1	9.4′	54.0′
16	60°55.0	18.7	242°31.5	12.9′	22°15.5	9.3′	54.0′
17	75°55.0	19.3	257°03.4	12.8′	22°24.8	9.2′	54.0′
18	90°55.0	N18°19.9	271°35.3	12.8′	S22°34.0	9.1′	54.0′
19	105°55.0	20.5	286°07.0	12.7′	22°43.1	9.0′	54.1′
20	120°55.0	21.1	300°38.7	12.6′	22°52.1	8.9′	54.1′
21	135°55.0	·· 21.8	315°10.3	12.5′	23°01.0	8.8′	54.1′
22	150°55.0	22.4	329°41.9	12.5′	23°09.8	8.7′	54.1′
23	165°55.0	23.0	344°13.3	12.4′	23°18.5	8.6′	54.1′
	SD = 15.8′	d = 0.6′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	–:–	–:–	01:21	22:39	–:–	–:–
68°	–:–	–:–	02:07	21:50	–:–	–:–
66°	–:–	00:19	02:37	21:19	–:–	–:–
64°	–:–	01:33	02:59	20:56	22:25	–:–
62°	–:–	02:07	03:17	20:38	21:49	–:–
60°	00:17	02:31	03:31	20:23	21:24	–:–
N 58°	01:23	02:51	03:44	20:10	21:04	22:34
56°	01:55	03:06	03:54	20:00	20:48	22:01
54°	02:17	03:20	04:04	19:50	20:35	21:38
52°	02:35	03:31	04:12	19:42	20:23	21:19
50°	02:50	03:41	04:20	19:34	20:13	21:04
45°	03:19	04:02	04:36	19:18	19:52	20:34
N 40°	03:41	04:18	04:49	19:05	19:35	20:13
35°	03:58	04:32	05:00	18:54	19:21	19:55
30°	04:12	04:43	05:09	18:44	19:10	19:41
20°	04:34	05:02	05:26	18:27	18:51	19:19
N 10°	04:52	05:18	05:40	18:13	18:35	19:01
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:18	05:44	06:06	17:47	18:09	18:34
20°	05:30	05:57	06:20	17:33	17:56	18:22
30°	05:41	06:10	06:35	17:17	17:42	18:11
35°	05:47	06:18	06:44	17:08	17:35	18:05
40°	05:53	06:26	06:55	16:58	17:26	17:59
45°	06:00	06:35	07:07	16:45	17:17	17:52
S 50°	06:07	06:46	07:21	16:31	17:06	17:45
52°	06:10	06:51	07:28	16:24	17:01	17:42
54°	06:13	06:56	07:36	16:16	16:56	17:39
56°	06:17	07:02	07:44	16:08	16:50	17:35
58°	06:21	07:09	07:54	15:58	16:43	17:31
S 60°	06:25	07:16	08:05	15:47	16:36	17:27

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	19:57	▬	▬	01:46	00:53	▬
N 70°	19:26	22:17	▬	02:02	01:26	00:04
68°	19:03	21:13	▬	02:15	01:50	01:09
66°	18:46	20:38	23:10	02:25	02:08	01:45
64°	18:32	20:13	22:09	02:34	02:24	02:11
62°	18:20	19:54	21:35	02:42	02:37	02:31
60°	18:10	19:38	21:11	02:49	02:48	02:48
N 58°	18:02	19:25	20:51	02:54	02:57	03:02
56°	17:54	19:13	20:35	03:00	03:06	03:14
54°	17:47	19:03	20:21	03:04	03:13	03:24
52°	17:41	18:55	20:09	03:09	03:20	03:34
50°	17:36	18:47	19:59	03:13	03:26	03:42
45°	17:24	18:30	19:37	03:21	03:39	04:00
N 40°	17:15	18:16	19:19	03:28	03:50	04:15
35°	17:06	18:05	19:04	03:34	04:00	04:28
30°	16:59	17:55	18:52	03:40	04:08	04:39
20°	16:47	17:38	18:30	03:49	04:22	04:58
N 10°	16:36	17:23	18:11	03:58	04:35	05:15
0°	16:27	17:09	17:54	04:05	04:47	05:30
S 10°	16:17	16:55	17:37	04:13	04:58	05:46
20°	16:06	16:40	17:18	04:22	05:11	06:03
30°	15:54	16:24	16:57	04:31	05:26	06:22
35°	15:48	16:14	16:45	04:37	05:34	06:33
40°	15:40	16:03	16:31	04:43	05:44	06:47
45°	15:31	15:50	16:14	04:51	05:56	07:02
S 50°	15:20	15:35	15:54	05:00	06:10	07:21
52°	15:15	15:28	15:44	05:04	06:16	07:30
54°	15:10	15:20	15:33	05:09	06:24	07:41
56°	15:04	15:11	15:21	05:14	06:32	07:52
58°	14:57	15:01	15:07	05:20	06:41	08:06
S 60°	14:50	14:49	14:50	05:26	06:52	08:22

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 94-99%
10	03:36	03:37	11:56	22:36	10:16	
11	03:38	03:39	11:56	23:19	10:58	
12	03:39	03:40	11:56	–:–	11:42	◯

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2167 sec ΔT = TT-UT1 = +68.9673 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231°00.3	223°11.9	N02°44.7	96°43.6	N19°05.3	147°41.7	N23°04.9	231°06.9	S02°16.1
1	246°02.8	238°12.5	45.2	111°44.9	04.9	162°43.6	04.9	246°09.2	16.1
2	261°05.2	253°13.1	45.7	126°46.1	04.5	177°45.5	05.0	261°11.4	16.0
3	276°07.7	268°13.6	·· 46.1	141°47.3	·· 04.1	192°47.4	·· 05.0	276°13.7	·· 15.9
4	291°10.2	283°14.2	46.6	156°48.5	03.7	207°49.3	05.0	291°16.0	15.8
5	306°12.6	298°14.8	47.1	171°49.8	03.3	222°51.2	05.1	306°18.2	15.7
6	321°15.1	313°15.3	N02°47.6	186°51.0	N19°02.9	237°53.1	N23°05.1	321°20.5	S02°15.7
7	336°17.6	328°15.9	48.1	201°52.2	02.6	252°54.9	05.1	336°22.7	15.6
8	351°20.0	343°16.5	48.6	216°53.4	02.2	267°56.8	05.1	351°25.0	15.5
9	6°22.5	358°17.0	·· 49.2	231°54.7	·· 01.8	282°58.7	·· 05.2	6°27.2	·· 15.4
10	21°24.9	13°17.6	49.7	246°55.9	01.4	298°00.6	05.2	21°29.5	15.3
11	36°27.4	28°18.2	50.2	261°57.1	01.0	313°02.5	05.2	36°31.8	15.2
12	51°29.9	43°18.7	N02°50.7	276°58.3	N19°00.6	328°04.4	N23°05.3	51°34.0	S02°15.2
13	66°32.3	58°19.3	51.2	291°59.6	19°00.2	343°06.3	05.3	66°36.3	15.1
14	81°34.8	73°19.8	51.7	307°00.8	18°59.9	358°08.2	05.3	81°38.5	15.0
15	96°37.3	88°20.4	·· 52.2	322°02.0	·· 59.5	13°10.1	·· 05.4	96°40.8	·· 14.9
16	111°39.7	103°20.9	52.7	337°03.2	59.1	28°11.9	05.4	111°43.0	14.8
17	126°42.2	118°21.5	53.2	352°04.5	58.7	43°13.8	05.4	126°45.3	14.8
18	141°44.7	133°22.0	N02°53.7	7°05.7	N18°58.3	58°15.7	N23°05.4	141°47.5	S02°14.7
19	156°47.1	148°22.6	54.2	22°06.9	57.9	73°17.6	05.5	156°49.8	14.6
20	171°49.6	163°23.1	54.7	37°08.1	57.5	88°19.5	05.5	171°52.1	14.5
21	186°52.1	178°23.7	·· 55.3	52°09.4	·· 57.1	103°21.4	·· 05.5	186°54.3	·· 14.4
22	201°54.5	193°24.2	55.8	67°10.6	56.8	118°23.3	05.6	201°56.6	14.4
23	216°57.0	208°24.8	56.3	82°11.8	56.4	133°25.2	05.6	216°58.8	14.3
Mer.pass.	08:35	ν 0.6′	d 0.5′	m -4.60	ν 1.2′	d -0.4′	m 1.09	ν 1.9′	d 0.0′ m -1.95	ν 2.3′	d 0.1′ m 1.14

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231°59.4	223°25.3	N02°56.8	97°13.0	N18°56.0	148°27.0	N23°05.6	232°01.1	S02°14.2
1	247°01.9	238°25.9	57.3	112°14.3	55.6	163°28.9	05.6	247°03.4	14.1
2	262°04.4	253°26.4	57.8	127°15.5	55.2	178°30.8	05.7	262°05.6	14.0
3	277°06.8	268°27.0	·· 58.3	142°16.7	·· 54.8	193°32.7	·· 05.7	277°07.9	·· 14.0
4	292°09.3	283°27.5	58.9	157°17.9	54.4	208°34.6	05.7	292°10.1	13.9
5	307°11.8	298°28.0	59.4	172°19.2	54.0	223°36.5	05.8	307°12.4	13.8
6	322°14.2	313°28.6	N02°59.9	187°20.4	N18°53.6	238°38.4	N23°05.8	322°14.6	S02°13.7
7	337°16.7	328°29.1	03°00.4	202°21.6	53.2	253°40.2	05.8	337°16.9	13.6
8	352°19.2	343°29.6	00.9	217°22.8	52.9	268°42.1	05.8	352°19.2	13.6
9	7°21.6	358°30.2	·· 01.5	232°24.0	·· 52.5	283°44.0	·· 05.9	7°21.4	·· 13.5
10	22°24.1	13°30.7	02.0	247°25.3	52.1	298°45.9	05.9	22°23.7	13.4
11	37°26.5	28°31.2	02.5	262°26.5	51.7	313°47.8	05.9	37°25.9	13.3
12	52°29.0	43°31.8	N03°03.0	277°27.7	N18°51.3	328°49.7	N23°06.0	52°28.2	S02°13.2
13	67°31.5	58°32.3	03.6	292°28.9	50.9	343°51.6	06.0	67°30.5	13.2
14	82°33.9	73°32.8	04.1	307°30.2	50.5	358°53.4	06.0	82°32.7	13.1
15	97°36.4	88°33.4	·· 04.6	322°31.4	·· 50.1	13°55.3	·· 06.0	97°35.0	·· 13.0
16	112°38.9	103°33.9	05.2	337°32.6	49.7	28°57.2	06.1	112°37.2	12.9
17	127°41.3	118°34.4	05.7	352°33.8	49.3	43°59.1	06.1	127°39.5	12.8
18	142°43.8	133°34.9	N03°06.2	7°35.0	N18°48.9	59°01.0	N23°06.1	142°41.8	S02°12.8
19	157°46.3	148°35.5	06.7	22°36.3	48.6	74°02.9	06.1	157°44.0	12.7
20	172°48.7	163°36.0	07.3	37°37.5	48.2	89°04.8	06.2	172°46.3	12.6
21	187°51.2	178°36.5	·· 07.8	52°38.7	·· 47.8	104°06.6	·· 06.2	187°48.5	·· 12.5
22	202°53.7	193°37.0	08.3	67°39.9	47.4	119°08.5	06.2	202°50.8	12.4
23	217°56.1	208°37.5	08.9	82°41.1	47.0	134°10.4	06.3	217°53.1	12.4
Mer.pass.	08:31	ν 0.5′	d 0.5′	m -4.59	ν 1.2′	d -0.4′	m 1.10	ν 1.9′	d 0.0′ m -1.95	ν 2.3′	d 0.1′ m 1.14

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	232°58.6	223°38.1	N03°09.4	97°42.4	N18°46.6	149°12.3	N23°06.3	232°55.3	S02°12.3
1	248°01.0	238°38.6	10.0	112°43.6	46.2	164°14.2	06.3	247°57.6	12.2
2	263°03.5	253°39.1	10.5	127°44.8	45.8	179°16.1	06.3	262°59.8	12.1
3	278°06.0	268°39.6	·· 11.0	142°46.0	·· 45.4	194°17.9	·· 06.4	278°02.1	·· 12.0
4	293°08.4	283°40.1	11.6	157°47.2	45.0	209°19.8	06.4	293°04.4	12.0
5	308°10.9	298°40.6	12.1	172°48.5	44.6	224°21.7	06.4	308°06.6	11.9
6	323°13.4	313°41.1	N03°12.6	187°49.7	N18°44.2	239°23.6	N23°06.5	323°08.9	S02°11.8
7	338°15.8	328°41.7	13.2	202°50.9	43.8	254°25.5	06.5	338°11.1	11.7
8	353°18.3	343°42.2	13.7	217°52.1	43.4	269°27.4	06.5	353°13.4	11.7
9	8°20.8	358°42.7	·· 14.3	232°53.3	·· 43.0	284°29.3	·· 06.5	8°15.7	·· 11.6
10	23°23.2	13°43.2	14.8	247°54.5	42.6	299°31.1	06.6	23°17.9	11.5
11	38°25.7	28°43.7	15.4	262°55.8	42.3	314°33.0	06.6	38°20.2	11.4
12	53°28.2	43°44.2	N03°15.9	277°57.0	N18°41.9	329°34.9	N23°06.6	53°22.4	S02°11.3
13	68°30.6	58°44.7	16.4	292°58.2	41.5	344°36.8	06.6	68°24.7	11.3
14	83°33.1	73°45.2	17.0	307°59.4	41.1	359°38.7	06.7	83°27.0	11.2
15	98°35.5	88°45.7	·· 17.5	323°00.6	·· 40.7	14°40.6	·· 06.7	98°29.2	·· 11.1
16	113°38.0	103°46.2	18.1	338°01.9	40.3	29°42.4	06.7	113°31.5	11.0
17	128°40.5	118°46.7	18.6	353°03.1	39.9	44°44.3	06.8	128°33.8	10.9
18	143°42.9	133°47.2	N03°19.2	8°04.3	N18°39.5	59°46.2	N23°06.8	143°36.0	S02°10.9
19	158°45.4	148°47.7	19.7	23°05.5	39.1	74°48.1	06.8	158°38.3	10.8
20	173°47.9	163°48.2	20.3	38°06.7	38.7	89°50.0	06.8	173°40.5	10.7
21	188°50.3	178°48.7	·· 20.8	53°07.9	·· 38.3	104°51.8	·· 06.9	188°42.8	·· 10.6
22	203°52.8	193°49.2	21.4	68°09.2	37.9	119°53.7	06.9	203°45.1	10.6
23	218°55.3	208°49.7	21.9	83°10.4	37.5	134°55.6	06.9	218°47.3	10.5
Mer.pass.	08:27	ν 0.5′	d 0.5′	m -4.58	ν 1.2′	d -0.4′	m 1.11	ν 1.9′	d 0.0′ m -1.95	ν 2.3′	d 0.1′ m 1.14

Stars

	SHA	Dec
Alpheratz	357°34.7	29°13.6
Ankaa	353°07.2	-42°10.0
Schedar	349°31.2	56°40.4
Diphda	348°47.3	-17°50.8
Achernar	335°20.5	-57°06.4
Hamal	327°51.2	23°34.8
Polaris	314°23.7	89°22.2
Acamar	315°12.0	-40°12.2
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.7	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.8	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.7	-52°42.7
Sirius	258°26.3	-16°45.2
Adhara	255°05.9	-29°00.5
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°14.9	-59°35.7
Suhail	222°46.2	-43°32.3
Miaplacidus	221°38.4	-69°49.6
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.6
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.4
Spica	158°21.8	-11°17.7
Alkaid	152°51.3	49°11.2
Hadar	148°35.1	-60°29.9
Menkent	147°56.9	-36°29.8
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.5
Kochab	137°18.6	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.2	-26°29.3
Atria	107°08.6	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.0	12°32.3
Eltanin	90°41.6	51°28.9
Kaus Aust.	83°31.9	-34°22.3
Vega	80°32.7	38°48.2
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.0
Peacock	53°05.1	-56°39.0
Deneb	49°25.5	45°21.9
Enif	33°38.5	9°59.3
Al Na'ir	27°32.6	-46°50.1
Fomalhaut	15°14.3	-29°29.2
Scheat	13°45.1	28°13.0
Markab	13°29.8	15°20.3

May 13 Tue	SHA	Mer.pass
Venus	352°11.6	09:07
Mars	225°43.3	17:32
Jupiter	276°41.4	14:07
Saturn	0°06.6	08:34

May 14 Wed	SHA	Mer.pass
Venus	351°25.9	09:06
Mars	225°13.6	17:30
Jupiter	276°27.6	14:04
Saturn	0°01.7	08:31

May 15 Thu	SHA	Mer.pass
Venus	350°39.5	09:05
Mars	224°43.8	17:28
Jupiter	276°13.7	14:01
Saturn	359°56.7	08:27

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.0	N18°23.6	358°44.7	12.3′	S23°27.1	8.5′	54.1′
1	195°55.0	24.2	13°16.0	12.2′	23°35.6	8.4′	54.1′
2	210°55.0	24.8	27°47.2	12.2′	23°44.0	8.3′	54.1′
3	225°55.0	·· 25.5	42°18.4	12.1′	23°52.3	8.2′	54.1′
4	240°55.0	26.1	56°49.5	12.0′	24°00.5	8.1′	54.1′
5	255°55.0	26.7	71°20.5	11.9′	24°08.6	8.0′	54.1′
6	270°55.0	N18°27.3	85°51.4	11.9′	S24°16.6	7.9′	54.1′
7	285°55.0	27.9	100°22.3	11.8′	24°24.5	7.7′	54.1′
8	300°55.1	28.5	114°53.1	11.7′	24°32.2	7.7′	54.1′
9	315°55.1	·· 29.1	129°23.8	11.6′	24°39.9	7.6′	54.2′
10	330°55.1	29.7	143°54.4	11.6′	24°47.5	7.4′	54.2′
11	345°55.1	30.4	158°25.0	11.5′	24°54.9	7.3′	54.2′
12	0°55.1	N18°31.0	172°55.4	11.4′	S25°02.2	7.2′	54.2′
13	15°55.1	31.6	187°25.9	11.3′	25°09.4	7.1′	54.2′
14	30°55.1	32.2	201°56.2	11.3′	25°16.5	7.0′	54.2′
15	45°55.1	·· 32.8	216°26.5	11.2′	25°23.5	6.9′	54.2′
16	60°55.1	33.4	230°56.7	11.1′	25°30.4	6.8′	54.2′
17	75°55.1	34.0	245°26.8	11.1′	25°37.2	6.6′	54.2′
18	90°55.1	N18°34.6	259°56.8	11.0′	S25°43.8	6.5′	54.2′
19	105°55.1	35.2	274°26.8	10.9′	25°50.3	6.4′	54.2′
20	120°55.1	35.8	288°56.7	10.8′	25°56.7	6.3′	54.3′
21	135°55.1	·· 36.4	303°26.6	10.8′	26°03.0	6.2′	54.3′
22	150°55.1	37.0	317°56.4	10.7′	26°09.2	6.0′	54.3′
23	165°55.1	37.6	332°26.1	10.6′	26°15.2	6.0′	54.3′
	SD = 15.8′	d = 0.6′	SD = 14.8′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.1	N18°38.2	346°55.7	10.6′	S26°21.2	5.8′	54.3′
1	195°55.1	38.8	1°25.3	10.5′	26°27.0	5.6′	54.3′
2	210°55.1	39.4	15°54.8	10.4′	26°32.6	5.6′	54.3′
3	225°55.1	·· 40.0	30°24.2	10.4′	26°38.2	5.4′	54.3′
4	240°55.1	40.6	44°53.6	10.3′	26°43.6	5.3′	54.3′
5	255°55.1	41.2	59°22.9	10.2′	26°48.9	5.2′	54.4′
6	270°55.1	N18°41.8	73°52.1	10.2′	S26°54.1	5.0′	54.4′
7	285°55.1	42.4	88°21.3	10.1′	26°59.1	4.9′	54.4′
8	300°55.1	43.0	102°50.4	10.1′	27°04.0	4.8′	54.4′
9	315°55.1	·· 43.6	117°19.5	10.0′	27°08.8	4.7′	54.4′
10	330°55.1	44.2	131°48.5	9.9′	27°13.5	4.5′	54.4′
11	345°55.1	44.8	146°17.4	9.9′	27°18.0	4.4′	54.4′
12	0°55.1	N18°45.4	160°46.3	9.8′	S27°22.4	4.2′	54.4′
13	15°55.1	46.0	175°15.1	9.8′	27°26.6	4.1′	54.5′
14	30°55.1	46.6	189°43.9	9.7′	27°30.7	4.0′	54.5′
15	45°55.0	·· 47.2	204°12.6	9.7′	27°34.7	3.9′	54.5′
16	60°55.0	47.8	218°41.3	9.6′	27°38.6	3.7′	54.5′
17	75°55.0	48.4	233°09.9	9.6′	27°42.3	3.6′	54.5′
18	90°55.0	N18°49.0	247°38.4	9.5′	S27°45.9	3.4′	54.5′
19	105°55.0	49.6	262°07.0	9.5′	27°49.3	3.3′	54.5′
20	120°55.0	50.2	276°35.4	9.4′	27°52.6	3.2′	54.5′
21	135°55.0	·· 50.8	291°03.8	9.4′	27°55.8	3.0′	54.6′
22	150°55.0	51.4	305°32.2	9.3′	27°58.8	2.9′	54.6′
23	165°55.0	52.0	320°00.5	9.3′	28°01.7	2.8′	54.6′
	SD = 15.8′	d = 0.6′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.0	N18°52.5	334°28.7	9.2′	S28°04.5	2.6′	54.6′
1	195°55.0	53.1	348°57.0	9.2′	28°07.1	2.5′	54.6′
2	210°55.0	53.7	3°25.1	9.1′	28°09.6	2.3′	54.6′
3	225°55.0	·· 54.3	17°53.3	9.1′	28°11.9	2.2′	54.6′
4	240°55.0	54.9	32°21.4	9.1′	28°14.1	2.0′	54.7′
5	255°55.0	55.5	46°49.4	9.0′	28°16.1	1.9′	54.7′
6	270°55.0	N18°56.1	61°17.4	9.0′	S28°18.0	1.8′	54.7′
7	285°55.0	56.7	75°45.4	8.9′	28°19.8	1.6′	54.7′
8	300°54.9	57.2	90°13.4	8.9′	28°21.4	1.4′	54.7′
9	315°54.9	·· 57.8	104°41.3	8.9′	28°22.8	1.4′	54.7′
10	330°54.9	58.4	119°09.2	8.9′	28°24.2	1.1′	54.8′
11	345°54.9	59.0	133°37.0	8.8′	28°25.3	1.1′	54.8′
12	0°54.9	N18°59.6	148°04.8	8.8′	S28°26.4	0.9′	54.8′
13	15°54.9	19°00.2	162°32.6	8.8′	28°27.3	0.7′	54.8′
14	30°54.9	00.7	177°00.4	8.7′	28°28.0	0.6′	54.8′
15	45°54.9	·· 01.3	191°28.1	8.7′	28°28.6	0.4′	54.8′
16	60°54.9	01.9	205°55.9	8.7′	28°29.0	0.3′	54.8′
17	75°54.9	02.5	220°23.6	8.7′	28°29.3	0.2′	54.9′
18	90°54.8	N19°03.1	234°51.2	8.7′	S28°29.5	0.0′	54.9′
19	105°54.8	03.6	249°18.9	8.6′	28°29.5	0.2′	54.9′
20	120°54.8	04.2	263°46.5	8.6′	28°29.3	0.3′	54.9′
21	135°54.8	·· 04.8	278°14.1	8.6′	28°29.0	0.4′	54.9′
22	150°54.8	05.4	292°41.7	8.6′	28°28.6	0.6′	54.9′
23	165°54.8	06.0	307°09.3	8.6′	28°28.0	0.8′	55.0′
	SD = 15.8′	d = 0.6′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°	–:–	–:–	00:51	23:15	–:–	–:–
68°	–:–	–:–	01:51	22:06	–:–	–:–
66°	–:–	–:–	02:25	21:31	–:–	–:–
64°	–:–	01:14	02:50	21:05	22:45	–:–
62°	–:–	01:55	03:09	20:46	22:02	–:–
60°	–:–	02:22	03:24	20:30	21:34	–:–
N 58°	01:06	02:42	03:37	20:17	21:12	22:52
56°	01:43	02:59	03:49	20:05	20:55	22:13
54°	02:09	03:13	03:59	19:55	20:41	21:46
52°	02:28	03:25	04:07	19:46	20:28	21:26
50°	02:44	03:36	04:15	19:38	20:18	21:10
45°	03:15	03:58	04:32	19:21	19:56	20:39
N 40°	03:37	04:15	04:46	19:08	19:38	20:16
35°	03:55	04:29	04:57	18:56	19:24	19:58
30°	04:10	04:41	05:07	18:46	19:12	19:43
20°	04:33	05:01	05:24	18:29	18:52	19:20
N 10°	04:51	05:17	05:39	18:14	18:36	19:02
0°	05:06	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:44	06:06	17:46	18:08	18:34
20°	05:31	05:58	06:21	17:32	17:55	18:22
30°	05:43	06:12	06:37	17:15	17:40	18:09
35°	05:49	06:20	06:47	17:06	17:32	18:03
40°	05:56	06:29	06:58	16:55	17:24	17:57
45°	06:03	06:38	07:10	16:42	17:14	17:49
S 50°	06:11	06:50	07:26	16:27	17:02	17:42
52°	06:14	06:55	07:33	16:19	16:57	17:38
54°	06:18	07:01	07:41	16:11	16:51	17:34
56°	06:21	07:07	07:50	16:02	16:45	17:31
58°	06:26	07:14	08:00	15:52	16:38	17:26
S 60°	06:30	07:22	08:12	15:40	16:30	17:22

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°						
N 70°						
68°						
66°				00:48		
64°				01:50		
62°	23:27			02:24	02:14	
60°	22:46	·· ··	00:15	02:49	02:55	03:13
N 58°	22:18	23:37	·· ··	03:09	03:24	03:52
56°	21:56	23:10	·· ··	03:26	03:46	04:19
54°	21:38	22:49	23:47	03:40	04:04	04:40
52°	21:23	22:32	23:29	03:53	04:19	04:58
50°	21:10	22:17	23:14	04:04	04:33	05:13
45°	20:43	21:46	22:43	04:27	05:00	05:43
N 40°	20:22	21:23	22:19	04:45	05:22	06:07
35°	20:05	21:04	21:59	05:01	05:40	06:27
30°	19:50	20:47	21:42	05:15	05:56	06:43
20°	19:24	20:19	21:14	05:38	06:22	07:12
N 10°	19:02	19:55	20:49	05:58	06:45	07:36
0°	18:42	19:33	20:26	06:17	07:06	07:59
S 10°	18:22	19:11	20:04	06:36	07:28	08:21
20°	18:00	18:47	19:39	06:56	07:51	08:46
30°	17:35	18:20	19:11	07:20	08:17	09:14
35°	17:21	18:04	18:54	07:33	08:33	09:31
40°	17:04	17:45	18:34	07:50	08:52	09:50
45°	16:44	17:22	18:10	08:09	09:14	10:14
S 50°	16:19	16:53	17:40	08:33	09:42	10:45
52°	16:07	16:39	17:24	08:45	09:56	11:00
54°	15:53	16:22	17:06	08:58	10:13	11:18
56°	15:37	16:03	16:45	09:14	10:32	11:39
58°	15:18	15:38	16:17	09:32	10:56	12:07
S 60°	14:54	15:06	15:38	09:55	11:28	12:46

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 100-95%
13	03:40	03:40	11:56	00:05	12:29	
14	03:40	03:40	11:56	00:54	13:20	
15	03:40	03:40	11:56	01:46	14:12	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2174 sec ΔT = TT-UT1 = +68.9666 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	233°57.7	223°50.2	N03°22.5	98°11.6	N18°37.1	149°57.5	N23°06.9	233°49.6	S02°10.4
1	249°00.2	238°50.6	23.1	113°12.8	36.7	164°59.4	07.0	248°51.9	10.3
2	264°02.7	253°51.1	23.6	128°14.0	36.3	180°01.3	07.0	263°54.1	10.2
3	279°05.1	268°51.6	·· 24.2	143°15.2	·· 35.9	195°03.1	·· 07.0	278°56.4	·· 10.2
4	294°07.6	283°52.1	24.7	158°16.4	35.5	210°05.0	07.1	293°58.6	10.1
5	309°10.0	298°52.6	25.3	173°17.7	35.1	225°06.9	07.1	309°00.9	10.0
6	324°12.5	313°53.1	N03°25.8	188°18.9	N18°34.7	240°08.8	N23°07.1	324°03.2	S02°09.9
7	339°15.0	328°53.6	26.4	203°20.1	34.3	255°10.7	07.1	339°05.4	09.9
8	354°17.4	343°54.0	27.0	218°21.3	33.9	270°12.6	07.2	354°07.7	09.8
9	9°19.9	358°54.5	·· 27.5	233°22.5	·· 33.5	285°14.4	·· 07.2	9°10.0	·· 09.7
10	24°22.4	13°55.0	28.1	248°23.7	33.1	300°16.3	07.2	24°12.2	09.6
11	39°24.8	28°55.5	28.6	263°25.0	32.7	315°18.2	07.2	39°14.5	09.5
12	54°27.3	43°56.0	N03°29.2	278°26.2	N18°32.3	330°20.1	N23°07.3	54°16.8	S02°09.5
13	69°29.8	58°56.4	29.8	293°27.4	31.9	345°22.0	07.3	69°19.0	09.4
14	84°32.2	73°56.9	30.3	308°28.6	31.5	0°23.8	07.3	84°21.3	09.3
15	99°34.7	88°57.4	·· 30.9	323°29.8	·· 31.1	15°25.7	·· 07.3	99°23.5	·· 09.2
16	114°37.2	103°57.9	31.5	338°31.0	30.7	30°27.6	07.4	114°25.8	09.2
17	129°39.6	118°58.3	32.0	353°32.2	30.3	45°29.5	07.4	129°28.1	09.1
18	144°42.1	133°58.8	N03°32.6	8°33.4	N18°29.9	60°31.4	N23°07.4	144°30.3	S02°09.0
19	159°44.5	148°59.3	33.2	23°34.7	29.5	75°33.2	07.5	159°32.6	08.9
20	174°47.0	163°59.7	33.7	38°35.9	29.1	90°35.1	07.5	174°34.9	08.9
21	189°49.5	179°00.2	·· 34.3	53°37.1	·· 28.7	105°37.0	·· 07.5	189°37.1	·· 08.8
22	204°51.9	194°00.7	34.9	68°38.3	28.3	120°38.9	07.5	204°39.4	08.7
23	219°54.4	209°01.2	35.5	83°39.5	27.9	135°40.8	07.6	219°41.7	08.6
Mer.pass.	08:23	ν 0.5′	d 0.6′	m -4.57	ν 1.2′	d -0.4′	m 1.12	ν 1.9′	d 0.0′	m -1.94	ν 2.3′	d 0.1′	m 1.13

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	234°56.9	224°01.6	N03°36.0	98°40.7	N18°27.5	150°42.6	N23°07.6	234°43.9	S02°08.5
1	249°59.3	239°02.1	36.6	113°41.9	27.1	165°44.5	07.6	249°46.2	08.5
2	265°01.8	254°02.5	37.2	128°43.1	26.7	180°46.4	07.6	264°48.5	08.4
3	280°04.3	269°03.0	·· 37.7	143°44.4	·· 26.3	195°48.3	·· 07.7	279°50.7	·· 08.3
4	295°06.7	284°03.5	38.3	158°45.6	25.9	210°50.2	07.7	294°53.0	08.2
5	310°09.2	299°03.9	38.9	173°46.8	25.5	225°52.0	07.7	309°55.3	08.2
6	325°11.7	314°04.4	N03°39.5	188°48.0	N18°25.1	240°53.9	N23°07.7	324°57.5	S02°08.1
7	340°14.1	329°04.8	40.0	203°49.2	24.7	255°55.8	07.8	339°59.8	08.0
8	355°16.6	344°05.3	40.6	218°50.4	24.3	270°57.7	07.8	355°02.1	07.9
9	10°19.0	359°05.8	·· 41.2	233°51.6	·· 23.9	285°59.6	·· 07.8	10°04.3	·· 07.9
10	25°21.5	14°06.2	41.8	248°52.8	23.5	301°01.4	07.8	25°06.6	07.8
11	40°24.0	29°06.7	42.4	263°54.0	23.1	316°03.3	07.9	40°08.9	07.7
12	55°26.4	44°07.1	N03°42.9	278°55.3	N18°22.7	331°05.2	N23°07.9	55°11.1	S02°07.6
13	70°28.9	59°07.6	43.5	293°56.5	22.3	346°07.1	07.9	70°13.4	07.5
14	85°31.4	74°08.0	44.1	308°57.7	21.9	1°09.0	07.9	85°15.7	07.5
15	100°33.8	89°08.5	·· 44.7	323°58.9	·· 21.5	16°10.8	·· 08.0	100°17.9	·· 07.4
16	115°36.3	104°08.9	45.3	339°00.1	21.1	31°12.7	08.0	115°20.2	07.3
17	130°38.8	119°09.4	45.9	354°01.3	20.6	46°14.6	08.0	130°22.5	07.2
18	145°41.2	134°09.8	N03°46.4	9°02.5	N18°20.2	61°16.5	N23°08.0	145°24.7	S02°07.2
19	160°43.7	149°10.3	47.0	24°03.7	19.8	76°18.4	08.1	160°27.0	07.1
20	175°46.1	164°10.7	47.6	39°04.9	19.4	91°20.2	08.1	175°29.3	07.0
21	190°48.6	179°11.1	·· 48.2	54°06.1	·· 19.0	106°22.1	·· 08.1	190°31.5	·· 06.9
22	205°51.1	194°11.6	48.8	69°07.4	18.6	121°24.0	08.2	205°33.8	06.9
23	220°53.5	209°12.0	49.4	84°08.6	18.2	136°25.9	08.2	220°36.1	06.8
Mer.pass.	08:19	ν 0.5′	d 0.6′	m -4.55	ν 1.2′	d -0.4′	m 1.14	ν 1.9′	d 0.0′	m -1.94	ν 2.3′	d 0.1′	m 1.13

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	235°56.0	224°12.5	N03°50.0	99°09.8	N18°17.8	151°27.7	N23°08.2	235°38.3	S02°06.7
1	250°58.5	239°12.9	50.6	114°11.0	17.4	166°29.6	08.2	250°40.6	06.6
2	266°00.9	254°13.4	51.2	129°12.2	17.0	181°31.5	08.3	265°42.9	06.6
3	281°03.4	269°13.8	·· 51.7	144°13.4	·· 16.6	196°33.4	·· 08.3	280°45.1	·· 06.5
4	296°05.9	284°14.2	52.3	159°14.6	16.2	211°35.3	08.3	295°47.4	06.4
5	311°08.3	299°14.7	52.9	174°15.8	15.8	226°37.1	08.3	310°49.7	06.3
6	326°10.8	314°15.1	N03°53.5	189°17.0	N18°15.4	241°39.0	N23°08.4	325°51.9	S02°06.3
7	341°13.3	329°15.5	54.1	204°18.2	15.0	256°40.9	08.4	340°54.2	06.2
8	356°15.7	344°16.0	54.7	219°19.4	14.6	271°42.8	08.4	355°56.5	06.1
9	11°18.2	359°16.4	·· 55.3	234°20.6	·· 14.1	286°44.6	·· 08.4	10°58.8	·· 06.0
10	26°20.6	14°16.8	55.9	249°21.8	13.7	301°46.5	08.5	26°01.0	06.0
11	41°23.1	29°17.3	56.5	264°23.1	13.3	316°48.4	08.5	41°03.3	05.9
12	56°25.6	44°17.7	N03°57.1	279°24.3	N18°12.9	331°50.3	N23°08.5	56°05.6	S02°05.8
13	71°28.0	59°18.1	57.7	294°25.5	12.5	346°52.2	08.5	71°07.8	05.7
14	86°30.5	74°18.5	58.3	309°26.7	12.1	1°54.0	08.6	86°10.1	05.7
15	101°33.0	89°19.0	·· 58.9	324°27.9	·· 11.7	16°55.9	·· 08.6	101°12.4	·· 05.6
16	116°35.4	104°19.4	03°59.5	339°29.1	11.3	31°57.8	08.6	116°14.6	05.5
17	131°37.9	119°19.8	04°00.1	354°30.3	10.9	46°59.7	08.6	131°16.9	05.4
18	146°40.4	134°20.2	N04°00.7	9°31.5	N18°10.5	62°01.5	N23°08.7	146°19.2	S02°05.4
19	161°42.8	149°20.7	01.3	24°32.7	10.1	77°03.4	08.7	161°21.4	05.3
20	176°45.3	164°21.1	01.9	39°33.9	09.6	92°05.3	08.7	176°23.7	05.2
21	191°47.8	179°21.5	·· 02.5	54°35.1	·· 09.2	107°07.2	·· 08.7	191°26.0	·· 05.1
22	206°50.2	194°21.9	03.1	69°36.3	08.8	122°09.0	08.8	206°28.3	05.1
23	221°52.7	209°22.3	03.7	84°37.5	08.4	137°10.9	08.8	221°30.5	05.0
Mer.pass.	08:15	ν 0.4′	d 0.6′	m -4.54	ν 1.2′	d -0.4′	m 1.15	ν 1.9′	d 0.0′	m -1.94	ν 2.3′	d 0.1′	m 1.13

Stars	SHA	Dec
Alpheratz	357°34.7	29°13.6
Ankaa	353°07.1	-42°10.0
Schedar	349°31.2	56°40.4
Diphda	348°47.3	-17°50.8
Achernar	335°20.5	-57°06.3
Hamal	327°51.2	23°34.8
Polaris	314°23.1	89°22.2
Acamar	315°12.0	-40°12.1
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.8	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.7	-52°42.7
Sirius	258°26.3	-16°45.2
Adhara	255°05.9	-29°00.5
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°14.9	-59°35.7
Suhail	222°46.2	-43°32.3
Miaplacidus	221°38.4	-69°49.6
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.4	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.7
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.5
Spica	158°21.7	-11°17.7
Alkaid	152°51.3	49°11.2
Hadar	148°35.0	-60°29.9
Menkent	147°56.9	-36°29.8
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.5
Kochab	137°18.6	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.3
Atria	107°08.6	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.0	12°32.4
Eltanin	90°41.6	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°32.7	38°48.2
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.0
Peacock	53°05.1	-56°39.0
Deneb	49°25.5	45°21.9
Enif	33°38.5	9°59.3
Al Na'ir	27°32.6	-46°50.1
Fomalhaut	15°14.3	-29°29.2
Scheat	13°45.1	28°13.0
Markab	13°29.7	15°20.3

May 16 Fri	SHA	Mer.pass
Venus	349°52.4	09:04
Mars	224°13.9	17:26
Jupiter	275°59.8	13:58
Saturn	359°51.9	08:23

May 17 Sat	SHA	Mer.pass
Venus	349°04.8	09:04
Mars	223°43.9	17:24
Jupiter	275°45.8	13:55
Saturn	359°47.1	08:20

May 18 Sun	SHA	Mer.pass
Venus	348°16.5	09:03
Mars	223°13.8	17:22
Jupiter	275°31.7	13:52
Saturn	359°42.3	08:16

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N19°06.5	321°36.9	8.6′	S28°27.2	0.9′	55.0′
1	195°54.8	07.1	336°04.5	8.6′	28°26.3	1.0′	55.0′
2	210°54.8	07.7	350°32.0	8.6′	28°25.3	1.2′	55.0′
3	225°54.7	·· 08.3	4°59.6	8.5′	28°24.1	1.3′	55.0′
4	240°54.7	08.8	19°27.1	8.5′	28°22.8	1.5′	55.1′
5	255°54.7	09.4	33°54.7	8.5′	28°21.3	1.7′	55.1′
6	270°54.7	N19°10.0	48°22.2	8.5′	S28°19.6	1.7′	55.1′
7	285°54.7	10.6	62°49.7	8.5′	28°17.9	2.0′	55.1′
8	300°54.7	11.1	77°17.3	8.5′	28°15.9	2.1′	55.1′
9	315°54.7	·· 11.7	91°44.8	8.5′	28°13.8	2.2′	55.2′
10	330°54.6	12.3	106°12.3	8.5′	28°11.6	2.4′	55.2′
11	345°54.6	12.8	120°39.9	8.5′	28°09.2	2.5′	55.2′
12	0°54.6	N19°13.4	135°07.4	8.6′	S28°06.7	2.7′	55.2′
13	15°54.6	14.0	149°35.0	8.6′	28°04.0	2.8′	55.2′
14	30°54.6	14.5	164°02.5	8.6′	28°01.2	3.0′	55.2′
15	45°54.6	·· 15.1	178°30.1	8.6′	27°58.2	3.2′	55.3′
16	60°54.6	15.7	192°57.7	8.6′	27°55.0	3.2′	55.3′
17	75°54.5	16.2	207°25.3	8.6′	27°51.8	3.5′	55.3′
18	90°54.5	N19°16.8	221°52.9	8.6′	S27°48.3	3.6′	55.3′
19	105°54.5	17.4	236°20.5	8.6′	27°44.7	3.7′	55.4′
20	120°54.5	17.9	250°48.1	8.6′	27°41.0	3.9′	55.4′
21	135°54.5	·· 18.5	265°15.8	8.7′	27°37.1	4.0′	55.4′
22	150°54.5	19.1	279°43.4	8.7′	27°33.1	4.1′	55.4′
23	165°54.4	19.6	294°11.1	8.7′	27°29.0	4.4′	55.4′
	SD = 15.8′	d = 0.6′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N19°20.2	308°38.8	8.7′	S27°24.6	4.4′	55.5′
1	195°54.4	20.8	323°06.6	8.8′	27°20.2	4.6′	55.5′
2	210°54.4	21.3	337°34.3	8.8′	27°15.6	4.8′	55.5′
3	225°54.4	·· 21.9	352°02.1	8.8′	27°10.8	4.9′	55.5′
4	240°54.3	22.4	6°29.9	8.8′	27°05.9	5.0′	55.5′
5	255°54.3	23.0	20°57.7	8.9′	27°00.9	5.2′	55.6′
6	270°54.3	N19°23.6	35°25.6	8.9′	S26°55.7	5.4′	55.6′
7	285°54.3	24.1	49°53.4	8.9′	26°50.3	5.5′	55.6′
8	300°54.3	24.7	64°21.4	8.9′	26°44.8	5.6′	55.6′
9	315°54.2	·· 25.2	78°49.3	9.0′	26°39.2	5.8′	55.7′
10	330°54.2	25.8	93°17.3	9.0′	26°33.4	5.9′	55.7′
11	345°54.2	26.4	107°45.3	9.0′	26°27.5	6.0′	55.7′
12	0°54.2	N19°26.9	122°13.3	9.1′	S26°21.5	6.2′	55.7′
13	15°54.2	27.5	136°41.4	9.1′	26°15.3	6.4′	55.8′
14	30°54.1	28.0	151°09.5	9.1′	26°08.9	6.4′	55.8′
15	45°54.1	·· 28.6	165°37.7	9.2′	26°02.5	6.6′	55.8′
16	60°54.1	29.1	180°05.8	9.2′	25°55.9	6.8′	55.8′
17	75°54.1	29.7	194°34.1	9.3′	25°49.1	6.9′	55.8′
18	90°54.0	N19°30.2	209°02.3	9.3′	S25°42.2	7.0′	55.9′
19	105°54.0	30.8	223°30.6	9.3′	25°35.2	7.2′	55.9′
20	120°54.0	31.3	237°59.0	9.4′	25°28.0	7.3′	55.9′
21	135°54.0	·· 31.9	252°27.3	9.4′	25°20.7	7.5′	55.9′
22	150°54.0	32.4	266°55.8	9.5′	25°13.2	7.6′	56.0′
23	165°53.9	33.0	281°24.2	9.5′	25°05.6	7.7′	56.0′
	SD = 15.8′	d = 0.6′	SD = 15.1′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.9	N19°33.5	295°52.7	9.5′	S24°57.9	7.8′	56.0′
1	195°53.9	34.1	310°21.3	9.6′	24°50.1	8.0′	56.0′
2	210°53.9	34.6	324°49.9	9.6′	24°42.1	8.2′	56.1′
3	225°53.8	·· 35.2	339°18.5	9.7′	24°33.9	8.2′	56.1′
4	240°53.8	35.7	353°47.2	9.7′	24°25.7	8.4′	56.1′
5	255°53.8	36.3	8°15.9	9.8′	24°17.3	8.5′	56.2′
6	270°53.8	N19°36.8	22°44.7	9.8′	S24°08.8	8.7′	56.2′
7	285°53.7	37.4	37°13.5	9.9′	24°00.1	8.7′	56.2′
8	300°53.7	37.9	51°42.4	9.9′	23°51.4	9.0′	56.2′
9	315°53.7	·· 38.5	66°11.3	10.0′	23°42.4	9.0′	56.3′
10	330°53.7	39.0	80°40.3	10.0′	23°33.4	9.2′	56.3′
11	345°53.6	39.5	95°09.3	10.1′	23°24.2	9.3′	56.3′
12	0°53.6	N19°40.1	109°38.3	10.1′	S23°14.9	9.4′	56.3′
13	15°53.6	40.6	124°07.4	10.1′	23°05.5	9.5′	56.4′
14	30°53.5	41.2	138°36.6	10.2′	22°56.0	9.7′	56.4′
15	45°53.5	·· 41.7	153°05.8	10.2′	22°46.3	9.8′	56.4′
16	60°53.5	42.3	167°35.0	10.3′	22°36.5	9.9′	56.5′
17	75°53.5	42.8	182°04.3	10.3′	22°26.6	10.0′	56.5′
18	90°53.4	N19°43.3	196°33.6	10.4′	S22°16.6	10.2′	56.5′
19	105°53.4	43.9	211°03.0	10.4′	22°06.4	10.3′	56.5′
20	120°53.4	44.4	225°32.5	10.5′	21°56.1	10.4′	56.6′
21	135°53.3	·· 44.9	240°02.0	10.5′	21°45.7	10.5′	56.6′
22	150°53.3	45.5	254°31.5	10.6′	21°35.2	10.6′	56.6′
23	165°53.3	46.0	269°01.1	10.6′	21°24.6	10.8′	56.7′
	SD = 15.8′	d = 0.5′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°	-:--	-:--	01:34	22:24	-:--	-:--
66°	-:--	-:--	02:13	21:43	-:--	-:--
64°	-:--	00:50	02:40	21:15	23:12	-:--
62°	-:--	01:42	03:01	20:54	22:15	-:--
60°	-:--	02:12	03:17	20:37	21:43	-:--
N 58°	00:45	02:34	03:31	20:23	21:20	23:16
56°	01:32	02:52	03:43	20:11	21:02	22:25
54°	02:00	03:07	03:54	20:00	20:47	21:55
52°	02:21	03:20	04:03	19:51	20:34	21:34
50°	02:38	03:31	04:11	19:42	20:22	21:16
45°	03:10	03:54	04:29	19:25	19:59	20:44
N 40°	03:34	04:12	04:43	19:10	19:41	20:20
35°	03:52	04:27	04:55	18:58	19:27	20:01
30°	04:07	04:39	05:05	18:48	19:14	19:46
20°	04:31	04:59	05:23	18:30	18:54	19:22
N 10°	04:50	05:16	05:39	18:14	18:37	19:03
0°	05:05	05:31	05:53	18:00	18:22	18:47
S 10°	05:19	05:45	06:07	17:46	18:08	18:34
20°	05:32	05:59	06:22	17:31	17:54	18:21
30°	05:45	06:14	06:39	17:13	17:39	18:08
35°	05:51	06:22	06:49	17:03	17:31	18:01
40°	05:58	06:31	07:00	16:52	17:21	17:54
45°	06:06	06:41	07:14	16:39	17:11	17:47
S 50°	06:14	06:54	07:30	16:23	16:59	17:38
52°	06:18	06:59	07:37	16:15	16:53	17:35
54°	06:22	07:05	07:46	16:07	16:47	17:31
56°	06:26	07:12	07:55	15:57	16:40	17:26
58°	06:30	07:19	08:06	15:46	16:33	17:22
S 60°	06:35	07:28	08:18	15:34	16:24	17:17

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	03:04	▬	▬	05:59
62°	▬	02:36	02:22	▬	04:36	06:40
60°	01:18	01:44	01:54	04:02	05:28	07:08
N 58°	00:37	01:13	01:31	04:43	05:59	07:30
56°	00:09	00:49	01:13	05:11	06:23	07:47
54°	·· ··	00:29	00:58	05:33	06:42	08:02
52°	·· ··	00:13	00:45	05:51	06:58	08:15
50°	23:59	·· ··	00:33	06:06	07:12	08:26
45°	23:30	·· ··	00:08	06:37	07:40	08:50
N 40°	23:08	23:49	·· ··	07:01	08:02	09:08
35°	22:49	23:32	·· ··	07:20	08:20	09:24
30°	22:33	23:18	23:58	07:37	08:36	09:37
20°	22:06	22:54	23:38	08:05	09:02	10:00
N 10°	21:42	22:33	23:21	08:30	09:25	10:20
0°	21:20	22:13	23:05	08:52	09:46	10:38
S 10°	20:58	21:53	22:48	09:15	10:07	10:56
20°	20:35	21:32	22:31	09:39	10:29	11:16
30°	20:07	21:08	22:10	10:07	10:55	11:38
35°	19:51	20:53	21:58	10:24	11:10	11:51
40°	19:32	20:36	21:44	10:43	11:28	12:05
45°	19:09	20:16	21:28	11:06	11:49	12:23
S 50°	18:39	19:50	21:08	11:36	12:15	12:44
52°	18:25	19:38	20:58	11:51	12:28	12:55
54°	18:08	19:23	20:47	12:08	12:43	13:06
56°	17:47	19:07	20:34	12:28	13:00	13:19
58°	17:22	18:47	20:20	12:54	13:21	13:35
S 60°	16:47	18:21	20:03	13:30	13:46	13:53

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 90-75%
16	03:39	03:38	11:56	02:39	15:06	
17	03:38	03:37	11:56	03:33	16:00	
18	03:36	03:34	11:56	04:26	16:51	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2181 sec ΔT = TT-UT1 = +68.9659 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°55.1	224°22.8	N04°04.3	99°38.7	N18°08.0	152°12.8	N23°08.8	236°32.8	S02°04.9
1	251°57.6	239°23.2	04.9	114°39.9	07.6	167°14.7	08.8	251°35.1	04.8
2	267°00.1	254°23.6	05.5	129°41.1	07.2	182°16.5	08.9	266°37.3	04.8
3	282°02.5	269°24.0	·· 06.1	144°42.3	·· 06.8	197°18.4	·· 08.9	281°39.6	·· 04.7
4	297°05.0	284°24.4	06.8	159°43.5	06.4	212°20.3	08.9	296°41.9	04.6
5	312°07.5	299°24.8	07.4	174°44.7	06.0	227°22.2	08.9	311°44.2	04.5
6	327°09.9	314°25.2	N04°08.0	189°46.0	N18°05.5	242°24.1	N23°08.9	326°46.4	S02°04.5
7	342°12.4	329°25.6	08.6	204°47.2	05.1	257°25.9	09.0	341°48.7	04.4
8	357°14.9	344°26.0	09.2	219°48.4	04.7	272°27.8	09.0	356°51.0	04.3
9	12°17.3	359°26.5	·· 09.8	234°49.6	·· 04.3	287°29.7	·· 09.0	11°53.2	·· 04.2
10	27°19.8	14°26.9	10.4	249°50.8	03.9	302°31.6	09.0	26°55.5	04.2
11	42°22.3	29°27.3	11.0	264°52.0	03.5	317°33.4	09.1	41°57.8	04.1
12	57°24.7	44°27.7	N04°11.6	279°53.2	N18°03.1	332°35.3	N23°09.1	57°00.1	S02°04.0
13	72°27.2	59°28.1	12.3	294°54.4	02.7	347°37.2	09.1	72°02.3	04.0
14	87°29.6	74°28.5	12.9	309°55.6	02.2	2°39.1	09.1	87°04.6	03.9
15	102°32.1	89°28.9	·· 13.5	324°56.8	·· 01.8	17°40.9	·· 09.2	102°06.9	·· 03.8
16	117°34.6	104°29.3	14.1	339°58.0	01.4	32°42.8	09.2	117°09.1	03.7
17	132°37.0	119°29.7	14.7	354°59.2	01.0	47°44.7	09.2	132°11.4	03.7
18	147°39.5	134°30.1	N04°15.3	10°00.4	N18°00.6	62°46.6	N23°09.2	147°13.7	S02°03.6
19	162°42.0	149°30.5	16.0	25°01.6	18°00.2	77°48.4	09.3	162°16.0	03.5
20	177°44.4	164°30.9	16.6	40°02.8	17°59.8	92°50.3	09.3	177°18.2	03.4
21	192°46.9	179°31.3	·· 17.2	55°04.0	·· 59.3	107°52.2	·· 09.3	192°20.5	·· 03.4
22	207°49.4	194°31.7	17.8	70°05.2	58.9	122°54.1	09.3	207°22.8	03.3
23	222°51.8	209°32.1	18.4	85°06.4	58.5	137°55.9	09.4	222°25.1	03.2
Mer.pass.	08:11	ν 0.4′	d 0.6′	m -4.53	ν 1.2′	d -0.4′	m 1.16	ν 1.9′	d 0.0′	m -1.94	ν 2.3′	d 0.1′	m 1.12

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°54.3	224°32.5	N04°19.1	100°07.6	N17°58.1	152°57.8	N23°09.4	237°27.3	S02°03.1
1	252°56.7	239°32.9	19.7	115°08.8	57.7	167°59.7	09.4	252°29.6	03.1
2	267°59.2	254°33.2	20.3	130°10.0	57.3	183°01.5	09.4	267°31.9	03.0
3	283°01.7	269°33.6	·· 20.9	145°11.2	·· 56.9	198°03.4	·· 09.5	282°34.1	·· 02.9
4	298°04.1	284°34.0	21.5	160°12.4	56.4	213°05.3	09.5	297°36.4	02.9
5	313°06.6	299°34.4	22.2	175°13.6	56.0	228°07.2	09.5	312°38.7	02.8
6	328°09.1	314°34.8	N04°22.8	190°14.8	N17°55.6	243°09.0	N23°09.5	327°41.0	S02°02.7
7	343°11.5	329°35.2	23.4	205°16.0	55.2	258°10.9	09.5	342°43.2	02.6
8	358°14.0	344°35.6	24.0	220°17.2	54.8	273°12.8	09.6	357°45.5	02.6
9	13°16.5	359°36.0	·· 24.7	235°18.4	·· 54.4	288°14.7	·· 09.6	12°47.8	·· 02.5
10	28°18.9	14°36.3	25.3	250°19.6	53.9	303°16.5	09.6	27°50.1	02.4
11	43°21.4	29°36.7	25.9	265°20.8	53.5	318°18.4	09.6	42°52.3	02.3
12	58°23.9	44°37.1	N04°26.6	280°22.0	N17°53.1	333°20.3	N23°09.7	57°54.6	S02°02.3
13	73°26.3	59°37.5	27.2	295°23.2	52.7	348°22.2	09.7	72°56.9	02.2
14	88°28.8	74°37.9	27.8	310°24.4	52.3	3°24.0	09.7	87°59.2	02.1
15	103°31.2	89°38.3	·· 28.5	325°25.6	·· 51.9	18°25.9	·· 09.7	103°01.4	·· 02.1
16	118°33.7	104°38.6	29.1	340°26.8	51.4	33°27.8	09.8	118°03.7	02.0
17	133°36.2	119°39.0	29.7	355°28.0	51.0	48°29.6	09.8	133°06.0	01.9
18	148°38.6	134°39.4	N04°30.3	10°29.2	N17°50.6	63°31.5	N23°09.8	148°08.3	S02°01.8
19	163°41.1	149°39.8	31.0	25°30.4	50.2	78°33.4	09.8	163°10.5	01.8
20	178°43.6	164°40.1	31.6	40°31.6	49.8	93°35.3	09.8	178°12.8	01.7
21	193°46.0	179°40.5	·· 32.2	55°32.8	·· 49.3	108°37.1	·· 09.9	193°15.1	·· 01.6
22	208°48.5	194°40.9	32.9	70°34.0	48.9	123°39.0	09.9	208°17.4	01.6
23	223°51.0	209°41.3	33.5	85°35.2	48.5	138°40.9	09.9	223°19.6	01.5
Mer.pass.	08:07	ν 0.4′	d 0.6′	m -4.52	ν 1.2′	d -0.4′	m 1.17	ν 1.9′	d 0.0′	m -1.94	ν 2.3′	d 0.1′	m 1.12

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	238°53.4	224°41.6	N04°34.2	100°36.4	N17°48.1	153°42.8	N23°09.9	238°21.9	S02°01.4
1	253°55.9	239°42.0	34.8	115°37.6	47.7	168°44.6	10.0	253°24.2	01.3
2	268°58.4	254°42.4	35.4	130°38.8	47.3	183°46.5	10.0	268°26.5	01.3
3	284°00.8	269°42.7	·· 36.1	145°40.0	·· 46.8	198°48.4	·· 10.0	283°28.7	·· 01.2
4	299°03.3	284°43.1	36.7	160°41.2	46.4	213°50.2	10.0	298°31.0	01.1
5	314°05.7	299°43.5	37.3	175°42.4	46.0	228°52.1	10.1	313°33.3	01.0
6	329°08.2	314°43.8	N04°38.0	190°43.6	N17°45.6	243°54.0	N23°10.1	328°35.6	S02°01.0
7	344°10.7	329°44.2	38.6	205°44.8	45.2	258°55.9	10.1	343°37.8	00.9
8	359°13.1	344°44.6	39.3	220°46.0	44.7	273°57.7	10.1	358°40.1	00.8
9	14°15.6	359°44.9	·· 39.9	235°47.2	·· 44.3	288°59.6	·· 10.1	13°42.4	·· 00.8
10	29°18.1	14°45.3	40.5	250°48.4	43.9	304°01.5	10.2	28°44.7	00.7
11	44°20.5	29°45.6	41.2	265°49.6	43.5	319°03.3	10.2	43°47.0	00.6
12	59°23.0	44°46.0	N04°41.8	280°50.8	N17°43.0	334°05.2	N23°10.2	58°49.2	S02°00.5
13	74°25.5	59°46.4	42.5	295°52.0	42.6	349°07.1	10.2	73°51.5	00.5
14	89°27.9	74°46.7	43.1	310°53.2	42.2	4°09.0	10.3	88°53.8	00.4
15	104°30.4	89°47.1	·· 43.8	325°54.4	·· 41.8	19°10.8	·· 10.3	103°56.1	·· 00.3
16	119°32.8	104°47.4	44.4	340°55.5	41.4	34°12.7	10.3	118°58.3	00.3
17	134°35.3	119°47.8	45.1	355°56.7	40.9	49°14.6	10.3	134°00.6	00.2
18	149°37.8	134°48.2	N04°45.7	10°57.9	N17°40.5	64°16.4	N23°10.3	149°02.9	S02°00.1
19	164°40.2	149°48.5	46.4	25°59.1	40.1	79°18.3	10.4	164°05.2	00.1
20	179°42.7	164°48.9	47.0	41°00.3	39.7	94°20.2	10.4	179°07.5	02°00.0
21	194°45.2	179°49.2	·· 47.7	56°01.5	·· 39.2	109°22.1	·· 10.4	194°09.7	01°59.9
22	209°47.6	194°49.6	48.3	71°02.7	38.8	124°23.9	10.4	209°12.0	59.8
23	224°50.1	209°49.9	48.9	86°03.9	38.4	139°25.8	10.5	224°14.3	59.8
Mer.pass.	08:03	ν 0.4′	d 0.6′	m -4.51	ν 1.2′	d -0.4′	m 1.18	ν 1.9′	d 0.0′	m -1.93	ν 2.3′	d 0.1′	m 1.12

Stars

	SHA	Dec
Alpheratz	357°34.7	29°13.6
Ankaa	353°07.1	-42°09.9
Schedar	349°31.1	56°40.3
Diphda	348°47.2	-17°50.8
Achernar	335°20.4	-57°06.3
Hamal	327°51.2	23°34.8
Polaris	314°22.7	89°22.2
Acamar	315°12.0	-40°12.1
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.7	-52°42.7
Sirius	258°26.3	-16°45.1
Adhara	255°05.9	-29°00.5
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°14.9	-59°35.7
Suhail	222°46.2	-43°32.3
Miaplacidus	221°38.5	-69°49.6
Alphard	217°47.5	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.5	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.7
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.5
Spica	158°21.7	-11°17.8
Alkaid	152°51.3	49°11.3
Hadar	148°35.0	-60°29.9
Menkent	147°56.9	-36°29.9
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.6	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.6	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.0	12°32.4
Eltanin	90°41.6	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°32.7	38°48.2
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.0
Peacock	53°05.0	-56°39.0
Deneb	49°25.5	45°21.9
Enif	33°38.5	9°59.3
Al Na'ir	27°32.6	-46°50.1
Fomalhaut	15°14.3	-29°29.2
Scheat	13°45.0	28°13.0
Markab	13°29.7	15°20.4

May 19 Mon	SHA	Mer.pass
Venus	347°27.6	09:02
Mars	222°43.6	17:20
Jupiter	275°17.7	13:49
Saturn	359°37.7	08:13

May 20 Tue	SHA	Mer.pass
Venus	346°38.2	09:02
Mars	222°13.3	17:18
Jupiter	275°03.5	13:46
Saturn	359°33.0	08:09

May 21 Wed	SHA	Mer.pass
Venus	345°48.2	09:01
Mars	221°43.0	17:16
Jupiter	274°49.3	13:43
Saturn	359°28.5	08:05

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	N19°46.5	283°30.7	10.7′	S21°13.8	10.9′	56.7′
1	195°53.2	47.1	298°00.4	10.7′	21°02.9	11.0′	56.7′
2	210°53.2	47.6	312°30.1	10.8′	20°51.9	11.1′	56.7′
3	225°53.2	·· 48.2	326°59.9	10.8′	20°40.8	11.2′	56.8′
4	240°53.1	48.7	341°29.7	10.9′	20°29.6	11.3′	56.8′
5	255°53.1	49.2	355°59.6	10.9′	20°18.3	11.4′	56.8′
6	270°53.1	N19°49.7	10°29.5	11.0′	S20°06.9	11.6′	56.9′
7	285°53.0	50.3	24°59.5	11.0′	19°55.3	11.7′	56.9′
8	300°53.0	50.8	39°29.5	11.1′	19°43.6	11.7′	56.9′
9	315°53.0	·· 51.3	53°59.5	11.1′	19°31.9	11.9′	56.9′
10	330°52.9	51.9	68°29.6	11.1′	19°20.0	12.0′	57.0′
11	345°52.9	52.4	82°59.8	11.2′	19°08.0	12.1′	57.0′
12	0°52.9	N19°52.9	97°30.0	11.2′	S18°55.9	12.2′	57.0′
13	15°52.8	53.5	112°00.2	11.3′	18°43.7	12.3′	57.1′
14	30°52.8	54.0	126°30.5	11.3′	18°31.4	12.4′	57.1′
15	45°52.8	·· 54.5	141°00.8	11.4′	18°19.0	12.5′	57.1′
16	60°52.7	55.0	155°31.2	11.4′	18°06.5	12.6′	57.2′
17	75°52.7	55.6	170°01.6	11.5′	17°53.9	12.7′	57.2′
18	90°52.7	N19°56.1	184°32.1	11.5′	S17°41.2	12.9′	57.2′
19	105°52.6	56.6	199°02.6	11.5′	17°28.3	12.9′	57.3′
20	120°52.6	57.1	213°33.1	11.6′	17°15.4	13.0′	57.3′
21	135°52.6	·· 57.7	228°03.7	11.6′	17°02.4	13.1′	57.3′
22	150°52.5	58.2	242°34.3	11.7′	16°49.3	13.2′	57.4′
23	165°52.5	58.7	257°04.9	11.7′	16°36.1	13.3′	57.4′
	SD = 15.8′	d = 0.5′	SD = 15.5′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.5	N19°59.2	271°35.6	11.7′	S16°22.8	13.4′	57.4′
1	195°52.4	19°59.7	286°06.4	11.8′	16°09.4	13.5′	57.4′
2	210°52.4	20°00.3	300°37.1	11.8′	15°55.9	13.5′	57.5′
3	225°52.4	·· 00.8	315°07.9	11.8′	15°42.4	13.7′	57.5′
4	240°52.3	01.3	329°38.8	11.9′	15°28.7	13.8′	57.5′
5	255°52.3	01.8	344°09.6	11.9′	15°14.9	13.8′	57.6′
6	270°52.2	N20°02.3	358°40.5	11.9′	S15°01.1	14.0′	57.6′
7	285°52.2	02.9	13°11.5	12.0′	14°47.1	14.0′	57.6′
8	300°52.2	03.4	27°42.5	12.0′	14°33.1	14.1′	57.7′
9	315°52.1	·· 03.9	42°13.5	12.0′	14°19.0	14.2′	57.7′
10	330°52.1	04.4	56°44.5	12.1′	14°04.8	14.3′	57.7′
11	345°52.1	04.9	71°15.6	12.1′	13°50.5	14.3′	57.8′
12	0°52.0	N20°05.4	85°46.7	12.1′	S13°36.2	14.5′	57.8′
13	15°52.0	05.9	100°17.8	12.1′	13°21.7	14.5′	57.8′
14	30°51.9	06.5	114°48.9	12.2′	13°07.2	14.6′	57.9′
15	45°51.9	·· 07.0	129°20.1	12.2′	12°52.6	14.7′	57.9′
16	60°51.9	07.5	143°51.3	12.2′	12°37.9	14.7′	57.9′
17	75°51.8	08.0	158°22.5	12.2′	12°23.2	14.9′	58.0′
18	90°51.8	N20°08.5	172°53.8	12.3′	S12°08.3	14.9′	58.0′
19	105°51.7	09.0	187°25.0	12.3′	11°53.4	15.0′	58.0′
20	120°51.7	09.5	201°56.3	12.3′	11°38.4	15.0′	58.1′
21	135°51.7	·· 10.0	216°27.6	12.3′	11°23.4	15.1′	58.1′
22	150°51.6	10.5	230°58.9	12.3′	11°08.3	15.2′	58.1′
23	165°51.6	11.0	245°30.3	12.4′	10°53.1	15.3′	58.2′
	SD = 15.8′	d = 0.5′	SD = 15.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.5	N20°11.6	260°01.6	12.4′	S10°37.8	15.4′	58.2′
1	195°51.5	12.1	274°33.0	12.4′	10°22.4	15.4′	58.2′
2	210°51.5	12.6	289°04.4	12.4′	10°07.0	15.4′	58.3′
3	225°51.4	·· 13.1	303°35.8	12.4′	09°51.6	15.6′	58.3′
4	240°51.4	13.6	318°07.2	12.4′	09°36.0	15.6′	58.3′
5	255°51.3	14.1	332°38.7	12.4′	09°20.4	15.7′	58.4′
6	270°51.3	N20°14.6	347°10.1	12.4′	S09°04.7	15.7′	58.4′
7	285°51.2	15.1	1°41.5	12.5′	08°49.0	15.8′	58.4′
8	300°51.2	15.6	16°13.0	12.5′	08°33.2	15.8′	58.5′
9	315°51.2	·· 16.1	30°44.5	12.5′	08°17.4	15.9′	58.5′
10	330°51.1	16.6	45°15.9	12.5′	08°01.5	16.0′	58.5′
11	345°51.1	17.1	59°47.4	12.5′	07°45.5	16.0′	58.6′
12	0°51.0	N20°17.6	74°18.9	12.5′	S07°29.5	16.1′	58.6′
13	15°51.0	18.1	88°50.3	12.5′	07°13.4	16.1′	58.6′
14	30°50.9	18.6	103°21.8	12.5′	06°57.3	16.2′	58.7′
15	45°50.9	·· 19.1	117°53.3	12.5′	06°41.1	16.3′	58.7′
16	60°50.8	19.6	132°24.7	12.5′	06°24.8	16.2′	58.7′
17	75°50.8	20.1	146°56.2	12.5′	06°08.6	16.4′	58.8′
18	90°50.7	N20°20.6	161°27.7	12.5′	S05°52.2	16.4′	58.8′
19	105°50.7	21.1	175°59.1	12.4′	05°35.8	16.4′	58.8′
20	120°50.7	21.6	190°30.6	12.4′	05°19.4	16.5′	58.9′
21	135°50.6	·· 22.1	205°02.0	12.4′	05°02.9	16.5′	58.9′
22	150°50.6	22.6	219°33.5	12.4′	04°46.4	16.5′	58.9′
23	165°50.5	23.1	234°04.9	12.4′	04°29.9	16.6′	59.0′
	SD = 15.8′	d = 0.5′	SD = 15.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°	–:–	–:–	01:15	22:45	–:–	–:–
66°	–:–	–:–	02:01	21:55	–:–	–:–
64°	–:–	00:05	02:31	21:25	–:–	–:–
62°	–:–	01:28	02:53	21:02	22:29	–:–
60°	–:–	02:02	03:11	20:44	21:53	–:–
N 58°	00:04	02:27	03:26	20:29	21:28	–:–
56°	01:19	02:46	03:38	20:16	21:09	22:37
54°	01:51	03:02	03:49	20:05	20:53	22:04
52°	02:14	03:15	03:59	19:55	20:39	21:41
50°	02:32	03:27	04:07	19:46	20:27	21:22
45°	03:06	03:51	04:26	19:28	20:03	20:48
N 40°	03:31	04:09	04:40	19:13	19:44	20:23
35°	03:50	04:24	04:53	19:01	19:29	20:04
30°	04:05	04:37	05:04	18:50	19:16	19:48
20°	04:30	04:58	05:22	18:31	18:55	19:23
N 10°	04:49	05:16	05:38	18:15	18:37	19:04
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:45	06:08	17:45	18:08	18:33
20°	05:33	06:00	06:23	17:30	17:53	18:20
30°	05:46	06:15	06:41	17:12	17:37	18:07
35°	05:53	06:24	06:51	17:02	17:29	18:00
40°	06:00	06:34	07:03	16:50	17:19	17:52
45°	06:08	06:44	07:17	16:36	17:08	17:44
S 50°	06:17	06:57	07:34	16:19	16:55	17:35
52°	06:21	07:03	07:41	16:11	16:49	17:31
54°	06:25	07:09	07:50	16:02	16:43	17:27
56°	06:30	07:17	08:00	15:52	16:36	17:23
58°	06:35	07:24	08:11	15:41	16:28	17:18
S 60°	06:40	07:33	08:24	15:28	16:19	17:12

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°		03:59	02:57		08:39	11:22
N 70°		03:23	02:42		09:12	11:34
68°	03:49	02:58	02:30	07:02	09:36	11:44
66°	03:06	02:38	02:19	07:44	09:54	11:52
64°	02:37	02:22	02:11	08:12	10:08	11:59
62°	02:15	02:09	02:03	08:33	10:21	12:05
60°	01:57	01:57	01:57	08:50	10:31	12:10
N 58°	01:41	01:47	01:51	09:05	10:40	12:14
56°	01:28	01:39	01:46	09:17	10:47	12:18
54°	01:17	01:31	01:41	09:28	10:54	12:21
52°	01:07	01:24	01:37	09:37	11:01	12:24
50°	00:58	01:17	01:33	09:45	11:06	12:27
45°	00:39	01:04	01:25	10:03	11:18	12:33
N 40°	00:23	00:52	01:18	10:18	11:28	12:38
35°	00:10	00:43	01:12	10:30	11:36	12:43
30°	·· ··	00:34	01:07	10:40	11:43	12:47
20°	·· ··	00:19	00:58	10:58	11:56	12:53
N 10°	·· ··	00:06	00:49	11:14	12:07	12:59
0°	23:54	·· ··	00:42	11:28	12:17	13:04
S 10°	23:42	·· ··	00:34	11:43	12:27	13:09
20°	23:28	·· ··	00:26	11:58	12:37	13:15
30°	23:13	·· ··	00:16	12:15	12:49	13:21
35°	23:04	·· ··	00:11	12:25	12:56	13:25
40°	22:54	·· ··	00:05	12:37	13:04	13:29
45°	22:42	23:57	·· ··	12:50	13:13	13:33
S 50°	22:28	23:48	·· ··	13:07	13:24	13:39
52°	22:21	23:44	·· ··	13:14	13:29	13:41
54°	22:13	23:40	·· ··	13:22	13:34	13:44
56°	22:05	23:35	·· ··	13:32	13:40	13:47
58°	21:55	23:29	·· ··	13:42	13:47	13:50
S 60°	21:44	23:23	·· ··	13:55	13:55	13:54

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 66-45%
19	03:33	03:32	11:56	05:17	17:41	
20	03:30	03:28	11:57	06:05	18:29	
21	03:26	03:24	11:57	06:53	19:17	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2188 sec ΔT = TT-UT1 = +68.9652 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	239°52.6	224°50.3	N04°49.6	101°05.1	N17°38.0	154°27.7	N23°10.5	239°16.6	S01°59.7
1	254°55.0	239°50.6	50.3	116°06.3	37.6	169°29.5	10.5	254°18.9	59.6
2	269°57.5	254°51.0	50.9	131°07.5	37.1	184°31.4	10.5	269°21.1	59.6
3	285°00.0	269°51.3	·· 51.6	146°08.7	·· 36.7	199°33.3	·· 10.5	284°23.4	·· 59.5
4	300°02.4	284°51.6	52.2	161°09.9	36.3	214°35.1	10.6	299°25.7	59.4
5	315°04.9	299°52.0	52.9	176°11.1	35.9	229°37.0	10.6	314°28.0	59.3
6	330°07.3	314°52.3	N04°53.5	191°12.3	N17°35.4	244°38.9	N23°10.6	329°30.2	S01°59.3
7	345°09.8	329°52.7	54.2	206°13.5	35.0	259°40.8	10.6	344°32.5	59.2
8	0°12.3	344°53.0	54.8	221°14.7	34.6	274°42.6	10.7	359°34.8	59.1
9	15°14.7	359°53.4	·· 55.5	236°15.9	·· 34.2	289°44.5	·· 10.7	14°37.1	·· 59.1
10	30°17.2	14°53.7	56.1	251°17.1	33.7	304°46.4	10.7	29°39.4	59.0
11	45°19.7	29°54.0	56.8	266°18.2	33.3	319°48.2	10.7	44°41.6	58.9
12	60°22.1	44°54.4	N04°57.4	281°19.4	N17°32.9	334°50.1	N23°10.7	59°43.9	S01°58.9
13	75°24.6	59°54.7	58.1	296°20.6	32.5	349°52.0	10.8	74°46.2	58.8
14	90°27.1	74°55.1	58.8	311°21.8	32.0	4°53.8	10.8	89°48.5	58.7
15	105°29.5	89°55.4	04°59.4	326°23.0	·· 31.6	19°55.7	·· 10.8	104°50.8	·· 58.6
16	120°32.0	104°55.7	05°00.1	341°24.2	31.2	34°57.6	10.8	119°53.0	58.6
17	135°34.5	119°56.1	00.7	356°25.4	30.8	49°59.5	10.8	134°55.3	58.5
18	150°36.9	134°56.4	N05°01.4	11°26.6	N17°30.3	65°01.3	N23°10.9	149°57.6	S01°58.4
19	165°39.4	149°56.7	02.1	26°27.8	29.9	80°03.2	10.9	164°59.9	58.4
20	180°41.8	164°57.1	02.7	41°29.0	29.5	95°05.1	10.9	180°02.2	58.3
21	195°44.3	179°57.4	·· 03.4	56°30.2	·· 29.0	110°06.9	·· 10.9	195°04.4	·· 58.2
22	210°46.8	194°57.7	04.0	71°31.4	28.6	125°08.8	11.0	210°06.7	58.2
23	225°49.2	209°58.1	04.7	86°32.6	28.2	140°10.7	11.0	225°09.0	58.1
Mer.pass.	07:59	ν 0.3′	d 0.7′	m -4.50	ν 1.2′	d -0.4′	m 1.19	ν 1.9′	d 0.0′	m -1.93	ν 2.3′	d 0.1′	m 1.11

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	240°51.7	224°58.4	N05°05.4	101°33.7	N17°27.8	155°12.5	N23°11.0	240°11.3	S01°58.0
1	255°54.2	239°58.7	06.0	116°34.9	27.3	170°14.4	11.0	255°13.6	58.0
2	270°56.6	254°59.0	06.7	131°36.1	26.9	185°16.3	11.0	270°15.9	57.9
3	285°59.1	269°59.4	·· 07.4	146°37.3	·· 26.5	200°18.1	·· 11.1	285°18.1	·· 57.8
4	301°01.6	284°59.7	08.0	161°38.5	26.1	215°20.0	11.1	300°20.4	57.7
5	316°04.0	300°00.0	08.7	176°39.7	25.6	230°21.9	11.1	315°22.7	57.7
6	331°06.5	315°00.3	N05°09.4	191°40.9	N17°25.2	245°23.7	N23°11.1	330°25.0	S01°57.6
7	346°08.9	330°00.7	10.0	206°42.1	24.8	260°25.6	11.1	345°27.3	57.5
8	1°11.4	345°01.0	10.7	221°43.3	24.3	275°27.5	11.2	0°29.5	57.5
9	16°13.9	0°01.3	·· 11.4	236°44.5	·· 23.9	290°29.3	·· 11.2	15°31.8	·· 57.4
10	31°16.3	15°01.6	12.0	251°45.7	23.5	305°31.2	11.2	30°34.1	57.3
11	46°18.8	30°01.9	12.7	266°46.8	23.0	320°33.1	11.2	45°36.4	57.3
12	61°21.3	45°02.3	N05°13.4	281°48.0	N17°22.6	335°35.0	N23°11.2	60°38.7	S01°57.2
13	76°23.7	60°02.6	14.0	296°49.2	22.2	350°36.8	11.3	75°41.0	57.1
14	91°26.2	75°02.9	14.7	311°50.4	21.8	5°38.7	11.3	90°43.2	57.1
15	106°28.7	90°03.2	·· 15.4	326°51.6	·· 21.3	20°40.6	·· 11.3	105°45.5	·· 57.0
16	121°31.1	105°03.5	16.1	341°52.8	20.9	35°42.4	11.3	120°47.8	56.9
17	136°33.6	120°03.8	16.7	356°54.0	20.5	50°44.3	11.3	135°50.1	56.9
18	151°36.1	135°04.1	N05°17.4	11°55.2	N17°20.0	65°46.2	N23°11.4	150°52.4	S01°56.8
19	166°38.5	150°04.5	18.1	26°56.4	19.6	80°48.0	11.4	165°54.7	56.7
20	181°41.0	165°04.8	18.7	41°57.5	19.2	95°49.9	11.4	180°56.9	56.7
21	196°43.4	180°05.1	·· 19.4	56°58.7	·· 18.7	110°51.8	·· 11.4	195°59.2	·· 56.6
22	211°45.9	195°05.4	20.1	71°59.9	18.3	125°53.6	11.5	211°01.5	56.5
23	226°48.4	210°05.7	20.8	87°01.1	17.9	140°55.5	11.5	226°03.8	56.4
Mer.pass.	07:55	ν 0.3′	d 0.7′	m -4.49	ν 1.2′	d -0.4′	m 1.20	ν 1.9′	d 0.0′	m -1.93	ν 2.3′	d 0.1′	m 1.11

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	241°50.8	225°06.0	N05°21.4	102°02.3	N17°17.4	155°57.4	N23°11.5	241°06.1	S01°56.4
1	256°53.3	240°06.3	22.1	117°03.5	17.0	170°59.2	11.5	256°08.4	56.3
2	271°55.8	255°06.6	22.8	132°04.7	16.6	186°01.1	11.5	271°10.7	56.2
3	286°58.2	270°06.9	·· 23.5	147°05.9	·· 16.1	201°03.0	·· 11.6	286°12.9	·· 56.2
4	302°00.7	285°07.2	24.2	162°07.1	15.7	216°04.8	11.6	301°15.2	56.1
5	317°03.2	300°07.5	24.8	177°08.2	15.3	231°06.7	11.6	316°17.5	56.0
6	332°05.6	315°07.8	N05°25.5	192°09.4	N17°14.8	246°08.6	N23°11.6	331°19.8	S01°56.0
7	347°08.1	330°08.1	26.2	207°10.6	14.4	261°10.4	11.6	346°22.1	55.9
8	2°10.5	345°08.4	26.9	222°11.8	14.0	276°12.3	11.7	1°24.4	55.8
9	17°13.0	0°08.7	·· 27.6	237°13.0	·· 13.5	291°14.2	·· 11.7	16°26.6	·· 55.8
10	32°15.5	15°09.0	28.2	252°14.2	13.1	306°16.0	11.7	31°28.9	55.7
11	47°17.9	30°09.3	28.9	267°15.4	12.7	321°17.9	11.7	46°31.2	55.6
12	62°20.4	45°09.6	N05°29.6	282°16.6	N17°12.2	336°19.8	N23°11.7	61°33.5	S01°55.6
13	77°22.9	60°09.9	30.3	297°17.7	11.8	351°21.6	11.7	76°35.8	55.5
14	92°25.3	75°10.2	31.0	312°18.9	11.4	6°23.5	11.8	91°38.1	55.4
15	107°27.8	90°10.5	·· 31.6	327°20.1	·· 10.9	21°25.4	·· 11.8	106°40.4	·· 55.4
16	122°30.3	105°10.8	32.3	342°21.3	10.5	36°27.2	11.8	121°42.6	55.3
17	137°32.7	120°11.1	33.0	357°22.5	10.1	51°29.1	11.8	136°44.9	55.2
18	152°35.2	135°11.4	N05°33.7	12°23.7	N17°09.6	66°30.9	N23°11.8	151°47.2	S01°55.2
19	167°37.7	150°11.7	34.4	27°24.9	09.2	81°32.8	11.9	166°49.5	55.1
20	182°40.1	165°12.0	35.1	42°26.0	08.8	96°34.7	11.9	181°51.8	55.0
21	197°42.6	180°12.3	·· 35.8	57°27.2	·· 08.3	111°36.5	·· 11.9	196°54.1	·· 55.0
22	212°45.0	195°12.6	36.4	72°28.4	07.9	126°38.4	11.9	211°56.4	54.9
23	227°47.5	210°12.9	37.1	87°29.6	07.5	141°40.3	11.9	226°58.7	54.8
Mer.pass.	07:51	ν 0.3′	d 0.7′	m -4.48	ν 1.2′	d -0.4′	m 1.21	ν 1.9′	d 0.0′	m -1.93	ν 2.3′	d 0.1′	m 1.11

Stars

	SHA	Dec
Alpheratz	357°34.7	29°13.6
Ankaa	353°07.1	-42°09.9
Schedar	349°31.1	56°40.3
Diphda	348°47.2	-17°50.8
Achernar	335°20.4	-57°06.3
Hamal	327°51.2	23°34.8
Polaris	314°22.3	89°22.2
Acamar	315°12.0	-40°12.1
Menkar	314°06.2	4°11.3
Mirfak	308°28.4	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.8	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.7	-52°42.7
Sirius	258°26.3	-16°45.1
Adhara	255°05.9	-29°00.5
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.0	-59°35.7
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.5	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.1	11°50.6
Dubhe	193°40.5	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.7
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°29.9
Menkent	147°56.9	-36°29.9
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.6	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.5	-69°04.3
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.0	12°32.4
Eltanin	90°41.6	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°32.7	38°48.2
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.0
Peacock	53°05.0	-56°39.0
Deneb	49°25.4	45°22.0
Enif	33°38.5	9°59.4
Al Na'ir	27°32.5	-46°50.1
Fomalhaut	15°14.3	-29°29.2
Scheat	13°45.0	28°13.0
Markab	13°29.7	15°20.4

May 22 Thu	SHA	Mer.pass
Venus	344°57.7	09:00
Mars	221°12.5	17:14
Jupiter	274°35.1	13:40
Saturn	359°24.0	08:02

May 23 Fri	SHA	Mer.pass
Venus	344°06.7	09:00
Mars	220°42.0	17:12
Jupiter	274°20.8	13:37
Saturn	359°19.6	07:58

May 24 Sat	SHA	Mer.pass
Venus	343°15.2	08:59
Mars	220°11.5	17:10
Jupiter	274°06.5	13:34
Saturn	359°15.2	07:54

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	Sun		Moon				
h Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.5	N20°23.5	248°36.3	12.4′	S04°13.3	16.7′	59.0′
1	195°50.4	24.0	263°07.7	12.4′	03°56.6	16.6′	59.0′
2	210°50.4	24.5	277°39.0	12.4′	03°40.0	16.8′	59.1′
3	225°50.3	·· 25.0	292°10.4	12.3′	03°23.2	16.7′	59.1′
4	240°50.3	25.5	306°41.7	12.3′	03°06.5	16.8′	59.1′
5	255°50.2	26.0	321°13.1	12.3′	02°49.7	16.8′	59.2′
6	270°50.2	N20°26.5	335°44.4	12.3′	S02°32.9	16.9′	59.2′
7	285°50.1	27.0	350°15.6	12.3′	02°16.0	16.9′	59.2′
8	300°50.1	27.5	4°46.9	12.2′	01°59.1	16.9′	59.3′
9	315°50.0	·· 28.0	19°18.1	12.2′	01°42.2	16.9′	59.3′
10	330°50.0	28.4	33°49.3	12.2′	01°25.3	17.0′	59.3′
11	345°49.9	28.9	48°20.5	12.1′	01°08.3	16.9′	59.4′
12	0°49.9	N20°29.4	62°51.7	12.1′	S00°51.4	17.1′	59.4′
13	15°49.8	29.9	77°22.8	12.1′	00°34.3	17.0′	59.4′
14	30°49.8	30.4	91°53.9	12.1′	00°17.3	17.0′	59.5′
15	45°49.7	·· 30.9	106°24.9	12.0′	S00°00.3	17.1′	59.5′
16	60°49.7	31.3	120°55.9	12.0′	N00°16.8	17.1′	59.5′
17	75°49.6	31.8	135°26.9	11.9′	00°33.9	17.1′	59.6′
18	90°49.6	N20°32.3	149°57.8	11.9′	N00°51.0	17.1′	59.6′
19	105°49.5	32.8	164°28.7	11.9′	01°08.1	17.2′	59.6′
20	120°49.5	33.3	178°59.6	11.8′	01°25.3	17.1′	59.6′
21	135°49.4	·· 33.7	193°30.4	11.8′	01°42.4	17.2′	59.7′
22	150°49.4	34.2	208°01.2	11.7′	01°59.6	17.1′	59.7′
23	165°49.3	34.7	222°31.9	11.7′	02°16.7	17.2′	59.7′
	SD = 15.8′	d = 0.5′		SD = 16.1′			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.3	N20°35.2	237°02.6	11.6′	N02°33.9	17.2′	59.8′
1	195°49.2	35.7	251°33.3	11.6′	02°51.1	17.1′	59.8′
2	210°49.2	36.1	266°03.9	11.5′	03°08.2	17.2′	59.8′
3	225°49.1	·· 36.6	280°34.4	11.5′	03°25.4	17.2′	59.9′
4	240°49.0	37.1	295°04.9	11.4′	03°42.6	17.2′	59.9′
5	255°49.0	37.6	309°35.3	11.4′	03°59.8	17.1′	59.9′
6	270°48.9	N20°38.0	324°05.7	11.3′	N04°16.9	17.2′	59.9′
7	285°48.9	38.5	338°36.0	11.3′	04°34.1	17.1′	60.0′
8	300°48.8	39.0	353°06.3	11.2′	04°51.2	17.2′	60.0′
9	315°48.8	·· 39.5	7°36.5	11.1′	05°08.4	17.1′	60.0′
10	330°48.7	39.9	22°06.6	11.1′	05°25.5	17.2′	60.0′
11	345°48.7	40.4	36°36.7	11.0′	05°42.7	17.1′	60.1′
12	0°48.6	N20°40.9	51°06.7	11.0′	N05°59.8	17.1′	60.1′
13	15°48.6	41.3	65°36.7	10.9′	06°16.9	17.0′	60.1′
14	30°48.5	41.8	80°06.5	10.8′	06°33.9	17.1′	60.2′
15	45°48.4	·· 42.3	94°36.4	10.7′	06°51.0	17.0′	60.2′
16	60°48.4	42.7	109°06.1	10.7′	07°08.0	17.1′	60.2′
17	75°48.3	43.2	123°35.8	10.6′	07°25.1	17.0′	60.2′
18	90°48.3	N20°43.7	138°05.4	10.5′	N07°42.1	16.9′	60.3′
19	105°48.2	44.1	152°34.9	10.5′	07°59.0	16.9′	60.3′
20	120°48.2	44.6	167°04.4	10.4′	08°15.9	17.0′	60.3′
21	135°48.1	·· 45.1	181°33.8	10.3′	08°32.9	16.8′	60.3′
22	150°48.0	45.5	196°03.1	10.2′	08°49.7	16.9′	60.4′
23	165°48.0	46.0	210°32.3	10.1′	09°06.6	16.8′	60.4′
	SD = 15.8′	d = 0.5′		SD = 16.3′			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.9	N20°46.5	225°01.4	10.1′	N09°23.4	16.7′	60.4′
1	195°47.9	46.9	239°30.5	10.0′	09°40.1	16.7′	60.4′
2	210°47.8	47.4	253°59.5	9.9′	09°56.8	16.7′	60.4′
3	225°47.7	·· 47.9	268°28.4	9.8′	10°13.5	16.7′	60.5′
4	240°47.7	48.3	282°57.2	9.7′	10°30.2	16.5′	60.5′
5	255°47.6	48.8	297°25.9	9.6′	10°46.7	16.6′	60.5′
6	270°47.6	N20°49.2	311°54.6	9.5′	N11°03.3	16.5′	60.5′
7	285°47.5	49.7	326°23.1	9.5′	11°19.8	16.4′	60.5′
8	300°47.4	50.2	340°51.6	9.4′	11°36.2	16.4′	60.6′
9	315°47.4	·· 50.6	355°19.9	9.3′	11°52.6	16.3′	60.6′
10	330°47.3	51.1	9°48.2	9.2′	12°08.9	16.3′	60.6′
11	345°47.3	51.5	24°16.4	9.1′	12°25.2	16.2′	60.6′
12	0°47.2	N20°52.0	38°44.5	9.0′	N12°41.4	16.1′	60.6′
13	15°47.1	52.4	53°12.5	8.9′	12°57.5	16.1′	60.7′
14	30°47.1	52.9	67°40.3	8.8′	13°13.6	16.0′	60.7′
15	45°47.0	·· 53.3	82°08.1	8.7′	13°29.6	15.9′	60.7′
16	60°47.0	53.8	96°35.8	8.6′	13°45.5	15.9′	60.7′
17	75°46.9	54.2	111°03.4	8.5′	14°01.4	15.8′	60.7′
18	90°46.8	N20°54.7	125°30.9	8.4′	N14°17.2	15.7′	60.7′
19	105°46.8	55.2	139°58.3	8.3′	14°32.9	15.6′	60.8′
20	120°46.7	55.6	154°25.6	8.2′	14°48.5	15.6′	60.8′
21	135°46.6	·· 56.1	168°52.8	8.1′	15°04.1	15.4′	60.8′
22	150°46.6	56.5	183°19.9	8.0′	15°19.5	15.4′	60.8′
23	165°46.5	57.0	197°46.8	7.9′	15°34.9	15.3′	60.8′
	SD = 15.8′	d = 0.5′		SD = 16.5′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°	–:–	–:–	00:52	23:11	–:–	–:–
66°	–:–	–:–	01:49	22:08	–:–	–:–
64°	–:–	–:–	02:22	21:34	–:–	–:–
62°	–:–	01:13	02:46	21:10	22:45	–:–
60°	–:–	01:53	03:05	20:50	22:03	–:–
N 58°	–:–	02:19	03:20	20:35	21:36	–:–
56°	01:06	02:40	03:33	20:21	21:15	22:52
54°	01:43	02:57	03:45	20:10	20:58	22:13
52°	02:07	03:11	03:55	19:59	20:44	21:48
50°	02:27	03:23	04:04	19:50	20:32	21:28
45°	03:02	03:48	04:23	19:31	20:07	20:52
N 40°	03:28	04:07	04:38	19:16	19:47	20:27
35°	03:47	04:22	04:51	19:03	19:31	20:07
30°	04:04	04:36	05:02	18:51	19:18	19:50
20°	04:29	04:57	05:21	18:32	18:56	19:25
N 10°	04:49	05:15	05:38	18:16	18:38	19:05
0°	05:05	05:31	05:53	18:00	18:22	18:48
S 10°	05:20	05:46	06:08	17:45	18:07	18:33
20°	05:34	06:01	06:24	17:29	17:52	18:19
30°	05:48	06:17	06:43	17:11	17:36	18:06
35°	05:55	06:26	06:53	17:00	17:27	17:58
40°	06:03	06:36	07:06	16:48	17:17	17:51
45°	06:11	06:47	07:20	16:33	17:06	17:42
S 50°	06:20	07:01	07:37	16:16	16:52	17:33
52°	06:25	07:07	07:46	16:08	16:46	17:28
54°	06:29	07:13	07:55	15:58	16:40	17:24
56°	06:34	07:21	08:05	15:48	16:32	17:19
58°	06:39	07:29	08:17	15:36	16:24	17:14
S 60°	06:45	07:38	08:31	15:22	16:15	17:08

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	02:16	01:39	00:58 23:53	13:46	16:13	19:10
N 70°	02:11	01:43	01:12	13:46	16:02	18:37
68°	02:07	01:46	01:24	13:47	15:53	18:13
66°	02:04	01:49	01:33	13:47	15:46	17:55
64°	02:01	01:51	01:41	13:48	15:40	17:40
62°	01:58	01:53	01:49	13:48	15:35	17:28
60°	01:56	01:55	01:55	13:48	15:30	17:18
N 58°	01:54	01:57	02:00	13:49	15:26	17:09
56°	01:52	01:58	02:05	13:49	15:23	17:01
54°	01:51	01:59	02:09	13:49	15:20	16:55
52°	01:49	02:01	02:13	13:49	15:17	16:48
50°	01:48	02:02	02:17	13:50	15:14	16:43
45°	01:45	02:04	02:25	13:50	15:09	16:31
N 40°	01:42	02:06	02:32	13:50	15:04	16:21
35°	01:40	02:08	02:37	13:50	15:00	16:13
30°	01:38	02:09	02:43	13:51	14:57	16:06
20°	01:35	02:12	02:52	13:51	14:51	15:53
N 10°	01:32	02:15	02:59	13:51	14:45	15:42
0°	01:29	02:17	03:07	13:52	14:40	15:32
S 10°	01:26	02:19	03:15	13:52	14:35	15:22
20°	01:23	02:22	03:23	13:52	14:30	15:11
30°	01:20	02:25	03:32	13:52	14:24	14:59
35°	01:18	02:27	03:38	13:52	14:21	14:52
40°	01:16	02:28	03:44	13:52	14:17	14:44
45°	01:13	02:31	03:51	13:53	14:12	14:34
S 50°	01:10	02:34	04:00	13:53	14:07	14:23
52°	01:09	02:35	04:04	13:53	14:05	14:18
54°	01:07	02:36	04:09	13:53	14:02	14:13
56°	01:05	02:38	04:14	13:53	13:59	14:06
58°	01:03	02:40	04:20	13:53	13:56	14:00
S 60°	01:01	02:42	04:26	13:53	13:52	13:52

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 34-14%
22	03:22	03:20	11:57	07:40	20:04	
23	03:17	03:14	11:57	08:29	20:54	
24	03:12	03:09	11:57	09:19	21:46	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2195 sec ΔT = TT-UT1 = +68.9645 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	242°50.0	225°13.2	N05°37.8	102°30.8	N17°07.0	156°42.1	N23°12.0	242°00.9	S01°54.8
1	257°52.4	240°13.4	38.5	117°32.0	06.6	171°44.0	12.0	257°03.2	54.7
2	272°54.9	255°13.7	39.2	132°33.2	06.1	186°45.9	12.0	272°05.5	54.6
3	287°57.4	270°14.0	·· 39.9	147°34.3	·· 05.7	201°47.7	·· 12.0	287°07.8	·· 54.6
4	302°59.8	285°14.3	40.6	162°35.5	05.3	216°49.6	12.0	302°10.1	54.5
5	318°02.3	300°14.6	41.3	177°36.7	04.8	231°51.5	12.1	317°12.4	54.4
6	333°04.8	315°14.9	N05°41.9	192°37.9	N17°04.4	246°53.3	N23°12.1	332°14.7	S01°54.4
7	348°07.2	330°15.1	42.6	207°39.1	04.0	261°55.2	12.1	347°17.0	54.3
8	3°09.7	345°15.4	43.3	222°40.3	03.5	276°57.1	12.1	2°19.2	54.2
9	18°12.2	0°15.7	·· 44.0	237°41.5	·· 03.1	291°58.9	·· 12.1	17°21.5	·· 54.2
10	33°14.6	15°16.0	44.7	252°42.6	02.6	307°00.8	12.2	32°23.8	54.1
11	48°17.1	30°16.3	45.4	267°43.8	02.2	322°02.7	12.2	47°26.1	54.0
12	63°19.5	45°16.6	N05°46.1	282°45.0	N17°01.8	337°04.5	N23°12.2	62°28.4	S01°54.0
13	78°22.0	60°16.8	46.8	297°46.2	01.3	352°06.4	12.2	77°30.7	53.9
14	93°24.5	75°17.1	47.5	312°47.4	00.9	7°08.2	12.2	92°33.0	53.8
15	108°26.9	90°17.4	·· 48.2	327°48.6	·· 00.5	22°10.1	·· 12.2	107°35.3	·· 53.8
16	123°29.4	105°17.7	48.9	342°49.7	17°00.0	37°12.0	12.3	122°37.6	53.7
17	138°31.9	120°17.9	49.6	357°50.9	16°59.6	52°13.8	12.3	137°39.8	53.6
18	153°34.3	135°18.2	N05°50.3	12°52.1	N16°59.1	67°15.7	N23°12.3	152°42.1	S01°53.6
19	168°36.8	150°18.5	51.0	27°53.3	58.7	82°17.6	12.3	167°44.4	53.5
20	183°39.3	165°18.7	51.7	42°54.5	58.3	97°19.4	12.3	182°46.7	53.4
21	198°41.7	180°19.0	·· 52.4	57°55.7	·· 57.8	112°21.3	·· 12.4	197°49.0	·· 53.4
22	213°44.2	195°19.3	53.1	72°56.8	57.4	127°23.2	12.4	212°51.3	53.3
23	228°46.7	210°19.6	53.8	87°58.0	56.9	142°25.0	12.4	227°53.6	53.2
Mer.pass.	07:47	ν 0.3′	d 0.7′	m -4.47	ν 1.2′	d -0.4′	m 1.22	ν 1.9′	d 0.0′	m -1.93	ν 2.3′	d 0.1′	m 1.11

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	243°49.1	225°19.8	N05°54.5	102°59.2	N16°56.5	157°26.9	N23°12.4	242°55.9	S01°53.2
1	258°51.6	240°20.1	55.2	118°00.4	56.1	172°28.7	12.4	257°58.2	53.1
2	273°54.0	255°20.4	55.9	133°01.6	55.6	187°30.6	12.5	273°00.4	53.1
3	288°56.5	270°20.6	·· 56.6	148°02.7	·· 55.2	202°32.5	·· 12.5	288°02.7	·· 53.0
4	303°59.0	285°20.9	57.3	163°03.9	54.7	217°34.3	12.5	303°05.0	52.9
5	319°01.4	300°21.2	58.0	178°05.1	54.3	232°36.2	12.5	318°07.3	52.9
6	334°03.9	315°21.4	N05°58.7	193°06.3	N16°53.8	247°38.1	N23°12.5	333°09.6	S01°52.8
7	349°06.4	330°21.7	05°59.4	208°07.5	53.4	262°39.9	12.5	348°11.9	52.7
8	4°08.8	345°22.0	06°00.1	223°08.7	53.0	277°41.8	12.6	3°14.2	52.7
9	19°11.3	0°22.2	·· 00.8	238°09.8	·· 52.5	292°43.7	·· 12.6	18°16.5	·· 52.6
10	34°13.8	15°22.5	01.5	253°11.0	52.1	307°45.5	12.6	33°18.8	52.5
11	49°16.2	30°22.7	02.2	268°12.2	51.6	322°47.4	12.6	48°21.1	52.5
12	64°18.7	45°23.0	N06°02.9	283°13.4	N16°51.2	337°49.2	N23°12.6	63°23.4	S01°52.4
13	79°21.1	60°23.3	03.6	298°14.6	50.7	352°51.1	12.7	78°25.6	52.3
14	94°23.6	75°23.5	04.3	313°15.7	50.3	7°53.0	12.7	93°27.9	52.3
15	109°26.1	90°23.8	·· 05.0	328°16.9	·· 49.9	22°54.8	·· 12.7	108°30.2	·· 52.2
16	124°28.5	105°24.0	05.7	343°18.1	49.4	37°56.7	12.7	123°32.5	52.1
17	139°31.0	120°24.3	06.4	358°19.3	49.0	52°58.6	12.7	138°34.8	52.1
18	154°33.5	135°24.5	N06°07.1	13°20.5	N16°48.5	68°00.4	N23°12.7	153°37.1	S01°52.0
19	169°35.9	150°24.8	07.8	28°21.6	48.1	83°02.3	12.8	168°39.4	52.0
20	184°38.4	165°25.0	08.5	43°22.8	47.6	98°04.1	12.8	183°41.7	51.9
21	199°40.9	180°25.3	·· 09.2	58°24.0	·· 47.2	113°06.0	·· 12.8	198°44.0	·· 51.8
22	214°43.3	195°25.6	09.9	73°25.2	46.8	128°07.9	12.8	213°46.3	51.8
23	229°45.8	210°25.8	10.6	88°26.4	46.3	143°09.7	12.8	228°48.6	51.7
Mer.pass.	07:43	ν 0.3′	d 0.7′	m -4.45	ν 1.2′	d -0.4′	m 1.23	ν 1.9′	d 0.0′	m -1.92	ν 2.3′	d 0.1′	m 1.10

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	244°48.3	225°26.1	N06°11.3	103°27.5	N16°45.9	158°11.6	N23°12.8	243°50.9	S01°51.6
1	259°50.7	240°26.3	12.1	118°28.7	45.4	173°13.4	12.9	258°53.2	51.6
2	274°53.2	255°26.6	12.8	133°29.9	45.0	188°15.3	12.9	273°55.4	51.5
3	289°55.6	270°26.8	·· 13.5	148°31.1	·· 44.5	203°17.2	·· 12.9	288°57.7	·· 51.4
4	304°58.1	285°27.0	14.2	163°32.3	44.1	218°19.0	12.9	304°00.0	51.4
5	320°00.6	300°27.3	14.9	178°33.4	43.6	233°20.9	12.9	319°02.3	51.3
6	335°03.0	315°27.5	N06°15.6	193°34.6	N16°43.2	248°22.8	N23°12.9	334°04.6	S01°51.2
7	350°05.5	330°27.8	16.3	208°35.8	42.7	263°24.6	13.0	349°06.9	51.2
8	5°08.0	345°28.0	17.0	223°37.0	42.3	278°26.5	13.0	4°09.2	51.1
9	20°10.4	0°28.3	·· 17.7	238°38.2	·· 41.9	293°28.3	·· 13.0	19°11.5	·· 51.1
10	35°12.9	15°28.5	18.5	253°39.3	41.4	308°30.2	13.0	34°13.8	51.0
11	50°15.4	30°28.8	19.2	268°40.5	41.0	323°32.1	13.0	49°16.1	50.9
12	65°17.8	45°29.0	N06°19.9	283°41.7	N16°40.5	338°33.9	N23°13.1	64°18.4	S01°50.9
13	80°20.3	60°29.2	20.6	298°42.9	40.1	353°35.8	13.1	79°20.7	50.8
14	95°22.8	75°29.5	21.3	313°44.0	39.6	8°37.6	13.1	94°23.0	50.7
15	110°25.2	90°29.7	·· 22.0	328°45.2	·· 39.2	23°39.5	·· 13.1	109°25.3	·· 50.7
16	125°27.7	105°30.0	22.7	343°46.4	38.7	38°41.4	13.1	124°27.6	50.6
17	140°30.1	120°30.2	23.5	358°47.6	38.3	53°43.2	13.1	139°29.9	50.6
18	155°32.6	135°30.4	N06°24.2	13°48.8	N16°37.8	68°45.1	N23°13.2	154°32.2	S01°50.5
19	170°35.1	150°30.7	24.9	28°49.9	37.4	83°47.0	13.2	169°34.5	50.4
20	185°37.5	165°30.9	25.6	43°51.1	36.9	98°48.8	13.2	184°36.7	50.4
21	200°40.0	180°31.1	·· 26.3	58°52.3	·· 36.5	113°50.7	·· 13.2	199°39.0	·· 50.3
22	215°42.5	195°31.4	27.0	73°53.5	36.0	128°52.5	13.2	214°41.3	50.2
23	230°44.9	210°31.6	27.8	88°54.6	35.6	143°54.4	13.2	229°43.6	50.2
Mer.pass.	07:40	ν 0.2′	d 0.7′	m -4.44	ν 1.2′	d -0.4′	m 1.24	ν 1.9′	d 0.0′	m -1.92	ν 2.3′	d 0.1′	m 1.10

Stars	SHA	Dec
Alpheratz	357°34.6	29°13.6
Ankaa	353°07.1	-42°09.9
Schedar	349°31.1	56°40.3
Diphda	348°47.2	-17°50.8
Achernar	335°20.4	-57°06.3
Hamal	327°51.2	23°34.8
Polaris	314°21.6	89°22.1
Acamar	315°11.9	-40°12.1
Menkar	314°06.2	4°11.3
Mirfak	308°28.3	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.8	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°05.9	-29°00.5
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.0	-59°35.7
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.6	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.5	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.7
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°29.9
Menkent	147°56.9	-36°29.9
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.7	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.5	-69°04.4
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.3
Rasalhague	95°58.0	12°32.4
Eltanin	90°41.5	51°28.9
Kaus Aust.	83°31.8	-34°22.3
Vega	80°32.7	38°48.2
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.0
Peacock	53°05.0	-56°39.0
Deneb	49°25.4	45°22.0
Enif	33°38.5	9°59.4
Al Na'ir	27°32.5	-46°50.1
Fomalhaut	15°14.2	-29°29.1
Scheat	13°45.0	28°13.0
Markab	13°29.7	15°20.4

May 25 Sun	SHA	Mer.pass
Venus	342°23.2	08:59
Mars	219°40.8	17:09
Jupiter	273°52.2	13:32
Saturn	359°11.0	07:51

May 26 Mon	SHA	Mer.pass
Venus	341°30.7	08:59
Mars	219°10.1	17:07
Jupiter	273°37.8	13:29
Saturn	359°06.8	07:47

May 27 Tue	SHA	Mer.pass
Venus	340°37.8	08:58
Mars	218°39.3	17:05
Jupiter	273°23.3	13:26
Saturn	359°02.6	07:43

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.5	N20°57.4	212°13.7	7.8′	N15°50.2	15.2′	60.8′
1	195°46.4	57.8	226°40.5	7.7′	16°05.4	15.1′	60.8′
2	210°46.3	58.3	241°07.1	7.5′	16°20.5	15.1′	60.9′
3	225°46.3	·· 58.7	255°33.7	7.4′	16°35.6	14.9′	60.9′
4	240°46.2	59.2	270°00.1	7.3′	16°50.5	14.8′	60.9′
5	255°46.1	20°59.6	284°26.4	7.2′	17°05.3	14.7′	60.9′
6	270°46.1	N21°00.1	298°52.6	7.1′	N17°20.0	14.6′	60.9′
7	285°46.0	00.5	313°18.7	7.0′	17°34.6	14.6′	60.9′
8	300°45.9	01.0	327°44.7	6.9′	17°49.2	14.4′	60.9′
9	315°45.9	·· 01.4	342°10.6	6.8′	18°03.6	14.3′	60.9′
10	330°45.8	01.8	356°36.4	6.7′	18°17.9	14.1′	60.9′
11	345°45.7	02.3	11°02.0	6.5′	18°32.0	14.1′	60.9′
12	0°45.7	N21°02.7	25°27.6	6.4′	N18°46.1	13.9′	61.0′
13	15°45.6	03.2	39°53.0	6.3′	19°00.0	13.9′	61.0′
14	30°45.5	03.6	54°18.3	6.2′	19°13.9	13.7′	61.0′
15	45°45.5	·· 04.0	68°43.5	6.1′	19°27.6	13.6′	61.0′
16	60°45.4	04.5	83°08.6	6.0′	19°41.2	13.4′	61.0′
17	75°45.3	04.9	97°33.6	5.9′	19°54.6	13.3′	61.0′
18	90°45.3	N21°05.4	111°58.5	5.8′	N20°07.9	13.2′	61.0′
19	105°45.2	05.8	126°23.2	5.6′	20°21.1	13.1′	61.0′
20	120°45.1	06.2	140°47.9	5.5′	20°34.2	12.9′	61.0′
21	135°45.1	·· 06.7	155°12.4	5.4′	20°47.1	12.8′	61.0′
22	150°45.0	07.1	169°36.8	5.3′	20°59.9	12.6′	61.0′
23	165°44.9	07.5	184°01.1	5.2′	21°12.5	12.6′	61.0′
	SD = 15.8′	d = 0.4′		SD = 16.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.9	N21°08.0	198°25.3	5.1′	N21°25.1	12.3′	61.0′
1	195°44.8	08.4	212°49.4	5.0′	21°37.4	12.2′	61.0′
2	210°44.7	08.8	227°13.3	4.9′	21°49.6	12.1′	61.0′
3	225°44.6	·· 09.3	241°37.2	4.7′	22°01.7	11.9′	61.0′
4	240°44.6	09.7	256°00.9	4.6′	22°13.6	11.7′	61.0′
5	255°44.5	10.1	270°24.6	4.5′	22°25.3	11.6′	61.0′
6	270°44.4	N21°10.6	284°48.1	4.4′	N22°36.9	11.5′	61.0′
7	285°44.4	11.0	299°11.5	4.3′	22°48.4	11.3′	61.0′
8	300°44.3	11.4	313°34.9	4.2′	22°59.7	11.1′	61.0′
9	315°44.2	·· 11.8	327°58.1	4.1′	23°10.8	10.9′	61.0′
10	330°44.2	12.3	342°21.2	4.0′	23°21.7	10.8′	61.0′
11	345°44.1	12.7	356°44.2	3.9′	23°32.5	10.7′	61.0′
12	0°44.0	N21°13.1	11°07.1	3.8′	N23°43.2	10.4′	61.0′
13	15°43.9	13.5	25°29.9	3.7′	23°53.6	10.3′	61.0′
14	30°43.9	14.0	39°52.6	3.6′	24°03.9	10.1′	61.0′
15	45°43.8	·· 14.4	54°15.2	3.5′	24°14.0	9.9′	61.0′
16	60°43.7	14.8	68°37.7	3.4′	24°23.9	9.8′	60.9′
17	75°43.7	15.2	83°00.1	3.3′	24°33.7	9.5′	60.9′
18	90°43.6	N21°15.7	97°22.5	3.2′	N24°43.2	9.4′	60.9′
19	105°43.5	16.1	111°44.7	3.1′	24°52.6	9.2′	60.9′
20	120°43.4	16.5	126°06.8	3.1′	25°01.8	9.1′	60.9′
21	135°43.4	·· 16.9	140°28.9	3.0′	25°10.9	8.8′	60.9′
22	150°43.3	17.3	154°50.9	2.9′	25°19.7	8.7′	60.9′
23	165°43.2	17.8	169°12.7	2.8′	25°28.4	8.4′	60.9′
	SD = 15.8′	d = 0.4′		SD = 16.6′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.1	N21°18.2	183°34.6	2.7′	N25°36.8	8.3′	60.9′
1	195°43.1	18.6	197°56.3	2.6′	25°45.1	8.0′	60.9′
2	210°43.0	19.0	212°17.9	2.6′	25°53.1	7.9′	60.8′
3	225°42.9	·· 19.4	226°39.5	2.5′	26°01.0	7.7′	60.8′
4	240°42.8	19.8	241°01.0	2.4′	26°08.7	7.5′	60.8′
5	255°42.8	20.2	255°22.4	2.4′	26°16.2	7.3′	60.8′
6	270°42.7	N21°20.7	269°43.8	2.3′	N26°23.5	7.1′	60.8′
7	285°42.6	21.1	284°05.1	2.2′	26°30.6	6.9′	60.8′
8	300°42.5	21.5	298°26.3	2.2′	26°37.5	6.6′	60.8′
9	315°42.5	·· 21.9	312°47.5	2.1′	26°44.1	6.5′	60.7′
10	330°42.4	22.3	327°08.6	2.1′	26°50.6	6.3′	60.7′
11	345°42.3	22.7	341°29.7	2.0′	26°56.9	6.1′	60.7′
12	0°42.2	N21°23.1	355°50.7	2.0′	N27°03.0	5.8′	60.7′
13	15°42.2	23.5	10°11.7	1.9′	27°08.8	5.7′	60.7′
14	30°42.1	24.0	24°32.6	1.9′	27°14.5	5.4′	60.6′
15	45°42.0	·· 24.4	38°53.5	1.8′	27°19.9	5.3′	60.6′
16	60°41.9	24.8	53°14.3	1.8′	27°25.2	5.0′	60.6′
17	75°41.8	25.2	67°35.1	1.8′	27°30.2	4.8′	60.6′
18	90°41.8	N21°25.6	81°55.9	1.7′	N27°35.0	4.6′	60.6′
19	105°41.7	26.0	96°16.6	1.7′	27°39.6	4.4′	60.5′
20	120°41.6	26.4	110°37.3	1.7′	27°44.0	4.2′	60.5′
21	135°41.5	·· 26.8	124°58.0	1.7′	27°48.2	3.9′	60.5′
22	150°41.5	27.2	139°18.7	1.6′	27°52.1	3.8′	60.5′
23	165°41.4	27.6	153°39.4	1.6′	27°55.9	3.5′	60.5′
	SD = 15.8′	d = 0.4′		SD = 16.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°	–:–	–:–	00:11	–:–	–:–	–:–
66°	–:–	–:–	01:37	22:21	–:–	–:–
64°	–:–	–:–	02:13	21:43	–:–	–:–
62°	–:–	00:57	02:39	21:17	23:03	–:–
60°	–:–	01:44	02:59	20:57	22:13	–:–
N 58°	–:–	02:12	03:15	20:40	21:44	–:–
56°	00:52	02:34	03:29	20:26	21:21	23:08
54°	01:34	02:52	03:41	20:14	21:04	22:22
52°	02:01	03:06	03:52	20:03	20:49	21:55
50°	02:21	03:19	04:01	19:54	20:36	21:34
45°	02:59	03:45	04:20	19:34	20:10	20:56
N 40°	03:25	04:05	04:36	19:18	19:50	20:30
35°	03:45	04:21	04:50	19:05	19:34	20:09
30°	04:02	04:34	05:01	18:53	19:20	19:52
20°	04:28	04:57	05:21	18:34	18:58	19:26
N 10°	04:48	05:15	05:38	18:16	18:39	19:06
0°	05:06	05:31	05:53	18:01	18:23	18:49
S 10°	05:21	05:47	06:09	17:45	18:07	18:33
20°	05:35	06:02	06:26	17:28	17:52	18:19
30°	05:49	06:19	06:45	17:09	17:35	18:05
35°	05:57	06:28	06:56	16:58	17:26	17:57
40°	06:05	06:38	07:08	16:46	17:16	17:49
45°	06:14	06:50	07:23	16:31	17:04	17:40
S 50°	06:23	07:04	07:41	16:13	16:50	17:30
52°	06:28	07:10	07:49	16:04	16:43	17:26
54°	06:32	07:17	07:59	15:55	16:36	17:21
56°	06:38	07:25	08:10	15:44	16:29	17:16
58°	06:43	07:34	08:22	15:32	16:20	17:11
S 60°	06:49	07:43	08:36	15:17	16:10	17:04

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°						
N 70°	00:28					
68°	00:54 23:50			21:16		
66°	01:14	00:42		20:26		
64°	01:30	01:14	00:34	19:55	22:44	
62°	01:44	01:38	01:31	19:32	21:48	·· ··
60°	01:55	01:57	02:05	19:13	21:15	23:09
N 58°	02:05	02:14	02:30	18:58	20:50	22:33
56°	02:14	02:27	02:50	18:45	20:31	22:08
54°	02:22	02:39	03:06	18:34	20:15	21:47
52°	02:29	02:50	03:21	18:24	20:01	21:30
50°	02:35	03:00	03:33	18:15	19:49	21:15
45°	02:49	03:20	04:00	17:57	19:24	20:45
N 40°	03:01	03:36	04:20	17:42	19:04	20:22
35°	03:11	03:50	04:38	17:29	18:47	20:03
30°	03:19	04:02	04:53	17:18	18:33	19:47
20°	03:35	04:23	05:19	16:59	18:09	19:19
N 10°	03:48	04:42	05:41	16:43	17:48	18:55
0°	04:01	04:59	06:02	16:28	17:28	18:33
S 10°	04:14	05:17	06:23	16:13	17:09	18:11
20°	04:27	05:35	06:46	15:57	16:48	17:47
30°	04:43	05:57	07:12	15:38	16:25	17:20
35°	04:52	06:10	07:28	15:28	16:11	17:03
40°	05:03	06:25	07:46	15:15	15:55	16:44
45°	05:16	06:43	08:08	15:01	15:36	16:22
S 50°	05:31	07:05	08:37	14:44	15:12	15:53
52°	05:39	07:16	08:50	14:36	15:01	15:38
54°	05:47	07:28	09:07	14:27	14:48	15:22
56°	05:56	07:42	09:26	14:17	14:33	15:02
58°	06:06	07:59	09:50	14:05	14:16	14:38
S 60°	06:18	08:19	10:21	13:52	13:55	14:06

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 28-0 7-0%
25	03:06	03:03	11:57	10:14	22:43	
26	02:59	02:56	11:57	11:14	23:45	
27	02:53	02:49	11:57	12:17	–:–	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2202 sec ΔT = TT-UT1 = +68.9638 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	245°47.4	225°31.8	N06°28.5	103°55.8	N16°35.1	158°56.3	N23°13.3	244°45.9	S01°50.1
1	260°49.9	240°32.1	29.2	118°57.0	34.7	173°58.1	13.3	259°48.2	50.1
2	275°52.3	255°32.3	29.9	133°58.2	34.2	189°00.0	13.3	274°50.5	50.0
3	290°54.8	270°32.5	·· 30.6	148°59.3	·· 33.8	204°01.8	·· 13.3	289°52.8	·· 49.9
4	305°57.3	285°32.8	31.3	164°00.5	33.3	219°03.7	13.3	304°55.1	49.9
5	320°59.7	300°33.0	32.1	179°01.7	32.9	234°05.6	13.3	319°57.4	49.8
6	336°02.2	315°33.2	N06°32.8	194°02.9	N16°32.4	249°07.4	N23°13.4	334°59.7	S01°49.7
7	351°04.6	330°33.4	33.5	209°04.0	32.0	264°09.3	13.4	350°02.0	49.7
8	6°07.1	345°33.7	34.2	224°05.2	31.5	279°11.1	13.4	5°04.3	49.6
9	21°09.6	0°33.9	·· 35.0	239°06.4	·· 31.1	294°13.0	·· 13.4	20°06.6	·· 49.6
10	36°12.0	15°34.1	35.7	254°07.6	30.6	309°14.9	13.4	35°08.9	49.5
11	51°14.5	30°34.3	36.4	269°08.7	30.2	324°16.7	13.4	50°11.2	49.4
12	66°17.0	45°34.6	N06°37.1	284°09.9	N16°29.7	339°18.6	N23°13.4	65°13.5	S01°49.4
13	81°19.4	60°34.8	37.8	299°11.1	29.3	354°20.4	13.5	80°15.8	49.3
14	96°21.9	75°35.0	38.6	314°12.3	28.8	9°22.3	13.5	95°18.1	49.2
15	111°24.4	90°35.2	·· 39.3	329°13.4	·· 28.4	24°24.2	·· 13.5	110°20.4	·· 49.2
16	126°26.8	105°35.4	40.0	344°14.6	27.9	39°26.0	13.5	125°22.7	49.1
17	141°29.3	120°35.7	40.7	359°15.8	27.5	54°27.9	13.5	140°25.0	49.1
18	156°31.8	135°35.9	N06°41.5	14°17.0	N16°27.0	69°29.7	N23°13.5	155°27.3	S01°49.0
19	171°34.2	150°36.1	42.2	29°18.1	26.6	84°31.6	13.6	170°29.6	48.9
20	186°36.7	165°36.3	42.9	44°19.3	26.1	99°33.5	13.6	185°31.9	48.9
21	201°39.1	180°36.5	·· 43.6	59°20.5	·· 25.7	114°35.3	·· 13.6	200°34.2	·· 48.8
22	216°41.6	195°36.7	44.4	74°21.7	25.2	129°37.2	13.6	215°36.5	48.8
23	231°44.1	210°37.0	45.1	89°22.8	24.8	144°39.0	13.6	230°38.8	48.7
Mer.pass.	07:36	ν 0.2′	d 0.7′	m -4.43	ν 1.2′	d -0.4′	m 1.25	ν 1.9′	d 0.0′ m -1.92	ν 2.3′	d 0.1′ m 1.10

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	246°46.5	225°37.2	N06°45.8	104°24.0	N16°24.3	159°40.9	N23°13.6	245°41.1	S01°48.6
1	261°49.0	240°37.4	46.5	119°25.2	23.8	174°42.8	13.7	260°43.4	48.6
2	276°51.5	255°37.6	47.3	134°26.4	23.4	189°44.6	13.7	275°45.7	48.5
3	291°53.9	270°37.8	·· 48.0	149°27.5	·· 22.9	204°46.5	·· 13.7	290°48.0	·· 48.4
4	306°56.4	285°38.0	48.7	164°28.7	22.5	219°48.3	13.7	305°50.3	48.4
5	321°58.9	300°38.2	49.5	179°29.9	22.0	234°50.2	13.7	320°52.6	48.3
6	337°01.3	315°38.4	N06°50.2	194°31.1	N16°21.6	249°52.0	N23°13.7	335°54.9	S01°48.3
7	352°03.8	330°38.7	50.9	209°32.2	21.1	264°53.9	13.7	350°57.2	48.2
8	7°06.3	345°38.9	51.6	224°33.4	20.7	279°55.8	13.8	5°59.5	48.1
9	22°08.7	0°39.1	·· 52.4	239°34.6	·· 20.2	294°57.6	·· 13.8	21°01.8	·· 48.1
10	37°11.2	15°39.3	53.1	254°35.8	19.8	309°59.5	13.8	36°04.1	48.0
11	52°13.6	30°39.5	53.8	269°36.9	19.3	325°01.3	13.8	51°06.4	48.0
12	67°16.1	45°39.7	N06°54.6	284°38.1	N16°18.8	340°03.2	N23°13.8	66°08.7	S01°47.9
13	82°18.6	60°39.9	55.3	299°39.3	18.4	355°05.1	13.8	81°11.0	47.8
14	97°21.0	75°40.1	56.0	314°40.4	17.9	10°06.9	13.9	96°13.3	47.8
15	112°23.5	90°40.3	·· 56.8	329°41.6	·· 17.5	25°08.8	·· 13.9	111°15.6	·· 47.7
16	127°26.0	105°40.5	57.5	344°42.8	17.0	40°10.6	13.9	126°17.9	47.7
17	142°28.4	120°40.7	58.2	359°44.0	16.6	55°12.5	13.9	141°20.2	47.6
18	157°30.9	135°40.9	N06°59.0	14°45.1	N16°16.1	70°14.3	N23°13.9	156°22.5	S01°47.5
19	172°33.4	150°41.1	06°59.7	29°46.3	15.7	85°16.2	13.9	171°24.8	47.5
20	187°35.8	165°41.3	07°00.4	44°47.5	15.2	100°18.1	13.9	186°27.1	47.4
21	202°38.3	180°41.5	·· 01.2	59°48.6	·· 14.7	115°19.9	·· 14.0	201°29.4	·· 47.4
22	217°40.8	195°41.7	01.9	74°49.8	14.3	130°21.8	14.0	216°31.7	47.3
23	232°43.2	210°41.9	02.6	89°51.0	13.8	145°23.6	14.0	231°34.0	47.2
Mer.pass.	07:32	ν 0.2′	d 0.7′	m -4.42	ν 1.2′	d -0.5′	m 1.26	ν 1.9′	d 0.0′ m -1.92	ν 2.3′	d 0.1′ m 1.09

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	247°45.7	225°42.1	N07°03.4	104°52.2	N16°13.4	160°25.5	N23°14.0	246°36.3	S01°47.2
1	262°48.1	240°42.3	04.1	119°53.3	12.9	175°27.4	14.0	261°38.6	47.1
2	277°50.6	255°42.5	04.8	134°54.5	12.5	190°29.2	14.0	276°40.9	47.1
3	292°53.1	270°42.7	·· 05.6	149°55.7	·· 12.0	205°31.1	·· 14.0	291°43.2	·· 47.0
4	307°55.5	285°42.9	06.3	164°56.8	11.5	220°32.9	14.1	306°45.5	46.9
5	322°58.0	300°43.1	07.0	179°58.0	11.1	235°34.8	14.1	321°47.8	46.9
6	338°00.5	315°43.3	N07°07.8	194°59.2	N16°10.6	250°36.6	N23°14.1	336°50.1	S01°46.8
7	353°02.9	330°43.5	08.5	210°00.4	10.2	265°38.5	14.1	351°52.4	46.8
8	8°05.4	345°43.6	09.3	225°01.5	09.7	280°40.4	14.1	6°54.7	46.7
9	23°07.9	0°43.8	·· 10.0	240°02.7	·· 09.2	295°42.2	·· 14.1	21°57.0	·· 46.6
10	38°10.3	15°44.0	10.7	255°03.9	08.8	310°44.1	14.1	36°59.3	46.6
11	53°12.8	30°44.2	11.5	270°05.0	08.3	325°45.9	14.2	52°01.6	46.5
12	68°15.3	45°44.4	N07°12.2	285°06.2	N16°07.9	340°47.8	N23°14.2	67°03.9	S01°46.5
13	83°17.7	60°44.6	12.9	300°07.4	07.4	355°49.6	14.2	82°06.2	46.4
14	98°20.2	75°44.8	13.7	315°08.5	06.9	10°51.5	14.2	97°08.5	46.3
15	113°22.6	90°45.0	·· 14.4	330°09.7	·· 06.5	25°53.4	·· 14.2	112°10.8	·· 46.3
16	128°25.1	105°45.2	15.2	345°10.9	06.0	40°55.2	14.2	127°13.1	46.2
17	143°27.6	120°45.3	15.9	0°12.1	05.6	55°57.1	14.2	142°15.4	46.2
18	158°30.0	135°45.5	N07°16.6	15°13.2	N16°05.1	70°58.9	N23°14.3	157°17.7	S01°46.1
19	173°32.5	150°45.7	17.4	30°14.4	04.6	86°00.8	14.3	172°20.0	46.1
20	188°35.0	165°45.9	18.1	45°15.6	04.2	101°02.6	14.3	187°22.3	46.0
21	203°37.4	180°46.1	·· 18.9	60°16.7	·· 03.7	116°04.5	·· 14.3	202°24.6	·· 45.9
22	218°39.9	195°46.2	19.6	75°17.9	03.3	131°06.3	14.3	217°27.0	45.9
23	233°42.4	210°46.4	20.4	90°19.1	02.8	146°08.2	14.3	232°29.3	45.8
Mer.pass.	07:28	ν 0.2′	d 0.7′	m -4.41	ν 1.2′	d -0.5′	m 1.27	ν 1.9′	d 0.0′ m -1.92	ν 2.3′	d 0.1′ m 1.09

Stars

	SHA	Dec
Alpheratz	357°34.6	29°13.7
Ankaa	353°07.0	-42°09.9
Schedar	349°31.0	56°40.3
Diphda	348°47.2	-17°50.8
Achernar	335°20.4	-57°06.3
Hamal	327°51.1	23°34.8
Polaris	314°20.5	89°22.1
Acamar	315°11.9	-40°12.1
Menkar	314°06.1	4°11.3
Mirfak	308°28.3	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.9	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°05.9	-29°00.5
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.0	-59°35.7
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.6	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.5	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.4	-63°14.7
Gacrux	171°51.0	-57°15.6
Alioth	166°12.3	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°29.9
Menkent	147°56.9	-36°29.9
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.7	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.5	-69°04.4
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°28.9
Kaus Aust.	83°31.7	-34°22.3
Vega	80°32.6	38°48.2
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.0
Peacock	53°04.9	-56°39.0
Deneb	49°25.4	45°22.0
Enif	33°38.4	9°59.4
Al Na'ir	27°32.5	-46°50.1
Fomalhaut	15°14.2	-29°29.1
Scheat	13°45.0	28°13.0
Markab	13°29.6	15°20.4

May 28 Wed	SHA	Mer.pass
Venus	339°44.4	08:58
Mars	218°08.4	17:03
Jupiter	273°08.9	13:23
Saturn	358°58.5	07:40

May 29 Thu	SHA	Mer.pass
Venus	338°50.6	08:57
Mars	217°37.5	17:01
Jupiter	272°54.4	13:20
Saturn	358°54.5	07:36

May 30 Fri	SHA	Mer.pass
Venus	337°56.4	08:57
Mars	217°06.5	16:59
Jupiter	272°39.8	13:17
Saturn	358°50.6	07:32

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.3	N21°28.0	168°00.0	1.6′	N27°59.4	3.4′	60.4′
1	195°41.2	28.4	182°20.6	1.6′	28°02.8	3.1′	60.4′
2	210°41.1	28.8	196°41.2	1.6′	28°05.9	2.9′	60.4′
3	225°41.1	·· 29.2	211°01.8	1.6′	28°08.8	2.7′	60.4′
4	240°41.0	29.6	225°22.5	1.6′	28°11.5	2.4′	60.3′
5	255°40.9	30.0	239°43.1	1.6′	28°13.9	2.3′	60.3′
6	270°40.8	N21°30.4	254°03.7	1.6′	N28°16.2	2.0′	60.3′
7	285°40.7	30.8	268°24.3	1.6′	28°18.2	1.8′	60.3′
8	300°40.7	31.2	282°45.0	1.7′	28°20.0	1.6′	60.2′
9	315°40.6	·· 31.6	297°05.6	1.7′	28°21.6	1.4′	60.2′
10	330°40.5	32.0	311°26.3	1.7′	28°23.0	1.2′	60.2′
11	345°40.4	32.4	325°47.0	1.7′	28°24.2	1.0′	60.2′
12	0°40.3	N21°32.8	340°07.7	1.8′	N28°25.2	0.7′	60.1′
13	15°40.3	33.2	354°28.5	1.8′	28°25.9	0.6′	60.1′
14	30°40.2	33.6	8°49.3	1.8′	28°26.5	0.3′	60.1′
15	45°40.1	·· 34.0	23°10.1	1.9′	28°26.8	0.1′	60.0′
16	60°40.0	34.4	37°31.0	1.9′	28°26.9	0.1′	60.0′
17	75°39.9	34.7	51°51.9	2.0′	28°26.8	0.3′	60.0′
18	90°39.9	N21°35.1	66°12.9	2.0′	N28°26.5	0.5′	59.9′
19	105°39.8	35.5	80°33.9	2.1′	28°26.0	0.7′	59.9′
20	120°39.7	35.9	94°54.9	2.1′	28°25.3	0.9′	59.9′
21	135°39.6	·· 36.3	109°16.0	2.2′	28°24.4	1.2′	59.9′
22	150°39.5	36.7	123°37.2	2.2′	28°23.2	1.3′	59.8′
23	165°39.4	37.1	137°58.5	2.3′	28°21.9	1.6′	59.8′
	SD = 15.8′	d = 0.4′	SD = 16.5′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.4	N21°37.5	152°19.8	2.4′	N28°20.3	1.7′	59.8′
1	195°39.3	37.9	166°41.1	2.4′	28°18.6	2.0′	59.7′
2	210°39.2	38.2	181°02.6	2.5′	28°16.6	2.1′	59.7′
3	225°39.1	·· 38.6	195°24.1	2.6′	28°14.5	2.4′	59.7′
4	240°39.0	39.0	209°45.7	2.7′	28°12.1	2.5′	59.6′
5	255°38.9	39.4	224°07.3	2.8′	28°09.6	2.8′	59.6′
6	270°38.8	N21°39.8	238°29.1	2.8′	N28°06.8	3.0′	59.6′
7	285°38.8	40.2	252°50.9	2.9′	28°03.8	3.1′	59.5′
8	300°38.7	40.5	267°12.9	3.0′	28°00.7	3.3′	59.5′
9	315°38.6	·· 40.9	281°34.9	3.1′	27°57.4	3.6′	59.5′
10	330°38.5	41.3	295°57.0	3.2′	27°53.8	3.7′	59.4′
11	345°38.4	41.7	310°19.2	3.3′	27°50.1	3.9′	59.4′
12	0°38.3	N21°42.1	324°41.5	3.4′	N27°46.2	4.1′	59.3′
13	15°38.3	42.4	339°03.9	3.5′	27°42.1	4.3′	59.3′
14	30°38.2	42.8	353°26.4	3.6′	27°37.8	4.5′	59.3′
15	45°38.1	·· 43.2	7°49.0	3.7′	27°33.3	4.7′	59.2′
16	60°38.0	43.6	22°11.7	3.8′	27°28.6	4.8′	59.2′
17	75°37.9	43.9	36°34.5	3.9′	27°23.8	5.0′	59.2′
18	90°37.8	N21°44.3	50°57.5	4.0′	N27°18.8	5.2′	59.1′
19	105°37.7	44.7	65°20.5	4.2′	27°13.6	5.4′	59.1′
20	120°37.6	45.1	79°43.7	4.3′	27°08.2	5.6′	59.1′
21	135°37.6	·· 45.4	94°06.9	4.4′	27°02.6	5.7′	59.0′
22	150°37.5	45.8	108°30.3	4.5′	26°56.9	5.9′	59.0′
23	165°37.4	46.2	122°53.8	4.6′	26°51.0	6.0′	58.9′
	SD = 15.8′	d = 0.4′	SD = 16.3′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.3	N21°46.6	137°17.5	4.8′	N26°45.0	6.3′	58.9′
1	195°37.2	46.9	151°41.2	4.9′	26°38.7	6.4′	58.9′
2	210°37.1	47.3	166°05.1	5.0′	26°32.3	6.5′	58.8′
3	225°37.0	·· 47.7	180°29.1	5.1′	26°25.8	6.8′	58.8′
4	240°36.9	48.0	194°53.2	5.3′	26°19.0	6.9′	58.8′
5	255°36.9	48.4	209°17.5	5.4′	26°12.1	7.0′	58.7′
6	270°36.8	N21°48.8	223°41.9	5.5′	N26°05.1	7.2′	58.7′
7	285°36.7	49.1	238°06.4	5.6′	25°57.9	7.4′	58.6′
8	300°36.6	49.5	252°31.0	5.8′	25°50.5	7.5′	58.6′
9	315°36.5	·· 49.9	266°55.8	5.9′	25°43.0	7.6′	58.6′
10	330°36.4	50.2	281°20.7	6.0′	25°35.4	7.8′	58.5′
11	345°36.3	50.6	295°45.8	6.2′	25°27.6	8.0′	58.5′
12	0°36.2	N21°51.0	310°10.9	6.3′	N25°19.6	8.1′	58.5′
13	15°36.1	51.3	324°36.2	6.4′	25°11.5	8.2′	58.4′
14	30°36.0	51.7	339°01.7	6.6′	25°03.3	8.4′	58.4′
15	45°36.0	·· 52.0	353°27.3	6.7′	24°54.9	8.6′	58.3′
16	60°35.9	52.4	7°53.0	6.9′	24°46.3	8.6′	58.3′
17	75°35.8	52.8	22°18.8	7.0′	24°37.7	8.8′	58.3′
18	90°35.7	N21°53.1	36°44.8	7.1′	N24°28.9	8.9′	58.2′
19	105°35.6	53.5	51°10.9	7.3′	24°20.0	9.1′	58.2′
20	120°35.5	53.8	65°37.2	7.4′	24°10.9	9.2′	58.1′
21	135°35.4	·· 54.2	80°03.6	7.5′	24°01.7	9.3′	58.1′
22	150°35.3	54.5	94°30.2	7.7′	23°52.4	9.4′	58.1′
23	165°35.2	54.9	108°56.8	7.8′	23°43.0	9.6′	58.0′
	SD = 15.8′	d = 0.4′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	01:24	22:35	–:–	–:–
64°	–:–	–:–	02:05	21:52	–:–	–:–
62°	–:–	00:37	02:33	21:24	23:26	–:–
60°	–:–	01:34	02:54	21:03	22:23	–:–
N 58°	–:–	02:06	03:11	20:45	21:51	–:–
56°	00:33	02:29	03:25	20:31	21:27	23:29
54°	01:26	02:47	03:38	20:18	21:09	22:31
52°	01:55	03:03	03:48	20:07	20:53	22:01
50°	02:17	03:16	03:58	19:57	20:40	21:39
45°	02:55	03:42	04:18	19:37	20:13	21:00
N 40°	03:23	04:03	04:35	19:21	19:53	20:33
35°	03:44	04:19	04:48	19:07	19:36	20:12
30°	04:01	04:33	05:00	18:55	19:22	19:55
20°	04:27	04:56	05:20	18:35	18:59	19:28
N 10°	04:48	05:15	05:38	18:17	18:40	19:07
0°	05:06	05:32	05:54	18:01	18:23	18:49
S 10°	05:21	05:47	06:10	17:45	18:08	18:34
20°	05:36	06:03	06:27	17:28	17:52	18:19
30°	05:51	06:20	06:46	17:08	17:34	18:04
35°	05:59	06:30	06:57	16:57	17:25	17:56
40°	06:07	06:40	07:10	16:44	17:14	17:48
45°	06:16	06:53	07:26	16:29	17:02	17:39
S 50°	06:26	07:07	07:44	16:10	16:48	17:28
52°	06:31	07:14	07:53	16:01	16:41	17:24
54°	06:36	07:21	08:03	15:52	16:34	17:19
56°	06:41	07:29	08:14	15:40	16:26	17:13
58°	06:47	07:38	08:27	15:28	16:17	17:08
S 60°	06:53	07:48	08:42	15:13	16:07	17:01

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°						
68°						
66°						
64°						
62°	01:13		04:33	00:23		01:32
60°	02:27	03:30	05:12	·· ··	00:24	00:52
N 58°	03:03	04:07	05:40	23:46	·· ··	00:24
56°	03:29	04:34	06:01	23:19	·· ··	00:03
54°	03:50	04:55	06:18	22:58	23:45	·· ··
52°	04:07	05:13	06:33	22:41	23:29	·· ··
50°	04:22	05:28	06:46	22:25	23:16	23:50
45°	04:52	05:58	07:13	21:55	22:49	23:28
N 40°	05:16	06:22	07:34	21:31	22:27	23:10
35°	05:35	06:41	07:51	21:11	22:09	22:55
30°	05:52	06:58	08:06	20:55	21:53	22:42
20°	06:20	07:26	08:31	20:26	21:27	22:19
N 10°	06:45	07:50	08:53	20:02	21:04	21:59
0°	07:07	08:12	09:13	19:39	20:42	21:41
S 10°	07:30	08:35	09:34	19:16	20:21	21:22
20°	07:55	08:59	09:55	18:51	19:57	21:02
30°	08:24	09:27	10:20	18:22	19:30	20:38
35°	08:41	09:44	10:35	18:05	19:14	20:25
40°	09:00	10:03	10:52	17:45	18:55	20:09
45°	09:25	10:26	11:12	17:21	18:32	19:49
S 50°	09:56	10:56	11:37	16:50	18:03	19:25
52°	10:11	11:11	11:49	16:34	17:49	19:13
54°	10:30	11:28	12:03	16:16	17:32	19:00
56°	10:52	11:48	12:19	15:54	17:12	18:44
58°	11:20	12:14	12:38	15:25	16:46	18:26
S 60°	12:02	12:49	13:02	14:43	16:12	18:03

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 1-11%
28	02:45	02:41	11:57	13:23	00:50	
29	02:37	02:33	11:57	14:27	01:56	
30	02:29	02:25	11:58	15:27	02:58	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2209 sec ΔT = TT-UT1 = +68.9631 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	248°44.8	225°46.6	N07°21.1	105°20.2	N16°02.3	161°10.1	N23°14.3	247°31.6	S01°45.8
1	263°47.3	240°46.8	21.8	120°21.4	01.9	176°11.9	14.4	262°33.9	45.7
2	278°49.8	255°47.0	22.6	135°22.6	01.4	191°13.8	14.4	277°36.2	45.6
3	293°52.2	270°47.1	·· 23.3	150°23.7	·· 01.0	206°15.6	·· 14.4	292°38.5	·· 45.6
4	308°54.7	285°47.3	24.1	165°24.9	00.5	221°17.5	14.4	307°40.8	45.5
5	323°57.1	300°47.5	24.8	180°26.1	16°00.0	236°19.3	14.4	322°43.1	45.5
6	338°59.6	315°47.7	N07°25.6	195°27.3	N15°59.6	251°21.2	N23°14.4	337°45.4	S01°45.4
7	354°02.1	330°47.8	26.3	210°28.4	59.1	266°23.1	14.4	352°47.7	45.4
8	9°04.5	345°48.0	27.0	225°29.6	58.6	281°24.9	14.5	7°50.0	45.3
9	24°07.0	0°48.2	·· 27.8	240°30.8	·· 58.2	296°26.8	·· 14.5	22°52.3	·· 45.2
10	39°09.5	15°48.4	28.5	255°31.9	57.7	311°28.6	14.5	37°54.6	45.2
11	54°11.9	30°48.5	29.3	270°33.1	57.3	326°30.5	14.5	52°56.9	45.1
12	69°14.4	45°48.7	N07°30.0	285°34.3	N15°56.8	341°32.3	N23°14.5	67°59.2	S01°45.1
13	84°16.9	60°48.9	30.8	300°35.4	56.3	356°34.2	14.5	83°01.5	45.0
14	99°19.3	75°49.0	31.5	315°36.6	55.9	11°36.0	14.5	98°03.8	45.0
15	114°21.8	90°49.2	·· 32.3	330°37.8	·· 55.4	26°37.9	·· 14.5	113°06.2	·· 44.9
16	129°24.2	105°49.4	33.0	345°38.9	54.9	41°39.8	14.6	128°08.5	44.8
17	144°26.7	120°49.6	33.8	0°40.1	54.5	56°41.6	14.6	143°10.8	44.8
18	159°29.2	135°49.7	N07°34.5	15°41.3	N15°54.0	71°43.5	N23°14.6	158°13.1	S01°44.7
19	174°31.6	150°49.9	35.3	30°42.4	53.5	86°45.3	14.6	173°15.4	44.7
20	189°34.1	165°50.1	36.0	45°43.6	53.1	101°47.2	14.6	188°17.7	44.6
21	204°36.6	180°50.2	·· 36.8	60°44.8	·· 52.6	116°49.0	·· 14.6	203°20.0	·· 44.6
22	219°39.0	195°50.4	37.5	75°45.9	52.1	131°50.9	14.6	218°22.3	44.5
23	234°41.5	210°50.5	38.2	90°47.1	51.7	146°52.7	14.7	233°24.6	44.4
Mer.pass.	07:24	ν 0.2′	d 0.7′	m -4.40	ν 1.2′	d -0.5′	m 1.28	ν 1.9′	d 0.0′ m -1.92	ν 2.3′	d 0.1′ m 1.09

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	249°44.0	225°50.7	N07°39.0	105°48.3	N15°51.2	161°54.6	N23°14.7	248°26.9	S01°44.4
1	264°46.4	240°50.9	39.7	120°49.4	50.7	176°56.5	14.7	263°29.2	44.3
2	279°48.9	255°51.0	40.5	135°50.6	50.3	191°58.3	14.7	278°31.5	44.3
3	294°51.4	270°51.2	·· 41.2	150°51.8	·· 49.8	207°00.2	·· 14.7	293°33.8	·· 44.2
4	309°53.8	285°51.3	42.0	165°52.9	49.3	222°02.0	14.7	308°36.2	44.2
5	324°56.3	300°51.5	42.7	180°54.1	48.9	237°03.9	14.7	323°38.5	44.1
6	339°58.7	315°51.7	N07°43.5	195°55.3	N15°48.4	252°05.7	N23°14.7	338°40.8	S01°44.0
7	355°01.2	330°51.8	44.2	210°56.4	47.9	267°07.6	14.8	353°43.1	44.0
8	10°03.7	345°52.0	45.0	225°57.6	47.5	282°09.4	14.8	8°45.4	43.9
9	25°06.1	0°52.1	·· 45.7	240°58.8	·· 47.0	297°11.3	·· 14.8	23°47.7	·· 43.9
10	40°08.6	15°52.3	46.5	255°59.9	46.5	312°13.2	14.8	38°50.0	43.8
11	55°11.1	30°52.4	47.3	271°01.1	46.1	327°15.0	14.8	53°52.3	43.8
12	70°13.5	45°52.6	N07°48.0	286°02.3	N15°45.6	342°16.9	N23°14.8	68°54.6	S01°43.7
13	85°16.0	60°52.8	48.8	301°03.4	45.1	357°18.7	14.8	83°56.9	43.6
14	100°18.5	75°52.9	49.5	316°04.6	44.7	12°20.6	14.8	98°59.2	43.6
15	115°20.9	90°53.1	·· 50.3	331°05.8	·· 44.2	27°22.4	·· 14.9	114°01.6	·· 43.5
16	130°23.4	105°53.2	51.0	346°06.9	43.7	42°24.3	14.9	129°03.9	43.5
17	145°25.9	120°53.4	51.8	1°08.1	43.3	57°26.1	14.9	144°06.2	43.4
18	160°28.3	135°53.5	N07°52.5	16°09.2	N15°42.8	72°28.0	N23°14.9	159°08.5	S01°43.4
19	175°30.8	150°53.7	53.3	31°10.4	42.3	87°29.8	14.9	174°10.8	43.3
20	190°33.2	165°53.8	54.0	46°11.6	41.9	102°31.7	14.9	189°13.1	43.3
21	205°35.7	180°54.0	·· 54.8	61°12.7	·· 41.4	117°33.6	·· 14.9	204°15.4	·· 43.2
22	220°38.2	195°54.1	55.5	76°13.9	40.9	132°35.4	14.9	219°17.7	43.1
23	235°40.6	210°54.3	56.3	91°15.1	40.5	147°37.3	15.0	234°20.0	43.1
Mer.pass.	07:20	ν 0.2′	d 0.7′	m -4.39	ν 1.2′	d -0.5′	m 1.29	ν 1.9′	d 0.0′ m -1.91	ν 2.3′	d 0.1′ m 1.08

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	250°43.1	225°54.4	N07°57.1	106°16.2	N15°40.0	162°39.1	N23°15.0	249°22.4	S01°43.0
1	265°45.6	240°54.5	57.8	121°17.4	39.5	177°41.0	15.0	264°24.7	43.0
2	280°48.0	255°54.7	58.6	136°18.6	39.0	192°42.8	15.0	279°27.0	42.9
3	295°50.5	270°54.8	07°59.3	151°19.7	·· 38.6	207°44.7	·· 15.0	294°29.3	·· 42.9
4	310°53.0	285°55.0	08°00.1	166°20.9	38.1	222°46.5	15.0	309°31.6	42.8
5	325°55.4	300°55.1	00.8	181°22.1	37.6	237°48.4	15.0	324°33.9	42.8
6	340°57.9	315°55.3	N08°01.6	196°23.2	N15°37.2	252°50.2	N23°15.0	339°36.2	S01°42.7
7	356°00.3	330°55.4	02.3	211°24.4	36.7	267°52.1	15.0	354°38.5	42.6
8	11°02.8	345°55.5	03.1	226°25.5	36.2	282°53.9	15.1	9°40.8	42.6
9	26°05.3	0°55.7	·· 03.9	241°26.7	·· 35.8	297°55.8	·· 15.1	24°43.2	·· 42.5
10	41°07.7	15°55.8	04.6	256°27.9	35.3	312°57.7	15.1	39°45.5	42.5
11	56°10.2	30°56.0	05.4	271°29.0	34.8	327°59.5	15.1	54°47.8	42.4
12	71°12.7	45°56.1	N08°06.1	286°30.2	N15°34.3	343°01.4	N23°15.1	69°50.1	S01°42.4
13	86°15.1	60°56.2	06.9	301°31.4	33.9	358°03.2	15.1	84°52.4	42.3
14	101°17.6	75°56.4	07.6	316°32.5	33.4	13°05.1	15.1	99°54.7	42.3
15	116°20.1	90°56.5	·· 08.4	331°33.7	·· 32.9	28°06.9	·· 15.1	114°57.0	·· 42.2
16	131°22.5	105°56.6	09.2	346°34.9	32.5	43°08.8	15.1	129°59.4	42.2
17	146°25.0	120°56.8	09.9	1°36.0	32.0	58°10.6	15.2	145°01.7	42.1
18	161°27.5	135°56.9	N08°10.7	16°37.2	N15°31.5	73°12.5	N23°15.2	160°04.0	S01°42.0
19	176°29.9	150°57.0	11.4	31°38.3	31.0	88°14.3	15.2	175°06.3	42.0
20	191°32.4	165°57.2	12.2	46°39.5	30.6	103°16.2	15.2	190°08.6	41.9
21	206°34.8	180°57.3	·· 13.0	61°40.7	·· 30.1	118°18.0	·· 15.2	205°10.9	·· 41.9
22	221°37.3	195°57.4	13.7	76°41.8	29.6	133°19.9	15.2	220°13.2	41.8
23	236°39.8	210°57.6	14.5	91°43.0	29.1	148°21.8	15.2	235°15.5	41.8
Mer.pass.	07:16	ν 0.1′	d 0.8′	m -4.38	ν 1.2′	d -0.5′	m 1.29	ν 1.9′	d 0.0′ m -1.91	ν 2.3′	d 0.1′ m 1.08

Stars

	SHA	Dec
Alpheratz	357°34.6	29°13.7
Ankaa	353°07.0	-42°09.9
Schedar	349°31.0	56°40.3
Diphda	348°47.1	-17°50.8
Achernar	335°20.3	-57°06.3
Hamal	327°51.1	23°34.8
Polaris	314°19.7	89°22.1
Acamar	315°11.9	-40°12.1
Menkar	314°06.1	4°11.3
Mirfak	308°28.3	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.4
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°05.9	-29°00.5
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.0	-59°35.7
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.6	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.5	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.5	-63°14.7
Gacrux	171°51.0	-57°15.6
Alioth	166°12.4	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°29.9
Menkent	147°56.9	-36°29.9
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.7	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.4	-69°04.4
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°29.0
Kaus Aust.	83°31.7	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.0
Peacock	53°04.9	-56°39.0
Deneb	49°25.3	45°22.0
Enif	33°38.4	9°59.4
Al Na'ir	27°32.4	-46°50.1
Fomalhaut	15°14.2	-29°29.1
Scheat	13°44.9	28°13.0
Markab	13°29.6	15°20.4

May 31 Sat	SHA	Mer.pass
Venus	337°01.8	08:57
Mars	216°35.4	16:57
Jupiter	272°25.2	13:14
Saturn	358°46.7	07:29

Jun 01 Sun	SHA	Mer.pass
Venus	336°06.7	08:57
Mars	216°04.3	16:55
Jupiter	272°10.6	13:11
Saturn	358°43.0	07:25

Jun 02 Mon	SHA	Mer.pass
Venus	335°11.3	08:56
Mars	215°33.1	16:54
Jupiter	271°56.0	13:08
Saturn	358°39.3	07:21

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.1	N21°55.3	123°23.6	8.0′	N23°33.4	9.7′	58.0′
1	195°35.0	55.6	137°50.6	8.1′	23°23.7	9.8′	57.9′
2	210°34.9	56.0	152°17.7	8.2′	23°13.9	9.9′	57.9′
3	225°34.9	·· 56.3	166°44.9	8.4′	23°04.0	10.1′	57.9′
4	240°34.8	56.7	181°12.3	8.5′	22°53.9	10.1′	57.8′
5	255°34.7	57.0	195°39.8	8.6′	22°43.8	10.3′	57.8′
6	270°34.6	N21°57.4	210°07.4	8.8′	N22°33.5	10.4′	57.7′
7	285°34.5	57.7	224°35.2	8.9′	22°23.1	10.4′	57.7′
8	300°34.4	58.1	239°03.1	9.0′	22°12.7	10.6′	57.7′
9	315°34.3	·· 58.4	253°31.1	9.2′	22°02.1	10.7′	57.6′
10	330°34.2	58.8	267°59.3	9.3′	21°51.4	10.8′	57.6′
11	345°34.1	59.1	282°27.6	9.4′	21°40.6	10.9′	57.6′
12	0°34.0	N21°59.5	296°56.1	9.6′	N21°29.7	11.0′	57.5′
13	15°33.9	21°59.8	311°24.7	9.7′	21°18.7	11.1′	57.5′
14	30°33.8	22°00.2	325°53.4	9.8′	21°07.6	11.2′	57.4′
15	45°33.7	·· 00.5	340°22.2	10.0′	20°56.4	11.3′	57.4′
16	60°33.6	00.8	354°51.2	10.1′	20°45.1	11.4′	57.4′
17	75°33.5	01.2	9°20.3	10.2′	20°33.7	11.4′	57.3′
18	90°33.4	N22°01.5	23°49.5	10.4′	N20°22.3	11.6′	57.3′
19	105°33.4	01.9	38°18.9	10.5′	20°10.7	11.6′	57.2′
20	120°33.3	02.2	52°48.4	10.6′	19°59.1	11.7′	57.2′
21	135°33.2	·· 02.6	67°18.0	10.7′	19°47.4	11.9′	57.2′
22	150°33.1	02.9	81°47.8	10.9′	19°35.5	11.8′	57.1′
23	165°33.0	03.2	96°17.6	11.0′	19°23.7	12.0′	57.1′
	SD = 15.8′	d = 0.4′		SD = 15.8′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.9	N22°03.6	110°47.6	11.1′	N19°11.7	12.1′	57.1′
1	195°32.8	03.9	125°17.8	11.2′	18°59.6	12.1′	57.0′
2	210°32.7	04.3	139°48.0	11.4′	18°47.5	12.2′	57.0′
3	225°32.6	·· 04.6	154°18.4	11.5′	18°35.3	12.3′	56.9′
4	240°32.5	04.9	168°48.9	11.6′	18°23.0	12.3′	56.9′
5	255°32.4	05.3	183°19.5	11.7′	18°10.7	12.4′	56.9′
6	270°32.3	N22°05.6	197°50.2	11.8′	N17°58.3	12.5′	56.8′
7	285°32.2	05.9	212°21.0	12.0′	17°45.8	12.6′	56.8′
8	300°32.1	06.3	226°52.0	12.1′	17°33.2	12.6′	56.8′
9	315°32.0	·· 06.6	241°23.0	12.2′	17°20.6	12.7′	56.7′
10	330°31.9	06.9	255°54.2	12.3′	17°07.9	12.7′	56.7′
11	345°31.8	07.3	270°25.5	12.4′	16°55.2	12.8′	56.6′
12	0°31.7	N22°07.6	284°56.9	12.5′	N16°42.4	12.9′	56.6′
13	15°31.6	07.9	299°28.5	12.6′	16°29.5	12.9′	56.6′
14	30°31.5	08.3	314°00.1	12.7′	16°16.6	13.0′	56.5′
15	45°31.4	·· 08.6	328°31.8	12.8′	16°03.6	13.1′	56.5′
16	60°31.3	08.9	343°03.7	12.9′	15°50.5	13.1′	56.5′
17	75°31.2	09.2	357°35.6	13.1′	15°37.4	13.1′	56.4′
18	90°31.1	N22°09.6	12°07.7	13.2′	N15°24.3	13.2′	56.4′
19	105°31.0	09.9	26°39.8	13.3′	15°11.1	13.3′	56.4′
20	120°30.9	10.2	41°12.1	13.4′	14°57.8	13.3′	56.3′
21	135°30.8	·· 10.5	55°44.4	13.5′	14°44.5	13.3′	56.3′
22	150°30.7	10.9	70°16.9	13.6′	14°31.2	13.4′	56.3′
23	165°30.6	11.2	84°49.4	13.7′	14°17.8	13.5′	56.2′
	SD = 15.8′	d = 0.3′		SD = 15.6′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.5	N22°11.5	99°22.1	13.7′	N14°04.3	13.5′	56.2′
1	195°30.4	11.8	113°54.8	13.8′	13°50.8	13.5′	56.2′
2	210°30.3	12.2	128°27.7	13.9′	13°37.3	13.6′	56.1′
3	225°30.2	·· 12.5	143°00.6	14.0′	13°23.7	13.6′	56.1′
4	240°30.1	12.8	157°33.6	14.1′	13°10.1	13.6′	56.1′
5	255°30.0	13.1	172°06.8	14.2′	12°56.5	13.7′	56.0′
6	270°29.9	N22°13.4	186°40.0	14.3′	N12°42.8	13.7′	56.0′
7	285°29.8	13.8	201°13.2	14.4′	12°29.1	13.8′	56.0′
8	300°29.7	14.1	215°46.6	14.5′	12°15.3	13.8′	55.9′
9	315°29.6	·· 14.4	230°20.1	14.5′	12°01.5	13.8′	55.9′
10	330°29.5	14.7	244°53.6	14.6′	11°47.7	13.9′	55.9′
11	345°29.4	15.0	259°27.2	14.7′	11°33.8	13.9′	55.8′
12	0°29.3	N22°15.3	274°01.0	14.8′	N11°19.9	13.9′	55.8′
13	15°29.2	15.7	288°34.7	14.9′	11°06.0	14.0′	55.8′
14	30°29.1	16.0	303°08.6	14.9′	10°52.0	14.0′	55.7′
15	45°29.0	·· 16.3	317°42.5	15.0′	10°38.0	14.0′	55.7′
16	60°28.9	16.6	332°16.5	15.1′	10°24.0	14.0′	55.7′
17	75°28.8	16.9	346°50.6	15.2′	10°10.0	14.1′	55.7′
18	90°28.7	N22°17.2	1°24.8	15.2′	N09°55.9	14.1′	55.6′
19	105°28.6	17.5	15°59.0	15.3′	09°41.8	14.1′	55.6′
20	120°28.5	17.8	30°33.3	15.4′	09°27.7	14.1′	55.6′
21	135°28.4	·· 18.1	45°07.7	15.4′	09°13.6	14.2′	55.5′
22	150°28.3	18.5	59°42.1	15.5′	08°59.4	14.2′	55.5′
23	165°28.2	18.8	74°16.6	15.6′	08°45.2	14.2′	55.5′
	SD = 15.8′	d = 0.3′		SD = 15.3′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	–:–	–:–	01:11	22:49	–:–	–:–
64°	–:–	–:–	01:57	22:01	–:–	–:–
62°	–:–	–:–	02:27	21:30	–:–	–:–
60°	–:–	01:26	02:49	21:08	22:33	–:–
N 58°	–:–	02:00	03:07	20:50	21:58	–:–
56°	–:–	02:24	03:22	20:35	21:33	–:–
54°	01:18	02:43	03:35	20:22	21:13	22:40
52°	01:50	02:59	03:46	20:11	20:57	22:08
50°	02:13	03:13	03:56	20:01	20:44	21:44
45°	02:53	03:40	04:17	19:40	20:16	21:04
N 40°	03:21	04:01	04:33	19:23	19:55	20:36
35°	03:42	04:18	04:47	19:09	19:38	20:14
30°	04:00	04:32	04:59	18:57	19:24	19:56
20°	04:27	04:56	05:20	18:36	19:00	19:29
N 10°	04:48	05:15	05:38	18:18	18:41	19:08
0°	05:06	05:32	05:54	18:02	18:24	18:50
S 10°	05:22	05:48	06:11	17:45	18:08	18:34
20°	05:37	06:04	06:28	17:28	17:51	18:19
30°	05:52	06:22	06:48	17:08	17:34	18:03
35°	06:00	06:32	06:59	16:56	17:24	17:55
40°	06:09	06:42	07:13	16:43	17:13	17:47
45°	06:18	06:55	07:28	16:27	17:01	17:37
S 50°	06:29	07:10	07:47	16:08	16:46	17:27
52°	06:34	07:17	07:56	15:59	16:39	17:22
54°	06:39	07:24	08:07	15:49	16:31	17:17
56°	06:44	07:32	08:18	15:37	16:23	17:11
58°	06:50	07:42	08:31	15:24	16:14	17:05
S 60°	06:57	07:52	08:47	15:09	16:03	16:59

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▭	▭	08:56	▭	▭	02:35
N 70°	▭	06:45	09:19	▭	03:08	02:11
68°	▭	07:25	09:35	▭	02:27	01:52
66°	05:23	07:53	09:49	02:41	01:58	01:37
64°	06:09	08:13	10:00	01:55	01:36	01:24
62°	06:39	08:30	10:10	01:24	01:19	01:14
60°	07:01	08:44	10:18	01:01	01:04	01:04
N 58°	07:19	08:55	10:25	00:42	00:51	00:56
56°	07:35	09:05	10:31	00:26	00:40	00:49
54°	07:47	09:14	10:36	00:13	00:31	00:43
52°	07:59	09:22	10:41	00:01	00:22	00:37
50°	08:09	09:29	10:46	·· ··	00:14	00:32
45°	08:30	09:45	10:55	23:57	·· ··	00:20
N 40°	08:47	09:57	11:03	23:44	·· ··	00:11
35°	09:01	10:07	11:10	23:32	·· ··	00:02
30°	09:13	10:17	11:16	23:22	23:55	·· ··
20°	09:34	10:32	11:27	23:04	23:43	·· ··
N 10°	09:52	10:46	11:36	22:48	23:31	·· ··
0°	10:09	10:59	11:44	22:33	23:21	·· ··
S 10°	10:26	11:11	11:52	22:19	23:10	23:58
20°	10:44	11:25	12:01	22:03	22:59	23:51
30°	11:04	11:40	12:11	21:44	22:46	23:44
35°	11:16	11:49	12:17	21:33	22:38	23:39
40°	11:30	11:59	12:24	21:21	22:29	23:34
45°	11:46	12:11	12:31	21:06	22:19	23:28
S 50°	12:05	12:25	12:40	20:48	22:07	23:21
52°	12:15	12:32	12:44	20:39	22:01	23:18
54°	12:25	12:39	12:49	20:29	21:54	23:14
56°	12:37	12:47	12:54	20:18	21:47	23:10
58°	12:50	12:56	13:00	20:06	21:39	23:05
S 60°	13:06	13:07	13:06	19:51	21:29	23:00

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 19-38%
31	02:21	02:16	11:58	16:21	03:55	
01	02:11	02:07	11:58	17:10	04:46	
02	02:02	01:57	11:58	17:54	05:33	

No IERS EOP prediction data available

June 03, 04, 05 UT (Tue., Wed., Thu.)

DUT1 = UT1-UTC = +0.2216 sec ΔT = TT-UT1 = +68.9624 sec

2025 June 03 to Jun. 05 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	251°42.2	225°57.7	N08°15.2	106°44.1	N15°28.7	163°23.6	N23°15.2	250°17.9	S01°41.7
1	266°44.7	240°57.8	16.0	121°45.3	28.2	178°25.5	15.2	265°20.2	41.7
2	281°47.2	255°58.0	16.8	136°46.5	27.7	193°27.3	15.3	280°22.5	41.6
3	296°49.6	270°58.1	·· 17.5	151°47.6	·· 27.2	208°29.2	·· 15.3	295°24.8	·· 41.6
4	311°52.1	285°58.2	18.3	166°48.8	26.8	223°31.0	15.3	310°27.1	41.5
5	326°54.6	300°58.3	19.1	181°50.0	26.3	238°32.9	15.3	325°29.4	41.5
6	341°57.0	315°58.5	N08°19.8	196°51.1	N15°25.8	253°34.7	N23°15.3	340°31.7	S01°41.4
7	356°59.5	330°58.6	20.6	211°52.3	25.3	268°36.6	15.3	355°34.1	41.3
8	12°02.0	345°58.7	21.3	226°53.4	24.9	283°38.4	15.3	10°36.4	41.3
9	27°04.4	0°58.8	·· 22.1	241°54.6	·· 24.4	298°40.3	·· 15.3	25°38.7	·· 41.2
10	42°06.9	15°59.0	22.9	256°55.8	23.9	313°42.1	15.3	40°41.0	41.2
11	57°09.3	30°59.1	23.6	271°56.9	23.4	328°44.0	15.4	55°43.3	41.1
12	72°11.8	45°59.2	N08°24.4	286°58.1	N15°23.0	343°45.8	N23°15.4	70°45.6	S01°41.1
13	87°14.3	60°59.3	25.2	301°59.2	22.5	358°47.7	15.4	85°48.0	41.0
14	102°16.7	75°59.4	25.9	317°00.4	22.0	13°49.5	15.4	100°50.3	41.0
15	117°19.2	90°59.6	·· 26.7	332°01.6	·· 21.5	28°51.4	·· 15.4	115°52.6	·· 40.9
16	132°21.7	105°59.7	27.4	347°02.7	21.1	43°53.2	15.4	130°54.9	40.9
17	147°24.1	120°59.8	28.2	2°03.9	20.6	58°55.1	15.4	145°57.2	40.8
18	162°26.6	135°59.9	N08°29.0	17°05.1	N15°20.1	73°57.0	N23°15.4	160°59.5	S01°40.8
19	177°29.1	151°00.0	29.7	32°06.2	19.6	88°58.8	15.4	176°01.9	40.7
20	192°31.5	166°00.2	30.5	47°07.4	19.2	104°00.7	15.4	191°04.2	40.7
21	207°34.0	181°00.3	·· 31.3	62°08.5	·· 18.7	119°02.5	·· 15.5	206°06.5	·· 40.6
22	222°36.4	196°00.4	32.0	77°09.7	18.2	134°04.4	15.5	221°08.8	40.5
23	237°38.9	211°00.5	32.8	92°10.9	17.7	149°06.2	15.5	236°11.1	40.5
Mer.pass.	07:12	ν 0.1′	d 0.8′	m -4.37	ν 1.2′	d -0.5′	m 1.30	ν 1.9′	d 0.0′ m -1.91	ν 2.3′	d 0.1′ m 1.08

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	252°41.4	226°00.6	N08°33.6	107°12.0	N15°17.3	164°08.1	N23°15.5	251°13.4	S01°40.4
1	267°43.8	241°00.7	34.3	122°13.2	16.8	179°09.9	15.5	266°15.8	40.4
2	282°46.3	256°00.8	35.1	137°14.3	16.3	194°11.8	15.5	281°18.1	40.3
3	297°48.8	271°00.9	·· 35.9	152°15.5	·· 15.8	209°13.6	·· 15.5	296°20.4	·· 40.3
4	312°51.2	286°01.1	36.6	167°16.7	15.3	224°15.5	15.5	311°22.7	40.2
5	327°53.7	301°01.2	37.4	182°17.8	14.9	239°17.3	15.5	326°25.0	40.2
6	342°56.2	316°01.3	N08°38.2	197°19.0	N15°14.4	254°19.2	N23°15.5	341°27.4	S01°40.1
7	357°58.6	331°01.4	38.9	212°20.1	13.9	269°21.0	15.6	356°29.7	40.1
8	13°01.1	346°01.5	39.7	227°21.3	13.4	284°22.9	15.6	11°32.0	40.0
9	28°03.6	1°01.6	·· 40.5	242°22.4	·· 12.9	299°24.7	·· 15.6	26°34.3	·· 40.0
10	43°06.0	16°01.7	41.2	257°23.6	12.5	314°26.6	15.6	41°36.6	39.9
11	58°08.5	31°01.8	42.0	272°24.8	12.0	329°28.4	15.6	56°38.9	39.9
12	73°10.9	46°01.9	N08°42.8	287°25.9	N15°11.5	344°30.3	N23°15.6	71°41.3	S01°39.8
13	88°13.4	61°02.0	43.5	302°27.1	11.0	359°32.1	15.6	86°43.6	39.8
14	103°15.9	76°02.1	44.3	317°28.2	10.5	14°34.0	15.6	101°45.9	39.7
15	118°18.3	91°02.2	·· 45.1	332°29.4	·· 10.1	29°35.8	·· 15.6	116°48.2	·· 39.7
16	133°20.8	106°02.3	45.8	347°30.6	09.6	44°37.7	15.6	131°50.5	39.6
17	148°23.3	121°02.4	46.6	2°31.7	09.1	59°39.5	15.6	146°52.9	39.6
18	163°25.7	136°02.5	N08°47.4	17°32.9	N15°08.6	74°41.4	N23°15.7	161°55.2	S01°39.5
19	178°28.2	151°02.6	48.1	32°34.0	08.1	89°43.2	15.7	176°57.5	39.5
20	193°30.7	166°02.7	48.9	47°35.2	07.7	104°45.1	15.7	191°59.8	39.4
21	208°33.1	181°02.8	·· 49.7	62°36.4	·· 07.2	119°46.9	·· 15.7	207°02.1	·· 39.4
22	223°35.6	196°02.9	50.5	77°37.5	06.7	134°48.8	15.7	222°04.5	39.3
23	238°38.1	211°03.0	51.2	92°38.7	06.2	149°50.7	15.7	237°06.8	39.3
Mer.pass.	07:08	ν 0.1′	d 0.8′	m -4.36	ν 1.2′	d -0.5′	m 1.31	ν 1.9′	d 0.0′ m -1.91	ν 2.3′	d 0.1′ m 1.07

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	253°40.5	226°03.1	N08°52.0	107°39.8	N15°05.7	164°52.5	N23°15.7	252°09.1	S01°39.2
1	268°43.0	241°03.2	52.8	122°41.0	05.3	179°54.4	15.7	267°11.4	39.2
2	283°45.4	256°03.3	53.5	137°42.1	04.8	194°56.2	15.7	282°13.7	39.1
3	298°47.9	271°03.4	·· 54.3	152°43.3	·· 04.3	209°58.1	·· 15.7	297°16.1	·· 39.0
4	313°50.4	286°03.5	55.1	167°44.5	03.8	224°59.9	15.7	312°18.4	39.0
5	328°52.8	301°03.6	55.8	182°45.6	03.3	240°01.8	15.8	327°20.7	38.9
6	343°55.3	316°03.7	N08°56.6	197°46.8	N15°02.8	255°03.6	N23°15.8	342°23.0	S01°38.9
7	358°57.8	331°03.8	57.4	212°47.9	02.4	270°05.5	15.8	357°25.4	38.8
8	14°00.2	346°03.9	58.2	227°49.1	01.9	285°07.3	15.8	12°27.7	38.8
9	29°02.7	1°04.0	·· 58.9	242°50.2	·· 01.4	300°09.2	·· 15.8	27°30.0	·· 38.7
10	44°05.2	16°04.1	08°59.7	257°51.4	00.9	315°11.0	15.8	42°32.3	38.7
11	59°07.6	31°04.2	09°00.5	272°52.6	15°00.4	330°12.9	15.8	57°34.6	38.6
12	74°10.1	46°04.2	N09°01.2	287°53.7	N14°59.9	345°14.7	N23°15.8	72°37.0	S01°38.6
13	89°12.5	61°04.3	02.0	302°54.9	59.5	0°16.6	15.8	87°39.3	38.5
14	104°15.0	76°04.4	02.8	317°56.0	59.0	15°18.4	15.8	102°41.6	38.5
15	119°17.5	91°04.5	·· 03.6	332°57.2	·· 58.5	30°20.3	·· 15.8	117°43.9	·· 38.4
16	134°19.9	106°04.6	04.3	347°58.3	58.0	45°22.1	15.9	132°46.3	38.4
17	149°22.4	121°04.7	05.1	2°59.5	57.5	60°24.0	15.9	147°48.6	38.3
18	164°24.9	136°04.8	N09°05.9	18°00.7	N14°57.0	75°25.8	N23°15.9	162°50.9	S01°38.3
19	179°27.3	151°04.8	06.6	33°01.8	56.6	90°27.7	15.9	177°53.2	38.2
20	194°29.8	166°04.9	07.4	48°03.0	56.1	105°29.5	15.9	192°55.5	38.2
21	209°32.3	181°05.0	·· 08.2	63°04.1	·· 55.6	120°31.4	·· 15.9	207°57.9	·· 38.1
22	224°34.7	196°05.1	09.0	78°05.3	55.1	135°33.2	15.9	223°00.2	38.1
23	239°37.2	211°05.2	09.7	93°06.4	54.6	150°35.1	15.9	238°02.5	38.0
Mer.pass.	07:04	ν 0.1′	d 0.8′	m -4.35	ν 1.2′	d -0.5′	m 1.32	ν 1.9′	d 0.0′ m -1.91	ν 2.3′	d 0.1′ m 1.07

Stars

	SHA	Dec
Alpheratz	357°34.6	29°13.7
Ankaa	353°07.0	-42°09.9
Schedar	349°31.0	56°40.3
Diphda	348°47.1	-17°50.8
Achernar	335°20.3	-57°06.2
Hamal	327°51.1	23°34.8
Polaris	314°19.0	89°22.1
Acamar	315°11.9	-40°12.0
Menkar	314°06.1	4°11.3
Mirfak	308°28.3	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.3
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.2
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°06.0	-29°00.5
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.0	-59°35.6
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.7	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.6	61°37.1
Denebola	182°24.5	14°25.8
Gienah	175°43.1	-17°41.1
Acrux	172°59.5	-63°14.7
Gacrux	171°51.1	-57°15.6
Alioth	166°12.4	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°30.0
Menkent	147°56.9	-36°29.9
Arcturus	145°47.3	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.7	74°03.1
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.4	-69°04.4
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°29.0
Kaus Aust.	83°31.7	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.0
Peacock	53°04.8	-56°39.0
Deneb	49°25.3	45°22.0
Enif	33°38.4	9°59.4
Al Na'ir	27°32.4	-46°50.1
Fomalhaut	15°14.2	-29°29.1
Scheat	13°44.9	28°13.1
Markab	13°29.6	15°20.4

Jun 03 Tue	SHA	Mer.pass
Venus	334°15.5	08:56
Mars	215°01.9	16:52
Jupiter	271°41.4	13:05
Saturn	358°35.6	07:18

Jun 04 Wed	SHA	Mer.pass
Venus	333°19.2	08:56
Mars	214°30.6	16:50
Jupiter	271°26.7	13:02
Saturn	358°32.1	07:14

Jun 05 Thu	SHA	Mer.pass
Venus	332°22.6	08:56
Mars	213°59.3	16:48
Jupiter	271°12.0	12:59
Saturn	358°28.6	07:10

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	Sun			Moon				
h								
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	180°28.1	N22°19.1		88°51.2	15.6′	N08°31.0	14.2′	55.5′
1	195°28.0	19.4		103°25.8	15.7′	08°16.8	14.2′	55.4′
2	210°27.9	19.7		118°00.5	15.7′	08°02.6	14.3′	55.4′
3	225°27.8	·· 20.0		132°35.3	15.8′	07°48.3	14.2′	55.4′
4	240°27.7	20.3		147°10.1	15.9′	07°34.1	14.3′	55.3′
5	255°27.6	20.6		161°44.9	15.9′	07°19.8	14.3′	55.3′
6	270°27.4	N22°20.9		176°19.8	16.0′	N07°05.5	14.3′	55.3′
7	285°27.3	21.2		190°54.8	16.0′	06°51.2	14.3′	55.3′
8	300°27.2	21.5		205°29.8	16.1′	06°36.9	14.4′	55.2′
9	315°27.1	·· 21.8		220°04.9	16.1′	06°22.5	14.3′	55.2′
10	330°27.0	22.1		234°40.1	16.2′	06°08.2	14.4′	55.2′
11	345°26.9	22.4		249°15.2	16.2′	05°53.8	14.3′	55.2′
12	0°26.8	N22°22.7		263°50.5	16.3′	N05°39.5	14.4′	55.1′
13	15°26.7	23.0		278°25.7	16.3′	05°25.1	14.4′	55.1′
14	30°26.6	23.3		293°01.1	16.4′	05°10.7	14.4′	55.1′
15	45°26.5	·· 23.6		307°36.4	16.4′	04°56.3	14.3′	55.1′
16	60°26.4	23.9		322°11.8	16.4′	04°42.0	14.4′	55.0′
17	75°26.3	24.2		336°47.3	16.5′	04°27.6	14.4′	55.0′
18	90°26.2	N22°24.5		351°22.8	16.5′	N04°13.2	14.4′	55.0′
19	105°26.1	24.8		5°58.3	16.6′	03°58.8	14.5′	55.0′
20	120°26.0	25.1		20°33.9	16.6′	03°44.3	14.4′	54.9′
21	135°25.9	·· 25.3		35°09.5	16.6′	03°29.9	14.4′	54.9′
22	150°25.8	25.6		49°45.1	16.7′	03°15.5	14.4′	54.9′
23	165°25.7	25.9		64°20.8	16.7′	03°01.1	14.4′	54.9′
	SD = 15.8′	d = 0.3′		SD = 15.1′				
Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	180°25.5	N22°26.2		78°56.5	16.7′	N02°46.7	14.4′	54.9′
1	195°25.4	26.5		93°32.2	16.8′	02°32.3	14.4′	54.8′
2	210°25.3	26.8		108°08.0	16.8′	02°17.9	14.4′	54.8′
3	225°25.2	·· 27.1		122°43.8	16.8′	02°03.5	14.4′	54.8′
4	240°25.1	27.4		137°19.6	16.8′	01°49.1	14.4′	54.8′
5	255°25.0	27.7		151°55.5	16.9′	01°34.7	14.4′	54.8′
6	270°24.9	N22°27.9		166°31.3	16.9′	N01°20.3	14.4′	54.7′
7	285°24.8	28.2		181°07.2	16.9′	01°05.9	14.4′	54.7′
8	300°24.7	28.5		195°43.1	16.9′	00°51.5	14.3′	54.7′
9	315°24.6	·· 28.8		210°19.1	17.0′	00°37.2	14.4′	54.7′
10	330°24.5	29.1		224°55.0	17.0′	00°22.8	14.4′	54.7′
11	345°24.4	29.4		239°31.0	17.0′	N00°08.4	14.3′	54.6′
12	0°24.2	N22°29.7		254°07.0	17.0′	S00°05.9	14.4′	54.6′
13	15°24.1	29.9		268°43.0	17.0′	00°20.3	14.3′	54.6′
14	30°24.0	30.2		283°19.1	17.0′	00°34.6	14.3′	54.6′
15	45°23.9	·· 30.5		297°55.1	17.1′	00°48.9	14.3′	54.6′
16	60°23.8	30.8		312°31.2	17.1′	01°03.2	14.3′	54.5′
17	75°23.7	31.1		327°07.2	17.1′	01°17.5	14.3′	54.5′
18	90°23.6	N22°31.3		341°43.3	17.1′	S01°31.8	14.3′	54.5′
19	105°23.5	31.6		356°19.4	17.1′	01°46.1	14.2′	54.5′
20	120°23.4	31.9		10°55.5	17.1′	02°00.3	14.3′	54.5′
21	135°23.3	·· 32.2		25°31.6	17.1′	02°14.6	14.2′	54.5′
22	150°23.2	32.4		40°07.7	17.1′	02°28.8	14.2′	54.4′
23	165°23.0	32.7		54°43.8	17.1′	02°43.0	14.2′	54.4′
	SD = 15.8′	d = 0.3′		SD = 15.0′				
Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	180°22.9	N22°33.0		69°19.9	17.1′	S02°57.2	14.2′	54.4′
1	195°22.8	33.3		83°56.0	17.1′	03°11.4	14.1′	54.4′
2	210°22.7	33.5		98°32.1	17.1′	03°25.5	14.2′	54.4′
3	225°22.6	·· 33.8		113°08.2	17.1′	03°39.7	14.1′	54.4′
4	240°22.5	34.1		127°44.3	17.1′	03°53.8	14.1′	54.4′
5	255°22.4	34.3		142°20.4	17.1′	04°07.9	14.1′	54.3′
6	270°22.3	N22°34.6		156°56.5	17.1′	S04°22.0	14.0′	54.3′
7	285°22.2	34.9		171°32.6	17.1′	04°36.0	14.1′	54.3′
8	300°22.0	35.2		186°08.7	17.1′	04°50.1	14.0′	54.3′
9	315°21.9	·· 35.4		200°44.8	17.1′	05°04.1	14.0′	54.3′
10	330°21.8	35.7		215°20.9	17.1′	05°18.1	13.9′	54.3′
11	345°21.7	36.0		229°56.9	17.1′	05°32.0	14.0′	54.3′
12	0°21.6	N22°36.2		244°33.0	17.0′	S05°46.0	13.9′	54.3′
13	15°21.5	36.5		259°09.0	17.0′	05°59.9	13.9′	54.2′
14	30°21.4	36.7		273°45.1	17.0′	06°13.8	13.8′	54.2′
15	45°21.3	·· 37.0		288°21.1	17.0′	06°27.6	13.9′	54.2′
16	60°21.1	37.3		302°57.1	17.0′	06°41.5	13.8′	54.2′
17	75°21.0	37.5		317°33.1	17.0′	06°55.3	13.7′	54.2′
18	90°20.9	N22°37.8		332°09.0	16.9′	S07°09.0	13.8′	54.2′
19	105°20.8	38.1		346°45.0	16.9′	07°22.8	13.7′	54.2′
20	120°20.7	38.3		1°20.9	16.9′	07°36.5	13.7′	54.2′
21	135°20.6	·· 38.6		15°56.8	16.9′	07°50.2	13.6′	54.2′
22	150°20.5	38.8		30°32.7	16.9′	08°03.8	13.7′	54.2′
23	165°20.4	39.1		45°08.5	16.8′	08°17.5	13.6′	54.1′
	SD = 15.8′	d = 0.3′		SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	–:–	–:–	00:58	23:03	–:–	–:–
64°	–:–	–:–	01:50	22:08	–:–	–:–
62°	–:–	–:–	02:22	21:36	–:–	–:–
60°	–:–	01:17	02:45	21:13	22:42	–:–
N 58°	–:–	01:54	03:04	20:54	22:04	–:–
56°	–:–	02:20	03:19	20:39	21:38	–:–
54°	01:10	02:40	03:32	20:25	21:18	22:49
52°	01:45	02:57	03:44	20:14	21:01	22:13
50°	02:09	03:11	03:54	20:03	20:47	21:49
45°	02:50	03:38	04:15	19:42	20:19	21:07
N 40°	03:19	04:00	04:32	19:25	19:57	20:38
35°	03:41	04:17	04:46	19:11	19:40	20:16
30°	03:59	04:32	04:59	18:58	19:25	19:58
20°	04:27	04:55	05:20	18:37	19:01	19:30
N 10°	04:48	05:15	05:38	18:19	18:42	19:09
0°	05:06	05:32	05:55	18:02	18:24	18:50
S 10°	05:23	05:49	06:11	17:45	18:08	18:34
20°	05:38	06:05	06:29	17:28	17:51	18:19
30°	05:54	06:23	06:49	17:07	17:33	18:03
35°	06:02	06:33	07:01	16:55	17:23	17:55
40°	06:11	06:44	07:15	16:42	17:12	17:46
45°	06:20	06:57	07:31	16:26	16:59	17:36
S 50°	06:31	07:12	07:50	16:06	16:44	17:25
52°	06:36	07:19	07:59	15:57	16:37	17:20
54°	06:41	07:27	08:10	15:47	16:30	17:15
56°	06:47	07:35	08:22	15:35	16:21	17:09
58°	06:53	07:45	08:35	15:21	16:11	17:03
S 60°	07:00	07:56	08:51	15:05	16:01	16:56

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	11:11	13:11	15:10	01:50	01:16	00:44
N 70°	11:20	13:11	15:00	01:38	01:12	00:48
68°	11:27	13:10	14:52	01:29	01:10	00:52
66°	11:32	13:10	14:46	01:21	01:08	00:55
64°	11:37	13:09	14:40	01:15	01:06	00:57
62°	11:41	13:09	14:35	01:09	01:04	00:59
60°	11:45	13:09	14:31	01:04	01:03	01:01
N 58°	11:48	13:08	14:27	00:59	01:01	01:03
56°	11:51	13:08	14:24	00:55	01:00	01:05
54°	11:54	13:08	14:21	00:52	00:59	01:06
52°	11:56	13:08	14:19	00:48	00:58	01:07
50°	11:58	13:08	14:16	00:45	00:57	01:09
45°	12:03	13:07	14:11	00:39	00:55	01:11
N 40°	12:06	13:07	14:07	00:33	00:54	01:13
35°	12:10	13:07	14:03	00:29	00:52	01:15
30°	12:12	13:07	14:00	00:24	00:51	01:17
20°	12:17	13:06	13:54	00:17	00:49	01:20
N 10°	12:22	13:06	13:49	00:10	00:47	01:22
0°	12:26	13:06	13:45	00:04	00:45	01:25
S 10°	12:30	13:05	13:40	·· ··	00:43	01:27
20°	12:34	13:05	13:36	·· ··	00:41	01:29
30°	12:39	13:05	13:30	·· ··	00:39	01:32
35°	12:42	13:05	13:27	·· ··	00:37	01:34
40°	12:45	13:05	13:24	·· ··	00:36	01:36
45°	12:48	13:04	13:20	·· ··	00:34	01:38
S 50°	12:53	13:04	13:15	·· ··	00:32	01:41
52°	12:55	13:04	13:13	·· ··	00:31	01:42
54°	12:57	13:04	13:11	·· ··	00:30	01:43
56°	12:59	13:04	13:08	·· ··	00:28	01:45
58°	13:02	13:04	13:05	·· ··	00:27	01:46
S 60°	13:05	13:04	13:02	·· ··	00:26	01:48

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 48-68%
03	01:52	01:47	11:58	18:35	06:15	
04	01:42	01:37	11:58	19:15	06:55	
05	01:32	01:26	11:59	19:54	07:35	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2223 sec ΔT = TT-UT1 = +68.9617 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	254°39.7	226°05.3	N09°10.5	108°07.6	N14°54.1	165°36.9	N23°15.9	253°04.8	S01°38.0
1	269°42.1	241°05.3	11.3	123°08.7	53.6	180°38.8	15.9	268°07.2	37.9
2	284°44.6	256°05.4	12.1	138°09.9	53.2	195°40.6	15.9	283°09.5	37.9
3	299°47.0	271°05.5	·· 12.8	153°11.1	·· 52.7	210°42.5	·· 15.9	298°11.8	·· 37.8
4	314°49.5	286°05.6	13.6	168°12.2	52.2	225°44.3	15.9	313°14.1	37.8
5	329°52.0	301°05.7	14.4	183°13.4	51.7	240°46.2	16.0	328°16.5	37.7
6	344°54.4	316°05.7	N09°15.2	198°14.5	N14°51.2	255°48.0	N23°16.0	343°18.8	S01°37.7
7	359°56.9	331°05.8	15.9	213°15.7	50.7	270°49.9	16.0	358°21.1	37.6
8	14°59.4	346°05.9	16.7	228°16.8	50.2	285°51.7	16.0	13°23.4	37.6
9	30°01.8	1°06.0	·· 17.5	243°18.0	·· 49.8	300°53.6	·· 16.0	28°25.8	·· 37.6
10	45°04.3	16°06.0	18.3	258°19.1	49.3	315°55.4	16.0	43°28.1	37.5
11	60°06.8	31°06.1	19.0	273°20.3	48.8	330°57.3	16.0	58°30.4	37.5
12	75°09.2	46°06.2	N09°19.8	288°21.5	N14°48.3	345°59.1	N23°16.0	73°32.7	S01°37.4
13	90°11.7	61°06.3	20.6	303°22.6	47.8	1°01.0	16.0	88°35.1	37.4
14	105°14.2	76°06.3	21.4	318°23.8	47.3	16°02.8	16.0	103°37.4	37.3
15	120°16.6	91°06.4	·· 22.1	333°24.9	·· 46.8	31°04.7	·· 16.0	118°39.7	·· 37.3
16	135°19.1	106°06.5	22.9	348°26.1	46.3	46°06.5	16.0	133°42.0	37.2
17	150°21.5	121°06.5	23.7	3°27.2	45.9	61°08.4	16.0	148°44.4	37.2
18	165°24.0	136°06.6	N09°24.5	18°28.4	N14°45.4	76°10.2	N23°16.1	163°46.7	S01°37.1
19	180°26.5	151°06.7	25.2	33°29.5	44.9	91°12.1	16.1	178°49.0	37.1
20	195°28.9	166°06.7	26.0	48°30.7	44.4	106°13.9	16.1	193°51.3	37.0
21	210°31.4	181°06.8	·· 26.8	63°31.8	·· 43.9	121°15.8	·· 16.1	208°53.7	·· 37.0
22	225°33.9	196°06.9	27.6	78°33.0	43.4	136°17.6	16.1	223°56.0	36.9
23	240°36.3	211°06.9	28.3	93°34.2	42.9	151°19.5	16.1	238°58.3	36.9
Mer.pass.	07:00	ν 0.1′	d 0.8′	m -4.34	ν 1.2′	d -0.5′	m 1.33	ν 1.9′	d 0.0′	m -1.91	ν 2.3′	d 0.0′	m 1.06

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	255°38.8	226°07.0	N09°29.1	108°35.3	N14°42.4	166°21.3	N23°16.1	254°00.7	S01°36.8
1	270°41.3	241°07.1	29.9	123°36.5	41.9	181°23.2	16.1	269°03.0	36.8
2	285°43.7	256°07.1	30.7	138°37.6	41.5	196°25.0	16.1	284°05.3	36.7
3	300°46.2	271°07.2	·· 31.4	153°38.8	·· 41.0	211°26.9	·· 16.1	299°07.6	·· 36.7
4	315°48.6	286°07.3	32.2	168°39.9	40.5	226°28.7	16.1	314°10.0	36.6
5	330°51.1	301°07.3	33.0	183°41.1	40.0	241°30.6	16.1	329°12.3	36.6
6	345°53.6	316°07.4	N09°33.8	198°42.2	N14°39.5	256°32.4	N23°16.1	344°14.6	S01°36.5
7	0°56.0	331°07.5	34.6	213°43.4	39.0	271°34.3	16.1	359°16.9	36.5
8	15°58.5	346°07.5	35.3	228°44.5	38.5	286°36.1	16.1	14°19.3	36.4
9	31°01.0	1°07.6	·· 36.1	243°45.7	·· 38.0	301°38.0	·· 16.2	29°21.6	·· 36.4
10	46°03.4	16°07.6	36.9	258°46.8	37.5	316°39.8	16.2	44°23.9	36.3
11	61°05.9	31°07.7	37.7	273°48.0	37.0	331°41.7	16.2	59°26.3	36.3
12	76°08.4	46°07.7	N09°38.4	288°49.2	N14°36.5	346°43.5	N23°16.2	74°28.6	S01°36.2
13	91°10.8	61°07.8	39.2	303°50.3	36.1	1°45.4	16.2	89°30.9	36.2
14	106°13.3	76°07.9	40.0	318°51.5	35.6	16°47.2	16.2	104°33.3	36.2
15	121°15.8	91°07.9	·· 40.8	333°52.6	·· 35.1	31°49.0	·· 16.2	119°35.6	·· 36.1
16	136°18.2	106°08.0	41.6	348°53.8	34.6	46°50.9	16.2	134°37.9	36.1
17	151°20.7	121°08.0	42.3	3°54.9	34.1	61°52.7	16.2	149°40.2	36.0
18	166°23.1	136°08.1	N09°43.1	18°56.1	N14°33.6	76°54.6	N23°16.2	164°42.6	S01°36.0
19	181°25.6	151°08.1	43.9	33°57.2	33.1	91°56.4	16.2	179°44.9	35.9
20	196°28.1	166°08.2	44.7	48°58.4	32.6	106°58.3	16.2	194°47.2	35.9
21	211°30.5	181°08.2	·· 45.4	63°59.5	·· 32.1	122°00.1	·· 16.2	209°49.6	·· 35.8
22	226°33.0	196°08.3	46.2	79°00.7	31.6	137°02.0	16.2	224°51.9	35.8
23	241°35.5	211°08.3	47.0	94°01.8	31.1	152°03.8	16.2	239°54.2	35.7
Mer.pass.	06:56	ν 0.1′	d 0.8′	m -4.33	ν 1.2′	d -0.5′	m 1.34	ν 1.8′	d 0.0′	m -1.91	ν 2.3′	d 0.0′	m 1.06

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	256°37.9	226°08.4	N09°47.8	109°03.0	N14°30.6	167°05.7	N23°16.3	254°56.5	S01°35.7
1	271°40.4	241°08.4	48.6	124°04.1	30.1	182°07.5	16.3	269°58.9	35.6
2	286°42.9	256°08.5	49.3	139°05.3	29.7	197°09.4	16.3	285°01.2	35.6
3	301°45.3	271°08.5	·· 50.1	154°06.4	·· 29.2	212°11.2	·· 16.3	300°03.5	·· 35.5
4	316°47.8	286°08.6	50.9	169°07.6	28.7	227°13.1	16.3	315°05.9	35.5
5	331°50.3	301°08.6	51.7	184°08.7	28.2	242°14.9	16.3	330°08.2	35.5
6	346°52.7	316°08.7	N09°52.5	199°09.9	N14°27.7	257°16.8	N23°16.3	345°10.5	S01°35.4
7	1°55.2	331°08.7	53.2	214°11.0	27.2	272°18.6	16.3	0°12.9	35.4
8	16°57.6	346°08.8	54.0	229°12.2	26.7	287°20.5	16.3	15°15.2	35.3
9	32°00.1	1°08.8	·· 54.8	244°13.3	·· 26.2	302°22.3	·· 16.3	30°17.5	·· 35.3
10	47°02.6	16°08.8	55.6	259°14.5	25.7	317°24.2	16.3	45°19.9	35.2
11	62°05.0	31°08.9	56.4	274°15.7	25.2	332°26.0	16.3	60°22.2	35.2
12	77°07.5	46°08.9	N09°57.1	289°16.8	N14°24.7	347°27.9	N23°16.3	75°24.5	S01°35.1
13	92°10.0	61°09.0	57.9	304°18.0	24.2	2°29.7	16.3	90°26.9	35.1
14	107°12.4	76°09.0	58.7	319°19.1	23.7	17°31.6	16.3	105°29.2	35.0
15	122°14.9	91°09.1	09°59.5	334°20.3	·· 23.2	32°33.4	·· 16.3	120°31.5	·· 35.0
16	137°17.4	106°09.1	10°00.3	349°21.4	22.7	47°35.3	16.3	135°33.9	34.9
17	152°19.8	121°09.1	01.0	4°22.6	22.2	62°37.1	16.3	150°36.2	34.9
18	167°22.3	136°09.2	N10°01.8	19°23.7	N14°21.7	77°39.0	N23°16.4	165°38.5	S01°34.9
19	182°24.7	151°09.2	02.6	34°24.9	21.2	92°40.8	16.4	180°40.9	34.8
20	197°27.2	166°09.2	03.4	49°26.0	20.7	107°42.7	16.4	195°43.2	34.8
21	212°29.7	181°09.3	·· 04.2	64°27.2	·· 20.3	122°44.5	·· 16.4	210°45.5	·· 34.7
22	227°32.1	196°09.3	04.9	79°28.3	19.8	137°46.3	16.4	225°47.9	34.7
23	242°34.6	211°09.3	05.7	94°29.5	19.3	152°48.2	16.4	240°50.2	34.6
Mer.pass.	06:52	ν 0.0′	d 0.8′	m -4.32	ν 1.2′	d -0.5′	m 1.34	ν 1.8′	d 0.0′	m -1.91	ν 2.3′	d 0.0′	m 1.06

Stars	SHA	Dec
Alpheratz	357°34.5	29°13.7
Ankaa	353°07.0	-42°09.9
Schedar	349°30.9	56°40.3
Diphda	348°47.1	-17°50.7
Achernar	335°20.3	-57°06.2
Hamal	327°51.1	23°34.8
Polaris	314°18.1	89°22.1
Acamar	315°11.9	-40°12.0
Menkar	314°06.1	4°11.3
Mirfak	308°28.3	49°57.0
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°06.0	-29°00.5
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.1	-59°35.6
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.7	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.6	61°37.1
Denebola	182°24.6	14°25.8
Gienah	175°43.2	-17°41.1
Acrux	172°59.5	-63°14.7
Gacrux	171°51.1	-57°15.6
Alioth	166°12.4	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.8	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.7
Antares	112°15.1	-26°29.4
Atria	107°08.4	-69°04.4
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°29.0
Kaus Aust.	83°31.7	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.0
Peacock	53°04.8	-56°39.0
Deneb	49°25.3	45°22.0
Enif	33°38.4	9°59.4
Al Na'ir	27°32.4	-46°50.0
Fomalhaut	15°14.1	-29°29.1
Scheat	13°44.9	28°13.1
Markab	13°29.6	15°20.4

Jun 06 Fri	SHA	Mer.pass
Venus	331°25.6	08:56
Mars	213°27.9	16:46
Jupiter	270°57.3	12:56
Saturn	358°25.2	07:07

Jun 07 Sat	SHA	Mer.pass
Venus	330°28.2	08:55
Mars	212°56.5	16:44
Jupiter	270°42.5	12:53
Saturn	358°21.9	07:03

Jun 08 Sun	SHA	Mer.pass
Venus	329°30.5	08:55
Mars	212°25.1	16:43
Jupiter	270°27.8	12:50
Saturn	358°18.6	06:59

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°20.2	N22°39.4	59°44.4	16.8′	S08°31.1	13.5′	54.1′
1	195°20.1	39.6	74°20.2	16.8′	08°44.6	13.5′	54.1′
2	210°20.0	39.9	88°56.0	16.8′	08°58.1	13.5′	54.1′
3	225°19.9	·· 40.1	103°31.7	16.7′	09°11.6	13.5′	54.1′
4	240°19.8	40.4	118°07.5	16.7′	09°25.1	13.4′	54.1′
5	255°19.7	40.6	132°43.2	16.7′	09°38.5	13.3′	54.1′
6	270°19.6	N22°40.9	147°18.8	16.6′	S09°51.8	13.4′	54.1′
7	285°19.4	41.1	161°54.5	16.6′	10°05.2	13.3′	54.1′
8	300°19.3	41.4	176°30.1	16.6′	10°18.5	13.2′	54.1′
9	315°19.2	·· 41.6	191°05.6	16.5′	10°31.7	13.3′	54.1′
10	330°19.1	41.9	205°41.2	16.5′	10°45.0	13.1′	54.1′
11	345°19.0	42.1	220°16.7	16.5′	10°58.1	13.2′	54.1′
12	0°18.9	N22°42.4	234°52.1	16.4′	S11°11.3	13.1′	54.1′
13	15°18.8	42.6	249°27.5	16.4′	11°24.4	13.0′	54.1′
14	30°18.6	42.9	264°02.9	16.3′	11°37.4	13.0′	54.0′
15	45°18.5	·· 43.1	278°38.3	16.3′	11°50.4	13.0′	54.0′
16	60°18.4	43.4	293°13.6	16.3′	12°03.4	12.9′	54.0′
17	75°18.3	43.6	307°48.9	16.2′	12°16.3	12.9′	54.0′
18	90°18.2	N22°43.9	322°24.1	16.2′	S12°29.2	12.8′	54.0′
19	105°18.1	44.1	336°59.2	16.1′	12°42.0	12.8′	54.0′
20	120°17.9	44.4	351°34.4	16.1′	12°54.8	12.7′	54.0′
21	135°17.8	·· 44.6	6°09.5	16.0′	13°07.5	12.7′	54.0′
22	150°17.7	44.8	20°44.5	16.0′	13°20.2	12.6′	54.0′
23	165°17.6	45.1	35°19.5	15.9′	13°32.8	12.6′	54.0′
	SD = 15.8′	d = 0.3′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°17.5	N22°45.3	49°54.5	15.9′	S13°45.4	12.6′	54.0′
1	195°17.4	45.6	64°29.3	15.8′	13°58.0	12.4′	54.0′
2	210°17.2	45.8	79°04.2	15.8′	14°10.4	12.5′	54.0′
3	225°17.1	·· 46.0	93°39.0	15.7′	14°22.9	12.3′	54.0′
4	240°17.0	46.3	108°13.7	15.7′	14°35.2	12.3′	54.0′
5	255°16.9	46.5	122°48.4	15.6′	14°47.5	12.3′	54.0′
6	270°16.8	N22°46.8	137°23.1	15.6′	S14°59.8	12.2′	54.0′
7	285°16.7	47.0	151°57.6	15.5′	15°12.0	12.2′	54.0′
8	300°16.5	47.2	166°32.2	15.5′	15°24.2	12.1′	54.0′
9	315°16.4	·· 47.5	181°06.6	15.4′	15°36.3	12.0′	54.0′
10	330°16.3	47.7	195°41.1	15.4′	15°48.3	12.0′	54.0′
11	345°16.2	47.9	210°15.4	15.3′	16°00.3	11.9′	54.0′
12	0°16.1	N22°48.2	224°49.7	15.2′	S16°12.2	11.8′	54.0′
13	15°16.0	48.4	239°23.9	15.2′	16°24.0	11.8′	54.0′
14	30°15.8	48.6	253°58.1	15.1′	16°35.8	11.7′	54.0′
15	45°15.7	·· 48.9	268°32.2	15.1′	16°47.5	11.7′	54.0′
16	60°15.6	49.1	283°06.3	15.0′	16°59.2	11.6′	54.0′
17	75°15.5	49.3	297°40.3	14.9′	17°10.8	11.5′	54.0′
18	90°15.4	N22°49.5	312°14.2	14.9′	S17°22.3	11.5′	54.0′
19	105°15.2	49.8	326°48.1	14.8′	17°33.8	11.4′	54.0′
20	120°15.1	50.0	341°21.9	14.7′	17°45.2	11.3′	54.0′
21	135°15.0	·· 50.2	355°55.6	14.7′	17°56.5	11.3′	54.0′
22	150°14.9	50.4	10°29.3	14.6′	18°07.8	11.2′	54.0′
23	165°14.8	50.7	25°02.9	14.5′	18°19.0	11.1′	54.0′
	SD = 15.8′	d = 0.2′	SD = 14.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°14.7	N22°50.9	39°36.4	14.5′	S18°30.1	11.0′	54.0′
1	195°14.5	51.1	54°09.9	14.4′	18°41.1	11.0′	54.0′
2	210°14.4	51.3	68°43.3	14.3′	18°52.1	10.9′	54.0′
3	225°14.3	·· 51.6	83°16.6	14.3′	19°03.0	10.9′	54.0′
4	240°14.2	51.8	97°49.9	14.2′	19°13.9	10.7′	54.0′
5	255°14.1	52.0	112°23.1	14.1′	19°24.6	10.7′	54.0′
6	270°13.9	N22°52.2	126°56.2	14.0′	S19°35.3	10.6′	54.0′
7	285°13.8	52.4	141°29.2	14.0′	19°45.9	10.5′	54.0′
8	300°13.7	52.7	156°02.2	13.9′	19°56.4	10.5′	54.0′
9	315°13.6	·· 52.9	170°35.1	13.8′	20°06.9	10.3′	54.1′
10	330°13.5	53.1	185°07.9	13.8′	20°17.2	10.3′	54.1′
11	345°13.3	53.3	199°40.7	13.7′	20°27.5	10.2′	54.1′
12	0°13.2	N22°53.5	214°13.4	13.6′	S20°37.7	10.1′	54.1′
13	15°13.1	53.7	228°46.0	13.5′	20°47.8	10.0′	54.1′
14	30°13.0	54.0	243°18.5	13.5′	20°57.8	10.0′	54.1′
15	45°12.9	·· 54.2	257°51.0	13.4′	21°07.8	9.9′	54.1′
16	60°12.7	54.4	272°23.3	13.3′	21°17.7	9.7′	54.1′
17	75°12.6	54.6	286°55.7	13.2′	21°27.4	9.7′	54.1′
18	90°12.5	N22°54.8	301°27.9	13.2′	S21°37.1	9.6′	54.1′
19	105°12.4	55.0	316°00.0	13.1′	21°46.7	9.5′	54.1′
20	120°12.2	55.2	330°32.1	13.0′	21°56.2	9.5′	54.1′
21	135°12.1	·· 55.4	345°04.1	12.9′	22°05.7	9.3′	54.1′
22	150°12.0	55.6	359°36.0	12.8′	22°15.0	9.2′	54.1′
23	165°11.9	55.9	14°07.9	12.8′	22°24.2	9.2′	54.1′
	SD = 15.8′	d = 0.2′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	00:44	23:19	–:–	–:–
64°	–:–	–:–	01:44	22:15	–:–	–:–
62°	–:–	–:–	02:17	21:42	–:–	–:–
60°	–:–	01:09	02:42	21:17	22:51	–:–
N 58°	–:–	01:50	03:01	20:58	22:10	–:–
56°	–:–	02:17	03:17	20:42	21:42	–:–
54°	01:03	02:37	03:30	20:28	21:21	22:57
52°	01:41	02:54	03:42	20:16	21:04	22:19
50°	02:06	03:09	03:52	20:06	20:50	21:53
45°	02:48	03:37	04:14	19:44	20:21	21:10
N 40°	03:18	03:59	04:31	19:27	19:59	20:40
35°	03:40	04:16	04:46	19:12	19:42	20:18
30°	03:58	04:31	04:58	19:00	19:27	20:00
20°	04:26	04:55	05:20	18:38	19:03	19:32
N 10°	04:48	05:15	05:38	18:20	18:43	19:10
0°	05:07	05:33	05:55	18:03	18:25	18:51
S 10°	05:23	05:49	06:12	17:46	18:08	18:35
20°	05:39	06:06	06:30	17:28	17:52	18:19
30°	05:55	06:25	06:51	17:07	17:33	18:03
35°	06:03	06:35	07:03	16:55	17:23	17:55
40°	06:12	06:46	07:16	16:41	17:12	17:45
45°	06:22	06:59	07:33	16:25	16:59	17:36
S 50°	06:33	07:15	07:53	16:05	16:43	17:24
52°	06:38	07:22	08:02	15:56	16:36	17:19
54°	06:44	07:30	08:13	15:45	16:28	17:14
56°	06:50	07:38	08:25	15:33	16:19	17:08
58°	06:56	07:48	08:39	15:19	16:10	17:02
S 60°	07:03	07:59	08:55	15:02	15:58	16:54

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	17:20			00:10 23:25		
N 70°	16:57	19:19		00:22 23:50	22:56	
68°	16:39	18:39		00:33	00:10 23:37	
66°	16:24	18:12	20:21	00:41	00:26	00:05 23:29
64°	16:13	17:51	19:41	00:48	00:39	00:27
62°	16:03	17:35	19:13	00:55	00:50	00:44
60°	15:54	17:21	18:52	01:00	00:59	00:59
N 58°	15:47	17:09	18:34	01:05	01:08	01:11
56°	15:41	16:59	18:20	01:09	01:15	01:22
54°	15:35	16:50	18:08	01:13	01:21	01:32
52°	15:30	16:42	17:57	01:17	01:27	01:40
50°	15:25	16:35	17:47	01:20	01:33	01:48
45°	15:15	16:20	17:27	01:27	01:44	02:05
N 40°	15:07	16:08	17:10	01:33	01:54	02:18
35°	15:00	15:57	16:57	01:38	02:03	02:30
30°	14:53	15:48	16:45	01:43	02:10	02:40
20°	14:43	15:33	16:24	01:50	02:23	02:58
N 10°	14:33	15:19	16:07	01:57	02:34	03:13
0°	14:25	15:06	15:51	02:04	02:45	03:27
S 10°	14:16	14:54	15:34	02:11	02:55	03:42
20°	14:07	14:41	15:17	02:18	03:07	03:57
30°	13:57	14:25	14:57	02:26	03:20	04:15
35°	13:51	14:17	14:46	02:30	03:27	04:26
40°	13:44	14:07	14:33	02:36	03:36	04:38
45°	13:37	13:55	14:18	02:42	03:46	04:52
S 50°	13:27	13:41	13:59	02:49	03:59	05:10
52°	13:23	13:35	13:50	02:53	04:05	05:18
54°	13:18	13:28	13:40	02:57	04:11	05:27
56°	13:13	13:20	13:29	03:01	04:18	05:38
58°	13:08	13:11	13:16	03:06	04:26	05:50
S 60°	13:01	13:01	13:01	03:11	04:35	06:04

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 76-90%
06	01:21	01:15	11:59	20:35	08:14	
07	01:10	01:04	11:59	21:17	08:55	
08	00:59	00:53	11:59	22:02	09:39	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2230 sec ΔT = TT-UT1 = +68.9610 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	257°37.1	226°09.4	N10°06.5	109°30.6	N14°18.8	167°50.0	N23°16.4	255°52.5	S01°34.6
1	272°39.5	241°09.4	07.3	124°31.8	18.3	182°51.9	16.4	270°54.9	34.5
2	287°42.0	256°09.4	08.1	139°32.9	17.8	197°53.7	16.4	285°57.2	34.5
3	302°44.5	271°09.5	·· 08.8	154°34.1	·· 17.3	212°55.6	·· 16.4	300°59.5	·· 34.5
4	317°46.9	286°09.5	09.6	169°35.2	16.8	227°57.4	16.4	316°01.9	34.4
5	332°49.4	301°09.5	10.4	184°36.4	16.3	242°59.3	16.4	331°04.2	34.4
6	347°51.9	316°09.6	N10°11.2	199°37.5	N14°15.8	258°01.1	N23°16.4	346°06.5	S01°34.3
7	2°54.3	331°09.6	12.0	214°38.7	15.3	273°03.0	16.4	1°08.9	34.3
8	17°56.8	346°09.6	12.7	229°39.8	14.8	288°04.8	16.4	16°11.2	34.2
9	32°59.2	1°09.7	·· 13.5	244°41.0	·· 14.3	303°06.7	·· 16.4	31°13.5	·· 34.2
10	48°01.7	16°09.7	14.3	259°42.1	13.8	318°08.5	16.4	46°15.9	34.1
11	63°04.2	31°09.7	15.1	274°43.3	13.3	333°10.4	16.4	61°18.2	34.1
12	78°06.6	46°09.7	N10°15.9	289°44.4	N14°12.8	348°12.2	N23°16.4	76°20.5	S01°34.0
13	93°09.1	61°09.8	16.7	304°45.6	12.3	3°14.1	16.4	91°22.9	34.0
14	108°11.6	76°09.8	17.4	319°46.7	11.8	18°15.9	16.4	106°25.2	34.0
15	123°14.0	91°09.8	·· 18.2	334°47.9	·· 11.3	33°17.8	·· 16.5	121°27.5	·· 33.9
16	138°16.5	106°09.8	19.0	349°49.0	10.8	48°19.6	16.5	136°29.9	33.9
17	153°19.0	121°09.9	19.8	4°50.2	10.3	63°21.5	16.5	151°32.2	33.8
18	168°21.4	136°09.9	N10°20.6	19°51.3	N14°09.8	78°23.3	N23°16.5	166°34.6	S01°33.8
19	183°23.9	151°09.9	21.3	34°52.5	09.3	93°25.1	16.5	181°36.9	33.7
20	198°26.4	166°09.9	22.1	49°53.6	08.8	108°27.0	16.5	196°39.2	33.7
21	213°28.8	181°09.9	·· 22.9	64°54.8	·· 08.3	123°28.8	·· 16.5	211°41.6	·· 33.7
22	228°31.3	196°10.0	23.7	79°55.9	07.8	138°30.7	16.5	226°43.9	33.6
23	243°33.7	211°10.0	24.5	94°57.1	07.3	153°32.5	16.5	241°46.2	33.6
Mer.pass.	06:48	ν 0.0′	d 0.8′	m -4.31	ν 1.2′	d -0.5′	m 1.35	ν 1.8′	d 0.0′ m -1.90	ν 2.3′	d 0.0′ m 1.05

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	258°36.2	226°10.0	N10°25.2	109°58.2	N14°06.8	168°34.4	N23°16.5	256°48.6	S01°33.5
1	273°38.7	241°10.0	26.0	124°59.4	06.3	183°36.2	16.5	271°50.9	33.5
2	288°41.1	256°10.0	26.8	140°00.5	05.8	198°38.1	16.5	286°53.2	33.4
3	303°43.6	271°10.1	·· 27.6	155°01.6	·· 05.3	213°39.9	·· 16.5	301°55.6	·· 33.4
4	318°46.1	286°10.1	28.4	170°02.8	04.8	228°41.8	16.5	316°57.9	33.3
5	333°48.5	301°10.1	29.2	185°03.9	04.3	243°43.6	16.5	332°00.3	33.3
6	348°51.0	316°10.1	N10°29.9	200°05.1	N14°03.8	258°45.5	N23°16.5	347°02.6	S01°33.3
7	3°53.5	331°10.1	30.7	215°06.2	03.3	273°47.3	16.5	2°04.9	33.2
8	18°55.9	346°10.1	31.5	230°07.4	02.8	288°49.2	16.5	17°07.3	33.2
9	33°58.4	1°10.1	·· 32.3	245°08.5	·· 02.3	303°51.0	·· 16.5	32°09.6	·· 33.1
10	49°00.9	16°10.1	33.1	260°09.7	01.8	318°52.9	16.5	47°12.0	33.1
11	64°03.3	31°10.2	33.9	275°10.8	01.3	333°54.7	16.5	62°14.3	33.0
12	79°05.8	46°10.2	N10°34.6	290°12.0	N14°00.8	348°56.5	N23°16.5	77°16.6	S01°33.0
13	94°08.2	61°10.2	35.4	305°13.1	14°00.3	3°58.4	16.5	92°19.0	33.0
14	109°10.7	76°10.2	36.2	320°14.3	13°59.8	19°00.2	16.5	107°21.3	32.9
15	124°13.2	91°10.2	·· 37.0	335°15.4	·· 59.3	34°02.1	·· 16.5	122°23.6	·· 32.9
16	139°15.6	106°10.2	37.8	350°16.6	58.8	49°03.9	16.6	137°26.0	32.8
17	154°18.1	121°10.2	38.5	5°17.7	58.3	64°05.8	16.6	152°28.3	32.8
18	169°20.6	136°10.2	N10°39.3	20°18.9	N13°57.7	79°07.6	N23°16.6	167°30.7	S01°32.7
19	184°23.0	151°10.2	40.1	35°20.0	57.2	94°09.5	16.6	182°33.0	32.7
20	199°25.5	166°10.2	40.9	50°21.2	56.7	109°11.3	16.6	197°35.3	32.7
21	214°28.0	181°10.2	·· 41.7	65°22.3	·· 56.2	124°13.2	·· 16.6	212°37.7	·· 32.6
22	229°30.4	196°10.2	42.5	80°23.5	55.7	139°15.0	16.6	227°40.0	32.6
23	244°32.9	211°10.2	43.2	95°24.6	55.2	154°16.9	16.6	242°42.4	32.5
Mer.pass.	06:44	ν 0.0′	d 0.8′	m -4.30	ν 1.1′	d -0.5′	m 1.36	ν 1.8′	d 0.0′ m -1.90	ν 2.3′	d 0.0′ m 1.05

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	259°35.4	226°10.2	N10°44.0	110°25.7	N13°54.7	169°18.7	N23°16.6	257°44.7	S01°32.5
1	274°37.8	241°10.2	44.8	125°26.9	54.2	184°20.5	16.6	272°47.0	32.4
2	289°40.3	256°10.3	45.6	140°28.0	53.7	199°22.4	16.6	287°49.4	32.4
3	304°42.7	271°10.3	·· 46.4	155°29.2	·· 53.2	214°24.2	·· 16.6	302°51.7	·· 32.4
4	319°45.2	286°10.3	47.2	170°30.3	52.7	229°26.1	16.6	317°54.1	32.3
5	334°47.7	301°10.3	47.9	185°31.5	52.2	244°27.9	16.6	332°56.4	32.3
6	349°50.1	316°10.3	N10°48.7	200°32.6	N13°51.7	259°29.8	N23°16.6	347°58.8	S01°32.2
7	4°52.6	331°10.2	49.5	215°33.8	51.2	274°31.6	16.6	3°01.1	32.2
8	19°55.1	346°10.2	50.3	230°34.9	50.7	289°33.5	16.6	18°03.4	32.2
9	34°57.5	1°10.2	·· 51.1	245°36.1	·· 50.2	304°35.3	·· 16.6	33°05.8	·· 32.1
10	50°00.0	16°10.2	51.9	260°37.2	49.7	319°37.2	16.6	48°08.1	32.1
11	65°02.5	31°10.2	52.6	275°38.4	49.2	334°39.0	16.6	63°10.5	32.0
12	80°04.9	46°10.2	N10°53.4	290°39.5	N13°48.7	349°40.9	N23°16.6	78°12.8	S01°32.0
13	95°07.4	61°10.2	54.2	305°40.7	48.2	4°42.7	16.6	93°15.1	31.9
14	110°09.8	76°10.2	55.0	320°41.8	47.6	19°44.6	16.6	108°17.5	31.9
15	125°12.3	91°10.2	·· 55.8	335°42.9	·· 47.1	34°46.4	·· 16.6	123°19.8	·· 31.9
16	140°14.8	106°10.2	56.5	350°44.1	46.6	49°48.2	16.6	138°22.2	31.8
17	155°17.2	121°10.2	57.3	5°45.2	46.1	64°50.1	16.6	153°24.5	31.8
18	170°19.7	136°10.2	N10°58.1	20°46.4	N13°45.6	79°51.9	N23°16.6	168°26.9	S01°31.7
19	185°22.2	151°10.2	58.9	35°47.5	45.1	94°53.8	16.6	183°29.2	31.7
20	200°24.6	166°10.2	10°59.7	50°48.7	44.6	109°55.6	16.6	198°31.5	31.7
21	215°27.1	181°10.2	11°00.5	65°49.8	·· 44.1	124°57.5	·· 16.6	213°33.9	·· 31.6
22	230°29.6	196°10.1	01.2	80°51.0	43.6	139°59.3	16.6	228°36.2	31.6
23	245°32.0	211°10.1	02.0	95°52.1	43.1	155°01.2	16.6	243°38.6	31.5
Mer.pass.	06:41	ν 0.0′	d 0.8′	m -4.29	ν 1.1′	d -0.5′	m 1.37	ν 1.8′	d 0.0′ m -1.90	ν 2.3′	d 0.0′ m 1.04

Stars

	SHA	Dec
Alpheratz	357°34.5	29°13.7
Ankaa	353°06.9	-42°09.8
Schedar	349°30.9	56°40.3
Diphda	348°47.1	-17°50.7
Achernar	335°20.3	-57°06.2
Hamal	327°51.1	23°34.9
Polaris	314°17.0	89°22.1
Acamar	315°11.9	-40°12.0
Menkar	314°06.1	4°11.3
Mirfak	308°28.2	49°56.9
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.9	46°01.4
Bellatrix	278°22.9	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°06.0	-29°00.4
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°58.0
Avior	234°15.1	-59°35.6
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.8	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.6	61°37.1
Denebola	182°24.6	14°25.8
Gienah	175°43.2	-17°41.1
Acrux	172°59.5	-63°14.7
Gacrux	171°51.1	-57°15.6
Alioth	166°12.4	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.8	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.1	-26°29.4
Atria	107°08.4	-69°04.4
Sabik	102°02.0	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°29.0
Kaus Aust.	83°31.7	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.4	8°56.1
Peacock	53°04.8	-56°39.0
Deneb	49°25.3	45°22.0
Enif	33°38.3	9°59.4
Al Na'ir	27°32.3	-46°50.0
Fomalhaut	15°14.1	-29°29.1
Scheat	13°44.9	28°13.1
Markab	13°29.5	15°20.4

Jun 09 Mon	SHA	Mer.pass
Venus	328°32.3	08:55
Mars	211°53.5	16:41
Jupiter	270°13.0	12:47
Saturn	358°15.5	06:55

Jun 10 Tue	SHA	Mer.pass
Venus	327°33.8	08:55
Mars	211°22.0	16:39
Jupiter	269°58.2	12:44
Saturn	358°12.4	06:52

Jun 11 Wed	SHA	Mer.pass
Venus	326°34.9	08:55
Mars	210°50.4	16:37
Jupiter	269°43.4	12:41
Saturn	358°09.4	06:48

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°11.8	N22°56.1	28°39.6	12.7′	S22°33.4	9.0′	54.1′
1	195°11.6	56.3	43°11.3	12.6′	22°42.4	8.9′	54.1′
2	210°11.5	56.5	57°42.9	12.5′	22°51.3	8.9′	54.2′
3	225°11.4	·· 56.7	72°14.5	12.5′	23°00.2	8.8′	54.2′
4	240°11.3	56.9	86°45.9	12.4′	23°09.0	8.6′	54.2′
5	255°11.2	57.1	101°17.3	12.3′	23°17.6	8.6′	54.2′
6	270°11.0	N22°57.3	115°48.6	12.2′	S23°26.2	8.4′	54.2′
7	285°10.9	57.5	130°19.8	12.1′	23°34.6	8.4′	54.2′
8	300°10.8	57.7	144°50.9	12.1′	23°43.0	8.2′	54.2′
9	315°10.7	·· 57.9	159°22.0	12.0′	23°51.2	8.2′	54.2′
10	330°10.5	58.1	173°53.0	11.9′	23°59.4	8.0′	54.2′
11	345°10.4	58.3	188°23.9	11.8′	24°07.4	8.0′	54.2′
12	0°10.3	N22°58.5	202°54.7	11.7′	S24°15.4	7.8′	54.2′
13	15°10.2	58.7	217°25.4	11.7′	24°23.2	7.7′	54.3′
14	30°10.0	58.9	231°56.1	11.6′	24°30.9	7.6′	54.3′
15	45°09.9	·· 59.1	246°26.7	11.5′	24°38.5	7.6′	54.3′
16	60°09.8	59.3	260°57.2	11.4′	24°46.1	7.3′	54.3′
17	75°09.7	59.5	275°27.6	11.4′	24°53.4	7.3′	54.3′
18	90°09.6	N22°59.7	289°58.0	11.3′	S25°00.7	7.2′	54.3′
19	105°09.4	22°59.9	304°28.3	11.2′	25°07.9	7.1′	54.3′
20	120°09.3	23°00.1	318°58.5	11.1′	25°15.0	6.9′	54.3′
21	135°09.2	·· 00.3	333°28.6	11.1′	25°21.9	6.8′	54.3′
22	150°09.1	00.4	347°58.6	11.0′	25°28.7	6.7′	54.3′
23	165°08.9	00.6	2°28.6	10.9′	25°35.4	6.6′	54.4′
	SD = 15.8′	d = 0.2′	SD = 14.8′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.8	N23°00.8	16°58.5	10.8′	S25°42.0	6.5′	54.4′
1	195°08.7	01.0	31°28.3	10.8′	25°48.5	6.4′	54.4′
2	210°08.6	01.2	45°58.1	10.7′	25°54.9	6.2′	54.4′
3	225°08.4	·· 01.4	60°27.8	10.6′	26°01.1	6.1′	54.4′
4	240°08.3	01.6	74°57.4	10.5′	26°07.2	6.0′	54.4′
5	255°08.2	01.8	89°26.9	10.5′	26°13.2	5.9′	54.4′
6	270°08.1	N23°02.0	103°56.4	10.4′	S26°19.1	5.7′	54.4′
7	285°07.9	02.1	118°25.8	10.3′	26°24.8	5.7′	54.4′
8	300°07.8	02.3	132°55.1	10.3′	26°30.5	5.5′	54.5′
9	315°07.7	·· 02.5	147°24.3	10.2′	26°36.0	5.3′	54.5′
10	330°07.6	02.7	161°53.5	10.1′	26°41.3	5.3′	54.5′
11	345°07.4	02.9	176°22.6	10.0′	26°46.6	5.1′	54.5′
12	0°07.3	N23°03.1	190°51.7	10.0′	S26°51.7	5.0′	54.5′
13	15°07.2	03.2	205°20.7	9.9′	26°56.7	4.8′	54.5′
14	30°07.1	03.4	219°49.6	9.9′	27°01.5	4.8′	54.5′
15	45°06.9	·· 03.6	234°18.4	9.8′	27°06.3	4.6′	54.5′
16	60°06.8	03.8	248°47.2	9.7′	27°10.9	4.4′	54.6′
17	75°06.7	04.0	263°15.9	9.7′	27°15.3	4.3′	54.6′
18	90°06.6	N23°04.1	277°44.6	9.6′	S27°19.6	4.2′	54.6′
19	105°06.4	04.3	292°13.2	9.5′	27°23.8	4.1′	54.6′
20	120°06.3	04.5	306°41.7	9.5′	27°27.9	3.9′	54.6′
21	135°06.2	·· 04.7	321°10.2	9.4′	27°31.8	3.8′	54.6′
22	150°06.1	04.8	335°38.6	9.4′	27°35.6	3.7′	54.6′
23	165°05.9	05.0	350°07.0	9.3′	27°39.3	3.5′	54.7′
	SD = 15.7′	d = 0.2′	SD = 14.8′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°05.8	N23°05.2	4°35.3	9.3′	S27°42.8	3.3′	54.7′
1	195°05.7	05.4	19°03.6	9.2′	27°46.1	3.3′	54.7′
2	210°05.6	05.5	33°31.8	9.2′	27°49.4	3.1′	54.7′
3	225°05.4	·· 05.7	48°00.0	9.1′	27°52.5	2.9′	54.7′
4	240°05.3	05.9	62°28.1	9.1′	27°55.4	2.8′	54.7′
5	255°05.2	06.0	76°56.1	9.0′	27°58.2	2.7′	54.7′
6	270°05.0	N23°06.2	91°24.1	9.0′	S28°00.9	2.5′	54.8′
7	285°04.9	06.4	105°52.1	8.9′	28°03.4	2.4′	54.8′
8	300°04.8	06.6	120°20.0	8.9′	28°05.8	2.3′	54.8′
9	315°04.7	·· 06.7	134°47.9	8.8′	28°08.1	2.1′	54.8′
10	330°04.5	06.9	149°15.7	8.8′	28°10.2	1.9′	54.8′
11	345°04.4	07.1	163°43.5	8.7′	28°12.1	1.8′	54.8′
12	0°04.3	N23°07.2	178°11.2	8.7′	S28°13.9	1.7′	54.9′
13	15°04.2	07.4	192°39.0	8.7′	28°15.6	1.5′	54.9′
14	30°04.0	07.5	207°06.6	8.6′	28°17.1	1.4′	54.9′
15	45°03.9	·· 07.7	221°34.3	8.6′	28°18.5	1.2′	54.9′
16	60°03.8	07.9	236°01.9	8.6′	28°19.7	1.1′	54.9′
17	75°03.6	08.0	250°29.4	8.5′	28°20.8	0.9′	54.9′
18	90°03.5	N23°08.2	264°57.0	8.5′	S28°21.7	0.8′	54.9′
19	105°03.4	08.4	279°24.5	8.5′	28°22.5	0.6′	55.0′
20	120°03.3	08.5	293°52.0	8.5′	28°23.1	0.5′	55.0′
21	135°03.1	·· 08.7	308°19.4	8.4′	28°23.6	0.3′	55.0′
22	150°03.0	08.8	322°46.9	8.4′	28°23.9	0.2′	55.0′
23	165°02.9	09.0	337°14.3	8.4′	28°24.1	0.0′	55.0′
	SD = 15.7′	d = 0.2′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	00:27	23:39	–:–	–:–
64°	–:–	–:–	01:39	22:21	–:–	–:–
62°	–:–	–:–	02:14	21:46	–:–	–:–
60°	–:–	01:02	02:39	21:21	22:59	–:–
N 58°	–:–	01:46	02:59	21:01	22:14	–:–
56°	–:–	02:14	03:15	20:45	21:46	–:–
54°	00:57	02:35	03:29	20:31	21:25	23:04
52°	01:37	02:52	03:41	20:19	21:07	22:23
50°	02:03	03:07	03:51	20:08	20:52	21:57
45°	02:47	03:36	04:13	19:46	20:23	21:12
N 40°	03:17	03:58	04:31	19:28	20:01	20:42
35°	03:40	04:16	04:46	19:14	19:43	20:20
30°	03:58	04:31	04:58	19:01	19:28	20:01
20°	04:26	04:55	05:20	18:39	19:04	19:33
N 10°	04:49	05:16	05:39	18:20	18:43	19:10
0°	05:07	05:33	05:56	18:03	18:26	18:52
S 10°	05:24	05:50	06:13	17:46	18:09	18:35
20°	05:40	06:07	06:31	17:28	17:52	18:19
30°	05:56	06:26	06:52	17:07	17:33	18:03
35°	06:04	06:36	07:04	16:55	17:23	17:54
40°	06:14	06:48	07:18	16:41	17:11	17:45
45°	06:24	07:01	07:35	16:24	16:58	17:35
S 50°	06:35	07:17	07:55	16:04	16:42	17:24
52°	06:40	07:24	08:04	15:54	16:35	17:19
54°	06:46	07:32	08:15	15:44	16:27	17:13
56°	06:52	07:41	08:28	15:31	16:18	17:07
58°	06:58	07:51	08:42	15:17	16:08	17:00
S 60°	07:06	08:02	08:59	15:00	15:57	16:53

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°						
N 70°						
68°						
66°						
64°	22:04			00:10		
				23:26		
62°	21:00	23:07		00:38	00:30	00:10
60°	20:26	21:59	23:12	01:00	01:05	01:19
N 58°	20:01	21:24	22:31	01:18	01:30	01:54
56°	19:42	20:59	22:03	01:33	01:51	02:19
54°	19:25	20:39	21:42	01:46	02:07	02:40
52°	19:11	20:22	21:24	01:58	02:22	02:57
50°	18:59	20:07	21:08	02:08	02:35	03:11
45°	18:33	19:38	20:38	02:29	03:01	03:41
N 40°	18:13	19:15	20:14	02:47	03:21	04:04
35°	17:57	18:57	19:54	03:01	03:39	04:23
30°	17:42	18:41	19:37	03:14	03:54	04:40
20°	17:18	18:13	19:09	03:36	04:19	05:07
N 10°	16:57	17:50	18:44	03:55	04:41	05:31
0°	16:38	17:28	18:21	04:13	05:02	05:54
S 10°	16:19	17:07	17:59	04:31	05:23	06:16
20°	15:58	16:44	17:34	04:50	05:45	06:40
30°	15:34	16:17	17:06	05:12	06:11	07:08
35°	15:20	16:01	16:49	05:26	06:26	07:25
40°	15:04	15:43	16:30	05:41	06:44	07:44
45°	14:45	15:21	16:06	05:59	07:05	08:07
S 50°	14:22	14:53	15:36	06:21	07:32	08:37
52°	14:10	14:39	15:21	06:32	07:45	08:52
54°	13:58	14:24	15:04	06:45	08:01	09:10
56°	13:43	14:05	14:43	06:59	08:19	09:31
58°	13:26	13:43	14:16	07:16	08:41	09:57
S 60°	13:05	13:14	13:38	07:36	09:10	10:35

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 95-100%
09	00:47	00:41	11:59	22:50	10:25	
10	00:35	00:29	12:00	23:41	11:15	
11	00:23	00:17	12:00	–:–	12:08	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2237 sec ΔT = TT-UT1 = +68.9603 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	260°34.5	226°10.1	N11°02.8	110°53.3	N13°42.6	170°03.0	N23°16.6	258°40.9	S01°31.5
1	275°37.0	241°10.1	03.6	125°54.4	42.1	185°04.9	16.6	273°43.3	31.5
2	290°39.4	256°10.1	04.4	140°55.5	41.6	200°06.7	16.6	288°45.6	31.4
3	305°41.9	271°10.1	·· 05.2	155°56.7	·· 41.0	215°08.5	·· 16.6	303°47.9	·· 31.4
4	320°44.3	286°10.1	05.9	170°57.8	40.5	230°10.4	16.6	318°50.3	31.3
5	335°46.8	301°10.0	06.7	185°59.0	40.0	245°12.2	16.6	333°52.6	31.3
6	350°49.3	316°10.0	N11°07.5	201°00.1	N13°39.5	260°14.1	N23°16.7	348°55.0	S01°31.3
7	5°51.7	331°10.0	08.3	216°01.3	39.0	275°15.9	16.7	3°57.3	31.2
8	20°54.2	346°10.0	09.1	231°02.4	38.5	290°17.8	16.7	18°59.7	31.2
9	35°56.7	1°10.0	·· 09.8	246°03.6	·· 38.0	305°19.6	·· 16.7	34°02.0	·· 31.1
10	50°59.1	16°10.0	10.6	261°04.7	37.5	320°21.5	16.7	49°04.4	31.1
11	66°01.6	31°09.9	11.4	276°05.8	37.0	335°23.3	16.7	64°06.7	31.1
12	81°04.1	46°09.9	N11°12.2	291°07.0	N13°36.5	350°25.2	N23°16.7	79°09.1	S01°31.0
13	96°06.5	61°09.9	13.0	306°08.1	36.0	5°27.0	16.7	94°11.4	31.0
14	111°09.0	76°09.9	13.8	321°09.3	35.4	20°28.8	16.7	109°13.7	30.9
15	126°11.5	91°09.9	·· 14.5	336°10.4	·· 34.9	35°30.7	·· 16.7	124°16.1	·· 30.9
16	141°13.9	106°09.8	15.3	351°11.6	34.4	50°32.5	16.7	139°18.4	30.9
17	156°16.4	121°09.8	16.1	6°12.7	33.9	65°34.4	16.7	154°20.8	30.8
18	171°18.8	136°09.8	N11°16.9	21°13.9	N13°33.4	80°36.2	N23°16.7	169°23.1	S01°30.8
19	186°21.3	151°09.8	17.7	36°15.0	32.9	95°38.1	16.7	184°25.5	30.7
20	201°23.8	166°09.7	18.5	51°16.1	32.4	110°39.9	16.7	199°27.8	30.7
21	216°26.2	181°09.7	·· 19.2	66°17.3	·· 31.9	125°41.8	·· 16.7	214°30.2	·· 30.7
22	231°28.7	196°09.7	20.0	81°18.4	31.4	140°43.6	16.7	229°32.5	30.6
23	246°31.2	211°09.7	20.8	96°19.6	30.8	155°45.5	16.7	244°34.9	30.6
Mer.pass. 06:37		ν -0.0′	d 0.8′	m -4.29	ν 1.1′	d -0.5′	m 1.37	ν 1.8′	d 0.0′ m -1.90	ν 2.3′	d 0.0′ m 1.04

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	261°33.6	226°09.6	N11°21.6	111°20.7	N13°30.3	170°47.3	N23°16.7	259°37.2	S01°30.5
1	276°36.1	241°09.6	22.4	126°21.9	29.8	185°49.1	16.7	274°39.6	30.5
2	291°38.6	256°09.6	23.1	141°23.0	29.3	200°51.0	16.7	289°41.9	30.5
3	306°41.0	271°09.5	·· 23.9	156°24.1	·· 28.8	215°52.8	·· 16.7	304°44.3	·· 30.4
4	321°43.5	286°09.5	24.7	171°25.3	28.3	230°54.7	16.7	319°46.6	30.4
5	336°46.0	301°09.5	25.5	186°26.4	27.8	245°56.5	16.7	334°48.9	30.3
6	351°48.4	316°09.4	N11°26.3	201°27.6	N13°27.3	260°58.4	N23°16.7	349°51.3	S01°30.3
7	6°50.9	331°09.4	27.1	216°28.7	26.7	276°00.2	16.7	4°53.6	30.3
8	21°53.3	346°09.4	27.8	231°29.9	26.2	291°02.1	16.7	19°56.0	30.2
9	36°55.8	1°09.3	·· 28.6	246°31.0	·· 25.7	306°03.9	·· 16.7	34°58.3	·· 30.2
10	51°58.3	16°09.3	29.4	261°32.2	25.2	321°05.8	16.7	50°00.7	30.2
11	67°00.7	31°09.3	30.2	276°33.3	24.7	336°07.6	16.7	65°03.0	30.1
12	82°03.2	46°09.2	N11°31.0	291°34.4	N13°24.2	351°09.4	N23°16.7	80°05.4	S01°30.1
13	97°05.7	61°09.2	31.7	306°35.6	23.7	6°11.3	16.7	95°07.7	30.0
14	112°08.1	76°09.2	32.5	321°36.7	23.2	21°13.1	16.7	110°10.1	30.0
15	127°10.6	91°09.1	·· 33.3	336°37.9	·· 22.6	36°15.0	·· 16.7	125°12.4	·· 30.0
16	142°13.1	106°09.1	34.1	351°39.0	22.1	51°16.8	16.7	140°14.8	29.9
17	157°15.5	121°09.0	34.9	6°40.1	21.6	66°18.7	16.7	155°17.1	29.9
18	172°18.0	136°09.0	N11°35.7	21°41.3	N13°21.1	81°20.5	N23°16.7	170°19.5	S01°29.9
19	187°20.5	151°09.0	36.4	36°42.4	20.6	96°22.4	16.7	185°21.8	29.8
20	202°22.9	166°08.9	37.2	51°43.6	20.1	111°24.2	16.7	200°24.2	29.8
21	217°25.4	181°08.9	·· 38.0	66°44.7	·· 19.6	126°26.0	·· 16.7	215°26.5	·· 29.7
22	232°27.8	196°08.8	38.8	81°45.9	19.0	141°27.9	16.7	230°28.9	29.7
23	247°30.3	211°08.8	39.6	96°47.0	18.5	156°29.7	16.7	245°31.2	29.7
Mer.pass. 06:33		ν -0.0′	d 0.8′	m -4.28	ν 1.1′	d -0.5′	m 1.38	ν 1.8′	d 0.0′ m -1.90	ν 2.3′	d 0.0′ m 1.04

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	262°32.8	226°08.8	N11°40.3	111°48.1	N13°18.0	171°31.6	N23°16.7	260°33.6	S01°29.6
1	277°35.2	241°08.7	41.1	126°49.3	17.5	186°33.4	16.7	275°35.9	29.6
2	292°37.7	256°08.7	41.9	141°50.4	17.0	201°35.3	16.7	290°38.3	29.6
3	307°40.2	271°08.6	·· 42.7	156°51.6	·· 16.5	216°37.1	·· 16.7	305°40.6	·· 29.5
4	322°42.6	286°08.6	43.5	171°52.7	15.9	231°39.0	16.7	320°43.0	29.5
5	337°45.1	301°08.5	44.2	186°53.9	15.4	246°40.8	16.7	335°45.3	29.4
6	352°47.6	316°08.5	N11°45.0	201°55.0	N13°14.9	261°42.7	N23°16.7	350°47.7	S01°29.4
7	7°50.0	331°08.4	45.8	216°56.1	14.4	276°44.5	16.7	5°50.0	29.4
8	22°52.5	346°08.4	46.6	231°57.3	13.9	291°46.3	16.7	20°52.4	29.3
9	37°55.0	1°08.3	·· 47.4	246°58.4	·· 13.4	306°48.2	·· 16.7	35°54.7	·· 29.3
10	52°57.4	16°08.3	48.1	261°59.6	12.8	321°50.0	16.7	50°57.1	29.3
11	67°59.9	31°08.2	48.9	277°00.7	12.3	336°51.9	16.7	65°59.5	29.2
12	83°02.3	46°08.2	N11°49.7	292°01.8	N13°11.8	351°53.7	N23°16.7	81°01.8	S01°29.2
13	98°04.8	61°08.1	50.5	307°03.0	11.3	6°55.6	16.7	96°04.2	29.1
14	113°07.3	76°08.1	51.3	322°04.1	10.8	21°57.4	16.7	111°06.5	29.1
15	128°09.7	91°08.0	·· 52.0	337°05.3	·· 10.3	36°59.3	·· 16.7	126°08.9	·· 29.1
16	143°12.2	106°08.0	52.8	352°06.4	09.7	52°01.1	16.7	141°11.2	29.0
17	158°14.7	121°07.9	53.6	7°07.5	09.2	67°02.9	16.7	156°13.6	29.0
18	173°17.1	136°07.9	N11°54.4	22°08.7	N13°08.7	82°04.8	N23°16.7	171°15.9	S01°29.0
19	188°19.6	151°07.8	55.2	37°09.8	08.2	97°06.6	16.7	186°18.3	28.9
20	203°22.1	166°07.8	55.9	52°11.0	07.7	112°08.5	16.7	201°20.6	28.9
21	218°24.5	181°07.7	·· 56.7	67°12.1	·· 07.1	127°10.3	·· 16.7	216°23.0	·· 28.9
22	233°27.0	196°07.6	57.5	82°13.3	06.6	142°12.2	16.7	231°25.3	28.8
23	248°29.4	211°07.6	58.3	97°14.4	06.1	157°14.0	16.7	246°27.7	28.8
Mer.pass. 06:29		ν -0.0′	d 0.8′	m -4.27	ν 1.1′	d -0.5′	m 1.39	ν 1.8′	d 0.0′ m -1.90	ν 2.4′	d 0.0′ m 1.03

Stars

	SHA	Dec
Alpheratz	357°34.5	29°13.7
Ankaa	353°06.9	-42°09.8
Schedar	349°30.8	56°40.3
Diphda	348°47.1	-17°50.7
Achernar	335°20.2	-57°06.2
Hamal	327°51.0	23°34.9
Polaris	314°15.8	89°22.1
Acamar	315°11.9	-40°12.0
Menkar	314°06.1	4°11.4
Mirfak	308°28.2	49°56.9
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.9	46°01.4
Bellatrix	278°22.8	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.1	7°24.7
Canopus	263°52.8	-52°42.6
Sirius	258°26.3	-16°45.1
Adhara	255°06.0	-29°00.4
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.1	-59°35.6
Suhail	222°46.3	-43°32.3
Miaplacidus	221°38.8	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°37.1
Denebola	182°24.6	14°25.8
Gienah	175°43.2	-17°41.1
Acrux	172°59.6	-63°14.7
Gacrux	171°51.1	-57°15.6
Alioth	166°12.4	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.0
Rigil Kent.	139°39.3	-60°56.6
Kochab	137°18.8	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.4
Sabik	102°02.0	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°29.0
Kaus Aust.	83°31.7	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.7	-56°39.0
Deneb	49°25.3	45°22.0
Enif	33°38.3	9°59.4
Al Na'ir	27°32.3	-46°50.0
Fomalhaut	15°14.1	-29°29.1
Scheat	13°44.8	28°13.1
Markab	13°29.5	15°20.4

Jun 12 Thu	SHA	Mer.pass
Venus	325°35.6	08:55
Mars	210°18.8	16:35
Jupiter	269°28.5	12:38
Saturn	358°06.4	06:44

Jun 13 Fri	SHA	Mer.pass
Venus	324°36.0	08:55
Mars	209°47.1	16:33
Jupiter	269°13.7	12:35
Saturn	358°03.6	06:40

Jun 14 Sat	SHA	Mer.pass
Venus	323°36.0	08:55
Mars	209°15.4	16:32
Jupiter	268°58.8	12:32
Saturn	358°00.8	06:37

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	Sun		Moon				
h Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°02.7	N23°09.1	351°41.7	8.4′	S28°24.1	0.1′	55.0′
1	195°02.6	09.3	6°09.0	8.4′	28°24.0	0.3′	55.1′
2	210°02.5	09.5	20°36.4	8.3′	28°23.7	0.4′	55.1′
3	225°02.4	·· 09.6	35°03.7	8.3′	28°23.3	0.6′	55.1′
4	240°02.2	09.8	49°31.0	8.3′	28°22.7	0.7′	55.1′
5	255°02.1	09.9	63°58.4	8.3′	28°22.0	0.9′	55.1′
6	270°02.0	N23°10.1	78°25.6	8.3′	S28°21.1	1.0′	55.1′
7	285°01.8	10.2	92°52.9	8.3′	28°20.1	1.2′	55.2′
8	300°01.7	10.4	107°20.2	8.3′	28°18.9	1.3′	55.2′
9	315°01.6	·· 10.5	121°47.5	8.3′	28°17.6	1.5′	55.2′
10	330°01.5	10.7	136°14.7	8.3′	28°16.1	1.6′	55.2′
11	345°01.3	10.8	150°42.0	8.3′	28°14.5	1.8′	55.2′
12	0°01.2	N23°11.0	165°09.2	8.3′	S28°12.7	1.9′	55.3′
13	15°01.1	11.1	179°36.5	8.3′	28°10.8	2.1′	55.3′
14	30°00.9	11.3	194°03.8	8.3′	28°08.7	2.2′	55.3′
15	45°00.8	·· 11.4	208°31.0	8.3′	28°06.5	2.4′	55.3′
16	60°00.7	11.6	222°58.3	8.3′	28°04.1	2.6′	55.3′
17	75°00.6	11.7	237°25.5	8.3′	28°01.5	2.7′	55.3′
18	90°00.4	N23°11.8	251°52.8	8.3′	S27°58.8	2.8′	55.4′
19	105°00.3	12.0	266°20.1	8.3′	27°56.0	3.0′	55.4′
20	120°00.2	12.1	280°47.4	8.3′	27°53.0	3.2′	55.4′
21	135°00.0	·· 12.3	295°14.7	8.3′	27°49.8	3.2′	55.4′
22	149°59.9	12.4	309°42.0	8.3′	27°46.6	3.5′	55.4′
23	164°59.8	12.6	324°09.3	8.3′	27°43.1	3.6′	55.5′
	SD = 15.7′	d = 0.2′		SD = 15.0′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.6	N23°12.7	338°36.7	8.4′	S27°39.5	3.7′	55.5′
1	194°59.5	12.8	353°04.1	8.4′	27°35.8	3.9′	55.5′
2	209°59.4	13.0	7°31.4	8.4′	27°31.9	4.1′	55.5′
3	224°59.3	·· 13.1	21°58.8	8.4′	27°27.8	4.2′	55.5′
4	239°59.1	13.2	36°26.3	8.4′	27°23.6	4.3′	55.5′
5	254°59.0	13.4	50°53.7	8.5′	27°19.3	4.5′	55.6′
6	269°58.9	N23°13.5	65°21.2	8.5′	S27°14.8	4.7′	55.6′
7	284°58.7	13.7	79°48.7	8.5′	27°10.1	4.8′	55.6′
8	299°58.6	13.8	94°16.2	8.6′	27°05.3	4.9′	55.6′
9	314°58.5	·· 13.9	108°43.8	8.6′	27°00.4	5.1′	55.6′
10	329°58.3	14.1	123°11.4	8.6′	26°55.3	5.2′	55.7′
11	344°58.2	14.2	137°39.0	8.6′	26°50.1	5.4′	55.7′
12	359°58.1	N23°14.3	152°06.6	8.7′	S26°44.7	5.5′	55.7′
13	14°57.9	14.4	166°34.3	8.7′	26°39.2	5.7′	55.7′
14	29°57.8	14.6	181°02.0	8.8′	26°33.5	5.8′	55.7′
15	44°57.7	·· 14.7	195°29.8	8.8′	26°27.7	6.0′	55.8′
16	59°57.6	14.8	209°57.6	8.8′	26°21.7	6.1′	55.8′
17	74°57.4	15.0	224°25.4	8.9′	26°15.6	6.2′	55.8′
18	89°57.3	N23°15.1	238°53.3	8.9′	S26°09.4	6.4′	55.8′
19	104°57.2	15.2	253°21.2	8.9′	26°03.0	6.5′	55.8′
20	119°57.0	15.3	267°49.1	9.0′	25°56.5	6.7′	55.9′
21	134°56.9	·· 15.5	282°17.1	9.0′	25°49.8	6.8′	55.9′
22	149°56.8	15.6	296°45.1	9.1′	25°43.0	6.9′	55.9′
23	164°56.6	15.7	311°13.2	9.1′	25°36.1	7.1′	55.9′
	SD = 15.7′	d = 0.1′		SD = 15.1′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°56.5	N23°15.8	325°41.3	9.2′	S25°29.0	7.2′	55.9′
1	194°56.4	16.0	340°09.5	9.2′	25°21.8	7.4′	56.0′
2	209°56.2	16.1	354°37.7	9.3′	25°14.4	7.5′	56.0′
3	224°56.1	·· 16.2	9°06.0	9.3′	25°06.9	7.6′	56.0′
4	239°56.0	16.3	23°34.3	9.4′	24°59.3	7.8′	56.0′
5	254°55.8	16.4	38°02.6	9.4′	24°51.5	7.9′	56.0′
6	269°55.7	N23°16.6	52°31.0	9.5′	S24°43.6	8.0′	56.1′
7	284°55.6	16.7	66°59.5	9.5′	24°35.6	8.2′	56.1′
8	299°55.4	16.8	81°28.0	9.6′	24°27.4	8.3′	56.1′
9	314°55.3	·· 16.9	95°56.5	9.6′	24°19.1	8.4′	56.1′
10	329°55.2	17.0	110°25.1	9.7′	24°10.7	8.6′	56.1′
11	344°55.1	17.1	124°53.8	9.7′	24°02.1	8.7′	56.2′
12	359°54.9	N23°17.3	139°22.5	9.8′	S23°53.4	8.8′	56.2′
13	14°54.8	17.4	153°51.3	9.8′	23°44.6	9.0′	56.2′
14	29°54.7	17.5	168°20.1	9.9′	23°35.6	9.0′	56.2′
15	44°54.5	·· 17.6	182°49.0	9.9′	23°26.6	9.3′	56.3′
16	59°54.4	17.7	197°17.9	10.0′	23°17.3	9.3′	56.3′
17	74°54.3	17.8	211°46.9	10.0′	23°08.0	9.4′	56.3′
18	89°54.1	N23°17.9	226°15.9	10.1′	S22°58.6	9.6′	56.3′
19	104°54.0	18.0	240°45.0	10.1′	22°49.0	9.7′	56.3′
20	119°53.9	18.1	255°14.1	10.2′	22°39.3	9.8′	56.4′
21	134°53.7	·· 18.2	269°43.3	10.3′	22°29.5	10.0′	56.4′
22	149°53.6	18.4	284°12.6	10.3′	22°19.5	10.0′	56.4′
23	164°53.5	18.5	298°41.9	10.4′	22°09.5	10.2′	56.4′
	SD = 15.7′	d = 0.1′		SD = 15.3′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	-:-	-:-	01:35	22:26	-:-	-:-
62°	-:-	-:-	02:11	21:50	-:-	-:-
60°	-:-	00:56	02:37	21:24	23:06	-:-
N 58°	-:-	01:43	02:57	21:04	22:18	-:-
56°	-:-	02:12	03:14	20:47	21:49	-:-
54°	00:51	02:34	03:28	20:33	21:27	23:11
52°	01:34	02:51	03:40	20:21	21:09	22:27
50°	02:01	03:06	03:50	20:10	20:54	21:59
45°	02:46	03:35	04:13	19:48	20:25	21:14
N 40°	03:16	03:58	04:31	19:30	20:03	20:44
35°	03:39	04:16	04:45	19:15	19:45	20:21
30°	03:58	04:31	04:58	19:02	19:29	20:03
20°	04:27	04:56	05:20	18:40	19:05	19:34
N 10°	04:49	05:16	05:39	18:21	18:44	19:11
0°	05:08	05:34	05:56	18:04	18:26	18:52
S 10°	05:25	05:51	06:14	17:46	18:09	18:36
20°	05:41	06:08	06:32	17:28	17:52	18:20
30°	05:57	06:27	06:53	17:07	17:33	18:03
35°	06:06	06:37	07:05	16:55	17:23	17:55
40°	06:15	06:49	07:19	16:41	17:11	17:45
45°	06:25	07:02	07:36	16:24	16:58	17:35
S 50°	06:37	07:18	07:57	16:03	16:42	17:23
52°	06:42	07:26	08:06	15:54	16:34	17:18
54°	06:48	07:34	08:17	15:43	16:26	17:13
56°	06:54	07:43	08:30	15:30	16:17	17:06
58°	07:00	07:53	08:44	15:16	16:07	17:00
S 60°	07:08	08:04	09:02	14:58	15:56	16:52

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°						
N 70°						
68°						
66°						
64°			01:28			03:27
62°		00:52	00:34		02:11	04:20
60°	23:48	·· ··	00:02	01:57	03:14	04:52
N 58°	23:14	23:37	23:49	02:38	03:48	05:16
56°	22:49	23:18	23:35	03:06	04:13	05:35
54°	22:29	23:01	23:23	03:27	04:33	05:51
52°	22:12	22:47	23:12	03:45	04:49	06:05
50°	21:58	22:35	23:02	04:01	05:04	06:17
45°	21:28	22:09	22:42	04:32	05:33	06:41
N 40°	21:05	21:49	22:25	04:56	05:55	07:01
35°	20:46	21:32	22:11	05:15	06:14	07:17
30°	20:30	21:17	21:59	05:32	06:30	07:31
20°	20:02	20:52	21:37	06:00	06:57	07:55
N 10°	19:38	20:30	21:19	06:25	07:20	08:16
0°	19:16	20:10	21:02	06:48	07:42	08:35
S 10°	18:53	19:49	20:44	07:10	08:03	08:54
20°	18:30	19:27	20:26	07:34	08:26	09:14
30°	18:02	19:02	20:04	08:03	08:53	09:37
35°	17:45	18:47	19:51	08:19	09:08	09:51
40°	17:26	18:29	19:37	08:39	09:26	10:06
45°	17:03	18:08	19:19	09:02	09:48	10:25
S 50°	16:33	17:41	18:57	09:33	10:16	10:48
52°	16:18	17:28	18:47	09:48	10:29	10:59
54°	16:00	17:13	18:35	10:05	10:44	11:11
56°	15:40	16:55	18:22	10:26	11:03	11:25
58°	15:13	16:34	18:06	10:52	11:24	11:42
S 60°	14:36	16:06	17:47	11:29	11:53	12:01

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 99-93%
12	00:11	00:05	12:00	00:34	13:02	
13	00:01	00:08	12:00	01:29	13:56	
14	00:14	00:20	12:00	02:22	14:48	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	263°31.9	226°07.5	N11°59.1	112°15.5	N13°05.6	172°15.9	N23°16.7	261°30.0	S01°28.7
1	278°34.4	241°07.5	11°59.8	127°16.7	05.1	187°17.7	16.7	276°32.4	28.7
2	293°36.8	256°07.4	12°00.6	142°17.8	04.6	202°19.5	16.7	291°34.8	28.7
3	308°39.3	271°07.3	·· 01.4	157°19.0	·· 04.0	217°21.4	·· 16.7	306°37.1	·· 28.6
4	323°41.8	286°07.3	02.2	172°20.1	03.5	232°23.2	16.7	321°39.5	28.6
5	338°44.2	301°07.2	02.9	187°21.2	03.0	247°25.1	16.7	336°41.8	28.6
6	353°46.7	316°07.2	N12°03.7	202°22.4	N13°02.5	262°26.9	N23°16.7	351°44.2	S01°28.5
7	8°49.2	331°07.1	04.5	217°23.5	02.0	277°28.8	16.7	6°46.5	28.5
8	23°51.6	346°07.0	05.3	232°24.7	01.4	292°30.6	16.7	21°48.9	28.5
9	38°54.1	1°07.0	·· 06.1	247°25.8	·· 00.9	307°32.5	·· 16.7	36°51.2	·· 28.4
10	53°56.6	16°06.9	06.8	262°26.9	13°00.4	322°34.3	16.7	51°53.6	28.4
11	68°59.0	31°06.8	07.6	277°28.1	12°59.9	337°36.1	16.7	66°56.0	28.4
12	84°01.5	46°06.8	N12°08.4	292°29.2	N12°59.4	352°38.0	N23°16.7	81°58.3	S01°28.3
13	99°03.9	61°06.7	09.2	307°30.4	58.8	7°39.8	16.7	97°00.7	28.3
14	114°06.4	76°06.6	10.0	322°31.5	58.3	22°41.7	16.7	112°03.0	28.2
15	129°08.9	91°06.6	·· 10.7	337°32.6	·· 57.8	37°43.5	·· 16.7	127°05.4	·· 28.2
16	144°11.3	106°06.5	11.5	352°33.8	57.3	52°45.4	16.7	142°07.7	28.2
17	159°13.8	121°06.4	12.3	7°34.9	56.7	67°47.2	16.7	157°10.1	28.1
18	174°16.3	136°06.4	N12°13.1	22°36.0	N12°56.2	82°49.0	N23°16.7	172°12.4	S01°28.1
19	189°18.7	151°06.3	13.8	37°37.2	55.7	97°50.9	16.7	187°14.8	28.1
20	204°21.2	166°06.2	14.6	52°38.3	55.2	112°52.7	16.7	202°17.2	28.0
21	219°23.7	181°06.1	·· 15.4	67°39.5	·· 54.7	127°54.6	·· 16.7	217°19.5	·· 28.0
22	234°26.1	196°06.1	16.2	82°40.6	54.1	142°56.4	16.7	232°21.9	28.0
23	249°28.6	211°06.0	16.9	97°41.7	53.6	157°58.3	16.7	247°24.2	27.9
Mer.pass.	06:25	ν -0.1′	d 0.8′	m -4.26	ν 1.1′	d -0.5′	m 1.40	ν 1.8′	d -0.0′	m -1.90	ν 2.4′	d 0.0′	m 1.03

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	264°31.1	226°05.9	N12°17.7	112°42.9	N12°53.1	173°00.1	N23°16.7	262°26.6	S01°27.9
1	279°33.5	241°05.8	18.5	127°44.0	52.6	188°02.0	16.7	277°28.9	27.9
2	294°36.0	256°05.8	19.3	142°45.2	52.0	203°03.8	16.6	292°31.3	27.8
3	309°38.4	271°05.7	·· 20.1	157°46.3	·· 51.5	218°05.6	·· 16.6	307°33.7	·· 27.8
4	324°40.9	286°05.6	20.8	172°47.4	51.0	233°07.5	16.6	322°36.0	27.8
5	339°43.4	301°05.5	21.6	187°48.6	50.5	248°09.3	16.6	337°38.4	27.7
6	354°45.8	316°05.5	N12°22.4	202°49.7	N12°50.0	263°11.2	N23°16.6	352°40.7	S01°27.7
7	9°48.3	331°05.4	23.2	217°50.9	49.4	278°13.0	16.6	7°43.1	27.7
8	24°50.8	346°05.3	23.9	232°52.0	48.9	293°14.9	16.6	22°45.5	27.6
9	39°53.2	1°05.2	·· 24.7	247°53.1	·· 48.4	308°16.7	·· 16.6	37°47.8	·· 27.6
10	54°55.7	16°05.1	25.5	262°54.3	47.9	323°18.6	16.6	52°50.2	27.6
11	69°58.2	31°05.1	26.3	277°55.4	47.3	338°20.4	16.6	67°52.5	27.5
12	85°00.6	46°05.0	N12°27.0	292°56.5	N12°46.8	353°22.2	N23°16.6	82°54.9	S01°27.5
13	100°03.1	61°04.9	27.8	307°57.7	46.3	8°24.1	16.6	97°57.2	27.5
14	115°05.6	76°04.8	28.6	322°58.8	45.8	23°25.9	16.6	112°59.6	27.4
15	130°08.0	91°04.7	·· 29.4	338°00.0	·· 45.2	38°27.8	·· 16.6	128°02.0	·· 27.4
16	145°10.5	106°04.6	30.1	353°01.1	44.7	53°29.6	16.6	143°04.3	27.4
17	160°12.9	121°04.6	30.9	8°02.2	44.2	68°31.5	16.6	158°06.7	27.3
18	175°15.4	136°04.5	N12°31.7	23°03.4	N12°43.7	83°33.3	N23°16.6	173°09.0	S01°27.3
19	190°17.9	151°04.4	32.5	38°04.5	43.1	98°35.1	16.6	188°11.4	27.3
20	205°20.3	166°04.3	33.2	53°05.6	42.6	113°37.0	16.6	203°13.8	27.2
21	220°22.8	181°04.2	·· 34.0	68°06.8	·· 42.1	128°38.8	·· 16.6	218°16.1	·· 27.2
22	235°25.3	196°04.1	34.8	83°07.9	41.6	143°40.7	16.6	233°18.5	27.2
23	250°27.7	211°04.0	35.6	98°09.1	41.0	158°42.5	16.6	248°20.9	27.1
Mer.pass.	06:21	ν -0.1′	d 0.8′	m -4.25	ν 1.1′	d -0.5′	m 1.40	ν 1.8′	d -0.0′	m -1.90	ν 2.4′	d 0.0′	m 1.02

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	265°30.2	226°04.0	N12°36.3	113°10.2	N12°40.5	173°44.4	N23°16.6	263°23.2	S01°27.1
1	280°32.7	241°03.9	37.1	128°11.3	40.0	188°46.2	16.6	278°25.6	27.1
2	295°35.1	256°03.8	37.9	143°12.5	39.5	203°48.0	16.6	293°27.9	27.0
3	310°37.6	271°03.7	·· 38.6	158°13.6	·· 38.9	218°49.9	·· 16.6	308°30.3	·· 27.0
4	325°40.0	286°03.6	39.4	173°14.7	38.4	233°51.7	16.6	323°32.7	27.0
5	340°42.5	301°03.5	40.2	188°15.9	37.9	248°53.6	16.6	338°35.0	26.9
6	355°45.0	316°03.4	N12°41.0	203°17.0	N12°37.4	263°55.4	N23°16.6	353°37.4	S01°26.9
7	10°47.4	331°03.3	41.7	218°18.1	36.8	278°57.3	16.6	8°39.7	26.9
8	25°49.9	346°03.2	42.5	233°19.3	36.3	293°59.1	16.6	23°42.1	26.8
9	40°52.4	1°03.1	·· 43.3	248°20.4	·· 35.8	309°01.0	·· 16.6	38°44.5	·· 26.8
10	55°54.8	16°03.0	44.1	263°21.6	35.2	324°02.8	16.6	53°46.8	26.8
11	70°57.3	31°02.9	44.8	278°22.7	34.7	339°04.6	16.6	68°49.2	26.7
12	85°59.8	46°02.8	N12°45.6	293°23.8	N12°34.2	354°06.5	N23°16.6	83°51.6	S01°26.7
13	101°02.2	61°02.7	46.4	308°25.0	33.7	9°08.3	16.6	98°53.9	26.7
14	116°04.7	76°02.6	47.1	323°26.1	33.1	24°10.2	16.6	113°56.3	26.6
15	131°07.2	91°02.5	·· 47.9	338°27.2	·· 32.6	39°12.0	·· 16.5	128°58.6	·· 26.6
16	146°09.6	106°02.4	48.7	353°28.4	32.1	54°13.9	16.5	144°01.0	26.6
17	161°12.1	121°02.3	49.5	8°29.5	31.5	69°15.7	16.5	159°03.4	26.5
18	176°14.5	136°02.2	N12°50.2	23°30.6	N12°31.0	84°17.5	N23°16.5	174°05.7	S01°26.5
19	191°17.0	151°02.1	51.0	38°31.8	30.5	99°19.4	16.5	189°08.1	26.5
20	206°19.5	166°02.0	51.8	53°32.9	30.0	114°21.2	16.5	204°10.5	26.5
21	221°21.9	181°01.9	·· 52.5	68°34.1	·· 29.4	129°23.1	·· 16.5	219°12.8	·· 26.4
22	236°24.4	196°01.8	53.3	83°35.2	28.9	144°24.9	16.5	234°15.2	26.4
23	251°26.9	211°01.7	54.1	98°36.3	28.4	159°26.8	16.5	249°17.6	26.4
Mer.pass.	06:17	ν -0.1′	d 0.8′	m -4.24	ν 1.1′	d -0.5′	m 1.41	ν 1.8′	d -0.0′	m -1.90	ν 2.4′	d 0.0′	m 1.02

Stars

	SHA	Dec
Alpheratz	357°34.5	29°13.7
Ankaa	353°06.9	-42°09.8
Schedar	349°30.8	56°40.4
Diphda	348°47.0	-17°50.7
Achernar	335°20.2	-57°06.2
Hamal	327°51.0	23°34.9
Polaris	314°14.7	89°22.1
Acamar	315°11.8	-40°12.0
Menkar	314°06.0	4°11.4
Mirfak	308°28.2	49°56.9
Aldebaran	290°39.6	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.8	46°01.4
Bellatrix	278°22.8	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.5
Sirius	258°26.3	-16°45.1
Adhara	255°06.0	-29°00.4
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.1	-59°35.6
Suhail	222°46.4	-43°32.3
Miaplacidus	221°38.8	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°37.1
Denebola	182°24.6	14°25.8
Gienah	175°43.2	-17°41.1
Acrux	172°59.6	-63°14.7
Gacrux	171°51.1	-57°15.6
Alioth	166°12.5	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.4	49°11.3
Hadar	148°35.1	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.0
Rigil Kent.	139°39.3	-60°56.7
Kochab	137°18.9	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.4
Sabik	102°02.0	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.4
Eltanin	90°41.5	51°29.0
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.7	-56°39.0
Deneb	49°25.2	45°22.1
Enif	33°38.3	9°59.4
Al Na'ir	27°32.3	-46°50.0
Fomalhaut	15°14.0	-29°29.1
Scheat	13°44.8	28°13.1
Markab	13°29.5	15°20.4

Jun 15 Sun	SHA	Mer.pass
Venus	322°35.6	08:56
Mars	208°43.6	16:30
Jupiter	268°43.9	12:29
Saturn	357°58.1	06:33

Jun 16 Mon	SHA	Mer.pass
Venus	321°34.9	08:56
Mars	208°11.8	16:28
Jupiter	268°29.1	12:26
Saturn	357°55.5	06:29

Jun 17 Tue	SHA	Mer.pass
Venus	320°33.8	08:56
Mars	207°40.0	16:26
Jupiter	268°14.2	12:24
Saturn	357°53.0	06:25

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		179°53.3	N23°18.6	313°11.3	10.4′	S21°59.3	10.3′	56.5′
1		194°53.2	18.7	327°40.7	10.5′	21°49.0	10.4′	56.5′
2		209°53.1	18.8	342°10.2	10.5′	21°38.6	10.6′	56.5′
3		224°52.9	·· 18.9	356°39.7	10.6′	21°28.0	10.6′	56.5′
4		239°52.8	19.0	11°09.3	10.7′	21°17.4	10.8′	56.5′
5		254°52.7	19.1	25°39.0	10.7′	21°06.6	10.8′	56.6′
6		269°52.5	N23°19.2	40°08.7	10.8′	S20°55.8	11.0′	56.6′
7		284°52.4	19.3	54°38.5	10.8′	20°44.8	11.1′	56.6′
8		299°52.3	19.4	69°08.3	10.9′	20°33.7	11.2′	56.6′
9		314°52.1	·· 19.5	83°38.2	10.9′	20°22.5	11.4′	56.7′
10		329°52.0	19.6	98°08.1	11.0′	20°11.1	11.4′	56.7′
11		344°51.9	19.7	112°38.1	11.0′	19°59.7	11.5′	56.7′
12		359°51.7	N23°19.8	127°08.1	11.1′	S19°48.2	11.6′	56.7′
13		14°51.6	19.9	141°38.2	11.2′	19°36.6	11.8′	56.7′
14		29°51.5	20.0	156°08.4	11.2′	19°24.8	11.8′	56.8′
15		44°51.3	·· 20.1	170°38.6	11.3′	19°13.0	12.0′	56.8′
16		59°51.2	20.2	185°08.9	11.3′	19°01.0	12.0′	56.8′
17		74°51.1	20.3	199°39.2	11.4′	18°49.0	12.2′	56.8′
18		89°50.9	N23°20.3	214°09.6	11.4′	S18°36.8	12.2′	56.9′
19		104°50.8	20.4	228°40.0	11.5′	18°24.6	12.4′	56.9′
20		119°50.7	20.5	243°10.5	11.5′	18°12.2	12.4′	56.9′
21		134°50.5	·· 20.6	257°41.0	11.6′	17°59.8	12.6′	56.9′
22		149°50.4	20.7	272°11.6	11.6′	17°47.2	12.6′	57.0′
23		164°50.3	20.8	286°42.2	11.7′	17°34.6	12.8′	57.0′
		SD = 15.7′	d = 0.1′	SD = 15.4′				

Mon	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°50.1	N23°20.9	301°12.9	11.7′	S17°21.8	12.8′	57.0′
1		194°50.0	21.0	315°43.6	11.8′	17°09.0	12.9′	57.0′
2		209°49.8	21.1	330°14.4	11.8′	16°56.1	13.0′	57.0′
3		224°49.7	·· 21.1	344°45.2	11.9′	16°43.1	13.1′	57.1′
4		239°49.6	21.2	359°16.1	11.9′	16°30.0	13.2′	57.1′
5		254°49.4	21.3	13°47.0	12.0′	16°16.8	13.3′	57.1′
6		269°49.3	N23°21.4	28°18.0	12.0′	S16°03.5	13.4′	57.1′
7		284°49.2	21.5	42°49.0	12.1′	15°50.1	13.4′	57.2′
8		299°49.0	21.6	57°20.1	12.1′	15°36.7	13.5′	57.2′
9		314°48.9	·· 21.7	71°51.2	12.2′	15°23.2	13.7′	57.2′
10		329°48.8	21.7	86°22.4	12.2′	15°09.5	13.7′	57.2′
11		344°48.6	21.8	100°53.6	12.2′	14°55.8	13.8′	57.3′
12		359°48.5	N23°21.9	115°24.8	12.3′	S14°42.0	13.8′	57.3′
13		14°48.4	22.0	129°56.1	12.3′	14°28.2	14.0′	57.3′
14		29°48.2	22.0	144°27.4	12.4′	14°14.2	14.0′	57.3′
15		44°48.1	·· 22.1	158°58.8	12.4′	14°00.2	14.1′	57.4′
16		59°48.0	22.2	173°30.2	12.4′	13°46.1	14.2′	57.4′
17		74°47.8	22.3	188°01.6	12.5′	13°31.9	14.2′	57.4′
18		89°47.7	N23°22.4	202°33.1	12.5′	S13°17.7	14.3′	57.4′
19		104°47.6	22.4	217°04.6	12.5′	13°03.4	14.4′	57.5′
20		119°47.4	22.5	231°36.1	12.6′	12°49.0	14.5′	57.5′
21		134°47.3	·· 22.6	246°07.7	12.6′	12°34.5	14.5′	57.5′
22		149°47.2	22.7	260°39.3	12.6′	12°20.0	14.7′	57.5′
23		164°47.0	22.7	275°11.0	12.7′	12°05.3	14.6′	57.6′
		SD = 15.7′	d = 0.1′	SD = 15.5′				

Tue	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°46.9	N23°22.8	289°42.7	12.7′	S11°50.7	14.8′	57.6′
1		194°46.7	22.9	304°14.4	12.7′	11°35.9	14.8′	57.6′
2		209°46.6	22.9	318°46.1	12.8′	11°21.1	14.9′	57.6′
3		224°46.5	·· 23.0	333°17.9	12.8′	11°06.2	14.9′	57.7′
4		239°46.3	23.1	347°49.7	12.8′	10°51.3	15.0′	57.7′
5		254°46.2	23.1	2°21.5	12.8′	10°36.3	15.1′	57.7′
6		269°46.1	N23°23.2	16°53.4	12.9′	S10°21.2	15.1′	57.7′
7		284°45.9	23.3	31°25.2	12.9′	10°06.1	15.2′	57.8′
8		299°45.8	23.3	45°57.1	12.9′	09°50.9	15.2′	57.8′
9		314°45.7	·· 23.4	60°29.1	12.9′	09°35.7	15.3′	57.8′
10		329°45.5	23.5	75°01.0	13.0′	09°20.4	15.4′	57.8′
11		344°45.4	23.5	89°33.0	13.0′	09°05.0	15.4′	57.9′
12		359°45.3	N23°23.6	104°04.9	13.0′	S08°49.6	15.5′	57.9′
13		14°45.1	23.7	118°36.9	13.0′	08°34.1	15.5′	57.9′
14		29°45.0	23.7	133°08.9	13.0′	08°18.6	15.5′	57.9′
15		44°44.8	·· 23.8	147°41.0	13.0′	08°03.1	15.7′	58.0′
16		59°44.7	23.8	162°13.0	13.1′	07°47.4	15.6′	58.0′
17		74°44.6	23.9	176°45.1	13.1′	07°31.8	15.8′	58.0′
18		89°44.4	N23°24.0	191°17.1	13.1′	S07°16.0	15.7′	58.0′
19		104°44.3	24.0	205°49.2	13.1′	07°00.3	15.8′	58.1′
20		119°44.2	24.1	220°21.3	13.1′	06°44.5	15.9′	58.1′
21		134°44.0	·· 24.1	234°53.4	13.1′	06°28.6	15.9′	58.1′
22		149°43.9	24.2	249°25.5	13.1′	06°12.7	15.9′	58.1′
23		164°43.8	24.2	263°57.6	13.1′	05°56.8	16.0′	58.2′
		SD = 15.7′	d = 0.1′	SD = 15.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	–:–	–:–	01:32	22:30	–:–	–:–
62°	–:–	–:–	02:10	21:52	–:–	–:–
60°	–:–	00:52	02:36	21:26	23:11	–:–
N 58°	–:–	01:41	02:56	21:06	22:21	–:–
56°	–:–	02:11	03:13	20:49	21:51	–:–
54°	00:47	02:33	03:27	20:35	21:29	23:15
52°	01:33	02:51	03:39	20:22	21:11	22:29
50°	02:00	03:06	03:50	20:11	20:56	22:02
45°	02:46	03:35	04:13	19:49	20:26	21:16
N 40°	03:16	03:58	04:31	19:31	20:04	20:46
35°	03:39	04:16	04:46	19:16	19:46	20:22
30°	03:58	04:31	04:59	19:03	19:30	20:04
20°	04:27	04:56	05:21	18:41	19:05	19:35
N 10°	04:49	05:16	05:40	18:22	18:45	19:12
0°	05:08	05:35	05:57	18:04	18:27	18:53
S 10°	05:25	05:52	06:14	17:47	18:10	18:36
20°	05:41	06:09	06:33	17:29	17:53	18:20
30°	05:58	06:28	06:54	17:07	17:34	18:04
35°	06:07	06:38	07:07	16:55	17:23	17:55
40°	06:16	06:50	07:21	16:41	17:11	17:45
45°	06:26	07:04	07:37	16:24	16:58	17:35
S 50°	06:38	07:20	07:58	16:03	16:42	17:23
52°	06:43	07:27	08:08	15:53	16:34	17:18
54°	06:49	07:35	08:19	15:42	16:26	17:12
56°	06:55	07:44	08:32	15:30	16:17	17:06
58°	07:02	07:55	08:46	15:15	16:07	17:00
S 60°	07:09	08:06	09:04	14:58	15:55	16:52

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°		02:38	01:21		05:53	08:50
N 70°		01:49	01:02		06:39	09:06
68°	02:31	01:18	00:47	04:14	07:09	09:19
66°	01:27	00:54	00:35	05:16	07:31	09:30
64°	00:52	00:36	00:24	05:50	07:49	09:38
62°	00:26	00:20	00:15	06:15	08:03	09:46
60°	00:06	00:08	00:07	06:34	08:15	09:52
N 58°	23:56	·· ··	00:01	06:50	08:25	09:58
56°	23:47	23:55	·· ··	07:04	08:34	10:03
54°	23:38	23:49	23:58	07:16	08:42	10:07
52°	23:30	23:44	23:56	07:26	08:49	10:11
50°	23:23	23:40	23:54	07:35	08:55	10:15
45°	23:08	23:30	23:50	07:54	09:08	10:22
N 40°	22:55	23:22	23:46	08:10	09:19	10:29
35°	22:45	23:15	23:42	08:23	09:29	10:34
30°	22:35	23:08	23:39	08:34	09:37	10:39
20°	22:19	22:58	23:34	08:54	09:51	10:47
N 10°	22:05	22:48	23:30	09:10	10:03	10:55
0°	21:51	22:39	23:26	09:26	10:14	11:01
S 10°	21:38	22:30	23:21	09:41	10:26	11:08
20°	21:24	22:20	23:17	09:58	10:38	11:15
30°	21:07	22:09	23:11	10:16	10:51	11:23
35°	20:57	22:03	23:08	10:27	10:59	11:27
40°	20:46	21:56	23:05	10:39	11:08	11:32
45°	20:33	21:47	23:01	10:54	11:18	11:38
S 50°	20:17	21:37	22:56	11:12	11:30	11:45
52°	20:09	21:32	22:54	11:20	11:36	11:49
54°	20:01	21:26	22:52	11:29	11:42	11:52
56°	19:51	21:20	22:49	11:39	11:49	11:56
58°	19:40	21:14	22:46	11:51	11:57	12:00
S 60°	19:28	21:06	22:43	12:05	12:05	12:05

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 87-69%
15	00:27	00:33	12:01	03:14	15:39	
16	00:40	00:46	12:01	04:03	16:27	
17	00:52	00:59	12:01	04:50	17:13	

DUT1 = UT1-UTC = +0.2251 sec ΔT = TT-UT1 = +68.9589 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	266°29.3	226°01.6	N12°54.9	113°37.5	N12°27.8	174°28.6	N23°16.5	264°19.9	S01°26.3
1	281°31.8	241°01.5	55.6	128°38.6	27.3	189°30.4	16.5	279°22.3	26.3
2	296°34.3	256°01.4	56.4	143°39.7	26.8	204°32.3	16.5	294°24.7	26.3
3	311°36.7	271°01.3	·· 57.2	158°40.9	·· 26.3	219°34.1	·· 16.5	309°27.0	·· 26.2
4	326°39.2	286°01.2	57.9	173°42.0	25.7	234°36.0	16.5	324°29.4	26.2
5	341°41.7	301°01.1	58.7	188°43.1	25.2	249°37.8	16.5	339°31.8	26.2
6	356°44.1	316°01.0	N12°59.5	203°44.3	N12°24.7	264°39.7	N23°16.5	354°34.1	S01°26.1
7	11°46.6	331°00.9	13°00.2	218°45.4	24.1	279°41.5	16.5	9°36.5	26.1
8	26°49.0	346°00.8	01.0	233°46.5	23.6	294°43.3	16.5	24°38.8	26.1
9	41°51.5	1°00.6	·· 01.8	248°47.7	·· 23.1	309°45.2	·· 16.5	39°41.2	·· 26.1
10	56°54.0	16°00.5	02.5	263°48.8	22.5	324°47.0	16.5	54°43.6	26.0
11	71°56.4	31°00.4	03.3	278°49.9	22.0	339°48.9	16.5	69°45.9	26.0
12	86°58.9	46°00.3	N13°04.1	293°51.1	N12°21.5	354°50.7	N23°16.5	84°48.3	S01°26.0
13	102°01.4	61°00.2	04.8	308°52.2	20.9	9°52.6	16.5	99°50.7	25.9
14	117°03.8	76°00.1	05.6	323°53.4	20.4	24°54.4	16.5	114°53.0	25.9
15	132°06.3	91°00.0	·· 06.4	338°54.5	·· 19.9	39°56.3	·· 16.5	129°55.4	·· 25.9
16	147°08.8	105°59.9	07.1	353°55.6	19.4	54°58.1	16.4	144°57.8	25.8
17	162°11.2	120°59.7	07.9	8°56.8	18.8	69°59.9	16.4	160°00.1	25.8
18	177°13.7	135°59.6	N13°08.7	23°57.9	N12°18.3	85°01.8	N23°16.4	175°02.5	S01°25.8
19	192°16.1	150°59.5	09.5	38°59.0	17.8	100°03.6	16.4	190°04.9	25.8
20	207°18.6	165°59.4	10.2	54°00.2	17.2	115°05.5	16.4	205°07.2	25.7
21	222°21.1	180°59.3	·· 11.0	69°01.3	·· 16.7	130°07.3	·· 16.4	220°09.6	·· 25.7
22	237°23.5	195°59.2	11.8	84°02.4	16.2	145°09.2	16.4	235°12.0	25.7
23	252°26.0	210°59.0	12.5	99°03.6	15.6	160°11.0	16.4	250°14.4	25.6
Mer.pass.	06:13	ν -0.1′	d 0.8′	m -4.23	ν 1.1′	d -0.5′	m 1.42	ν 1.8′	d -0.0′ m -1.90	ν 2.4′	d 0.0′ m 1.02

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	267°28.5	225°58.9	N13°13.3	114°04.7	N12°15.1	175°12.8	N23°16.4	265°16.7	S01°25.6
1	282°30.9	240°58.8	14.0	129°05.8	14.6	190°14.7	16.4	280°19.1	25.6
2	297°33.4	255°58.7	14.8	144°07.0	14.0	205°16.5	16.4	295°21.5	25.5
3	312°35.9	270°58.6	·· 15.6	159°08.1	·· 13.5	220°18.4	·· 16.4	310°23.8	·· 25.5
4	327°38.3	285°58.4	16.3	174°09.2	13.0	235°20.2	16.4	325°26.2	25.5
5	342°40.8	300°58.3	17.1	189°10.4	12.4	250°22.1	16.4	340°28.6	25.5
6	357°43.3	315°58.2	N13°17.9	204°11.5	N12°11.9	265°23.9	N23°16.4	355°30.9	S01°25.4
7	12°45.7	330°58.1	18.6	219°12.6	11.4	280°25.7	16.4	10°33.3	25.4
8	27°48.2	345°57.9	19.4	234°13.8	10.8	295°27.6	16.4	25°35.7	25.4
9	42°50.6	0°57.8	·· 20.2	249°14.9	·· 10.3	310°29.4	·· 16.4	40°38.0	·· 25.3
10	57°53.1	15°57.7	20.9	264°16.0	09.8	325°31.3	16.4	55°40.4	25.3
11	72°55.6	30°57.6	21.7	279°17.2	09.2	340°33.1	16.4	70°42.8	25.3
12	87°58.0	45°57.4	N13°22.5	294°18.3	N12°08.7	355°35.0	N23°16.3	85°45.2	S01°25.3
13	103°00.5	60°57.3	23.2	309°19.4	08.1	10°36.8	16.3	100°47.5	25.2
14	118°03.0	75°57.2	24.0	324°20.6	07.6	25°38.6	16.3	115°49.9	25.2
15	133°05.4	90°57.0	·· 24.7	339°21.7	·· 07.1	40°40.5	·· 16.3	130°52.3	·· 25.2
16	148°07.9	105°56.9	25.5	354°22.8	06.5	55°42.3	16.3	145°54.6	25.1
17	163°10.4	120°56.8	26.3	9°24.0	06.0	70°44.2	16.3	160°57.0	25.1
18	178°12.8	135°56.7	N13°27.0	24°25.1	N12°05.5	85°46.0	N23°16.3	175°59.4	S01°25.1
19	193°15.3	150°56.5	27.8	39°26.2	04.9	100°47.9	16.3	191°01.7	25.1
20	208°17.8	165°56.4	28.6	54°27.4	04.4	115°49.7	16.3	206°04.1	25.0
21	223°20.2	180°56.3	·· 29.3	69°28.5	·· 03.9	130°51.5	·· 16.3	221°06.5	·· 25.0
22	238°22.7	195°56.1	30.1	84°29.6	03.3	145°53.4	16.3	236°08.9	25.0
23	253°25.1	210°56.0	30.8	99°30.8	02.8	160°55.2	16.3	251°11.2	24.9
Mer.pass.	06:09	ν -0.1′	d 0.8′	m -4.23	ν 1.1′	d -0.5′	m 1.42	ν 1.8′	d -0.0′ m -1.90	ν 2.4′	d 0.0′ m 1.01

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	268°27.6	225°55.9	N13°31.6	114°31.9	N12°02.3	175°57.1	N23°16.3	266°13.6	S01°24.9
1	283°30.1	240°55.7	32.4	129°33.0	01.7	190°58.9	16.3	281°16.0	24.9
2	298°32.5	255°55.6	33.1	144°34.2	01.2	206°00.8	16.3	296°18.3	24.9
3	313°35.0	270°55.4	·· 33.9	159°35.3	·· 00.6	221°02.6	·· 16.3	311°20.7	·· 24.8
4	328°37.5	285°55.3	34.6	174°36.4	12°00.1	236°04.4	16.3	326°23.1	24.8
5	343°39.9	300°55.2	35.4	189°37.6	11°59.6	251°06.3	16.3	341°25.5	24.8
6	358°42.4	315°55.0	N13°36.2	204°38.7	N11°59.0	266°08.1	N23°16.2	356°27.8	S01°24.7
7	13°44.9	330°54.9	36.9	219°39.8	58.5	281°10.0	16.2	11°30.2	24.7
8	28°47.3	345°54.8	37.7	234°40.9	58.0	296°11.8	16.2	26°32.6	24.7
9	43°49.8	0°54.6	·· 38.4	249°42.1	·· 57.4	311°13.7	·· 16.2	41°35.0	·· 24.7
10	58°52.2	15°54.5	39.2	264°43.2	56.9	326°15.5	16.2	56°37.3	24.6
11	73°54.7	30°54.3	40.0	279°44.3	56.3	341°17.3	16.2	71°39.7	24.6
12	88°57.2	45°54.2	N13°40.7	294°45.5	N11°55.8	356°19.2	N23°16.2	86°42.1	S01°24.6
13	103°59.6	60°54.0	41.5	309°46.6	55.3	11°21.0	16.2	101°44.5	24.6
14	119°02.1	75°53.9	42.2	324°47.7	54.7	26°22.9	16.2	116°46.8	24.5
15	134°04.6	90°53.8	·· 43.0	339°48.9	·· 54.2	41°24.7	·· 16.2	131°49.2	·· 24.5
16	149°07.0	105°53.6	43.8	354°50.0	53.7	56°26.6	16.2	146°51.6	24.5
17	164°09.5	120°53.5	44.5	9°51.1	53.1	71°28.4	16.2	161°53.9	24.4
18	179°12.0	135°53.3	N13°45.3	24°52.3	N11°52.6	86°30.2	N23°16.2	176°56.3	S01°24.4
19	194°14.4	150°53.2	46.0	39°53.4	52.0	101°32.1	16.2	191°58.7	24.4
20	209°16.9	165°53.0	46.8	54°54.5	51.5	116°33.9	16.2	207°01.1	24.4
21	224°19.4	180°52.9	·· 47.5	69°55.7	·· 51.0	131°35.8	·· 16.1	222°03.4	·· 24.3
22	239°21.8	195°52.7	48.3	84°56.8	50.4	146°37.6	16.1	237°05.8	24.3
23	254°24.3	210°52.6	49.0	99°57.9	49.9	161°39.5	16.1	252°08.2	24.3
Mer.pass.	06:05	ν -0.1′	d 0.8′	m -4.22	ν 1.1′	d -0.5′	m 1.43	ν 1.8′	d -0.0′ m -1.90	ν 2.4′	d 0.0′ m 1.01

Stars

	SHA	Dec
Alpheratz	357°34.4	29°13.7
Ankaa	353°06.8	-42°09.8
Schedar	349°30.8	56°40.4
Diphda	348°47.0	-17°50.7
Achernar	335°20.2	-57°06.2
Hamal	327°51.0	23°34.9
Polaris	314°13.7	89°22.1
Acamar	315°11.8	-40°12.0
Menkar	314°06.0	4°11.4
Mirfak	308°28.2	49°56.9
Aldebaran	290°39.5	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.8	46°01.4
Bellatrix	278°22.8	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.5
Sirius	258°26.3	-16°45.1
Adhara	255°06.0	-29°00.4
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.1	-59°35.6
Suhail	222°46.4	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.6	-63°14.7
Gacrux	171°51.2	-57°15.6
Alioth	166°12.5	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.5	49°11.4
Hadar	148°35.1	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.0
Rigil Kent.	139°39.4	-60°56.7
Kochab	137°18.9	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.5	-37°07.3
Rasalhague	95°57.9	12°32.5
Eltanin	90°41.5	51°29.1
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.6	38°48.3
Nunki	75°46.9	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.7	-56°39.0
Deneb	49°25.2	45°22.1
Enif	33°38.3	9°59.4
Al Na'ir	27°32.2	-46°50.0
Fomalhaut	15°14.0	-29°29.1
Scheat	13°44.8	28°13.1
Markab	13°29.5	15°20.4

Jun 18 Wed	SHA	Mer.pass
Venus	319°32.3	08:56
Mars	207°08.1	16:24
Jupiter	267°59.3	12:21
Saturn	357°50.6	06:22

Jun 19 Thu	SHA	Mer.pass
Venus	318°30.4	08:56
Mars	206°36.2	16:22
Jupiter	267°44.4	12:18
Saturn	357°48.3	06:18

Jun 20 Fri	SHA	Mer.pass
Venus	317°28.2	08:56
Mars	206°04.3	16:21
Jupiter	267°29.5	12:15
Saturn	357°46.0	06:14

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.6	N23°24.3	278°29.7	13.1′	S05°40.8	16.0′	58.2′
1	194°43.5	24.3	293°01.8	13.1′	05°24.8	16.1′	58.2′
2	209°43.4	24.4	307°33.9	13.1′	05°08.7	16.1′	58.2′
3	224°43.2	·· 24.4	322°06.0	13.1′	04°52.6	16.1′	58.3′
4	239°43.1	24.5	336°38.1	13.1′	04°36.5	16.2′	58.3′
5	254°42.9	24.6	351°10.3	13.1′	04°20.3	16.2′	58.3′
6	269°42.8	N23°24.6	5°42.4	13.1′	S04°04.1	16.2′	58.3′
7	284°42.7	24.6	20°14.5	13.1′	03°47.9	16.3′	58.4′
8	299°42.5	24.7	34°46.6	13.1′	03°31.6	16.3′	58.4′
9	314°42.4	·· 24.7	49°18.6	13.1′	03°15.3	16.3′	58.4′
10	329°42.3	24.8	63°50.7	13.1′	02°59.0	16.3′	58.4′
11	344°42.1	24.8	78°22.8	13.1′	02°42.7	16.4′	58.5′
12	359°42.0	N23°24.9	92°54.8	13.0′	S02°26.3	16.4′	58.5′
13	14°41.9	24.9	107°26.9	13.0′	02°09.9	16.5′	58.5′
14	29°41.7	25.0	121°58.9	13.0′	01°53.4	16.4′	58.5′
15	44°41.6	·· 25.0	136°30.9	13.0′	01°37.0	16.5′	58.6′
16	59°41.4	25.1	151°02.9	13.0′	01°20.5	16.5′	58.6′
17	74°41.3	25.1	165°34.9	13.0′	01°04.0	16.5′	58.6′
18	89°41.2	N23°25.1	180°06.9	12.9′	S00°47.5	16.5′	58.6′
19	104°41.0	25.2	194°38.8	12.9′	00°31.0	16.6′	58.6′
20	119°40.9	25.2	209°10.7	12.9′	S00°14.4	16.5′	58.7′
21	134°40.8	·· 25.3	223°42.6	12.9′	N00°02.1	16.6′	58.7′
22	149°40.6	25.3	238°14.5	12.8′	00°18.7	16.6′	58.7′
23	164°40.5	25.3	252°46.3	12.8′	00°35.3	16.6′	58.7′
	SD = 15.7′	d = 0.1′	SD = 15.9′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.3	N23°25.4	267°18.1	12.8′	N00°51.9	16.6′	58.8′
1	194°40.2	25.4	281°49.9	12.7′	01°08.5	16.6′	58.8′
2	209°40.1	25.4	296°21.6	12.7′	01°25.1	16.6′	58.8′
3	224°39.9	·· 25.5	310°53.3	12.7′	01°41.7	16.6′	58.8′
4	239°39.8	25.5	325°25.0	12.6′	01°58.3	16.7′	58.9′
5	254°39.7	25.5	339°56.6	12.6′	02°15.0	16.6′	58.9′
6	269°39.5	N23°25.6	354°28.2	12.6′	N02°31.6	16.6′	58.9′
7	284°39.4	25.6	8°59.8	12.5′	02°48.2	16.7′	58.9′
8	299°39.3	25.6	23°31.3	12.5′	03°04.9	16.6′	59.0′
9	314°39.1	·· 25.7	38°02.8	12.4′	03°21.5	16.7′	59.0′
10	329°39.0	25.7	52°34.3	12.4′	03°38.2	16.6′	59.0′
11	344°38.8	25.7	67°05.7	12.3′	03°54.8	16.6′	59.0′
12	359°38.7	N23°25.8	81°37.0	12.3′	N04°11.4	16.6′	59.1′
13	14°38.6	25.8	96°08.3	12.3′	04°28.0	16.6′	59.1′
14	29°38.4	25.8	110°39.6	12.2′	04°44.6	16.6′	59.1′
15	44°38.3	·· 25.8	125°10.8	12.2′	05°01.2	16.6′	59.1′
16	59°38.2	25.9	139°41.9	12.1′	05°17.8	16.6′	59.2′
17	74°38.0	25.9	154°13.0	12.0′	05°34.4	16.5′	59.2′
18	89°37.9	N23°25.9	168°44.0	12.0′	N05°50.9	16.6′	59.2′
19	104°37.8	25.9	183°15.0	11.9′	06°07.5	16.5′	59.2′
20	119°37.6	26.0	197°46.0	11.9′	06°24.0	16.5′	59.2′
21	134°37.5	·· 26.0	212°16.8	11.8′	06°40.5	16.5′	59.3′
22	149°37.3	26.0	226°47.6	11.7′	06°57.0	16.5′	59.3′
23	164°37.2	26.0	241°18.4	11.7′	07°13.5	16.4′	59.3′
	SD = 15.7′	d = 0.0′	SD = 16.0′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.1	N23°26.0	255°49.1	11.6′	N07°29.9	16.4′	59.3′
1	194°36.9	26.1	270°19.7	11.6′	07°46.3	16.4′	59.4′
2	209°36.8	26.1	284°50.3	11.5′	08°02.7	16.4′	59.4′
3	224°36.7	·· 26.1	299°20.7	11.4′	08°19.1	16.3′	59.4′
4	239°36.5	26.1	313°51.2	11.3′	08°35.4	16.3′	59.4′
5	254°36.4	26.1	328°21.5	11.3′	08°51.7	16.2′	59.4′
6	269°36.2	N23°26.1	342°51.8	11.2′	N09°07.9	16.3′	59.5′
7	284°36.1	26.2	357°22.0	11.1′	09°24.2	16.1′	59.5′
8	299°36.0	26.2	11°52.1	11.1′	09°40.3	16.2′	59.5′
9	314°35.8	·· 26.2	26°22.2	11.0′	09°56.5	16.1′	59.5′
10	329°35.7	26.2	40°52.1	10.9′	10°12.6	16.1′	59.5′
11	344°35.6	26.2	55°22.0	10.8′	10°28.7	16.0′	59.6′
12	359°35.4	N23°26.2	69°51.8	10.7′	N10°44.7	16.0′	59.6′
13	14°35.3	26.2	84°21.6	10.7′	11°00.7	15.9′	59.6′
14	29°35.1	26.2	98°51.2	10.6′	11°16.6	15.9′	59.6′
15	44°35.0	·· 26.3	113°20.8	10.5′	11°32.5	15.8′	59.6′
16	59°34.9	26.3	127°50.3	10.4′	11°48.3	15.8′	59.7′
17	74°34.7	26.3	142°19.7	10.3′	12°04.1	15.7′	59.7′
18	89°34.6	N23°26.3	156°49.0	10.2′	N12°19.8	15.7′	59.7′
19	104°34.5	26.3	171°18.2	10.1′	12°35.5	15.6′	59.7′
20	119°34.3	26.3	185°47.3	10.0′	12°51.1	15.6′	59.7′
21	134°34.2	·· 26.3	200°16.4	9.9′	13°06.7	15.4′	59.8′
22	149°34.1	26.3	214°45.3	9.9′	13°22.1	15.5′	59.8′
23	164°33.9	26.3	229°14.2	9.8′	13°37.6	15.3′	59.8′
	SD = 15.7′	d = 0.0′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	–:–	–:–	01:31	22:32	–:–	–:–
62°	–:–	–:–	02:09	21:54	–:–	–:–
60°	–:–	00:49	02:36	21:27	23:14	–:–
N 58°	–:–	01:40	02:56	21:07	22:23	–:–
56°	–:–	02:10	03:13	20:50	21:53	–:–
54°	00:45	02:33	03:27	20:36	21:30	23:18
52°	01:32	02:51	03:39	20:23	21:12	22:31
50°	02:00	03:06	03:50	20:13	20:57	22:03
45°	02:46	03:35	04:13	19:50	20:27	21:17
N 40°	03:16	03:58	04:31	19:32	20:05	20:47
35°	03:40	04:16	04:46	19:17	19:47	20:23
30°	03:58	04:32	04:59	19:04	19:31	20:05
20°	04:27	04:57	05:21	18:42	19:06	19:36
N 10°	04:50	05:17	05:40	18:23	18:46	19:13
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	05:26	05:52	06:15	17:48	18:10	18:37
20°	05:42	06:10	06:34	17:29	17:53	18:21
30°	05:59	06:29	06:55	17:08	17:34	18:04
35°	06:08	06:39	07:07	16:55	17:24	17:55
40°	06:17	06:51	07:22	16:41	17:12	17:46
45°	06:27	07:05	07:38	16:24	16:58	17:36
S 50°	06:39	07:21	07:59	16:04	16:42	17:24
52°	06:44	07:28	08:09	15:54	16:35	17:18
54°	06:50	07:36	08:20	15:43	16:26	17:13
56°	06:56	07:45	08:33	15:30	16:17	17:07
58°	07:03	07:56	08:48	15:15	16:07	17:00
S 60°	07:11	08:07	09:05	14:58	15:55	16:52

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	00:38	00:02 23:24	22:34	11:12	13:32	16:07
N 70°	00:30	00:03 23:34	22:59	11:16	13:25	15:45
68°	00:24	00:04 23:43	23:17	11:20	13:20	15:29
66°	00:19	00:04 23:50	23:33	11:22	13:16	15:15
64°	00:14	00:05 23:56	23:45	11:25	13:12	15:04
62°	00:10	00:05	00:01 23:56	11:27	13:09	14:55
60°	00:07	00:06	00:05	11:28	13:06	14:47
N 58°	00:04	00:06	00:09	11:30	13:03	14:40
56°	00:01	00:07	00:13	11:31	13:01	14:34
54°	·· ··	00:07	00:16	11:32	12:59	14:29
52°	·· ··	00:07	00:19	11:33	12:57	14:24
50°	·· ··	00:08	00:22	11:34	12:56	14:20
45°	·· ··	00:08	00:28	11:37	12:52	14:10
N 40°	·· ··	00:09	00:33	11:38	12:49	14:02
35°	·· ··	00:09	00:37	11:40	12:47	13:56
30°	·· ··	00:10	00:41	11:41	12:44	13:50
20°	·· ··	00:10	00:48	11:44	12:41	13:40
N 10°	·· ··	00:11	00:54	11:46	12:37	13:31
0°	·· ··	00:12	00:59	11:47	12:34	13:23
S 10°	·· ··	00:12	01:05	11:49	12:31	13:14
20°	·· ··	00:13	01:11	11:51	12:27	13:06
30°	·· ··	00:14	01:18	11:53	12:24	12:56
35°	·· ··	00:15	01:22	11:54	12:21	12:50
40°	·· ··	00:15	01:27	11:56	12:19	12:44
45°	·· ··	00:16	01:33	11:57	12:16	12:36
S 50°	·· ··	00:17	01:39	11:59	12:13	12:28
52°	·· ··	00:17	01:42	12:00	12:11	12:23
54°	·· ··	00:18	01:46	12:01	12:09	12:19
56°	·· ··	00:18	01:50	12:02	12:08	12:14
58°	·· ··	00:19	01:54	12:03	12:05	12:09
S 60°	·· ··	00:19	01:58	12:04	12:03	12:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 59-37%
18	01:06	01:12	12:01	05:36	18:00	
19	01:19	01:25	12:01	06:23	18:47	
20	01:32	01:38	12:02	07:11	19:36	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2258 sec ΔT = TT-UT1 = +68.9582 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	269°26.7	225°52.4	N13°49.8	114°59.0	N11°49.3	176°41.3	N23°16.1	267°10.6	S01°24.3
1	284°29.2	240°52.3	50.6	130°00.2	48.8	191°43.1	16.1	282°12.9	24.2
2	299°31.7	255°52.1	51.3	145°01.3	48.3	206°45.0	16.1	297°15.3	24.2
3	314°34.1	270°52.0	·· 52.1	160°02.4	·· 47.7	221°46.8	·· 16.1	312°17.7	·· 24.2
4	329°36.6	285°51.8	52.8	175°03.6	47.2	236°48.7	16.1	327°20.1	24.2
5	344°39.1	300°51.7	53.6	190°04.7	46.6	251°50.5	16.1	342°22.5	24.1
6	359°41.5	315°51.5	N13°54.3	205°05.8	N11°46.1	266°52.3	N23°16.1	357°24.8	S01°24.1
7	14°44.0	330°51.4	55.1	220°07.0	45.6	281°54.2	16.1	12°27.2	24.1
8	29°46.5	345°51.2	55.8	235°08.1	45.0	296°56.0	16.1	27°29.6	24.1
9	44°48.9	0°51.1	·· 56.6	250°09.2	·· 44.5	311°57.9	·· 16.1	42°32.0	·· 24.0
10	59°51.4	15°50.9	57.3	265°10.4	43.9	326°59.7	16.1	57°34.3	24.0
11	74°53.9	30°50.7	58.1	280°11.5	43.4	342°01.6	16.0	72°36.7	24.0
12	89°56.3	45°50.6	N13°58.9	295°12.6	N11°42.8	357°03.4	N23°16.0	87°39.1	S01°23.9
13	104°58.8	60°50.4	13°59.6	310°13.7	42.3	12°05.2	16.0	102°41.5	23.9
14	120°01.2	75°50.3	14°00.4	325°14.9	41.8	27°07.1	16.0	117°43.8	23.9
15	135°03.7	90°50.1	·· 01.1	340°16.0	·· 41.2	42°08.9	·· 16.0	132°46.2	·· 23.9
16	150°06.2	105°49.9	01.9	355°17.1	40.7	57°10.8	16.0	147°48.6	23.8
17	165°08.6	120°49.8	02.6	10°18.3	40.1	72°12.6	16.0	162°51.0	23.8
18	180°11.1	135°49.6	N14°03.4	25°19.4	N11°39.6	87°14.5	N23°16.0	177°53.4	S01°23.8
19	195°13.6	150°49.5	04.1	40°20.5	39.1	102°16.3	16.0	192°55.7	23.8
20	210°16.0	165°49.3	04.9	55°21.6	38.5	117°18.1	16.0	207°58.1	23.7
21	225°18.5	180°49.1	·· 05.6	70°22.8	·· 38.0	132°20.0	·· 16.0	223°00.5	·· 23.7
22	240°21.0	195°49.0	06.4	85°23.9	37.4	147°21.8	16.0	238°02.9	23.7
23	255°23.4	210°48.8	07.1	100°25.0	36.9	162°23.7	16.0	253°05.2	23.7
Mer.pass.	06:01	ν -0.2′	d 0.8′	m -4.21	ν 1.1′	d -0.5′	m 1.44	ν 1.8′	d -0.0′ m -1.90	ν 2.4′	d 0.0′ m 1.00

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	270°25.9	225°48.6	N14°07.9	115°26.2	N11°36.3	177°25.5	N23°16.0	268°07.6	S01°23.6
1	285°28.3	240°48.5	08.6	130°27.3	35.8	192°27.4	15.9	283°10.0	23.6
2	300°30.8	255°48.3	09.4	145°28.4	35.2	207°29.2	15.9	298°12.4	23.6
3	315°33.3	270°48.1	·· 10.1	160°29.6	·· 34.7	222°31.0	·· 15.9	313°14.8	·· 23.6
4	330°35.7	285°48.0	10.9	175°30.7	34.2	237°32.9	15.9	328°17.1	23.5
5	345°38.2	300°47.8	11.6	190°31.8	33.6	252°34.7	15.9	343°19.5	23.5
6	0°40.7	315°47.6	N14°12.4	205°32.9	N11°33.1	267°36.6	N23°15.9	358°21.9	S01°23.5
7	15°43.1	330°47.5	13.1	220°34.1	32.5	282°38.4	15.9	13°24.3	23.5
8	30°45.6	345°47.3	13.9	235°35.2	32.0	297°40.3	15.9	28°26.7	23.5
9	45°48.1	0°47.1	·· 14.6	250°36.3	·· 31.4	312°42.1	·· 15.9	43°29.0	·· 23.4
10	60°50.5	15°47.0	15.4	265°37.5	30.9	327°43.9	15.9	58°31.4	23.4
11	75°53.0	30°46.8	16.1	280°38.6	30.3	342°45.8	15.9	73°33.8	23.4
12	90°55.5	45°46.6	N14°16.8	295°39.7	N11°29.8	357°47.6	N23°15.9	88°36.2	S01°23.4
13	105°57.9	60°46.4	17.6	310°40.8	29.3	12°49.5	15.8	103°38.6	23.3
14	121°00.4	75°46.3	18.3	325°42.0	28.7	27°51.3	15.8	118°41.0	23.3
15	136°02.8	90°46.1	·· 19.1	340°43.1	·· 28.2	42°53.2	·· 15.8	133°43.3	·· 23.3
16	151°05.3	105°45.9	19.8	355°44.2	27.6	57°55.0	15.8	148°45.7	23.3
17	166°07.8	120°45.7	20.6	10°45.4	27.1	72°56.8	15.8	163°48.1	23.2
18	181°10.2	135°45.6	N14°21.3	25°46.5	N11°26.5	87°58.7	N23°15.8	178°50.5	S01°23.2
19	196°12.7	150°45.4	22.1	40°47.6	26.0	103°00.5	15.8	193°52.9	23.2
20	211°15.2	165°45.2	22.8	55°48.7	25.4	118°02.4	15.8	208°55.2	23.2
21	226°17.6	180°45.0	·· 23.6	70°49.9	·· 24.9	133°04.2	·· 15.8	223°57.6	·· 23.1
22	241°20.1	195°44.9	24.3	85°51.0	24.3	148°06.0	15.8	239°00.0	23.1
23	256°22.6	210°44.7	25.0	100°52.1	23.8	163°07.9	15.8	254°02.4	23.1
Mer.pass.	05:57	ν -0.2′	d 0.7′	m -4.20	ν 1.1′	d -0.5′	m 1.44	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 1.00

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	271°25.0	225°44.5	N14°25.8	115°53.2	N11°23.3	178°09.7	N23°15.7	269°04.8	S01°23.1
1	286°27.5	240°44.3	26.5	130°54.4	22.7	193°11.6	15.7	284°07.2	23.1
2	301°30.0	255°44.1	27.3	145°55.5	22.2	208°13.4	15.7	299°09.5	23.0
3	316°32.4	270°44.0	·· 28.0	160°56.6	·· 21.6	223°15.3	·· 15.7	314°11.9	·· 23.0
4	331°34.9	285°43.8	28.8	175°57.8	21.1	238°17.1	15.7	329°14.3	23.0
5	346°37.3	300°43.6	29.5	190°58.9	20.5	253°18.9	15.7	344°16.7	23.0
6	1°39.8	315°43.4	N14°30.2	206°00.0	N11°20.0	268°20.8	N23°15.7	359°19.1	S01°22.9
7	16°42.3	330°43.2	31.0	221°01.1	19.4	283°22.6	15.7	14°21.5	22.9
8	31°44.7	345°43.0	31.7	236°02.3	18.9	298°24.5	15.7	29°23.8	22.9
9	46°47.2	0°42.9	·· 32.5	251°03.4	·· 18.3	313°26.3	·· 15.7	44°26.2	·· 22.9
10	61°49.7	15°42.7	33.2	266°04.5	17.8	328°28.2	15.7	59°28.6	22.8
11	76°52.1	30°42.5	33.9	281°05.6	17.2	343°30.0	15.6	74°31.0	22.8
12	91°54.6	45°42.3	N14°34.7	296°06.8	N11°16.7	358°31.8	N23°15.6	89°33.4	S01°22.8
13	106°57.1	60°42.1	35.4	311°07.9	16.1	13°33.7	15.6	104°35.8	22.8
14	121°59.5	75°41.9	36.2	326°09.0	15.6	28°35.5	15.6	119°38.1	22.8
15	137°02.0	90°41.7	·· 36.9	341°10.2	·· 15.0	43°37.4	·· 15.6	134°40.5	·· 22.7
16	152°04.5	105°41.5	37.6	356°11.3	14.5	58°39.2	15.6	149°42.9	22.7
17	167°06.9	120°41.4	38.4	11°12.4	13.9	73°41.1	15.6	164°45.3	22.7
18	182°09.4	135°41.2	N14°39.1	26°13.5	N11°13.4	88°42.9	N23°15.6	179°47.7	S01°22.7
19	197°11.8	150°41.0	39.8	41°14.7	12.8	103°44.7	15.6	194°50.1	22.6
20	212°14.3	165°40.8	40.6	56°15.8	12.3	118°46.6	15.6	209°52.5	22.6
21	227°16.8	180°40.6	·· 41.3	71°16.9	·· 11.7	133°48.4	·· 15.5	224°54.8	·· 22.6
22	242°19.2	195°40.4	42.1	86°18.0	11.2	148°50.3	15.5	239°57.2	22.6
23	257°21.7	210°40.2	42.8	101°19.2	10.6	163°52.1	15.5	254°59.6	22.6
Mer.pass.	05:53	ν -0.2′	d 0.7′	m -4.20	ν 1.1′	d -0.5′	m 1.45	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.99

Stars

	SHA	Dec
Alpheratz	357°34.4	29°13.7
Ankaa	353°06.8	-42°09.8
Schedar	349°30.7	56°40.4
Diphda	348°47.0	-17°50.7
Achernar	335°20.1	-57°06.2
Hamal	327°51.0	23°34.9
Polaris	314°12.5	89°22.0
Acamar	315°11.8	-40°12.0
Menkar	314°06.0	4°11.4
Mirfak	308°28.1	49°56.9
Aldebaran	290°39.5	16°33.6
Rigel	281°03.9	-8°10.3
Capella	280°21.8	46°01.4
Bellatrix	278°22.8	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.5
Sirius	258°26.3	-16°45.0
Adhara	255°06.0	-29°00.4
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.6
Suhail	222°46.4	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.6	-63°14.7
Gacrux	171°51.2	-57°15.6
Alioth	166°12.5	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.5	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.4	-60°56.7
Kochab	137°19.0	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.5
Eltanin	90°41.5	51°29.1
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.9	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.6	-56°39.0
Deneb	49°25.2	45°22.1
Enif	33°38.2	9°59.5
Al Na'ir	27°32.2	-46°50.0
Fomalhaut	15°14.0	-29°29.1
Scheat	13°44.8	28°13.1
Markab	13°29.4	15°20.5

Jun 21 Sat	SHA	Mer.pass
Venus	316°25.7	08:57
Mars	205°32.3	16:19
Jupiter	267°14.5	12:12
Saturn	357°43.8	06:10

Jun 22 Sun	SHA	Mer.pass
Venus	315°22.8	08:57
Mars	205°00.3	16:17
Jupiter	266°59.6	12:09
Saturn	357°41.7	06:07

Jun 23 Mon	SHA	Mer.pass
Venus	314°19.5	08:57
Mars	204°28.2	16:15
Jupiter	266°44.7	12:06
Saturn	357°39.7	06:03

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.8	N23°26.3	243°42.9	9.7′	N13°52.9	15.3′	59.8′
1	194°33.6	26.3	258°11.6	9.6′	14°08.2	15.2′	59.8′
2	209°33.5	26.3	272°40.1	9.5′	14°23.4	15.2′	59.8′
3	224°33.4	·· 26.3	287°08.6	9.4′	14°38.6	15.1′	59.9′
4	239°33.2	26.3	301°37.0	9.3′	14°53.7	15.0′	59.9′
5	254°33.1	26.3	316°05.2	9.2′	15°08.7	14.9′	59.9′
6	269°33.0	N23°26.3	330°33.4	9.1′	N15°23.6	14.8′	59.9′
7	284°32.8	26.3	345°01.5	9.0′	15°38.4	14.8′	59.9′
8	299°32.7	26.3	359°29.4	8.9′	15°53.2	14.7′	59.9′
9	314°32.5	·· 26.3	13°57.3	8.7′	16°07.9	14.6′	60.0′
10	329°32.4	26.3	28°25.0	8.6′	16°22.5	14.5′	60.0′
11	344°32.3	26.3	42°52.7	8.5′	16°37.0	14.4′	60.0′
12	359°32.1	N23°26.3	57°20.2	8.4′	N16°51.4	14.3′	60.0′
13	14°32.0	26.3	71°47.6	8.3′	17°05.7	14.3′	60.0′
14	29°31.9	26.3	86°14.9	8.2′	17°20.0	14.1′	60.0′
15	44°31.7	·· 26.2	100°42.1	8.1′	17°34.1	14.0′	60.0′
16	59°31.6	26.2	115°09.2	8.0′	17°48.1	14.0′	60.1′
17	74°31.5	26.2	129°36.2	7.9′	18°02.1	13.8′	60.1′
18	89°31.3	N23°26.2	144°03.1	7.8′	N18°15.9	13.7′	60.1′
19	104°31.2	26.2	158°29.9	7.7′	18°29.6	13.7′	60.1′
20	119°31.0	26.2	172°56.5	7.5′	18°43.3	13.5′	60.1′
21	134°30.9	·· 26.2	187°23.1	7.4′	18°56.8	13.4′	60.1′
22	149°30.8	26.2	201°49.5	7.3′	19°10.2	13.3′	60.1′
23	164°30.6	26.2	216°15.8	7.2′	19°23.5	13.2′	60.1′
	SD = 15.7′	d = 0.0′	SD = 16.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°30.5	N23°26.1	230°42.0	7.1′	N19°36.7	13.1′	60.1′
1	194°30.4	26.1	245°08.1	7.0′	19°49.8	12.9′	60.2′
2	209°30.2	26.1	259°34.1	6.9′	20°02.7	12.9′	60.2′
3	224°30.1	·· 26.1	273°59.9	6.7′	20°15.6	12.7′	60.2′
4	239°29.9	26.1	288°25.7	6.6′	20°28.3	12.6′	60.2′
5	254°29.8	26.1	302°51.3	6.5′	20°40.9	12.4′	60.2′
6	269°29.7	N23°26.0	317°16.8	6.4′	N20°53.3	12.4′	60.2′
7	284°29.5	26.0	331°42.2	6.3′	21°05.7	12.2′	60.2′
8	299°29.4	26.0	346°07.5	6.2′	21°17.9	12.0′	60.2′
9	314°29.3	·· 26.0	0°32.6	6.1′	21°29.9	12.0′	60.2′
10	329°29.1	25.9	14°57.7	5.9′	21°41.9	11.8′	60.2′
11	344°29.0	25.9	29°22.6	5.8′	21°53.7	11.6′	60.2′
12	359°28.9	N23°25.9	43°47.5	5.7′	N22°05.3	11.5′	60.2′
13	14°28.7	25.9	58°12.2	5.6′	22°16.8	11.4′	60.3′
14	29°28.6	25.9	72°36.8	5.5′	22°28.2	11.2′	60.3′
15	44°28.4	·· 25.8	87°01.2	5.4′	22°39.4	11.1′	60.3′
16	59°28.3	25.8	101°25.6	5.3′	22°50.5	10.9′	60.3′
17	74°28.2	25.8	115°49.9	5.1′	23°01.4	10.8′	60.3′
18	89°28.0	N23°25.7	130°14.0	5.0′	N23°12.2	10.6′	60.3′
19	104°27.9	25.7	144°38.1	4.9′	23°22.8	10.5′	60.3′
20	119°27.8	25.7	159°02.0	4.8′	23°33.3	10.3′	60.3′
21	134°27.6	·· 25.7	173°25.8	4.7′	23°43.6	10.2′	60.3′
22	149°27.5	25.6	187°49.5	4.6′	23°53.8	10.0′	60.3′
23	164°27.4	25.6	202°13.1	4.5′	24°03.8	9.8′	60.3′
	SD = 15.7′	d = -0.0′	SD = 16.4′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.2	N23°25.6	216°36.6	4.4′	N24°13.6	9.7′	60.3′
1	194°27.1	25.5	231°00.0	4.3′	24°23.3	9.5′	60.3′
2	209°26.9	25.5	245°23.3	4.2′	24°32.8	9.3′	60.3′
3	224°26.8	·· 25.5	259°46.5	4.1′	24°42.1	9.2′	60.3′
4	239°26.7	25.4	274°09.6	4.0′	24°51.3	9.0′	60.3′
5	254°26.5	25.4	288°32.6	3.9′	25°00.3	8.8′	60.3′
6	269°26.4	N23°25.4	302°55.5	3.8′	N25°09.1	8.6′	60.3′
7	284°26.3	25.3	317°18.3	3.7′	25°17.7	8.5′	60.3′
8	299°26.1	25.3	331°41.0	3.6′	25°26.2	8.2′	60.3′
9	314°26.0	·· 25.2	346°03.6	3.5′	25°34.4	8.1′	60.3′
10	329°25.9	25.2	0°26.1	3.4′	25°42.5	8.0′	60.3′
11	344°25.7	25.2	14°48.5	3.3′	25°50.5	7.7′	60.3′
12	359°25.6	N23°25.1	29°10.8	3.3′	N25°58.2	7.6′	60.3′
13	14°25.5	25.1	43°33.1	3.2′	26°05.8	7.3′	60.3′
14	29°25.3	25.0	57°55.3	3.1′	26°13.1	7.2′	60.3′
15	44°25.2	·· 25.0	72°17.4	3.0′	26°20.3	7.0′	60.3′
16	59°25.0	25.0	86°39.4	2.9′	26°27.3	6.8′	60.3′
17	74°24.9	24.9	101°01.3	2.9′	26°34.1	6.6′	60.3′
18	89°24.8	N23°24.9	115°23.2	2.8′	N26°40.7	6.4′	60.3′
19	104°24.6	24.8	129°44.9	2.7′	26°47.1	6.2′	60.3′
20	119°24.5	24.8	144°06.7	2.7′	26°53.3	6.0′	60.3′
21	134°24.4	·· 24.7	158°28.3	2.6′	26°59.3	5.8′	60.2′
22	149°24.2	24.7	172°49.9	2.5′	27°05.1	5.6′	60.2′
23	164°24.1	24.6	187°11.4	2.5′	27°10.7	5.5′	60.2′
	SD = 15.7′	d = -0.0′	SD = 16.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	–:–	–:–	01:31	22:33	–:–	–:–
62°	–:–	–:–	02:10	21:54	–:–	–:–
60°	–:–	00:50	02:36	21:28	23:14	–:–
N 58°	–:–	01:41	02:57	21:07	22:23	–:–
56°	–:–	02:11	03:13	20:51	21:53	–:–
54°	00:45	02:33	03:28	20:36	21:31	23:18
52°	01:33	02:51	03:40	20:24	21:13	22:31
50°	02:01	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:14	19:51	20:28	21:18
N 40°	03:17	03:59	04:32	19:33	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:51	05:18	05:41	18:23	18:46	19:14
0°	05:10	05:36	05:58	18:06	18:28	18:55
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:18	06:52	07:22	16:42	17:12	17:47
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:31	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°						
N 70°	21:49			18:46		
68°	22:37			18:00		
66°	23:09	22:04		17:30	20:35	
64°	23:32	23:10		17:08	19:31	
62°	23:51	23:45	23:37	16:50	18:56	21:16
60°	00:05	00:06	00:11	16:35	18:31	20:28
N 58°	00:13	00:20	00:32	16:23	18:11	19:58
56°	00:21	00:31	00:49	16:13	17:55	19:35
54°	00:27	00:42	01:03	16:03	17:41	19:16
52°	00:33	00:51	01:16	15:55	17:29	19:00
50°	00:38	00:59	01:27	15:48	17:18	18:47
45°	00:50	01:16	01:51	15:32	16:56	18:19
N 40°	00:59	01:31	02:10	15:19	16:38	17:57
35°	01:08	01:43	02:26	15:08	16:23	17:39
30°	01:15	01:54	02:39	14:58	16:10	17:23
20°	01:28	02:12	03:03	14:42	15:48	16:57
N 10°	01:39	02:29	03:24	14:28	15:29	16:34
0°	01:50	02:44	03:43	14:15	15:12	16:13
S 10°	02:00	03:00	04:03	14:02	14:54	15:52
20°	02:12	03:16	04:24	13:48	14:35	15:30
30°	02:25	03:36	04:49	13:32	14:14	15:04
35°	02:33	03:47	05:03	13:23	14:01	14:48
40°	02:42	04:00	05:20	13:12	13:47	14:31
45°	02:53	04:16	05:40	13:00	13:30	14:09
S 50°	03:05	04:35	06:06	12:45	13:09	13:43
52°	03:11	04:44	06:19	12:39	12:59	13:30
54°	03:18	04:55	06:33	12:31	12:48	13:15
56°	03:25	05:07	06:50	12:23	12:36	12:58
58°	03:34	05:20	07:10	12:13	12:21	12:37
S 60°	03:44	05:36	07:36	12:02	12:04	12:11

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 26-8%
21	01:45	01:51	12:02	08:02	20:29	
22	01:58	02:05	12:02	08:58	21:27	
23	02:11	02:18	12:02	09:58	22:30	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2265 sec ΔT = TT-UT1 = +68.9575 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	272°24.2	225°40.0	N14°43.5	116°20.3	N11°10.1	178°53.9	N23°15.5	270°02.0	S01°22.5
1	287°26.6	240°39.8	44.3	131°21.4	09.5	193°55.8	15.5	285°04.4	22.5
2	302°29.1	255°39.6	45.0	146°22.5	09.0	208°57.6	15.5	300°06.8	22.5
3	317°31.6	270°39.4	·· 45.7	161°23.7	·· 08.4	223°59.5	·· 15.5	315°09.2	·· 22.5
4	332°34.0	285°39.2	46.5	176°24.8	07.9	239°01.3	15.5	330°11.6	22.5
5	347°36.5	300°39.0	47.2	191°25.9	07.3	254°03.2	15.5	345°13.9	22.4
6	2°39.0	315°38.8	N14°47.9	206°27.0	N11°06.8	269°05.0	N23°15.5	0°16.3	S01°22.4
7	17°41.4	330°38.6	48.7	221°28.2	06.2	284°06.8	15.4	15°18.7	22.4
8	32°43.9	345°38.4	49.4	236°29.3	05.7	299°08.7	15.4	30°21.1	22.4
9	47°46.3	0°38.2	·· 50.1	251°30.4	·· 05.1	314°10.5	·· 15.4	45°23.5	·· 22.3
10	62°48.8	15°38.0	50.9	266°31.5	04.6	329°12.4	15.4	60°25.9	22.3
11	77°51.3	30°37.8	51.6	281°32.7	04.0	344°14.2	15.4	75°28.3	22.3
12	92°53.7	45°37.6	N14°52.3	296°33.8	N11°03.5	359°16.0	N23°15.4	90°30.7	S01°22.3
13	107°56.2	60°37.4	53.1	311°34.9	02.9	14°17.9	15.4	105°33.0	22.3
14	122°58.7	75°37.2	53.8	326°36.0	02.4	29°19.7	15.3	120°35.4	22.2
15	138°01.1	90°37.0	·· 54.5	341°37.2	·· 01.8	44°21.6	·· 15.3	135°37.8	·· 22.2
16	153°03.6	105°36.8	55.3	356°38.3	01.3	59°23.4	15.3	150°40.2	22.2
17	168°06.1	120°36.6	56.0	11°39.4	00.7	74°25.3	15.3	165°42.6	22.2
18	183°08.5	135°36.4	N14°56.7	26°40.5	N11°00.2	89°27.1	N23°15.3	180°45.0	S01°22.2
19	198°11.0	150°36.2	57.5	41°41.7	10°59.6	104°29.0	15.3	195°47.4	22.1
20	213°13.5	165°36.0	58.2	56°42.8	59.1	119°30.8	15.3	210°49.8	22.1
21	228°15.9	180°35.8	·· 58.9	71°43.9	·· 58.5	134°32.7	·· 15.3	225°52.2	·· 22.1
22	243°18.4	195°35.6	14°59.6	86°45.0	58.0	149°34.5	15.3	240°54.5	22.1
23	258°20.8	210°35.4	15°00.4	101°46.2	57.4	164°36.4	15.3	255°56.9	22.1
Mer.pass.	05:49	ν -0.2′	d 0.7′	m -4.19	ν 1.1′	d -0.6′	m 1.45	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.99

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°23.3	225°35.2	N15°01.1	116°47.3	N10°56.8	179°38.2	N23°15.3	270°59.3	S01°22.0
1	288°25.8	240°34.9	01.8	131°48.4	56.3	194°40.0	15.3	286°01.7	22.0
2	303°28.2	255°34.7	02.6	146°49.5	55.7	209°41.9	15.2	301°04.1	22.0
3	318°30.7	270°34.5	·· 03.3	161°50.7	·· 55.2	224°43.7	·· 15.2	316°06.5	·· 22.0
4	333°33.2	285°34.3	04.0	176°51.8	54.6	239°45.6	15.2	331°08.9	22.0
5	348°35.6	300°34.1	04.7	191°52.9	54.1	254°47.4	15.2	346°11.3	21.9
6	3°38.1	315°33.9	N15°05.5	206°54.0	N10°53.5	269°49.3	N23°15.2	1°13.7	S01°21.9
7	18°40.6	330°33.7	06.2	221°55.2	53.0	284°51.1	15.2	16°16.1	21.9
8	33°43.0	345°33.5	06.9	236°56.3	52.4	299°52.9	15.2	31°18.5	21.9
9	48°45.5	0°33.2	·· 07.6	251°57.4	·· 51.9	314°54.8	·· 15.2	46°20.8	·· 21.9
10	63°48.0	15°33.0	08.4	266°58.5	51.3	329°56.6	15.2	61°23.2	21.8
11	78°50.4	30°32.8	09.1	281°59.7	50.8	344°58.5	15.1	76°25.6	21.8
12	93°52.9	45°32.6	N15°09.8	297°00.8	N10°50.2	0°00.3	N23°15.1	91°28.0	S01°21.8
13	108°55.3	60°32.4	10.5	312°01.9	49.6	15°02.1	15.1	106°30.4	21.8
14	123°57.8	75°32.2	11.3	327°03.0	49.1	30°04.0	15.1	121°32.8	21.8
15	139°00.3	90°31.9	·· 12.0	342°04.1	·· 48.5	45°05.8	·· 15.1	136°35.2	·· 21.8
16	154°02.7	105°31.7	12.7	357°05.3	48.0	60°07.7	15.1	151°37.6	21.7
17	169°05.2	120°31.5	13.4	12°06.4	47.4	75°09.5	15.1	166°40.0	21.7
18	184°07.7	135°31.3	N15°14.2	27°07.5	N10°46.9	90°11.4	N23°15.1	181°42.4	S01°21.7
19	199°10.1	150°31.1	14.9	42°08.6	46.3	105°13.2	15.1	196°44.8	21.7
20	214°12.6	165°30.8	15.6	57°09.8	45.8	120°15.0	15.0	211°47.2	21.7
21	229°15.1	180°30.6	·· 16.3	72°10.9	·· 45.2	135°16.9	·· 15.0	226°49.6	·· 21.6
22	244°17.5	195°30.4	17.0	87°12.0	44.6	150°18.7	15.0	241°51.9	21.6
23	259°20.0	210°30.2	17.8	102°13.1	44.1	165°20.6	15.0	256°54.3	21.6
Mer.pass.	05:45	ν -0.2′	d 0.7′	m -4.18	ν 1.1′	d -0.6′	m 1.46	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.99

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	274°22.5	225°30.0	N15°18.5	117°14.3	N10°43.5	180°22.4	N23°15.0	271°56.7	S01°21.6
1	289°24.9	240°29.7	19.2	132°15.4	43.0	195°24.3	15.0	286°59.1	21.6
2	304°27.4	255°29.5	19.9	147°16.5	42.4	210°26.1	15.0	302°01.5	21.6
3	319°29.8	270°29.3	·· 20.6	162°17.6	·· 41.9	225°27.9	·· 15.0	317°03.9	·· 21.5
4	334°32.3	285°29.1	21.4	177°18.7	41.3	240°29.8	15.0	332°06.3	21.5
5	349°34.8	300°28.8	22.1	192°19.9	40.7	255°31.6	14.9	347°08.7	21.5
6	4°37.2	315°28.6	N15°22.8	207°21.0	N10°40.2	270°33.5	N23°14.9	2°11.1	S01°21.5
7	19°39.7	330°28.4	23.5	222°22.1	39.6	285°35.3	14.9	17°13.5	21.5
8	34°42.2	345°28.1	24.2	237°23.2	39.1	300°37.2	14.9	32°15.9	21.4
9	49°44.6	0°27.9	·· 25.0	252°24.4	·· 38.5	315°39.0	·· 14.9	47°18.3	·· 21.4
10	64°47.1	15°27.7	25.7	267°25.5	38.0	330°40.8	14.9	62°20.7	21.4
11	79°49.6	30°27.5	26.4	282°26.6	37.4	345°42.7	14.9	77°23.1	21.4
12	94°52.0	45°27.2	N15°27.1	297°27.7	N10°36.8	0°44.5	N23°14.9	92°25.5	S01°21.4
13	109°54.5	60°27.0	27.8	312°28.8	36.3	15°46.4	14.8	107°27.9	21.4
14	124°56.9	75°26.8	28.5	327°30.0	35.7	30°48.2	14.8	122°30.3	21.3
15	139°59.4	90°26.5	·· 29.2	342°31.1	·· 35.2	45°50.1	·· 14.8	137°32.7	·· 21.3
16	155°01.9	105°26.3	30.0	357°32.2	34.6	60°51.9	14.8	152°35.1	21.3
17	170°04.3	120°26.1	30.7	12°33.3	34.0	75°53.7	14.8	167°37.5	21.3
18	185°06.8	135°25.8	N15°31.4	27°34.5	N10°33.5	90°55.6	N23°14.8	182°39.9	S01°21.3
19	200°09.3	150°25.6	32.1	42°35.6	32.9	105°57.4	14.8	197°42.3	21.3
20	215°11.7	165°25.4	32.8	57°36.7	32.4	120°59.3	14.8	212°44.6	21.2
21	230°14.2	180°25.1	·· 33.5	72°37.8	·· 31.8	136°01.1	·· 14.7	227°47.0	·· 21.2
22	245°16.7	195°24.9	34.2	87°38.9	31.2	151°03.0	14.7	242°49.4	21.2
23	260°19.1	210°24.6	34.9	102°40.1	30.7	166°04.8	14.7	257°51.8	21.2
Mer.pass.	05:42	ν -0.2′	d 0.7′	m -4.17	ν 1.1′	d -0.6′	m 1.47	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.98

Stars

	SHA	Dec
Alpheratz	357°34.4	29°13.7
Ankaa	353°06.8	-42°09.8
Schedar	349°30.7	56°40.4
Diphda	348°47.0	-17°50.7
Achernar	335°20.1	-57°06.1
Hamal	327°50.9	23°34.9
Polaris	314°10.9	89°22.0
Acamar	315°11.8	-40°11.9
Menkar	314°06.0	4°11.4
Mirfak	308°28.1	49°56.9
Aldebaran	290°39.5	16°33.6
Rigel	281°03.8	-8°10.3
Capella	280°21.8	46°01.4
Bellatrix	278°22.8	6°22.4
Elnath	278°01.8	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.5
Sirius	258°26.3	-16°45.0
Adhara	255°06.0	-29°00.4
Procyon	244°50.8	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.6
Suhail	222°46.4	-43°32.3
Miaplacidus	221°38.9	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.7	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.7	-63°14.7
Gacrux	171°51.2	-57°15.6
Alioth	166°12.5	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.5	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.4	-60°56.7
Kochab	137°19.0	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.5
Eltanin	90°41.5	51°29.1
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.9	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.6	-56°39.0
Deneb	49°25.2	45°22.1
Enif	33°38.2	9°59.5
Al Na'ir	27°32.2	-46°50.0
Fomalhaut	15°14.0	-29°29.1
Scheat	13°44.7	28°13.1
Markab	13°29.4	15°20.5

Jun 24 Tue	SHA	Mer.pass
Venus	313°15.8	08:57
Mars	203°56.1	16:13
Jupiter	266°29.8	12:03
Saturn	357°37.8	05:59

Jun 25 Wed	SHA	Mer.pass
Venus	312°11.8	08:58
Mars	203°24.0	16:12
Jupiter	266°14.9	12:00
Saturn	357°36.0	05:55

Jun 26 Thu	SHA	Mer.pass
Venus	311°07.5	08:58
Mars	202°51.8	16:10
Jupiter	266°00.0	11:57
Saturn	357°34.3	05:51

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.0	N23°24.6	201°32.9	2.4′	N27°16.2	5.2′	60.2′
1	194°23.8	24.5	215°54.3	2.4′	27°21.4	5.0′	60.2′
2	209°23.7	24.5	230°15.7	2.3′	27°26.4	4.8′	60.2′
3	224°23.6	·· 24.4	244°37.0	2.3′	27°31.2	4.6′	60.2′
4	239°23.4	24.4	258°58.2	2.2′	27°35.8	4.4′	60.2′
5	254°23.3	24.3	273°19.4	2.2′	27°40.2	4.2′	60.2′
6	269°23.1	N23°24.3	287°40.6	2.1′	N27°44.4	4.0′	60.2′
7	284°23.0	24.2	302°01.7	2.1′	27°48.4	3.8′	60.2′
8	299°22.9	24.2	316°22.8	2.1′	27°52.2	3.6′	60.1′
9	314°22.7	·· 24.1	330°43.9	2.0′	27°55.8	3.3′	60.1′
10	329°22.6	24.0	345°04.9	2.0′	27°59.1	3.2′	60.1′
11	344°22.5	24.0	359°25.9	2.0′	28°02.3	2.9′	60.1′
12	359°22.3	N23°23.9	13°46.9	2.0′	N28°05.2	2.8′	60.1′
13	14°22.2	23.9	28°07.9	1.9′	28°08.0	2.5′	60.1′
14	29°22.1	23.8	42°28.8	1.9′	28°10.5	2.3′	60.1′
15	44°21.9	·· 23.8	56°49.7	1.9′	28°12.8	2.2′	60.1′
16	59°21.8	23.7	71°10.7	1.9′	28°15.0	1.9′	60.0′
17	74°21.7	23.6	85°31.6	1.9′	28°16.9	1.6′	60.0′
18	89°21.5	N23°23.6	99°52.5	1.9′	N28°18.5	1.5′	60.0′
19	104°21.4	23.5	114°13.4	1.9′	28°20.0	1.3′	60.0′
20	119°21.3	23.4	128°34.3	1.9′	28°21.3	1.0′	60.0′
21	134°21.1	·· 23.4	142°55.2	1.9′	28°22.3	0.9′	60.0′
22	149°21.0	23.3	157°16.2	1.9′	28°23.2	0.6′	59.9′
23	164°20.9	23.2	171°37.1	2.0′	28°23.8	0.5′	59.9′
	SD = 15.7′	d = -0.1′	SD = 16.4′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°20.7	N23°23.2	185°58.1	2.0′	N28°24.3	0.2′	59.9′
1	194°20.6	23.1	200°19.0	2.0′	28°24.5	0.0′	59.9′
2	209°20.5	23.0	214°40.0	2.0′	28°24.5	0.2′	59.9′
3	224°20.3	·· 23.0	229°01.1	2.1′	28°24.3	0.4′	59.9′
4	239°20.2	22.9	243°22.1	2.1′	28°23.9	0.7′	59.8′
5	254°20.1	22.8	257°43.2	2.1′	28°23.2	0.8′	59.8′
6	269°19.9	N23°22.8	272°04.4	2.2′	N28°22.4	1.0′	59.8′
7	284°19.8	22.7	286°25.5	2.2′	28°21.4	1.3′	59.8′
8	299°19.6	22.6	300°46.7	2.3′	28°20.1	1.4′	59.8′
9	314°19.5	·· 22.5	315°08.0	2.3′	28°18.7	1.7′	59.7′
10	329°19.4	22.5	329°29.3	2.4′	28°17.0	1.8′	59.7′
11	344°19.2	22.4	343°50.6	2.4′	28°15.2	2.1′	59.7′
12	359°19.1	N23°22.3	358°12.1	2.5′	N28°13.1	2.3′	59.7′
13	14°19.0	22.2	12°33.5	2.5′	28°10.8	2.4′	59.7′
14	29°18.8	22.2	26°55.1	2.6′	28°08.4	2.7′	59.6′
15	44°18.7	·· 22.1	41°16.7	2.7′	28°05.7	2.9′	59.6′
16	59°18.6	22.0	55°38.3	2.7′	28°02.8	3.1′	59.6′
17	74°18.4	21.9	70°00.1	2.8′	27°59.7	3.2′	59.6′
18	89°18.3	N23°21.9	84°21.9	2.9′	N27°56.5	3.5′	59.5′
19	104°18.2	21.8	98°43.7	3.0′	27°53.0	3.6′	59.5′
20	119°18.0	21.7	113°05.7	3.0′	27°49.4	3.9′	59.5′
21	134°17.9	·· 21.6	127°27.7	3.1′	27°45.5	4.0′	59.5′
22	149°17.8	21.5	141°49.9	3.2′	27°41.5	4.3′	59.4′
23	164°17.6	21.4	156°12.1	3.3′	27°37.2	4.4′	59.4′
	SD = 15.7′	d = -0.1′	SD = 16.3′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.5	N23°21.4	170°34.4	3.4′	N27°32.8	4.6′	59.4′
1	194°17.4	21.3	184°56.8	3.5′	27°28.2	4.8′	59.4′
2	209°17.2	21.2	199°19.2	3.6′	27°23.4	5.0′	59.3′
3	224°17.1	·· 21.1	213°41.8	3.7′	27°18.4	5.2′	59.3′
4	239°17.0	21.0	228°04.5	3.8′	27°13.2	5.3′	59.3′
5	254°16.9	20.9	242°27.3	3.9′	27°07.9	5.5′	59.2′
6	269°16.7	N23°20.8	256°50.2	4.0′	N27°02.4	5.7′	59.2′
7	284°16.6	20.8	271°13.1	4.1′	26°56.7	5.9′	59.2′
8	299°16.5	20.7	285°36.2	4.2′	26°50.8	6.1′	59.2′
9	314°16.3	·· 20.6	299°59.4	4.3′	26°44.7	6.2′	59.1′
10	329°16.2	20.5	314°22.7	4.4′	26°38.5	6.4′	59.1′
11	344°16.1	20.4	328°46.2	4.5′	26°32.1	6.6′	59.1′
12	359°15.9	N23°20.3	343°09.7	4.6′	N26°25.5	6.8′	59.1′
13	14°15.8	20.2	357°33.3	4.8′	26°18.7	6.9′	59.0′
14	29°15.7	20.1	11°57.1	4.9′	26°11.8	7.1′	59.0′
15	44°15.5	·· 20.0	26°21.0	5.0′	26°04.7	7.2′	59.0′
16	59°15.4	19.9	40°45.0	5.1′	25°57.5	7.4′	58.9′
17	74°15.3	19.8	55°09.1	5.2′	25°50.1	7.6′	58.9′
18	89°15.1	N23°19.7	69°33.3	5.4′	N25°42.5	7.7′	58.9′
19	104°15.0	19.6	83°57.7	5.5′	25°34.8	7.9′	58.8′
20	119°14.9	19.5	98°22.2	5.6′	25°26.9	8.0′	58.8′
21	134°14.7	·· 19.4	112°46.8	5.7′	25°18.9	8.2′	58.8′
22	149°14.6	19.3	127°11.6	5.9′	25°10.7	8.4′	58.7′
23	164°14.5	19.2	141°36.4	6.0′	25°02.3	8.4′	58.7′
	SD = 15.7′	d = -0.1′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	–:–	–:–	01:33	22:31	–:–	–:–
62°	–:–	–:–	02:11	21:54	–:–	–:–
60°	–:–	00:52	02:37	21:28	23:12	–:–
N 58°	–:–	01:42	02:58	21:07	22:23	–:–
56°	–:–	02:12	03:15	20:51	21:53	–:–
54°	00:48	02:34	03:29	20:36	21:31	23:16
52°	01:34	02:52	03:41	20:24	21:13	22:31
50°	02:02	03:07	03:52	20:13	20:58	22:03
45°	02:47	03:37	04:14	19:51	20:28	21:18
N 40°	03:18	04:00	04:32	19:33	20:06	20:47
35°	03:41	04:18	04:48	19:18	19:48	20:24
30°	04:00	04:33	05:01	19:05	19:32	20:06
20°	04:29	04:58	05:23	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:37	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	06:16	17:49	18:12	18:38
20°	05:43	06:11	06:35	17:30	17:54	18:22
30°	06:00	06:30	06:56	17:09	17:36	18:06
35°	06:09	06:40	07:09	16:57	17:25	17:57
40°	06:18	06:52	07:23	16:43	17:13	17:47
45°	06:28	07:06	07:39	16:26	17:00	17:37
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:29	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:32	16:19	17:08
58°	07:04	07:57	08:48	15:17	16:09	17:02
S 60°	07:12	08:08	09:06	15:00	15:57	16:54

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°						
N 70°						
68°						
66°						
64°						
62°			01:39		23:46	23:37
60°	00:24	01:05	02:33	22:05	22:52	23:08
N 58°	00:55	01:44	03:05	21:26	22:19	22:45
56°	01:19	02:11	03:29	20:59	21:55	22:27
54°	01:38	02:32	03:48	20:38	21:35	22:11
52°	01:54	02:50	04:05	20:20	21:19	21:58
50°	02:08	03:05	04:19	20:05	21:04	21:46
45°	02:36	03:36	04:47	19:34	20:35	21:21
N 40°	02:59	04:00	05:10	19:10	20:12	21:02
35°	03:18	04:19	05:28	18:50	19:53	20:45
30°	03:34	04:36	05:44	18:34	19:37	20:31
20°	04:01	05:05	06:11	18:05	19:09	20:06
N 10°	04:25	05:29	06:34	17:41	18:45	19:45
0°	04:47	05:52	06:56	17:18	18:23	19:24
S 10°	05:09	06:15	07:17	16:55	18:00	19:04
20°	05:33	06:40	07:40	16:31	17:36	18:43
30°	06:01	07:08	08:07	16:02	17:08	18:17
35°	06:18	07:25	08:22	15:45	16:51	18:02
40°	06:37	07:45	08:40	15:26	16:32	17:45
45°	07:00	08:09	09:02	15:02	16:08	17:24
S 50°	07:31	08:40	09:30	14:31	15:37	16:57
52°	07:46	08:55	09:43	14:16	15:22	16:44
54°	08:03	09:13	09:59	13:58	15:04	16:29
56°	08:24	09:35	10:17	13:37	14:43	16:11
58°	08:51	10:03	10:39	13:10	14:15	15:50
S 60°	09:29	10:42	11:07	12:31	13:36	15:22

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 28-1 3-1%
24	02:24	02:31	12:03	11:02	23:35	
25	02:37	02:44	12:03	12:08	–:–	
26	02:50	02:56	12:03	13:10	00:39	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2272 sec ΔT = TT-UT1 = +68.9568 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	275°21.6	225°24.4	N15°35.7	117°41.2	N10°30.1	181°06.6	N23°14.7	272°54.2	S01°21.2
1	290°24.1	240°24.2	36.4	132°42.3	29.6	196°08.5	14.7	287°56.6	21.2
2	305°26.5	255°23.9	37.1	147°43.4	29.0	211°10.3	14.7	302°59.0	21.1
3	320°29.0	270°23.7	·· 37.8	162°44.5	·· 28.4	226°12.2	·· 14.7	318°01.4	·· 21.1
4	335°31.4	285°23.4	38.5	177°45.7	27.9	241°14.0	14.7	333°03.8	21.1
5	350°33.9	300°23.2	39.2	192°46.8	27.3	256°15.9	14.6	348°06.2	21.1
6	5°36.4	315°23.0	N15°39.9	207°47.9	N10°26.8	271°17.7	N23°14.6	3°08.6	S01°21.1
7	20°38.8	330°22.7	40.6	222°49.0	26.2	286°19.5	14.6	18°11.0	21.1
8	35°41.3	345°22.5	41.3	237°50.2	25.6	301°21.4	14.6	33°13.4	21.0
9	50°43.8	0°22.2	·· 42.0	252°51.3	·· 25.1	316°23.2	·· 14.6	48°15.8	·· 21.0
10	65°46.2	15°22.0	42.8	267°52.4	24.5	331°25.1	14.6	63°18.2	21.0
11	80°48.7	30°21.7	43.5	282°53.5	24.0	346°26.9	14.6	78°20.6	21.0
12	95°51.2	45°21.5	N15°44.2	297°54.6	N10°23.4	1°28.8	N23°14.5	93°23.0	S01°21.0
13	110°53.6	60°21.3	44.9	312°55.8	22.8	16°30.6	14.5	108°25.4	21.0
14	125°56.1	75°21.0	45.6	327°56.9	22.3	31°32.4	14.5	123°27.8	20.9
15	140°58.6	90°20.8	·· 46.3	342°58.0	·· 21.7	46°34.3	·· 14.5	138°30.2	·· 20.9
16	156°01.0	105°20.5	47.0	357°59.1	21.2	61°36.1	14.5	153°32.6	20.9
17	171°03.5	120°20.3	47.7	13°00.2	20.6	76°38.0	14.5	168°35.0	20.9
18	186°05.9	135°20.0	N15°48.4	28°01.4	N10°20.0	91°39.8	N23°14.5	183°37.4	S01°20.9
19	201°08.4	150°19.8	49.1	43°02.5	19.5	106°41.7	14.5	198°39.8	20.9
20	216°10.9	165°19.5	49.8	58°03.6	18.9	121°43.5	14.4	213°42.2	20.9
21	231°13.3	180°19.3	·· 50.5	73°04.7	·· 18.3	136°45.3	·· 14.4	228°44.6	·· 20.8
22	246°15.8	195°19.0	51.2	88°05.8	17.8	151°47.2	14.4	243°47.0	20.8
23	261°18.3	210°18.8	51.9	103°07.0	17.2	166°49.0	14.4	258°49.4	20.8
Mer.pass.	05:38	ν -0.2′	d 0.7′	m -4.17	ν 1.1′	d -0.6′	m 1.47	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.98

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	276°20.7	225°18.5	N15°52.6	118°08.1	N10°16.7	181°50.9	N23°14.4	273°51.8	S01°20.8
1	291°23.2	240°18.3	53.3	133°09.2	16.1	196°52.7	14.4	288°54.2	20.8
2	306°25.7	255°18.0	54.0	148°10.3	15.5	211°54.6	14.4	303°56.6	20.8
3	321°28.1	270°17.7	·· 54.7	163°11.4	·· 15.0	226°56.4	·· 14.3	318°59.0	·· 20.8
4	336°30.6	285°17.5	55.4	178°12.6	14.4	241°58.3	14.3	334°01.4	20.7
5	351°33.1	300°17.2	56.1	193°13.7	13.8	257°00.1	14.3	349°03.8	20.7
6	6°35.5	315°17.0	N15°56.8	208°14.8	N10°13.3	272°01.9	N23°14.3	4°06.2	S01°20.7
7	21°38.0	330°16.7	57.5	223°15.9	12.7	287°03.8	14.3	19°08.6	20.7
8	36°40.4	345°16.5	58.2	238°17.0	12.1	302°05.6	14.3	34°11.0	20.7
9	51°42.9	0°16.2	·· 58.9	253°18.2	·· 11.6	317°07.5	·· 14.3	49°13.4	·· 20.7
10	66°45.4	15°15.9	15°59.6	268°19.3	11.0	332°09.3	14.2	64°15.9	20.7
11	81°47.8	30°15.7	16°00.3	283°20.4	10.5	347°11.2	14.2	79°18.3	20.6
12	96°50.3	45°15.4	N16°01.0	298°21.5	N10°09.9	2°13.0	N23°14.2	94°20.7	S01°20.6
13	111°52.8	60°15.2	01.7	313°22.6	09.3	17°14.8	14.2	109°23.1	20.6
14	126°55.2	75°14.9	02.4	328°23.7	08.8	32°16.7	14.2	124°25.5	20.6
15	141°57.7	90°14.6	·· 03.1	343°24.9	·· 08.2	47°18.5	·· 14.2	139°27.9	·· 20.6
16	157°00.2	105°14.4	03.8	358°26.0	07.6	62°20.4	14.2	154°30.3	20.6
17	172°02.6	120°14.1	04.5	13°27.1	07.1	77°22.2	14.1	169°32.7	20.6
18	187°05.1	135°13.9	N16°05.2	28°28.2	N10°06.5	92°24.1	N23°14.1	184°35.1	S01°20.5
19	202°07.6	150°13.6	05.9	43°29.3	05.9	107°25.9	14.1	199°37.5	20.5
20	217°10.0	165°13.3	06.6	58°30.5	05.4	122°27.7	14.1	214°39.9	20.5
21	232°12.5	180°13.1	·· 07.3	73°31.6	·· 04.8	137°29.6	·· 14.1	229°42.3	·· 20.5
22	247°14.9	195°12.8	08.0	88°32.7	04.2	152°31.4	14.1	244°44.7	20.5
23	262°17.4	210°12.5	08.7	103°33.8	03.7	167°33.3	14.1	259°47.1	20.5
Mer.pass.	05:34	ν -0.3′	d 0.7′	m -4.16	ν 1.1′	d -0.6′	m 1.48	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.97

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	277°19.9	225°12.3	N16°09.3	118°34.9	N10°03.1	182°35.1	N23°14.0	274°49.5	S01°20.5
1	292°22.3	240°12.0	10.0	133°36.1	02.5	197°37.0	14.0	289°51.9	20.4
2	307°24.8	255°11.7	10.7	148°37.2	02.0	212°38.8	14.0	304°54.3	20.4
3	322°27.3	270°11.5	·· 11.4	163°38.3	·· 01.4	227°40.7	·· 14.0	319°56.7	·· 20.4
4	337°29.7	285°11.2	12.1	178°39.4	00.8	242°42.5	14.0	334°59.1	20.4
5	352°32.2	300°10.9	12.8	193°40.5	10°00.3	257°44.3	14.0	350°01.5	20.4
6	7°34.7	315°10.6	N16°13.5	208°41.6	N09°59.7	272°46.2	N23°14.0	5°03.9	S01°20.4
7	22°37.1	330°10.4	14.2	223°42.8	59.1	287°48.0	13.9	20°06.4	20.4
8	37°39.6	345°10.1	14.9	238°43.9	58.6	302°49.9	13.9	35°08.8	20.4
9	52°42.0	0°09.8	·· 15.6	253°45.0	·· 58.0	317°51.7	·· 13.9	50°11.2	·· 20.3
10	67°44.5	15°09.6	16.2	268°46.1	57.4	332°53.6	13.9	65°13.6	20.3
11	82°47.0	30°09.3	16.9	283°47.2	56.9	347°55.4	13.9	80°16.0	20.3
12	97°49.4	45°09.0	N16°17.6	298°48.4	N09°56.3	2°57.2	N23°13.9	95°18.4	S01°20.3
13	112°51.9	60°08.7	18.3	313°49.5	55.7	17°59.1	13.8	110°20.8	20.3
14	127°54.4	75°08.5	19.0	328°50.6	55.2	33°00.9	13.8	125°23.2	20.3
15	142°56.8	90°08.2	·· 19.7	343°51.7	·· 54.6	48°02.8	·· 13.8	140°25.6	·· 20.3
16	157°59.3	105°07.9	20.4	358°52.8	54.0	63°04.6	13.8	155°28.0	20.3
17	173°01.8	120°07.6	21.0	13°53.9	53.5	78°06.5	13.8	170°30.4	20.2
18	188°04.2	135°07.4	N16°21.7	28°55.1	N09°52.9	93°08.3	N23°13.8	185°32.8	S01°20.2
19	203°06.7	150°07.1	22.4	43°56.2	52.3	108°10.2	13.8	200°35.2	20.2
20	218°09.2	165°06.8	23.1	58°57.3	51.8	123°12.0	13.7	215°37.6	20.2
21	233°11.6	180°06.5	·· 23.8	73°58.4	·· 51.2	138°13.8	·· 13.7	230°40.1	·· 20.2
22	248°14.1	195°06.2	24.5	88°59.5	50.6	153°15.7	13.7	245°42.5	20.2
23	263°16.5	210°06.0	25.1	104°00.6	50.1	168°17.5	13.7	260°44.9	20.2
Mer.pass.	05:30	ν -0.3′	d 0.7′	m -4.15	ν 1.1′	d -0.6′	m 1.48	ν 1.8′	d -0.0′ m -1.89	ν 2.4′	d 0.0′ m 0.97

Stars

	SHA	Dec
Alpheratz	357°34.3	29°13.7
Ankaa	353°06.8	-42°09.8
Schedar	349°30.7	56°40.4
Diphda	348°46.9	-17°50.7
Achernar	335°20.1	-57°06.1
Hamal	327°50.9	23°34.9
Polaris	314°09.5	89°22.0
Acamar	315°11.7	-40°11.9
Menkar	314°06.0	4°11.4
Mirfak	308°28.1	49°56.9
Aldebaran	290°39.5	16°33.6
Rigel	281°03.8	-8°10.3
Capella	280°21.8	46°01.3
Bellatrix	278°22.8	6°22.4
Elnath	278°01.7	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.5
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.4
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.6
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.0	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.8	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.7	-63°14.7
Gacrux	171°51.2	-57°15.6
Alioth	166°12.5	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.5	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.4	-60°56.7
Kochab	137°19.0	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.1
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.9	-26°15.9
Altair	61°59.3	8°56.1
Peacock	53°04.6	-56°39.0
Deneb	49°25.1	45°22.1
Enif	33°38.2	9°59.5
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.9	-29°29.0
Scheat	13°44.7	28°13.1
Markab	13°29.4	15°20.5

Jun 27 Fri	SHA	Mer.pass
Venus	310°02.8	08:59
Mars	202°19.6	16:08
Jupiter	265°45.0	11:54
Saturn	357°32.6	05:47

Jun 28 Sat	SHA	Mer.pass
Venus	308°57.8	08:59
Mars	201°47.3	16:06
Jupiter	265°30.1	11:51
Saturn	357°31.1	05:44

Jun 29 Sun	SHA	Mer.pass
Venus	307°52.4	08:59
Mars	201°15.1	16:04
Jupiter	265°15.2	11:48
Saturn	357°29.6	05:40

Horizontal parallax

Venus: 0.2

Mars: 0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.3	N23°19.1	156°01.4	6.1′	N24°53.9	8.7′	58.7′
1	194°14.2	19.0	170°26.6	6.3′	24°45.2	8.7′	58.6′
2	209°14.1	18.9	184°51.8	6.4′	24°36.5	9.0′	58.6′
3	224°14.0	·· 18.8	199°17.2	6.5′	24°27.5	9.0′	58.6′
4	239°13.8	18.7	213°42.7	6.7′	24°18.5	9.2′	58.6′
5	254°13.7	18.6	228°08.4	6.8′	24°09.3	9.3′	58.5′
6	269°13.6	N23°18.5	242°34.2	6.9′	N24°00.0	9.5′	58.5′
7	284°13.4	18.4	257°00.1	7.0′	23°50.5	9.6′	58.5′
8	299°13.3	18.3	271°26.1	7.2′	23°40.9	9.7′	58.4′
9	314°13.2	·· 18.2	285°52.3	7.3′	23°31.2	9.9′	58.4′
10	329°13.0	18.1	300°18.6	7.4′	23°21.3	10.0′	58.4′
11	344°12.9	18.0	314°45.1	7.6′	23°11.3	10.1′	58.3′
12	359°12.8	N23°17.9	329°11.6	7.7′	N23°01.2	10.2′	58.3′
13	14°12.6	17.8	343°38.4	7.8′	22°51.0	10.3′	58.3′
14	29°12.5	17.7	358°05.2	8.0′	22°40.7	10.5′	58.2′
15	44°12.4	·· 17.5	12°32.2	8.1′	22°30.2	10.6′	58.2′
16	59°12.3	17.4	26°59.3	8.3′	22°19.6	10.7′	58.1′
17	74°12.1	17.3	41°26.6	8.4′	22°08.9	10.8′	58.1′
18	89°12.0	N23°17.2	55°53.9	8.5′	N21°58.1	10.9′	58.1′
19	104°11.9	17.1	70°21.5	8.6′	21°47.2	11.0′	58.0′
20	119°11.7	17.0	84°49.1	8.8′	21°36.2	11.2′	58.0′
21	134°11.6	·· 16.9	99°16.9	8.9′	21°25.0	11.2′	58.0′
22	149°11.5	16.7	113°44.8	9.0′	21°13.8	11.4′	57.9′
23	164°11.4	16.6	128°12.8	9.2′	21°02.4	11.4′	57.9′
	SD = 15.7′	d = -0.1′	SD = 16.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.2	N23°16.5	142°41.0	9.3′	N20°51.0	11.5′	57.9′
1	194°11.1	16.4	157°09.3	9.4′	20°39.5	11.7′	57.8′
2	209°11.0	16.3	171°37.8	9.6′	20°27.8	11.7′	57.8′
3	224°10.8	·· 16.2	186°06.3	9.7′	20°16.1	11.8′	57.8′
4	239°10.7	16.0	200°35.0	9.8′	20°04.3	12.0′	57.7′
5	254°10.6	15.9	215°03.9	10.0′	19°52.3	12.0′	57.7′
6	269°10.4	N23°15.8	229°32.8	10.1′	N19°40.3	12.1′	57.7′
7	284°10.3	15.7	244°01.9	10.2′	19°28.2	12.1′	57.6′
8	299°10.2	15.5	258°31.1	10.3′	19°16.1	12.3′	57.6′
9	314°10.1	·· 15.4	273°00.4	10.5′	19°03.8	12.4′	57.6′
10	329°09.9	15.3	287°29.9	10.6′	18°51.4	12.4′	57.5′
11	344°09.8	15.2	301°59.5	10.7′	18°39.0	12.5′	57.5′
12	359°09.7	N23°15.0	316°29.2	10.8′	N18°26.5	12.6′	57.5′
13	14°09.6	14.9	330°59.0	10.9′	18°13.9	12.7′	57.4′
14	29°09.4	14.8	345°29.0	11.1′	18°01.2	12.7′	57.4′
15	44°09.3	·· 14.7	359°59.0	11.2′	17°48.5	12.8′	57.3′
16	59°09.2	14.5	14°29.2	11.3′	17°35.7	12.9′	57.3′
17	74°09.0	14.4	28°59.5	11.4′	17°22.8	12.9′	57.3′
18	89°08.9	N23°14.3	43°29.9	11.5′	N17°09.9	13.1′	57.2′
19	104°08.8	14.1	58°00.5	11.7′	16°56.8	13.0′	57.2′
20	119°08.7	14.0	72°31.1	11.8′	16°43.8	13.2′	57.2′
21	134°08.5	·· 13.9	87°01.9	11.9′	16°30.6	13.2′	57.1′
22	149°08.4	13.7	101°32.8	12.0′	16°17.4	13.3′	57.1′
23	164°08.3	13.6	116°03.8	12.1′	16°04.1	13.3′	57.1′
	SD = 15.7′	d = -0.1′	SD = 15.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.1	N23°13.5	130°34.9	12.2′	N15°50.8	13.4′	57.0′
1	194°08.0	13.3	145°06.1	12.3′	15°37.4	13.4′	57.0′
2	209°07.9	13.2	159°37.4	12.4′	15°24.0	13.5′	57.0′
3	224°07.8	·· 13.1	174°08.9	12.5′	15°10.5	13.6′	56.9′
4	239°07.6	12.9	188°40.4	12.6′	14°56.9	13.6′	56.9′
5	254°07.5	12.8	203°12.0	12.7′	14°43.3	13.6′	56.9′
6	269°07.4	N23°12.6	217°43.8	12.8′	N14°29.7	13.7′	56.8′
7	284°07.3	12.5	232°15.6	12.9′	14°16.0	13.8′	56.8′
8	299°07.1	12.4	246°47.6	13.1′	14°02.2	13.8′	56.8′
9	314°07.0	·· 12.2	261°19.6	13.1′	13°48.4	13.8′	56.7′
10	329°06.9	12.1	275°51.8	13.2′	13°34.6	13.9′	56.7′
11	344°06.8	11.9	290°24.0	13.3′	13°20.7	13.9′	56.7′
12	359°06.6	N23°11.8	304°56.4	13.4′	N13°06.8	14.0′	56.6′
13	14°06.5	11.6	319°28.8	13.5′	12°52.8	14.0′	56.6′
14	29°06.4	11.5	334°01.3	13.6′	12°38.8	14.0′	56.6′
15	44°06.3	·· 11.4	348°34.0	13.7′	12°24.8	14.1′	56.5′
16	59°06.1	11.2	3°06.7	13.8′	12°10.7	14.1′	56.5′
17	74°06.0	11.1	17°39.5	13.9′	11°56.6	14.2′	56.5′
18	89°05.9	N23°10.9	32°12.4	14.0′	N11°42.4	14.2′	56.4′
19	104°05.8	10.8	46°45.4	14.1′	11°28.2	14.2′	56.4′
20	119°05.6	10.6	61°18.4	14.2′	11°14.0	14.2′	56.4′
21	134°05.5	·· 10.5	75°51.6	14.2′	10°59.8	14.3′	56.3′
22	149°05.4	10.3	90°24.8	14.3′	10°45.5	14.3′	56.3′
23	164°05.3	10.2	104°58.1	14.4′	10°31.2	14.3′	56.3′
	SD = 15.7′	d = -0.1′	SD = 15.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°						
64°	-:-	-:-	01:37	22:29	-:-	-:-
62°	-:-	-:-	02:14	21:52	-:-	-:-
60°	-:-	00:57	02:40	21:27	23:08	-:-
N 58°	-:-	01:45	03:00	21:07	22:21	-:-
56°	-:-	02:14	03:16	20:50	21:52	-:-
54°	00:53	02:36	03:30	20:36	21:30	23:13
52°	01:37	02:54	03:43	20:24	21:12	22:29
50°	02:04	03:09	03:53	20:13	20:57	22:02
45°	02:49	03:38	04:16	19:51	20:28	21:17
N 40°	03:19	04:01	04:34	19:33	20:06	20:47
35°	03:42	04:19	04:49	19:18	19:48	20:24
30°	04:01	04:34	05:01	19:05	19:33	20:06
20°	04:30	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:15
0°	05:11	05:37	06:00	18:07	18:30	18:56
S 10°	05:28	05:54	06:17	17:50	18:13	18:39
20°	05:44	06:11	06:35	17:31	17:55	18:23
30°	06:00	06:30	06:56	17:10	17:37	18:06
35°	06:09	06:41	07:09	16:58	17:26	17:58
40°	06:18	06:52	07:23	16:44	17:14	17:48
45°	06:29	07:06	07:40	16:27	17:01	17:38
S 50°	06:40	07:22	08:00	16:07	16:45	17:27
52°	06:45	07:29	08:10	15:57	16:38	17:21
54°	06:51	07:37	08:21	15:46	16:30	17:16
56°	06:57	07:46	08:33	15:33	16:21	17:10
58°	07:04	07:56	08:48	15:19	16:11	17:03
S 60°	07:11	08:08	09:05	15:02	15:59	16:56

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°			06:01			01:13
N 70°			06:33			00:39
68°		04:25	06:56		01:03	00:14
66°		05:05	07:14		00:21	23:47
64°	03:13	05:33	07:29	00:19	23:55	23:37
62°	03:55	05:54	07:41	23:31	23:39	23:28
60°	04:23	06:11	07:51	23:13	23:26	23:21
N 58°	04:45	06:25	07:59	22:58	23:14	23:14
56°	05:02	06:37	08:07	22:45	23:04	23:08
54°	05:17	06:48	08:14	22:34	22:56	23:03
52°	05:30	06:57	08:20	22:24	22:48	22:59
50°	05:42	07:05	08:26	22:15	22:41	22:54
45°	06:05	07:23	08:37	21:55	22:35	22:50
N 40°	06:24	07:37	08:47	21:40	22:21	22:42
35°	06:40	07:49	08:55	21:27	22:10	22:35
30°	06:53	08:00	09:03	21:15	22:00	22:29
20°	07:16	08:18	09:15	20:55	21:52	22:23
N 10°	07:36	08:34	09:26	20:37	21:37	22:14
0°	07:55	08:48	09:36	20:21	21:24	22:06
S 10°	08:13	09:03	09:46	20:04	21:12	21:58
20°	08:33	09:18	09:57	19:46	20:59	21:50
30°	08:55	09:36	10:09	19:26	20:46	21:41
35°	09:09	09:46	10:16	19:13	20:31	21:31
40°	09:24	09:57	10:24	18:59	20:22	21:26
45°	09:42	10:11	10:34	18:43	20:11	21:19
S 50°	10:04	10:27	10:45	18:22	19:59	21:12
52°	10:14	10:35	10:50	18:12	19:44	21:02
54°	10:26	10:44	10:55	18:00	19:37	20:58
56°	10:40	10:53	11:02	17:47	19:29	20:53
58°	10:56	11:04	11:09	17:32	19:21	20:48
S 60°	11:14	11:16	11:17	17:14	18:59	20:35

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 2-4 3-15%
27	03:03	03:09	12:03	14:08	01:40	
28	03:15	03:21	12:03	15:00	02:35	
29	03:27	03:33	12:04	15:47	03:24	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2279 sec ΔT = TT-UT1 = +68.9561 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°19.0	225°05.7	N16°25.8	119°01.8	N09°49.5	183°19.4	N23°13.7	275°47.3	S01°20.2
1	293°21.5	240°05.4	26.5	134°02.9	48.9	198°21.2	13.7	290°49.7	20.2
2	308°23.9	255°05.1	27.2	149°04.0	48.3	213°23.1	13.6	305°52.1	20.1
3	323°26.4	270°04.8	·· 27.9	164°05.1	·· 47.8	228°24.9	·· 13.6	320°54.5	·· 20.1
4	338°28.9	285°04.5	28.5	179°06.2	47.2	243°26.8	13.6	335°56.9	20.1
5	353°31.3	300°04.3	29.2	194°07.3	46.6	258°28.6	13.6	350°59.3	20.1
6	8°33.8	315°04.0	N16°29.9	209°08.5	N09°46.1	273°30.4	N23°13.6	6°01.7	S01°20.1
7	23°36.3	330°03.7	30.6	224°09.6	45.5	288°32.3	13.6	21°04.2	20.1
8	38°38.7	345°03.4	31.3	239°10.7	44.9	303°34.1	13.5	36°06.6	20.1
9	53°41.2	0°03.1	·· 31.9	254°11.8	·· 44.4	318°36.0	·· 13.5	51°09.0	·· 20.1
10	68°43.7	15°02.8	32.6	269°12.9	43.8	333°37.8	13.5	66°11.4	20.1
11	83°46.1	30°02.5	33.3	284°14.0	43.2	348°39.7	13.5	81°13.8	20.0
12	98°48.6	45°02.2	N16°34.0	299°15.2	N09°42.7	3°41.5	N23°13.5	96°16.2	S01°20.0
13	113°51.0	60°02.0	34.6	314°16.3	42.1	18°43.3	13.5	111°18.6	20.0
14	128°53.5	75°01.7	35.3	329°17.4	41.5	33°45.2	13.4	126°21.0	20.0
15	143°56.0	90°01.4	·· 36.0	344°18.5	·· 40.9	48°47.0	·· 13.4	141°23.4	·· 20.0
16	158°58.4	105°01.1	36.7	359°19.6	40.4	63°48.9	13.4	156°25.9	20.0
17	174°00.9	120°00.8	37.3	14°20.7	39.8	78°50.7	13.4	171°28.3	20.0
18	189°03.4	135°00.5	N16°38.0	29°21.9	N09°39.2	93°52.6	N23°13.4	186°30.7	S01°20.0
19	204°05.8	150°00.2	38.7	44°23.0	38.7	108°54.4	13.4	201°33.1	20.0
20	219°08.3	164°59.9	39.4	59°24.1	38.1	123°56.3	13.4	216°35.5	20.0
21	234°10.8	179°59.6	·· 40.0	74°25.2	·· 37.5	138°58.1	·· 13.3	231°37.9	·· 19.9
22	249°13.2	194°59.3	40.7	89°26.3	36.9	154°00.0	13.3	246°40.3	19.9
23	264°15.7	209°59.0	41.4	104°27.4	36.4	169°01.8	13.3	261°42.7	19.9
Mer.pass.	05:26	ν -0.3′	d 0.7′	m -4.15	ν 1.1′	d -0.6′	m 1.49	ν 1.8′	d -0.0′	m -1.89	ν 2.4′	d 0.0′	m 0.96

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°18.1	224°58.7	N16°42.1	119°28.5	N09°35.8	184°03.6	N23°13.3	276°45.1	S01°19.9
1	294°20.6	239°58.4	42.7	134°29.7	35.2	199°05.5	13.3	291°47.6	19.9
2	309°23.1	254°58.1	43.4	149°30.8	34.7	214°07.3	13.3	306°50.0	19.9
3	324°25.5	269°57.8	·· 44.1	164°31.9	·· 34.1	229°09.2	·· 13.2	321°52.4	·· 19.9
4	339°28.0	284°57.5	44.7	179°33.0	33.5	244°11.0	13.2	336°54.8	19.9
5	354°30.5	299°57.2	45.4	194°34.1	32.9	259°12.9	13.2	351°57.2	19.9
6	9°32.9	314°56.9	N16°46.1	209°35.2	N09°32.4	274°14.7	N23°13.2	6°59.6	S01°19.9
7	24°35.4	329°56.6	46.7	224°36.4	31.8	289°16.6	13.2	22°02.0	19.8
8	39°37.9	344°56.3	47.4	239°37.5	31.2	304°18.4	13.1	37°04.5	19.8
9	54°40.3	359°56.0	·· 48.1	254°38.6	·· 30.6	319°20.2	·· 13.1	52°06.9	·· 19.8
10	69°42.8	14°55.7	48.7	269°39.7	30.1	334°22.1	13.1	67°09.3	19.8
11	84°45.3	29°55.4	49.4	284°40.8	29.5	349°23.9	13.1	82°11.7	19.8
12	99°47.7	44°55.1	N16°50.1	299°41.9	N09°28.9	4°25.8	N23°13.1	97°14.1	S01°19.8
13	114°50.2	59°54.8	50.7	314°43.0	28.4	19°27.6	13.1	112°16.5	19.8
14	129°52.6	74°54.5	51.4	329°44.2	27.8	34°29.5	13.0	127°18.9	19.8
15	144°55.1	89°54.2	·· 52.1	344°45.3	·· 27.2	49°31.3	·· 13.0	142°21.4	·· 19.8
16	159°57.6	104°53.9	52.7	359°46.4	26.6	64°33.2	13.0	157°23.8	19.8
17	175°00.0	119°53.6	53.4	14°47.5	26.1	79°35.0	13.0	172°26.2	19.8
18	190°02.5	134°53.3	N16°54.0	29°48.6	N09°25.5	94°36.8	N23°13.0	187°28.6	S01°19.7
19	205°05.0	149°53.0	54.7	44°49.7	24.9	109°38.7	13.0	202°31.0	19.7
20	220°07.4	164°52.7	55.4	59°50.8	24.3	124°40.5	12.9	217°33.4	19.7
21	235°09.9	179°52.4	·· 56.0	74°52.0	·· 23.8	139°42.4	·· 12.9	232°35.9	·· 19.7
22	250°12.4	194°52.1	56.7	89°53.1	23.2	154°44.2	12.9	247°38.3	19.7
23	265°14.8	209°51.8	57.4	104°54.2	22.6	169°46.1	12.9	262°40.7	19.7
Mer.pass.	05:22	ν -0.3′	d 0.7′	m -4.14	ν 1.1′	d -0.6′	m 1.49	ν 1.8′	d -0.0′	m -1.89	ν 2.4′	d 0.0′	m 0.96

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°17.3	224°51.5	N16°58.0	119°55.3	N09°22.0	184°47.9	N23°12.9	277°43.1	S01°19.7
1	295°19.8	239°51.1	58.7	134°56.4	21.5	199°49.8	12.9	292°45.5	19.7
2	310°22.2	254°50.8	16°59.3	149°57.5	20.9	214°51.6	12.8	307°47.9	19.7
3	325°24.7	269°50.5	17°00.0	164°58.6	·· 20.3	229°53.5	·· 12.8	322°50.4	·· 19.7
4	340°27.1	284°50.2	00.6	179°59.8	19.7	244°55.3	12.8	337°52.8	19.7
5	355°29.6	299°49.9	01.3	195°00.9	19.2	259°57.1	12.8	352°55.2	19.7
6	10°32.1	314°49.6	N17°02.0	210°02.0	N09°18.6	274°59.0	N23°12.8	7°57.6	S01°19.7
7	25°34.5	329°49.3	02.6	225°03.1	18.0	290°00.8	12.7	23°00.0	19.6
8	40°37.0	344°48.9	03.3	240°04.2	17.4	305°02.7	12.7	38°02.4	19.6
9	55°39.5	359°48.6	·· 03.9	255°05.3	·· 16.9	320°04.5	·· 12.7	53°04.9	·· 19.6
10	70°41.9	14°48.3	04.6	270°06.4	16.3	335°06.4	12.7	68°07.3	19.6
11	85°44.4	29°48.0	05.2	285°07.6	15.7	350°08.2	12.7	83°09.7	19.6
12	100°46.9	44°47.7	N17°05.9	300°08.7	N09°15.1	5°10.1	N23°12.7	98°12.1	S01°19.6
13	115°49.3	59°47.4	06.5	315°09.8	14.6	20°11.9	12.6	113°14.5	19.6
14	130°51.8	74°47.0	07.2	330°10.9	14.0	35°13.8	12.6	128°17.0	19.6
15	145°54.2	89°46.7	·· 07.8	345°12.0	·· 13.4	50°15.6	·· 12.6	143°19.4	·· 19.6
16	160°56.7	104°46.4	08.5	0°13.1	12.8	65°17.4	12.6	158°21.8	19.6
17	175°59.2	119°46.1	09.1	15°14.2	12.2	80°19.3	12.6	173°24.2	19.6
18	191°01.6	134°45.8	N17°09.8	30°15.3	N09°11.7	95°21.1	N23°12.5	188°26.6	S01°19.6
19	206°04.1	149°45.4	10.4	45°16.5	11.1	110°23.0	12.5	203°29.1	19.6
20	221°06.6	164°45.1	11.1	60°17.6	10.5	125°24.8	12.5	218°31.5	19.5
21	236°09.0	179°44.8	·· 11.7	75°18.7	·· 09.9	140°26.7	·· 12.5	233°33.9	·· 19.5
22	251°11.5	194°44.5	12.4	90°19.8	09.4	155°28.5	12.5	248°36.3	19.5
23	266°14.0	209°44.2	13.0	105°20.9	08.8	170°30.4	12.5	263°38.7	19.5
Mer.pass.	05:18	ν -0.3′	d 0.7′	m -4.13	ν 1.1′	d -0.6′	m 1.50	ν 1.8′	d -0.0′	m -1.89	ν 2.4′	d 0.0′	m 0.95

Stars

	SHA	Dec
Alpheratz	357°34.3	29°13.7
Ankaa	353°06.7	-42°09.8
Schedar	349°30.6	56°40.4
Diphda	348°46.9	-17°50.7
Achernar	335°20.0	-57°06.1
Hamal	327°50.9	23°34.9
Polaris	314°08.3	89°22.0
Acamar	315°11.7	-40°11.9
Menkar	314°05.9	4°11.4
Mirfak	308°28.0	49°56.9
Aldebaran	290°39.5	16°33.6
Rigel	281°03.8	-8°10.3
Capella	280°21.8	46°01.3
Bellatrix	278°22.8	6°22.4
Elnath	278°01.7	28°37.7
Alnilam	275°37.7	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.5
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.4
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.0	-69°49.5
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.8	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.7	-63°14.7
Gacrux	171°51.2	-57°15.6
Alioth	166°12.5	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.5	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.4	-60°56.7
Kochab	137°19.1	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.1
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.1
Peacock	53°04.5	-56°39.0
Deneb	49°25.1	45°22.1
Enif	33°38.2	9°59.5
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.9	-29°29.0
Scheat	13°44.7	28°13.1
Markab	13°29.4	15°20.5

Jun 30 Mon	SHA	Mer.pass
Venus	306°46.7	09:00
Mars	200°42.7	16:03
Jupiter	265°00.4	11:45
Saturn	357°28.3	05:36

Jul 01 Tue	SHA	Mer.pass
Venus	305°40.6	09:00
Mars	200°10.4	16:01
Jupiter	264°45.5	11:42
Saturn	357°27.0	05:32

Jul 02 Wed	SHA	Mer.pass
Venus	304°34.2	09:01
Mars	199°38.0	15:59
Jupiter	264°30.6	11:39
Saturn	357°25.8	05:28

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	Sun			Moon				
h								
Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	179°05.1	N23°10.0		119°31.5	14.5′	N10°16.9	14.4′	56.2′
1	194°05.0	09.9		134°05.0	14.6′	10°02.5	14.4′	56.2′
2	209°04.9	09.7		148°38.5	14.6′	09°48.1	14.4′	56.2′
3	224°04.8	·· 09.6		163°12.2	14.7′	09°33.7	14.4′	56.1′
4	239°04.6	09.4		177°45.9	14.8′	09°19.3	14.5′	56.1′
5	254°04.5	09.2		192°19.7	14.9′	09°04.8	14.4′	56.1′
6	269°04.4	N23°09.1		206°53.5	14.9′	N08°50.4	14.5′	56.0′
7	284°04.3	08.9		221°27.4	15.0′	08°35.9	14.5′	56.0′
8	299°04.1	08.8		236°01.4	15.1′	08°21.4	14.6′	56.0′
9	314°04.0	·· 08.6		250°35.5	15.1′	08°06.8	14.5′	55.9′
10	329°03.9	08.5		265°09.6	15.2′	07°52.3	14.6′	55.9′
11	344°03.8	08.3		279°43.8	15.3′	07°37.7	14.5′	55.9′
12	359°03.7	N23°08.1		294°18.1	15.3′	N07°23.2	14.6′	55.8′
13	14°03.5	08.0		308°52.4	15.4′	07°08.6	14.6′	55.8′
14	29°03.4	07.8		323°26.8	15.4′	06°54.0	14.6′	55.8′
15	44°03.3	·· 07.7		338°01.2	15.5′	06°39.4	14.6′	55.8′
16	59°03.2	07.5		352°35.7	15.6′	06°24.8	14.6′	55.7′
17	74°03.0	07.3		7°10.3	15.6′	06°10.2	14.7′	55.7′
18	89°02.9	N23°07.2		21°44.9	15.7′	N05°55.5	14.6′	55.7′
19	104°02.8	07.0		36°19.6	15.7′	05°40.9	14.7′	55.6′
20	119°02.7	06.8		50°54.3	15.8′	05°26.2	14.6′	55.6′
21	134°02.5	·· 06.7		65°29.1	15.8′	05°11.6	14.7′	55.6′
22	149°02.4	06.5		80°03.9	15.9′	04°56.9	14.6′	55.6′
23	164°02.3	06.3		94°38.8	15.9′	04°42.3	14.7′	55.5′
	SD = 15.7′	d = -0.2′		SD = 15.3′				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	179°02.2	N23°06.2		109°13.7	16.0′	N04°27.6	14.7′	55.5′
1	194°02.1	06.0		123°48.7	16.0′	04°12.9	14.6′	55.5′
2	209°01.9	05.8		138°23.7	16.1′	03°58.3	14.7′	55.4′
3	224°01.8	·· 05.7		152°58.8	16.1′	03°43.6	14.6′	55.4′
4	239°01.7	05.5		167°33.9	16.1′	03°29.0	14.7′	55.4′
5	254°01.6	05.3		182°09.0	16.2′	03°14.3	14.7′	55.4′
6	269°01.5	N23°05.1		196°44.2	16.2′	N02°59.6	14.6′	55.3′
7	284°01.3	05.0		211°19.5	16.3′	02°45.0	14.7′	55.3′
8	299°01.2	04.8		225°54.7	16.3′	02°30.3	14.6′	55.3′
9	314°01.1	·· 04.6		240°30.0	16.3′	02°15.7	14.7′	55.3′
10	329°01.0	04.4		255°05.4	16.4′	02°01.0	14.6′	55.2′
11	344°00.9	04.3		269°40.7	16.4′	01°46.4	14.7′	55.2′
12	359°00.7	N23°04.1		284°16.2	16.4′	N01°31.7	14.6′	55.2′
13	14°00.6	03.9		298°51.6	16.5′	01°17.1	14.6′	55.2′
14	29°00.5	03.7		313°27.1	16.5′	01°02.5	14.6′	55.1′
15	44°00.4	·· 03.5		328°02.5	16.5′	00°47.9	14.6′	55.1′
16	59°00.3	03.4		342°38.1	16.5′	00°33.3	14.6′	55.1′
17	74°00.1	03.2		357°13.6	16.6′	00°18.7	14.5′	55.1′
18	89°00.0	N23°03.0		11°49.2	16.6′	N00°04.2	14.6′	55.0′
19	103°59.9	02.8		26°24.8	16.6′	S00°10.4	14.6′	55.0′
20	118°59.8	02.6		41°00.4	16.6′	00°25.0	14.5′	55.0′
21	133°59.7	·· 02.5		55°36.1	16.7′	00°39.5	14.5′	55.0′
22	148°59.5	02.3		70°11.7	16.7′	00°54.0	14.5′	55.0′
23	163°59.4	02.1		84°47.4	16.7′	01°08.5	14.5′	54.9′
	SD = 15.7′	d = -0.2′		SD = 15.1′				

Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	178°59.3	N23°01.9		99°23.1	16.7′	S01°23.0	14.5′	54.9′
1	193°59.2	01.7		113°58.8	16.7′	01°37.5	14.4′	54.9′
2	208°59.1	01.5		128°34.5	16.7′	01°51.9	14.5′	54.9′
3	223°58.9	·· 01.3		143°10.3	16.8′	02°06.4	14.4′	54.9′
4	238°58.8	01.2		157°46.0	16.8′	02°20.8	14.4′	54.8′
5	253°58.7	01.0		172°21.8	16.8′	02°35.2	14.4′	54.8′
6	268°58.6	N23°00.8		186°57.6	16.8′	S02°49.6	14.3′	54.8′
7	283°58.5	00.6		201°33.3	16.8′	03°03.9	14.3′	54.8′
8	298°58.4	00.4		216°09.1	16.8′	03°18.2	14.4′	54.8′
9	313°58.2	·· 00.2		230°44.9	16.8′	03°32.6	14.3′	54.7′
10	328°58.1	23°00.0		245°20.7	16.8′	03°46.9	14.2′	54.7′
11	343°58.0	22°59.8		259°56.5	16.8′	04°01.1	14.3′	54.7′
12	358°57.9	N22°59.6		274°32.4	16.8′	S04°15.4	14.2′	54.7′
13	13°57.8	59.4		289°08.2	16.8′	04°29.6	14.2′	54.7′
14	28°57.7	59.2		303°44.0	16.8′	04°43.8	14.1′	54.6′
15	43°57.5	·· 59.0		318°19.8	16.8′	04°57.9	14.2′	54.6′
16	58°57.4	58.8		332°55.6	16.8′	05°12.1	14.1′	54.6′
17	73°57.3	58.6		347°31.4	16.8′	05°26.2	14.1′	54.6′
18	88°57.2	N22°58.4		2°07.2	16.8′	S05°40.3	14.0′	54.6′
19	103°57.1	58.2		16°43.0	16.8′	05°54.3	14.1′	54.6′
20	118°57.0	58.0		31°18.8	16.8′	06°08.4	14.0′	54.5′
21	133°56.8	·· 57.8		45°54.6	16.8′	06°22.4	13.9′	54.5′
22	148°56.7	57.6		60°30.3	16.8′	06°36.3	14.0′	54.5′
23	163°56.6	57.4		75°06.1	16.7′	06°50.3	13.9′	54.5′
	SD = 15.7′	d = -0.2′		SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	00:22	23:38	–:–	–:–
64°	–:–	–:–	01:42	22:25	–:–	–:–
62°	–:–	–:–	02:17	21:50	–:–	–:–
60°	–:–	01:04	02:42	21:25	23:02	–:–
N 58°	–:–	01:49	03:02	21:05	22:18	–:–
56°	–:–	02:17	03:19	20:49	21:50	–:–
54°	00:59	02:39	03:32	20:35	21:29	23:07
52°	01:40	02:56	03:45	20:23	21:11	22:27
50°	02:07	03:11	03:55	20:12	20:56	22:00
45°	02:51	03:40	04:17	19:50	20:27	21:17
N 40°	03:21	04:02	04:35	19:33	20:05	20:47
35°	03:44	04:20	04:50	19:18	19:48	20:24
30°	04:02	04:35	05:03	19:05	19:33	20:06
20°	04:31	05:00	05:24	18:44	19:08	19:37
N 10°	04:53	05:20	05:43	18:25	18:48	19:15
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	05:28	05:55	06:17	17:50	18:13	18:40
20°	05:44	06:12	06:36	17:32	17:56	18:24
30°	06:00	06:30	06:57	17:11	17:38	18:07
35°	06:09	06:41	07:09	16:59	17:27	17:59
40°	06:18	06:52	07:23	16:45	17:16	17:50
45°	06:28	07:06	07:39	16:29	17:03	17:40
S 50°	06:40	07:21	08:00	16:09	16:47	17:28
52°	06:45	07:29	08:09	15:59	16:40	17:23
54°	06:51	07:37	08:20	15:48	16:32	17:18
56°	06:57	07:45	08:32	15:36	16:23	17:12
58°	07:03	07:55	08:47	15:21	16:13	17:05
S 60°	07:10	08:07	09:04	15:04	16:01	16:58

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	08:33	10:39	12:39	00:15	23:05	22:32
				23:38		
N 70°	08:46	10:42	12:32	00:00	23:07	22:42
				23:32		
68°	08:56	10:44	12:27	23:27	23:08	22:50
66°	09:04	10:45	12:23	23:23	23:10	22:56
64°	09:11	10:47	12:19	23:19	23:11	23:02
62°	09:17	10:48	12:16	23:16	23:11	23:07
60°	09:23	10:49	12:13	23:13	23:12	23:11
N 58°	09:27	10:50	12:10	23:11	23:13	23:15
56°	09:31	10:51	12:08	23:09	23:13	23:18
54°	09:35	10:52	12:06	23:07	23:14	23:21
52°	09:38	10:52	12:05	23:05	23:14	23:24
50°	09:41	10:53	12:03	23:03	23:15	23:26
45°	09:48	10:55	11:59	23:00	23:16	23:32
N 40°	09:53	10:56	11:57	22:57	23:17	23:37
35°	09:58	10:57	11:54	22:54	23:17	23:41
30°	10:02	10:58	11:52	22:52	23:18	23:44
20°	10:09	10:59	11:48	22:48	23:19	23:50
N 10°	10:15	11:00	11:45	22:44	23:20	23:56
0°	10:20	11:02	11:42	22:40	23:21	·· ··
S 10°	10:26	11:03	11:39	22:37	23:22	·· ··
20°	10:32	11:04	11:36	22:33	23:23	·· ··
30°	10:39	11:06	11:32	22:29	23:24	·· ··
35°	10:43	11:07	11:30	22:26	23:24	·· ··
40°	10:47	11:08	11:28	22:23	23:25	·· ··
45°	10:52	11:09	11:25	22:20	23:26	·· ··
S 50°	10:59	11:10	11:22	22:16	23:27	·· ··
52°	11:01	11:11	11:20	22:14	23:27	·· ··
54°	11:04	11:12	11:19	22:12	23:28	·· ··
56°	11:08	11:13	11:17	22:10	23:28	·· ··
58°	11:11	11:13	11:15	22:07	23:29	·· ··
S 60°	11:16	11:14	11:13	22:05	23:30	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 5-7 24-42%
30	03:39	03:45	12:04	16:30	04:09	
01	03:51	03:57	12:04	17:11	04:51	
02	04:03	04:08	12:04	17:51	05:31	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2286 sec ΔT = TT-UT1 = +68.9554 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281°16.4	224°43.8	N17°13.7	120°22.0	N09°08.2	185°32.2	N23°12.4	278°41.2	S01°19.5
1	296°18.9	239°43.5	14.3	135°23.1	07.6	200°34.1	12.4	293°43.6	19.5
2	311°21.4	254°43.2	15.0	150°24.2	07.0	215°35.9	12.4	308°46.0	19.5
3	326°23.8	269°42.8	·· 15.6	165°25.4	·· 06.5	230°37.7	·· 12.4	323°48.4	·· 19.5
4	341°26.3	284°42.5	16.3	180°26.5	05.9	245°39.6	12.4	338°50.8	19.5
5	356°28.7	299°42.2	16.9	195°27.6	05.3	260°41.4	12.3	353°53.3	19.5
6	11°31.2	314°41.9	N17°17.6	210°28.7	N09°04.7	275°43.3	N23°12.3	8°55.7	S01°19.5
7	26°33.7	329°41.5	18.2	225°29.8	04.2	290°45.1	12.3	23°58.1	19.5
8	41°36.1	344°41.2	18.8	240°30.9	03.6	305°47.0	12.3	39°00.5	19.5
9	56°38.6	359°40.9	·· 19.5	255°32.0	·· 03.0	320°48.8	·· 12.3	54°02.9	·· 19.5
10	71°41.1	14°40.5	20.1	270°33.1	02.4	335°50.7	12.2	69°05.4	19.5
11	86°43.5	29°40.2	20.8	285°34.3	01.8	350°52.5	12.2	84°07.8	19.5
12	101°46.0	44°39.9	N17°21.4	300°35.4	N09°01.3	5°54.4	N23°12.2	99°10.2	S01°19.5
13	116°48.5	59°39.6	22.1	315°36.5	00.7	20°56.2	12.2	114°12.6	19.4
14	131°50.9	74°39.2	22.7	330°37.6	09°00.1	35°58.0	12.2	129°15.1	19.4
15	146°53.4	89°38.9	·· 23.3	345°38.7	08°59.5	50°59.9	·· 12.1	144°17.5	·· 19.4
16	161°55.9	104°38.6	24.0	0°39.8	58.9	66°01.7	12.1	159°19.9	19.4
17	176°58.3	119°38.2	24.6	15°40.9	58.4	81°03.6	12.1	174°22.3	19.4
18	192°00.8	134°37.9	N17°25.3	30°42.0	N08°57.8	96°05.4	N23°12.1	189°24.7	S01°19.4
19	207°03.2	149°37.5	25.9	45°43.2	57.2	111°07.3	12.1	204°27.2	19.4
20	222°05.7	164°37.2	26.5	60°44.3	56.6	126°09.1	12.1	219°29.6	19.4
21	237°08.2	179°36.9	·· 27.2	75°45.4	·· 56.0	141°11.0	·· 12.0	234°32.0	·· 19.4
22	252°10.6	194°36.5	27.8	90°46.5	55.5	156°12.8	12.0	249°34.4	19.4
23	267°13.1	209°36.2	28.4	105°47.6	54.9	171°14.7	12.0	264°36.9	19.4
Mer.pass.	05:14	ν -0.3′	d 0.6′	m -4.13	ν 1.1′	d -0.6′	m 1.50	ν 1.8′	d -0.0′	m -1.89	ν 2.4′	d 0.0′	m 0.95

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°15.6	224°35.9	N17°29.1	120°48.7	N08°54.3	186°16.5	N23°12.0	279°39.3	S01°19.4
1	297°18.0	239°35.5	29.7	135°49.8	53.7	201°18.4	12.0	294°41.7	19.4
2	312°20.5	254°35.2	30.3	150°50.9	53.1	216°20.2	11.9	309°44.1	19.4
3	327°23.0	269°34.8	·· 31.0	165°52.0	·· 52.6	231°22.1	·· 11.9	324°46.6	·· 19.4
4	342°25.4	284°34.5	31.6	180°53.2	52.0	246°23.9	11.9	339°49.0	19.4
5	357°27.9	299°34.2	32.2	195°54.3	51.4	261°25.7	11.9	354°51.4	19.4
6	12°30.3	314°33.8	N17°32.9	210°55.4	N08°50.8	276°27.6	N23°11.9	9°53.8	S01°19.4
7	27°32.8	329°33.5	33.5	225°56.5	50.2	291°29.4	11.8	24°56.3	19.4
8	42°35.3	344°33.1	34.1	240°57.6	49.7	306°31.3	11.8	39°58.7	19.4
9	57°37.7	359°32.8	·· 34.8	255°58.7	·· 49.1	321°33.1	·· 11.8	55°01.1	·· 19.3
10	72°40.2	14°32.4	35.4	270°59.8	48.5	336°35.0	11.8	70°03.5	19.3
11	87°42.7	29°32.1	36.0	286°00.9	47.9	351°36.8	11.8	85°06.0	19.3
12	102°45.1	44°31.7	N17°36.6	301°02.0	N08°47.3	6°38.7	N23°11.7	100°08.4	S01°19.3
13	117°47.6	59°31.4	37.3	316°03.2	46.7	21°40.5	11.7	115°10.8	19.3
14	132°50.1	74°31.1	37.9	331°04.3	46.2	36°42.4	11.7	130°13.2	19.3
15	147°52.5	89°30.7	·· 38.5	346°05.4	·· 45.6	51°44.2	·· 11.7	145°15.7	·· 19.3
16	162°55.0	104°30.4	39.2	1°06.5	45.0	66°46.1	11.7	160°18.1	19.3
17	177°57.5	119°30.0	39.8	16°07.6	44.4	81°47.9	11.6	175°20.5	19.3
18	192°59.9	134°29.7	N17°40.4	31°08.7	N08°43.8	96°49.8	N23°11.6	190°23.0	S01°19.3
19	208°02.4	149°29.3	41.0	46°09.8	43.3	111°51.6	11.6	205°25.4	19.3
20	223°04.8	164°29.0	41.7	61°10.9	42.7	126°53.4	11.6	220°27.8	19.3
21	238°07.3	179°28.6	·· 42.3	76°12.0	·· 42.1	141°55.3	·· 11.5	235°30.2	·· 19.3
22	253°09.8	194°28.3	42.9	91°13.1	41.5	156°57.1	11.5	250°32.7	19.3
23	268°12.2	209°27.9	43.5	106°14.3	40.9	171°59.0	11.5	265°35.1	19.3
Mer.pass.	05:10	ν -0.3′	d 0.6′	m -4.12	ν 1.1′	d -0.6′	m 1.51	ν 1.8′	d -0.0′	m -1.89	ν 2.4′	d 0.0′	m 0.94

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°14.7	224°27.6	N17°44.1	121°15.4	N08°40.3	187°00.8	N23°11.5	280°37.5	S01°19.3
1	298°17.2	239°27.2	44.8	136°16.5	39.8	202°02.7	11.5	295°39.9	19.3
2	313°19.6	254°26.8	45.4	151°17.6	39.2	217°04.5	11.4	310°42.4	19.3
3	328°22.1	269°26.5	·· 46.0	166°18.7	·· 38.6	232°06.4	·· 11.4	325°44.8	·· 19.3
4	343°24.6	284°26.1	46.6	181°19.8	38.0	247°08.2	11.4	340°47.2	19.3
5	358°27.0	299°25.8	47.2	196°20.9	37.4	262°10.1	11.4	355°49.7	19.3
6	13°29.5	314°25.4	N17°47.9	211°22.0	N08°36.8	277°11.9	N23°11.4	10°52.1	S01°19.3
7	28°32.0	329°25.1	48.5	226°23.1	36.2	292°13.8	11.3	25°54.5	19.3
8	43°34.4	344°24.7	49.1	241°24.2	35.7	307°15.6	11.3	40°57.0	19.3
9	58°36.9	359°24.3	·· 49.7	256°25.4	·· 35.1	322°17.5	·· 11.3	55°59.4	·· 19.3
10	73°39.3	14°24.0	50.3	271°26.5	34.5	337°19.3	11.3	71°01.8	19.3
11	88°41.8	29°23.6	51.0	286°27.6	33.9	352°21.2	11.3	86°04.2	19.3
12	103°44.3	44°23.3	N17°51.6	301°28.7	N08°33.3	7°23.0	N23°11.2	101°06.7	S01°19.3
13	118°46.7	59°22.9	52.2	316°29.8	32.7	22°24.8	11.2	116°09.1	19.3
14	133°49.2	74°22.5	52.8	331°30.9	32.2	37°26.7	11.2	131°11.5	19.3
15	148°51.7	89°22.2	·· 53.4	346°32.0	·· 31.6	52°28.5	·· 11.2	146°14.0	·· 19.3
16	163°54.1	104°21.8	54.0	1°33.1	31.0	67°30.4	11.2	161°16.4	19.3
17	178°56.6	119°21.5	54.6	16°34.2	30.4	82°32.2	11.1	176°18.8	19.3
18	193°59.1	134°21.1	N17°55.2	31°35.3	N08°29.8	97°34.1	N23°11.1	191°21.3	S01°19.2
19	209°01.5	149°20.7	55.9	46°36.4	29.2	112°35.9	11.1	206°23.7	19.2
20	224°04.0	164°20.4	56.5	61°37.6	28.6	127°37.8	11.1	221°26.1	19.2
21	239°06.4	179°20.0	·· 57.1	76°38.7	·· 28.1	142°39.6	·· 11.0	236°28.5	·· 19.2
22	254°08.9	194°19.6	57.7	91°39.8	27.5	157°41.5	11.0	251°31.0	19.2
23	269°11.4	209°19.3	58.3	106°40.9	26.9	172°43.3	11.0	266°33.4	19.2
Mer.pass.	05:06	ν -0.4′	d 0.6′	m -4.12	ν 1.1′	d -0.6′	m 1.51	ν 1.8′	d -0.0′	m -1.89	ν 2.4′	d 0.0′	m 0.94

Stars

	SHA	Dec
Alpheratz	357°34.3	29°13.8
Ankaa	353°06.7	-42°09.8
Schedar	349°30.6	56°40.4
Diphda	348°46.9	-17°50.6
Achernar	335°20.0	-57°06.1
Hamal	327°50.9	23°34.9
Polaris	314°07.0	89°22.0
Acamar	315°11.7	-40°11.9
Menkar	314°05.9	4°11.4
Mirfak	308°28.0	49°56.9
Aldebaran	290°39.5	16°33.6
Rigel	281°03.8	-8°10.3
Capella	280°21.7	46°01.3
Bellatrix	278°22.8	6°22.4
Elnath	278°01.7	28°37.7
Alnilam	275°37.6	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.0	-69°49.4
Alphard	217°47.6	-8°46.2
Regulus	207°34.2	11°50.6
Dubhe	193°40.8	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.7	-63°14.7
Gacrux	171°51.3	-57°15.6
Alioth	166°12.6	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.5	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.4	-60°56.7
Kochab	137°19.1	74°03.2
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.1
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.1
Peacock	53°04.5	-56°39.0
Deneb	49°25.1	45°22.2
Enif	33°38.2	9°59.5
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.9	-29°29.0
Scheat	13°44.7	28°13.2
Markab	13°29.4	15°20.5

Jul 03 Thu	SHA	Mer.pass
Venus	303°27.4	09:01
Mars	199°05.6	15:57
Jupiter	264°15.8	11:36
Saturn	357°24.7	05:24

Jul 04 Fri	SHA	Mer.pass
Venus	302°20.3	09:02
Mars	198°33.1	15:56
Jupiter	264°00.9	11:33
Saturn	357°23.7	05:21

Jul 05 Sat	SHA	Mer.pass
Venus	301°12.9	09:02
Mars	198°00.7	15:54
Jupiter	263°46.1	11:31
Saturn	357°22.8	05:17

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.5	N22°57.2	89°41.8	16.7′	S07°04.2	13.8′	54.5′
1	193°56.4	57.0	104°17.6	16.7′	07°18.0	13.9′	54.5′
2	208°56.3	56.8	118°53.3	16.7′	07°31.9	13.8′	54.5′
3	223°56.2	·· 56.6	133°29.0	16.7′	07°45.7	13.7′	54.4′
4	238°56.0	56.4	148°04.7	16.7′	07°59.4	13.8′	54.4′
5	253°55.9	56.2	162°40.4	16.7′	08°13.2	13.7′	54.4′
6	268°55.8	N22°56.0	177°16.0	16.6′	S08°26.9	13.6′	54.4′
7	283°55.7	55.8	191°51.7	16.6′	08°40.5	13.6′	54.4′
8	298°55.6	55.6	206°27.3	16.6′	08°54.1	13.6′	54.4′
9	313°55.5	·· 55.4	221°02.9	16.6′	09°07.7	13.6′	54.4′
10	328°55.4	55.2	235°38.4	16.5′	09°21.3	13.5′	54.4′
11	343°55.2	55.0	250°14.0	16.5′	09°34.8	13.4′	54.3′
12	358°55.1	N22°54.8	264°49.5	16.5′	S09°48.2	13.5′	54.3′
13	13°55.0	54.5	279°25.0	16.5′	10°01.7	13.3′	54.3′
14	28°54.9	54.3	294°00.5	16.4′	10°15.0	13.4′	54.3′
15	43°54.8	·· 54.1	308°35.9	16.4′	10°28.4	13.3′	54.3′
16	58°54.7	53.9	323°11.3	16.4′	10°41.7	13.2′	54.3′
17	73°54.6	53.7	337°46.7	16.3′	10°54.9	13.2′	54.3′
18	88°54.4	N22°53.5	352°22.1	16.3′	S11°08.1	13.2′	54.3′
19	103°54.3	53.3	6°57.4	16.3′	11°21.3	13.1′	54.3′
20	118°54.2	53.0	21°32.7	16.2′	11°34.4	13.1′	54.3′
21	133°54.1	·· 52.8	36°07.9	16.2′	11°47.5	13.0′	54.2′
22	148°54.0	52.6	50°43.1	16.2′	12°00.5	13.0′	54.2′
23	163°53.9	52.4	65°18.3	16.1′	12°13.5	13.0′	54.2′
	SD = 15.7′	d = -0.2′	SD = 14.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.8	N22°52.2	79°53.4	16.1′	S12°26.5	12.8′	54.2′
1	193°53.7	52.0	94°28.5	16.1′	12°39.3	12.9′	54.2′
2	208°53.5	51.7	109°03.6	16.0′	12°52.2	12.7′	54.2′
3	223°53.4	·· 51.5	123°38.6	16.0′	13°04.9	12.8′	54.2′
4	238°53.3	51.3	138°13.6	15.9′	13°17.7	12.7′	54.2′
5	253°53.2	51.1	152°48.5	15.9′	13°30.4	12.6′	54.2′
6	268°53.1	N22°50.8	167°23.4	15.8′	S13°43.0	12.6′	54.2′
7	283°53.0	50.6	181°58.3	15.8′	13°55.6	12.5′	54.2′
8	298°52.9	50.4	196°33.1	15.8′	14°08.1	12.4′	54.2′
9	313°52.8	·· 50.2	211°07.8	15.7′	14°20.5	12.5′	54.2′
10	328°52.7	50.0	225°42.5	15.7′	14°33.0	12.3′	54.2′
11	343°52.5	49.7	240°17.2	15.6′	14°45.3	12.3′	54.2′
12	358°52.4	N22°49.5	254°51.8	15.6′	S14°57.6	12.2′	54.1′
13	13°52.3	49.3	269°26.3	15.5′	15°09.8	12.2′	54.1′
14	28°52.2	49.0	284°00.9	15.5′	15°22.0	12.2′	54.1′
15	43°52.1	·· 48.8	298°35.3	15.4′	15°34.2	12.0′	54.1′
16	58°52.0	48.6	313°09.7	15.3′	15°46.2	12.0′	54.1′
17	73°51.9	48.4	327°44.1	15.3′	15°58.2	12.0′	54.1′
18	88°51.8	N22°48.1	342°18.3	15.2′	S16°10.2	11.8′	54.1′
19	103°51.7	47.9	356°52.6	15.2′	16°22.0	11.8′	54.1′
20	118°51.6	47.7	11°26.8	15.1′	16°33.8	11.8′	54.1′
21	133°51.5	·· 47.4	26°00.9	15.1′	16°45.6	11.7′	54.1′
22	148°51.3	47.2	40°34.9	15.0′	16°57.3	11.6′	54.1′
23	163°51.2	47.0	55°09.0	14.9′	17°08.9	11.5′	54.1′
	SD = 15.7′	d = -0.2′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.1	N22°46.7	69°42.9	14.9′	S17°20.4	11.5′	54.1′
1	193°51.0	46.5	84°16.8	14.8′	17°31.9	11.5′	54.1′
2	208°50.9	46.2	98°50.6	14.8′	17°43.4	11.3′	54.1′
3	223°50.8	·· 46.0	113°24.4	14.7′	17°54.7	11.3′	54.1′
4	238°50.7	45.8	127°58.1	14.6′	18°06.0	11.2′	54.1′
5	253°50.6	45.5	142°31.7	14.6′	18°17.2	11.1′	54.1′
6	268°50.5	N22°45.3	157°05.3	14.5′	S18°28.3	11.1′	54.1′
7	283°50.4	45.1	171°38.8	14.4′	18°39.4	11.0′	54.1′
8	298°50.3	44.8	186°12.2	14.4′	18°50.4	10.9′	54.1′
9	313°50.2	·· 44.6	200°45.6	14.3′	19°01.3	10.8′	54.1′
10	328°50.1	44.3	215°18.9	14.2′	19°12.1	10.8′	54.1′
11	343°49.9	44.1	229°52.1	14.2′	19°22.9	10.7′	54.1′
12	358°49.8	N22°43.8	244°25.3	14.1′	S19°33.6	10.6′	54.1′
13	13°49.7	43.6	258°58.3	14.0′	19°44.2	10.6′	54.1′
14	28°49.6	43.4	273°31.4	14.0′	19°54.8	10.4′	54.1′
15	43°49.5	·· 43.1	288°04.3	13.9′	20°05.2	10.4′	54.1′
16	58°49.4	42.9	302°37.2	13.8′	20°15.6	10.3′	54.1′
17	73°49.3	42.6	317°10.0	13.7′	20°25.9	10.2′	54.1′
18	88°49.2	N22°42.4	331°42.8	13.7′	S20°36.1	10.1′	54.2′
19	103°49.1	42.1	346°15.4	13.6′	20°46.2	10.1′	54.2′
20	118°49.0	41.9	0°48.0	13.5′	20°56.3	9.9′	54.2′
21	133°48.9	·· 41.6	15°20.5	13.4′	21°06.2	9.9′	54.2′
22	148°48.8	41.4	29°53.0	13.4′	21°16.1	9.8′	54.2′
23	163°48.7	41.1	44°25.3	13.3′	21°25.9	9.7′	54.2′
	SD = 15.7′	d = -0.2′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	-:--	-:--	00:43	23:21	-:--	-:--
64°	-:--	-:--	01:48	22:20	-:--	-:--
62°	-:--	-:--	02:21	21:46	-:--	-:--
60°	-:--	01:12	02:46	21:22	22:55	-:--
N 58°	-:--	01:54	03:05	21:03	22:14	-:--
56°	-:--	02:21	03:21	20:47	21:47	-:--
54°	01:06	02:42	03:35	20:34	21:26	23:01
52°	01:45	02:59	03:47	20:22	21:09	22:23
50°	02:10	03:13	03:57	20:11	20:55	21:58
45°	02:53	03:42	04:19	19:50	20:27	21:15
N 40°	03:23	04:04	04:37	19:32	20:05	20:46
35°	03:45	04:22	04:51	19:18	19:47	20:23
30°	04:03	04:37	05:04	19:05	19:32	20:05
20°	04:32	05:01	05:25	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:31	18:57
S 10°	05:29	05:55	06:18	17:51	18:14	18:40
20°	05:45	06:12	06:36	17:33	17:57	18:25
30°	06:01	06:30	06:56	17:13	17:39	18:09
35°	06:09	06:40	07:08	17:01	17:29	18:00
40°	06:18	06:52	07:22	16:47	17:17	17:51
45°	06:28	07:05	07:39	16:31	17:04	17:41
S 50°	06:39	07:20	07:59	16:11	16:49	17:30
52°	06:44	07:28	08:08	16:01	16:42	17:25
54°	06:50	07:36	08:19	15:50	16:34	17:20
56°	06:56	07:44	08:31	15:38	16:25	17:14
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:09	08:05	09:02	15:08	16:04	17:00

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	14:44	17:21		21:52	20:43	
N 70°	14:26	16:36		22:12	21:29	
68°	14:12	16:07	18:34	22:28	22:00	21:04
66°	14:01	15:45	17:44	22:41	22:23	21:55
64°	13:51	15:28	17:13	22:52	22:41	22:27
62°	13:43	15:14	16:50	23:02	22:57	22:51
60°	13:36	15:02	16:31	23:10	23:09	23:10
N 58°	13:30	14:52	16:16	23:17	23:20	23:26
56°	13:25	14:43	16:03	23:23	23:30	23:39
54°	13:20	14:35	15:52	23:29	23:38	23:51
52°	13:16	14:28	15:42	23:34	23:46	·· ··
50°	13:12	14:22	15:33	23:39	23:53	·· ··
45°	13:04	14:09	15:15	23:49	·· ··	00:08
N 40°	12:57	13:58	15:00	23:57	·· ··	00:20
35°	12:51	13:48	14:47	·· ··	00:05	00:31
30°	12:46	13:40	14:36	·· ··	00:11	00:40
20°	12:37	13:26	14:17	·· ··	00:22	00:56
N 10°	12:29	13:14	14:01	·· ··	00:32	01:10
0°	12:22	13:03	13:46	00:01	00:41	01:23
S 10°	12:14	12:51	13:31	00:06	00:51	01:36
20°	12:07	12:40	13:15	00:12	01:00	01:51
30°	11:58	12:26	12:57	00:18	01:12	02:07
35°	11:53	12:18	12:46	00:21	01:19	02:17
40°	11:48	12:09	12:34	00:26	01:26	02:27
45°	11:41	11:59	12:20	00:30	01:35	02:40
S 50°	11:34	11:47	12:03	00:36	01:46	02:56
52°	11:30	11:41	11:55	00:39	01:51	03:04
54°	11:26	11:35	11:46	00:42	01:56	03:12
56°	11:22	11:28	11:36	00:45	02:02	03:21
58°	11:17	11:20	11:24	00:49	02:09	03:32
S 60°	11:12	11:11	11:11	00:53	02:17	03:44

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 8-10 52-70%
03	04:14	04:20	12:04	18:31	06:11	
04	04:25	04:30	12:05	19:13	06:52	
05	04:35	04:41	12:05	19:57	07:34	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2293 sec ΔT = TT-UT1 = +68.9547 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	284°13.8	224°18.9	N17°58.9	121°42.0	N08°26.3	187°45.2	N23°11.0	281°35.8	S01°19.2
1	299°16.3	239°18.5	17°59.5	136°43.1	25.7	202°47.0	11.0	296°38.3	19.2
2	314°18.8	254°18.2	18°00.1	151°44.2	25.1	217°48.9	10.9	311°40.7	19.2
3	329°21.2	269°17.8	·· 00.7	166°45.3	·· 24.5	232°50.7	·· 10.9	326°43.1	·· 19.2
4	344°23.7	284°17.4	01.3	181°46.4	24.0	247°52.6	10.9	341°45.6	19.2
5	359°26.2	299°17.1	01.9	196°47.5	23.4	262°54.4	10.9	356°48.0	19.2
6	14°28.6	314°16.7	N18°02.5	211°48.6	N08°22.8	277°56.3	N23°10.9	11°50.4	S01°19.2
7	29°31.1	329°16.3	03.2	226°49.7	22.2	292°58.1	10.8	26°52.9	19.2
8	44°33.6	344°15.9	03.8	241°50.9	21.6	308°00.0	10.8	41°55.3	19.2
9	59°36.0	359°15.6	·· 04.4	256°52.0	·· 21.0	323°01.8	·· 10.8	56°57.7	·· 19.2
10	74°38.5	14°15.2	05.0	271°53.1	20.4	338°03.6	10.8	72°00.2	19.2
11	89°40.9	29°14.8	05.6	286°54.2	19.9	353°05.5	10.7	87°02.6	19.2
12	104°43.4	44°14.5	N18°06.2	301°55.3	N08°19.3	8°07.3	N23°10.7	102°05.0	S01°19.2
13	119°45.9	59°14.1	06.8	316°56.4	18.7	23°09.2	10.7	117°07.5	19.2
14	134°48.3	74°13.7	07.4	331°57.5	18.1	38°11.0	10.7	132°09.9	19.2
15	149°50.8	89°13.3	·· 08.0	346°58.6	·· 17.5	53°12.9	·· 10.7	147°12.3	·· 19.2
16	164°53.3	104°13.0	08.6	1°59.7	16.9	68°14.7	10.6	162°14.8	19.2
17	179°55.7	119°12.6	09.2	17°00.8	16.3	83°16.6	10.6	177°17.2	19.2
18	194°58.2	134°12.2	N18°09.8	32°01.9	N08°15.7	98°18.4	N23°10.6	192°19.6	S01°19.2
19	210°00.7	149°11.8	10.4	47°03.0	15.1	113°20.3	10.6	207°22.1	19.2
20	225°03.1	164°11.4	11.0	62°04.1	14.6	128°22.1	10.5	222°24.5	19.2
21	240°05.6	179°11.1	·· 11.6	77°05.3	·· 14.0	143°24.0	·· 10.5	237°26.9	·· 19.2
22	255°08.1	194°10.7	12.1	92°06.4	13.4	158°25.8	10.5	252°29.4	19.2
23	270°10.5	209°10.3	12.7	107°07.5	12.8	173°27.7	10.5	267°31.8	19.2
Mer.pass.	05:02	ν -0.4′	d 0.6′	ν 1.1′	d -0.6′	ν 1.8′	d -0.0′	ν 2.4′	d 0.0′
		m -4.11		m 1.52		m -1.89		m 0.93	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	285°13.0	224°09.9	N18°13.3	122°08.6	N08°12.2	188°29.5	N23°10.5	282°34.3	S01°19.2
1	300°15.4	239°09.5	13.9	137°09.7	11.6	203°31.4	10.4	297°36.7	19.2
2	315°17.9	254°09.2	14.5	152°10.8	11.0	218°33.2	10.4	312°39.1	19.2
3	330°20.4	269°08.8	·· 15.1	167°11.9	·· 10.4	233°35.1	·· 10.4	327°41.6	·· 19.2
4	345°22.8	284°08.4	15.7	182°13.0	09.9	248°36.9	10.4	342°44.0	19.2
5	0°25.3	299°08.0	16.3	197°14.1	09.3	263°38.8	10.3	357°46.4	19.2
6	15°27.8	314°07.6	N18°16.9	212°15.2	N08°08.7	278°40.6	N23°10.3	12°48.9	S01°19.2
7	30°30.2	329°07.2	17.5	227°16.3	08.1	293°42.5	10.3	27°51.3	19.2
8	45°32.7	344°06.9	18.1	242°17.4	07.5	308°44.3	10.3	42°53.7	19.2
9	60°35.2	359°06.5	·· 18.7	257°18.5	·· 06.9	323°46.2	·· 10.2	57°56.2	·· 19.2
10	75°37.6	14°06.1	19.3	272°19.6	06.3	338°48.0	10.2	72°58.6	19.2
11	90°40.1	29°05.7	19.8	287°20.8	05.7	353°49.9	10.2	88°01.1	19.2
12	105°42.6	44°05.3	N18°20.4	302°21.9	N08°05.1	8°51.7	N23°10.2	103°03.5	S01°19.2
13	120°45.0	59°04.9	21.0	317°23.0	04.5	23°53.6	10.2	118°05.9	19.2
14	135°47.5	74°04.5	21.6	332°24.1	04.0	38°55.4	10.1	133°08.4	19.2
15	150°49.9	89°04.1	·· 22.2	347°25.2	·· 03.4	53°57.3	·· 10.1	148°10.8	·· 19.2
16	165°52.4	104°03.7	22.8	2°26.3	02.8	68°59.1	10.1	163°13.3	19.2
17	180°54.9	119°03.4	23.4	17°27.4	02.2	84°01.0	10.1	178°15.7	19.2
18	195°57.3	134°03.0	N18°23.9	32°28.5	N08°01.6	99°02.8	N23°10.0	193°18.1	S01°19.2
19	210°59.8	149°02.6	24.5	47°29.6	01.0	114°04.7	10.0	208°20.6	19.2
20	226°02.3	164°02.2	25.1	62°30.7	08°00.4	129°06.5	10.0	223°23.0	19.2
21	241°04.7	179°01.8	·· 25.7	77°31.8	07°59.8	144°08.4	·· 10.0	238°25.4	·· 19.2
22	256°07.2	194°01.4	26.3	92°32.9	59.2	159°10.2	09.9	253°27.9	19.2
23	271°09.7	209°01.0	26.8	107°34.0	58.6	174°12.1	09.9	268°30.3	19.2
Mer.pass.	04:58	ν -0.4′	d 0.6′	ν 1.1′	d -0.6′	ν 1.8′	d -0.0′	ν 2.4′	d -0.0′
		m -4.11		m 1.52		m -1.89		m 0.93	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°12.1	224°00.6	N18°27.4	122°35.1	N07°58.0	189°13.9	N23°09.9	283°32.8	S01°19.2
1	301°14.6	239°00.2	28.0	137°36.2	57.5	204°15.8	09.9	298°35.2	19.2
2	316°17.0	253°59.8	28.6	152°37.3	56.9	219°17.6	09.9	313°37.6	19.3
3	331°19.5	268°59.4	·· 29.2	167°38.5	·· 56.3	234°19.5	·· 09.8	328°40.1	·· 19.3
4	346°22.0	283°59.0	29.7	182°39.6	55.7	249°21.3	09.8	343°42.5	19.3
5	1°24.4	298°58.6	30.3	197°40.7	55.1	264°23.1	09.8	358°45.0	19.3
6	16°26.9	313°58.2	N18°30.9	212°41.8	N07°54.5	279°25.0	N23°09.8	13°47.4	S01°19.3
7	31°29.4	328°57.8	31.5	227°42.9	53.9	294°26.8	09.7	28°49.8	19.3
8	46°31.8	343°57.4	32.0	242°44.0	53.3	309°28.7	09.7	43°52.3	19.3
9	61°34.3	358°57.0	·· 32.6	257°45.1	·· 52.7	324°30.5	·· 09.7	58°54.7	·· 19.3
10	76°36.8	13°56.6	33.2	272°46.2	52.1	339°32.4	09.7	73°57.2	19.3
11	91°39.2	28°56.2	33.8	287°47.3	51.5	354°34.2	09.6	88°59.6	19.3
12	106°41.7	43°55.8	N18°34.3	302°48.4	N07°50.9	9°36.1	N23°09.6	104°02.1	S01°19.3
13	121°44.2	58°55.4	34.9	317°49.5	50.4	24°37.9	09.6	119°04.5	19.3
14	136°46.6	73°55.0	35.5	332°50.6	49.8	39°39.8	09.6	134°06.9	19.3
15	151°49.1	88°54.6	·· 36.1	347°51.7	·· 49.2	54°41.6	·· 09.5	149°09.4	·· 19.3
16	166°51.5	103°54.2	36.6	2°52.8	48.6	69°43.5	09.5	164°11.8	19.3
17	181°54.0	118°53.8	37.2	17°53.9	48.0	84°45.3	09.5	179°14.3	19.3
18	196°56.5	133°53.4	N18°37.8	32°55.0	N07°47.4	99°47.2	N23°09.5	194°16.7	S01°19.3
19	211°58.9	148°53.0	38.3	47°56.1	46.8	114°49.0	09.4	209°19.1	19.3
20	227°01.4	163°52.6	38.9	62°57.2	46.2	129°50.9	09.4	224°21.6	19.3
21	242°03.9	178°52.2	·· 39.5	77°58.3	·· 45.6	144°52.7	·· 09.4	239°24.0	·· 19.3
22	257°06.3	193°51.8	40.0	92°59.4	45.0	159°54.6	09.4	254°26.5	19.3
23	272°08.8	208°51.4	40.6	108°00.6	44.4	174°56.4	09.4	269°28.9	19.3
Mer.pass.	04:54	ν -0.4′	d 0.6′	ν 1.1′	d -0.6′	ν 1.8′	d -0.0′	ν 2.4′	d -0.0′
		m -4.10		m 1.53		m -1.89		m 0.92	

Stars

	SHA	Dec
Alpheratz	357°34.3	29°13.8
Ankaa	353°06.7	-42°09.8
Schedar	349°30.5	56°40.4
Diphda	348°46.9	-17°50.6
Achernar	335°20.0	-57°06.1
Hamal	327°50.8	23°34.9
Polaris	314°05.5	89°22.0
Acamar	315°11.7	-40°11.9
Menkar	314°05.9	4°11.4
Mirfak	308°28.0	49°56.9
Aldebaran	290°39.4	16°33.6
Rigel	281°03.8	-8°10.2
Capella	280°21.7	46°01.3
Bellatrix	278°22.8	6°22.4
Elnath	278°01.7	28°37.7
Alnilam	275°37.6	-1°11.1
Betelgeuse	270°52.0	7°24.7
Canopus	263°52.8	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.0	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.8	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.8	-63°14.7
Gacrux	171°51.3	-57°15.6
Alioth	166°12.6	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.5	-60°56.7
Kochab	137°19.2	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.1	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.4
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.5	-56°39.0
Deneb	49°25.1	45°22.2
Enif	33°38.1	9°59.5
Al Na'ir	27°32.1	-46°50.0
Fomalhaut	15°13.9	-29°29.0
Scheat	13°44.6	28°13.2
Markab	13°29.3	15°20.5

Jul 06 Sun	SHA	Mer.pass
Venus	300°05.1	09:03
Mars	197°28.1	15:52
Jupiter	263°31.3	11:28
Saturn	357°22.0	05:13

Jul 07 Mon	SHA	Mer.pass
Venus	298°56.9	09:04
Mars	196°55.6	15:50
Jupiter	263°16.5	11:25
Saturn	357°21.3	05:09

Jul 08 Tue	SHA	Mer.pass
Venus	297°48.5	09:04
Mars	196°23.0	15:48
Jupiter	263°01.8	11:22
Saturn	357°20.6	05:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.6	N22°40.9	58°57.6	13.2′	S21°35.6	9.6′	54.2′
1	193°48.5	40.6	73°29.8	13.1′	21°45.2	9.5′	54.2′
2	208°48.4	40.4	88°02.0	13.1′	21°54.7	9.5′	54.2′
3	223°48.3	·· 40.1	102°34.0	13.0′	22°04.2	9.3′	54.2′
4	238°48.2	39.8	117°06.0	12.9′	22°13.5	9.3′	54.2′
5	253°48.1	39.6	131°37.9	12.8′	22°22.8	9.1′	54.2′
6	268°48.0	N22°39.3	146°09.8	12.8′	S22°31.9	9.1′	54.2′
7	283°47.9	39.1	160°41.5	12.7′	22°41.0	9.0′	54.2′
8	298°47.7	38.8	175°13.2	12.6′	22°50.0	8.9′	54.2′
9	313°47.6	·· 38.6	189°44.8	12.5′	22°58.9	8.7′	54.2′
10	328°47.5	38.3	204°16.3	12.4′	23°07.6	8.7′	54.3′
11	343°47.4	38.0	218°47.7	12.4′	23°16.3	8.6′	54.3′
12	358°47.3	N22°37.8	233°19.1	12.3′	S23°24.9	8.5′	54.3′
13	13°47.2	37.5	247°50.4	12.2′	23°33.4	8.4′	54.3′
14	28°47.1	37.3	262°21.6	12.1′	23°41.8	8.2′	54.3′
15	43°47.0	·· 37.0	276°52.7	12.0′	23°50.0	8.2′	54.3′
16	58°46.9	36.7	291°23.7	12.0′	23°58.2	8.1′	54.3′
17	73°46.8	36.5	305°54.7	11.9′	24°06.3	7.9′	54.3′
18	88°46.7	N22°36.2	320°25.6	11.8′	S24°14.2	7.9′	54.3′
19	103°46.6	35.9	334°56.4	11.7′	24°22.1	7.8′	54.3′
20	118°46.5	35.7	349°27.1	11.6′	24°29.9	7.6′	54.3′
21	133°46.4	·· 35.4	3°57.7	11.6′	24°37.5	7.6′	54.4′
22	148°46.3	35.2	18°28.3	11.5′	24°45.1	7.4′	54.4′
23	163°46.2	34.9	32°58.8	11.4′	24°52.5	7.3′	54.4′
	SD = 15.7′	d = -0.3′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.1	N22°34.6	47°29.2	11.3′	S24°59.8	7.2′	54.4′
1	193°46.0	34.3	61°59.5	11.2′	25°07.0	7.1′	54.4′
2	208°45.9	34.1	76°29.7	11.2′	25°14.1	7.0′	54.4′
3	223°45.8	·· 33.8	90°59.9	11.1′	25°21.1	6.9′	54.4′
4	238°45.7	33.5	105°30.0	11.0′	25°28.0	6.7′	54.4′
5	253°45.6	33.3	120°00.0	10.9′	25°34.7	6.6′	54.4′
6	268°45.5	N22°33.0	134°29.9	10.9′	S25°41.3	6.6′	54.5′
7	283°45.4	32.7	148°59.8	10.8′	25°47.9	6.4′	54.5′
8	298°45.3	32.4	163°29.6	10.7′	25°54.3	6.2′	54.5′
9	313°45.2	·· 32.2	177°59.3	10.6′	26°00.5	6.2′	54.5′
10	328°45.1	31.9	192°28.9	10.5′	26°06.7	6.0′	54.5′
11	343°45.0	31.6	206°58.4	10.5′	26°12.7	6.0′	54.5′
12	358°44.9	N22°31.3	221°27.9	10.4′	S26°18.7	5.8′	54.5′
13	13°44.8	31.1	235°57.3	10.3′	26°24.5	5.6′	54.5′
14	28°44.7	30.8	250°26.6	10.3′	26°30.1	5.6′	54.6′
15	43°44.6	·· 30.5	264°55.9	10.2′	26°35.7	5.4′	54.6′
16	58°44.5	30.2	279°25.1	10.1′	26°41.1	5.3′	54.6′
17	73°44.4	30.0	293°54.2	10.0′	26°46.4	5.2′	54.6′
18	88°44.3	N22°29.7	308°23.2	10.0′	S26°51.6	5.0′	54.6′
19	103°44.2	29.4	322°52.2	9.9′	26°56.6	4.9′	54.6′
20	118°44.1	29.1	337°21.0	9.8′	27°01.5	4.8′	54.6′
21	133°44.1	·· 28.8	351°49.9	9.8′	27°06.3	4.6′	54.7′
22	148°44.0	28.5	6°18.6	9.7′	27°10.9	4.5′	54.7′
23	163°43.9	28.3	20°47.3	9.6′	27°15.4	4.4′	54.7′
	SD = 15.7′	d = -0.3′	SD = 14.8′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.8	N22°28.0	35°15.9	9.6′	S27°19.8	4.3′	54.7′
1	193°43.7	27.7	49°44.5	9.5′	27°24.1	4.1′	54.7′
2	208°43.6	27.4	64°13.0	9.4′	27°28.2	4.0′	54.7′
3	223°43.5	·· 27.1	78°41.4	9.4′	27°32.2	3.8′	54.8′
4	238°43.4	26.8	93°09.8	9.3′	27°36.0	3.7′	54.8′
5	253°43.3	26.5	107°38.1	9.2′	27°39.7	3.6′	54.8′
6	268°43.2	N22°26.3	122°06.3	9.2′	S27°43.3	3.4′	54.8′
7	283°43.1	26.0	136°34.5	9.1′	27°46.7	3.3′	54.8′
8	298°43.0	25.7	151°02.6	9.1′	27°50.0	3.1′	54.8′
9	313°42.9	·· 25.4	165°30.7	9.0′	27°53.1	3.0′	54.9′
10	328°42.8	25.1	179°58.7	9.0′	27°56.1	2.9′	54.9′
11	343°42.7	24.8	194°26.6	8.9′	27°59.0	2.7′	54.9′
12	358°42.6	N22°24.5	208°54.5	8.8′	S28°01.7	2.6′	54.9′
13	13°42.5	24.2	223°22.4	8.8′	28°04.3	2.5′	54.9′
14	28°42.4	23.9	237°50.2	8.7′	28°06.8	2.2′	54.9′
15	43°42.3	·· 23.6	252°17.9	8.7′	28°09.0	2.2′	55.0′
16	58°42.2	23.3	266°45.6	8.6′	28°11.2	2.0′	55.0′
17	73°42.2	23.0	281°13.3	8.6′	28°13.2	1.9′	55.0′
18	88°42.1	N22°22.7	295°40.9	8.6′	S28°15.1	1.7′	55.0′
19	103°42.0	22.4	310°08.4	8.5′	28°16.8	1.5′	55.0′
20	118°41.9	22.2	324°35.9	8.5′	28°18.3	1.4′	55.1′
21	133°41.8	·· 21.9	339°03.4	8.4′	28°19.7	1.3′	55.1′
22	148°41.7	21.6	353°30.8	8.4′	28°21.0	1.1′	55.1′
23	163°41.6	21.3	7°58.2	8.4′	28°22.1	1.0′	55.1′
	SD = 15.7′	d = -0.3′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	00:59	23:07	–:–	–:–
64°	–:–	–:–	01:54	22:14	–:–	–:–
62°	–:–	–:–	02:27	21:42	–:–	–:–
60°	–:–	01:20	02:50	21:19	22:47	–:–
N 58°	–:–	01:59	03:09	21:00	22:09	–:–
56°	–:–	02:25	03:25	20:45	21:44	–:–
54°	01:14	02:46	03:38	20:31	21:24	22:54
52°	01:50	03:02	03:49	20:20	21:07	22:19
50°	02:14	03:16	04:00	20:10	20:53	21:55
45°	02:56	03:44	04:21	19:48	20:25	21:13
N 40°	03:25	04:06	04:38	19:31	20:04	20:45
35°	03:47	04:23	04:53	19:17	19:46	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:55	05:22	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:15	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:10
35°	06:09	06:40	07:08	17:02	17:30	18:02
40°	06:17	06:51	07:22	16:49	17:19	17:53
45°	06:27	07:04	07:38	16:33	17:06	17:43
S 50°	06:38	07:19	07:57	16:13	16:51	17:32
52°	06:43	07:26	08:06	16:04	16:44	17:27
54°	06:48	07:34	08:17	15:53	16:36	17:22
56°	06:54	07:43	08:29	15:41	16:28	17:16
58°	07:00	07:52	08:43	15:28	16:18	17:10
S 60°	07:07	08:03	08:59	15:12	16:07	17:03

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°						
N 70°						
68°						
66°						
64°	19:17			21:59		
62°	18:34	20:31		22:44	22:31	
60°	18:05	19:39	21:03	23:13	23:22	23:50
N 58°	17:43	19:08	20:22	23:36	23:54	·· ··
56°	17:25	18:44	19:55	23:54	·· ··	00:18
54°	17:10	18:25	19:33	·· ··	00:10	00:37
52°	16:57	18:09	19:15	00:02	00:23	00:54
50°	16:45	17:56	19:00	00:11	00:35	01:08
45°	16:22	17:27	18:29	00:31	01:00	01:36
N 40°	16:03	17:05	18:05	00:47	01:19	01:59
35°	15:47	16:47	17:46	01:01	01:36	02:18
30°	15:33	16:32	17:29	01:13	01:50	02:34
20°	15:10	16:05	17:01	01:33	02:14	03:01
N 10°	14:50	15:42	16:36	01:51	02:36	03:25
0°	14:32	15:21	16:14	02:08	02:55	03:46
S 10°	14:14	15:00	15:51	02:25	03:15	04:08
20°	13:54	14:38	15:27	02:43	03:37	04:32
30°	13:32	14:12	14:59	03:04	04:01	04:59
35°	13:18	13:57	14:43	03:16	04:16	05:16
40°	13:03	13:39	14:24	03:30	04:33	05:35
45°	12:46	13:18	14:00	03:47	04:53	05:58
S 50°	12:24	12:52	13:30	04:08	05:19	06:27
52°	12:13	12:39	13:16	04:18	05:32	06:42
54°	12:01	12:24	12:59	04:29	05:46	06:58
56°	11:48	12:07	12:38	04:42	06:03	07:19
58°	11:32	11:46	12:13	04:57	06:23	07:44
S 60°	11:13	11:20	11:37	05:15	06:49	08:19

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 11-13 78-92%
06	04:46	04:51	12:05	20:44	08:20	
07	04:56	05:00	12:05	21:34	09:08	
08	05:05	05:10	12:05	22:27	10:00	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2300 sec ΔT = TT-UT1 = +68.9540 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°11.3	223°50.9	N18°41.2	123°01.7	N07°43.8	189°58.3	N23°09.3	284°31.4	S01°19.3
1	302°13.7	238°50.5	41.7	138°02.8	43.2	205°00.1	09.3	299°33.8	19.3
2	317°16.2	253°50.1	42.3	153°03.9	42.6	220°02.0	09.3	314°36.2	19.3
3	332°18.7	268°49.7	·· 42.9	168°05.0	·· 42.0	235°03.8	·· 09.3	329°38.7	·· 19.3
4	347°21.1	283°49.3	43.4	183°06.1	41.4	250°05.7	09.2	344°41.1	19.3
5	2°23.6	298°48.9	44.0	198°07.2	40.9	265°07.5	09.2	359°43.6	19.3
6	17°26.0	313°48.5	N18°44.5	213°08.3	N07°40.3	280°09.4	N23°09.2	14°46.0	S01°19.3
7	32°28.5	328°48.1	45.1	228°09.4	39.7	295°11.3	09.2	29°48.5	19.3
8	47°31.0	343°47.7	45.7	243°10.5	39.1	310°13.1	09.1	44°50.9	19.3
9	62°33.4	358°47.2	·· 46.2	258°11.6	·· 38.5	325°15.0	·· 09.1	59°53.4	·· 19.3
10	77°35.9	13°46.8	46.8	273°12.7	37.9	340°16.8	09.1	74°55.8	19.3
11	92°38.4	28°46.4	47.3	288°13.8	37.3	355°18.7	09.1	89°58.3	19.4
12	107°40.8	43°46.0	N18°47.9	303°14.9	N07°36.7	10°20.5	N23°09.0	105°00.7	S01°19.4
13	122°43.3	58°45.6	48.5	318°16.0	36.1	25°22.4	09.0	120°03.1	19.4
14	137°45.8	73°45.2	49.0	333°17.1	35.5	40°24.2	09.0	135°05.6	19.4
15	152°48.2	88°44.7	·· 49.6	348°18.2	·· 34.9	55°26.1	·· 09.0	150°08.0	·· 19.4
16	167°50.7	103°44.3	50.1	3°19.3	34.3	70°27.9	08.9	165°10.5	19.4
17	182°53.2	118°43.9	50.7	18°20.4	33.7	85°29.8	08.9	180°12.9	19.4
18	197°55.6	133°43.5	N18°51.2	33°21.5	N07°33.1	100°31.6	N23°08.9	195°15.4	S01°19.4
19	212°58.1	148°43.1	51.8	48°22.6	32.5	115°33.5	08.9	210°17.8	19.4
20	228°00.5	163°42.7	52.3	63°23.7	31.9	130°35.3	08.8	225°20.3	19.4
21	243°03.0	178°42.2	·· 52.9	78°24.8	·· 31.3	145°37.2	·· 08.8	240°22.7	·· 19.4
22	258°05.5	193°41.8	53.4	93°25.9	30.7	160°39.0	08.8	255°25.2	19.4
23	273°07.9	208°41.4	54.0	108°27.0	30.1	175°40.9	08.8	270°27.6	19.4
Mer.pass.	04:50	ν -0.4′	d 0.6′	m -4.09	ν 1.1′	d -0.6′	m 1.53	ν 1.9′	d -0.0′ m -1.89	ν 2.4′	d -0.0′ m 0.92

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°10.4	223°41.0	N18°54.5	123°28.1	N07°29.5	190°42.7	N23°08.7	285°30.1	S01°19.4
1	303°12.9	238°40.5	55.1	138°29.2	28.9	205°44.6	08.7	300°32.5	19.4
2	318°15.3	253°40.1	55.6	153°30.3	28.3	220°46.4	08.7	315°34.9	19.4
3	333°17.8	268°39.7	·· 56.2	168°31.5	·· 27.8	235°48.3	·· 08.7	330°37.4	·· 19.4
4	348°20.3	283°39.3	56.7	183°32.6	27.2	250°50.1	08.6	345°39.8	19.4
5	3°22.7	298°38.8	57.3	198°33.7	26.6	265°52.0	08.6	0°42.3	19.4
6	18°25.2	313°38.4	N18°57.8	213°34.8	N07°26.0	280°53.8	N23°08.6	15°44.7	S01°19.4
7	33°27.7	328°38.0	58.4	228°35.9	25.4	295°55.7	08.6	30°47.2	19.5
8	48°30.1	343°37.6	58.9	243°37.0	24.8	310°57.5	08.5	45°49.6	19.5
9	63°32.6	358°37.1	18°59.5	258°38.1	·· 24.2	325°59.4	·· 08.5	60°52.1	·· 19.5
10	78°35.0	13°36.7	19°00.0	273°39.2	23.6	341°01.2	08.5	75°54.5	19.5
11	93°37.5	28°36.3	00.5	288°40.3	23.0	356°03.1	08.5	90°57.0	19.5
12	108°40.0	43°35.9	N19°01.1	303°41.4	N07°22.4	11°04.9	N23°08.4	105°59.4	S01°19.5
13	123°42.4	58°35.4	01.6	318°42.5	21.8	26°06.8	08.4	121°01.9	19.5
14	138°44.9	73°35.0	02.2	333°43.6	21.2	41°08.6	08.4	136°04.3	19.5
15	153°47.4	88°34.6	·· 02.7	348°44.7	·· 20.6	56°10.5	·· 08.3	151°06.8	·· 19.5
16	168°49.8	103°34.1	03.2	3°45.8	20.0	71°12.3	08.3	166°09.2	19.5
17	183°52.3	118°33.7	03.8	18°46.9	19.4	86°14.2	08.3	181°11.7	19.5
18	198°54.8	133°33.3	N19°04.3	33°48.0	N07°18.8	101°16.0	N23°08.3	196°14.1	S01°19.5
19	213°57.2	148°32.8	04.9	48°49.1	18.2	116°17.9	08.2	211°16.6	19.5
20	228°59.7	163°32.4	05.4	63°50.2	17.6	131°19.7	08.2	226°19.0	19.5
21	244°02.2	178°32.0	·· 05.9	78°51.3	·· 17.0	146°21.6	·· 08.2	241°21.5	·· 19.5
22	259°04.6	193°31.5	06.5	93°52.4	16.4	161°23.5	08.2	256°23.9	19.5
23	274°07.1	208°31.1	07.0	108°53.5	15.8	176°25.3	08.1	271°26.4	19.6
Mer.pass.	04:47	ν -0.4′	d 0.5′	m -4.09	ν 1.1′	d -0.6′	m 1.53	ν 1.9′	d -0.0′ m -1.90	ν 2.4′	d -0.0′ m 0.91

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	289°09.5	223°30.7	N19°07.5	123°54.6	N07°15.2	191°27.2	N23°08.1	286°28.8	S01°19.6
1	304°12.0	238°30.2	08.1	138°55.7	14.6	206°29.0	08.1	301°31.3	19.6
2	319°14.5	253°29.8	08.6	153°56.8	14.0	221°30.9	08.1	316°33.7	19.6
3	334°16.9	268°29.3	·· 09.1	168°57.9	·· 13.4	236°32.7	·· 08.0	331°36.2	·· 19.6
4	349°19.4	283°28.9	09.7	183°59.0	12.8	251°34.6	08.0	346°38.6	19.6
5	4°21.9	298°28.5	10.2	199°00.1	12.2	266°36.4	08.0	1°41.1	19.6
6	19°24.3	313°28.0	N19°10.7	214°01.2	N07°11.6	281°38.3	N23°08.0	16°43.5	S01°19.6
7	34°26.8	328°27.6	11.3	229°02.3	11.0	296°40.1	07.9	31°46.0	19.6
8	49°29.3	343°27.1	11.8	244°03.4	10.4	311°42.0	07.9	46°48.5	19.6
9	64°31.7	358°26.7	·· 12.3	259°04.5	·· 09.8	326°43.8	·· 07.9	61°50.9	·· 19.6
10	79°34.2	13°26.3	12.8	274°05.6	09.2	341°45.7	07.9	76°53.4	19.6
11	94°36.7	28°25.8	13.4	289°06.7	08.6	356°47.5	07.8	91°55.8	19.6
12	109°39.1	43°25.4	N19°13.9	304°07.8	N07°08.0	11°49.4	N23°07.8	106°58.3	S01°19.6
13	124°41.6	58°24.9	14.4	319°08.9	07.4	26°51.2	07.8	122°00.7	19.7
14	139°44.0	73°24.5	14.9	334°10.0	06.8	41°53.1	07.7	137°03.2	19.7
15	154°46.5	88°24.0	·· 15.5	349°11.1	·· 06.2	56°54.9	·· 07.7	152°05.6	·· 19.7
16	169°49.0	103°23.6	16.0	4°12.2	05.6	71°56.8	07.7	167°08.1	19.7
17	184°51.4	118°23.2	16.5	19°13.3	05.0	86°58.7	07.7	182°10.5	19.7
18	199°53.9	133°22.7	N19°17.0	34°14.4	N07°04.4	102°00.5	N23°07.6	197°13.0	S01°19.7
19	214°56.4	148°22.3	17.6	49°15.5	03.8	117°02.4	07.6	212°15.4	19.7
20	229°58.8	163°21.8	18.1	64°16.6	03.2	132°04.2	07.6	227°17.9	19.7
21	245°01.3	178°21.4	·· 18.6	79°17.7	·· 02.6	147°06.1	·· 07.6	242°20.3	·· 19.7
22	260°03.8	193°20.9	19.1	94°18.8	02.0	162°07.9	07.5	257°22.8	19.7
23	275°06.2	208°20.5	19.6	109°19.9	01.4	177°09.8	07.5	272°25.3	19.7
Mer.pass.	04:43	ν -0.4′	d 0.5′	m -4.08	ν 1.1′	d -0.6′	m 1.54	ν 1.9′	d -0.0′ m -1.90	ν 2.5′	d -0.0′ m 0.91

Stars	SHA	Dec
Alpheratz	357°34.2	29°13.8
Ankaa	353°06.6	-42°09.8
Schedar	349°30.5	56°40.4
Diphda	348°46.8	-17°50.6
Achernar	335°19.9	-57°06.1
Hamal	327°50.8	23°34.9
Polaris	314°03.8	89°22.0
Acamar	315°11.7	-40°11.9
Menkar	314°05.9	4°11.4
Mirfak	308°27.9	49°56.9
Aldebaran	290°39.4	16°33.6
Rigel	281°03.8	-8°10.2
Capella	280°21.7	46°01.3
Bellatrix	278°22.7	6°22.4
Elnath	278°01.7	28°37.7
Alnilam	275°37.6	-1°11.1
Betelgeuse	270°52.0	7°24.8
Canopus	263°52.8	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.1	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.8	61°37.1
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.8	-63°14.7
Gacrux	171°51.3	-57°15.6
Alioth	166°12.6	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.2	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.5	-60°56.7
Kochab	137°19.2	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.5
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.6	-34°22.3
Vega	80°32.5	38°48.5
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.5	-56°39.0
Deneb	49°25.1	45°22.2
Enif	33°38.1	9°59.5
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.8	-29°29.0
Scheat	13°44.6	28°13.2
Markab	13°29.3	15°20.5

Jul 09 Wed	SHA	Mer.pass
Venus	296°39.7	09:05
Mars	195°50.4	15:47
Jupiter	262°47.0	11:19
Saturn	357°20.1	05:01

Jul 10 Thu	SHA	Mer.pass
Venus	295°30.6	09:06
Mars	195°17.7	15:45
Jupiter	262°32.3	11:16
Saturn	357°19.7	04:57

Jul 11 Fri	SHA	Mer.pass
Venus	294°21.1	09:06
Mars	194°45.1	15:43
Jupiter	262°17.6	11:13
Saturn	357°19.3	04:53

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.5	N22°21.0	22°25.6	8.3′	S28°23.1	0.8′	55.1′
1	193°41.4	20.7	36°52.9	8.3′	28°23.9	0.7′	55.1′
2	208°41.3	20.4	51°20.2	8.3′	28°24.6	0.5′	55.2′
3	223°41.2	·· 20.0	65°47.4	8.2′	28°25.1	0.4′	55.2′
4	238°41.1	19.7	80°14.7	8.2′	28°25.5	0.2′	55.2′
5	253°41.0	19.4	94°41.8	8.2′	28°25.7	0.1′	55.2′
6	268°41.0	N22°19.1	109°09.0	8.1′	S28°25.8	0.1′	55.2′
7	283°40.9	18.8	123°36.1	8.1′	28°25.7	0.3′	55.3′
8	298°40.8	18.5	138°03.3	8.1′	28°25.4	0.4′	55.3′
9	313°40.7	·· 18.2	152°30.4	8.1′	28°25.0	0.5′	55.3′
10	328°40.6	17.9	166°57.4	8.0′	28°24.5	0.7′	55.3′
11	343°40.5	17.6	181°24.5	8.0′	28°23.8	0.9′	55.3′
12	358°40.4	N22°17.3	195°51.5	8.0′	S28°22.9	1.0′	55.4′
13	13°40.3	17.0	210°18.5	8.0′	28°21.9	1.1′	55.4′
14	28°40.2	16.7	224°45.5	8.0′	28°20.8	1.4′	55.4′
15	43°40.1	·· 16.4	239°12.5	8.0′	28°19.4	1.4′	55.4′
16	58°40.1	16.1	253°39.5	8.0′	28°18.0	1.6′	55.4′
17	73°40.0	15.7	268°06.4	8.0′	28°16.4	1.8′	55.5′
18	88°39.9	N22°15.4	282°33.4	7.9′	S28°14.6	2.0′	55.5′
19	103°39.8	15.1	297°00.3	7.9′	28°12.6	2.1′	55.5′
20	118°39.7	14.8	311°27.3	7.9′	28°10.5	2.2′	55.5′
21	133°39.6	·· 14.5	325°54.2	7.9′	28°08.3	2.4′	55.5′
22	148°39.5	14.2	340°21.1	7.9′	28°05.9	2.6′	55.6′
23	163°39.4	13.9	354°48.1	7.9′	28°03.3	2.7′	55.6′
	SD = 15.7′	d = -0.3′	SD = 15.0′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.4	N22°13.5	9°15.0	7.9′	S28°00.6	2.8′	55.6′
1	193°39.3	13.2	23°41.9	7.9′	27°57.8	3.0′	55.6′
2	208°39.2	12.9	38°08.9	7.9′	27°54.8	3.2′	55.6′
3	223°39.1	·· 12.6	52°35.8	8.0′	27°51.6	3.3′	55.7′
4	238°39.0	12.3	67°02.8	8.0′	27°48.3	3.5′	55.7′
5	253°38.9	12.0	81°29.8	8.0′	27°44.8	3.7′	55.7′
6	268°38.8	N22°11.6	95°56.7	8.0′	S27°41.1	3.8′	55.7′
7	283°38.7	11.3	110°23.7	8.0′	27°37.3	3.9′	55.8′
8	298°38.7	11.0	124°50.7	8.0′	27°33.4	4.1′	55.8′
9	313°38.6	·· 10.7	139°17.7	8.0′	27°29.3	4.2′	55.8′
10	328°38.5	10.3	153°44.8	8.1′	27°25.1	4.4′	55.8′
11	343°38.4	10.0	168°11.8	8.1′	27°20.7	4.6′	55.8′
12	358°38.3	N22°09.7	182°38.9	8.1′	S27°16.1	4.7′	55.9′
13	13°38.2	09.4	197°06.0	8.1′	27°11.4	4.9′	55.9′
14	28°38.1	09.0	211°33.1	8.1′	27°06.5	5.0′	55.9′
15	43°38.1	·· 08.7	226°00.3	8.2′	27°01.5	5.1′	55.9′
16	58°38.0	08.4	240°27.4	8.2′	26°56.4	5.4′	55.9′
17	73°37.9	08.1	254°54.6	8.2′	26°51.0	5.4′	56.0′
18	88°37.8	N22°07.7	269°21.9	8.3′	S26°45.6	5.6′	56.0′
19	103°37.7	07.4	283°49.1	8.3′	26°40.0	5.8′	56.0′
20	118°37.6	07.1	298°16.4	8.3′	26°34.2	5.9′	56.0′
21	133°37.6	·· 06.8	312°43.7	8.4′	26°28.3	6.1′	56.1′
22	148°37.5	06.4	327°11.1	8.4′	26°22.2	6.2′	56.1′
23	163°37.4	06.1	341°38.5	8.4′	26°16.0	6.3′	56.1′
	SD = 15.7′	d = -0.3′	SD = 15.2′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.3	N22°05.8	356°05.9	8.5′	S26°09.7	6.5′	56.1′
1	193°37.2	05.4	10°33.4	8.5′	26°03.2	6.7′	56.1′
2	208°37.1	05.1	25°00.9	8.5′	25°56.5	6.8′	56.2′
3	223°37.1	·· 04.8	39°28.4	8.6′	25°49.7	6.9′	56.2′
4	238°37.0	04.4	53°56.0	8.6′	25°42.8	7.1′	56.2′
5	253°36.9	04.1	68°23.6	8.7′	25°35.7	7.2′	56.2′
6	268°36.8	N22°03.7	82°51.3	8.7′	S25°28.5	7.4′	56.3′
7	283°36.7	03.4	97°19.0	8.8′	25°21.1	7.5′	56.3′
8	298°36.7	03.1	111°46.7	8.8′	25°13.6	7.6′	56.3′
9	313°36.6	·· 02.7	126°14.5	8.8′	25°06.0	7.8′	56.3′
10	328°36.5	02.4	140°42.4	8.9′	24°58.2	8.0′	56.3′
11	343°36.4	02.1	155°10.3	8.9′	24°50.2	8.0′	56.4′
12	358°36.3	N22°01.7	169°38.2	9.0′	S24°42.2	8.2′	56.4′
13	13°36.2	01.4	184°06.2	9.0′	24°34.0	8.4′	56.4′
14	28°36.2	01.0	198°34.3	9.1′	24°25.6	8.5′	56.4′
15	43°36.1	·· 00.7	213°02.4	9.1′	24°17.1	8.6′	56.5′
16	58°36.0	00.4	227°30.5	9.2′	24°08.5	8.7′	56.5′
17	73°35.9	22°00.0	241°58.7	9.2′	23°59.8	8.9′	56.5′
18	88°35.8	N21°59.7	256°27.0	9.3′	S23°50.9	9.0′	56.5′
19	103°35.8	59.3	270°55.3	9.4′	23°41.9	9.2′	56.5′
20	118°35.7	59.0	285°23.6	9.4′	23°32.7	9.2′	56.6′
21	133°35.6	·· 58.6	299°52.0	9.5′	23°23.5	9.5′	56.6′
22	148°35.5	58.3	314°20.5	9.5′	23°14.0	9.5′	56.6′
23	163°35.5	57.9	328°49.0	9.6′	23°04.5	9.7′	56.6′
	SD = 15.7′	d = -0.3′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	-:-	-:-	01:14	22:53	-:-	-:-
64°	-:-	-:-	02:02	22:07	-:-	-:-
62°	-:-	-:-	02:32	21:37	-:-	-:-
60°	-:-	01:30	02:55	21:15	22:39	-:-
N 58°	-:-	02:05	03:13	20:57	22:04	-:-
56°	-:-	02:30	03:28	20:42	21:40	-:-
54°	01:22	02:50	03:41	20:29	21:20	22:46
52°	01:55	03:06	03:52	20:18	21:04	22:14
50°	02:19	03:20	04:03	20:08	20:51	21:51
45°	02:59	03:47	04:23	19:47	20:23	21:11
N 40°	03:28	04:08	04:40	19:30	20:02	20:43
35°	03:49	04:25	04:54	19:16	19:45	20:21
30°	04:07	04:40	05:07	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:36
N 10°	04:56	05:22	05:45	18:26	18:48	19:15
0°	05:14	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:39	07:07	17:04	17:32	18:03
40°	06:17	06:50	07:20	16:51	17:21	17:54
45°	06:26	07:03	07:36	16:35	17:08	17:45
S 50°	06:37	07:18	07:55	16:16	16:53	17:34
52°	06:42	07:25	08:04	16:07	16:47	17:30
54°	06:47	07:32	08:15	15:57	16:39	17:24
56°	06:52	07:40	08:26	15:45	16:31	17:19
58°	06:58	07:50	08:40	15:32	16:22	17:13
S 60°	07:05	08:00	08:55	15:16	16:11	17:06

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°						
68°						
66°			23:58			
64°			23:10			
62°		22:49	22:40			01:52
60°	21:52	22:10	22:16	·· ··	00:55	02:30
N 58°	21:14	21:43	21:58	00:30	01:32	02:57
56°	20:47	21:21	21:42	00:58	01:59	03:18
54°	20:26	21:03	21:28	01:20	02:20	03:36
52°	20:09	20:48	21:16	01:38	02:37	03:51
50°	19:54	20:35	21:06	01:53	02:52	04:03
45°	19:23	20:08	20:44	02:24	03:22	04:30
N 40°	19:00	19:46	20:26	02:48	03:45	04:50
35°	18:40	19:29	20:10	03:07	04:05	05:08
30°	18:23	19:13	19:57	03:24	04:21	05:23
20°	17:55	18:47	19:35	03:53	04:49	05:48
N 10°	17:31	18:24	19:15	04:17	05:13	06:09
0°	17:08	18:03	18:57	04:40	05:35	06:29
S 10°	16:46	17:42	18:38	05:03	05:57	06:49
20°	16:21	17:19	18:18	05:27	06:20	07:10
30°	15:53	16:53	17:55	05:56	06:48	07:35
35°	15:37	16:37	17:42	06:12	07:04	07:49
40°	15:17	16:19	17:26	06:32	07:23	08:05
45°	14:53	15:57	17:08	06:56	07:45	08:25
S 50°	14:23	15:29	16:44	07:26	08:14	08:50
52°	14:08	15:15	16:33	07:41	08:28	09:01
54°	13:50	14:59	16:20	07:59	08:44	09:15
56°	13:29	14:40	16:05	08:21	09:03	09:30
58°	13:01	14:16	15:47	08:48	09:27	09:48
S 60°	12:23	13:45	15:26	09:27	09:59	10:11

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 14-16 96-100%
09	05:14	05:18	12:05	23:22	10:54	
10	05:23	05:27	12:05	-:-	11:49	
11	05:31	05:35	12:06	00:16	12:43	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2307 sec ΔT = TT-UT1 = +68.9533 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	290°08.7	223°20.0	N19°20.1	124°21.0	N07°00.8	192°11.6	N23°07.5	287°27.7	S01°19.7
1	305°11.1	238°19.6	20.7	139°22.1	07°00.2	207°13.5	07.4	302°30.2	19.7
2	320°13.6	253°19.1	21.2	154°23.2	06°59.6	222°15.3	07.4	317°32.6	19.8
3	335°16.1	268°18.7	·· 21.7	169°24.3	·· 59.0	237°17.2	·· 07.4	332°35.1	·· 19.8
4	350°18.5	283°18.2	22.2	184°25.4	58.4	252°19.0	07.4	347°37.5	19.8
5	5°21.0	298°17.8	22.7	199°26.5	57.8	267°20.9	07.3	2°40.0	19.8
6	20°23.5	313°17.3	N19°23.2	214°27.6	N06°57.2	282°22.7	N23°07.3	17°42.4	S01°19.8
7	35°25.9	328°16.9	23.8	229°28.7	56.6	297°24.6	07.3	32°44.9	19.8
8	50°28.4	343°16.4	24.3	244°29.8	56.0	312°26.4	07.3	47°47.4	19.8
9	65°30.9	358°15.9	·· 24.8	259°30.9	·· 55.4	327°28.3	·· 07.2	62°49.8	·· 19.8
10	80°33.3	13°15.5	25.3	274°32.0	54.8	342°30.2	07.2	77°52.3	19.8
11	95°35.8	28°15.0	25.8	289°33.1	54.2	357°32.0	07.2	92°54.7	19.8
12	110°38.3	43°14.6	N19°26.3	304°34.2	N06°53.6	12°33.9	N23°07.1	107°57.2	S01°19.8
13	125°40.7	58°14.1	26.8	319°35.3	53.0	27°35.7	07.1	122°59.6	19.9
14	140°43.2	73°13.7	27.3	334°36.4	52.4	42°37.6	07.1	138°02.1	19.9
15	155°45.6	88°13.2	·· 27.8	349°37.5	·· 51.8	57°39.4	·· 07.1	153°04.6	·· 19.9
16	170°48.1	103°12.8	28.3	4°38.6	51.2	72°41.3	07.0	168°07.0	19.9
17	185°50.6	118°12.3	28.8	19°39.7	50.6	87°43.1	07.0	183°09.5	19.9
18	200°53.0	133°11.8	N19°29.3	34°40.8	N06°50.0	102°45.0	N23°07.0	198°11.9	S01°19.9
19	215°55.5	148°11.4	29.9	49°41.9	49.4	117°46.8	07.0	213°14.4	19.9
20	230°58.0	163°10.9	30.4	64°43.0	48.8	132°48.7	06.9	228°16.8	19.9
21	246°00.4	178°10.5	·· 30.9	79°44.1	·· 48.2	147°50.5	·· 06.9	243°19.3	·· 19.9
22	261°02.9	193°10.0	31.4	94°45.2	47.5	162°52.4	06.9	258°21.8	19.9
23	276°05.4	208°09.5	31.9	109°46.3	46.9	177°54.3	06.8	273°24.2	20.0
Mer.pass.	04:39	ν -0.5′	d 0.5′	m -4.08	ν 1.1′	d -0.6′	m 1.54	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.90

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	291°07.8	223°09.1	N19°32.4	124°47.4	N06°46.3	192°56.1	N23°06.8	288°26.7	S01°20.0
1	306°10.3	238°08.6	32.9	139°48.5	45.7	207°58.0	06.8	303°29.1	20.0
2	321°12.8	253°08.1	33.4	154°49.6	45.1	222°59.8	06.8	318°31.6	20.0
3	336°15.2	268°07.7	·· 33.9	169°50.7	·· 44.5	238°01.7	·· 06.7	333°34.1	·· 20.0
4	351°17.7	283°07.2	34.4	184°51.8	43.9	253°03.5	06.7	348°36.5	20.0
5	6°20.1	298°06.7	34.9	199°52.9	43.3	268°05.4	06.7	3°39.0	20.0
6	21°22.6	313°06.3	N19°35.4	214°54.0	N06°42.7	283°07.2	N23°06.6	18°41.4	S01°20.0
7	36°25.1	328°05.8	35.8	229°55.1	42.1	298°09.1	06.6	33°43.9	20.0
8	51°27.5	343°05.3	36.3	244°56.2	41.5	313°10.9	06.6	48°46.4	20.0
9	66°30.0	358°04.9	·· 36.8	259°57.3	·· 40.9	328°12.8	·· 06.6	63°48.8	·· 20.1
10	81°32.5	13°04.4	37.3	274°58.4	40.3	343°14.7	06.5	78°51.3	20.1
11	96°34.9	28°03.9	37.8	289°59.5	39.7	358°16.5	06.5	93°53.7	20.1
12	111°37.4	43°03.5	N19°38.3	305°00.6	N06°39.1	13°18.4	N23°06.5	108°56.2	S01°20.1
13	126°39.9	58°03.0	38.8	320°01.7	38.5	28°20.2	06.5	123°58.7	20.1
14	141°42.3	73°02.5	39.3	335°02.8	37.9	43°22.1	06.4	139°01.1	20.1
15	156°44.8	88°02.1	·· 39.8	350°03.9	·· 37.3	58°23.9	·· 06.4	154°03.6	·· 20.1
16	171°47.3	103°01.6	40.3	5°05.0	36.7	73°25.8	06.4	169°06.0	20.1
17	186°49.7	118°01.1	40.8	20°06.1	36.1	88°27.6	06.3	184°08.5	20.1
18	201°52.2	133°00.6	N19°41.3	35°07.2	N06°35.5	103°29.5	N23°06.3	199°11.0	S01°20.2
19	216°54.6	148°00.2	41.7	50°08.3	34.9	118°31.4	06.3	214°13.4	20.2
20	231°57.1	162°59.7	42.2	65°09.4	34.2	133°33.2	06.3	229°15.9	20.2
21	246°59.6	177°59.2	·· 42.7	80°10.4	·· 33.6	148°35.1	·· 06.2	244°18.4	·· 20.2
22	262°02.0	192°58.7	43.2	95°11.5	33.0	163°36.9	06.2	259°20.8	20.2
23	277°04.5	207°58.3	43.7	110°12.6	32.4	178°38.8	06.2	274°23.3	20.2
Mer.pass.	04:35	ν -0.5′	d 0.5′	m -4.07	ν 1.1′	d -0.6′	m 1.55	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.90

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°07.0	222°57.8	N19°44.2	125°13.7	N06°31.8	193°40.6	N23°06.1	289°25.7	S01°20.2
1	307°09.4	237°57.3	44.6	140°14.8	31.2	208°42.5	06.1	304°28.2	20.2
2	322°11.9	252°56.8	45.1	155°15.9	30.6	223°44.3	06.1	319°30.7	20.3
3	337°14.4	267°56.4	·· 45.6	170°17.0	·· 30.0	238°46.2	·· 06.0	334°33.1	·· 20.3
4	352°16.8	282°55.9	46.1	185°18.1	29.4	253°48.1	06.0	349°35.6	20.3
5	7°19.3	297°55.4	46.6	200°19.2	28.8	268°49.9	06.0	4°38.1	20.3
6	22°21.7	312°54.9	N19°47.0	215°20.3	N06°28.2	283°51.8	N23°06.0	19°40.5	S01°20.3
7	37°24.2	327°54.4	47.5	230°21.4	27.6	298°53.6	05.9	34°43.0	20.3
8	52°26.7	342°54.0	48.0	245°22.5	27.0	313°55.5	05.9	49°45.5	20.3
9	67°29.1	357°53.5	·· 48.5	260°23.6	·· 26.4	328°57.3	·· 05.9	64°47.9	·· 20.3
10	82°31.6	12°53.0	49.0	275°24.7	25.8	343°59.2	05.8	79°50.4	20.3
11	97°34.1	27°52.5	49.4	290°25.8	25.2	359°01.0	05.8	94°52.8	20.4
12	112°36.5	42°52.0	N19°49.9	305°26.9	N06°24.5	14°02.9	N23°05.8	109°55.3	S01°20.4
13	127°39.0	57°51.6	50.4	320°28.0	23.9	29°04.8	05.8	124°57.8	20.4
14	142°41.5	72°51.1	50.9	335°29.1	23.3	44°06.6	05.7	140°00.2	20.4
15	157°43.9	87°50.6	·· 51.3	350°30.2	·· 22.7	59°08.5	·· 05.7	155°02.7	·· 20.4
16	172°46.4	102°50.1	51.8	5°31.3	22.1	74°10.3	05.7	170°05.2	20.4
17	187°48.9	117°49.6	52.3	20°32.4	21.5	89°12.2	05.6	185°07.6	20.4
18	202°51.3	132°49.1	N19°52.7	35°33.5	N06°20.9	104°14.0	N23°05.6	200°10.1	S01°20.5
19	217°53.8	147°48.7	53.2	50°34.6	20.3	119°15.9	05.6	215°12.6	20.5
20	232°56.2	162°48.2	53.7	65°35.7	19.7	134°17.7	05.6	230°15.0	20.5
21	247°58.7	177°47.7	·· 54.1	80°36.8	·· 19.1	149°19.6	·· 05.5	245°17.5	·· 20.5
22	263°01.2	192°47.2	54.6	95°37.9	18.5	164°21.5	05.5	260°20.0	20.5
23	278°03.6	207°46.7	55.1	110°38.9	17.9	179°23.3	05.5	275°22.4	20.5
Mer.pass.	04:31	ν -0.5′	d 0.5′	m -4.07	ν 1.1′	d -0.6′	m 1.55	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.89

Stars	SHA	Dec
Alpheratz	357°34.2	29°13.8
Ankaa	353°06.6	-42°09.7
Schedar	349°30.5	56°40.4
Diphda	348°46.8	-17°50.6
Achernar	335°19.9	-57°06.1
Hamal	327°50.8	23°34.9
Polaris	314°02.4	89°22.0
Acamar	315°11.6	-40°11.9
Menkar	314°05.8	4°11.4
Mirfak	308°27.9	49°56.9
Aldebaran	290°39.4	16°33.6
Rigel	281°03.7	-8°10.2
Capella	280°21.7	46°01.3
Bellatrix	278°22.7	6°22.4
Elnath	278°01.7	28°37.7
Alnilam	275°37.6	-1°11.1
Betelgeuse	270°51.9	7°24.8
Canopus	263°52.7	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.1	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.8	61°37.0
Denebola	182°24.6	14°25.9
Gienah	175°43.2	-17°41.1
Acrux	172°59.8	-63°14.7
Gacrux	171°51.3	-57°15.6
Alioth	166°12.6	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.3	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.5	-60°56.7
Kochab	137°19.3	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.8
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.5	-34°22.3
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.5	-56°39.0
Deneb	49°25.1	45°22.2
Enif	33°38.1	9°59.5
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.8	-29°29.0
Scheat	13°44.6	28°13.2
Markab	13°29.3	15°20.5

Jul 12 Sat	SHA	Mer.pass
Venus	293°11.3	09:07
Mars	194°12.3	15:41
Jupiter	262°02.9	11:10
Saturn	357°19.0	04:49

Jul 13 Sun	SHA	Mer.pass
Venus	292°01.2	09:08
Mars	193°39.6	15:40
Jupiter	261°48.3	11:07
Saturn	357°18.9	04:45

Jul 14 Mon	SHA	Mer.pass
Venus	290°50.8	09:08
Mars	193°06.8	15:38
Jupiter	261°33.7	11:04
Saturn	357°18.8	04:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.4	N21°57.6	343°17.6	9.6′	S22°54.8	9.8′	56.6′
1	193°35.3	57.2	357°46.2	9.7′	22°45.0	9.9′	56.7′
2	208°35.2	56.9	12°14.9	9.7′	22°35.1	10.0′	56.7′
3	223°35.1	·· 56.5	26°43.7	9.8′	22°25.1	10.2′	56.7′
4	238°35.1	56.2	41°12.5	9.9′	22°14.9	10.3′	56.7′
5	253°35.0	55.8	55°41.3	9.9′	22°04.6	10.4′	56.8′
6	268°34.9	N21°55.5	70°10.3	10.0′	S21°54.2	10.5′	56.8′
7	283°34.8	55.1	84°39.2	10.0′	21°43.7	10.7′	56.8′
8	298°34.8	54.8	99°08.3	10.1′	21°33.0	10.7′	56.8′
9	313°34.7	·· 54.4	113°37.4	10.2′	21°22.3	10.9′	56.8′
10	328°34.6	54.1	128°06.5	10.2′	21°11.4	11.0′	56.9′
11	343°34.5	53.7	142°35.7	10.3′	21°00.4	11.2′	56.9′
12	358°34.5	N21°53.4	157°05.0	10.3′	S20°49.2	11.2′	56.9′
13	13°34.4	53.0	171°34.3	10.4′	20°38.0	11.3′	56.9′
14	28°34.3	52.6	186°03.7	10.5′	20°26.7	11.5′	56.9′
15	43°34.2	·· 52.3	200°33.2	10.5′	20°15.2	11.6′	57.0′
16	58°34.2	51.9	215°02.7	10.6′	20°03.6	11.7′	57.0′
17	73°34.1	51.6	229°32.3	10.6′	19°51.9	11.8′	57.0′
18	88°34.0	N21°51.2	244°01.9	10.7′	S19°40.1	11.9′	57.0′
19	103°33.9	50.9	258°31.6	10.7′	19°28.2	12.0′	57.1′
20	118°33.9	50.5	273°01.3	10.8′	19°16.2	12.1′	57.1′
21	133°33.8	·· 50.1	287°31.1	10.9′	19°04.1	12.2′	57.1′
22	148°33.7	49.8	302°01.0	10.9′	18°51.9	12.3′	57.1′
23	163°33.6	49.4	316°30.9	11.0′	18°39.6	12.4′	57.1′
	SD = 15.7′	d = -0.3′	SD = 15.4′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.6	N21°49.0	331°00.9	11.0′	S18°27.2	12.6′	57.2′
1	193°33.5	48.7	345°30.9	11.1′	18°14.6	12.6′	57.2′
2	208°33.4	48.3	0°01.0	11.1′	18°02.0	12.7′	57.2′
3	223°33.3	·· 47.9	14°31.1	11.2′	17°49.3	12.8′	57.2′
4	238°33.3	47.6	29°01.3	11.3′	17°36.5	12.9′	57.2′
5	253°33.2	47.2	43°31.6	11.3′	17°23.6	13.0′	57.3′
6	268°33.1	N21°46.8	58°01.9	11.4′	S17°10.6	13.1′	57.3′
7	283°33.0	46.5	72°32.3	11.4′	16°57.5	13.2′	57.3′
8	298°33.0	46.1	87°02.7	11.5′	16°44.3	13.3′	57.3′
9	313°32.9	·· 45.7	101°33.2	11.5′	16°31.0	13.4′	57.3′
10	328°32.8	45.4	116°03.7	11.6′	16°17.6	13.4′	57.4′
11	343°32.8	45.0	130°34.3	11.6′	16°04.2	13.6′	57.4′
12	358°32.7	N21°44.6	145°04.9	11.7′	S15°50.6	13.6′	57.4′
13	13°32.6	44.3	159°35.6	11.7′	15°37.0	13.7′	57.4′
14	28°32.6	43.9	174°06.3	11.8′	15°23.3	13.8′	57.4′
15	43°32.5	·· 43.5	188°37.1	11.8′	15°09.5	13.9′	57.5′
16	58°32.4	43.1	203°07.9	11.9′	14°55.6	14.0′	57.5′
17	73°32.3	42.8	217°38.8	11.9′	14°41.6	14.1′	57.5′
18	88°32.3	N21°42.4	232°09.8	12.0′	S14°27.5	14.1′	57.5′
19	103°32.2	42.0	246°40.7	12.0′	14°13.4	14.2′	57.5′
20	118°32.1	41.6	261°11.8	12.1′	13°59.2	14.3′	57.6′
21	133°32.1	·· 41.3	275°42.8	12.1′	13°44.9	14.3′	57.6′
22	148°32.0	40.9	290°13.9	12.2′	13°30.6	14.4′	57.6′
23	163°31.9	40.5	304°45.1	12.2′	13°16.2	14.6′	57.6′
	SD = 15.7′	d = -0.4′	SD = 15.6′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°31.9	N21°40.1	319°16.3	12.2′	S13°01.6	14.5′	57.6′
1	193°31.8	39.7	333°47.5	12.3′	12°47.1	14.7′	57.7′
2	208°31.7	39.4	348°18.8	12.3′	12°32.4	14.7′	57.7′
3	223°31.7	·· 39.0	2°50.2	12.4′	12°17.7	14.8′	57.7′
4	238°31.6	38.6	17°21.5	12.4′	12°02.9	14.8′	57.7′
5	253°31.5	38.2	31°52.9	12.4′	11°48.1	14.9′	57.7′
6	268°31.5	N21°37.8	46°24.4	12.5′	S11°33.2	15.0′	57.8′
7	283°31.4	37.5	60°55.9	12.5′	11°18.2	15.0′	57.8′
8	298°31.3	37.1	75°27.4	12.6′	11°03.2	15.1′	57.8′
9	313°31.3	·· 36.7	89°58.9	12.6′	10°48.1	15.2′	57.8′
10	328°31.2	36.3	104°30.5	12.6′	10°32.9	15.2′	57.8′
11	343°31.1	35.9	119°02.1	12.7′	10°17.7	15.3′	57.8′
12	358°31.1	N21°35.5	133°33.8	12.7′	S10°02.4	15.3′	57.9′
13	13°31.0	35.1	148°05.5	12.7′	09°47.1	15.4′	57.9′
14	28°30.9	34.8	162°37.2	12.7′	09°31.7	15.4′	57.9′
15	43°30.9	·· 34.4	177°08.9	12.8′	09°16.3	15.5′	57.9′
16	58°30.8	34.0	191°40.7	12.8′	09°00.8	15.6′	57.9′
17	73°30.7	33.6	206°12.5	12.8′	08°45.2	15.6′	58.0′
18	88°30.7	N21°33.2	220°44.3	12.8′	S08°29.6	15.6′	58.0′
19	103°30.6	32.8	235°16.2	12.9′	08°14.0	15.7′	58.0′
20	118°30.5	32.4	249°48.0	12.9′	07°58.3	15.7′	58.0′
21	133°30.5	·· 32.0	264°19.9	12.9′	07°42.6	15.8′	58.0′
22	148°30.4	31.6	278°51.8	12.9′	07°26.8	15.9′	58.1′
23	163°30.3	31.2	293°23.8	13.0′	07°10.9	15.8′	58.1′
	SD = 15.7′	d = -0.4′	SD = 15.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	01:27	22:40	–:–	–:–
64°	–:–	–:–	02:10	21:59	–:–	–:–
62°	–:–	00:34	02:39	21:31	23:29	–:–
60°	–:–	01:39	03:00	21:10	22:30	–:–
N 58°	–:–	02:12	03:18	20:53	21:58	–:–
56°	00:31	02:35	03:32	20:38	21:35	23:32
54°	01:31	02:54	03:45	20:26	21:16	22:38
52°	02:01	03:10	03:56	20:15	21:01	22:09
50°	02:23	03:23	04:06	20:05	20:48	21:47
45°	03:03	03:50	04:26	19:45	20:21	21:08
N 40°	03:30	04:10	04:42	19:29	20:01	20:41
35°	03:51	04:27	04:56	19:15	19:44	20:20
30°	04:09	04:41	05:08	19:03	19:30	20:03
20°	04:36	05:04	05:28	18:43	19:07	19:36
N 10°	04:56	05:23	05:46	18:26	18:48	19:15
0°	05:14	05:40	06:02	18:09	18:32	18:58
S 10°	05:30	05:56	06:18	17:53	18:16	18:42
20°	05:44	06:12	06:35	17:36	18:00	18:27
30°	05:59	06:29	06:55	17:17	17:43	18:12
35°	06:07	06:39	07:06	17:06	17:33	18:05
40°	06:16	06:49	07:19	16:53	17:23	17:56
45°	06:25	07:01	07:34	16:37	17:10	17:47
S 50°	06:35	07:16	07:53	16:19	16:56	17:37
52°	06:40	07:22	08:02	16:10	16:49	17:32
54°	06:45	07:30	08:12	16:00	16:42	17:27
56°	06:50	07:38	08:23	15:49	16:34	17:22
58°	06:56	07:47	08:36	15:36	16:25	17:16
S 60°	07:02	07:57	08:51	15:21	16:15	17:10

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°		23:48	23:00			06:18
N 70°		00:24	22:49		03:58	06:39
68°	23:42	23:24	22:41	04:38	06:56	
66°	23:13	23:05	22:34	02:35	05:06	07:09
64°	22:51	22:51	22:28	03:22	05:26	07:20
62°	22:33	22:28	22:23	03:52	05:43	07:29
60°	22:18	22:19	22:18	04:14	05:57	07:36
N 58°	22:06	22:11	22:14	04:32	06:09	07:43
56°	21:55	22:04	22:10	04:47	06:19	07:49
54°	21:45	21:57	22:07	05:00	06:28	07:55
52°	21:36	21:52	22:04	05:12	06:36	07:59
50°	21:29	21:46	22:01	05:22	06:43	08:04
45°	21:12	21:35	21:55	05:43	06:58	08:13
N 40°	20:58	21:26	21:50	06:00	07:10	08:21
35°	20:46	21:18	21:46	06:14	07:21	08:27
30°	20:36	21:10	21:42	06:26	07:30	08:33
20°	20:18	20:58	21:35	06:47	07:46	08:43
N 10°	20:03	20:47	21:30	07:05	07:59	08:52
0°	19:48	20:37	21:24	07:22	08:12	09:00
S 10°	19:33	20:27	21:18	07:38	08:24	09:07
20°	19:18	20:16	21:12	07:56	08:37	09:16
30°	18:59	20:03	21:06	08:16	08:52	09:25
35°	18:49	19:56	21:02	08:28	09:01	09:31
40°	18:36	19:47	20:57	08:41	09:11	09:37
45°	18:22	19:37	20:52	08:57	09:22	09:44
S 50°	18:04	19:25	20:46	09:16	09:36	09:52
52°	17:56	19:20	20:43	09:25	09:43	09:56
54°	17:46	19:13	20:40	09:35	09:50	10:00
56°	17:36	19:06	20:36	09:47	09:57	10:05
58°	17:23	18:59	20:32	10:00	10:06	10:10
S 60°	17:09	18:50	20:28	10:15	10:16	10:16

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 17-19 98-89%
12	05:38	05:42	12:06	01:09	13:35	
13	05:46	05:49	12:06	02:00	14:24	
14	05:53	05:56	12:06	02:48	15:12	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2314 sec ΔT = TT-UT1 = +68.9526 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	293°06.1	222°46.2	N19°55.5	125°40.0	N06°17.3	194°25.2	N23°05.4	290°24.9	S01°20.5
1	308°08.6	237°45.7	56.0	140°41.1	16.6	209°27.0	05.4	305°27.4	20.5
2	323°11.0	252°45.2	56.5	155°42.2	16.0	224°28.9	05.4	320°29.8	20.6
3	338°13.5	267°44.7	·· 56.9	170°43.3	·· 15.4	239°30.7	·· 05.3	335°32.3	·· 20.6
4	353°16.0	282°44.3	57.4	185°44.4	14.8	254°32.6	05.3	350°34.8	20.6
5	8°18.4	297°43.8	57.9	200°45.5	14.2	269°34.5	05.3	5°37.2	20.6
6	23°20.9	312°43.3	N19°58.3	215°46.6	N06°13.6	284°36.3	N23°05.3	20°39.7	S01°20.6
7	38°23.4	327°42.8	58.8	230°47.7	13.0	299°38.2	05.2	35°42.2	20.6
8	53°25.8	342°42.3	59.2	245°48.8	12.4	314°40.0	05.2	50°44.6	20.6
9	68°28.3	357°41.8	19°59.7	260°49.9	·· 11.8	329°41.9	·· 05.2	65°47.1	·· 20.7
10	83°30.7	12°41.3	20°00.2	275°51.0	11.2	344°43.7	05.1	80°49.6	20.7
11	98°33.2	27°40.8	00.6	290°52.1	10.6	359°45.6	05.1	95°52.0	20.7
12	113°35.7	42°40.3	N20°01.1	305°53.2	N06°10.0	14°47.5	N23°05.1	110°54.5	S01°20.7
13	128°38.1	57°39.8	01.5	320°54.3	09.3	29°49.3	05.0	125°57.0	20.7
14	143°40.6	72°39.3	02.0	335°55.4	08.7	44°51.2	05.0	140°59.4	20.7
15	158°43.1	87°38.8	·· 02.4	350°56.5	·· 08.1	59°53.0	·· 05.0	156°01.9	·· 20.7
16	173°45.5	102°38.3	02.9	5°57.6	07.5	74°54.9	05.0	171°04.4	20.8
17	188°48.0	117°37.8	03.3	20°58.7	06.9	89°56.7	04.9	186°06.9	20.8
18	203°50.5	132°37.3	N20°03.8	35°59.7	N06°06.3	104°58.6	N23°04.9	201°09.3	S01°20.8
19	218°52.9	147°36.8	04.3	51°00.8	05.7	120°00.5	04.9	216°11.8	20.8
20	233°55.4	162°36.3	04.7	66°01.9	05.1	135°02.3	04.8	231°14.3	20.8
21	248°57.8	177°35.8	·· 05.2	81°03.0	·· 04.5	150°04.2	·· 04.8	246°16.7	·· 20.8
22	264°00.3	192°35.3	05.6	96°04.1	03.9	165°06.0	04.8	261°19.2	20.8
23	279°02.8	207°34.8	06.0	111°05.2	03.2	180°07.9	04.7	276°21.7	20.9
Mer.pass.	04:27	ν -0.5′	d 0.5′	m -4.07	ν 1.1′	d -0.6′	m 1.55	ν 1.9′	d -0.0′ m -1.90	ν 2.5′	d -0.0′ m 0.89

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	294°05.2	222°34.3	N20°06.5	126°06.3	N06°02.6	195°09.7	N23°04.7	291°24.1	S01°20.9
1	309°07.7	237°33.8	06.9	141°07.4	02.0	210°11.6	04.7	306°26.6	20.9
2	324°10.2	252°33.3	07.4	156°08.5	01.4	225°13.5	04.6	321°29.1	20.9
3	339°12.6	267°32.8	·· 07.8	171°09.6	·· 00.8	240°15.3	·· 04.6	336°31.6	·· 20.9
4	354°15.1	282°32.3	08.3	186°10.7	06°00.2	255°17.2	04.6	351°34.0	20.9
5	9°17.6	297°31.8	08.7	201°11.8	05°59.6	270°19.0	04.6	6°36.5	20.9
6	24°20.0	312°31.3	N20°09.2	216°12.9	N05°59.0	285°20.9	N23°04.5	21°39.0	S01°21.0
7	39°22.5	327°30.8	09.6	231°14.0	58.4	300°22.8	04.5	36°41.4	21.0
8	54°25.0	342°30.3	10.0	246°15.1	57.7	315°24.6	04.5	51°43.9	21.0
9	69°27.4	357°29.8	·· 10.5	261°16.2	·· 57.1	330°26.5	·· 04.4	66°46.4	·· 21.0
10	84°29.9	12°29.3	10.9	276°17.2	56.5	345°28.3	04.4	81°48.9	21.0
11	99°32.3	27°28.8	11.4	291°18.3	55.9	0°30.2	04.4	96°51.3	21.0
12	114°34.8	42°28.3	N20°11.8	306°19.4	N05°55.3	15°32.0	N23°04.3	111°53.8	S01°21.1
13	129°37.3	57°27.8	12.2	321°20.5	54.7	30°33.9	04.3	126°56.3	21.1
14	144°39.7	72°27.3	12.7	336°21.6	54.1	45°35.8	04.3	141°58.7	21.1
15	159°42.2	87°26.7	·· 13.1	351°22.7	·· 53.5	60°37.6	·· 04.2	157°01.2	·· 21.1
16	174°44.7	102°26.2	13.5	6°23.8	52.9	75°39.5	04.2	172°03.7	21.1
17	189°47.1	117°25.7	14.0	21°24.9	52.2	90°41.3	04.2	187°06.2	21.1
18	204°49.6	132°25.2	N20°14.4	36°26.0	N05°51.6	105°43.2	N23°04.2	202°08.6	S01°21.2
19	219°52.1	147°24.7	14.8	51°27.1	51.0	120°45.1	04.1	217°11.1	21.2
20	234°54.5	162°24.2	15.3	66°28.2	50.4	135°46.9	04.1	232°13.6	21.2
21	249°57.0	177°23.7	·· 15.7	81°29.3	·· 49.8	150°48.8	·· 04.1	247°16.1	·· 21.2
22	264°59.4	192°23.2	16.1	96°30.4	49.2	165°50.6	04.0	262°18.5	21.2
23	280°01.9	207°22.7	16.6	111°31.4	48.6	180°52.5	04.0	277°21.0	21.2
Mer.pass.	04:23	ν -0.5′	d 0.4′	m -4.06	ν 1.1′	d -0.6′	m 1.56	ν 1.9′	d -0.0′ m -1.90	ν 2.5′	d -0.0′ m 0.88

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	295°04.4	222°22.1	N20°17.0	126°32.5	N05°48.0	195°54.3	N23°04.0	292°23.5	S01°21.3
1	310°06.8	237°21.6	17.4	141°33.6	47.3	210°56.2	03.9	307°26.0	21.3
2	325°09.3	252°21.1	17.9	156°34.7	46.7	225°58.1	03.9	322°28.4	21.3
3	340°11.8	267°20.6	·· 18.3	171°35.8	·· 46.1	240°59.9	·· 03.9	337°30.9	·· 21.3
4	355°14.2	282°20.1	18.7	186°36.9	45.5	256°01.8	03.8	352°33.4	21.3
5	10°16.7	297°19.6	19.1	201°38.0	44.9	271°03.6	03.8	7°35.9	21.3
6	25°19.2	312°19.0	N20°19.6	216°39.1	N05°44.3	286°05.5	N23°03.8	22°38.3	S01°21.4
7	40°21.6	327°18.5	20.0	231°40.2	43.7	301°07.4	03.7	37°40.8	21.4
8	55°24.1	342°18.0	20.4	246°41.3	43.1	316°09.2	03.7	52°43.3	21.4
9	70°26.6	357°17.5	·· 20.8	261°42.4	·· 42.4	331°11.1	·· 03.7	67°45.8	·· 21.4
10	85°29.0	12°17.0	21.2	276°43.5	41.8	346°12.9	03.6	82°48.2	21.4
11	100°31.5	27°16.5	21.7	291°44.5	41.2	1°14.8	03.6	97°50.7	21.4
12	115°33.9	42°15.9	N20°22.1	306°45.6	N05°40.6	16°16.7	N23°03.6	112°53.2	S01°21.5
13	130°36.4	57°15.4	22.5	321°46.7	40.0	31°18.5	03.6	127°55.7	21.5
14	145°38.9	72°14.9	22.9	336°47.8	39.4	46°20.4	03.5	142°58.1	21.5
15	160°41.3	87°14.4	·· 23.3	351°48.9	·· 38.8	61°22.2	·· 03.5	158°00.6	·· 21.5
16	175°43.8	102°13.8	23.8	6°50.0	38.1	76°24.1	03.5	173°03.1	21.5
17	190°46.3	117°13.3	24.2	21°51.1	37.5	91°26.0	03.4	188°05.6	21.5
18	205°48.7	132°12.8	N20°24.6	36°52.2	N05°36.9	106°27.8	N23°03.4	203°08.0	S01°21.6
19	220°51.2	147°12.3	25.0	51°53.3	36.3	121°29.7	03.4	218°10.5	21.6
20	235°53.7	162°11.8	25.4	66°54.4	35.7	136°31.5	03.3	233°13.0	21.6
21	250°56.1	177°11.2	·· 25.8	81°55.5	·· 35.1	151°33.4	·· 03.3	248°15.5	·· 21.6
22	265°58.6	192°10.7	26.2	96°56.5	34.5	166°35.3	03.3	263°18.0	21.6
23	281°01.1	207°10.2	26.6	111°57.6	33.8	181°37.1	03.2	278°20.4	21.7
Mer.pass.	04:19	ν -0.5′	d 0.4′	m -4.06	ν 1.1′	d -0.6′	m 1.56	ν 1.9′	d -0.0′ m -1.90	ν 2.5′	d -0.0′ m 0.88

Stars	SHA	Dec
Alpheratz	357°34.2	29°13.8
Ankaa	353°06.6	-42°09.7
Schedar	349°30.4	56°40.4
Diphda	348°46.8	-17°50.6
Achernar	335°19.9	-57°06.1
Hamal	327°50.8	23°34.9
Polaris	314°01.1	89°22.0
Acamar	315°11.6	-40°11.8
Menkar	314°05.8	4°11.5
Mirfak	308°27.9	49°56.9
Aldebaran	290°39.4	16°33.6
Rigel	281°03.7	-8°10.2
Capella	280°21.6	46°01.3
Bellatrix	278°22.7	6°22.4
Elnath	278°01.6	28°37.7
Alnilam	275°37.6	-1°11.1
Betelgeuse	270°51.9	7°24.8
Canopus	263°52.7	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.2	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.1	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.6	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	172°59.8	-63°14.7
Gacrux	171°51.3	-57°15.6
Alioth	166°12.6	55°49.5
Spica	158°21.8	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.3	-60°30.0
Menkent	147°57.0	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.5	-60°56.7
Kochab	137°19.3	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.5	-34°22.3
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.1	45°22.2
Enif	33°38.1	9°59.5
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.8	-29°29.0
Scheat	13°44.6	28°13.2
Markab	13°29.3	15°20.6

Jul 15 Tue	SHA	Mer.pass
Venus	289°40.1	09:09
Mars	192°33.9	15:36
Jupiter	261°19.1	11:01
Saturn	357°18.8	04:38

Jul 16 Wed	SHA	Mer.pass
Venus	288°29.1	09:10
Mars	192°01.1	15:34
Jupiter	261°04.5	10:58
Saturn	357°18.9	04:34

Jul 17 Thu	SHA	Mer.pass
Venus	287°17.8	09:11
Mars	191°28.2	15:33
Jupiter	260°50.0	10:55
Saturn	357°19.1	04:30

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.3	N21°30.8	307°55.7	13.0′	S06°55.1	15.9′	58.1′
1	193°30.2	30.4	322°27.7	13.0′	06°39.2	16.0′	58.1′
2	208°30.2	30.0	336°59.7	13.0′	06°23.2	16.0′	58.1′
3	223°30.1	·· 29.7	351°31.7	13.0′	06°07.2	16.0′	58.1′
4	238°30.0	29.3	6°03.7	13.0′	05°51.2	16.1′	58.2′
5	253°30.0	28.9	20°35.8	13.0′	05°35.1	16.0′	58.2′
6	268°29.9	N21°28.5	35°07.8	13.1′	S05°19.1	16.2′	58.2′
7	283°29.8	28.1	49°39.9	13.1′	05°02.9	16.1′	58.2′
8	298°29.8	27.7	64°11.9	13.1′	04°46.8	16.2′	58.2′
9	313°29.7	·· 27.3	78°44.0	13.1′	04°30.6	16.3′	58.2′
10	328°29.7	26.9	93°16.1	13.1′	04°14.3	16.2′	58.3′
11	343°29.6	26.5	107°48.2	13.1′	03°58.1	16.3′	58.3′
12	358°29.5	N21°26.1	122°20.3	13.1′	S03°41.8	16.3′	58.3′
13	13°29.5	25.7	136°52.3	13.1′	03°25.5	16.3′	58.3′
14	28°29.4	25.3	151°24.4	13.1′	03°09.2	16.4′	58.3′
15	43°29.4	·· 24.8	165°56.5	13.1′	02°52.8	16.3′	58.3′
16	58°29.3	24.4	180°28.6	13.1′	02°36.5	16.4′	58.4′
17	73°29.2	24.0	195°00.7	13.1′	02°20.1	16.4′	58.4′
18	88°29.2	N21°23.6	209°32.8	13.1′	S02°03.7	16.5′	58.4′
19	103°29.1	23.2	224°04.9	13.1′	01°47.2	16.4′	58.4′
20	118°29.1	22.8	238°37.0	13.1′	01°30.8	16.5′	58.4′
21	133°29.0	·· 22.4	253°09.1	13.1′	01°14.3	16.4′	58.4′
22	148°28.9	22.0	267°41.1	13.1′	00°57.9	16.5′	58.5′
23	163°28.9	21.6	282°13.2	13.0′	00°41.4	16.5′	58.5′
	SD = 15.7′	d = -0.4′	SD = 15.8′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.8	N21°21.2	296°45.2	13.0′	S00°24.9	16.5′	58.5′
1	193°28.8	20.8	311°17.3	13.0′	S00°08.4	16.6′	58.5′
2	208°28.7	20.4	325°49.3	13.0′	N00°08.2	16.5′	58.5′
3	223°28.6	·· 20.0	340°21.3	13.0′	00°24.7	16.5′	58.5′
4	238°28.6	19.5	354°53.3	13.0′	00°41.2	16.6′	58.6′
5	253°28.5	19.1	9°25.2	12.9′	00°57.8	16.5′	58.6′
6	268°28.5	N21°18.7	23°57.2	12.9′	N01°14.3	16.5′	58.6′
7	283°28.4	18.3	38°29.1	12.9′	01°30.8	16.6′	58.6′
8	298°28.4	17.9	53°01.0	12.9′	01°47.4	16.5′	58.6′
9	313°28.3	·· 17.5	67°32.9	12.9′	02°03.9	16.6′	58.6′
10	328°28.2	17.1	82°04.8	12.8′	02°20.5	16.5′	58.6′
11	343°28.2	16.6	96°36.6	12.8′	02°37.0	16.5′	58.7′
12	358°28.1	N21°16.2	111°08.4	12.8′	N02°53.5	16.6′	58.7′
13	13°28.1	15.8	125°40.2	12.7′	03°10.1	16.5′	58.7′
14	28°28.0	15.4	140°11.9	12.7′	03°26.6	16.5′	58.7′
15	43°28.0	·· 15.0	154°43.6	12.7′	03°43.1	16.5′	58.7′
16	58°27.9	14.5	169°15.3	12.6′	03°59.6	16.5′	58.7′
17	73°27.9	14.1	183°47.0	12.6′	04°16.1	16.4′	58.7′
18	88°27.8	N21°13.7	198°18.6	12.6′	N04°32.5	16.5′	58.8′
19	103°27.8	13.3	212°50.2	12.5′	04°49.0	16.4′	58.8′
20	118°27.7	12.9	227°21.7	12.5′	05°05.4	16.5′	58.8′
21	133°27.6	·· 12.4	241°53.2	12.5′	05°21.9	16.4′	58.8′
22	148°27.6	12.0	256°24.6	12.4′	05°38.3	16.4′	58.8′
23	163°27.5	11.6	270°56.1	12.4′	05°54.7	16.3′	58.8′
	SD = 15.7′	d = -0.4′	SD = 16.0′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.5	N21°11.2	285°27.4	12.3′	N06°11.0	16.4′	58.8′
1	193°27.4	10.7	299°58.7	12.3′	06°27.4	16.3′	58.9′
2	208°27.4	10.3	314°30.0	12.2′	06°43.7	16.3′	58.9′
3	223°27.3	·· 09.9	329°01.2	12.2′	07°00.0	16.2′	58.9′
4	238°27.3	09.5	343°32.4	12.1′	07°16.2	16.3′	58.9′
5	253°27.2	09.0	358°03.6	12.1′	07°32.5	16.2′	58.9′
6	268°27.2	N21°08.6	12°34.6	12.0′	N07°48.7	16.2′	58.9′
7	283°27.1	08.2	27°05.6	12.0′	08°04.9	16.1′	58.9′
8	298°27.1	07.7	41°36.6	11.9′	08°21.0	16.1′	58.9′
9	313°27.0	·· 07.3	56°07.5	11.9′	08°37.1	16.1′	59.0′
10	328°27.0	06.9	70°38.4	11.8′	08°53.2	16.0′	59.0′
11	343°26.9	06.5	85°09.2	11.7′	09°09.2	16.0′	59.0′
12	358°26.9	N21°06.0	99°39.9	11.7′	N09°25.2	16.0′	59.0′
13	13°26.8	05.6	114°10.6	11.6′	09°41.2	15.9′	59.0′
14	28°26.8	05.2	128°41.2	11.5′	09°57.1	15.8′	59.0′
15	43°26.7	·· 04.7	143°11.7	11.5′	10°12.9	15.8′	59.0′
16	58°26.7	04.3	157°42.2	11.4′	10°28.7	15.8′	59.0′
17	73°26.6	03.9	172°12.6	11.3′	10°44.5	15.7′	59.1′
18	88°26.6	N21°03.4	186°43.0	11.3′	N11°00.2	15.7′	59.1′
19	103°26.5	03.0	201°13.2	11.2′	11°15.9	15.6′	59.1′
20	118°26.5	02.5	215°43.4	11.1′	11°31.5	15.6′	59.1′
21	133°26.4	·· 02.1	230°13.6	11.1′	11°47.1	15.5′	59.1′
22	148°26.4	01.7	244°43.6	11.0′	12°02.6	15.5′	59.1′
23	163°26.3	01.2	259°13.6	10.9′	12°18.1	15.4′	59.1′
	SD = 15.7′	d = -0.4′	SD = 16.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	▭	▭	▭	▭
66°	–:–	–:–	01:41	22:28	–:–	–:–
64°	–:–	–:–	02:19	21:51	–:–	–:–
62°	–:–	00:58	02:45	21:25	23:08	–:–
60°	–:–	01:49	03:06	21:05	22:21	–:–
N 58°	–:–	02:19	03:23	20:48	21:51	–:–
56°	00:54	02:41	03:37	20:35	21:30	23:13
54°	01:40	02:59	03:49	20:23	21:12	22:30
52°	02:08	03:14	03:59	20:12	20:57	22:03
50°	02:29	03:27	04:09	20:03	20:44	21:42
45°	03:06	03:53	04:29	19:43	20:19	21:05
N 40°	03:33	04:13	04:45	19:27	19:59	20:38
35°	03:54	04:29	04:58	19:14	19:43	20:18
30°	04:11	04:43	05:10	19:02	19:29	20:01
20°	04:37	05:05	05:30	18:42	19:07	19:35
N 10°	04:57	05:24	05:47	18:25	18:48	19:15
0°	05:15	05:40	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:54	18:17	18:42
20°	05:44	06:11	06:35	17:37	18:01	18:28
30°	05:59	06:28	06:54	17:19	17:44	18:14
35°	06:06	06:37	07:05	17:07	17:35	18:06
40°	06:14	06:48	07:18	16:55	17:25	17:58
45°	06:23	07:00	07:32	16:40	17:13	17:49
S 50°	06:33	07:14	07:51	16:22	16:59	17:39
52°	06:38	07:20	07:59	16:13	16:53	17:35
54°	06:42	07:27	08:09	16:04	16:46	17:30
56°	06:47	07:35	08:20	15:53	16:38	17:25
58°	06:53	07:44	08:32	15:41	16:29	17:20
S 60°	06:59	07:53	08:46	15:26	16:19	17:14

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	22:22	21:46	21:02	08:46	11:04	13:31
N 70°	22:21	21:53	21:21	08:53	11:01	13:14
68°	22:20	21:59	21:36	08:58	10:58	13:02
66°	22:19	22:05	21:48	09:03	10:55	12:51
64°	22:18	22:09	21:59	09:07	10:53	12:43
62°	22:18	22:13	22:08	09:10	10:51	12:35
60°	22:17	22:16	22:16	09:13	10:50	12:29
N 58°	22:17	22:19	22:23	09:16	10:49	12:23
56°	22:16	22:22	22:29	09:18	10:47	12:18
54°	22:16	22:24	22:34	09:20	10:46	12:14
52°	22:15	22:26	22:39	09:22	10:45	12:10
50°	22:15	22:29	22:44	09:24	10:44	12:06
45°	22:14	22:33	22:54	09:28	10:42	11:59
N 40°	22:13	22:37	23:02	09:31	10:41	11:52
35°	22:13	22:40	23:09	09:33	10:39	11:47
30°	22:12	22:43	23:15	09:35	10:38	11:42
20°	22:12	22:48	23:26	09:39	10:36	11:34
N 10°	22:11	22:52	23:36	09:43	10:34	11:26
0°	22:10	22:57	23:45	09:46	10:32	11:19
S 10°	22:09	23:01	23:55	09:49	10:30	11:13
20°	22:09	23:06	·· ··	09:52	10:28	11:05
30°	22:08	23:11	·· ··	09:56	10:26	10:57
35°	22:08	23:14	·· ··	09:58	10:25	10:53
40°	22:07	23:18	·· ··	10:00	10:23	10:47
45°	22:07	23:22	·· ··	10:03	10:22	10:41
S 50°	22:06	23:27	·· ··	10:06	10:20	10:34
52°	22:06	23:29	·· ··	10:08	10:19	10:31
54°	22:05	23:32	·· ··	10:09	10:18	10:27
56°	22:05	23:35	·· ··	10:11	10:17	10:23
58°	22:04	23:38	·· ··	10:13	10:16	10:18
S 60°	22:04	23:41	·· ··	10:15	10:14	10:13

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	20-22 82-62%
15	05:59	06:02	12:06	03:35	15:58	
16	06:05	06:07	12:06	04:21	16:44	
17	06:10	06:13	12:06	05:08	17:32	

No IERS EOP prediction data available

July 18, 19, 20 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2320 sec ΔT = TT-UT1 = +68.9520 sec

2025 July 18 to Jul. 20 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	296°03.5	222°09.7	N20°27.1	126°58.7	N05°33.2	196°39.0	N23°03.2	293°22.9	S01°21.7
1	311°06.0	237°09.1	27.5	141°59.8	32.6	211°40.8	03.2	308°25.4	21.7
2	326°08.4	252°08.6	27.9	157°00.9	32.0	226°42.7	03.1	323°27.9	21.7
3	341°10.9	267°08.1	·· 28.3	172°02.0	·· 31.4	241°44.6	·· 03.1	338°30.4	·· 21.7
4	356°13.4	282°07.5	28.7	187°03.1	30.8	256°46.4	03.1	353°32.8	21.8
5	11°15.8	297°07.0	29.1	202°04.2	30.1	271°48.3	03.0	8°35.3	21.8
6	26°18.3	312°06.5	N20°29.5	217°05.3	N05°29.5	286°50.1	N23°03.0	23°37.8	S01°21.8
7	41°20.8	327°06.0	29.9	232°06.4	28.9	301°52.0	03.0	38°40.3	21.8
8	56°23.2	342°05.4	30.3	247°07.4	28.3	316°53.9	02.9	53°42.7	21.8
9	71°25.7	357°04.9	·· 30.7	262°08.5	·· 27.7	331°55.7	·· 02.9	68°45.2	·· 21.8
10	86°28.2	12°04.4	31.1	277°09.6	27.1	346°57.6	02.9	83°47.7	21.9
11	101°30.6	27°03.8	31.5	292°10.7	26.5	1°59.4	02.8	98°50.2	21.9
12	116°33.1	42°03.3	N20°31.9	307°11.8	N05°25.8	17°01.3	N23°02.8	113°52.7	S01°21.9
13	131°35.5	57°02.8	32.3	322°12.9	25.2	32°03.2	02.8	128°55.1	21.9
14	146°38.0	72°02.2	32.7	337°14.0	24.6	47°05.0	02.7	143°57.6	21.9
15	161°40.5	87°01.7	·· 33.1	352°15.1	·· 24.0	62°06.9	·· 02.7	159°00.1	·· 22.0
16	176°42.9	102°01.2	33.5	7°16.2	23.4	77°08.8	02.7	174°02.6	22.0
17	191°45.4	117°00.6	33.9	22°17.2	22.8	92°10.6	02.6	189°05.1	22.0
18	206°47.9	132°00.1	N20°34.3	37°18.3	N05°22.1	107°12.5	N23°02.6	204°07.6	S01°22.0
19	221°50.3	146°59.6	34.7	52°19.4	21.5	122°14.3	02.6	219°10.0	22.0
20	236°52.8	161°59.0	35.1	67°20.5	20.9	137°16.2	02.5	234°12.5	22.1
21	251°55.3	176°58.5	·· 35.5	82°21.6	·· 20.3	152°18.1	·· 02.5	249°15.0	·· 22.1
22	266°57.7	191°58.0	35.9	97°22.7	19.7	167°19.9	02.5	264°17.5	22.1
23	282°00.2	206°57.4	36.3	112°23.8	19.1	182°21.8	02.4	279°20.0	22.1
Mer.pass.	04:15	ν -0.5′	d 0.4′	m -4.05	ν 1.1′	d -0.6′	m 1.56	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.87

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	297°02.7	221°56.9	N20°36.6	127°24.9	N05°18.4	197°23.6	N23°02.4	294°22.4	S01°22.1
1	312°05.1	236°56.3	37.0	142°26.0	17.8	212°25.5	02.4	309°24.9	22.2
2	327°07.6	251°55.8	37.4	157°27.0	17.2	227°27.4	02.3	324°27.4	22.2
3	342°10.0	266°55.3	·· 37.8	172°28.1	·· 16.6	242°29.2	·· 02.3	339°29.9	·· 22.2
4	357°12.5	281°54.7	38.2	187°29.2	16.0	257°31.1	02.3	354°32.4	22.2
5	12°15.0	296°54.2	38.6	202°30.3	15.4	272°33.0	02.2	9°34.9	22.2
6	27°17.4	311°53.7	N20°39.0	217°31.4	N05°14.7	287°34.8	N23°02.2	24°37.3	S01°22.3
7	42°19.9	326°53.1	39.4	232°32.5	14.1	302°36.7	02.2	39°39.8	22.3
8	57°22.4	341°52.6	39.7	247°33.6	13.5	317°38.5	02.1	54°42.3	22.3
9	72°24.8	356°52.0	·· 40.1	262°34.7	·· 12.9	332°40.4	·· 02.1	69°44.8	·· 22.3
10	87°27.3	11°51.5	40.5	277°35.7	12.3	347°42.3	02.1	84°47.3	22.3
11	102°29.8	26°50.9	40.9	292°36.8	11.6	2°44.1	02.0	99°49.8	22.4
12	117°32.2	41°50.4	N20°41.3	307°37.9	N05°11.0	17°46.0	N23°02.0	114°52.2	S01°22.4
13	132°34.7	56°49.9	41.6	322°39.0	10.4	32°47.9	02.0	129°54.7	22.4
14	147°37.2	71°49.3	42.0	337°40.1	09.8	47°49.7	01.9	144°57.2	22.4
15	162°39.6	86°48.8	·· 42.4	352°41.2	·· 09.2	62°51.6	·· 01.9	159°59.7	·· 22.4
16	177°42.1	101°48.2	42.8	7°42.3	08.6	77°53.4	01.9	175°02.2	22.5
17	192°44.5	116°47.7	43.2	22°43.4	07.9	92°55.3	01.8	190°04.7	22.5
18	207°47.0	131°47.1	N20°43.5	37°44.4	N05°07.3	107°57.2	N23°01.8	205°07.1	S01°22.5
19	222°49.5	146°46.6	43.9	52°45.5	06.7	122°59.0	01.8	220°09.6	22.5
20	237°51.9	161°46.0	44.3	67°46.6	06.1	138°00.9	01.7	235°12.1	22.6
21	252°54.4	176°45.5	·· 44.6	82°47.7	·· 05.5	153°02.8	·· 01.7	250°14.6	·· 22.6
22	267°56.9	191°44.9	45.0	97°48.8	04.8	168°04.6	01.7	265°17.1	22.6
23	282°59.3	206°44.4	45.4	112°49.9	04.2	183°06.5	01.6	280°19.6	22.6
Mer.pass.	04:11	ν -0.5′	d 0.4′	m -4.05	ν 1.1′	d -0.6′	m 1.57	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.87

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	298°01.8	221°43.8	N20°45.8	127°51.0	N05°03.6	198°08.3	N23°01.6	295°22.1	S01°22.6
1	313°04.3	236°43.3	46.1	142°52.1	03.0	213°10.2	01.6	310°24.5	22.7
2	328°06.7	251°42.7	46.5	157°53.1	02.4	228°12.1	01.5	325°27.0	22.7
3	343°09.2	266°42.2	·· 46.9	172°54.2	·· 01.7	243°13.9	·· 01.5	340°29.5	·· 22.7
4	358°11.7	281°41.6	47.2	187°55.3	01.1	258°15.8	01.5	355°32.0	22.7
5	13°14.1	296°41.1	47.6	202°56.4	05°00.5	273°17.7	01.4	10°34.5	22.7
6	28°16.6	311°40.5	N20°48.0	217°57.5	N04°59.9	288°19.5	N23°01.4	25°37.0	S01°22.8
7	43°19.0	326°40.0	48.3	232°58.6	59.3	303°21.4	01.4	40°39.5	22.8
8	58°21.5	341°39.4	48.7	247°59.7	58.6	318°23.3	01.3	55°42.0	22.8
9	73°24.0	356°38.9	·· 49.1	263°00.7	·· 58.0	333°25.1	·· 01.3	70°44.4	·· 22.8
10	88°26.4	11°38.3	49.4	278°01.8	57.4	348°27.0	01.3	85°46.9	22.9
11	103°28.9	26°37.8	49.8	293°02.9	56.8	3°28.8	01.2	100°49.4	22.9
12	118°31.4	41°37.2	N20°50.1	308°04.0	N04°56.2	18°30.7	N23°01.2	115°51.9	S01°22.9
13	133°33.8	56°36.7	50.5	323°05.1	55.5	33°32.6	01.2	130°54.4	22.9
14	148°36.3	71°36.1	50.9	338°06.2	54.9	48°34.4	01.1	145°56.9	22.9
15	163°38.8	86°35.6	·· 51.2	353°07.3	·· 54.3	63°36.3	·· 01.1	160°59.4	·· 23.0
16	178°41.2	101°35.0	51.6	8°08.3	53.7	78°38.2	01.1	176°01.9	23.0
17	193°43.7	116°34.4	51.9	23°09.4	53.1	93°40.0	01.0	191°04.3	23.0
18	208°46.1	131°33.9	N20°52.3	38°10.5	N04°52.4	108°41.9	N23°01.0	206°06.8	S01°23.0
19	223°48.6	146°33.3	52.6	53°11.6	51.8	123°43.8	01.0	221°09.3	23.1
20	238°51.1	161°32.8	53.0	68°12.7	51.2	138°45.6	00.9	236°11.8	23.1
21	253°53.5	176°32.2	·· 53.3	83°13.8	·· 50.6	153°47.5	·· 00.9	251°14.3	·· 23.1
22	268°56.0	191°31.6	53.7	98°14.9	50.0	168°49.4	00.8	266°16.8	23.1
23	283°58.5	206°31.1	54.0	113°15.9	49.3	183°51.2	00.8	281°19.3	23.2
Mer.pass.	04:07	ν -0.5′	d 0.4′	m -4.04	ν 1.1′	d -0.6′	m 1.57	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.86

Stars

	SHA	Dec
Alpheratz	357°34.2	29°13.8
Ankaa	353°06.6	-42°09.7
Schedar	349°30.4	56°40.4
Diphda	348°46.8	-17°50.6
Achernar	335°19.8	-57°06.1
Hamal	327°50.7	23°34.9
Polaris	313°59.5	89°22.0
Acamar	315°11.6	-40°11.8
Menkar	314°05.8	4°11.5
Mirfak	308°27.9	49°56.9
Aldebaran	290°39.4	16°33.6
Rigel	281°03.7	-8°10.2
Capella	280°21.6	46°01.3
Bellatrix	278°22.7	6°22.4
Elnath	278°01.6	28°37.7
Alnilam	275°37.6	-1°11.0
Betelgeuse	270°51.9	7°24.8
Canopus	263°52.7	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.5
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.1	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	172°59.9	-63°14.7
Gacrux	171°51.4	-57°15.6
Alioth	166°12.7	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.3	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.4	19°03.1
Rigil Kent.	139°39.5	-60°56.7
Kochab	137°19.4	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.5
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.1	45°22.2
Enif	33°38.1	9°59.6
Al Na'ir	27°32.0	-46°50.0
Fomalhaut	15°13.8	-29°29.0
Scheat	13°44.5	28°13.2
Markab	13°29.2	15°20.6

Jul 18 Fri	SHA	Mer.pass
Venus	286°06.1	09:12
Mars	190°55.2	15:31
Jupiter	260°35.5	10:52
Saturn	357°19.4	04:26

Jul 19 Sat	SHA	Mer.pass
Venus	284°54.2	09:13
Mars	190°22.2	15:29
Jupiter	260°21.0	10:49
Saturn	357°19.8	04:22

Jul 20 Sun	SHA	Mer.pass
Venus	283°42.0	09:13
Mars	189°49.2	15:27
Jupiter	260°06.6	10:46
Saturn	357°20.3	04:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.3	N21°00.8	273°43.5	10.8′	N12°33.5	15.3′	59.1′
1	193°26.2	21°00.3	288°13.4	10.8′	12°48.8	15.3′	59.1′
2	208°26.2	20°59.9	302°43.1	10.7′	13°04.1	15.2′	59.2′
3	223°26.1	·· 59.5	317°12.8	10.6′	13°19.3	15.1′	59.2′
4	238°26.1	59.0	331°42.4	10.5′	13°34.4	15.1′	59.2′
5	253°26.0	58.6	346°11.9	10.4′	13°49.5	15.0′	59.2′
6	268°26.0	N20°58.1	0°41.3	10.3′	N14°04.5	15.0′	59.2′
7	283°26.0	57.7	15°10.7	10.3′	14°19.5	14.8′	59.2′
8	298°25.9	57.3	29°39.9	10.2′	14°34.3	14.8′	59.2′
9	313°25.9	·· 56.8	44°09.1	10.1′	14°49.1	14.8′	59.2′
10	328°25.8	56.4	58°38.2	10.0′	15°03.9	14.6′	59.2′
11	343°25.8	55.9	73°07.2	9.9′	15°18.5	14.6′	59.2′
12	358°25.7	N20°55.5	87°36.1	9.8′	N15°33.1	14.5′	59.3′
13	13°25.7	55.0	102°04.9	9.7′	15°47.6	14.4′	59.3′
14	28°25.6	54.6	116°33.6	9.6′	16°02.0	14.3′	59.3′
15	43°25.6	·· 54.1	131°02.3	9.5′	16°16.3	14.2′	59.3′
16	58°25.5	53.7	145°30.8	9.5′	16°30.5	14.2′	59.3′
17	73°25.5	53.2	159°59.3	9.4′	16°44.7	14.0′	59.3′
18	88°25.5	N20°52.8	174°27.6	9.3′	N16°58.7	14.0′	59.3′
19	103°25.4	52.3	188°55.9	9.2′	17°12.7	13.9′	59.3′
20	118°25.4	51.9	203°24.0	9.1′	17°26.6	13.8′	59.3′
21	133°25.3	·· 51.4	217°52.1	9.0′	17°40.4	13.7′	59.3′
22	148°25.3	51.0	232°20.1	8.9′	17°54.1	13.6′	59.3′
23	163°25.2	50.5	246°48.0	8.8′	18°07.7	13.4′	59.4′
	SD = 15.7′	d = -0.4′	SD = 16.1′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.2	N20°50.1	261°15.7	8.7′	N18°21.1	13.4′	59.4′
1	193°25.2	49.6	275°43.4	8.6′	18°34.5	13.3′	59.4′
2	208°25.1	49.1	290°11.0	8.5′	18°47.8	13.2′	59.4′
3	223°25.1	·· 48.7	304°38.4	8.4′	19°01.0	13.1′	59.4′
4	238°25.0	48.2	319°05.8	8.3′	19°14.1	13.0′	59.4′
5	253°25.0	47.8	333°33.1	8.2′	19°27.1	12.8′	59.4′
6	268°25.0	N20°47.3	348°00.2	8.1′	N19°39.9	12.8′	59.4′
7	283°24.9	46.9	2°27.3	8.0′	19°52.7	12.6′	59.4′
8	298°24.9	46.4	16°54.2	7.9′	20°05.3	12.5′	59.4′
9	313°24.8	·· 45.9	31°21.1	7.7′	20°17.8	12.4′	59.4′
10	328°24.8	45.5	45°47.8	7.6′	20°30.2	12.3′	59.4′
11	343°24.8	45.0	60°14.5	7.5′	20°42.5	12.1′	59.4′
12	358°24.7	N20°44.6	74°41.0	7.4′	N20°54.6	12.1′	59.4′
13	13°24.7	44.1	89°07.5	7.3′	21°06.7	11.9′	59.4′
14	28°24.6	43.6	103°33.8	7.2′	21°18.6	11.8′	59.4′
15	43°24.6	·· 43.2	118°00.0	7.1′	21°30.4	11.6′	59.5′
16	58°24.6	42.7	132°26.1	7.0′	21°42.0	11.5′	59.5′
17	73°24.5	42.2	146°52.1	6.9′	21°53.5	11.4′	59.5′
18	88°24.5	N20°41.8	161°18.0	6.8′	N22°04.9	11.3′	59.5′
19	103°24.4	41.3	175°43.8	6.7′	22°16.2	11.1′	59.5′
20	118°24.4	40.8	190°09.5	6.6′	22°27.3	11.0′	59.5′
21	133°24.4	·· 40.4	204°35.1	6.5′	22°38.3	10.9′	59.5′
22	148°24.3	39.9	219°00.6	6.4′	22°49.2	10.7′	59.5′
23	163°24.3	39.4	233°26.0	6.3′	22°59.9	10.5′	59.5′
	SD = 15.7′	d = -0.5′	SD = 16.2′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.3	N20°39.0	247°51.3	6.2′	N23°10.4	10.4′	59.5′
1	193°24.2	38.5	262°16.5	6.1′	23°20.8	10.3′	59.5′
2	208°24.2	38.0	276°41.5	6.0′	23°31.1	10.1′	59.5′
3	223°24.1	·· 37.6	291°06.5	5.9′	23°41.2	10.0′	59.5′
4	238°24.1	37.1	305°31.4	5.8′	23°51.2	9.8′	59.5′
5	253°24.1	36.6	319°56.2	5.7′	24°01.0	9.7′	59.5′
6	268°24.0	N20°36.1	334°20.8	5.6′	N24°10.7	9.5′	59.5′
7	283°24.0	35.7	348°45.4	5.5′	24°20.2	9.4′	59.5′
8	298°24.0	35.2	3°09.9	5.4′	24°29.6	9.2′	59.5′
9	313°23.9	·· 34.7	17°34.3	5.3′	24°38.8	9.0′	59.5′
10	328°23.9	34.2	31°58.5	5.2′	24°47.8	8.9′	59.5′
11	343°23.9	33.8	46°22.7	5.1′	24°56.7	8.7′	59.5′
12	358°23.8	N20°33.3	60°46.8	5.0′	N25°05.4	8.6′	59.5′
13	13°23.8	32.8	75°10.8	4.9′	25°14.0	8.4′	59.5′
14	28°23.8	32.3	89°34.7	4.8′	25°22.4	8.2′	59.5′
15	43°23.7	·· 31.9	103°58.5	4.7′	25°30.6	8.1′	59.5′
16	58°23.7	31.4	118°22.2	4.6′	25°38.7	7.8′	59.5′
17	73°23.7	30.9	132°45.9	4.5′	25°46.5	7.8′	59.5′
18	88°23.6	N20°30.4	147°09.4	4.5′	N25°54.3	7.5′	59.5′
19	103°23.6	29.9	161°32.9	4.4′	26°01.8	7.3′	59.5′
20	118°23.6	29.5	175°56.3	4.3′	26°09.1	7.2′	59.5′
21	133°23.5	·· 29.0	190°19.5	4.2′	26°16.3	7.0′	59.5′
22	148°23.5	28.5	204°42.8	4.1′	26°23.3	6.9′	59.5′
23	163°23.5	28.0	219°05.9	4.1′	26°30.2	6.6′	59.5′
	SD = 15.7′	d = -0.5′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	–:–	–:–	00:49	23:14	–:–	–:–
66°	–:–	–:–	01:54	22:15	–:–	–:–
64°	–:–	–:–	02:28	21:42	–:–	–:–
62°	–:–	01:17	02:53	21:18	22:51	–:–
60°	–:–	01:59	03:12	20:59	22:11	–:–
N 58°	–:–	02:26	03:28	20:44	21:44	–:–
56°	01:10	02:47	03:41	20:30	21:24	22:58
54°	01:49	03:04	03:53	20:19	21:07	22:21
52°	02:14	03:19	04:03	20:09	20:53	21:56
50°	02:34	03:31	04:12	20:00	20:41	21:37
45°	03:10	03:56	04:32	19:41	20:16	21:01
N 40°	03:36	04:16	04:47	19:25	19:57	20:36
35°	03:56	04:31	05:00	19:12	19:41	20:16
30°	04:13	04:45	05:11	19:01	19:28	20:00
20°	04:38	05:07	05:31	18:42	19:06	19:34
N 10°	04:58	05:25	05:47	18:25	18:48	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:56	06:18	17:55	18:17	18:43
20°	05:44	06:11	06:34	17:39	18:02	18:29
30°	05:58	06:27	06:53	17:20	17:46	18:15
35°	06:05	06:36	07:03	17:09	17:37	18:08
40°	06:13	06:46	07:16	16:57	17:27	18:00
45°	06:21	06:58	07:30	16:43	17:16	17:52
S 50°	06:31	07:11	07:48	16:25	17:02	17:42
52°	06:35	07:17	07:56	16:17	16:56	17:38
54°	06:39	07:24	08:05	16:08	16:49	17:34
56°	06:44	07:31	08:16	15:58	16:42	17:29
58°	06:50	07:40	08:27	15:46	16:34	17:24
S 60°	06:55	07:49	08:41	15:32	16:24	17:18

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	19:36	▭	▭	16:43	▭	▭
N 70°	20:30	▭	▭	15:52	▭	▭
68°	21:03	▭	▭	15:20	▭	▭
66°	21:27	20:49	▭	14:57	17:30	▭
64°	21:47	21:29	▭	14:39	16:51	▭
62°	22:03	21:57	21:49	14:25	16:24	18:35
60°	22:16	22:19	22:27	14:13	16:03	17:58
N 58°	22:28	22:37	22:54	14:02	15:46	17:31
56°	22:38	22:52	23:15	13:53	15:32	17:11
54°	22:47	23:05	23:33	13:45	15:19	16:54
52°	22:55	23:16	23:48	13:38	15:08	16:39
50°	23:02	23:26	·· ··	13:31	14:59	16:26
45°	23:18	23:48	·· ··	13:17	14:39	16:00
N 40°	23:31	·· ··	00:05	13:06	14:22	15:40
35°	23:42	·· ··	00:20	12:56	14:09	15:22
30°	23:51	·· ··	00:33	12:48	13:57	15:08
20°	·· ··	00:08	00:55	12:34	13:37	14:43
N 10°	·· ··	00:23	01:15	12:21	13:19	14:21
0°	·· ··	00:37	01:33	12:09	13:03	14:01
S 10°	·· ··	00:51	01:51	11:58	12:47	13:41
20°	00:05	01:06	02:11	11:45	12:30	13:20
30°	00:16	01:24	02:34	11:31	12:10	12:55
35°	00:23	01:34	02:47	11:23	11:58	12:41
40°	00:30	01:46	03:03	11:14	11:45	12:24
45°	00:40	02:00	03:22	11:03	11:30	12:04
S 50°	00:50	02:17	03:46	10:50	11:11	11:39
52°	00:56	02:25	03:57	10:44	11:02	11:28
54°	01:01	02:34	04:10	10:38	10:52	11:14
56°	01:08	02:45	04:25	10:30	10:41	10:58
58°	01:15	02:57	04:43	10:22	10:28	10:40
S 60°	01:23	03:10	05:05	10:13	10:14	10:17

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 50-28%
18	06:15	06:17	12:06	05:57	18:23	
19	06:19	06:21	12:06	06:50	19:18	
20	06:23	06:25	12:06	07:47	20:17	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2327 sec ΔT = TT-UT1 = +68.9513 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	299°00.9	221°30.5	N20°54.4	128°17.0	N04°48.7	198°53.1	N23°00.8	296°21.8	S01°23.2
1	314°03.4	236°30.0	54.7	143°18.1	48.1	213°54.9	00.7	311°24.3	23.2
2	329°05.9	251°29.4	55.1	158°19.2	47.5	228°56.8	00.7	326°26.7	23.2
3	344°08.3	266°28.8	·· 55.4	173°20.3	·· 46.9	243°58.7	·· 00.7	341°29.2	·· 23.2
4	359°10.8	281°28.3	55.8	188°21.4	46.2	259°00.5	00.6	356°31.7	23.3
5	14°13.3	296°27.7	56.1	203°22.4	45.6	274°02.4	00.6	11°34.2	23.3
6	29°15.7	311°27.2	N20°56.5	218°23.5	N04°45.0	289°04.3	N23°00.6	26°36.7	S01°23.3
7	44°18.2	326°26.6	56.8	233°24.6	44.4	304°06.1	00.5	41°39.2	23.3
8	59°20.6	341°26.0	57.2	248°25.7	43.7	319°08.0	00.5	56°41.7	23.4
9	74°23.1	356°25.5	·· 57.5	263°26.8	·· 43.1	334°09.9	·· 00.5	71°44.2	·· 23.4
10	89°25.6	11°24.9	57.8	278°27.9	42.5	349°11.7	00.4	86°46.7	23.4
11	104°28.0	26°24.3	58.2	293°29.0	41.9	4°13.6	00.4	101°49.2	23.4
12	119°30.5	41°23.8	N20°58.5	308°30.0	N04°41.3	19°15.5	N23°00.4	116°51.7	S01°23.5
13	134°33.0	56°23.2	58.9	323°31.1	40.6	34°17.3	00.3	131°54.2	23.5
14	149°35.4	71°22.6	59.2	338°32.2	40.0	49°19.2	00.3	146°56.6	23.5
15	164°37.9	86°22.1	·· 59.5	353°33.3	·· 39.4	64°21.1	·· 00.2	161°59.1	·· 23.5
16	179°40.4	101°21.5	20°59.9	8°34.4	38.8	79°22.9	00.2	177°01.6	23.6
17	194°42.8	116°20.9	21°00.2	23°35.5	38.1	94°24.8	00.2	192°04.1	23.6
18	209°45.3	131°20.4	N21°00.5	38°36.5	N04°37.5	109°26.7	N23°00.1	207°06.6	S01°23.6
19	224°47.8	146°19.8	00.9	53°37.6	36.9	124°28.5	00.1	222°09.1	23.6
20	239°50.2	161°19.2	01.2	68°38.7	36.3	139°30.4	00.1	237°11.6	23.7
21	254°52.7	176°18.7	·· 01.5	83°39.8	·· 35.7	154°32.3	·· 00.0	252°14.1	·· 23.7
22	269°55.1	191°18.1	01.9	98°40.9	35.0	169°34.1	00.0	267°16.6	23.7
23	284°57.6	206°17.5	02.2	113°42.0	34.4	184°36.0	00.0	282°19.1	23.7
Mer.pass.	04:03	ν -0.6′	d 0.3′	m -4.04	ν 1.1′	d -0.6′	m 1.57	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.86

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°00.1	221°16.9	N21°02.5	128°43.0	N04°33.8	199°37.9	N22°59.9	297°21.6	S01°23.8
1	315°02.5	236°16.4	02.9	143°44.1	33.2	214°39.7	59.9	312°24.1	23.8
2	330°05.0	251°15.8	03.2	158°45.2	32.5	229°41.6	59.9	327°26.6	23.8
3	345°07.5	266°15.2	·· 03.5	173°46.3	·· 31.9	244°43.5	·· 59.8	342°29.1	·· 23.8
4	0°09.9	281°14.7	03.8	188°47.4	31.3	259°45.3	59.8	357°31.5	23.9
5	15°12.4	296°14.1	04.2	203°48.4	30.7	274°47.2	59.8	12°34.0	23.9
6	30°14.9	311°13.5	N21°04.5	218°49.5	N04°30.0	289°49.1	N22°59.7	27°36.5	S01°23.9
7	45°17.3	326°12.9	04.8	233°50.6	29.4	304°50.9	59.7	42°39.0	23.9
8	60°19.8	341°12.4	05.1	248°51.7	28.8	319°52.8	59.6	57°41.5	24.0
9	75°22.3	356°11.8	·· 05.5	263°52.8	·· 28.2	334°54.7	·· 59.6	72°44.0	·· 24.0
10	90°24.7	11°11.2	05.8	278°53.9	27.6	349°56.5	59.6	87°46.5	24.0
11	105°27.2	26°10.6	06.1	293°54.9	26.9	4°58.4	59.5	102°49.0	24.0
12	120°29.6	41°10.1	N21°06.4	308°56.0	N04°26.3	20°00.3	N22°59.5	117°51.5	S01°24.1
13	135°32.1	56°09.5	06.7	323°57.1	25.7	35°02.1	59.5	132°54.0	24.1
14	150°34.6	71°08.9	07.1	338°58.2	25.1	50°04.0	59.4	147°56.5	24.1
15	165°37.0	86°08.3	·· 07.4	353°59.3	·· 24.4	65°05.9	·· 59.4	162°59.0	·· 24.1
16	180°39.5	101°07.8	07.7	9°00.3	23.8	80°07.7	59.4	178°01.5	24.2
17	195°42.0	116°07.2	08.0	24°01.4	23.2	95°09.6	59.3	193°04.0	24.2
18	210°44.4	131°06.6	N21°08.3	39°02.5	N04°22.6	110°11.5	N22°59.3	208°06.5	S01°24.2
19	225°46.9	146°06.0	08.6	54°03.6	21.9	125°13.3	59.2	223°09.0	24.2
20	240°49.4	161°05.4	08.9	69°04.7	21.3	140°15.2	59.2	238°11.5	24.3
21	255°51.8	176°04.9	·· 09.3	84°05.8	·· 20.7	155°17.1	·· 59.2	253°14.0	·· 24.3
22	270°54.3	191°04.3	09.6	99°06.8	20.1	170°18.9	59.1	268°16.5	24.3
23	285°56.8	206°03.7	09.9	114°07.9	19.4	185°20.8	59.1	283°19.0	24.3
Mer.pass.	03:59	ν -0.6′	d 0.3′	m -4.04	ν 1.1′	d -0.6′	m 1.58	ν 1.9′	d -0.0′	m -1.90	ν 2.5′	d -0.0′	m 0.85

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°59.2	221°03.1	N21°10.2	129°09.0	N04°18.8	200°22.7	N22°59.1	298°21.5	S01°24.4
1	316°01.7	236°02.5	10.5	144°10.1	18.2	215°24.5	59.0	313°24.0	24.4
2	331°04.1	251°02.0	10.8	159°11.2	17.6	230°26.4	59.0	328°26.5	24.4
3	346°06.6	266°01.4	·· 11.1	174°12.2	·· 16.9	245°28.3	·· 59.0	343°29.0	·· 24.4
4	1°09.1	281°00.8	11.4	189°13.3	16.3	260°30.1	58.9	358°31.5	24.5
5	16°11.5	296°00.2	11.7	204°14.4	15.7	275°32.0	58.9	13°34.0	24.5
6	31°14.0	310°59.6	N21°12.0	219°15.5	N04°15.1	290°33.9	N22°58.8	28°36.5	S01°24.5
7	46°16.5	325°59.0	12.3	234°16.6	14.4	305°35.7	58.8	43°39.0	24.6
8	61°18.9	340°58.5	12.6	249°17.6	13.8	320°37.6	58.8	58°41.5	24.6
9	76°21.4	355°57.9	·· 12.9	264°18.7	·· 13.2	335°39.5	·· 58.7	73°44.0	·· 24.6
10	91°23.9	10°57.3	13.2	279°19.8	12.6	350°41.3	58.7	88°46.5	24.6
11	106°26.3	25°56.7	13.5	294°20.9	11.9	5°43.2	58.7	103°48.9	24.7
12	121°28.8	40°56.1	N21°13.8	309°22.0	N04°11.3	20°45.1	N22°58.6	118°51.4	S01°24.7
13	136°31.3	55°55.5	14.1	324°23.0	10.7	35°47.0	58.6	133°53.9	24.7
14	151°33.7	70°54.9	14.4	339°24.1	10.0	50°48.8	58.6	148°56.4	24.7
15	166°36.2	85°54.4	·· 14.7	354°25.2	·· 09.4	65°50.7	·· 58.5	163°58.9	·· 24.8
16	181°38.6	100°53.8	15.0	9°26.3	08.8	80°52.6	58.5	179°01.4	24.8
17	196°41.1	115°53.2	15.3	24°27.4	08.2	95°54.4	58.4	194°03.9	24.8
18	211°43.6	130°52.6	N21°15.6	39°28.4	N04°07.5	110°56.3	N22°58.4	209°06.4	S01°24.9
19	226°46.0	145°52.0	15.9	54°29.5	06.9	125°58.2	58.4	224°08.9	24.9
20	241°48.5	160°51.4	16.2	69°30.6	06.3	141°00.0	58.3	239°11.4	24.9
21	256°51.0	175°50.8	·· 16.4	84°31.7	·· 05.7	156°01.9	·· 58.3	254°14.0	·· 24.9
22	271°53.4	190°50.2	16.7	99°32.8	05.0	171°03.8	58.3	269°16.5	25.0
23	286°55.9	205°49.6	17.0	114°33.8	04.4	186°05.6	58.2	284°19.0	25.0
Mer.pass.	03:55	ν -0.6′	d 0.3′	m -4.03	ν 1.1′	d -0.6′	m 1.58	ν 1.9′	d -0.0′	m -1.91	ν 2.5′	d -0.0′	m 0.85

Stars

	SHA	Dec
Alpheratz	357°34.1	29°13.8
Ankaa	353°06.5	-42°09.7
Schedar	349°30.4	56°40.4
Diphda	348°46.7	-17°50.6
Achernar	335°19.8	-57°06.1
Hamal	327°50.7	23°34.9
Polaris	313°57.7	89°22.0
Acamar	315°11.5	-40°11.8
Menkar	314°05.8	4°11.5
Mirfak	308°27.8	49°56.9
Aldebaran	290°39.3	16°33.6
Rigel	281°03.7	-8°10.2
Capella	280°21.6	46°01.3
Bellatrix	278°22.7	6°22.4
Elnath	278°01.6	28°37.7
Alnilam	275°37.5	-1°11.0
Betelgeuse	270°51.9	7°24.8
Canopus	263°52.7	-52°42.4
Sirius	258°26.2	-16°45.0
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.2
Miaplacidus	221°39.1	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	172°59.9	-63°14.7
Gacrux	171°51.4	-57°15.6
Alioth	166°12.7	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.3	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.6	-60°56.7
Kochab	137°19.5	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.6
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.0	45°22.3
Enif	33°38.1	9°59.6
Al Na'ir	27°31.9	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.2
Markab	13°29.2	15°20.6

Jul 21 Mon	SHA	Mer.pass
Venus	282°29.6	09:14
Mars	189°16.1	15:26
Jupiter	259°52.1	10:43
Saturn	357°20.8	04:14

Jul 22 Tue	SHA	Mer.pass
Venus	281°16.9	09:15
Mars	188°43.0	15:24
Jupiter	259°37.8	10:40
Saturn	357°21.5	04:10

Jul 23 Wed	SHA	Mer.pass
Venus	280°03.9	09:16
Mars	188°09.8	15:22
Jupiter	259°23.4	10:37
Saturn	357°22.2	04:06

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.4	N20°27.5	233°29.0	4.0′	N26°36.8	6.5′	59.5′
1	193°23.4	27.0	247°51.9	3.9′	26°43.3	6.3′	59.5′
2	208°23.4	26.6	262°14.9	3.8′	26°49.6	6.1′	59.5′
3	223°23.4	·· 26.1	276°37.7	3.8′	26°55.7	5.9′	59.5′
4	238°23.3	25.6	291°00.5	3.7′	27°01.6	5.7′	59.5′
5	253°23.3	25.1	305°23.2	3.6′	27°07.3	5.6′	59.5′
6	268°23.3	N20°24.6	319°45.8	3.6′	N27°12.9	5.3′	59.5′
7	283°23.2	24.1	334°08.4	3.5′	27°18.2	5.2′	59.5′
8	298°23.2	23.6	348°30.9	3.5′	27°23.4	4.9′	59.5′
9	313°23.2	·· 23.2	2°53.4	3.4′	27°28.3	4.8′	59.5′
10	328°23.1	22.7	17°15.8	3.3′	27°33.1	4.6′	59.5′
11	343°23.1	22.2	31°38.1	3.3′	27°37.7	4.4′	59.5′
12	358°23.1	N20°21.7	46°00.4	3.3′	N27°42.1	4.2′	59.4′
13	13°23.1	21.2	60°22.7	3.2′	27°46.3	4.0′	59.4′
14	28°23.0	20.7	74°44.9	3.2′	27°50.3	3.8′	59.4′
15	43°23.0	·· 20.2	89°07.0	3.1′	27°54.1	3.6′	59.4′
16	58°23.0	19.7	103°29.2	3.1′	27°57.7	3.5′	59.4′
17	73°23.0	19.2	117°51.2	3.0′	28°01.2	3.2′	59.4′
18	88°22.9	N20°18.7	132°13.3	3.0′	N28°04.4	3.0′	59.4′
19	103°22.9	18.2	146°35.3	3.0′	28°07.4	2.8′	59.4′
20	118°22.9	17.7	160°57.3	3.0′	28°10.2	2.6′	59.4′
21	133°22.8	·· 17.2	175°19.2	2.9′	28°12.8	2.5′	59.4′
22	148°22.8	16.7	189°41.2	2.9′	28°15.3	2.2′	59.4′
23	163°22.8	16.2	204°03.1	2.9′	28°17.5	2.0′	59.4′
	SD = 15.7′	d = -0.5′	SD = 16.2′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.8	N20°15.8	218°25.0	2.9′	N28°19.5	1.8′	59.4′
1	193°22.7	15.3	232°46.9	2.9′	28°21.3	1.7′	59.4′
2	208°22.7	14.8	247°08.7	2.9′	28°23.0	1.4′	59.3′
3	223°22.7	·· 14.3	261°30.6	2.9′	28°24.4	1.2′	59.3′
4	238°22.7	13.8	275°52.5	2.8′	28°25.6	1.0′	59.3′
5	253°22.6	13.3	290°14.3	2.8′	28°26.6	0.8′	59.3′
6	268°22.6	N20°12.8	304°36.1	2.8′	N28°27.4	0.6′	59.3′
7	283°22.6	12.3	318°58.0	2.9′	28°28.0	0.5′	59.3′
8	298°22.6	11.7	333°19.8	2.9′	28°28.5	0.2′	59.3′
9	313°22.6	·· 11.2	347°41.7	2.9′	28°28.7	0.0′	59.3′
10	328°22.5	10.7	2°03.6	2.9′	28°28.7	0.2′	59.3′
11	343°22.5	10.2	16°25.5	2.9′	28°28.5	0.4′	59.3′
12	358°22.5	N20°09.7	30°47.4	2.9′	N28°28.1	0.6′	59.2′
13	13°22.5	09.2	45°09.3	2.9′	28°27.5	0.8′	59.2′
14	28°22.4	08.7	59°31.3	3.0′	28°26.7	1.0′	59.2′
15	43°22.4	·· 08.2	73°53.2	3.0′	28°25.7	1.2′	59.2′
16	58°22.4	07.7	88°15.2	3.0′	28°24.5	1.4′	59.2′
17	73°22.4	07.2	102°37.3	3.1′	28°23.1	1.6′	59.2′
18	88°22.4	N20°06.7	116°59.3	3.1′	N28°21.5	1.7′	59.2′
19	103°22.3	06.2	131°21.4	3.1′	28°19.8	2.0′	59.2′
20	118°22.3	05.7	145°43.6	3.2′	28°17.8	2.2′	59.1′
21	133°22.3	·· 05.2	160°05.8	3.2′	28°15.6	2.4′	59.1′
22	148°22.3	04.7	174°28.0	3.3′	28°13.2	2.6′	59.1′
23	163°22.3	04.1	188°50.3	3.3′	28°10.6	2.7′	59.1′
	SD = 15.7′	d = -0.5′	SD = 16.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.2	N20°03.6	203°12.6	3.4′	N28°07.9	3.0′	59.1′
1	193°22.2	03.1	217°35.0	3.4′	28°04.9	3.1′	59.1′
2	208°22.2	02.6	231°57.5	3.5′	28°01.8	3.4′	59.0′
3	223°22.2	·· 02.1	246°20.0	3.6′	27°58.4	3.5′	59.0′
4	238°22.2	01.6	260°42.5	3.6′	27°54.9	3.7′	59.0′
5	253°22.1	01.1	275°05.2	3.7′	27°51.2	4.0′	59.0′
6	268°22.1	N20°00.5	289°27.9	3.8′	N27°47.2	4.1′	59.0′
7	283°22.1	20°00.0	303°50.6	3.8′	27°43.1	4.2′	59.0′
8	298°22.1	19°59.5	318°13.5	3.9′	27°38.9	4.5′	58.9′
9	313°22.1	·· 59.0	332°36.4	4.0′	27°34.4	4.7′	58.9′
10	328°22.1	58.5	346°59.4	4.1′	27°29.7	4.8′	58.9′
11	343°22.0	58.0	1°22.5	4.2′	27°24.9	5.0′	58.9′
12	358°22.0	N19°57.4	15°45.6	4.2′	N27°19.9	5.2′	58.9′
13	13°22.0	56.9	30°08.8	4.3′	27°14.7	5.4′	58.9′
14	28°22.0	56.4	44°32.2	4.4′	27°09.3	5.6′	58.8′
15	43°22.0	·· 55.9	58°55.6	4.5′	27°03.7	5.7′	58.8′
16	58°22.0	55.4	73°19.1	4.6′	26°58.0	5.9′	58.8′
17	73°21.9	54.8	87°42.6	4.7′	26°52.1	6.1′	58.8′
18	88°21.9	N19°54.3	102°06.3	4.8′	N26°46.0	6.3′	58.8′
19	103°21.9	53.8	116°30.1	4.9′	26°39.7	6.4′	58.7′
20	118°21.9	53.3	130°54.0	5.0′	26°33.3	6.6′	58.7′
21	133°21.9	·· 52.7	145°17.9	5.1′	26°26.7	6.7′	58.7′
22	148°21.9	52.2	159°42.0	5.2′	26°20.0	7.0′	58.7′
23	163°21.9	51.7	174°06.2	5.3′	26°13.0	7.1′	58.7′
	SD = 15.7′	d = -0.5′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°	–:–	–:–	01:16	22:51	–:–	–:–
66°	–:–	–:–	02:06	22:03	–:–	–:–
64°	–:–	–:–	02:37	21:33	–:–	–:–
62°	–:–	01:32	03:00	21:11	22:37	–:–
60°	–:–	02:09	03:18	20:53	22:02	–:–
N 58°	–:–	02:34	03:34	20:38	21:37	–:–
56°	01:24	02:54	03:46	20:25	21:18	22:45
54°	01:58	03:10	03:58	20:14	21:02	22:13
52°	02:21	03:24	04:07	20:05	20:48	21:50
50°	02:40	03:35	04:16	19:56	20:37	21:32
45°	03:14	04:00	04:35	19:38	20:13	20:57
N 40°	03:39	04:18	04:50	19:23	19:54	20:33
35°	03:59	04:34	05:02	19:10	19:39	20:14
30°	04:15	04:47	05:13	18:59	19:26	19:58
20°	04:40	05:08	05:32	18:41	19:05	19:33
N 10°	04:59	05:25	05:48	18:25	18:47	19:14
0°	05:15	05:41	06:03	18:10	18:32	18:58
S 10°	05:30	05:55	06:18	17:55	18:18	18:43
20°	05:43	06:10	06:33	17:40	18:03	18:30
30°	05:57	06:26	06:51	17:22	17:47	18:17
35°	06:04	06:34	07:02	17:12	17:39	18:10
40°	06:11	06:44	07:14	17:00	17:29	18:02
45°	06:19	06:55	07:27	16:46	17:18	17:54
S 50°	06:28	07:08	07:44	16:29	17:05	17:45
52°	06:32	07:14	07:52	16:21	17:00	17:41
54°	06:36	07:20	08:01	16:12	16:53	17:37
56°	06:41	07:28	08:11	16:02	16:46	17:33
58°	06:46	07:35	08:23	15:51	16:38	17:28
S 60°	06:51	07:44	08:36	15:38	16:29	17:22

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°						
N 70°						
68°						
66°						
64°						
62°						21:52
60°	22:52	23:59	·· ··	19:44	20:50	21:14
N 58°	23:29	·· ··	00:36	19:07	20:13	20:48
56°	23:56	·· ··	01:03	18:40	19:46	20:26
54°	·· ··	00:17	01:24	18:19	19:25	20:09
52°	·· ··	00:35	01:41	18:02	19:08	19:54
50°	00:01	00:50	01:56	17:47	18:53	19:41
45°	00:28	01:20	02:26	17:17	18:22	19:14
N 40°	00:49	01:44	02:49	16:53	17:59	18:52
35°	01:07	02:04	03:09	16:34	17:39	18:35
30°	01:23	02:20	03:25	16:17	17:22	18:19
20°	01:49	02:49	03:53	15:49	16:54	17:53
N 10°	02:12	03:13	04:17	15:25	16:29	17:30
0°	02:33	03:36	04:39	15:03	16:07	17:09
S 10°	02:55	03:59	05:02	14:41	15:44	16:47
20°	03:18	04:24	05:26	14:17	15:19	16:24
30°	03:45	04:52	05:54	13:49	14:50	15:57
35°	04:01	05:10	06:10	13:32	14:33	15:42
40°	04:19	05:29	06:29	13:13	14:13	15:23
45°	04:42	05:54	06:52	12:50	13:49	15:00
S 50°	05:11	06:25	07:22	12:20	13:18	14:31
52°	05:25	06:41	07:36	12:06	13:02	14:17
54°	05:42	06:59	07:53	11:49	12:44	14:01
56°	06:02	07:21	08:13	11:29	12:22	13:41
58°	06:26	07:50	08:38	11:04	11:53	13:16
S 60°	07:00	08:32	09:12	10:30	11:11	12:43

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 26-28 18-4%
21	06:26	06:28	12:06	08:48	21:20	
22	06:29	06:30	12:07	09:51	22:23	
23	06:31	06:32	12:07	10:54	23:25	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2334 sec ΔT = TT-UT1 = +68.9506 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	301°58.4	220°49.1	N21°17.3	129°34.9	N04°03.8	201°07.5	N22°58.2	299°21.5	S01°25.0
1	317°00.8	235°48.5	17.6	144°36.0	03.2	216°09.4	58.1	314°24.0	25.0
2	332°03.3	250°47.9	17.9	159°37.1	02.5	231°11.3	58.1	329°26.5	25.1
3	347°05.8	265°47.3	·· 18.2	174°38.1	·· 01.9	246°13.1	·· 58.1	344°29.0	·· 25.1
4	2°08.2	280°46.7	18.5	189°39.2	01.3	261°15.0	58.0	359°31.5	25.1
5	17°10.7	295°46.1	18.7	204°40.3	00.6	276°16.9	58.0	14°34.0	25.2
6	32°13.1	310°45.5	N21°19.0	219°41.4	N04°00.0	291°18.7	N22°58.0	29°36.5	S01°25.2
7	47°15.6	325°44.9	19.3	234°42.5	03°59.4	306°20.6	57.9	44°39.0	25.2
8	62°18.1	340°44.3	19.6	249°43.5	58.8	321°22.5	57.9	59°41.5	25.2
9	77°20.5	355°43.7	·· 19.9	264°44.6	·· 58.1	336°24.3	·· 57.8	74°44.0	·· 25.3
10	92°23.0	10°43.1	20.1	279°45.7	57.5	351°26.2	57.8	89°46.5	25.3
11	107°25.5	25°42.5	20.4	294°46.8	56.9	6°28.1	57.8	104°49.0	25.3
12	122°27.9	40°41.9	N21°20.7	309°47.9	N03°56.3	21°30.0	N22°57.7	119°51.5	S01°25.4
13	137°30.4	55°41.3	21.0	324°48.9	55.6	36°31.8	57.7	134°54.0	25.4
14	152°32.9	70°40.7	21.2	339°50.0	55.0	51°33.7	57.7	149°56.5	25.4
15	167°35.3	85°40.1	·· 21.5	354°51.1	·· 54.4	66°35.6	·· 57.6	164°59.0	·· 25.4
16	182°37.8	100°39.5	21.8	9°52.2	53.7	81°37.4	57.6	180°01.5	25.5
17	197°40.3	115°38.9	22.1	24°53.2	53.1	96°39.3	57.5	195°04.0	25.5
18	212°42.7	130°38.3	N21°22.3	39°54.3	N03°52.5	111°41.2	N22°57.5	210°06.5	S01°25.5
19	227°45.2	145°37.7	22.6	54°55.4	51.9	126°43.1	57.5	225°09.0	25.6
20	242°47.6	160°37.1	22.9	69°56.5	51.2	141°44.9	57.4	240°11.5	25.6
21	257°50.1	175°36.6	·· 23.1	84°57.5	·· 50.6	156°46.8	·· 57.4	255°14.0	·· 25.6
22	272°52.6	190°36.0	23.4	99°58.6	50.0	171°48.7	57.4	270°16.5	25.7
23	287°55.0	205°35.4	23.7	114°59.7	49.3	186°50.5	57.3	285°19.0	25.7
Mer.pass.	03:51	ν -0.6′	d 0.3′	m -4.03	ν 1.1′	d -0.6′	m 1.58	ν 1.9′	d -0.0′	m -1.91	ν 2.5′	d -0.0′	m 0.84

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	302°57.5	220°34.8	N21°23.9	130°00.8	N03°48.7	201°52.4	N22°57.3	300°21.5	S01°25.7
1	318°00.0	235°34.1	24.2	145°01.9	48.1	216°54.3	57.2	315°24.0	25.7
2	333°02.4	250°33.5	24.5	160°02.9	47.5	231°56.1	57.2	330°26.5	25.8
3	348°04.9	265°32.9	·· 24.7	175°04.0	·· 46.8	246°58.0	·· 57.2	345°29.0	·· 25.8
4	3°07.4	280°32.3	25.0	190°05.1	46.2	261°59.9	57.1	0°31.6	25.8
5	18°09.8	295°31.7	25.2	205°06.2	45.6	277°01.8	57.1	15°34.1	25.9
6	33°12.3	310°31.1	N21°25.5	220°07.2	N03°44.9	292°03.6	N22°57.0	30°36.6	S01°25.9
7	48°14.7	325°30.5	25.8	235°08.3	44.3	307°05.5	57.0	45°39.1	25.9
8	63°17.2	340°29.9	26.0	250°09.4	43.7	322°07.4	57.0	60°41.6	26.0
9	78°19.7	355°29.3	·· 26.3	265°10.5	·· 43.0	337°09.3	·· 56.9	75°44.1	·· 26.0
10	93°22.1	10°28.7	26.5	280°11.5	42.4	352°11.1	56.9	90°46.6	26.0
11	108°24.6	25°28.1	26.8	295°12.6	41.8	7°13.0	56.9	105°49.1	26.0
12	123°27.1	40°27.5	N21°27.0	310°13.7	N03°41.2	22°14.9	N22°56.8	120°51.6	S01°26.1
13	138°29.5	55°26.9	27.3	325°14.8	40.5	37°16.7	56.8	135°54.1	26.1
14	153°32.0	70°26.3	27.5	340°15.8	39.9	52°18.6	56.7	150°56.6	26.1
15	168°34.5	85°25.7	·· 27.8	355°16.9	·· 39.3	67°20.5	·· 56.7	165°59.1	·· 26.2
16	183°36.9	100°25.1	28.0	10°18.0	38.6	82°22.4	56.7	181°01.6	26.2
17	198°39.4	115°24.5	28.3	25°19.1	38.0	97°24.2	56.6	196°04.1	26.2
18	213°41.9	130°23.9	N21°28.5	40°20.2	N03°37.4	112°26.1	N22°56.6	211°06.7	S01°26.3
19	228°44.3	145°23.3	28.8	55°21.2	36.7	127°28.0	56.6	226°09.2	26.3
20	243°46.8	160°22.7	29.0	70°22.3	36.1	142°29.8	56.5	241°11.7	26.3
21	258°49.2	175°22.1	·· 29.3	85°23.4	·· 35.5	157°31.7	·· 56.5	256°14.2	·· 26.3
22	273°51.7	190°21.4	29.5	100°24.5	34.9	172°33.6	56.4	271°16.7	26.4
23	288°54.2	205°20.8	29.8	115°25.5	34.2	187°35.5	56.4	286°19.2	26.4
Mer.pass.	03:48	ν -0.6′	d 0.3′	m -4.03	ν 1.1′	d -0.6′	m 1.59	ν 1.9′	d -0.0′	m -1.91	ν 2.5′	d -0.0′	m 0.84

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	303°56.6	220°20.2	N21°30.0	130°26.6	N03°33.6	202°37.3	N22°56.4	301°21.7	S01°26.4
1	318°59.1	235°19.6	30.3	145°27.7	33.0	217°39.2	56.3	316°24.2	26.5
2	334°01.6	250°19.0	30.5	160°28.8	32.3	232°41.1	56.3	331°26.7	26.5
3	349°04.0	265°18.4	·· 30.7	175°29.8	·· 31.7	247°43.0	·· 56.2	346°29.2	·· 26.5
4	4°06.5	280°17.8	31.0	190°30.9	31.1	262°44.8	56.2	1°31.7	26.6
5	19°09.0	295°17.2	31.2	205°32.0	30.4	277°46.7	56.2	16°34.2	26.6
6	34°11.4	310°16.6	N21°31.5	220°33.0	N03°29.8	292°48.6	N22°56.1	31°36.8	S01°26.6
7	49°13.9	325°16.0	31.7	235°34.1	29.2	307°50.5	56.1	46°39.3	26.7
8	64°16.4	340°15.3	31.9	250°35.2	28.6	322°52.3	56.0	61°41.8	26.7
9	79°18.8	355°14.7	·· 32.2	265°36.3	·· 27.9	337°54.2	·· 56.0	76°44.3	·· 26.7
10	94°21.3	10°14.1	32.4	280°37.3	27.3	352°56.1	56.0	91°46.8	26.8
11	109°23.7	25°13.5	32.6	295°38.4	26.7	7°58.0	55.9	106°49.3	26.8
12	124°26.2	40°12.9	N21°32.9	310°39.5	N03°26.0	22°59.8	N22°55.9	121°51.8	S01°26.8
13	139°28.7	55°12.3	33.1	325°40.6	25.4	38°01.7	55.9	136°54.3	26.9
14	154°31.1	70°11.7	33.3	340°41.6	24.8	53°03.6	55.8	151°56.8	26.9
15	169°33.6	85°11.0	·· 33.6	355°42.7	·· 24.1	68°05.4	·· 55.8	166°59.4	·· 26.9
16	184°36.1	100°10.4	33.8	10°43.8	23.5	83°07.3	55.7	182°01.9	27.0
17	199°38.5	115°09.8	34.0	25°44.9	22.9	98°09.2	55.7	197°04.4	27.0
18	214°41.0	130°09.2	N21°34.2	40°45.9	N03°22.2	113°11.1	N22°55.7	212°06.9	S01°27.0
19	229°43.5	145°08.6	34.5	55°47.0	21.6	128°12.9	55.6	227°09.4	27.0
20	244°45.9	160°08.0	34.7	70°48.1	21.0	143°14.8	55.6	242°11.9	27.1
21	259°48.4	175°07.3	·· 34.9	85°49.2	·· 20.3	158°16.7	·· 55.5	257°14.4	·· 27.1
22	274°50.8	190°06.7	35.1	100°50.2	19.7	173°18.6	55.5	272°16.9	27.1
23	289°53.3	205°06.1	35.4	115°51.3	19.1	188°20.4	55.5	287°19.4	27.2
Mer.pass.	03:44	ν -0.6′	d 0.2′	m -4.02	ν 1.1′	d -0.6′	m 1.59	ν 1.9′	d -0.0′	m -1.91	ν 2.5′	d -0.0′	m 0.83

Stars	SHA	Dec
Alpheratz	357°34.1	29°13.8
Ankaa	353°06.5	-42°09.7
Schedar	349°30.3	56°40.5
Diphda	348°46.7	-17°50.6
Achernar	335°19.8	-57°06.1
Hamal	327°50.7	23°35.0
Polaris	313°56.0	89°22.0
Acamar	315°11.5	-40°11.8
Menkar	314°05.7	4°11.5
Mirfak	308°27.8	49°56.9
Aldebaran	290°39.3	16°33.7
Rigel	281°03.7	-8°10.2
Capella	280°21.6	46°01.3
Bellatrix	278°22.6	6°22.4
Elnath	278°01.6	28°37.7
Alnilam	275°37.5	-1°11.0
Betelgeuse	270°51.9	7°24.8
Canopus	263°52.7	-52°42.3
Sirius	258°26.2	-16°44.9
Adhara	255°05.9	-29°00.3
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.1	-69°49.4
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	172°59.9	-63°14.7
Gacrux	171°51.4	-57°15.6
Alioth	166°12.7	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.6	49°11.4
Hadar	148°35.4	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.6	-60°56.7
Kochab	137°19.5	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.0	-26°29.4
Atria	107°08.4	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.6
Eltanin	90°41.5	51°29.2
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.0	45°22.3
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.3
Markab	13°29.2	15°20.6

Jul 24 Thu	SHA	Mer.pass
Venus	278°50.7	09:17
Mars	187°36.6	15:21
Jupiter	259°09.2	10:34
Saturn	357°23.1	04:02

Jul 25 Fri	SHA	Mer.pass
Venus	277°37.3	09:18
Mars	187°03.3	15:19
Jupiter	258°54.9	10:31
Saturn	357°24.0	03:58

Jul 26 Sat	SHA	Mer.pass
Venus	276°23.6	09:19
Mars	186°30.0	15:17
Jupiter	258°40.7	10:28
Saturn	357°25.1	03:54

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.9	N19°51.2	188°30.5	5.4′	N26°05.9	7.2′	58.6′
1	193°21.8	50.6	202°54.8	5.5′	25°58.7	7.4′	58.6′
2	208°21.8	50.1	217°19.3	5.6′	25°51.3	7.6′	58.6′
3	223°21.8	·· 49.6	231°43.9	5.7′	25°43.7	7.7′	58.6′
4	238°21.8	49.1	246°08.6	5.8′	25°36.0	7.9′	58.6′
5	253°21.8	48.5	260°33.4	5.9′	25°28.1	8.1′	58.5′
6	268°21.8	N19°48.0	274°58.3	6.0′	N25°20.0	8.2′	58.5′
7	283°21.8	47.5	289°23.4	6.1′	25°11.8	8.3′	58.5′
8	298°21.8	46.9	303°48.5	6.3′	25°03.5	8.5′	58.5′
9	313°21.7	·· 46.4	318°13.8	6.4′	24°55.0	8.6′	58.4′
10	328°21.7	45.9	332°39.1	6.5′	24°46.4	8.8′	58.4′
11	343°21.7	45.4	347°04.6	6.6′	24°37.6	8.9′	58.4′
12	358°21.7	N19°44.8	1°30.2	6.7′	N24°28.7	9.1′	58.4′
13	13°21.7	44.3	15°56.0	6.8′	24°19.6	9.2′	58.3′
14	28°21.7	43.8	30°21.8	7.0′	24°10.4	9.4′	58.3′
15	43°21.7	·· 43.2	44°47.8	7.1′	24°01.0	9.5′	58.3′
16	58°21.7	42.7	59°13.8	7.2′	23°51.5	9.6′	58.3′
17	73°21.7	42.2	73°40.0	7.3′	23°41.9	9.7′	58.3′
18	88°21.7	N19°41.6	88°06.3	7.4′	N23°32.2	9.9′	58.2′
19	103°21.6	41.1	102°32.8	7.6′	23°22.3	10.0′	58.2′
20	118°21.6	40.5	116°59.3	7.7′	23°12.3	10.2′	58.2′
21	133°21.6	·· 40.0	131°26.0	7.8′	23°02.1	10.2′	58.2′
22	148°21.6	39.5	145°52.8	7.9′	22°51.9	10.4′	58.1′
23	163°21.6	38.9	160°19.7	8.0′	22°41.5	10.5′	58.1′
	SD = 15.7′	d = -0.5′	SD = 16.0′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.6	N19°38.4	174°46.8	8.2′	N22°31.0	10.7′	58.1′
1	193°21.6	37.8	189°14.0	8.3′	22°20.3	10.7′	58.1′
2	208°21.6	37.3	203°41.2	8.4′	22°09.6	10.9′	58.0′
3	223°21.6	·· 36.8	218°08.6	8.5′	21°58.7	10.9′	58.0′
4	238°21.6	36.2	232°36.2	8.7′	21°47.8	11.1′	58.0′
5	253°21.6	35.7	247°03.8	8.8′	21°36.7	11.2′	57.9′
6	268°21.6	N19°35.1	261°31.6	8.9′	N21°25.5	11.3′	57.9′
7	283°21.6	34.6	275°59.5	9.0′	21°14.2	11.4′	57.9′
8	298°21.6	34.1	290°27.5	9.1′	21°02.8	11.6′	57.9′
9	313°21.6	·· 33.5	304°55.7	9.3′	20°51.2	11.6′	57.8′
10	328°21.6	33.0	319°23.9	9.4′	20°39.6	11.7′	57.8′
11	343°21.5	32.4	333°52.3	9.5′	20°27.9	11.8′	57.8′
12	358°21.5	N19°31.9	348°20.8	9.6′	N20°16.1	11.9′	57.8′
13	13°21.5	31.3	2°49.4	9.7′	20°04.2	12.0′	57.7′
14	28°21.5	30.8	17°18.2	9.9′	19°52.2	12.2′	57.7′
15	43°21.5	·· 30.2	31°47.0	10.0′	19°40.0	12.2′	57.7′
16	58°21.5	29.7	46°16.0	10.1′	19°27.8	12.2′	57.6′
17	73°21.5	29.1	60°45.1	10.2′	19°15.6	12.4′	57.6′
18	88°21.5	N19°28.6	75°14.3	10.3′	N19°03.2	12.5′	57.6′
19	103°21.5	28.0	89°43.6	10.4′	18°50.7	12.5′	57.6′
20	118°21.5	27.5	104°13.1	10.6′	18°38.2	12.7′	57.5′
21	133°21.5	·· 26.9	118°42.6	10.7′	18°25.5	12.7′	57.5′
22	148°21.5	26.4	133°12.3	10.8′	18°12.8	12.8′	57.5′
23	163°21.5	25.8	147°42.1	10.9′	18°00.0	12.8′	57.4′
	SD = 15.7′	d = -0.5′	SD = 15.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.5	N19°25.3	162°12.0	11.0′	N17°47.2	13.0′	57.4′
1	193°21.5	24.7	176°42.0	11.1′	17°34.2	13.0′	57.4′
2	208°21.5	24.2	191°12.1	11.2′	17°21.2	13.1′	57.4′
3	223°21.5	·· 23.6	205°42.3	11.3′	17°08.1	13.2′	57.3′
4	238°21.5	23.1	220°12.7	11.4′	16°54.9	13.2′	57.3′
5	253°21.5	22.5	234°43.1	11.6′	16°41.7	13.3′	57.3′
6	268°21.5	N19°21.9	249°13.7	11.7′	N16°28.4	13.4′	57.2′
7	283°21.5	21.4	263°44.3	11.8′	16°15.0	13.4′	57.2′
8	298°21.5	20.8	278°15.1	11.9′	16°01.6	13.5′	57.2′
9	313°21.5	·· 20.3	292°46.0	12.0′	15°48.1	13.6′	57.2′
10	328°21.5	19.7	307°17.0	12.1′	15°34.5	13.6′	57.1′
11	343°21.5	19.2	321°48.0	12.2′	15°20.9	13.7′	57.1′
12	358°21.5	N19°18.6	336°19.2	12.3′	N15°07.2	13.7′	57.1′
13	13°21.5	18.0	350°50.5	12.4′	14°53.5	13.8′	57.0′
14	28°21.5	17.5	5°21.9	12.5′	14°39.7	13.9′	57.0′
15	43°21.5	·· 16.9	19°53.4	12.6′	14°25.8	13.9′	57.0′
16	58°21.5	16.4	34°25.0	12.7′	14°11.9	13.9′	57.0′
17	73°21.5	15.8	48°56.7	12.8′	13°58.0	14.0′	56.9′
18	88°21.5	N19°15.2	63°28.4	12.9′	N13°44.0	14.1′	56.9′
19	103°21.6	14.7	78°00.3	13.0′	13°29.9	14.1′	56.9′
20	118°21.6	14.1	92°32.3	13.1′	13°15.8	14.1′	56.8′
21	133°21.6	·· 13.5	107°04.3	13.1′	13°01.7	14.2′	56.8′
22	148°21.6	13.0	121°36.5	13.2′	12°47.5	14.2′	56.8′
23	163°21.6	12.4	136°08.7	13.3′	12°33.3	14.3′	56.7′
	SD = 15.7′	d = -0.6′	SD = 15.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	–:–	–:–	01:37	22:31	–:–	–:–
66°	–:–	–:–	02:19	21:51	–:–	–:–
64°	–:–	00:47	02:47	21:24	23:16	–:–
62°	–:–	01:46	03:08	21:03	22:23	–:–
60°	–:–	02:18	03:25	20:46	21:52	–:–
N 58°	00:43	02:42	03:39	20:32	21:29	23:21
56°	01:37	03:00	03:52	20:20	21:11	22:33
54°	02:07	03:15	04:02	20:10	20:56	22:04
52°	02:28	03:29	04:12	20:01	20:43	21:43
50°	02:46	03:40	04:20	19:52	20:32	21:26
45°	03:19	04:03	04:38	19:35	20:09	20:53
N 40°	03:43	04:21	04:52	19:20	19:51	20:30
35°	04:02	04:36	05:04	19:08	19:37	20:11
30°	04:17	04:49	05:15	18:58	19:24	19:56
20°	04:41	05:09	05:33	18:40	19:04	19:32
N 10°	05:00	05:26	05:49	18:24	18:47	19:13
0°	05:16	05:41	06:03	18:10	18:32	18:58
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:42	06:09	06:33	17:41	18:04	18:31
30°	05:55	06:24	06:50	17:24	17:49	18:18
35°	06:02	06:33	07:00	17:14	17:41	18:12
40°	06:09	06:42	07:11	17:02	17:32	18:05
45°	06:17	06:52	07:25	16:49	17:21	17:57
S 50°	06:25	07:05	07:41	16:33	17:09	17:49
52°	06:29	07:10	07:48	16:25	17:03	17:45
54°	06:33	07:17	07:57	16:17	16:57	17:41
56°	06:37	07:23	08:06	16:07	16:50	17:37
58°	06:42	07:31	08:17	15:56	16:43	17:32
S 60°	06:47	07:39	08:30	15:44	16:34	17:27

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	▭	▭	02:31	▭	▭	00:21
						22:47
N 70°	▭	▭	03:32	▭	23:18	22:25
68°	▭	▭	04:07	▭	22:42	22:09
66°	▭	02:05	04:31	22:54	22:16	21:55
64°	▭	02:45	04:50	22:13	21:55	21:43
62°	01:07	03:13	05:06	21:44	21:39	21:34
60°	01:44	03:34	05:18	21:22	21:25	21:25
N 58°	02:10	03:51	05:29	21:04	21:13	21:18
56°	02:31	04:06	05:39	20:49	21:02	21:11
54°	02:48	04:18	05:47	20:36	20:53	21:05
52°	03:02	04:29	05:55	20:24	20:45	21:00
50°	03:15	04:39	06:02	20:14	20:38	20:55
45°	03:41	04:59	06:16	19:52	20:22	20:44
N 40°	04:02	05:16	06:28	19:35	20:08	20:35
35°	04:19	05:29	06:38	19:20	19:57	20:28
30°	04:33	05:41	06:46	19:07	19:47	20:21
20°	04:58	06:02	07:01	18:45	19:30	20:09
N 10°	05:20	06:19	07:14	18:25	19:15	19:59
0°	05:40	06:36	07:26	18:07	19:01	19:49
S 10°	06:00	06:52	07:39	17:49	18:46	19:39
20°	06:21	07:09	07:51	17:29	18:31	19:28
30°	06:46	07:29	08:06	17:06	18:13	19:16
35°	07:00	07:41	08:14	16:53	18:02	19:09
40°	07:17	07:54	08:24	16:37	17:50	19:01
45°	07:37	08:10	08:35	16:18	17:36	18:51
S 50°	08:01	08:29	08:49	15:54	17:19	18:40
52°	08:13	08:38	08:55	15:43	17:10	18:34
54°	08:27	08:48	09:02	15:30	17:01	18:28
56°	08:42	08:59	09:09	15:15	16:50	18:21
58°	09:01	09:12	09:18	14:57	16:38	18:14
S 60°	09:24	09:27	09:28	14:35	16:24	18:05

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 0-2 1-2%
24	06:33	06:33	12:07	11:54	–:–	
25	06:34	06:34	12:07	12:48	00:22	
26	06:34	06:34	12:07	13:38	01:14	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2341 sec ΔT = TT-UT1 = +68.9499 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	304°55.8	220°05.5	N21°35.6	130°52.4	N03°18.4	203°22.3	N22°55.4	302°22.0	S01°27.2
1	319°58.2	235°04.9	35.8	145°53.4	17.8	218°24.2	55.4	317°24.5	27.2
2	335°00.7	250°04.3	36.0	160°54.5	17.2	233°26.1	55.3	332°27.0	27.3
3	350°03.2	265°03.6	·· 36.2	175°55.6	·· 16.5	248°27.9	·· 55.3	347°29.5	·· 27.3
4	5°05.6	280°03.0	36.5	190°56.7	15.9	263°29.8	55.3	2°32.0	27.3
5	20°08.1	295°02.4	36.7	205°57.7	15.3	278°31.7	55.2	17°34.5	27.4
6	35°10.6	310°01.8	N21°36.9	220°58.8	N03°14.6	293°33.6	N22°55.2	32°37.0	S01°27.4
7	50°13.0	325°01.2	37.1	235°59.9	14.0	308°35.5	55.1	47°39.6	27.4
8	65°15.5	340°00.5	37.3	251°01.0	13.4	323°37.3	55.1	62°42.1	27.5
9	80°18.0	354°59.9	·· 37.5	266°02.0	·· 12.8	338°39.2	·· 55.1	77°44.6	·· 27.5
10	95°20.4	9°59.3	37.7	281°03.1	12.1	353°41.1	55.0	92°47.1	27.5
11	110°22.9	24°58.7	37.9	296°04.2	11.5	8°43.0	55.0	107°49.6	27.6
12	125°25.3	39°58.0	N21°38.2	311°05.2	N03°10.9	23°44.8	N22°54.9	122°52.1	S01°27.6
13	140°27.8	54°57.4	38.4	326°06.3	10.2	38°46.7	54.9	137°54.6	27.6
14	155°30.3	69°56.8	38.6	341°07.4	09.6	53°48.6	54.9	152°57.2	27.7
15	170°32.7	84°56.2	·· 38.8	356°08.5	·· 09.0	68°50.5	·· 54.8	167°59.7	·· 27.7
16	185°35.2	99°55.6	39.0	11°09.5	08.3	83°52.3	54.8	183°02.2	27.7
17	200°37.7	114°54.9	39.2	26°10.6	07.7	98°54.2	54.7	198°04.7	27.8
18	215°40.1	129°54.3	N21°39.4	41°11.7	N03°07.1	113°56.1	N22°54.7	213°07.2	S01°27.8
19	230°42.6	144°53.7	39.6	56°12.7	06.4	128°58.0	54.7	228°09.7	27.8
20	245°45.1	159°53.1	39.8	71°13.8	05.8	143°59.8	54.6	243°12.2	27.9
21	260°47.5	174°52.4	·· 40.0	86°14.9	·· 05.2	159°01.7	·· 54.6	258°14.8	·· 27.9
22	275°50.0	189°51.8	40.2	101°16.0	04.5	174°03.6	54.5	273°17.3	27.9
23	290°52.5	204°51.2	40.4	116°17.0	03.9	189°05.5	54.5	288°19.8	28.0
Mer.pass.	03:40	ν -0.6′	d 0.2′	m -4.02	ν 1.1′	d -0.6′	m 1.59	ν 1.9′	d -0.0′ m -1.91	ν 2.5′	d -0.0′ m 0.83

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	305°54.9	219°50.6	N21°40.6	131°18.1	N03°03.3	204°07.3	N22°54.5	303°22.3	S01°28.0
1	320°57.4	234°49.9	40.8	146°19.2	02.6	219°09.2	54.4	318°24.8	28.1
2	335°59.8	249°49.3	41.0	161°20.2	02.0	234°11.1	54.4	333°27.3	28.1
3	351°02.3	264°48.7	·· 41.2	176°21.3	·· 01.3	249°13.0	·· 54.3	348°29.9	·· 28.1
4	6°04.8	279°48.0	41.4	191°22.4	00.7	264°14.9	54.3	3°32.4	28.2
5	21°07.2	294°47.4	41.6	206°23.4	03°00.1	279°16.7	54.3	18°34.9	28.2
6	36°09.7	309°46.8	N21°41.8	221°24.5	N02°59.4	294°18.6	N22°54.2	33°37.4	S01°28.2
7	51°12.2	324°46.2	42.0	236°25.6	58.8	309°20.5	54.2	48°39.9	28.3
8	66°14.6	339°45.5	42.1	251°26.7	58.2	324°22.4	54.1	63°42.4	28.3
9	81°17.1	354°44.9	·· 42.3	266°27.7	·· 57.5	339°24.2	·· 54.1	78°45.0	·· 28.3
10	96°19.6	9°44.3	42.5	281°28.8	56.9	354°26.1	54.1	93°47.5	28.4
11	111°22.0	24°43.6	42.7	296°29.9	56.3	9°28.0	54.0	108°50.0	28.4
12	126°24.5	39°43.0	N21°42.9	311°30.9	N02°55.6	24°29.9	N22°54.0	123°52.5	S01°28.4
13	141°26.9	54°42.4	43.1	326°32.0	55.0	39°31.8	53.9	138°55.0	28.5
14	156°29.4	69°41.8	43.3	341°33.1	54.4	54°33.6	53.9	153°57.6	28.5
15	171°31.9	84°41.1	·· 43.5	356°34.1	·· 53.7	69°35.5	·· 53.9	169°00.1	·· 28.5
16	186°34.3	99°40.5	43.6	11°35.2	53.1	84°37.4	53.8	184°02.6	28.6
17	201°36.8	114°39.9	43.8	26°36.3	52.5	99°39.3	53.8	199°05.1	28.6
18	216°39.3	129°39.2	N21°44.0	41°37.4	N02°51.8	114°41.2	N22°53.7	214°07.6	S01°28.6
19	231°41.7	144°38.6	44.2	56°38.4	51.2	129°43.0	53.7	229°10.2	28.7
20	246°44.2	159°38.0	44.4	71°39.5	50.6	144°44.9	53.7	244°12.7	28.7
21	261°46.7	174°37.3	·· 44.5	86°40.6	·· 49.9	159°46.8	·· 53.6	259°15.2	·· 28.8
22	276°49.1	189°36.7	44.7	101°41.6	49.3	174°48.7	53.6	274°17.7	28.8
23	291°51.6	204°36.1	44.9	116°42.7	48.7	189°50.5	53.5	289°20.2	28.8
Mer.pass.	03:36	ν -0.6′	d 0.2′	m -4.02	ν 1.1′	d -0.6′	m 1.59	ν 1.9′	d -0.0′ m -1.91	ν 2.5′	d -0.0′ m 0.82

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	306°54.1	219°35.4	N21°45.1	131°43.8	N02°48.0	204°52.4	N22°53.5	304°22.7	S01°28.9
1	321°56.5	234°34.8	45.2	146°44.8	47.4	219°54.3	53.4	319°25.3	28.9
2	336°59.0	249°34.2	45.4	161°45.9	46.7	234°56.2	53.4	334°27.8	28.9
3	352°01.4	264°33.5	·· 45.6	176°47.0	·· 46.1	249°58.1	·· 53.4	349°30.3	·· 29.0
4	7°03.9	279°32.9	45.8	191°48.0	45.5	264°59.9	53.3	4°32.8	29.0
5	22°06.4	294°32.2	45.9	206°49.1	44.8	280°01.8	53.3	19°35.4	29.0
6	37°08.8	309°31.6	N21°46.1	221°50.2	N02°44.2	295°03.7	N22°53.2	34°37.9	S01°29.1
7	52°11.3	324°31.0	46.3	236°51.2	43.6	310°05.6	53.2	49°40.4	29.1
8	67°13.8	339°30.3	46.4	251°52.3	42.9	325°07.5	53.2	64°42.9	29.2
9	82°16.2	354°29.7	·· 46.6	266°53.4	·· 42.3	340°09.3	·· 53.1	79°45.4	·· 29.2
10	97°18.7	9°29.1	46.8	281°54.5	41.7	355°11.2	53.1	94°48.0	29.2
11	112°21.2	24°28.4	46.9	296°55.5	41.0	10°13.1	53.0	109°50.5	29.3
12	127°23.6	39°27.8	N21°47.1	311°56.6	N02°40.4	25°15.0	N22°53.0	124°53.0	S01°29.3
13	142°26.1	54°27.2	47.3	326°57.7	39.8	40°16.9	53.0	139°55.5	29.3
14	157°28.5	69°26.5	47.4	341°58.7	39.1	55°18.7	52.9	154°58.0	29.4
15	172°31.0	84°25.9	·· 47.6	356°59.8	·· 38.5	70°20.6	·· 52.9	170°00.6	·· 29.4
16	187°33.5	99°25.2	47.7	12°00.9	37.8	85°22.5	52.8	185°03.1	29.4
17	202°35.9	114°24.6	47.9	27°01.9	37.2	100°24.4	52.8	200°05.6	29.5
18	217°38.4	129°24.0	N21°48.1	42°03.0	N02°36.6	115°26.3	N22°52.7	215°08.1	S01°29.5
19	232°40.9	144°23.3	48.2	57°04.1	35.9	130°28.1	52.7	230°10.7	29.6
20	247°43.3	159°22.7	48.4	72°05.1	35.3	145°30.0	52.7	245°13.2	29.6
21	262°45.8	174°22.0	·· 48.5	87°06.2	·· 34.7	160°31.9	·· 52.6	260°15.7	·· 29.6
22	277°48.3	189°21.4	48.7	102°07.3	34.0	175°33.8	52.6	275°18.2	29.7
23	292°50.7	204°20.8	48.8	117°08.3	33.4	190°35.7	52.5	290°20.8	29.7
Mer.pass.	03:32	ν -0.6′	d 0.2′	m -4.01	ν 1.1′	d -0.6′	m 1.60	ν 1.9′	d -0.0′ m -1.91	ν 2.5′	d -0.0′ m 0.82

Stars	SHA	Dec
Alpheratz	357°34.1	29°13.9
Ankaa	353°06.5	-42°09.7
Schedar	349°30.3	56°40.5
Diphda	348°46.7	-17°50.6
Achernar	335°19.7	-57°06.1
Hamal	327°50.7	23°35.0
Polaris	313°54.6	89°22.0
Acamar	315°11.5	-40°11.8
Menkar	314°05.7	4°11.5
Mirfak	308°27.7	49°56.9
Aldebaran	290°39.3	16°33.7
Rigel	281°03.7	-8°10.2
Capella	280°21.5	46°01.3
Bellatrix	278°22.6	6°22.4
Elnath	278°01.6	28°37.7
Alnilam	275°37.5	-1°11.0
Betelgeuse	270°51.9	7°24.8
Canopus	263°52.7	-52°42.3
Sirius	258°26.1	-16°44.9
Adhara	255°05.9	-29°00.2
Procyon	244°50.7	5°09.6
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.2	-69°49.3
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	172°59.9	-63°14.7
Gacrux	171°51.4	-57°15.6
Alioth	166°12.7	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.7	49°11.4
Hadar	148°35.4	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.6	-60°56.7
Kochab	137°19.6	74°03.3
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.0	-26°29.4
Atria	107°08.5	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.8	12°32.6
Eltanin	90°41.5	51°29.3
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.0	45°22.3
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.3
Markab	13°29.2	15°20.6

Jul 27 Sun	SHA	Mer.pass
Venus	275°09.7	09:20
Mars	185°56.6	15:15
Jupiter	258°26.5	10:25
Saturn	357°26.2	03:50

Jul 28 Mon	SHA	Mer.pass
Venus	273°55.6	09:21
Mars	185°23.2	15:14
Jupiter	258°12.4	10:22
Saturn	357°27.4	03:46

Jul 29 Tue	SHA	Mer.pass
Venus	272°41.4	09:22
Mars	184°49.7	15:12
Jupiter	257°58.4	10:19
Saturn	357°28.7	03:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.6	N19°11.8	150°41.0	13.4′	N12°19.0	14.3′	56.7′
1	193°21.6	11.3	165°13.4	13.5′	12°04.7	14.3′	56.7′
2	208°21.6	10.7	179°45.9	13.6′	11°50.4	14.4′	56.7′
3	223°21.6	·· 10.1	194°18.5	13.7′	11°36.0	14.4′	56.6′
4	238°21.6	09.6	208°51.2	13.8′	11°21.6	14.5′	56.6′
5	253°21.6	09.0	223°23.9	13.8′	11°07.1	14.4′	56.6′
6	268°21.6	N19°08.4	237°56.8	13.9′	N10°52.7	14.6′	56.5′
7	283°21.6	07.9	252°29.7	14.0′	10°38.1	14.5′	56.5′
8	298°21.6	07.3	267°02.7	14.1′	10°23.6	14.6′	56.5′
9	313°21.6	·· 06.7	281°35.8	14.1′	10°09.0	14.6′	56.5′
10	328°21.6	06.1	296°08.9	14.2′	09°54.4	14.6′	56.4′
11	343°21.7	05.6	310°42.1	14.3′	09°39.8	14.7′	56.4′
12	358°21.7	N19°05.0	325°15.4	14.4′	N09°25.1	14.6′	56.4′
13	13°21.7	04.4	339°48.8	14.4′	09°10.5	14.7′	56.3′
14	28°21.7	03.9	354°22.3	14.5′	08°55.8	14.8′	56.3′
15	43°21.7	·· 03.3	8°55.8	14.6′	08°41.0	14.7′	56.3′
16	58°21.7	02.7	23°29.4	14.7′	08°26.3	14.8′	56.3′
17	73°21.7	02.1	38°03.0	14.7′	08°11.5	14.7′	56.2′
18	88°21.7	N19°01.6	52°36.7	14.8′	N07°56.8	14.8′	56.2′
19	103°21.7	01.0	67°10.5	14.9′	07°42.0	14.8′	56.2′
20	118°21.7	19°00.4	81°44.4	14.9′	07°27.2	14.9′	56.1′
21	133°21.8	18°59.8	96°18.3	15.0′	07°12.3	14.8′	56.1′
22	148°21.8	59.2	110°52.3	15.0′	06°57.5	14.9′	56.1′
23	163°21.8	58.7	125°26.3	15.1′	06°42.6	14.8′	56.1′
	SD = 15.7′	d = -0.6′	SD = 15.5′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.8	N18°58.1	140°00.4	15.2′	N06°27.8	14.9′	56.0′
1	193°21.8	57.5	154°34.6	15.2′	06°12.9	14.9′	56.0′
2	208°21.8	56.9	169°08.8	15.3′	05°58.0	14.9′	56.0′
3	223°21.8	·· 56.3	183°43.0	15.3′	05°43.1	14.9′	55.9′
4	238°21.8	55.8	198°17.4	15.4′	05°28.2	14.9′	55.9′
5	253°21.9	55.2	212°51.7	15.4′	05°13.3	14.9′	55.9′
6	268°21.9	N18°54.6	227°26.2	15.5′	N04°58.4	14.9′	55.9′
7	283°21.9	54.0	242°00.6	15.5′	04°43.5	14.9′	55.8′
8	298°21.9	53.4	256°35.2	15.6′	04°28.6	14.9′	55.8′
9	313°21.9	·· 52.8	271°09.7	15.6′	04°13.7	15.0′	55.8′
10	328°21.9	52.3	285°44.4	15.7′	03°58.7	14.9′	55.8′
11	343°21.9	51.7	300°19.0	15.7′	03°43.8	14.9′	55.7′
12	358°22.0	N18°51.1	314°53.7	15.8′	N03°28.9	14.9′	55.7′
13	13°22.0	50.5	329°28.5	15.8′	03°14.0	14.9′	55.7′
14	28°22.0	49.9	344°03.3	15.8′	02°59.1	15.0′	55.6′
15	43°22.0	·· 49.3	358°38.1	15.9′	02°44.1	14.9′	55.6′
16	58°22.0	48.7	13°13.0	15.9′	02°29.2	14.9′	55.6′
17	73°22.0	48.2	27°47.9	16.0′	02°14.3	14.9′	55.6′
18	88°22.0	N18°47.6	42°22.9	16.0′	N01°59.4	14.9′	55.5′
19	103°22.1	47.0	56°57.9	16.0′	01°44.5	14.8′	55.5′
20	118°22.1	46.4	71°32.9	16.1′	01°29.7	14.9′	55.5′
21	133°22.1	·· 45.8	86°08.0	16.1′	01°14.8	14.9′	55.5′
22	148°22.1	45.2	100°43.0	16.1′	00°59.9	14.8′	55.4′
23	163°22.1	44.6	115°18.2	16.1′	00°45.1	14.9′	55.4′
	SD = 15.7′	d = -0.6′	SD = 15.3′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.2	N18°44.0	129°53.3	16.2′	N00°30.2	14.8′	55.4′
1	193°22.2	43.4	144°28.5	16.2′	00°15.4	14.8′	55.4′
2	208°22.2	42.8	159°03.7	16.2′	N00°00.6	14.8′	55.3′
3	223°22.2	·· 42.2	173°38.9	16.3′	S00°14.2	14.8′	55.3′
4	238°22.2	41.6	188°14.2	16.3′	00°29.0	14.8′	55.3′
5	253°22.2	41.1	202°49.5	16.3′	00°43.8	14.8′	55.3′
6	268°22.3	N18°40.5	217°24.8	16.3′	S00°58.6	14.7′	55.3′
7	283°22.3	39.9	232°00.1	16.3′	01°13.3	14.7′	55.2′
8	298°22.3	39.3	246°35.4	16.4′	01°28.0	14.7′	55.2′
9	313°22.3	·· 38.7	261°10.8	16.4′	01°42.7	14.7′	55.2′
10	328°22.4	38.1	275°46.2	16.4′	01°57.4	14.7′	55.2′
11	343°22.4	37.5	290°21.6	16.4′	02°12.1	14.6′	55.1′
12	358°22.4	N18°36.9	304°57.0	16.4′	S02°26.7	14.6′	55.1′
13	13°22.4	36.3	319°32.4	16.4′	02°41.3	14.6′	55.1′
14	28°22.4	35.7	334°07.8	16.4′	02°55.9	14.6′	55.1′
15	43°22.5	·· 35.1	348°43.3	16.5′	03°10.5	14.6′	55.1′
16	58°22.5	34.5	3°18.7	16.5′	03°25.1	14.5′	55.0′
17	73°22.5	33.9	17°54.2	16.5′	03°39.6	14.5′	55.0′
18	88°22.5	N18°33.3	32°29.7	16.5′	S03°54.1	14.5′	55.0′
19	103°22.6	32.7	47°05.2	16.5′	04°08.6	14.4′	55.0′
20	118°22.6	32.1	61°40.6	16.5′	04°23.0	14.4′	54.9′
21	133°22.6	·· 31.5	76°16.1	16.5′	04°37.4	14.4′	54.9′
22	148°22.6	30.9	90°51.6	16.5′	04°51.8	14.4′	54.9′
23	163°22.6	30.3	105°27.1	16.5′	05°06.2	14.3′	54.9′
	SD = 15.7′	d = -0.6′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°	–:–	–:–	00:41	23:17	–:–	–:–
68°	–:–	–:–	01:55	22:14	–:–	–:–
66°	–:–	–:–	02:31	21:39	–:–	–:–
64°	–:–	01:15	02:56	21:15	22:52	–:–
62°	–:–	01:59	03:16	20:55	22:10	–:–
60°	–:–	02:28	03:32	20:40	21:42	–:–
N 58°	01:08	02:50	03:45	20:26	21:22	22:59
56°	01:49	03:07	03:57	20:15	21:05	22:21
54°	02:15	03:21	04:07	20:05	20:50	21:55
52°	02:35	03:34	04:16	19:56	20:38	21:36
50°	02:52	03:45	04:24	19:48	20:27	21:20
45°	03:23	04:07	04:41	19:31	20:05	20:49
N 40°	03:46	04:24	04:55	19:18	19:48	20:26
35°	04:04	04:38	05:07	19:06	19:34	20:08
30°	04:19	04:51	05:17	18:56	19:22	19:53
20°	04:42	05:10	05:34	18:39	19:02	19:30
N 10°	05:01	05:27	05:49	18:24	18:46	19:12
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:55	06:17	17:56	18:18	18:44
20°	05:41	06:08	06:31	17:42	18:05	18:32
30°	05:54	06:23	06:48	17:25	17:51	18:20
35°	06:00	06:31	06:58	17:16	17:43	18:13
40°	06:07	06:39	07:09	17:05	17:34	18:07
45°	06:14	06:49	07:21	16:52	17:24	18:00
S 50°	06:22	07:01	07:37	16:37	17:12	17:52
52°	06:25	07:07	07:44	16:29	17:07	17:48
54°	06:29	07:12	07:52	16:21	17:01	17:45
56°	06:33	07:19	08:01	16:12	16:55	17:41
58°	06:37	07:26	08:12	16:02	16:48	17:37
S 60°	06:42	07:34	08:23	15:50	16:40	17:32

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	05:44	07:59	10:03	22:03	21:29	20:56
N 70°	06:03	08:06	10:00	21:54	21:27	21:02
68°	06:17	08:11	09:57	21:46	21:26	21:08
66°	06:29	08:15	09:55	21:39	21:25	21:12
64°	06:39	08:19	09:54	21:34	21:25	21:16
62°	06:48	08:22	09:52	21:29	21:24	21:19
60°	06:55	08:25	09:51	21:24	21:23	21:22
N 58°	07:01	08:27	09:50	21:21	21:23	21:24
56°	07:07	08:29	09:49	21:17	21:22	21:27
54°	07:12	08:31	09:48	21:14	21:22	21:29
52°	07:16	08:33	09:47	21:11	21:21	21:31
50°	07:20	08:35	09:46	21:09	21:21	21:32
45°	07:29	08:38	09:45	21:03	21:20	21:36
N 40°	07:36	08:41	09:43	20:59	21:19	21:39
35°	07:42	08:43	09:42	20:54	21:19	21:42
30°	07:48	08:46	09:41	20:51	21:18	21:45
20°	07:57	08:49	09:40	20:44	21:17	21:49
N 10°	08:05	08:53	09:38	20:39	21:16	21:53
0°	08:13	08:56	09:37	20:34	21:15	21:56
S 10°	08:20	08:59	09:35	20:28	21:15	22:00
20°	08:28	09:02	09:34	20:22	21:14	22:03
30°	08:37	09:06	09:32	20:16	21:13	22:08
35°	08:43	09:08	09:31	20:12	21:12	22:10
40°	08:49	09:10	09:30	20:08	21:11	22:13
45°	08:55	09:13	09:29	20:02	21:10	22:16
S 50°	09:04	09:16	09:28	19:56	21:09	22:20
52°	09:07	09:18	09:27	19:53	21:09	22:22
54°	09:12	09:20	09:27	19:50	21:08	22:24
56°	09:16	09:21	09:26	19:47	21:08	22:26
58°	09:21	09:23	09:25	19:43	21:07	22:29
S 60°	09:27	09:26	09:24	19:38	21:06	22:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 3-5 6-18%
27	06:34	06:33	12:07	14:23	02:01	
28	06:33	06:32	12:07	15:06	02:45	
29	06:31	06:30	12:07	15:46	03:26	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2348 sec ΔT = TT-UT1 = +68.9492 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	307°53.2	219°20.1	N21°49.0	132°09.4	N02°32.8	205°37.5	N22°52.5	305°23.3	S01°29.7
1	322°55.7	234°19.5	49.1	147°10.5	32.1	220°39.4	52.5	320°25.8	29.8
2	337°58.1	249°18.8	49.3	162°11.5	31.5	235°41.3	52.4	335°28.3	29.8
3	353°00.6	264°18.2	·· 49.4	177°12.6	·· 30.8	250°43.2	·· 52.4	350°30.8	·· 29.9
4	8°03.0	279°17.5	49.6	192°13.7	30.2	265°45.1	52.3	5°33.4	29.9
5	23°05.5	294°16.9	49.7	207°14.7	29.6	280°47.0	52.3	20°35.9	29.9
6	38°08.0	309°16.3	N21°49.9	222°15.8	N02°28.9	295°48.8	N22°52.2	35°38.4	S01°30.0
7	53°10.4	324°15.6	50.0	237°16.9	28.3	310°50.7	52.2	50°40.9	30.0
8	68°12.9	339°15.0	50.2	252°17.9	27.7	325°52.6	52.2	65°43.5	30.0
9	83°15.4	354°14.3	·· 50.3	267°19.0	·· 27.0	340°54.5	·· 52.1	80°46.0	·· 30.1
10	98°17.8	9°13.7	50.5	282°20.1	26.4	355°56.4	52.1	95°48.5	30.1
11	113°20.3	24°13.0	50.6	297°21.1	25.7	10°58.2	52.0	110°51.0	30.2
12	128°22.8	39°12.4	N21°50.7	312°22.2	N02°25.1	26°00.1	N22°52.0	125°53.6	S01°30.2
13	143°25.2	54°11.7	50.9	327°23.3	24.5	41°02.0	52.0	140°56.1	30.2
14	158°27.7	69°11.1	51.0	342°24.3	23.8	56°03.9	51.9	155°58.6	30.3
15	173°30.2	84°10.5	·· 51.2	357°25.4	·· 23.2	71°05.8	·· 51.9	171°01.2	·· 30.3
16	188°32.6	99°09.8	51.3	12°26.4	22.6	86°07.7	51.8	186°03.7	30.3
17	203°35.1	114°09.2	51.4	27°27.5	21.9	101°09.5	51.8	201°06.2	30.4
18	218°37.5	129°08.5	N21°51.6	42°28.6	N02°21.3	116°11.4	N22°51.7	216°08.7	S01°30.4
19	233°40.0	144°07.9	51.7	57°29.6	20.6	131°13.3	51.7	231°11.3	30.5
20	248°42.5	159°07.2	51.8	72°30.7	20.0	146°15.2	51.7	246°13.8	30.5
21	263°44.9	174°06.6	·· 52.0	87°31.8	·· 19.4	161°17.1	·· 51.6	261°16.3	·· 30.5
22	278°47.4	189°05.9	52.1	102°32.8	18.7	176°19.0	51.6	276°18.8	30.6
23	293°49.9	204°05.3	52.2	117°33.9	18.1	191°20.8	51.5	291°21.4	30.6
Mer.pass.	03:28	ν -0.6′	d 0.2′	m -4.01	ν 1.1′	d -0.6′	m 1.60	ν 1.9′	d -0.0′ m -1.91	ν 2.5′	d -0.0′ m 0.81

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	308°52.3	219°04.6	N21°52.3	132°35.0	N02°17.4	206°22.7	N22°51.5	306°23.9	S01°30.7
1	323°54.8	234°04.0	52.5	147°36.0	16.8	221°24.6	51.4	321°26.4	30.7
2	338°57.3	249°03.3	52.6	162°37.1	16.2	236°26.5	51.4	336°28.9	30.7
3	353°59.7	264°02.7	·· 52.7	177°38.2	·· 15.5	251°28.4	·· 51.4	351°31.5	·· 30.8
4	9°02.2	279°02.0	52.8	192°39.2	14.9	266°30.3	51.3	6°34.0	30.8
5	24°04.6	294°01.4	53.0	207°40.3	14.3	281°32.1	51.3	21°36.5	30.9
6	39°07.1	309°00.7	N21°53.1	222°41.4	N02°13.6	296°34.0	N22°51.2	36°39.1	S01°30.9
7	54°09.6	324°00.1	53.2	237°42.4	13.0	311°35.9	51.2	51°41.6	30.9
8	69°12.0	338°59.4	53.3	252°43.5	12.3	326°37.8	51.1	66°44.1	31.0
9	84°14.5	353°58.8	·· 53.5	267°44.5	·· 11.7	341°39.7	·· 51.1	81°46.6	·· 31.0
10	99°17.0	8°58.1	53.6	282°45.6	11.1	356°41.6	51.1	96°49.2	31.0
11	114°19.4	23°57.5	53.7	297°46.7	10.4	11°43.4	51.0	111°51.7	31.1
12	129°21.9	38°56.8	N21°53.8	312°47.7	N02°09.8	26°45.3	N22°51.0	126°54.2	S01°31.1
13	144°24.4	53°56.2	53.9	327°48.8	09.1	41°47.2	50.9	141°56.8	31.2
14	159°26.8	68°55.5	54.0	342°49.9	08.5	56°49.1	50.9	156°59.3	31.2
15	174°29.3	83°54.9	·· 54.2	357°50.9	·· 07.9	71°51.0	·· 50.8	172°01.8	·· 31.2
16	189°31.8	98°54.2	54.3	12°52.0	07.2	86°52.9	50.8	187°04.4	31.3
17	204°34.2	113°53.6	54.4	27°53.0	06.6	101°54.8	50.8	202°06.9	31.3
18	219°36.7	128°52.9	N21°54.5	42°54.1	N02°06.0	116°56.6	N22°50.7	217°09.4	S01°31.4
19	234°39.1	143°52.3	54.6	57°55.2	05.3	131°58.5	50.7	232°11.9	31.4
20	249°41.6	158°51.6	54.7	72°56.2	04.7	147°00.4	50.6	247°14.5	31.4
21	264°44.1	173°51.0	·· 54.8	87°57.3	·· 04.0	162°02.3	·· 50.6	262°17.0	·· 31.5
22	279°46.5	188°50.3	54.9	102°58.4	03.4	177°04.2	50.5	277°19.5	31.5
23	294°49.0	203°49.6	55.0	117°59.4	02.8	192°06.1	50.5	292°22.1	31.6
Mer.pass.	03:24	ν -0.6′	d 0.1′	m -4.01	ν 1.1′	d -0.6′	m 1.60	ν 1.9′	d -0.0′ m -1.92	ν 2.5′	d -0.0′ m 0.81

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	309°51.5	218°49.0	N21°55.1	133°00.5	N02°02.1	207°08.0	N22°50.5	307°24.6	S01°31.6
1	324°53.9	233°48.3	55.2	148°01.5	01.5	222°09.8	50.4	322°27.1	31.6
2	339°56.4	248°47.7	55.3	163°02.6	00.8	237°11.7	50.4	337°29.7	31.7
3	354°58.9	263°47.0	·· 55.4	178°03.7	02°00.2	252°13.6	·· 50.3	352°32.2	·· 31.7
4	10°01.3	278°46.4	55.5	193°04.7	01°59.6	267°15.5	50.3	7°34.7	31.8
5	25°03.8	293°45.7	55.7	208°05.8	58.9	282°17.4	50.2	22°37.3	31.8
6	40°06.3	308°45.1	N21°55.7	223°06.9	N01°58.3	297°19.3	N22°50.2	37°39.8	S01°31.9
7	55°08.7	323°44.4	55.8	238°07.9	57.6	312°21.2	50.2	52°42.3	31.9
8	70°11.2	338°43.7	55.9	253°09.0	57.0	327°23.0	50.1	67°44.8	31.9
9	85°13.6	353°43.1	·· 56.0	268°10.0	·· 56.4	342°24.9	·· 50.1	82°47.4	·· 32.0
10	100°16.1	8°42.4	56.1	283°11.1	55.7	357°26.8	50.0	97°49.9	32.0
11	115°18.6	23°41.8	56.2	298°12.2	55.1	12°28.7	50.0	112°52.4	32.1
12	130°21.0	38°41.1	N21°56.3	313°13.2	N01°54.4	27°30.6	N22°49.9	127°55.0	S01°32.1
13	145°23.5	53°40.5	56.4	328°14.3	53.8	42°32.5	49.9	142°57.5	32.1
14	160°26.0	68°39.8	56.5	343°15.3	53.2	57°34.4	49.9	158°00.0	32.2
15	175°28.4	83°39.1	·· 56.6	358°16.4	·· 52.5	72°36.2	·· 49.8	173°02.6	·· 32.2
16	190°30.9	98°38.5	56.7	13°17.5	51.9	87°38.1	49.8	188°05.1	32.3
17	205°33.4	113°37.8	56.8	28°18.5	51.2	102°40.0	49.7	203°07.6	32.3
18	220°35.8	128°37.2	N21°56.9	43°19.6	N01°50.6	117°41.9	N22°49.7	218°10.2	S01°32.3
19	235°38.3	143°36.5	56.9	58°20.7	49.9	132°43.8	49.6	233°12.7	32.4
20	250°40.7	158°35.8	57.0	73°21.7	49.3	147°45.7	49.6	248°15.2	32.4
21	265°43.2	173°35.2	·· 57.1	88°22.8	·· 48.7	162°47.6	·· 49.6	263°17.8	·· 32.5
22	280°45.7	188°34.5	57.2	103°23.8	48.0	177°49.5	49.5	278°20.3	32.5
23	295°48.1	203°33.9	57.3	118°24.9	47.4	192°51.3	49.5	293°22.8	32.6
Mer.pass.	03:20	ν -0.7′	d 0.1′	m -4.00	ν 1.1′	d -0.6′	m 1.60	ν 1.9′	d -0.0′ m -1.92	ν 2.5′	d -0.0′ m 0.80

Stars	SHA	Dec
Alpheratz	357°34.1	29°13.9
Ankaa	353°06.4	-42°09.7
Schedar	349°30.3	56°40.5
Diphda	348°46.7	-17°50.6
Achernar	335°19.7	-57°06.1
Hamal	327°50.6	23°35.0
Polaris	313°53.1	89°22.0
Acamar	315°11.5	-40°11.8
Menkar	314°05.7	4°11.5
Mirfak	308°27.7	49°56.9
Aldebaran	290°39.3	16°33.7
Rigel	281°03.6	-8°10.2
Capella	280°21.5	46°01.3
Bellatrix	278°22.6	6°22.5
Elnath	278°01.5	28°37.7
Alnilam	275°37.5	-1°11.0
Betelgeuse	270°51.8	7°24.8
Canopus	263°52.7	-52°42.3
Sirius	258°26.1	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.7	5°09.7
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.2	-69°49.3
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	173°00.0	-63°14.7
Gacrux	171°51.4	-57°15.6
Alioth	166°12.7	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.7	49°11.4
Hadar	148°35.4	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.6	-60°56.7
Kochab	137°19.6	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.5	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.5	51°29.3
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.5
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.0	45°22.3
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.3
Markab	13°29.2	15°20.6

Jul 30 Wed	SHA	Mer.pass
Venus	271°26.9	09:23
Mars	184°16.2	15:10
Jupiter	257°44.4	10:16
Saturn	357°30.1	03:38

Jul 31 Thu	SHA	Mer.pass
Venus	270°12.3	09:24
Mars	183°42.6	15:09
Jupiter	257°30.4	10:13
Saturn	357°31.6	03:34

Aug 01 Fri	SHA	Mer.pass
Venus	268°57.5	09:25
Mars	183°09.0	15:07
Jupiter	257°16.5	10:10
Saturn	357°33.1	03:30

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.7	N18°29.7	120°02.6	16.5′	S05°20.5	14.3′	54.9′
1	193°22.7	29.0	134°38.1	16.5′	05°34.8	14.3′	54.8′
2	208°22.7	28.4	149°13.6	16.5′	05°49.1	14.2′	54.8′
3	223°22.8	·· 27.8	163°49.1	16.5′	06°03.3	14.3′	54.8′
4	238°22.8	27.2	178°24.6	16.5′	06°17.6	14.1′	54.8′
5	253°22.8	26.6	193°00.1	16.5′	06°31.7	14.2′	54.8′
6	268°22.8	N18°26.0	207°35.6	16.5′	S06°45.9	14.1′	54.8′
7	283°22.9	25.4	222°11.1	16.5′	07°00.0	14.0′	54.7′
8	298°22.9	24.8	236°46.5	16.5′	07°14.0	14.1′	54.7′
9	313°22.9	·· 24.2	251°22.0	16.4′	07°28.1	14.0′	54.7′
10	328°22.9	23.6	265°57.4	16.4′	07°42.1	13.9′	54.7′
11	343°23.0	23.0	280°32.9	16.4′	07°56.0	14.0′	54.7′
12	358°23.0	N18°22.4	295°08.3	16.4′	S08°10.0	13.8′	54.7′
13	13°23.0	21.7	309°43.7	16.4′	08°23.8	13.9′	54.6′
14	28°23.1	21.1	324°19.1	16.4′	08°37.7	13.8′	54.6′
15	43°23.1	·· 20.5	338°54.5	16.4′	08°51.5	13.7′	54.6′
16	58°23.1	19.9	353°29.8	16.3′	09°05.2	13.8′	54.6′
17	73°23.1	19.3	8°05.2	16.3′	09°19.0	13.6′	54.6′
18	88°23.2	N18°18.7	22°40.5	16.3′	S09°32.6	13.7′	54.6′
19	103°23.2	18.1	37°15.8	16.3′	09°46.3	13.6′	54.5′
20	118°23.2	17.4	51°51.1	16.3′	09°59.9	13.5′	54.5′
21	133°23.3	·· 16.8	66°26.3	16.2′	10°13.4	13.5′	54.5′
22	148°23.3	16.2	81°01.6	16.2′	10°26.9	13.5′	54.5′
23	163°23.3	15.6	95°36.8	16.2′	10°40.4	13.4′	54.5′
	SD = 15.7′	d = -0.6′	SD = 15.0′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.4	N18°15.0	110°12.0	16.2′	S10°53.8	13.3′	54.5′
1	193°23.4	14.4	124°47.1	16.1′	11°07.1	13.4′	54.5′
2	208°23.4	13.7	139°22.3	16.1′	11°20.5	13.2′	54.5′
3	223°23.4	·· 13.1	153°57.4	16.1′	11°33.7	13.2′	54.4′
4	238°23.5	12.5	168°32.5	16.0′	11°46.9	13.2′	54.4′
5	253°23.5	11.9	183°07.5	16.0′	12°00.1	13.1′	54.4′
6	268°23.5	N18°11.3	197°42.5	16.0′	S12°13.2	13.1′	54.4′
7	283°23.6	10.6	212°17.5	15.9′	12°26.3	13.0′	54.4′
8	298°23.6	10.0	226°52.4	15.9′	12°39.3	13.0′	54.4′
9	313°23.6	·· 09.4	241°27.4	15.9′	12°52.3	12.9′	54.4′
10	328°23.7	08.8	256°02.2	15.8′	13°05.2	12.8′	54.4′
11	343°23.7	08.2	270°37.1	15.8′	13°18.0	12.8′	54.4′
12	358°23.8	N18°07.5	285°11.9	15.8′	S13°30.8	12.7′	54.3′
13	13°23.8	06.9	299°46.6	15.7′	13°43.5	12.7′	54.3′
14	28°23.8	06.3	314°21.4	15.7′	13°56.2	12.7′	54.3′
15	43°23.9	·· 05.7	328°56.1	15.6′	14°08.9	12.5′	54.3′
16	58°23.9	05.0	343°30.7	15.6′	14°21.4	12.5′	54.3′
17	73°23.9	04.4	358°05.3	15.6′	14°33.9	12.5′	54.3′
18	88°24.0	N18°03.8	12°39.9	15.5′	S14°46.4	12.4′	54.3′
19	103°24.0	03.2	27°14.4	15.5′	14°58.8	12.3′	54.3′
20	118°24.0	02.5	41°48.8	15.4′	15°11.1	12.3′	54.3′
21	133°24.1	·· 01.9	56°23.3	15.4′	15°23.4	12.2′	54.3′
22	148°24.1	01.3	70°57.6	15.3′	15°35.6	12.1′	54.3′
23	163°24.1	00.6	85°32.0	15.3′	15°47.7	12.1′	54.3′
	SD = 15.7′	d = -0.6′	SD = 14.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.2	N18°00.0	100°06.2	15.2′	S15°59.8	12.0′	54.2′
1	193°24.2	17°59.4	114°40.5	15.2′	16°11.8	12.0′	54.2′
2	208°24.3	58.7	129°14.6	15.1′	16°23.8	11.9′	54.2′
3	223°24.3	·· 58.1	143°48.8	15.1′	16°35.7	11.8′	54.2′
4	238°24.3	57.5	158°22.8	15.0′	16°47.5	11.8′	54.2′
5	253°24.4	56.9	172°56.8	15.0′	16°59.3	11.6′	54.2′
6	268°24.4	N17°56.2	187°30.8	14.9′	S17°10.9	11.7′	54.2′
7	283°24.5	55.6	202°04.7	14.9′	17°22.6	11.5′	54.2′
8	298°24.5	55.0	216°38.6	14.8′	17°34.1	11.5′	54.2′
9	313°24.5	·· 54.3	231°12.4	14.7′	17°45.6	11.4′	54.2′
10	328°24.6	53.7	245°46.1	14.7′	17°57.0	11.3′	54.2′
11	343°24.6	53.0	260°19.8	14.6′	18°08.3	11.3′	54.2′
12	358°24.7	N17°52.4	274°53.4	14.6′	S18°19.6	11.2′	54.2′
13	13°24.7	51.8	289°27.0	14.5′	18°30.8	11.1′	54.2′
14	28°24.7	51.1	304°00.5	14.4′	18°41.9	11.0′	54.2′
15	43°24.8	·· 50.5	318°33.9	14.4′	18°52.9	11.0′	54.2′
16	58°24.8	49.9	333°07.3	14.3′	19°03.9	10.9′	54.2′
17	73°24.9	49.2	347°40.6	14.3′	19°14.8	10.8′	54.2′
18	88°24.9	N17°48.6	2°13.9	14.2′	S19°25.6	10.7′	54.2′
19	103°25.0	47.9	16°47.1	14.1′	19°36.3	10.7′	54.2′
20	118°25.0	47.3	31°20.2	14.1′	19°47.0	10.5′	54.2′
21	133°25.0	·· 46.7	45°53.3	14.0′	19°57.5	10.5′	54.2′
22	148°25.1	46.0	60°26.2	13.9′	20°08.0	10.4′	54.2′
23	163°25.1	45.4	74°59.2	13.9′	20°18.4	10.4′	54.2′
	SD = 15.8′	d = -0.6′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°	–:–	–:–	01:19	22:45	–:–	–:–
68°	–:–	–:–	02:11	21:57	–:–	–:–
66°	–:–	–:–	02:43	21:27	–:–	–:–
64°	–:–	01:35	03:06	21:05	22:33	–:–
62°	–:–	02:12	03:24	20:47	21:57	–:–
60°	–:–	02:38	03:39	20:32	21:33	–:–
N 58°	01:26	02:57	03:52	20:20	21:13	22:42
56°	02:00	03:14	04:02	20:09	20:57	22:10
54°	02:24	03:27	04:12	20:00	20:44	21:47
52°	02:43	03:39	04:21	19:51	20:33	21:28
50°	02:58	03:49	04:28	19:44	20:22	21:13
45°	03:28	04:11	04:44	19:28	20:01	20:44
N 40°	03:50	04:27	04:58	19:15	19:45	20:22
35°	04:07	04:41	05:09	19:04	19:31	20:05
30°	04:21	04:53	05:19	18:54	19:20	19:51
20°	04:44	05:12	05:35	18:37	19:01	19:29
N 10°	05:01	05:27	05:50	18:23	18:45	19:11
0°	05:16	05:41	06:03	18:10	18:32	18:57
S 10°	05:29	05:54	06:16	17:57	18:19	18:44
20°	05:40	06:07	06:30	17:43	18:06	18:33
30°	05:52	06:21	06:46	17:27	17:52	18:21
35°	05:58	06:28	06:55	17:18	17:45	18:15
40°	06:04	06:37	07:06	17:08	17:36	18:09
45°	06:11	06:46	07:18	16:55	17:27	18:03
S 50°	06:18	06:57	07:33	16:41	17:16	17:55
52°	06:21	07:02	07:40	16:34	17:11	17:52
54°	06:25	07:08	07:47	16:26	17:06	17:49
56°	06:28	07:14	07:56	16:18	17:00	17:45
58°	06:32	07:21	08:05	16:08	16:53	17:41
S 60°	06:37	07:28	08:17	15:57	16:46	17:37

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	12:06	14:26		20:19	19:26	
N 70°	11:53	13:56	16:45	20:35	19:58	18:38
68°	11:43	13:33	15:43	20:47	20:22	19:42
66°	11:34	13:16	15:09	20:58	20:41	20:17
64°	11:27	13:02	14:44	21:06	20:56	20:43
62°	11:21	12:51	14:25	21:14	21:09	21:03
60°	11:15	12:41	14:09	21:21	21:20	21:20
N 58°	11:11	12:32	13:56	21:26	21:29	21:34
56°	11:07	12:25	13:44	21:32	21:38	21:46
54°	11:03	12:18	13:34	21:36	21:45	21:56
52°	11:00	12:12	13:26	21:41	21:52	22:06
50°	10:56	12:07	13:18	21:44	21:58	22:14
45°	10:50	11:55	13:01	21:53	22:11	22:32
N 40°	10:45	11:46	12:47	22:00	22:22	22:47
35°	10:40	11:38	12:36	22:06	22:31	22:59
30°	10:36	11:30	12:26	22:11	22:39	23:10
20°	10:29	11:18	12:09	22:21	22:54	23:29
N 10°	10:23	11:08	11:54	22:29	23:06	23:46
0°	10:17	10:58	11:40	22:37	23:18	·· ··
S 10°	10:11	10:48	11:27	22:44	23:30	·· ··
20°	10:05	10:38	11:12	22:53	23:43	·· ··
30°	09:59	10:26	10:55	23:02	23:57	·· ··
35°	09:55	10:19	10:46	23:08	·· ··	00:06
40°	09:50	10:12	10:35	23:14	·· ··	00:15
45°	09:45	10:03	10:22	23:21	·· ··	00:27
S 50°	09:40	09:52	10:07	23:30	·· ··	00:41
52°	09:37	09:47	10:00	23:34	·· ··	00:47
54°	09:34	09:42	09:52	23:39	·· ··	00:55
56°	09:31	09:36	09:43	23:44	·· ··	01:03
58°	09:27	09:29	09:33	23:50	·· ··	01:12
S 60°	09:23	09:22	09:21	23:56	·· ··	01:23

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 6-8 27-45%
30	06:29	06:28	12:06	16:27	04:07	
31	06:27	06:25	12:06	17:08	04:47	
01	06:23	06:21	12:06	17:51	05:29	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2355 sec ΔT = TT-UT1 = +68.9485 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	310°50.6	218°33.2	N21°57.4	133°26.0	N01°46.7	207°53.2	N22°49.4	308°25.4	S01°32.6
1	325°53.1	233°32.5	57.4	148°27.0	46.1	222°55.1	49.4	323°27.9	32.6
2	340°55.5	248°31.9	57.5	163°28.1	45.5	237°57.0	49.3	338°30.5	32.7
3	355°58.0	263°31.2	·· 57.6	178°29.1	·· 44.8	252°58.9	·· 49.3	353°33.0	·· 32.7
4	11°00.5	278°30.6	57.7	193°30.2	44.2	268°00.8	49.2	8°35.5	32.8
5	26°02.9	293°29.9	57.8	208°31.3	43.5	283°02.7	49.2	23°38.1	32.8
6	41°05.4	308°29.2	N21°57.8	223°32.3	N01°42.9	298°04.6	N22°49.2	38°40.6	S01°32.8
7	56°07.9	323°28.6	57.9	238°33.4	42.3	313°06.4	49.1	53°43.1	32.9
8	71°10.3	338°27.9	58.0	253°34.4	41.6	328°08.3	49.1	68°45.7	32.9
9	86°12.8	353°27.2	·· 58.1	268°35.5	·· 41.0	343°10.2	·· 49.0	83°48.2	·· 33.0
10	101°15.2	8°26.6	58.1	283°36.6	40.3	358°12.1	49.0	98°50.7	33.0
11	116°17.7	23°25.9	58.2	298°37.6	39.7	13°14.0	48.9	113°53.3	33.1
12	131°20.2	38°25.2	N21°58.3	313°38.7	N01°39.0	28°15.9	N22°48.9	128°55.8	S01°33.1
13	146°22.6	53°24.6	58.3	328°39.7	38.4	43°17.8	48.8	143°58.3	33.1
14	161°25.1	68°23.9	58.4	343°40.8	37.8	58°19.7	48.8	159°00.9	33.2
15	176°27.6	83°23.3	·· 58.5	358°41.8	·· 37.1	73°21.6	·· 48.8	174°03.4	·· 33.2
16	191°30.0	98°22.6	58.5	13°42.9	36.5	88°23.4	48.7	189°06.0	33.3
17	206°32.5	113°21.9	58.6	28°44.0	35.8	103°25.3	48.7	204°08.5	33.3
18	221°35.0	128°21.3	N21°58.7	43°45.0	N01°35.2	118°27.2	N22°48.6	219°11.0	S01°33.4
19	236°37.4	143°20.6	58.7	58°46.1	34.6	133°29.1	48.6	234°13.6	33.4
20	251°39.9	158°19.9	58.8	73°47.1	33.9	148°31.0	48.5	249°16.1	33.4
21	266°42.4	173°19.3	·· 58.8	88°48.2	·· 33.3	163°32.9	·· 48.5	264°18.6	·· 33.5
22	281°44.8	188°18.6	58.9	103°49.3	32.6	178°34.8	48.5	279°21.2	33.5
23	296°47.3	203°17.9	59.0	118°50.3	32.0	193°36.7	48.4	294°23.7	33.6
Mer.pass.	03:16	ν -0.7′	d 0.1′	m -4.00	ν 1.1′	d -0.6′	m 1.60	ν 1.9′	d -0.0′ m -1.92	ν 2.5′	d -0.0′ m 0.79

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	311°49.7	218°17.3	N21°59.0	133°51.4	N01°31.3	208°38.6	N22°48.4	309°26.3	S01°33.6
1	326°52.2	233°16.6	59.1	148°52.4	30.7	223°40.5	48.3	324°28.8	33.7
2	341°54.7	248°15.9	59.1	163°53.5	30.1	238°42.3	48.3	339°31.3	33.7
3	356°57.1	263°15.3	·· 59.2	178°54.5	·· 29.4	253°44.2	·· 48.2	354°33.9	·· 33.7
4	11°59.6	278°14.6	59.2	193°55.6	28.8	268°46.1	48.2	9°36.4	33.8
5	27°02.1	293°13.9	59.3	208°56.7	28.1	283°48.0	48.1	24°39.0	33.8
6	42°04.5	308°13.3	N21°59.3	223°57.7	N01°27.5	298°49.9	N22°48.1	39°41.5	S01°33.9
7	57°07.0	323°12.6	59.4	238°58.8	26.8	313°51.8	48.1	54°44.0	33.9
8	72°09.5	338°11.9	59.4	253°59.8	26.2	328°53.7	48.0	69°46.6	34.0
9	87°11.9	353°11.3	·· 59.5	269°00.9	·· 25.6	343°55.6	·· 48.0	84°49.1	·· 34.0
10	102°14.4	8°10.6	59.5	284°01.9	24.9	358°57.5	47.9	99°51.6	34.0
11	117°16.8	23°09.9	59.6	299°03.0	24.3	13°59.4	47.9	114°54.2	34.1
12	132°19.3	38°09.3	N21°59.6	314°04.1	N01°23.6	29°01.3	N22°47.8	129°56.7	S01°34.1
13	147°21.8	53°08.6	59.7	329°05.1	23.0	44°03.1	47.8	144°59.3	34.2
14	162°24.2	68°07.9	59.7	344°06.2	22.4	59°05.0	47.7	160°01.8	34.2
15	177°26.7	83°07.2	·· 59.8	359°07.2	·· 21.7	74°06.9	·· 47.7	175°04.3	·· 34.3
16	192°29.2	98°06.6	59.8	14°08.3	21.1	89°08.8	47.6	190°06.9	34.3
17	207°31.6	113°05.9	59.8	29°09.3	20.4	104°10.7	47.6	205°09.4	34.4
18	222°34.1	128°05.2	N21°59.9	44°10.4	N01°19.8	119°12.6	N22°47.6	220°12.0	S01°34.4
19	237°36.6	143°04.6	21°59.9	59°11.5	19.1	134°14.5	47.5	235°14.5	34.4
20	252°39.0	158°03.9	22°00.0	74°12.5	18.5	149°16.4	47.5	250°17.1	34.5
21	267°41.5	173°03.2	·· 00.0	89°13.6	·· 17.8	164°18.3	·· 47.4	265°19.6	·· 34.5
22	282°44.0	188°02.5	00.0	104°14.6	17.2	179°20.2	47.4	280°22.1	34.6
23	297°46.4	203°01.9	00.1	119°15.7	16.6	194°22.1	47.3	295°24.7	34.6
Mer.pass.	03:12	ν -0.7′	d 0.1′	m -4.00	ν 1.1′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.92	ν 2.5′	d -0.0′ m 0.79

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	312°48.9	218°01.2	N22°00.1	134°16.7	N01°15.9	209°24.0	N22°47.3	310°27.2	S01°34.7
1	327°51.3	233°00.5	00.1	149°17.8	15.3	224°25.8	47.2	325°29.8	34.7
2	342°53.8	247°59.9	00.2	164°18.8	14.6	239°27.7	47.2	340°32.3	34.8
3	357°56.3	262°59.2	·· 00.2	179°19.9	·· 14.0	254°29.6	·· 47.2	355°34.8	·· 34.8
4	12°58.7	277°58.5	00.2	194°21.0	13.3	269°31.5	47.1	10°37.4	34.8
5	28°01.2	292°57.8	00.2	209°22.0	12.7	284°33.4	47.1	25°39.9	34.9
6	43°03.7	307°57.2	N22°00.3	224°23.1	N01°12.1	299°35.3	N22°47.0	40°42.5	S01°34.9
7	58°06.1	322°56.5	00.3	239°24.1	11.4	314°37.2	47.0	55°45.0	35.0
8	73°08.6	337°55.8	00.3	254°25.2	10.8	329°39.1	46.9	70°47.6	35.0
9	88°11.1	352°55.2	·· 00.3	269°26.2	·· 10.1	344°41.0	·· 46.9	85°50.1	·· 35.1
10	103°13.5	7°54.5	00.4	284°27.3	09.5	359°42.9	46.8	100°52.6	35.1
11	118°16.0	22°53.8	00.4	299°28.3	08.8	14°44.8	46.8	115°55.2	35.2
12	133°18.5	37°53.1	N22°00.4	314°29.4	N01°08.2	29°46.7	N22°46.7	130°57.7	S01°35.2
13	148°20.9	52°52.5	00.4	329°30.4	07.6	44°48.6	46.7	146°00.3	35.3
14	163°23.4	67°51.8	00.4	344°31.5	06.9	59°50.5	46.7	161°02.8	35.3
15	178°25.8	82°51.1	·· 00.5	359°32.6	·· 06.3	74°52.4	·· 46.6	176°05.4	·· 35.3
16	193°28.3	97°50.4	00.5	14°33.6	05.6	89°54.2	46.6	191°07.9	35.4
17	208°30.8	112°49.8	00.5	29°34.7	05.0	104°56.1	46.5	206°10.4	35.4
18	223°33.2	127°49.1	N22°00.5	44°35.7	N01°04.3	119°58.0	N22°46.5	221°13.0	S01°35.5
19	238°35.7	142°48.4	00.5	59°36.8	03.7	134°59.9	46.4	236°15.5	35.5
20	253°38.2	157°47.7	00.5	74°37.8	03.0	150°01.8	46.4	251°18.1	35.6
21	268°40.6	172°47.1	·· 00.6	89°38.9	·· 02.4	165°03.7	·· 46.3	266°20.6	·· 35.6
22	283°43.1	187°46.4	00.6	104°39.9	01.8	180°05.6	46.3	281°23.2	35.7
23	298°45.6	202°45.7	00.6	119°41.0	01.1	195°07.5	46.2	296°25.7	35.7
Mer.pass.	03:08	ν -0.7′	d 0.0′	m -3.99	ν 1.1′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.92	ν 2.5′	d -0.0′ m 0.78

Stars

	SHA	Dec
Alpheratz	357°34.1	29°13.9
Ankaa	353°06.4	-42°09.7
Schedar	349°30.2	56°40.5
Diphda	348°46.6	-17°50.6
Achernar	335°19.7	-57°06.1
Hamal	327°50.6	23°35.0
Polaris	313°51.4	89°22.0
Acamar	315°11.4	-40°11.8
Menkar	314°05.7	4°11.5
Mirfak	308°27.7	49°56.9
Aldebaran	290°39.2	16°33.7
Rigel	281°03.6	-8°10.2
Capella	280°21.5	46°01.3
Bellatrix	278°22.6	6°22.5
Elnath	278°01.5	28°37.7
Alnilam	275°37.5	-1°11.0
Betelgeuse	270°51.8	7°24.8
Canopus	263°52.6	-52°42.3
Sirius	258°26.1	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.7	5°09.7
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.2	-69°49.3
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	173°00.0	-63°14.7
Gacrux	171°51.5	-57°15.6
Alioth	166°12.8	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.7	49°11.4
Hadar	148°35.4	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.7	-60°56.7
Kochab	137°19.7	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.5	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.4	-56°39.1
Deneb	49°25.0	45°22.3
Enif	33°38.0	9°59.6
Al Na'ir	27°31.9	-46°50.0
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.5	28°13.3
Markab	13°29.2	15°20.6

Aug 02 Sat	SHA	Mer.pass
Venus	267°42.6	09:26
Mars	182°35.4	15:05
Jupiter	257°02.6	10:07
Saturn	357°34.8	03:26

Aug 03 Sun	SHA	Mer.pass
Venus	266°27.5	09:27
Mars	182°01.6	15:04
Jupiter	256°48.8	10:04
Saturn	357°36.5	03:22

Aug 04 Mon	SHA	Mer.pass
Venus	265°12.3	09:28
Mars	181°27.9	15:02
Jupiter	256°35.1	10:01
Saturn	357°38.3	03:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.2	N17°44.7	89°32.0	13.8′	S20°28.8	10.2′	54.2′
1	193°25.2	44.1	104°04.8	13.7′	20°39.0	10.2′	54.2′
2	208°25.3	43.5	118°37.6	13.7′	20°49.2	10.0′	54.2′
3	223°25.3	·· 42.8	133°10.2	13.6′	20°59.2	10.0′	54.2′
4	238°25.4	42.2	147°42.8	13.5′	21°09.2	9.9′	54.2′
5	253°25.4	41.5	162°15.3	13.4′	21°19.1	9.8′	54.2′
6	268°25.4	N17°40.9	176°47.8	13.4′	S21°28.9	9.8′	54.2′
7	283°25.5	40.2	191°20.1	13.3′	21°38.7	9.6′	54.2′
8	298°25.5	39.6	205°52.4	13.2′	21°48.3	9.6′	54.2′
9	313°25.6	·· 38.9	220°24.7	13.2′	21°57.9	9.4′	54.2′
10	328°25.6	38.3	234°56.8	13.1′	22°07.3	9.4′	54.2′
11	343°25.7	37.7	249°28.9	13.0′	22°16.7	9.3′	54.2′
12	358°25.7	N17°37.0	264°00.9	12.9′	S22°26.0	9.1′	54.2′
13	13°25.8	36.4	278°32.9	12.9′	22°35.1	9.1′	54.2′
14	28°25.8	35.7	293°04.7	12.8′	22°44.2	9.0′	54.2′
15	43°25.9	·· 35.1	307°36.5	12.7′	22°53.2	8.9′	54.2′
16	58°25.9	34.4	322°08.2	12.6′	23°02.1	8.8′	54.2′
17	73°26.0	33.8	336°39.9	12.6′	23°10.9	8.7′	54.2′
18	88°26.0	N17°33.1	351°11.4	12.5′	S23°19.6	8.6′	54.2′
19	103°26.1	32.5	5°42.9	12.4′	23°28.2	8.5′	54.3′
20	118°26.1	31.8	20°14.3	12.3′	23°36.7	8.4′	54.3′
21	133°26.2	·· 31.2	34°45.7	12.3′	23°45.1	8.3′	54.3′
22	148°26.2	30.5	49°16.9	12.2′	23°53.4	8.2′	54.3′
23	163°26.3	29.8	63°48.1	12.1′	24°01.6	8.1′	54.3′
	SD = 15.8′	d = -0.6′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.3	N17°29.2	78°19.2	12.0′	S24°09.7	7.9′	54.3′
1	193°26.4	28.5	92°50.3	12.0′	24°17.6	7.9′	54.3′
2	208°26.4	27.9	107°21.2	11.9′	24°25.5	7.8′	54.3′
3	223°26.5	·· 27.2	121°52.1	11.8′	24°33.3	7.7′	54.3′
4	238°26.5	26.6	136°22.9	11.7′	24°41.0	7.5′	54.3′
5	253°26.6	25.9	150°53.6	11.6′	24°48.5	7.5′	54.3′
6	268°26.6	N17°25.3	165°24.3	11.6′	S24°56.0	7.3′	54.3′
7	283°26.7	24.6	179°54.8	11.5′	25°03.3	7.2′	54.4′
8	298°26.7	23.9	194°25.3	11.4′	25°10.5	7.2′	54.4′
9	313°26.8	·· 23.3	208°55.8	11.3′	25°17.7	7.0′	54.4′
10	328°26.8	22.6	223°26.1	11.3′	25°24.7	6.9′	54.4′
11	343°26.9	22.0	237°56.4	11.2′	25°31.6	6.7′	54.4′
12	358°27.0	N17°21.3	252°26.5	11.1′	S25°38.3	6.7′	54.4′
13	13°27.0	20.7	266°56.7	11.0′	25°45.0	6.5′	54.4′
14	28°27.1	20.0	281°26.7	11.0′	25°51.5	6.5′	54.4′
15	43°27.1	·· 19.3	295°56.7	10.9′	25°58.0	6.3′	54.4′
16	58°27.2	18.7	310°26.5	10.8′	26°04.3	6.2′	54.5′
17	73°27.2	18.0	324°56.4	10.7′	26°10.5	6.0′	54.5′
18	88°27.3	N17°17.3	339°26.1	10.7′	S26°16.5	6.0′	54.5′
19	103°27.3	16.7	353°55.8	10.6′	26°22.5	5.8′	54.5′
20	118°27.4	16.0	8°25.3	10.5′	26°28.3	5.7′	54.5′
21	133°27.5	·· 15.4	22°54.9	10.4′	26°34.0	5.6′	54.5′
22	148°27.5	14.7	37°24.3	10.4′	26°39.6	5.5′	54.5′
23	163°27.6	14.0	51°53.7	10.3′	26°45.1	5.3′	54.6′
	SD = 15.8′	d = -0.7′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.6	N17°13.4	66°23.0	10.2′	S26°50.4	5.2′	54.6′
1	193°27.7	12.7	80°52.2	10.2′	26°55.6	5.1′	54.6′
2	208°27.7	12.0	95°21.3	10.1′	27°00.7	4.9′	54.6′
3	223°27.8	·· 11.4	109°50.4	10.0′	27°05.6	4.8′	54.6′
4	238°27.9	10.7	124°19.4	9.9′	27°10.4	4.7′	54.6′
5	253°27.9	10.0	138°48.4	9.9′	27°15.1	4.6′	54.6′
6	268°28.0	N17°09.4	153°17.3	9.8′	S27°19.7	4.4′	54.7′
7	283°28.0	08.7	167°46.1	9.7′	27°24.1	4.3′	54.7′
8	298°28.1	08.0	182°14.8	9.7′	27°28.4	4.2′	54.7′
9	313°28.2	·· 07.4	196°43.5	9.6′	27°32.6	4.0′	54.7′
10	328°28.2	06.7	211°12.1	9.5′	27°36.6	3.9′	54.7′
11	343°28.3	06.0	225°40.7	9.5′	27°40.5	3.8′	54.7′
12	358°28.3	N17°05.3	240°09.1	9.4′	S27°44.3	3.6′	54.8′
13	13°28.4	04.7	254°37.6	9.4′	27°47.9	3.5′	54.8′
14	28°28.5	04.0	269°05.9	9.3′	27°51.4	3.4′	54.8′
15	43°28.5	·· 03.3	283°34.2	9.2′	27°54.8	3.2′	54.8′
16	58°28.6	02.7	298°02.5	9.2′	27°58.0	3.0′	54.8′
17	73°28.6	02.0	312°30.6	9.1′	28°01.0	3.0′	54.8′
18	88°28.7	N17°01.3	326°58.8	9.1′	S28°04.0	2.8′	54.9′
19	103°28.8	00.6	341°26.8	9.0′	28°06.8	2.6′	54.9′
20	118°28.8	17°00.0	355°54.8	9.0′	28°09.4	2.5′	54.9′
21	133°28.9	16°59.3	10°22.8	8.9′	28°11.9	2.4′	54.9′
22	148°29.0	58.6	24°50.7	8.8′	28°14.3	2.2′	54.9′
23	163°29.0	57.9	39°18.6	8.8′	28°16.5	2.1′	55.0′
	SD = 15.8′	d = -0.7′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°	–:–	–:–	01:45	22:21	–:–	–:–
68°	–:–	–:–	02:26	21:42	–:–	–:–
66°	–:–	00:56	02:54	21:15	23:06	–:–
64°	–:–	01:52	03:15	20:55	22:16	–:–
62°	–:–	02:24	03:32	20:38	21:45	–:–
60°	00:51	02:47	03:46	20:25	21:23	23:12
N 58°	01:42	03:05	03:58	20:13	21:05	22:27
56°	02:11	03:20	04:08	20:03	20:50	21:59
54°	02:32	03:33	04:17	19:54	20:38	21:38
52°	02:50	03:44	04:25	19:46	20:27	21:21
50°	03:04	03:54	04:32	19:39	20:17	21:07
45°	03:32	04:14	04:48	19:24	19:57	20:39
N 40°	03:53	04:30	05:00	19:11	19:41	20:18
35°	04:10	04:43	05:11	19:01	19:28	20:02
30°	04:24	04:55	05:20	18:52	19:17	19:48
20°	04:45	05:13	05:36	18:36	18:59	19:27
N 10°	05:02	05:28	05:50	18:22	18:44	19:10
0°	05:16	05:41	06:03	18:10	18:31	18:56
S 10°	05:28	05:53	06:15	17:57	18:19	18:44
20°	05:39	06:06	06:29	17:44	18:07	18:33
30°	05:50	06:19	06:44	17:29	17:54	18:23
35°	05:56	06:26	06:53	17:20	17:47	18:17
40°	06:01	06:34	07:03	17:10	17:39	18:11
45°	06:08	06:43	07:14	16:59	17:30	18:05
S 50°	06:14	06:53	07:28	16:45	17:20	17:59
52°	06:17	06:58	07:35	16:38	17:15	17:56
54°	06:20	07:03	07:42	16:31	17:10	17:53
56°	06:24	07:09	07:50	16:23	17:04	17:50
58°	06:27	07:15	07:59	16:14	16:58	17:46
S 60°	06:31	07:22	08:09	16:04	16:51	17:42

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°						
N 70°						
68°						
66°	17:39			19:22		
64°	16:39			20:22		
62°	16:06	17:57		20:56	20:45	
60°	15:41	17:16	18:47	21:21	21:27	21:44
N 58°	15:22	16:48	18:08	21:41	21:55	22:22
56°	15:06	16:27	17:41	21:58	22:17	22:50
54°	14:52	16:09	17:20	22:12	22:35	23:11
52°	14:40	15:54	17:03	22:24	22:51	23:29
50°	14:30	15:41	16:48	22:35	23:04	23:44
45°	14:08	15:14	16:18	22:58	23:31	·· ··
N 40°	13:50	14:53	15:54	23:17	23:53	·· ··
35°	13:35	14:36	15:35	23:32	·· ··	00:11
30°	13:23	14:21	15:18	23:46	·· ··	00:27
20°	13:01	13:55	14:50	·· ··	00:09	00:53
N 10°	12:42	13:33	14:26	·· ··	00:29	01:16
0°	12:25	13:13	14:04	00:02	00:48	01:37
S 10°	12:08	12:53	13:42	00:17	01:07	01:59
20°	11:50	12:31	13:18	00:34	01:27	02:22
30°	11:28	12:07	12:51	00:53	01:51	02:48
35°	11:16	11:52	12:35	01:05	02:04	03:04
40°	11:02	11:35	12:16	01:18	02:20	03:23
45°	10:46	11:15	11:53	01:33	02:40	03:45
S 50°	10:25	10:50	11:24	01:52	03:04	04:13
52°	10:16	10:38	11:10	02:01	03:16	04:27
54°	10:05	10:24	10:53	02:12	03:29	04:44
56°	09:53	10:08	10:34	02:23	03:44	05:03
58°	09:39	09:49	10:10	02:37	04:03	05:27
S 60°	09:22	09:26	09:37	02:52	04:26	05:59

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 9-11 54-73%
02	06:19	06:17	12:06	18:36	06:13	
03	06:15	06:12	12:06	19:25	07:00	
04	06:09	06:07	12:06	20:17	07:51	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2362 sec ΔT = TT-UT1 = +68.9478 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	313°48.0	217°45.0	N22°00.6	134°42.0	N01°00.5	210°09.4	N22°46.2	311°28.3	S01°35.8
1	328°50.5	232°44.4	00.6	149°43.1	00°59.8	225°11.3	46.2	326°30.8	35.8
2	343°53.0	247°43.7	00.6	164°44.1	59.2	240°13.2	46.1	341°33.4	35.8
3	358°55.4	262°43.0	·· 00.6	179°45.2	·· 58.5	255°15.1	·· 46.1	356°35.9	·· 35.9
4	13°57.9	277°42.3	00.6	194°46.3	57.9	270°17.0	46.0	11°38.4	35.9
5	29°00.3	292°41.6	00.6	209°47.3	57.2	285°18.9	46.0	26°41.0	36.0
6	44°02.8	307°41.0	N22°00.6	224°48.4	N00°56.6	300°20.8	N22°45.9	41°43.5	S01°36.0
7	59°05.3	322°40.3	00.6	239°49.4	56.0	315°22.7	45.9	56°46.1	36.1
8	74°07.7	337°39.6	00.6	254°50.5	55.3	330°24.6	45.8	71°48.6	36.1
9	89°10.2	352°38.9	·· 00.6	269°51.5	·· 54.7	345°26.5	·· 45.8	86°51.2	·· 36.2
10	104°12.7	7°38.3	00.6	284°52.6	54.0	0°28.4	45.7	101°53.7	36.2
11	119°15.1	22°37.6	00.6	299°53.6	53.4	15°30.3	45.7	116°56.3	36.3
12	134°17.6	37°36.9	N22°00.6	314°54.7	N00°52.7	30°32.2	N22°45.7	131°58.8	S01°36.3
13	149°20.1	52°36.2	00.6	329°55.7	52.1	45°34.0	45.6	147°01.4	36.4
14	164°22.5	67°35.5	00.6	344°56.8	51.4	60°35.9	45.6	162°03.9	36.4
15	179°25.0	82°34.9	·· 00.6	359°57.8	·· 50.8	75°37.8	·· 45.5	177°06.5	·· 36.5
16	194°27.5	97°34.2	00.6	14°58.9	50.1	90°39.7	45.5	192°09.0	36.5
17	209°29.9	112°33.5	00.6	29°59.9	49.5	105°41.6	45.4	207°11.5	36.5
18	224°32.4	127°32.8	N22°00.6	45°01.0	N00°48.9	120°43.5	N22°45.4	222°14.1	S01°36.6
19	239°34.8	142°32.1	00.6	60°02.0	48.2	135°45.4	45.3	237°16.6	36.6
20	254°37.3	157°31.5	00.5	75°03.1	47.6	150°47.3	45.3	252°19.2	36.7
21	269°39.8	172°30.8	·· 00.5	90°04.1	·· 46.9	165°49.2	·· 45.2	267°21.7	·· 36.7
22	284°42.2	187°30.1	00.5	105°05.2	46.3	180°51.1	45.2	282°24.3	36.8
23	299°44.7	202°29.4	00.5	120°06.2	45.6	195°53.0	45.1	297°26.8	36.8
Mer.pass.	03:04	ν -0.7′	d 0.0′	m -3.99	ν 1.1′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.92	ν 2.5′	d -0.0′ m 0.78

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	314°47.2	217°28.7	N22°00.5	135°07.3	N00°45.0	210°54.9	N22°45.1	312°29.4	S01°36.9
1	329°49.6	232°28.1	00.5	150°08.3	44.3	225°56.8	45.1	327°31.9	36.9
2	344°52.1	247°27.4	00.5	165°09.4	43.7	240°58.7	45.0	342°34.5	37.0
3	359°54.6	262°26.7	·· 00.4	180°10.4	·· 43.0	256°00.6	·· 45.0	357°37.0	·· 37.0
4	14°57.0	277°26.0	00.4	195°11.5	42.4	271°02.5	44.9	12°39.6	37.1
5	29°59.5	292°25.3	00.4	210°12.5	41.8	286°04.4	44.9	27°42.1	37.1
6	45°01.9	307°24.7	N22°00.4	225°13.6	N00°41.1	301°06.3	N22°44.8	42°44.7	S01°37.2
7	60°04.4	322°24.0	00.3	240°14.6	40.5	316°08.2	44.8	57°47.2	37.2
8	75°06.9	337°23.3	00.3	255°15.7	39.8	331°10.1	44.7	72°49.8	37.3
9	90°09.3	352°22.6	·· 00.3	270°16.7	·· 39.2	346°12.0	·· 44.7	87°52.3	·· 37.3
10	105°11.8	7°21.9	00.3	285°17.8	38.5	1°13.9	44.6	102°54.9	37.4
11	120°14.3	22°21.3	00.2	300°18.8	37.9	16°15.8	44.6	117°57.4	37.4
12	135°16.7	37°20.6	N22°00.2	315°19.9	N00°37.2	31°17.7	N22°44.5	133°00.0	S01°37.4
13	150°19.2	52°19.9	00.2	330°20.9	36.6	46°19.6	44.5	148°02.5	37.5
14	165°21.7	67°19.2	00.2	345°22.0	35.9	61°21.5	44.5	163°05.1	37.5
15	180°24.1	82°18.5	·· 00.1	0°23.0	·· 35.3	76°23.4	·· 44.4	178°07.6	·· 37.6
16	195°26.6	97°17.8	00.1	15°24.1	34.6	91°25.3	44.4	193°10.2	37.6
17	210°29.1	112°17.2	00.1	30°25.1	34.0	106°27.2	44.3	208°12.7	37.7
18	225°31.5	127°16.5	N22°00.0	45°26.2	N00°33.4	121°29.1	N22°44.3	223°15.3	S01°37.7
19	240°34.0	142°15.8	00.0	60°27.2	32.7	136°31.0	44.2	238°17.8	37.8
20	255°36.4	157°15.1	22°00.0	75°28.3	32.1	151°32.9	44.2	253°20.4	37.8
21	270°38.9	172°14.4	21°59.9	90°29.3	·· 31.4	166°34.8	·· 44.1	268°22.9	·· 37.9
22	285°41.4	187°13.7	59.9	105°30.4	30.8	181°36.7	44.1	283°25.5	37.9
23	300°43.8	202°13.1	59.8	120°31.4	30.1	196°38.6	44.0	298°28.0	38.0
Mer.pass.	03:00	ν -0.7′	d -0.0′	m -3.99	ν 1.1′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.93	ν 2.5′	d -0.0′ m 0.77

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	315°46.3	217°12.4	N21°59.8	135°32.5	N00°29.5	211°40.5	N22°44.0	313°30.6	S01°38.0
1	330°48.8	232°11.7	59.8	150°33.5	28.8	226°42.4	43.9	328°33.1	38.1
2	345°51.2	247°11.0	59.7	165°34.6	28.2	241°44.3	43.9	343°35.7	38.1
3	0°53.7	262°10.3	·· 59.7	180°35.6	·· 27.5	256°46.2	·· 43.8	358°38.3	·· 38.2
4	15°56.2	277°09.6	59.6	195°36.7	26.9	271°48.1	43.8	13°40.8	38.2
5	30°58.6	292°08.9	59.6	210°37.7	26.2	286°50.0	43.8	28°43.4	38.3
6	46°01.1	307°08.3	N21°59.5	225°38.8	N00°25.6	301°51.9	N22°43.7	43°45.9	S01°38.3
7	61°03.6	322°07.6	59.5	240°39.8	25.0	316°53.8	43.7	58°48.5	38.4
8	76°06.0	337°06.9	59.4	255°40.9	24.3	331°55.7	43.6	73°51.0	38.4
9	91°08.5	352°06.2	·· 59.4	270°41.9	·· 23.7	346°57.6	·· 43.6	88°53.6	·· 38.5
10	106°10.9	7°05.5	59.3	285°43.0	23.0	1°59.5	43.5	103°56.1	38.5
11	121°13.4	22°04.8	59.3	300°44.0	22.4	17°01.4	43.5	118°58.7	38.6
12	136°15.9	37°04.1	N21°59.2	315°45.1	N00°21.7	32°03.3	N22°43.4	134°01.2	S01°38.6
13	151°18.3	52°03.5	59.2	330°46.1	21.1	47°05.2	43.4	149°03.8	38.7
14	166°20.8	67°02.8	59.1	345°47.2	20.4	62°07.1	43.3	164°06.3	38.7
15	181°23.3	82°02.1	·· 59.1	0°48.2	·· 19.8	77°09.0	·· 43.3	179°08.9	·· 38.8
16	196°25.7	97°01.4	59.0	15°49.3	19.1	92°10.9	43.2	194°11.4	38.8
17	211°28.2	112°00.7	59.0	30°50.3	18.5	107°12.8	43.2	209°14.0	38.9
18	226°30.7	127°00.0	N21°58.9	45°51.3	N00°17.8	122°14.7	N22°43.1	224°16.6	S01°38.9
19	241°33.1	141°59.3	58.8	60°52.4	17.2	137°16.6	43.1	239°19.1	39.0
20	256°35.6	156°58.7	58.8	75°53.4	16.5	152°18.5	43.0	254°21.7	39.0
21	271°38.1	171°58.0	·· 58.7	90°54.5	·· 15.9	167°20.4	·· 43.0	269°24.2	·· 39.1
22	286°40.5	186°57.3	58.7	105°55.5	15.2	182°22.3	43.0	284°26.8	39.1
23	301°43.0	201°56.6	58.6	120°56.6	14.6	197°24.2	42.9	299°29.3	39.2
Mer.pass.	02:56	ν -0.7′	d -0.0′	m -3.99	ν 1.0′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.93	ν 2.6′	d -0.0′ m 0.77

Stars	SHA	Dec
Alpheratz	357°34.0	29°13.9
Ankaa	353°06.4	-42°09.7
Schedar	349°30.2	56°40.5
Diphda	348°46.6	-17°50.6
Achernar	335°19.6	-57°06.1
Hamal	327°50.6	23°35.0
Polaris	313°49.6	89°22.0
Acamar	315°11.4	-40°11.8
Menkar	314°05.7	4°11.5
Mirfak	308°27.6	49°57.0
Aldebaran	290°39.2	16°33.7
Rigel	281°03.6	-8°10.2
Capella	280°21.5	46°01.3
Bellatrix	278°22.6	6°22.5
Elnath	278°01.5	28°37.7
Alnilam	275°37.5	-1°11.0
Betelgeuse	270°51.8	7°24.8
Canopus	263°52.6	-52°42.3
Sirius	258°26.1	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.6	5°09.7
Pollux	243°17.1	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.2	-69°49.3
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°37.0
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	173°00.0	-63°14.7
Gacrux	171°51.5	-57°15.6
Alioth	166°12.8	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.7	49°11.4
Hadar	148°35.5	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.7	-60°56.7
Kochab	137°19.7	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.2	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.5	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.2
Peacock	53°04.3	-56°39.1
Deneb	49°25.0	45°22.3
Enif	33°38.0	9°59.6
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.7	-29°29.0
Scheat	13°44.4	28°13.3
Markab	13°29.1	15°20.6

Aug 05 Tue	SHA	Mer.pass
Venus	263°57.0	09:29
Mars	180°54.0	15:00
Jupiter	256°21.4	09:58
Saturn	357°40.2	03:14

Aug 06 Wed	SHA	Mer.pass
Venus	262°41.6	09:31
Mars	180°20.1	14:58
Jupiter	256°07.7	09:55
Saturn	357°42.2	03:10

Aug 07 Thu	SHA	Mer.pass
Venus	261°26.1	09:32
Mars	179°46.2	14:57
Jupiter	255°54.2	09:52
Saturn	357°44.3	03:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.1	N16°57.3	53°46.4	8.7′	S28°18.6	1.9′	55.0′
1	193°29.1	56.6	68°14.1	8.7′	28°20.5	1.8′	55.0′
2	208°29.2	55.9	82°41.8	8.7′	28°22.3	1.7′	55.0′
3	223°29.3	·· 55.2	97°09.5	8.6′	28°24.0	1.5′	55.0′
4	238°29.3	54.5	111°37.1	8.6′	28°25.5	1.3′	55.1′
5	253°29.4	53.9	126°04.6	8.5′	28°26.8	1.2′	55.1′
6	268°29.5	N16°53.2	140°32.1	8.5′	S28°28.0	1.1′	55.1′
7	283°29.5	52.5	154°59.6	8.4′	28°29.1	0.9′	55.1′
8	298°29.6	51.8	169°27.1	8.4′	28°30.0	0.7′	55.1′
9	313°29.7	·· 51.1	183°54.4	8.4′	28°30.7	0.6′	55.2′
10	328°29.7	50.5	198°21.8	8.3′	28°31.3	0.5′	55.2′
11	343°29.8	49.8	212°49.1	8.3′	28°31.8	0.3′	55.2′
12	358°29.9	N16°49.1	227°16.4	8.3′	S28°32.1	0.2′	55.2′
13	13°29.9	48.4	241°43.7	8.2′	28°32.3	0.0′	55.3′
14	28°30.0	47.7	256°10.9	8.2′	28°32.3	0.2′	55.3′
15	43°30.1	·· 47.0	270°38.1	8.2′	28°32.1	0.3′	55.3′
16	58°30.1	46.4	285°05.2	8.1′	28°31.8	0.4′	55.3′
17	73°30.2	45.7	299°32.4	8.1′	28°31.4	0.6′	55.4′
18	88°30.3	N16°45.0	313°59.5	8.1′	S28°30.8	0.8′	55.4′
19	103°30.3	44.3	328°26.6	8.1′	28°30.0	0.9′	55.4′
20	118°30.4	43.6	342°53.6	8.0′	28°29.1	1.1′	55.4′
21	133°30.5	·· 42.9	357°20.6	8.0′	28°28.0	1.2′	55.4′
22	148°30.6	42.2	11°47.7	8.0′	28°26.8	1.4′	55.5′
23	163°30.6	41.6	26°14.7	8.0′	28°25.4	1.5′	55.5′
	SD = 15.8′	d = -0.7′	SD = 15.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.7	N16°40.9	40°41.6	8.0′	S28°23.9	1.7′	55.5′
1	193°30.8	40.2	55°08.6	7.9′	28°22.2	1.9′	55.5′
2	208°30.8	39.5	69°35.5	7.9′	28°20.3	2.0′	55.6′
3	223°30.9	·· 38.8	84°02.5	7.9′	28°18.3	2.1′	55.6′
4	238°31.0	38.1	98°29.4	7.9′	28°16.2	2.3′	55.6′
5	253°31.0	37.4	112°56.3	7.9′	28°13.9	2.5′	55.6′
6	268°31.1	N16°36.7	127°23.2	7.9′	S28°11.4	2.6′	55.7′
7	283°31.2	36.0	141°50.1	7.9′	28°08.8	2.8′	55.7′
8	298°31.3	35.4	156°17.0	7.9′	28°06.0	2.9′	55.7′
9	313°31.3	·· 34.7	170°43.9	7.9′	28°03.1	3.1′	55.7′
10	328°31.4	34.0	185°10.8	7.9′	28°00.0	3.3′	55.8′
11	343°31.5	33.3	199°37.7	7.9′	27°56.7	3.4′	55.8′
12	358°31.6	N16°32.6	214°04.6	7.9′	S27°53.3	3.5′	55.8′
13	13°31.6	31.9	228°31.5	7.9′	27°49.8	3.7′	55.8′
14	28°31.7	31.2	242°58.4	7.9′	27°46.1	3.9′	55.9′
15	43°31.8	·· 30.5	257°25.3	7.9′	27°42.2	4.0′	55.9′
16	58°31.9	29.8	271°52.2	7.9′	27°38.2	4.2′	55.9′
17	73°31.9	29.1	286°19.1	7.9′	27°34.0	4.3′	55.9′
18	88°32.0	N16°28.4	300°46.1	7.9′	S27°29.7	4.5′	56.0′
19	103°32.1	27.7	315°13.0	8.0′	27°25.2	4.7′	56.0′
20	118°32.2	27.0	329°40.0	8.0′	27°20.5	4.8′	56.0′
21	133°32.2	·· 26.3	344°06.9	8.0′	27°15.7	4.9′	56.1′
22	148°32.3	25.6	358°33.9	8.0′	27°10.8	5.1′	56.1′
23	163°32.4	24.9	13°00.9	8.0′	27°05.7	5.3′	56.1′
	SD = 15.8′	d = -0.7′	SD = 15.1′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.5	N16°24.2	27°27.9	8.0′	S27°00.4	5.4′	56.1′
1	193°32.5	23.5	41°55.0	8.1′	26°55.0	5.6′	56.2′
2	208°32.6	22.8	56°22.0	8.1′	26°49.4	5.7′	56.2′
3	223°32.7	·· 22.1	70°49.1	8.1′	26°43.7	5.9′	56.2′
4	238°32.8	21.4	85°16.2	8.1′	26°37.8	6.0′	56.2′
5	253°32.8	20.7	99°43.4	8.2′	26°31.8	6.2′	56.3′
6	268°32.9	N16°20.0	114°10.6	8.2′	S26°25.6	6.3′	56.3′
7	283°33.0	19.3	128°37.7	8.2′	26°19.3	6.5′	56.3′
8	298°33.1	18.6	143°05.0	8.3′	26°12.8	6.6′	56.3′
9	313°33.2	·· 17.9	157°32.2	8.3′	26°06.2	6.8′	56.4′
10	328°33.2	17.2	171°59.5	8.3′	25°59.4	6.9′	56.4′
11	343°33.3	16.5	186°26.8	8.3′	25°52.5	7.1′	56.4′
12	358°33.4	N16°15.8	200°54.2	8.4′	S25°45.4	7.2′	56.5′
13	13°33.5	15.1	215°21.5	8.4′	25°38.2	7.3′	56.5′
14	28°33.6	14.4	229°49.0	8.5′	25°30.9	7.6′	56.5′
15	43°33.6	·· 13.7	244°16.4	8.5′	25°23.3	7.6′	56.5′
16	58°33.7	13.0	258°43.9	8.5′	25°15.7	7.8′	56.6′
17	73°33.8	12.3	273°11.5	8.6′	25°07.9	8.0′	56.6′
18	88°33.9	N16°11.6	287°39.0	8.6′	S24°59.9	8.1′	56.6′
19	103°34.0	10.9	302°06.6	8.7′	24°51.8	8.2′	56.6′
20	118°34.0	10.1	316°34.3	8.7′	24°43.6	8.4′	56.7′
21	133°34.1	·· 09.4	331°02.0	8.7′	24°35.2	8.5′	56.7′
22	148°34.2	08.7	345°29.7	8.8′	24°26.7	8.7′	56.7′
23	163°34.3	08.0	359°57.5	8.8′	24°18.0	8.8′	56.8′
	SD = 15.8′	d = -0.7′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	01:02	22:57	–:–	–:–
N 70°	–:–	–:–	02:06	22:01	–:–	–:–
68°	–:–	–:–	02:41	21:27	–:–	–:–
66°	–:–	01:25	03:05	21:04	22:39	–:–
64°	–:–	02:08	03:25	20:45	22:00	–:–
62°	–:–	02:35	03:40	20:30	21:33	–:–
60°	01:17	02:56	03:53	20:17	21:13	22:49
N 58°	01:55	03:13	04:04	20:06	20:57	22:13
56°	02:21	03:27	04:14	19:57	20:43	21:48
54°	02:41	03:39	04:22	19:48	20:31	21:29
52°	02:57	03:50	04:30	19:41	20:21	21:13
50°	03:10	03:59	04:37	19:34	20:12	21:00
45°	03:37	04:18	04:51	19:20	19:53	20:34
N 40°	03:57	04:33	05:03	19:08	19:38	20:14
35°	04:13	04:46	05:13	18:58	19:25	19:58
30°	04:26	04:57	05:22	18:49	19:15	19:45
20°	04:47	05:14	05:37	18:34	18:58	19:25
N 10°	05:03	05:28	05:50	18:21	18:43	19:09
0°	05:16	05:41	06:02	18:09	18:31	18:56
S 10°	05:27	05:53	06:14	17:57	18:19	18:45
20°	05:38	06:04	06:27	17:45	18:08	18:34
30°	05:48	06:17	06:42	17:31	17:56	18:24
35°	05:53	06:23	06:50	17:22	17:49	18:19
40°	05:58	06:31	06:59	17:13	17:42	18:14
45°	06:04	06:39	07:10	17:02	17:33	18:08
S 50°	06:10	06:49	07:23	16:49	17:24	18:02
52°	06:13	06:53	07:30	16:43	17:19	18:00
54°	06:15	06:58	07:36	16:36	17:15	17:57
56°	06:18	07:03	07:44	16:29	17:09	17:54
58°	06:22	07:09	07:52	16:20	17:04	17:51
S 60°	06:25	07:15	08:02	16:10	16:57	17:48

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	21:37	▬	▬	▬
62°	▬	21:11	20:56	▬	23:08	·· ··
60°	19:51	20:18	20:27	22:32	·· ··	00:00
N 58°	19:10	19:46	20:05	23:14	·· ··	00:32
56°	18:41	19:22	19:47	23:42	·· ··	00:55
54°	18:19	19:03	19:32	·· ··	00:04	01:15
52°	18:01	18:46	19:18	·· ··	00:22	01:31
50°	17:46	18:32	19:07	·· ··	00:37	01:45
45°	17:15	18:03	18:42	00:14	01:08	02:13
N 40°	16:51	17:41	18:23	00:38	01:32	02:35
35°	16:31	17:22	18:06	00:58	01:52	02:53
30°	16:14	17:06	17:52	01:14	02:09	03:09
20°	15:45	16:38	17:28	01:43	02:37	03:35
N 10°	15:21	16:15	17:07	02:07	03:02	03:58
0°	14:58	15:53	16:47	02:30	03:24	04:19
S 10°	14:35	15:31	16:28	02:53	03:47	04:40
20°	14:11	15:07	16:06	03:17	04:11	05:03
30°	13:42	14:40	15:42	03:45	04:39	05:28
35°	13:25	14:23	15:27	04:02	04:56	05:44
40°	13:05	14:04	15:10	04:22	05:15	06:01
45°	12:41	13:41	14:50	04:46	05:39	06:22
S 50°	12:11	13:11	14:24	05:16	06:09	06:49
52°	11:55	12:57	14:12	05:32	06:23	07:02
54°	11:37	12:40	13:58	05:49	06:41	07:16
56°	11:16	12:19	13:41	06:11	07:01	07:33
58°	10:48	11:54	13:21	06:39	07:27	07:54
S 60°	10:08	11:18	12:55	07:18	08:03	08:20

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass mm:ss	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 12-14 81-94%
05	06:04	06:01	12:06	21:11	08:44	
06	05:57	05:54	12:06	22:06	09:38	
07	05:50	05:46	12:06	23:00	10:33	

No IERS EOP prediction data available

August 08, 09, 10 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2369 sec ΔT = TT-UT1 = +68.9471 sec

2025 August 08 to Aug. 10 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	316°45.4	216°55.9	N21°58.5	135°57.6	N00°14.0	212°26.1	N22°42.9	314°31.9	S01°39.2
1	331°47.9	231°55.2	58.5	150°58.7	13.3	227°28.0	42.8	329°34.4	39.3
2	346°50.4	246°54.5	58.4	165°59.7	12.7	242°29.9	42.8	344°37.0	39.3
3	1°52.8	261°53.8	·· 58.3	181°00.8	·· 12.0	257°31.8	·· 42.7	359°39.6	·· 39.4
4	16°55.3	276°53.2	58.3	196°01.8	11.4	272°33.7	42.7	14°42.1	39.4
5	31°57.8	291°52.5	58.2	211°02.9	10.7	287°35.6	42.6	29°44.7	39.5
6	47°00.2	306°51.8	N21°58.1	226°03.9	N00°10.1	302°37.5	N22°42.6	44°47.2	S01°39.5
7	62°02.7	321°51.1	58.0	241°04.9	09.4	317°39.4	42.5	59°49.8	39.6
8	77°05.2	336°50.4	58.0	256°06.0	08.8	332°41.3	42.5	74°52.3	39.6
9	92°07.6	351°49.7	·· 57.9	271°07.0	·· 08.1	347°43.2	·· 42.4	89°54.9	·· 39.7
10	107°10.1	6°49.0	57.8	286°08.1	07.5	2°45.1	42.4	104°57.4	39.7
11	122°12.6	21°48.3	57.7	301°09.1	06.8	17°47.0	42.3	120°00.0	39.8
12	137°15.0	36°47.6	N21°57.7	316°10.2	N00°06.2	32°48.9	N22°42.3	135°02.6	S01°39.8
13	152°17.5	51°47.0	57.6	331°11.2	05.5	47°50.8	42.2	150°05.1	39.9
14	167°19.9	66°46.3	57.5	346°12.3	04.9	62°52.7	42.2	165°07.7	39.9
15	182°22.4	81°45.6	·· 57.4	1°13.3	·· 04.2	77°54.7	·· 42.1	180°10.2	·· 40.0
16	197°24.9	96°44.9	57.3	16°14.4	03.6	92°56.6	42.1	195°12.8	40.0
17	212°27.3	111°44.2	57.3	31°15.4	02.9	107°58.5	42.1	210°15.3	40.1
18	227°29.8	126°43.5	N21°57.2	46°16.4	N00°02.3	123°00.4	N22°42.0	225°17.9	S01°40.1
19	242°32.3	141°42.8	57.1	61°17.5	01.6	138°02.3	42.0	240°20.5	40.2
20	257°34.7	156°42.1	57.0	76°18.5	01.0	153°04.2	41.9	255°23.0	40.2
21	272°37.2	171°41.4	·· 56.9	91°19.6	N00°00.3	168°06.1	·· 41.9	270°25.6	·· 40.3
22	287°39.7	186°40.8	56.8	106°20.6	S00°00.3	183°08.0	41.8	285°28.1	40.3
23	302°42.1	201°40.1	56.7	121°21.7	00.9	198°09.9	41.8	300°30.7	40.4
Mer.pass.	02:52	ν -0.7′	d -0.1′	m -3.98	ν 1.0′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.93	ν 2.6′	d -0.1′ m 0.76

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	317°44.6	216°39.4	N21°56.7	136°22.7	S00°01.6	213°11.8	N22°41.7	315°33.3	S01°40.4
1	332°47.0	231°38.7	56.6	151°23.7	02.2	228°13.7	41.7	330°35.8	40.5
2	347°49.5	246°38.0	56.5	166°24.8	02.9	243°15.6	41.6	345°38.4	40.5
3	2°52.0	261°37.3	·· 56.4	181°25.8	·· 03.5	258°17.5	·· 41.6	0°40.9	·· 40.6
4	17°54.4	276°36.6	56.3	196°26.9	04.2	273°19.4	41.5	15°43.5	40.6
5	32°56.9	291°35.9	56.2	211°27.9	04.8	288°21.3	41.5	30°46.0	40.7
6	47°59.4	306°35.2	N21°56.1	226°29.0	S00°05.5	303°23.2	N22°41.4	45°48.6	S01°40.7
7	63°01.8	321°34.5	56.0	241°30.0	06.1	318°25.1	41.4	60°51.2	40.8
8	78°04.3	336°33.8	55.9	256°31.0	06.8	333°27.0	41.3	75°53.7	40.8
9	93°06.8	351°33.2	·· 55.8	271°32.1	·· 07.4	348°28.9	·· 41.3	90°56.3	·· 40.9
10	108°09.2	6°32.5	55.7	286°33.1	08.1	3°30.8	41.2	105°58.8	40.9
11	123°11.7	21°31.8	55.6	301°34.2	08.7	18°32.8	41.2	121°01.4	41.0
12	138°14.2	36°31.1	N21°55.5	316°35.2	S00°09.4	33°34.7	N22°41.1	136°04.0	S01°41.1
13	153°16.6	51°30.4	55.4	331°36.3	10.0	48°36.6	41.1	151°06.5	41.1
14	168°19.1	66°29.7	55.3	346°37.3	10.7	63°38.5	41.0	166°09.1	41.2
15	183°21.5	81°29.0	·· 55.2	1°38.3	·· 11.3	78°40.4	·· 41.0	181°11.7	·· 41.2
16	198°24.0	96°28.3	55.1	16°39.4	12.0	93°42.3	40.9	196°14.2	41.3
17	213°26.5	111°27.6	55.0	31°40.4	12.6	108°44.2	40.9	211°16.8	41.3
18	228°28.9	126°26.9	N21°54.9	46°41.5	S00°13.3	123°46.1	N22°40.9	226°19.3	S01°41.4
19	243°31.4	141°26.2	54.7	61°42.5	13.9	138°48.0	40.8	241°21.9	41.4
20	258°33.9	156°25.5	54.6	76°43.6	14.6	153°49.9	40.8	256°24.5	41.5
21	273°36.3	171°24.9	·· 54.5	91°44.6	·· 15.2	168°51.8	·· 40.7	271°27.0	·· 41.5
22	288°38.8	186°24.2	54.4	106°45.6	15.9	183°53.7	40.7	286°29.6	41.6
23	303°41.3	201°23.5	54.3	121°46.7	16.5	198°55.6	40.6	301°32.1	41.6
Mer.pass.	02:49	ν -0.7′	d -0.1′	m -3.98	ν 1.0′	d -0.6′	m 1.61	ν 1.9′	d -0.0′ m -1.93	ν 2.6′	d -0.1′ m 0.76

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	318°43.7	216°22.8	N21°54.2	136°47.7	S00°17.2	213°57.5	N22°40.6	316°34.7	S01°41.7
1	333°46.2	231°22.1	54.1	151°48.8	17.8	228°59.5	40.5	331°37.3	41.7
2	348°48.7	246°21.4	54.0	166°49.8	18.5	244°01.4	40.5	346°39.8	41.8
3	3°51.1	261°20.7	·· 53.8	181°50.8	·· 19.1	259°03.3	·· 40.4	1°42.4	·· 41.8
4	18°53.6	276°20.0	53.7	196°51.9	19.8	274°05.2	40.4	16°45.0	41.9
5	33°56.0	291°19.3	53.6	211°52.9	20.4	289°07.1	40.3	31°47.5	41.9
6	48°58.5	306°18.6	N21°53.5	226°54.0	S00°21.1	304°09.0	N22°40.3	46°50.1	S01°42.0
7	64°01.0	321°17.9	53.4	241°55.0	21.7	319°10.9	40.2	61°52.6	42.1
8	79°03.4	336°17.2	53.2	256°56.0	22.4	334°12.8	40.2	76°55.2	42.1
9	94°05.9	351°16.5	·· 53.1	271°57.1	·· 23.0	349°14.7	·· 40.1	91°57.8	·· 42.2
10	109°08.4	6°15.8	53.0	286°58.1	23.7	4°16.6	40.1	107°00.3	42.2
11	124°10.8	21°15.1	52.9	301°59.2	24.3	19°18.5	40.0	122°02.9	42.3
12	139°13.3	36°14.5	N21°52.7	317°00.2	S00°25.0	34°20.4	N22°40.0	137°05.5	S01°42.3
13	154°15.8	51°13.8	52.6	332°01.2	25.6	49°22.4	39.9	152°08.0	42.4
14	169°18.2	66°13.1	52.5	347°02.3	26.3	64°24.3	39.9	167°10.6	42.4
15	184°20.7	81°12.4	·· 52.3	2°03.3	·· 26.9	79°26.2	·· 39.8	182°13.1	·· 42.5
16	199°23.1	96°11.7	52.2	17°04.4	27.6	94°28.1	39.8	197°15.7	42.5
17	214°25.6	111°11.0	52.1	32°05.4	28.2	109°30.0	39.7	212°18.3	42.6
18	229°28.1	126°10.3	N21°51.9	47°06.4	S00°28.9	124°31.9	N22°39.7	227°20.8	S01°42.6
19	244°30.5	141°09.6	51.8	62°07.5	29.5	139°33.8	39.6	242°23.4	42.7
20	259°33.0	156°08.9	51.7	77°08.5	30.2	154°35.7	39.6	257°26.0	42.7
21	274°35.5	171°08.2	·· 51.5	92°09.6	·· 30.8	169°37.6	·· 39.5	272°28.5	·· 42.8
22	289°37.9	186°07.5	51.4	107°10.6	31.5	184°39.5	39.5	287°31.1	42.9
23	304°40.4	201°06.8	51.3	122°11.6	32.1	199°41.5	39.4	302°33.7	42.9
Mer.pass.	02:45	ν -0.7′	d -0.1′	m -3.98	ν 1.0′	d -0.6′	m 1.62	ν 1.9′	d -0.0′ m -1.93	ν 2.6′	d -0.1′ m 0.75

Stars

	SHA	Dec
Alpheratz	357°34.0	29°13.9
Ankaa	353°06.4	-42°09.7
Schedar	349°30.2	56°40.5
Diphda	348°46.6	-17°50.6
Achernar	335°19.6	-57°06.0
Hamal	327°50.6	23°35.0
Polaris	313°47.9	89°22.0
Acamar	315°11.4	-40°11.8
Menkar	314°05.6	4°11.5
Mirfak	308°27.6	49°57.0
Aldebaran	290°39.2	16°33.7
Rigel	281°03.6	-8°10.1
Capella	280°21.4	46°01.3
Bellatrix	278°22.5	6°22.5
Elnath	278°01.5	28°37.7
Alnilam	275°37.4	-1°11.0
Betelgeuse	270°51.8	7°24.8
Canopus	263°52.6	-52°42.3
Sirius	258°26.1	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.6	5°09.7
Pollux	243°17.0	27°57.9
Avior	234°15.2	-59°35.4
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.2	-69°49.3
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°36.9
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	173°00.0	-63°14.7
Gacrux	171°51.5	-57°15.6
Alioth	166°12.8	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.7	49°11.4
Hadar	148°35.5	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.7	-60°56.7
Kochab	137°19.8	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.6	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.5	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.1
Deneb	49°25.0	45°22.4
Enif	33°38.0	9°59.6
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.3
Markab	13°29.1	15°20.7

Aug 08 Fri	SHA	Mer.pass
Venus	260°10.5	09:33
Mars	179°12.2	14:55
Jupiter	255°40.7	09:49
Saturn	357°46.4	03:01

Aug 09 Sat	SHA	Mer.pass
Venus	258°54.8	09:34
Mars	178°38.1	14:53
Jupiter	255°27.2	09:46
Saturn	357°48.7	02:57

Aug 10 Sun	SHA	Mer.pass
Venus	257°39.0	09:35
Mars	178°04.0	14:52
Jupiter	255°13.8	09:43
Saturn	357°51.0	02:53

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.4	N16°07.3	14°25.3	8.9′	S24°09.2	8.9′	56.8′
1	193°34.5	06.6	28°53.2	8.9′	24°00.3	9.1′	56.8′
2	208°34.5	05.9	43°21.1	9.0′	23°51.2	9.2′	56.8′
3	223°34.6	·· 05.2	57°49.1	9.0′	23°42.0	9.4′	56.9′
4	238°34.7	04.5	72°17.1	9.1′	23°32.6	9.4′	56.9′
5	253°34.8	03.8	86°45.2	9.1′	23°23.2	9.7′	56.9′
6	268°34.9	N16°03.0	101°13.3	9.2′	S23°13.5	9.7′	56.9′
7	283°35.0	02.3	115°41.5	9.2′	23°03.8	9.9′	57.0′
8	298°35.0	01.6	130°09.7	9.3′	22°53.9	10.0′	57.0′
9	313°35.1	·· 00.9	144°37.9	9.3′	22°43.9	10.2′	57.0′
10	328°35.2	16°00.2	159°06.3	9.4′	22°33.7	10.3′	57.1′
11	343°35.3	15°59.5	173°34.6	9.4′	22°23.4	10.4′	57.1′
12	358°35.4	N15°58.8	188°03.0	9.5′	S22°13.0	10.5′	57.1′
13	13°35.5	58.0	202°31.5	9.5′	22°02.5	10.7′	57.1′
14	28°35.6	57.3	217°00.0	9.6′	21°51.8	10.8′	57.2′
15	43°35.6	·· 56.6	231°28.6	9.6′	21°41.0	10.9′	57.2′
16	58°35.7	55.9	245°57.2	9.7′	21°30.1	11.1′	57.2′
17	73°35.8	55.2	260°25.9	9.7′	21°19.0	11.1′	57.2′
18	88°35.9	N15°54.5	274°54.6	9.8′	S21°07.9	11.3′	57.3′
19	103°36.0	53.7	289°23.4	9.8′	20°56.6	11.4′	57.3′
20	118°36.1	53.0	303°52.3	9.9′	20°45.2	11.6′	57.3′
21	133°36.2	·· 52.3	318°21.2	9.9′	20°33.6	11.6′	57.3′
22	148°36.2	51.6	332°50.1	10.0′	20°22.0	11.8′	57.4′
23	163°36.3	50.9	347°19.1	10.1′	20°10.2	11.9′	57.4′
	SD = 15.8′	d = -0.7′	SD = 15.5′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°36.4	N15°50.1	1°48.2	10.1′	S19°58.3	12.0′	57.4′
1	193°36.5	49.4	16°17.3	10.2′	19°46.3	12.1′	57.4′
2	208°36.6	48.7	30°46.4	10.2′	19°34.2	12.2′	57.5′
3	223°36.7	·· 48.0	45°15.7	10.3′	19°22.0	12.3′	57.5′
4	238°36.8	47.3	59°44.9	10.3′	19°09.7	12.5′	57.5′
5	253°36.9	46.5	74°14.3	10.4′	18°57.2	12.5′	57.5′
6	268°37.0	N15°45.8	88°43.6	10.4′	S18°44.7	12.7′	57.6′
7	283°37.1	45.1	103°13.1	10.5′	18°32.0	12.8′	57.6′
8	298°37.1	44.4	117°42.6	10.5′	18°19.2	12.8′	57.6′
9	313°37.2	·· 43.6	132°12.1	10.6′	18°06.4	13.0′	57.6′
10	328°37.3	42.9	146°41.7	10.6′	17°53.4	13.1′	57.7′
11	343°37.4	42.2	161°11.3	10.7′	17°40.3	13.2′	57.7′
12	358°37.5	N15°41.5	175°41.0	10.7′	S17°27.1	13.3′	57.7′
13	13°37.6	40.7	190°10.8	10.8′	17°13.8	13.4′	57.7′
14	28°37.7	40.0	204°40.6	10.8′	17°00.4	13.4′	57.8′
15	43°37.8	·· 39.3	219°10.4	10.9′	16°47.0	13.6′	57.8′
16	58°37.9	38.6	233°40.3	11.0′	16°33.4	13.7′	57.8′
17	73°38.0	37.8	248°10.3	11.0′	16°19.7	13.8′	57.8′
18	88°38.1	N15°37.1	262°40.3	11.0′	S16°05.9	13.8′	57.9′
19	103°38.2	36.4	277°10.3	11.1′	15°52.1	14.0′	57.9′
20	118°38.3	35.6	291°40.4	11.1′	15°38.1	14.0′	57.9′
21	133°38.3	·· 34.9	306°10.6	11.2′	15°24.1	14.2′	57.9′
22	148°38.4	34.2	320°40.8	11.2′	15°09.9	14.2′	58.0′
23	163°38.5	33.5	335°11.0	11.3′	14°55.7	14.3′	58.0′
	SD = 15.8′	d = -0.7′	SD = 15.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.6	N15°32.7	349°41.3	11.3′	S14°41.4	14.4′	58.0′
1	193°38.7	32.0	4°11.6	11.4′	14°27.0	14.5′	58.0′
2	208°38.8	31.3	18°42.0	11.4′	14°12.5	14.5′	58.1′
3	223°38.9	·· 30.5	33°12.4	11.5′	13°58.0	14.7′	58.1′
4	238°39.0	29.8	47°42.9	11.5′	13°43.3	14.7′	58.1′
5	253°39.1	29.1	62°13.4	11.6′	13°28.6	14.8′	58.1′
6	268°39.2	N15°28.3	76°44.0	11.6′	S13°13.8	14.8′	58.1′
7	283°39.3	27.6	91°14.5	11.6′	12°59.0	15.0′	58.2′
8	298°39.4	26.9	105°45.2	11.7′	12°44.0	15.0′	58.2′
9	313°39.5	·· 26.1	120°15.9	11.7′	12°29.0	15.1′	58.2′
10	328°39.6	25.4	134°46.6	11.8′	12°13.9	15.2′	58.2′
11	343°39.7	24.7	149°17.3	11.8′	11°58.7	15.2′	58.2′
12	358°39.8	N15°23.9	163°48.1	11.8′	S11°43.5	15.3′	58.3′
13	13°39.9	23.2	178°19.0	11.9′	11°28.2	15.4′	58.3′
14	28°40.0	22.4	192°49.8	11.9′	11°12.8	15.4′	58.3′
15	43°40.1	·· 21.7	207°20.7	11.9′	10°57.4	15.5′	58.3′
16	58°40.2	21.0	221°51.7	12.0′	10°41.9	15.6′	58.4′
17	73°40.3	20.2	236°22.6	12.0′	10°26.3	15.6′	58.4′
18	88°40.4	N15°19.5	250°53.6	12.0′	S10°10.7	15.7′	58.4′
19	103°40.5	18.8	265°24.7	12.1′	09°55.0	15.7′	58.4′
20	118°40.6	18.0	279°55.7	12.1′	09°39.3	15.8′	58.4′
21	133°40.7	·· 17.3	294°26.8	12.1′	09°23.5	15.9′	58.4′
22	148°40.8	16.5	308°58.0	12.2′	09°07.6	15.9′	58.5′
23	163°40.9	15.8	323°29.1	12.2′	08°51.7	16.0′	58.5′
	SD = 15.8′	d = -0.7′	SD = 15.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	01:37	22:25	–:–	–:–
N 70°	–:–	–:–	02:24	21:42	–:–	–:–
68°	–:–	00:35	02:54	21:13	23:18	–:–
66°	–:–	01:47	03:17	20:52	22:18	–:–
64°	–:–	02:22	03:34	20:35	21:45	–:–
62°	00:32	02:46	03:48	20:21	21:22	23:23
60°	01:36	03:06	04:00	20:09	21:03	22:30
N 58°	02:08	03:21	04:11	19:59	20:48	22:00
56°	02:31	03:34	04:20	19:50	20:35	21:38
54°	02:49	03:45	04:28	19:42	20:24	21:20
52°	03:04	03:55	04:35	19:35	20:14	21:06
50°	03:16	04:04	04:41	19:29	20:06	20:53
45°	03:41	04:22	04:55	19:15	19:48	20:28
N 40°	04:00	04:36	05:06	19:04	19:34	20:10
35°	04:16	04:48	05:16	18:55	19:22	19:55
30°	04:28	04:58	05:24	18:47	19:12	19:42
20°	04:48	05:15	05:38	18:32	18:56	19:23
N 10°	05:03	05:29	05:51	18:20	18:42	19:08
0°	05:16	05:41	06:02	18:09	18:30	18:55
S 10°	05:26	05:52	06:13	17:58	18:19	18:45
20°	05:36	06:03	06:25	17:46	18:09	18:35
30°	05:46	06:14	06:39	17:32	17:57	18:26
35°	05:50	06:20	06:47	17:25	17:51	18:21
40°	05:55	06:27	06:56	17:16	17:44	18:16
45°	06:00	06:35	07:06	17:06	17:36	18:11
S 50°	06:06	06:44	07:18	16:53	17:28	18:06
52°	06:08	06:48	07:24	16:47	17:24	18:04
54°	06:10	06:53	07:31	16:41	17:19	18:01
56°	06:13	06:57	07:38	16:34	17:14	17:59
58°	06:16	07:03	07:46	16:26	17:09	17:56
S 60°	06:19	07:09	07:55	16:17	17:03	17:53

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	22:25	21:26	▬	▬	03:28
N 70°	▬	21:53	21:12	▬	▬	03:58
68°	22:18	21:29	21:01	▬	01:46	04:20
66°	21:38	21:10	20:51	▬	02:25	04:37
64°	21:09	20:54	20:43	00:35	02:52	04:51
62°	20:48	20:42	20:36	01:16	03:13	05:03
60°	20:30	20:31	20:30	01:44	03:30	05:13
N 58°	20:15	20:21	20:25	02:05	03:44	05:21
56°	20:02	20:13	20:20	02:23	03:56	05:28
54°	19:51	20:05	20:16	02:38	04:06	05:35
52°	19:41	19:58	20:12	02:50	04:15	05:41
50°	19:32	19:52	20:08	03:02	04:23	05:46
45°	19:14	19:39	20:00	03:25	04:41	05:58
N 40°	18:58	19:28	19:54	03:44	04:55	06:07
35°	18:45	19:18	19:48	03:59	05:07	06:15
30°	18:33	19:10	19:43	04:12	05:17	06:22
20°	18:14	18:56	19:34	04:35	05:35	06:34
N 10°	17:56	18:43	19:27	04:55	05:50	06:45
0°	17:40	18:31	19:20	05:13	06:05	06:54
S 10°	17:24	18:19	19:12	05:31	06:19	07:04
20°	17:06	18:06	19:05	05:50	06:34	07:14
30°	16:46	17:51	18:56	06:12	06:51	07:26
35°	16:34	17:43	18:51	06:25	07:01	07:32
40°	16:21	17:33	18:45	06:40	07:12	07:40
45°	16:04	17:21	18:38	06:57	07:25	07:48
S 50°	15:44	17:07	18:30	07:19	07:41	07:59
52°	15:35	17:00	18:26	07:29	07:48	08:03
54°	15:24	16:53	18:21	07:40	07:57	08:09
56°	15:11	16:45	18:17	07:53	08:06	08:14
58°	14:57	16:35	18:11	08:08	08:16	08:21
S 60°	14:40	16:24	18:06	08:26	08:28	08:28

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 15-17 98-99%
08	05:43	05:38	12:06	23:53	11:27	
09	05:34	05:30	12:05	–:–	12:18	
10	05:25	05:21	12:05	00:43	13:07	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2375 sec ΔT = TT-UT1 = +68.9465 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	319°42.9	216°06.1	N21°51.1	137°12.7	S00°32.8	214°43.4	N22°39.4	317°36.2	S01°43.0
1	334°45.3	231°05.4	51.0	152°13.7	33.4	229°45.3	39.3	332°38.8	43.0
2	349°47.8	246°04.7	50.8	167°14.8	34.1	244°47.2	39.3	347°41.4	43.1
3	4°50.3	261°04.0	·· 50.7	182°15.8	·· 34.7	259°49.1	·· 39.2	2°43.9	·· 43.1
4	19°52.7	276°03.3	50.5	197°16.8	35.4	274°51.0	39.2	17°46.5	43.2
5	34°55.2	291°02.7	50.4	212°17.9	36.0	289°52.9	39.2	32°49.1	43.2
6	49°57.6	306°02.0	N21°50.3	227°18.9	S00°36.7	304°54.8	N22°39.1	47°51.6	S01°43.3
7	65°00.1	321°01.3	50.1	242°19.9	37.3	319°56.7	39.1	62°54.2	43.3
8	80°02.6	336°00.6	50.0	257°21.0	38.0	334°58.7	39.0	77°56.8	43.4
9	95°05.0	350°59.9	·· 49.8	272°22.0	·· 38.6	350°00.6	·· 39.0	92°59.3	·· 43.5
10	110°07.5	5°59.2	49.7	287°23.1	39.3	5°02.5	38.9	108°01.9	43.5
11	125°10.0	20°58.5	49.5	302°24.1	39.9	20°04.4	38.9	123°04.5	43.6
12	140°12.4	35°57.8	N21°49.4	317°25.1	S00°40.6	35°06.3	N22°38.8	138°07.0	S01°43.6
13	155°14.9	50°57.1	49.2	332°26.2	41.2	50°08.2	38.8	153°09.6	43.7
14	170°17.4	65°56.4	49.1	347°27.2	41.9	65°10.1	38.7	168°12.2	43.7
15	185°19.8	80°55.7	·· 48.9	2°28.2	·· 42.5	80°12.0	·· 38.7	183°14.7	·· 43.8
16	200°22.3	95°55.0	48.7	17°29.3	43.2	95°13.9	38.6	198°17.3	43.8
17	215°24.8	110°54.3	48.6	32°30.3	43.8	110°15.9	38.6	213°19.9	43.9
18	230°27.2	125°53.6	N21°48.4	47°31.3	S00°44.5	125°17.8	N22°38.5	228°22.4	S01°43.9
19	245°29.7	140°52.9	48.3	62°32.4	45.1	140°19.7	38.5	243°25.0	44.0
20	260°32.1	155°52.2	48.1	77°33.4	45.8	155°21.6	38.4	258°27.6	44.1
21	275°34.6	170°51.5	·· 47.9	92°34.5	·· 46.4	170°23.5	·· 38.4	273°30.1	·· 44.1
22	290°37.1	185°50.8	47.8	107°35.5	47.1	185°25.4	38.3	288°32.7	44.2
23	305°39.5	200°50.1	47.6	122°36.5	47.7	200°27.3	38.3	303°35.3	44.2
Mer.pass.	02:41	ν -0.7′	d -0.1′	m -3.98	ν 1.0′	d -0.6′	m 1.62	ν 1.9′	d -0.0′ m -1.94	ν 2.6′	d -0.1′ m 0.75

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	320°42.0	215°49.4	N21°47.5	137°37.6	S00°48.4	215°29.2	N22°38.2	318°37.8	S01°44.3
1	335°44.5	230°48.7	47.3	152°38.6	49.0	230°31.2	38.2	333°40.4	44.3
2	350°46.9	245°48.0	47.1	167°39.6	49.7	245°33.1	38.1	348°43.0	44.4
3	5°49.4	260°47.4	·· 46.9	182°40.7	·· 50.3	260°35.0	·· 38.1	3°45.5	·· 44.4
4	20°51.9	275°46.7	46.8	197°41.7	51.0	275°36.9	38.0	18°48.1	44.5
5	35°54.3	290°46.0	46.6	212°42.7	51.6	290°38.8	38.0	33°50.7	44.6
6	50°56.8	305°45.3	N21°46.4	227°43.8	S00°52.3	305°40.7	N22°37.9	48°53.2	S01°44.6
7	65°59.2	320°44.6	46.3	242°44.8	52.9	320°42.6	37.9	63°55.8	44.7
8	81°01.7	335°43.9	46.1	257°45.8	53.6	335°44.6	37.8	78°58.4	44.7
9	96°04.2	350°43.2	·· 45.9	272°46.9	·· 54.2	350°46.5	·· 37.8	94°01.0	·· 44.8
10	111°06.6	5°42.5	45.7	287°47.9	54.9	5°48.4	37.7	109°03.5	44.8
11	126°09.1	20°41.8	45.6	302°49.0	55.5	20°50.3	37.7	124°06.1	44.9
12	141°11.6	35°41.1	N21°45.4	317°50.0	S00°56.2	35°52.2	N22°37.6	139°08.7	S01°44.9
13	156°14.0	50°40.4	45.2	332°51.0	56.8	50°54.1	37.6	154°11.2	45.0
14	171°16.5	65°39.7	45.0	347°52.1	57.5	65°56.0	37.5	169°13.8	45.1
15	186°19.0	80°39.0	·· 44.9	2°53.1	·· 58.1	80°58.0	·· 37.5	184°16.4	·· 45.1
16	201°21.4	95°38.3	44.7	17°54.1	58.8	95°59.9	37.4	199°18.9	45.2
17	216°23.9	110°37.6	44.5	32°55.2	00°59.4	111°01.8	37.4	214°21.5	45.2
18	231°26.4	125°36.9	N21°44.3	47°56.2	S01°00.1	126°03.7	N22°37.3	229°24.1	S01°45.3
19	246°28.8	140°36.2	44.1	62°57.2	00.7	141°05.6	37.3	244°26.7	45.3
20	261°31.3	155°35.5	43.9	77°58.3	01.4	156°07.5	37.2	259°29.2	45.4
21	276°33.7	170°34.8	·· 43.7	92°59.3	·· 02.0	171°09.5	·· 37.2	274°31.8	·· 45.4
22	291°36.2	185°34.1	43.6	108°00.3	02.7	186°11.4	37.1	289°34.4	45.5
23	306°38.7	200°33.4	43.4	123°01.4	03.3	201°13.3	37.1	304°36.9	45.6
Mer.pass.	02:37	ν -0.7′	d -0.2′	m -3.98	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.0′ m -1.94	ν 2.6′	d -0.1′ m 0.74

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	321°41.1	215°32.7	N21°43.2	138°02.4	S01°04.0	216°15.2	N22°37.0	319°39.5	S01°45.6
1	336°43.6	230°32.0	43.0	153°03.4	04.6	231°17.1	37.0	334°42.1	45.7
2	351°46.1	245°31.3	42.8	168°04.5	05.3	246°19.0	36.9	349°44.7	45.7
3	6°48.5	260°30.6	·· 42.6	183°05.5	·· 05.9	261°20.9	·· 36.9	4°47.2	·· 45.8
4	21°51.0	275°29.9	42.4	198°06.5	06.6	276°22.9	36.8	19°49.8	45.8
5	36°53.5	290°29.2	42.2	213°07.6	07.2	291°24.8	36.8	34°52.4	45.9
6	51°55.9	305°28.5	N21°42.0	228°08.6	S01°07.9	306°26.7	N22°36.7	49°54.9	S01°46.0
7	66°58.4	320°27.8	41.8	243°09.6	08.5	321°28.6	36.7	64°57.5	46.0
8	82°00.8	335°27.1	41.6	258°10.6	09.2	336°30.5	36.6	80°00.1	46.1
9	97°03.3	350°26.5	·· 41.4	273°11.7	·· 09.8	351°32.4	·· 36.6	95°02.7	·· 46.1
10	112°05.8	5°25.8	41.2	288°12.7	10.5	6°34.4	36.5	110°05.2	46.2
11	127°08.2	20°25.1	41.0	303°13.7	11.1	21°36.3	36.5	125°07.8	46.2
12	142°10.7	35°24.4	N21°40.8	318°14.8	S01°11.8	36°38.2	N22°36.4	140°10.4	S01°46.3
13	157°13.2	50°23.7	40.6	333°15.8	12.4	51°40.1	36.4	155°13.0	46.4
14	172°15.6	65°23.0	40.4	348°16.8	13.1	66°42.0	36.3	170°15.5	46.4
15	187°18.1	80°22.3	·· 40.2	3°17.9	·· 13.7	81°44.0	·· 36.3	185°18.1	·· 46.5
16	202°20.6	95°21.6	40.0	18°18.9	14.4	96°45.9	36.2	200°20.7	46.5
17	217°23.0	110°20.9	39.8	33°19.9	15.0	111°47.8	36.2	215°23.3	46.6
18	232°25.5	125°20.2	N21°39.6	48°21.0	S01°15.7	126°49.7	N22°36.1	230°25.8	S01°46.6
19	247°28.0	140°19.5	39.4	63°22.0	16.4	141°51.6	36.1	245°28.4	46.7
20	262°30.4	155°18.8	39.2	78°23.0	17.0	156°53.5	36.0	260°31.0	46.8
21	277°32.9	170°18.1	·· 39.0	93°24.1	·· 17.7	171°55.5	·· 36.0	275°33.6	·· 46.8
22	292°35.3	185°17.4	38.7	108°25.1	18.3	186°57.4	35.9	290°36.1	46.9
23	307°37.8	200°16.7	38.5	123°26.1	19.0	201°59.3	35.9	305°38.7	46.9
Mer.pass.	02:33	ν -0.7′	d -0.2′	m -3.97	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.0′ m -1.94	ν 2.6′	d -0.1′ m 0.74

Stars	SHA	Dec
Alpheratz	357°34.0	29°13.9
Ankaa	353°06.3	-42°09.7
Schedar	349°30.1	56°40.5
Diphda	348°46.6	-17°50.6
Achernar	335°19.5	-57°06.0
Hamal	327°50.5	23°35.0
Polaris	313°46.5	89°22.0
Acamar	315°11.4	-40°11.8
Menkar	314°05.6	4°11.5
Mirfak	308°27.6	49°57.0
Aldebaran	290°39.2	16°33.7
Rigel	281°03.6	-8°10.1
Capella	280°21.4	46°01.3
Bellatrix	278°22.5	6°22.5
Elnath	278°01.4	28°37.7
Alnilam	275°37.4	-1°11.0
Betelgeuse	270°51.8	7°24.8
Canopus	263°52.6	-52°42.3
Sirius	258°26.1	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.6	5°09.7
Pollux	243°17.0	27°57.9
Avior	234°15.2	-59°35.3
Suhail	222°46.4	-43°32.1
Miaplacidus	221°39.2	-69°49.3
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.9
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.1
Acrux	173°00.1	-63°14.7
Gacrux	171°51.5	-57°15.6
Alioth	166°12.8	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.8	49°11.4
Hadar	148°35.5	-60°30.0
Menkent	147°57.1	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.7	-60°56.7
Kochab	137°19.8	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.6	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.4	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°31.5	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.1
Deneb	49°25.0	45°22.4
Enif	33°38.0	9°59.6
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.3
Markab	13°29.1	15°20.7

Aug 11 Mon	SHA	Mer.pass
Venus	256°23.3	09:36
Mars	177°29.8	14:50
Jupiter	255°00.5	09:40
Saturn	357°53.4	02:49

Aug 12 Tue	SHA	Mer.pass
Venus	255°07.4	09:37
Mars	176°55.6	14:48
Jupiter	254°47.2	09:37
Saturn	357°55.8	02:45

Aug 13 Wed	SHA	Mer.pass
Venus	253°51.6	09:38
Mars	176°21.3	14:47
Jupiter	254°34.1	09:34
Saturn	357°58.4	02:41

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.0	N15°15.1	338°00.3	12.2′	S08°35.7	16.0′	58.5′
1	193°41.1	14.3	352°31.5	12.2′	08°19.7	16.1′	58.5′
2	208°41.2	13.6	7°02.7	12.3′	08°03.6	16.1′	58.5′
3	223°41.3	·· 12.8	21°34.0	12.3′	07°47.5	16.1′	58.6′
4	238°41.4	12.1	36°05.3	12.3′	07°31.4	16.3′	58.6′
5	253°41.5	11.3	50°36.6	12.3′	07°15.1	16.2′	58.6′
6	268°41.6	N15°10.6	65°07.9	12.3′	S06°58.9	16.3′	58.6′
7	283°41.7	09.9	79°39.2	12.4′	06°42.6	16.3′	58.6′
8	298°41.8	09.1	94°10.6	12.4′	06°26.3	16.4′	58.6′
9	313°41.9	·· 08.4	108°41.9	12.4′	06°09.9	16.4′	58.7′
10	328°42.0	07.6	123°13.3	12.4′	05°53.5	16.5′	58.7′
11	343°42.1	06.9	137°44.7	12.4′	05°37.0	16.5′	58.7′
12	358°42.2	N15°06.1	152°16.2	12.4′	S05°20.5	16.5′	58.7′
13	13°42.3	05.4	166°47.6	12.4′	05°04.0	16.5′	58.7′
14	28°42.4	04.6	181°19.0	12.5′	04°47.5	16.6′	58.7′
15	43°42.5	·· 03.9	195°50.5	12.5′	04°30.9	16.6′	58.8′
16	58°42.6	03.1	210°22.0	12.5′	04°14.3	16.7′	58.8′
17	73°42.7	02.4	224°53.4	12.5′	03°57.6	16.7′	58.8′
18	88°42.8	N15°01.6	239°24.9	12.5′	S03°40.9	16.7′	58.8′
19	103°42.9	00.9	253°56.4	12.5′	03°24.2	16.7′	58.8′
20	118°43.0	15°00.1	268°27.9	12.5′	03°07.5	16.7′	58.8′
21	133°43.1	14°59.4	282°59.4	12.5′	02°50.8	16.8′	58.8′
22	148°43.3	58.6	297°30.9	12.5′	02°34.0	16.8′	58.9′
23	163°43.4	57.9	312°02.4	12.5′	02°17.2	16.8′	58.9′
	SD = 15.8′	d = -0.7′	SD = 16.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.5	N14°57.1	326°33.9	12.5′	S02°00.4	16.8′	58.9′
1	193°43.6	56.4	341°05.4	12.5′	01°43.6	16.8′	58.9′
2	208°43.7	55.6	355°36.9	12.5′	01°26.8	16.9′	58.9′
3	223°43.8	·· 54.9	10°08.4	12.5′	01°09.9	16.8′	58.9′
4	238°43.9	54.1	24°39.9	12.5′	00°53.1	16.9′	58.9′
5	253°44.0	53.4	39°11.4	12.5′	00°36.2	16.9′	58.9′
6	268°44.1	N14°52.6	53°42.8	12.5′	S00°19.3	16.8′	59.0′
7	283°44.2	51.9	68°14.3	12.5′	S00°02.5	16.9′	59.0′
8	298°44.3	51.1	82°45.8	12.4′	N00°14.4	16.9′	59.0′
9	313°44.4	·· 50.4	97°17.2	12.4′	00°31.3	16.9′	59.0′
10	328°44.5	49.6	111°48.6	12.4′	00°48.2	16.9′	59.0′
11	343°44.7	48.8	126°20.1	12.4′	01°05.1	16.9′	59.0′
12	358°44.8	N14°48.1	140°51.5	12.4′	N01°22.0	16.9′	59.0′
13	13°44.9	47.3	155°22.8	12.4′	01°38.9	16.9′	59.0′
14	28°45.0	46.6	169°54.2	12.4′	01°55.8	16.9′	59.1′
15	43°45.1	·· 45.8	184°25.6	12.3′	02°12.7	16.9′	59.1′
16	58°45.2	45.1	198°56.9	12.3′	02°29.6	16.8′	59.1′
17	73°45.3	44.3	213°28.2	12.3′	02°46.4	16.9′	59.1′
18	88°45.4	N14°43.5	227°59.5	12.3′	N03°03.3	16.9′	59.1′
19	103°45.5	42.8	242°30.8	12.2′	03°20.2	16.8′	59.1′
20	118°45.6	42.0	257°02.0	12.2′	03°37.0	16.8′	59.1′
21	133°45.8	·· 41.3	271°33.2	12.2′	03°53.8	16.8′	59.1′
22	148°45.9	40.5	286°04.4	12.2′	04°10.6	16.8′	59.1′
23	163°46.0	39.7	300°35.5	12.1′	04°27.4	16.8′	59.1′
	SD = 15.8′	d = -0.8′	SD = 16.1′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.1	N14°39.0	315°06.7	12.1′	N04°44.2	16.8′	59.1′
1	193°46.2	38.2	329°37.8	12.1′	05°01.0	16.7′	59.2′
2	208°46.3	37.5	344°08.8	12.0′	05°17.7	16.7′	59.2′
3	223°46.4	·· 36.7	358°39.8	12.0′	05°34.4	16.7′	59.2′
4	238°46.5	35.9	13°10.8	12.0′	05°51.1	16.7′	59.2′
5	253°46.7	35.2	27°41.8	11.9′	06°07.8	16.6′	59.2′
6	268°46.8	N14°34.4	42°12.7	11.9′	N06°24.4	16.6′	59.2′
7	283°46.9	33.6	56°43.6	11.8′	06°41.0	16.6′	59.2′
8	298°47.0	32.9	71°14.4	11.8′	06°57.6	16.5′	59.2′
9	313°47.1	·· 32.1	85°45.2	11.8′	07°14.1	16.5′	59.2′
10	328°47.2	31.4	100°16.0	11.7′	07°30.6	16.5′	59.2′
11	343°47.3	30.6	114°46.7	11.7′	07°47.1	16.4′	59.2′
12	358°47.5	N14°29.8	129°17.3	11.6′	N08°03.5	16.4′	59.2′
13	13°47.6	29.1	143°47.9	11.6′	08°19.9	16.4′	59.2′
14	28°47.7	28.3	158°18.5	11.5′	08°36.3	16.3′	59.2′
15	43°47.8	·· 27.5	172°49.0	11.5′	08°52.6	16.3′	59.2′
16	58°47.9	26.8	187°19.5	11.4′	09°08.9	16.2′	59.2′
17	73°48.0	26.0	201°49.9	11.4′	09°25.1	16.2′	59.3′
18	88°48.1	N14°25.2	216°20.3	11.3′	N09°41.3	16.1′	59.3′
19	103°48.3	24.4	230°50.6	11.3′	09°57.4	16.1′	59.3′
20	118°48.4	23.7	245°20.8	11.2′	10°13.5	16.0′	59.3′
21	133°48.5	·· 22.9	259°51.0	11.1′	10°29.5	16.0′	59.3′
22	148°48.6	22.1	274°21.2	11.1′	10°45.5	15.9′	59.3′
23	163°48.7	21.4	288°51.2	11.0′	11°01.4	15.9′	59.3′
	SD = 15.8′	d = -0.8′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:04	22:00	–:–	–:–
N 70°	–:–	–:–	02:42	21:24	–:–	–:–
68°	–:–	01:19	03:08	20:59	22:43	–:–
66°	–:–	02:06	03:27	20:40	21:59	–:–
64°	–:–	02:35	03:43	20:24	21:31	–:–
62°	01:10	02:57	03:56	20:12	21:10	22:52
60°	01:53	03:14	04:07	20:01	20:53	22:13
N 58°	02:20	03:29	04:17	19:51	20:39	21:47
56°	02:40	03:41	04:25	19:43	20:27	21:27
54°	02:57	03:52	04:33	19:36	20:17	21:11
52°	03:10	04:01	04:39	19:29	20:08	20:58
50°	03:22	04:09	04:45	19:24	20:00	20:46
45°	03:46	04:26	04:58	19:11	19:43	20:23
N 40°	04:04	04:40	05:09	19:00	19:30	20:05
35°	04:18	04:51	05:18	18:52	19:19	19:51
30°	04:30	05:00	05:26	18:44	19:09	19:39
20°	04:49	05:16	05:39	18:31	18:54	19:21
N 10°	05:04	05:29	05:51	18:19	18:41	19:06
0°	05:15	05:40	06:02	18:08	18:30	18:55
S 10°	05:26	05:51	06:12	17:58	18:19	18:45
20°	05:35	06:01	06:24	17:47	18:09	18:36
30°	05:43	06:12	06:36	17:34	17:59	18:27
35°	05:48	06:17	06:44	17:27	17:53	18:23
40°	05:52	06:24	06:52	17:19	17:47	18:19
45°	05:56	06:31	07:02	17:09	17:40	18:14
S 50°	06:01	06:39	07:13	16:57	17:32	18:10
52°	06:03	06:43	07:19	16:52	17:28	18:08
54°	06:05	06:47	07:24	16:46	17:24	18:06
56°	06:07	06:51	07:31	16:40	17:20	18:04
58°	06:09	06:56	07:38	16:32	17:15	18:02
S 60°	06:12	07:01	07:47	16:24	17:10	17:59

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	20:46	20:09	19:27	06:10	08:33	10:58
N 70°	20:42	20:13	19:42	06:21	08:33	10:46
68°	20:38	20:17	19:54	06:30	08:32	10:36
66°	20:35	20:20	20:05	06:37	08:32	10:28
64°	20:33	20:23	20:13	06:43	08:32	10:22
62°	20:31	20:26	20:21	06:48	08:32	10:16
60°	20:29	20:28	20:27	06:53	08:31	10:11
N 58°	20:27	20:30	20:33	06:57	08:31	10:07
56°	20:26	20:32	20:38	07:00	08:31	10:03
54°	20:25	20:33	20:42	07:03	08:31	10:00
52°	20:23	20:35	20:47	07:06	08:31	09:57
50°	20:22	20:36	20:50	07:09	08:31	09:54
45°	20:20	20:39	20:59	07:14	08:31	09:48
N 40°	20:18	20:41	21:06	07:19	08:30	09:43
35°	20:16	20:43	21:12	07:23	08:30	09:38
30°	20:14	20:45	21:17	07:26	08:30	09:35
20°	20:12	20:48	21:26	07:32	08:30	09:28
N 10°	20:09	20:51	21:35	07:37	08:30	09:22
0°	20:07	20:54	21:43	07:42	08:29	09:17
S 10°	20:05	20:57	21:51	07:47	08:29	09:12
20°	20:02	21:00	21:59	07:52	08:29	09:06
30°	20:00	21:04	22:09	07:58	08:28	08:59
35°	19:58	21:06	22:15	08:01	08:28	08:56
40°	19:56	21:08	22:21	08:04	08:28	08:52
45°	19:54	21:11	22:29	08:08	08:28	08:47
S 50°	19:52	21:14	22:38	08:13	08:27	08:41
52°	19:51	21:16	22:42	08:16	08:27	08:38
54°	19:49	21:17	22:47	08:18	08:27	08:36
56°	19:48	21:19	22:52	08:21	08:27	08:32
58°	19:46	21:21	22:58	08:24	08:26	08:29
S 60°	19:45	21:24	23:05	08:27	08:26	08:25

Day	Sun Eqn.of Time 00h	Sun Eqn.of Time 12h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-20 97-84%
11	05:16	05:11	12:05	01:31	13:55	
12	05:06	05:01	12:05	02:18	14:42	
13	04:56	04:50	12:05	03:06	15:30	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2382 sec ΔT = TT-UT1 = +68.9458 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	322°40.3	215°16.0	N21°38.3	138°27.1	S01°19.6	217°01.2	N22°35.8	320°41.3	S01°47.0
1	337°42.7	230°15.3	38.1	153°28.2	20.3	232°03.1	35.8	335°43.8	47.0
2	352°45.2	245°14.6	37.9	168°29.2	20.9	247°05.1	35.7	350°46.4	47.1
3	7°47.7	260°13.9	·· 37.7	183°30.2	·· 21.6	262°07.0	·· 35.7	5°49.0	·· 47.2
4	22°50.1	275°13.2	37.4	198°31.3	22.2	277°08.9	35.6	20°51.6	47.2
5	37°52.6	290°12.5	37.2	213°32.3	22.9	292°10.8	35.6	35°54.1	47.3
6	52°55.1	305°11.8	N21°37.0	228°33.3	S01°23.5	307°12.7	N22°35.5	50°56.7	S01°47.3
7	67°57.5	320°11.1	36.8	243°34.4	24.2	322°14.7	35.5	65°59.3	47.4
8	83°00.0	335°10.4	36.6	258°35.4	24.8	337°16.6	35.4	81°01.9	47.5
9	98°02.5	350°09.7	·· 36.3	273°36.4	·· 25.5	352°18.5	·· 35.4	96°04.5	·· 47.5
10	113°04.9	5°09.0	36.1	288°37.4	26.1	7°20.4	35.3	111°07.0	47.6
11	128°07.4	20°08.3	35.9	303°38.5	26.8	22°22.3	35.3	126°09.6	47.6
12	143°09.8	35°07.6	N21°35.6	318°39.5	S01°27.4	37°24.3	N22°35.2	141°12.2	S01°47.7
13	158°12.3	50°06.9	35.4	333°40.5	28.1	52°26.2	35.2	156°14.8	47.7
14	173°14.8	65°06.2	35.2	348°41.6	28.7	67°28.1	35.1	171°17.3	47.8
15	188°17.2	80°05.5	·· 35.0	3°42.6	·· 29.4	82°30.0	·· 35.1	186°19.9	·· 47.9
16	203°19.7	95°04.8	34.7	18°43.6	30.0	97°31.9	35.0	201°22.5	47.9
17	218°22.2	110°04.1	34.5	33°44.6	30.7	112°33.9	35.0	216°25.1	48.0
18	233°24.6	125°03.4	N21°34.3	48°45.7	S01°31.3	127°35.8	N22°34.9	231°27.6	S01°48.0
19	248°27.1	140°02.7	34.0	63°46.7	32.0	142°37.7	34.9	246°30.2	48.1
20	263°29.6	155°02.0	33.8	78°47.7	32.6	157°39.6	34.8	261°32.8	48.2
21	278°32.0	170°01.3	·· 33.6	93°48.7	·· 33.3	172°41.5	·· 34.8	276°35.4	·· 48.2
22	293°34.5	185°00.7	33.3	108°49.8	34.0	187°43.5	34.7	291°38.0	48.3
23	308°36.9	200°00.0	33.1	123°50.8	34.6	202°45.4	34.7	306°40.5	48.3
Mer.pass.	02:29	ν -0.7′	d -0.2′	m -3.97	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′ m -1.94	ν 2.6′	d -0.1′ m 0.73

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	323°39.4	214°59.3	N21°32.8	138°51.8	S01°35.3	217°47.3	N22°34.6	321°43.1	S01°48.4
1	338°41.9	229°58.6	32.6	153°52.9	35.9	232°49.2	34.6	336°45.7	48.4
2	353°44.3	244°57.9	32.4	168°53.9	36.6	247°51.2	34.5	351°48.3	48.5
3	8°46.8	259°57.2	·· 32.1	183°54.9	·· 37.2	262°53.1	·· 34.5	6°50.8	·· 48.6
4	23°49.3	274°56.5	31.9	198°55.9	37.9	277°55.0	34.4	21°53.4	48.6
5	38°51.7	289°55.8	31.6	213°57.0	38.5	292°56.9	34.4	36°56.0	48.7
6	53°54.2	304°55.1	N21°31.4	228°58.0	S01°39.2	307°58.8	N22°34.3	51°58.6	S01°48.7
7	68°56.7	319°54.4	31.1	243°59.0	39.8	323°00.8	34.3	67°01.2	48.8
8	83°59.1	334°53.7	30.9	259°00.0	40.5	338°02.7	34.2	82°03.7	48.9
9	99°01.6	349°53.0	·· 30.6	274°01.1	·· 41.1	353°04.6	·· 34.1	97°06.3	·· 48.9
10	114°04.1	4°52.3	30.4	289°02.1	41.8	8°06.5	34.1	112°08.9	49.0
11	129°06.5	19°51.6	30.1	304°03.1	42.4	23°08.5	34.0	127°11.5	49.0
12	144°09.0	34°50.9	N21°29.9	319°04.1	S01°43.1	38°10.4	N22°34.0	142°14.0	S01°49.1
13	159°11.4	49°50.2	29.6	334°05.2	43.7	53°12.3	33.9	157°16.6	49.2
14	174°13.9	64°49.5	29.4	349°06.2	44.4	68°14.2	33.9	172°19.2	49.2
15	189°16.4	79°48.8	·· 29.1	4°07.2	·· 45.0	83°16.1	·· 33.8	187°21.8	·· 49.3
16	204°18.8	94°48.1	28.9	19°08.2	45.7	98°18.1	33.8	202°24.4	49.3
17	219°21.3	109°47.4	28.6	34°09.3	46.3	113°20.0	33.7	217°26.9	49.4
18	234°23.8	124°46.7	N21°28.3	49°10.3	S01°47.0	128°21.9	N22°33.7	232°29.5	S01°49.5
19	249°26.2	139°46.0	28.1	64°11.3	47.7	143°23.8	33.6	247°32.1	49.5
20	264°28.7	154°45.3	27.8	79°12.3	48.3	158°25.8	33.6	262°34.7	49.6
21	279°31.2	169°44.6	·· 27.6	94°13.4	·· 49.0	173°27.7	·· 33.5	277°37.3	·· 49.6
22	294°33.6	184°43.9	27.3	109°14.4	49.6	188°29.6	33.5	292°39.8	49.7
23	309°36.1	199°43.2	27.0	124°15.4	50.3	203°31.5	33.4	307°42.4	49.8
Mer.pass.	02:25	ν -0.7′	d -0.2′	m -3.97	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′ m -1.94	ν 2.6′	d -0.1′ m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	324°38.6	214°42.5	N21°26.8	139°16.4	S01°50.9	218°33.5	N22°33.4	322°45.0	S01°49.8
1	339°41.0	229°41.8	26.5	154°17.5	51.6	233°35.4	33.3	337°47.6	49.9
2	354°43.5	244°41.1	26.2	169°18.5	52.2	248°37.3	33.3	352°50.2	49.9
3	9°45.9	259°40.4	·· 26.0	184°19.5	·· 52.9	263°39.2	·· 33.2	7°52.8	·· 50.0
4	24°48.4	274°39.7	25.7	199°20.5	53.5	278°41.2	33.2	22°55.3	50.1
5	39°50.9	289°39.0	25.4	214°21.6	54.2	293°43.1	33.1	37°57.9	50.1
6	54°53.3	304°38.3	N21°25.1	229°22.6	S01°54.8	308°45.0	N22°33.1	53°00.5	S01°50.2
7	69°55.8	319°37.7	24.9	244°23.6	55.5	323°46.9	33.0	68°03.1	50.2
8	84°58.3	334°37.0	24.6	259°24.6	56.1	338°48.9	33.0	83°05.7	50.3
9	100°00.7	349°36.3	·· 24.3	274°25.7	·· 56.8	353°50.8	·· 32.9	98°08.2	·· 50.4
10	115°03.2	4°35.6	24.1	289°26.7	57.4	8°52.7	32.9	113°10.8	50.4
11	130°05.7	19°34.9	23.8	304°27.7	58.1	23°54.7	32.8	128°13.4	50.5
12	145°08.1	34°34.2	N21°23.5	319°28.7	S01°58.8	38°56.6	N22°32.8	143°16.0	S01°50.5
13	160°10.6	49°33.5	23.2	334°29.7	01°59.4	53°58.5	32.7	158°18.6	50.6
14	175°13.0	64°32.8	22.9	349°30.8	02°00.1	69°00.4	32.7	173°21.2	50.7
15	190°15.5	79°32.1	·· 22.7	4°31.8	·· 00.7	84°02.4	·· 32.6	188°23.7	·· 50.7
16	205°18.0	94°31.4	22.4	19°32.8	01.4	99°04.3	32.6	203°26.3	50.8
17	220°20.4	109°30.7	22.1	34°33.8	02.0	114°06.2	32.5	218°28.9	50.8
18	235°22.9	124°30.0	N21°21.8	49°34.9	S02°02.7	129°08.1	N22°32.5	233°31.5	S01°50.9
19	250°25.4	139°29.3	21.5	64°35.9	03.3	144°10.1	32.4	248°34.1	51.0
20	265°27.8	154°28.6	21.2	79°36.9	04.0	159°12.0	32.4	263°36.7	51.0
21	280°30.3	169°27.9	·· 21.0	94°37.9	·· 04.6	174°13.9	·· 32.3	278°39.2	·· 51.1
22	295°32.8	184°27.2	20.7	109°38.9	05.3	189°15.8	32.2	293°41.8	51.1
23	310°35.2	199°26.5	20.4	124°40.0	05.9	204°17.8	32.2	308°44.4	51.2
Mer.pass.	02:21	ν -0.7′	d -0.3′	m -3.97	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′ m -1.95	ν 2.6′	d -0.1′ m 0.72

Stars

	SHA	Dec
Alpheratz	357°34.0	29°13.9
Ankaa	353°06.3	-42°09.7
Schedar	349°30.1	56°40.6
Diphda	348°46.6	-17°50.6
Achernar	335°19.5	-57°06.1
Hamal	327°50.5	23°35.0
Polaris	313°44.9	89°22.0
Acamar	315°11.3	-40°11.8
Menkar	314°05.6	4°11.5
Mirfak	308°27.5	49°57.0
Aldebaran	290°39.1	16°33.7
Rigel	281°03.5	-8°10.1
Capella	280°21.4	46°01.3
Bellatrix	278°22.5	6°22.5
Elnath	278°01.4	28°37.7
Alnilam	275°37.4	-1°11.0
Betelgeuse	270°51.7	7°24.8
Canopus	263°52.6	-52°42.2
Sirius	258°26.1	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.6	5°09.7
Pollux	243°17.0	27°57.9
Avior	234°15.2	-59°35.3
Suhail	222°46.4	-43°32.0
Miaplacidus	221°39.2	-69°49.2
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.9
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.7
Gacrux	171°51.5	-57°15.6
Alioth	166°12.8	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.8	49°11.4
Hadar	148°35.5	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.8	-60°56.7
Kochab	137°19.9	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.6	-69°04.6
Sabik	102°02.0	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.1
Deneb	49°25.0	45°22.4
Enif	33°38.0	9°59.6
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.4
Markab	13°29.1	15°20.7

Aug 14 Thu	SHA	Mer.pass
Venus	252°35.7	09:39
Mars	175°46.9	14:45
Jupiter	254°20.9	09:31
Saturn	358°01.0	02:37

Aug 15 Fri	SHA	Mer.pass
Venus	251°19.8	09:40
Mars	175°12.4	14:44
Jupiter	254°07.9	09:28
Saturn	358°03.7	02:33

Aug 16 Sat	SHA	Mer.pass
Venus	250°04.0	09:42
Mars	174°37.9	14:42
Jupiter	253°54.9	09:25
Saturn	358°06.5	02:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.9	N14°20.6	303°21.3	11.0′	N11°17.3	15.8′	59.3′
1	193°49.0	19.8	317°51.2	10.9′	11°33.1	15.7′	59.3′
2	208°49.1	19.1	332°21.1	10.8′	11°48.8	15.7′	59.3′
3	223°49.2	·· 18.3	346°50.9	10.8′	12°04.5	15.6′	59.3′
4	238°49.3	17.5	1°20.7	10.7′	12°20.1	15.6′	59.3′
5	253°49.4	16.7	15°50.4	10.6′	12°35.7	15.5′	59.3′
6	268°49.6	N14°16.0	30°20.0	10.6′	N12°51.2	15.4′	59.3′
7	283°49.7	15.2	44°49.6	10.5′	13°06.6	15.3′	59.3′
8	298°49.8	14.4	59°19.1	10.4′	13°21.9	15.3′	59.3′
9	313°49.9	·· 13.6	73°48.5	10.4′	13°37.2	15.2′	59.3′
10	328°50.0	12.9	88°17.9	10.3′	13°52.4	15.2′	59.3′
11	343°50.2	12.1	102°47.2	10.2′	14°07.6	15.0′	59.3′
12	358°50.3	N14°11.3	117°16.4	10.1′	N14°22.6	15.0′	59.3′
13	13°50.4	10.5	131°45.5	10.1′	14°37.6	14.9′	59.3′
14	28°50.5	09.8	146°14.6	10.0′	14°52.5	14.8′	59.3′
15	43°50.6	·· 09.0	160°43.6	9.9′	15°07.3	14.8′	59.3′
16	58°50.8	08.2	175°12.5	9.8′	15°22.1	14.6′	59.3′
17	73°50.9	07.4	189°41.3	9.8′	15°36.7	14.6′	59.3′
18	88°51.0	N14°06.7	204°10.1	9.7′	N15°51.3	14.5′	59.3′
19	103°51.1	05.9	218°38.7	9.6′	16°05.8	14.4′	59.3′
20	118°51.2	05.1	233°07.3	9.5′	16°20.2	14.3′	59.3′
21	133°51.4	·· 04.3	247°35.8	9.4′	16°34.5	14.2′	59.3′
22	148°51.5	03.5	262°04.3	9.3′	16°48.7	14.1′	59.3′
23	163°51.6	02.8	276°32.6	9.3′	17°02.8	14.0′	59.3′
	SD = 15.8′	d = -0.8′	SD = 16.2′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.7	N14°02.0	291°00.9	9.2′	N17°16.8	13.9′	59.3′
1	193°51.9	01.2	305°29.1	9.1′	17°30.7	13.8′	59.3′
2	208°52.0	14°00.4	319°57.2	9.0′	17°44.5	13.8′	59.3′
3	223°52.1	13°59.6	334°25.2	8.9′	17°58.3	13.6′	59.3′
4	238°52.2	58.9	348°53.1	8.8′	18°11.9	13.5′	59.3′
5	253°52.4	58.1	3°20.9	8.8′	18°25.4	13.4′	59.3′
6	268°52.5	N13°57.3	17°48.7	8.7′	N18°38.8	13.3′	59.3′
7	283°52.6	56.5	32°16.3	8.6′	18°52.1	13.2′	59.3′
8	298°52.7	55.7	46°43.9	8.5′	19°05.3	13.1′	59.3′
9	313°52.9	·· 54.9	61°11.4	8.4′	19°18.4	12.9′	59.3′
10	328°53.0	54.2	75°38.8	8.3′	19°31.3	12.9′	59.3′
11	343°53.1	53.4	90°06.1	8.2′	19°44.2	12.7′	59.3′
12	358°53.2	N13°52.6	104°33.3	8.1′	N19°56.9	12.6′	59.3′
13	13°53.4	51.8	119°00.5	8.0′	20°09.5	12.5′	59.3′
14	28°53.5	51.0	133°27.5	7.9′	20°22.0	12.4′	59.3′
15	43°53.6	·· 50.2	147°54.4	7.9′	20°34.4	12.2′	59.3′
16	58°53.7	49.4	162°21.3	7.8′	20°46.6	12.2′	59.3′
17	73°53.9	48.7	176°48.1	7.7′	20°58.8	12.0′	59.3′
18	88°54.0	N13°47.9	191°14.7	7.6′	N21°10.8	11.9′	59.3′
19	103°54.1	47.1	205°41.3	7.5′	21°22.7	11.7′	59.3′
20	118°54.2	46.3	220°07.8	7.4′	21°34.4	11.6′	59.3′
21	133°54.4	·· 45.5	234°34.2	7.3′	21°46.0	11.5′	59.2′
22	148°54.5	44.7	249°00.5	7.2′	21°57.5	11.4′	59.2′
23	163°54.6	43.9	263°26.7	7.1′	22°08.9	11.2′	59.2′
	SD = 15.8′	d = -0.8′	SD = 16.2′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.8	N13°43.1	277°52.9	7.0′	N22°20.1	11.0′	59.2′
1	193°54.9	42.3	292°18.9	6.9′	22°31.1	11.0′	59.2′
2	208°55.0	41.6	306°44.8	6.9′	22°42.1	10.8′	59.2′
3	223°55.1	·· 40.8	321°10.7	6.8′	22°52.9	10.6′	59.2′
4	238°55.3	40.0	335°36.5	6.7′	23°03.5	10.5′	59.2′
5	253°55.4	39.2	350°02.1	6.6′	23°14.0	10.4′	59.2′
6	268°55.5	N13°38.4	4°27.7	6.5′	N23°24.4	10.2′	59.2′
7	283°55.7	37.6	18°53.2	6.4′	23°34.6	10.1′	59.2′
8	298°55.8	36.8	33°18.6	6.3′	23°44.7	9.9′	59.2′
9	313°55.9	·· 36.0	47°43.9	6.2′	23°54.6	9.8′	59.2′
10	328°56.1	35.2	62°09.2	6.1′	24°04.4	9.6′	59.2′
11	343°56.2	34.4	76°34.3	6.1′	24°14.0	9.5′	59.2′
12	358°56.3	N13°33.6	90°59.4	6.0′	N24°23.5	9.3′	59.2′
13	13°56.4	32.8	105°24.3	5.9′	24°32.8	9.2′	59.2′
14	28°56.6	32.0	119°49.2	5.8′	24°42.0	9.0′	59.2′
15	43°56.7	·· 31.2	134°14.0	5.7′	24°51.0	8.8′	59.2′
16	58°56.8	30.5	148°38.8	5.6′	24°59.8	8.7′	59.1′
17	73°57.0	29.7	163°03.4	5.6′	25°08.5	8.5′	59.1′
18	88°57.1	N13°28.9	177°28.0	5.5′	N25°17.0	8.3′	59.1′
19	103°57.2	28.1	191°52.5	5.4′	25°25.3	8.2′	59.1′
20	118°57.4	27.3	206°16.9	5.3′	25°33.5	8.0′	59.1′
21	133°57.5	·· 26.5	220°41.2	5.3′	25°41.5	7.9′	59.1′
22	148°57.6	25.7	235°05.4	5.2′	25°49.4	7.7′	59.1′
23	163°57.8	24.9	249°29.6	5.1′	25°57.1	7.5′	59.1′
	SD = 15.8′	d = -0.8′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:26	21:37	–:–	–:–
N 70°	–:–	–:–	02:57	21:07	23:25	–:–
68°	–:–	01:45	03:20	20:45	22:17	–:–
66°	–:–	02:22	03:38	20:28	21:42	–:–
64°	–:–	02:48	03:53	20:14	21:18	23:30
62°	01:33	03:07	04:04	20:02	20:59	22:30
60°	02:07	03:23	04:15	19:52	20:43	21:58
N 58°	02:31	03:37	04:24	19:44	20:30	21:35
56°	02:49	03:48	04:31	19:36	20:19	21:17
54°	03:04	03:58	04:38	19:30	20:10	21:02
52°	03:17	04:06	04:44	19:23	20:01	20:50
50°	03:28	04:14	04:50	19:18	19:54	20:39
45°	03:51	04:30	05:02	19:06	19:38	20:17
N 40°	04:08	04:43	05:12	18:56	19:25	20:00
35°	04:21	04:53	05:20	18:48	19:15	19:47
30°	04:32	05:02	05:27	18:41	19:06	19:36
20°	04:50	05:17	05:40	18:29	18:51	19:18
N 10°	05:04	05:29	05:51	18:18	18:39	19:05
0°	05:15	05:40	06:01	18:08	18:29	18:54
S 10°	05:24	05:49	06:11	17:58	18:20	18:44
20°	05:33	05:59	06:22	17:48	18:10	18:36
30°	05:41	06:09	06:33	17:36	18:00	18:29
35°	05:44	06:14	06:40	17:29	17:55	18:25
40°	05:48	06:20	06:48	17:21	17:49	18:21
45°	05:52	06:27	06:57	17:12	17:43	18:18
S 50°	05:56	06:34	07:08	17:02	17:36	18:14
52°	05:58	06:37	07:13	16:57	17:32	18:12
54°	05:59	06:41	07:18	16:51	17:29	18:10
56°	06:01	06:45	07:24	16:45	17:25	18:09
58°	06:03	06:49	07:31	16:39	17:21	18:07
S 60°	06:05	06:54	07:39	16:31	17:16	18:05

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	18:22	▭	▭	13:50	▭	▭
N 70°	18:59	▭	▭	13:15	▭	▭
68°	19:25	18:25	▭	12:51	15:43	▭
66°	19:45	19:14	▭	12:32	14:55	▭
64°	20:02	19:46	19:10	12:17	14:24	16:59
62°	20:15	20:09	20:02	12:05	14:02	16:08
60°	20:27	20:28	20:34	11:55	13:43	15:37
N 58°	20:37	20:44	20:58	11:46	13:28	15:13
56°	20:46	20:58	21:17	11:38	13:15	14:55
54°	20:54	21:10	21:34	11:31	13:04	14:39
52°	21:01	21:20	21:48	11:24	12:55	14:25
50°	21:08	21:30	22:00	11:19	12:46	14:13
45°	21:22	21:50	22:26	11:07	12:27	13:49
N 40°	21:33	22:06	22:46	10:57	12:12	13:29
35°	21:43	22:20	23:03	10:48	12:00	13:13
30°	21:52	22:32	23:18	10:41	11:49	12:59
20°	22:07	22:53	23:43	10:28	11:30	12:35
N 10°	22:21	23:11	·· ··	10:17	11:14	12:14
0°	22:34	23:28	·· ··	10:06	10:59	11:55
S 10°	22:46	23:45	·· ··	09:56	10:44	11:36
20°	23:00	·· ··	00:04	09:45	10:28	11:16
30°	23:16	·· ··	00:25	09:33	10:10	10:52
35°	23:25	·· ··	00:38	09:25	09:59	10:39
40°	23:36	·· ··	00:53	09:17	09:47	10:23
45°	23:49	·· ··	01:10	09:08	09:33	10:04
S 50°	·· ··	00:04	01:32	08:57	09:16	09:41
52°	·· ··	00:12	01:43	08:51	09:08	09:30
54°	·· ··	00:20	01:55	08:46	08:59	09:18
56°	·· ··	00:29	02:08	08:39	08:49	09:03
58°	·· ··	00:39	02:24	08:32	08:37	08:46
S 60°	·· ··	00:51	02:44	08:24	08:24	08:26

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 21-23 75-53%
14	04:45	04:39	12:05	03:54	16:20	
15	04:33	04:27	12:04	04:46	17:13	
16	04:21	04:15	12:04	05:41	18:11	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2389 sec ΔT = TT-UT1 = +68.9451 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	325°37.7	214°25.8	N21°20.1	139°41.0	S02°06.6	219°19.7	N22°32.1	323°47.0	S01°51.3
1	340°40.2	229°25.1	19.8	154°42.0	07.2	234°21.6	32.1	338°49.6	51.3
2	355°42.6	244°24.4	19.5	169°43.0	07.9	249°23.6	32.0	353°52.2	51.4
3	10°45.1	259°23.7	·· 19.2	184°44.1	·· 08.5	264°25.5	·· 32.0	8°54.7	·· 51.5
4	25°47.5	274°23.0	18.9	199°45.1	09.2	279°27.4	31.9	23°57.3	51.5
5	40°50.0	289°22.3	18.6	214°46.1	09.9	294°29.3	31.9	38°59.9	51.6
6	55°52.5	304°21.6	N21°18.3	229°47.1	S02°10.5	309°31.3	N22°31.8	54°02.5	S01°51.6
7	70°54.9	319°21.0	18.0	244°48.1	11.2	324°33.2	31.8	69°05.1	51.7
8	85°57.4	334°20.3	17.7	259°49.2	11.8	339°35.1	31.7	84°07.7	51.8
9	100°59.9	349°19.6	·· 17.4	274°50.2	·· 12.5	354°37.1	·· 31.7	99°10.2	·· 51.8
10	116°02.3	4°18.9	17.1	289°51.2	13.1	9°39.0	31.6	114°12.8	51.9
11	131°04.8	19°18.2	16.8	304°52.2	13.8	24°40.9	31.6	129°15.4	51.9
12	146°07.3	34°17.5	N21°16.5	319°53.2	S02°14.4	39°42.8	N22°31.5	144°18.0	S01°52.0
13	161°09.7	49°16.8	16.2	334°54.3	15.1	54°44.8	31.5	159°20.6	52.1
14	176°12.2	64°16.1	15.9	349°55.3	15.7	69°46.7	31.4	174°23.2	52.1
15	191°14.7	79°15.4	·· 15.6	4°56.3	·· 16.4	84°48.6	·· 31.4	189°25.8	·· 52.2
16	206°17.1	94°14.7	15.3	19°57.3	17.0	99°50.6	31.3	204°28.3	52.3
17	221°19.6	109°14.0	15.0	34°58.3	17.7	114°52.5	31.3	219°30.9	52.3
18	236°22.0	124°13.3	N21°14.7	49°59.3	S02°18.4	129°54.4	N22°31.2	234°33.5	S01°52.4
19	251°24.5	139°12.6	14.4	65°00.4	19.0	144°56.4	31.2	249°36.1	52.4
20	266°27.0	154°11.9	14.1	80°01.4	19.7	159°58.3	31.1	264°38.7	52.5
21	281°29.4	169°11.2	·· 13.8	95°02.4	·· 20.3	175°00.2	·· 31.1	279°41.3	·· 52.6
22	296°31.9	184°10.5	13.4	110°03.4	21.0	190°02.2	31.0	294°43.9	52.6
23	311°34.4	199°09.8	13.1	125°04.4	21.6	205°04.1	31.0	309°46.4	52.7
Mer.pass.	02:17	ν -0.7′	d -0.3′	m -3.97	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′	m -1.95	ν 2.6′	d -0.1′	m 0.72

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	326°36.8	214°09.1	N21°12.8	140°05.5	S02°22.3	220°06.0	N22°30.9	324°49.0	S01°52.7
1	341°39.3	229°08.4	12.5	155°06.5	22.9	235°07.9	30.8	339°51.6	52.8
2	356°41.8	244°07.8	12.2	170°07.5	23.6	250°09.9	30.8	354°54.2	52.9
3	11°44.2	259°07.1	·· 11.9	185°08.5	·· 24.2	265°11.8	·· 30.7	9°56.8	·· 52.9
4	26°46.7	274°06.4	11.5	200°09.5	24.9	280°13.7	30.7	24°59.4	53.0
5	41°49.2	289°05.7	11.2	215°10.5	25.5	295°15.7	30.6	40°02.0	53.1
6	56°51.6	304°05.0	N21°10.9	230°11.6	S02°26.2	310°17.6	N22°30.6	55°04.6	S01°53.1
7	71°54.1	319°04.3	10.6	245°12.6	26.8	325°19.5	30.5	70°07.1	53.2
8	86°56.5	334°03.6	10.3	260°13.6	27.5	340°21.5	30.5	85°09.7	53.2
9	101°59.0	349°02.9	·· 09.9	275°14.6	·· 28.2	355°23.4	·· 30.4	100°12.3	·· 53.3
10	117°01.5	4°02.2	09.6	290°15.6	28.8	10°25.3	30.4	115°14.9	53.4
11	132°03.9	19°01.5	09.3	305°16.6	29.5	25°27.3	30.3	130°17.5	53.4
12	147°06.4	34°00.8	N21°09.0	320°17.7	S02°30.1	40°29.2	N22°30.3	145°20.1	S01°53.5
13	162°08.9	49°00.1	08.6	335°18.7	30.8	55°31.1	30.2	160°22.7	53.6
14	177°11.3	63°59.4	08.3	350°19.7	31.4	70°33.1	30.2	175°25.3	53.6
15	192°13.8	78°58.7	·· 08.0	5°20.7	·· 32.1	85°35.0	·· 30.1	190°27.9	·· 53.7
16	207°16.3	93°58.0	07.6	20°21.7	32.7	100°36.9	30.1	205°30.4	53.8
17	222°18.7	108°57.4	07.3	35°22.7	33.4	115°38.9	30.0	220°33.0	53.8
18	237°21.2	123°56.7	N21°07.0	50°23.8	S02°34.0	130°40.8	N22°30.0	235°35.6	S01°53.9
19	252°23.7	138°56.0	06.6	65°24.8	34.7	145°42.7	29.9	250°38.2	53.9
20	267°26.1	153°55.3	06.3	80°25.8	35.3	160°44.7	29.9	265°40.8	54.0
21	282°28.6	168°54.6	·· 06.0	95°26.8	·· 36.0	175°46.6	·· 29.8	280°43.4	·· 54.1
22	297°31.0	183°53.9	05.6	110°27.8	36.7	190°48.5	29.8	295°46.0	54.1
23	312°33.5	198°53.2	05.3	125°28.8	37.3	205°50.5	29.7	310°48.6	54.2
Mer.pass.	02:13	ν -0.7′	d -0.3′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′	m -1.95	ν 2.6′	d -0.1′	m 0.71

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	327°36.0	213°52.5	N21°04.9	140°29.8	S02°38.0	220°52.4	N22°29.6	325°51.2	S01°54.3
1	342°38.4	228°51.8	04.6	155°30.9	38.6	235°54.3	29.6	340°53.7	54.3
2	357°40.9	243°51.1	04.3	170°31.9	39.3	250°56.3	29.5	355°56.3	54.4
3	12°43.4	258°50.4	·· 03.9	185°32.9	·· 39.9	265°58.2	·· 29.5	10°58.9	·· 54.4
4	27°45.8	273°49.7	03.6	200°33.9	40.6	281°00.1	29.4	26°01.5	54.5
5	42°48.3	288°49.0	03.2	215°34.9	41.2	296°02.1	29.4	41°04.1	54.6
6	57°50.8	303°48.4	N21°02.9	230°35.9	S02°41.9	311°04.0	N22°29.3	56°06.7	S01°54.6
7	72°53.2	318°47.7	02.5	245°36.9	42.5	326°05.9	29.3	71°09.3	54.7
8	87°55.7	333°47.0	02.2	260°38.0	43.2	341°07.9	29.2	86°11.9	54.8
9	102°58.2	348°46.3	·· 01.8	275°39.0	·· 43.8	356°09.8	·· 29.2	101°14.5	·· 54.8
10	118°00.6	3°45.6	01.5	290°40.0	44.5	11°11.7	29.1	116°17.1	54.9
11	133°03.1	18°44.9	01.1	305°41.0	45.2	26°13.7	29.1	131°19.6	55.0
12	148°05.5	33°44.2	N21°00.8	320°42.0	S02°45.8	41°15.6	N22°29.0	146°22.2	S01°55.0
13	163°08.0	48°43.5	00.4	335°43.0	46.5	56°17.6	29.0	161°24.8	55.1
14	178°10.5	63°42.8	21°00.1	350°44.0	47.1	71°19.5	28.9	176°27.4	55.1
15	193°12.9	78°42.1	20°59.7	5°45.1	·· 47.8	86°21.4	·· 28.9	191°30.0	·· 55.2
16	208°15.4	93°41.4	59.4	20°46.1	48.4	101°23.4	28.8	206°32.6	55.3
17	223°17.9	108°40.8	59.0	35°47.1	49.1	116°25.3	28.8	221°35.2	55.3
18	238°20.3	123°40.1	N20°58.6	50°48.1	S02°49.7	131°27.2	N22°28.7	236°37.8	S01°55.4
19	253°22.8	138°39.4	58.3	65°49.1	50.4	146°29.2	28.6	251°40.4	55.5
20	268°25.3	153°38.7	57.9	80°50.1	51.0	161°31.1	28.6	266°43.0	55.5
21	283°27.7	168°38.0	·· 57.6	95°51.1	·· 51.7	176°33.0	·· 28.5	281°45.6	·· 55.6
22	298°30.2	183°37.3	57.2	110°52.1	52.3	191°35.0	28.5	296°48.2	55.7
23	313°32.6	198°36.6	56.8	125°53.1	53.0	206°36.9	28.4	311°50.7	55.7
Mer.pass.	02:09	ν -0.7′	d -0.3′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′	m -1.95	ν 2.6′	d -0.1′	m 0.71

Stars

	SHA	Dec
Alpheratz	357°34.0	29°13.9
Ankaa	353°06.3	-42°09.7
Schedar	349°30.1	56°40.6
Diphda	348°46.5	-17°50.5
Achernar	335°19.5	-57°06.1
Hamal	327°50.5	23°35.0
Polaris	313°43.1	89°22.0
Acamar	315°11.3	-40°11.8
Menkar	314°05.6	4°11.5
Mirfak	308°27.5	49°57.0
Aldebaran	290°39.1	16°33.7
Rigel	281°03.5	-8°10.1
Capella	280°21.3	46°01.3
Bellatrix	278°22.5	6°22.5
Elnath	278°01.4	28°37.7
Alnilam	275°37.4	-1°11.0
Betelgeuse	270°51.7	7°24.8
Canopus	263°52.5	-52°42.2
Sirius	258°26.0	-16°44.9
Adhara	255°05.8	-29°00.2
Procyon	244°50.6	5°09.7
Pollux	243°17.0	27°57.9
Avior	234°15.2	-59°35.3
Suhail	222°46.4	-43°32.0
Miaplacidus	221°39.2	-69°49.2
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.9
Denebola	182°24.7	14°25.9
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.6
Gacrux	171°51.5	-57°15.6
Alioth	166°12.9	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.8	49°11.4
Hadar	148°35.5	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.5	19°03.1
Rigil Kent.	139°39.8	-60°56.7
Kochab	137°20.0	74°03.3
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.7	-69°04.6
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.6	51°29.3
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.2
Deneb	49°25.0	45°22.4
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.4
Markab	13°29.1	15°20.7

Aug 17 Sun	SHA	Mer.pass
Venus	248°48.1	09:43
Mars	174°03.3	14:40
Jupiter	253°42.0	09:21
Saturn	358°09.3	02:24

Aug 18 Mon	SHA	Mer.pass
Venus	247°32.3	09:44
Mars	173°28.6	14:39
Jupiter	253°29.2	09:18
Saturn	358°12.2	02:20

Aug 19 Tue	SHA	Mer.pass
Venus	246°16.5	09:45
Mars	172°53.9	14:37
Jupiter	253°16.4	09:15
Saturn	358°15.2	02:16

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.9	N13°24.1	263°53.7	5.0′	N26°04.6	7.3′	59.1′
1	193°58.0	23.3	278°17.7	5.0′	26°11.9	7.2′	59.1′
2	208°58.2	22.5	292°41.7	4.9′	26°19.1	7.0′	59.1′
3	223°58.3	·· 21.7	307°05.6	4.8′	26°26.1	6.8′	59.1′
4	238°58.4	20.9	321°29.4	4.8′	26°32.9	6.6′	59.1′
5	253°58.6	20.1	335°53.2	4.7′	26°39.5	6.5′	59.0′
6	268°58.7	N13°19.3	350°16.9	4.6′	N26°46.0	6.3′	59.0′
7	283°58.8	18.5	4°40.5	4.6′	26°52.3	6.1′	59.0′
8	298°59.0	17.7	19°04.1	4.5′	26°58.4	5.9′	59.0′
9	313°59.1	·· 16.9	33°27.6	4.5′	27°04.3	5.8′	59.0′
10	328°59.2	16.1	47°51.0	4.4′	27°10.1	5.6′	59.0′
11	343°59.4	15.3	62°14.4	4.3′	27°15.7	5.4′	59.0′
12	358°59.5	N13°14.5	76°37.8	4.3′	N27°21.1	5.2′	59.0′
13	13°59.7	13.7	91°01.1	4.2′	27°26.3	5.0′	59.0′
14	28°59.8	12.9	105°24.3	4.2′	27°31.3	4.8′	59.0′
15	43°59.9	·· 12.1	119°47.5	4.2′	27°36.1	4.7′	59.0′
16	59°00.1	11.2	134°10.7	4.1′	27°40.8	4.4′	58.9′
17	74°00.2	10.4	148°33.8	4.1′	27°45.2	4.3′	58.9′
18	89°00.3	N13°09.6	162°56.8	4.0′	N27°49.5	4.1′	58.9′
19	104°00.5	08.8	177°19.9	4.0′	27°53.6	3.9′	58.9′
20	119°00.6	08.0	191°42.9	4.0′	27°57.5	3.7′	58.9′
21	134°00.8	·· 07.2	206°05.8	3.9′	28°01.2	3.5′	58.9′
22	149°00.9	06.4	220°28.7	3.9′	28°04.7	3.3′	58.9′
23	164°01.0	05.6	234°51.6	3.9′	28°08.0	3.2′	58.9′
	SD = 15.8′	d = -0.8′	SD = 16.1′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°01.2	N13°04.8	249°14.5	3.8′	N28°11.2	2.9′	58.9′
1	194°01.3	04.0	263°37.3	3.8′	28°14.1	2.8′	58.8′
2	209°01.4	03.2	278°00.2	3.8′	28°16.9	2.5′	58.8′
3	224°01.6	·· 02.4	292°23.0	3.8′	28°19.4	2.4′	58.8′
4	239°01.7	01.6	306°45.7	3.8′	28°21.8	2.2′	58.8′
5	254°01.9	13°00.8	321°08.5	3.8′	28°24.0	2.0′	58.8′
6	269°02.0	N12°59.9	335°31.3	3.7′	N28°26.0	1.8′	58.8′
7	284°02.1	59.1	349°54.0	3.7′	28°27.8	1.6′	58.8′
8	299°02.3	58.3	4°16.7	3.7′	28°29.4	1.4′	58.8′
9	314°02.4	·· 57.5	18°39.5	3.7′	28°30.8	1.2′	58.8′
10	329°02.6	56.7	33°02.2	3.7′	28°32.0	1.0′	58.7′
11	344°02.7	55.9	47°24.9	3.7′	28°33.0	0.9′	58.7′
12	359°02.8	N12°55.1	61°47.7	3.7′	N28°33.9	0.6′	58.7′
13	14°03.0	54.3	76°10.4	3.7′	28°34.5	0.4′	58.7′
14	29°03.1	53.5	90°33.1	3.8′	28°34.9	0.3′	58.7′
15	44°03.3	·· 52.6	104°55.9	3.8′	28°35.2	0.0′	58.7′
16	59°03.4	51.8	119°18.7	3.8′	28°35.2	0.1′	58.7′
17	74°03.6	51.0	133°41.4	3.8′	28°35.1	0.3′	58.7′
18	89°03.7	N12°50.2	148°04.2	3.8′	N28°34.8	0.5′	58.6′
19	104°03.8	49.4	162°27.0	3.8′	28°34.3	0.8′	58.6′
20	119°04.0	48.6	176°49.9	3.9′	28°33.5	0.9′	58.6′
21	134°04.1	·· 47.8	191°12.8	3.9′	28°32.6	1.1′	58.6′
22	149°04.3	46.9	205°35.6	3.9′	28°31.5	1.2′	58.6′
23	164°04.4	46.1	219°58.6	4.0′	28°30.3	1.5′	58.6′
	SD = 15.8′	d = -0.8′	SD = 16.1′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°04.6	N12°45.3	234°21.5	4.0′	N28°28.8	1.7′	58.6′
1	194°04.7	44.5	248°44.5	4.0′	28°27.1	1.8′	58.5′
2	209°04.8	43.7	263°07.6	4.1′	28°25.3	2.1′	58.5′
3	224°05.0	·· 42.9	277°30.6	4.1′	28°23.2	2.2′	58.5′
4	239°05.1	42.0	291°53.7	4.2′	28°21.0	2.4′	58.5′
5	254°05.3	41.2	306°16.9	4.2′	28°18.6	2.6′	58.5′
6	269°05.4	N12°40.4	320°40.1	4.3′	N28°16.0	2.8′	58.5′
7	284°05.6	39.6	335°03.4	4.3′	28°13.2	3.0′	58.5′
8	299°05.7	38.8	349°26.7	4.4′	28°10.2	3.2′	58.4′
9	314°05.9	·· 38.0	3°50.0	4.4′	28°07.0	3.3′	58.4′
10	329°06.0	37.1	18°13.5	4.5′	28°03.7	3.5′	58.4′
11	344°06.1	36.3	32°36.9	4.5′	28°00.2	3.7′	58.4′
12	359°06.3	N12°35.5	47°00.5	4.6′	N27°56.5	3.9′	58.4′
13	14°06.4	34.7	61°24.1	4.7′	27°52.6	4.1′	58.4′
14	29°06.6	33.8	75°47.7	4.7′	27°48.5	4.2′	58.4′
15	44°06.7	·· 33.0	90°11.5	4.8′	27°44.3	4.4′	58.3′
16	59°06.9	32.2	104°35.3	4.9′	27°39.9	4.6′	58.3′
17	74°07.0	31.4	118°59.1	4.9′	27°35.3	4.8′	58.3′
18	89°07.2	N12°30.6	133°23.1	5.0′	N27°30.5	5.0′	58.3′
19	104°07.3	29.7	147°47.1	5.1′	27°25.5	5.1′	58.3′
20	119°07.5	28.9	162°11.2	5.2′	27°20.4	5.3′	58.3′
21	134°07.6	·· 28.1	176°35.4	5.3′	27°15.1	5.4′	58.2′
22	149°07.8	27.3	190°59.7	5.3′	27°09.7	5.7′	58.2′
23	164°07.9	26.4	205°24.0	5.4′	27°04.0	5.8′	58.2′
	SD = 15.8′	d = -0.8′	SD = 16.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:46	21:17	–:–	–:–
N 70°	–:–	01:16	03:13	20:51	22:41	–:–
68°	–:–	02:07	03:33	20:32	21:56	–:–
66°	–:–	02:37	03:49	20:16	21:26	–:–
64°	01:07	03:00	04:02	20:04	21:05	22:52
62°	01:52	03:18	04:13	19:53	20:48	22:11
60°	02:20	03:32	04:22	19:44	20:33	21:44
N 58°	02:41	03:44	04:30	19:36	20:22	21:24
56°	02:58	03:55	04:37	19:29	20:11	21:07
54°	03:12	04:04	04:44	19:23	20:02	20:54
52°	03:24	04:12	04:49	19:17	19:55	20:42
50°	03:34	04:19	04:54	19:12	19:48	20:32
45°	03:55	04:34	05:05	19:01	19:33	20:11
N 40°	04:11	04:46	05:15	18:52	19:21	19:56
35°	04:24	04:56	05:22	18:45	19:11	19:43
30°	04:35	05:04	05:29	18:38	19:03	19:32
20°	04:51	05:18	05:41	18:26	18:49	19:16
N 10°	05:04	05:29	05:51	18:16	18:38	19:03
0°	05:15	05:39	06:00	18:07	18:28	18:53
S 10°	05:23	05:48	06:10	17:58	18:19	18:44
20°	05:31	05:57	06:19	17:48	18:11	18:37
30°	05:38	06:06	06:31	17:37	18:02	18:30
35°	05:41	06:11	06:37	17:31	17:57	18:27
40°	05:44	06:16	06:44	17:24	17:52	18:24
45°	05:48	06:22	06:52	17:16	17:46	18:21
S 50°	05:51	06:29	07:02	17:06	17:40	18:18
52°	05:52	06:32	07:07	17:02	17:37	18:16
54°	05:54	06:35	07:12	16:57	17:34	18:15
56°	05:55	06:38	07:17	16:51	17:30	18:14
58°	05:56	06:42	07:24	16:45	17:26	18:12
S 60°	05:58	06:47	07:31	16:38	17:22	18:11

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°						
N 70°						
68°						
66°						
64°						
62°	19:43		22:24	18:34		20:12
60°	20:50	21:39	23:13	17:27	18:48	19:22
N 58°	21:25	22:19	23:44	16:52	18:08	18:51
56°	21:51	22:47	·· ··	16:27	17:40	18:28
54°	22:11	23:09	·· ··	16:07	17:19	18:08
52°	22:28	23:27	·· ··	15:50	17:01	17:52
50°	22:43	23:42	·· ··	15:35	16:45	17:38
45°	23:13	·· ··	00:13	15:06	16:14	17:09
N 40°	23:36	·· ··	00:37	14:43	15:50	16:47
35°	23:56	·· ··	00:57	14:24	15:30	16:28
30°	·· ··	00:12	01:13	14:08	15:13	16:12
20°	·· ··	00:40	01:42	13:41	14:45	15:44
N 10°	00:06	01:05	02:07	13:17	14:20	15:21
0°	00:26	01:27	02:29	12:55	13:57	14:59
S 10°	00:47	01:50	02:52	12:33	13:34	14:36
20°	01:09	02:15	03:17	12:10	13:09	14:12
30°	01:35	02:43	03:45	11:43	12:40	13:44
35°	01:51	03:00	04:02	11:26	12:23	13:28
40°	02:09	03:20	04:22	11:08	12:03	13:08
45°	02:30	03:44	04:46	10:45	11:39	12:45
S 50°	02:58	04:15	05:17	10:17	11:08	12:15
52°	03:12	04:31	05:32	10:03	10:52	12:00
54°	03:27	04:49	05:50	09:47	10:34	11:42
56°	03:46	05:11	06:11	09:28	10:11	11:21
58°	04:09	05:40	06:38	09:05	09:43	10:54
S 60°	04:39	06:22	07:17	08:34	09:01	10:15

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 24-26 41-20%
17	04:08	04:02	12:04	06:41	19:11	
18	03:55	03:49	12:04	07:42	20:13	
19	03:42	03:35	12:04	08:44	21:14	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	328°35.1	213°35.9	N20°56.5	140°54.2	S02°53.7	221°38.9	N22°28.4	326°53.3	S01°55.8
1	343°37.6	228°35.2	56.1	155°55.2	54.3	236°40.8	28.3	341°55.9	55.9
2	358°40.0	243°34.5	55.7	170°56.2	55.0	251°42.7	28.3	356°58.5	55.9
3	13°42.5	258°33.9	·· 55.4	185°57.2	·· 55.6	266°44.7	·· 28.2	12°01.1	·· 56.0
4	28°45.0	273°33.2	55.0	200°58.2	56.3	281°46.6	28.2	27°03.7	56.0
5	43°47.4	288°32.5	54.6	215°59.2	56.9	296°48.6	28.1	42°06.3	56.1
6	58°49.9	303°31.8	N20°54.3	231°00.2	S02°57.6	311°50.5	N22°28.1	57°08.9	S01°56.2
7	73°52.4	318°31.1	53.9	246°01.2	58.2	326°52.4	28.0	72°11.5	56.2
8	88°54.8	333°30.4	53.5	261°02.2	58.9	341°54.4	28.0	87°14.1	56.3
9	103°57.3	348°29.7	·· 53.2	276°03.3	02°59.5	356°56.3	·· 27.9	102°16.7	·· 56.4
10	118°59.8	3°29.0	52.8	291°04.3	03°00.2	11°58.2	27.9	117°19.3	56.4
11	134°02.2	18°28.3	52.4	306°05.3	00.9	27°00.2	27.8	132°21.9	56.5
12	149°04.7	33°27.7	N20°52.0	321°06.3	S03°01.5	42°02.1	N22°27.8	147°24.5	S01°56.6
13	164°07.1	48°27.0	51.6	336°07.3	02.2	57°04.1	27.7	162°27.0	56.6
14	179°09.6	63°26.3	51.3	351°08.3	02.8	72°06.0	27.6	177°29.6	56.7
15	194°12.1	78°25.6	·· 50.9	6°09.3	·· 03.5	87°07.9	·· 27.6	192°32.2	·· 56.8
16	209°14.5	93°24.9	50.5	21°10.3	04.1	102°09.9	27.5	207°34.8	56.8
17	224°17.0	108°24.2	50.1	36°11.3	04.8	117°11.8	27.5	222°37.4	56.9
18	239°19.5	123°23.5	N20°49.7	51°12.3	S03°05.4	132°13.8	N22°27.4	237°40.0	S01°57.0
19	254°21.9	138°22.8	49.4	66°13.4	06.1	147°15.7	27.4	252°42.6	57.0
20	269°24.4	153°22.2	49.0	81°14.4	06.7	162°17.6	27.3	267°45.2	57.1
21	284°26.9	168°21.5	·· 48.6	96°15.4	·· 07.4	177°19.6	·· 27.3	282°47.8	·· 57.1
22	299°29.3	183°20.8	48.2	111°16.4	08.0	192°21.5	27.2	297°50.4	57.2
23	314°31.8	198°20.1	47.8	126°17.4	08.7	207°23.5	27.2	312°53.0	57.3
Mer.pass.	02:05	ν -0.7′	d -0.4′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′	m -1.96	ν 2.6′	d -0.1′	m 0.71

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	329°34.3	213°19.4	N20°47.4	141°18.4	S03°09.4	222°25.4	N22°27.1	327°55.6	S01°57.3
1	344°36.7	228°18.7	47.0	156°19.4	10.0	237°27.3	27.1	342°58.2	57.4
2	359°39.2	243°18.0	46.6	171°20.4	10.7	252°29.3	27.0	358°00.8	57.5
3	14°41.6	258°17.3	·· 46.2	186°21.4	·· 11.3	267°31.2	·· 27.0	13°03.4	·· 57.5
4	29°44.1	273°16.7	45.9	201°22.4	12.0	282°33.2	26.9	28°06.0	57.6
5	44°46.6	288°16.0	45.5	216°23.4	12.6	297°35.1	26.9	43°08.6	57.7
6	59°49.0	303°15.3	N20°45.1	231°24.4	S03°13.3	312°37.1	N22°26.8	58°11.2	S01°57.7
7	74°51.5	318°14.6	44.7	246°25.4	13.9	327°39.0	26.7	73°13.8	57.8
8	89°54.0	333°13.9	44.3	261°26.5	14.6	342°40.9	26.7	88°16.4	57.9
9	104°56.4	348°13.2	·· 43.9	276°27.5	·· 15.2	357°42.9	·· 26.6	103°19.0	·· 57.9
10	119°58.9	3°12.5	43.5	291°28.5	15.9	12°44.8	26.6	118°21.5	58.0
11	135°01.4	18°11.9	43.1	306°29.5	16.6	27°46.8	26.5	133°24.1	58.1
12	150°03.8	33°11.2	N20°42.7	321°30.5	S03°17.2	42°48.7	N22°26.5	148°26.7	S01°58.1
13	165°06.3	48°10.5	42.3	336°31.5	17.9	57°50.7	26.4	163°29.3	58.2
14	180°08.8	63°09.8	41.9	351°32.5	18.5	72°52.6	26.4	178°31.9	58.3
15	195°11.2	78°09.1	·· 41.5	6°33.5	·· 19.2	87°54.5	·· 26.3	193°34.5	·· 58.3
16	210°13.7	93°08.4	41.1	21°34.5	19.8	102°56.5	26.3	208°37.1	58.4
17	225°16.1	108°07.7	40.7	36°35.5	20.5	117°58.4	26.2	223°39.7	58.5
18	240°18.6	123°07.1	N20°40.2	51°36.5	S03°21.1	133°00.4	N22°26.2	238°42.3	S01°58.5
19	255°21.1	138°06.4	39.8	66°37.5	21.8	148°02.3	26.1	253°44.9	58.6
20	270°23.5	153°05.7	39.4	81°38.5	22.4	163°04.3	26.1	268°47.5	58.7
21	285°26.0	168°05.0	·· 39.0	96°39.5	·· 23.1	178°06.2	·· 26.0	283°50.1	·· 58.7
22	300°28.5	183°04.3	38.6	111°40.5	23.8	193°08.1	25.9	298°52.7	58.8
23	315°30.9	198°03.6	38.2	126°41.5	24.4	208°10.1	25.9	313°55.3	58.9
Mer.pass.	02:01	ν -0.7′	d -0.4′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′	m -1.96	ν 2.6′	d -0.1′	m 0.70

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330°33.4	213°03.0	N20°37.8	141°42.5	S03°25.1	223°12.0	N22°25.8	328°57.9	S01°58.9
1	345°35.9	228°02.3	37.4	156°43.6	25.7	238°14.0	25.8	344°00.5	59.0
2	0°38.3	243°01.6	37.0	171°44.6	26.4	253°15.9	25.7	359°03.1	59.1
3	15°40.8	258°00.9	·· 36.5	186°45.6	·· 27.0	268°17.9	·· 25.7	14°05.7	·· 59.1
4	30°43.2	273°00.2	36.1	201°46.6	27.7	283°19.8	25.6	29°08.3	59.2
5	45°45.7	287°59.5	35.7	216°47.6	28.3	298°21.8	25.6	44°10.9	59.3
6	60°48.2	302°58.9	N20°35.3	231°48.6	S03°29.0	313°23.7	N22°25.5	59°13.5	S01°59.3
7	75°50.6	317°58.2	34.9	246°49.6	29.6	328°25.6	25.5	74°16.1	59.4
8	90°53.1	332°57.5	34.4	261°50.6	30.3	343°27.6	25.4	89°18.7	59.5
9	105°55.6	347°56.8	·· 34.0	276°51.6	·· 30.9	358°29.5	·· 25.4	104°21.3	·· 59.5
10	120°58.0	2°56.1	33.6	291°52.6	31.6	13°31.5	25.3	119°23.9	59.6
11	136°00.5	17°55.5	33.2	306°53.6	32.3	28°33.4	25.3	134°26.5	59.7
12	151°03.0	32°54.8	N20°32.7	321°54.6	S03°32.9	43°35.4	N22°25.2	149°29.1	S01°59.7
13	166°05.4	47°54.1	32.3	336°55.6	33.6	58°37.3	25.1	164°31.7	59.8
14	181°07.9	62°53.4	31.9	351°56.6	34.2	73°39.3	25.1	179°34.3	59.9
15	196°10.4	77°52.7	·· 31.5	6°57.6	·· 34.9	88°41.2	·· 25.0	194°36.9	01°59.9
16	211°12.8	92°52.0	31.0	21°58.6	35.5	103°43.2	25.0	209°39.5	02°00.0
17	226°15.3	107°51.4	30.6	36°59.6	36.2	118°45.1	24.9	224°42.1	00.1
18	241°17.7	122°50.7	N20°30.2	52°00.6	S03°36.8	133°47.1	N22°24.9	239°44.7	S02°00.1
19	256°20.2	137°50.0	29.7	67°01.6	37.5	148°49.0	24.8	254°47.3	00.2
20	271°22.7	152°49.3	29.3	82°02.6	38.1	163°51.0	24.8	269°49.9	00.3
21	286°25.1	167°48.6	·· 28.9	97°03.6	·· 38.8	178°52.9	·· 24.7	284°52.5	·· 00.3
22	301°27.6	182°48.0	28.4	112°04.6	39.5	193°54.8	24.7	299°55.1	00.4
23	316°30.1	197°47.3	28.0	127°05.6	40.1	208°56.8	24.6	314°57.7	00.5
Mer.pass.	01:57	ν -0.7′	d -0.4′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′	m -1.96	ν 2.6′	d -0.1′	m 0.70

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.3	-42°09.7
Schedar	349°30.1	56°40.6
Diphda	348°46.5	-17°50.5
Achernar	335°19.5	-57°06.1
Hamal	327°50.5	23°35.0
Polaris	313°41.3	89°22.0
Acamar	315°11.3	-40°11.8
Menkar	314°05.5	4°11.5
Mirfak	308°27.5	49°57.0
Aldebaran	290°39.1	16°33.7
Rigel	281°03.5	-8°10.1
Capella	280°21.3	46°01.3
Bellatrix	278°22.5	6°22.5
Elnath	278°01.4	28°37.7
Alnilam	275°37.3	-1°11.0
Betelgeuse	270°51.7	7°24.8
Canopus	263°52.5	-52°42.2
Sirius	258°26.0	-16°44.9
Adhara	255°05.7	-29°00.2
Procyon	244°50.6	5°09.7
Pollux	243°17.0	27°57.9
Avior	234°15.1	-59°35.3
Suhail	222°46.4	-43°32.0
Miaplacidus	221°39.1	-69°49.2
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.9
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.6
Gacrux	171°51.5	-57°15.6
Alioth	166°12.9	55°49.5
Spica	158°21.9	-11°17.7
Alkaid	152°51.8	49°11.3
Hadar	148°35.6	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°39.8	-60°56.7
Kochab	137°20.0	74°03.2
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.7	-69°04.6
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.7	51°29.3
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.2
Deneb	49°25.0	45°22.4
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.4
Markab	13°29.1	15°20.7

Aug 20 Wed	SHA	Mer.pass
Venus	245°00.8	09:46
Mars	172°19.0	14:35
Jupiter	253°03.7	09:12
Saturn	358°18.2	02:12

Aug 21 Thu	SHA	Mer.pass
Venus	243°45.2	09:47
Mars	171°44.1	14:34
Jupiter	252°51.2	09:09
Saturn	358°21.3	02:08

Aug 22 Fri	SHA	Mer.pass
Venus	242°29.6	09:48
Mars	171°09.2	14:32
Jupiter	252°38.6	09:06
Saturn	358°24.5	02:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.1	N12°25.6	219°48.4	5.5′	N26°58.2	6.0′	58.2′
1	194°08.2	24.8	234°12.9	5.6′	26°52.2	6.1′	58.2′
2	209°08.4	24.0	248°37.5	5.7′	26°46.1	6.3′	58.2′
3	224°08.5	·· 23.1	263°02.2	5.8′	26°39.8	6.4′	58.1′
4	239°08.7	22.3	277°27.0	5.9′	26°33.4	6.7′	58.1′
5	254°08.8	21.5	291°51.8	6.0′	26°26.7	6.8′	58.1′
6	269°09.0	N12°20.7	306°16.8	6.1′	N26°19.9	6.9′	58.1′
7	284°09.1	19.8	320°41.9	6.1′	26°13.0	7.1′	58.1′
8	299°09.3	19.0	335°07.0	6.2′	26°05.9	7.2′	58.1′
9	314°09.4	·· 18.2	349°32.2	6.3′	25°58.7	7.5′	58.0′
10	329°09.6	17.4	3°57.6	6.4′	25°51.2	7.5′	58.0′
11	344°09.7	16.5	18°23.0	6.5′	25°43.7	7.7′	58.0′
12	359°09.9	N12°15.7	32°48.6	6.6′	N25°36.0	7.9′	58.0′
13	14°10.0	14.9	47°14.2	6.7′	25°28.1	8.0′	58.0′
14	29°10.2	14.0	61°39.9	6.8′	25°20.1	8.2′	58.0′
15	44°10.3	·· 13.2	76°05.8	6.9′	25°11.9	8.3′	57.9′
16	59°10.5	12.4	90°31.7	7.0′	25°03.6	8.4′	57.9′
17	74°10.6	11.6	104°57.8	7.2′	24°55.2	8.6′	57.9′
18	89°10.8	N12°10.7	119°23.9	7.3′	N24°46.6	8.7′	57.9′
19	104°10.9	09.9	133°50.2	7.4′	24°37.9	8.9′	57.9′
20	119°11.1	09.1	148°16.6	7.5′	24°29.0	9.0′	57.8′
21	134°11.2	·· 08.2	162°43.0	7.6′	24°20.0	9.2′	57.8′
22	149°11.4	07.4	177°09.6	7.7′	24°10.8	9.2′	57.8′
23	164°11.5	06.6	191°36.3	7.8′	24°01.6	9.5′	57.8′
	SD = 15.8′	d = -0.8′	SD = 15.9′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.7	N12°05.7	206°03.1	7.9′	N23°52.1	9.5′	57.8′
1	194°11.8	04.9	220°30.0	8.0′	23°42.6	9.7′	57.7′
2	209°12.0	04.1	234°57.0	8.1′	23°32.9	9.8′	57.7′
3	224°12.1	·· 03.2	249°24.1	8.2′	23°23.1	9.9′	57.7′
4	239°12.3	02.4	263°51.4	8.3′	23°13.2	10.0′	57.7′
5	254°12.4	01.6	278°18.7	8.5′	23°03.2	10.2′	57.7′
6	269°12.6	N12°00.7	292°46.2	8.6′	N22°53.0	10.3′	57.6′
7	284°12.8	11°59.9	307°13.7	8.7′	22°42.7	10.4′	57.6′
8	299°12.9	59.1	321°41.4	8.8′	22°32.3	10.5′	57.6′
9	314°13.1	·· 58.2	336°09.2	8.9′	22°21.8	10.7′	57.6′
10	329°13.2	57.4	350°37.1	9.0′	22°11.1	10.7′	57.6′
11	344°13.4	56.6	5°05.1	9.1′	22°00.4	10.9′	57.5′
12	359°13.5	N11°55.7	19°33.2	9.2′	N21°49.5	11.0′	57.5′
13	14°13.7	54.9	34°01.4	9.3′	21°38.5	11.1′	57.5′
14	29°13.8	54.0	48°29.8	9.4′	21°27.4	11.2′	57.5′
15	44°14.0	·· 53.2	62°58.2	9.6′	21°16.2	11.3′	57.5′
16	59°14.2	52.4	77°26.8	9.7′	21°04.9	11.4′	57.4′
17	74°14.3	51.5	91°55.4	9.8′	20°53.5	11.5′	57.4′
18	89°14.5	N11°50.7	106°24.2	9.9′	N20°42.0	11.6′	57.4′
19	104°14.6	49.9	120°53.1	10.0′	20°30.4	11.7′	57.4′
20	119°14.8	49.0	135°22.1	10.1′	20°18.7	11.9′	57.4′
21	134°14.9	·· 48.2	149°51.2	10.2′	20°06.8	11.9′	57.3′
22	149°15.1	47.3	164°20.4	10.3′	19°54.9	12.0′	57.3′
23	164°15.3	46.5	178°49.7	10.4′	19°42.9	12.1′	57.3′
	SD = 15.8′	d = -0.8′	SD = 15.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.4	N11°45.7	193°19.1	10.5′	N19°30.8	12.1′	57.3′
1	194°15.6	44.8	207°48.6	10.6′	19°18.7	12.3′	57.2′
2	209°15.7	44.0	222°18.3	10.7′	19°06.4	12.4′	57.2′
3	224°15.9	·· 43.1	236°48.0	10.8′	18°54.0	12.4′	57.2′
4	239°16.0	42.3	251°17.8	10.9′	18°41.6	12.6′	57.2′
5	254°16.2	41.4	265°47.8	11.1′	18°29.0	12.6′	57.2′
6	269°16.4	N11°40.6	280°17.8	11.2′	N18°16.4	12.7′	57.1′
7	284°16.5	39.8	294°48.0	11.3′	18°03.7	12.7′	57.1′
8	299°16.7	38.9	309°18.2	11.4′	17°51.0	12.9′	57.1′
9	314°16.8	·· 38.1	323°48.6	11.5′	17°38.1	12.9′	57.1′
10	329°17.0	37.2	338°19.1	11.6′	17°25.2	13.0′	57.0′
11	344°17.2	36.4	352°49.6	11.7′	17°12.2	13.1′	57.0′
12	359°17.3	N11°35.5	7°20.3	11.8′	N16°59.1	13.2′	57.0′
13	14°17.5	34.7	21°51.0	11.9′	16°45.9	13.2′	57.0′
14	29°17.6	33.9	36°21.9	11.9′	16°32.7	13.3′	57.0′
15	44°17.8	·· 33.0	50°52.8	12.0′	16°19.4	13.3′	56.9′
16	59°18.0	32.2	65°23.9	12.1′	16°06.1	13.5′	56.9′
17	74°18.1	31.3	79°55.0	12.2′	15°52.6	13.5′	56.9′
18	89°18.3	N11°30.5	94°26.3	12.3′	N15°39.1	13.5′	56.9′
19	104°18.5	29.6	108°57.6	12.4′	15°25.6	13.6′	56.8′
20	119°18.6	28.8	123°29.0	12.5′	15°12.0	13.7′	56.8′
21	134°18.8	·· 27.9	138°00.5	12.6′	14°58.3	13.7′	56.8′
22	149°18.9	27.1	152°32.1	12.7′	14°44.6	13.8′	56.8′
23	164°19.1	26.2	167°03.8	12.8′	14°30.8	13.9′	56.7′
	SD = 15.8′	d = -0.8′	SD = 15.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	03:04	20:58	23:25	–:–
N 70°	–:–	01:47	03:27	20:36	22:12	–:–
68°	–:–	02:25	03:45	20:18	21:36	–:–
66°	–:–	02:51	03:59	20:05	21:11	23:30
64°	01:33	03:11	04:11	19:53	20:52	22:26
62°	02:08	03:27	04:21	19:44	20:36	21:54
60°	02:32	03:40	04:29	19:35	20:24	21:30
N 58°	02:51	03:52	04:37	19:28	20:13	21:12
56°	03:07	04:01	04:43	19:22	20:03	20:57
54°	03:19	04:10	04:49	19:16	19:55	20:45
52°	03:30	04:17	04:54	19:11	19:48	20:34
50°	03:40	04:24	04:59	19:06	19:41	20:25
45°	03:59	04:38	05:09	18:56	19:27	20:06
N 40°	04:15	04:49	05:17	18:48	19:16	19:51
35°	04:27	04:58	05:25	18:41	19:07	19:39
30°	04:37	05:06	05:31	18:35	19:00	19:29
20°	04:52	05:19	05:42	18:24	18:47	19:13
N 10°	05:04	05:30	05:51	18:15	18:36	19:02
0°	05:14	05:39	06:00	18:06	18:28	18:52
S 10°	05:22	05:47	06:08	17:58	18:19	18:44
20°	05:29	05:55	06:17	17:49	18:12	18:37
30°	05:35	06:03	06:27	17:39	18:04	18:32
35°	05:38	06:07	06:33	17:33	17:59	18:29
40°	05:40	06:12	06:40	17:27	17:55	18:26
45°	05:43	06:17	06:47	17:19	17:50	18:24
S 50°	05:45	06:23	06:56	17:11	17:44	18:22
52°	05:46	06:26	07:01	17:06	17:41	18:21
54°	05:47	06:29	07:05	17:02	17:38	18:20
56°	05:48	06:32	07:10	16:57	17:35	18:19
58°	05:49	06:35	07:16	16:51	17:32	18:18
S 60°	05:50	06:39	07:22	16:45	17:29	18:17

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▭	▭	▭	▭	▭	21:25
N 70°	▭	▭	00:07	▭	22:23	20:55
68°	▭	▭	01:12	▭	21:17	20:33
66°	▭	▭	01:47	▭	20:40	20:15
64°	23:58	·· ··	02:12	20:38	20:14	20:00
62°	·· ··	00:35	02:32	20:00	19:53	19:48
60°	·· ··	01:02	02:48	19:33	19:37	19:37
N 58°	·· ··	01:22	03:01	19:12	19:22	19:28
56°	00:07	01:39	03:13	18:54	19:10	19:20
54°	00:26	01:54	03:23	18:40	18:59	19:13
52°	00:42	02:06	03:32	18:27	18:50	19:06
50°	00:56	02:17	03:39	18:15	18:41	19:00
45°	01:24	02:40	03:56	17:51	18:23	18:47
N 40°	01:46	02:58	04:10	17:32	18:08	18:37
35°	02:04	03:13	04:22	17:16	17:55	18:27
30°	02:19	03:26	04:32	17:02	17:44	18:19
20°	02:46	03:49	04:49	16:38	17:24	18:05
N 10°	03:09	04:08	05:04	16:17	17:07	17:53
0°	03:30	04:26	05:18	15:57	16:51	17:41
S 10°	03:51	04:44	05:32	15:37	16:35	17:29
20°	04:13	05:03	05:47	15:16	16:18	17:17
30°	04:39	05:25	06:03	14:51	15:58	17:02
35°	04:55	05:38	06:13	14:37	15:46	16:53
40°	05:12	05:53	06:24	14:20	15:33	16:44
45°	05:34	06:10	06:37	13:59	15:16	16:32
S 50°	06:01	06:31	06:53	13:33	14:56	16:18
52°	06:14	06:41	07:00	13:21	14:47	16:11
54°	06:29	06:53	07:09	13:06	14:36	16:04
56°	06:46	07:06	07:18	12:49	14:24	15:56
58°	07:07	07:21	07:28	12:29	14:09	15:46
S 60°	07:34	07:39	07:40	12:02	13:52	15:36

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 27-29 12-2%
20	03:28	03:21	12:03	09:44	22:12	
21	03:13	03:06	12:03	10:39	23:05	
22	02:58	02:51	12:03	11:30	23:53	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2403 sec ΔT = TT-UT1 = +68.9437 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	331°32.5	212°46.6	N20°27.6	142°06.6	S03°40.8	223°58.7	N22°24.6	330°00.3	S02°00.5
1	346°35.0	227°45.9	27.1	157°07.6	41.4	239°00.7	24.5	345°02.9	00.6
2	1°37.5	242°45.2	26.7	172°08.6	42.1	254°02.6	24.4	0°05.5	00.7
3	16°39.9	257°44.6	·· 26.2	187°09.6	·· 42.7	269°04.6	·· 24.4	15°08.1	·· 00.7
4	31°42.4	272°43.9	25.8	202°10.6	43.4	284°06.5	24.3	30°10.7	00.8
5	46°44.9	287°43.2	25.4	217°11.6	44.0	299°08.5	24.3	45°13.3	00.9
6	61°47.3	302°42.5	N20°24.9	232°12.6	S03°44.7	314°10.4	N22°24.2	60°15.9	S02°00.9
7	76°49.8	317°41.9	24.5	247°13.6	45.3	329°12.4	24.2	75°18.5	01.0
8	91°52.2	332°41.2	24.0	262°14.6	46.0	344°14.3	24.1	90°21.1	01.1
9	106°54.7	347°40.5	·· 23.6	277°15.6	·· 46.7	359°16.3	·· 24.1	105°23.7	·· 01.1
10	121°57.2	2°39.8	23.1	292°16.6	47.3	14°18.2	24.0	120°26.3	01.2
11	136°59.6	17°39.1	22.7	307°17.6	48.0	29°20.2	24.0	135°28.9	01.3
12	152°02.1	32°38.5	N20°22.2	322°18.6	S03°48.6	44°22.1	N22°23.9	150°31.5	S02°01.3
13	167°04.6	47°37.8	21.8	337°19.6	49.3	59°24.1	23.9	165°34.1	01.4
14	182°07.0	62°37.1	21.3	352°20.6	49.9	74°26.0	23.8	180°36.7	01.5
15	197°09.5	77°36.4	·· 20.9	7°21.6	·· 50.6	89°28.0	·· 23.8	195°39.3	·· 01.5
16	212°12.0	92°35.8	20.4	22°22.6	51.2	104°29.9	23.7	210°41.9	01.6
17	227°14.4	107°35.1	20.0	37°23.6	51.9	119°31.9	23.6	225°44.5	01.7
18	242°16.9	122°34.4	N20°19.5	52°24.6	S03°52.5	134°33.8	N22°23.6	240°47.1	S02°01.8
19	257°19.3	137°33.7	19.0	67°25.6	53.2	149°35.8	23.5	255°49.7	01.8
20	272°21.8	152°33.1	18.6	82°26.6	53.8	164°37.7	23.5	270°52.3	01.9
21	287°24.3	167°32.4	·· 18.1	97°27.6	·· 54.5	179°39.7	·· 23.4	285°54.9	·· 02.0
22	302°26.7	182°31.7	17.7	112°28.6	55.2	194°41.6	23.4	300°57.5	02.0
23	317°29.2	197°31.0	17.2	127°29.6	55.8	209°43.6	23.3	316°00.1	02.1
Mer.pass.	01:54	ν -0.7′	d -0.4′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 1.9′	d -0.1′ m -1.96	ν 2.6′	d -0.1′ m 0.69

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°31.7	212°30.3	N20°16.8	142°30.6	S03°56.5	224°45.5	N22°23.3	331°02.7	S02°02.2
1	347°34.1	227°29.7	16.3	157°31.6	57.1	239°47.5	23.2	346°05.3	02.2
2	2°36.6	242°29.0	15.8	172°32.6	57.8	254°49.4	23.2	1°07.9	02.3
3	17°39.1	257°28.3	·· 15.4	187°33.6	·· 58.4	269°51.4	·· 23.1	16°10.5	·· 02.4
4	32°41.5	272°27.6	14.9	202°34.6	59.1	284°53.3	23.1	31°13.1	02.4
5	47°44.0	287°27.0	14.4	217°35.6	03°59.7	299°55.3	23.0	46°15.7	02.5
6	62°46.5	302°26.3	N20°14.0	232°36.6	S04°00.4	314°57.3	N22°22.9	61°18.4	S02°02.6
7	77°48.9	317°25.6	13.5	247°37.6	01.0	329°59.2	22.9	76°21.0	02.6
8	92°51.4	332°25.0	13.0	262°38.6	01.7	345°01.2	22.8	91°23.6	02.7
9	107°53.8	347°24.3	·· 12.6	277°39.6	·· 02.4	0°03.1	·· 22.8	106°26.2	·· 02.8
10	122°56.3	2°23.6	12.1	292°40.6	03.0	15°05.1	22.7	121°28.8	02.8
11	137°58.8	17°22.9	11.6	307°41.6	03.7	30°07.0	22.7	136°31.4	02.9
12	153°01.2	32°22.3	N20°11.1	322°42.6	S04°04.3	45°09.0	N22°22.6	151°34.0	S02°03.0
13	168°03.7	47°21.6	10.7	337°43.6	05.0	60°10.9	22.6	166°36.6	03.1
14	183°06.2	62°20.9	10.2	352°44.6	05.6	75°12.9	22.5	181°39.2	03.1
15	198°08.6	77°20.2	·· 09.7	7°45.6	·· 06.3	90°14.8	·· 22.5	196°41.8	·· 03.2
16	213°11.1	92°19.6	09.2	22°46.6	06.9	105°16.8	22.4	211°44.4	03.3
17	228°13.6	107°18.9	08.7	37°47.6	07.6	120°18.7	22.3	226°47.0	03.3
18	243°16.0	122°18.2	N20°08.3	52°48.5	S04°08.2	135°20.7	N22°22.3	241°49.6	S02°03.4
19	258°18.5	137°17.6	07.8	67°49.5	08.9	150°22.7	22.2	256°52.2	03.5
20	273°20.9	152°16.9	07.3	82°50.5	09.5	165°24.6	22.2	271°54.8	03.5
21	288°23.4	167°16.2	·· 06.8	97°51.5	·· 10.2	180°26.6	·· 22.1	286°57.4	·· 03.6
22	303°25.9	182°15.5	06.3	112°52.5	10.9	195°28.5	22.1	302°00.0	03.7
23	318°28.3	197°14.9	05.9	127°53.5	11.5	210°30.5	22.0	317°02.6	03.7
Mer.pass.	01:50	ν -0.7′	d -0.5′	m -3.96	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′ m -1.97	ν 2.6′	d -0.1′ m 0.69

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	333°30.8	212°14.2	N20°05.4	142°54.5	S04°12.2	225°32.4	N22°22.0	332°05.2	S02°03.8
1	348°33.3	227°13.5	04.9	157°55.5	12.8	240°34.4	21.9	347°07.8	03.9
2	3°35.7	242°12.9	04.4	172°56.5	13.5	255°36.3	21.9	2°10.4	04.0
3	18°38.2	257°12.2	·· 03.9	187°57.5	·· 14.1	270°38.3	·· 21.8	17°13.1	·· 04.0
4	33°40.7	272°11.5	03.4	202°58.5	14.8	285°40.2	21.8	32°15.7	04.1
5	48°43.1	287°10.8	02.9	217°59.5	15.4	300°42.2	21.7	47°18.3	04.2
6	63°45.6	302°10.2	N20°02.4	233°00.5	S04°16.1	315°44.2	N22°21.6	62°20.9	S02°04.2
7	78°48.1	317°09.5	01.9	248°01.5	16.7	330°46.1	21.6	77°23.5	04.3
8	93°50.5	332°08.8	01.5	263°02.5	17.4	345°48.1	21.5	92°26.1	04.4
9	108°53.0	347°08.2	·· 01.0	278°03.5	·· 18.0	0°50.0	·· 21.5	107°28.7	·· 04.4
10	123°55.4	2°07.5	00.5	293°04.5	18.7	15°52.0	21.4	122°31.3	04.5
11	138°57.9	17°06.8	20°00.0	308°05.4	19.4	30°53.9	21.4	137°33.9	04.6
12	154°00.4	32°06.2	N19°59.5	323°06.4	S04°20.0	45°55.9	N22°21.3	152°36.5	S02°04.6
13	169°02.8	47°05.5	59.0	338°07.4	20.7	60°57.9	21.3	167°39.1	04.7
14	184°05.3	62°04.8	58.5	353°08.4	21.3	75°59.8	21.2	182°41.7	04.8
15	199°07.8	77°04.2	·· 58.0	8°09.4	·· 22.0	91°01.8	·· 21.2	197°44.3	·· 04.9
16	214°10.2	92°03.5	57.5	23°10.4	22.6	106°03.7	21.1	212°46.9	04.9
17	229°12.7	107°02.8	57.0	38°11.4	23.3	121°05.7	21.0	227°49.5	05.0
18	244°15.2	122°02.2	N19°56.5	53°12.4	S04°23.9	136°07.6	N22°21.0	242°52.2	S02°05.1
19	259°17.6	137°01.5	56.0	68°13.4	24.6	151°09.6	20.9	257°54.8	05.1
20	274°20.1	152°00.8	55.5	83°14.4	25.2	166°11.6	20.9	272°57.4	05.2
21	289°22.5	167°00.2	·· 54.9	98°15.4	·· 25.9	181°13.5	·· 20.8	288°00.0	·· 05.3
22	304°25.0	181°59.5	54.4	113°16.4	26.5	196°15.5	20.8	303°02.6	05.3
23	319°27.5	196°58.8	53.9	128°17.3	27.2	211°17.4	20.7	318°05.2	05.4
Mer.pass.	01:46	ν -0.7′	d -0.5′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′ m -1.97	ν 2.6′	d -0.1′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.3	-42°09.7
Schedar	349°30.0	56°40.6
Diphda	348°46.5	-17°50.5
Achernar	335°19.4	-57°06.1
Hamal	327°50.4	23°35.1
Polaris	313°39.9	89°22.0
Acamar	315°11.2	-40°11.8
Menkar	314°05.5	4°11.6
Mirfak	308°27.4	49°57.0
Aldebaran	290°39.1	16°33.7
Rigel	281°03.5	-8°10.1
Capella	280°21.3	46°01.3
Bellatrix	278°22.4	6°22.5
Elnath	278°01.3	28°37.7
Alnilam	275°37.3	-1°11.0
Betelgeuse	270°51.7	7°24.8
Canopus	263°52.5	-52°42.2
Sirius	258°26.0	-16°44.9
Adhara	255°05.7	-29°00.2
Procyon	244°50.5	5°09.7
Pollux	243°17.0	27°57.9
Avior	234°15.1	-59°35.3
Suhail	222°46.4	-43°32.0
Miaplacidus	221°39.1	-69°49.2
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.9
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.6
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°21.9	-11°17.7
Alkaid	152°51.8	49°11.3
Hadar	148°35.6	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°39.8	-60°56.7
Kochab	137°20.1	74°03.2
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.1	-26°29.4
Atria	107°08.7	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.7	51°29.3
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.8	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.2
Deneb	49°25.0	45°22.4
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.4
Markab	13°29.1	15°20.7

Aug 23 Sat	SHA	Mer.pass
Venus	241°14.1	09:49
Mars	170°34.1	14:31
Jupiter	252°26.2	09:03
Saturn	358°27.8	02:00

Aug 24 Sun	SHA	Mer.pass
Venus	239°58.7	09:50
Mars	169°58.9	14:29
Jupiter	252°13.9	09:00
Saturn	358°31.1	01:55

Aug 25 Mon	SHA	Mer.pass
Venus	238°43.4	09:51
Mars	169°23.7	14:27
Jupiter	252°01.6	08:57
Saturn	358°34.4	01:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°19.3	N11°25.4	181°35.6	12.9′	N14°16.9	13.9′	56.7′
1	194°19.4	24.5	196°07.5	13.0′	14°03.0	13.9′	56.7′
2	209°19.6	23.7	210°39.4	13.0′	13°49.1	14.0′	56.7′
3	224°19.8	·· 22.8	225°11.5	13.1′	13°35.1	14.1′	56.7′
4	239°19.9	22.0	239°43.6	13.2′	13°21.0	14.1′	56.6′
5	254°20.1	21.1	254°15.8	13.3′	13°06.9	14.1′	56.6′
6	269°20.2	N11°20.3	268°48.1	13.4′	N12°52.8	14.2′	56.6′
7	284°20.4	19.4	283°20.5	13.5′	12°38.6	14.3′	56.6′
8	299°20.6	18.6	297°52.9	13.5′	12°24.3	14.2′	56.5′
9	314°20.7	·· 17.7	312°25.4	13.6′	12°10.1	14.4′	56.5′
10	329°20.9	16.9	326°58.1	13.7′	11°55.7	14.3′	56.5′
11	344°21.1	16.0	341°30.8	13.8′	11°41.4	14.4′	56.5′
12	359°21.2	N11°15.2	356°03.5	13.8′	N11°27.0	14.5′	56.4′
13	14°21.4	14.3	10°36.4	13.9′	11°12.5	14.5′	56.4′
14	29°21.6	13.5	25°09.3	14.0′	10°58.0	14.5′	56.4′
15	44°21.7	·· 12.6	39°42.3	14.1′	10°43.5	14.5′	56.4′
16	59°21.9	11.8	54°15.3	14.1′	10°29.0	14.6′	56.3′
17	74°22.1	10.9	68°48.5	14.2′	10°14.4	14.6′	56.3′
18	89°22.2	N11°10.1	83°21.7	14.3′	N09°59.8	14.7′	56.3′
19	104°22.4	09.2	97°54.9	14.3′	09°45.1	14.6′	56.3′
20	119°22.6	08.4	112°28.3	14.4′	09°30.5	14.7′	56.3′
21	134°22.7	·· 07.5	127°01.7	14.5′	09°15.8	14.7′	56.2′
22	149°22.9	06.7	141°35.2	14.5′	09°01.1	14.8′	56.2′
23	164°23.1	05.8	156°08.7	14.6′	08°46.3	14.8′	56.2′
	SD = 15.8′	d = -0.8′	SD = 15.5′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.2	N11°04.9	170°42.3	14.7′	N08°31.5	14.8′	56.2′
1	194°23.4	04.1	185°15.9	14.7′	08°16.7	14.8′	56.1′
2	209°23.6	03.2	199°49.7	14.8′	08°01.9	14.8′	56.1′
3	224°23.7	·· 02.4	214°23.5	14.8′	07°47.1	14.9′	56.1′
4	239°23.9	01.5	228°57.3	14.9′	07°32.2	14.9′	56.1′
5	254°24.1	11°00.7	243°31.2	15.0′	07°17.3	14.9′	56.0′
6	269°24.2	N10°59.8	258°05.1	15.0′	N07°02.4	14.9′	56.0′
7	284°24.4	58.9	272°39.2	15.1′	06°47.5	14.9′	56.0′
8	299°24.6	58.1	287°13.2	15.1′	06°32.6	14.9′	56.0′
9	314°24.7	·· 57.2	301°47.3	15.2′	06°17.7	15.0′	56.0′
10	329°24.9	56.4	316°21.5	15.2′	06°02.7	14.9′	55.9′
11	344°25.1	55.5	330°55.7	15.3′	05°47.8	15.0′	55.9′
12	359°25.2	N10°54.7	345°30.0	15.3′	N05°32.8	15.0′	55.9′
13	14°25.4	53.8	0°04.3	15.4′	05°17.8	15.0′	55.9′
14	29°25.6	52.9	14°38.7	15.4′	05°02.8	15.0′	55.8′
15	44°25.7	·· 52.1	29°13.1	15.5′	04°47.8	15.0′	55.8′
16	59°25.9	51.2	43°47.5	15.5′	04°32.8	15.0′	55.8′
17	74°26.1	50.4	58°22.0	15.5′	04°17.8	15.0′	55.8′
18	89°26.3	N10°49.5	72°56.6	15.6′	N04°02.8	15.0′	55.7′
19	104°26.4	48.6	87°31.2	15.6′	03°47.8	15.1′	55.7′
20	119°26.6	47.8	102°05.8	15.7′	03°32.7	15.0′	55.7′
21	134°26.8	·· 46.9	116°40.4	15.7′	03°17.7	15.0′	55.7′
22	149°26.9	46.0	131°15.1	15.7′	03°02.7	15.0′	55.7′
23	164°27.1	45.2	145°49.9	15.8′	02°47.7	15.0′	55.6′
	SD = 15.8′	d = -0.9′	SD = 15.3′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.3	N10°44.3	160°24.6	15.8′	N02°32.7	15.0′	55.6′
1	194°27.5	43.5	174°59.4	15.8′	02°17.7	15.1′	55.6′
2	209°27.6	42.6	189°34.3	15.9′	02°02.6	15.0′	55.6′
3	224°27.8	·· 41.7	204°09.2	15.9′	01°47.6	15.0′	55.5′
4	239°28.0	40.9	218°44.1	15.9′	01°32.6	14.9′	55.5′
5	254°28.1	40.0	233°19.0	16.0′	01°17.7	15.0′	55.5′
6	269°28.3	N10°39.1	247°54.0	16.0′	N01°02.7	15.0′	55.5′
7	284°28.5	38.3	262°28.9	16.0′	00°47.7	15.0′	55.5′
8	299°28.7	37.4	277°04.0	16.0′	00°32.7	14.9′	55.4′
9	314°28.8	·· 36.5	291°39.0	16.1′	00°17.8	15.0′	55.4′
10	329°29.0	35.7	306°14.1	16.1′	N00°02.8	14.9′	55.4′
11	344°29.2	34.8	320°49.2	16.1′	S00°12.1	14.9′	55.4′
12	359°29.4	N10°33.9	335°24.3	16.1′	S00°27.0	14.9′	55.3′
13	14°29.5	33.1	349°59.4	16.2′	00°41.9	14.9′	55.3′
14	29°29.7	32.2	4°34.6	16.2′	00°56.8	14.9′	55.3′
15	44°29.9	·· 31.3	19°09.7	16.2′	01°11.7	14.9′	55.3′
16	59°30.0	30.5	33°44.9	16.2′	01°26.6	14.8′	55.3′
17	74°30.2	29.6	48°20.1	16.2′	01°41.4	14.8′	55.2′
18	89°30.4	N10°28.7	62°55.3	16.2′	S01°56.2	14.8′	55.2′
19	104°30.6	27.9	77°30.6	16.2′	02°11.0	14.8′	55.2′
20	119°30.7	27.0	92°05.8	16.3′	02°25.8	14.8′	55.2′
21	134°30.9	·· 26.1	106°41.1	16.3′	02°40.6	14.7′	55.2′
22	149°31.1	25.3	121°16.4	16.3′	02°55.3	14.7′	55.1′
23	164°31.3	24.4	135°51.6	16.3′	03°10.0	14.7′	55.1′
	SD = 15.8′	d = -0.9′	SD = 15.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	01:18	03:21	20:40	22:35	–:–
N 70°	–:–	02:10	03:41	20:20	21:48	–:–
68°	–:–	02:42	03:57	20:05	21:18	–:–
66°	01:07	03:05	04:09	19:53	20:56	22:47
64°	01:54	03:22	04:20	19:43	20:39	22:05
62°	02:23	03:37	04:29	19:34	20:25	21:38
60°	02:44	03:49	04:36	19:27	20:14	21:18
N 58°	03:01	03:59	04:43	19:20	20:04	21:01
56°	03:15	04:08	04:49	19:14	19:55	20:48
54°	03:27	04:16	04:54	19:09	19:48	20:36
52°	03:37	04:23	04:59	19:04	19:41	20:26
50°	03:46	04:29	05:03	19:00	19:35	20:17
45°	04:04	04:42	05:13	18:51	19:22	20:00
N 40°	04:18	04:52	05:20	18:44	19:12	19:46
35°	04:29	05:01	05:27	18:37	19:03	19:35
30°	04:39	05:08	05:33	18:32	18:56	19:25
20°	04:53	05:20	05:43	18:22	18:44	19:11
N 10°	05:05	05:30	05:51	18:13	18:35	19:00
0°	05:13	05:38	05:59	18:06	18:27	18:51
S 10°	05:21	05:45	06:07	17:58	18:19	18:44
20°	05:27	05:53	06:15	17:50	18:12	18:38
30°	05:32	06:00	06:24	17:41	18:05	18:33
35°	05:34	06:04	06:29	17:36	18:01	18:31
40°	05:36	06:08	06:35	17:30	17:57	18:29
45°	05:38	06:12	06:42	17:23	17:53	18:27
S 50°	05:40	06:17	06:50	17:15	17:48	18:26
52°	05:41	06:20	06:54	17:11	17:46	18:25
54°	05:41	06:22	06:58	17:07	17:43	18:25
56°	05:42	06:25	07:03	17:03	17:41	18:24
58°	05:42	06:28	07:08	16:58	17:38	18:24
S 60°	05:42	06:31	07:14	16:52	17:35	18:23

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	02:48	05:16	07:23	20:32	19:54	19:21
N 70°	03:16	05:27	07:24	20:18	19:50	19:24
68°	03:37	05:36	07:25	20:07	19:46	19:27
66°	03:53	05:43	07:26	19:57	19:43	19:29
64°	04:06	05:49	07:26	19:49	19:40	19:31
62°	04:17	05:55	07:27	19:43	19:38	19:33
60°	04:27	05:59	07:27	19:37	19:35	19:34
N 58°	04:35	06:03	07:27	19:31	19:34	19:35
56°	04:42	06:07	07:28	19:27	19:32	19:36
54°	04:48	06:10	07:28	19:22	19:30	19:37
52°	04:54	06:13	07:28	19:19	19:29	19:38
50°	04:59	06:15	07:28	19:15	19:28	19:39
45°	05:10	06:21	07:29	19:07	19:25	19:41
N 40°	05:19	06:26	07:29	19:01	19:22	19:43
35°	05:27	06:30	07:30	18:55	19:20	19:44
30°	05:34	06:33	07:30	18:50	19:19	19:45
20°	05:46	06:39	07:30	18:42	19:15	19:47
N 10°	05:56	06:45	07:31	18:34	19:12	19:49
0°	06:05	06:50	07:31	18:27	19:10	19:51
S 10°	06:15	06:55	07:32	18:20	19:07	19:53
20°	06:25	07:00	07:32	18:12	19:04	19:55
30°	06:36	07:06	07:33	18:03	19:01	19:57
35°	06:43	07:09	07:33	17:58	18:59	19:58
40°	06:51	07:13	07:34	17:52	18:56	19:59
45°	06:59	07:18	07:34	17:45	18:54	20:01
S 50°	07:10	07:23	07:35	17:36	18:51	20:03
52°	07:14	07:25	07:35	17:32	18:49	20:04
54°	07:20	07:28	07:35	17:28	18:48	20:05
56°	07:25	07:31	07:36	17:23	18:46	20:06
58°	07:32	07:34	07:36	17:18	18:44	20:07
S 60°	07:39	07:38	07:36	17:12	18:42	20:08

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 0-2 0-3%
23	02:43	02:35	12:03	12:16	–:–	
24	02:27	02:19	12:02	13:00	00:38	
25	02:11	02:03	12:02	13:41	01:21	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2410 sec ΔT = TT-UT1 = +68.9430 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	334°29.9	211°58.2	N19°53.4	143°18.3	S04°27.9	226°19.4	N22°20.7	333°07.8	S02°05.5
1	349°32.4	226°57.5	52.9	158°19.3	28.5	241°21.4	20.6	348°10.4	05.6
2	4°34.9	241°56.8	52.4	173°20.3	29.2	256°23.3	20.6	3°13.0	05.6
3	19°37.3	256°56.2	·· 51.9	188°21.3	·· 29.8	271°25.3	·· 20.5	18°15.6	·· 05.7
4	34°39.8	271°55.5	51.4	203°22.3	30.5	286°27.2	20.5	33°18.2	05.8
5	49°42.3	286°54.8	50.9	218°23.3	31.1	301°29.2	20.4	48°20.8	05.8
6	64°44.7	301°54.2	N19°50.3	233°24.3	S04°31.8	316°31.2	N22°20.3	63°23.4	S02°05.9
7	79°47.2	316°53.5	49.8	248°25.3	32.4	331°33.1	20.3	78°26.1	06.0
8	94°49.7	331°52.8	49.3	263°26.3	33.1	346°35.1	20.2	93°28.7	06.0
9	109°52.1	346°52.2	·· 48.8	278°27.2	·· 33.7	1°37.0	·· 20.2	108°31.3	·· 06.1
10	124°54.6	1°51.5	48.3	293°28.2	34.4	16°39.0	20.1	123°33.9	06.2
11	139°57.0	16°50.8	47.8	308°29.2	35.0	31°41.0	20.1	138°36.5	06.3
12	154°59.5	31°50.2	N19°47.2	323°30.2	S04°35.7	46°42.9	N22°20.0	153°39.1	S02°06.3
13	170°02.0	46°49.5	46.7	338°31.2	36.4	61°44.9	20.0	168°41.7	06.4
14	185°04.4	61°48.9	46.2	353°32.2	37.0	76°46.8	19.9	183°44.3	06.5
15	200°06.9	76°48.2	·· 45.7	8°33.2	·· 37.7	91°48.8	·· 19.9	198°46.9	·· 06.5
16	215°09.4	91°47.5	45.1	23°34.2	38.3	106°50.8	19.8	213°49.5	06.6
17	230°11.8	106°46.9	44.6	38°35.2	39.0	121°52.7	19.7	228°52.1	06.7
18	245°14.3	121°46.2	N19°44.1	53°36.1	S04°39.6	136°54.7	N22°19.7	243°54.8	S02°06.8
19	260°16.8	136°45.5	43.6	68°37.1	40.3	151°56.6	19.6	258°57.4	06.8
20	275°19.2	151°44.9	43.0	83°38.1	40.9	166°58.6	19.6	274°00.0	06.9
21	290°21.7	166°44.2	·· 42.5	98°39.1	·· 41.6	182°00.6	·· 19.5	289°02.6	·· 07.0
22	305°24.2	181°43.6	42.0	113°40.1	42.2	197°02.5	19.5	304°05.2	07.0
23	320°26.6	196°42.9	41.4	128°41.1	42.9	212°04.5	19.4	319°07.8	07.1
Mer.pass.	01:42	ν -0.7′	d -0.5′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′ m -1.97	ν 2.6′	d -0.1′ m 0.68

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°29.1	211°42.2	N19°40.9	143°42.1	S04°43.5	227°06.5	N22°19.4	334°10.4	S02°07.2
1	350°31.5	226°41.6	40.4	158°43.1	44.2	242°08.4	19.3	349°13.0	07.2
2	5°34.0	241°40.9	39.8	173°44.0	44.8	257°10.4	19.3	4°15.6	07.3
3	20°36.5	256°40.3	·· 39.3	188°45.0	·· 45.5	272°12.4	·· 19.2	19°18.2	·· 07.4
4	35°38.9	271°39.6	38.8	203°46.0	46.2	287°14.3	19.1	34°20.9	07.5
5	50°41.4	286°38.9	38.2	218°47.0	46.8	302°16.3	19.1	49°23.5	07.5
6	65°43.9	301°38.3	N19°37.7	233°48.0	S04°47.5	317°18.2	N22°19.0	64°26.1	S02°07.6
7	80°46.3	316°37.6	37.1	248°49.0	48.1	332°20.2	19.0	79°28.7	07.7
8	95°48.8	331°37.0	36.6	263°50.0	48.8	347°22.2	18.9	94°31.3	07.7
9	110°51.3	346°36.3	·· 36.1	278°51.0	·· 49.4	2°24.1	·· 18.9	109°33.9	·· 07.8
10	125°53.7	1°35.6	35.5	293°51.9	50.1	17°26.1	18.8	124°36.5	07.9
11	140°56.2	16°35.0	35.0	308°52.9	50.7	32°28.1	18.8	139°39.1	08.0
12	155°58.6	31°34.3	N19°34.4	323°53.9	S04°51.4	47°30.0	N22°18.7	154°41.7	S02°08.0
13	171°01.1	46°33.7	33.9	338°54.9	52.0	62°32.0	18.7	169°44.4	08.1
14	186°03.6	61°33.0	33.3	353°55.9	52.7	77°34.0	18.6	184°47.0	08.2
15	201°06.0	76°32.4	·· 32.8	8°56.9	·· 53.3	92°35.9	·· 18.5	199°49.6	·· 08.2
16	216°08.5	91°31.7	32.3	23°57.8	54.0	107°37.9	18.5	214°52.2	08.3
17	231°11.0	106°31.0	31.7	38°58.8	54.6	122°39.9	18.4	229°54.8	08.4
18	246°13.4	121°30.4	N19°31.2	53°59.8	S04°55.3	137°41.8	N22°18.4	244°57.4	S02°08.5
19	261°15.9	136°29.7	30.6	69°00.8	56.0	152°43.8	18.3	260°00.0	08.5
20	276°18.4	151°29.1	30.0	84°01.8	56.6	167°45.8	18.3	275°02.6	08.6
21	291°20.8	166°28.4	·· 29.5	99°02.8	·· 57.3	182°47.7	·· 18.2	290°05.2	·· 08.7
22	306°23.3	181°27.8	28.9	114°03.8	57.9	197°49.7	18.2	305°07.9	08.7
23	321°25.8	196°27.1	28.4	129°04.7	58.6	212°51.7	18.1	320°10.5	08.8
Mer.pass.	01:38	ν -0.7′	d -0.5′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′ m -1.98	ν 2.6′	d -0.1′ m 0.67

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	336°28.2	211°26.5	N19°27.8	144°05.7	S04°59.2	227°53.6	N22°18.1	335°13.1	S02°08.9
1	351°30.7	226°25.8	27.3	159°06.7	04°59.9	242°55.6	18.0	350°15.7	09.0
2	6°33.1	241°25.1	26.7	174°07.7	05°00.5	257°57.6	17.9	5°18.3	09.0
3	21°35.6	256°24.5	·· 26.2	189°08.7	·· 01.2	272°59.5	·· 17.9	20°20.9	·· 09.1
4	36°38.1	271°23.8	25.6	204°09.7	01.8	288°01.5	17.8	35°23.5	09.2
5	51°40.5	286°23.2	25.0	219°10.6	02.5	303°03.5	17.8	50°26.2	09.2
6	66°43.0	301°22.5	N19°24.5	234°11.6	S05°03.1	318°05.4	N22°17.7	65°28.8	S02°09.3
7	81°45.5	316°21.9	23.9	249°12.6	03.8	333°07.4	17.7	80°31.4	09.4
8	96°47.9	331°21.2	23.3	264°13.6	04.4	348°09.4	17.6	95°34.0	09.5
9	111°50.4	346°20.6	·· 22.8	279°14.6	·· 05.1	3°11.3	·· 17.6	110°36.6	·· 09.5
10	126°52.9	1°19.9	22.2	294°15.5	05.7	18°13.3	17.5	125°39.2	09.6
11	141°55.3	16°19.3	21.7	309°16.5	06.4	33°15.3	17.4	140°41.8	09.7
12	156°57.8	31°18.6	N19°21.1	324°17.5	S05°07.1	48°17.2	N22°17.4	155°44.4	S02°09.7
13	172°00.2	46°18.0	20.5	339°18.5	07.7	63°19.2	17.3	170°47.1	09.8
14	187°02.7	61°17.3	19.9	354°19.5	08.4	78°21.2	17.3	185°49.7	09.9
15	202°05.2	76°16.7	·· 19.4	9°20.5	·· 09.0	93°23.1	·· 17.2	200°52.3	·· 10.0
16	217°07.6	91°16.0	18.8	24°21.4	09.7	108°25.1	17.2	215°54.9	10.0
17	232°10.1	106°15.4	18.2	39°22.4	10.3	123°27.1	17.1	230°57.5	10.1
18	247°12.6	121°14.7	N19°17.7	54°23.4	S05°11.0	138°29.0	N22°17.1	246°00.1	S02°10.2
19	262°15.0	136°14.1	17.1	69°24.4	11.6	153°31.0	17.0	261°02.7	10.3
20	277°17.5	151°13.4	16.5	84°25.4	12.3	168°33.0	17.0	276°05.4	10.3
21	292°20.0	166°12.8	·· 15.9	99°26.3	·· 12.9	183°35.0	·· 16.9	291°08.0	·· 10.4
22	307°22.4	181°12.1	15.4	114°27.3	13.6	198°36.9	16.8	306°10.6	10.5
23	322°24.9	196°11.5	14.8	129°28.3	14.2	213°38.9	16.8	321°13.2	10.5
Mer.pass.	01:34	ν -0.7′	d -0.6′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′ m -1.98	ν 2.6′	d -0.1′ m 0.67

Stars	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.2	-42°09.7
Schedar	349°30.0	56°40.6
Diphda	348°46.5	-17°50.5
Achernar	335°19.4	-57°06.1
Hamal	327°50.4	23°35.1
Polaris	313°38.5	89°22.0
Acamar	315°11.2	-40°11.8
Menkar	314°05.5	4°11.6
Mirfak	308°27.4	49°57.0
Aldebaran	290°39.0	16°33.7
Rigel	281°03.4	-8°10.1
Capella	280°21.2	46°01.3
Bellatrix	278°22.4	6°22.5
Elnath	278°01.3	28°37.7
Alnilam	275°37.3	-1°11.0
Betelgeuse	270°51.7	7°24.8
Canopus	263°52.5	-52°42.2
Sirius	258°26.0	-16°44.9
Adhara	255°05.7	-29°00.1
Procyon	244°50.5	5°09.7
Pollux	243°16.9	27°57.9
Avior	234°15.1	-59°35.3
Suhail	222°46.4	-43°32.0
Miaplacidus	221°39.1	-69°49.2
Alphard	217°47.6	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.9
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.6
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.8	49°11.3
Hadar	148°35.6	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°39.9	-60°56.7
Kochab	137°20.1	74°03.2
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.3	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°08.8	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.7	51°29.3
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.3	-56°39.2
Deneb	49°25.0	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.4	28°13.4
Markab	13°29.1	15°20.7

Aug 26 Tue	SHA	Mer.pass
Venus	237°28.2	09:53
Mars	168°48.4	14:26
Jupiter	251°49.5	08:54
Saturn	358°37.9	01:47

Aug 27 Wed	SHA	Mer.pass
Venus	236°13.2	09:54
Mars	168°13.0	14:24
Jupiter	251°37.4	08:50
Saturn	358°41.3	01:43

Aug 28 Thu	SHA	Mer.pass
Venus	234°58.2	09:55
Mars	167°37.5	14:23
Jupiter	251°25.4	08:47
Saturn	358°44.9	01:39

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.4	N10°23.5	150°26.9	16.3′	S03°24.7	14.7′	55.1′
1	194°31.6	22.7	165°02.2	16.3′	03°39.4	14.6′	55.1′
2	209°31.8	21.8	179°37.5	16.3′	03°54.0	14.7′	55.1′
3	224°32.0	·· 20.9	194°12.8	16.3′	04°08.7	14.6′	55.0′
4	239°32.2	20.0	208°48.2	16.3′	04°23.3	14.5′	55.0′
5	254°32.3	19.2	223°23.5	16.3′	04°37.8	14.6′	55.0′
6	269°32.5	N10°18.3	237°58.8	16.3′	S04°52.4	14.5′	55.0′
7	284°32.7	17.4	252°34.1	16.3′	05°06.9	14.4′	55.0′
8	299°32.9	16.6	267°09.4	16.3′	05°21.3	14.5′	54.9′
9	314°33.0	·· 15.7	281°44.8	16.3′	05°35.8	14.4′	54.9′
10	329°33.2	14.8	296°20.1	16.3′	05°50.2	14.4′	54.9′
11	344°33.4	13.9	310°55.4	16.3′	06°04.6	14.3′	54.9′
12	359°33.6	N10°13.1	325°30.7	16.3′	S06°18.9	14.3′	54.9′
13	14°33.7	12.2	340°06.0	16.3′	06°33.2	14.3′	54.9′
14	29°33.9	11.3	354°41.3	16.3′	06°47.5	14.3′	54.8′
15	44°34.1	·· 10.4	9°16.6	16.3′	07°01.8	14.2′	54.8′
16	59°34.3	09.6	23°51.9	16.3′	07°16.0	14.1′	54.8′
17	74°34.5	08.7	38°27.2	16.3′	07°30.1	14.2′	54.8′
18	89°34.6	N10°07.8	53°02.4	16.3′	S07°44.3	14.1′	54.8′
19	104°34.8	06.9	67°37.7	16.2′	07°58.4	14.0′	54.7′
20	119°35.0	06.1	82°12.9	16.2′	08°12.4	14.0′	54.7′
21	134°35.2	·· 05.2	96°48.2	16.2′	08°26.4	14.0′	54.7′
22	149°35.4	04.3	111°23.4	16.2′	08°40.4	14.0′	54.7′
23	164°35.5	03.4	125°58.6	16.2′	08°54.4	13.8′	54.7′
	SD = 15.8′	d = -0.9′	SD = 15.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.7	N10°02.6	140°33.8	16.2′	S09°08.2	13.9′	54.7′
1	194°35.9	01.7	155°08.9	16.1′	09°22.1	13.8′	54.7′
2	209°36.1	10°00.8	169°44.1	16.1′	09°35.9	13.8′	54.6′
3	224°36.3	09°59.9	184°19.2	16.1′	09°49.7	13.7′	54.6′
4	239°36.4	59.1	198°54.3	16.1′	10°03.4	13.6′	54.6′
5	254°36.6	58.2	213°29.4	16.1′	10°17.0	13.7′	54.6′
6	269°36.8	N09°57.3	228°04.5	16.0′	S10°30.7	13.5′	54.6′
7	284°37.0	56.4	242°39.5	16.0′	10°44.2	13.6′	54.6′
8	299°37.2	55.6	257°14.6	16.0′	10°57.8	13.4′	54.5′
9	314°37.3	·· 54.7	271°49.5	16.0′	11°11.2	13.5′	54.5′
10	329°37.5	53.8	286°24.5	15.9′	11°24.7	13.3′	54.5′
11	344°37.7	52.9	300°59.5	15.9′	11°38.0	13.4′	54.5′
12	359°37.9	N09°52.0	315°34.4	15.9′	S11°51.4	13.2′	54.5′
13	14°38.1	51.2	330°09.2	15.9′	12°04.6	13.3′	54.5′
14	29°38.3	50.3	344°44.1	15.8′	12°17.9	13.1′	54.5′
15	44°38.4	·· 49.4	359°18.9	15.8′	12°31.0	13.1′	54.5′
16	59°38.6	48.5	13°53.7	15.8′	12°44.1	13.1′	54.4′
17	74°38.8	47.6	28°28.5	15.7′	12°57.2	13.0′	54.4′
18	89°39.0	N09°46.8	43°03.2	15.7′	S13°10.2	12.9′	54.4′
19	104°39.2	45.9	57°37.9	15.7′	13°23.1	12.9′	54.4′
20	119°39.3	45.0	72°12.6	15.6′	13°36.0	12.9′	54.4′
21	134°39.5	·· 44.1	86°47.2	15.6′	13°48.9	12.7′	54.4′
22	149°39.7	43.2	101°21.8	15.5′	14°01.6	12.7′	54.4′
23	164°39.9	42.3	115°56.3	15.5′	14°14.3	12.7′	54.4′
	SD = 15.8′	d = -0.9′	SD = 14.9′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.1	N09°41.5	130°30.8	15.5′	S14°27.0	12.6′	54.3′
1	194°40.3	40.6	145°05.3	15.4′	14°39.6	12.5′	54.3′
2	209°40.5	39.7	159°39.7	15.4′	14°52.1	12.5′	54.3′
3	224°40.6	·· 38.8	174°14.1	15.3′	15°04.6	12.4′	54.3′
4	239°40.8	37.9	188°48.4	15.3′	15°17.0	12.3′	54.3′
5	254°41.0	37.0	203°22.7	15.3′	15°29.3	12.3′	54.3′
6	269°41.2	N09°36.2	217°57.0	15.2′	S15°41.6	12.2′	54.3′
7	284°41.4	35.3	232°31.2	15.2′	15°53.8	12.1′	54.3′
8	299°41.6	34.4	247°05.3	15.1′	16°05.9	12.1′	54.3′
9	314°41.7	·· 33.5	261°39.5	15.1′	16°18.0	12.0′	54.3′
10	329°41.9	32.6	276°13.5	15.0′	16°30.0	12.0′	54.3′
11	344°42.1	31.7	290°47.6	15.0′	16°42.0	11.8′	54.2′
12	359°42.3	N09°30.8	305°21.5	14.9′	S16°53.8	11.8′	54.2′
13	14°42.5	30.0	319°55.5	14.9′	17°05.6	11.8′	54.2′
14	29°42.7	29.1	334°29.3	14.8′	17°17.4	11.6′	54.2′
15	44°42.9	·· 28.2	349°03.2	14.8′	17°29.0	11.6′	54.2′
16	59°43.0	27.3	3°36.9	14.7′	17°40.6	11.5′	54.2′
17	74°43.2	26.4	18°10.6	14.7′	17°52.1	11.5′	54.2′
18	89°43.4	N09°25.5	32°44.3	14.6′	S18°03.6	11.3′	54.2′
19	104°43.6	24.6	47°17.9	14.6′	18°14.9	11.3′	54.2′
20	119°43.8	23.7	61°51.5	14.5′	18°26.2	11.2′	54.2′
21	134°44.0	·· 22.9	76°25.0	14.4′	18°37.4	11.2′	54.2′
22	149°44.2	22.0	90°58.4	14.4′	18°48.6	11.0′	54.2′
23	164°44.4	21.1	105°31.8	14.3′	18°59.6	11.0′	54.2′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	01:52	03:37	20:22	22:03	–:–
N 70°	–:–	02:31	03:54	20:05	21:27	–:–
68°	–:–	02:57	04:08	19:52	21:02	23:23
66°	01:36	03:17	04:19	19:41	20:42	22:20
64°	02:12	03:33	04:29	19:32	20:27	21:47
62°	02:36	03:46	04:37	19:25	20:15	21:23
60°	02:55	03:57	04:44	19:18	20:04	21:05
N 58°	03:10	04:06	04:50	19:12	19:55	20:50
56°	03:23	04:14	04:55	19:07	19:47	20:38
54°	03:34	04:22	05:00	19:02	19:40	20:27
52°	03:43	04:28	05:04	18:58	19:34	20:18
50°	03:51	04:34	05:08	18:54	19:28	20:10
45°	04:08	04:45	05:16	18:46	19:17	19:54
N 40°	04:21	04:55	05:23	18:39	19:07	19:41
35°	04:32	05:03	05:29	18:33	18:59	19:30
30°	04:41	05:10	05:34	18:28	18:53	19:22
20°	04:54	05:21	05:43	18:19	18:42	19:08
N 10°	05:05	05:30	05:51	18:12	18:33	18:58
0°	05:13	05:37	05:58	18:05	18:26	18:50
S 10°	05:19	05:44	06:05	17:58	18:19	18:44
20°	05:25	05:50	06:13	17:51	18:13	18:39
30°	05:29	05:57	06:21	17:42	18:07	18:35
35°	05:31	06:00	06:26	17:38	18:03	18:33
40°	05:32	06:04	06:31	17:33	18:00	18:31
45°	05:33	06:07	06:37	17:27	17:56	18:30
S 50°	05:34	06:12	06:44	17:19	17:52	18:30
52°	05:34	06:14	06:48	17:16	17:50	18:29
54°	05:35	06:16	06:51	17:12	17:48	18:29
56°	05:35	06:18	06:56	17:08	17:46	18:29
58°	05:35	06:20	07:00	17:04	17:44	18:30
S 60°	05:34	06:23	07:05	16:59	17:42	18:30

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	09:27	11:38	14:50	18:46	18:02	16:19
N 70°	09:18	11:16	13:37	18:58	18:26	17:34
68°	09:11	11:00	13:00	19:07	18:44	18:12
66°	09:05	10:46	12:34	19:15	18:59	18:39
64°	09:00	10:35	12:15	19:22	19:12	19:00
62°	08:56	10:26	11:59	19:27	19:22	19:16
60°	08:52	10:18	11:46	19:33	19:31	19:31
N 58°	08:49	10:11	11:34	19:37	19:39	19:43
56°	08:46	10:05	11:25	19:41	19:46	19:53
54°	08:44	10:00	11:16	19:45	19:53	20:03
52°	08:42	09:55	11:08	19:48	19:58	20:11
50°	08:39	09:50	11:01	19:51	20:04	20:18
45°	08:35	09:41	10:47	19:57	20:15	20:35
N 40°	08:31	09:33	10:35	20:03	20:24	20:48
35°	08:28	09:26	10:24	20:08	20:32	20:59
30°	08:25	09:20	10:16	20:12	20:39	21:09
20°	08:20	09:10	10:00	20:19	20:52	21:26
N 10°	08:16	09:01	09:47	20:26	21:03	21:41
0°	08:12	08:53	09:35	20:32	21:13	21:56
S 10°	08:08	08:45	09:23	20:38	21:23	22:10
20°	08:04	08:36	09:10	20:44	21:34	22:25
30°	07:59	08:26	08:55	20:52	21:47	22:43
35°	07:57	08:21	08:46	20:56	21:54	22:53
40°	07:54	08:14	08:37	21:01	22:03	23:05
45°	07:50	08:07	08:25	21:07	22:12	23:19
S 50°	07:46	07:58	08:12	21:14	22:24	23:36
52°	07:44	07:54	08:06	21:17	22:30	23:44
54°	07:42	07:50	07:59	21:20	22:36	23:53
56°	07:40	07:45	07:51	21:24	22:43	·· ··
58°	07:38	07:40	07:42	21:29	22:51	·· ··
S 60°	07:35	07:33	07:33	21:33	23:00	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 3-5 8-21%
26	01:54	01:46	12:02	14:22	02:02	
27	01:37	01:28	12:01	15:03	02:42	
28	01:20	01:11	12:01	15:45	03:24	

No IERS EOP prediction data available

August 29, 30, 31 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2416 sec ΔT = TT-UT1 = +68.9424 sec

2025 August 29 to Aug. 31 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	337°27.4	211°10.8	N19°14.2	144°29.3	S05°14.9	228°40.9	N22°16.7	336°15.8	S02°10.6
1	352°29.8	226°10.2	13.6	159°30.3	15.5	243°42.8	16.7	351°18.4	10.7
2	7°32.3	241°09.5	13.0	174°31.2	16.2	258°44.8	16.6	6°21.0	10.8
3	22°34.7	256°08.9	·· 12.5	189°32.2	·· 16.8	273°46.8	·· 16.6	21°23.7	·· 10.8
4	37°37.2	271°08.2	11.9	204°33.2	17.5	288°48.8	16.5	36°26.3	10.9
5	52°39.7	286°07.6	11.3	219°34.2	18.1	303°50.7	16.5	51°28.9	11.0
6	67°42.1	301°06.9	N19°10.7	234°35.2	S05°18.8	318°52.7	N22°16.4	66°31.5	S02°11.0
7	82°44.6	316°06.3	10.1	249°36.1	19.5	333°54.7	16.4	81°34.1	11.1
8	97°47.1	331°05.6	09.5	264°37.1	20.1	348°56.6	16.3	96°36.7	11.2
9	112°49.5	346°05.0	·· 09.0	279°38.1	·· 20.8	3°58.6	·· 16.2	111°39.3	·· 11.3
10	127°52.0	1°04.3	08.4	294°39.1	21.4	19°00.6	16.2	126°42.0	11.3
11	142°54.5	16°03.7	07.8	309°40.0	22.1	34°02.6	16.1	141°44.6	11.4
12	157°56.9	31°03.0	N19°07.2	324°41.0	S05°22.7	49°04.5	N22°16.1	156°47.2	S02°11.5
13	172°59.4	46°02.4	06.6	339°42.0	23.4	64°06.5	16.0	171°49.8	11.6
14	188°01.9	61°01.7	06.0	354°43.0	24.0	79°08.5	16.0	186°52.4	11.6
15	203°04.3	76°01.1	·· 05.4	9°44.0	·· 24.7	94°10.4	·· 15.9	201°55.0	·· 11.7
16	218°06.8	91°00.5	04.8	24°44.9	25.3	109°12.4	15.9	216°57.7	11.8
17	233°09.2	105°59.8	04.2	39°45.9	26.0	124°14.4	15.8	232°00.3	11.8
18	248°11.7	120°59.2	N19°03.6	54°46.9	S05°26.6	139°16.4	N22°15.7	247°02.9	S02°11.9
19	263°14.2	135°58.5	03.0	69°47.9	27.3	154°18.3	15.7	262°05.5	12.0
20	278°16.6	150°57.9	02.4	84°48.8	27.9	169°20.3	15.6	277°08.1	12.1
21	293°19.1	165°57.2	·· 01.8	99°49.8	·· 28.6	184°22.3	·· 15.6	292°10.7	·· 12.1
22	308°21.6	180°56.6	01.2	114°50.8	29.2	199°24.3	15.5	307°13.4	12.2
23	323°24.0	195°55.9	00.6	129°51.8	29.9	214°26.2	15.5	322°16.0	12.3
Mer.pass.	01:30	ν -0.6′	d -0.6′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′	m -1.98	ν 2.6′	d -0.1′	m 0.66

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	338°26.5	210°55.3	N19°00.0	144°52.8	S05°30.5	229°28.2	N22°15.4	337°18.6	S02°12.4
1	353°29.0	225°54.7	18°59.4	159°53.7	31.2	244°30.2	15.4	352°21.2	12.4
2	8°31.4	240°54.0	58.8	174°54.7	31.8	259°32.2	15.3	7°23.8	12.5
3	23°33.9	255°53.4	·· 58.2	189°55.7	·· 32.5	274°34.1	·· 15.3	22°26.4	·· 12.6
4	38°36.3	270°52.7	57.6	204°56.7	33.1	289°36.1	15.2	37°29.1	12.7
5	53°38.8	285°52.1	57.0	219°57.6	33.8	304°38.1	15.1	52°31.7	12.7
6	68°41.3	300°51.4	N18°56.4	234°58.6	S05°34.5	319°40.1	N22°15.1	67°34.3	S02°12.8
7	83°43.7	315°50.8	55.8	249°59.6	35.1	334°42.0	15.0	82°36.9	12.9
8	98°46.2	330°50.2	55.2	265°00.6	35.8	349°44.0	15.0	97°39.5	12.9
9	113°48.7	345°49.5	·· 54.6	280°01.5	·· 36.4	4°46.0	·· 14.9	112°42.1	·· 13.0
10	128°51.1	0°48.9	54.0	295°02.5	37.1	19°48.0	14.9	127°44.8	13.1
11	143°53.6	15°48.2	53.4	310°03.5	37.7	34°49.9	14.8	142°47.4	13.2
12	158°56.1	30°47.6	N18°52.7	325°04.5	S05°38.4	49°51.9	N22°14.8	157°50.0	S02°13.2
13	173°58.5	45°47.0	52.1	340°05.4	39.0	64°53.9	14.7	172°52.6	13.3
14	189°01.0	60°46.3	51.5	355°06.4	39.7	79°55.9	14.6	187°55.2	13.4
15	204°03.5	75°45.7	·· 50.9	10°07.4	·· 40.3	94°57.9	·· 14.6	202°57.9	·· 13.5
16	219°05.9	90°45.0	50.3	25°08.3	41.0	109°59.8	14.5	218°00.5	13.5
17	234°08.4	105°44.4	49.7	40°09.3	41.6	125°01.8	14.5	233°03.1	13.6
18	249°10.8	120°43.8	N18°49.0	55°10.3	S05°42.3	140°03.8	N22°14.4	248°05.7	S02°13.7
19	264°13.3	135°43.1	48.4	70°11.3	42.9	155°05.8	14.4	263°08.3	13.8
20	279°15.8	150°42.5	47.8	85°12.2	43.6	170°07.7	14.3	278°10.9	13.8
21	294°18.2	165°41.9	·· 47.2	100°13.2	·· 44.2	185°09.7	·· 14.3	293°13.6	·· 13.9
22	309°20.7	180°41.2	46.6	115°14.2	44.9	200°11.7	14.2	308°16.2	14.0
23	324°23.2	195°40.6	45.9	130°15.2	45.5	215°13.7	14.2	323°18.8	14.0
Mer.pass.	01:26	ν -0.6′	d -0.6′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′	m -1.99	ν 2.6′	d -0.1′	m 0.66

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	339°25.6	210°39.9	N18°45.3	145°16.1	S05°46.2	230°15.7	N22°14.1	338°21.4	S02°14.1
1	354°28.1	225°39.3	44.7	160°17.1	46.8	245°17.6	14.0	353°24.0	14.2
2	9°30.6	240°38.7	44.1	175°18.1	47.5	260°19.6	14.0	8°26.7	14.3
3	24°33.0	255°38.0	·· 43.4	190°19.0	·· 48.1	275°21.6	·· 13.9	23°29.3	·· 14.3
4	39°35.5	270°37.4	42.8	205°20.0	48.8	290°23.6	13.9	38°31.9	14.4
5	54°38.0	285°36.8	42.2	220°21.0	49.4	305°25.5	13.8	53°34.5	14.5
6	69°40.4	300°36.1	N18°41.6	235°22.0	S05°50.1	320°27.5	N22°13.8	68°37.1	S02°14.6
7	84°42.9	315°35.5	40.9	250°22.9	50.7	335°29.5	13.7	83°39.7	14.6
8	99°45.3	330°34.9	40.3	265°23.9	51.4	350°31.5	13.7	98°42.4	14.7
9	114°47.8	345°34.2	·· 39.7	280°24.9	·· 52.0	5°33.5	·· 13.6	113°45.0	·· 14.8
10	129°50.3	0°33.6	39.0	295°25.8	52.7	20°35.4	13.5	128°47.6	14.9
11	144°52.7	15°33.0	38.4	310°26.8	53.3	35°37.4	13.5	143°50.2	14.9
12	159°55.2	30°32.3	N18°37.8	325°27.8	S05°54.0	50°39.4	N22°13.4	158°52.8	S02°15.0
13	174°57.7	45°31.7	37.1	340°28.8	54.6	65°41.4	13.4	173°55.5	15.1
14	190°00.1	60°31.1	36.5	355°29.7	55.3	80°43.4	13.3	188°58.1	15.2
15	205°02.6	75°30.4	·· 35.8	10°30.7	·· 55.9	95°45.4	·· 13.3	204°00.7	·· 15.2
16	220°05.1	90°29.8	35.2	25°31.7	56.6	110°47.3	13.2	219°03.3	15.3
17	235°07.5	105°29.2	34.6	40°32.6	57.2	125°49.3	13.2	234°05.9	15.4
18	250°10.0	120°28.5	N18°33.9	55°33.6	S05°57.9	140°51.3	N22°13.1	249°08.6	S02°15.5
19	265°12.5	135°27.9	33.3	70°34.6	58.5	155°53.3	13.1	264°11.2	15.5
20	280°14.9	150°27.3	32.6	85°35.5	59.2	170°55.3	13.0	279°13.8	15.6
21	295°17.4	165°26.6	·· 32.0	100°36.5	05°59.9	185°57.2	·· 12.9	294°16.4	·· 15.7
22	310°19.8	180°26.0	31.4	115°37.5	06°00.5	200°59.2	12.9	309°19.0	15.7
23	325°22.3	195°25.4	30.7	130°38.4	01.2	216°01.2	12.8	324°21.7	15.8
Mer.pass.	01:22	ν -0.6′	d -0.6′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′	m -1.99	ν 2.6′	d -0.1′	m 0.66

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.2	-42°09.8
Schedar	349°30.0	56°40.6
Diphda	348°46.5	-17°50.5
Achernar	335°19.4	-57°06.1
Hamal	327°50.4	23°35.1
Polaris	313°36.8	89°22.0
Acamar	315°11.2	-40°11.8
Menkar	314°05.5	4°11.6
Mirfak	308°27.4	49°57.0
Aldebaran	290°39.0	16°33.7
Rigel	281°03.4	-8°10.1
Capella	280°21.2	46°01.3
Bellatrix	278°22.4	6°22.5
Elnath	278°01.3	28°37.7
Alnilam	275°37.3	-1°11.0
Betelgeuse	270°51.6	7°24.8
Canopus	263°52.4	-52°42.2
Sirius	258°26.0	-16°44.8
Adhara	255°05.7	-29°00.1
Procyon	244°50.5	5°09.7
Pollux	243°16.9	27°57.9
Avior	234°15.1	-59°35.2
Suhail	222°46.4	-43°32.0
Miaplacidus	221°39.1	-69°49.2
Alphard	217°47.5	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.8
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.6
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.6	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°39.9	-60°56.7
Kochab	137°20.2	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°08.8	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°57.9	12°32.6
Eltanin	90°41.7	51°29.4
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.6	38°48.6
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.0	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.6	-29°29.0
Scheat	13°44.3	28°13.4
Markab	13°29.0	15°20.7

Aug 29 Fri	SHA	Mer.pass
Venus	233°43.5	09:56
Mars	167°01.9	14:21
Jupiter	251°13.5	08:44
Saturn	358°48.5	01:35

Aug 30 Sat	SHA	Mer.pass
Venus	232°28.8	09:57
Mars	166°26.3	14:20
Jupiter	251°01.7	08:41
Saturn	358°52.1	01:30

Aug 31 Sun	SHA	Mer.pass
Venus	231°14.3	09:58
Mars	165°50.5	14:18
Jupiter	250°50.0	08:38
Saturn	358°55.8	01:26

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.5	N09°20.2	120°05.2	14.3′	S19°10.6	10.9′	54.2′
1	194°44.7	19.3	134°38.4	14.2′	19°21.5	10.9′	54.2′
2	209°44.9	18.4	149°11.6	14.2′	19°32.4	10.7′	54.2′
3	224°45.1	·· 17.5	163°44.8	14.1′	19°43.1	10.7′	54.2′
4	239°45.3	16.6	178°17.9	14.0′	19°53.8	10.5′	54.1′
5	254°45.5	15.7	192°50.9	14.0′	20°04.3	10.5′	54.1′
6	269°45.7	N09°14.9	207°23.9	13.9′	S20°14.8	10.4′	54.1′
7	284°45.9	14.0	221°56.8	13.9′	20°25.2	10.4′	54.1′
8	299°46.0	13.1	236°29.7	13.8′	20°35.6	10.2′	54.1′
9	314°46.2	·· 12.2	251°02.5	13.7′	20°45.8	10.2′	54.1′
10	329°46.4	11.3	265°35.2	13.7′	20°56.0	10.0′	54.1′
11	344°46.6	10.4	280°07.9	13.6′	21°06.0	10.0′	54.1′
12	359°46.8	N09°09.5	294°40.5	13.5′	S21°16.0	9.9′	54.1′
13	14°47.0	08.6	309°13.0	13.5′	21°25.9	9.8′	54.1′
14	29°47.2	07.7	323°45.5	13.4′	21°35.7	9.7′	54.1′
15	44°47.4	·· 06.8	338°17.9	13.3′	21°45.4	9.6′	54.1′
16	59°47.6	05.9	352°50.2	13.3′	21°55.0	9.5′	54.1′
17	74°47.8	05.0	7°22.5	13.2′	22°04.5	9.5′	54.1′
18	89°47.9	N09°04.1	21°54.7	13.1′	S22°14.0	9.3′	54.1′
19	104°48.1	03.3	36°26.8	13.1′	22°23.3	9.3′	54.1′
20	119°48.3	02.4	50°58.9	13.0′	22°32.6	9.1′	54.1′
21	134°48.5	·· 01.5	65°30.9	12.9′	22°41.7	9.1′	54.1′
22	149°48.7	09°00.6	80°02.8	12.9′	22°50.8	8.9′	54.1′
23	164°48.9	08°59.7	94°34.7	12.8′	22°59.7	8.9′	54.1′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°49.1	N08°58.8	109°06.5	12.7′	S23°08.6	8.7′	54.1′
1	194°49.3	57.9	123°38.2	12.7′	23°17.3	8.7′	54.1′
2	209°49.5	57.0	138°09.9	12.6′	23°26.0	8.6′	54.1′
3	224°49.7	·· 56.1	152°41.5	12.5′	23°34.6	8.4′	54.1′
4	239°49.9	55.2	167°13.0	12.5′	23°43.0	8.4′	54.2′
5	254°50.1	54.3	181°44.5	12.4′	23°51.4	8.2′	54.2′
6	269°50.2	N08°53.4	196°15.8	12.3′	S23°59.6	8.2′	54.2′
7	284°50.4	52.5	210°47.2	12.2′	24°07.8	8.0′	54.2′
8	299°50.6	51.6	225°18.4	12.2′	24°15.8	8.0′	54.2′
9	314°50.8	·· 50.7	239°49.6	12.1′	24°23.8	7.8′	54.2′
10	329°51.0	49.8	254°20.7	12.0′	24°31.6	7.7′	54.2′
11	344°51.2	48.9	268°51.7	12.0′	24°39.3	7.7′	54.2′
12	359°51.4	N08°48.0	283°22.7	11.9′	S24°47.0	7.5′	54.2′
13	14°51.6	47.1	297°53.6	11.8′	24°54.5	7.4′	54.2′
14	29°51.8	46.2	312°24.4	11.8′	25°01.9	7.3′	54.2′
15	44°52.0	·· 45.3	326°55.1	11.7′	25°09.2	7.2′	54.2′
16	59°52.2	44.4	341°25.8	11.6′	25°16.4	7.0′	54.2′
17	74°52.4	43.5	355°56.4	11.5′	25°23.4	7.0′	54.2′
18	89°52.6	N08°42.6	10°27.0	11.5′	S25°30.4	6.8′	54.2′
19	104°52.8	41.7	24°57.4	11.4′	25°37.2	6.8′	54.2′
20	119°53.0	40.8	39°27.8	11.3′	25°44.0	6.6′	54.2′
21	134°53.1	·· 39.9	53°58.2	11.3′	25°50.6	6.5′	54.3′
22	149°53.3	39.0	68°28.4	11.2′	25°57.1	6.4′	54.3′
23	164°53.5	38.1	82°58.6	11.1′	26°03.5	6.2′	54.3′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.7	N08°37.2	97°28.8	11.1′	S26°09.7	6.2′	54.3′
1	194°53.9	36.3	111°58.8	11.0′	26°15.9	6.0′	54.3′
2	209°54.1	35.4	126°28.8	10.9′	26°21.9	5.9′	54.3′
3	224°54.3	·· 34.5	140°58.7	10.9′	26°27.8	5.8′	54.3′
4	239°54.5	33.6	155°28.6	10.8′	26°33.6	5.6′	54.3′
5	254°54.7	32.7	169°58.4	10.7′	26°39.2	5.6′	54.3′
6	269°54.9	N08°31.8	184°28.1	10.7′	S26°44.8	5.4′	54.3′
7	284°55.1	30.9	198°57.7	10.6′	26°50.2	5.3′	54.4′
8	299°55.3	30.0	213°27.3	10.5′	26°55.5	5.2′	54.4′
9	314°55.5	·· 29.1	227°56.8	10.5′	27°00.7	5.0′	54.4′
10	329°55.7	28.2	242°26.3	10.4′	27°05.7	4.9′	54.4′
11	344°55.9	27.3	256°55.7	10.3′	27°10.6	4.8′	54.4′
12	359°56.1	N08°26.4	271°25.0	10.3′	S27°15.4	4.7′	54.4′
13	14°56.3	25.5	285°54.3	10.2′	27°20.1	4.5′	54.4′
14	29°56.5	24.6	300°23.5	10.1′	27°24.6	4.4′	54.4′
15	44°56.7	·· 23.7	314°52.6	10.1′	27°29.0	4.3′	54.5′
16	59°56.9	22.8	329°21.7	10.0′	27°33.3	4.1′	54.5′
17	74°57.1	21.9	343°50.7	10.0′	27°37.4	4.0′	54.5′
18	89°57.3	N08°21.0	358°19.6	9.9′	S27°41.4	3.9′	54.5′
19	104°57.5	20.1	12°48.5	9.8′	27°45.3	3.8′	54.5′
20	119°57.7	19.2	27°17.4	9.8′	27°49.1	3.6′	54.5′
21	134°57.9	·· 18.3	41°46.2	9.7′	27°52.7	3.4′	54.6′
22	149°58.1	17.3	56°14.9	9.7′	27°56.1	3.4′	54.6′
23	164°58.3	16.4	70°43.5	9.6′	27°59.5	3.2′	54.6′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:18	03:52	20:05	21:37	–:–
N 70°	–:–	02:49	04:07	19:51	21:07	–:–
68°	01:12	03:12	04:19	19:39	20:46	22:39
66°	01:58	03:29	04:29	19:30	20:29	21:57
64°	02:27	03:44	04:38	19:22	20:15	21:30
62°	02:48	03:55	04:45	19:15	20:04	21:09
60°	03:05	04:05	04:51	19:09	19:54	20:53
N 58°	03:19	04:14	04:56	19:04	19:46	20:40
56°	03:31	04:21	05:01	18:59	19:39	20:29
54°	03:41	04:27	05:05	18:55	19:32	20:19
52°	03:49	04:33	05:09	18:51	19:27	20:10
50°	03:57	04:38	05:12	18:48	19:22	20:03
45°	04:13	04:49	05:20	18:41	19:11	19:47
N 40°	04:25	04:58	05:26	18:34	19:02	19:35
35°	04:35	05:05	05:31	18:29	18:55	19:26
30°	04:43	05:12	05:36	18:25	18:49	19:18
20°	04:55	05:22	05:44	18:17	18:39	19:05
N 10°	05:05	05:30	05:51	18:10	18:31	18:56
0°	05:12	05:36	05:57	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:58	18:19	18:43
20°	05:22	05:48	06:10	17:51	18:14	18:39
30°	05:26	05:53	06:17	17:44	18:08	18:36
35°	05:27	05:56	06:22	17:40	18:05	18:35
40°	05:28	05:59	06:26	17:35	18:03	18:34
45°	05:28	06:02	06:32	17:30	18:00	18:34
S 50°	05:28	06:06	06:38	17:24	17:56	18:34
52°	05:28	06:07	06:41	17:21	17:55	18:34
54°	05:28	06:09	06:44	17:18	17:53	18:34
56°	05:28	06:10	06:48	17:14	17:52	18:35
58°	05:27	06:12	06:52	17:10	17:50	18:35
S 60°	05:26	06:14	06:56	17:06	17:48	18:36

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	14:42	▬	▬	18:03	▬	▬
64°	14:04	16:22	▬	18:42	18:01	▬
62°	13:37	15:24	17:33	19:10	19:01	18:36
60°	13:17	14:51	16:25	19:31	19:34	19:44
N 58°	13:00	14:26	15:50	19:49	19:59	20:19
56°	12:46	14:07	15:25	20:03	20:19	20:45
54°	12:33	13:51	15:05	20:16	20:36	21:05
52°	12:23	13:37	14:48	20:27	20:50	21:22
50°	12:13	13:25	14:33	20:37	21:02	21:37
45°	11:53	13:00	14:04	20:58	21:28	22:06
N 40°	11:37	12:40	13:41	21:16	21:49	22:30
35°	11:24	12:23	13:23	21:30	22:06	22:49
30°	11:12	12:09	13:07	21:43	22:21	23:05
20°	10:52	11:45	12:39	22:04	22:46	23:33
N 10°	10:35	11:24	12:16	22:23	23:08	23:57
0°	10:19	11:05	11:55	22:41	23:29	·· ··
S 10°	10:03	10:46	11:33	22:58	23:49	·· ··
20°	09:46	10:26	11:10	23:17	·· ··	00:11
30°	09:26	10:02	10:43	23:39	·· ··	00:37
35°	09:15	09:48	10:28	23:52	·· ··	00:52
40°	09:02	09:33	10:09	·· ··	00:07	01:10
45°	08:47	09:14	09:48	·· ··	00:25	01:31
S 50°	08:29	08:50	09:20	·· ··	00:48	01:58
52°	08:20	08:39	09:06	·· ··	00:58	02:11
54°	08:10	08:27	08:51	·· ··	01:10	02:26
56°	07:59	08:12	08:32	00:03	01:24	02:44
58°	07:47	07:55	08:10	00:15	01:41	03:06
S 60°	07:33	07:35	07:41	00:29	02:01	03:35

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 6-8 29-47%
29	01:02	00:53	12:01	16:30	04:07	
30	00:44	00:34	12:01	17:17	04:53	
31	00:25	00:16	12:00	18:07	05:42	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	340°24.8	210°24.8	N18°30.1	145°39.4	S06°01.8	231°03.2	N22°12.8	339°24.3	S02°15.9
1	355°27.2	225°24.1	29.4	160°40.4	02.5	246°05.2	12.7	354°26.9	16.0
2	10°29.7	240°23.5	28.8	175°41.4	03.1	261°07.2	12.7	9°29.5	16.0
3	25°32.2	255°22.9	·· 28.1	190°42.3	·· 03.8	276°09.1	·· 12.6	24°32.2	·· 16.1
4	40°34.6	270°22.2	27.5	205°43.3	04.4	291°11.1	12.6	39°34.8	16.2
5	55°37.1	285°21.6	26.8	220°44.3	05.1	306°13.1	12.5	54°37.4	16.3
6	70°39.6	300°21.0	N18°26.2	235°45.2	S06°05.7	321°15.1	N22°12.4	69°40.0	S02°16.3
7	85°42.0	315°20.3	25.5	250°46.2	06.4	336°17.1	12.4	84°42.6	16.4
8	100°44.5	330°19.7	24.9	265°47.2	07.0	351°19.1	12.3	99°45.3	16.5
9	115°46.9	345°19.1	·· 24.2	280°48.1	·· 07.7	6°21.0	·· 12.3	114°47.9	·· 16.6
10	130°49.4	0°18.5	23.6	295°49.1	08.3	21°23.0	12.2	129°50.5	16.6
11	145°51.9	15°17.8	22.9	310°50.1	09.0	36°25.0	12.2	144°53.1	16.7
12	160°54.3	30°17.2	N18°22.2	325°51.0	S06°09.6	51°27.0	N22°12.1	159°55.7	S02°16.8
13	175°56.8	45°16.6	21.6	340°52.0	10.3	66°29.0	12.1	174°58.4	16.9
14	190°59.3	60°16.0	20.9	355°53.0	10.9	81°31.0	12.0	190°01.0	16.9
15	206°01.7	75°15.3	·· 20.3	10°53.9	·· 11.6	96°33.0	·· 12.0	205°03.6	·· 17.0
16	221°04.2	90°14.7	19.6	25°54.9	12.2	111°34.9	11.9	220°06.2	17.1
17	236°06.7	105°14.1	18.9	40°55.9	12.9	126°36.9	11.8	235°08.9	17.2
18	251°09.1	120°13.5	N18°18.3	55°56.8	S06°13.5	141°38.9	N22°11.8	250°11.5	S02°17.2
19	266°11.6	135°12.8	17.6	70°57.8	14.2	156°40.9	11.7	265°14.1	17.3
20	281°14.1	150°12.2	17.0	85°58.8	14.8	171°42.9	11.7	280°16.7	17.4
21	296°16.5	165°11.6	·· 16.3	100°59.7	·· 15.5	186°44.9	·· 11.6	295°19.3	·· 17.5
22	311°19.0	180°11.0	15.6	116°00.7	16.1	201°46.9	11.6	310°22.0	17.5
23	326°21.4	195°10.3	15.0	131°01.6	16.8	216°48.8	11.5	325°24.6	17.6
Mer.pass.	01:18	ν -0.6′	d -0.6′	m -3.95	ν 1.0′	d -0.7′	m 1.62	ν 2.0′	d -0.1′	m -1.99	ν 2.6′	d -0.1′	m 0.65
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	341°23.9	210°09.7	N18°14.3	146°02.6	S06°17.4	231°50.8	N22°11.5	340°27.2	S02°17.7
1	356°26.4	225°09.1	13.6	161°03.6	18.1	246°52.8	11.4	355°29.8	17.8
2	11°28.8	240°08.5	13.0	176°04.5	18.7	261°54.8	11.3	10°32.5	17.8
3	26°31.3	255°07.8	·· 12.3	191°05.5	·· 19.4	276°56.8	·· 11.3	25°35.1	·· 17.9
4	41°33.8	270°07.2	11.6	206°06.5	20.0	291°58.8	11.2	40°37.7	18.0
5	56°36.2	285°06.6	10.9	221°07.4	20.7	307°00.8	11.2	55°40.3	18.1
6	71°38.7	300°06.0	N18°10.3	236°08.4	S06°21.3	322°02.8	N22°11.1	70°42.9	S02°18.1
7	86°41.2	315°05.4	09.6	251°09.4	22.0	337°04.7	11.1	85°45.6	18.2
8	101°43.6	330°04.7	08.9	266°10.3	22.6	352°06.7	11.0	100°48.2	18.3
9	116°46.1	345°04.1	·· 08.2	281°11.3	·· 23.3	7°08.7	·· 11.0	115°50.8	·· 18.4
10	131°48.6	0°03.5	07.6	296°12.2	23.9	22°10.7	10.9	130°53.4	18.4
11	146°51.0	15°02.9	06.9	311°13.2	24.6	37°12.7	10.8	145°56.1	18.5
12	161°53.5	30°02.3	N18°06.2	326°14.2	S06°25.2	52°14.7	N22°10.8	160°58.7	S02°18.6
13	176°55.9	45°01.6	05.5	341°15.1	25.9	67°16.7	10.7	176°01.3	18.7
14	191°58.4	60°01.0	04.8	356°16.1	26.5	82°18.7	10.7	191°03.9	18.7
15	207°00.9	75°00.4	·· 04.2	11°17.1	·· 27.1	97°20.7	·· 10.6	206°06.6	·· 18.8
16	222°03.3	89°59.8	03.5	26°18.0	27.8	112°22.6	10.6	221°09.2	18.9
17	237°05.8	104°59.2	02.8	41°19.0	28.4	127°24.6	10.5	236°11.8	19.0
18	252°08.3	119°58.5	N18°02.1	56°19.9	S06°29.1	142°26.6	N22°10.5	251°14.4	S02°19.0
19	267°10.7	134°57.9	01.4	71°20.9	29.7	157°28.6	10.4	266°17.0	19.1
20	282°13.2	149°57.3	00.7	86°21.9	30.4	172°30.6	10.4	281°19.7	19.2
21	297°15.7	164°56.7	18°00.1	101°22.8	·· 31.0	187°32.6	·· 10.3	296°22.3	·· 19.3
22	312°18.1	179°56.1	17°59.4	116°23.8	31.7	202°34.6	10.2	311°24.9	19.3
23	327°20.6	194°55.5	58.7	131°24.8	32.3	217°36.6	10.2	326°27.5	19.4
Mer.pass.	01:14	ν -0.6′	d -0.7′	m -3.95	ν 1.0′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.00	ν 2.6′	d -0.1′	m 0.65
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	342°23.1	209°54.8	N17°58.0	146°25.7	S06°33.0	232°38.6	N22°10.1	341°30.2	S02°19.5
1	357°25.5	224°54.2	57.3	161°26.7	33.6	247°40.6	10.1	356°32.8	19.6
2	12°28.0	239°53.6	56.6	176°27.6	34.3	262°42.6	10.0	11°35.4	19.6
3	27°30.4	254°53.0	·· 55.9	191°28.6	·· 34.9	277°44.5	·· 10.0	26°38.0	·· 19.7
4	42°32.9	269°52.4	55.2	206°29.6	35.6	292°46.5	09.9	41°40.7	19.8
5	57°35.4	284°51.8	54.5	221°30.5	36.2	307°48.5	09.9	56°43.3	19.9
6	72°37.8	299°51.2	N17°53.8	236°31.5	S06°36.9	322°50.5	N22°09.8	71°45.9	S02°19.9
7	87°40.3	314°50.5	53.1	251°32.4	37.5	337°52.5	09.7	86°48.5	20.0
8	102°42.8	329°49.9	52.5	266°33.4	38.2	352°54.5	09.7	101°51.2	20.1
9	117°45.2	344°49.3	·· 51.8	281°34.3	·· 38.8	7°56.5	·· 09.6	116°53.8	·· 20.2
10	132°47.7	359°48.7	51.1	296°35.3	39.5	22°58.5	09.6	131°56.4	20.2
11	147°50.2	14°48.1	50.4	311°36.3	40.1	38°00.5	09.5	146°59.0	20.3
12	162°52.6	29°47.5	N17°49.7	326°37.2	S06°40.8	53°02.5	N22°09.5	162°01.7	S02°20.4
13	177°55.1	44°46.9	49.0	341°38.2	41.4	68°04.5	09.4	177°04.3	20.5
14	192°57.5	59°46.2	48.3	356°39.1	42.1	83°06.5	09.4	192°06.9	20.6
15	208°00.0	74°45.6	·· 47.6	11°40.1	·· 42.7	98°08.5	·· 09.3	207°09.5	·· 20.6
16	223°02.5	89°45.0	46.8	26°41.1	43.4	113°10.5	09.2	222°12.2	20.7
17	238°04.9	104°44.4	46.1	41°42.0	44.0	128°12.5	09.2	237°14.8	20.8
18	253°07.4	119°43.8	N17°45.4	56°43.0	S06°44.7	143°14.4	N22°09.1	252°17.4	S02°20.9
19	268°09.9	134°43.2	44.7	71°43.9	45.3	158°16.4	09.1	267°20.0	20.9
20	283°12.3	149°42.6	44.0	86°44.9	46.0	173°18.4	09.0	282°22.7	21.0
21	298°14.8	164°42.0	·· 43.3	101°45.8	·· 46.6	188°20.4	·· 09.0	297°25.3	·· 21.1
22	313°17.3	179°41.4	42.6	116°46.8	47.3	203°22.4	08.9	312°27.9	21.2
23	328°19.7	194°40.7	41.9	131°47.8	47.9	218°24.4	08.9	327°30.5	21.2
Mer.pass.	01:10	ν -0.6′	d -0.7′	m -3.94	ν 1.0′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.00	ν 2.6′	d -0.1′	m 0.64

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.2	-42°09.8
Schedar	349°30.0	56°40.6
Diphda	348°46.5	-17°50.5
Achernar	335°19.3	-57°06.1
Hamal	327°50.4	23°35.1
Polaris	313°35.1	89°22.1
Acamar	315°11.2	-40°11.8
Menkar	314°05.5	4°11.6
Mirfak	308°27.3	49°57.0
Aldebaran	290°39.0	16°33.7
Rigel	281°03.4	-8°10.1
Capella	280°21.2	46°01.3
Bellatrix	278°22.4	6°22.5
Elnath	278°01.3	28°37.7
Alnilam	275°37.3	-1°11.0
Betelgeuse	270°51.6	7°24.8
Canopus	263°52.4	-52°42.2
Sirius	258°25.9	-16°44.8
Adhara	255°05.7	-29°00.1
Procyon	244°50.5	5°09.7
Pollux	243°16.9	27°57.9
Avior	234°15.1	-59°35.2
Suhail	222°46.3	-43°32.0
Miaplacidus	221°39.1	-69°49.2
Alphard	217°47.5	-8°46.1
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.8
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.6
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.7	-60°30.0
Menkent	147°57.2	-36°29.9
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°39.9	-60°56.7
Kochab	137°20.3	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°08.8	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.7	51°29.4
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.7	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.1	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.1
Fomalhaut	15°13.5	-29°29.0
Scheat	13°44.3	28°13.4
Markab	13°29.0	15°20.7

Sep 01 Mon	SHA	Mer.pass
Venus	230°00.0	09:59
Mars	165°14.6	14:16
Jupiter	250°38.4	08:35
Saturn	358°59.5	01:22

Sep 02 Tue	SHA	Mer.pass
Venus	228°45.8	10:00
Mars	164°38.7	14:15
Jupiter	250°26.9	08:31
Saturn	359°03.3	01:18

Sep 03 Wed	SHA	Mer.pass
Venus	227°31.8	10:01
Mars	164°02.7	14:13
Jupiter	250°15.5	08:28
Saturn	359°07.1	01:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°58.4	N08°15.5	85°12.2	9.6′	S28°02.7	3.1′	54.6′
1	194°58.6	14.6	99°40.7	9.5′	28°05.8	2.9′	54.6′
2	209°58.8	13.7	114°09.2	9.5′	28°08.7	2.8′	54.6′
3	224°59.0	·· 12.8	128°37.7	9.4′	28°11.5	2.6′	54.7′
4	239°59.2	11.9	143°06.1	9.3′	28°14.1	2.5′	54.7′
5	254°59.4	11.0	157°34.4	9.3′	28°16.6	2.4′	54.7′
6	269°59.6	N08°10.1	172°02.7	9.2′	S28°19.0	2.3′	54.7′
7	284°59.8	09.2	186°31.0	9.2′	28°21.3	2.1′	54.7′
8	300°00.0	08.3	200°59.2	9.2′	28°23.4	1.9′	54.7′
9	315°00.2	·· 07.4	215°27.3	9.1′	28°25.3	1.8′	54.8′
10	330°00.4	06.5	229°55.4	9.1′	28°27.1	1.7′	54.8′
11	345°00.6	05.5	244°23.5	9.0′	28°28.8	1.5′	54.8′
12	0°00.8	N08°04.6	258°51.5	9.0′	S28°30.3	1.4′	54.8′
13	15°01.0	03.7	273°19.5	8.9′	28°31.7	1.2′	54.8′
14	30°01.2	02.8	287°47.4	8.9′	28°32.9	1.1′	54.9′
15	45°01.4	·· 01.9	302°15.3	8.9′	28°34.0	1.0′	54.9′
16	60°01.6	01.0	316°43.2	8.8′	28°35.0	0.8′	54.9′
17	75°01.8	08°00.1	331°11.0	8.8′	28°35.8	0.6′	54.9′
18	90°02.0	N07°59.2	345°38.8	8.7′	S28°36.4	0.5′	54.9′
19	105°02.2	58.3	0°06.5	8.7′	28°36.9	0.4′	55.0′
20	120°02.4	57.4	14°34.2	8.7′	28°37.3	0.2′	55.0′
21	135°02.6	·· 56.4	29°01.9	8.6′	28°37.5	0.1′	55.0′
22	150°02.8	55.5	43°29.6	8.6′	28°37.6	0.1′	55.0′
23	165°03.0	54.6	57°57.2	8.6′	28°37.5	0.3′	55.1′
	SD = 15.8′	d = -0.9′	SD = 14.9′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°03.2	N07°53.7	72°24.8	8.6′	S28°37.2	0.3′	55.1′
1	195°03.4	52.8	86°52.3	8.5′	28°36.9	0.6′	55.1′
2	210°03.7	51.9	101°19.9	8.5′	28°36.3	0.7′	55.1′
3	225°03.9	·· 51.0	115°47.4	8.5′	28°35.6	0.8′	55.2′
4	240°04.1	50.1	130°14.9	8.5′	28°34.8	1.0′	55.2′
5	255°04.3	49.1	144°42.3	8.4′	28°33.8	1.1′	55.2′
6	270°04.5	N07°48.2	159°09.8	8.4′	S28°32.7	1.3′	55.2′
7	285°04.7	47.3	173°37.2	8.4′	28°31.4	1.4′	55.3′
8	300°04.9	46.4	188°04.6	8.4′	28°30.0	1.6′	55.3′
9	315°05.1	·· 45.5	202°32.0	8.4′	28°28.4	1.7′	55.3′
10	330°05.3	44.6	216°59.4	8.4′	28°26.7	1.9′	55.3′
11	345°05.5	43.7	231°26.7	8.3′	28°24.8	2.1′	55.4′
12	0°05.7	N07°42.8	245°54.1	8.3′	S28°22.7	2.2′	55.4′
13	15°05.9	41.8	260°21.4	8.3′	28°20.5	2.3′	55.4′
14	30°06.1	40.9	274°48.7	8.3′	28°18.2	2.5′	55.4′
15	45°06.3	·· 40.0	289°16.0	8.3′	28°15.7	2.7′	55.5′
16	60°06.5	39.1	303°43.3	8.3′	28°13.0	2.8′	55.5′
17	75°06.7	38.2	318°10.6	8.3′	28°10.2	2.9′	55.5′
18	90°06.9	N07°37.3	332°37.9	8.3′	S28°07.3	3.1′	55.5′
19	105°07.1	36.3	347°05.2	8.3′	28°04.2	3.3′	55.6′
20	120°07.3	35.4	1°32.5	8.3′	28°00.9	3.4′	55.6′
21	135°07.5	·· 34.5	15°59.8	8.3′	27°57.5	3.6′	55.6′
22	150°07.7	33.6	30°27.1	8.3′	27°53.9	3.7′	55.7′
23	165°07.9	32.7	44°54.3	8.3′	27°50.2	3.9′	55.7′
	SD = 15.8′	d = -0.9′	SD = 15.0′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.1	N07°31.8	59°21.6	8.3′	S27°46.3	4.0′	55.7′
1	195°08.3	30.8	73°48.9	8.3′	27°42.3	4.2′	55.7′
2	210°08.5	29.9	88°16.2	8.3′	27°38.1	4.3′	55.8′
3	225°08.7	·· 29.0	102°43.5	8.3′	27°33.8	4.5′	55.8′
4	240°08.9	28.1	117°10.8	8.3′	27°29.3	4.6′	55.8′
5	255°09.1	27.2	131°38.2	8.3′	27°24.7	4.8′	55.9′
6	270°09.3	N07°26.3	146°05.5	8.3′	S27°19.9	5.0′	55.9′
7	285°09.6	25.3	160°32.8	8.4′	27°14.9	5.1′	55.9′
8	300°09.8	24.4	175°00.2	8.4′	27°09.8	5.2′	55.9′
9	315°10.0	·· 23.5	189°27.6	8.4′	27°04.6	5.4′	56.0′
10	330°10.2	22.6	203°54.9	8.4′	26°59.2	5.6′	56.0′
11	345°10.4	21.7	218°22.3	8.4′	26°53.6	5.7′	56.0′
12	0°10.6	N07°20.7	232°49.8	8.4′	S26°47.9	5.8′	56.1′
13	15°10.8	19.8	247°17.2	8.5′	26°42.1	6.0′	56.1′
14	30°11.0	18.9	261°44.7	8.5′	26°36.1	6.2′	56.1′
15	45°11.2	·· 18.0	276°12.1	8.5′	26°29.9	6.2′	56.2′
16	60°11.4	17.1	290°39.6	8.5′	26°23.7	6.5′	56.2′
17	75°11.6	16.1	305°07.1	8.5′	26°17.2	6.6′	56.2′
18	90°11.8	N07°15.2	319°34.7	8.6′	S26°10.6	6.7′	56.2′
19	105°12.0	14.3	334°02.3	8.6′	26°03.9	6.9′	56.3′
20	120°12.2	13.4	348°29.9	8.6′	25°57.0	7.1′	56.3′
21	135°12.4	·· 12.5	2°57.5	8.6′	25°49.9	7.2′	56.3′
22	150°12.6	11.5	17°25.1	8.7′	25°42.7	7.3′	56.4′
23	165°12.9	10.6	31°52.8	8.7′	25°35.4	7.5′	56.4′
	SD = 15.8′	d = -0.9′	SD = 15.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:40	04:07	19:48	21:14	–:–
N 70°	00:24	03:06	04:20	19:36	20:49	23:10
68°	01:42	03:26	04:31	19:26	20:30	22:10
66°	02:17	03:41	04:39	19:18	20:15	21:37
64°	02:41	03:54	04:46	19:11	20:03	21:14
62°	03:00	04:04	04:52	19:05	19:53	20:56
60°	03:15	04:13	04:58	19:00	19:44	20:42
N 58°	03:28	04:21	05:02	18:55	19:37	20:30
56°	03:38	04:27	05:07	18:51	19:30	20:19
54°	03:47	04:33	05:10	18:48	19:25	20:10
52°	03:55	04:38	05:14	18:44	19:20	20:02
50°	04:02	04:43	05:17	18:41	19:15	19:56
45°	04:17	04:53	05:23	18:35	19:05	19:41
N 40°	04:28	05:01	05:29	18:30	18:57	19:30
35°	04:37	05:08	05:34	18:25	18:51	19:21
30°	04:45	05:13	05:38	18:21	18:45	19:14
20°	04:56	05:22	05:45	18:14	18:37	19:03
N 10°	05:05	05:30	05:51	18:08	18:30	18:54
0°	05:11	05:35	05:56	18:03	18:24	18:48
S 10°	05:16	05:41	06:02	17:58	18:19	18:43
20°	05:20	05:45	06:08	17:52	18:14	18:40
30°	05:22	05:50	06:14	17:46	18:10	18:38
35°	05:23	05:52	06:18	17:42	18:08	18:37
40°	05:23	05:55	06:22	17:38	18:05	18:37
45°	05:23	05:57	06:26	17:34	18:03	18:37
S 50°	05:22	06:00	06:32	17:28	18:01	18:38
52°	05:22	06:01	06:35	17:26	18:00	18:39
54°	05:21	06:02	06:37	17:23	17:58	18:39
56°	05:20	06:03	06:40	17:20	17:57	18:40
58°	05:19	06:04	06:44	17:16	17:56	18:41
S 60°	05:18	06:06	06:48	17:13	17:55	18:43

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	20:40	▬	▬	21:05
62°	▬	▬	19:14	▬	▬	22:31
60°	17:43	18:23	18:37	20:16	21:28	23:07
N 58°	17:00	17:46	18:11	20:59	22:05	23:33
56°	16:31	17:19	17:50	21:27	22:31	23:53
54°	16:09	16:58	17:33	21:50	22:52	·· ··
52°	15:51	16:41	17:18	22:08	23:10	·· ··
50°	15:35	16:26	17:05	22:24	23:24	·· ··
45°	15:04	15:56	16:38	22:55	23:54	·· ··
N 40°	14:40	15:32	16:17	23:19	·· ··	00:18
35°	14:20	15:12	15:59	23:39	·· ··	00:37
30°	14:03	14:56	15:44	23:56	·· ··	00:53
20°	13:34	14:27	15:18	·· ··	00:25	01:21
N 10°	13:10	14:03	14:56	·· ··	00:50	01:45
0°	12:47	13:41	14:35	00:19	01:12	02:07
S 10°	12:24	13:18	14:14	00:42	01:35	02:29
20°	11:59	12:54	13:51	01:06	02:00	02:52
30°	11:31	12:25	13:25	01:34	02:29	03:19
35°	11:14	12:08	13:09	01:50	02:45	03:35
40°	10:55	11:49	12:51	02:10	03:05	03:54
45°	10:31	11:25	12:29	02:33	03:29	04:16
S 50°	10:00	10:54	12:02	03:04	04:00	04:45
52°	09:45	10:39	11:48	03:19	04:15	04:59
54°	09:28	10:21	11:32	03:36	04:33	05:15
56°	09:06	10:00	11:14	03:57	04:55	05:34
58°	08:39	09:32	10:51	04:24	05:23	05:57
S 60°	08:01	08:52	10:20	05:02	06:02	06:28

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 9-11 57-75%
01	00:06	00:03	12:00	19:00	06:33	
02	00:13	00:23	12:00	19:54	07:26	
03	00:32	00:42	11:59	20:48	08:21	

No IERS EOP prediction data available

September 04, 05, 06 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.2430 sec ΔT = TT-UT1 = +68.9410 sec

2025 September 04 to Sep. 06 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°22.2	209°40.1	N17°41.2	146°48.7	S06°48.6	233°26.4	N22°08.8	342°33.2	S02°21.3
1	358°24.7	224°39.5	40.5	161°49.7	49.2	248°28.4	08.8	357°35.8	21.4
2	13°27.1	239°38.9	39.8	176°50.6	49.8	263°30.4	08.7	12°38.4	21.5
3	28°29.6	254°38.3	·· 39.1	191°51.6	·· 50.5	278°32.4	·· 08.6	27°41.1	·· 21.5
4	43°32.0	269°37.7	38.3	206°52.5	51.1	293°34.4	08.6	42°43.7	21.6
5	58°34.5	284°37.1	37.6	221°53.5	51.8	308°36.4	08.5	57°46.3	21.7
6	73°37.0	299°36.5	N17°36.9	236°54.5	S06°52.4	323°38.4	N22°08.5	72°48.9	S02°21.8
7	88°39.4	314°35.9	36.2	251°55.4	53.1	338°40.4	08.4	87°51.6	21.8
8	103°41.9	329°35.3	35.5	266°56.4	53.7	353°42.4	08.4	102°54.2	21.9
9	118°44.4	344°34.7	·· 34.8	281°57.3	·· 54.4	8°44.4	·· 08.3	117°56.8	·· 22.0
10	133°46.8	359°34.1	34.0	296°58.3	55.0	23°46.4	08.3	132°59.4	22.1
11	148°49.3	14°33.5	33.3	311°59.2	55.7	38°48.4	08.2	148°02.1	22.1
12	163°51.8	29°32.9	N17°32.6	327°00.2	S06°56.3	53°50.4	N22°08.1	163°04.7	S02°22.2
13	178°54.2	44°32.2	31.9	342°01.1	57.0	68°52.4	08.1	178°07.3	22.3
14	193°56.7	59°31.6	31.2	357°02.1	57.6	83°54.4	08.0	193°09.9	22.4
15	208°59.2	74°31.0	·· 30.4	12°03.0	·· 58.3	98°56.4	·· 08.0	208°12.6	·· 22.5
16	224°01.6	89°30.4	29.7	27°04.0	58.9	113°58.4	07.9	223°15.2	22.5
17	239°04.1	104°29.8	29.0	42°05.0	06°59.6	129°00.4	07.9	238°17.8	22.6
18	254°06.5	119°29.2	N17°28.3	57°05.9	S07°00.2	144°02.4	N22°07.8	253°20.5	S02°22.7
19	269°09.0	134°28.6	27.5	72°06.9	00.9	159°04.4	07.8	268°23.1	22.8
20	284°11.5	149°28.0	26.8	87°07.8	01.5	174°06.4	07.7	283°25.7	22.8
21	299°13.9	164°27.4	·· 26.1	102°08.8	·· 02.1	189°08.4	·· 07.7	298°28.3	·· 22.9
22	314°16.4	179°26.8	25.3	117°09.7	02.8	204°10.4	07.6	313°31.0	23.0
23	329°18.9	194°26.2	24.6	132°10.7	03.4	219°12.4	07.5	328°33.6	23.1
Mer.pass.	01:06	ν -0.6′	d -0.7′	m -3.94	ν 1.0′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.00	ν 2.6′	d -0.1′	m 0.64

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°21.3	209°25.6	N17°23.9	147°11.6	S07°04.1	234°14.4	N22°07.5	343°36.2	S02°23.1
1	359°23.8	224°25.0	23.2	162°12.6	04.7	249°16.4	07.4	358°38.8	23.2
2	14°26.3	239°24.4	22.4	177°13.5	05.4	264°18.4	07.4	13°41.5	23.3
3	29°28.7	254°23.8	·· 21.7	192°14.5	·· 06.0	279°20.4	·· 07.3	28°44.1	·· 23.4
4	44°31.2	269°23.2	21.0	207°15.4	06.7	294°22.4	07.3	43°46.7	23.4
5	59°33.7	284°22.6	20.2	222°16.4	07.3	309°24.4	07.2	58°49.4	23.5
6	74°36.1	299°22.0	N17°19.5	237°17.3	S07°08.0	324°26.4	N22°07.2	73°52.0	S02°23.6
7	89°38.6	314°21.4	18.7	252°18.3	08.6	339°28.4	07.1	88°54.6	23.7
8	104°41.0	329°20.8	18.0	267°19.2	09.3	354°30.4	07.0	103°57.2	23.7
9	119°43.5	344°20.2	·· 17.3	282°20.2	·· 09.9	9°32.4	·· 07.0	118°59.9	·· 23.8
10	134°46.0	359°19.6	16.5	297°21.1	10.6	24°34.4	06.9	134°02.5	23.9
11	149°48.4	14°19.0	15.8	312°22.1	11.2	39°36.4	06.9	149°05.1	24.0
12	164°50.9	29°18.4	N17°15.0	327°23.0	S07°11.8	54°38.4	N22°06.8	164°07.8	S02°24.1
13	179°53.4	44°17.8	14.3	342°24.0	12.5	69°40.4	06.8	179°10.4	24.1
14	194°55.8	59°17.2	13.6	357°24.9	13.1	84°42.4	06.7	194°13.0	24.2
15	209°58.3	74°16.6	·· 12.8	12°25.9	·· 13.8	99°44.4	·· 06.7	209°15.6	·· 24.3
16	225°00.8	89°16.0	12.1	27°26.8	14.4	114°46.4	06.6	224°18.3	24.4
17	240°03.2	104°15.4	11.3	42°27.8	15.1	129°48.4	06.5	239°20.9	24.4
18	255°05.7	119°14.8	N17°10.6	57°28.7	S07°15.7	144°50.4	N22°06.5	254°23.5	S02°24.5
19	270°08.1	134°14.2	09.8	72°29.7	16.4	159°52.4	06.4	269°26.2	24.6
20	285°10.6	149°13.6	09.1	87°30.6	17.0	174°54.4	06.4	284°28.8	24.7
21	300°13.1	164°13.0	·· 08.3	102°31.6	·· 17.7	189°56.4	·· 06.3	299°31.4	·· 24.7
22	315°15.5	179°12.4	07.6	117°32.5	18.3	204°58.4	06.3	314°34.0	24.8
23	330°18.0	194°11.9	06.8	132°33.5	19.0	220°00.4	06.2	329°36.7	24.9
Mer.pass.	01:02	ν -0.6′	d -0.7′	m -3.94	ν 1.0′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.01	ν 2.6′	d -0.1′	m 0.64

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	345°20.5	209°11.3	N17°06.1	147°34.4	S07°19.6	235°02.4	N22°06.2	344°39.3	S02°25.0
1	0°22.9	224°10.7	05.3	162°35.4	20.2	250°04.4	06.1	359°41.9	25.1
2	15°25.4	239°10.1	04.6	177°36.3	20.9	265°06.4	06.1	14°44.6	25.1
3	30°27.9	254°09.5	·· 03.8	192°37.3	·· 21.5	280°08.4	·· 06.0	29°47.2	·· 25.2
4	45°30.3	269°08.9	03.1	207°38.2	22.2	295°10.4	05.9	44°49.8	25.3
5	60°32.8	284°08.3	02.3	222°39.2	22.8	310°12.4	05.9	59°52.4	25.4
6	75°35.3	299°07.7	N17°01.6	237°40.1	S07°23.5	325°14.4	N22°05.8	74°55.1	S02°25.4
7	90°37.7	314°07.1	00.8	252°41.1	24.1	340°16.5	05.8	89°57.7	25.5
8	105°40.2	329°06.5	17°00.0	267°42.0	24.8	355°18.5	05.7	105°00.3	25.6
9	120°42.6	344°05.9	16°59.3	282°43.0	·· 25.4	10°20.5	·· 05.7	120°03.0	·· 25.7
10	135°45.1	359°05.3	58.5	297°43.9	26.1	25°22.5	05.6	135°05.6	25.7
11	150°47.6	14°04.7	57.8	312°44.8	26.7	40°24.5	05.6	150°08.2	25.8
12	165°50.0	29°04.1	N16°57.0	327°45.8	S07°27.3	55°26.5	N22°05.5	165°10.8	S02°25.9
13	180°52.5	44°03.6	56.2	342°46.7	28.0	70°28.5	05.4	180°13.5	26.0
14	195°55.0	59°03.0	55.5	357°47.7	28.6	85°30.5	05.4	195°16.1	26.1
15	210°57.4	74°02.4	·· 54.7	12°48.6	·· 29.3	100°32.5	·· 05.3	210°18.7	·· 26.1
16	225°59.9	89°01.8	53.9	27°49.6	29.9	115°34.5	05.3	225°21.4	26.2
17	241°02.4	104°01.2	53.2	42°50.5	30.6	130°36.5	05.2	240°24.0	26.3
18	256°04.8	119°00.6	N16°52.4	57°51.5	S07°31.2	145°38.5	N22°05.2	255°26.6	S02°26.4
19	271°07.3	134°00.0	51.6	72°52.4	31.9	160°40.5	05.1	270°29.3	26.4
20	286°09.8	148°59.4	50.9	87°53.4	32.5	175°42.5	05.1	285°31.9	26.5
21	301°12.2	163°58.8	·· 50.1	102°54.3	·· 33.1	190°44.6	·· 05.0	300°34.5	·· 26.6
22	316°14.7	178°58.3	49.3	117°55.2	33.8	205°46.6	05.0	315°37.2	26.7
23	331°17.1	193°57.7	48.6	132°56.2	34.4	220°48.6	04.9	330°39.8	26.8
Mer.pass.	00:58	ν -0.6′	d -0.8′	m -3.94	ν 0.9′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.01	ν 2.6′	d -0.1′	m 0.63

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.2	-42°09.8
Schedar	349°29.9	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.3	-57°06.1
Hamal	327°50.4	23°35.1
Polaris	313°33.6	89°22.1
Acamar	315°11.1	-40°11.8
Menkar	314°05.4	4°11.6
Mirfak	308°27.3	49°57.0
Aldebaran	290°39.0	16°33.7
Rigel	281°03.4	-8°10.1
Capella	280°21.1	46°01.3
Bellatrix	278°22.3	6°22.5
Elnath	278°01.2	28°37.7
Alnilam	275°37.2	-1°11.0
Betelgeuse	270°51.6	7°24.8
Canopus	263°52.4	-52°42.2
Sirius	258°25.9	-16°44.8
Adhara	255°05.6	-29°00.1
Procyon	244°50.5	5°09.7
Pollux	243°16.9	27°57.9
Avior	234°15.0	-59°35.2
Suhail	222°46.3	-43°32.0
Miaplacidus	221°39.1	-69°49.1
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°41.0	61°36.8
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.6
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.7	-60°30.0
Menkent	147°57.2	-36°29.8
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°39.9	-60°56.7
Kochab	137°20.3	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°08.9	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.5	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.8	51°29.4
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.7	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.1	45°22.5
Enif	33°37.9	9°59.7
Al Na'ir	27°31.7	-46°50.1
Fomalhaut	15°13.5	-29°29.0
Scheat	13°44.3	28°13.4
Markab	13°29.0	15°20.7

Sep 04 Thu	SHA	Mer.pass
Venus	226°17.9	10:02
Mars	163°26.5	14:12
Jupiter	250°04.2	08:25
Saturn	359°11.0	01:10

Sep 05 Fri	SHA	Mer.pass
Venus	225°04.3	10:03
Mars	162°50.3	14:10
Jupiter	249°53.0	08:22
Saturn	359°14.9	01:05

Sep 06 Sat	SHA	Mer.pass
Venus	223°50.8	10:04
Mars	162°14.0	14:09
Jupiter	249°41.9	08:19
Saturn	359°18.8	01:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°13.1	N07°09.7	46°20.5	8.7′	S25°27.9	7.6′	56.4′
1	195°13.3	08.8	60°48.2	8.8′	25°20.3	7.8′	56.5′
2	210°13.5	07.9	75°16.0	8.8′	25°12.5	7.9′	56.5′
3	225°13.7	·· 06.9	89°43.8	8.8′	25°04.6	8.0′	56.5′
4	240°13.9	06.0	104°11.6	8.9′	24°56.6	8.2′	56.6′
5	255°14.1	05.1	118°39.5	8.9′	24°48.4	8.4′	56.6′
6	270°14.3	N07°04.2	133°07.4	8.9′	S24°40.0	8.5′	56.6′
7	285°14.5	03.2	147°35.3	9.0′	24°31.5	8.6′	56.7′
8	300°14.7	02.3	162°03.3	9.0′	24°22.9	8.8′	56.7′
9	315°14.9	·· 01.4	176°31.3	9.0′	24°14.1	8.9′	56.7′
10	330°15.1	07°00.5	190°59.4	9.1′	24°05.2	9.0′	56.8′
11	345°15.3	06°59.5	205°27.5	9.1′	23°56.2	9.2′	56.8′
12	0°15.6	N06°58.6	219°55.6	9.2′	S23°47.0	9.3′	56.8′
13	15°15.8	57.7	234°23.7	9.2′	23°37.7	9.5′	56.9′
14	30°16.0	56.8	248°51.9	9.2′	23°28.2	9.6′	56.9′
15	45°16.2	·· 55.9	263°20.2	9.3′	23°18.6	9.7′	56.9′
16	60°16.4	54.9	277°48.4	9.3′	23°08.9	9.9′	57.0′
17	75°16.6	54.0	292°16.8	9.4′	22°59.0	10.0′	57.0′
18	90°16.8	N06°53.1	306°45.1	9.4′	S22°49.0	10.1′	57.0′
19	105°17.0	52.1	321°13.5	9.4′	22°38.9	10.3′	57.1′
20	120°17.2	51.2	335°42.0	9.5′	22°28.6	10.4′	57.1′
21	135°17.4	·· 50.3	350°10.4	9.5′	22°18.2	10.5′	57.1′
22	150°17.6	49.4	4°39.0	9.6′	22°07.7	10.7′	57.2′
23	165°17.9	48.4	19°07.5	9.6′	21°57.0	10.8′	57.2′
	SD = 15.9′	d = -0.9′	SD = 15.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.1	N06°47.5	33°36.2	9.7′	S21°46.2	10.9′	57.2′
1	195°18.3	46.6	48°04.8	9.7′	21°35.3	11.1′	57.3′
2	210°18.5	45.7	62°33.5	9.7′	21°24.2	11.1′	57.3′
3	225°18.7	·· 44.7	77°02.3	9.8′	21°13.1	11.3′	57.3′
4	240°18.9	43.8	91°31.0	9.8′	21°01.8	11.5′	57.4′
5	255°19.1	42.9	105°59.9	9.9′	20°50.3	11.5′	57.4′
6	270°19.3	N06°42.0	120°28.7	9.9′	S20°38.8	11.7′	57.4′
7	285°19.5	41.0	134°57.7	10.0′	20°27.1	11.8′	57.5′
8	300°19.7	40.1	149°26.6	10.0′	20°15.3	11.9′	57.5′
9	315°20.0	·· 39.2	163°55.6	10.0′	20°03.4	12.0′	57.5′
10	330°20.2	38.2	178°24.7	10.1′	19°51.4	12.2′	57.6′
11	345°20.4	37.3	192°53.8	10.1′	19°39.2	12.2′	57.6′
12	0°20.6	N06°36.4	207°22.9	10.2′	S19°27.0	12.4′	57.6′
13	15°20.8	35.5	221°52.1	10.2′	19°14.6	12.5′	57.7′
14	30°21.0	34.5	236°21.3	10.3′	19°02.1	12.6′	57.7′
15	45°21.2	·· 33.6	250°50.6	10.3′	18°49.5	12.8′	57.7′
16	60°21.4	32.7	265°19.9	10.4′	18°36.7	12.8′	57.8′
17	75°21.6	31.7	279°49.2	10.4′	18°23.9	13.0′	57.8′
18	90°21.9	N06°30.8	294°18.6	10.4′	S18°10.9	13.0′	57.8′
19	105°22.1	29.9	308°48.1	10.5′	17°57.9	13.2′	57.9′
20	120°22.3	29.0	323°17.6	10.5′	17°44.7	13.3′	57.9′
21	135°22.5	·· 28.0	337°47.1	10.6′	17°31.4	13.3′	57.9′
22	150°22.7	27.1	352°16.6	10.6′	17°18.1	13.5′	58.0′
23	165°22.9	26.2	6°46.2	10.6′	17°04.6	13.6′	58.0′
	SD = 15.9′	d = -0.9′	SD = 15.6′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.1	N06°25.2	21°15.9	10.7′	S16°51.0	13.7′	58.0′
1	195°23.3	24.3	35°45.6	10.7′	16°37.3	13.8′	58.1′
2	210°23.6	23.4	50°15.3	10.8′	16°23.5	13.9′	58.1′
3	225°23.8	·· 22.4	64°45.1	10.8′	16°09.6	14.0′	58.1′
4	240°24.0	21.5	79°14.9	10.8′	15°55.6	14.1′	58.2′
5	255°24.2	20.6	93°44.7	10.9′	15°41.5	14.2′	58.2′
6	270°24.4	N06°19.6	108°14.6	10.9′	S15°27.3	14.3′	58.2′
7	285°24.6	18.7	122°44.5	11.0′	15°13.0	14.4′	58.3′
8	300°24.8	17.8	137°14.5	11.0′	14°58.6	14.4′	58.3′
9	315°25.0	·· 16.8	151°44.5	11.0′	14°44.2	14.6′	58.3′
10	330°25.3	15.9	166°14.5	11.1′	14°29.6	14.6′	58.4′
11	345°25.5	15.0	180°44.6	11.1′	14°15.0	14.8′	58.4′
12	0°25.7	N06°14.0	195°14.7	11.1′	S14°00.2	14.8′	58.4′
13	15°25.9	13.1	209°44.8	11.2′	13°45.4	14.9′	58.4′
14	30°26.1	12.2	224°15.0	11.2′	13°30.5	15.0′	58.5′
15	45°26.3	·· 11.2	238°45.2	11.2′	13°15.5	15.1′	58.5′
16	60°26.5	10.3	253°15.4	11.3′	13°00.4	15.2′	58.5′
17	75°26.8	09.4	267°45.7	11.3′	12°45.2	15.2′	58.6′
18	90°27.0	N06°08.4	282°16.0	11.3′	S12°30.0	15.4′	58.6′
19	105°27.2	07.5	296°46.3	11.4′	12°14.6	15.4′	58.6′
20	120°27.4	06.6	311°16.7	11.4′	11°59.2	15.5′	58.7′
21	135°27.6	·· 05.6	325°47.0	11.4′	11°43.7	15.5′	58.7′
22	150°27.8	04.7	340°17.5	11.4′	11°28.2	15.6′	58.7′
23	165°28.0	03.8	354°47.9	11.5′	11°12.6	15.7′	58.7′
	SD = 15.9′	d = -0.9′	SD = 15.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	-:-	03:00	04:22	19:32	20:53	-:-
N 70°	01:20	03:22	04:33	19:22	20:32	22:27
68°	02:05	03:39	04:42	19:13	20:15	21:46
66°	02:34	03:52	04:49	19:06	20:02	21:19
64°	02:55	04:03	04:55	19:00	19:51	20:59
62°	03:11	04:13	05:00	18:55	19:42	20:43
60°	03:25	04:21	05:05	18:51	19:35	20:30
N 58°	03:36	04:28	05:09	18:47	19:28	20:19
56°	03:45	04:34	05:12	18:44	19:22	20:10
54°	03:54	04:39	05:16	18:40	19:17	20:02
52°	04:01	04:44	05:19	18:38	19:12	19:55
50°	04:08	04:48	05:21	18:35	19:08	19:48
45°	04:21	04:57	05:27	18:29	18:59	19:35
N 40°	04:31	05:04	05:32	18:25	18:52	19:25
35°	04:40	05:10	05:36	18:21	18:47	19:17
30°	04:47	05:15	05:39	18:18	18:42	19:10
20°	04:57	05:23	05:45	18:12	18:34	19:00
N 10°	05:05	05:29	05:51	18:07	18:28	18:52
0°	05:10	05:35	05:55	18:02	18:23	18:47
S 10°	05:14	05:39	06:00	17:57	18:18	18:43
20°	05:17	05:43	06:05	17:53	18:15	18:40
30°	05:19	05:46	06:10	17:47	18:11	18:39
35°	05:19	05:48	06:13	17:44	18:10	18:39
40°	05:19	05:50	06:17	17:41	18:08	18:39
45°	05:18	05:52	06:21	17:37	18:06	18:40
S 50°	05:16	05:53	06:26	17:32	18:05	18:42
52°	05:15	05:54	06:28	17:30	18:04	18:43
54°	05:14	05:55	06:30	17:28	18:04	18:44
56°	05:13	05:56	06:33	17:26	18:03	18:46
58°	05:11	05:56	06:36	17:23	18:02	18:48
S 60°	05:09	05:57	06:39	17:20	18:01	18:50

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	▬	21:36	20:01	▬	23:53	·· ··
N 70°	▬	20:34	19:40	▬	▬	00:53
68°	▬	19:59	19:24	▬	▬	01:27
66°	20:13	19:33	19:11	23:23	·· ··	01:51
64°	19:32	19:13	19:00	·· ··	00:04	02:10
62°	19:04	18:57	18:51	·· ··	00:31	02:25
60°	18:42	18:43	18:43	·· ··	00:53	02:38
N 58°	18:24	18:31	18:35	·· ··	01:10	02:49
56°	18:09	18:21	18:29	·· ··	01:24	02:58
54°	17:56	18:11	18:23	00:10	01:37	03:06
52°	17:44	18:03	18:18	00:25	01:48	03:14
50°	17:34	17:56	18:13	00:37	01:57	03:20
45°	17:12	17:40	18:03	01:03	02:17	03:35
N 40°	16:55	17:27	17:54	01:23	02:34	03:46
35°	16:40	17:16	17:47	01:40	02:47	03:56
30°	16:27	17:06	17:41	01:55	02:59	04:05
20°	16:05	16:49	17:29	02:20	03:20	04:19
N 10°	15:46	16:34	17:19	02:41	03:37	04:32
0°	15:28	16:20	17:10	03:01	03:53	04:44
S 10°	15:10	16:06	17:00	03:20	04:09	04:56
20°	14:51	15:51	16:50	03:41	04:26	05:08
30°	14:28	15:33	16:39	04:05	04:46	05:22
35°	14:15	15:23	16:32	04:19	04:57	05:30
40°	14:00	15:11	16:24	04:35	05:10	05:40
45°	13:42	14:58	16:15	04:55	05:25	05:50
S 50°	13:19	14:41	16:04	05:18	05:44	06:03
52°	13:08	14:33	15:59	05:30	05:52	06:09
54°	12:55	14:24	15:53	05:43	06:02	06:16
56°	12:41	14:14	15:47	05:58	06:13	06:23
58°	12:24	14:02	15:40	06:15	06:25	06:31
S 60°	12:03	13:48	15:32	06:37	06:40	06:40

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 12-14 84-96%
04	00:52	01:02	11:59	21:41	09:14	
05	01:12	01:22	11:59	22:32	10:07	
06	01:33	01:43	11:58	23:22	10:57	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	346°19.6	208°57.1	N16°47.8	147°57.1	S07°35.1	235°50.6	N22°04.8	345°42.4	S02°26.8
1	1°22.1	223°56.5	47.0	162°58.1	35.7	250°52.6	04.8	0°45.0	26.9
2	16°24.5	238°55.9	46.2	177°59.0	36.4	265°54.6	04.7	15°47.7	27.0
3	31°27.0	253°55.3	·· 45.5	193°00.0	·· 37.0	280°56.6	·· 04.7	30°50.3	·· 27.1
4	46°29.5	268°54.7	44.7	208°00.9	37.7	295°58.6	04.6	45°52.9	27.1
5	61°31.9	283°54.2	43.9	223°01.9	38.3	311°00.6	04.6	60°55.6	27.2
6	76°34.4	298°53.6	N16°43.1	238°02.8	S07°38.9	326°02.6	N22°04.5	75°58.2	S02°27.3
7	91°36.9	313°53.0	42.4	253°03.7	39.6	341°04.6	04.5	91°00.8	27.4
8	106°39.3	328°52.4	41.6	268°04.7	40.2	356°06.7	04.4	106°03.5	27.4
9	121°41.8	343°51.8	·· 40.8	283°05.6	·· 40.9	11°08.7	·· 04.3	121°06.1	·· 27.5
10	136°44.2	358°51.2	40.0	298°06.6	41.5	26°10.7	04.3	136°08.7	27.6
11	151°46.7	13°50.6	39.2	313°07.5	42.2	41°12.7	04.2	151°11.4	27.7
12	166°49.2	28°50.1	N16°38.5	328°08.5	S07°42.8	56°14.7	N22°04.2	166°14.0	S02°27.8
13	181°51.6	43°49.5	37.7	343°09.4	43.4	71°16.7	04.1	181°16.6	27.8
14	196°54.1	58°48.9	36.9	358°10.3	44.1	86°18.7	04.1	196°19.2	27.9
15	211°56.6	73°48.3	·· 36.1	13°11.3	·· 44.7	101°20.7	·· 04.0	211°21.9	·· 28.0
16	226°59.0	88°47.7	35.3	28°12.2	45.4	116°22.7	04.0	226°24.5	28.1
17	242°01.5	103°47.1	34.5	43°13.2	46.0	131°24.8	03.9	241°27.1	28.1
18	257°04.0	118°46.6	N16°33.8	58°14.1	S07°46.7	146°26.8	N22°03.9	256°29.8	S02°28.2
19	272°06.4	133°46.0	33.0	73°15.0	47.3	161°28.8	03.8	271°32.4	28.3
20	287°08.9	148°45.4	32.2	88°16.0	48.0	176°30.8	03.7	286°35.0	28.4
21	302°11.4	163°44.8	·· 31.4	103°16.9	·· 48.6	191°32.8	·· 03.7	301°37.7	·· 28.5
22	317°13.8	178°44.2	30.6	118°17.9	49.2	206°34.8	03.6	316°40.3	28.5
23	332°16.3	193°43.7	29.8	133°18.8	49.9	221°36.8	03.6	331°42.9	28.6
Mer.pass.	00:55	ν -0.6′	d -0.8′	m -3.94	ν 0.9′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.01	ν 2.6′	d -0.1′	m 0.63
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	347°18.7	208°43.1	N16°29.0	148°19.7	S07°50.5	236°38.8	N22°03.5	346°45.6	S02°28.7
1	2°21.2	223°42.5	28.2	163°20.7	51.2	251°40.9	03.5	1°48.2	28.8
2	17°23.7	238°41.9	27.4	178°21.6	51.8	266°42.9	03.4	16°50.8	28.8
3	32°26.1	253°41.3	·· 26.6	193°22.6	·· 52.5	281°44.9	·· 03.4	31°53.5	·· 28.9
4	47°28.6	268°40.8	25.8	208°23.5	53.1	296°46.9	03.3	46°56.1	29.0
5	62°31.1	283°40.2	25.0	223°24.4	53.7	311°48.9	03.3	61°58.7	29.1
6	77°33.5	298°39.6	N16°24.2	238°25.4	S07°54.4	326°50.9	N22°03.2	77°01.4	S02°29.2
7	92°36.0	313°39.0	23.5	253°26.3	55.0	341°52.9	03.1	92°04.0	29.2
8	107°38.5	328°38.5	22.7	268°27.3	55.7	356°55.0	03.1	107°06.6	29.3
9	122°40.9	343°37.9	·· 21.9	283°28.2	·· 56.3	11°57.0	·· 03.0	122°09.3	·· 29.4
10	137°43.4	358°37.3	21.1	298°29.1	57.0	26°59.0	03.0	137°11.9	29.5
11	152°45.8	13°36.7	20.3	313°30.1	57.6	42°01.0	02.9	152°14.5	29.5
12	167°48.3	28°36.2	N16°19.5	328°31.0	S07°58.2	57°03.0	N22°02.9	167°17.1	S02°29.6
13	182°50.8	43°35.6	18.7	343°31.9	58.9	72°05.0	02.8	182°19.8	29.7
14	197°53.2	58°35.0	17.8	358°32.9	07°59.5	87°07.1	02.8	197°22.4	29.8
15	212°55.7	73°34.4	·· 17.0	13°33.8	08°00.2	102°09.1	·· 02.7	212°25.0	·· 29.9
16	227°58.2	88°33.9	16.2	28°34.8	00.8	117°11.1	02.6	227°27.7	29.9
17	243°00.6	103°33.3	15.4	43°35.7	01.5	132°13.1	02.6	242°30.3	30.0
18	258°03.1	118°32.7	N16°14.6	58°36.6	S08°02.1	147°15.1	N22°02.5	257°32.9	S02°30.1
19	273°05.6	133°32.1	13.8	73°37.6	02.7	162°17.1	02.5	272°35.6	30.2
20	288°08.0	148°31.6	13.0	88°38.5	03.4	177°19.2	02.4	287°38.2	30.2
21	303°10.5	163°31.0	·· 12.2	103°39.4	·· 04.0	192°21.2	·· 02.4	302°40.8	·· 30.3
22	318°13.0	178°30.4	11.4	118°40.4	04.7	207°23.2	02.3	317°43.5	30.4
23	333°15.4	193°29.8	10.6	133°41.3	05.3	222°25.2	02.3	332°46.1	30.5
Mer.pass.	00:51	ν -0.6′	d -0.8′	m -3.94	ν 0.9′	d -0.6′	m 1.62	ν 2.0′	d -0.1′	m -2.02	ν 2.6′	d -0.1′	m 0.63
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	348°17.9	208°29.3	N16°09.8	148°42.2	S08°05.9	237°27.2	N22°02.2	347°48.7	S02°30.6
1	3°20.3	223°28.7	09.0	163°43.2	06.6	252°29.2	02.2	2°51.4	30.6
2	18°22.8	238°28.1	08.1	178°44.1	07.2	267°31.3	02.1	17°54.0	30.7
3	33°25.3	253°27.6	·· 07.3	193°45.0	·· 07.9	282°33.3	·· 02.0	32°56.6	·· 30.8
4	48°27.7	268°27.0	06.5	208°46.0	08.5	297°35.3	02.0	47°59.3	30.9
5	63°30.2	283°26.4	05.7	223°46.9	09.2	312°37.3	01.9	63°01.9	30.9
6	78°32.7	298°25.8	N16°04.9	238°47.8	S08°09.8	327°39.3	N22°01.9	78°04.5	S02°31.0
7	93°35.1	313°25.3	04.1	253°48.8	10.4	342°41.4	01.8	93°07.2	31.1
8	108°37.6	328°24.7	03.3	268°49.7	11.1	357°43.4	01.8	108°09.8	31.2
9	123°40.1	343°24.1	·· 02.4	283°50.7	·· 11.7	12°45.4	·· 01.7	123°12.4	·· 31.3
10	138°42.5	358°23.6	01.6	298°51.6	12.4	27°47.4	01.7	138°15.1	31.3
11	153°45.0	13°23.0	00.8	313°52.5	13.0	42°49.4	01.6	153°17.7	31.4
12	168°47.4	28°22.4	N16°00.0	328°53.5	S08°13.6	57°51.5	N22°01.6	168°20.3	S02°31.5
13	183°49.9	43°21.9	15°59.2	343°54.4	14.3	72°53.5	01.5	183°23.0	31.6
14	198°52.4	58°21.3	58.3	358°55.3	14.9	87°55.5	01.4	198°25.6	31.6
15	213°54.8	73°20.7	·· 57.5	13°56.2	·· 15.6	102°57.5	·· 01.4	213°28.2	·· 31.7
16	228°57.3	88°20.2	56.7	28°57.2	16.2	117°59.5	01.3	228°30.9	31.8
17	243°59.8	103°19.6	55.9	43°58.1	16.8	133°01.6	01.3	243°33.5	31.9
18	259°02.2	118°19.0	N15°55.0	58°59.0	S08°17.5	148°03.6	N22°01.2	258°36.1	S02°32.0
19	274°04.7	133°18.5	54.2	74°00.0	18.1	163°05.6	01.2	273°38.8	32.0
20	289°07.2	148°17.9	53.4	89°00.9	18.8	178°07.6	01.1	288°41.4	32.1
21	304°09.6	163°17.3	·· 52.6	104°01.8	·· 19.4	193°09.7	·· 01.1	303°44.0	·· 32.2
22	319°12.1	178°16.8	51.7	119°02.8	20.0	208°11.7	01.0	318°46.7	32.3
23	334°14.6	193°16.2	50.9	134°03.7	20.7	223°13.7	01.0	333°49.3	32.4
Mer.pass.	00:47	ν -0.6′	d -0.8′	m -3.94	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.02	ν 2.6′	d -0.1′	m 0.62

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.2	-42°09.8
Schedar	349°29.9	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.3	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°32.3	89°22.1
Acamar	315°11.1	-40°11.8
Menkar	314°05.4	4°11.6
Mirfak	308°27.3	49°57.0
Aldebaran	290°39.0	16°33.7
Rigel	281°03.4	-8°10.1
Capella	280°21.1	46°01.3
Bellatrix	278°22.3	6°22.5
Elnath	278°01.2	28°37.7
Alnilam	275°37.2	-1°11.0
Betelgeuse	270°51.6	7°24.8
Canopus	263°52.3	-52°42.2
Sirius	258°25.9	-16°44.8
Adhara	255°05.6	-29°00.1
Procyon	244°50.5	5°09.7
Pollux	243°16.9	27°57.9
Avior	234°15.0	-59°35.2
Suhail	222°46.3	-43°32.0
Miaplacidus	221°39.0	-69°49.1
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°36.8
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.6
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.7	-60°30.0
Menkent	147°57.2	-36°29.8
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°40.0	-60°56.7
Kochab	137°20.3	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°08.9	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.8	51°29.4
Kaus Aust.	83°31.6	-34°22.4
Vega	80°32.7	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.1	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.7	-46°50.1
Fomalhaut	15°13.5	-29°29.0
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.7

Sep 07 Sun	**SHA**	**Mer.pass**
Venus	222°37.5	10:05
Mars	161°37.5	14:07
Jupiter	249°31.0	08:16
Saturn	359°22.8	00:57

Sep 08 Mon	**SHA**	**Mer.pass**
Venus	221°24.3	10:06
Mars	161°01.0	14:06
Jupiter	249°20.1	08:12
Saturn	359°26.8	00:53

Sep 09 Tue	**SHA**	**Mer.pass**
Venus	220°11.4	10:06
Mars	160°24.4	14:04
Jupiter	249°09.3	08:09
Saturn	359°30.9	00:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0		180°28.3	N06°02.8	9°18.4	11.5′	S10°56.9	15.8′	58.8′
1		195°28.5	01.9	23°48.8	11.5′	10°41.1	15.9′	58.8′
2		210°28.7	01.0	38°19.4	11.5′	10°25.2	15.9′	58.8′
3		225°28.9	06°00.0	52°49.9	11.6′	10°09.3	16.0′	58.9′
4		240°29.1	05°59.1	67°20.5	11.6′	09°53.3	16.0′	58.9′
5		255°29.3	58.2	81°51.0	11.6′	09°37.3	16.1′	58.9′
6		270°29.5	N05°57.2	96°21.6	11.6′	S09°21.2	16.2′	58.9′
7		285°29.8	56.3	110°52.3	11.6′	09°05.0	16.2′	59.0′
8		300°30.0	55.4	125°22.9	11.7′	08°48.8	16.3′	59.0′
9		315°30.2	·· 54.4	139°53.6	11.7′	08°32.5	16.4′	59.0′
10		330°30.4	53.5	154°24.2	11.7′	08°16.1	16.4′	59.0′
11		345°30.6	52.5	168°54.9	11.7′	07°59.7	16.4′	59.1′
12		0°30.8	N05°51.6	183°25.6	11.7′	S07°43.3	16.5′	59.1′
13		15°31.0	50.7	197°56.3	11.7′	07°26.8	16.6′	59.1′
14		30°31.3	49.7	212°27.1	11.7′	07°10.2	16.6′	59.1′
15		45°31.5	·· 48.8	226°57.8	11.8′	06°53.6	16.7′	59.2′
16		60°31.7	47.9	241°28.6	11.8′	06°36.9	16.7′	59.2′
17		75°31.9	46.9	255°59.3	11.8′	06°20.2	16.7′	59.2′
18		90°32.1	N05°46.0	270°30.1	11.8′	S06°03.5	16.8′	59.2′
19		105°32.3	45.0	285°00.9	11.8′	05°46.7	16.9′	59.3′
20		120°32.6	44.1	299°31.7	11.8′	05°29.8	16.9′	59.3′
21		135°32.8	·· 43.2	314°02.5	11.8′	05°12.9	16.9′	59.3′
22		150°33.0	42.2	328°33.3	11.8′	04°56.0	17.0′	59.3′
23		165°33.2	41.3	343°04.1	11.8′	04°39.0	17.0′	59.4′
		SD = 15.9′	d = -0.9′	SD = 16.0′				
Mon		**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0		180°33.4	N05°40.3	357°34.9	11.8′	S04°22.0	17.0′	59.4′
1		195°33.6	39.4	12°05.7	11.8′	04°05.0	17.1′	59.4′
2		210°33.9	38.5	26°36.5	11.8′	03°47.9	17.0′	59.4′
3		225°34.1	·· 37.5	41°07.3	11.8′	03°30.9	17.2′	59.4′
4		240°34.3	36.6	55°38.1	11.8′	03°13.7	17.1′	59.5′
5		255°34.5	35.6	70°08.9	11.8′	02°56.6	17.2′	59.5′
6		270°34.7	N05°34.7	84°39.7	11.8′	S02°39.4	17.2′	59.5′
7		285°34.9	33.8	99°10.5	11.8′	02°22.2	17.2′	59.5′
8		300°35.2	32.8	113°41.2	11.8′	02°05.0	17.3′	59.5′
9		315°35.4	·· 31.9	128°12.0	11.8′	01°47.7	17.3′	59.6′
10		330°35.6	30.9	142°42.8	11.8′	01°30.4	17.2′	59.6′
11		345°35.8	30.0	157°13.5	11.7′	01°13.2	17.3′	59.6′
12		0°36.0	N05°29.1	171°44.3	11.7′	S00°55.9	17.4′	59.6′
13		15°36.2	28.1	186°15.0	11.7′	00°38.5	17.3′	59.6′
14		30°36.5	27.2	200°45.7	11.7′	00°21.2	17.3′	59.6′
15		45°36.7	·· 26.2	215°16.4	11.7′	S00°03.9	17.4′	59.7′
16		60°36.9	25.3	229°47.1	11.7′	N00°13.5	17.3′	59.7′
17		75°37.1	24.4	244°17.8	11.6′	00°30.8	17.4′	59.7′
18		90°37.3	N05°23.4	258°48.4	11.6′	N00°48.2	17.4′	59.7′
19		105°37.5	22.5	273°19.0	11.6′	01°05.6	17.3′	59.7′
20		120°37.8	21.5	287°49.6	11.6′	01°22.9	17.4′	59.7′
21		135°38.0	·· 20.6	302°20.2	11.6′	01°40.3	17.4′	59.8′
22		150°38.2	19.6	316°50.8	11.5′	01°57.7	17.4′	59.8′
23		165°38.4	18.7	331°21.3	11.5′	02°15.1	17.3′	59.8′
		SD = 15.9′	d = -0.9′	SD = 16.2′				
Tue		**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0		180°38.6	N05°17.8	345°51.8	11.5′	N02°32.4	17.4′	59.8′
1		195°38.8	16.8	0°22.3	11.5′	02°49.8	17.3′	59.8′
2		210°39.1	15.9	14°52.7	11.4′	03°07.1	17.4′	59.8′
3		225°39.3	·· 14.9	29°23.2	11.4′	03°24.5	17.3′	59.8′
4		240°39.5	14.0	43°53.6	11.4′	03°41.8	17.3′	59.8′
5		255°39.7	13.0	58°23.9	11.3′	03°59.1	17.3′	59.9′
6		270°39.9	N05°12.1	72°54.2	11.3′	N04°16.4	17.3′	59.9′
7		285°40.2	11.2	87°24.5	11.3′	04°33.7	17.3′	59.9′
8		300°40.4	10.2	101°54.8	11.2′	04°51.0	17.2′	59.9′
9		315°40.6	·· 09.3	116°25.0	11.2′	05°08.2	17.2′	59.9′
10		330°40.8	08.3	130°55.2	11.1′	05°25.4	17.2′	59.9′
11		345°41.0	07.4	145°25.3	11.1′	05°42.6	17.2′	59.9′
12		0°41.2	N05°06.4	159°55.4	11.1′	N05°59.8	17.2′	59.9′
13		15°41.5	05.5	174°25.5	11.0′	06°17.0	17.1′	59.9′
14		30°41.7	04.5	188°55.5	11.0′	06°34.1	17.1′	59.9′
15		45°41.9	·· 03.6	203°25.5	10.9′	06°51.2	17.0′	60.0′
16		60°42.1	02.7	217°55.4	10.9′	07°08.2	17.0′	60.0′
17		75°42.3	01.7	232°25.3	10.8′	07°25.2	17.0′	60.0′
18		90°42.6	N05°00.8	246°55.1	10.8′	N07°42.2	17.0′	60.0′
19		105°42.8	04°59.8	261°24.9	10.7′	07°59.2	16.9′	60.0′
20		120°43.0	58.9	275°54.6	10.7′	08°16.1	16.8′	60.0′
21		135°43.2	·· 57.9	290°24.3	10.6′	08°32.9	16.8′	60.0′
22		150°43.4	57.0	304°53.9	10.6′	08°49.7	16.8′	60.0′
23		165°43.7	56.0	319°23.5	10.5′	09°06.5	16.7′	60.0′
		SD = 15.9′	d = -0.9′	SD = 16.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	00:42	03:18	04:36	19:16	20:33	22:54
N 70°	01:50	03:37	04:45	19:08	20:15	21:58
68°	02:25	03:51	04:52	19:01	20:01	21:26
66°	02:49	04:03	04:58	18:55	19:49	21:03
64°	03:07	04:13	05:04	18:50	19:40	20:45
62°	03:22	04:21	05:08	18:46	19:32	20:31
60°	03:34	04:28	05:12	18:42	19:25	20:19
N 58°	03:44	04:35	05:15	18:39	19:19	20:09
56°	03:53	04:40	05:18	18:36	19:14	20:01
54°	04:00	04:45	05:21	18:33	19:09	19:53
52°	04:07	04:49	05:23	18:31	19:05	19:47
50°	04:13	04:53	05:26	18:29	19:01	19:41
45°	04:25	05:01	05:30	18:24	18:54	19:29
N 40°	04:35	05:07	05:34	18:20	18:47	19:20
35°	04:42	05:12	05:38	18:17	18:42	19:12
30°	04:48	05:17	05:41	18:14	18:38	19:06
20°	04:58	05:24	05:46	18:09	18:31	18:57
N 10°	05:05	05:29	05:50	18:05	18:26	18:50
0°	05:09	05:34	05:54	18:01	18:22	18:46
S 10°	05:13	05:37	05:58	17:57	18:18	18:43
20°	05:15	05:40	06:02	17:53	18:15	18:41
30°	05:15	05:43	06:07	17:49	18:13	18:41
35°	05:15	05:44	06:09	17:46	18:12	18:41
40°	05:14	05:45	06:12	17:44	18:11	18:42
45°	05:12	05:46	06:15	17:41	18:10	18:44
S 50°	05:10	05:47	06:19	17:37	18:09	18:47
52°	05:08	05:47	06:21	17:35	18:09	18:48
54°	05:07	05:48	06:23	17:33	18:09	18:50
56°	05:05	05:48	06:25	17:31	18:08	18:52
58°	05:03	05:48	06:27	17:29	18:08	18:54
S 60°	05:00	05:48	06:30	17:27	18:08	18:56

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°	19:14	18:36	17:56	03:14	05:45	08:12
N 70°	19:06	18:37	18:07	03:32	05:49	08:05
68°	19:00	18:38	18:16	03:45	05:53	07:59
66°	18:54	18:39	18:23	03:57	05:56	07:54
64°	18:49	18:39	18:29	04:06	05:58	07:50
62°	18:45	18:40	18:35	04:14	06:00	07:47
60°	18:42	18:40	18:39	04:20	06:02	07:44
N 58°	18:38	18:41	18:44	04:26	06:03	07:41
56°	18:35	18:41	18:47	04:32	06:05	07:39
54°	18:33	18:42	18:51	04:36	06:06	07:37
52°	18:30	18:42	18:54	04:40	06:07	07:35
50°	18:28	18:42	18:57	04:44	06:08	07:33
45°	18:24	18:43	19:03	04:52	06:10	07:29
N 40°	18:20	18:44	19:08	04:59	06:12	07:26
35°	18:16	18:44	19:13	05:05	06:14	07:23
30°	18:13	18:45	19:17	05:10	06:15	07:21
20°	18:08	18:45	19:24	05:19	06:18	07:17
N 10°	18:03	18:46	19:30	05:26	06:20	07:13
0°	17:59	18:47	19:36	05:33	06:21	07:10
S 10°	17:54	18:48	19:42	05:40	06:23	07:07
20°	17:49	18:49	19:49	05:47	06:25	07:03
30°	17:44	18:50	19:56	05:56	06:27	06:59
35°	17:41	18:50	20:01	06:00	06:29	06:57
40°	17:37	18:51	20:05	06:06	06:30	06:54
45°	17:33	18:52	20:11	06:12	06:32	06:51
S 50°	17:28	18:52	20:18	06:19	06:33	06:47
52°	17:26	18:53	20:22	06:22	06:34	06:46
54°	17:23	18:53	20:25	06:26	06:35	06:44
56°	17:20	18:54	20:29	06:30	06:36	06:42
58°	17:17	18:55	20:34	06:35	06:37	06:40
S 60°	17:14	18:55	20:39	06:40	06:39	06:37

Day	**Sun** Eqn.of Time 00h mm:ss	12h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 15-17 99-98%
07	01:53	02:03	11:58	–:–	11:46	
08	02:14	02:24	11:58	00:10	12:34	
09	02:35	02:45	11:57	00:58	13:23	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°17.0	208°15.6	N15°50.1	149°04.6	S08°21.3	238°15.7	N22°00.9	348°52.0	S02°32.4
1	4°19.5	223°15.1	49.2	164°05.6	22.0	253°17.7	00.8	3°54.6	32.5
2	19°21.9	238°14.5	48.4	179°06.5	22.6	268°19.8	00.8	18°57.2	32.6
3	34°24.4	253°13.9	·· 47.6	194°07.4	·· 23.3	283°21.8	·· 00.7	33°59.9	·· 32.7
4	49°26.9	268°13.4	46.7	209°08.4	23.9	298°23.8	00.7	49°02.5	32.7
5	64°29.3	283°12.8	45.9	224°09.3	24.5	313°25.8	00.6	64°05.1	32.8
6	79°31.8	298°12.3	N15°45.1	239°10.2	S08°25.2	328°27.9	N22°00.6	79°07.8	S02°32.9
7	94°34.3	313°11.7	44.2	254°11.1	25.8	343°29.9	00.5	94°10.4	33.0
8	109°36.7	328°11.1	43.4	269°12.1	26.4	358°31.9	00.5	109°13.0	33.1
9	124°39.2	343°10.6	·· 42.6	284°13.0	·· 27.1	13°33.9	·· 00.4	124°15.7	·· 33.1
10	139°41.7	358°10.0	41.7	299°13.9	27.7	28°36.0	00.4	139°18.3	33.2
11	154°44.1	13°09.4	40.9	314°14.9	28.4	43°38.0	00.3	154°20.9	33.3
12	169°46.6	28°08.9	N15°40.0	329°15.8	S08°29.0	58°40.0	N22°00.2	169°23.6	S02°33.4
13	184°49.0	43°08.3	39.2	344°16.7	29.6	73°42.0	00.2	184°26.2	33.4
14	199°51.5	58°07.8	38.4	359°17.6	30.3	88°44.1	00.1	199°28.8	33.5
15	214°54.0	73°07.2	·· 37.5	14°18.6	·· 30.9	103°46.1	·· 00.1	214°31.5	·· 33.6
16	229°56.4	88°06.6	36.7	29°19.5	31.6	118°48.1	00.0	229°34.1	33.7
17	244°58.9	103°06.1	35.8	44°20.4	32.2	133°50.1	22°00.0	244°36.7	33.8
18	260°01.4	118°05.5	N15°35.0	59°21.4	S08°32.8	148°52.2	N21°59.9	259°39.4	S02°33.8
19	275°03.8	133°05.0	34.1	74°22.3	33.5	163°54.2	59.9	274°42.0	33.9
20	290°06.3	148°04.4	33.3	89°23.2	34.1	178°56.2	59.8	289°44.6	34.0
21	305°08.8	163°03.9	·· 32.5	104°24.1	·· 34.8	193°58.2	·· 59.8	304°47.3	·· 34.1
22	320°11.2	178°03.3	31.6	119°25.1	35.4	209°00.3	59.7	319°49.9	34.2
23	335°13.7	193°02.7	30.8	134°26.0	36.0	224°02.3	59.6	334°52.6	34.2
Mer.pass.	00:43	ν -0.6′	d -0.8′	m -3.94	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.02	ν 2.6′	d -0.1′	m 0.62

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°16.2	208°02.2	N15°29.9	149°26.9	S08°36.7	239°04.3	N21°59.6	349°55.2	S02°34.3
1	5°18.6	223°01.6	29.1	164°27.8	37.3	254°06.4	59.5	4°57.8	34.4
2	20°21.1	238°01.1	28.2	179°28.8	38.0	269°08.4	59.5	20°00.5	34.5
3	35°23.5	253°00.5	·· 27.4	194°29.7	·· 38.6	284°10.4	·· 59.4	35°03.1	·· 34.5
4	50°26.0	268°00.0	26.5	209°30.6	39.2	299°12.4	59.4	50°05.7	34.6
5	65°28.5	282°59.4	25.7	224°31.5	39.9	314°14.5	59.3	65°08.4	34.7
6	80°30.9	297°58.8	N15°24.8	239°32.5	S08°40.5	329°16.5	N21°59.3	80°11.0	S02°34.8
7	95°33.4	312°58.3	23.9	254°33.4	41.1	344°18.5	59.2	95°13.6	34.9
8	110°35.9	327°57.7	23.1	269°34.3	41.8	359°20.6	59.2	110°16.3	34.9
9	125°38.3	342°57.2	·· 22.2	284°35.2	·· 42.4	14°22.6	·· 59.1	125°18.9	·· 35.0
10	140°40.8	357°56.6	21.4	299°36.2	43.1	29°24.6	59.0	140°21.5	35.1
11	155°43.3	12°56.1	20.5	314°37.1	43.7	44°26.6	59.0	155°24.2	35.2
12	170°45.7	27°55.5	N15°19.7	329°38.0	S08°44.3	59°28.7	N21°58.9	170°26.8	S02°35.3
13	185°48.2	42°55.0	18.8	344°38.9	45.0	74°30.7	58.9	185°29.5	35.3
14	200°50.7	57°54.4	17.9	359°39.9	45.6	89°32.7	58.8	200°32.1	35.4
15	215°53.1	72°53.9	·· 17.1	14°40.8	·· 46.3	104°34.8	·· 58.8	215°34.7	·· 35.5
16	230°55.6	87°53.3	16.2	29°41.7	46.9	119°36.8	58.7	230°37.4	35.6
17	245°58.0	102°52.8	15.4	44°42.6	47.5	134°38.8	58.7	245°40.0	35.6
18	261°00.5	117°52.2	N15°14.5	59°43.6	S08°48.2	149°40.9	N21°58.6	260°42.6	S02°35.7
19	276°03.0	132°51.7	13.6	74°44.5	48.8	164°42.9	58.6	275°45.3	35.8
20	291°05.4	147°51.1	12.8	89°45.4	49.4	179°44.9	58.5	290°47.9	35.9
21	306°07.9	162°50.6	·· 11.9	104°46.3	·· 50.1	194°46.9	·· 58.4	305°50.5	·· 36.0
22	321°10.4	177°50.0	11.0	119°47.2	50.7	209°49.0	58.4	320°53.2	36.0
23	336°12.8	192°49.5	10.2	134°48.2	51.4	224°51.0	58.3	335°55.8	36.1
Mer.pass.	00:39	ν -0.6′	d -0.8′	m -3.94	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.03	ν 2.6′	d -0.1′	m 0.61

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	351°15.3	207°48.9	N15°09.3	149°49.1	S08°52.0	239°53.0	N21°58.3	350°58.5	S02°36.2
1	6°17.8	222°48.4	08.4	164°50.0	52.6	254°55.1	58.2	6°01.1	36.3
2	21°20.2	237°47.8	07.6	179°50.9	53.3	269°57.1	58.2	21°03.7	36.4
3	36°22.7	252°47.3	·· 06.7	194°51.9	·· 53.9	284°59.1	·· 58.1	36°06.4	·· 36.4
4	51°25.1	267°46.7	05.8	209°52.8	54.5	300°01.2	58.1	51°09.0	36.5
5	66°27.6	282°46.2	05.0	224°53.7	55.2	315°03.2	58.0	66°11.6	36.6
6	81°30.1	297°45.6	N15°04.1	239°54.6	S08°55.8	330°05.2	N21°58.0	81°14.3	S02°36.7
7	96°32.5	312°45.1	03.2	254°55.5	56.4	345°07.3	57.9	96°16.9	36.7
8	111°35.0	327°44.5	02.3	269°56.5	57.1	0°09.3	57.8	111°19.5	36.8
9	126°37.5	342°44.0	·· 01.5	284°57.4	·· 57.7	15°11.3	·· 57.8	126°22.2	·· 36.9
10	141°39.9	357°43.4	15°00.6	299°58.3	58.4	30°13.4	57.7	141°24.8	37.0
11	156°42.4	12°42.9	14°59.7	314°59.2	59.0	45°15.4	57.7	156°27.5	37.1
12	171°44.9	27°42.3	N14°58.8	330°00.1	S08°59.6	60°17.4	N21°57.6	171°30.1	S02°37.1
13	186°47.3	42°41.8	58.0	345°01.1	09°00.3	75°19.5	57.6	186°32.7	37.2
14	201°49.8	57°41.3	57.1	0°02.0	00.9	90°21.5	57.5	201°35.4	37.3
15	216°52.3	72°40.7	·· 56.2	15°02.9	·· 01.5	105°23.6	·· 57.5	216°38.0	·· 37.4
16	231°54.7	87°40.2	55.3	30°03.8	02.2	120°25.6	57.4	231°40.6	37.5
17	246°57.2	102°39.6	54.4	45°04.7	02.8	135°27.6	57.4	246°43.3	37.5
18	261°59.6	117°39.1	N14°53.6	60°05.6	S09°03.4	150°29.7	N21°57.3	261°45.9	S02°37.6
19	277°02.1	132°38.5	52.7	75°06.6	04.1	165°31.7	57.3	276°48.6	37.7
20	292°04.6	147°38.0	51.8	90°07.5	04.7	180°33.7	57.2	291°51.2	37.8
21	307°07.0	162°37.5	·· 50.9	105°08.4	·· 05.4	195°35.8	·· 57.1	306°53.8	·· 37.9
22	322°09.5	177°36.9	50.0	120°09.3	06.0	210°37.8	57.1	321°56.5	37.9
23	337°12.0	192°36.4	49.2	135°10.2	06.6	225°39.8	57.0	336°59.1	38.0
Mer.pass.	00:35	ν -0.5′	d -0.9′	m -3.94	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.03	ν 2.6′	d -0.1′	m 0.61

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.2	-42°09.8
Schedar	349°29.9	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.3	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°30.9	89°22.1
Acamar	315°11.1	-40°11.8
Menkar	314°05.4	4°11.6
Mirfak	308°27.3	49°57.0
Aldebaran	290°38.9	16°33.7
Rigel	281°03.3	-8°10.1
Capella	280°21.1	46°01.3
Bellatrix	278°22.3	6°22.5
Elnath	278°01.2	28°37.7
Alnilam	275°37.2	-1°11.0
Betelgeuse	270°51.5	7°24.8
Canopus	263°52.3	-52°42.2
Sirius	258°25.9	-16°44.8
Adhara	255°05.6	-29°00.1
Procyon	244°50.4	5°09.7
Pollux	243°16.8	27°57.9
Avior	234°15.0	-59°35.2
Suhail	222°46.3	-43°31.9
Miaplacidus	221°39.0	-69°49.1
Alphard	217°47.5	-8°46.0
Regulus	207°34.2	11°50.6
Dubhe	193°40.9	61°36.8
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.5
Alioth	166°12.9	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.7	-60°30.0
Menkent	147°57.3	-36°29.8
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°40.0	-60°56.7
Kochab	137°20.4	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°09.0	-69°04.7
Sabik	102°02.1	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.8	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.7	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.1	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.7	-46°50.2
Fomalhaut	15°13.5	-29°29.0
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 10 Wed	SHA	Mer.pass
Venus	218°58.6	10:07
Mars	159°47.6	14:03
Jupiter	248°58.7	08:06
Saturn	359°34.9	00:44

Sep 11 Thu	SHA	Mer.pass
Venus	217°46.0	10:08
Mars	159°10.8	14:01
Jupiter	248°48.2	08:03
Saturn	359°39.0	00:40

Sep 12 Fri	SHA	Mer.pass
Venus	216°33.6	10:09
Mars	158°33.8	14:00
Jupiter	248°37.8	07:59
Saturn	359°43.2	00:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.9	N04°55.1	333°53.0	10.5′	N09°23.2	16.7′	60.0′
1	195°44.1	54.1	348°22.5	10.4′	09°39.9	16.6′	60.0′
2	210°44.3	53.2	2°51.9	10.3′	09°56.5	16.6′	60.0′
3	225°44.5	·· 52.2	17°21.2	10.3′	10°13.1	16.5′	60.0′
4	240°44.8	51.3	31°50.5	10.2′	10°29.6	16.5′	60.0′
5	255°45.0	50.3	46°19.7	10.2′	10°46.1	16.4′	60.0′
6	270°45.2	N04°49.4	60°48.9	10.1′	N11°02.5	16.3′	60.0′
7	285°45.4	48.5	75°18.0	10.0′	11°18.8	16.3′	60.0′
8	300°45.6	47.5	89°47.0	10.0′	11°35.1	16.2′	60.0′
9	315°45.9	·· 46.6	104°16.0	9.9′	11°51.3	16.2′	60.0′
10	330°46.1	45.6	118°44.9	9.8′	12°07.5	16.0′	60.0′
11	345°46.3	44.7	133°13.8	9.8′	12°23.5	16.0′	60.0′
12	0°46.5	N04°43.7	147°42.6	9.7′	N12°39.5	16.0′	60.0′
13	15°46.7	42.8	162°11.3	9.6′	12°55.5	15.8′	60.0′
14	30°47.0	41.8	176°39.9	9.6′	13°11.3	15.8′	60.0′
15	45°47.2	·· 40.9	191°08.5	9.5′	13°27.1	15.7′	60.0′
16	60°47.4	39.9	205°37.0	9.4′	13°42.8	15.7′	60.0′
17	75°47.6	39.0	220°05.4	9.4′	13°58.5	15.5′	60.0′
18	90°47.8	N04°38.0	234°33.8	9.3′	N14°14.0	15.5′	60.0′
19	105°48.1	37.1	249°02.1	9.2′	14°29.5	15.4′	60.0′
20	120°48.3	36.1	263°30.3	9.1′	14°44.9	15.3′	60.0′
21	135°48.5	·· 35.2	277°58.4	9.1′	15°00.2	15.2′	60.0′
22	150°48.7	34.2	292°26.5	9.0′	15°15.4	15.1′	60.0′
23	165°48.9	33.3	306°54.4	8.9′	15°30.5	15.0′	60.0′
	SD = 15.9′	d = -0.9′	SD = 16.4′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.2	N04°32.3	321°22.3	8.8′	N15°45.5	14.9′	60.0′
1	195°49.4	31.4	335°50.2	8.7′	16°00.4	14.9′	60.0′
2	210°49.6	30.4	350°17.9	8.7′	16°15.3	14.7′	60.0′
3	225°49.8	·· 29.5	4°45.6	8.6′	16°30.0	14.6′	60.0′
4	240°50.0	28.5	19°13.2	8.5′	16°44.6	14.6′	60.0′
5	255°50.3	27.6	33°40.7	8.4′	16°59.2	14.4′	60.0′
6	270°50.5	N04°26.6	48°08.1	8.3′	N17°13.6	14.3′	60.0′
7	285°50.7	25.7	62°35.4	8.3′	17°27.9	14.3′	60.0′
8	300°50.9	24.7	77°02.7	8.2′	17°42.2	14.1′	60.0′
9	315°51.1	·· 23.8	91°29.9	8.1′	17°56.3	14.0′	60.0′
10	330°51.4	22.8	105°57.0	8.0′	18°10.3	13.9′	60.0′
11	345°51.6	21.9	120°24.0	7.9′	18°24.2	13.7′	60.0′
12	0°51.8	N04°20.9	134°50.9	7.8′	N18°37.9	13.7′	59.9′
13	15°52.0	20.0	149°17.8	7.8′	18°51.6	13.5′	59.9′
14	30°52.2	19.0	163°44.5	7.7′	19°05.1	13.4′	59.9′
15	45°52.5	·· 18.1	178°11.2	7.6′	19°18.5	13.3′	59.9′
16	60°52.7	17.1	192°37.8	7.5′	19°31.8	13.2′	59.9′
17	75°52.9	16.1	207°04.3	7.4′	19°45.0	13.1′	59.9′
18	90°53.1	N04°15.2	221°30.8	7.3′	N19°58.1	12.9′	59.9′
19	105°53.4	14.2	235°57.1	7.3′	20°11.0	12.8′	59.9′
20	120°53.6	13.3	250°23.3	7.2′	20°23.8	12.7′	59.9′
21	135°53.8	·· 12.3	264°49.5	7.1′	20°36.5	12.5′	59.9′
22	150°54.0	11.4	279°15.6	7.0′	20°49.0	12.4′	59.9′
23	165°54.2	10.4	293°41.6	6.9′	21°01.4	12.3′	59.8′
	SD = 15.9′	d = -1.0′	SD = 16.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.5	N04°09.5	308°07.5	6.8′	N21°13.7	12.1′	59.8′
1	195°54.7	08.5	322°33.3	6.7′	21°25.8	12.0′	59.8′
2	210°54.9	07.6	336°59.1	6.7′	21°37.8	11.8′	59.8′
3	225°55.1	·· 06.6	351°24.7	6.6′	21°49.6	11.7′	59.8′
4	240°55.3	05.7	5°50.3	6.5′	22°01.3	11.6′	59.8′
5	255°55.6	04.7	20°15.8	6.4′	22°12.9	11.4′	59.8′
6	270°55.8	N04°03.8	34°41.2	6.3′	N22°24.3	11.3′	59.8′
7	285°56.0	02.8	49°06.5	6.2′	22°35.6	11.1′	59.7′
8	300°56.2	01.8	63°31.8	6.2′	22°46.7	11.0′	59.7′
9	315°56.5	04°00.9	77°56.9	6.1′	22°57.7	10.8′	59.7′
10	330°56.7	03°59.9	92°22.0	6.0′	23°08.5	10.7′	59.7′
11	345°56.9	59.0	106°47.0	5.9′	23°19.2	10.5′	59.7′
12	0°57.1	N03°58.0	121°11.9	5.8′	N23°29.7	10.4′	59.7′
13	15°57.3	57.1	135°36.8	5.8′	23°40.1	10.2′	59.7′
14	30°57.6	56.1	150°01.5	5.7′	23°50.3	10.0′	59.7′
15	45°57.8	·· 55.2	164°26.2	5.6′	24°00.3	9.9′	59.6′
16	60°58.0	54.2	178°50.8	5.5′	24°10.2	9.7′	59.6′
17	75°58.2	53.2	193°15.3	5.5′	24°19.9	9.6′	59.6′
18	90°58.5	N03°52.3	207°39.8	5.4′	N24°29.5	9.4′	59.6′
19	105°58.7	51.3	222°04.1	5.3′	24°38.9	9.2′	59.6′
20	120°58.9	50.4	236°28.5	5.2′	24°48.1	9.1′	59.6′
21	135°59.1	·· 49.4	250°52.7	5.2′	24°57.2	8.9′	59.5′
22	150°59.3	48.5	265°16.8	5.1′	25°06.1	8.7′	59.5′
23	165°59.6	47.5	279°40.9	5.0′	25°14.8	8.6′	59.5′
	SD = 15.9′	d = -1.0′	SD = 16.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:30	03:35	04:50	19:00	20:14	22:13
N 70°	02:14	03:51	04:57	18:53	19:59	21:33
68°	02:42	04:04	05:03	18:48	19:47	21:07
66°	03:02	04:14	05:08	18:43	19:37	20:47
64°	03:19	04:23	05:12	18:39	19:28	20:32
62°	03:32	04:30	05:16	18:36	19:21	20:19
60°	03:42	04:36	05:19	18:33	19:15	20:08
N 58°	03:52	04:41	05:22	18:30	19:10	19:59
56°	04:00	04:46	05:24	18:28	19:06	19:52
54°	04:06	04:50	05:26	18:26	19:02	19:45
52°	04:13	04:54	05:28	18:24	18:58	19:39
50°	04:18	04:57	05:30	18:22	18:55	19:34
45°	04:29	05:04	05:34	18:18	18:48	19:23
N 40°	04:38	05:10	05:37	18:15	18:42	19:15
35°	04:45	05:15	05:40	18:12	18:38	19:08
30°	04:50	05:18	05:42	18:10	18:34	19:02
20°	04:59	05:24	05:47	18:06	18:28	18:54
N 10°	05:05	05:29	05:50	18:03	18:24	18:48
0°	05:09	05:33	05:53	18:00	18:21	18:45
S 10°	05:11	05:35	05:56	17:57	18:18	18:42
20°	05:12	05:38	06:00	17:54	18:16	18:41
30°	05:11	05:39	06:03	17:50	18:14	18:42
35°	05:11	05:40	06:05	17:49	18:14	18:43
40°	05:09	05:40	06:07	17:46	18:14	18:45
45°	05:07	05:40	06:10	17:44	18:13	18:47
S 50°	05:03	05:41	06:13	17:41	18:14	18:51
52°	05:01	05:40	06:14	17:40	18:14	18:53
54°	04:59	05:40	06:15	17:39	18:14	18:55
56°	04:57	05:40	06:17	17:37	18:14	18:57
58°	04:54	05:40	06:19	17:35	18:15	19:00
S 60°	04:51	05:39	06:21	17:34	18:15	19:04

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	17:03	▭	▭	10:54	▭	▭
N 70°	17:29	16:08	▭	10:30	13:44	▭
68°	17:49	17:04	▭	10:13	12:49	▭
66°	18:05	17:39	▭	09:58	12:17	▭
64°	18:18	18:04	17:38	09:47	11:53	14:18
62°	18:29	18:23	18:16	09:37	11:34	13:40
60°	18:39	18:40	18:43	09:29	11:19	13:14
N 58°	18:47	18:54	19:05	09:22	11:06	12:53
56°	18:55	19:06	19:22	09:15	10:55	12:37
54°	19:02	19:16	19:37	09:10	10:45	12:22
52°	19:08	19:26	19:50	09:04	10:37	12:10
50°	19:13	19:34	20:02	09:00	10:29	11:59
45°	19:25	19:52	20:26	08:50	10:13	11:36
N 40°	19:35	20:07	20:45	08:42	09:59	11:18
35°	19:44	20:19	21:01	08:35	09:48	11:02
30°	19:52	20:31	21:15	08:29	09:38	10:49
20°	20:05	20:50	21:40	08:18	09:21	10:27
N 10°	20:17	21:06	22:01	08:09	09:07	10:07
0°	20:28	21:22	22:20	08:00	08:53	09:49
S 10°	20:39	21:38	22:40	07:52	08:40	09:32
20°	20:51	21:55	23:02	07:43	08:25	09:12
30°	21:05	22:15	23:27	07:32	08:09	08:50
35°	21:13	22:27	23:41	07:26	07:59	08:38
40°	21:22	22:40	23:58	07:20	07:49	08:23
45°	21:33	22:56	·· ··	07:12	07:36	08:06
S 50°	21:46	23:16	·· ··	07:03	07:21	07:44
52°	21:53	23:26	·· ··	06:58	07:14	07:34
54°	22:00	23:37	·· ··	06:54	07:06	07:23
56°	22:07	23:49	·· ··	06:48	06:57	07:10
58°	22:16	·· ··	00:03	06:43	06:47	06:55
S 60°	22:26	·· ··	00:20	06:36	06:36	06:37

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 18-20 93-77%
10	02:56	03:06	11:57	01:48	14:14	
11	03:17	03:27	11:57	02:40	15:08	
12	03:38	03:48	11:56	03:36	16:05	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	352°14.4	207°35.8	N14°48.3	150°11.2	S09°07.3	240°41.9	N21°57.0	352°01.7	S02°38.1
1	7°16.9	222°35.3	47.4	165°12.1	07.9	255°43.9	56.9	7°04.4	38.2
2	22°19.4	237°34.7	46.5	180°13.0	08.5	270°46.0	56.9	22°07.0	38.2
3	37°21.8	252°34.2	·· 45.6	195°13.9	·· 09.2	285°48.0	·· 56.8	37°09.7	·· 38.3
4	52°24.3	267°33.7	44.7	210°14.8	09.8	300°50.0	56.8	52°12.3	38.4
5	67°26.8	282°33.1	43.8	225°15.7	10.4	315°52.1	56.7	67°14.9	38.5
6	82°29.2	297°32.6	N14°42.9	240°16.7	S09°11.1	330°54.1	N21°56.7	82°17.6	S02°38.6
7	97°31.7	312°32.0	42.1	255°17.6	11.7	345°56.1	56.6	97°20.2	38.6
8	112°34.1	327°31.5	41.2	270°18.5	12.3	0°58.2	56.5	112°22.8	38.7
9	127°36.6	342°31.0	·· 40.3	285°19.4	·· 13.0	16°00.2	·· 56.5	127°25.5	·· 38.8
10	142°39.1	357°30.4	39.4	300°20.3	13.6	31°02.3	56.4	142°28.1	38.9
11	157°41.5	12°29.9	38.5	315°21.2	14.3	46°04.3	56.4	157°30.8	39.0
12	172°44.0	27°29.4	N14°37.6	330°22.1	S09°14.9	61°06.3	N21°56.3	172°33.4	S02°39.0
13	187°46.5	42°28.8	36.7	345°23.1	15.5	76°08.4	56.3	187°36.0	39.1
14	202°48.9	57°28.3	35.8	0°24.0	16.2	91°10.4	56.2	202°38.7	39.2
15	217°51.4	72°27.7	·· 34.9	15°24.9	·· 16.8	106°12.5	·· 56.2	217°41.3	·· 39.3
16	232°53.9	87°27.2	34.0	30°25.8	17.4	121°14.5	56.1	232°43.9	39.4
17	247°56.3	102°26.7	33.1	45°26.7	18.1	136°16.5	56.1	247°46.6	39.4
18	262°58.8	117°26.1	N14°32.2	60°27.6	S09°18.7	151°18.6	N21°56.0	262°49.2	S02°39.5
19	278°01.3	132°25.6	31.3	75°28.5	19.3	166°20.6	56.0	277°51.9	39.6
20	293°03.7	147°25.1	30.4	90°29.5	20.0	181°22.7	55.9	292°54.5	39.7
21	308°06.2	162°24.5	·· 29.5	105°30.4	·· 20.6	196°24.7	·· 55.8	307°57.1	·· 39.7
22	323°08.6	177°24.0	28.6	120°31.3	21.2	211°26.8	55.8	322°59.8	39.8
23	338°11.1	192°23.5	27.7	135°32.2	21.9	226°28.8	55.7	338°02.4	39.9
Mer.pass.	00:31	ν -0.5′	d -0.9′	m -3.94	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.04	ν 2.6′	d -0.1′	m 0.61

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	353°13.6	207°22.9	N14°26.8	150°33.1	S09°22.5	241°30.8	N21°55.7	353°05.1	S02°40.0
1	8°16.0	222°22.4	25.9	165°34.0	23.1	256°32.9	55.6	8°07.7	40.1
2	23°18.5	237°21.9	25.0	180°34.9	23.8	271°34.9	55.6	23°10.3	40.1
3	38°21.0	252°21.3	·· 24.1	195°35.8	·· 24.4	286°37.0	·· 55.5	38°13.0	·· 40.2
4	53°23.4	267°20.8	23.2	210°36.7	25.0	301°39.0	55.5	53°15.6	40.3
5	68°25.9	282°20.3	22.3	225°37.7	25.7	316°41.1	55.4	68°18.2	40.4
6	83°28.4	297°19.7	N14°21.4	240°38.6	S09°26.3	331°43.1	N21°55.4	83°20.9	S02°40.5
7	98°30.8	312°19.2	20.5	255°39.5	26.9	346°45.1	55.3	98°23.5	40.5
8	113°33.3	327°18.7	19.6	270°40.4	27.6	1°47.2	55.3	113°26.2	40.6
9	128°35.8	342°18.1	·· 18.6	285°41.3	·· 28.2	16°49.2	·· 55.2	128°28.8	·· 40.7
10	143°38.2	357°17.6	17.7	300°42.2	28.8	31°51.3	55.1	143°31.4	40.8
11	158°40.7	12°17.1	16.8	315°43.1	29.5	46°53.3	55.1	158°34.1	40.9
12	173°43.1	27°16.5	N14°15.9	330°44.0	S09°30.1	61°55.4	N21°55.0	173°36.7	S02°40.9
13	188°45.6	42°16.0	15.0	345°44.9	30.7	76°57.4	55.0	188°39.4	41.0
14	203°48.1	57°15.5	14.1	0°45.8	31.4	91°59.5	54.9	203°42.0	41.1
15	218°50.5	72°14.9	·· 13.2	15°46.8	·· 32.0	107°01.5	·· 54.9	218°44.6	·· 41.2
16	233°53.0	87°14.4	12.3	30°47.7	32.6	122°03.5	54.8	233°47.3	41.2
17	248°55.5	102°13.9	11.3	45°48.6	33.3	137°05.6	54.8	248°49.9	41.3
18	263°57.9	117°13.4	N14°10.4	60°49.5	S09°33.9	152°07.6	N21°54.7	263°52.5	S02°41.4
19	279°00.4	132°12.8	09.5	75°50.4	34.5	167°09.7	54.7	278°55.2	41.5
20	294°02.9	147°12.3	08.6	90°51.3	35.2	182°11.7	54.6	293°57.8	41.6
21	309°05.3	162°11.8	·· 07.7	105°52.2	·· 35.8	197°13.8	·· 54.6	309°00.5	·· 41.6
22	324°07.8	177°11.3	06.8	120°53.1	36.4	212°15.8	54.5	324°03.1	41.7
23	339°10.2	192°10.7	05.8	135°54.0	37.1	227°17.9	54.5	339°05.7	41.8
Mer.pass.	00:27	ν -0.5′	d -0.9′	m -3.94	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.04	ν 2.6′	d -0.1′	m 0.60

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	354°12.7	207°10.2	N14°04.9	150°54.9	S09°37.7	242°19.9	N21°54.4	354°08.4	S02°41.9
1	9°15.2	222°09.7	04.0	165°55.8	38.3	257°22.0	54.3	9°11.0	42.0
2	24°17.6	237°09.1	03.1	180°56.7	39.0	272°24.0	54.3	24°13.7	42.0
3	39°20.1	252°08.6	·· 02.2	195°57.7	·· 39.6	287°26.1	·· 54.2	39°16.3	·· 42.1
4	54°22.6	267°08.1	01.2	210°58.6	40.2	302°28.1	54.2	54°18.9	42.2
5	69°25.0	282°07.6	14°00.3	225°59.5	40.8	317°30.2	54.1	69°21.6	42.3
6	84°27.5	297°07.0	N13°59.4	241°00.4	S09°41.5	332°32.2	N21°54.1	84°24.2	S02°42.4
7	99°30.0	312°06.5	58.5	256°01.3	42.1	347°34.3	54.0	99°26.9	42.4
8	114°32.4	327°06.0	57.5	271°02.2	42.7	2°36.3	54.0	114°29.5	42.5
9	129°34.9	342°05.5	·· 56.6	286°03.1	·· 43.4	17°38.4	·· 53.9	129°32.1	·· 42.6
10	144°37.4	357°05.0	55.7	301°04.0	44.0	32°40.4	53.9	144°34.8	42.7
11	159°39.8	12°04.4	54.8	316°04.9	44.6	47°42.4	53.8	159°37.4	42.7
12	174°42.3	27°03.9	N13°53.8	331°05.8	S09°45.3	62°44.5	N21°53.8	174°40.1	S02°42.8
13	189°44.7	42°03.4	52.9	346°06.7	45.9	77°46.5	53.7	189°42.7	42.9
14	204°47.2	57°02.9	52.0	1°07.6	46.5	92°48.6	53.6	204°45.3	43.0
15	219°49.7	72°02.3	·· 51.0	16°08.5	·· 47.2	107°50.7	·· 53.6	219°48.0	·· 43.1
16	234°52.1	87°01.8	50.1	31°09.4	47.8	122°52.7	53.5	234°50.6	43.1
17	249°54.6	102°01.3	49.2	46°10.3	48.4	137°54.8	53.5	249°53.2	43.2
18	264°57.1	117°00.8	N13°48.3	61°11.2	S09°49.1	152°56.8	N21°53.4	264°55.9	S02°43.3
19	279°59.5	132°00.3	47.3	76°12.1	49.7	167°58.9	53.4	279°58.5	43.4
20	295°02.0	146°59.7	46.4	91°13.0	50.3	183°00.9	53.3	295°01.2	43.5
21	310°04.5	161°59.2	·· 45.5	106°13.9	·· 50.9	198°03.0	·· 53.3	310°03.8	·· 43.5
22	325°06.9	176°58.7	44.5	121°14.8	51.6	213°05.0	53.2	325°06.4	43.6
23	340°09.4	191°58.2	43.6	136°15.7	52.2	228°07.1	53.2	340°09.1	43.7
Mer.pass.	00:23	ν -0.5′	d -0.9′	m -3.93	ν 0.9′	d -0.6′	m 1.61	ν 2.0′	d -0.1′	m -2.05	ν 2.6′	d -0.1′	m 0.60

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.1
Ankaa	353°06.2	-42°09.8
Schedar	349°29.9	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.2	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°29.2	89°22.1
Acamar	315°11.1	-40°11.8
Menkar	314°05.4	4°11.6
Mirfak	308°27.2	49°57.0
Aldebaran	290°38.9	16°33.7
Rigel	281°03.3	-8°10.1
Capella	280°21.0	46°01.3
Bellatrix	278°22.3	6°22.5
Elnath	278°01.2	28°37.7
Alnilam	275°37.2	-1°11.0
Betelgeuse	270°51.5	7°24.8
Canopus	263°52.3	-52°42.2
Sirius	258°25.9	-16°44.8
Adhara	255°05.6	-29°00.1
Procyon	244°50.4	5°09.7
Pollux	243°16.8	27°57.8
Avior	234°15.0	-59°35.2
Suhail	222°46.3	-43°31.9
Miaplacidus	221°39.0	-69°49.1
Alphard	217°47.5	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.9	61°36.8
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.5
Alioth	166°13.0	55°49.4
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.7	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°40.0	-60°56.6
Kochab	137°20.5	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°09.0	-69°04.7
Sabik	102°02.2	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.8	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.7	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.1	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.7	-46°50.2
Fomalhaut	15°13.5	-29°29.0
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 13 Sat	SHA	Mer.pass
Venus	215°21.4	10:10
Mars	157°56.7	13:58
Jupiter	248°27.5	07:56
Saturn	359°47.3	00:32

Sep 14 Sun	SHA	Mer.pass
Venus	214°09.4	10:11
Mars	157°19.5	13:57
Jupiter	248°17.3	07:53
Saturn	359°51.5	00:28

Sep 15 Mon	SHA	Mer.pass
Venus	212°57.5	10:12
Mars	156°42.2	13:55
Jupiter	248°07.2	07:50
Saturn	359°55.7	00:23

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°59.8	N03°46.6	294°05.0	5.0′	N25°23.4	8.4′	59.5′
1	196°00.0	45.6	308°28.9	4.9′	25°31.8	8.2′	59.5′
2	211°00.2	44.6	322°52.8	4.8′	25°40.0	8.0′	59.5′
3	226°00.5	·· 43.7	337°16.6	4.8′	25°48.0	7.9′	59.4′
4	241°00.7	42.7	351°40.4	4.7′	25°55.9	7.7′	59.4′
5	256°00.9	41.8	6°04.1	4.6′	26°03.6	7.5′	59.4′
6	271°01.1	N03°40.8	20°27.7	4.6′	N26°11.1	7.3′	59.4′
7	286°01.3	39.9	34°51.3	4.5′	26°18.4	7.2′	59.4′
8	301°01.6	38.9	49°14.8	4.5′	26°25.6	6.9′	59.4′
9	316°01.8	·· 37.9	63°38.3	4.4′	26°32.5	6.8′	59.3′
10	331°02.0	37.0	78°01.7	4.4′	26°39.3	6.6′	59.3′
11	346°02.2	36.0	92°25.1	4.3′	26°45.9	6.5′	59.3′
12	1°02.5	N03°35.1	106°48.4	4.3′	N26°52.4	6.2′	59.3′
13	16°02.7	34.1	121°11.7	4.2′	26°58.6	6.1′	59.3′
14	31°02.9	33.2	135°34.9	4.2′	27°04.7	5.8′	59.3′
15	46°03.1	·· 32.2	149°58.1	4.1′	27°10.5	5.7′	59.2′
16	61°03.3	31.2	164°21.2	4.1′	27°16.2	5.5′	59.2′
17	76°03.6	30.3	178°44.3	4.1′	27°21.7	5.3′	59.2′
18	91°03.8	N03°29.3	193°07.4	4.0′	N27°27.0	5.1′	59.2′
19	106°04.0	28.4	207°30.4	4.0′	27°32.1	5.0′	59.2′
20	121°04.2	27.4	221°53.4	4.0′	27°37.1	4.7′	59.1′
21	136°04.5	·· 26.4	236°16.3	3.9′	27°41.8	4.6′	59.1′
22	151°04.7	25.5	250°39.2	3.9′	27°46.4	4.3′	59.1′
23	166°04.9	24.5	265°02.1	3.9′	27°50.7	4.2′	59.1′
	SD = 15.9′	d = -1.0′		SD = 16.2′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°05.1	N03°23.6	279°25.0	3.9′	N27°54.9	4.0′	59.1′
1	196°05.4	22.6	293°47.9	3.8′	27°58.9	3.7′	59.0′
2	211°05.6	21.6	308°10.7	3.8′	28°02.6	3.6′	59.0′
3	226°05.8	·· 20.7	322°33.5	3.8′	28°06.2	3.4′	59.0′
4	241°06.0	19.7	336°56.3	3.8′	28°09.6	3.2′	59.0′
5	256°06.2	18.8	351°19.1	3.8′	28°12.8	3.1′	59.0′
6	271°06.5	N03°17.8	5°41.9	3.8′	N28°15.9	2.8′	58.9′
7	286°06.7	16.9	20°04.6	3.8′	28°18.7	2.6′	58.9′
8	301°06.9	15.9	34°27.4	3.8′	28°21.3	2.4′	58.9′
9	316°07.1	·· 14.9	48°50.1	3.8′	28°23.7	2.3′	58.9′
10	331°07.4	14.0	63°12.9	3.8′	28°26.0	2.0′	58.9′
11	346°07.6	13.0	77°35.6	3.8′	28°28.0	1.9′	58.8′
12	1°07.8	N03°12.0	91°58.4	3.8′	N28°29.9	1.7′	58.8′
13	16°08.0	11.1	106°21.2	3.8′	28°31.6	1.4′	58.8′
14	31°08.2	10.1	120°43.9	3.8′	28°33.0	1.3′	58.8′
15	46°08.5	·· 09.2	135°06.7	3.8′	28°34.3	1.1′	58.8′
16	61°08.7	08.2	149°29.5	3.8′	28°35.4	0.9′	58.7′
17	76°08.9	07.2	163°52.3	3.8′	28°36.3	0.7′	58.7′
18	91°09.1	N03°06.3	178°15.1	3.8′	N28°37.0	0.5′	58.7′
19	106°09.4	05.3	192°38.0	3.9′	28°37.5	0.3′	58.7′
20	121°09.6	04.4	207°00.9	3.9′	28°37.8	0.1′	58.7′
21	136°09.8	·· 03.4	221°23.7	3.9′	28°37.9	0.1′	58.6′
22	151°10.0	02.4	235°46.7	4.0′	28°37.8	0.2′	58.6′
23	166°10.3	01.5	250°09.6	4.0′	28°37.6	0.5′	58.6′
	SD = 15.9′	d = -1.0′		SD = 16.1′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°10.5	N03°00.5	264°32.6	4.0′	N28°37.1	0.6′	58.6′
1	196°10.7	02°59.6	278°55.6	4.1′	28°36.5	0.9′	58.5′
2	211°10.9	58.6	293°18.7	4.1′	28°35.6	1.0′	58.5′
3	226°11.1	·· 57.6	307°41.8	4.1′	28°34.6	1.2′	58.5′
4	241°11.4	56.7	322°04.9	4.2′	28°33.4	1.4′	58.5′
5	256°11.6	55.7	336°28.1	4.2′	28°32.0	1.6′	58.5′
6	271°11.8	N02°54.7	350°51.3	4.3′	N28°30.4	1.8′	58.4′
7	286°12.0	53.8	5°14.6	4.3′	28°28.6	1.9′	58.4′
8	301°12.3	52.8	19°38.0	4.4′	28°26.7	2.2′	58.4′
9	316°12.5	·· 51.9	34°01.3	4.4′	28°24.5	2.3′	58.4′
10	331°12.7	50.9	48°24.8	4.5′	28°22.2	2.5′	58.4′
11	346°12.9	49.9	62°48.3	4.6′	28°19.7	2.7′	58.3′
12	1°13.2	N02°49.0	77°11.8	4.6′	N28°17.0	2.9′	58.3′
13	16°13.4	48.0	91°35.5	4.7′	28°14.1	3.0′	58.3′
14	31°13.6	47.0	105°59.1	4.7′	28°11.1	3.3′	58.3′
15	46°13.8	·· 46.1	120°22.9	4.8′	28°07.8	3.4′	58.2′
16	61°14.0	45.1	134°46.7	4.9′	28°04.4	3.6′	58.2′
17	76°14.3	44.1	149°10.6	5.0′	28°00.8	3.7′	58.2′
18	91°14.5	N02°43.2	163°34.5	5.0′	N27°57.1	4.0′	58.2′
19	106°14.7	42.2	177°58.6	5.1′	27°53.1	4.1′	58.2′
20	121°14.9	41.3	192°22.7	5.2′	27°49.0	4.3′	58.1′
21	136°15.2	·· 40.3	206°46.8	5.3′	27°44.7	4.4′	58.1′
22	151°15.4	39.3	221°11.1	5.3′	27°40.3	4.7′	58.1′
23	166°15.6	38.4	235°35.4	5.4′	27°35.6	4.8′	58.1′
	SD = 15.9′	d = -1.0′		SD = 16.0′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:01	03:51	05:04	18:45	19:56	21:43
N 70°	02:34	04:05	05:09	18:39	19:43	21:12
68°	02:58	04:15	05:14	18:35	19:33	20:49
66°	03:16	04:24	05:17	18:32	19:24	20:32
64°	03:30	04:32	05:21	18:29	19:17	20:18
62°	03:41	04:38	05:23	18:26	19:11	20:07
60°	03:51	04:43	05:26	18:24	19:06	19:58
N 58°	03:59	04:48	05:28	18:22	19:01	19:50
56°	04:06	04:52	05:30	18:20	18:57	19:43
54°	04:13	04:56	05:32	18:18	18:54	19:37
52°	04:18	04:59	05:33	18:17	18:51	19:31
50°	04:23	05:02	05:35	18:15	18:48	19:27
45°	04:33	05:08	05:38	18:13	18:42	19:17
N 40°	04:41	05:13	05:40	18:10	18:37	19:09
35°	04:47	05:17	05:42	18:08	18:34	19:03
30°	04:52	05:20	05:44	18:06	18:30	18:58
20°	04:59	05:25	05:47	18:03	18:26	18:51
N 10°	05:04	05:29	05:50	18:01	18:22	18:46
0°	05:08	05:32	05:52	17:59	18:19	18:43
S 10°	05:09	05:34	05:55	17:57	18:18	18:42
20°	05:09	05:35	05:57	17:54	18:16	18:42
30°	05:08	05:35	05:59	17:52	18:16	18:44
35°	05:06	05:36	06:01	17:51	18:16	18:45
40°	05:04	05:35	06:02	17:49	18:16	18:48
45°	05:01	05:35	06:04	17:48	18:17	18:51
S 50°	04:57	05:34	06:06	17:46	18:18	18:56
52°	04:54	05:34	06:07	17:45	18:18	18:58
54°	04:52	05:33	06:08	17:44	18:19	19:00
56°	04:49	05:32	06:09	17:43	18:20	19:03
58°	04:46	05:31	06:10	17:42	18:21	19:07
S 60°	04:42	05:30	06:12	17:40	18:22	19:11

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°						
N 70°						
68°						
66°						
64°						
62°	18:03		19:47	16:00		18:36
60°	18:55	19:31	20:53	15:09	16:43	17:29
N 58°	19:27	20:11	21:27	14:37	16:02	16:54
56°	19:51	20:39	21:52	14:14	15:34	16:29
54°	20:10	21:01	22:13	13:55	15:13	16:09
52°	20:27	21:19	22:29	13:39	14:55	15:51
50°	20:41	21:35	22:44	13:25	14:39	15:37
45°	21:10	22:06	23:13	12:56	14:08	15:07
N 40°	21:32	22:30	23:36	12:34	13:44	14:44
35°	21:51	22:50	23:55	12:16	13:24	14:24
30°	22:08	23:07	·· ··	12:00	13:07	14:08
20°	22:35	23:36	·· ··	11:33	12:39	13:40
N 10°	22:59	·· ··	00:00	11:10	12:14	13:15
0°	23:21	·· ··	00:23	10:49	11:51	12:53
S 10°	23:44	·· ··	00:46	10:28	11:28	12:30
20°	·· ··	00:08	01:11	10:05	11:04	12:06
30°	·· ··	00:36	01:40	09:39	10:35	11:37
35°	·· ··	00:53	01:57	09:23	10:18	11:20
40°	·· ··	01:12	02:17	09:06	09:58	11:00
45°	00:19	01:36	02:42	08:44	09:34	10:36
S 50°	00:45	02:07	03:13	08:17	09:03	10:05
52°	00:58	02:22	03:29	08:04	08:48	09:50
54°	01:13	02:40	03:47	07:49	08:30	09:31
56°	01:30	03:01	04:09	07:31	08:08	09:09
58°	01:51	03:29	04:38	07:09	07:40	08:41
S 60°	02:18	04:08	05:20	06:42	07:00	07:59

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass 00h hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 21-23 66-44%
13	03:59	04:10	11:56	04:35	17:05	
14	04:21	04:31	11:55	05:36	18:07	
15	04:42	04:53	11:55	06:38	19:08	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°11.9	206°57.7	N13°42.6	151°16.6	S09°52.8	243°09.1	N21°53.1	355°11.7	S02°43.8
1	10°14.3	221°57.1	41.7	166°17.5	53.5	258°11.2	53.1	10°14.4	43.9
2	25°16.8	236°56.6	40.8	181°18.4	54.1	273°13.2	53.0	25°17.0	43.9
3	40°19.2	251°56.1	·· 39.8	196°19.3	·· 54.7	288°15.3	·· 53.0	40°19.6	·· 44.0
4	55°21.7	266°55.6	38.9	211°20.2	55.4	303°17.3	52.9	55°22.3	44.1
5	70°24.2	281°55.1	38.0	226°21.2	56.0	318°19.4	52.9	70°24.9	44.2
6	85°26.6	296°54.5	N13°37.0	241°22.1	S09°56.6	333°21.4	N21°52.8	85°27.6	S02°44.3
7	100°29.1	311°54.0	36.1	256°23.0	57.2	348°23.5	52.7	100°30.2	44.3
8	115°31.6	326°53.5	35.1	271°23.9	57.9	3°25.5	52.7	115°32.8	44.4
9	130°34.0	341°53.0	·· 34.2	286°24.8	·· 58.5	18°27.6	·· 52.6	130°35.5	·· 44.5
10	145°36.5	356°52.5	33.2	301°25.7	59.1	33°29.7	52.6	145°38.1	44.6
11	160°39.0	11°52.0	32.3	316°26.6	09°59.8	48°31.7	52.5	160°40.8	44.6
12	175°41.4	26°51.5	N13°31.4	331°27.5	S10°00.4	63°33.8	N21°52.5	175°43.4	S02°44.7
13	190°43.9	41°50.9	30.4	346°28.4	01.0	78°35.8	52.4	190°46.0	44.8
14	205°46.4	56°50.4	29.5	1°29.3	01.6	93°37.9	52.4	205°48.7	44.9
15	220°48.8	71°49.9	·· 28.5	16°30.2	·· 02.3	108°39.9	·· 52.3	220°51.3	·· 45.0
16	235°51.3	86°49.4	27.6	31°31.0	02.9	123°42.0	52.3	235°54.0	45.0
17	250°53.7	101°48.9	26.6	46°31.9	03.5	138°44.0	52.2	250°56.6	45.1
18	265°56.2	116°48.4	N13°25.7	61°32.8	S10°04.2	153°46.1	N21°52.2	265°59.2	S02°45.2
19	280°58.7	131°47.9	24.7	76°33.7	04.8	168°48.2	52.1	281°01.9	45.3
20	296°01.1	146°47.3	23.8	91°34.6	05.4	183°50.2	52.1	296°04.5	45.4
21	311°03.6	161°46.8	·· 22.8	106°35.5	·· 06.0	198°52.3	·· 52.0	311°07.2	·· 45.4
22	326°06.1	176°46.3	21.9	121°36.4	06.7	213°54.3	51.9	326°09.8	45.5
23	341°08.5	191°45.8	20.9	136°37.3	07.3	228°56.4	51.9	341°12.4	45.6
Mer.pass.	00:19	ν -0.5′	d -0.9′	ν 0.9′	d -0.6′	ν 2.1′	d -0.1′	ν 2.6′	d -0.1′
		m -3.93		m 1.60		m -2.05		m 0.60	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°11.0	206°45.3	N13°20.0	151°38.2	S10°07.9	243°58.4	N21°51.8	356°15.1	S02°45.7
1	11°13.5	221°44.8	19.0	166°39.1	08.6	259°00.5	51.8	11°17.7	45.8
2	26°15.9	236°44.3	18.1	181°40.0	09.2	274°02.6	51.7	26°20.4	45.8
3	41°18.4	251°43.8	·· 17.1	196°40.9	·· 09.8	289°04.6	·· 51.7	41°23.0	·· 45.9
4	56°20.9	266°43.3	16.2	211°41.8	10.4	304°06.7	51.6	56°25.6	46.0
5	71°23.3	281°42.7	15.2	226°42.7	11.1	319°08.7	51.6	71°28.3	46.1
6	86°25.8	296°42.2	N13°14.2	241°43.6	S10°11.7	334°10.8	N21°51.5	86°30.9	S02°46.2
7	101°28.2	311°41.7	13.3	256°44.5	12.3	349°12.8	51.5	101°33.6	46.2
8	116°30.7	326°41.2	12.3	271°45.4	13.0	4°14.9	51.4	116°36.2	46.3
9	131°33.2	341°40.7	·· 11.4	286°46.3	·· 13.6	19°17.0	·· 51.4	131°38.9	·· 46.4
10	146°35.6	356°40.2	10.4	301°47.2	14.2	34°19.0	51.3	146°41.5	46.5
11	161°38.1	11°39.7	09.4	316°48.1	14.8	49°21.1	51.3	161°44.1	46.5
12	176°40.6	26°39.2	N13°08.5	331°49.0	S10°15.5	64°23.1	N21°51.2	176°46.8	S02°46.6
13	191°43.0	41°38.7	07.5	346°49.9	16.1	79°25.2	51.2	191°49.4	46.7
14	206°45.5	56°38.2	06.6	1°50.8	16.7	94°27.3	51.1	206°52.1	46.8
15	221°48.0	71°37.7	·· 05.6	16°51.7	·· 17.3	109°29.3	·· 51.1	221°54.7	·· 46.9
16	236°50.4	86°37.2	04.6	31°52.6	18.0	124°31.4	51.0	236°57.3	46.9
17	251°52.9	101°36.6	03.7	46°53.5	18.6	139°33.5	50.9	252°00.0	47.0
18	266°55.3	116°36.1	N13°02.7	61°54.3	S10°19.2	154°35.5	N21°50.9	267°02.6	S02°47.1
19	281°57.8	131°35.6	01.7	76°55.2	19.8	169°37.6	50.8	282°05.3	47.2
20	297°00.3	146°35.1	13°00.8	91°56.1	20.5	184°39.6	50.8	297°07.9	47.3
21	312°02.7	161°34.6	12°59.8	106°57.0	·· 21.1	199°41.7	·· 50.7	312°10.5	·· 47.3
22	327°05.2	176°34.1	58.8	121°57.9	21.7	214°43.8	50.7	327°13.2	47.4
23	342°07.7	191°33.6	57.9	136°58.8	22.4	229°45.8	50.6	342°15.8	47.5
Mer.pass.	00:15	ν -0.5′	d -1.0′	ν 0.9′	d -0.6′	ν 2.1′	d -0.1′	ν 2.6′	d -0.1′
		m -3.93		m 1.60		m -2.05		m 0.59	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	357°10.1	206°33.1	N12°56.9	151°59.7	S10°23.0	244°47.9	N21°50.6	357°18.5	S02°47.6
1	12°12.6	221°32.6	55.9	167°00.6	23.6	259°50.0	50.5	12°21.1	47.7
2	27°15.1	236°32.1	55.0	182°01.5	24.2	274°52.0	50.5	27°23.7	47.7
3	42°17.5	251°31.6	·· 54.0	197°02.4	·· 24.9	289°54.1	·· 50.4	42°26.4	·· 47.8
4	57°20.0	266°31.1	53.0	212°03.3	25.5	304°56.1	50.4	57°29.0	47.9
5	72°22.5	281°30.6	52.1	227°04.2	26.1	319°58.2	50.3	72°31.7	48.0
6	87°24.9	296°30.1	N12°51.1	242°05.1	S10°26.7	335°00.3	N21°50.3	87°34.3	S02°48.1
7	102°27.4	311°29.6	50.1	257°05.9	27.4	350°02.3	50.2	102°36.9	48.1
8	117°29.8	326°29.1	49.1	272°06.8	28.0	5°04.4	50.2	117°39.6	48.2
9	132°32.3	341°28.6	·· 48.2	287°07.7	·· 28.6	20°06.5	·· 50.1	132°42.2	·· 48.3
10	147°34.8	356°28.1	47.2	302°08.6	29.2	35°08.5	50.1	147°44.9	48.4
11	162°37.2	11°27.6	46.2	317°09.5	29.9	50°10.6	50.0	162°47.5	48.4
12	177°39.7	26°27.1	N12°45.2	332°10.4	S10°30.5	65°12.7	N21°50.0	177°50.2	S02°48.5
13	192°42.2	41°26.6	44.3	347°11.3	31.1	80°14.7	49.9	192°52.8	48.6
14	207°44.6	56°26.1	43.3	2°12.2	31.7	95°16.8	49.8	207°55.4	48.7
15	222°47.1	71°25.6	·· 42.3	17°13.1	·· 32.4	110°18.9	·· 49.8	222°58.1	·· 48.8
16	237°49.6	86°25.1	41.3	32°13.9	33.0	125°20.9	49.7	238°00.7	48.8
17	252°52.0	101°24.6	40.3	47°14.8	33.6	140°23.0	49.7	253°03.4	48.9
18	267°54.5	116°24.1	N12°39.4	62°15.7	S10°34.2	155°25.1	N21°49.6	268°06.0	S02°49.0
19	282°57.0	131°23.6	38.4	77°16.6	34.9	170°27.1	49.6	283°08.6	49.1
20	297°59.4	146°23.1	37.4	92°17.5	35.5	185°29.2	49.5	298°11.3	49.2
21	313°01.9	161°22.6	·· 36.4	107°18.4	·· 36.1	200°31.3	·· 49.5	313°13.9	·· 49.2
22	328°04.3	176°22.1	35.4	122°19.3	36.7	215°33.3	49.4	328°16.6	49.3
23	343°06.8	191°21.6	34.5	137°20.2	37.4	230°35.4	49.4	343°19.2	49.4
Mer.pass.	00:11	ν -0.5′	d -1.0′	ν 0.9′	d -0.6′	ν 2.1′	d -0.1′	ν 2.6′	d -0.1′
		m -3.93		m 1.60		m -2.06		m 0.59	

Stars	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.8
Schedar	349°29.9	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.2	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°27.7	89°22.1
Acamar	315°11.1	-40°11.8
Menkar	314°05.4	4°11.6
Mirfak	308°27.2	49°57.1
Aldebaran	290°38.9	16°33.7
Rigel	281°03.3	-8°10.1
Capella	280°21.0	46°01.3
Bellatrix	278°22.2	6°22.5
Elnath	278°01.1	28°37.7
Alnilam	275°37.1	-1°11.0
Betelgeuse	270°51.5	7°24.8
Canopus	263°52.3	-52°42.2
Sirius	258°25.8	-16°44.8
Adhara	255°05.5	-29°00.1
Procyon	244°50.4	5°09.7
Pollux	243°16.8	27°57.8
Avior	234°14.9	-59°35.2
Suhail	222°46.3	-43°31.9
Miaplacidus	221°39.0	-69°49.1
Alphard	217°47.5	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.9	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.3
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.3
Hadar	148°35.7	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.6	19°03.1
Rigil Kent.	139°40.0	-60°56.6
Kochab	137°20.5	74°03.2
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°09.0	-69°04.7
Sabik	102°02.2	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.9	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.7	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.2
Deneb	49°25.1	45°22.5
Enif	33°38.0	9°59.7
Al Na'ir	27°31.7	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 16 Tue	SHA	Mer.pass
Venus	211°45.8	10:13
Mars	156°04.8	13:54
Jupiter	247°57.3	07:46
Saturn	359°59.9	00:19

Sep 17 Wed	SHA	Mer.pass
Venus	210°34.3	10:13
Mars	155°27.2	13:53
Jupiter	247°47.4	07:43
Saturn	0°04.1	00:15

Sep 18 Thu	SHA	Mer.pass
Venus	209°23.0	10:14
Mars	154°49.6	13:51
Jupiter	247°37.8	07:40
Saturn	0°08.3	00:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°15.8	N02°37.4	249°59.9	5.5′	N27°30.8	4.9′	58.0′
1	196°16.1	36.4	264°24.4	5.6′	27°25.9	5.2′	58.0′
2	211°16.3	35.5	278°49.0	5.7′	27°20.7	5.3′	58.0′
3	226°16.5	·· 34.5	293°13.6	5.8′	27°15.4	5.5′	58.0′
4	241°16.7	33.5	307°38.4	5.9′	27°09.9	5.6′	58.0′
5	256°16.9	32.6	322°03.3	5.9′	27°04.3	5.8′	57.9′
6	271°17.2	N02°31.6	336°28.2	6.0′	N26°58.5	5.9′	57.9′
7	286°17.4	30.7	350°53.2	6.1′	26°52.6	6.2′	57.9′
8	301°17.6	29.7	5°18.4	6.2′	26°46.4	6.2′	57.9′
9	316°17.8	·· 28.7	19°43.6	6.3′	26°40.2	6.5′	57.8′
10	331°18.1	27.8	34°08.9	6.4′	26°33.7	6.5′	57.8′
11	346°18.3	26.8	48°34.3	6.5′	26°27.2	6.8′	57.8′
12	1°18.5	N02°25.8	62°59.8	6.6′	N26°20.4	6.9′	57.8′
13	16°18.7	24.9	77°25.4	6.7′	26°13.5	7.0′	57.8′
14	31°19.0	23.9	91°51.1	6.8′	26°06.5	7.2′	57.7′
15	46°19.2	·· 22.9	106°16.9	6.9′	25°59.3	7.4′	57.7′
16	61°19.4	22.0	120°42.8	7.0′	25°51.9	7.5′	57.7′
17	76°19.6	21.0	135°08.9	7.1′	25°44.4	7.6′	57.7′
18	91°19.8	N02°20.0	149°35.0	7.2′	N25°36.8	7.8′	57.7′
19	106°20.1	19.1	164°01.2	7.3′	25°29.0	7.9′	57.6′
20	121°20.3	18.1	178°27.5	7.4′	25°21.1	8.1′	57.6′
21	136°20.5	·· 17.1	192°53.9	7.5′	25°13.0	8.2′	57.6′
22	151°20.7	16.2	207°20.5	7.6′	25°04.8	8.3′	57.6′
23	166°21.0	15.2	221°47.1	7.7′	24°56.5	8.5′	57.5′
	SD = 15.9′	d = -1.0′	SD = 15.8′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°21.2	N02°14.2	236°13.8	7.8′	N24°48.0	8.6′	57.5′
1	196°21.4	13.3	250°40.7	8.0′	24°39.4	8.7′	57.5′
2	211°21.6	12.3	265°07.6	8.1′	24°30.7	8.9′	57.5′
3	226°21.9	·· 11.3	279°34.7	8.2′	24°21.8	9.0′	57.5′
4	241°22.1	10.4	294°01.9	8.3′	24°12.8	9.2′	57.4′
5	256°22.3	09.4	308°29.2	8.4′	24°03.6	9.2′	57.4′
6	271°22.5	N02°08.4	322°56.6	8.5′	N23°54.4	9.4′	57.4′
7	286°22.7	07.5	337°24.0	8.6′	23°45.0	9.5′	57.4′
8	301°23.0	06.5	351°51.7	8.7′	23°35.5	9.7′	57.3′
9	316°23.2	·· 05.5	6°19.4	8.8′	23°25.8	9.7′	57.3′
10	331°23.4	04.6	20°47.2	8.9′	23°16.1	9.9′	57.3′
11	346°23.6	03.6	35°15.1	9.0′	23°06.2	10.0′	57.3′
12	1°23.9	N02°02.6	49°43.2	9.1′	N22°56.2	10.1′	57.3′
13	16°24.1	01.7	64°11.3	9.3′	22°46.1	10.2′	57.2′
14	31°24.3	02°00.7	78°39.6	9.4′	22°35.9	10.4′	57.2′
15	46°24.5	01°59.7	93°07.9	9.5′	22°25.5	10.4′	57.2′
16	61°24.8	58.8	107°36.4	9.6′	22°15.1	10.6′	57.2′
17	76°25.0	57.8	122°05.0	9.7′	22°04.5	10.7′	57.1′
18	91°25.2	N01°56.8	136°33.7	9.8′	N21°53.8	10.7′	57.1′
19	106°25.4	55.9	151°02.5	9.9′	21°43.1	10.9′	57.1′
20	121°25.6	54.9	165°31.4	10.0′	21°32.2	11.0′	57.1′
21	136°25.9	·· 53.9	180°00.4	10.1′	21°21.2	11.1′	57.1′
22	151°26.1	53.0	194°29.5	10.2′	21°10.1	11.2′	57.0′
23	166°26.3	52.0	208°58.7	10.3′	20°58.9	11.3′	57.0′
	SD = 15.9′	d = -1.0′	SD = 15.7′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°26.5	N01°51.0	223°28.0	10.4′	N20°47.6	11.4′	57.0′
1	196°26.8	50.1	237°57.5	10.5′	20°36.2	11.5′	57.0′
2	211°27.0	49.1	252°27.0	10.6′	20°24.7	11.5′	57.0′
3	226°27.2	·· 48.1	266°56.7	10.7′	20°13.2	11.7′	56.9′
4	241°27.4	47.2	281°26.4	10.9′	20°01.5	11.8′	56.9′
5	256°27.7	46.2	295°56.3	11.0′	19°49.7	11.8′	56.9′
6	271°27.9	N01°45.2	310°26.2	11.1′	N19°37.9	12.0′	56.9′
7	286°28.1	44.2	324°56.3	11.2′	19°25.9	12.0′	56.8′
8	301°28.3	43.3	339°26.4	11.3′	19°13.9	12.1′	56.8′
9	316°28.5	·· 42.3	353°56.7	11.4′	19°01.8	12.2′	56.8′
10	331°28.8	41.3	8°27.0	11.5′	18°49.6	12.3′	56.8′
11	346°29.0	40.4	22°57.5	11.6′	18°37.3	12.4′	56.8′
12	1°29.2	N01°39.4	37°28.1	11.7′	N18°24.9	12.4′	56.7′
13	16°29.4	38.4	51°58.7	11.8′	18°12.5	12.5′	56.7′
14	31°29.7	37.5	66°29.5	11.8′	18°00.0	12.6′	56.7′
15	46°29.9	·· 36.5	81°00.3	11.9′	17°47.4	12.7′	56.7′
16	61°30.1	35.5	95°31.3	12.0′	17°34.7	12.8′	56.7′
17	76°30.3	34.6	110°02.3	12.1′	17°21.9	12.8′	56.6′
18	91°30.5	N01°33.6	124°33.4	12.2′	N17°09.1	12.9′	56.6′
19	106°30.8	32.6	139°04.6	12.3′	16°56.2	13.0′	56.6′
20	121°31.0	31.7	153°36.0	12.4′	16°43.2	13.0′	56.6′
21	136°31.2	·· 30.7	168°07.4	12.5′	16°30.2	13.1′	56.5′
22	151°31.4	29.7	182°38.9	12.6′	16°17.1	13.2′	56.5′
23	166°31.7	28.7	197°10.5	12.7′	16°03.9	13.2′	56.5′
	SD = 15.9′	d = -1.0′	SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:25	04:06	05:17	18:29	19:39	21:17
N 70°	02:53	04:18	05:21	18:25	19:28	20:52
68°	03:12	04:27	05:24	18:22	19:19	20:33
66°	03:28	04:35	05:27	18:20	19:12	20:18
64°	03:40	04:41	05:29	18:18	19:06	20:06
62°	03:51	04:46	05:31	18:16	19:01	19:56
60°	03:59	04:51	05:33	18:14	18:56	19:47
N 58°	04:07	04:55	05:34	18:13	18:53	19:40
56°	04:13	04:58	05:36	18:12	18:49	19:34
54°	04:19	05:01	05:37	18:11	18:46	19:29
52°	04:24	05:04	05:38	18:10	18:44	19:24
50°	04:28	05:07	05:39	18:09	18:41	19:20
45°	04:37	05:12	05:41	18:07	18:36	19:11
N 40°	04:44	05:16	05:43	18:05	18:32	19:04
35°	04:49	05:19	05:44	18:04	18:29	18:59
30°	04:54	05:22	05:46	18:03	18:27	18:54
20°	05:00	05:26	05:48	18:01	18:23	18:48
N 10°	05:04	05:29	05:50	17:59	18:20	18:44
0°	05:06	05:30	05:51	17:58	18:18	18:42
S 10°	05:07	05:32	05:53	17:56	18:17	18:42
20°	05:07	05:32	05:54	17:55	18:17	18:43
30°	05:04	05:32	05:56	17:54	18:18	18:45
35°	05:02	05:31	05:56	17:53	18:18	18:48
40°	04:59	05:30	05:57	17:52	18:19	18:51
45°	04:55	05:29	05:58	17:51	18:20	18:55
S 50°	04:50	05:27	06:00	17:50	18:22	19:00
52°	04:47	05:27	06:00	17:50	18:23	19:03
54°	04:44	05:25	06:01	17:49	18:24	19:06
56°	04:41	05:24	06:01	17:49	18:26	19:09
58°	04:37	05:23	06:02	17:48	18:27	19:13
S 60°	04:32	05:21	06:03	17:47	18:29	19:18

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°			23:52			20:11
N 70°						19:27
68°		22:15	·· ··		20:02	18:57
66°		23:10	·· ··		19:07	18:35
64°	21:15	23:42	·· ··	19:09	18:33	18:17
62°	22:07	·· ··	00:06	18:16	18:08	18:02
60°	22:39	·· ··	00:25	17:44	17:49	17:50
N 58°	23:02	·· ··	00:40	17:20	17:32	17:39
56°	23:21	·· ··	00:53	17:00	17:18	17:30
54°	23:37	·· ··	01:05	16:44	17:06	17:21
52°	23:51	·· ··	01:15	16:30	16:56	17:13
50°	·· ··	00:03	01:24	16:18	16:46	17:07
45°	·· ··	00:27	01:43	15:52	16:26	16:52
N 40°	·· ··	00:47	01:58	15:32	16:09	16:40
35°	·· ··	01:03	02:11	15:14	15:55	16:29
30°	00:11	01:17	02:22	15:00	15:43	16:20
20°	00:39	01:41	02:41	14:34	15:22	16:04
N 10°	01:02	02:02	02:58	14:12	15:04	15:50
0°	01:24	02:21	03:13	13:52	14:46	15:37
S 10°	01:46	02:40	03:29	13:31	14:29	15:23
20°	02:09	03:00	03:45	13:09	14:10	15:09
30°	02:36	03:24	04:04	12:43	13:49	14:52
35°	02:52	03:37	04:14	12:27	13:36	14:43
40°	03:11	03:53	04:27	12:09	13:21	14:32
45°	03:33	04:12	04:41	11:48	13:03	14:18
S 50°	04:01	04:35	04:59	11:20	12:41	14:02
52°	04:15	04:46	05:07	11:07	12:31	13:55
54°	04:31	04:59	05:16	10:51	12:19	13:46
56°	04:50	05:13	05:27	10:32	12:05	13:36
58°	05:14	05:30	05:39	10:10	11:48	13:25
S 60°	05:44	05:51	05:52	09:40	11:29	13:13

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 24-26 33-15%
16	05:03	05:14	11:55	07:38	20:06	
17	05:25	05:35	11:54	08:34	21:00	
18	05:46	05:57	11:54	09:25	21:49	

No IERS EOP prediction data available

September 19, 20, 21 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2464 sec ΔT = TT-UT1 = +68.9376 sec

2025 September 19 to Sep. 21 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	358°09.3	206°21.1	N12°33.5	152°21.1	S10°38.0	245°37.5	N21°49.3	358°21.8	S02°49.5
1	13°11.7	221°20.6	32.5	167°21.9	38.6	260°39.5	49.3	13°24.5	49.6
2	28°14.2	236°20.1	31.5	182°22.8	39.2	275°41.6	49.2	28°27.1	49.6
3	43°16.7	251°19.6	·· 30.5	197°23.7	·· 39.8	290°43.7	·· 49.2	43°29.8	·· 49.7
4	58°19.1	266°19.1	29.5	212°24.6	40.5	305°45.7	49.1	58°32.4	49.8
5	73°21.6	281°18.6	28.5	227°25.5	41.1	320°47.8	49.1	73°35.1	49.9
6	88°24.1	296°18.1	N12°27.6	242°26.4	S10°41.7	335°49.9	N21°49.0	88°37.7	S02°49.9
7	103°26.5	311°17.6	26.6	257°27.3	42.3	350°52.0	49.0	103°40.3	50.0
8	118°29.0	326°17.1	25.6	272°28.1	43.0	5°54.0	48.9	118°43.0	50.1
9	133°31.4	341°16.6	·· 24.6	287°29.0	·· 43.6	20°56.1	·· 48.9	133°45.6	·· 50.2
10	148°33.9	356°16.1	23.6	302°29.9	44.2	35°58.2	48.8	148°48.3	50.3
11	163°36.4	11°15.7	22.6	317°30.8	44.8	51°00.2	48.8	163°50.9	50.3
12	178°38.8	26°15.2	N12°21.6	332°31.7	S10°45.5	66°02.3	N21°48.7	178°53.5	S02°50.4
13	193°41.3	41°14.7	20.6	347°32.6	46.1	81°04.4	48.6	193°56.2	50.5
14	208°43.8	56°14.2	19.6	2°33.4	46.7	96°06.5	48.6	208°58.8	50.6
15	223°46.2	71°13.7	·· 18.6	17°34.3	·· 47.3	111°08.5	·· 48.5	224°01.5	·· 50.7
16	238°48.7	86°13.2	17.7	32°35.2	47.9	126°10.6	48.5	239°04.1	50.7
17	253°51.2	101°12.7	16.7	47°36.1	48.6	141°12.7	48.4	254°06.7	50.8
18	268°53.6	116°12.2	N12°15.7	62°37.0	S10°49.2	156°14.7	N21°48.4	269°09.4	S02°50.9
19	283°56.1	131°11.7	14.7	77°37.9	49.8	171°16.8	48.3	284°12.0	51.0
20	298°58.6	146°11.2	13.7	92°38.7	50.4	186°18.9	48.3	299°14.7	51.1
21	314°01.0	161°10.7	·· 12.7	107°39.6	·· 51.1	201°21.0	·· 48.2	314°17.3	·· 51.1
22	329°03.5	176°10.2	11.7	122°40.5	51.7	216°23.0	48.2	329°20.0	51.2
23	344°05.9	191°09.8	10.7	137°41.4	52.3	231°25.1	48.1	344°22.6	51.3
Mer.pass.	00:07	ν -0.5′	d -1.0′	m -3.93	ν 0.9′	d -0.6′	m 1.60	ν 2.1′	d -0.1′ m -2.06	ν 2.6′	d -0.1′ m 0.59

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	359°08.4	206°09.3	N12°09.7	152°42.3	S10°52.9	246°27.2	N21°48.1	359°25.2	S02°51.4
1	14°10.9	221°08.8	08.7	167°43.2	53.5	261°29.3	48.0	14°27.9	51.4
2	29°13.3	236°08.3	07.7	182°44.0	54.2	276°31.3	48.0	29°30.5	51.5
3	44°15.8	251°07.8	·· 06.7	197°44.9	·· 54.8	291°33.4	·· 47.9	44°33.2	·· 51.6
4	59°18.3	266°07.3	05.7	212°45.8	55.4	306°35.5	47.9	59°35.8	51.7
5	74°20.7	281°06.8	04.7	227°46.7	56.0	321°37.6	47.8	74°38.4	51.8
6	89°23.2	296°06.3	N12°03.7	242°47.6	S10°56.6	336°39.6	N21°47.8	89°41.1	S02°51.8
7	104°25.7	311°05.8	02.7	257°48.4	57.3	351°41.7	47.7	104°43.7	51.9
8	119°28.1	326°05.4	01.7	272°49.3	57.9	6°43.8	47.7	119°46.4	52.0
9	134°30.6	341°04.9	12°00.7	287°50.2	·· 58.5	21°45.9	·· 47.6	134°49.0	·· 52.1
10	149°33.0	356°04.4	11°59.7	302°51.1	59.1	36°47.9	47.6	149°51.7	52.2
11	164°35.5	11°03.9	58.7	317°52.0	10°59.7	51°50.0	47.5	164°54.3	52.2
12	179°38.0	26°03.4	N11°57.7	332°52.8	S11°00.4	66°52.1	N21°47.5	179°56.9	S02°52.3
13	194°40.4	41°02.9	56.6	347°53.7	01.0	81°54.2	47.4	194°59.6	52.4
14	209°42.9	56°02.4	55.6	2°54.6	01.6	96°56.2	47.4	210°02.2	52.5
15	224°45.4	71°02.0	·· 54.6	17°55.5	·· 02.2	111°58.3	·· 47.3	225°04.9	·· 52.6
16	239°47.8	86°01.5	53.6	32°56.4	02.8	127°00.4	47.3	240°07.5	52.6
17	254°50.3	101°01.0	52.6	47°57.2	03.5	142°02.5	47.2	255°10.1	52.7
18	269°52.8	116°00.5	N11°51.6	62°58.1	S11°04.1	157°04.6	N21°47.2	270°12.8	S02°52.8
19	284°55.2	131°00.0	50.6	77°59.0	04.7	172°06.6	47.1	285°15.4	52.9
20	299°57.7	145°59.5	49.6	92°59.9	05.3	187°08.7	47.1	300°18.1	52.9
21	315°00.2	160°59.1	·· 48.6	108°00.7	·· 05.9	202°10.8	·· 47.0	315°20.7	·· 53.0
22	330°02.6	175°58.6	47.6	123°01.6	06.6	217°12.9	46.9	330°23.4	53.1
23	345°05.1	190°58.1	46.6	138°02.5	07.2	232°14.9	46.9	345°26.0	53.2
Mer.pass.	23:59	ν -0.5′	d -1.0′	m -3.93	ν 0.9′	d -0.6′	m 1.60	ν 2.1′	d -0.1′ m -2.07	ν 2.6′	d -0.1′ m 0.58

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	0°07.5	205°57.6	N11°45.5	153°03.4	S11°07.8	247°17.0	N21°46.8	0°28.6	S02°53.3
1	15°10.0	220°57.1	44.5	168°04.2	08.4	262°19.1	46.8	15°31.3	53.3
2	30°12.5	235°56.6	43.5	183°05.1	09.0	277°21.2	46.7	30°33.9	53.4
3	45°14.9	250°56.2	·· 42.5	198°06.0	·· 09.7	292°23.3	·· 46.7	45°36.6	·· 53.5
4	60°17.4	265°55.7	41.5	213°06.9	10.3	307°25.3	46.6	60°39.2	53.6
5	75°19.9	280°55.2	40.5	228°07.8	10.9	322°27.4	46.6	75°41.8	53.7
6	90°22.3	295°54.7	N11°39.5	243°08.6	S11°11.5	337°29.5	N21°46.5	90°44.5	S02°53.7
7	105°24.8	310°54.2	38.4	258°09.5	12.1	352°31.6	46.5	105°47.1	53.8
8	120°27.3	325°53.8	37.4	273°10.4	12.8	7°33.7	46.4	120°49.8	53.9
9	135°29.7	340°53.3	·· 36.4	288°11.3	·· 13.4	22°35.8	·· 46.4	135°52.4	·· 54.0
10	150°32.2	355°52.8	35.4	303°12.1	14.0	37°37.8	46.3	150°55.1	54.0
11	165°34.6	10°52.3	34.4	318°13.0	14.6	52°39.9	46.3	165°57.7	54.1
12	180°37.1	25°51.8	N11°33.3	333°13.9	S11°15.2	67°42.0	N21°46.2	181°00.3	S02°54.2
13	195°39.6	40°51.4	32.3	348°14.7	15.8	82°44.1	46.2	196°03.0	54.3
14	210°42.0	55°50.9	31.3	3°15.6	16.5	97°46.2	46.1	211°05.6	54.4
15	225°44.5	70°50.4	·· 30.3	18°16.5	·· 17.1	112°48.2	·· 46.1	226°08.3	·· 54.4
16	240°47.0	85°49.9	29.3	33°17.4	17.7	127°50.3	46.0	241°10.9	54.5
17	255°49.4	100°49.4	28.2	48°18.2	18.3	142°52.4	46.0	256°13.5	54.6
18	270°51.9	115°49.0	N11°27.2	63°19.1	S11°18.9	157°54.5	N21°45.9	271°16.2	S02°54.7
19	285°54.4	130°48.5	26.2	78°20.0	19.5	172°56.6	45.9	286°18.8	54.8
20	300°56.8	145°48.0	25.2	93°20.9	20.2	187°58.7	45.8	301°21.5	54.8
21	315°59.3	160°47.5	·· 24.1	108°21.7	·· 20.8	203°00.8	·· 45.8	316°24.1	·· 54.9
22	331°01.8	175°47.1	23.1	123°22.6	21.4	218°02.8	45.7	331°26.8	55.0
23	346°04.2	190°46.6	22.1	138°23.5	22.0	233°04.9	45.7	346°29.4	55.1
Mer.pass.	23:56	ν -0.5′	d -1.0′	m -3.93	ν 0.9′	d -0.6′	m 1.59	ν 2.1′	d -0.1′ m -2.07	ν 2.6′	d -0.1′ m 0.58

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.8
Schedar	349°29.9	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.2	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°26.5	89°22.1
Acamar	315°11.0	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.2	49°57.1
Aldebaran	290°38.9	16°33.7
Rigel	281°03.3	-8°10.1
Capella	280°21.0	46°01.3
Bellatrix	278°22.2	6°22.5
Elnath	278°01.1	28°37.7
Alnilam	275°37.1	-1°10.9
Betelgeuse	270°51.5	7°24.8
Canopus	263°52.2	-52°42.2
Sirius	258°25.8	-16°44.8
Adhara	255°05.5	-29°00.1
Procyon	244°50.4	5°09.7
Pollux	243°16.8	27°57.8
Avior	234°14.9	-59°35.2
Suhail	222°46.2	-43°31.9
Miaplacidus	221°38.9	-69°49.1
Alphard	217°47.5	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.9	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.3
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.6	19°03.0
Rigil Kent.	139°40.0	-60°56.6
Kochab	137°20.5	74°03.1
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.4	26°37.9
Antares	112°15.2	-26°29.4
Atria	107°09.1	-69°04.7
Sabik	102°02.2	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.9	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.8	38°48.7
Nunki	75°46.9	-26°15.9
Altair	61°59.2	8°56.3
Peacock	53°04.4	-56°39.3
Deneb	49°25.1	45°22.6
Enif	33°38.0	9°59.7
Al Na'ir	27°31.7	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 19 Fri	SHA	Mer.pass
Venus	208°11.8	10:15
Mars	154°11.8	13:50
Jupiter	247°28.2	07:36
Saturn	0°12.6	00:07

Sep 20 Sat	SHA	Mer.pass
Venus	207°00.9	10:16
Mars	153°33.9	13:48
Jupiter	247°18.8	07:33
Saturn	0°16.8	00:02

Sep 21 Sun	SHA	Mer.pass
Venus	205°50.1	10:16
Mars	152°55.8	13:47
Jupiter	247°09.5	07:30
Saturn	0°21.1	23:54

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun		Moon				
h							
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°31.9	N01°27.8	211°42.1	12.8′	N15°50.7	13.3′	56.5′
1	196°32.1	26.8	226°13.9	12.9′	15°37.4	13.4′	56.5′
2	211°32.3	25.8	240°45.8	12.9′	15°24.0	13.4′	56.4′
3	226°32.5	·· 24.9	255°17.7	13.0′	15°10.6	13.5′	56.4′
4	241°32.8	23.9	269°49.7	13.1′	14°57.1	13.5′	56.4′
5	256°33.0	22.9	284°21.8	13.2′	14°43.6	13.6′	56.4′
6	271°33.2	N01°22.0	298°54.0	13.3′	N14°30.0	13.6′	56.4′
7	286°33.4	21.0	313°26.3	13.4′	14°16.4	13.7′	56.3′
8	301°33.7	20.0	327°58.6	13.4′	14°02.7	13.8′	56.3′
9	316°33.9	·· 19.0	342°31.1	13.5′	13°48.9	13.8′	56.3′
10	331°34.1	18.1	357°03.6	13.6′	13°35.1	13.9′	56.3′
11	346°34.3	17.1	11°36.2	13.7′	13°21.2	13.9′	56.3′
12	1°34.5	N01°16.1	26°08.9	13.7′	N13°07.3	13.9′	56.2′
13	16°34.8	15.2	40°41.6	13.8′	12°53.4	14.0′	56.2′
14	31°35.0	14.2	55°14.4	13.9′	12°39.4	14.1′	56.2′
15	46°35.2	·· 13.2	69°47.3	14.0′	12°25.3	14.1′	56.2′
16	61°35.4	12.3	84°20.3	14.0′	12°11.2	14.1′	56.1′
17	76°35.7	11.3	98°53.3	14.1′	11°57.1	14.2′	56.1′
18	91°35.9	N01°10.3	113°26.4	14.2′	N11°42.9	14.2′	56.1′
19	106°36.1	09.3	127°59.6	14.2′	11°28.7	14.2′	56.1′
20	121°36.3	08.4	142°32.9	14.3′	11°14.5	14.3′	56.1′
21	136°36.5	·· 07.4	157°06.2	14.4′	11°00.2	14.3′	56.0′
22	151°36.8	06.4	171°39.5	14.4′	10°45.9	14.4′	56.0′
23	166°37.0	05.5	186°13.0	14.5′	10°31.5	14.4′	56.0′
	SD = 15.9′	d = -1.0′	SD = 15.4′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°37.2	N01°04.5	200°46.5	14.6′	N10°17.1	14.4′	56.0′
1	196°37.4	03.5	215°20.1	14.6′	10°02.7	14.5′	56.0′
2	211°37.7	02.5	229°53.7	14.7′	09°48.2	14.5′	55.9′
3	226°37.9	·· 01.6	244°27.4	14.8′	09°33.7	14.5′	55.9′
4	241°38.1	01°00.6	259°01.2	14.8′	09°19.2	14.6′	55.9′
5	256°38.3	00°59.6	273°35.0	14.9′	09°04.6	14.5′	55.9′
6	271°38.5	N00°58.7	288°08.9	14.9′	N08°50.1	14.6′	55.9′
7	286°38.8	57.7	302°42.8	15.0′	08°35.5	14.7′	55.8′
8	301°39.0	56.7	317°16.8	15.0′	08°20.8	14.6′	55.8′
9	316°39.2	·· 55.7	331°50.8	15.1′	08°06.2	14.7′	55.8′
10	331°39.4	54.8	346°24.9	15.1′	07°51.5	14.7′	55.8′
11	346°39.6	53.8	0°59.1	15.2′	07°36.8	14.7′	55.8′
12	1°39.9	N00°52.8	15°33.3	15.2′	N07°22.1	14.8′	55.7′
13	16°40.1	51.9	30°07.5	15.3′	07°07.3	14.7′	55.7′
14	31°40.3	50.9	44°41.8	15.3′	06°52.6	14.8′	55.7′
15	46°40.5	·· 49.9	59°16.1	15.4′	06°37.8	14.8′	55.7′
16	61°40.8	48.9	73°50.5	15.4′	06°23.0	14.8′	55.7′
17	76°41.0	48.0	88°25.0	15.5′	06°08.2	14.8′	55.6′
18	91°41.2	N00°47.0	102°59.4	15.5′	N05°53.4	14.8′	55.6′
19	106°41.4	46.0	117°34.0	15.6′	05°38.6	14.9′	55.6′
20	121°41.6	45.1	132°08.5	15.6′	05°23.7	14.8′	55.6′
21	136°41.9	·· 44.1	146°43.1	15.6′	05°08.9	14.9′	55.6′
22	151°42.1	43.1	161°17.8	15.7′	04°54.0	14.9′	55.6′
23	166°42.3	42.1	175°52.5	15.7′	04°39.1	14.9′	55.5′
	SD = 15.9′	d = -1.0′	SD = 15.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°42.5	N00°41.2	190°27.2	15.8′	N04°24.2	14.9′	55.5′
1	196°42.7	40.2	205°02.0	15.8′	04°09.3	14.9′	55.5′
2	211°43.0	39.2	219°36.8	15.8′	03°54.4	14.9′	55.5′
3	226°43.2	·· 38.3	234°11.6	15.9′	03°39.5	14.9′	55.5′
4	241°43.4	37.3	248°46.5	15.9′	03°24.6	14.9′	55.4′
5	256°43.6	36.3	263°21.3	15.9′	03°09.7	14.9′	55.4′
6	271°43.8	N00°35.3	277°56.3	16.0′	N02°54.8	14.9′	55.4′
7	286°44.1	34.4	292°31.2	16.0′	02°39.9	14.9′	55.4′
8	301°44.3	33.4	307°06.2	16.0′	02°25.0	15.0′	55.4′
9	316°44.5	·· 32.4	321°41.2	16.0′	02°10.0	14.9′	55.3′
10	331°44.7	31.4	336°16.3	16.1′	01°55.1	14.9′	55.3′
11	346°44.9	30.5	350°51.3	16.1′	01°40.2	14.9′	55.3′
12	1°45.2	N00°29.5	5°26.4	16.1′	N01°25.3	14.9′	55.3′
13	16°45.4	28.5	20°01.6	16.1′	01°10.4	14.9′	55.3′
14	31°45.6	27.6	34°36.7	16.2′	00°55.5	14.9′	55.3′
15	46°45.8	·· 26.6	49°11.8	16.2′	00°40.6	14.9′	55.2′
16	61°46.0	25.6	63°47.0	16.2′	00°25.7	14.8′	55.2′
17	76°46.3	24.6	78°22.2	16.2′	N00°10.9	14.9′	55.2′
18	91°46.5	N00°23.7	92°57.4	16.2′	S00°04.0	14.9′	55.2′
19	106°46.7	22.7	107°32.7	16.3′	00°18.9	14.8′	55.2′
20	121°46.9	21.7	122°07.9	16.3′	00°33.7	14.9′	55.1′
21	136°47.1	·· 20.7	136°43.2	16.3′	00°48.6	14.8′	55.1′
22	151°47.4	19.8	151°18.5	16.3′	01°03.4	14.8′	55.1′
23	166°47.6	18.8	165°53.8	16.3′	01°18.2	14.8′	55.1′
	SD = 15.9′	d = -1.0′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:47	04:21	05:31	18:14	19:22	20:55
N 70°	03:09	04:31	05:33	18:12	19:13	20:33
68°	03:26	04:38	05:35	18:10	19:06	20:17
66°	03:40	04:45	05:36	18:08	19:00	20:04
64°	03:51	04:50	05:38	18:07	18:55	19:54
62°	04:00	04:54	05:39	18:06	18:51	19:45
60°	04:07	04:58	05:40	18:05	18:47	19:37
N 58°	04:14	05:01	05:41	18:05	18:44	19:31
56°	04:20	05:04	05:42	18:04	18:41	19:25
54°	04:25	05:07	05:42	18:03	18:39	19:21
52°	04:29	05:09	05:43	18:03	18:36	19:16
50°	04:33	05:11	05:44	18:02	18:34	19:13
45°	04:41	05:15	05:45	18:01	18:30	19:05
N 40°	04:47	05:19	05:46	18:00	18:27	18:59
35°	04:52	05:21	05:47	18:00	18:25	18:54
30°	04:56	05:23	05:47	17:59	18:23	18:51
20°	05:01	05:26	05:48	17:58	18:20	18:46
N 10°	05:04	05:28	05:49	17:57	18:18	18:43
0°	05:05	05:29	05:50	17:57	18:17	18:41
S 10°	05:05	05:30	05:51	17:56	18:17	18:41
20°	05:04	05:29	05:51	17:56	18:18	18:43
30°	05:00	05:28	05:52	17:55	18:19	18:47
35°	04:58	05:27	05:52	17:55	18:20	18:50
40°	04:54	05:25	05:52	17:55	18:22	18:54
45°	04:49	05:23	05:53	17:55	18:24	18:58
S 50°	04:43	05:21	05:53	17:55	18:27	19:05
52°	04:40	05:19	05:53	17:55	18:28	19:08
54°	04:36	05:18	05:53	17:55	18:30	19:12
56°	04:33	05:16	05:53	17:55	18:32	19:16
58°	04:28	05:14	05:53	17:54	18:34	19:20
S 60°	04:23	05:12	05:54	17:54	18:36	19:26

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	·· ··	02:37	04:48	19:01	18:20	17:46
N 70°	00:34	02:53	04:52	18:43	18:12	17:47
68°	01:02	03:05	04:56	18:28	18:06	17:47
66°	01:23	03:16	04:59	18:16	18:01	17:47
64°	01:39	03:24	05:02	18:06	17:56	17:47
62°	01:53	03:31	05:04	17:57	17:52	17:47
60°	02:04	03:37	05:06	17:49	17:48	17:47
N 58°	02:14	03:43	05:07	17:43	17:45	17:47
56°	02:23	03:48	05:09	17:37	17:42	17:47
54°	02:30	03:52	05:10	17:32	17:40	17:47
52°	02:37	03:56	05:12	17:27	17:38	17:47
50°	02:43	03:59	05:13	17:22	17:35	17:47
45°	02:56	04:07	05:15	17:13	17:31	17:47
N 40°	03:07	04:13	05:17	17:05	17:27	17:47
35°	03:16	04:19	05:19	16:58	17:23	17:47
30°	03:24	04:24	05:21	16:52	17:20	17:47
20°	03:38	04:32	05:23	16:41	17:15	17:47
N 10°	03:50	04:39	05:26	16:32	17:11	17:47
0°	04:01	04:46	05:28	16:23	17:06	17:47
S 10°	04:12	04:52	05:30	16:14	17:02	17:47
20°	04:24	04:59	05:32	16:04	16:57	17:47
30°	04:38	05:08	05:35	15:53	16:51	17:47
35°	04:45	05:12	05:37	15:47	16:48	17:47
40°	04:54	05:17	05:38	15:39	16:44	17:47
45°	05:04	05:23	05:40	15:31	16:40	17:47
S 50°	05:17	05:31	05:43	15:20	16:35	17:47
52°	05:22	05:34	05:44	15:15	16:33	17:47
54°	05:28	05:37	05:45	15:10	16:30	17:47
56°	05:35	05:41	05:46	15:04	16:27	17:47
58°	05:43	05:46	05:48	14:57	16:24	17:47
S 60°	05:52	05:51	05:49	14:49	16:20	17:47

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 27-0 8-1%
19	06:08	06:18	11:54	10:12	22:34	
20	06:29	06:39	11:53	10:56	23:17	
21	06:50	07:01	11:53	11:38	23:58	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	1°06.7	205°46.1	N11°21.1	153°24.3	S11°22.6	248°07.0	N21°45.6	1°32.0	S02°55.1
1	16°09.1	220°45.6	20.0	168°25.2	23.2	263°09.1	45.6	16°34.7	55.2
2	31°11.6	235°45.2	19.0	183°26.1	23.9	278°11.2	45.5	31°37.3	55.3
3	46°14.1	250°44.7	·· 18.0	198°27.0	·· 24.5	293°13.3	·· 45.5	46°40.0	·· 55.4
4	61°16.5	265°44.2	16.9	213°27.8	25.1	308°15.4	45.4	61°42.6	55.5
5	76°19.0	280°43.7	15.9	228°28.7	25.7	323°17.4	45.4	76°45.2	55.5
6	91°21.5	295°43.3	N11°14.9	243°29.6	S11°26.3	338°19.5	N21°45.3	91°47.9	S02°55.6
7	106°23.9	310°42.8	13.9	258°30.4	26.9	353°21.6	45.3	106°50.5	55.7
8	121°26.4	325°42.3	12.8	273°31.3	27.6	8°23.7	45.2	121°53.2	55.8
9	136°28.9	340°41.8	·· 11.8	288°32.2	·· 28.2	23°25.8	·· 45.2	136°55.8	·· 55.9
10	151°31.3	355°41.4	10.8	303°33.0	28.8	38°27.9	45.1	151°58.5	55.9
11	166°33.8	10°40.9	09.7	318°33.9	29.4	53°30.0	45.1	167°01.1	56.0
12	181°36.2	25°40.4	N11°08.7	333°34.8	S11°30.0	68°32.0	N21°45.0	182°03.7	S02°56.1
13	196°38.7	40°39.9	07.7	348°35.6	30.6	83°34.1	45.0	197°06.4	56.2
14	211°41.2	55°39.5	06.6	3°36.5	31.3	98°36.2	44.9	212°09.0	56.2
15	226°43.6	70°39.0	·· 05.6	18°37.4	·· 31.9	113°38.3	·· 44.9	227°11.7	·· 56.3
16	241°46.1	85°38.5	04.6	33°38.3	32.5	128°40.4	44.8	242°14.3	56.4
17	256°48.6	100°38.1	03.5	48°39.1	33.1	143°42.5	44.8	257°16.9	56.5
18	271°51.0	115°37.6	N11°02.5	63°40.0	S11°33.7	158°44.6	N21°44.7	272°19.6	S02°56.6
19	286°53.5	130°37.1	01.4	78°40.9	34.3	173°46.7	44.7	287°22.2	56.6
20	301°56.0	145°36.7	11°00.4	93°41.7	34.9	188°48.8	44.6	302°24.9	56.7
21	316°58.4	160°36.2	10°59.4	108°42.6	·· 35.6	203°50.9	·· 44.6	317°27.5	·· 56.8
22	332°00.9	175°35.7	58.3	123°43.5	36.2	218°52.9	44.5	332°30.2	56.9
23	347°03.4	190°35.2	57.3	138°44.3	36.8	233°55.0	44.5	347°32.8	57.0
Mer.pass.	23:52	ν -0.5′	d -1.0′	m -3.93	ν 0.9′	d -0.6′	m 1.59	ν 2.1′	d -0.1′ m -2.08	ν 2.6′	d -0.1′ m 0.58

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	2°05.8	205°34.8	N10°56.2	153°45.2	S11°37.4	248°57.1	N21°44.4	2°35.4	S02°57.0
1	17°08.3	220°34.3	55.2	168°46.1	38.0	263°59.2	44.4	17°38.1	57.1
2	32°10.7	235°33.8	54.2	183°46.9	38.6	279°01.3	44.3	32°40.7	57.2
3	47°13.2	250°33.4	·· 53.1	198°47.8	·· 39.2	294°03.4	·· 44.3	47°43.4	·· 57.3
4	62°15.7	265°32.9	52.1	213°48.6	39.9	309°05.5	44.2	62°46.0	57.3
5	77°18.1	280°32.4	51.0	228°49.5	40.5	324°07.6	44.2	77°48.6	57.4
6	92°20.6	295°32.0	N10°50.0	243°50.4	S11°41.1	339°09.7	N21°44.1	92°51.3	S02°57.5
7	107°23.1	310°31.5	48.9	258°51.2	41.7	354°11.8	44.1	107°53.9	57.6
8	122°25.5	325°31.0	47.9	273°52.1	42.3	9°13.9	44.0	122°56.6	57.7
9	137°28.0	340°30.6	·· 46.9	288°53.0	·· 42.9	24°16.0	·· 44.0	137°59.2	·· 57.7
10	152°30.5	355°30.1	45.8	303°53.8	43.5	39°18.0	43.9	153°01.9	57.8
11	167°32.9	10°29.6	44.8	318°54.7	44.1	54°20.1	43.9	168°04.5	57.9
12	182°35.4	25°29.2	N10°43.7	333°55.6	S11°44.8	69°22.2	N21°43.8	183°07.1	S02°58.0
13	197°37.9	40°28.7	42.7	348°56.4	45.4	84°24.3	43.8	198°09.8	58.0
14	212°40.3	55°28.2	41.6	3°57.3	46.0	99°26.4	43.7	213°12.4	58.1
15	227°42.8	70°27.8	·· 40.6	18°58.1	·· 46.6	114°28.5	·· 43.7	228°15.1	·· 58.2
16	242°45.2	85°27.3	39.5	33°59.0	47.2	129°30.6	43.6	243°17.7	58.3
17	257°47.7	100°26.8	38.5	48°59.9	47.8	144°32.7	43.6	258°20.3	58.4
18	272°50.2	115°26.4	N10°37.4	64°00.7	S11°48.4	159°34.8	N21°43.5	273°23.0	S02°58.4
19	287°52.6	130°25.9	36.4	79°01.6	49.0	174°36.9	43.5	288°25.6	58.5
20	302°55.1	145°25.5	35.3	94°02.5	49.7	189°39.0	43.4	303°28.3	58.6
21	317°57.6	160°25.0	·· 34.3	109°03.3	·· 50.3	204°41.1	·· 43.4	318°30.9	·· 58.7
22	333°00.0	175°24.5	33.2	124°04.2	50.9	219°43.2	43.3	333°33.6	58.8
23	348°02.5	190°24.1	32.2	139°05.0	51.5	234°45.3	43.3	348°36.2	58.8
Mer.pass.	23:48	ν -0.5′	d -1.0′	m -3.93	ν 0.9′	d -0.6′	m 1.59	ν 2.1′	d -0.1′ m -2.08	ν 2.6′	d -0.1′ m 0.59

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	3°05.0	205°23.6	N10°31.1	154°05.9	S11°52.1	249°47.4	N21°43.2	3°38.8	S02°58.9
1	18°07.4	220°23.1	30.1	169°06.8	52.7	264°49.5	43.2	18°41.5	59.0
2	33°09.9	235°22.7	29.0	184°07.6	53.3	279°51.6	43.1	33°44.1	59.1
3	48°12.3	250°22.2	·· 28.0	199°08.5	·· 53.9	294°53.7	·· 43.1	48°46.8	·· 59.1
4	63°14.8	265°21.8	26.9	214°09.3	54.5	309°55.8	43.0	63°49.4	59.2
5	78°17.3	280°21.3	25.8	229°10.2	55.2	324°57.9	43.0	78°52.0	59.3
6	93°19.7	295°20.8	N10°24.8	244°11.1	S11°55.8	340°00.0	N21°42.9	93°54.7	S02°59.4
7	108°22.2	310°20.4	23.7	259°11.9	56.4	355°02.1	42.9	108°57.3	59.5
8	123°24.7	325°19.9	22.7	274°12.8	57.0	10°04.2	42.8	124°00.0	59.5
9	138°27.1	340°19.5	·· 21.6	289°13.6	·· 57.6	25°06.3	·· 42.8	139°02.6	·· 59.6
10	153°29.6	355°19.0	20.6	304°14.5	58.2	40°08.4	42.7	154°05.3	59.7
11	168°32.1	10°18.5	19.5	319°15.3	58.8	55°10.5	42.7	169°07.9	59.8
12	183°34.5	25°18.1	N10°18.4	334°16.2	S11°59.4	70°12.6	N21°42.6	184°10.5	S02°59.8
13	198°37.0	40°17.6	17.4	349°17.1	12°00.0	85°14.7	42.6	199°13.2	02°59.9
14	213°39.5	55°17.2	16.3	4°17.9	00.6	100°16.8	42.5	214°15.8	03°00.0
15	228°41.9	70°16.7	·· 15.3	19°18.8	·· 01.3	115°18.9	·· 42.5	229°18.5	·· 00.1
16	243°44.4	85°16.2	14.2	34°19.6	01.9	130°21.0	42.4	244°21.1	00.2
17	258°46.8	100°15.8	13.1	49°20.5	02.5	145°23.1	42.4	259°23.7	00.2
18	273°49.3	115°15.3	N10°12.1	64°21.3	S12°03.1	160°25.2	N21°42.3	274°26.4	S03°00.3
19	288°51.8	130°14.9	11.0	79°22.2	03.7	175°27.3	42.3	289°29.0	00.4
20	303°54.2	145°14.4	09.9	94°23.1	04.3	190°29.4	42.2	304°31.7	00.5
21	318°56.7	160°14.0	·· 08.9	109°23.9	·· 04.9	205°31.5	·· 42.2	319°34.3	·· 00.5
22	333°59.2	175°13.5	07.8	124°24.8	05.5	220°33.6	42.1	334°36.9	00.6
23	349°01.6	190°13.0	06.7	139°25.6	06.1	235°35.7	42.1	349°39.6	00.7
Mer.pass.	23:44	ν -0.5′	d -1.1′	m -3.93	ν 0.9′	d -0.6′	m 1.59	ν 2.1′	d -0.0′ m -2.09	ν 2.6′	d -0.1′ m 0.59

Stars	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.8
Schedar	349°29.9	56°40.8
Diphda	348°46.4	-17°50.6
Achernar	335°19.2	-57°06.1
Hamal	327°50.3	23°35.1
Polaris	313°25.4	89°22.1
Acamar	315°11.0	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.1
Aldebaran	290°38.8	16°33.7
Rigel	281°03.2	-8°10.1
Capella	280°20.9	46°01.3
Bellatrix	278°22.2	6°22.5
Elnath	278°01.1	28°37.7
Alnilam	275°37.1	-1°10.9
Betelgeuse	270°51.5	7°24.8
Canopus	263°52.2	-52°42.2
Sirius	258°25.8	-16°44.8
Adhara	255°05.5	-29°00.1
Procyon	244°50.4	5°09.7
Pollux	243°16.8	27°57.8
Avior	234°14.9	-59°35.2
Suhail	222°46.2	-43°31.9
Miaplacidus	221°38.9	-69°49.1
Alphard	217°47.4	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.9	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.3
Spica	158°22.0	-11°17.7
Alkaid	152°51.9	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.9
Antares	112°15.3	-26°29.4
Atria	107°09.1	-69°04.6
Sabik	102°02.2	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.0	12°32.6
Eltanin	90°41.9	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.8	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.5	-56°39.3
Deneb	49°25.1	45°22.6
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 22 Mon	SHA	Mer.pass
Venus	204°39.4	10:17
Mars	152°17.7	13:46
Jupiter	247°00.3	07:26
Saturn	0°25.4	23:50

Sep 23 Tue	SHA	Mer.pass
Venus	203°29.0	10:18
Mars	151°39.4	13:44
Jupiter	246°51.3	07:23
Saturn	0°29.6	23:45

Sep 24 Wed	SHA	Mer.pass
Venus	202°18.6	10:19
Mars	151°00.9	13:43
Jupiter	246°42.4	07:20
Saturn	0°33.9	23:41

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°47.8	N00°17.8	180°29.1	16.3′	S01°33.0	14.8′	55.1′
1	196°48.0	16.9	195°04.4	16.3′	01°47.8	14.7′	55.1′
2	211°48.2	15.9	209°39.7	16.3′	02°02.5	14.8′	55.0′
3	226°48.5	·· 14.9	224°15.1	16.3′	02°17.3	14.7′	55.0′
4	241°48.7	13.9	238°50.4	16.3′	02°32.0	14.7′	55.0′
5	256°48.9	13.0	253°25.7	16.4′	02°46.7	14.7′	55.0′
6	271°49.1	N00°12.0	268°01.1	16.4′	S03°01.4	14.7′	55.0′
7	286°49.3	11.0	282°36.5	16.4′	03°16.1	14.6′	55.0′
8	301°49.6	10.0	297°11.8	16.4′	03°30.7	14.6′	54.9′
9	316°49.8	·· 09.1	311°47.2	16.4′	03°45.3	14.6′	54.9′
10	331°50.0	08.1	326°22.6	16.4′	03°59.9	14.6′	54.9′
11	346°50.2	07.1	340°57.9	16.4′	04°14.5	14.6′	54.9′
12	1°50.4	N00°06.2	355°33.3	16.4′	S04°29.1	14.5′	54.9′
13	16°50.7	05.2	10°08.7	16.4′	04°43.6	14.5′	54.9′
14	31°50.9	04.2	24°44.0	16.4′	04°58.1	14.5′	54.8′
15	46°51.1	·· 03.2	39°19.4	16.4′	05°12.6	14.4′	54.8′
16	61°51.3	02.3	53°54.7	16.4′	05°27.0	14.4′	54.8′
17	76°51.5	01.3	68°30.1	16.3′	05°41.4	14.4′	54.8′
18	91°51.8	N00°00.3	83°05.4	16.3′	S05°55.8	14.4′	54.8′
19	106°52.0	S00°00.7	97°40.8	16.3′	06°10.2	14.3′	54.8′
20	121°52.2	01.6	112°16.1	16.3′	06°24.5	14.3′	54.7′
21	136°52.4	·· 02.6	126°51.4	16.3′	06°38.8	14.3′	54.7′
22	151°52.6	03.6	141°26.7	16.3′	06°53.1	14.2′	54.7′
23	166°52.9	04.6	156°02.0	16.3′	07°07.3	14.2′	54.7′
	SD = 15.9′	d = -1.0′	SD = 15.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°53.1	S00°05.5	170°37.3	16.3′	S07°21.5	14.1′	54.7′
1	196°53.3	06.5	185°12.6	16.3′	07°35.6	14.2′	54.7′
2	211°53.5	07.5	199°47.9	16.2′	07°49.8	14.0′	54.7′
3	226°53.7	·· 08.5	214°23.1	16.2′	08°03.8	14.1′	54.6′
4	241°53.9	09.4	228°58.3	16.2′	08°17.9	14.0′	54.6′
5	256°54.2	10.4	243°33.5	16.2′	08°31.9	13.9′	54.6′
6	271°54.4	S00°11.4	258°08.7	16.2′	S08°45.8	14.0′	54.6′
7	286°54.6	12.3	272°43.9	16.2′	08°59.8	13.8′	54.6′
8	301°54.8	13.3	287°19.1	16.1′	09°13.6	13.9′	54.6′
9	316°55.0	·· 14.3	301°54.2	16.1′	09°27.5	13.8′	54.6′
10	331°55.3	15.3	316°29.3	16.1′	09°41.3	13.7′	54.5′
11	346°55.5	16.2	331°04.4	16.1′	09°55.0	13.7′	54.5′
12	1°55.7	S00°17.2	345°39.5	16.0′	S10°08.7	13.7′	54.5′
13	16°55.9	18.2	0°14.5	16.0′	10°22.4	13.6′	54.5′
14	31°56.1	19.2	14°49.5	16.0′	10°36.0	13.6′	54.5′
15	46°56.3	·· 20.1	29°24.5	16.0′	10°49.6	13.5′	54.5′
16	61°56.6	21.1	43°59.5	15.9′	11°03.1	13.5′	54.5′
17	76°56.8	22.1	58°34.4	15.9′	11°16.6	13.4′	54.4′
18	91°57.0	S00°23.1	73°09.4	15.9′	S11°30.0	13.4′	54.4′
19	106°57.2	24.0	87°44.2	15.9′	11°43.4	13.3′	54.4′
20	121°57.4	25.0	102°19.1	15.8′	11°56.7	13.3′	54.4′
21	136°57.7	·· 26.0	116°53.9	15.8′	12°10.0	13.2′	54.4′
22	151°57.9	27.0	131°28.7	15.8′	12°23.2	13.2′	54.4′
23	166°58.1	27.9	146°03.5	15.7′	12°36.4	13.1′	54.4′
	SD = 15.9′	d = -1.0′	SD = 14.9′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°58.3	S00°28.9	160°38.2	15.7′	S12°49.5	13.0′	54.4′
1	196°58.5	29.9	175°12.9	15.7′	13°02.5	13.0′	54.4′
2	211°58.7	30.8	189°47.5	15.6′	13°15.5	13.0′	54.3′
3	226°59.0	·· 31.8	204°22.1	15.6′	13°28.5	12.8′	54.3′
4	241°59.2	32.8	218°56.7	15.5′	13°41.3	12.9′	54.3′
5	256°59.4	33.8	233°31.3	15.5′	13°54.2	12.7′	54.3′
6	271°59.6	S00°34.7	248°05.8	15.5′	S14°06.9	12.7′	54.3′
7	286°59.8	35.7	262°40.2	15.4′	14°19.6	12.7′	54.3′
8	302°00.0	36.7	277°14.6	15.4′	14°32.3	12.6′	54.3′
9	317°00.3	·· 37.7	291°49.0	15.3′	14°44.9	12.5′	54.3′
10	332°00.5	38.6	306°23.4	15.3′	14°57.4	12.5′	54.3′
11	347°00.7	39.6	320°57.7	15.3′	15°09.9	12.4′	54.2′
12	2°00.9	S00°40.6	335°31.9	15.2′	S15°22.3	12.3′	54.2′
13	17°01.1	41.6	350°06.1	15.2′	15°34.6	12.2′	54.2′
14	32°01.3	42.5	4°40.3	15.1′	15°46.8	12.2′	54.2′
15	47°01.6	·· 43.5	19°14.4	15.1′	15°59.0	12.2′	54.2′
16	62°01.8	44.5	33°48.5	15.0′	16°11.2	12.0′	54.2′
17	77°02.0	45.5	48°22.6	15.0′	16°23.2	12.0′	54.2′
18	92°02.2	S00°46.4	62°56.5	14.9′	S16°35.2	12.0′	54.2′
19	107°02.4	47.4	77°30.5	14.9′	16°47.2	11.8′	54.2′
20	122°02.6	48.4	92°04.4	14.8′	16°59.0	11.8′	54.2′
21	137°02.9	·· 49.4	106°38.2	14.8′	17°10.8	11.7′	54.2′
22	152°03.1	50.3	121°12.0	14.7′	17°22.5	11.7′	54.1′
23	167°03.3	51.3	135°45.7	14.7′	17°34.2	11.5′	54.1′
	SD = 15.9′	d = -1.0′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:06	04:36	05:44	17:58	19:06	20:34
N 70°	03:25	04:43	05:45	17:58	18:59	20:16
68°	03:39	04:49	05:45	17:57	18:53	20:02
66°	03:51	04:54	05:46	17:57	18:48	19:51
64°	04:01	04:59	05:46	17:57	18:44	19:42
62°	04:09	05:02	05:47	17:56	18:41	19:34
60°	04:15	05:05	05:47	17:56	18:38	19:27
N 58°	04:21	05:08	05:47	17:56	18:35	19:22
56°	04:26	05:10	05:48	17:56	18:33	19:17
54°	04:31	05:12	05:48	17:56	18:31	19:13
52°	04:34	05:14	05:48	17:56	18:29	19:09
50°	04:38	05:16	05:48	17:56	18:28	19:06
45°	04:45	05:19	05:48	17:55	18:25	18:59
N 40°	04:50	05:22	05:49	17:55	18:22	18:54
35°	04:54	05:24	05:49	17:55	18:20	18:50
30°	04:57	05:25	05:49	17:55	18:19	18:47
20°	05:02	05:27	05:49	17:55	18:17	18:43
N 10°	05:04	05:28	05:49	17:55	18:16	18:41
0°	05:04	05:28	05:49	17:56	18:16	18:40
S 10°	05:04	05:28	05:49	17:56	18:17	18:41
20°	05:01	05:27	05:49	17:56	18:18	18:44
30°	04:56	05:24	05:48	17:57	18:21	18:49
35°	04:53	05:23	05:48	17:57	18:23	18:52
40°	04:49	05:20	05:47	17:58	18:25	18:57
45°	04:43	05:18	05:47	17:58	18:28	19:02
S 50°	04:36	05:14	05:46	17:59	18:32	19:10
52°	04:33	05:12	05:46	18:00	18:33	19:13
54°	04:29	05:10	05:46	18:00	18:35	19:17
56°	04:24	05:08	05:45	18:00	18:38	19:22
58°	04:19	05:06	05:45	18:01	18:40	19:27
S 60°	04:13	05:03	05:44	18:02	18:43	19:34

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	06:51	08:57	11:28	17:13	16:34	15:31
N 70°	06:46	08:41	10:49	17:21	16:52	16:11
68°	06:42	08:29	10:23	17:27	17:06	16:39
66°	06:39	08:19	10:03	17:33	17:18	17:00
64°	06:36	08:10	09:47	17:38	17:28	17:17
62°	06:34	08:03	09:34	17:42	17:37	17:31
60°	06:31	07:57	09:23	17:45	17:44	17:43
N 58°	06:30	07:51	09:14	17:49	17:51	17:54
56°	06:28	07:46	09:06	17:51	17:56	18:03
54°	06:27	07:42	08:58	17:54	18:02	18:11
52°	06:25	07:38	08:52	17:56	18:06	18:18
50°	06:24	07:35	08:46	17:59	18:11	18:25
45°	06:22	07:27	08:33	18:03	18:20	18:39
N 40°	06:19	07:21	08:23	18:07	18:28	18:51
35°	06:18	07:16	08:14	18:11	18:35	19:01
30°	06:16	07:11	08:06	18:14	18:41	19:10
20°	06:13	07:03	07:53	18:19	18:51	19:25
N 10°	06:11	06:56	07:41	18:24	19:00	19:38
0°	06:09	06:49	07:31	18:28	19:09	19:51
S 10°	06:06	06:43	07:20	18:32	19:18	20:04
20°	06:04	06:36	07:09	18:37	19:27	20:17
30°	06:01	06:28	06:56	18:42	19:38	20:33
35°	06:00	06:23	06:48	18:46	19:44	20:42
40°	05:58	06:18	06:40	18:49	19:51	20:53
45°	05:56	06:13	06:30	18:53	19:59	21:05
S 50°	05:54	06:06	06:19	18:58	20:09	21:20
52°	05:53	06:03	06:13	19:00	20:14	21:27
54°	05:52	05:59	06:07	19:03	20:19	21:35
56°	05:51	05:55	06:01	19:06	20:24	21:44
58°	05:49	05:51	05:53	19:09	20:31	21:54
S 60°	05:48	05:46	05:45	19:12	20:38	22:06

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 0-4%
22	07:11	07:22	11:53	12:18	–:–	
23	07:32	07:43	11:52	12:59	00:39	
24	07:53	08:04	11:52	13:41	01:20	

September 25, 26, 27 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.2477 sec ΔT = TT-UT1 = +68.9363 sec

2025 September 25 to Sep. 27 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	4°04.1	205°12.6	N10°05.7	154°26.5	S12°06.7	250°37.8	N21°42.0	4°42.2	S03°00.8
1	19°06.6	220°12.1	04.6	169°27.3	07.3	265°39.9	42.0	19°44.9	00.9
2	34°09.0	235°11.7	03.5	184°28.2	07.9	280°42.0	41.9	34°47.5	00.9
3	49°11.5	250°11.2	·· 02.5	199°29.0	·· 08.6	295°44.1	·· 41.9	49°50.2	·· 01.0
4	64°13.9	265°10.8	01.4	214°29.9	09.2	310°46.2	41.8	64°52.8	01.1
5	79°16.4	280°10.3	10°00.3	229°30.8	09.8	325°48.3	41.8	79°55.4	01.2
6	94°18.9	295°09.9	N09°59.3	244°31.6	S12°10.4	340°50.4	N21°41.7	94°58.1	S03°01.2
7	109°21.3	310°09.4	58.2	259°32.5	11.0	355°52.5	41.7	110°00.7	01.3
8	124°23.8	325°08.9	57.1	274°33.3	11.6	10°54.6	41.6	125°03.4	01.4
9	139°26.3	340°08.5	·· 56.1	289°34.2	·· 12.2	25°56.7	·· 41.6	140°06.0	·· 01.5
10	154°28.7	355°08.0	55.0	304°35.0	12.8	40°58.8	41.5	155°08.6	01.5
11	169°31.2	10°07.6	53.9	319°35.9	13.4	56°00.9	41.5	170°11.3	01.6
12	184°33.7	25°07.1	N09°52.9	334°36.7	S12°14.0	71°03.0	N21°41.4	185°13.9	S03°01.7
13	199°36.1	40°06.7	51.8	349°37.6	14.6	86°05.1	41.4	200°16.6	01.8
14	214°38.6	55°06.2	50.7	4°38.4	15.2	101°07.2	41.3	215°19.2	01.9
15	229°41.1	70°05.8	·· 49.6	19°39.3	·· 15.8	116°09.3	·· 41.3	230°21.8	·· 01.9
16	244°43.5	85°05.3	48.6	34°40.1	16.5	131°11.5	41.2	245°24.5	02.0
17	259°46.0	100°04.9	47.5	49°41.0	17.1	146°13.6	41.2	260°27.1	02.1
18	274°48.4	115°04.4	N09°46.4	64°41.8	S12°17.7	161°15.7	N21°41.1	275°29.8	S03°02.2
19	289°50.9	130°04.0	45.3	79°42.7	18.3	176°17.8	41.1	290°32.4	02.2
20	304°53.4	145°03.5	44.3	94°43.5	18.9	191°19.9	41.0	305°35.1	02.3
21	319°55.8	160°03.1	·· 43.2	109°44.4	·· 19.5	206°22.0	·· 41.0	320°37.7	·· 02.4
22	334°58.3	175°02.6	42.1	124°45.2	20.1	221°24.1	40.9	335°40.3	02.5
23	350°00.8	190°02.2	41.0	139°46.1	20.7	236°26.2	40.9	350°43.0	02.6
Mer.pass.	23:40	ν -0.5′	d -1.1′	m -3.93	ν 0.9′	d -0.6′	m 1.59	ν 2.1′	d -0.0′ m -2.09	ν 2.6′	d -0.1′ m 0.59

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°03.2	205°01.7	N09°39.9	154°46.9	S12°21.3	251°28.3	N21°40.9	5°45.6	S03°02.6
1	20°05.7	220°01.3	38.9	169°47.8	21.9	266°30.4	40.8	20°48.3	02.7
2	35°08.2	235°00.8	37.8	184°48.6	22.5	281°32.5	40.8	35°50.9	02.8
3	50°10.6	250°00.4	·· 36.7	199°49.5	·· 23.1	296°34.6	·· 40.7	50°53.5	·· 02.9
4	65°13.1	264°59.9	35.6	214°50.3	23.7	311°36.8	40.7	65°56.2	02.9
5	80°15.6	279°59.5	34.6	229°51.2	24.3	326°38.9	40.6	80°58.8	03.0
6	95°18.0	294°59.0	N09°33.5	244°52.0	S12°24.9	341°41.0	N21°40.6	96°01.5	S03°03.1
7	110°20.5	309°58.6	32.4	259°52.9	25.5	356°43.1	40.5	111°04.1	03.2
8	125°22.9	324°58.1	31.3	274°53.7	26.1	11°45.2	40.5	126°06.7	03.2
9	140°25.4	339°57.7	·· 30.2	289°54.6	·· 26.7	26°47.3	·· 40.4	141°09.4	·· 03.3
10	155°27.9	354°57.2	29.1	304°55.4	27.3	41°49.4	40.4	156°12.0	03.4
11	170°30.3	9°56.8	28.1	319°56.3	28.0	56°51.5	40.3	171°14.7	03.5
12	185°32.8	24°56.3	N09°27.0	334°57.1	S12°28.6	71°53.6	N21°40.3	186°17.3	S03°03.6
13	200°35.3	39°55.9	25.9	349°58.0	29.2	86°55.7	40.2	201°20.0	03.6
14	215°37.7	54°55.5	24.8	4°58.8	29.8	101°57.9	40.2	216°22.6	03.7
15	230°40.2	69°55.0	·· 23.7	19°59.6	·· 30.4	117°00.0	·· 40.1	231°25.2	·· 03.8
16	245°42.7	84°54.6	22.6	35°00.5	31.0	132°02.1	40.1	246°27.9	03.9
17	260°45.1	99°54.1	21.6	50°01.3	31.6	147°04.2	40.0	261°30.5	03.9
18	275°47.6	114°53.7	N09°20.5	65°02.2	S12°32.2	162°06.3	N21°40.0	276°33.2	S03°04.0
19	290°50.0	129°53.2	19.4	80°03.0	32.8	177°08.4	39.9	291°35.8	04.1
20	305°52.5	144°52.8	18.3	95°03.9	33.4	192°10.5	39.9	306°38.4	04.2
21	320°55.0	159°52.3	·· 17.2	110°04.7	·· 34.0	207°12.7	·· 39.8	321°41.1	·· 04.2
22	335°57.4	174°51.9	16.1	125°05.6	34.6	222°14.8	39.8	336°43.7	04.3
23	350°59.9	189°51.4	15.0	140°06.4	35.2	237°16.9	39.7	351°46.4	04.4
Mer.pass.	23:36	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.58	ν 2.1′	d -0.0′ m -2.10	ν 2.6′	d -0.1′ m 0.60

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°02.4	204°51.0	N09°13.9	155°07.3	S12°35.8	252°19.0	N21°39.7	6°49.0	S03°04.5
1	21°04.8	219°50.6	12.8	170°08.1	36.4	267°21.1	39.6	21°51.6	04.6
2	36°07.3	234°50.1	11.8	185°08.9	37.0	282°23.2	39.6	36°54.3	04.6
3	51°09.8	249°49.7	·· 10.7	200°09.8	·· 37.6	297°25.3	·· 39.5	51°56.9	·· 04.7
4	66°12.2	264°49.2	09.6	215°10.6	38.2	312°27.5	39.5	66°59.6	04.8
5	81°14.7	279°48.8	08.5	230°11.5	38.8	327°29.6	39.5	82°02.2	04.9
6	96°17.2	294°48.3	N09°07.4	245°12.3	S12°39.4	342°31.7	N21°39.4	97°04.8	S03°04.9
7	111°19.6	309°47.9	06.3	260°13.2	40.0	357°33.8	39.4	112°07.5	05.0
8	126°22.1	324°47.5	05.2	275°14.0	40.6	12°35.9	39.3	127°10.1	05.1
9	141°24.5	339°47.0	·· 04.1	290°14.8	·· 41.2	27°38.0	·· 39.3	142°12.8	·· 05.2
10	156°27.0	354°46.6	03.0	305°15.7	41.8	42°40.2	39.2	157°15.4	05.2
11	171°29.5	9°46.1	01.9	320°16.5	42.4	57°42.3	39.2	172°18.0	05.3
12	186°31.9	24°45.7	N09°00.8	335°17.4	S12°43.0	72°44.4	N21°39.1	187°20.7	S03°05.4
13	201°34.4	39°45.3	08°59.7	350°18.2	43.6	87°46.5	39.1	202°23.3	05.5
14	216°36.9	54°44.8	58.6	5°19.0	44.2	102°48.6	39.0	217°26.0	05.6
15	231°39.3	69°44.4	·· 57.5	20°19.9	·· 44.8	117°50.7	·· 39.0	232°28.6	·· 05.6
16	246°41.8	84°43.9	56.4	35°20.7	45.4	132°52.9	38.9	247°31.2	05.7
17	261°44.3	99°43.5	55.3	50°21.6	46.0	147°55.0	38.9	262°33.9	05.8
18	276°46.7	114°43.1	N08°54.2	65°22.4	S12°46.6	162°57.1	N21°38.8	277°36.5	S03°05.9
19	291°49.2	129°42.6	53.1	80°23.2	47.2	177°59.2	38.8	292°39.2	05.9
20	306°51.7	144°42.2	52.0	95°24.1	47.8	193°01.3	38.7	307°41.8	06.0
21	321°54.1	159°41.7	·· 51.0	110°24.9	·· 48.4	208°03.5	·· 38.7	322°44.4	·· 06.1
22	336°56.6	174°41.3	49.9	125°25.8	49.0	223°05.6	38.6	337°47.1	06.2
23	351°59.0	189°40.9	48.8	140°26.6	49.6	238°07.7	38.6	352°49.7	06.2
Mer.pass.	23:32	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.58	ν 2.1′	d -0.0′ m -2.10	ν 2.6′	d -0.1′ m 0.60

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.8
Schedar	349°29.8	56°40.8
Diphda	348°46.4	-17°50.6
Achernar	335°19.2	-57°06.2
Hamal	327°50.2	23°35.1
Polaris	313°24.0	89°22.1
Acamar	315°11.0	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.1
Aldebaran	290°38.8	16°33.7
Rigel	281°03.2	-8°10.1
Capella	280°20.9	46°01.3
Bellatrix	278°22.2	6°22.5
Elnath	278°01.1	28°37.7
Alnilam	275°37.1	-1°10.9
Betelgeuse	270°51.4	7°24.8
Canopus	263°52.2	-52°42.2
Sirius	258°25.8	-16°44.8
Adhara	255°05.5	-29°00.1
Procyon	244°50.3	5°09.7
Pollux	243°16.7	27°57.8
Avior	234°14.9	-59°35.2
Suhail	222°46.2	-43°31.9
Miaplacidus	221°38.9	-69°49.1
Alphard	217°47.4	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.9	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.3
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Kochab	137°20.6	74°03.1
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.9
Antares	112°15.3	-26°29.4
Atria	107°09.2	-69°04.6
Sabik	102°02.2	-15°45.4
Shaula	96°09.6	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.0	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.8	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.5	-56°39.3
Deneb	49°25.2	45°22.6
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 25 Thu	SHA	Mer.pass
Venus	201°08.5	10:19
Mars	150°22.4	13:41
Jupiter	246°33.7	07:16
Saturn	0°38.1	23:37

Sep 26 Fri	SHA	Mer.pass
Venus	199°58.5	10:20
Mars	149°43.7	13:40
Jupiter	246°25.1	07:13
Saturn	0°42.4	23:33

Sep 27 Sat	SHA	Mer.pass
Venus	198°48.6	10:21
Mars	149°04.9	13:39
Jupiter	246°16.6	07:10
Saturn	0°46.6	23:29

Horizontal parallax
Venus: 0.1
Mars: 0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°03.5	S00°52.3	150°19.4	14.6′	S17°45.7	11.5′	54.1′
1	197°03.7	53.2	164°53.1	14.6′	17°57.2	11.4′	54.1′
2	212°03.9	54.2	179°26.7	14.5′	18°08.6	11.4′	54.1′
3	227°04.2	·· 55.2	194°00.2	14.5′	18°20.0	11.2′	54.1′
4	242°04.4	56.2	208°33.7	14.4′	18°31.2	11.2′	54.1′
5	257°04.6	57.1	223°07.1	14.4′	18°42.4	11.1′	54.1′
6	272°04.8	S00°58.1	237°40.5	14.3′	S18°53.5	11.1′	54.1′
7	287°05.0	00°59.1	252°13.8	14.3′	19°04.6	10.9′	54.1′
8	302°05.2	01°00.1	266°47.0	14.2′	19°15.5	10.9′	54.1′
9	317°05.4	·· 01.0	281°20.3	14.1′	19°26.4	10.8′	54.1′
10	332°05.7	02.0	295°53.4	14.1′	19°37.2	10.7′	54.1′
11	347°05.9	03.0	310°26.5	14.0′	19°47.9	10.6′	54.1′
12	2°06.1	S01°04.0	324°59.5	14.0′	S19°58.5	10.5′	54.1′
13	17°06.3	04.9	339°32.5	13.9′	20°09.0	10.5′	54.0′
14	32°06.5	05.9	354°05.4	13.9′	20°19.5	10.3′	54.0′
15	47°06.7	·· 06.9	8°38.3	13.8′	20°29.8	10.3′	54.0′
16	62°06.9	07.9	23°11.1	13.7′	20°40.1	10.2′	54.0′
17	77°07.2	08.8	37°43.8	13.7′	20°50.3	10.1′	54.0′
18	92°07.4	S01°09.8	52°16.5	13.6′	S21°00.4	10.0′	54.0′
19	107°07.6	10.8	66°49.1	13.6′	21°10.4	10.0′	54.0′
20	122°07.8	11.7	81°21.7	13.5′	21°20.4	9.8′	54.0′
21	137°08.0	·· 12.7	95°54.2	13.4′	21°30.2	9.7′	54.0′
22	152°08.2	13.7	110°26.6	13.4′	21°39.9	9.7′	54.0′
23	167°08.5	14.7	124°59.0	13.3′	21°49.6	9.6′	54.0′
	SD = 15.9′	d = -1.0′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°08.7	S01°15.6	139°31.3	13.3′	S21°59.2	9.4′	54.0′
1	197°08.9	16.6	154°03.6	13.2′	22°08.6	9.4′	54.0′
2	212°09.1	17.6	168°35.8	13.1′	22°18.0	9.3′	54.0′
3	227°09.3	·· 18.6	183°07.9	13.1′	22°27.3	9.1′	54.0′
4	242°09.5	19.5	197°39.9	13.0′	22°36.4	9.1′	54.0′
5	257°09.7	20.5	212°11.9	12.9′	22°45.5	9.0′	54.0′
6	272°09.9	S01°21.5	226°43.9	12.9′	S22°54.5	8.9′	54.0′
7	287°10.2	22.5	241°15.8	12.8′	23°03.4	8.8′	54.0′
8	302°10.4	23.4	255°47.6	12.7′	23°12.2	8.7′	54.0′
9	317°10.6	·· 24.4	270°19.3	12.7′	23°20.9	8.6′	54.0′
10	332°10.8	25.4	284°51.0	12.6′	23°29.5	8.4′	54.0′
11	347°11.0	26.4	299°22.6	12.6′	23°37.9	8.4′	54.0′
12	2°11.2	S01°27.3	313°54.2	12.5′	S23°46.3	8.3′	54.0′
13	17°11.4	28.3	328°25.7	12.4′	23°54.6	8.2′	54.0′
14	32°11.7	29.3	342°57.1	12.4′	24°02.8	8.0′	54.0′
15	47°11.9	·· 30.3	357°28.5	12.3′	24°10.8	8.0′	54.0′
16	62°12.1	31.2	11°59.8	12.2′	24°18.8	7.9′	54.0′
17	77°12.3	32.2	26°31.0	12.2′	24°26.7	7.7′	54.0′
18	92°12.5	S01°33.2	41°02.2	12.1′	S24°34.4	7.7′	54.0′
19	107°12.7	34.1	55°33.3	12.0′	24°42.1	7.5′	54.0′
20	122°12.9	35.1	70°04.3	12.0′	24°49.6	7.4′	54.0′
21	137°13.1	·· 36.1	84°35.3	11.9′	24°57.0	7.3′	54.0′
22	152°13.4	37.1	99°06.2	11.9′	25°04.3	7.2′	54.0′
23	167°13.6	38.0	113°37.1	11.8′	25°11.5	7.1′	54.0′
	SD = 15.9′	d = -1.0′	SD = 14.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°13.8	S01°39.0	128°07.9	11.7′	S25°18.6	7.0′	54.0′
1	197°14.0	40.0	142°38.6	11.7′	25°25.6	6.9′	54.0′
2	212°14.2	41.0	157°09.2	11.6′	25°32.5	6.7′	54.0′
3	227°14.4	·· 41.9	171°39.8	11.5′	25°39.2	6.6′	54.0′
4	242°14.6	42.9	186°10.4	11.5′	25°45.8	6.6′	54.0′
5	257°14.8	43.9	200°40.9	11.4′	25°52.4	6.4′	54.0′
6	272°15.1	S01°44.9	215°11.3	11.4′	S25°58.8	6.2′	54.0′
7	287°15.3	45.8	229°41.6	11.3′	26°05.0	6.2′	54.1′
8	302°15.5	46.8	244°11.9	11.2′	26°11.2	6.1′	54.1′
9	317°15.7	·· 47.8	258°42.2	11.2′	26°17.3	5.9′	54.1′
10	332°15.9	48.7	273°12.3	11.1′	26°23.2	5.8′	54.1′
11	347°16.1	49.7	287°42.4	11.1′	26°29.0	5.7′	54.1′
12	2°16.3	S01°50.7	302°12.5	11.0′	S26°34.7	5.5′	54.1′
13	17°16.5	51.7	316°42.5	10.9′	26°40.2	5.5′	54.1′
14	32°16.7	52.6	331°12.4	10.9′	26°45.7	5.3′	54.1′
15	47°17.0	·· 53.6	345°42.3	10.8′	26°51.0	5.2′	54.1′
16	62°17.2	54.6	0°12.1	10.8′	26°56.2	5.1′	54.1′
17	77°17.4	55.6	14°41.9	10.7′	27°01.3	4.9′	54.1′
18	92°17.6	S01°56.5	29°11.6	10.6′	S27°06.2	4.8′	54.1′
19	107°17.8	57.5	43°41.2	10.6′	27°11.0	4.7′	54.1′
20	122°18.0	58.5	58°10.8	10.5′	27°15.7	4.6′	54.1′
21	137°18.2	01°59.4	72°40.4	10.5′	27°20.3	4.5′	54.2′
22	152°18.4	02°00.4	87°09.9	10.4′	27°24.8	4.3′	54.2′
23	167°18.6	01.4	101°39.3	10.4′	27°29.1	4.2′	54.2′
	SD = 15.9′	d = -1.0′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:23	04:50	05:57	17:43	18:50	20:15
N 70°	03:39	04:55	05:57	17:44	18:44	20:00
68°	03:52	05:00	05:56	17:45	18:40	19:48
66°	04:02	05:04	05:55	17:45	18:36	19:38
64°	04:10	05:07	05:55	17:46	18:33	19:30
62°	04:17	05:10	05:54	17:47	18:31	19:23
60°	04:23	05:13	05:54	17:47	18:28	19:18
N 58°	04:28	05:15	05:54	17:48	18:27	19:13
56°	04:33	05:16	05:53	17:48	18:25	19:09
54°	04:36	05:18	05:53	17:48	18:23	19:05
52°	04:40	05:19	05:53	17:49	18:22	19:02
50°	04:43	05:20	05:53	17:49	18:21	18:59
45°	04:49	05:23	05:52	17:50	18:19	18:53
N 40°	04:53	05:25	05:52	17:50	18:17	18:49
35°	04:56	05:26	05:51	17:51	18:16	18:45
30°	04:59	05:27	05:51	17:51	18:15	18:43
20°	05:02	05:28	05:50	17:52	18:14	18:40
N 10°	05:04	05:28	05:49	17:53	18:14	18:39
0°	05:03	05:27	05:48	17:54	18:15	18:39
S 10°	05:02	05:26	05:47	17:56	18:17	18:41
20°	04:58	05:24	05:46	17:57	18:19	18:45
30°	04:53	05:20	05:44	17:59	18:23	18:50
35°	04:49	05:18	05:43	18:00	18:25	18:55
40°	04:44	05:15	05:42	18:01	18:28	19:00
45°	04:37	05:12	05:41	18:02	18:31	19:06
S 50°	04:29	05:07	05:40	18:04	18:36	19:15
52°	04:25	05:05	05:39	18:05	18:38	19:19
54°	04:21	05:03	05:38	18:05	18:41	19:23
56°	04:15	05:00	05:37	18:06	18:44	19:29
58°	04:10	04:57	05:36	18:07	18:47	19:35
S 60°	04:03	04:54	05:35	18:09	18:51	19:42

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°						
N 70°						
68°	12:43			15:49		
66°	12:01			16:33		
64°	11:32	13:33		17:02	16:37	
62°	11:10	12:53	14:48	17:25	17:17	17:04
60°	10:53	12:26	14:00	17:43	17:45	17:52
N 58°	10:39	12:05	13:30	17:58	18:07	18:22
56°	10:26	11:48	13:07	18:11	18:24	18:46
54°	10:15	11:33	12:48	18:23	18:40	19:04
52°	10:06	11:20	12:33	18:33	18:53	19:20
50°	09:58	11:09	12:19	18:42	19:04	19:34
45°	09:40	10:46	11:52	19:01	19:28	20:03
N 40°	09:25	10:28	11:30	19:17	19:48	20:25
35°	09:13	10:12	11:12	19:30	20:04	20:43
30°	09:02	09:59	10:56	19:42	20:18	20:59
20°	08:44	09:37	10:30	20:01	20:42	21:26
N 10°	08:28	09:17	10:08	20:19	21:02	21:50
0°	08:14	08:59	09:47	20:35	21:22	22:11
S 10°	07:59	08:41	09:26	20:52	21:41	22:33
20°	07:44	08:22	09:04	21:09	22:02	22:56
30°	07:26	08:00	08:39	21:30	22:27	23:24
35°	07:16	07:47	08:24	21:42	22:41	23:40
40°	07:04	07:32	08:06	21:55	22:58	23:59
45°	06:51	07:15	07:46	22:12	23:18	·· ··
S 50°	06:34	06:54	07:20	22:32	23:43	·· ··
52°	06:26	06:43	07:07	22:42	23:55	·· ··
54°	06:18	06:32	06:53	22:53	·· ··	00:10
56°	06:08	06:19	06:36	23:05	·· ··	00:26
58°	05:57	06:04	06:16	23:20	·· ··	00:46
S 60°	05:45	05:46	05:50	23:37	·· ··	01:10

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 9-23%
25	08:14	08:24	11:52	14:24	02:02	
26	08:35	08:45	11:51	15:10	02:47	
27	08:55	09:05	11:51	15:59	03:34	

No IERS EOP prediction data available

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	7°01.5	204°40.4	N08°47.6	155°27.4	S12°50.2	253°09.8	N21°38.5	7°52.4	S03°06.3
1	22°04.0	219°40.0	46.5	170°28.3	50.8	268°11.9	38.5	22°55.0	06.4
2	37°06.4	234°39.5	45.4	185°29.1	51.4	283°14.1	38.5	37°57.6	06.5
3	52°08.9	249°39.1	·· 44.3	200°30.0	·· 52.0	298°16.2	·· 38.4	53°00.3	·· 06.5
4	67°11.4	264°38.7	43.2	215°30.8	52.6	313°18.3	38.4	68°02.9	06.6
5	82°13.8	279°38.2	42.1	230°31.6	53.2	328°20.4	38.3	83°05.6	06.7
6	97°16.3	294°37.8	N08°41.0	245°32.5	S12°53.8	343°22.6	N21°38.3	98°08.2	S03°06.8
7	112°18.8	309°37.4	39.9	260°33.3	54.4	358°24.7	38.2	113°10.8	06.8
8	127°21.2	324°36.9	38.8	275°34.1	55.0	13°26.8	38.2	128°13.5	06.9
9	142°23.7	339°36.5	·· 37.7	290°35.0	·· 55.6	28°28.9	·· 38.1	143°16.1	·· 07.0
10	157°26.2	354°36.1	36.6	305°35.8	56.2	43°31.0	38.1	158°18.8	07.1
11	172°28.6	9°35.6	35.5	320°36.6	56.8	58°33.2	38.0	173°21.4	07.2
12	187°31.1	24°35.2	N08°34.4	335°37.5	S12°57.4	73°35.3	N21°38.0	188°24.0	S03°07.2
13	202°33.5	39°34.7	33.3	350°38.3	58.0	88°37.4	37.9	203°26.7	07.3
14	217°36.0	54°34.3	32.2	5°39.2	58.6	103°39.5	37.9	218°29.3	07.4
15	232°38.5	69°33.9	·· 31.1	20°40.0	·· 59.2	118°41.7	·· 37.8	233°32.0	·· 07.5
16	247°40.9	84°33.4	30.0	35°40.8	12°59.8	133°43.8	37.8	248°34.6	07.5
17	262°43.4	99°33.0	28.9	50°41.7	13°00.4	148°45.9	37.7	263°37.2	07.6
18	277°45.9	114°32.6	N08°27.8	65°42.5	S13°01.0	163°48.0	N21°37.7	278°39.9	S03°07.7
19	292°48.3	129°32.1	26.7	80°43.3	01.6	178°50.2	37.7	293°42.5	07.8
20	307°50.8	144°31.7	25.5	95°44.2	02.2	193°52.3	37.6	308°45.2	07.8
21	322°53.3	159°31.3	·· 24.4	110°45.0	·· 02.8	208°54.4	·· 37.6	323°47.8	·· 07.9
22	337°55.7	174°30.8	23.3	125°45.8	03.4	223°56.5	37.5	338°50.4	08.0
23	352°58.2	189°30.4	22.2	140°46.7	04.0	238°58.7	37.5	353°53.1	08.1
Mer.pass.	23:28	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.58	ν 2.1′	d -0.0′ m -2.11	ν 2.6′	d -0.1′ m 0.60

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	8°00.6	204°30.0	N08°21.1	155°47.5	S13°04.6	254°00.8	N21°37.4	8°55.7	S03°08.1
1	23°03.1	219°29.5	20.0	170°48.3	05.2	269°02.9	37.4	23°58.4	08.2
2	38°05.6	234°29.1	18.9	185°49.2	05.8	284°05.1	37.3	39°01.0	08.3
3	53°08.0	249°28.7	·· 17.8	200°50.0	·· 06.4	299°07.2	·· 37.3	54°03.6	·· 08.4
4	68°10.5	264°28.2	16.7	215°50.8	06.9	314°09.3	37.2	69°06.3	08.4
5	83°13.0	279°27.8	15.5	230°51.7	07.5	329°11.4	37.2	84°08.9	08.5
6	98°15.4	294°27.4	N08°14.4	245°52.5	S13°08.1	344°13.6	N21°37.1	99°11.6	S03°08.6
7	113°17.9	309°27.0	13.3	260°53.3	08.7	359°15.7	37.1	114°14.2	08.7
8	128°20.4	324°26.5	12.2	275°54.1	09.3	14°17.8	37.1	129°16.8	08.7
9	143°22.8	339°26.1	·· 11.1	290°55.0	·· 09.9	29°20.0	·· 37.0	144°19.5	·· 08.8
10	158°25.3	354°25.7	10.0	305°55.8	10.5	44°22.1	37.0	159°22.1	08.9
11	173°27.8	9°25.2	08.9	320°56.6	11.1	59°24.2	36.9	174°24.8	09.0
12	188°30.2	24°24.8	N08°07.7	335°57.5	S13°11.7	74°26.3	N21°36.9	189°27.4	S03°09.0
13	203°32.7	39°24.4	06.6	350°58.3	12.3	89°28.5	36.8	204°30.0	09.1
14	218°35.1	54°23.9	05.5	5°59.1	12.9	104°30.6	36.8	219°32.7	09.2
15	233°37.6	69°23.5	·· 04.4	21°00.0	·· 13.5	119°32.7	·· 36.7	234°35.3	·· 09.3
16	248°40.1	84°23.1	03.3	36°00.8	14.1	134°34.9	36.7	249°37.9	09.3
17	263°42.5	99°22.7	02.1	51°01.6	14.7	149°37.0	36.6	264°40.6	09.4
18	278°45.0	114°22.2	N08°01.0	66°02.4	S13°15.3	164°39.1	N21°36.6	279°43.2	S03°09.5
19	293°47.5	129°21.8	07°59.9	81°03.3	15.9	179°41.3	36.5	294°45.9	09.6
20	308°49.9	144°21.4	58.8	96°04.1	16.5	194°43.4	36.5	309°48.5	09.7
21	323°52.4	159°20.9	·· 57.7	111°04.9	·· 17.1	209°45.5	·· 36.5	324°51.1	·· 09.7
22	338°54.9	174°20.5	56.6	126°05.8	17.6	224°47.7	36.4	339°53.8	09.8
23	353°57.3	189°20.1	55.4	141°06.6	18.2	239°49.8	36.4	354°56.4	09.9
Mer.pass.	23:24	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.58	ν 2.1′	d -0.0′ m -2.11	ν 2.6′	d -0.1′ m 0.61

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	8°59.8	204°19.7	N07°54.3	156°07.4	S13°18.8	254°51.9	N21°36.3	9°59.1	S03°10.0
1	24°02.3	219°19.2	53.2	171°08.2	19.4	269°54.1	36.3	25°01.7	10.0
2	39°04.7	234°18.8	52.1	186°09.1	20.0	284°56.2	36.2	40°04.3	10.1
3	54°07.2	249°18.4	·· 50.9	201°09.9	·· 20.6	299°58.3	·· 36.2	55°07.0	·· 10.2
4	69°09.6	264°17.9	49.8	216°10.7	21.2	315°00.5	36.1	70°09.6	10.3
5	84°12.1	279°17.5	48.7	231°11.5	21.8	330°02.6	36.1	85°12.3	10.3
6	99°14.6	294°17.1	N07°47.6	246°12.4	S13°22.4	345°04.7	N21°36.0	100°14.9	S03°10.4
7	114°17.0	309°16.7	46.4	261°13.2	23.0	0°06.9	36.0	115°17.5	10.5
8	129°19.5	324°16.2	45.3	276°14.0	23.6	15°09.0	35.9	130°20.2	10.6
9	144°22.0	339°15.8	·· 44.2	291°14.8	·· 24.2	30°11.1	·· 35.9	145°22.8	·· 10.6
10	159°24.4	354°15.4	43.1	306°15.7	24.8	45°13.3	35.9	160°25.4	10.7
11	174°26.9	9°15.0	41.9	321°16.5	25.3	60°15.4	35.8	175°28.1	10.8
12	189°29.4	24°14.5	N07°40.8	336°17.3	S13°25.9	75°17.5	N21°35.8	190°30.7	S03°10.9
13	204°31.8	39°14.1	39.7	351°18.1	26.5	90°19.7	35.7	205°33.4	10.9
14	219°34.3	54°13.7	38.6	6°19.0	27.1	105°21.8	35.7	220°36.0	11.0
15	234°36.8	69°13.3	·· 37.4	21°19.8	·· 27.7	120°24.0	·· 35.6	235°38.6	·· 11.1
16	249°39.2	84°12.8	36.3	36°20.6	28.3	135°26.1	35.6	250°41.3	11.2
17	264°41.7	99°12.4	35.2	51°21.4	28.9	150°28.2	35.5	265°43.9	11.2
18	279°44.1	114°12.0	N07°34.1	66°22.3	S13°29.5	165°30.4	N21°35.5	280°46.6	S03°11.3
19	294°46.6	129°11.6	32.9	81°23.1	30.1	180°32.5	35.4	295°49.2	11.4
20	309°49.1	144°11.1	31.8	96°23.9	30.7	195°34.6	35.4	310°51.8	11.4
21	324°51.5	159°10.7	·· 30.7	111°24.7	·· 31.2	210°36.8	·· 35.4	325°54.5	·· 11.5
22	339°54.0	174°10.3	29.5	126°25.5	31.8	225°38.9	35.3	340°57.1	11.6
23	354°56.5	189°09.9	28.4	141°26.4	32.4	240°41.1	35.3	355°59.7	11.7
Mer.pass.	23:20	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.57	ν 2.1′	d -0.0′ m -2.12	ν 2.6′	d -0.1′ m 0.61

Stars

	SHA	**Dec**
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.8
Schedar	349°29.8	56°40.8
Diphda	348°46.4	-17°50.6
Achernar	335°19.2	-57°06.2
Hamal	327°50.2	23°35.1
Polaris	313°22.6	89°22.2
Acamar	315°11.0	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.1
Aldebaran	290°38.8	16°33.7
Rigel	281°03.2	-8°10.1
Capella	280°20.9	46°01.3
Bellatrix	278°22.2	6°22.5
Elnath	278°01.0	28°37.7
Alnilam	275°37.1	-1°11.0
Betelgeuse	270°51.4	7°24.8
Canopus	263°52.1	-52°42.2
Sirius	258°25.7	-16°44.8
Adhara	255°05.5	-29°00.1
Procyon	244°50.3	5°09.7
Pollux	243°16.7	27°57.8
Avior	234°14.8	-59°35.2
Suhail	222°46.2	-43°31.9
Miaplacidus	221°38.8	-69°49.1
Alphard	217°47.4	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.9	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.3
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Kochab	137°20.7	74°03.1
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.2	-69°04.6
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.0	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.8	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.5	-56°39.3
Deneb	49°25.2	45°22.6
Enif	33°38.0	9°59.7
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Sep 28 Sun	**SHA**	**Mer.pass**
Venus	197°38.9	10:22
Mars	148°25.9	13:37
Jupiter	246°08.3	07:06
Saturn	0°50.9	23:24

Sep 29 Mon	**SHA**	**Mer.pass**
Venus	196°29.3	10:22
Mars	147°46.8	13:36
Jupiter	246°00.2	07:03
Saturn	0°55.1	23:20

Sep 30 Tue	**SHA**	**Mer.pass**
Venus	195°19.9	10:23
Mars	147°07.6	13:35
Jupiter	245°52.1	07:00
Saturn	0°59.3	23:16

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0		182°18.8	S02°02.4	116°08.7	10.3′	S27°33.3	4.0′	54.2′
1		197°19.1	03.3	130°38.0	10.3′	27°37.3	3.9′	54.2′
2		212°19.3	04.3	145°07.3	10.2′	27°41.2	3.8′	54.2′
3		227°19.5	·· 05.3	159°36.5	10.2′	27°45.0	3.7′	54.2′
4		242°19.7	06.3	174°05.7	10.1′	27°48.7	3.5′	54.2′
5		257°19.9	07.2	188°34.8	10.1′	27°52.2	3.4′	54.2′
6		272°20.1	S02°08.2	203°03.9	10.0′	S27°55.6	3.3′	54.3′
7		287°20.3	09.2	217°32.9	10.0′	27°58.9	3.1′	54.3′
8		302°20.5	10.1	232°01.9	9.9′	28°02.0	3.0′	54.3′
9		317°20.7	·· 11.1	246°30.8	9.9′	28°05.0	2.9′	54.3′
10		332°20.9	12.1	260°59.7	9.9′	28°07.9	2.7′	54.3′
11		347°21.2	13.1	275°28.6	9.8′	28°10.6	2.6′	54.3′
12		2°21.4	S02°14.0	289°57.4	9.8′	S28°13.2	2.4′	54.3′
13		17°21.6	15.0	304°26.2	9.7′	28°15.6	2.4′	54.3′
14		32°21.8	16.0	318°54.9	9.7′	28°18.0	2.1′	54.4′
15		47°22.0	·· 17.0	333°23.6	9.6′	28°20.1	2.1′	54.4′
16		62°22.2	17.9	347°52.2	9.6′	28°22.2	1.9′	54.4′
17		77°22.4	18.9	2°20.8	9.6′	28°24.1	1.8′	54.4′
18		92°22.6	S02°19.9	16°49.4	9.5′	S28°25.9	1.6′	54.4′
19		107°22.8	20.8	31°18.0	9.5′	28°27.5	1.5′	54.4′
20		122°23.0	21.8	45°46.5	9.5′	28°29.0	1.3′	54.4′
21		137°23.2	·· 22.8	60°14.9	9.4′	28°30.3	1.2′	54.5′
22		152°23.4	23.8	74°43.4	9.4′	28°31.5	1.1′	54.5′
23		167°23.7	24.7	89°11.8	9.4′	28°32.6	0.9′	54.5′
		SD = 16.0′	d = -1.0′		SD = 14.8′			

Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	182°23.9	S02°25.7	103°40.1	9.3′	S28°33.5	0.8′	54.5′
1	197°24.1	26.7	118°08.5	9.3′	28°34.3	0.6′	54.5′
2	212°24.3	27.6	132°36.8	9.3′	28°34.9	0.5′	54.6′
3	227°24.5	·· 28.6	147°05.1	9.3′	28°35.4	0.4′	54.6′
4	242°24.7	29.6	161°33.3	9.2′	28°35.8	0.2′	54.6′
5	257°24.9	30.6	176°01.6	9.2′	28°36.0	0.1′	54.6′
6	272°25.1	S02°31.5	190°29.8	9.2′	S28°36.1	0.1′	54.6′
7	287°25.3	32.5	204°58.0	9.2′	28°36.0	0.2′	54.6′
8	302°25.5	33.5	219°26.1	9.1′	28°35.8	0.4′	54.7′
9	317°25.7	·· 34.4	233°54.3	9.1′	28°35.4	0.5′	54.7′
10	332°25.9	35.4	248°22.4	9.1′	28°34.9	0.6′	54.7′
11	347°26.1	36.4	262°50.5	9.1′	28°34.3	0.8′	54.7′
12	2°26.3	S02°37.4	277°18.6	9.1′	S28°33.5	1.0′	54.7′
13	17°26.6	38.3	291°46.7	9.1′	28°32.5	1.1′	54.8′
14	32°26.8	39.3	306°14.8	9.0′	28°31.4	1.2′	54.8′
15	47°27.0	·· 40.3	320°42.8	9.0′	28°30.2	1.4′	54.8′
16	62°27.2	41.2	335°10.8	9.0′	28°28.8	1.5′	54.8′
17	77°27.4	42.2	349°38.9	9.0′	28°27.3	1.7′	54.9′
18	92°27.6	S02°43.2	4°06.9	9.0′	S28°25.6	1.8′	54.9′
19	107°27.8	44.2	18°34.9	9.0′	28°23.8	1.9′	54.9′
20	122°28.0	45.1	33°02.9	9.0′	28°21.9	2.1′	54.9′
21	137°28.2	·· 46.1	47°30.9	9.0′	28°19.8	2.3′	54.9′
22	152°28.4	47.1	61°58.8	9.0′	28°17.5	2.4′	55.0′
23	167°28.6	48.0	76°26.8	9.0′	28°15.1	2.5′	55.0′
	SD = 16.0′	d = -1.0′		SD = 14.9′			

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	182°28.8	S02°49.0	90°54.8	9.0′	S28°12.6	2.7′	55.0′
1	197°29.0	50.0	105°22.8	9.0′	28°09.9	2.9′	55.0′
2	212°29.2	50.9	119°50.8	9.0′	28°07.0	3.0′	55.1′
3	227°29.4	·· 51.9	134°18.7	9.0′	28°04.0	3.1′	55.1′
4	242°29.6	52.9	148°46.7	9.0′	28°00.9	3.3′	55.1′
5	257°29.8	53.9	163°14.7	9.0′	27°57.6	3.4′	55.1′
6	272°30.0	S02°54.8	177°42.7	9.0′	S27°54.2	3.6′	55.2′
7	287°30.3	55.8	192°10.7	9.0′	27°50.6	3.7′	55.2′
8	302°30.5	56.8	206°38.6	9.0′	27°46.9	3.8′	55.2′
9	317°30.7	·· 57.7	221°06.6	9.0′	27°43.1	4.1′	55.2′
10	332°30.9	58.7	235°34.7	9.0′	27°39.0	4.1′	55.3′
11	347°31.1	02°59.7	250°02.7	9.0′	27°34.9	4.3′	55.3′
12	2°31.3	S03°00.7	264°30.7	9.0′	S27°30.6	4.5′	55.3′
13	17°31.5	01.6	278°58.7	9.0′	27°26.1	4.5′	55.3′
14	32°31.7	02.6	293°26.8	9.1′	27°21.6	4.8′	55.4′
15	47°31.9	·· 03.6	307°54.8	9.1′	27°16.8	4.9′	55.4′
16	62°32.1	04.5	322°22.9	9.1′	27°11.9	5.0′	55.4′
17	77°32.3	05.5	336°51.0	9.1′	27°06.9	5.2′	55.5′
18	92°32.5	S03°06.5	351°19.1	9.1′	S27°01.7	5.3′	55.5′
19	107°32.7	07.4	5°47.2	9.1′	26°56.4	5.4′	55.5′
20	122°32.9	08.4	20°15.4	9.2′	26°51.0	5.7′	55.5′
21	137°33.1	·· 09.4	34°43.5	9.2′	26°45.3	5.7′	55.6′
22	152°33.3	10.3	49°11.7	9.2′	26°39.6	5.9′	55.6′
23	167°33.5	11.3	63°39.9	9.2′	26°33.7	6.0′	55.6′
	SD = 16.0′	d = -1.0′		SD = 15.0′			

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	03:40	05:03	06:11	17:27	18:34	19:57
N 70°	03:53	05:08	06:08	17:30	18:30	19:44
68°	04:04	05:11	06:06	17:32	18:27	19:34
66°	04:13	05:14	06:05	17:34	18:25	19:25
64°	04:20	05:16	06:03	17:35	18:23	19:19
62°	04:26	05:18	06:02	17:37	18:21	19:13
60°	04:31	05:20	06:01	17:38	18:19	19:08
N 58°	04:35	05:21	06:00	17:39	18:18	19:04
56°	04:39	05:22	05:59	17:40	18:17	19:00
54°	04:42	05:23	05:59	17:41	18:16	18:57
52°	04:45	05:24	05:58	17:42	18:15	18:54
50°	04:47	05:25	05:57	17:42	18:15	18:52
45°	04:52	05:26	05:56	17:44	18:13	18:47
N 40°	04:56	05:27	05:54	17:45	18:12	18:44
35°	04:59	05:28	05:53	17:47	18:12	18:41
30°	05:01	05:28	05:52	17:48	18:12	18:39
20°	05:03	05:28	05:50	17:50	18:12	18:37
N 10°	05:03	05:28	05:49	17:52	18:13	18:37
0°	05:02	05:26	05:47	17:53	18:14	18:38
S 10°	05:00	05:24	05:45	17:55	18:16	18:41
20°	04:55	05:21	05:43	17:58	18:20	18:45
30°	04:49	05:17	05:41	18:00	18:24	18:52
35°	04:44	05:14	05:39	18:02	18:27	18:57
40°	04:39	05:10	05:38	18:04	18:31	19:03
45°	04:31	05:06	05:36	18:06	18:35	19:10
S 50°	04:22	05:01	05:33	18:08	18:41	19:20
52°	04:18	04:58	05:32	18:10	18:44	19:24
54°	04:13	04:55	05:31	18:11	18:47	19:29
56°	04:07	04:52	05:29	18:12	18:50	19:35
58°	04:00	04:48	05:28	18:14	18:54	19:42
S 60°	03:53	04:44	05:26	18:16	18:58	19:50

Lat.	**Moonrise** Sun	Mon	Tue	**Moonset** Sun	Mon	Tue
N 72°						
N 70°						
68°						
66°						
64°						
62°			17:33			19:46
60°	15:26	16:22	16:44	18:12	19:06	20:34
N 58°	14:46	15:41	16:14	18:52	19:46	21:05
56°	14:18	15:13	15:50	19:20	20:14	21:28
54°	13:57	14:51	15:31	19:42	20:36	21:47
52°	13:39	14:33	15:15	20:00	20:54	22:02
50°	13:23	14:18	15:01	20:15	21:09	22:16
45°	12:53	13:47	14:33	20:46	21:40	22:44
N 40°	12:29	13:23	14:10	21:10	22:04	23:06
35°	12:09	13:03	13:52	21:30	22:24	23:24
30°	11:53	12:46	13:36	21:47	22:41	23:39
20°	11:24	12:18	13:08	22:16	23:09	·· ··
N 10°	11:00	11:53	12:45	22:40	23:33	·· ··
0°	10:38	11:30	12:23	23:03	23:56	·· ··
S 10°	10:15	11:07	12:01	23:26	·· ··	00:18
20°	09:51	10:43	11:38	23:50	·· ··	00:42
30°	09:23	10:14	11:11	·· ··	00:19	01:10
35°	09:07	09:57	10:54	·· ··	00:36	01:27
40°	08:48	09:38	10:35	·· ··	00:55	01:46
45°	08:25	09:14	10:13	00:21	01:19	02:09
S 50°	07:55	08:43	09:43	00:51	01:50	02:39
52°	07:40	08:27	09:29	01:05	02:06	02:54
54°	07:23	08:09	09:12	01:22	02:24	03:11
56°	07:03	07:47	08:52	01:42	02:45	03:31
58°	06:38	07:19	08:26	02:07	03:13	03:57
S 60°	06:03	06:39	07:52	02:41	03:54	04:32

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 7-9 31-50%
28	09:15	09:25	11:51	16:50	04:24	
29	09:35	09:45	11:50	17:43	05:16	
30	09:55	10:05	11:50	18:36	06:09	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2491 sec ΔT = TT-UT1 = +68.9349 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°58.9	204°09.5	N07°27.3	156°27.2	S13°33.0	255°43.2	N21°35.2	11°02.4	S03°11.7
1	25°01.4	219°09.0	26.1	171°28.0	33.6	270°45.3	35.2	26°05.0	11.8
2	40°03.9	234°08.6	25.0	186°28.8	34.2	285°47.5	35.1	41°07.7	11.9
3	55°06.3	249°08.2	·· 23.9	201°29.7	·· 34.8	300°49.6	·· 35.1	56°10.3	·· 12.0
4	70°08.8	264°07.8	22.7	216°30.5	35.4	315°51.8	35.0	71°12.9	12.0
5	85°11.2	279°07.3	21.6	231°31.3	36.0	330°53.9	35.0	86°15.6	12.1
6	100°13.7	294°06.9	N07°20.5	246°32.1	S13°36.5	345°56.0	N21°35.0	101°18.2	S03°12.2
7	115°16.2	309°06.5	19.3	261°32.9	37.1	0°58.2	34.9	116°20.8	12.3
8	130°18.6	324°06.1	18.2	276°33.8	37.7	16°00.3	34.9	131°23.5	12.3
9	145°21.1	339°05.7	·· 17.1	291°34.6	·· 38.3	31°02.5	·· 34.8	146°26.1	·· 12.4
10	160°23.6	354°05.2	15.9	306°35.4	38.9	46°04.6	34.8	161°28.8	12.5
11	175°26.0	9°04.8	14.8	321°36.2	39.5	61°06.7	34.7	176°31.4	12.6
12	190°28.5	24°04.4	N07°13.7	336°37.0	S13°40.1	76°08.9	N21°34.7	191°34.0	S03°12.6
13	205°31.0	39°04.0	12.5	351°37.8	40.7	91°11.0	34.6	206°36.7	12.7
14	220°33.4	54°03.6	11.4	6°38.7	41.3	106°13.2	34.6	221°39.3	12.8
15	235°35.9	69°03.1	·· 10.3	21°39.5	·· 41.8	121°15.3	·· 34.5	236°41.9	·· 12.9
16	250°38.4	84°02.7	09.1	36°40.3	42.4	136°17.5	34.5	251°44.6	12.9
17	265°40.8	99°02.3	08.0	51°41.1	43.0	151°19.6	34.5	266°47.2	13.0
18	280°43.3	114°01.9	N07°06.9	66°41.9	S13°43.6	166°21.8	N21°34.4	281°49.9	S03°13.1
19	295°45.7	129°01.5	05.7	81°42.8	44.2	181°23.9	34.4	296°52.5	13.2
20	310°48.2	144°01.0	04.6	96°43.6	44.8	196°26.0	34.3	311°55.1	13.2
21	325°50.7	159°00.6	·· 03.4	111°44.4	·· 45.4	211°28.2	·· 34.3	326°57.8	·· 13.3
22	340°53.1	174°00.2	02.3	126°45.2	45.9	226°30.3	34.2	342°00.4	13.4
23	355°55.6	188°59.8	01.2	141°46.0	46.5	241°32.5	34.2	357°03.0	13.5
Mer.pass.	23:16	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.57	ν 2.1′	d -0.0′ m -2.12	ν 2.6′	d -0.1′ m 0.62

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°58.1	203°59.4	N07°00.0	156°46.8	S13°47.1	256°34.6	N21°34.1	12°05.7	S03°13.5
1	26°00.5	218°59.0	06°58.9	171°47.6	47.7	271°36.8	34.1	27°08.3	13.6
2	41°03.0	233°58.5	57.7	186°48.5	48.3	286°38.9	34.1	42°11.0	13.7
3	56°05.5	248°58.1	·· 56.6	201°49.3	·· 48.9	301°41.1	·· 34.0	57°13.6	·· 13.8
4	71°07.9	263°57.7	55.5	216°50.1	49.5	316°43.2	34.0	72°16.2	13.8
5	86°10.4	278°57.3	54.3	231°50.9	50.0	331°45.4	33.9	87°18.9	13.9
6	101°12.9	293°56.9	N06°53.2	246°51.7	S13°50.6	346°47.5	N21°33.9	102°21.5	S03°14.0
7	116°15.3	308°56.4	52.0	261°52.5	51.2	1°49.7	33.8	117°24.1	14.0
8	131°17.8	323°56.0	50.9	276°53.4	51.8	16°51.8	33.8	132°26.8	14.1
9	146°20.2	338°55.6	·· 49.7	291°54.2	·· 52.4	31°53.9	·· 33.7	147°29.4	·· 14.2
10	161°22.7	353°55.2	48.6	306°55.0	53.0	46°56.1	33.7	162°32.0	14.3
11	176°25.2	8°54.8	47.5	321°55.8	53.6	61°58.2	33.7	177°34.7	14.3
12	191°27.6	23°54.4	N06°46.3	336°56.6	S13°54.1	77°00.4	N21°33.6	192°37.3	S03°14.4
13	206°30.1	38°54.0	45.2	351°57.4	54.7	92°02.5	33.6	207°40.0	14.5
14	221°32.6	53°53.5	44.0	6°58.2	55.3	107°04.7	33.5	222°42.6	14.6
15	236°35.0	68°53.1	·· 42.9	21°59.0	·· 55.9	122°06.8	·· 33.5	237°45.2	·· 14.6
16	251°37.5	83°52.7	41.7	36°59.9	56.5	137°09.0	33.4	252°47.9	14.7
17	266°40.0	98°52.3	40.6	52°00.7	57.1	152°11.1	33.4	267°50.5	14.8
18	281°42.4	113°51.9	N06°39.4	67°01.5	S13°57.6	167°13.3	N21°33.4	282°53.1	S03°14.9
19	296°44.9	128°51.5	38.3	82°02.3	58.2	182°15.4	33.3	297°55.8	14.9
20	311°47.3	143°51.0	37.1	97°03.1	58.8	197°17.6	33.3	312°58.4	15.0
21	326°49.8	158°50.6	·· 36.0	112°03.9	13°59.4	212°19.8	·· 33.2	328°01.0	·· 15.1
22	341°52.3	173°50.2	34.8	127°04.7	14°00.0	227°21.9	33.2	343°03.7	15.2
23	356°54.7	188°49.8	33.7	142°05.5	00.6	242°24.1	33.1	358°06.3	15.2
Mer.pass.	23:12	ν -0.4′	d -1.1′	m -3.93	ν 0.8′	d -0.6′	m 1.57	ν 2.1′	d -0.0′ m -2.13	ν 2.6′	d -0.1′ m 0.62

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	11°57.2	203°49.4	N06°32.5	157°06.3	S14°01.1	257°26.2	N21°33.1	13°09.0	S03°15.3
1	26°59.7	218°49.0	31.4	172°07.1	01.7	272°28.4	33.0	28°11.6	15.4
2	42°02.1	233°48.6	30.2	187°08.0	02.3	287°30.5	33.0	43°14.2	15.4
3	57°04.6	248°48.1	·· 29.1	202°08.8	·· 02.9	302°32.7	·· 33.0	58°16.9	·· 15.5
4	72°07.1	263°47.7	27.9	217°09.6	03.5	317°34.8	32.9	73°19.5	15.6
5	87°09.5	278°47.3	26.8	232°10.4	04.0	332°37.0	32.9	88°22.1	15.7
6	102°12.0	293°46.9	N06°25.6	247°11.2	S14°04.6	347°39.1	N21°32.8	103°24.8	S03°15.7
7	117°14.5	308°46.5	24.5	262°12.0	05.2	2°41.3	32.8	118°27.4	15.8
8	132°16.9	323°46.1	23.3	277°12.8	05.8	17°43.4	32.7	133°30.0	15.9
9	147°19.4	338°45.7	·· 22.2	292°13.6	·· 06.4	32°45.6	·· 32.7	148°32.7	·· 16.0
10	162°21.8	353°45.3	21.0	307°14.4	06.9	47°47.7	32.7	163°35.3	16.0
11	177°24.3	8°44.8	19.9	322°15.2	07.5	62°49.9	32.6	178°38.0	16.1
12	192°26.8	23°44.4	N06°18.7	337°16.0	S14°08.1	77°52.1	N21°32.6	193°40.6	S03°16.2
13	207°29.2	38°44.0	17.6	352°16.8	08.7	92°54.2	32.5	208°43.2	16.2
14	222°31.7	53°43.6	16.4	7°17.7	09.3	107°56.4	32.5	223°45.9	16.3
15	237°34.2	68°43.2	·· 15.3	22°18.5	·· 09.8	122°58.5	·· 32.4	238°48.5	·· 16.4
16	252°36.6	83°42.8	14.1	37°19.3	10.4	138°00.7	32.4	253°51.1	16.5
17	267°39.1	98°42.4	13.0	52°20.1	11.0	153°02.8	32.4	268°53.8	16.5
18	282°41.6	113°42.0	N06°11.8	67°20.9	S14°11.6	168°05.0	N21°32.3	283°56.4	S03°16.6
19	297°44.0	128°41.6	10.6	82°21.7	12.2	183°07.2	32.3	298°59.0	16.7
20	312°46.5	143°41.1	09.5	97°22.5	12.7	198°09.3	32.2	314°01.7	16.8
21	327°49.0	158°40.7	·· 08.3	112°23.3	·· 13.3	213°11.5	·· 32.2	329°04.3	·· 16.8
22	342°51.4	173°40.3	07.2	127°24.1	13.9	228°13.6	32.1	344°06.9	16.9
23	357°53.9	188°39.9	06.0	142°24.9	14.5	243°15.8	32.1	359°09.6	17.0
Mer.pass.	23:08	ν -0.4′	d -1.1′	m -3.92	ν 0.8′	d -0.6′	m 1.56	ν 2.2′	d -0.0′ m -2.13	ν 2.6′	d -0.1′ m 0.63

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.8
Schedar	349°29.8	56°40.8
Diphda	348°46.4	-17°50.6
Achernar	335°19.1	-57°06.2
Hamal	327°50.2	23°35.2
Polaris	313°21.4	89°22.2
Acamar	315°11.0	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.0	49°57.1
Aldebaran	290°38.8	16°33.7
Rigel	281°03.2	-8°10.1
Capella	280°20.8	46°01.3
Bellatrix	278°22.1	6°22.5
Elnath	278°01.0	28°37.7
Alnilam	275°37.0	-1°11.0
Betelgeuse	270°51.4	7°24.8
Canopus	263°52.1	-52°42.2
Sirius	258°25.7	-16°44.8
Adhara	255°05.4	-29°00.1
Procyon	244°50.3	5°09.7
Pollux	243°16.7	27°57.8
Avior	234°14.8	-59°35.2
Suhail	222°46.2	-43°31.9
Miaplacidus	221°38.8	-69°49.0
Alphard	217°47.4	-8°46.0
Regulus	207°34.1	11°50.6
Dubhe	193°40.8	61°36.7
Denebola	182°24.7	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.5
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.3
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Kochab	137°20.7	74°03.1
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.2	-69°04.6
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.0	51°29.4
Kaus Aust.	83°31.7	-34°22.4
Vega	80°32.8	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.5	-56°39.3
Deneb	49°25.2	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Oct 01 Wed	SHA	Mer.pass
Venus	194°10.5	10:24
Mars	146°28.3	13:33
Jupiter	245°44.3	06:56
Saturn	1°03.5	23:12

Oct 02 Thu	SHA	Mer.pass
Venus	193°01.3	10:24
Mars	145°48.8	13:32
Jupiter	245°36.6	06:53
Saturn	1°07.6	23:08

Oct 03 Fri	SHA	Mer.pass
Venus	191°52.2	10:25
Mars	145°09.1	13:31
Jupiter	245°29.0	06:49
Saturn	1°11.8	23:03

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°33.7	S03°12.3	78°08.1	9.2′	S26°27.7	6.2′	55.7′
1	197°33.9	13.3	92°36.4	9.3′	26°21.5	6.3′	55.7′
2	212°34.1	14.2	107°04.6	9.3′	26°15.2	6.5′	55.7′
3	227°34.3	·· 15.2	121°32.9	9.3′	26°08.7	6.6′	55.8′
4	242°34.5	16.2	136°01.3	9.3′	26°02.1	6.7′	55.8′
5	257°34.7	17.1	150°29.6	9.4′	25°55.4	6.9′	55.8′
6	272°34.9	S03°18.1	164°58.0	9.4′	S25°48.5	7.1′	55.9′
7	287°35.1	19.1	179°26.3	9.4′	25°41.4	7.1′	55.9′
8	302°35.3	20.0	193°54.8	9.4′	25°34.3	7.3′	55.9′
9	317°35.5	·· 21.0	208°23.2	9.5′	25°27.0	7.5′	56.0′
10	332°35.7	22.0	222°51.7	9.5′	25°19.5	7.6′	56.0′
11	347°35.9	22.9	237°20.2	9.5′	25°11.9	7.7′	56.0′
12	2°36.1	S03°23.9	251°48.7	9.6′	S25°04.2	7.8′	56.0′
13	17°36.3	24.9	266°17.3	9.6′	24°56.4	8.0′	56.1′
14	32°36.5	25.8	280°45.9	9.6′	24°48.4	8.2′	56.1′
15	47°36.7	·· 26.8	295°14.5	9.7′	24°40.2	8.3′	56.1′
16	62°36.9	27.8	309°43.2	9.7′	24°31.9	8.4′	56.2′
17	77°37.1	28.8	324°11.9	9.7′	24°23.5	8.5′	56.2′
18	92°37.3	S03°29.7	338°40.6	9.8′	S24°15.0	8.7′	56.3′
19	107°37.5	30.7	353°09.3	9.8′	24°06.3	8.8′	56.3′
20	122°37.7	31.7	7°38.1	9.8′	23°57.5	8.9′	56.3′
21	137°37.9	·· 32.6	22°06.9	9.9′	23°48.6	9.1′	56.4′
22	152°38.1	33.6	36°35.8	9.9′	23°39.5	9.2′	56.4′
23	167°38.3	34.6	51°04.7	9.9′	23°30.3	9.4′	56.4′
	SD = 16.0′	d = -1.0′	SD = 15.2′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°38.5	S03°35.5	65°33.6	10.0′	S23°20.9	9.5′	56.5′
1	197°38.7	36.5	80°02.6	10.0′	23°11.4	9.6′	56.5′
2	212°38.9	37.5	94°31.6	10.0′	23°01.8	9.7′	56.5′
3	227°39.1	·· 38.4	109°00.6	10.1′	22°52.1	9.9′	56.6′
4	242°39.3	39.4	123°29.7	10.1′	22°42.2	10.0′	56.6′
5	257°39.5	40.4	137°58.8	10.1′	22°32.2	10.1′	56.6′
6	272°39.7	S03°41.3	152°27.9	10.2′	S22°22.1	10.2′	56.7′
7	287°39.9	42.3	166°57.1	10.2′	22°11.9	10.4′	56.7′
8	302°40.1	43.3	181°26.3	10.3′	22°01.5	10.5′	56.7′
9	317°40.3	·· 44.2	195°55.6	10.3′	21°51.0	10.6′	56.8′
10	332°40.5	45.2	210°24.9	10.3′	21°40.4	10.8′	56.8′
11	347°40.7	46.2	224°54.2	10.4′	21°29.6	10.9′	56.9′
12	2°40.9	S03°47.1	239°23.5	10.4′	S21°18.7	11.0′	56.9′
13	17°41.1	48.1	253°52.9	10.4′	21°07.7	11.1′	56.9′
14	32°41.3	49.1	268°22.4	10.5′	20°56.6	11.2′	57.0′
15	47°41.5	·· 50.0	282°51.8	10.5′	20°45.4	11.4′	57.0′
16	62°41.7	51.0	297°21.4	10.5′	20°34.0	11.5′	57.0′
17	77°41.9	52.0	311°50.9	10.6′	20°22.5	11.6′	57.1′
18	92°42.1	S03°52.9	326°20.5	10.6′	S20°10.9	11.7′	57.1′
19	107°42.3	53.9	340°50.1	10.6′	19°59.2	11.8′	57.2′
20	122°42.5	54.9	355°19.7	10.7′	19°47.4	12.0′	57.2′
21	137°42.7	·· 55.8	9°49.4	10.7′	19°35.4	12.0′	57.2′
22	152°42.9	56.8	24°19.1	10.8′	19°23.4	12.2′	57.3′
23	167°43.1	57.8	38°48.9	10.8′	19°11.2	12.3′	57.3′
	SD = 16.0′	d = -1.0′	SD = 15.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°43.3	S03°58.7	53°18.7	10.8′	S18°58.9	12.4′	57.4′
1	197°43.5	03°59.7	67°48.5	10.9′	18°46.5	12.5′	57.4′
2	212°43.7	04°00.7	82°18.4	10.9′	18°34.0	12.6′	57.4′
3	227°43.9	·· 01.6	96°48.3	10.9′	18°21.4	12.8′	57.5′
4	242°44.1	02.6	111°18.2	11.0′	18°08.6	12.8′	57.5′
5	257°44.3	03.6	125°48.1	11.0′	17°55.8	13.0′	57.5′
6	272°44.5	S04°04.5	140°18.1	11.0′	S17°42.8	13.1′	57.6′
7	287°44.7	05.5	154°48.2	11.1′	17°29.7	13.1′	57.6′
8	302°44.9	06.4	169°18.2	11.1′	17°16.6	13.3′	57.7′
9	317°45.1	·· 07.4	183°48.3	11.1′	17°03.3	13.4′	57.7′
10	332°45.2	08.4	198°18.4	11.1′	16°49.9	13.5′	57.7′
11	347°45.4	09.3	212°48.6	11.2′	16°36.4	13.6′	57.8′
12	2°45.6	S04°10.3	227°18.8	11.2′	S16°22.8	13.6′	57.8′
13	17°45.8	11.3	241°49.0	11.2′	16°09.2	13.8′	57.9′
14	32°46.0	12.2	256°19.2	11.3′	15°55.4	13.9′	57.9′
15	47°46.2	·· 13.2	270°49.5	11.3′	15°41.5	14.0′	57.9′
16	62°46.4	14.2	285°19.8	11.3′	15°27.5	14.1′	58.0′
17	77°46.6	15.1	299°50.1	11.3′	15°13.4	14.2′	58.0′
18	92°46.8	S04°16.1	314°20.4	11.4′	S14°59.2	14.2′	58.1′
19	107°47.0	17.1	328°50.8	11.4′	14°45.0	14.4′	58.1′
20	122°47.2	18.0	343°21.2	11.4′	14°30.6	14.5′	58.1′
21	137°47.4	·· 19.0	357°51.6	11.4′	14°16.1	14.5′	58.2′
22	152°47.6	19.9	12°22.1	11.5′	14°01.6	14.7′	58.2′
23	167°47.8	20.9	26°52.5	11.5′	13°46.9	14.7′	58.2′
	SD = 16.0′	d = -1.0′	SD = 15.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:55	05:17	06:24	17:12	18:19	19:40
N 70°	04:07	05:20	06:20	17:16	18:17	19:29
68°	04:16	05:22	06:17	17:20	18:15	19:20
66°	04:23	05:23	06:14	17:22	18:13	19:13
64°	04:29	05:25	06:12	17:25	18:12	19:08
62°	04:34	05:26	06:10	17:27	18:11	19:03
60°	04:38	05:27	06:08	17:29	18:10	18:59
N 58°	04:42	05:28	06:07	17:31	18:10	18:55
56°	04:45	05:28	06:05	17:32	18:09	18:52
54°	04:48	05:29	06:04	17:33	18:09	18:50
52°	04:50	05:29	06:03	17:35	18:08	18:47
50°	04:52	05:30	06:02	17:36	18:08	18:45
45°	04:56	05:30	05:59	17:38	18:08	18:42
N 40°	04:59	05:30	05:57	17:41	18:07	18:39
35°	05:01	05:30	05:56	17:42	18:08	18:37
30°	05:02	05:30	05:54	17:44	18:08	18:36
20°	05:04	05:29	05:51	17:47	18:09	18:35
N 10°	05:03	05:28	05:49	17:50	18:11	18:35
0°	05:01	05:25	05:46	17:53	18:13	18:37
S 10°	04:58	05:22	05:43	17:55	18:16	18:41
20°	04:53	05:18	05:40	17:58	18:20	18:46
30°	04:45	05:13	05:37	18:02	18:26	18:54
35°	04:40	05:10	05:35	18:04	18:30	19:00
40°	04:33	05:05	05:33	18:07	18:34	19:06
45°	04:25	05:00	05:30	18:09	18:39	19:14
S 50°	04:15	04:54	05:27	18:13	18:46	19:25
52°	04:10	04:51	05:25	18:15	18:49	19:30
54°	04:04	04:48	05:23	18:16	18:52	19:36
56°	03:58	04:44	05:21	18:18	18:56	19:42
58°	03:51	04:39	05:19	18:20	19:01	19:50
S 60°	03:42	04:35	05:17	18:23	19:06	19:59

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	▬	18:45	▬	▬	▬
N 70°	▬	19:58	18:14	▬	21:01	·· ··
68°	▬	18:38	17:51	▬	22:20	·· ··
66°	▬	18:00	17:33	▬	22:57	·· ··
64°	17:58	17:32	17:18	21:11	23:23	·· ··
62°	17:19	17:11	17:05	21:49	23:43	·· ··
60°	16:52	16:54	16:54	22:16	23:59	·· ··
N 58°	16:30	16:40	16:45	22:36	·· ··	00:13
56°	16:13	16:27	16:37	22:54	·· ··	00:24
54°	15:58	16:16	16:29	23:08	·· ··	00:35
52°	15:45	16:06	16:23	23:20	·· ··	00:44
50°	15:33	15:58	16:17	23:31	·· ··	00:52
45°	15:09	15:39	16:04	23:54	·· ··	01:09
N 40°	14:50	15:24	15:53	·· ··	00:13	01:23
35°	14:34	15:11	15:44	·· ··	00:28	01:35
30°	14:20	15:00	15:36	·· ··	00:41	01:45
20°	13:56	14:40	15:21	00:05	01:04	02:02
N 10°	13:35	14:23	15:09	00:28	01:23	02:17
0°	13:16	14:07	14:57	00:49	01:41	02:31
S 10°	12:56	13:51	14:45	01:09	01:59	02:45
20°	12:35	13:34	14:33	01:32	02:17	03:00
30°	12:11	13:14	14:18	01:57	02:39	03:17
35°	11:57	13:02	14:10	02:12	02:52	03:26
40°	11:40	12:49	14:00	02:30	03:06	03:37
45°	11:20	12:33	13:49	02:50	03:23	03:50
S 50°	10:55	12:13	13:35	03:16	03:44	04:06
52°	10:43	12:04	13:28	03:29	03:54	04:13
54°	10:29	11:53	13:21	03:44	04:06	04:21
56°	10:12	11:41	13:13	04:00	04:18	04:30
58°	09:53	11:27	13:04	04:20	04:33	04:40
S 60°	09:28	11:10	12:53	04:46	04:50	04:52

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 60-79%
01	10:15	10:25	11:50	19:28	07:02	
02	10:34	10:44	11:49	20:19	07:54	
03	10:53	11:03	11:49	21:09	08:44	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2497 sec ΔT = TT-UT1 = +68.9343 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	12°56.3	203°39.5	N06°04.9	157°25.7	S14°15.1	258°17.9	N21°32.1	14°12.2	S03°17.0
1	27°58.8	218°39.1	03.7	172°26.5	15.6	273°20.1	32.0	29°14.8	17.1
2	43°01.3	233°38.7	02.6	187°27.3	16.2	288°22.3	32.0	44°17.5	17.2
3	58°03.7	248°38.3	·· 01.4	202°28.1	·· 16.8	303°24.4	·· 31.9	59°20.1	·· 17.3
4	73°06.2	263°37.9	06°00.2	217°28.9	17.4	318°26.6	31.9	74°22.7	17.3
5	88°08.7	278°37.5	05°59.1	232°29.7	18.0	333°28.7	31.8	89°25.4	17.4
6	103°11.1	293°37.1	N05°57.9	247°30.5	S14°18.5	348°30.9	N21°31.8	104°28.0	S03°17.5
7	118°13.6	308°36.6	56.8	262°31.3	19.1	3°33.1	31.8	119°30.7	17.6
8	133°16.1	323°36.2	55.6	277°32.1	19.7	18°35.2	31.7	134°33.3	17.6
9	148°18.5	338°35.8	·· 54.4	292°32.9	·· 20.3	33°37.4	·· 31.7	149°35.9	·· 17.7
10	163°21.0	353°35.4	53.3	307°33.7	20.8	48°39.5	31.6	164°38.6	17.8
11	178°23.4	8°35.0	52.1	322°34.5	21.4	63°41.7	31.6	179°41.2	17.8
12	193°25.9	23°34.6	N05°51.0	337°35.3	S14°22.0	78°43.9	N21°31.5	194°43.8	S03°17.9
13	208°28.4	38°34.2	49.8	352°36.1	22.6	93°46.0	31.5	209°46.5	18.0
14	223°30.8	53°33.8	48.6	7°36.9	23.1	108°48.2	31.5	224°49.1	18.1
15	238°33.3	68°33.4	·· 47.5	22°37.7	·· 23.7	123°50.4	·· 31.4	239°51.7	·· 18.1
16	253°35.8	83°33.0	46.3	37°38.5	24.3	138°52.5	31.4	254°54.4	18.2
17	268°38.2	98°32.6	45.1	52°39.3	24.9	153°54.7	31.3	269°57.0	18.3
18	283°40.7	113°32.2	N05°44.0	67°40.1	S14°25.4	168°56.8	N21°31.3	284°59.6	S03°18.4
19	298°43.2	128°31.7	42.8	82°40.9	26.0	183°59.0	31.2	300°02.3	18.4
20	313°45.6	143°31.3	41.7	97°41.7	26.6	199°01.2	31.2	315°04.9	18.5
21	328°48.1	158°30.9	·· 40.5	112°42.5	·· 27.2	214°03.3	·· 31.2	330°07.5	·· 18.6
22	343°50.6	173°30.5	39.3	127°43.3	27.7	229°05.5	31.1	345°10.2	18.6
23	358°53.0	188°30.1	38.2	142°44.1	28.3	244°07.7	31.1	0°12.8	18.7
Mer.pass.	23:04	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.56	ν 2.2′	d -0.0′ m -2.14	ν 2.6′	d -0.1′ m 0.63

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°55.5	203°29.7	N05°37.0	157°44.9	S14°28.9	259°09.8	N21°31.0	15°15.4	S03°18.8
1	28°57.9	218°29.3	35.8	172°45.7	29.5	274°12.0	31.0	30°18.1	18.9
2	44°00.4	233°28.9	34.7	187°46.5	30.0	289°14.2	31.0	45°20.7	18.9
3	59°02.9	248°28.5	·· 33.5	202°47.3	·· 30.6	304°16.3	·· 30.9	60°23.3	·· 19.0
4	74°05.3	263°28.1	32.3	217°48.1	31.2	319°18.5	30.9	75°26.0	19.1
5	89°07.8	278°27.7	31.2	232°48.9	31.8	334°20.7	30.8	90°28.6	19.1
6	104°10.3	293°27.3	N05°30.0	247°49.7	S14°32.3	349°22.8	N21°30.8	105°31.2	S03°19.2
7	119°12.7	308°26.9	28.8	262°50.5	32.9	4°25.0	30.7	120°33.9	19.3
8	134°15.2	323°26.5	27.7	277°51.3	33.5	19°27.2	30.7	135°36.5	19.4
9	149°17.7	338°26.1	·· 26.5	292°52.1	·· 34.1	34°29.3	·· 30.7	150°39.1	·· 19.4
10	164°20.1	353°25.7	25.3	307°52.9	34.6	49°31.5	30.6	165°41.8	19.5
11	179°22.6	8°25.3	24.2	322°53.7	35.2	64°33.7	30.6	180°44.4	19.6
12	194°25.0	23°24.9	N05°23.0	337°54.5	S14°35.8	79°35.8	N21°30.5	195°47.0	S03°19.6
13	209°27.5	38°24.4	21.8	352°55.3	36.4	94°38.0	30.5	210°49.7	19.7
14	224°30.0	53°24.0	20.7	7°56.1	36.9	109°40.2	30.5	225°52.3	19.8
15	239°32.4	68°23.6	·· 19.5	22°56.9	·· 37.5	124°42.4	·· 30.4	240°54.9	·· 19.9
16	254°34.9	83°23.2	18.3	37°57.7	38.1	139°44.5	30.4	255°57.6	19.9
17	269°37.4	98°22.8	17.1	52°58.5	38.6	154°46.7	30.3	271°00.2	20.0
18	284°39.8	113°22.4	N05°16.0	67°59.2	S14°39.2	169°48.9	N21°30.3	286°02.8	S03°20.1
19	299°42.3	128°22.0	14.8	83°00.0	39.8	184°51.0	30.2	301°05.5	20.1
20	314°44.8	143°21.6	13.6	98°00.8	40.4	199°53.2	30.2	316°08.1	20.2
21	329°47.2	158°21.2	·· 12.5	113°01.6	·· 40.9	214°55.4	·· 30.2	331°10.7	·· 20.3
22	344°49.7	173°20.8	11.3	128°02.4	41.5	229°57.5	30.1	346°13.4	20.4
23	359°52.2	188°20.4	10.1	143°03.2	42.1	244°59.7	30.1	1°16.0	20.4
Mer.pass.	23:01	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.56	ν 2.2′	d -0.0′ m -2.15	ν 2.6′	d -0.1′ m 0.63

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°54.6	203°20.0	N05°08.9	158°04.0	S14°42.6	260°01.9	N21°30.0	16°18.6	S03°20.5
1	29°57.1	218°19.6	07.8	173°04.8	43.2	275°04.1	30.0	31°21.3	20.6
2	44°59.5	233°19.2	06.6	188°05.6	43.8	290°06.2	30.0	46°23.9	20.6
3	60°02.0	248°18.8	·· 05.4	203°06.4	·· 44.3	305°08.4	·· 29.9	61°26.5	·· 20.7
4	75°04.5	263°18.4	04.3	218°07.2	44.9	320°10.6	29.9	76°29.2	20.8
5	90°06.9	278°18.0	03.1	233°08.0	45.5	335°12.8	29.8	91°31.8	20.9
6	105°09.4	293°17.6	N05°01.9	248°08.8	S14°46.1	350°14.9	N21°29.8	106°34.4	S03°20.9
7	120°11.9	308°17.2	05°00.7	263°09.5	46.6	5°17.1	29.8	121°37.1	21.0
8	135°14.3	323°16.8	04°59.6	278°10.3	47.2	20°19.3	29.7	136°39.7	21.1
9	150°16.8	338°16.4	·· 58.4	293°11.1	·· 47.8	35°21.5	·· 29.7	151°42.3	·· 21.1
10	165°19.3	353°16.0	57.2	308°11.9	48.3	50°23.6	29.6	166°45.0	21.2
11	180°21.7	8°15.6	56.0	323°12.7	48.9	65°25.8	29.6	181°47.6	21.3
12	195°24.2	23°15.2	N04°54.9	338°13.5	S14°49.5	80°28.0	N21°29.6	196°50.2	S03°21.3
13	210°26.7	38°14.8	53.7	353°14.3	50.0	95°30.2	29.5	211°52.8	21.4
14	225°29.1	53°14.4	52.5	8°15.1	50.6	110°32.3	29.5	226°55.5	21.5
15	240°31.6	68°14.0	·· 51.3	23°15.9	·· 51.2	125°34.5	·· 29.4	241°58.1	·· 21.6
16	255°34.0	83°13.6	50.2	38°16.6	51.7	140°36.7	29.4	257°00.7	21.6
17	270°36.5	98°13.2	49.0	53°17.4	52.3	155°38.9	29.3	272°03.4	21.7
18	285°39.0	113°12.8	N04°47.8	68°18.2	S14°52.9	170°41.0	N21°29.3	287°06.0	S03°21.8
19	300°41.4	128°12.4	46.6	83°19.0	53.4	185°43.2	29.3	302°08.6	21.8
20	315°43.9	143°12.0	45.4	98°19.8	54.0	200°45.4	29.2	317°11.3	21.9
21	330°46.4	158°11.6	·· 44.3	113°20.6	·· 54.6	215°47.6	·· 29.2	332°13.9	·· 22.0
22	345°48.8	173°11.2	43.1	128°21.4	55.1	230°49.7	29.1	347°16.5	22.1
23	0°51.3	188°10.8	41.9	143°22.2	55.7	245°51.9	29.1	2°19.2	22.1
Mer.pass.	22:57	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.56	ν 2.2′	d -0.0′ m -2.15	ν 2.6′	d -0.1′ m 0.64

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.8
Diphda	348°46.4	-17°50.6
Achernar	335°19.1	-57°06.2
Hamal	327°50.2	23°35.2
Polaris	313°20.5	89°22.2
Acamar	315°10.9	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.0	49°57.1
Aldebaran	290°38.7	16°33.7
Rigel	281°03.2	-8°10.1
Capella	280°20.8	46°01.3
Bellatrix	278°22.1	6°22.5
Elnath	278°01.0	28°37.7
Alnilam	275°37.0	-1°11.0
Betelgeuse	270°51.4	7°24.8
Canopus	263°52.1	-52°42.2
Sirius	258°25.7	-16°44.8
Adhara	255°05.4	-29°00.1
Procyon	244°50.3	5°09.7
Pollux	243°16.7	27°57.8
Avior	234°14.8	-59°35.1
Suhail	222°46.1	-43°31.9
Miaplacidus	221°38.7	-69°49.0
Alphard	217°47.4	-8°46.0
Regulus	207°34.0	11°50.6
Dubhe	193°40.8	61°36.6
Denebola	182°24.6	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.4
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.2
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Kochab	137°20.7	74°03.1
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.2	-69°04.6
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.0	51°29.4
Kaus Aust.	83°31.8	-34°22.4
Vega	80°32.9	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.5	-56°39.3
Deneb	49°25.2	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.5
Markab	13°29.0	15°20.8

Oct 04 Sat	SHA	Mer.pass
Venus	190°43.2	10:26
Mars	144°29.4	13:30
Jupiter	245°21.6	06:46
Saturn	1°15.9	22:59

Oct 05 Sun	SHA	Mer.pass
Venus	189°34.2	10:26
Mars	143°49.4	13:28
Jupiter	245°14.4	06:42
Saturn	1°20.0	22:55

Oct 06 Mon	SHA	Mer.pass
Venus	188°25.4	10:27
Mars	143°09.4	13:27
Jupiter	245°07.3	06:39
Saturn	1°24.0	22:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°48.0	S04°21.9	41°23.0	11.5′	S13°32.2	14.8′	58.3′
1	197°48.2	22.8	55°53.5	11.5′	13°17.4	14.9′	58.3′
2	212°48.3	23.8	70°24.0	11.6′	13°02.5	15.0′	58.4′
3	227°48.5	·· 24.8	84°54.6	11.6′	12°47.5	15.1′	58.4′
4	242°48.7	25.7	99°25.2	11.6′	12°32.4	15.1′	58.4′
5	257°48.9	26.7	113°55.8	11.6′	12°17.3	15.3′	58.5′
6	272°49.1	S04°27.7	128°26.4	11.6′	S12°02.0	15.3′	58.5′
7	287°49.3	28.6	142°57.0	11.6′	11°46.7	15.4′	58.6′
8	302°49.5	29.6	157°27.6	11.7′	11°31.3	15.5′	58.6′
9	317°49.7	·· 30.5	171°58.3	11.7′	11°15.8	15.5′	58.6′
10	332°49.9	31.5	186°28.9	11.7′	11°00.3	15.7′	58.7′
11	347°50.1	32.5	200°59.6	11.7′	10°44.6	15.7′	58.7′
12	2°50.3	S04°33.4	215°30.3	11.7′	S10°28.9	15.8′	58.7′
13	17°50.5	34.4	230°01.0	11.7′	10°13.1	15.8′	58.8′
14	32°50.7	35.4	244°31.7	11.7′	09°57.3	16.0′	58.8′
15	47°50.8	·· 36.3	259°02.4	11.7′	09°41.3	16.0′	58.9′
16	62°51.0	37.3	273°33.2	11.7′	09°25.3	16.0′	58.9′
17	77°51.2	38.2	288°03.9	11.7′	09°09.3	16.1′	58.9′
18	92°51.4	S04°39.2	302°34.6	11.7′	S08°53.2	16.2′	59.0′
19	107°51.6	40.2	317°05.4	11.8′	08°37.0	16.3′	59.0′
20	122°51.8	41.1	331°36.1	11.8′	08°20.7	16.3′	59.0′
21	137°52.0	·· 42.1	346°06.9	11.8′	08°04.4	16.4′	59.1′
22	152°52.2	43.0	0°37.6	11.8′	07°48.0	16.5′	59.1′
23	167°52.4	44.0	15°08.4	11.8′	07°31.5	16.5′	59.1′
	SD = 16.0′	d = -1.0′	SD = 15.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°52.6	S04°45.0	29°39.2	11.8′	S07°15.0	16.5′	59.2′
1	197°52.7	45.9	44°09.9	11.8′	06°58.5	16.6′	59.2′
2	212°52.9	46.9	58°40.7	11.8′	06°41.9	16.7′	59.2′
3	227°53.1	·· 47.9	73°11.4	11.7′	06°25.2	16.7′	59.3′
4	242°53.3	48.8	87°42.2	11.7′	06°08.5	16.8′	59.3′
5	257°53.5	49.8	102°12.9	11.7′	05°51.7	16.9′	59.4′
6	272°53.7	S04°50.7	116°43.6	11.7′	S05°34.8	16.8′	59.4′
7	287°53.9	51.7	131°14.4	11.7′	05°18.0	16.9′	59.4′
8	302°54.1	52.7	145°45.1	11.7′	05°01.1	17.0′	59.5′
9	317°54.3	·· 53.6	160°15.8	11.7′	04°44.1	17.0′	59.5′
10	332°54.4	54.6	174°46.5	11.7′	04°27.1	17.1′	59.5′
11	347°54.6	55.5	189°17.2	11.7′	04°10.0	17.1′	59.6′
12	2°54.8	S04°56.5	203°47.8	11.7′	S03°52.9	17.1′	59.6′
13	17°55.0	57.5	218°18.5	11.6′	03°35.8	17.2′	59.6′
14	32°55.2	58.4	232°49.1	11.6′	03°18.6	17.2′	59.6′
15	47°55.4	04°59.4	247°19.7	11.6′	03°01.4	17.2′	59.7′
16	62°55.6	05°00.3	261°50.4	11.6′	02°44.2	17.3′	59.7′
17	77°55.7	01.3	276°20.9	11.6′	02°26.9	17.3′	59.7′
18	92°55.9	S05°02.3	290°51.5	11.5′	S02°09.6	17.3′	59.8′
19	107°56.1	03.2	305°22.0	11.5′	01°52.3	17.4′	59.8′
20	122°56.3	04.2	319°52.6	11.5′	01°34.9	17.4′	59.8′
21	137°56.5	·· 05.1	334°23.1	11.5′	01°17.5	17.4′	59.9′
22	152°56.7	06.1	348°53.5	11.4′	01°00.1	17.4′	59.9′
23	167°56.9	07.0	3°24.0	11.4′	00°42.7	17.5′	59.9′
	SD = 16.0′	d = -1.0′	SD = 16.1′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°57.1	S05°08.0	17°54.4	11.4′	S00°25.2	17.5′	60.0′
1	197°57.2	09.0	32°24.8	11.4′	S00°07.7	17.5′	60.0′
2	212°57.4	09.9	46°55.1	11.3′	N00°09.8	17.5′	60.0′
3	227°57.6	·· 10.9	61°25.4	11.3′	00°27.3	17.5′	60.0′
4	242°57.8	11.8	75°55.7	11.3′	00°44.8	17.5′	60.1′
5	257°58.0	12.8	90°26.0	11.2′	01°02.3	17.6′	60.1′
6	272°58.2	S05°13.8	104°56.2	11.2′	N01°19.9	17.5′	60.1′
7	287°58.3	14.7	119°26.4	11.1′	01°37.4	17.6′	60.1′
8	302°58.5	15.7	133°56.5	11.1′	01°55.0	17.6′	60.2′
9	317°58.7	·· 16.6	148°26.6	11.1′	02°12.6	17.5′	60.2′
10	332°58.9	17.6	162°56.7	11.0′	02°30.1	17.6′	60.2′
11	347°59.1	18.5	177°26.7	11.0′	02°47.7	17.6′	60.2′
12	2°59.3	S05°19.5	191°56.7	10.9′	N03°05.3	17.5′	60.3′
13	17°59.4	20.5	206°26.6	10.9′	03°22.8	17.6′	60.3′
14	32°59.6	21.4	220°56.5	10.8′	03°40.4	17.6′	60.3′
15	47°59.8	·· 22.4	235°26.4	10.8′	03°58.0	17.5′	60.3′
16	63°00.0	23.3	249°56.1	10.7′	04°15.5	17.5′	60.4′
17	78°00.2	24.3	264°25.9	10.7′	04°33.0	17.6′	60.4′
18	93°00.4	S05°25.2	278°55.6	10.6′	N04°50.6	17.5′	60.4′
19	108°00.5	26.2	293°25.2	10.6′	05°08.1	17.5′	60.4′
20	123°00.7	27.2	307°54.8	10.5′	05°25.6	17.5′	60.4′
21	138°00.9	·· 28.1	322°24.3	10.5′	05°43.1	17.4′	60.5′
22	153°01.1	29.1	336°53.8	10.4′	06°00.5	17.5′	60.5′
23	168°01.3	30.0	351°23.2	10.4′	06°18.0	17.4′	60.5′
	SD = 16.0′	d = -1.0′	SD = 16.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:10	05:30	06:38	16:57	18:04	19:23
N 70°	04:20	05:31	06:32	17:02	18:03	19:14
68°	04:27	05:32	06:28	17:07	18:02	19:07
66°	04:33	05:33	06:24	17:11	18:02	19:02
64°	04:38	05:33	06:21	17:14	18:02	18:57
62°	04:42	05:34	06:18	17:17	18:01	18:53
60°	04:46	05:34	06:15	17:20	18:01	18:50
N 58°	04:48	05:34	06:13	17:22	18:01	18:47
56°	04:51	05:34	06:11	17:24	18:01	18:44
54°	04:53	05:34	06:10	17:26	18:01	18:42
52°	04:55	05:34	06:08	17:28	18:01	18:40
50°	04:57	05:34	06:06	17:29	18:02	18:39
45°	05:00	05:34	06:03	17:33	18:02	18:36
N 40°	05:02	05:33	06:00	17:36	18:03	18:34
35°	05:03	05:33	05:58	17:38	18:03	18:33
30°	05:04	05:32	05:56	17:40	18:04	18:32
20°	05:04	05:30	05:52	17:44	18:07	18:32
N 10°	05:03	05:27	05:48	17:48	18:09	18:34
0°	05:00	05:24	05:45	17:52	18:12	18:36
S 10°	04:56	05:21	05:42	17:55	18:16	18:41
20°	04:50	05:16	05:38	17:59	18:21	18:47
30°	04:41	05:09	05:33	18:04	18:28	18:56
35°	04:35	05:05	05:31	18:07	18:32	19:02
40°	04:28	05:00	05:28	18:10	18:37	19:09
45°	04:19	04:55	05:24	18:13	18:43	19:18
S 50°	04:08	04:47	05:20	18:18	18:51	19:30
52°	04:02	04:44	05:18	18:20	18:54	19:36
54°	03:56	04:40	05:16	18:22	18:58	19:42
56°	03:49	04:36	05:14	18:24	19:03	19:49
58°	03:41	04:31	05:11	18:27	19:08	19:58
S 60°	03:31	04:25	05:08	18:30	19:13	20:08

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	17:47	17:07	16:29	00:01	02:42	05:10
N 70°	17:34	17:03	16:34	00:29	02:53	05:09
68°	17:23	17:01	16:39	00:51	03:01	05:07
66°	17:14	16:58	16:43	01:07	03:08	05:07
64°	17:06	16:56	16:46	01:21	03:13	05:06
62°	17:00	16:54	16:49	01:32	03:18	05:05
60°	16:54	16:53	16:52	01:41	03:23	05:04
N 58°	16:49	16:51	16:54	01:50	03:26	05:04
56°	16:44	16:50	16:56	01:57	03:30	05:03
54°	16:40	16:49	16:58	02:03	03:32	05:03
52°	16:36	16:48	17:00	02:09	03:35	05:03
50°	16:33	16:47	17:02	02:14	03:38	05:02
45°	16:25	16:45	17:05	02:25	03:43	05:02
N 40°	16:19	16:43	17:08	02:34	03:47	05:01
35°	16:13	16:42	17:11	02:42	03:51	05:00
30°	16:09	16:41	17:13	02:49	03:54	05:00
20°	16:00	16:38	17:17	03:01	04:00	04:59
N 10°	15:53	16:36	17:20	03:11	04:04	04:58
0°	15:46	16:34	17:24	03:20	04:09	04:58
S 10°	15:39	16:33	17:27	03:30	04:13	04:57
20°	15:31	16:31	17:31	03:40	04:18	04:56
30°	15:23	16:28	17:35	03:51	04:23	04:55
35°	15:18	16:27	17:38	03:57	04:26	04:54
40°	15:12	16:26	17:40	04:05	04:30	04:54
45°	15:06	16:24	17:44	04:13	04:33	04:53
S 50°	14:58	16:22	17:48	04:23	04:38	04:52
52°	14:54	16:21	17:50	04:28	04:40	04:52
54°	14:50	16:20	17:52	04:33	04:42	04:51
56°	14:45	16:19	17:54	04:38	04:45	04:51
58°	14:40	16:17	17:56	04:45	04:48	04:50
S 60°	14:35	16:16	17:59	04:52	04:51	04:50

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 87-98%
04	11:12	11:21	11:49	21:57	09:33	
05	11:30	11:39	11:48	22:46	10:22	
06	11:48	11:57	11:48	23:36	11:11	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2504 sec ΔT = TT-UT1 = +68.9336 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	15°53.8	203°10.4	N04°40.7	158°22.9	S14°56.3	260°54.1	N21°29.1	17°21.8	S03°22.2
1	30°56.2	218°10.0	39.6	173°23.7	56.8	275°56.3	29.0	32°24.4	22.3
2	45°58.7	233°09.6	38.4	188°24.5	57.4	290°58.5	29.0	47°27.1	22.3
3	61°01.1	248°09.2	·· 37.2	203°25.3	·· 58.0	306°00.6	·· 28.9	62°29.7	·· 22.4
4	76°03.6	263°08.8	36.0	218°26.1	58.5	321°02.8	28.9	77°32.3	22.5
5	91°06.1	278°08.4	34.8	233°26.9	59.1	336°05.0	28.9	92°35.0	22.5
6	106°08.5	293°08.0	N04°33.7	248°27.7	S14°59.7	351°07.2	N21°28.8	107°37.6	S03°22.6
7	121°11.0	308°07.6	32.5	263°28.4	15°00.2	6°09.4	28.8	122°40.2	22.7
8	136°13.5	323°07.2	31.3	278°29.2	00.8	21°11.5	28.7	137°42.8	22.8
9	151°15.9	338°06.8	·· 30.1	293°30.0	·· 01.4	36°13.7	·· 28.7	152°45.5	·· 22.8
10	166°18.4	353°06.4	28.9	308°30.8	01.9	51°15.9	28.7	167°48.1	22.9
11	181°20.9	8°06.0	27.7	323°31.6	02.5	66°18.1	28.6	182°50.7	23.0
12	196°23.3	23°05.6	N04°26.6	338°32.4	S15°03.1	81°20.3	N21°28.6	197°53.4	S03°23.0
13	211°25.8	38°05.2	25.4	353°33.1	03.6	96°22.5	28.5	212°56.0	23.1
14	226°28.3	53°04.8	24.2	8°33.9	04.2	111°24.6	28.5	227°58.6	23.2
15	241°30.7	68°04.4	·· 23.0	23°34.7	·· 04.8	126°26.8	·· 28.5	243°01.3	·· 23.2
16	256°33.2	83°04.0	21.8	38°35.5	05.3	141°29.0	28.4	258°03.9	23.3
17	271°35.6	98°03.6	20.6	53°36.3	05.9	156°31.2	28.4	273°06.5	23.4
18	286°38.1	113°03.2	N04°19.5	68°37.1	S15°06.5	171°33.4	N21°28.3	288°09.1	S03°23.5
19	301°40.6	128°02.8	18.3	83°37.8	07.0	186°35.6	28.3	303°11.8	23.5
20	316°43.0	143°02.4	17.1	98°38.6	07.6	201°37.7	28.3	318°14.4	23.6
21	331°45.5	158°02.0	·· 15.9	113°39.4	·· 08.1	216°39.9	·· 28.2	333°17.0	·· 23.7
22	346°48.0	173°01.6	14.7	128°40.2	08.7	231°42.1	28.2	348°19.7	23.7
23	1°50.4	188°01.2	13.5	143°41.0	09.3	246°44.3	28.2	3°22.3	23.8
Mer.pass.	22:53	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.55	ν 2.2′	d -0.0′ m -2.16	ν 2.6′	d -0.1′ m 0.64

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°52.9	203°00.8	N04°12.4	158°41.7	S15°09.8	261°46.5	N21°28.1	18°24.9	S03°23.9
1	31°55.4	218°00.4	11.2	173°42.5	10.4	276°48.7	28.1	33°27.6	23.9
2	46°57.8	233°00.0	10.0	188°43.3	11.0	291°50.9	28.0	48°30.2	24.0
3	62°00.3	247°59.6	·· 08.8	203°44.1	·· 11.5	306°53.0	·· 28.0	63°32.8	·· 24.1
4	77°02.7	262°59.2	07.6	218°44.9	12.1	321°55.2	28.0	78°35.4	24.1
5	92°05.2	277°58.8	06.4	233°45.6	12.6	336°57.4	27.9	93°38.1	24.2
6	107°07.7	292°58.4	N04°05.2	248°46.4	S15°13.2	351°59.6	N21°27.9	108°40.7	S03°24.3
7	122°10.1	307°58.0	04.0	263°47.2	13.8	7°01.8	27.8	123°43.3	24.4
8	137°12.6	322°57.6	02.9	278°48.0	14.3	22°04.0	27.8	138°46.0	24.4
9	152°15.1	337°57.2	·· 01.7	293°48.7	·· 14.9	37°06.2	·· 27.8	153°48.6	·· 24.5
10	167°17.5	352°56.8	04°00.5	308°49.5	15.4	52°08.4	27.7	168°51.2	24.6
11	182°20.0	7°56.4	03°59.3	323°50.3	16.0	67°10.5	27.7	183°53.9	24.6
12	197°22.5	22°56.0	N03°58.1	338°51.1	S15°16.6	82°12.7	N21°27.6	198°56.5	S03°24.7
13	212°24.9	37°55.6	56.9	353°51.9	17.1	97°14.9	27.6	213°59.1	24.8
14	227°27.4	52°55.2	55.7	8°52.6	17.7	112°17.1	27.6	229°01.7	24.8
15	242°29.9	67°54.8	·· 54.5	23°53.4	·· 18.2	127°19.3	·· 27.5	244°04.4	·· 24.9
16	257°32.3	82°54.4	53.4	38°54.2	18.8	142°21.5	27.5	259°07.0	25.0
17	272°34.8	97°54.1	52.2	53°55.0	19.4	157°23.7	27.4	274°09.6	25.0
18	287°37.2	112°53.7	N03°51.0	68°55.7	S15°19.9	172°25.9	N21°27.4	289°12.3	S03°25.1
19	302°39.7	127°53.3	49.8	83°56.5	20.5	187°28.1	27.4	304°14.9	25.2
20	317°42.2	142°52.9	48.6	98°57.3	21.0	202°30.3	27.3	319°17.5	25.2
21	332°44.6	157°52.5	·· 47.4	113°58.1	·· 21.6	217°32.4	·· 27.3	334°20.1	·· 25.3
22	347°47.1	172°52.1	46.2	128°58.8	22.2	232°34.6	27.3	349°22.8	25.4
23	2°49.6	187°51.7	45.0	143°59.6	22.7	247°36.8	27.2	4°25.4	25.5
Mer.pass.	22:49	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.55	ν 2.2′	d -0.0′ m -2.16	ν 2.6′	d -0.1′ m 0.65

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°52.0	202°51.3	N03°43.8	159°00.4	S15°23.3	262°39.0	N21°27.2	19°28.0	S03°25.5
1	32°54.5	217°50.9	42.6	174°01.2	23.8	277°41.2	27.1	34°30.7	25.6
2	47°57.0	232°50.5	41.4	189°01.9	24.4	292°43.4	27.1	49°33.3	25.7
3	62°59.4	247°50.1	·· 40.3	204°02.7	·· 24.9	307°45.6	·· 27.1	64°35.9	·· 25.7
4	78°01.9	262°49.7	39.1	219°03.5	25.5	322°47.8	27.0	79°38.5	25.8
5	93°04.4	277°49.3	37.9	234°04.2	26.1	337°50.0	27.0	94°41.2	25.9
6	108°06.8	292°48.9	N03°36.7	249°05.0	S15°26.6	352°52.2	N21°26.9	109°43.8	S03°25.9
7	123°09.3	307°48.5	35.5	264°05.8	27.2	7°54.4	26.9	124°46.4	26.0
8	138°11.7	322°48.1	34.3	279°06.6	27.7	22°56.6	26.9	139°49.0	26.1
9	153°14.2	337°47.7	·· 33.1	294°07.3	·· 28.3	37°58.8	·· 26.8	154°51.7	·· 26.1
10	168°16.7	352°47.3	31.9	309°08.1	28.8	53°01.0	26.8	169°54.3	26.2
11	183°19.1	7°46.9	30.7	324°08.9	29.4	68°03.2	26.8	184°56.9	26.3
12	198°21.6	22°46.5	N03°29.5	339°09.6	S15°30.0	83°05.4	N21°26.7	199°59.6	S03°26.3
13	213°24.1	37°46.1	28.3	354°10.4	30.5	98°07.5	26.7	215°02.2	26.4
14	228°26.5	52°45.8	27.1	9°11.2	31.1	113°09.7	26.6	230°04.8	26.5
15	243°29.0	67°45.4	·· 25.9	24°12.0	·· 31.6	128°11.9	·· 26.6	245°07.4	·· 26.5
16	258°31.5	82°45.0	24.7	39°12.7	32.2	143°14.1	26.6	260°10.1	26.6
17	273°33.9	97°44.6	23.5	54°13.5	32.7	158°16.3	26.5	275°12.7	26.7
18	288°36.4	112°44.2	N03°22.3	69°14.3	S15°33.3	173°18.5	N21°26.5	290°15.3	S03°26.7
19	303°38.8	127°43.8	21.2	84°15.0	33.8	188°20.7	26.5	305°17.9	26.8
20	318°41.3	142°43.4	20.0	99°15.8	34.4	203°22.9	26.4	320°20.6	26.9
21	333°43.8	157°43.0	·· 18.8	114°16.6	·· 35.0	218°25.1	·· 26.4	335°23.2	·· 27.0
22	348°46.2	172°42.6	17.6	129°17.3	35.5	233°27.3	26.3	350°25.8	27.0
23	3°48.7	187°42.2	16.4	144°18.1	36.1	248°29.5	26.3	5°28.5	27.1
Mer.pass.	22:45	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.55	ν 2.2′	d -0.0′ m -2.17	ν 2.6′	d -0.1′ m 0.65

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.8
Diphda	348°46.4	-17°50.6
Achernar	335°19.1	-57°06.2
Hamal	327°50.2	23°35.2
Polaris	313°19.5	89°22.2
Acamar	315°10.9	-40°11.8
Menkar	314°05.2	4°11.6
Mirfak	308°27.0	49°57.1
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.1
Capella	280°20.8	46°01.3
Bellatrix	278°22.1	6°22.5
Elnath	278°01.0	28°37.7
Alnilam	275°37.0	-1°11.0
Betelgeuse	270°51.3	7°24.8
Canopus	263°52.0	-52°42.2
Sirius	258°25.7	-16°44.8
Adhara	255°05.4	-29°00.1
Procyon	244°50.3	5°09.7
Pollux	243°16.6	27°57.8
Avior	234°14.7	-59°35.1
Suhail	222°46.1	-43°31.9
Miaplacidus	221°38.7	-69°49.0
Alphard	217°47.4	-8°46.0
Regulus	207°34.0	11°50.6
Dubhe	193°40.8	61°36.6
Denebola	182°24.6	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.4
Gacrux	171°51.6	-57°15.4
Alioth	166°13.0	55°49.2
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.2
Hadar	148°35.8	-60°29.9
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Kochab	137°20.8	74°03.1
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.3	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.1	51°29.4
Kaus Aust.	83°31.8	-34°22.4
Vega	80°32.9	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.6	-56°39.3
Deneb	49°25.2	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.6
Markab	13°29.0	15°20.8

Oct 07 Tue	SHA	Mer.pass
Venus	187°16.6	10:28
Mars	142°29.2	13:26
Jupiter	245°00.4	06:35
Saturn	1°28.0	22:47

Oct 08 Wed	SHA	Mer.pass
Venus	186°07.9	10:28
Mars	141°48.8	13:25
Jupiter	244°53.6	06:32
Saturn	1°32.0	22:42

Oct 09 Thu	SHA	Mer.pass
Venus	184°59.3	10:29
Mars	141°08.3	13:23
Jupiter	244°47.0	06:28
Saturn	1°36.0	22:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°01.5	S05°31.0	5°52.6	10.3′	N06°35.4	17.4′	60.5′
1	198°01.6	31.9	20°21.9	10.2′	06°52.8	17.3′	60.5′
2	213°01.8	32.9	34°51.2	10.2′	07°10.1	17.3′	60.6′
3	228°02.0	·· 33.8	49°20.3	10.1′	07°27.4	17.3′	60.6′
4	243°02.2	34.8	63°49.5	10.1′	07°44.7	17.3′	60.6′
5	258°02.4	35.8	78°18.5	10.0′	08°02.0	17.2′	60.6′
6	273°02.5	S05°36.7	92°47.5	9.9′	N08°19.2	17.2′	60.6′
7	288°02.7	37.7	107°16.4	9.9′	08°36.4	17.2′	60.6′
8	303°02.9	38.6	121°45.3	9.8′	08°53.6	17.1′	60.7′
9	318°03.1	·· 39.6	136°14.1	9.7′	09°10.7	17.0′	60.7′
10	333°03.3	40.5	150°42.8	9.6′	09°27.7	17.0′	60.7′
11	348°03.4	41.5	165°11.5	9.6′	09°44.7	17.0′	60.7′
12	3°03.6	S05°42.4	179°40.0	9.5′	N10°01.7	16.9′	60.7′
13	18°03.8	43.4	194°08.5	9.4′	10°18.6	16.9′	60.7′
14	33°04.0	44.3	208°37.0	9.4′	10°35.5	16.8′	60.7′
15	48°04.2	·· 45.3	223°05.3	9.3′	10°52.3	16.8′	60.7′
16	63°04.3	46.3	237°33.6	9.2′	11°09.1	16.6′	60.8′
17	78°04.5	47.2	252°01.8	9.1′	11°25.7	16.7′	60.8′
18	93°04.7	S05°48.2	266°29.9	9.0′	N11°42.4	16.5′	60.8′
19	108°04.9	49.1	280°58.0	9.0′	11°58.9	16.5′	60.8′
20	123°05.0	50.1	295°25.9	8.9′	12°15.4	16.5′	60.8′
21	138°05.2	·· 51.0	309°53.8	8.8′	12°31.9	16.3′	60.8′
22	153°05.4	52.0	324°21.6	8.7′	12°48.2	16.3′	60.8′
23	168°05.6	52.9	338°49.3	8.6′	13°04.5	16.2′	60.8′
	SD = 16.0′	d = -1.0′	SD = 16.5′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°05.8	S05°53.9	353°17.0	8.6′	N13°20.7	16.2′	60.8′
1	198°05.9	54.8	7°44.5	8.5′	13°36.9	16.0′	60.8′
2	213°06.1	55.8	22°12.0	8.4′	13°52.9	16.0′	60.8′
3	228°06.3	·· 56.7	36°39.4	8.3′	14°08.9	15.9′	60.8′
4	243°06.5	57.7	51°06.7	8.2′	14°24.8	15.8′	60.8′
5	258°06.6	58.6	65°33.9	8.1′	14°40.6	15.8′	60.8′
6	273°06.8	S05°59.6	80°01.0	8.0′	N14°56.4	15.6′	60.9′
7	288°07.0	06°00.5	94°28.0	7.9′	15°12.0	15.5′	60.9′
8	303°07.2	01.5	108°55.0	7.8′	15°27.5	15.5′	60.9′
9	318°07.3	·· 02.4	123°21.8	7.8′	15°43.0	15.3′	60.9′
10	333°07.5	03.4	137°48.6	7.7′	15°58.3	15.3′	60.9′
11	348°07.7	04.4	152°15.2	7.6′	16°13.6	15.1′	60.9′
12	3°07.9	S06°05.3	166°41.8	7.5′	N16°28.7	15.1′	60.9′
13	18°08.0	06.3	181°08.3	7.4′	16°43.8	14.9′	60.9′
14	33°08.2	07.2	195°34.7	7.3′	16°58.7	14.9′	60.9′
15	48°08.4	·· 08.2	210°01.0	7.2′	17°13.6	14.7′	60.9′
16	63°08.6	09.1	224°27.2	7.1′	17°28.3	14.6′	60.9′
17	78°08.7	10.1	238°53.3	7.0′	17°42.9	14.5′	60.9′
18	93°08.9	S06°11.0	253°19.3	6.9′	N17°57.4	14.4′	60.9′
19	108°09.1	12.0	267°45.2	6.8′	18°11.8	14.3′	60.9′
20	123°09.3	12.9	282°11.1	6.7′	18°26.1	14.1′	60.9′
21	138°09.4	·· 13.9	296°36.8	6.6′	18°40.2	14.0′	60.8′
22	153°09.6	14.8	311°02.4	6.5′	18°54.2	13.9′	60.8′
23	168°09.8	15.8	325°28.0	6.4′	19°08.1	13.8′	60.8′
	SD = 16.0′	d = -1.0′	SD = 16.6′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°10.0	S06°16.7	339°53.4	6.4′	N19°21.9	13.7′	60.8′
1	198°10.1	17.7	354°18.8	6.3′	19°35.6	13.5′	60.8′
2	213°10.3	18.6	8°44.0	6.2′	19°49.1	13.4′	60.8′
3	228°10.5	·· 19.6	23°09.2	6.1′	20°02.5	13.2′	60.8′
4	243°10.6	20.5	37°34.2	6.0′	20°15.7	13.1′	60.8′
5	258°10.8	21.5	51°59.2	5.9′	20°28.8	13.0′	60.8′
6	273°11.0	S06°22.4	66°24.1	5.8′	N20°41.8	12.8′	60.8′
7	288°11.2	23.3	80°48.9	5.7′	20°54.6	12.7′	60.8′
8	303°11.3	24.3	95°13.6	5.6′	21°07.3	12.6′	60.8′
9	318°11.5	·· 25.2	109°38.2	5.5′	21°19.9	12.4′	60.8′
10	333°11.7	26.2	124°02.7	5.4′	21°32.3	12.2′	60.8′
11	348°11.8	27.1	138°27.1	5.3′	21°44.5	12.1′	60.7′
12	3°12.0	S06°28.1	152°51.4	5.2′	N21°56.6	12.0′	60.7′
13	18°12.2	29.0	167°15.6	5.1′	22°08.6	11.7′	60.7′
14	33°12.3	30.0	181°39.8	5.1′	22°20.3	11.7′	60.7′
15	48°12.5	·· 30.9	196°03.8	5.0′	22°32.0	11.5′	60.7′
16	63°12.7	31.9	210°27.8	4.9′	22°43.5	11.3′	60.7′
17	78°12.9	32.8	224°51.7	4.8′	22°54.8	11.1′	60.7′
18	93°13.0	S06°33.8	239°15.5	4.7′	N23°05.9	11.0′	60.7′
19	108°13.2	34.7	253°39.2	4.6′	23°16.9	10.9′	60.6′
20	123°13.4	35.7	268°02.8	4.5′	23°27.8	10.6′	60.6′
21	138°13.5	·· 36.6	282°26.3	4.4′	23°38.4	10.5′	60.6′
22	153°13.7	37.6	296°49.8	4.4′	23°48.9	10.3′	60.6′
23	168°13.9	38.5	311°13.1	4.3′	23°59.2	10.2′	60.6′
	SD = 16.0′	d = -0.9′	SD = 16.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:24	05:44	06:52	16:41	17:49	19:07
N 70°	04:32	05:43	06:45	16:49	17:50	19:00
68°	04:38	05:43	06:39	16:55	17:50	18:55
66°	04:43	05:42	06:34	17:00	17:51	18:50
64°	04:47	05:42	06:30	17:04	17:51	18:46
62°	04:50	05:41	06:26	17:08	17:52	18:43
60°	04:53	05:41	06:23	17:11	17:53	18:41
N 58°	04:55	05:41	06:20	17:14	17:53	18:38
56°	04:57	05:40	06:17	17:17	17:54	18:37
54°	04:59	05:40	06:15	17:19	17:54	18:35
52°	05:00	05:39	06:13	17:21	17:55	18:34
50°	05:01	05:39	06:11	17:23	17:55	18:33
45°	05:04	05:38	06:07	17:27	17:57	18:31
N 40°	05:05	05:36	06:03	17:31	17:58	18:29
35°	05:06	05:35	06:00	17:34	17:59	18:29
30°	05:06	05:34	05:58	17:37	18:01	18:29
20°	05:05	05:31	05:53	17:42	18:04	18:30
N 10°	05:03	05:27	05:48	17:46	18:08	18:32
0°	04:59	05:23	05:44	17:51	18:12	18:36
S 10°	04:54	05:19	05:40	17:55	18:16	18:41
20°	04:47	05:13	05:35	18:00	18:22	18:48
30°	04:37	05:06	05:30	18:06	18:30	18:58
35°	04:31	05:01	05:27	18:09	18:35	19:05
40°	04:23	04:56	05:23	18:13	18:40	19:13
45°	04:13	04:49	05:19	18:17	18:47	19:23
S 50°	04:01	04:41	05:14	18:22	18:56	19:36
52°	03:55	04:37	05:11	18:25	19:00	19:42
54°	03:48	04:32	05:09	18:28	19:04	19:49
56°	03:40	04:27	05:06	18:30	19:09	19:57
58°	03:31	04:22	05:03	18:34	19:15	20:06
S 60°	03:21	04:15	04:59	18:38	19:21	20:17

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	15:44	14:22	▭	07:44	11:00	▭
N 70°	16:01	15:10	▭	07:30	10:15	▭
68°	16:15	15:41	▭	07:19	09:45	▭
66°	16:26	16:05	15:24	07:09	09:23	12:04
64°	16:36	16:23	16:05	07:02	09:06	11:25
62°	16:44	16:39	16:33	06:55	08:52	10:58
60°	16:51	16:52	16:54	06:50	08:40	10:37
N 58°	16:58	17:03	17:12	06:45	08:30	10:20
56°	17:03	17:13	17:27	06:40	08:21	10:06
54°	17:09	17:22	17:40	06:36	08:13	09:54
52°	17:13	17:30	17:52	06:33	08:06	09:43
50°	17:17	17:37	18:02	06:30	08:00	09:33
45°	17:27	17:52	18:24	06:23	07:47	09:13
N 40°	17:34	18:05	18:41	06:17	07:36	08:57
35°	17:41	18:16	18:56	06:12	07:26	08:43
30°	17:47	18:25	19:09	06:08	07:18	08:31
20°	17:57	18:42	19:31	06:00	07:04	08:11
N 10°	18:07	18:56	19:51	05:54	06:52	07:54
0°	18:15	19:10	20:09	05:48	06:41	07:37
S 10°	18:24	19:24	20:27	05:42	06:29	07:21
20°	18:33	19:39	20:47	05:35	06:17	07:04
30°	18:44	19:56	21:10	05:28	06:04	06:44
35°	18:51	20:06	21:24	05:24	05:56	06:33
40°	18:58	20:18	21:40	05:19	05:47	06:20
45°	19:07	20:32	21:59	05:14	05:37	06:05
S 50°	19:17	20:49	22:22	05:07	05:24	05:46
52°	19:22	20:57	22:34	05:04	05:18	05:37
54°	19:27	21:06	22:47	05:01	05:12	05:27
56°	19:33	21:16	23:02	04:57	05:05	05:16
58°	19:40	21:28	23:20	04:53	04:57	05:04
S 60°	19:47	21:42	23:42	04:49	04:48	04:49

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 100-95%
07	12:06	12:14	11:48	–:–	12:01	
08	12:23	12:31	11:47	00:28	12:55	
09	12:40	12:48	11:47	01:24	13:53	

No IERS EOP prediction data available

October 10, 11, 12 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2511 sec ΔT = TT-UT1 = +68.9329 sec

2025 October 10 to Oct. 12 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	18°51.2	202°41.8	N03°15.2	159°18.9	S15°36.6	263°31.7	N21°26.3	20°31.1	S03°27.2
1	33°53.6	217°41.4	14.0	174°19.6	37.2	278°33.9	26.2	35°33.7	27.2
2	48°56.1	232°41.0	12.8	189°20.4	37.7	293°36.1	26.2	50°36.3	27.3
3	63°58.6	247°40.6	·· 11.6	204°21.2	·· 38.3	308°38.3	·· 26.2	65°39.0	·· 27.4
4	79°01.0	262°40.2	10.4	219°21.9	38.8	323°40.5	26.1	80°41.6	27.4
5	94°03.5	277°39.8	09.2	234°22.7	39.4	338°42.7	26.1	95°44.2	27.5
6	109°06.0	292°39.4	N03°08.0	249°23.5	S15°39.9	353°44.9	N21°26.0	110°46.8	S03°27.6
7	124°08.4	307°39.1	06.8	264°24.2	40.5	8°47.1	26.0	125°49.5	27.6
8	139°10.9	322°38.7	05.6	279°25.0	41.0	23°49.3	26.0	140°52.1	27.7
9	154°13.3	337°38.3	·· 04.4	294°25.8	·· 41.6	38°51.5	·· 25.9	155°54.7	·· 27.8
10	169°15.8	352°37.9	03.2	309°26.5	42.1	53°53.7	25.9	170°57.3	27.8
11	184°18.3	7°37.5	02.0	324°27.3	42.7	68°55.9	25.9	186°00.0	27.9
12	199°20.7	22°37.1	N03°00.8	339°28.1	S15°43.2	83°58.1	N21°25.8	201°02.6	S03°28.0
13	214°23.2	37°36.7	02°59.6	354°28.8	43.8	99°00.3	25.8	216°05.2	28.0
14	229°25.7	52°36.3	58.4	9°29.6	44.4	114°02.5	25.7	231°07.8	28.1
15	244°28.1	67°35.9	·· 57.2	24°30.4	·· 44.9	129°04.8	·· 25.7	246°10.5	·· 28.2
16	259°30.6	82°35.5	56.0	39°31.1	45.5	144°07.0	25.7	261°13.1	28.2
17	274°33.1	97°35.1	54.8	54°31.9	46.0	159°09.2	25.6	276°15.7	28.3
18	289°35.5	112°34.7	N02°53.6	69°32.6	S15°46.6	174°11.4	N21°25.6	291°18.4	S03°28.4
19	304°38.0	127°34.3	52.4	84°33.4	47.1	189°13.6	25.6	306°21.0	28.4
20	319°40.5	142°33.9	51.2	99°34.2	47.7	204°15.8	25.5	321°23.6	28.5
21	334°42.9	157°33.6	·· 50.0	114°34.9	·· 48.2	219°18.0	·· 25.5	336°26.2	·· 28.6
22	349°45.4	172°33.2	48.8	129°35.7	48.8	234°20.2	25.5	351°28.9	28.6
23	4°47.8	187°32.8	47.6	144°36.5	49.3	249°22.4	25.4	6°31.5	28.7
Mer.pass.	22:41	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.6′	m 1.54	ν 2.2′	d -0.0′ m -2.17	ν 2.6′	d -0.1′ m 0.66

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	19°50.3	202°32.4	N02°46.4	159°37.2	S15°49.9	264°24.6	N21°25.4	21°34.1	S03°28.8
1	34°52.8	217°32.0	45.2	174°38.0	50.4	279°26.8	25.3	36°36.7	28.8
2	49°55.2	232°31.6	44.0	189°38.7	51.0	294°29.0	25.3	51°39.4	28.9
3	64°57.7	247°31.2	·· 42.8	204°39.5	·· 51.5	309°31.2	·· 25.3	66°42.0	·· 29.0
4	80°00.2	262°30.8	41.6	219°40.3	52.0	324°33.4	25.2	81°44.6	29.0
5	95°02.6	277°30.4	40.4	234°41.0	52.6	339°35.6	25.2	96°47.2	29.1
6	110°05.1	292°30.0	N02°39.2	249°41.8	S15°53.1	354°37.8	N21°25.2	111°49.9	S03°29.2
7	125°07.6	307°29.6	38.0	264°42.5	53.7	9°40.1	25.1	126°52.5	29.2
8	140°10.0	322°29.2	36.8	279°43.3	54.2	24°42.3	25.1	141°55.1	29.3
9	155°12.5	337°28.8	·· 35.6	294°44.1	·· 54.8	39°44.5	·· 25.1	156°57.7	·· 29.4
10	170°15.0	352°28.5	34.4	309°44.8	55.3	54°46.7	25.0	172°00.3	29.4
11	185°17.4	7°28.1	33.2	324°45.6	55.9	69°48.9	25.0	187°03.0	29.5
12	200°19.9	22°27.7	N02°32.0	339°46.3	S15°56.4	84°51.1	N21°24.9	202°05.6	S03°29.6
13	215°22.3	37°27.3	30.8	354°47.1	57.0	99°53.3	24.9	217°08.2	29.6
14	230°24.8	52°26.9	29.5	9°47.8	57.5	114°55.5	24.9	232°10.8	29.7
15	245°27.3	67°26.5	·· 28.3	24°48.6	·· 58.1	129°57.7	·· 24.8	247°13.5	·· 29.8
16	260°29.7	82°26.1	27.1	39°49.4	58.6	144°59.9	24.8	262°16.1	29.8
17	275°32.2	97°25.7	25.9	54°50.1	59.2	160°02.2	24.8	277°18.7	29.9
18	290°34.7	112°25.3	N02°24.7	69°50.9	S15°59.7	175°04.4	N21°24.7	292°21.3	S03°30.0
19	305°37.1	127°24.9	23.5	84°51.6	16°00.3	190°06.6	24.7	307°24.0	30.0
20	320°39.6	142°24.5	22.3	99°52.4	00.8	205°08.8	24.7	322°26.6	30.1
21	335°42.1	157°24.1	·· 21.1	114°53.1	·· 01.3	220°11.0	·· 24.6	337°29.2	·· 30.2
22	350°44.5	172°23.8	19.9	129°53.9	01.9	235°13.2	24.6	352°31.8	30.2
23	5°47.0	187°23.4	18.7	144°54.7	02.4	250°15.4	24.6	7°34.5	30.3
Mer.pass.	22:37	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.5′	m 1.54	ν 2.2′	d -0.0′ m -2.18	ν 2.6′	d -0.1′ m 0.66

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	20°49.5	202°23.0	N02°17.5	159°55.4	S16°03.0	265°17.6	N21°24.5	22°37.1	S03°30.4
1	35°51.9	217°22.6	16.3	174°56.2	03.5	280°19.9	24.5	37°39.7	30.4
2	50°54.4	232°22.2	15.1	189°56.9	04.1	295°22.1	24.4	52°42.3	30.5
3	65°56.8	247°21.8	·· 13.9	204°57.7	·· 04.6	310°24.3	·· 24.4	67°45.0	·· 30.5
4	80°59.3	262°21.4	12.7	219°58.4	05.2	325°26.5	24.4	82°47.6	30.6
5	96°01.8	277°21.0	11.5	234°59.2	05.7	340°28.7	24.3	97°50.2	30.7
6	111°04.2	292°20.6	N02°10.3	249°59.9	S16°06.2	355°30.9	N21°24.3	112°52.8	S03°30.7
7	126°06.7	307°20.2	09.0	265°00.7	06.8	10°33.1	24.3	127°55.4	30.8
8	141°09.2	322°19.8	07.8	280°01.4	07.3	25°35.4	24.2	142°58.1	30.9
9	156°11.6	337°19.4	·· 06.6	295°02.2	·· 07.9	40°37.6	·· 24.2	158°00.7	·· 30.9
10	171°14.1	352°19.1	05.4	310°02.9	08.4	55°39.8	24.2	173°03.3	31.0
11	186°16.6	7°18.7	04.2	325°03.7	09.0	70°42.0	24.1	188°05.9	31.1
12	201°19.0	22°18.3	N02°03.0	340°04.5	S16°09.5	85°44.2	N21°24.1	203°08.6	S03°31.1
13	216°21.5	37°17.9	01.8	355°05.2	10.0	100°46.4	24.1	218°11.2	31.2
14	231°23.9	52°17.5	02°00.6	10°06.0	10.6	115°48.7	24.0	233°13.8	31.3
15	246°26.4	67°17.1	01°59.4	25°06.7	·· 11.1	130°50.9	·· 24.0	248°16.4	·· 31.3
16	261°28.9	82°16.7	58.2	40°07.5	11.7	145°53.1	24.0	263°19.0	31.4
17	276°31.3	97°16.3	57.0	55°08.2	12.2	160°55.3	23.9	278°21.7	31.5
18	291°33.8	112°15.9	N01°55.8	70°09.0	S16°12.8	175°57.5	N21°23.9	293°24.3	S03°31.5
19	306°36.3	127°15.5	54.6	85°09.7	13.3	190°59.8	23.9	308°26.9	31.6
20	321°38.7	142°15.1	53.3	100°10.5	13.8	206°02.0	23.8	323°29.5	31.7
21	336°41.2	157°14.8	·· 52.1	115°11.2	·· 14.4	221°04.2	·· 23.8	338°32.2	·· 31.7
22	351°43.7	172°14.4	50.9	130°12.0	14.9	236°06.4	23.7	353°34.8	31.8
23	6°46.1	187°14.0	49.7	145°12.7	15.5	251°08.6	23.7	8°37.4	31.8
Mer.pass.	22:33	ν -0.4′	d -1.2′	m -3.92	ν 0.8′	d -0.5′	m 1.54	ν 2.2′	d -0.0′ m -2.19	ν 2.6′	d -0.1′ m 0.67

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.1
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.4	-17°50.6
Achernar	335°19.1	-57°06.2
Hamal	327°50.2	23°35.2
Polaris	313°18.2	89°22.2
Acamar	315°10.9	-40°11.8
Menkar	314°05.2	4°11.6
Mirfak	308°27.0	49°57.1
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.1
Capella	280°20.8	46°01.3
Bellatrix	278°22.1	6°22.5
Elnath	278°00.9	28°37.7
Alnilam	275°37.0	-1°11.0
Betelgeuse	270°51.3	7°24.8
Canopus	263°52.0	-52°42.2
Sirius	258°25.7	-16°44.8
Adhara	255°05.4	-29°00.1
Procyon	244°50.2	5°09.6
Pollux	243°16.6	27°57.8
Avior	234°14.7	-59°35.1
Suhail	222°46.1	-43°31.9
Miaplacidus	221°38.6	-69°49.0
Alphard	217°47.3	-8°46.0
Regulus	207°34.0	11°50.5
Dubhe	193°40.8	61°36.6
Denebola	182°24.6	14°25.8
Gienah	175°43.3	-17°41.0
Acrux	173°00.2	-63°14.4
Gacrux	171°51.6	-57°15.3
Alioth	166°13.0	55°49.2
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.6
Kochab	137°20.8	74°03.0
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.3	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.1	51°29.4
Kaus Aust.	83°31.8	-34°22.4
Vega	80°32.9	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.6	-56°39.3
Deneb	49°25.2	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.6
Markab	13°29.0	15°20.8

Oct 10 Fri	SHA	Mer.pass
Venus	183°50.6	10:29
Mars	140°27.7	13:22
Jupiter	244°40.6	06:25
Saturn	1°39.9	22:34

Oct 11 Sat	SHA	Mer.pass
Venus	182°42.1	10:30
Mars	139°46.9	13:21
Jupiter	244°34.3	06:21
Saturn	1°43.8	22:30

Oct 12 Sun	SHA	Mer.pass
Venus	181°33.5	10:31
Mars	139°06.0	13:20
Jupiter	244°28.2	06:18
Saturn	1°47.6	22:26

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°14.0	S06°39.5	325°36.4	4.2′	N24°09.4	10.0′	60.6′
1	198°14.2	40.4	339°59.6	4.1′	24°19.4	9.8′	60.5′
2	213°14.4	41.3	354°22.7	4.1′	24°29.2	9.6′	60.5′
3	228°14.5	·· 42.3	8°45.8	4.0′	24°38.8	9.4′	60.5′
4	243°14.7	43.2	23°08.8	3.9′	24°48.2	9.3′	60.5′
5	258°14.9	44.2	37°31.7	3.8′	24°57.5	9.1′	60.5′
6	273°15.0	S06°45.1	51°54.5	3.8′	N25°06.6	8.9′	60.5′
7	288°15.2	46.1	66°17.3	3.7′	25°15.5	8.7′	60.4′
8	303°15.4	47.0	80°40.0	3.6′	25°24.2	8.6′	60.4′
9	318°15.5	·· 48.0	95°02.6	3.6′	25°32.8	8.3′	60.4′
10	333°15.7	48.9	109°25.2	3.5′	25°41.1	8.2′	60.4′
11	348°15.9	49.8	123°47.7	3.4′	25°49.3	7.9′	60.4′
12	3°16.0	S06°50.8	138°10.1	3.4′	N25°57.2	7.8′	60.3′
13	18°16.2	51.7	152°32.5	3.3′	26°05.0	7.6′	60.3′
14	33°16.4	52.7	166°54.8	3.3′	26°12.6	7.4′	60.3′
15	48°16.5	·· 53.6	181°17.1	3.2′	26°20.0	7.2′	60.3′
16	63°16.7	54.6	195°39.3	3.2′	26°27.2	7.1′	60.3′
17	78°16.9	55.5	210°01.5	3.1′	26°34.3	6.8′	60.2′
18	93°17.0	S06°56.5	224°23.6	3.1′	N26°41.1	6.6′	60.2′
19	108°17.2	57.4	238°45.7	3.0′	26°47.7	6.4′	60.2′
20	123°17.3	58.3	253°07.7	3.0′	26°54.1	6.3′	60.2′
21	138°17.5	06°59.3	267°29.7	2.9′	27°00.4	6.0′	60.1′
22	153°17.7	07°00.2	281°51.6	2.9′	27°06.4	5.8′	60.1′
23	168°17.8	01.2	296°13.5	2.9′	27°12.2	5.6′	60.1′
	SD = 16.0′	d = -0.9′	SD = 16.5′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°18.0	S07°02.1	310°35.4	2.8′	N27°17.8	5.5′	60.1′
1	198°18.2	03.1	324°57.3	2.8′	27°23.3	5.2′	60.0′
2	213°18.3	04.0	339°19.1	2.8′	27°28.5	5.0′	60.0′
3	228°18.5	·· 04.9	353°40.9	2.8′	27°33.5	4.9′	60.0′
4	243°18.6	05.9	8°02.6	2.7′	27°38.4	4.6′	60.0′
5	258°18.8	06.8	22°24.4	2.7′	27°43.0	4.4′	59.9′
6	273°19.0	S07°07.8	36°46.1	2.7′	N27°47.4	4.2′	59.9′
7	288°19.1	08.7	51°07.8	2.7′	27°51.6	4.0′	59.9′
8	303°19.3	09.6	65°29.5	2.7′	27°55.6	3.9′	59.9′
9	318°19.4	·· 10.6	79°51.2	2.7′	27°59.5	3.6′	59.8′
10	333°19.6	11.5	94°12.9	2.7′	28°03.1	3.4′	59.8′
11	348°19.8	12.5	108°34.6	2.7′	28°06.5	3.2′	59.8′
12	3°19.9	S07°13.4	122°56.2	2.7′	N28°09.7	3.0′	59.8′
13	18°20.1	14.3	137°17.9	2.7′	28°12.7	2.7′	59.7′
14	33°20.2	15.3	151°39.6	2.7′	28°15.4	2.6′	59.7′
15	48°20.4	·· 16.2	166°01.3	2.7′	28°18.0	2.4′	59.7′
16	63°20.6	17.2	180°23.0	2.7′	28°20.4	2.2′	59.6′
17	78°20.7	18.1	194°44.7	2.7′	28°22.6	2.0′	59.6′
18	93°20.9	S07°19.0	209°06.4	2.7′	N28°24.6	1.7′	59.6′
19	108°21.0	20.0	223°28.1	2.8′	28°26.3	1.6′	59.6′
20	123°21.2	20.9	237°49.9	2.8′	28°27.9	1.3′	59.5′
21	138°21.4	·· 21.9	252°11.7	2.8′	28°29.2	1.2′	59.5′
22	153°21.5	22.8	266°33.5	2.8′	28°30.4	1.0′	59.5′
23	168°21.7	23.7	280°55.3	2.9′	28°31.4	0.7′	59.4′
	SD = 16.0′	d = -0.9′	SD = 16.4′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°21.8	S07°24.7	295°17.2	2.9′	N28°32.1	0.6′	59.4′
1	198°22.0	25.6	309°39.1	2.9′	28°32.7	0.3′	59.4′
2	213°22.1	26.6	324°01.0	3.0′	28°33.0	0.2′	59.4′
3	228°22.3	·· 27.5	338°23.0	3.0′	28°33.2	0.1′	59.3′
4	243°22.5	28.4	352°45.0	3.1′	28°33.1	0.2′	59.3′
5	258°22.6	29.4	7°07.1	3.1′	28°32.9	0.5′	59.3′
6	273°22.8	S07°30.3	21°29.2	3.2′	N28°32.4	0.6′	59.2′
7	288°22.9	31.2	35°51.3	3.2′	28°31.8	0.9′	59.2′
8	303°23.1	32.2	50°13.5	3.3′	28°30.9	1.0′	59.2′
9	318°23.2	·· 33.1	64°35.8	3.3′	28°29.9	1.3′	59.1′
10	333°23.4	34.0	78°58.1	3.4′	28°28.6	1.4′	59.1′
11	348°23.5	35.0	93°20.5	3.4′	28°27.2	1.6′	59.1′
12	3°23.7	S07°35.9	107°43.0	3.5′	N28°25.6	1.9′	59.1′
13	18°23.9	36.9	122°05.5	3.6′	28°23.7	2.0′	59.0′
14	33°24.0	37.8	136°28.1	3.6′	28°21.7	2.2′	59.0′
15	48°24.2	·· 38.7	150°50.7	3.7′	28°19.5	2.4′	59.0′
16	63°24.3	39.7	165°13.4	3.8′	28°17.1	2.5′	58.9′
17	78°24.5	40.6	179°36.2	3.9′	28°14.6	2.8′	58.9′
18	93°24.6	S07°41.5	193°59.1	4.0′	N28°11.8	3.0′	58.9′
19	108°24.8	42.5	208°22.0	4.0′	28°08.8	3.1′	58.8′
20	123°24.9	43.4	222°45.1	4.1′	28°05.7	3.3′	58.8′
21	138°25.1	·· 44.3	237°08.2	4.2′	28°02.4	3.5′	58.8′
22	153°25.2	45.3	251°31.4	4.3′	27°58.9	3.7′	58.7′
23	168°25.4	46.2	265°54.7	4.4′	27°55.2	3.9′	58.7′
	SD = 16.0′	d = -0.9′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:38	05:57	07:06	16:26	17:34	18:52
N 70°	04:44	05:55	06:57	16:35	17:36	18:47
68°	04:49	05:53	06:50	16:42	17:38	18:42
66°	04:52	05:52	06:44	16:48	17:40	18:39
64°	04:55	05:50	06:38	16:54	17:41	18:36
62°	04:58	05:49	06:34	16:58	17:43	18:34
60°	05:00	05:48	06:30	17:02	17:44	18:32
N 58°	05:02	05:47	06:27	17:06	17:45	18:30
56°	05:03	05:46	06:23	17:09	17:46	18:29
54°	05:04	05:45	06:21	17:12	17:47	18:28
52°	05:05	05:44	06:18	17:14	17:48	18:27
50°	05:06	05:43	06:16	17:17	17:49	18:26
45°	05:07	05:41	06:11	17:22	17:51	18:25
N 40°	05:08	05:39	06:06	17:26	17:53	18:25
35°	05:08	05:37	06:03	17:30	17:55	18:25
30°	05:08	05:35	05:59	17:33	17:57	18:25
20°	05:06	05:31	05:54	17:39	18:02	18:27
N 10°	05:03	05:27	05:48	17:45	18:06	18:30
0°	04:58	05:23	05:43	17:50	18:11	18:35
S 10°	04:52	05:17	05:38	17:55	18:16	18:41
20°	04:44	05:10	05:33	18:01	18:23	18:49
30°	04:34	05:02	05:26	18:07	18:32	19:00
35°	04:27	04:57	05:23	18:11	18:37	19:08
40°	04:18	04:51	05:18	18:16	18:43	19:16
45°	04:07	04:43	05:13	18:21	18:51	19:27
S 50°	03:54	04:34	05:07	18:27	19:01	19:41
52°	03:47	04:30	05:04	18:30	19:05	19:48
54°	03:39	04:25	05:01	18:33	19:10	19:56
56°	03:31	04:19	04:58	18:37	19:16	20:04
58°	03:21	04:13	04:54	18:41	19:22	20:15
S 60°	03:09	04:06	04:50	18:45	19:29	20:27

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°						
N 70°						
68°						
66°						
64°						
62°	16:24			13:15		
60°	17:03	17:28	18:37	12:37	14:25	15:30
N 58°	17:30	18:07	19:14	12:11	13:47	14:52
56°	17:51	18:34	19:41	11:50	13:21	14:26
54°	18:09	18:55	20:02	11:32	12:59	14:05
52°	18:24	19:13	20:19	11:17	12:42	13:47
50°	18:38	19:28	20:34	11:05	12:27	13:32
45°	19:05	19:58	21:04	10:38	11:56	13:01
N 40°	19:27	20:22	21:27	10:17	11:33	12:38
35°	19:45	20:42	21:47	10:00	11:13	12:18
30°	20:00	20:59	22:03	09:45	10:57	12:01
20°	20:27	21:28	22:31	09:20	10:28	11:33
N 10°	20:50	21:52	22:55	08:58	10:04	11:08
0°	21:11	22:15	23:18	08:38	09:42	10:45
S 10°	21:33	22:38	23:40	08:18	09:19	10:22
20°	21:56	23:03	·· ··	07:57	08:55	09:58
30°	22:23	23:32	·· ··	07:32	08:27	09:29
35°	22:39	23:49	·· ··	07:17	08:10	09:12
40°	22:58	·· ··	00:09	07:01	07:51	08:52
45°	23:21	·· ··	00:33	06:41	07:28	08:28
S 50°	23:50	·· ··	01:05	06:16	06:58	07:56
52°	·· ··	00:05	01:20	06:04	06:43	07:40
54°	·· ··	00:22	01:39	05:50	06:26	07:22
56°	·· ··	00:42	02:01	05:34	06:05	07:00
58°	·· ··	01:07	02:30	05:15	05:40	06:31
S 60°	·· ··	01:42	03:13	04:52	05:05	05:48

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 88-69%
10	12:56	13:04	11:47	02:23	14:55	
11	13:12	13:20	11:47	03:26	15:58	
12	13:27	13:35	11:46	04:30	17:02	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2517 sec ΔT = TT-UT1 = +68.9323 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	21°48.6	202°13.6	N01°48.5	160°13.5	S16°16.0	266°10.9	N21°23.7	23°40.0	S03°31.9
1	36°51.1	217°13.2	47.3	175°14.2	16.5	281°13.1	23.6	38°42.6	32.0
2	51°53.5	232°12.8	46.1	190°14.9	17.1	296°15.3	23.6	53°45.3	32.0
3	66°56.0	247°12.4	·· 44.9	205°15.7	·· 17.6	311°17.5	·· 23.6	68°47.9	·· 32.1
4	81°58.4	262°12.0	43.7	220°16.4	18.2	326°19.7	23.5	83°50.5	32.2
5	97°00.9	277°11.6	42.5	235°17.2	18.7	341°22.0	23.5	98°53.1	32.2
6	112°03.4	292°11.2	N01°41.2	250°17.9	S16°19.2	356°24.2	N21°23.5	113°55.7	S03°32.3
7	127°05.8	307°10.8	40.0	265°18.7	19.8	11°26.4	23.4	128°58.4	32.4
8	142°08.3	322°10.5	38.8	280°19.4	20.3	26°28.6	23.4	144°01.0	32.4
9	157°10.8	337°10.1	·· 37.6	295°20.2	·· 20.9	41°30.9	·· 23.4	159°03.6	·· 32.5
10	172°13.2	352°09.7	36.4	310°20.9	21.4	56°33.1	23.3	174°06.2	32.6
11	187°15.7	7°09.3	35.2	325°21.7	21.9	71°35.3	23.3	189°08.8	32.6
12	202°18.2	22°08.9	N01°34.0	340°22.4	S16°22.5	86°37.5	N21°23.3	204°11.5	S03°32.7
13	217°20.6	37°08.5	32.8	355°23.2	23.0	101°39.8	23.2	219°14.1	32.7
14	232°23.1	52°08.1	31.5	10°23.9	23.5	116°42.0	23.2	234°16.7	32.8
15	247°25.6	67°07.7	·· 30.3	25°24.6	·· 24.1	131°44.2	·· 23.2	249°19.3	·· 32.9
16	262°28.0	82°07.3	29.1	40°25.4	24.6	146°46.4	23.1	264°21.9	32.9
17	277°30.5	97°06.9	27.9	55°26.1	25.2	161°48.7	23.1	279°24.6	33.0
18	292°32.9	112°06.6	N01°26.7	70°26.9	S16°25.7	176°50.9	N21°23.1	294°27.2	S03°33.1
19	307°35.4	127°06.2	25.5	85°27.6	26.2	191°53.1	23.0	309°29.8	33.1
20	322°37.9	142°05.8	24.3	100°28.4	26.8	206°55.3	23.0	324°32.4	33.2
21	337°40.3	157°05.4	·· 23.1	115°29.1	·· 27.3	221°57.6	·· 23.0	339°35.0	·· 33.3
22	352°42.8	172°05.0	21.8	130°29.9	27.8	236°59.8	22.9	354°37.7	33.3
23	7°45.3	187°04.6	20.6	145°30.6	28.4	252°02.0	22.9	9°40.3	33.4
Mer.pass.	22:29	ν -0.4′	d -1.2′	ν 0.7′	d -0.5′	ν 2.2′	d -0.0′	ν 2.6′	d -0.1′
		m -3.92		m 1.53		m -2.19		m 0.67	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	22°47.7	202°04.2	N01°19.4	160°31.3	S16°28.9	267°04.2	N21°22.9	24°42.9	S03°33.4
1	37°50.2	217°03.8	18.2	175°32.1	29.4	282°06.5	22.8	39°45.5	33.5
2	52°52.7	232°03.4	17.0	190°32.8	30.0	297°08.7	22.8	54°48.1	33.6
3	67°55.1	247°03.0	·· 15.8	205°33.6	·· 30.5	312°10.9	·· 22.8	69°50.8	·· 33.6
4	82°57.6	262°02.6	14.6	220°34.3	31.0	327°13.2	22.7	84°53.4	33.7
5	98°00.1	277°02.3	13.4	235°35.0	31.6	342°15.4	22.7	99°56.0	33.8
6	113°02.5	292°01.9	N01°12.1	250°35.8	S16°32.1	357°17.6	N21°22.7	114°58.6	S03°33.8
7	128°05.0	307°01.5	10.9	265°36.5	32.7	12°19.8	22.6	130°01.2	33.9
8	143°07.4	322°01.1	09.7	280°37.3	33.2	27°22.1	22.6	145°03.9	34.0
9	158°09.9	337°00.7	·· 08.5	295°38.0	·· 33.7	42°24.3	·· 22.6	160°06.5	·· 34.0
10	173°12.4	352°00.3	07.3	310°38.7	34.3	57°26.5	22.5	175°09.1	34.1
11	188°14.8	6°59.9	06.1	325°39.5	34.8	72°28.8	22.5	190°11.7	34.1
12	203°17.3	21°59.5	N01°04.9	340°40.2	S16°35.3	87°31.0	N21°22.5	205°14.3	S03°34.2
13	218°19.8	36°59.1	03.6	355°41.0	35.9	102°33.2	22.4	220°17.0	34.3
14	233°22.2	51°58.7	02.4	10°41.7	36.4	117°35.5	22.4	235°19.6	34.3
15	248°24.7	66°58.3	·· 01.2	25°42.4	·· 36.9	132°37.7	·· 22.4	250°22.2	·· 34.4
16	263°27.2	81°58.0	01°00.0	40°43.2	37.4	147°39.9	22.3	265°24.8	34.5
17	278°29.6	96°57.6	00°58.8	55°43.9	38.0	162°42.2	22.3	280°27.4	34.5
18	293°32.1	111°57.2	N00°57.6	70°44.7	S16°38.5	177°44.4	N21°22.3	295°30.0	S03°34.6
19	308°34.6	126°56.8	56.3	85°45.4	39.0	192°46.6	22.2	310°32.7	34.6
20	323°37.0	141°56.4	55.1	100°46.1	39.6	207°48.9	22.2	325°35.3	34.7
21	338°39.5	156°56.0	·· 53.9	115°46.9	·· 40.1	222°51.1	·· 22.2	340°37.9	·· 34.8
22	353°41.9	171°55.6	52.7	130°47.6	40.6	237°53.3	22.1	355°40.5	34.8
23	8°44.4	186°55.2	51.5	145°48.3	41.2	252°55.6	22.1	10°43.1	34.9
Mer.pass.	22:25	ν -0.4′	d -1.2′	ν 0.7′	d -0.5′	ν 2.2′	d -0.0′	ν 2.6′	d -0.1′
		m -3.92		m 1.53		m -2.20		m 0.68	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	23°46.9	201°54.8	N00°50.3	160°49.1	S16°41.7	267°57.8	N21°22.1	25°45.7	S03°35.0
1	38°49.3	216°54.4	49.1	175°49.8	42.2	283°00.0	22.1	40°48.4	35.0
2	53°51.8	231°54.1	47.8	190°50.5	42.8	298°02.3	22.0	55°51.0	35.1
3	68°54.3	246°53.7	·· 46.6	205°51.3	·· 43.3	313°04.5	·· 22.0	70°53.6	·· 35.1
4	83°56.7	261°53.3	45.4	220°52.0	43.8	328°06.8	22.0	85°56.2	35.2
5	98°59.2	276°52.9	44.2	235°52.7	44.3	343°09.0	21.9	100°58.8	35.3
6	114°01.7	291°52.5	N00°43.0	250°53.5	S16°44.9	358°11.2	N21°21.9	116°01.5	S03°35.3
7	129°04.1	306°52.1	41.8	265°54.2	45.4	13°13.5	21.9	131°04.1	35.4
8	144°06.6	321°51.7	40.5	280°54.9	45.9	28°15.7	21.8	146°06.7	35.5
9	159°09.0	336°51.3	·· 39.3	295°55.7	·· 46.5	43°17.9	·· 21.8	161°09.3	·· 35.5
10	174°11.5	351°50.9	38.1	310°56.4	47.0	58°20.2	21.8	176°11.9	35.6
11	189°14.0	6°50.5	36.9	325°57.1	47.5	73°22.4	21.7	191°14.5	35.6
12	204°16.4	21°50.1	N00°35.7	340°57.9	S16°48.0	88°24.7	N21°21.7	206°17.2	S03°35.7
13	219°18.9	36°49.8	34.4	355°58.6	48.6	103°26.9	21.7	221°19.8	35.8
14	234°21.4	51°49.4	33.2	10°59.3	49.1	118°29.1	21.6	236°22.4	35.8
15	249°23.8	66°49.0	·· 32.0	26°00.1	·· 49.6	133°31.4	·· 21.6	251°25.0	·· 35.9
16	264°26.3	81°48.6	30.8	41°00.8	50.2	148°33.6	21.6	266°27.6	36.0
17	279°28.8	96°48.2	29.6	56°01.5	50.7	163°35.9	21.5	281°30.2	36.0
18	294°31.2	111°47.8	N00°28.4	71°02.3	S16°51.2	178°38.1	N21°21.5	296°32.8	S03°36.1
19	309°33.7	126°47.4	27.1	86°03.0	51.7	193°40.3	21.5	311°35.5	36.1
20	324°36.2	141°47.0	25.9	101°03.7	52.3	208°42.6	21.4	326°38.1	36.2
21	339°38.6	156°46.6	·· 24.7	116°04.5	·· 52.8	223°44.8	·· 21.4	341°40.7	·· 36.3
22	354°41.1	171°46.2	23.5	131°05.2	53.3	238°47.1	21.4	356°43.3	36.3
23	9°43.5	186°45.8	22.3	146°05.9	53.8	253°49.3	21.4	11°45.9	36.4
Mer.pass.	22:21	ν -0.4′	d -1.2′	ν 0.7′	d -0.5′	ν 2.2′	d -0.0′	ν 2.6′	d -0.1′
		m -3.92		m 1.53		m -2.21		m 0.68	

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.2
Hamal	327°50.2	23°35.2
Polaris	313°17.1	89°22.2
Acamar	315°10.9	-40°11.9
Menkar	314°05.2	4°11.6
Mirfak	308°26.9	49°57.1
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.1
Capella	280°20.7	46°01.3
Bellatrix	278°22.0	6°22.5
Elnath	278°00.9	28°37.7
Alnilam	275°36.9	-1°11.0
Betelgeuse	270°51.3	7°24.8
Canopus	263°52.0	-52°42.2
Sirius	258°25.6	-16°44.8
Adhara	255°05.3	-29°00.1
Procyon	244°50.2	5°09.6
Pollux	243°16.6	27°57.8
Avior	234°14.7	-59°35.1
Suhail	222°46.1	-43°31.9
Miaplacidus	221°38.6	-69°49.0
Alphard	217°47.3	-8°46.0
Regulus	207°34.0	11°50.5
Dubhe	193°40.8	61°36.6
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.4
Gacrux	171°51.6	-57°15.3
Alioth	166°13.0	55°49.2
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.8	74°03.0
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.3	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.1	51°29.4
Kaus Aust.	83°31.8	-34°22.4
Vega	80°32.9	38°48.7
Nunki	75°47.0	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.6	-56°39.3
Deneb	49°25.3	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.8	-46°50.2
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.6
Markab	13°29.0	15°20.8

Oct 13 Mon	SHA	Mer.pass
Venus	180°25.0	10:31
Mars	138°24.9	13:18
Jupiter	244°22.3	06:14
Saturn	1°51.4	22:21

Oct 14 Tue	SHA	Mer.pass
Venus	179°16.5	10:32
Mars	137°43.6	13:17
Jupiter	244°16.5	06:11
Saturn	1°55.2	22:17

Oct 15 Wed	SHA	Mer.pass
Venus	178°08.0	10:33
Mars	137°02.2	13:16
Jupiter	244°10.9	06:07
Saturn	1°58.9	22:13

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°25.5	S07°47.1	280°18.1	4.5′	N27°51.3	4.0′	58.7′
1	198°25.7	48.1	294°41.5	4.6′	27°47.3	4.3′	58.6′
2	213°25.8	49.0	309°05.1	4.7′	27°43.0	4.4′	58.6′
3	228°26.0	·· 49.9	323°28.7	4.7′	27°38.6	4.5′	58.6′
4	243°26.1	50.9	337°52.5	4.8′	27°34.1	4.8′	58.6′
5	258°26.3	51.8	352°16.3	4.9′	27°29.3	4.9′	58.5′
6	273°26.4	S07°52.7	6°40.3	5.0′	N27°24.4	5.1′	58.5′
7	288°26.6	53.7	21°04.3	5.1′	27°19.3	5.3′	58.5′
8	303°26.7	54.6	35°28.4	5.2′	27°14.0	5.4′	58.4′
9	318°26.9	·· 55.5	49°52.7	5.4′	27°08.6	5.6′	58.4′
10	333°27.0	56.5	64°17.0	5.5′	27°03.0	5.7′	58.4′
11	348°27.2	57.4	78°41.5	5.6′	26°57.3	6.0′	58.3′
12	3°27.3	S07°58.3	93°06.1	5.7′	N26°51.3	6.1′	58.3′
13	18°27.5	07°59.3	107°30.7	5.8′	26°45.2	6.2′	58.3′
14	33°27.6	08°00.2	121°55.5	5.9′	26°39.0	6.4′	58.2′
15	48°27.8	·· 01.1	136°20.4	6.0′	26°32.6	6.6′	58.2′
16	63°27.9	02.1	150°45.4	6.1′	26°26.0	6.7′	58.2′
17	78°28.1	03.0	165°10.5	6.2′	26°19.3	6.8′	58.1′
18	93°28.2	S08°03.9	179°35.8	6.3′	N26°12.5	7.1′	58.1′
19	108°28.4	04.9	194°01.1	6.5′	26°05.4	7.1′	58.1′
20	123°28.5	05.8	208°26.6	6.6′	25°58.3	7.3′	58.1′
21	138°28.7	·· 06.7	222°52.2	6.7′	25°51.0	7.5′	58.0′
22	153°28.8	07.6	237°17.9	6.8′	25°43.5	7.6′	58.0′
23	168°29.0	08.6	251°43.7	6.9′	25°35.9	7.8′	58.0′
	SD = 16.0′	d = -0.9′	SD = 16.0′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.1	S08°09.5	266°09.6	7.0′	N25°28.1	7.9′	57.9′
1	198°29.3	10.4	280°35.6	7.2′	25°20.2	8.0′	57.9′
2	213°29.4	11.4	295°01.8	7.3′	25°12.2	8.2′	57.9′
3	228°29.5	·· 12.3	309°28.1	7.4′	25°04.0	8.3′	57.8′
4	243°29.7	13.2	323°54.5	7.5′	24°55.7	8.4′	57.8′
5	258°29.8	14.1	338°21.0	7.6′	24°47.3	8.6′	57.8′
6	273°30.0	S08°15.1	352°47.6	7.8′	N24°38.7	8.7′	57.7′
7	288°30.1	16.0	7°14.4	7.9′	24°30.0	8.8′	57.7′
8	303°30.3	16.9	21°41.3	8.0′	24°21.2	9.0′	57.7′
9	318°30.4	·· 17.9	36°08.3	8.1′	24°12.2	9.1′	57.6′
10	333°30.6	18.8	50°35.4	8.2′	24°03.1	9.2′	57.6′
11	348°30.7	19.7	65°02.6	8.4′	23°53.9	9.4′	57.6′
12	3°30.8	S08°20.6	79°30.0	8.5′	N23°44.5	9.4′	57.6′
13	18°31.0	21.6	93°57.5	8.6′	23°35.1	9.6′	57.5′
14	33°31.1	22.5	108°25.1	8.7′	23°25.5	9.7′	57.5′
15	48°31.3	·· 23.4	122°52.8	8.8′	23°15.8	9.9′	57.5′
16	63°31.4	24.4	137°20.7	9.0′	23°05.9	9.9′	57.4′
17	78°31.6	25.3	151°48.6	9.1′	22°56.0	10.0′	57.4′
18	93°31.7	S08°26.2	166°16.7	9.2′	N22°46.0	10.2′	57.4′
19	108°31.8	27.1	180°44.9	9.3′	22°35.8	10.3′	57.3′
20	123°32.0	28.1	195°13.2	9.4′	22°25.5	10.4′	57.3′
21	138°32.1	·· 29.0	209°41.7	9.6′	22°15.1	10.5′	57.3′
22	153°32.3	29.9	224°10.2	9.7′	22°04.6	10.6′	57.3′
23	168°32.4	30.8	238°38.9	9.8′	21°54.0	10.7′	57.2′
	SD = 16.0′	d = -0.9′	SD = 15.8′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°32.5	S08°31.8	253°07.7	9.9′	N21°43.3	10.8′	57.2′
1	198°32.7	32.7	267°36.6	10.0′	21°32.5	10.9′	57.2′
2	213°32.8	33.6	282°05.6	10.1′	21°21.6	11.0′	57.1′
3	228°33.0	·· 34.5	296°34.8	10.3′	21°10.6	11.1′	57.1′
4	243°33.1	35.5	311°04.0	10.4′	20°59.5	11.2′	57.1′
5	258°33.2	36.4	325°33.4	10.5′	20°48.3	11.2′	57.1′
6	273°33.4	S08°37.3	340°02.9	10.6′	N20°37.1	11.4′	57.0′
7	288°33.5	38.2	354°32.5	10.7′	20°25.7	11.5′	57.0′
8	303°33.6	39.1	9°02.2	10.8′	20°14.2	11.6′	57.0′
9	318°33.8	·· 40.1	23°32.0	10.9′	20°02.6	11.6′	56.9′
10	333°33.9	41.0	38°02.0	11.0′	19°51.0	11.8′	56.9′
11	348°34.1	41.9	52°32.0	11.2′	19°39.2	11.8′	56.9′
12	3°34.2	S08°42.8	67°02.2	11.3′	N19°27.4	11.9′	56.9′
13	18°34.3	43.8	81°32.4	11.4′	19°15.5	12.0′	56.8′
14	33°34.5	44.7	96°02.8	11.5′	19°03.5	12.1′	56.8′
15	48°34.6	·· 45.6	110°33.3	11.6′	18°51.4	12.1′	56.8′
16	63°34.7	46.5	125°03.9	11.7′	18°39.3	12.2′	56.7′
17	78°34.9	47.4	139°34.5	11.8′	18°27.1	12.3′	56.7′
18	93°35.0	S08°48.4	154°05.3	11.9′	N18°14.8	12.4′	56.7′
19	108°35.2	49.3	168°36.2	12.0′	18°02.4	12.5′	56.7′
20	123°35.3	50.2	183°07.2	12.1′	17°49.9	12.5′	56.6′
21	138°35.4	·· 51.1	197°38.3	12.2′	17°37.4	12.6′	56.6′
22	153°35.6	52.0	212°09.5	12.3′	17°24.8	12.7′	56.6′
23	168°35.7	53.0	226°40.8	12.4′	17°12.1	12.7′	56.6′
	SD = 16.0′	d = -0.9′	SD = 15.6′				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	04:52	06:10	07:20	16:10	17:20	18:37
N 70°	04:56	06:07	07:10	16:21	17:23	18:34
68°	04:59	06:04	07:01	16:30	17:26	18:31
66°	05:02	06:01	06:53	16:37	17:29	18:28
64°	05:04	05:59	06:47	16:43	17:31	18:26
62°	05:06	05:57	06:42	16:49	17:34	18:25
60°	05:07	05:55	06:37	16:53	17:35	18:23
N 58°	05:08	05:54	06:33	16:58	17:37	18:22
56°	05:09	05:52	06:30	17:01	17:39	18:22
54°	05:10	05:51	06:26	17:05	17:40	18:21
52°	05:10	05:49	06:23	17:08	17:42	18:21
50°	05:11	05:48	06:21	17:11	17:43	18:20
45°	05:11	05:45	06:15	17:17	17:46	18:20
N 40°	05:11	05:42	06:10	17:22	17:49	18:20
35°	05:10	05:40	06:05	17:26	17:52	18:21
30°	05:09	05:37	06:01	17:30	17:54	18:22
20°	05:07	05:32	05:55	17:37	17:59	18:25
N 10°	05:03	05:27	05:48	17:43	18:04	18:29
0°	04:58	05:22	05:43	17:49	18:10	18:34
S 10°	04:51	05:15	05:37	17:55	18:17	18:41
20°	04:42	05:08	05:30	18:02	18:24	18:50
30°	04:30	04:59	05:23	18:09	18:34	19:03
35°	04:22	04:53	05:19	18:14	18:40	19:10
40°	04:13	04:46	05:14	18:19	18:47	19:20
45°	04:01	04:38	05:08	18:25	18:55	19:32
S 50°	03:46	04:27	05:01	18:32	19:06	19:47
52°	03:39	04:22	04:58	18:35	19:11	19:54
54°	03:31	04:17	04:54	18:39	19:16	20:03
56°	03:22	04:11	04:50	18:43	19:23	20:12
58°	03:11	04:04	04:46	18:47	19:30	20:24
S 60°	02:58	03:56	04:41	18:53	19:38	20:37

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°			20:40			19:17
N 70°			21:56			18:00
68°			22:33			17:21
66°		20:35	22:59		17:34	16:54
64°		21:17	23:18		16:51	16:33
62°	19:42	21:45	23:34	16:30	16:22	16:16
60°	20:20	22:07	23:48	15:52	15:59	16:02
N 58°	20:46	22:24	23:59	15:25	15:41	15:49
56°	21:07	22:39	·· ··	15:04	15:26	15:39
54°	21:24	22:52	·· ··	14:47	15:13	15:29
52°	21:39	23:03	·· ··	14:32	15:01	15:21
50°	21:51	23:13	·· ··	14:19	14:51	15:13
45°	22:17	23:33	·· ··	13:52	14:29	14:57
N 40°	22:38	23:50	·· ··	13:30	14:11	14:43
35°	22:55	·· ··	00:04	13:12	13:56	14:32
30°	23:10	·· ··	00:16	12:57	13:43	14:22
20°	23:35	·· ··	00:36	12:30	13:21	14:04
N 10°	23:57	·· ··	00:54	12:08	13:01	13:49
0°	·· ··	00:17	01:10	11:46	12:43	13:34
S 10°	·· ··	00:37	01:27	11:25	12:25	13:20
20°	00:04	00:58	01:44	11:02	12:05	13:04
30°	00:32	01:23	02:05	10:35	11:42	12:46
35°	00:48	01:37	02:16	10:19	11:28	12:35
40°	01:07	01:54	02:30	10:00	11:12	12:23
45°	01:31	02:13	02:45	09:38	10:53	12:09
S 50°	02:00	02:38	03:05	09:09	10:30	11:51
52°	02:15	02:50	03:14	08:55	10:18	11:42
54°	02:31	03:04	03:24	08:38	10:05	11:33
56°	02:51	03:19	03:35	08:18	09:50	11:22
58°	03:16	03:38	03:48	07:54	09:32	11:10
S 60°	03:50	04:01	04:04	07:20	09:10	10:55

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	22-24
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-37%
13	13:42	13:49	11:46	05:32	18:02	
14	13:56	14:03	11:46	06:30	18:57	
15	14:10	14:17	11:46	07:23	19:47	

No IERS EOP prediction data available

October 16, 17, 18 UT (Thu., Fri., Sat.)

DUT1 = UT1-UTC = +0.2524 sec ΔT = TT-UT1 = +68.9316 sec

2025 October 16 to Oct. 18 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	24°46.0	201°45.5	N00°21.1	161°06.6	S16°54.4	268°51.5	N21°21.3	26°48.5	S03°36.4
1	39°48.5	216°45.1	19.8	176°07.4	54.9	283°53.8	21.3	41°51.2	36.5
2	54°50.9	231°44.7	18.6	191°08.1	55.4	298°56.0	21.3	56°53.8	36.6
3	69°53.4	246°44.3	·· 17.4	206°08.8	·· 55.9	313°58.3	·· 21.2	71°56.4	·· 36.6
4	84°55.9	261°43.9	16.2	221°09.6	56.5	329°00.5	21.2	86°59.0	36.7
5	99°58.3	276°43.5	15.0	236°10.3	57.0	344°02.8	21.2	102°01.6	36.8
6	115°00.8	291°43.1	N00°13.7	251°11.0	S16°57.5	359°05.0	N21°21.1	117°04.2	S03°36.8
7	130°03.3	306°42.7	12.5	266°11.7	58.0	14°07.3	21.1	132°06.8	36.9
8	145°05.7	321°42.3	11.3	281°12.5	58.6	29°09.5	21.1	147°09.5	36.9
9	160°08.2	336°41.9	·· 10.1	296°13.2	·· 59.1	44°11.7	·· 21.0	162°12.1	·· 37.0
10	175°10.7	351°41.5	08.9	311°13.9	16°59.6	59°14.0	21.0	177°14.7	37.1
11	190°13.1	6°41.1	07.6	326°14.6	17°00.1	74°16.2	21.0	192°17.3	37.1
12	205°15.6	21°40.8	N00°06.4	341°15.4	S17°00.7	89°18.5	N21°21.0	207°19.9	S03°37.2
13	220°18.0	36°40.4	05.2	356°16.1	01.2	104°20.7	20.9	222°22.5	37.2
14	235°20.5	51°40.0	04.0	11°16.8	01.7	119°23.0	20.9	237°25.1	37.3
15	250°23.0	66°39.6	·· 02.8	26°17.5	·· 02.2	134°25.2	·· 20.9	252°27.8	·· 37.4
16	265°25.4	81°39.2	01.5	41°18.3	02.7	149°27.5	20.8	267°30.4	37.4
17	280°27.9	96°38.8	N00°00.3	56°19.0	03.3	164°29.7	20.8	282°33.0	37.5
18	295°30.4	111°38.4	S00°00.9	71°19.7	S17°03.8	179°32.0	N21°20.8	297°35.6	S03°37.5
19	310°32.8	126°38.0	02.1	86°20.4	04.3	194°34.2	20.7	312°38.2	37.6
20	325°35.3	141°37.6	03.3	101°21.2	04.8	209°36.5	20.7	327°40.8	37.7
21	340°37.8	156°37.2	·· 04.6	116°21.9	·· 05.4	224°38.7	·· 20.7	342°43.4	·· 37.7
22	355°40.2	171°36.8	05.8	131°22.6	05.9	239°41.0	20.7	357°46.1	37.8
23	10°42.7	186°36.4	07.0	146°23.3	06.4	254°43.2	20.6	12°48.7	37.8
Mer.pass.	22:17	ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.52	ν 2.2′	d -0.0′ m -2.21	ν 2.6′	d -0.1′ m 0.68

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	25°45.1	201°36.1	S00°08.2	161°24.1	S17°06.9	269°45.5	N21°20.6	27°51.3	S03°37.9
1	40°47.6	216°35.7	09.4	176°24.8	07.4	284°47.7	20.6	42°53.9	38.0
2	55°50.1	231°35.3	10.7	191°25.5	08.0	299°50.0	20.5	57°56.5	38.0
3	70°52.5	246°34.9	·· 11.9	206°26.2	·· 08.5	314°52.2	·· 20.5	72°59.1	·· 38.1
4	85°55.0	261°34.5	13.1	221°26.9	09.0	329°54.5	20.5	88°01.7	38.1
5	100°57.5	276°34.1	14.3	236°27.7	09.5	344°56.7	20.4	103°04.3	38.2
6	115°59.9	291°33.7	S00°15.5	251°28.4	S17°10.0	359°59.0	N21°20.4	118°07.0	S03°38.3
7	131°02.4	306°33.3	16.8	266°29.1	10.6	15°01.2	20.4	133°09.6	38.3
8	146°04.9	321°32.9	18.0	281°29.8	11.1	30°03.5	20.4	148°12.2	38.4
9	161°07.3	336°32.5	·· 19.2	296°30.6	·· 11.6	45°05.7	·· 20.3	163°14.8	·· 38.4
10	176°09.8	351°32.1	20.4	311°31.3	12.1	60°08.0	20.3	178°17.4	38.5
11	191°12.3	6°31.7	21.6	326°32.0	12.6	75°10.2	20.3	193°20.0	38.6
12	206°14.7	21°31.3	S00°22.9	341°32.7	S17°13.1	90°12.5	N21°20.2	208°22.6	S03°38.6
13	221°17.2	36°31.0	24.1	356°33.4	13.7	105°14.8	20.2	223°25.2	38.7
14	236°19.6	51°30.6	25.3	11°34.1	14.2	120°17.0	20.2	238°27.9	38.7
15	251°22.1	66°30.2	·· 26.5	26°34.9	·· 14.7	135°19.3	·· 20.1	253°30.5	·· 38.8
16	266°24.6	81°29.8	27.7	41°35.6	15.2	150°21.5	20.1	268°33.1	38.9
17	281°27.0	96°29.4	29.0	56°36.3	15.7	165°23.8	20.1	283°35.7	38.9
18	296°29.5	111°29.0	S00°30.2	71°37.0	S17°16.2	180°26.0	N21°20.1	298°38.3	S03°39.0
19	311°32.0	126°28.6	31.4	86°37.7	16.8	195°28.3	20.0	313°40.9	39.0
20	326°34.4	141°28.2	32.6	101°38.5	17.3	210°30.5	20.0	328°43.5	39.1
21	341°36.9	156°27.8	·· 33.9	116°39.2	·· 17.8	225°32.8	·· 20.0	343°46.1	·· 39.2
22	356°39.4	171°27.4	35.1	131°39.9	18.3	240°35.1	19.9	358°48.7	39.2
23	11°41.8	186°27.0	36.3	146°40.6	18.8	255°37.3	19.9	13°51.4	39.3
Mer.pass.	22:13	ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.52	ν 2.3′	d -0.0′ m -2.22	ν 2.6′	d -0.1′ m 0.69

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	26°44.3	201°26.6	S00°37.5	161°41.3	S17°19.3	270°39.6	N21°19.9	28°54.0	S03°39.3
1	41°46.7	216°26.2	38.7	176°42.0	19.9	285°41.8	19.9	43°56.6	39.4
2	56°49.2	231°25.8	40.0	191°42.8	20.4	300°44.1	19.8	58°59.2	39.5
3	71°51.7	246°25.5	·· 41.2	206°43.5	·· 20.9	315°46.3	·· 19.8	74°01.8	·· 39.5
4	86°54.1	261°25.1	42.4	221°44.2	21.4	330°48.6	19.8	89°04.4	39.6
5	101°56.6	276°24.7	43.6	236°44.9	21.9	345°50.9	19.7	104°07.0	39.6
6	116°59.1	291°24.3	S00°44.8	251°45.6	S17°22.4	0°53.1	N21°19.7	119°09.6	S03°39.7
7	132°01.5	306°23.9	46.1	266°46.3	22.9	15°55.4	19.7	134°12.2	39.7
8	147°04.0	321°23.5	47.3	281°47.0	23.5	30°57.6	19.7	149°14.9	39.8
9	162°06.5	336°23.1	·· 48.5	296°47.8	·· 24.0	45°59.9	·· 19.6	164°17.5	·· 39.9
10	177°08.9	351°22.7	49.7	311°48.5	24.5	61°02.2	19.6	179°20.1	39.9
11	192°11.4	6°22.3	51.0	326°49.2	25.0	76°04.4	19.6	194°22.7	40.0
12	207°13.9	21°21.9	S00°52.2	341°49.9	S17°25.5	91°06.7	N21°19.5	209°25.3	S03°40.0
13	222°16.3	36°21.5	53.4	356°50.6	26.0	106°09.0	19.5	224°27.9	40.1
14	237°18.8	51°21.1	54.6	11°51.3	26.5	121°11.2	19.5	239°30.5	40.2
15	252°21.2	66°20.7	·· 55.8	26°52.0	·· 27.0	136°13.5	·· 19.5	254°33.1	·· 40.2
16	267°23.7	81°20.3	57.1	41°52.7	27.6	151°15.7	19.4	269°35.7	40.3
17	282°26.2	96°19.9	58.3	56°53.5	28.1	166°18.0	19.4	284°38.3	40.3
18	297°28.6	111°19.5	S00°59.5	71°54.2	S17°28.6	181°20.3	N21°19.4	299°40.9	S03°40.4
19	312°31.1	126°19.1	01°00.7	86°54.9	29.1	196°22.5	19.4	314°43.6	40.4
20	327°33.6	141°18.8	02.0	101°55.6	29.6	211°24.8	19.3	329°46.2	40.5
21	342°36.0	156°18.4	·· 03.2	116°56.3	·· 30.1	226°27.1	·· 19.3	344°48.8	·· 40.6
22	357°38.5	171°18.0	04.4	131°57.0	30.6	241°29.3	19.3	359°51.4	40.6
23	12°41.0	186°17.6	05.6	146°57.7	31.1	256°31.6	19.2	14°54.0	40.7
Mer.pass.	22:09	ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.52	ν 2.3′	d -0.0′ m -2.23	ν 2.6′	d -0.1′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.2
Hamal	327°50.2	23°35.2
Polaris	313°16.3	89°22.3
Acamar	315°10.9	-40°11.9
Menkar	314°05.2	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.1
Capella	280°20.7	46°01.3
Bellatrix	278°22.0	6°22.5
Elnath	278°00.9	28°37.7
Alnilam	275°36.9	-1°11.0
Betelgeuse	270°51.3	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.6	-16°44.8
Adhara	255°05.3	-29°00.1
Procyon	244°50.2	5°09.6
Pollux	243°16.5	27°57.8
Avior	234°14.6	-59°35.1
Suhail	222°46.0	-43°31.9
Miaplacidus	221°38.6	-69°49.0
Alphard	217°47.3	-8°46.1
Regulus	207°34.0	11°50.5
Dubhe	193°40.7	61°36.6
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.4
Gacrux	171°51.6	-57°15.3
Alioth	166°12.9	55°49.2
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.8
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°03.0
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.3	-26°29.4
Atria	107°09.4	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.7	-37°07.4
Rasalhague	95°58.1	12°32.6
Eltanin	90°42.1	51°29.4
Kaus Aust.	83°31.8	-34°22.4
Vega	80°32.9	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.3	8°56.3
Peacock	53°04.6	-56°39.3
Deneb	49°25.3	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.8	-46°50.3
Fomalhaut	15°13.5	-29°29.1
Scheat	13°44.3	28°13.6
Markab	13°29.0	15°20.8

Oct 16 Thu	SHA	Mer.pass
Venus	176°59.4	10:33
Mars	136°20.6	13:15
Jupiter	244°05.5	06:04
Saturn	2°02.5	22:09

Oct 17 Fri	SHA	Mer.pass
Venus	175°50.9	10:34
Mars	135°38.9	13:14
Jupiter	244°00.3	06:00
Saturn	2°06.1	22:05

Oct 18 Sat	SHA	Mer.pass
Venus	174°42.3	10:34
Mars	134°57.0	13:13
Jupiter	243°55.3	05:56
Saturn	2°09.7	22:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun		Moon				
h	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.8	S08°53.9	241°12.2	12.5′	N16°59.4	12.8′	56.5′
1	198°36.0	54.8	255°43.7	12.6′	16°46.6	12.9′	56.5′
2	213°36.1	55.7	270°15.3	12.7′	16°33.7	12.9′	56.5′
3	228°36.2	·· 56.6	284°47.0	12.8′	16°20.8	13.0′	56.4′
4	243°36.4	57.6	299°18.8	12.9′	16°07.8	13.1′	56.4′
5	258°36.5	58.5	313°50.6	13.0′	15°54.7	13.1′	56.4′
6	273°36.6	S08°59.4	328°22.6	13.1′	N15°41.6	13.2′	56.4′
7	288°36.8	09°00.3	342°54.7	13.1′	15°28.4	13.2′	56.3′
8	303°36.9	01.2	357°26.8	13.2′	15°15.2	13.3′	56.3′
9	318°37.0	·· 02.2	11°59.0	13.3′	15°01.9	13.4′	56.3′
10	333°37.1	03.1	26°31.4	13.4′	14°48.5	13.4′	56.3′
11	348°37.3	04.0	41°03.8	13.5′	14°35.1	13.4′	56.2′
12	3°37.4	S09°04.9	55°36.3	13.6′	N14°21.7	13.5′	56.2′
13	18°37.5	05.8	70°08.8	13.7′	14°08.2	13.6′	56.2′
14	33°37.7	06.7	84°41.5	13.7′	13°54.6	13.6′	56.2′
15	48°37.8	·· 07.7	99°14.2	13.8′	13°41.0	13.6′	56.1′
16	63°37.9	08.6	113°47.1	13.9′	13°27.4	13.7′	56.1′
17	78°38.1	09.5	128°20.0	14.0′	13°13.7	13.8′	56.1′
18	93°38.2	S09°10.4	142°53.0	14.1′	N12°59.9	13.8′	56.1′
19	108°38.3	11.3	157°26.0	14.1′	12°46.1	13.8′	56.0′
20	123°38.4	12.2	171°59.2	14.2′	12°32.3	13.9′	56.0′
21	138°38.6	·· 13.2	186°32.4	14.3′	12°18.4	13.9′	56.0′
22	153°38.7	14.1	201°05.6	14.4′	12°04.5	14.0′	56.0′
23	168°38.8	15.0	215°39.0	14.4′	11°50.5	14.0′	56.0′
	SD = 16.0′	d = -0.9′	SD = 15.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°39.0	S09°15.9	230°12.4	14.5′	N11°36.5	14.0′	55.9′
1	198°39.1	16.8	244°45.9	14.6′	11°22.5	14.1′	55.9′
2	213°39.2	17.7	259°19.5	14.6′	11°08.4	14.1′	55.9′
3	228°39.3	·· 18.6	273°53.1	14.7′	10°54.3	14.1′	55.9′
4	243°39.5	19.5	288°26.8	14.8′	10°40.2	14.2′	55.8′
5	258°39.6	20.5	303°00.6	14.8′	10°26.0	14.2′	55.8′
6	273°39.7	S09°21.4	317°34.4	14.9′	N10°11.8	14.2′	55.8′
7	288°39.8	22.3	332°08.3	15.0′	09°57.6	14.3′	55.8′
8	303°40.0	23.2	346°42.3	15.0′	09°43.3	14.3′	55.7′
9	318°40.1	·· 24.1	1°16.3	15.1′	09°29.0	14.3′	55.7′
10	333°40.2	25.0	15°50.4	15.1′	09°14.7	14.4′	55.7′
11	348°40.3	25.9	30°24.5	15.2′	09°00.3	14.3′	55.7′
12	3°40.5	S09°26.8	44°58.7	15.2′	N08°46.0	14.4′	55.7′
13	18°40.6	27.8	59°33.0	15.3′	08°31.6	14.5′	55.6′
14	33°40.7	28.7	74°07.3	15.4′	08°17.1	14.4′	55.6′
15	48°40.8	·· 29.6	88°41.6	15.4′	08°02.7	14.5′	55.6′
16	63°41.0	30.5	103°16.0	15.5′	07°48.2	14.5′	55.6′
17	78°41.1	31.4	117°50.5	15.5′	07°33.7	14.5′	55.6′
18	93°41.2	S09°32.3	132°25.0	15.6′	N07°19.2	14.5′	55.5′
19	108°41.3	33.2	146°59.6	15.6′	07°04.7	14.5′	55.5′
20	123°41.5	34.1	161°34.2	15.7′	06°50.2	14.6′	55.5′
21	138°41.6	·· 35.0	176°08.8	15.7′	06°35.6	14.6′	55.5′
22	153°41.7	36.0	190°43.5	15.7′	06°21.0	14.6′	55.4′
23	168°41.8	36.9	205°18.3	15.8′	06°06.4	14.6′	55.4′
	SD = 16.0′	d = -0.9′	SD = 15.3′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°41.9	S09°37.8	219°53.0	15.8′	N05°51.8	14.6′	55.4′
1	198°42.1	38.7	234°27.9	15.9′	05°37.2	14.6′	55.4′
2	213°42.2	39.6	249°02.7	15.9′	05°22.6	14.7′	55.4′
3	228°42.3	·· 40.5	263°37.7	15.9′	05°07.9	14.6′	55.3′
4	243°42.4	41.4	278°12.6	16.0′	04°53.3	14.7′	55.3′
5	258°42.6	42.3	292°47.6	16.0′	04°38.6	14.7′	55.3′
6	273°42.7	S09°43.2	307°22.6	16.1′	N04°23.9	14.6′	55.3′
7	288°42.8	44.1	321°57.7	16.1′	04°09.3	14.7′	55.3′
8	303°42.9	45.0	336°32.7	16.1′	03°54.6	14.7′	55.3′
9	318°43.0	·· 45.9	351°07.9	16.2′	03°39.9	14.7′	55.2′
10	333°43.1	46.8	5°43.0	16.2′	03°25.2	14.7′	55.2′
11	348°43.3	47.7	20°18.2	16.2′	03°10.5	14.7′	55.2′
12	3°43.4	S09°48.7	34°53.4	16.2′	N02°55.8	14.7′	55.2′
13	18°43.5	49.6	49°28.6	16.3′	02°41.1	14.7′	55.2′
14	33°43.6	50.5	64°03.9	16.3′	02°26.4	14.7′	55.1′
15	48°43.7	·· 51.4	78°39.2	16.3′	02°11.7	14.7′	55.1′
16	63°43.9	52.3	93°14.5	16.3′	01°57.0	14.8′	55.1′
17	78°44.0	53.2	107°49.8	16.4′	01°42.2	14.7′	55.1′
18	93°44.1	S09°54.1	122°25.2	16.4′	N01°27.5	14.7′	55.1′
19	108°44.2	55.0	137°00.6	16.4′	01°12.8	14.6′	55.1′
20	123°44.3	55.9	151°36.0	16.4′	00°58.2	14.7′	55.0′
21	138°44.4	·· 56.8	166°11.4	16.4′	00°43.5	14.7′	55.0′
22	153°44.5	57.7	180°46.8	16.5′	00°28.8	14.7′	55.0′
23	168°44.7	58.6	195°22.3	16.5′	00°14.1	14.7′	55.0′
	SD = 16.0′	d = -0.9′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:05	06:23	07:35	15:54	17:05	18:23
N 70°	05:08	06:18	07:22	16:07	17:10	18:21
68°	05:10	06:14	07:12	16:17	17:15	18:19
66°	05:11	06:11	07:04	16:26	17:18	18:18
64°	05:12	06:07	06:56	16:33	17:22	18:17
62°	05:13	06:05	06:50	16:39	17:25	18:16
60°	05:14	06:02	06:45	16:45	17:27	18:15
N 58°	05:15	06:00	06:40	16:50	17:29	18:15
56°	05:15	05:58	06:36	16:54	17:32	18:15
54°	05:15	05:56	06:32	16:58	17:34	18:14
52°	05:15	05:54	06:28	17:01	17:35	18:14
50°	05:15	05:53	06:25	17:04	17:37	18:15
45°	05:15	05:49	06:18	17:11	17:41	18:15
N 40°	05:14	05:45	06:13	17:17	17:45	18:16
35°	05:13	05:42	06:08	17:22	17:48	18:17
30°	05:11	05:39	06:03	17:27	17:51	18:19
20°	05:08	05:33	05:56	17:35	17:57	18:23
N 10°	05:03	05:27	05:49	17:42	18:03	18:28
0°	04:57	05:21	05:42	17:49	18:10	18:34
S 10°	04:49	05:14	05:35	17:55	18:17	18:42
20°	04:39	05:06	05:28	18:03	18:25	18:52
30°	04:26	04:55	05:20	18:11	18:36	19:05
35°	04:18	04:49	05:15	18:16	18:42	19:13
40°	04:08	04:41	05:09	18:22	18:50	19:24
45°	03:55	04:32	05:03	18:29	18:59	19:36
S 50°	03:39	04:21	04:55	18:37	19:11	19:53
52°	03:31	04:15	04:51	18:41	19:16	20:01
54°	03:22	04:09	04:47	18:45	19:23	20:10
56°	03:12	04:03	04:43	18:49	19:29	20:21
58°	03:00	03:55	04:38	18:54	19:37	20:33
S 60°	02:46	03:46	04:32	19:00	19:46	20:47

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	·· ··	00:05	02:19	17:29	16:44	16:10
N 70°	·· ··	00:25	02:27	17:06	16:33	16:07
68°	·· ··	00:41	02:33	16:48	16:25	16:05
66°	·· ··	00:54	02:39	16:33	16:17	16:04
64°	·· ··	01:05	02:43	16:21	16:11	16:02
62°	·· ··	01:14	02:47	16:11	16:06	16:01
60°	·· ··	01:22	02:50	16:02	16:01	16:00
N 58°	·· ··	01:28	02:53	15:54	15:57	15:59
56°	00:09	01:34	02:55	15:47	15:53	15:58
54°	00:18	01:40	02:58	15:41	15:50	15:57
52°	00:25	01:44	03:00	15:35	15:47	15:56
50°	00:32	01:49	03:02	15:30	15:44	15:56
45°	00:47	01:58	03:06	15:19	15:38	15:54
N 40°	00:59	02:05	03:09	15:10	15:32	15:53
35°	01:09	02:12	03:12	15:02	15:28	15:52
30°	01:18	02:18	03:15	14:55	15:24	15:51
20°	01:34	02:28	03:19	14:42	15:17	15:49
N 10°	01:47	02:36	03:23	14:32	15:11	15:48
0°	01:59	02:44	03:27	14:21	15:05	15:46
S 10°	02:12	02:53	03:30	14:11	14:59	15:45
20°	02:25	03:01	03:34	14:00	14:53	15:43
30°	02:40	03:11	03:39	13:47	14:45	15:41
35°	02:49	03:16	03:41	13:40	14:41	15:40
40°	02:58	03:23	03:44	13:31	14:36	15:39
45°	03:10	03:30	03:47	13:21	14:31	15:38
S 50°	03:24	03:39	03:51	13:09	14:24	15:36
52°	03:30	03:43	03:53	13:04	14:21	15:35
54°	03:37	03:47	03:55	12:57	14:17	15:34
56°	03:45	03:52	03:57	12:50	14:14	15:33
58°	03:54	03:57	03:59	12:42	14:09	15:32
S 60°	04:04	04:03	04:02	12:33	14:04	15:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 27-11%
16	14:23	14:30	11:46	08:11	20:33	
17	14:36	14:42	11:45	08:55	21:16	
18	14:48	14:54	11:45	09:36	21:57	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2531 sec ΔT = TT-UT1 = +68.9309 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	27°43.4	201°17.2	S01°06.8	161°58.4	S17°31.6	271°33.9	N21°19.2	29°56.6	S03°40.7
1	42°45.9	216°16.8	08.1	176°59.1	32.1	286°36.1	19.2	44°59.2	40.8
2	57°48.3	231°16.4	09.3	191°59.8	32.7	301°38.4	19.2	60°01.8	40.8
3	72°50.8	246°16.0	·· 10.5	207°00.5	·· 33.2	316°40.7	·· 19.1	75°04.4	·· 40.9
4	87°53.3	261°15.6	11.7	222°01.3	33.7	331°42.9	19.1	90°07.0	41.0
5	102°55.7	276°15.2	13.0	237°02.0	34.2	346°45.2	19.1	105°09.6	41.0
6	117°58.2	291°14.8	S01°14.2	252°02.7	S17°34.7	1°47.5	N21°19.0	120°12.3	S03°41.1
7	133°00.7	306°14.4	15.4	267°03.4	35.2	16°49.7	19.0	135°14.9	41.1
8	148°03.1	321°14.0	16.6	282°04.1	35.7	31°52.0	19.0	150°17.5	41.2
9	163°05.6	336°13.6	·· 17.8	297°04.8	·· 36.2	46°54.3	·· 19.0	165°20.1	·· 41.3
10	178°08.1	351°13.2	19.1	312°05.5	36.7	61°56.5	18.9	180°22.7	41.3
11	193°10.5	6°12.8	20.3	327°06.2	37.2	76°58.8	18.9	195°25.3	41.4
12	208°13.0	21°12.4	S01°21.5	342°06.9	S17°37.7	92°01.1	N21°18.9	210°27.9	S03°41.4
13	223°15.5	36°12.0	22.7	357°07.6	38.2	107°03.3	18.9	225°30.5	41.5
14	238°17.9	51°11.6	24.0	12°08.3	38.8	122°05.6	18.8	240°33.1	41.5
15	253°20.4	66°11.2	·· 25.2	27°09.0	·· 39.3	137°07.9	·· 18.8	255°35.7	·· 41.6
16	268°22.8	81°10.8	26.4	42°09.7	39.8	152°10.2	18.8	270°38.3	41.7
17	283°25.3	96°10.4	27.6	57°10.4	40.3	167°12.4	18.8	285°40.9	41.7
18	298°27.8	111°10.1	S01°28.9	72°11.1	S17°40.8	182°14.7	N21°18.7	300°43.5	S03°41.8
19	313°30.2	126°09.7	30.1	87°11.8	41.3	197°17.0	18.7	315°46.1	41.8
20	328°32.7	141°09.3	31.3	102°12.6	41.8	212°19.2	18.7	330°48.8	41.9
21	343°35.2	156°08.9	·· 32.5	117°13.3	·· 42.3	227°21.5	·· 18.6	345°51.4	·· 41.9
22	358°37.6	171°08.5	33.7	132°14.0	42.8	242°23.8	18.6	0°54.0	42.0
23	13°40.1	186°08.1	35.0	147°14.7	43.3	257°26.1	18.6	15°56.6	42.0
Mer.pass.	22:05	ν -0.4′	d -1.2′	ν 0.7′	d -0.5′	ν 2.3′	d -0.0′	ν 2.6′	d -0.1′
		m -3.92		m 1.51		m -2.23		m 0.70	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	28°42.6	201°07.7	S01°36.2	162°15.4	S17°43.8	272°28.3	N21°18.6	30°59.2	S03°42.1
1	43°45.0	216°07.3	37.4	177°16.1	44.3	287°30.6	18.5	46°01.8	42.2
2	58°47.5	231°06.9	38.6	192°16.8	44.8	302°32.9	18.5	61°04.4	42.2
3	73°50.0	246°06.5	·· 39.9	207°17.5	·· 45.3	317°35.2	·· 18.5	76°07.0	·· 42.3
4	88°52.4	261°06.1	41.1	222°18.2	45.8	332°37.4	18.5	91°09.6	42.3
5	103°54.9	276°05.7	42.3	237°18.9	46.3	347°39.7	18.4	106°12.2	42.4
6	118°57.3	291°05.3	S01°43.5	252°19.6	S17°46.8	2°42.0	N21°18.4	121°14.8	S03°42.4
7	133°59.8	306°04.9	44.7	267°20.3	47.3	17°44.3	18.4	136°17.4	42.5
8	149°02.3	321°04.5	46.0	282°21.0	47.8	32°46.5	18.4	151°20.0	42.6
9	164°04.7	336°04.1	·· 47.2	297°21.7	·· 48.3	47°48.8	·· 18.3	166°22.6	·· 42.6
10	179°07.2	351°03.7	48.4	312°22.4	48.8	62°51.1	18.3	181°25.2	42.7
11	194°09.7	6°03.3	49.6	327°23.1	49.3	77°53.4	18.3	196°27.8	42.7
12	209°12.1	21°02.9	S01°50.9	342°23.8	S17°49.8	92°55.6	N21°18.3	211°30.4	S03°42.8
13	224°14.6	36°02.5	52.1	357°24.5	50.3	107°57.9	18.2	226°33.0	42.8
14	239°17.1	51°02.1	53.3	12°25.2	50.8	123°00.2	18.2	241°35.6	42.9
15	254°19.5	66°01.7	·· 54.5	27°25.9	·· 51.3	138°02.5	·· 18.2	256°38.3	·· 42.9
16	269°22.0	81°01.3	55.8	42°26.6	51.8	153°04.8	18.2	271°40.9	43.0
17	284°24.4	96°00.9	57.0	57°27.3	52.3	168°07.0	18.1	286°43.5	43.1
18	299°26.9	111°00.5	S01°58.2	72°28.0	S17°52.8	183°09.3	N21°18.1	301°46.1	S03°43.1
19	314°29.4	126°00.1	01°59.4	87°28.7	53.3	198°11.6	18.1	316°48.7	43.2
20	329°31.8	140°59.7	02°00.6	102°29.4	53.8	213°13.9	18.1	331°51.3	43.2
21	344°34.3	155°59.3	·· 01.9	117°30.1	·· 54.3	228°16.1	·· 18.0	346°53.9	·· 43.3
22	359°36.8	170°58.9	03.1	132°30.8	54.8	243°18.4	18.0	1°56.5	43.3
23	14°39.2	185°58.5	04.3	147°31.5	55.3	258°20.7	18.0	16°59.1	43.4
Mer.pass.	22:02	ν -0.4′	d -1.2′	ν 0.7′	d -0.5′	ν 2.3′	d -0.0′	ν 2.6′	d -0.1′
		m -3.92		m 1.51		m -2.24		m 0.70	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	29°41.7	200°58.1	S02°05.5	162°32.2	S17°55.8	273°23.0	N21°18.0	32°01.7	S03°43.4
1	44°44.2	215°57.7	06.8	177°32.8	56.3	288°25.3	17.9	47°04.3	43.5
2	59°46.6	230°57.3	08.0	192°33.5	56.8	303°27.6	17.9	62°06.9	43.6
3	74°49.1	245°56.9	·· 09.2	207°34.2	·· 57.3	318°29.8	·· 17.9	77°09.5	·· 43.6
4	89°51.6	260°56.5	10.4	222°34.9	57.8	333°32.1	17.9	92°12.1	43.7
5	104°54.0	275°56.1	11.6	237°35.6	58.3	348°34.4	17.8	107°14.7	43.7
6	119°56.5	290°55.7	S02°12.9	252°36.3	S17°58.8	3°36.7	N21°17.8	122°17.3	S03°43.8
7	134°58.9	305°55.3	14.1	267°37.0	59.3	18°39.0	17.8	137°19.9	43.8
8	150°01.4	320°54.9	15.3	282°37.7	17°59.8	33°41.3	17.8	152°22.5	43.9
9	165°03.9	335°54.5	·· 16.5	297°38.4	18°00.3	48°43.5	·· 17.7	167°25.1	·· 43.9
10	180°06.3	350°54.1	17.8	312°39.1	00.8	63°45.8	17.7	182°27.7	44.0
11	195°08.8	5°53.7	19.0	327°39.8	01.3	78°48.1	17.7	197°30.3	44.0
12	210°11.3	20°53.3	S02°20.2	342°40.5	S18°01.8	93°50.4	N21°17.7	212°32.9	S03°44.1
13	225°13.7	35°52.9	21.4	357°41.2	02.3	108°52.7	17.6	227°35.5	44.2
14	240°16.2	50°52.5	22.6	12°41.9	02.8	123°55.0	17.6	242°38.1	44.2
15	255°18.7	65°52.1	·· 23.9	27°42.6	·· 03.3	138°57.2	·· 17.6	257°40.7	·· 44.3
16	270°21.1	80°51.7	25.1	42°43.3	03.8	153°59.5	17.6	272°43.3	44.3
17	285°23.6	95°51.3	26.3	57°43.9	04.3	169°01.8	17.5	287°45.9	44.4
18	300°26.0	110°50.9	S02°27.5	72°44.6	S18°04.8	184°04.1	N21°17.5	302°48.5	S03°44.4
19	315°28.5	125°50.5	28.8	87°45.3	05.3	199°06.4	17.5	317°51.1	44.5
20	330°31.0	140°50.1	30.0	102°46.0	05.8	214°08.7	17.5	332°53.7	44.5
21	345°33.4	155°49.7	·· 31.2	117°46.7	·· 06.3	229°11.0	·· 17.4	347°56.3	·· 44.6
22	0°35.9	170°49.3	32.4	132°47.4	06.8	244°13.3	17.4	2°58.9	44.6
23	15°38.4	185°48.9	33.6	147°48.1	07.2	259°15.5	17.4	18°01.5	44.7
Mer.pass.	21:58	ν -0.4′	d -1.2′	ν 0.7′	d -0.5′	ν 2.3′	d -0.0′	ν 2.6′	d -0.1′
		m -3.92		m 1.50		m -2.24		m 0.71	

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°15.6	89°22.3
Acamar	315°10.9	-40°11.9
Menkar	314°05.2	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.8
Rigel	281°03.1	-8°10.1
Capella	280°20.7	46°01.3
Bellatrix	278°22.0	6°22.5
Elnath	278°00.9	28°37.7
Alnilam	275°36.9	-1°11.0
Betelgeuse	270°51.2	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.6	-16°44.9
Adhara	255°05.3	-29°00.1
Procyon	244°50.2	5°09.6
Pollux	243°16.5	27°57.8
Avior	234°14.6	-59°35.1
Suhail	222°46.0	-43°31.9
Miaplacidus	221°38.5	-69°49.0
Alphard	217°47.3	-8°46.1
Regulus	207°34.0	11°50.5
Dubhe	193°40.7	61°36.6
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.4
Gacrux	171°51.5	-57°15.3
Alioth	166°12.9	55°49.2
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°03.0
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.4	-26°29.4
Atria	107°09.4	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.1	51°29.3
Kaus Aust.	83°31.8	-34°22.4
Vega	80°32.9	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.6	-56°39.3
Deneb	49°25.3	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.1
Scheat	13°44.3	28°13.6
Markab	13°29.0	15°20.8

Oct 19 Sun	SHA	Mer.pass
Venus	173°33.8	10:35
Mars	134°15.0	13:11
Jupiter	243°50.4	05:53
Saturn	2°13.2	21:56

Oct 20 Mon	SHA	Mer.pass
Venus	172°25.1	10:36
Mars	133°32.8	13:10
Jupiter	243°45.8	05:49
Saturn	2°16.6	21:52

Oct 21 Tue	SHA	Mer.pass
Venus	171°16.4	10:36
Mars	132°50.5	13:09
Jupiter	243°41.3	05:46
Saturn	2°20.0	21:48

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°44.8	S09°59.5	209°57.8	16.5′	S00°00.6	14.6′	55.0′
1	198°44.9	10°00.4	224°33.2	16.5′	00°15.2	14.7′	54.9′
2	213°45.0	01.3	239°08.7	16.5′	00°29.9	14.6′	54.9′
3	228°45.1	·· 02.2	253°44.3	16.5′	00°44.5	14.7′	54.9′
4	243°45.2	03.1	268°19.8	16.5′	00°59.2	14.6′	54.9′
5	258°45.3	04.0	282°55.3	16.5′	01°13.8	14.6′	54.9′
6	273°45.5	S10°04.9	297°30.8	16.5′	S01°28.4	14.6′	54.9′
7	288°45.6	05.8	312°06.4	16.6′	01°43.0	14.6′	54.8′
8	303°45.7	06.7	326°42.0	16.6′	01°57.6	14.5′	54.8′
9	318°45.8	·· 07.6	341°17.5	16.6′	02°12.1	14.6′	54.8′
10	333°45.9	08.5	355°53.1	16.6′	02°26.7	14.5′	54.8′
11	348°46.0	09.4	10°28.7	16.6′	02°41.2	14.5′	54.8′
12	3°46.1	S10°10.3	25°04.2	16.6′	S02°55.7	14.5′	54.8′
13	18°46.2	11.2	39°39.8	16.6′	03°10.2	14.5′	54.8′
14	33°46.4	12.1	54°15.4	16.6′	03°24.7	14.5′	54.7′
15	48°46.5	·· 13.0	68°51.0	16.6′	03°39.2	14.4′	54.7′
16	63°46.6	13.9	83°26.5	16.6′	03°53.6	14.4′	54.7′
17	78°46.7	14.8	98°02.1	16.6′	04°08.0	14.4′	54.7′
18	93°46.8	S10°15.7	112°37.7	16.6′	S04°22.4	14.4′	54.7′
19	108°46.9	16.6	127°13.2	16.6′	04°36.8	14.4′	54.7′
20	123°47.0	17.5	141°48.8	16.6′	04°51.2	14.3′	54.7′
21	138°47.1	·· 18.4	156°24.3	16.5′	05°05.5	14.3′	54.6′
22	153°47.2	19.3	170°59.9	16.5′	05°19.8	14.2′	54.6′
23	168°47.3	20.2	185°35.4	16.5′	05°34.0	14.3′	54.6′
	SD = 16.0′	d = -0.9′	SD = 15.0′				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°47.5	S10°21.1	200°10.9	16.5′	S05°48.3	14.2′	54.6′
1	198°47.6	22.0	214°46.5	16.5′	06°02.5	14.2′	54.6′
2	213°47.7	22.9	229°22.0	16.5′	06°16.7	14.2′	54.6′
3	228°47.8	·· 23.8	243°57.5	16.5′	06°30.9	14.1′	54.6′
4	243°47.9	24.7	258°32.9	16.5′	06°45.0	14.1′	54.5′
5	258°48.0	25.6	273°08.4	16.4′	06°59.1	14.0′	54.5′
6	273°48.1	S10°26.5	287°43.8	16.4′	S07°13.1	14.1′	54.5′
7	288°48.2	27.4	302°19.3	16.4′	07°27.2	14.0′	54.5′
8	303°48.3	28.3	316°54.7	16.4′	07°41.2	13.9′	54.5′
9	318°48.4	·· 29.2	331°30.1	16.4′	07°55.1	14.0′	54.5′
10	333°48.5	30.0	346°05.5	16.4′	08°09.1	13.8′	54.5′
11	348°48.6	30.9	0°40.8	16.3′	08°22.9	13.9′	54.4′
12	3°48.7	S10°31.8	15°16.2	16.3′	S08°36.8	13.8′	54.4′
13	18°48.8	32.7	29°51.5	16.3′	08°50.6	13.8′	54.4′
14	33°48.9	33.6	44°26.8	16.3′	09°04.4	13.7′	54.4′
15	48°49.0	·· 34.5	59°02.1	16.2′	09°18.1	13.7′	54.4′
16	63°49.1	35.4	73°37.3	16.2′	09°31.8	13.7′	54.4′
17	78°49.2	36.3	88°12.5	16.2′	09°45.5	13.6′	54.4′
18	93°49.3	S10°37.2	102°47.7	16.2′	S09°59.1	13.6′	54.4′
19	108°49.5	38.1	117°22.9	16.1′	10°12.7	13.5′	54.4′
20	123°49.6	39.0	131°58.0	16.1′	10°26.2	13.5′	54.3′
21	138°49.7	·· 39.9	146°33.1	16.1′	10°39.7	13.4′	54.3′
22	153°49.8	40.8	161°08.2	16.0′	10°53.1	13.4′	54.3′
23	168°49.9	41.6	175°43.3	16.0′	11°06.5	13.4′	54.3′
	SD = 16.1′	d = -0.9′	SD = 14.9′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.0	S10°42.5	190°18.3	16.0′	S11°19.9	13.3′	54.3′
1	198°50.1	43.4	204°53.3	16.0′	11°33.2	13.2′	54.3′
2	213°50.2	44.3	219°28.2	15.9′	11°46.4	13.2′	54.3′
3	228°50.3	·· 45.2	234°03.1	15.9′	11°59.6	13.2′	54.3′
4	243°50.4	46.1	248°38.0	15.8′	12°12.8	13.1′	54.3′
5	258°50.5	47.0	263°12.9	15.8′	12°25.9	13.0′	54.2′
6	273°50.6	S10°47.9	277°47.7	15.8′	S12°38.9	13.0′	54.2′
7	288°50.7	48.8	292°22.5	15.7′	12°51.9	12.9′	54.2′
8	303°50.8	49.6	306°57.2	15.7′	13°04.8	12.9′	54.2′
9	318°50.9	·· 50.5	321°31.9	15.7′	13°17.7	12.9′	54.2′
10	333°51.0	51.4	336°06.6	15.6′	13°30.6	12.7′	54.2′
11	348°51.1	52.3	350°41.2	15.6′	13°43.3	12.8′	54.2′
12	3°51.2	S10°53.2	5°15.7	15.5′	S13°56.1	12.6′	54.2′
13	18°51.3	54.1	19°50.3	15.5′	14°08.7	12.6′	54.2′
14	33°51.3	55.0	34°24.8	15.5′	14°21.3	12.6′	54.2′
15	48°51.4	·· 55.9	48°59.2	15.4′	14°33.9	12.4′	54.1′
16	63°51.5	56.7	63°33.6	15.4′	14°46.3	12.5′	54.1′
17	78°51.6	57.6	78°08.0	15.3′	14°58.8	12.3′	54.1′
18	93°51.7	S10°58.5	92°42.3	15.3′	S15°11.1	12.3′	54.1′
19	108°51.8	10°59.4	107°16.6	15.2′	15°23.4	12.3′	54.1′
20	123°51.9	11°00.3	121°50.8	15.2′	15°35.7	12.1′	54.1′
21	138°52.0	·· 01.2	136°25.0	15.1′	15°47.8	12.1′	54.1′
22	153°52.1	02.0	150°59.1	15.1′	15°59.9	12.1′	54.1′
23	168°52.2	02.9	165°33.2	15.0′	16°12.0	12.0′	54.1′
	SD = 16.1′	d = -0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:18	06:37	07:50	15:37	16:51	18:09
N 70°	05:19	06:30	07:35	15:52	16:58	18:08
68°	05:20	06:25	07:24	16:05	17:03	18:08
66°	05:20	06:20	07:14	16:14	17:08	18:07
64°	05:21	06:16	07:05	16:23	17:12	18:07
62°	05:21	06:12	06:58	16:30	17:16	18:07
60°	05:21	06:09	06:52	16:36	17:19	18:07
N 58°	05:21	06:06	06:47	16:42	17:22	18:07
56°	05:21	06:04	06:42	16:47	17:25	18:08
54°	05:20	06:02	06:38	16:51	17:27	18:08
52°	05:20	05:59	06:34	16:55	17:29	18:08
50°	05:20	05:57	06:30	16:59	17:31	18:09
45°	05:18	05:53	06:22	17:06	17:36	18:10
N 40°	05:17	05:48	06:16	17:13	17:40	18:12
35°	05:15	05:45	06:10	17:19	17:44	18:14
30°	05:13	05:41	06:05	17:24	17:48	18:16
20°	05:08	05:34	05:57	17:33	17:55	18:21
N 10°	05:03	05:27	05:49	17:41	18:02	18:27
0°	04:56	05:20	05:41	17:48	18:09	18:34
S 10°	04:48	05:13	05:34	17:56	18:17	18:42
20°	04:37	05:03	05:26	18:04	18:27	18:53
30°	04:23	04:52	05:16	18:14	18:38	19:07
35°	04:14	04:45	05:11	18:19	18:45	19:16
40°	04:03	04:37	05:05	18:25	18:54	19:28
45°	03:49	04:27	04:58	18:33	19:04	19:41
S 50°	03:32	04:14	04:49	18:42	19:16	19:59
52°	03:23	04:09	04:45	18:46	19:22	20:08
54°	03:14	04:02	04:40	18:51	19:29	20:18
56°	03:03	03:55	04:35	18:56	19:37	20:29
58°	02:50	03:46	04:30	19:01	19:45	20:43
S 60°	02:34	03:37	04:23	19:08	19:55	20:59

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	04:22	06:24	08:40	15:37	15:01	14:12
N 70°	04:20	06:13	08:13	15:42	15:15	14:41
68°	04:19	06:03	07:53	15:47	15:27	15:03
66°	04:18	05:56	07:38	15:50	15:36	15:20
64°	04:17	05:50	07:25	15:53	15:44	15:34
62°	04:16	05:44	07:14	15:56	15:51	15:46
60°	04:15	05:39	07:05	15:58	15:57	15:56
N 58°	04:15	05:35	06:57	16:00	16:02	16:05
56°	04:14	05:32	06:50	16:02	16:07	16:13
54°	04:13	05:28	06:44	16:04	16:11	16:20
52°	04:13	05:25	06:38	16:06	16:15	16:26
50°	04:13	05:23	06:33	16:07	16:19	16:32
45°	04:12	05:17	06:22	16:10	16:27	16:45
N 40°	04:11	05:12	06:13	16:13	16:33	16:55
35°	04:10	05:08	06:06	16:15	16:39	17:04
30°	04:10	05:04	05:59	16:17	16:44	17:12
20°	04:09	04:58	05:48	16:21	16:52	17:25
N 10°	04:08	04:53	05:38	16:24	17:00	17:37
0°	04:07	04:47	05:28	16:27	17:07	17:48
S 10°	04:07	04:42	05:19	16:29	17:14	18:00
20°	04:06	04:37	05:09	16:33	17:22	18:12
30°	04:05	04:31	04:58	16:36	17:31	18:26
35°	04:04	04:28	04:52	16:38	17:36	18:34
40°	04:04	04:24	04:45	16:40	17:42	18:43
45°	04:03	04:19	04:36	16:43	17:48	18:54
S 50°	04:03	04:14	04:27	16:46	17:57	19:07
52°	04:02	04:12	04:22	16:48	18:00	19:13
54°	04:02	04:09	04:17	16:50	18:04	19:20
56°	04:02	04:06	04:11	16:51	18:09	19:28
58°	04:01	04:03	04:05	16:53	18:14	19:37
S 60°	04:01	03:59	03:58	16:56	18:20	19:47

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 28-0 6-0%
19	14:59	15:05	11:45	10:17	22:37	
20	15:10	15:15	11:45	10:57	23:18	
21	15:20	15:25	11:45	11:38	–:–	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2537 sec ΔT = TT-UT1 = +68.9303 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	30°40.8	200°48.5	S02°34.9	162°48.8	S18°07.7	274°17.8	N21°17.4	33°04.1	S03°44.8
1	45°43.3	215°48.1	36.1	177°49.5	08.2	289°20.1	17.3	48°06.7	44.8
2	60°45.8	230°47.7	37.3	192°50.2	08.7	304°22.4	17.3	63°09.3	44.9
3	75°48.2	245°47.3	·· 38.5	207°50.8	·· 09.2	319°24.7	·· 17.3	78°11.9	·· 44.9
4	90°50.7	260°46.9	39.7	222°51.5	09.7	334°27.0	17.3	93°14.5	45.0
5	105°53.2	275°46.5	41.0	237°52.2	10.2	349°29.3	17.2	108°17.1	45.0
6	120°55.6	290°46.1	S02°42.2	252°52.9	S18°10.7	4°31.6	N21°17.2	123°19.7	S03°45.1
7	135°58.1	305°45.7	43.4	267°53.6	11.2	19°33.9	17.2	138°22.3	45.1
8	151°00.5	320°45.3	44.6	282°54.3	11.7	34°36.2	17.2	153°24.9	45.2
9	166°03.0	335°44.9	·· 45.9	297°55.0	·· 12.2	49°38.5	·· 17.2	168°27.5	·· 45.2
10	181°05.5	350°44.5	47.1	312°55.7	12.7	64°40.7	17.1	183°30.1	45.3
11	196°07.9	5°44.1	48.3	327°56.3	13.1	79°43.0	17.1	198°32.7	45.3
12	211°10.4	20°43.7	S02°49.5	342°57.0	S18°13.6	94°45.3	N21°17.1	213°35.3	S03°45.4
13	226°12.9	35°43.3	50.7	357°57.7	14.1	109°47.6	17.1	228°37.9	45.4
14	241°15.3	50°42.9	52.0	12°58.4	14.6	124°49.9	17.0	243°40.5	45.5
15	256°17.8	65°42.5	·· 53.2	27°59.1	·· 15.1	139°52.2	·· 17.0	258°43.1	·· 45.6
16	271°20.3	80°42.1	54.4	42°59.8	15.6	154°54.5	17.0	273°45.7	45.6
17	286°22.7	95°41.7	55.6	58°00.5	16.1	169°56.8	17.0	288°48.3	45.7
18	301°25.2	110°41.2	S02°56.8	73°01.1	S18°16.6	184°59.1	N21°16.9	303°50.9	S03°45.7
19	316°27.7	125°40.8	58.1	88°01.8	17.1	200°01.4	16.9	318°53.5	45.8
20	331°30.1	140°40.4	02°59.3	103°02.5	17.5	215°03.7	16.9	333°56.1	45.8
21	346°32.6	155°40.0	03°00.5	118°03.2	·· 18.0	230°06.0	·· 16.9	348°58.7	·· 45.9
22	1°35.0	170°39.6	01.7	133°03.9	18.5	245°08.3	16.9	4°01.3	45.9
23	16°37.5	185°39.2	02.9	148°04.6	19.0	260°10.6	16.8	19°03.9	46.0
Mer.pass. 21:54		ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.50	ν 2.3′	d -0.0′ m -2.25	ν 2.6′	d -0.1′ m 0.71
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	31°40.0	200°38.8	S03°04.2	163°05.2	S18°19.5	275°12.9	N21°16.8	34°06.5	S03°46.0
1	46°42.4	215°38.4	05.4	178°05.9	20.0	290°15.2	16.8	49°09.1	46.1
2	61°44.9	230°38.0	06.6	193°06.6	20.5	305°17.5	16.8	64°11.7	46.1
3	76°47.4	245°37.6	·· 07.8	208°07.3	·· 21.0	320°19.8	·· 16.7	79°14.3	·· 46.2
4	91°49.8	260°37.2	09.0	223°08.0	21.4	335°22.1	16.7	94°16.9	46.2
5	106°52.3	275°36.8	10.3	238°08.7	21.9	350°24.4	16.7	109°19.5	46.3
6	121°54.8	290°36.4	S03°11.5	253°09.3	S18°22.4	5°26.7	N21°16.7	124°22.1	S03°46.3
7	136°57.2	305°36.0	12.7	268°10.0	22.9	20°29.0	16.7	139°24.7	46.4
8	151°59.7	320°35.6	13.9	283°10.7	23.4	35°31.3	16.6	154°27.3	46.4
9	167°02.1	335°35.2	·· 15.1	298°11.4	·· 23.9	50°33.6	·· 16.6	169°29.9	·· 46.5
10	182°04.6	350°34.8	16.4	313°12.1	24.4	65°35.9	16.6	184°32.5	46.5
11	197°07.1	5°34.4	17.6	328°12.7	24.8	80°38.2	16.6	199°35.1	46.6
12	212°09.5	20°33.9	S03°18.8	343°13.4	S18°25.3	95°40.5	N21°16.5	214°37.7	S03°46.7
13	227°12.0	35°33.5	20.0	358°14.1	25.8	110°42.8	16.5	229°40.3	46.7
14	242°14.5	50°33.1	21.2	13°14.8	26.3	125°45.1	16.5	244°42.9	46.8
15	257°16.9	65°32.7	·· 22.5	28°15.5	·· 26.8	140°47.4	·· 16.5	259°45.5	·· 46.8
16	272°19.4	80°32.3	23.7	43°16.1	27.3	155°49.7	16.5	274°48.1	46.9
17	287°21.9	95°31.9	24.9	58°16.8	27.7	170°52.0	16.4	289°50.7	46.9
18	302°24.3	110°31.5	S03°26.1	73°17.5	S18°28.2	185°54.3	N21°16.4	304°53.3	S03°47.0
19	317°26.8	125°31.1	27.3	88°18.2	28.7	200°56.6	16.4	319°55.9	47.0
20	332°29.3	140°30.7	28.6	103°18.8	29.2	215°58.9	16.4	334°58.5	47.1
21	347°31.7	155°30.3	·· 29.8	118°19.5	·· 29.7	231°01.2	·· 16.3	350°01.1	·· 47.1
22	2°34.2	170°29.9	31.0	133°20.2	30.2	246°03.5	16.3	5°03.7	47.2
23	17°36.6	185°29.5	32.2	148°20.9	30.6	261°05.8	16.3	20°06.3	47.2
Mer.pass. 21:50		ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.50	ν 2.3′	d -0.0′ m -2.26	ν 2.6′	d -0.1′ m 0.72
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	32°39.1	200°29.1	S03°33.4	163°21.6	S18°31.1	276°08.1	N21°16.3	35°08.9	S03°47.3
1	47°41.6	215°28.6	34.6	178°22.2	31.6	291°10.4	16.3	50°11.5	47.3
2	62°44.0	230°28.2	35.9	193°22.9	32.1	306°12.7	16.2	65°14.0	47.4
3	77°46.5	245°27.8	·· 37.1	208°23.6	·· 32.6	321°15.0	·· 16.2	80°16.6	·· 47.4
4	92°49.0	260°27.4	38.3	223°24.3	33.0	336°17.3	16.2	95°19.2	47.5
5	107°51.4	275°27.0	39.5	238°24.9	33.5	351°19.6	16.2	110°21.8	47.5
6	122°53.9	290°26.6	S03°40.7	253°25.6	S18°34.0	6°21.9	N21°16.2	125°24.4	S03°47.6
7	137°56.4	305°26.2	42.0	268°26.3	34.5	21°24.2	16.1	140°27.0	47.6
8	152°58.8	320°25.8	43.2	283°27.0	35.0	36°26.6	16.1	155°29.6	47.7
9	168°01.3	335°25.4	·· 44.4	298°27.6	·· 35.4	51°28.9	·· 16.1	170°32.2	·· 47.7
10	183°03.8	350°25.0	45.6	313°28.3	35.9	66°31.2	16.1	185°34.8	47.8
11	198°06.2	5°24.6	46.8	328°29.0	36.4	81°33.5	16.1	200°37.4	47.8
12	213°08.7	20°24.1	S03°48.0	343°29.6	S18°36.9	96°35.8	N21°16.0	215°40.0	S03°47.9
13	228°11.1	35°23.7	49.3	358°30.3	37.3	111°38.1	16.0	230°42.6	47.9
14	243°13.6	50°23.3	50.5	13°31.0	37.8	126°40.4	16.0	245°45.2	48.0
15	258°16.1	65°22.9	·· 51.7	28°31.7	·· 38.3	141°42.7	·· 16.0	260°47.8	·· 48.0
16	273°18.5	80°22.5	52.9	43°32.3	38.8	156°45.0	16.0	275°50.4	48.1
17	288°21.0	95°22.1	54.1	58°33.0	39.3	171°47.3	15.9	290°53.0	48.1
18	303°23.5	110°21.7	S03°55.3	73°33.7	S18°39.7	186°49.7	N21°15.9	305°55.6	S03°48.2
19	318°25.9	125°21.3	56.6	88°34.4	40.2	201°52.0	15.9	320°58.1	48.2
20	333°28.4	140°20.9	57.8	103°35.0	40.7	216°54.3	15.9	336°00.7	48.3
21	348°30.9	155°20.4	03°59.0	118°35.7	·· 41.2	231°56.6	·· 15.8	351°03.3	·· 48.3
22	3°33.3	170°20.0	04°00.2	133°36.4	41.6	246°58.9	15.8	6°05.9	48.4
23	18°35.8	185°19.6	01.4	148°37.0	42.1	262°01.2	15.8	21°08.5	48.4
Mer.pass. 21:46		ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.49	ν 2.3′	d -0.0′ m -2.27	ν 2.6′	d -0.1′ m 0.73

Stars	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°14.8	89°22.3
Acamar	315°10.9	-40°11.9
Menkar	314°05.2	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.1
Capella	280°20.6	46°01.3
Bellatrix	278°22.0	6°22.5
Elnath	278°00.8	28°37.7
Alnilam	275°36.9	-1°11.0
Betelgeuse	270°51.2	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.6	-16°44.9
Adhara	255°05.3	-29°00.1
Procyon	244°50.1	5°09.6
Pollux	243°16.5	27°57.8
Avior	234°14.5	-59°35.1
Suhail	222°46.0	-43°31.9
Miaplacidus	221°38.5	-69°49.0
Alphard	217°47.3	-8°46.1
Regulus	207°33.9	11°50.5
Dubhe	193°40.7	61°36.5
Denebola	182°24.6	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	173°00.1	-63°14.4
Gacrux	171°51.5	-57°15.3
Alioth	166°12.9	55°49.1
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°03.0
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.4	-26°29.3
Atria	107°09.4	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.2	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.7	-56°39.3
Deneb	49°25.3	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.1
Scheat	13°44.4	28°13.6
Markab	13°29.0	15°20.8

Oct 22 Wed	SHA	Mer.pass
Venus	170°07.7	10:37
Mars	132°07.9	13:08
Jupiter	243°37.0	05:42
Saturn	2°23.3	21:44

Oct 23 Thu	SHA	Mer.pass
Venus	168°58.8	10:38
Mars	131°25.3	13:07
Jupiter	243°32.9	05:38
Saturn	2°26.6	21:40

Oct 24 Fri	SHA	Mer.pass
Venus	167°49.9	10:38
Mars	130°42.4	13:06
Jupiter	243°29.0	05:35
Saturn	2°29.7	21:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.3	S11°03.8	180°07.2	15.0′	S16°24.0	11.9′	54.1′
1	198°52.4	04.7	194°41.2	14.9′	16°35.9	11.8′	54.1′
2	213°52.5	05.6	209°15.1	14.9′	16°47.7	11.8′	54.1′
3	228°52.6	·· 06.5	223°49.0	14.8′	16°59.5	11.7′	54.0′
4	243°52.7	07.3	238°22.9	14.8′	17°11.2	11.6′	54.0′
5	258°52.8	08.2	252°56.6	14.7′	17°22.8	11.5′	54.0′
6	273°52.9	S11°09.1	267°30.4	14.7′	S17°34.3	11.5′	54.0′
7	288°53.0	10.0	282°04.0	14.6′	17°45.8	11.4′	54.0′
8	303°53.1	10.9	296°37.6	14.6′	17°57.2	11.4′	54.0′
9	318°53.1	·· 11.8	311°11.2	14.5′	18°08.6	11.2′	54.0′
10	333°53.2	12.6	325°44.7	14.5′	18°19.8	11.2′	54.0′
11	348°53.3	13.5	340°18.2	14.4′	18°31.0	11.1′	54.0′
12	3°53.4	S11°14.4	354°51.6	14.3′	S18°42.1	11.0′	54.0′
13	18°53.5	15.3	9°24.9	14.3′	18°53.1	11.0′	54.0′
14	33°53.6	16.2	23°58.2	14.2′	19°04.1	10.9′	54.0′
15	48°53.7	·· 17.0	38°31.4	14.2′	19°15.0	10.7′	54.0′
16	63°53.8	17.9	53°04.6	14.1′	19°25.7	10.8′	54.0′
17	78°53.9	18.8	67°37.7	14.1′	19°36.5	10.6′	54.0′
18	93°54.0	S11°19.7	82°10.8	14.0′	S19°47.1	10.5′	54.0′
19	108°54.0	20.5	96°43.8	13.9′	19°57.6	10.5′	54.0′
20	123°54.1	21.4	111°16.7	13.9′	20°08.1	10.4′	53.9′
21	138°54.2	·· 22.3	125°49.6	13.8′	20°18.5	10.2′	53.9′
22	153°54.3	23.2	140°22.4	13.8′	20°28.7	10.2′	53.9′
23	168°54.4	24.1	154°55.1	13.7′	20°38.9	10.2′	53.9′
	SD = 16.1′	d = -0.9′	SD = 14.7′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.5	S11°24.9	169°27.8	13.6′	S20°49.1	10.0′	53.9′
1	198°54.6	25.8	184°00.5	13.6′	20°59.1	9.9′	53.9′
2	213°54.7	26.7	198°33.1	13.5′	21°09.0	9.9′	53.9′
3	228°54.7	·· 27.6	213°05.6	13.5′	21°18.9	9.7′	53.9′
4	243°54.8	28.4	227°38.0	13.4′	21°28.6	9.7′	53.9′
5	258°54.9	29.3	242°10.4	13.3′	21°38.3	9.6′	53.9′
6	273°55.0	S11°30.2	256°42.7	13.3′	S21°47.9	9.4′	53.9′
7	288°55.1	31.1	271°15.0	13.2′	21°57.3	9.4′	53.9′
8	303°55.2	31.9	285°47.2	13.1′	22°06.7	9.3′	53.9′
9	318°55.3	·· 32.8	300°19.4	13.1′	22°16.0	9.2′	53.9′
10	333°55.3	33.7	314°51.4	13.0′	22°25.2	9.1′	53.9′
11	348°55.4	34.6	329°23.5	13.0′	22°34.3	9.0′	53.9′
12	3°55.5	S11°35.4	343°55.4	12.9′	S22°43.3	8.9′	53.9′
13	18°55.6	36.3	358°27.3	12.8′	22°52.2	8.8′	53.9′
14	33°55.7	37.2	12°59.1	12.8′	23°01.0	8.7′	53.9′
15	48°55.8	·· 38.0	27°30.9	12.7′	23°09.7	8.6′	53.9′
16	63°55.8	38.9	42°02.6	12.6′	23°18.3	8.5′	53.9′
17	78°55.9	39.8	56°34.3	12.6′	23°26.8	8.4′	53.9′
18	93°56.0	S11°40.7	71°05.9	12.5′	S23°35.2	8.3′	53.9′
19	108°56.1	41.5	85°37.4	12.5′	23°43.5	8.2′	53.9′
20	123°56.2	42.4	100°08.8	12.4′	23°51.7	8.1′	53.9′
21	138°56.2	·· 43.3	114°40.2	12.3′	23°59.8	8.0′	53.9′
22	153°56.3	44.1	129°11.6	12.3′	24°07.8	7.9′	53.9′
23	168°56.4	45.0	143°42.8	12.2′	24°15.7	7.7′	53.9′
	SD = 16.1′	d = -0.9′	SD = 14.7′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.5	S11°45.9	158°14.0	12.1′	S24°23.4	7.7′	53.9′
1	198°56.6	46.7	172°45.2	12.1′	24°31.1	7.6′	53.9′
2	213°56.6	47.6	187°16.3	12.0′	24°38.7	7.4′	53.9′
3	228°56.7	·· 48.5	201°47.3	12.0′	24°46.1	7.3′	53.9′
4	243°56.8	49.3	216°18.3	11.9′	24°53.4	7.3′	53.9′
5	258°56.9	50.2	230°49.2	11.8′	25°00.7	7.1′	53.9′
6	273°57.0	S11°51.1	245°20.0	11.8′	S25°07.8	7.0′	53.9′
7	288°57.0	51.9	259°50.8	11.7′	25°14.8	6.8′	53.9′
8	303°57.1	52.8	274°21.5	11.7′	25°21.6	6.8′	53.9′
9	318°57.2	·· 53.7	288°52.2	11.6′	25°28.4	6.7′	53.9′
10	333°57.3	54.5	303°22.8	11.5′	25°35.1	6.5′	53.9′
11	348°57.3	55.4	317°53.3	11.5′	25°41.6	6.4′	53.9′
12	3°57.4	S11°56.3	332°23.8	11.4′	S25°48.0	6.3′	53.9′
13	18°57.5	57.1	346°54.3	11.4′	25°54.3	6.2′	53.9′
14	33°57.6	58.0	1°24.6	11.3′	26°00.5	6.1′	53.9′
15	48°57.7	·· 58.9	15°55.0	11.3′	26°06.6	5.9′	53.9′
16	63°57.7	11°59.7	30°25.2	11.2′	26°12.5	5.9′	53.9′
17	78°57.8	12°00.6	44°55.4	11.2′	26°18.4	5.7′	53.9′
18	93°57.9	S12°01.5	59°25.6	11.1′	S26°24.1	5.6′	53.9′
19	108°58.0	02.3	73°55.7	11.0′	26°29.7	5.5′	53.9′
20	123°58.0	03.2	88°25.7	11.0′	26°35.2	5.3′	53.9′
21	138°58.1	·· 04.1	102°55.7	10.9′	26°40.5	5.2′	53.9′
22	153°58.2	04.9	117°25.7	10.9′	26°45.7	5.1′	53.9′
23	168°58.2	05.8	131°55.5	10.8′	26°50.8	5.0′	53.9′
	SD = 16.1′	d = -0.9′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:30	06:50	08:06	15:21	16:37	17:56
N 70°	05:30	06:42	07:49	15:38	16:45	17:56
68°	05:30	06:35	07:35	15:52	16:52	17:57
66°	05:29	06:29	07:24	16:03	16:58	17:57
64°	05:29	06:24	07:15	16:13	17:03	17:58
62°	05:28	06:20	07:07	16:21	17:07	17:59
60°	05:28	06:16	07:00	16:28	17:11	18:00
N 58°	05:27	06:13	06:54	16:34	17:15	18:00
56°	05:26	06:10	06:48	16:39	17:18	18:01
54°	05:26	06:07	06:43	16:44	17:21	18:02
52°	05:25	06:04	06:39	16:49	17:23	18:03
50°	05:24	06:02	06:35	16:53	17:26	18:04
45°	05:22	05:56	06:26	17:02	17:31	18:06
N 40°	05:20	05:52	06:19	17:09	17:36	18:08
35°	05:18	05:47	06:13	17:15	17:41	18:11
30°	05:15	05:43	06:07	17:21	17:45	18:13
20°	05:09	05:35	05:58	17:31	17:53	18:19
N 10°	05:03	05:28	05:49	17:39	18:01	18:26
0°	04:55	05:20	05:41	17:48	18:09	18:33
S 10°	04:46	05:11	05:33	17:56	18:18	18:43
20°	04:35	05:01	05:24	18:05	18:28	18:54
30°	04:19	04:49	05:13	18:16	18:40	19:10
35°	04:10	04:41	05:07	18:22	18:48	19:20
40°	03:58	04:32	05:01	18:29	18:57	19:31
45°	03:44	04:21	04:53	18:37	19:08	19:46
S 50°	03:25	04:08	04:43	18:47	19:22	20:05
52°	03:16	04:02	04:38	18:51	19:28	20:15
54°	03:05	03:55	04:33	18:56	19:36	20:25
56°	02:53	03:47	04:28	19:02	19:44	20:38
58°	02:39	03:37	04:22	19:08	19:53	20:53
S 60°	02:21	03:27	04:15	19:16	20:04	21:11

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	▬	▬	▬	▬	▬
N 70°	10:48	▬	▬	13:36	▬	▬
68°	09:59	▬	▬	14:26	▬	▬
66°	09:28	11:46	▬	14:58	14:14	▬
64°	09:06	10:58	▬	15:22	15:03	▬
62°	08:48	10:27	12:15	15:40	15:34	15:25
60°	08:33	10:04	11:38	15:56	15:58	16:03
N 58°	08:20	09:46	11:12	16:09	16:17	16:30
56°	08:10	09:31	10:51	16:21	16:33	16:51
54°	08:00	09:18	10:34	16:31	16:46	17:08
52°	07:52	09:06	10:19	16:40	16:58	17:23
50°	07:44	08:56	10:07	16:48	17:09	17:36
45°	07:28	08:35	09:41	17:06	17:31	18:03
N 40°	07:15	08:18	09:20	17:20	17:49	18:24
35°	07:04	08:04	09:03	17:32	18:04	18:42
30°	06:55	07:51	08:48	17:43	18:17	18:57
20°	06:38	07:30	08:24	18:01	18:40	19:23
N 10°	06:24	07:12	08:02	18:17	18:59	19:45
0°	06:11	06:55	07:42	18:32	19:18	20:06
S 10°	05:57	06:38	07:23	18:47	19:36	20:27
20°	05:43	06:21	07:02	19:03	19:56	20:50
30°	05:28	06:00	06:37	19:22	20:19	21:16
35°	05:18	05:48	06:23	19:33	20:32	21:31
40°	05:08	05:35	06:07	19:45	20:48	21:49
45°	04:56	05:19	05:47	20:00	21:07	22:11
S 50°	04:41	04:59	05:23	20:19	21:30	22:39
52°	04:34	04:50	05:11	20:28	21:42	22:53
54°	04:27	04:39	04:58	20:37	21:54	23:08
56°	04:18	04:28	04:42	20:48	22:09	23:27
58°	04:09	04:14	04:24	21:01	22:27	23:50
S 60°	03:58	03:59	04:02	21:16	22:49	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 0-6%
22	15:29	15:34	11:44	12:21	00:00	
23	15:38	15:42	11:44	13:06	00:43	
24	15:46	15:50	11:44	13:54	01:30	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2544 sec ΔT = TT-UT1 = +68.9296 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	33°38.2	200°19.2	S04°02.6	163°37.7	S18°42.6	277°03.5	N21°15.8	36°11.1	S03°48.5
1	48°40.7	215°18.8	03.9	178°38.4	43.1	292°05.8	15.8	51°13.7	48.5
2	63°43.2	230°18.4	05.1	193°39.0	43.5	307°08.2	15.8	66°16.3	48.6
3	78°45.6	245°18.0	·· 06.3	208°39.7	·· 44.0	322°10.5	·· 15.7	81°18.9	·· 48.6
4	93°48.1	260°17.6	07.5	223°40.4	44.5	337°12.8	15.7	96°21.5	48.7
5	108°50.6	275°17.1	08.7	238°41.0	45.0	352°15.1	15.7	111°24.1	48.7
6	123°53.0	290°16.7	S04°09.9	253°41.7	S18°45.4	7°17.4	N21°15.7	126°26.7	S03°48.8
7	138°55.5	305°16.3	11.2	268°42.4	45.9	22°19.7	15.7	141°29.3	48.8
8	153°58.0	320°15.9	12.4	283°43.1	46.4	37°22.0	15.6	156°31.8	48.9
9	169°00.4	335°15.5	·· 13.6	298°43.7	·· 46.9	52°24.4	·· 15.6	171°34.4	·· 48.9
10	184°02.9	350°15.1	14.8	313°44.4	47.3	67°26.7	15.6	186°37.0	49.0
11	199°05.4	5°14.7	16.0	328°45.1	47.8	82°29.0	15.6	201°39.6	49.0
12	214°07.8	20°14.2	S04°17.2	343°45.7	S18°48.3	97°31.3	N21°15.6	216°42.2	S03°49.1
13	229°10.3	35°13.8	18.4	358°46.4	48.7	112°33.6	15.5	231°44.8	49.1
14	244°12.7	50°13.4	19.7	13°47.1	49.2	127°35.9	15.5	246°47.4	49.2
15	259°15.2	65°13.0	·· 20.9	28°47.7	·· 49.7	142°38.3	·· 15.5	261°50.0	·· 49.2
16	274°17.7	80°12.6	22.1	43°48.4	50.2	157°40.6	15.5	276°52.6	49.3
17	289°20.1	95°12.2	23.3	58°49.0	50.6	172°42.9	15.5	291°55.2	49.3
18	304°22.6	110°11.7	S04°24.5	73°49.7	S18°51.1	187°45.2	N21°15.4	306°57.8	S03°49.4
19	319°25.1	125°11.3	25.7	88°50.4	51.6	202°47.5	15.4	322°00.4	49.4
20	334°27.5	140°10.9	26.9	103°51.0	52.0	217°49.9	15.4	337°02.9	49.5
21	349°30.0	155°10.5	·· 28.2	118°51.7	·· 52.5	232°52.2	·· 15.4	352°05.5	·· 49.5
22	4°32.5	170°10.1	29.4	133°52.4	53.0	247°54.5	15.4	7°08.1	49.6
23	19°34.9	185°09.7	30.6	148°53.0	53.4	262°56.8	15.3	22°10.7	49.6
Mer.pass.	21:42	ν -0.4′	d -1.2′	m -3.92	ν 0.7′	d -0.5′	m 1.49	ν 2.3′	d -0.0′ m -2.27	ν 2.6′	d -0.0′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	34°37.4	200°09.3	S04°31.8	163°53.7	S18°53.9	277°59.1	N21°15.3	37°13.3	S03°49.7
1	49°39.9	215°08.8	33.0	178°54.4	54.4	293°01.5	15.3	52°15.9	49.7
2	64°42.3	230°08.4	34.2	193°55.0	54.8	308°03.8	15.3	67°18.5	49.7
3	79°44.8	245°08.0	·· 35.4	208°55.7	·· 55.3	323°06.1	·· 15.3	82°21.1	·· 49.8
4	94°47.2	260°07.6	36.6	223°56.3	55.8	338°08.4	15.3	97°23.7	49.8
5	109°49.7	275°07.2	37.9	238°57.0	56.3	353°10.8	15.2	112°26.2	49.9
6	124°52.2	290°06.7	S04°39.1	253°57.7	S18°56.7	8°13.1	N21°15.2	127°28.8	S03°49.9
7	139°54.6	305°06.3	40.3	268°58.3	57.2	23°15.4	15.2	142°31.4	50.0
8	154°57.1	320°05.9	41.5	283°59.0	57.7	38°17.7	15.2	157°34.0	50.0
9	169°59.6	335°05.5	·· 42.7	298°59.6	·· 58.1	53°20.0	·· 15.2	172°36.6	·· 50.1
10	185°02.0	350°05.1	43.9	314°00.3	58.6	68°22.4	15.1	187°39.2	50.1
11	200°04.5	5°04.7	45.1	329°01.0	59.1	83°24.7	15.1	202°41.8	50.2
12	215°07.0	20°04.2	S04°46.3	344°01.6	S18°59.5	98°27.0	N21°15.1	217°44.4	S03°50.2
13	230°09.4	35°03.8	47.6	359°02.3	19°00.0	113°29.3	15.1	232°47.0	50.3
14	245°11.9	50°03.4	48.8	14°02.9	00.4	128°31.7	15.1	247°49.5	50.3
15	260°14.4	65°03.0	·· 50.0	29°03.6	·· 00.9	143°34.0	·· 15.1	262°52.1	·· 50.4
16	275°16.8	80°02.6	51.2	44°04.3	01.4	158°36.3	15.0	277°54.7	50.4
17	290°19.3	95°02.1	52.4	59°04.9	01.8	173°38.7	15.0	292°57.3	50.5
18	305°21.7	110°01.7	S04°53.6	74°05.6	S19°02.3	188°41.0	N21°15.0	307°59.9	S03°50.5
19	320°24.2	125°01.3	54.8	89°06.2	02.8	203°43.3	15.0	323°02.5	50.6
20	335°26.7	140°00.9	56.0	104°06.9	03.2	218°45.6	15.0	338°05.1	50.6
21	350°29.1	155°00.5	·· 57.2	119°07.6	·· 03.7	233°48.0	·· 15.0	353°07.7	·· 50.7
22	5°31.6	170°00.0	58.5	134°08.2	04.2	248°50.3	14.9	8°10.2	50.7
23	20°34.1	184°59.6	59.7	149°08.9	04.6	263°52.6	14.9	23°12.8	50.7
Mer.pass.	21:38	ν -0.4′	d -1.2′	m -3.91	ν 0.7′	d -0.5′	m 1.48	ν 2.3′	d -0.0′ m -2.28	ν 2.6′	d -0.0′ m 0.74

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	35°36.5	199°59.2	S05°00.9	164°09.5	S19°05.1	278°55.0	N21°14.9	38°15.4	S03°50.8
1	50°39.0	214°58.8	02.1	179°10.2	05.5	293°57.3	14.9	53°18.0	50.8
2	65°41.5	229°58.3	03.3	194°10.8	06.0	308°59.6	14.9	68°20.6	50.9
3	80°43.9	244°57.9	·· 04.5	209°11.5	·· 06.5	324°01.9	·· 14.8	83°23.2	·· 50.9
4	95°46.4	259°57.5	05.7	224°12.2	06.9	339°04.3	14.8	98°25.8	51.0
5	110°48.9	274°57.1	06.9	239°12.8	07.4	354°06.6	14.8	113°28.4	51.0
6	125°51.3	289°56.7	S05°08.1	254°13.5	S19°07.9	9°08.9	N21°14.8	128°30.9	S03°51.1
7	140°53.8	304°56.2	09.3	269°14.1	08.3	24°11.3	14.8	143°33.5	51.1
8	155°56.2	319°55.8	10.5	284°14.8	08.8	39°13.6	14.8	158°36.1	51.2
9	170°58.7	334°55.4	·· 11.8	299°15.4	·· 09.2	54°15.9	·· 14.7	173°38.7	·· 51.2
10	186°01.2	349°55.0	13.0	314°16.1	09.7	69°18.3	14.7	188°41.3	51.3
11	201°03.6	4°54.5	14.2	329°16.7	10.2	84°20.6	14.7	203°43.9	51.3
12	216°06.1	19°54.1	S05°15.4	344°17.4	S19°10.6	99°22.9	N21°14.7	218°46.5	S03°51.3
13	231°08.6	34°53.7	16.6	359°18.0	11.1	114°25.3	14.7	233°49.0	51.4
14	246°11.0	49°53.3	17.8	14°18.7	11.5	129°27.6	14.7	248°51.6	51.4
15	261°13.5	64°52.8	·· 19.0	29°19.3	·· 12.0	144°29.9	·· 14.7	263°54.2	·· 51.5
16	276°16.0	79°52.4	20.2	44°20.0	12.5	159°32.3	14.6	278°56.8	51.5
17	291°18.4	94°52.0	21.4	59°20.6	12.9	174°34.6	14.6	293°59.4	51.6
18	306°20.9	109°51.6	S05°22.6	74°21.3	S19°13.4	189°36.9	N21°14.6	309°02.0	S03°51.6
19	321°23.3	124°51.1	23.8	89°21.9	13.8	204°39.3	14.6	324°04.5	51.7
20	336°25.8	139°50.7	25.0	104°22.6	14.3	219°41.6	14.6	339°07.1	51.7
21	351°28.3	154°50.3	·· 26.2	119°23.3	·· 14.7	234°43.9	·· 14.6	354°09.7	·· 51.8
22	6°30.7	169°49.9	27.4	134°23.9	15.2	249°46.3	14.5	9°12.3	51.8
23	21°33.2	184°49.4	28.7	149°24.6	15.7	264°48.6	14.5	24°14.9	51.8
Mer.pass.	21:34	ν -0.4′	d -1.2′	m -3.91	ν 0.7′	d -0.5′	m 1.48	ν 2.3′	d -0.0′ m -2.29	ν 2.6′	d -0.0′ m 0.74

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°13.9	89°22.3
Acamar	315°10.9	-40°11.9
Menkar	314°05.2	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.1
Capella	280°20.6	46°01.3
Bellatrix	278°22.0	6°22.5
Elnath	278°00.8	28°37.7
Alnilam	275°36.9	-1°11.0
Betelgeuse	270°51.2	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.5	-16°44.9
Adhara	255°05.2	-29°00.1
Procyon	244°50.1	5°09.6
Pollux	243°16.5	27°57.8
Avior	234°14.5	-59°35.1
Suhail	222°46.0	-43°31.9
Miaplacidus	221°38.4	-69°49.0
Alphard	217°47.2	-8°46.1
Regulus	207°33.9	11°50.5
Dubhe	193°40.6	61°36.5
Denebola	182°24.6	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	173°00.1	-63°14.4
Gacrux	171°51.5	-57°15.3
Alioth	166°12.9	55°49.1
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°02.9
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°02.9
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.4	-26°29.3
Atria	107°09.4	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.2	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.7	-56°39.3
Deneb	49°25.3	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.1
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Oct 25 Sat	SHA	Mer.pass
Venus	166°41.0	10:39
Mars	129°59.5	13:05
Jupiter	243°25.3	05:31
Saturn	2°32.9	21:32

Oct 26 Sun	SHA	Mer.pass
Venus	165°31.9	10:40
Mars	129°16.3	13:04
Jupiter	243°21.8	05:27
Saturn	2°35.9	21:27

Oct 27 Mon	SHA	Mer.pass
Venus	164°22.7	10:40
Mars	128°33.0	13:03
Jupiter	243°18.4	05:23
Saturn	2°38.9	21:23

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.3	S12°06.6	146°25.4	10.8′	S26°55.8	4.8′	53.9′
1	198°58.4	07.5	160°55.2	10.7′	27°00.6	4.8′	53.9′
2	213°58.5	08.4	175°24.9	10.7′	27°05.4	4.6′	53.9′
3	228°58.5	·· 09.2	189°54.6	10.6′	27°10.0	4.4′	54.0′
4	243°58.6	10.1	204°24.2	10.6′	27°14.4	4.4′	54.0′
5	258°58.7	10.9	218°53.8	10.5′	27°18.8	4.2′	54.0′
6	273°58.7	S12°11.8	233°23.4	10.5′	S27°23.0	4.1′	54.0′
7	288°58.8	12.7	247°52.9	10.5′	27°27.1	3.9′	54.0′
8	303°58.9	13.5	262°22.3	10.4′	27°31.0	3.9′	54.0′
9	318°59.0	·· 14.4	276°51.7	10.4′	27°34.9	3.7′	54.0′
10	333°59.0	15.2	291°21.1	10.3′	27°38.6	3.5′	54.0′
11	348°59.1	16.1	305°50.4	10.3′	27°42.1	3.5′	54.0′
12	3°59.2	S12°16.9	320°19.7	10.2′	S27°45.6	3.3′	54.0′
13	18°59.2	17.8	334°48.9	10.2′	27°48.9	3.1′	54.0′
14	33°59.3	18.7	349°18.1	10.2′	27°52.0	3.1′	54.0′
15	48°59.4	·· 19.5	3°47.3	10.1′	27°55.1	2.9′	54.0′
16	63°59.4	20.4	18°16.4	10.1′	27°58.0	2.8′	54.0′
17	78°59.5	21.2	32°45.5	10.1′	28°00.8	2.6′	54.1′
18	93°59.6	S12°22.1	47°14.6	10.0′	S28°03.4	2.5′	54.1′
19	108°59.6	22.9	61°43.6	10.0′	28°05.9	2.4′	54.1′
20	123°59.7	23.8	76°12.6	10.0′	28°08.3	2.2′	54.1′
21	138°59.8	·· 24.7	90°41.5	9.9′	28°10.5	2.1′	54.1′
22	153°59.8	25.5	105°10.5	9.9′	28°12.6	1.9′	54.1′
23	168°59.9	26.4	119°39.3	9.9′	28°14.5	1.9′	54.1′
	SD = 16.1′	d = -0.9′	SD = 14.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°00.0	S12°27.2	134°08.2	9.8′	S28°16.4	1.7′	54.1′
1	199°00.0	28.1	148°37.0	9.8′	28°18.1	1.5′	54.1′
2	214°00.1	28.9	163°05.8	9.8′	28°19.6	1.4′	54.1′
3	229°00.2	·· 29.8	177°34.6	9.8′	28°21.0	1.3′	54.1′
4	244°00.2	30.6	192°03.4	9.7′	28°22.3	1.1′	54.2′
5	259°00.3	31.5	206°32.1	9.7′	28°23.4	1.0′	54.2′
6	274°00.4	S12°32.3	221°00.8	9.7′	S28°24.4	0.9′	54.2′
7	289°00.4	33.2	235°29.5	9.7′	28°25.3	0.7′	54.2′
8	304°00.5	34.0	249°58.2	9.6′	28°26.0	0.6′	54.2′
9	319°00.5	·· 34.9	264°26.8	9.6′	28°26.6	0.4′	54.2′
10	334°00.6	35.7	278°55.5	9.6′	28°27.0	0.3′	54.2′
11	349°00.7	36.6	293°24.1	9.6′	28°27.3	0.2′	54.2′
12	4°00.7	S12°37.4	307°52.7	9.6′	S28°27.5	0.0′	54.3′
13	19°00.8	38.3	322°21.2	9.6′	28°27.5	0.1′	54.3′
14	34°00.9	39.1	336°49.8	9.6′	28°27.4	0.2′	54.3′
15	49°00.9	·· 40.0	351°18.4	9.5′	28°27.2	0.4′	54.3′
16	64°01.0	40.8	5°46.9	9.5′	28°26.8	0.6′	54.3′
17	79°01.0	41.7	20°15.5	9.5′	28°26.2	0.7′	54.3′
18	94°01.1	S12°42.5	34°44.0	9.5′	S28°25.5	0.8′	54.3′
19	109°01.2	43.4	49°12.5	9.5′	28°24.7	0.9′	54.4′
20	124°01.2	44.2	63°41.0	9.5′	28°23.8	1.1′	54.4′
21	139°01.3	·· 45.1	78°09.5	9.5′	28°22.7	1.3′	54.4′
22	154°01.3	45.9	92°38.0	9.5′	28°21.4	1.4′	54.4′
23	169°01.4	46.7	107°06.5	9.5′	28°20.0	1.5′	54.4′
	SD = 16.1′	d = -0.9′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.4	S12°47.6	121°35.0	9.5′	S28°18.5	1.7′	54.4′
1	199°01.5	48.4	136°03.5	9.5′	28°16.8	1.8′	54.5′
2	214°01.6	49.3	150°32.0	9.5′	28°15.0	1.9′	54.5′
3	229°01.6	·· 50.1	165°00.5	9.5′	28°13.1	2.1′	54.5′
4	244°01.7	51.0	179°29.0	9.5′	28°11.0	2.2′	54.5′
5	259°01.7	51.8	193°57.5	9.5′	28°08.8	2.4′	54.5′
6	274°01.8	S12°52.7	208°26.0	9.5′	S28°06.4	2.5′	54.5′
7	289°01.8	53.5	222°54.6	9.5′	28°03.9	2.7′	54.6′
8	304°01.9	54.3	237°23.1	9.5′	28°01.2	2.8′	54.6′
9	319°01.9	·· 55.2	251°51.6	9.5′	27°58.4	2.9′	54.6′
10	334°02.0	56.0	266°20.2	9.6′	27°55.5	3.1′	54.6′
11	349°02.1	56.9	280°48.7	9.6′	27°52.4	3.2′	54.6′
12	4°02.1	S12°57.7	295°17.3	9.6′	S27°49.2	3.4′	54.6′
13	19°02.2	58.6	309°45.8	9.6′	27°45.8	3.5′	54.7′
14	34°02.2	12°59.4	324°14.4	9.6′	27°42.3	3.6′	54.7′
15	49°02.3	13°00.2	338°43.0	9.6′	27°38.7	3.8′	54.7′
16	64°02.3	01.1	353°11.7	9.6′	27°34.9	3.9′	54.7′
17	79°02.4	01.9	7°40.3	9.7′	27°31.0	4.0′	54.7′
18	94°02.4	S13°02.8	22°08.9	9.7′	S27°27.0	4.2′	54.8′
19	109°02.5	03.6	36°37.6	9.7′	27°22.8	4.4′	54.8′
20	124°02.5	04.4	51°06.3	9.7′	27°18.4	4.4′	54.8′
21	139°02.6	·· 05.3	65°35.0	9.7′	27°14.0	4.6′	54.8′
22	154°02.6	06.1	80°03.7	9.8′	27°09.4	4.8′	54.9′
23	169°02.7	06.9	94°32.5	9.8′	27°04.6	4.9′	54.9′
	SD = 16.1′	d = -0.8′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:43	07:03	08:23	15:04	16:23	17:43
N 70°	05:41	06:53	08:03	15:24	16:33	17:45
68°	05:40	06:45	07:47	15:39	16:41	17:46
66°	05:38	06:39	07:35	15:52	16:48	17:48
64°	05:37	06:33	07:24	16:03	16:54	17:49
62°	05:36	06:28	07:15	16:12	16:59	17:51
60°	05:35	06:23	07:07	16:19	17:03	17:52
N 58°	05:33	06:19	07:01	16:26	17:07	17:53
56°	05:32	06:16	06:55	16:32	17:11	17:55
54°	05:31	06:12	06:49	16:38	17:15	17:56
52°	05:30	06:09	06:44	16:43	17:18	17:57
50°	05:29	06:07	06:40	16:47	17:21	17:58
45°	05:26	06:00	06:30	16:57	17:27	18:01
N 40°	05:23	05:55	06:22	17:05	17:33	18:04
35°	05:20	05:50	06:16	17:12	17:38	18:07
30°	05:17	05:45	06:10	17:18	17:42	18:11
20°	05:10	05:36	05:59	17:29	17:51	18:17
N 10°	05:03	05:28	05:50	17:38	18:00	18:25
0°	04:55	05:19	05:41	17:47	18:09	18:33
S 10°	04:45	05:10	05:32	17:57	18:18	18:43
20°	04:32	04:59	05:22	18:06	18:29	18:56
30°	04:16	04:46	05:11	18:18	18:43	19:12
35°	04:06	04:37	05:04	18:24	18:51	19:23
40°	03:53	04:28	04:56	18:32	19:01	19:35
45°	03:38	04:16	04:48	18:41	19:13	19:51
S 50°	03:18	04:02	04:37	18:52	19:27	20:12
52°	03:08	03:55	04:32	18:57	19:34	20:22
54°	02:57	03:47	04:27	19:02	19:42	20:33
56°	02:43	03:39	04:21	19:09	19:51	20:47
58°	02:27	03:29	04:14	19:16	20:01	21:03
S 60°	02:08	03:17	04:06	19:23	20:13	21:24

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	▬	▬	15:50	▬	▬	17:12
60°	13:07	14:15	14:48	16:18	16:58	18:14
N 58°	12:31	13:34	14:14	16:54	17:39	18:47
56°	12:05	13:06	13:49	17:20	18:07	19:12
54°	11:45	12:44	13:28	17:41	18:28	19:32
52°	11:28	12:26	13:12	17:58	18:46	19:49
50°	11:13	12:11	12:57	18:13	19:02	20:03
45°	10:43	11:40	12:28	18:43	19:33	20:32
N 40°	10:20	11:16	12:05	19:06	19:57	20:54
35°	10:01	10:56	11:46	19:26	20:16	21:13
30°	09:45	10:39	11:29	19:42	20:33	21:29
20°	09:17	10:11	11:02	20:10	21:02	21:56
N 10°	08:54	09:46	10:38	20:34	21:26	22:19
0°	08:32	09:23	10:16	20:57	21:49	22:41
S 10°	08:10	09:01	09:53	21:19	22:11	23:02
20°	07:47	08:36	09:30	21:43	22:36	23:25
30°	07:20	08:08	09:02	22:11	23:04	23:52
35°	07:04	07:51	08:45	22:28	23:20	·· ··
40°	06:45	07:32	08:26	22:47	23:40	·· ··
45°	06:23	07:08	08:03	23:11	·· ··	00:03
S 50°	05:55	06:37	07:33	23:41	·· ··	00:34
52°	05:41	06:22	07:18	23:56	·· ··	00:49
54°	05:25	06:05	07:01	·· ··	00:14	01:06
56°	05:06	05:43	06:40	·· ··	00:35	01:27
58°	04:42	05:16	06:13	·· ··	01:02	01:53
S 60°	04:12	04:38	05:37	00:20	01:41	02:30

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 11-25%
25	15:53	15:57	11:44	14:44	02:19	
26	16:00	16:03	11:44	15:36	03:10	
27	16:06	16:08	11:44	16:28	04:02	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2551 sec ΔT = TT-UT1 = +68.9289 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	36°35.7	199°49.0	S05°29.9	164°25.2	S19°16.1	279°51.0	N21°14.5	39°17.5	S03°51.9
1	51°38.1	214°48.6	31.1	179°25.9	16.6	294°53.3	14.5	54°20.0	51.9
2	66°40.6	229°48.2	32.3	194°26.5	17.0	309°55.6	14.5	69°22.6	52.0
3	81°43.1	244°47.7	·· 33.5	209°27.2	·· 17.5	324°58.0	·· 14.5	84°25.2	·· 52.0
4	96°45.5	259°47.3	34.7	224°27.8	17.9	340°00.3	14.4	99°27.8	52.1
5	111°48.0	274°46.9	35.9	239°28.4	18.4	355°02.7	14.4	114°30.4	52.1
6	126°50.5	289°46.5	S05°37.1	254°29.1	S19°18.8	10°05.0	N21°14.4	129°33.0	S03°52.2
7	141°52.9	304°46.0	38.3	269°29.7	19.3	25°07.3	14.4	144°35.5	52.2
8	156°55.4	319°45.6	39.5	284°30.4	19.7	40°09.7	14.4	159°38.1	52.3
9	171°57.8	334°45.2	·· 40.7	299°31.0	·· 20.2	55°12.0	·· 14.4	174°40.7	·· 52.3
10	187°00.3	349°44.7	41.9	314°31.7	20.7	70°14.4	14.4	189°43.3	52.3
11	202°02.8	4°44.3	43.1	329°32.3	21.1	85°16.7	14.3	204°45.9	52.4
12	217°05.2	19°43.9	S05°44.3	344°33.0	S19°21.6	100°19.0	N21°14.3	219°48.5	S03°52.4
13	232°07.7	34°43.4	45.5	359°33.6	22.0	115°21.4	14.3	234°51.0	52.5
14	247°10.2	49°43.0	46.7	14°34.3	22.5	130°23.7	14.3	249°53.6	52.5
15	262°12.6	64°42.6	·· 47.9	29°34.9	·· 22.9	145°26.1	·· 14.3	264°56.2	·· 52.6
16	277°15.1	79°42.2	49.1	44°35.6	23.4	160°28.4	14.3	279°58.8	52.6
17	292°17.6	94°41.7	50.3	59°36.2	23.8	175°30.7	14.2	295°01.4	52.7
18	307°20.0	109°41.3	S05°51.5	74°36.9	S19°24.3	190°33.1	N21°14.2	310°04.0	S03°52.7
19	322°22.5	124°40.9	52.7	89°37.5	24.7	205°35.4	14.2	325°06.5	52.7
20	337°25.0	139°40.4	53.9	104°38.1	25.2	220°37.8	14.2	340°09.1	52.8
21	352°27.4	154°40.0	·· 55.1	119°38.8	·· 25.6	235°40.1	·· 14.2	355°11.7	·· 52.8
22	7°29.9	169°39.6	56.3	134°39.4	26.1	250°42.5	14.2	10°14.3	52.9
23	22°32.3	184°39.1	57.5	149°40.1	26.5	265°44.8	14.2	25°16.9	52.9
Mer.pass.	21:30	ν -0.4′	d -1.2′	m -3.91	ν 0.6′	d -0.5′	m 1.48	ν 2.3′	d -0.0′ m -2.29	ν 2.6′	d -0.0′ m 0.75

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	37°34.8	199°38.7	S05°58.7	164°40.7	S19°27.0	280°47.2	N21°14.1	40°19.4	S03°53.0
1	52°37.3	214°38.3	05°59.9	179°41.4	27.4	295°49.5	14.1	55°22.0	53.0
2	67°39.7	229°37.8	06°01.1	194°42.0	27.9	310°51.9	14.1	70°24.6	53.1
3	82°42.2	244°37.4	·· 02.3	209°42.6	·· 28.3	325°54.2	·· 14.1	85°27.2	·· 53.1
4	97°44.7	259°37.0	03.5	224°43.3	28.8	340°56.5	14.1	100°29.8	53.1
5	112°47.1	274°36.5	04.7	239°43.9	29.2	355°58.9	14.1	115°32.3	53.2
6	127°49.6	289°36.1	S06°06.0	254°44.6	S19°29.7	11°01.2	N21°14.1	130°34.9	S03°53.2
7	142°52.1	304°35.7	07.2	269°45.2	30.1	26°03.6	14.0	145°37.5	53.3
8	157°54.5	319°35.2	08.3	284°45.9	30.6	41°05.9	14.0	160°40.1	53.3
9	172°57.0	334°34.8	·· 09.5	299°46.5	·· 31.0	56°08.3	·· 14.0	175°42.7	·· 53.4
10	187°59.5	349°34.4	10.7	314°47.1	31.5	71°10.6	14.0	190°45.2	53.4
11	203°01.9	4°33.9	11.9	329°47.8	31.9	86°13.0	14.0	205°47.8	53.4
12	218°04.4	19°33.5	S06°13.1	344°48.4	S19°32.3	101°15.3	N21°14.0	220°50.4	S03°53.5
13	233°06.8	34°33.1	14.3	359°49.1	32.8	116°17.7	14.0	235°53.0	53.5
14	248°09.3	49°32.6	15.5	14°49.7	33.2	131°20.0	14.0	250°55.6	53.6
15	263°11.8	64°32.2	·· 16.7	29°50.3	·· 33.7	146°22.4	·· 13.9	265°58.1	·· 53.6
16	278°14.2	79°31.8	17.9	44°51.0	34.1	161°24.7	13.9	281°00.7	53.7
17	293°16.7	94°31.3	19.1	59°51.6	34.6	176°27.1	13.9	296°03.3	53.7
18	308°19.2	109°30.9	S06°20.3	74°52.3	S19°35.0	191°29.4	N21°13.9	311°05.9	S03°53.7
19	323°21.6	124°30.5	21.5	89°52.9	35.5	206°31.8	13.9	326°08.4	53.8
20	338°24.1	139°30.0	22.7	104°53.5	35.9	221°34.2	13.9	341°11.0	53.8
21	353°26.6	154°29.6	·· 23.9	119°54.2	·· 36.4	236°36.5	·· 13.9	356°13.6	·· 53.9
22	8°29.0	169°29.1	25.1	134°54.8	36.8	251°38.9	13.8	11°16.2	53.9
23	23°31.5	184°28.7	26.3	149°55.4	37.2	266°41.2	13.8	26°18.8	54.0
Mer.pass.	21:26	ν -0.4′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.47	ν 2.3′	d -0.0′ m -2.30	ν 2.6′	d -0.0′ m 0.75

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	38°33.9	199°28.3	S06°27.5	164°56.1	S19°37.7	281°43.6	N21°13.8	41°21.3	S03°54.0
1	53°36.4	214°27.8	28.7	179°56.7	38.1	296°45.9	13.8	56°23.9	54.0
2	68°38.9	229°27.4	29.9	194°57.4	38.6	311°48.3	13.8	71°26.5	54.1
3	83°41.3	244°27.0	·· 31.1	209°58.0	·· 39.0	326°50.6	·· 13.8	86°29.1	·· 54.1
4	98°43.8	259°26.5	32.3	224°58.6	39.4	341°53.0	13.8	101°31.6	54.2
5	113°46.3	274°26.1	33.5	239°59.3	39.9	356°55.3	13.8	116°34.2	54.2
6	128°48.7	289°25.6	S06°34.7	254°59.9	S19°40.3	11°57.7	N21°13.7	131°36.8	S03°54.2
7	143°51.2	304°25.2	35.9	270°00.5	40.8	27°00.1	13.7	146°39.4	54.3
8	158°53.7	319°24.8	37.1	285°01.2	41.2	42°02.4	13.7	161°42.0	54.3
9	173°56.1	334°24.3	·· 38.3	300°01.8	·· 41.7	57°04.8	·· 13.7	176°44.5	·· 54.4
10	188°58.6	349°23.9	39.5	315°02.4	42.1	72°07.1	13.7	191°47.1	54.4
11	204°01.1	4°23.4	40.7	330°03.1	42.5	87°09.5	13.7	206°49.7	54.5
12	219°03.5	19°23.0	S06°41.9	345°03.7	S19°43.0	102°11.8	N21°13.7	221°52.3	S03°54.5
13	234°06.0	34°22.6	43.1	0°04.3	43.4	117°14.2	13.7	236°54.8	54.5
14	249°08.4	49°22.1	44.2	15°05.0	43.9	132°16.6	13.6	251°57.4	54.6
15	264°10.9	64°21.7	·· 45.4	30°05.6	·· 44.3	147°18.9	·· 13.6	267°00.0	·· 54.6
16	279°13.4	79°21.2	46.6	45°06.2	44.7	162°21.3	13.6	282°02.6	54.7
17	294°15.8	94°20.8	47.8	60°06.9	45.2	177°23.6	13.6	297°05.1	54.7
18	309°18.3	109°20.4	S06°49.0	75°07.5	S19°45.6	192°26.0	N21°13.6	312°07.7	S03°54.7
19	324°20.8	124°19.9	50.2	90°08.1	46.0	207°28.4	13.6	327°10.3	54.8
20	339°23.2	139°19.5	51.4	105°08.8	46.5	222°30.7	13.6	342°12.9	54.8
21	354°25.7	154°19.0	·· 52.6	120°09.4	·· 46.9	237°33.1	·· 13.6	357°15.4	·· 54.9
22	9°28.2	169°18.6	53.8	135°10.0	47.4	252°35.4	13.5	12°18.0	54.9
23	24°30.6	184°18.1	55.0	150°10.7	47.8	267°37.8	13.5	27°20.6	54.9
Mer.pass.	21:22	ν -0.4′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.47	ν 2.4′	d -0.0′ m -2.31	ν 2.6′	d -0.0′ m 0.76

Stars	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°13.2	89°22.3
Acamar	315°10.8	-40°11.9
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.1
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.5
Elnath	278°00.8	28°37.7
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.2	7°24.8
Canopus	263°51.8	-52°42.2
Sirius	258°25.5	-16°44.9
Adhara	255°05.2	-29°00.1
Procyon	244°50.1	5°09.6
Pollux	243°16.4	27°57.8
Avior	234°14.5	-59°35.1
Suhail	222°45.9	-43°31.9
Miaplacidus	221°38.4	-69°49.0
Alphard	217°47.2	-8°46.1
Regulus	207°33.9	11°50.5
Dubhe	193°40.6	61°36.5
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	173°00.0	-63°14.3
Gacrux	171°51.5	-57°15.3
Alioth	166°12.9	55°49.1
Spica	158°21.9	-11°17.7
Alkaid	152°52.0	49°11.0
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°02.9
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°02.9
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.4	-26°29.3
Atria	107°09.4	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.2	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.7	-56°39.3
Deneb	49°25.4	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.1
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Oct 28 Tue	SHA	Mer.pass
Venus	163°13.3	10:41
Mars	127°49.5	13:02
Jupiter	243°15.3	05:20
Saturn	2°41.8	21:19

Oct 29 Wed	SHA	Mer.pass
Venus	162°03.9	10:42
Mars	127°05.9	13:01
Jupiter	243°12.4	05:16
Saturn	2°44.6	21:15

Oct 30 Thu	SHA	Mer.pass
Venus	160°54.3	10:42
Mars	126°22.1	13:00
Jupiter	243°09.6	05:12
Saturn	2°47.4	21:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°02.7	S13°07.8	109°01.3	9.8′	S26°59.7	5.0′	54.9′
1	199°02.8	08.6	123°30.1	9.8′	26°54.7	5.2′	54.9′
2	214°02.8	09.4	137°58.9	9.8′	26°49.5	5.3′	54.9′
3	229°02.9	·· 10.3	152°27.8	9.9′	26°44.2	5.4′	55.0′
4	244°02.9	11.1	166°56.6	9.9′	26°38.8	5.6′	55.0′
5	259°03.0	12.0	181°25.5	9.9′	26°33.2	5.7′	55.0′
6	274°03.0	S13°12.8	195°54.5	10.0′	S26°27.5	5.8′	55.0′
7	289°03.1	13.6	210°23.4	10.0′	26°21.7	6.0′	55.1′
8	304°03.1	14.5	224°52.4	10.0′	26°15.7	6.1′	55.1′
9	319°03.2	·· 15.3	239°21.4	10.0′	26°09.6	6.2′	55.1′
10	334°03.2	16.1	253°50.5	10.1′	26°03.4	6.4′	55.1′
11	349°03.3	17.0	268°19.5	10.1′	25°57.0	6.5′	55.2′
12	4°03.3	S13°17.8	282°48.6	10.1′	S25°50.5	6.6′	55.2′
13	19°03.4	18.6	297°17.8	10.2′	25°43.9	6.8′	55.2′
14	34°03.4	19.5	311°47.0	10.2′	25°37.1	6.9′	55.2′
15	49°03.4	·· 20.3	326°16.2	10.2′	25°30.2	7.1′	55.3′
16	64°03.5	21.1	340°45.4	10.3′	25°23.1	7.1′	55.3′
17	79°03.5	21.9	355°14.7	10.3′	25°16.0	7.3′	55.3′
18	94°03.6	S13°22.8	9°44.0	10.3′	S25°08.7	7.5′	55.4′
19	109°03.6	23.6	24°13.3	10.4′	25°01.2	7.5′	55.4′
20	124°03.7	24.4	38°42.7	10.4′	24°53.7	7.7′	55.4′
21	139°03.7	·· 25.3	53°12.1	10.4′	24°46.0	7.8′	55.4′
22	154°03.8	26.1	67°41.6	10.5′	24°38.2	8.0′	55.5′
23	169°03.8	26.9	82°11.1	10.5′	24°30.2	8.0′	55.5′
	SD = 16.1′	d = -0.8′	SD = 15.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°03.8	S13°27.8	96°40.6	10.6′	S24°22.2	8.2′	55.5′
1	199°03.9	28.6	111°10.1	10.6′	24°14.0	8.4′	55.5′
2	214°03.9	29.4	125°39.7	10.6′	24°05.6	8.4′	55.6′
3	229°04.0	·· 30.2	140°09.4	10.7′	23°57.2	8.6′	55.6′
4	244°04.0	31.1	154°39.0	10.7′	23°48.6	8.7′	55.6′
5	259°04.0	31.9	169°08.8	10.7′	23°39.9	8.8′	55.7′
6	274°04.1	S13°32.7	183°38.5	10.8′	S23°31.1	9.0′	55.7′
7	289°04.1	33.5	198°08.3	10.8′	23°22.1	9.0′	55.7′
8	304°04.2	34.4	212°38.1	10.9′	23°13.1	9.2′	55.8′
9	319°04.2	·· 35.2	227°08.0	10.9′	23°03.9	9.3′	55.8′
10	334°04.2	36.0	241°37.9	10.9′	22°54.6	9.5′	55.8′
11	349°04.3	36.8	256°07.8	11.0′	22°45.1	9.5′	55.9′
12	4°04.3	S13°37.7	270°37.8	11.0′	S22°35.6	9.7′	55.9′
13	19°04.4	38.5	285°07.8	11.1′	22°25.9	9.8′	55.9′
14	34°04.4	39.3	299°37.9	11.1′	22°16.1	9.9′	55.9′
15	49°04.4	·· 40.1	314°08.0	11.1′	22°06.2	10.0′	56.0′
16	64°04.5	41.0	328°38.1	11.2′	21°56.2	10.2′	56.0′
17	79°04.5	41.8	343°08.3	11.2′	21°46.0	10.2′	56.0′
18	94°04.5	S13°42.6	357°38.5	11.3′	S21°35.8	10.4′	56.1′
19	109°04.6	43.4	12°08.8	11.3′	21°25.4	10.5′	56.1′
20	124°04.6	44.2	26°39.0	11.3′	21°14.9	10.6′	56.1′
21	139°04.7	·· 45.1	41°09.4	11.4′	21°04.3	10.7′	56.2′
22	154°04.7	45.9	55°39.7	11.4′	20°53.6	10.9′	56.2′
23	169°04.7	46.7	70°10.1	11.4′	20°42.7	10.9′	56.2′
	SD = 16.1′	d = -0.8′	SD = 15.1′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.8	S13°47.5	84°40.6	11.5′	S20°31.8	11.1′	56.3′
1	199°04.8	48.3	99°11.1	11.5′	20°20.7	11.1′	56.3′
2	214°04.8	49.2	113°41.6	11.6′	20°09.6	11.3′	56.4′
3	229°04.9	·· 50.0	128°12.1	11.6′	19°58.3	11.4′	56.4′
4	244°04.9	50.8	142°42.7	11.6′	19°46.9	11.5′	56.4′
5	259°04.9	51.6	157°13.3	11.7′	19°35.4	11.6′	56.5′
6	274°05.0	S13°52.4	171°44.0	11.7′	S19°23.8	11.7′	56.5′
7	289°05.0	53.2	186°14.7	11.7′	19°12.1	11.8′	56.5′
8	304°05.0	54.1	200°45.4	11.8′	19°00.3	12.0′	56.6′
9	319°05.1	·· 54.9	215°16.2	11.8′	18°48.3	12.0′	56.6′
10	334°05.1	55.7	229°47.0	11.8′	18°36.3	12.1′	56.6′
11	349°05.1	56.5	244°17.8	11.9′	18°24.2	12.3′	56.7′
12	4°05.1	S13°57.3	258°48.7	11.9′	S18°11.9	12.3′	56.7′
13	19°05.2	58.1	273°19.5	11.9′	17°59.6	12.4′	56.7′
14	34°05.2	58.9	287°50.5	12.0′	17°47.2	12.6′	56.8′
15	49°05.2	13°59.8	302°21.4	12.0′	17°34.6	12.6′	56.8′
16	64°05.3	14°00.6	316°52.4	12.0′	17°22.0	12.8′	56.9′
17	79°05.3	01.4	331°23.4	12.0′	17°09.2	12.8′	56.9′
18	94°05.3	S14°02.2	345°54.5	12.1′	S16°56.4	12.9′	56.9′
19	109°05.4	03.0	0°25.6	12.1′	16°43.5	13.1′	57.0′
20	124°05.4	03.8	14°56.7	12.1′	16°30.4	13.1′	57.0′
21	139°05.4	·· 04.6	29°27.8	12.2′	16°17.3	13.2′	57.1′
22	154°05.4	05.4	43°58.9	12.2′	16°04.1	13.3′	57.1′
23	169°05.5	06.2	58°30.1	12.2′	15°50.8	13.4′	57.1′
	SD = 16.1′	d = -0.8′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:55	07:17	08:40	14:46	16:09	17:30
N 70°	05:52	07:05	08:17	15:09	16:21	17:34
68°	05:50	06:56	07:59	15:27	16:30	17:36
66°	05:47	06:48	07:45	15:41	16:38	17:39
64°	05:45	06:41	07:33	15:53	16:45	17:41
62°	05:43	06:36	07:24	16:03	16:51	17:43
60°	05:41	06:30	07:15	16:11	16:56	17:45
N 58°	05:40	06:26	07:08	16:19	17:01	17:47
56°	05:38	06:22	07:01	16:26	17:05	17:49
54°	05:36	06:18	06:55	16:31	17:09	17:50
52°	05:35	06:14	06:50	16:37	17:12	17:52
50°	05:33	06:11	06:45	16:42	17:15	17:53
45°	05:30	06:04	06:35	16:52	17:23	17:57
N 40°	05:26	05:58	06:26	17:01	17:29	18:01
35°	05:23	05:52	06:18	17:09	17:35	18:04
30°	05:19	05:47	06:12	17:15	17:40	18:08
20°	05:12	05:38	06:00	17:27	17:50	18:16
N 10°	05:03	05:28	05:50	17:37	17:59	18:24
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:44	05:09	05:31	17:57	18:19	18:44
20°	04:30	04:57	05:20	18:08	18:31	18:58
30°	04:13	04:43	05:08	18:20	18:45	19:15
35°	04:02	04:34	05:01	18:27	18:54	19:26
40°	03:49	04:24	04:53	18:36	19:04	19:40
45°	03:32	04:11	04:43	18:45	19:17	19:56
S 50°	03:11	03:56	04:32	18:57	19:33	20:18
52°	03:00	03:48	04:26	19:02	19:40	20:29
54°	02:48	03:40	04:20	19:08	19:49	20:42
56°	02:33	03:31	04:14	19:15	19:58	20:56
58°	02:16	03:20	04:06	19:23	20:10	21:15
S 60°	01:54	03:07	03:58	19:31	20:22	21:37

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°			17:42			20:39
N 70°			16:50			21:29
68°		17:35	16:17		19:01	22:00
66°		16:26	15:53		20:08	22:23
64°	16:27	15:50	15:34	18:23	20:44	22:41
62°	15:32	15:24	15:18	19:17	21:09	22:55
60°	14:59	15:04	15:05	19:49	21:28	23:07
N 58°	14:35	14:47	14:54	20:13	21:45	23:18
56°	14:15	14:32	14:44	20:32	21:58	23:27
54°	13:59	14:20	14:35	20:48	22:10	23:35
52°	13:45	14:09	14:27	21:02	22:21	23:42
50°	13:33	13:59	14:20	21:14	22:30	23:49
45°	13:07	13:38	14:04	21:38	22:49	·· ··
N 40°	12:47	13:22	13:52	21:58	23:05	·· ··
35°	12:29	13:07	13:41	22:14	23:18	·· ··
30°	12:15	12:55	13:31	22:28	23:29	·· ··
20°	11:50	12:34	13:15	22:52	23:49	·· ··
N 10°	11:28	12:15	13:00	23:13	·· ··	00:06
0°	11:07	11:58	12:47	23:32	·· ··	00:22
S 10°	10:47	11:40	12:33	23:51	·· ··	00:37
20°	10:25	11:22	12:19	·· ··	00:11	00:54
30°	10:00	11:00	12:02	·· ··	00:34	01:12
35°	09:45	10:47	11:52	00:07	00:48	01:23
40°	09:27	10:33	11:40	00:25	01:04	01:36
45°	09:06	10:15	11:27	00:47	01:22	01:50
S 50°	08:39	09:53	11:11	01:14	01:45	02:08
52°	08:26	09:42	11:03	01:28	01:56	02:17
54°	08:11	09:31	10:54	01:43	02:08	02:26
56°	07:53	09:17	10:45	02:01	02:23	02:36
58°	07:32	09:01	10:34	02:23	02:39	02:48
S 60°	07:04	08:42	10:21	02:51	02:59	03:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 34-53%
28	16:11	16:13	11:44	17:20	04:54	
29	16:15	16:17	11:44	18:10	05:45	
30	16:19	16:21	11:44	18:58	06:34	

No IERS EOP prediction data available

October 31, 01, 02 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2557 sec ΔT = TT-UT1 = +68.9283 sec

2025 October 31 to Nov. 02 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	39°33.1	199°17.7	S06°56.2	165°11.3	S19°48.2	282°40.2	N21°13.5	42°23.2	S03°55.0
1	54°35.6	214°17.2	57.4	180°11.9	48.7	297°42.5	13.5	57°25.7	55.0
2	69°38.0	229°16.8	58.5	195°12.5	49.1	312°44.9	13.5	72°28.3	55.1
3	84°40.5	244°16.4	06°59.7	210°13.2	·· 49.5	327°47.3	·· 13.5	87°30.9	·· 55.1
4	99°42.9	259°15.9	07°00.9	225°13.8	50.0	342°49.6	13.5	102°33.5	55.2
5	114°45.4	274°15.5	02.1	240°14.4	50.4	357°52.0	13.5	117°36.0	55.2
6	129°47.9	289°15.0	S07°03.3	255°15.1	S19°50.8	12°54.4	N21°13.5	132°38.6	S03°55.2
7	144°50.3	304°14.6	04.5	270°15.7	51.3	27°56.7	13.4	147°41.2	55.3
8	159°52.8	319°14.1	05.7	285°16.3	51.7	42°59.1	13.4	162°43.7	55.3
9	174°55.3	334°13.7	·· 06.9	300°16.9	·· 52.1	58°01.4	·· 13.4	177°46.3	·· 55.4
10	189°57.7	349°13.2	08.1	315°17.6	52.6	73°03.8	13.4	192°48.9	55.4
11	205°00.2	4°12.8	09.2	330°18.2	53.0	88°06.2	13.4	207°51.5	55.4
12	220°02.7	19°12.3	S07°10.4	345°18.8	S19°53.4	103°08.5	N21°13.4	222°54.0	S03°55.5
13	235°05.1	34°11.9	11.6	0°19.5	53.9	118°10.9	13.4	237°56.6	55.5
14	250°07.6	49°11.4	12.8	15°20.1	54.3	133°13.3	13.4	252°59.2	55.6
15	265°10.0	64°11.0	·· 14.0	30°20.7	·· 54.7	148°15.6	·· 13.4	268°01.8	·· 55.6
16	280°12.5	79°10.6	15.2	45°21.3	55.2	163°18.0	13.4	283°04.3	55.6
17	295°15.0	94°10.1	16.4	60°22.0	55.6	178°20.4	13.3	298°06.9	55.7
18	310°17.4	109°09.7	S07°17.6	75°22.6	S19°56.0	193°22.8	N21°13.3	313°09.5	S03°55.7
19	325°19.9	124°09.2	18.7	90°23.2	56.5	208°25.1	13.3	328°12.0	55.8
20	340°22.4	139°08.8	19.9	105°23.8	56.9	223°27.5	13.3	343°14.6	55.8
21	355°24.8	154°08.3	·· 21.1	120°24.5	·· 57.3	238°29.9	·· 13.3	358°17.2	·· 55.8
22	10°27.3	169°07.9	22.3	135°25.1	57.7	253°32.2	13.3	13°19.8	55.9
23	25°29.8	184°07.4	23.5	150°25.7	58.2	268°34.6	13.3	28°22.3	55.9
Mer.pass.	21:18	ν -0.4′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.46	ν 2.4′	d -0.0′ m -2.31	ν 2.6′	d -0.0′ m 0.76

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	40°32.2	199°07.0	S07°24.7	165°26.3	S19°58.6	283°37.0	N21°13.3	43°24.9	S03°55.9
1	55°34.7	214°06.5	25.9	180°27.0	59.0	298°39.3	13.3	58°27.5	56.0
2	70°37.2	229°06.1	27.0	195°27.6	59.5	313°41.7	13.2	73°30.0	56.0
3	85°39.6	244°05.6	·· 28.2	210°28.2	19°59.9	328°44.1	·· 13.2	88°32.6	·· 56.1
4	100°42.1	259°05.1	29.4	225°28.8	20°00.3	343°46.5	13.2	103°35.2	56.1
5	115°44.5	274°04.7	30.6	240°29.4	00.7	358°48.8	13.2	118°37.8	56.1
6	130°47.0	289°04.2	S07°31.8	255°30.1	S20°01.2	13°51.2	N21°13.2	133°40.3	S03°56.2
7	145°49.5	304°03.8	33.0	270°30.7	01.6	28°53.6	13.2	148°42.9	56.2
8	160°51.9	319°03.3	34.1	285°31.3	02.0	43°56.0	13.2	163°45.5	56.3
9	175°54.4	334°02.9	·· 35.3	300°31.9	·· 02.5	58°58.3	·· 13.2	178°48.0	·· 56.3
10	190°56.9	349°02.4	36.5	315°32.6	02.9	74°00.7	13.2	193°50.6	56.3
11	205°59.3	4°02.0	37.7	330°33.2	03.3	89°03.1	13.2	208°53.2	56.4
12	221°01.8	19°01.5	S07°38.9	345°33.8	S20°03.7	104°05.5	N21°13.2	223°55.7	S03°56.4
13	236°04.3	34°01.1	40.0	0°34.4	04.2	119°07.8	13.1	238°58.3	56.5
14	251°06.7	49°00.6	41.2	15°35.0	04.6	134°10.2	13.1	254°00.9	56.5
15	266°09.2	64°00.2	·· 42.4	30°35.7	·· 05.0	149°12.6	·· 13.1	269°03.5	·· 56.5
16	281°11.7	78°59.7	43.6	45°36.3	05.4	164°15.0	13.1	284°06.0	56.6
17	296°14.1	93°59.3	44.8	60°36.9	05.9	179°17.3	13.1	299°08.6	56.6
18	311°16.6	108°58.8	S07°45.9	75°37.5	S20°06.3	194°19.7	N21°13.1	314°11.2	S03°56.6
19	326°19.0	123°58.3	47.1	90°38.1	06.7	209°22.1	13.1	329°13.7	56.7
20	341°21.5	138°57.9	48.3	105°38.8	07.1	224°24.5	13.1	344°16.3	56.7
21	356°24.0	153°57.4	·· 49.5	120°39.4	·· 07.5	239°26.8	·· 13.1	359°18.9	·· 56.8
22	11°26.4	168°57.0	50.7	135°40.0	08.0	254°29.2	13.1	14°21.4	56.8
23	26°28.9	183°56.5	51.8	150°40.6	08.4	269°31.6	13.1	29°24.0	56.8
Mer.pass.	21:14	ν -0.5′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.46	ν 2.4′	d -0.0′ m -2.32	ν 2.6′	d -0.0′ m 0.77

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	41°31.4	198°56.1	S07°53.0	165°41.2	S20°08.8	284°34.0	N21°13.0	44°26.6	S03°56.9
1	56°33.8	213°55.6	54.2	180°41.8	09.2	299°36.4	13.0	59°29.1	56.9
2	71°36.3	228°55.1	55.4	195°42.5	09.7	314°38.7	13.0	74°31.7	56.9
3	86°38.8	243°54.7	·· 56.6	210°43.1	·· 10.1	329°41.1	·· 13.0	89°34.3	·· 57.0
4	101°41.2	258°54.2	57.7	225°43.7	10.5	344°43.5	13.0	104°36.8	57.0
5	116°43.7	273°53.8	07°58.9	240°44.3	10.9	359°45.9	13.0	119°39.4	57.1
6	131°46.1	288°53.3	S08°00.1	255°44.9	S20°11.3	14°48.3	N21°13.0	134°42.0	S03°57.1
7	146°48.6	303°52.8	01.3	270°45.5	11.8	29°50.6	13.0	149°44.5	57.1
8	161°51.1	318°52.4	02.4	285°46.2	12.2	44°53.0	13.0	164°47.1	57.2
9	176°53.5	333°51.9	·· 03.6	300°46.8	·· 12.6	59°55.4	·· 13.0	179°49.7	·· 57.2
10	191°56.0	348°51.5	04.8	315°47.4	13.0	74°57.8	13.0	194°52.2	57.2
11	206°58.5	3°51.0	06.0	330°48.0	13.4	90°00.2	13.0	209°54.8	57.3
12	222°00.9	18°50.5	S08°07.1	345°48.6	S20°13.9	105°02.6	N21°12.9	224°57.4	S03°57.3
13	237°03.4	33°50.1	08.3	0°49.2	14.3	120°04.9	12.9	239°59.9	57.4
14	252°05.9	48°49.6	09.5	15°49.8	14.7	135°07.3	12.9	255°02.5	57.4
15	267°08.3	63°49.2	·· 10.7	30°50.4	·· 15.1	150°09.7	·· 12.9	270°05.1	·· 57.4
16	282°10.8	78°48.7	11.8	45°51.1	15.5	165°12.1	12.9	285°07.6	57.5
17	297°13.3	93°48.2	13.0	60°51.7	15.9	180°14.5	12.9	300°10.2	57.5
18	312°15.7	108°47.8	S08°14.2	75°52.3	S20°16.4	195°16.9	N21°12.9	315°12.8	S03°57.5
19	327°18.2	123°47.3	15.3	90°52.9	16.8	210°19.3	12.9	330°15.3	57.6
20	342°20.6	138°46.8	16.5	105°53.5	17.2	225°21.6	12.9	345°17.9	57.6
21	357°23.1	153°46.4	·· 17.7	120°54.1	·· 17.6	240°24.0	·· 12.9	0°20.5	·· 57.6
22	12°25.6	168°45.9	18.9	135°54.7	18.0	255°26.4	12.9	15°23.0	57.7
23	27°28.0	183°45.4	20.0	150°55.3	18.4	270°28.8	12.9	30°25.6	57.7
Mer.pass.	21:10	ν -0.5′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.45	ν 2.4′	d -0.0′ m -2.33	ν 2.6′	d -0.0′ m 0.77

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°10.0
Schedar	349°29.8	56°41.0
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°12.8	89°22.3
Acamar	315°10.8	-40°11.9
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.2
Aldebaran	290°38.6	16°33.8
Rigel	281°03.0	-8°10.1
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.5
Elnath	278°00.8	28°37.7
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.2	7°24.8
Canopus	263°51.8	-52°42.2
Sirius	258°25.5	-16°44.9
Adhara	255°05.2	-29°00.2
Procyon	244°50.1	5°09.6
Pollux	243°16.4	27°57.8
Avior	234°14.4	-59°35.1
Suhail	222°45.9	-43°31.9
Miaplacidus	221°38.3	-69°49.0
Alphard	217°47.2	-8°46.1
Regulus	207°33.9	11°50.5
Dubhe	193°40.6	61°36.5
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	173°00.0	-63°14.3
Gacrux	171°51.5	-57°15.3
Alioth	166°12.9	55°49.1
Spica	158°21.9	-11°17.7
Alkaid	152°52.0	49°11.0
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°02.9
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°02.9
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.2	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.7	-56°39.3
Deneb	49°25.4	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Oct 31 Fri	SHA	Mer.pass
Venus	159°44.6	10:43
Mars	125°38.2	12:59
Jupiter	243°07.1	05:09
Saturn	2°50.1	21:07

Nov 01 Sat	SHA	Mer.pass
Venus	158°34.7	10:44
Mars	124°54.1	12:58
Jupiter	243°04.7	05:05
Saturn	2°52.7	21:03

Nov 02 Sun	SHA	Mer.pass
Venus	157°24.7	10:45
Mars	124°09.9	12:57
Jupiter	243°02.6	05:01
Saturn	2°55.2	20:59

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.5	S14°07.1	73°01.3	12.2′	S15°37.4	13.5′	57.2′
1	199°05.5	07.9	87°32.6	12.3′	15°23.9	13.6′	57.2′
2	214°05.5	08.7	102°03.8	12.3′	15°10.3	13.7′	57.2′
3	229°05.6	·· 09.5	116°35.1	12.3′	14°56.6	13.8′	57.3′
4	244°05.6	10.3	131°06.4	12.3′	14°42.8	13.9′	57.3′
5	259°05.6	11.1	145°37.7	12.3′	14°28.9	13.9′	57.4′
6	274°05.6	S14°11.9	160°09.1	12.4′	S14°15.0	14.1′	57.4′
7	289°05.7	12.7	174°40.4	12.4′	14°00.9	14.1′	57.4′
8	304°05.7	13.5	189°11.8	12.4′	13°46.8	14.2′	57.5′
9	319°05.7	·· 14.3	203°43.2	12.4′	13°32.6	14.3′	57.5′
10	334°05.7	15.1	218°14.6	12.4′	13°18.3	14.4′	57.6′
11	349°05.8	15.9	232°46.1	12.4′	13°03.9	14.4′	57.6′
12	4°05.8	S14°16.7	247°17.5	12.5′	S12°49.5	14.6′	57.6′
13	19°05.8	17.5	261°49.0	12.5′	12°34.9	14.6′	57.7′
14	34°05.8	18.4	276°20.4	12.5′	12°20.3	14.7′	57.7′
15	49°05.8	·· 19.2	290°51.9	12.5′	12°05.6	14.8′	57.8′
16	64°05.9	20.0	305°23.4	12.5′	11°50.8	14.8′	57.8′
17	79°05.9	20.8	319°54.9	12.5′	11°36.0	15.0′	57.8′
18	94°05.9	S14°21.6	334°26.5	12.5′	S11°21.0	15.0′	57.9′
19	109°05.9	22.4	348°58.0	12.5′	11°06.0	15.0′	57.9′
20	124°05.9	23.2	3°29.5	12.5′	10°51.0	15.2′	58.0′
21	139°06.0	·· 24.0	18°01.1	12.5′	10°35.8	15.2′	58.0′
22	154°06.0	24.8	32°32.6	12.6′	10°20.6	15.3′	58.0′
23	169°06.0	25.6	47°04.2	12.6′	10°05.3	15.4′	58.1′
	SD = 16.1′	d = -0.8′	SD = 15.6′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.0	S14°26.4	61°35.7	12.6′	S09°49.9	15.5′	58.1′
1	199°06.0	27.2	76°07.3	12.6′	09°34.4	15.5′	58.2′
2	214°06.1	28.0	90°38.9	12.6′	09°18.9	15.5′	58.2′
3	229°06.1	·· 28.8	105°10.4	12.6′	09°03.4	15.7′	58.3′
4	244°06.1	29.6	119°42.0	12.6′	08°47.7	15.7′	58.3′
5	259°06.1	30.4	134°13.5	12.6′	08°32.0	15.8′	58.3′
6	274°06.1	S14°31.2	148°45.1	12.6′	S08°16.2	15.8′	58.4′
7	289°06.1	32.0	163°16.6	12.5′	08°00.4	15.9′	58.4′
8	304°06.2	32.8	177°48.2	12.5′	07°44.5	15.9′	58.5′
9	319°06.2	·· 33.6	192°19.7	12.5′	07°28.6	16.1′	58.5′
10	334°06.2	34.3	206°51.3	12.5′	07°12.5	16.0′	58.5′
11	349°06.2	35.1	221°22.8	12.5′	06°56.5	16.2′	58.6′
12	4°06.2	S14°35.9	235°54.3	12.5′	S06°40.3	16.1′	58.6′
13	19°06.2	36.7	250°25.8	12.5′	06°24.2	16.3′	58.7′
14	34°06.2	37.5	264°57.3	12.5′	06°07.9	16.3′	58.7′
15	49°06.3	·· 38.3	279°28.7	12.5′	05°51.6	16.3′	58.7′
16	64°06.3	39.1	294°00.2	12.4′	05°35.3	16.4′	58.8′
17	79°06.3	39.9	308°31.6	12.4′	05°18.9	16.5′	58.8′
18	94°06.3	S14°40.7	323°03.1	12.4′	S05°02.4	16.5′	58.9′
19	109°06.3	41.5	337°34.5	12.4′	04°45.9	16.5′	58.9′
20	124°06.3	42.3	352°05.9	12.4′	04°29.4	16.6′	58.9′
21	139°06.3	·· 43.1	6°37.2	12.3′	04°12.8	16.6′	59.0′
22	154°06.3	43.9	21°08.6	12.3′	03°56.2	16.7′	59.0′
23	169°06.4	44.7	35°39.9	12.3′	03°39.5	16.7′	59.1′
	SD = 16.1′	d = -0.8′	SD = 15.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.4	S14°45.4	50°11.2	12.3′	S03°22.8	16.8′	59.1′
1	199°06.4	46.2	64°42.4	12.2′	03°06.0	16.8′	59.1′
2	214°06.4	47.0	79°13.7	12.2′	02°49.2	16.8′	59.2′
3	229°06.4	·· 47.8	93°44.9	12.2′	02°32.4	16.9′	59.2′
4	244°06.4	48.6	108°16.1	12.1′	02°15.5	16.9′	59.3′
5	259°06.4	49.4	122°47.2	12.1′	01°58.6	16.9′	59.3′
6	274°06.4	S14°50.2	137°18.3	12.1′	S01°41.7	17.0′	59.3′
7	289°06.4	51.0	151°49.4	12.0′	01°24.7	17.0′	59.4′
8	304°06.4	51.8	166°20.4	12.0′	01°07.7	17.0′	59.4′
9	319°06.4	·· 52.5	180°51.5	12.0′	00°50.7	17.0′	59.5′
10	334°06.4	53.3	195°22.4	11.9′	00°33.7	17.1′	59.5′
11	349°06.5	54.1	209°53.3	11.9′	S00°16.6	17.1′	59.5′
12	4°06.5	S14°54.9	224°24.2	11.8′	N00°00.5	17.2′	59.6′
13	19°06.5	55.7	238°55.1	11.8′	00°17.7	17.1′	59.6′
14	34°06.5	56.5	253°25.9	11.8′	00°34.8	17.2′	59.6′
15	49°06.5	·· 57.3	267°56.6	11.7′	00°52.0	17.2′	59.7′
16	64°06.5	58.0	282°27.3	11.7′	01°09.2	17.2′	59.7′
17	79°06.5	58.8	296°58.0	11.6′	01°26.4	17.2′	59.8′
18	94°06.5	S14°59.6	311°28.6	11.6′	N01°43.6	17.2′	59.8′
19	109°06.5	15°00.4	325°59.2	11.5′	02°00.8	17.2′	59.8′
20	124°06.5	01.2	340°29.7	11.5′	02°18.0	17.3′	59.9′
21	139°06.5	·· 01.9	355°00.1	11.4′	02°35.3	17.2′	59.9′
22	154°06.5	02.7	9°30.5	11.3′	02°52.5	17.3′	59.9′
23	169°06.5	03.5	24°00.9	11.3′	03°09.8	17.3′	60.0′
	SD = 16.1′	d = -0.8′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:07	07:30	08:58	14:27	15:55	17:18
N 70°	06:03	07:17	08:32	14:54	16:09	17:23
68°	05:59	07:06	08:12	15:14	16:19	17:27
66°	05:56	06:57	07:56	15:30	16:28	17:30
64°	05:53	06:50	07:43	15:43	16:36	17:33
62°	05:50	06:43	07:32	15:54	16:43	17:36
60°	05:48	06:37	07:23	16:04	16:49	17:38
N 58°	05:46	06:32	07:15	16:12	16:54	17:40
56°	05:44	06:28	07:07	16:19	16:59	17:43
54°	05:42	06:23	07:01	16:25	17:03	17:45
52°	05:40	06:20	06:55	16:31	17:07	17:47
50°	05:38	06:16	06:50	16:37	17:10	17:49
45°	05:33	06:08	06:39	16:48	17:19	17:53
N 40°	05:29	06:01	06:29	16:57	17:26	17:58
35°	05:25	05:55	06:21	17:06	17:32	18:02
30°	05:21	05:49	06:14	17:13	17:38	18:06
20°	05:13	05:39	06:02	17:25	17:48	18:14
N 10°	05:04	05:29	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:42	05:08	05:30	17:58	18:19	18:45
20°	04:28	04:55	05:18	18:09	18:32	18:59
30°	04:10	04:40	05:05	18:22	18:48	19:18
35°	03:58	04:31	04:58	18:30	18:57	19:30
40°	03:44	04:20	04:49	18:39	19:08	19:44
45°	03:27	04:06	04:39	18:49	19:22	20:02
S 50°	03:04	03:50	04:26	19:02	19:39	20:25
52°	02:52	03:42	04:20	19:08	19:47	20:37
54°	02:39	03:33	04:14	19:15	19:56	20:50
56°	02:23	03:23	04:07	19:22	20:06	21:06
58°	02:04	03:11	03:59	19:30	20:18	21:26
S 60°	01:39	02:57	03:49	19:39	20:32	21:53

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	16:21	15:37	15:00	23:41	·· ··	02:07
N 70°	16:01	15:29	15:01	23:58	·· ··	02:11
68°	15:46	15:22	15:01	·· ··	00:11	02:15
66°	15:33	15:17	15:02	·· ··	00:22	02:18
64°	15:22	15:12	15:03	·· ··	00:31	02:20
62°	15:13	15:08	15:03	·· ··	00:39	02:22
60°	15:05	15:04	15:03	·· ··	00:45	02:24
N 58°	14:58	15:01	15:04	·· ··	00:51	02:25
56°	14:52	14:58	15:04	·· ··	00:56	02:27
54°	14:46	14:56	15:05	·· ··	01:01	02:28
52°	14:41	14:53	15:05	·· ··	01:05	02:29
50°	14:36	14:51	15:05	·· ··	01:09	02:30
45°	14:26	14:46	15:06	00:02	01:17	02:33
N 40°	14:18	14:42	15:06	00:14	01:23	02:34
35°	14:11	14:39	15:07	00:23	01:29	02:36
30°	14:04	14:36	15:07	00:31	01:34	02:37
20°	13:53	14:31	15:08	00:46	01:42	02:40
N 10°	13:44	14:26	15:09	00:58	01:50	02:42
0°	13:34	14:21	15:09	01:10	01:57	02:44
S 10°	13:25	14:17	15:10	01:21	02:04	02:46
20°	13:15	14:12	15:11	01:33	02:11	02:48
30°	13:04	14:07	15:11	01:47	02:19	02:50
35°	12:57	14:04	15:12	01:55	02:24	02:51
40°	12:50	14:00	15:13	02:04	02:29	02:53
45°	12:41	13:56	15:13	02:14	02:35	02:54
S 50°	12:30	13:51	15:14	02:27	02:42	02:56
52°	12:25	13:49	15:14	02:32	02:45	02:57
54°	12:20	13:46	15:15	02:39	02:49	02:58
56°	12:14	13:44	15:15	02:46	02:53	02:59
58°	12:07	13:40	15:16	02:54	02:57	03:00
S 60°	11:59	13:37	15:17	03:03	03:02	03:01

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 63-83%
31	16:22	16:23	11:44	19:46	07:22	
01	16:24	16:25	11:44	20:33	08:09	
02	16:25	16:26	11:44	21:21	08:56	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2564 sec ΔT = TT-UT1 = +68.9276 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	42°30.5	198°45.0	S08°21.2	165°56.0	S20°18.9	285°31.2	N21°12.9	45°28.2	S03°57.7
1	57°33.0	213°44.5	22.4	180°56.6	19.3	300°33.6	12.8	60°30.7	57.8
2	72°35.4	228°44.1	23.5	195°57.2	19.7	315°36.0	12.8	75°33.3	57.8
3	87°37.9	243°43.6	·· 24.7	210°57.8	·· 20.1	330°38.4	·· 12.8	90°35.8	·· 57.9
4	102°40.4	258°43.1	25.9	225°58.4	20.5	345°40.7	12.8	105°38.4	57.9
5	117°42.8	273°42.7	27.1	240°59.0	20.9	0°43.1	12.8	120°41.0	57.9
6	132°45.3	288°42.2	S08°28.2	255°59.6	S20°21.3	15°45.5	N21°12.8	135°43.5	S03°58.0
7	147°47.7	303°41.7	29.4	271°00.2	21.8	30°47.9	12.8	150°46.1	58.0
8	162°50.2	318°41.3	30.6	286°00.8	22.2	45°50.3	12.8	165°48.7	58.0
9	177°52.7	333°40.8	·· 31.7	301°01.4	·· 22.6	60°52.7	·· 12.8	180°51.2	·· 58.1
10	192°55.1	348°40.3	32.9	316°02.1	23.0	75°55.1	12.8	195°53.8	58.1
11	207°57.6	3°39.8	34.1	331°02.7	23.4	90°57.5	12.8	210°56.4	58.1
12	223°00.1	18°39.4	S08°35.2	346°03.3	S20°23.8	105°59.9	N21°12.8	225°58.9	S03°58.2
13	238°02.5	33°38.9	36.4	1°03.9	24.2	121°02.3	12.8	241°01.5	58.2
14	253°05.0	48°38.4	37.6	16°04.5	24.6	136°04.7	12.8	256°04.0	58.2
15	268°07.5	63°38.0	·· 38.7	31°05.1	·· 25.0	151°07.0	·· 12.8	271°06.6	·· 58.3
16	283°09.9	78°37.5	39.9	46°05.7	25.5	166°09.4	12.8	286°09.2	58.3
17	298°12.4	93°37.0	41.1	61°06.3	25.9	181°11.8	12.7	301°11.7	58.4
18	313°14.9	108°36.6	S08°42.2	76°06.9	S20°26.3	196°14.2	N21°12.7	316°14.3	S03°58.4
19	328°17.3	123°36.1	43.4	91°07.5	26.7	211°16.6	12.7	331°16.8	58.4
20	343°19.8	138°35.6	44.6	106°08.1	27.1	226°19.0	12.7	346°19.4	58.5
21	358°22.2	153°35.1	·· 45.7	121°08.7	·· 27.5	241°21.4	·· 12.7	1°22.0	·· 58.5
22	13°24.7	168°34.7	46.9	136°09.3	27.9	256°23.8	12.7	16°24.5	58.5
23	28°27.2	183°34.2	48.1	151°09.9	28.3	271°26.2	12.7	31°27.1	58.6
Mer.pass.	21:06	ν -0.5′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.45	ν 2.4′	d -0.0′ m -2.34	ν 2.6′	d -0.0′ m 0.78

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	43°29.6	198°33.7	S08°49.2	166°10.5	S20°28.7	286°28.6	N21°12.7	46°29.7	S03°58.6
1	58°32.1	213°33.3	50.4	181°11.1	29.1	301°31.0	12.7	61°32.2	58.6
2	73°34.6	228°32.8	51.5	196°11.7	29.5	316°33.4	12.7	76°34.8	58.7
3	88°37.0	243°32.3	·· 52.7	211°12.3	·· 29.9	331°35.8	·· 12.7	91°37.3	·· 58.7
4	103°39.5	258°31.8	53.9	226°13.0	30.4	346°38.2	12.7	106°39.9	58.7
5	118°42.0	273°31.4	55.0	241°13.6	30.8	1°40.6	12.7	121°42.5	58.8
6	133°44.4	288°30.9	S08°56.2	256°14.2	S20°31.2	16°43.0	N21°12.7	136°45.0	S03°58.8
7	148°46.9	303°30.4	57.3	271°14.8	31.6	31°45.4	12.7	151°47.6	58.8
8	163°49.3	318°29.9	58.5	286°15.4	32.0	46°47.8	12.7	166°50.1	58.9
9	178°51.8	333°29.5	08°59.7	301°16.0	·· 32.4	61°50.2	·· 12.7	181°52.7	·· 58.9
10	193°54.3	348°29.0	09°00.8	316°16.6	32.8	76°52.6	12.6	196°55.3	58.9
11	208°56.7	3°28.5	02.0	331°17.2	33.2	91°55.0	12.6	211°57.8	59.0
12	223°59.2	18°28.0	S09°03.1	346°17.8	S20°33.6	106°57.4	N21°12.6	227°00.4	S03°59.0
13	239°01.7	33°27.6	04.3	1°18.4	34.0	121°59.8	12.6	242°02.9	59.0
14	254°04.1	48°27.1	05.5	16°19.0	34.4	137°02.2	12.6	257°05.5	59.1
15	269°06.6	63°26.6	·· 06.6	31°19.6	·· 34.8	152°04.6	·· 12.6	272°08.1	·· 59.1
16	284°09.1	78°26.1	07.8	46°20.2	35.2	167°07.0	12.6	287°10.6	59.1
17	299°11.5	93°25.6	08.9	61°20.8	35.6	182°09.4	12.6	302°13.2	59.2
18	314°14.0	108°25.2	S09°10.1	76°21.4	S20°36.0	197°11.8	N21°12.6	317°15.7	S03°59.2
19	329°16.5	123°24.7	11.3	91°22.0	36.4	212°14.2	12.6	332°18.3	59.2
20	344°18.9	138°24.2	12.4	106°22.6	36.8	227°16.6	12.6	347°20.8	59.3
21	359°21.4	153°23.7	·· 13.6	121°23.2	·· 37.2	242°19.0	·· 12.6	2°23.4	·· 59.3
22	14°23.8	168°23.2	14.7	136°23.8	37.6	257°21.4	12.6	17°26.0	59.3
23	29°26.3	183°22.8	15.9	151°24.4	38.0	272°23.8	12.6	32°28.5	59.4
Mer.pass.	21:03	ν -0.5′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.44	ν 2.4′	d -0.0′ m -2.34	ν 2.6′	d -0.0′ m 0.78

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°28.8	198°22.3	S09°17.0	166°25.0	S20°38.4	287°26.2	N21°12.6	47°31.1	S03°59.4
1	59°31.2	213°21.8	18.2	181°25.6	38.8	302°28.6	12.6	62°33.6	59.4
2	74°33.7	228°21.3	19.3	196°26.2	39.2	317°31.0	12.6	77°36.2	59.5
3	89°36.2	243°20.8	·· 20.5	211°26.8	·· 39.6	332°33.4	·· 12.6	92°38.7	·· 59.5
4	104°38.6	258°20.4	21.7	226°27.3	40.0	347°35.8	12.6	107°41.3	59.5
5	119°41.1	273°19.9	22.8	241°27.9	40.4	2°38.2	12.6	122°43.9	59.6
6	134°43.6	288°19.4	S09°24.0	256°28.5	S20°40.8	17°40.7	N21°12.6	137°46.4	S03°59.6
7	149°46.0	303°18.9	25.1	271°29.1	41.2	32°43.1	12.6	152°49.0	59.6
8	164°48.5	318°18.4	26.3	286°29.7	41.6	47°45.5	12.6	167°51.5	59.7
9	179°51.0	333°17.9	·· 27.4	301°30.3	·· 42.0	62°47.9	·· 12.5	182°54.1	·· 59.7
10	194°53.4	348°17.5	28.6	316°30.9	42.4	77°50.3	12.5	197°56.6	59.7
11	209°55.9	3°17.0	29.7	331°31.5	42.8	92°52.7	12.5	212°59.2	59.8
12	224°58.3	18°16.5	S09°30.9	346°32.1	S20°43.2	107°55.1	N21°12.5	228°01.8	S03°59.8
13	240°00.8	33°16.0	32.0	1°32.7	43.6	122°57.5	12.5	243°04.3	59.8
14	255°03.3	48°15.5	33.2	16°33.3	44.0	137°59.9	12.5	258°06.9	59.8
15	270°05.7	63°15.0	·· 34.3	31°33.9	·· 44.4	153°02.3	·· 12.5	273°09.4	·· 59.9
16	285°08.2	78°14.5	35.5	46°34.5	44.8	168°04.7	12.5	288°12.0	59.9
17	300°10.7	93°14.1	36.6	61°35.1	45.2	183°07.2	12.5	303°14.5	03°59.9
18	315°13.1	108°13.6	S09°37.8	76°35.7	S20°45.6	198°09.6	N21°12.5	318°17.1	S04°00.0
19	330°15.6	123°13.1	38.9	91°36.3	46.0	213°12.0	12.5	333°19.6	00.0
20	345°18.1	138°12.6	40.1	106°36.9	46.4	228°14.4	12.5	348°22.2	00.0
21	0°20.5	153°12.1	·· 41.2	121°37.5	·· 46.7	243°16.8	·· 12.5	3°24.8	·· 00.1
22	15°23.0	168°11.6	42.4	136°38.0	47.1	258°19.2	12.5	18°27.3	00.1
23	30°25.5	183°11.1	43.5	151°38.6	47.5	273°21.6	12.5	33°29.9	00.1
Mer.pass.	20:59	ν -0.5′	d -1.2′	m -3.91	ν 0.6′	d -0.4′	m 1.44	ν 2.4′	d -0.0′ m -2.35	ν 2.6′	d -0.0′ m 0.79

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°10.0
Schedar	349°29.8	56°41.0
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°12.5	89°22.4
Acamar	315°10.8	-40°11.9
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.2
Aldebaran	290°38.6	16°33.8
Rigel	281°03.0	-8°10.1
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.5
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.1	7°24.8
Canopus	263°51.8	-52°42.2
Sirius	258°25.5	-16°44.9
Adhara	255°05.2	-29°00.2
Procyon	244°50.0	5°09.6
Pollux	243°16.4	27°57.8
Avior	234°14.4	-59°35.2
Suhail	222°45.9	-43°31.9
Miaplacidus	221°38.3	-69°49.0
Alphard	217°47.2	-8°46.1
Regulus	207°33.9	11°50.5
Dubhe	193°40.5	61°36.5
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	173°00.0	-63°14.3
Gacrux	171°51.4	-57°15.3
Alioth	166°12.9	55°49.1
Spica	158°21.9	-11°17.7
Alkaid	152°51.9	49°11.0
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°02.9
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°21.0	74°02.9
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.3	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.6
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.8	-56°39.3
Deneb	49°25.4	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 03 Mon	SHA	Mer.pass
Venus	156°14.5	10:45
Mars	123°25.5	12:56
Jupiter	243°00.7	04:57
Saturn	2°57.7	20:55

Nov 04 Tue	SHA	Mer.pass
Venus	155°04.1	10:46
Mars	122°40.9	12:55
Jupiter	242°59.0	04:53
Saturn	3°00.0	20:50

Nov 05 Wed	SHA	Mer.pass
Venus	153°53.5	10:47
Mars	121°56.2	12:54
Jupiter	242°57.4	04:49
Saturn	3°02.3	20:46

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.5	S15°04.3	38°31.1	11.2′	N03°27.1	17.3′	60.0′
1	199°06.5	05.1	53°01.4	11.2′	03°44.4	17.2′	60.0′
2	214°06.5	05.8	67°31.5	11.1′	04°01.6	17.3′	60.1′
3	229°06.5	·· 06.6	82°01.6	11.0′	04°18.9	17.3′	60.1′
4	244°06.5	07.4	96°31.7	11.0′	04°36.2	17.2′	60.1′
5	259°06.5	08.2	111°01.6	10.9′	04°53.4	17.3′	60.2′
6	274°06.5	S15°09.0	125°31.5	10.8′	N05°10.7	17.2′	60.2′
7	289°06.5	09.7	140°01.4	10.8′	05°27.9	17.3′	60.2′
8	304°06.5	10.5	154°31.2	10.7′	05°45.2	17.2′	60.3′
9	319°06.5	·· 11.3	169°00.9	10.6′	06°02.4	17.2′	60.3′
10	334°06.5	12.1	183°30.5	10.6′	06°19.6	17.2′	60.3′
11	349°06.5	12.8	198°00.0	10.5′	06°36.8	17.2′	60.4′
12	4°06.5	S15°13.6	212°29.5	10.4′	N06°54.0	17.2′	60.4′
13	19°06.5	14.4	226°58.9	10.3′	07°11.2	17.1′	60.4′
14	34°06.5	15.2	241°28.2	10.2′	07°28.3	17.1′	60.5′
15	49°06.5	·· 15.9	255°57.5	10.2′	07°45.4	17.1′	60.5′
16	64°06.5	16.7	270°26.7	10.1′	08°02.5	17.1′	60.5′
17	79°06.5	17.5	284°55.8	10.0′	08°19.6	17.0′	60.6′
18	94°06.5	S15°18.3	299°24.8	9.9′	N08°36.6	17.0′	60.6′
19	109°06.5	19.0	313°53.7	9.8′	08°53.6	17.0′	60.6′
20	124°06.5	19.8	328°22.5	9.8′	09°10.6	16.9′	60.6′
21	139°06.5	·· 20.6	342°51.3	9.7′	09°27.5	16.9′	60.7′
22	154°06.5	21.3	357°19.9	9.6′	09°44.4	16.9′	60.7′
23	169°06.5	22.1	11°48.5	9.5′	10°01.3	16.8′	60.7′
	SD = 16.1′	d = -0.8′	SD = 16.4′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.5	S15°22.9	26°17.0	9.4′	N10°18.1	16.8′	60.7′
1	199°06.4	23.7	40°45.4	9.3′	10°34.9	16.7′	60.8′
2	214°06.4	24.4	55°13.7	9.2′	10°51.6	16.7′	60.8′
3	229°06.4	·· 25.2	69°41.9	9.1′	11°08.3	16.6′	60.8′
4	244°06.4	26.0	84°10.0	9.0′	11°24.9	16.5′	60.8′
5	259°06.4	26.7	98°38.0	8.9′	11°41.4	16.6′	60.9′
6	274°06.4	S15°27.5	113°06.0	8.8′	N11°58.0	16.4′	60.9′
7	289°06.4	28.3	127°33.8	8.7′	12°14.4	16.4′	60.9′
8	304°06.4	29.0	142°01.5	8.6′	12°30.8	16.3′	60.9′
9	319°06.4	·· 29.8	156°29.1	8.5′	12°47.1	16.3′	61.0′
10	334°06.4	30.6	170°56.7	8.4′	13°03.4	16.2′	61.0′
11	349°06.4	31.3	185°24.1	8.3′	13°19.6	16.1′	61.0′
12	4°06.3	S15°32.1	199°51.4	8.2′	N13°35.7	16.1′	61.0′
13	19°06.3	32.8	214°18.6	8.1′	13°51.8	16.0′	61.0′
14	34°06.3	33.6	228°45.7	8.0′	14°07.8	15.9′	61.1′
15	49°06.3	·· 34.4	243°12.7	7.9′	14°23.7	15.8′	61.1′
16	64°06.3	35.1	257°39.6	7.8′	14°39.5	15.8′	61.1′
17	79°06.3	35.9	272°06.4	7.7′	14°55.3	15.6′	61.1′
18	94°06.3	S15°36.7	286°33.1	7.6′	N15°10.9	15.6′	61.1′
19	109°06.3	37.4	300°59.7	7.5′	15°26.5	15.5′	61.1′
20	124°06.2	38.2	315°26.1	7.4′	15°42.0	15.4′	61.2′
21	139°06.2	·· 38.9	329°52.5	7.2′	15°57.4	15.3′	61.2′
22	154°06.2	39.7	344°18.7	7.1′	16°12.7	15.2′	61.2′
23	169°06.2	40.5	358°44.9	7.0′	16°27.9	15.1′	61.2′
	SD = 16.1′	d = -0.8′	SD = 16.6′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.2	S15°41.2	13°10.9	6.9′	N16°43.0	15.1′	61.2′
1	199°06.2	42.0	27°36.8	6.8′	16°58.1	14.9′	61.2′
2	214°06.2	42.7	42°02.6	6.7′	17°13.0	14.8′	61.2′
3	229°06.1	·· 43.5	56°28.2	6.6′	17°27.8	14.7′	61.3′
4	244°06.1	44.3	70°53.8	6.4′	17°42.5	14.6′	61.3′
5	259°06.1	45.0	85°19.3	6.3′	17°57.1	14.4′	61.3′
6	274°06.1	S15°45.8	99°44.6	6.2′	N18°11.5	14.4′	61.3′
7	289°06.1	46.5	114°09.8	6.1′	18°25.9	14.2′	61.3′
8	304°06.1	47.3	128°34.9	6.0′	18°40.1	14.2′	61.3′
9	319°06.0	·· 48.0	142°59.9	5.9′	18°54.3	14.0′	61.3′
10	334°06.0	48.8	157°24.8	5.8′	19°08.3	13.8′	61.3′
11	349°06.0	49.5	171°49.5	5.6′	19°22.1	13.8′	61.3′
12	4°06.0	S15°50.3	186°14.2	5.5′	N19°35.9	13.6′	61.3′
13	19°06.0	51.0	200°38.7	5.4′	19°49.5	13.5′	61.3′
14	34°05.9	51.8	215°03.1	5.3′	20°03.0	13.4′	61.4′
15	49°05.9	·· 52.6	229°27.4	5.2′	20°16.4	13.2′	61.4′
16	64°05.9	53.3	243°51.6	5.1′	20°29.6	13.1′	61.4′
17	79°05.9	54.1	258°15.7	5.0′	20°42.7	12.9′	61.4′
18	94°05.9	S15°54.8	272°39.6	4.8′	N20°55.6	12.8′	61.4′
19	109°05.8	55.6	287°03.5	4.7′	21°08.4	12.6′	61.4′
20	124°05.8	56.3	301°27.2	4.6′	21°21.0	12.5′	61.4′
21	139°05.8	·· 57.1	315°50.8	4.5′	21°33.5	12.4′	61.4′
22	154°05.8	57.8	330°14.3	4.4′	21°45.9	12.2′	61.4′
23	169°05.7	58.6	344°37.7	4.3′	21°58.1	12.0′	61.4′
	SD = 16.1′	d = -0.8′	SD = 16.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:19	07:44	09:18	14:08	15:42	17:07
N 70°	06:13	07:29	08:47	14:39	15:57	17:12
68°	06:09	07:17	08:24	15:02	16:09	17:17
66°	06:04	07:07	08:07	15:19	16:19	17:21
64°	06:01	06:58	07:53	15:34	16:28	17:25
62°	05:57	06:51	07:41	15:46	16:35	17:29
60°	05:54	06:44	07:30	15:56	16:42	17:32
N 58°	05:52	06:39	07:22	16:05	16:48	17:34
56°	05:49	06:34	07:14	16:13	16:53	17:37
54°	05:47	06:29	07:07	16:20	16:58	17:40
52°	05:44	06:25	07:01	16:26	17:02	17:42
50°	05:42	06:21	06:55	16:32	17:06	17:44
45°	05:37	06:12	06:43	16:44	17:15	17:50
N 40°	05:32	06:04	06:33	16:54	17:22	17:54
35°	05:28	05:58	06:24	17:03	17:29	17:59
30°	05:23	05:51	06:16	17:11	17:35	18:04
20°	05:14	05:40	06:03	17:24	17:47	18:13
N 10°	05:04	05:30	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:41	05:07	05:29	17:58	18:20	18:46
20°	04:26	04:54	05:17	18:11	18:34	19:01
30°	04:07	04:37	05:03	18:25	18:50	19:21
35°	03:55	04:28	04:55	18:33	19:00	19:33
40°	03:40	04:16	04:45	18:42	19:12	19:48
45°	03:22	04:02	04:34	18:54	19:26	20:07
S 50°	02:57	03:44	04:21	19:07	19:44	20:32
52°	02:45	03:36	04:15	19:14	19:53	20:44
54°	02:30	03:26	04:08	19:21	20:03	20:59
56°	02:13	03:15	04:00	19:28	20:14	21:17
58°	01:52	03:03	03:51	19:37	20:27	21:39
S 60°	01:22	02:48	03:41	19:48	20:42	22:10

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	14:21	13:27	▭	04:32	07:16	▭
N 70°	14:31	13:53	12:28	04:25	06:53	10:16
68°	14:40	14:13	13:28	04:20	06:35	09:18
66°	14:47	14:29	14:03	04:15	06:21	08:45
64°	14:53	14:42	14:28	04:11	06:10	08:21
62°	14:58	14:53	14:48	04:08	06:00	08:02
60°	15:03	15:03	15:05	04:05	05:52	07:46
N 58°	15:07	15:12	15:19	04:02	05:44	07:33
56°	15:11	15:19	15:31	04:00	05:38	07:22
54°	15:14	15:26	15:42	03:58	05:32	07:12
52°	15:17	15:32	15:51	03:56	05:27	07:03
50°	15:20	15:38	16:00	03:55	05:23	06:55
45°	15:26	15:50	16:18	03:51	05:13	06:39
N 40°	15:31	16:00	16:33	03:48	05:05	06:25
35°	15:36	16:08	16:46	03:45	04:58	06:14
30°	15:40	16:16	16:57	03:43	04:52	06:04
20°	15:47	16:29	17:17	03:39	04:41	05:47
N 10°	15:53	16:41	17:34	03:36	04:32	05:32
0°	15:59	16:52	17:50	03:32	04:23	05:19
S 10°	16:05	17:03	18:06	03:29	04:15	05:05
20°	16:11	17:15	18:23	03:26	04:06	04:51
30°	16:19	17:29	18:43	03:22	03:56	04:34
35°	16:23	17:37	18:55	03:19	03:50	04:24
40°	16:28	17:47	19:09	03:17	03:43	04:14
45°	16:33	17:58	19:25	03:14	03:35	04:01
S 50°	16:40	18:11	19:46	03:10	03:26	03:45
52°	16:44	18:17	19:55	03:09	03:22	03:38
54°	16:47	18:24	20:06	03:07	03:17	03:30
56°	16:51	18:32	20:19	03:05	03:12	03:22
58°	16:55	18:41	20:33	03:03	03:06	03:12
S 60°	17:00	18:51	20:51	03:01	03:00	03:00

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 91-99%
03	16:26	16:26	11:44	22:11	09:45	
04	16:26	16:25	11:44	23:05	10:38	
05	16:25	16:24	11:44	–:–	11:34	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2571 sec ΔT = TT-UT1 = +68.9269 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°27.9	198°10.6	S09°44.7	166°39.2	S20°47.9	288°24.0	N21°12.5	48°32.4	S04°00.2
1	60°30.4	213°10.2	45.8	181°39.8	48.3	303°26.5	12.5	63°35.0	00.2
2	75°32.8	228°09.7	46.9	196°40.4	48.7	318°28.9	12.5	78°37.5	00.2
3	90°35.3	243°09.2	·· 48.1	211°41.0	·· 49.1	333°31.3	·· 12.5	93°40.1	·· 00.3
4	105°37.8	258°08.7	49.2	226°41.6	49.5	348°33.7	12.5	108°42.6	00.3
5	120°40.2	273°08.2	50.4	241°42.2	49.9	3°36.1	12.5	123°45.2	00.3
6	135°42.7	288°07.7	S09°51.5	256°42.8	S20°50.3	18°38.5	N21°12.5	138°47.7	S04°00.3
7	150°45.2	303°07.2	52.7	271°43.4	50.7	33°40.9	12.5	153°50.3	00.4
8	165°47.6	318°06.7	53.8	286°43.9	51.1	48°43.4	12.5	168°52.8	00.4
9	180°50.1	333°06.2	·· 55.0	301°44.5	·· 51.4	63°45.8	·· 12.5	183°55.4	·· 00.4
10	195°52.6	348°05.7	56.1	316°45.1	51.8	78°48.2	12.5	198°57.9	00.5
11	210°55.0	3°05.2	57.2	331°45.7	52.2	93°50.6	12.5	214°00.5	00.5
12	225°57.5	18°04.7	S09°58.4	346°46.3	S20°52.6	108°53.0	N21°12.5	229°03.1	S04°00.5
13	240°59.9	33°04.2	09°59.5	1°46.9	53.0	123°55.4	12.5	244°05.6	00.6
14	256°02.4	48°03.8	10°00.7	16°47.5	53.4	138°57.9	12.5	259°08.2	00.6
15	271°04.9	63°03.3	·· 01.8	31°48.1	·· 53.8	154°00.3	·· 12.5	274°10.7	·· 00.6
16	286°07.3	78°02.8	02.9	46°48.7	54.2	169°02.7	12.5	289°13.3	00.6
17	301°09.8	93°02.3	04.1	61°49.2	54.6	184°05.1	12.5	304°15.8	00.7
18	316°12.3	108°01.8	S10°05.2	76°49.8	S20°54.9	199°07.5	N21°12.5	319°18.4	S04°00.7
19	331°14.7	123°01.3	06.4	91°50.4	55.3	214°10.0	12.5	334°20.9	00.7
20	346°17.2	138°00.8	07.5	106°51.0	55.7	229°12.4	12.5	349°23.5	00.8
21	1°19.7	153°00.3	·· 08.6	121°51.6	·· 56.1	244°14.8	·· 12.5	4°26.0	·· 00.8
22	16°22.1	167°59.8	09.8	136°52.2	56.5	259°17.2	12.5	19°28.6	00.8
23	31°24.6	182°59.3	10.9	151°52.8	56.9	274°19.6	12.5	34°31.1	00.9
Mer.pass.	20:55	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.4′	m 1.43	ν 2.4′	d -0.0′ m -2.36	ν 2.6′	d -0.0′ m 0.79

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°27.1	197°58.8	S10°12.1	166°53.3	S20°57.3	289°22.1	N21°12.5	49°33.7	S04°00.9
1	61°29.5	212°58.3	13.2	181°53.9	57.6	304°24.5	12.5	64°36.2	00.9
2	76°32.0	227°57.8	14.3	196°54.5	58.0	319°26.9	12.4	79°38.8	00.9
3	91°34.4	242°57.3	·· 15.5	211°55.1	·· 58.4	334°29.3	·· 12.4	94°41.3	·· 01.0
4	106°36.9	257°56.8	16.6	226°55.7	58.8	349°31.8	12.4	109°43.9	01.0
5	121°39.4	272°56.3	17.7	241°56.3	59.2	4°34.2	12.4	124°46.4	01.0
6	136°41.8	287°55.8	S10°18.9	256°56.8	S20°59.6	19°36.6	N21°12.4	139°49.0	S04°01.1
7	151°44.3	302°55.3	20.0	271°57.4	20°59.9	34°39.0	12.4	154°51.5	01.1
8	166°46.8	317°54.8	21.1	286°58.0	21°00.3	49°41.5	12.4	169°54.1	01.1
9	181°49.2	332°54.3	·· 22.3	301°58.6	·· 00.7	64°43.9	·· 12.4	184°56.6	·· 01.1
10	196°51.7	347°53.8	23.4	316°59.2	01.1	79°46.3	12.4	199°59.2	01.2
11	211°54.2	2°53.3	24.5	331°59.8	01.5	94°48.7	12.4	215°01.7	01.2
12	226°56.6	17°52.8	S10°25.7	347°00.3	S21°01.9	109°51.2	N21°12.4	230°04.3	S04°01.2
13	241°59.1	32°52.3	26.8	2°00.9	02.2	124°53.6	12.4	245°06.8	01.3
14	257°01.6	47°51.8	27.9	17°01.5	02.6	139°56.0	12.4	260°09.4	01.3
15	272°04.0	62°51.3	·· 29.1	32°02.1	·· 03.0	154°58.4	·· 12.4	275°11.9	·· 01.3
16	287°06.5	77°50.8	30.2	47°02.7	03.4	170°00.9	12.4	290°14.5	01.3
17	302°08.9	92°50.3	31.3	62°03.2	03.8	185°03.3	12.4	305°17.0	01.4
18	317°11.4	107°49.8	S10°32.5	77°03.8	S21°04.1	200°05.7	N21°12.4	320°19.6	S04°01.4
19	332°13.9	122°49.2	33.6	92°04.4	04.5	215°08.2	12.4	335°22.1	01.4
20	347°16.3	137°48.7	34.7	107°05.0	04.9	230°10.6	12.4	350°24.7	01.5
21	2°18.8	152°48.2	·· 35.8	122°05.6	·· 05.3	245°13.0	·· 12.4	5°27.2	·· 01.5
22	17°21.3	167°47.7	37.0	137°06.1	05.7	260°15.4	12.4	20°29.7	01.5
23	32°23.7	182°47.2	38.1	152°06.7	06.0	275°17.9	12.4	35°32.3	01.5
Mer.pass.	20:51	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.4′	m 1.43	ν 2.4′	d -0.0′ m -2.36	ν 2.6′	d -0.0′ m 0.80

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	47°26.2	197°46.7	S10°39.2	167°07.3	S21°06.4	290°20.3	N21°12.4	50°34.8	S04°01.6
1	62°28.7	212°46.2	40.4	182°07.9	06.8	305°22.7	12.4	65°37.4	01.6
2	77°31.1	227°45.7	41.5	197°08.5	07.2	320°25.2	12.4	80°39.9	01.6
3	92°33.6	242°45.2	·· 42.6	212°09.0	·· 07.5	335°27.6	·· 12.4	95°42.5	·· 01.7
4	107°36.1	257°44.7	43.7	227°09.6	07.9	350°30.0	12.4	110°45.0	01.7
5	122°38.5	272°44.2	44.9	242°10.2	08.3	5°32.5	12.4	125°47.6	01.7
6	137°41.0	287°43.7	S10°46.0	257°10.8	S21°08.7	20°34.9	N21°12.4	140°50.1	S04°01.7
7	152°43.4	302°43.2	47.1	272°11.3	09.0	35°37.3	12.4	155°52.7	01.8
8	167°45.9	317°42.6	48.2	287°11.9	09.4	50°39.8	12.4	170°55.2	01.8
9	182°48.4	332°42.1	·· 49.4	302°12.5	·· 09.8	65°42.2	·· 12.4	185°57.8	·· 01.8
10	197°50.8	347°41.6	50.5	317°13.1	10.2	80°44.6	12.4	201°00.3	01.8
11	212°53.3	2°41.1	51.6	332°13.6	10.5	95°47.1	12.4	216°02.8	01.9
12	227°55.8	17°40.6	S10°52.7	347°14.2	S21°10.9	110°49.5	N21°12.4	231°05.4	S04°01.9
13	242°58.2	32°40.1	53.8	2°14.8	11.3	125°51.9	12.4	246°07.9	01.9
14	258°00.7	47°39.6	55.0	17°15.4	11.7	140°54.4	12.4	261°10.5	02.0
15	273°03.2	62°39.1	·· 56.1	32°15.9	·· 12.0	155°56.8	·· 12.5	276°13.0	·· 02.0
16	288°05.6	77°38.5	57.2	47°16.5	12.4	170°59.2	12.5	291°15.6	02.0
17	303°08.1	92°38.0	58.3	62°17.1	12.8	186°01.7	12.5	306°18.1	02.0
18	318°10.6	107°37.5	S10°59.4	77°17.7	S21°13.2	201°04.1	N21°12.5	321°20.7	S04°02.1
19	333°13.0	122°37.0	11°00.6	92°18.2	13.5	216°06.5	12.5	336°23.2	02.1
20	348°15.5	137°36.5	01.7	107°18.8	13.9	231°09.0	12.5	351°25.7	02.1
21	3°17.9	152°36.0	·· 02.8	122°19.4	·· 14.3	246°11.4	·· 12.5	6°28.3	·· 02.1
22	18°20.4	167°35.5	03.9	137°20.0	14.6	261°13.9	12.5	21°30.8	02.2
23	33°22.9	182°34.9	05.0	152°20.5	15.0	276°16.3	12.5	36°33.4	02.2
Mer.pass.	20:47	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.4′	m 1.43	ν 2.4′	d 0.0′ m -2.37	ν 2.5′	d -0.0′ m 0.80

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°10.0
Schedar	349°29.8	56°41.0
Diphda	348°46.4	-17°50.6
Achernar	335°19.1	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°11.8	89°22.4
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.2
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.5
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.1	7°24.8
Canopus	263°51.7	-52°42.2
Sirius	258°25.5	-16°44.9
Adhara	255°05.1	-29°00.2
Procyon	244°50.0	5°09.6
Pollux	243°16.4	27°57.8
Avior	234°14.4	-59°35.2
Suhail	222°45.8	-43°31.9
Miaplacidus	221°38.2	-69°49.0
Alphard	217°47.1	-8°46.1
Regulus	207°33.8	11°50.5
Dubhe	193°40.5	61°36.5
Denebola	182°24.5	14°25.7
Gienah	175°43.2	-17°41.0
Acrux	173°00.0	-63°14.3
Gacrux	171°51.4	-57°15.3
Alioth	166°12.9	55°49.0
Spica	158°21.9	-11°17.7
Alkaid	152°51.9	49°11.0
Hadar	148°35.7	-60°29.7
Menkent	147°57.2	-36°29.7
Arcturus	145°47.6	19°02.9
Rigil Kent.	139°40.1	-60°56.4
Kochab	137°21.0	74°02.9
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.3	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.6
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.8	-56°39.3
Deneb	49°25.4	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.6	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 06 Thu	SHA	Mer.pass
Venus	152°42.7	10:48
Mars	121°11.3	12:53
Jupiter	242°56.1	04:46
Saturn	3°04.5	20:42

Nov 07 Fri	SHA	Mer.pass
Venus	151°31.7	10:48
Mars	120°26.3	12:52
Jupiter	242°55.0	04:42
Saturn	3°06.6	20:38

Nov 08 Sat	SHA	Mer.pass
Venus	150°20.5	10:49
Mars	119°41.1	12:51
Jupiter	242°54.1	04:38
Saturn	3°08.6	20:34

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun		Moon				
h							
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.7	S15°59.3	359°01.0	4.2′	N22°10.1	11.9′	61.4′
1	199°05.7	16°00.1	13°24.2	4.1′	22°22.0	11.7′	61.4′
2	214°05.7	00.8	27°47.2	4.0′	22°33.7	11.6′	61.4′
3	229°05.7	·· 01.5	42°10.2	3.8′	22°45.3	11.4′	61.4′
4	244°05.6	02.3	56°33.0	3.7′	22°56.7	11.2′	61.4′
5	259°05.6	03.0	70°55.8	3.6′	23°07.9	11.1′	61.4′
6	274°05.6	S16°03.8	85°18.4	3.5′	N23°19.0	10.9′	61.4′
7	289°05.5	04.5	99°40.9	3.4′	23°29.9	10.7′	61.4′
8	304°05.5	05.3	114°03.4	3.3′	23°40.6	10.5′	61.3′
9	319°05.5	·· 06.0	128°25.7	3.2′	23°51.1	10.4′	61.3′
10	334°05.5	06.8	142°48.0	3.1′	24°01.5	10.2′	61.3′
11	349°05.4	07.5	157°10.1	3.0′	24°11.7	10.0′	61.3′
12	4°05.4	S16°08.2	171°32.1	2.9′	N24°21.7	9.8′	61.3′
13	19°05.4	09.0	185°54.1	2.9′	24°31.5	9.7′	61.3′
14	34°05.4	09.7	200°15.9	2.8′	24°41.2	9.4′	61.3′
15	49°05.3	·· 10.5	214°37.7	2.7′	24°50.6	9.3′	61.3′
16	64°05.3	11.2	228°59.4	2.6′	24°59.9	9.1′	61.3′
17	79°05.3	12.0	243°21.0	2.5′	25°09.0	8.9′	61.3′
18	94°05.2	S16°12.7	257°42.5	2.4′	N25°17.9	8.7′	61.3′
19	109°05.2	13.4	272°03.9	2.3′	25°26.6	8.5′	61.2′
20	124°05.2	14.2	286°25.2	2.3′	25°35.1	8.3′	61.2′
21	139°05.1	·· 14.9	300°46.5	2.2′	25°43.4	8.1′	61.2′
22	154°05.1	15.6	315°07.7	2.1′	25°51.5	7.9′	61.2′
23	169°05.1	16.4	329°28.8	2.0′	25°59.4	7.7′	61.2′
	SD = 16.1′	d = -0.7′	SD = 16.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.0	S16°17.1	343°49.9	2.0′	N26°07.1	7.5′	61.2′
1	199°05.0	17.9	358°10.8	1.9′	26°14.6	7.3′	61.2′
2	214°05.0	18.6	12°31.8	1.9′	26°21.9	7.1′	61.2′
3	229°04.9	·· 19.3	26°52.6	1.8′	26°29.0	6.9′	61.1′
4	244°04.9	20.1	41°13.4	1.7′	26°35.9	6.7′	61.1′
5	259°04.9	20.8	55°34.1	1.7′	26°42.6	6.5′	61.1′
6	274°04.8	S16°21.5	69°54.8	1.6′	N26°49.1	6.3′	61.1′
7	289°04.8	22.3	84°15.4	1.6′	26°55.4	6.0′	61.1′
8	304°04.8	23.0	98°36.0	1.5′	27°01.4	5.9′	61.0′
9	319°04.7	·· 23.7	112°56.6	1.5′	27°07.3	5.6′	61.0′
10	334°04.7	24.5	127°17.0	1.5′	27°12.9	5.4′	61.0′
11	349°04.7	25.2	141°37.5	1.4′	27°18.3	5.2′	61.0′
12	4°04.6	S16°25.9	155°57.9	1.4′	N27°23.5	5.0′	61.0′
13	19°04.6	26.7	170°18.3	1.4′	27°28.5	4.8′	60.9′
14	34°04.6	27.4	184°38.6	1.3′	27°33.3	4.6′	60.9′
15	49°04.5	·· 28.1	198°59.0	1.3′	27°37.9	4.3′	60.9′
16	64°04.5	28.9	213°19.3	1.3′	27°42.2	4.1′	60.9′
17	79°04.4	29.6	227°39.5	1.3′	27°46.3	4.0′	60.9′
18	94°04.4	S16°30.3	241°59.8	1.2′	N27°50.3	3.6′	60.8′
19	109°04.4	31.0	256°20.0	1.2′	27°53.9	3.5′	60.8′
20	124°04.3	31.8	270°40.3	1.2′	27°57.4	3.3′	60.8′
21	139°04.3	·· 32.5	285°00.5	1.2′	28°00.7	3.0′	60.8′
22	154°04.2	33.2	299°20.7	1.2′	28°03.7	2.8′	60.7′
23	169°04.2	33.9	313°41.0	1.2′	28°06.5	2.7′	60.7′
	SD = 16.1′	d = -0.7′	SD = 16.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.2	S16°34.7	328°01.2	1.2′	N28°09.2	2.3′	60.7′
1	199°04.1	35.4	342°21.4	1.2′	28°11.5	2.2′	60.7′
2	214°04.1	36.1	356°41.7	1.3′	28°13.7	2.0′	60.6′
3	229°04.0	·· 36.8	11°01.9	1.3′	28°15.7	1.7′	60.6′
4	244°04.0	37.6	25°22.2	1.3′	28°17.4	1.5′	60.6′
5	259°04.0	38.3	39°42.5	1.3′	28°18.9	1.3′	60.5′
6	274°03.9	S16°39.0	54°02.8	1.3′	N28°20.2	1.1′	60.5′
7	289°03.9	39.7	68°23.2	1.4′	28°21.3	0.8′	60.5′
8	304°03.8	40.5	82°43.6	1.4′	28°22.1	0.7′	60.5′
9	319°03.8	·· 41.2	97°04.0	1.4′	28°22.8	0.4′	60.4′
10	334°03.7	41.9	111°24.4	1.5′	28°23.2	0.2′	60.4′
11	349°03.7	42.6	125°44.9	1.5′	28°23.4	0.0′	60.4′
12	4°03.6	S16°43.3	140°05.4	1.6′	N28°23.4	0.2′	60.3′
13	19°03.6	44.1	154°26.0	1.6′	28°23.2	0.4′	60.3′
14	34°03.5	44.8	168°46.7	1.7′	28°22.8	0.7′	60.3′
15	49°03.5	·· 45.5	183°07.3	1.7′	28°22.1	0.8′	60.3′
16	64°03.5	46.2	197°28.1	1.8′	28°21.3	1.1′	60.2′
17	79°03.4	46.9	211°48.9	1.9′	28°20.2	1.2′	60.2′
18	94°03.4	S16°47.6	226°09.7	1.9′	N28°19.0	1.5′	60.2′
19	109°03.3	48.4	240°30.7	2.0′	28°17.5	1.7′	60.1′
20	124°03.3	49.1	254°51.7	2.1′	28°15.8	1.9′	60.1′
21	139°03.2	·· 49.8	269°12.7	2.1′	28°13.9	2.1′	60.1′
22	154°03.2	50.5	283°33.9	2.2′	28°11.8	2.3′	60.0′
23	169°03.1	51.2	297°55.1	2.3′	28°09.5	2.5′	60.0′
	SD = 16.1′	d = -0.7′	SD = 16.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:30	07:58	09:40	13:46	15:28	16:55
N 70°	06:24	07:41	09:03	14:23	15:45	17:02
68°	06:18	07:27	08:37	14:49	15:59	17:08
66°	06:13	07:16	08:18	15:08	16:10	17:13
64°	06:08	07:07	08:02	15:24	16:20	17:18
62°	06:04	06:58	07:49	15:37	16:28	17:22
60°	06:01	06:51	07:38	15:48	16:35	17:25
N 58°	05:58	06:45	07:29	15:58	16:41	17:29
56°	05:55	06:39	07:20	16:06	16:47	17:32
54°	05:52	06:34	07:13	16:14	16:52	17:35
52°	05:49	06:30	07:06	16:21	16:57	17:38
50°	05:47	06:25	07:00	16:27	17:01	17:40
45°	05:41	06:16	06:47	16:40	17:11	17:46
N 40°	05:35	06:08	06:36	16:51	17:19	17:52
35°	05:30	06:00	06:27	17:00	17:27	17:57
30°	05:25	05:54	06:19	17:08	17:33	18:02
20°	05:15	05:42	06:05	17:23	17:46	18:12
N 10°	05:05	05:30	05:52	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:41	05:06	05:28	17:59	18:21	18:47
20°	04:25	04:52	05:15	18:12	18:35	19:03
30°	04:04	04:35	05:01	18:27	18:53	19:23
35°	03:52	04:25	04:52	18:36	19:03	19:36
40°	03:36	04:12	04:42	18:46	19:16	19:52
45°	03:16	03:57	04:30	18:58	19:31	20:12
S 50°	02:50	03:39	04:16	19:12	19:50	20:39
52°	02:37	03:30	04:09	19:19	19:59	20:52
54°	02:22	03:19	04:02	19:27	20:09	21:08
56°	02:03	03:08	03:54	19:35	20:21	21:27
58°	01:39	02:54	03:44	19:45	20:35	21:53
S 60°	01:04	02:38	03:34	19:56	20:52	22:30

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°						
N 70°						
68°						
66°						
64°	14:02			10:55		
62°	14:43	14:33		10:15	12:42	
60°	15:11	15:28	16:18	09:48	11:47	13:16
N 58°	15:33	16:01	16:57	09:26	11:15	12:38
56°	15:51	16:25	17:24	09:09	10:51	12:11
54°	16:06	16:45	17:45	08:54	10:31	11:50
52°	16:19	17:02	18:03	08:41	10:15	11:32
50°	16:31	17:16	18:18	08:30	10:01	11:17
45°	16:56	17:45	18:48	08:07	09:32	10:46
N 40°	17:15	18:08	19:12	07:48	09:09	10:22
35°	17:32	18:27	19:32	07:33	08:51	10:02
30°	17:46	18:44	19:49	07:19	08:35	09:46
20°	18:11	19:12	20:17	06:57	08:08	09:17
N 10°	18:32	19:36	20:41	06:37	07:45	08:52
0°	18:52	19:58	21:04	06:19	07:23	08:30
S 10°	19:12	20:20	21:27	06:01	07:02	08:07
20°	19:34	20:45	21:51	05:41	06:39	07:42
30°	19:59	21:13	22:20	05:19	06:12	07:13
35°	20:14	21:30	22:36	05:06	05:56	06:56
40°	20:32	21:50	22:56	04:51	05:38	06:37
45°	20:53	22:13	23:20	04:33	05:16	06:13
S 50°	21:20	22:44	23:50	04:11	04:48	05:42
52°	21:33	22:59	·· ··	04:01	04:35	05:26
54°	21:48	23:17	·· ··	03:49	04:20	05:08
56°	22:06	23:39	·· ··	03:36	04:01	04:46
58°	22:27	·· ··	00:07	03:21	03:39	04:18
S 60°	22:55	·· ··	00:47	03:03	03:11	03:38

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 100-91%
06	16:23	16:22	11:44	00:04	12:35	
07	16:20	16:19	11:44	01:08	13:41	
08	16:17	16:15	11:44	02:14	14:47	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2577 sec ΔT = TT-UT1 = +68.9263 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	48°25.3	197°34.4	S11°06.2	167°21.1	S21°15.4	291°18.7	N21°12.5	51°35.9	S04°02.2
1	63°27.8	212°33.9	07.3	182°21.7	15.7	306°21.2	12.5	66°38.5	02.2
2	78°30.3	227°33.4	08.4	197°22.2	16.1	321°23.6	12.5	81°41.0	02.3
3	93°32.7	242°32.9	·· 09.5	212°22.8	·· 16.5	336°26.1	·· 12.5	96°43.6	·· 02.3
4	108°35.2	257°32.3	10.6	227°23.4	16.8	351°28.5	12.5	111°46.1	02.3
5	123°37.7	272°31.8	11.7	242°24.0	17.2	6°30.9	12.5	126°48.6	02.3
6	138°40.1	287°31.3	S11°12.8	257°24.5	S21°17.6	21°33.4	N21°12.5	141°51.2	S04°02.4
7	153°42.6	302°30.8	14.0	272°25.1	18.0	36°35.8	12.5	156°53.7	02.4
8	168°45.1	317°30.3	15.1	287°25.7	18.3	51°38.3	12.5	171°56.3	02.4
9	183°47.5	332°29.7	·· 16.2	302°26.2	·· 18.7	66°40.7	·· 12.5	186°58.8	·· 02.4
10	198°50.0	347°29.2	17.3	317°26.8	19.1	81°43.2	12.5	202°01.3	02.5
11	213°52.4	2°28.7	18.4	332°27.4	19.4	96°45.6	12.5	217°03.9	02.5
12	228°54.9	17°28.2	S11°19.5	347°27.9	S21°19.8	111°48.0	N21°12.5	232°06.4	S04°02.5
13	243°57.4	32°27.7	20.6	2°28.5	20.2	126°50.5	12.5	247°09.0	02.5
14	258°59.8	47°27.1	21.7	17°29.1	20.5	141°52.9	12.5	262°11.5	02.6
15	274°02.3	62°26.6	·· 22.9	32°29.7	·· 20.9	156°55.4	·· 12.5	277°14.1	·· 02.6
16	289°04.8	77°26.1	24.0	47°30.2	21.2	171°57.8	12.5	292°16.6	02.6
17	304°07.2	92°25.6	25.1	62°30.8	21.6	187°00.3	12.5	307°19.1	02.6
18	319°09.7	107°25.0	S11°26.2	77°31.4	S21°22.0	202°02.7	N21°12.5	322°21.7	S04°02.7
19	334°12.2	122°24.5	27.3	92°31.9	22.3	217°05.2	12.5	337°24.2	02.7
20	349°14.6	137°24.0	28.4	107°32.5	22.7	232°07.6	12.5	352°26.8	02.7
21	4°17.1	152°23.5	·· 29.5	122°33.1	·· 23.1	247°10.0	·· 12.5	7°29.3	·· 02.7
22	19°19.6	167°22.9	30.6	137°33.6	23.4	262°12.5	12.5	22°31.8	02.8
23	34°22.0	182°22.4	31.7	152°34.2	23.8	277°14.9	12.5	37°34.4	02.8
Mer.pass.	20:43	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.4′	m 1.42	ν 2.4′	d 0.0′ m -2.38	ν 2.5′	d -0.0′ m 0.81
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	49°24.5	197°21.9	S11°32.8	167°34.8	S21°24.1	292°17.4	N21°12.5	52°36.9	S04°02.8
1	64°26.9	212°21.4	33.9	182°35.3	24.5	307°19.8	12.5	67°39.5	02.8
2	79°29.4	227°20.8	35.0	197°35.9	24.9	322°22.3	12.5	82°42.0	02.9
3	94°31.9	242°20.3	·· 36.1	212°36.4	·· 25.2	337°24.7	·· 12.5	97°44.5	·· 02.9
4	109°34.3	257°19.8	37.2	227°37.0	25.6	352°27.2	12.5	112°47.1	02.9
5	124°36.8	272°19.2	38.4	242°37.6	26.0	7°29.6	12.5	127°49.6	02.9
6	139°39.3	287°18.7	S11°39.5	257°38.1	S21°26.3	22°32.1	N21°12.5	142°52.2	S04°03.0
7	154°41.7	302°18.2	40.6	272°38.7	26.7	37°34.5	12.6	157°54.7	03.0
8	169°44.2	317°17.7	41.7	287°39.3	27.0	52°37.0	12.6	172°57.2	03.0
9	184°46.7	332°17.1	·· 42.8	302°39.8	·· 27.4	67°39.4	·· 12.6	187°59.8	·· 03.0
10	199°49.1	347°16.6	43.9	317°40.4	27.7	82°41.9	12.6	203°02.3	03.1
11	214°51.6	2°16.1	45.0	332°41.0	28.1	97°44.3	12.6	218°04.8	03.1
12	229°54.1	17°15.5	S11°46.1	347°41.5	S21°28.5	112°46.8	N21°12.6	233°07.4	S04°03.1
13	244°56.5	32°15.0	47.2	2°42.1	28.8	127°49.2	12.6	248°09.9	03.1
14	259°59.0	47°14.5	48.3	17°42.6	29.2	142°51.7	12.6	263°12.5	03.2
15	275°01.4	62°13.9	·· 49.4	32°43.2	·· 29.5	157°54.2	·· 12.6	278°15.0	·· 03.2
16	290°03.9	77°13.4	50.5	47°43.8	29.9	172°56.6	12.6	293°17.5	03.2
17	305°06.4	92°12.9	51.6	62°44.3	30.2	187°59.1	12.6	308°20.1	03.2
18	320°08.8	107°12.3	S11°52.7	77°44.9	S21°30.6	203°01.5	N21°12.6	323°22.6	S04°03.2
19	335°11.3	122°11.8	53.8	92°45.4	31.0	218°04.0	12.6	338°25.1	03.3
20	350°13.8	137°11.3	54.9	107°46.0	31.3	233°06.4	12.6	353°27.7	03.3
21	5°16.2	152°10.7	·· 55.9	122°46.6	·· 31.7	248°08.9	·· 12.6	8°30.2	·· 03.3
22	20°18.7	167°10.2	57.0	137°47.1	32.0	263°11.3	12.6	23°32.8	03.3
23	35°21.2	182°09.7	58.1	152°47.7	32.4	278°13.8	12.6	38°35.3	03.4
Mer.pass.	20:39	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.4′	m 1.42	ν 2.4′	d 0.0′ m -2.39	ν 2.5′	d -0.0′ m 0.81
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°23.6	197°09.1	S11°59.2	167°48.2	S21°32.7	293°16.2	N21°12.6	53°37.8	S04°03.4
1	65°26.1	212°08.6	12°00.3	182°48.8	33.1	308°18.7	12.6	68°40.4	03.4
2	80°28.5	227°08.0	01.4	197°49.4	33.4	323°21.2	12.6	83°42.9	03.4
3	95°31.0	242°07.5	·· 02.5	212°49.9	·· 33.8	338°23.6	·· 12.6	98°45.4	·· 03.4
4	110°33.5	257°07.0	03.6	227°50.5	34.1	353°26.1	12.6	113°48.0	03.5
5	125°35.9	272°06.4	04.7	242°51.0	34.5	8°28.5	12.6	128°50.5	03.5
6	140°38.4	287°05.9	S12°05.8	257°51.6	S21°34.8	23°31.0	N21°12.7	143°53.0	S04°03.5
7	155°40.9	302°05.3	06.9	272°52.2	35.2	38°33.5	12.7	158°55.6	03.5
8	170°43.3	317°04.8	08.0	287°52.7	35.6	53°35.9	12.7	173°58.1	03.6
9	185°45.8	332°04.3	·· 09.1	302°53.3	·· 35.9	68°38.4	·· 12.7	189°00.6	·· 03.6
10	200°48.3	347°03.7	10.2	317°53.8	36.3	83°40.8	12.7	204°03.2	03.6
11	215°50.7	2°03.2	11.2	332°54.4	36.6	98°43.3	12.7	219°05.7	03.6
12	230°53.2	17°02.6	S12°12.3	347°54.9	S21°37.0	113°45.8	N21°12.7	234°08.2	S04°03.6
13	245°55.7	32°02.1	13.4	2°55.5	37.3	128°48.2	12.7	249°10.8	03.7
14	260°58.1	47°01.6	14.5	17°56.0	37.7	143°50.7	12.7	264°13.3	03.7
15	276°00.6	62°01.0	·· 15.6	32°56.6	·· 38.0	158°53.1	·· 12.7	279°15.8	·· 03.7
16	291°03.0	77°00.5	16.7	47°57.2	38.3	173°55.6	12.7	294°18.4	03.7
17	306°05.5	91°59.9	17.8	62°57.7	38.7	188°58.1	12.7	309°20.9	03.8
18	321°08.0	106°59.4	S12°18.9	77°58.3	S21°39.0	204°00.5	N21°12.7	324°23.4	S04°03.8
19	336°10.4	121°58.8	19.9	92°58.8	39.4	219°03.0	12.7	339°26.0	03.8
20	351°12.9	136°58.3	21.0	107°59.4	39.7	234°05.5	12.7	354°28.5	03.8
21	6°15.4	151°57.7	·· 22.1	122°59.9	·· 40.1	249°07.9	·· 12.7	9°31.0	·· 03.8
22	21°17.8	166°57.2	23.2	138°00.5	40.4	264°10.4	12.7	24°33.6	03.9
23	36°20.3	181°56.6	24.3	153°01.0	40.8	279°12.9	12.8	39°36.1	03.9
Mer.pass.	20:35	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.4′	m 1.41	ν 2.5′	d 0.0′ m -2.39	ν 2.5′	d -0.0′ m 0.82

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°10.0
Schedar	349°29.8	56°41.0
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°11.2	89°22.4
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.2
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.5
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.1	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°25.4	-16°44.9
Adhara	255°05.1	-29°00.2
Procyon	244°50.0	5°09.6
Pollux	243°16.3	27°57.8
Avior	234°14.3	-59°35.2
Suhail	222°45.8	-43°31.9
Miaplacidus	221°38.1	-69°49.0
Alphard	217°47.1	-8°46.1
Regulus	207°33.8	11°50.5
Dubhe	193°40.5	61°36.5
Denebola	182°24.5	14°25.7
Gienah	175°43.1	-17°41.0
Acrux	172°59.9	-63°14.3
Gacrux	171°51.4	-57°15.3
Alioth	166°12.8	55°49.0
Spica	158°21.9	-11°17.7
Alkaid	152°51.9	49°11.0
Hadar	148°35.7	-60°29.7
Menkent	147°57.2	-36°29.7
Arcturus	145°47.6	19°02.9
Rigil Kent.	139°40.1	-60°56.4
Kochab	137°21.0	74°02.9
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.3	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.0	38°48.6
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.8	-56°39.3
Deneb	49°25.4	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.6	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 09 Sun	SHA	Mer.pass
Venus	149°09.1	10:50
Mars	118°55.8	12:50
Jupiter	242°53.4	04:34
Saturn	3°10.6	20:30

Nov 10 Mon	SHA	Mer.pass
Venus	147°57.4	10:51
Mars	118°10.3	12:49
Jupiter	242°52.9	04:30
Saturn	3°12.4	20:26

Nov 11 Tue	SHA	Mer.pass
Venus	146°45.5	10:52
Mars	117°24.6	12:48
Jupiter	242°52.6	04:26
Saturn	3°14.2	20:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		184°03.1	S16°51.9	312°16.4	2.4′	N28°07.0	2.7′	60.0′
1		199°03.0	52.7	326°37.8	2.5′	28°04.3	2.9′	59.9′
2		214°03.0	53.4	340°59.3	2.6′	28°01.4	3.1′	59.9′
3		229°02.9	·· 54.1	355°20.8	2.7′	27°58.3	3.3′	59.9′
4		244°02.9	54.8	9°42.5	2.7′	27°55.0	3.5′	59.8′
5		259°02.8	55.5	24°04.2	2.8′	27°51.5	3.7′	59.8′
6		274°02.8	S16°56.2	38°26.1	2.9′	N27°47.8	3.9′	59.7′
7		289°02.7	56.9	52°48.0	3.0′	27°43.9	4.1′	59.7′
8		304°02.6	57.6	67°10.1	3.1′	27°39.8	4.3′	59.7′
9		319°02.6	·· 58.3	81°32.2	3.2′	27°35.5	4.4′	59.6′
10		334°02.5	59.1	95°54.4	3.4′	27°31.1	4.7′	59.6′
11		349°02.5	16°59.8	110°16.8	3.5′	27°26.4	4.8′	59.6′
12		4°02.4	S17°00.5	124°39.3	3.6′	N27°21.6	5.0′	59.5′
13		19°02.4	01.2	139°01.8	3.7′	27°16.6	5.2′	59.5′
14		34°02.3	01.9	153°24.5	3.8′	27°11.4	5.4′	59.5′
15		49°02.3	·· 02.6	167°47.3	3.9′	27°06.0	5.5′	59.4′
16		64°02.2	03.3	182°10.3	4.0′	27°00.5	5.8′	59.4′
17		79°02.2	04.0	196°33.3	4.2′	26°54.7	5.9′	59.3′
18		94°02.1	S17°04.7	210°56.5	4.3′	N26°48.8	6.0′	59.3′
19		109°02.0	05.4	225°19.7	4.4′	26°42.8	6.3′	59.3′
20		124°02.0	06.1	239°43.1	4.5′	26°36.5	6.4′	59.2′
21		139°01.9	·· 06.8	254°06.7	4.7′	26°30.1	6.6′	59.2′
22		154°01.9	07.5	268°30.3	4.8′	26°23.5	6.7′	59.2′
23		169°01.8	08.2	282°54.1	4.9′	26°16.8	6.9′	59.1′
		SD = 16.1′	d = -0.7′	SD = 16.4′				
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		184°01.7	S17°08.9	297°18.0	5.0′	N26°09.9	7.1′	59.1′
1		199°01.7	09.6	311°42.0	5.2′	26°02.8	7.2′	59.0′
2		214°01.6	10.3	326°06.2	5.3′	25°55.6	7.4′	59.0′
3		229°01.6	·· 11.0	340°30.5	5.4′	25°48.2	7.6′	59.0′
4		244°01.5	11.7	354°54.9	5.6′	25°40.6	7.7′	58.9′
5		259°01.4	12.4	9°19.5	5.7′	25°32.9	7.8′	58.9′
6		274°01.4	S17°13.1	23°44.2	5.8′	N25°25.1	8.0′	58.9′
7		289°01.3	13.8	38°09.0	6.0′	25°17.1	8.2′	58.8′
8		304°01.3	14.5	52°34.0	6.1′	25°08.9	8.2′	58.8′
9		319°01.2	·· 15.2	66°59.1	6.2′	25°00.7	8.5′	58.7′
10		334°01.1	15.9	81°24.3	6.4′	24°52.2	8.6′	58.7′
11		349°01.1	16.6	95°49.7	6.5′	24°43.6	8.7′	58.7′
12		4°01.0	S17°17.3	110°15.2	6.6′	N24°34.9	8.8′	58.6′
13		19°00.9	18.0	124°40.9	6.8′	24°26.1	9.0′	58.6′
14		34°00.9	18.7	139°06.6	6.9′	24°17.1	9.1′	58.5′
15		49°00.8	·· 19.4	153°32.6	7.1′	24°08.0	9.3′	58.5′
16		64°00.7	20.1	167°58.6	7.2′	23°58.7	9.4′	58.5′
17		79°00.7	20.8	182°24.8	7.3′	23°49.3	9.5′	58.4′
18		94°00.6	S17°21.5	196°51.2	7.5′	N23°39.8	9.6′	58.4′
19		109°00.5	22.2	211°17.6	7.6′	23°30.2	9.8′	58.3′
20		124°00.5	22.9	225°44.2	7.7′	23°20.4	9.9′	58.3′
21		139°00.4	·· 23.5	240°11.0	7.9′	23°10.5	10.0′	58.3′
22		154°00.3	24.2	254°37.9	8.0′	23°00.5	10.1′	58.2′
23		169°00.3	24.9	269°04.9	8.2′	22°50.4	10.3′	58.2′
		SD = 16.1′	d = -0.7′	SD = 16.1′				
Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		184°00.2	S17°25.6	283°32.0	8.3′	N22°40.1	10.3′	58.2′
1		199°00.1	26.3	297°59.3	8.4′	22°29.8	10.5′	58.1′
2		214°00.1	27.0	312°26.8	8.6′	22°19.3	10.6′	58.1′
3		229°00.0	·· 27.7	326°54.3	8.7′	22°08.7	10.7′	58.0′
4		243°59.9	28.4	341°22.0	8.8′	21°58.0	10.7′	58.0′
5		258°59.9	29.1	355°49.9	9.0′	21°47.3	10.9′	58.0′
6		273°59.8	S17°29.7	10°17.8	9.1′	N21°36.4	11.1′	57.9′
7		288°59.7	30.4	24°45.9	9.2′	21°25.3	11.1′	57.9′
8		303°59.7	31.1	39°14.2	9.4′	21°14.2	11.2′	57.8′
9		318°59.6	·· 31.8	53°42.5	9.5′	21°03.0	11.3′	57.8′
10		333°59.5	32.5	68°11.0	9.6′	20°51.7	11.4′	57.8′
11		348°59.4	33.2	82°39.7	9.8′	20°40.3	11.5′	57.7′
12		3°59.4	S17°33.9	97°08.4	9.9′	N20°28.8	11.5′	57.7′
13		18°59.3	34.5	111°37.3	10.0′	20°17.3	11.7′	57.7′
14		33°59.2	35.2	126°06.3	10.1′	20°05.6	11.8′	57.6′
15		48°59.1	·· 35.9	140°35.5	10.3′	19°53.8	11.8′	57.6′
16		63°59.1	36.6	155°04.8	10.4′	19°42.0	12.0′	57.5′
17		78°59.0	37.3	169°34.2	10.5′	19°30.0	12.0′	57.5′
18		93°58.9	S17°37.9	184°03.7	10.6′	N19°18.0	12.1′	57.5′
19		108°58.8	38.6	198°33.3	10.8′	19°05.9	12.2′	57.4′
20		123°58.8	39.3	213°03.1	10.9′	18°53.7	12.3′	57.4′
21		138°58.7	·· 40.0	227°33.0	11.0′	18°41.4	12.3′	57.4′
22		153°58.6	40.7	242°03.0	11.1′	18°29.1	12.4′	57.3′
23		168°58.5	41.3	256°33.1	11.2′	18°16.7	12.5′	57.3′
		SD = 16.1′	d = -0.7′	SD = 15.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:42	08:12	10:05	13:22	15:15	16:45
N 70°	06:34	07:53	09:20	14:07	15:34	16:53
68°	06:27	07:38	08:51	14:36	15:49	17:00
66°	06:21	07:25	08:29	14:58	16:02	17:06
64°	06:16	07:15	08:12	15:15	16:12	17:11
62°	06:11	07:06	07:58	15:29	16:21	17:16
60°	06:07	06:58	07:46	15:41	16:29	17:20
N 58°	06:03	06:51	07:35	15:52	16:36	17:24
56°	06:00	06:45	07:26	16:01	16:42	17:27
54°	05:57	06:40	07:19	16:09	16:48	17:30
52°	05:54	06:35	07:11	16:16	16:53	17:33
50°	05:51	06:30	07:05	16:22	16:57	17:36
45°	05:44	06:20	06:51	16:36	17:08	17:43
N 40°	05:38	06:11	06:40	16:48	17:17	17:49
35°	05:33	06:03	06:30	16:58	17:24	17:55
30°	05:27	05:56	06:21	17:06	17:32	18:00
20°	05:17	05:43	06:06	17:22	17:45	18:11
N 10°	05:06	05:31	05:53	17:35	17:57	18:22
0°	04:54	05:19	05:40	17:47	18:09	18:34
S 10°	04:40	05:06	05:28	18:00	18:22	18:48
20°	04:23	04:51	05:14	18:14	18:37	19:05
30°	04:02	04:33	04:59	18:30	18:55	19:26
35°	03:49	04:22	04:49	18:39	19:07	19:40
40°	03:32	04:09	04:39	18:50	19:20	19:57
45°	03:12	03:53	04:27	19:02	19:36	20:18
S 50°	02:44	03:33	04:11	19:17	19:56	20:46
52°	02:30	03:24	04:04	19:25	20:05	21:00
54°	02:13	03:13	03:56	19:33	20:16	21:17
56°	01:52	03:00	03:48	19:42	20:29	21:39
58°	01:25	02:46	03:38	19:52	20:44	22:08
S 60°	00:40	02:28	03:26	20:04	21:02	22:57

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°						
N 70°			19:03			16:44
68°			19:59			15:47
66°		17:37	20:32		16:17	15:13
64°		18:44	20:55		15:09	14:48
62°	17:08	19:19	21:14	14:41	14:33	14:28
60°	17:54	19:44	21:30	13:55	14:07	14:11
N 58°	18:24	20:04	21:43	13:25	13:47	13:58
56°	18:47	20:21	21:54	13:01	13:30	13:46
54°	19:05	20:35	22:03	12:43	13:15	13:35
52°	19:21	20:47	22:12	12:27	13:02	13:26
50°	19:34	20:58	22:20	12:13	12:51	13:17
45°	20:02	21:20	22:36	11:44	12:28	12:59
N 40°	20:24	21:38	22:50	11:22	12:09	12:45
35°	20:42	21:53	23:01	11:03	11:53	12:32
30°	20:57	22:06	23:11	10:47	11:39	12:21
20°	21:23	22:28	23:28	10:20	11:15	12:02
N 10°	21:46	22:47	23:42	09:57	10:54	11:45
0°	22:07	23:04	23:56	09:35	10:35	11:30
S 10°	22:28	23:22	·· ··	09:13	10:16	11:14
20°	22:50	23:41	·· ··	08:49	09:55	10:57
30°	23:16	·· ··	00:02	08:21	09:30	10:37
35°	23:31	·· ··	00:15	08:04	09:16	10:26
40°	23:49	·· ··	00:29	07:45	08:59	10:12
45°	·· ··	00:10	00:47	07:22	08:39	09:57
S 50°	·· ··	00:36	01:08	06:52	08:13	09:37
52°	00:05	00:49	01:18	06:37	08:01	09:28
54°	00:23	01:04	01:29	06:19	07:46	09:17
56°	00:44	01:21	01:41	05:59	07:30	09:05
58°	01:11	01:42	01:56	05:32	07:10	08:51
S 60°	01:48	02:08	02:13	04:55	06:44	08:35

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 83-63%
09	16:12	16:10	11:44	03:19	15:51	
10	16:07	16:04	11:44	04:21	16:50	
11	16:01	15:57	11:44	05:17	17:43	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2584 sec ΔT = TT-UT1 = +68.9256 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	51°22.8	196°56.1	S12°25.4	168°01.6	S21°41.1	294°15.3	N21°12.8	54°38.6	S04°03.9
1	66°25.2	211°55.5	26.4	183°02.1	41.5	309°17.8	12.8	69°41.2	03.9
2	81°27.7	226°55.0	27.5	198°02.7	41.8	324°20.3	12.8	84°43.7	03.9
3	96°30.2	241°54.5	·· 28.6	213°03.2	·· 42.2	339°22.7	·· 12.8	99°46.2	·· 04.0
4	111°32.6	256°53.9	29.7	228°03.8	42.5	354°25.2	12.8	114°48.8	04.0
5	126°35.1	271°53.4	30.8	243°04.4	42.8	9°27.7	12.8	129°51.3	04.0
6	141°37.5	286°52.8	S12°31.8	258°04.9	S21°43.2	24°30.1	N21°12.8	144°53.8	S04°04.0
7	156°40.0	301°52.3	32.9	273°05.5	43.5	39°32.6	12.8	159°56.4	04.0
8	171°42.5	316°51.7	34.0	288°06.0	43.9	54°35.1	12.8	174°58.9	04.1
9	186°44.9	331°51.1	·· 35.1	303°06.6	·· 44.2	69°37.5	·· 12.8	190°01.4	·· 04.1
10	201°47.4	346°50.6	36.2	318°07.1	44.6	84°40.0	12.8	205°04.0	04.1
11	216°49.9	1°50.0	37.2	333°07.7	44.9	99°42.5	12.8	220°06.5	04.1
12	231°52.3	16°49.5	S12°38.3	348°08.2	S21°45.2	114°44.9	N21°12.8	235°09.0	S04°04.1
13	246°54.8	31°48.9	39.4	3°08.8	45.6	129°47.4	12.8	250°11.5	04.2
14	261°57.3	46°48.4	40.5	18°09.3	45.9	144°49.9	12.9	265°14.1	04.2
15	276°59.7	61°47.8	·· 41.5	33°09.9	·· 46.3	159°52.3	·· 12.9	280°16.6	·· 04.2
16	292°02.2	76°47.3	42.6	48°10.4	46.6	174°54.8	12.9	295°19.1	04.2
17	307°04.6	91°46.7	43.7	63°10.9	46.9	189°57.3	12.9	310°21.7	04.2
18	322°07.1	106°46.2	S12°44.8	78°11.5	S21°47.3	204°59.8	N21°12.9	325°24.2	S04°04.3
19	337°09.6	121°45.6	45.8	93°12.0	47.6	220°02.2	12.9	340°26.7	04.3
20	352°12.0	136°45.1	46.9	108°12.6	48.0	235°04.7	12.9	355°29.3	04.3
21	7°14.5	151°44.5	·· 48.0	123°13.1	·· 48.3	250°07.2	·· 12.9	10°31.8	·· 04.3
22	22°17.0	166°43.9	49.0	138°13.7	48.6	265°09.7	12.9	25°34.3	04.3
23	37°19.4	181°43.4	50.1	153°14.2	49.0	280°12.1	12.9	40°36.8	04.4
Mer.pass.	20:31	ν -0.5′	d -1.1′	m -3.91	ν 0.6′	d -0.3′	m 1.41	ν 2.5′	d 0.0′ m -2.40	ν 2.5′	d -0.0′ m 0.82

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	52°21.9	196°42.8	S12°51.2	168°14.8	S21°49.3	295°14.6	N21°12.9	55°39.4	S04°04.4
1	67°24.4	211°42.3	52.3	183°15.3	49.7	310°17.1	12.9	70°41.9	04.4
2	82°26.8	226°41.7	53.3	198°15.9	50.0	325°19.6	12.9	85°44.4	04.4
3	97°29.3	241°41.1	·· 54.4	213°16.4	·· 50.3	340°22.0	·· 13.0	100°47.0	·· 04.4
4	112°31.8	256°40.6	55.5	228°17.0	50.7	355°24.5	13.0	115°49.5	04.5
5	127°34.2	271°40.0	56.5	243°17.5	51.0	10°27.0	13.0	130°52.0	04.5
6	142°36.7	286°39.5	S12°57.6	258°18.1	S21°51.3	25°29.5	N21°13.0	145°54.5	S04°04.5
7	157°39.1	301°38.9	58.7	273°18.6	51.7	40°31.9	13.0	160°57.1	04.5
8	172°41.6	316°38.3	12°59.7	288°19.1	52.0	55°34.4	13.0	175°59.6	04.5
9	187°44.1	331°37.8	13°00.8	303°19.7	·· 52.3	70°36.9	·· 13.0	191°02.1	·· 04.6
10	202°46.5	346°37.2	01.9	318°20.2	52.7	85°39.4	13.0	206°04.6	04.6
11	217°49.0	1°36.6	02.9	333°20.8	53.0	100°41.8	13.0	221°07.2	04.6
12	232°51.5	16°36.1	S13°04.0	348°21.3	S21°53.3	115°44.3	N21°13.0	236°09.7	S04°04.6
13	247°53.9	31°35.5	05.0	3°21.9	53.7	130°46.8	13.0	251°12.2	04.6
14	262°56.4	46°35.0	06.1	18°22.4	54.0	145°49.3	13.1	266°14.8	04.6
15	277°58.9	61°34.4	·· 07.2	33°22.9	·· 54.3	160°51.8	·· 13.1	281°17.3	·· 04.7
16	293°01.3	76°33.8	08.2	48°23.5	54.7	175°54.2	13.1	296°19.8	04.7
17	308°03.8	91°33.3	09.3	63°24.0	55.0	190°56.7	13.1	311°22.3	04.7
18	323°06.3	106°32.7	S13°10.4	78°24.6	S21°55.3	205°59.2	N21°13.1	326°24.9	S04°04.7
19	338°08.7	121°32.1	11.4	93°25.1	55.7	221°01.7	13.1	341°27.4	04.7
20	353°11.2	136°31.6	12.5	108°25.7	56.0	236°04.2	13.1	356°29.9	04.8
21	8°13.6	151°31.0	·· 13.5	123°26.2	·· 56.3	251°06.6	·· 13.1	11°32.4	·· 04.8
22	23°16.1	166°30.4	14.6	138°26.7	56.6	266°09.1	13.1	26°35.0	04.8
23	38°18.6	181°29.9	15.6	153°27.3	57.0	281°11.6	13.1	41°37.5	04.8
Mer.pass.	20:27	ν -0.6′	d -1.1′	m -3.91	ν 0.5′	d -0.3′	m 1.40	ν 2.5′	d 0.0′ m -2.41	ν 2.5′	d -0.0′ m 0.83

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	53°21.0	196°29.3	S13°16.7	168°27.8	S21°57.3	296°14.1	N21°13.1	56°40.0	S04°04.8
1	68°23.5	211°28.7	17.8	183°28.4	57.6	311°16.6	13.2	71°42.5	04.8
2	83°26.0	226°28.1	18.8	198°28.9	58.0	326°19.1	13.2	86°45.1	04.9
3	98°28.4	241°27.6	·· 19.9	213°29.4	·· 58.3	341°21.5	·· 13.2	101°47.6	·· 04.9
4	113°30.9	256°27.0	20.9	228°30.0	58.6	356°24.0	13.2	116°50.1	04.9
5	128°33.4	271°26.4	22.0	243°30.5	58.9	11°26.5	13.2	131°52.6	04.9
6	143°35.8	286°25.9	S13°23.0	258°31.1	S21°59.3	26°29.0	N21°13.2	146°55.2	S04°04.9
7	158°38.3	301°25.3	24.1	273°31.6	59.6	41°31.5	13.2	161°57.7	04.9
8	173°40.7	316°24.7	25.1	288°32.1	21°59.9	56°34.0	13.2	177°00.2	05.0
9	188°43.2	331°24.1	·· 26.2	303°32.7	22°00.3	71°36.5	·· 13.2	192°02.7	·· 05.0
10	203°45.7	346°23.6	27.2	318°33.2	00.6	86°38.9	13.2	207°05.2	05.0
11	218°48.1	1°23.0	28.3	333°33.7	00.9	101°41.4	13.3	222°07.8	05.0
12	233°50.6	16°22.4	S13°29.3	348°34.3	S22°01.2	116°43.9	N21°13.3	237°10.3	S04°05.0
13	248°53.1	31°21.8	30.4	3°34.8	01.6	131°46.4	13.3	252°12.8	05.0
14	263°55.5	46°21.3	31.4	18°35.4	01.9	146°48.9	13.3	267°15.3	05.1
15	278°58.0	61°20.7	·· 32.5	33°35.9	·· 02.2	161°51.4	·· 13.3	282°17.9	·· 05.1
16	294°00.5	76°20.1	33.5	48°36.4	02.5	176°53.9	13.3	297°20.4	05.1
17	309°02.9	91°19.5	34.6	63°37.0	02.8	191°56.4	13.3	312°22.9	05.1
18	324°05.4	106°19.0	S13°35.6	78°37.5	S22°03.2	206°58.9	N21°13.3	327°25.4	S04°05.1
19	339°07.9	121°18.4	36.7	93°38.0	03.5	222°01.3	13.3	342°27.9	05.1
20	354°10.3	136°17.8	37.7	108°38.6	03.8	237°03.8	13.3	357°30.5	05.2
21	9°12.8	151°17.2	·· 38.8	123°39.1	·· 04.1	252°06.3	·· 13.4	12°33.0	·· 05.2
22	24°15.2	166°16.6	39.8	138°39.6	04.5	267°08.8	13.4	27°35.5	05.2
23	39°17.7	181°16.1	40.9	153°40.2	04.8	282°11.3	13.4	42°38.0	05.2
Mer.pass.	20:23	ν -0.6′	d -1.1′	m -3.91	ν 0.5′	d -0.3′	m 1.40	ν 2.5′	d 0.0′ m -2.42	ν 2.5′	d -0.0′ m 0.83

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.8	56°41.0
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°11.1	89°22.4
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.3
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.5
Elnath	278°00.7	28°37.8
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.1	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°25.4	-16°44.9
Adhara	255°05.1	-29°00.2
Procyon	244°50.0	5°09.6
Pollux	243°16.3	27°57.7
Avior	234°14.3	-59°35.2
Suhail	222°45.8	-43°31.9
Miaplacidus	221°38.1	-69°49.0
Alphard	217°47.1	-8°46.1
Regulus	207°33.8	11°50.5
Dubhe	193°40.4	61°36.4
Denebola	182°24.4	14°25.6
Gienah	175°43.1	-17°41.0
Acrux	172°59.9	-63°14.3
Gacrux	171°51.3	-57°15.3
Alioth	166°12.8	55°49.0
Spica	158°21.9	-11°17.7
Alkaid	152°51.9	49°10.9
Hadar	148°35.7	-60°29.7
Menkent	147°57.2	-36°29.7
Arcturus	145°47.6	19°02.9
Rigil Kent.	139°40.0	-60°56.4
Kochab	137°21.0	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.3	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.8	-56°39.3
Deneb	49°25.5	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.6	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 12 Wed	SHA	Mer.pass
Venus	145°33.3	10:53
Mars	116°38.8	12:47
Jupiter	242°52.6	04:22
Saturn	3°15.9	20:18

Nov 13 Thu	SHA	Mer.pass
Venus	144°20.9	10:54
Mars	115°52.9	12:47
Jupiter	242°52.7	04:18
Saturn	3°17.5	20:14

Nov 14 Fri	SHA	Mer.pass
Venus	143°08.2	10:54
Mars	115°06.8	12:46
Jupiter	242°53.1	04:14
Saturn	3°19.0	20:10

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.5	S17°42.0	271°03.4	11.4′	N18°04.2	12.6′	57.3′
1	198°58.4	42.7	285°33.7	11.5′	17°51.6	12.6′	57.2′
2	213°58.3	43.4	300°04.2	11.6′	17°39.0	12.7′	57.2′
3	228°58.2	·· 44.0	314°34.8	11.7′	17°26.3	12.8′	57.1′
4	243°58.2	44.7	329°05.5	11.8′	17°13.5	12.8′	57.1′
5	258°58.1	45.4	343°36.4	11.9′	17°00.7	12.9′	57.1′
6	273°58.0	S17°46.1	358°07.3	12.0′	N16°47.8	13.0′	57.0′
7	288°57.9	46.7	12°38.3	12.2′	16°34.8	13.0′	57.0′
8	303°57.8	47.4	27°09.5	12.3′	16°21.8	13.1′	57.0′
9	318°57.8	·· 48.1	41°40.8	12.4′	16°08.7	13.2′	56.9′
10	333°57.7	48.8	56°12.1	12.5′	15°55.5	13.2′	56.9′
11	348°57.6	49.4	70°43.6	12.6′	15°42.3	13.3′	56.9′
12	3°57.5	S17°50.1	85°15.2	12.7′	N15°29.0	13.3′	56.8′
13	18°57.4	50.8	99°46.9	12.8′	15°15.7	13.4′	56.8′
14	33°57.3	51.4	114°18.7	12.9′	15°02.3	13.4′	56.8′
15	48°57.3	·· 52.1	128°50.6	13.0′	14°48.9	13.5′	56.7′
16	63°57.2	52.8	143°22.5	13.1′	14°35.4	13.5′	56.7′
17	78°57.1	53.4	157°54.6	13.2′	14°21.9	13.6′	56.7′
18	93°57.0	S17°54.1	172°26.8	13.3′	N14°08.3	13.6′	56.6′
19	108°56.9	54.8	186°59.1	13.4′	13°54.7	13.7′	56.6′
20	123°56.8	55.4	201°31.5	13.5′	13°41.0	13.7′	56.6′
21	138°56.8	·· 56.1	216°03.9	13.6′	13°27.3	13.7′	56.5′
22	153°56.7	56.8	230°36.5	13.6′	13°13.6	13.8′	56.5′
23	168°56.6	57.4	245°09.1	13.7′	12°59.8	13.9′	56.5′
	SD = 16.1′	d = -0.7′	SD = 15.6′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.5	S17°58.1	259°41.9	13.8′	N12°45.9	13.8′	56.4′
1	198°56.4	58.8	274°14.7	13.9′	12°32.1	14.0′	56.4′
2	213°56.3	17°59.4	288°47.6	14.0′	12°18.1	13.9′	56.4′
3	228°56.2	18°00.1	303°20.6	14.1′	12°04.2	14.0′	56.3′
4	243°56.1	00.8	317°53.7	14.2′	11°50.2	14.0′	56.3′
5	258°56.1	01.4	332°26.8	14.2′	11°36.2	14.1′	56.3′
6	273°56.0	S18°02.1	347°00.1	14.3′	N11°22.1	14.1′	56.2′
7	288°55.9	02.7	1°33.4	14.4′	11°08.0	14.1′	56.2′
8	303°55.8	03.4	16°06.8	14.5′	10°53.9	14.2′	56.2′
9	318°55.7	·· 04.1	30°40.2	14.5′	10°39.7	14.2′	56.1′
10	333°55.6	04.7	45°13.8	14.6′	10°25.5	14.2′	56.1′
11	348°55.5	05.4	59°47.4	14.7′	10°11.3	14.2′	56.1′
12	3°55.4	S18°06.0	74°21.1	14.8′	N09°57.1	14.3′	56.1′
13	18°55.3	06.7	88°54.9	14.8′	09°42.8	14.3′	56.0′
14	33°55.2	07.4	103°28.7	14.9′	09°28.5	14.3′	56.0′
15	48°55.2	·· 08.0	118°02.6	15.0′	09°14.2	14.3′	56.0′
16	63°55.1	08.7	132°36.6	15.0′	08°59.9	14.4′	55.9′
17	78°55.0	09.3	147°10.6	15.1′	08°45.5	14.4′	55.9′
18	93°54.9	S18°10.0	161°44.7	15.2′	N08°31.1	14.4′	55.9′
19	108°54.8	10.6	176°18.9	15.2′	08°16.7	14.4′	55.8′
20	123°54.7	11.3	190°53.1	15.3′	08°02.3	14.4′	55.8′
21	138°54.6	·· 11.9	205°27.4	15.3′	07°47.9	14.5′	55.8′
22	153°54.5	12.6	220°01.8	15.4′	07°33.4	14.5′	55.8′
23	168°54.4	13.2	234°36.2	15.5′	07°18.9	14.4′	55.7′
	SD = 16.2′	d = -0.7′	SD = 15.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.3	S18°13.9	249°10.6	15.5′	N07°04.5	14.6′	55.7′
1	198°54.2	14.5	263°45.1	15.6′	06°49.9	14.5′	55.7′
2	213°54.1	15.2	278°19.7	15.6′	06°35.4	14.5′	55.7′
3	228°54.0	·· 15.8	292°54.3	15.7′	06°20.9	14.5′	55.6′
4	243°53.9	16.5	307°29.0	15.7′	06°06.4	14.6′	55.6′
5	258°53.8	17.1	322°03.7	15.8′	05°51.8	14.5′	55.6′
6	273°53.7	S18°17.8	336°38.5	15.8′	N05°37.3	14.6′	55.5′
7	288°53.6	18.4	351°13.3	15.9′	05°22.7	14.6′	55.5′
8	303°53.5	19.1	5°48.2	15.9′	05°08.1	14.6′	55.5′
9	318°53.4	·· 19.7	20°23.1	16.0′	04°53.5	14.6′	55.5′
10	333°53.3	20.4	34°58.0	16.0′	04°38.9	14.6′	55.4′
11	348°53.2	21.0	49°33.0	16.0′	04°24.3	14.6′	55.4′
12	3°53.1	S18°21.7	64°08.1	16.1′	N04°09.7	14.6′	55.4′
13	18°53.0	22.3	78°43.1	16.1′	03°55.1	14.6′	55.4′
14	33°52.9	22.9	93°18.2	16.1′	03°40.5	14.6′	55.3′
15	48°52.8	·· 23.6	107°53.4	16.2′	03°25.9	14.6′	55.3′
16	63°52.7	24.2	122°28.6	16.2′	03°11.3	14.6′	55.3′
17	78°52.6	24.9	137°03.8	16.3′	02°56.7	14.6′	55.3′
18	93°52.5	S18°25.5	151°39.0	16.3′	N02°42.1	14.6′	55.3′
19	108°52.4	26.2	166°14.3	16.3′	02°27.5	14.6′	55.2′
20	123°52.3	26.8	180°49.6	16.3′	02°12.9	14.6′	55.2′
21	138°52.2	·· 27.4	195°25.0	16.4′	01°58.3	14.6′	55.2′
22	153°52.1	28.1	210°00.4	16.4′	01°43.7	14.6′	55.2′
23	168°52.0	28.7	224°35.8	16.4′	01°29.1	14.6′	55.1′
	SD = 16.2′	d = -0.7′	SD = 15.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:53	08:26	10:36	12:52	15:02	16:34
N 70°	06:44	08:05	09:38	13:49	15:23	16:44
68°	06:36	07:48	09:05	14:23	15:40	16:52
66°	06:29	07:34	08:40	14:47	15:53	16:58
64°	06:23	07:23	08:22	15:06	16:05	17:04
62°	06:18	07:13	08:06	15:22	16:14	17:10
60°	06:13	07:05	07:53	15:34	16:23	17:14
N 58°	06:09	06:57	07:42	15:45	16:30	17:19
56°	06:05	06:51	07:33	15:55	16:37	17:23
54°	06:02	06:45	07:24	16:04	16:43	17:26
52°	05:58	06:39	07:17	16:11	16:49	17:30
50°	05:55	06:34	07:10	16:18	16:54	17:33
45°	05:48	06:23	06:55	16:33	17:05	17:40
N 40°	05:41	06:14	06:43	16:45	17:14	17:47
35°	05:35	06:06	06:33	16:56	17:22	17:53
30°	05:29	05:58	06:24	17:05	17:30	17:59
20°	05:18	05:45	06:08	17:21	17:44	18:10
N 10°	05:06	05:32	05:54	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:35
S 10°	04:39	05:05	05:28	18:01	18:23	18:49
20°	04:22	04:50	05:13	18:16	18:39	19:07
30°	04:00	04:31	04:57	18:32	18:58	19:29
35°	03:46	04:19	04:47	18:42	19:10	19:44
40°	03:29	04:06	04:36	18:53	19:23	20:01
45°	03:07	03:49	04:23	19:06	19:40	20:23
S 50°	02:38	03:28	04:07	19:22	20:01	20:53
52°	02:23	03:18	04:00	19:30	20:12	21:08
54°	02:04	03:07	03:51	19:39	20:23	21:27
56°	01:41	02:53	03:42	19:48	20:37	21:50
58°	01:09	02:38	03:31	19:59	20:53	22:24
S 60°	–:–	02:18	03:19	20:12	21:13	–:–

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	21:32	23:55	·· ··	15:57	15:06	14:30
N 70°	21:58	·· ··	00:05	15:28	14:53	14:26
68°	22:18	·· ··	00:14	15:06	14:42	14:22
66°	22:34	·· ··	00:21	14:49	14:33	14:19
64°	22:47	·· ··	00:27	14:35	14:25	14:16
62°	22:57	·· ··	00:32	14:23	14:18	14:14
60°	23:07	·· ··	00:37	14:13	14:12	14:11
N 58°	23:14	·· ··	00:41	14:04	14:07	14:10
56°	23:21	·· ··	00:44	13:56	14:03	14:08
54°	23:28	·· ··	00:47	13:49	13:58	14:06
52°	23:33	·· ··	00:50	13:42	13:55	14:05
50°	23:38	·· ··	00:52	13:36	13:51	14:04
45°	23:49	·· ··	00:58	13:24	13:44	14:01
N 40°	23:58	·· ··	01:03	13:13	13:37	13:59
35°	·· ··	00:06	01:07	13:04	13:32	13:57
30°	·· ··	00:12	01:10	12:56	13:27	13:55
20°	·· ··	00:24	01:16	12:43	13:19	13:52
N 10°	·· ··	00:34	01:21	12:31	13:11	13:49
0°	·· ··	00:43	01:26	12:19	13:04	13:46
S 10°	00:10	00:52	01:31	12:08	12:57	13:43
20°	00:24	01:02	01:36	11:55	12:49	13:40
30°	00:41	01:13	01:42	11:41	12:40	13:37
35°	00:50	01:20	01:46	11:32	12:35	13:35
40°	01:01	01:27	01:49	11:23	12:29	13:33
45°	01:14	01:36	01:54	11:12	12:23	13:30
S 50°	01:29	01:46	01:59	10:58	12:14	13:27
52°	01:37	01:50	02:01	10:51	12:10	13:26
54°	01:44	01:56	02:04	10:44	12:06	13:24
56°	01:53	02:01	02:07	10:36	12:02	13:22
58°	02:03	02:08	02:10	10:27	11:56	13:20
S 60°	02:15	02:15	02:14	10:17	11:50	13:18

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 52-32%
12	15:54	15:50	11:44	06:08	18:31	
13	15:46	15:42	11:44	06:54	19:15	
14	15:37	15:33	11:44	07:36	19:57	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2590 sec ΔT = TT-UT1 = +68.9250 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°20.2	196°15.5	S13°41.9	168°40.7	S22°05.1	297°13.8	N21°13.4	57°40.6	S04°05.2
1	69°22.6	211°14.9	42.9	183°41.2	05.4	312°16.3	13.4	72°43.1	05.2
2	84°25.1	226°14.3	44.0	198°41.8	05.7	327°18.8	13.4	87°45.6	05.3
3	99°27.6	241°13.7	·· 45.0	213°42.3	·· 06.1	342°21.3	·· 13.4	102°48.1	·· 05.3
4	114°30.0	256°13.2	46.1	228°42.8	06.4	357°23.8	13.4	117°50.6	05.3
5	129°32.5	271°12.6	47.1	243°43.4	06.7	12°26.3	13.4	132°53.2	05.3
6	144°35.0	286°12.0	S13°48.1	258°43.9	S22°07.0	27°28.8	N21°13.5	147°55.7	S04°05.3
7	159°37.4	301°11.4	49.2	273°44.4	07.3	42°31.3	13.5	162°58.2	05.3
8	174°39.9	316°10.8	50.2	288°45.0	07.6	57°33.7	13.5	178°00.7	05.3
9	189°42.4	331°10.2	·· 51.3	303°45.5	·· 08.0	72°36.2	·· 13.5	193°03.2	·· 05.4
10	204°44.8	346°09.7	52.3	318°46.0	08.3	87°38.7	13.5	208°05.8	05.4
11	219°47.3	1°09.1	53.3	333°46.6	08.6	102°41.2	13.5	223°08.3	05.4
12	234°49.7	16°08.5	S13°54.4	348°47.1	S22°08.9	117°43.7	N21°13.5	238°10.8	S04°05.4
13	249°52.2	31°07.9	55.4	3°47.6	09.2	132°46.2	13.5	253°13.3	05.4
14	264°54.7	46°07.3	56.4	18°48.2	09.5	147°48.7	13.6	268°15.8	05.4
15	279°57.1	61°06.7	·· 57.5	33°48.7	·· 09.9	162°51.2	·· 13.6	283°18.3	·· 05.4
16	294°59.6	76°06.1	58.5	48°49.2	10.2	177°53.7	13.6	298°20.9	05.5
17	310°02.1	91°05.5	13°59.5	63°49.8	10.5	192°56.2	13.6	313°23.4	05.5
18	325°04.5	106°05.0	S14°00.6	78°50.3	S22°10.8	207°58.7	N21°13.6	328°25.9	S04°05.5
19	340°07.0	121°04.4	01.6	93°50.8	11.1	223°01.2	13.6	343°28.4	05.5
20	355°09.5	136°03.8	02.6	108°51.3	11.4	238°03.7	13.6	358°30.9	05.5
21	10°11.9	151°03.2	·· 03.7	123°51.9	·· 11.7	253°06.2	·· 13.6	13°33.5	·· 05.5
22	25°14.4	166°02.6	04.7	138°52.4	12.1	268°08.7	13.6	28°36.0	05.5
23	40°16.8	181°02.0	05.7	153°52.9	12.4	283°11.2	13.7	43°38.5	05.6
Mer.pass.	20:19	ν -0.6′	d -1.0′	m -3.91	ν 0.5′	d -0.3′	m 1.39	ν 2.5′	d 0.0′ m -2.42	ν 2.5′	d -0.0′ m 0.84

Sun	GHA	Venus	Dec	Mars	Dec	Jupiter	Dec	Saturn	Dec
0	55°19.3	196°01.4	S14°06.8	168°53.5	S22°12.7	298°13.7	N21°13.7	58°41.0	S04°05.6
1	70°21.8	211°00.8	07.8	183°54.0	13.0	313°16.2	13.7	73°43.5	05.6
2	85°24.2	226°00.2	08.8	198°54.5	13.3	328°18.7	13.7	88°46.0	05.6
3	100°26.7	240°59.6	·· 09.8	213°55.0	·· 13.6	343°21.2	·· 13.7	103°48.6	·· 05.6
4	115°29.2	255°59.0	10.9	228°55.6	13.9	358°23.7	13.7	118°51.1	05.6
5	130°31.6	270°58.4	11.9	243°56.1	14.2	13°26.2	13.7	133°53.6	05.6
6	145°34.1	285°57.8	S14°12.9	258°56.6	S22°14.5	28°28.7	N21°13.7	148°56.1	S04°05.7
7	160°36.6	300°57.3	13.9	273°57.1	14.9	43°31.2	13.8	163°58.6	05.7
8	175°39.0	315°56.7	15.0	288°57.7	15.2	58°33.7	13.8	179°01.1	05.7
9	190°41.5	330°56.1	·· 16.0	303°58.2	·· 15.5	73°36.2	·· 13.8	194°03.6	·· 05.7
10	205°44.0	345°55.5	17.0	318°58.7	15.8	88°38.7	13.8	209°06.2	05.7
11	220°46.4	0°54.9	18.0	333°59.3	16.1	103°41.2	13.8	224°08.7	05.7
12	235°48.9	15°54.3	S14°19.1	348°59.8	S22°16.4	118°43.8	N21°13.8	239°11.2	S04°05.7
13	250°51.3	30°53.7	20.1	4°00.3	16.7	133°46.3	13.8	254°13.7	05.8
14	265°53.8	45°53.1	21.1	19°00.8	17.0	148°48.8	13.9	269°16.2	05.8
15	280°56.3	60°52.5	·· 22.1	34°01.4	·· 17.3	163°51.3	·· 13.9	284°18.7	·· 05.8
16	295°58.7	75°51.9	23.1	49°01.9	17.6	178°53.8	13.9	299°21.3	05.8
17	311°01.2	90°51.3	24.2	64°02.4	17.9	193°56.3	13.9	314°23.8	05.8
18	326°03.7	105°50.7	S14°25.2	79°02.9	S22°18.2	208°58.8	N21°13.9	329°26.3	S04°05.8
19	341°06.1	120°50.1	26.2	94°03.4	18.5	224°01.3	13.9	344°28.8	05.8
20	356°08.6	135°49.5	27.2	109°04.0	18.8	239°03.8	13.9	359°31.3	05.8
21	11°11.1	150°48.9	·· 28.2	124°04.5	·· 19.1	254°06.3	·· 14.0	14°33.8	·· 05.9
22	26°13.5	165°48.3	29.2	139°05.0	19.4	269°08.8	14.0	29°36.3	05.9
23	41°16.0	180°47.7	30.3	154°05.5	19.8	284°11.3	14.0	44°38.8	05.9
Mer.pass.	20:15	ν -0.6′	d -1.0′	m -3.91	ν 0.5′	d -0.3′	m 1.39	ν 2.5′	d 0.0′ m -2.43	ν 2.5′	d -0.0′ m 0.85

Mon	GHA	Venus	Dec	Mars	Dec	Jupiter	Dec	Saturn	Dec
0	56°18.4	195°47.1	S14°31.3	169°06.1	S22°20.1	299°13.8	N21°14.0	59°41.4	S04°05.9
1	71°20.9	210°46.5	32.3	184°06.6	20.4	314°16.4	14.0	74°43.9	05.9
2	86°23.4	225°45.8	33.3	199°07.1	20.7	329°18.9	14.0	89°46.4	05.9
3	101°25.8	240°45.2	·· 34.3	214°07.6	·· 21.0	344°21.4	·· 14.0	104°48.9	·· 05.9
4	116°28.3	255°44.6	35.3	229°08.1	21.3	359°23.9	14.0	119°51.4	05.9
5	131°30.8	270°44.0	36.3	244°08.7	21.6	14°26.4	14.1	134°53.9	05.9
6	146°33.2	285°43.4	S14°37.3	259°09.2	S22°21.9	29°28.9	N21°14.1	149°56.4	S04°06.0
7	161°35.7	300°42.8	38.4	274°09.7	22.2	44°31.4	14.1	164°58.9	06.0
8	176°38.2	315°42.2	39.4	289°10.2	22.5	59°33.9	14.1	180°01.5	06.0
9	191°40.6	330°41.6	·· 40.4	304°10.7	·· 22.8	74°36.4	·· 14.1	195°04.0	·· 06.0
10	206°43.1	345°41.0	41.4	319°11.3	23.1	89°39.0	14.1	210°06.5	06.0
11	221°45.6	0°40.4	42.4	334°11.8	23.4	104°41.5	14.2	225°09.0	06.0
12	236°48.0	15°39.8	S14°43.4	349°12.3	S22°23.7	119°44.0	N21°14.2	240°11.5	S04°06.0
13	251°50.5	30°39.2	44.4	4°12.8	24.0	134°46.5	14.2	255°14.0	06.0
14	266°52.9	45°38.6	45.4	19°13.3	24.3	149°49.0	14.2	270°16.5	06.1
15	281°55.4	60°37.9	·· 46.4	34°13.9	·· 24.6	164°51.5	·· 14.2	285°19.0	·· 06.1
16	296°57.9	75°37.3	47.4	49°14.4	24.9	179°54.0	14.2	300°21.5	06.1
17	312°00.3	90°36.7	48.4	64°14.9	25.2	194°56.6	14.2	315°24.1	06.1
18	327°02.8	105°36.1	S14°49.4	79°15.4	S22°25.4	209°59.1	N21°14.3	330°26.6	S04°06.1
19	342°05.3	120°35.5	50.4	94°15.9	25.7	225°01.6	14.3	345°29.1	06.1
20	357°07.7	135°34.9	51.4	109°16.4	26.0	240°04.1	14.3	0°31.6	06.1
21	12°10.2	150°34.3	·· 52.4	124°17.0	·· 26.3	255°06.6	·· 14.3	15°34.1	·· 06.1
22	27°12.7	165°33.7	53.4	139°17.5	26.6	270°09.1	14.3	30°36.6	06.1
23	42°15.1	180°33.0	54.4	154°18.0	26.9	285°11.7	14.3	45°39.1	06.1
Mer.pass.	20:11	ν -0.6′	d -1.0′	m -3.91	ν 0.5′	d -0.3′	m 1.38	ν 2.5′	d 0.0′ m -2.44	ν 2.5′	d -0.0′ m 0.85

Stars

	SHA	Dec
Alpheratz	357°33.8	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.9	56°41.0
Diphda	348°46.4	-17°50.7
Achernar	335°19.1	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°11.1	89°22.4
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.3
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.7	28°37.8
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.1	7°24.8
Canopus	263°51.7	-52°42.3
Sirius	258°25.4	-16°44.9
Adhara	255°05.1	-29°00.2
Procyon	244°49.9	5°09.6
Pollux	243°16.3	27°57.7
Avior	234°14.2	-59°35.2
Suhail	222°45.8	-43°31.9
Miaplacidus	221°38.0	-69°49.0
Alphard	217°47.1	-8°46.1
Regulus	207°33.7	11°50.4
Dubhe	193°40.4	61°36.4
Denebola	182°24.4	14°25.6
Gienah	175°43.1	-17°41.0
Acrux	172°59.9	-63°14.3
Gacrux	171°51.3	-57°15.3
Alioth	166°12.8	55°49.0
Spica	158°21.9	-11°17.7
Alkaid	152°51.9	49°10.9
Hadar	148°35.7	-60°29.7
Menkent	147°57.2	-36°29.7
Arcturus	145°47.6	19°02.9
Rigil Kent.	139°40.0	-60°56.4
Kochab	137°21.0	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.3	51°29.3
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.8	-56°39.3
Deneb	49°25.5	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.6	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 15 Sat	SHA	Mer.pass
Venus	141°55.3	10:55
Mars	114°20.5	12:45
Jupiter	242°53.6	04:10
Saturn	3°20.4	20:06

Nov 16 Sun	SHA	Mer.pass
Venus	140°42.1	10:56
Mars	113°34.1	12:44
Jupiter	242°54.4	04:06
Saturn	3°21.7	20:02

Nov 17 Mon	SHA	Mer.pass
Venus	139°28.6	10:57
Mars	112°47.6	12:43
Jupiter	242°55.4	04:02
Saturn	3°22.9	19:58

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.9	S18°29.4	239°11.2	16.4′	N01°14.5	14.6′	55.1′
1	198°51.8	30.0	253°46.6	16.5′	00°59.9	14.6′	55.1′
2	213°51.7	30.6	268°22.1	16.5′	00°45.3	14.5′	55.1′
3	228°51.6	·· 31.3	282°57.6	16.5′	00°30.8	14.6′	55.0′
4	243°51.5	31.9	297°33.1	16.5′	00°16.2	14.5′	55.0′
5	258°51.4	32.5	312°08.6	16.6′	N00°01.7	14.6′	55.0′
6	273°51.3	S18°33.2	326°44.2	16.6′	S00°12.9	14.5′	55.0′
7	288°51.2	33.8	341°19.8	16.6′	00°27.4	14.5′	55.0′
8	303°51.1	34.4	355°55.3	16.6′	00°41.9	14.5′	54.9′
9	318°51.0	·· 35.1	10°30.9	16.6′	00°56.4	14.5′	54.9′
10	333°50.8	35.7	25°06.6	16.6′	01°10.9	14.5′	54.9′
11	348°50.7	36.3	39°42.2	16.6′	01°25.4	14.5′	54.9′
12	3°50.6	S18°37.0	54°17.8	16.6′	S01°39.9	14.4′	54.9′
13	18°50.5	37.6	68°53.5	16.7′	01°54.3	14.4′	54.8′
14	33°50.4	38.2	83°29.1	16.7′	02°08.7	14.4′	54.8′
15	48°50.3	·· 38.9	98°04.8	16.7′	02°23.1	14.4′	54.8′
16	63°50.2	39.5	112°40.5	16.7′	02°37.5	14.4′	54.8′
17	78°50.1	40.1	127°16.1	16.7′	02°51.9	14.4′	54.8′
18	93°50.0	S18°40.7	141°51.8	16.7′	S03°06.3	14.3′	54.8′
19	108°49.9	41.4	156°27.5	16.7′	03°20.6	14.3′	54.7′
20	123°49.7	42.0	171°03.2	16.7′	03°34.9	14.3′	54.7′
21	138°49.6	·· 42.6	185°38.9	16.7′	03°49.2	14.3′	54.7′
22	153°49.5	43.2	200°14.6	16.7′	04°03.5	14.3′	54.7′
23	168°49.4	43.9	214°50.3	16.7′	04°17.8	14.2′	54.7′
	SD = 16.2′	d = -0.6′	SD = 15.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.3	S18°44.5	229°25.9	16.7′	S04°32.0	14.2′	54.6′
1	198°49.2	45.1	244°01.6	16.7′	04°46.2	14.2′	54.6′
2	213°49.1	45.7	258°37.3	16.7′	05°00.4	14.1′	54.6′
3	228°49.0	·· 46.4	273°13.0	16.7′	05°14.5	14.2′	54.6′
4	243°48.8	47.0	287°48.6	16.7′	05°28.7	14.1′	54.6′
5	258°48.7	47.6	302°24.3	16.6′	05°42.8	14.0′	54.6′
6	273°48.6	S18°48.2	316°59.9	16.6′	S05°56.8	14.1′	54.5′
7	288°48.5	48.8	331°35.6	16.6′	06°10.9	14.0′	54.5′
8	303°48.4	49.5	346°11.2	16.6′	06°24.9	14.0′	54.5′
9	318°48.3	·· 50.1	0°46.8	16.6′	06°38.9	13.9′	54.5′
10	333°48.1	50.7	15°22.4	16.6′	06°52.8	14.0′	54.5′
11	348°48.0	51.3	29°58.0	16.6′	07°06.8	13.9′	54.5′
12	3°47.9	S18°51.9	44°33.6	16.6′	S07°20.7	13.8′	54.5′
13	18°47.8	52.5	59°09.1	16.5′	07°34.5	13.8′	54.4′
14	33°47.7	53.2	73°44.7	16.5′	07°48.3	13.8′	54.4′
15	48°47.6	·· 53.8	88°20.2	16.5′	08°02.1	13.8′	54.4′
16	63°47.4	54.4	102°55.7	16.5′	08°15.9	13.7′	54.4′
17	78°47.3	55.0	117°31.2	16.5′	08°29.6	13.7′	54.4′
18	93°47.2	S18°55.6	132°06.6	16.4′	S08°43.3	13.6′	54.4′
19	108°47.1	56.2	146°42.1	16.4′	08°56.9	13.6′	54.4′
20	123°47.0	56.8	161°17.5	16.4′	09°10.5	13.6′	54.3′
21	138°46.8	·· 57.5	175°52.9	16.4′	09°24.1	13.5′	54.3′
22	153°46.7	58.1	190°28.2	16.3′	09°37.6	13.5′	54.3′
23	168°46.6	58.7	205°03.6	16.3′	09°51.1	13.4′	54.3′
	SD = 16.2′	d = -0.6′	SD = 14.9′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°46.5	S18°59.3	219°38.9	16.3′	S10°04.5	13.4′	54.3′
1	198°46.3	18°59.9	234°14.2	16.3′	10°17.9	13.4′	54.3′
2	213°46.2	19°00.5	248°49.4	16.2′	10°31.3	13.3′	54.3′
3	228°46.1	·· 01.1	263°24.7	16.2′	10°44.6	13.3′	54.3′
4	243°46.0	01.7	277°59.9	16.2′	10°57.9	13.2′	54.2′
5	258°45.9	02.3	292°35.0	16.1′	11°11.1	13.2′	54.2′
6	273°45.7	S19°02.9	307°10.1	16.1′	S11°24.3	13.1′	54.2′
7	288°45.6	03.5	321°45.2	16.1′	11°37.4	13.1′	54.2′
8	303°45.5	04.2	336°20.3	16.0′	11°50.5	13.0′	54.2′
9	318°45.4	·· 04.8	350°55.3	16.0′	12°03.5	13.0′	54.2′
10	333°45.2	05.4	5°30.3	16.0′	12°16.5	12.9′	54.2′
11	348°45.1	06.0	20°05.3	15.9′	12°29.4	12.9′	54.2′
12	3°45.0	S19°06.6	34°40.2	15.9′	S12°42.3	12.8′	54.2′
13	18°44.8	07.2	49°15.1	15.8′	12°55.1	12.8′	54.1′
14	33°44.7	07.8	63°49.9	15.8′	13°07.9	12.8′	54.1′
15	48°44.6	·· 08.4	78°24.7	15.8′	13°20.7	12.6′	54.1′
16	63°44.5	09.0	92°59.5	15.7′	13°33.3	12.6′	54.1′
17	78°44.3	09.6	107°34.2	15.7′	13°45.9	12.6′	54.1′
18	93°44.2	S19°10.2	122°08.9	15.6′	S13°58.5	12.5′	54.1′
19	108°44.1	10.8	136°43.5	15.6′	14°11.0	12.5′	54.1′
20	123°43.9	11.4	151°18.1	15.5′	14°23.5	12.4′	54.1′
21	138°43.8	·· 12.0	165°52.6	15.5′	14°35.9	12.3′	54.1′
22	153°43.7	12.6	180°27.1	15.4′	14°48.2	12.3′	54.1′
23	168°43.6	13.2	195°01.6	15.4′	15°00.5	12.2′	54.1′
	SD = 16.2′	d = -0.6′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:04	08:40	▬	▬	14:48	16:25
N 70°	06:53	08:16	09:58	13:31	15:12	16:35
68°	06:44	07:58	09:19	14:10	15:31	16:44
66°	06:37	07:43	08:52	14:37	15:45	16:52
64°	06:30	07:31	08:31	14:58	15:58	16:58
62°	06:25	07:21	08:15	15:14	16:08	17:04
60°	06:19	07:11	08:01	15:28	16:17	17:09
N 58°	06:15	07:04	07:49	15:40	16:25	17:14
56°	06:11	06:56	07:39	15:50	16:32	17:18
54°	06:07	06:50	07:30	15:59	16:39	17:22
52°	06:03	06:44	07:22	16:07	16:45	17:26
50°	05:59	06:39	07:15	16:14	16:50	17:30
45°	05:52	06:27	06:59	16:30	17:02	17:37
N 40°	05:45	06:17	06:46	16:43	17:12	17:45
35°	05:38	06:09	06:36	16:54	17:21	17:51
30°	05:32	06:01	06:26	17:03	17:29	17:58
20°	05:20	05:46	06:09	17:20	17:43	18:10
N 10°	05:07	05:33	05:55	17:35	17:57	18:22
0°	04:54	05:19	05:41	17:48	18:10	18:36
S 10°	04:39	05:05	05:27	18:02	18:25	18:51
20°	04:21	04:49	05:13	18:17	18:41	19:09
30°	03:58	04:29	04:55	18:35	19:01	19:32
35°	03:43	04:17	04:45	18:45	19:13	19:47
40°	03:25	04:03	04:34	18:57	19:27	20:05
45°	03:02	03:46	04:20	19:10	19:45	20:28
S 50°	02:32	03:24	04:03	19:27	20:07	21:00
52°	02:15	03:13	03:55	19:35	20:18	21:16
54°	01:56	03:01	03:46	19:44	20:30	21:36
56°	01:30	02:47	03:36	19:55	20:45	22:03
58°	00:52	02:30	03:25	20:06	21:02	22:44
S 60°	–:–	02:09	03:12	20:20	21:24	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	01:58	03:59	06:07	13:58	13:25	12:42
N 70°	01:59	03:50	05:46	14:01	13:36	13:05
68°	02:00	03:44	05:30	14:04	13:45	13:23
66°	02:01	03:38	05:17	14:06	13:52	13:37
64°	02:01	03:33	05:07	14:08	13:59	13:49
62°	02:02	03:29	04:58	14:09	14:04	14:00
60°	02:02	03:26	04:50	14:10	14:09	14:09
N 58°	02:03	03:23	04:43	14:12	14:14	14:16
56°	02:03	03:20	04:37	14:13	14:17	14:23
54°	02:03	03:18	04:32	14:14	14:21	14:29
52°	02:03	03:15	04:27	14:15	14:24	14:35
50°	02:04	03:13	04:23	14:15	14:27	14:40
45°	02:04	03:09	04:14	14:17	14:33	14:51
N 40°	02:05	03:06	04:06	14:19	14:39	15:00
35°	02:05	03:02	04:00	14:20	14:43	15:08
30°	02:05	03:00	03:54	14:21	14:47	15:15
20°	02:06	02:55	03:44	14:23	14:54	15:27
N 10°	02:07	02:51	03:35	14:25	15:01	15:37
0°	02:07	02:47	03:27	14:26	15:06	15:47
S 10°	02:08	02:43	03:20	14:28	15:12	15:57
20°	02:08	02:39	03:11	14:30	15:19	16:08
30°	02:09	02:35	03:02	14:32	15:26	16:20
35°	02:09	02:32	02:56	14:33	15:30	16:28
40°	02:10	02:30	02:50	14:34	15:35	16:36
45°	02:10	02:26	02:43	14:36	15:40	16:45
S 50°	02:11	02:22	02:34	14:37	15:47	16:57
52°	02:11	02:21	02:31	14:38	15:50	17:02
54°	02:11	02:19	02:26	14:39	15:53	17:08
56°	02:12	02:16	02:22	14:40	15:57	17:15
58°	02:12	02:14	02:16	14:41	16:01	17:23
S 60°	02:13	02:11	02:10	14:42	16:06	17:31

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 23-9%
15	15:28	15:23	11:45	08:17	20:37	
16	15:17	15:12	11:45	08:57	21:17	
17	15:06	15:00	11:45	09:37	21:58	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2597 sec ΔT = TT-UT1 = +68.9243 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	57°17.6	195°32.4	S14°55.4	169°18.5	S22°27.2	300°14.2	N21°14.3	60°41.6	S04°06.2
1	72°20.1	210°31.8	56.4	184°19.0	27.5	315°16.7	14.4	75°44.1	06.2
2	87°22.5	225°31.2	57.4	199°19.5	27.8	330°19.2	14.4	90°46.6	06.2
3	102°25.0	240°30.6	·· 58.4	214°20.1	·· 28.1	345°21.7	·· 14.4	105°49.2	·· 06.2
4	117°27.4	255°30.0	14°59.4	229°20.6	28.4	0°24.3	14.4	120°51.7	06.2
5	132°29.9	270°29.3	15°00.4	244°21.1	28.7	15°26.8	14.4	135°54.2	06.2
6	147°32.4	285°28.7	S15°01.4	259°21.6	S22°29.0	30°29.3	N21°14.4	150°56.7	S04°06.2
7	162°34.8	300°28.1	02.4	274°22.1	29.3	45°31.8	14.5	165°59.2	06.2
8	177°37.3	315°27.5	03.4	289°22.6	29.6	60°34.3	14.5	181°01.7	06.2
9	192°39.8	330°26.9	·· 04.4	304°23.1	·· 29.9	75°36.9	·· 14.5	196°04.2	·· 06.2
10	207°42.2	345°26.2	05.4	319°23.7	30.1	90°39.4	14.5	211°06.7	06.3
11	222°44.7	0°25.6	06.4	334°24.2	30.4	105°41.9	14.5	226°09.2	06.3
12	237°47.2	15°25.0	S15°07.3	349°24.7	S22°30.7	120°44.4	N21°14.5	241°11.7	S04°06.3
13	252°49.6	30°24.4	08.3	4°25.2	31.0	135°47.0	14.6	256°14.2	06.3
14	267°52.1	45°23.8	09.3	19°25.7	31.3	150°49.5	14.6	271°16.7	06.3
15	282°54.5	60°23.1	·· 10.3	34°26.2	·· 31.6	165°52.0	·· 14.6	286°19.2	·· 06.3
16	297°57.0	75°22.5	11.3	49°26.7	31.9	180°54.5	14.6	301°21.7	06.3
17	312°59.5	90°21.9	12.3	64°27.2	32.2	195°57.1	14.6	316°24.3	06.3
18	328°01.9	105°21.3	S15°13.3	79°27.8	S22°32.5	210°59.6	N21°14.6	331°26.8	S04°06.3
19	343°04.4	120°20.6	14.3	94°28.3	32.7	226°02.1	14.7	346°29.3	06.3
20	358°06.9	135°20.0	15.2	109°28.8	33.0	241°04.6	14.7	1°31.8	06.3
21	13°09.3	150°19.4	·· 16.2	124°29.3	·· 33.3	256°07.2	·· 14.7	16°34.3	·· 06.4
22	28°11.8	165°18.8	17.2	139°29.8	33.6	271°09.7	14.7	31°36.8	06.4
23	43°14.3	180°18.1	18.2	154°30.3	33.9	286°12.2	14.7	46°39.3	06.4
Mer.pass.	20:08	ν -0.6′	d -1.0′	m -3.91	ν 0.5′	d -0.3′	m 1.38	ν 2.5′	d 0.0′ m -2.45	ν 2.5′	d -0.0′ m 0.85
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	58°16.7	195°17.5	S15°19.2	169°30.8	S22°34.2	301°14.7	N21°14.7	61°41.8	S04°06.4
1	73°19.2	210°16.9	20.2	184°31.3	34.5	316°17.3	14.8	76°44.3	06.4
2	88°21.7	225°16.3	21.1	199°31.8	34.7	331°19.8	14.8	91°46.8	06.4
3	103°24.1	240°15.6	·· 22.1	214°32.4	·· 35.0	346°22.3	·· 14.8	106°49.3	·· 06.4
4	118°26.6	255°15.0	23.1	229°32.9	35.3	1°24.8	14.8	121°51.8	06.4
5	133°29.0	270°14.4	24.1	244°33.4	35.6	16°27.4	14.8	136°54.3	06.4
6	148°31.5	285°13.7	S15°25.1	259°33.9	S22°35.9	31°29.9	N21°14.8	151°56.8	S04°06.4
7	163°34.0	300°13.1	26.0	274°34.4	36.2	46°32.4	14.9	166°59.3	06.4
8	178°36.4	315°12.5	27.0	289°34.9	36.4	61°35.0	14.9	182°01.8	06.4
9	193°38.9	330°11.8	·· 28.0	304°35.4	·· 36.7	76°37.5	·· 14.9	197°04.3	·· 06.5
10	208°41.4	345°11.2	29.0	319°35.9	37.0	91°40.0	14.9	212°06.8	06.5
11	223°43.8	0°10.6	29.9	334°36.4	37.3	106°42.6	14.9	227°09.3	06.5
12	238°46.3	15°09.9	S15°30.9	349°36.9	S22°37.6	121°45.1	N21°15.0	242°11.8	S04°06.5
13	253°48.8	30°09.3	31.9	4°37.4	37.8	136°47.6	15.0	257°14.3	06.5
14	268°51.2	45°08.7	32.9	19°37.9	38.1	151°50.2	15.0	272°16.8	06.5
15	283°53.7	60°08.0	·· 33.8	34°38.5	·· 38.4	166°52.7	·· 15.0	287°19.3	·· 06.5
16	298°56.2	75°07.4	34.8	49°39.0	38.7	181°55.2	15.0	302°21.9	06.5
17	313°58.6	90°06.8	35.8	64°39.5	39.0	196°57.8	15.0	317°24.4	06.5
18	329°01.1	105°06.1	S15°36.8	79°40.0	S22°39.2	212°00.3	N21°15.1	332°26.9	S04°06.5
19	344°03.5	120°05.5	37.7	94°40.5	39.5	227°02.8	15.1	347°29.4	06.5
20	359°06.0	135°04.9	38.7	109°41.0	39.8	242°05.4	15.1	2°31.9	06.5
21	14°08.5	150°04.2	·· 39.7	124°41.5	·· 40.1	257°07.9	·· 15.1	17°34.4	·· 06.5
22	29°10.9	165°03.6	40.6	139°42.0	40.4	272°10.4	15.1	32°36.9	06.6
23	44°13.4	180°02.9	41.6	154°42.5	40.6	287°13.0	15.2	47°39.4	06.6
Mer.pass.	20:04	ν -0.6′	d -1.0′	m -3.91	ν 0.5′	d -0.3′	m 1.37	ν 2.5′	d 0.0′ m -2.45	ν 2.5′	d -0.0′ m 0.86
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	59°15.9	195°02.3	S15°42.6	169°43.0	S22°40.9	302°15.5	N21°15.2	62°41.9	S04°06.6
1	74°18.3	210°01.7	43.5	184°43.5	41.2	317°18.0	15.2	77°44.4	06.6
2	89°20.8	225°01.0	44.5	199°44.0	41.5	332°20.6	15.2	92°46.9	06.6
3	104°23.3	240°00.4	·· 45.5	214°44.5	·· 41.7	347°23.1	·· 15.2	107°49.4	·· 06.6
4	119°25.7	254°59.7	46.4	229°45.0	42.0	2°25.6	15.2	122°51.9	06.6
5	134°28.2	269°59.1	47.4	244°45.5	42.3	17°28.2	15.3	137°54.4	06.6
6	149°30.7	284°58.5	S15°48.3	259°46.0	S22°42.6	32°30.7	N21°15.3	152°56.9	S04°06.6
7	164°33.1	299°57.8	49.3	274°46.5	42.8	47°33.3	15.3	167°59.4	06.6
8	179°35.6	314°57.2	50.3	289°47.0	43.1	62°35.8	15.3	183°01.9	06.6
9	194°38.0	329°56.5	·· 51.2	304°47.5	·· 43.4	77°38.3	·· 15.3	198°04.4	·· 06.6
10	209°40.5	344°55.9	52.2	319°48.0	43.7	92°40.9	15.4	213°06.9	06.6
11	224°43.0	359°55.2	53.1	334°48.5	43.9	107°43.4	15.4	228°09.4	06.6
12	239°45.4	14°54.6	S15°54.1	349°49.0	S22°44.2	122°46.0	N21°15.4	243°11.9	S04°06.6
13	254°47.9	29°53.9	55.1	4°49.5	44.5	137°48.5	15.4	258°14.4	06.6
14	269°50.4	44°53.3	56.0	19°50.0	44.7	152°51.0	15.4	273°16.9	06.7
15	284°52.8	59°52.6	·· 57.0	34°50.5	·· 45.0	167°53.6	·· 15.5	288°19.4	·· 06.7
16	299°55.3	74°52.0	57.9	49°51.0	45.3	182°56.1	15.5	303°21.9	06.7
17	314°57.8	89°51.4	58.9	64°51.5	45.5	197°58.7	15.5	318°24.4	06.7
18	330°00.2	104°50.7	S15°59.8	79°52.0	S22°45.8	213°01.2	N21°15.5	333°26.9	S04°06.7
19	345°02.7	119°50.1	16°00.8	94°52.5	46.1	228°03.8	15.5	348°29.4	06.7
20	0°05.1	134°49.4	01.7	109°53.0	46.4	243°06.3	15.6	3°31.9	06.7
21	15°07.6	149°48.8	·· 02.7	124°53.5	·· 46.6	258°08.8	·· 15.6	18°34.3	·· 06.7
22	30°10.1	164°48.1	03.6	139°54.0	46.9	273°11.4	15.6	33°36.8	06.7
23	45°12.5	179°47.5	04.6	154°54.5	47.2	288°13.9	15.6	48°39.3	06.7
Mer.pass.	20:00	ν -0.6′	d -1.0′	m -3.91	ν 0.5′	d -0.3′	m 1.37	ν 2.5′	d 0.0′ m -2.46	ν 2.5′	d -0.0′ m 0.86

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.9	56°41.0
Diphda	348°46.4	-17°50.7
Achernar	335°19.1	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°10.9	89°22.5
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.8	49°57.3
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°25.4	-16°44.9
Adhara	255°05.1	-29°00.2
Procyon	244°49.9	5°09.6
Pollux	243°16.3	27°57.7
Avior	234°14.2	-59°35.2
Suhail	222°45.7	-43°31.9
Miaplacidus	221°38.0	-69°49.0
Alphard	217°47.0	-8°46.1
Regulus	207°33.7	11°50.4
Dubhe	193°40.4	61°36.4
Denebola	182°24.4	14°25.6
Gienah	175°43.1	-17°41.0
Acrux	172°59.8	-63°14.3
Gacrux	171°51.3	-57°15.2
Alioth	166°12.8	55°49.0
Spica	158°21.8	-11°17.7
Alkaid	152°51.9	49°10.9
Hadar	148°35.6	-60°29.7
Menkent	147°57.2	-36°29.7
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°40.0	-60°56.4
Kochab	137°21.0	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.7
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.5
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.3	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.5	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 18 Tue	SHA	Mer.pass
Venus	138°14.8	10:58
Mars	112°00.9	12:42
Jupiter	242°56.6	03:58
Saturn	3°24.0	19:54

Nov 19 Wed	SHA	Mer.pass
Venus	137°00.8	10:59
Mars	111°14.1	12:42
Jupiter	242°58.0	03:54
Saturn	3°25.1	19:50

Nov 20 Thu	SHA	Mer.pass
Venus	135°46.4	11:00
Mars	110°27.1	12:41
Jupiter	242°59.6	03:50
Saturn	3°26.0	19:46

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°43.4	S19°13.8	209°36.0	15.4′	S15°12.7	12.1′	54.0′
1	198°43.3	14.4	224°10.3	15.3′	15°24.8	12.1′	54.0′
2	213°43.2	15.0	238°44.6	15.3′	15°36.9	12.0′	54.0′
3	228°43.0	·· 15.5	253°18.9	15.2′	15°48.9	12.0′	54.0′
4	243°42.9	16.1	267°53.1	15.2′	16°00.9	11.9′	54.0′
5	258°42.8	16.7	282°27.2	15.1′	16°12.8	11.8′	54.0′
6	273°42.6	S19°17.3	297°01.3	15.1′	S16°24.6	11.8′	54.0′
7	288°42.5	17.9	311°35.4	15.0′	16°36.4	11.7′	54.0′
8	303°42.4	18.5	326°09.4	14.9′	16°48.1	11.6′	54.0′
9	318°42.2	·· 19.1	340°43.3	14.9′	16°59.7	11.6′	54.0′
10	333°42.1	19.7	355°17.2	14.8′	17°11.3	11.5′	54.0′
11	348°42.0	20.3	9°51.1	14.8′	17°22.8	11.4′	54.0′
12	3°41.8	S19°20.9	24°24.9	14.7′	S17°34.2	11.4′	54.0′
13	18°41.7	21.5	38°58.6	14.7′	17°45.6	11.2′	54.0′
14	33°41.6	22.0	53°32.2	14.6′	17°56.8	11.3′	54.0′
15	48°41.4	·· 22.6	68°05.9	14.6′	18°08.1	11.1′	53.9′
16	63°41.3	23.2	82°39.4	14.5′	18°19.2	11.0′	53.9′
17	78°41.1	23.8	97°12.9	14.4′	18°30.2	11.0′	53.9′
18	93°41.0	S19°24.4	111°46.4	14.4′	S18°41.2	10.9′	53.9′
19	108°40.9	25.0	126°19.7	14.3′	18°52.1	10.9′	53.9′
20	123°40.7	25.6	140°53.1	14.3′	19°03.0	10.7′	53.9′
21	138°40.6	·· 26.1	155°26.3	14.2′	19°13.7	10.7′	53.9′
22	153°40.5	26.7	169°59.5	14.1′	19°24.4	10.6′	53.9′
23	168°40.3	27.3	184°32.7	14.1′	19°35.0	10.5′	53.9′
	SD = 16.2′	d = -0.6′	SD = 14.7′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°40.2	S19°27.9	199°05.7	14.0′	S19°45.5	10.4′	53.9′
1	198°40.0	28.5	213°38.8	14.0′	19°55.9	10.4′	53.9′
2	213°39.9	29.0	228°11.7	13.9′	20°06.3	10.2′	53.9′
3	228°39.8	·· 29.6	242°44.6	13.8′	20°16.5	10.2′	53.9′
4	243°39.6	30.2	257°17.4	13.8′	20°26.7	10.1′	53.9′
5	258°39.5	30.8	271°50.2	13.7′	20°36.8	10.0′	53.9′
6	273°39.3	S19°31.4	286°22.9	13.6′	S20°46.8	9.9′	53.9′
7	288°39.2	31.9	300°55.6	13.6′	20°56.7	9.9′	53.9′
8	303°39.0	32.5	315°28.1	13.5′	21°06.6	9.7′	53.9′
9	318°38.9	·· 33.1	330°00.7	13.5′	21°16.3	9.7′	53.9′
10	333°38.8	33.7	344°33.1	13.4′	21°26.0	9.5′	53.9′
11	348°38.6	34.2	359°05.5	13.3′	21°35.5	9.5′	53.9′
12	3°38.5	S19°34.8	13°37.8	13.3′	S21°45.0	9.4′	53.9′
13	18°38.3	35.4	28°10.1	13.2′	21°54.4	9.3′	53.9′
14	33°38.2	36.0	42°42.3	13.1′	22°03.7	9.2′	53.9′
15	48°38.0	·· 36.5	57°14.4	13.1′	22°12.9	9.1′	53.9′
16	63°37.9	37.1	71°46.5	13.0′	22°22.0	9.0′	53.9′
17	78°37.8	37.7	86°18.5	12.9′	22°31.0	8.9′	53.9′
18	93°37.6	S19°38.2	100°50.4	12.9′	S22°39.9	8.8′	53.9′
19	108°37.5	38.8	115°22.3	12.8′	22°48.7	8.7′	53.9′
20	123°37.3	39.4	129°54.1	12.7′	22°57.4	8.6′	53.9′
21	138°37.2	·· 40.0	144°25.8	12.7′	23°06.0	8.6′	53.9′
22	153°37.0	40.5	158°57.5	12.6′	23°14.6	8.4′	53.9′
23	168°36.9	41.1	173°29.1	12.5′	23°23.0	8.3′	53.9′
	SD = 16.2′	d = -0.6′	SD = 14.7′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°36.7	S19°41.7	188°00.7	12.5′	S23°31.3	8.2′	53.9′
1	198°36.6	42.2	202°32.1	12.4′	23°39.5	8.1′	53.8′
2	213°36.4	42.8	217°03.5	12.4′	23°47.6	8.0′	53.8′
3	228°36.3	·· 43.4	231°34.9	12.3′	23°55.6	7.9′	53.8′
4	243°36.1	43.9	246°06.2	12.2′	24°03.5	7.8′	53.8′
5	258°36.0	44.5	260°37.4	12.2′	24°11.3	7.7′	53.8′
6	273°35.8	S19°45.0	275°08.6	12.1′	S24°19.0	7.5′	53.9′
7	288°35.7	45.6	289°39.7	12.0′	24°26.5	7.5′	53.9′
8	303°35.5	46.2	304°10.7	12.0′	24°34.0	7.4′	53.9′
9	318°35.4	·· 46.7	318°41.7	11.9′	24°41.4	7.2′	53.9′
10	333°35.2	47.3	333°12.6	11.8′	24°48.6	7.2′	53.9′
11	348°35.1	47.9	347°43.4	11.8′	24°55.8	7.0′	53.9′
12	3°34.9	S19°48.4	2°14.2	11.7′	S25°02.8	6.9′	53.9′
13	18°34.8	49.0	16°44.9	11.7′	25°09.7	6.8′	53.9′
14	33°34.6	49.5	31°15.6	11.6′	25°16.5	6.7′	53.9′
15	48°34.5	·· 50.1	45°46.2	11.5′	25°23.2	6.6′	53.9′
16	63°34.3	50.6	60°16.7	11.5′	25°29.8	6.4′	53.9′
17	78°34.1	51.2	74°47.2	11.4′	25°36.2	6.4′	53.9′
18	93°34.0	S19°51.8	89°17.6	11.4′	S25°42.6	6.2′	53.9′
19	108°33.8	52.3	103°48.0	11.3′	25°48.8	6.1′	53.9′
20	123°33.7	52.9	118°18.3	11.2′	25°54.9	6.0′	53.9′
21	138°33.5	·· 53.4	132°48.5	11.2′	26°00.9	5.9′	53.9′
22	153°33.4	54.0	147°18.7	11.1′	26°06.8	5.7′	53.9′
23	168°33.2	54.5	161°48.9	11.1′	26°12.5	5.6′	53.9′
	SD = 16.2′	d = -0.6′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:14	08:54	▬	▬	14:35	16:15
N 70°	07:02	08:28	10:20	13:10	15:02	16:27
68°	06:53	08:08	09:33	13:57	15:22	16:37
66°	06:44	07:52	09:03	14:27	15:38	16:46
64°	06:37	07:39	08:41	14:49	15:51	16:53
62°	06:31	07:28	08:23	15:07	16:03	16:59
60°	06:25	07:18	08:08	15:22	16:12	17:05
N 58°	06:20	07:09	07:56	15:34	16:21	17:10
56°	06:16	07:02	07:45	15:45	16:28	17:15
54°	06:11	06:55	07:36	15:55	16:35	17:19
52°	06:07	06:49	07:27	16:03	16:41	17:23
50°	06:04	06:43	07:19	16:11	16:47	17:27
45°	05:55	06:31	07:03	16:27	16:59	17:35
N 40°	05:48	06:21	06:50	16:41	17:10	17:43
35°	05:41	06:11	06:38	16:52	17:19	17:50
30°	05:34	06:03	06:28	17:02	17:28	17:57
20°	05:21	05:48	06:11	17:19	17:43	18:10
N 10°	05:08	05:34	05:56	17:35	17:57	18:23
0°	04:54	05:20	05:42	17:49	18:11	18:36
S 10°	04:39	05:05	05:27	18:04	18:26	18:52
20°	04:20	04:48	05:12	18:19	18:43	19:11
30°	03:56	04:28	04:54	18:37	19:04	19:35
35°	03:41	04:15	04:43	18:48	19:16	19:51
40°	03:22	04:00	04:31	19:00	19:31	20:10
45°	02:58	03:42	04:17	19:15	19:49	20:34
S 50°	02:26	03:19	03:59	19:32	20:13	21:07
52°	02:09	03:08	03:51	19:41	20:24	21:24
54°	01:47	02:55	03:42	19:50	20:37	21:46
56°	01:18	02:40	03:31	20:01	20:52	22:16
58°	00:29	02:22	03:19	20:13	21:11	23:12
S 60°	–:–	01:59	03:05	20:28	21:35	–:–

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	09:02	▬	▬	11:16	▬	▬
N 70°	08:02	▬	▬	12:17	▬	▬
68°	07:28	10:14	▬	12:53	11:39	▬
66°	07:03	09:06	▬	13:19	12:47	▬
64°	06:44	08:31	10:39	13:38	13:23	12:52
62°	06:29	08:06	09:50	13:55	13:49	13:43
60°	06:16	07:46	09:19	14:08	14:10	14:14
N 58°	06:05	07:30	08:55	14:20	14:27	14:38
56°	05:56	07:16	08:37	14:30	14:41	14:57
54°	05:48	07:04	08:21	14:40	14:53	15:13
52°	05:40	06:54	08:08	14:48	15:04	15:27
50°	05:33	06:45	07:56	14:55	15:14	15:39
45°	05:19	06:25	07:31	15:11	15:35	16:04
N 40°	05:07	06:10	07:12	15:24	15:51	16:25
35°	04:58	05:56	06:56	15:35	16:06	16:41
30°	04:49	05:45	06:42	15:45	16:18	16:56
20°	04:34	05:25	06:18	16:01	16:39	17:21
N 10°	04:21	05:09	05:58	16:16	16:58	17:42
0°	04:09	04:53	05:39	16:30	17:15	18:03
S 10°	03:57	04:37	05:20	16:44	17:32	18:23
20°	03:45	04:21	05:00	16:59	17:51	18:44
30°	03:30	04:02	04:37	17:16	18:12	19:10
35°	03:22	03:51	04:24	17:26	18:25	19:24
40°	03:12	03:38	04:08	17:37	18:40	19:42
45°	03:01	03:23	03:50	17:51	18:57	20:03
S 50°	02:48	03:05	03:27	18:08	19:19	20:29
52°	02:42	02:57	03:16	18:16	19:30	20:42
54°	02:35	02:47	03:04	18:24	19:41	20:57
56°	02:28	02:37	02:50	18:34	19:55	21:14
58°	02:20	02:25	02:33	18:46	20:11	21:35
S 60°	02:10	02:11	02:14	18:59	20:30	22:02

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 28-0 5-0%
18	14:54	14:47	11:45	10:19	22:41	
19	14:41	14:34	11:45	11:04	23:27	
20	14:27	14:20	11:46	11:51	–:–	

No IERS EOP prediction data available

November 21, 22, 23 UT (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°15.0	194°46.8	S16°05.5	169°55.0	S22°47.4	303°16.5	N21°15.6	63°41.8	S04°06.7
1	75°17.5	209°46.2	06.5	184°55.5	47.7	318°19.0	15.7	78°44.3	06.7
2	90°19.9	224°45.5	07.4	199°56.0	48.0	333°21.6	15.7	93°46.8	06.7
3	105°22.4	239°44.8	·· 08.4	214°56.5	·· 48.2	348°24.1	·· 15.7	108°49.3	·· 06.7
4	120°24.9	254°44.2	09.3	229°57.0	48.5	3°26.7	15.7	123°51.8	06.7
5	135°27.3	269°43.5	10.3	244°57.5	48.8	18°29.2	15.7	138°54.3	06.7
6	150°29.8	284°42.9	S16°11.2	259°58.0	S22°49.0	33°31.7	N21°15.8	153°56.8	S04°06.7
7	165°32.3	299°42.2	12.2	274°58.5	49.3	48°34.3	15.8	168°59.3	06.7
8	180°34.7	314°41.6	13.1	289°59.0	49.6	63°36.8	15.8	184°01.8	06.7
9	195°37.2	329°40.9	·· 14.0	304°59.5	·· 49.8	78°39.4	·· 15.8	199°04.3	·· 06.7
10	210°39.6	344°40.3	15.0	320°00.0	50.1	93°41.9	15.8	214°06.8	06.7
11	225°42.1	359°39.6	15.9	335°00.5	50.3	108°44.5	15.9	229°09.3	06.8
12	240°44.6	14°38.9	S16°16.9	350°01.0	S22°50.6	123°47.0	N21°15.9	244°11.8	S04°06.8
13	255°47.0	29°38.3	17.8	5°01.5	50.9	138°49.6	15.9	259°14.3	06.8
14	270°49.5	44°37.6	18.7	20°02.0	51.1	153°52.1	15.9	274°16.8	06.8
15	285°52.0	59°37.0	·· 19.7	35°02.5	·· 51.4	168°54.7	·· 15.9	289°19.3	·· 06.8
16	300°54.4	74°36.3	20.6	50°03.0	51.6	183°57.2	16.0	304°21.8	06.8
17	315°56.9	89°35.6	21.6	65°03.5	51.9	198°59.8	16.0	319°24.3	06.8
18	330°59.4	104°35.0	S16°22.5	80°04.0	S22°52.2	214°02.3	N21°16.0	334°26.8	S04°06.8
19	346°01.8	119°34.3	23.4	95°04.5	52.4	229°04.9	16.0	349°29.3	06.8
20	1°04.3	134°33.7	24.4	110°05.0	52.7	244°07.4	16.1	4°31.7	06.8
21	16°06.8	149°33.0	·· 25.3	125°05.5	·· 52.9	259°10.0	·· 16.1	19°34.2	·· 06.8
22	31°09.2	164°32.3	26.2	140°06.0	53.2	274°12.5	16.1	34°36.7	06.8
23	46°11.7	179°31.7	27.2	155°06.4	53.5	289°15.1	16.1	49°39.2	06.8
Mer.pass.	19:56	ν -0.7′	d -0.9′	m -3.90	ν 0.5′	d -0.3′	m 1.36	ν 2.5′	d 0.0′ m -2.47	ν 2.5′	d -0.0′ m 0.87

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	61°14.1	194°31.0	S16°28.1	170°06.9	S22°53.7	304°17.7	N21°16.1	64°41.7	S04°06.8
1	76°16.6	209°30.3	29.0	185°07.4	54.0	319°20.2	16.2	79°44.2	06.8
2	91°19.1	224°29.7	30.0	200°07.9	54.2	334°22.8	16.2	94°46.7	06.8
3	106°21.5	239°29.0	·· 30.9	215°08.4	·· 54.5	349°25.3	·· 16.2	109°49.2	·· 06.8
4	121°24.0	254°28.4	31.8	230°08.9	54.8	4°27.9	16.2	124°51.7	06.8
5	136°26.5	269°27.7	32.7	245°09.4	55.0	19°30.4	16.3	139°54.2	06.8
6	151°28.9	284°27.0	S16°33.7	260°09.9	S22°55.3	34°33.0	N21°16.3	154°56.7	S04°06.8
7	166°31.4	299°26.3	34.6	275°10.4	55.5	49°35.5	16.3	169°59.2	06.8
8	181°33.9	314°25.7	35.5	290°10.9	55.8	64°38.1	16.3	185°01.7	06.8
9	196°36.3	329°25.0	·· 36.4	305°11.4	·· 56.0	79°40.7	·· 16.3	200°04.1	·· 06.8
10	211°38.8	344°24.3	37.4	320°11.9	56.3	94°43.2	16.4	215°06.6	06.8
11	226°41.3	359°23.7	38.3	335°12.4	56.5	109°45.8	16.4	230°09.1	06.8
12	241°43.7	14°23.0	S16°39.2	350°12.8	S22°56.8	124°48.3	N21°16.4	245°11.6	S04°06.8
13	256°46.2	29°22.3	40.1	5°13.3	57.0	139°50.9	16.4	260°14.1	06.8
14	271°48.6	44°21.7	41.1	20°13.8	57.3	154°53.4	16.5	275°16.6	06.8
15	286°51.1	59°21.0	·· 42.0	35°14.3	·· 57.5	169°56.0	·· 16.5	290°19.1	·· 06.8
16	301°53.6	74°20.3	42.9	50°14.8	57.8	184°58.6	16.5	305°21.6	06.8
17	316°56.0	89°19.6	43.8	65°15.3	58.0	200°01.1	16.5	320°24.1	06.8
18	331°58.5	104°19.0	S16°44.7	80°15.8	S22°58.3	215°03.7	N21°16.5	335°26.6	S04°06.8
19	347°01.0	119°18.3	45.6	95°16.3	58.6	230°06.2	16.6	350°29.1	06.8
20	2°03.4	134°17.6	46.6	110°16.8	58.8	245°08.8	16.6	5°31.5	06.8
21	17°05.9	149°17.0	·· 47.5	125°17.2	·· 59.1	260°11.4	·· 16.6	20°34.0	·· 06.8
22	32°08.4	164°16.3	48.4	140°17.7	59.3	275°13.9	16.6	35°36.5	06.8
23	47°10.8	179°15.6	49.3	155°18.2	59.5	290°16.5	16.7	50°39.0	06.8
Mer.pass.	19:52	ν -0.7′	d -0.9′	m -3.90	ν 0.5′	d -0.3′	m 1.36	ν 2.6′	d 0.0′ m -2.47	ν 2.5′	d -0.0′ m 0.87

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°13.3	194°14.9	S16°50.2	170°18.7	S22°59.8	305°19.0	N21°16.7	65°41.5	S04°06.8
1	77°15.8	209°14.2	51.1	185°19.2	23°00.0	320°21.6	16.7	80°44.0	06.8
2	92°18.2	224°13.6	52.0	200°19.7	00.3	335°24.2	16.7	95°46.5	06.8
3	107°20.7	239°12.9	·· 53.0	215°20.2	·· 00.5	350°26.7	·· 16.7	110°49.0	·· 06.9
4	122°23.1	254°12.2	53.9	230°20.7	00.8	5°29.3	16.8	125°51.5	06.9
5	137°25.6	269°11.5	54.8	245°21.1	01.0	20°31.9	16.8	140°53.9	06.9
6	152°28.1	284°10.9	S16°55.7	260°21.6	S23°01.3	35°34.4	N21°16.8	155°56.4	S04°06.9
7	167°30.5	299°10.2	56.6	275°22.1	01.5	50°37.0	16.8	170°58.9	06.9
8	182°33.0	314°09.5	57.5	290°22.6	01.8	65°39.6	16.9	186°01.4	06.9
9	197°35.5	329°08.8	·· 58.4	305°23.1	·· 02.0	80°42.1	·· 16.9	201°03.9	·· 06.9
10	212°37.9	344°08.1	16°59.3	320°23.6	02.3	95°44.7	16.9	216°06.4	06.9
11	227°40.4	359°07.4	17°00.2	335°24.1	02.5	110°47.3	16.9	231°08.9	06.9
12	242°42.9	14°06.8	S17°01.1	350°24.5	S23°02.8	125°49.8	N21°17.0	246°11.4	S04°06.9
13	257°45.3	29°06.1	02.0	5°25.0	03.0	140°52.4	17.0	261°13.8	06.9
14	272°47.8	44°05.4	02.9	20°25.5	03.2	155°55.0	17.0	276°16.3	06.9
15	287°50.2	59°04.7	·· 03.8	35°26.0	·· 03.5	170°57.5	·· 17.0	291°18.8	·· 06.9
16	302°52.7	74°04.0	04.7	50°26.5	03.7	186°00.1	17.1	306°21.3	06.9
17	317°55.2	89°03.3	05.6	65°27.0	04.0	201°02.7	17.1	321°23.8	06.9
18	332°57.6	104°02.7	S17°06.5	80°27.5	S23°04.2	216°05.2	N21°17.1	336°26.3	S04°06.9
19	348°00.1	119°02.0	07.4	95°27.9	04.4	231°07.8	17.1	351°28.8	06.9
20	3°02.6	134°01.3	08.3	110°28.4	04.7	246°10.4	17.2	6°31.2	06.9
21	18°05.0	149°00.6	·· 09.2	125°28.9	·· 04.9	261°12.9	·· 17.2	21°33.7	·· 06.9
22	33°07.5	163°59.9	10.1	140°29.4	05.2	276°15.5	17.2	36°36.2	06.9
23	48°10.0	178°59.2	11.0	155°29.9	05.4	291°18.1	17.2	51°38.7	06.9
Mer.pass.	19:48	ν -0.7′	d -0.9′	m -3.90	ν 0.5′	d -0.2′	m 1.35	ν 2.6′	d 0.0′ m -2.48	ν 2.5′	d -0.0′ m 0.88

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.9	56°41.0
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°10.7	89°22.5
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.0	-29°00.2
Procyon	244°49.9	5°09.6
Pollux	243°16.2	27°57.7
Avior	234°14.2	-59°35.2
Suhail	222°45.7	-43°31.9
Miaplacidus	221°37.9	-69°49.0
Alphard	217°47.0	-8°46.1
Regulus	207°33.7	11°50.4
Dubhe	193°40.3	61°36.4
Denebola	182°24.4	14°25.6
Gienah	175°43.1	-17°41.0
Acrux	172°59.8	-63°14.3
Gacrux	171°51.2	-57°15.2
Alioth	166°12.7	55°49.0
Spica	158°21.8	-11°17.7
Alkaid	152°51.9	49°10.9
Hadar	148°35.6	-60°29.7
Menkent	147°57.2	-36°29.7
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°40.0	-60°56.4
Kochab	137°20.9	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.6
Antares	112°15.4	-26°29.3
Atria	107°09.5	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.3	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.5	45°22.6
Enif	33°38.1	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 21 Fri	SHA	Mer.pass
Venus	134°31.8	11:01
Mars	109°40.0	12:40
Jupiter	243°01.5	03:46
Saturn	3°26.8	19:42

Nov 22 Sat	SHA	Mer.pass
Venus	133°16.9	11:02
Mars	108°52.8	12:39
Jupiter	243°03.5	03:42
Saturn	3°27.6	19:38

Nov 23 Sun	SHA	Mer.pass
Venus	132°01.6	11:04
Mars	108°05.4	12:38
Jupiter	243°05.8	03:38
Saturn	3°28.2	19:34

Horizontal parallax	
Venus:	0.1
Mars:	0.1

DUT1 = UT1-UTC = +0.2604 sec ΔT = TT-UT1 = +68.9236 sec

2025 November 21 to Nov. 23 UT

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.1	S19°55.1	176°18.9	11.0′	S26°18.1	5.5′	53.9′
1	198°32.9	55.6	190°49.0	11.0′	26°23.6	5.4′	53.9′
2	213°32.7	56.2	205°18.9	10.9′	26°29.0	5.3′	53.9′
3	228°32.6	·· 56.7	219°48.8	10.9′	26°34.3	5.1′	53.9′
4	243°32.4	57.3	234°18.7	10.8′	26°39.4	5.0′	53.9′
5	258°32.3	57.8	248°48.5	10.8′	26°44.4	4.9′	53.9′
6	273°32.1	S19°58.4	263°18.3	10.7′	S26°49.3	4.8′	53.9′
7	288°32.0	58.9	277°48.0	10.7′	26°54.1	4.6′	53.9′
8	303°31.8	19°59.5	292°17.6	10.6′	26°58.7	4.5′	53.9′
9	318°31.6	20°00.0	306°47.2	10.6′	27°03.2	4.4′	53.9′
10	333°31.5	00.6	321°16.8	10.5′	27°07.6	4.3′	53.9′
11	348°31.3	01.1	335°46.3	10.5′	27°11.9	4.1′	53.9′
12	3°31.2	S20°01.6	350°15.8	10.4′	S27°16.0	4.0′	53.9′
13	18°31.0	02.2	4°45.2	10.4′	27°20.0	3.9′	53.9′
14	33°30.8	02.7	19°14.6	10.3′	27°23.9	3.7′	53.9′
15	48°30.7	·· 03.3	33°43.9	10.3′	27°27.6	3.6′	53.9′
16	63°30.5	03.8	48°13.2	10.3′	27°31.2	3.5′	54.0′
17	78°30.3	04.4	62°42.5	10.2′	27°34.7	3.4′	54.0′
18	93°30.2	S20°04.9	77°11.7	10.2′	S27°38.1	3.2′	54.0′
19	108°30.0	05.4	91°40.9	10.1′	27°41.3	3.1′	54.0′
20	123°29.9	06.0	106°10.0	10.1′	27°44.4	2.9′	54.0′
21	138°29.7	·· 06.5	120°39.1	10.1′	27°47.3	2.8′	54.0′
22	153°29.5	07.0	135°08.2	10.0′	27°50.1	2.7′	54.0′
23	168°29.4	07.6	149°37.2	10.0′	27°52.8	2.6′	54.0′
	SD = 16.2′	d = -0.6′	SD = 14.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.2	S20°08.1	164°06.2	10.0′	S27°55.4	2.4′	54.0′
1	198°29.0	08.7	178°35.1	9.9′	27°57.8	2.2′	54.0′
2	213°28.9	09.2	193°04.1	9.9′	28°00.0	2.2′	54.0′
3	228°28.7	·· 09.7	207°33.0	9.9′	28°02.2	2.0′	54.0′
4	243°28.5	10.3	222°01.9	9.8′	28°04.2	1.9′	54.0′
5	258°28.4	10.8	236°30.7	9.8′	28°06.1	1.7′	54.0′
6	273°28.2	S20°11.3	250°59.5	9.8′	S28°07.8	1.6′	54.0′
7	288°28.0	11.9	265°28.3	9.8′	28°09.4	1.4′	54.1′
8	303°27.9	12.4	279°57.1	9.7′	28°10.8	1.4′	54.1′
9	318°27.7	·· 12.9	294°25.8	9.7′	28°12.2	1.1′	54.1′
10	333°27.5	13.5	308°54.6	9.7′	28°13.3	1.1′	54.1′
11	348°27.4	14.0	323°23.3	9.7′	28°14.4	0.9′	54.1′
12	3°27.2	S20°14.5	337°52.0	9.7′	S28°15.3	0.8′	54.1′
13	18°27.0	15.0	352°20.6	9.7′	28°16.1	0.6′	54.1′
14	33°26.9	15.6	6°49.3	9.6′	28°16.7	0.5′	54.1′
15	48°26.7	·· 16.1	21°17.9	9.6′	28°17.2	0.3′	54.1′
16	63°26.5	16.6	35°46.6	9.6′	28°17.5	0.2′	54.1′
17	78°26.3	17.1	50°15.2	9.6′	28°17.7	0.1′	54.1′
18	93°26.2	S20°17.7	64°43.8	9.6′	S28°17.8	0.1′	54.2′
19	108°26.0	18.2	79°12.4	9.6′	28°17.7	0.2′	54.2′
20	123°25.8	18.7	93°40.9	9.6′	28°17.5	0.3′	54.2′
21	138°25.7	·· 19.2	108°09.5	9.6′	28°17.2	0.5′	54.2′
22	153°25.5	19.8	122°38.1	9.6′	28°16.7	0.7′	54.2′
23	168°25.3	20.3	137°06.7	9.6′	28°16.0	0.7′	54.2′
	SD = 16.2′	d = -0.5′	SD = 14.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°25.1	S20°20.8	151°35.2	9.6′	S28°15.3	0.9′	54.2′
1	198°25.0	21.3	166°03.8	9.6′	28°14.4	1.1′	54.2′
2	213°24.8	21.8	180°32.3	9.6′	28°13.3	1.2′	54.2′
3	228°24.6	·· 22.4	195°00.9	9.6′	28°12.1	1.3′	54.2′
4	243°24.4	22.9	209°29.5	9.6′	28°10.8	1.5′	54.3′
5	258°24.3	23.4	223°58.0	9.6′	28°09.3	1.6′	54.3′
6	273°24.1	S20°23.9	238°26.6	9.6′	S28°07.7	1.7′	54.3′
7	288°23.9	24.4	252°55.2	9.6′	28°06.0	1.9′	54.3′
8	303°23.7	24.9	267°23.8	9.6′	28°04.1	2.0′	54.3′
9	318°23.6	·· 25.5	281°52.4	9.6′	28°02.1	2.2′	54.3′
10	333°23.4	26.0	296°21.0	9.6′	27°59.9	2.3′	54.3′
11	348°23.2	26.5	310°49.6	9.6′	27°57.6	2.5′	54.3′
12	3°23.0	S20°27.0	325°18.2	9.6′	S27°55.1	2.6′	54.4′
13	18°22.9	27.5	339°46.8	9.6′	27°52.5	2.7′	54.4′
14	33°22.7	28.0	354°15.5	9.7′	27°49.8	2.8′	54.4′
15	48°22.5	·· 28.5	8°44.1	9.7′	27°47.0	3.1′	54.4′
16	63°22.3	29.1	23°12.8	9.7′	27°43.9	3.1′	54.4′
17	78°22.1	29.6	37°41.5	9.7′	27°40.8	3.3′	54.4′
18	93°22.0	S20°30.1	52°10.2	9.7′	S27°37.5	3.4′	54.4′
19	108°21.8	30.6	66°39.0	9.8′	27°34.1	3.5′	54.5′
20	123°21.6	31.1	81°07.7	9.8′	27°30.6	3.7′	54.5′
21	138°21.4	·· 31.6	95°36.5	9.8′	27°26.9	3.9′	54.5′
22	153°21.3	32.1	110°05.3	9.8′	27°23.0	3.9′	54.5′
23	168°21.1	32.6	124°34.1	9.9′	27°19.1	4.1′	54.5′
	SD = 16.2′	d = -0.5′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:24	09:09	▬	▬	14:23	16:07
N 70°	07:11	08:39	10:47	12:44	14:52	16:20
68°	07:01	08:18	09:48	13:43	15:14	16:31
66°	06:52	08:00	09:15	14:17	15:31	16:40
64°	06:44	07:46	08:50	14:41	15:45	16:48
62°	06:37	07:34	08:31	15:01	15:57	16:55
60°	06:31	07:24	08:16	15:16	16:08	17:01
N 58°	06:25	07:15	08:02	15:29	16:17	17:06
56°	06:20	07:07	07:51	15:41	16:25	17:11
54°	06:16	07:00	07:41	15:51	16:32	17:16
52°	06:12	06:54	07:32	16:00	16:38	17:20
50°	06:08	06:48	07:24	16:08	16:44	17:24
45°	05:59	06:35	07:07	16:25	16:57	17:33
N 40°	05:51	06:24	06:53	16:39	17:08	17:41
35°	05:43	06:14	06:41	16:51	17:18	17:49
30°	05:36	06:05	06:31	17:01	17:27	17:56
20°	05:23	05:50	06:13	17:19	17:43	18:09
N 10°	05:09	05:35	05:57	17:35	17:57	18:23
0°	04:55	05:21	05:43	17:50	18:12	18:37
S 10°	04:39	05:05	05:28	18:05	18:27	18:54
20°	04:19	04:48	05:12	18:21	18:45	19:13
30°	03:55	04:26	04:53	18:40	19:06	19:38
35°	03:39	04:13	04:42	18:51	19:19	19:54
40°	03:19	03:58	04:29	19:03	19:35	20:14
45°	02:55	03:39	04:14	19:19	19:54	20:39
S 50°	02:20	03:15	03:56	19:37	20:18	21:14
52°	02:02	03:04	03:47	19:46	20:30	21:32
54°	01:39	02:50	03:38	19:56	20:44	21:56
56°	01:06	02:34	03:26	20:07	21:00	22:31
58°	–:–	02:15	03:14	20:20	21:20	–:–
S 60°	–:–	01:50	02:59	20:35	21:46	–:–

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	11:44	▬	14:04	13:31	▬	14:47
60°	10:50	12:05	12:48	14:26	14:57	16:03
N 58°	10:17	11:26	12:13	14:59	15:37	16:38
56°	09:53	10:59	11:47	15:23	16:04	17:04
54°	09:34	10:37	11:26	15:42	16:26	17:24
52°	09:18	10:20	11:09	15:59	16:43	17:41
50°	09:04	10:04	10:54	16:13	16:58	17:56
45°	08:35	09:34	10:25	16:42	17:29	18:25
N 40°	08:13	09:10	10:01	17:05	17:53	18:48
35°	07:55	08:51	09:42	17:24	18:12	19:07
30°	07:39	08:34	09:25	17:40	18:29	19:24
20°	07:12	08:06	08:58	18:07	18:57	19:51
N 10°	06:49	07:42	08:34	18:31	19:22	20:14
0°	06:28	07:19	08:11	18:53	19:44	20:36
S 10°	06:07	06:57	07:49	19:15	20:07	20:58
20°	05:44	06:33	07:25	19:38	20:31	21:21
30°	05:18	06:05	06:57	20:06	20:59	21:48
35°	05:03	05:48	06:40	20:22	21:16	22:04
40°	04:45	05:29	06:21	20:41	21:35	22:23
45°	04:23	05:06	05:58	21:04	21:59	22:45
S 50°	03:56	04:36	05:27	21:34	22:29	23:13
52°	03:43	04:21	05:13	21:48	22:44	23:27
54°	03:28	04:04	04:55	22:05	23:02	23:43
56°	03:11	03:44	04:34	22:26	23:23	·· ··
58°	02:49	03:18	04:08	22:51	23:49	·· ··
S 60°	02:22	02:42	03:30	23:26	·· ··	00:27

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 1-7%
21	14:12	14:05	11:46	12:40	00:15	
22	13:57	13:49	11:46	13:32	01:06	
23	13:41	13:32	11:46	14:24	01:58	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2610 sec ΔT = TT-UT1 = +68.9230 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°12.4	193°58.5	S17°11.9	170°30.4	S23°05.6	306°20.6	N21°17.3	66°41.2	S04°06.9
1	78°14.9	208°57.8	12.8	185°30.8	05.9	321°23.2	17.3	81°43.7	06.9
2	93°17.4	223°57.2	13.7	200°31.3	06.1	336°25.8	17.3	96°46.2	06.9
3	108°19.8	238°56.5	·· 14.6	215°31.8	·· 06.4	351°28.4	·· 17.3	111°48.6	·· 06.9
4	123°22.3	253°55.8	15.5	230°32.3	06.6	6°30.9	17.4	126°51.1	06.9
5	138°24.7	268°55.1	16.4	245°32.8	06.8	21°33.5	17.4	141°53.6	06.9
6	153°27.2	283°54.4	S17°17.2	260°33.2	S23°07.1	36°36.1	N21°17.4	156°56.1	S04°06.8
7	168°29.7	298°53.7	18.1	275°33.7	07.3	51°38.7	17.4	171°58.6	06.8
8	183°32.1	313°53.0	19.0	290°34.2	07.5	66°41.2	17.5	187°01.1	06.8
9	198°34.6	328°52.3	·· 19.9	305°34.7	·· 07.8	81°43.8	·· 17.5	202°03.5	·· 06.8
10	213°37.1	343°51.6	20.8	320°35.2	08.0	96°46.4	17.5	217°06.0	06.8
11	228°39.5	358°50.9	21.7	335°35.6	08.3	111°48.9	17.5	232°08.5	06.8
12	243°42.0	13°50.2	S17°22.6	350°36.1	S23°08.5	126°51.5	N21°17.6	247°11.0	S04°06.8
13	258°44.5	28°49.5	23.5	5°36.6	08.7	141°54.1	17.6	262°13.5	06.8
14	273°46.9	43°48.8	24.3	20°37.1	09.0	156°56.7	17.6	277°16.0	06.8
15	288°49.4	58°48.1	·· 25.2	35°37.6	·· 09.2	171°59.3	·· 17.6	292°18.4	·· 06.8
16	303°51.9	73°47.4	26.1	50°38.0	09.4	187°01.8	17.7	307°20.9	06.8
17	318°54.3	88°46.7	27.0	65°38.5	09.7	202°04.4	17.7	322°23.4	06.8
18	333°56.8	103°46.1	S17°27.9	80°39.0	S23°09.9	217°07.0	N21°17.7	337°25.9	S04°06.8
19	348°59.2	118°45.4	28.7	95°39.5	10.1	232°09.6	17.7	352°28.4	06.8
20	4°01.7	133°44.7	29.6	110°40.0	10.3	247°12.1	17.8	7°30.8	06.8
21	19°04.2	148°44.0	·· 30.5	125°40.4	·· 10.6	262°14.7	·· 17.8	22°33.3	·· 06.8
22	34°06.6	163°43.3	31.4	140°40.9	10.8	277°17.3	17.8	37°35.8	06.8
23	49°09.1	178°42.6	32.2	155°41.4	11.0	292°19.9	17.8	52°38.3	06.8
Mer.pass.	19:44	ν -0.7′	d -0.9′	m -3.90	ν 0.5′	d -0.2′	m 1.34	ν 2.6′	d 0.0′ m -2.49	ν 2.5′	d 0.0′ m 0.88

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	64°11.6	193°41.9	S17°33.1	170°41.9	S23°11.3	307°22.5	N21°17.9	67°40.8	S04°06.8
1	79°14.0	208°41.1	34.0	185°42.3	11.5	322°25.0	17.9	82°43.2	06.8
2	94°16.5	223°40.4	34.9	200°42.8	11.7	337°27.6	17.9	97°45.7	06.8
3	109°19.0	238°39.7	·· 35.7	215°43.3	·· 12.0	352°30.2	·· 17.9	112°48.2	·· 06.8
4	124°21.4	253°39.0	36.6	230°43.8	12.2	7°32.8	18.0	127°50.7	06.8
5	139°23.9	268°38.3	37.5	245°44.3	12.4	22°35.4	18.0	142°53.2	06.8
6	154°26.4	283°37.6	S17°38.4	260°44.7	S23°12.6	37°37.9	N21°18.0	157°55.6	S04°06.8
7	169°28.8	298°36.9	39.2	275°45.2	12.9	52°40.5	18.0	172°58.1	06.8
8	184°31.3	313°36.2	40.1	290°45.7	13.1	67°43.1	18.1	188°00.6	06.8
9	199°33.7	328°35.5	·· 41.0	305°46.2	·· 13.3	82°45.7	·· 18.1	203°03.1	·· 06.8
10	214°36.2	343°34.8	41.8	320°46.6	13.5	97°48.3	18.1	218°05.6	06.8
11	229°38.7	358°34.1	42.7	335°47.1	13.8	112°50.9	18.2	233°08.0	06.8
12	244°41.1	13°33.4	S17°43.6	350°47.6	S23°14.0	127°53.4	N21°18.2	248°10.5	S04°06.8
13	259°43.6	28°32.7	44.4	5°48.1	14.2	142°56.0	18.2	263°13.0	06.8
14	274°46.1	43°32.0	45.3	20°48.5	14.4	157°58.6	18.2	278°15.5	06.8
15	289°48.5	58°31.3	·· 46.2	35°49.0	·· 14.7	173°01.2	·· 18.3	293°18.0	·· 06.8
16	304°51.0	73°30.6	47.0	50°49.5	14.9	188°03.8	18.3	308°20.4	06.8
17	319°53.5	88°29.9	47.9	65°49.9	15.1	203°06.4	18.3	323°22.9	06.8
18	334°55.9	103°29.1	S17°48.7	80°50.4	S23°15.3	218°08.9	N21°18.3	338°25.4	S04°06.8
19	349°58.4	118°28.4	49.6	95°50.9	15.6	233°11.5	18.4	353°27.9	06.8
20	5°00.9	133°27.7	50.5	110°51.4	15.8	248°14.1	18.4	8°30.3	06.8
21	20°03.3	148°27.0	·· 51.3	125°51.8	·· 16.0	263°16.7	·· 18.4	23°32.8	·· 06.7
22	35°05.8	163°26.3	52.2	140°52.3	16.2	278°19.3	18.5	38°35.3	06.7
23	50°08.2	178°25.6	53.0	155°52.8	16.4	293°21.9	18.5	53°37.8	06.7
Mer.pass.	19:40	ν -0.7′	d -0.9′	m -3.90	ν 0.5′	d -0.2′	m 1.34	ν 2.6′	d 0.0′ m -2.49	ν 2.5′	d 0.0′ m 0.89

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	65°10.7	193°24.9	S17°53.9	170°53.3	S23°16.7	308°24.5	N21°18.5	68°40.3	S04°06.7
1	80°13.2	208°24.2	54.7	185°53.7	16.9	323°27.1	18.5	83°42.7	06.7
2	95°15.6	223°23.4	55.6	200°54.2	17.1	338°29.6	18.6	98°45.2	06.7
3	110°18.1	238°22.7	·· 56.4	215°54.7	·· 17.3	353°32.2	·· 18.6	113°47.7	·· 06.7
4	125°20.6	253°22.0	57.3	230°55.1	17.5	8°34.8	18.6	128°50.2	06.7
5	140°23.0	268°21.3	58.1	245°55.6	17.8	23°37.4	18.6	143°52.6	06.7
6	155°25.5	283°20.6	S17°59.0	260°56.1	S23°18.0	38°40.0	N21°18.7	158°55.1	S04°06.7
7	170°28.0	298°19.9	17°59.8	275°56.6	18.2	53°42.6	18.7	173°57.6	06.7
8	185°30.4	313°19.1	18°00.7	290°57.0	18.4	68°45.2	18.7	189°00.1	06.7
9	200°32.9	328°18.4	·· 01.5	305°57.5	·· 18.6	83°47.8	·· 18.8	204°02.5	·· 06.7
10	215°35.3	343°17.7	02.4	320°58.0	18.8	98°50.4	18.8	219°05.0	06.7
11	230°37.8	358°17.0	03.2	335°58.4	19.1	113°53.0	18.8	234°07.5	06.7
12	245°40.3	13°16.3	S18°04.1	350°58.9	S23°19.3	128°55.5	N21°18.8	249°10.0	S04°06.7
13	260°42.7	28°15.5	04.9	5°59.4	19.5	143°58.1	18.9	264°12.4	06.7
14	275°45.2	43°14.8	05.8	20°59.8	19.7	159°00.7	18.9	279°14.9	06.7
15	290°47.7	58°14.1	·· 06.6	36°00.3	·· 19.9	174°03.3	·· 18.9	294°17.4	·· 06.7
16	305°50.1	73°13.4	07.4	51°00.8	20.1	189°05.9	19.0	309°19.9	06.7
17	320°52.6	88°12.7	08.3	66°01.3	20.3	204°08.5	19.0	324°22.3	06.7
18	335°55.1	103°11.9	S18°09.1	81°01.7	S23°20.5	219°11.1	N21°19.0	339°24.8	S04°06.6
19	350°57.5	118°11.2	10.0	96°02.2	20.8	234°13.7	19.0	354°27.3	06.6
20	6°00.0	133°10.5	10.8	111°02.7	21.0	249°16.3	19.1	9°29.7	06.6
21	21°02.5	148°09.8	·· 11.6	126°03.1	·· 21.2	264°18.9	·· 19.1	24°32.2	·· 06.6
22	36°04.9	163°09.0	12.5	141°03.6	21.4	279°21.5	19.1	39°34.7	06.6
23	51°07.4	178°08.3	13.3	156°04.1	21.6	294°24.1	19.2	54°37.2	06.6
Mer.pass.	19:36	ν -0.7′	d -0.9′	m -3.90	ν 0.5′	d -0.2′	m 1.33	ν 2.6′	d 0.0′ m -2.50	ν 2.5′	d 0.0′ m 0.89

Stars	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.9	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°10.7	89°22.5
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.5	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.0	-29°00.2
Procyon	244°49.9	5°09.6
Pollux	243°16.2	27°57.7
Avior	234°14.1	-59°35.2
Suhail	222°45.7	-43°31.9
Miaplacidus	221°37.9	-69°49.0
Alphard	217°47.0	-8°46.1
Regulus	207°33.7	11°50.4
Dubhe	193°40.3	61°36.4
Denebola	182°24.4	14°25.6
Gienah	175°43.0	-17°41.0
Acrux	172°59.7	-63°14.3
Gacrux	171°51.2	-57°15.2
Alioth	166°12.7	55°48.9
Spica	158°21.8	-11°17.7
Alkaid	152°51.8	49°10.9
Hadar	148°35.6	-60°29.7
Menkent	147°57.1	-36°29.7
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°40.0	-60°56.4
Kochab	137°20.9	74°02.8
Zuben'ubi	136°55.6	-16°08.9
Alphecca	126°03.5	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.5	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.3	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.5	45°22.6
Enif	33°38.2	9°59.8
Al Na'ir	27°32.0	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.4	28°13.6
Markab	13°29.1	15°20.8

Nov 24 Mon	SHA	Mer.pass
Venus	130°46.1	11:05
Mars	107°17.9	12:38
Jupiter	243°08.2	03:34
Saturn	3°28.8	19:30

Nov 25 Tue	SHA	Mer.pass
Venus	129°30.3	11:06
Mars	106°30.3	12:37
Jupiter	243°10.9	03:30
Saturn	3°29.2	19:26

Nov 26 Wed	SHA	Mer.pass
Venus	128°14.2	11:07
Mars	105°42.6	12:36
Jupiter	243°13.8	03:26
Saturn	3°29.5	19:22

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.9	S20°33.1	139°03.0	9.9′	S27°15.0	4.3′	54.5′
1	198°20.7	33.6	153°31.9	9.9′	27°10.7	4.3′	54.5′
2	213°20.5	34.1	168°00.8	9.9′	27°06.4	4.6′	54.6′
3	228°20.3	·· 34.6	182°29.7	10.0′	27°01.8	4.6′	54.6′
4	243°20.2	35.1	196°58.7	10.0′	26°57.2	4.8′	54.6′
5	258°20.0	35.6	211°27.7	10.0′	26°52.4	4.9′	54.6′
6	273°19.8	S20°36.1	225°56.7	10.1′	S26°47.5	5.0′	54.6′
7	288°19.6	36.6	240°25.8	10.1′	26°42.5	5.2′	54.6′
8	303°19.4	37.1	254°54.9	10.1′	26°37.3	5.3′	54.7′
9	318°19.2	·· 37.6	269°24.0	10.2′	26°32.0	5.5′	54.7′
10	333°19.1	38.1	283°53.1	10.2′	26°26.5	5.5′	54.7′
11	348°18.9	38.6	298°22.3	10.2′	26°21.0	5.8′	54.7′
12	3°18.7	S20°39.1	312°51.6	10.3′	S26°15.2	5.8′	54.7′
13	18°18.5	39.6	327°20.8	10.3′	26°09.4	6.0′	54.7′
14	33°18.3	40.1	341°50.1	10.3′	26°03.4	6.1′	54.8′
15	48°18.1	·· 40.6	356°19.5	10.4′	25°57.3	6.2′	54.8′
16	63°18.0	41.1	10°48.8	10.4′	25°51.1	6.3′	54.8′
17	78°17.8	41.6	25°18.3	10.5′	25°44.8	6.5′	54.8′
18	93°17.6	S20°42.1	39°47.7	10.5′	S25°38.3	6.6′	54.8′
19	108°17.4	42.6	54°17.2	10.5′	25°31.7	6.8′	54.8′
20	123°17.2	43.1	68°46.8	10.6′	25°24.9	6.8′	54.9′
21	138°17.0	·· 43.6	83°16.3	10.6′	25°18.1	7.0′	54.9′
22	153°16.8	44.1	97°46.0	10.7′	25°11.1	7.2′	54.9′
23	168°16.6	44.5	112°15.6	10.7′	25°03.9	7.2′	54.9′
	SD = 16.2′	d = -0.5′	SD = 14.9′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°16.4	S20°45.0	126°45.3	10.8′	S24°56.7	7.4′	54.9′
1	198°16.3	45.5	141°15.1	10.8′	24°49.3	7.5′	55.0′
2	213°16.1	46.0	155°44.9	10.8′	24°41.8	7.6′	55.0′
3	228°15.9	·· 46.5	170°14.7	10.9′	24°34.2	7.7′	55.0′
4	243°15.7	47.0	184°44.6	10.9′	24°26.5	7.9′	55.0′
5	258°15.5	47.5	199°14.6	11.0′	24°18.6	7.9′	55.1′
6	273°15.3	S20°48.0	213°44.5	11.0′	S24°10.7	8.1′	55.1′
7	288°15.1	48.4	228°14.6	11.1′	24°02.6	8.2′	55.1′
8	303°14.9	48.9	242°44.6	11.1′	23°54.4	8.4′	55.1′
9	318°14.7	·· 49.4	257°14.8	11.2′	23°46.0	8.4′	55.1′
10	333°14.5	49.9	271°44.9	11.2′	23°37.6	8.6′	55.2′
11	348°14.4	50.4	286°15.1	11.3′	23°29.0	8.7′	55.2′
12	3°14.2	S20°50.9	300°45.4	11.3′	S23°20.3	8.8′	55.2′
13	18°14.0	51.3	315°15.7	11.4′	23°11.5	8.9′	55.2′
14	33°13.8	51.8	329°46.0	11.4′	23°02.6	9.1′	55.2′
15	48°13.6	·· 52.3	344°16.4	11.4′	22°53.5	9.1′	55.3′
16	63°13.4	52.8	358°46.9	11.5′	22°44.4	9.3′	55.3′
17	78°13.2	53.2	13°17.4	11.5′	22°35.1	9.4′	55.3′
18	93°13.0	S20°53.7	27°47.9	11.6′	S22°25.7	9.4′	55.3′
19	108°12.8	54.2	42°18.5	11.6′	22°16.3	9.6′	55.4′
20	123°12.6	54.7	56°49.1	11.7′	22°06.7	9.8′	55.4′
21	138°12.4	·· 55.2	71°19.8	11.7′	21°56.9	9.8′	55.4′
22	153°12.2	55.6	85°50.6	11.8′	21°47.1	9.9′	55.4′
23	168°12.0	56.1	100°21.3	11.8′	21°37.2	10.0′	55.5′
	SD = 16.2′	d = -0.5′	SD = 15.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°11.8	S20°56.6	114°52.1	11.9′	S21°27.2	10.2′	55.5′
1	198°11.6	57.0	129°23.0	11.9′	21°17.0	10.2′	55.5′
2	213°11.4	57.5	143°53.9	12.0′	21°06.8	10.4′	55.5′
3	228°11.2	·· 58.0	158°24.9	12.0′	20°56.4	10.5′	55.6′
4	243°11.0	58.5	172°55.9	12.1′	20°45.9	10.5′	55.6′
5	258°10.8	58.9	187°27.0	12.1′	20°35.4	10.7′	55.6′
6	273°10.6	S20°59.4	201°58.1	12.1′	S20°24.7	10.8′	55.6′
7	288°10.4	20°59.9	216°29.2	12.2′	20°13.9	10.9′	55.7′
8	303°10.2	21°00.3	231°00.4	12.2′	20°03.0	10.9′	55.7′
9	318°10.0	·· 00.8	245°31.6	12.3′	19°52.1	11.1′	55.7′
10	333°09.8	01.3	260°02.9	12.3′	19°41.0	11.2′	55.8′
11	348°09.6	01.7	274°34.2	12.4′	19°29.8	11.3′	55.8′
12	3°09.4	S21°02.2	289°05.6	12.4′	S19°18.5	11.4′	55.8′
13	18°09.2	02.7	303°37.0	12.4′	19°07.1	11.4′	55.8′
14	33°09.0	03.1	318°08.4	12.5′	18°55.7	11.6′	55.9′
15	48°08.8	·· 03.6	332°39.9	12.5′	18°44.1	11.7′	55.9′
16	63°08.6	04.0	347°11.5	12.6′	18°32.4	11.7′	55.9′
17	78°08.4	04.5	1°43.0	12.6′	18°20.7	11.9′	55.9′
18	93°08.2	S21°05.0	16°14.7	12.7′	S18°08.8	11.9′	56.0′
19	108°08.0	05.4	30°46.3	12.7′	17°56.9	12.1′	56.0′
20	123°07.8	05.9	45°18.0	12.7′	17°44.8	12.1′	56.0′
21	138°07.6	·· 06.3	59°49.7	12.8′	17°32.7	12.3′	56.1′
22	153°07.4	06.8	74°21.5	12.8′	17°20.4	12.3′	56.1′
23	168°07.2	07.3	88°53.3	12.8′	17°08.1	12.4′	56.1′
	SD = 16.2′	d = -0.5′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:34	09:23	▬	▬	14:10	15:59
N 70°	07:20	08:51	▬	▬	14:43	16:13
68°	07:08	08:27	10:04	13:30	15:06	16:25
66°	06:58	08:09	09:26	14:08	15:25	16:35
64°	06:50	07:54	08:59	14:34	15:40	16:43
62°	06:43	07:41	08:39	14:54	15:53	16:51
60°	06:36	07:30	08:22	15:11	16:03	16:57
N 58°	06:30	07:21	08:09	15:25	16:13	17:03
56°	06:25	07:12	07:57	15:37	16:21	17:08
54°	06:20	07:05	07:46	15:47	16:29	17:13
52°	06:16	06:58	07:37	15:57	16:36	17:18
50°	06:11	06:52	07:29	16:05	16:42	17:22
45°	06:02	06:38	07:11	16:23	16:55	17:32
N 40°	05:53	06:27	06:56	16:37	17:07	17:40
35°	05:46	06:17	06:44	16:50	17:17	17:48
30°	05:38	06:08	06:33	17:00	17:26	17:55
20°	05:24	05:51	06:15	17:19	17:43	18:10
N 10°	05:10	05:36	05:59	17:35	17:58	18:24
0°	04:56	05:21	05:43	17:51	18:13	18:39
S 10°	04:39	05:05	05:28	18:06	18:29	18:55
20°	04:19	04:47	05:11	18:23	18:47	19:15
30°	03:53	04:25	04:52	18:42	19:09	19:41
35°	03:37	04:12	04:41	18:54	19:22	19:58
40°	03:17	03:56	04:28	19:07	19:38	20:18
45°	02:51	03:37	04:12	19:22	19:58	20:44
S 50°	02:15	03:12	03:53	19:42	20:23	21:20
52°	01:56	03:00	03:44	19:51	20:36	21:40
54°	01:30	02:45	03:34	20:01	20:50	22:06
56°	00:52	02:28	03:22	20:13	21:07	22:46
58°	–:–	02:07	03:09	20:27	21:29	–:–
S 60°	–:–	01:40	02:53	20:43	21:57	–:–

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	15:26	▬	▬	18:40
68°	▬	▬	14:41	▬	▬	19:24
66°	▬	14:53	14:11	▬	17:31	19:53
64°	▬	14:06	13:48	▬	18:17	20:14
62°	13:43	13:35	13:29	16:56	18:47	20:32
60°	13:05	13:12	13:14	17:33	19:09	20:46
N 58°	12:39	12:53	13:01	17:59	19:27	20:58
56°	12:18	12:37	12:50	18:19	19:43	21:08
54°	12:01	12:24	12:40	18:36	19:56	21:18
52°	11:46	12:12	12:31	18:51	20:07	21:26
50°	11:33	12:02	12:23	19:03	20:17	21:33
45°	11:06	11:39	12:06	19:29	20:38	21:49
N 40°	10:45	11:22	11:53	19:50	20:55	22:01
35°	10:27	11:07	11:41	20:07	21:09	22:12
30°	10:12	10:53	11:30	20:22	21:21	22:21
20°	09:46	10:31	11:12	20:46	21:42	22:37
N 10°	09:24	10:12	10:56	21:08	22:00	22:51
0°	09:03	09:53	10:42	21:27	22:17	23:04
S 10°	08:42	09:35	10:27	21:47	22:33	23:17
20°	08:19	09:15	10:11	22:08	22:51	23:30
30°	07:53	08:52	09:52	22:32	23:11	23:46
35°	07:38	08:39	09:42	22:46	23:23	23:55
40°	07:20	08:23	09:29	23:03	23:36	·· ··
45°	06:58	08:05	09:15	23:22	23:52	·· ··
S 50°	06:30	07:41	08:56	23:47	·· ··	00:12
52°	06:17	07:30	08:48	23:58	·· ··	00:21
54°	06:01	07:17	08:38	·· ··	00:11	00:31
56°	05:43	07:03	08:27	00:02	00:27	00:42
58°	05:20	06:45	08:15	00:25	00:45	00:56
S 60°	04:50	06:24	08:00	00:55	01:07	01:11

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 12-27%
24	13:24	13:15	11:47	15:15	02:50	
25	13:06	12:57	11:47	16:05	03:40	
26	12:47	12:38	11:47	16:53	04:29	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2617 sec ΔT = TT-UT1 = +68.9223 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	66°09.8	193°07.6	S18°14.1	171°04.5	S23°21.8	309°26.7	N21°19.2	69°39.6	S04°06.6
1	81°12.3	208°06.9	15.0	186°05.0	22.0	324°29.3	19.2	84°42.1	06.6
2	96°14.8	223°06.1	15.8	201°05.5	22.2	339°31.9	19.2	99°44.6	06.6
3	111°17.2	238°05.4	·· 16.6	216°05.9	·· 22.4	354°34.5	·· 19.3	114°47.1	·· 06.6
4	126°19.7	253°04.7	17.5	231°06.4	22.7	9°37.1	19.3	129°49.5	06.6
5	141°22.2	268°03.9	18.3	246°06.9	22.9	24°39.7	19.3	144°52.0	06.6
6	156°24.6	283°03.2	S18°19.1	261°07.3	S23°23.1	39°42.3	N21°19.4	159°54.5	S04°06.6
7	171°27.1	298°02.5	20.0	276°07.8	23.3	54°44.9	19.4	174°56.9	06.6
8	186°29.6	313°01.8	20.8	291°08.3	23.5	69°47.5	19.4	189°59.4	06.6
9	201°32.0	328°01.0	·· 21.6	306°08.7	·· 23.7	84°50.1	·· 19.4	205°01.9	·· 06.6
10	216°34.5	343°00.3	22.4	321°09.2	23.9	99°52.7	19.5	220°04.4	06.5
11	231°37.0	357°59.6	23.3	336°09.7	24.1	114°55.3	19.5	235°06.8	06.5
12	246°39.4	12°58.8	S18°24.1	351°10.1	S23°24.3	129°57.9	N21°19.5	250°09.3	S04°06.5
13	261°41.9	27°58.1	24.9	6°10.6	24.5	145°00.5	19.6	265°11.8	06.5
14	276°44.3	42°57.4	25.7	21°11.0	24.7	160°03.1	19.6	280°14.2	06.5
15	291°46.8	57°56.6	·· 26.6	36°11.5	·· 24.9	175°05.7	·· 19.6	295°16.7	·· 06.5
16	306°49.3	72°55.9	27.4	51°12.0	25.1	190°08.3	19.7	310°19.2	06.5
17	321°51.7	87°55.2	28.2	66°12.4	25.3	205°10.9	19.7	325°21.6	06.5
18	336°54.2	102°54.4	S18°29.0	81°12.9	S23°25.5	220°13.5	N21°19.7	340°24.1	S04°06.5
19	351°56.7	117°53.7	29.8	96°13.4	25.7	235°16.1	19.7	355°26.6	06.5
20	6°59.1	132°53.0	30.7	111°13.8	25.9	250°18.7	19.8	10°29.1	06.5
21	22°01.6	147°52.2	·· 31.5	126°14.3	·· 26.1	265°21.3	·· 19.8	25°31.5	·· 06.5
22	37°04.1	162°51.5	32.3	141°14.8	26.3	280°23.9	19.8	40°34.0	06.5
23	52°06.5	177°50.7	33.1	156°15.2	26.5	295°26.5	19.9	55°36.5	06.5
Mer.pass.	19:32	ν -0.7′	d -0.8′	m -3.90	ν 0.5′	d -0.2′	m 1.33	ν 2.6′	d 0.0′ m -2.51	ν 2.5′	d 0.0′ m 0.90

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	67°09.0	192°50.0	S18°33.9	171°15.7	S23°26.7	310°29.1	N21°19.9	70°38.9	S04°06.4
1	82°11.5	207°49.3	34.7	186°16.1	26.9	325°31.7	19.9	85°41.4	06.4
2	97°13.9	222°48.5	35.5	201°16.6	27.1	340°34.3	20.0	100°43.9	06.4
3	112°16.4	237°47.8	·· 36.4	216°17.1	·· 27.3	355°36.9	·· 20.0	115°46.3	·· 06.4
4	127°18.8	252°47.0	37.2	231°17.5	27.5	10°39.5	20.0	130°48.8	06.4
5	142°21.3	267°46.3	38.0	246°18.0	27.7	25°42.1	20.1	145°51.3	06.4
6	157°23.8	282°45.6	S18°38.8	261°18.5	S23°27.9	40°44.7	N21°20.1	160°53.7	S04°06.4
7	172°26.2	297°44.8	39.6	276°18.9	28.1	55°47.3	20.1	175°56.2	06.4
8	187°28.7	312°44.1	40.4	291°19.4	28.3	70°50.0	20.1	190°58.7	06.4
9	202°31.2	327°43.3	·· 41.2	306°19.8	·· 28.5	85°52.6	·· 20.2	206°01.1	·· 06.4
10	217°33.6	342°42.6	42.0	321°20.3	28.7	100°55.2	20.2	221°03.6	06.4
11	232°36.1	357°41.8	42.8	336°20.8	28.9	115°57.8	20.2	236°06.1	06.4
12	247°38.6	12°41.1	S18°43.6	351°21.2	S23°29.1	131°00.4	N21°20.3	251°08.5	S04°06.3
13	262°41.0	27°40.4	44.4	6°21.7	29.3	146°03.0	20.3	266°11.0	06.3
14	277°43.5	42°39.6	45.2	21°22.1	29.5	161°05.6	20.3	281°13.5	06.3
15	292°45.9	57°38.9	·· 46.0	36°22.6	·· 29.7	176°08.2	·· 20.4	296°15.9	·· 06.3
16	307°48.4	72°38.1	46.8	51°23.1	29.9	191°10.8	20.4	311°18.4	06.3
17	322°50.9	87°37.4	47.6	66°23.5	30.1	206°13.4	20.4	326°20.9	06.3
18	337°53.3	102°36.6	S18°48.4	81°24.0	S23°30.3	221°16.0	N21°20.5	341°23.3	S04°06.3
19	352°55.8	117°35.9	49.2	96°24.4	30.5	236°18.7	20.5	356°25.8	06.3
20	7°58.3	132°35.1	50.0	111°24.9	30.7	251°21.3	20.5	11°28.3	06.3
21	23°00.7	147°34.4	·· 50.8	126°25.3	·· 30.9	266°23.9	·· 20.5	26°30.7	·· 06.3
22	38°03.2	162°33.6	51.6	141°25.8	31.0	281°26.5	20.6	41°33.2	06.3
23	53°05.7	177°32.9	52.4	156°26.3	31.2	296°29.1	20.6	56°35.7	06.2
Mer.pass.	19:28	ν -0.7′	d -0.8′	m -3.90	ν 0.5′	d -0.2′	m 1.32	ν 2.6′	d 0.0′ m -2.52	ν 2.5′	d 0.0′ m 0.90

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	68°08.1	192°32.1	S18°53.2	171°26.7	S23°31.4	311°31.7	N21°20.6	71°38.1	S04°06.2
1	83°10.6	207°31.4	54.0	186°27.2	31.6	326°34.3	20.7	86°40.6	06.2
2	98°13.1	222°30.6	54.8	201°27.6	31.8	341°36.9	20.7	101°43.0	06.2
3	113°15.5	237°29.9	·· 55.6	216°28.1	·· 32.0	356°39.6	·· 20.7	116°45.5	·· 06.2
4	128°18.0	252°29.1	56.4	231°28.5	32.2	11°42.2	20.8	131°48.0	06.2
5	143°20.4	267°28.4	57.1	246°29.0	32.4	26°44.8	20.8	146°50.4	06.2
6	158°22.9	282°27.6	S18°57.9	261°29.5	S23°32.6	41°47.4	N21°20.8	161°52.9	S04°06.2
7	173°25.4	297°26.8	58.7	276°29.9	32.7	56°50.0	20.9	176°55.4	06.2
8	188°27.8	312°26.1	18°59.5	291°30.4	32.9	71°52.6	20.9	191°57.8	06.2
9	203°30.3	327°25.3	19°00.3	306°30.8	·· 33.1	86°55.3	·· 20.9	207°00.3	·· 06.1
10	218°32.8	342°24.6	01.1	321°31.3	33.3	101°57.9	21.0	222°02.8	06.1
11	233°35.2	357°23.8	01.8	336°31.7	33.5	117°00.5	21.0	237°05.2	06.1
12	248°37.7	12°23.1	S19°02.6	351°32.2	S23°33.7	132°03.1	N21°21.0	252°07.7	S04°06.1
13	263°40.2	27°22.3	03.4	6°32.7	33.9	147°05.7	21.1	267°10.1	06.1
14	278°42.6	42°21.6	04.2	21°33.1	34.0	162°08.3	21.1	282°12.6	06.1
15	293°45.1	57°20.8	·· 05.0	36°33.6	·· 34.2	177°11.0	·· 21.1	297°15.1	·· 06.1
16	308°47.5	72°20.0	05.7	51°34.0	34.4	192°13.6	21.2	312°17.5	06.1
17	323°50.0	87°19.3	06.5	66°34.5	34.6	207°16.2	21.2	327°20.0	06.1
18	338°52.5	102°18.5	S19°07.3	81°34.9	S23°34.8	222°18.8	N21°21.2	342°22.4	S04°06.0
19	353°54.9	117°17.8	08.1	96°35.4	35.0	237°21.4	21.3	357°24.9	06.0
20	8°57.4	132°17.0	08.8	111°35.8	35.1	252°24.1	21.3	12°27.4	06.0
21	23°59.9	147°16.2	·· 09.6	126°36.3	·· 35.3	267°26.7	·· 21.3	27°29.8	·· 06.0
22	39°02.3	162°15.5	10.4	141°36.7	35.5	282°29.3	21.4	42°32.3	06.0
23	54°04.8	177°14.7	11.2	156°37.2	35.7	297°31.9	21.4	57°34.7	06.0
Mer.pass.	19:24	ν -0.8′	d -0.8′	m -3.90	ν 0.5′	d -0.2′	m 1.32	ν 2.6′	d 0.0′ m -2.52	ν 2.5′	d 0.0′ m 0.91

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.9	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.4
Hamal	327°50.1	23°35.2
Polaris	313°10.9	89°22.5
Acamar	315°10.8	-40°12.0
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.2
Capella	280°20.3	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.0
Betelgeuse	270°51.0	7°24.8
Canopus	263°51.6	-52°42.3
Sirius	258°25.3	-16°45.0
Adhara	255°05.0	-29°00.3
Procyon	244°49.9	5°09.5
Pollux	243°16.2	27°57.7
Avior	234°14.1	-59°35.2
Suhail	222°45.6	-43°32.0
Miaplacidus	221°37.8	-69°49.1
Alphard	217°47.0	-8°46.2
Regulus	207°33.6	11°50.4
Dubhe	193°40.2	61°36.4
Denebola	182°24.3	14°25.6
Gienah	175°43.0	-17°41.0
Acrux	172°59.7	-63°14.3
Gacrux	171°51.2	-57°15.2
Alioth	166°12.7	55°48.9
Spica	158°21.8	-11°17.7
Alkaid	152°51.8	49°10.9
Hadar	148°35.6	-60°29.7
Menkent	147°57.1	-36°29.7
Arcturus	145°47.6	19°02.8
Rigil Kent.	139°39.9	-60°56.4
Kochab	137°20.9	74°02.7
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.5	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.5	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.5	45°22.6
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.1	15°20.8

Nov 27 Thu	SHA	Mer.pass
Venus	126°57.7	11:08
Mars	104°54.7	12:35
Jupiter	243°16.8	03:22
Saturn	3°29.8	19:18

Nov 28 Fri	SHA	Mer.pass
Venus	125°41.0	11:09
Mars	104°06.7	12:35
Jupiter	243°20.1	03:17
Saturn	3°29.9	19:14

Nov 29 Sat	SHA	Mer.pass
Venus	124°24.0	11:10
Mars	103°18.6	12:34
Jupiter	243°23.6	03:13
Saturn	3°30.0	19:10

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°07.0	S21°07.7	103°25.2	12.9′	S16°55.7	12.5′	56.2′
1	198°06.8	08.2	117°57.0	12.9′	16°43.2	12.6′	56.2′
2	213°06.6	08.6	132°29.0	13.0′	16°30.6	12.6′	56.2′
3	228°06.4	·· 09.1	147°00.9	13.0′	16°18.0	12.8′	56.2′
4	243°06.2	09.5	161°32.9	13.0′	16°05.2	12.8′	56.3′
5	258°06.0	10.0	176°04.9	13.0′	15°52.4	13.0′	56.3′
6	273°05.8	S21°10.4	190°37.0	13.1′	S15°39.4	13.0′	56.3′
7	288°05.6	10.9	205°09.0	13.1′	15°26.4	13.1′	56.4′
8	303°05.4	11.3	219°41.1	13.1′	15°13.3	13.1′	56.4′
9	318°05.2	·· 11.8	234°13.3	13.2′	15°00.2	13.3′	56.4′
10	333°05.0	12.2	248°45.5	13.2′	14°46.9	13.3′	56.5′
11	348°04.8	12.7	263°17.7	13.2′	14°33.6	13.5′	56.5′
12	3°04.5	S21°13.1	277°49.9	13.3′	S14°20.1	13.5′	56.5′
13	18°04.3	13.6	292°22.1	13.3′	14°06.6	13.5′	56.6′
14	33°04.1	14.0	306°54.4	13.3′	13°53.1	13.7′	56.6′
15	48°03.9	·· 14.5	321°26.7	13.3′	13°39.4	13.7′	56.6′
16	63°03.7	14.9	335°59.1	13.4′	13°25.7	13.8′	56.7′
17	78°03.5	15.4	350°31.4	13.4′	13°11.9	13.9′	56.7′
18	93°03.3	S21°15.8	5°03.8	13.4′	S12°58.0	14.0′	56.7′
19	108°03.1	16.3	19°36.2	13.4′	12°44.0	14.0′	56.8′
20	123°02.9	16.7	34°08.6	13.4′	12°30.0	14.1′	56.8′
21	138°02.7	·· 17.1	48°41.0	13.5′	12°15.9	14.1′	56.8′
22	153°02.5	17.6	63°13.5	13.5′	12°01.8	14.3′	56.9′
23	168°02.2	18.0	77°46.0	13.5′	11°47.5	14.3′	56.9′
	SD = 16.2′	d = -0.5′	SD = 15.3′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°02.0	S21°18.5	92°18.4	13.5′	S11°33.2	14.4′	56.9′
1	198°01.8	18.9	106°50.9	13.5′	11°18.8	14.4′	57.0′
2	213°01.6	19.3	121°23.5	13.5′	11°04.4	14.5′	57.0′
3	228°01.4	·· 19.8	135°56.0	13.5′	10°49.9	14.6′	57.0′
4	243°01.2	20.2	150°28.5	13.6′	10°35.3	14.6′	57.1′
5	258°01.0	20.7	165°01.1	13.6′	10°20.7	14.8′	57.1′
6	273°00.8	S21°21.1	179°33.6	13.6′	S10°05.9	14.7′	57.1′
7	288°00.6	21.5	194°06.2	13.6′	09°51.2	14.9′	57.2′
8	303°00.3	22.0	208°38.8	13.6′	09°36.3	14.8′	57.2′
9	318°00.1	·· 22.4	223°11.4	13.6′	09°21.5	15.0′	57.2′
10	332°59.9	22.8	237°44.0	13.6′	09°06.5	15.0′	57.3′
11	347°59.7	23.3	252°16.6	13.6′	08°51.5	15.1′	57.3′
12	2°59.5	S21°23.7	266°49.2	13.6′	S08°36.4	15.1′	57.4′
13	17°59.3	24.1	281°21.8	13.6′	08°21.3	15.2′	57.4′
14	32°59.1	24.5	295°54.4	13.6′	08°06.1	15.2′	57.4′
15	47°58.8	·· 25.0	310°27.0	13.6′	07°50.9	15.3′	57.5′
16	62°58.6	25.4	324°59.6	13.6′	07°35.6	15.4′	57.5′
17	77°58.4	25.8	339°32.2	13.6′	07°20.2	15.4′	57.5′
18	92°58.2	S21°26.3	354°04.7	13.6′	S07°04.8	15.4′	57.6′
19	107°58.0	26.7	8°37.3	13.6′	06°49.4	15.5′	57.6′
20	122°57.8	27.1	23°09.9	13.6′	06°33.9	15.6′	57.6′
21	137°57.5	·· 27.5	37°42.5	13.6′	06°18.3	15.6′	57.7′
22	152°57.3	28.0	52°15.0	13.6′	06°02.7	15.7′	57.7′
23	167°57.1	28.4	66°47.6	13.5′	05°47.0	15.7′	57.8′
	SD = 16.2′	d = -0.4′	SD = 15.5′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°56.9	S21°28.8	81°20.1	13.5′	S05°31.3	15.7′	57.8′
1	197°56.7	29.2	95°52.6	13.5′	05°15.6	15.8′	57.8′
2	212°56.4	29.6	110°25.2	13.5′	04°59.8	15.8′	57.9′
3	227°56.2	·· 30.1	124°57.7	13.5′	04°44.0	15.9′	57.9′
4	242°56.0	30.5	139°30.1	13.5′	04°28.1	15.9′	57.9′
5	257°55.8	30.9	154°02.6	13.4′	04°12.2	16.0′	58.0′
6	272°55.6	S21°31.3	168°35.0	13.4′	S03°56.2	15.9′	58.0′
7	287°55.3	31.7	183°07.5	13.4′	03°40.3	16.1′	58.1′
8	302°55.1	32.2	197°39.8	13.4′	03°24.2	16.1′	58.1′
9	317°54.9	·· 32.6	212°12.2	13.3′	03°08.1	16.1′	58.1′
10	332°54.7	33.0	226°44.6	13.3′	02°52.0	16.1′	58.2′
11	347°54.5	33.4	241°16.9	13.3′	02°35.9	16.2′	58.2′
12	2°54.2	S21°33.8	255°49.2	13.3′	S02°19.7	16.2′	58.2′
13	17°54.0	34.2	270°21.5	13.2′	02°03.5	16.2′	58.3′
14	32°53.8	34.7	284°53.7	13.2′	01°47.3	16.3′	58.3′
15	47°53.6	·· 35.1	299°25.9	13.2′	01°31.0	16.3′	58.4′
16	62°53.4	35.5	313°58.1	13.1′	01°14.7	16.3′	58.4′
17	77°53.1	35.9	328°30.2	13.1′	00°58.4	16.4′	58.4′
18	92°52.9	S21°36.3	343°02.3	13.1′	S00°42.0	16.3′	58.5′
19	107°52.7	36.7	357°34.3	13.0′	00°25.7	16.4′	58.5′
20	122°52.5	37.1	12°06.4	13.0′	S00°09.3	16.5′	58.6′
21	137°52.2	·· 37.5	26°38.3	12.9′	N00°07.2	16.4′	58.6′
22	152°52.0	37.9	41°10.3	12.9′	00°23.6	16.5′	58.6′
23	167°51.8	38.3	55°42.2	12.8′	00°40.1	16.5′	58.7′
	SD = 16.2′	d = -0.4′	SD = 15.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:43	09:37	▬	▬	13:58	15:52
N 70°	07:28	09:01	▬	▬	14:34	16:07
68°	07:15	08:36	10:20	13:15	14:59	16:20
66°	07:05	08:16	09:37	13:59	15:19	16:30
64°	06:56	08:00	09:08	14:27	15:35	16:39
62°	06:48	07:47	08:47	14:49	15:48	16:47
60°	06:41	07:36	08:29	15:06	16:00	16:54
N 58°	06:35	07:26	08:15	15:21	16:10	17:00
56°	06:30	07:17	08:02	15:34	16:18	17:06
54°	06:24	07:09	07:51	15:44	16:26	17:11
52°	06:20	07:02	07:42	15:54	16:33	17:16
50°	06:15	06:56	07:33	16:03	16:40	17:20
45°	06:05	06:42	07:15	16:21	16:54	17:30
N 40°	05:56	06:30	07:00	16:36	17:06	17:39
35°	05:48	06:19	06:47	16:49	17:16	17:48
30°	05:41	06:10	06:36	17:00	17:26	17:55
20°	05:26	05:53	06:17	17:19	17:43	18:10
N 10°	05:12	05:38	06:00	17:36	17:58	18:24
0°	04:56	05:22	05:44	17:52	18:14	18:40
S 10°	04:39	05:06	05:28	18:08	18:30	18:57
20°	04:19	04:47	05:11	18:25	18:49	19:18
30°	03:52	04:25	04:52	18:45	19:12	19:44
35°	03:36	04:11	04:40	18:57	19:25	20:01
40°	03:15	03:55	04:26	19:10	19:42	20:22
45°	02:48	03:35	04:10	19:26	20:02	20:49
S 50°	02:11	03:09	03:51	19:46	20:28	21:27
52°	01:50	02:56	03:41	19:56	20:41	21:48
54°	01:22	02:41	03:31	20:06	20:56	22:17
56°	00:37	02:23	03:18	20:19	21:15	23:05
58°	–:–	02:01	03:04	20:33	21:37	–:–
S 60°	–:–	01:31	02:48	20:50	22:08	–:–

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	14:51	14:02	13:25	20:55	23:20	·· ··
N 70°	14:25	13:50	13:22	21:18	23:29	·· ··
68°	14:05	13:41	13:20	21:36	23:36	·· ··
66°	13:49	13:33	13:18	21:51	23:42	·· ··
64°	13:36	13:26	13:17	22:02	23:47	·· ··
62°	13:24	13:20	13:15	22:12	23:51	·· ··
60°	13:15	13:15	13:14	22:21	23:55	·· ··
N 58°	13:06	13:10	13:13	22:28	23:58	·· ··
56°	12:59	13:06	13:12	22:34	·· ··	00:01
54°	12:52	13:02	13:11	22:40	·· ··	00:03
52°	12:46	12:59	13:10	22:45	·· ··	00:06
50°	12:41	12:56	13:09	22:50	·· ··	00:08
45°	12:29	12:49	13:08	23:00	·· ··	00:12
N 40°	12:19	12:43	13:06	23:08	·· ··	00:16
35°	12:11	12:38	13:05	23:15	·· ··	00:19
30°	12:03	12:34	13:04	23:22	·· ··	00:22
20°	11:50	12:27	13:02	23:32	·· ··	00:27
N 10°	11:39	12:20	13:01	23:41	·· ··	00:31
0°	11:28	12:14	12:59	23:50	·· ··	00:35
S 10°	11:17	12:07	12:58	23:58	·· ··	00:39
20°	11:06	12:01	12:56	·· ··	00:07	00:43
30°	10:53	11:53	12:54	·· ··	00:18	00:48
35°	10:45	11:49	12:53	·· ··	00:24	00:50
40°	10:36	11:43	12:52	00:05	00:30	00:53
45°	10:26	11:38	12:51	00:17	00:38	00:57
S 50°	10:13	11:30	12:49	00:31	00:47	01:01
52°	10:07	11:27	12:48	00:38	00:51	01:03
54°	10:01	11:24	12:47	00:45	00:56	01:05
56°	09:53	11:20	12:47	00:53	01:01	01:07
58°	09:45	11:15	12:46	01:02	01:06	01:09
S 60°	09:36	11:10	12:44	01:13	01:13	01:12

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 37-58%
27	12:28	12:18	11:48	17:39	05:16	
28	12:08	11:58	11:48	18:24	06:02	
29	11:48	11:37	11:48	19:10	06:47	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2623 sec ΔT = TT-UT1 = +68.9217 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	69°07.3	192°13.9	S19°11.9	171°37.6	S23°35.9	312°34.5	N21°21.4	72°37.2	S04°06.0
1	84°09.7	207°13.2	12.7	186°38.1	36.1	327°37.2	21.5	87°39.7	06.0
2	99°12.2	222°12.4	13.5	201°38.6	36.2	342°39.8	21.5	102°42.1	06.0
3	114°14.7	237°11.6	·· 14.2	216°39.0	·· 36.4	357°42.4	·· 21.5	117°44.6	·· 05.9
4	129°17.1	252°10.9	15.0	231°39.5	36.6	12°45.0	21.6	132°47.0	05.9
5	144°19.6	267°10.1	15.8	246°39.9	36.8	27°47.7	21.6	147°49.5	05.9
6	159°22.0	282°09.4	S19°16.5	261°40.4	S23°36.9	42°50.3	N21°21.6	162°52.0	S04°05.9
7	174°24.5	297°08.6	17.3	276°40.8	37.1	57°52.9	21.7	177°54.4	05.9
8	189°27.0	312°07.8	18.1	291°41.3	37.3	72°55.5	21.7	192°56.9	05.9
9	204°29.4	327°07.0	·· 18.8	306°41.7	·· 37.5	87°58.1	·· 21.7	207°59.3	·· 05.9
10	219°31.9	342°06.3	19.6	321°42.2	37.7	103°00.8	21.8	223°01.8	05.9
11	234°34.4	357°05.5	20.4	336°42.6	37.8	118°03.4	21.8	238°04.3	05.9
12	249°36.8	12°04.7	S19°21.1	351°43.1	S23°38.0	133°06.0	N21°21.8	253°06.7	S04°05.8
13	264°39.3	27°04.0	21.9	6°43.5	38.2	148°08.6	21.9	268°09.2	05.8
14	279°41.8	42°03.2	22.6	21°44.0	38.4	163°11.3	21.9	283°11.6	05.8
15	294°44.2	57°02.4	·· 23.4	36°44.4	·· 38.5	178°13.9	·· 21.9	298°14.1	·· 05.8
16	309°46.7	72°01.7	24.1	51°44.9	38.7	193°16.5	22.0	313°16.5	05.8
17	324°49.2	87°00.9	24.9	66°45.3	38.9	208°19.2	22.0	328°19.0	05.8
18	339°51.6	102°00.1	S19°25.6	81°45.8	S23°39.0	223°21.8	N21°22.0	343°21.5	S04°05.8
19	354°54.1	116°59.3	26.4	96°46.2	39.2	238°24.4	22.1	358°23.9	05.8
20	9°56.5	131°58.6	27.2	111°46.7	39.4	253°27.0	22.1	13°26.4	05.7
21	24°59.0	146°57.8	·· 27.9	126°47.1	·· 39.6	268°29.7	·· 22.1	28°28.8	·· 05.7
22	40°01.5	161°57.0	28.7	141°47.6	39.7	283°32.3	22.2	43°31.3	05.7
23	55°03.9	176°56.2	29.4	156°48.0	39.9	298°34.9	22.2	58°33.7	05.7
Mer.pass.	19:20	ν -0.8′	d -0.8′	m -3.90	ν 0.5′	d -0.2′	m 1.31	ν 2.6′	d 0.0′ m -2.53	ν 2.5′	d 0.0′ m 0.91

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	70°06.4	191°55.5	S19°30.1	171°48.5	S23°40.1	313°37.6	N21°22.2	73°36.2	S04°05.7
1	85°08.9	206°54.7	30.9	186°48.9	40.2	328°40.2	22.3	88°38.7	05.7
2	100°11.3	221°53.9	31.6	201°49.4	40.4	343°42.8	22.3	103°41.1	05.7
3	115°13.8	236°53.1	·· 32.4	216°49.8	·· 40.6	358°45.4	·· 22.3	118°43.6	·· 05.6
4	130°16.3	251°52.4	33.1	231°50.3	40.8	13°48.1	22.4	133°46.0	05.6
5	145°18.7	266°51.6	33.9	246°50.7	40.9	28°50.7	22.4	148°48.5	05.6
6	160°21.2	281°50.8	S19°34.6	261°51.1	S23°41.1	43°53.3	N21°22.4	163°50.9	S04°05.6
7	175°23.6	296°50.0	35.4	276°51.6	41.3	58°56.0	22.5	178°53.4	05.6
8	190°26.1	311°49.2	36.1	291°52.0	41.4	73°58.6	22.5	193°55.8	05.6
9	205°28.6	326°48.5	·· 36.8	306°52.5	·· 41.6	89°01.2	·· 22.5	208°58.3	·· 05.6
10	220°31.0	341°47.7	37.6	321°52.9	41.8	104°03.9	22.6	224°00.8	05.5
11	235°33.5	356°46.9	38.3	336°53.4	41.9	119°06.5	22.6	239°03.2	05.5
12	250°36.0	11°46.1	S19°39.1	351°53.8	S23°42.1	134°09.1	N21°22.6	254°05.7	S04°05.5
13	265°38.4	26°45.3	39.8	6°54.3	42.3	149°11.8	22.7	269°08.1	05.5
14	280°40.9	41°44.6	40.5	21°54.7	42.4	164°14.4	22.7	284°10.6	05.5
15	295°43.4	56°43.8	·· 41.3	36°55.2	·· 42.6	179°17.0	·· 22.8	299°13.0	·· 05.5
16	310°45.8	71°43.0	42.0	51°55.6	42.7	194°19.7	22.8	314°15.5	05.5
17	325°48.3	86°42.2	42.7	66°56.1	42.9	209°22.3	22.8	329°17.9	05.4
18	340°50.8	101°41.4	S19°43.5	81°56.5	S23°43.1	224°24.9	N21°22.9	344°20.4	S04°05.4
19	355°53.2	116°40.6	44.2	96°56.9	43.2	239°27.6	22.9	359°22.8	05.4
20	10°55.7	131°39.9	44.9	111°57.4	43.4	254°30.2	22.9	14°25.3	05.4
21	25°58.1	146°39.1	·· 45.6	126°57.8	·· 43.6	269°32.9	·· 23.0	29°27.7	·· 05.4
22	41°00.6	161°38.3	46.4	141°58.3	43.7	284°35.5	23.0	44°30.2	05.4
23	56°03.1	176°37.5	47.1	156°58.7	43.9	299°38.1	23.0	59°32.6	05.4
Mer.pass.	19:16	ν -0.8′	d -0.7′	m -3.90	ν 0.4′	d -0.2′	m 1.31	ν 2.6′	d 0.0′ m -2.54	ν 2.5′	d 0.0′ m 0.91

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°05.5	191°36.7	S19°47.8	171°59.2	S23°44.0	314°40.8	N21°23.1	74°35.1	S04°05.3
1	86°08.0	206°35.9	48.5	186°59.6	44.2	329°43.4	23.1	89°37.5	05.3
2	101°10.5	221°35.1	49.3	202°00.1	44.4	344°46.0	23.1	104°40.0	05.3
3	116°12.9	236°34.3	·· 50.0	217°00.5	·· 44.5	359°48.7	·· 23.2	119°42.4	·· 05.3
4	131°15.4	251°33.5	50.7	232°00.9	44.7	14°51.3	23.2	134°44.9	05.3
5	146°17.9	266°32.8	51.4	247°01.4	44.8	29°54.0	23.2	149°47.4	05.3
6	161°20.3	281°32.0	S19°52.1	262°01.8	S23°45.0	44°56.6	N21°23.3	164°49.8	S04°05.3
7	176°22.8	296°31.2	52.9	277°02.3	45.2	59°59.2	23.3	179°52.3	05.2
8	191°25.3	311°30.4	53.6	292°02.7	45.3	75°01.9	23.4	194°54.7	05.2
9	206°27.7	326°29.6	·· 54.3	307°03.2	·· 45.5	90°04.5	·· 23.4	209°57.2	·· 05.2
10	221°30.2	341°28.8	55.0	322°03.6	45.6	105°07.2	23.4	224°59.6	05.2
11	236°32.6	356°28.0	55.7	337°04.0	45.8	120°09.8	23.5	240°02.1	05.2
12	251°35.1	11°27.2	S19°56.4	352°04.5	S23°45.9	135°12.4	N21°23.5	255°04.5	S04°05.2
13	266°37.6	26°26.4	57.2	7°04.9	46.1	150°15.1	23.5	270°07.0	05.1
14	281°40.0	41°25.6	57.9	22°05.4	46.2	165°17.7	23.6	285°09.4	05.1
15	296°42.5	56°24.8	·· 58.6	37°05.8	·· 46.4	180°20.4	·· 23.6	300°11.9	·· 05.1
16	311°45.0	71°24.0	19°59.3	52°06.3	46.5	195°23.0	23.6	315°14.3	05.1
17	326°47.4	86°23.2	20°00.0	67°06.7	46.7	210°25.7	23.7	330°16.8	05.1
18	341°49.9	101°22.4	S20°00.7	82°07.1	S23°46.9	225°28.3	N21°23.7	345°19.2	S04°05.1
19	356°52.4	116°21.6	01.4	97°07.6	47.0	240°30.9	23.8	0°21.6	05.0
20	11°54.8	131°20.8	02.1	112°08.0	47.2	255°33.6	23.8	15°24.1	05.0
21	26°57.3	146°20.0	·· 02.8	127°08.5	·· 47.3	270°36.2	·· 23.8	30°26.5	·· 05.0
22	41°59.7	161°19.3	03.5	142°08.9	47.5	285°38.9	23.9	45°29.0	05.0
23	57°02.2	176°18.5	04.2	157°09.3	47.6	300°41.5	23.9	60°31.4	05.0
Mer.pass.	19:12	ν -0.8′	d -0.7′	m -3.90	ν 0.4′	d -0.2′	m 1.30	ν 2.6′	d 0.0′ m -2.54	ν 2.5′	d 0.0′ m 0.92

Stars	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.0
Schedar	349°29.9	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.5
Hamal	327°50.1	23°35.2
Polaris	313°11.3	89°22.5
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.2
Capella	280°20.3	46°01.4
Bellatrix	278°21.8	6°22.4
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.1
Betelgeuse	270°51.0	7°24.8
Canopus	263°51.6	-52°42.4
Sirius	258°25.3	-16°45.0
Adhara	255°05.0	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.2	27°57.7
Avior	234°14.1	-59°35.2
Suhail	222°45.6	-43°32.0
Miaplacidus	221°37.8	-69°49.1
Alphard	217°46.9	-8°46.2
Regulus	207°33.6	11°50.4
Dubhe	193°40.2	61°36.4
Denebola	182°24.3	14°25.6
Gienah	175°43.0	-17°41.0
Acrux	172°59.7	-63°14.3
Gacrux	171°51.1	-57°15.2
Alioth	166°12.7	55°48.9
Spica	158°21.8	-11°17.7
Alkaid	152°51.8	49°10.8
Hadar	148°35.5	-60°29.7
Menkent	147°57.1	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.9	-60°56.4
Kochab	137°20.9	74°02.7
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.5	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.5	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.6
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.6	45°22.6
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.1	15°20.8

Nov 30 Sun	SHA	Mer.pass
Venus	123°06.7	11:12
Mars	102°30.4	12:33
Jupiter	243°27.3	03:09
Saturn	3°29.9	19:06

Dec 01 Mon	SHA	Mer.pass
Venus	121°49.1	11:13
Mars	101°42.1	12:32
Jupiter	243°31.2	03:05
Saturn	3°29.8	19:02

Dec 02 Tue	SHA	Mer.pass
Venus	120°31.2	11:14
Mars	100°53.6	12:32
Jupiter	243°35.2	03:01
Saturn	3°29.6	18:59

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°51.6	S21°38.7	70°14.0	12.8′	N00°56.6	16.5′	58.7′
1	197°51.3	39.1	84°45.8	12.8′	01°13.1	16.5′	58.7′
2	212°51.1	39.5	99°17.6	12.7′	01°29.6	16.5′	58.8′
3	227°50.9	·· 40.0	113°49.3	12.7′	01°46.1	16.6′	58.8′
4	242°50.7	40.4	128°20.9	12.6′	02°02.7	16.5′	58.9′
5	257°50.4	40.8	142°52.5	12.5′	02°19.2	16.6′	58.9′
6	272°50.2	S21°41.2	157°24.1	12.5′	N02°35.8	16.6′	58.9′
7	287°50.0	41.6	171°55.6	12.4′	02°52.4	16.6′	59.0′
8	302°49.8	42.0	186°27.0	12.4′	03°09.0	16.5′	59.0′
9	317°49.5	·· 42.4	200°58.4	12.3′	03°25.5	16.6′	59.0′
10	332°49.3	42.8	215°29.7	12.3′	03°42.1	16.7′	59.1′
11	347°49.1	43.2	230°01.0	12.2′	03°58.8	16.6′	59.1′
12	2°48.8	S21°43.6	244°32.2	12.1′	N04°15.4	16.6′	59.2′
13	17°48.6	43.9	259°03.3	12.1′	04°32.0	16.6′	59.2′
14	32°48.4	44.3	273°34.4	12.0′	04°48.6	16.6′	59.2′
15	47°48.2	·· 44.7	288°05.4	11.9′	05°05.2	16.6′	59.3′
16	62°47.9	45.1	302°36.3	11.9′	05°21.8	16.6′	59.3′
17	77°47.7	45.5	317°07.2	11.8′	05°38.4	16.6′	59.3′
18	92°47.5	S21°45.9	331°37.9	11.7′	N05°55.0	16.5′	59.4′
19	107°47.2	46.3	346°08.7	11.6′	06°11.5	16.6′	59.4′
20	122°47.0	46.7	0°39.3	11.6′	06°28.1	16.6′	59.5′
21	137°46.8	·· 47.1	15°09.9	11.5′	06°44.7	16.5′	59.5′
22	152°46.5	47.5	29°40.4	11.4′	07°01.2	16.5′	59.5′
23	167°46.3	47.9	44°10.8	11.3′	07°17.7	16.5′	59.6′
	SD = 16.2′	d = -0.4′	SD = 16.0′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°46.1	S21°48.3	58°41.1	11.2′	N07°34.2	16.5′	59.6′
1	197°45.9	48.6	73°11.3	11.2′	07°50.7	16.5′	59.6′
2	212°45.6	49.0	87°41.5	11.1′	08°07.2	16.5′	59.7′
3	227°45.4	·· 49.4	102°11.6	11.0′	08°23.7	16.4′	59.7′
4	242°45.2	49.8	116°41.6	10.9′	08°40.1	16.4′	59.7′
5	257°44.9	50.2	131°11.5	10.8′	08°56.5	16.4′	59.8′
6	272°44.7	S21°50.6	145°41.3	10.7′	N09°12.9	16.3′	59.8′
7	287°44.5	51.0	160°11.0	10.6′	09°29.2	16.3′	59.8′
8	302°44.2	51.3	174°40.6	10.5′	09°45.5	16.3′	59.9′
9	317°44.0	·· 51.7	189°10.1	10.4′	10°01.8	16.2′	59.9′
10	332°43.8	52.1	203°39.6	10.3′	10°18.0	16.2′	59.9′
11	347°43.5	52.5	218°08.9	10.2′	10°34.2	16.2′	60.0′
12	2°43.3	S21°52.9	232°38.2	10.1′	N10°50.4	16.1′	60.0′
13	17°43.1	53.2	247°07.3	10.0′	11°06.5	16.1′	60.0′
14	32°42.8	53.6	261°36.4	9.9′	11°22.6	16.1′	60.1′
15	47°42.6	·· 54.0	276°05.3	9.8′	11°38.7	16.0′	60.1′
16	62°42.3	54.4	290°34.2	9.7′	11°54.7	15.9′	60.1′
17	77°42.1	54.8	305°02.9	9.6′	12°10.6	15.9′	60.2′
18	92°41.9	S21°55.1	319°31.5	9.5′	N12°26.5	15.9′	60.2′
19	107°41.6	55.5	334°00.0	9.4′	12°42.4	15.7′	60.2′
20	122°41.4	55.9	348°28.5	9.3′	12°58.1	15.8′	60.3′
21	137°41.2	·· 56.2	2°56.8	9.2′	13°13.9	15.6′	60.3′
22	152°40.9	56.6	17°24.9	9.1′	13°29.5	15.7′	60.3′
23	167°40.7	57.0	31°53.0	9.0′	13°45.2	15.5′	60.4′
	SD = 16.2′	d = -0.4′	SD = 16.3′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°40.4	S21°57.4	46°21.0	8.9′	N14°00.7	15.5′	60.4′
1	197°40.2	57.7	60°48.9	8.7′	14°16.2	15.4′	60.4′
2	212°40.0	58.1	75°16.6	8.6′	14°31.6	15.3′	60.5′
3	227°39.7	·· 58.5	89°44.2	8.5′	14°46.9	15.3′	60.5′
4	242°39.5	58.8	104°11.7	8.4′	15°02.2	15.2′	60.5′
5	257°39.3	59.2	118°39.1	8.3′	15°17.4	15.1′	60.5′
6	272°39.0	S21°59.6	133°06.4	8.1′	N15°32.5	15.1′	60.6′
7	287°38.8	21°59.9	147°33.5	8.0′	15°47.6	14.9′	60.6′
8	302°38.5	22°00.3	162°00.5	7.9′	16°02.5	14.9′	60.6′
9	317°38.3	·· 00.7	176°27.4	7.8′	16°17.4	14.8′	60.6′
10	332°38.1	01.0	190°54.2	7.7′	16°32.2	14.7′	60.7′
11	347°37.8	01.4	205°20.9	7.5′	16°46.9	14.6′	60.7′
12	2°37.6	S22°01.8	219°47.4	7.4′	N17°01.5	14.5′	60.7′
13	17°37.3	02.1	234°13.8	7.3′	17°16.0	14.5′	60.7′
14	32°37.1	02.5	248°40.1	7.1′	17°30.5	14.3′	60.8′
15	47°36.8	·· 02.8	263°06.2	7.0′	17°44.8	14.2′	60.8′
16	62°36.6	03.2	277°32.3	6.9′	17°59.0	14.1′	60.8′
17	77°36.4	03.6	291°58.1	6.8′	18°13.1	14.0′	60.8′
18	92°36.1	S22°03.9	306°23.9	6.6′	N18°27.1	14.0′	60.9′
19	107°35.9	04.3	320°49.5	6.5′	18°41.1	13.8′	60.9′
20	122°35.6	04.6	335°15.1	6.4′	18°54.9	13.6′	60.9′
21	137°35.4	·· 05.0	349°40.4	6.2′	19°08.5	13.6′	60.9′
22	152°35.1	05.3	4°05.7	6.1′	19°22.1	13.5′	61.0′
23	167°34.9	05.7	18°30.8	6.0′	19°35.6	13.3′	61.0′
	SD = 16.2′	d = -0.4′	SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:52	09:51	▬	▬	13:46	15:46
N 70°	07:35	09:12	▬	▬	14:26	16:02
68°	07:22	08:44	10:38	13:00	14:53	16:16
66°	07:11	08:24	09:48	13:50	15:14	16:27
64°	07:02	08:07	09:17	14:21	15:31	16:36
62°	06:53	07:53	08:54	14:44	15:45	16:44
60°	06:46	07:41	08:35	15:02	15:57	16:52
N 58°	06:40	07:31	08:20	15:18	16:07	16:58
56°	06:34	07:22	08:07	15:31	16:16	17:04
54°	06:28	07:14	07:56	15:42	16:24	17:09
52°	06:23	07:06	07:46	15:52	16:32	17:14
50°	06:19	07:00	07:37	16:01	16:38	17:19
45°	06:08	06:45	07:18	16:20	16:53	17:30
N 40°	05:59	06:33	07:03	16:35	17:05	17:39
35°	05:51	06:22	06:50	16:48	17:16	17:47
30°	05:43	06:12	06:38	17:00	17:26	17:55
20°	05:28	05:55	06:19	17:19	17:43	18:10
N 10°	05:13	05:39	06:02	17:37	17:59	18:25
0°	04:57	05:23	05:45	17:53	18:15	18:41
S 10°	04:40	05:06	05:29	18:09	18:32	18:59
20°	04:19	04:47	05:12	18:27	18:51	19:20
30°	03:52	04:24	04:51	18:47	19:14	19:47
35°	03:34	04:10	04:39	18:59	19:28	20:04
40°	03:13	03:53	04:25	19:13	19:45	20:26
45°	02:46	03:33	04:09	19:30	20:06	20:53
S 50°	02:06	03:06	03:49	19:50	20:33	21:33
52°	01:44	02:53	03:39	20:00	20:46	21:56
54°	01:14	02:37	03:28	20:11	21:02	22:27
56°	00:15	02:18	03:15	20:24	21:21	23:36
58°	–:–	01:55	03:01	20:39	21:45	–:–
S 60°	–:–	01:22	02:43	20:56	22:19	–:–

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	12:50	12:07	10:53	01:37	04:03	07:09
N 70°	12:55	12:24	11:37	01:36	03:49	06:27
68°	13:00	12:38	12:06	01:34	03:38	05:59
66°	13:04	12:49	12:29	01:33	03:29	05:38
64°	13:08	12:58	12:47	01:32	03:22	05:22
62°	13:11	13:06	13:02	01:31	03:15	05:08
60°	13:13	13:13	13:14	01:30	03:10	04:57
N 58°	13:16	13:20	13:25	01:29	03:05	04:47
56°	13:18	13:25	13:35	01:29	03:01	04:38
54°	13:20	13:30	13:44	01:28	02:57	04:31
52°	13:22	13:35	13:51	01:28	02:53	04:24
50°	13:23	13:39	13:58	01:27	02:50	04:18
45°	13:27	13:48	14:13	01:26	02:43	04:05
N 40°	13:30	13:55	14:25	01:25	02:38	03:54
35°	13:32	14:02	14:36	01:25	02:33	03:45
30°	13:35	14:08	14:45	01:24	02:29	03:37
20°	13:39	14:18	15:02	01:23	02:21	03:23
N 10°	13:42	14:27	15:16	01:22	02:15	03:11
0°	13:46	14:35	15:29	01:21	02:09	03:00
S 10°	13:49	14:44	15:43	01:20	02:03	02:49
20°	13:53	14:53	15:58	01:19	01:57	02:38
30°	13:57	15:04	16:15	01:18	01:49	02:24
35°	14:00	15:10	16:25	01:17	01:45	02:17
40°	14:03	15:17	16:36	01:16	01:41	02:08
45°	14:06	15:26	16:49	01:15	01:35	01:58
S 50°	14:10	15:36	17:06	01:14	01:29	01:46
52°	14:12	15:40	17:14	01:14	01:26	01:40
54°	14:14	15:46	17:23	01:13	01:23	01:34
56°	14:16	15:51	17:33	01:13	01:19	01:27
58°	14:19	15:58	17:44	01:12	01:15	01:19
S 60°	14:22	16:05	17:57	01:11	01:11	01:11

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 68-87%
30	11:26	11:15	11:49	19:57	07:33	
01	11:04	10:53	11:49	20:48	08:22	
02	10:42	10:30	11:49	21:43	09:15	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2630 sec ΔT = TT-UT1 = +68.9210 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	72°04.7	191°17.7	S20°04.9	172°09.8	S23°47.8	315°44.2	N21°23.9	75°33.9	S04°05.0
1	87°07.1	206°16.9	05.6	187°10.2	47.9	330°46.8	24.0	90°36.3	04.9
2	102°09.6	221°16.1	06.3	202°10.7	48.1	345°49.5	24.0	105°38.8	04.9
3	117°12.1	236°15.3	·· 07.0	217°11.1	·· 48.2	0°52.1	·· 24.1	120°41.2	·· 04.9
4	132°14.5	251°14.4	07.7	232°11.5	48.4	15°54.8	24.1	135°43.7	04.9
5	147°17.0	266°13.6	08.4	247°12.0	48.5	30°57.4	24.1	150°46.1	04.9
6	162°19.5	281°12.8	S20°09.1	262°12.4	S23°48.6	46°00.0	N21°24.2	165°48.6	S04°04.9
7	177°21.9	296°12.0	09.8	277°12.9	48.8	61°02.7	24.2	180°51.0	04.8
8	192°24.4	311°11.2	10.5	292°13.3	48.9	76°05.3	24.2	195°53.5	04.8
9	207°26.9	326°10.4	·· 11.2	307°13.7	·· 49.1	91°08.0	·· 24.3	210°55.9	·· 04.8
10	222°29.3	341°09.6	11.9	322°14.2	49.2	106°10.6	24.3	225°58.4	04.8
11	237°31.8	356°08.8	12.6	337°14.6	49.4	121°13.3	24.3	241°00.8	04.8
12	252°34.2	11°08.0	S20°13.3	352°15.0	S23°49.5	136°15.9	N21°24.4	256°03.2	S04°04.8
13	267°36.7	26°07.2	14.0	7°15.5	49.7	151°18.6	24.4	271°05.7	04.7
14	282°39.2	41°06.4	14.6	22°15.9	49.8	166°21.2	24.5	286°08.1	04.7
15	297°41.6	56°05.6	·· 15.3	37°16.4	·· 50.0	181°23.9	·· 24.5	301°10.6	·· 04.7
16	312°44.1	71°04.8	16.0	52°16.8	50.1	196°26.5	24.5	316°13.0	04.7
17	327°46.6	86°04.0	16.7	67°17.2	50.2	211°29.2	24.6	331°15.5	04.7
18	342°49.0	101°03.2	S20°17.4	82°17.7	S23°50.4	226°31.8	N21°24.6	346°17.9	S04°04.6
19	357°51.5	116°02.4	18.1	97°18.1	50.5	241°34.5	24.7	1°20.4	04.6
20	12°54.0	131°01.6	18.8	112°18.5	50.7	256°37.1	24.7	16°22.8	04.6
21	27°56.4	146°00.7	·· 19.4	127°19.0	·· 50.8	271°39.8	·· 24.7	31°25.3	·· 04.6
22	42°58.9	160°59.9	20.1	142°19.4	51.0	286°42.4	24.8	46°27.7	04.6
23	58°01.4	175°59.1	20.8	157°19.8	51.1	301°45.1	24.8	61°30.1	04.6
Mer.pass.	19:09	ν -0.8′	d -0.7′	m -3.90	ν 0.4′	d -0.1′	m 1.29	ν 2.6′	d 0.0′ m -2.55	ν 2.4′	d 0.0′ m 0.92

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	73°03.8	190°58.3	S20°21.5	172°20.3	S23°51.2	316°47.8	N21°24.8	76°32.6	S04°04.5
1	88°06.3	205°57.5	22.1	187°20.7	51.4	331°50.4	24.9	91°35.0	04.5
2	103°08.7	220°56.7	22.8	202°21.2	51.5	346°53.1	24.9	106°37.5	04.5
3	118°11.2	235°55.9	·· 23.5	217°21.6	·· 51.6	1°55.7	·· 25.0	121°39.9	·· 04.5
4	133°13.7	250°55.1	24.2	232°22.0	51.8	16°58.4	25.0	136°42.4	04.5
5	148°16.1	265°54.2	24.8	247°22.5	51.9	32°01.0	25.0	151°44.8	04.4
6	163°18.6	280°53.4	S20°25.5	262°22.9	S23°52.1	47°03.7	N21°25.1	166°47.2	S04°04.4
7	178°21.1	295°52.6	26.2	277°23.3	52.2	62°06.3	25.1	181°49.7	04.4
8	193°23.5	310°51.8	26.9	292°23.8	52.3	77°09.0	25.1	196°52.1	04.4
9	208°26.0	325°51.0	·· 27.5	307°24.2	·· 52.5	92°11.7	·· 25.2	211°54.6	·· 04.4
10	223°28.5	340°50.2	28.2	322°24.6	52.6	107°14.3	25.2	226°57.0	04.3
11	238°30.9	355°49.4	28.9	337°25.1	52.7	122°17.0	25.3	241°59.5	04.3
12	253°33.4	10°48.5	S20°29.5	352°25.5	S23°52.9	137°19.6	N21°25.3	257°01.9	S04°04.3
13	268°35.9	25°47.7	30.2	7°25.9	53.0	152°22.3	25.3	272°04.3	04.3
14	283°38.3	40°46.9	30.9	22°26.4	53.1	167°24.9	25.4	287°06.8	04.3
15	298°40.8	55°46.1	·· 31.5	37°26.8	·· 53.3	182°27.6	·· 25.4	302°09.2	·· 04.2
16	313°43.2	70°45.3	32.2	52°27.2	53.4	197°30.3	25.5	317°11.7	04.2
17	328°45.7	85°44.4	32.8	67°27.7	53.5	212°32.9	25.5	332°14.1	04.2
18	343°48.2	100°43.6	S20°33.5	82°28.1	S23°53.7	227°35.6	N21°25.5	347°16.5	S04°04.2
19	358°50.6	115°42.8	34.2	97°28.5	53.8	242°38.2	25.6	2°19.0	04.2
20	13°53.1	130°42.0	34.8	112°29.0	53.9	257°40.9	25.6	17°21.4	04.1
21	28°55.6	145°41.2	·· 35.5	127°29.4	·· 54.1	272°43.6	·· 25.7	32°23.9	·· 04.1
22	43°58.0	160°40.3	36.1	142°29.8	54.2	287°46.2	25.7	47°26.3	04.1
23	59°00.5	175°39.5	36.8	157°30.3	54.3	302°48.9	25.7	62°28.7	04.1
Mer.pass.	19:05	ν -0.8′	d -0.7′	m -3.90	ν 0.4′	d -0.1′	m 1.29	ν 2.7′	d 0.0′ m -2.55	ν 2.4′	d 0.0′ m 0.93

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	74°03.0	190°38.7	S20°37.4	172°30.7	S23°54.5	317°51.5	N21°25.8	77°31.2	S04°04.1
1	89°05.4	205°37.9	38.1	187°31.1	54.6	332°54.2	25.8	92°33.6	04.0
2	104°07.9	220°37.0	38.7	202°31.6	54.7	347°56.9	25.8	107°36.1	04.0
3	119°10.4	235°36.2	·· 39.4	217°32.0	·· 54.8	2°59.5	·· 25.9	122°38.5	·· 04.0
4	134°12.8	250°35.4	40.0	232°32.4	55.0	18°02.2	25.9	137°40.9	04.0
5	149°15.3	265°34.6	40.7	247°32.8	55.1	33°04.8	26.0	152°43.4	04.0
6	164°17.7	280°33.7	S20°41.3	262°33.3	S23°55.2	48°07.5	N21°26.0	167°45.8	S04°03.9
7	179°20.2	295°32.9	42.0	277°33.7	55.3	63°10.2	26.0	182°48.3	03.9
8	194°22.7	310°32.1	42.6	292°34.1	55.5	78°12.8	26.1	197°50.7	03.9
9	209°25.1	325°31.3	·· 43.3	307°34.6	·· 55.6	93°15.5	·· 26.1	212°53.1	·· 03.9
10	224°27.6	340°30.4	43.9	322°35.0	55.7	108°18.2	26.2	227°55.6	03.9
11	239°30.1	355°29.6	44.6	337°35.4	55.8	123°20.8	26.2	242°58.0	03.8
12	254°32.5	10°28.8	S20°45.2	352°35.9	S23°56.0	138°23.5	N21°26.2	258°00.4	S04°03.8
13	269°35.0	25°27.9	45.8	7°36.3	56.1	153°26.2	26.3	273°02.9	03.8
14	284°37.5	40°27.1	46.5	22°36.7	56.2	168°28.8	26.3	288°05.3	03.8
15	299°39.9	55°26.3	·· 47.1	37°37.1	·· 56.3	183°31.5	·· 26.4	303°07.8	·· 03.7
16	314°42.4	70°25.5	47.8	52°37.6	56.5	198°34.2	26.4	318°10.2	03.7
17	329°44.9	85°24.6	48.4	67°38.0	56.6	213°36.8	26.4	333°12.6	03.7
18	344°47.3	100°23.8	S20°49.0	82°38.4	S23°56.7	228°39.5	N21°26.5	348°15.1	S04°03.7
19	359°49.8	115°23.0	49.7	97°38.9	56.8	243°42.2	26.5	3°17.5	03.7
20	14°52.2	130°22.1	50.3	112°39.3	57.0	258°44.8	26.6	18°19.9	03.6
21	29°54.7	145°21.3	·· 50.9	127°39.7	·· 57.1	273°47.5	·· 26.6	33°22.4	·· 03.6
22	44°57.2	160°20.5	51.6	142°40.1	57.2	288°50.2	26.6	48°24.8	03.6
23	59°59.6	175°19.6	52.2	157°40.6	57.3	303°52.8	26.7	63°27.2	03.6
Mer.pass.	19:01	ν -0.8′	d -0.7′	m -3.90	ν 0.4′	d -0.1′	m 1.28	ν 2.7′	d 0.0′ m -2.56	ν 2.4′	d 0.0′ m 0.93

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.1
Schedar	349°29.9	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.5
Hamal	327°50.1	23°35.2
Polaris	313°11.4	89°22.5
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.2
Capella	280°20.3	46°01.4
Bellatrix	278°21.8	6°22.4
Elnath	278°00.6	28°37.8
Alnilam	275°36.7	-1°11.1
Betelgeuse	270°51.0	7°24.8
Canopus	263°51.6	-52°42.4
Sirius	258°25.3	-16°45.0
Adhara	255°05.0	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.0	-59°35.3
Suhail	222°45.6	-43°32.0
Miaplacidus	221°37.7	-69°49.1
Alphard	217°46.9	-8°46.2
Regulus	207°33.6	11°50.4
Dubhe	193°40.1	61°36.4
Denebola	182°24.3	14°25.6
Gienah	175°43.0	-17°41.0
Acrux	172°59.6	-63°14.3
Gacrux	171°51.1	-57°15.2
Alioth	166°12.6	55°48.9
Spica	158°21.7	-11°17.7
Alkaid	152°51.8	49°10.8
Hadar	148°35.5	-60°29.7
Menkent	147°57.1	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.9	-60°56.4
Kochab	137°20.9	74°02.7
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.5	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.5	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.6	45°22.6
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 03 Wed	SHA	Mer.pass
Venus	119°13.0	11:15
Mars	100°05.1	12:31
Jupiter	243°39.5	02:57
Saturn	3°29.2	18:55

Dec 04 Thu	SHA	Mer.pass
Venus	117°54.5	11:17
Mars	99°16.5	12:30
Jupiter	243°43.9	02:52
Saturn	3°28.8	18:51

Dec 05 Fri	SHA	Mer.pass
Venus	116°35.7	11:18
Mars	98°27.7	12:30
Jupiter	243°48.6	02:48
Saturn	3°28.2	18:47

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°34.7	S22°06.0	32°55.8	5.9′	N19°48.9	13.2′	61.0′
1	197°34.4	06.4	47°20.6	5.7′	20°02.1	13.1′	61.0′
2	212°34.2	06.8	61°45.3	5.6′	20°15.2	13.0′	61.0′
3	227°33.9	·· 07.1	76°09.9	5.5′	20°28.2	12.8′	61.0′
4	242°33.7	07.5	90°34.4	5.3′	20°41.0	12.7′	61.1′
5	257°33.4	07.8	104°58.7	5.2′	20°53.7	12.6′	61.1′
6	272°33.2	S22°08.2	119°22.9	5.1′	N21°06.3	12.4′	61.1′
7	287°32.9	08.5	133°47.0	4.9′	21°18.7	12.3′	61.1′
8	302°32.7	08.8	148°10.9	4.8′	21°31.0	12.2′	61.1′
9	317°32.4	·· 09.2	162°34.7	4.7′	21°43.2	12.0′	61.1′
10	332°32.2	09.5	176°58.4	4.5′	21°55.2	11.9′	61.2′
11	347°32.0	09.9	191°22.0	4.4′	22°07.1	11.7′	61.2′
12	2°31.7	S22°10.2	205°45.4	4.3′	N22°18.8	11.5′	61.2′
13	17°31.5	10.6	220°08.7	4.2′	22°30.3	11.5′	61.2′
14	32°31.2	10.9	234°31.8	4.0′	22°41.8	11.2′	61.2′
15	47°31.0	·· 11.3	248°54.9	3.9′	22°53.0	11.1′	61.2′
16	62°30.7	11.6	263°17.8	3.8′	23°04.1	10.9′	61.2′
17	77°30.5	11.9	277°40.6	3.7′	23°15.0	10.8′	61.3′
18	92°30.2	S22°12.3	292°03.2	3.5′	N23°25.8	10.6′	61.3′
19	107°30.0	12.6	306°25.8	3.4′	23°36.4	10.5′	61.3′
20	122°29.7	13.0	320°48.2	3.3′	23°46.9	10.2′	61.3′
21	137°29.5	·· 13.3	335°10.5	3.2′	23°57.1	10.1′	61.3′
22	152°29.2	13.6	349°32.7	3.1′	24°07.2	10.0′	61.3′
23	167°29.0	14.0	3°54.8	3.0′	24°17.2	9.7′	61.3′
	SD = 16.2′	d = -0.4′	SD = 16.6′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°28.7	S22°14.3	18°16.7	2.8′	N24°26.9	9.6′	61.3′
1	197°28.5	14.6	32°38.6	2.7′	24°36.5	9.4′	61.3′
2	212°28.2	15.0	47°00.3	2.6′	24°45.9	9.2′	61.3′
3	227°28.0	·· 15.3	61°21.9	2.5′	24°55.1	9.0′	61.3′
4	242°27.7	15.6	75°43.4	2.4′	25°04.1	8.8′	61.3′
5	257°27.5	16.0	90°04.8	2.3′	25°12.9	8.7′	61.3′
6	272°27.2	S22°16.3	104°26.1	2.2′	N25°21.6	8.4′	61.3′
7	287°27.0	16.6	118°47.3	2.1′	25°30.0	8.3′	61.3′
8	302°26.7	17.0	133°08.4	2.0′	25°38.3	8.1′	61.3′
9	317°26.5	·· 17.3	147°29.4	1.9′	25°46.4	7.9′	61.3′
10	332°26.2	17.6	161°50.3	1.8′	25°54.3	7.6′	61.3′
11	347°26.0	17.9	176°11.1	1.7′	26°01.9	7.5′	61.3′
12	2°25.7	S22°18.3	190°31.8	1.6′	N26°09.4	7.3′	61.3′
13	17°25.4	18.6	204°52.4	1.5′	26°16.7	7.0′	61.3′
14	32°25.2	18.9	219°13.0	1.5′	26°23.7	6.9′	61.3′
15	47°24.9	·· 19.2	233°33.4	1.4′	26°30.6	6.7′	61.3′
16	62°24.7	19.6	247°53.8	1.3′	26°37.3	6.4′	61.3′
17	77°24.4	19.9	262°14.1	1.2′	26°43.7	6.3′	61.3′
18	92°24.2	S22°20.2	276°34.3	1.2′	N26°50.0	6.0′	61.3′
19	107°23.9	20.5	290°54.5	1.1′	26°56.0	5.8′	61.3′
20	122°23.7	20.9	305°14.6	1.0′	27°01.8	5.6′	61.3′
21	137°23.4	·· 21.2	319°34.6	1.0′	27°07.4	5.4′	61.3′
22	152°23.2	21.5	333°54.6	0.9′	27°12.8	5.2′	61.3′
23	167°22.9	21.8	348°14.5	0.8′	27°18.0	5.0′	61.3′
	SD = 16.2′	d = -0.3′	SD = 16.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°22.6	S22°22.1	2°34.3	0.8′	N27°23.0	4.7′	61.3′
1	197°22.4	22.4	16°54.1	0.7′	27°27.7	4.5′	61.3′
2	212°22.1	22.8	31°13.9	0.7′	27°32.2	4.3′	61.3′
3	227°21.9	·· 23.1	45°33.6	0.7′	27°36.5	4.1′	61.3′
4	242°21.6	23.4	59°53.2	0.6′	27°40.6	3.9′	61.3′
5	257°21.4	23.7	74°12.9	0.6′	27°44.5	3.6′	61.3′
6	272°21.1	S22°24.0	88°32.5	0.6′	N27°48.1	3.4′	61.2′
7	287°20.8	24.3	102°52.0	0.5′	27°51.5	3.2′	61.2′
8	302°20.6	24.6	117°11.6	0.5′	27°54.7	3.0′	61.2′
9	317°20.3	·· 25.0	131°31.1	0.5′	27°57.7	2.7′	61.2′
10	332°20.1	25.3	145°50.6	0.5′	28°00.4	2.6′	61.2′
11	347°19.8	25.6	160°10.0	0.5′	28°03.0	2.3′	61.2′
12	2°19.5	S22°25.9	174°29.5	0.5′	N28°05.3	2.0′	61.2′
13	17°19.3	26.2	188°49.0	0.5′	28°07.3	1.9′	61.2′
14	32°19.0	26.5	203°08.4	0.5′	28°09.2	1.6′	61.1′
15	47°18.8	·· 26.8	217°27.9	0.5′	28°10.8	1.4′	61.1′
16	62°18.5	27.1	231°47.3	0.5′	28°12.2	1.2′	61.1′
17	77°18.3	27.4	246°06.8	0.5′	28°13.4	0.9′	61.1′
18	92°18.0	S22°27.7	260°26.3	0.5′	N28°14.3	0.8′	61.1′
19	107°17.7	28.0	274°45.7	0.5′	28°15.1	0.5′	61.1′
20	122°17.5	28.3	289°05.3	0.5′	28°15.6	0.2′	61.0′
21	137°17.2	·· 28.6	303°24.8	0.6′	28°15.8	0.1′	61.0′
22	152°16.9	28.9	317°44.3	0.6′	28°15.9	0.2′	61.0′
23	167°16.7	29.2	332°03.9	0.6′	28°15.7	0.4′	61.0′
	SD = 16.2′	d = -0.3′	SD = 16.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:59	10:05	▬	▬	13:35	15:41
N 70°	07:42	09:21	▬	▬	14:19	15:58
68°	07:28	08:52	10:57	12:43	14:48	16:12
66°	07:17	08:30	09:58	13:42	15:10	16:24
64°	07:07	08:13	09:25	14:16	15:27	16:33
62°	06:58	07:58	09:00	14:40	15:42	16:42
60°	06:51	07:46	08:41	14:59	15:54	16:50
N 58°	06:44	07:35	08:25	15:15	16:05	16:56
56°	06:38	07:26	08:12	15:28	16:14	17:03
54°	06:32	07:18	08:00	15:40	16:23	17:08
52°	06:27	07:10	07:50	15:50	16:30	17:13
50°	06:22	07:03	07:41	16:00	16:37	17:18
45°	06:11	06:48	07:21	16:19	16:52	17:29
N 40°	06:02	06:35	07:06	16:35	17:05	17:39
35°	05:53	06:24	06:52	16:48	17:16	17:47
30°	05:45	06:15	06:41	17:00	17:26	17:55
20°	05:30	05:57	06:21	17:20	17:44	18:11
N 10°	05:14	05:40	06:03	17:37	18:00	18:26
0°	04:58	05:24	05:47	17:54	18:16	18:42
S 10°	04:40	05:07	05:30	18:11	18:34	19:00
20°	04:19	04:48	05:12	18:29	18:53	19:22
30°	03:51	04:24	04:51	18:50	19:17	19:50
35°	03:34	04:10	04:39	19:02	19:31	20:07
40°	03:12	03:53	04:25	19:16	19:48	20:29
45°	02:44	03:31	04:08	19:33	20:10	20:58
S 50°	02:03	03:04	03:47	19:54	20:37	21:39
52°	01:39	02:50	03:37	20:04	20:51	22:03
54°	01:06	02:34	03:26	20:16	21:08	22:37
56°	–:–	02:14	03:13	20:29	21:28	–:–
58°	–:–	01:49	02:57	20:44	21:53	–:–
S 60°	–:–	01:14	02:39	21:03	22:30	–:–

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	10:39	▭	▭	09:27	▭	▭
66°	11:53	▭	▭	08:14	▭	▭
64°	12:30	11:35	▭	07:38	10:46	▭
62°	12:57	12:52	▭	07:12	09:30	▭
60°	13:18	13:29	14:00	06:52	08:54	10:44
N 58°	13:36	13:55	14:36	06:36	08:28	10:08
56°	13:50	14:16	15:02	06:22	08:07	09:42
54°	14:03	14:33	15:23	06:10	07:50	09:21
52°	14:14	14:48	15:40	05:59	07:36	09:04
50°	14:24	15:01	15:55	05:50	07:23	08:49
45°	14:45	15:28	16:26	05:30	06:57	08:19
N 40°	15:03	15:50	16:49	05:15	06:37	07:55
35°	15:17	16:08	17:09	05:01	06:20	07:36
30°	15:30	16:23	17:25	04:50	06:05	07:20
20°	15:52	16:49	17:54	04:30	05:40	06:52
N 10°	16:11	17:12	18:18	04:13	05:19	06:28
0°	16:29	17:33	18:41	03:57	04:59	06:05
S 10°	16:47	17:55	19:04	03:41	04:39	05:43
20°	17:06	18:18	19:28	03:24	04:18	05:19
30°	17:29	18:45	19:57	03:05	03:53	04:51
35°	17:43	19:01	20:14	02:54	03:39	04:35
40°	17:58	19:19	20:34	02:41	03:22	04:15
45°	18:17	19:42	20:58	02:26	03:03	03:52
S 50°	18:40	20:11	21:29	02:07	02:38	03:23
52°	18:51	20:25	21:44	01:59	02:26	03:08
54°	19:04	20:42	22:02	01:49	02:13	02:51
56°	19:19	21:02	22:24	01:39	01:57	02:31
58°	19:36	21:26	22:52	01:26	01:39	02:06
S 60°	19:58	22:00	23:32	01:12	01:17	01:33

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 13-15 94-100%
03	10:19	10:07	11:50	22:44	10:13	
04	09:55	09:43	11:50	23:49	11:16	◯
05	09:31	09:18	11:51	–:–	12:23	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2636 sec ΔT = TT-UT1 = +68.9204 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	75°02.1	190°18.8	S20°52.8	172°41.0	S23°57.4	318°55.5	N21°26.7	78°29.7	S04°03.5
1	90°04.6	205°18.0	53.4	187°41.4	57.5	333°58.2	26.8	93°32.1	03.5
2	105°07.0	220°17.1	54.1	202°41.9	57.7	349°00.8	26.8	108°34.6	03.5
3	120°09.5	235°16.3	·· 54.7	217°42.3	·· 57.8	4°03.5	·· 26.8	123°37.0	·· 03.5
4	135°12.0	250°15.5	55.3	232°42.7	57.9	19°06.2	26.9	138°39.4	03.5
5	150°14.4	265°14.6	55.9	247°43.1	58.0	34°08.8	26.9	153°41.9	03.4
6	165°16.9	280°13.8	S20°56.6	262°43.6	S23°58.1	49°11.5	N21°27.0	168°44.3	S04°03.4
7	180°19.4	295°12.9	57.2	277°44.0	58.3	64°14.2	27.0	183°46.7	03.4
8	195°21.8	310°12.1	57.8	292°44.4	58.4	79°16.9	27.1	198°49.2	03.4
9	210°24.3	325°11.3	·· 58.4	307°44.8	·· 58.5	94°19.5	·· 27.1	213°51.6	·· 03.3
10	225°26.7	340°10.4	59.0	322°45.3	58.6	109°22.2	27.1	228°54.0	03.3
11	240°29.2	355°09.6	20°59.7	337°45.7	58.7	124°24.9	27.2	243°56.5	03.3
12	255°31.7	10°08.7	S21°00.3	352°46.1	S23°58.8	139°27.6	N21°27.2	258°58.9	S04°03.3
13	270°34.1	25°07.9	00.9	7°46.5	58.9	154°30.2	27.3	274°01.3	03.2
14	285°36.6	40°07.1	01.5	22°47.0	59.1	169°32.9	27.3	289°03.8	03.2
15	300°39.1	55°06.2	·· 02.1	37°47.4	·· 59.2	184°35.6	·· 27.3	304°06.2	·· 03.2
16	315°41.5	70°05.4	02.7	52°47.8	59.3	199°38.2	27.4	319°08.6	03.2
17	330°44.0	85°04.5	03.3	67°48.2	59.4	214°40.9	27.4	334°11.1	03.2
18	345°46.5	100°03.7	S21°04.0	82°48.7	S23°59.5	229°43.6	N21°27.5	349°13.5	S04°03.1
19	0°48.9	115°02.8	04.6	97°49.1	59.6	244°46.3	27.5	4°15.9	03.1
20	15°51.4	130°02.0	05.2	112°49.5	59.7	259°48.9	27.5	19°18.4	03.1
21	30°53.9	145°01.2	·· 05.8	127°49.9	·· 59.8	274°51.6	·· 27.6	34°20.8	·· 03.1
22	45°56.3	160°00.3	06.4	142°50.4	23°59.9	289°54.3	27.6	49°23.2	03.0
23	60°58.8	174°59.5	07.0	157°50.8	24°00.0	304°57.0	27.7	64°25.6	03.0
Mer.pass.	18:57	ν -0.8′	d -0.6′	m -3.90	ν 0.4′	d -0.1′	m 1.28	ν 2.7′	d 0.0′	m -2.57	ν 2.4′	d 0.0′	m 0.93

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	76°01.2	189°58.6	S21°07.6	172°51.2	S24°00.2	319°59.6	N21°27.7	79°28.1	S04°03.0
1	91°03.7	204°57.8	08.2	187°51.6	00.3	335°02.3	27.8	94°30.5	03.0
2	106°06.2	219°56.9	08.8	202°52.1	00.4	350°05.0	27.8	109°32.9	02.9
3	121°08.6	234°56.1	·· 09.4	217°52.5	·· 00.5	5°07.7	·· 27.8	124°35.4	·· 02.9
4	136°11.1	249°55.2	10.0	232°52.9	00.6	20°10.4	27.9	139°37.8	02.9
5	151°13.6	264°54.4	10.6	247°53.3	00.7	35°13.0	27.9	154°40.2	02.9
6	166°16.0	279°53.5	S21°11.2	262°53.8	S24°00.8	50°15.7	N21°28.0	169°42.7	S04°02.8
7	181°18.5	294°52.7	11.8	277°54.2	00.9	65°18.4	28.0	184°45.1	02.8
8	196°21.0	309°51.8	12.4	292°54.6	01.0	80°21.1	28.0	199°47.5	02.8
9	211°23.4	324°51.0	·· 13.0	307°55.0	·· 01.1	95°23.7	·· 28.1	214°50.0	·· 02.8
10	226°25.9	339°50.1	13.6	322°55.4	01.2	110°26.4	28.1	229°52.4	02.7
11	241°28.4	354°49.3	14.2	337°55.9	01.3	125°29.1	28.2	244°54.8	02.7
12	256°30.8	9°48.4	S21°14.7	352°56.3	S24°01.4	140°31.8	N21°28.2	259°57.2	S04°02.7
13	271°33.3	24°47.6	15.3	7°56.7	01.5	155°34.5	28.3	274°59.7	02.7
14	286°35.7	39°46.7	15.9	22°57.1	01.6	170°37.2	28.3	290°02.1	02.6
15	301°38.2	54°45.9	·· 16.5	37°57.6	·· 01.7	185°39.8	·· 28.3	305°04.5	·· 02.6
16	316°40.7	69°45.0	17.1	52°58.0	01.8	200°42.5	28.4	320°07.0	02.6
17	331°43.1	84°44.2	17.7	67°58.4	01.9	215°45.2	28.4	335°09.4	02.6
18	346°45.6	99°43.3	S21°18.3	82°58.8	S24°02.0	230°47.9	N21°28.5	350°11.8	S04°02.5
19	1°48.1	114°42.5	18.9	97°59.2	02.1	245°50.6	28.5	5°14.2	02.5
20	16°50.5	129°41.6	19.4	112°59.7	02.2	260°53.2	28.6	20°16.7	02.5
21	31°53.0	144°40.8	·· 20.0	128°00.1	·· 02.3	275°55.9	·· 28.6	35°19.1	·· 02.5
22	46°55.5	159°39.9	20.6	143°00.5	02.4	290°58.6	28.6	50°21.5	02.4
23	61°57.9	174°39.0	21.2	158°00.9	02.5	306°01.3	28.7	65°24.0	02.4
Mer.pass.	18:53	ν -0.8′	d -0.6′	m -3.90	ν 0.4′	d -0.1′	m 1.27	ν 2.7′	d 0.0′	m -2.57	ν 2.4′	d 0.0′	m 0.94

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°00.4	189°38.2	S21°21.8	173°01.3	S24°02.6	321°04.0	N21°28.7	80°26.4	S04°02.4
1	92°02.9	204°37.3	22.3	188°01.8	02.7	336°06.7	28.8	95°28.8	02.4
2	107°05.3	219°36.5	22.9	203°02.2	02.8	351°09.3	28.8	110°31.2	02.3
3	122°07.8	234°35.6	·· 23.5	218°02.6	·· 02.9	6°12.0	·· 28.9	125°33.7	·· 02.3
4	137°10.2	249°34.8	24.1	233°03.0	03.0	21°14.7	28.9	140°36.1	02.3
5	152°12.7	264°33.9	24.6	248°03.4	03.1	36°17.4	28.9	155°38.5	02.3
6	167°15.2	279°33.0	S21°25.2	263°03.9	S24°03.2	51°20.1	N21°29.0	170°40.9	S04°02.2
7	182°17.6	294°32.2	25.8	278°04.3	03.3	66°22.8	29.0	185°43.4	02.2
8	197°20.1	309°31.3	26.3	293°04.7	03.4	81°25.5	29.1	200°45.8	02.2
9	212°22.6	324°30.5	·· 26.9	308°05.1	·· 03.5	96°28.1	·· 29.1	215°48.2	·· 02.2
10	227°25.0	339°29.6	27.5	323°05.5	03.6	111°30.8	29.2	230°50.6	02.1
11	242°27.5	354°28.7	28.0	338°06.0	03.7	126°33.5	29.2	245°53.1	02.1
12	257°30.0	9°27.9	S21°28.6	353°06.4	S24°03.8	141°36.2	N21°29.2	260°55.5	S04°02.1
13	272°32.4	24°27.0	29.2	8°06.8	03.9	156°38.9	29.3	275°57.9	02.0
14	287°34.9	39°26.2	29.7	23°07.2	04.0	171°41.6	29.3	291°00.3	02.0
15	302°37.3	54°25.3	·· 30.3	38°07.6	·· 04.0	186°44.3	·· 29.4	306°02.8	·· 02.0
16	317°39.8	69°24.4	30.9	53°08.0	04.1	201°47.0	29.4	321°05.2	02.0
17	332°42.3	84°23.6	31.4	68°08.5	04.2	216°49.7	29.5	336°07.6	01.9
18	347°44.7	99°22.7	S21°32.0	83°08.9	S24°04.3	231°52.3	N21°29.5	351°10.0	S04°01.9
19	2°47.2	114°21.8	32.5	98°09.3	04.4	246°55.0	29.5	6°12.5	01.9
20	17°49.7	129°21.0	33.1	113°09.7	04.5	261°57.7	29.6	21°14.9	01.9
21	32°52.1	144°20.1	·· 33.6	128°10.1	·· 04.6	277°00.4	·· 29.6	36°17.3	·· 01.8
22	47°54.6	159°19.2	34.2	143°10.6	04.7	292°03.1	29.7	51°19.7	01.8
23	62°57.1	174°18.4	34.7	158°11.0	04.8	307°05.8	29.7	66°22.2	01.8
Mer.pass.	18:49	ν -0.9′	d -0.6′	m -3.90	ν 0.4′	d -0.1′	m 1.27	ν 2.7′	d 0.0′	m -2.58	ν 2.4′	d 0.0′	m 0.94

Stars	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.2	-42°10.1
Schedar	349°29.9	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°11.5	89°22.6
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.2
Capella	280°20.3	46°01.4
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.4
Sirius	258°25.3	-16°45.0
Adhara	255°04.9	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.0	-59°35.3
Suhail	222°45.5	-43°32.0
Miaplacidus	221°37.7	-69°49.1
Alphard	217°46.9	-8°46.2
Regulus	207°33.6	11°50.4
Dubhe	193°40.1	61°36.4
Denebola	182°24.3	14°25.5
Gienah	175°42.9	-17°41.1
Acrux	172°59.5	-63°14.3
Gacrux	171°51.1	-57°15.2
Alioth	166°12.6	55°48.9
Spica	158°21.7	-11°17.7
Alkaid	152°51.8	49°10.8
Hadar	148°35.4	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.5	19°02.8
Rigil Kent.	139°39.8	-60°56.4
Kochab	137°20.8	74°02.7
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.5	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.4	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.2
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°04.9	-56°39.3
Deneb	49°25.6	45°22.6
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 06 Sat	SHA	Mer.pass
Venus	115°16.7	11:19
Mars	97°38.9	12:29
Jupiter	243°53.4	02:44
Saturn	3°27.6	18:43

Dec 07 Sun	SHA	Mer.pass
Venus	113°57.4	11:21
Mars	96°50.0	12:28
Jupiter	243°58.4	02:40
Saturn	3°26.8	18:39

Dec 08 Mon	SHA	Mer.pass
Venus	112°37.8	11:22
Mars	96°01.0	12:28
Jupiter	244°03.6	02:35
Saturn	3°26.0	18:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°16.4	S22°29.5	346°23.6	0.7′	N28°15.3	0.6′	61.0′
1	197°16.2	29.8	0°43.2	0.7′	28°14.7	0.9′	60.9′
2	212°15.9	30.1	15°02.9	0.7′	28°13.8	1.0′	60.9′
3	227°15.6	·· 30.4	29°22.7	0.8′	28°12.8	1.3′	60.9′
4	242°15.4	30.7	43°42.5	0.9′	28°11.5	1.5′	60.9′
5	257°15.1	31.0	58°02.3	0.9′	28°10.0	1.7′	60.8′
6	272°14.8	S22°31.3	72°22.2	1.0′	N28°08.3	2.0′	60.8′
7	287°14.6	31.6	86°42.2	1.0′	28°06.3	2.1′	60.8′
8	302°14.3	31.9	101°02.2	1.1′	28°04.2	2.4′	60.8′
9	317°14.1	·· 32.2	115°22.3	1.2′	28°01.8	2.6′	60.7′
10	332°13.8	32.5	129°42.5	1.2′	27°59.2	2.8′	60.7′
11	347°13.5	32.8	144°02.7	1.3′	27°56.4	3.0′	60.7′
12	2°13.3	S22°33.1	158°23.0	1.4′	N27°53.4	3.2′	60.7′
13	17°13.0	33.3	172°43.4	1.5′	27°50.2	3.5′	60.6′
14	32°12.7	33.6	187°03.9	1.6′	27°46.7	3.6′	60.6′
15	47°12.5	·· 33.9	201°24.5	1.7′	27°43.1	3.8′	60.6′
16	62°12.2	34.2	215°45.1	1.7′	27°39.3	4.1′	60.6′
17	77°11.9	34.5	230°05.9	1.8′	27°35.2	4.3′	60.5′
18	92°11.7	S22°34.8	244°26.7	1.9′	N27°30.9	4.4′	60.5′
19	107°11.4	35.1	258°47.7	2.0′	27°26.5	4.7′	60.5′
20	122°11.1	35.4	273°08.7	2.1′	27°21.8	4.8′	60.4′
21	137°10.9	·· 35.6	287°29.8	2.2′	27°17.0	5.1′	60.4′
22	152°10.6	35.9	301°51.1	2.4′	27°11.9	5.2′	60.4′
23	167°10.3	36.2	316°12.4	2.5′	27°06.7	5.5′	60.3′
	SD = 16.2′	d = -0.3′	SD = 16.6′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°10.1	S22°36.5	330°33.9	2.6′	N27°01.2	5.6′	60.3′
1	197°09.8	36.8	344°55.5	2.7′	26°55.6	5.8′	60.3′
2	212°09.5	37.0	359°17.2	2.8′	26°49.8	6.0′	60.3′
3	227°09.3	·· 37.3	13°39.0	2.9′	26°43.8	6.2′	60.2′
4	242°09.0	37.6	28°00.9	3.1′	26°37.6	6.4′	60.2′
5	257°08.7	37.9	42°23.0	3.2′	26°31.2	6.6′	60.2′
6	272°08.5	S22°38.2	56°45.1	3.3′	N26°24.6	6.7′	60.1′
7	287°08.2	38.4	71°07.4	3.4′	26°17.9	6.9′	60.1′
8	302°07.9	38.7	85°29.9	3.6′	26°11.0	7.1′	60.1′
9	317°07.7	·· 39.0	99°52.4	3.7′	26°03.9	7.3′	60.0′
10	332°07.4	39.2	114°15.1	3.8′	25°56.6	7.5′	60.0′
11	347°07.1	39.5	128°37.9	4.0′	25°49.1	7.6′	59.9′
12	2°06.8	S22°39.8	143°00.9	4.1′	N25°41.5	7.7′	59.9′
13	17°06.6	40.1	157°24.0	4.2′	25°33.8	8.0′	59.9′
14	32°06.3	40.3	171°47.2	4.4′	25°25.8	8.1′	59.8′
15	47°06.0	·· 40.6	186°10.6	4.5′	25°17.7	8.3′	59.8′
16	62°05.8	40.9	200°34.1	4.6′	25°09.4	8.4′	59.8′
17	77°05.5	41.1	214°57.7	4.8′	25°01.0	8.6′	59.7′
18	92°05.2	S22°41.4	229°21.5	4.9′	N24°52.4	8.7′	59.7′
19	107°05.0	41.7	243°45.4	5.1′	24°43.7	8.9′	59.7′
20	122°04.7	41.9	258°09.4	5.2′	24°34.8	9.1′	59.6′
21	137°04.4	·· 42.2	272°33.6	5.3′	24°25.7	9.1′	59.6′
22	152°04.1	42.5	286°58.0	5.5′	24°16.6	9.4′	59.5′
23	167°03.9	42.7	301°22.5	5.6′	24°07.2	9.5′	59.5′
	SD = 16.2′	d = -0.3′	SD = 16.4′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°03.6	S22°43.0	315°47.1	5.8′	N23°57.7	9.6′	59.5′
1	197°03.3	43.3	330°11.9	5.9′	23°48.1	9.7′	59.4′
2	212°03.0	43.5	344°36.8	6.1′	23°38.4	9.9′	59.4′
3	227°02.8	·· 43.8	359°01.9	6.2′	23°28.5	10.1′	59.4′
4	242°02.5	44.0	13°27.1	6.4′	23°18.4	10.1′	59.3′
5	257°02.2	44.3	27°52.5	6.5′	23°08.3	10.3′	59.3′
6	272°02.0	S22°44.6	42°18.0	6.7′	N22°58.0	10.4′	59.2′
7	287°01.7	44.8	56°43.7	6.8′	22°47.6	10.6′	59.2′
8	302°01.4	45.1	71°09.5	6.9′	22°37.0	10.6′	59.2′
9	317°01.1	·· 45.3	85°35.4	7.1′	22°26.4	10.8′	59.1′
10	332°00.9	45.6	100°01.5	7.2′	22°15.6	10.9′	59.1′
11	347°00.6	45.8	114°27.7	7.4′	22°04.7	11.1′	59.0′
12	2°00.3	S22°46.1	128°54.1	7.5′	N21°53.6	11.1′	59.0′
13	17°00.0	46.3	143°20.7	7.7′	21°42.5	11.3′	59.0′
14	31°59.8	46.6	157°47.3	7.8′	21°31.2	11.3′	58.9′
15	46°59.5	·· 46.8	172°14.2	8.0′	21°19.9	11.5′	58.9′
16	61°59.2	47.1	186°41.1	8.1′	21°08.4	11.6′	58.8′
17	76°58.9	47.3	201°08.2	8.3′	20°56.8	11.7′	58.8′
18	91°58.7	S22°47.6	215°35.5	8.4′	N20°45.1	11.8′	58.8′
19	106°58.4	47.8	230°02.9	8.5′	20°33.3	11.8′	58.7′
20	121°58.1	48.1	244°30.4	8.7′	20°21.5	12.0′	58.7′
21	136°57.8	·· 48.3	258°58.1	8.8′	20°09.5	12.1′	58.6′
22	151°57.5	48.6	273°25.9	9.0′	19°57.4	12.2′	58.6′
23	166°57.3	48.8	287°53.9	9.1′	19°45.2	12.2′	58.5′
	SD = 16.2′	d = -0.3′	SD = 16.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:06	10:18	▬	▬	13:24	15:36
N 70°	07:48	09:30	▬	▬	14:13	15:54
68°	07:34	08:59	11:21	12:21	14:43	16:09
66°	07:22	08:36	10:08	13:35	15:06	16:21
64°	07:11	08:18	09:32	14:11	15:25	16:31
62°	07:02	08:03	09:06	14:36	15:40	16:40
60°	06:55	07:50	08:46	14:56	15:52	16:48
N 58°	06:48	07:39	08:30	15:13	16:03	16:55
56°	06:41	07:30	08:16	15:27	16:13	17:02
54°	06:35	07:21	08:04	15:39	16:22	17:07
52°	06:30	07:13	07:54	15:49	16:29	17:13
50°	06:25	07:06	07:44	15:59	16:36	17:18
45°	06:14	06:51	07:24	16:18	16:52	17:29
N 40°	06:04	06:38	07:08	16:34	17:05	17:39
35°	05:55	06:27	06:55	16:48	17:16	17:48
30°	05:47	06:17	06:43	17:00	17:26	17:56
20°	05:31	05:59	06:22	17:21	17:44	18:12
N 10°	05:16	05:42	06:05	17:38	18:01	18:27
0°	04:59	05:25	05:48	17:55	18:18	18:44
S 10°	04:41	05:08	05:31	18:12	18:35	19:02
20°	04:19	04:48	05:13	18:31	18:55	19:24
30°	03:51	04:24	04:51	18:52	19:19	19:52
35°	03:33	04:10	04:39	19:04	19:34	20:10
40°	03:11	03:52	04:24	19:19	19:51	20:32
45°	02:42	03:30	04:07	19:36	20:13	21:02
S 50°	02:00	03:02	03:46	19:58	20:41	21:44
52°	01:35	02:48	03:35	20:08	20:56	22:09
54°	00:59	02:31	03:24	20:20	21:13	22:46
56°	–:–	02:11	03:10	20:33	21:33	–:–
58°	–:–	01:45	02:55	20:49	22:00	–:–
S 60°	–:–	01:06	02:36	21:08	22:40	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▭	▭	▭	▭	▭	▭
N 70°	▭	▭	▭	▭	▭	▭
68°	▭	▭	16:54	▭	▭	14:28
66°	▭	▭	17:46	▭	▭	13:36
64°	▭	15:44	18:17	▭	13:36	13:03
62°	14:15	16:36	18:41	12:51	12:44	12:39
60°	15:17	17:07	18:59	11:48	12:11	12:19
N 58°	15:51	17:31	19:15	11:14	11:47	12:03
56°	16:16	17:50	19:28	10:49	11:28	11:49
54°	16:36	18:06	19:39	10:28	11:11	11:37
52°	16:53	18:19	19:49	10:11	10:57	11:26
50°	17:07	18:31	19:58	09:57	10:45	11:17
45°	17:37	18:56	20:17	09:27	10:19	10:57
N 40°	18:00	19:16	20:32	09:04	09:58	10:40
35°	18:19	19:32	20:45	08:44	09:41	10:26
30°	18:35	19:46	20:56	08:28	09:26	10:14
20°	19:02	20:10	21:15	08:00	09:01	09:53
N 10°	19:26	20:31	21:31	07:36	08:39	09:35
0°	19:48	20:50	21:46	07:13	08:18	09:18
S 10°	20:10	21:09	22:02	06:50	07:57	09:00
20°	20:33	21:30	22:18	06:26	07:35	08:42
30°	21:00	21:53	22:36	05:58	07:09	08:20
35°	21:16	22:07	22:47	05:41	06:53	08:07
40°	21:35	22:23	22:59	05:21	06:35	07:52
45°	21:57	22:41	23:14	04:57	06:13	07:35
S 50°	22:26	23:05	23:31	04:26	05:46	07:12
52°	22:40	23:16	23:39	04:11	05:32	07:02
54°	22:56	23:29	23:49	03:53	05:16	06:50
56°	23:15	23:43	23:59	03:31	04:58	06:36
58°	23:38	·· ··	00:00	03:03	04:35	06:20
S 60°	·· ··	00:09	00:20	02:23	04:04	06:00

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 16-18 98-87%
06	09:06	08:53	11:51	00:57	13:30	
07	08:40	08:27	11:52	02:03	14:34	
08	08:14	08:01	11:52	03:04	15:32	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2643 sec ΔT = TT-UT1 = +68.9197 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°59.5	189°17.5	S21°35.3	173°11.4	S24°04.8	322°08.5	N21°29.8	81°24.6	S04°01.8
1	93°02.0	204°16.6	35.8	188°11.8	04.9	337°11.2	29.8	96°27.0	01.7
2	108°04.5	219°15.8	36.4	203°12.2	05.0	352°13.9	29.9	111°29.4	01.7
3	123°06.9	234°14.9	·· 36.9	218°12.6	·· 05.1	7°16.6	·· 29.9	126°31.9	·· 01.7
4	138°09.4	249°14.0	37.5	233°13.1	05.2	22°19.3	29.9	141°34.3	01.6
5	153°11.8	264°13.2	38.0	248°13.5	05.3	37°21.9	30.0	156°36.7	01.6
6	168°14.3	279°12.3	S21°38.6	263°13.9	S24°05.4	52°24.6	N21°30.0	171°39.1	S04°01.6
7	183°16.8	294°11.4	39.1	278°14.3	05.4	67°27.3	30.1	186°41.5	01.6
8	198°19.2	309°10.5	39.7	293°14.7	05.5	82°30.0	30.1	201°44.0	01.5
9	213°21.7	324°09.7	·· 40.2	308°15.1	·· 05.6	97°32.7	·· 30.2	216°46.4	·· 01.5
10	228°24.2	339°08.8	40.8	323°15.5	05.7	112°35.4	30.2	231°48.8	01.5
11	243°26.6	354°07.9	41.3	338°16.0	05.8	127°38.1	30.3	246°51.2	01.4
12	258°29.1	9°07.1	S21°41.8	353°16.4	S24°05.9	142°40.8	N21°30.3	261°53.7	S04°01.4
13	273°31.6	24°06.2	42.4	8°16.8	05.9	157°43.5	30.3	276°56.1	01.4
14	288°34.0	39°05.3	42.9	23°17.2	06.0	172°46.2	30.4	291°58.5	01.4
15	303°36.5	54°04.4	·· 43.4	38°17.6	·· 06.1	187°48.9	·· 30.4	307°00.9	·· 01.3
16	318°39.0	69°03.6	44.0	53°18.0	06.2	202°51.6	30.5	322°03.3	01.3
17	333°41.4	84°02.7	44.5	68°18.4	06.3	217°54.3	30.5	337°05.8	01.3
18	348°43.9	99°01.8	S21°45.0	83°18.9	S24°06.3	232°57.0	N21°30.6	352°08.2	S04°01.2
19	3°46.3	114°00.9	45.6	98°19.3	06.4	247°59.7	30.6	7°10.6	01.2
20	18°48.8	129°00.1	46.1	113°19.7	06.5	263°02.4	30.7	22°13.0	01.2
21	33°51.3	143°59.2	·· 46.6	128°20.1	·· 06.6	278°05.1	·· 30.7	37°15.4	·· 01.2
22	48°53.7	158°58.3	47.2	143°20.5	06.7	293°07.8	30.7	52°17.9	01.1
23	63°56.2	173°57.4	47.7	158°20.9	06.7	308°10.5	30.8	67°20.3	01.1
Mer.pass.	18:45	ν -0.9′	d -0.6′	m -3.90	ν 0.4′	d -0.1′	m 1.26	ν 2.7′	d 0.0′ m -2.58	ν 2.4′	d 0.0′ m 0.94
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°58.7	188°56.6	S21°48.2	173°21.3	S24°06.8	323°13.2	N21°30.8	82°22.7	S04°01.1
1	94°01.1	203°55.7	48.7	188°21.8	06.9	338°15.9	30.9	97°25.1	01.0
2	109°03.6	218°54.8	49.3	203°22.2	07.0	353°18.6	30.9	112°27.5	01.0
3	124°06.1	233°53.9	·· 49.8	218°22.6	·· 07.0	8°21.3	·· 31.0	127°29.9	·· 01.0
4	139°08.5	248°53.0	50.3	233°23.0	07.1	23°24.0	31.0	142°32.4	01.0
5	154°11.0	263°52.2	50.8	248°23.4	07.2	38°26.7	31.1	157°34.8	00.9
6	169°13.5	278°51.3	S21°51.3	263°23.8	S24°07.3	53°29.4	N21°31.1	172°37.2	S04°00.9
7	184°15.9	293°50.4	51.9	278°24.2	07.3	68°32.1	31.1	187°39.6	00.9
8	199°18.4	308°49.5	52.4	293°24.6	07.4	83°34.8	31.2	202°42.0	00.8
9	214°20.8	323°48.6	·· 52.9	308°25.1	·· 07.5	98°37.5	·· 31.2	217°44.5	·· 00.8
10	229°23.3	338°47.8	53.4	323°25.5	07.5	113°40.2	31.3	232°46.9	00.8
11	244°25.8	353°46.9	53.9	338°25.9	07.6	128°42.9	31.3	247°49.3	00.7
12	259°28.2	8°46.0	S21°54.4	353°26.3	S24°07.7	143°45.6	N21°31.4	262°51.7	S04°00.7
13	274°30.7	23°45.1	54.9	8°26.7	07.8	158°48.3	31.4	277°54.1	00.7
14	289°33.2	38°44.2	55.4	23°27.1	07.8	173°51.0	31.5	292°56.5	00.7
15	304°35.6	53°43.3	·· 56.0	38°27.5	·· 07.9	188°53.7	·· 31.5	307°59.0	·· 00.6
16	319°38.1	68°42.5	56.5	53°27.9	08.0	203°56.4	31.6	323°01.4	00.6
17	334°40.6	83°41.6	57.0	68°28.3	08.0	218°59.1	31.6	338°03.8	00.6
18	349°43.0	98°40.7	S21°57.5	83°28.8	S24°08.1	234°01.8	N21°31.6	353°06.2	S04°00.5
19	4°45.5	113°39.8	58.0	98°29.2	08.2	249°04.5	31.7	8°08.6	00.5
20	19°47.9	128°38.9	58.5	113°29.6	08.2	264°07.2	31.7	23°11.0	00.5
21	34°50.4	143°38.0	·· 59.0	128°30.0	·· 08.3	279°09.9	·· 31.8	38°13.5	·· 00.4
22	49°52.9	158°37.1	21°59.5	143°30.4	08.4	294°12.6	31.8	53°15.9	00.4
23	64°55.3	173°36.3	22°00.0	158°30.8	08.4	309°15.3	31.9	68°18.3	00.4
Mer.pass.	18:41	ν -0.9′	d -0.5′	m -3.90	ν 0.4′	d -0.1′	m 1.25	ν 2.7′	d 0.0′ m -2.59	ν 2.4′	d 0.0′ m 0.95
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	79°57.8	188°35.4	S22°00.5	173°31.2	S24°08.5	324°18.0	N21°31.9	83°20.7	S04°00.3
1	95°00.3	203°34.5	01.0	188°31.6	08.6	339°20.7	32.0	98°23.1	00.3
2	110°02.7	218°33.6	01.5	203°32.0	08.6	354°23.4	32.0	113°25.5	00.3
3	125°05.2	233°32.7	·· 02.0	218°32.4	·· 08.7	9°26.1	·· 32.1	128°27.9	·· 00.3
4	140°07.7	248°31.8	02.5	233°32.9	08.8	24°28.8	32.1	143°30.4	00.2
5	155°10.1	263°30.9	02.9	248°33.3	08.8	39°31.6	32.2	158°32.8	00.2
6	170°12.6	278°30.0	S22°03.4	263°33.7	S24°08.9	54°34.3	N21°32.2	173°35.2	S04°00.2
7	185°15.1	293°29.1	03.9	278°34.1	09.0	69°37.0	32.2	188°37.6	00.1
8	200°17.5	308°28.3	04.4	293°34.5	09.0	84°39.7	32.3	203°40.0	00.1
9	215°20.0	323°27.4	·· 04.9	308°34.9	·· 09.1	99°42.4	·· 32.3	218°42.4	·· 00.1
10	230°22.4	338°26.5	05.4	323°35.3	09.1	114°45.1	32.4	233°44.8	00.0
11	245°24.9	353°25.6	05.9	338°35.7	09.2	129°47.8	32.4	248°47.3	00.0
12	260°27.4	8°24.7	S22°06.4	353°36.1	S24°09.3	144°50.5	N21°32.5	263°49.7	S04°00.0
13	275°29.8	23°23.8	06.8	8°36.5	09.3	159°53.2	32.5	278°52.1	03°59.9
14	290°32.3	38°22.9	07.3	23°36.9	09.4	174°55.9	32.6	293°54.5	59.9
15	305°34.8	53°22.0	·· 07.8	38°37.4	·· 09.4	189°58.6	·· 32.6	308°56.9	·· 59.9
16	320°37.2	68°21.1	08.3	53°37.8	09.5	205°01.4	32.7	323°59.3	59.8
17	335°39.7	83°20.2	08.8	68°38.2	09.6	220°04.1	32.7	339°01.7	59.8
18	350°42.2	98°19.3	S22°09.3	83°38.6	S24°09.6	235°06.8	N21°32.8	354°04.1	S03°59.8
19	5°44.6	113°18.4	09.7	98°39.0	09.7	250°09.5	32.8	9°06.6	59.7
20	20°47.1	128°17.5	10.2	113°39.4	09.7	265°12.2	32.9	24°09.0	59.7
21	35°49.6	143°16.6	·· 10.7	128°39.8	·· 09.8	280°14.9	·· 32.9	39°11.4	·· 59.7
22	50°52.0	158°15.7	11.1	143°40.2	09.8	295°17.6	32.9	54°13.8	59.6
23	65°54.5	173°14.8	11.6	158°40.6	09.9	310°20.3	33.0	69°16.2	59.6
Mer.pass.	18:37	ν -0.9′	d -0.5′	m -3.90	ν 0.4′	d -0.1′	m 1.25	ν 2.7′	d 0.0′ m -2.60	ν 2.4′	d 0.0′ m 0.95

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.0	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.2	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°12.0	89°22.6
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.3
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.2
Capella	280°20.3	46°01.4
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.4
Sirius	258°25.2	-16°45.0
Adhara	255°04.9	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.0	-59°35.3
Suhail	222°45.5	-43°32.0
Miaplacidus	221°37.6	-69°49.1
Alphard	217°46.9	-8°46.2
Regulus	207°33.5	11°50.4
Dubhe	193°40.0	61°36.3
Denebola	182°24.2	14°25.5
Gienah	175°42.9	-17°41.1
Acrux	172°59.5	-63°14.3
Gacrux	171°51.0	-57°15.2
Alioth	166°12.5	55°48.9
Spica	158°21.7	-11°17.8
Alkaid	152°51.7	49°10.8
Hadar	148°35.4	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.5	19°02.7
Rigil Kent.	139°39.8	-60°56.4
Kochab	137°20.8	74°02.7
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.4	26°37.6
Antares	112°15.3	-26°29.3
Atria	107°09.4	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.1
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°05.0	-56°39.3
Deneb	49°25.6	45°22.6
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 09 Tue	SHA	Mer.pass
Venus	111°18.0	11:23
Mars	95°11.9	12:27
Jupiter	244°09.0	02:31
Saturn	3°25.1	18:31

Dec 10 Wed	SHA	Mer.pass
Venus	109°57.9	11:25
Mars	94°22.7	12:26
Jupiter	244°14.5	02:27
Saturn	3°24.0	18:28

Dec 11 Thu	SHA	Mer.pass
Venus	108°37.6	11:26
Mars	93°33.4	12:26
Jupiter	244°20.2	02:22
Saturn	3°22.9	18:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun		Moon				
h							
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°57.0	S22°49.1	302°22.0	9.2′	N19°33.0	12.4′	58.5′
1	196°56.7	49.3	316°50.2	9.4′	19°20.6	12.4′	58.5′
2	211°56.4	49.6	331°18.6	9.5′	19°08.2	12.6′	58.4′
3	226°56.2	·· 49.8	345°47.1	9.6′	18°55.6	12.6′	58.4′
4	241°55.9	50.0	0°15.7	9.8′	18°43.0	12.7′	58.3′
5	256°55.6	50.3	14°44.5	9.9′	18°30.3	12.8′	58.3′
6	271°55.3	S22°50.5	29°13.4	10.0′	N18°17.5	12.8′	58.3′
7	286°55.0	50.8	43°42.5	10.2′	18°04.7	12.9′	58.2′
8	301°54.8	51.0	58°11.6	10.3′	17°51.8	13.1′	58.2′
9	316°54.5	·· 51.2	72°40.9	10.4′	17°38.7	13.0′	58.1′
10	331°54.2	51.5	87°10.4	10.6′	17°25.7	13.2′	58.1′
11	346°53.9	51.7	101°39.9	10.7′	17°12.5	13.2′	58.1′
12	1°53.6	S22°51.9	116°09.6	10.8′	N16°59.3	13.3′	58.0′
13	16°53.4	52.2	130°39.4	10.9′	16°46.0	13.3′	58.0′
14	31°53.1	52.4	145°09.4	11.1′	16°32.7	13.5′	57.9′
15	46°52.8	·· 52.6	159°39.4	11.2′	16°19.2	13.4′	57.9′
16	61°52.5	52.9	174°09.6	11.3′	16°05.8	13.6′	57.8′
17	76°52.2	53.1	188°39.9	11.4′	15°52.2	13.6′	57.8′
18	91°52.0	S22°53.3	203°10.3	11.5′	N15°38.6	13.6′	57.8′
19	106°51.7	53.6	217°40.9	11.7′	15°25.0	13.7′	57.7′
20	121°51.4	53.8	232°11.5	11.8′	15°11.3	13.8′	57.7′
21	136°51.1	·· 54.0	246°42.3	11.9′	14°57.5	13.8′	57.6′
22	151°50.8	54.2	261°13.2	12.0′	14°43.7	13.9′	57.6′
23	166°50.6	54.5	275°44.2	12.1′	14°29.8	13.9′	57.6′
	SD = 16.2′	d = -0.2′	SD = 16.0′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°50.3	S22°54.7	290°15.3	12.2′	N14°15.9	14.0′	57.5′
1	196°50.0	54.9	304°46.6	12.3′	14°01.9	14.0′	57.5′
2	211°49.7	55.1	319°17.9	12.4′	13°47.9	14.0′	57.4′
3	226°49.4	·· 55.4	333°49.3	12.5′	13°33.9	14.1′	57.4′
4	241°49.1	55.6	348°20.9	12.7′	13°19.8	14.2′	57.4′
5	256°48.9	55.8	2°52.5	12.8′	13°05.6	14.2′	57.3′
6	271°48.6	S22°56.0	17°24.3	12.9′	N12°51.4	14.2′	57.3′
7	286°48.3	56.2	31°56.1	13.0′	12°37.2	14.3′	57.2′
8	301°48.0	56.5	46°28.1	13.1′	12°22.9	14.3′	57.2′
9	316°47.7	·· 56.7	61°00.1	13.2′	12°08.6	14.3′	57.2′
10	331°47.4	56.9	75°32.3	13.2′	11°54.3	14.4′	57.1′
11	346°47.2	57.1	90°04.5	13.3′	11°39.9	14.4′	57.1′
12	1°46.9	S22°57.3	104°36.9	13.4′	N11°25.5	14.4′	57.1′
13	16°46.6	57.6	119°09.3	13.5′	11°11.1	14.4′	57.0′
14	31°46.3	57.8	133°41.9	13.6′	10°56.7	14.5′	57.0′
15	46°46.0	·· 58.0	148°14.5	13.7′	10°42.2	14.5′	56.9′
16	61°45.7	58.2	162°47.2	13.8′	10°27.7	14.6′	56.9′
17	76°45.5	58.4	177°20.0	13.9′	10°13.1	14.6′	56.9′
18	91°45.2	S22°58.6	191°52.9	14.0′	N09°58.5	14.5′	56.8′
19	106°44.9	58.8	206°25.8	14.0′	09°44.0	14.7′	56.8′
20	121°44.6	59.0	220°58.9	14.1′	09°29.3	14.6′	56.7′
21	136°44.3	·· 59.2	235°32.0	14.2′	09°14.7	14.6′	56.7′
22	151°44.0	59.5	250°05.2	14.3′	09°00.1	14.7′	56.7′
23	166°43.7	59.7	264°38.5	14.4′	08°45.4	14.7′	56.6′
	SD = 16.2′	d = -0.2′	SD = 15.7′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°43.5	S22°59.9	279°11.9	14.4′	N08°30.7	14.7′	56.6′
1	196°43.2	23°00.1	293°45.3	14.5′	08°16.0	14.7′	56.6′
2	211°42.9	00.3	308°18.8	14.6′	08°01.3	14.8′	56.5′
3	226°42.6	·· 00.5	322°52.4	14.7′	07°46.5	14.7′	56.5′
4	241°42.3	00.7	337°26.1	14.7′	07°31.8	14.8′	56.5′
5	256°42.0	00.9	351°59.8	14.8′	07°17.0	14.7′	56.4′
6	271°41.7	S23°01.1	6°33.6	14.9′	N07°02.3	14.8′	56.4′
7	286°41.4	01.3	21°07.4	14.9′	06°47.5	14.8′	56.3′
8	301°41.2	01.5	35°41.4	15.0′	06°32.7	14.8′	56.3′
9	316°40.9	·· 01.7	50°15.4	15.1′	06°17.9	14.8′	56.3′
10	331°40.6	01.9	64°49.4	15.1′	06°03.1	14.8′	56.2′
11	346°40.3	02.1	79°23.5	15.2′	05°48.3	14.8′	56.2′
12	1°40.0	S23°02.3	93°57.7	15.2′	N05°33.5	14.9′	56.2′
13	16°39.7	02.5	108°32.0	15.3′	05°18.6	14.8′	56.1′
14	31°39.4	02.7	123°06.2	15.3′	05°03.8	14.8′	56.1′
15	46°39.1	·· 02.9	137°40.6	15.4′	04°49.0	14.9′	56.1′
16	61°38.8	03.1	152°15.0	15.5′	04°34.1	14.8′	56.0′
17	76°38.6	03.3	166°49.5	15.5′	04°19.3	14.8′	56.0′
18	91°38.3	S23°03.4	181°24.0	15.6′	N04°04.5	14.8′	56.0′
19	106°38.0	03.6	195°58.5	15.6′	03°49.7	14.9′	55.9′
20	121°37.7	03.8	210°33.1	15.7′	03°34.8	14.8′	55.9′
21	136°37.4	·· 04.0	225°07.8	15.7′	03°20.0	14.8′	55.9′
22	151°37.1	04.2	239°42.5	15.7′	03°05.2	14.8′	55.8′
23	166°36.8	04.4	254°17.2	15.8′	02°50.4	14.8′	55.8′
	SD = 16.2′	d = -0.2′	SD = 15.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:12	10:30	▬	▬	13:15	15:33
N 70°	07:54	09:38	▬	▬	14:08	15:52
68°	07:38	09:05	▬	▬	14:40	16:07
66°	07:26	08:42	10:16	13:29	15:04	16:19
64°	07:15	08:23	09:38	14:07	15:23	16:30
62°	07:06	08:07	09:12	14:34	15:38	16:39
60°	06:58	07:54	08:51	14:54	15:51	16:47
N 58°	06:51	07:43	08:34	15:11	16:02	16:54
56°	06:44	07:33	08:20	15:25	16:12	17:01
54°	06:39	07:24	08:08	15:38	16:21	17:07
52°	06:33	07:17	07:57	15:48	16:29	17:12
50°	06:28	07:09	07:48	15:58	16:36	17:18
45°	06:17	06:54	07:27	16:18	16:52	17:29
N 40°	06:07	06:41	07:11	16:35	17:05	17:39
35°	05:58	06:29	06:57	16:48	17:17	17:48
30°	05:49	06:19	06:45	17:01	17:27	17:57
20°	05:33	06:00	06:24	17:21	17:45	18:13
N 10°	05:17	05:43	06:06	17:40	18:02	18:29
0°	05:01	05:27	05:49	17:57	18:19	18:45
S 10°	04:42	05:09	05:32	18:14	18:37	19:04
20°	04:20	04:49	05:13	18:32	18:57	19:26
30°	03:51	04:25	04:52	18:54	19:21	19:55
35°	03:33	04:10	04:39	19:07	19:36	20:13
40°	03:11	03:52	04:25	19:21	19:54	20:35
45°	02:41	03:30	04:07	19:39	20:16	21:05
S 50°	01:58	03:01	03:45	20:01	20:45	21:49
52°	01:32	02:47	03:35	20:12	21:00	22:15
54°	00:53	02:29	03:23	20:24	21:17	22:55
56°	–:–	02:08	03:09	20:37	21:38	–:–
58°	–:–	01:41	02:53	20:54	22:06	–:–
S 60°	–:–	00:58	02:33	21:13	22:50	–:–

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	18:37	21:21	23:32	14:36	13:30	12:51
N 70°	19:16	21:36	23:35	13:56	13:13	12:44
68°	19:43	21:48	23:38	13:27	12:59	12:38
66°	20:03	21:57	23:41	13:06	12:48	12:33
64°	20:19	22:05	23:43	12:48	12:38	12:29
62°	20:32	22:12	23:45	12:34	12:30	12:25
60°	20:43	22:18	23:47	12:22	12:22	12:22
N 58°	20:53	22:23	23:48	12:11	12:16	12:19
56°	21:01	22:28	23:49	12:02	12:10	12:17
54°	21:08	22:32	23:50	11:54	12:05	12:14
52°	21:15	22:35	23:52	11:46	12:01	12:12
50°	21:21	22:39	23:52	11:40	11:56	12:10
45°	21:34	22:46	23:55	11:25	11:47	12:06
N 40°	21:44	22:52	23:56	11:13	11:40	12:02
35°	21:53	22:57	23:58	11:03	11:33	11:59
30°	22:01	23:02	23:59	10:54	11:27	11:56
20°	22:14	23:09	·· ··	10:38	11:17	11:52
N 10°	22:26	23:16	·· ··	10:24	11:08	11:47
0°	22:37	23:23	·· ··	10:11	10:59	11:43
S 10°	22:48	23:29	·· ··	09:58	10:51	11:39
20°	22:59	23:36	·· ··	09:44	10:41	11:35
30°	23:12	23:43	·· ··	09:27	10:31	11:30
35°	23:20	23:48	·· ··	09:18	10:24	11:27
40°	23:28	23:53	·· ··	09:07	10:17	11:23
45°	23:38	23:58	·· ··	08:54	10:09	11:19
S 50°	23:50	·· ··	00:05	08:38	09:59	11:15
52°	23:56	·· ··	00:08	08:30	09:54	11:12
54°	·· ··	00:02	00:12	08:22	09:49	11:10
56°	·· ··	00:09	00:15	08:13	09:43	11:07
58°	00:10	00:16	00:20	08:02	09:37	11:04
S 60°	00:24	00:25	00:24	07:49	09:29	11:01

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 19-21 78-59%
09	07:48	07:35	11:52	03:59	16:24	
10	07:21	07:08	11:53	04:48	17:11	
11	06:54	06:40	11:53	05:33	17:54	

No IERS EOP prediction data available

December 12, 13, 14 UT (Fri., Sat., Sun.)

DUT1 = UT1-UTC = +0.2650 sec ΔT = TT-UT1 = +68.9190 sec

2025 December 12 to Dec. 14 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	80°56.9	188°13.9	S22°12.1	173°41.0	S24°10.0	325°23.0	N21°33.0	84°18.6	S03°59.6
1	95°59.4	203°13.1	12.6	188°41.4	10.0	340°25.8	33.1	99°21.0	59.5
2	111°01.9	218°12.2	13.0	203°41.8	10.1	355°28.5	33.1	114°23.4	59.5
3	126°04.3	233°11.3	·· 13.5	218°42.2	·· 10.1	10°31.2	·· 33.2	129°25.8	·· 59.5
4	141°06.8	248°10.4	14.0	233°42.6	10.2	25°33.9	33.2	144°28.3	59.4
5	156°09.3	263°09.5	14.4	248°43.0	10.2	40°36.6	33.3	159°30.7	59.4
6	171°11.7	278°08.6	S22°14.9	263°43.5	S24°10.3	55°39.3	N21°33.3	174°33.1	S03°59.4
7	186°14.2	293°07.7	15.4	278°43.9	10.3	70°42.0	33.4	189°35.5	59.3
8	201°16.7	308°06.8	15.8	293°44.3	10.4	85°44.8	33.4	204°37.9	59.3
9	216°19.1	323°05.9	·· 16.3	308°44.7	·· 10.4	100°47.5	·· 33.5	219°40.3	·· 59.3
10	231°21.6	338°05.0	16.7	323°45.1	10.5	115°50.2	33.5	234°42.7	59.2
11	246°24.0	353°04.1	17.2	338°45.5	10.5	130°52.9	33.6	249°45.1	59.2
12	261°26.5	8°03.2	S22°17.7	353°45.9	S24°10.6	145°55.6	N21°33.6	264°47.5	S03°59.2
13	276°29.0	23°02.3	18.1	8°46.3	10.6	160°58.3	33.7	279°49.9	59.1
14	291°31.4	38°01.4	18.6	23°46.7	10.7	176°01.1	33.7	294°52.3	59.1
15	306°33.9	53°00.4	·· 19.0	38°47.1	·· 10.7	191°03.8	·· 33.7	309°54.8	·· 59.1
16	321°36.4	67°59.5	19.5	53°47.5	10.8	206°06.5	33.8	324°57.2	59.0
17	336°38.8	82°58.6	19.9	68°47.9	10.8	221°09.2	33.8	339°59.6	59.0
18	351°41.3	97°57.7	S22°20.4	83°48.3	S24°10.9	236°11.9	N21°33.9	355°02.0	S03°59.0
19	6°43.8	112°56.8	20.8	98°48.7	10.9	251°14.6	33.9	10°04.4	58.9
20	21°46.2	127°55.9	21.3	113°49.1	11.0	266°17.4	34.0	25°06.8	58.9
21	36°48.7	142°55.0	·· 21.7	128°49.5	·· 11.0	281°20.1	·· 34.0	40°09.2	·· 58.9
22	51°51.2	157°54.1	22.2	143°49.9	11.1	296°22.8	34.1	55°11.6	58.8
23	66°53.6	172°53.2	22.6	158°50.3	11.1	311°25.5	34.1	70°14.0	58.8
Mer.pass.	18:33	ν -0.9′	d -0.5′	m -3.90	ν 0.4′	d -0.1′	m 1.24	ν 2.7′	d 0.0′	m -2.60	ν 2.4′	d 0.0′	m 0.95

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	81°56.1	187°52.3	S22°23.0	173°50.7	S24°11.1	326°28.2	N21°34.2	85°16.4	S03°58.8
1	96°58.5	202°51.4	23.5	188°51.1	11.2	341°31.0	34.2	100°18.8	58.7
2	112°01.0	217°50.5	23.9	203°51.5	11.2	356°33.7	34.3	115°21.2	58.7
3	127°03.5	232°49.6	·· 24.4	218°52.0	·· 11.3	11°36.4	·· 34.3	130°23.6	·· 58.7
4	142°05.9	247°48.7	24.8	233°52.4	11.3	26°39.1	34.4	145°26.1	58.6
5	157°08.4	262°47.8	25.2	248°52.8	11.4	41°41.8	34.4	160°28.5	58.6
6	172°10.9	277°46.9	S22°25.7	263°53.2	S24°11.4	56°44.6	N21°34.5	175°30.9	S03°58.6
7	187°13.3	292°46.0	26.1	278°53.6	11.4	71°47.3	34.5	190°33.3	58.5
8	202°15.8	307°45.0	26.6	293°54.0	11.5	86°50.0	34.6	205°35.7	58.5
9	217°18.3	322°44.1	·· 27.0	308°54.4	·· 11.5	101°52.7	·· 34.6	220°38.1	·· 58.5
10	232°20.7	337°43.2	27.4	323°54.8	11.6	116°55.4	34.7	235°40.5	58.4
11	247°23.2	352°42.3	27.8	338°55.2	11.6	131°58.2	34.7	250°42.9	58.4
12	262°25.6	7°41.4	S22°28.3	353°55.6	S24°11.6	147°00.9	N21°34.8	265°45.3	S03°58.4
13	277°28.1	22°40.5	28.7	8°56.0	11.7	162°03.6	34.8	280°47.7	58.3
14	292°30.6	37°39.6	29.1	23°56.4	11.7	177°06.3	34.8	295°50.1	58.3
15	307°33.0	52°38.7	·· 29.6	38°56.8	·· 11.8	192°09.1	·· 34.9	310°52.5	·· 58.2
16	322°35.5	67°37.8	30.0	53°57.2	11.8	207°11.8	34.9	325°54.9	58.2
17	337°38.0	82°36.8	30.4	68°57.6	11.8	222°14.5	35.0	340°57.3	58.2
18	352°40.4	97°35.9	S22°30.8	83°58.0	S24°11.9	237°17.2	N21°35.0	355°59.7	S03°58.1
19	7°42.9	112°35.0	31.3	98°58.4	11.9	252°20.0	35.1	11°02.1	58.1
20	22°45.4	127°34.1	31.7	113°58.8	11.9	267°22.7	35.1	26°04.5	58.1
21	37°47.8	142°33.2	·· 32.1	128°59.2	·· 12.0	282°25.4	·· 35.2	41°06.9	·· 58.0
22	52°50.3	157°32.3	32.5	143°59.6	12.0	297°28.1	35.2	56°09.3	58.0
23	67°52.8	172°31.4	32.9	159°00.0	12.0	312°30.9	35.3	71°11.7	58.0
Mer.pass.	18:29	ν -0.9′	d -0.4′	m -3.90	ν 0.4′	d -0.0′	m 1.24	ν 2.7′	d 0.0′	m -2.61	ν 2.4′	d 0.0′	m 0.96

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	82°55.2	187°30.5	S22°33.3	174°00.4	S24°12.1	327°33.6	N21°35.3	86°14.1	S03°57.9
1	97°57.7	202°29.5	33.8	189°00.8	12.1	342°36.3	35.4	101°16.5	57.9
2	113°00.1	217°28.6	34.2	204°01.2	12.1	357°39.0	35.4	116°18.9	57.8
3	128°02.6	232°27.7	·· 34.6	219°01.6	·· 12.2	12°41.8	·· 35.5	131°21.3	·· 57.8
4	143°05.1	247°26.8	35.0	234°02.0	12.2	27°44.5	35.5	146°23.7	57.8
5	158°07.5	262°25.9	35.4	249°02.4	12.2	42°47.2	35.6	161°26.2	57.7
6	173°10.0	277°25.0	S22°35.8	264°02.8	S24°12.3	57°49.9	N21°35.6	176°28.6	S03°57.7
7	188°12.5	292°24.0	36.2	279°03.2	12.3	72°52.7	35.7	191°31.0	57.7
8	203°14.9	307°23.1	36.6	294°03.6	12.3	87°55.4	35.7	206°33.4	57.6
9	218°17.4	322°22.2	·· 37.0	309°04.0	·· 12.3	102°58.1	·· 35.8	221°35.8	·· 57.6
10	233°19.9	337°21.3	37.4	324°04.4	12.4	118°00.9	35.8	236°38.2	57.6
11	248°22.3	352°20.4	37.8	339°04.8	12.4	133°03.6	35.9	251°40.6	57.5
12	263°24.8	7°19.5	S22°38.2	354°05.2	S24°12.4	148°06.3	N21°35.9	266°43.0	S03°57.5
13	278°27.3	22°18.5	38.6	9°05.6	12.5	163°09.1	36.0	281°45.4	57.4
14	293°29.7	37°17.6	39.0	24°06.0	12.5	178°11.8	36.0	296°47.8	57.4
15	308°32.2	52°16.7	·· 39.4	39°06.4	·· 12.5	193°14.5	·· 36.1	311°50.2	·· 57.4
16	323°34.6	67°15.8	39.8	54°06.8	12.5	208°17.2	36.1	326°52.6	57.3
17	338°37.1	82°14.9	40.2	69°07.2	12.6	223°20.0	36.2	341°55.0	57.3
18	353°39.6	97°13.9	S22°40.6	84°07.6	S24°12.6	238°22.7	N21°36.2	356°57.4	S03°57.3
19	8°42.0	112°13.0	41.0	99°08.0	12.6	253°25.4	36.3	11°59.8	57.2
20	23°44.5	127°12.1	41.4	114°08.4	12.6	268°28.2	36.3	27°02.2	57.2
21	38°47.0	142°11.2	·· 41.8	129°08.8	·· 12.7	283°30.9	·· 36.4	42°04.6	·· 57.1
22	53°49.4	157°10.2	42.2	144°09.2	12.7	298°33.6	36.4	57°07.0	57.1
23	68°51.9	172°09.3	42.6	159°09.6	12.7	313°36.4	36.5	72°09.4	57.1
Mer.pass.	18:25	ν -0.9′	d -0.4′	m -3.90	ν 0.4′	d -0.0′	m 1.23	ν 2.7′	d 0.0′	m -2.61	ν 2.4′	d 0.0′	m 0.96

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.0	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.3	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°12.7	89°22.6
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.6
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.3	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.4
Sirius	258°25.2	-16°45.0
Adhara	255°04.9	-29°00.3
Procyon	244°49.8	5°09.5
Pollux	243°16.1	27°57.7
Avior	234°14.0	-59°35.3
Suhail	222°45.5	-43°32.0
Miaplacidus	221°37.6	-69°49.1
Alphard	217°46.8	-8°46.2
Regulus	207°33.5	11°50.4
Dubhe	193°40.0	61°36.3
Denebola	182°24.2	14°25.5
Gienah	175°42.9	-17°41.1
Acrux	172°59.5	-63°14.3
Gacrux	171°51.0	-57°15.2
Alioth	166°12.5	55°48.8
Spica	158°21.7	-11°17.8
Alkaid	152°51.7	49°10.8
Hadar	148°35.4	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.5	19°02.7
Rigil Kent.	139°39.8	-60°56.4
Kochab	137°20.8	74°02.6
Zuben'ubi	136°55.5	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.3	-26°29.3
Atria	107°09.4	-69°04.4
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.1
Kaus Aust.	83°31.9	-34°22.4
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°05.0	-56°39.3
Deneb	49°25.6	45°22.6
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 12 Fri	SHA	Mer.pass
Venus	107°17.0	11:28
Mars	92°44.1	12:25
Jupiter	244°26.1	02:18
Saturn	3°21.7	18:20

Dec 13 Sat	SHA	Mer.pass
Venus	105°56.2	11:29
Mars	91°54.7	12:24
Jupiter	244°32.2	02:14
Saturn	3°20.3	18:16

Dec 14 Sun	SHA	Mer.pass
Venus	104°35.2	11:31
Mars	91°05.2	12:24
Jupiter	244°38.4	02:09
Saturn	3°18.9	18:12

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°36.5	S23°04.6	268°52.0	15.8′	N02°35.6	14.8′	55.8′
1	196°36.2	04.8	283°26.8	15.9′	02°20.8	14.8′	55.8′
2	211°35.9	05.0	298°01.7	15.9′	02°06.0	14.8′	55.7′
3	226°35.7	·· 05.1	312°36.6	15.9′	01°51.2	14.8′	55.7′
4	241°35.4	05.3	327°11.5	16.0′	01°36.4	14.8′	55.7′
5	256°35.1	05.5	341°46.5	16.0′	01°21.6	14.7′	55.6′
6	271°34.8	S23°05.7	356°21.5	16.0′	N01°06.9	14.8′	55.6′
7	286°34.5	05.9	10°56.6	16.1′	00°52.1	14.7′	55.6′
8	301°34.2	06.1	25°31.7	16.1′	00°37.4	14.7′	55.5′
9	316°33.9	·· 06.2	40°06.8	16.1′	00°22.7	14.7′	55.5′
10	331°33.6	06.4	54°41.9	16.2′	N00°08.0	14.7′	55.5′
11	346°33.3	06.6	69°17.1	16.2′	S00°06.7	14.7′	55.5′
12	1°33.0	S23°06.8	83°52.3	16.2′	S00°21.4	14.7′	55.4′
13	16°32.7	06.9	98°27.5	16.2′	00°36.1	14.6′	55.4′
14	31°32.4	07.1	113°02.8	16.3′	00°50.7	14.6′	55.4′
15	46°32.1	·· 07.3	127°38.0	16.3′	01°05.3	14.6′	55.3′
16	61°31.9	07.5	142°13.3	16.3′	01°19.9	14.6′	55.3′
17	76°31.6	07.6	156°48.6	16.3′	01°34.5	14.6′	55.3′
18	91°31.3	S23°07.8	171°24.0	16.3′	S01°49.1	14.6′	55.3′
19	106°31.0	08.0	185°59.3	16.4′	02°03.7	14.5′	55.2′
20	121°30.7	08.2	200°34.7	16.4′	02°18.2	14.5′	55.2′
21	136°30.4	·· 08.3	215°10.1	16.4′	02°32.7	14.5′	55.2′
22	151°30.1	08.5	229°45.5	16.4′	02°47.2	14.4′	55.2′
23	166°29.8	08.7	244°20.9	16.4′	03°01.6	14.5′	55.1′
	SD = 16.2′	d = -0.2′	SD = 15.2′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°29.5	S23°08.8	258°56.3	16.4′	S03°16.1	14.4′	55.1′
1	196°29.2	09.0	273°31.7	16.4′	03°30.5	14.4′	55.1′
2	211°28.9	09.2	288°07.2	16.4′	03°44.9	14.3′	55.1′
3	226°28.6	·· 09.3	302°42.6	16.5′	03°59.2	14.4′	55.0′
4	241°28.3	09.5	317°18.1	16.5′	04°13.6	14.3′	55.0′
5	256°28.0	09.7	331°53.5	16.5′	04°27.9	14.2′	55.0′
6	271°27.7	S23°09.8	346°29.0	16.5′	S04°42.1	14.3′	55.0′
7	286°27.4	10.0	1°04.5	16.5′	04°56.4	14.2′	54.9′
8	301°27.1	10.2	15°39.9	16.5′	05°10.6	14.2′	54.9′
9	316°26.8	·· 10.3	30°15.4	16.5′	05°24.8	14.2′	54.9′
10	331°26.6	10.5	44°50.9	16.5′	05°39.0	14.1′	54.9′
11	346°26.3	10.6	59°26.3	16.5′	05°53.1	14.1′	54.8′
12	1°26.0	S23°10.8	74°01.8	16.5′	S06°07.2	14.0′	54.8′
13	16°25.7	11.0	88°37.3	16.5′	06°21.2	14.1′	54.8′
14	31°25.4	11.1	103°12.7	16.5′	06°35.3	14.0′	54.8′
15	46°25.1	·· 11.3	117°48.2	16.4′	06°49.3	13.9′	54.8′
16	61°24.8	11.4	132°23.6	16.4′	07°03.2	13.9′	54.7′
17	76°24.5	11.6	146°59.1	16.4′	07°17.1	13.9′	54.7′
18	91°24.2	S23°11.7	161°34.5	16.4′	S07°31.0	13.9′	54.7′
19	106°23.9	11.9	176°09.9	16.4′	07°44.9	13.8′	54.7′
20	121°23.6	12.0	190°45.3	16.4′	07°58.7	13.8′	54.7′
21	136°23.3	·· 12.2	205°20.7	16.4′	08°12.5	13.7′	54.6′
22	151°23.0	12.3	219°56.1	16.4′	08°26.2	13.7′	54.6′
23	166°22.7	12.5	234°31.4	16.3′	08°39.9	13.6′	54.6′
	SD = 16.2′	d = -0.2′	SD = 15.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°22.4	S23°12.6	249°06.8	16.3′	S08°53.5	13.7′	54.6′
1	196°22.1	12.8	263°42.1	16.3′	09°07.2	13.5′	54.6′
2	211°21.8	12.9	278°17.4	16.3′	09°20.7	13.6′	54.5′
3	226°21.5	·· 13.1	292°52.7	16.3′	09°34.3	13.4′	54.5′
4	241°21.2	13.2	307°28.0	16.2′	09°47.7	13.5′	54.5′
5	256°20.9	13.4	322°03.2	16.2′	10°01.2	13.4′	54.5′
6	271°20.6	S23°13.5	336°38.5	16.2′	S10°14.6	13.3′	54.5′
7	286°20.3	13.7	351°13.7	16.2′	10°27.9	13.3′	54.5′
8	301°20.0	13.8	5°48.8	16.2′	10°41.2	13.3′	54.4′
9	316°19.7	·· 13.9	20°24.0	16.1′	10°54.5	13.2′	54.4′
10	331°19.4	14.1	34°59.1	16.1′	11°07.7	13.2′	54.4′
11	346°19.1	14.2	49°34.2	16.1′	11°20.9	13.1′	54.4′
12	1°18.8	S23°14.4	64°09.3	16.0′	S11°34.0	13.0′	54.4′
13	16°18.5	14.5	78°44.3	16.0′	11°47.0	13.1′	54.4′
14	31°18.2	14.6	93°19.3	16.0′	12°00.1	12.9′	54.4′
15	46°17.9	·· 14.8	107°54.3	15.9′	12°13.0	12.9′	54.3′
16	61°17.6	14.9	122°29.3	15.9′	12°25.9	12.9′	54.3′
17	76°17.3	15.1	137°04.2	15.9′	12°38.8	12.8′	54.3′
18	91°17.0	S23°15.2	151°39.1	15.8′	S12°51.6	12.7′	54.3′
19	106°16.7	15.3	166°13.9	15.8′	13°04.3	12.7′	54.3′
20	121°16.4	15.5	180°48.7	15.8′	13°17.0	12.7′	54.3′
21	136°16.1	·· 15.6	195°23.5	15.7′	13°29.7	12.6′	54.3′
22	151°15.8	15.7	209°58.2	15.7′	13°42.3	12.5′	54.2′
23	166°15.5	15.9	224°32.9	15.7′	13°54.8	12.5′	54.2′
	SD = 16.2′	d = -0.1′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:18	10:41	▬	▬	13:07	15:31
N 70°	07:58	09:44	▬	▬	14:04	15:50
68°	07:43	09:11	▬	▬	14:38	16:06
66°	07:30	08:46	10:24	13:25	15:02	16:18
64°	07:19	08:27	09:43	14:05	15:21	16:29
62°	07:10	08:11	09:16	14:32	15:37	16:39
60°	07:01	07:58	08:55	14:53	15:50	16:47
N 58°	06:54	07:46	08:38	15:10	16:02	16:54
56°	06:47	07:36	08:23	15:25	16:12	17:01
54°	06:41	07:27	08:11	15:37	16:21	17:07
52°	06:36	07:19	08:00	15:48	16:29	17:13
50°	06:31	07:12	07:50	15:58	16:36	17:18
45°	06:19	06:56	07:30	16:19	16:52	17:29
N 40°	06:09	06:43	07:13	16:35	17:06	17:40
35°	06:00	06:31	06:59	16:49	17:17	17:49
30°	05:51	06:21	06:47	17:01	17:28	17:58
20°	05:35	06:02	06:26	17:22	17:46	18:14
N 10°	05:19	05:45	06:08	17:41	18:04	18:30
0°	05:02	05:28	05:51	17:58	18:20	18:47
S 10°	04:43	05:10	05:33	18:15	18:38	19:05
20°	04:21	04:50	05:14	18:34	18:59	19:28
30°	03:52	04:25	04:53	18:56	19:23	19:57
35°	03:34	04:10	04:40	19:09	19:39	20:15
40°	03:11	03:52	04:25	19:24	19:57	20:38
45°	02:41	03:30	04:07	19:42	20:19	21:08
S 50°	01:56	03:01	03:45	20:04	20:48	21:53
52°	01:30	02:46	03:34	20:15	21:03	22:20
54°	00:47	02:28	03:22	20:27	21:21	23:03
56°	–:–	02:07	03:08	20:41	21:43	–:–
58°	–:–	01:38	02:52	20:57	22:11	–:–
S 60°	–:–	00:52	02:32	21:17	22:58	–:–

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	·· ··	01:33	03:38	12:18	11:46	11:07
N 70°	·· ··	01:28	03:22	12:19	11:54	11:26
68°	·· ··	01:23	03:09	12:20	12:01	11:41
66°	·· ··	01:20	02:58	12:20	12:07	11:53
64°	·· ··	01:17	02:50	12:21	12:12	12:03
62°	·· ··	01:14	02:42	12:21	12:16	12:12
60°	·· ··	01:12	02:36	12:21	12:20	12:20
N 58°	·· ··	01:10	02:30	12:21	12:24	12:26
56°	·· ··	01:08	02:25	12:22	12:27	12:32
54°	·· ··	01:06	02:21	12:22	12:29	12:37
52°	·· ··	01:05	02:17	12:22	12:32	12:42
50°	·· ··	01:03	02:13	12:22	12:34	12:47
45°	·· ··	01:01	02:06	12:23	12:39	12:56
N 40°	·· ··	00:58	01:59	12:23	12:43	13:04
35°	·· ··	00:56	01:54	12:23	12:47	13:11
30°	·· ··	00:54	01:49	12:24	12:50	13:17
20°	00:01	00:51	01:40	12:24	12:56	13:28
N 10°	00:03	00:48	01:33	12:24	13:01	13:37
0°	00:05	00:46	01:26	12:25	13:05	13:46
S 10°	00:07	00:43	01:20	12:25	13:10	13:55
20°	00:09	00:41	01:12	12:25	13:15	14:04
30°	00:11	00:38	01:04	12:26	13:21	14:15
35°	00:13	00:36	01:00	12:26	13:24	14:21
40°	00:14	00:34	00:55	12:26	13:28	14:28
45°	00:16	00:32	00:49	12:27	13:32	14:37
S 50°	00:18	00:30	00:42	12:27	13:37	14:47
52°	00:19	00:28	00:38	12:27	13:40	14:52
54°	00:20	00:27	00:35	12:27	13:42	14:57
56°	00:21	00:26	00:31	12:27	13:45	15:03
58°	00:22	00:24	00:26	12:27	13:48	15:09
S 60°	00:23	00:22	00:21	12:28	13:52	15:17

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 22-24 49-30%
12	06:26	06:12	11:54	06:15	18:35	
13	05:58	05:44	11:54	06:56	19:16	
14	05:30	05:15	11:55	07:36	19:57	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2656 sec ΔT = TT-UT1 = +68.9184 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	83°54.4	187°08.4	S22°42.9	174°10.0	S24°12.7	328°39.1	N21°36.5	87°11.8	S03°57.0
1	98°56.8	202°07.5	43.3	189°10.4	12.8	343°41.8	36.6	102°14.2	57.0
2	113°59.3	217°06.6	43.7	204°10.8	12.8	358°44.6	36.6	117°16.6	57.0
3	129°01.7	232°05.6	·· 44.1	219°11.2	·· 12.8	13°47.3	·· 36.7	132°19.0	·· 56.9
4	144°04.2	247°04.7	44.5	234°11.6	12.8	28°50.0	36.7	147°21.4	56.9
5	159°06.7	262°03.8	44.9	249°12.0	12.8	43°52.8	36.8	162°23.7	56.8
6	174°09.1	277°02.9	S22°45.2	264°12.4	S24°12.9	58°55.5	N21°36.8	177°26.1	S03°56.8
7	189°11.6	292°01.9	45.6	279°12.8	12.9	73°58.2	36.9	192°28.5	56.8
8	204°14.1	307°01.0	46.0	294°13.2	12.9	89°01.0	36.9	207°30.9	56.7
9	219°16.5	322°00.1	·· 46.4	309°13.6	·· 12.9	104°03.7	·· 37.0	222°33.3	·· 56.7
10	234°19.0	336°59.2	46.8	324°14.0	12.9	119°06.4	37.0	237°35.7	56.6
11	249°21.5	351°58.2	47.1	339°14.4	12.9	134°09.2	37.1	252°38.1	56.6
12	264°23.9	6°57.3	S22°47.5	354°14.8	S24°13.0	149°11.9	N21°37.1	267°40.5	S03°56.6
13	279°26.4	21°56.4	47.9	9°15.2	13.0	164°14.6	37.2	282°42.9	56.5
14	294°28.9	36°55.4	48.2	24°15.6	13.0	179°17.4	37.2	297°45.3	56.5
15	309°31.3	51°54.5	·· 48.6	39°15.9	·· 13.0	194°20.1	·· 37.3	312°47.7	·· 56.5
16	324°33.8	66°53.6	49.0	54°16.3	13.0	209°22.9	37.3	327°50.1	56.4
17	339°36.2	81°52.7	49.3	69°16.7	13.0	224°25.6	37.4	342°52.5	56.4
18	354°38.7	96°51.7	S22°49.7	84°17.1	S24°13.1	239°28.3	N21°37.4	357°54.9	S03°56.3
19	9°41.2	111°50.8	50.1	99°17.5	13.1	254°31.1	37.5	12°57.3	56.3
20	24°43.6	126°49.9	50.4	114°17.9	13.1	269°33.8	37.5	27°59.7	56.3
21	39°46.1	141°48.9	·· 50.8	129°18.3	·· 13.1	284°36.5	·· 37.6	43°02.1	·· 56.2
22	54°48.6	156°48.0	51.2	144°18.7	13.1	299°39.3	37.6	58°04.5	56.2
23	69°51.0	171°47.1	51.5	159°19.1	13.1	314°42.0	37.7	73°06.9	56.1
Mer.pass.	18:21	ν -0.9′	d -0.4′	m -3.90	ν 0.4′	d -0.0′	m 1.23	ν 2.7′	d 0.0′ m -2.62	ν 2.4′	d 0.0′ m 0.96

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	84°53.5	186°46.2	S22°51.9	174°19.5	S24°13.1	329°44.8	N21°37.7	88°09.3	S03°56.1
1	99°56.0	201°45.2	52.2	189°19.9	13.1	344°47.5	37.8	103°11.7	56.1
2	114°58.4	216°44.3	52.6	204°20.3	13.1	359°50.2	37.8	118°14.1	56.0
3	130°00.9	231°43.4	·· 52.9	219°20.7	·· 13.2	14°53.0	·· 37.9	133°16.5	·· 56.0
4	145°03.4	246°42.4	53.3	234°21.1	13.2	29°55.7	37.9	148°18.9	55.9
5	160°05.8	261°41.5	53.6	249°21.5	13.2	44°58.5	38.0	163°21.3	55.9
6	175°08.3	276°40.6	S22°54.0	264°21.9	S24°13.2	60°01.2	N21°38.0	178°23.6	S03°55.9
7	190°10.7	291°39.6	54.3	279°22.3	13.2	75°03.9	38.1	193°26.0	55.8
8	205°13.2	306°38.7	54.7	294°22.7	13.2	90°06.7	38.1	208°28.4	55.8
9	220°15.7	321°37.8	·· 55.0	309°23.1	·· 13.2	105°09.4	·· 38.2	223°30.8	·· 55.7
10	235°18.1	336°36.8	55.4	324°23.5	13.2	120°12.2	38.2	238°33.2	55.7
11	250°20.6	351°35.9	55.7	339°23.9	13.2	135°14.9	38.3	253°35.6	55.7
12	265°23.1	6°35.0	S22°56.1	354°24.3	S24°13.2	150°17.6	N21°38.3	268°38.0	S03°55.6
13	280°25.5	21°34.0	56.4	9°24.6	13.2	165°20.4	38.4	283°40.4	55.6
14	295°28.0	36°33.1	56.8	24°25.0	13.2	180°23.1	38.4	298°42.8	55.5
15	310°30.5	51°32.2	·· 57.1	39°25.4	·· 13.2	195°25.9	·· 38.5	313°45.2	·· 55.5
16	325°32.9	66°31.2	57.4	54°25.8	13.2	210°28.6	38.5	328°47.6	55.5
17	340°35.4	81°30.3	57.8	69°26.2	13.3	225°31.4	38.6	343°50.0	55.4
18	355°37.9	96°29.4	S22°58.1	84°26.6	S24°13.3	240°34.1	N21°38.6	358°52.4	S03°55.4
19	10°40.3	111°28.4	58.5	99°27.0	13.3	255°36.9	38.7	13°54.7	55.3
20	25°42.8	126°27.5	58.8	114°27.4	13.3	270°39.6	38.7	28°57.1	55.3
21	40°45.2	141°26.6	·· 59.1	129°27.8	·· 13.3	285°42.3	·· 38.8	43°59.5	·· 55.2
22	55°47.7	156°25.6	59.5	144°28.2	13.3	300°45.1	38.8	59°01.9	55.2
23	70°50.2	171°24.7	59.8	159°28.6	13.3	315°47.8	38.9	74°04.3	55.2
Mer.pass.	18:17	ν -0.9′	d -0.4′	m -3.90	ν 0.4′	d -0.0′	m 1.22	ν 2.7′	d 0.1′ m -2.62	ν 2.4′	d 0.0′ m 0.97

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	85°52.6	186°23.7	S23°00.1	174°29.0	S24°13.3	330°50.6	N21°38.9	89°06.7	S03°55.1
1	100°55.1	201°22.8	00.4	189°29.4	13.3	345°53.3	39.0	104°09.1	55.1
2	115°57.6	216°21.9	00.8	204°29.8	13.3	0°56.1	39.0	119°11.5	55.0
3	131°00.0	231°20.9	·· 01.1	219°30.2	·· 13.3	15°58.8	·· 39.1	134°13.9	·· 55.0
4	146°02.5	246°20.0	01.4	234°30.6	13.3	31°01.6	39.1	149°16.3	55.0
5	161°05.0	261°19.0	01.7	249°30.9	13.3	46°04.3	39.2	164°18.7	54.9
6	176°07.4	276°18.1	S23°02.1	264°31.3	S24°13.3	61°07.1	N21°39.2	179°21.0	S03°54.9
7	191°09.9	291°17.2	02.4	279°31.7	13.3	76°09.8	39.3	194°23.4	54.8
8	206°12.3	306°16.2	02.7	294°32.1	13.2	91°12.5	39.3	209°25.8	54.8
9	221°14.8	321°15.3	·· 03.0	309°32.5	·· 13.2	106°15.3	·· 39.4	224°28.2	·· 54.7
10	236°17.3	336°14.3	03.3	324°32.9	13.2	121°18.0	39.4	239°30.6	54.7
11	251°19.7	351°13.4	03.7	339°33.3	13.2	136°20.8	39.5	254°33.0	54.7
12	266°22.2	6°12.5	S23°04.0	354°33.7	S24°13.2	151°23.5	N21°39.5	269°35.4	S03°54.6
13	281°24.7	21°11.5	04.3	9°34.1	13.2	166°26.3	39.6	284°37.8	54.6
14	296°27.1	36°10.6	04.6	24°34.5	13.2	181°29.0	39.7	299°40.2	54.5
15	311°29.6	51°09.6	·· 04.9	39°34.9	·· 13.2	196°31.8	·· 39.7	314°42.5	·· 54.5
16	326°32.1	66°08.7	05.2	54°35.3	13.2	211°34.5	39.8	329°44.9	54.5
17	341°34.5	81°07.8	05.5	69°35.7	13.2	226°37.3	39.8	344°47.3	54.4
18	356°37.0	96°06.8	S23°05.8	84°36.0	S24°13.2	241°40.0	N21°39.9	359°49.7	S03°54.4
19	11°39.5	111°05.9	06.1	99°36.4	13.2	256°42.8	39.9	14°52.1	54.3
20	26°41.9	126°04.9	06.4	114°36.8	13.2	271°45.5	40.0	29°54.5	54.3
21	41°44.4	141°04.0	·· 06.7	129°37.2	·· 13.2	286°48.3	·· 40.0	44°56.9	·· 54.2
22	56°46.8	156°03.0	07.0	144°37.6	13.2	301°51.0	40.1	59°59.3	54.2
23	71°49.3	171°02.1	07.3	159°38.0	13.1	316°53.8	40.1	75°01.6	54.2
Mer.pass.	18:13	ν -0.9′	d -0.3′	m -3.90	ν 0.4′	d 0.0′	m 1.21	ν 2.7′	d 0.1′ m -2.63	ν 2.4′	d 0.0′ m 0.97

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.0	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.3	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°13.3	89°22.6
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.3	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.5
Sirius	258°25.2	-16°45.0
Adhara	255°04.9	-29°00.3
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°13.9	-59°35.3
Suhail	222°45.5	-43°32.0
Miaplacidus	221°37.6	-69°49.1
Alphard	217°46.8	-8°46.2
Regulus	207°33.5	11°50.3
Dubhe	193°40.0	61°36.3
Denebola	182°24.2	14°25.5
Gienah	175°42.9	-17°41.1
Acrux	172°59.4	-63°14.3
Gacrux	171°50.9	-57°15.2
Alioth	166°12.5	55°48.8
Spica	158°21.7	-11°17.8
Alkaid	152°51.7	49°10.8
Hadar	148°35.3	-60°29.7
Menkent	147°57.0	-36°29.7
Arcturus	145°47.4	19°02.7
Rigil Kent.	139°39.7	-60°56.3
Kochab	137°20.7	74°02.6
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.3	-26°29.3
Atria	107°09.4	-69°04.3
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.3
Rasalhague	95°58.2	12°32.5
Eltanin	90°42.4	51°29.1
Kaus Aust.	83°31.9	-34°22.3
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.3
Peacock	53°05.0	-56°39.2
Deneb	49°25.6	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.1	-46°50.3
Fomalhaut	15°13.7	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 15 Mon	SHA	Mer.pass
Venus	103°14.0	11:32
Mars	90°15.6	12:23
Jupiter	244°44.7	02:05
Saturn	3°17.4	18:08

Dec 16 Tue	SHA	Mer.pass
Venus	101°52.7	11:34
Mars	89°26.0	12:22
Jupiter	244°51.3	02:01
Saturn	3°15.8	18:04

Dec 17 Wed	SHA	Mer.pass
Venus	100°31.1	11:35
Mars	88°36.3	12:22
Jupiter	244°57.9	01:56
Saturn	3°14.1	18:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°15.2	S23°16.0	239°07.6	15.6′	S14°07.3	12.4′	54.2′
1	196°14.9	16.1	253°42.2	15.6′	14°19.7	12.4′	54.2′
2	211°14.6	16.2	268°16.7	15.5′	14°32.1	12.2′	54.2′
3	226°14.3	·· 16.4	282°51.3	15.5′	14°44.3	12.3′	54.2′
4	241°14.0	16.5	297°25.7	15.4′	14°56.6	12.2′	54.2′
5	256°13.7	16.6	312°00.2	15.4′	15°08.8	12.1′	54.2′
6	271°13.4	S23°16.7	326°34.6	15.3′	S15°20.9	12.0′	54.1′
7	286°13.1	16.9	341°08.9	15.3′	15°32.9	12.0′	54.1′
8	301°12.8	17.0	355°43.2	15.3′	15°44.9	11.9′	54.1′
9	316°12.5	·· 17.1	10°17.5	15.2′	15°56.8	11.9′	54.1′
10	331°12.2	17.2	24°51.7	15.2′	16°08.7	11.8′	54.1′
11	346°11.9	17.4	39°25.9	15.1′	16°20.5	11.7′	54.1′
12	1°11.6	S23°17.5	54°00.0	15.1′	S16°32.2	11.7′	54.1′
13	16°11.3	17.6	68°34.0	15.0′	16°43.9	11.6′	54.1′
14	31°11.0	17.7	83°08.0	15.0′	16°55.5	11.5′	54.1′
15	46°10.7	·· 17.8	97°42.0	14.9′	17°07.0	11.5′	54.1′
16	61°10.4	17.9	112°15.9	14.8′	17°18.5	11.3′	54.1′
17	76°10.1	18.1	126°49.7	14.8′	17°29.8	11.3′	54.0′
18	91°09.8	S23°18.2	141°23.5	14.7′	S17°41.1	11.3′	54.0′
19	106°09.5	18.3	155°57.3	14.7′	17°52.4	11.2′	54.0′
20	121°09.2	18.4	170°31.0	14.6′	18°03.6	11.1′	54.0′
21	136°08.9	·· 18.5	185°04.6	14.6′	18°14.7	11.0′	54.0′
22	151°08.6	18.6	199°38.2	14.5′	18°25.7	10.9′	54.0′
23	166°08.3	18.7	214°11.7	14.5′	18°36.6	10.9′	54.0′
	SD = 16.2′	d = -0.1′	SD = 14.8′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°08.0	S23°18.9	228°45.1	14.4′	S18°47.5	10.8′	54.0′
1	196°07.7	19.0	243°18.5	14.3′	18°58.3	10.7′	54.0′
2	211°07.4	19.1	257°51.9	14.3′	19°09.0	10.6′	54.0′
3	226°07.0	·· 19.2	272°25.2	14.2′	19°19.6	10.6′	54.0′
4	241°06.7	19.3	286°58.4	14.2′	19°30.2	10.5′	54.0′
5	256°06.4	19.4	301°31.5	14.1′	19°40.7	10.4′	54.0′
6	271°06.1	S23°19.5	316°04.6	14.0′	S19°51.1	10.3′	54.0′
7	286°05.8	19.6	330°37.7	14.0′	20°01.4	10.2′	54.0′
8	301°05.5	19.7	345°10.7	13.9′	20°11.6	10.2′	54.0′
9	316°05.2	·· 19.8	359°43.6	13.9′	20°21.8	10.0′	53.9′
10	331°04.9	19.9	14°16.4	13.8′	20°31.8	10.0′	53.9′
11	346°04.6	20.0	28°49.2	13.7′	20°41.8	9.9′	53.9′
12	1°04.3	S23°20.1	43°21.9	13.7′	S20°51.7	9.8′	53.9′
13	16°04.0	20.2	57°54.6	13.6′	21°01.5	9.8′	53.9′
14	31°03.7	20.3	72°27.2	13.5′	21°11.3	9.6′	53.9′
15	46°03.4	·· 20.4	86°59.7	13.5′	21°20.9	9.5′	53.9′
16	61°03.1	20.5	101°32.2	13.4′	21°30.4	9.5′	53.9′
17	76°02.8	20.6	116°04.6	13.3′	21°39.9	9.3′	53.9′
18	91°02.5	S23°20.7	130°37.0	13.3′	S21°49.2	9.3′	53.9′
19	106°02.2	20.8	145°09.2	13.2′	21°58.5	9.2′	53.9′
20	121°01.9	20.9	159°41.4	13.1′	22°07.7	9.1′	53.9′
21	136°01.6	·· 21.0	174°13.6	13.1′	22°16.8	9.0′	53.9′
22	151°01.3	21.1	188°45.6	13.0′	22°25.8	8.9′	53.9′
23	166°01.0	21.2	203°17.7	12.9′	22°34.7	8.8′	53.9′
	SD = 16.2′	d = -0.1′	SD = 14.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°00.6	S23°21.3	217°49.6	12.9′	S22°43.5	8.7′	53.9′
1	196°00.3	21.4	232°21.5	12.8′	22°52.2	8.6′	53.9′
2	211°00.0	21.4	246°53.3	12.7′	23°00.8	8.5′	53.9′
3	225°59.7	·· 21.5	261°25.0	12.7′	23°09.3	8.4′	53.9′
4	240°59.4	21.6	275°56.7	12.6′	23°17.7	8.3′	53.9′
5	255°59.1	21.7	290°28.3	12.5′	23°26.0	8.2′	53.9′
6	270°58.8	S23°21.8	304°59.8	12.5′	S23°34.2	8.1′	53.9′
7	285°58.5	21.9	319°31.3	12.4′	23°42.3	8.0′	53.9′
8	300°58.2	22.0	334°02.7	12.3′	23°50.3	7.9′	53.9′
9	315°57.9	·· 22.0	348°34.1	12.3′	23°58.2	7.8′	53.9′
10	330°57.6	22.1	3°05.4	12.2′	24°06.0	7.7′	53.9′
11	345°57.3	22.2	17°36.6	12.1′	24°13.7	7.6′	53.9′
12	0°57.0	S23°22.3	32°07.7	12.1′	S24°21.3	7.5′	53.9′
13	15°56.7	22.4	46°38.8	12.0′	24°28.8	7.3′	53.9′
14	30°56.4	22.4	61°09.8	11.9′	24°36.1	7.3′	53.9′
15	45°56.1	·· 22.5	75°40.7	11.9′	24°43.4	7.2′	53.9′
16	60°55.7	22.6	90°11.6	11.8′	24°50.6	7.0′	53.9′
17	75°55.4	22.7	104°42.4	11.8′	24°57.6	6.9′	53.9′
18	90°55.1	S23°22.8	119°13.2	11.7′	S25°04.5	6.8′	53.9′
19	105°54.8	22.8	133°43.9	11.6′	25°11.3	6.8′	53.9′
20	120°54.5	22.9	148°14.5	11.6′	25°18.1	6.5′	53.9′
21	135°54.2	·· 23.0	162°45.0	11.5′	25°24.6	6.5′	53.9′
22	150°53.9	23.1	177°15.5	11.4′	25°31.1	6.4′	53.9′
23	165°53.6	23.1	191°46.0	11.4′	25°37.5	6.2′	53.9′
	SD = 16.2′	d = -0.1′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:22	10:50	▬	▬	13:01	15:30
N 70°	08:02	09:50	▬	▬	14:02	15:49
68°	07:46	09:15	▬	▬	14:36	16:05
66°	07:33	08:50	10:29	13:22	15:01	16:18
64°	07:22	08:30	09:48	14:04	15:21	16:29
62°	07:12	08:14	09:20	14:31	15:37	16:39
60°	07:04	08:01	08:58	14:53	15:51	16:47
N 58°	06:57	07:49	08:41	15:10	16:02	16:55
56°	06:50	07:39	08:26	15:25	16:12	17:01
54°	06:44	07:30	08:14	15:38	16:21	17:08
52°	06:38	07:22	08:03	15:49	16:30	17:13
50°	06:33	07:14	07:53	15:59	16:37	17:18
45°	06:21	06:58	07:32	16:19	16:53	17:30
N 40°	06:11	06:45	07:15	16:36	17:06	17:41
35°	06:01	06:33	07:01	16:50	17:18	17:50
30°	05:53	06:23	06:49	17:02	17:29	17:59
20°	05:36	06:04	06:28	17:24	17:48	18:15
N 10°	05:20	05:47	06:09	17:42	18:05	18:31
0°	05:03	05:29	05:52	17:59	18:22	18:48
S 10°	04:44	05:11	05:34	18:17	18:40	19:07
20°	04:22	04:51	05:16	18:36	19:00	19:30
30°	03:53	04:26	04:54	18:58	19:25	19:59
35°	03:34	04:11	04:41	19:11	19:41	20:17
40°	03:11	03:53	04:26	19:26	19:59	20:40
45°	02:41	03:30	04:08	19:44	20:21	21:11
S 50°	01:56	03:01	03:45	20:06	20:51	21:56
52°	01:28	02:46	03:34	20:17	21:06	22:24
54°	00:43	02:28	03:22	20:29	21:24	23:09
56°	–:–	02:06	03:08	20:44	21:46	–:–
58°	–:–	01:36	02:51	21:00	22:16	–:–
S 60°	–:–	00:48	02:31	21:21	23:05	–:–

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	06:07	▬	▬	10:06	▬	▬
N 70°	05:28	▬	▬	10:46	▬	▬
68°	05:02	07:20	▬	11:14	10:27	▬
66°	04:42	06:37	▬	11:36	11:11	▬
64°	04:26	06:09	08:06	11:53	11:40	11:18
62°	04:12	05:47	07:28	12:07	12:02	11:57
60°	04:01	05:30	07:01	12:19	12:20	12:24
N 58°	03:52	05:15	06:40	12:30	12:36	12:45
56°	03:43	05:03	06:23	12:39	12:49	13:03
54°	03:36	04:52	06:09	12:47	13:00	13:18
52°	03:29	04:43	05:56	12:55	13:10	13:31
50°	03:23	04:34	05:45	13:01	13:19	13:42
45°	03:11	04:16	05:22	13:15	13:38	14:06
N 40°	03:00	04:02	05:04	13:27	13:54	14:25
35°	02:51	03:50	04:49	13:37	14:07	14:41
30°	02:43	03:39	04:36	13:46	14:18	14:55
20°	02:30	03:21	04:13	14:02	14:38	15:19
N 10°	02:18	03:05	03:54	14:15	14:56	15:39
0°	02:07	02:50	03:36	14:28	15:12	15:59
S 10°	01:57	02:36	03:18	14:41	15:28	16:18
20°	01:45	02:20	02:59	14:54	15:46	16:39
30°	01:32	02:03	02:37	15:10	16:06	17:03
35°	01:25	01:53	02:24	15:19	16:18	17:17
40°	01:16	01:41	02:10	15:30	16:32	17:34
45°	01:07	01:27	01:52	15:42	16:48	17:54
S 50°	00:55	01:11	01:31	15:57	17:08	18:19
52°	00:49	01:03	01:21	16:05	17:18	18:31
54°	00:43	00:54	01:09	16:12	17:29	18:45
56°	00:37	00:45	00:57	16:21	17:41	19:01
58°	00:29	00:34	00:42	16:32	17:56	19:20
S 60°	00:21	00:21	00:24	16:43	18:13	19:45

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 25-27 21-8%
15	05:01	04:46	11:55	08:18	20:39	
16	04:32	04:17	11:56	09:01	21:24	
17	04:03	03:48	11:56	09:47	22:11	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2663 sec ΔT = TT-UT1 = +68.9177 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	86°51.8	186°01.2	S23°07.6	174°38.4	S24°13.1	331°56.5	N21°40.2	90°04.0	S03°54.1
1	101°54.2	201°00.2	07.9	189°38.8	13.1	346°59.3	40.2	105°06.4	54.1
2	116°56.7	215°59.3	08.2	204°39.2	13.1	2°02.0	40.3	120°08.8	54.0
3	131°59.2	230°58.3	·· 08.5	219°39.6	·· 13.1	17°04.8	·· 40.3	135°11.2	·· 54.0
4	147°01.6	245°57.4	08.8	234°40.0	13.1	32°07.5	40.4	150°13.6	53.9
5	162°04.1	260°56.4	09.1	249°40.4	13.1	47°10.3	40.4	165°16.0	53.9
6	177°06.6	275°55.5	S23°09.4	264°40.7	S24°13.1	62°13.0	N21°40.5	180°18.4	S03°53.8
7	192°09.0	290°54.5	09.7	279°41.1	13.0	77°15.8	40.5	195°20.7	53.8
8	207°11.5	305°53.6	10.0	294°41.5	13.0	92°18.5	40.6	210°23.1	53.8
9	222°14.0	320°52.7	·· 10.3	309°41.9	·· 13.0	107°21.3	·· 40.6	225°25.5	·· 53.7
10	237°16.4	335°51.7	10.6	324°42.3	13.0	122°24.1	40.7	240°27.9	53.7
11	252°18.9	350°50.8	10.9	339°42.7	13.0	137°26.8	40.7	255°30.3	53.6
12	267°21.3	5°49.8	S23°11.2	354°43.1	S24°13.0	152°29.6	N21°40.8	270°32.7	S03°53.6
13	282°23.8	20°48.9	11.4	9°43.5	12.9	167°32.3	40.8	285°35.0	53.5
14	297°26.3	35°47.9	11.7	24°43.9	12.9	182°35.1	40.9	300°37.4	53.5
15	312°28.7	50°47.0	·· 12.0	39°44.3	·· 12.9	197°37.8	·· 41.0	315°39.8	·· 53.5
16	327°31.2	65°46.0	12.3	54°44.6	12.9	212°40.6	41.0	330°42.2	53.4
17	342°33.7	80°45.1	12.6	69°45.0	12.9	227°43.3	41.1	345°44.6	53.4
18	357°36.1	95°44.1	S23°12.8	84°45.4	S24°12.9	242°46.1	N21°41.1	0°47.0	S03°53.3
19	12°38.6	110°43.2	13.1	99°45.8	12.8	257°48.8	41.2	15°49.4	53.3
20	27°41.1	125°42.2	13.4	114°46.2	12.8	272°51.6	41.2	30°51.7	53.2
21	42°43.5	140°41.3	·· 13.7	129°46.6	·· 12.8	287°54.4	·· 41.3	45°54.1	·· 53.2
22	57°46.0	155°40.3	13.9	144°47.0	12.8	302°57.1	41.3	60°56.5	53.1
23	72°48.5	170°39.4	14.2	159°47.4	12.8	317°59.9	41.4	75°58.9	53.1
Mer.pass.	18:10	ν -0.9′	d -0.3′	m -3.90	ν 0.4′	d 0.0′	m 1.21	ν 2.8′	d 0.1′ m -2.63	ν 2.4′	d 0.0′ m 0.97

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	87°50.9	185°38.4	S23°14.5	174°47.8	S24°12.7	333°02.6	N21°41.4	91°01.3	S03°53.1
1	102°53.4	200°37.5	14.7	189°48.1	12.7	348°05.4	41.5	106°03.7	53.0
2	117°55.8	215°36.5	15.0	204°48.5	12.7	3°08.1	41.5	121°06.0	53.0
3	132°58.3	230°35.6	·· 15.3	219°48.9	·· 12.7	18°10.9	·· 41.6	136°08.4	·· 52.9
4	148°00.8	245°34.6	15.5	234°49.3	12.6	33°13.7	41.6	151°10.8	52.9
5	163°03.2	260°33.7	15.8	249°49.7	12.6	48°16.4	41.7	166°13.2	52.8
6	178°05.7	275°32.7	S23°16.1	264°50.1	S24°12.6	63°19.2	N21°41.7	181°15.6	S03°52.8
7	193°08.2	290°31.8	16.3	279°50.5	12.6	78°21.9	41.8	196°17.9	52.7
8	208°10.6	305°30.8	16.6	294°50.9	12.5	93°24.7	41.8	211°20.3	52.7
9	223°13.1	320°29.9	·· 16.9	309°51.3	·· 12.5	108°27.5	·· 41.9	226°22.7	·· 52.6
10	238°15.6	335°28.9	17.1	324°51.6	12.5	123°30.2	42.0	241°25.1	52.6
11	253°18.0	350°28.0	17.4	339°52.0	12.5	138°33.0	42.0	256°27.5	52.6
12	268°20.5	5°27.0	S23°17.6	354°52.4	S24°12.4	153°35.7	N21°42.1	271°29.8	S03°52.5
13	283°23.0	20°26.1	17.9	9°52.8	12.4	168°38.5	42.1	286°32.2	52.5
14	298°25.4	35°25.1	18.1	24°53.2	12.4	183°41.3	42.2	301°34.6	52.4
15	313°27.9	50°24.2	·· 18.4	39°53.6	·· 12.3	198°44.0	·· 42.2	316°37.0	·· 52.4
16	328°30.3	65°23.2	18.6	54°54.0	12.3	213°46.8	42.3	331°39.4	52.3
17	343°32.8	80°22.2	18.9	69°54.4	12.3	228°49.5	42.3	346°41.8	52.3
18	358°35.3	95°21.3	S23°19.1	84°54.8	S24°12.3	243°52.3	N21°42.4	1°44.1	S03°52.2
19	13°37.7	110°20.3	19.4	99°55.1	12.2	258°55.1	42.4	16°46.5	52.2
20	28°40.2	125°19.4	19.6	114°55.5	12.2	273°57.8	42.5	31°48.9	52.1
21	43°42.7	140°18.4	·· 19.9	129°55.9	·· 12.2	289°00.6	·· 42.5	46°51.3	·· 52.1
22	58°45.1	155°17.5	20.1	144°56.3	12.1	304°03.3	42.6	61°53.6	52.0
23	73°47.6	170°16.5	20.4	159°56.7	12.1	319°06.1	42.6	76°56.0	52.0
Mer.pass.	18:06	ν -1.0′	d -0.3′	m -3.90	ν 0.4′	d 0.0′	m 1.20	ν 2.8′	d 0.1′ m -2.63	ν 2.4′	d 0.0′ m 0.98

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	88°50.1	185°15.6	S23°20.6	174°57.1	S24°12.1	334°08.9	N21°42.7	91°58.4	S03°52.0
1	103°52.5	200°14.6	20.8	189°57.5	12.0	349°11.6	42.7	107°00.8	51.9
2	118°55.0	215°13.7	21.1	204°57.9	12.0	4°14.4	42.8	122°03.2	51.9
3	133°57.5	230°12.7	·· 21.3	219°58.2	·· 12.0	19°17.2	·· 42.9	137°05.5	·· 51.8
4	148°59.9	245°11.7	21.6	234°58.6	11.9	34°19.9	42.9	152°07.9	51.8
5	164°02.4	260°10.8	21.8	249°59.0	11.9	49°22.7	43.0	167°10.3	51.7
6	179°04.8	275°09.8	S23°22.0	264°59.4	S24°11.9	64°25.4	N21°43.0	182°12.7	S03°51.7
7	194°07.3	290°08.9	22.3	279°59.8	11.8	79°28.2	43.1	197°15.1	51.6
8	209°09.8	305°07.9	22.5	295°00.2	11.8	94°31.0	43.1	212°17.4	51.6
9	224°12.2	320°07.0	·· 22.7	310°00.6	·· 11.8	109°33.7	·· 43.2	227°19.8	·· 51.5
10	239°14.7	335°06.0	22.9	325°01.0	11.7	124°36.5	43.2	242°22.2	51.5
11	254°17.2	350°05.0	23.2	340°01.3	11.7	139°39.3	43.3	257°24.6	51.4
12	269°19.6	5°04.1	S23°23.4	355°01.7	S24°11.6	154°42.0	N21°43.3	272°26.9	S03°51.4
13	284°22.1	20°03.1	23.6	10°02.1	11.6	169°44.8	43.4	287°29.3	51.3
14	299°24.6	35°02.2	23.8	25°02.5	11.6	184°47.6	43.4	302°31.7	51.3
15	314°27.0	50°01.2	·· 24.1	40°02.9	·· 11.5	199°50.3	·· 43.5	317°34.1	·· 51.2
16	329°29.5	65°00.3	24.3	55°03.3	11.5	214°53.1	43.5	332°36.4	51.2
17	344°31.9	79°59.3	24.5	70°03.7	11.4	229°55.9	43.6	347°38.8	51.2
18	359°34.4	94°58.3	S23°24.7	85°04.0	S24°11.4	244°58.6	N21°43.7	2°41.2	S03°51.1
19	14°36.9	109°57.4	24.9	100°04.4	11.4	260°01.4	43.7	17°43.6	51.1
20	29°39.3	124°56.4	25.2	115°04.8	11.3	275°04.2	43.8	32°46.0	51.0
21	44°41.8	139°55.5	·· 25.4	130°05.2	·· 11.3	290°06.9	·· 43.8	47°48.3	·· 51.0
22	59°44.3	154°54.5	25.6	145°05.6	11.2	305°09.7	43.9	62°50.7	50.9
23	74°46.7	169°53.5	25.8	160°06.0	11.2	320°12.5	43.9	77°53.1	50.9
Mer.pass.	18:02	ν -1.0′	d -0.2′	m -3.90	ν 0.4′	d 0.0′	m 1.20	ν 2.8′	d 0.1′ m -2.64	ν 2.4′	d 0.0′ m 0.98

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.0	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.3	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°13.9	89°22.6
Acamar	315°10.8	-40°12.1
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.5
Sirius	258°25.2	-16°45.1
Adhara	255°04.9	-29°00.4
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°13.9	-59°35.3
Suhail	222°45.4	-43°32.0
Miaplacidus	221°37.5	-69°49.1
Alphard	217°46.8	-8°46.2
Regulus	207°33.5	11°50.3
Dubhe	193°39.9	61°36.3
Denebola	182°24.2	14°25.5
Gienah	175°42.8	-17°41.1
Acrux	172°59.4	-63°14.3
Gacrux	171°50.9	-57°15.3
Alioth	166°12.5	55°48.8
Spica	158°21.6	-11°17.8
Alkaid	152°51.6	49°10.7
Hadar	148°35.3	-60°29.7
Menkent	147°56.9	-36°29.7
Arcturus	145°47.4	19°02.7
Rigil Kent.	139°39.7	-60°56.3
Kochab	137°20.7	74°02.6
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.2	-26°29.3
Atria	107°09.3	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.2	12°32.4
Eltanin	90°42.4	51°29.1
Kaus Aust.	83°31.9	-34°22.3
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.6	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 18 Thu	SHA	Mer.pass
Venus	99°09.4	11:37
Mars	87°46.6	12:21
Jupiter	245°04.8	01:52
Saturn	3°12.3	17:57

Dec 19 Fri	SHA	Mer.pass
Venus	97°47.5	11:38
Mars	86°56.8	12:20
Jupiter	245°11.7	01:47
Saturn	3°10.4	17:53

Dec 20 Sat	SHA	Mer.pass
Venus	96°25.5	11:40
Mars	86°07.0	12:20
Jupiter	245°18.8	01:43
Saturn	3°08.3	17:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun		Moon				
h							
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	S23°23.2	206°16.3	11.3′	S25°43.7	6.2′	53.9′
1	195°53.0	23.3	220°46.7	11.2′	25°49.9	6.0′	53.9′
2	210°52.7	23.3	235°16.9	11.2′	25°55.9	5.9′	53.9′
3	225°52.4	·· 23.4	249°47.1	11.1′	26°01.8	5.7′	53.9′
4	240°52.1	23.5	264°17.2	11.1′	26°07.5	5.7′	53.9′
5	255°51.7	23.5	278°47.3	11.0′	26°13.2	5.5′	53.9′
6	270°51.4	S23°23.6	293°17.3	10.9′	S26°18.7	5.4′	54.0′
7	285°51.1	23.7	307°47.2	10.9′	26°24.1	5.3′	54.0′
8	300°50.8	23.7	322°17.1	10.8′	26°29.4	5.2′	54.0′
9	315°50.5	·· 23.8	336°47.0	10.8′	26°34.6	5.1′	54.0′
10	330°50.2	23.9	351°16.7	10.7′	26°39.7	4.9′	54.0′
11	345°49.9	23.9	5°46.5	10.7′	26°44.6	4.8′	54.0′
12	0°49.6	S23°24.0	20°16.1	10.6′	S26°49.4	4.6′	54.0′
13	15°49.3	24.1	34°45.7	10.6′	26°54.0	4.6′	54.0′
14	30°49.0	24.1	49°15.3	10.5′	26°58.6	4.4′	54.0′
15	45°48.7	·· 24.2	63°44.8	10.5′	27°03.0	4.3′	54.0′
16	60°48.3	24.2	78°14.3	10.4′	27°07.3	4.2′	54.0′
17	75°48.0	24.3	92°43.7	10.4′	27°11.5	4.0′	54.0′
18	90°47.7	S23°24.3	107°13.0	10.3′	S27°15.5	3.9′	54.0′
19	105°47.4	24.4	121°42.3	10.3′	27°19.4	3.8′	54.0′
20	120°47.1	24.5	136°11.6	10.2′	27°23.2	3.6′	54.0′
21	135°46.8	·· 24.5	150°40.8	10.2′	27°26.8	3.5′	54.0′
22	150°46.5	24.6	165°10.0	10.1′	27°30.3	3.4′	54.0′
23	165°46.2	24.6	179°39.1	10.1′	27°33.7	3.3′	54.0′
	SD = 16.2′	d = -0.1′	SD = 14.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.9	S23°24.7	194°08.2	10.0′	S27°37.0	3.1′	54.1′
1	195°45.6	24.7	208°37.2	10.0′	27°40.1	3.0′	54.1′
2	210°45.3	24.8	223°06.2	10.0′	27°43.1	2.8′	54.1′
3	225°44.9	·· 24.8	237°35.2	9.9′	27°45.9	2.7′	54.1′
4	240°44.6	24.9	252°04.1	9.9′	27°48.6	2.6′	54.1′
5	255°44.3	24.9	266°33.0	9.8′	27°51.2	2.4′	54.1′
6	270°44.0	S23°25.0	281°01.9	9.8′	S27°53.6	2.3′	54.1′
7	285°43.7	25.0	295°30.7	9.8′	27°55.9	2.2′	54.1′
8	300°43.4	25.1	309°59.4	9.7′	27°58.1	2.1′	54.1′
9	315°43.1	·· 25.1	324°28.2	9.7′	28°00.2	1.9′	54.1′
10	330°42.8	25.1	338°56.9	9.7′	28°02.1	1.7′	54.1′
11	345°42.5	25.2	353°25.6	9.7′	28°03.8	1.6′	54.1′
12	0°42.2	S23°25.2	7°54.2	9.6′	S28°05.4	1.5′	54.1′
13	15°41.9	25.3	22°22.9	9.6′	28°06.9	1.4′	54.2′
14	30°41.5	25.3	36°51.5	9.6′	28°08.3	1.2′	54.2′
15	45°41.2	·· 25.4	51°20.0	9.5′	28°09.5	1.0′	54.2′
16	60°40.9	25.4	65°48.6	9.5′	28°10.5	1.0′	54.2′
17	75°40.6	25.4	80°17.1	9.5′	28°11.5	0.8′	54.2′
18	90°40.3	S23°25.5	94°45.6	9.5′	S28°12.3	0.6′	54.2′
19	105°40.0	25.5	109°14.1	9.5′	28°12.9	0.5′	54.2′
20	120°39.7	25.5	123°42.6	9.4′	28°13.4	0.4′	54.2′
21	135°39.4	·· 25.6	138°11.0	9.4′	28°13.8	0.2′	54.2′
22	150°39.1	25.6	152°39.4	9.4′	28°14.0	0.1′	54.2′
23	165°38.7	25.6	167°07.9	9.4′	28°14.1	0.0′	54.2′
	SD = 16.2′	d = -0.1′	SD = 14.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.4	S23°25.7	181°36.3	9.4′	S28°14.1	0.2′	54.3′
1	195°38.1	25.7	196°04.7	9.4′	28°13.9	0.4′	54.3′
2	210°37.8	25.7	210°33.0	9.4′	28°13.5	0.5′	54.3′
3	225°37.5	·· 25.8	225°01.4	9.4′	28°13.0	0.6′	54.3′
4	240°37.2	25.8	239°29.8	9.4′	28°12.4	0.7′	54.3′
5	255°36.9	25.8	253°58.1	9.4′	28°11.7	0.9′	54.3′
6	270°36.6	S23°25.8	268°26.5	9.4′	S28°10.8	1.1′	54.3′
7	285°36.3	25.9	282°54.9	9.4′	28°09.7	1.2′	54.3′
8	300°36.0	25.9	297°23.2	9.4′	28°08.5	1.3′	54.3′
9	315°35.6	·· 25.9	311°51.6	9.4′	28°07.2	1.5′	54.4′
10	330°35.3	26.0	326°19.9	9.4′	28°05.7	1.6′	54.4′
11	345°35.0	26.0	340°48.3	9.4′	28°04.1	1.7′	54.4′
12	0°34.7	S23°26.0	355°16.6	9.4′	S28°02.4	1.9′	54.4′
13	15°34.4	26.0	9°45.0	9.4′	28°00.5	2.1′	54.4′
14	30°34.1	26.0	24°13.4	9.4′	27°58.4	2.1′	54.4′
15	45°33.8	·· 26.1	38°41.7	9.4′	27°56.3	2.4′	54.4′
16	60°33.5	26.1	53°10.1	9.4′	27°53.9	2.4′	54.4′
17	75°33.2	26.1	67°38.5	9.4′	27°51.5	2.6′	54.4′
18	90°32.8	S23°26.1	82°06.9	9.4′	S27°48.9	2.8′	54.5′
19	105°32.5	26.1	96°35.4	9.4′	27°46.1	2.8′	54.5′
20	120°32.2	26.1	111°03.8	9.5′	27°43.3	3.1′	54.5′
21	135°31.9	·· 26.2	125°32.3	9.5′	27°40.2	3.1′	54.5′
22	150°31.6	26.2	140°00.7	9.5′	27°37.1	3.3′	54.5′
23	165°31.3	26.2	154°29.2	9.5′	27°33.8	3.5′	54.5′
	SD = 16.2′	d = -0.0′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:25	10:56	▬	▬	12:58	15:30
N 70°	08:04	09:53	▬	▬	14:01	15:50
68°	07:49	09:18	▬	▬	14:36	16:06
66°	07:35	08:53	10:33	13:21	15:02	16:19
64°	07:24	08:33	09:51	14:03	15:22	16:30
62°	07:15	08:17	09:23	14:32	15:38	16:40
60°	07:06	08:03	09:01	14:53	15:51	16:48
N 58°	06:59	07:51	08:43	15:11	16:03	16:56
56°	06:52	07:41	08:29	15:26	16:13	17:02
54°	06:46	07:32	08:16	15:38	16:22	17:09
52°	06:40	07:24	08:05	15:50	16:31	17:14
50°	06:35	07:16	07:55	15:59	16:38	17:20
45°	06:23	07:00	07:34	16:20	16:54	17:31
N 40°	06:13	06:47	07:17	16:37	17:08	17:42
35°	06:03	06:35	07:03	16:51	17:19	17:51
30°	05:54	06:24	06:51	17:04	17:30	18:00
20°	05:38	06:05	06:29	17:25	17:49	18:16
N 10°	05:22	05:48	06:11	17:43	18:06	18:33
0°	05:05	05:31	05:53	18:01	18:23	18:50
S 10°	04:46	05:13	05:36	18:19	18:42	19:09
20°	04:23	04:52	05:17	18:38	19:02	19:31
30°	03:54	04:27	04:55	19:00	19:27	20:00
35°	03:35	04:12	04:42	19:13	19:42	20:19
40°	03:12	03:54	04:27	19:28	20:01	20:42
45°	02:41	03:31	04:09	19:46	20:23	21:13
S 50°	01:56	03:01	03:46	20:08	20:53	21:59
52°	01:28	02:46	03:35	20:19	21:08	22:27
54°	00:41	02:28	03:23	20:32	21:26	23:14
56°	–:–	02:06	03:09	20:46	21:49	–:–
58°	–:–	01:36	02:52	21:03	22:18	–:–
S 60°	–:–	00:45	02:31	21:23	23:10	–:–

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	▬	▬	▬	▬
64°	▬	▬	▬	▬	▬	▬
62°	09:17	▬	▬	11:48	▬	▬
60°	08:33	09:55	10:49	12:33	12:57	13:53
N 58°	08:04	09:18	10:11	13:03	13:35	14:30
56°	07:42	08:51	09:45	13:25	14:02	14:57
54°	07:23	08:30	09:24	13:44	14:23	15:17
52°	07:08	08:13	09:06	14:00	14:40	15:35
50°	06:54	07:58	08:51	14:13	14:55	15:50
45°	06:27	07:28	08:21	14:41	15:25	16:20
N 40°	06:06	07:04	07:58	15:03	15:49	16:43
35°	05:48	06:45	07:38	15:21	16:08	17:02
30°	05:33	06:29	07:22	15:37	16:25	17:19
20°	05:07	06:01	06:54	16:04	16:53	17:46
N 10°	04:45	05:37	06:29	16:27	17:17	18:10
0°	04:24	05:15	06:07	16:48	17:40	18:32
S 10°	04:04	04:53	05:44	17:10	18:02	18:54
20°	03:42	04:29	05:20	17:33	18:26	19:18
30°	03:16	04:01	04:52	18:00	18:55	19:45
35°	03:01	03:45	04:36	18:16	19:11	20:02
40°	02:44	03:26	04:16	18:34	19:31	20:20
45°	02:24	03:03	03:53	18:57	19:54	20:43
S 50°	01:58	02:34	03:23	19:25	20:24	21:12
52°	01:45	02:20	03:08	19:40	20:39	21:26
54°	01:31	02:03	02:50	19:56	20:57	21:43
56°	01:15	01:44	02:29	20:16	21:18	22:02
58°	00:55	01:19	02:03	20:40	21:44	22:26
S 60°	00:30	00:46	01:25	21:13	22:22	22:59

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 28-0 4-0%
18	03:33	03:18	11:57	10:36	23:01	
19	03:04	02:49	11:57	11:27	23:53	
20	02:34	02:19	11:58	12:20	–:–	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2669 sec ΔT = TT-UT1 = +68.9171 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	89°49.2	184°52.6	S23°26.0	175°06.4	S24°11.1	335°15.2	N21°44.0	92°55.5	S03°50.8
1	104°51.7	199°51.6	26.2	190°06.7	11.1	350°18.0	44.0	107°57.8	50.8
2	119°54.1	214°50.7	26.4	205°07.1	11.0	5°20.8	44.1	123°00.2	50.7
3	134°56.6	229°49.7	·· 26.6	220°07.5	·· 11.0	20°23.5	·· 44.1	138°02.6	·· 50.7
4	149°59.1	244°48.7	26.8	235°07.9	11.0	35°26.3	44.2	153°04.9	50.6
5	165°01.5	259°47.8	27.0	250°08.3	10.9	50°29.1	44.2	168°07.3	50.6
6	180°04.0	274°46.8	S23°27.2	265°08.7	S24°10.9	65°31.8	N21°44.3	183°09.7	S03°50.5
7	195°06.4	289°45.9	27.4	280°09.1	10.8	80°34.6	44.4	198°12.1	50.5
8	210°08.9	304°44.9	27.6	295°09.4	10.8	95°37.4	44.4	213°14.4	50.4
9	225°11.4	319°43.9	·· 27.8	310°09.8	·· 10.7	110°40.1	·· 44.5	228°16.8	·· 50.4
10	240°13.8	334°43.0	28.0	325°10.2	10.7	125°42.9	44.5	243°19.2	50.3
11	255°16.3	349°42.0	28.2	340°10.6	10.6	140°45.7	44.6	258°21.6	50.3
12	270°18.8	4°41.0	S23°28.4	355°11.0	S24°10.6	155°48.5	N21°44.6	273°23.9	S03°50.2
13	285°21.2	19°40.1	28.6	10°11.4	10.5	170°51.2	44.7	288°26.3	50.2
14	300°23.7	34°39.1	28.8	25°11.8	10.5	185°54.0	44.7	303°28.7	50.1
15	315°26.2	49°38.2	·· 29.0	40°12.1	·· 10.4	200°56.8	·· 44.8	318°31.1	·· 50.1
16	330°28.6	64°37.2	29.2	55°12.5	10.4	215°59.5	44.8	333°33.4	50.0
17	345°31.1	79°36.2	29.4	70°12.9	10.3	231°02.3	44.9	348°35.8	50.0
18	0°33.6	94°35.3	S23°29.6	85°13.3	S24°10.3	246°05.1	N21°45.0	3°38.2	S03°49.9
19	15°36.0	109°34.3	29.8	100°13.7	10.2	261°07.9	45.0	18°40.5	49.9
20	30°38.5	124°33.3	30.0	115°14.1	10.2	276°10.6	45.1	33°42.9	49.8
21	45°40.9	139°32.4	·· 30.1	130°14.4	·· 10.1	291°13.4	·· 45.1	48°45.3	·· 49.8
22	60°43.4	154°31.4	30.3	145°14.8	10.1	306°16.2	45.2	63°47.7	49.7
23	75°45.9	169°30.5	30.5	160°15.2	10.0	321°18.9	45.2	78°50.0	49.7
Mer.pass.	17:58	ν -1.0′	d -0.2′	m -3.90	ν 0.4′	d 0.0′	m 1.19	ν 2.8′	d 0.1′ m -2.64	ν 2.4′	d 0.0′ m 0.98
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	90°48.3	184°29.5	S23°30.7	175°15.6	S24°09.9	336°21.7	N21°45.3	93°52.4	S03°49.6
1	105°50.8	199°28.5	30.9	190°16.0	09.9	351°24.5	45.3	108°54.8	49.6
2	120°53.3	214°27.6	31.0	205°16.4	09.8	6°27.3	45.4	123°57.1	49.5
3	135°55.7	229°26.6	·· 31.2	220°16.8	·· 09.8	21°30.0	·· 45.4	138°59.5	·· 49.5
4	150°58.2	244°25.6	31.4	235°17.1	09.7	36°32.8	45.5	154°01.9	49.4
5	166°00.7	259°24.7	31.6	250°17.5	09.7	51°35.6	45.5	169°04.3	49.4
6	181°03.1	274°23.7	S23°31.8	265°17.9	S24°09.6	66°38.4	N21°45.6	184°06.6	S03°49.3
7	196°05.6	289°22.7	31.9	280°18.3	09.5	81°41.1	45.7	199°09.0	49.3
8	211°08.1	304°21.8	32.1	295°18.7	09.5	96°43.9	45.7	214°11.4	49.2
9	226°10.5	319°20.8	·· 32.3	310°19.1	·· 09.4	111°46.7	·· 45.8	229°13.7	·· 49.2
10	241°13.0	334°19.8	32.4	325°19.4	09.4	126°49.5	45.8	244°16.1	49.1
11	256°15.4	349°18.9	32.6	340°19.8	09.3	141°52.2	45.9	259°18.5	49.1
12	271°17.9	4°17.9	S23°32.8	355°20.2	S24°09.2	156°55.0	N21°45.9	274°20.8	S03°49.0
13	286°20.4	19°16.9	32.9	10°20.6	09.2	171°57.8	46.0	289°23.2	49.0
14	301°22.8	34°16.0	33.1	25°21.0	09.1	187°00.6	46.0	304°25.6	48.9
15	316°25.3	49°15.0	·· 33.3	40°21.4	·· 09.1	202°03.3	·· 46.1	319°27.9	·· 48.9
16	331°27.8	64°14.1	33.4	55°21.7	09.0	217°06.1	46.2	334°30.3	48.8
17	346°30.2	79°13.1	33.6	70°22.1	08.9	232°08.9	46.2	349°32.7	48.8
18	1°32.7	94°12.1	S23°33.7	85°22.5	S24°08.9	247°11.7	N21°46.3	4°35.1	S03°48.7
19	16°35.2	109°11.2	33.9	100°22.9	08.8	262°14.4	46.3	19°37.4	48.7
20	31°37.6	124°10.2	34.0	115°23.3	08.7	277°17.2	46.4	34°39.8	48.6
21	46°40.1	139°09.2	·· 34.2	130°23.7	·· 08.7	292°20.0	·· 46.4	49°42.2	·· 48.6
22	61°42.6	154°08.3	34.4	145°24.0	08.6	307°22.8	46.5	64°44.5	48.5
23	76°45.0	169°07.3	34.5	160°24.4	08.5	322°25.6	46.5	79°46.9	48.5
Mer.pass.	17:54	ν -1.0′	d -0.2′	m -3.90	ν 0.4′	d 0.1′	m 1.18	ν 2.8′	d 0.1′ m -2.65	ν 2.4′	d 0.0′ m 0.98
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°47.5	184°06.3	S23°34.7	175°24.8	S24°08.5	337°28.3	N21°46.6	94°49.3	S03°48.4
1	106°49.9	199°05.3	34.8	190°25.2	08.4	352°31.1	46.6	109°51.6	48.4
2	121°52.4	214°04.4	35.0	205°25.6	08.3	7°33.9	46.7	124°54.0	48.3
3	136°54.9	229°03.4	·· 35.1	220°26.0	·· 08.3	22°36.7	·· 46.8	139°56.4	·· 48.3
4	151°57.3	244°02.4	35.2	235°26.3	08.2	37°39.4	46.8	154°58.7	48.2
5	166°59.8	259°01.5	35.4	250°26.7	08.1	52°42.2	46.9	170°01.1	48.2
6	182°02.3	274°00.5	S23°35.5	265°27.1	S24°08.1	67°45.0	N21°46.9	185°03.5	S03°48.1
7	197°04.7	288°59.5	35.7	280°27.5	08.0	82°47.8	47.0	200°05.8	48.1
8	212°07.2	303°58.6	35.8	295°27.9	07.9	97°50.6	47.0	215°08.2	48.0
9	227°09.7	318°57.6	·· 36.0	310°28.3	·· 07.9	112°53.3	·· 47.1	230°10.6	·· 48.0
10	242°12.1	333°56.6	36.1	325°28.6	07.8	127°56.1	47.1	245°12.9	47.9
11	257°14.6	348°55.7	36.2	340°29.0	07.7	142°58.9	47.2	260°15.3	47.9
12	272°17.1	3°54.7	S23°36.4	355°29.4	S24°07.6	158°01.7	N21°47.2	275°17.7	S03°47.8
13	287°19.5	18°53.7	36.5	10°29.8	07.6	173°04.5	47.3	290°20.0	47.8
14	302°22.0	33°52.8	36.6	25°30.2	07.5	188°07.2	47.4	305°22.4	47.7
15	317°24.4	48°51.8	·· 36.8	40°30.6	·· 07.4	203°10.0	·· 47.4	320°24.7	·· 47.6
16	332°26.9	63°50.8	36.9	55°30.9	07.3	218°12.8	47.5	335°27.1	47.6
17	347°29.4	78°49.9	37.0	70°31.3	07.3	233°15.6	47.5	350°29.5	47.5
18	2°31.8	93°48.9	S23°37.1	85°31.7	S24°07.2	248°18.4	N21°47.6	5°31.8	S03°47.5
19	17°34.3	108°47.9	37.3	100°32.1	07.1	263°21.1	47.6	20°34.2	47.4
20	32°36.8	123°46.9	37.4	115°32.5	07.0	278°23.9	47.7	35°36.6	47.4
21	47°39.2	138°46.0	·· 37.5	130°32.8	·· 07.0	293°26.7	·· 47.7	50°38.9	·· 47.3
22	62°41.7	153°45.0	37.6	145°33.2	06.9	308°29.5	47.8	65°41.3	47.3
23	77°44.2	168°44.0	37.8	160°33.6	06.8	323°32.3	47.9	80°43.7	47.2
Mer.pass.	17:50	ν -1.0′	d -0.1′	m -3.90	ν 0.4′	d 0.1′	m 1.18	ν 2.8′	d 0.1′ m -2.65	ν 2.4′	d 0.1′ m 0.99

Stars

	SHA	Dec
Alpheratz	357°33.9	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.0	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.3	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°14.5	89°22.6
Acamar	315°10.9	-40°12.1
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.5
Sirius	258°25.2	-16°45.1
Adhara	255°04.9	-29°00.4
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°13.9	-59°35.4
Suhail	222°45.4	-43°32.1
Miaplacidus	221°37.5	-69°49.2
Alphard	217°46.8	-8°46.2
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.3
Denebola	182°24.1	14°25.5
Gienah	175°42.8	-17°41.1
Acrux	172°59.3	-63°14.3
Gacrux	171°50.9	-57°15.3
Alioth	166°12.4	55°48.8
Spica	158°21.6	-11°17.8
Alkaid	152°51.6	49°10.7
Hadar	148°35.2	-60°29.7
Menkent	147°56.9	-36°29.7
Arcturus	145°47.4	19°02.7
Rigil Kent.	139°39.6	-60°56.3
Kochab	137°20.6	74°02.6
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.2	-26°29.3
Atria	107°09.3	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.2	12°32.4
Eltanin	90°42.4	51°29.1
Kaus Aust.	83°31.9	-34°22.3
Vega	80°33.1	38°48.5
Nunki	75°47.2	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.6	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 21 Sun	SHA	Mer.pass
Venus	95°03.4	11:41
Mars	85°17.2	12:19
Jupiter	245°26.0	01:39
Saturn	3°06.3	17:45

Dec 22 Mon	SHA	Mer.pass
Venus	93°41.2	11:43
Mars	84°27.3	12:19
Jupiter	245°33.4	01:34
Saturn	3°04.1	17:42

Dec 23 Tue	SHA	Mer.pass
Venus	92°18.8	11:44
Mars	83°37.3	12:18
Jupiter	245°40.8	01:30
Saturn	3°01.8	17:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		180°31.0	S23°26.2	168°57.7	9.5′	S27°30.3	3.6′	54.5′
1		195°30.7	26.2	183°26.3	9.6′	27°26.7	3.7′	54.6′
2		210°30.4	26.2	197°54.8	9.6′	27°23.0	3.8′	54.6′
3		225°30.0	·· 26.2	212°23.4	9.6′	27°19.2	4.0′	54.6′
4		240°29.7	26.2	226°52.0	9.6′	27°15.2	4.2′	54.6′
5		255°29.4	26.3	241°20.6	9.7′	27°11.0	4.2′	54.6′
6		270°29.1	S23°26.3	255°49.3	9.7′	S27°06.8	4.5′	54.6′
7		285°28.8	26.3	270°18.0	9.7′	27°02.3	4.5′	54.6′
8		300°28.5	26.3	284°46.7	9.7′	26°57.8	4.7′	54.6′
9		315°28.2	·· 26.3	299°15.4	9.8′	26°53.1	4.8′	54.7′
10		330°27.9	26.3	313°44.2	9.8′	26°48.3	5.0′	54.7′
11		345°27.6	26.3	328°13.0	9.8′	26°43.3	5.1′	54.7′
12		0°27.2	S23°26.3	342°41.8	9.9′	S26°38.2	5.2′	54.7′
13		15°26.9	26.3	357°10.7	9.9′	26°33.0	5.3′	54.7′
14		30°26.6	26.3	11°39.6	9.9′	26°27.7	5.5′	54.7′
15		45°26.3	·· 26.3	26°08.6	10.0′	26°22.2	5.7′	54.7′
16		60°26.0	26.3	40°37.5	10.0′	26°16.5	5.7′	54.8′
17		75°25.7	26.3	55°06.6	10.1′	26°10.8	5.9′	54.8′
18		90°25.4	S23°26.3	69°35.6	10.1′	S26°04.9	6.0′	54.8′
19		105°25.1	26.3	84°04.7	10.1′	25°58.9	6.2′	54.8′
20		120°24.7	26.3	98°33.9	10.2′	25°52.7	6.3′	54.8′
21		135°24.4	·· 26.3	113°03.0	10.2′	25°46.4	6.4′	54.8′
22		150°24.1	26.3	127°32.3	10.3′	25°40.0	6.5′	54.9′
23		165°23.8	26.3	142°01.5	10.3′	25°33.5	6.7′	54.9′
		SD = 16.2′	d = -0.0′		SD = 14.9′			
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		180°23.5	S23°26.3	156°30.9	10.4′	S25°26.8	6.8′	54.9′
1		195°23.2	26.3	171°00.2	10.4′	25°20.0	6.9′	54.9′
2		210°22.9	26.2	185°29.6	10.4′	25°13.1	7.1′	54.9′
3		225°22.6	·· 26.2	199°59.1	10.5′	25°06.0	7.1′	54.9′
4		240°22.3	26.2	214°28.6	10.5′	24°58.9	7.3′	54.9′
5		255°21.9	26.2	228°58.1	10.6′	24°51.6	7.5′	55.0′
6		270°21.6	S23°26.2	243°27.7	10.6′	S24°44.1	7.5′	55.0′
7		285°21.3	26.2	257°57.3	10.7′	24°36.6	7.7′	55.0′
8		300°21.0	26.2	272°27.0	10.7′	24°28.9	7.8′	55.0′
9		315°20.7	·· 26.2	286°56.8	10.8′	24°21.1	7.9′	55.0′
10		330°20.4	26.1	301°26.6	10.8′	24°13.2	8.0′	55.0′
11		345°20.1	26.1	315°56.4	10.9′	24°05.2	8.2′	55.1′
12		0°19.8	S23°26.1	330°26.3	10.9′	S23°57.0	8.3′	55.1′
13		15°19.5	26.1	344°56.2	11.0′	23°48.7	8.4′	55.1′
14		30°19.1	26.1	359°26.2	11.0′	23°40.3	8.5′	55.1′
15		45°18.8	·· 26.1	13°56.3	11.1′	23°31.8	8.6′	55.1′
16		60°18.5	26.0	28°26.4	11.2′	23°23.2	8.8′	55.2′
17		75°18.2	26.0	42°56.5	11.2′	23°14.4	8.8′	55.2′
18		90°17.9	S23°26.0	57°26.7	11.3′	S23°05.6	9.0′	55.2′
19		105°17.6	26.0	71°57.0	11.3′	22°56.6	9.1′	55.2′
20		120°17.3	26.0	86°27.3	11.4′	22°47.5	9.2′	55.2′
21		135°17.0	·· 25.9	100°57.6	11.4′	22°38.3	9.3′	55.2′
22		150°16.6	25.9	115°28.1	11.5′	22°29.0	9.4′	55.3′
23		165°16.3	25.9	129°58.5	11.5′	22°19.6	9.6′	55.3′
		SD = 16.3′	d = 0.0′		SD = 15.0′			
Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		180°16.0	S23°25.8	144°29.0	11.6′	S22°10.0	9.6′	55.3′
1		195°15.7	25.8	158°59.6	11.6′	22°00.4	9.8′	55.3′
2		210°15.4	25.8	173°30.3	11.7′	21°50.6	9.8′	55.3′
3		225°15.1	·· 25.8	188°00.9	11.7′	21°40.8	10.0′	55.4′
4		240°14.8	25.7	202°31.7	11.8′	21°30.8	10.1′	55.4′
5		255°14.5	25.7	217°02.5	11.8′	21°20.7	10.1′	55.4′
6		270°14.2	S23°25.7	231°33.3	11.9′	S21°10.6	10.3′	55.4′
7		285°13.8	25.6	246°04.2	12.0′	21°00.3	10.4′	55.4′
8		300°13.5	25.6	260°35.2	12.0′	20°49.9	10.5′	55.4′
9		315°13.2	·· 25.6	275°06.2	12.1′	20°39.4	10.6′	55.5′
10		330°12.9	25.5	289°37.2	12.1′	20°28.8	10.7′	55.5′
11		345°12.6	25.5	304°08.4	12.2′	20°18.1	10.8′	55.5′
12		0°12.3	S23°25.5	318°39.5	12.2′	S20°07.3	10.9′	55.5′
13		15°12.0	25.4	333°10.7	12.3′	19°56.4	11.0′	55.5′
14		30°11.7	25.4	347°42.0	12.3′	19°45.4	11.1′	55.6′
15		45°11.4	·· 25.4	2°13.3	12.4′	19°34.3	11.1′	55.6′
16		60°11.0	25.3	16°44.7	12.4′	19°23.2	11.3′	55.6′
17		75°10.7	25.3	31°16.1	12.5′	19°11.9	11.4′	55.6′
18		90°10.4	S23°25.2	45°47.6	12.5′	S19°00.5	11.5′	55.6′
19		105°10.1	25.2	60°19.1	12.6′	18°49.0	11.5′	55.7′
20		120°09.8	25.1	74°50.7	12.6′	18°37.5	11.7′	55.7′
21		135°09.5	·· 25.1	89°22.3	12.7′	18°25.8	11.7′	55.7′
22		150°09.2	25.1	103°54.0	12.7′	18°14.1	11.9′	55.7′
23		165°08.9	25.0	118°25.8	12.8′	18°02.2	11.9′	55.8′
		SD = 16.3′	d = 0.0′		SD = 15.1′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:26	10:58	▬	▬	12:59	15:31
N 70°	08:06	09:55	▬	▬	14:02	15:51
68°	07:50	09:20	▬	▬	14:38	16:07
66°	07:37	08:54	10:35	13:22	15:03	16:20
64°	07:26	08:35	09:53	14:05	15:23	16:31
62°	07:16	08:18	09:24	14:33	15:39	16:41
60°	07:08	08:05	09:03	14:55	15:53	16:50
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:54	07:43	08:30	15:27	16:15	17:04
54°	06:47	07:34	08:18	15:40	16:24	17:10
52°	06:42	07:25	08:06	15:51	16:32	17:16
50°	06:36	07:18	07:56	16:01	16:39	17:21
45°	06:25	07:02	07:36	16:22	16:56	17:33
N 40°	06:14	06:48	07:19	16:39	17:09	17:43
35°	06:05	06:36	07:05	16:53	17:21	17:53
30°	05:56	06:26	06:52	17:05	17:32	18:01
20°	05:39	06:07	06:31	17:26	17:50	18:18
N 10°	05:23	05:50	06:12	17:45	18:08	18:34
0°	05:06	05:32	05:55	18:02	18:25	18:51
S 10°	04:47	05:14	05:37	18:20	18:43	19:10
20°	04:24	04:54	05:18	18:39	19:04	19:33
30°	03:55	04:29	04:56	19:01	19:29	20:02
35°	03:37	04:13	04:43	19:14	19:44	20:21
40°	03:13	03:55	04:28	19:29	20:02	20:44
45°	02:43	03:33	04:10	19:47	20:25	21:15
S 50°	01:57	03:03	03:47	20:10	20:55	22:00
52°	01:29	02:48	03:37	20:21	21:10	22:28
54°	00:42	02:30	03:24	20:33	21:28	23:15
56°	–:–	02:07	03:10	20:47	21:50	–:–
58°	–:–	01:37	02:53	21:04	22:20	–:–
S 60°	–:–	00:46	02:33	21:25	23:11	–:–

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	14:17	▬	▬	15:44
68°	▬	▬	13:05	▬	▬	16:54
66°	▬	13:33	12:28	▬	14:44	17:30
64°	▬	12:23	12:02	▬	15:54	17:55
62°	11:55	11:47	11:41	14:36	16:29	18:15
60°	11:12	11:21	11:24	15:18	16:54	18:31
N 58°	10:43	11:00	11:10	15:47	17:14	18:45
56°	10:21	10:43	10:57	16:09	17:31	18:56
54°	10:02	10:29	10:47	16:27	17:45	19:06
52°	09:47	10:16	10:37	16:42	17:57	19:15
50°	09:33	10:05	10:28	16:55	18:08	19:23
45°	09:06	09:41	10:10	17:22	18:30	19:40
N 40°	08:44	09:23	09:55	17:43	18:48	19:54
35°	08:26	09:07	09:42	18:01	19:03	20:06
30°	08:10	08:53	09:31	18:16	19:16	20:16
20°	07:43	08:30	09:12	18:42	19:38	20:33
N 10°	07:21	08:09	08:55	19:04	19:57	20:48
0°	06:59	07:50	08:39	19:24	20:14	21:02
S 10°	06:38	07:31	08:24	19:44	20:32	21:16
20°	06:15	07:11	08:07	20:06	20:50	21:31
30°	05:48	06:47	07:47	20:31	21:12	21:47
35°	05:32	06:33	07:35	20:46	21:24	21:57
40°	05:14	06:17	07:22	21:03	21:38	22:08
45°	04:51	05:57	07:06	21:23	21:55	22:21
S 50°	04:23	05:32	06:47	21:49	22:16	22:37
52°	04:09	05:21	06:38	22:01	22:26	22:44
54°	03:53	05:07	06:27	22:15	22:37	22:52
56°	03:33	04:51	06:15	22:31	22:49	23:01
58°	03:09	04:32	06:02	22:50	23:03	23:11
S 60°	02:37	04:09	05:45	23:14	23:20	23:23

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 1-3 1-8%
21	02:04	01:49	11:58	13:12	00:46	
22	01:34	01:19	11:59	14:02	01:37	
23	01:04	00:49	11:59	14:51	02:27	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2676 sec ΔT = TT-UT1 = +68.9164 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	92°46.6	183°43.1	S23°37.9	175°34.0	S24°06.7	338°35.1	N21°47.9	95°46.0	S03°47.2
1	107°49.1	198°42.1	38.0	190°34.4	06.7	353°37.8	48.0	110°48.4	47.1
2	122°51.5	213°41.1	38.1	205°34.8	06.6	8°40.6	48.0	125°50.7	47.1
3	137°54.0	228°40.2	·· 38.2	220°35.1	·· 06.5	23°43.4	·· 48.1	140°53.1	·· 47.0
4	152°56.5	243°39.2	38.4	235°35.5	06.4	38°46.2	48.1	155°55.5	47.0
5	167°58.9	258°38.2	38.5	250°35.9	06.3	53°49.0	48.2	170°57.8	46.9
6	183°01.4	273°37.2	S23°38.6	265°36.3	S24°06.3	68°51.8	N21°48.2	186°00.2	S03°46.9
7	198°03.9	288°36.3	38.7	280°36.7	06.2	83°54.5	48.3	201°02.6	46.8
8	213°06.3	303°35.3	38.8	295°37.0	06.1	98°57.3	48.4	216°04.9	46.7
9	228°08.8	318°34.3	·· 38.9	310°37.4	·· 06.0	114°00.1	·· 48.4	231°07.3	·· 46.7
10	243°11.3	333°33.4	39.0	325°37.8	05.9	129°02.9	48.5	246°09.6	46.6
11	258°13.7	348°32.4	39.1	340°38.2	05.9	144°05.7	48.5	261°12.0	46.6
12	273°16.2	3°31.4	S23°39.2	355°38.6	S24°05.8	159°08.5	N21°48.6	276°14.4	S03°46.5
13	288°18.7	18°30.4	39.3	10°39.0	05.7	174°11.2	48.6	291°16.7	46.5
14	303°21.1	33°29.5	39.4	25°39.3	05.6	189°14.0	48.7	306°19.1	46.4
15	318°23.6	48°28.5	·· 39.5	40°39.7	·· 05.5	204°16.8	·· 48.7	321°21.5	·· 46.4
16	333°26.0	63°27.5	39.6	55°40.1	05.4	219°19.6	48.8	336°23.8	46.3
17	348°28.5	78°26.6	39.7	70°40.5	05.4	234°22.4	48.9	351°26.2	46.3
18	3°31.0	93°25.6	S23°39.8	85°40.9	S24°05.3	249°25.2	N21°48.9	6°28.5	S03°46.2
19	18°33.4	108°24.6	39.9	100°41.2	05.2	264°28.0	49.0	21°30.9	46.2
20	33°35.9	123°23.6	40.0	115°41.6	05.1	279°30.7	49.0	36°33.3	46.1
21	48°38.4	138°22.7	·· 40.1	130°42.0	·· 05.0	294°33.5	·· 49.1	51°35.6	·· 46.0
22	63°40.8	153°21.7	40.2	145°42.4	04.9	309°36.3	49.1	66°38.0	46.0
23	78°43.3	168°20.7	40.3	160°42.8	04.8	324°39.1	49.2	81°40.3	45.9
Mer.pass.	17:46	ν -1.0′	d -0.1′	m -3.90	ν 0.4′	d 0.1′	m 1.17	ν 2.8′	d 0.1′ m -2.65	ν 2.4′	d 0.1′ m 0.99

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	93°45.8	183°19.8	S23°40.4	175°43.2	S24°04.7	339°41.9	N21°49.2	96°42.7	S03°45.9
1	108°48.2	198°18.8	40.5	190°43.5	04.6	354°44.7	49.3	111°45.1	45.8
2	123°50.7	213°17.8	40.6	205°43.9	04.6	9°47.5	49.4	126°47.4	45.8
3	138°53.2	228°16.8	·· 40.7	220°44.3	·· 04.5	24°50.2	·· 49.4	141°49.8	·· 45.7
4	153°55.6	243°15.9	40.7	235°44.7	04.4	39°53.0	49.5	156°52.1	45.7
5	168°58.1	258°14.9	40.8	250°45.1	04.3	54°55.8	49.5	171°54.5	45.6
6	184°00.5	273°13.9	S23°40.9	265°45.4	S24°04.2	69°58.6	N21°49.6	186°56.8	S03°45.6
7	199°03.0	288°13.0	41.0	280°45.8	04.1	85°01.4	49.6	201°59.2	45.5
8	214°05.5	303°12.0	41.1	295°46.2	04.0	100°04.2	49.7	217°01.6	45.4
9	229°07.9	318°11.0	·· 41.1	310°46.6	·· 03.9	115°07.0	·· 49.7	232°03.9	·· 45.4
10	244°10.4	333°10.0	41.2	325°47.0	03.8	130°09.8	49.8	247°06.3	45.3
11	259°12.9	348°09.1	41.3	340°47.3	03.7	145°12.6	49.9	262°08.6	45.3
12	274°15.3	3°08.1	S23°41.4	355°47.7	S24°03.6	160°15.3	N21°49.9	277°11.0	S03°45.2
13	289°17.8	18°07.1	41.4	10°48.1	03.5	175°18.1	50.0	292°13.4	45.2
14	304°20.3	33°06.1	41.5	25°48.5	03.4	190°20.9	50.0	307°15.7	45.1
15	319°22.7	48°05.2	·· 41.6	40°48.9	·· 03.4	205°23.7	·· 50.1	322°18.1	·· 45.1
16	334°25.2	63°04.2	41.7	55°49.2	03.3	220°26.5	50.1	337°20.4	45.0
17	349°27.6	78°03.2	41.7	70°49.6	03.2	235°29.3	50.2	352°22.8	44.9
18	4°30.1	93°02.3	S23°41.8	85°50.0	S24°03.1	250°32.1	N21°50.3	7°25.1	S03°44.9
19	19°32.6	108°01.3	41.9	100°50.4	03.0	265°34.9	50.3	22°27.5	44.8
20	34°35.0	123°00.3	41.9	115°50.8	02.9	280°37.7	50.4	37°29.8	44.8
21	49°37.5	137°59.3	·· 42.0	130°51.1	·· 02.8	295°40.5	·· 50.4	52°32.2	·· 44.7
22	64°40.0	152°58.4	42.0	145°51.5	02.7	310°43.2	50.5	67°34.6	44.7
23	79°42.4	167°57.4	42.1	160°51.9	02.6	325°46.0	50.5	82°36.9	44.6
Mer.pass.	17:42	ν -1.0′	d -0.1′	m -3.90	ν 0.4′	d 0.1′	m 1.17	ν 2.8′	d 0.1′ m -2.66	ν 2.4′	d 0.1′ m 0.99

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	94°44.9	182°56.4	S23°42.2	175°52.3	S24°02.5	340°48.8	N21°50.6	97°39.3	S03°44.5
1	109°47.4	197°55.4	42.2	190°52.7	02.4	355°51.6	50.6	112°41.6	44.5
2	124°49.8	212°54.5	42.3	205°53.1	02.3	10°54.4	50.7	127°44.0	44.4
3	139°52.3	227°53.5	·· 42.3	220°53.4	·· 02.2	25°57.2	·· 50.8	142°46.3	·· 44.4
4	154°54.8	242°52.5	42.4	235°53.8	02.1	41°00.0	50.8	157°48.7	44.3
5	169°57.2	257°51.5	42.4	250°54.2	02.0	56°02.8	50.9	172°51.0	44.3
6	184°59.7	272°50.6	S23°42.5	265°54.6	S24°01.9	71°05.6	N21°50.9	187°53.4	S03°44.2
7	200°02.1	287°49.6	42.5	280°55.0	01.8	86°08.4	51.0	202°55.8	44.2
8	215°04.6	302°48.6	42.6	295°55.3	01.7	101°11.2	51.0	217°58.1	44.1
9	230°07.1	317°47.6	·· 42.6	310°55.7	·· 01.5	116°14.0	·· 51.1	233°00.5	·· 44.0
10	245°09.5	332°46.7	42.7	325°56.1	01.4	131°16.7	51.1	248°02.8	44.0
11	260°12.0	347°45.7	42.7	340°56.5	01.3	146°19.5	51.2	263°05.2	43.9
12	275°14.5	2°44.7	S23°42.8	355°56.9	S24°01.2	161°22.3	N21°51.3	278°07.5	S03°43.9
13	290°16.9	17°43.8	42.8	10°57.2	01.1	176°25.1	51.3	293°09.9	43.8
14	305°19.4	32°42.8	42.9	25°57.6	01.0	191°27.9	51.4	308°12.2	43.8
15	320°21.9	47°41.8	·· 42.9	40°58.0	·· 00.9	206°30.7	·· 51.4	323°14.6	·· 43.7
16	335°24.3	62°40.8	42.9	55°58.4	00.8	221°33.5	51.5	338°16.9	43.6
17	350°26.8	77°39.9	43.0	70°58.8	00.7	236°36.3	51.5	353°19.3	43.6
18	5°29.3	92°38.9	S23°43.0	85°59.1	S24°00.6	251°39.1	N21°51.6	8°21.6	S03°43.5
19	20°31.7	107°37.9	43.0	100°59.5	00.5	266°41.9	51.7	23°24.0	43.5
20	35°34.2	122°36.9	43.1	115°59.9	00.4	281°44.7	51.7	38°26.4	43.4
21	50°36.6	137°36.0	·· 43.1	131°00.3	·· 00.3	296°47.5	·· 51.8	53°28.7	·· 43.4
22	65°39.1	152°35.0	43.1	146°00.7	00.1	311°50.3	51.8	68°31.1	43.3
23	80°41.6	167°34.0	43.2	161°01.0	00.0	326°53.1	51.9	83°33.4	43.2
Mer.pass.	17:38	ν -1.0′	d -0.1′	m -3.90	ν 0.4′	d 0.1′	m 1.16	ν 2.8′	d 0.1′ m -2.66	ν 2.4′	d 0.1′ m 0.99

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.1	56°41.1
Diphda	348°46.4	-17°50.7
Achernar	335°19.4	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°15.5	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.5
Sirius	258°25.2	-16°45.1
Adhara	255°04.9	-29°00.4
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°13.9	-59°35.4
Suhail	222°45.4	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°46.7	-8°46.3
Regulus	207°33.4	11°50.3
Dubhe	193°39.8	61°36.3
Denebola	182°24.1	14°25.5
Gienah	175°42.8	-17°41.1
Acrux	172°59.3	-63°14.3
Gacrux	171°50.8	-57°15.3
Alioth	166°12.4	55°48.8
Spica	158°21.6	-11°17.8
Alkaid	152°51.6	49°10.7
Hadar	148°35.2	-60°29.7
Menkent	147°56.9	-36°29.7
Arcturus	145°47.4	19°02.7
Rigil Kent.	139°39.6	-60°56.3
Kochab	137°20.6	74°02.6
Zuben'ubi	136°55.4	-16°08.9
Alphecca	126°03.4	26°37.5
Antares	112°15.2	-26°29.3
Atria	107°09.3	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.2	12°32.4
Eltanin	90°42.4	51°29.0
Kaus Aust.	83°31.9	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.5	28°13.6
Markab	13°29.2	15°20.8

Dec 24 Wed	SHA	Mer.pass
Venus	90°56.4	11:46
Mars	82°47.4	12:17
Jupiter	245°48.4	01:25
Saturn	2°59.4	17:34

Dec 25 Thu	SHA	Mer.pass
Venus	89°34.0	11:47
Mars	81°57.4	12:17
Jupiter	245°56.1	01:21
Saturn	2°56.9	17:30

Dec 26 Fri	SHA	Mer.pass
Venus	88°11.5	11:49
Mars	81°07.4	12:16
Jupiter	246°03.9	01:17
Saturn	2°54.4	17:27

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.5	S23°25.0	132°57.5	12.8′	S17°50.3	12.0′	55.8′
1	195°08.2	24.9	147°29.4	12.9′	17°38.3	12.1′	55.8′
2	210°07.9	24.9	162°01.2	12.9′	17°26.2	12.2′	55.8′
3	225°07.6	·· 24.8	176°33.1	13.0′	17°14.0	12.3′	55.8′
4	240°07.3	24.8	191°05.1	13.0′	17°01.7	12.3′	55.9′
5	255°07.0	24.7	205°37.1	13.1′	16°49.4	12.4′	55.9′
6	270°06.7	S23°24.7	220°09.2	13.1′	S16°37.0	12.6′	55.9′
7	285°06.4	24.6	234°41.3	13.1′	16°24.4	12.6′	55.9′
8	300°06.1	24.6	249°13.4	13.2′	16°11.8	12.7′	55.9′
9	315°05.7	·· 24.5	263°45.6	13.2′	15°59.1	12.7′	56.0′
10	330°05.4	24.5	278°17.8	13.3′	15°46.4	12.9′	56.0′
11	345°05.1	24.4	292°50.1	13.3′	15°33.5	12.9′	56.0′
12	0°04.8	S23°24.3	307°22.4	13.4′	S15°20.6	13.0′	56.0′
13	15°04.5	24.3	321°54.8	13.4′	15°07.6	13.1′	56.1′
14	30°04.2	24.2	336°27.2	13.4′	14°54.5	13.1′	56.1′
15	45°03.9	·· 24.2	350°59.6	13.5′	14°41.4	13.2′	56.1′
16	60°03.6	24.1	5°32.1	13.5′	14°28.2	13.3′	56.1′
17	75°03.3	24.1	20°04.6	13.5′	14°14.9	13.4′	56.2′
18	90°03.0	S23°24.0	34°37.1	13.6′	S14°01.5	13.4′	56.2′
19	105°02.6	23.9	49°09.7	13.6′	13°48.1	13.6′	56.2′
20	120°02.3	23.9	63°42.3	13.6′	13°34.5	13.5′	56.2′
21	135°02.0	·· 23.8	78°14.9	13.7′	13°21.0	13.7′	56.2′
22	150°01.7	23.7	92°47.6	13.7′	13°07.3	13.7′	56.3′
23	165°01.4	23.7	107°20.3	13.7′	12°53.6	13.8′	56.3′
	SD = 16.3′	d = 0.0′	SD = 15.2′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°01.1	S23°23.6	121°53.1	13.8′	S12°39.8	13.8′	56.3′
1	195°00.8	23.5	136°25.8	13.8′	12°26.0	14.0′	56.3′
2	210°00.5	23.5	150°58.7	13.8′	12°12.0	13.9′	56.4′
3	225°00.2	·· 23.4	165°31.5	13.9′	11°58.1	14.1′	56.4′
4	239°59.8	23.3	180°04.3	13.9′	11°44.0	14.1′	56.4′
5	254°59.5	23.3	194°37.2	13.9′	11°29.9	14.2′	56.4′
6	269°59.2	S23°23.2	209°10.1	13.9′	S11°15.7	14.2′	56.5′
7	284°58.9	23.1	223°43.1	14.0′	11°01.5	14.3′	56.5′
8	299°58.6	23.1	238°16.0	14.0′	10°47.2	14.3′	56.5′
9	314°58.3	·· 23.0	252°49.0	14.0′	10°32.9	14.4′	56.5′
10	329°58.0	22.9	267°22.0	14.0′	10°18.5	14.5′	56.6′
11	344°57.7	22.8	281°55.1	14.0′	10°04.0	14.5′	56.6′
12	359°57.4	S23°22.8	296°28.1	14.1′	S09°49.5	14.6′	56.6′
13	14°57.1	22.7	311°01.2	14.1′	09°34.9	14.6′	56.6′
14	29°56.8	22.6	325°34.2	14.1′	09°20.3	14.7′	56.7′
15	44°56.4	·· 22.5	340°07.3	14.1′	09°05.6	14.7′	56.7′
16	59°56.1	22.4	354°40.5	14.1′	08°50.9	14.8′	56.7′
17	74°55.8	22.4	9°13.6	14.1′	08°36.1	14.8′	56.8′
18	89°55.5	S23°22.3	23°46.7	14.2′	S08°21.3	14.9′	56.8′
19	104°55.2	22.2	38°19.9	14.2′	08°06.4	14.9′	56.8′
20	119°54.9	22.1	52°53.0	14.2′	07°51.5	15.0′	56.8′
21	134°54.6	·· 22.0	67°26.2	14.2′	07°36.5	15.0′	56.9′
22	149°54.3	22.0	81°59.4	14.2′	07°21.5	15.1′	56.9′
23	164°54.0	21.9	96°32.6	14.2′	07°06.4	15.1′	56.9′
	SD = 16.3′	d = 0.1′	SD = 15.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.7	S23°21.8	111°05.8	14.2′	S06°51.3	15.1′	56.9′
1	194°53.3	21.7	125°39.0	14.2′	06°36.2	15.2′	57.0′
2	209°53.0	21.6	140°12.2	14.2′	06°21.0	15.3′	57.0′
3	224°52.7	·· 21.5	154°45.4	14.2′	06°05.7	15.2′	57.0′
4	239°52.4	21.4	169°18.6	14.2′	05°50.5	15.4′	57.0′
5	254°52.1	21.3	183°51.8	14.2′	05°35.1	15.3′	57.1′
6	269°51.8	S23°21.3	198°25.0	14.2′	S05°19.8	15.4′	57.1′
7	284°51.5	21.2	212°58.2	14.2′	05°04.4	15.4′	57.1′
8	299°51.2	21.1	227°31.4	14.2′	04°49.0	15.5′	57.2′
9	314°50.9	·· 21.0	242°04.6	14.2′	04°33.5	15.5′	57.2′
10	329°50.6	20.9	256°37.8	14.2′	04°18.0	15.5′	57.2′
11	344°50.3	20.8	271°11.0	14.2′	04°02.5	15.6′	57.2′
12	359°50.0	S23°20.7	285°44.1	14.2′	S03°46.9	15.6′	57.3′
13	14°49.6	20.6	300°17.3	14.1′	03°31.3	15.6′	57.3′
14	29°49.3	20.5	314°50.4	14.1′	03°15.7	15.7′	57.3′
15	44°49.0	·· 20.4	329°23.6	14.1′	03°00.0	15.6′	57.4′
16	59°48.7	20.3	343°56.7	14.1′	02°44.4	15.7′	57.4′
17	74°48.4	20.2	358°29.8	14.1′	02°28.7	15.8′	57.4′
18	89°48.1	S23°20.1	13°02.9	14.1′	S02°12.9	15.7′	57.4′
19	104°47.8	20.0	27°36.0	14.1′	01°57.2	15.8′	57.5′
20	119°47.5	19.9	42°09.0	14.0′	01°41.4	15.8′	57.5′
21	134°47.2	·· 19.8	56°42.1	14.0′	01°25.6	15.9′	57.5′
22	149°46.9	19.7	71°15.1	14.0′	01°09.7	15.8′	57.6′
23	164°46.6	19.6	85°48.1	14.0′	00°53.9	15.9′	57.6′
	SD = 16.3′	d = 0.1′	SD = 15.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:27	10:57	▬	▬	13:04	15:34
N 70°	08:07	09:55	▬	▬	14:05	15:53
68°	07:51	09:20	▬	▬	14:40	16:09
66°	07:38	08:55	10:35	13:25	15:05	16:22
64°	07:27	08:35	09:53	14:07	15:25	16:34
62°	07:17	08:19	09:25	14:35	15:41	16:43
60°	07:09	08:06	09:03	14:57	15:55	16:51
N 58°	07:01	07:54	08:46	15:14	16:06	16:59
56°	06:55	07:44	08:31	15:29	16:17	17:06
54°	06:49	07:35	08:19	15:42	16:26	17:12
52°	06:43	07:27	08:08	15:53	16:34	17:18
50°	06:38	07:19	07:58	16:03	16:41	17:23
45°	06:26	07:03	07:37	16:23	16:57	17:35
N 40°	06:15	06:50	07:20	16:40	17:11	17:45
35°	06:06	06:38	07:06	16:54	17:23	17:54
30°	05:57	06:27	06:54	17:07	17:33	18:03
20°	05:41	06:08	06:32	17:28	17:52	18:20
N 10°	05:25	05:51	06:14	17:46	18:09	18:36
0°	05:08	05:34	05:56	18:04	18:26	18:53
S 10°	04:49	05:16	05:39	18:21	18:45	19:12
20°	04:26	04:55	05:20	18:40	19:05	19:34
30°	03:57	04:30	04:58	19:02	19:30	20:03
35°	03:38	04:15	04:45	19:15	19:45	20:22
40°	03:15	03:57	04:30	19:30	20:03	20:45
45°	02:45	03:34	04:12	19:48	20:26	21:16
S 50°	01:59	03:05	03:49	20:11	20:56	22:01
52°	01:31	02:50	03:38	20:22	21:11	22:29
54°	00:45	02:32	03:26	20:34	21:28	23:14
56°	–:–	02:09	03:12	20:48	21:51	–:–
58°	–:–	01:40	02:55	21:05	22:20	–:–
S 60°	–:–	00:49	02:35	21:25	23:10	–:–

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	13:19	12:24	11:46	18:20	20:51	23:04
N 70°	12:47	12:09	11:41	18:51	21:03	23:06
68°	12:23	11:57	11:36	19:13	21:13	23:07
66°	12:04	11:47	11:33	19:30	21:21	23:08
64°	11:49	11:39	11:30	19:44	21:27	23:09
62°	11:36	11:31	11:27	19:56	21:33	23:10
60°	11:25	11:25	11:24	20:06	21:38	23:10
N 58°	11:16	11:19	11:22	20:14	21:42	23:11
56°	11:07	11:14	11:20	20:22	21:46	23:11
54°	11:00	11:10	11:19	20:28	21:50	23:12
52°	10:53	11:06	11:17	20:34	21:53	23:12
50°	10:47	11:02	11:16	20:39	21:56	23:12
45°	10:34	10:54	11:12	20:51	22:02	23:13
N 40°	10:23	10:47	11:10	21:00	22:07	23:14
35°	10:13	10:41	11:07	21:09	22:11	23:14
30°	10:05	10:36	11:05	21:16	22:15	23:15
20°	09:51	10:27	11:02	21:28	22:21	23:15
N 10°	09:38	10:19	10:59	21:38	22:27	23:16
0°	09:26	10:11	10:56	21:48	22:32	23:17
S 10°	09:14	10:04	10:53	21:58	22:38	23:17
20°	09:02	09:56	10:50	22:08	22:43	23:18
30°	08:47	09:46	10:46	22:20	22:50	23:19
35°	08:38	09:41	10:44	22:26	22:53	23:19
40°	08:29	09:35	10:42	22:34	22:57	23:19
45°	08:17	09:28	10:39	22:43	23:02	23:20
S 50°	08:03	09:19	10:35	22:53	23:07	23:20
52°	07:56	09:15	10:34	22:58	23:10	23:21
54°	07:49	09:11	10:32	23:03	23:13	23:21
56°	07:41	09:06	10:30	23:09	23:16	23:21
58°	07:32	09:00	10:28	23:16	23:19	23:22
S 60°	07:21	08:54	10:26	23:23	23:23	23:22

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 4-6 14-31%
24	00:34	00:19	12:00	15:37	03:14	
25	00:04	00:11	12:00	16:22	04:00	
26	00:25	00:40	12:01	17:06	04:44	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2682 sec ΔT = TT-UT1 = +68.9158 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	95°44.0	182°33.0	S23°43.2	176°01.4	S23°59.9	341°55.9	N21°51.9	98°35.8	S03°43.2
1	110°46.5	197°32.1	43.2	191°01.8	59.8	356°58.7	52.0	113°38.1	43.1
2	125°49.0	212°31.1	43.3	206°02.2	59.7	12°01.4	52.0	128°40.5	43.1
3	140°51.4	227°30.1	·· 43.3	221°02.6	·· 59.6	27°04.2	·· 52.1	143°42.8	·· 43.0
4	155°53.9	242°29.1	43.3	236°02.9	59.5	42°07.0	52.2	158°45.2	43.0
5	170°56.4	257°28.2	43.3	251°03.3	59.4	57°09.8	52.2	173°47.5	42.9
6	185°58.8	272°27.2	S23°43.3	266°03.7	S23°59.3	72°12.6	N21°52.3	188°49.9	S03°42.8
7	201°01.3	287°26.2	43.4	281°04.1	59.1	87°15.4	52.3	203°52.2	42.8
8	216°03.7	302°25.2	43.4	296°04.5	59.0	102°18.2	52.4	218°54.6	42.7
9	231°06.2	317°24.3	·· 43.4	311°04.8	·· 58.9	117°21.0	·· 52.4	233°56.9	·· 42.7
10	246°08.7	332°23.3	43.4	326°05.2	58.8	132°23.8	52.5	248°59.3	42.6
11	261°11.1	347°22.3	43.4	341°05.6	58.7	147°26.6	52.6	264°01.6	42.5
12	276°13.6	2°21.3	S23°43.4	356°06.0	S23°58.6	162°29.4	N21°52.6	279°04.0	S03°42.5
13	291°16.1	17°20.4	43.5	11°06.4	58.4	177°32.2	52.7	294°06.3	42.4
14	306°18.5	32°19.4	43.5	26°06.7	58.3	192°35.0	52.7	309°08.7	42.4
15	321°21.0	47°18.4	·· 43.5	41°07.1	·· 58.2	207°37.8	·· 52.8	324°11.0	·· 42.3
16	336°23.5	62°17.4	43.5	56°07.5	58.1	222°40.6	52.8	339°13.4	42.2
17	351°25.9	77°16.5	43.5	71°07.9	58.0	237°43.4	52.9	354°15.7	42.2
18	6°28.4	92°15.5	S23°43.5	86°08.3	S23°57.8	252°46.2	N21°53.0	9°18.1	S03°42.1
19	21°30.9	107°14.5	43.5	101°08.6	57.7	267°49.0	53.0	24°20.4	42.1
20	36°33.3	122°13.5	43.5	116°09.0	57.6	282°51.8	53.1	39°22.8	42.0
21	51°35.8	137°12.6	·· 43.5	131°09.4	·· 57.5	297°54.6	·· 53.1	54°25.1	·· 42.0
22	66°38.2	152°11.6	43.5	146°09.8	57.4	312°57.4	53.2	69°27.5	41.9
23	81°40.7	167°10.6	43.5	161°10.1	57.2	328°00.2	53.2	84°29.8	41.8
Mer.pass.	17:34	ν -1.0′	d -0.0′	m -3.90	ν 0.4′	d 0.1′	m 1.15	ν 2.8′	d 0.1′ m -2.66	ν 2.4′	d 0.1′ m 1.00

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	96°43.2	182°09.7	S23°43.5	176°10.5	S23°57.1	343°03.0	N21°53.3	99°32.2	S03°41.8
1	111°45.6	197°08.7	43.5	191°10.9	57.0	358°05.8	53.3	114°34.5	41.7
2	126°48.1	212°07.7	43.5	206°11.3	56.9	13°08.6	53.4	129°36.9	41.7
3	141°50.6	227°06.7	·· 43.5	221°11.7	·· 56.7	28°11.4	·· 53.5	144°39.2	·· 41.6
4	156°53.0	242°05.8	43.5	236°12.0	56.6	43°14.2	53.5	159°41.6	41.5
5	171°55.5	257°04.8	43.5	251°12.4	56.5	58°17.0	53.6	174°43.9	41.5
6	186°58.0	272°03.8	S23°43.5	266°12.8	S23°56.4	73°19.8	N21°53.6	189°46.2	S03°41.4
7	202°00.4	287°02.8	43.5	281°13.2	56.2	88°22.6	53.7	204°48.6	41.4
8	217°02.9	302°01.9	43.4	296°13.6	56.1	103°25.4	53.7	219°50.9	41.3
9	232°05.4	317°00.9	·· 43.4	311°13.9	·· 56.0	118°28.2	·· 53.8	234°53.3	·· 41.2
10	247°07.8	331°59.9	43.4	326°14.3	55.9	133°31.0	53.9	249°55.6	41.2
11	262°10.3	346°58.9	43.4	341°14.7	55.7	148°33.8	53.9	264°58.0	41.1
12	277°12.7	1°58.0	S23°43.4	356°15.1	S23°55.6	163°36.6	N21°54.0	280°00.3	S03°41.1
13	292°15.2	16°57.0	43.4	11°15.5	55.5	178°39.4	54.0	295°02.7	41.0
14	307°17.7	31°56.0	43.3	26°15.8	55.4	193°42.2	54.1	310°05.0	40.9
15	322°20.1	46°55.0	·· 43.3	41°16.2	·· 55.2	208°45.0	·· 54.1	325°07.4	·· 40.9
16	337°22.6	61°54.1	43.3	56°16.6	55.1	223°47.8	54.2	340°09.7	40.8
17	352°25.1	76°53.1	43.3	71°17.0	55.0	238°50.6	54.3	355°12.1	40.8
18	7°27.5	91°52.1	S23°43.2	86°17.4	S23°54.8	253°53.4	N21°54.3	10°14.4	S03°40.7
19	22°30.0	106°51.1	43.2	101°17.7	54.7	268°56.2	54.4	25°16.7	40.6
20	37°32.5	121°50.2	43.2	116°18.1	54.6	283°59.0	54.4	40°19.1	40.6
21	52°34.9	136°49.2	·· 43.2	131°18.5	·· 54.4	299°01.8	·· 54.5	55°21.4	·· 40.5
22	67°37.4	151°48.2	43.1	146°18.9	54.3	314°04.6	54.5	70°23.8	40.5
23	82°39.8	166°47.3	43.1	161°19.3	54.2	329°07.4	54.6	85°26.1	40.4
Mer.pass.	17:30	ν -1.0′	d 0.0′	m -3.90	ν 0.4′	d 0.1′	m 1.15	ν 2.8′	d 0.1′ m -2.66	ν 2.3′	d 0.1′ m 1.00

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	97°42.3	181°46.3	S23°43.1	176°19.6	S23°54.0	344°10.2	N21°54.7	100°28.5	S03°40.3
1	112°44.8	196°45.3	43.0	191°20.0	53.9	359°13.0	54.7	115°30.8	40.3
2	127°47.2	211°44.3	43.0	206°20.4	53.8	14°15.8	54.8	130°33.2	40.2
3	142°49.7	226°43.4	·· 43.0	221°20.8	·· 53.6	29°18.6	·· 54.8	145°35.5	·· 40.2
4	157°52.2	241°42.4	42.9	236°21.2	53.5	44°21.4	54.9	160°37.8	40.1
5	172°54.6	256°41.4	42.9	251°21.5	53.4	59°24.2	54.9	175°40.2	40.0
6	187°57.1	271°40.4	S23°42.8	266°21.9	S23°53.2	74°27.0	N21°55.0	190°42.5	S03°40.0
7	202°59.6	286°39.5	42.8	281°22.3	53.1	89°29.8	55.0	205°44.9	39.9
8	218°02.0	301°38.5	42.8	296°22.7	53.0	104°32.6	55.1	220°47.2	39.8
9	233°04.5	316°37.5	·· 42.7	311°23.1	·· 52.8	119°35.4	·· 55.2	235°49.6	·· 39.8
10	248°07.0	331°36.5	42.7	326°23.4	52.7	134°38.2	55.2	250°51.9	39.7
11	263°09.4	346°35.6	42.6	341°23.8	52.5	149°41.0	55.3	265°54.2	39.7
12	278°11.9	1°34.6	S23°42.6	356°24.2	S23°52.4	164°43.8	N21°55.3	280°56.6	S03°39.6
13	293°14.3	16°33.6	42.5	11°24.6	52.3	179°46.6	55.4	295°58.9	39.5
14	308°16.8	31°32.6	42.5	26°24.9	52.1	194°49.4	55.4	311°01.3	39.5
15	323°19.3	46°31.7	·· 42.4	41°25.3	·· 52.0	209°52.2	·· 55.5	326°03.6	·· 39.4
16	338°21.7	61°30.7	42.4	56°25.7	51.8	224°55.0	55.6	341°06.0	39.4
17	353°24.2	76°29.7	42.3	71°26.1	51.7	239°57.8	55.6	356°08.3	39.3
18	8°26.7	91°28.8	S23°42.3	86°26.5	S23°51.6	255°00.7	N21°55.7	11°10.6	S03°39.2
19	23°29.1	106°27.8	42.2	101°26.8	51.4	270°03.5	55.7	26°13.0	39.2
20	38°31.6	121°26.8	42.1	116°27.2	51.3	285°06.3	55.8	41°15.3	39.1
21	53°34.1	136°25.8	·· 42.1	131°27.6	·· 51.1	300°09.1	·· 55.8	56°17.7	·· 39.0
22	68°36.5	151°24.9	42.0	146°28.0	51.0	315°11.9	55.9	71°20.0	39.0
23	83°39.0	166°23.9	42.0	161°28.4	50.8	330°14.7	56.0	86°22.4	38.9
Mer.pass.	17:26	ν -1.0′	d 0.0′	m -3.90	ν 0.4′	d 0.1′	m 1.14	ν 2.8′	d 0.1′ m -2.67	ν 2.3′	d 0.1′ m 1.00

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.3	-42°10.1
Schedar	349°30.1	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.4	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°16.6	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.5
Sirius	258°25.2	-16°45.1
Adhara	255°04.8	-29°00.4
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°13.8	-59°35.4
Suhail	222°45.4	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°46.7	-8°46.3
Regulus	207°33.4	11°50.3
Dubhe	193°39.8	61°36.3
Denebola	182°24.1	14°25.5
Gienah	175°42.8	-17°41.1
Acrux	172°59.2	-63°14.3
Gacrux	171°50.8	-57°15.3
Alioth	166°12.3	55°48.8
Spica	158°21.6	-11°17.8
Alkaid	152°51.6	49°10.7
Hadar	148°35.2	-60°29.7
Menkent	147°56.9	-36°29.7
Arcturus	145°47.3	19°02.7
Rigil Kent.	139°39.6	-60°56.3
Kochab	137°20.5	74°02.6
Zuben'ubi	136°55.3	-16°09.0
Alphecca	126°03.3	26°37.5
Antares	112°15.2	-26°29.3
Atria	107°09.2	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.1	12°32.4
Eltanin	90°42.4	51°29.0
Kaus Aust.	83°31.9	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.2	15°20.8

Dec 27 Sat	SHA	Mer.pass
Venus	86°49.0	11:51
Mars	80°17.4	12:16
Jupiter	246°11.8	01:12
Saturn	2°51.7	17:23

Dec 28 Sun	SHA	Mer.pass
Venus	85°26.5	11:52
Mars	79°27.4	12:15
Jupiter	246°19.8	01:08
Saturn	2°49.0	17:19

Dec 29 Mon	SHA	Mer.pass
Venus	84°04.0	11:54
Mars	78°37.3	12:14
Jupiter	246°27.9	01:03
Saturn	2°46.2	17:15

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.3	S23°19.5	100°21.0	13.9′	S00°38.0	15.9′	57.6′
1	194°45.9	19.4	114°54.0	13.9′	00°22.1	15.9′	57.6′
2	209°45.6	19.3	129°26.9	13.9′	S00°06.2	15.9′	57.7′
3	224°45.3	·· 19.2	143°59.7	13.8′	N00°09.7	15.9′	57.7′
4	239°45.0	19.1	158°32.6	13.8′	00°25.6	16.0′	57.7′
5	254°44.7	19.0	173°05.4	13.8′	00°41.6	15.9′	57.8′
6	269°44.4	S23°18.8	187°38.2	13.7′	N00°57.5	16.0′	57.8′
7	284°44.1	18.7	202°10.9	13.7′	01°13.5	16.0′	57.8′
8	299°43.8	18.6	216°43.7	13.7′	01°29.5	16.0′	57.9′
9	314°43.5	·· 18.5	231°16.3	13.6′	01°45.5	16.0′	57.9′
10	329°43.2	18.4	245°49.0	13.6′	02°01.5	16.0′	57.9′
11	344°42.9	18.3	260°21.6	13.6′	02°17.5	16.0′	57.9′
12	359°42.6	S23°18.2	274°54.1	13.5′	N02°33.5	16.1′	58.0′
13	14°42.3	18.1	289°26.6	13.5′	02°49.6	16.0′	58.0′
14	29°42.0	17.9	303°59.1	13.4′	03°05.6	16.0′	58.0′
15	44°41.7	·· 17.8	318°31.5	13.4′	03°21.6	16.0′	58.1′
16	59°41.3	17.7	333°03.9	13.3′	03°37.6	16.1′	58.1′
17	74°41.0	17.6	347°36.2	13.3′	03°53.7	16.0′	58.1′
18	89°40.7	S23°17.5	2°08.5	13.2′	N04°09.7	16.0′	58.2′
19	104°40.4	17.3	16°40.7	13.2′	04°25.7	16.1′	58.2′
20	119°40.1	17.2	31°12.9	13.1′	04°41.8	16.0′	58.2′
21	134°39.8	·· 17.1	45°45.0	13.1′	04°57.8	16.0′	58.2′
22	149°39.5	17.0	60°17.1	13.0′	05°13.8	16.0′	58.3′
23	164°39.2	16.9	74°49.1	12.9′	05°29.8	16.0′	58.3′
	SD = 16.3′	d = 0.1′	SD = 15.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°38.9	S23°16.7	89°21.0	12.9′	N05°45.8	16.0′	58.3′
1	194°38.6	16.6	103°52.9	12.8′	06°01.8	15.9′	58.4′
2	209°38.3	16.5	118°24.7	12.8′	06°17.7	16.0′	58.4′
3	224°38.0	·· 16.4	132°56.5	12.7′	06°33.7	15.9′	58.4′
4	239°37.7	16.2	147°28.1	12.6′	06°49.6	16.0′	58.5′
5	254°37.4	16.1	161°59.8	12.6′	07°05.6	15.9′	58.5′
6	269°37.1	S23°16.0	176°31.3	12.5′	N07°21.5	15.9′	58.5′
7	284°36.8	15.8	191°02.8	12.4′	07°37.4	15.8′	58.6′
8	299°36.5	15.7	205°34.2	12.3′	07°53.2	15.9′	58.6′
9	314°36.2	·· 15.6	220°05.6	12.3′	08°09.1	15.8′	58.6′
10	329°35.8	15.4	234°36.8	12.2′	08°24.9	15.8′	58.6′
11	344°35.5	15.3	249°08.0	12.1′	08°40.7	15.8′	58.7′
12	359°35.2	S23°15.2	263°39.1	12.0′	N08°56.5	15.8′	58.7′
13	14°34.9	15.0	278°10.2	12.0′	09°12.3	15.7′	58.7′
14	29°34.6	14.9	292°41.1	11.9′	09°28.0	15.7′	58.8′
15	44°34.3	·· 14.8	307°12.0	11.8′	09°43.7	15.6′	58.8′
16	59°34.0	14.6	321°42.8	11.7′	09°59.3	15.7′	58.8′
17	74°33.7	14.5	336°13.5	11.6′	10°15.0	15.5′	58.9′
18	89°33.4	S23°14.4	350°44.1	11.5′	N10°30.5	15.6′	58.9′
19	104°33.1	14.2	5°14.7	11.4′	10°46.1	15.5′	58.9′
20	119°32.8	14.1	19°45.1	11.4′	11°01.6	15.5′	58.9′
21	134°32.5	·· 13.9	34°15.5	11.3′	11°17.1	15.4′	59.0′
22	149°32.2	13.8	48°45.7	11.2′	11°32.5	15.4′	59.0′
23	164°31.9	13.6	63°15.9	11.1′	11°47.9	15.4′	59.0′
	SD = 16.3′	d = 0.1′	SD = 15.9′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.6	S23°13.5	77°46.0	11.0′	N12°03.3	15.3′	59.1′
1	194°31.3	13.4	92°16.0	10.9′	12°18.6	15.2′	59.1′
2	209°31.0	13.2	106°45.8	10.8′	12°33.8	15.2′	59.1′
3	224°30.7	·· 13.1	121°15.6	10.7′	12°49.0	15.2′	59.2′
4	239°30.4	12.9	135°45.3	10.6′	13°04.2	15.0′	59.2′
5	254°30.1	12.8	150°14.9	10.5′	13°19.2	15.1′	59.2′
6	269°29.8	S23°12.6	164°44.4	10.4′	N13°34.3	15.0′	59.2′
7	284°29.5	12.5	179°13.8	10.3′	13°49.3	14.9′	59.3′
8	299°29.2	12.3	193°43.1	10.2′	14°04.2	14.9′	59.3′
9	314°28.9	·· 12.2	208°12.2	10.1′	14°19.1	14.8′	59.3′
10	329°28.6	12.0	222°41.3	10.0′	14°33.9	14.7′	59.4′
11	344°28.3	11.9	237°10.2	9.8′	14°48.6	14.7′	59.4′
12	359°28.0	S23°11.7	251°39.1	9.7′	N15°03.3	14.6′	59.4′
13	14°27.7	11.6	266°07.8	9.6′	15°17.9	14.5′	59.4′
14	29°27.4	11.4	280°36.4	9.5′	15°32.4	14.4′	59.5′
15	44°27.1	·· 11.2	295°05.0	9.4′	15°46.8	14.4′	59.5′
16	59°26.8	11.1	309°33.3	9.3′	16°01.2	14.3′	59.5′
17	74°26.4	10.9	324°01.6	9.2′	16°15.5	14.3′	59.5′
18	89°26.1	S23°10.8	338°29.8	9.0′	N16°29.8	14.1′	59.6′
19	104°25.8	10.6	352°57.8	8.9′	16°43.9	14.1′	59.6′
20	119°25.5	10.5	7°25.8	8.8′	16°58.0	14.0′	59.6′
21	134°25.2	·· 10.3	21°53.6	8.7′	17°12.0	13.9′	59.7′
22	149°24.9	10.1	36°21.3	8.6′	17°25.9	13.8′	59.7′
23	164°24.6	10.0	50°48.8	8.4′	17°39.7	13.7′	59.7′
	SD = 16.3′	d = 0.1′	SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:26	10:52	▬	▬	13:11	15:37
N 70°	08:07	09:54	▬	▬	14:10	15:57
68°	07:51	09:20	▬	▬	14:44	16:12
66°	07:38	08:55	10:33	13:30	15:09	16:25
64°	07:27	08:35	09:52	14:11	15:28	16:36
62°	07:18	08:20	09:25	14:39	15:44	16:46
60°	07:09	08:06	09:03	15:00	15:57	16:54
N 58°	07:02	07:55	08:46	15:17	16:09	17:01
56°	06:55	07:44	08:32	15:32	16:19	17:08
54°	06:49	07:35	08:19	15:44	16:28	17:14
52°	06:44	07:27	08:08	15:55	16:36	17:20
50°	06:38	07:20	07:58	16:05	16:43	17:25
45°	06:27	07:04	07:38	16:26	16:59	17:37
N 40°	06:17	06:51	07:21	16:42	17:13	17:47
35°	06:07	06:39	07:07	16:56	17:24	17:56
30°	05:59	06:28	06:55	17:09	17:35	18:05
20°	05:42	06:10	06:34	17:30	17:54	18:21
N 10°	05:26	05:52	06:15	17:48	18:11	18:37
0°	05:09	05:35	05:58	18:05	18:28	18:54
S 10°	04:50	05:17	05:40	18:23	18:46	19:13
20°	04:28	04:57	05:22	18:42	19:06	19:35
30°	03:59	04:32	05:00	19:04	19:31	20:04
35°	03:40	04:17	04:47	19:16	19:46	20:23
40°	03:17	03:59	04:32	19:31	20:04	20:46
45°	02:47	03:37	04:14	19:49	20:26	21:16
S 50°	02:02	03:07	03:52	20:12	20:56	22:01
52°	01:35	02:52	03:41	20:22	21:11	22:28
54°	00:51	02:34	03:29	20:34	21:28	23:11
56°	–:–	02:12	03:14	20:48	21:50	–:–
58°	–:–	01:43	02:58	21:05	22:19	–:–
S 60°	–:–	00:55	02:38	21:25	23:06	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	11:12	10:34	09:41	·· ··	01:20	03:56
N 70°	11:15	10:46	10:09	·· ··	01:11	03:30
68°	11:17	10:56	10:31	·· ··	01:04	03:11
66°	11:19	11:05	10:48	·· ··	00:58	02:56
64°	11:21	11:12	11:02	·· ··	00:53	02:43
62°	11:22	11:18	11:14	·· ··	00:48	02:33
60°	11:24	11:23	11:24	·· ··	00:45	02:24
N 58°	11:25	11:28	11:33	·· ··	00:41	02:16
56°	11:26	11:32	11:40	·· ··	00:38	02:10
54°	11:27	11:36	11:48	·· ··	00:36	02:04
52°	11:28	11:40	11:54	·· ··	00:33	01:58
50°	11:29	11:43	12:00	·· ··	00:31	01:53
45°	11:31	11:50	12:12	·· ··	00:26	01:43
N 40°	11:32	11:56	12:23	·· ··	00:22	01:34
35°	11:33	12:01	12:31	·· ··	00:19	01:27
30°	11:35	12:05	12:39	·· ··	00:16	01:20
20°	11:37	12:13	12:53	·· ··	00:11	01:09
N 10°	11:39	12:20	13:05	·· ··	00:06	00:59
0°	11:40	12:27	13:17	·· ··	00:02	00:50
S 10°	11:42	12:34	13:28	23:58	·· ··	00:41
20°	11:44	12:41	13:41	23:53	·· ··	00:31
30°	11:46	12:49	13:55	23:48	·· ··	00:20
35°	11:48	12:54	14:03	23:45	·· ··	00:14
40°	11:49	12:59	14:13	23:42	·· ··	00:07
45°	11:51	13:06	14:24	23:38	23:59	·· ··
S 50°	11:53	13:14	14:38	23:34	23:49	·· ··
52°	11:54	13:17	14:45	23:32	23:44	·· ··
54°	11:55	13:21	14:52	23:29	23:39	23:52
56°	11:56	13:26	15:00	23:27	23:34	23:43
58°	11:58	13:30	15:09	23:24	23:28	23:33
S 60°	11:59	13:36	15:20	23:21	23:21	23:21

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 7-9 41-63%
27	00:55	01:10	12:01	17:51	05:29	
28	01:24	01:39	12:02	18:38	06:14	
29	01:54	02:08	12:02	19:29	07:03	

No IERS EOP prediction data available

DUT1 = UT1-UTC = +0.2689 sec ΔT = TT-UT1 = +68.9151 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	98°41.5	181°22.9	S23°41.9	176°28.7	S23°50.7	345°17.5	N21°56.0	101°24.7	S03°38.9
1	113°43.9	196°22.0	41.8	191°29.1	50.6	0°20.3	56.1	116°27.0	38.8
2	128°46.4	211°21.0	41.8	206°29.5	50.4	15°23.1	56.1	131°29.4	38.7
3	143°48.8	226°20.0	·· 41.7	221°29.9	·· 50.3	30°25.9	·· 56.2	146°31.7	·· 38.7
4	158°51.3	241°19.0	41.6	236°30.3	50.1	45°28.7	56.2	161°34.1	38.6
5	173°53.8	256°18.1	41.6	251°30.6	50.0	60°31.5	56.3	176°36.4	38.5
6	188°56.2	271°17.1	S23°41.5	266°31.0	S23°49.8	75°34.3	N21°56.4	191°38.7	S03°38.5
7	203°58.7	286°16.1	41.4	281°31.4	49.7	90°37.1	56.4	206°41.1	38.4
8	219°01.2	301°15.1	41.3	296°31.8	49.5	105°39.9	56.5	221°43.4	38.4
9	234°03.6	316°14.2	·· 41.3	311°32.2	·· 49.4	120°42.7	·· 56.5	236°45.8	·· 38.3
10	249°06.1	331°13.2	41.2	326°32.5	49.2	135°45.5	56.6	251°48.1	38.2
11	264°08.6	346°12.2	41.1	341°32.9	49.1	150°48.3	56.6	266°50.4	38.2
12	279°11.0	1°11.3	S23°41.0	356°33.3	S23°48.9	165°51.2	N21°56.7	281°52.8	S03°38.1
13	294°13.5	16°10.3	41.0	11°33.7	48.8	180°54.0	56.8	296°55.1	38.0
14	309°16.0	31°09.3	40.9	26°34.1	48.6	195°56.8	56.8	311°57.4	38.0
15	324°18.4	46°08.3	·· 40.8	41°34.4	·· 48.5	210°59.6	·· 56.9	326°59.8	·· 37.9
16	339°20.9	61°07.4	40.7	56°34.8	48.3	226°02.4	56.9	342°02.1	37.8
17	354°23.3	76°06.4	40.6	71°35.2	48.2	241°05.2	57.0	357°04.5	37.8
18	9°25.8	91°05.4	S23°40.5	86°35.6	S23°48.0	256°08.0	N21°57.0	12°06.8	S03°37.7
19	24°28.3	106°04.5	40.4	101°35.9	47.9	271°10.8	57.1	27°09.1	37.7
20	39°30.7	121°03.5	40.4	116°36.3	47.7	286°13.6	57.2	42°11.5	37.6
21	54°33.2	136°02.5	·· 40.3	131°36.7	·· 47.5	301°16.4	·· 57.2	57°13.8	·· 37.5
22	69°35.7	151°01.5	40.2	146°37.1	47.4	316°19.2	57.3	72°16.2	37.5
23	84°38.1	166°00.6	40.1	161°37.5	47.2	331°22.0	57.3	87°18.5	37.4
Mer.pass.	17:22	ν -1.0′	d 0.1′	m -3.90	ν 0.4′	d 0.1′	m 1.14	ν 2.8′	d 0.1′	m -2.67	ν 2.3′	d 0.1′	m 1.00
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	99°40.6	180°59.6	S23°40.0	176°37.8	S23°47.1	346°24.8	N21°57.4	102°20.8	S03°37.3
1	114°43.1	195°58.6	39.9	191°38.2	46.9	1°27.7	57.4	117°23.2	37.3
2	129°45.5	210°57.7	39.8	206°38.6	46.8	16°30.5	57.5	132°25.5	37.2
3	144°48.0	225°56.7	·· 39.7	221°39.0	·· 46.6	31°33.3	·· 57.6	147°27.8	·· 37.1
4	159°50.4	240°55.7	39.6	236°39.4	46.5	46°36.1	57.6	162°30.2	37.1
5	174°52.9	255°54.8	39.5	251°39.7	46.3	61°38.9	57.7	177°32.5	37.0
6	189°55.4	270°53.8	S23°39.4	266°40.1	S23°46.1	76°41.7	N21°57.7	192°34.8	S03°37.0
7	204°57.8	285°52.8	39.3	281°40.5	46.0	91°44.5	57.8	207°37.2	36.9
8	220°00.3	300°51.8	39.2	296°40.9	45.8	106°47.3	57.8	222°39.5	36.8
9	235°02.8	315°50.9	·· 39.1	311°41.3	·· 45.7	121°50.1	·· 57.9	237°41.9	·· 36.8
10	250°05.2	330°49.9	39.0	326°41.6	45.5	136°52.9	58.0	252°44.2	36.7
11	265°07.7	345°48.9	38.9	341°42.0	45.3	151°55.7	58.0	267°46.5	36.6
12	280°10.2	0°48.0	S23°38.8	356°42.4	S23°45.2	166°58.6	N21°58.1	282°48.9	S03°36.6
13	295°12.6	15°47.0	38.6	11°42.8	45.0	182°01.4	58.1	297°51.2	36.5
14	310°15.1	30°46.0	38.5	26°43.2	44.9	197°04.2	58.2	312°53.5	36.4
15	325°17.6	45°45.1	·· 38.4	41°43.5	·· 44.7	212°07.0	·· 58.2	327°55.9	·· 36.4
16	340°20.0	60°44.1	38.3	56°43.9	44.5	227°09.8	58.3	342°58.2	36.3
17	355°22.5	75°43.1	38.2	71°44.3	44.4	242°12.6	58.3	358°00.5	36.2
18	10°24.9	90°42.2	S23°38.1	86°44.7	S23°44.2	257°15.4	N21°58.4	13°02.9	S03°36.2
19	25°27.4	105°41.2	38.0	101°45.1	44.0	272°18.2	58.5	28°05.2	36.1
20	40°29.9	120°40.2	37.8	116°45.4	43.9	287°21.0	58.5	43°07.5	36.0
21	55°32.3	135°39.2	·· 37.7	131°45.8	·· 43.7	302°23.8	·· 58.6	58°09.9	·· 36.0
22	70°34.8	150°38.3	37.6	146°46.2	43.5	317°26.7	58.6	73°12.2	35.9
23	85°37.3	165°37.3	37.5	161°46.6	43.4	332°29.5	58.7	88°14.5	35.8
Mer.pass.	17:18	ν -1.0′	d 0.1′	m -3.90	ν 0.4′	d 0.2′	m 1.13	ν 2.8′	d 0.1′	m -2.67	ν 2.3′	d 0.1′	m 1.00
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°39.7	180°36.3	S23°37.3	176°47.0	S23°43.2	347°32.3	N21°58.7	103°16.9	S03°35.8
1	115°42.2	195°35.4	37.2	191°47.3	43.0	2°35.1	58.8	118°19.2	35.7
2	130°44.7	210°34.4	37.1	206°47.7	42.9	17°37.9	58.9	133°21.5	35.7
3	145°47.1	225°33.4	·· 37.0	221°48.1	·· 42.7	32°40.7	·· 58.9	148°23.9	·· 35.6
4	160°49.6	240°32.5	36.8	236°48.5	42.5	47°43.5	59.0	163°26.2	35.5
5	175°52.1	255°31.5	36.7	251°48.9	42.4	62°46.3	59.0	178°28.5	35.5
6	190°54.5	270°30.5	S23°36.6	266°49.2	S23°42.2	77°49.1	N21°59.1	193°30.9	S03°35.4
7	205°57.0	285°29.6	36.4	281°49.6	42.0	92°52.0	59.1	208°33.2	35.3
8	220°59.4	300°28.6	36.3	296°50.0	41.8	107°54.8	59.2	223°35.5	35.3
9	236°01.9	315°27.6	·· 36.2	311°50.4	·· 41.7	122°57.6	·· 59.3	238°37.9	·· 35.2
10	251°04.4	330°26.7	36.0	326°50.8	41.5	138°00.4	59.3	253°40.2	35.1
11	266°06.8	345°25.7	35.9	341°51.1	41.3	153°03.2	59.4	268°42.5	35.1
12	281°09.3	0°24.7	S23°35.7	356°51.5	S23°41.2	168°06.0	N21°59.4	283°44.9	S03°35.0
13	296°11.8	15°23.8	35.6	11°51.9	41.0	183°08.8	59.5	298°47.2	34.9
14	311°14.2	30°22.8	35.5	26°52.3	40.8	198°11.6	59.5	313°49.5	34.9
15	326°16.7	45°21.8	·· 35.3	41°52.7	·· 40.6	213°14.4	·· 59.6	328°51.9	·· 34.8
16	341°19.2	60°20.9	35.2	56°53.0	40.5	228°17.3	59.7	343°54.2	34.7
17	356°21.6	75°19.9	35.0	71°53.4	40.3	243°20.1	59.7	358°56.5	34.7
18	11°24.1	90°18.9	S23°34.9	86°53.8	S23°40.1	258°22.9	N21°59.8	13°58.9	S03°34.6
19	26°26.6	105°18.0	34.7	101°54.2	39.9	273°25.7	59.8	29°01.2	34.5
20	41°29.0	120°17.0	34.6	116°54.6	39.8	288°28.5	59.9	44°03.5	34.5
21	56°31.5	135°16.0	·· 34.4	131°54.9	·· 39.6	303°31.3	21°59.9	59°05.8	·· 34.4
22	71°33.9	150°15.1	34.3	146°55.3	39.4	318°34.1	22°00.0	74°08.2	34.3
23	86°36.4	165°14.1	34.1	161°55.7	39.2	333°37.0	00.1	89°10.5	34.3
Mer.pass.	17:15	ν -1.0′	d 0.1′	m -3.90	ν 0.4′	d 0.2′	m 1.12	ν 2.8′	d 0.1′	m -2.67	ν 2.3′	d 0.1′	m 1.01

Stars

	SHA	Dec
Alpheratz	357°34.0	29°14.2
Ankaa	353°06.4	-42°10.1
Schedar	349°30.1	56°41.1
Diphda	348°46.5	-17°50.7
Achernar	335°19.4	-57°06.5
Hamal	327°50.1	23°35.3
Polaris	313°17.4	89°22.7
Acamar	315°10.9	-40°12.2
Menkar	314°05.1	4°11.5
Mirfak	308°26.7	49°57.4
Aldebaran	290°38.4	16°33.7
Rigel	281°02.8	-8°10.3
Capella	280°20.2	46°01.5
Bellatrix	278°21.7	6°22.4
Elnath	278°00.5	28°37.8
Alnilam	275°36.6	-1°11.1
Betelgeuse	270°50.9	7°24.7
Canopus	263°51.5	-52°42.5
Sirius	258°25.2	-16°45.1
Adhara	255°04.8	-29°00.4
Procyon	244°49.7	5°09.5
Pollux	243°16.0	27°57.7
Avior	234°13.8	-59°35.4
Suhail	222°45.4	-43°32.1
Miaplacidus	221°37.4	-69°49.2
Alphard	217°46.7	-8°46.3
Regulus	207°33.4	11°50.3
Dubhe	193°39.7	61°36.3
Denebola	182°24.1	14°25.5
Gienah	175°42.7	-17°41.1
Acrux	172°59.2	-63°14.3
Gacrux	171°50.7	-57°15.3
Alioth	166°12.3	55°48.8
Spica	158°21.5	-11°17.8
Alkaid	152°51.5	49°10.7
Hadar	148°35.1	-60°29.7
Menkent	147°56.8	-36°29.7
Arcturus	145°47.3	19°02.7
Rigil Kent.	139°39.5	-60°56.3
Kochab	137°20.5	74°02.6
Zuben'ubi	136°55.3	-16°09.0
Alphecca	126°03.3	26°37.5
Antares	112°15.2	-26°29.3
Atria	107°09.2	-69°04.3
Sabik	102°02.2	-15°45.4
Shaula	96°09.7	-37°07.3
Rasalhague	95°58.1	12°32.4
Eltanin	90°42.3	51°29.0
Kaus Aust.	83°31.9	-34°22.3
Vega	80°33.1	38°48.4
Nunki	75°47.1	-26°15.9
Altair	61°59.5	8°56.2
Peacock	53°05.0	-56°39.2
Deneb	49°25.7	45°22.5
Enif	33°38.2	9°59.7
Al Na'ir	27°32.2	-46°50.3
Fomalhaut	15°13.8	-29°29.2
Scheat	13°44.6	28°13.6
Markab	13°29.2	15°20.8

Dec 30 Tue	SHA	Mer.pass
Venus	82°41.5	11:55
Mars	77°47.3	12:14
Jupiter	246°36.0	00:59
Saturn	2°43.2	17:12

Dec 31 Wed	SHA	Mer.pass
Venus	81°19.0	11:57
Mars	76°57.3	12:13
Jupiter	246°44.3	00:54
Saturn	2°40.2	17:08

Jan 01 Thu	SHA	Mer.pass
Venus	79°56.6	11:58
Mars	76°07.2	12:13
Jupiter	246°52.5	00:50
Saturn	2°37.1	17:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun			Moon				
h								
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	179°24.3	S23°09.8		65°16.3	8.3′	N17°53.4	13.6′	59.7′
1	194°24.0	09.6		79°43.6	8.2′	18°07.0	13.6′	59.8′
2	209°23.7	09.5		94°10.8	8.1′	18°20.6	13.4′	59.8′
3	224°23.4	·· 09.3		108°37.8	7.9′	18°34.0	13.3′	59.8′
4	239°23.1	09.1		123°04.8	7.8′	18°47.3	13.3′	59.8′
5	254°22.8	09.0		137°31.6	7.7′	19°00.6	13.1′	59.9′
6	269°22.5	S23°08.8		151°58.3	7.6′	N19°13.7	13.1′	59.9′
7	284°22.2	08.6		166°24.9	7.4′	19°26.8	12.9′	59.9′
8	299°21.9	08.5		180°51.3	7.3′	19°39.7	12.8′	59.9′
9	314°21.6	·· 08.3		195°17.6	7.2′	19°52.5	12.7′	60.0′
10	329°21.3	08.1		209°43.8	7.1′	20°05.2	12.6′	60.0′
11	344°21.0	08.0		224°09.9	6.9′	20°17.8	12.5′	60.0′
12	359°20.7	S23°07.8		238°35.8	6.8′	N20°30.3	12.3′	60.0′
13	14°20.4	07.6		253°01.6	6.7′	20°42.6	12.3′	60.1′
14	29°20.1	07.4		267°27.2	6.5′	20°54.9	12.1′	60.1′
15	44°19.8	·· 07.3		281°52.8	6.4′	21°07.0	12.0′	60.1′
16	59°19.5	07.1		296°18.2	6.3′	21°19.0	11.9′	60.1′
17	74°19.2	06.9		310°43.4	6.1′	21°30.9	11.7′	60.1′
18	89°18.9	S23°06.7		325°08.6	6.0′	N21°42.6	11.6′	60.2′
19	104°18.6	06.6		339°33.6	5.9′	21°54.2	11.5′	60.2′
20	119°18.4	06.4		353°58.5	5.7′	22°05.7	11.3′	60.2′
21	134°18.1	·· 06.2		8°23.2	5.6′	22°17.0	11.2′	60.2′
22	149°17.8	06.0		22°47.8	5.5′	22°28.2	11.1′	60.3′
23	164°17.5	05.8		37°12.3	5.4′	22°39.3	10.9′	60.3′
	SD = 16.3′	d = 0.2′		SD = 16.3′				

Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	179°17.2	S23°05.7		51°36.7	5.2′	N22°50.2	10.8′	60.3′
1	194°16.9	05.5		66°00.9	5.1′	23°01.0	10.6′	60.3′
2	209°16.6	05.3		80°25.0	5.0′	23°11.6	10.5′	60.3′
3	224°16.3	·· 05.1		94°49.0	4.8′	23°22.1	10.3′	60.3′
4	239°16.0	04.9		109°12.8	4.7′	23°32.4	10.2′	60.4′
5	254°15.7	04.7		123°36.5	4.6′	23°42.6	10.0′	60.4′
6	269°15.4	S23°04.5		138°00.1	4.5′	N23°52.6	9.9′	60.4′
7	284°15.1	04.4		152°23.6	4.3′	24°02.5	9.7′	60.4′
8	299°14.8	04.2		166°46.9	4.2′	24°12.2	9.6′	60.4′
9	314°14.5	·· 04.0		181°10.2	4.1′	24°21.8	9.3′	60.5′
10	329°14.2	03.8		195°33.3	4.0′	24°31.1	9.3′	60.5′
11	344°13.9	03.6		209°56.2	3.9′	24°40.4	9.0′	60.5′
12	359°13.6	S23°03.4		224°19.1	3.7′	N24°49.4	8.9′	60.5′
13	14°13.3	03.2		238°41.8	3.6′	24°58.3	8.7′	60.5′
14	29°13.0	03.0		253°04.4	3.5′	25°07.0	8.5′	60.5′
15	44°12.7	·· 02.8		267°26.9	3.4′	25°15.5	8.4′	60.5′
16	59°12.4	02.6		281°49.3	3.3′	25°23.9	8.2′	60.6′
17	74°12.1	02.4		296°11.6	3.2′	25°32.1	8.0′	60.6′
18	89°11.8	S23°02.2		310°33.8	3.1′	N25°40.1	7.8′	60.6′
19	104°11.5	02.0		324°55.8	2.9′	25°47.9	7.6′	60.6′
20	119°11.2	01.8		339°17.8	2.8′	25°55.5	7.5′	60.6′
21	134°10.9	·· 01.6		353°39.6	2.7′	26°03.0	7.3′	60.6′
22	149°10.6	01.4		8°01.3	2.6′	26°10.3	7.0′	60.6′
23	164°10.3	01.2		22°23.0	2.5′	26°17.3	6.9′	60.6′
	SD = 16.3′	d = 0.2′		SD = 16.4′				

Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	179°10.1	S23°01.0		36°44.5	2.4′	N26°24.2	6.7′	60.7′
1	194°09.8	00.8		51°06.0	2.3′	26°30.9	6.5′	60.7′
2	209°09.5	00.6		65°27.3	2.3′	26°37.4	6.3′	60.7′
3	224°09.2	·· 00.4		79°48.6	2.2′	26°43.7	6.1′	60.7′
4	239°08.9	00.2		94°09.7	2.1′	26°49.8	5.9′	60.7′
5	254°08.6	23°00.0		108°30.8	2.0′	26°55.7	5.8′	60.7′
6	269°08.3	S22°59.8		122°51.8	1.9′	N27°01.5	5.5′	60.7′
7	284°08.0	59.6		137°12.7	1.8′	27°07.0	5.3′	60.7′
8	299°07.7	59.4		151°33.5	1.8′	27°12.3	5.1′	60.7′
9	314°07.4	·· 59.2		165°54.3	1.7′	27°17.4	4.9′	60.7′
10	329°07.1	59.0		180°14.9	1.6′	27°22.3	4.7′	60.7′
11	344°06.8	58.8		194°35.6	1.5′	27°27.0	4.4′	60.7′
12	359°06.5	S22°58.6		208°56.1	1.5′	N27°31.4	4.3′	60.7′
13	14°06.2	58.3		223°16.6	1.4′	27°35.7	4.1′	60.8′
14	29°05.9	58.1		237°37.0	1.4′	27°39.8	3.8′	60.8′
15	44°05.6	·· 57.9		251°57.3	1.3′	27°43.6	3.7′	60.8′
16	59°05.4	57.7		266°17.6	1.2′	27°47.3	3.4′	60.8′
17	74°05.1	57.5		280°37.9	1.2′	27°50.7	3.2′	60.8′
18	89°04.8	S22°57.3		294°58.1	1.2′	N27°53.9	3.0′	60.8′
19	104°04.5	57.1		309°18.2	1.1′	27°56.9	2.8′	60.8′
20	119°04.2	56.8		323°38.3	1.1′	27°59.7	2.5′	60.8′
21	134°03.9	·· 56.6		337°58.4	1.0′	28°02.2	2.4′	60.8′
22	149°03.6	56.4		352°18.5	1.0′	28°04.6	2.1′	60.8′
23	164°03.3	56.2		6°38.5	1.0′	28°06.7	1.9′	60.8′
	SD = 16.3′	d = 0.2′		SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:25	10:45	▬	▬	13:21	15:42
N 70°	08:06	09:51	▬	▬	14:16	16:01
68°	07:50	09:18	▬	▬	14:49	16:16
66°	07:38	08:54	10:29	13:37	15:13	16:29
64°	07:27	08:35	09:50	14:16	15:32	16:40
62°	07:18	08:19	09:23	14:43	15:47	16:49
60°	07:09	08:06	09:03	15:04	16:01	16:57
N 58°	07:02	07:54	08:46	15:21	16:12	17:04
56°	06:56	07:44	08:31	15:35	16:22	17:11
54°	06:50	07:36	08:19	15:47	16:31	17:17
52°	06:44	07:28	08:08	15:58	16:39	17:22
50°	06:39	07:20	07:59	16:08	16:46	17:27
45°	06:27	07:05	07:38	16:28	17:02	17:39
N 40°	06:17	06:51	07:22	16:45	17:15	17:49
35°	06:08	06:40	07:08	16:58	17:27	17:58
30°	06:00	06:29	06:56	17:11	17:37	18:07
20°	05:43	06:11	06:35	17:31	17:55	18:23
N 10°	05:27	05:54	06:17	17:50	18:12	18:39
0°	05:11	05:37	05:59	18:07	18:29	18:55
S 10°	04:52	05:19	05:42	18:24	18:47	19:14
20°	04:30	04:59	05:23	18:43	19:07	19:36
30°	04:01	04:34	05:02	19:04	19:32	20:05
35°	03:43	04:19	04:49	19:17	19:47	20:23
40°	03:20	04:01	04:34	19:32	20:05	20:46
45°	02:50	03:39	04:16	19:50	20:27	21:16
S 50°	02:06	03:10	03:54	20:12	20:56	22:00
52°	01:39	02:55	03:44	20:22	21:10	22:26
54°	00:58	02:38	03:32	20:34	21:28	23:06
56°	–:–	02:16	03:18	20:48	21:49	–:–
58°	–:–	01:48	03:01	21:04	22:17	–:–
S 60°	–:–	01:03	02:42	21:24	23:01	–:–

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	▭	▭	▭	▭	▭	▭
N 70°	08:43	▭	▭	06:48	▭	▭
68°	09:47	▭	▭	05:46	▭	▭
66°	10:23	▭	▭	05:11	▭	▭
64°	10:49	10:25	▭	04:46	07:12	▭
62°	11:09	11:04	10:58	04:27	06:34	08:53
60°	11:26	11:32	11:50	04:11	06:06	08:02
N 58°	11:40	11:54	12:21	03:58	05:45	07:31
56°	11:52	12:12	12:45	03:47	05:28	07:07
54°	12:03	12:27	13:05	03:37	05:14	06:48
52°	12:13	12:40	13:21	03:28	05:01	06:32
50°	12:21	12:52	13:36	03:20	04:50	06:18
45°	12:40	13:16	14:05	03:03	04:27	05:49
N 40°	12:55	13:35	14:27	02:50	04:08	05:27
35°	13:08	13:52	14:46	02:38	03:53	05:09
30°	13:19	14:06	15:03	02:28	03:40	04:53
20°	13:38	14:30	15:30	02:11	03:17	04:26
N 10°	13:55	14:52	15:54	01:56	02:57	04:03
0°	14:11	15:11	16:16	01:42	02:39	03:42
S 10°	14:27	15:31	16:39	01:28	02:21	03:20
20°	14:45	15:53	17:03	01:13	02:02	02:58
30°	15:05	16:18	17:31	00:57	01:40	02:31
35°	15:17	16:33	17:48	00:47	01:27	02:16
40°	15:31	16:50	18:07	00:36	01:12	01:58
45°	15:47	17:11	18:31	00:23	00:54	01:36
S 50°	16:07	17:38	19:01	00:07	00:32	01:08
52°	16:17	17:51	19:16	00:00	00:22	00:55
54°	16:28	18:05	19:34	·· ··	00:11	00:40
56°	16:40	18:23	19:55	23:57	·· ··	00:22
58°	16:55	18:44	20:23	23:42	·· ··	00:00
S 60°	17:12	19:11	21:01	23:24	23:33	·· ··

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 10-12 74-91%
30	02:23	02:37	12:03	20:25	07:56	
31	02:51	03:06	12:03	21:26	08:55	
01	03:20	03:34	12:04	22:32	09:59	

No IERS EOP prediction data available

Conversion of Arc to Time

0° - 59°		
°	h	m
0	0	00
1	0	04
2	0	08
3	0	12
4	0	16
5	0	20
6	0	24
7	0	28
8	0	32
9	0	36
10	0	40
11	0	44
12	0	48
13	0	52
14	0	56
15	1	00
16	1	04
17	1	08
18	1	12
19	1	16
20	1	20
21	1	24
22	1	28
23	1	32
24	1	36
25	1	40
26	1	44
27	1	48
28	1	52
29	1	56
30	2	00
31	2	04
32	2	08
33	2	12
34	2	16
35	2	20
36	2	24
37	2	28
38	2	32
39	2	36
40	2	40
41	2	44
42	2	48
43	2	52
44	2	56
45	3	00
46	3	04
47	3	08
48	3	12
49	3	16
50	3	20
51	3	24
52	3	28
53	3	32
54	3	36
55	3	40
56	3	44
57	3	48
58	3	52
59	3	56
60	4	00

60° - 119°		
°	h	m
60	4	00
61	4	04
62	4	08
63	4	12
64	4	16
65	4	20
66	4	24
67	4	28
68	4	32
69	4	36
70	4	40
71	4	44
72	4	48
73	4	52
74	4	56
75	5	00
76	5	04
77	5	08
78	5	12
79	5	16
80	5	20
81	5	24
82	5	28
83	5	32
84	5	36
85	5	40
86	5	44
87	5	48
88	5	52
89	5	56
90	6	00
91	6	04
92	6	08
93	6	12
94	6	16
95	6	20
96	6	24
97	6	28
98	6	32
99	6	36
100	6	40
101	6	44
102	6	48
103	6	52
104	6	56
105	7	00
106	7	04
107	7	08
108	7	12
109	7	16
110	7	20
111	7	24
112	7	28
113	7	32
114	7	36
115	7	40
116	7	44
117	7	48
118	7	52
119	7	56
120	8	00

120° - 179°		
°	h	m
120	8	00
121	8	04
122	8	08
123	8	12
124	8	16
125	8	20
126	8	24
127	8	28
128	8	32
129	8	36
130	8	40
131	8	44
132	8	48
133	8	52
134	8	56
135	9	00
136	9	04
137	9	08
138	9	12
139	9	16
140	9	20
141	9	24
142	9	28
143	9	32
144	9	36
145	9	40
146	9	44
147	9	48
148	9	52
149	9	56
150	10	00
151	10	04
152	10	08
153	10	12
154	10	16
155	10	20
156	10	24
157	10	28
158	10	32
159	10	36
160	10	40
161	10	44
162	10	48
163	10	52
164	10	56
165	11	00
166	11	04
167	11	08
168	11	12
169	11	16
170	11	20
171	11	24
172	11	28
173	11	32
174	11	36
175	11	40
176	11	44
177	11	48
178	11	52
179	11	56
180	12	00

180° - 239°		
°	h	m
180	12	00
181	12	04
182	12	08
183	12	12
184	12	16
185	12	20
186	12	24
187	12	28
188	12	32
189	12	36
190	12	40
191	12	44
192	12	48
193	12	52
194	12	56
195	13	00
196	13	04
197	13	08
198	13	12
199	13	16
200	13	20
201	13	24
202	13	28
203	13	32
204	13	36
205	13	40
206	13	44
207	13	48
208	13	52
209	13	56
210	14	00
211	14	04
212	14	08
213	14	12
214	14	16
215	14	20
216	14	24
217	14	28
218	14	32
219	14	36
220	14	40
221	14	44
222	14	48
223	14	52
224	14	56
225	15	00
226	15	04
227	15	08
228	15	12
229	15	16
230	15	20
231	15	24
232	15	28
233	15	32
234	15	36
235	15	40
236	15	44
237	15	48
238	15	52
239	15	56
240	16	00

240° - 299°		
°	h	m
240	16	00
241	16	04
242	16	08
243	16	12
244	16	16
245	16	20
246	16	24
247	16	28
248	16	32
249	16	36
250	16	40
251	16	44
252	16	48
253	16	52
254	16	56
255	17	00
256	17	04
257	17	08
258	17	12
259	17	16
260	17	20
261	17	24
262	17	28
263	17	32
264	17	36
265	17	40
266	17	44
267	17	48
268	17	52
269	17	56
270	18	00
271	18	04
272	18	08
273	18	12
274	18	16
275	18	20
276	18	24
277	18	28
278	18	32
279	18	36
280	18	40
281	18	44
282	18	48
283	18	52
284	18	56
285	19	00
286	19	04
287	19	08
288	19	12
289	19	16
290	19	20
291	19	24
292	19	28
293	19	32
294	19	36
295	19	40
296	19	44
297	19	48
298	19	52
299	19	56
300	20	00

300° - 360°		
°	h	m
300	20	00
301	20	04
302	20	08
303	20	12
304	20	16
305	20	20
306	20	24
307	20	28
308	20	32
309	20	36
310	20	40
311	20	44
312	20	48
313	20	52
314	20	56
315	21	00
316	21	04
317	21	08
318	21	12
319	21	16
320	21	20
321	21	24
322	21	28
323	21	32
324	21	36
325	21	40
326	21	44
327	21	48
328	21	52
329	21	56
330	22	00
331	22	04
332	22	08
333	22	12
334	22	16
335	22	20
336	22	24
337	22	28
338	22	32
339	22	36
340	22	40
341	22	44
342	22	48
343	22	52
344	22	56
345	23	00
346	23	04
347	23	08
348	23	12
349	23	16
350	23	20
351	23	24
352	23	28
353	23	32
354	23	36
355	23	40
356	23	44
357	23	48
358	23	52
359	23	56
360	24	00

0′ - 59′		
′	m	s
0	0	00
1	0	04
2	0	08
3	0	12
4	0	16
5	0	20
6	0	24
7	0	28
8	0	32
9	0	36
10	0	40
11	0	44
12	0	48
13	0	52
14	0	56
15	1	00
16	1	04
17	1	08
18	1	12
19	1	16
20	1	20
21	1	24
22	1	28
23	1	32
24	1	36
25	1	40
26	1	44
27	1	48
28	1	52
29	1	56
30	2	00
31	2	04
32	2	08
33	2	12
34	2	16
35	2	20
36	2	24
37	2	28
38	2	32
39	2	36
40	2	40
41	2	44
42	2	48
43	2	52
44	2	56
45	3	00
46	3	04
47	3	08
48	3	12
49	3	16
50	3	20
51	3	24
52	3	28
53	3	32
54	3	36
55	3	40
56	3	44
57	3	48
58	3	52
59	3	56
60	4	00

0″ - 59″	
″	s
0	0.00
1	0.07
2	0.13
3	0.20
4	0.27
5	0.33
6	0.40
7	0.47
8	0.53
9	0.60
10	0.67
11	0.73
12	0.80
13	0.87
14	0.93
15	1.00
16	1.07
17	1.13
18	1.20
19	1.27
20	1.33
21	1.40
22	1.47
23	1.53
24	1.60
25	1.67
26	1.73
27	1.80
28	1.87
29	1.93
30	2.00
31	2.07
32	2.13
33	2.20
34	2.27
35	2.33
36	2.40
37	2.47
38	2.53
39	2.60
40	2.67
41	2.73
42	2.80
43	2.87
44	2.93
45	3.00
46	3.07
47	3.13
48	3.20
49	3.27
50	3.33
51	3.40
52	3.47
53	3.53
54	3.60
55	3.67
56	3.73
57	3.80
58	3.87
59	3.93
60	4.00

h= hours of time **m**= minutes of time **s** = seconds of time **′** = minutes of arc **″** = seconds of arc

Increments and Corrections

m 0	Sun Plan.	Aries	Moon	v and d corr		
0	0°00.0	0°00.0	0°00.0	0.0 - 0.0	6.0 - 0.1	12.0 - 0.1
1	0°00.3	0°00.3	0°00.2	0.1 - 0.0	6.1 - 0.1	12.1 - 0.1
2	0°00.5	0°00.5	0°00.5	0.2 - 0.0	6.2 - 0.1	12.2 - 0.1
3	0°00.8	0°00.8	0°00.7	0.3 - 0.0	6.3 - 0.1	12.3 - 0.1
4	0°01.0	0°01.0	0°01.0	0.4 - 0.0	6.4 - 0.1	12.4 - 0.1
5	0°01.3	0°01.3	0°01.2	0.5 - 0.0	6.5 - 0.1	12.5 - 0.1
6	0°01.5	0°01.5	0°01.4	0.6 - 0.0	6.6 - 0.1	12.6 - 0.1
7	0°01.8	0°01.8	0°01.7	0.7 - 0.0	6.7 - 0.1	12.7 - 0.1
8	0°02.0	0°02.0	0°01.9	0.8 - 0.0	6.8 - 0.1	12.8 - 0.1
9	0°02.3	0°02.3	0°02.1	0.9 - 0.0	6.9 - 0.1	12.9 - 0.1
10	0°02.5	0°02.5	0°02.4	1.0 - 0.0	7.0 - 0.1	13.0 - 0.1
11	0°02.8	0°02.8	0°02.6	1.1 - 0.0	7.1 - 0.1	13.1 - 0.1
12	0°03.0	0°03.0	0°02.9	1.2 - 0.0	7.2 - 0.1	13.2 - 0.1
13	0°03.3	0°03.3	0°03.1	1.3 - 0.0	7.3 - 0.1	13.3 - 0.1
14	0°03.5	0°03.5	0°03.3	1.4 - 0.0	7.4 - 0.1	13.4 - 0.1
15	0°03.8	0°03.8	0°03.6	1.5 - 0.0	7.5 - 0.1	13.5 - 0.1
16	0°04.0	0°04.0	0°03.8	1.6 - 0.0	7.6 - 0.1	13.6 - 0.1
17	0°04.3	0°04.3	0°04.1	1.7 - 0.0	7.7 - 0.1	13.7 - 0.1
18	0°04.5	0°04.5	0°04.3	1.8 - 0.0	7.8 - 0.1	13.8 - 0.1
19	0°04.8	0°04.8	0°04.5	1.9 - 0.0	7.9 - 0.1	13.9 - 0.1
20	0°05.0	0°05.0	0°04.8	2.0 - 0.0	8.0 - 0.1	14.0 - 0.1
21	0°05.3	0°05.3	0°05.0	2.1 - 0.0	8.1 - 0.1	14.1 - 0.1
22	0°05.5	0°05.5	0°05.2	2.2 - 0.0	8.2 - 0.1	14.2 - 0.1
23	0°05.8	0°05.8	0°05.5	2.3 - 0.0	8.3 - 0.1	14.3 - 0.1
24	0°06.0	0°06.0	0°05.7	2.4 - 0.0	8.4 - 0.1	14.4 - 0.1
25	0°06.3	0°06.3	0°06.0	2.5 - 0.0	8.5 - 0.1	14.5 - 0.1
26	0°06.5	0°06.5	0°06.2	2.6 - 0.0	8.6 - 0.1	14.6 - 0.1
27	0°06.8	0°06.8	0°06.4	2.7 - 0.0	8.7 - 0.1	14.7 - 0.1
28	0°07.0	0°07.0	0°06.7	2.8 - 0.0	8.8 - 0.1	14.8 - 0.1
29	0°07.3	0°07.3	0°06.9	2.9 - 0.0	8.9 - 0.1	14.9 - 0.1
30	0°07.5	0°07.5	0°07.2	3.0 - 0.0	9.0 - 0.1	15.0 - 0.1
31	0°07.8	0°07.8	0°07.4	3.1 - 0.0	9.1 - 0.1	15.1 - 0.1
32	0°08.0	0°08.0	0°07.6	3.2 - 0.0	9.2 - 0.1	15.2 - 0.1
33	0°08.3	0°08.3	0°07.9	3.3 - 0.0	9.3 - 0.1	15.3 - 0.1
34	0°08.5	0°08.5	0°08.1	3.4 - 0.0	9.4 - 0.1	15.4 - 0.1
35	0°08.8	0°08.8	0°08.4	3.5 - 0.0	9.5 - 0.1	15.5 - 0.1
36	0°09.0	0°09.0	0°08.6	3.6 - 0.0	9.6 - 0.1	15.6 - 0.1
37	0°09.3	0°09.3	0°08.8	3.7 - 0.0	9.7 - 0.1	15.7 - 0.1
38	0°09.5	0°09.5	0°09.1	3.8 - 0.0	9.8 - 0.1	15.8 - 0.1
39	0°09.8	0°09.8	0°09.3	3.9 - 0.0	9.9 - 0.1	15.9 - 0.1
40	0°10.0	0°10.0	0°09.5	4.0 - 0.0	10.0 - 0.1	16.0 - 0.1
41	0°10.3	0°10.3	0°09.8	4.1 - 0.0	10.1 - 0.1	16.1 - 0.1
42	0°10.5	0°10.5	0°10.0	4.2 - 0.0	10.2 - 0.1	16.2 - 0.1
43	0°10.8	0°10.8	0°10.3	4.3 - 0.0	10.3 - 0.1	16.3 - 0.1
44	0°11.0	0°11.0	0°10.5	4.4 - 0.0	10.4 - 0.1	16.4 - 0.1
45	0°11.3	0°11.3	0°10.7	4.5 - 0.0	10.5 - 0.1	16.5 - 0.1
46	0°11.5	0°11.5	0°11.0	4.6 - 0.0	10.6 - 0.1	16.6 - 0.1
47	0°11.8	0°11.8	0°11.2	4.7 - 0.0	10.7 - 0.1	16.7 - 0.1
48	0°12.0	0°12.0	0°11.5	4.8 - 0.0	10.8 - 0.1	16.8 - 0.1
49	0°12.3	0°12.3	0°11.7	4.9 - 0.0	10.9 - 0.1	16.9 - 0.1
50	0°12.5	0°12.5	0°11.9	5.0 - 0.0	11.0 - 0.1	17.0 - 0.1
51	0°12.8	0°12.8	0°12.2	5.1 - 0.0	11.1 - 0.1	17.1 - 0.1
52	0°13.0	0°13.0	0°12.4	5.2 - 0.0	11.2 - 0.1	17.2 - 0.1
53	0°13.3	0°13.3	0°12.6	5.3 - 0.0	11.3 - 0.1	17.3 - 0.1
54	0°13.5	0°13.5	0°12.9	5.4 - 0.0	11.4 - 0.1	17.4 - 0.1
55	0°13.8	0°13.8	0°13.1	5.5 - 0.0	11.5 - 0.1	17.5 - 0.1
56	0°14.0	0°14.0	0°13.4	5.6 - 0.0	11.6 - 0.1	17.6 - 0.1
57	0°14.2	0°14.3	0°13.6	5.7 - 0.0	11.7 - 0.1	17.7 - 0.1
58	0°14.5	0°14.5	0°13.8	5.8 - 0.0	11.8 - 0.1	17.8 - 0.1
59	0°14.7	0°14.8	0°14.1	5.9 - 0.0	11.9 - 0.1	17.9 - 0.1

m 1	Sun Plan.	Aries	Moon	v and d corr		
0	0°15.0	0°15.0	0°14.3	0.0 - 0.0	6.0 - 0.2	12.0 - 0.3
1	0°15.3	0°15.3	0°14.6	0.1 - 0.0	6.1 - 0.2	12.1 - 0.3
2	0°15.5	0°15.5	0°14.8	0.2 - 0.0	6.2 - 0.2	12.2 - 0.3
3	0°15.8	0°15.8	0°15.0	0.3 - 0.0	6.3 - 0.2	12.3 - 0.3
4	0°16.0	0°16.0	0°15.3	0.4 - 0.0	6.4 - 0.2	12.4 - 0.3
5	0°16.3	0°16.3	0°15.5	0.5 - 0.0	6.5 - 0.2	12.5 - 0.3
6	0°16.5	0°16.5	0°15.7	0.6 - 0.0	6.6 - 0.2	12.6 - 0.3
7	0°16.8	0°16.8	0°16.0	0.7 - 0.0	6.7 - 0.2	12.7 - 0.3
8	0°17.0	0°17.0	0°16.2	0.8 - 0.0	6.8 - 0.2	12.8 - 0.3
9	0°17.3	0°17.3	0°16.5	0.9 - 0.0	6.9 - 0.2	12.9 - 0.3
10	0°17.5	0°17.5	0°16.7	1.0 - 0.0	7.0 - 0.2	13.0 - 0.3
11	0°17.8	0°17.8	0°16.9	1.1 - 0.0	7.1 - 0.2	13.1 - 0.3
12	0°18.0	0°18.0	0°17.2	1.2 - 0.0	7.2 - 0.2	13.2 - 0.3
13	0°18.3	0°18.3	0°17.4	1.3 - 0.0	7.3 - 0.2	13.3 - 0.3
14	0°18.5	0°18.6	0°17.7	1.4 - 0.0	7.4 - 0.2	13.4 - 0.3
15	0°18.8	0°18.8	0°17.9	1.5 - 0.0	7.5 - 0.2	13.5 - 0.3
16	0°19.0	0°19.1	0°18.1	1.6 - 0.0	7.6 - 0.2	13.6 - 0.3
17	0°19.3	0°19.3	0°18.4	1.7 - 0.0	7.7 - 0.2	13.7 - 0.3
18	0°19.5	0°19.6	0°18.6	1.8 - 0.0	7.8 - 0.2	13.8 - 0.3
19	0°19.8	0°19.8	0°18.9	1.9 - 0.0	7.9 - 0.2	13.9 - 0.3
20	0°20.0	0°20.1	0°19.1	2.0 - 0.1	8.0 - 0.2	14.0 - 0.4
21	0°20.3	0°20.3	0°19.3	2.1 - 0.1	8.1 - 0.2	14.1 - 0.4
22	0°20.5	0°20.6	0°19.6	2.2 - 0.1	8.2 - 0.2	14.2 - 0.4
23	0°20.8	0°20.8	0°19.8	2.3 - 0.1	8.3 - 0.2	14.3 - 0.4
24	0°21.0	0°21.1	0°20.0	2.4 - 0.1	8.4 - 0.2	14.4 - 0.4
25	0°21.3	0°21.3	0°20.3	2.5 - 0.1	8.5 - 0.2	14.5 - 0.4
26	0°21.5	0°21.6	0°20.5	2.6 - 0.1	8.6 - 0.2	14.6 - 0.4
27	0°21.8	0°21.8	0°20.8	2.7 - 0.1	8.7 - 0.2	14.7 - 0.4
28	0°22.0	0°22.1	0°21.0	2.8 - 0.1	8.8 - 0.2	14.8 - 0.4
29	0°22.3	0°22.3	0°21.2	2.9 - 0.1	8.9 - 0.2	14.9 - 0.4
30	0°22.5	0°22.6	0°21.5	3.0 - 0.1	9.0 - 0.2	15.0 - 0.4
31	0°22.8	0°22.8	0°21.7	3.1 - 0.1	9.1 - 0.2	15.1 - 0.4
32	0°23.0	0°23.1	0°22.0	3.2 - 0.1	9.2 - 0.2	15.2 - 0.4
33	0°23.3	0°23.3	0°22.2	3.3 - 0.1	9.3 - 0.2	15.3 - 0.4
34	0°23.5	0°23.6	0°22.4	3.4 - 0.1	9.4 - 0.2	15.4 - 0.4
35	0°23.8	0°23.8	0°22.7	3.5 - 0.1	9.5 - 0.2	15.5 - 0.4
36	0°24.0	0°24.1	0°22.9	3.6 - 0.1	9.6 - 0.2	15.6 - 0.4
37	0°24.3	0°24.3	0°23.1	3.7 - 0.1	9.7 - 0.2	15.7 - 0.4
38	0°24.5	0°24.6	0°23.4	3.8 - 0.1	9.8 - 0.2	15.8 - 0.4
39	0°24.8	0°24.8	0°23.6	3.9 - 0.1	9.9 - 0.2	15.9 - 0.4
40	0°25.0	0°25.1	0°23.9	4.0 - 0.1	10.0 - 0.3	16.0 - 0.4
41	0°25.3	0°25.3	0°24.1	4.1 - 0.1	10.1 - 0.3	16.1 - 0.4
42	0°25.5	0°25.6	0°24.3	4.2 - 0.1	10.2 - 0.3	16.2 - 0.4
43	0°25.8	0°25.8	0°24.6	4.3 - 0.1	10.3 - 0.3	16.3 - 0.4
44	0°26.0	0°26.1	0°24.8	4.4 - 0.1	10.4 - 0.3	16.4 - 0.4
45	0°26.3	0°26.3	0°25.1	4.5 - 0.1	10.5 - 0.3	16.5 - 0.4
46	0°26.5	0°26.6	0°25.3	4.6 - 0.1	10.6 - 0.3	16.6 - 0.4
47	0°26.8	0°26.8	0°25.5	4.7 - 0.1	10.7 - 0.3	16.7 - 0.4
48	0°27.0	0°27.1	0°25.8	4.8 - 0.1	10.8 - 0.3	16.8 - 0.4
49	0°27.3	0°27.3	0°26.0	4.9 - 0.1	10.9 - 0.3	16.9 - 0.4
50	0°27.5	0°27.6	0°26.2	5.0 - 0.1	11.0 - 0.3	17.0 - 0.4
51	0°27.8	0°27.8	0°26.5	5.1 - 0.1	11.1 - 0.3	17.1 - 0.4
52	0°28.0	0°28.1	0°26.7	5.2 - 0.1	11.2 - 0.3	17.2 - 0.4
53	0°28.3	0°28.3	0°27.0	5.3 - 0.1	11.3 - 0.3	17.3 - 0.4
54	0°28.5	0°28.6	0°27.2	5.4 - 0.1	11.4 - 0.3	17.4 - 0.4
55	0°28.7	0°28.8	0°27.4	5.5 - 0.1	11.5 - 0.3	17.5 - 0.4
56	0°29.0	0°29.1	0°27.7	5.6 - 0.1	11.6 - 0.3	17.6 - 0.4
57	0°29.3	0°29.3	0°27.9	5.7 - 0.1	11.7 - 0.3	17.7 - 0.4
58	0°29.5	0°29.6	0°28.2	5.8 - 0.1	11.8 - 0.3	17.8 - 0.4
59	0°29.7	0°29.8	0°28.4	5.9 - 0.1	11.9 - 0.3	17.9 - 0.4

m 2	Sun Plan.	Aries	Moon	v and d corr		
0	0°30.0	0°30.1	0°28.6	0.0 - 0.0	6.0 - 0.3	12.0 - 0.5
1	0°30.3	0°30.3	0°28.9	0.1 - 0.0	6.1 - 0.3	12.1 - 0.5
2	0°30.5	0°30.6	0°29.1	0.2 - 0.0	6.2 - 0.3	12.2 - 0.5
3	0°30.7	0°30.8	0°29.3	0.3 - 0.0	6.3 - 0.3	12.3 - 0.5
4	0°31.0	0°31.1	0°29.6	0.4 - 0.0	6.4 - 0.3	12.4 - 0.5
5	0°31.3	0°31.3	0°29.8	0.5 - 0.0	6.5 - 0.3	12.5 - 0.5
6	0°31.5	0°31.6	0°30.1	0.6 - 0.0	6.6 - 0.3	12.6 - 0.5
7	0°31.8	0°31.8	0°30.3	0.7 - 0.0	6.7 - 0.3	12.7 - 0.5
8	0°32.0	0°32.1	0°30.5	0.8 - 0.0	6.8 - 0.3	12.8 - 0.5
9	0°32.3	0°32.3	0°30.8	0.9 - 0.0	6.9 - 0.3	12.9 - 0.5
10	0°32.5	0°32.6	0°31.0	1.0 - 0.0	7.0 - 0.3	13.0 - 0.5
11	0°32.8	0°32.8	0°31.3	1.1 - 0.0	7.1 - 0.3	13.1 - 0.5
12	0°33.0	0°33.1	0°31.5	1.2 - 0.1	7.2 - 0.3	13.2 - 0.5
13	0°33.3	0°33.3	0°31.7	1.3 - 0.1	7.3 - 0.3	13.3 - 0.6
14	0°33.5	0°33.6	0°32.0	1.4 - 0.1	7.4 - 0.3	13.4 - 0.6
15	0°33.8	0°33.8	0°32.2	1.5 - 0.1	7.5 - 0.3	13.5 - 0.6
16	0°34.0	0°34.1	0°32.5	1.6 - 0.1	7.6 - 0.3	13.6 - 0.6
17	0°34.3	0°34.3	0°32.7	1.7 - 0.1	7.7 - 0.3	13.7 - 0.6
18	0°34.5	0°34.6	0°32.9	1.8 - 0.1	7.8 - 0.3	13.8 - 0.6
19	0°34.8	0°34.8	0°33.2	1.9 - 0.1	7.9 - 0.3	13.9 - 0.6
20	0°35.0	0°35.1	0°33.4	2.0 - 0.1	8.0 - 0.3	14.0 - 0.6
21	0°35.3	0°35.3	0°33.6	2.1 - 0.1	8.1 - 0.3	14.1 - 0.6
22	0°35.5	0°35.6	0°33.9	2.2 - 0.1	8.2 - 0.3	14.2 - 0.6
23	0°35.8	0°35.8	0°34.1	2.3 - 0.1	8.3 - 0.3	14.3 - 0.6
24	0°36.0	0°36.1	0°34.4	2.4 - 0.1	8.4 - 0.3	14.4 - 0.6
25	0°36.3	0°36.3	0°34.6	2.5 - 0.1	8.5 - 0.4	14.5 - 0.6
26	0°36.5	0°36.6	0°34.8	2.6 - 0.1	8.6 - 0.4	14.6 - 0.6
27	0°36.8	0°36.9	0°35.1	2.7 - 0.1	8.7 - 0.4	14.7 - 0.6
28	0°37.0	0°37.1	0°35.3	2.8 - 0.1	8.8 - 0.4	14.8 - 0.6
29	0°37.3	0°37.4	0°35.6	2.9 - 0.1	8.9 - 0.4	14.9 - 0.6
30	0°37.5	0°37.6	0°35.8	3.0 - 0.1	9.0 - 0.4	15.0 - 0.6
31	0°37.8	0°37.9	0°36.0	3.1 - 0.1	9.1 - 0.4	15.1 - 0.6
32	0°38.0	0°38.1	0°36.3	3.2 - 0.1	9.2 - 0.4	15.2 - 0.6
33	0°38.3	0°38.4	0°36.5	3.3 - 0.1	9.3 - 0.4	15.3 - 0.6
34	0°38.5	0°38.6	0°36.7	3.4 - 0.1	9.4 - 0.4	15.4 - 0.6
35	0°38.8	0°38.9	0°37.0	3.5 - 0.1	9.5 - 0.4	15.5 - 0.6
36	0°39.0	0°39.1	0°37.2	3.6 - 0.1	9.6 - 0.4	15.6 - 0.6
37	0°39.3	0°39.4	0°37.5	3.7 - 0.2	9.7 - 0.4	15.7 - 0.7
38	0°39.5	0°39.6	0°37.7	3.8 - 0.2	9.8 - 0.4	15.8 - 0.7
39	0°39.8	0°39.9	0°37.9	3.9 - 0.2	9.9 - 0.4	15.9 - 0.7
40	0°40.0	0°40.1	0°38.2	4.0 - 0.2	10.0 - 0.4	16.0 - 0.7
41	0°40.3	0°40.4	0°38.4	4.1 - 0.2	10.1 - 0.4	16.1 - 0.7
42	0°40.5	0°40.6	0°38.7	4.2 - 0.2	10.2 - 0.4	16.2 - 0.7
43	0°40.8	0°40.9	0°38.9	4.3 - 0.2	10.3 - 0.4	16.3 - 0.7
44	0°41.0	0°41.1	0°39.1	4.4 - 0.2	10.4 - 0.4	16.4 - 0.7
45	0°41.3	0°41.4	0°39.4	4.5 - 0.2	10.5 - 0.4	16.5 - 0.7
46	0°41.5	0°41.6	0°39.6	4.6 - 0.2	10.6 - 0.4	16.6 - 0.7
47	0°41.8	0°41.9	0°39.8	4.7 - 0.2	10.7 - 0.4	16.7 - 0.7
48	0°42.0	0°42.1	0°40.1	4.8 - 0.2	10.8 - 0.5	16.8 - 0.7
49	0°42.3	0°42.4	0°40.3	4.9 - 0.2	10.9 - 0.5	16.9 - 0.7
50	0°42.5	0°42.6	0°40.6	5.0 - 0.2	11.0 - 0.5	17.0 - 0.7
51	0°42.8	0°42.9	0°40.8	5.1 - 0.2	11.1 - 0.5	17.1 - 0.7
52	0°43.0	0°43.1	0°41.0	5.2 - 0.2	11.2 - 0.5	17.2 - 0.7
53	0°43.3	0°43.4	0°41.3	5.3 - 0.2	11.3 - 0.5	17.3 - 0.7
54	0°43.5	0°43.6	0°41.5	5.4 - 0.2	11.4 - 0.5	17.4 - 0.7
55	0°43.8	0°43.9	0°41.8	5.5 - 0.2	11.5 - 0.5	17.5 - 0.7
56	0°44.0	0°44.1	0°42.0	5.6 - 0.2	11.6 - 0.5	17.6 - 0.7
57	0°44.3	0°44.4	0°42.2	5.7 - 0.2	11.7 - 0.5	17.7 - 0.7
58	0°44.5	0°44.6	0°42.5	5.8 - 0.2	11.8 - 0.5	17.8 - 0.7
59	0°44.8	0°44.9	0°42.7	5.9 - 0.2	11.9 - 0.5	17.9 - 0.7

Increments and Corrections

m 3	Sun Plan.	Aries	Moon	v and d corr		
0	0°45.0	0°45.1	0°43.0	0.0 - 0.0	6.0 - 0.3	12.0 - 0.7
1	0°45.3	0°45.4	0°43.2	0.1 - 0.0	6.1 - 0.4	12.1 - 0.7
2	0°45.5	0°45.6	0°43.4	0.2 - 0.0	6.2 - 0.4	12.2 - 0.7
3	0°45.8	0°45.9	0°43.7	0.3 - 0.0	6.3 - 0.4	12.3 - 0.7
4	0°46.0	0°46.1	0°43.9	0.4 - 0.0	6.4 - 0.4	12.4 - 0.7
5	0°46.3	0°46.4	0°44.1	0.5 - 0.0	6.5 - 0.4	12.5 - 0.7
6	0°46.5	0°46.6	0°44.4	0.6 - 0.0	6.6 - 0.4	12.6 - 0.7
7	0°46.8	0°46.9	0°44.6	0.7 - 0.0	6.7 - 0.4	12.7 - 0.7
8	0°47.0	0°47.1	0°44.9	0.8 - 0.0	6.8 - 0.4	12.8 - 0.7
9	0°47.3	0°47.4	0°45.1	0.9 - 0.1	6.9 - 0.4	12.9 - 0.8
10	0°47.5	0°47.6	0°45.3	1.0 - 0.1	7.0 - 0.4	13.0 - 0.8
11	0°47.8	0°47.9	0°45.6	1.1 - 0.1	7.1 - 0.4	13.1 - 0.8
12	0°48.0	0°48.1	0°45.8	1.2 - 0.1	7.2 - 0.4	13.2 - 0.8
13	0°48.3	0°48.4	0°46.1	1.3 - 0.1	7.3 - 0.4	13.3 - 0.8
14	0°48.5	0°48.6	0°46.3	1.4 - 0.1	7.4 - 0.4	13.4 - 0.8
15	0°48.8	0°48.9	0°46.5	1.5 - 0.1	7.5 - 0.4	13.5 - 0.8
16	0°49.0	0°49.1	0°46.8	1.6 - 0.1	7.6 - 0.4	13.6 - 0.8
17	0°49.3	0°49.4	0°47.0	1.7 - 0.1	7.7 - 0.4	13.7 - 0.8
18	0°49.5	0°49.6	0°47.2	1.8 - 0.1	7.8 - 0.5	13.8 - 0.8
19	0°49.8	0°49.9	0°47.5	1.9 - 0.1	7.9 - 0.5	13.9 - 0.8
20	0°50.0	0°50.1	0°47.7	2.0 - 0.1	8.0 - 0.5	14.0 - 0.8
21	0°50.3	0°50.4	0°48.0	2.1 - 0.1	8.1 - 0.5	14.1 - 0.8
22	0°50.5	0°50.6	0°48.2	2.2 - 0.1	8.2 - 0.5	14.2 - 0.8
23	0°50.8	0°50.9	0°48.4	2.3 - 0.1	8.3 - 0.5	14.3 - 0.8
24	0°51.0	0°51.1	0°48.7	2.4 - 0.1	8.4 - 0.5	14.4 - 0.8
25	0°51.3	0°51.4	0°48.9	2.5 - 0.1	8.5 - 0.5	14.5 - 0.8
26	0°51.5	0°51.6	0°49.2	2.6 - 0.2	8.6 - 0.5	14.6 - 0.9
27	0°51.8	0°51.9	0°49.4	2.7 - 0.2	8.7 - 0.5	14.7 - 0.9
28	0°52.0	0°52.1	0°49.6	2.8 - 0.2	8.8 - 0.5	14.8 - 0.9
29	0°52.3	0°52.4	0°49.9	2.9 - 0.2	8.9 - 0.5	14.9 - 0.9
30	0°52.5	0°52.6	0°50.1	3.0 - 0.2	9.0 - 0.5	15.0 - 0.9
31	0°52.8	0°52.9	0°50.3	3.1 - 0.2	9.1 - 0.5	15.1 - 0.9
32	0°53.0	0°53.1	0°50.6	3.2 - 0.2	9.2 - 0.5	15.2 - 0.9
33	0°53.3	0°53.4	0°50.8	3.3 - 0.2	9.3 - 0.5	15.3 - 0.9
34	0°53.5	0°53.6	0°51.1	3.4 - 0.2	9.4 - 0.5	15.4 - 0.9
35	0°53.8	0°53.9	0°51.3	3.5 - 0.2	9.5 - 0.6	15.5 - 0.9
36	0°54.0	0°54.1	0°51.5	3.6 - 0.2	9.6 - 0.6	15.6 - 0.9
37	0°54.3	0°54.4	0°51.8	3.7 - 0.2	9.7 - 0.6	15.7 - 0.9
38	0°54.5	0°54.6	0°52.0	3.8 - 0.2	9.8 - 0.6	15.8 - 0.9
39	0°54.8	0°54.9	0°52.3	3.9 - 0.2	9.9 - 0.6	15.9 - 0.9
40	0°55.0	0°55.2	0°52.5	4.0 - 0.2	10.0 - 0.6	16.0 - 0.9
41	0°55.3	0°55.4	0°52.7	4.1 - 0.2	10.1 - 0.6	16.1 - 0.9
42	0°55.5	0°55.7	0°53.0	4.2 - 0.2	10.2 - 0.6	16.2 - 0.9
43	0°55.8	0°55.9	0°53.2	4.3 - 0.3	10.3 - 0.6	16.3 - 1.0
44	0°56.0	0°56.2	0°53.4	4.4 - 0.3	10.4 - 0.6	16.4 - 1.0
45	0°56.3	0°56.4	0°53.7	4.5 - 0.3	10.5 - 0.6	16.5 - 1.0
46	0°56.5	0°56.7	0°53.9	4.6 - 0.3	10.6 - 0.6	16.6 - 1.0
47	0°56.8	0°56.9	0°54.2	4.7 - 0.3	10.7 - 0.6	16.7 - 1.0
48	0°57.0	0°57.2	0°54.4	4.8 - 0.3	10.8 - 0.6	16.8 - 1.0
49	0°57.3	0°57.4	0°54.6	4.9 - 0.3	10.9 - 0.6	16.9 - 1.0
50	0°57.5	0°57.7	0°54.9	5.0 - 0.3	11.0 - 0.6	17.0 - 1.0
51	0°57.7	0°57.9	0°55.1	5.1 - 0.3	11.1 - 0.6	17.1 - 1.0
52	0°58.0	0°58.2	0°55.4	5.2 - 0.3	11.2 - 0.7	17.2 - 1.0
53	0°58.3	0°58.4	0°55.6	5.3 - 0.3	11.3 - 0.7	17.3 - 1.0
54	0°58.5	0°58.7	0°55.8	5.4 - 0.3	11.4 - 0.7	17.4 - 1.0
55	0°58.8	0°58.9	0°56.1	5.5 - 0.3	11.5 - 0.7	17.5 - 1.0
56	0°59.0	0°59.2	0°56.3	5.6 - 0.3	11.6 - 0.7	17.6 - 1.0
57	0°59.3	0°59.4	0°56.6	5.7 - 0.3	11.7 - 0.7	17.7 - 1.0
58	0°59.5	0°59.7	0°56.8	5.8 - 0.3	11.8 - 0.7	17.8 - 1.0
59	0°59.8	0°59.9	0°57.0	5.9 - 0.3	11.9 - 0.7	17.9 - 1.0

m 4	Sun Plan.	Aries	Moon	v and d corr		
0	1°00.0	1°00.2	0°57.3	0.0 - 0.0	6.0 - 0.4	12.0 - 0.9
1	1°00.2	1°00.4	0°57.5	0.1 - 0.0	6.1 - 0.5	12.1 - 0.9
2	1°00.5	1°00.7	0°57.7	0.2 - 0.0	6.2 - 0.5	12.2 - 0.9
3	1°00.7	1°00.9	0°58.0	0.3 - 0.0	6.3 - 0.5	12.3 - 0.9
4	1°01.0	1°01.2	0°58.2	0.4 - 0.0	6.4 - 0.5	12.4 - 0.9
5	1°01.2	1°01.4	0°58.5	0.5 - 0.0	6.5 - 0.5	12.5 - 0.9
6	1°01.5	1°01.7	0°58.7	0.6 - 0.0	6.6 - 0.5	12.6 - 0.9
7	1°01.7	1°01.9	0°58.9	0.7 - 0.1	6.7 - 0.5	12.7 - 1.0
8	1°02.0	1°02.2	0°59.2	0.8 - 0.1	6.8 - 0.5	12.8 - 1.0
9	1°02.3	1°02.4	0°59.4	0.9 - 0.1	6.9 - 0.5	12.9 - 1.0
10	1°02.5	1°02.7	0°59.7	1.0 - 0.1	7.0 - 0.5	13.0 - 1.0
11	1°02.8	1°02.9	0°59.9	1.1 - 0.1	7.1 - 0.5	13.1 - 1.0
12	1°03.0	1°03.2	1°00.1	1.2 - 0.1	7.2 - 0.5	13.2 - 1.0
13	1°03.3	1°03.4	1°00.4	1.3 - 0.1	7.3 - 0.5	13.3 - 1.0
14	1°03.5	1°03.7	1°00.6	1.4 - 0.1	7.4 - 0.6	13.4 - 1.0
15	1°03.8	1°03.9	1°00.8	1.5 - 0.1	7.5 - 0.6	13.5 - 1.0
16	1°04.0	1°04.2	1°01.1	1.6 - 0.1	7.6 - 0.6	13.6 - 1.0
17	1°04.2	1°04.4	1°01.3	1.7 - 0.1	7.7 - 0.6	13.7 - 1.0
18	1°04.5	1°04.7	1°01.6	1.8 - 0.1	7.8 - 0.6	13.8 - 1.0
19	1°04.7	1°04.9	1°01.8	1.9 - 0.1	7.9 - 0.6	13.9 - 1.0
20	1°05.0	1°05.2	1°02.0	2.0 - 0.1	8.0 - 0.6	14.0 - 1.1
21	1°05.2	1°05.4	1°02.3	2.1 - 0.2	8.1 - 0.6	14.1 - 1.1
22	1°05.5	1°05.7	1°02.5	2.2 - 0.2	8.2 - 0.6	14.2 - 1.1
23	1°05.8	1°05.9	1°02.8	2.3 - 0.2	8.3 - 0.6	14.3 - 1.1
24	1°06.0	1°06.2	1°03.0	2.4 - 0.2	8.4 - 0.6	14.4 - 1.1
25	1°06.3	1°06.4	1°03.2	2.5 - 0.2	8.5 - 0.6	14.5 - 1.1
26	1°06.5	1°06.7	1°03.5	2.6 - 0.2	8.6 - 0.6	14.6 - 1.1
27	1°06.8	1°06.9	1°03.7	2.7 - 0.2	8.7 - 0.7	14.7 - 1.1
28	1°07.0	1°07.2	1°03.9	2.8 - 0.2	8.8 - 0.7	14.8 - 1.1
29	1°07.3	1°07.4	1°04.2	2.9 - 0.2	8.9 - 0.7	14.9 - 1.1
30	1°07.5	1°07.7	1°04.4	3.0 - 0.2	9.0 - 0.7	15.0 - 1.1
31	1°07.7	1°07.9	1°04.7	3.1 - 0.2	9.1 - 0.7	15.1 - 1.1
32	1°08.0	1°08.2	1°04.9	3.2 - 0.2	9.2 - 0.7	15.2 - 1.1
33	1°08.2	1°08.4	1°05.1	3.3 - 0.2	9.3 - 0.7	15.3 - 1.1
34	1°08.5	1°08.7	1°05.4	3.4 - 0.3	9.4 - 0.7	15.4 - 1.2
35	1°08.7	1°08.9	1°05.6	3.5 - 0.3	9.5 - 0.7	15.5 - 1.2
36	1°09.0	1°09.2	1°05.9	3.6 - 0.3	9.6 - 0.7	15.6 - 1.2
37	1°09.3	1°09.4	1°06.1	3.7 - 0.3	9.7 - 0.7	15.7 - 1.2
38	1°09.5	1°09.7	1°06.3	3.8 - 0.3	9.8 - 0.7	15.8 - 1.2
39	1°09.8	1°09.9	1°06.6	3.9 - 0.3	9.9 - 0.7	15.9 - 1.2
40	1°10.0	1°10.2	1°06.8	4.0 - 0.3	10.0 - 0.8	16.0 - 1.2
41	1°10.3	1°10.4	1°07.0	4.1 - 0.3	10.1 - 0.8	16.1 - 1.2
42	1°10.5	1°10.7	1°07.3	4.2 - 0.3	10.2 - 0.8	16.2 - 1.2
43	1°10.8	1°10.9	1°07.5	4.3 - 0.3	10.3 - 0.8	16.3 - 1.2
44	1°11.0	1°11.2	1°07.8	4.4 - 0.3	10.4 - 0.8	16.4 - 1.2
45	1°11.3	1°11.4	1°08.0	4.5 - 0.3	10.5 - 0.8	16.5 - 1.2
46	1°11.5	1°11.7	1°08.2	4.6 - 0.3	10.6 - 0.8	16.6 - 1.2
47	1°11.7	1°11.9	1°08.5	4.7 - 0.4	10.7 - 0.8	16.7 - 1.3
48	1°12.0	1°12.2	1°08.7	4.8 - 0.4	10.8 - 0.8	16.8 - 1.3
49	1°12.2	1°12.4	1°09.0	4.9 - 0.4	10.9 - 0.8	16.9 - 1.3
50	1°12.5	1°12.7	1°09.2	5.0 - 0.4	11.0 - 0.8	17.0 - 1.3
51	1°12.7	1°12.9	1°09.4	5.1 - 0.4	11.1 - 0.8	17.1 - 1.3
52	1°13.0	1°13.2	1°09.7	5.2 - 0.4	11.2 - 0.8	17.2 - 1.3
53	1°13.2	1°13.5	1°09.9	5.3 - 0.4	11.3 - 0.8	17.3 - 1.3
54	1°13.5	1°13.7	1°10.2	5.4 - 0.4	11.4 - 0.9	17.4 - 1.3
55	1°13.8	1°14.0	1°10.4	5.5 - 0.4	11.5 - 0.9	17.5 - 1.3
56	1°14.0	1°14.2	1°10.6	5.6 - 0.4	11.6 - 0.9	17.6 - 1.3
57	1°14.3	1°14.5	1°10.9	5.7 - 0.4	11.7 - 0.9	17.7 - 1.3
58	1°14.5	1°14.7	1°11.1	5.8 - 0.4	11.8 - 0.9	17.8 - 1.3
59	1°14.8	1°15.0	1°11.3	5.9 - 0.4	11.9 - 0.9	17.9 - 1.3

m 5	Sun Plan.	Aries	Moon	v and d corr		
0	1°15.0	1°15.2	1°11.6	0.0 - 0.0	6.0 - 0.5	12.0 - 1.1
1	1°15.3	1°15.5	1°11.8	0.1 - 0.0	6.1 - 0.6	12.1 - 1.1
2	1°15.5	1°15.7	1°12.1	0.2 - 0.0	6.2 - 0.6	12.2 - 1.1
3	1°15.7	1°16.0	1°12.3	0.3 - 0.0	6.3 - 0.6	12.3 - 1.1
4	1°16.0	1°16.2	1°12.5	0.4 - 0.0	6.4 - 0.6	12.4 - 1.1
5	1°16.2	1°16.5	1°12.8	0.5 - 0.0	6.5 - 0.6	12.5 - 1.1
6	1°16.5	1°16.7	1°13.0	0.6 - 0.1	6.6 - 0.6	12.6 - 1.2
7	1°16.7	1°17.0	1°13.3	0.7 - 0.1	6.7 - 0.6	12.7 - 1.2
8	1°17.0	1°17.2	1°13.5	0.8 - 0.1	6.8 - 0.6	12.8 - 1.2
9	1°17.3	1°17.5	1°13.7	0.9 - 0.1	6.9 - 0.6	12.9 - 1.2
10	1°17.5	1°17.7	1°14.0	1.0 - 0.1	7.0 - 0.6	13.0 - 1.2
11	1°17.8	1°18.0	1°14.2	1.1 - 0.1	7.1 - 0.7	13.1 - 1.2
12	1°18.0	1°18.2	1°14.4	1.2 - 0.1	7.2 - 0.7	13.2 - 1.2
13	1°18.3	1°18.5	1°14.7	1.3 - 0.1	7.3 - 0.7	13.3 - 1.2
14	1°18.5	1°18.7	1°14.9	1.4 - 0.1	7.4 - 0.7	13.4 - 1.2
15	1°18.8	1°19.0	1°15.2	1.5 - 0.1	7.5 - 0.7	13.5 - 1.2
16	1°19.0	1°19.2	1°15.4	1.6 - 0.1	7.6 - 0.7	13.6 - 1.2
17	1°19.3	1°19.5	1°15.6	1.7 - 0.2	7.7 - 0.7	13.7 - 1.3
18	1°19.5	1°19.7	1°15.9	1.8 - 0.2	7.8 - 0.7	13.8 - 1.3
19	1°19.7	1°20.0	1°16.1	1.9 - 0.2	7.9 - 0.7	13.9 - 1.3
20	1°20.0	1°20.2	1°16.4	2.0 - 0.2	8.0 - 0.7	14.0 - 1.3
21	1°20.2	1°20.5	1°16.6	2.1 - 0.2	8.1 - 0.7	14.1 - 1.3
22	1°20.5	1°20.7	1°16.8	2.2 - 0.2	8.2 - 0.8	14.2 - 1.3
23	1°20.8	1°21.0	1°17.1	2.3 - 0.2	8.3 - 0.8	14.3 - 1.3
24	1°21.0	1°21.2	1°17.3	2.4 - 0.2	8.4 - 0.8	14.4 - 1.3
25	1°21.3	1°21.5	1°17.5	2.5 - 0.2	8.5 - 0.8	14.5 - 1.3
26	1°21.5	1°21.7	1°17.8	2.6 - 0.2	8.6 - 0.8	14.6 - 1.3
27	1°21.8	1°22.0	1°18.0	2.7 - 0.2	8.7 - 0.8	14.7 - 1.3
28	1°22.0	1°22.2	1°18.3	2.8 - 0.3	8.8 - 0.8	14.8 - 1.4
29	1°22.3	1°22.5	1°18.5	2.9 - 0.3	8.9 - 0.8	14.9 - 1.4
30	1°22.5	1°22.7	1°18.7	3.0 - 0.3	9.0 - 0.8	15.0 - 1.4
31	1°22.8	1°23.0	1°19.0	3.1 - 0.3	9.1 - 0.8	15.1 - 1.4
32	1°23.0	1°23.2	1°19.2	3.2 - 0.3	9.2 - 0.8	15.2 - 1.4
33	1°23.2	1°23.5	1°19.5	3.3 - 0.3	9.3 - 0.9	15.3 - 1.4
34	1°23.5	1°23.7	1°19.7	3.4 - 0.3	9.4 - 0.9	15.4 - 1.4
35	1°23.7	1°24.0	1°19.9	3.5 - 0.3	9.5 - 0.9	15.5 - 1.4
36	1°24.0	1°24.2	1°20.2	3.6 - 0.3	9.6 - 0.9	15.6 - 1.4
37	1°24.3	1°24.5	1°20.4	3.7 - 0.3	9.7 - 0.9	15.7 - 1.4
38	1°24.5	1°24.7	1°20.7	3.8 - 0.3	9.8 - 0.9	15.8 - 1.4
39	1°24.8	1°25.0	1°20.9	3.9 - 0.4	9.9 - 0.9	15.9 - 1.5
40	1°25.0	1°25.2	1°21.1	4.0 - 0.4	10.0 - 0.9	16.0 - 1.5
41	1°25.3	1°25.5	1°21.4	4.1 - 0.4	10.1 - 0.9	16.1 - 1.5
42	1°25.5	1°25.7	1°21.6	4.2 - 0.4	10.2 - 0.9	16.2 - 1.5
43	1°25.8	1°26.0	1°21.8	4.3 - 0.4	10.3 - 0.9	16.3 - 1.5
44	1°26.0	1°26.2	1°22.1	4.4 - 0.4	10.4 - 1.0	16.4 - 1.5
45	1°26.3	1°26.5	1°22.3	4.5 - 0.4	10.5 - 1.0	16.5 - 1.5
46	1°26.5	1°26.7	1°22.6	4.6 - 0.4	10.6 - 1.0	16.6 - 1.5
47	1°26.8	1°27.0	1°22.8	4.7 - 0.4	10.7 - 1.0	16.7 - 1.5
48	1°27.0	1°27.2	1°23.0	4.8 - 0.4	10.8 - 1.0	16.8 - 1.5
49	1°27.2	1°27.5	1°23.3	4.9 - 0.4	10.9 - 1.0	16.9 - 1.5
50	1°27.5	1°27.7	1°23.5	5.0 - 0.5	11.0 - 1.0	17.0 - 1.6
51	1°27.7	1°28.0	1°23.8	5.1 - 0.5	11.1 - 1.0	17.1 - 1.6
52	1°28.0	1°28.2	1°24.0	5.2 - 0.5	11.2 - 1.0	17.2 - 1.6
53	1°28.2	1°28.5	1°24.2	5.3 - 0.5	11.3 - 1.0	17.3 - 1.6
54	1°28.5	1°28.7	1°24.5	5.4 - 0.5	11.4 - 1.0	17.4 - 1.6
55	1°28.8	1°29.0	1°24.7	5.5 - 0.5	11.5 - 1.1	17.5 - 1.6
56	1°29.0	1°29.2	1°24.9	5.6 - 0.5	11.6 - 1.1	17.6 - 1.6
57	1°29.3	1°29.5	1°25.2	5.7 - 0.5	11.7 - 1.1	17.7 - 1.6
58	1°29.5	1°29.7	1°25.4	5.8 - 0.5	11.8 - 1.1	17.8 - 1.6
59	1°29.8	1°30.0	1°25.7	5.9 - 0.5	11.9 - 1.1	17.9 - 1.6

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
6	Plan.					
0	1°30.0	1°30.2	1°25.9	0.0 - 0.0	6.0 - 0.7	12.0 - 1.3
1	1°30.3	1°30.5	1°26.1	0.1 - 0.0	6.1 - 0.7	12.1 - 1.3
2	1°30.5	1°30.7	1°26.4	0.2 - 0.0	6.2 - 0.7	12.2 - 1.3
3	1°30.7	1°31.0	1°26.6	0.3 - 0.0	6.3 - 0.7	12.3 - 1.3
4	1°31.0	1°31.2	1°26.9	0.4 - 0.0	6.4 - 0.7	12.4 - 1.3
5	1°31.2	1°31.5	1°27.1	0.5 - 0.1	6.5 - 0.7	12.5 - 1.4
6	1°31.5	1°31.8	1°27.3	0.6 - 0.1	6.6 - 0.7	12.6 - 1.4
7	1°31.7	1°32.0	1°27.6	0.7 - 0.1	6.7 - 0.7	12.7 - 1.4
8	1°32.0	1°32.3	1°27.8	0.8 - 0.1	6.8 - 0.7	12.8 - 1.4
9	1°32.3	1°32.5	1°28.0	0.9 - 0.1	6.9 - 0.7	12.9 - 1.4
10	1°32.5	1°32.8	1°28.3	1.0 - 0.1	7.0 - 0.8	13.0 - 1.4
11	1°32.8	1°33.0	1°28.5	1.1 - 0.1	7.1 - 0.8	13.1 - 1.4
12	1°33.0	1°33.3	1°28.8	1.2 - 0.1	7.2 - 0.8	13.2 - 1.4
13	1°33.3	1°33.5	1°29.0	1.3 - 0.1	7.3 - 0.8	13.3 - 1.4
14	1°33.5	1°33.8	1°29.2	1.4 - 0.2	7.4 - 0.8	13.4 - 1.5
15	1°33.8	1°34.0	1°29.5	1.5 - 0.2	7.5 - 0.8	13.5 - 1.5
16	1°34.0	1°34.3	1°29.7	1.6 - 0.2	7.6 - 0.8	13.6 - 1.5
17	1°34.3	1°34.5	1°30.0	1.7 - 0.2	7.7 - 0.8	13.7 - 1.5
18	1°34.5	1°34.8	1°30.2	1.8 - 0.2	7.8 - 0.8	13.8 - 1.5
19	1°34.8	1°35.0	1°30.4	1.9 - 0.2	7.9 - 0.9	13.9 - 1.5
20	1°35.0	1°35.3	1°30.7	2.0 - 0.2	8.0 - 0.9	14.0 - 1.5
21	1°35.2	1°35.5	1°30.9	2.1 - 0.2	8.1 - 0.9	14.1 - 1.5
22	1°35.5	1°35.8	1°31.1	2.2 - 0.2	8.2 - 0.9	14.2 - 1.5
23	1°35.8	1°36.0	1°31.4	2.3 - 0.2	8.3 - 0.9	14.3 - 1.5
24	1°36.0	1°36.3	1°31.6	2.4 - 0.3	8.4 - 0.9	14.4 - 1.6
25	1°36.3	1°36.5	1°31.9	2.5 - 0.3	8.5 - 0.9	14.5 - 1.6
26	1°36.5	1°36.8	1°32.1	2.6 - 0.3	8.6 - 0.9	14.6 - 1.6
27	1°36.8	1°37.0	1°32.3	2.7 - 0.3	8.7 - 0.9	14.7 - 1.6
28	1°37.0	1°37.3	1°32.6	2.8 - 0.3	8.8 - 1.0	14.8 - 1.6
29	1°37.3	1°37.5	1°32.8	2.9 - 0.3	8.9 - 1.0	14.9 - 1.6
30	1°37.5	1°37.8	1°33.1	3.0 - 0.3	9.0 - 1.0	15.0 - 1.6
31	1°37.8	1°38.0	1°33.3	3.1 - 0.3	9.1 - 1.0	15.1 - 1.6
32	1°38.0	1°38.3	1°33.5	3.2 - 0.3	9.2 - 1.0	15.2 - 1.6
33	1°38.3	1°38.5	1°33.8	3.3 - 0.4	9.3 - 1.0	15.3 - 1.7
34	1°38.5	1°38.8	1°34.0	3.4 - 0.4	9.4 - 1.0	15.4 - 1.7
35	1°38.7	1°39.0	1°34.3	3.5 - 0.4	9.5 - 1.0	15.5 - 1.7
36	1°39.0	1°39.3	1°34.5	3.6 - 0.4	9.6 - 1.0	15.6 - 1.7
37	1°39.3	1°39.5	1°34.7	3.7 - 0.4	9.7 - 1.1	15.7 - 1.7
38	1°39.5	1°39.8	1°35.0	3.8 - 0.4	9.8 - 1.1	15.8 - 1.7
39	1°39.8	1°40.0	1°35.2	3.9 - 0.4	9.9 - 1.1	15.9 - 1.7
40	1°40.0	1°40.3	1°35.4	4.0 - 0.4	10.0 - 1.1	16.0 - 1.7
41	1°40.3	1°40.5	1°35.7	4.1 - 0.4	10.1 - 1.1	16.1 - 1.7
42	1°40.5	1°40.8	1°35.9	4.2 - 0.5	10.2 - 1.1	16.2 - 1.8
43	1°40.8	1°41.0	1°36.2	4.3 - 0.5	10.3 - 1.1	16.3 - 1.8
44	1°41.0	1°41.3	1°36.4	4.4 - 0.5	10.4 - 1.1	16.4 - 1.8
45	1°41.3	1°41.5	1°36.6	4.5 - 0.5	10.5 - 1.1	16.5 - 1.8
46	1°41.5	1°41.8	1°36.9	4.6 - 0.5	10.6 - 1.1	16.6 - 1.8
47	1°41.8	1°42.0	1°37.1	4.7 - 0.5	10.7 - 1.2	16.7 - 1.8
48	1°42.0	1°42.3	1°37.4	4.8 - 0.5	10.8 - 1.2	16.8 - 1.8
49	1°42.3	1°42.5	1°37.6	4.9 - 0.5	10.9 - 1.2	16.9 - 1.8
50	1°42.5	1°42.8	1°37.8	5.0 - 0.5	11.0 - 1.2	17.0 - 1.8
51	1°42.7	1°43.0	1°38.1	5.1 - 0.6	11.1 - 1.2	17.1 - 1.9
52	1°43.0	1°43.3	1°38.3	5.2 - 0.6	11.2 - 1.2	17.2 - 1.9
53	1°43.2	1°43.5	1°38.5	5.3 - 0.6	11.3 - 1.2	17.3 - 1.9
54	1°43.5	1°43.8	1°38.8	5.4 - 0.6	11.4 - 1.2	17.4 - 1.9
55	1°43.8	1°44.0	1°39.0	5.5 - 0.6	11.5 - 1.2	17.5 - 1.9
56	1°44.0	1°44.3	1°39.3	5.6 - 0.6	11.6 - 1.3	17.6 - 1.9
57	1°44.3	1°44.5	1°39.5	5.7 - 0.6	11.7 - 1.3	17.7 - 1.9
58	1°44.5	1°44.8	1°39.7	5.8 - 0.6	11.8 - 1.3	17.8 - 1.9
59	1°44.8	1°45.0	1°40.0	5.9 - 0.6	11.9 - 1.3	17.9 - 1.9

m	Sun	Aries	Moon	v and d corr		
7	Plan.					
0	1°45.0	1°45.3	1°40.2	0.0 - 0.0	6.0 - 0.8	12.0 - 1.5
1	1°45.3	1°45.5	1°40.5	0.1 - 0.0	6.1 - 0.8	12.1 - 1.5
2	1°45.5	1°45.8	1°40.7	0.2 - 0.0	6.2 - 0.8	12.2 - 1.5
3	1°45.8	1°46.0	1°40.9	0.3 - 0.0	6.3 - 0.8	12.3 - 1.5
4	1°46.0	1°46.3	1°41.2	0.4 - 0.1	6.4 - 0.8	12.4 - 1.6
5	1°46.2	1°46.5	1°41.4	0.5 - 0.1	6.5 - 0.8	12.5 - 1.6
6	1°46.5	1°46.8	1°41.6	0.6 - 0.1	6.6 - 0.8	12.6 - 1.6
7	1°46.7	1°47.0	1°41.9	0.7 - 0.1	6.7 - 0.8	12.7 - 1.6
8	1°47.0	1°47.3	1°42.1	0.8 - 0.1	6.8 - 0.8	12.8 - 1.6
9	1°47.3	1°47.5	1°42.4	0.9 - 0.1	6.9 - 0.9	12.9 - 1.6
10	1°47.5	1°47.8	1°42.6	1.0 - 0.1	7.0 - 0.9	13.0 - 1.6
11	1°47.8	1°48.0	1°42.8	1.1 - 0.1	7.1 - 0.9	13.1 - 1.6
12	1°48.0	1°48.3	1°43.1	1.2 - 0.2	7.2 - 0.9	13.2 - 1.6
13	1°48.3	1°48.5	1°43.3	1.3 - 0.2	7.3 - 0.9	13.3 - 1.7
14	1°48.5	1°48.8	1°43.6	1.4 - 0.2	7.4 - 0.9	13.4 - 1.7
15	1°48.8	1°49.0	1°43.8	1.5 - 0.2	7.5 - 0.9	13.5 - 1.7
16	1°49.0	1°49.3	1°44.0	1.6 - 0.2	7.6 - 0.9	13.6 - 1.7
17	1°49.3	1°49.5	1°44.3	1.7 - 0.2	7.7 - 1.0	13.7 - 1.7
18	1°49.5	1°49.8	1°44.5	1.8 - 0.2	7.8 - 1.0	13.8 - 1.7
19	1°49.8	1°50.0	1°44.8	1.9 - 0.2	7.9 - 1.0	13.9 - 1.7
20	1°50.0	1°50.3	1°45.0	2.0 - 0.3	8.0 - 1.0	14.0 - 1.8
21	1°50.2	1°50.6	1°45.2	2.1 - 0.3	8.1 - 1.0	14.1 - 1.8
22	1°50.5	1°50.8	1°45.5	2.2 - 0.3	8.2 - 1.0	14.2 - 1.8
23	1°50.8	1°51.1	1°45.7	2.3 - 0.3	8.3 - 1.0	14.3 - 1.8
24	1°51.0	1°51.3	1°45.9	2.4 - 0.3	8.4 - 1.1	14.4 - 1.8
25	1°51.3	1°51.6	1°46.2	2.5 - 0.3	8.5 - 1.1	14.5 - 1.8
26	1°51.5	1°51.8	1°46.4	2.6 - 0.3	8.6 - 1.1	14.6 - 1.8
27	1°51.8	1°52.1	1°46.7	2.7 - 0.3	8.7 - 1.1	14.7 - 1.8
28	1°52.0	1°52.3	1°46.9	2.8 - 0.4	8.8 - 1.1	14.8 - 1.9
29	1°52.3	1°52.6	1°47.1	2.9 - 0.4	8.9 - 1.1	14.9 - 1.9
30	1°52.5	1°52.8	1°47.4	3.0 - 0.4	9.0 - 1.1	15.0 - 1.9
31	1°52.7	1°53.1	1°47.6	3.1 - 0.4	9.1 - 1.1	15.1 - 1.9
32	1°53.0	1°53.3	1°47.9	3.2 - 0.4	9.2 - 1.1	15.2 - 1.9
33	1°53.3	1°53.6	1°48.1	3.3 - 0.4	9.3 - 1.2	15.3 - 1.9
34	1°53.5	1°53.8	1°48.3	3.4 - 0.4	9.4 - 1.2	15.4 - 1.9
35	1°53.7	1°54.1	1°48.6	3.5 - 0.4	9.5 - 1.2	15.5 - 1.9
36	1°54.0	1°54.3	1°48.8	3.6 - 0.5	9.6 - 1.2	15.6 - 1.9
37	1°54.2	1°54.6	1°49.0	3.7 - 0.5	9.7 - 1.2	15.7 - 2.0
38	1°54.5	1°54.8	1°49.3	3.8 - 0.5	9.8 - 1.2	15.8 - 2.0
39	1°54.8	1°55.1	1°49.5	3.9 - 0.5	9.9 - 1.2	15.9 - 2.0
40	1°55.0	1°55.3	1°49.8	4.0 - 0.5	10.0 - 1.3	16.0 - 2.0
41	1°55.3	1°55.6	1°50.0	4.1 - 0.5	10.1 - 1.3	16.1 - 2.0
42	1°55.5	1°55.8	1°50.2	4.2 - 0.5	10.2 - 1.3	16.2 - 2.0
43	1°55.8	1°56.1	1°50.5	4.3 - 0.5	10.3 - 1.3	16.3 - 2.0
44	1°56.0	1°56.3	1°50.7	4.4 - 0.6	10.4 - 1.3	16.4 - 2.0
45	1°56.3	1°56.6	1°51.0	4.5 - 0.6	10.5 - 1.3	16.5 - 2.1
46	1°56.5	1°56.8	1°51.2	4.6 - 0.6	10.6 - 1.3	16.6 - 2.1
47	1°56.7	1°57.1	1°51.4	4.7 - 0.6	10.7 - 1.3	16.7 - 2.1
48	1°57.0	1°57.3	1°51.7	4.8 - 0.6	10.8 - 1.4	16.8 - 2.1
49	1°57.3	1°57.6	1°51.9	4.9 - 0.6	10.9 - 1.4	16.9 - 2.1
50	1°57.5	1°57.8	1°52.1	5.0 - 0.6	11.0 - 1.4	17.0 - 2.1
51	1°57.7	1°58.1	1°52.4	5.1 - 0.6	11.1 - 1.4	17.1 - 2.1
52	1°58.0	1°58.3	1°52.6	5.2 - 0.7	11.2 - 1.4	17.2 - 2.1
53	1°58.2	1°58.6	1°52.9	5.3 - 0.7	11.3 - 1.4	17.3 - 2.2
54	1°58.5	1°58.8	1°53.1	5.4 - 0.7	11.4 - 1.4	17.4 - 2.2
55	1°58.8	1°59.1	1°53.3	5.5 - 0.7	11.5 - 1.4	17.5 - 2.2
56	1°59.0	1°59.3	1°53.6	5.6 - 0.7	11.6 - 1.5	17.6 - 2.2
57	1°59.3	1°59.6	1°53.8	5.7 - 0.7	11.7 - 1.5	17.7 - 2.2
58	1°59.5	1°59.8	1°54.1	5.8 - 0.7	11.8 - 1.5	17.8 - 2.2
59	1°59.8	2°00.1	1°54.3	5.9 - 0.7	11.9 - 1.5	17.9 - 2.2

m	Sun	Aries	Moon	v and d corr		
8	Plan.					
0	2°00.0	2°00.3	1°54.5	0.0 - 0.0	6.0 - 0.8	12.0 - 1.7
1	2°00.3	2°00.6	1°54.8	0.1 - 0.0	6.1 - 0.9	12.1 - 1.7
2	2°00.5	2°00.8	1°55.0	0.2 - 0.0	6.2 - 0.9	12.2 - 1.7
3	2°00.8	2°01.1	1°55.2	0.3 - 0.0	6.3 - 0.9	12.3 - 1.7
4	2°01.0	2°01.3	1°55.5	0.4 - 0.1	6.4 - 0.9	12.4 - 1.8
5	2°01.3	2°01.6	1°55.7	0.5 - 0.1	6.5 - 0.9	12.5 - 1.8
6	2°01.5	2°01.8	1°56.0	0.6 - 0.1	6.6 - 0.9	12.6 - 1.8
7	2°01.8	2°02.1	1°56.2	0.7 - 0.1	6.7 - 0.9	12.7 - 1.8
8	2°02.0	2°02.3	1°56.4	0.8 - 0.1	6.8 - 1.0	12.8 - 1.8
9	2°02.3	2°02.6	1°56.7	0.9 - 0.1	6.9 - 1.0	12.9 - 1.8
10	2°02.5	2°02.8	1°56.9	1.0 - 0.1	7.0 - 1.0	13.0 - 1.8
11	2°02.8	2°03.1	1°57.2	1.1 - 0.2	7.1 - 1.0	13.1 - 1.9
12	2°03.0	2°03.3	1°57.4	1.2 - 0.2	7.2 - 1.0	13.2 - 1.9
13	2°03.3	2°03.6	1°57.6	1.3 - 0.2	7.3 - 1.0	13.3 - 1.9
14	2°03.5	2°03.8	1°57.9	1.4 - 0.2	7.4 - 1.0	13.4 - 1.9
15	2°03.8	2°04.1	1°58.1	1.5 - 0.2	7.5 - 1.1	13.5 - 1.9
16	2°04.0	2°04.3	1°58.4	1.6 - 0.2	7.6 - 1.1	13.6 - 1.9
17	2°04.2	2°04.6	1°58.6	1.7 - 0.2	7.7 - 1.1	13.7 - 1.9
18	2°04.5	2°04.8	1°58.8	1.8 - 0.3	7.8 - 1.1	13.8 - 2.0
19	2°04.7	2°05.1	1°59.1	1.9 - 0.3	7.9 - 1.1	13.9 - 2.0
20	2°05.0	2°05.3	1°59.3	2.0 - 0.3	8.0 - 1.1	14.0 - 2.0
21	2°05.2	2°05.6	1°59.5	2.1 - 0.3	8.1 - 1.1	14.1 - 2.0
22	2°05.5	2°05.8	1°59.8	2.2 - 0.3	8.2 - 1.2	14.2 - 2.0
23	2°05.7	2°06.1	2°00.0	2.3 - 0.3	8.3 - 1.2	14.3 - 2.0
24	2°06.0	2°06.3	2°00.3	2.4 - 0.3	8.4 - 1.2	14.4 - 2.0
25	2°06.2	2°06.6	2°00.5	2.5 - 0.4	8.5 - 1.2	14.5 - 2.1
26	2°06.5	2°06.8	2°00.7	2.6 - 0.4	8.6 - 1.2	14.6 - 2.1
27	2°06.7	2°07.1	2°01.0	2.7 - 0.4	8.7 - 1.2	14.7 - 2.1
28	2°07.0	2°07.3	2°01.2	2.8 - 0.4	8.8 - 1.2	14.8 - 2.1
29	2°07.2	2°07.6	2°01.5	2.9 - 0.4	8.9 - 1.3	14.9 - 2.1
30	2°07.5	2°07.8	2°01.7	3.0 - 0.4	9.0 - 1.3	15.0 - 2.1
31	2°07.8	2°08.1	2°01.9	3.1 - 0.4	9.1 - 1.3	15.1 - 2.1
32	2°08.0	2°08.3	2°02.2	3.2 - 0.5	9.2 - 1.3	15.2 - 2.2
33	2°08.3	2°08.6	2°02.4	3.3 - 0.5	9.3 - 1.3	15.3 - 2.2
34	2°08.5	2°08.9	2°02.6	3.4 - 0.5	9.4 - 1.3	15.4 - 2.2
35	2°08.8	2°09.1	2°02.9	3.5 - 0.5	9.5 - 1.3	15.5 - 2.2
36	2°09.0	2°09.4	2°03.1	3.6 - 0.5	9.6 - 1.4	15.6 - 2.2
37	2°09.3	2°09.6	2°03.4	3.7 - 0.5	9.7 - 1.4	15.7 - 2.2
38	2°09.5	2°09.9	2°03.6	3.8 - 0.5	9.8 - 1.4	15.8 - 2.2
39	2°09.8	2°10.1	2°03.8	3.9 - 0.6	9.9 - 1.4	15.9 - 2.3
40	2°10.0	2°10.4	2°04.1	4.0 - 0.6	10.0 - 1.4	16.0 - 2.3
41	2°10.3	2°10.6	2°04.3	4.1 - 0.6	10.1 - 1.4	16.1 - 2.3
42	2°10.5	2°10.9	2°04.6	4.2 - 0.6	10.2 - 1.4	16.2 - 2.3
43	2°10.8	2°11.1	2°04.8	4.3 - 0.6	10.3 - 1.5	16.3 - 2.3
44	2°11.0	2°11.4	2°05.0	4.4 - 0.6	10.4 - 1.5	16.4 - 2.3
45	2°11.3	2°11.6	2°05.3	4.5 - 0.6	10.5 - 1.5	16.5 - 2.3
46	2°11.5	2°11.9	2°05.5	4.6 - 0.7	10.6 - 1.5	16.6 - 2.4
47	2°11.7	2°12.1	2°05.7	4.7 - 0.7	10.7 - 1.5	16.7 - 2.4
48	2°12.0	2°12.4	2°06.0	4.8 - 0.7	10.8 - 1.5	16.8 - 2.4
49	2°12.2	2°12.6	2°06.2	4.9 - 0.7	10.9 - 1.5	16.9 - 2.4
50	2°12.5	2°12.9	2°06.5	5.0 - 0.7	11.0 - 1.6	17.0 - 2.4
51	2°12.7	2°13.1	2°06.7	5.1 - 0.7	11.1 - 1.6	17.1 - 2.4
52	2°13.0	2°13.4	2°06.9	5.2 - 0.7	11.2 - 1.6	17.2 - 2.4
53	2°13.2	2°13.6	2°07.2	5.3 - 0.8	11.3 - 1.6	17.3 - 2.5
54	2°13.5	2°13.9	2°07.4	5.4 - 0.8	11.4 - 1.6	17.4 - 2.5
55	2°13.7	2°14.1	2°07.7	5.5 - 0.8	11.5 - 1.6	17.5 - 2.5
56	2°14.0	2°14.4	2°07.9	5.6 - 0.8	11.6 - 1.6	17.6 - 2.5
57	2°14.2	2°14.6	2°08.1	5.7 - 0.8	11.7 - 1.7	17.7 - 2.5
58	2°14.5	2°14.9	2°08.4	5.8 - 0.8	11.8 - 1.7	17.8 - 2.5
59	2°14.7	2°15.1	2°08.6	5.9 - 0.8	11.9 - 1.7	17.9 - 2.5

Increments and Corrections

m 9	Sun Plan.	Aries	Moon	v and d corr		
0	2°15.0	2°15.4	2°08.8	0.0 - 0.0	6.0 - 0.9	12.0 - 1.9
1	2°15.3	2°15.6	2°09.1	0.1 - 0.0	6.1 - 1.0	12.1 - 1.9
2	2°15.5	2°15.9	2°09.3	0.2 - 0.0	6.2 - 1.0	12.2 - 1.9
3	2°15.8	2°16.1	2°09.6	0.3 - 0.0	6.3 - 1.0	12.3 - 1.9
4	2°16.0	2°16.4	2°09.8	0.4 - 0.1	6.4 - 1.0	12.4 - 2.0
5	2°16.3	2°16.6	2°10.0	0.5 - 0.1	6.5 - 1.0	12.5 - 2.0
6	2°16.5	2°16.9	2°10.3	0.6 - 0.1	6.6 - 1.0	12.6 - 2.0
7	2°16.8	2°17.1	2°10.5	0.7 - 0.1	6.7 - 1.1	12.7 - 2.0
8	2°17.0	2°17.4	2°10.8	0.8 - 0.1	6.8 - 1.1	12.8 - 2.0
9	2°17.3	2°17.6	2°11.0	0.9 - 0.1	6.9 - 1.1	12.9 - 2.0
10	2°17.5	2°17.9	2°11.2	1.0 - 0.2	7.0 - 1.1	13.0 - 2.1
11	2°17.8	2°18.1	2°11.5	1.1 - 0.2	7.1 - 1.1	13.1 - 2.1
12	2°18.0	2°18.4	2°11.7	1.2 - 0.2	7.2 - 1.1	13.2 - 2.1
13	2°18.3	2°18.6	2°12.0	1.3 - 0.2	7.3 - 1.2	13.3 - 2.1
14	2°18.5	2°18.9	2°12.2	1.4 - 0.2	7.4 - 1.2	13.4 - 2.1
15	2°18.8	2°19.1	2°12.4	1.5 - 0.2	7.5 - 1.2	13.5 - 2.1
16	2°19.0	2°19.4	2°12.7	1.6 - 0.3	7.6 - 1.2	13.6 - 2.2
17	2°19.3	2°19.6	2°12.9	1.7 - 0.3	7.7 - 1.2	13.7 - 2.2
18	2°19.5	2°19.9	2°13.1	1.8 - 0.3	7.8 - 1.2	13.8 - 2.2
19	2°19.7	2°20.1	2°13.4	1.9 - 0.3	7.9 - 1.3	13.9 - 2.2
20	2°20.0	2°20.4	2°13.6	2.0 - 0.3	8.0 - 1.3	14.0 - 2.2
21	2°20.2	2°20.6	2°13.9	2.1 - 0.3	8.1 - 1.3	14.1 - 2.2
22	2°20.5	2°20.9	2°14.1	2.2 - 0.3	8.2 - 1.3	14.2 - 2.2
23	2°20.7	2°21.1	2°14.3	2.3 - 0.4	8.3 - 1.3	14.3 - 2.3
24	2°21.0	2°21.4	2°14.6	2.4 - 0.4	8.4 - 1.3	14.4 - 2.3
25	2°21.2	2°21.6	2°14.8	2.5 - 0.4	8.5 - 1.3	14.5 - 2.3
26	2°21.5	2°21.9	2°15.1	2.6 - 0.4	8.6 - 1.4	14.6 - 2.3
27	2°21.7	2°22.1	2°15.3	2.7 - 0.4	8.7 - 1.4	14.7 - 2.3
28	2°22.0	2°22.4	2°15.5	2.8 - 0.4	8.8 - 1.4	14.8 - 2.3
29	2°22.2	2°22.6	2°15.8	2.9 - 0.5	8.9 - 1.4	14.9 - 2.4
30	2°22.5	2°22.9	2°16.0	3.0 - 0.5	9.0 - 1.4	15.0 - 2.4
31	2°22.8	2°23.1	2°16.2	3.1 - 0.5	9.1 - 1.4	15.1 - 2.4
32	2°23.0	2°23.4	2°16.5	3.2 - 0.5	9.2 - 1.5	15.2 - 2.4
33	2°23.3	2°23.6	2°16.7	3.3 - 0.5	9.3 - 1.5	15.3 - 2.4
34	2°23.5	2°23.9	2°17.0	3.4 - 0.5	9.4 - 1.5	15.4 - 2.4
35	2°23.8	2°24.1	2°17.2	3.5 - 0.6	9.5 - 1.5	15.5 - 2.5
36	2°24.0	2°24.4	2°17.4	3.6 - 0.6	9.6 - 1.5	15.6 - 2.5
37	2°24.3	2°24.6	2°17.7	3.7 - 0.6	9.7 - 1.5	15.7 - 2.5
38	2°24.5	2°24.9	2°17.9	3.8 - 0.6	9.8 - 1.6	15.8 - 2.5
39	2°24.8	2°25.1	2°18.2	3.9 - 0.6	9.9 - 1.6	15.9 - 2.5
40	2°25.0	2°25.4	2°18.4	4.0 - 0.6	10.0 - 1.6	16.0 - 2.5
41	2°25.3	2°25.6	2°18.6	4.1 - 0.6	10.1 - 1.6	16.1 - 2.5
42	2°25.5	2°25.9	2°18.9	4.2 - 0.7	10.2 - 1.6	16.2 - 2.6
43	2°25.8	2°26.1	2°19.1	4.3 - 0.7	10.3 - 1.6	16.3 - 2.6
44	2°26.0	2°26.4	2°19.3	4.4 - 0.7	10.4 - 1.6	16.4 - 2.6
45	2°26.3	2°26.6	2°19.6	4.5 - 0.7	10.5 - 1.7	16.5 - 2.6
46	2°26.5	2°26.9	2°19.8	4.6 - 0.7	10.6 - 1.7	16.6 - 2.6
47	2°26.8	2°27.2	2°20.1	4.7 - 0.7	10.7 - 1.7	16.7 - 2.6
48	2°27.0	2°27.4	2°20.3	4.8 - 0.8	10.8 - 1.7	16.8 - 2.7
49	2°27.2	2°27.7	2°20.5	4.9 - 0.8	10.9 - 1.7	16.9 - 2.7
50	2°27.5	2°27.9	2°20.8	5.0 - 0.8	11.0 - 1.7	17.0 - 2.7
51	2°27.7	2°28.2	2°21.0	5.1 - 0.8	11.1 - 1.8	17.1 - 2.7
52	2°28.0	2°28.4	2°21.3	5.2 - 0.8	11.2 - 1.8	17.2 - 2.7
53	2°28.2	2°28.7	2°21.5	5.3 - 0.8	11.3 - 1.8	17.3 - 2.7
54	2°28.5	2°28.9	2°21.7	5.4 - 0.9	11.4 - 1.8	17.4 - 2.8
55	2°28.7	2°29.2	2°22.0	5.5 - 0.9	11.5 - 1.8	17.5 - 2.8
56	2°29.0	2°29.4	2°22.2	5.6 - 0.9	11.6 - 1.8	17.6 - 2.8
57	2°29.2	2°29.7	2°22.5	5.7 - 0.9	11.7 - 1.9	17.7 - 2.8
58	2°29.5	2°29.9	2°22.7	5.8 - 0.9	11.8 - 1.9	17.8 - 2.8
59	2°29.7	2°30.2	2°22.9	5.9 - 0.9	11.9 - 1.9	17.9 - 2.8

m 10	Sun Plan.	Aries	Moon	v and d corr		
0	2°30.0	2°30.4	2°23.2	0.0 - 0.0	6.0 - 1.0	12.0 - 2.1
1	2°30.3	2°30.7	2°23.4	0.1 - 0.0	6.1 - 1.1	12.1 - 2.1
2	2°30.5	2°30.9	2°23.6	0.2 - 0.0	6.2 - 1.1	12.2 - 2.1
3	2°30.8	2°31.2	2°23.9	0.3 - 0.1	6.3 - 1.1	12.3 - 2.2
4	2°31.0	2°31.4	2°24.1	0.4 - 0.1	6.4 - 1.1	12.4 - 2.2
5	2°31.3	2°31.7	2°24.4	0.5 - 0.1	6.5 - 1.1	12.5 - 2.2
6	2°31.5	2°31.9	2°24.6	0.6 - 0.1	6.6 - 1.2	12.6 - 2.2
7	2°31.8	2°32.2	2°24.8	0.7 - 0.1	6.7 - 1.2	12.7 - 2.2
8	2°32.0	2°32.4	2°25.1	0.8 - 0.1	6.8 - 1.2	12.8 - 2.2
9	2°32.3	2°32.7	2°25.3	0.9 - 0.2	6.9 - 1.2	12.9 - 2.3
10	2°32.5	2°32.9	2°25.6	1.0 - 0.2	7.0 - 1.2	13.0 - 2.3
11	2°32.8	2°33.2	2°25.8	1.1 - 0.2	7.1 - 1.2	13.1 - 2.3
12	2°33.0	2°33.4	2°26.0	1.2 - 0.2	7.2 - 1.3	13.2 - 2.3
13	2°33.3	2°33.7	2°26.3	1.3 - 0.2	7.3 - 1.3	13.3 - 2.3
14	2°33.5	2°33.9	2°26.5	1.4 - 0.2	7.4 - 1.3	13.4 - 2.3
15	2°33.8	2°34.2	2°26.7	1.5 - 0.3	7.5 - 1.3	13.5 - 2.4
16	2°34.0	2°34.4	2°27.0	1.6 - 0.3	7.6 - 1.3	13.6 - 2.4
17	2°34.3	2°34.7	2°27.2	1.7 - 0.3	7.7 - 1.3	13.7 - 2.4
18	2°34.5	2°34.9	2°27.5	1.8 - 0.3	7.8 - 1.4	13.8 - 2.4
19	2°34.8	2°35.2	2°27.7	1.9 - 0.3	7.9 - 1.4	13.9 - 2.4
20	2°35.0	2°35.4	2°27.9	2.0 - 0.3	8.0 - 1.4	14.0 - 2.4
21	2°35.2	2°35.7	2°28.2	2.1 - 0.4	8.1 - 1.4	14.1 - 2.5
22	2°35.5	2°35.9	2°28.4	2.2 - 0.4	8.2 - 1.4	14.2 - 2.5
23	2°35.7	2°36.2	2°28.7	2.3 - 0.4	8.3 - 1.5	14.3 - 2.5
24	2°36.0	2°36.4	2°28.9	2.4 - 0.4	8.4 - 1.5	14.4 - 2.5
25	2°36.2	2°36.7	2°29.1	2.5 - 0.4	8.5 - 1.5	14.5 - 2.5
26	2°36.5	2°36.9	2°29.4	2.6 - 0.5	8.6 - 1.5	14.6 - 2.6
27	2°36.7	2°37.2	2°29.6	2.7 - 0.5	8.7 - 1.5	14.7 - 2.6
28	2°37.0	2°37.4	2°29.8	2.8 - 0.5	8.8 - 1.5	14.8 - 2.6
29	2°37.2	2°37.7	2°30.1	2.9 - 0.5	8.9 - 1.6	14.9 - 2.6
30	2°37.5	2°37.9	2°30.3	3.0 - 0.5	9.0 - 1.6	15.0 - 2.6
31	2°37.8	2°38.2	2°30.6	3.1 - 0.5	9.1 - 1.6	15.1 - 2.6
32	2°38.0	2°38.4	2°30.8	3.2 - 0.6	9.2 - 1.6	15.2 - 2.7
33	2°38.3	2°38.7	2°31.0	3.3 - 0.6	9.3 - 1.6	15.3 - 2.7
34	2°38.5	2°38.9	2°31.3	3.4 - 0.6	9.4 - 1.6	15.4 - 2.7
35	2°38.8	2°39.2	2°31.5	3.5 - 0.6	9.5 - 1.7	15.5 - 2.7
36	2°39.0	2°39.4	2°31.8	3.6 - 0.6	9.6 - 1.7	15.6 - 2.7
37	2°39.3	2°39.7	2°32.0	3.7 - 0.6	9.7 - 1.7	15.7 - 2.7
38	2°39.5	2°39.9	2°32.2	3.8 - 0.7	9.8 - 1.7	15.8 - 2.8
39	2°39.8	2°40.2	2°32.5	3.9 - 0.7	9.9 - 1.7	15.9 - 2.8
40	2°40.0	2°40.4	2°32.7	4.0 - 0.7	10.0 - 1.8	16.0 - 2.8
41	2°40.3	2°40.7	2°32.9	4.1 - 0.7	10.1 - 1.8	16.1 - 2.8
42	2°40.5	2°40.9	2°33.2	4.2 - 0.7	10.2 - 1.8	16.2 - 2.8
43	2°40.8	2°41.2	2°33.4	4.3 - 0.8	10.3 - 1.8	16.3 - 2.9
44	2°41.0	2°41.4	2°33.7	4.4 - 0.8	10.4 - 1.8	16.4 - 2.9
45	2°41.3	2°41.7	2°33.9	4.5 - 0.8	10.5 - 1.8	16.5 - 2.9
46	2°41.5	2°41.9	2°34.1	4.6 - 0.8	10.6 - 1.9	16.6 - 2.9
47	2°41.8	2°42.2	2°34.4	4.7 - 0.8	10.7 - 1.9	16.7 - 2.9
48	2°42.0	2°42.4	2°34.6	4.8 - 0.8	10.8 - 1.9	16.8 - 2.9
49	2°42.3	2°42.7	2°34.9	4.9 - 0.9	10.9 - 1.9	16.9 - 3.0
50	2°42.5	2°42.9	2°35.1	5.0 - 0.9	11.0 - 1.9	17.0 - 3.0
51	2°42.7	2°43.2	2°35.3	5.1 - 0.9	11.1 - 1.9	17.1 - 3.0
52	2°43.0	2°43.4	2°35.6	5.2 - 0.9	11.2 - 2.0	17.2 - 3.0
53	2°43.2	2°43.7	2°35.8	5.3 - 0.9	11.3 - 2.0	17.3 - 3.0
54	2°43.5	2°43.9	2°36.1	5.4 - 0.9	11.4 - 2.0	17.4 - 3.0
55	2°43.7	2°44.2	2°36.3	5.5 - 1.0	11.5 - 2.0	17.5 - 3.1
56	2°44.0	2°44.4	2°36.5	5.6 - 1.0	11.6 - 2.0	17.6 - 3.1
57	2°44.2	2°44.7	2°36.8	5.7 - 1.0	11.7 - 2.0	17.7 - 3.1
58	2°44.5	2°44.9	2°37.0	5.8 - 1.0	11.8 - 2.1	17.8 - 3.1
59	2°44.7	2°45.2	2°37.2	5.9 - 1.0	11.9 - 2.1	17.9 - 3.1

m 11	Sun Plan.	Aries	Moon	v and d corr		
0	2°45.0	2°45.5	2°37.5	0.0 - 0.0	6.0 - 1.2	12.0 - 2.3
1	2°45.3	2°45.7	2°37.7	0.1 - 0.0	6.1 - 1.2	12.1 - 2.3
2	2°45.5	2°46.0	2°38.0	0.2 - 0.0	6.2 - 1.2	12.2 - 2.3
3	2°45.8	2°46.2	2°38.2	0.3 - 0.1	6.3 - 1.2	12.3 - 2.4
4	2°46.0	2°46.5	2°38.4	0.4 - 0.1	6.4 - 1.2	12.4 - 2.4
5	2°46.3	2°46.7	2°38.7	0.5 - 0.1	6.5 - 1.2	12.5 - 2.4
6	2°46.5	2°47.0	2°38.9	0.6 - 0.1	6.6 - 1.3	12.6 - 2.4
7	2°46.8	2°47.2	2°39.2	0.7 - 0.1	6.7 - 1.3	12.7 - 2.4
8	2°47.0	2°47.5	2°39.4	0.8 - 0.2	6.8 - 1.3	12.8 - 2.5
9	2°47.3	2°47.7	2°39.6	0.9 - 0.2	6.9 - 1.3	12.9 - 2.5
10	2°47.5	2°48.0	2°39.9	1.0 - 0.2	7.0 - 1.3	13.0 - 2.5
11	2°47.8	2°48.2	2°40.1	1.1 - 0.2	7.1 - 1.4	13.1 - 2.5
12	2°48.0	2°48.5	2°40.3	1.2 - 0.2	7.2 - 1.4	13.2 - 2.5
13	2°48.3	2°48.7	2°40.6	1.3 - 0.2	7.3 - 1.4	13.3 - 2.5
14	2°48.5	2°49.0	2°40.8	1.4 - 0.3	7.4 - 1.4	13.4 - 2.6
15	2°48.8	2°49.2	2°41.1	1.5 - 0.3	7.5 - 1.4	13.5 - 2.6
16	2°49.0	2°49.5	2°41.3	1.6 - 0.3	7.6 - 1.5	13.6 - 2.6
17	2°49.3	2°49.7	2°41.5	1.7 - 0.3	7.7 - 1.5	13.7 - 2.6
18	2°49.5	2°50.0	2°41.8	1.8 - 0.3	7.8 - 1.5	13.8 - 2.6
19	2°49.8	2°50.2	2°42.0	1.9 - 0.4	7.9 - 1.5	13.9 - 2.7
20	2°50.0	2°50.5	2°42.3	2.0 - 0.4	8.0 - 1.5	14.0 - 2.7
21	2°50.2	2°50.7	2°42.5	2.1 - 0.4	8.1 - 1.6	14.1 - 2.7
22	2°50.5	2°51.0	2°42.7	2.2 - 0.4	8.2 - 1.6	14.2 - 2.7
23	2°50.7	2°51.2	2°43.0	2.3 - 0.4	8.3 - 1.6	14.3 - 2.7
24	2°51.0	2°51.5	2°43.2	2.4 - 0.5	8.4 - 1.6	14.4 - 2.8
25	2°51.2	2°51.7	2°43.4	2.5 - 0.5	8.5 - 1.6	14.5 - 2.8
26	2°51.5	2°52.0	2°43.7	2.6 - 0.5	8.6 - 1.6	14.6 - 2.8
27	2°51.7	2°52.2	2°43.9	2.7 - 0.5	8.7 - 1.7	14.7 - 2.8
28	2°52.0	2°52.5	2°44.2	2.8 - 0.5	8.8 - 1.7	14.8 - 2.8
29	2°52.2	2°52.7	2°44.4	2.9 - 0.6	8.9 - 1.7	14.9 - 2.9
30	2°52.5	2°53.0	2°44.6	3.0 - 0.6	9.0 - 1.7	15.0 - 2.9
31	2°52.8	2°53.2	2°44.9	3.1 - 0.6	9.1 - 1.7	15.1 - 2.9
32	2°53.0	2°53.5	2°45.1	3.2 - 0.6	9.2 - 1.8	15.2 - 2.9
33	2°53.3	2°53.7	2°45.4	3.3 - 0.6	9.3 - 1.8	15.3 - 2.9
34	2°53.5	2°54.0	2°45.6	3.4 - 0.7	9.4 - 1.8	15.4 - 3.0
35	2°53.8	2°54.2	2°45.8	3.5 - 0.7	9.5 - 1.8	15.5 - 3.0
36	2°54.0	2°54.5	2°46.1	3.6 - 0.7	9.6 - 1.8	15.6 - 3.0
37	2°54.3	2°54.7	2°46.3	3.7 - 0.7	9.7 - 1.9	15.7 - 3.0
38	2°54.5	2°55.0	2°46.6	3.8 - 0.7	9.8 - 1.9	15.8 - 3.0
39	2°54.8	2°55.2	2°46.8	3.9 - 0.7	9.9 - 1.9	15.9 - 3.0
40	2°55.0	2°55.5	2°47.0	4.0 - 0.8	10.0 - 1.9	16.0 - 3.1
41	2°55.3	2°55.7	2°47.3	4.1 - 0.8	10.1 - 1.9	16.1 - 3.1
42	2°55.5	2°56.0	2°47.5	4.2 - 0.8	10.2 - 2.0	16.2 - 3.1
43	2°55.8	2°56.2	2°47.7	4.3 - 0.8	10.3 - 2.0	16.3 - 3.1
44	2°56.0	2°56.5	2°48.0	4.4 - 0.8	10.4 - 2.0	16.4 - 3.1
45	2°56.3	2°56.7	2°48.2	4.5 - 0.9	10.5 - 2.0	16.5 - 3.2
46	2°56.5	2°57.0	2°48.5	4.6 - 0.9	10.6 - 2.0	16.6 - 3.2
47	2°56.8	2°57.2	2°48.7	4.7 - 0.9	10.7 - 2.1	16.7 - 3.2
48	2°57.0	2°57.5	2°48.9	4.8 - 0.9	10.8 - 2.1	16.8 - 3.2
49	2°57.3	2°57.7	2°49.2	4.9 - 0.9	10.9 - 2.1	16.9 - 3.2
50	2°57.5	2°58.0	2°49.4	5.0 - 1.0	11.0 - 2.1	17.0 - 3.3
51	2°57.7	2°58.2	2°49.7	5.1 - 1.0	11.1 - 2.1	17.1 - 3.3
52	2°58.0	2°58.5	2°49.9	5.2 - 1.0	11.2 - 2.1	17.2 - 3.3
53	2°58.2	2°58.7	2°50.1	5.3 - 1.0	11.3 - 2.2	17.3 - 3.3
54	2°58.5	2°59.0	2°50.4	5.4 - 1.0	11.4 - 2.2	17.4 - 3.3
55	2°58.7	2°59.2	2°50.6	5.5 - 1.1	11.5 - 2.2	17.5 - 3.4
56	2°59.0	2°59.5	2°50.8	5.6 - 1.1	11.6 - 2.2	17.6 - 3.4
57	2°59.2	2°59.7	2°51.1	5.7 - 1.1	11.7 - 2.2	17.7 - 3.4
58	2°59.5	3°00.0	2°51.3	5.8 - 1.1	11.8 - 2.3	17.8 - 3.4
59	2°59.7	3°00.2	2°51.6	5.9 - 1.1	11.9 - 2.3	17.9 - 3.4

Increments and Corrections

m 12	Sun Plan.	Aries	Moon	v and d corr		
0	3°00.0	3°00.5	2°51.8	0.0 - 0.0	6.0 - 1.3	12.0 - 2.5
1	3°00.3	3°00.7	2°52.0	0.1 - 0.0	6.1 - 1.3	12.1 - 2.5
2	3°00.5	3°01.0	2°52.3	0.2 - 0.0	6.2 - 1.3	12.2 - 2.5
3	3°00.8	3°01.2	2°52.5	0.3 - 0.1	6.3 - 1.3	12.3 - 2.6
4	3°01.0	3°01.5	2°52.8	0.4 - 0.1	6.4 - 1.3	12.4 - 2.6
5	3°01.3	3°01.7	2°53.0	0.5 - 0.1	6.5 - 1.4	12.5 - 2.6
6	3°01.5	3°02.0	2°53.2	0.6 - 0.1	6.6 - 1.4	12.6 - 2.6
7	3°01.8	3°02.2	2°53.5	0.7 - 0.1	6.7 - 1.4	12.7 - 2.6
8	3°02.0	3°02.5	2°53.7	0.8 - 0.2	6.8 - 1.4	12.8 - 2.7
9	3°02.3	3°02.7	2°53.9	0.9 - 0.2	6.9 - 1.4	12.9 - 2.7
10	3°02.5	3°03.0	2°54.2	1.0 - 0.2	7.0 - 1.5	13.0 - 2.7
11	3°02.8	3°03.2	2°54.4	1.1 - 0.2	7.1 - 1.5	13.1 - 2.7
12	3°03.0	3°03.5	2°54.7	1.2 - 0.3	7.2 - 1.5	13.2 - 2.8
13	3°03.3	3°03.8	2°54.9	1.3 - 0.3	7.3 - 1.5	13.3 - 2.8
14	3°03.5	3°04.0	2°55.1	1.4 - 0.3	7.4 - 1.5	13.4 - 2.8
15	3°03.8	3°04.3	2°55.4	1.5 - 0.3	7.5 - 1.6	13.5 - 2.8
16	3°04.0	3°04.5	2°55.6	1.6 - 0.3	7.6 - 1.6	13.6 - 2.8
17	3°04.2	3°04.8	2°55.9	1.7 - 0.4	7.7 - 1.6	13.7 - 2.9
18	3°04.5	3°05.0	2°56.1	1.8 - 0.4	7.8 - 1.6	13.8 - 2.9
19	3°04.7	3°05.3	2°56.3	1.9 - 0.4	7.9 - 1.6	13.9 - 2.9
20	3°05.0	3°05.5	2°56.6	2.0 - 0.4	8.0 - 1.7	14.0 - 2.9
21	3°05.2	3°05.8	2°56.8	2.1 - 0.4	8.1 - 1.7	14.1 - 2.9
22	3°05.5	3°06.0	2°57.0	2.2 - 0.5	8.2 - 1.7	14.2 - 3.0
23	3°05.7	3°06.3	2°57.3	2.3 - 0.5	8.3 - 1.7	14.3 - 3.0
24	3°06.0	3°06.5	2°57.5	2.4 - 0.5	8.4 - 1.8	14.4 - 3.0
25	3°06.2	3°06.8	2°57.8	2.5 - 0.5	8.5 - 1.8	14.5 - 3.0
26	3°06.5	3°07.0	2°58.0	2.6 - 0.5	8.6 - 1.8	14.6 - 3.0
27	3°06.7	3°07.3	2°58.2	2.7 - 0.6	8.7 - 1.8	14.7 - 3.1
28	3°07.0	3°07.5	2°58.5	2.8 - 0.6	8.8 - 1.8	14.8 - 3.1
29	3°07.2	3°07.8	2°58.7	2.9 - 0.6	8.9 - 1.9	14.9 - 3.1
30	3°07.5	3°08.0	2°59.0	3.0 - 0.6	9.0 - 1.9	15.0 - 3.1
31	3°07.8	3°08.3	2°59.2	3.1 - 0.6	9.1 - 1.9	15.1 - 3.1
32	3°08.0	3°08.5	2°59.4	3.2 - 0.7	9.2 - 1.9	15.2 - 3.2
33	3°08.3	3°08.8	2°59.7	3.3 - 0.7	9.3 - 1.9	15.3 - 3.2
34	3°08.5	3°09.0	2°59.9	3.4 - 0.7	9.4 - 2.0	15.4 - 3.2
35	3°08.8	3°09.3	3°00.2	3.5 - 0.7	9.5 - 2.0	15.5 - 3.2
36	3°09.0	3°09.5	3°00.4	3.6 - 0.8	9.6 - 2.0	15.6 - 3.3
37	3°09.3	3°09.8	3°00.6	3.7 - 0.8	9.7 - 2.0	15.7 - 3.3
38	3°09.5	3°10.0	3°00.9	3.8 - 0.8	9.8 - 2.0	15.8 - 3.3
39	3°09.8	3°10.3	3°01.1	3.9 - 0.8	9.9 - 2.1	15.9 - 3.3
40	3°10.0	3°10.5	3°01.3	4.0 - 0.8	10.0 - 2.1	16.0 - 3.3
41	3°10.3	3°10.8	3°01.6	4.1 - 0.9	10.1 - 2.1	16.1 - 3.4
42	3°10.5	3°11.0	3°01.8	4.2 - 0.9	10.2 - 2.1	16.2 - 3.4
43	3°10.8	3°11.3	3°02.1	4.3 - 0.9	10.3 - 2.1	16.3 - 3.4
44	3°11.0	3°11.5	3°02.3	4.4 - 0.9	10.4 - 2.2	16.4 - 3.4
45	3°11.3	3°11.8	3°02.5	4.5 - 0.9	10.5 - 2.2	16.5 - 3.4
46	3°11.5	3°12.0	3°02.8	4.6 - 1.0	10.6 - 2.2	16.6 - 3.5
47	3°11.7	3°12.3	3°03.0	4.7 - 1.0	10.7 - 2.2	16.7 - 3.5
48	3°12.0	3°12.5	3°03.3	4.8 - 1.0	10.8 - 2.3	16.8 - 3.5
49	3°12.2	3°12.8	3°03.5	4.9 - 1.0	10.9 - 2.3	16.9 - 3.5
50	3°12.5	3°13.0	3°03.7	5.0 - 1.0	11.0 - 2.3	17.0 - 3.5
51	3°12.7	3°13.3	3°04.0	5.1 - 1.1	11.1 - 2.3	17.1 - 3.6
52	3°13.0	3°13.5	3°04.2	5.2 - 1.1	11.2 - 2.3	17.2 - 3.6
53	3°13.2	3°13.8	3°04.4	5.3 - 1.1	11.3 - 2.4	17.3 - 3.6
54	3°13.5	3°14.0	3°04.7	5.4 - 1.1	11.4 - 2.4	17.4 - 3.6
55	3°13.7	3°14.3	3°04.9	5.5 - 1.1	11.5 - 2.4	17.5 - 3.6
56	3°14.0	3°14.5	3°05.2	5.6 - 1.2	11.6 - 2.4	17.6 - 3.7
57	3°14.2	3°14.8	3°05.4	5.7 - 1.2	11.7 - 2.4	17.7 - 3.7
58	3°14.5	3°15.0	3°05.6	5.8 - 1.2	11.8 - 2.5	17.8 - 3.7
59	3°14.7	3°15.3	3°05.9	5.9 - 1.2	11.9 - 2.5	17.9 - 3.7

m 13	Sun Plan.	Aries	Moon	v and d corr		
0	3°15.0	3°15.5	3°06.1	0.0 - 0.0	6.0 - 1.4	12.0 - 2.7
1	3°15.3	3°15.8	3°06.4	0.1 - 0.0	6.1 - 1.4	12.1 - 2.7
2	3°15.5	3°16.0	3°06.6	0.2 - 0.0	6.2 - 1.4	12.2 - 2.7
3	3°15.8	3°16.3	3°06.8	0.3 - 0.1	6.3 - 1.4	12.3 - 2.8
4	3°16.0	3°16.5	3°07.1	0.4 - 0.1	6.4 - 1.4	12.4 - 2.8
5	3°16.3	3°16.8	3°07.3	0.5 - 0.1	6.5 - 1.5	12.5 - 2.8
6	3°16.5	3°17.0	3°07.5	0.6 - 0.1	6.6 - 1.5	12.6 - 2.8
7	3°16.8	3°17.3	3°07.8	0.7 - 0.2	6.7 - 1.5	12.7 - 2.9
8	3°17.0	3°17.5	3°08.0	0.8 - 0.2	6.8 - 1.5	12.8 - 2.9
9	3°17.3	3°17.8	3°08.3	0.9 - 0.2	6.9 - 1.6	12.9 - 2.9
10	3°17.5	3°18.0	3°08.5	1.0 - 0.2	7.0 - 1.6	13.0 - 2.9
11	3°17.8	3°18.3	3°08.7	1.1 - 0.2	7.1 - 1.6	13.1 - 2.9
12	3°18.0	3°18.5	3°09.0	1.2 - 0.3	7.2 - 1.6	13.2 - 3.0
13	3°18.3	3°18.8	3°09.2	1.3 - 0.3	7.3 - 1.6	13.3 - 3.0
14	3°18.5	3°19.0	3°09.5	1.4 - 0.3	7.4 - 1.7	13.4 - 3.0
15	3°18.8	3°19.3	3°09.7	1.5 - 0.3	7.5 - 1.7	13.5 - 3.0
16	3°19.0	3°19.5	3°09.9	1.6 - 0.4	7.6 - 1.7	13.6 - 3.1
17	3°19.3	3°19.8	3°10.2	1.7 - 0.4	7.7 - 1.7	13.7 - 3.1
18	3°19.5	3°20.0	3°10.4	1.8 - 0.4	7.8 - 1.8	13.8 - 3.1
19	3°19.7	3°20.3	3°10.7	1.9 - 0.4	7.9 - 1.8	13.9 - 3.1
20	3°20.0	3°20.5	3°10.9	2.0 - 0.5	8.0 - 1.8	14.0 - 3.1
21	3°20.2	3°20.8	3°11.1	2.1 - 0.5	8.1 - 1.8	14.1 - 3.2
22	3°20.5	3°21.0	3°11.4	2.2 - 0.5	8.2 - 1.8	14.2 - 3.2
23	3°20.7	3°21.3	3°11.6	2.3 - 0.5	8.3 - 1.9	14.3 - 3.2
24	3°21.0	3°21.5	3°11.8	2.4 - 0.5	8.4 - 1.9	14.4 - 3.2
25	3°21.2	3°21.8	3°12.1	2.5 - 0.6	8.5 - 1.9	14.5 - 3.3
26	3°21.5	3°22.1	3°12.3	2.6 - 0.6	8.6 - 1.9	14.6 - 3.3
27	3°21.7	3°22.3	3°12.6	2.7 - 0.6	8.7 - 2.0	14.7 - 3.3
28	3°22.0	3°22.6	3°12.8	2.8 - 0.6	8.8 - 2.0	14.8 - 3.3
29	3°22.2	3°22.8	3°13.0	2.9 - 0.7	8.9 - 2.0	14.9 - 3.4
30	3°22.5	3°23.1	3°13.3	3.0 - 0.7	9.0 - 2.0	15.0 - 3.4
31	3°22.8	3°23.3	3°13.5	3.1 - 0.7	9.1 - 2.0	15.1 - 3.4
32	3°23.0	3°23.6	3°13.8	3.2 - 0.7	9.2 - 2.1	15.2 - 3.4
33	3°23.3	3°23.8	3°14.0	3.3 - 0.7	9.3 - 2.1	15.3 - 3.4
34	3°23.5	3°24.1	3°14.2	3.4 - 0.8	9.4 - 2.1	15.4 - 3.5
35	3°23.8	3°24.3	3°14.5	3.5 - 0.8	9.5 - 2.1	15.5 - 3.5
36	3°24.0	3°24.6	3°14.7	3.6 - 0.8	9.6 - 2.2	15.6 - 3.5
37	3°24.3	3°24.8	3°14.9	3.7 - 0.8	9.7 - 2.2	15.7 - 3.5
38	3°24.5	3°25.1	3°15.2	3.8 - 0.9	9.8 - 2.2	15.8 - 3.6
39	3°24.8	3°25.3	3°15.4	3.9 - 0.9	9.9 - 2.2	15.9 - 3.6
40	3°25.0	3°25.6	3°15.7	4.0 - 0.9	10.0 - 2.3	16.0 - 3.6
41	3°25.3	3°25.8	3°15.9	4.1 - 0.9	10.1 - 2.3	16.1 - 3.6
42	3°25.5	3°26.1	3°16.1	4.2 - 0.9	10.2 - 2.3	16.2 - 3.6
43	3°25.8	3°26.3	3°16.4	4.3 - 1.0	10.3 - 2.3	16.3 - 3.7
44	3°26.0	3°26.6	3°16.6	4.4 - 1.0	10.4 - 2.3	16.4 - 3.7
45	3°26.3	3°26.8	3°16.9	4.5 - 1.0	10.5 - 2.4	16.5 - 3.7
46	3°26.5	3°27.1	3°17.1	4.6 - 1.0	10.6 - 2.4	16.6 - 3.7
47	3°26.8	3°27.3	3°17.3	4.7 - 1.1	10.7 - 2.4	16.7 - 3.8
48	3°27.0	3°27.6	3°17.6	4.8 - 1.1	10.8 - 2.4	16.8 - 3.8
49	3°27.2	3°27.8	3°17.8	4.9 - 1.1	10.9 - 2.5	16.9 - 3.8
50	3°27.5	3°28.1	3°18.0	5.0 - 1.1	11.0 - 2.5	17.0 - 3.8
51	3°27.7	3°28.3	3°18.3	5.1 - 1.1	11.1 - 2.5	17.1 - 3.8
52	3°28.0	3°28.6	3°18.5	5.2 - 1.2	11.2 - 2.5	17.2 - 3.9
53	3°28.2	3°28.8	3°18.8	5.3 - 1.2	11.3 - 2.5	17.3 - 3.9
54	3°28.5	3°29.1	3°19.0	5.4 - 1.2	11.4 - 2.6	17.4 - 3.9
55	3°28.7	3°29.3	3°19.2	5.5 - 1.2	11.5 - 2.6	17.5 - 3.9
56	3°29.0	3°29.6	3°19.5	5.6 - 1.3	11.6 - 2.6	17.6 - 4.0
57	3°29.2	3°29.8	3°19.7	5.7 - 1.3	11.7 - 2.6	17.7 - 4.0
58	3°29.5	3°30.1	3°20.0	5.8 - 1.3	11.8 - 2.7	17.8 - 4.0
59	3°29.7	3°30.3	3°20.2	5.9 - 1.3	11.9 - 2.7	17.9 - 4.0

m 14	Sun Plan.	Aries	Moon	v and d corr		
0	3°30.0	3°30.6	3°20.4	0.0 - 0.0	6.0 - 1.4	12.0 - 2.9
1	3°30.3	3°30.8	3°20.7	0.1 - 0.0	6.1 - 1.5	12.1 - 2.9
2	3°30.5	3°31.1	3°20.9	0.2 - 0.0	6.2 - 1.5	12.2 - 2.9
3	3°30.8	3°31.3	3°21.1	0.3 - 0.1	6.3 - 1.5	12.3 - 3.0
4	3°31.0	3°31.6	3°21.4	0.4 - 0.1	6.4 - 1.5	12.4 - 3.0
5	3°31.3	3°31.8	3°21.6	0.5 - 0.1	6.5 - 1.6	12.5 - 3.0
6	3°31.5	3°32.1	3°21.9	0.6 - 0.1	6.6 - 1.6	12.6 - 3.0
7	3°31.8	3°32.3	3°22.1	0.7 - 0.2	6.7 - 1.6	12.7 - 3.1
8	3°32.0	3°32.6	3°22.3	0.8 - 0.2	6.8 - 1.6	12.8 - 3.1
9	3°32.3	3°32.8	3°22.6	0.9 - 0.2	6.9 - 1.7	12.9 - 3.1
10	3°32.5	3°33.1	3°22.8	1.0 - 0.2	7.0 - 1.7	13.0 - 3.1
11	3°32.8	3°33.3	3°23.1	1.1 - 0.3	7.1 - 1.7	13.1 - 3.2
12	3°33.0	3°33.6	3°23.3	1.2 - 0.3	7.2 - 1.7	13.2 - 3.2
13	3°33.3	3°33.8	3°23.5	1.3 - 0.3	7.3 - 1.8	13.3 - 3.2
14	3°33.5	3°34.1	3°23.8	1.4 - 0.3	7.4 - 1.8	13.4 - 3.2
15	3°33.8	3°34.3	3°24.0	1.5 - 0.4	7.5 - 1.8	13.5 - 3.3
16	3°34.0	3°34.6	3°24.3	1.6 - 0.4	7.6 - 1.8	13.6 - 3.3
17	3°34.3	3°34.8	3°24.5	1.7 - 0.4	7.7 - 1.9	13.7 - 3.3
18	3°34.5	3°35.1	3°24.7	1.8 - 0.4	7.8 - 1.9	13.8 - 3.3
19	3°34.8	3°35.3	3°25.0	1.9 - 0.5	7.9 - 1.9	13.9 - 3.4
20	3°35.0	3°35.6	3°25.2	2.0 - 0.5	8.0 - 1.9	14.0 - 3.4
21	3°35.2	3°35.8	3°25.4	2.1 - 0.5	8.1 - 2.0	14.1 - 3.4
22	3°35.5	3°36.1	3°25.7	2.2 - 0.5	8.2 - 2.0	14.2 - 3.4
23	3°35.7	3°36.3	3°25.9	2.3 - 0.6	8.3 - 2.0	14.3 - 3.5
24	3°36.0	3°36.6	3°26.2	2.4 - 0.6	8.4 - 2.0	14.4 - 3.5
25	3°36.2	3°36.8	3°26.4	2.5 - 0.6	8.5 - 2.1	14.5 - 3.5
26	3°36.5	3°37.1	3°26.6	2.6 - 0.6	8.6 - 2.1	14.6 - 3.5
27	3°36.7	3°37.3	3°26.9	2.7 - 0.7	8.7 - 2.1	14.7 - 3.6
28	3°37.0	3°37.6	3°27.1	2.8 - 0.7	8.8 - 2.1	14.8 - 3.6
29	3°37.2	3°37.8	3°27.4	2.9 - 0.7	8.9 - 2.2	14.9 - 3.6
30	3°37.5	3°38.1	3°27.6	3.0 - 0.7	9.0 - 2.2	15.0 - 3.6
31	3°37.8	3°38.3	3°27.8	3.1 - 0.7	9.1 - 2.2	15.1 - 3.6
32	3°38.0	3°38.6	3°28.1	3.2 - 0.8	9.2 - 2.2	15.2 - 3.7
33	3°38.3	3°38.8	3°28.3	3.3 - 0.8	9.3 - 2.2	15.3 - 3.7
34	3°38.5	3°39.1	3°28.5	3.4 - 0.8	9.4 - 2.3	15.4 - 3.7
35	3°38.8	3°39.3	3°28.8	3.5 - 0.8	9.5 - 2.3	15.5 - 3.7
36	3°39.0	3°39.6	3°29.0	3.6 - 0.9	9.6 - 2.3	15.6 - 3.8
37	3°39.3	3°39.8	3°29.3	3.7 - 0.9	9.7 - 2.3	15.7 - 3.8
38	3°39.5	3°40.1	3°29.5	3.8 - 0.9	9.8 - 2.4	15.8 - 3.8
39	3°39.8	3°40.4	3°29.7	3.9 - 0.9	9.9 - 2.4	15.9 - 3.8
40	3°40.0	3°40.6	3°30.0	4.0 - 1.0	10.0 - 2.4	16.0 - 3.9
41	3°40.3	3°40.9	3°30.2	4.1 - 1.0	10.1 - 2.4	16.1 - 3.9
42	3°40.5	3°41.1	3°30.5	4.2 - 1.0	10.2 - 2.5	16.2 - 3.9
43	3°40.8	3°41.4	3°30.7	4.3 - 1.0	10.3 - 2.5	16.3 - 3.9
44	3°41.0	3°41.6	3°30.9	4.4 - 1.1	10.4 - 2.5	16.4 - 4.0
45	3°41.3	3°41.9	3°31.2	4.5 - 1.1	10.5 - 2.5	16.5 - 4.0
46	3°41.5	3°42.1	3°31.4	4.6 - 1.1	10.6 - 2.6	16.6 - 4.0
47	3°41.8	3°42.4	3°31.6	4.7 - 1.1	10.7 - 2.6	16.7 - 4.0
48	3°42.0	3°42.6	3°31.9	4.8 - 1.2	10.8 - 2.6	16.8 - 4.1
49	3°42.3	3°42.9	3°32.1	4.9 - 1.2	10.9 - 2.6	16.9 - 4.1
50	3°42.5	3°43.1	3°32.4	5.0 - 1.2	11.0 - 2.7	17.0 - 4.1
51	3°42.7	3°43.4	3°32.6	5.1 - 1.2	11.1 - 2.7	17.1 - 4.1
52	3°43.0	3°43.6	3°32.8	5.2 - 1.3	11.2 - 2.7	17.2 - 4.2
53	3°43.2	3°43.9	3°33.1	5.3 - 1.3	11.3 - 2.7	17.3 - 4.2
54	3°43.5	3°44.1	3°33.3	5.4 - 1.3	11.4 - 2.8	17.4 - 4.2
55	3°43.7	3°44.4	3°33.6	5.5 - 1.3	11.5 - 2.8	17.5 - 4.2
56	3°44.0	3°44.6	3°33.8	5.6 - 1.4	11.6 - 2.8	17.6 - 4.3
57	3°44.2	3°44.9	3°34.0	5.7 - 1.4	11.7 - 2.8	17.7 - 4.3
58	3°44.5	3°45.1	3°34.3	5.8 - 1.4	11.8 - 2.9	17.8 - 4.3
59	3°44.7	3°45.4	3°34.5	5.9 - 1.4	11.9 - 2.9	17.9 - 4.3

Increments and Corrections

m 15	Sun Plan.	Aries	Moon	v and d corr		
0	3°45.0	3°45.6	3°34.8	0.0 - 0.0	6.0 - 1.6	12.0 - 3.1
1	3°45.2	3°45.9	3°35.0	0.1 - 0.0	6.1 - 1.6	12.1 - 3.1
2	3°45.5	3°46.1	3°35.2	0.2 - 0.1	6.2 - 1.6	12.2 - 3.2
3	3°45.8	3°46.4	3°35.5	0.3 - 0.1	6.3 - 1.6	12.3 - 3.2
4	3°46.0	3°46.6	3°35.7	0.4 - 0.1	6.4 - 1.7	12.4 - 3.2
5	3°46.2	3°46.9	3°35.9	0.5 - 0.1	6.5 - 1.7	12.5 - 3.2
6	3°46.5	3°47.1	3°36.2	0.6 - 0.2	6.6 - 1.7	12.6 - 3.3
7	3°46.8	3°47.4	3°36.4	0.7 - 0.2	6.7 - 1.7	12.7 - 3.3
8	3°47.0	3°47.6	3°36.7	0.8 - 0.2	6.8 - 1.8	12.8 - 3.3
9	3°47.3	3°47.9	3°36.9	0.9 - 0.2	6.9 - 1.8	12.9 - 3.3
10	3°47.5	3°48.1	3°37.1	1.0 - 0.3	7.0 - 1.8	13.0 - 3.4
11	3°47.7	3°48.4	3°37.4	1.1 - 0.3	7.1 - 1.8	13.1 - 3.4
12	3°48.0	3°48.6	3°37.6	1.2 - 0.3	7.2 - 1.9	13.2 - 3.4
13	3°48.3	3°48.9	3°37.9	1.3 - 0.3	7.3 - 1.9	13.3 - 3.4
14	3°48.5	3°49.1	3°38.1	1.4 - 0.4	7.4 - 1.9	13.4 - 3.5
15	3°48.8	3°49.4	3°38.3	1.5 - 0.4	7.5 - 1.9	13.5 - 3.5
16	3°49.0	3°49.6	3°38.6	1.6 - 0.4	7.6 - 2.0	13.6 - 3.5
17	3°49.3	3°49.9	3°38.8	1.7 - 0.4	7.7 - 2.0	13.7 - 3.5
18	3°49.5	3°50.1	3°39.0	1.8 - 0.5	7.8 - 2.0	13.8 - 3.6
19	3°49.8	3°50.4	3°39.3	1.9 - 0.5	7.9 - 2.0	13.9 - 3.6
20	3°50.0	3°50.6	3°39.5	2.0 - 0.5	8.0 - 2.1	14.0 - 3.6
21	3°50.2	3°50.9	3°39.8	2.1 - 0.5	8.1 - 2.1	14.1 - 3.6
22	3°50.5	3°51.1	3°40.0	2.2 - 0.6	8.2 - 2.1	14.2 - 3.7
23	3°50.7	3°51.4	3°40.2	2.3 - 0.6	8.3 - 2.1	14.3 - 3.7
24	3°51.0	3°51.6	3°40.5	2.4 - 0.6	8.4 - 2.2	14.4 - 3.7
25	3°51.2	3°51.9	3°40.7	2.5 - 0.6	8.5 - 2.2	14.5 - 3.7
26	3°51.5	3°52.1	3°41.0	2.6 - 0.7	8.6 - 2.2	14.6 - 3.8
27	3°51.8	3°52.4	3°41.2	2.7 - 0.7	8.7 - 2.2	14.7 - 3.8
28	3°52.0	3°52.6	3°41.4	2.8 - 0.7	8.8 - 2.3	14.8 - 3.8
29	3°52.2	3°52.9	3°41.7	2.9 - 0.7	8.9 - 2.3	14.9 - 3.8
30	3°52.5	3°53.1	3°41.9	3.0 - 0.8	9.0 - 2.3	15.0 - 3.9
31	3°52.8	3°53.4	3°42.1	3.1 - 0.8	9.1 - 2.4	15.1 - 3.9
32	3°53.0	3°53.6	3°42.4	3.2 - 0.8	9.2 - 2.4	15.2 - 3.9
33	3°53.2	3°53.9	3°42.6	3.3 - 0.9	9.3 - 2.4	15.3 - 4.0
34	3°53.5	3°54.1	3°42.9	3.4 - 0.9	9.4 - 2.4	15.4 - 4.0
35	3°53.8	3°54.4	3°43.1	3.5 - 0.9	9.5 - 2.5	15.5 - 4.0
36	3°54.0	3°54.6	3°43.3	3.6 - 0.9	9.6 - 2.5	15.6 - 4.0
37	3°54.3	3°54.9	3°43.6	3.7 - 1.0	9.7 - 2.5	15.7 - 4.1
38	3°54.5	3°55.1	3°43.8	3.8 - 1.0	9.8 - 2.5	15.8 - 4.1
39	3°54.8	3°55.4	3°44.1	3.9 - 1.0	9.9 - 2.6	15.9 - 4.1
40	3°55.0	3°55.6	3°44.3	4.0 - 1.0	10.0 - 2.6	16.0 - 4.1
41	3°55.3	3°55.9	3°44.5	4.1 - 1.1	10.1 - 2.6	16.1 - 4.2
42	3°55.5	3°56.1	3°44.8	4.2 - 1.1	10.2 - 2.6	16.2 - 4.2
43	3°55.7	3°56.4	3°45.0	4.3 - 1.1	10.3 - 2.7	16.3 - 4.2
44	3°56.0	3°56.6	3°45.2	4.4 - 1.1	10.4 - 2.7	16.4 - 4.2
45	3°56.3	3°56.9	3°45.5	4.5 - 1.2	10.5 - 2.7	16.5 - 4.3
46	3°56.5	3°57.1	3°45.7	4.6 - 1.2	10.6 - 2.7	16.6 - 4.3
47	3°56.8	3°57.4	3°46.0	4.7 - 1.2	10.7 - 2.8	16.7 - 4.3
48	3°57.0	3°57.6	3°46.2	4.8 - 1.2	10.8 - 2.8	16.8 - 4.3
49	3°57.3	3°57.9	3°46.4	4.9 - 1.3	10.9 - 2.8	16.9 - 4.4
50	3°57.5	3°58.1	3°46.7	5.0 - 1.3	11.0 - 2.8	17.0 - 4.4
51	3°57.7	3°58.4	3°46.9	5.1 - 1.3	11.1 - 2.9	17.1 - 4.4
52	3°58.0	3°58.7	3°47.2	5.2 - 1.3	11.2 - 2.9	17.2 - 4.4
53	3°58.2	3°58.9	3°47.4	5.3 - 1.4	11.3 - 2.9	17.3 - 4.5
54	3°58.5	3°59.2	3°47.6	5.4 - 1.4	11.4 - 2.9	17.4 - 4.5
55	3°58.7	3°59.4	3°47.9	5.5 - 1.4	11.5 - 3.0	17.5 - 4.5
56	3°59.0	3°59.7	3°48.1	5.6 - 1.4	11.6 - 3.0	17.6 - 4.5
57	3°59.2	3°59.9	3°48.4	5.7 - 1.5	11.7 - 3.0	17.7 - 4.6
58	3°59.5	4°00.2	3°48.6	5.8 - 1.5	11.8 - 3.0	17.8 - 4.6
59	3°59.8	4°00.4	3°48.8	5.9 - 1.5	11.9 - 3.1	17.9 - 4.6

m 16	Sun Plan.	Aries	Moon	v and d corr		
0	4°00.0	4°00.7	3°49.1	0.0 - 0.0	6.0 - 1.7	12.0 - 3.3
1	4°00.2	4°00.9	3°49.3	0.1 - 0.0	6.1 - 1.7	12.1 - 3.3
2	4°00.5	4°01.2	3°49.5	0.2 - 0.1	6.2 - 1.7	12.2 - 3.4
3	4°00.8	4°01.4	3°49.8	0.3 - 0.1	6.3 - 1.7	12.3 - 3.4
4	4°01.0	4°01.7	3°50.0	0.4 - 0.1	6.4 - 1.8	12.4 - 3.4
5	4°01.2	4°01.9	3°50.3	0.5 - 0.1	6.5 - 1.8	12.5 - 3.4
6	4°01.5	4°02.2	3°50.5	0.6 - 0.2	6.6 - 1.8	12.6 - 3.5
7	4°01.8	4°02.4	3°50.7	0.7 - 0.2	6.7 - 1.8	12.7 - 3.5
8	4°02.0	4°02.7	3°51.0	0.8 - 0.2	6.8 - 1.9	12.8 - 3.5
9	4°02.2	4°02.9	3°51.2	0.9 - 0.2	6.9 - 1.9	12.9 - 3.5
10	4°02.5	4°03.2	3°51.5	1.0 - 0.3	7.0 - 1.9	13.0 - 3.6
11	4°02.8	4°03.4	3°51.7	1.1 - 0.3	7.1 - 2.0	13.1 - 3.6
12	4°03.0	4°03.7	3°51.9	1.2 - 0.3	7.2 - 2.0	13.2 - 3.6
13	4°03.2	4°03.9	3°52.2	1.3 - 0.4	7.3 - 2.0	13.3 - 3.7
14	4°03.5	4°04.2	3°52.4	1.4 - 0.4	7.4 - 2.0	13.4 - 3.7
15	4°03.8	4°04.4	3°52.6	1.5 - 0.4	7.5 - 2.1	13.5 - 3.7
16	4°04.0	4°04.7	3°52.9	1.6 - 0.4	7.6 - 2.1	13.6 - 3.7
17	4°04.3	4°04.9	3°53.1	1.7 - 0.5	7.7 - 2.1	13.7 - 3.8
18	4°04.5	4°05.2	3°53.4	1.8 - 0.5	7.8 - 2.1	13.8 - 3.8
19	4°04.7	4°05.4	3°53.6	1.9 - 0.5	7.9 - 2.2	13.9 - 3.8
20	4°05.0	4°05.7	3°53.8	2.0 - 0.6	8.0 - 2.2	14.0 - 3.9
21	4°05.3	4°05.9	3°54.1	2.1 - 0.6	8.1 - 2.2	14.1 - 3.9
22	4°05.5	4°06.2	3°54.3	2.2 - 0.6	8.2 - 2.3	14.2 - 3.9
23	4°05.7	4°06.4	3°54.6	2.3 - 0.6	8.3 - 2.3	14.3 - 3.9
24	4°06.0	4°06.7	3°54.8	2.4 - 0.7	8.4 - 2.3	14.4 - 4.0
25	4°06.3	4°06.9	3°55.0	2.5 - 0.7	8.5 - 2.3	14.5 - 4.0
26	4°06.5	4°07.2	3°55.3	2.6 - 0.7	8.6 - 2.4	14.6 - 4.0
27	4°06.7	4°07.4	3°55.5	2.7 - 0.7	8.7 - 2.4	14.7 - 4.0
28	4°07.0	4°07.7	3°55.7	2.8 - 0.8	8.8 - 2.4	14.8 - 4.1
29	4°07.3	4°07.9	3°56.0	2.9 - 0.8	8.9 - 2.4	14.9 - 4.1
30	4°07.5	4°08.2	3°56.2	3.0 - 0.8	9.0 - 2.5	15.0 - 4.1
31	4°07.7	4°08.4	3°56.5	3.1 - 0.9	9.1 - 2.5	15.1 - 4.2
32	4°08.0	4°08.7	3°56.7	3.2 - 0.9	9.2 - 2.5	15.2 - 4.2
33	4°08.3	4°08.9	3°56.9	3.3 - 0.9	9.3 - 2.6	15.3 - 4.2
34	4°08.5	4°09.2	3°57.2	3.4 - 0.9	9.4 - 2.6	15.4 - 4.2
35	4°08.7	4°09.4	3°57.4	3.5 - 1.0	9.5 - 2.6	15.5 - 4.3
36	4°09.0	4°09.7	3°57.7	3.6 - 1.0	9.6 - 2.6	15.6 - 4.3
37	4°09.3	4°09.9	3°57.9	3.7 - 1.0	9.7 - 2.7	15.7 - 4.3
38	4°09.5	4°10.2	3°58.1	3.8 - 1.0	9.8 - 2.7	15.8 - 4.3
39	4°09.7	4°10.4	3°58.4	3.9 - 1.1	9.9 - 2.7	15.9 - 4.4
40	4°10.0	4°10.7	3°58.6	4.0 - 1.1	10.0 - 2.8	16.0 - 4.4
41	4°10.3	4°10.9	3°58.8	4.1 - 1.1	10.1 - 2.8	16.1 - 4.4
42	4°10.5	4°11.2	3°59.1	4.2 - 1.2	10.2 - 2.8	16.2 - 4.5
43	4°10.7	4°11.4	3°59.3	4.3 - 1.2	10.3 - 2.8	16.3 - 4.5
44	4°11.0	4°11.7	3°59.6	4.4 - 1.2	10.4 - 2.9	16.4 - 4.5
45	4°11.3	4°11.9	3°59.8	4.5 - 1.2	10.5 - 2.9	16.5 - 4.5
46	4°11.5	4°12.2	4°00.0	4.6 - 1.3	10.6 - 2.9	16.6 - 4.6
47	4°11.8	4°12.4	4°00.3	4.7 - 1.3	10.7 - 2.9	16.7 - 4.6
48	4°12.0	4°12.7	4°00.5	4.8 - 1.3	10.8 - 3.0	16.8 - 4.6
49	4°12.2	4°12.9	4°00.8	4.9 - 1.3	10.9 - 3.0	16.9 - 4.6
50	4°12.5	4°13.2	4°01.0	5.0 - 1.4	11.0 - 3.0	17.0 - 4.7
51	4°12.8	4°13.4	4°01.2	5.1 - 1.4	11.1 - 3.1	17.1 - 4.7
52	4°13.0	4°13.7	4°01.5	5.2 - 1.4	11.2 - 3.1	17.2 - 4.7
53	4°13.2	4°13.9	4°01.7	5.3 - 1.5	11.3 - 3.1	17.3 - 4.8
54	4°13.5	4°14.2	4°02.0	5.4 - 1.5	11.4 - 3.1	17.4 - 4.8
55	4°13.8	4°14.4	4°02.2	5.5 - 1.5	11.5 - 3.2	17.5 - 4.8
56	4°14.0	4°14.7	4°02.4	5.6 - 1.5	11.6 - 3.2	17.6 - 4.8
57	4°14.2	4°14.9	4°02.7	5.7 - 1.6	11.7 - 3.2	17.7 - 4.9
58	4°14.5	4°15.2	4°02.9	5.8 - 1.6	11.8 - 3.2	17.8 - 4.9
59	4°14.8	4°15.4	4°03.1	5.9 - 1.6	11.9 - 3.3	17.9 - 4.9

m 17	Sun Plan.	Aries	Moon	v and d corr		
0	4°15.0	4°15.7	4°03.4	0.0 - 0.0	6.0 - 1.8	12.0 - 3.5
1	4°15.2	4°15.9	4°03.6	0.1 - 0.0	6.1 - 1.8	12.1 - 3.5
2	4°15.5	4°16.2	4°03.9	0.2 - 0.1	6.2 - 1.8	12.2 - 3.6
3	4°15.8	4°16.4	4°04.1	0.3 - 0.1	6.3 - 1.8	12.3 - 3.6
4	4°16.0	4°16.7	4°04.3	0.4 - 0.1	6.4 - 1.9	12.4 - 3.6
5	4°16.2	4°17.0	4°04.6	0.5 - 0.1	6.5 - 1.9	12.5 - 3.6
6	4°16.5	4°17.2	4°04.8	0.6 - 0.2	6.6 - 1.9	12.6 - 3.7
7	4°16.8	4°17.5	4°05.1	0.7 - 0.2	6.7 - 2.0	12.7 - 3.7
8	4°17.0	4°17.7	4°05.3	0.8 - 0.2	6.8 - 2.0	12.8 - 3.7
9	4°17.2	4°18.0	4°05.5	0.9 - 0.3	6.9 - 2.0	12.9 - 3.8
10	4°17.5	4°18.2	4°05.8	1.0 - 0.3	7.0 - 2.0	13.0 - 3.8
11	4°17.8	4°18.5	4°06.0	1.1 - 0.3	7.1 - 2.1	13.1 - 3.8
12	4°18.0	4°18.7	4°06.2	1.2 - 0.4	7.2 - 2.1	13.2 - 3.9
13	4°18.2	4°19.0	4°06.5	1.3 - 0.4	7.3 - 2.1	13.3 - 3.9
14	4°18.5	4°19.2	4°06.7	1.4 - 0.4	7.4 - 2.2	13.4 - 3.9
15	4°18.8	4°19.5	4°07.0	1.5 - 0.4	7.5 - 2.2	13.5 - 3.9
16	4°19.0	4°19.7	4°07.2	1.6 - 0.5	7.6 - 2.2	13.6 - 4.0
17	4°19.3	4°20.0	4°07.4	1.7 - 0.5	7.7 - 2.2	13.7 - 4.0
18	4°19.5	4°20.2	4°07.7	1.8 - 0.5	7.8 - 2.3	13.8 - 4.0
19	4°19.7	4°20.5	4°07.9	1.9 - 0.6	7.9 - 2.3	13.9 - 4.1
20	4°20.0	4°20.7	4°08.2	2.0 - 0.6	8.0 - 2.3	14.0 - 4.1
21	4°20.3	4°21.0	4°08.4	2.1 - 0.6	8.1 - 2.4	14.1 - 4.1
22	4°20.5	4°21.2	4°08.6	2.2 - 0.6	8.2 - 2.4	14.2 - 4.1
23	4°20.7	4°21.5	4°08.9	2.3 - 0.7	8.3 - 2.4	14.3 - 4.2
24	4°21.0	4°21.7	4°09.1	2.4 - 0.7	8.4 - 2.5	14.4 - 4.2
25	4°21.3	4°22.0	4°09.3	2.5 - 0.7	8.5 - 2.5	14.5 - 4.2
26	4°21.5	4°22.2	4°09.6	2.6 - 0.8	8.6 - 2.5	14.6 - 4.3
27	4°21.7	4°22.5	4°09.8	2.7 - 0.8	8.7 - 2.5	14.7 - 4.3
28	4°22.0	4°22.7	4°10.1	2.8 - 0.8	8.8 - 2.6	14.8 - 4.3
29	4°22.3	4°23.0	4°10.3	2.9 - 0.8	8.9 - 2.6	14.9 - 4.3
30	4°22.5	4°23.2	4°10.5	3.0 - 0.9	9.0 - 2.6	15.0 - 4.4
31	4°22.7	4°23.5	4°10.8	3.1 - 0.9	9.1 - 2.7	15.1 - 4.4
32	4°23.0	4°23.7	4°11.0	3.2 - 0.9	9.2 - 2.7	15.2 - 4.4
33	4°23.3	4°24.0	4°11.3	3.3 - 1.0	9.3 - 2.7	15.3 - 4.5
34	4°23.5	4°24.2	4°11.5	3.4 - 1.0	9.4 - 2.7	15.4 - 4.5
35	4°23.7	4°24.5	4°11.7	3.5 - 1.0	9.5 - 2.8	15.5 - 4.5
36	4°24.0	4°24.7	4°12.0	3.6 - 1.1	9.6 - 2.8	15.6 - 4.5
37	4°24.3	4°25.0	4°12.2	3.7 - 1.1	9.7 - 2.8	15.7 - 4.6
38	4°24.5	4°25.2	4°12.5	3.8 - 1.1	9.8 - 2.9	15.8 - 4.6
39	4°24.7	4°25.5	4°12.7	3.9 - 1.1	9.9 - 2.9	15.9 - 4.6
40	4°25.0	4°25.7	4°12.9	4.0 - 1.2	10.0 - 2.9	16.0 - 4.7
41	4°25.3	4°26.0	4°13.2	4.1 - 1.2	10.1 - 2.9	16.1 - 4.7
42	4°25.5	4°26.2	4°13.4	4.2 - 1.2	10.2 - 3.0	16.2 - 4.7
43	4°25.7	4°26.5	4°13.6	4.3 - 1.3	10.3 - 3.0	16.3 - 4.8
44	4°26.0	4°26.7	4°13.9	4.4 - 1.3	10.4 - 3.0	16.4 - 4.8
45	4°26.3	4°27.0	4°14.1	4.5 - 1.3	10.5 - 3.1	16.5 - 4.8
46	4°26.5	4°27.2	4°14.4	4.6 - 1.3	10.6 - 3.1	16.6 - 4.8
47	4°26.8	4°27.5	4°14.6	4.7 - 1.4	10.7 - 3.1	16.7 - 4.9
48	4°27.0	4°27.7	4°14.8	4.8 - 1.4	10.8 - 3.2	16.8 - 4.9
49	4°27.2	4°28.0	4°15.1	4.9 - 1.4	10.9 - 3.2	16.9 - 4.9
50	4°27.5	4°28.2	4°15.3	5.0 - 1.5	11.0 - 3.2	17.0 - 5.0
51	4°27.8	4°28.5	4°15.6	5.1 - 1.5	11.1 - 3.2	17.1 - 5.0
52	4°28.0	4°28.7	4°15.8	5.2 - 1.5	11.2 - 3.3	17.2 - 5.0
53	4°28.2	4°29.0	4°16.0	5.3 - 1.5	11.3 - 3.3	17.3 - 5.0
54	4°28.5	4°29.2	4°16.3	5.4 - 1.6	11.4 - 3.3	17.4 - 5.1
55	4°28.8	4°29.5	4°16.5	5.5 - 1.6	11.5 - 3.4	17.5 - 5.1
56	4°29.0	4°29.7	4°16.7	5.6 - 1.6	11.6 - 3.4	17.6 - 5.1
57	4°29.2	4°30.0	4°17.0	5.7 - 1.7	11.7 - 3.4	17.7 - 5.2
58	4°29.5	4°30.2	4°17.2	5.8 - 1.7	11.8 - 3.4	17.8 - 5.2
59	4°29.8	4°30.5	4°17.5	5.9 - 1.7	11.9 - 3.5	17.9 - 5.2

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
18	Plan.					
0	4°30.0	4°30.7	4°17.7	0.0 - 0.0	6.0 - 1.9	12.0 - 3.7
1	4°30.2	4°31.0	4°17.9	0.1 - 0.0	6.1 - 1.9	12.1 - 3.7
2	4°30.5	4°31.2	4°18.2	0.2 - 0.1	6.2 - 1.9	12.2 - 3.8
3	4°30.8	4°31.5	4°18.4	0.3 - 0.1	6.3 - 1.9	12.3 - 3.8
4	4°31.0	4°31.7	4°18.7	0.4 - 0.1	6.4 - 2.0	12.4 - 3.8
5	4°31.2	4°32.0	4°18.9	0.5 - 0.2	6.5 - 2.0	12.5 - 3.9
6	4°31.5	4°32.2	4°19.1	0.6 - 0.2	6.6 - 2.0	12.6 - 3.9
7	4°31.8	4°32.5	4°19.4	0.7 - 0.2	6.7 - 2.1	12.7 - 3.9
8	4°32.0	4°32.7	4°19.6	0.8 - 0.2	6.8 - 2.1	12.8 - 3.9
9	4°32.2	4°33.0	4°19.8	0.9 - 0.3	6.9 - 2.1	12.9 - 4.0
10	4°32.5	4°33.2	4°20.1	1.0 - 0.3	7.0 - 2.2	13.0 - 4.0
11	4°32.8	4°33.5	4°20.3	1.1 - 0.3	7.1 - 2.2	13.1 - 4.0
12	4°33.0	4°33.7	4°20.6	1.2 - 0.4	7.2 - 2.2	13.2 - 4.1
13	4°33.2	4°34.0	4°20.8	1.3 - 0.4	7.3 - 2.3	13.3 - 4.1
14	4°33.5	4°34.2	4°21.0	1.4 - 0.4	7.4 - 2.3	13.4 - 4.1
15	4°33.8	4°34.5	4°21.3	1.5 - 0.5	7.5 - 2.3	13.5 - 4.2
16	4°34.0	4°34.7	4°21.5	1.6 - 0.5	7.6 - 2.3	13.6 - 4.2
17	4°34.3	4°35.0	4°21.8	1.7 - 0.5	7.7 - 2.4	13.7 - 4.2
18	4°34.5	4°35.3	4°22.0	1.8 - 0.6	7.8 - 2.4	13.8 - 4.3
19	4°34.8	4°35.5	4°22.2	1.9 - 0.6	7.9 - 2.4	13.9 - 4.3
20	4°35.0	4°35.8	4°22.5	2.0 - 0.6	8.0 - 2.5	14.0 - 4.3
21	4°35.3	4°36.0	4°22.7	2.1 - 0.6	8.1 - 2.5	14.1 - 4.3
22	4°35.5	4°36.3	4°22.9	2.2 - 0.7	8.2 - 2.5	14.2 - 4.4
23	4°35.7	4°36.5	4°23.2	2.3 - 0.7	8.3 - 2.6	14.3 - 4.4
24	4°36.0	4°36.8	4°23.4	2.4 - 0.7	8.4 - 2.6	14.4 - 4.4
25	4°36.3	4°37.0	4°23.7	2.5 - 0.8	8.5 - 2.6	14.5 - 4.5
26	4°36.5	4°37.3	4°23.9	2.6 - 0.8	8.6 - 2.7	14.6 - 4.5
27	4°36.7	4°37.5	4°24.1	2.7 - 0.8	8.7 - 2.7	14.7 - 4.5
28	4°37.0	4°37.8	4°24.4	2.8 - 0.9	8.8 - 2.7	14.8 - 4.6
29	4°37.3	4°38.0	4°24.6	2.9 - 0.9	8.9 - 2.7	14.9 - 4.6
30	4°37.5	4°38.3	4°24.9	3.0 - 0.9	9.0 - 2.8	15.0 - 4.6
31	4°37.7	4°38.5	4°25.1	3.1 - 1.0	9.1 - 2.8	15.1 - 4.7
32	4°38.0	4°38.8	4°25.3	3.2 - 1.0	9.2 - 2.8	15.2 - 4.7
33	4°38.3	4°39.0	4°25.6	3.3 - 1.0	9.3 - 2.9	15.3 - 4.7
34	4°38.5	4°39.3	4°25.8	3.4 - 1.0	9.4 - 2.9	15.4 - 4.7
35	4°38.7	4°39.5	4°26.1	3.5 - 1.1	9.5 - 2.9	15.5 - 4.8
36	4°39.0	4°39.8	4°26.3	3.6 - 1.1	9.6 - 3.0	15.6 - 4.8
37	4°39.3	4°40.0	4°26.5	3.7 - 1.1	9.7 - 3.0	15.7 - 4.8
38	4°39.5	4°40.3	4°26.8	3.8 - 1.2	9.8 - 3.0	15.8 - 4.9
39	4°39.7	4°40.5	4°27.0	3.9 - 1.2	9.9 - 3.1	15.9 - 4.9
40	4°40.0	4°40.8	4°27.2	4.0 - 1.2	10.0 - 3.1	16.0 - 4.9
41	4°40.3	4°41.0	4°27.5	4.1 - 1.3	10.1 - 3.1	16.1 - 5.0
42	4°40.5	4°41.3	4°27.7	4.2 - 1.3	10.2 - 3.1	16.2 - 5.0
43	4°40.7	4°41.5	4°28.0	4.3 - 1.3	10.3 - 3.2	16.3 - 5.0
44	4°41.0	4°41.8	4°28.2	4.4 - 1.4	10.4 - 3.2	16.4 - 5.1
45	4°41.3	4°42.0	4°28.4	4.5 - 1.4	10.5 - 3.2	16.5 - 5.1
46	4°41.5	4°42.3	4°28.7	4.6 - 1.4	10.6 - 3.3	16.6 - 5.1
47	4°41.8	4°42.5	4°28.9	4.7 - 1.4	10.7 - 3.3	16.7 - 5.1
48	4°42.0	4°42.8	4°29.2	4.8 - 1.5	10.8 - 3.3	16.8 - 5.2
49	4°42.3	4°43.0	4°29.4	4.9 - 1.5	10.9 - 3.4	16.9 - 5.2
50	4°42.5	4°43.3	4°29.6	5.0 - 1.5	11.0 - 3.4	17.0 - 5.2
51	4°42.8	4°43.5	4°29.9	5.1 - 1.6	11.1 - 3.4	17.1 - 5.3
52	4°43.0	4°43.8	4°30.1	5.2 - 1.6	11.2 - 3.5	17.2 - 5.3
53	4°43.2	4°44.0	4°30.3	5.3 - 1.6	11.3 - 3.5	17.3 - 5.3
54	4°43.5	4°44.3	4°30.6	5.4 - 1.7	11.4 - 3.5	17.4 - 5.4
55	4°43.8	4°44.5	4°30.8	5.5 - 1.7	11.5 - 3.5	17.5 - 5.4
56	4°44.0	4°44.8	4°31.1	5.6 - 1.7	11.6 - 3.6	17.6 - 5.4
57	4°44.2	4°45.0	4°31.3	5.7 - 1.8	11.7 - 3.6	17.7 - 5.5
58	4°44.5	4°45.3	4°31.5	5.8 - 1.8	11.8 - 3.6	17.8 - 5.5
59	4°44.8	4°45.5	4°31.8	5.9 - 1.8	11.9 - 3.7	17.9 - 5.5

m	Sun	Aries	Moon	v and d corr		
19	Plan.					
0	4°45.0	4°45.8	4°32.0	0.0 - 0.0	6.0 - 2.0	12.0 - 3.9
1	4°45.2	4°46.0	4°32.3	0.1 - 0.0	6.1 - 2.0	12.1 - 3.9
2	4°45.5	4°46.3	4°32.5	0.2 - 0.1	6.2 - 2.0	12.2 - 4.0
3	4°45.8	4°46.5	4°32.7	0.3 - 0.1	6.3 - 2.0	12.3 - 4.0
4	4°46.0	4°46.8	4°33.0	0.4 - 0.1	6.4 - 2.1	12.4 - 4.0
5	4°46.2	4°47.0	4°33.2	0.5 - 0.2	6.5 - 2.1	12.5 - 4.1
6	4°46.5	4°47.3	4°33.4	0.6 - 0.2	6.6 - 2.1	12.6 - 4.1
7	4°46.8	4°47.5	4°33.7	0.7 - 0.2	6.7 - 2.2	12.7 - 4.1
8	4°47.0	4°47.8	4°33.9	0.8 - 0.3	6.8 - 2.2	12.8 - 4.2
9	4°47.2	4°48.0	4°34.2	0.9 - 0.3	6.9 - 2.2	12.9 - 4.2
10	4°47.5	4°48.3	4°34.4	1.0 - 0.3	7.0 - 2.3	13.0 - 4.2
11	4°47.8	4°48.5	4°34.6	1.1 - 0.4	7.1 - 2.3	13.1 - 4.3
12	4°48.0	4°48.8	4°34.9	1.2 - 0.4	7.2 - 2.3	13.2 - 4.3
13	4°48.2	4°49.0	4°35.1	1.3 - 0.4	7.3 - 2.4	13.3 - 4.3
14	4°48.5	4°49.3	4°35.4	1.4 - 0.5	7.4 - 2.4	13.4 - 4.4
15	4°48.8	4°49.5	4°35.6	1.5 - 0.5	7.5 - 2.4	13.5 - 4.4
16	4°49.0	4°49.8	4°35.8	1.6 - 0.5	7.6 - 2.5	13.6 - 4.4
17	4°49.3	4°50.0	4°36.1	1.7 - 0.6	7.7 - 2.5	13.7 - 4.5
18	4°49.5	4°50.3	4°36.3	1.8 - 0.6	7.8 - 2.5	13.8 - 4.5
19	4°49.8	4°50.5	4°36.6	1.9 - 0.6	7.9 - 2.6	13.9 - 4.5
20	4°50.0	4°50.8	4°36.8	2.0 - 0.7	8.0 - 2.6	14.0 - 4.5
21	4°50.3	4°51.0	4°37.0	2.1 - 0.7	8.1 - 2.6	14.1 - 4.6
22	4°50.5	4°51.3	4°37.3	2.2 - 0.7	8.2 - 2.7	14.2 - 4.6
23	4°50.7	4°51.5	4°37.5	2.3 - 0.7	8.3 - 2.7	14.3 - 4.6
24	4°51.0	4°51.8	4°37.7	2.4 - 0.8	8.4 - 2.7	14.4 - 4.7
25	4°51.3	4°52.0	4°38.0	2.5 - 0.8	8.5 - 2.8	14.5 - 4.7
26	4°51.5	4°52.3	4°38.2	2.6 - 0.8	8.6 - 2.8	14.6 - 4.7
27	4°51.7	4°52.5	4°38.5	2.7 - 0.9	8.7 - 2.8	14.7 - 4.8
28	4°52.0	4°52.8	4°38.7	2.8 - 0.9	8.8 - 2.9	14.8 - 4.8
29	4°52.3	4°53.0	4°38.9	2.9 - 0.9	8.9 - 2.9	14.9 - 4.8
30	4°52.5	4°53.3	4°39.2	3.0 - 1.0	9.0 - 2.9	15.0 - 4.9
31	4°52.7	4°53.6	4°39.4	3.1 - 1.0	9.1 - 3.0	15.1 - 4.9
32	4°53.0	4°53.8	4°39.7	3.2 - 1.0	9.2 - 3.0	15.2 - 4.9
33	4°53.3	4°54.1	4°39.9	3.3 - 1.1	9.3 - 3.0	15.3 - 5.0
34	4°53.5	4°54.3	4°40.1	3.4 - 1.1	9.4 - 3.1	15.4 - 5.0
35	4°53.7	4°54.6	4°40.4	3.5 - 1.1	9.5 - 3.1	15.5 - 5.0
36	4°54.0	4°54.8	4°40.6	3.6 - 1.2	9.6 - 3.1	15.6 - 5.1
37	4°54.3	4°55.1	4°40.8	3.7 - 1.2	9.7 - 3.2	15.7 - 5.1
38	4°54.5	4°55.3	4°41.1	3.8 - 1.2	9.8 - 3.2	15.8 - 5.1
39	4°54.7	4°55.6	4°41.3	3.9 - 1.3	9.9 - 3.2	15.9 - 5.2
40	4°55.0	4°55.8	4°41.6	4.0 - 1.3	10.0 - 3.3	16.0 - 5.2
41	4°55.3	4°56.1	4°41.8	4.1 - 1.3	10.1 - 3.3	16.1 - 5.2
42	4°55.5	4°56.3	4°42.0	4.2 - 1.4	10.2 - 3.3	16.2 - 5.3
43	4°55.7	4°56.6	4°42.3	4.3 - 1.4	10.3 - 3.3	16.3 - 5.3
44	4°56.0	4°56.8	4°42.5	4.4 - 1.4	10.4 - 3.4	16.4 - 5.3
45	4°56.3	4°57.1	4°42.8	4.5 - 1.5	10.5 - 3.4	16.5 - 5.4
46	4°56.5	4°57.3	4°43.0	4.6 - 1.5	10.6 - 3.4	16.6 - 5.4
47	4°56.8	4°57.6	4°43.2	4.7 - 1.5	10.7 - 3.5	16.7 - 5.4
48	4°57.0	4°57.8	4°43.5	4.8 - 1.6	10.8 - 3.5	16.8 - 5.5
49	4°57.3	4°58.1	4°43.7	4.9 - 1.6	10.9 - 3.5	16.9 - 5.5
50	4°57.5	4°58.3	4°43.9	5.0 - 1.6	11.0 - 3.6	17.0 - 5.5
51	4°57.8	4°58.6	4°44.2	5.1 - 1.7	11.1 - 3.6	17.1 - 5.6
52	4°58.0	4°58.8	4°44.4	5.2 - 1.7	11.2 - 3.6	17.2 - 5.6
53	4°58.2	4°59.1	4°44.7	5.3 - 1.7	11.3 - 3.7	17.3 - 5.6
54	4°58.5	4°59.3	4°44.9	5.4 - 1.8	11.4 - 3.7	17.4 - 5.7
55	4°58.8	4°59.6	4°45.1	5.5 - 1.8	11.5 - 3.7	17.5 - 5.7
56	4°59.0	4°59.8	4°45.4	5.6 - 1.8	11.6 - 3.8	17.6 - 5.7
57	4°59.2	5°00.1	4°45.6	5.7 - 1.9	11.7 - 3.8	17.7 - 5.8
58	4°59.5	5°00.3	4°45.9	5.8 - 1.9	11.8 - 3.8	17.8 - 5.8
59	4°59.8	5°00.6	4°46.1	5.9 - 1.9	11.9 - 3.9	17.9 - 5.8

m	Sun	Aries	Moon	v and d corr		
20	Plan.					
0	5°00.0	5°00.8	4°46.3	0.0 - 0.0	6.0 - 2.0	12.0 - 4.1
1	5°00.2	5°01.1	4°46.6	0.1 - 0.0	6.1 - 2.1	12.1 - 4.1
2	5°00.5	5°01.3	4°46.8	0.2 - 0.1	6.2 - 2.1	12.2 - 4.2
3	5°00.8	5°01.6	4°47.0	0.3 - 0.1	6.3 - 2.2	12.3 - 4.2
4	5°01.0	5°01.8	4°47.3	0.4 - 0.1	6.4 - 2.2	12.4 - 4.2
5	5°01.2	5°02.1	4°47.5	0.5 - 0.2	6.5 - 2.2	12.5 - 4.3
6	5°01.5	5°02.3	4°47.8	0.6 - 0.2	6.6 - 2.3	12.6 - 4.3
7	5°01.8	5°02.6	4°48.0	0.7 - 0.2	6.7 - 2.3	12.7 - 4.3
8	5°02.0	5°02.8	4°48.2	0.8 - 0.3	6.8 - 2.3	12.8 - 4.4
9	5°02.2	5°03.1	4°48.5	0.9 - 0.3	6.9 - 2.4	12.9 - 4.4
10	5°02.5	5°03.3	4°48.7	1.0 - 0.3	7.0 - 2.4	13.0 - 4.4
11	5°02.8	5°03.6	4°49.0	1.1 - 0.4	7.1 - 2.4	13.1 - 4.5
12	5°03.0	5°03.8	4°49.2	1.2 - 0.4	7.2 - 2.5	13.2 - 4.5
13	5°03.2	5°04.1	4°49.4	1.3 - 0.4	7.3 - 2.5	13.3 - 4.5
14	5°03.5	5°04.3	4°49.7	1.4 - 0.5	7.4 - 2.5	13.4 - 4.6
15	5°03.8	5°04.6	4°49.9	1.5 - 0.5	7.5 - 2.6	13.5 - 4.6
16	5°04.0	5°04.8	4°50.2	1.6 - 0.5	7.6 - 2.6	13.6 - 4.6
17	5°04.3	5°05.1	4°50.4	1.7 - 0.6	7.7 - 2.6	13.7 - 4.7
18	5°04.5	5°05.3	4°50.6	1.8 - 0.6	7.8 - 2.7	13.8 - 4.7
19	5°04.7	5°05.6	4°50.9	1.9 - 0.6	7.9 - 2.7	13.9 - 4.7
20	5°05.0	5°05.8	4°51.1	2.0 - 0.7	8.0 - 2.7	14.0 - 4.8
21	5°05.3	5°06.1	4°51.3	2.1 - 0.7	8.1 - 2.8	14.1 - 4.8
22	5°05.5	5°06.3	4°51.6	2.2 - 0.8	8.2 - 2.8	14.2 - 4.9
23	5°05.7	5°06.6	4°51.8	2.3 - 0.8	8.3 - 2.8	14.3 - 4.9
24	5°06.0	5°06.8	4°52.1	2.4 - 0.8	8.4 - 2.9	14.4 - 4.9
25	5°06.3	5°07.1	4°52.3	2.5 - 0.9	8.5 - 2.9	14.5 - 5.0
26	5°06.5	5°07.3	4°52.5	2.6 - 0.9	8.6 - 2.9	14.6 - 5.0
27	5°06.7	5°07.6	4°52.8	2.7 - 0.9	8.7 - 3.0	14.7 - 5.0
28	5°07.0	5°07.8	4°53.0	2.8 - 1.0	8.8 - 3.0	14.8 - 5.1
29	5°07.3	5°08.1	4°53.3	2.9 - 1.0	8.9 - 3.0	14.9 - 5.1
30	5°07.5	5°08.3	4°53.5	3.0 - 1.0	9.0 - 3.1	15.0 - 5.1
31	5°07.7	5°08.6	4°53.7	3.1 - 1.1	9.1 - 3.1	15.1 - 5.2
32	5°08.0	5°08.8	4°54.0	3.2 - 1.1	9.2 - 3.1	15.2 - 5.2
33	5°08.3	5°09.1	4°54.2	3.3 - 1.1	9.3 - 3.2	15.3 - 5.2
34	5°08.5	5°09.3	4°54.4	3.4 - 1.2	9.4 - 3.2	15.4 - 5.3
35	5°08.7	5°09.6	4°54.7	3.5 - 1.2	9.5 - 3.2	15.5 - 5.3
36	5°09.0	5°09.8	4°54.9	3.6 - 1.2	9.6 - 3.3	15.6 - 5.3
37	5°09.3	5°10.1	4°55.2	3.7 - 1.3	9.7 - 3.3	15.7 - 5.4
38	5°09.5	5°10.3	4°55.4	3.8 - 1.3	9.8 - 3.3	15.8 - 5.4
39	5°09.7	5°10.6	4°55.6	3.9 - 1.3	9.9 - 3.4	15.9 - 5.4
40	5°10.0	5°10.8	4°55.9	4.0 - 1.4	10.0 - 3.4	16.0 - 5.5
41	5°10.3	5°11.1	4°56.1	4.1 - 1.4	10.1 - 3.5	16.1 - 5.5
42	5°10.5	5°11.3	4°56.4	4.2 - 1.4	10.2 - 3.5	16.2 - 5.5
43	5°10.7	5°11.6	4°56.6	4.3 - 1.5	10.3 - 3.5	16.3 - 5.6
44	5°11.0	5°11.9	4°56.8	4.4 - 1.5	10.4 - 3.6	16.4 - 5.6
45	5°11.3	5°12.1	4°57.1	4.5 - 1.5	10.5 - 3.6	16.5 - 5.6
46	5°11.5	5°12.4	4°57.3	4.6 - 1.6	10.6 - 3.6	16.6 - 5.7
47	5°11.8	5°12.6	4°57.5	4.7 - 1.6	10.7 - 3.7	16.7 - 5.7
48	5°12.0	5°12.9	4°57.8	4.8 - 1.6	10.8 - 3.7	16.8 - 5.7
49	5°12.2	5°13.1	4°58.0	4.9 - 1.7	10.9 - 3.7	16.9 - 5.8
50	5°12.5	5°13.4	4°58.3	5.0 - 1.7	11.0 - 3.8	17.0 - 5.8
51	5°12.8	5°13.6	4°58.5	5.1 - 1.7	11.1 - 3.8	17.1 - 5.8
52	5°13.0	5°13.9	4°58.7	5.2 - 1.8	11.2 - 3.8	17.2 - 5.9
53	5°13.2	5°14.1	4°59.0	5.3 - 1.8	11.3 - 3.9	17.3 - 5.9
54	5°13.5	5°14.4	4°59.2	5.4 - 1.8	11.4 - 3.9	17.4 - 5.9
55	5°13.8	5°14.6	4°59.5	5.5 - 1.9	11.5 - 3.9	17.5 - 6.0
56	5°14.0	5°14.9	4°59.7	5.6 - 1.9	11.6 - 4.0	17.6 - 6.0
57	5°14.2	5°15.1	4°59.9	5.7 - 1.9	11.7 - 4.0	17.7 - 6.0
58	5°14.5	5°15.4	5°00.2	5.8 - 2.0	11.8 - 4.0	17.8 - 6.1
59	5°14.8	5°15.6	5°00.4	5.9 - 2.0	11.9 - 4.1	17.9 - 6.1

Increments and Corrections

m 21	Sun Plan.	Aries	Moon	v and d corr		
0	5°15.0	5°15.9	5°00.6	0.0 - 0.0	6.0 - 2.1	12.0 - 4.3
1	5°15.2	5°16.1	5°00.9	0.1 - 0.0	6.1 - 2.2	12.1 - 4.3
2	5°15.5	5°16.4	5°01.1	0.2 - 0.1	6.2 - 2.2	12.2 - 4.4
3	5°15.8	5°16.6	5°01.4	0.3 - 0.1	6.3 - 2.3	12.3 - 4.4
4	5°16.0	5°16.9	5°01.6	0.4 - 0.1	6.4 - 2.3	12.4 - 4.4
5	5°16.2	5°17.1	5°01.8	0.5 - 0.2	6.5 - 2.3	12.5 - 4.5
6	5°16.5	5°17.4	5°02.1	0.6 - 0.2	6.6 - 2.4	12.6 - 4.5
7	5°16.8	5°17.6	5°02.3	0.7 - 0.3	6.7 - 2.4	12.7 - 4.6
8	5°17.0	5°17.9	5°02.6	0.8 - 0.3	6.8 - 2.4	12.8 - 4.6
9	5°17.2	5°18.1	5°02.8	0.9 - 0.3	6.9 - 2.5	12.9 - 4.6
10	5°17.5	5°18.4	5°03.0	1.0 - 0.4	7.0 - 2.5	13.0 - 4.7
11	5°17.8	5°18.6	5°03.3	1.1 - 0.4	7.1 - 2.5	13.1 - 4.7
12	5°18.0	5°18.9	5°03.5	1.2 - 0.4	7.2 - 2.6	13.2 - 4.7
13	5°18.2	5°19.1	5°03.8	1.3 - 0.5	7.3 - 2.6	13.3 - 4.8
14	5°18.5	5°19.4	5°04.0	1.4 - 0.5	7.4 - 2.7	13.4 - 4.8
15	5°18.8	5°19.6	5°04.2	1.5 - 0.5	7.5 - 2.7	13.5 - 4.8
16	5°19.0	5°19.9	5°04.5	1.6 - 0.6	7.6 - 2.7	13.6 - 4.9
17	5°19.3	5°20.1	5°04.7	1.7 - 0.6	7.7 - 2.8	13.7 - 4.9
18	5°19.5	5°20.4	5°04.9	1.8 - 0.6	7.8 - 2.8	13.8 - 4.9
19	5°19.7	5°20.6	5°05.2	1.9 - 0.7	7.9 - 2.8	13.9 - 5.0
20	5°20.0	5°20.9	5°05.4	2.0 - 0.7	8.0 - 2.9	14.0 - 5.0
21	5°20.3	5°21.1	5°05.7	2.1 - 0.8	8.1 - 2.9	14.1 - 5.1
22	5°20.5	5°21.4	5°05.9	2.2 - 0.8	8.2 - 2.9	14.2 - 5.1
23	5°20.7	5°21.6	5°06.1	2.3 - 0.8	8.3 - 3.0	14.3 - 5.1
24	5°21.0	5°21.9	5°06.4	2.4 - 0.9	8.4 - 3.0	14.4 - 5.2
25	5°21.3	5°22.1	5°06.6	2.5 - 0.9	8.5 - 3.0	14.5 - 5.2
26	5°21.5	5°22.4	5°06.9	2.6 - 0.9	8.6 - 3.1	14.6 - 5.2
27	5°21.7	5°22.6	5°07.1	2.7 - 1.0	8.7 - 3.1	14.7 - 5.3
28	5°22.0	5°22.9	5°07.3	2.8 - 1.0	8.8 - 3.2	14.8 - 5.3
29	5°22.3	5°23.1	5°07.6	2.9 - 1.0	8.9 - 3.2	14.9 - 5.3
30	5°22.5	5°23.4	5°07.8	3.0 - 1.1	9.0 - 3.2	15.0 - 5.4
31	5°22.7	5°23.6	5°08.0	3.1 - 1.1	9.1 - 3.3	15.1 - 5.4
32	5°23.0	5°23.9	5°08.3	3.2 - 1.1	9.2 - 3.3	15.2 - 5.4
33	5°23.3	5°24.1	5°08.5	3.3 - 1.2	9.3 - 3.3	15.3 - 5.5
34	5°23.5	5°24.4	5°08.8	3.4 - 1.2	9.4 - 3.4	15.4 - 5.5
35	5°23.7	5°24.6	5°09.0	3.5 - 1.3	9.5 - 3.4	15.5 - 5.6
36	5°24.0	5°24.9	5°09.2	3.6 - 1.3	9.6 - 3.4	15.6 - 5.6
37	5°24.3	5°25.1	5°09.5	3.7 - 1.3	9.7 - 3.5	15.7 - 5.6
38	5°24.5	5°25.4	5°09.7	3.8 - 1.4	9.8 - 3.5	15.8 - 5.7
39	5°24.7	5°25.6	5°10.0	3.9 - 1.4	9.9 - 3.5	15.9 - 5.7
40	5°25.0	5°25.9	5°10.2	4.0 - 1.4	10.0 - 3.6	16.0 - 5.7
41	5°25.3	5°26.1	5°10.4	4.1 - 1.5	10.1 - 3.6	16.1 - 5.8
42	5°25.5	5°26.4	5°10.7	4.2 - 1.5	10.2 - 3.7	16.2 - 5.8
43	5°25.7	5°26.6	5°10.9	4.3 - 1.5	10.3 - 3.7	16.3 - 5.8
44	5°26.0	5°26.9	5°11.1	4.4 - 1.6	10.4 - 3.7	16.4 - 5.9
45	5°26.3	5°27.1	5°11.4	4.5 - 1.6	10.5 - 3.8	16.5 - 5.9
46	5°26.5	5°27.4	5°11.6	4.6 - 1.6	10.6 - 3.8	16.6 - 5.9
47	5°26.8	5°27.6	5°11.9	4.7 - 1.7	10.7 - 3.8	16.7 - 6.0
48	5°27.0	5°27.9	5°12.1	4.8 - 1.7	10.8 - 3.9	16.8 - 6.0
49	5°27.2	5°28.1	5°12.3	4.9 - 1.8	10.9 - 3.9	16.9 - 6.1
50	5°27.5	5°28.4	5°12.6	5.0 - 1.8	11.0 - 3.9	17.0 - 6.1
51	5°27.8	5°28.6	5°12.8	5.1 - 1.8	11.1 - 4.0	17.1 - 6.1
52	5°28.0	5°28.9	5°13.1	5.2 - 1.9	11.2 - 4.0	17.2 - 6.2
53	5°28.2	5°29.1	5°13.3	5.3 - 1.9	11.3 - 4.0	17.3 - 6.2
54	5°28.5	5°29.4	5°13.5	5.4 - 1.9	11.4 - 4.1	17.4 - 6.2
55	5°28.8	5°29.6	5°13.8	5.5 - 2.0	11.5 - 4.1	17.5 - 6.3
56	5°29.0	5°29.9	5°14.0	5.6 - 2.0	11.6 - 4.2	17.6 - 6.3
57	5°29.2	5°30.1	5°14.3	5.7 - 2.0	11.7 - 4.2	17.7 - 6.3
58	5°29.5	5°30.4	5°14.5	5.8 - 2.1	11.8 - 4.2	17.8 - 6.4
59	5°29.8	5°30.7	5°14.7	5.9 - 2.1	11.9 - 4.3	17.9 - 6.4

m 22	Sun Plan.	Aries	Moon	v and d corr		
0	5°30.0	5°30.9	5°15.0	0.0 - 0.0	6.0 - 2.3	12.0 - 4.5
1	5°30.2	5°31.2	5°15.2	0.1 - 0.0	6.1 - 2.3	12.1 - 4.5
2	5°30.5	5°31.4	5°15.4	0.2 - 0.1	6.2 - 2.3	12.2 - 4.6
3	5°30.8	5°31.7	5°15.7	0.3 - 0.1	6.3 - 2.4	12.3 - 4.6
4	5°31.0	5°31.9	5°15.9	0.4 - 0.2	6.4 - 2.4	12.4 - 4.7
5	5°31.2	5°32.2	5°16.2	0.5 - 0.2	6.5 - 2.4	12.5 - 4.7
6	5°31.5	5°32.4	5°16.4	0.6 - 0.2	6.6 - 2.5	12.6 - 4.7
7	5°31.8	5°32.7	5°16.6	0.7 - 0.3	6.7 - 2.5	12.7 - 4.8
8	5°32.0	5°32.9	5°16.9	0.8 - 0.3	6.8 - 2.5	12.8 - 4.8
9	5°32.2	5°33.2	5°17.1	0.9 - 0.3	6.9 - 2.6	12.9 - 4.8
10	5°32.5	5°33.4	5°17.4	1.0 - 0.4	7.0 - 2.6	13.0 - 4.9
11	5°32.8	5°33.7	5°17.6	1.1 - 0.4	7.1 - 2.7	13.1 - 4.9
12	5°33.0	5°33.9	5°17.8	1.2 - 0.5	7.2 - 2.7	13.2 - 4.9
13	5°33.2	5°34.2	5°18.1	1.3 - 0.5	7.3 - 2.7	13.3 - 5.0
14	5°33.5	5°34.4	5°18.3	1.4 - 0.5	7.4 - 2.8	13.4 - 5.0
15	5°33.8	5°34.7	5°18.5	1.5 - 0.6	7.5 - 2.8	13.5 - 5.1
16	5°34.0	5°34.9	5°18.8	1.6 - 0.6	7.6 - 2.8	13.6 - 5.1
17	5°34.3	5°35.2	5°19.0	1.7 - 0.6	7.7 - 2.9	13.7 - 5.1
18	5°34.5	5°35.4	5°19.3	1.8 - 0.7	7.8 - 2.9	13.8 - 5.2
19	5°34.8	5°35.7	5°19.5	1.9 - 0.7	7.9 - 3.0	13.9 - 5.2
20	5°35.0	5°35.9	5°19.7	2.0 - 0.8	8.0 - 3.0	14.0 - 5.3
21	5°35.3	5°36.2	5°20.0	2.1 - 0.8	8.1 - 3.0	14.1 - 5.3
22	5°35.5	5°36.4	5°20.2	2.2 - 0.8	8.2 - 3.1	14.2 - 5.3
23	5°35.7	5°36.7	5°20.5	2.3 - 0.9	8.3 - 3.1	14.3 - 5.4
24	5°36.0	5°36.9	5°20.7	2.4 - 0.9	8.4 - 3.2	14.4 - 5.4
25	5°36.3	5°37.2	5°20.9	2.5 - 0.9	8.5 - 3.2	14.5 - 5.4
26	5°36.5	5°37.4	5°21.2	2.6 - 1.0	8.6 - 3.2	14.6 - 5.5
27	5°36.7	5°37.7	5°21.4	2.7 - 1.0	8.7 - 3.3	14.7 - 5.5
28	5°37.0	5°37.9	5°21.6	2.8 - 1.1	8.8 - 3.3	14.8 - 5.6
29	5°37.3	5°38.2	5°21.9	2.9 - 1.1	8.9 - 3.3	14.9 - 5.6
30	5°37.5	5°38.4	5°22.1	3.0 - 1.1	9.0 - 3.4	15.0 - 5.6
31	5°37.7	5°38.7	5°22.4	3.1 - 1.2	9.1 - 3.4	15.1 - 5.7
32	5°38.0	5°38.9	5°22.6	3.2 - 1.2	9.2 - 3.4	15.2 - 5.7
33	5°38.3	5°39.2	5°22.8	3.3 - 1.2	9.3 - 3.5	15.3 - 5.7
34	5°38.5	5°39.4	5°23.1	3.4 - 1.3	9.4 - 3.5	15.4 - 5.8
35	5°38.7	5°39.7	5°23.3	3.5 - 1.3	9.5 - 3.6	15.5 - 5.8
36	5°39.0	5°39.9	5°23.6	3.6 - 1.4	9.6 - 3.6	15.6 - 5.8
37	5°39.3	5°40.2	5°23.8	3.7 - 1.4	9.7 - 3.6	15.7 - 5.9
38	5°39.5	5°40.4	5°24.0	3.8 - 1.4	9.8 - 3.7	15.8 - 5.9
39	5°39.7	5°40.7	5°24.3	3.9 - 1.5	9.9 - 3.7	15.9 - 6.0
40	5°40.0	5°40.9	5°24.5	4.0 - 1.5	10.0 - 3.8	16.0 - 6.0
41	5°40.3	5°41.2	5°24.7	4.1 - 1.5	10.1 - 3.8	16.1 - 6.0
42	5°40.5	5°41.4	5°25.0	4.2 - 1.6	10.2 - 3.8	16.2 - 6.1
43	5°40.7	5°41.7	5°25.2	4.3 - 1.6	10.3 - 3.9	16.3 - 6.1
44	5°41.0	5°41.9	5°25.5	4.4 - 1.7	10.4 - 3.9	16.4 - 6.1
45	5°41.3	5°42.2	5°25.7	4.5 - 1.7	10.5 - 3.9	16.5 - 6.2
46	5°41.5	5°42.4	5°25.9	4.6 - 1.7	10.6 - 4.0	16.6 - 6.2
47	5°41.8	5°42.7	5°26.2	4.7 - 1.8	10.7 - 4.0	16.7 - 6.3
48	5°42.0	5°42.9	5°26.4	4.8 - 1.8	10.8 - 4.1	16.8 - 6.3
49	5°42.3	5°43.2	5°26.7	4.9 - 1.8	10.9 - 4.1	16.9 - 6.3
50	5°42.5	5°43.4	5°26.9	5.0 - 1.9	11.0 - 4.1	17.0 - 6.4
51	5°42.8	5°43.7	5°27.1	5.1 - 1.9	11.1 - 4.2	17.1 - 6.4
52	5°43.0	5°43.9	5°27.4	5.2 - 2.0	11.2 - 4.2	17.2 - 6.4
53	5°43.2	5°44.2	5°27.6	5.3 - 2.0	11.3 - 4.2	17.3 - 6.5
54	5°43.5	5°44.4	5°27.9	5.4 - 2.0	11.4 - 4.3	17.4 - 6.5
55	5°43.8	5°44.7	5°28.1	5.5 - 2.1	11.5 - 4.3	17.5 - 6.6
56	5°44.0	5°44.9	5°28.3	5.6 - 2.1	11.6 - 4.4	17.6 - 6.6
57	5°44.2	5°45.2	5°28.6	5.7 - 2.1	11.7 - 4.4	17.7 - 6.6
58	5°44.5	5°45.4	5°28.8	5.8 - 2.2	11.8 - 4.4	17.8 - 6.7
59	5°44.8	5°45.7	5°29.0	5.9 - 2.2	11.9 - 4.5	17.9 - 6.7

m 23	Sun Plan.	Aries	Moon	v and d corr		
0	5°45.0	5°45.9	5°29.3	0.0 - 0.0	6.0 - 2.4	12.0 - 4.7
1	5°45.2	5°46.2	5°29.5	0.1 - 0.0	6.1 - 2.4	12.1 - 4.7
2	5°45.5	5°46.4	5°29.8	0.2 - 0.1	6.2 - 2.4	12.2 - 4.8
3	5°45.8	5°46.7	5°30.0	0.3 - 0.1	6.3 - 2.5	12.3 - 4.8
4	5°46.0	5°46.9	5°30.2	0.4 - 0.2	6.4 - 2.5	12.4 - 4.9
5	5°46.2	5°47.2	5°30.5	0.5 - 0.2	6.5 - 2.5	12.5 - 4.9
6	5°46.5	5°47.4	5°30.7	0.6 - 0.2	6.6 - 2.6	12.6 - 4.9
7	5°46.8	5°47.7	5°31.0	0.7 - 0.3	6.7 - 2.6	12.7 - 5.0
8	5°47.0	5°47.9	5°31.2	0.8 - 0.3	6.8 - 2.7	12.8 - 5.0
9	5°47.2	5°48.2	5°31.4	0.9 - 0.4	6.9 - 2.7	12.9 - 5.1
10	5°47.5	5°48.4	5°31.7	1.0 - 0.4	7.0 - 2.7	13.0 - 5.1
11	5°47.8	5°48.7	5°31.9	1.1 - 0.4	7.1 - 2.8	13.1 - 5.1
12	5°48.0	5°49.0	5°32.1	1.2 - 0.5	7.2 - 2.8	13.2 - 5.2
13	5°48.2	5°49.2	5°32.4	1.3 - 0.5	7.3 - 2.9	13.3 - 5.2
14	5°48.5	5°49.5	5°32.6	1.4 - 0.5	7.4 - 2.9	13.4 - 5.2
15	5°48.8	5°49.7	5°32.9	1.5 - 0.6	7.5 - 2.9	13.5 - 5.3
16	5°49.0	5°50.0	5°33.1	1.6 - 0.6	7.6 - 3.0	13.6 - 5.3
17	5°49.3	5°50.2	5°33.3	1.7 - 0.7	7.7 - 3.0	13.7 - 5.4
18	5°49.5	5°50.5	5°33.6	1.8 - 0.7	7.8 - 3.1	13.8 - 5.4
19	5°49.8	5°50.7	5°33.8	1.9 - 0.7	7.9 - 3.1	13.9 - 5.4
20	5°50.0	5°51.0	5°34.1	2.0 - 0.8	8.0 - 3.1	14.0 - 5.5
21	5°50.3	5°51.2	5°34.3	2.1 - 0.8	8.1 - 3.2	14.1 - 5.5
22	5°50.5	5°51.5	5°34.5	2.2 - 0.9	8.2 - 3.2	14.2 - 5.6
23	5°50.7	5°51.7	5°34.8	2.3 - 0.9	8.3 - 3.3	14.3 - 5.6
24	5°51.0	5°52.0	5°35.0	2.4 - 0.9	8.4 - 3.3	14.4 - 5.6
25	5°51.3	5°52.2	5°35.2	2.5 - 1.0	8.5 - 3.3	14.5 - 5.7
26	5°51.5	5°52.5	5°35.5	2.6 - 1.0	8.6 - 3.4	14.6 - 5.7
27	5°51.7	5°52.7	5°35.7	2.7 - 1.1	8.7 - 3.4	14.7 - 5.8
28	5°52.0	5°53.0	5°36.0	2.8 - 1.1	8.8 - 3.4	14.8 - 5.8
29	5°52.3	5°53.2	5°36.2	2.9 - 1.1	8.9 - 3.5	14.9 - 5.8
30	5°52.5	5°53.5	5°36.4	3.0 - 1.2	9.0 - 3.5	15.0 - 5.9
31	5°52.7	5°53.7	5°36.7	3.1 - 1.2	9.1 - 3.6	15.1 - 5.9
32	5°53.0	5°54.0	5°36.9	3.2 - 1.3	9.2 - 3.6	15.2 - 6.0
33	5°53.3	5°54.2	5°37.2	3.3 - 1.3	9.3 - 3.6	15.3 - 6.0
34	5°53.5	5°54.5	5°37.4	3.4 - 1.3	9.4 - 3.7	15.4 - 6.0
35	5°53.7	5°54.7	5°37.6	3.5 - 1.4	9.5 - 3.7	15.5 - 6.1
36	5°54.0	5°55.0	5°37.9	3.6 - 1.4	9.6 - 3.8	15.6 - 6.1
37	5°54.3	5°55.2	5°38.1	3.7 - 1.4	9.7 - 3.8	15.7 - 6.1
38	5°54.5	5°55.5	5°38.4	3.8 - 1.5	9.8 - 3.8	15.8 - 6.2
39	5°54.7	5°55.7	5°38.6	3.9 - 1.5	9.9 - 3.9	15.9 - 6.2
40	5°55.0	5°56.0	5°38.8	4.0 - 1.6	10.0 - 3.9	16.0 - 6.3
41	5°55.3	5°56.2	5°39.1	4.1 - 1.6	10.1 - 4.0	16.1 - 6.3
42	5°55.5	5°56.5	5°39.3	4.2 - 1.6	10.2 - 4.0	16.2 - 6.3
43	5°55.7	5°56.7	5°39.5	4.3 - 1.7	10.3 - 4.0	16.3 - 6.4
44	5°56.0	5°57.0	5°39.8	4.4 - 1.7	10.4 - 4.1	16.4 - 6.4
45	5°56.3	5°57.2	5°40.0	4.5 - 1.8	10.5 - 4.1	16.5 - 6.5
46	5°56.5	5°57.5	5°40.3	4.6 - 1.8	10.6 - 4.2	16.6 - 6.5
47	5°56.8	5°57.7	5°40.5	4.7 - 1.8	10.7 - 4.2	16.7 - 6.5
48	5°57.0	5°58.0	5°40.7	4.8 - 1.9	10.8 - 4.2	16.8 - 6.6
49	5°57.3	5°58.2	5°41.0	4.9 - 1.9	10.9 - 4.3	16.9 - 6.6
50	5°57.5	5°58.5	5°41.2	5.0 - 2.0	11.0 - 4.3	17.0 - 6.7
51	5°57.8	5°58.7	5°41.5	5.1 - 2.0	11.1 - 4.3	17.1 - 6.7
52	5°58.0	5°59.0	5°41.7	5.2 - 2.0	11.2 - 4.4	17.2 - 6.7
53	5°58.2	5°59.2	5°41.9	5.3 - 2.1	11.3 - 4.4	17.3 - 6.8
54	5°58.5	5°59.5	5°42.2	5.4 - 2.1	11.4 - 4.5	17.4 - 6.8
55	5°58.8	5°59.7	5°42.4	5.5 - 2.2	11.5 - 4.5	17.5 - 6.9
56	5°59.0	6°00.0	5°42.6	5.6 - 2.2	11.6 - 4.5	17.6 - 6.9
57	5°59.2	6°00.2	5°42.9	5.7 - 2.2	11.7 - 4.6	17.7 - 6.9
58	5°59.5	6°00.5	5°43.1	5.8 - 2.3	11.8 - 4.6	17.8 - 7.0
59	5°59.8	6°00.7	5°43.4	5.9 - 2.3	11.9 - 4.7	17.9 - 7.0

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
24	Plan.					
0	6°00.0	6°01.0	5°43.6	0.0 - 0.0	6.0 - 2.5	12.0 - 4.9
1	6°00.2	6°01.2	5°43.8	0.1 - 0.0	6.1 - 2.5	12.1 - 4.9
2	6°00.5	6°01.5	5°44.1	0.2 - 0.1	6.2 - 2.5	12.2 - 5.0
3	6°00.8	6°01.7	5°44.3	0.3 - 0.1	6.3 - 2.6	12.3 - 5.0
4	6°01.0	6°02.0	5°44.6	0.4 - 0.2	6.4 - 2.6	12.4 - 5.1
5	6°01.2	6°02.2	5°44.8	0.5 - 0.2	6.5 - 2.7	12.5 - 5.1
6	6°01.5	6°02.5	5°45.0	0.6 - 0.2	6.6 - 2.7	12.6 - 5.1
7	6°01.8	6°02.7	5°45.3	0.7 - 0.3	6.7 - 2.7	12.7 - 5.2
8	6°02.0	6°03.0	5°45.5	0.8 - 0.3	6.8 - 2.8	12.8 - 5.2
9	6°02.2	6°03.2	5°45.7	0.9 - 0.4	6.9 - 2.8	12.9 - 5.3
10	6°02.5	6°03.5	5°46.0	1.0 - 0.4	7.0 - 2.9	13.0 - 5.3
11	6°02.8	6°03.7	5°46.2	1.1 - 0.4	7.1 - 2.9	13.1 - 5.3
12	6°03.0	6°04.0	5°46.5	1.2 - 0.5	7.2 - 2.9	13.2 - 5.4
13	6°03.2	6°04.2	5°46.7	1.3 - 0.5	7.3 - 3.0	13.3 - 5.4
14	6°03.5	6°04.5	5°46.9	1.4 - 0.6	7.4 - 3.0	13.4 - 5.5
15	6°03.8	6°04.7	5°47.2	1.5 - 0.6	7.5 - 3.1	13.5 - 5.5
16	6°04.0	6°05.0	5°47.4	1.6 - 0.7	7.6 - 3.1	13.6 - 5.6
17	6°04.3	6°05.2	5°47.7	1.7 - 0.7	7.7 - 3.1	13.7 - 5.6
18	6°04.5	6°05.5	5°47.9	1.8 - 0.7	7.8 - 3.2	13.8 - 5.6
19	6°04.7	6°05.7	5°48.1	1.9 - 0.8	7.9 - 3.2	13.9 - 5.7
20	6°05.0	6°06.0	5°48.4	2.0 - 0.8	8.0 - 3.3	14.0 - 5.7
21	6°05.3	6°06.2	5°48.6	2.1 - 0.9	8.1 - 3.3	14.1 - 5.8
22	6°05.5	6°06.5	5°48.8	2.2 - 0.9	8.2 - 3.3	14.2 - 5.8
23	6°05.7	6°06.7	5°49.1	2.3 - 0.9	8.3 - 3.4	14.3 - 5.8
24	6°06.0	6°07.0	5°49.3	2.4 - 1.0	8.4 - 3.4	14.4 - 5.9
25	6°06.3	6°07.3	5°49.6	2.5 - 1.0	8.5 - 3.5	14.5 - 5.9
26	6°06.5	6°07.5	5°49.8	2.6 - 1.1	8.6 - 3.5	14.6 - 6.0
27	6°06.7	6°07.8	5°50.0	2.7 - 1.1	8.7 - 3.6	14.7 - 6.0
28	6°07.0	6°08.0	5°50.3	2.8 - 1.1	8.8 - 3.6	14.8 - 6.0
29	6°07.3	6°08.3	5°50.5	2.9 - 1.2	8.9 - 3.6	14.9 - 6.1
30	6°07.5	6°08.5	5°50.8	3.0 - 1.2	9.0 - 3.7	15.0 - 6.1
31	6°07.7	6°08.8	5°51.0	3.1 - 1.3	9.1 - 3.7	15.1 - 6.2
32	6°08.0	6°09.0	5°51.2	3.2 - 1.3	9.2 - 3.8	15.2 - 6.2
33	6°08.3	6°09.3	5°51.5	3.3 - 1.3	9.3 - 3.8	15.3 - 6.2
34	6°08.5	6°09.5	5°51.7	3.4 - 1.4	9.4 - 3.8	15.4 - 6.3
35	6°08.7	6°09.8	5°52.0	3.5 - 1.4	9.5 - 3.9	15.5 - 6.3
36	6°09.0	6°10.0	5°52.2	3.6 - 1.5	9.6 - 3.9	15.6 - 6.4
37	6°09.3	6°10.3	5°52.4	3.7 - 1.5	9.7 - 4.0	15.7 - 6.4
38	6°09.5	6°10.5	5°52.7	3.8 - 1.6	9.8 - 4.0	15.8 - 6.5
39	6°09.7	6°10.8	5°52.9	3.9 - 1.6	9.9 - 4.0	15.9 - 6.5
40	6°10.0	6°11.0	5°53.1	4.0 - 1.6	10.0 - 4.1	16.0 - 6.5
41	6°10.3	6°11.3	5°53.4	4.1 - 1.7	10.1 - 4.1	16.1 - 6.6
42	6°10.5	6°11.5	5°53.6	4.2 - 1.7	10.2 - 4.2	16.2 - 6.6
43	6°10.7	6°11.8	5°53.9	4.3 - 1.8	10.3 - 4.2	16.3 - 6.7
44	6°11.0	6°12.0	5°54.1	4.4 - 1.8	10.4 - 4.2	16.4 - 6.7
45	6°11.3	6°12.3	5°54.3	4.5 - 1.8	10.5 - 4.3	16.5 - 6.7
46	6°11.5	6°12.5	5°54.6	4.6 - 1.9	10.6 - 4.3	16.6 - 6.8
47	6°11.8	6°12.8	5°54.8	4.7 - 1.9	10.7 - 4.4	16.7 - 6.8
48	6°12.0	6°13.0	5°55.1	4.8 - 2.0	10.8 - 4.4	16.8 - 6.9
49	6°12.2	6°13.3	5°55.3	4.9 - 2.0	10.9 - 4.5	16.9 - 6.9
50	6°12.5	6°13.5	5°55.5	5.0 - 2.0	11.0 - 4.5	17.0 - 6.9
51	6°12.8	6°13.8	5°55.8	5.1 - 2.1	11.1 - 4.5	17.1 - 7.0
52	6°13.0	6°14.0	5°56.0	5.2 - 2.1	11.2 - 4.6	17.2 - 7.0
53	6°13.2	6°14.3	5°56.2	5.3 - 2.2	11.3 - 4.6	17.3 - 7.1
54	6°13.5	6°14.5	5°56.5	5.4 - 2.2	11.4 - 4.7	17.4 - 7.1
55	6°13.8	6°14.8	5°56.7	5.5 - 2.2	11.5 - 4.7	17.5 - 7.1
56	6°14.0	6°15.0	5°57.0	5.6 - 2.3	11.6 - 4.7	17.6 - 7.2
57	6°14.2	6°15.3	5°57.2	5.7 - 2.3	11.7 - 4.8	17.7 - 7.2
58	6°14.5	6°15.5	5°57.4	5.8 - 2.4	11.8 - 4.8	17.8 - 7.3
59	6°14.8	6°15.8	5°57.7	5.9 - 2.4	11.9 - 4.9	17.9 - 7.3

m	Sun	Aries	Moon	v and d corr		
25	Plan.					
0	6°15.0	6°16.0	5°57.9	0.0 - 0.0	6.0 - 2.5	12.0 - 5.1
1	6°15.2	6°16.3	5°58.2	0.1 - 0.0	6.1 - 2.6	12.1 - 5.1
2	6°15.5	6°16.5	5°58.4	0.2 - 0.1	6.2 - 2.6	12.2 - 5.2
3	6°15.8	6°16.8	5°58.6	0.3 - 0.1	6.3 - 2.7	12.3 - 5.2
4	6°16.0	6°17.0	5°58.9	0.4 - 0.2	6.4 - 2.7	12.4 - 5.3
5	6°16.2	6°17.3	5°59.1	0.5 - 0.2	6.5 - 2.8	12.5 - 5.3
6	6°16.5	6°17.5	5°59.3	0.6 - 0.3	6.6 - 2.8	12.6 - 5.4
7	6°16.8	6°17.8	5°59.6	0.7 - 0.3	6.7 - 2.8	12.7 - 5.4
8	6°17.0	6°18.0	5°59.8	0.8 - 0.3	6.8 - 2.9	12.8 - 5.4
9	6°17.2	6°18.3	6°00.1	0.9 - 0.4	6.9 - 2.9	12.9 - 5.5
10	6°17.5	6°18.5	6°00.3	1.0 - 0.4	7.0 - 3.0	13.0 - 5.5
11	6°17.8	6°18.8	6°00.5	1.1 - 0.5	7.1 - 3.0	13.1 - 5.6
12	6°18.0	6°19.0	6°00.8	1.2 - 0.5	7.2 - 3.1	13.2 - 5.6
13	6°18.2	6°19.3	6°01.0	1.3 - 0.6	7.3 - 3.1	13.3 - 5.7
14	6°18.5	6°19.5	6°01.3	1.4 - 0.6	7.4 - 3.1	13.4 - 5.7
15	6°18.8	6°19.8	6°01.5	1.5 - 0.6	7.5 - 3.2	13.5 - 5.7
16	6°19.0	6°20.0	6°01.7	1.6 - 0.7	7.6 - 3.2	13.6 - 5.8
17	6°19.3	6°20.3	6°02.0	1.7 - 0.7	7.7 - 3.3	13.7 - 5.8
18	6°19.5	6°20.5	6°02.2	1.8 - 0.8	7.8 - 3.3	13.8 - 5.9
19	6°19.7	6°20.8	6°02.5	1.9 - 0.8	7.9 - 3.4	13.9 - 5.9
20	6°20.0	6°21.0	6°02.7	2.0 - 0.8	8.0 - 3.4	14.0 - 6.0
21	6°20.3	6°21.3	6°02.9	2.1 - 0.9	8.1 - 3.4	14.1 - 6.0
22	6°20.5	6°21.5	6°03.2	2.2 - 0.9	8.2 - 3.5	14.2 - 6.0
23	6°20.7	6°21.8	6°03.4	2.3 - 1.0	8.3 - 3.5	14.3 - 6.1
24	6°21.0	6°22.0	6°03.6	2.4 - 1.0	8.4 - 3.6	14.4 - 6.1
25	6°21.3	6°22.3	6°03.9	2.5 - 1.1	8.5 - 3.6	14.5 - 6.2
26	6°21.5	6°22.5	6°04.1	2.6 - 1.1	8.6 - 3.7	14.6 - 6.2
27	6°21.7	6°22.8	6°04.4	2.7 - 1.1	8.7 - 3.7	14.7 - 6.2
28	6°22.0	6°23.0	6°04.6	2.8 - 1.2	8.8 - 3.7	14.8 - 6.3
29	6°22.3	6°23.3	6°04.8	2.9 - 1.2	8.9 - 3.8	14.9 - 6.3
30	6°22.5	6°23.5	6°05.1	3.0 - 1.3	9.0 - 3.8	15.0 - 6.4
31	6°22.7	6°23.8	6°05.3	3.1 - 1.3	9.1 - 3.9	15.1 - 6.4
32	6°23.0	6°24.0	6°05.6	3.2 - 1.4	9.2 - 3.9	15.2 - 6.5
33	6°23.3	6°24.3	6°05.8	3.3 - 1.4	9.3 - 4.0	15.3 - 6.5
34	6°23.5	6°24.5	6°06.0	3.4 - 1.4	9.4 - 4.0	15.4 - 6.5
35	6°23.7	6°24.8	6°06.3	3.5 - 1.5	9.5 - 4.0	15.5 - 6.6
36	6°24.0	6°25.0	6°06.5	3.6 - 1.5	9.6 - 4.1	15.6 - 6.6
37	6°24.3	6°25.3	6°06.7	3.7 - 1.6	9.7 - 4.1	15.7 - 6.7
38	6°24.5	6°25.6	6°07.0	3.8 - 1.6	9.8 - 4.2	15.8 - 6.7
39	6°24.7	6°25.8	6°07.2	3.9 - 1.7	9.9 - 4.2	15.9 - 6.8
40	6°25.0	6°26.1	6°07.5	4.0 - 1.7	10.0 - 4.3	16.0 - 6.8
41	6°25.3	6°26.3	6°07.7	4.1 - 1.7	10.1 - 4.3	16.1 - 6.8
42	6°25.5	6°26.6	6°07.9	4.2 - 1.8	10.2 - 4.3	16.2 - 6.9
43	6°25.7	6°26.8	6°08.2	4.3 - 1.8	10.3 - 4.4	16.3 - 6.9
44	6°26.0	6°27.1	6°08.4	4.4 - 1.9	10.4 - 4.4	16.4 - 7.0
45	6°26.3	6°27.3	6°08.7	4.5 - 1.9	10.5 - 4.5	16.5 - 7.0
46	6°26.5	6°27.6	6°08.9	4.6 - 2.0	10.6 - 4.5	16.6 - 7.1
47	6°26.8	6°27.8	6°09.1	4.7 - 2.0	10.7 - 4.5	16.7 - 7.1
48	6°27.0	6°28.1	6°09.4	4.8 - 2.0	10.8 - 4.6	16.8 - 7.1
49	6°27.2	6°28.3	6°09.6	4.9 - 2.1	10.9 - 4.6	16.9 - 7.2
50	6°27.5	6°28.6	6°09.8	5.0 - 2.1	11.0 - 4.7	17.0 - 7.2
51	6°27.8	6°28.8	6°10.1	5.1 - 2.2	11.1 - 4.7	17.1 - 7.3
52	6°28.0	6°29.1	6°10.3	5.2 - 2.2	11.2 - 4.8	17.2 - 7.3
53	6°28.2	6°29.3	6°10.6	5.3 - 2.3	11.3 - 4.8	17.3 - 7.4
54	6°28.5	6°29.6	6°10.8	5.4 - 2.3	11.4 - 4.8	17.4 - 7.4
55	6°28.8	6°29.8	6°11.0	5.5 - 2.3	11.5 - 4.9	17.5 - 7.4
56	6°29.0	6°30.1	6°11.3	5.6 - 2.4	11.6 - 4.9	17.6 - 7.5
57	6°29.2	6°30.3	6°11.5	5.7 - 2.4	11.7 - 5.0	17.7 - 7.5
58	6°29.5	6°30.6	6°11.8	5.8 - 2.5	11.8 - 5.0	17.8 - 7.6
59	6°29.8	6°30.8	6°12.0	5.9 - 2.5	11.9 - 5.1	17.9 - 7.6

m	Sun	Aries	Moon	v and d corr		
26	Plan.					
0	6°30.0	6°31.1	6°12.2	0.0 - 0.0	6.0 - 2.6	12.0 - 5.3
1	6°30.2	6°31.3	6°12.5	0.1 - 0.0	6.1 - 2.7	12.1 - 5.3
2	6°30.5	6°31.6	6°12.7	0.2 - 0.1	6.2 - 2.7	12.2 - 5.4
3	6°30.8	6°31.8	6°12.9	0.3 - 0.1	6.3 - 2.8	12.3 - 5.4
4	6°31.0	6°32.1	6°13.2	0.4 - 0.2	6.4 - 2.8	12.4 - 5.5
5	6°31.2	6°32.3	6°13.4	0.5 - 0.2	6.5 - 2.9	12.5 - 5.5
6	6°31.5	6°32.6	6°13.7	0.6 - 0.3	6.6 - 2.9	12.6 - 5.6
7	6°31.8	6°32.8	6°13.9	0.7 - 0.3	6.7 - 3.0	12.7 - 5.6
8	6°32.0	6°33.1	6°14.1	0.8 - 0.4	6.8 - 3.0	12.8 - 5.7
9	6°32.2	6°33.3	6°14.4	0.9 - 0.4	6.9 - 3.0	12.9 - 5.7
10	6°32.5	6°33.6	6°14.6	1.0 - 0.4	7.0 - 3.1	13.0 - 5.7
11	6°32.8	6°33.8	6°14.9	1.1 - 0.5	7.1 - 3.1	13.1 - 5.8
12	6°33.0	6°34.1	6°15.1	1.2 - 0.5	7.2 - 3.2	13.2 - 5.8
13	6°33.2	6°34.3	6°15.3	1.3 - 0.6	7.3 - 3.2	13.3 - 5.9
14	6°33.5	6°34.6	6°15.6	1.4 - 0.6	7.4 - 3.3	13.4 - 5.9
15	6°33.8	6°34.8	6°15.8	1.5 - 0.7	7.5 - 3.3	13.5 - 6.0
16	6°34.0	6°35.1	6°16.1	1.6 - 0.7	7.6 - 3.4	13.6 - 6.0
17	6°34.3	6°35.3	6°16.3	1.7 - 0.8	7.7 - 3.4	13.7 - 6.1
18	6°34.5	6°35.6	6°16.5	1.8 - 0.8	7.8 - 3.4	13.8 - 6.1
19	6°34.8	6°35.8	6°16.8	1.9 - 0.8	7.9 - 3.5	13.9 - 6.1
20	6°35.0	6°36.1	6°17.0	2.0 - 0.9	8.0 - 3.5	14.0 - 6.2
21	6°35.3	6°36.3	6°17.2	2.1 - 0.9	8.1 - 3.6	14.1 - 6.2
22	6°35.5	6°36.6	6°17.5	2.2 - 1.0	8.2 - 3.6	14.2 - 6.3
23	6°35.7	6°36.8	6°17.7	2.3 - 1.0	8.3 - 3.7	14.3 - 6.3
24	6°36.0	6°37.1	6°18.0	2.4 - 1.1	8.4 - 3.7	14.4 - 6.4
25	6°36.3	6°37.3	6°18.2	2.5 - 1.1	8.5 - 3.8	14.5 - 6.4
26	6°36.5	6°37.6	6°18.4	2.6 - 1.1	8.6 - 3.8	14.6 - 6.4
27	6°36.7	6°37.8	6°18.7	2.7 - 1.2	8.7 - 3.8	14.7 - 6.5
28	6°37.0	6°38.1	6°18.9	2.8 - 1.2	8.8 - 3.9	14.8 - 6.5
29	6°37.3	6°38.3	6°19.2	2.9 - 1.3	8.9 - 3.9	14.9 - 6.6
30	6°37.5	6°38.6	6°19.4	3.0 - 1.3	9.0 - 4.0	15.0 - 6.6
31	6°37.7	6°38.8	6°19.6	3.1 - 1.4	9.1 - 4.0	15.1 - 6.7
32	6°38.0	6°39.1	6°19.9	3.2 - 1.4	9.2 - 4.1	15.2 - 6.7
33	6°38.3	6°39.3	6°20.1	3.3 - 1.5	9.3 - 4.1	15.3 - 6.8
34	6°38.5	6°39.6	6°20.3	3.4 - 1.5	9.4 - 4.2	15.4 - 6.8
35	6°38.7	6°39.8	6°20.6	3.5 - 1.5	9.5 - 4.2	15.5 - 6.8
36	6°39.0	6°40.1	6°20.8	3.6 - 1.6	9.6 - 4.2	15.6 - 6.9
37	6°39.3	6°40.3	6°21.1	3.7 - 1.6	9.7 - 4.3	15.7 - 6.9
38	6°39.5	6°40.6	6°21.3	3.8 - 1.7	9.8 - 4.3	15.8 - 7.0
39	6°39.7	6°40.8	6°21.5	3.9 - 1.7	9.9 - 4.4	15.9 - 7.0
40	6°40.0	6°41.1	6°21.8	4.0 - 1.8	10.0 - 4.4	16.0 - 7.1
41	6°40.3	6°41.3	6°22.0	4.1 - 1.8	10.1 - 4.5	16.1 - 7.1
42	6°40.5	6°41.6	6°22.3	4.2 - 1.9	10.2 - 4.5	16.2 - 7.2
43	6°40.7	6°41.8	6°22.5	4.3 - 1.9	10.3 - 4.5	16.3 - 7.2
44	6°41.0	6°42.1	6°22.7	4.4 - 1.9	10.4 - 4.6	16.4 - 7.2
45	6°41.3	6°42.3	6°23.0	4.5 - 2.0	10.5 - 4.6	16.5 - 7.3
46	6°41.5	6°42.6	6°23.2	4.6 - 2.0	10.6 - 4.7	16.6 - 7.3
47	6°41.8	6°42.8	6°23.4	4.7 - 2.1	10.7 - 4.7	16.7 - 7.4
48	6°42.0	6°43.1	6°23.7	4.8 - 2.1	10.8 - 4.8	16.8 - 7.4
49	6°42.3	6°43.3	6°23.9	4.9 - 2.2	10.9 - 4.8	16.9 - 7.5
50	6°42.5	6°43.6	6°24.2	5.0 - 2.2	11.0 - 4.9	17.0 - 7.5
51	6°42.8	6°43.9	6°24.4	5.1 - 2.3	11.1 - 4.9	17.1 - 7.6
52	6°43.0	6°44.1	6°24.6	5.2 - 2.3	11.2 - 4.9	17.2 - 7.6
53	6°43.2	6°44.4	6°24.9	5.3 - 2.3	11.3 - 5.0	17.3 - 7.6
54	6°43.5	6°44.6	6°25.1	5.4 - 2.4	11.4 - 5.0	17.4 - 7.7
55	6°43.8	6°44.9	6°25.4	5.5 - 2.4	11.5 - 5.1	17.5 - 7.7
56	6°44.0	6°45.1	6°25.6	5.6 - 2.5	11.6 - 5.1	17.6 - 7.8
57	6°44.2	6°45.4	6°25.8	5.7 - 2.5	11.7 - 5.2	17.7 - 7.8
58	6°44.5	6°45.6	6°26.1	5.8 - 2.6	11.8 - 5.2	17.8 - 7.9
59	6°44.8	6°45.9	6°26.3	5.9 - 2.6	11.9 - 5.3	17.9 - 7.9

Increments and Corrections

m 27	Sun Plan.	Aries	Moon	v and d corr		
0	6°45.0	6°46.1	6°26.5	0.0 - 0.0	6.0 - 2.8	12.0 - 5.5
1	6°45.2	6°46.4	6°26.8	0.1 - 0.0	6.1 - 2.8	12.1 - 5.5
2	6°45.5	6°46.6	6°27.0	0.2 - 0.1	6.2 - 2.8	12.2 - 5.6
3	6°45.8	6°46.9	6°27.3	0.3 - 0.1	6.3 - 2.9	12.3 - 5.6
4	6°46.0	6°47.1	6°27.5	0.4 - 0.2	6.4 - 2.9	12.4 - 5.7
5	6°46.2	6°47.4	6°27.7	0.5 - 0.2	6.5 - 3.0	12.5 - 5.7
6	6°46.5	6°47.6	6°28.0	0.6 - 0.3	6.6 - 3.0	12.6 - 5.8
7	6°46.8	6°47.9	6°28.2	0.7 - 0.3	6.7 - 3.1	12.7 - 5.8
8	6°47.0	6°48.1	6°28.5	0.8 - 0.4	6.8 - 3.1	12.8 - 5.9
9	6°47.2	6°48.4	6°28.7	0.9 - 0.4	6.9 - 3.2	12.9 - 5.9
10	6°47.5	6°48.6	6°28.9	1.0 - 0.5	7.0 - 3.2	13.0 - 6.0
11	6°47.8	6°48.9	6°29.2	1.1 - 0.5	7.1 - 3.3	13.1 - 6.0
12	6°48.0	6°49.1	6°29.4	1.2 - 0.6	7.2 - 3.3	13.2 - 6.0
13	6°48.2	6°49.4	6°29.7	1.3 - 0.6	7.3 - 3.3	13.3 - 6.1
14	6°48.5	6°49.6	6°29.9	1.4 - 0.6	7.4 - 3.4	13.4 - 6.1
15	6°48.8	6°49.9	6°30.1	1.5 - 0.7	7.5 - 3.4	13.5 - 6.2
16	6°49.0	6°50.1	6°30.4	1.6 - 0.7	7.6 - 3.5	13.6 - 6.2
17	6°49.3	6°50.4	6°30.6	1.7 - 0.8	7.7 - 3.5	13.7 - 6.3
18	6°49.5	6°50.6	6°30.8	1.8 - 0.8	7.8 - 3.6	13.8 - 6.3
19	6°49.8	6°50.9	6°31.1	1.9 - 0.9	7.9 - 3.6	13.9 - 6.4
20	6°50.0	6°51.1	6°31.3	2.0 - 0.9	8.0 - 3.7	14.0 - 6.4
21	6°50.3	6°51.4	6°31.6	2.1 - 1.0	8.1 - 3.7	14.1 - 6.5
22	6°50.5	6°51.6	6°31.8	2.2 - 1.0	8.2 - 3.8	14.2 - 6.5
23	6°50.7	6°51.9	6°32.0	2.3 - 1.1	8.3 - 3.8	14.3 - 6.6
24	6°51.0	6°52.1	6°32.3	2.4 - 1.1	8.4 - 3.9	14.4 - 6.6
25	6°51.3	6°52.4	6°32.5	2.5 - 1.1	8.5 - 3.9	14.5 - 6.6
26	6°51.5	6°52.6	6°32.8	2.6 - 1.2	8.6 - 3.9	14.6 - 6.7
27	6°51.7	6°52.9	6°33.0	2.7 - 1.2	8.7 - 4.0	14.7 - 6.7
28	6°52.0	6°53.1	6°33.2	2.8 - 1.3	8.8 - 4.0	14.8 - 6.8
29	6°52.3	6°53.4	6°33.5	2.9 - 1.3	8.9 - 4.1	14.9 - 6.8
30	6°52.5	6°53.6	6°33.7	3.0 - 1.4	9.0 - 4.1	15.0 - 6.9
31	6°52.7	6°53.9	6°33.9	3.1 - 1.4	9.1 - 4.2	15.1 - 6.9
32	6°53.0	6°54.1	6°34.2	3.2 - 1.5	9.2 - 4.2	15.2 - 7.0
33	6°53.3	6°54.4	6°34.4	3.3 - 1.5	9.3 - 4.3	15.3 - 7.0
34	6°53.5	6°54.6	6°34.7	3.4 - 1.6	9.4 - 4.3	15.4 - 7.1
35	6°53.7	6°54.9	6°34.9	3.5 - 1.6	9.5 - 4.4	15.5 - 7.1
36	6°54.0	6°55.1	6°35.1	3.6 - 1.6	9.6 - 4.4	15.6 - 7.1
37	6°54.3	6°55.4	6°35.4	3.7 - 1.7	9.7 - 4.4	15.7 - 7.2
38	6°54.5	6°55.6	6°35.6	3.8 - 1.7	9.8 - 4.5	15.8 - 7.2
39	6°54.7	6°55.9	6°35.9	3.9 - 1.8	9.9 - 4.5	15.9 - 7.3
40	6°55.0	6°56.1	6°36.1	4.0 - 1.8	10.0 - 4.6	16.0 - 7.3
41	6°55.3	6°56.4	6°36.3	4.1 - 1.9	10.1 - 4.6	16.1 - 7.4
42	6°55.5	6°56.6	6°36.6	4.2 - 1.9	10.2 - 4.7	16.2 - 7.4
43	6°55.7	6°56.9	6°36.8	4.3 - 2.0	10.3 - 4.7	16.3 - 7.5
44	6°56.0	6°57.1	6°37.0	4.4 - 2.0	10.4 - 4.8	16.4 - 7.5
45	6°56.3	6°57.4	6°37.3	4.5 - 2.1	10.5 - 4.8	16.5 - 7.6
46	6°56.5	6°57.6	6°37.5	4.6 - 2.1	10.6 - 4.9	16.6 - 7.6
47	6°56.8	6°57.9	6°37.8	4.7 - 2.2	10.7 - 4.9	16.7 - 7.7
48	6°57.0	6°58.1	6°38.0	4.8 - 2.2	10.8 - 5.0	16.8 - 7.7
49	6°57.3	6°58.4	6°38.2	4.9 - 2.2	10.9 - 5.0	16.9 - 7.7
50	6°57.5	6°58.6	6°38.5	5.0 - 2.3	11.0 - 5.0	17.0 - 7.8
51	6°57.8	6°58.9	6°38.7	5.1 - 2.3	11.1 - 5.1	17.1 - 7.8
52	6°58.0	6°59.1	6°39.0	5.2 - 2.4	11.2 - 5.1	17.2 - 7.9
53	6°58.2	6°59.4	6°39.2	5.3 - 2.4	11.3 - 5.2	17.3 - 7.9
54	6°58.5	6°59.6	6°39.4	5.4 - 2.5	11.4 - 5.2	17.4 - 8.0
55	6°58.8	6°59.9	6°39.7	5.5 - 2.5	11.5 - 5.3	17.5 - 8.0
56	6°59.0	7°00.1	6°39.9	5.6 - 2.6	11.6 - 5.3	17.6 - 8.1
57	6°59.2	7°00.4	6°40.2	5.7 - 2.6	11.7 - 5.4	17.7 - 8.1
58	6°59.5	7°00.6	6°40.4	5.8 - 2.7	11.8 - 5.4	17.8 - 8.2
59	6°59.8	7°00.9	6°40.6	5.9 - 2.7	11.9 - 5.5	17.9 - 8.2

m 28	Sun Plan.	Aries	Moon	v and d corr		
0	7°00.0	7°01.1	6°40.9	0.0 - 0.0	6.0 - 2.8	12.0 - 5.7
1	7°00.2	7°01.4	6°41.1	0.1 - 0.0	6.1 - 2.9	12.1 - 5.7
2	7°00.5	7°01.6	6°41.3	0.2 - 0.1	6.2 - 2.9	12.2 - 5.8
3	7°00.8	7°01.9	6°41.6	0.3 - 0.1	6.3 - 3.0	12.3 - 5.8
4	7°01.0	7°02.2	6°41.8	0.4 - 0.2	6.4 - 3.0	12.4 - 5.9
5	7°01.2	7°02.4	6°42.1	0.5 - 0.2	6.5 - 3.1	12.5 - 5.9
6	7°01.5	7°02.7	6°42.3	0.6 - 0.3	6.6 - 3.1	12.6 - 6.0
7	7°01.8	7°02.9	6°42.5	0.7 - 0.3	6.7 - 3.2	12.7 - 6.0
8	7°02.0	7°03.2	6°42.8	0.8 - 0.4	6.8 - 3.2	12.8 - 6.1
9	7°02.2	7°03.4	6°43.0	0.9 - 0.4	6.9 - 3.3	12.9 - 6.1
10	7°02.5	7°03.7	6°43.3	1.0 - 0.5	7.0 - 3.3	13.0 - 6.2
11	7°02.8	7°03.9	6°43.5	1.1 - 0.5	7.1 - 3.4	13.1 - 6.2
12	7°03.0	7°04.2	6°43.7	1.2 - 0.6	7.2 - 3.4	13.2 - 6.3
13	7°03.2	7°04.4	6°44.0	1.3 - 0.6	7.3 - 3.5	13.3 - 6.3
14	7°03.5	7°04.7	6°44.2	1.4 - 0.7	7.4 - 3.5	13.4 - 6.4
15	7°03.8	7°04.9	6°44.4	1.5 - 0.7	7.5 - 3.6	13.5 - 6.4
16	7°04.0	7°05.2	6°44.7	1.6 - 0.8	7.6 - 3.6	13.6 - 6.5
17	7°04.3	7°05.4	6°44.9	1.7 - 0.8	7.7 - 3.7	13.7 - 6.5
18	7°04.5	7°05.7	6°45.2	1.8 - 0.9	7.8 - 3.7	13.8 - 6.6
19	7°04.7	7°05.9	6°45.4	1.9 - 0.9	7.9 - 3.8	13.9 - 6.6
20	7°05.0	7°06.2	6°45.6	2.0 - 0.9	8.0 - 3.8	14.0 - 6.6
21	7°05.3	7°06.4	6°45.9	2.1 - 1.0	8.1 - 3.8	14.1 - 6.7
22	7°05.5	7°06.7	6°46.1	2.2 - 1.0	8.2 - 3.9	14.2 - 6.7
23	7°05.7	7°06.9	6°46.4	2.3 - 1.1	8.3 - 3.9	14.3 - 6.8
24	7°06.0	7°07.2	6°46.6	2.4 - 1.1	8.4 - 4.0	14.4 - 6.8
25	7°06.3	7°07.4	6°46.8	2.5 - 1.2	8.5 - 4.0	14.5 - 6.9
26	7°06.5	7°07.7	6°47.1	2.6 - 1.2	8.6 - 4.1	14.6 - 6.9
27	7°06.7	7°07.9	6°47.3	2.7 - 1.3	8.7 - 4.1	14.7 - 7.0
28	7°07.0	7°08.2	6°47.5	2.8 - 1.3	8.8 - 4.2	14.8 - 7.0
29	7°07.3	7°08.4	6°47.8	2.9 - 1.4	8.9 - 4.2	14.9 - 7.1
30	7°07.5	7°08.7	6°48.0	3.0 - 1.4	9.0 - 4.3	15.0 - 7.1
31	7°07.7	7°08.9	6°48.3	3.1 - 1.5	9.1 - 4.3	15.1 - 7.2
32	7°08.0	7°09.2	6°48.5	3.2 - 1.5	9.2 - 4.4	15.2 - 7.2
33	7°08.3	7°09.4	6°48.7	3.3 - 1.6	9.3 - 4.4	15.3 - 7.3
34	7°08.5	7°09.7	6°49.0	3.4 - 1.6	9.4 - 4.5	15.4 - 7.3
35	7°08.7	7°09.9	6°49.2	3.5 - 1.7	9.5 - 4.5	15.5 - 7.4
36	7°09.0	7°10.2	6°49.5	3.6 - 1.7	9.6 - 4.6	15.6 - 7.4
37	7°09.3	7°10.4	6°49.7	3.7 - 1.8	9.7 - 4.6	15.7 - 7.5
38	7°09.5	7°10.7	6°49.9	3.8 - 1.8	9.8 - 4.7	15.8 - 7.5
39	7°09.7	7°10.9	6°50.2	3.9 - 1.9	9.9 - 4.7	15.9 - 7.6
40	7°10.0	7°11.2	6°50.4	4.0 - 1.9	10.0 - 4.8	16.0 - 7.6
41	7°10.3	7°11.4	6°50.6	4.1 - 1.9	10.1 - 4.8	16.1 - 7.6
42	7°10.5	7°11.7	6°50.9	4.2 - 2.0	10.2 - 4.8	16.2 - 7.7
43	7°10.7	7°11.9	6°51.1	4.3 - 2.0	10.3 - 4.9	16.3 - 7.7
44	7°11.0	7°12.2	6°51.4	4.4 - 2.1	10.4 - 4.9	16.4 - 7.8
45	7°11.3	7°12.4	6°51.6	4.5 - 2.1	10.5 - 5.0	16.5 - 7.8
46	7°11.5	7°12.7	6°51.8	4.6 - 2.2	10.6 - 5.0	16.6 - 7.9
47	7°11.8	7°12.9	6°52.1	4.7 - 2.2	10.7 - 5.1	16.7 - 7.9
48	7°12.0	7°13.2	6°52.3	4.8 - 2.3	10.8 - 5.1	16.8 - 8.0
49	7°12.2	7°13.4	6°52.6	4.9 - 2.3	10.9 - 5.2	16.9 - 8.0
50	7°12.5	7°13.7	6°52.8	5.0 - 2.4	11.0 - 5.2	17.0 - 8.1
51	7°12.8	7°13.9	6°53.0	5.1 - 2.4	11.1 - 5.3	17.1 - 8.1
52	7°13.0	7°14.2	6°53.3	5.2 - 2.5	11.2 - 5.3	17.2 - 8.2
53	7°13.2	7°14.4	6°53.5	5.3 - 2.5	11.3 - 5.4	17.3 - 8.2
54	7°13.5	7°14.7	6°53.8	5.4 - 2.6	11.4 - 5.4	17.4 - 8.3
55	7°13.8	7°14.9	6°54.0	5.5 - 2.6	11.5 - 5.5	17.5 - 8.3
56	7°14.0	7°15.2	6°54.2	5.6 - 2.7	11.6 - 5.5	17.6 - 8.4
57	7°14.2	7°15.4	6°54.5	5.7 - 2.7	11.7 - 5.6	17.7 - 8.4
58	7°14.5	7°15.7	6°54.7	5.8 - 2.8	11.8 - 5.6	17.8 - 8.5
59	7°14.8	7°15.9	6°54.9	5.9 - 2.8	11.9 - 5.7	17.9 - 8.5

m 29	Sun Plan.	Aries	Moon	v and d corr		
0	7°15.0	7°16.2	6°55.2	0.0 - 0.0	6.0 - 2.9	12.0 - 5.9
1	7°15.2	7°16.4	6°55.4	0.1 - 0.0	6.1 - 3.0	12.1 - 5.9
2	7°15.5	7°16.7	6°55.7	0.2 - 0.1	6.2 - 3.0	12.2 - 6.0
3	7°15.8	7°16.9	6°55.9	0.3 - 0.1	6.3 - 3.1	12.3 - 6.0
4	7°16.0	7°17.2	6°56.1	0.4 - 0.2	6.4 - 3.1	12.4 - 6.1
5	7°16.2	7°17.4	6°56.4	0.5 - 0.2	6.5 - 3.2	12.5 - 6.1
6	7°16.5	7°17.7	6°56.6	0.6 - 0.3	6.6 - 3.2	12.6 - 6.2
7	7°16.8	7°17.9	6°56.9	0.7 - 0.3	6.7 - 3.3	12.7 - 6.2
8	7°17.0	7°18.2	6°57.1	0.8 - 0.4	6.8 - 3.3	12.8 - 6.3
9	7°17.2	7°18.4	6°57.3	0.9 - 0.4	6.9 - 3.4	12.9 - 6.3
10	7°17.5	7°18.7	6°57.6	1.0 - 0.5	7.0 - 3.4	13.0 - 6.4
11	7°17.8	7°18.9	6°57.8	1.1 - 0.5	7.1 - 3.5	13.1 - 6.4
12	7°18.0	7°19.2	6°58.0	1.2 - 0.6	7.2 - 3.5	13.2 - 6.5
13	7°18.2	7°19.4	6°58.3	1.3 - 0.6	7.3 - 3.6	13.3 - 6.5
14	7°18.5	7°19.7	6°58.5	1.4 - 0.7	7.4 - 3.6	13.4 - 6.6
15	7°18.8	7°19.9	6°58.8	1.5 - 0.7	7.5 - 3.7	13.5 - 6.6
16	7°19.0	7°20.2	6°59.0	1.6 - 0.8	7.6 - 3.7	13.6 - 6.7
17	7°19.3	7°20.5	6°59.2	1.7 - 0.8	7.7 - 3.8	13.7 - 6.7
18	7°19.5	7°20.7	6°59.5	1.8 - 0.9	7.8 - 3.8	13.8 - 6.8
19	7°19.7	7°21.0	6°59.7	1.9 - 0.9	7.9 - 3.9	13.9 - 6.8
20	7°20.0	7°21.2	7°00.0	2.0 - 1.0	8.0 - 3.9	14.0 - 6.9
21	7°20.3	7°21.5	7°00.2	2.1 - 1.0	8.1 - 4.0	14.1 - 6.9
22	7°20.5	7°21.7	7°00.4	2.2 - 1.1	8.2 - 4.0	14.2 - 7.0
23	7°20.7	7°22.0	7°00.7	2.3 - 1.1	8.3 - 4.1	14.3 - 7.0
24	7°21.0	7°22.2	7°00.9	2.4 - 1.2	8.4 - 4.1	14.4 - 7.1
25	7°21.3	7°22.5	7°01.1	2.5 - 1.2	8.5 - 4.2	14.5 - 7.1
26	7°21.5	7°22.7	7°01.4	2.6 - 1.3	8.6 - 4.2	14.6 - 7.2
27	7°21.7	7°23.0	7°01.6	2.7 - 1.3	8.7 - 4.3	14.7 - 7.2
28	7°22.0	7°23.2	7°01.9	2.8 - 1.4	8.8 - 4.3	14.8 - 7.3
29	7°22.3	7°23.5	7°02.1	2.9 - 1.4	8.9 - 4.4	14.9 - 7.3
30	7°22.5	7°23.7	7°02.3	3.0 - 1.5	9.0 - 4.4	15.0 - 7.4
31	7°22.7	7°24.0	7°02.6	3.1 - 1.5	9.1 - 4.5	15.1 - 7.4
32	7°23.0	7°24.2	7°02.8	3.2 - 1.6	9.2 - 4.5	15.2 - 7.5
33	7°23.3	7°24.5	7°03.1	3.3 - 1.6	9.3 - 4.6	15.3 - 7.5
34	7°23.5	7°24.7	7°03.3	3.4 - 1.7	9.4 - 4.6	15.4 - 7.6
35	7°23.7	7°25.0	7°03.5	3.5 - 1.7	9.5 - 4.7	15.5 - 7.6
36	7°24.0	7°25.2	7°03.8	3.6 - 1.8	9.6 - 4.7	15.6 - 7.7
37	7°24.3	7°25.5	7°04.0	3.7 - 1.8	9.7 - 4.8	15.7 - 7.7
38	7°24.5	7°25.7	7°04.3	3.8 - 1.9	9.8 - 4.8	15.8 - 7.8
39	7°24.7	7°26.0	7°04.5	3.9 - 1.9	9.9 - 4.9	15.9 - 7.8
40	7°25.0	7°26.2	7°04.7	4.0 - 2.0	10.0 - 4.9	16.0 - 7.9
41	7°25.3	7°26.5	7°05.0	4.1 - 2.0	10.1 - 5.0	16.1 - 7.9
42	7°25.5	7°26.7	7°05.2	4.2 - 2.1	10.2 - 5.0	16.2 - 8.0
43	7°25.7	7°27.0	7°05.4	4.3 - 2.1	10.3 - 5.1	16.3 - 8.0
44	7°26.0	7°27.2	7°05.7	4.4 - 2.2	10.4 - 5.1	16.4 - 8.1
45	7°26.3	7°27.5	7°05.9	4.5 - 2.2	10.5 - 5.2	16.5 - 8.1
46	7°26.5	7°27.7	7°06.2	4.6 - 2.3	10.6 - 5.2	16.6 - 8.2
47	7°26.8	7°28.0	7°06.4	4.7 - 2.3	10.7 - 5.3	16.7 - 8.2
48	7°27.0	7°28.2	7°06.6	4.8 - 2.4	10.8 - 5.3	16.8 - 8.3
49	7°27.2	7°28.5	7°06.9	4.9 - 2.4	10.9 - 5.4	16.9 - 8.3
50	7°27.5	7°28.7	7°07.1	5.0 - 2.5	11.0 - 5.4	17.0 - 8.4
51	7°27.8	7°29.0	7°07.4	5.1 - 2.5	11.1 - 5.5	17.1 - 8.4
52	7°28.0	7°29.2	7°07.6	5.2 - 2.6	11.2 - 5.5	17.2 - 8.5
53	7°28.2	7°29.5	7°07.8	5.3 - 2.6	11.3 - 5.6	17.3 - 8.5
54	7°28.5	7°29.7	7°08.1	5.4 - 2.7	11.4 - 5.6	17.4 - 8.6
55	7°28.8	7°30.0	7°08.3	5.5 - 2.7	11.5 - 5.7	17.5 - 8.6
56	7°29.0	7°30.2	7°08.5	5.6 - 2.8	11.6 - 5.7	17.6 - 8.7
57	7°29.2	7°30.5	7°08.8	5.7 - 2.8	11.7 - 5.8	17.7 - 8.7
58	7°29.5	7°30.7	7°09.0	5.8 - 2.9	11.8 - 5.8	17.8 - 8.8
59	7°29.8	7°31.0	7°09.3	5.9 - 2.9	11.9 - 5.9	17.9 - 8.8

Increments and Corrections

m 30	Sun Plan.	Aries	Moon	v and d corr		
0	7°30.0	7°31.2	7°09.5	0.0 - 0.0	6.0 - 3.0	12.0 - 6.1
1	7°30.2	7°31.5	7°09.7	0.1 - 0.1	6.1 - 3.1	12.1 - 6.2
2	7°30.5	7°31.7	7°10.0	0.2 - 0.1	6.2 - 3.2	12.2 - 6.2
3	7°30.8	7°32.0	7°10.2	0.3 - 0.2	6.3 - 3.2	12.3 - 6.3
4	7°31.0	7°32.2	7°10.5	0.4 - 0.2	6.4 - 3.3	12.4 - 6.3
5	7°31.2	7°32.5	7°10.7	0.5 - 0.3	6.5 - 3.3	12.5 - 6.4
6	7°31.5	7°32.7	7°10.9	0.6 - 0.3	6.6 - 3.4	12.6 - 6.4
7	7°31.7	7°33.0	7°11.2	0.7 - 0.4	6.7 - 3.4	12.7 - 6.5
8	7°32.0	7°33.2	7°11.4	0.8 - 0.4	6.8 - 3.5	12.8 - 6.5
9	7°32.2	7°33.5	7°11.6	0.9 - 0.5	6.9 - 3.5	12.9 - 6.6
10	7°32.5	7°33.7	7°11.9	1.0 - 0.5	7.0 - 3.6	13.0 - 6.6
11	7°32.8	7°34.0	7°12.1	1.1 - 0.6	7.1 - 3.6	13.1 - 6.7
12	7°33.0	7°34.2	7°12.4	1.2 - 0.6	7.2 - 3.7	13.2 - 6.7
13	7°33.3	7°34.5	7°12.6	1.3 - 0.7	7.3 - 3.7	13.3 - 6.8
14	7°33.5	7°34.7	7°12.8	1.4 - 0.7	7.4 - 3.8	13.4 - 6.8
15	7°33.8	7°35.0	7°13.1	1.5 - 0.8	7.5 - 3.8	13.5 - 6.9
16	7°34.0	7°35.2	7°13.3	1.6 - 0.8	7.6 - 3.9	13.6 - 6.9
17	7°34.3	7°35.5	7°13.6	1.7 - 0.9	7.7 - 3.9	13.7 - 7.0
18	7°34.5	7°35.7	7°13.8	1.8 - 0.9	7.8 - 4.0	13.8 - 7.0
19	7°34.8	7°36.0	7°14.0	1.9 - 1.0	7.9 - 4.0	13.9 - 7.1
20	7°35.0	7°36.2	7°14.3	2.0 - 1.0	8.0 - 4.1	14.0 - 7.1
21	7°35.3	7°36.5	7°14.5	2.1 - 1.1	8.1 - 4.1	14.1 - 7.2
22	7°35.5	7°36.7	7°14.7	2.2 - 1.1	8.2 - 4.2	14.2 - 7.2
23	7°35.7	7°37.0	7°15.0	2.3 - 1.2	8.3 - 4.2	14.3 - 7.3
24	7°36.0	7°37.2	7°15.2	2.4 - 1.2	8.4 - 4.3	14.4 - 7.3
25	7°36.2	7°37.5	7°15.5	2.5 - 1.3	8.5 - 4.3	14.5 - 7.4
26	7°36.5	7°37.7	7°15.7	2.6 - 1.3	8.6 - 4.4	14.6 - 7.4
27	7°36.7	7°38.0	7°15.9	2.7 - 1.4	8.7 - 4.4	14.7 - 7.5
28	7°37.0	7°38.2	7°16.2	2.8 - 1.4	8.8 - 4.5	14.8 - 7.5
29	7°37.3	7°38.5	7°16.4	2.9 - 1.5	8.9 - 4.5	14.9 - 7.6
30	7°37.5	7°38.8	7°16.7	3.0 - 1.5	9.0 - 4.6	15.0 - 7.6
31	7°37.7	7°39.0	7°16.9	3.1 - 1.6	9.1 - 4.6	15.1 - 7.7
32	7°38.0	7°39.3	7°17.1	3.2 - 1.6	9.2 - 4.7	15.2 - 7.7
33	7°38.3	7°39.5	7°17.4	3.3 - 1.7	9.3 - 4.7	15.3 - 7.8
34	7°38.5	7°39.8	7°17.6	3.4 - 1.7	9.4 - 4.8	15.4 - 7.8
35	7°38.7	7°40.0	7°17.9	3.5 - 1.8	9.5 - 4.8	15.5 - 7.9
36	7°39.0	7°40.3	7°18.1	3.6 - 1.8	9.6 - 4.9	15.6 - 7.9
37	7°39.3	7°40.5	7°18.3	3.7 - 1.9	9.7 - 4.9	15.7 - 8.0
38	7°39.5	7°40.8	7°18.6	3.8 - 1.9	9.8 - 5.0	15.8 - 8.0
39	7°39.8	7°41.0	7°18.8	3.9 - 2.0	9.9 - 5.0	15.9 - 8.1
40	7°40.0	7°41.3	7°19.0	4.0 - 2.0	10.0 - 5.1	16.0 - 8.1
41	7°40.3	7°41.5	7°19.3	4.1 - 2.1	10.1 - 5.1	16.1 - 8.2
42	7°40.5	7°41.8	7°19.5	4.2 - 2.1	10.2 - 5.2	16.2 - 8.2
43	7°40.7	7°42.0	7°19.8	4.3 - 2.2	10.3 - 5.2	16.3 - 8.3
44	7°41.0	7°42.3	7°20.0	4.4 - 2.2	10.4 - 5.3	16.4 - 8.3
45	7°41.2	7°42.5	7°20.2	4.5 - 2.3	10.5 - 5.3	16.5 - 8.4
46	7°41.5	7°42.8	7°20.5	4.6 - 2.3	10.6 - 5.4	16.6 - 8.4
47	7°41.8	7°43.0	7°20.7	4.7 - 2.4	10.7 - 5.4	16.7 - 8.5
48	7°42.0	7°43.3	7°21.0	4.8 - 2.4	10.8 - 5.5	16.8 - 8.5
49	7°42.3	7°43.5	7°21.2	4.9 - 2.5	10.9 - 5.5	16.9 - 8.6
50	7°42.5	7°43.8	7°21.4	5.0 - 2.5	11.0 - 5.6	17.0 - 8.6
51	7°42.8	7°44.0	7°21.7	5.1 - 2.6	11.1 - 5.6	17.1 - 8.7
52	7°43.0	7°44.3	7°21.9	5.2 - 2.6	11.2 - 5.7	17.2 - 8.7
53	7°43.2	7°44.5	7°22.1	5.3 - 2.7	11.3 - 5.7	17.3 - 8.8
54	7°43.5	7°44.8	7°22.4	5.4 - 2.7	11.4 - 5.8	17.4 - 8.8
55	7°43.8	7°45.0	7°22.6	5.5 - 2.8	11.5 - 5.8	17.5 - 8.9
56	7°44.0	7°45.3	7°22.9	5.6 - 2.8	11.6 - 5.9	17.6 - 8.9
57	7°44.3	7°45.5	7°23.1	5.7 - 2.9	11.7 - 5.9	17.7 - 9.0
58	7°44.5	7°45.8	7°23.3	5.8 - 2.9	11.8 - 6.0	17.8 - 9.0
59	7°44.8	7°46.0	7°23.6	5.9 - 3.0	11.9 - 6.0	17.9 - 9.1

m 31	Sun Plan.	Aries	Moon	v and d corr		
0	7°45.0	7°46.3	7°23.8	0.0 - 0.0	6.0 - 3.2	12.0 - 6.3
1	7°45.2	7°46.5	7°24.1	0.1 - 0.1	6.1 - 3.2	12.1 - 6.4
2	7°45.5	7°46.8	7°24.3	0.2 - 0.1	6.2 - 3.3	12.2 - 6.4
3	7°45.7	7°47.0	7°24.5	0.3 - 0.2	6.3 - 3.3	12.3 - 6.5
4	7°46.0	7°47.3	7°24.8	0.4 - 0.2	6.4 - 3.4	12.4 - 6.5
5	7°46.2	7°47.5	7°25.0	0.5 - 0.3	6.5 - 3.4	12.5 - 6.6
6	7°46.5	7°47.8	7°25.2	0.6 - 0.3	6.6 - 3.5	12.6 - 6.6
7	7°46.8	7°48.0	7°25.5	0.7 - 0.4	6.7 - 3.5	12.7 - 6.7
8	7°47.0	7°48.3	7°25.7	0.8 - 0.4	6.8 - 3.6	12.8 - 6.7
9	7°47.2	7°48.5	7°26.0	0.9 - 0.5	6.9 - 3.6	12.9 - 6.8
10	7°47.5	7°48.8	7°26.2	1.0 - 0.5	7.0 - 3.7	13.0 - 6.8
11	7°47.7	7°49.0	7°26.4	1.1 - 0.6	7.1 - 3.7	13.1 - 6.9
12	7°48.0	7°49.3	7°26.7	1.2 - 0.6	7.2 - 3.8	13.2 - 6.9
13	7°48.2	7°49.5	7°26.9	1.3 - 0.7	7.3 - 3.8	13.3 - 7.0
14	7°48.5	7°49.8	7°27.2	1.4 - 0.7	7.4 - 3.9	13.4 - 7.0
15	7°48.8	7°50.0	7°27.4	1.5 - 0.8	7.5 - 3.9	13.5 - 7.1
16	7°49.0	7°50.3	7°27.6	1.6 - 0.8	7.6 - 4.0	13.6 - 7.1
17	7°49.3	7°50.5	7°27.9	1.7 - 0.9	7.7 - 4.0	13.7 - 7.2
18	7°49.5	7°50.8	7°28.1	1.8 - 0.9	7.8 - 4.1	13.8 - 7.2
19	7°49.8	7°51.0	7°28.4	1.9 - 1.0	7.9 - 4.1	13.9 - 7.3
20	7°50.0	7°51.3	7°28.6	2.0 - 1.1	8.0 - 4.2	14.0 - 7.4
21	7°50.3	7°51.5	7°28.8	2.1 - 1.1	8.1 - 4.3	14.1 - 7.4
22	7°50.5	7°51.8	7°29.1	2.2 - 1.2	8.2 - 4.3	14.2 - 7.5
23	7°50.7	7°52.0	7°29.3	2.3 - 1.2	8.3 - 4.4	14.3 - 7.5
24	7°51.0	7°52.3	7°29.5	2.4 - 1.3	8.4 - 4.4	14.4 - 7.6
25	7°51.3	7°52.5	7°29.8	2.5 - 1.3	8.5 - 4.5	14.5 - 7.6
26	7°51.5	7°52.8	7°30.0	2.6 - 1.4	8.6 - 4.5	14.6 - 7.7
27	7°51.7	7°53.0	7°30.3	2.7 - 1.4	8.7 - 4.6	14.7 - 7.7
28	7°52.0	7°53.3	7°30.5	2.8 - 1.5	8.8 - 4.6	14.8 - 7.8
29	7°52.2	7°53.5	7°30.7	2.9 - 1.5	8.9 - 4.7	14.9 - 7.8
30	7°52.5	7°53.8	7°31.0	3.0 - 1.6	9.0 - 4.7	15.0 - 7.9
31	7°52.7	7°54.0	7°31.2	3.1 - 1.6	9.1 - 4.8	15.1 - 7.9
32	7°53.0	7°54.3	7°31.5	3.2 - 1.7	9.2 - 4.8	15.2 - 8.0
33	7°53.3	7°54.5	7°31.7	3.3 - 1.7	9.3 - 4.9	15.3 - 8.0
34	7°53.5	7°54.8	7°31.9	3.4 - 1.8	9.4 - 4.9	15.4 - 8.1
35	7°53.8	7°55.0	7°32.2	3.5 - 1.8	9.5 - 5.0	15.5 - 8.1
36	7°54.0	7°55.3	7°32.4	3.6 - 1.9	9.6 - 5.0	15.6 - 8.2
37	7°54.3	7°55.5	7°32.6	3.7 - 1.9	9.7 - 5.1	15.7 - 8.2
38	7°54.5	7°55.8	7°32.9	3.8 - 2.0	9.8 - 5.1	15.8 - 8.3
39	7°54.7	7°56.0	7°33.1	3.9 - 2.0	9.9 - 5.2	15.9 - 8.3
40	7°55.0	7°56.3	7°33.4	4.0 - 2.1	10.0 - 5.3	16.0 - 8.4
41	7°55.3	7°56.5	7°33.6	4.1 - 2.2	10.1 - 5.3	16.1 - 8.5
42	7°55.5	7°56.8	7°33.8	4.2 - 2.2	10.2 - 5.4	16.2 - 8.5
43	7°55.7	7°57.1	7°34.1	4.3 - 2.3	10.3 - 5.4	16.3 - 8.6
44	7°56.0	7°57.3	7°34.3	4.4 - 2.3	10.4 - 5.5	16.4 - 8.6
45	7°56.3	7°57.6	7°34.6	4.5 - 2.4	10.5 - 5.5	16.5 - 8.7
46	7°56.5	7°57.8	7°34.8	4.6 - 2.4	10.6 - 5.6	16.6 - 8.7
47	7°56.7	7°58.1	7°35.0	4.7 - 2.5	10.7 - 5.6	16.7 - 8.8
48	7°57.0	7°58.3	7°35.3	4.8 - 2.5	10.8 - 5.7	16.8 - 8.8
49	7°57.2	7°58.6	7°35.5	4.9 - 2.6	10.9 - 5.7	16.9 - 8.9
50	7°57.5	7°58.8	7°35.7	5.0 - 2.6	11.0 - 5.8	17.0 - 8.9
51	7°57.8	7°59.1	7°36.0	5.1 - 2.7	11.1 - 5.8	17.1 - 9.0
52	7°58.0	7°59.3	7°36.2	5.2 - 2.7	11.2 - 5.9	17.2 - 9.0
53	7°58.2	7°59.6	7°36.5	5.3 - 2.8	11.3 - 5.9	17.3 - 9.1
54	7°58.5	7°59.8	7°36.7	5.4 - 2.8	11.4 - 6.0	17.4 - 9.1
55	7°58.8	8°00.1	7°36.9	5.5 - 2.9	11.5 - 6.0	17.5 - 9.2
56	7°59.0	8°00.3	7°37.2	5.6 - 2.9	11.6 - 6.1	17.6 - 9.2
57	7°59.2	8°00.6	7°37.4	5.7 - 3.0	11.7 - 6.1	17.7 - 9.3
58	7°59.5	8°00.8	7°37.7	5.8 - 3.0	11.8 - 6.2	17.8 - 9.3
59	7°59.8	8°01.1	7°37.9	5.9 - 3.1	11.9 - 6.2	17.9 - 9.4

m 32	Sun Plan.	Aries	Moon	v and d corr		
0	8°00.0	8°01.3	7°38.1	0.0 - 0.0	6.0 - 3.3	12.0 - 6.5
1	8°00.2	8°01.6	7°38.4	0.1 - 0.1	6.1 - 3.3	12.1 - 6.6
2	8°00.5	8°01.8	7°38.6	0.2 - 0.1	6.2 - 3.4	12.2 - 6.6
3	8°00.7	8°02.1	7°38.8	0.3 - 0.2	6.3 - 3.4	12.3 - 6.7
4	8°01.0	8°02.3	7°39.1	0.4 - 0.2	6.4 - 3.5	12.4 - 6.7
5	8°01.3	8°02.6	7°39.3	0.5 - 0.3	6.5 - 3.5	12.5 - 6.8
6	8°01.5	8°02.8	7°39.6	0.6 - 0.3	6.6 - 3.6	12.6 - 6.8
7	8°01.8	8°03.1	7°39.8	0.7 - 0.4	6.7 - 3.6	12.7 - 6.9
8	8°02.0	8°03.3	7°40.0	0.8 - 0.4	6.8 - 3.7	12.8 - 6.9
9	8°02.2	8°03.6	7°40.3	0.9 - 0.5	6.9 - 3.7	12.9 - 7.0
10	8°02.5	8°03.8	7°40.5	1.0 - 0.5	7.0 - 3.8	13.0 - 7.0
11	8°02.7	8°04.1	7°40.8	1.1 - 0.6	7.1 - 3.8	13.1 - 7.1
12	8°03.0	8°04.3	7°41.0	1.2 - 0.7	7.2 - 3.9	13.2 - 7.1
13	8°03.3	8°04.6	7°41.2	1.3 - 0.7	7.3 - 4.0	13.3 - 7.2
14	8°03.5	8°04.8	7°41.5	1.4 - 0.8	7.4 - 4.0	13.4 - 7.3
15	8°03.8	8°05.1	7°41.7	1.5 - 0.8	7.5 - 4.1	13.5 - 7.3
16	8°04.0	8°05.3	7°42.0	1.6 - 0.9	7.6 - 4.1	13.6 - 7.4
17	8°04.2	8°05.6	7°42.2	1.7 - 0.9	7.7 - 4.2	13.7 - 7.4
18	8°04.5	8°05.8	7°42.4	1.8 - 1.0	7.8 - 4.2	13.8 - 7.5
19	8°04.8	8°06.1	7°42.7	1.9 - 1.0	7.9 - 4.3	13.9 - 7.5
20	8°05.0	8°06.3	7°42.9	2.0 - 1.1	8.0 - 4.3	14.0 - 7.6
21	8°05.3	8°06.6	7°43.1	2.1 - 1.1	8.1 - 4.4	14.1 - 7.6
22	8°05.5	8°06.8	7°43.4	2.2 - 1.2	8.2 - 4.4	14.2 - 7.7
23	8°05.7	8°07.1	7°43.6	2.3 - 1.2	8.3 - 4.5	14.3 - 7.7
24	8°06.0	8°07.3	7°43.9	2.4 - 1.3	8.4 - 4.5	14.4 - 7.8
25	8°06.2	8°07.6	7°44.1	2.5 - 1.4	8.5 - 4.6	14.5 - 7.9
26	8°06.5	8°07.8	7°44.3	2.6 - 1.4	8.6 - 4.7	14.6 - 7.9
27	8°06.8	8°08.1	7°44.6	2.7 - 1.5	8.7 - 4.7	14.7 - 8.0
28	8°07.0	8°08.3	7°44.8	2.8 - 1.5	8.8 - 4.8	14.8 - 8.0
29	8°07.3	8°08.6	7°45.1	2.9 - 1.6	8.9 - 4.8	14.9 - 8.1
30	8°07.5	8°08.8	7°45.3	3.0 - 1.6	9.0 - 4.9	15.0 - 8.1
31	8°07.7	8°09.1	7°45.5	3.1 - 1.7	9.1 - 4.9	15.1 - 8.2
32	8°08.0	8°09.3	7°45.8	3.2 - 1.7	9.2 - 5.0	15.2 - 8.2
33	8°08.2	8°09.6	7°46.0	3.3 - 1.8	9.3 - 5.0	15.3 - 8.3
34	8°08.5	8°09.8	7°46.2	3.4 - 1.8	9.4 - 5.1	15.4 - 8.3
35	8°08.8	8°10.1	7°46.5	3.5 - 1.9	9.5 - 5.1	15.5 - 8.4
36	8°09.0	8°10.3	7°46.7	3.6 - 1.9	9.6 - 5.2	15.6 - 8.4
37	8°09.3	8°10.6	7°47.0	3.7 - 2.0	9.7 - 5.3	15.7 - 8.5
38	8°09.5	8°10.8	7°47.2	3.8 - 2.1	9.8 - 5.3	15.8 - 8.6
39	8°09.7	8°11.1	7°47.4	3.9 - 2.1	9.9 - 5.4	15.9 - 8.6
40	8°10.0	8°11.3	7°47.7	4.0 - 2.2	10.0 - 5.4	16.0 - 8.7
41	8°10.2	8°11.6	7°47.9	4.1 - 2.2	10.1 - 5.5	16.1 - 8.7
42	8°10.5	8°11.8	7°48.2	4.2 - 2.3	10.2 - 5.5	16.2 - 8.8
43	8°10.8	8°12.1	7°48.4	4.3 - 2.3	10.3 - 5.6	16.3 - 8.8
44	8°11.0	8°12.3	7°48.6	4.4 - 2.4	10.4 - 5.6	16.4 - 8.9
45	8°11.3	8°12.6	7°48.9	4.5 - 2.4	10.5 - 5.7	16.5 - 8.9
46	8°11.5	8°12.8	7°49.1	4.6 - 2.5	10.6 - 5.7	16.6 - 9.0
47	8°11.7	8°13.1	7°49.3	4.7 - 2.5	10.7 - 5.8	16.7 - 9.0
48	8°12.0	8°13.3	7°49.6	4.8 - 2.6	10.8 - 5.8	16.8 - 9.1
49	8°12.3	8°13.6	7°49.8	4.9 - 2.7	10.9 - 5.9	16.9 - 9.2
50	8°12.5	8°13.8	7°50.1	5.0 - 2.7	11.0 - 6.0	17.0 - 9.2
51	8°12.8	8°14.1	7°50.3	5.1 - 2.8	11.1 - 6.0	17.1 - 9.3
52	8°13.0	8°14.3	7°50.5	5.2 - 2.8	11.2 - 6.1	17.2 - 9.3
53	8°13.2	8°14.6	7°50.8	5.3 - 2.9	11.3 - 6.1	17.3 - 9.4
54	8°13.5	8°14.8	7°51.0	5.4 - 2.9	11.4 - 6.2	17.4 - 9.4
55	8°13.7	8°15.1	7°51.3	5.5 - 3.0	11.5 - 6.2	17.5 - 9.5
56	8°14.0	8°15.4	7°51.5	5.6 - 3.0	11.6 - 6.3	17.6 - 9.5
57	8°14.3	8°15.6	7°51.7	5.7 - 3.1	11.7 - 6.3	17.7 - 9.6
58	8°14.5	8°15.9	7°52.0	5.8 - 3.1	11.8 - 6.4	17.8 - 9.6
59	8°14.8	8°16.1	7°52.2	5.9 - 3.2	11.9 - 6.4	17.9 - 9.7

Increments and Corrections

m 33	Sun Plan.	Aries	Moon	v and d corr		
0	8°15.0	8°16.4	7°52.5	0.0 - 0.0	6.0 - 3.4	12.0 - 6.7
1	8°15.2	8°16.6	7°52.7	0.1 - 0.1	6.1 - 3.4	12.1 - 6.8
2	8°15.5	8°16.9	7°52.9	0.2 - 0.1	6.2 - 3.5	12.2 - 6.8
3	8°15.7	8°17.1	7°53.2	0.3 - 0.2	6.3 - 3.5	12.3 - 6.9
4	8°16.0	8°17.4	7°53.4	0.4 - 0.2	6.4 - 3.6	12.4 - 6.9
5	8°16.3	8°17.6	7°53.6	0.5 - 0.3	6.5 - 3.6	12.5 - 7.0
6	8°16.5	8°17.9	7°53.9	0.6 - 0.3	6.6 - 3.7	12.6 - 7.0
7	8°16.8	8°18.1	7°54.1	0.7 - 0.4	6.7 - 3.7	12.7 - 7.1
8	8°17.0	8°18.4	7°54.4	0.8 - 0.4	6.8 - 3.8	12.8 - 7.1
9	8°17.2	8°18.6	7°54.6	0.9 - 0.5	6.9 - 3.9	12.9 - 7.2
10	8°17.5	8°18.9	7°54.8	1.0 - 0.6	7.0 - 3.9	13.0 - 7.3
11	8°17.7	8°19.1	7°55.1	1.1 - 0.6	7.1 - 4.0	13.1 - 7.3
12	8°18.0	8°19.4	7°55.3	1.2 - 0.7	7.2 - 4.0	13.2 - 7.4
13	8°18.3	8°19.6	7°55.6	1.3 - 0.7	7.3 - 4.1	13.3 - 7.4
14	8°18.5	8°19.9	7°55.8	1.4 - 0.8	7.4 - 4.1	13.4 - 7.5
15	8°18.8	8°20.1	7°56.0	1.5 - 0.8	7.5 - 4.2	13.5 - 7.5
16	8°19.0	8°20.4	7°56.3	1.6 - 0.9	7.6 - 4.2	13.6 - 7.6
17	8°19.2	8°20.6	7°56.5	1.7 - 0.9	7.7 - 4.3	13.7 - 7.6
18	8°19.5	8°20.9	7°56.7	1.8 - 1.0	7.8 - 4.4	13.8 - 7.7
19	8°19.8	8°21.1	7°57.0	1.9 - 1.1	7.9 - 4.4	13.9 - 7.8
20	8°20.0	8°21.4	7°57.2	2.0 - 1.1	8.0 - 4.5	14.0 - 7.8
21	8°20.3	8°21.6	7°57.5	2.1 - 1.2	8.1 - 4.5	14.1 - 7.9
22	8°20.5	8°21.9	7°57.7	2.2 - 1.2	8.2 - 4.6	14.2 - 7.9
23	8°20.7	8°22.1	7°57.9	2.3 - 1.3	8.3 - 4.6	14.3 - 8.0
24	8°21.0	8°22.4	7°58.2	2.4 - 1.3	8.4 - 4.7	14.4 - 8.0
25	8°21.2	8°22.6	7°58.4	2.5 - 1.4	8.5 - 4.7	14.5 - 8.1
26	8°21.5	8°22.9	7°58.7	2.6 - 1.5	8.6 - 4.8	14.6 - 8.2
27	8°21.8	8°23.1	7°58.9	2.7 - 1.5	8.7 - 4.9	14.7 - 8.2
28	8°22.0	8°23.4	7°59.1	2.8 - 1.6	8.8 - 4.9	14.8 - 8.3
29	8°22.3	8°23.6	7°59.4	2.9 - 1.6	8.9 - 5.0	14.9 - 8.3
30	8°22.5	8°23.9	7°59.6	3.0 - 1.7	9.0 - 5.0	15.0 - 8.4
31	8°22.7	8°24.1	7°59.8	3.1 - 1.7	9.1 - 5.1	15.1 - 8.4
32	8°23.0	8°24.4	8°00.1	3.2 - 1.8	9.2 - 5.1	15.2 - 8.5
33	8°23.2	8°24.6	8°00.3	3.3 - 1.8	9.3 - 5.2	15.3 - 8.5
34	8°23.5	8°24.9	8°00.6	3.4 - 1.9	9.4 - 5.2	15.4 - 8.6
35	8°23.8	8°25.1	8°00.8	3.5 - 2.0	9.5 - 5.3	15.5 - 8.7
36	8°24.0	8°25.4	8°01.0	3.6 - 2.0	9.6 - 5.4	15.6 - 8.7
37	8°24.3	8°25.6	8°01.3	3.7 - 2.1	9.7 - 5.4	15.7 - 8.8
38	8°24.5	8°25.9	8°01.5	3.8 - 2.1	9.8 - 5.5	15.8 - 8.8
39	8°24.7	8°26.1	8°01.8	3.9 - 2.2	9.9 - 5.5	15.9 - 8.9
40	8°25.0	8°26.4	8°02.0	4.0 - 2.2	10.0 - 5.6	16.0 - 8.9
41	8°25.2	8°26.6	8°02.2	4.1 - 2.3	10.1 - 5.6	16.1 - 9.0
42	8°25.5	8°26.9	8°02.5	4.2 - 2.3	10.2 - 5.7	16.2 - 9.0
43	8°25.8	8°27.1	8°02.7	4.3 - 2.4	10.3 - 5.8	16.3 - 9.1
44	8°26.0	8°27.4	8°02.9	4.4 - 2.5	10.4 - 5.8	16.4 - 9.2
45	8°26.3	8°27.6	8°03.2	4.5 - 2.5	10.5 - 5.9	16.5 - 9.2
46	8°26.5	8°27.9	8°03.4	4.6 - 2.6	10.6 - 5.9	16.6 - 9.3
47	8°26.7	8°28.1	8°03.7	4.7 - 2.6	10.7 - 6.0	16.7 - 9.3
48	8°27.0	8°28.4	8°03.9	4.8 - 2.7	10.8 - 6.0	16.8 - 9.4
49	8°27.3	8°28.6	8°04.1	4.9 - 2.7	10.9 - 6.1	16.9 - 9.4
50	8°27.5	8°28.9	8°04.4	5.0 - 2.8	11.0 - 6.1	17.0 - 9.5
51	8°27.8	8°29.1	8°04.6	5.1 - 2.8	11.1 - 6.2	17.1 - 9.5
52	8°28.0	8°29.4	8°04.9	5.2 - 2.9	11.2 - 6.3	17.2 - 9.6
53	8°28.2	8°29.6	8°05.1	5.3 - 3.0	11.3 - 6.3	17.3 - 9.7
54	8°28.5	8°29.9	8°05.3	5.4 - 3.0	11.4 - 6.4	17.4 - 9.7
55	8°28.7	8°30.1	8°05.6	5.5 - 3.1	11.5 - 6.4	17.5 - 9.8
56	8°29.0	8°30.4	8°05.8	5.6 - 3.1	11.6 - 6.5	17.6 - 9.8
57	8°29.3	8°30.6	8°06.1	5.7 - 3.2	11.7 - 6.5	17.7 - 9.9
58	8°29.5	8°30.9	8°06.3	5.8 - 3.2	11.8 - 6.6	17.8 - 9.9
59	8°29.8	8°31.1	8°06.5	5.9 - 3.3	11.9 - 6.6	17.9 - 10.0

m 34	Sun Plan.	Aries	Moon	v and d corr		
0	8°30.0	8°31.4	8°06.8	0.0 - 0.0	6.0 - 3.4	12.0 - 6.9
1	8°30.2	8°31.6	8°07.0	0.1 - 0.1	6.1 - 3.5	12.1 - 7.0
2	8°30.5	8°31.9	8°07.2	0.2 - 0.1	6.2 - 3.6	12.2 - 7.0
3	8°30.7	8°32.1	8°07.5	0.3 - 0.2	6.3 - 3.6	12.3 - 7.1
4	8°31.0	8°32.4	8°07.7	0.4 - 0.2	6.4 - 3.7	12.4 - 7.1
5	8°31.3	8°32.6	8°08.0	0.5 - 0.3	6.5 - 3.7	12.5 - 7.2
6	8°31.5	8°32.9	8°08.2	0.6 - 0.3	6.6 - 3.8	12.6 - 7.2
7	8°31.8	8°33.1	8°08.4	0.7 - 0.4	6.7 - 3.9	12.7 - 7.3
8	8°32.0	8°33.4	8°08.7	0.8 - 0.5	6.8 - 3.9	12.8 - 7.4
9	8°32.2	8°33.7	8°08.9	0.9 - 0.5	6.9 - 4.0	12.9 - 7.4
10	8°32.5	8°33.9	8°09.2	1.0 - 0.6	7.0 - 4.0	13.0 - 7.5
11	8°32.7	8°34.2	8°09.4	1.1 - 0.6	7.1 - 4.1	13.1 - 7.5
12	8°33.0	8°34.4	8°09.6	1.2 - 0.7	7.2 - 4.1	13.2 - 7.6
13	8°33.3	8°34.7	8°09.9	1.3 - 0.7	7.3 - 4.2	13.3 - 7.6
14	8°33.5	8°34.9	8°10.1	1.4 - 0.8	7.4 - 4.3	13.4 - 7.7
15	8°33.8	8°35.2	8°10.3	1.5 - 0.9	7.5 - 4.3	13.5 - 7.8
16	8°34.0	8°35.4	8°10.6	1.6 - 0.9	7.6 - 4.4	13.6 - 7.8
17	8°34.2	8°35.7	8°10.8	1.7 - 1.0	7.7 - 4.4	13.7 - 7.9
18	8°34.5	8°35.9	8°11.1	1.8 - 1.0	7.8 - 4.5	13.8 - 7.9
19	8°34.8	8°36.2	8°11.3	1.9 - 1.1	7.9 - 4.5	13.9 - 8.0
20	8°35.0	8°36.4	8°11.5	2.0 - 1.1	8.0 - 4.6	14.0 - 8.0
21	8°35.3	8°36.7	8°11.8	2.1 - 1.2	8.1 - 4.7	14.1 - 8.1
22	8°35.5	8°36.9	8°12.0	2.2 - 1.3	8.2 - 4.7	14.2 - 8.2
23	8°35.7	8°37.2	8°12.3	2.3 - 1.3	8.3 - 4.8	14.3 - 8.2
24	8°36.0	8°37.4	8°12.5	2.4 - 1.4	8.4 - 4.8	14.4 - 8.3
25	8°36.2	8°37.7	8°12.7	2.5 - 1.4	8.5 - 4.9	14.5 - 8.3
26	8°36.5	8°37.9	8°13.0	2.6 - 1.5	8.6 - 4.9	14.6 - 8.4
27	8°36.8	8°38.2	8°13.2	2.7 - 1.6	8.7 - 5.0	14.7 - 8.5
28	8°37.0	8°38.4	8°13.4	2.8 - 1.6	8.8 - 5.1	14.8 - 8.5
29	8°37.3	8°38.7	8°13.7	2.9 - 1.7	8.9 - 5.1	14.9 - 8.6
30	8°37.5	8°38.9	8°13.9	3.0 - 1.7	9.0 - 5.2	15.0 - 8.6
31	8°37.7	8°39.2	8°14.2	3.1 - 1.8	9.1 - 5.2	15.1 - 8.7
32	8°38.0	8°39.4	8°14.4	3.2 - 1.8	9.2 - 5.3	15.2 - 8.7
33	8°38.2	8°39.7	8°14.6	3.3 - 1.9	9.3 - 5.3	15.3 - 8.8
34	8°38.5	8°39.9	8°14.9	3.4 - 2.0	9.4 - 5.4	15.4 - 8.9
35	8°38.8	8°40.2	8°15.1	3.5 - 2.0	9.5 - 5.5	15.5 - 8.9
36	8°39.0	8°40.4	8°15.4	3.6 - 2.1	9.6 - 5.5	15.6 - 9.0
37	8°39.3	8°40.7	8°15.6	3.7 - 2.1	9.7 - 5.6	15.7 - 9.0
38	8°39.5	8°40.9	8°15.8	3.8 - 2.2	9.8 - 5.6	15.8 - 9.1
39	8°39.7	8°41.2	8°16.1	3.9 - 2.2	9.9 - 5.7	15.9 - 9.1
40	8°40.0	8°41.4	8°16.3	4.0 - 2.3	10.0 - 5.8	16.0 - 9.2
41	8°40.2	8°41.7	8°16.5	4.1 - 2.4	10.1 - 5.8	16.1 - 9.3
42	8°40.5	8°41.9	8°16.8	4.2 - 2.4	10.2 - 5.9	16.2 - 9.3
43	8°40.8	8°42.2	8°17.0	4.3 - 2.5	10.3 - 5.9	16.3 - 9.4
44	8°41.0	8°42.4	8°17.3	4.4 - 2.5	10.4 - 6.0	16.4 - 9.4
45	8°41.3	8°42.7	8°17.5	4.5 - 2.6	10.5 - 6.0	16.5 - 9.5
46	8°41.5	8°42.9	8°17.7	4.6 - 2.6	10.6 - 6.1	16.6 - 9.5
47	8°41.7	8°43.2	8°18.0	4.7 - 2.7	10.7 - 6.2	16.7 - 9.6
48	8°42.0	8°43.4	8°18.2	4.8 - 2.8	10.8 - 6.2	16.8 - 9.7
49	8°42.3	8°43.7	8°18.5	4.9 - 2.8	10.9 - 6.3	16.9 - 9.7
50	8°42.5	8°43.9	8°18.7	5.0 - 2.9	11.0 - 6.3	17.0 - 9.8
51	8°42.8	8°44.2	8°18.9	5.1 - 2.9	11.1 - 6.4	17.1 - 9.8
52	8°43.0	8°44.4	8°19.2	5.2 - 3.0	11.2 - 6.4	17.2 - 9.9
53	8°43.2	8°44.7	8°19.4	5.3 - 3.0	11.3 - 6.5	17.3 - 9.9
54	8°43.5	8°44.9	8°19.7	5.4 - 3.1	11.4 - 6.6	17.4 - 10.0
55	8°43.7	8°45.2	8°19.9	5.5 - 3.2	11.5 - 6.6	17.5 - 10.1
56	8°44.0	8°45.4	8°20.1	5.6 - 3.2	11.6 - 6.7	17.6 - 10.1
57	8°44.3	8°45.7	8°20.4	5.7 - 3.3	11.7 - 6.7	17.7 - 10.2
58	8°44.5	8°45.9	8°20.6	5.8 - 3.3	11.8 - 6.8	17.8 - 10.2
59	8°44.8	8°46.2	8°20.8	5.9 - 3.4	11.9 - 6.8	17.9 - 10.3

m 35	Sun Plan.	Aries	Moon	v and d corr		
0	8°45.0	8°46.4	8°21.1	0.0 - 0.0	6.0 - 3.5	12.0 - 7.1
1	8°45.2	8°46.7	8°21.3	0.1 - 0.1	6.1 - 3.6	12.1 - 7.2
2	8°45.5	8°46.9	8°21.6	0.2 - 0.1	6.2 - 3.7	12.2 - 7.2
3	8°45.7	8°47.2	8°21.8	0.3 - 0.2	6.3 - 3.7	12.3 - 7.3
4	8°46.0	8°47.4	8°22.0	0.4 - 0.2	6.4 - 3.8	12.4 - 7.3
5	8°46.3	8°47.7	8°22.3	0.5 - 0.3	6.5 - 3.8	12.5 - 7.4
6	8°46.5	8°47.9	8°22.5	0.6 - 0.4	6.6 - 3.9	12.6 - 7.5
7	8°46.8	8°48.2	8°22.8	0.7 - 0.4	6.7 - 4.0	12.7 - 7.5
8	8°47.0	8°48.4	8°23.0	0.8 - 0.5	6.8 - 4.0	12.8 - 7.6
9	8°47.2	8°48.7	8°23.2	0.9 - 0.5	6.9 - 4.1	12.9 - 7.6
10	8°47.5	8°48.9	8°23.5	1.0 - 0.6	7.0 - 4.1	13.0 - 7.7
11	8°47.7	8°49.2	8°23.7	1.1 - 0.7	7.1 - 4.2	13.1 - 7.8
12	8°48.0	8°49.4	8°23.9	1.2 - 0.7	7.2 - 4.3	13.2 - 7.8
13	8°48.3	8°49.7	8°24.2	1.3 - 0.8	7.3 - 4.3	13.3 - 7.9
14	8°48.5	8°49.9	8°24.4	1.4 - 0.8	7.4 - 4.4	13.4 - 7.9
15	8°48.8	8°50.2	8°24.7	1.5 - 0.9	7.5 - 4.4	13.5 - 8.0
16	8°49.0	8°50.4	8°24.9	1.6 - 0.9	7.6 - 4.5	13.6 - 8.0
17	8°49.2	8°50.7	8°25.1	1.7 - 1.0	7.7 - 4.6	13.7 - 8.1
18	8°49.5	8°50.9	8°25.4	1.8 - 1.1	7.8 - 4.6	13.8 - 8.2
19	8°49.8	8°51.2	8°25.6	1.9 - 1.1	7.9 - 4.7	13.9 - 8.2
20	8°50.0	8°51.4	8°25.9	2.0 - 1.2	8.0 - 4.7	14.0 - 8.3
21	8°50.3	8°51.7	8°26.1	2.1 - 1.2	8.1 - 4.8	14.1 - 8.3
22	8°50.5	8°52.0	8°26.3	2.2 - 1.3	8.2 - 4.9	14.2 - 8.4
23	8°50.7	8°52.2	8°26.6	2.3 - 1.4	8.3 - 4.9	14.3 - 8.5
24	8°51.0	8°52.5	8°26.8	2.4 - 1.4	8.4 - 5.0	14.4 - 8.5
25	8°51.2	8°52.7	8°27.0	2.5 - 1.5	8.5 - 5.0	14.5 - 8.6
26	8°51.5	8°53.0	8°27.3	2.6 - 1.5	8.6 - 5.1	14.6 - 8.6
27	8°51.8	8°53.2	8°27.5	2.7 - 1.6	8.7 - 5.1	14.7 - 8.7
28	8°52.0	8°53.5	8°27.8	2.8 - 1.7	8.8 - 5.2	14.8 - 8.8
29	8°52.3	8°53.7	8°28.0	2.9 - 1.7	8.9 - 5.3	14.9 - 8.8
30	8°52.5	8°54.0	8°28.2	3.0 - 1.8	9.0 - 5.3	15.0 - 8.9
31	8°52.7	8°54.2	8°28.5	3.1 - 1.8	9.1 - 5.4	15.1 - 8.9
32	8°53.0	8°54.5	8°28.7	3.2 - 1.9	9.2 - 5.4	15.2 - 9.0
33	8°53.2	8°54.7	8°29.0	3.3 - 2.0	9.3 - 5.5	15.3 - 9.1
34	8°53.5	8°55.0	8°29.2	3.4 - 2.0	9.4 - 5.6	15.4 - 9.1
35	8°53.8	8°55.2	8°29.4	3.5 - 2.1	9.5 - 5.6	15.5 - 9.2
36	8°54.0	8°55.5	8°29.7	3.6 - 2.1	9.6 - 5.7	15.6 - 9.2
37	8°54.3	8°55.7	8°29.9	3.7 - 2.2	9.7 - 5.7	15.7 - 9.3
38	8°54.5	8°56.0	8°30.2	3.8 - 2.2	9.8 - 5.8	15.8 - 9.3
39	8°54.7	8°56.2	8°30.4	3.9 - 2.3	9.9 - 5.9	15.9 - 9.4
40	8°55.0	8°56.5	8°30.6	4.0 - 2.4	10.0 - 5.9	16.0 - 9.5
41	8°55.2	8°56.7	8°30.9	4.1 - 2.4	10.1 - 6.0	16.1 - 9.5
42	8°55.5	8°57.0	8°31.1	4.2 - 2.5	10.2 - 6.0	16.2 - 9.6
43	8°55.8	8°57.2	8°31.3	4.3 - 2.5	10.3 - 6.1	16.3 - 9.6
44	8°56.0	8°57.5	8°31.6	4.4 - 2.6	10.4 - 6.2	16.4 - 9.7
45	8°56.3	8°57.7	8°31.8	4.5 - 2.7	10.5 - 6.2	16.5 - 9.8
46	8°56.5	8°58.0	8°32.1	4.6 - 2.7	10.6 - 6.3	16.6 - 9.8
47	8°56.7	8°58.2	8°32.3	4.7 - 2.8	10.7 - 6.3	16.7 - 9.9
48	8°57.0	8°58.5	8°32.5	4.8 - 2.8	10.8 - 6.4	16.8 - 9.9
49	8°57.3	8°58.7	8°32.8	4.9 - 2.9	10.9 - 6.4	16.9 - 10.0
50	8°57.5	8°59.0	8°33.0	5.0 - 3.0	11.0 - 6.5	17.0 - 10.1
51	8°57.8	8°59.2	8°33.3	5.1 - 3.0	11.1 - 6.6	17.1 - 10.1
52	8°58.0	8°59.5	8°33.5	5.2 - 3.1	11.2 - 6.6	17.2 - 10.2
53	8°58.2	8°59.7	8°33.7	5.3 - 3.1	11.3 - 6.7	17.3 - 10.2
54	8°58.5	9°00.0	8°34.0	5.4 - 3.2	11.4 - 6.7	17.4 - 10.3
55	8°58.7	9°00.2	8°34.2	5.5 - 3.3	11.5 - 6.8	17.5 - 10.4
56	8°59.0	9°00.5	8°34.4	5.6 - 3.3	11.6 - 6.9	17.6 - 10.4
57	8°59.3	9°00.7	8°34.7	5.7 - 3.4	11.7 - 6.9	17.7 - 10.5
58	8°59.5	9°01.0	8°34.9	5.8 - 3.4	11.8 - 7.0	17.8 - 10.5
59	8°59.8	9°01.2	8°35.2	5.9 - 3.5	11.9 - 7.0	17.9 - 10.6

Increments and Corrections

m 36	Sun Plan.	Aries	Moon	v and d corr		
0	9°00.0	9°01.5	8°35.4	0.0 - 0.0	6.0 - 3.6	12.0 - 7.3
1	9°00.2	9°01.7	8°35.6	0.1 - 0.1	6.1 - 3.7	12.1 - 7.4
2	9°00.5	9°02.0	8°35.9	0.2 - 0.1	6.2 - 3.8	12.2 - 7.4
3	9°00.7	9°02.2	8°36.1	0.3 - 0.2	6.3 - 3.8	12.3 - 7.5
4	9°01.0	9°02.5	8°36.4	0.4 - 0.2	6.4 - 3.9	12.4 - 7.5
5	9°01.3	9°02.7	8°36.6	0.5 - 0.3	6.5 - 4.0	12.5 - 7.6
6	9°01.5	9°03.0	8°36.8	0.6 - 0.4	6.6 - 4.0	12.6 - 7.7
7	9°01.8	9°03.2	8°37.1	0.7 - 0.4	6.7 - 4.1	12.7 - 7.7
8	9°02.0	9°03.5	8°37.3	0.8 - 0.5	6.8 - 4.1	12.8 - 7.8
9	9°02.2	9°03.7	8°37.5	0.9 - 0.5	6.9 - 4.2	12.9 - 7.8
10	9°02.5	9°04.0	8°37.8	1.0 - 0.6	7.0 - 4.3	13.0 - 7.9
11	9°02.7	9°04.2	8°38.0	1.1 - 0.7	7.1 - 4.3	13.1 - 8.0
12	9°03.0	9°04.5	8°38.3	1.2 - 0.7	7.2 - 4.4	13.2 - 8.0
13	9°03.3	9°04.7	8°38.5	1.3 - 0.8	7.3 - 4.4	13.3 - 8.1
14	9°03.5	9°05.0	8°38.7	1.4 - 0.9	7.4 - 4.5	13.4 - 8.2
15	9°03.8	9°05.2	8°39.0	1.5 - 0.9	7.5 - 4.6	13.5 - 8.2
16	9°04.0	9°05.5	8°39.2	1.6 - 1.0	7.6 - 4.6	13.6 - 8.3
17	9°04.2	9°05.7	8°39.5	1.7 - 1.0	7.7 - 4.7	13.7 - 8.3
18	9°04.5	9°06.0	8°39.7	1.8 - 1.1	7.8 - 4.7	13.8 - 8.4
19	9°04.8	9°06.2	8°39.9	1.9 - 1.2	7.9 - 4.8	13.9 - 8.5
20	9°05.0	9°06.5	8°40.2	2.0 - 1.2	8.0 - 4.9	14.0 - 8.5
21	9°05.3	9°06.7	8°40.4	2.1 - 1.3	8.1 - 4.9	14.1 - 8.6
22	9°05.5	9°07.0	8°40.6	2.2 - 1.3	8.2 - 5.0	14.2 - 8.6
23	9°05.7	9°07.2	8°40.9	2.3 - 1.4	8.3 - 5.0	14.3 - 8.7
24	9°06.0	9°07.5	8°41.1	2.4 - 1.5	8.4 - 5.1	14.4 - 8.8
25	9°06.2	9°07.7	8°41.4	2.5 - 1.5	8.5 - 5.2	14.5 - 8.8
26	9°06.5	9°08.0	8°41.6	2.6 - 1.6	8.6 - 5.2	14.6 - 8.9
27	9°06.8	9°08.2	8°41.8	2.7 - 1.6	8.7 - 5.3	14.7 - 8.9
28	9°07.0	9°08.5	8°42.1	2.8 - 1.7	8.8 - 5.4	14.8 - 9.0
29	9°07.3	9°08.7	8°42.3	2.9 - 1.8	8.9 - 5.4	14.9 - 9.1
30	9°07.5	9°09.0	8°42.6	3.0 - 1.8	9.0 - 5.5	15.0 - 9.1
31	9°07.7	9°09.2	8°42.8	3.1 - 1.9	9.1 - 5.5	15.1 - 9.2
32	9°08.0	9°09.5	8°43.0	3.2 - 1.9	9.2 - 5.6	15.2 - 9.2
33	9°08.2	9°09.7	8°43.3	3.3 - 2.0	9.3 - 5.7	15.3 - 9.3
34	9°08.5	9°10.0	8°43.5	3.4 - 2.1	9.4 - 5.7	15.4 - 9.4
35	9°08.8	9°10.2	8°43.8	3.5 - 2.1	9.5 - 5.8	15.5 - 9.4
36	9°09.0	9°10.5	8°44.0	3.6 - 2.2	9.6 - 5.8	15.6 - 9.5
37	9°09.3	9°10.8	8°44.2	3.7 - 2.3	9.7 - 5.9	15.7 - 9.6
38	9°09.5	9°11.0	8°44.5	3.8 - 2.3	9.8 - 6.0	15.8 - 9.6
39	9°09.7	9°11.3	8°44.7	3.9 - 2.4	9.9 - 6.0	15.9 - 9.7
40	9°10.0	9°11.5	8°44.9	4.0 - 2.4	10.0 - 6.1	16.0 - 9.7
41	9°10.2	9°11.8	8°45.2	4.1 - 2.5	10.1 - 6.1	16.1 - 9.8
42	9°10.5	9°12.0	8°45.4	4.2 - 2.6	10.2 - 6.2	16.2 - 9.9
43	9°10.8	9°12.3	8°45.7	4.3 - 2.6	10.3 - 6.3	16.3 - 9.9
44	9°11.0	9°12.5	8°45.9	4.4 - 2.7	10.4 - 6.3	16.4 - 10.0
45	9°11.3	9°12.8	8°46.1	4.5 - 2.7	10.5 - 6.4	16.5 - 10.0
46	9°11.5	9°13.0	8°46.4	4.6 - 2.8	10.6 - 6.4	16.6 - 10.1
47	9°11.7	9°13.3	8°46.6	4.7 - 2.9	10.7 - 6.5	16.7 - 10.2
48	9°12.0	9°13.5	8°46.9	4.8 - 2.9	10.8 - 6.6	16.8 - 10.2
49	9°12.3	9°13.8	8°47.1	4.9 - 3.0	10.9 - 6.6	16.9 - 10.3
50	9°12.5	9°14.0	8°47.3	5.0 - 3.0	11.0 - 6.7	17.0 - 10.3
51	9°12.8	9°14.3	8°47.6	5.1 - 3.1	11.1 - 6.8	17.1 - 10.4
52	9°13.0	9°14.5	8°47.8	5.2 - 3.2	11.2 - 6.8	17.2 - 10.5
53	9°13.2	9°14.8	8°48.0	5.3 - 3.2	11.3 - 6.9	17.3 - 10.5
54	9°13.5	9°15.0	8°48.3	5.4 - 3.3	11.4 - 6.9	17.4 - 10.6
55	9°13.7	9°15.3	8°48.5	5.5 - 3.3	11.5 - 7.0	17.5 - 10.6
56	9°14.0	9°15.5	8°48.8	5.6 - 3.4	11.6 - 7.1	17.6 - 10.7
57	9°14.3	9°15.8	8°49.0	5.7 - 3.5	11.7 - 7.1	17.7 - 10.8
58	9°14.5	9°16.0	8°49.2	5.8 - 3.5	11.8 - 7.2	17.8 - 10.8
59	9°14.8	9°16.3	8°49.5	5.9 - 3.6	11.9 - 7.2	17.9 - 10.9

m 37	Sun Plan.	Aries	Moon	v and d corr		
0	9°15.0	9°16.5	8°49.7	0.0 - 0.0	6.0 - 3.8	12.0 - 7.5
1	9°15.2	9°16.8	8°50.0	0.1 - 0.1	6.1 - 3.8	12.1 - 7.6
2	9°15.5	9°17.0	8°50.2	0.2 - 0.1	6.2 - 3.9	12.2 - 7.6
3	9°15.7	9°17.3	8°50.4	0.3 - 0.2	6.3 - 3.9	12.3 - 7.7
4	9°16.0	9°17.5	8°50.7	0.4 - 0.3	6.4 - 4.0	12.4 - 7.8
5	9°16.3	9°17.8	8°50.9	0.5 - 0.3	6.5 - 4.1	12.5 - 7.8
6	9°16.5	9°18.0	8°51.1	0.6 - 0.4	6.6 - 4.1	12.6 - 7.9
7	9°16.8	9°18.3	8°51.4	0.7 - 0.4	6.7 - 4.2	12.7 - 7.9
8	9°17.0	9°18.5	8°51.6	0.8 - 0.5	6.8 - 4.3	12.8 - 8.0
9	9°17.2	9°18.8	8°51.9	0.9 - 0.6	6.9 - 4.3	12.9 - 8.1
10	9°17.5	9°19.0	8°52.1	1.0 - 0.6	7.0 - 4.4	13.0 - 8.1
11	9°17.7	9°19.3	8°52.3	1.1 - 0.7	7.1 - 4.4	13.1 - 8.2
12	9°18.0	9°19.5	8°52.6	1.2 - 0.8	7.2 - 4.5	13.2 - 8.3
13	9°18.3	9°19.8	8°52.8	1.3 - 0.8	7.3 - 4.6	13.3 - 8.3
14	9°18.5	9°20.0	8°53.1	1.4 - 0.9	7.4 - 4.6	13.4 - 8.4
15	9°18.8	9°20.3	8°53.3	1.5 - 0.9	7.5 - 4.7	13.5 - 8.4
16	9°19.0	9°20.5	8°53.5	1.6 - 1.0	7.6 - 4.8	13.6 - 8.5
17	9°19.2	9°20.8	8°53.8	1.7 - 1.1	7.7 - 4.8	13.7 - 8.6
18	9°19.5	9°21.0	8°54.0	1.8 - 1.1	7.8 - 4.9	13.8 - 8.6
19	9°19.8	9°21.3	8°54.3	1.9 - 1.2	7.9 - 4.9	13.9 - 8.7
20	9°20.0	9°21.5	8°54.5	2.0 - 1.3	8.0 - 5.0	14.0 - 8.8
21	9°20.3	9°21.8	8°54.7	2.1 - 1.3	8.1 - 5.1	14.1 - 8.8
22	9°20.5	9°22.0	8°55.0	2.2 - 1.4	8.2 - 5.1	14.2 - 8.9
23	9°20.7	9°22.3	8°55.2	2.3 - 1.4	8.3 - 5.2	14.3 - 8.9
24	9°21.0	9°22.5	8°55.4	2.4 - 1.5	8.4 - 5.3	14.4 - 9.0
25	9°21.2	9°22.8	8°55.7	2.5 - 1.6	8.5 - 5.3	14.5 - 9.1
26	9°21.5	9°23.0	8°55.9	2.6 - 1.6	8.6 - 5.4	14.6 - 9.1
27	9°21.8	9°23.3	8°56.2	2.7 - 1.7	8.7 - 5.4	14.7 - 9.2
28	9°22.0	9°23.5	8°56.4	2.8 - 1.8	8.8 - 5.5	14.8 - 9.3
29	9°22.3	9°23.8	8°56.6	2.9 - 1.8	8.9 - 5.6	14.9 - 9.3
30	9°22.5	9°24.0	8°56.9	3.0 - 1.9	9.0 - 5.6	15.0 - 9.4
31	9°22.7	9°24.3	8°57.1	3.1 - 1.9	9.1 - 5.7	15.1 - 9.4
32	9°23.0	9°24.5	8°57.4	3.2 - 2.0	9.2 - 5.8	15.2 - 9.5
33	9°23.2	9°24.8	8°57.6	3.3 - 2.1	9.3 - 5.8	15.3 - 9.6
34	9°23.5	9°25.0	8°57.8	3.4 - 2.1	9.4 - 5.9	15.4 - 9.6
35	9°23.8	9°25.3	8°58.1	3.5 - 2.2	9.5 - 5.9	15.5 - 9.7
36	9°24.0	9°25.5	8°58.3	3.6 - 2.3	9.6 - 6.0	15.6 - 9.8
37	9°24.3	9°25.8	8°58.5	3.7 - 2.3	9.7 - 6.1	15.7 - 9.8
38	9°24.5	9°26.0	8°58.8	3.8 - 2.4	9.8 - 6.1	15.8 - 9.9
39	9°24.7	9°26.3	8°59.0	3.9 - 2.4	9.9 - 6.2	15.9 - 9.9
40	9°25.0	9°26.5	8°59.3	4.0 - 2.5	10.0 - 6.3	16.0 - 10.0
41	9°25.2	9°26.8	8°59.5	4.1 - 2.6	10.1 - 6.3	16.1 - 10.1
42	9°25.5	9°27.0	8°59.7	4.2 - 2.6	10.2 - 6.4	16.2 - 10.1
43	9°25.8	9°27.3	9°00.0	4.3 - 2.7	10.3 - 6.4	16.3 - 10.2
44	9°26.0	9°27.5	9°00.2	4.4 - 2.8	10.4 - 6.5	16.4 - 10.3
45	9°26.3	9°27.8	9°00.5	4.5 - 2.8	10.5 - 6.6	16.5 - 10.3
46	9°26.5	9°28.0	9°00.7	4.6 - 2.9	10.6 - 6.6	16.6 - 10.4
47	9°26.7	9°28.3	9°00.9	4.7 - 2.9	10.7 - 6.7	16.7 - 10.4
48	9°27.0	9°28.5	9°01.2	4.8 - 3.0	10.8 - 6.8	16.8 - 10.5
49	9°27.3	9°28.8	9°01.4	4.9 - 3.1	10.9 - 6.8	16.9 - 10.6
50	9°27.5	9°29.1	9°01.6	5.0 - 3.1	11.0 - 6.9	17.0 - 10.6
51	9°27.8	9°29.3	9°01.9	5.1 - 3.2	11.1 - 6.9	17.1 - 10.7
52	9°28.0	9°29.6	9°02.1	5.2 - 3.3	11.2 - 7.0	17.2 - 10.8
53	9°28.2	9°29.8	9°02.4	5.3 - 3.3	11.3 - 7.1	17.3 - 10.8
54	9°28.5	9°30.1	9°02.6	5.4 - 3.4	11.4 - 7.1	17.4 - 10.9
55	9°28.7	9°30.3	9°02.8	5.5 - 3.4	11.5 - 7.2	17.5 - 10.9
56	9°29.0	9°30.6	9°03.1	5.6 - 3.5	11.6 - 7.3	17.6 - 11.0
57	9°29.3	9°30.8	9°03.3	5.7 - 3.6	11.7 - 7.3	17.7 - 11.1
58	9°29.5	9°31.1	9°03.6	5.8 - 3.6	11.8 - 7.4	17.8 - 11.1
59	9°29.8	9°31.3	9°03.8	5.9 - 3.7	11.9 - 7.4	17.9 - 11.2

m 38	Sun Plan.	Aries	Moon	v and d corr		
0	9°30.0	9°31.6	9°04.0	0.0 - 0.0	6.0 - 3.9	12.0 - 7.7
1	9°30.2	9°31.8	9°04.3	0.1 - 0.1	6.1 - 3.9	12.1 - 7.8
2	9°30.5	9°32.1	9°04.5	0.2 - 0.1	6.2 - 4.0	12.2 - 7.8
3	9°30.7	9°32.3	9°04.7	0.3 - 0.2	6.3 - 4.0	12.3 - 7.9
4	9°31.0	9°32.6	9°05.0	0.4 - 0.3	6.4 - 4.1	12.4 - 8.0
5	9°31.3	9°32.8	9°05.2	0.5 - 0.3	6.5 - 4.2	12.5 - 8.0
6	9°31.5	9°33.1	9°05.5	0.6 - 0.4	6.6 - 4.2	12.6 - 8.1
7	9°31.8	9°33.3	9°05.7	0.7 - 0.4	6.7 - 4.3	12.7 - 8.1
8	9°32.0	9°33.6	9°05.9	0.8 - 0.5	6.8 - 4.4	12.8 - 8.2
9	9°32.2	9°33.8	9°06.2	0.9 - 0.6	6.9 - 4.4	12.9 - 8.3
10	9°32.5	9°34.1	9°06.4	1.0 - 0.6	7.0 - 4.5	13.0 - 8.3
11	9°32.7	9°34.3	9°06.7	1.1 - 0.7	7.1 - 4.6	13.1 - 8.4
12	9°33.0	9°34.6	9°06.9	1.2 - 0.8	7.2 - 4.6	13.2 - 8.5
13	9°33.3	9°34.8	9°07.1	1.3 - 0.8	7.3 - 4.7	13.3 - 8.5
14	9°33.5	9°35.1	9°07.4	1.4 - 0.9	7.4 - 4.7	13.4 - 8.6
15	9°33.8	9°35.3	9°07.6	1.5 - 1.0	7.5 - 4.8	13.5 - 8.7
16	9°34.0	9°35.6	9°07.9	1.6 - 1.0	7.6 - 4.9	13.6 - 8.7
17	9°34.2	9°35.8	9°08.1	1.7 - 1.1	7.7 - 4.9	13.7 - 8.8
18	9°34.5	9°36.1	9°08.3	1.8 - 1.2	7.8 - 5.0	13.8 - 8.9
19	9°34.8	9°36.3	9°08.6	1.9 - 1.2	7.9 - 5.1	13.9 - 8.9
20	9°35.0	9°36.6	9°08.8	2.0 - 1.3	8.0 - 5.1	14.0 - 9.0
21	9°35.3	9°36.8	9°09.0	2.1 - 1.3	8.1 - 5.2	14.1 - 9.0
22	9°35.5	9°37.1	9°09.3	2.2 - 1.4	8.2 - 5.3	14.2 - 9.1
23	9°35.7	9°37.3	9°09.5	2.3 - 1.5	8.3 - 5.3	14.3 - 9.2
24	9°36.0	9°37.6	9°09.8	2.4 - 1.5	8.4 - 5.4	14.4 - 9.2
25	9°36.2	9°37.8	9°10.0	2.5 - 1.6	8.5 - 5.5	14.5 - 9.3
26	9°36.5	9°38.1	9°10.2	2.6 - 1.7	8.6 - 5.5	14.6 - 9.4
27	9°36.8	9°38.3	9°10.5	2.7 - 1.7	8.7 - 5.6	14.7 - 9.4
28	9°37.0	9°38.6	9°10.7	2.8 - 1.8	8.8 - 5.6	14.8 - 9.5
29	9°37.3	9°38.8	9°11.0	2.9 - 1.9	8.9 - 5.7	14.9 - 9.6
30	9°37.5	9°39.1	9°11.2	3.0 - 1.9	9.0 - 5.8	15.0 - 9.6
31	9°37.7	9°39.3	9°11.4	3.1 - 2.0	9.1 - 5.8	15.1 - 9.7
32	9°38.0	9°39.6	9°11.7	3.2 - 2.1	9.2 - 5.9	15.2 - 9.8
33	9°38.2	9°39.8	9°11.9	3.3 - 2.1	9.3 - 6.0	15.3 - 9.8
34	9°38.5	9°40.1	9°12.1	3.4 - 2.2	9.4 - 6.0	15.4 - 9.9
35	9°38.8	9°40.3	9°12.4	3.5 - 2.2	9.5 - 6.1	15.5 - 9.9
36	9°39.0	9°40.6	9°12.6	3.6 - 2.3	9.6 - 6.2	15.6 - 10.0
37	9°39.3	9°40.8	9°12.9	3.7 - 2.4	9.7 - 6.2	15.7 - 10.1
38	9°39.5	9°41.1	9°13.1	3.8 - 2.4	9.8 - 6.3	15.8 - 10.1
39	9°39.7	9°41.3	9°13.3	3.9 - 2.5	9.9 - 6.4	15.9 - 10.2
40	9°40.0	9°41.6	9°13.6	4.0 - 2.6	10.0 - 6.4	16.0 - 10.3
41	9°40.2	9°41.8	9°13.8	4.1 - 2.6	10.1 - 6.5	16.1 - 10.3
42	9°40.5	9°42.1	9°14.1	4.2 - 2.7	10.2 - 6.5	16.2 - 10.4
43	9°40.8	9°42.3	9°14.3	4.3 - 2.8	10.3 - 6.6	16.3 - 10.5
44	9°41.0	9°42.6	9°14.5	4.4 - 2.8	10.4 - 6.7	16.4 - 10.5
45	9°41.3	9°42.8	9°14.8	4.5 - 2.9	10.5 - 6.7	16.5 - 10.6
46	9°41.5	9°43.1	9°15.0	4.6 - 3.0	10.6 - 6.8	16.6 - 10.7
47	9°41.7	9°43.3	9°15.2	4.7 - 3.0	10.7 - 6.9	16.7 - 10.7
48	9°42.0	9°43.6	9°15.5	4.8 - 3.1	10.8 - 6.9	16.8 - 10.8
49	9°42.3	9°43.8	9°15.7	4.9 - 3.1	10.9 - 7.0	16.9 - 10.8
50	9°42.5	9°44.1	9°16.0	5.0 - 3.2	11.0 - 7.1	17.0 - 10.9
51	9°42.8	9°44.3	9°16.2	5.1 - 3.3	11.1 - 7.1	17.1 - 11.0
52	9°43.0	9°44.6	9°16.4	5.2 - 3.3	11.2 - 7.2	17.2 - 11.0
53	9°43.2	9°44.8	9°16.7	5.3 - 3.4	11.3 - 7.3	17.3 - 11.1
54	9°43.5	9°45.1	9°16.9	5.4 - 3.5	11.4 - 7.3	17.4 - 11.2
55	9°43.7	9°45.3	9°17.2	5.5 - 3.5	11.5 - 7.4	17.5 - 11.2
56	9°44.0	9°45.6	9°17.4	5.6 - 3.6	11.6 - 7.4	17.6 - 11.3
57	9°44.3	9°45.8	9°17.6	5.7 - 3.7	11.7 - 7.5	17.7 - 11.4
58	9°44.5	9°46.1	9°17.9	5.8 - 3.7	11.8 - 7.6	17.8 - 11.4
59	9°44.8	9°46.3	9°18.1	5.9 - 3.8	11.9 - 7.6	17.9 - 11.5

Increments and Corrections

m 39	Sun Plan.	Aries	Moon	v and d corr		
0	9°45.0	9°46.6	9°18.4	0.0 - 0.0	6.0 - 4.0	12.0 - 7.9
1	9°45.2	9°46.8	9°18.6	0.1 - 0.1	6.1 - 4.0	12.1 - 8.0
2	9°45.5	9°47.1	9°18.8	0.2 - 0.1	6.2 - 4.1	12.2 - 8.0
3	9°45.7	9°47.4	9°19.1	0.3 - 0.2	6.3 - 4.1	12.3 - 8.1
4	9°46.0	9°47.6	9°19.3	0.4 - 0.3	6.4 - 4.2	12.4 - 8.2
5	9°46.3	9°47.9	9°19.5	0.5 - 0.3	6.5 - 4.3	12.5 - 8.2
6	9°46.5	9°48.1	9°19.8	0.6 - 0.4	6.6 - 4.3	12.6 - 8.3
7	9°46.8	9°48.4	9°20.0	0.7 - 0.5	6.7 - 4.4	12.7 - 8.4
8	9°47.0	9°48.6	9°20.3	0.8 - 0.5	6.8 - 4.5	12.8 - 8.4
9	9°47.2	9°48.9	9°20.5	0.9 - 0.6	6.9 - 4.5	12.9 - 8.5
10	9°47.5	9°49.1	9°20.7	1.0 - 0.7	7.0 - 4.6	13.0 - 8.6
11	9°47.7	9°49.4	9°21.0	1.1 - 0.7	7.1 - 4.7	13.1 - 8.6
12	9°48.0	9°49.6	9°21.2	1.2 - 0.8	7.2 - 4.7	13.2 - 8.7
13	9°48.3	9°49.9	9°21.5	1.3 - 0.9	7.3 - 4.8	13.3 - 8.8
14	9°48.5	9°50.1	9°21.7	1.4 - 0.9	7.4 - 4.9	13.4 - 8.8
15	9°48.8	9°50.4	9°21.9	1.5 - 1.0	7.5 - 4.9	13.5 - 8.9
16	9°49.0	9°50.6	9°22.2	1.6 - 1.1	7.6 - 5.0	13.6 - 9.0
17	9°49.2	9°50.9	9°22.4	1.7 - 1.1	7.7 - 5.1	13.7 - 9.0
18	9°49.5	9°51.1	9°22.6	1.8 - 1.2	7.8 - 5.1	13.8 - 9.1
19	9°49.8	9°51.4	9°22.9	1.9 - 1.3	7.9 - 5.2	13.9 - 9.2
20	9°50.0	9°51.6	9°23.1	2.0 - 1.3	8.0 - 5.3	14.0 - 9.2
21	9°50.3	9°51.9	9°23.4	2.1 - 1.4	8.1 - 5.3	14.1 - 9.3
22	9°50.5	9°52.1	9°23.6	2.2 - 1.4	8.2 - 5.4	14.2 - 9.3
23	9°50.7	9°52.4	9°23.8	2.3 - 1.5	8.3 - 5.5	14.3 - 9.4
24	9°51.0	9°52.6	9°24.1	2.4 - 1.6	8.4 - 5.5	14.4 - 9.5
25	9°51.2	9°52.9	9°24.3	2.5 - 1.6	8.5 - 5.6	14.5 - 9.5
26	9°51.5	9°53.1	9°24.6	2.6 - 1.7	8.6 - 5.7	14.6 - 9.6
27	9°51.8	9°53.4	9°24.8	2.7 - 1.8	8.7 - 5.7	14.7 - 9.7
28	9°52.0	9°53.6	9°25.0	2.8 - 1.8	8.8 - 5.8	14.8 - 9.7
29	9°52.3	9°53.9	9°25.3	2.9 - 1.9	8.9 - 5.9	14.9 - 9.8
30	9°52.5	9°54.1	9°25.5	3.0 - 2.0	9.0 - 5.9	15.0 - 9.9
31	9°52.7	9°54.4	9°25.7	3.1 - 2.0	9.1 - 6.0	15.1 - 9.9
32	9°53.0	9°54.6	9°26.0	3.2 - 2.1	9.2 - 6.1	15.2 - 10.0
33	9°53.2	9°54.9	9°26.2	3.3 - 2.2	9.3 - 6.1	15.3 - 10.1
34	9°53.5	9°55.1	9°26.5	3.4 - 2.2	9.4 - 6.2	15.4 - 10.1
35	9°53.8	9°55.4	9°26.7	3.5 - 2.3	9.5 - 6.3	15.5 - 10.2
36	9°54.0	9°55.6	9°26.9	3.6 - 2.4	9.6 - 6.3	15.6 - 10.3
37	9°54.3	9°55.9	9°27.2	3.7 - 2.4	9.7 - 6.4	15.7 - 10.3
38	9°54.5	9°56.1	9°27.4	3.8 - 2.5	9.8 - 6.5	15.8 - 10.4
39	9°54.7	9°56.4	9°27.7	3.9 - 2.6	9.9 - 6.5	15.9 - 10.5
40	9°55.0	9°56.6	9°27.9	4.0 - 2.6	10.0 - 6.6	16.0 - 10.5
41	9°55.2	9°56.9	9°28.1	4.1 - 2.7	10.1 - 6.6	16.1 - 10.6
42	9°55.5	9°57.1	9°28.4	4.2 - 2.8	10.2 - 6.7	16.2 - 10.7
43	9°55.8	9°57.4	9°28.6	4.3 - 2.8	10.3 - 6.8	16.3 - 10.7
44	9°56.0	9°57.6	9°28.8	4.4 - 2.9	10.4 - 6.8	16.4 - 10.8
45	9°56.3	9°57.9	9°29.1	4.5 - 3.0	10.5 - 6.9	16.5 - 10.9
46	9°56.5	9°58.1	9°29.3	4.6 - 3.0	10.6 - 7.0	16.6 - 10.9
47	9°56.7	9°58.4	9°29.6	4.7 - 3.1	10.7 - 7.0	16.7 - 11.0
48	9°57.0	9°58.6	9°29.8	4.8 - 3.2	10.8 - 7.1	16.8 - 11.1
49	9°57.3	9°58.9	9°30.0	4.9 - 3.2	10.9 - 7.2	16.9 - 11.1
50	9°57.5	9°59.1	9°30.3	5.0 - 3.3	11.0 - 7.2	17.0 - 11.2
51	9°57.8	9°59.4	9°30.5	5.1 - 3.4	11.1 - 7.3	17.1 - 11.3
52	9°58.0	9°59.6	9°30.8	5.2 - 3.4	11.2 - 7.4	17.2 - 11.3
53	9°58.2	9°59.9	9°31.0	5.3 - 3.5	11.3 - 7.4	17.3 - 11.4
54	9°58.5	10°00.1	9°31.2	5.4 - 3.6	11.4 - 7.5	17.4 - 11.5
55	9°58.7	10°00.4	9°31.5	5.5 - 3.6	11.5 - 7.6	17.5 - 11.5
56	9°59.0	10°00.6	9°31.7	5.6 - 3.7	11.6 - 7.6	17.6 - 11.6
57	9°59.3	10°00.9	9°32.0	5.7 - 3.8	11.7 - 7.7	17.7 - 11.7
58	9°59.5	10°01.1	9°32.2	5.8 - 3.8	11.8 - 7.8	17.8 - 11.7
59	9°59.8	10°01.4	9°32.4	5.9 - 3.9	11.9 - 7.8	17.9 - 11.8

m 40	Sun Plan.	Aries	Moon	v and d corr		
0	10°00.0	10°01.6	9°32.7	0.0 - 0.0	6.0 - 4.1	12.0 - 8.1
1	10°00.2	10°01.9	9°32.9	0.1 - 0.1	6.1 - 4.1	12.1 - 8.2
2	10°00.5	10°02.1	9°33.1	0.2 - 0.1	6.2 - 4.2	12.2 - 8.2
3	10°00.7	10°02.4	9°33.4	0.3 - 0.2	6.3 - 4.3	12.3 - 8.3
4	10°01.0	10°02.6	9°33.6	0.4 - 0.3	6.4 - 4.3	12.4 - 8.4
5	10°01.3	10°02.9	9°33.9	0.5 - 0.3	6.5 - 4.4	12.5 - 8.4
6	10°01.5	10°03.1	9°34.1	0.6 - 0.4	6.6 - 4.5	12.6 - 8.5
7	10°01.8	10°03.4	9°34.3	0.7 - 0.5	6.7 - 4.5	12.7 - 8.6
8	10°02.0	10°03.6	9°34.6	0.8 - 0.5	6.8 - 4.6	12.8 - 8.6
9	10°02.2	10°03.9	9°34.8	0.9 - 0.6	6.9 - 4.7	12.9 - 8.7
10	10°02.5	10°04.1	9°35.1	1.0 - 0.7	7.0 - 4.7	13.0 - 8.8
11	10°02.7	10°04.4	9°35.3	1.1 - 0.7	7.1 - 4.8	13.1 - 8.8
12	10°03.0	10°04.6	9°35.5	1.2 - 0.8	7.2 - 4.9	13.2 - 8.9
13	10°03.3	10°04.9	9°35.8	1.3 - 0.9	7.3 - 4.9	13.3 - 9.0
14	10°03.5	10°05.1	9°36.0	1.4 - 0.9	7.4 - 5.0	13.4 - 9.0
15	10°03.8	10°05.4	9°36.2	1.5 - 1.0	7.5 - 5.1	13.5 - 9.1
16	10°04.0	10°05.7	9°36.5	1.6 - 1.1	7.6 - 5.1	13.6 - 9.2
17	10°04.2	10°05.9	9°36.7	1.7 - 1.1	7.7 - 5.2	13.7 - 9.2
18	10°04.5	10°06.2	9°37.0	1.8 - 1.2	7.8 - 5.3	13.8 - 9.3
19	10°04.8	10°06.4	9°37.2	1.9 - 1.3	7.9 - 5.3	13.9 - 9.4
20	10°05.0	10°06.7	9°37.4	2.0 - 1.4	8.0 - 5.4	14.0 - 9.5
21	10°05.3	10°06.9	9°37.7	2.1 - 1.4	8.1 - 5.5	14.1 - 9.5
22	10°05.5	10°07.2	9°37.9	2.2 - 1.5	8.2 - 5.5	14.2 - 9.6
23	10°05.7	10°07.4	9°38.2	2.3 - 1.6	8.3 - 5.6	14.3 - 9.7
24	10°06.0	10°07.7	9°38.4	2.4 - 1.6	8.4 - 5.7	14.4 - 9.7
25	10°06.2	10°07.9	9°38.6	2.5 - 1.7	8.5 - 5.7	14.5 - 9.8
26	10°06.5	10°08.2	9°38.9	2.6 - 1.8	8.6 - 5.8	14.6 - 9.9
27	10°06.8	10°08.4	9°39.1	2.7 - 1.8	8.7 - 5.9	14.7 - 9.9
28	10°07.0	10°08.7	9°39.3	2.8 - 1.9	8.8 - 5.9	14.8 - 10.0
29	10°07.3	10°08.9	9°39.6	2.9 - 2.0	8.9 - 6.0	14.9 - 10.1
30	10°07.5	10°09.2	9°39.8	3.0 - 2.0	9.0 - 6.1	15.0 - 10.1
31	10°07.7	10°09.4	9°40.1	3.1 - 2.1	9.1 - 6.1	15.1 - 10.2
32	10°08.0	10°09.7	9°40.3	3.2 - 2.2	9.2 - 6.2	15.2 - 10.3
33	10°08.2	10°09.9	9°40.5	3.3 - 2.2	9.3 - 6.3	15.3 - 10.3
34	10°08.5	10°10.2	9°40.8	3.4 - 2.3	9.4 - 6.3	15.4 - 10.4
35	10°08.8	10°10.4	9°41.0	3.5 - 2.4	9.5 - 6.4	15.5 - 10.5
36	10°09.0	10°10.7	9°41.3	3.6 - 2.4	9.6 - 6.5	15.6 - 10.5
37	10°09.3	10°10.9	9°41.5	3.7 - 2.5	9.7 - 6.5	15.7 - 10.6
38	10°09.5	10°11.2	9°41.7	3.8 - 2.6	9.8 - 6.6	15.8 - 10.7
39	10°09.7	10°11.4	9°42.0	3.9 - 2.6	9.9 - 6.7	15.9 - 10.7
40	10°10.0	10°11.7	9°42.2	4.0 - 2.7	10.0 - 6.8	16.0 - 10.8
41	10°10.2	10°11.9	9°42.4	4.1 - 2.8	10.1 - 6.8	16.1 - 10.9
42	10°10.5	10°12.2	9°42.7	4.2 - 2.8	10.2 - 6.9	16.2 - 10.9
43	10°10.8	10°12.4	9°42.9	4.3 - 2.9	10.3 - 7.0	16.3 - 11.0
44	10°11.0	10°12.7	9°43.2	4.4 - 3.0	10.4 - 7.0	16.4 - 11.1
45	10°11.3	10°12.9	9°43.4	4.5 - 3.0	10.5 - 7.1	16.5 - 11.1
46	10°11.5	10°13.2	9°43.6	4.6 - 3.1	10.6 - 7.2	16.6 - 11.2
47	10°11.7	10°13.4	9°43.9	4.7 - 3.2	10.7 - 7.2	16.7 - 11.3
48	10°12.0	10°13.7	9°44.1	4.8 - 3.2	10.8 - 7.3	16.8 - 11.3
49	10°12.3	10°13.9	9°44.4	4.9 - 3.3	10.9 - 7.4	16.9 - 11.4
50	10°12.5	10°14.2	9°44.6	5.0 - 3.4	11.0 - 7.4	17.0 - 11.5
51	10°12.8	10°14.4	9°44.8	5.1 - 3.4	11.1 - 7.5	17.1 - 11.5
52	10°13.0	10°14.7	9°45.1	5.2 - 3.5	11.2 - 7.6	17.2 - 11.6
53	10°13.2	10°14.9	9°45.3	5.3 - 3.6	11.3 - 7.6	17.3 - 11.7
54	10°13.5	10°15.2	9°45.6	5.4 - 3.6	11.4 - 7.7	17.4 - 11.7
55	10°13.7	10°15.4	9°45.8	5.5 - 3.7	11.5 - 7.8	17.5 - 11.8
56	10°14.0	10°15.7	9°46.0	5.6 - 3.8	11.6 - 7.8	17.6 - 11.9
57	10°14.3	10°15.9	9°46.3	5.7 - 3.8	11.7 - 7.9	17.7 - 11.9
58	10°14.5	10°16.2	9°46.5	5.8 - 3.9	11.8 - 8.0	17.8 - 12.0
59	10°14.8	10°16.4	9°46.7	5.9 - 4.0	11.9 - 8.0	17.9 - 12.1

m 41	Sun Plan.	Aries	Moon	v and d corr		
0	10°15.0	10°16.7	9°47.0	0.0 - 0.0	6.0 - 4.2	12.0 - 8.3
1	10°15.2	10°16.9	9°47.2	0.1 - 0.1	6.1 - 4.2	12.1 - 8.4
2	10°15.5	10°17.2	9°47.5	0.2 - 0.1	6.2 - 4.3	12.2 - 8.4
3	10°15.7	10°17.4	9°47.7	0.3 - 0.2	6.3 - 4.4	12.3 - 8.5
4	10°16.0	10°17.7	9°47.9	0.4 - 0.3	6.4 - 4.4	12.4 - 8.6
5	10°16.3	10°17.9	9°48.2	0.5 - 0.3	6.5 - 4.5	12.5 - 8.6
6	10°16.5	10°18.2	9°48.4	0.6 - 0.4	6.6 - 4.6	12.6 - 8.7
7	10°16.8	10°18.4	9°48.7	0.7 - 0.5	6.7 - 4.6	12.7 - 8.8
8	10°17.0	10°18.7	9°48.9	0.8 - 0.6	6.8 - 4.7	12.8 - 8.9
9	10°17.2	10°18.9	9°49.1	0.9 - 0.6	6.9 - 4.8	12.9 - 8.9
10	10°17.5	10°19.2	9°49.4	1.0 - 0.7	7.0 - 4.8	13.0 - 9.0
11	10°17.7	10°19.4	9°49.6	1.1 - 0.8	7.1 - 4.9	13.1 - 9.1
12	10°18.0	10°19.7	9°49.8	1.2 - 0.8	7.2 - 5.0	13.2 - 9.1
13	10°18.3	10°19.9	9°50.1	1.3 - 0.9	7.3 - 5.0	13.3 - 9.2
14	10°18.5	10°20.2	9°50.3	1.4 - 1.0	7.4 - 5.1	13.4 - 9.3
15	10°18.8	10°20.4	9°50.6	1.5 - 1.0	7.5 - 5.2	13.5 - 9.3
16	10°19.0	10°20.7	9°50.8	1.6 - 1.1	7.6 - 5.3	13.6 - 9.4
17	10°19.2	10°20.9	9°51.0	1.7 - 1.2	7.7 - 5.3	13.7 - 9.5
18	10°19.5	10°21.2	9°51.3	1.8 - 1.2	7.8 - 5.4	13.8 - 9.5
19	10°19.8	10°21.4	9°51.5	1.9 - 1.3	7.9 - 5.5	13.9 - 9.6
20	10°20.0	10°21.7	9°51.8	2.0 - 1.4	8.0 - 5.5	14.0 - 9.7
21	10°20.3	10°21.9	9°52.0	2.1 - 1.5	8.1 - 5.6	14.1 - 9.8
22	10°20.5	10°22.2	9°52.2	2.2 - 1.5	8.2 - 5.7	14.2 - 9.8
23	10°20.7	10°22.4	9°52.5	2.3 - 1.6	8.3 - 5.7	14.3 - 9.9
24	10°21.0	10°22.7	9°52.7	2.4 - 1.7	8.4 - 5.8	14.4 - 10.0
25	10°21.2	10°22.9	9°52.9	2.5 - 1.7	8.5 - 5.9	14.5 - 10.0
26	10°21.5	10°23.2	9°53.2	2.6 - 1.8	8.6 - 5.9	14.6 - 10.1
27	10°21.8	10°23.4	9°53.4	2.7 - 1.9	8.7 - 6.0	14.7 - 10.2
28	10°22.0	10°23.7	9°53.7	2.8 - 1.9	8.8 - 6.1	14.8 - 10.2
29	10°22.3	10°24.0	9°53.9	2.9 - 2.0	8.9 - 6.2	14.9 - 10.3
30	10°22.5	10°24.2	9°54.1	3.0 - 2.1	9.0 - 6.2	15.0 - 10.4
31	10°22.7	10°24.5	9°54.4	3.1 - 2.1	9.1 - 6.3	15.1 - 10.4
32	10°23.0	10°24.7	9°54.6	3.2 - 2.2	9.2 - 6.4	15.2 - 10.5
33	10°23.2	10°25.0	9°54.9	3.3 - 2.3	9.3 - 6.4	15.3 - 10.6
34	10°23.5	10°25.2	9°55.1	3.4 - 2.4	9.4 - 6.5	15.4 - 10.7
35	10°23.8	10°25.5	9°55.3	3.5 - 2.4	9.5 - 6.6	15.5 - 10.7
36	10°24.0	10°25.7	9°55.6	3.6 - 2.5	9.6 - 6.6	15.6 - 10.8
37	10°24.3	10°26.0	9°55.8	3.7 - 2.6	9.7 - 6.7	15.7 - 10.9
38	10°24.5	10°26.2	9°56.1	3.8 - 2.6	9.8 - 6.8	15.8 - 10.9
39	10°24.7	10°26.5	9°56.3	3.9 - 2.7	9.9 - 6.8	15.9 - 11.0
40	10°25.0	10°26.7	9°56.5	4.0 - 2.8	10.0 - 6.9	16.0 - 11.1
41	10°25.2	10°27.0	9°56.8	4.1 - 2.8	10.1 - 7.0	16.1 - 11.1
42	10°25.5	10°27.2	9°57.0	4.2 - 2.9	10.2 - 7.1	16.2 - 11.2
43	10°25.8	10°27.5	9°57.2	4.3 - 3.0	10.3 - 7.1	16.3 - 11.3
44	10°26.0	10°27.7	9°57.5	4.4 - 3.0	10.4 - 7.2	16.4 - 11.3
45	10°26.3	10°28.0	9°57.7	4.5 - 3.1	10.5 - 7.3	16.5 - 11.4
46	10°26.5	10°28.2	9°58.0	4.6 - 3.2	10.6 - 7.3	16.6 - 11.5
47	10°26.7	10°28.5	9°58.2	4.7 - 3.3	10.7 - 7.4	16.7 - 11.6
48	10°27.0	10°28.7	9°58.4	4.8 - 3.3	10.8 - 7.5	16.8 - 11.6
49	10°27.3	10°29.0	9°58.7	4.9 - 3.4	10.9 - 7.5	16.9 - 11.7
50	10°27.5	10°29.2	9°58.9	5.0 - 3.5	11.0 - 7.6	17.0 - 11.8
51	10°27.8	10°29.5	9°59.2	5.1 - 3.5	11.1 - 7.7	17.1 - 11.8
52	10°28.0	10°29.7	9°59.4	5.2 - 3.6	11.2 - 7.7	17.2 - 11.9
53	10°28.2	10°30.0	9°59.6	5.3 - 3.7	11.3 - 7.8	17.3 - 12.0
54	10°28.5	10°30.2	9°59.9	5.4 - 3.7	11.4 - 7.9	17.4 - 12.0
55	10°28.7	10°30.5	10°00.1	5.5 - 3.8	11.5 - 8.0	17.5 - 12.1
56	10°29.0	10°30.7	10°00.3	5.6 - 3.9	11.6 - 8.0	17.6 - 12.2
57	10°29.3	10°31.0	10°00.6	5.7 - 3.9	11.7 - 8.1	17.7 - 12.2
58	10°29.5	10°31.2	10°00.8	5.8 - 4.0	11.8 - 8.2	17.8 - 12.3
59	10°29.8	10°31.5	10°01.1	5.9 - 4.1	11.9 - 8.2	17.9 - 12.4

Increments and Corrections

m 42	Sun Plan.	Aries	Moon	v and d corr		
0	10°30.0	10°31.7	10°01.3	0.0 - 0.0	6.0 - 4.3	12.0 - 8.5
1	10°30.2	10°32.0	10°01.5	0.1 - 0.1	6.1 - 4.3	12.1 - 8.6
2	10°30.5	10°32.2	10°01.8	0.2 - 0.1	6.2 - 4.4	12.2 - 8.6
3	10°30.7	10°32.5	10°02.0	0.3 - 0.2	6.3 - 4.5	12.3 - 8.7
4	10°31.0	10°32.7	10°02.3	0.4 - 0.3	6.4 - 4.5	12.4 - 8.8
5	10°31.3	10°33.0	10°02.5	0.5 - 0.4	6.5 - 4.6	12.5 - 8.9
6	10°31.5	10°33.2	10°02.7	0.6 - 0.4	6.6 - 4.7	12.6 - 8.9
7	10°31.8	10°33.5	10°03.0	0.7 - 0.5	6.7 - 4.7	12.7 - 9.0
8	10°32.0	10°33.7	10°03.2	0.8 - 0.6	6.8 - 4.8	12.8 - 9.1
9	10°32.2	10°34.0	10°03.4	0.9 - 0.6	6.9 - 4.9	12.9 - 9.1
10	10°32.5	10°34.2	10°03.7	1.0 - 0.7	7.0 - 5.0	13.0 - 9.2
11	10°32.7	10°34.5	10°03.9	1.1 - 0.8	7.1 - 5.0	13.1 - 9.3
12	10°33.0	10°34.7	10°04.2	1.2 - 0.9	7.2 - 5.1	13.2 - 9.3
13	10°33.3	10°35.0	10°04.4	1.3 - 0.9	7.3 - 5.2	13.3 - 9.4
14	10°33.5	10°35.2	10°04.6	1.4 - 1.0	7.4 - 5.2	13.4 - 9.5
15	10°33.8	10°35.5	10°04.9	1.5 - 1.1	7.5 - 5.3	13.5 - 9.6
16	10°34.0	10°35.7	10°05.1	1.6 - 1.1	7.6 - 5.4	13.6 - 9.6
17	10°34.2	10°36.0	10°05.4	1.7 - 1.2	7.7 - 5.5	13.7 - 9.7
18	10°34.5	10°36.2	10°05.6	1.8 - 1.3	7.8 - 5.5	13.8 - 9.8
19	10°34.8	10°36.5	10°05.8	1.9 - 1.3	7.9 - 5.6	13.9 - 9.8
20	10°35.0	10°36.7	10°06.1	2.0 - 1.4	8.0 - 5.7	14.0 - 9.9
21	10°35.3	10°37.0	10°06.3	2.1 - 1.5	8.1 - 5.7	14.1 - 10.0
22	10°35.5	10°37.2	10°06.5	2.2 - 1.6	8.2 - 5.8	14.2 - 10.1
23	10°35.7	10°37.5	10°06.8	2.3 - 1.6	8.3 - 5.9	14.3 - 10.1
24	10°36.0	10°37.7	10°07.0	2.4 - 1.7	8.4 - 6.0	14.4 - 10.2
25	10°36.2	10°38.0	10°07.3	2.5 - 1.8	8.5 - 6.0	14.5 - 10.3
26	10°36.5	10°38.2	10°07.5	2.6 - 1.8	8.6 - 6.1	14.6 - 10.3
27	10°36.8	10°38.5	10°07.7	2.7 - 1.9	8.7 - 6.2	14.7 - 10.4
28	10°37.0	10°38.7	10°08.0	2.8 - 2.0	8.8 - 6.2	14.8 - 10.5
29	10°37.3	10°39.0	10°08.2	2.9 - 2.1	8.9 - 6.3	14.9 - 10.6
30	10°37.5	10°39.2	10°08.5	3.0 - 2.1	9.0 - 6.4	15.0 - 10.6
31	10°37.7	10°39.5	10°08.7	3.1 - 2.2	9.1 - 6.4	15.1 - 10.7
32	10°38.0	10°39.7	10°08.9	3.2 - 2.3	9.2 - 6.5	15.2 - 10.8
33	10°38.2	10°40.0	10°09.2	3.3 - 2.3	9.3 - 6.6	15.3 - 10.8
34	10°38.5	10°40.2	10°09.4	3.4 - 2.4	9.4 - 6.7	15.4 - 10.9
35	10°38.8	10°40.5	10°09.7	3.5 - 2.5	9.5 - 6.7	15.5 - 11.0
36	10°39.0	10°40.7	10°09.9	3.6 - 2.6	9.6 - 6.8	15.6 - 11.1
37	10°39.3	10°41.0	10°10.1	3.7 - 2.6	9.7 - 6.9	15.7 - 11.1
38	10°39.5	10°41.2	10°10.4	3.8 - 2.7	9.8 - 6.9	15.8 - 11.2
39	10°39.7	10°41.5	10°10.6	3.9 - 2.8	9.9 - 7.0	15.9 - 11.3
40	10°40.0	10°41.7	10°10.8	4.0 - 2.8	10.0 - 7.1	16.0 - 11.3
41	10°40.2	10°42.0	10°11.1	4.1 - 2.9	10.1 - 7.2	16.1 - 11.4
42	10°40.5	10°42.3	10°11.3	4.2 - 3.0	10.2 - 7.2	16.2 - 11.5
43	10°40.8	10°42.5	10°11.6	4.3 - 3.0	10.3 - 7.3	16.3 - 11.5
44	10°41.0	10°42.8	10°11.8	4.4 - 3.1	10.4 - 7.4	16.4 - 11.6
45	10°41.3	10°43.0	10°12.0	4.5 - 3.2	10.5 - 7.4	16.5 - 11.7
46	10°41.5	10°43.3	10°12.3	4.6 - 3.3	10.6 - 7.5	16.6 - 11.8
47	10°41.7	10°43.5	10°12.5	4.7 - 3.3	10.7 - 7.6	16.7 - 11.8
48	10°42.0	10°43.8	10°12.8	4.8 - 3.4	10.8 - 7.7	16.8 - 11.9
49	10°42.3	10°44.0	10°13.0	4.9 - 3.5	10.9 - 7.7	16.9 - 12.0
50	10°42.5	10°44.3	10°13.2	5.0 - 3.5	11.0 - 7.8	17.0 - 12.0
51	10°42.8	10°44.5	10°13.5	5.1 - 3.6	11.1 - 7.9	17.1 - 12.1
52	10°43.0	10°44.8	10°13.7	5.2 - 3.7	11.2 - 7.9	17.2 - 12.2
53	10°43.2	10°45.0	10°13.9	5.3 - 3.8	11.3 - 8.0	17.3 - 12.3
54	10°43.5	10°45.3	10°14.2	5.4 - 3.8	11.4 - 8.1	17.4 - 12.3
55	10°43.7	10°45.5	10°14.4	5.5 - 3.9	11.5 - 8.1	17.5 - 12.4
56	10°44.0	10°45.8	10°14.7	5.6 - 4.0	11.6 - 8.2	17.6 - 12.5
57	10°44.3	10°46.0	10°14.9	5.7 - 4.0	11.7 - 8.3	17.7 - 12.5
58	10°44.5	10°46.3	10°15.1	5.8 - 4.1	11.8 - 8.4	17.8 - 12.6
59	10°44.8	10°46.5	10°15.4	5.9 - 4.2	11.9 - 8.4	17.9 - 12.7

m 43	Sun Plan.	Aries	Moon	v and d corr		
0	10°45.0	10°46.8	10°15.6	0.0 - 0.0	6.0 - 4.3	12.0 - 8.7
1	10°45.2	10°47.0	10°15.9	0.1 - 0.1	6.1 - 4.4	12.1 - 8.8
2	10°45.5	10°47.3	10°16.1	0.2 - 0.1	6.2 - 4.5	12.2 - 8.8
3	10°45.7	10°47.5	10°16.3	0.3 - 0.2	6.3 - 4.6	12.3 - 8.9
4	10°46.0	10°47.8	10°16.6	0.4 - 0.3	6.4 - 4.6	12.4 - 9.0
5	10°46.3	10°48.0	10°16.8	0.5 - 0.4	6.5 - 4.7	12.5 - 9.1
6	10°46.5	10°48.3	10°17.0	0.6 - 0.4	6.6 - 4.8	12.6 - 9.1
7	10°46.8	10°48.5	10°17.3	0.7 - 0.5	6.7 - 4.9	12.7 - 9.2
8	10°47.0	10°48.8	10°17.5	0.8 - 0.6	6.8 - 4.9	12.8 - 9.3
9	10°47.2	10°49.0	10°17.8	0.9 - 0.7	6.9 - 5.0	12.9 - 9.4
10	10°47.5	10°49.3	10°18.0	1.0 - 0.7	7.0 - 5.1	13.0 - 9.4
11	10°47.7	10°49.5	10°18.2	1.1 - 0.8	7.1 - 5.1	13.1 - 9.5
12	10°48.0	10°49.8	10°18.5	1.2 - 0.9	7.2 - 5.2	13.2 - 9.6
13	10°48.3	10°50.0	10°18.7	1.3 - 0.9	7.3 - 5.3	13.3 - 9.6
14	10°48.5	10°50.3	10°19.0	1.4 - 1.0	7.4 - 5.4	13.4 - 9.7
15	10°48.8	10°50.5	10°19.2	1.5 - 1.1	7.5 - 5.4	13.5 - 9.8
16	10°49.0	10°50.8	10°19.4	1.6 - 1.2	7.6 - 5.5	13.6 - 9.9
17	10°49.2	10°51.0	10°19.7	1.7 - 1.2	7.7 - 5.6	13.7 - 9.9
18	10°49.5	10°51.3	10°19.9	1.8 - 1.3	7.8 - 5.7	13.8 - 10.0
19	10°49.8	10°51.5	10°20.2	1.9 - 1.4	7.9 - 5.7	13.9 - 10.1
20	10°50.0	10°51.8	10°20.4	2.0 - 1.4	8.0 - 5.8	14.0 - 10.2
21	10°50.3	10°52.0	10°20.6	2.1 - 1.5	8.1 - 5.9	14.1 - 10.2
22	10°50.5	10°52.3	10°20.9	2.2 - 1.6	8.2 - 5.9	14.2 - 10.3
23	10°50.7	10°52.5	10°21.1	2.3 - 1.7	8.3 - 6.0	14.3 - 10.4
24	10°51.0	10°52.8	10°21.3	2.4 - 1.7	8.4 - 6.1	14.4 - 10.4
25	10°51.2	10°53.0	10°21.6	2.5 - 1.8	8.5 - 6.2	14.5 - 10.5
26	10°51.5	10°53.3	10°21.8	2.6 - 1.9	8.6 - 6.2	14.6 - 10.6
27	10°51.8	10°53.5	10°22.1	2.7 - 2.0	8.7 - 6.3	14.7 - 10.7
28	10°52.0	10°53.8	10°22.3	2.8 - 2.0	8.8 - 6.4	14.8 - 10.7
29	10°52.3	10°54.0	10°22.5	2.9 - 2.1	8.9 - 6.5	14.9 - 10.8
30	10°52.5	10°54.3	10°22.8	3.0 - 2.2	9.0 - 6.5	15.0 - 10.9
31	10°52.7	10°54.5	10°23.0	3.1 - 2.2	9.1 - 6.6	15.1 - 10.9
32	10°53.0	10°54.8	10°23.3	3.2 - 2.3	9.2 - 6.7	15.2 - 11.0
33	10°53.2	10°55.0	10°23.5	3.3 - 2.4	9.3 - 6.7	15.3 - 11.1
34	10°53.5	10°55.3	10°23.7	3.4 - 2.5	9.4 - 6.8	15.4 - 11.2
35	10°53.8	10°55.5	10°24.0	3.5 - 2.5	9.5 - 6.9	15.5 - 11.2
36	10°54.0	10°55.8	10°24.2	3.6 - 2.6	9.6 - 7.0	15.6 - 11.3
37	10°54.3	10°56.0	10°24.4	3.7 - 2.7	9.7 - 7.0	15.7 - 11.4
38	10°54.5	10°56.3	10°24.7	3.8 - 2.8	9.8 - 7.1	15.8 - 11.5
39	10°54.7	10°56.5	10°24.9	3.9 - 2.8	9.9 - 7.2	15.9 - 11.5
40	10°55.0	10°56.8	10°25.2	4.0 - 2.9	10.0 - 7.3	16.0 - 11.6
41	10°55.2	10°57.0	10°25.4	4.1 - 3.0	10.1 - 7.3	16.1 - 11.7
42	10°55.5	10°57.3	10°25.6	4.2 - 3.0	10.2 - 7.4	16.2 - 11.7
43	10°55.8	10°57.5	10°25.9	4.3 - 3.1	10.3 - 7.5	16.3 - 11.8
44	10°56.0	10°57.8	10°26.1	4.4 - 3.2	10.4 - 7.5	16.4 - 11.9
45	10°56.3	10°58.0	10°26.4	4.5 - 3.3	10.5 - 7.6	16.5 - 12.0
46	10°56.5	10°58.3	10°26.6	4.6 - 3.3	10.6 - 7.7	16.6 - 12.0
47	10°56.7	10°58.5	10°26.8	4.7 - 3.4	10.7 - 7.8	16.7 - 12.1
48	10°57.0	10°58.8	10°27.1	4.8 - 3.5	10.8 - 7.8	16.8 - 12.2
49	10°57.3	10°59.0	10°27.3	4.9 - 3.6	10.9 - 7.9	16.9 - 12.3
50	10°57.5	10°59.3	10°27.5	5.0 - 3.6	11.0 - 8.0	17.0 - 12.3
51	10°57.8	10°59.5	10°27.8	5.1 - 3.7	11.1 - 8.0	17.1 - 12.4
52	10°58.0	10°59.8	10°28.0	5.2 - 3.8	11.2 - 8.1	17.2 - 12.5
53	10°58.2	11°00.0	10°28.3	5.3 - 3.8	11.3 - 8.2	17.3 - 12.5
54	10°58.5	11°00.3	10°28.5	5.4 - 3.9	11.4 - 8.3	17.4 - 12.6
55	10°58.7	11°00.6	10°28.7	5.5 - 4.0	11.5 - 8.3	17.5 - 12.7
56	10°59.0	11°00.8	10°29.0	5.6 - 4.1	11.6 - 8.4	17.6 - 12.8
57	10°59.3	11°01.1	10°29.2	5.7 - 4.1	11.7 - 8.5	17.7 - 12.8
58	10°59.5	11°01.3	10°29.5	5.8 - 4.2	11.8 - 8.6	17.8 - 12.9
59	10°59.8	11°01.6	10°29.7	5.9 - 4.3	11.9 - 8.6	17.9 - 13.0

m 44	Sun Plan.	Aries	Moon	v and d corr		
0	11°00.0	11°01.8	10°29.9	0.0 - 0.0	6.0 - 4.5	12.0 - 8.9
1	11°00.2	11°02.1	10°30.2	0.1 - 0.1	6.1 - 4.5	12.1 - 9.0
2	11°00.5	11°02.3	10°30.4	0.2 - 0.1	6.2 - 4.6	12.2 - 9.0
3	11°00.7	11°02.6	10°30.6	0.3 - 0.2	6.3 - 4.7	12.3 - 9.1
4	11°01.0	11°02.8	10°30.9	0.4 - 0.3	6.4 - 4.7	12.4 - 9.2
5	11°01.3	11°03.1	10°31.1	0.5 - 0.4	6.5 - 4.8	12.5 - 9.3
6	11°01.5	11°03.3	10°31.4	0.6 - 0.4	6.6 - 4.9	12.6 - 9.3
7	11°01.8	11°03.6	10°31.6	0.7 - 0.5	6.7 - 5.0	12.7 - 9.4
8	11°02.0	11°03.8	10°31.8	0.8 - 0.6	6.8 - 5.0	12.8 - 9.5
9	11°02.2	11°04.1	10°32.1	0.9 - 0.7	6.9 - 5.1	12.9 - 9.6
10	11°02.5	11°04.3	10°32.3	1.0 - 0.7	7.0 - 5.2	13.0 - 9.6
11	11°02.7	11°04.6	10°32.6	1.1 - 0.8	7.1 - 5.3	13.1 - 9.7
12	11°03.0	11°04.8	10°32.8	1.2 - 0.9	7.2 - 5.3	13.2 - 9.8
13	11°03.3	11°05.1	10°33.0	1.3 - 1.0	7.3 - 5.4	13.3 - 9.9
14	11°03.5	11°05.3	10°33.3	1.4 - 1.0	7.4 - 5.5	13.4 - 9.9
15	11°03.8	11°05.6	10°33.5	1.5 - 1.1	7.5 - 5.6	13.5 - 10.0
16	11°04.0	11°05.8	10°33.8	1.6 - 1.2	7.6 - 5.6	13.6 - 10.1
17	11°04.2	11°06.1	10°34.0	1.7 - 1.3	7.7 - 5.7	13.7 - 10.2
18	11°04.5	11°06.3	10°34.2	1.8 - 1.3	7.8 - 5.8	13.8 - 10.2
19	11°04.8	11°06.6	10°34.5	1.9 - 1.4	7.9 - 5.9	13.9 - 10.3
20	11°05.0	11°06.8	10°34.7	2.0 - 1.5	8.0 - 5.9	14.0 - 10.4
21	11°05.3	11°07.1	10°34.9	2.1 - 1.6	8.1 - 6.0	14.1 - 10.5
22	11°05.5	11°07.3	10°35.2	2.2 - 1.6	8.2 - 6.1	14.2 - 10.5
23	11°05.7	11°07.6	10°35.4	2.3 - 1.7	8.3 - 6.2	14.3 - 10.6
24	11°06.0	11°07.8	10°35.7	2.4 - 1.8	8.4 - 6.2	14.4 - 10.7
25	11°06.2	11°08.1	10°35.9	2.5 - 1.9	8.5 - 6.3	14.5 - 10.8
26	11°06.5	11°08.3	10°36.1	2.6 - 1.9	8.6 - 6.4	14.6 - 10.8
27	11°06.8	11°08.6	10°36.4	2.7 - 2.0	8.7 - 6.5	14.7 - 10.9
28	11°07.0	11°08.8	10°36.6	2.8 - 2.1	8.8 - 6.5	14.8 - 11.0
29	11°07.3	11°09.1	10°36.9	2.9 - 2.2	8.9 - 6.6	14.9 - 11.1
30	11°07.5	11°09.3	10°37.1	3.0 - 2.2	9.0 - 6.7	15.0 - 11.1
31	11°07.7	11°09.6	10°37.3	3.1 - 2.3	9.1 - 6.7	15.1 - 11.2
32	11°08.0	11°09.8	10°37.6	3.2 - 2.4	9.2 - 6.8	15.2 - 11.3
33	11°08.2	11°10.1	10°37.8	3.3 - 2.4	9.3 - 6.9	15.3 - 11.3
34	11°08.5	11°10.3	10°38.0	3.4 - 2.5	9.4 - 7.0	15.4 - 11.4
35	11°08.8	11°10.6	10°38.3	3.5 - 2.6	9.5 - 7.0	15.5 - 11.5
36	11°09.0	11°10.8	10°38.5	3.6 - 2.7	9.6 - 7.1	15.6 - 11.6
37	11°09.3	11°11.1	10°38.8	3.7 - 2.7	9.7 - 7.2	15.7 - 11.6
38	11°09.5	11°11.3	10°39.0	3.8 - 2.8	9.8 - 7.3	15.8 - 11.7
39	11°09.7	11°11.6	10°39.2	3.9 - 2.9	9.9 - 7.3	15.9 - 11.8
40	11°10.0	11°11.8	10°39.5	4.0 - 3.0	10.0 - 7.4	16.0 - 11.9
41	11°10.2	11°12.1	10°39.7	4.1 - 3.0	10.1 - 7.5	16.1 - 11.9
42	11°10.5	11°12.3	10°40.0	4.2 - 3.1	10.2 - 7.6	16.2 - 12.0
43	11°10.8	11°12.6	10°40.2	4.3 - 3.2	10.3 - 7.6	16.3 - 12.1
44	11°11.0	11°12.8	10°40.4	4.4 - 3.3	10.4 - 7.7	16.4 - 12.2
45	11°11.3	11°13.1	10°40.7	4.5 - 3.3	10.5 - 7.8	16.5 - 12.2
46	11°11.5	11°13.3	10°40.9	4.6 - 3.4	10.6 - 7.9	16.6 - 12.3
47	11°11.7	11°13.6	10°41.1	4.7 - 3.5	10.7 - 7.9	16.7 - 12.4
48	11°12.0	11°13.8	10°41.4	4.8 - 3.6	10.8 - 8.0	16.8 - 12.5
49	11°12.3	11°14.1	10°41.6	4.9 - 3.6	10.9 - 8.1	16.9 - 12.5
50	11°12.5	11°14.3	10°41.9	5.0 - 3.7	11.0 - 8.2	17.0 - 12.6
51	11°12.8	11°14.6	10°42.1	5.1 - 3.8	11.1 - 8.2	17.1 - 12.7
52	11°13.0	11°14.8	10°42.3	5.2 - 3.9	11.2 - 8.3	17.2 - 12.8
53	11°13.2	11°15.1	10°42.6	5.3 - 3.9	11.3 - 8.4	17.3 - 12.8
54	11°13.5	11°15.3	10°42.8	5.4 - 4.0	11.4 - 8.5	17.4 - 12.9
55	11°13.7	11°15.6	10°43.1	5.5 - 4.1	11.5 - 8.5	17.5 - 13.0
56	11°14.0	11°15.8	10°43.3	5.6 - 4.2	11.6 - 8.6	17.6 - 13.1
57	11°14.3	11°16.1	10°43.5	5.7 - 4.2	11.7 - 8.7	17.7 - 13.1
58	11°14.5	11°16.3	10°43.8	5.8 - 4.3	11.8 - 8.8	17.8 - 13.2
59	11°14.8	11°16.6	10°44.0	5.9 - 4.4	11.9 - 8.8	17.9 - 13.3

Increments and Corrections

m 45	Sun Plan.	Aries	Moon	v and d corr		
0	11°15.0	11°16.8	10°44.3	0.0 - 0.0	6.0 - 4.5	12.0 - 9.1
1	11°15.2	11°17.1	10°44.5	0.1 - 0.1	6.1 - 4.6	12.1 - 9.2
2	11°15.5	11°17.3	10°44.7	0.2 - 0.2	6.2 - 4.7	12.2 - 9.3
3	11°15.7	11°17.6	10°45.0	0.3 - 0.2	6.3 - 4.8	12.3 - 9.3
4	11°16.0	11°17.8	10°45.2	0.4 - 0.3	6.4 - 4.9	12.4 - 9.4
5	11°16.3	11°18.1	10°45.4	0.5 - 0.4	6.5 - 4.9	12.5 - 9.5
6	11°16.5	11°18.3	10°45.7	0.6 - 0.5	6.6 - 5.0	12.6 - 9.6
7	11°16.8	11°18.6	10°45.9	0.7 - 0.5	6.7 - 5.1	12.7 - 9.6
8	11°17.0	11°18.9	10°46.2	0.8 - 0.6	6.8 - 5.2	12.8 - 9.7
9	11°17.2	11°19.1	10°46.4	0.9 - 0.7	6.9 - 5.2	12.9 - 9.8
10	11°17.5	11°19.4	10°46.6	1.0 - 0.8	7.0 - 5.3	13.0 - 9.9
11	11°17.7	11°19.6	10°46.9	1.1 - 0.8	7.1 - 5.4	13.1 - 9.9
12	11°18.0	11°19.9	10°47.1	1.2 - 0.9	7.2 - 5.5	13.2 - 10.0
13	11°18.3	11°20.1	10°47.4	1.3 - 1.0	7.3 - 5.5	13.3 - 10.1
14	11°18.5	11°20.4	10°47.6	1.4 - 1.1	7.4 - 5.6	13.4 - 10.2
15	11°18.8	11°20.6	10°47.8	1.5 - 1.1	7.5 - 5.7	13.5 - 10.2
16	11°19.0	11°20.9	10°48.1	1.6 - 1.2	7.6 - 5.8	13.6 - 10.3
17	11°19.2	11°21.1	10°48.3	1.7 - 1.3	7.7 - 5.8	13.7 - 10.4
18	11°19.5	11°21.4	10°48.5	1.8 - 1.4	7.8 - 5.9	13.8 - 10.5
19	11°19.8	11°21.6	10°48.8	1.9 - 1.4	7.9 - 6.0	13.9 - 10.5
20	11°20.0	11°21.9	10°49.0	2.0 - 1.5	8.0 - 6.1	14.0 - 10.6
21	11°20.3	11°22.1	10°49.3	2.1 - 1.6	8.1 - 6.1	14.1 - 10.7
22	11°20.5	11°22.4	10°49.5	2.2 - 1.7	8.2 - 6.2	14.2 - 10.8
23	11°20.7	11°22.6	10°49.7	2.3 - 1.7	8.3 - 6.3	14.3 - 10.8
24	11°21.0	11°22.9	10°50.0	2.4 - 1.8	8.4 - 6.4	14.4 - 10.9
25	11°21.2	11°23.1	10°50.2	2.5 - 1.9	8.5 - 6.4	14.5 - 11.0
26	11°21.5	11°23.4	10°50.5	2.6 - 2.0	8.6 - 6.5	14.6 - 11.1
27	11°21.8	11°23.6	10°50.7	2.7 - 2.0	8.7 - 6.6	14.7 - 11.1
28	11°22.0	11°23.9	10°50.9	2.8 - 2.1	8.8 - 6.7	14.8 - 11.2
29	11°22.3	11°24.1	10°51.2	2.9 - 2.2	8.9 - 6.7	14.9 - 11.3
30	11°22.5	11°24.4	10°51.4	3.0 - 2.3	9.0 - 6.8	15.0 - 11.4
31	11°22.7	11°24.6	10°51.6	3.1 - 2.4	9.1 - 6.9	15.1 - 11.5
32	11°23.0	11°24.9	10°51.9	3.2 - 2.4	9.2 - 7.0	15.2 - 11.5
33	11°23.2	11°25.1	10°52.1	3.3 - 2.5	9.3 - 7.1	15.3 - 11.6
34	11°23.5	11°25.4	10°52.4	3.4 - 2.6	9.4 - 7.1	15.4 - 11.7
35	11°23.8	11°25.6	10°52.6	3.5 - 2.7	9.5 - 7.2	15.5 - 11.8
36	11°24.0	11°25.9	10°52.8	3.6 - 2.7	9.6 - 7.3	15.6 - 11.8
37	11°24.3	11°26.1	10°53.1	3.7 - 2.8	9.7 - 7.4	15.7 - 11.9
38	11°24.5	11°26.4	10°53.3	3.8 - 2.9	9.8 - 7.4	15.8 - 12.0
39	11°24.7	11°26.6	10°53.6	3.9 - 3.0	9.9 - 7.5	15.9 - 12.1
40	11°25.0	11°26.9	10°53.8	4.0 - 3.0	10.0 - 7.6	16.0 - 12.1
41	11°25.2	11°27.1	10°54.0	4.1 - 3.1	10.1 - 7.7	16.1 - 12.2
42	11°25.5	11°27.4	10°54.3	4.2 - 3.2	10.2 - 7.7	16.2 - 12.3
43	11°25.8	11°27.6	10°54.5	4.3 - 3.3	10.3 - 7.8	16.3 - 12.4
44	11°26.0	11°27.9	10°54.7	4.4 - 3.3	10.4 - 7.9	16.4 - 12.4
45	11°26.3	11°28.1	10°55.0	4.5 - 3.4	10.5 - 8.0	16.5 - 12.5
46	11°26.5	11°28.4	10°55.2	4.6 - 3.5	10.6 - 8.0	16.6 - 12.6
47	11°26.7	11°28.6	10°55.5	4.7 - 3.6	10.7 - 8.1	16.7 - 12.7
48	11°27.0	11°28.9	10°55.7	4.8 - 3.6	10.8 - 8.2	16.8 - 12.7
49	11°27.3	11°29.1	10°55.9	4.9 - 3.7	10.9 - 8.3	16.9 - 12.8
50	11°27.5	11°29.4	10°56.2	5.0 - 3.8	11.0 - 8.3	17.0 - 12.9
51	11°27.8	11°29.6	10°56.4	5.1 - 3.9	11.1 - 8.4	17.1 - 13.0
52	11°28.0	11°29.9	10°56.7	5.2 - 3.9	11.2 - 8.5	17.2 - 13.0
53	11°28.2	11°30.1	10°56.9	5.3 - 4.0	11.3 - 8.6	17.3 - 13.1
54	11°28.5	11°30.4	10°57.1	5.4 - 4.1	11.4 - 8.6	17.4 - 13.2
55	11°28.7	11°30.6	10°57.4	5.5 - 4.2	11.5 - 8.7	17.5 - 13.3
56	11°29.0	11°30.9	10°57.6	5.6 - 4.2	11.6 - 8.8	17.6 - 13.3
57	11°29.3	11°31.1	10°57.9	5.7 - 4.3	11.7 - 8.9	17.7 - 13.4
58	11°29.5	11°31.4	10°58.1	5.8 - 4.4	11.8 - 8.9	17.8 - 13.5
59	11°29.8	11°31.6	10°58.3	5.9 - 4.5	11.9 - 9.0	17.9 - 13.6

m 46	Sun Plan.	Aries	Moon	v and d corr		
0	11°30.0	11°31.9	10°58.6	0.0 - 0.0	6.0 - 4.7	12.0 - 9.3
1	11°30.2	11°32.1	10°58.8	0.1 - 0.1	6.1 - 4.7	12.1 - 9.4
2	11°30.5	11°32.4	10°59.0	0.2 - 0.2	6.2 - 4.8	12.2 - 9.5
3	11°30.7	11°32.6	10°59.3	0.3 - 0.2	6.3 - 4.9	12.3 - 9.5
4	11°31.0	11°32.9	10°59.5	0.4 - 0.3	6.4 - 5.0	12.4 - 9.6
5	11°31.3	11°33.1	10°59.8	0.5 - 0.4	6.5 - 5.0	12.5 - 9.7
6	11°31.5	11°33.4	11°00.0	0.6 - 0.5	6.6 - 5.1	12.6 - 9.8
7	11°31.8	11°33.6	11°00.2	0.7 - 0.5	6.7 - 5.2	12.7 - 9.8
8	11°32.0	11°33.9	11°00.5	0.8 - 0.6	6.8 - 5.3	12.8 - 9.9
9	11°32.2	11°34.1	11°00.7	0.9 - 0.7	6.9 - 5.3	12.9 - 10.0
10	11°32.5	11°34.4	11°01.0	1.0 - 0.8	7.0 - 5.4	13.0 - 10.1
11	11°32.7	11°34.6	11°01.2	1.1 - 0.9	7.1 - 5.5	13.1 - 10.2
12	11°33.0	11°34.9	11°01.4	1.2 - 0.9	7.2 - 5.6	13.2 - 10.2
13	11°33.3	11°35.1	11°01.7	1.3 - 1.0	7.3 - 5.7	13.3 - 10.3
14	11°33.5	11°35.4	11°01.9	1.4 - 1.1	7.4 - 5.7	13.4 - 10.4
15	11°33.8	11°35.6	11°02.1	1.5 - 1.2	7.5 - 5.8	13.5 - 10.5
16	11°34.0	11°35.9	11°02.4	1.6 - 1.2	7.6 - 5.9	13.6 - 10.5
17	11°34.2	11°36.1	11°02.6	1.7 - 1.3	7.7 - 6.0	13.7 - 10.6
18	11°34.5	11°36.4	11°02.9	1.8 - 1.4	7.8 - 6.0	13.8 - 10.7
19	11°34.8	11°36.6	11°03.1	1.9 - 1.5	7.9 - 6.1	13.9 - 10.8
20	11°35.0	11°36.9	11°03.3	2.0 - 1.6	8.0 - 6.2	14.0 - 10.8
21	11°35.3	11°37.2	11°03.6	2.1 - 1.6	8.1 - 6.3	14.1 - 10.9
22	11°35.5	11°37.4	11°03.8	2.2 - 1.7	8.2 - 6.4	14.2 - 11.0
23	11°35.7	11°37.7	11°04.1	2.3 - 1.8	8.3 - 6.4	14.3 - 11.1
24	11°36.0	11°37.9	11°04.3	2.4 - 1.9	8.4 - 6.5	14.4 - 11.2
25	11°36.2	11°38.2	11°04.5	2.5 - 1.9	8.5 - 6.6	14.5 - 11.2
26	11°36.5	11°38.4	11°04.8	2.6 - 2.0	8.6 - 6.7	14.6 - 11.3
27	11°36.8	11°38.7	11°05.0	2.7 - 2.1	8.7 - 6.7	14.7 - 11.4
28	11°37.0	11°38.9	11°05.2	2.8 - 2.2	8.8 - 6.8	14.8 - 11.5
29	11°37.3	11°39.2	11°05.5	2.9 - 2.2	8.9 - 6.9	14.9 - 11.5
30	11°37.5	11°39.4	11°05.7	3.0 - 2.3	9.0 - 7.0	15.0 - 11.6
31	11°37.7	11°39.7	11°06.0	3.1 - 2.4	9.1 - 7.1	15.1 - 11.7
32	11°38.0	11°39.9	11°06.2	3.2 - 2.5	9.2 - 7.1	15.2 - 11.8
33	11°38.2	11°40.2	11°06.4	3.3 - 2.6	9.3 - 7.2	15.3 - 11.9
34	11°38.5	11°40.4	11°06.7	3.4 - 2.6	9.4 - 7.3	15.4 - 11.9
35	11°38.8	11°40.7	11°06.9	3.5 - 2.7	9.5 - 7.4	15.5 - 12.0
36	11°39.0	11°40.9	11°07.2	3.6 - 2.8	9.6 - 7.4	15.6 - 12.1
37	11°39.3	11°41.2	11°07.4	3.7 - 2.9	9.7 - 7.5	15.7 - 12.2
38	11°39.5	11°41.4	11°07.6	3.8 - 2.9	9.8 - 7.6	15.8 - 12.2
39	11°39.7	11°41.7	11°07.9	3.9 - 3.0	9.9 - 7.7	15.9 - 12.3
40	11°40.0	11°41.9	11°08.1	4.0 - 3.1	10.0 - 7.8	16.0 - 12.4
41	11°40.2	11°42.2	11°08.3	4.1 - 3.2	10.1 - 7.8	16.1 - 12.5
42	11°40.5	11°42.4	11°08.6	4.2 - 3.3	10.2 - 7.9	16.2 - 12.6
43	11°40.8	11°42.7	11°08.8	4.3 - 3.3	10.3 - 8.0	16.3 - 12.6
44	11°41.0	11°42.9	11°09.1	4.4 - 3.4	10.4 - 8.1	16.4 - 12.7
45	11°41.3	11°43.2	11°09.3	4.5 - 3.5	10.5 - 8.1	16.5 - 12.8
46	11°41.5	11°43.4	11°09.5	4.6 - 3.6	10.6 - 8.2	16.6 - 12.9
47	11°41.7	11°43.7	11°09.8	4.7 - 3.6	10.7 - 8.3	16.7 - 12.9
48	11°42.0	11°43.9	11°10.0	4.8 - 3.7	10.8 - 8.4	16.8 - 13.0
49	11°42.3	11°44.2	11°10.3	4.9 - 3.8	10.9 - 8.4	16.9 - 13.1
50	11°42.5	11°44.4	11°10.5	5.0 - 3.9	11.0 - 8.5	17.0 - 13.2
51	11°42.8	11°44.7	11°10.7	5.1 - 4.0	11.1 - 8.6	17.1 - 13.3
52	11°43.0	11°44.9	11°11.0	5.2 - 4.0	11.2 - 8.7	17.2 - 13.3
53	11°43.2	11°45.2	11°11.2	5.3 - 4.1	11.3 - 8.8	17.3 - 13.4
54	11°43.5	11°45.4	11°11.5	5.4 - 4.2	11.4 - 8.8	17.4 - 13.5
55	11°43.7	11°45.7	11°11.7	5.5 - 4.3	11.5 - 8.9	17.5 - 13.6
56	11°44.0	11°45.9	11°11.9	5.6 - 4.3	11.6 - 9.0	17.6 - 13.6
57	11°44.3	11°46.2	11°12.2	5.7 - 4.4	11.7 - 9.1	17.7 - 13.7
58	11°44.5	11°46.4	11°12.4	5.8 - 4.5	11.8 - 9.1	17.8 - 13.8
59	11°44.8	11°46.7	11°12.6	5.9 - 4.6	11.9 - 9.2	17.9 - 13.9

m 47	Sun Plan.	Aries	Moon	v and d corr		
0	11°45.0	11°46.9	11°12.9	0.0 - 0.0	6.0 - 4.8	12.0 - 9.5
1	11°45.2	11°47.2	11°13.1	0.1 - 0.1	6.1 - 4.8	12.1 - 9.6
2	11°45.5	11°47.4	11°13.4	0.2 - 0.2	6.2 - 4.9	12.2 - 9.7
3	11°45.7	11°47.7	11°13.6	0.3 - 0.2	6.3 - 5.0	12.3 - 9.7
4	11°46.0	11°47.9	11°13.8	0.4 - 0.3	6.4 - 5.1	12.4 - 9.8
5	11°46.3	11°48.2	11°14.1	0.5 - 0.4	6.5 - 5.1	12.5 - 9.9
6	11°46.5	11°48.4	11°14.3	0.6 - 0.5	6.6 - 5.2	12.6 - 10.0
7	11°46.8	11°48.7	11°14.6	0.7 - 0.6	6.7 - 5.3	12.7 - 10.1
8	11°47.0	11°48.9	11°14.8	0.8 - 0.6	6.8 - 5.4	12.8 - 10.1
9	11°47.2	11°49.2	11°15.0	0.9 - 0.7	6.9 - 5.5	12.9 - 10.2
10	11°47.5	11°49.4	11°15.3	1.0 - 0.8	7.0 - 5.5	13.0 - 10.3
11	11°47.7	11°49.7	11°15.5	1.1 - 0.9	7.1 - 5.6	13.1 - 10.4
12	11°48.0	11°49.9	11°15.7	1.2 - 1.0	7.2 - 5.7	13.2 - 10.4
13	11°48.3	11°50.2	11°16.0	1.3 - 1.0	7.3 - 5.8	13.3 - 10.5
14	11°48.5	11°50.4	11°16.2	1.4 - 1.1	7.4 - 5.9	13.4 - 10.6
15	11°48.8	11°50.7	11°16.5	1.5 - 1.2	7.5 - 5.9	13.5 - 10.7
16	11°49.0	11°50.9	11°16.7	1.6 - 1.3	7.6 - 6.0	13.6 - 10.8
17	11°49.2	11°51.2	11°16.9	1.7 - 1.3	7.7 - 6.1	13.7 - 10.8
18	11°49.5	11°51.4	11°17.2	1.8 - 1.4	7.8 - 6.2	13.8 - 10.9
19	11°49.8	11°51.7	11°17.4	1.9 - 1.5	7.9 - 6.3	13.9 - 11.0
20	11°50.0	11°51.9	11°17.7	2.0 - 1.6	8.0 - 6.3	14.0 - 11.1
21	11°50.3	11°52.2	11°17.9	2.1 - 1.7	8.1 - 6.4	14.1 - 11.2
22	11°50.5	11°52.4	11°18.1	2.2 - 1.7	8.2 - 6.5	14.2 - 11.2
23	11°50.7	11°52.7	11°18.4	2.3 - 1.8	8.3 - 6.6	14.3 - 11.3
24	11°51.0	11°52.9	11°18.6	2.4 - 1.9	8.4 - 6.7	14.4 - 11.4
25	11°51.2	11°53.2	11°18.8	2.5 - 2.0	8.5 - 6.7	14.5 - 11.5
26	11°51.5	11°53.4	11°19.1	2.6 - 2.1	8.6 - 6.8	14.6 - 11.6
27	11°51.8	11°53.7	11°19.3	2.7 - 2.1	8.7 - 6.9	14.7 - 11.6
28	11°52.0	11°53.9	11°19.6	2.8 - 2.2	8.8 - 7.0	14.8 - 11.7
29	11°52.3	11°54.2	11°19.8	2.9 - 2.3	8.9 - 7.0	14.9 - 11.8
30	11°52.5	11°54.4	11°20.0	3.0 - 2.4	9.0 - 7.1	15.0 - 11.9
31	11°52.7	11°54.7	11°20.3	3.1 - 2.5	9.1 - 7.2	15.1 - 12.0
32	11°53.0	11°54.9	11°20.5	3.2 - 2.5	9.2 - 7.3	15.2 - 12.0
33	11°53.2	11°55.2	11°20.8	3.3 - 2.6	9.3 - 7.4	15.3 - 12.1
34	11°53.5	11°55.5	11°21.0	3.4 - 2.7	9.4 - 7.4	15.4 - 12.2
35	11°53.8	11°55.7	11°21.2	3.5 - 2.8	9.5 - 7.5	15.5 - 12.3
36	11°54.0	11°56.0	11°21.5	3.6 - 2.9	9.6 - 7.6	15.6 - 12.3
37	11°54.3	11°56.2	11°21.7	3.7 - 2.9	9.7 - 7.7	15.7 - 12.4
38	11°54.5	11°56.5	11°22.0	3.8 - 3.0	9.8 - 7.8	15.8 - 12.5
39	11°54.7	11°56.7	11°22.2	3.9 - 3.1	9.9 - 7.8	15.9 - 12.6
40	11°55.0	11°57.0	11°22.4	4.0 - 3.2	10.0 - 7.9	16.0 - 12.7
41	11°55.2	11°57.2	11°22.7	4.1 - 3.2	10.1 - 8.0	16.1 - 12.7
42	11°55.5	11°57.5	11°22.9	4.2 - 3.3	10.2 - 8.1	16.2 - 12.8
43	11°55.8	11°57.7	11°23.1	4.3 - 3.4	10.3 - 8.2	16.3 - 12.9
44	11°56.0	11°58.0	11°23.4	4.4 - 3.5	10.4 - 8.2	16.4 - 13.0
45	11°56.3	11°58.2	11°23.6	4.5 - 3.6	10.5 - 8.3	16.5 - 13.1
46	11°56.5	11°58.5	11°23.9	4.6 - 3.6	10.6 - 8.4	16.6 - 13.1
47	11°56.7	11°58.7	11°24.1	4.7 - 3.7	10.7 - 8.5	16.7 - 13.2
48	11°57.0	11°59.0	11°24.3	4.8 - 3.8	10.8 - 8.6	16.8 - 13.3
49	11°57.3	11°59.2	11°24.6	4.9 - 3.9	10.9 - 8.6	16.9 - 13.4
50	11°57.5	11°59.5	11°24.8	5.0 - 4.0	11.0 - 8.7	17.0 - 13.5
51	11°57.8	11°59.7	11°25.1	5.1 - 4.0	11.1 - 8.8	17.1 - 13.5
52	11°58.0	12°00.0	11°25.3	5.2 - 4.1	11.2 - 8.9	17.2 - 13.6
53	11°58.2	12°00.2	11°25.5	5.3 - 4.2	11.3 - 8.9	17.3 - 13.7
54	11°58.5	12°00.5	11°25.8	5.4 - 4.3	11.4 - 9.0	17.4 - 13.8
55	11°58.7	12°00.7	11°26.0	5.5 - 4.4	11.5 - 9.1	17.5 - 13.9
56	11°59.0	12°01.0	11°26.2	5.6 - 4.4	11.6 - 9.2	17.6 - 13.9
57	11°59.3	12°01.2	11°26.5	5.7 - 4.5	11.7 - 9.3	17.7 - 14.0
58	11°59.5	12°01.5	11°26.7	5.8 - 4.6	11.8 - 9.3	17.8 - 14.1
59	11°59.8	12°01.7	11°27.0	5.9 - 4.7	11.9 - 9.4	17.9 - 14.2

Increments and Corrections

m 48	Sun Plan.	Aries	Moon	v and d corr		
0	12°00.0	12°02.0	11°27.2	0.0 - 0.0	6.0 - 4.8	12.0 - 9.7
1	12°00.2	12°02.2	11°27.4	0.1 - 0.1	6.1 - 4.9	12.1 - 9.8
2	12°00.5	12°02.5	11°27.7	0.2 - 0.2	6.2 - 5.0	12.2 - 9.9
3	12°00.7	12°02.7	11°27.9	0.3 - 0.2	6.3 - 5.1	12.3 - 9.9
4	12°01.0	12°03.0	11°28.2	0.4 - 0.3	6.4 - 5.2	12.4 - 10.0
5	12°01.3	12°03.2	11°28.4	0.5 - 0.4	6.5 - 5.3	12.5 - 10.1
6	12°01.5	12°03.5	11°28.6	0.6 - 0.5	6.6 - 5.3	12.6 - 10.2
7	12°01.8	12°03.7	11°28.9	0.7 - 0.6	6.7 - 5.4	12.7 - 10.3
8	12°02.0	12°04.0	11°29.1	0.8 - 0.6	6.8 - 5.5	12.8 - 10.3
9	12°02.2	12°04.2	11°29.3	0.9 - 0.7	6.9 - 5.6	12.9 - 10.4
10	12°02.5	12°04.5	11°29.6	1.0 - 0.8	7.0 - 5.7	13.0 - 10.5
11	12°02.7	12°04.7	11°29.8	1.1 - 0.9	7.1 - 5.7	13.1 - 10.6
12	12°03.0	12°05.0	11°30.1	1.2 - 1.0	7.2 - 5.8	13.2 - 10.7
13	12°03.3	12°05.2	11°30.3	1.3 - 1.1	7.3 - 5.9	13.3 - 10.8
14	12°03.5	12°05.5	11°30.5	1.4 - 1.1	7.4 - 6.0	13.4 - 10.8
15	12°03.8	12°05.7	11°30.8	1.5 - 1.2	7.5 - 6.1	13.5 - 10.9
16	12°04.0	12°06.0	11°31.0	1.6 - 1.3	7.6 - 6.1	13.6 - 11.0
17	12°04.2	12°06.2	11°31.3	1.7 - 1.4	7.7 - 6.2	13.7 - 11.1
18	12°04.5	12°06.5	11°31.5	1.8 - 1.5	7.8 - 6.3	13.8 - 11.2
19	12°04.8	12°06.7	11°31.7	1.9 - 1.5	7.9 - 6.4	13.9 - 11.2
20	12°05.0	12°07.0	11°32.0	2.0 - 1.6	8.0 - 6.5	14.0 - 11.3
21	12°05.3	12°07.2	11°32.2	2.1 - 1.7	8.1 - 6.5	14.1 - 11.4
22	12°05.5	12°07.5	11°32.4	2.2 - 1.8	8.2 - 6.6	14.2 - 11.5
23	12°05.7	12°07.7	11°32.7	2.3 - 1.9	8.3 - 6.7	14.3 - 11.6
24	12°06.0	12°08.0	11°32.9	2.4 - 1.9	8.4 - 6.8	14.4 - 11.6
25	12°06.2	12°08.2	11°33.2	2.5 - 2.0	8.5 - 6.9	14.5 - 11.7
26	12°06.5	12°08.5	11°33.4	2.6 - 2.1	8.6 - 7.0	14.6 - 11.8
27	12°06.8	12°08.7	11°33.6	2.7 - 2.2	8.7 - 7.0	14.7 - 11.9
28	12°07.0	12°09.0	11°33.9	2.8 - 2.3	8.8 - 7.1	14.8 - 12.0
29	12°07.3	12°09.2	11°34.1	2.9 - 2.3	8.9 - 7.2	14.9 - 12.0
30	12°07.5	12°09.5	11°34.4	3.0 - 2.4	9.0 - 7.3	15.0 - 12.1
31	12°07.7	12°09.7	11°34.6	3.1 - 2.5	9.1 - 7.4	15.1 - 12.2
32	12°08.0	12°10.0	11°34.8	3.2 - 2.6	9.2 - 7.4	15.2 - 12.3
33	12°08.2	12°10.2	11°35.1	3.3 - 2.7	9.3 - 7.5	15.3 - 12.4
34	12°08.5	12°10.5	11°35.3	3.4 - 2.7	9.4 - 7.6	15.4 - 12.4
35	12°08.8	12°10.7	11°35.6	3.5 - 2.8	9.5 - 7.7	15.5 - 12.5
36	12°09.0	12°11.0	11°35.8	3.6 - 2.9	9.6 - 7.8	15.6 - 12.6
37	12°09.3	12°11.2	11°36.0	3.7 - 3.0	9.7 - 7.8	15.7 - 12.7
38	12°09.5	12°11.5	11°36.3	3.8 - 3.1	9.8 - 7.9	15.8 - 12.8
39	12°09.7	12°11.7	11°36.5	3.9 - 3.2	9.9 - 8.0	15.9 - 12.9
40	12°10.0	12°12.0	11°36.7	4.0 - 3.2	10.0 - 8.1	16.0 - 12.9
41	12°10.2	12°12.2	11°37.0	4.1 - 3.3	10.1 - 8.2	16.1 - 13.0
42	12°10.5	12°12.5	11°37.2	4.2 - 3.4	10.2 - 8.2	16.2 - 13.1
43	12°10.8	12°12.7	11°37.5	4.3 - 3.5	10.3 - 8.3	16.3 - 13.2
44	12°11.0	12°13.0	11°37.7	4.4 - 3.6	10.4 - 8.4	16.4 - 13.3
45	12°11.3	12°13.2	11°37.9	4.5 - 3.6	10.5 - 8.5	16.5 - 13.3
46	12°11.5	12°13.5	11°38.2	4.6 - 3.7	10.6 - 8.6	16.6 - 13.4
47	12°11.7	12°13.8	11°38.4	4.7 - 3.8	10.7 - 8.6	16.7 - 13.5
48	12°12.0	12°14.0	11°38.7	4.8 - 3.9	10.8 - 8.7	16.8 - 13.6
49	12°12.3	12°14.3	11°38.9	4.9 - 4.0	10.9 - 8.8	16.9 - 13.7
50	12°12.5	12°14.5	11°39.1	5.0 - 4.0	11.0 - 8.9	17.0 - 13.7
51	12°12.8	12°14.8	11°39.4	5.1 - 4.1	11.1 - 9.0	17.1 - 13.8
52	12°13.0	12°15.0	11°39.6	5.2 - 4.2	11.2 - 9.1	17.2 - 13.9
53	12°13.2	12°15.3	11°39.8	5.3 - 4.3	11.3 - 9.1	17.3 - 14.0
54	12°13.5	12°15.5	11°40.1	5.4 - 4.4	11.4 - 9.2	17.4 - 14.1
55	12°13.7	12°15.8	11°40.3	5.5 - 4.4	11.5 - 9.3	17.5 - 14.1
56	12°14.0	12°16.0	11°40.6	5.6 - 4.5	11.6 - 9.4	17.6 - 14.2
57	12°14.3	12°16.3	11°40.8	5.7 - 4.6	11.7 - 9.5	17.7 - 14.3
58	12°14.5	12°16.5	11°41.0	5.8 - 4.7	11.8 - 9.5	17.8 - 14.4
59	12°14.8	12°16.8	11°41.3	5.9 - 4.8	11.9 - 9.6	17.9 - 14.5

m 49	Sun Plan.	Aries	Moon	v and d corr		
0	12°15.0	12°17.0	11°41.5	0.0 - 0.0	6.0 - 4.9	12.0 - 9.9
1	12°15.2	12°17.3	11°41.8	0.1 - 0.1	6.1 - 5.0	12.1 - 10.0
2	12°15.5	12°17.5	11°42.0	0.2 - 0.2	6.2 - 5.1	12.2 - 10.1
3	12°15.7	12°17.8	11°42.2	0.3 - 0.2	6.3 - 5.2	12.3 - 10.1
4	12°16.0	12°18.0	11°42.5	0.4 - 0.3	6.4 - 5.3	12.4 - 10.2
5	12°16.3	12°18.3	11°42.7	0.5 - 0.4	6.5 - 5.4	12.5 - 10.3
6	12°16.5	12°18.5	11°42.9	0.6 - 0.5	6.6 - 5.4	12.6 - 10.4
7	12°16.8	12°18.8	11°43.2	0.7 - 0.6	6.7 - 5.5	12.7 - 10.5
8	12°17.0	12°19.0	11°43.4	0.8 - 0.7	6.8 - 5.6	12.8 - 10.6
9	12°17.2	12°19.3	11°43.7	0.9 - 0.7	6.9 - 5.7	12.9 - 10.6
10	12°17.5	12°19.5	11°43.9	1.0 - 0.8	7.0 - 5.8	13.0 - 10.7
11	12°17.7	12°19.8	11°44.1	1.1 - 0.9	7.1 - 5.9	13.1 - 10.8
12	12°18.0	12°20.0	11°44.4	1.2 - 1.0	7.2 - 5.9	13.2 - 10.9
13	12°18.3	12°20.3	11°44.6	1.3 - 1.1	7.3 - 6.0	13.3 - 11.0
14	12°18.5	12°20.5	11°44.9	1.4 - 1.2	7.4 - 6.1	13.4 - 11.1
15	12°18.8	12°20.8	11°45.1	1.5 - 1.2	7.5 - 6.2	13.5 - 11.1
16	12°19.0	12°21.0	11°45.3	1.6 - 1.3	7.6 - 6.3	13.6 - 11.2
17	12°19.2	12°21.3	11°45.6	1.7 - 1.4	7.7 - 6.4	13.7 - 11.3
18	12°19.5	12°21.5	11°45.8	1.8 - 1.5	7.8 - 6.4	13.8 - 11.4
19	12°19.8	12°21.8	11°46.1	1.9 - 1.6	7.9 - 6.5	13.9 - 11.5
20	12°20.0	12°22.0	11°46.3	2.0 - 1.6	8.0 - 6.6	14.0 - 11.5
21	12°20.3	12°22.3	11°46.5	2.1 - 1.7	8.1 - 6.7	14.1 - 11.6
22	12°20.5	12°22.5	11°46.8	2.2 - 1.8	8.2 - 6.8	14.2 - 11.7
23	12°20.7	12°22.8	11°47.0	2.3 - 1.9	8.3 - 6.8	14.3 - 11.8
24	12°21.0	12°23.0	11°47.2	2.4 - 2.0	8.4 - 6.9	14.4 - 11.9
25	12°21.2	12°23.3	11°47.5	2.5 - 2.1	8.5 - 7.0	14.5 - 12.0
26	12°21.5	12°23.5	11°47.7	2.6 - 2.1	8.6 - 7.1	14.6 - 12.0
27	12°21.8	12°23.8	11°48.0	2.7 - 2.2	8.7 - 7.2	14.7 - 12.1
28	12°22.0	12°24.0	11°48.2	2.8 - 2.3	8.8 - 7.3	14.8 - 12.2
29	12°22.3	12°24.3	11°48.4	2.9 - 2.4	8.9 - 7.3	14.9 - 12.3
30	12°22.5	12°24.5	11°48.7	3.0 - 2.5	9.0 - 7.4	15.0 - 12.4
31	12°22.7	12°24.8	11°48.9	3.1 - 2.6	9.1 - 7.5	15.1 - 12.5
32	12°23.0	12°25.0	11°49.2	3.2 - 2.6	9.2 - 7.6	15.2 - 12.5
33	12°23.2	12°25.3	11°49.4	3.3 - 2.7	9.3 - 7.7	15.3 - 12.6
34	12°23.5	12°25.5	11°49.6	3.4 - 2.8	9.4 - 7.8	15.4 - 12.7
35	12°23.8	12°25.8	11°49.9	3.5 - 2.9	9.5 - 7.8	15.5 - 12.8
36	12°24.0	12°26.0	11°50.1	3.6 - 3.0	9.6 - 7.9	15.6 - 12.9
37	12°24.3	12°26.3	11°50.3	3.7 - 3.1	9.7 - 8.0	15.7 - 13.0
38	12°24.5	12°26.5	11°50.6	3.8 - 3.1	9.8 - 8.1	15.8 - 13.0
39	12°24.7	12°26.8	11°50.8	3.9 - 3.2	9.9 - 8.2	15.9 - 13.1
40	12°25.0	12°27.0	11°51.1	4.0 - 3.3	10.0 - 8.3	16.0 - 13.2
41	12°25.2	12°27.3	11°51.3	4.1 - 3.4	10.1 - 8.3	16.1 - 13.3
42	12°25.5	12°27.5	11°51.5	4.2 - 3.5	10.2 - 8.4	16.2 - 13.4
43	12°25.8	12°27.8	11°51.8	4.3 - 3.5	10.3 - 8.5	16.3 - 13.4
44	12°26.0	12°28.0	11°52.0	4.4 - 3.6	10.4 - 8.6	16.4 - 13.5
45	12°26.3	12°28.3	11°52.3	4.5 - 3.7	10.5 - 8.7	16.5 - 13.6
46	12°26.5	12°28.5	11°52.5	4.6 - 3.8	10.6 - 8.7	16.6 - 13.7
47	12°26.7	12°28.8	11°52.7	4.7 - 3.9	10.7 - 8.8	16.7 - 13.8
48	12°27.0	12°29.0	11°53.0	4.8 - 4.0	10.8 - 8.9	16.8 - 13.9
49	12°27.3	12°29.3	11°53.2	4.9 - 4.0	10.9 - 9.0	16.9 - 13.9
50	12°27.5	12°29.5	11°53.4	5.0 - 4.1	11.0 - 9.1	17.0 - 14.0
51	12°27.8	12°29.8	11°53.7	5.1 - 4.2	11.1 - 9.2	17.1 - 14.1
52	12°28.0	12°30.0	11°53.9	5.2 - 4.3	11.2 - 9.2	17.2 - 14.2
53	12°28.2	12°30.3	11°54.2	5.3 - 4.4	11.3 - 9.3	17.3 - 14.3
54	12°28.5	12°30.5	11°54.4	5.4 - 4.5	11.4 - 9.4	17.4 - 14.4
55	12°28.7	12°30.8	11°54.6	5.5 - 4.5	11.5 - 9.5	17.5 - 14.4
56	12°29.0	12°31.0	11°54.9	5.6 - 4.6	11.6 - 9.6	17.6 - 14.5
57	12°29.3	12°31.3	11°55.1	5.7 - 4.7	11.7 - 9.7	17.7 - 14.6
58	12°29.5	12°31.5	11°55.4	5.8 - 4.8	11.8 - 9.7	17.8 - 14.7
59	12°29.8	12°31.8	11°55.6	5.9 - 4.9	11.9 - 9.8	17.9 - 14.8

m 50	Sun Plan.	Aries	Moon	v and d corr		
0	12°30.0	12°32.1	11°55.8	0.0 - 0.0	6.0 - 5.0	12.0 - 10.1
1	12°30.2	12°32.3	11°56.1	0.1 - 0.1	6.1 - 5.1	12.1 - 10.2
2	12°30.5	12°32.6	11°56.3	0.2 - 0.2	6.2 - 5.2	12.2 - 10.3
3	12°30.7	12°32.8	11°56.5	0.3 - 0.3	6.3 - 5.3	12.3 - 10.4
4	12°31.0	12°33.1	11°56.8	0.4 - 0.3	6.4 - 5.4	12.4 - 10.4
5	12°31.3	12°33.3	11°57.0	0.5 - 0.4	6.5 - 5.5	12.5 - 10.5
6	12°31.5	12°33.6	11°57.3	0.6 - 0.5	6.6 - 5.6	12.6 - 10.6
7	12°31.8	12°33.8	11°57.5	0.7 - 0.6	6.7 - 5.6	12.7 - 10.7
8	12°32.0	12°34.1	11°57.7	0.8 - 0.7	6.8 - 5.7	12.8 - 10.8
9	12°32.2	12°34.3	11°58.0	0.9 - 0.8	6.9 - 5.8	12.9 - 10.9
10	12°32.5	12°34.6	11°58.2	1.0 - 0.8	7.0 - 5.9	13.0 - 10.9
11	12°32.7	12°34.8	11°58.5	1.1 - 0.9	7.1 - 6.0	13.1 - 11.0
12	12°33.0	12°35.1	11°58.7	1.2 - 1.0	7.2 - 6.1	13.2 - 11.1
13	12°33.3	12°35.3	11°58.9	1.3 - 1.1	7.3 - 6.1	13.3 - 11.2
14	12°33.5	12°35.6	11°59.2	1.4 - 1.2	7.4 - 6.2	13.4 - 11.3
15	12°33.8	12°35.8	11°59.4	1.5 - 1.3	7.5 - 6.3	13.5 - 11.4
16	12°34.0	12°36.1	11°59.7	1.6 - 1.3	7.6 - 6.4	13.6 - 11.4
17	12°34.2	12°36.3	11°59.9	1.7 - 1.4	7.7 - 6.5	13.7 - 11.5
18	12°34.5	12°36.6	12°00.1	1.8 - 1.5	7.8 - 6.6	13.8 - 11.6
19	12°34.8	12°36.8	12°00.4	1.9 - 1.6	7.9 - 6.6	13.9 - 11.7
20	12°35.0	12°37.1	12°00.6	2.0 - 1.7	8.0 - 6.7	14.0 - 11.8
21	12°35.3	12°37.3	12°00.8	2.1 - 1.8	8.1 - 6.8	14.1 - 11.9
22	12°35.5	12°37.6	12°01.1	2.2 - 1.9	8.2 - 6.9	14.2 - 12.0
23	12°35.7	12°37.8	12°01.3	2.3 - 1.9	8.3 - 7.0	14.3 - 12.0
24	12°36.0	12°38.1	12°01.6	2.4 - 2.0	8.4 - 7.1	14.4 - 12.1
25	12°36.2	12°38.3	12°01.8	2.5 - 2.1	8.5 - 7.2	14.5 - 12.2
26	12°36.5	12°38.6	12°02.0	2.6 - 2.2	8.6 - 7.2	14.6 - 12.3
27	12°36.8	12°38.8	12°02.3	2.7 - 2.3	8.7 - 7.3	14.7 - 12.4
28	12°37.0	12°39.1	12°02.5	2.8 - 2.4	8.8 - 7.4	14.8 - 12.5
29	12°37.3	12°39.3	12°02.8	2.9 - 2.4	8.9 - 7.5	14.9 - 12.5
30	12°37.5	12°39.6	12°03.0	3.0 - 2.5	9.0 - 7.6	15.0 - 12.6
31	12°37.7	12°39.8	12°03.2	3.1 - 2.6	9.1 - 7.7	15.1 - 12.7
32	12°38.0	12°40.1	12°03.5	3.2 - 2.7	9.2 - 7.7	15.2 - 12.8
33	12°38.2	12°40.3	12°03.7	3.3 - 2.8	9.3 - 7.8	15.3 - 12.9
34	12°38.5	12°40.6	12°03.9	3.4 - 2.9	9.4 - 7.9	15.4 - 13.0
35	12°38.8	12°40.8	12°04.2	3.5 - 2.9	9.5 - 8.0	15.5 - 13.0
36	12°39.0	12°41.1	12°04.4	3.6 - 3.0	9.6 - 8.1	15.6 - 13.1
37	12°39.3	12°41.3	12°04.7	3.7 - 3.1	9.7 - 8.2	15.7 - 13.2
38	12°39.5	12°41.6	12°04.9	3.8 - 3.2	9.8 - 8.2	15.8 - 13.3
39	12°39.7	12°41.8	12°05.1	3.9 - 3.3	9.9 - 8.3	15.9 - 13.4
40	12°40.0	12°42.1	12°05.4	4.0 - 3.4	10.0 - 8.4	16.0 - 13.5
41	12°40.2	12°42.3	12°05.6	4.1 - 3.5	10.1 - 8.5	16.1 - 13.6
42	12°40.5	12°42.6	12°05.9	4.2 - 3.5	10.2 - 8.6	16.2 - 13.6
43	12°40.8	12°42.8	12°06.1	4.3 - 3.6	10.3 - 8.7	16.3 - 13.7
44	12°41.0	12°43.1	12°06.3	4.4 - 3.7	10.4 - 8.8	16.4 - 13.8
45	12°41.3	12°43.3	12°06.6	4.5 - 3.8	10.5 - 8.8	16.5 - 13.9
46	12°41.5	12°43.6	12°06.8	4.6 - 3.9	10.6 - 8.9	16.6 - 14.0
47	12°41.7	12°43.8	12°07.0	4.7 - 4.0	10.7 - 9.0	16.7 - 14.1
48	12°42.0	12°44.1	12°07.3	4.8 - 4.0	10.8 - 9.1	16.8 - 14.1
49	12°42.3	12°44.3	12°07.5	4.9 - 4.1	10.9 - 9.2	16.9 - 14.2
50	12°42.5	12°44.6	12°07.8	5.0 - 4.2	11.0 - 9.3	17.0 - 14.3
51	12°42.8	12°44.8	12°08.0	5.1 - 4.3	11.1 - 9.3	17.1 - 14.4
52	12°43.0	12°45.1	12°08.2	5.2 - 4.4	11.2 - 9.4	17.2 - 14.5
53	12°43.2	12°45.3	12°08.5	5.3 - 4.5	11.3 - 9.5	17.3 - 14.6
54	12°43.5	12°45.6	12°08.7	5.4 - 4.5	11.4 - 9.6	17.4 - 14.6
55	12°43.7	12°45.8	12°09.0	5.5 - 4.6	11.5 - 9.7	17.5 - 14.7
56	12°44.0	12°46.1	12°09.2	5.6 - 4.7	11.6 - 9.8	17.6 - 14.8
57	12°44.3	12°46.3	12°09.4	5.7 - 4.8	11.7 - 9.8	17.7 - 14.9
58	12°44.5	12°46.6	12°09.7	5.8 - 4.9	11.8 - 9.9	17.8 - 15.0
59	12°44.8	12°46.8	12°09.9	5.9 - 5.0	11.9 - 10.0	17.9 - 15.1

Increments and Corrections

m 51	Sun Plan.	Aries	Moon	v and d corr		
0	12°45.0	12°47.1	12°10.1	0.0 - 0.0	6.0 - 5.1	12.0 - 10.3
1	12°45.2	12°47.3	12°10.4	0.1 - 0.1	6.1 - 5.2	12.1 - 10.4
2	12°45.5	12°47.6	12°10.6	0.2 - 0.2	6.2 - 5.3	12.2 - 10.5
3	12°45.7	12°47.8	12°10.9	0.3 - 0.3	6.3 - 5.4	12.3 - 10.6
4	12°46.0	12°48.1	12°11.1	0.4 - 0.3	6.4 - 5.5	12.4 - 10.6
5	12°46.3	12°48.3	12°11.3	0.5 - 0.4	6.5 - 5.6	12.5 - 10.7
6	12°46.5	12°48.6	12°11.6	0.6 - 0.5	6.6 - 5.7	12.6 - 10.8
7	12°46.8	12°48.8	12°11.8	0.7 - 0.6	6.7 - 5.8	12.7 - 10.9
8	12°47.0	12°49.1	12°12.1	0.8 - 0.7	6.8 - 5.8	12.8 - 11.0
9	12°47.2	12°49.3	12°12.3	0.9 - 0.8	6.9 - 5.9	12.9 - 11.1
10	12°47.5	12°49.6	12°12.5	1.0 - 0.9	7.0 - 6.0	13.0 - 11.2
11	12°47.7	12°49.8	12°12.8	1.1 - 0.9	7.1 - 6.1	13.1 - 11.2
12	12°48.0	12°50.1	12°13.0	1.2 - 1.0	7.2 - 6.2	13.2 - 11.3
13	12°48.3	12°50.3	12°13.3	1.3 - 1.1	7.3 - 6.3	13.3 - 11.4
14	12°48.5	12°50.6	12°13.5	1.4 - 1.2	7.4 - 6.4	13.4 - 11.5
15	12°48.8	12°50.9	12°13.7	1.5 - 1.3	7.5 - 6.4	13.5 - 11.6
16	12°49.0	12°51.1	12°14.0	1.6 - 1.4	7.6 - 6.5	13.6 - 11.7
17	12°49.2	12°51.4	12°14.2	1.7 - 1.5	7.7 - 6.6	13.7 - 11.8
18	12°49.5	12°51.6	12°14.4	1.8 - 1.5	7.8 - 6.7	13.8 - 11.8
19	12°49.8	12°51.9	12°14.7	1.9 - 1.6	7.9 - 6.8	13.9 - 11.9
20	12°50.0	12°52.1	12°14.9	2.0 - 1.7	8.0 - 6.9	14.0 - 12.0
21	12°50.3	12°52.4	12°15.2	2.1 - 1.8	8.1 - 7.0	14.1 - 12.1
22	12°50.5	12°52.6	12°15.4	2.2 - 1.9	8.2 - 7.0	14.2 - 12.2
23	12°50.7	12°52.9	12°15.6	2.3 - 2.0	8.3 - 7.1	14.3 - 12.3
24	12°51.0	12°53.1	12°15.9	2.4 - 2.1	8.4 - 7.2	14.4 - 12.4
25	12°51.2	12°53.4	12°16.1	2.5 - 2.1	8.5 - 7.3	14.5 - 12.4
26	12°51.5	12°53.6	12°16.4	2.6 - 2.2	8.6 - 7.4	14.6 - 12.5
27	12°51.8	12°53.9	12°16.6	2.7 - 2.3	8.7 - 7.5	14.7 - 12.6
28	12°52.0	12°54.1	12°16.8	2.8 - 2.4	8.8 - 7.6	14.8 - 12.7
29	12°52.3	12°54.4	12°17.1	2.9 - 2.5	8.9 - 7.6	14.9 - 12.8
30	12°52.5	12°54.6	12°17.3	3.0 - 2.6	9.0 - 7.7	15.0 - 12.9
31	12°52.7	12°54.9	12°17.5	3.1 - 2.7	9.1 - 7.8	15.1 - 13.0
32	12°53.0	12°55.1	12°17.8	3.2 - 2.7	9.2 - 7.9	15.2 - 13.0
33	12°53.2	12°55.4	12°18.0	3.3 - 2.8	9.3 - 8.0	15.3 - 13.1
34	12°53.5	12°55.6	12°18.3	3.4 - 2.9	9.4 - 8.1	15.4 - 13.2
35	12°53.8	12°55.9	12°18.5	3.5 - 3.0	9.5 - 8.2	15.5 - 13.3
36	12°54.0	12°56.1	12°18.7	3.6 - 3.1	9.6 - 8.2	15.6 - 13.4
37	12°54.3	12°56.4	12°19.0	3.7 - 3.2	9.7 - 8.3	15.7 - 13.5
38	12°54.5	12°56.6	12°19.2	3.8 - 3.3	9.8 - 8.4	15.8 - 13.6
39	12°54.7	12°56.9	12°19.5	3.9 - 3.3	9.9 - 8.5	15.9 - 13.6
40	12°55.0	12°57.1	12°19.7	4.0 - 3.4	10.0 - 8.6	16.0 - 13.7
41	12°55.2	12°57.4	12°19.9	4.1 - 3.5	10.1 - 8.7	16.1 - 13.8
42	12°55.5	12°57.6	12°20.2	4.2 - 3.6	10.2 - 8.8	16.2 - 13.9
43	12°55.8	12°57.9	12°20.4	4.3 - 3.7	10.3 - 8.8	16.3 - 14.0
44	12°56.0	12°58.1	12°20.6	4.4 - 3.8	10.4 - 8.9	16.4 - 14.1
45	12°56.3	12°58.4	12°20.9	4.5 - 3.9	10.5 - 9.0	16.5 - 14.2
46	12°56.5	12°58.6	12°21.1	4.6 - 3.9	10.6 - 9.1	16.6 - 14.2
47	12°56.7	12°58.9	12°21.4	4.7 - 4.0	10.7 - 9.2	16.7 - 14.3
48	12°57.0	12°59.1	12°21.6	4.8 - 4.1	10.8 - 9.3	16.8 - 14.4
49	12°57.3	12°59.4	12°21.8	4.9 - 4.2	10.9 - 9.4	16.9 - 14.5
50	12°57.5	12°59.6	12°22.1	5.0 - 4.3	11.0 - 9.4	17.0 - 14.6
51	12°57.8	12°59.9	12°22.3	5.1 - 4.4	11.1 - 9.5	17.1 - 14.7
52	12°58.0	13°00.1	12°22.6	5.2 - 4.5	11.2 - 9.6	17.2 - 14.8
53	12°58.2	13°00.4	12°22.8	5.3 - 4.5	11.3 - 9.7	17.3 - 14.8
54	12°58.5	13°00.6	12°23.0	5.4 - 4.6	11.4 - 9.8	17.4 - 14.9
55	12°58.7	13°00.9	12°23.3	5.5 - 4.7	11.5 - 9.9	17.5 - 15.0
56	12°59.0	13°01.1	12°23.5	5.6 - 4.8	11.6 - 10.0	17.6 - 15.1
57	12°59.3	13°01.4	12°23.8	5.7 - 4.9	11.7 - 10.0	17.7 - 15.2
58	12°59.5	13°01.6	12°24.0	5.8 - 5.0	11.8 - 10.1	17.8 - 15.3
59	12°59.8	13°01.9	12°24.2	5.9 - 5.1	11.9 - 10.2	17.9 - 15.4

m 52	Sun Plan.	Aries	Moon	v and d corr		
0	13°00.0	13°02.1	12°24.5	0.0 - 0.0	6.0 - 5.3	12.0 - 10.5
1	13°00.2	13°02.4	12°24.7	0.1 - 0.1	6.1 - 5.3	12.1 - 10.6
2	13°00.5	13°02.6	12°24.9	0.2 - 0.2	6.2 - 5.4	12.2 - 10.7
3	13°00.7	13°02.9	12°25.2	0.3 - 0.3	6.3 - 5.5	12.3 - 10.8
4	13°01.0	13°03.1	12°25.4	0.4 - 0.4	6.4 - 5.6	12.4 - 10.8
5	13°01.3	13°03.4	12°25.7	0.5 - 0.4	6.5 - 5.7	12.5 - 10.9
6	13°01.5	13°03.6	12°25.9	0.6 - 0.5	6.6 - 5.8	12.6 - 11.0
7	13°01.8	13°03.9	12°26.1	0.7 - 0.6	6.7 - 5.9	12.7 - 11.1
8	13°02.0	13°04.1	12°26.4	0.8 - 0.7	6.8 - 6.0	12.8 - 11.2
9	13°02.2	13°04.4	12°26.6	0.9 - 0.8	6.9 - 6.0	12.9 - 11.3
10	13°02.5	13°04.6	12°26.9	1.0 - 0.9	7.0 - 6.1	13.0 - 11.4
11	13°02.7	13°04.9	12°27.1	1.1 - 1.0	7.1 - 6.2	13.1 - 11.5
12	13°03.0	13°05.1	12°27.3	1.2 - 1.1	7.2 - 6.3	13.2 - 11.5
13	13°03.3	13°05.4	12°27.6	1.3 - 1.1	7.3 - 6.4	13.3 - 11.6
14	13°03.5	13°05.6	12°27.8	1.4 - 1.2	7.4 - 6.5	13.4 - 11.7
15	13°03.8	13°05.9	12°28.0	1.5 - 1.3	7.5 - 6.6	13.5 - 11.8
16	13°04.0	13°06.1	12°28.3	1.6 - 1.4	7.6 - 6.6	13.6 - 11.9
17	13°04.2	13°06.4	12°28.5	1.7 - 1.5	7.7 - 6.7	13.7 - 12.0
18	13°04.5	13°06.6	12°28.8	1.8 - 1.6	7.8 - 6.8	13.8 - 12.1
19	13°04.8	13°06.9	12°29.0	1.9 - 1.7	7.9 - 6.9	13.9 - 12.2
20	13°05.0	13°07.1	12°29.2	2.0 - 1.8	8.0 - 7.0	14.0 - 12.3
21	13°05.3	13°07.4	12°29.5	2.1 - 1.8	8.1 - 7.1	14.1 - 12.3
22	13°05.5	13°07.6	12°29.7	2.2 - 1.9	8.2 - 7.2	14.2 - 12.4
23	13°05.7	13°07.9	12°30.0	2.3 - 2.0	8.3 - 7.3	14.3 - 12.5
24	13°06.0	13°08.1	12°30.2	2.4 - 2.1	8.4 - 7.4	14.4 - 12.6
25	13°06.2	13°08.4	12°30.4	2.5 - 2.2	8.5 - 7.4	14.5 - 12.7
26	13°06.5	13°08.6	12°30.7	2.6 - 2.3	8.6 - 7.5	14.6 - 12.8
27	13°06.8	13°08.9	12°30.9	2.7 - 2.4	8.7 - 7.6	14.7 - 12.9
28	13°07.0	13°09.2	12°31.1	2.8 - 2.5	8.8 - 7.7	14.8 - 13.0
29	13°07.3	13°09.4	12°31.4	2.9 - 2.5	8.9 - 7.8	14.9 - 13.0
30	13°07.5	13°09.7	12°31.6	3.0 - 2.6	9.0 - 7.9	15.0 - 13.1
31	13°07.7	13°09.9	12°31.9	3.1 - 2.7	9.1 - 8.0	15.1 - 13.2
32	13°08.0	13°10.2	12°32.1	3.2 - 2.8	9.2 - 8.0	15.2 - 13.3
33	13°08.2	13°10.4	12°32.3	3.3 - 2.9	9.3 - 8.1	15.3 - 13.4
34	13°08.5	13°10.7	12°32.6	3.4 - 3.0	9.4 - 8.2	15.4 - 13.5
35	13°08.8	13°10.9	12°32.8	3.5 - 3.1	9.5 - 8.3	15.5 - 13.6
36	13°09.0	13°11.2	12°33.1	3.6 - 3.1	9.6 - 8.4	15.6 - 13.7
37	13°09.3	13°11.4	12°33.3	3.7 - 3.2	9.7 - 8.5	15.7 - 13.7
38	13°09.5	13°11.7	12°33.5	3.8 - 3.3	9.8 - 8.6	15.8 - 13.8
39	13°09.7	13°11.9	12°33.8	3.9 - 3.4	9.9 - 8.7	15.9 - 13.9
40	13°10.0	13°12.2	12°34.0	4.0 - 3.5	10.0 - 8.8	16.0 - 14.0
41	13°10.2	13°12.4	12°34.2	4.1 - 3.6	10.1 - 8.8	16.1 - 14.1
42	13°10.5	13°12.7	12°34.5	4.2 - 3.7	10.2 - 8.9	16.2 - 14.2
43	13°10.8	13°12.9	12°34.7	4.3 - 3.8	10.3 - 9.0	16.3 - 14.3
44	13°11.0	13°13.2	12°35.0	4.4 - 3.9	10.4 - 9.1	16.4 - 14.3
45	13°11.3	13°13.4	12°35.2	4.5 - 3.9	10.5 - 9.2	16.5 - 14.4
46	13°11.5	13°13.7	12°35.4	4.6 - 4.0	10.6 - 9.3	16.6 - 14.5
47	13°11.7	13°13.9	12°35.7	4.7 - 4.1	10.7 - 9.4	16.7 - 14.6
48	13°12.0	13°14.2	12°35.9	4.8 - 4.2	10.8 - 9.5	16.8 - 14.7
49	13°12.3	13°14.4	12°36.2	4.9 - 4.3	10.9 - 9.5	16.9 - 14.8
50	13°12.5	13°14.7	12°36.4	5.0 - 4.4	11.0 - 9.6	17.0 - 14.9
51	13°12.8	13°14.9	12°36.6	5.1 - 4.5	11.1 - 9.7	17.1 - 15.0
52	13°13.0	13°15.2	12°36.9	5.2 - 4.5	11.2 - 9.8	17.2 - 15.0
53	13°13.2	13°15.4	12°37.1	5.3 - 4.6	11.3 - 9.9	17.3 - 15.1
54	13°13.5	13°15.7	12°37.4	5.4 - 4.7	11.4 - 10.0	17.4 - 15.2
55	13°13.7	13°15.9	12°37.6	5.5 - 4.8	11.5 - 10.1	17.5 - 15.3
56	13°14.0	13°16.2	12°37.8	5.6 - 4.9	11.6 - 10.2	17.6 - 15.4
57	13°14.3	13°16.4	12°38.1	5.7 - 5.0	11.7 - 10.2	17.7 - 15.5
58	13°14.5	13°16.7	12°38.3	5.8 - 5.1	11.8 - 10.3	17.8 - 15.6
59	13°14.8	13°16.9	12°38.5	5.9 - 5.2	11.9 - 10.4	17.9 - 15.7

m 53	Sun Plan.	Aries	Moon	v and d corr		
0	13°15.0	13°17.2	12°38.8	0.0 - 0.0	6.0 - 5.4	12.0 - 10.7
1	13°15.2	13°17.4	12°39.0	0.1 - 0.1	6.1 - 5.4	12.1 - 10.8
2	13°15.5	13°17.7	12°39.3	0.2 - 0.2	6.2 - 5.5	12.2 - 10.9
3	13°15.7	13°17.9	12°39.5	0.3 - 0.3	6.3 - 5.6	12.3 - 11.0
4	13°16.0	13°18.2	12°39.7	0.4 - 0.4	6.4 - 5.7	12.4 - 11.1
5	13°16.3	13°18.4	12°40.0	0.5 - 0.4	6.5 - 5.8	12.5 - 11.1
6	13°16.5	13°18.7	12°40.2	0.6 - 0.5	6.6 - 5.9	12.6 - 11.2
7	13°16.8	13°18.9	12°40.5	0.7 - 0.6	6.7 - 6.0	12.7 - 11.3
8	13°17.0	13°19.2	12°40.7	0.8 - 0.7	6.8 - 6.1	12.8 - 11.4
9	13°17.2	13°19.4	12°40.9	0.9 - 0.8	6.9 - 6.2	12.9 - 11.5
10	13°17.5	13°19.7	12°41.2	1.0 - 0.9	7.0 - 6.2	13.0 - 11.6
11	13°17.7	13°19.9	12°41.4	1.1 - 1.0	7.1 - 6.3	13.1 - 11.7
12	13°18.0	13°20.2	12°41.6	1.2 - 1.1	7.2 - 6.4	13.2 - 11.8
13	13°18.3	13°20.4	12°41.9	1.3 - 1.2	7.3 - 6.5	13.3 - 11.9
14	13°18.5	13°20.7	12°42.1	1.4 - 1.2	7.4 - 6.6	13.4 - 11.9
15	13°18.8	13°20.9	12°42.4	1.5 - 1.3	7.5 - 6.7	13.5 - 12.0
16	13°19.0	13°21.2	12°42.6	1.6 - 1.4	7.6 - 6.8	13.6 - 12.1
17	13°19.2	13°21.4	12°42.8	1.7 - 1.5	7.7 - 6.9	13.7 - 12.2
18	13°19.5	13°21.7	12°43.1	1.8 - 1.6	7.8 - 7.0	13.8 - 12.3
19	13°19.8	13°21.9	12°43.3	1.9 - 1.7	7.9 - 7.0	13.9 - 12.4
20	13°20.0	13°22.2	12°43.6	2.0 - 1.8	8.0 - 7.1	14.0 - 12.5
21	13°20.3	13°22.4	12°43.8	2.1 - 1.9	8.1 - 7.2	14.1 - 12.6
22	13°20.5	13°22.7	12°44.0	2.2 - 2.0	8.2 - 7.3	14.2 - 12.7
23	13°20.7	13°22.9	12°44.3	2.3 - 2.1	8.3 - 7.4	14.3 - 12.8
24	13°21.0	13°23.2	12°44.5	2.4 - 2.1	8.4 - 7.5	14.4 - 12.8
25	13°21.2	13°23.4	12°44.7	2.5 - 2.2	8.5 - 7.6	14.5 - 12.9
26	13°21.5	13°23.7	12°45.0	2.6 - 2.3	8.6 - 7.7	14.6 - 13.0
27	13°21.8	13°23.9	12°45.2	2.7 - 2.4	8.7 - 7.8	14.7 - 13.1
28	13°22.0	13°24.2	12°45.5	2.8 - 2.5	8.8 - 7.8	14.8 - 13.2
29	13°22.3	13°24.4	12°45.7	2.9 - 2.6	8.9 - 7.9	14.9 - 13.3
30	13°22.5	13°24.7	12°45.9	3.0 - 2.7	9.0 - 8.0	15.0 - 13.4
31	13°22.7	13°24.9	12°46.2	3.1 - 2.8	9.1 - 8.1	15.1 - 13.5
32	13°23.0	13°25.2	12°46.4	3.2 - 2.9	9.2 - 8.2	15.2 - 13.6
33	13°23.2	13°25.4	12°46.7	3.3 - 2.9	9.3 - 8.3	15.3 - 13.6
34	13°23.5	13°25.7	12°46.9	3.4 - 3.0	9.4 - 8.4	15.4 - 13.7
35	13°23.8	13°25.9	12°47.1	3.5 - 3.1	9.5 - 8.5	15.5 - 13.8
36	13°24.0	13°26.2	12°47.4	3.6 - 3.2	9.6 - 8.6	15.6 - 13.9
37	13°24.3	13°26.4	12°47.6	3.7 - 3.3	9.7 - 8.6	15.7 - 14.0
38	13°24.5	13°26.7	12°47.9	3.8 - 3.4	9.8 - 8.7	15.8 - 14.1
39	13°24.7	13°26.9	12°48.1	3.9 - 3.5	9.9 - 8.8	15.9 - 14.2
40	13°25.0	13°27.2	12°48.3	4.0 - 3.6	10.0 - 8.9	16.0 - 14.3
41	13°25.2	13°27.5	12°48.6	4.1 - 3.7	10.1 - 9.0	16.1 - 14.4
42	13°25.5	13°27.7	12°48.8	4.2 - 3.7	10.2 - 9.1	16.2 - 14.4
43	13°25.8	13°28.0	12°49.0	4.3 - 3.8	10.3 - 9.2	16.3 - 14.5
44	13°26.0	13°28.2	12°49.3	4.4 - 3.9	10.4 - 9.3	16.4 - 14.6
45	13°26.3	13°28.5	12°49.5	4.5 - 4.0	10.5 - 9.4	16.5 - 14.7
46	13°26.5	13°28.7	12°49.8	4.6 - 4.1	10.6 - 9.5	16.6 - 14.8
47	13°26.7	13°29.0	12°50.0	4.7 - 4.2	10.7 - 9.5	16.7 - 14.9
48	13°27.0	13°29.2	12°50.2	4.8 - 4.3	10.8 - 9.6	16.8 - 15.0
49	13°27.3	13°29.5	12°50.5	4.9 - 4.4	10.9 - 9.7	16.9 - 15.1
50	13°27.5	13°29.7	12°50.7	5.0 - 4.5	11.0 - 9.8	17.0 - 15.2
51	13°27.8	13°30.0	12°51.0	5.1 - 4.5	11.1 - 9.9	17.1 - 15.2
52	13°28.0	13°30.2	12°51.2	5.2 - 4.6	11.2 - 10.0	17.2 - 15.3
53	13°28.2	13°30.5	12°51.4	5.3 - 4.7	11.3 - 10.1	17.3 - 15.4
54	13°28.5	13°30.7	12°51.7	5.4 - 4.8	11.4 - 10.2	17.4 - 15.5
55	13°28.7	13°31.0	12°51.9	5.5 - 4.9	11.5 - 10.3	17.5 - 15.6
56	13°29.0	13°31.2	12°52.1	5.6 - 5.0	11.6 - 10.3	17.6 - 15.7
57	13°29.3	13°31.5	12°52.4	5.7 - 5.1	11.7 - 10.4	17.7 - 15.8
58	13°29.5	13°31.7	12°52.6	5.8 - 5.2	11.8 - 10.5	17.8 - 15.9
59	13°29.8	13°32.0	12°52.9	5.9 - 5.3	11.9 - 10.6	17.9 - 16.0

Increments and Corrections

m 54	Sun Plan.	Aries	Moon	v and d corr		
0	13°30.0	13°32.2	12°53.1	0.0 - 0.0	6.0 - 5.5	12.0 - 10.9
1	13°30.2	13°32.5	12°53.3	0.1 - 0.1	6.1 - 5.5	12.1 - 11.0
2	13°30.5	13°32.7	12°53.6	0.2 - 0.2	6.2 - 5.6	12.2 - 11.1
3	13°30.7	13°33.0	12°53.8	0.3 - 0.3	6.3 - 5.7	12.3 - 11.2
4	13°31.0	13°33.2	12°54.1	0.4 - 0.4	6.4 - 5.8	12.4 - 11.3
5	13°31.3	13°33.5	12°54.3	0.5 - 0.5	6.5 - 5.9	12.5 - 11.4
6	13°31.5	13°33.7	12°54.5	0.6 - 0.5	6.6 - 6.0	12.6 - 11.4
7	13°31.8	13°34.0	12°54.8	0.7 - 0.6	6.7 - 6.1	12.7 - 11.5
8	13°32.0	13°34.2	12°55.0	0.8 - 0.7	6.8 - 6.2	12.8 - 11.6
9	13°32.2	13°34.5	12°55.2	0.9 - 0.8	6.9 - 6.3	12.9 - 11.7
10	13°32.5	13°34.7	12°55.5	1.0 - 0.9	7.0 - 6.4	13.0 - 11.8
11	13°32.7	13°35.0	12°55.7	1.1 - 1.0	7.1 - 6.4	13.1 - 11.9
12	13°33.0	13°35.2	12°56.0	1.2 - 1.1	7.2 - 6.5	13.2 - 12.0
13	13°33.3	13°35.5	12°56.2	1.3 - 1.2	7.3 - 6.6	13.3 - 12.1
14	13°33.5	13°35.7	12°56.4	1.4 - 1.3	7.4 - 6.7	13.4 - 12.2
15	13°33.8	13°36.0	12°56.7	1.5 - 1.4	7.5 - 6.8	13.5 - 12.3
16	13°34.0	13°36.2	12°56.9	1.6 - 1.5	7.6 - 6.9	13.6 - 12.4
17	13°34.2	13°36.5	12°57.2	1.7 - 1.5	7.7 - 7.0	13.7 - 12.4
18	13°34.5	13°36.7	12°57.4	1.8 - 1.6	7.8 - 7.1	13.8 - 12.5
19	13°34.8	13°37.0	12°57.6	1.9 - 1.7	7.9 - 7.2	13.9 - 12.6
20	13°35.0	13°37.2	12°57.9	2.0 - 1.8	8.0 - 7.3	14.0 - 12.7
21	13°35.3	13°37.5	12°58.1	2.1 - 1.9	8.1 - 7.4	14.1 - 12.8
22	13°35.5	13°37.7	12°58.3	2.2 - 2.0	8.2 - 7.4	14.2 - 12.9
23	13°35.7	13°38.0	12°58.6	2.3 - 2.1	8.3 - 7.5	14.3 - 13.0
24	13°36.0	13°38.2	12°58.8	2.4 - 2.2	8.4 - 7.6	14.4 - 13.1
25	13°36.2	13°38.5	12°59.1	2.5 - 2.3	8.5 - 7.7	14.5 - 13.2
26	13°36.5	13°38.7	12°59.3	2.6 - 2.4	8.6 - 7.8	14.6 - 13.3
27	13°36.8	13°39.0	12°59.5	2.7 - 2.5	8.7 - 7.9	14.7 - 13.4
28	13°37.0	13°39.2	12°59.8	2.8 - 2.5	8.8 - 8.0	14.8 - 13.4
29	13°37.3	13°39.5	13°00.0	2.9 - 2.6	8.9 - 8.1	14.9 - 13.5
30	13°37.5	13°39.7	13°00.3	3.0 - 2.7	9.0 - 8.2	15.0 - 13.6
31	13°37.7	13°40.0	13°00.5	3.1 - 2.8	9.1 - 8.3	15.1 - 13.7
32	13°38.0	13°40.2	13°00.7	3.2 - 2.9	9.2 - 8.4	15.2 - 13.8
33	13°38.2	13°40.5	13°01.0	3.3 - 3.0	9.3 - 8.4	15.3 - 13.9
34	13°38.5	13°40.7	13°01.2	3.4 - 3.1	9.4 - 8.5	15.4 - 14.0
35	13°38.8	13°41.0	13°01.5	3.5 - 3.2	9.5 - 8.6	15.5 - 14.1
36	13°39.0	13°41.2	13°01.7	3.6 - 3.3	9.6 - 8.7	15.6 - 14.2
37	13°39.3	13°41.5	13°01.9	3.7 - 3.4	9.7 - 8.8	15.7 - 14.3
38	13°39.5	13°41.7	13°02.2	3.8 - 3.5	9.8 - 8.9	15.8 - 14.4
39	13°39.7	13°42.0	13°02.4	3.9 - 3.5	9.9 - 9.0	15.9 - 14.4
40	13°40.0	13°42.2	13°02.6	4.0 - 3.6	10.0 - 9.1	16.0 - 14.5
41	13°40.2	13°42.5	13°02.9	4.1 - 3.7	10.1 - 9.2	16.1 - 14.6
42	13°40.5	13°42.7	13°03.1	4.2 - 3.8	10.2 - 9.3	16.2 - 14.7
43	13°40.8	13°43.0	13°03.4	4.3 - 3.9	10.3 - 9.4	16.3 - 14.8
44	13°41.0	13°43.2	13°03.6	4.4 - 4.0	10.4 - 9.4	16.4 - 14.9
45	13°41.3	13°43.5	13°03.8	4.5 - 4.1	10.5 - 9.5	16.5 - 15.0
46	13°41.5	13°43.7	13°04.1	4.6 - 4.2	10.6 - 9.6	16.6 - 15.1
47	13°41.7	13°44.0	13°04.3	4.7 - 4.3	10.7 - 9.7	16.7 - 15.2
48	13°42.0	13°44.2	13°04.6	4.8 - 4.4	10.8 - 9.8	16.8 - 15.3
49	13°42.3	13°44.5	13°04.8	4.9 - 4.5	10.9 - 9.9	16.9 - 15.4
50	13°42.5	13°44.7	13°05.0	5.0 - 4.5	11.0 - 10.0	17.0 - 15.4
51	13°42.8	13°45.0	13°05.3	5.1 - 4.6	11.1 - 10.1	17.1 - 15.5
52	13°43.0	13°45.2	13°05.5	5.2 - 4.7	11.2 - 10.2	17.2 - 15.6
53	13°43.2	13°45.5	13°05.7	5.3 - 4.8	11.3 - 10.3	17.3 - 15.7
54	13°43.5	13°45.8	13°06.0	5.4 - 4.9	11.4 - 10.4	17.4 - 15.8
55	13°43.7	13°46.0	13°06.2	5.5 - 5.0	11.5 - 10.4	17.5 - 15.9
56	13°44.0	13°46.3	13°06.5	5.6 - 5.1	11.6 - 10.5	17.6 - 16.0
57	13°44.3	13°46.5	13°06.7	5.7 - 5.2	11.7 - 10.6	17.7 - 16.1
58	13°44.5	13°46.8	13°06.9	5.8 - 5.3	11.8 - 10.7	17.8 - 16.2
59	13°44.8	13°47.0	13°07.2	5.9 - 5.4	11.9 - 10.8	17.9 - 16.3

m 55	Sun Plan.	Aries	Moon	v and d corr		
0	13°45.0	13°47.3	13°07.4	0.0 - 0.0	6.0 - 5.6	12.0 - 11.1
1	13°45.2	13°47.5	13°07.7	0.1 - 0.1	6.1 - 5.6	12.1 - 11.2
2	13°45.5	13°47.8	13°07.9	0.2 - 0.2	6.2 - 5.7	12.2 - 11.3
3	13°45.7	13°48.0	13°08.1	0.3 - 0.3	6.3 - 5.8	12.3 - 11.4
4	13°46.0	13°48.3	13°08.4	0.4 - 0.4	6.4 - 5.9	12.4 - 11.5
5	13°46.3	13°48.5	13°08.6	0.5 - 0.5	6.5 - 6.0	12.5 - 11.6
6	13°46.5	13°48.8	13°08.8	0.6 - 0.6	6.6 - 6.1	12.6 - 11.7
7	13°46.8	13°49.0	13°09.1	0.7 - 0.6	6.7 - 6.2	12.7 - 11.7
8	13°47.0	13°49.3	13°09.3	0.8 - 0.7	6.8 - 6.3	12.8 - 11.8
9	13°47.2	13°49.5	13°09.6	0.9 - 0.8	6.9 - 6.4	12.9 - 11.9
10	13°47.5	13°49.8	13°09.8	1.0 - 0.9	7.0 - 6.5	13.0 - 12.0
11	13°47.7	13°50.0	13°10.0	1.1 - 1.0	7.1 - 6.6	13.1 - 12.1
12	13°48.0	13°50.3	13°10.3	1.2 - 1.1	7.2 - 6.7	13.2 - 12.2
13	13°48.3	13°50.5	13°10.5	1.3 - 1.2	7.3 - 6.8	13.3 - 12.3
14	13°48.5	13°50.8	13°10.8	1.4 - 1.3	7.4 - 6.8	13.4 - 12.4
15	13°48.8	13°51.0	13°11.0	1.5 - 1.4	7.5 - 6.9	13.5 - 12.5
16	13°49.0	13°51.3	13°11.2	1.6 - 1.5	7.6 - 7.0	13.6 - 12.6
17	13°49.2	13°51.5	13°11.5	1.7 - 1.6	7.7 - 7.1	13.7 - 12.7
18	13°49.5	13°51.8	13°11.7	1.8 - 1.7	7.8 - 7.2	13.8 - 12.8
19	13°49.8	13°52.0	13°12.0	1.9 - 1.8	7.9 - 7.3	13.9 - 12.9
20	13°50.0	13°52.3	13°12.2	2.0 - 1.9	8.0 - 7.4	14.0 - 13.0
21	13°50.3	13°52.5	13°12.4	2.1 - 1.9	8.1 - 7.5	14.1 - 13.0
22	13°50.5	13°52.8	13°12.7	2.2 - 2.0	8.2 - 7.6	14.2 - 13.1
23	13°50.7	13°53.0	13°12.9	2.3 - 2.1	8.3 - 7.7	14.3 - 13.2
24	13°51.0	13°53.3	13°13.1	2.4 - 2.2	8.4 - 7.8	14.4 - 13.3
25	13°51.2	13°53.5	13°13.4	2.5 - 2.3	8.5 - 7.9	14.5 - 13.4
26	13°51.5	13°53.8	13°13.6	2.6 - 2.4	8.6 - 8.0	14.6 - 13.5
27	13°51.8	13°54.0	13°13.9	2.7 - 2.5	8.7 - 8.0	14.7 - 13.6
28	13°52.0	13°54.3	13°14.1	2.8 - 2.6	8.8 - 8.1	14.8 - 13.7
29	13°52.3	13°54.5	13°14.3	2.9 - 2.7	8.9 - 8.2	14.9 - 13.8
30	13°52.5	13°54.8	13°14.6	3.0 - 2.8	9.0 - 8.3	15.0 - 13.9
31	13°52.7	13°55.0	13°14.8	3.1 - 2.9	9.1 - 8.4	15.1 - 14.0
32	13°53.0	13°55.3	13°15.1	3.2 - 3.0	9.2 - 8.5	15.2 - 14.1
33	13°53.2	13°55.5	13°15.3	3.3 - 3.1	9.3 - 8.6	15.3 - 14.2
34	13°53.5	13°55.8	13°15.5	3.4 - 3.1	9.4 - 8.7	15.4 - 14.2
35	13°53.8	13°56.0	13°15.8	3.5 - 3.2	9.5 - 8.8	15.5 - 14.3
36	13°54.0	13°56.3	13°16.0	3.6 - 3.3	9.6 - 8.9	15.6 - 14.4
37	13°54.3	13°56.5	13°16.2	3.7 - 3.4	9.7 - 9.0	15.7 - 14.5
38	13°54.5	13°56.8	13°16.5	3.8 - 3.5	9.8 - 9.1	15.8 - 14.6
39	13°54.7	13°57.0	13°16.7	3.9 - 3.6	9.9 - 9.2	15.9 - 14.7
40	13°55.0	13°57.3	13°17.0	4.0 - 3.7	10.0 - 9.3	16.0 - 14.8
41	13°55.2	13°57.5	13°17.2	4.1 - 3.8	10.1 - 9.3	16.1 - 14.9
42	13°55.5	13°57.8	13°17.4	4.2 - 3.9	10.2 - 9.4	16.2 - 15.0
43	13°55.8	13°58.0	13°17.7	4.3 - 4.0	10.3 - 9.5	16.3 - 15.1
44	13°56.0	13°58.3	13°17.9	4.4 - 4.1	10.4 - 9.6	16.4 - 15.2
45	13°56.3	13°58.5	13°18.2	4.5 - 4.2	10.5 - 9.7	16.5 - 15.3
46	13°56.5	13°58.8	13°18.4	4.6 - 4.3	10.6 - 9.8	16.6 - 15.4
47	13°56.7	13°59.0	13°18.6	4.7 - 4.3	10.7 - 9.9	16.7 - 15.4
48	13°57.0	13°59.3	13°18.9	4.8 - 4.4	10.8 - 10.0	16.8 - 15.5
49	13°57.3	13°59.5	13°19.1	4.9 - 4.5	10.9 - 10.1	16.9 - 15.6
50	13°57.5	13°59.8	13°19.3	5.0 - 4.6	11.0 - 10.2	17.0 - 15.7
51	13°57.8	14°00.0	13°19.6	5.1 - 4.7	11.1 - 10.3	17.1 - 15.8
52	13°58.0	14°00.3	13°19.8	5.2 - 4.8	11.2 - 10.4	17.2 - 15.9
53	13°58.2	14°00.5	13°20.1	5.3 - 4.9	11.3 - 10.5	17.3 - 16.0
54	13°58.5	14°00.8	13°20.3	5.4 - 5.0	11.4 - 10.5	17.4 - 16.1
55	13°58.7	14°01.0	13°20.5	5.5 - 5.1	11.5 - 10.6	17.5 - 16.2
56	13°59.0	14°01.3	13°20.8	5.6 - 5.2	11.6 - 10.7	17.6 - 16.3
57	13°59.3	14°01.5	13°21.0	5.7 - 5.3	11.7 - 10.8	17.7 - 16.4
58	13°59.5	14°01.8	13°21.3	5.8 - 5.4	11.8 - 10.9	17.8 - 16.5
59	13°59.8	14°02.0	13°21.5	5.9 - 5.5	11.9 - 11.0	17.9 - 16.6

m 56	Sun Plan.	Aries	Moon	v and d corr		
0	14°00.0	14°02.3	13°21.7	0.0 - 0.0	6.0 - 5.7	12.0 - 11.3
1	14°00.2	14°02.5	13°22.0	0.1 - 0.1	6.1 - 5.7	12.1 - 11.4
2	14°00.5	14°02.8	13°22.2	0.2 - 0.2	6.2 - 5.8	12.2 - 11.5
3	14°00.7	14°03.0	13°22.4	0.3 - 0.3	6.3 - 5.9	12.3 - 11.6
4	14°01.0	14°03.3	13°22.7	0.4 - 0.4	6.4 - 6.0	12.4 - 11.7
5	14°01.3	14°03.5	13°22.9	0.5 - 0.5	6.5 - 6.1	12.5 - 11.8
6	14°01.5	14°03.8	13°23.2	0.6 - 0.6	6.6 - 6.2	12.6 - 11.9
7	14°01.8	14°04.1	13°23.4	0.7 - 0.7	6.7 - 6.3	12.7 - 12.0
8	14°02.0	14°04.3	13°23.6	0.8 - 0.8	6.8 - 6.4	12.8 - 12.1
9	14°02.2	14°04.6	13°23.9	0.9 - 0.8	6.9 - 6.5	12.9 - 12.1
10	14°02.5	14°04.8	13°24.1	1.0 - 0.9	7.0 - 6.6	13.0 - 12.2
11	14°02.7	14°05.1	13°24.4	1.1 - 1.0	7.1 - 6.7	13.1 - 12.3
12	14°03.0	14°05.3	13°24.6	1.2 - 1.1	7.2 - 6.8	13.2 - 12.4
13	14°03.3	14°05.6	13°24.8	1.3 - 1.2	7.3 - 6.9	13.3 - 12.5
14	14°03.5	14°05.8	13°25.1	1.4 - 1.3	7.4 - 7.0	13.4 - 12.6
15	14°03.8	14°06.1	13°25.3	1.5 - 1.4	7.5 - 7.1	13.5 - 12.7
16	14°04.0	14°06.3	13°25.6	1.6 - 1.5	7.6 - 7.2	13.6 - 12.8
17	14°04.2	14°06.6	13°25.8	1.7 - 1.6	7.7 - 7.3	13.7 - 12.9
18	14°04.5	14°06.8	13°26.0	1.8 - 1.7	7.8 - 7.3	13.8 - 13.0
19	14°04.8	14°07.1	13°26.3	1.9 - 1.8	7.9 - 7.4	13.9 - 13.1
20	14°05.0	14°07.3	13°26.5	2.0 - 1.9	8.0 - 7.5	14.0 - 13.2
21	14°05.3	14°07.6	13°26.7	2.1 - 2.0	8.1 - 7.6	14.1 - 13.3
22	14°05.5	14°07.8	13°27.0	2.2 - 2.1	8.2 - 7.7	14.2 - 13.4
23	14°05.7	14°08.1	13°27.2	2.3 - 2.2	8.3 - 7.8	14.3 - 13.5
24	14°06.0	14°08.3	13°27.5	2.4 - 2.3	8.4 - 7.9	14.4 - 13.6
25	14°06.2	14°08.6	13°27.7	2.5 - 2.4	8.5 - 8.0	14.5 - 13.7
26	14°06.5	14°08.8	13°27.9	2.6 - 2.4	8.6 - 8.1	14.6 - 13.7
27	14°06.8	14°09.1	13°28.2	2.7 - 2.5	8.7 - 8.2	14.7 - 13.8
28	14°07.0	14°09.3	13°28.4	2.8 - 2.6	8.8 - 8.3	14.8 - 13.9
29	14°07.3	14°09.6	13°28.7	2.9 - 2.7	8.9 - 8.4	14.9 - 14.0
30	14°07.5	14°09.8	13°28.9	3.0 - 2.8	9.0 - 8.5	15.0 - 14.1
31	14°07.7	14°10.1	13°29.1	3.1 - 2.9	9.1 - 8.6	15.1 - 14.2
32	14°08.0	14°10.3	13°29.4	3.2 - 3.0	9.2 - 8.7	15.2 - 14.3
33	14°08.2	14°10.6	13°29.6	3.3 - 3.1	9.3 - 8.8	15.3 - 14.4
34	14°08.5	14°10.8	13°29.8	3.4 - 3.2	9.4 - 8.9	15.4 - 14.5
35	14°08.8	14°11.1	13°30.1	3.5 - 3.3	9.5 - 8.9	15.5 - 14.6
36	14°09.0	14°11.3	13°30.3	3.6 - 3.4	9.6 - 9.0	15.6 - 14.7
37	14°09.3	14°11.6	13°30.6	3.7 - 3.5	9.7 - 9.1	15.7 - 14.8
38	14°09.5	14°11.8	13°30.8	3.8 - 3.6	9.8 - 9.2	15.8 - 14.9
39	14°09.7	14°12.1	13°31.0	3.9 - 3.7	9.9 - 9.3	15.9 - 15.0
40	14°10.0	14°12.3	13°31.3	4.0 - 3.8	10.0 - 9.4	16.0 - 15.1
41	14°10.2	14°12.6	13°31.5	4.1 - 3.9	10.1 - 9.5	16.1 - 15.2
42	14°10.5	14°12.8	13°31.8	4.2 - 4.0	10.2 - 9.6	16.2 - 15.3
43	14°10.8	14°13.1	13°32.0	4.3 - 4.0	10.3 - 9.7	16.3 - 15.3
44	14°11.0	14°13.3	13°32.2	4.4 - 4.1	10.4 - 9.8	16.4 - 15.4
45	14°11.3	14°13.6	13°32.5	4.5 - 4.2	10.5 - 9.9	16.5 - 15.5
46	14°11.5	14°13.8	13°32.7	4.6 - 4.3	10.6 - 10.0	16.6 - 15.6
47	14°11.7	14°14.1	13°32.9	4.7 - 4.4	10.7 - 10.1	16.7 - 15.7
48	14°12.0	14°14.3	13°33.2	4.8 - 4.5	10.8 - 10.2	16.8 - 15.8
49	14°12.3	14°14.6	13°33.4	4.9 - 4.6	10.9 - 10.3	16.9 - 15.9
50	14°12.5	14°14.8	13°33.7	5.0 - 4.7	11.0 - 10.4	17.0 - 16.0
51	14°12.8	14°15.1	13°33.9	5.1 - 4.8	11.1 - 10.5	17.1 - 16.1
52	14°13.0	14°15.3	13°34.1	5.2 - 4.9	11.2 - 10.5	17.2 - 16.2
53	14°13.2	14°15.6	13°34.4	5.3 - 5.0	11.3 - 10.6	17.3 - 16.3
54	14°13.5	14°15.8	13°34.6	5.4 - 5.1	11.4 - 10.7	17.4 - 16.4
55	14°13.7	14°16.1	13°34.9	5.5 - 5.2	11.5 - 10.8	17.5 - 16.5
56	14°14.0	14°16.3	13°35.1	5.6 - 5.3	11.6 - 10.9	17.6 - 16.6
57	14°14.3	14°16.6	13°35.3	5.7 - 5.4	11.7 - 11.0	17.7 - 16.7
58	14°14.5	14°16.8	13°35.6	5.8 - 5.5	11.8 - 11.1	17.8 - 16.8
59	14°14.8	14°17.1	13°35.8	5.9 - 5.6	11.9 - 11.2	17.9 - 16.9

Increments and Corrections

m	Sun	Aries	Moon	v and d corr		
57	Plan.					
0	14°15.0	14°17.3	13°36.0	0.0 - 0.0	6.0 - 5.8	12.0 - 11.5
1	14°15.2	14°17.6	13°36.3	0.1 - 0.1	6.1 - 5.8	12.1 - 11.6
2	14°15.5	14°17.8	13°36.5	0.2 - 0.2	6.2 - 5.9	12.2 - 11.7
3	14°15.7	14°18.1	13°36.8	0.3 - 0.3	6.3 - 6.0	12.3 - 11.8
4	14°16.0	14°18.3	13°37.0	0.4 - 0.4	6.4 - 6.1	12.4 - 11.9
5	14°16.3	14°18.6	13°37.2	0.5 - 0.5	6.5 - 6.2	12.5 - 12.0
6	14°16.5	14°18.8	13°37.5	0.6 - 0.6	6.6 - 6.3	12.6 - 12.1
7	14°16.8	14°19.1	13°37.7	0.7 - 0.7	6.7 - 6.4	12.7 - 12.2
8	14°17.0	14°19.3	13°38.0	0.8 - 0.8	6.8 - 6.5	12.8 - 12.3
9	14°17.2	14°19.6	13°38.2	0.9 - 0.9	6.9 - 6.6	12.9 - 12.4
10	14°17.5	14°19.8	13°38.4	1.0 - 1.0	7.0 - 6.7	13.0 - 12.5
11	14°17.7	14°20.1	13°38.7	1.1 - 1.1	7.1 - 6.8	13.1 - 12.6
12	14°18.0	14°20.3	13°38.9	1.2 - 1.2	7.2 - 6.9	13.2 - 12.7
13	14°18.3	14°20.6	13°39.2	1.3 - 1.2	7.3 - 7.0	13.3 - 12.7
14	14°18.5	14°20.8	13°39.4	1.4 - 1.3	7.4 - 7.1	13.4 - 12.8
15	14°18.8	14°21.1	13°39.6	1.5 - 1.4	7.5 - 7.2	13.5 - 12.9
16	14°19.0	14°21.3	13°39.9	1.6 - 1.5	7.6 - 7.3	13.6 - 13.0
17	14°19.2	14°21.6	13°40.1	1.7 - 1.6	7.7 - 7.4	13.7 - 13.1
18	14°19.5	14°21.8	13°40.3	1.8 - 1.7	7.8 - 7.5	13.8 - 13.2
19	14°19.8	14°22.1	13°40.6	1.9 - 1.8	7.9 - 7.6	13.9 - 13.3
20	14°20.0	14°22.4	13°40.8	2.0 - 1.9	8.0 - 7.7	14.0 - 13.4
21	14°20.3	14°22.6	13°41.1	2.1 - 2.0	8.1 - 7.8	14.1 - 13.5
22	14°20.5	14°22.9	13°41.3	2.2 - 2.1	8.2 - 7.9	14.2 - 13.6
23	14°20.7	14°23.1	13°41.5	2.3 - 2.2	8.3 - 8.0	14.3 - 13.7
24	14°21.0	14°23.4	13°41.8	2.4 - 2.3	8.4 - 8.1	14.4 - 13.8
25	14°21.2	14°23.6	13°42.0	2.5 - 2.4	8.5 - 8.1	14.5 - 13.9
26	14°21.5	14°23.9	13°42.3	2.6 - 2.5	8.6 - 8.2	14.6 - 14.0
27	14°21.8	14°24.1	13°42.5	2.7 - 2.6	8.7 - 8.3	14.7 - 14.1
28	14°22.0	14°24.4	13°42.7	2.8 - 2.7	8.8 - 8.4	14.8 - 14.2
29	14°22.3	14°24.6	13°43.0	2.9 - 2.8	8.9 - 8.5	14.9 - 14.3
30	14°22.5	14°24.9	13°43.2	3.0 - 2.9	9.0 - 8.6	15.0 - 14.4
31	14°22.7	14°25.1	13°43.4	3.1 - 3.0	9.1 - 8.7	15.1 - 14.5
32	14°23.0	14°25.4	13°43.7	3.2 - 3.1	9.2 - 8.8	15.2 - 14.6
33	14°23.2	14°25.6	13°43.9	3.3 - 3.2	9.3 - 8.9	15.3 - 14.7
34	14°23.5	14°25.9	13°44.2	3.4 - 3.3	9.4 - 9.0	15.4 - 14.8
35	14°23.8	14°26.1	13°44.4	3.5 - 3.4	9.5 - 9.1	15.5 - 14.9
36	14°24.0	14°26.4	13°44.6	3.6 - 3.5	9.6 - 9.2	15.6 - 15.0
37	14°24.3	14°26.6	13°44.9	3.7 - 3.5	9.7 - 9.3	15.7 - 15.0
38	14°24.5	14°26.9	13°45.1	3.8 - 3.6	9.8 - 9.4	15.8 - 15.1
39	14°24.7	14°27.1	13°45.4	3.9 - 3.7	9.9 - 9.5	15.9 - 15.2
40	14°25.0	14°27.4	13°45.6	4.0 - 3.8	10.0 - 9.6	16.0 - 15.3
41	14°25.2	14°27.6	13°45.8	4.1 - 3.9	10.1 - 9.7	16.1 - 15.4
42	14°25.5	14°27.9	13°46.1	4.2 - 4.0	10.2 - 9.8	16.2 - 15.5
43	14°25.8	14°28.1	13°46.3	4.3 - 4.1	10.3 - 9.9	16.3 - 15.6
44	14°26.0	14°28.4	13°46.5	4.4 - 4.2	10.4 - 10.0	16.4 - 15.7
45	14°26.3	14°28.6	13°46.8	4.5 - 4.3	10.5 - 10.1	16.5 - 15.8
46	14°26.5	14°28.9	13°47.0	4.6 - 4.4	10.6 - 10.2	16.6 - 15.9
47	14°26.7	14°29.1	13°47.3	4.7 - 4.5	10.7 - 10.3	16.7 - 16.0
48	14°27.0	14°29.4	13°47.5	4.8 - 4.6	10.8 - 10.4	16.8 - 16.1
49	14°27.3	14°29.6	13°47.7	4.9 - 4.7	10.9 - 10.4	16.9 - 16.2
50	14°27.5	14°29.9	13°48.0	5.0 - 4.8	11.0 - 10.5	17.0 - 16.3
51	14°27.8	14°30.1	13°48.2	5.1 - 4.9	11.1 - 10.6	17.1 - 16.4
52	14°28.0	14°30.4	13°48.5	5.2 - 5.0	11.2 - 10.7	17.2 - 16.5
53	14°28.2	14°30.6	13°48.7	5.3 - 5.1	11.3 - 10.8	17.3 - 16.6
54	14°28.5	14°30.9	13°48.9	5.4 - 5.2	11.4 - 10.9	17.4 - 16.7
55	14°28.7	14°31.1	13°49.2	5.5 - 5.3	11.5 - 11.0	17.5 - 16.8
56	14°29.0	14°31.4	13°49.4	5.6 - 5.4	11.6 - 11.1	17.6 - 16.9
57	14°29.3	14°31.6	13°49.7	5.7 - 5.5	11.7 - 11.2	17.7 - 17.0
58	14°29.5	14°31.9	13°49.9	5.8 - 5.6	11.8 - 11.3	17.8 - 17.1
59	14°29.8	14°32.1	13°50.1	5.9 - 5.7	11.9 - 11.4	17.9 - 17.2

m	Sun	Aries	Moon	v and d corr		
58	Plan.					
0	14°30.0	14°32.4	13°50.4	0.0 - 0.0	6.0 - 5.8	12.0 - 11.7
1	14°30.2	14°32.6	13°50.6	0.1 - 0.1	6.1 - 5.9	12.1 - 11.8
2	14°30.5	14°32.9	13°50.8	0.2 - 0.2	6.2 - 6.0	12.2 - 11.9
3	14°30.7	14°33.1	13°51.1	0.3 - 0.3	6.3 - 6.1	12.3 - 12.0
4	14°31.0	14°33.4	13°51.3	0.4 - 0.4	6.4 - 6.2	12.4 - 12.1
5	14°31.3	14°33.6	13°51.6	0.5 - 0.5	6.5 - 6.3	12.5 - 12.2
6	14°31.5	14°33.9	13°51.8	0.6 - 0.6	6.6 - 6.4	12.6 - 12.3
7	14°31.8	14°34.1	13°52.0	0.7 - 0.7	6.7 - 6.5	12.7 - 12.4
8	14°32.0	14°34.4	13°52.3	0.8 - 0.8	6.8 - 6.6	12.8 - 12.5
9	14°32.2	14°34.6	13°52.5	0.9 - 0.9	6.9 - 6.7	12.9 - 12.6
10	14°32.5	14°34.9	13°52.8	1.0 - 1.0	7.0 - 6.8	13.0 - 12.7
11	14°32.7	14°35.1	13°53.0	1.1 - 1.1	7.1 - 6.9	13.1 - 12.8
12	14°33.0	14°35.4	13°53.2	1.2 - 1.2	7.2 - 7.0	13.2 - 12.9
13	14°33.3	14°35.6	13°53.5	1.3 - 1.3	7.3 - 7.1	13.3 - 13.0
14	14°33.5	14°35.9	13°53.7	1.4 - 1.4	7.4 - 7.2	13.4 - 13.1
15	14°33.8	14°36.1	13°53.9	1.5 - 1.5	7.5 - 7.3	13.5 - 13.2
16	14°34.0	14°36.4	13°54.2	1.6 - 1.6	7.6 - 7.4	13.6 - 13.3
17	14°34.2	14°36.6	13°54.4	1.7 - 1.7	7.7 - 7.5	13.7 - 13.4
18	14°34.5	14°36.9	13°54.7	1.8 - 1.8	7.8 - 7.6	13.8 - 13.5
19	14°34.8	14°37.1	13°54.9	1.9 - 1.9	7.9 - 7.7	13.9 - 13.6
20	14°35.0	14°37.4	13°55.1	2.0 - 1.9	8.0 - 7.8	14.0 - 13.7
21	14°35.3	14°37.6	13°55.4	2.1 - 2.0	8.1 - 7.9	14.1 - 13.7
22	14°35.5	14°37.9	13°55.6	2.2 - 2.1	8.2 - 8.0	14.2 - 13.8
23	14°35.7	14°38.1	13°55.9	2.3 - 2.2	8.3 - 8.1	14.3 - 13.9
24	14°36.0	14°38.4	13°56.1	2.4 - 2.3	8.4 - 8.2	14.4 - 14.0
25	14°36.2	14°38.6	13°56.3	2.5 - 2.4	8.5 - 8.3	14.5 - 14.1
26	14°36.5	14°38.9	13°56.6	2.6 - 2.5	8.6 - 8.4	14.6 - 14.2
27	14°36.8	14°39.1	13°56.8	2.7 - 2.6	8.7 - 8.5	14.7 - 14.3
28	14°37.0	14°39.4	13°57.0	2.8 - 2.7	8.8 - 8.6	14.8 - 14.4
29	14°37.3	14°39.6	13°57.3	2.9 - 2.8	8.9 - 8.7	14.9 - 14.5
30	14°37.5	14°39.9	13°57.5	3.0 - 2.9	9.0 - 8.8	15.0 - 14.6
31	14°37.7	14°40.1	13°57.8	3.1 - 3.0	9.1 - 8.9	15.1 - 14.7
32	14°38.0	14°40.4	13°58.0	3.2 - 3.1	9.2 - 9.0	15.2 - 14.8
33	14°38.2	14°40.7	13°58.2	3.3 - 3.2	9.3 - 9.1	15.3 - 14.9
34	14°38.5	14°40.9	13°58.5	3.4 - 3.3	9.4 - 9.2	15.4 - 15.0
35	14°38.8	14°41.2	13°58.7	3.5 - 3.4	9.5 - 9.3	15.5 - 15.1
36	14°39.0	14°41.4	13°59.0	3.6 - 3.5	9.6 - 9.4	15.6 - 15.2
37	14°39.3	14°41.7	13°59.2	3.7 - 3.6	9.7 - 9.5	15.7 - 15.3
38	14°39.5	14°41.9	13°59.4	3.8 - 3.7	9.8 - 9.6	15.8 - 15.4
39	14°39.7	14°42.2	13°59.7	3.9 - 3.8	9.9 - 9.7	15.9 - 15.5
40	14°40.0	14°42.4	13°59.9	4.0 - 3.9	10.0 - 9.8	16.0 - 15.6
41	14°40.2	14°42.7	14°00.1	4.1 - 4.0	10.1 - 9.8	16.1 - 15.7
42	14°40.5	14°42.9	14°00.4	4.2 - 4.1	10.2 - 9.9	16.2 - 15.8
43	14°40.8	14°43.2	14°00.6	4.3 - 4.2	10.3 - 10.0	16.3 - 15.9
44	14°41.0	14°43.4	14°00.9	4.4 - 4.3	10.4 - 10.1	16.4 - 16.0
45	14°41.3	14°43.7	14°01.1	4.5 - 4.4	10.5 - 10.2	16.5 - 16.1
46	14°41.5	14°43.9	14°01.3	4.6 - 4.5	10.6 - 10.3	16.6 - 16.2
47	14°41.7	14°44.2	14°01.6	4.7 - 4.6	10.7 - 10.4	16.7 - 16.3
48	14°42.0	14°44.4	14°01.8	4.8 - 4.7	10.8 - 10.5	16.8 - 16.4
49	14°42.3	14°44.7	14°02.1	4.9 - 4.8	10.9 - 10.6	16.9 - 16.5
50	14°42.5	14°44.9	14°02.3	5.0 - 4.9	11.0 - 10.7	17.0 - 16.6
51	14°42.8	14°45.2	14°02.5	5.1 - 5.0	11.1 - 10.8	17.1 - 16.7
52	14°43.0	14°45.4	14°02.8	5.2 - 5.1	11.2 - 10.9	17.2 - 16.8
53	14°43.2	14°45.7	14°03.0	5.3 - 5.2	11.3 - 11.0	17.3 - 16.9
54	14°43.5	14°45.9	14°03.3	5.4 - 5.3	11.4 - 11.1	17.4 - 17.0
55	14°43.7	14°46.2	14°03.5	5.5 - 5.4	11.5 - 11.2	17.5 - 17.1
56	14°44.0	14°46.4	14°03.7	5.6 - 5.5	11.6 - 11.3	17.6 - 17.2
57	14°44.3	14°46.7	14°04.0	5.7 - 5.6	11.7 - 11.4	17.7 - 17.3
58	14°44.5	14°46.9	14°04.2	5.8 - 5.7	11.8 - 11.5	17.8 - 17.4
59	14°44.8	14°47.2	14°04.4	5.9 - 5.8	11.9 - 11.6	17.9 - 17.5

m	Sun	Aries	Moon	v and d corr		
59	Plan.					
0	14°45.0	14°47.4	14°04.7	0.0 - 0.0	6.0 - 6.0	12.0 - 11.9
1	14°45.2	14°47.7	14°04.9	0.1 - 0.1	6.1 - 6.0	12.1 - 12.0
2	14°45.5	14°47.9	14°05.2	0.2 - 0.2	6.2 - 6.1	12.2 - 12.1
3	14°45.7	14°48.2	14°05.4	0.3 - 0.3	6.3 - 6.2	12.3 - 12.2
4	14°46.0	14°48.4	14°05.6	0.4 - 0.4	6.4 - 6.3	12.4 - 12.3
5	14°46.3	14°48.7	14°05.9	0.5 - 0.5	6.5 - 6.4	12.5 - 12.4
6	14°46.5	14°48.9	14°06.1	0.6 - 0.6	6.6 - 6.5	12.6 - 12.5
7	14°46.8	14°49.2	14°06.4	0.7 - 0.7	6.7 - 6.6	12.7 - 12.6
8	14°47.0	14°49.4	14°06.6	0.8 - 0.8	6.8 - 6.7	12.8 - 12.7
9	14°47.2	14°49.7	14°06.8	0.9 - 0.9	6.9 - 6.8	12.9 - 12.8
10	14°47.5	14°49.9	14°07.1	1.0 - 1.0	7.0 - 6.9	13.0 - 12.9
11	14°47.7	14°50.2	14°07.3	1.1 - 1.1	7.1 - 7.0	13.1 - 13.0
12	14°48.0	14°50.4	14°07.5	1.2 - 1.2	7.2 - 7.1	13.2 - 13.1
13	14°48.3	14°50.7	14°07.8	1.3 - 1.3	7.3 - 7.2	13.3 - 13.2
14	14°48.5	14°50.9	14°08.0	1.4 - 1.4	7.4 - 7.3	13.4 - 13.3
15	14°48.8	14°51.2	14°08.3	1.5 - 1.5	7.5 - 7.4	13.5 - 13.4
16	14°49.0	14°51.4	14°08.5	1.6 - 1.6	7.6 - 7.5	13.6 - 13.5
17	14°49.2	14°51.7	14°08.7	1.7 - 1.7	7.7 - 7.6	13.7 - 13.6
18	14°49.5	14°51.9	14°09.0	1.8 - 1.8	7.8 - 7.7	13.8 - 13.7
19	14°49.8	14°52.2	14°09.2	1.9 - 1.9	7.9 - 7.8	13.9 - 13.8
20	14°50.0	14°52.4	14°09.5	2.0 - 2.0	8.0 - 7.9	14.0 - 13.9
21	14°50.3	14°52.7	14°09.7	2.1 - 2.1	8.1 - 8.0	14.1 - 14.0
22	14°50.5	14°52.9	14°09.9	2.2 - 2.2	8.2 - 8.1	14.2 - 14.1
23	14°50.7	14°53.2	14°10.2	2.3 - 2.3	8.3 - 8.2	14.3 - 14.2
24	14°51.0	14°53.4	14°10.4	2.4 - 2.4	8.4 - 8.3	14.4 - 14.3
25	14°51.2	14°53.7	14°10.6	2.5 - 2.5	8.5 - 8.4	14.5 - 14.4
26	14°51.5	14°53.9	14°10.9	2.6 - 2.6	8.6 - 8.5	14.6 - 14.5
27	14°51.8	14°54.2	14°11.1	2.7 - 2.7	8.7 - 8.6	14.7 - 14.6
28	14°52.0	14°54.4	14°11.4	2.8 - 2.8	8.8 - 8.7	14.8 - 14.7
29	14°52.3	14°54.7	14°11.6	2.9 - 2.9	8.9 - 8.8	14.9 - 14.8
30	14°52.5	14°54.9	14°11.8	3.0 - 3.0	9.0 - 8.9	15.0 - 14.9
31	14°52.7	14°55.2	14°12.1	3.1 - 3.1	9.1 - 9.0	15.1 - 15.0
32	14°53.0	14°55.4	14°12.3	3.2 - 3.2	9.2 - 9.1	15.2 - 15.1
33	14°53.2	14°55.7	14°12.6	3.3 - 3.3	9.3 - 9.2	15.3 - 15.2
34	14°53.5	14°55.9	14°12.8	3.4 - 3.4	9.4 - 9.3	15.4 - 15.3
35	14°53.8	14°56.2	14°13.0	3.5 - 3.5	9.5 - 9.4	15.5 - 15.4
36	14°54.0	14°56.4	14°13.3	3.6 - 3.6	9.6 - 9.5	15.6 - 15.5
37	14°54.3	14°56.7	14°13.5	3.7 - 3.7	9.7 - 9.6	15.7 - 15.6
38	14°54.5	14°56.9	14°13.8	3.8 - 3.8	9.8 - 9.7	15.8 - 15.7
39	14°54.7	14°57.2	14°14.0	3.9 - 3.9	9.9 - 9.8	15.9 - 15.8
40	14°55.0	14°57.4	14°14.2	4.0 - 4.0	10.0 - 9.9	16.0 - 15.9
41	14°55.2	14°57.7	14°14.5	4.1 - 4.1	10.1 - 10.0	16.1 - 16.0
42	14°55.5	14°57.9	14°14.7	4.2 - 4.2	10.2 - 10.1	16.2 - 16.1
43	14°55.8	14°58.2	14°14.9	4.3 - 4.3	10.3 - 10.2	16.3 - 16.2
44	14°56.0	14°58.4	14°15.2	4.4 - 4.4	10.4 - 10.3	16.4 - 16.3
45	14°56.3	14°58.7	14°15.4	4.5 - 4.5	10.5 - 10.4	16.5 - 16.4
46	14°56.5	14°59.0	14°15.7	4.6 - 4.6	10.6 - 10.5	16.6 - 16.5
47	14°56.7	14°59.2	14°15.9	4.7 - 4.7	10.7 - 10.6	16.7 - 16.6
48	14°57.0	14°59.5	14°16.1	4.8 - 4.8	10.8 - 10.7	16.8 - 16.7
49	14°57.3	14°59.7	14°16.4	4.9 - 4.9	10.9 - 10.8	16.9 - 16.8
50	14°57.5	15°00.0	14°16.6	5.0 - 5.0	11.0 - 10.9	17.0 - 16.9
51	14°57.8	15°00.2	14°16.9	5.1 - 5.1	11.1 - 11.0	17.1 - 17.0
52	14°58.0	15°00.5	14°17.1	5.2 - 5.2	11.2 - 11.1	17.2 - 17.1
53	14°58.2	15°00.7	14°17.3	5.3 - 5.3	11.3 - 11.2	17.3 - 17.2
54	14°58.5	15°01.0	14°17.6	5.4 - 5.4	11.4 - 11.3	17.4 - 17.3
55	14°58.7	15°01.2	14°17.8	5.5 - 5.5	11.5 - 11.4	17.5 - 17.4
56	14°59.0	15°01.5	14°18.0	5.6 - 5.6	11.6 - 11.5	17.6 - 17.5
57	14°59.3	15°01.7	14°18.3	5.7 - 5.7	11.7 - 11.6	17.7 - 17.6
58	14°59.5	15°02.0	14°18.5	5.8 - 5.8	11.8 - 11.7	17.8 - 17.7
59	14°59.8	15°02.2	14°18.8	5.9 - 5.9	11.9 - 11.8	17.9 - 17.8

Altitude Correction Tables for 10° to 90° — Sun, Stars, Planets

SUN
October – March

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 33	+10.8	– 21.5
9 45	+10.9	– 21.4
9 56	+11.0	– 21.3
10 08	+11.1	– 21.2
10 20	+11.2	– 21.1
10 33	+11.3	– 21.0
10 46	+11.4	– 20.9
11 00	+11.5	– 20.8
11 15	+11.6	– 20.7
11 30	+11.7	– 20.6
11 45	+11.8	– 20.5
12 01	+11.9	– 20.4
12 18	+12.0	– 20.3
12 36	+12.1	– 20.2
12 54	+12.2	– 20.1
13 14	+12.3	– 20.0
13 34	+12.4	– 19.9
13 55	+12.5	– 19.8
14 17	+12.6	– 19.7
14 41	+12.7	– 19.6
15 05	+12.8	– 19.5
15 31	+12.9	– 19.4
15 59	+13.0	– 19.3
16 27	+13.1	– 19.2
16 58	+13.2	– 19.1
17 30	+13.3	– 19.0
18 05	+13.4	– 18.9
18 41	+13.5	– 18.8
19 20	+13.6	– 18.7
20 02	+13.7	– 18.6
20 46	+13.8	– 18.5
21 34	+13.9	– 18.4
22 25	+14.0	– 18.3
23 20	+14.1	– 18.2
24 20	+14.2	– 18.1
25 24	+14.3	– 18.0
26 34	+14.4	– 17.9
27 50	+14.5	– 17.8
29 13	+14.6	– 17.7
30 44	+14.7	– 17.6
32 24	+14.8	– 17.5
34 15	+14.9	– 17.4
36 17	+15.0	– 17.3
38 34	+15.1	– 17.2
41 06	+15.2	– 17.1
43 56	+15.3	– 17.0
47 07	+15.4	– 16.9
50 43	+15.5	– 16.8
54 46	+15.6	– 16.7
59 21	+15.7	– 16.6
64 28	+15.8	– 16.5
70 10	+15.9	– 16.4
76 24	+16.0	– 16.3
83 05	+16.1	– 16.2
90 00		

SUN
April – September

App. Alt.	Lower Limb	Upper Limb
° ′	′	′
9 39	+10.6	– 21.2
9 50	+10.7	– 21.1
10 02	+10.8	– 21.0
10 14	+10.9	– 20.9
10 27	+11.0	– 20.8
10 40	+11.1	– 20.7
10 53	+11.2	– 20.6
11 07	+11.3	– 20.5
11 22	+11.4	– 20.4
11 37	+11.5	– 20.3
11 53	+11.6	– 20.2
12 10	+11.7	– 20.1
12 27	+11.8	– 20.0
14 45	+11.9	– 19.9
13 04	+12.0	– 19.8
13 24	+12.1	– 19.7
13 44	+12.2	– 19.6
14 06	+12.3	– 19.5
14 29	+12.4	– 19.4
14 53	+12.5	– 19.3
15 18	+12.6	– 19.2
15 45	+12.7	– 19.1
16 13	+12.8	– 19.0
16 43	+12.9	– 18.9
17 14	+13.0	– 18.8
17 47	+13.1	– 18.7
18 23	+13.2	– 18.6
19 00	+13.3	– 18.5
19 41	+13.4	– 18.4
20 24	+13.5	– 18.3
21 10	+13.6	– 18.2
21 59	+13.7	– 18.1
22 52	+13.8	– 18.0
23 49	+13.9	– 17.9
24 51	+14.0	– 17.8
25 58	+14.1	– 17.7
27 11	+14.2	– 17.6
28 31	+14.3	– 17.5
29 58	+14.4	– 17.4
31 33	+14.5	– 17.3
33 18	+14.6	– 17.2
35 15	+14.7	– 17.1
37 24	+14.8	– 17.0
39 48	+14.9	– 16.9
42 28	+15.0	– 16.8
45 29	+15.1	– 16.7
48 52	+15.2	– 16.6
51 41	+15.3	– 16.5
56 59	+15.4	– 16.4
61 50	+15.5	– 16.3
67 15	+15.6	– 16.2
73 14	+15.7	– 16.1
79 42	+15.8	– 16.0
86 21	+15.9	– 15.9
90 00		

Stars & Planets

App. Alt.	Corr
° ′	′
9 55	– 5.3
10 07	– 5.2
10 20	– 5.1
10 32	– 5.0
10 46	– 4.9
10 59	– 4.8
11 14	– 4.7
11 29	– 4.6
11 44	– 4.5
12 00	– 4.4
12 17	– 4.3
12 35	– 4.2
12 53	– 4.1
13 12	– 4.0
13 32	– 3.9
13 53	– 3.8
14 16	– 3.7
14 39	– 3.6
15 03	– 3.5
15 29	– 3.4
15 56	– 3.3
16 25	– 3.2
16 55	– 3.1
17 27	– 3.0
18 01	– 2.9
18 37	– 2.8
19 16	– 2.7
19 56	– 2.6
20 40	– 2.5
21 27	– 2.4
22 17	– 2.3
23 11	– 2.2
24 09	– 2.1
25 12	– 2.0
26 20	– 1.9
27 34	– 1.8
28 54	– 1.7
30 22	– 1.6
31 58	– 1.5
33 43	– 1.4
35 38	– 1.3
37 45	– 1.2
40 06	– 1.1
42 42	– 1.0
45 34	– 0.9
48 45	– 0.8
52 16	– 0.7
56 09	– 0.6
60 26	– 0.5
65 06	– 0.4
70 09	– 0.3
75 32	– 0.2
81 12	– 0.1
87 03	0.0
90 00	

Additional Altitude Correction for Mars & Venus

A small additional altitude correction for Mars & Venus can be obtained in the Daily Pages of The Nautical Almanac for the day of the observation.

Find the correction in the block labeled **Horizontal parallax**.

The figure will cover the range of 3 days found on that Daily Page.

The correction is to be added to Apparent Altitude.

Refraction

App. Alt.	Corr
°	′
5.5	– 9.1
6.0	– 8.5
6.5	– 7.9
7.0	– 7.5
7.5	– 7.0
8.0	– 6.6
8.5	– 6.3
9.0	– 5.9
9.5	– 5.7
10.0	– 5.4
10.5	– 5.1
11.0	– 4.9
11.5	– 4.7
12.0	– 4.5
12.5	– 4.4
13.0	– 4.2
13.5	– 4.0
14.0	– 3.9
14.5	– 3.8
15.0	– 3.6
15.5	– 3.5
16.0	– 3.4
16.5	– 3.3
17.0	– 3.2
17.5	– 3.1
18.0	– 3.0
18.5	– 2.9
19.0	– 2.9
19.5	– 2.8
20.0	– 2.7
21.0	– 2.6
22.0	– 2.4
23.0	– 2.3
24.0	– 2.2
25.0	– 2.1
26.0	– 2.0
27.0	– 1.9
28.0	– 1.9
29.0	– 1.8
30.0	– 1.7
31.0	– 1.7
32.0	– 1.6
33.0	– 1.5
34.0	– 1.5
35.0	– 1.4
36.0	– 1.4
37.0	– 1.3
38.0	– 1.3
39.0	– 1.2
40.0	– 1.2
45.0	– 1.0
50.0	– 0.8
55.0	– 0.7
60.0	– 0.6
65.0	– 0.5
70.0	– 0.4
75.0	– 0.3
80.0	– 0.2
85.0	– 0.1

DIP
always subtracted from Hs

Ht. of Eye	Corr	Ht. of Eye	Ht. of Eye	Corr
meters	′	**feet**	**meters**	′
2.4	**– 2.8**	8.0	1.0	**– 1.8**
2.6	**– 2.9**	8.6	1.5	**– 2.2**
2.8	**– 3.0**	9.2	2.0	**– 2.5**
3.0	**– 3.1**	9.8	2.5	**– 2.8**
3.2	**– 3.2**	10.5	3.0	**– 3.0**
3.4	**– 3.3**	11.2	See table ←	
3.6	**– 3.4**	11.9		
3.8	**– 3.5**	12.6	**meters**	
4.0	**– 3.6**	13.3	20	**– 7.9**
4.3	**– 3.7**	14.1	22	**– 8.3**
4.5	**– 3.8**	14.9	24	**– 8.6**
4.7	**– 3.9**	15.7	26	**– 9.0**
5.0	**– 4.0**	16.5	28	**– 9.3**
5.2	**– 4.1**	17.4		
5.5	**– 4.2**	18.3	30	**– 9.6**
5.8	**– 4.3**	19.1	32	**– 10.0**
6.1	**– 4.4**	20.1	34	**– 10.3**
6.3	**– 4.5**	21.0	36	**– 10.6**
6.6	**– 4.6**	22.0	38	**– 10.8**
6.9	**– 4.7**	22.9		
7.2	**– 4.8**	23.9	40	**– 11.1**
7.5	**– 4.9**	24.9	42	**– 11.4**
7.9	**– 5.0**	26.0	44	**– 11.7**
8.2	**– 5.1**	27.1	46	**– 11.9**
8.5	**– 5.2**	28.1	48	**– 12.2**
8.8	**– 5.3**	29.2	**feet**	′
9.2	**– 5.4**	30.4	2	**– 1.4**
9.5	**– 5.5**	31.5	4	**– 1.9**
9.9	**– 5.6**	32.7	6	**– 2.4**
10.3	**– 5.7**	33.9	8	**– 2.7**
10.6	**– 5.8**	35.1	10	**– 3.1**
11.0	**– 5.9**	36.3	See table ←	
11.4	**– 6.0**	37.6		
11.8	**– 6.1**	38.9	**feet**	′
12.2	**– 6.2**	40.1	70	**– 8.1**
12.6	**– 6.3**	41.5	75	**– 8.4**
13.0	**– 6.4**	42.8	80	**– 8.7**
13.4	**– 6.5**	44.2	85	**– 8.9**
13.8	**– 6.6**	45.5	90	**– 9.2**
14.2	**– 6.7**	46.9	95	**9.5**
14.7	**– 6.8**	48.4		
15.1	**– 6.9**	49.8	100	**– 9.7**
15.5	**– 7.0**	51.3	105	**– 9.9**
16.0	**– 7.1**	52.8	110	**– 10.2**
16.5	**– 7.2**	54.3	115	**– 10.4**
16.9	**– 7.3**	55.8	120	**– 10.6**
17.4	**– 7.4**	57.4	125	**– 10.8**
17.9	**– 7.5**	58.9	130	**– 11.1**
18.4	**– 7.6**	60.5	135	**– 11.3**
18.8	**– 7.7**	62.1	140	**– 11.5**
19.3	**– 7.8**	63.8	145	**– 11.7**
19.8	**– 7.9**	65.4	150	**– 11.9**
20.4	**– 8.0**	67.1	155	**– 12.1**
20.9	**– 8.1**	68.8		
21.4		70.5		

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

Altitude Correction Tables for 0° to 10° — Sun, Stars, Planets

App. Alt.	Sun October – March Lower Limb	Sun October – March Upper Limb	Sun April – September Lower Limb	Sun April – September Upper Limb	Stars & Planets
° ′	′	′	′	′	′
0 00	– 17.5	– 49.8	– 17.8	– 49.6	– 33.8
0 03	16.9	49.2	17.2	49.0	33.2
0 06	16.3	48.6	16.6	48.4	32.6
0 09	15.7	48.0	16.0	47.8	32.0
0 12	15.2	47.5	15.4	47.2	31.5
0 15	14.6	46.9	14.8	46.6	30.9
0 18	– 14.1	– 46.4	– 14.3	– 46.1	– 30.4
0 21	13.5	45.8	13.8	33.8	29.8
0 24	13.0	45.3	13.3	45.1	29.3
0 27	12.5	44.8	12.8	44.6	28.8
0 30	12.0	44.3	12.3	44.1	28.3
0 33	11.6	43.9	11.8	43.6	27.9
0 36	– 11.1	– 10.0	– 11.3	– 43.1	– 27.4
0 39	10.6	42.9	10.9	42.7	26.9
0 42	10.2	42.5	10.5	42.3	26.5
0 45	9.8	42.1	10.0	41.8	26.1
0 48	9.4	41.7	9.6	41.4	25.7
0 51	9.0	41.3	9.2	41.0	25.3
0 54	– 8.6	– 40.9	– 8.8	– 40.6	– 24.9
0 57	8.2	40.5	8.4	40.2	24.5
1 00	7.8	40.1	8.0	39.8	24.1
1 03	7.4	39.7	7.7	39.5	23.7
1 06	7.1	39.4	7.3	39.1	23.4
1 09	6.7	39.0	7.0	38.8	23.0
1 12	– 6.4	– 38.7	– 6.6	– 38.4	– 22.7
1 15	6.0	38.3	6.3	38.1	22.3
1 18	5.7	38.0	6.0	37.8	22.0
1 21	5.4	37.7	5.7	37.5	21.7
1 24	5.1	37.4	5.3	37.1	21.4
1 27	4.8	37.1	5.0	33.8	21.1
1 30	– 4.5	– 36.8	– 4.7	– 36.5	– 20.8
1 35	4.0	36.3	4.3	36.1	20.3
1 40	3.6	35.9	3.8	35.6	19.9
1 45	3.1	35.4	3.4	35.2	19.4
1 50	2.7	35.0	2.9	34.7	19.0
1 55	2.3	34.6	2.5	34.3	18.6
2 00	– 1.9	– 34.2	– 2.1	– 33.9	– 18.2
2 05	1.5	33.8	1.7	33.5	17.8
2 10	1.1	33.4	1.4	33.2	17.4
2 15	0.8	33.1	1.0	32.8	17.1
2 20	0.4	32.7	0.7	32.5	16.7
2 25	– 0.1	32.4	– 0.3	32.1	16.4
2 30	+ 0.2	– 32.1	0.0	– 31.8	– 16.1
2 35	0.5	31.8	+ 0.3	31.5	15.8
2 40	0.8	31.5	0.6	31.2	15.4
2 45	1.1	31.2	0.9	30.9	15.2
2 50	1.4	30.9	1.2	30.6	14.9
2 55	1.7	30.6	1.4	30.4	14.9
3 00	+ 2.0	– 30.3	+ 1.7	– 30.1	– 14.3
3 05	2.2	30.1	2.0	29.8	14.1
3 10	2.5	29.8	2.2	29.6	13.8
3 15	2.7	29.6	2.5	29.3	13.6
3 20	2.9	29.4	2.7	29.1	13.4
3 25	3.2	29.1	2.9	28.9	13.4
3 30	3.4	– 28.9	+ 3.1	– 28.7	– 12.9

App. Alt.	Sun October – March Lower Limb	Sun October – March Upper Limb	Sun April – September Lower Limb	Sun April – September Upper Limb	Stars & Planets
° ′	′	′	′	′	′
3 30	+ 3.4	– 28.9	+ 3.1	– 28.7	– 12.9
3 35	3.6	28.7	3.3	28.5	12.7
3 40	3.8	28.5	3.6	28.2	12.5
3 45	4.0	28.3	3.8	28.0	12.3
3 50	4.2	28.1	4.0	27.8	12.1
3 55	4.4	27.9	4.1	27.7	11.9
4 00	+ 4.6	– 27.7	+ 4.3	– 27.5	– 11.7
4 05	4.8	27.5	4.5	27.3	11.5
4 10	4.9	27.4	4.7	27.1	11.4
4 15	5.1	27.2	4.9	26.9	11.2
4 20	5.3	27.0	5.0	26.8	11.0
4 25	5.4	26.9	5.2	26.6	10.9
4 30	+ 5.6	– 26.7	+ 5.3	– 26.5	– 10.7
4 35	5.7	26.6	5.5	26.3	10.6
4 40	5.9	26.4	5.6	26.2	10.4
4 45	6.0	26.3	5.8	26.0	10.3
4 50	6.2	26.1	5.9	25.9	10.1
4 55	6.3	26.0	6.1	25.7	10.0
5 00	+ 6.4	– 25.9	+ 6.2	– 25.6	– 9.9
5 05	6.6	25.7	6.3	25.5	9.7
5 10	6.7	25.6	6.5	25.3	9.6
5 15	6.8	25.5	6.6	25.2	9.5
5 20	7.0	25.3	6.7	25.1	9.3
5 25	7.1	25.2	6.8	25.0	9.2
5 30	+ 7.2	– 25.1	+ 6.9	– 24.9	– 9.1
5 35	7.3	25.0	7.1	24.7	9.0
5 40	7.4	24.9	7.2	24.6	8.9
5 45	7.5	24.8	7.3	24.5	8.8
5 50	7.6	24.7	7.4	24.4	8.7
5 55	7.7	24.6	7.5	24.3	8.6
6 00	+ 7.8	– 24.5	+ 7.6	– 24.2	– 8.5
6 10	8.0	24.3	7.8	24.0	8.3
6 20	8.2	24.1	8.0	23.8	8.1
6 30	8.4	23.9	8.2	23.6	7.9
6 40	8.6	23.7	8.3	23.5	7.7
6 50	8.7	23.6	8.5	23.3	7.6
7 00	+ 8.9	– 23.4	+ 8.7	– 23.1	– 7.4
7 10	9.1	23.2	8.8	23.0	7.2
7 20	9.2	23.1	9.0	22.8	7.1
7 30	9.3	23.0	9.1	22.7	6.9
7 40	9.5	22.8	9.2	22.6	6.8
7 50	9.6	22.7	9.4	22.4	6.7
8 00	+ 9.7	– 22.6	+ 9.5	– 22.3	– 6.6
8 10	9.9	22.4	9.6	22.2	6.4
8 20	10.0	22.3	9.7	22.1	6.3
8 30	10.1	22.2	9.9	21.9	6.2
8 40	10.2	22.1	10.0	21.8	6.1
8 50	10.3	22.0	10.1	21.7	6.0
9 00	+ 10.4	– 21.9	+ 10.2	– 21.6	– 5.9
9 10	10.5	21.8	10.3	21.5	5.8
9 20	10.6	21.7	10.4	21.4	5.7
9 30	10.7	21.6	10.5	21.3	5.6
9 40	10.8	21.5	10.6	21.2	5.5
9 50	10.9	21.4	10.6	21.2	5.4
10 00	+ 11.0	– 21.3	+ 10.7	– 21.1	– 5.3

For bubble sextant observations- ignore dip and use star corrections for the Sun, planets and stars.

ALTITUDE CORRECTION TABLES 0° – 35° — MOON

App. Alt.	0° – 4°		5° – 9°		10° – 14°		15° – 19°		20° – 24°		25° – 29°		30° – 34°		App. Alt.
	Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		
'	'		'		'		'		'		'		'		'
	0°		5°		10°		15°		20°		25°		30°		
00	34.5		58.2		62.1		62.8		62.2		60.8		58.9		00
10	36.5		58.5		62.2		62.8		62.2		60.8		58.8		10
20	38.3		58.7		62.2		62.8		62.1		60.7		58.8		20
30	40.0		58.9		62.3		62.8		62.1		60.7		58.7		30
40	41.5		59.1		62.3		62.8		62.0		60.6		58.6		40
50	42.9		59.3		62.4		62.7		62.0		60.6		58.5		50
	1°		6°		11°		16°		21°		26°		31°		
00	44.2		59.5		62.4		62.7		62.0		60.5		58.5		00
10	45.4		59.7		62.4		62.7		61.9		60.4		58.4		10
20	46.5		59.9		62.5		62.7		61.9		60.4		58.3		20
30	47.5		60.0		62.5		62.7		61.9		60.3		58.2		30
40	48.4		60.2		62.5		62.7		61.8		60.3		58.2		40
50	49.3		60.3		62.6		62.7		61.8		60.2		58.1		50
	2°		7°		12°		17°		22°		27°		32°		
00	50.1		60.5		62.6		62.7		61.7		60.1		58.0		00
10	50.8		60.6		62.6		62.6		61.7		60.1		57.9		10
20	51.5		60.7		62.6		62.6		61.6		60.0		57.8		20
30	52.2		60.9		62.7		62.6		61.6		59.9		57.8		30
40	52.8		61.0		62.7		62.6		61.6		59.9		57.7		40
50	53.4		61.1		62.7		62.6		61.5		59.8		57.6		50
	3°		8°		13°		18°		23°		28°		33°		
00	53.9		61.2		62.7		62.5		61.5		59.7		57.5		00
10	54.4		61.3		62.7		62.5		61.4		59.7		57.4		10
20	54.9		61.4		62.7		62.5		61.4		59.6		57.4		20
30	55.3		61.5		62.8		62.5		61.3		59.5		57.3		30
40	55.7		61.6		62.8		62.4		61.3		59.5		57.2		40
50	56.1		61.6		62.8		62.4		61.2		59.4		57.1		50
	4°		9°		14°		19°		24°		29°		34°		
00	56.4		61.7		62.8		62.4		61.2		59.3		57.0		00
10	56.8		61.8		62.8		62.4		61.1		59.3		56.9		10
20	57.1		61.9		62.8		62.3		61.1		59.2		56.9		20
30	57.4		61.9		62.8		62.3		61.0		59.1		56.8		30
40	57.7		62.0		62.8		62.3		61.0		59.1		56.7		40
50	58.0		62.1		62.8		62.2		60.9		59.0		56.6		50
HP	**L**	**U**	**L**	**U**	**L**	**U**	**L**	**U**	**L**	**U**	**L**	**U**	**L**	**U**	**HP**
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
54.0	0.3	0.9	0.3	0.9	0.4	1.0	0.5	1.1	0.6	1.2	0.7	1.3	0.9	1.5	**54.0**
54.3	0.7	1.1	0.7	1.2	0.8	1.2	0.8	1.3	0.9	1.4	1.1	1.5	1.2	1.7	**54.3**
54.6	1.1	1.4	1.1	1.4	1.1	1.4	1.2	1.5	1.3	1.6	1.4	1.7	1.5	1.8	**54.6**
54.9	1.4	1.6	1.4	1.6	1.5	1.6	1.6	1.7	1.6	1.8	1.8	1.9	1.9	2.0	**54.9**
55.2	1.8	1.8	1.8	1.8	1.9	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	**55.2**
55.5	2.2	2.0	2.2	2.0	2.3	2.1	2.3	2.1	2.4	2.2	2.4	2.3	2.5	2.4	**55.5**
55.8	2.6	2.2	2.6	2.2	2.6	2.3	2.7	2.3	2.7	2.4	2.8	2.4	2.9	2.5	**55.8**
56.1	3.0	2.4	3.0	2.5	3.0	2.5	3.0	2.5	3.1	2.6	3.1	2.6	3.2	2.7	**56.1**
56.4	3.3	2.7	3.3	2.7	3.4	2.7	3.4	2.7	3.4	2.8	3.5	2.8	3.5	2.9	**56.4**
56.7	3.7	2.9	3.7	2.9	3.8	2.9	3.8	2.9	3.8	3.0	3.8	3.0	3.9	3.0	**56.7**
57.0	4.1	3.1	4.1	3.1	4.1	3.1	4.1	3.1	4.2	3.2	4.2	3.2	4.2	3.2	**57.0**
57.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.3	4.5	3.4	4.6	3.4	**57.3**
57.6	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.5	4.9	3.6	**57.6**
57.9	5.3	3.8	5.3	3.8	5.2	3.8	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	**57.9**
58.2	5.6	4.0	5.6	4.0	5.6	4.0	5.6	4.0	5.6	3.9	5.6	3.9	5.6	3.9	**58.2**
58.5	6.0	4.2	6.0	4.2	6.0	4.2	6.0	4.2	6.0	4.1	5.9	4.1	5.9	4.1	**58.5**
58.8	6.4	4.4	6.4	4.4	6.4	4.4	6.3	4.4	6.3	4.3	6.3	4.3	6.2	4.2	**58.8**
59.1	6.8	4.6	6.8	4.6	6.7	4.6	6.7	4.6	6.7	4.5	6.6	4.5	6.6	4.4	**59.1**
59.4	7.2	4.8	7.1	4.8	7.1	4.8	7.1	4.8	7.0	4.7	7.0	4.7	6.9	4.6	**59.4**
59.7	7.5	5.1	7.5	5.0	7.5	5.0	7.5	5.0	7.4	4.9	7.3	4.8	7.2	4.8	**59.7**
60.0	7.9	5.3	7.9	5.3	7.9	5.2	7.8	5.2	7.8	5.1	7.7	5.0	7.6	4.9	**60.0**
60.3	8.3	5.5	8.3	5.5	8.2	5.4	8.2	5.4	8.1	5.3	8.0	5.2	7.9	5.1	**60.3**
60.6	8.7	5.7	8.7	5.7	8.6	5.7	8.6	5.6	8.5	5.5	8.4	5.4	8.2	5.3	**60.6**
60.9	9.1	5.9	9.0	5.9	9.0	5.9	8.9	5.8	8.8	5.7	8.7	5.6	8.6	5.4	**60.9**
61.2	9.5	6.2	9.4	6.1	9.4	6.1	9.3	6.0	9.2	5.9	9.1	5.8	8.9	5.6	**61.2**
61.5	9.8	6.4	9.8	6.3	9.7	6.3	9.7	6.2	9.5	6.1	9.4	5.9	9.2	5.8	**61.5**

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ	Ht. of Eye
m	'	ft	m	'	ft
2.4	-2.8	7.9	9.5	-5.5	31.2
2.6	-2.9	8.5	9.9	-5.6	32.5
2.8	-3.0	9.2	10.3	-5.7	33.8
3.0	-3.1	9.8	10.6	-5.8	34.8
3.2	-3.2	10.5	11.0	-5.9	36.1
3.4	-3.3	11.2	11.4	-6.0	37.4
3.6	-3.4	11.8	11.8	-6.1	38.7
3.8	-3.5	12.5	12.2	-6.2	40.0
4.0	-3.6	13.1	12.6	-6.3	41.3
4.3	-3.7	14.1	13.0	-6.4	42.7
4.5	-3.8	14.8	13.4	-6.5	44.0
4.7	-3.9	15.4	13.8	-6.6	45.3
5.0	-4.0	16.4	14.2	-6.7	46.6
5.2	-4.1	17.1	14.7	-6.8	48.2
5.5	-4.2	18.0	15.1	-6.9	49.5
5.8	-4.3	19.0	15.5	-7.0	50.9
6.1	-4.4	20.0	16.0	-7.1	52.5
6.3	-4.5	20.7	16.5	-7.2	54.1
6.6	-4.6	21.7	16.9	-7.3	55.4
6.9	-4.7	22.6	17.4	-7.4	57.1
7.2	-4.8	23.6	17.9	-7.5	58.7
7.5	-4.9	24.6	18.4	-7.6	60.4
7.9	-5.0	25.9	18.8	-7.7	61.7
8.2	-5.1	26.9	19.3	-7.8	63.3
8.5	-5.2	27.9	19.8	-7.9	65.0
8.8	-5.3	28.9	20.4	-8.0	66.9
9.2	-5.4	30.2	20.9	-8.1	68.6
9.5		31.2	21.4		70.2

MOON CORRECTION TABLE

The correction is in two parts; the first correction is taken from the upper part of the table with argument apparent altitude, and the second from the lower part, with argument HP, in the same column as that from which the first correction was taken. Separate corrections are given in the lower part for lower (L) and upper (U) limbs. All corrections are to be **added** to apparent altitude, *but* 30' *is to be subtracted from the altitude of the upper limb.*

For corrections for pressure and temperature see page A4.

For bubble sextant observations ignore dip, take the mean of upper and lower limb corrections and subtract 15' from the altitude.

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

ALTITUDE CORRECTION TABLES 35° – 90° — MOON

App. Alt.	35° – 39°		40° – 44°		45° – 49°		50° – 54°		55° – 59°		60° – 64°		65° – 69°		70° – 74°		75° – 79°		80° – 84°		85° – 89°		App. Alt.
	Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		Corrⁿ		
'	35°	'	40°	'	45°	'	50°	'	55°	'	60°	'	65°	'	70°	'	75°	'	80°	'	85°	'	'
00		56.5		53.7		50.5		46.9		43.1		38.9		34.6		30.0		25.3		20.5		15.6	00
10		56.4		53.6		50.4		46.8		42.9		38.8		34.4		29.9		25.2		20.4		15.5	10
20		56.3		53.5		50.2		46.7		42.8		38.7		34.3		29.7		25.0		20.2		15.3	20
30		56.2		53.4		50.1		46.5		42.7		38.5		34.1		29.6		24.9		20.0		15.1	30
40		56.2		53.3		50.0		46.4		42.5		38.4		34.0		29.4		24.7		19.9		15.0	40
50		56.1		53.2		49.9		46.3		42.4		38.2		33.8		29.3		24.5		19.7		14.8	50
	36°		41°		46°		51°		56°		61°		66°		71°		76°		81°		86°		
00		56.0		53.1		49.8		46.2		42.3		38.1		33.7		29.1		24.4		19.6		14.6	00
10		55.9		53.0		49.7		46.0		42.1		37.9		33.5		29.0		24.2		19.4		14.5	10
20		55.8		52.9		49.5		45.9		42.0		37.8		33.4		28.8		24.1		19.2		14.3	20
30		55.7		52.8		49.4		45.8		41.9		37.7		33.2		28.7		23.9		19.1		14.2	30
40		55.6		52.6		49.3		45.7		41.7		37.5		33.1		28.5		23.8		18.9		14.0	40
50		55.5		52.5		49.2		45.5		41.6		37.4		32.9		28.3		23.6		18.7		13.8	50
	37°		42°		47°		52°		57°		62°		67°		72°		77°		82°		87°		
00		55.4		52.4		49.1		45.4		41.4		37.2		32.8		28.2		23.4		18.6		13.7	00
10		55.3		52.3		49.0		45.3		41.3		37.1		32.6		28.0		23.3		18.4		13.5	10
20		55.2		52.2		48.8		45.2		41.2		36.9		32.5		27.9		23.1		18.2		13.3	20
30		55.1		52.1		48.7		45.0		41.0		36.8		32.3		27.7		22.9		18.1		13.2	30
40		55.0		52.0		48.6		44.9		40.9		36.6		32.2		27.6		22.8		17.9		13.0	40
50		55.0		51.9		48.5		44.8		40.8		36.5		32.0		27.4		22.6		17.8		12.8	50
	38°		43°		48°		53°		58°		63°		68°		73°		78°		83°		88°		
00		54.9		51.8		48.4		44.6		40.6		36.4		31.9		27.2		22.5		17.6		12.7	00
10		54.8		51.7		48.3		44.5		40.5		36.2		31.7		27.1		22.3		17.4		12.5	10
20		54.7		51.6		48.1		44.4		40.3		36.1		31.6		26.9		22.1		17.3		12.3	20
30		54.6		51.5		48.0		44.2		40.2		35.9		31.4		26.8		22.0		17.1		12.2	30
40		54.5		51.4		47.9		44.1		40.1		35.8		31.3		26.6		21.8		16.9		12.0	40
50		54.4		51.2		47.8		44.0		39.9		35.6		31.1		26.5		21.7		16.8		11.8	50
	39°		44°		49°		54°		59°		64°		69°		74°		79°		84°		89°		
00		54.3		51.1		47.7		43.9		39.8		35.5		31.0		26.3		21.5		16.6		11.7	00
10		54.2		51.0		47.5		43.7		39.6		35.3		30.8		26.1		21.3		16.4		11.5	10
20		54.1		50.9		47.4		43.6		39.5		35.2		30.7		26.0		21.2		16.3		11.4	20
30		54.0		50.8		47.3		43.5		39.4		35.0		30.5		25.8		21.0		16.1		11.2	30
40		53.9		50.7		47.2		43.3		39.2		34.9		30.4		25.7		20.9		16.0		11.0	40
50		53.8		50.6		47.0		43.2		39.1		34.7		30.2		25.5		20.7		15.8		10.9	50
HP	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	L	U	HP
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
54.0	1.1	1.7	1.3	1.9	1.5	2.1	1.7	2.4	2.0	2.6	2.3	2.9	2.6	3.2	2.9	3.5	3.2	3.8	3.5	4.1	3.8	4.5	54.0
54.3	1.4	1.8	1.6	2.0	1.8	2.2	2.0	2.5	2.2	2.7	2.5	3.0	2.8	3.2	3.1	3.5	3.3	3.8	3.6	4.1	3.9	4.4	54.3
54.6	1.7	2.0	1.9	2.2	2.1	2.4	2.3	2.6	2.5	2.8	2.7	3.0	3.0	3.3	3.2	3.5	3.5	3.8	3.8	4.0	4.0	4.3	54.6
54.9	2.0	2.2	2.2	2.3	2.4	2.5	2.5	2.7	2.7	2.9	2.9	3.1	3.2	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.3	54.9
55.2	2.3	2.3	2.5	2.4	2.6	2.6	2.8	2.8	3.0	2.9	3.2	3.1	3.4	3.3	3.6	3.5	3.8	3.7	4.0	4.0	4.2	4.2	55.2
55.5	2.7	2.5	2.8	2.6	2.9	2.7	3.1	2.9	3.2	3.0	3.4	3.2	3.6	3.4	3.7	3.5	3.9	3.7	4.1	3.9	4.3	4.1	55.5
55.8	3.0	2.6	3.1	2.7	3.2	2.8	3.3	3.0	3.5	3.1	3.6	3.3	3.8	3.4	3.9	3.6	4.1	3.7	4.2	3.9	4.4	4.0	55.8
56.1	3.3	2.8	3.4	2.9	3.5	3.0	3.6	3.1	3.7	3.2	3.8	3.3	4.0	3.4	4.1	3.6	4.2	3.7	4.4	3.8	4.5	4.0	56.1
56.4	3.6	2.9	3.7	3.0	3.8	3.1	3.9	3.2	3.9	3.3	4.0	3.4	4.1	3.5	4.3	3.6	4.4	3.7	4.5	3.8	4.6	3.9	56.4
56.7	3.9	3.1	4.0	3.1	4.1	3.2	4.1	3.3	4.2	3.3	4.3	3.4	4.3	3.5	4.4	3.6	4.5	3.7	4.6	3.8	4.7	3.8	56.7
57.0	4.3	3.2	4.3	3.3	4.3	3.3	4.4	3.4	4.4	3.4	4.5	3.5	4.5	3.5	4.6	3.6	4.7	3.6	4.7	3.7	4.8	3.8	57.0
57.3	4.6	3.4	4.6	3.4	4.6	3.4	4.6	3.5	4.7	3.5	4.7	3.5	4.7	3.6	4.8	3.6	4.8	3.6	4.8	3.7	4.9	3.7	57.3
57.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	4.9	3.6	5.0	3.6	5.0	3.6	5.0	3.6	57.6
57.9	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	5.2	3.7	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	5.1	3.6	57.9
58.2	5.5	3.9	5.5	3.8	5.5	3.8	5.4	3.8	5.4	3.7	5.4	3.7	5.3	3.7	5.3	3.6	5.2	3.6	5.2	3.5	5.2	3.5	58.2
58.5	5.9	4.0	5.8	4.0	5.8	3.9	5.7	3.9	5.6	3.8	5.6	3.8	5.5	3.7	5.5	3.6	5.4	3.6	5.3	3.5	5.3	3.4	58.5
58.8	6.2	4.2	6.1	4.1	6.0	4.1	6.0	4.0	5.9	3.9	5.8	3.8	5.7	3.7	5.6	3.6	5.5	3.5	5.4	3.5	5.3	3.4	58.8
59.1	6.5	4.3	6.4	4.3	6.3	4.2	6.2	4.1	6.1	4.0	6.0	3.9	5.9	3.8	5.8	3.6	5.7	3.5	5.6	3.4	5.4	3.3	59.1
59.4	6.8	4.5	6.7	4.4	6.6	4.3	6.5	4.2	6.4	4.1	6.2	3.9	6.1	3.8	6.0	3.7	5.8	3.5	5.7	3.4	5.5	3.2	59.4
59.7	7.1	4.7	7.0	4.5	6.9	4.4	6.8	4.3	6.6	4.1	6.5	4.0	6.3	3.8	6.1	3.7	6.0	3.5	5.8	3.3	5.6	3.2	59.7
60.0	7.5	4.8	7.3	4.7	7.2	4.5	7.0	4.4	6.9	4.2	6.7	4.0	6.5	3.9	6.3	3.7	6.1	3.5	5.9	3.3	5.7	3.1	60.0
60.3	7.8	5.0	7.6	4.8	7.5	4.7	7.3	4.5	7.1	4.3	6.9	4.1	6.7	3.9	6.5	3.7	6.3	3.5	6.0	3.2	5.8	3.0	60.3
60.6	8.1	5.1	7.9	5.0	7.7	4.8	7.6	4.6	7.3	4.4	7.1	4.2	6.9	3.9	6.7	3.7	6.4	3.4	6.2	3.2	5.9	2.9	60.6
60.9	8.4	5.3	8.2	5.1	8.0	4.9	7.8	4.7	7.6	4.5	7.3	4.2	7.1	4.0	6.8	3.7	6.6	3.4	6.3	3.2	6.0	2.9	60.9
61.2	8.7	5.4	8.5	5.2	8.3	5.0	8.1	4.8	7.8	4.5	7.6	4.3	7.3	4.0	7.0	3.7	6.7	3.4	6.4	3.1	6.1	2.8	61.2
61.5	9.1	5.6	8.8	5.4	8.6	5.1	8.3	4.9	8.1	4.6	7.8	4.3	7.5	4.0	7.2	3.7	6.9	3.4	6.5	3.1	6.2	2.7	61.5

Total Lunar Eclipse of 2025 Mar 14

Ecliptic Conjunction = 06:55:48.0 TD (= 06:54:33.5 UT)
Greatest Eclipse = 06:59:56.2 TD (= 06:58:41.7 UT)

Penumbral Magnitude = 2.2595 P. Radius = 1.1899° Gamma = 0.3484
Umbral Magnitude = 1.1784 U. Radius = 0.6537° Axis = 0.3171°

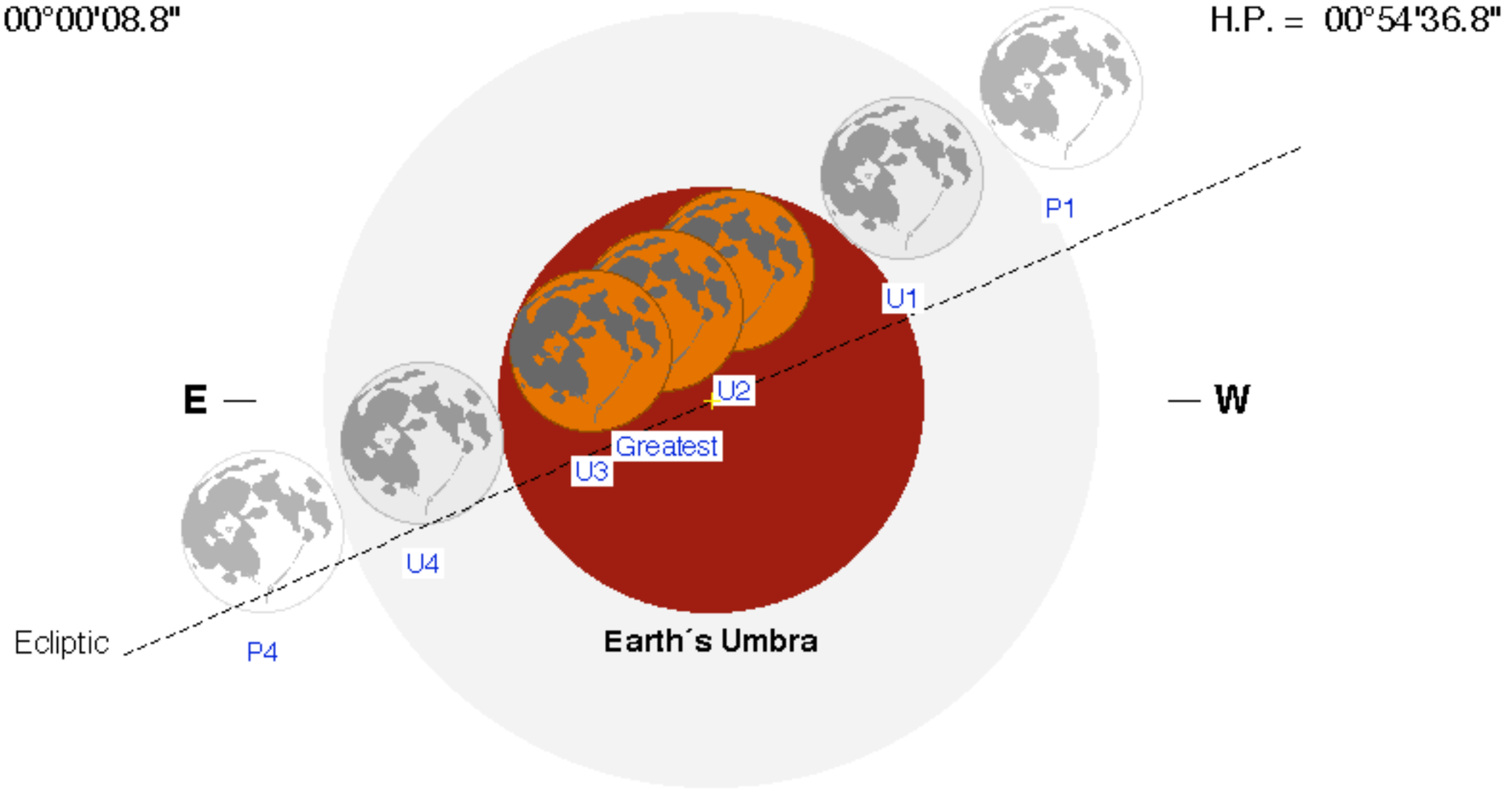
Saros Series = 123 Member = 53 of 73

<u>Sun at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 23h37m46.0s
Dec. = -02°24'16.8"
S.D. = 00°16'05.2"
H.P. = 00°00'08.8"

<u>Moon at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 11h38m23.0s
Dec. = +02°40'54.6"
S.D. = 00°14'52.8"
H.P. = 00°54'36.8"



<u>Eclipse Durations</u>

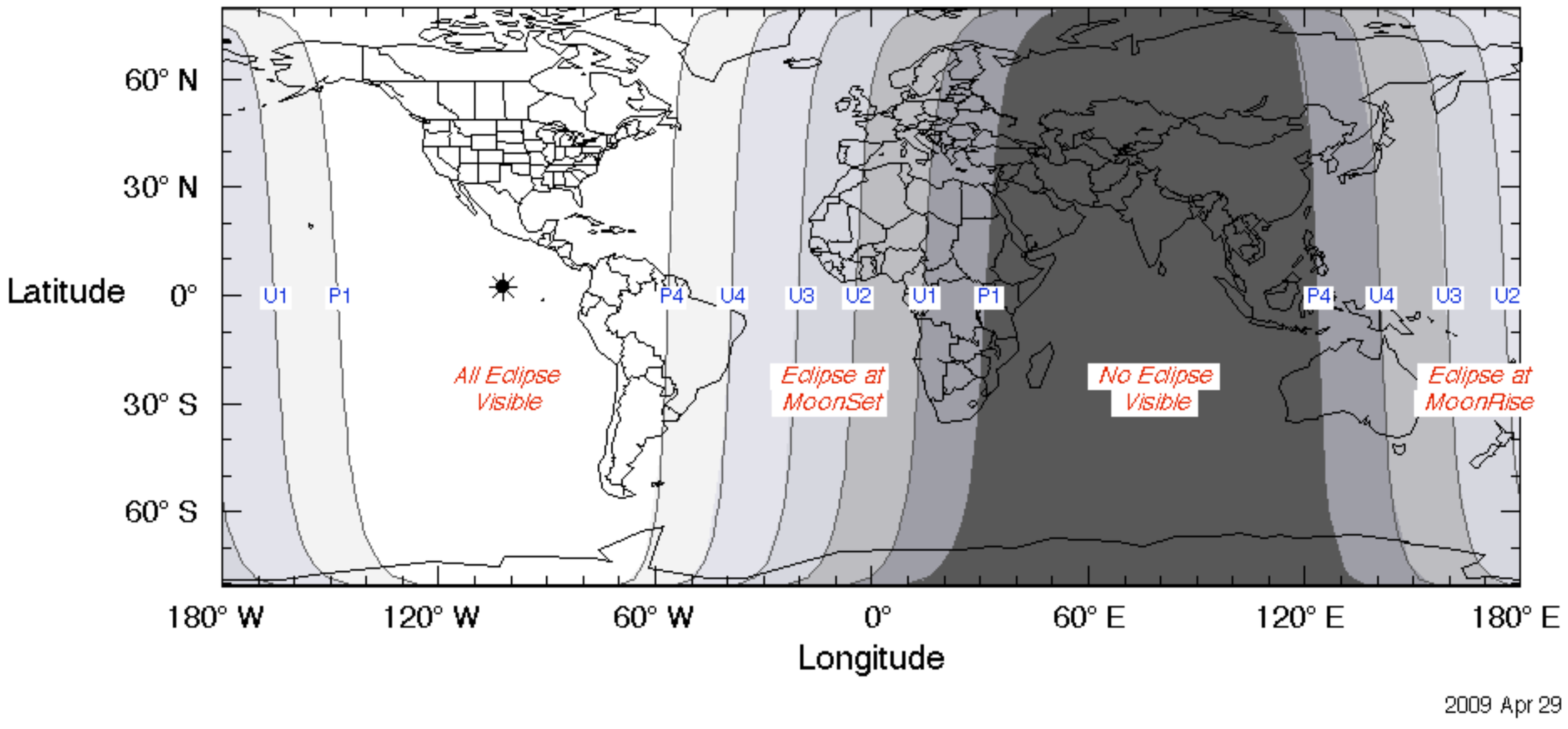
Penumbral = 06h02m37s
Umbral = 03h38m15s
Total = 01h05m24s

ΔT = 75 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html

<u>Eclipse Contacts</u>

P1 = 03:57:24 UT
U1 = 05:09:33 UT
U2 = 06:25:59 UT
U3 = 07:31:23 UT
U4 = 08:47:48 UT
P4 = 10:00:01 UT



2009 Apr 29

Total Lunar Eclipse of 2025 Sep 07

Ecliptic Conjunction = 18:10:03.1 TD (= 18:08:48.3 UT)
Greatest Eclipse = 18:12:57.9 TD (= 18:11:43.1 UT)

Penumbral Magnitude = 2.3440 P. Radius = 1.2655° Gamma = -0.2752
Umbral Magnitude = 1.3619 U. Radius = 0.7364° Axis = 0.2720°

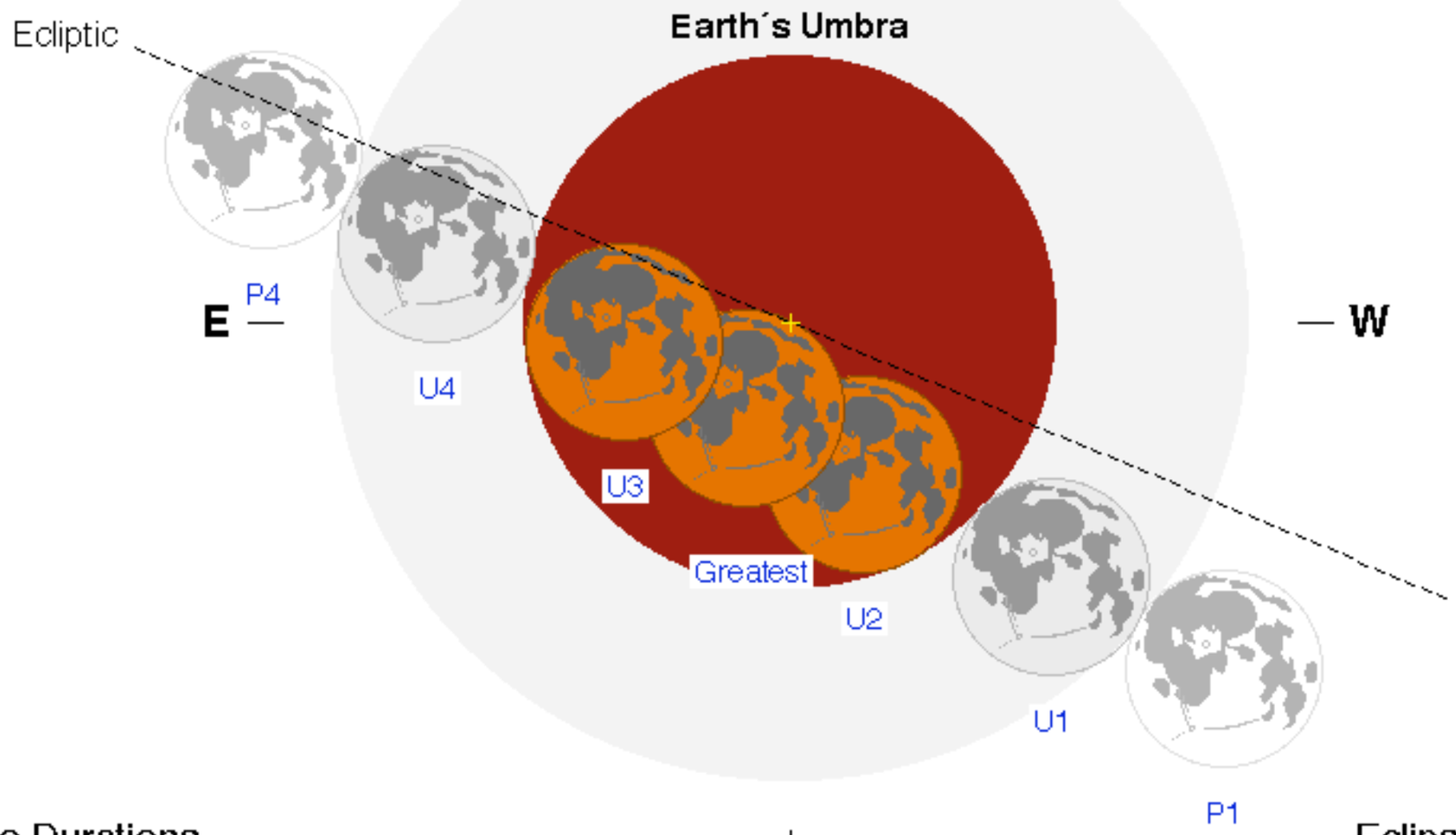
Saros Series = 128 Member = 41 of 71

<u>Sun at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 11h06m09.1s
Dec. = +05°45'47.5"
S.D. = 00°15'52.4"
H.P. = 00°00'08.7"

<u>Moon at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 23h06m40.4s
Dec. = -06°00'08.9"
S.D. = 00°16'09.8"
H.P. = 00°59'19.1"



<u>Eclipse Durations</u>

Penumbral = 05h26m40s
Umbral = 03h29m24s
Total = 01h22m06s

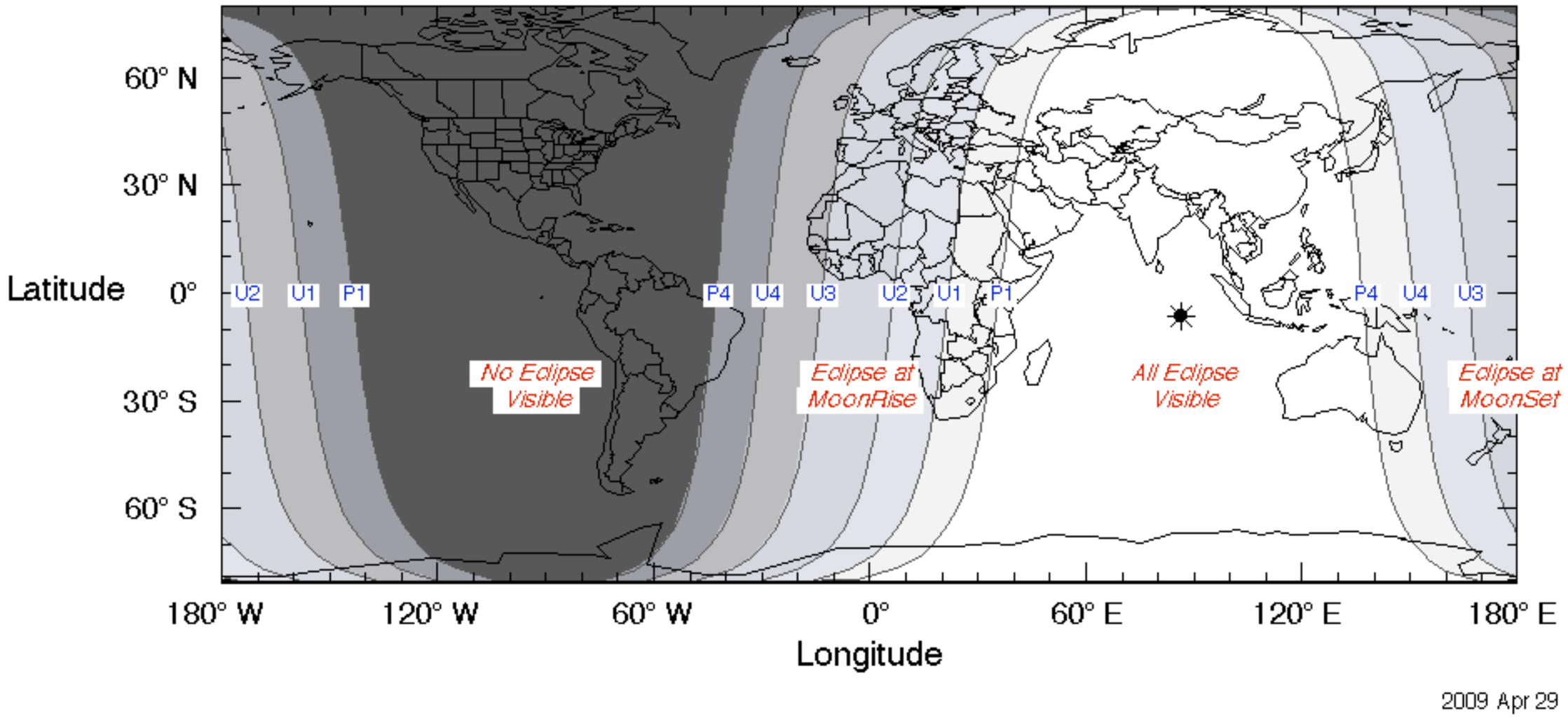
ΔT = 75 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

0 15 30 45 60
Arc-Minutes

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html

<u>Eclipse Contacts</u>

P1 = 15:28:21 UT
U1 = 16:27:02 UT
U2 = 17:30:41 UT
U3 = 18:52:47 UT
U4 = 19:56:26 UT
P4 = 20:55:00 UT



2009 Apr 29

Partial Solar Eclipse of 2025 Mar 29

Geocentric Conjunction = 11:46:09.2 UT J.D. = 2460763.990384
Greatest Eclipse = 10:47:18.4 UT J.D. = 2460763.949519

Eclipse Magnitude = 0.9361 Gamma = 1.0405

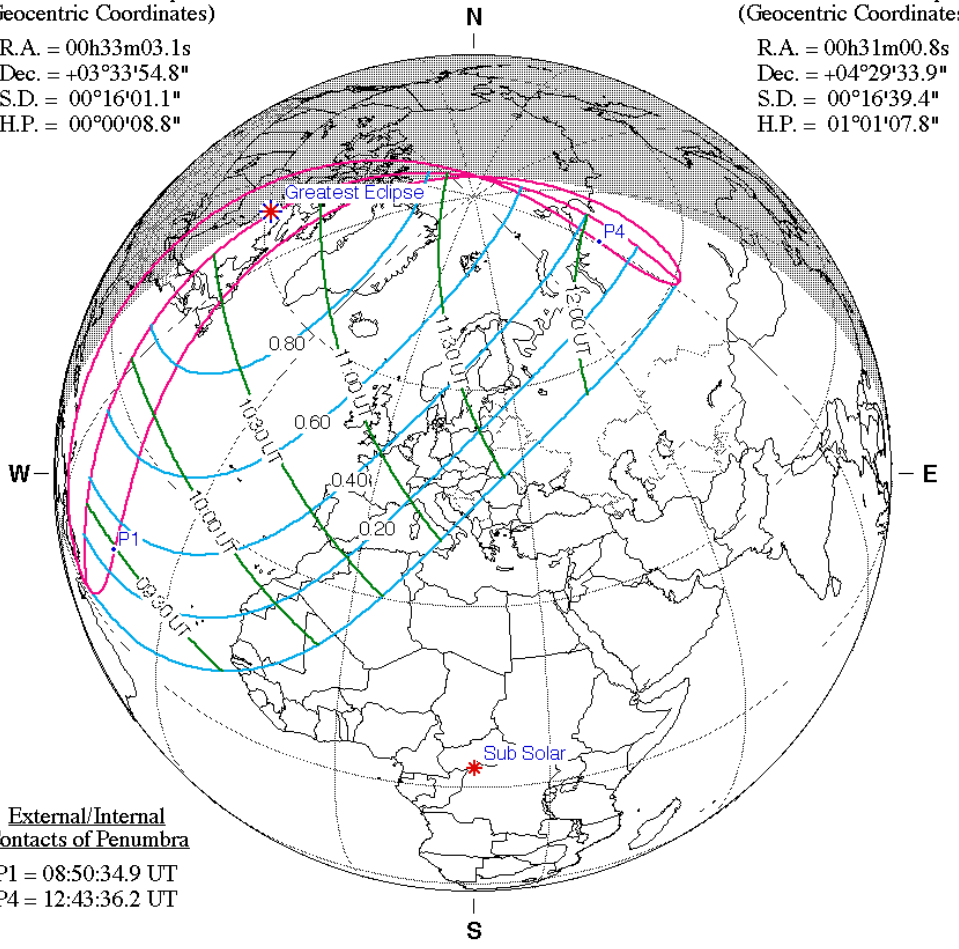
Saros Series = 149 Member = 21 of 71

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 00h33m03.1s
Dec. = +03°33'54.8"
S.D. = 00°16'01.1"
H.P. = 00°00'08.8"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 00h31m00.8s
Dec. = +04°29'33.9"
S.D. = 00°16'39.4"
H.P. = 01°01'07.8"



External/Internal Contacts of Penumbra

P1 = 08:50:34.9 UT
P4 = 12:43:36.2 UT

Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 82.3 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

Geocentric Libration
(Optical + Physical)

l = -2.00°
b = -1.35°
c = -21.73°

Brown Lun. No. = 1265

0 1000 2000 3000 4000 5000
Kilometers

F. Espenak, NASA's GSFC - Fri, Jul 2,
sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Partial Solar Eclipse of 2025 Sep 21

Geocentric Conjunction = 20:50:18.4 UT J.D. = 2460940.368269
Greatest Eclipse = 19:41:43.6 UT J.D. = 2460940.320643

Eclipse Magnitude = 0.8535 Gamma = -1.0652

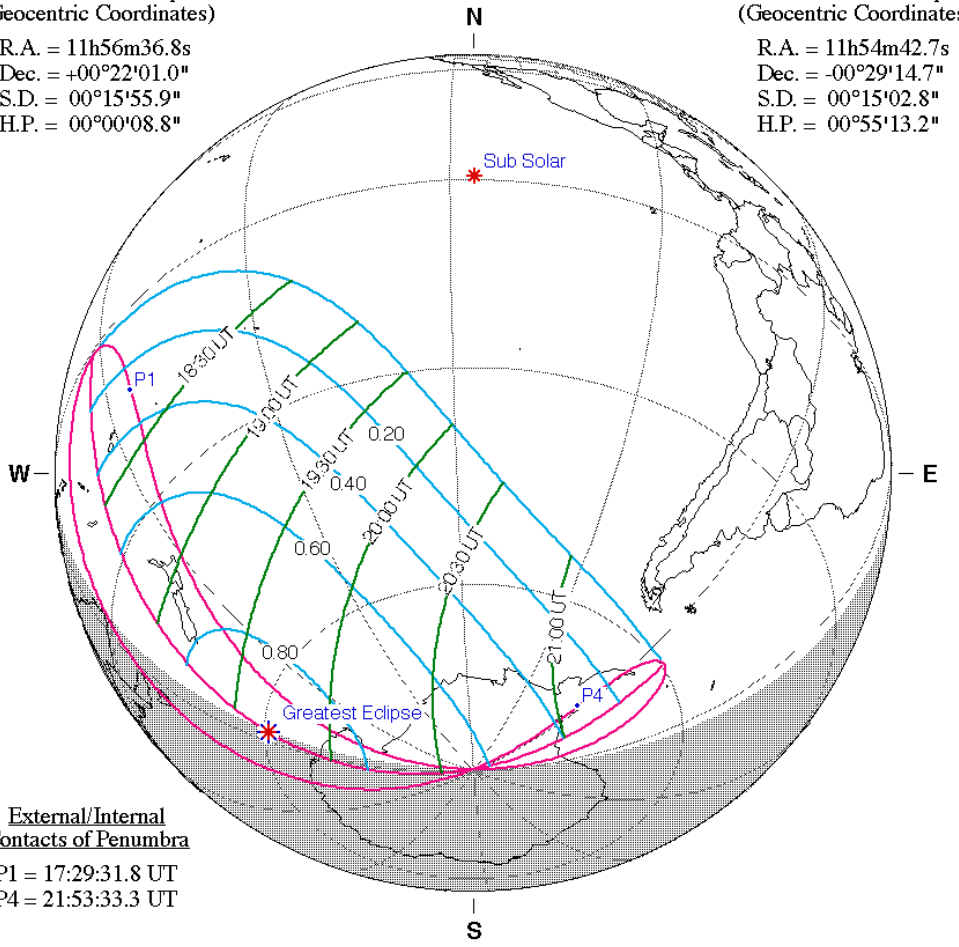
Saros Series = 154 Member = 7 of 71

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 11h56m36.8s
Dec. = +00°22'01.0"
S.D. = 00°15'55.9"
H.P. = 00°00'08.8"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 11h54m42.7s
Dec. = -00°29'14.7"
S.D. = 00°15'02.8"
H.P. = 00°55'13.2"



External/Internal Contacts of Penumbra

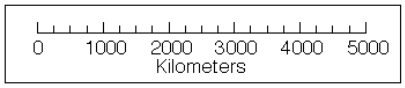
P1 = 17:29:31.8 UT
P4 = 21:53:33.3 UT

Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 82.8 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

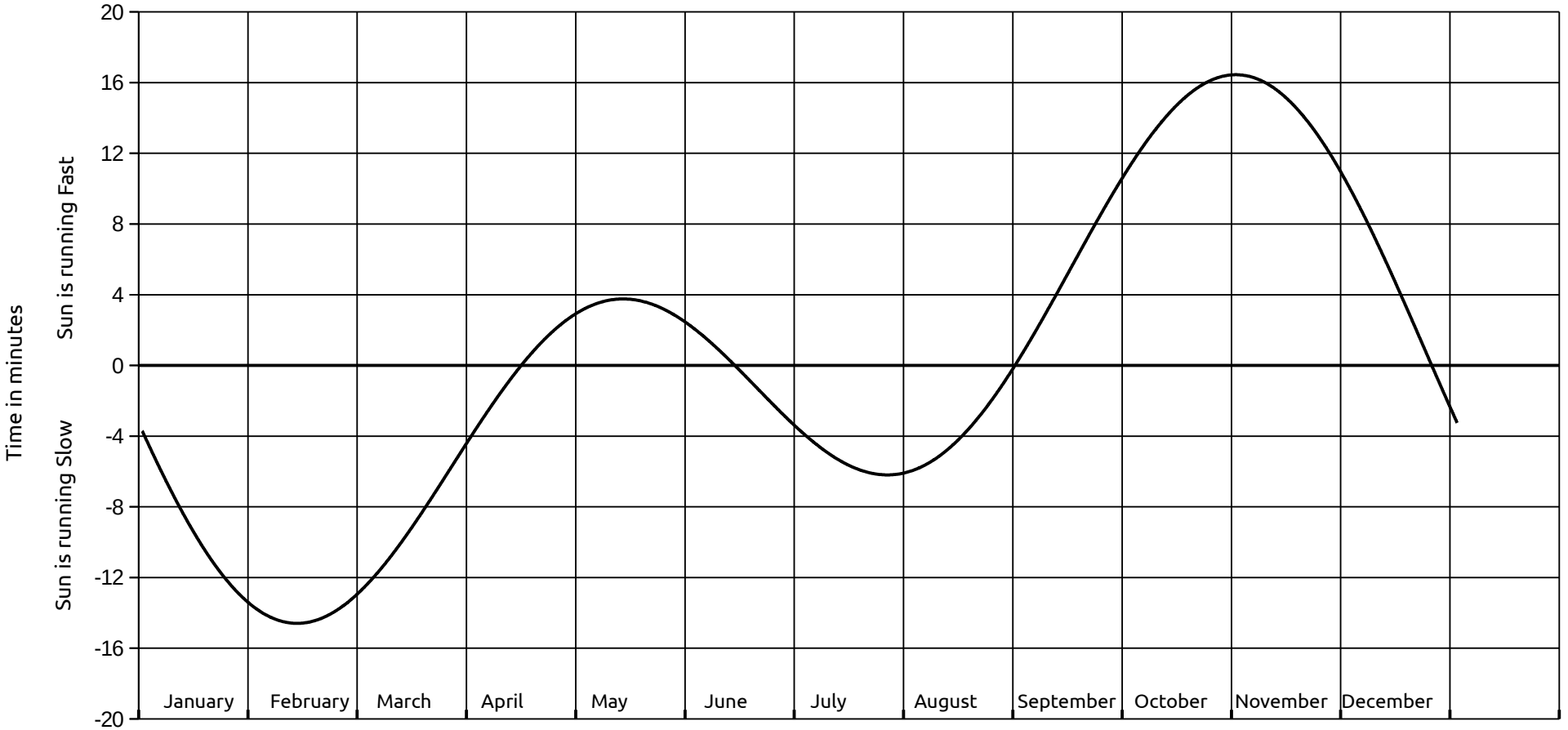
Geocentric Libration
(Optical + Physical)

l = 4.15°
b = 1.31°
c = 21.92°
Brown Lun. No. = 1271



F. Espenak, NASA's GSFC - Fri, Jul 2,
sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Equation of Time
for the Sun



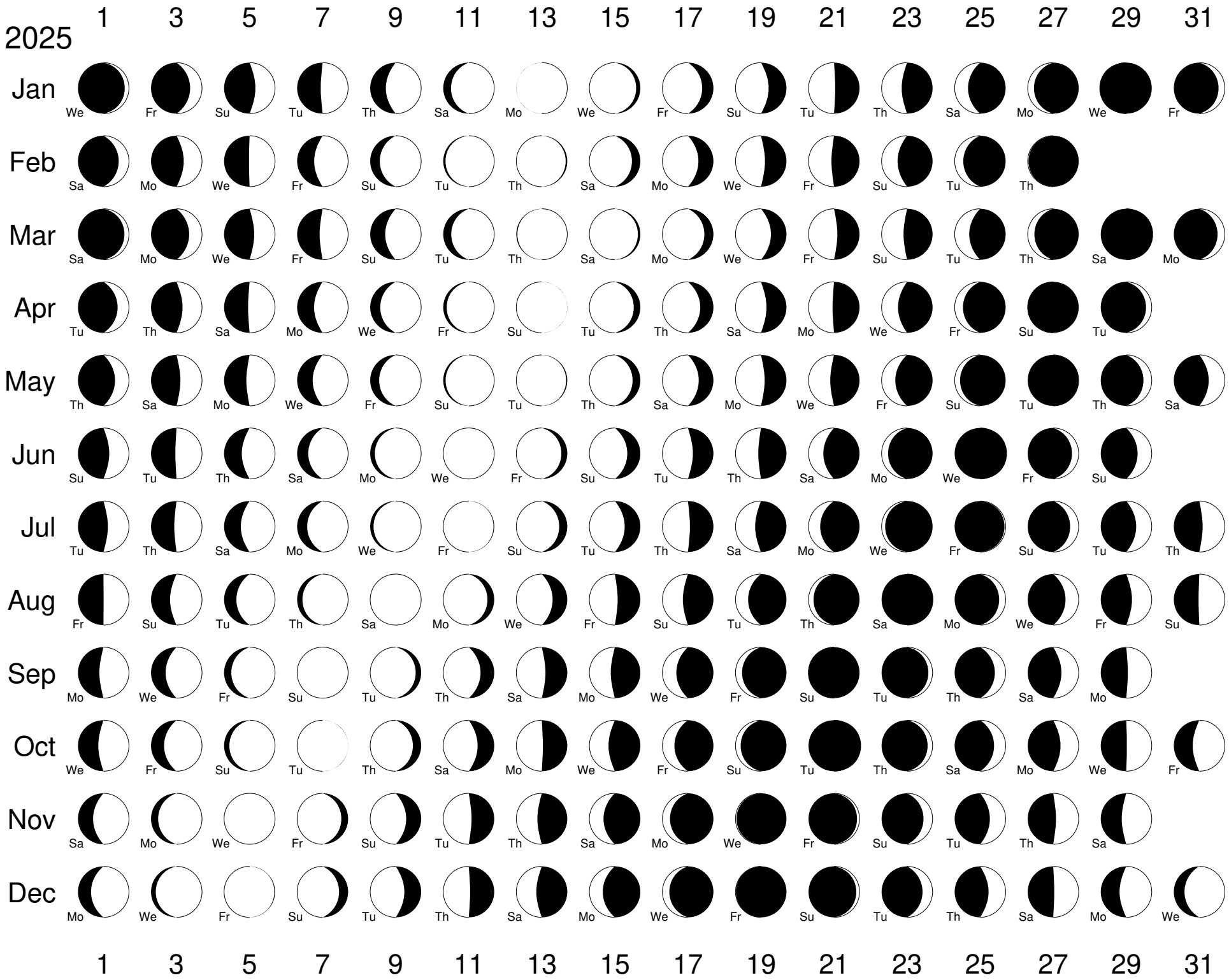
Equation_of_Time_Curve.odt

2025 Moon Phases

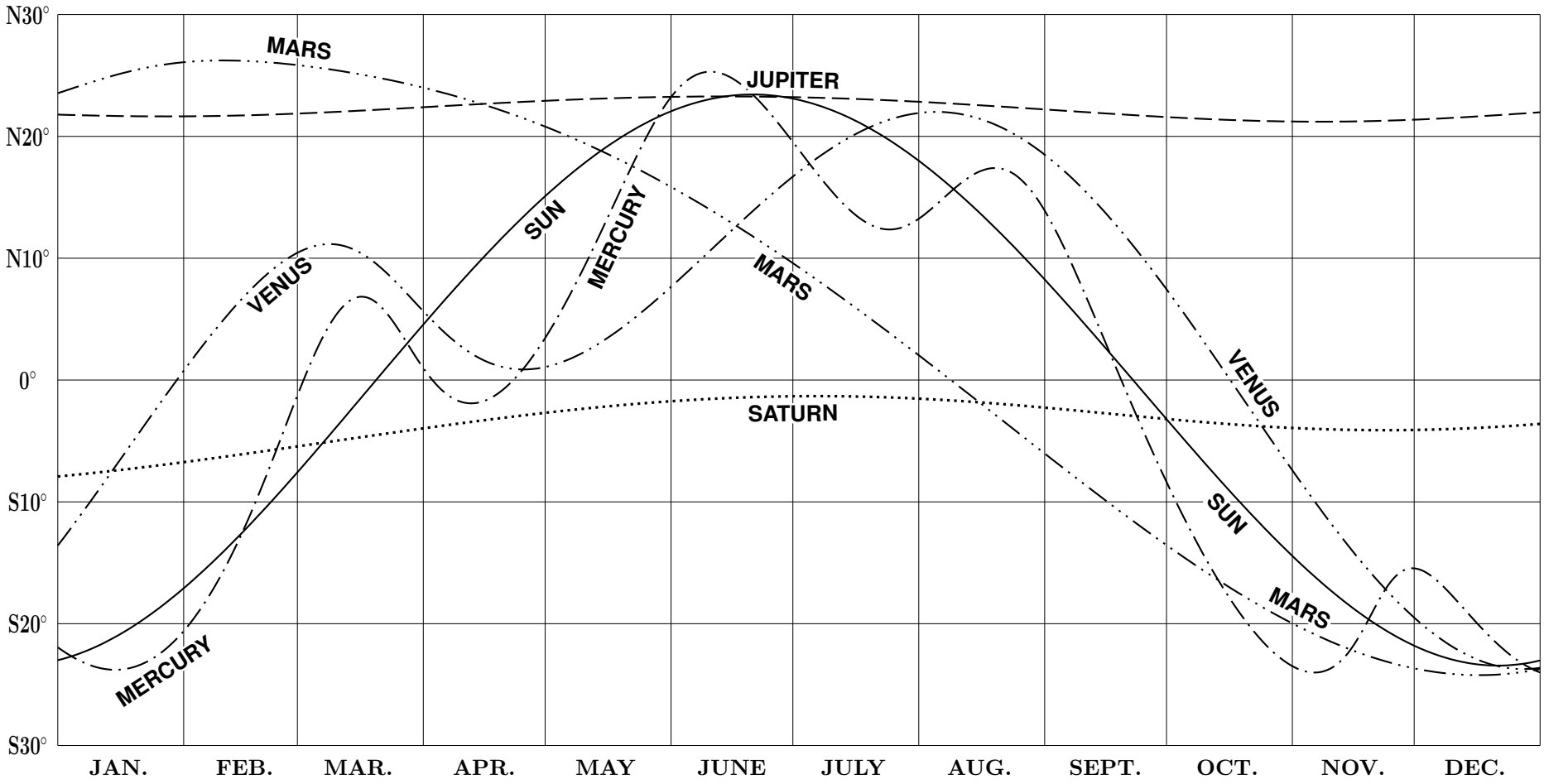
Date and Time (GMT/Universal Time)

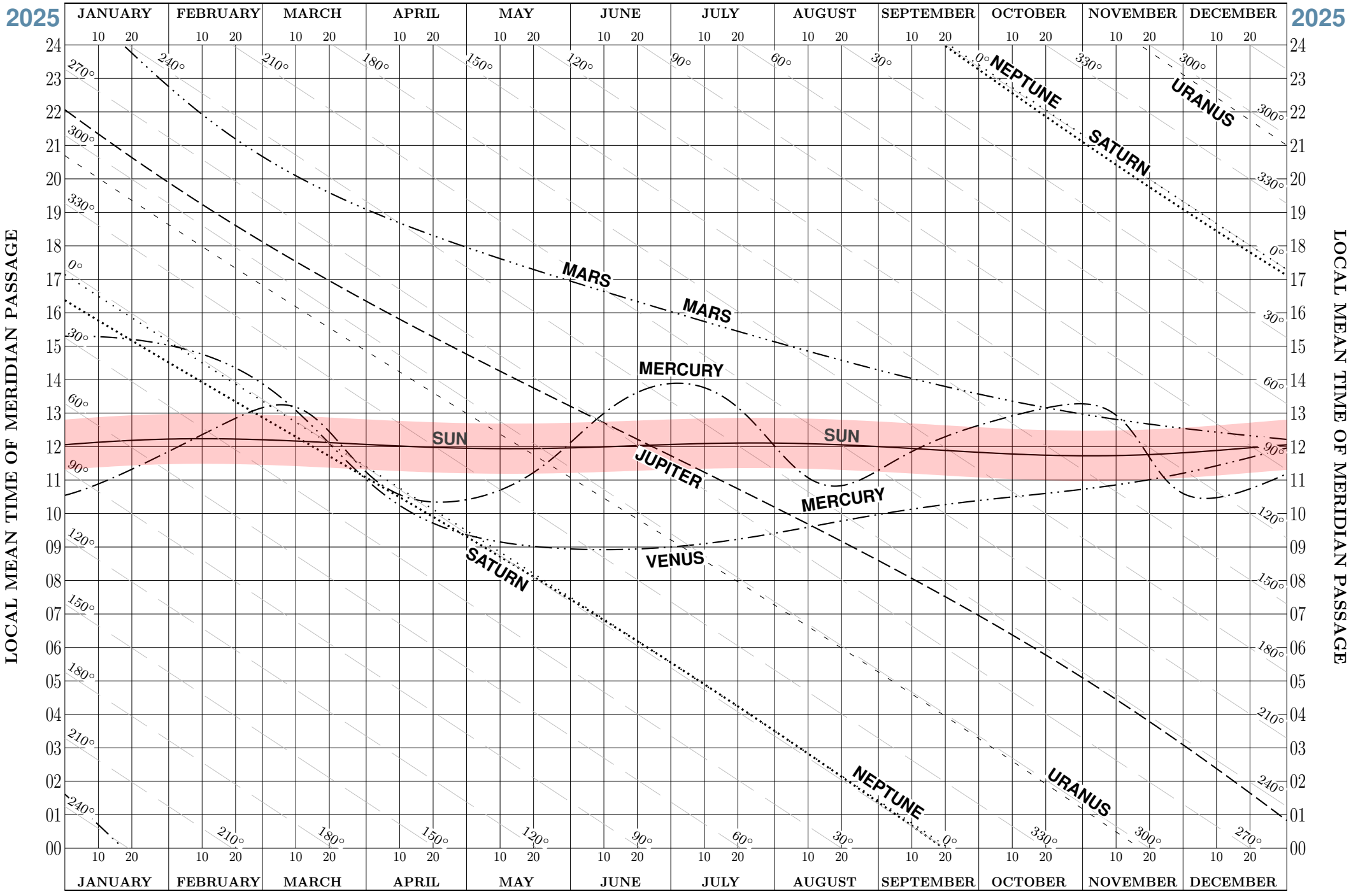
New Moon	First Quarter	Full Moon	Last Quarter
--	January 06 23:56	January 13 22:27	January 21 20:31
January 29 12:36	February 05 08:02	February 12 13:53	February 20 17:32
February 28 00:45	March 06 16:31	March 14 06:55	March 22 11:29
March 29 10:58	April 05 02:15	April 13 00:22	April 21 01:35
April 27 19:31	May 04 13:52	May 12 16:56	May 20 11:59
May 27 03:02	June 03 03:41	June 11 07:44	June 18 19:19
June 25 10:31	July 02 19:30	July 10 20:37	July 18 00:38
July 24 19:11	August 01 12:41	August 09 07:55	August 16 05:12
August 23 06:06	August 31 06:25	September 07 18:09	September 14 10:33
September 21 19:54	September 29 23:54	October 07 03:47	October 13 18:13
October 21 12:25	October 29 16:21	November 05 13:19	November 12 05:28
November 20 06:47	November 28 06:59	December 04 23:14	December 11 20:52
December 20 01:43	December 27 19:10	--	--

Add or subtract your time difference from Greenwich to determine local time and date of Moon phase.


2025
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
Jan We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr
Feb Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th
Mar Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Apr Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
May Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Jun Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Jul Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th
Aug Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Sep Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Oct We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr
Nov Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Dec Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31

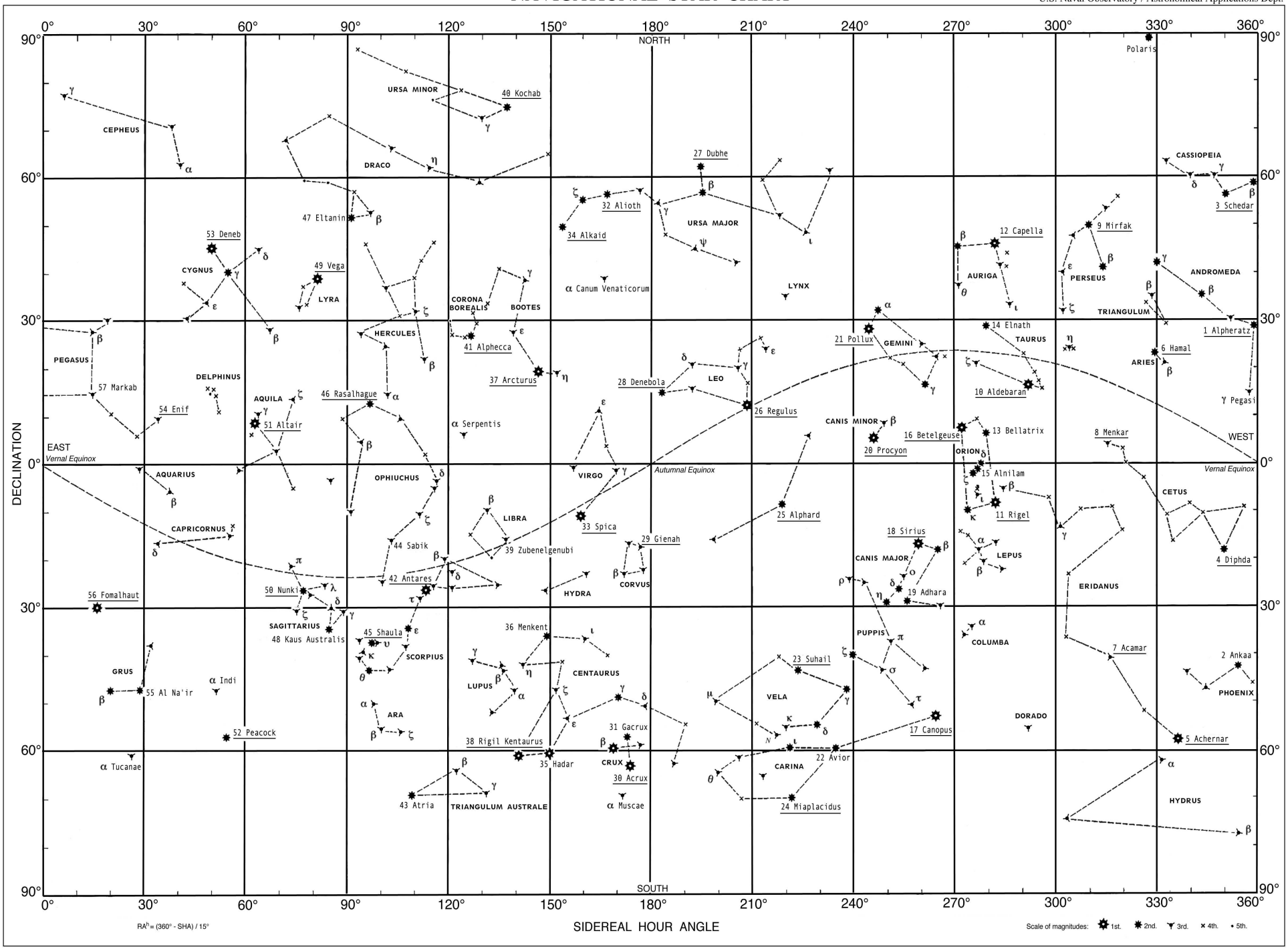
DECLINATION OF SUN AND PLANETS, 2025

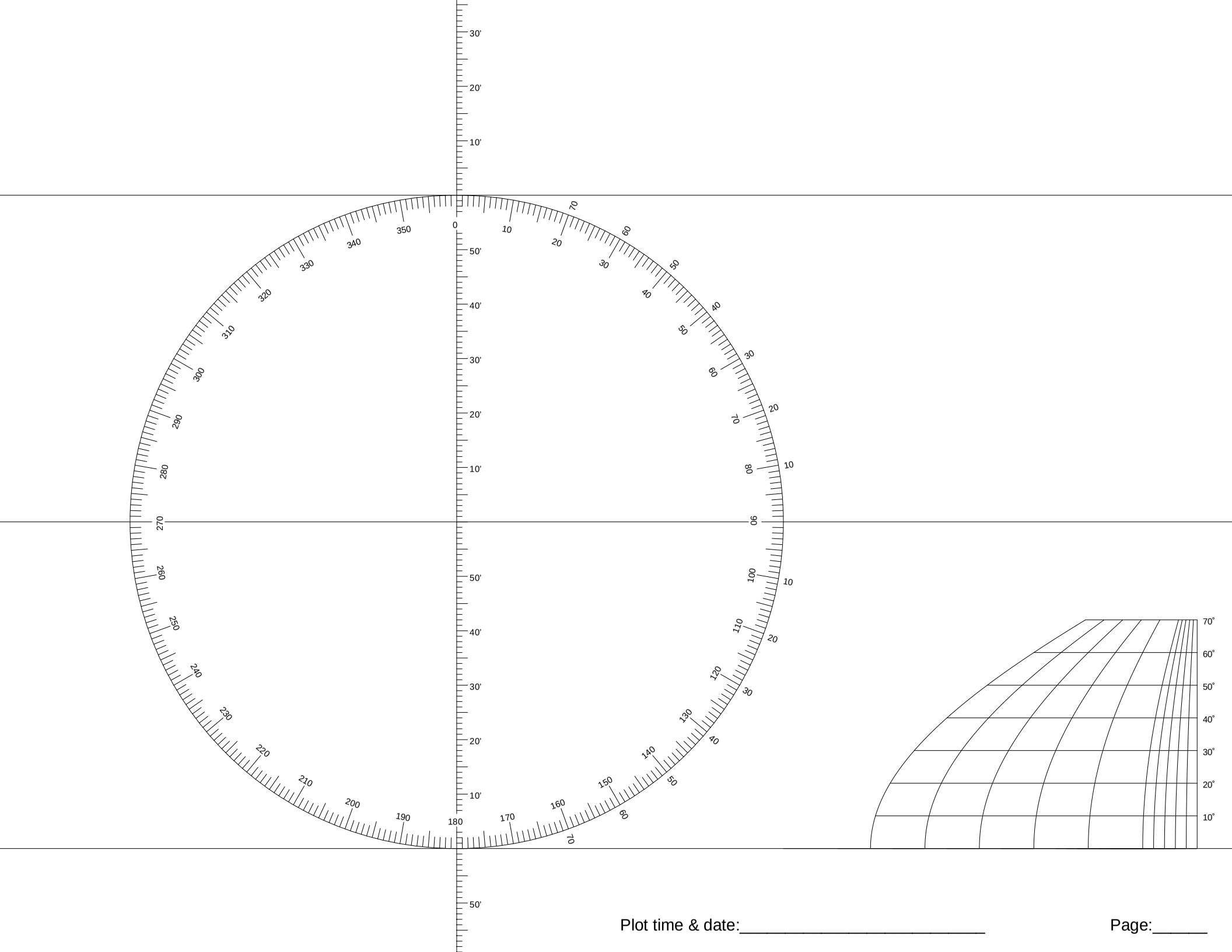



2025
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
LOCAL MEAN TIME OF MERIDIAN PASSAGE
LOCAL MEAN TIME OF MERIDIAN PASSAGE
NEPTUNE
URANUS
SATURN
MARS
MERCURY
SUN
JUPITER
VENUS

NAVIGATIONAL STAR CHART

U.S. Naval Observatory / Astronomical Applications Dept.





Plot time & date:_____

Page:_____