The Nautical Almanac 2021

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. To that end 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

2021

January

wk	Su	M	Tu	W	Th	F	Sa
53						1	2
1	3	4	5	6	7	8	9
2	10	11	12	13	14	15	16
3	17	18	19	20	21	22	23
4	24	25	26	27	28	29	30
5	31						

February

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

March

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

April

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

May

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

June

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

July

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

August

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

September

wk	Su	M	Tu	W	Th	F	Sa
35				1	2	3	4
36	5	6	7	8	9	10	11
37	12	13	14	15	16	17	18
38	19	20	21	22	23	24	25
39	26	27	28	29	30		

October

wk	Su	M	Tu	W	Th	F	Sa
39						1	2
40	3	4	5	6	7	8	9
41	10	11	12	13	14	15	16
42	17	18	19	20	21	22	23
43	24	25	26	27	28	29	30
44	31						

November

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

December

wk	Su	M	Tu	W	Th	F	Sa
48				1	2	3	4
49	5	6	7	8	9	10	11
50	12	13	14	15	16	17	18
51	19	20	21	22	23	24	25
52	26	27	28	29	30	31	

2021

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

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

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

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

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

Day of Month	6 June			
	Day of Week	Day of Year	Days remaining	Week number
1	Tue	152	213	22
2	Wed	153	212	
3	Thu	154	211	
4	Fri	155	210	
5	Sat	156	209	
6	Sun	157	208	23
7	Mon	158	207	
8	Tue	159	206	
9	Wed	160	205	
10	Thu	161	204	
11	Fri	162	203	
12	Sat	163	202	
13	Sun	164	201	24
14	Mon	165	200	
15	Tue	166	199	
16	Wed	167	198	
17	Thu	168	197	
18	Fri	169	196	
19	Sat	170	195	
20	Sun	171	194	25
21	Mon	172	193	
22	Tue	173	192	
23	Wed	174	191	
24	Thu	175	190	
25	Fri	176	189	
26	Sat	177	188	
27	Sun	178	187	26
28	Mon	179	186	
29	Tue	180	185	
30	Wed	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	Thu	182	183	26
2	Fri	183	182	
3	Sat	184	181	
4	Sun	185	180	27
5	Mon	186	179	
6	Tue	187	178	
7	Wed	188	177	
8	Thu	189	176	
9	Fri	190	175	
10	Sat	191	174	
11	Sun	192	173	28
12	Mon	193	172	
13	Tue	194	171	
14	Wed	195	170	
15	Thu	196	169	
16	Fri	197	168	
17	Sat	198	167	
18	Sun	199	166	29
19	Mon	200	165	
20	Tue	201	164	
21	Wed	202	163	
22	Thu	203	162	
23	Fri	204	161	
24	Sat	205	160	
25	Sun	206	159	30
26	Mon	207	158	
27	Tue	208	157	
28	Wed	209	156	
29	Thu	210	155	
30	Fri	211	154	
31	Sat	212	153	

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

Day of Month	9 September			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	244	121	35
2	Thu	245	120	
3	Fri	246	119	
4	Sat	247	118	
5	Sun	248	117	36
6	Mon	249	116	
7	Tue	250	115	
8	Wed	251	114	
9	Thu	252	113	
10	Fri	253	112	
11	Sat	254	111	
12	Sun	255	110	37
13	Mon	256	109	
14	Tue	257	108	
15	Wed	258	107	
16	Thu	259	106	
17	Fri	260	105	
18	Sat	261	104	
19	Sun	262	103	38
20	Mon	263	102	
21	Tue	264	101	
22	Wed	265	100	
23	Thu	266	99	
24	Fri	267	98	
25	Sat	268	97	
26	Sun	269	96	39
27	Mon	270	95	
28	Tue	271	94	
29	Wed	272	93	
30	Thu	273	92	

Day of Month	10 October			
	Day of Week	Day of Year	Days remaining	Week number
1	Fri	274	91	39
2	Sat	275	90	
3	Sun	276	89	40
4	Mon	277	88	
5	Tue	278	87	
6	Wed	279	86	
7	Thu	280	85	
8	Fri	281	84	
9	Sat	282	83	
10	Sun	283	82	41
11	Mon	284	81	
12	Tue	285	80	
13	Wed	286	79	
14	Thu	287	78	
15	Fri	288	77	
16	Sat	289	76	
17	Sun	290	75	42
18	Mon	291	74	
19	Tue	292	73	
20	Wed	293	72	
21	Thu	294	71	
22	Fri	295	70	
23	Sat	296	69	
24	Sun	297	68	43
25	Mon	298	67	
26	Tue	299	66	
27	Wed	300	65	
28	Thu	301	64	
29	Fri	302	63	
30	Sat	303	62	
31	Sun	304	61	44

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

Day of Month	12 December			
	Day of Week	Day of Year	Days remaining	Week number
1	Wed	335	30	48
2	Thu	336	29	
3	Fri	337	28	
4	Sat	338	27	
5	Sun	339	26	49
6	Mon	340	25	
7	Tue	341	24	
8	Wed	342	23	
9	Thu	343	22	
10	Fri	344	21	
11	Sat	345	20	
12	Sun	346	19	50
13	Mon	347	18	
14	Tue	348	17	
15	Wed	349	16	
16	Thu	350	15	
17	Fri	351	14	
18	Sat	352	13	
19	Sun	353	12	51
20	Mon	354	11	
21	Tue	355	10	
22	Wed	356	9	
23	Thu	357	8	
24	Fri	358	7	
25	Sat	359	6	
26	Sun	360	5	52
27	Mon	361	4	
28	Tue	362	3	
29	Wed	363	2	
30	Thu	364	1	
31	Fri	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

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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.

Wednesday, February 24, 2021

Explanation_of_The_Nautical_Almanac_Daily_Pages.odt

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	▭

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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 (Fri., Sat., Sun.)

DUT1 = UT1-UTC = -0.1753 sec ΔT = TT-UT1 = +69.3593 sec

2021 January 01 to Jan. 03 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°51.9	201°14.8	S22°26.0	75°47.3	N11°20.7	155°40.7	S20°00.7	156°54.3	S20°10.5
1	115°54.3	216°13.9	26.4	90°48.8	21.1	170°42.6	00.6	171°56.4	10.4
2	130°56.8	231°13.0	26.7	105°50.3	21.6	185°44.5	00.5	186°58.6	10.4
3	145°59.3	246°12.0	·· 27.0	120°51.7	·· 22.0	200°46.3	·· 00.4	202°00.8	·· 10.3
4	161°01.7	261°11.1	27.3	135°53.2	22.4	215°48.2	00.2	217°02.9	10.2
5	176°04.2	276°10.2	27.6	150°54.6	22.9	230°50.1	00.1	232°05.1	10.2
6	191°06.7	291°09.3	S22°28.0	165°56.1	N11°23.3	245°52.0	S20°00.0	247°07.3	S20°10.1
7	206°09.1	306°08.4	28.3	180°57.5	23.7	260°53.8	19°59.8	262°09.4	10.1
8	221°11.6	321°07.5	28.6	195°59.0	24.2	275°55.7	59.7	277°11.6	10.0
9	236°14.1	336°06.6	·· 28.9	211°00.4	·· 24.6	290°57.6	·· 59.6	292°13.8	·· 09.9
10	251°16.5	351°05.7	29.2	226°01.9	25.0	305°59.4	59.5	307°16.0	09.9
11	266°19.0	6°04.8	29.6	241°03.3	25.5	321°01.3	59.3	322°18.1	09.8
12	281°21.4	21°03.9	S22°29.9	256°04.8	N11°25.9	336°03.2	S19°59.2	337°20.3	S20°09.7
13	296°23.9	36°03.0	30.2	271°06.2	26.3	351°05.1	59.1	352°22.5	09.7
14	311°26.4	51°02.1	30.5	286°07.7	26.8	6°06.9	58.9	7°24.6	09.6
15	326°28.8	66°01.1	·· 30.8	301°09.1	·· 27.2	21°08.8	·· 58.8	22°26.8	·· 09.6
16	341°31.3	81°00.2	31.1	316°10.6	27.7	36°10.7	58.7	37°29.0	09.5
17	356°33.8	95°59.3	31.4	331°12.0	28.1	51°12.5	58.6	52°31.1	09.4
18	11°36.2	110°58.4	S22°31.7	346°13.5	N11°28.5	66°14.4	S19°58.4	67°33.3	S20°09.4
19	26°38.7	125°57.5	32.0	1°14.9	29.0	81°16.3	58.3	82°35.5	09.3
20	41°41.2	140°56.6	32.3	16°16.3	29.4	96°18.2	58.2	97°37.6	09.3
21	56°43.6	155°55.7	·· 32.6	31°17.8	·· 29.8	111°20.0	·· 58.0	112°39.8	·· 09.2
22	71°46.1	170°54.8	32.9	46°19.2	30.3	126°21.9	57.9	127°42.0	09.1
23	86°48.6	185°53.9	33.2	61°20.7	30.7	141°23.8	57.8	142°44.1	09.1
Mer.pass.	17:14	ν -0.9′	d 0.3′	m -3.90	ν 1.5′	d 0.4′	m -0.25	ν 1.9′	d -0.1′ m -1.97	ν 2.2′	d -0.1′ m 0.68

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	101°51.0	200°52.9	S22°33.5	76°22.1	N11°31.1	156°25.6	S19°57.6	157°46.3	S20°09.0
1	116°53.5	215°52.0	33.8	91°23.6	31.6	171°27.5	57.5	172°48.5	09.0
2	131°55.9	230°51.1	34.1	106°25.0	32.0	186°29.4	57.4	187°50.6	08.9
3	146°58.4	245°50.2	·· 34.4	121°26.4	·· 32.5	201°31.3	·· 57.3	202°52.8	·· 08.8
4	162°00.9	260°49.3	34.7	136°27.9	32.9	216°33.1	57.1	217°55.0	08.8
5	177°03.3	275°48.4	35.0	151°29.3	33.3	231°35.0	57.0	232°57.1	08.7
6	192°05.8	290°47.5	S22°35.3	166°30.8	N11°33.8	246°36.9	S19°56.9	247°59.3	S20°08.6
7	207°08.3	305°46.6	35.6	181°32.2	34.2	261°38.7	56.7	263°01.5	08.6
8	222°10.7	320°45.6	35.9	196°33.6	34.6	276°40.6	56.6	278°03.6	08.5
9	237°13.2	335°44.7	·· 36.2	211°35.1	·· 35.1	291°42.5	·· 56.5	293°05.8	·· 08.5
10	252°15.7	350°43.8	36.5	226°36.5	35.5	306°44.4	56.4	308°08.0	08.4
11	267°18.1	5°42.9	36.8	241°38.0	35.9	321°46.2	56.2	323°10.1	08.3
12	282°20.6	20°42.0	S22°37.1	256°39.4	N11°36.4	336°48.1	S19°56.1	338°12.3	S20°08.3
13	297°23.1	35°41.1	37.3	271°40.8	36.8	351°50.0	56.0	353°14.5	08.2
14	312°25.5	50°40.1	37.6	286°42.3	37.3	6°51.8	55.8	8°16.6	08.2
15	327°28.0	65°39.2	·· 37.9	301°43.7	·· 37.7	21°53.7	·· 55.7	23°18.8	·· 08.1
16	342°30.4	80°38.3	38.2	316°45.1	38.1	36°55.6	55.6	38°21.0	08.0
17	357°32.9	95°37.4	38.5	331°46.6	38.6	51°57.5	55.4	53°23.1	08.0
18	12°35.4	110°36.5	S22°38.7	346°48.0	N11°39.0	66°59.3	S19°55.3	68°25.3	S20°07.9
19	27°37.8	125°35.6	39.0	1°49.4	39.4	82°01.2	55.2	83°27.5	07.8
20	42°40.3	140°34.6	39.3	16°50.9	39.9	97°03.1	55.1	98°29.6	07.8
21	57°42.8	155°33.7	·· 39.6	31°52.3	·· 40.3	112°04.9	·· 54.9	113°31.8	·· 07.7
22	72°45.2	170°32.8	39.8	46°53.7	40.8	127°06.8	54.8	128°34.0	07.7
23	87°47.7	185°31.9	40.1	61°55.2	41.2	142°08.7	54.7	143°36.1	07.6
Mer.pass.	17:10	ν -0.9′	d 0.3′	m -3.90	ν 1.4′	d 0.4′	m -0.22	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.68

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	102°50.2	200°31.0	S22°40.4	76°56.6	N11°41.6	157°10.5	S19°54.5	158°38.3	S20°07.5
1	117°52.6	215°30.1	40.7	91°58.0	42.1	172°12.4	54.4	173°40.4	07.5
2	132°55.1	230°29.1	40.9	106°59.4	42.5	187°14.3	54.3	188°42.6	07.4
3	147°57.5	245°28.2	·· 41.2	122°00.9	·· 43.0	202°16.2	·· 54.1	203°44.8	·· 07.4
4	163°00.0	260°27.3	41.5	137°02.3	43.4	217°18.0	54.0	218°46.9	07.3
5	178°02.5	275°26.4	41.7	152°03.7	43.8	232°19.9	53.9	233°49.1	07.2
6	193°04.9	290°25.5	S22°42.0	167°05.2	N11°44.3	247°21.8	S19°53.7	248°51.3	S20°07.2
7	208°07.4	305°24.5	42.3	182°06.6	44.7	262°23.6	53.6	263°53.4	07.1
8	223°09.9	320°23.6	42.5	197°08.0	45.1	277°25.5	53.5	278°55.6	07.0
9	238°12.3	335°22.7	·· 42.8	212°09.4	·· 45.6	292°27.4	·· 53.4	293°57.8	·· 07.0
10	253°14.8	350°21.8	43.0	227°10.9	46.0	307°29.2	53.2	308°59.9	06.9
11	268°17.3	5°20.9	43.3	242°12.3	46.5	322°31.1	53.1	324°02.1	06.9
12	283°19.7	20°19.9	S22°43.6	257°13.7	N11°46.9	337°33.0	S19°53.0	339°04.3	S20°06.8
13	298°22.2	35°19.0	43.8	272°15.1	47.3	352°34.9	52.8	354°06.4	06.7
14	313°24.7	50°18.1	44.1	287°16.6	47.8	7°36.7	52.7	9°08.6	06.7
15	328°27.1	65°17.2	·· 44.3	302°18.0	·· 48.2	22°38.6	·· 52.6	24°10.8	·· 06.6
16	343°29.6	80°16.2	44.6	317°19.4	48.7	37°40.5	52.4	39°12.9	06.5
17	358°32.0	95°15.3	44.8	332°20.8	49.1	52°42.3	52.3	54°15.1	06.5
18	13°34.5	110°14.4	S22°45.1	347°22.2	N11°49.5	67°44.2	S19°52.2	69°17.3	S20°06.4
19	28°37.0	125°13.5	45.3	2°23.7	50.0	82°46.1	52.0	84°19.4	06.4
20	43°39.4	140°12.6	45.6	17°25.1	50.4	97°47.9	51.9	99°21.6	06.3
21	58°41.9	155°11.6	·· 45.8	32°26.5	·· 50.9	112°49.8	·· 51.8	114°23.8	·· 06.2
22	73°44.4	170°10.7	46.1	47°27.9	51.3	127°51.7	51.6	129°25.9	06.2
23	88°46.8	185°09.8	46.3	62°29.3	51.7	142°53.5	51.5	144°28.1	06.1
Mer.pass.	17:06	ν -0.9′	d 0.3′	m -3.91	ν 1.4′	d 0.4′	m -0.20	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.6	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.6	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°13.0	89°21.3
Acamar	315°14.1	-40°13.5
Menkar	314°09.4	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.0	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.0	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.4	-59°34.5
Suhail	222°48.3	-43°30.9
Miaplacidus	221°38.0	-69°48.0
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.8
Dubhe	193°44.9	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.9	-17°39.3
Acrux	173°03.5	-63°12.5
Gacrux	171°55.1	-57°13.5
Alioth	166°16.0	55°50.6
Spica	158°25.8	-11°16.1
Alkaid	152°54.8	49°12.4
Hadar	148°40.8	-60°28.0
Menkent	148°01.6	-36°28.1
Arcturus	145°51.1	19°04.4
Rigil Kent.	139°45.0	-60°54.9
Kochab	137°20.6	74°03.9
Zuben'ubi	136°59.8	-16°07.6
Alphecca	126°06.8	26°38.6
Antares	112°20.1	-26°28.5
Atria	107°17.8	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.2	-37°07.0
Rasalhague	96°01.9	12°32.7
Eltanin	90°44.2	51°29.1
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.4	45°21.4
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.1

Jan 01 Fri	SHA	Mer.pass
Venus	100°22.9	10:36
Mars	334°55.5	18:55
Jupiter	54°48.8	13:36
Saturn	56°02.4	13:30

Jan 02 Sat	SHA	Mer.pass
Venus	99°01.9	10:37
Mars	334°31.1	18:53
Jupiter	54°34.6	13:33
Saturn	55°55.3	13:27

Jan 03 Sun	SHA	Mer.pass
Venus	97°40.8	10:39
Mars	334°06.4	18:50
Jupiter	54°20.4	13:30
Saturn	55°48.1	13:24

Horizontal parallax	
Venus:	0.1
Mars:	0.2

	h	Sun		Moon				
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		179°08.5	S23°00.0	334°57.7	8.5′	N23°01.4	-5.6′	56.7′
1		194°08.2	22°59.7	349°25.2	8.5′	22°55.8	-5.7′	56.7′
2		209°07.9	59.5	3°52.7	8.5′	22°50.1	-5.8′	56.7′
3		224°07.6	·· 59.3	18°20.2	8.5′	22°44.3	-6.0′	56.7′
4		239°07.3	59.1	32°47.7	8.6′	22°38.3	-6.1′	56.7′
5		254°07.0	58.9	47°15.3	8.6′	22°32.3	-6.2′	56.8′
6		269°06.7	S22°58.7	61°42.9	8.6′	N22°26.0	-6.3′	56.8′
7		284°06.4	58.5	76°10.6	8.7′	22°19.7	-6.5′	56.8′
8		299°06.1	58.3	90°38.2	8.7′	22°13.2	-6.6′	56.8′
9		314°05.8	·· 58.1	105°05.9	8.7′	22°06.6	-6.7′	56.8′
10		329°05.5	57.9	119°33.7	8.8′	21°59.9	-6.8′	56.9′
11		344°05.3	57.6	134°01.4	8.8′	21°53.1	-7.0′	56.9′
12		359°05.0	S22°57.4	148°29.2	8.8′	N21°46.1	-7.1′	56.9′
13		14°04.7	57.2	162°57.1	8.9′	21°39.0	-7.2′	56.9′
14		29°04.4	57.0	177°24.9	8.9′	21°31.8	-7.3′	56.9′
15		44°04.1	·· 56.8	191°52.8	8.9′	21°24.4	-7.5′	57.0′
16		59°03.8	56.6	206°20.8	9.0′	21°17.0	-7.6′	57.0′
17		74°03.5	56.3	220°48.8	9.0′	21°09.4	-7.7′	57.0′
18		89°03.2	S22°56.1	235°16.8	9.1′	N21°01.7	-7.8′	57.0′
19		104°02.9	55.9	249°44.8	9.1′	20°53.8	-8.0′	57.0′
20		119°02.6	55.7	264°12.9	9.1′	20°45.9	-8.1′	57.1′
21		134°02.3	·· 55.5	278°41.1	9.2′	20°37.8	-8.2′	57.1′
22		149°02.0	55.2	293°09.2	9.2′	20°29.6	-8.3′	57.1′
23		164°01.7	55.0	307°37.5	9.3′	20°21.3	-8.4′	57.1′
		SD = 16.3′	d = -0.2′	SD = 15.5′				

Sat	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°01.5	S22°54.8	322°05.7	9.3′	N20°12.9	-8.5′	57.1′
1		194°01.2	54.6	336°34.0	9.3′	20°04.4	-8.7′	57.2′
2		209°00.9	54.3	351°02.4	9.4′	19°55.7	-8.8′	57.2′
3		224°00.6	·· 54.1	5°30.7	9.4′	19°47.0	-8.9′	57.2′
4		239°00.3	53.9	19°59.2	9.5′	19°38.1	-9.0′	57.2′
5		254°00.0	53.6	34°27.6	9.5′	19°29.1	-9.1′	57.2′
6		268°59.7	S22°53.4	48°56.1	9.6′	N19°20.0	-9.2′	57.3′
7		283°59.4	53.2	63°24.7	9.6′	19°10.8	-9.3′	57.3′
8		298°59.1	53.0	77°53.3	9.6′	19°01.5	-9.4′	57.3′
9		313°58.8	·· 52.7	92°21.9	9.7′	18°52.0	-9.5′	57.3′
10		328°58.6	52.5	106°50.6	9.7′	18°42.5	-9.6′	57.3′
11		343°58.3	52.3	121°19.4	9.8′	18°32.9	-9.7′	57.4′
12		358°58.0	S22°52.0	135°48.1	9.8′	N18°23.1	-9.9′	57.4′
13		13°57.7	51.8	150°16.9	9.9′	18°13.2	-10.0′	57.4′
14		28°57.4	51.6	164°45.8	9.9′	18°03.3	-10.1′	57.4′
15		43°57.1	·· 51.3	179°14.7	10.0′	17°53.2	-10.2′	57.4′
16		58°56.8	51.1	193°43.7	10.0′	17°43.1	-10.3′	57.5′
17		73°56.5	50.8	208°12.7	10.0′	17°32.8	-10.4′	57.5′
18		88°56.2	S22°50.6	222°41.7	10.1′	N17°22.4	-10.5′	57.5′
19		103°56.0	50.4	237°10.8	10.1′	17°12.0	-10.6′	57.5′
20		118°55.7	50.1	251°39.9	10.2′	17°01.4	-10.7′	57.5′
21		133°55.4	·· 49.9	266°09.1	10.2′	16°50.8	-10.7′	57.5′
22		148°55.1	49.6	280°38.3	10.3′	16°40.0	-10.8′	57.6′
23		163°54.8	49.4	295°07.6	10.3′	16°29.2	-10.9′	57.6′
		SD = 16.3′	d = -0.2′	SD = 15.6′				

Sun	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		178°54.5	S22°49.2	309°36.9	10.3′	N16°18.2	-11.0′	57.6′
1		193°54.2	48.9	324°06.2	10.4′	16°07.2	-11.1′	57.6′
2		208°53.9	48.7	338°35.6	10.4′	15°56.1	-11.2′	57.6′
3		223°53.7	·· 48.4	353°05.0	10.5′	15°44.9	-11.3′	57.7′
4		238°53.4	48.2	7°34.5	10.5′	15°33.6	-11.4′	57.7′
5		253°53.1	47.9	22°04.0	10.6′	15°22.2	-11.5′	57.7′
6		268°52.8	S22°47.7	36°33.6	10.6′	N15°10.7	-11.6′	57.7′
7		283°52.5	47.4	51°03.2	10.6′	14°59.2	-11.6′	57.7′
8		298°52.2	47.2	65°32.8	10.7′	14°47.5	-11.7′	57.8′
9		313°51.9	·· 46.9	80°02.5	10.7′	14°35.8	-11.8′	57.8′
10		328°51.7	46.7	94°32.2	10.8′	14°24.0	-11.9′	57.8′
11		343°51.4	46.4	109°02.0	10.8′	14°12.1	-12.0′	57.8′
12		358°51.1	S22°46.2	123°31.8	10.8′	N14°00.1	-12.1′	57.8′
13		13°50.8	45.9	138°01.6	10.9′	13°48.0	-12.1′	57.8′
14		28°50.5	45.7	152°31.5	10.9′	13°35.9	-12.2′	57.9′
15		43°50.2	·· 45.4	167°01.4	11.0′	13°23.7	-12.3′	57.9′
16		58°49.9	45.2	181°31.4	11.0′	13°11.4	-12.4′	57.9′
17		73°49.7	44.9	196°01.4	11.0′	12°59.0	-12.4′	57.9′
18		88°49.4	S22°44.6	210°31.4	11.1′	N12°46.6	-12.5′	57.9′
19		103°49.1	44.4	225°01.4	11.1′	12°34.1	-12.6′	58.0′
20		118°48.8	44.1	239°31.5	11.1′	12°21.5	-12.7′	58.0′
21		133°48.5	·· 43.9	254°01.7	11.2′	12°08.9	-12.7′	58.0′
22		148°48.2	43.6	268°31.8	11.2′	11°56.1	-12.8′	58.0′
23		163°48.0	43.3	283°02.0	11.2′	11°43.4	-12.9′	58.0′
		SD = 16.3′	d = -0.2′	SD = 15.7′				

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

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 18-20 96-84%
01	03:26	03:40	12:04	01:44	14:11	
02	03:54	04:08	12:04	02:37	15:03	
03	04:22	04:36	12:05	03:29	15:54	

DUT1 = UT1-UTC = -0.1743 sec ΔT = TT-UT1 = +69.3583 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	103°49.3	200°08.9	S22°46.6	77°30.8	N11°52.2	157°55.4	S19°51.4	159°30.3	S20°06.1
1	118°51.8	215°07.9	46.8	92°32.2	52.6	172°57.3	51.3	174°32.4	06.0
2	133°54.2	230°07.0	47.0	107°33.6	53.1	187°59.2	51.1	189°34.6	05.9
3	148°56.7	245°06.1	·· 47.3	122°35.0	·· 53.5	203°01.0	·· 51.0	204°36.7	·· 05.9
4	163°59.2	260°05.2	47.5	137°36.4	53.9	218°02.9	50.9	219°38.9	05.8
5	179°01.6	275°04.2	47.7	152°37.8	54.4	233°04.8	50.7	234°41.1	05.7
6	194°04.1	290°03.3	S22°48.0	167°39.3	N11°54.8	248°06.6	S19°50.6	249°43.2	S20°05.7
7	209°06.5	305°02.4	48.2	182°40.7	55.2	263°08.5	50.5	264°45.4	05.6
8	224°09.0	320°01.5	48.5	197°42.1	55.7	278°10.4	50.3	279°47.6	05.6
9	239°11.5	335°00.5	·· 48.7	212°43.5	·· 56.1	293°12.2	·· 50.2	294°49.7	·· 05.5
10	254°13.9	349°59.6	48.9	227°44.9	56.6	308°14.1	50.1	309°51.9	05.4
11	269°16.4	4°58.7	49.1	242°46.3	57.0	323°16.0	49.9	324°54.1	05.4
12	284°18.9	19°57.8	S22°49.4	257°47.7	N11°57.5	338°17.8	S19°49.8	339°56.2	S20°05.3
13	299°21.3	34°56.8	49.6	272°49.1	57.9	353°19.7	49.7	354°58.4	05.2
14	314°23.8	49°55.9	49.8	287°50.6	58.3	8°21.6	49.5	10°00.6	05.2
15	329°26.3	64°55.0	·· 50.1	302°52.0	·· 58.8	23°23.4	·· 49.4	25°02.7	·· 05.1
16	344°28.7	79°54.0	50.3	317°53.4	59.2	38°25.3	49.3	40°04.9	05.1
17	359°31.2	94°53.1	50.5	332°54.8	11°59.7	53°27.2	49.1	55°07.0	05.0
18	14°33.6	109°52.2	S22°50.7	347°56.2	N12°00.1	68°29.1	S19°49.0	70°09.2	S20°04.9
19	29°36.1	124°51.3	50.9	2°57.6	00.5	83°30.9	48.9	85°11.4	04.9
20	44°38.6	139°50.3	51.2	17°59.0	01.0	98°32.8	48.7	100°13.5	04.8
21	59°41.0	154°49.4	·· 51.4	33°00.4	·· 01.4	113°34.7	·· 48.6	115°15.7	·· 04.7
22	74°43.5	169°48.5	51.6	48°01.8	01.9	128°36.5	48.5	130°17.9	04.7
23	89°46.0	184°47.5	51.8	63°03.2	02.3	143°38.4	48.3	145°20.0	04.6
	Mer.pass. 17:02	ν -0.9′	d 0.2′	m -3.91	ν 1.4′	d 0.4′	m -0.18	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.68
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	104°48.4	199°46.6	S22°52.0	78°04.6	N12°02.7	158°40.3	S19°48.2	160°22.2	S20°04.6
1	119°50.9	214°45.7	52.2	93°06.0	03.2	173°42.1	48.1	175°24.4	04.5
2	134°53.4	229°44.8	52.5	108°07.4	03.6	188°44.0	48.0	190°26.5	04.4
3	149°55.8	244°43.8	·· 52.7	123°08.9	·· 04.1	203°45.9	·· 47.8	205°28.7	·· 04.4
4	164°58.3	259°42.9	52.9	138°10.3	04.5	218°47.7	47.7	220°30.9	04.3
5	180°00.8	274°42.0	53.1	153°11.7	04.9	233°49.6	47.6	235°33.0	04.2
6	195°03.2	289°41.0	S22°53.3	168°13.1	N12°05.4	248°51.5	S19°47.4	250°35.2	S20°04.2
7	210°05.7	304°40.1	53.5	183°14.5	05.8	263°53.3	47.3	265°37.3	04.1
8	225°08.1	319°39.2	53.7	198°15.9	06.3	278°55.2	47.2	280°39.5	04.1
9	240°10.6	334°38.2	·· 53.9	213°17.3	·· 06.7	293°57.1	·· 47.0	295°41.7	·· 04.0
10	255°13.1	349°37.3	54.1	228°18.7	07.1	308°58.9	46.9	310°43.8	03.9
11	270°15.5	4°36.4	54.3	243°20.1	07.6	324°00.8	46.8	325°46.0	03.9
12	285°18.0	19°35.5	S22°54.5	258°21.5	N12°08.0	339°02.7	S19°46.6	340°48.2	S20°03.8
13	300°20.5	34°34.5	54.7	273°22.9	08.5	354°04.5	46.5	355°50.3	03.7
14	315°22.9	49°33.6	54.9	288°24.3	08.9	9°06.4	46.4	10°52.5	03.7
15	330°25.4	64°32.7	·· 55.1	303°25.7	·· 09.4	24°08.3	·· 46.2	25°54.7	·· 03.6
16	345°27.9	79°31.7	55.3	318°27.1	09.8	39°10.1	46.1	40°56.8	03.6
17	0°30.3	94°30.8	55.5	333°28.5	10.2	54°12.0	46.0	55°59.0	03.5
18	15°32.8	109°29.9	S22°55.7	348°29.9	N12°10.7	69°13.9	S19°45.8	71°01.1	S20°03.4
19	30°35.3	124°28.9	55.9	3°31.2	11.1	84°15.7	45.7	86°03.3	03.4
20	45°37.7	139°28.0	56.1	18°32.6	11.6	99°17.6	45.6	101°05.5	03.3
21	60°40.2	154°27.1	·· 56.2	33°34.0	·· 12.0	114°19.5	·· 45.4	116°07.6	·· 03.2
22	75°42.6	169°26.1	56.4	48°35.4	12.4	129°21.3	45.3	131°09.8	03.2
23	90°45.1	184°25.2	56.6	63°36.8	12.9	144°23.2	45.2	146°12.0	03.1
	Mer.pass. 16:58	ν -0.9′	d 0.2′	m -3.91	ν 1.4′	d 0.4′	m -0.15	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.67
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	105°47.6	199°24.3	S22°56.8	78°38.2	N12°13.3	159°25.1	S19°45.0	161°14.1	S20°03.1
1	120°50.0	214°23.3	57.0	93°39.6	13.8	174°26.9	44.9	176°16.3	03.0
2	135°52.5	229°22.4	57.2	108°41.0	14.2	189°28.8	44.8	191°18.4	02.9
3	150°55.0	244°21.5	·· 57.4	123°42.4	·· 14.7	204°30.7	·· 44.6	206°20.6	·· 02.9
4	165°57.4	259°20.5	57.5	138°43.8	15.1	219°32.5	44.5	221°22.8	02.8
5	180°59.9	274°19.6	57.7	153°45.2	15.5	234°34.4	44.4	236°24.9	02.7
6	196°02.4	289°18.7	S22°57.9	168°46.6	N12°16.0	249°36.3	S19°44.2	251°27.1	S20°02.7
7	211°04.8	304°17.7	58.1	183°48.0	16.4	264°38.1	44.1	266°29.3	02.6
8	226°07.3	319°16.8	58.2	198°49.4	16.9	279°40.0	43.9	281°31.4	02.6
9	241°09.7	334°15.9	·· 58.4	213°50.7	·· 17.3	294°41.9	·· 43.8	296°33.6	·· 02.5
10	256°12.2	349°14.9	58.6	228°52.1	17.8	309°43.7	43.7	311°35.7	02.4
11	271°14.7	4°14.0	58.8	243°53.5	18.2	324°45.6	43.5	326°37.9	02.4
12	286°17.1	19°13.0	S22°58.9	258°54.9	N12°18.6	339°47.5	S19°43.4	341°40.1	S20°02.3
13	301°19.6	34°12.1	59.1	273°56.3	19.1	354°49.3	43.3	356°42.2	02.2
14	316°22.1	49°11.2	59.3	288°57.7	19.5	9°51.2	43.1	11°44.4	02.2
15	331°24.5	64°10.2	·· 59.4	303°59.1	·· 20.0	24°53.1	·· 43.0	26°46.6	·· 02.1
16	346°27.0	79°09.3	59.6	319°00.5	20.4	39°54.9	42.9	41°48.7	02.0
17	1°29.5	94°08.4	59.8	334°01.8	20.9	54°56.8	42.7	56°50.9	02.0
18	16°31.9	109°07.4	S22°59.9	349°03.2	N12°21.3	69°58.7	S19°42.6	71°53.1	S20°01.9
19	31°34.4	124°06.5	23°00.1	4°04.6	21.7	85°00.5	42.5	86°55.2	01.9
20	46°36.9	139°05.6	00.3	19°06.0	22.2	100°02.4	42.3	101°57.4	01.8
21	61°39.3	154°04.6	·· 00.4	34°07.4	·· 22.6	115°04.3	·· 42.2	116°59.5	·· 01.7
22	76°41.8	169°03.7	00.6	49°08.8	23.1	130°06.1	42.1	132°01.7	01.7
23	91°44.2	184°02.7	00.7	64°10.1	23.5	145°08.0	41.9	147°03.9	01.6
	Mer.pass. 16:54	ν -0.9′	d 0.2′	m -3.91	ν 1.4′	d 0.4′	m -0.13	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.67

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.7	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.6	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°14.3	89°21.4
Acamar	315°14.1	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.0	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.0	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.5
Suhail	222°48.2	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.8
Dubhe	193°44.8	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.9	-17°39.3
Acrux	173°03.5	-63°12.5
Gacrux	171°55.1	-57°13.5
Alioth	166°16.0	55°50.6
Spica	158°25.8	-11°16.1
Alkaid	152°54.8	49°12.3
Hadar	148°40.7	-60°28.1
Menkent	148°01.5	-36°28.1
Arcturus	145°51.0	19°04.4
Rigil Kent.	139°45.0	-60°54.9
Kochab	137°20.6	74°03.9
Zuben'ubi	136°59.8	-16°07.6
Alphecca	126°06.8	26°38.6
Antares	112°20.1	-26°28.5
Atria	107°17.7	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.2	-37°07.0
Rasalhague	96°01.9	12°32.7
Eltanin	90°44.2	51°29.1
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.8	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.4	45°21.4
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.1

Jan 04 Mon	SHA	Mer.pass
Venus	96°19.6	10:40
Mars	333°41.5	18:48
Jupiter	54°06.1	13:27
Saturn	55°41.0	13:20

Jan 05 Tue	SHA	Mer.pass
Venus	94°58.2	10:42
Mars	333°16.2	18:46
Jupiter	53°51.8	13:24
Saturn	55°33.8	13:17

Jan 06 Wed	SHA	Mer.pass
Venus	93°36.7	10:43
Mars	332°50.7	18:44
Jupiter	53°37.5	13:21
Saturn	55°26.5	13:13

Horizontal parallax	
Venus:	0.1
Mars:	0.2

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.7	S22°43.1	297°32.3	11.3′	N11°30.5	-12.9′	58.0′
1	193°47.4	42.8	312°02.5	11.3′	11°17.6	-13.0′	58.1′
2	208°47.1	42.6	326°32.8	11.3′	11°04.6	-13.1′	58.1′
3	223°46.8	·· 42.3	341°03.2	11.4′	10°51.5	-13.1′	58.1′
4	238°46.5	42.0	355°33.5	11.4′	10°38.4	-13.2′	58.1′
5	253°46.3	41.8	10°03.9	11.4′	10°25.2	-13.2′	58.1′
6	268°46.0	S22°41.5	24°34.3	11.4′	N10°12.0	-13.3′	58.1′
7	283°45.7	41.2	39°04.8	11.5′	09°58.7	-13.4′	58.2′
8	298°45.4	41.0	53°35.2	11.5′	09°45.4	-13.4′	58.2′
9	313°45.1	·· 40.7	68°05.7	11.5′	09°32.0	-13.5′	58.2′
10	328°44.9	40.4	82°36.2	11.5′	09°18.5	-13.5′	58.2′
11	343°44.6	40.1	97°06.8	11.6′	09°05.0	-13.6′	58.2′
12	358°44.3	S22°39.9	111°37.3	11.6′	N08°51.4	-13.6′	58.3′
13	13°44.0	39.6	126°07.9	11.6′	08°37.8	-13.7′	58.3′
14	28°43.7	39.3	140°38.5	11.6′	08°24.1	-13.7′	58.3′
15	43°43.4	·· 39.0	155°09.2	11.7′	08°10.4	-13.8′	58.3′
16	58°43.2	38.8	169°39.8	11.7′	07°56.6	-13.8′	58.3′
17	73°42.9	38.5	184°10.5	11.7′	07°42.8	-13.9′	58.3′
18	88°42.6	S22°38.2	198°41.2	11.7′	N07°28.9	-13.9′	58.4′
19	103°42.3	37.9	213°11.9	11.7′	07°15.0	-14.0′	58.4′
20	118°42.0	37.7	227°42.6	11.7′	07°01.0	-14.0′	58.4′
21	133°41.8	·· 37.4	242°13.3	11.8′	06°47.0	-14.0′	58.4′
22	148°41.5	37.1	256°44.1	11.8′	06°33.0	-14.1′	58.4′
23	163°41.2	36.8	271°14.9	11.8′	06°18.9	-14.1′	58.4′
	SD = 16.3′	d = -0.3′	SD = 15.8′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.9	S22°36.5	285°45.6	11.8′	N06°04.8	-14.2′	58.5′
1	193°40.7	36.3	300°16.4	11.8′	05°50.6	-14.2′	58.5′
2	208°40.4	36.0	314°47.2	11.8′	05°36.4	-14.2′	58.5′
3	223°40.1	·· 35.7	329°18.0	11.8′	05°22.2	-14.3′	58.5′
4	238°39.8	35.4	343°48.8	11.8′	05°07.9	-14.3′	58.5′
5	253°39.5	35.1	358°19.7	11.8′	04°53.6	-14.3′	58.5′
6	268°39.3	S22°34.8	12°50.5	11.8′	N04°39.3	-14.4′	58.6′
7	283°39.0	34.6	27°21.3	11.8′	04°24.9	-14.4′	58.6′
8	298°38.7	34.3	41°52.2	11.8′	04°10.5	-14.4′	58.6′
9	313°38.4	·· 34.0	56°23.0	11.8′	03°56.1	-14.5′	58.6′
10	328°38.1	33.7	70°53.9	11.8′	03°41.6	-14.5′	58.6′
11	343°37.9	33.4	85°24.7	11.8′	03°27.2	-14.5′	58.6′
12	358°37.6	S22°33.1	99°55.6	11.8′	N03°12.7	-14.5′	58.6′
13	13°37.3	32.8	114°26.4	11.8′	02°58.1	-14.5′	58.7′
14	28°37.0	32.5	128°57.2	11.8′	02°43.6	-14.6′	58.7′
15	43°36.8	·· 32.2	143°28.1	11.8′	02°29.0	-14.6′	58.7′
16	58°36.5	31.9	157°58.9	11.8′	02°14.4	-14.6′	58.7′
17	73°36.2	31.7	172°29.7	11.8′	01°59.8	-14.6′	58.7′
18	88°35.9	S22°31.4	187°00.6	11.8′	N01°45.2	-14.6′	58.7′
19	103°35.7	31.1	201°31.4	11.8′	01°30.6	-14.7′	58.8′
20	118°35.4	30.8	216°02.2	11.8′	01°15.9	-14.7′	58.8′
21	133°35.1	·· 30.5	230°33.0	11.8′	01°01.2	-14.7′	58.8′
22	148°34.8	30.2	245°03.8	11.8′	00°46.6	-14.7′	58.8′
23	163°34.6	29.9	259°34.5	11.8′	00°31.9	-14.7′	58.8′
	SD = 16.3′	d = -0.3′	SD = 15.9′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.3	S22°29.6	274°05.3	11.7′	N00°17.2	-14.7′	58.8′
1	193°34.0	29.3	288°36.1	11.7′	N00°02.4	-14.7′	58.8′
2	208°33.7	29.0	303°06.8	11.7′	S00°12.3	14.7′	58.9′
3	223°33.5	·· 28.7	317°37.5	11.7′	00°27.0	14.7′	58.9′
4	238°33.2	28.4	332°08.2	11.7′	00°41.7	14.7′	58.9′
5	253°32.9	28.1	346°38.9	11.7′	00°56.5	14.7′	58.9′
6	268°32.6	S22°27.8	1°09.5	11.6′	S01°11.2	14.7′	58.9′
7	283°32.4	27.5	15°40.2	11.6′	01°25.9	14.7′	58.9′
8	298°32.1	27.1	30°10.8	11.6′	01°40.7	14.7′	59.0′
9	313°31.8	·· 26.8	44°41.4	11.6′	01°55.4	14.7′	59.0′
10	328°31.5	26.5	59°11.9	11.5′	02°10.1	14.7′	59.0′
11	343°31.3	26.2	73°42.5	11.5′	02°24.9	14.7′	59.0′
12	358°31.0	S22°25.9	88°13.0	11.5′	S02°39.6	14.7′	59.0′
13	13°30.7	25.6	102°43.5	11.5′	02°54.3	14.7′	59.0′
14	28°30.5	25.3	117°14.0	11.4′	03°09.0	14.7′	59.0′
15	43°30.2	·· 25.0	131°44.4	11.4′	03°23.7	14.7′	59.0′
16	58°29.9	24.7	146°14.8	11.4′	03°38.4	14.7′	59.1′
17	73°29.6	24.4	160°45.1	11.3′	03°53.1	14.7′	59.1′
18	88°29.4	S22°24.0	175°15.5	11.3′	S04°07.8	14.6′	59.1′
19	103°29.1	23.7	189°45.8	11.3′	04°22.4	14.6′	59.1′
20	118°28.8	23.4	204°16.0	11.2′	04°37.0	14.6′	59.1′
21	133°28.6	·· 23.1	218°46.3	11.2′	04°51.6	14.6′	59.1′
22	148°28.3	22.8	233°16.4	11.1′	05°06.2	14.6′	59.1′
23	163°28.0	22.5	247°46.6	11.1′	05°20.8	14.6′	59.2′
	SD = 16.3′	d = -0.3′	SD = 16.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:19	10:29	▬	▬	13:43	15:52
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	16:18	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	17:52	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	05:05	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°	01:13	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	22:11	–:–
S 60°	–:–	01:20	02:50	21:20	22:48	–:–

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

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 76-55%
04	04:49	05:03	12:05	04:18	16:43	
05	05:16	05:30	12:05	05:07	17:31	
06	05:43	05:56	12:06	05:55	18:20	

IERS Earth Orientation data as of 08-Dec-2022

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	106°46.7	199°01.8	S23°00.9	79°11.5	N12°24.0	160°09.9	S19°41.8	162°06.0	S20°01.5
1	121°49.2	214°00.9	01.0	94°12.9	24.4	175°11.7	41.7	177°08.2	01.5
2	136°51.6	228°59.9	01.2	109°14.3	24.8	190°13.6	41.5	192°10.3	01.4
3	151°54.1	243°59.0	·· 01.3	124°15.7	·· 25.3	205°15.5	·· 41.4	207°12.5	·· 01.4
4	166°56.6	258°58.1	01.5	139°17.0	25.7	220°17.3	41.3	222°14.7	01.3
5	181°59.0	273°57.1	01.6	154°18.4	26.2	235°19.2	41.1	237°16.8	01.2
6	197°01.5	288°56.2	S23°01.8	169°19.8	N12°26.6	250°21.1	S19°41.0	252°19.0	S20°01.2
7	212°04.0	303°55.2	01.9	184°21.2	27.1	265°22.9	40.9	267°21.2	01.1
8	227°06.4	318°54.3	02.1	199°22.6	27.5	280°24.8	40.7	282°23.3	01.0
9	242°08.9	333°53.4	·· 02.2	214°23.9	·· 27.9	295°26.7	·· 40.6	297°25.5	·· 01.0
10	257°11.4	348°52.4	02.4	229°25.3	28.4	310°28.5	40.4	312°27.6	00.9
11	272°13.8	3°51.5	02.5	244°26.7	28.8	325°30.4	40.3	327°29.8	00.8
12	287°16.3	18°50.5	S23°02.7	259°28.1	N12°29.3	340°32.2	S19°40.2	342°32.0	S20°00.8
13	302°18.7	33°49.6	02.8	274°29.4	29.7	355°34.1	40.0	357°34.1	00.7
14	317°21.2	48°48.7	02.9	289°30.8	30.2	10°36.0	39.9	12°36.3	00.7
15	332°23.7	63°47.7	·· 03.1	304°32.2	·· 30.6	25°37.8	·· 39.8	27°38.5	·· 00.6
16	347°26.1	78°46.8	03.2	319°33.6	31.1	40°39.7	39.6	42°40.6	00.5
17	2°28.6	93°45.8	03.4	334°34.9	31.5	55°41.6	39.5	57°42.8	00.5
18	17°31.1	108°44.9	S23°03.5	349°36.3	N12°31.9	70°43.4	S19°39.4	72°44.9	S20°00.4
19	32°33.5	123°44.0	03.6	4°37.7	32.4	85°45.3	39.2	87°47.1	00.3
20	47°36.0	138°43.0	03.8	19°39.1	32.8	100°47.2	39.1	102°49.3	00.3
21	62°38.5	153°42.1	·· 03.9	34°40.4	·· 33.3	115°49.0	·· 39.0	117°51.4	·· 00.2
22	77°40.9	168°41.1	04.0	49°41.8	33.7	130°50.9	38.8	132°53.6	00.1
23	92°43.4	183°40.2	04.1	64°43.2	34.2	145°52.8	38.7	147°55.7	00.1
Mer.pass.	16:50	ν -0.9′	d 0.2′	m -3.91	ν 1.4′	d 0.4′	m -0.10	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.67

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	107°45.8	198°39.3	S23°04.3	79°44.5	N12°34.6	160°54.6	S19°38.6	162°57.9	S20°00.0
1	122°48.3	213°38.3	04.4	94°45.9	35.0	175°56.5	38.4	178°00.1	20°00.0
2	137°50.8	228°37.4	04.5	109°47.3	35.5	190°58.4	38.3	193°02.2	19°59.9
3	152°53.2	243°36.4	·· 04.6	124°48.7	·· 35.9	206°00.2	·· 38.1	208°04.4	·· 59.8
4	167°55.7	258°35.5	04.8	139°50.0	36.4	221°02.1	38.0	223°06.6	59.8
5	182°58.2	273°34.6	04.9	154°51.4	36.8	236°04.0	37.9	238°08.7	59.7
6	198°00.6	288°33.6	S23°05.0	169°52.8	N12°37.3	251°05.8	S19°37.7	253°10.9	S19°59.6
7	213°03.1	303°32.7	05.1	184°54.1	37.7	266°07.7	37.6	268°13.0	59.6
8	228°05.6	318°31.7	05.2	199°55.5	38.2	281°09.5	37.5	283°15.2	59.5
9	243°08.0	333°30.8	·· 05.4	214°56.9	·· 38.6	296°11.4	·· 37.3	298°17.4	·· 59.4
10	258°10.5	348°29.9	05.5	229°58.2	39.0	311°13.3	37.2	313°19.5	59.4
11	273°13.0	3°28.9	05.6	244°59.6	39.5	326°15.1	37.1	328°21.7	59.3
12	288°15.4	18°28.0	S23°05.7	260°01.0	N12°39.9	341°17.0	S19°36.9	343°23.8	S19°59.3
13	303°17.9	33°27.0	05.8	275°02.3	40.4	356°18.9	36.8	358°26.0	59.2
14	318°20.3	48°26.1	05.9	290°03.7	40.8	11°20.7	36.6	13°28.2	59.1
15	333°22.8	63°25.1	·· 06.0	305°05.0	·· 41.3	26°22.6	·· 36.5	28°30.3	·· 59.1
16	348°25.3	78°24.2	06.1	320°06.4	41.7	41°24.5	36.4	43°32.5	59.0
17	3°27.7	93°23.3	06.2	335°07.8	42.2	56°26.3	36.2	58°34.6	58.9
18	18°30.2	108°22.3	S23°06.3	350°09.1	N12°42.6	71°28.2	S19°36.1	73°36.8	S19°58.9
19	33°32.7	123°21.4	06.4	5°10.5	43.0	86°30.1	36.0	88°39.0	58.8
20	48°35.1	138°20.4	06.5	20°11.9	43.5	101°31.9	35.8	103°41.1	58.7
21	63°37.6	153°19.5	·· 06.6	35°13.2	·· 43.9	116°33.8	·· 35.7	118°43.3	·· 58.7
22	78°40.1	168°18.5	06.7	50°14.6	44.4	131°35.6	35.6	133°45.5	58.6
23	93°42.5	183°17.6	06.8	65°15.9	44.8	146°37.5	35.4	148°47.6	58.6
Mer.pass.	16:46	ν -0.9′	d 0.1′	m -3.91	ν 1.4′	d 0.4′	m -0.08	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.67

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	108°45.0	198°16.7	S23°06.9	80°17.3	N12°45.3	161°39.4	S19°35.3	163°49.8	S19°58.5
1	123°47.5	213°15.7	07.0	95°18.6	45.7	176°41.2	35.1	178°51.9	58.4
2	138°49.9	228°14.8	07.1	110°20.0	46.2	191°43.1	35.0	193°54.1	58.4
3	153°52.4	243°13.8	·· 07.2	125°21.4	·· 46.6	206°45.0	·· 34.9	208°56.3	·· 58.3
4	168°54.8	258°12.9	07.3	140°22.7	47.1	221°46.8	34.7	223°58.4	58.2
5	183°57.3	273°11.9	07.4	155°24.1	47.5	236°48.7	34.6	239°00.6	58.2
6	198°59.8	288°11.0	S23°07.5	170°25.4	N12°47.9	251°50.6	S19°34.5	254°02.7	S19°58.1
7	214°02.2	303°10.0	07.6	185°26.8	48.4	266°52.4	34.3	269°04.9	58.0
8	229°04.7	318°09.1	07.7	200°28.1	48.8	281°54.3	34.2	284°07.1	58.0
9	244°07.2	333°08.2	·· 07.8	215°29.5	·· 49.3	296°56.1	·· 34.0	299°09.2	·· 57.9
10	259°09.6	348°07.2	07.8	230°30.9	49.7	311°58.0	33.9	314°11.4	57.8
11	274°12.1	3°06.3	07.9	245°32.2	50.2	326°59.9	33.8	329°13.5	57.8
12	289°14.6	18°05.3	S23°08.0	260°33.6	N12°50.6	342°01.7	S19°33.6	344°15.7	S19°57.7
13	304°17.0	33°04.4	08.1	275°34.9	51.1	357°03.6	33.5	359°17.9	57.7
14	319°19.5	48°03.4	08.2	290°36.3	51.5	12°05.5	33.4	14°20.0	57.6
15	334°22.0	63°02.5	·· 08.3	305°37.6	·· 51.9	27°07.3	·· 33.2	29°22.2	·· 57.5
16	349°24.4	78°01.6	08.3	320°39.0	52.4	42°09.2	33.1	44°24.3	57.5
17	4°26.9	93°00.6	08.4	335°40.3	52.8	57°11.1	32.9	59°26.5	57.4
18	19°29.3	107°59.7	S23°08.5	350°41.7	N12°53.3	72°12.9	S19°32.8	74°28.7	S19°57.3
19	34°31.8	122°58.7	08.6	5°43.0	53.7	87°14.8	32.7	89°30.8	57.3
20	49°34.3	137°57.8	08.6	20°44.4	54.2	102°16.6	32.5	104°33.0	57.2
21	64°36.7	152°56.8	·· 08.7	35°45.7	·· 54.6	117°18.5	·· 32.4	119°35.1	·· 57.1
22	79°39.2	167°55.9	08.8	50°47.1	55.1	132°20.4	32.3	134°37.3	57.1
23	94°41.7	182°54.9	08.8	65°48.4	55.5	147°22.2	32.1	149°39.5	57.0
Mer.pass.	16:42	ν -0.9′	d 0.1′	m -3.91	ν 1.4′	d 0.4′	m -0.06	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.67

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.7	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.6	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°15.5	89°21.4
Acamar	315°14.1	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.5
Suhail	222°48.2	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°50.7	-8°45.0
Regulus	207°37.7	11°51.8
Dubhe	193°44.8	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.8	-17°39.3
Acrux	173°03.4	-63°12.5
Gacrux	171°55.0	-57°13.5
Alioth	166°15.9	55°50.6
Spica	158°25.7	-11°16.1
Alkaid	152°54.8	49°12.3
Hadar	148°40.7	-60°28.1
Menkent	148°01.5	-36°28.1
Arcturus	145°51.0	19°04.4
Rigil Kent.	139°44.9	-60°54.9
Kochab	137°20.5	74°03.9
Zuben'ubi	136°59.8	-16°07.6
Alphecca	126°06.8	26°38.6
Antares	112°20.1	-26°28.5
Atria	107°17.7	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.2	-37°07.0
Rasalhague	96°01.9	12°32.7
Eltanin	90°44.2	51°29.1
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.8	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.4	45°21.4
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.1

Jan 07 Thu	SHA	Mer.pass
Venus	92°15.1	10:45
Mars	332°24.8	18:42
Jupiter	53°23.2	13:18
Saturn	55°19.3	13:10

Jan 08 Fri	SHA	Mer.pass
Venus	90°53.4	10:46
Mars	331°58.7	18:39
Jupiter	53°08.8	13:15
Saturn	55°12.1	13:06

Jan 09 Sat	SHA	Mer.pass
Venus	89°31.7	10:48
Mars	331°32.3	18:37
Jupiter	52°54.4	13:12
Saturn	55°04.8	13:03

Horizontal parallax	
Venus:	0.1
Mars:	0.2

	h	Sun		Moon				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		178°27.7	S22°22.1	262°16.7	11.1′	S05°35.4	14.5′	59.2′
1		193°27.5	21.8	276°46.8	11.0′	05°49.9	14.5′	59.2′
2		208°27.2	21.5	291°16.8	11.0′	06°04.4	14.5′	59.2′
3		223°26.9	·· 21.2	305°46.8	10.9′	06°18.9	14.5′	59.2′
4		238°26.7	20.9	320°16.7	10.9′	06°33.3	14.4′	59.2′
5		253°26.4	20.5	334°46.6	10.8′	06°47.8	14.4′	59.2′
6		268°26.1	S22°20.2	349°16.4	10.8′	S07°02.2	14.4′	59.2′
7		283°25.9	19.9	3°46.2	10.7′	07°16.5	14.3′	59.2′
8		298°25.6	19.6	18°16.0	10.7′	07°30.8	14.3′	59.3′
9		313°25.3	·· 19.3	32°45.7	10.6′	07°45.1	14.3′	59.3′
10		328°25.1	18.9	47°15.3	10.6′	07°59.4	14.2′	59.3′
11		343°24.8	18.6	61°44.9	10.5′	08°13.6	14.2′	59.3′
12		358°24.5	S22°18.3	76°14.5	10.5′	S08°27.8	14.1′	59.3′
13		13°24.3	17.9	90°44.0	10.4′	08°41.9	14.1′	59.3′
14		28°24.0	17.6	105°13.4	10.4′	08°56.0	14.1′	59.3′
15		43°23.7	·· 17.3	119°42.8	10.3′	09°10.1	14.0′	59.3′
16		58°23.5	17.0	134°12.1	10.3′	09°24.1	14.0′	59.3′
17		73°23.2	16.6	148°41.3	10.2′	09°38.1	13.9′	59.4′
18		88°22.9	S22°16.3	163°10.6	10.1′	S09°52.0	13.9′	59.4′
19		103°22.7	16.0	177°39.7	10.1′	10°05.9	13.8′	59.4′
20		118°22.4	15.6	192°08.8	10.0′	10°19.7	13.8′	59.4′
21		133°22.1	·· 15.3	206°37.8	10.0′	10°33.4	13.7′	59.4′
22		148°21.9	15.0	221°06.8	9.9′	10°47.2	13.7′	59.4′
23		163°21.6	14.6	235°35.7	9.8′	11°00.8	13.6′	59.4′
		SD = 16.3′	d = -0.3′	SD = 16.1′				

Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		178°21.3	S22°14.3	250°04.5	9.8′	S11°14.4	13.5′	59.4′
1		193°21.1	13.9	264°33.3	9.7′	11°28.0	13.5′	59.4′
2		208°20.8	13.6	279°02.0	9.6′	11°41.4	13.4′	59.4′
3		223°20.5	·· 13.3	293°30.6	9.6′	11°54.9	13.4′	59.5′
4		238°20.3	12.9	307°59.2	9.5′	12°08.2	13.3′	59.5′
5		253°20.0	12.6	322°27.7	9.4′	12°21.5	13.2′	59.5′
6		268°19.7	S22°12.3	336°56.1	9.4′	S12°34.7	13.2′	59.5′
7		283°19.5	11.9	351°24.5	9.3′	12°47.9	13.1′	59.5′
8		298°19.2	11.6	5°52.8	9.2′	13°01.0	13.0′	59.5′
9		313°19.0	·· 11.2	20°21.0	9.2′	13°14.0	12.9′	59.5′
10		328°18.7	10.9	34°49.2	9.1′	13°27.0	12.9′	59.5′
11		343°18.4	10.5	49°17.2	9.0′	13°39.8	12.8′	59.5′
12		358°18.2	S22°10.2	63°45.2	8.9′	S13°52.6	12.7′	59.5′
13		13°17.9	09.8	78°13.2	8.9′	14°05.3	12.6′	59.5′
14		28°17.6	09.5	92°41.0	8.8′	14°18.0	12.6′	59.5′
15		43°17.4	·· 09.1	107°08.8	8.7′	14°30.6	12.5′	59.5′
16		58°17.1	08.8	121°36.5	8.6′	14°43.0	12.4′	59.5′
17		73°16.9	08.5	136°04.2	8.6′	14°55.4	12.3′	59.5′
18		88°16.6	S22°08.1	150°31.7	8.5′	S15°07.7	12.2′	59.6′
19		103°16.3	07.8	164°59.2	8.4′	15°20.0	12.1′	59.6′
20		118°16.1	07.4	179°26.6	8.3′	15°32.1	12.0′	59.6′
21		133°15.8	·· 07.0	193°54.0	8.3′	15°44.2	12.0′	59.6′
22		148°15.6	06.7	208°21.2	8.2′	15°56.1	11.9′	59.6′
23		163°15.3	06.3	222°48.4	8.1′	16°08.0	11.8′	59.6′
		SD = 16.3′	d = -0.3′	SD = 16.2′				

Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		178°15.0	S22°06.0	237°15.5	8.0′	S16°19.7	11.7′	59.6′
1		193°14.8	05.6	251°42.5	7.9′	16°31.4	11.6′	59.6′
2		208°14.5	05.3	266°09.5	7.9′	16°43.0	11.5′	59.6′
3		223°14.3	·· 04.9	280°36.3	7.8′	16°54.5	11.4′	59.6′
4		238°14.0	04.6	295°03.1	7.7′	17°05.8	11.3′	59.6′
5		253°13.7	04.2	309°29.8	7.6′	17°17.1	11.2′	59.6′
6		268°13.5	S22°03.8	323°56.4	7.5′	S17°28.3	11.1′	59.6′
7		283°13.2	03.5	338°23.0	7.5′	17°39.4	11.0′	59.6′
8		298°13.0	03.1	352°49.5	7.4′	17°50.3	10.8′	59.6′
9		313°12.7	·· 02.8	7°15.9	7.3′	18°01.2	10.7′	59.6′
10		328°12.5	02.4	21°42.2	7.2′	18°11.9	10.6′	59.6′
11		343°12.2	02.0	36°08.4	7.2′	18°22.5	10.5′	59.6′
12		358°11.9	S22°01.7	50°34.6	7.1′	S18°33.0	10.4′	59.6′
13		13°11.7	01.3	65°00.6	7.0′	18°43.4	10.3′	59.6′
14		28°11.4	00.9	79°26.6	6.9′	18°53.7	10.2′	59.6′
15		43°11.2	·· 00.6	93°52.6	6.8′	19°03.9	10.0′	59.6′
16		58°10.9	22°00.2	108°18.4	6.8′	19°13.9	9.9′	59.6′
17		73°10.7	21°59.8	122°44.2	6.7′	19°23.8	9.8′	59.6′
18		88°10.4	S21°59.5	137°09.9	6.6′	S19°33.6	9.7′	59.6′
19		103°10.1	59.1	151°35.5	6.5′	19°43.3	9.6′	59.6′
20		118°09.9	58.7	166°01.0	6.5′	19°52.9	9.4′	59.6′
21		133°09.6	·· 58.4	180°26.5	6.4′	20°02.3	9.3′	59.6′
22		148°09.4	58.0	194°51.9	6.3′	20°11.6	9.2′	59.6′
23		163°09.1	57.6	209°17.2	6.2′	20°20.7	9.0′	59.6′
		SD = 16.3′	d = -0.4′	SD = 16.2′				

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

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 43-22%
07	06:09	06:22	12:06	06:44	19:10	
08	06:35	06:47	12:07	07:36	20:02	
09	07:00	07:12	12:07	08:30	20:58	

January 10, 11, 12 UT (Sun., Mon., Tue.)

DUT1 = UT1-UTC = -0.1749 sec ΔT = TT-UT1 = +69.3589 sec

2021 January 10 to Jan. 12 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	109°44.1	197°54.0	S23°08.9	80°49.8	N12°56.0	162°24.1	S19°32.0	164°41.6	S19°56.9
1	124°46.6	212°53.0	09.0	95°51.1	56.4	177°26.0	31.8	179°43.8	56.9
2	139°49.1	227°52.1	09.0	110°52.5	56.9	192°27.8	31.7	194°45.9	56.8
3	154°51.5	242°51.2	·· 09.1	125°53.8	·· 57.3	207°29.7	·· 31.6	209°48.1	·· 56.8
4	169°54.0	257°50.2	09.2	140°55.1	57.7	222°31.5	31.4	224°50.3	56.7
5	184°56.4	272°49.3	09.2	155°56.5	58.2	237°33.4	31.3	239°52.4	56.6
6	199°58.9	287°48.3	S23°09.3	170°57.8	N12°58.6	252°35.3	S19°31.2	254°54.6	S19°56.6
7	215°01.4	302°47.4	09.4	185°59.2	59.1	267°37.1	31.0	269°56.7	56.5
8	230°03.8	317°46.4	09.4	201°00.5	12°59.5	282°39.0	30.9	284°58.9	56.4
9	245°06.3	332°45.5	·· 09.5	216°01.9	13°00.0	297°40.9	·· 30.7	300°01.1	·· 56.4
10	260°08.8	347°44.5	09.5	231°03.2	00.4	312°42.7	30.6	315°03.2	56.3
11	275°11.2	2°43.6	09.6	246°04.6	00.9	327°44.6	30.5	330°05.4	56.2
12	290°13.7	17°42.6	S23°09.6	261°05.9	N13°01.3	342°46.4	S19°30.3	345°07.5	S19°56.2
13	305°16.2	32°41.7	09.7	276°07.2	01.8	357°48.3	30.2	0°09.7	56.1
14	320°18.6	47°40.8	09.7	291°08.6	02.2	12°50.2	30.0	15°11.9	56.0
15	335°21.1	62°39.8	·· 09.8	306°09.9	·· 02.6	27°52.0	·· 29.9	30°14.0	·· 56.0
16	350°23.6	77°38.9	09.8	321°11.3	03.1	42°53.9	29.8	45°16.2	55.9
17	5°26.0	92°37.9	09.9	336°12.6	03.5	57°55.8	29.6	60°18.3	55.9
18	20°28.5	107°37.0	S23°09.9	351°13.9	N13°04.0	72°57.6	S19°29.5	75°20.5	S19°55.8
19	35°30.9	122°36.0	10.0	6°15.3	04.4	87°59.5	29.4	90°22.7	55.7
20	50°33.4	137°35.1	10.0	21°16.6	04.9	103°01.3	29.2	105°24.8	55.7
21	65°35.9	152°34.1	·· 10.0	36°18.0	·· 05.3	118°03.2	·· 29.1	120°27.0	·· 55.6
22	80°38.3	167°33.2	10.1	51°19.3	05.8	133°05.1	28.9	135°29.1	55.5
23	95°40.8	182°32.2	10.1	66°20.6	06.2	148°06.9	28.8	150°31.3	55.5
	Mer.pass. 16:38	ν -0.9′	d 0.1′	m -3.91	ν 1.3′	d 0.4′	m -0.03	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.67

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	110°43.3	197°31.3	S23°10.2	81°22.0	N13°06.7	163°08.8	S19°28.7	165°33.5	S19°55.4
1	125°45.7	212°30.3	10.2	96°23.3	07.1	178°10.7	28.5	180°35.6	55.3
2	140°48.2	227°29.4	10.2	111°24.6	07.6	193°12.5	28.4	195°37.8	55.3
3	155°50.7	242°28.4	·· 10.3	126°26.0	·· 08.0	208°14.4	·· 28.2	210°39.9	·· 55.2
4	170°53.1	257°27.5	10.3	141°27.3	08.5	223°16.2	28.1	225°42.1	55.1
5	185°55.6	272°26.6	10.3	156°28.6	08.9	238°18.1	28.0	240°44.3	55.1
6	200°58.1	287°25.6	S23°10.4	171°30.0	N13°09.3	253°20.0	S19°27.8	255°46.4	S19°55.0
7	216°00.5	302°24.7	10.4	186°31.3	09.8	268°21.8	27.7	270°48.6	54.9
8	231°03.0	317°23.7	10.4	201°32.6	10.2	283°23.7	27.5	285°50.7	54.9
9	246°05.4	332°22.8	·· 10.5	216°34.0	·· 10.7	298°25.6	·· 27.4	300°52.9	·· 54.8
10	261°07.9	347°21.8	10.5	231°35.3	11.1	313°27.4	27.3	315°55.1	54.8
11	276°10.4	2°20.9	10.5	246°36.6	11.6	328°29.3	27.1	330°57.2	54.7
12	291°12.8	17°19.9	S23°10.5	261°38.0	N13°12.0	343°31.1	S19°27.0	345°59.4	S19°54.6
13	306°15.3	32°19.0	10.6	276°39.3	12.5	358°33.0	26.8	1°01.5	54.6
14	321°17.8	47°18.0	10.6	291°40.6	12.9	13°34.9	26.7	16°03.7	54.5
15	336°20.2	62°17.1	·· 10.6	306°42.0	·· 13.4	28°36.7	·· 26.6	31°05.8	·· 54.4
16	351°22.7	77°16.1	10.6	321°43.3	13.8	43°38.6	26.4	46°08.0	54.4
17	6°25.2	92°15.2	10.6	336°44.6	14.3	58°40.5	26.3	61°10.2	54.3
18	21°27.6	107°14.2	S23°10.6	351°45.9	N13°14.7	73°42.3	S19°26.2	76°12.3	S19°54.2
19	36°30.1	122°13.3	10.7	6°47.3	15.1	88°44.2	26.0	91°14.5	54.2
20	51°32.6	137°12.3	10.7	21°48.6	15.6	103°46.0	25.9	106°16.6	54.1
21	66°35.0	152°11.4	·· 10.7	36°49.9	·· 16.0	118°47.9	·· 25.7	121°18.8	·· 54.0
22	81°37.5	167°10.5	10.7	51°51.2	16.5	133°49.8	25.6	136°21.0	54.0
23	96°39.9	182°09.5	10.7	66°52.6	16.9	148°51.6	25.5	151°23.1	53.9
	Mer.pass. 16:34	ν -0.9′	d 0.0′	m -3.91	ν 1.3′	d 0.4′	m -0.01	ν 1.9′	d -0.1′ m -1.96	ν 2.2′	d -0.1′ m 0.66

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	111°42.4	197°08.6	S23°10.7	81°53.9	N13°17.4	163°53.5	S19°25.3	166°25.3	S19°53.8
1	126°44.9	212°07.6	10.7	96°55.2	17.8	178°55.3	25.2	181°27.4	53.8
2	141°47.3	227°06.7	10.7	111°56.5	18.3	193°57.2	25.0	196°29.6	53.7
3	156°49.8	242°05.7	·· 10.7	126°57.9	·· 18.7	208°59.1	·· 24.9	211°31.8	·· 53.6
4	171°52.3	257°04.8	10.7	141°59.2	19.2	224°00.9	24.8	226°33.9	53.6
5	186°54.7	272°03.8	10.7	157°00.5	19.6	239°02.8	24.6	241°36.1	53.5
6	201°57.2	287°02.9	S23°10.7	172°01.8	N13°20.1	254°04.7	S19°24.5	256°38.2	S19°53.5
7	216°59.7	302°01.9	10.7	187°03.2	20.5	269°06.5	24.3	271°40.4	53.4
8	232°02.1	317°01.0	10.7	202°04.5	21.0	284°08.4	24.2	286°42.5	53.3
9	247°04.6	332°00.0	·· 10.7	217°05.8	·· 21.4	299°10.2	·· 24.1	301°44.7	·· 53.3
10	262°07.1	346°59.1	10.7	232°07.1	21.9	314°12.1	23.9	316°46.9	53.2
11	277°09.5	1°58.1	10.7	247°08.4	22.3	329°14.0	23.8	331°49.0	53.1
12	292°12.0	16°57.2	S23°10.7	262°09.8	N13°22.7	344°15.8	S19°23.6	346°51.2	S19°53.1
13	307°14.4	31°56.2	10.7	277°11.1	23.2	359°17.7	23.5	1°53.3	53.0
14	322°16.9	46°55.3	10.7	292°12.4	23.6	14°19.5	23.4	16°55.5	52.9
15	337°19.4	61°54.4	·· 10.7	307°13.7	·· 24.1	29°21.4	·· 23.2	31°57.7	·· 52.9
16	352°21.8	76°53.4	10.7	322°15.0	24.5	44°23.3	23.1	46°59.8	52.8
17	7°24.3	91°52.5	10.7	337°16.4	25.0	59°25.1	22.9	62°02.0	52.7
18	22°26.8	106°51.5	S23°10.7	352°17.7	N13°25.4	74°27.0	S19°22.8	77°04.1	S19°52.7
19	37°29.2	121°50.6	10.6	7°19.0	25.9	89°28.8	22.6	92°06.3	52.6
20	52°31.7	136°49.6	10.6	22°20.3	26.3	104°30.7	22.5	107°08.5	52.5
21	67°34.2	151°48.7	·· 10.6	37°21.6	·· 26.8	119°32.6	·· 22.4	122°10.6	·· 52.5
22	82°36.6	166°47.7	10.6	52°22.9	27.2	134°34.4	22.2	137°12.8	52.4
23	97°39.1	181°46.8	10.6	67°24.3	27.7	149°36.3	22.1	152°14.9	52.3
	Mer.pass. 16:30	ν -0.9′	d 0.0′	m -3.91	ν 1.3′	d 0.4′	m 0.01	ν 1.9′	d -0.1′ m -1.95	ν 2.2′	d -0.1′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.7	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.7	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°16.5	89°21.4
Acamar	315°14.1	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.0	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.5
Suhail	222°48.2	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°50.6	-8°45.0
Regulus	207°37.6	11°51.8
Dubhe	193°44.7	61°38.1
Denebola	182°28.1	14°27.2
Gienah	175°46.8	-17°39.4
Acrux	173°03.4	-63°12.5
Gacrux	171°55.0	-57°13.5
Alioth	166°15.9	55°50.5
Spica	158°25.7	-11°16.1
Alkaid	152°54.7	49°12.3
Hadar	148°40.6	-60°28.1
Menkent	148°01.5	-36°28.1
Arcturus	145°51.0	19°04.3
Rigil Kent.	139°44.9	-60°54.9
Kochab	137°20.4	74°03.9
Zuben'ubi	136°59.7	-16°07.6
Alphecca	126°06.7	26°38.6
Antares	112°20.1	-26°28.5
Atria	107°17.7	-69°03.6
Sabik	102°06.8	-15°45.0
Shaula	96°15.1	-37°07.0
Rasalhague	96°01.9	12°32.7
Eltanin	90°44.2	51°29.1
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.8	38°48.1
Nunki	75°52.2	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.5	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 10 Sun	SHA	Mer.pass
Venus	88°09.9	10:49
Mars	331°05.6	18:35
Jupiter	52°40.0	13:09
Saturn	54°57.5	12:59

Jan 11 Mon	SHA	Mer.pass
Venus	86°48.0	10:51
Mars	330°38.7	18:33
Jupiter	52°25.5	13:06
Saturn	54°50.2	12:56

Jan 12 Tue	SHA	Mer.pass
Venus	85°26.1	10:52
Mars	330°11.5	18:31
Jupiter	52°11.1	13:03
Saturn	54°42.9	12:52

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun			Moon				
h	GHA	Dec		GHA	ν	Dec	d	HP
0	178°08.9	S21°57.3		223°42.4	6.2′	S20°29.8	8.9′	59.6′
1	193°08.6	56.9		238°07.6	6.1′	20°38.7	8.8′	59.6′
2	208°08.4	56.5		252°32.7	6.0′	20°47.4	8.6′	59.6′
3	223°08.1	·· 56.1		266°57.7	6.0′	20°56.1	8.5′	59.6′
4	238°07.9	55.8		281°22.7	5.9′	21°04.6	8.4′	59.6′
5	253°07.6	55.4		295°47.6	5.8′	21°12.9	8.2′	59.6′
6	268°07.4	S21°55.0		310°12.4	5.8′	S21°21.1	8.1′	59.6′
7	283°07.1	54.6		324°37.1	5.7′	21°29.2	7.9′	59.6′
8	298°06.8	54.2		339°01.8	5.6′	21°37.2	7.8′	59.6′
9	313°06.6	·· 53.9		353°26.4	5.6′	21°44.9	7.6′	59.6′
10	328°06.3	53.5		7°51.0	5.5′	21°52.6	7.5′	59.6′
11	343°06.1	53.1		22°15.5	5.4′	22°00.1	7.4′	59.6′
12	358°05.8	S21°52.7		36°39.9	5.4′	S22°07.4	7.2′	59.6′
13	13°05.6	52.3		51°04.3	5.3′	22°14.7	7.1′	59.5′
14	28°05.3	52.0		65°28.6	5.3′	22°21.7	6.9′	59.5′
15	43°05.1	·· 51.6		79°52.8	5.2′	22°28.6	6.8′	59.5′
16	58°04.8	51.2		94°17.0	5.1′	22°35.4	6.6′	59.5′
17	73°04.6	50.8		108°41.2	5.1′	22°42.0	6.4′	59.5′
18	88°04.3	S21°50.4		123°05.3	5.0′	S22°48.4	6.3′	59.5′
19	103°04.1	50.0		137°29.3	5.0′	22°54.7	6.1′	59.5′
20	118°03.8	49.6		151°53.3	4.9′	23°00.9	6.0′	59.5′
21	133°03.6	·· 49.3		166°17.2	4.9′	23°06.8	5.8′	59.5′
22	148°03.3	48.9		180°41.1	4.8′	23°12.7	5.7′	59.5′
23	163°03.1	48.5		195°04.9	4.8′	23°18.3	5.5′	59.5′
	SD = 16.3′	d = -0.4′		SD = 16.3′				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	178°02.8	S21°48.1		209°28.7	4.7′	S23°23.8	5.3′	59.5′
1	193°02.6	47.7		223°52.5	4.7′	23°29.2	5.2′	59.5′
2	208°02.3	47.3		238°16.2	4.7′	23°34.4	5.0′	59.4′
3	223°02.1	·· 46.9		252°39.8	4.6′	23°39.4	4.9′	59.4′
4	238°01.9	46.5		267°03.5	4.6′	23°44.2	4.7′	59.4′
5	253°01.6	46.1		281°27.1	4.6′	23°48.9	4.5′	59.4′
6	268°01.4	S21°45.7		295°50.6	4.5′	S23°53.5	4.4′	59.4′
7	283°01.1	45.3		310°14.1	4.5′	23°57.8	4.2′	59.4′
8	298°00.9	44.9		324°37.6	4.5′	24°02.0	4.0′	59.4′
9	313°00.6	·· 44.5		339°01.1	4.4′	24°06.1	3.9′	59.4′
10	328°00.4	44.1		353°24.6	4.4′	24°09.9	3.7′	59.3′
11	343°00.1	43.7		7°48.0	4.4′	24°13.6	3.5′	59.3′
12	357°59.9	S21°43.3		22°11.4	4.4′	S24°17.2	3.4′	59.3′
13	12°59.6	42.9		36°34.7	4.4′	24°20.5	3.2′	59.3′
14	27°59.4	42.5		50°58.1	4.3′	24°23.7	3.0′	59.3′
15	42°59.1	·· 42.1		65°21.5	4.3′	24°26.8	2.9′	59.3′
16	57°58.9	41.7		79°44.8	4.3′	24°29.6	2.7′	59.3′
17	72°58.7	41.3		94°08.1	4.3′	24°32.3	2.5′	59.3′
18	87°58.4	S21°40.9		108°31.4	4.3′	S24°34.8	2.3′	59.2′
19	102°58.2	40.5		122°54.7	4.3′	24°37.2	2.2′	59.2′
20	117°57.9	40.1		137°18.0	4.3′	24°39.4	2.0′	59.2′
21	132°57.7	·· 39.7		151°41.3	4.3′	24°41.4	1.8′	59.2′
22	147°57.4	39.3		166°04.6	4.3′	24°43.2	1.7′	59.2′
23	162°57.2	38.9		180°27.9	4.3′	24°44.9	1.5′	59.2′
	SD = 16.3′	d = -0.4′		SD = 16.2′				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	177°57.0	S21°38.5		194°51.2	4.3′	S24°46.4	1.3′	59.1′
1	192°56.7	38.1		209°14.5	4.3′	24°47.7	1.2′	59.1′
2	207°56.5	37.7		223°37.8	4.3′	24°48.8	1.0′	59.1′
3	222°56.2	·· 37.3		238°01.1	4.3′	24°49.8	0.8′	59.1′
4	237°56.0	36.9		252°24.4	4.3′	24°50.6	0.6′	59.1′
5	252°55.8	36.5		266°47.8	4.4′	24°51.3	0.5′	59.1′
6	267°55.5	S21°36.0		281°11.2	4.4′	S24°51.8	0.3′	59.0′
7	282°55.3	35.6		295°34.5	4.4′	24°52.1	0.1′	59.0′
8	297°55.0	35.2		309°58.0	4.4′	24°52.2	-0.0′	59.0′
9	312°54.8	·· 34.8		324°21.4	4.5′	24°52.2	-0.2′	59.0′
10	327°54.6	34.4		338°44.8	4.5′	24°51.9	-0.4′	59.0′
11	342°54.3	34.0		353°08.3	4.5′	24°51.6	-0.5′	58.9′
12	357°54.1	S21°33.6		7°31.8	4.5′	S24°51.0	-0.7′	58.9′
13	12°53.8	33.1		21°55.4	4.6′	24°50.3	-0.9′	58.9′
14	27°53.6	32.7		36°19.0	4.6′	24°49.4	-1.0′	58.9′
15	42°53.4	·· 32.3		50°42.6	4.7′	24°48.4	-1.2′	58.9′
16	57°53.1	31.9		65°06.2	4.7′	24°47.2	-1.4′	58.8′
17	72°52.9	31.5		79°29.9	4.7′	24°45.8	-1.5′	58.8′
18	87°52.6	S21°31.0		93°53.7	4.8′	S24°44.3	-1.7′	58.8′
19	102°52.4	30.6		108°17.5	4.8′	24°42.6	-1.9′	58.8′
20	117°52.2	30.2		122°41.3	4.9′	24°40.7	-2.0′	58.7′
21	132°51.9	·· 29.8		137°05.2	4.9′	24°38.6	-2.2′	58.7′
22	147°51.7	29.3		151°29.1	5.0′	24°36.4	-2.4′	58.7′
23	162°51.5	28.9		165°53.1	5.0′	24°34.1	-2.5′	58.7′
	SD = 16.3′	d = -0.4′		SD = 16.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:09	10:07	▬	▬	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	08:25	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	15:23	16:17	17:12
N 58°	06:58	07:49	08:38	15:38	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	07:25	08:04	16:12	16:52	17:35
50°	06:37	07:18	07:55	16:21	16:58	17:39
45°	06:27	07:03	07:37	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°	06:02	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°	00:34	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	22:32	–:–

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

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 27-29 13-2%
10	07:25	07:37	12:08	09:27	21:57	
11	07:49	08:00	12:08	10:27	22:58	
12	08:12	08:24	12:08	11:29	23:59	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	112°41.6	196°45.8	S23°10.5	82°25.6	N13°28.1	164°38.2	S19°21.9	167°17.1	S19°52.3
1	127°44.0	211°44.9	10.5	97°26.9	28.6	179°40.0	21.8	182°19.2	52.2
2	142°46.5	226°43.9	10.5	112°28.2	29.0	194°41.9	21.7	197°21.4	52.1
3	157°48.9	241°43.0	·· 10.5	127°29.5	·· 29.5	209°43.7	·· 21.5	212°23.6	·· 52.1
4	172°51.4	256°42.0	10.5	142°30.8	29.9	224°45.6	21.4	227°25.7	52.0
5	187°53.9	271°41.1	10.4	157°32.1	30.3	239°47.5	21.2	242°27.9	52.0
6	202°56.3	286°40.1	S23°10.4	172°33.4	N13°30.8	254°49.3	S19°21.1	257°30.0	S19°51.9
7	217°58.8	301°39.2	10.4	187°34.8	31.2	269°51.2	21.0	272°32.2	51.8
8	233°01.3	316°38.2	10.3	202°36.1	31.7	284°53.0	20.8	287°34.4	51.8
9	248°03.7	331°37.3	·· 10.3	217°37.4	·· 32.1	299°54.9	·· 20.7	302°36.5	·· 51.7
10	263°06.2	346°36.4	10.3	232°38.7	32.6	314°56.8	20.5	317°38.7	51.6
11	278°08.7	1°35.4	10.2	247°40.0	33.0	329°58.6	20.4	332°40.8	51.6
12	293°11.1	16°34.5	S23°10.2	262°41.3	N13°33.5	345°00.5	S19°20.3	347°43.0	S19°51.5
13	308°13.6	31°33.5	10.2	277°42.6	33.9	0°02.3	20.1	2°45.1	51.4
14	323°16.1	46°32.6	10.1	292°43.9	34.4	15°04.2	20.0	17°47.3	51.4
15	338°18.5	61°31.6	·· 10.1	307°45.2	·· 34.8	30°06.1	·· 19.8	32°49.5	·· 51.3
16	353°21.0	76°30.7	10.0	322°46.5	35.3	45°07.9	19.7	47°51.6	51.2
17	8°23.4	91°29.7	10.0	337°47.8	35.7	60°09.8	19.5	62°53.8	51.2
18	23°25.9	106°28.8	S23°10.0	352°49.2	N13°36.2	75°11.6	S19°19.4	77°55.9	S19°51.1
19	38°28.4	121°27.8	09.9	7°50.5	36.6	90°13.5	19.3	92°58.1	51.0
20	53°30.8	136°26.9	09.9	22°51.8	37.1	105°15.4	19.1	108°00.2	51.0
21	68°33.3	151°25.9	·· 09.8	37°53.1	·· 37.5	120°17.2	·· 19.0	123°02.4	·· 50.9
22	83°35.8	166°25.0	09.8	52°54.4	38.0	135°19.1	18.8	138°04.6	50.8
23	98°38.2	181°24.0	09.7	67°55.7	38.4	150°20.9	18.7	153°06.7	50.8
Mer.pass.	16:27	ν -0.9′	d -0.0′	m -3.91	ν 1.3′	d 0.4′	m 0.04	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.66
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	113°40.7	196°23.1	S23°09.7	82°57.0	N13°38.8	165°22.8	S19°18.6	168°08.9	S19°50.7
1	128°43.2	211°22.2	09.6	97°58.3	39.3	180°24.7	18.4	183°11.0	50.6
2	143°45.6	226°21.2	09.6	112°59.6	39.7	195°26.5	18.3	198°13.2	50.6
3	158°48.1	241°20.3	·· 09.5	128°00.9	·· 40.2	210°28.4	·· 18.1	213°15.4	·· 50.5
4	173°50.6	256°19.3	09.5	143°02.2	40.6	225°30.2	18.0	228°17.5	50.4
5	188°53.0	271°18.4	09.4	158°03.5	41.1	240°32.1	17.8	243°19.7	50.4
6	203°55.5	286°17.4	S23°09.3	173°04.8	N13°41.5	255°34.0	S19°17.7	258°21.8	S19°50.3
7	218°57.9	301°16.5	09.3	188°06.1	42.0	270°35.8	17.6	273°24.0	50.2
8	234°00.4	316°15.5	09.2	203°07.4	42.4	285°37.7	17.4	288°26.1	50.2
9	249°02.9	331°14.6	·· 09.2	218°08.7	·· 42.9	300°39.6	·· 17.3	303°28.3	·· 50.1
10	264°05.3	346°13.6	09.1	233°10.0	43.3	315°41.4	17.1	318°30.5	50.1
11	279°07.8	1°12.7	09.0	248°11.3	43.8	330°43.3	17.0	333°32.6	50.0
12	294°10.3	16°11.7	S23°09.0	263°12.6	N13°44.2	345°45.1	S19°16.8	348°34.8	S19°49.9
13	309°12.7	31°10.8	08.9	278°13.9	44.7	0°47.0	16.7	3°36.9	49.9
14	324°15.2	46°09.9	08.8	293°15.2	45.1	15°48.9	16.6	18°39.1	49.8
15	339°17.7	61°08.9	·· 08.8	308°16.5	·· 45.6	30°50.7	·· 16.4	33°41.2	·· 49.7
16	354°20.1	76°08.0	08.7	323°17.8	46.0	45°52.6	16.3	48°43.4	49.7
17	9°22.6	91°07.0	08.6	338°19.1	46.5	60°54.4	16.1	63°45.6	49.6
18	24°25.0	106°06.1	S23°08.5	353°20.4	N13°46.9	75°56.3	S19°16.0	78°47.7	S19°49.5
19	39°27.5	121°05.1	08.5	8°21.7	47.4	90°58.2	15.8	93°49.9	49.5
20	54°30.0	136°04.2	08.4	23°23.0	47.8	106°00.0	15.7	108°52.0	49.4
21	69°32.4	151°03.2	·· 08.3	38°24.3	·· 48.2	121°01.9	·· 15.6	123°54.2	·· 49.3
22	84°34.9	166°02.3	08.2	53°25.6	48.7	136°03.7	15.4	138°56.4	49.3
23	99°37.4	181°01.3	08.2	68°26.9	49.1	151°05.6	15.3	153°58.5	49.2
Mer.pass.	16:23	ν -0.9′	d -0.1′	m -3.91	ν 1.3′	d 0.4′	m 0.06	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.65
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	114°39.8	196°00.4	S23°08.1	83°28.1	N13°49.6	166°07.5	S19°15.1	169°00.7	S19°49.1
1	129°42.3	210°59.5	08.0	98°29.4	50.0	181°09.3	15.0	184°02.8	49.1
2	144°44.8	225°58.5	07.9	113°30.7	50.5	196°11.2	14.9	199°05.0	49.0
3	159°47.2	240°57.6	·· 07.8	128°32.0	·· 50.9	211°13.0	·· 14.7	214°07.1	·· 48.9
4	174°49.7	255°56.6	07.7	143°33.3	51.4	226°14.9	14.6	229°09.3	48.9
5	189°52.2	270°55.7	07.7	158°34.6	51.8	241°16.8	14.4	244°11.5	48.8
6	204°54.6	285°54.7	S23°07.6	173°35.9	N13°52.3	256°18.6	S19°14.3	259°13.6	S19°48.7
7	219°57.1	300°53.8	07.5	188°37.2	52.7	271°20.5	14.1	274°15.8	48.7
8	234°59.5	315°52.8	07.4	203°38.5	53.2	286°22.3	14.0	289°17.9	48.6
9	250°02.0	330°51.9	·· 07.3	218°39.8	·· 53.6	301°24.2	·· 13.8	304°20.1	·· 48.5
10	265°04.5	345°51.0	07.2	233°41.1	54.1	316°26.1	13.7	319°22.2	48.5
11	280°06.9	0°50.0	07.1	248°42.3	54.5	331°27.9	13.6	334°24.4	48.4
12	295°09.4	15°49.1	S23°07.0	263°43.6	N13°55.0	346°29.8	S19°13.4	349°26.6	S19°48.3
13	310°11.9	30°48.1	06.9	278°44.9	55.4	1°31.6	13.3	4°28.7	48.3
14	325°14.3	45°47.2	06.8	293°46.2	55.9	16°33.5	13.1	19°30.9	48.2
15	340°16.8	60°46.2	·· 06.7	308°47.5	·· 56.3	31°35.3	·· 13.0	34°33.0	·· 48.1
16	355°19.3	75°45.3	06.6	323°48.8	56.7	46°37.2	12.8	49°35.2	48.1
17	10°21.7	90°44.3	06.5	338°50.1	57.2	61°39.1	12.7	64°37.3	48.0
18	25°24.2	105°43.4	S23°06.4	353°51.4	N13°57.6	76°40.9	S19°12.6	79°39.5	S19°47.9
19	40°26.7	120°42.5	06.3	8°52.6	58.1	91°42.8	12.4	94°41.7	47.9
20	55°29.1	135°41.5	06.2	23°53.9	58.5	106°44.6	12.3	109°43.8	47.8
21	70°31.6	150°40.6	·· 06.1	38°55.2	·· 59.0	121°46.5	·· 12.1	124°46.0	·· 47.7
22	85°34.0	165°39.6	06.0	53°56.5	59.4	136°48.4	12.0	139°48.1	47.7
23	100°36.5	180°38.7	05.9	68°57.8	59.9	151°50.2	11.8	154°50.3	47.6
Mer.pass.	16:19	ν -0.9′	d -0.1′	m -3.91	ν 1.3′	d 0.4′	m 0.08	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.65

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.7	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.7	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°17.6	89°21.4
Acamar	315°14.1	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.6	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.0	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.5
Suhail	222°48.2	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°50.6	-8°45.0
Regulus	207°37.6	11°51.8
Dubhe	193°44.7	61°38.1
Denebola	182°28.1	14°27.2
Gienah	175°46.8	-17°39.4
Acrux	173°03.4	-63°12.6
Gacrux	171°55.0	-57°13.5
Alioth	166°15.8	55°50.5
Spica	158°25.7	-11°16.1
Alkaid	152°54.7	49°12.3
Hadar	148°40.6	-60°28.1
Menkent	148°01.4	-36°28.1
Arcturus	145°51.0	19°04.3
Rigil Kent.	139°44.8	-60°54.9
Kochab	137°20.4	74°03.9
Zuben'ubi	136°59.7	-16°07.6
Alphecca	126°06.7	26°38.6
Antares	112°20.0	-26°28.5
Atria	107°17.6	-69°03.6
Sabik	102°06.8	-15°45.0
Shaula	96°15.1	-37°07.0
Rasalhague	96°01.8	12°32.7
Eltanin	90°44.2	51°29.1
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.8	38°48.1
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.5	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 13 Wed	SHA	Mer.pass
Venus	84°04.3	10:54
Mars	329°44.0	18:29
Jupiter	51°56.6	13:00
Saturn	54°35.5	12:49

Jan 14 Thu	SHA	Mer.pass
Venus	82°42.4	10:55
Mars	329°16.3	18:27
Jupiter	51°42.1	12:57
Saturn	54°28.2	12:46

Jan 15 Fri	SHA	Mer.pass
Venus	81°20.6	10:57
Mars	328°48.3	18:25
Jupiter	51°27.6	12:54
Saturn	54°20.8	12:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°51.2	S21°28.5	180°17.1	5.1′	S24°31.6	-2.7′	58.7′
1	192°51.0	28.1	194°41.2	5.2′	24°28.9	-2.8′	58.6′
2	207°50.8	27.6	209°05.4	5.2′	24°26.0	-3.0′	58.6′
3	222°50.5	·· 27.2	223°29.6	5.3′	24°23.0	-3.2′	58.6′
4	237°50.3	26.8	237°53.9	5.3′	24°19.9	-3.3′	58.6′
5	252°50.1	26.4	252°18.2	5.4′	24°16.6	-3.5′	58.5′
6	267°49.8	S21°25.9	266°42.7	5.5′	S24°13.1	-3.6′	58.5′
7	282°49.6	25.5	281°07.1	5.5′	24°09.5	-3.8′	58.5′
8	297°49.4	25.1	295°31.7	5.6′	24°05.7	-3.9′	58.5′
9	312°49.1	·· 24.6	309°56.3	5.7′	24°01.8	-4.1′	58.4′
10	327°48.9	24.2	324°21.0	5.8′	23°57.7	-4.2′	58.4′
11	342°48.7	23.8	338°45.7	5.8′	23°53.5	-4.4′	58.4′
12	357°48.4	S21°23.3	353°10.6	5.9′	S23°49.1	-4.5′	58.4′
13	12°48.2	22.9	7°35.5	6.0′	23°44.6	-4.7′	58.3′
14	27°48.0	22.5	22°00.5	6.1′	23°39.9	-4.8′	58.3′
15	42°47.7	·· 22.0	36°25.6	6.2′	23°35.1	-5.0′	58.3′
16	57°47.5	21.6	50°50.7	6.2′	23°30.1	-5.1′	58.3′
17	72°47.3	21.2	65°16.0	6.3′	23°25.0	-5.3′	58.2′
18	87°47.0	S21°20.7	79°41.3	6.4′	S23°19.7	-5.4′	58.2′
19	102°46.8	20.3	94°06.7	6.5′	23°14.4	-5.5′	58.2′
20	117°46.6	19.8	108°32.2	6.6′	23°08.8	-5.7′	58.1′
21	132°46.3	·· 19.4	122°57.8	6.7′	23°03.2	-5.8′	58.1′
22	147°46.1	19.0	137°23.4	6.8′	22°57.3	-5.9′	58.1′
23	162°45.9	18.5	151°49.2	6.8′	22°51.4	-6.1′	58.1′
	SD = 16.3′	d = -0.4′	SD = 16.0′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°45.7	S21°18.1	166°15.0	6.9′	S22°45.3	-6.2′	58.0′
1	192°45.4	17.6	180°41.0	7.0′	22°39.1	-6.3′	58.0′
2	207°45.2	17.2	195°07.0	7.1′	22°32.8	-6.5′	58.0′
3	222°45.0	·· 16.7	209°33.1	7.2′	22°26.3	-6.6′	57.9′
4	237°44.7	16.3	223°59.4	7.3′	22°19.7	-6.7′	57.9′
5	252°44.5	15.8	238°25.7	7.4′	22°13.0	-6.9′	57.9′
6	267°44.3	S21°15.4	252°52.1	7.5′	S22°06.1	-7.0′	57.9′
7	282°44.1	15.0	267°18.6	7.6′	21°59.2	-7.1′	57.8′
8	297°43.8	14.5	281°45.2	7.7′	21°52.1	-7.2′	57.8′
9	312°43.6	·· 14.1	296°11.9	7.8′	21°44.8	-7.3′	57.8′
10	327°43.4	13.6	310°38.7	7.9′	21°37.5	-7.5′	57.7′
11	342°43.2	13.2	325°05.6	8.0′	21°30.0	-7.6′	57.7′
12	357°42.9	S21°12.7	339°32.6	8.1′	S21°22.5	-7.7′	57.7′
13	12°42.7	12.3	353°59.7	8.2′	21°14.8	-7.8′	57.7′
14	27°42.5	11.8	8°26.9	8.3′	21°06.9	-7.9′	57.6′
15	42°42.3	·· 11.4	22°54.2	8.4′	20°59.0	-8.0′	57.6′
16	57°42.0	10.9	37°21.6	8.5′	20°51.0	-8.1′	57.6′
17	72°41.8	10.4	51°49.1	8.6′	20°42.9	-8.3′	57.5′
18	87°41.6	S21°10.0	66°16.7	8.7′	S20°34.6	-8.4′	57.5′
19	102°41.4	09.5	80°44.4	8.8′	20°26.2	-8.5′	57.5′
20	117°41.1	09.1	95°12.2	8.9′	20°17.8	-8.6′	57.4′
21	132°40.9	·· 08.6	109°40.1	9.0′	20°09.2	-8.7′	57.4′
22	147°40.7	08.2	124°08.1	9.1′	20°00.5	-8.8′	57.4′
23	162°40.5	07.7	138°36.2	9.2′	19°51.8	-8.9′	57.4′
	SD = 16.3′	d = -0.4′	SD = 15.8′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°40.2	S21°07.2	153°04.4	9.3′	S19°42.9	-9.0′	57.3′
1	192°40.0	06.8	167°32.7	9.4′	19°33.9	-9.1′	57.3′
2	207°39.8	06.3	182°01.2	9.5′	19°24.9	-9.2′	57.3′
3	222°39.6	·· 05.9	196°29.7	9.6′	19°15.7	-9.3′	57.2′
4	237°39.4	05.4	210°58.3	9.7′	19°06.4	-9.3′	57.2′
5	252°39.1	04.9	225°27.0	9.8′	18°57.1	-9.4′	57.2′
6	267°38.9	S21°04.5	239°55.9	9.9′	S18°47.6	-9.5′	57.1′
7	282°38.7	04.0	254°24.8	10.0′	18°38.1	-9.6′	57.1′
8	297°38.5	03.5	268°53.8	10.1′	18°28.5	-9.7′	57.1′
9	312°38.3	·· 03.1	283°22.9	10.2′	18°18.8	-9.8′	57.0′
10	327°38.0	02.6	297°52.2	10.3′	18°09.0	-9.9′	57.0′
11	342°37.8	02.1	312°21.5	10.4′	17°59.1	-10.0′	57.0′
12	357°37.6	S21°01.7	326°50.9	10.5′	S17°49.2	-10.0′	56.9′
13	12°37.4	01.2	341°20.5	10.6′	17°39.2	-10.1′	56.9′
14	27°37.2	00.7	355°50.1	10.7′	17°29.0	-10.2′	56.9′
15	42°36.9	21°00.3	10°19.8	10.8′	17°18.8	-10.3′	56.9′
16	57°36.7	20°59.8	24°49.7	10.9′	17°08.6	-10.3′	56.8′
17	72°36.5	59.3	39°19.6	11.0′	16°58.2	-10.4′	56.8′
18	87°36.3	S20°58.9	53°49.6	11.1′	S16°47.8	-10.5′	56.8′
19	102°36.1	58.4	68°19.8	11.2′	16°37.3	-10.6′	56.7′
20	117°35.9	57.9	82°50.0	11.3′	16°26.8	-10.6′	56.7′
21	132°35.6	·· 57.4	97°20.3	11.4′	16°16.1	-10.7′	56.7′
22	147°35.4	57.0	111°50.7	11.5′	16°05.4	-10.8′	56.6′
23	162°35.2	56.5	126°21.2	11.6′	15°54.7	-10.8′	56.6′
	SD = 16.3′	d = -0.5′	SD = 15.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	08:02	09:55	▬	▬	14:24	16:17
N 70°	07:47	09:20	▬	▬	14:59	16:32
68°	07:35	08:55	10:37	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°	00:58	02:45	03:40	20:37	21:32	23:14
58°	–:–	02:23	03:26	20:51	21:54	–:–
S 60°	–:–	01:53	03:09	21:07	22:23	–:–

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

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%
13	08:35	08:46	12:09	12:28	–:–	
14	08:57	09:08	12:09	13:25	00:57	
15	09:19	09:30	12:09	14:17	01:52	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	115°39.0	195°37.7	S23°05.8	83°59.1	N14°00.3	166°52.1	S19°11.7	169°52.4	S19°47.5
1	130°41.4	210°36.8	05.7	99°00.3	00.8	181°53.9	11.6	184°54.6	47.5
2	145°43.9	225°35.9	05.6	114°01.6	01.2	196°55.8	11.4	199°56.8	47.4
3	160°46.4	240°34.9	·· 05.4	129°02.9	·· 01.7	211°57.7	·· 11.3	214°58.9	·· 47.3
4	175°48.8	255°34.0	05.3	144°04.2	02.1	226°59.5	11.1	230°01.1	47.3
5	190°51.3	270°33.0	05.2	159°05.5	02.6	242°01.4	11.0	245°03.2	47.2
6	205°53.8	285°32.1	S23°05.1	174°06.8	N14°03.0	257°03.2	S19°10.8	260°05.4	S19°47.1
7	220°56.2	300°31.1	05.0	189°08.0	03.5	272°05.1	10.7	275°07.5	47.1
8	235°58.7	315°30.2	04.9	204°09.3	03.9	287°07.0	10.5	290°09.7	47.0
9	251°01.1	330°29.3	·· 04.7	219°10.6	·· 04.4	302°08.8	·· 10.4	305°11.9	·· 46.9
10	266°03.6	345°28.3	04.6	234°11.9	04.8	317°10.7	10.3	320°14.0	46.9
11	281°06.1	0°27.4	04.5	249°13.1	05.3	332°12.5	10.1	335°16.2	46.8
12	296°08.5	15°26.4	S23°04.4	264°14.4	N14°05.7	347°14.4	S19°10.0	350°18.3	S19°46.8
13	311°11.0	30°25.5	04.2	279°15.7	06.1	2°16.3	09.8	5°20.5	46.7
14	326°13.5	45°24.5	04.1	294°17.0	06.6	17°18.1	09.7	20°22.6	46.6
15	341°15.9	60°23.6	·· 04.0	309°18.3	·· 07.0	32°20.0	·· 09.5	35°24.8	·· 46.6
16	356°18.4	75°22.7	03.8	324°19.5	07.5	47°21.8	09.4	50°27.0	46.5
17	11°20.9	90°21.7	03.7	339°20.8	07.9	62°23.7	09.3	65°29.1	46.4
18	26°23.3	105°20.8	S23°03.6	354°22.1	N14°08.4	77°25.6	S19°09.1	80°31.3	S19°46.4
19	41°25.8	120°19.8	03.4	9°23.4	08.8	92°27.4	09.0	95°33.4	46.3
20	56°28.3	135°18.9	03.3	24°24.6	09.3	107°29.3	08.8	110°35.6	46.2
21	71°30.7	150°18.0	·· 03.2	39°25.9	·· 09.7	122°31.1	·· 08.7	125°37.7	·· 46.2
22	86°33.2	165°17.0	03.0	54°27.2	10.2	137°33.0	08.5	140°39.9	46.1
23	101°35.6	180°16.1	02.9	69°28.5	10.6	152°34.9	08.4	155°42.1	46.0
Mer.pass.	16:15	ν -0.9′	d -0.1′	m -3.91	ν 1.3′	d 0.4′	m 0.10	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.64

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	116°38.1	195°15.1	S23°02.8	84°29.7	N14°11.1	167°36.7	S19°08.2	170°44.2	S19°46.0
1	131°40.6	210°14.2	02.6	99°31.0	11.5	182°38.6	08.1	185°46.4	45.9
2	146°43.0	225°13.3	02.5	114°32.3	12.0	197°40.4	08.0	200°48.5	45.8
3	161°45.5	240°12.3	·· 02.3	129°33.5	·· 12.4	212°42.3	·· 07.8	215°50.7	·· 45.8
4	176°48.0	255°11.4	02.2	144°34.8	12.9	227°44.1	07.7	230°52.8	45.7
5	191°50.4	270°10.4	02.0	159°36.1	13.3	242°46.0	07.5	245°55.0	45.6
6	206°52.9	285°09.5	S23°01.9	174°37.4	N14°13.8	257°47.9	S19°07.4	260°57.2	S19°45.6
7	221°55.4	300°08.6	01.7	189°38.6	14.2	272°49.7	07.2	275°59.3	45.5
8	236°57.8	315°07.6	01.6	204°39.9	14.6	287°51.6	07.1	291°01.5	45.4
9	252°00.3	330°06.7	·· 01.4	219°41.2	·· 15.1	302°53.4	·· 06.9	306°03.6	·· 45.4
10	267°02.8	345°05.7	01.3	234°42.4	15.5	317°55.3	06.8	321°05.8	45.3
11	282°05.2	0°04.8	01.1	249°43.7	16.0	332°57.2	06.6	336°07.9	45.2
12	297°07.7	15°03.9	S23°01.0	264°45.0	N14°16.4	347°59.0	S19°06.5	351°10.1	S19°45.2
13	312°10.1	30°02.9	00.8	279°46.2	16.9	3°00.9	06.4	6°12.3	45.1
14	327°12.6	45°02.0	00.7	294°47.5	17.3	18°02.7	06.2	21°14.4	45.0
15	342°15.1	60°01.0	·· 00.5	309°48.8	·· 17.8	33°04.6	·· 06.1	36°16.6	·· 45.0
16	357°17.5	75°00.1	00.4	324°50.0	18.2	48°06.5	05.9	51°18.7	44.9
17	12°20.0	89°59.2	00.2	339°51.3	18.7	63°08.3	05.8	66°20.9	44.8
18	27°22.5	104°58.2	S23°00.0	354°52.6	N14°19.1	78°10.2	S19°05.6	81°23.0	S19°44.8
19	42°24.9	119°57.3	22°59.9	9°53.8	19.6	93°12.0	05.5	96°25.2	44.7
20	57°27.4	134°56.4	59.7	24°55.1	20.0	108°13.9	05.3	111°27.4	44.6
21	72°29.9	149°55.4	·· 59.5	39°56.4	·· 20.5	123°15.7	·· 05.2	126°29.5	·· 44.6
22	87°32.3	164°54.5	59.4	54°57.6	20.9	138°17.6	05.0	141°31.7	44.5
23	102°34.8	179°53.5	59.2	69°58.9	21.4	153°19.5	04.9	156°33.8	44.4
Mer.pass.	16:11	ν -0.9′	d -0.1′	m -3.91	ν 1.3′	d 0.4′	m 0.13	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.63

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	117°37.2	194°52.6	S22°59.0	85°00.2	N14°21.8	168°21.3	S19°04.8	171°36.0	S19°44.4
1	132°39.7	209°51.7	58.9	100°01.4	22.2	183°23.2	04.6	186°38.1	44.3
2	147°42.2	224°50.7	58.7	115°02.7	22.7	198°25.0	04.5	201°40.3	44.2
3	162°44.6	239°49.8	·· 58.5	130°04.0	·· 23.1	213°26.9	·· 04.3	216°42.4	·· 44.2
4	177°47.1	254°48.9	58.3	145°05.2	23.6	228°28.8	04.2	231°44.6	44.1
5	192°49.6	269°47.9	58.2	160°06.5	24.0	243°30.6	04.0	246°46.8	44.0
6	207°52.0	284°47.0	S22°58.0	175°07.7	N14°24.5	258°32.5	S19°03.9	261°48.9	S19°44.0
7	222°54.5	299°46.0	57.8	190°09.0	24.9	273°34.3	03.7	276°51.1	43.9
8	237°57.0	314°45.1	57.6	205°10.3	25.4	288°36.2	03.6	291°53.2	43.8
9	252°59.4	329°44.2	·· 57.5	220°11.5	·· 25.8	303°38.1	·· 03.4	306°55.4	·· 43.8
10	268°01.9	344°43.2	57.3	235°12.8	26.3	318°39.9	03.3	321°57.5	43.7
11	283°04.4	359°42.3	57.1	250°14.0	26.7	333°41.8	03.2	336°59.7	43.6
12	298°06.8	14°41.4	S22°56.9	265°15.3	N14°27.2	348°43.6	S19°03.0	352°01.9	S19°43.6
13	313°09.3	29°40.4	56.7	280°16.6	27.6	3°45.5	02.9	7°04.0	43.5
14	328°11.7	44°39.5	56.5	295°17.8	28.1	18°47.4	02.7	22°06.2	43.4
15	343°14.2	59°38.6	·· 56.4	310°19.1	·· 28.5	33°49.2	·· 02.6	37°08.3	·· 43.4
16	358°16.7	74°37.6	56.2	325°20.3	29.0	48°51.1	02.4	52°10.5	43.3
17	13°19.1	89°36.7	56.0	340°21.6	29.4	63°52.9	02.3	67°12.6	43.2
18	28°21.6	104°35.8	S22°55.8	355°22.8	N14°29.8	78°54.8	S19°02.1	82°14.8	S19°43.2
19	43°24.1	119°34.8	55.6	10°24.1	30.3	93°56.6	02.0	97°17.0	43.1
20	58°26.5	134°33.9	55.4	25°25.3	30.7	108°58.5	01.8	112°19.1	43.0
21	73°29.0	149°33.0	·· 55.2	40°26.6	·· 31.2	124°00.4	·· 01.7	127°21.3	·· 43.0
22	88°31.5	164°32.0	55.0	55°27.9	31.6	139°02.2	01.5	142°23.4	42.9
23	103°33.9	179°31.1	54.8	70°29.1	32.1	154°04.1	01.4	157°25.6	42.8
Mer.pass.	16:07	ν -0.9′	d -0.2′	m -3.91	ν 1.3′	d 0.4′	m 0.15	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.63

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.7	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.7	-57°08.2
Hamal	327°54.8	23°33.7
Polaris	315°19.1	89°21.4
Acamar	315°14.1	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.6	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.0	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.6
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.6
Suhail	222°48.2	-43°31.0
Miaplacidus	221°37.9	-69°48.0
Alphard	217°50.6	-8°45.0
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.1
Denebola	182°28.1	14°27.2
Gienah	175°46.7	-17°39.4
Acrux	173°03.3	-63°12.6
Gacrux	171°54.9	-57°13.5
Alioth	166°15.8	55°50.5
Spica	158°25.7	-11°16.1
Alkaid	152°54.7	49°12.3
Hadar	148°40.5	-60°28.1
Menkent	148°01.4	-36°28.1
Arcturus	145°50.9	19°04.3
Rigil Kent.	139°44.8	-60°54.9
Kochab	137°20.3	74°03.9
Zuben'ubi	136°59.7	-16°07.6
Alphecca	126°06.7	26°38.5
Antares	112°20.0	-26°28.5
Atria	107°17.6	-69°03.6
Sabik	102°06.7	-15°45.0
Shaula	96°15.1	-37°07.0
Rasalhague	96°01.8	12°32.7
Eltanin	90°44.2	51°29.0
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.8	38°48.1
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.5	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 16 Sat	SHA	Mer.pass
Venus	79°58.8	10:58
Mars	328°20.1	18:22
Jupiter	51°13.1	12:51
Saturn	54°13.5	12:39

Jan 17 Sun	SHA	Mer.pass
Venus	78°37.0	11:00
Mars	327°51.6	18:20
Jupiter	50°58.6	12:48
Saturn	54°06.1	12:35

Jan 18 Mon	SHA	Mer.pass
Venus	77°15.4	11:01
Mars	327°22.9	18:18
Jupiter	50°44.1	12:45
Saturn	53°58.7	12:32

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°35.0	S20°56.0	140°51.8	11.7′	S15°43.8	-10.9′	56.6′
1	192°34.8	55.5	155°22.5	11.8′	15°32.9	-11.0′	56.5′
2	207°34.6	55.0	169°53.3	11.9′	15°22.0	-11.0′	56.5′
3	222°34.4	·· 54.6	184°24.2	12.0′	15°10.9	-11.1′	56.5′
4	237°34.1	54.1	198°55.1	12.1′	14°59.9	-11.1′	56.5′
5	252°33.9	53.6	213°26.2	12.2′	14°48.7	-11.2′	56.4′
6	267°33.7	S20°53.1	227°57.4	12.2′	S14°37.5	-11.3′	56.4′
7	282°33.5	52.7	242°28.6	12.3′	14°26.3	-11.3′	56.4′
8	297°33.3	52.2	256°59.9	12.4′	14°15.0	-11.4′	56.3′
9	312°33.1	·· 51.7	271°31.4	12.5′	14°03.6	-11.4′	56.3′
10	327°32.9	51.2	286°02.9	12.6′	13°52.2	-11.5′	56.3′
11	342°32.7	50.7	300°34.5	12.7′	13°40.7	-11.5′	56.2′
12	357°32.4	S20°50.2	315°06.2	12.8′	S13°29.2	-11.6′	56.2′
13	12°32.2	49.8	329°37.9	12.8′	13°17.6	-11.6′	56.2′
14	27°32.0	49.3	344°09.8	12.9′	13°06.0	-11.7′	56.2′
15	42°31.8	·· 48.8	358°41.7	13.0′	12°54.3	-11.7′	56.1′
16	57°31.6	48.3	13°13.7	13.1′	12°42.6	-11.8′	56.1′
17	72°31.4	47.8	27°45.8	13.2′	12°30.9	-11.8′	56.1′
18	87°31.2	S20°47.3	42°18.0	13.3′	S12°19.1	-11.8′	56.0′
19	102°31.0	46.8	56°50.2	13.3′	12°07.2	-11.9′	56.0′
20	117°30.8	46.3	71°22.6	13.4′	11°55.3	-11.9′	56.0′
21	132°30.6	·· 45.8	85°55.0	13.5′	11°43.4	-12.0′	56.0′
22	147°30.4	45.4	100°27.5	13.6′	11°31.4	-12.0′	55.9′
23	162°30.1	44.9	115°00.0	13.6′	11°19.4	-12.0′	55.9′
	SD = 16.3′	d = -0.5′	SD = 15.4′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°29.9	S20°44.4	129°32.7	13.7′	S11°07.4	-12.1′	55.9′
1	192°29.7	43.9	144°05.4	13.8′	10°55.3	-12.1′	55.8′
2	207°29.5	43.4	158°38.2	13.9′	10°43.2	-12.1′	55.8′
3	222°29.3	·· 42.9	173°11.0	13.9′	10°31.1	-12.2′	55.8′
4	237°29.1	42.4	187°44.0	14.0′	10°18.9	-12.2′	55.8′
5	252°28.9	41.9	202°17.0	14.1′	10°06.7	-12.2′	55.7′
6	267°28.7	S20°41.4	216°50.0	14.1′	S09°54.5	-12.3′	55.7′
7	282°28.5	40.9	231°23.2	14.2′	09°42.2	-12.3′	55.7′
8	297°28.3	40.4	245°56.4	14.3′	09°29.9	-12.3′	55.6′
9	312°28.1	·· 39.9	260°29.7	14.3′	09°17.6	-12.3′	55.6′
10	327°27.9	39.4	275°03.0	14.4′	09°05.2	-12.4′	55.6′
11	342°27.7	38.9	289°36.4	14.5′	08°52.9	-12.4′	55.6′
12	357°27.5	S20°38.4	304°09.9	14.5′	S08°40.5	-12.4′	55.5′
13	12°27.3	37.9	318°43.4	14.6′	08°28.0	-12.4′	55.5′
14	27°27.1	37.4	333°17.0	14.6′	08°15.6	-12.5′	55.5′
15	42°26.9	·· 36.9	347°50.6	14.7′	08°03.1	-12.5′	55.5′
16	57°26.7	36.4	2°24.3	14.8′	07°50.6	-12.5′	55.4′
17	72°26.5	35.9	16°58.1	14.8′	07°38.1	-12.5′	55.4′
18	87°26.3	S20°35.4	31°31.9	14.9′	S07°25.6	-12.5′	55.4′
19	102°26.1	34.9	46°05.8	14.9′	07°13.1	-12.6′	55.4′
20	117°25.9	34.4	60°39.7	15.0′	07°00.5	-12.6′	55.3′
21	132°25.7	·· 33.9	75°13.7	15.0′	06°47.9	-12.6′	55.3′
22	147°25.5	33.4	89°47.7	15.1′	06°35.3	-12.6′	55.3′
23	162°25.3	32.8	104°21.8	15.1′	06°22.7	-12.6′	55.3′
	SD = 16.3′	d = -0.5′	SD = 15.2′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.1	S20°32.3	118°56.0	15.2′	S06°10.1	-12.6′	55.2′
1	192°24.9	31.8	133°30.2	15.2′	05°57.5	-12.6′	55.2′
2	207°24.7	31.3	148°04.4	15.3′	05°44.8	-12.7′	55.2′
3	222°24.5	·· 30.8	162°38.7	15.3′	05°32.2	-12.7′	55.2′
4	237°24.3	30.3	177°13.0	15.4′	05°19.5	-12.7′	55.1′
5	252°24.1	29.8	191°47.4	15.4′	05°06.8	-12.7′	55.1′
6	267°23.9	S20°29.3	206°21.8	15.5′	S04°54.1	-12.7′	55.1′
7	282°23.7	28.8	220°56.3	15.5′	04°41.4	-12.7′	55.1′
8	297°23.5	28.2	235°30.8	15.5′	04°28.7	-12.7′	55.0′
9	312°23.3	·· 27.7	250°05.3	15.6′	04°16.0	-12.7′	55.0′
10	327°23.1	27.2	264°39.9	15.6′	04°03.3	-12.7′	55.0′
11	342°22.9	26.7	279°14.5	15.7′	03°50.6	-12.7′	55.0′
12	357°22.7	S20°26.2	293°49.2	15.7′	S03°37.8	-12.7′	55.0′
13	12°22.5	25.7	308°23.9	15.7′	03°25.1	-12.7′	54.9′
14	27°22.3	25.1	322°58.6	15.8′	03°12.4	-12.7′	54.9′
15	42°22.1	·· 24.6	337°33.4	15.8′	02°59.6	-12.7′	54.9′
16	57°21.9	24.1	352°08.2	15.8′	02°46.9	-12.7′	54.9′
17	72°21.7	23.6	6°43.0	15.9′	02°34.2	-12.7′	54.9′
18	87°21.5	S20°23.1	21°17.9	15.9′	S02°21.4	-12.7′	54.8′
19	102°21.3	22.5	35°52.8	15.9′	02°08.7	-12.7′	54.8′
20	117°21.1	22.0	50°27.7	16.0′	01°56.0	-12.7′	54.8′
21	132°20.9	·· 21.5	65°02.6	16.0′	01°43.2	-12.7′	54.8′
22	147°20.7	21.0	79°37.6	16.0′	01°30.5	-12.7′	54.8′
23	162°20.5	20.4	94°12.6	16.0′	01°17.8	-12.7′	54.7′
	SD = 16.2′	d = -0.5′	SD = 15.1′				

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°	06:09	06:40	07:07	17:14	17:41	18:12
30°	06:01	06:31	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	18:46	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	21:05
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	23:00
58°	–:–	02:31	03:33	20:46	21:47	–:–
S 60°	–:–	02:04	03:17	21:02	22:13	–:–

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

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 3-5 9-24%
16	09:40	09:50	12:10	15:05	02:42	
17	10:00	10:10	12:10	15:50	03:28	
18	10:20	10:29	12:10	16:32	04:11	

January 19, 20, 21 UT (Tue., Wed., Thu.)

DUT1 = UT1-UTC = -0.1714 sec ΔT = TT-UT1 = +69.3554 sec

2021 January 19 to Jan. 21 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	118°36.4	194°30.2	S22°54.6	85°30.4	N14°32.5	169°05.9	S19°01.3	172°27.7	S19°42.8
1	133°38.9	209°29.2	54.4	100°31.6	33.0	184°07.8	01.1	187°29.9	42.7
2	148°41.3	224°28.3	54.2	115°32.9	33.4	199°09.7	01.0	202°32.0	42.6
3	163°43.8	239°27.4	·· 54.0	130°34.1	·· 33.9	214°11.5	·· 00.8	217°34.2	·· 42.6
4	178°46.2	254°26.4	53.8	145°35.4	34.3	229°13.4	00.7	232°36.4	42.5
5	193°48.7	269°25.5	53.6	160°36.6	34.8	244°15.2	00.5	247°38.5	42.4
6	208°51.2	284°24.6	S22°53.4	175°37.9	N14°35.2	259°17.1	S19°00.4	262°40.7	S19°42.4
7	223°53.6	299°23.6	53.2	190°39.1	35.6	274°18.9	00.2	277°42.8	42.3
8	238°56.1	314°22.7	53.0	205°40.4	36.1	289°20.8	19°00.1	292°45.0	42.2
9	253°58.6	329°21.8	·· 52.8	220°41.6	·· 36.5	304°22.7	18°59.9	307°47.1	·· 42.2
10	269°01.0	344°20.8	52.6	235°42.9	37.0	319°24.5	59.8	322°49.3	42.1
11	284°03.5	359°19.9	52.3	250°44.1	37.4	334°26.4	59.6	337°51.5	42.0
12	299°06.0	14°19.0	S22°52.1	265°45.4	N14°37.9	349°28.2	S18°59.5	352°53.6	S19°41.9
13	314°08.4	29°18.0	51.9	280°46.6	38.3	4°30.1	59.3	7°55.8	41.9
14	329°10.9	44°17.1	51.7	295°47.9	38.8	19°32.0	59.2	22°57.9	41.8
15	344°13.3	59°16.2	·· 51.5	310°49.1	·· 39.2	34°33.8	·· 59.1	38°00.1	·· 41.7
16	359°15.8	74°15.2	51.3	325°50.4	39.7	49°35.7	58.9	53°02.2	41.7
17	14°18.3	89°14.3	51.0	340°51.6	40.1	64°37.5	58.8	68°04.4	41.6
18	29°20.7	104°13.4	S22°50.8	355°52.9	N14°40.6	79°39.4	S18°58.6	83°06.6	S19°41.5
19	44°23.2	119°12.5	50.6	10°54.1	41.0	94°41.3	58.5	98°08.7	41.5
20	59°25.7	134°11.5	50.4	25°55.4	41.4	109°43.1	58.3	113°10.9	41.4
21	74°28.1	149°10.6	·· 50.2	40°56.6	·· 41.9	124°45.0	·· 58.2	128°13.0	·· 41.3
22	89°30.6	164°09.7	49.9	55°57.8	42.3	139°46.8	58.0	143°15.2	41.3
23	104°33.1	179°08.7	49.7	70°59.1	42.8	154°48.7	57.9	158°17.3	41.2
	Mer.pass. 16:03	ν -0.9′	d -0.2′	m -3.91	ν 1.3′	d 0.4′	m 0.17	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.62

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	119°35.5	194°07.8	S22°49.5	86°00.3	N14°43.2	169°50.5	S18°57.7	173°19.5	S19°41.1
1	134°38.0	209°06.9	49.2	101°01.6	43.7	184°52.4	57.6	188°21.6	41.1
2	149°40.5	224°06.0	49.0	116°02.8	44.1	199°54.3	57.4	203°23.8	41.0
3	164°42.9	239°05.0	·· 48.8	131°04.1	·· 44.6	214°56.1	·· 57.3	218°26.0	·· 40.9
4	179°45.4	254°04.1	48.5	146°05.3	45.0	229°58.0	57.1	233°28.1	40.9
5	194°47.8	269°03.2	48.3	161°06.5	45.5	244°59.8	57.0	248°30.3	40.8
6	209°50.3	284°02.2	S22°48.1	176°07.8	N14°45.9	260°01.7	S18°56.8	263°32.4	S19°40.7
7	224°52.8	299°01.3	47.8	191°09.0	46.4	275°03.6	56.7	278°34.6	40.7
8	239°55.2	314°00.4	47.6	206°10.3	46.8	290°05.4	56.6	293°36.7	40.6
9	254°57.7	328°59.5	·· 47.4	221°11.5	·· 47.2	305°07.3	·· 56.4	308°38.9	·· 40.5
10	270°00.2	343°58.5	47.1	236°12.8	47.7	320°09.1	56.3	323°41.1	40.5
11	285°02.6	358°57.6	46.9	251°14.0	48.1	335°11.0	56.1	338°43.2	40.4
12	300°05.1	13°56.7	S22°46.6	266°15.2	N14°48.6	350°12.8	S18°56.0	353°45.4	S19°40.3
13	315°07.6	28°55.7	46.4	281°16.5	49.0	5°14.7	55.8	8°47.5	40.3
14	330°10.0	43°54.8	46.1	296°17.7	49.5	20°16.6	55.7	23°49.7	40.2
15	345°12.5	58°53.9	·· 45.9	311°18.9	·· 49.9	35°18.4	·· 55.5	38°51.8	·· 40.1
16	0°14.9	73°53.0	45.7	326°20.2	50.4	50°20.3	55.4	53°54.0	40.1
17	15°17.4	88°52.0	45.4	341°21.4	50.8	65°22.1	55.2	68°56.1	40.0
18	30°19.9	103°51.1	S22°45.2	356°22.7	N14°51.3	80°24.0	S18°55.1	83°58.3	S19°39.9
19	45°22.3	118°50.2	44.9	11°23.9	51.7	95°25.9	54.9	99°00.5	39.9
20	60°24.8	133°49.3	44.7	26°25.1	52.1	110°27.7	54.8	114°02.6	39.8
21	75°27.3	148°48.3	·· 44.4	41°26.4	·· 52.6	125°29.6	·· 54.6	129°04.8	·· 39.7
22	90°29.7	163°47.4	44.1	56°27.6	53.0	140°31.4	54.5	144°06.9	39.7
23	105°32.2	178°46.5	43.9	71°28.8	53.5	155°33.3	54.3	159°09.1	39.6
	Mer.pass. 15:59	ν -0.9′	d -0.2′	m -3.91	ν 1.2′	d 0.4′	m 0.19	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.60

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	120°34.7	193°45.6	S22°43.6	86°30.1	N14°53.9	170°35.1	S18°54.2	174°11.2	S19°39.5
1	135°37.1	208°44.6	43.4	101°31.3	54.4	185°37.0	54.0	189°13.4	39.5
2	150°39.6	223°43.7	43.1	116°32.5	54.8	200°38.9	53.9	204°15.6	39.4
3	165°42.1	238°42.8	·· 42.9	131°33.8	·· 55.3	215°40.7	·· 53.7	219°17.7	·· 39.3
4	180°44.5	253°41.9	42.6	146°35.0	55.7	230°42.6	53.6	234°19.9	39.3
5	195°47.0	268°41.0	42.3	161°36.2	56.2	245°44.4	53.4	249°22.0	39.2
6	210°49.4	283°40.0	S22°42.1	176°37.5	N14°56.6	260°46.3	S18°53.3	264°24.2	S19°39.1
7	225°51.9	298°39.1	41.8	191°38.7	57.0	275°48.2	53.1	279°26.3	39.1
8	240°54.4	313°38.2	41.5	206°39.9	57.5	290°50.0	53.0	294°28.5	39.0
9	255°56.8	328°37.3	·· 41.3	221°41.2	·· 57.9	305°51.9	·· 52.9	309°30.7	·· 38.9
10	270°59.3	343°36.3	41.0	236°42.4	58.4	320°53.7	52.7	324°32.8	38.9
11	286°01.8	358°35.4	40.7	251°43.6	58.8	335°55.6	52.6	339°35.0	38.8
12	301°04.2	13°34.5	S22°40.5	266°44.9	N14°59.3	350°57.5	S18°52.4	354°37.1	S19°38.7
13	316°06.7	28°33.6	40.2	281°46.1	14°59.7	5°59.3	52.3	9°39.3	38.7
14	331°09.2	43°32.7	39.9	296°47.3	15°00.2	21°01.2	52.1	24°41.4	38.6
15	346°11.6	58°31.7	·· 39.6	311°48.5	·· 00.6	36°03.0	·· 52.0	39°43.6	·· 38.5
16	1°14.1	73°30.8	39.4	326°49.8	01.0	51°04.9	51.8	54°45.7	38.4
17	16°16.6	88°29.9	39.1	341°51.0	01.5	66°06.7	51.7	69°47.9	38.4
18	31°19.0	103°29.0	S22°38.8	356°52.2	N15°01.9	81°08.6	S18°51.5	84°50.1	S19°38.3
19	46°21.5	118°28.1	38.5	11°53.5	02.4	96°10.5	51.4	99°52.2	38.2
20	61°23.9	133°27.1	38.2	26°54.7	02.8	111°12.3	51.2	114°54.4	38.2
21	76°26.4	148°26.2	·· 38.0	41°55.9	·· 03.3	126°14.2	·· 51.1	129°56.5	·· 38.1
22	91°28.9	163°25.3	37.7	56°57.1	03.7	141°16.0	50.9	144°58.7	38.0
23	106°31.3	178°24.4	37.4	71°58.4	04.2	156°17.9	50.8	160°00.8	38.0
	Mer.pass. 15:55	ν -0.9′	d -0.3′	m -3.91	ν 1.2′	d 0.4′	m 0.21	ν 1.9′	d -0.1′	m -1.95	ν 2.2′	d -0.1′	m 0.59

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.6	-42°11.9
Schedar	349°34.8	56°39.3
Diphda	348°50.6	-17°52.5
Achernar	335°22.7	-57°08.2
Hamal	327°54.8	23°33.7
Polaris	315°20.6	89°21.4
Acamar	315°14.1	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.6	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.2	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.6
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.2
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.6
Suhail	222°48.2	-43°31.0
Miaplacidus	221°37.9	-69°48.1
Alphard	217°50.6	-8°45.0
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.1
Denebola	182°28.1	14°27.2
Gienah	175°46.7	-17°39.4
Acrux	173°03.3	-63°12.6
Gacrux	171°54.9	-57°13.5
Alioth	166°15.8	55°50.5
Spica	158°25.6	-11°16.2
Alkaid	152°54.6	49°12.3
Hadar	148°40.5	-60°28.1
Menkent	148°01.4	-36°28.1
Arcturus	145°50.9	19°04.3
Rigil Kent.	139°44.7	-60°54.9
Kochab	137°20.3	74°03.9
Zuben'ubi	136°59.7	-16°07.6
Alphecca	126°06.7	26°38.5
Antares	112°20.0	-26°28.6
Atria	107°17.5	-69°03.6
Sabik	102°06.7	-15°45.0
Shaula	96°15.1	-37°07.0
Rasalhague	96°01.8	12°32.6
Eltanin	90°44.2	51°29.0
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.8	38°48.1
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.5	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 19 Tue	SHA	Mer.pass
Venus	75°53.8	11:03
Mars	326°54.0	18:16
Jupiter	50°29.6	12:42
Saturn	53°51.4	12:28

Jan 20 Wed	SHA	Mer.pass
Venus	74°32.3	11:04
Mars	326°24.8	18:14
Jupiter	50°15.0	12:39
Saturn	53°44.0	12:25

Jan 21 Thu	SHA	Mer.pass
Venus	73°10.9	11:06
Mars	325°55.4	18:13
Jupiter	50°00.5	12:36
Saturn	53°36.6	12:21

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°20.4	S20°19.9	108°47.7	16.1′	S01°05.0	-12.7′	54.7′
1	192°20.2	19.4	123°22.7	16.1′	00°52.3	-12.7′	54.7′
2	207°20.0	18.9	137°57.8	16.1′	00°39.6	-12.7′	54.7′
3	222°19.8	·· 18.3	152°32.9	16.1′	00°26.9	-12.7′	54.7′
4	237°19.6	17.8	167°08.0	16.1′	00°14.2	-12.7′	54.7′
5	252°19.4	17.3	181°43.1	16.2′	S00°01.5	-12.7′	54.6′
6	267°19.2	S20°16.8	196°18.3	16.2′	N00°11.2	12.7′	54.6′
7	282°19.0	16.2	210°53.5	16.2′	00°23.8	12.7′	54.6′
8	297°18.8	15.7	225°28.7	16.2′	00°36.5	12.7′	54.6′
9	312°18.6	·· 15.2	240°03.9	16.2′	00°49.1	12.6′	54.6′
10	327°18.4	14.6	254°39.1	16.2′	01°01.8	12.6′	54.6′
11	342°18.3	14.1	269°14.3	16.2′	01°14.4	12.6′	54.5′
12	357°18.1	S20°13.6	283°49.6	16.3′	N01°27.0	12.6′	54.5′
13	12°17.9	13.0	298°24.8	16.3′	01°39.6	12.6′	54.5′
14	27°17.7	12.5	313°00.1	16.3′	01°52.2	12.6′	54.5′
15	42°17.5	·· 12.0	327°35.4	16.3′	02°04.8	12.6′	54.5′
16	57°17.3	11.4	342°10.6	16.3′	02°17.4	12.5′	54.5′
17	72°17.1	10.9	356°45.9	16.3′	02°29.9	12.5′	54.5′
18	87°16.9	S20°10.4	11°21.2	16.3′	N02°42.4	12.5′	54.4′
19	102°16.8	09.8	25°56.5	16.3′	02°55.0	12.5′	54.4′
20	117°16.6	09.3	40°31.8	16.3′	03°07.5	12.5′	54.4′
21	132°16.4	·· 08.7	55°07.1	16.3′	03°19.9	12.5′	54.4′
22	147°16.2	08.2	69°42.5	16.3′	03°32.4	12.4′	54.4′
23	162°16.0	07.7	84°17.8	16.3′	03°44.8	12.4′	54.4′
	SD = 16.2′	d = -0.5′	SD = 14.9′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°15.8	S20°07.1	98°53.1	16.3′	N03°57.3	12.4′	54.4′
1	192°15.7	06.6	113°28.4	16.3′	04°09.7	12.4′	54.4′
2	207°15.5	06.0	128°03.7	16.3′	04°22.0	12.4′	54.3′
3	222°15.3	·· 05.5	142°39.0	16.3′	04°34.4	12.3′	54.3′
4	237°15.1	04.9	157°14.3	16.3′	04°46.7	12.3′	54.3′
5	252°14.9	04.4	171°49.6	16.3′	04°59.1	12.3′	54.3′
6	267°14.7	S20°03.9	186°24.9	16.3′	N05°11.4	12.3′	54.3′
7	282°14.6	03.3	201°00.1	16.3′	05°23.6	12.2′	54.3′
8	297°14.4	02.8	215°35.4	16.3′	05°35.9	12.2′	54.3′
9	312°14.2	·· 02.2	230°10.7	16.2′	05°48.1	12.2′	54.3′
10	327°14.0	01.7	244°45.9	16.2′	06°00.3	12.2′	54.3′
11	342°13.8	01.1	259°21.2	16.2′	06°12.4	12.1′	54.3′
12	357°13.7	S20°00.6	273°56.4	16.2′	N06°24.6	12.1′	54.3′
13	12°13.5	20°00.0	288°31.6	16.2′	06°36.7	12.1′	54.2′
14	27°13.3	19°59.5	303°06.8	16.2′	06°48.8	12.1′	54.2′
15	42°13.1	·· 58.9	317°42.0	16.2′	07°00.8	12.0′	54.2′
16	57°12.9	58.4	332°17.1	16.1′	07°12.9	12.0′	54.2′
17	72°12.8	57.8	346°52.3	16.1′	07°24.9	12.0′	54.2′
18	87°12.6	S19°57.3	1°27.4	16.1′	N07°36.8	11.9′	54.2′
19	102°12.4	56.7	16°02.5	16.1′	07°48.8	11.9′	54.2′
20	117°12.2	56.2	30°37.6	16.1′	08°00.7	11.9′	54.2′
21	132°12.0	·· 55.6	45°12.7	16.0′	08°12.5	11.8′	54.2′
22	147°11.9	55.0	59°47.7	16.0′	08°24.4	11.8′	54.2′
23	162°11.7	54.5	74°22.8	16.0′	08°36.2	11.8′	54.2′
	SD = 16.2′	d = -0.5′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°11.5	S19°53.9	88°57.8	16.0′	N08°47.9	11.7′	54.2′
1	192°11.3	53.4	103°32.7	15.9′	08°59.7	11.7′	54.2′
2	207°11.2	52.8	118°07.7	15.9′	09°11.4	11.7′	54.2′
3	222°11.0	·· 52.3	132°42.6	15.9′	09°23.0	11.6′	54.2′
4	237°10.8	51.7	147°17.5	15.9′	09°34.6	11.6′	54.2′
5	252°10.6	51.1	161°52.4	15.8′	09°46.2	11.5′	54.2′
6	267°10.5	S19°50.6	176°27.2	15.8′	N09°57.8	11.5′	54.2′
7	282°10.3	50.0	191°02.0	15.8′	10°09.3	11.5′	54.2′
8	297°10.1	49.5	205°36.8	15.7′	10°20.8	11.4′	54.2′
9	312°09.9	·· 48.9	220°11.5	15.7′	10°32.2	11.4′	54.2′
10	327°09.8	48.3	234°46.2	15.7′	10°43.6	11.3′	54.2′
11	342°09.6	47.8	249°20.9	15.6′	10°54.9	11.3′	54.2′
12	357°09.4	S19°47.2	263°55.5	15.6′	N11°06.2	11.3′	54.2′
13	12°09.3	46.6	278°30.1	15.6′	11°17.5	11.2′	54.2′
14	27°09.1	46.1	293°04.7	15.5′	11°28.7	11.2′	54.2′
15	42°08.9	·· 45.5	307°39.2	15.5′	11°39.9	11.1′	54.2′
16	57°08.7	44.9	322°13.7	15.4′	11°51.0	11.1′	54.2′
17	72°08.6	44.4	336°48.2	15.4′	12°02.1	11.0′	54.2′
18	87°08.4	S19°43.8	351°22.6	15.4′	N12°13.2	11.0′	54.2′
19	102°08.2	43.2	5°56.9	15.3′	12°24.2	10.9′	54.2′
20	117°08.1	42.7	20°31.3	15.3′	12°35.1	10.9′	54.2′
21	132°07.9	·· 42.1	35°05.5	15.2′	12°46.0	10.9′	54.2′
22	147°07.7	41.5	49°39.8	15.2′	12°56.9	10.8′	54.2′
23	162°07.6	41.0	64°14.0	15.1′	13°07.7	10.8′	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			14:53	16:36
N 70°	07:34	09:01	11:03	13:20	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	08:10	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°	06:45	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	07:18	17:05	17:34	18:08
35°	06:08	06:39	07:06	17:17	17:44	18:15
30°	06:01	06:30	06:56	17:27	17:53	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°	04:45	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	19:15	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 Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	10:49	10:26	10:00	·· ··	00:13	02:06
N 70°	10:51	10:34	10:16	·· ··	00:08	01:51
68°	10:52	10:41	10:30	·· ··	00:03	01:40
66°	10:53	10:47	10:41	23:59	·· ··	01:30
64°	10:54	10:52	10:50	23:56	·· ··	01:22
62°	10:55	10:56	10:58	23:53	·· ··	01:15
60°	10:55	11:00	11:05	23:51	·· ··	01:09
N 58°	10:56	11:03	11:11	23:49	·· ··	01:04
56°	10:56	11:06	11:17	23:47	·· ··	00:59
54°	10:57	11:09	11:22	23:45	·· ··	00:55
52°	10:57	11:11	11:26	23:43	·· ··	00:52
50°	10:58	11:14	11:30	23:42	·· ··	00:48
45°	10:59	11:18	11:39	23:39	·· ··	00:41
N 40°	10:59	11:22	11:47	23:36	·· ··	00:35
35°	11:00	11:26	11:53	23:34	·· ··	00:30
30°	11:01	11:29	11:59	23:32	·· ··	00:25
20°	11:02	11:35	12:09	23:29	·· ··	00:17
N 10°	11:03	11:40	12:17	23:26	·· ··	00:10
0°	11:04	11:44	12:25	23:23	·· ··	00:04
S 10°	11:04	11:49	12:34	23:20	23:57	·· ··
20°	11:05	11:54	12:42	23:17	23:51	·· ··
30°	11:07	12:00	12:53	23:14	23:43	·· ··
35°	11:07	12:03	12:59	23:12	23:38	·· ··
40°	11:08	12:07	13:05	23:10	23:33	23:58
45°	11:09	12:11	13:13	23:07	23:28	23:49
S 50°	11:10	12:16	13:23	23:04	23:21	23:38
52°	11:10	12:19	13:27	23:03	23:17	23:33
54°	11:11	12:21	13:32	23:02	23:14	23:28
56°	11:12	12:24	13:37	23:00	23:10	23:22
58°	11:12	12:28	13:43	22:58	23:06	23:15
S 60°	11:13	12:31	13:50	22:56	23:01	23:07

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 6-8 33-51%
19	10:39	10:48	12:11	17:13	04:53	
20	10:57	11:05	12:11	17:54	05:34	
21	11:14	11:22	12:11	18:36	06:15	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	121°33.8	193°23.5	S22°37.1	86°59.6	N15°04.6	171°19.8	S18°50.6	175°03.0	S19°37.9
1	136°36.3	208°22.5	36.8	102°00.8	05.0	186°21.6	50.5	190°05.2	37.8
2	151°38.7	223°21.6	36.5	117°02.0	05.5	201°23.5	50.3	205°07.3	37.8
3	166°41.2	238°20.7	·· 36.2	132°03.3	·· 05.9	216°25.3	·· 50.2	220°09.5	·· 37.7
4	181°43.7	253°19.8	35.9	147°04.5	06.4	231°27.2	50.0	235°11.6	37.6
5	196°46.1	268°18.9	35.7	162°05.7	06.8	246°29.0	49.9	250°13.8	37.6
6	211°48.6	283°18.0	S22°35.4	177°06.9	N15°07.3	261°30.9	S18°49.7	265°15.9	S19°37.5
7	226°51.0	298°17.0	35.1	192°08.2	07.7	276°32.8	49.6	280°18.1	37.4
8	241°53.5	313°16.1	34.8	207°09.4	08.2	291°34.6	49.4	295°20.2	37.4
9	256°56.0	328°15.2	·· 34.5	222°10.6	·· 08.6	306°36.5	·· 49.3	310°22.4	·· 37.3
10	271°58.4	343°14.3	34.2	237°11.8	09.0	321°38.3	49.1	325°24.6	37.2
11	287°00.9	358°13.4	33.9	252°13.1	09.5	336°40.2	49.0	340°26.7	37.2
12	302°03.4	13°12.5	S22°33.6	267°14.3	N15°09.9	351°42.1	S18°48.8	355°28.9	S19°37.1
13	317°05.8	28°11.5	33.3	282°15.5	10.4	6°43.9	48.7	10°31.0	37.0
14	332°08.3	43°10.6	33.0	297°16.7	10.8	21°45.8	48.5	25°33.2	37.0
15	347°10.8	58°09.7	·· 32.7	312°17.9	·· 11.3	36°47.6	·· 48.4	40°35.3	·· 36.9
16	2°13.2	73°08.8	32.4	327°19.2	11.7	51°49.5	48.2	55°37.5	36.8
17	17°15.7	88°07.9	32.1	342°20.4	12.2	66°51.3	48.1	70°39.7	36.8
18	32°18.2	103°07.0	S22°31.7	357°21.6	N15°12.6	81°53.2	S18°47.9	85°41.8	S19°36.7
19	47°20.6	118°06.1	31.4	12°22.8	13.0	96°55.1	47.8	100°44.0	36.6
20	62°23.1	133°05.2	31.1	27°24.0	13.5	111°56.9	47.6	115°46.1	36.6
21	77°25.5	148°04.2	·· 30.8	42°25.2	·· 13.9	126°58.8	·· 47.5	130°48.3	·· 36.5
22	92°28.0	163°03.3	30.5	57°26.5	14.4	142°00.6	47.3	145°50.4	36.4
23	107°30.5	178°02.4	30.2	72°27.7	14.8	157°02.5	47.2	160°52.6	36.4
Mer.pass.	15:51	ν -0.9′	d -0.3′	m -3.91	ν 1.2′	d 0.4′	m 0.23	ν 1.9′	d -0.1′ m -1.95	ν 2.2′	d -0.1′ m 0.57

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	122°32.9	193°01.5	S22°29.9	87°28.9	N15°15.3	172°04.4	S18°47.0	175°54.7	S19°36.3
1	137°35.4	208°00.6	29.6	102°30.1	15.7	187°06.2	46.9	190°56.9	36.2
2	152°37.9	222°59.7	29.2	117°31.3	16.1	202°08.1	46.7	205°59.1	36.1
3	167°40.3	237°58.8	·· 28.9	132°32.5	·· 16.6	217°09.9	·· 46.6	221°01.2	·· 36.1
4	182°42.8	252°57.9	28.6	147°33.8	17.0	232°11.8	46.4	236°03.4	36.0
5	197°45.3	267°56.9	28.3	162°35.0	17.5	247°13.6	46.3	251°05.5	35.9
6	212°47.7	282°56.0	S22°28.0	177°36.2	N15°17.9	262°15.5	S18°46.1	266°07.7	S19°35.9
7	227°50.2	297°55.1	27.6	192°37.4	18.4	277°17.4	46.0	281°09.8	35.8
8	242°52.7	312°54.2	27.3	207°38.6	18.8	292°19.2	45.8	296°12.0	35.7
9	257°55.1	327°53.3	·· 27.0	222°39.8	·· 19.2	307°21.1	·· 45.7	311°14.1	·· 35.7
10	272°57.6	342°52.4	26.7	237°41.0	19.7	322°22.9	45.5	326°16.3	35.6
11	288°00.0	357°51.5	26.3	252°42.3	20.1	337°24.8	45.4	341°18.5	35.5
12	303°02.5	12°50.6	S22°26.0	267°43.5	N15°20.6	352°26.7	S18°45.2	356°20.6	S19°35.5
13	318°05.0	27°49.7	25.7	282°44.7	21.0	7°28.5	45.1	11°22.8	35.4
14	333°07.4	42°48.8	25.3	297°45.9	21.5	22°30.4	44.9	26°24.9	35.3
15	348°09.9	57°47.8	·· 25.0	312°47.1	·· 21.9	37°32.2	·· 44.8	41°27.1	·· 35.3
16	3°12.4	72°46.9	24.7	327°48.3	22.3	52°34.1	44.6	56°29.2	35.2
17	18°14.8	87°46.0	24.3	342°49.5	22.8	67°35.9	44.5	71°31.4	35.1
18	33°17.3	102°45.1	S22°24.0	357°50.7	N15°23.2	82°37.8	S18°44.3	86°33.6	S19°35.1
19	48°19.8	117°44.2	23.7	12°51.9	23.7	97°39.7	44.2	101°35.7	35.0
20	63°22.2	132°43.3	23.3	27°53.2	24.1	112°41.5	44.0	116°37.9	34.9
21	78°24.7	147°42.4	·· 23.0	42°54.4	·· 24.6	127°43.4	·· 43.9	131°40.0	·· 34.9
22	93°27.2	162°41.5	22.6	57°55.6	25.0	142°45.2	43.7	146°42.2	34.8
23	108°29.6	177°40.6	22.3	72°56.8	25.4	157°47.1	43.6	161°44.3	34.7
Mer.pass.	15:47	ν -0.9′	d -0.3′	m -3.91	ν 1.2′	d 0.4′	m 0.25	ν 1.9′	d -0.1′ m -1.95	ν 2.2′	d -0.1′ m 0.55

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	123°32.1	192°39.7	S22°22.0	87°58.0	N15°25.9	172°49.0	S18°43.4	176°46.5	S19°34.7
1	138°34.5	207°38.8	21.6	102°59.2	26.3	187°50.8	43.3	191°48.7	34.6
2	153°37.0	222°37.9	21.3	118°00.4	26.8	202°52.7	43.1	206°50.8	34.5
3	168°39.5	237°37.0	·· 20.9	133°01.6	·· 27.2	217°54.5	·· 43.0	221°53.0	·· 34.5
4	183°41.9	252°36.1	20.6	148°02.8	27.7	232°56.4	42.8	236°55.1	34.4
5	198°44.4	267°35.2	20.2	163°04.0	28.1	247°58.3	42.7	251°57.3	34.3
6	213°46.9	282°34.3	S22°19.9	178°05.2	N15°28.5	263°00.1	S18°42.5	266°59.4	S19°34.3
7	228°49.3	297°33.4	19.5	193°06.4	29.0	278°02.0	42.4	282°01.6	34.2
8	243°51.8	312°32.5	19.2	208°07.6	29.4	293°03.8	42.2	297°03.8	34.1
9	258°54.3	327°31.5	·· 18.8	223°08.8	·· 29.9	308°05.7	·· 42.1	312°05.9	·· 34.1
10	273°56.7	342°30.6	18.5	238°10.1	30.3	323°07.5	41.9	327°08.1	34.0
11	288°59.2	357°29.7	18.1	253°11.3	30.7	338°09.4	41.8	342°10.2	33.9
12	304°01.6	12°28.8	S22°17.7	268°12.5	N15°31.2	353°11.3	S18°41.6	357°12.4	S19°33.8
13	319°04.1	27°27.9	17.4	283°13.7	31.6	8°13.1	41.5	12°14.5	33.8
14	334°06.6	42°27.0	17.0	298°14.9	32.1	23°15.0	41.3	27°16.7	33.7
15	349°09.0	57°26.1	·· 16.7	313°16.1	·· 32.5	38°16.8	·· 41.2	42°18.9	·· 33.6
16	4°11.5	72°25.2	16.3	328°17.3	33.0	53°18.7	41.0	57°21.0	33.6
17	19°14.0	87°24.3	15.9	343°18.5	33.4	68°20.6	40.9	72°23.2	33.5
18	34°16.4	102°23.4	S22°15.6	358°19.7	N15°33.8	83°22.4	S18°40.7	87°25.3	S19°33.4
19	49°18.9	117°22.5	15.2	13°20.9	34.3	98°24.3	40.6	102°27.5	33.4
20	64°21.4	132°21.6	14.8	28°22.1	34.7	113°26.1	40.4	117°29.6	33.3
21	79°23.8	147°20.7	·· 14.5	43°23.3	·· 35.2	128°28.0	·· 40.3	132°31.8	·· 33.2
22	94°26.3	162°19.8	14.1	58°24.5	35.6	143°29.8	40.1	147°34.0	33.2
23	109°28.8	177°18.9	13.7	73°25.7	36.0	158°31.7	40.0	162°36.1	33.1
Mer.pass.	15:43	ν -0.9′	d -0.3′	m -3.91	ν 1.2′	d 0.4′	m 0.27	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.54

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.6	-42°11.9
Schedar	349°34.8	56°39.3
Diphda	348°50.7	-17°52.5
Achernar	335°22.8	-57°08.2
Hamal	327°54.8	23°33.7
Polaris	315°21.9	89°21.4
Acamar	315°14.2	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.6	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.6
Sirius	258°28.7	-16°44.8
Adhara	255°08.0	-29°00.2
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.6
Suhail	222°48.2	-43°31.0
Miaplacidus	221°37.8	-69°48.1
Alphard	217°50.6	-8°45.0
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.1
Denebola	182°28.1	14°27.2
Gienah	175°46.7	-17°39.4
Acrux	173°03.2	-63°12.6
Gacrux	171°54.9	-57°13.5
Alioth	166°15.7	55°50.5
Spica	158°25.6	-11°16.2
Alkaid	152°54.6	49°12.3
Hadar	148°40.5	-60°28.1
Menkent	148°01.4	-36°28.1
Arcturus	145°50.9	19°04.3
Rigil Kent.	139°44.7	-60°54.9
Kochab	137°20.2	74°03.9
Zuben'ubi	136°59.6	-16°07.6
Alphecca	126°06.6	26°38.5
Antares	112°20.0	-26°28.6
Atria	107°17.5	-69°03.6
Sabik	102°06.7	-15°45.0
Shaula	96°15.1	-37°07.0
Rasalhague	96°01.8	12°32.6
Eltanin	90°44.1	51°29.0
Kaus Aust.	83°37.1	-34°22.4
Vega	80°35.8	38°48.1
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.4	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 22 Fri	SHA	Mer.pass
Venus	71°49.7	11:07
Mars	325°25.8	18:11
Jupiter	49°46.0	12:33
Saturn	53°29.2	12:18

Jan 23 Sat	SHA	Mer.pass
Venus	70°28.6	11:09
Mars	324°56.0	18:09
Jupiter	49°31.4	12:30
Saturn	53°21.8	12:15

Jan 24 Sun	SHA	Mer.pass
Venus	69°07.6	11:10
Mars	324°25.9	18:07
Jupiter	49°16.9	12:27
Saturn	53°14.4	12:11

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°07.4	S19°40.4	78°48.1	15.1′	N13°18.4	10.7′	54.2′
1	192°07.2	39.8	93°22.2	15.1′	13°29.1	10.7′	54.2′
2	207°07.1	39.2	107°56.3	15.0′	13°39.8	10.6′	54.2′
3	222°06.9	·· 38.7	122°30.3	15.0′	13°50.4	10.5′	54.2′
4	237°06.7	38.1	137°04.2	14.9′	14°00.9	10.5′	54.2′
5	252°06.6	37.5	151°38.1	14.9′	14°11.4	10.4′	54.2′
6	267°06.4	S19°36.9	166°12.0	14.8′	N14°21.9	10.4′	54.2′
7	282°06.2	36.4	180°45.8	14.8′	14°32.2	10.3′	54.2′
8	297°06.1	35.8	195°19.5	14.7′	14°42.6	10.3′	54.2′
9	312°05.9	·· 35.2	209°53.2	14.6′	14°52.8	10.2′	54.2′
10	327°05.7	34.6	224°26.9	14.6′	15°03.1	10.2′	54.2′
11	342°05.6	34.1	239°00.5	14.5′	15°13.2	10.1′	54.2′
12	357°05.4	S19°33.5	253°34.0	14.5′	N15°23.3	10.0′	54.2′
13	12°05.2	32.9	268°07.5	14.4′	15°33.4	10.0′	54.2′
14	27°05.1	32.3	282°40.9	14.4′	15°43.3	9.9′	54.2′
15	42°04.9	·· 31.7	297°14.3	14.3′	15°53.2	9.9′	54.3′
16	57°04.7	31.1	311°47.6	14.3′	16°03.1	9.8′	54.3′
17	72°04.6	30.6	326°20.9	14.2′	16°12.9	9.7′	54.3′
18	87°04.4	S19°30.0	340°54.1	14.1′	N16°22.6	9.7′	54.3′
19	102°04.3	29.4	355°27.2	14.1′	16°32.3	9.6′	54.3′
20	117°04.1	28.8	10°00.3	14.0′	16°41.9	9.5′	54.3′
21	132°03.9	·· 28.2	24°33.3	14.0′	16°51.4	9.5′	54.3′
22	147°03.8	27.6	39°06.2	13.9′	17°00.9	9.4′	54.3′
23	162°03.6	27.1	53°39.1	13.8′	17°10.3	9.3′	54.3′
	SD = 16.2′	d = -0.6′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°03.5	S19°26.5	68°11.9	13.8′	N17°19.6	9.3′	54.3′
1	192°03.3	25.9	82°44.7	13.7′	17°28.9	9.2′	54.3′
2	207°03.1	25.3	97°17.4	13.6′	17°38.1	9.1′	54.4′
3	222°03.0	·· 24.7	111°50.0	13.6′	17°47.2	9.1′	54.4′
4	237°02.8	24.1	126°22.6	13.5′	17°56.3	9.0′	54.4′
5	252°02.7	23.5	140°55.1	13.4′	18°05.2	8.9′	54.4′
6	267°02.5	S19°22.9	155°27.6	13.4′	N18°14.2	8.8′	54.4′
7	282°02.3	22.3	169°59.9	13.3′	18°23.0	8.8′	54.4′
8	297°02.2	21.8	184°32.2	13.2′	18°31.7	8.7′	54.4′
9	312°02.0	·· 21.2	199°04.5	13.2′	18°40.4	8.6′	54.4′
10	327°01.9	20.6	213°36.6	13.1′	18°49.0	8.5′	54.5′
11	342°01.7	20.0	228°08.8	13.0′	18°57.6	8.5′	54.5′
12	357°01.6	S19°19.4	242°40.8	13.0′	N19°06.0	8.4′	54.5′
13	12°01.4	18.8	257°12.7	12.9′	19°14.4	8.3′	54.5′
14	27°01.3	18.2	271°44.6	12.8′	19°22.7	8.2′	54.5′
15	42°01.1	·· 17.6	286°16.5	12.8′	19°30.9	8.1′	54.5′
16	57°00.9	17.0	300°48.2	12.7′	19°39.0	8.1′	54.5′
17	72°00.8	16.4	315°19.9	12.6′	19°47.1	8.0′	54.5′
18	87°00.6	S19°15.8	329°51.5	12.5′	N19°55.1	7.9′	54.6′
19	102°00.5	15.2	344°23.1	12.5′	20°02.9	7.8′	54.6′
20	117°00.3	14.6	358°54.5	12.4′	20°10.7	7.7′	54.6′
21	132°00.2	·· 14.0	13°25.9	12.3′	20°18.5	7.6′	54.6′
22	147°00.0	13.4	27°57.3	12.3′	20°26.1	7.5′	54.6′
23	161°59.9	12.8	42°28.5	12.2′	20°33.6	7.4′	54.6′
	SD = 16.2′	d = -0.6′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°59.7	S19°12.2	56°59.7	12.1′	N20°41.1	7.4′	54.7′
1	191°59.6	11.6	71°30.8	12.0′	20°48.4	7.3′	54.7′
2	206°59.4	11.0	86°01.9	12.0′	20°55.7	7.2′	54.7′
3	221°59.3	·· 10.4	100°32.8	11.9′	21°02.9	7.1′	54.7′
4	236°59.1	09.8	115°03.7	11.8′	21°10.0	7.0′	54.7′
5	251°59.0	09.2	129°34.5	11.7′	21°17.0	6.9′	54.7′
6	266°58.8	S19°08.6	144°05.3	11.7′	N21°23.9	6.8′	54.8′
7	281°58.7	08.0	158°36.0	11.6′	21°30.7	6.7′	54.8′
8	296°58.5	07.4	173°06.6	11.5′	21°37.4	6.6′	54.8′
9	311°58.4	·· 06.8	187°37.1	11.5′	21°44.0	6.5′	54.8′
10	326°58.2	06.1	202°07.6	11.4′	21°50.5	6.4′	54.8′
11	341°58.1	05.5	216°37.9	11.3′	21°56.9	6.3′	54.9′
12	356°57.9	S19°04.9	231°08.2	11.2′	N22°03.2	6.2′	54.9′
13	11°57.8	04.3	245°38.5	11.2′	22°09.4	6.1′	54.9′
14	26°57.6	03.7	260°08.6	11.1′	22°15.6	6.0′	54.9′
15	41°57.5	·· 03.1	274°38.7	11.0′	22°21.6	5.9′	54.9′
16	56°57.3	02.5	289°08.8	10.9′	22°27.5	5.8′	54.9′
17	71°57.2	01.9	303°38.7	10.9′	22°33.3	5.7′	55.0′
18	86°57.1	S19°01.3	318°08.6	10.8′	N22°39.0	5.6′	55.0′
19	101°56.9	00.6	332°38.4	10.7′	22°44.6	5.5′	55.0′
20	116°56.8	19°00.0	347°08.1	10.7′	22°50.1	5.4′	55.0′
21	131°56.6	18°59.4	1°37.8	10.6′	22°55.5	5.3′	55.0′
22	146°56.5	58.8	16°07.4	10.5′	23°00.7	5.2′	55.1′
23	161°56.3	58.2	30°36.9	10.5′	23°05.9	5.1′	55.1′
	SD = 16.2′	d = -0.6′	SD = 14.9′				

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	17:07
66°	07:09	08:16	09:27	14:58	16:08	17:15
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	07:15	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	17:09	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	04:26	19:56	20:36	21:29
52°	02:36	03:35	04:18	20:05	20:47	21:46
54°	02:14	03:22	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	23:19
S 60°	–:–	02:27	03:32	20:50	21:54	–:–

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

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 9-11 60-78%
22	11:30	11:38	12:12	19:19	06:57	
23	11:46	11:54	12:12	20:05	07:41	
24	12:01	12:08	12:12	20:53	08:28	

January 25, 26, 27 UT (Mon., Tue., Wed.)

DUT1 = UT1-UTC = -0.1694 sec ΔT = TT-UT1 = +69.3534 sec

2021 January 25 to Jan. 27 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	124°31.2	192°18.0	S22°13.4	88°26.9	N15°36.5	173°33.6	S18°39.8	177°38.3	S19°33.0
1	139°33.7	207°17.1	13.0	103°28.1	36.9	188°35.4	39.7	192°40.4	33.0
2	154°36.1	222°16.2	12.6	118°29.3	37.4	203°37.3	39.5	207°42.6	32.9
3	169°38.6	237°15.3	·· 12.2	133°30.5	·· 37.8	218°39.1	·· 39.3	222°44.7	·· 32.8
4	184°41.1	252°14.4	11.9	148°31.7	38.3	233°41.0	39.2	237°46.9	32.7
5	199°43.5	267°13.6	11.5	163°32.9	38.7	248°42.9	39.0	252°49.0	32.7
6	214°46.0	282°12.7	S22°11.1	178°34.1	N15°39.1	263°44.7	S18°38.9	267°51.2	S19°32.6
7	229°48.5	297°11.8	10.7	193°35.3	39.6	278°46.6	38.7	282°53.4	32.5
8	244°50.9	312°10.9	10.3	208°36.5	40.0	293°48.4	38.6	297°55.5	32.5
9	259°53.4	327°10.0	·· 10.0	223°37.7	·· 40.5	308°50.3	·· 38.4	312°57.7	·· 32.4
10	274°55.9	342°09.1	09.6	238°38.9	40.9	323°52.2	38.3	327°59.8	32.3
11	289°58.3	357°08.2	09.2	253°40.0	41.3	338°54.0	38.1	343°02.0	32.3
12	305°00.8	12°07.3	S22°08.8	268°41.2	N15°41.8	353°55.9	S18°38.0	358°04.1	S19°32.2
13	320°03.3	27°06.4	08.4	283°42.4	42.2	8°57.7	37.8	13°06.3	32.1
14	335°05.7	42°05.5	08.0	298°43.6	42.7	23°59.6	37.7	28°08.5	32.1
15	350°08.2	57°04.6	·· 07.6	313°44.8	·· 43.1	39°01.4	·· 37.5	43°10.6	·· 32.0
16	5°10.6	72°03.7	07.3	328°46.0	43.5	54°03.3	37.4	58°12.8	31.9
17	20°13.1	87°02.8	06.9	343°47.2	44.0	69°05.2	37.2	73°14.9	31.9
18	35°15.6	102°01.9	S22°06.5	358°48.4	N15°44.4	84°07.0	S18°37.1	88°17.1	S19°31.8
19	50°18.0	117°01.0	06.1	13°49.6	44.9	99°08.9	36.9	103°19.2	31.7
20	65°20.5	132°00.1	05.7	28°50.8	45.3	114°10.7	36.8	118°21.4	31.7
21	80°23.0	146°59.2	·· 05.3	43°52.0	·· 45.7	129°12.6	·· 36.6	133°23.6	·· 31.6
22	95°25.4	161°58.4	04.9	58°53.2	46.2	144°14.5	36.5	148°25.7	31.5
23	110°27.9	176°57.5	04.5	73°54.4	46.6	159°16.3	36.3	163°27.9	31.4
Mer.pass.	15:39	ν -0.9′	d -0.4′	m -3.91	ν 1.2′	d 0.4′	m 0.30	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.56

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	125°30.4	191°56.6	S22°04.1	88°55.6	N15°47.1	174°18.2	S18°36.2	178°30.0	S19°31.4
1	140°32.8	206°55.7	03.7	103°56.7	47.5	189°20.0	36.0	193°32.2	31.3
2	155°35.3	221°54.8	03.3	118°57.9	47.9	204°21.9	35.9	208°34.3	31.2
3	170°37.8	236°53.9	·· 02.9	133°59.1	·· 48.4	219°23.8	·· 35.7	223°36.5	·· 31.2
4	185°40.2	251°53.0	02.5	149°00.3	48.8	234°25.6	35.6	238°38.6	31.1
5	200°42.7	266°52.1	02.1	164°01.5	49.3	249°27.5	35.4	253°40.8	31.0
6	215°45.1	281°51.2	S22°01.7	179°02.7	N15°49.7	264°29.3	S18°35.2	268°43.0	S19°31.0
7	230°47.6	296°50.3	01.3	194°03.9	50.1	279°31.2	35.1	283°45.1	30.9
8	245°50.1	311°49.5	00.9	209°05.1	50.6	294°33.0	34.9	298°47.3	30.8
9	260°52.5	326°48.6	·· 00.4	224°06.3	·· 51.0	309°34.9	·· 34.8	313°49.4	·· 30.8
10	275°55.0	341°47.7	22°00.0	239°07.4	51.4	324°36.8	34.6	328°51.6	30.7
11	290°57.5	356°46.8	21°59.6	254°08.6	51.9	339°38.6	34.5	343°53.7	30.6
12	305°59.9	11°45.9	S21°59.2	269°09.8	N15°52.3	354°40.5	S18°34.3	358°55.9	S19°30.6
13	321°02.4	26°45.0	58.8	284°11.0	52.8	9°42.3	34.2	13°58.1	30.5
14	336°04.9	41°44.1	58.4	299°12.2	53.2	24°44.2	34.0	29°00.2	30.4
15	351°07.3	56°43.2	·· 58.0	314°13.4	·· 53.6	39°46.1	·· 33.9	44°02.4	·· 30.4
16	6°09.8	71°42.4	57.5	329°14.6	54.1	54°47.9	33.7	59°04.5	30.3
17	21°12.3	86°41.5	57.1	344°15.7	54.5	69°49.8	33.6	74°06.7	30.2
18	36°14.7	101°40.6	S21°56.7	359°16.9	N15°55.0	84°51.6	S18°33.4	89°08.8	S19°30.1
19	51°17.2	116°39.7	56.3	14°18.1	55.4	99°53.5	33.3	104°11.0	30.1
20	66°19.6	131°38.8	55.9	29°19.3	55.8	114°55.4	33.1	119°13.2	30.0
21	81°22.1	146°37.9	·· 55.4	44°20.5	·· 56.3	129°57.2	·· 33.0	134°15.3	·· 29.9
22	96°24.6	161°37.1	55.0	59°21.7	56.7	144°59.1	32.8	149°17.5	29.9
23	111°27.0	176°36.2	54.6	74°22.9	57.2	160°00.9	32.7	164°19.6	29.8
Mer.pass.	15:35	ν -0.9′	d -0.4′	m -3.91	ν 1.2′	d 0.4′	m 0.32	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.58

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	126°29.5	191°35.3	S21°54.2	89°24.0	N15°57.6	175°02.8	S18°32.5	179°21.8	S19°29.7
1	141°32.0	206°34.4	53.7	104°25.2	58.0	190°04.6	32.3	194°23.9	29.7
2	156°34.4	221°33.5	53.3	119°26.4	58.5	205°06.5	32.2	209°26.1	29.6
3	171°36.9	236°32.6	·· 52.9	134°27.6	·· 58.9	220°08.4	·· 32.0	224°28.3	·· 29.5
4	186°39.4	251°31.8	52.4	149°28.8	59.3	235°10.2	31.9	239°30.4	29.5
5	201°41.8	266°30.9	52.0	164°29.9	15°59.8	250°12.1	31.7	254°32.6	29.4
6	216°44.3	281°30.0	S21°51.6	179°31.1	N16°00.2	265°13.9	S18°31.6	269°34.7	S19°29.3
7	231°46.7	296°29.1	51.1	194°32.3	00.7	280°15.8	31.4	284°36.9	29.3
8	246°49.2	311°28.2	50.7	209°33.5	01.1	295°17.7	31.3	299°39.0	29.2
9	261°51.7	326°27.4	·· 50.3	224°34.7	·· 01.5	310°19.5	·· 31.1	314°41.2	·· 29.1
10	276°54.1	341°26.5	49.8	239°35.8	02.0	325°21.4	31.0	329°43.4	29.1
11	291°56.6	356°25.6	49.4	254°37.0	02.4	340°23.2	30.8	344°45.5	29.0
12	306°59.1	11°24.7	S21°48.9	269°38.2	N16°02.8	355°25.1	S18°30.7	359°47.7	S19°28.9
13	322°01.5	26°23.8	48.5	284°39.4	03.3	10°27.0	30.5	14°49.8	28.8
14	337°04.0	41°23.0	48.0	299°40.6	03.7	25°28.8	30.4	29°52.0	28.8
15	352°06.5	56°22.1	·· 47.6	314°41.7	·· 04.2	40°30.7	·· 30.2	44°54.1	·· 28.7
16	7°08.9	71°21.2	47.2	329°42.9	04.6	55°32.5	30.0	59°56.3	28.6
17	22°11.4	86°20.3	46.7	344°44.1	05.0	70°34.4	29.9	74°58.5	28.6
18	37°13.9	101°19.5	S21°46.3	359°45.3	N16°05.5	85°36.3	S18°29.7	90°00.6	S19°28.5
19	52°16.3	116°18.6	45.8	14°46.4	05.9	100°38.1	29.6	105°02.8	28.4
20	67°18.8	131°17.7	45.4	29°47.6	06.3	115°40.0	29.4	120°04.9	28.4
21	82°21.2	146°16.8	·· 44.9	44°48.8	·· 06.8	130°41.8	·· 29.3	135°07.1	·· 28.3
22	97°23.7	161°16.0	44.5	59°50.0	07.2	145°43.7	29.1	150°09.2	28.2
23	112°26.2	176°15.1	44.0	74°51.1	07.7	160°45.6	29.0	165°11.4	28.2
Mer.pass.	15:31	ν -0.9′	d -0.4′	m -3.91	ν 1.2′	d 0.4′	m 0.34	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.60

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.6	-42°11.9
Schedar	349°34.8	56°39.3
Diphda	348°50.7	-17°52.5
Achernar	335°22.8	-57°08.2
Hamal	327°54.8	23°33.7
Polaris	315°23.1	89°21.4
Acamar	315°14.2	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.6	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.6
Sirius	258°28.7	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.6
Suhail	222°48.2	-43°31.0
Miaplacidus	221°37.8	-69°48.1
Alphard	217°50.6	-8°45.0
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.1
Denebola	182°28.0	14°27.2
Gienah	175°46.7	-17°39.4
Acrux	173°03.2	-63°12.6
Gacrux	171°54.8	-57°13.5
Alioth	166°15.7	55°50.5
Spica	158°25.6	-11°16.2
Alkaid	152°54.6	49°12.3
Hadar	148°40.4	-60°28.1
Menkent	148°01.3	-36°28.2
Arcturus	145°50.9	19°04.3
Rigil Kent.	139°44.7	-60°54.9
Kochab	137°20.1	74°03.9
Zuben'ubi	136°59.6	-16°07.6
Alphecca	126°06.6	26°38.5
Antares	112°20.0	-26°28.6
Atria	107°17.4	-69°03.6
Sabik	102°06.7	-15°45.0
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.8	12°32.6
Eltanin	90°44.1	51°29.0
Kaus Aust.	83°37.1	-34°22.4
Vega	80°35.8	38°48.1
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.4	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 25 Mon	SHA	Mer.pass
Venus	67°46.8	11:11
Mars	323°55.7	18:05
Jupiter	49°02.3	12:24
Saturn	53°07.0	12:08

Jan 26 Tue	SHA	Mer.pass
Venus	66°26.2	11:13
Mars	323°25.2	18:03
Jupiter	48°47.8	12:21
Saturn	52°59.7	12:04

Jan 27 Wed	SHA	Mer.pass
Venus	65°05.8	11:14
Mars	322°54.5	18:01
Jupiter	48°33.3	12:18
Saturn	52°52.3	12:01

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°56.2	S18°57.6	45°06.4	10.4′	N23°11.0	4.9′	55.1′
1	191°56.1	57.0	59°35.7	10.3′	23°15.9	4.8′	55.1′
2	206°55.9	56.3	74°05.0	10.2′	23°20.7	4.7′	55.2′
3	221°55.8	·· 55.7	88°34.3	10.2′	23°25.5	4.6′	55.2′
4	236°55.6	55.1	103°03.5	10.1′	23°30.1	4.5′	55.2′
5	251°55.5	54.5	117°32.6	10.0′	23°34.6	4.4′	55.2′
6	266°55.3	S18°53.9	132°01.6	10.0′	N23°38.9	4.3′	55.2′
7	281°55.2	53.2	146°30.6	9.9′	23°43.2	4.1′	55.3′
8	296°55.1	52.6	160°59.5	9.8′	23°47.3	4.0′	55.3′
9	311°54.9	·· 52.0	175°28.3	9.8′	23°51.4	3.9′	55.3′
10	326°54.8	51.4	189°57.1	9.7′	23°55.3	3.8′	55.3′
11	341°54.6	50.8	204°25.8	9.6′	23°59.1	3.7′	55.4′
12	356°54.5	S18°50.1	218°54.5	9.6′	N24°02.7	3.5′	55.4′
13	11°54.4	49.5	233°23.1	9.5′	24°06.3	3.4′	55.4′
14	26°54.2	48.9	247°51.6	9.5′	24°09.7	3.3′	55.4′
15	41°54.1	·· 48.3	262°20.0	9.4′	24°13.0	3.2′	55.4′
16	56°54.0	47.6	276°48.4	9.3′	24°16.2	3.1′	55.5′
17	71°53.8	47.0	291°16.8	9.3′	24°19.2	2.9′	55.5′
18	86°53.7	S18°46.4	305°45.1	9.2′	N24°22.2	2.8′	55.5′
19	101°53.5	45.7	320°13.3	9.2′	24°25.0	2.7′	55.5′
20	116°53.4	45.1	334°41.4	9.1′	24°27.7	2.6′	55.6′
21	131°53.3	·· 44.5	349°09.6	9.1′	24°30.2	2.4′	55.6′
22	146°53.1	43.9	3°37.6	9.0′	24°32.6	2.3′	55.6′
23	161°53.0	43.2	18°05.6	8.9′	24°34.9	2.2′	55.6′
	SD = 16.2′	d = -0.6′	SD = 15.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°52.9	S18°42.6	32°33.5	8.9′	N24°37.1	2.0′	55.7′
1	191°52.7	42.0	47°01.4	8.8′	24°39.1	1.9′	55.7′
2	206°52.6	41.3	61°29.3	8.8′	24°41.0	1.8′	55.7′
3	221°52.5	·· 40.7	75°57.1	8.7′	24°42.8	1.6′	55.7′
4	236°52.3	40.1	90°24.8	8.7′	24°44.5	1.5′	55.8′
5	251°52.2	39.4	104°52.5	8.6′	24°46.0	1.4′	55.8′
6	266°52.1	S18°38.8	119°20.1	8.6′	N24°47.3	1.2′	55.8′
7	281°51.9	38.2	133°47.7	8.6′	24°48.6	1.1′	55.8′
8	296°51.8	37.5	148°15.3	8.5′	24°49.7	1.0′	55.9′
9	311°51.7	·· 36.9	162°42.8	8.5′	24°50.7	0.8′	55.9′
10	326°51.5	36.3	177°10.3	8.4′	24°51.5	0.7′	55.9′
11	341°51.4	35.6	191°37.7	8.4′	24°52.2	0.6′	55.9′
12	356°51.3	S18°35.0	206°05.1	8.3′	N24°52.8	0.4′	56.0′
13	11°51.1	34.3	220°32.4	8.3′	24°53.2	0.3′	56.0′
14	26°51.0	33.7	234°59.7	8.3′	24°53.5	0.2′	56.0′
15	41°50.9	·· 33.1	249°27.0	8.2′	24°53.7	0.0′	56.0′
16	56°50.8	32.4	263°54.2	8.2′	24°53.7	-0.1′	56.1′
17	71°50.6	31.8	278°21.4	8.2′	24°53.6	-0.3′	56.1′
18	86°50.5	S18°31.1	292°48.6	8.1′	N24°53.3	-0.4′	56.1′
19	101°50.4	30.5	307°15.7	8.1′	24°52.9	-0.5′	56.2′
20	116°50.2	29.9	321°42.8	8.1′	24°52.4	-0.7′	56.2′
21	131°50.1	·· 29.2	336°09.9	8.0′	24°51.7	-0.8′	56.2′
22	146°50.0	28.6	350°36.9	8.0′	24°50.9	-1.0′	56.2′
23	161°49.9	27.9	5°03.9	8.0′	24°50.0	-1.1′	56.3′
	SD = 16.2′	d = -0.6′	SD = 15.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°49.7	S18°27.3	19°30.9	8.0′	N24°48.9	-1.2′	56.3′
1	191°49.6	26.6	33°57.9	7.9′	24°47.6	-1.4′	56.3′
2	206°49.5	26.0	48°24.9	7.9′	24°46.2	-1.5′	56.3′
3	221°49.4	·· 25.4	62°51.8	7.9′	24°44.7	-1.7′	56.4′
4	236°49.2	24.7	77°18.7	7.9′	24°43.1	-1.8′	56.4′
5	251°49.1	24.1	91°45.6	7.9′	24°41.3	-1.9′	56.4′
6	266°49.0	S18°23.4	106°12.4	7.9′	N24°39.3	-2.1′	56.4′
7	281°48.9	22.8	120°39.3	7.8′	24°37.2	-2.2′	56.5′
8	296°48.7	22.1	135°06.1	7.8′	24°35.0	-2.4′	56.5′
9	311°48.6	·· 21.5	149°33.0	7.8′	24°32.6	-2.5′	56.5′
10	326°48.5	20.8	163°59.8	7.8′	24°30.1	-2.7′	56.5′
11	341°48.4	20.2	178°26.6	7.8′	24°27.5	-2.8′	56.6′
12	356°48.3	S18°19.5	192°53.4	7.8′	N24°24.7	-2.9′	56.6′
13	11°48.1	18.9	207°20.1	7.8′	24°21.7	-3.1′	56.6′
14	26°48.0	18.2	221°46.9	7.8′	24°18.6	-3.2′	56.7′
15	41°47.9	·· 17.5	236°13.7	7.8′	24°15.4	-3.4′	56.7′
16	56°47.8	16.9	250°40.5	7.8′	24°12.0	-3.5′	56.7′
17	71°47.6	16.2	265°07.2	7.8′	24°08.5	-3.7′	56.7′
18	86°47.5	S18°15.6	279°34.0	7.8′	N24°04.9	-3.8′	56.8′
19	101°47.4	14.9	294°00.8	7.8′	24°01.1	-3.9′	56.8′
20	116°47.3	14.3	308°27.5	7.8′	23°57.1	-4.1′	56.8′
21	131°47.2	·· 13.6	322°54.3	7.8′	23°53.0	-4.2′	56.8′
22	146°47.1	13.0	337°21.1	7.8′	23°48.8	-4.4′	56.9′
23	161°46.9	12.3	351°47.9	7.8′	23°44.5	-4.5′	56.9′
	SD = 16.2′	d = -0.6′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:29	09:04	11:34	12:53	15:23	16:57
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	07:49	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	06:45	07:14	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	06:01	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	03:29	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	21:25	22:58
S 60°	–:–	02:38	03:40	20:43	21:45	–:–

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°						
N 70°						
68°						
66°	09:51			08:41		
64°	11:02	11:30	12:40	07:31	08:52	09:37
62°	11:38	12:15	13:20	06:55	08:07	08:56
60°	12:03	12:45	13:48	06:29	07:38	08:28
N 58°	12:24	13:08	14:10	06:09	07:15	08:07
56°	12:41	13:26	14:27	05:52	06:57	07:49
54°	12:55	13:42	14:42	05:38	06:41	07:34
52°	13:08	13:55	14:55	05:26	06:28	07:21
50°	13:19	14:07	15:06	05:15	06:16	07:09
45°	13:42	14:31	15:30	04:52	05:52	06:45
N 40°	14:01	14:51	15:49	04:34	05:32	06:26
35°	14:16	15:07	16:05	04:19	05:16	06:10
30°	14:30	15:21	16:19	04:06	05:02	05:56
20°	14:53	15:46	16:42	03:43	04:38	05:32
N 10°	15:13	16:06	17:02	03:24	04:17	05:11
0°	15:32	16:26	17:21	03:05	03:58	04:52
S 10°	15:51	16:45	17:40	02:47	03:38	04:33
20°	16:11	17:06	18:00	02:28	03:18	04:12
30°	16:35	17:30	18:23	02:06	02:54	03:48
35°	16:49	17:45	18:37	01:53	02:40	03:34
40°	17:05	18:01	18:52	01:37	02:23	03:17
45°	17:24	18:21	19:11	01:20	02:04	02:58
S 50°	17:48	18:46	19:34	00:57	01:40	02:33
52°	18:00	18:58	19:45	00:47	01:28	02:21
54°	18:13	19:11	19:58	00:35	01:15	02:08
56°	18:28	19:27	20:13	00:21	00:59	01:52
58°	18:46	19:46	20:30	00:06	00:41	01:33
S 60°	19:08	20:09	20:50	·· ··	00:19	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 12-14 85-96%
25	12:15	12:22	12:12	21:45	09:19	
26	12:29	12:35	12:13	22:39	10:12	
27	12:41	12:47	12:13	23:34	11:06	

IERS Earth Orientation data as of 08-Dec-2022

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	127°28.6	191°14.2	S21°43.5	89°52.3	N16°08.1	175°47.4	S18°28.8	180°13.6	S19°28.1
1	142°31.1	206°13.3	43.1	104°53.5	08.5	190°49.3	28.7	195°15.7	28.0
2	157°33.6	221°12.5	42.6	119°54.7	09.0	205°51.1	28.5	210°17.9	28.0
3	172°36.0	236°11.6	·· 42.2	134°55.8	·· 09.4	220°53.0	·· 28.4	225°20.0	·· 27.9
4	187°38.5	251°10.7	41.7	149°57.0	09.8	235°54.8	28.2	240°22.2	27.8
5	202°41.0	266°09.8	41.3	164°58.2	10.3	250°56.7	28.1	255°24.3	27.7
6	217°43.4	281°09.0	S21°40.8	179°59.4	N16°10.7	265°58.6	S18°27.9	270°26.5	S19°27.7
7	232°45.9	296°08.1	40.3	195°00.5	11.1	281°00.4	27.7	285°28.7	27.6
8	247°48.4	311°07.2	39.9	210°01.7	11.6	296°02.3	27.6	300°30.8	27.5
9	262°50.8	326°06.4	·· 39.4	225°02.9	·· 12.0	311°04.1	·· 27.4	315°33.0	·· 27.5
10	277°53.3	341°05.5	38.9	240°04.0	12.4	326°06.0	27.3	330°35.1	27.4
11	292°55.7	356°04.6	38.5	255°05.2	12.9	341°07.9	27.1	345°37.3	27.3
12	307°58.2	11°03.7	S21°38.0	270°06.4	N16°13.3	356°09.7	S18°27.0	0°39.4	S19°27.3
13	323°00.7	26°02.9	37.5	285°07.6	13.8	11°11.6	26.8	15°41.6	27.2
14	338°03.1	41°02.0	37.1	300°08.7	14.2	26°13.4	26.7	30°43.8	27.1
15	353°05.6	56°01.1	·· 36.6	315°09.9	·· 14.6	41°15.3	·· 26.5	45°45.9	·· 27.1
16	8°08.1	71°00.3	36.1	330°11.1	15.1	56°17.2	26.4	60°48.1	27.0
17	23°10.5	85°59.4	35.6	345°12.2	15.5	71°19.0	26.2	75°50.2	26.9
18	38°13.0	100°58.5	S21°35.2	0°13.4	N16°15.9	86°20.9	S18°26.1	90°52.4	S19°26.9
19	53°15.5	115°57.7	34.7	15°14.6	16.4	101°22.7	25.9	105°54.5	26.8
20	68°17.9	130°56.8	34.2	30°15.7	16.8	116°24.6	25.8	120°56.7	26.7
21	83°20.4	145°55.9	·· 33.7	45°16.9	·· 17.2	131°26.5	·· 25.6	135°58.9	·· 26.6
22	98°22.9	160°55.1	33.3	60°18.1	17.7	146°28.3	25.4	151°01.0	26.6
23	113°25.3	175°54.2	32.8	75°19.2	18.1	161°30.2	25.3	166°03.2	26.5
Mer.pass.	15:28	ν -0.9′	d -0.5′	ν 1.2′	d 0.4′	ν 1.9′	d -0.2′	ν 2.2′	d -0.1′
	m -3.92	m 0.36		m -1.95		m 0.61			

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	128°27.8	190°53.3	S21°32.3	90°20.4	N16°18.5	176°32.0	S18°25.1	181°05.3	S19°26.4
1	143°30.2	205°52.5	31.8	105°21.6	19.0	191°33.9	25.0	196°07.5	26.4
2	158°32.7	220°51.6	31.3	120°22.7	19.4	206°35.8	24.8	211°09.6	26.3
3	173°35.2	235°50.7	·· 30.8	135°23.9	·· 19.8	221°37.6	·· 24.7	226°11.8	·· 26.2
4	188°37.6	250°49.9	30.4	150°25.1	20.3	236°39.5	24.5	241°14.0	26.2
5	203°40.1	265°49.0	29.9	165°26.2	20.7	251°41.3	24.4	256°16.1	26.1
6	218°42.6	280°48.1	S21°29.4	180°27.4	N16°21.1	266°43.2	S18°24.2	271°18.3	S19°26.0
7	233°45.0	295°47.3	28.9	195°28.6	21.6	281°45.1	24.1	286°20.4	26.0
8	248°47.5	310°46.4	28.4	210°29.7	22.0	296°46.9	23.9	301°22.6	25.9
9	263°50.0	325°45.6	·· 27.9	225°30.9	·· 22.5	311°48.8	·· 23.7	316°24.7	·· 25.8
10	278°52.4	340°44.7	27.4	240°32.0	22.9	326°50.6	23.6	331°26.9	25.8
11	293°54.9	355°43.8	26.9	255°33.2	23.3	341°52.5	23.4	346°29.1	25.7
12	308°57.4	10°43.0	S21°26.4	270°34.4	N16°23.8	356°54.4	S18°23.3	1°31.2	S19°25.6
13	323°59.8	25°42.1	25.9	285°35.5	24.2	11°56.2	23.1	16°33.4	25.5
14	339°02.3	40°41.3	25.4	300°36.7	24.6	26°58.1	23.0	31°35.5	25.5
15	354°04.7	55°40.4	·· 24.9	315°37.9	·· 25.1	41°59.9	·· 22.8	46°37.7	·· 25.4
16	9°07.2	70°39.5	24.4	330°39.0	25.5	57°01.8	22.7	61°39.9	25.3
17	24°09.7	85°38.7	23.9	345°40.2	25.9	72°03.7	22.5	76°42.0	25.3
18	39°12.1	100°37.8	S21°23.4	0°41.3	N16°26.4	87°05.5	S18°22.3	91°44.2	S19°25.2
19	54°14.6	115°37.0	22.9	15°42.5	26.8	102°07.4	22.2	106°46.3	25.1
20	69°17.1	130°36.1	22.4	30°43.7	27.2	117°09.2	22.0	121°48.5	25.1
21	84°19.5	145°35.2	·· 21.9	45°44.8	·· 27.7	132°11.1	·· 21.9	136°50.6	·· 25.0
22	99°22.0	160°34.4	21.4	60°46.0	28.1	147°13.0	21.7	151°52.8	24.9
23	114°24.5	175°33.5	20.9	75°47.1	28.5	162°14.8	21.6	166°55.0	24.9
Mer.pass.	15:24	ν -0.9′	d -0.5′	ν 1.2′	d 0.4′	ν 1.9′	d -0.2′	ν 2.2′	d -0.1′
	m -3.92	m 0.38		m -1.95		m 0.62			

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	129°26.9	190°32.7	S21°20.4	90°48.3	N16°29.0	177°16.7	S18°21.4	181°57.1	S19°24.8
1	144°29.4	205°31.8	19.9	105°49.5	29.4	192°18.6	21.3	196°59.3	24.7
2	159°31.8	220°31.0	19.4	120°50.6	29.8	207°20.4	21.1	212°01.4	24.7
3	174°34.3	235°30.1	·· 18.8	135°51.8	·· 30.3	222°22.3	·· 21.0	227°03.6	·· 24.6
4	189°36.8	250°29.3	18.3	150°52.9	30.7	237°24.1	20.8	242°05.7	24.5
5	204°39.2	265°28.4	17.8	165°54.1	31.1	252°26.0	20.6	257°07.9	24.4
6	219°41.7	280°27.5	S21°17.3	180°55.2	N16°31.6	267°27.9	S18°20.5	272°10.1	S19°24.4
7	234°44.2	295°26.7	16.8	195°56.4	32.0	282°29.7	20.3	287°12.2	24.3
8	249°46.6	310°25.8	16.3	210°57.6	32.4	297°31.6	20.2	302°14.4	24.2
9	264°49.1	325°25.0	·· 15.8	225°58.7	·· 32.8	312°33.4	·· 20.0	317°16.5	·· 24.2
10	279°51.6	340°24.1	15.2	240°59.9	33.3	327°35.3	19.9	332°18.7	24.1
11	294°54.0	355°23.3	14.7	256°01.0	33.7	342°37.2	19.7	347°20.9	24.0
12	309°56.5	10°22.4	S21°14.2	271°02.2	N16°34.1	357°39.0	S18°19.6	2°23.0	S19°24.0
13	324°59.0	25°21.6	13.7	286°03.3	34.6	12°40.9	19.4	17°25.2	23.9
14	340°01.4	40°20.7	13.1	301°04.5	35.0	27°42.7	19.2	32°27.3	23.8
15	355°03.9	55°19.9	·· 12.6	316°05.6	·· 35.4	42°44.6	·· 19.1	47°29.5	·· 23.8
16	10°06.3	70°19.0	12.1	331°06.8	35.9	57°46.5	18.9	62°31.6	23.7
17	25°08.8	85°18.2	11.6	346°07.9	36.3	72°48.3	18.8	77°33.8	23.6
18	40°11.3	100°17.3	S21°11.0	1°09.1	N16°36.7	87°50.2	S18°18.6	92°36.0	S19°23.6
19	55°13.7	115°16.5	10.5	16°10.2	37.2	102°52.0	18.5	107°38.1	23.5
20	70°16.2	130°15.6	10.0	31°11.4	37.6	117°53.9	18.3	122°40.3	23.4
21	85°18.7	145°14.8	·· 09.4	46°12.5	·· 38.0	132°55.8	·· 18.2	137°42.4	·· 23.3
22	100°21.1	160°13.9	08.9	61°13.7	38.5	147°57.6	18.0	152°44.6	23.3
23	115°23.6	175°13.1	08.4	76°14.9	38.9	162°59.5	17.8	167°46.7	23.2
Mer.pass.	15:20	ν -0.9′	d -0.5′	ν 1.2′	d 0.4′	ν 1.9′	d -0.2′	ν 2.2′	d -0.1′
	m -3.92	m 0.40		m -1.95		m 0.64			

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.6	-42°11.8
Schedar	349°34.8	56°39.3
Diphda	348°50.7	-17°52.5
Achernar	335°22.8	-57°08.2
Hamal	327°54.8	23°33.7
Polaris	315°24.5	89°21.4
Acamar	315°14.2	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.6	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.5
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.6
Sirius	258°28.7	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.8	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.6
Suhail	222°48.1	-43°31.0
Miaplacidus	221°37.8	-69°48.1
Alphard	217°50.6	-8°45.0
Regulus	207°37.5	11°51.8
Dubhe	193°44.5	61°38.1
Denebola	182°28.0	14°27.2
Gienah	175°46.7	-17°39.4
Acrux	173°03.2	-63°12.6
Gacrux	171°54.8	-57°13.6
Alioth	166°15.7	55°50.5
Spica	158°25.6	-11°16.2
Alkaid	152°54.5	49°12.3
Hadar	148°40.4	-60°28.1
Menkent	148°01.3	-36°28.2
Arcturus	145°50.8	19°04.3
Rigil Kent.	139°44.6	-60°55.0
Kochab	137°20.1	74°03.9
Zuben'ubi	136°59.6	-16°07.6
Alphecca	126°06.6	26°38.5
Antares	112°19.9	-26°28.6
Atria	107°17.3	-69°03.6
Sabik	102°06.7	-15°45.0
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.8	12°32.6
Eltanin	90°44.1	51°29.0
Kaus Aust.	83°37.1	-34°22.4
Vega	80°35.7	38°48.1
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.4
Peacock	53°11.4	-56°40.1
Deneb	49°28.4	45°21.3
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.0

Jan 28 Thu	SHA	Mer.pass
Venus	63°45.6	11:16
Mars	322°23.7	17:59
Jupiter	48°18.8	12:15
Saturn	52°44.9	11:57

Jan 29 Fri	SHA	Mer.pass
Venus	62°25.6	11:17
Mars	321°52.6	17:57
Jupiter	48°04.3	12:12
Saturn	52°37.5	11:54

Jan 30 Sat	SHA	Mer.pass
Venus	61°05.8	11:18
Mars	321°21.4	17:55
Jupiter	47°49.8	12:09
Saturn	52°30.2	11:50

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°46.8	S18°11.6	6°14.7	7.8′	N23°40.0	-4.6′	56.9′
1	191°46.7	11.0	20°41.5	7.8′	23°35.3	-4.8′	56.9′
2	206°46.6	10.3	35°08.3	7.8′	23°30.5	-4.9′	57.0′
3	221°46.5	·· 09.7	49°35.1	7.8′	23°25.6	-5.1′	57.0′
4	236°46.3	09.0	64°01.9	7.8′	23°20.5	-5.2′	57.0′
5	251°46.2	08.3	78°28.8	7.9′	23°15.3	-5.3′	57.0′
6	266°46.1	S18°07.7	92°55.6	7.9′	N23°10.0	-5.5′	57.1′
7	281°46.0	07.0	107°22.5	7.9′	23°04.5	-5.6′	57.1′
8	296°45.9	06.4	121°49.4	7.9′	22°58.9	-5.8′	57.1′
9	311°45.8	·· 05.7	136°16.3	7.9′	22°53.1	-5.9′	57.1′
10	326°45.7	05.0	150°43.2	7.9′	22°47.2	-6.0′	57.2′
11	341°45.5	04.4	165°10.2	8.0′	22°41.2	-6.2′	57.2′
12	356°45.4	S18°03.7	179°37.1	8.0′	N22°35.1	-6.3′	57.2′
13	11°45.3	03.0	194°04.1	8.0′	22°28.7	-6.4′	57.2′
14	26°45.2	02.4	208°31.1	8.0′	22°22.3	-6.6′	57.3′
15	41°45.1	·· 01.7	222°58.2	8.1′	22°15.7	-6.7′	57.3′
16	56°45.0	01.0	237°25.2	8.1′	22°09.0	-6.8′	57.3′
17	71°44.9	18°00.4	251°52.3	8.1′	22°02.2	-7.0′	57.3′
18	86°44.8	S17°59.7	266°19.4	8.1′	N21°55.2	-7.1′	57.4′
19	101°44.6	59.0	280°46.6	8.2′	21°48.1	-7.2′	57.4′
20	116°44.5	58.4	295°13.8	8.2′	21°40.9	-7.4′	57.4′
21	131°44.4	·· 57.7	309°41.0	8.2′	21°33.5	-7.5′	57.4′
22	146°44.3	57.0	324°08.2	8.3′	21°26.0	-7.6′	57.5′
23	161°44.2	56.3	338°35.5	8.3′	21°18.4	-7.8′	57.5′
	SD = 16.2′	d = -0.7′	SD = 15.5′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°44.1	S17°55.7	353°02.7	8.3′	N21°10.6	-7.9′	57.5′
1	191°44.0	55.0	7°30.1	8.4′	21°02.7	-8.0′	57.5′
2	206°43.9	54.3	21°57.4	8.4′	20°54.7	-8.1′	57.6′
3	221°43.8	·· 53.7	36°24.8	8.4′	20°46.6	-8.3′	57.6′
4	236°43.7	53.0	50°52.3	8.5′	20°38.3	-8.4′	57.6′
5	251°43.6	52.3	65°19.7	8.5′	20°29.9	-8.5′	57.6′
6	266°43.4	S17°51.6	79°47.2	8.5′	N20°21.4	-8.6′	57.7′
7	281°43.3	51.0	94°14.8	8.6′	20°12.8	-8.8′	57.7′
8	296°43.2	50.3	108°42.4	8.6′	20°04.0	-8.9′	57.7′
9	311°43.1	·· 49.6	123°10.0	8.7′	19°55.2	-9.0′	57.7′
10	326°43.0	48.9	137°37.7	8.7′	19°46.2	-9.1′	57.7′
11	341°42.9	48.2	152°05.3	8.7′	19°37.0	-9.2′	57.8′
12	356°42.8	S17°47.6	166°33.1	8.8′	N19°27.8	-9.4′	57.8′
13	11°42.7	46.9	181°00.9	8.8′	19°18.5	-9.5′	57.8′
14	26°42.6	46.2	195°28.7	8.9′	19°09.0	-9.6′	57.8′
15	41°42.5	·· 45.5	209°56.5	8.9′	18°59.4	-9.7′	57.9′
16	56°42.4	44.8	224°24.5	8.9′	18°49.7	-9.8′	57.9′
17	71°42.3	44.2	238°52.4	9.0′	18°39.9	-9.9′	57.9′
18	86°42.2	S17°43.5	253°20.4	9.0′	N18°30.0	-10.0′	57.9′
19	101°42.1	42.8	267°48.4	9.1′	18°19.9	-10.1′	57.9′
20	116°42.0	42.1	282°16.5	9.1′	18°09.8	-10.3′	58.0′
21	131°41.9	·· 41.4	296°44.6	9.2′	17°59.5	-10.4′	58.0′
22	146°41.8	40.8	311°12.8	9.2′	17°49.2	-10.5′	58.0′
23	161°41.7	40.1	325°41.0	9.2′	17°38.7	-10.6′	58.0′
	SD = 16.2′	d = -0.7′	SD = 15.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.6	S17°39.4	340°09.2	9.3′	N17°28.1	-10.7′	58.1′
1	191°41.5	38.7	354°37.5	9.3′	17°17.4	-10.8′	58.1′
2	206°41.4	38.0	9°05.8	9.4′	17°06.7	-10.9′	58.1′
3	221°41.3	·· 37.3	23°34.2	9.4′	16°55.8	-11.0′	58.1′
4	236°41.2	36.6	38°02.7	9.5′	16°44.8	-11.1′	58.1′
5	251°41.1	35.9	52°31.1	9.5′	16°33.7	-11.2′	58.2′
6	266°41.0	S17°35.3	66°59.6	9.6′	N16°22.5	-11.3′	58.2′
7	281°40.9	34.6	81°28.2	9.6′	16°11.2	-11.4′	58.2′
8	296°40.8	33.9	95°56.8	9.6′	15°59.8	-11.5′	58.2′
9	311°40.7	·· 33.2	110°25.4	9.7′	15°48.4	-11.6′	58.2′
10	326°40.6	32.5	124°54.1	9.7′	15°36.8	-11.7′	58.2′
11	341°40.5	31.8	139°22.9	9.8′	15°25.1	-11.8′	58.3′
12	356°40.4	S17°31.1	153°51.7	9.8′	N15°13.4	-11.8′	58.3′
13	11°40.3	30.4	168°20.5	9.9′	15°01.5	-11.9′	58.3′
14	26°40.2	29.7	182°49.3	9.9′	14°49.6	-12.0′	58.3′
15	41°40.1	·· 29.0	197°18.2	10.0′	14°37.5	-12.1′	58.3′
16	56°40.0	28.3	211°47.2	10.0′	14°25.4	-12.2′	58.4′
17	71°39.9	27.7	226°16.2	10.0′	14°13.2	-12.3′	58.4′
18	86°39.8	S17°27.0	240°45.2	10.1′	N14°01.0	-12.4′	58.4′
19	101°39.7	26.3	255°14.3	10.1′	13°48.6	-12.4′	58.4′
20	116°39.6	25.6	269°43.4	10.2′	13°36.1	-12.5′	58.4′
21	131°39.5	·· 24.9	284°12.6	10.2′	13°23.6	-12.6′	58.4′
22	146°39.5	24.2	298°41.8	10.2′	13°11.0	-12.7′	58.5′
23	161°39.4	23.5	313°11.1	10.3′	12°58.3	-12.8′	58.5′
	SD = 16.2′	d = -0.7′	SD = 15.8′				

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	14:26	15:57	17:18
68°	07:03	08:14	09:29	14:58	16:13	17:25
66°	06:56	08:01	09:06	15:21	16:26	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	07:13	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	06:52	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	20:11
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	19:49	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	21:50
56°	02:11	03:23	04:12	20:13	21:01	22:12
58°	01:40	03:08	04:01	20:24	21:17	22:42
S 60°	00:30	02:48	03:49	20:36	21:35	23:37

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

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 15-17 99-98%
28	12:53	12:58	12:13	–:–	12:02	
29	13:04	13:09	12:13	00:29	12:56	
30	13:14	13:18	12:13	01:22	13:48	

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	130°26.1	190°12.3	S21°07.8	91°16.0	N16°39.3	178°01.3	S18°17.7	182°48.9	S19°23.1
1	145°28.5	205°11.4	07.3	106°17.2	39.8	193°03.2	17.5	197°51.1	23.1
2	160°31.0	220°10.6	06.8	121°18.3	40.2	208°05.1	17.4	212°53.2	23.0
3	175°33.5	235°09.7	·· 06.2	136°19.5	·· 40.6	223°06.9	·· 17.2	227°55.4	·· 22.9
4	190°35.9	250°08.9	05.7	151°20.6	41.0	238°08.8	17.1	242°57.5	22.9
5	205°38.4	265°08.0	05.1	166°21.8	41.5	253°10.6	16.9	257°59.7	22.8
6	220°40.8	280°07.2	S21°04.6	181°22.9	N16°41.9	268°12.5	S18°16.8	273°01.9	S19°22.7
7	235°43.3	295°06.3	04.1	196°24.0	42.3	283°14.4	16.6	288°04.0	22.7
8	250°45.8	310°05.5	03.5	211°25.2	42.8	298°16.2	16.4	303°06.2	22.6
9	265°48.2	325°04.7	·· 03.0	226°26.3	·· 43.2	313°18.1	·· 16.3	318°08.3	·· 22.5
10	280°50.7	340°03.8	02.4	241°27.5	43.6	328°19.9	16.1	333°10.5	22.4
11	295°53.2	355°03.0	01.9	256°28.6	44.1	343°21.8	16.0	348°12.6	22.4
12	310°55.6	10°02.1	S21°01.3	271°29.8	N16°44.5	358°23.7	S18°15.8	3°14.8	S19°22.3
13	325°58.1	25°01.3	00.8	286°30.9	44.9	13°25.5	15.7	18°17.0	22.2
14	341°00.6	40°00.4	21°00.2	301°32.1	45.3	28°27.4	15.5	33°19.1	22.2
15	356°03.0	54°59.6	20°59.7	316°33.2	·· 45.8	43°29.2	·· 15.3	48°21.3	·· 22.1
16	11°05.5	69°58.8	59.1	331°34.4	46.2	58°31.1	15.2	63°23.4	22.0
17	26°07.9	84°57.9	58.6	346°35.5	46.6	73°33.0	15.0	78°25.6	22.0
18	41°10.4	99°57.1	S20°58.0	1°36.7	N16°47.1	88°34.8	S18°14.9	93°27.8	S19°21.9
19	56°12.9	114°56.2	57.5	16°37.8	47.5	103°36.7	14.7	108°29.9	21.8
20	71°15.3	129°55.4	56.9	31°38.9	47.9	118°38.6	14.6	123°32.1	21.8
21	86°17.8	144°54.6	·· 56.3	46°40.1	·· 48.4	133°40.4	·· 14.4	138°34.2	·· 21.7
22	101°20.3	159°53.7	55.8	61°41.2	48.8	148°42.3	14.3	153°36.4	21.6
23	116°22.7	174°52.9	55.2	76°42.4	49.2	163°44.1	14.1	168°38.6	21.5
	Mer.pass. 15:16	ν -0.8′	d -0.5′	m -3.92	ν 1.2′	d 0.4′	m 0.41	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.65

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	131°25.2	189°52.1	S20°54.7	91°43.5	N16°49.6	178°46.0	S18°13.9	183°40.7	S19°21.5
1	146°27.7	204°51.2	54.1	106°44.7	50.1	193°47.9	13.8	198°42.9	21.4
2	161°30.1	219°50.4	53.5	121°45.8	50.5	208°49.7	13.6	213°45.0	21.3
3	176°32.6	234°49.6	·· 53.0	136°46.9	·· 50.9	223°51.6	·· 13.5	228°47.2	·· 21.3
4	191°35.1	249°48.7	52.4	151°48.1	51.4	238°53.4	13.3	243°49.3	21.2
5	206°37.5	264°47.9	51.8	166°49.2	51.8	253°55.3	13.2	258°51.5	21.1
6	221°40.0	279°47.0	S20°51.3	181°50.4	N16°52.2	268°57.2	S18°13.0	273°53.7	S19°21.1
7	236°42.4	294°46.2	50.7	196°51.5	52.6	283°59.0	12.8	288°55.8	21.0
8	251°44.9	309°45.4	50.1	211°52.7	53.1	299°00.9	12.7	303°58.0	20.9
9	266°47.4	324°44.6	·· 49.6	226°53.8	·· 53.5	314°02.7	·· 12.5	319°00.1	·· 20.9
10	281°49.8	339°43.7	49.0	241°54.9	53.9	329°04.6	12.4	334°02.3	20.8
11	296°52.3	354°42.9	48.4	256°56.1	54.3	344°06.5	12.2	349°04.5	20.7
12	311°54.8	9°42.1	S20°47.8	271°57.2	N16°54.8	359°08.3	S18°12.1	4°06.6	S19°20.7
13	326°57.2	24°41.2	47.3	286°58.3	55.2	14°10.2	11.9	19°08.8	20.6
14	341°59.7	39°40.4	46.7	301°59.5	55.6	29°12.1	11.7	34°10.9	20.5
15	357°02.2	54°39.6	·· 46.1	317°00.6	·· 56.1	44°13.9	·· 11.6	49°13.1	·· 20.4
16	12°04.6	69°38.7	45.5	332°01.8	56.5	59°15.8	11.4	64°15.3	20.4
17	27°07.1	84°37.9	44.9	347°02.9	56.9	74°17.6	11.3	79°17.4	20.3
18	42°09.5	99°37.1	S20°44.4	2°04.0	N16°57.3	89°19.5	S18°11.1	94°19.6	S19°20.2
19	57°12.0	114°36.2	43.8	17°05.2	57.8	104°21.4	11.0	109°21.7	20.2
20	72°14.5	129°35.4	43.2	32°06.3	58.2	119°23.2	10.8	124°23.9	20.1
21	87°16.9	144°34.6	·· 42.6	47°07.4	·· 58.6	134°25.1	·· 10.6	139°26.0	·· 20.0
22	102°19.4	159°33.8	42.0	62°08.6	59.0	149°26.9	10.5	154°28.2	20.0
23	117°21.9	174°32.9	41.4	77°09.7	59.5	164°28.8	10.3	169°30.4	19.9
	Mer.pass. 15:12	ν -0.8′	d -0.6′	m -3.92	ν 1.1′	d 0.4′	m 0.43	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.65

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	132°24.3	189°32.1	S20°40.9	92°10.9	N16°59.9	179°30.7	S18°10.2	184°32.5	S19°19.8
1	147°26.8	204°31.3	40.3	107°12.0	17°00.3	194°32.5	10.0	199°34.7	19.8
2	162°29.3	219°30.5	39.7	122°13.1	00.8	209°34.4	09.9	214°36.8	19.7
3	177°31.7	234°29.6	·· 39.1	137°14.3	·· 01.2	224°36.3	·· 09.7	229°39.0	·· 19.6
4	192°34.2	249°28.8	38.5	152°15.4	01.6	239°38.1	09.5	244°41.2	19.5
5	207°36.7	264°28.0	37.9	167°16.5	02.0	254°40.0	09.4	259°43.3	19.5
6	222°39.1	279°27.2	S20°37.3	182°17.7	N17°02.5	269°41.8	S18°09.2	274°45.5	S19°19.4
7	237°41.6	294°26.3	36.7	197°18.8	02.9	284°43.7	09.1	289°47.6	19.3
8	252°44.0	309°25.5	36.1	212°19.9	03.3	299°45.6	08.9	304°49.8	19.3
9	267°46.5	324°24.7	·· 35.5	227°21.1	·· 03.7	314°47.4	·· 08.8	319°52.0	·· 19.2
10	282°49.0	339°23.9	34.9	242°22.2	04.2	329°49.3	08.6	334°54.1	19.1
11	297°51.4	354°23.1	34.3	257°23.3	04.6	344°51.1	08.4	349°56.3	19.1
12	312°53.9	9°22.2	S20°33.7	272°24.5	N17°05.0	359°53.0	S18°08.3	4°58.4	S19°19.0
13	327°56.4	24°21.4	33.1	287°25.6	05.4	14°54.9	08.1	20°00.6	18.9
14	342°58.8	39°20.6	32.5	302°26.7	05.9	29°56.7	08.0	35°02.8	18.9
15	358°01.3	54°19.8	·· 31.9	317°27.8	·· 06.3	44°58.6	·· 07.8	50°04.9	·· 18.8
16	13°03.8	69°19.0	31.3	332°29.0	06.7	60°00.5	07.7	65°07.1	18.7
17	28°06.2	84°18.1	30.7	347°30.1	07.1	75°02.3	07.5	80°09.2	18.6
18	43°08.7	99°17.3	S20°30.1	2°31.2	N17°07.6	90°04.2	S18°07.3	95°11.4	S19°18.6
19	58°11.2	114°16.5	29.5	17°32.4	08.0	105°06.0	07.2	110°13.6	18.5
20	73°13.6	129°15.7	28.9	32°33.5	08.4	120°07.9	07.0	125°15.7	18.4
21	88°16.1	144°14.9	·· 28.3	47°34.6	·· 08.8	135°09.8	·· 06.9	140°17.9	·· 18.4
22	103°18.5	159°14.0	27.7	62°35.8	09.3	150°11.6	06.7	155°20.0	18.3
23	118°21.0	174°13.2	27.0	77°36.9	09.7	165°13.5	06.6	170°22.2	18.2
	Mer.pass. 15:08	ν -0.8′	d -0.6′	m -3.92	ν 1.1′	d 0.4′	m 0.45	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.4
Ankaa	353°10.6	-42°11.8
Schedar	349°34.9	56°39.3
Diphda	348°50.7	-17°52.5
Achernar	335°22.8	-57°08.2
Hamal	327°54.8	23°33.7
Polaris	315°26.1	89°21.4
Acamar	315°14.2	-40°13.6
Menkar	314°09.4	4°10.2
Mirfak	308°32.7	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.5
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.3	-52°42.6
Sirius	258°28.7	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.8	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.6
Suhail	222°48.1	-43°31.0
Miaplacidus	221°37.8	-69°48.1
Alphard	217°50.5	-8°45.0
Regulus	207°37.5	11°51.8
Dubhe	193°44.5	61°38.1
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.4
Acrux	173°03.1	-63°12.6
Gacrux	171°54.8	-57°13.6
Alioth	166°15.6	55°50.5
Spica	158°25.5	-11°16.2
Alkaid	152°54.5	49°12.3
Hadar	148°40.3	-60°28.1
Menkent	148°01.3	-36°28.2
Arcturus	145°50.8	19°04.3
Rigil Kent.	139°44.6	-60°55.0
Kochab	137°20.0	74°03.9
Zuben'ubi	136°59.6	-16°07.6
Alphecca	126°06.6	26°38.5
Antares	112°19.9	-26°28.6
Atria	107°17.3	-69°03.6
Sabik	102°06.6	-15°45.0
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.6
Eltanin	90°44.1	51°29.0
Kaus Aust.	83°37.1	-34°22.4
Vega	80°35.7	38°48.0
Nunki	75°52.0	-26°16.2
Altair	62°03.4	8°55.3
Peacock	53°11.4	-56°40.1
Deneb	49°28.4	45°21.2
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.6	28°11.8
Markab	13°33.3	15°19.0

Jan 31 Sun	SHA	Mer.pass
Venus	59°46.2	11:20
Mars	320°49.9	17:54
Jupiter	47°35.3	12:06
Saturn	52°22.8	11:47

Feb 01 Mon	SHA	Mer.pass
Venus	58°26.9	11:21
Mars	320°18.3	17:52
Jupiter	47°20.8	12:03
Saturn	52°15.5	11:44

Feb 02 Tue	SHA	Mer.pass
Venus	57°07.8	11:22
Mars	319°46.5	17:50
Jupiter	47°06.3	12:00
Saturn	52°08.2	11:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°39.3	S17°22.8	327°40.3	10.3′	N12°45.6	-12.8′	58.5′
1	191°39.2	22.1	342°09.7	10.4′	12°32.7	-12.9′	58.5′
2	206°39.1	21.4	356°39.0	10.4′	12°19.8	-13.0′	58.5′
3	221°39.0	·· 20.7	11°08.4	10.4′	12°06.8	-13.1′	58.5′
4	236°38.9	20.0	25°37.9	10.5′	11°53.8	-13.1′	58.6′
5	251°38.8	19.3	40°07.4	10.5′	11°40.7	-13.2′	58.6′
6	266°38.7	S17°18.6	54°36.9	10.6′	N11°27.5	-13.3′	58.6′
7	281°38.6	17.9	69°06.4	10.6′	11°14.2	-13.3′	58.6′
8	296°38.5	17.2	83°36.0	10.6′	11°00.9	-13.4′	58.6′
9	311°38.5	·· 16.5	98°05.7	10.7′	10°47.5	-13.5′	58.6′
10	326°38.4	15.8	112°35.3	10.7′	10°34.0	-13.5′	58.6′
11	341°38.3	15.1	127°05.0	10.7′	10°20.5	-13.6′	58.7′
12	356°38.2	S17°14.4	141°34.8	10.8′	N10°06.9	-13.6′	58.7′
13	11°38.1	13.7	156°04.5	10.8′	09°53.3	-13.7′	58.7′
14	26°38.0	13.0	170°34.3	10.8′	09°39.6	-13.8′	58.7′
15	41°37.9	·· 12.2	185°04.2	10.9′	09°25.8	-13.8′	58.7′
16	56°37.8	11.5	199°34.0	10.9′	09°12.0	-13.9′	58.7′
17	71°37.7	10.8	214°03.9	10.9′	08°58.2	-13.9′	58.7′
18	86°37.7	S17°10.1	228°33.9	11.0′	N08°44.3	-14.0′	58.7′
19	101°37.6	09.4	243°03.8	11.0′	08°30.3	-14.0′	58.8′
20	116°37.5	08.7	257°33.8	11.0′	08°16.3	-14.1′	58.8′
21	131°37.4	·· 08.0	272°03.8	11.0′	08°02.2	-14.1′	58.8′
22	146°37.3	07.3	286°33.8	11.1′	07°48.1	-14.2′	58.8′
23	161°37.2	06.6	301°03.9	11.1′	07°33.9	-14.2′	58.8′
	SD = 16.2′	d = -0.7′	SD = 16.0′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.2	S17°05.9	315°34.0	11.1′	N07°19.7	-14.2′	58.8′
1	191°37.1	05.2	330°04.1	11.1′	07°05.5	-14.3′	58.8′
2	206°37.0	04.4	344°34.2	11.2′	06°51.2	-14.3′	58.8′
3	221°36.9	·· 03.7	359°04.4	11.2′	06°36.9	-14.4′	58.9′
4	236°36.8	03.0	13°34.6	11.2′	06°22.5	-14.4′	58.9′
5	251°36.7	02.3	28°04.8	11.2′	06°08.1	-14.4′	58.9′
6	266°36.7	S17°01.6	42°35.0	11.2′	N05°53.7	-14.5′	58.9′
7	281°36.6	00.9	57°05.3	11.3′	05°39.2	-14.5′	58.9′
8	296°36.5	17°00.2	71°35.5	11.3′	05°24.7	-14.5′	58.9′
9	311°36.4	16°59.4	86°05.8	11.3′	05°10.1	-14.6′	58.9′
10	326°36.3	58.7	100°36.1	11.3′	04°55.6	-14.6′	58.9′
11	341°36.3	58.0	115°06.4	11.3′	04°41.0	-14.6′	58.9′
12	356°36.2	S16°57.3	129°36.7	11.3′	N04°26.3	-14.7′	58.9′
13	11°36.1	56.6	144°07.1	11.4′	04°11.7	-14.7′	58.9′
14	26°36.0	55.9	158°37.4	11.4′	03°57.0	-14.7′	59.0′
15	41°35.9	·· 55.1	173°07.8	11.4′	03°42.3	-14.7′	59.0′
16	56°35.9	54.4	187°38.2	11.4′	03°27.5	-14.8′	59.0′
17	71°35.8	53.7	202°08.6	11.4′	03°12.8	-14.8′	59.0′
18	86°35.7	S16°53.0	216°39.0	11.4′	N02°58.0	-14.8′	59.0′
19	101°35.6	52.3	231°09.4	11.4′	02°43.2	-14.8′	59.0′
20	116°35.5	51.5	245°39.8	11.4′	02°28.4	-14.8′	59.0′
21	131°35.5	·· 50.8	260°10.2	11.4′	02°13.6	-14.8′	59.0′
22	146°35.4	50.1	274°40.6	11.4′	01°58.8	-14.8′	59.0′
23	161°35.3	49.4	289°11.1	11.4′	01°43.9	-14.9′	59.0′
	SD = 16.2′	d = -0.7′	SD = 16.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.2	S16°48.7	303°41.5	11.4′	N01°29.1	-14.9′	59.0′
1	191°35.2	47.9	318°11.9	11.4′	01°14.2	-14.9′	59.0′
2	206°35.1	47.2	332°42.4	11.4′	00°59.3	-14.9′	59.0′
3	221°35.0	·· 46.5	347°12.8	11.4′	00°44.4	-14.9′	59.1′
4	236°34.9	45.8	1°43.3	11.4′	00°29.5	-14.9′	59.1′
5	251°34.9	45.0	16°13.7	11.4′	N00°14.6	-14.9′	59.1′
6	266°34.8	S16°44.3	30°44.1	11.4′	S00°00.3	14.9′	59.1′
7	281°34.7	43.6	45°14.5	11.4′	00°15.2	14.9′	59.1′
8	296°34.6	42.8	59°45.0	11.4′	00°30.1	14.9′	59.1′
9	311°34.6	·· 42.1	74°15.4	11.4′	00°45.0	14.9′	59.1′
10	326°34.5	41.4	88°45.8	11.4′	00°59.9	14.9′	59.1′
11	341°34.4	40.7	103°16.2	11.4′	01°14.8	14.9′	59.1′
12	356°34.4	S16°39.9	117°46.6	11.4′	S01°29.7	14.9′	59.1′
13	11°34.3	39.2	132°17.0	11.4′	01°44.6	14.9′	59.1′
14	26°34.2	38.5	146°47.3	11.4′	01°59.4	14.9′	59.1′
15	41°34.1	·· 37.7	161°17.7	11.3′	02°14.3	14.9′	59.1′
16	56°34.1	37.0	175°48.0	11.3′	02°29.2	14.8′	59.1′
17	71°34.0	36.3	190°18.4	11.3′	02°44.0	14.8′	59.1′
18	86°33.9	S16°35.5	204°48.7	11.3′	S02°58.9	14.8′	59.1′
19	101°33.9	34.8	219°19.0	11.3′	03°13.7	14.8′	59.1′
20	116°33.8	34.1	233°49.3	11.3′	03°28.5	14.8′	59.1′
21	131°33.7	·· 33.3	248°19.5	11.2′	03°43.3	14.8′	59.1′
22	146°33.7	32.6	262°49.8	11.2′	03°58.0	14.7′	59.1′
23	161°33.6	31.9	277°20.0	11.2′	04°12.8	14.7′	59.1′
	SD = 16.2′	d = -0.7′	SD = 16.1′				

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	16:09	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	17:44
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	16:54	17:29	18:08
45°	06:13	06:48	07:20	17:08	17:39	18:14
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	19:34
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°	04:02	04:39	05:09	19:17	19:47	20:24
45°	03:42	04:24	04:57	19:29	20:03	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°	01:12	02:59	03:57	20:28	21:25	23:07

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	19:00	21:15	23:27	10:46	10:17	09:51
N 70°	19:14	21:18	23:21	10:31	10:10	09:52
68°	19:24	21:20	23:15	10:18	10:05	09:54
66°	19:33	21:22	23:11	10:07	10:01	09:55
64°	19:40	21:24	23:07	09:58	09:57	09:55
62°	19:47	21:25	23:04	09:50	09:54	09:56
60°	19:52	21:27	23:01	09:44	09:51	09:57
N 58°	19:57	21:28	22:59	09:38	09:48	09:57
56°	20:01	21:29	22:57	09:33	09:46	09:58
54°	20:05	21:30	22:55	09:28	09:44	09:58
52°	20:08	21:31	22:53	09:23	09:42	09:59
50°	20:11	21:31	22:51	09:20	09:40	09:59
45°	20:18	21:33	22:48	09:11	09:36	10:00
N 40°	20:24	21:34	22:45	09:04	09:33	10:01
35°	20:28	21:35	22:42	08:58	09:30	10:01
30°	20:33	21:36	22:40	08:52	09:28	10:02
20°	20:40	21:38	22:37	08:42	09:23	10:03
N 10°	20:46	21:40	22:33	08:34	09:19	10:04
0°	20:52	21:41	22:30	08:26	09:16	10:04
S 10°	20:58	21:43	22:27	08:18	09:12	10:05
20°	21:04	21:44	22:24	08:09	09:08	10:06
30°	21:11	21:46	22:21	07:59	09:03	10:07
35°	21:16	21:47	22:19	07:53	09:00	10:07
40°	21:20	21:48	22:16	07:47	08:57	10:08
45°	21:25	21:50	22:14	07:39	08:54	10:09
S 50°	21:32	21:52	22:11	07:29	08:49	10:09
52°	21:35	21:52	22:09	07:25	08:47	10:10
54°	21:38	21:53	22:08	07:20	08:45	10:10
56°	21:42	21:54	22:06	07:15	08:43	10:10
58°	21:45	21:55	22:04	07:09	08:40	10:11
S 60°	21:50	21:56	22:02	07:02	08:37	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 18-20 94-79%
31	13:23	13:27	12:13	02:14	14:39	
01	13:31	13:35	12:14	03:04	15:28	
02	13:39	13:43	12:14	03:53	16:17	

DUT1 = UT1-UTC = -0.1682 sec ΔT = TT-UT1 = +69.3522 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	133°23.5	189°12.4	S20°26.4	92°38.0	N17°10.1	180°15.4	S18°06.4	185°24.4	S19°18.2
1	148°25.9	204°11.6	25.8	107°39.1	10.5	195°17.2	06.2	200°26.5	18.1
2	163°28.4	219°10.8	25.2	122°40.3	11.0	210°19.1	06.1	215°28.7	18.0
3	178°30.9	234°10.0	·· 24.6	137°41.4	·· 11.4	225°20.9	·· 05.9	230°30.8	·· 18.0
4	193°33.3	249°09.2	24.0	152°42.5	11.8	240°22.8	05.8	245°33.0	17.9
5	208°35.8	264°08.3	23.4	167°43.6	12.2	255°24.7	05.6	260°35.2	17.8
6	223°38.3	279°07.5	S20°22.7	182°44.8	N17°12.7	270°26.5	S18°05.5	275°37.3	S19°17.7
7	238°40.7	294°06.7	22.1	197°45.9	13.1	285°28.4	05.3	290°39.5	17.7
8	253°43.2	309°05.9	21.5	212°47.0	13.5	300°30.3	05.1	305°41.6	17.6
9	268°45.6	324°05.1	·· 20.9	227°48.1	·· 13.9	315°32.1	·· 05.0	320°43.8	·· 17.5
10	283°48.1	339°04.3	20.2	242°49.3	14.4	330°34.0	04.8	335°45.9	17.5
11	298°50.6	354°03.5	19.6	257°50.4	14.8	345°35.8	04.7	350°48.1	17.4
12	313°53.0	9°02.7	S20°19.0	272°51.5	N17°15.2	0°37.7	S18°04.5	5°50.3	S19°17.3
13	328°55.5	24°01.9	18.4	287°52.6	15.6	15°39.6	04.3	20°52.4	17.3
14	343°58.0	39°01.0	17.7	302°53.8	16.0	30°41.4	04.2	35°54.6	17.2
15	359°00.4	54°00.2	·· 17.1	317°54.9	·· 16.5	45°43.3	·· 04.0	50°56.7	·· 17.1
16	14°02.9	68°59.4	16.5	332°56.0	16.9	60°45.2	03.9	65°58.9	17.1
17	29°05.4	83°58.6	15.9	347°57.1	17.3	75°47.0	03.7	81°01.1	17.0
18	44°07.8	98°57.8	S20°15.2	2°58.3	N17°17.7	90°48.9	S18°03.6	96°03.2	S19°16.9
19	59°10.3	113°57.0	14.6	17°59.4	18.2	105°50.7	03.4	111°05.4	16.8
20	74°12.8	128°56.2	14.0	33°00.5	18.6	120°52.6	03.2	126°07.6	16.8
21	89°15.2	143°55.4	·· 13.3	48°01.6	·· 19.0	135°54.5	·· 03.1	141°09.7	·· 16.7
22	104°17.7	158°54.6	12.7	63°02.7	19.4	150°56.3	02.9	156°11.9	16.6
23	119°20.1	173°53.8	12.0	78°03.9	19.8	165°58.2	02.8	171°14.0	16.6
Mer.pass.	15:04	ν -0.8′	d -0.6′	m -3.92	ν 1.1′	d 0.4′	m 0.47	ν 1.9′	d -0.2′	m -1.95	ν 2.2′	d -0.1′	m 0.67
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	134°22.6	188°53.0	S20°11.4	93°05.0	N17°20.3	181°00.1	S18°02.6	186°16.2	S19°16.5
1	149°25.1	203°52.2	10.8	108°06.1	20.7	196°01.9	02.4	201°18.4	16.4
2	164°27.5	218°51.4	10.1	123°07.2	21.1	211°03.8	02.3	216°20.5	16.4
3	179°30.0	233°50.6	·· 09.5	138°08.3	·· 21.5	226°05.6	·· 02.1	231°22.7	·· 16.3
4	194°32.5	248°49.8	08.8	153°09.5	22.0	241°07.5	02.0	246°24.8	16.2
5	209°34.9	263°49.0	08.2	168°10.6	22.4	256°09.4	01.8	261°27.0	16.2
6	224°37.4	278°48.2	S20°07.6	183°11.7	N17°22.8	271°11.2	S18°01.7	276°29.2	S19°16.1
7	239°39.9	293°47.4	06.9	198°12.8	23.2	286°13.1	01.5	291°31.3	16.0
8	254°42.3	308°46.6	06.3	213°13.9	23.6	301°15.0	01.3	306°33.5	15.9
9	269°44.8	323°45.8	·· 05.6	228°15.0	·· 24.1	316°16.8	·· 01.2	321°35.6	·· 15.9
10	284°47.2	338°45.0	05.0	243°16.2	24.5	331°18.7	01.0	336°37.8	15.8
11	299°49.7	353°44.2	04.3	258°17.3	24.9	346°20.5	00.9	351°40.0	15.7
12	314°52.2	8°43.4	S20°03.7	273°18.4	N17°25.3	1°22.4	S18°00.7	6°42.1	S19°15.7
13	329°54.6	23°42.6	03.0	288°19.5	25.7	16°24.3	00.5	21°44.3	15.6
14	344°57.1	38°41.8	02.4	303°20.6	26.2	31°26.1	00.4	36°46.4	15.5
15	359°59.6	53°41.0	·· 01.7	318°21.7	·· 26.6	46°28.0	·· 00.2	51°48.6	·· 15.5
16	15°02.0	68°40.2	01.1	333°22.9	27.0	61°29.9	18°00.1	66°50.8	15.4
17	30°04.5	83°39.4	20°00.4	348°24.0	27.4	76°31.7	17°59.9	81°52.9	15.3
18	45°07.0	98°38.6	S19°59.8	3°25.1	N17°27.8	91°33.6	S17°59.8	96°55.1	S19°15.3
19	60°09.4	113°37.8	59.1	18°26.2	28.3	106°35.5	59.6	111°57.2	15.2
20	75°11.9	128°37.0	58.4	33°27.3	28.7	121°37.3	59.4	126°59.4	15.1
21	90°14.4	143°36.2	·· 57.8	48°28.4	·· 29.1	136°39.2	·· 59.3	142°01.6	·· 15.0
22	105°16.8	158°35.4	57.1	63°29.5	29.5	151°41.0	59.1	157°03.7	15.0
23	120°19.3	173°34.6	56.5	78°30.7	29.9	166°42.9	59.0	172°05.9	14.9
Mer.pass.	15:00	ν -0.8′	d -0.6′	m -3.92	ν 1.1′	d 0.4′	m 0.49	ν 1.9′	d -0.2′	m -1.95	ν 2.2′	d -0.1′	m 0.67
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	135°21.7	188°33.8	S19°55.8	93°31.8	N17°30.4	181°44.8	S17°58.8	187°08.0	S19°14.8
1	150°24.2	203°33.0	55.1	108°32.9	30.8	196°46.6	58.6	202°10.2	14.8
2	165°26.7	218°32.2	54.5	123°34.0	31.2	211°48.5	58.5	217°12.4	14.7
3	180°29.1	233°31.4	·· 53.8	138°35.1	·· 31.6	226°50.4	·· 58.3	232°14.5	·· 14.6
4	195°31.6	248°30.6	53.1	153°36.2	32.0	241°52.2	58.2	247°16.7	14.6
5	210°34.1	263°29.8	52.5	168°37.3	32.5	256°54.1	58.0	262°18.9	14.5
6	225°36.5	278°29.1	S19°51.8	183°38.4	N17°32.9	271°56.0	S17°57.8	277°21.0	S19°14.4
7	240°39.0	293°28.3	51.1	198°39.5	33.3	286°57.8	57.7	292°23.2	14.4
8	255°41.5	308°27.5	50.5	213°40.7	33.7	301°59.7	57.5	307°25.3	14.3
9	270°43.9	323°26.7	·· 49.8	228°41.8	·· 34.1	317°01.5	·· 57.4	322°27.5	·· 14.2
10	285°46.4	338°25.9	49.1	243°42.9	34.6	332°03.4	57.2	337°29.7	14.1
11	300°48.9	353°25.1	48.4	258°44.0	35.0	347°05.3	57.0	352°31.8	14.1
12	315°51.3	8°24.3	S19°47.8	273°45.1	N17°35.4	2°07.1	S17°56.9	7°34.0	S19°14.0
13	330°53.8	23°23.5	47.1	288°46.2	35.8	17°09.0	56.7	22°36.1	13.9
14	345°56.2	38°22.7	46.4	303°47.3	36.2	32°10.9	56.6	37°38.3	13.9
15	0°58.7	53°22.0	·· 45.7	318°48.4	·· 36.6	47°12.7	·· 56.4	52°40.5	·· 13.8
16	16°01.2	68°21.2	45.0	333°49.5	37.1	62°14.6	56.3	67°42.6	13.7
17	31°03.6	83°20.4	44.4	348°50.6	37.5	77°16.5	56.1	82°44.8	13.7
18	46°06.1	98°19.6	S19°43.7	3°51.7	N17°37.9	92°18.3	S17°55.9	97°46.9	S19°13.6
19	61°08.6	113°18.8	43.0	18°52.8	38.3	107°20.2	55.8	112°49.1	13.5
20	76°11.0	128°18.0	42.3	33°54.0	38.7	122°22.0	55.6	127°51.3	13.4
21	91°13.5	143°17.2	·· 41.6	48°55.1	·· 39.2	137°23.9	·· 55.5	142°53.4	·· 13.4
22	106°16.0	158°16.5	41.0	63°56.2	39.6	152°25.8	55.3	157°55.6	13.3
23	121°18.4	173°15.7	40.3	78°57.3	40.0	167°27.6	55.1	172°57.8	13.2
Mer.pass.	14:56	ν -0.8′	d -0.7′	m -3.92	ν 1.1′	d 0.4′	m 0.51	ν 1.9′	d -0.2′	m -1.95	ν 2.2′	d -0.1′	m 0.68

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.6	-42°11.8
Schedar	349°34.9	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°22.9	-57°08.2
Hamal	327°54.8	23°33.6
Polaris	315°27.7	89°21.4
Acamar	315°14.2	-40°13.6
Menkar	314°09.5	4°10.2
Mirfak	308°32.7	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.5
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.4	-52°42.6
Sirius	258°28.7	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.9	5°10.2
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.7
Suhail	222°48.1	-43°31.1
Miaplacidus	221°37.8	-69°48.2
Alphard	217°50.5	-8°45.0
Regulus	207°37.5	11°51.8
Dubhe	193°44.5	61°38.1
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.4
Acrux	173°03.1	-63°12.7
Gacrux	171°54.7	-57°13.6
Alioth	166°15.6	55°50.5
Spica	158°25.5	-11°16.2
Alkaid	152°54.5	49°12.3
Hadar	148°40.3	-60°28.1
Menkent	148°01.3	-36°28.2
Arcturus	145°50.8	19°04.3
Rigil Kent.	139°44.5	-60°55.0
Kochab	137°19.9	74°03.9
Zuben'ubi	136°59.5	-16°07.6
Alphecca	126°06.5	26°38.5
Antares	112°19.9	-26°28.6
Atria	107°17.2	-69°03.6
Sabik	102°06.6	-15°45.0
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.6
Eltanin	90°44.0	51°29.0
Kaus Aust.	83°37.1	-34°22.4
Vega	80°35.7	38°48.0
Nunki	75°52.0	-26°16.2
Altair	62°03.4	8°55.3
Peacock	53°11.4	-56°40.1
Deneb	49°28.4	45°21.2
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 03 Wed	SHA	Mer.pass
Venus	55°48.9	11:24
Mars	319°14.5	17:48
Jupiter	46°51.9	11:57
Saturn	52°00.9	11:37

Feb 04 Thu	SHA	Mer.pass
Venus	54°30.4	11:25
Mars	318°42.4	17:46
Jupiter	46°37.4	11:55
Saturn	51°53.6	11:33

Feb 05 Fri	SHA	Mer.pass
Venus	53°12.1	11:26
Mars	318°10.0	17:45
Jupiter	46°23.0	11:52
Saturn	51°46.3	11:30

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.5	S16°31.1	291°50.2	11.2′	S04°27.5	14.7′	59.1′
1	191°33.5	30.4	306°20.4	11.2′	04°42.2	14.7′	59.2′
2	206°33.4	29.7	320°50.5	11.1′	04°56.9	14.7′	59.2′
3	221°33.3	·· 28.9	335°20.7	11.1′	05°11.6	14.6′	59.2′
4	236°33.3	28.2	349°50.8	11.1′	05°26.2	14.6′	59.2′
5	251°33.2	27.5	4°20.9	11.0′	05°40.8	14.6′	59.2′
6	266°33.1	S16°26.7	18°50.9	11.0′	S05°55.4	14.5′	59.2′
7	281°33.1	26.0	33°20.9	11.0′	06°09.9	14.5′	59.2′
8	296°33.0	25.2	47°50.9	11.0′	06°24.4	14.5′	59.2′
9	311°32.9	·· 24.5	62°20.9	10.9′	06°38.9	14.4′	59.2′
10	326°32.9	23.8	76°50.8	10.9′	06°53.3	14.4′	59.2′
11	341°32.8	23.0	91°20.7	10.9′	07°07.7	14.4′	59.2′
12	356°32.7	S16°22.3	105°50.6	10.8′	S07°22.1	14.3′	59.2′
13	11°32.7	21.5	120°20.4	10.8′	07°36.4	14.3′	59.2′
14	26°32.6	20.8	134°50.2	10.8′	07°50.7	14.2′	59.2′
15	41°32.6	·· 20.1	149°19.9	10.7′	08°04.9	14.2′	59.2′
16	56°32.5	19.3	163°49.6	10.7′	08°19.1	14.2′	59.2′
17	71°32.4	18.6	178°19.3	10.6′	08°33.3	14.1′	59.2′
18	86°32.4	S16°17.8	192°49.0	10.6′	S08°47.4	14.1′	59.2′
19	101°32.3	17.1	207°18.6	10.6′	09°01.4	14.0′	59.2′
20	116°32.3	16.3	221°48.1	10.5′	09°15.4	14.0′	59.2′
21	131°32.2	·· 15.6	236°17.6	10.5′	09°29.4	13.9′	59.2′
22	146°32.1	14.8	250°47.1	10.4′	09°43.3	13.9′	59.2′
23	161°32.1	14.1	265°16.5	10.4′	09°57.2	13.8′	59.2′
	SD = 16.2′	d = -0.7′	SD = 16.1′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°32.0	S16°13.3	279°45.9	10.3′	S10°11.0	13.7′	59.2′
1	191°32.0	12.6	294°15.2	10.3′	10°24.7	13.7′	59.2′
2	206°31.9	11.9	308°44.5	10.2′	10°38.4	13.6′	59.2′
3	221°31.8	·· 11.1	323°13.8	10.2′	10°52.0	13.6′	59.2′
4	236°31.8	10.4	337°42.9	10.1′	11°05.6	13.5′	59.2′
5	251°31.7	09.6	352°12.1	10.1′	11°19.1	13.4′	59.2′
6	266°31.7	S16°08.9	6°41.2	10.0′	S11°32.5	13.4′	59.2′
7	281°31.6	08.1	21°10.2	10.0′	11°45.9	13.3′	59.2′
8	296°31.6	07.4	35°39.2	9.9′	11°59.2	13.2′	59.2′
9	311°31.5	·· 06.6	50°08.1	9.9′	12°12.5	13.2′	59.2′
10	326°31.4	05.8	64°37.0	9.8′	12°25.6	13.1′	59.2′
11	341°31.4	05.1	79°05.9	9.8′	12°38.7	13.0′	59.2′
12	356°31.3	S16°04.3	93°34.6	9.7′	S12°51.8	13.0′	59.2′
13	11°31.3	03.6	108°03.4	9.7′	13°04.7	12.9′	59.2′
14	26°31.2	02.8	122°32.0	9.6′	13°17.6	12.8′	59.2′
15	41°31.2	·· 02.1	137°00.6	9.5′	13°30.4	12.7′	59.1′
16	56°31.1	01.3	151°29.2	9.5′	13°43.2	12.7′	59.1′
17	71°31.1	16°00.6	165°57.7	9.4′	13°55.8	12.6′	59.1′
18	86°31.0	S15°59.8	180°26.1	9.4′	S14°08.4	12.5′	59.1′
19	101°31.0	59.1	194°54.5	9.3′	14°20.9	12.4′	59.1′
20	116°30.9	58.3	209°22.8	9.3′	14°33.3	12.3′	59.1′
21	131°30.9	·· 57.5	223°51.0	9.2′	14°45.6	12.2′	59.1′
22	146°30.8	56.8	238°19.2	9.1′	14°57.9	12.2′	59.1′
23	161°30.8	56.0	252°47.4	9.1′	15°10.0	12.1′	59.1′
	SD = 16.2′	d = -0.7′	SD = 16.1′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°30.7	S15°55.3	267°15.4	9.0′	S15°22.1	12.0′	59.1′
1	191°30.6	54.5	281°43.4	8.9′	15°34.1	11.9′	59.1′
2	206°30.6	53.7	296°11.4	8.9′	15°46.0	11.8′	59.1′
3	221°30.5	·· 53.0	310°39.3	8.8′	15°57.8	11.7′	59.1′
4	236°30.5	52.2	325°07.1	8.8′	16°09.5	11.6′	59.1′
5	251°30.4	51.5	339°34.8	8.7′	16°21.1	11.5′	59.1′
6	266°30.4	S15°50.7	354°02.5	8.6′	S16°32.6	11.4′	59.1′
7	281°30.4	49.9	8°30.1	8.6′	16°44.0	11.3′	59.1′
8	296°30.3	49.2	22°57.7	8.5′	16°55.3	11.2′	59.1′
9	311°30.3	·· 48.4	37°25.2	8.4′	17°06.5	11.1′	59.1′
10	326°30.2	47.7	51°52.6	8.4′	17°17.6	11.0′	59.1′
11	341°30.2	46.9	66°20.0	8.3′	17°28.6	10.9′	59.1′
12	356°30.1	S15°46.1	80°47.3	8.2′	S17°39.5	10.8′	59.1′
13	11°30.1	45.4	95°14.5	8.2′	17°50.3	10.7′	59.1′
14	26°30.0	44.6	109°41.7	8.1′	18°01.0	10.6′	59.1′
15	41°30.0	·· 43.8	124°08.8	8.0′	18°11.6	10.5′	59.1′
16	56°29.9	43.1	138°35.9	8.0′	18°22.1	10.4′	59.0′
17	71°29.9	42.3	153°02.8	7.9′	18°32.4	10.2′	59.0′
18	86°29.8	S15°41.5	167°29.7	7.8′	S18°42.7	10.1′	59.0′
19	101°29.8	40.8	181°56.6	7.8′	18°52.8	10.0′	59.0′
20	116°29.8	40.0	196°23.4	7.7′	19°02.8	9.9′	59.0′
21	131°29.7	·· 39.2	210°50.1	7.6′	19°12.7	9.8′	59.0′
22	146°29.7	38.5	225°16.7	7.6′	19°22.5	9.7′	59.0′
23	161°29.6	37.7	239°43.3	7.5′	19°32.2	9.5′	59.0′
	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	16:05	17:32
N 70°	06:51	08:08	09:28	15:01	16:22	17:38
68°	06:46	07:55	09:04	15:25	16:35	17:43
66°	06:41	07:44	08:45	15:44	16:45	17:48
64°	06:37	07:35	08:30	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°	06:24	07:08	07:49	16:40	17:21	18:05
54°	06:21	07:03	07:41	16:47	17:25	18:08
52°	06:18	06:59	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	06:12	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	19:05	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	22:14
S 60°	01:36	03:10	04:05	20:21	21:16	22:46

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

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 21-23 69-47%
03	13:46	13:49	12:14	04:42	17:07	
04	13:52	13:55	12:14	05:32	17:58	
05	13:57	14:00	12:14	06:25	18:52	

DUT1 = UT1-UTC = -0.1695 sec ΔT = TT-UT1 = +69.3535 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	136°20.9	188°14.9	S19°39.6	93°58.4	N17°40.4	182°29.5	S17°55.0	187°59.9	S19°13.2
1	151°23.4	203°14.1	38.9	108°59.5	40.8	197°31.4	54.8	203°02.1	13.1
2	166°25.8	218°13.3	38.2	124°00.6	41.2	212°33.2	54.7	218°04.2	13.0
3	181°28.3	233°12.6	·· 37.5	139°01.7	·· 41.7	227°35.1	·· 54.5	233°06.4	·· 13.0
4	196°30.7	248°11.8	36.8	154°02.8	42.1	242°37.0	54.3	248°08.6	12.9
5	211°33.2	263°11.0	36.1	169°03.9	42.5	257°38.8	54.2	263°10.7	12.8
6	226°35.7	278°10.2	S19°35.4	184°05.0	N17°42.9	272°40.7	S17°54.0	278°12.9	S19°12.8
7	241°38.1	293°09.4	34.7	199°06.1	43.3	287°42.6	53.9	293°15.0	12.7
8	256°40.6	308°08.7	34.1	214°07.2	43.7	302°44.4	53.7	308°17.2	12.6
9	271°43.1	323°07.9	·· 33.4	229°08.3	·· 44.2	317°46.3	·· 53.5	323°19.4	·· 12.5
10	286°45.5	338°07.1	32.7	244°09.4	44.6	332°48.1	53.4	338°21.5	12.5
11	301°48.0	353°06.3	32.0	259°10.5	45.0	347°50.0	53.2	353°23.7	12.4
12	316°50.5	8°05.6	S19°31.3	274°11.6	N17°45.4	2°51.9	S17°53.1	8°25.9	S19°12.3
13	331°52.9	23°04.8	30.6	289°12.7	45.8	17°53.7	52.9	23°28.0	12.3
14	346°55.4	38°04.0	29.9	304°13.8	46.2	32°55.6	52.7	38°30.2	12.2
15	1°57.8	53°03.2	·· 29.2	319°14.9	·· 46.6	47°57.5	·· 52.6	53°32.3	·· 12.1
16	17°00.3	68°02.5	28.5	334°16.0	47.1	62°59.3	52.4	68°34.5	12.1
17	32°02.8	83°01.7	27.8	349°17.1	47.5	78°01.2	52.3	83°36.7	12.0
18	47°05.2	98°00.9	S19°27.0	4°18.2	N17°47.9	93°03.1	S17°52.1	98°38.8	S19°11.9
19	62°07.7	113°00.1	26.3	19°19.3	48.3	108°04.9	51.9	113°41.0	11.9
20	77°10.2	127°59.4	25.6	34°20.4	48.7	123°06.8	51.8	128°43.2	11.8
21	92°12.6	142°58.6	·· 24.9	49°21.5	·· 49.1	138°08.7	·· 51.6	143°45.3	·· 11.7
22	107°15.1	157°57.8	24.2	64°22.6	49.6	153°10.5	51.5	158°47.5	11.6
23	122°17.6	172°57.0	23.5	79°23.7	50.0	168°12.4	51.3	173°49.6	11.6
Mer.pass.	14:52	ν -0.8′	d -0.7′	m -3.92	ν 1.1′	d 0.4′	m 0.53	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.68

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	137°20.0	187°56.3	S19°22.8	94°24.8	N17°50.4	183°14.3	S17°51.1	188°51.8	S19°11.5
1	152°22.5	202°55.5	22.1	109°25.9	50.8	198°16.1	51.0	203°54.0	11.4
2	167°25.0	217°54.7	21.4	124°27.0	51.2	213°18.0	50.8	218°56.1	11.4
3	182°27.4	232°54.0	·· 20.7	139°28.1	·· 51.6	228°19.9	·· 50.7	233°58.3	·· 11.3
4	197°29.9	247°53.2	19.9	154°29.2	52.0	243°21.7	50.5	249°00.5	11.2
5	212°32.3	262°52.4	19.2	169°30.3	52.5	258°23.6	50.3	264°02.6	11.2
6	227°34.8	277°51.7	S19°18.5	184°31.4	N17°52.9	273°25.4	S17°50.2	279°04.8	S19°11.1
7	242°37.3	292°50.9	17.8	199°32.5	53.3	288°27.3	50.0	294°06.9	11.0
8	257°39.7	307°50.1	17.1	214°33.6	53.7	303°29.2	49.9	309°09.1	11.0
9	272°42.2	322°49.4	·· 16.4	229°34.7	·· 54.1	318°31.0	·· 49.7	324°11.3	·· 10.9
10	287°44.7	337°48.6	15.6	244°35.8	54.5	333°32.9	49.5	339°13.4	10.8
11	302°47.1	352°47.8	14.9	259°36.9	54.9	348°34.8	49.4	354°15.6	10.7
12	317°49.6	7°47.1	S19°14.2	274°38.0	N17°55.3	3°36.6	S17°49.2	9°17.8	S19°10.7
13	332°52.1	22°46.3	13.5	289°39.1	55.8	18°38.5	49.1	24°19.9	10.6
14	347°54.5	37°45.5	12.7	304°40.2	56.2	33°40.4	48.9	39°22.1	10.5
15	2°57.0	52°44.8	·· 12.0	319°41.2	·· 56.6	48°42.2	·· 48.7	54°24.2	·· 10.5
16	17°59.5	67°44.0	11.3	334°42.3	57.0	63°44.1	48.6	69°26.4	10.4
17	33°01.9	82°43.2	10.6	349°43.4	57.4	78°46.0	48.4	84°28.6	10.3
18	48°04.4	97°42.5	S19°09.8	4°44.5	N17°57.8	93°47.8	S17°48.3	99°30.7	S19°10.3
19	63°06.8	112°41.7	09.1	19°45.6	58.2	108°49.7	48.1	114°32.9	10.2
20	78°09.3	127°41.0	08.4	34°46.7	58.6	123°51.6	47.9	129°35.1	10.1
21	93°11.8	142°40.2	·· 07.7	49°47.8	·· 59.1	138°53.4	·· 47.8	144°37.2	·· 10.0
22	108°14.2	157°39.4	06.9	64°48.9	59.5	153°55.3	47.6	159°39.4	10.0
23	123°16.7	172°38.7	06.2	79°50.0	59.9	168°57.2	47.5	174°41.5	09.9
Mer.pass.	14:48	ν -0.8′	d -0.7′	m -3.92	ν 1.1′	d 0.4′	m 0.55	ν 1.9′	d -0.2′ m -1.95	ν 2.2′	d -0.1′ m 0.69

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	138°19.2	187°37.9	S19°05.5	94°51.1	N18°00.3	183°59.0	S17°47.3	189°43.7	S19°09.8
1	153°21.6	202°37.2	04.7	109°52.2	00.7	199°00.9	47.1	204°45.9	09.8
2	168°24.1	217°36.4	04.0	124°53.3	01.1	214°02.8	47.0	219°48.0	09.7
3	183°26.6	232°35.7	·· 03.2	139°54.3	·· 01.5	229°04.6	·· 46.8	234°50.2	·· 09.6
4	198°29.0	247°34.9	02.5	154°55.4	01.9	244°06.5	46.6	249°52.4	09.6
5	213°31.5	262°34.1	01.8	169°56.5	02.4	259°08.4	46.5	264°54.5	09.5
6	228°34.0	277°33.4	S19°01.0	184°57.6	N18°02.8	274°10.2	S17°46.3	279°56.7	S19°09.4
7	243°36.4	292°32.6	19°00.3	199°58.7	03.2	289°12.1	46.2	294°58.8	09.4
8	258°38.9	307°31.9	18°59.5	214°59.8	03.6	304°14.0	46.0	310°01.0	09.3
9	273°41.3	322°31.1	·· 58.8	230°00.9	·· 04.0	319°15.8	·· 45.8	325°03.2	·· 09.2
10	288°43.8	337°30.4	58.1	245°02.0	04.4	334°17.7	45.7	340°05.3	09.1
11	303°46.3	352°29.6	57.3	260°03.0	04.8	349°19.6	45.5	355°07.5	09.1
12	318°48.7	7°28.9	S18°56.6	275°04.1	N18°05.2	4°21.4	S17°45.4	10°09.7	S19°09.0
13	333°51.2	22°28.1	55.8	290°05.2	05.6	19°23.3	45.2	25°11.8	08.9
14	348°53.7	37°27.4	55.1	305°06.3	06.0	34°25.2	45.0	40°14.0	08.9
15	3°56.1	52°26.6	·· 54.3	320°07.4	·· 06.5	49°27.0	·· 44.9	55°16.2	·· 08.8
16	18°58.6	67°25.9	53.6	335°08.5	06.9	64°28.9	44.7	70°18.3	08.7
17	34°01.1	82°25.1	52.8	350°09.6	07.3	79°30.8	44.6	85°20.5	08.7
18	49°03.5	97°24.4	S18°52.1	5°10.7	N18°07.7	94°32.6	S17°44.4	100°22.6	S19°08.6
19	64°06.0	112°23.6	51.3	20°11.7	08.1	109°34.5	44.2	115°24.8	08.5
20	79°08.5	127°22.9	50.6	35°12.8	08.5	124°36.4	44.1	130°27.0	08.5
21	94°10.9	142°22.1	·· 49.8	50°13.9	·· 08.9	139°38.2	·· 43.9	145°29.1	·· 08.4
22	109°13.4	157°21.4	49.1	65°15.0	09.3	154°40.1	43.8	160°31.3	08.3
23	124°15.8	172°20.6	48.3	80°16.1	09.7	169°42.0	43.6	175°33.5	08.2
Mer.pass.	14:44	ν -0.8′	d -0.7′	m -3.92	ν 1.1′	d 0.4′	m 0.56	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.69

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.6	-42°11.8
Schedar	349°34.9	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°22.9	-57°08.2
Hamal	327°54.8	23°33.6
Polaris	315°28.9	89°21.4
Acamar	315°14.2	-40°13.6
Menkar	314°09.5	4°10.2
Mirfak	308°32.7	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.4	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.4
Avior	234°15.3	-59°34.7
Suhail	222°48.1	-43°31.1
Miaplacidus	221°37.8	-69°48.2
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.1
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.1	-63°12.7
Gacrux	171°54.7	-57°13.6
Alioth	166°15.6	55°50.5
Spica	158°25.5	-11°16.2
Alkaid	152°54.4	49°12.3
Hadar	148°40.2	-60°28.1
Menkent	148°01.2	-36°28.2
Arcturus	145°50.8	19°04.3
Rigil Kent.	139°44.5	-60°55.0
Kochab	137°19.9	74°03.9
Zuben'ubi	136°59.5	-16°07.7
Alphecca	126°06.5	26°38.5
Antares	112°19.9	-26°28.6
Atria	107°17.2	-69°03.6
Sabik	102°06.6	-15°45.0
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.7	12°32.6
Eltanin	90°44.0	51°28.9
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.7	38°48.0
Nunki	75°52.0	-26°16.2
Altair	62°03.4	8°55.3
Peacock	53°11.4	-56°40.0
Deneb	49°28.4	45°21.2
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 06 Sat	SHA	Mer.pass
Venus	51°54.0	11:28
Mars	317°37.5	17:43
Jupiter	46°08.6	11:49
Saturn	51°39.0	11:26

Feb 07 Sun	SHA	Mer.pass
Venus	50°36.2	11:29
Mars	317°04.8	17:41
Jupiter	45°54.2	11:46
Saturn	51°31.8	11:23

Feb 08 Mon	SHA	Mer.pass
Venus	49°18.8	11:30
Mars	316°31.9	17:39
Jupiter	45°39.9	11:43
Saturn	51°24.5	11:19

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		176°29.6	S15°36.9	254°09.8	7.5′	S19°41.7	9.4′	59.0′
1		191°29.5	36.1	268°36.3	7.4′	19°51.2	9.3′	59.0′
2		206°29.5	35.4	283°02.6	7.3′	20°00.5	9.2′	59.0′
3		221°29.5	·· 34.6	297°29.0	7.3′	20°09.6	9.1′	59.0′
4		236°29.4	33.8	311°55.2	7.2′	20°18.7	8.9′	59.0′
5		251°29.4	33.1	326°21.4	7.1′	20°27.6	8.8′	59.0′
6		266°29.3	S15°32.3	340°47.6	7.1′	S20°36.4	8.7′	59.0′
7		281°29.3	31.5	355°13.6	7.0′	20°45.1	8.5′	58.9′
8		296°29.2	30.7	9°39.6	6.9′	20°53.6	8.4′	58.9′
9		311°29.2	·· 30.0	24°05.6	6.9′	21°02.1	8.3′	58.9′
10		326°29.2	29.2	38°31.5	6.8′	21°10.3	8.1′	58.9′
11		341°29.1	28.4	52°57.3	6.8′	21°18.5	8.0′	58.9′
12		356°29.1	S15°27.6	67°23.1	6.7′	S21°26.5	7.9′	58.9′
13		11°29.1	26.9	81°48.8	6.7′	21°34.4	7.7′	58.9′
14		26°29.0	26.1	96°14.4	6.6′	21°42.1	7.6′	58.9′
15		41°29.0	·· 25.3	110°40.0	6.5′	21°49.7	7.5′	58.9′
16		56°28.9	24.5	125°05.6	6.5′	21°57.2	7.3′	58.9′
17		71°28.9	23.7	139°31.1	6.4′	22°04.5	7.2′	58.9′
18		86°28.9	S15°23.0	153°56.5	6.4′	S22°11.7	7.0′	58.9′
19		101°28.8	22.2	168°21.9	6.3′	22°18.7	6.9′	58.8′
20		116°28.8	21.4	182°47.2	6.3′	22°25.6	6.8′	58.8′
21		131°28.8	·· 20.6	197°12.5	6.2′	22°32.4	6.6′	58.8′
22		146°28.7	19.9	211°37.7	6.2′	22°39.0	6.5′	58.8′
23		161°28.7	19.1	226°02.9	6.1′	22°45.4	6.3′	58.8′
		SD = 16.2′	d = -0.8′		SD = 16.1′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.7	S15°18.3	240°28.0	6.1′	S22°51.8	6.2′	58.8′
1	191°28.6	17.5	254°53.0	6.0′	22°57.9	6.0′	58.8′
2	206°28.6	16.7	269°18.1	6.0′	23°04.0	5.9′	58.8′
3	221°28.6	·· 15.9	283°43.1	5.9′	23°09.8	5.7′	58.8′
4	236°28.5	15.2	298°08.0	5.9′	23°15.6	5.6′	58.8′
5	251°28.5	14.4	312°32.9	5.9′	23°21.1	5.4′	58.7′
6	266°28.5	S15°13.6	326°57.7	5.8′	S23°26.6	5.3′	58.7′
7	281°28.4	12.8	341°22.6	5.8′	23°31.8	5.1′	58.7′
8	296°28.4	12.0	355°47.3	5.7′	23°36.9	5.0′	58.7′
9	311°28.4	·· 11.2	10°12.1	5.7′	23°41.9	4.8′	58.7′
10	326°28.3	10.5	24°36.8	5.7′	23°46.7	4.7′	58.7′
11	341°28.3	09.7	39°01.4	5.6′	23°51.4	4.5′	58.7′
12	356°28.3	S15°08.9	53°26.1	5.6′	S23°55.9	4.3′	58.7′
13	11°28.2	08.1	67°50.7	5.6′	24°00.2	4.2′	58.7′
14	26°28.2	07.3	82°15.3	5.5′	24°04.4	4.0′	58.7′
15	41°28.2	·· 06.5	96°39.8	5.5′	24°08.4	3.9′	58.6′
16	56°28.1	05.7	111°04.3	5.5′	24°12.3	3.7′	58.6′
17	71°28.1	04.9	125°28.8	5.5′	24°16.0	3.6′	58.6′
18	86°28.1	S15°04.2	139°53.3	5.4′	S24°19.6	3.4′	58.6′
19	101°28.1	03.4	154°17.7	5.4′	24°23.0	3.2′	58.6′
20	116°28.0	02.6	168°42.2	5.4′	24°26.2	3.1′	58.6′
21	131°28.0	·· 01.8	183°06.6	5.4′	24°29.3	2.9′	58.6′
22	146°28.0	01.0	197°31.0	5.4′	24°32.2	2.8′	58.6′
23	161°27.9	00.2	211°55.3	5.4′	24°35.0	2.6′	58.5′
	SD = 16.2′	d = -0.8′		SD = 16.0′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.9	S14°59.4	226°19.7	5.4′	S24°37.6	2.4′	58.5′
1	191°27.9	58.6	240°44.0	5.3′	24°40.0	2.3′	58.5′
2	206°27.9	57.8	255°08.4	5.3′	24°42.3	2.1′	58.5′
3	221°27.8	·· 57.0	269°32.7	5.3′	24°44.4	1.9′	58.5′
4	236°27.8	56.2	283°57.0	5.3′	24°46.3	1.8′	58.5′
5	251°27.8	55.4	298°21.4	5.3′	24°48.1	1.6′	58.5′
6	266°27.8	S14°54.6	312°45.7	5.3′	S24°49.7	1.5′	58.4′
7	281°27.7	53.8	327°10.0	5.3′	24°51.2	1.3′	58.4′
8	296°27.7	53.1	341°34.3	5.3′	24°52.5	1.1′	58.4′
9	311°27.7	·· 52.3	355°58.6	5.3′	24°53.6	1.0′	58.4′
10	326°27.7	51.5	10°23.0	5.3′	24°54.6	0.8′	58.4′
11	341°27.7	50.7	24°47.3	5.3′	24°55.4	0.7′	58.4′
12	356°27.6	S14°49.9	39°11.6	5.4′	S24°56.1	0.5′	58.4′
13	11°27.6	49.1	53°36.0	5.4′	24°56.6	0.3′	58.3′
14	26°27.6	48.3	68°00.4	5.4′	24°56.9	0.2′	58.3′
15	41°27.6	·· 47.5	82°24.7	5.4′	24°57.0	0.0′	58.3′
16	56°27.5	46.7	96°49.1	5.4′	24°57.1	-0.2′	58.3′
17	71°27.5	45.9	111°13.5	5.4′	24°56.9	-0.3′	58.3′
18	86°27.5	S14°45.1	125°38.0	5.5′	S24°56.6	-0.5′	58.3′
19	101°27.5	44.3	140°02.4	5.5′	24°56.1	-0.6′	58.3′
20	116°27.5	43.5	154°26.9	5.5′	24°55.5	-0.8′	58.2′
21	131°27.4	·· 42.7	168°51.4	5.5′	24°54.6	-1.0′	58.2′
22	146°27.4	41.9	183°15.9	5.6′	24°53.7	-1.1′	58.2′
23	161°27.4	41.1	197°40.5	5.6′	24°52.6	-1.3′	58.2′
	SD = 16.2′	d = -0.8′		SD = 16.0′			

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

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 36-16%
06	14:02	14:04	12:14	07:20	19:48	
07	14:05	14:07	12:14	08:18	20:47	
08	14:08	14:09	12:14	09:17	21:46	

DUT1 = UT1-UTC = -0.1693 sec ΔT = TT-UT1 = +69.3533 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	139°18.3	187°19.9	S18°47.6	95°17.2	N18°10.1	184°43.8	S17°43.4	190°35.6	S19°08.2
1	154°20.8	202°19.1	46.8	110°18.2	10.5	199°45.7	43.3	205°37.8	08.1
2	169°23.2	217°18.4	46.0	125°19.3	11.0	214°47.6	43.1	220°40.0	08.0
3	184°25.7	232°17.6	·· 45.3	140°20.4	·· 11.4	229°49.4	·· 42.9	235°42.1	·· 08.0
4	199°28.2	247°16.9	44.5	155°21.5	11.8	244°51.3	42.8	250°44.3	07.9
5	214°30.6	262°16.1	43.8	170°22.6	12.2	259°53.2	42.6	265°46.4	07.8
6	229°33.1	277°15.4	S18°43.0	185°23.7	N18°12.6	274°55.0	S17°42.5	280°48.6	S19°07.8
7	244°35.6	292°14.7	42.2	200°24.7	13.0	289°56.9	42.3	295°50.8	07.7
8	259°38.0	307°13.9	41.5	215°25.8	13.4	304°58.8	42.1	310°52.9	07.6
9	274°40.5	322°13.2	·· 40.7	230°26.9	·· 13.8	320°00.6	·· 42.0	325°55.1	·· 07.6
10	289°43.0	337°12.4	39.9	245°28.0	14.2	335°02.5	41.8	340°57.3	07.5
11	304°45.4	352°11.7	39.2	260°29.1	14.6	350°04.4	41.7	355°59.4	07.4
12	319°47.9	7°10.9	S18°38.4	275°30.1	N18°15.0	5°06.2	S17°41.5	11°01.6	S19°07.3
13	334°50.3	22°10.2	37.6	290°31.2	15.4	20°08.1	41.3	26°03.8	07.3
14	349°52.8	37°09.5	36.9	305°32.3	15.9	35°10.0	41.2	41°05.9	07.2
15	4°55.3	52°08.7	·· 36.1	320°33.4	·· 16.3	50°11.8	·· 41.0	56°08.1	·· 07.1
16	19°57.7	67°08.0	35.3	335°34.5	16.7	65°13.7	40.8	71°10.3	07.1
17	35°00.2	82°07.2	34.5	350°35.5	17.1	80°15.6	40.7	86°12.4	07.0
18	50°02.7	97°06.5	S18°33.8	5°36.6	N18°17.5	95°17.4	S17°40.5	101°14.6	S19°06.9
19	65°05.1	112°05.8	33.0	20°37.7	17.9	110°19.3	40.4	116°16.8	06.9
20	80°07.6	127°05.0	32.2	35°38.8	18.3	125°21.2	40.2	131°18.9	06.8
21	95°10.1	142°04.3	·· 31.4	50°39.8	·· 18.7	140°23.0	·· 40.0	146°21.1	·· 06.7
22	110°12.5	157°03.6	30.7	65°40.9	19.1	155°24.9	39.9	161°23.2	06.7
23	125°15.0	172°02.8	29.9	80°42.0	19.5	170°26.8	39.7	176°25.4	06.6
Mer.pass.	14:40	ν -0.7′	d -0.8′	m -3.92	ν 1.1′	d 0.4′	m 0.58	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.69

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	140°17.4	187°02.1	S18°29.1	95°43.1	N18°19.9	185°28.6	S17°39.6	191°27.6	S19°06.5
1	155°19.9	202°01.4	28.3	110°44.1	20.3	200°30.5	39.4	206°29.7	06.4
2	170°22.4	217°00.6	27.5	125°45.2	20.7	215°32.4	39.2	221°31.9	06.4
3	185°24.8	231°59.9	·· 26.8	140°46.3	·· 21.1	230°34.2	·· 39.1	236°34.1	·· 06.3
4	200°27.3	246°59.2	26.0	155°47.4	21.5	245°36.1	38.9	251°36.2	06.2
5	215°29.8	261°58.4	25.2	170°48.4	21.9	260°38.0	38.7	266°38.4	06.2
6	230°32.2	276°57.7	S18°24.4	185°49.5	N18°22.4	275°39.8	S17°38.6	281°40.6	S19°06.1
7	245°34.7	291°57.0	23.6	200°50.6	22.8	290°41.7	38.4	296°42.7	06.0
8	260°37.2	306°56.2	22.8	215°51.7	23.2	305°43.6	38.3	311°44.9	06.0
9	275°39.6	321°55.5	·· 22.1	230°52.7	·· 23.6	320°45.4	·· 38.1	326°47.1	·· 05.9
10	290°42.1	336°54.8	21.3	245°53.8	24.0	335°47.3	37.9	341°49.2	05.8
11	305°44.6	351°54.0	20.5	260°54.9	24.4	350°49.2	37.8	356°51.4	05.8
12	320°47.0	6°53.3	S18°19.7	275°56.0	N18°24.8	5°51.1	S17°37.6	11°53.6	S19°05.7
13	335°49.5	21°52.6	18.9	290°57.0	25.2	20°52.9	37.5	26°55.7	05.6
14	350°51.9	36°51.9	18.1	305°58.1	25.6	35°54.8	37.3	41°57.9	05.5
15	5°54.4	51°51.1	·· 17.3	320°59.2	·· 26.0	50°56.7	·· 37.1	57°00.0	·· 05.5
16	20°56.9	66°50.4	16.5	336°00.2	26.4	65°58.5	37.0	72°02.2	05.4
17	35°59.3	81°49.7	15.7	351°01.3	26.8	81°00.4	36.8	87°04.4	05.3
18	51°01.8	96°49.0	S18°14.9	6°02.4	N18°27.2	96°02.3	S17°36.6	102°06.5	S19°05.3
19	66°04.3	111°48.2	14.1	21°03.5	27.6	111°04.1	36.5	117°08.7	05.2
20	81°06.7	126°47.5	13.3	36°04.5	28.0	126°06.0	36.3	132°10.9	05.1
21	96°09.2	141°46.8	·· 12.5	51°05.6	·· 28.4	141°07.9	·· 36.2	147°13.0	·· 05.1
22	111°11.7	156°46.1	11.7	66°06.7	28.8	156°09.7	36.0	162°15.2	05.0
23	126°14.1	171°45.3	10.9	81°07.7	29.2	171°11.6	35.8	177°17.4	04.9
Mer.pass.	14:36	ν -0.7′	d -0.8′	m -3.92	ν 1.1′	d 0.4′	m 0.60	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.70

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	141°16.6	186°44.6	S18°10.1	96°08.8	N18°29.6	186°13.5	S17°35.7	192°19.5	S19°04.8
1	156°19.1	201°43.9	09.3	111°09.9	30.0	201°15.3	35.5	207°21.7	04.8
2	171°21.5	216°43.2	08.5	126°10.9	30.4	216°17.2	35.3	222°23.9	04.7
3	186°24.0	231°42.4	·· 07.7	141°12.0	·· 30.8	231°19.1	·· 35.2	237°26.0	·· 04.6
4	201°26.4	246°41.7	06.9	156°13.1	31.2	246°21.0	35.0	252°28.2	04.6
5	216°28.9	261°41.0	06.1	171°14.2	31.6	261°22.8	34.9	267°30.4	04.5
6	231°31.4	276°40.3	S18°05.3	186°15.2	N18°32.0	276°24.7	S17°34.7	282°32.5	S19°04.4
7	246°33.8	291°39.6	04.5	201°16.3	32.4	291°26.6	34.5	297°34.7	04.4
8	261°36.3	306°38.8	03.7	216°17.4	32.8	306°28.4	34.4	312°36.9	04.3
9	276°38.8	321°38.1	·· 02.9	231°18.4	·· 33.2	321°30.3	·· 34.2	327°39.0	·· 04.2
10	291°41.2	336°37.4	02.1	246°19.5	33.6	336°32.2	34.1	342°41.2	04.2
11	306°43.7	351°36.7	01.3	261°20.6	34.0	351°34.0	33.9	357°43.4	04.1
12	321°46.2	6°36.0	S18°00.4	276°21.6	N18°34.4	6°35.9	S17°33.7	12°45.5	S19°04.0
13	336°48.6	21°35.3	17°59.6	291°22.7	34.9	21°37.8	33.6	27°47.7	03.9
14	351°51.1	36°34.6	58.8	306°23.8	35.3	36°39.6	33.4	42°49.9	03.9
15	6°53.6	51°33.8	·· 58.0	321°24.8	·· 35.7	51°41.5	·· 33.2	57°52.0	·· 03.8
16	21°56.0	66°33.1	57.2	336°25.9	36.1	66°43.4	33.1	72°54.2	03.7
17	36°58.5	81°32.4	56.4	351°26.9	36.5	81°45.3	32.9	87°56.4	03.7
18	52°00.9	96°31.7	S17°55.6	6°28.0	N18°36.9	96°47.1	S17°32.8	102°58.5	S19°03.6
19	67°03.4	111°31.0	54.7	21°29.1	37.3	111°49.0	32.6	118°00.7	03.5
20	82°05.9	126°30.3	53.9	36°30.1	37.7	126°50.9	32.4	133°02.9	03.5
21	97°08.3	141°29.6	·· 53.1	51°31.2	·· 38.1	141°52.7	·· 32.3	148°05.0	·· 03.4
22	112°10.8	156°28.8	52.3	66°32.3	38.5	156°54.6	32.1	163°07.2	03.3
23	127°13.3	171°28.1	51.5	81°33.3	38.9	171°56.5	31.9	178°09.4	03.3
Mer.pass.	14:33	ν -0.7′	d -0.8′	m -3.92	ν 1.1′	d 0.4′	m 0.62	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.70

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.6	-42°11.8
Schedar	349°34.9	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°22.9	-57°08.2
Hamal	327°54.8	23°33.6
Polaris	315°30.3	89°21.4
Acamar	315°14.3	-40°13.6
Menkar	314°09.5	4°10.2
Mirfak	308°32.7	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.9
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.7	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.4	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.8	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.3	-59°34.7
Suhail	222°48.1	-43°31.1
Miaplacidus	221°37.8	-69°48.2
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.1
Denebola	182°27.9	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.0	-63°12.7
Gacrux	171°54.7	-57°13.6
Alioth	166°15.5	55°50.5
Spica	158°25.5	-11°16.2
Alkaid	152°54.4	49°12.3
Hadar	148°40.2	-60°28.1
Menkent	148°01.2	-36°28.2
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.4	-60°55.0
Kochab	137°19.8	74°03.9
Zuben'ubi	136°59.5	-16°07.7
Alphecca	126°06.5	26°38.5
Antares	112°19.8	-26°28.6
Atria	107°17.1	-69°03.6
Sabik	102°06.6	-15°45.0
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.7	12°32.6
Eltanin	90°44.0	51°28.9
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.7	38°48.0
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.3	-56°40.0
Deneb	49°28.4	45°21.2
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 09 Tue	SHA	Mer.pass
Venus	48°01.6	11:31
Mars	315°58.8	17:38
Jupiter	45°25.5	11:40
Saturn	51°17.3	11:16

Feb 10 Wed	SHA	Mer.pass
Venus	46°44.6	11:32
Mars	315°25.6	17:36
Jupiter	45°11.2	11:37
Saturn	51°10.1	11:13

Feb 11 Thu	SHA	Mer.pass
Venus	45°28.0	11:34
Mars	314°52.2	17:34
Jupiter	44°56.9	11:34
Saturn	51°03.0	11:09

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°27.4	S14°40.3	212°05.1	5.6′	S24°51.3	-1.4′	58.2′	
1	191°27.4	39.5	226°29.7	5.7′	24°49.8	-1.6′	58.2′	
2	206°27.4	38.7	240°54.3	5.7′	24°48.2	-1.8′	58.1′	
3	221°27.3	·· 37.9	255°19.0	5.7′	24°46.5	-1.9′	58.1′	
4	236°27.3	37.1	269°43.7	5.8′	24°44.6	-2.1′	58.1′	
5	251°27.3	36.2	284°08.5	5.8′	24°42.5	-2.2′	58.1′	
6	266°27.3	S14°35.4	298°33.3	5.8′	S24°40.3	-2.4′	58.1′	
7	281°27.3	34.6	312°58.2	5.9′	24°37.9	-2.5′	58.1′	
8	296°27.3	33.8	327°23.0	5.9′	24°35.4	-2.7′	58.0′	
9	311°27.2	·· 33.0	341°48.0	6.0′	24°32.7	-2.8′	58.0′	
10	326°27.2	32.2	356°13.0	6.0′	24°29.8	-3.0′	58.0′	
11	341°27.2	31.4	10°38.0	6.1′	24°26.8	-3.1′	58.0′	
12	356°27.2	S14°30.6	25°03.1	6.1′	S24°23.7	-3.3′	58.0′	
13	11°27.2	29.8	39°28.2	6.2′	24°20.4	-3.4′	58.0′	
14	26°27.2	29.0	53°53.4	6.2′	24°16.9	-3.6′	57.9′	
15	41°27.1	·· 28.2	68°18.7	6.3′	24°13.3	-3.7′	57.9′	
16	56°27.1	27.4	82°44.0	6.4′	24°09.6	-3.9′	57.9′	
17	71°27.1	26.6	97°09.3	6.4′	24°05.7	-4.0′	57.9′	
18	86°27.1	S14°25.8	111°34.8	6.5′	S24°01.7	-4.2′	57.9′	
19	101°27.1	24.9	126°00.2	6.5′	23°57.5	-4.3′	57.8′	
20	116°27.1	24.1	140°25.8	6.6′	23°53.1	-4.5′	57.8′	
21	131°27.1	·· 23.3	154°51.4	6.7′	23°48.7	-4.6′	57.8′	
22	146°27.1	22.5	169°17.1	6.7′	23°44.0	-4.8′	57.8′	
23	161°27.1	21.7	183°42.8	6.8′	23°39.3	-4.9′	57.8′	
	SD = 16.2′	d = -0.8′	SD = 15.9′					

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.0	S14°20.9	198°08.6	6.9′	S23°34.4	-5.0′	57.7′
1	191°27.0	20.1	212°34.5	6.9′	23°29.3	-5.2′	57.7′
2	206°27.0	19.3	227°00.5	7.0′	23°24.1	-5.3′	57.7′
3	221°27.0	·· 18.4	241°26.5	7.1′	23°18.8	-5.5′	57.7′
4	236°27.0	17.6	255°52.6	7.2′	23°13.3	-5.6′	57.7′
5	251°27.0	16.8	270°18.7	7.2′	23°07.7	-5.7′	57.6′
6	266°27.0	S14°16.0	284°45.0	7.3′	S23°02.0	-5.9′	57.6′
7	281°27.0	15.2	299°11.3	7.4′	22°56.1	-6.0′	57.6′
8	296°27.0	14.4	313°37.7	7.5′	22°50.2	-6.1′	57.6′
9	311°27.0	·· 13.5	328°04.2	7.5′	22°44.0	-6.3′	57.6′
10	326°27.0	12.7	342°30.7	7.6′	22°37.8	-6.4′	57.5′
11	341°26.9	11.9	356°57.3	7.7′	22°31.4	-6.5′	57.5′
12	356°26.9	S14°11.1	11°24.0	7.8′	S22°24.9	-6.6′	57.5′
13	11°26.9	10.3	25°50.8	7.9′	22°18.2	-6.8′	57.5′
14	26°26.9	09.5	40°17.7	8.0′	22°11.4	-6.9′	57.5′
15	41°26.9	·· 08.6	54°44.7	8.0′	22°04.5	-7.0′	57.4′
16	56°26.9	07.8	69°11.7	8.1′	21°57.5	-7.1′	57.4′
17	71°26.9	07.0	83°38.8	8.2′	21°50.4	-7.3′	57.4′
18	86°26.9	S14°06.2	98°06.0	8.3′	S21°43.1	-7.4′	57.4′
19	101°26.9	05.4	112°33.3	8.4′	21°35.8	-7.5′	57.4′
20	116°26.9	04.5	127°00.7	8.5′	21°28.3	-7.6′	57.3′
21	131°26.9	·· 03.7	141°28.1	8.5′	21°20.6	-7.7′	57.3′
22	146°26.9	02.9	155°55.7	8.6′	21°12.9	-7.8′	57.3′
23	161°26.9	02.1	170°23.3	8.7′	21°05.1	-8.0′	57.3′
	SD = 16.2′	d = -0.8′	SD = 15.7′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°26.9	S14°01.3	184°51.0	8.8′	S20°57.1	-8.1′	57.2′
1	191°26.9	14°00.4	199°18.9	8.9′	20°49.1	-8.2′	57.2′
2	206°26.9	13°59.6	213°46.8	9.0′	20°40.9	-8.3′	57.2′
3	221°26.9	·· 58.8	228°14.7	9.1′	20°32.6	-8.4′	57.2′
4	236°26.9	58.0	242°42.8	9.2′	20°24.2	-8.5′	57.2′
5	251°26.9	57.1	257°11.0	9.3′	20°15.7	-8.6′	57.1′
6	266°26.9	S13°56.3	271°39.2	9.3′	S20°07.1	-8.7′	57.1′
7	281°26.9	55.5	286°07.6	9.4′	19°58.4	-8.8′	57.1′
8	296°26.9	54.7	300°36.0	9.5′	19°49.6	-8.9′	57.1′
9	311°26.9	·· 53.8	315°04.5	9.6′	19°40.7	-9.0′	57.0′
10	326°26.9	53.0	329°33.2	9.7′	19°31.7	-9.1′	57.0′
11	341°26.9	52.2	344°01.9	9.8′	19°22.6	-9.2′	57.0′
12	356°26.9	S13°51.4	358°30.7	9.9′	S19°13.4	-9.3′	57.0′
13	11°26.9	50.5	12°59.5	10.0′	19°04.1	-9.4′	56.9′
14	26°26.9	49.7	27°28.5	10.1′	18°54.7	-9.5′	56.9′
15	41°26.9	·· 48.9	41°57.6	10.2′	18°45.2	-9.6′	56.9′
16	56°26.9	48.0	56°26.7	10.2′	18°35.6	-9.7′	56.9′
17	71°26.9	47.2	70°56.0	10.3′	18°25.9	-9.8′	56.9′
18	86°26.9	S13°46.4	85°25.3	10.4′	S18°16.2	-9.8′	56.8′
19	101°26.9	45.6	99°54.7	10.5′	18°06.4	-9.9′	56.8′
20	116°26.9	44.7	114°24.3	10.6′	17°56.4	-10.0′	56.8′
21	131°26.9	·· 43.9	128°53.9	10.7′	17°46.4	-10.1′	56.8′
22	146°26.9	43.1	143°23.5	10.8′	17°36.3	-10.2′	56.7′
23	161°26.9	42.2	157°53.3	10.9′	17°26.1	-10.3′	56.7′
	SD = 16.2′	d = -0.8′	SD = 15.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:34	07:57	09:22	15:08	16:33	17:56
N 70°	06:31	07:44	08:57	15:33	16:46	18:00
68°	06:27	07:34	08:38	15:51	16:56	18:03
66°	06:24	07:25	08:23	16:07	17:04	18:06
64°	06:22	07:18	08:11	16:19	17:12	18:08
62°	06:19	07:12	08:00	16:29	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	06:57	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	06:38	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	18:52	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°	03:58	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°	03:24	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	20:32	21:30
58°	02:37	03:43	04:31	19:56	20:43	21:49
S 60°	02:12	03:30	04:22	20:05	20:56	22:12

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

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 27-0 9-1%
09	14:10	14:11	12:14	10:16	22:45	
10	14:12	14:12	12:14	11:13	23:40	
11	14:12	14:12	12:14	12:06	–:–	

DUT1 = UT1-UTC = -0.1694 sec ΔT = TT-UT1 = +69.3534 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	142°15.7	186°27.4	S17°50.6	96°34.4	N18°39.3	186°58.3	S17°31.8	193°11.5	S19°03.2
1	157°18.2	201°26.7	49.8	111°35.4	39.7	202°00.2	31.6	208°13.7	03.1
2	172°20.7	216°26.0	49.0	126°36.5	40.1	217°02.1	31.5	223°15.9	03.0
3	187°23.1	231°25.3	·· 48.2	141°37.6	·· 40.5	232°04.0	·· 31.3	238°18.0	·· 03.0
4	202°25.6	246°24.6	47.3	156°38.6	40.9	247°05.8	31.1	253°20.2	02.9
5	217°28.0	261°23.9	46.5	171°39.7	41.3	262°07.7	31.0	268°22.4	02.8
6	232°30.5	276°23.2	S17°45.7	186°40.8	N18°41.7	277°09.6	S17°30.8	283°24.5	S19°02.8
7	247°33.0	291°22.5	44.8	201°41.8	42.1	292°11.4	30.6	298°26.7	02.7
8	262°35.4	306°21.8	44.0	216°42.9	42.5	307°13.3	30.5	313°28.9	02.6
9	277°37.9	321°21.1	·· 43.2	231°43.9	·· 42.8	322°15.2	·· 30.3	328°31.0	·· 02.6
10	292°40.4	336°20.4	42.4	246°45.0	43.2	337°17.0	30.2	343°33.2	02.5
11	307°42.8	351°19.6	41.5	261°46.1	43.6	352°18.9	30.0	358°35.4	02.4
12	322°45.3	6°18.9	S17°40.7	276°47.1	N18°44.0	7°20.8	S17°29.8	13°37.5	S19°02.4
13	337°47.8	21°18.2	39.9	291°48.2	44.4	22°22.7	29.7	28°39.7	02.3
14	352°50.2	36°17.5	39.0	306°49.2	44.8	37°24.5	29.5	43°41.9	02.2
15	7°52.7	51°16.8	·· 38.2	321°50.3	·· 45.2	52°26.4	·· 29.3	58°44.0	·· 02.2
16	22°55.2	66°16.1	37.3	336°51.3	45.6	67°28.3	29.2	73°46.2	02.1
17	37°57.6	81°15.4	36.5	351°52.4	46.0	82°30.1	29.0	88°48.4	02.0
18	53°00.1	96°14.7	S17°35.7	6°53.5	N18°46.4	97°32.0	S17°28.9	103°50.5	S19°01.9
19	68°02.5	111°14.0	34.8	21°54.5	46.8	112°33.9	28.7	118°52.7	01.9
20	83°05.0	126°13.3	34.0	36°55.6	47.2	127°35.8	28.5	133°54.9	01.8
21	98°07.5	141°12.6	·· 33.2	51°56.6	·· 47.6	142°37.6	·· 28.4	148°57.0	·· 01.7
22	113°09.9	156°11.9	32.3	66°57.7	48.0	157°39.5	28.2	163°59.2	01.7
23	128°12.4	171°11.2	31.5	81°58.7	48.4	172°41.4	28.0	179°01.4	01.6
Mer.pass.	14:29	ν -0.7′	d -0.8′	m -3.92	ν 1.1′	d 0.4′	m 0.64	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.70

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	143°14.9	186°10.5	S17°30.6	96°59.8	N18°48.8	187°43.2	S17°27.9	194°03.5	S19°01.5
1	158°17.3	201°09.8	29.8	112°00.9	49.2	202°45.1	27.7	209°05.7	01.5
2	173°19.8	216°09.1	28.9	127°01.9	49.6	217°47.0	27.5	224°07.9	01.4
3	188°22.3	231°08.4	·· 28.1	142°03.0	·· 50.0	232°48.8	·· 27.4	239°10.0	·· 01.3
4	203°24.7	246°07.8	27.2	157°04.0	50.4	247°50.7	27.2	254°12.2	01.3
5	218°27.2	261°07.1	26.4	172°05.1	50.8	262°52.6	27.1	269°14.4	01.2
6	233°29.6	276°06.4	S17°25.5	187°06.1	N18°51.2	277°54.5	S17°26.9	284°16.5	S19°01.1
7	248°32.1	291°05.7	24.7	202°07.2	51.6	292°56.3	26.7	299°18.7	01.0
8	263°34.6	306°05.0	23.8	217°08.2	52.0	307°58.2	26.6	314°20.9	01.0
9	278°37.0	321°04.3	·· 23.0	232°09.3	·· 52.4	323°00.1	·· 26.4	329°23.1	·· 00.9
10	293°39.5	336°03.6	22.1	247°10.3	52.8	338°02.0	26.2	344°25.2	00.8
11	308°42.0	351°02.9	21.3	262°11.4	53.2	353°03.8	26.1	359°27.4	00.8
12	323°44.4	6°02.2	S17°20.4	277°12.4	N18°53.6	8°05.7	S17°25.9	14°29.6	S19°00.7
13	338°46.9	21°01.5	19.6	292°13.5	54.0	23°07.6	25.8	29°31.7	00.6
14	353°49.4	36°00.8	18.7	307°14.5	54.4	38°09.4	25.6	44°33.9	00.6
15	8°51.8	51°00.1	·· 17.9	322°15.6	·· 54.7	53°11.3	·· 25.4	59°36.1	·· 00.5
16	23°54.3	65°59.4	17.0	337°16.6	55.1	68°13.2	25.3	74°38.2	00.4
17	38°56.8	80°58.8	16.2	352°17.7	55.5	83°15.1	25.1	89°40.4	00.4
18	53°59.2	95°58.1	S17°15.3	7°18.7	N18°55.9	98°16.9	S17°24.9	104°42.6	S19°00.3
19	69°01.7	110°57.4	14.4	22°19.8	56.3	113°18.8	24.8	119°44.7	00.2
20	84°04.1	125°56.7	13.6	37°20.8	56.7	128°20.7	24.6	134°46.9	00.1
21	99°06.6	140°56.0	·· 12.7	52°21.9	·· 57.1	143°22.5	·· 24.4	149°49.1	·· 00.1
22	114°09.1	155°55.3	11.8	67°22.9	57.5	158°24.4	24.3	164°51.2	19°00.0
23	129°11.5	170°54.6	11.0	82°24.0	57.9	173°26.3	24.1	179°53.4	18°59.9
Mer.pass.	14:25	ν -0.7′	d -0.8′	m -3.92	ν 1.1′	d 0.4′	m 0.65	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.70

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	144°14.0	185°53.9	S17°10.1	97°25.0	N18°58.3	188°28.2	S17°24.0	194°55.6	S18°59.9
1	159°16.5	200°53.3	09.3	112°26.1	58.7	203°30.0	23.8	209°57.8	59.8
2	174°18.9	215°52.6	08.4	127°27.1	59.1	218°31.9	23.6	224°59.9	59.7
3	189°21.4	230°51.9	·· 07.5	142°28.2	·· 59.5	233°33.8	·· 23.5	240°02.1	·· 59.7
4	204°23.9	245°51.2	06.7	157°29.2	18°59.9	248°35.6	23.3	255°04.3	59.6
5	219°26.3	260°50.5	05.8	172°30.3	19°00.3	263°37.5	23.1	270°06.4	59.5
6	234°28.8	275°49.8	S17°04.9	187°31.3	N19°00.6	278°39.4	S17°23.0	285°08.6	S18°59.5
7	249°31.3	290°49.2	04.0	202°32.4	01.0	293°41.3	22.8	300°10.8	59.4
8	264°33.7	305°48.5	03.2	217°33.4	01.4	308°43.1	22.7	315°12.9	59.3
9	279°36.2	320°47.8	·· 02.3	232°34.5	·· 01.8	323°45.0	·· 22.5	330°15.1	·· 59.2
10	294°38.6	335°47.1	01.4	247°35.5	02.2	338°46.9	22.3	345°17.3	59.2
11	309°41.1	350°46.4	17°00.6	262°36.6	02.6	353°48.8	22.2	0°19.4	59.1
12	324°43.6	5°45.8	S16°59.7	277°37.6	N19°03.0	8°50.6	S17°22.0	15°21.6	S18°59.0
13	339°46.0	20°45.1	58.8	292°38.6	03.4	23°52.5	21.8	30°23.8	59.0
14	354°48.5	35°44.4	57.9	307°39.7	03.8	38°54.4	21.7	45°26.0	58.9
15	9°51.0	50°43.7	·· 57.1	322°40.7	·· 04.2	53°56.3	·· 21.5	60°28.1	·· 58.8
16	24°53.4	65°43.1	56.2	337°41.8	04.6	68°58.1	21.3	75°30.3	58.8
17	39°55.9	80°42.4	55.3	352°42.8	05.0	84°00.0	21.2	90°32.5	58.7
18	54°58.4	95°41.7	S16°54.4	7°43.9	N19°05.3	99°01.9	S17°21.0	105°34.6	S18°58.6
19	70°00.8	110°41.0	53.5	22°44.9	05.7	114°03.7	20.9	120°36.8	58.6
20	85°03.3	125°40.3	52.7	37°46.0	06.1	129°05.6	20.7	135°39.0	58.5
21	100°05.7	140°39.7	·· 51.8	52°47.0	·· 06.5	144°07.5	·· 20.5	150°41.1	·· 58.4
22	115°08.2	155°39.0	50.9	67°48.0	06.9	159°09.4	20.4	165°43.3	58.4
23	130°10.7	170°38.3	50.0	82°49.1	07.3	174°11.2	20.2	180°45.5	58.3
Mer.pass.	14:21	ν -0.7′	d -0.9′	m -3.92	ν 1.0′	d 0.4′	m 0.67	ν 1.9′	d -0.2′ m -1.96	ν 2.2′	d -0.1′ m 0.71

	Stars	
	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.6	-42°11.8
Schedar	349°34.9	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°22.9	-57°08.2
Hamal	327°54.9	23°33.6
Polaris	315°31.9	89°21.4
Acamar	315°14.3	-40°13.6
Menkar	314°09.5	4°10.2
Mirfak	308°32.7	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.4	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.0	-29°00.2
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.3	-59°34.7
Suhail	222°48.1	-43°31.1
Miaplacidus	221°37.8	-69°48.2
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.1
Denebola	182°27.9	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.0	-63°12.7
Gacrux	171°54.6	-57°13.6
Alioth	166°15.5	55°50.5
Spica	158°25.5	-11°16.2
Alkaid	152°54.4	49°12.3
Hadar	148°40.2	-60°28.2
Menkent	148°01.2	-36°28.2
Arcturus	145°50.7	19°04.2
Rigil Kent.	139°44.4	-60°55.0
Kochab	137°19.7	74°03.9
Zuben'ubi	136°59.4	-16°07.7
Alphecca	126°06.5	26°38.5
Antares	112°19.8	-26°28.6
Atria	107°17.1	-69°03.6
Sabik	102°06.5	-15°45.0
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.7	12°32.6
Eltanin	90°44.0	51°28.9
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.7	38°48.0
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.3	-56°40.0
Deneb	49°28.4	45°21.2
Enif	33°42.2	9°58.2
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 12 Fri	SHA	Mer.pass
Venus	44°11.7	11:35
Mars	314°18.7	17:32
Jupiter	44°42.6	11:31
Saturn	50°55.8	11:06

Feb 13 Sat	SHA	Mer.pass
Venus	42°55.7	11:36
Mars	313°44.9	17:31
Jupiter	44°28.4	11:28
Saturn	50°48.7	11:02

Feb 14 Sun	SHA	Mer.pass
Venus	41°39.9	11:37
Mars	313°11.0	17:29
Jupiter	44°14.2	11:25
Saturn	50°41.6	10:59

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°26.9	S13°41.4	172°23.2	11.0′	S17°15.9	-10.3′	56.7′
1	191°26.9	40.6	186°53.2	11.0′	17°05.6	-10.4′	56.7′
2	206°26.9	39.7	201°23.2	11.1′	16°55.1	-10.5′	56.6′
3	221°26.9	·· 38.9	215°53.3	11.2′	16°44.6	-10.6′	56.6′
4	236°27.0	38.1	230°23.6	11.3′	16°34.1	-10.6′	56.6′
5	251°27.0	37.2	244°53.9	11.4′	16°23.4	-10.7′	56.6′
6	266°27.0	S13°36.4	259°24.3	11.5′	S16°12.7	-10.8′	56.5′
7	281°27.0	35.6	273°54.7	11.6′	16°02.0	-10.9′	56.5′
8	296°27.0	34.7	288°25.3	11.7′	15°51.1	-10.9′	56.5′
9	311°27.0	·· 33.9	302°56.0	11.7′	15°40.2	-11.0′	56.5′
10	326°27.0	33.1	317°26.7	11.8′	15°29.2	-11.1′	56.5′
11	341°27.0	32.2	331°57.5	11.9′	15°18.1	-11.1′	56.4′
12	356°27.0	S13°31.4	346°28.4	12.0′	S15°07.0	-11.2′	56.4′
13	11°27.0	30.5	0°59.4	12.1′	14°55.8	-11.2′	56.4′
14	26°27.0	29.7	15°30.5	12.2′	14°44.6	-11.3′	56.4′
15	41°27.1	·· 28.9	30°01.6	12.2′	14°33.3	-11.4′	56.3′
16	56°27.1	28.0	44°32.9	12.3′	14°21.9	-11.4′	56.3′
17	71°27.1	27.2	59°04.2	12.4′	14°10.5	-11.5′	56.3′
18	86°27.1	S13°26.4	73°35.6	12.5′	S13°59.0	-11.5′	56.3′
19	101°27.1	25.5	88°07.0	12.6′	13°47.5	-11.6′	56.2′
20	116°27.1	24.7	102°38.6	12.6′	13°35.9	-11.6′	56.2′
21	131°27.1	·· 23.8	117°10.2	12.7′	13°24.3	-11.7′	56.2′
22	146°27.1	23.0	131°41.9	12.8′	13°12.6	-11.7′	56.2′
23	161°27.1	22.2	146°13.7	12.9′	13°00.8	-11.8′	56.1′
	SD = 16.2′	d = -0.8′	SD = 15.5′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.2	S13°21.3	160°45.6	12.9′	S12°49.0	-11.8′	56.1′
1	191°27.2	20.5	175°17.5	13.0′	12°37.2	-11.9′	56.1′
2	206°27.2	19.6	189°49.5	13.1′	12°25.3	-11.9′	56.1′
3	221°27.2	·· 18.8	204°21.6	13.2′	12°13.3	-12.0′	56.0′
4	236°27.2	17.9	218°53.7	13.2′	12°01.4	-12.0′	56.0′
5	251°27.2	17.1	233°26.0	13.3′	11°49.3	-12.1′	56.0′
6	266°27.2	S13°16.3	247°58.3	13.4′	S11°37.3	-12.1′	56.0′
7	281°27.3	15.4	262°30.7	13.4′	11°25.1	-12.2′	55.9′
8	296°27.3	14.6	277°03.1	13.5′	11°13.0	-12.2′	55.9′
9	311°27.3	·· 13.7	291°35.6	13.6′	11°00.8	-12.2′	55.9′
10	326°27.3	12.9	306°08.2	13.6′	10°48.6	-12.3′	55.9′
11	341°27.3	12.0	320°40.8	13.7′	10°36.3	-12.3′	55.9′
12	356°27.3	S13°11.2	335°13.6	13.8′	S10°24.0	-12.3′	55.8′
13	11°27.4	10.3	349°46.3	13.8′	10°11.7	-12.4′	55.8′
14	26°27.4	09.5	4°19.2	13.9′	09°59.3	-12.4′	55.8′
15	41°27.4	·· 08.6	18°52.1	14.0′	09°46.9	-12.4′	55.8′
16	56°27.4	07.8	33°25.1	14.0′	09°34.5	-12.5′	55.7′
17	71°27.4	07.0	47°58.1	14.1′	09°22.0	-12.5′	55.7′
18	86°27.5	S13°06.1	62°31.2	14.2′	S09°09.5	-12.5′	55.7′
19	101°27.5	05.3	77°04.4	14.2′	08°57.0	-12.6′	55.7′
20	116°27.5	04.4	91°37.6	14.3′	08°44.4	-12.6′	55.6′
21	131°27.5	·· 03.6	106°10.9	14.3′	08°31.8	-12.6′	55.6′
22	146°27.5	02.7	120°44.2	14.4′	08°19.2	-12.6′	55.6′
23	161°27.6	01.9	135°17.6	14.4′	08°06.6	-12.7′	55.6′
	SD = 16.2′	d = -0.8′	SD = 15.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.6	S13°01.0	149°51.0	14.5′	S07°53.9	-12.7′	55.5′
1	191°27.6	13°00.2	164°24.5	14.6′	07°41.3	-12.7′	55.5′
2	206°27.6	12°59.3	178°58.1	14.6′	07°28.6	-12.7′	55.5′
3	221°27.6	·· 58.5	193°31.7	14.7′	07°15.9	-12.7′	55.5′
4	236°27.7	57.6	208°05.4	14.7′	07°03.1	-12.8′	55.5′
5	251°27.7	56.8	222°39.1	14.8′	06°50.4	-12.8′	55.4′
6	266°27.7	S12°55.9	237°12.9	14.8′	S06°37.6	-12.8′	55.4′
7	281°27.7	55.0	251°46.7	14.9′	06°24.8	-12.8′	55.4′
8	296°27.8	54.2	266°20.5	14.9′	06°12.0	-12.8′	55.4′
9	311°27.8	·· 53.3	280°54.5	15.0′	05°59.2	-12.8′	55.3′
10	326°27.8	52.5	295°28.4	15.0′	05°46.4	-12.8′	55.3′
11	341°27.8	51.6	310°02.4	15.1′	05°33.5	-12.9′	55.3′
12	356°27.9	S12°50.8	324°36.5	15.1′	S05°20.7	-12.9′	55.3′
13	11°27.9	49.9	339°10.6	15.1′	05°07.8	-12.9′	55.3′
14	26°27.9	49.1	353°44.7	15.2′	04°54.9	-12.9′	55.2′
15	41°27.9	·· 48.2	8°18.9	15.2′	04°42.0	-12.9′	55.2′
16	56°28.0	47.4	22°53.1	15.3′	04°29.1	-12.9′	55.2′
17	71°28.0	46.5	37°27.4	15.3′	04°16.2	-12.9′	55.2′
18	86°28.0	S12°45.6	52°01.7	15.3′	S04°03.3	-12.9′	55.2′
19	101°28.0	44.8	66°36.1	15.4′	03°50.4	-12.9′	55.1′
20	116°28.1	43.9	81°10.4	15.4′	03°37.5	-12.9′	55.1′
21	131°28.1	·· 43.1	95°44.9	15.5′	03°24.5	-12.9′	55.1′
22	146°28.1	42.2	110°19.3	15.5′	03°11.6	-12.9′	55.1′
23	161°28.2	41.4	124°53.8	15.5′	02°58.7	-12.9′	55.1′
	SD = 16.2′	d = -0.9′	SD = 15.1′				

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°	06:20	07:32	08:42	15:47	16:58	18:11
68°	06:17	07:23	08:26	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°	06:12	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	16:53	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	07:19	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	20:00	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°	02:48	03:52	04:38	19:48	20:34	21:37
S 60°	02:27	03:40	04:30	19:57	20:46	21:58

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

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 1-3 0-5%
12	14:12	14:12	12:14	12:56	00:32	
13	14:11	14:11	12:14	13:42	01:19	
14	14:10	14:09	12:14	14:26	02:04	

DUT1 = UT1-UTC = -0.1707 sec ΔT = TT-UT1 = +69.3547 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	145°13.1	185°37.7	S16°49.1	97°50.1	N19°07.7	189°13.1	S17°20.0	195°47.6	S18°58.2
1	160°15.6	200°37.0	48.2	112°51.2	08.1	204°15.0	19.9	210°49.8	58.1
2	175°18.1	215°36.3	47.4	127°52.2	08.5	219°16.9	19.7	225°52.0	58.1
3	190°20.5	230°35.6	·· 46.5	142°53.3	·· 08.9	234°18.7	·· 19.5	240°54.2	·· 58.0
4	205°23.0	245°35.0	45.6	157°54.3	09.2	249°20.6	19.4	255°56.3	57.9
5	220°25.5	260°34.3	44.7	172°55.3	09.6	264°22.5	19.2	270°58.5	57.9
6	235°27.9	275°33.6	S16°43.8	187°56.4	N19°10.0	279°24.4	S17°19.1	286°00.7	S18°57.8
7	250°30.4	290°33.0	42.9	202°57.4	10.4	294°26.2	18.9	301°02.8	57.7
8	265°32.9	305°32.3	42.0	217°58.5	10.8	309°28.1	18.7	316°05.0	57.7
9	280°35.3	320°31.6	·· 41.1	232°59.5	·· 11.2	324°30.0	·· 18.6	331°07.2	·· 57.6
10	295°37.8	335°31.0	40.2	248°00.5	11.6	339°31.9	18.4	346°09.4	57.5
11	310°40.2	350°30.3	39.4	263°01.6	12.0	354°33.7	18.2	1°11.5	57.5
12	325°42.7	5°29.6	S16°38.5	278°02.6	N19°12.4	9°35.6	S17°18.1	16°13.7	S18°57.4
13	340°45.2	20°29.0	37.6	293°03.6	12.7	24°37.5	17.9	31°15.9	57.3
14	355°47.6	35°28.3	36.7	308°04.7	13.1	39°39.4	17.7	46°18.0	57.3
15	10°50.1	50°27.6	·· 35.8	323°05.7	·· 13.5	54°41.2	·· 17.6	61°20.2	·· 57.2
16	25°52.6	65°27.0	34.9	338°06.8	13.9	69°43.1	17.4	76°22.4	57.1
17	40°55.0	80°26.3	34.0	353°07.8	14.3	84°45.0	17.2	91°24.5	57.0
18	55°57.5	95°25.6	S16°33.1	8°08.8	N19°14.7	99°46.8	S17°17.1	106°26.7	S18°57.0
19	71°00.0	110°25.0	32.2	23°09.9	15.1	114°48.7	16.9	121°28.9	56.9
20	86°02.4	125°24.3	31.3	38°10.9	15.5	129°50.6	16.8	136°31.1	56.8
21	101°04.9	140°23.6	·· 30.4	53°11.9	·· 15.8	144°52.5	·· 16.6	151°33.2	·· 56.8
22	116°07.3	155°23.0	29.5	68°13.0	16.2	159°54.3	16.4	166°35.4	56.7
23	131°09.8	170°22.3	28.6	83°14.0	16.6	174°56.2	16.3	181°37.6	56.6
Mer.pass.	14:17	ν -0.7′	d -0.9′	m -3.92	ν 1.0′	d 0.4′	m 0.69	ν 1.9′	d -0.2′	m -1.96	ν 2.2′	d -0.1′	m 0.71

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	146°12.3	185°21.7	S16°27.7	98°15.1	N19°17.0	189°58.1	S17°16.1	196°39.7	S18°56.6
1	161°14.7	200°21.0	26.8	113°16.1	17.4	205°00.0	15.9	211°41.9	56.5
2	176°17.2	215°20.3	25.9	128°17.1	17.8	220°01.8	15.8	226°44.1	56.4
3	191°19.7	230°19.7	·· 25.0	143°18.2	·· 18.2	235°03.7	·· 15.6	241°46.3	·· 56.4
4	206°22.1	245°19.0	24.0	158°19.2	18.5	250°05.6	15.4	256°48.4	56.3
5	221°24.6	260°18.4	23.1	173°20.2	18.9	265°07.5	15.3	271°50.6	56.2
6	236°27.1	275°17.7	S16°22.2	188°21.3	N19°19.3	280°09.3	S17°15.1	286°52.8	S18°56.1
7	251°29.5	290°17.1	21.3	203°22.3	19.7	295°11.2	15.0	301°54.9	56.1
8	266°32.0	305°16.4	20.4	218°23.3	20.1	310°13.1	14.8	316°57.1	56.0
9	281°34.5	320°15.7	·· 19.5	233°24.4	·· 20.5	325°15.0	·· 14.6	331°59.3	·· 55.9
10	296°36.9	335°15.1	18.6	248°25.4	20.9	340°16.9	14.5	347°01.5	55.9
11	311°39.4	350°14.4	17.7	263°26.4	21.2	355°18.7	14.3	2°03.6	55.8
12	326°41.8	5°13.8	S16°16.8	278°27.5	N19°21.6	10°20.6	S17°14.1	17°05.8	S18°55.7
13	341°44.3	20°13.1	15.9	293°28.5	22.0	25°22.5	14.0	32°08.0	55.7
14	356°46.8	35°12.5	14.9	308°29.5	22.4	40°24.4	13.8	47°10.1	55.6
15	11°49.2	50°11.8	·· 14.0	323°30.6	·· 22.8	55°26.2	·· 13.6	62°12.3	·· 55.5
16	26°51.7	65°11.2	13.1	338°31.6	23.2	70°28.1	13.5	77°14.5	55.5
17	41°54.2	80°10.5	12.2	353°32.6	23.6	85°30.0	13.3	92°16.7	55.4
18	56°56.6	95°09.9	S16°11.3	8°33.6	N19°23.9	100°31.9	S17°13.1	107°18.8	S18°55.3
19	71°59.1	110°09.2	10.4	23°34.7	24.3	115°33.7	13.0	122°21.0	55.3
20	87°01.6	125°08.6	09.4	38°35.7	24.7	130°35.6	12.8	137°23.2	55.2
21	102°04.0	140°07.9	·· 08.5	53°36.7	·· 25.1	145°37.5	·· 12.7	152°25.3	·· 55.1
22	117°06.5	155°07.3	07.6	68°37.8	25.5	160°39.4	12.5	167°27.5	55.0
23	132°08.9	170°06.6	06.7	83°38.8	25.9	175°41.2	12.3	182°29.7	55.0
Mer.pass.	14:13	ν -0.7′	d -0.9′	m -3.92	ν 1.0′	d 0.4′	m 0.70	ν 1.9′	d -0.2′	m -1.96	ν 2.2′	d -0.1′	m 0.71

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	147°11.4	185°06.0	S16°05.7	98°39.8	N19°26.2	190°43.1	S17°12.2	197°31.9	S18°54.9
1	162°13.9	200°05.3	04.8	113°40.9	26.6	205°45.0	12.0	212°34.0	54.8
2	177°16.3	215°04.7	03.9	128°41.9	27.0	220°46.9	11.8	227°36.2	54.8
3	192°18.8	230°04.0	·· 03.0	143°42.9	·· 27.4	235°48.7	·· 11.7	242°38.4	·· 54.7
4	207°21.3	245°03.4	02.1	158°43.9	27.8	250°50.6	11.5	257°40.6	54.6
5	222°23.7	260°02.7	01.1	173°45.0	28.1	265°52.5	11.3	272°42.7	54.6
6	237°26.2	275°02.1	S16°00.2	188°46.0	N19°28.5	280°54.4	S17°11.2	287°44.9	S18°54.5
7	252°28.7	290°01.4	15°59.3	203°47.0	28.9	295°56.3	11.0	302°47.1	54.4
8	267°31.1	305°00.8	58.3	218°48.0	29.3	310°58.1	10.8	317°49.2	54.4
9	282°33.6	320°00.2	·· 57.4	233°49.1	·· 29.7	326°00.0	·· 10.7	332°51.4	·· 54.3
10	297°36.1	334°59.5	56.5	248°50.1	30.1	341°01.9	10.5	347°53.6	54.2
11	312°38.5	349°58.9	55.5	263°51.1	30.4	356°03.8	10.3	2°55.8	54.2
12	327°41.0	4°58.2	S15°54.6	278°52.2	N19°30.8	11°05.6	S17°10.2	17°57.9	S18°54.1
13	342°43.4	19°57.6	53.7	293°53.2	31.2	26°07.5	10.0	33°00.1	54.0
14	357°45.9	34°56.9	52.8	308°54.2	31.6	41°09.4	09.9	48°02.3	54.0
15	12°48.4	49°56.3	·· 51.8	323°55.2	·· 32.0	56°11.3	·· 09.7	63°04.5	·· 53.9
16	27°50.8	64°55.7	50.9	338°56.3	32.3	71°13.1	09.5	78°06.6	53.8
17	42°53.3	79°55.0	49.9	353°57.3	32.7	86°15.0	09.4	93°08.8	53.7
18	57°55.8	94°54.4	S15°49.0	8°58.3	N19°33.1	101°16.9	S17°09.2	108°11.0	S18°53.7
19	72°58.2	109°53.8	48.1	23°59.3	33.5	116°18.8	09.0	123°13.2	53.6
20	88°00.7	124°53.1	47.1	39°00.4	33.9	131°20.7	08.9	138°15.3	53.5
21	103°03.2	139°52.5	·· 46.2	54°01.4	·· 34.2	146°22.5	·· 08.7	153°17.5	·· 53.5
22	118°05.6	154°51.8	45.3	69°02.4	34.6	161°24.4	08.5	168°19.7	53.4
23	133°08.1	169°51.2	44.3	84°03.4	35.0	176°26.3	08.4	183°21.8	53.3
Mer.pass.	14:09	ν -0.6′	d -0.9′	m -3.92	ν 1.0′	d 0.4′	m 0.72	ν 1.9′	d -0.2′	m -1.96	ν 2.2′	d -0.1′	m 0.71

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.6	-42°11.8
Schedar	349°34.9	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°22.9	-57°08.2
Hamal	327°54.9	23°33.6
Polaris	315°33.5	89°21.4
Acamar	315°14.3	-40°13.6
Menkar	314°09.5	4°10.2
Mirfak	308°32.8	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.4	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.3	-59°34.7
Suhail	222°48.1	-43°31.1
Miaplacidus	221°37.8	-69°48.2
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.1
Denebola	182°27.9	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.0	-63°12.7
Gacrux	171°54.6	-57°13.7
Alioth	166°15.5	55°50.5
Spica	158°25.4	-11°16.2
Alkaid	152°54.3	49°12.3
Hadar	148°40.1	-60°28.2
Menkent	148°01.1	-36°28.2
Arcturus	145°50.7	19°04.2
Rigil Kent.	139°44.4	-60°55.0
Kochab	137°19.7	74°03.9
Zuben'ubi	136°59.4	-16°07.7
Alphecca	126°06.4	26°38.5
Antares	112°19.8	-26°28.6
Atria	107°17.0	-69°03.6
Sabik	102°06.5	-15°45.0
Shaula	96°14.8	-37°07.0
Rasalhague	96°01.6	12°32.6
Eltanin	90°43.9	51°28.9
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.6	38°48.0
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.3	-56°40.0
Deneb	49°28.3	45°21.2
Enif	33°42.2	9°58.1
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 15 Mon	SHA	Mer.pass
Venus	40°24.5	11:38
Mars	312°37.0	17:27
Jupiter	44°00.0	11:22
Saturn	50°34.5	10:55

Feb 16 Tue	SHA	Mer.pass
Venus	39°09.4	11:39
Mars	312°02.8	17:26
Jupiter	43°45.8	11:19
Saturn	50°27.5	10:52

Feb 17 Wed	SHA	Mer.pass
Venus	37°54.6	11:40
Mars	311°28.4	17:24
Jupiter	43°31.7	11:16
Saturn	50°20.5	10:48

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.2	S12°40.5	139°28.3	15.6′	S02°45.7	-12.9′	55.0′
1	191°28.2	39.6	154°02.9	15.6′	02°32.8	-12.9′	55.0′
2	206°28.2	38.8	168°37.5	15.6′	02°19.9	-12.9′	55.0′
3	221°28.3	·· 37.9	183°12.1	15.6′	02°06.9	-12.9′	55.0′
4	236°28.3	37.1	197°46.7	15.7′	01°54.0	-12.9′	55.0′
5	251°28.3	36.2	212°21.4	15.7′	01°41.1	-12.9′	54.9′
6	266°28.4	S12°35.3	226°56.1	15.7′	S01°28.1	-12.9′	54.9′
7	281°28.4	34.5	241°30.8	15.8′	01°15.2	-12.9′	54.9′
8	296°28.4	33.6	256°05.6	15.8′	01°02.3	-12.9′	54.9′
9	311°28.5	·· 32.8	270°40.4	15.8′	00°49.4	-12.9′	54.9′
10	326°28.5	31.9	285°15.2	15.8′	00°36.5	-12.9′	54.8′
11	341°28.5	31.0	299°50.0	15.9′	00°23.6	-12.9′	54.8′
12	356°28.6	S12°30.2	314°24.9	15.9′	S00°10.7	-12.9′	54.8′
13	11°28.6	29.3	328°59.7	15.9′	N00°02.2	12.9′	54.8′
14	26°28.6	28.4	343°34.6	15.9′	00°15.1	12.9′	54.8′
15	41°28.6	·· 27.6	358°09.5	15.9′	00°27.9	12.9′	54.8′
16	56°28.7	26.7	12°44.5	15.9′	00°40.8	12.8′	54.7′
17	71°28.7	25.8	27°19.4	16.0′	00°53.6	12.8′	54.7′
18	86°28.8	S12°25.0	41°54.4	16.0′	N01°06.5	12.8′	54.7′
19	101°28.8	24.1	56°29.3	16.0′	01°19.3	12.8′	54.7′
20	116°28.8	23.2	71°04.3	16.0′	01°32.1	12.8′	54.7′
21	131°28.9	·· 22.4	85°39.3	16.0′	01°44.9	12.8′	54.7′
22	146°28.9	21.5	100°14.4	16.0′	01°57.6	12.8′	54.6′
23	161°28.9	20.6	114°49.4	16.0′	02°10.4	12.7′	54.6′
	SD = 16.2′	d = -0.9′	SD = 15.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.0	S12°19.8	129°24.4	16.0′	N02°23.1	12.7′	54.6′
1	191°29.0	18.9	143°59.5	16.1′	02°35.9	12.7′	54.6′
2	206°29.0	18.0	158°34.5	16.1′	02°48.6	12.7′	54.6′
3	221°29.1	·· 17.2	173°09.6	16.1′	03°01.3	12.7′	54.6′
4	236°29.1	16.3	187°44.7	16.1′	03°13.9	12.6′	54.6′
5	251°29.2	15.4	202°19.7	16.1′	03°26.6	12.6′	54.5′
6	266°29.2	S12°14.6	216°54.8	16.1′	N03°39.2	12.6′	54.5′
7	281°29.2	13.7	231°29.9	16.1′	03°51.8	12.6′	54.5′
8	296°29.3	12.8	246°05.0	16.1′	04°04.4	12.6′	54.5′
9	311°29.3	·· 12.0	260°40.1	16.1′	04°17.0	12.5′	54.5′
10	326°29.3	11.1	275°15.2	16.1′	04°29.5	12.5′	54.5′
11	341°29.4	10.2	289°50.3	16.1′	04°42.0	12.5′	54.5′
12	356°29.4	S12°09.3	304°25.4	16.1′	N04°54.5	12.5′	54.4′
13	11°29.5	08.5	319°00.4	16.1′	05°07.0	12.4′	54.4′
14	26°29.5	07.6	333°35.5	16.1′	05°19.4	12.4′	54.4′
15	41°29.6	·· 06.7	348°10.6	16.1′	05°31.8	12.4′	54.4′
16	56°29.6	05.9	2°45.7	16.1′	05°44.2	12.4′	54.4′
17	71°29.6	05.0	17°20.8	16.1′	05°56.6	12.3′	54.4′
18	86°29.7	S12°04.1	31°55.8	16.1′	N06°08.9	12.3′	54.4′
19	101°29.7	03.2	46°30.9	16.0′	06°21.2	12.3′	54.4′
20	116°29.8	02.4	61°05.9	16.0′	06°33.5	12.2′	54.4′
21	131°29.8	·· 01.5	75°41.0	16.0′	06°45.7	12.2′	54.3′
22	146°29.8	12°00.6	90°16.0	16.0′	06°57.9	12.2′	54.3′
23	161°29.9	11°59.7	104°51.0	16.0′	07°10.1	12.1′	54.3′
	SD = 16.2′	d = -0.9′	SD = 14.9′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.9	S11°58.9	119°26.0	16.0′	N07°22.3	12.1′	54.3′
1	191°30.0	58.0	134°01.0	16.0′	07°34.4	12.1′	54.3′
2	206°30.0	57.1	148°36.0	16.0′	07°46.5	12.0′	54.3′
3	221°30.1	·· 56.2	163°11.0	15.9′	07°58.5	12.0′	54.3′
4	236°30.1	55.4	177°45.9	15.9′	08°10.5	12.0′	54.3′
5	251°30.2	54.5	192°20.8	15.9′	08°22.5	11.9′	54.3′
6	266°30.2	S11°53.6	206°55.8	15.9′	N08°34.4	11.9′	54.3′
7	281°30.3	52.7	221°30.6	15.9′	08°46.3	11.9′	54.2′
8	296°30.3	51.9	236°05.5	15.9′	08°58.2	11.8′	54.2′
9	311°30.3	·· 51.0	250°40.4	15.8′	09°10.0	11.8′	54.2′
10	326°30.4	50.1	265°15.2	15.8′	09°21.8	11.7′	54.2′
11	341°30.4	49.2	279°50.0	15.8′	09°33.6	11.7′	54.2′
12	356°30.5	S11°48.3	294°24.8	15.8′	N09°45.3	11.7′	54.2′
13	11°30.5	47.5	308°59.6	15.7′	09°56.9	11.6′	54.2′
14	26°30.6	46.6	323°34.3	15.7′	10°08.6	11.6′	54.2′
15	41°30.6	·· 45.7	338°09.0	15.7′	10°20.1	11.5′	54.2′
16	56°30.7	44.8	352°43.7	15.7′	10°31.7	11.5′	54.2′
17	71°30.7	43.9	7°18.4	15.6′	10°43.2	11.5′	54.2′
18	86°30.8	S11°43.1	21°53.0	15.6′	N10°54.6	11.4′	54.2′
19	101°30.8	42.2	36°27.6	15.6′	11°06.1	11.4′	54.2′
20	116°30.9	41.3	51°02.2	15.5′	11°17.4	11.3′	54.2′
21	131°30.9	·· 40.4	65°36.7	15.5′	11°28.7	11.3′	54.2′
22	146°31.0	39.5	80°11.3	15.5′	11°40.0	11.2′	54.2′
23	161°31.0	38.6	94°45.7	15.4′	11°51.2	11.2′	54.2′
	SD = 16.2′	d = -0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:09	07:29	08:47	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	16:16	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	06:56	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	07:23	17:06	17:45	18:29
54°	06:00	06:41	07:17	17:12	17:48	18:30
52°	05:59	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	06:29	18:00	18:22	18:48
N 10°	05:33	05:58	06:19	18:09	18:30	18:55
0°	05:25	05:50	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	19:41
35°	04:37	05:08	05:35	18:53	19:19	19:51
40°	04:24	04:59	05:28	19:00	19:28	20:03
45°	04:09	04:48	05:19	19:08	19:40	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	20:08	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	21:26
S 60°	02:40	03:49	04:38	19:48	20:37	21:44

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

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 11-25%
15	14:07	14:06	12:14	15:08	02:47	
16	14:04	14:02	12:14	15:49	03:28	
17	14:00	13:58	12:14	16:30	04:09	

DUT1 = UT1-UTC = -0.1719 sec ΔT = TT-UT1 = +69.3559 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	148°10.6	184°50.6	S15°43.4	99°04.4	N19°35.4	191°28.2	S17°08.2	198°24.0	S18°53.3
1	163°13.0	199°49.9	42.4	114°05.5	35.8	206°30.0	08.0	213°26.2	53.2
2	178°15.5	214°49.3	41.5	129°06.5	36.1	221°31.9	07.9	228°28.4	53.1
3	193°17.9	229°48.7	·· 40.5	144°07.5	·· 36.5	236°33.8	·· 07.7	243°30.5	·· 53.1
4	208°20.4	244°48.0	39.6	159°08.5	36.9	251°35.7	07.6	258°32.7	53.0
5	223°22.9	259°47.4	38.7	174°09.6	37.3	266°37.6	07.4	273°34.9	52.9
6	238°25.3	274°46.8	S15°37.7	189°10.6	N19°37.6	281°39.4	S17°07.2	288°37.1	S18°52.9
7	253°27.8	289°46.1	36.8	204°11.6	38.0	296°41.3	07.1	303°39.2	52.8
8	268°30.3	304°45.5	35.8	219°12.6	38.4	311°43.2	06.9	318°41.4	52.7
9	283°32.7	319°44.9	·· 34.9	234°13.6	·· 38.8	326°45.1	·· 06.7	333°43.6	·· 52.6
10	298°35.2	334°44.2	33.9	249°14.7	39.2	341°47.0	06.6	348°45.8	52.6
11	313°37.7	349°43.6	33.0	264°15.7	39.5	356°48.8	06.4	3°47.9	52.5
12	328°40.1	4°43.0	S15°32.0	279°16.7	N19°39.9	11°50.7	S17°06.2	18°50.1	S18°52.4
13	343°42.6	19°42.3	31.1	294°17.7	40.3	26°52.6	06.1	33°52.3	52.4
14	358°45.0	34°41.7	30.1	309°18.7	40.7	41°54.5	05.9	48°54.5	52.3
15	13°47.5	49°41.1	·· 29.2	324°19.8	·· 41.0	56°56.3	·· 05.7	63°56.6	·· 52.2
16	28°50.0	64°40.5	28.2	339°20.8	41.4	71°58.2	05.6	78°58.8	52.2
17	43°52.4	79°39.8	27.3	354°21.8	41.8	87°00.1	05.4	94°01.0	52.1
18	58°54.9	94°39.2	S15°26.3	9°22.8	N19°42.2	102°02.0	S17°05.2	109°03.2	S18°52.0
19	73°57.4	109°38.6	25.4	24°23.8	42.5	117°03.9	05.1	124°05.3	52.0
20	88°59.8	124°38.0	24.4	39°24.8	42.9	132°05.7	04.9	139°07.5	51.9
21	104°02.3	139°37.3	·· 23.4	54°25.9	·· 43.3	147°07.6	·· 04.7	154°09.7	·· 51.8
22	119°04.8	154°36.7	22.5	69°26.9	43.7	162°09.5	04.6	169°11.9	51.8
23	134°07.2	169°36.1	21.5	84°27.9	44.0	177°11.4	04.4	184°14.0	51.7
Mer.pass.	14:05	ν -0.6′	d -0.9′	m -3.92	ν 1.0′	d 0.4′	m 0.74	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.71

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	149°09.7	184°35.5	S15°20.6	99°28.9	N19°44.4	192°13.3	S17°04.3	199°16.2	S18°51.6
1	164°12.2	199°34.8	19.6	114°29.9	44.8	207°15.1	04.1	214°18.4	51.6
2	179°14.6	214°34.2	18.6	129°30.9	45.2	222°17.0	03.9	229°20.6	51.5
3	194°17.1	229°33.6	·· 17.7	144°32.0	·· 45.5	237°18.9	·· 03.8	244°22.7	·· 51.4
4	209°19.5	244°33.0	16.7	159°33.0	45.9	252°20.8	03.6	259°24.9	51.3
5	224°22.0	259°32.4	15.8	174°34.0	46.3	267°22.7	03.4	274°27.1	51.3
6	239°24.5	274°31.7	S15°14.8	189°35.0	N19°46.7	282°24.5	S17°03.3	289°29.3	S18°51.2
7	254°26.9	289°31.1	13.8	204°36.0	47.0	297°26.4	03.1	304°31.4	51.1
8	269°29.4	304°30.5	12.9	219°37.0	47.4	312°28.3	02.9	319°33.6	51.1
9	284°31.9	319°29.9	·· 11.9	234°38.0	·· 47.8	327°30.2	·· 02.8	334°35.8	·· 51.0
10	299°34.3	334°29.3	10.9	249°39.1	48.2	342°32.1	02.6	349°38.0	50.9
11	314°36.8	349°28.6	10.0	264°40.1	48.5	357°33.9	02.4	4°40.1	50.9
12	329°39.3	4°28.0	S15°09.0	279°41.1	N19°48.9	12°35.8	S17°02.3	19°42.3	S18°50.8
13	344°41.7	19°27.4	08.0	294°42.1	49.3	27°37.7	02.1	34°44.5	50.7
14	359°44.2	34°26.8	07.1	309°43.1	49.7	42°39.6	01.9	49°46.7	50.7
15	14°46.7	49°26.2	·· 06.1	324°44.1	·· 50.0	57°41.5	·· 01.8	64°48.8	·· 50.6
16	29°49.1	64°25.6	05.1	339°45.1	50.4	72°43.3	01.6	79°51.0	50.5
17	44°51.6	79°24.9	04.2	354°46.2	50.8	87°45.2	01.4	94°53.2	50.5
18	59°54.0	94°24.3	S15°03.2	9°47.2	N19°51.2	102°47.1	S17°01.3	109°55.4	S18°50.4
19	74°56.5	109°23.7	02.2	24°48.2	51.5	117°49.0	01.1	124°57.5	50.3
20	89°59.0	124°23.1	01.2	39°49.2	51.9	132°50.9	01.0	139°59.7	50.3
21	105°01.4	139°22.5	15°00.3	54°50.2	·· 52.3	147°52.7	·· 00.8	155°01.9	·· 50.2
22	120°03.9	154°21.9	14°59.3	69°51.2	52.6	162°54.6	00.6	170°04.1	50.1
23	135°06.4	169°21.3	58.3	84°52.2	53.0	177°56.5	00.5	185°06.2	50.0
Mer.pass.	14:01	ν -0.6′	d -1.0′	m -3.92	ν 1.0′	d 0.4′	m 0.75	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.72

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	150°08.8	184°20.7	S14°57.3	99°53.2	N19°53.4	192°58.4	S17°00.3	200°08.4	S18°50.0
1	165°11.3	199°20.0	56.4	114°54.2	53.8	208°00.3	00.1	215°10.6	49.9
2	180°13.8	214°19.4	55.4	129°55.3	54.1	223°02.1	17°00.0	230°12.8	49.8
3	195°16.2	229°18.8	·· 54.4	144°56.3	·· 54.5	238°04.0	16°59.8	245°15.0	·· 49.8
4	210°18.7	244°18.2	53.4	159°57.3	54.9	253°05.9	59.6	260°17.1	49.7
5	225°21.1	259°17.6	52.4	174°58.3	55.2	268°07.8	59.5	275°19.3	49.6
6	240°23.6	274°17.0	S14°51.5	189°59.3	N19°55.6	283°09.7	S16°59.3	290°21.5	S18°49.6
7	255°26.1	289°16.4	50.5	205°00.3	56.0	298°11.6	59.1	305°23.7	49.5
8	270°28.5	304°15.8	49.5	220°01.3	56.3	313°13.4	59.0	320°25.8	49.4
9	285°31.0	319°15.2	·· 48.5	235°02.3	·· 56.7	328°15.3	·· 58.8	335°28.0	·· 49.4
10	300°33.5	334°14.6	47.5	250°03.3	57.1	343°17.2	58.6	350°30.2	49.3
11	315°35.9	349°14.0	46.6	265°04.3	57.5	358°19.1	58.5	5°32.4	49.2
12	330°38.4	4°13.4	S14°45.6	280°05.3	N19°57.8	13°21.0	S16°58.3	20°34.5	S18°49.2
13	345°40.9	19°12.7	44.6	295°06.3	58.2	28°22.8	58.1	35°36.7	49.1
14	0°43.3	34°12.1	43.6	310°07.4	58.6	43°24.7	58.0	50°38.9	49.0
15	15°45.8	49°11.5	·· 42.6	325°08.4	·· 58.9	58°26.6	·· 57.8	65°41.1	·· 49.0
16	30°48.3	64°10.9	41.6	340°09.4	59.3	73°28.5	57.6	80°43.3	48.9
17	45°50.7	79°10.3	40.6	355°10.4	19°59.7	88°30.4	57.5	95°45.4	48.8
18	60°53.2	94°09.7	S14°39.6	10°11.4	N20°00.0	103°32.3	S16°57.3	110°47.6	S18°48.8
19	75°55.6	109°09.1	38.7	25°12.4	00.4	118°34.1	57.1	125°49.8	48.7
20	90°58.1	124°08.5	37.7	40°13.4	00.8	133°36.0	57.0	140°52.0	48.6
21	106°00.6	139°07.9	·· 36.7	55°14.4	·· 01.1	148°37.9	·· 56.8	155°54.1	·· 48.5
22	121°03.0	154°07.3	35.7	70°15.4	01.5	163°39.8	56.7	170°56.3	48.5
23	136°05.5	169°06.7	34.7	85°16.4	01.9	178°41.7	56.5	185°58.5	48.4
Mer.pass.	13:57	ν -0.6′	d -1.0′	m -3.92	ν 1.0′	d 0.4′	m 0.77	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.72

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.8
Schedar	349°35.0	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°23.0	-57°08.2
Hamal	327°54.9	23°33.6
Polaris	315°34.9	89°21.4
Acamar	315°14.3	-40°13.6
Menkar	314°09.5	4°10.1
Mirfak	308°32.8	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.4	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.5	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.4	-59°34.7
Suhail	222°48.1	-43°31.1
Miaplacidus	221°37.9	-69°48.3
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.9	14°27.2
Gienah	175°46.5	-17°39.5
Acrux	173°02.9	-63°12.7
Gacrux	171°54.6	-57°13.7
Alioth	166°15.4	55°50.6
Spica	158°25.4	-11°16.2
Alkaid	152°54.3	49°12.3
Hadar	148°40.1	-60°28.2
Menkent	148°01.1	-36°28.2
Arcturus	145°50.7	19°04.2
Rigil Kent.	139°44.3	-60°55.0
Kochab	137°19.6	74°03.9
Zuben'ubi	136°59.4	-16°07.7
Alphecca	126°06.4	26°38.5
Antares	112°19.8	-26°28.6
Atria	107°17.0	-69°03.6
Sabik	102°06.5	-15°45.0
Shaula	96°14.8	-37°07.0
Rasalhague	96°01.6	12°32.6
Eltanin	90°43.9	51°28.9
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.6	38°48.0
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.3	-56°40.0
Deneb	49°28.3	45°21.1
Enif	33°42.2	9°58.1
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.8
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 18 Thu	SHA	Mer.pass
Venus	36°40.0	11:41
Mars	310°53.9	17:23
Jupiter	43°17.6	11:13
Saturn	50°13.5	10:45

Feb 19 Fri	SHA	Mer.pass
Venus	35°25.8	11:42
Mars	310°19.2	17:21
Jupiter	43°03.6	11:10
Saturn	50°06.5	10:41

Feb 20 Sat	SHA	Mer.pass
Venus	34°11.8	11:43
Mars	309°44.4	17:19
Jupiter	42°49.6	11:07
Saturn	49°59.6	10:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°31.1	S11°37.8	109°20.2	15.4′	N12°02.4	11.1′	54.2′
1	191°31.1	36.9	123°54.6	15.4′	12°13.6	11.1′	54.2′
2	206°31.2	36.0	138°29.0	15.3′	12°24.6	11.0′	54.2′
3	221°31.2	·· 35.1	153°03.3	15.3′	12°35.7	11.0′	54.1′
4	236°31.3	34.2	167°37.6	15.3′	12°46.6	10.9′	54.1′
5	251°31.3	33.3	182°11.9	15.2′	12°57.6	10.9′	54.1′
6	266°31.4	S11°32.5	196°46.1	15.2′	N13°08.5	10.8′	54.1′
7	281°31.4	31.6	211°20.3	15.2′	13°19.3	10.8′	54.1′
8	296°31.5	30.7	225°54.5	15.1′	13°30.1	10.7′	54.1′
9	311°31.6	·· 29.8	240°28.6	15.1′	13°40.8	10.7′	54.1′
10	326°31.6	28.9	255°02.7	15.0′	13°51.4	10.6′	54.1′
11	341°31.7	28.0	269°36.7	15.0′	14°02.0	10.6′	54.1′
12	356°31.7	S11°27.1	284°10.7	14.9′	N14°12.6	10.5′	54.1′
13	11°31.8	26.3	298°44.6	14.9′	14°23.1	10.4′	54.1′
14	26°31.8	25.4	313°18.5	14.9′	14°33.5	10.4′	54.1′
15	41°31.9	·· 24.5	327°52.4	14.8′	14°43.9	10.3′	54.1′
16	56°31.9	23.6	342°26.2	14.8′	14°54.2	10.3′	54.1′
17	71°32.0	22.7	356°59.9	14.7′	15°04.5	10.2′	54.1′
18	86°32.1	S11°21.8	11°33.7	14.7′	N15°14.7	10.1′	54.1′
19	101°32.1	20.9	26°07.3	14.6′	15°24.9	10.1′	54.2′
20	116°32.2	20.0	40°40.9	14.6′	15°34.9	10.0′	54.2′
21	131°32.2	·· 19.1	55°14.5	14.5′	15°45.0	10.0′	54.2′
22	146°32.3	18.3	69°48.0	14.5′	15°54.9	9.9′	54.2′
23	161°32.3	17.4	84°21.5	14.4′	16°04.8	9.8′	54.2′
	SD = 16.2′	d = -0.9′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°32.4	S11°16.5	98°54.9	14.4′	N16°14.7	9.8′	54.2′
1	191°32.5	15.6	113°28.3	14.3′	16°24.4	9.7′	54.2′
2	206°32.5	14.7	128°01.6	14.3′	16°34.1	9.6′	54.2′
3	221°32.6	·· 13.8	142°34.9	14.2′	16°43.8	9.6′	54.2′
4	236°32.6	12.9	157°08.1	14.2′	16°53.3	9.5′	54.2′
5	251°32.7	12.0	171°41.2	14.1′	17°02.8	9.4′	54.2′
6	266°32.8	S11°11.1	186°14.3	14.0′	N17°12.3	9.4′	54.2′
7	281°32.8	10.2	200°47.3	14.0′	17°21.6	9.3′	54.2′
8	296°32.9	09.3	215°20.3	13.9′	17°30.9	9.2′	54.2′
9	311°32.9	·· 08.4	229°53.3	13.9′	17°40.1	9.2′	54.2′
10	326°33.0	07.6	244°26.1	13.8′	17°49.3	9.1′	54.2′
11	341°33.1	06.7	258°58.9	13.8′	17°58.4	9.0′	54.2′
12	356°33.1	S11°05.8	273°31.7	13.7′	N18°07.4	8.9′	54.2′
13	11°33.2	04.9	288°04.4	13.6′	18°16.3	8.9′	54.2′
14	26°33.3	04.0	302°37.0	13.6′	18°25.2	8.8′	54.3′
15	41°33.3	·· 03.1	317°09.6	13.5′	18°34.0	8.7′	54.3′
16	56°33.4	02.2	331°42.1	13.5′	18°42.7	8.6′	54.3′
17	71°33.4	01.3	346°14.6	13.4′	18°51.3	8.6′	54.3′
18	86°33.5	S11°00.4	0°47.0	13.3′	N18°59.9	8.5′	54.3′
19	101°33.6	10°59.5	15°19.3	13.3′	19°08.3	8.4′	54.3′
20	116°33.6	58.6	29°51.6	13.2′	19°16.7	8.3′	54.3′
21	131°33.7	·· 57.7	44°23.8	13.1′	19°25.1	8.2′	54.3′
22	146°33.8	56.8	58°55.9	13.1′	19°33.3	8.2′	54.3′
23	161°33.8	55.9	73°28.0	13.0′	19°41.4	8.1′	54.3′
	SD = 16.2′	d = -0.9′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°33.9	S10°55.0	88°00.0	12.9′	N19°49.5	8.0′	54.4′
1	191°34.0	54.1	102°31.9	12.9′	19°57.5	7.9′	54.4′
2	206°34.0	53.2	117°03.8	12.8′	20°05.4	7.8′	54.4′
3	221°34.1	·· 52.3	131°35.7	12.8′	20°13.2	7.7′	54.4′
4	236°34.2	51.4	146°07.4	12.7′	20°21.0	7.7′	54.4′
5	251°34.2	50.5	160°39.1	12.6′	20°28.6	7.6′	54.4′
6	266°34.3	S10°49.6	175°10.7	12.6′	N20°36.2	7.5′	54.4′
7	281°34.4	48.7	189°42.3	12.5′	20°43.7	7.4′	54.4′
8	296°34.4	47.8	204°13.8	12.4′	20°51.1	7.3′	54.5′
9	311°34.5	·· 46.9	218°45.2	12.4′	20°58.4	7.2′	54.5′
10	326°34.6	46.0	233°16.5	12.3′	21°05.6	7.1′	54.5′
11	341°34.6	45.1	247°47.8	12.2′	21°12.7	7.0′	54.5′
12	356°34.7	S10°44.2	262°19.1	12.2′	N21°19.7	6.9′	54.5′
13	11°34.8	43.3	276°50.2	12.1′	21°26.7	6.8′	54.5′
14	26°34.8	42.4	291°21.3	12.0′	21°33.5	6.7′	54.5′
15	41°34.9	·· 41.5	305°52.3	11.9′	21°40.2	6.7′	54.6′
16	56°35.0	40.6	320°23.3	11.9′	21°46.9	6.6′	54.6′
17	71°35.1	39.7	334°54.1	11.8′	21°53.5	6.5′	54.6′
18	86°35.1	S10°38.8	349°25.0	11.7′	N21°59.9	6.4′	54.6′
19	101°35.2	37.9	3°55.7	11.7′	22°06.3	6.3′	54.6′
20	116°35.3	37.0	18°26.4	11.6′	22°12.5	6.2′	54.6′
21	131°35.3	·· 36.1	32°57.0	11.5′	22°18.7	6.1′	54.7′
22	146°35.4	35.2	47°27.5	11.5′	22°24.8	6.0′	54.7′
23	161°35.5	34.3	61°58.0	11.4′	22°30.7	5.9′	54.7′
	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	08:30	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°	05:56	06:47	07:33	16:56	17:42	18:33
60°	05:55	06:43	07:27	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	07:16	17:13	17:51	18:35
54°	05:54	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	06:55	17:34	18:04	18:38
N 40°	05:48	06:20	06:48	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°	05:39	06:04	06:27	18:01	18:24	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	21:15
S 60°	02:53	03:59	04:46	19:40	20:27	21:31

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

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 7-9 34-52%
18	13:56	13:53	12:14	17:12	04:51	
19	13:50	13:47	12:14	17:57	05:34	
20	13:44	13:41	12:14	18:44	06:20	

DUT1 = UT1-UTC = -0.1716 sec ΔT = TT-UT1 = +69.3556 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	151°08.0	184°06.1	S14°33.7	100°17.4	N20°02.2	193°43.5	S16°56.3	201°00.7	S18°48.3
1	166°10.4	199°05.5	32.7	115°18.4	02.6	208°45.4	56.2	216°02.9	48.3
2	181°12.9	214°04.9	31.7	130°19.4	03.0	223°47.3	56.0	231°05.0	48.2
3	196°15.4	229°04.3	·· 30.7	145°20.4	·· 03.3	238°49.2	·· 55.8	246°07.2	·· 48.1
4	211°17.8	244°03.7	29.7	160°21.4	03.7	253°51.1	55.7	261°09.4	48.1
5	226°20.3	259°03.1	28.7	175°22.4	04.1	268°53.0	55.5	276°11.6	48.0
6	241°22.8	274°02.5	S14°27.7	190°23.4	N20°04.4	283°54.8	S16°55.3	291°13.7	S18°47.9
7	256°25.2	289°01.9	26.7	205°24.4	04.8	298°56.7	55.2	306°15.9	47.9
8	271°27.7	304°01.3	25.7	220°25.4	05.2	313°58.6	55.0	321°18.1	47.8
9	286°30.1	319°00.8	·· 24.7	235°26.4	·· 05.5	329°00.5	·· 54.8	336°20.3	·· 47.7
10	301°32.6	334°00.2	23.7	250°27.4	05.9	344°02.4	54.7	351°22.5	47.7
11	316°35.1	348°59.6	22.7	265°28.4	06.3	359°04.3	54.5	6°24.6	47.6
12	331°37.5	3°59.0	S14°21.7	280°29.4	N20°06.6	14°06.1	S16°54.3	21°26.8	S18°47.5
13	346°40.0	18°58.4	20.7	295°30.4	07.0	29°08.0	54.2	36°29.0	47.5
14	1°42.5	33°57.8	19.7	310°31.4	07.4	44°09.9	54.0	51°31.2	47.4
15	16°44.9	48°57.2	·· 18.7	325°32.4	·· 07.7	59°11.8	·· 53.8	66°33.3	·· 47.3
16	31°47.4	63°56.6	17.7	340°33.4	08.1	74°13.7	53.7	81°35.5	47.3
17	46°49.9	78°56.0	16.7	355°34.4	08.5	89°15.6	53.5	96°37.7	47.2
18	61°52.3	93°55.4	S14°15.7	10°35.4	N20°08.8	104°17.4	S16°53.3	111°39.9	S18°47.1
19	76°54.8	108°54.8	14.7	25°36.4	09.2	119°19.3	53.2	126°42.1	47.1
20	91°57.3	123°54.2	13.7	40°37.4	09.6	134°21.2	53.0	141°44.2	47.0
21	106°59.7	138°53.7	·· 12.7	55°38.4	·· 09.9	149°23.1	·· 52.8	156°46.4	·· 46.9
22	122°02.2	153°53.1	11.7	70°39.4	10.3	164°25.0	52.7	171°48.6	46.8
23	137°04.6	168°52.5	10.7	85°40.4	10.6	179°26.9	52.5	186°50.8	46.8
Mer.pass.	13:53	ν -0.6′	d -1.0′	m -3.92	ν 1.0′	d 0.4′	m 0.79	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.72

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	152°07.1	183°51.9	S14°09.7	100°41.4	N20°11.0	194°28.8	S16°52.3	201°53.0	S18°46.7
1	167°09.6	198°51.3	08.6	115°42.4	11.4	209°30.6	52.2	216°55.1	46.6
2	182°12.0	213°50.7	07.6	130°43.4	11.7	224°32.5	52.0	231°57.3	46.6
3	197°14.5	228°50.1	·· 06.6	145°44.4	·· 12.1	239°34.4	·· 51.8	246°59.5	·· 46.5
4	212°17.0	243°49.5	05.6	160°45.4	12.5	254°36.3	51.7	262°01.7	46.4
5	227°19.4	258°49.0	04.6	175°46.4	12.8	269°38.2	51.5	277°03.9	46.4
6	242°21.9	273°48.4	S14°03.6	190°47.4	N20°13.2	284°40.1	S16°51.4	292°06.0	S18°46.3
7	257°24.4	288°47.8	02.6	205°48.4	13.5	299°41.9	51.2	307°08.2	46.2
8	272°26.8	303°47.2	01.6	220°49.4	13.9	314°43.8	51.0	322°10.4	46.2
9	287°29.3	318°46.6	14°00.5	235°50.4	·· 14.3	329°45.7	·· 50.9	337°12.6	·· 46.1
10	302°31.7	333°46.0	13°59.5	250°51.4	14.6	344°47.6	50.7	352°14.8	46.0
11	317°34.2	348°45.5	58.5	265°52.4	15.0	359°49.5	50.5	7°16.9	46.0
12	332°36.7	3°44.9	S13°57.5	280°53.4	N20°15.4	14°51.4	S16°50.4	22°19.1	S18°45.9
13	347°39.1	18°44.3	56.5	295°54.4	15.7	29°53.3	50.2	37°21.3	45.8
14	2°41.6	33°43.7	55.4	310°55.4	16.1	44°55.1	50.0	52°23.5	45.8
15	17°44.1	48°43.1	·· 54.4	325°56.4	·· 16.4	59°57.0	·· 49.9	67°25.7	·· 45.7
16	32°46.5	63°42.6	53.4	340°57.4	16.8	74°58.9	49.7	82°27.8	45.6
17	47°49.0	78°42.0	52.4	355°58.4	17.2	90°00.8	49.5	97°30.0	45.6
18	62°51.5	93°41.4	S13°51.4	10°59.4	N20°17.5	105°02.7	S16°49.4	112°32.2	S18°45.5
19	77°53.9	108°40.8	50.3	26°00.4	17.9	120°04.6	49.2	127°34.4	45.4
20	92°56.4	123°40.2	49.3	41°01.4	18.2	135°06.5	49.0	142°36.6	45.4
21	107°58.9	138°39.7	·· 48.3	56°02.4	·· 18.6	150°08.3	·· 48.9	157°38.7	·· 45.3
22	123°01.3	153°39.1	47.3	71°03.4	19.0	165°10.2	48.7	172°40.9	45.2
23	138°03.8	168°38.5	46.2	86°04.3	19.3	180°12.1	48.5	187°43.1	45.2
Mer.pass.	13:49	ν -0.6′	d -1.0′	m -3.92	ν 1.0′	d 0.4′	m 0.80	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.72

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	153°06.2	183°37.9	S13°45.2	101°05.3	N20°19.7	195°14.0	S16°48.4	202°45.3	S18°45.1
1	168°08.7	198°37.4	44.2	116°06.3	20.0	210°15.9	48.2	217°47.5	45.0
2	183°11.2	213°36.8	43.2	131°07.3	20.4	225°17.8	48.0	232°49.6	45.0
3	198°13.6	228°36.2	·· 42.1	146°08.3	·· 20.8	240°19.7	·· 47.9	247°51.8	·· 44.9
4	213°16.1	243°35.6	41.1	161°09.3	21.1	255°21.5	47.7	262°54.0	44.8
5	228°18.6	258°35.1	40.1	176°10.3	21.5	270°23.4	47.5	277°56.2	44.8
6	243°21.0	273°34.5	S13°39.1	191°11.3	N20°21.8	285°25.3	S16°47.4	292°58.4	S18°44.7
7	258°23.5	288°33.9	38.0	206°12.3	22.2	300°27.2	47.2	308°00.5	44.6
8	273°26.0	303°33.3	37.0	221°13.3	22.5	315°29.1	47.0	323°02.7	44.5
9	288°28.4	318°32.8	·· 36.0	236°14.3	·· 22.9	330°31.0	·· 46.9	338°04.9	·· 44.5
10	303°30.9	333°32.2	34.9	251°15.3	23.3	345°32.9	46.7	353°07.1	44.4
11	318°33.4	348°31.6	33.9	266°16.2	23.6	0°34.7	46.5	8°09.3	44.3
12	333°35.8	3°31.1	S13°32.9	281°17.2	N20°24.0	15°36.6	S16°46.4	23°11.5	S18°44.3
13	348°38.3	18°30.5	31.8	296°18.2	24.3	30°38.5	46.2	38°13.6	44.2
14	3°40.7	33°29.9	30.8	311°19.2	24.7	45°40.4	46.0	53°15.8	44.1
15	18°43.2	48°29.3	·· 29.8	326°20.2	·· 25.0	60°42.3	·· 45.9	68°18.0	·· 44.1
16	33°45.7	63°28.8	28.7	341°21.2	25.4	75°44.2	45.7	83°20.2	44.0
17	48°48.1	78°28.2	27.7	356°22.2	25.8	90°46.1	45.5	98°22.4	43.9
18	63°50.6	93°27.6	S13°26.7	11°23.2	N20°26.1	105°48.0	S16°45.4	113°24.5	S18°43.9
19	78°53.1	108°27.1	25.6	26°24.2	26.5	120°49.8	45.2	128°26.7	43.8
20	93°55.5	123°26.5	24.6	41°25.1	26.8	135°51.7	45.0	143°28.9	43.7
21	108°58.0	138°25.9	·· 23.5	56°26.1	·· 27.2	150°53.6	·· 44.9	158°31.1	·· 43.7
22	124°00.5	153°25.4	22.5	71°27.1	27.5	165°55.5	44.7	173°33.3	43.6
23	139°02.9	168°24.8	21.5	86°28.1	27.9	180°57.4	44.5	188°35.5	43.5
Mer.pass.	13:45	ν -0.6′	d -1.0′	m -3.92	ν 1.0′	d 0.4′	m 0.82	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.72

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.8
Schedar	349°35.0	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°23.0	-57°08.2
Hamal	327°54.9	23°33.6
Polaris	315°36.1	89°21.4
Acamar	315°14.3	-40°13.6
Menkar	314°09.5	4°10.1
Mirfak	308°32.8	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.4	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.5	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.4	-59°34.8
Suhail	222°48.1	-43°31.2
Miaplacidus	221°37.9	-69°48.3
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.9	14°27.2
Gienah	175°46.5	-17°39.5
Acrux	173°02.9	-63°12.8
Gacrux	171°54.6	-57°13.7
Alioth	166°15.4	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.3	49°12.3
Hadar	148°40.1	-60°28.2
Menkent	148°01.1	-36°28.2
Arcturus	145°50.7	19°04.2
Rigil Kent.	139°44.3	-60°55.0
Kochab	137°19.5	74°03.9
Zuben'ubi	136°59.4	-16°07.7
Alphecca	126°06.4	26°38.5
Antares	112°19.7	-26°28.6
Atria	107°16.9	-69°03.6
Sabik	102°06.5	-15°45.0
Shaula	96°14.8	-37°07.0
Rasalhague	96°01.6	12°32.6
Eltanin	90°43.9	51°28.9
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.6	38°48.0
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.3	-56°40.0
Deneb	49°28.3	45°21.1
Enif	33°42.2	9°58.1
Al Na'ir	27°37.4	-46°51.7
Fomalhaut	15°18.4	-29°30.8
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 21 Sun	SHA	Mer.pass
Venus	32°58.2	11:44
Mars	309°09.4	17:18
Jupiter	42°35.6	11:04
Saturn	49°52.7	10:34

Feb 22 Mon	SHA	Mer.pass
Venus	31°44.8	11:45
Mars	308°34.3	17:16
Jupiter	42°21.6	11:01
Saturn	49°45.9	10:31

Feb 23 Tue	SHA	Mer.pass
Venus	30°31.7	11:46
Mars	307°59.1	17:15
Jupiter	42°07.7	10:58
Saturn	49°39.0	10:27

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		176°35.6	S10°33.4	76°28.4	11.3′	N22°36.6	5.8′	54.7′
1		191°35.6	32.5	90°58.7	11.3′	22°42.4	5.7′	54.7′
2		206°35.7	31.6	105°29.0	11.2′	22°48.0	5.6′	54.8′
3		221°35.8	·· 30.7	119°59.2	11.1′	22°53.6	5.5′	54.8′
4		236°35.9	29.8	134°29.3	11.1′	22°59.0	5.3′	54.8′
5		251°35.9	28.9	148°59.4	11.0′	23°04.4	5.2′	54.8′
6		266°36.0	S10°27.9	163°29.4	10.9′	N23°09.6	5.1′	54.8′
7		281°36.1	27.0	177°59.3	10.9′	23°14.7	5.0′	54.8′
8		296°36.2	26.1	192°29.2	10.8′	23°19.8	4.9′	54.9′
9		311°36.2	·· 25.2	206°59.0	10.7′	23°24.7	4.8′	54.9′
10		326°36.3	24.3	221°28.7	10.7′	23°29.5	4.7′	54.9′
11		341°36.4	23.4	235°58.4	10.6′	23°34.2	4.6′	54.9′
12		356°36.5	S10°22.5	250°28.0	10.5′	N23°38.8	4.5′	55.0′
13		11°36.5	21.6	264°57.5	10.5′	23°43.2	4.4′	55.0′
14		26°36.6	20.7	279°27.0	10.4′	23°47.6	4.2′	55.0′
15		41°36.7	·· 19.8	293°56.4	10.3′	23°51.8	4.1′	55.0′
16		56°36.8	18.9	308°25.7	10.3′	23°56.0	4.0′	55.0′
17		71°36.8	18.0	322°55.0	10.2′	24°00.0	3.9′	55.1′
18		86°36.9	S10°17.1	337°24.2	10.1′	N24°03.9	3.8′	55.1′
19		101°37.0	16.1	351°53.3	10.1′	24°07.7	3.7′	55.1′
20		116°37.1	15.2	6°22.4	10.0′	24°11.3	3.5′	55.1′
21		131°37.2	·· 14.3	20°51.4	10.0′	24°14.9	3.4′	55.2′
22		146°37.2	13.4	35°20.4	9.9′	24°18.3	3.3′	55.2′
23		161°37.3	12.5	49°49.3	9.8′	24°21.6	3.2′	55.2′
		SD = 16.2′	d = -0.9′	SD = 14.9′				

Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		176°37.4	S10°11.6	64°18.1	9.8′	N24°24.8	3.1′	55.2′
1		191°37.5	10.7	78°46.9	9.7′	24°27.9	2.9′	55.3′
2		206°37.5	09.8	93°15.6	9.7′	24°30.8	2.8′	55.3′
3		221°37.6	·· 08.9	107°44.3	9.6′	24°33.6	2.7′	55.3′
4		236°37.7	07.9	122°12.9	9.5′	24°36.3	2.6′	55.3′
5		251°37.8	07.0	136°41.4	9.5′	24°38.9	2.4′	55.4′
6		266°37.9	S10°06.1	151°09.9	9.4′	N24°41.4	2.3′	55.4′
7		281°38.0	05.2	165°38.3	9.4′	24°43.7	2.2′	55.4′
8		296°38.0	04.3	180°06.7	9.3′	24°45.9	2.1′	55.4′
9		311°38.1	·· 03.4	194°35.0	9.3′	24°47.9	1.9′	55.5′
10		326°38.2	02.5	209°03.3	9.2′	24°49.9	1.8′	55.5′
11		341°38.3	01.5	223°31.5	9.2′	24°51.7	1.7′	55.5′
12		356°38.4	S10°00.6	237°59.6	9.1′	N24°53.4	1.6′	55.5′
13		11°38.4	09°59.7	252°27.8	9.1′	24°54.9	1.4′	55.6′
14		26°38.5	58.8	266°55.8	9.0′	24°56.4	1.3′	55.6′
15		41°38.6	·· 57.9	281°23.8	9.0′	24°57.7	1.2′	55.6′
16		56°38.7	57.0	295°51.8	8.9′	24°58.8	1.0′	55.7′
17		71°38.8	56.1	310°19.7	8.9′	24°59.9	0.9′	55.7′
18		86°38.9	S09°55.1	324°47.5	8.8′	N25°00.8	0.8′	55.7′
19		101°38.9	54.2	339°15.4	8.8′	25°01.5	0.6′	55.7′
20		116°39.0	53.3	353°43.1	8.7′	25°02.2	0.5′	55.8′
21		131°39.1	·· 52.4	8°10.9	8.7′	25°02.7	0.4′	55.8′
22		146°39.2	51.5	22°38.6	8.6′	25°03.0	0.2′	55.8′
23		161°39.3	50.6	37°06.2	8.6′	25°03.3	0.1′	55.9′
		SD = 16.2′	d = -0.9′	SD = 15.1′				

Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		176°39.4	S09°49.6	51°33.8	8.6′	N25°03.4	-0.0′	55.9′
1		191°39.5	48.7	66°01.4	8.5′	25°03.3	-0.2′	55.9′
2		206°39.5	47.8	80°28.9	8.5′	25°03.1	-0.3′	55.9′
3		221°39.6	·· 46.9	94°56.4	8.4′	25°02.8	-0.5′	56.0′
4		236°39.7	46.0	109°23.8	8.4′	25°02.4	-0.6′	56.0′
5		251°39.8	45.1	123°51.2	8.4′	25°01.8	-0.7′	56.0′
6		266°39.9	S09°44.1	138°18.6	8.3′	N25°01.1	-0.9′	56.1′
7		281°40.0	43.2	152°46.0	8.3′	25°00.2	-1.0′	56.1′
8		296°40.1	42.3	167°13.3	8.3′	24°59.2	-1.1′	56.1′
9		311°40.2	·· 41.4	181°40.6	8.3′	24°58.0	-1.3′	56.2′
10		326°40.3	40.5	196°07.8	8.2′	24°56.8	-1.4′	56.2′
11		341°40.3	39.5	210°35.0	8.2′	24°55.3	-1.6′	56.2′
12		356°40.4	S09°38.6	225°02.2	8.2′	N24°53.8	-1.7′	56.3′
13		11°40.5	37.7	239°29.4	8.1′	24°52.1	-1.8′	56.3′
14		26°40.6	36.8	253°56.5	8.1′	24°50.2	-2.0′	56.3′
15		41°40.7	·· 35.8	268°23.7	8.1′	24°48.2	-2.1′	56.3′
16		56°40.8	34.9	282°50.8	8.1′	24°46.1	-2.3′	56.4′
17		71°40.9	34.0	297°17.8	8.1′	24°43.8	-2.4′	56.4′
18		86°41.0	S09°33.1	311°44.9	8.0′	N24°41.4	-2.6′	56.4′
19		101°41.1	32.2	326°11.9	8.0′	24°38.9	-2.7′	56.5′
20		116°41.2	31.2	340°38.9	8.0′	24°36.2	-2.8′	56.5′
21		131°41.2	·· 30.3	355°05.9	8.0′	24°33.3	-3.0′	56.5′
22		146°41.3	29.4	9°32.9	8.0′	24°30.4	-3.1′	56.6′
23		161°41.4	28.5	23°59.9	8.0′	24°27.2	-3.3′	56.6′
		SD = 16.2′	d = -0.9′	SD = 15.2′				

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

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 61-79%
21	13:38	13:34	12:14	19:34	07:08	
22	13:30	13:27	12:13	20:26	08:00	
23	13:22	13:18	12:13	21:20	08:53	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	154°05.4	183°24.2	S13°20.4	101°29.1	N20°28.2	195°59.3	S16°44.4	203°37.6	S18°43.5
1	169°07.9	198°23.7	19.4	116°30.1	28.6	211°01.2	44.2	218°39.8	43.4
2	184°10.3	213°23.1	18.3	131°31.1	28.9	226°03.1	44.1	233°42.0	43.3
3	199°12.8	228°22.6	·· 17.3	146°32.1	·· 29.3	241°04.9	·· 43.9	248°44.2	·· 43.3
4	214°15.2	243°22.0	16.3	161°33.0	29.7	256°06.8	43.7	263°46.4	43.2
5	229°17.7	258°21.4	15.2	176°34.0	30.0	271°08.7	43.6	278°48.5	43.1
6	244°20.2	273°20.9	S13°14.2	191°35.0	N20°30.4	286°10.6	S16°43.4	293°50.7	S18°43.1
7	259°22.6	288°20.3	13.1	206°36.0	30.7	301°12.5	43.2	308°52.9	43.0
8	274°25.1	303°19.7	12.1	221°37.0	31.1	316°14.4	43.1	323°55.1	42.9
9	289°27.6	318°19.2	·· 11.0	236°38.0	·· 31.4	331°16.3	·· 42.9	338°57.3	·· 42.9
10	304°30.0	333°18.6	10.0	251°39.0	31.8	346°18.2	42.7	353°59.5	42.8
11	319°32.5	348°18.1	08.9	266°39.9	32.1	1°20.0	42.6	9°01.6	42.7
12	334°35.0	3°17.5	S13°07.9	281°40.9	N20°32.5	16°21.9	S16°42.4	24°03.8	S18°42.7
13	349°37.4	18°17.0	06.8	296°41.9	32.8	31°23.8	42.2	39°06.0	42.6
14	4°39.9	33°16.4	05.8	311°42.9	33.2	46°25.7	42.1	54°08.2	42.5
15	19°42.3	48°15.8	·· 04.7	326°43.9	·· 33.5	61°27.6	·· 41.9	69°10.4	·· 42.5
16	34°44.8	63°15.3	03.7	341°44.9	33.9	76°29.5	41.7	84°12.6	42.4
17	49°47.3	78°14.7	02.6	356°45.8	34.2	91°31.4	41.6	99°14.7	42.3
18	64°49.7	93°14.2	S13°01.6	11°46.8	N20°34.6	106°33.3	S16°41.4	114°16.9	S18°42.3
19	79°52.2	108°13.6	13°00.5	26°47.8	34.9	121°35.2	41.2	129°19.1	42.2
20	94°54.7	123°13.1	12°59.5	41°48.8	35.3	136°37.0	41.1	144°21.3	42.1
21	109°57.1	138°12.5	·· 58.4	56°49.8	·· 35.6	151°38.9	·· 40.9	159°23.5	·· 42.1
22	124°59.6	153°11.9	57.4	71°50.8	36.0	166°40.8	40.7	174°25.7	42.0
23	140°02.1	168°11.4	56.3	86°51.7	36.3	181°42.7	40.6	189°27.8	41.9
Mer.pass.	13:41	ν -0.6′	d -1.0′	m -3.92	ν 1.0′	d 0.4′	m 0.83	ν 1.9′	d -0.2′ m -1.97	ν 2.2′	d -0.1′ m 0.72

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	155°04.5	183°10.8	S12°55.3	101°52.7	N20°36.7	196°44.6	S16°40.4	204°30.0	S18°41.9
1	170°07.0	198°10.3	54.2	116°53.7	37.0	211°46.5	40.2	219°32.2	41.8
2	185°09.5	213°09.7	53.1	131°54.7	37.4	226°48.4	40.1	234°34.4	41.7
3	200°11.9	228°09.2	·· 52.1	146°55.7	·· 37.7	241°50.3	·· 39.9	249°36.6	·· 41.7
4	215°14.4	243°08.6	51.0	161°56.6	38.1	256°52.2	39.7	264°38.8	41.6
5	230°16.8	258°08.1	50.0	176°57.6	38.4	271°54.1	39.6	279°41.0	41.5
6	245°19.3	273°07.5	S12°48.9	191°58.6	N20°38.8	286°55.9	S16°39.4	294°43.1	S18°41.5
7	260°21.8	288°07.0	47.9	206°59.6	39.1	301°57.8	39.2	309°45.3	41.4
8	275°24.2	303°06.4	46.8	222°00.6	39.5	316°59.7	39.1	324°47.5	41.3
9	290°26.7	318°05.9	·· 45.7	237°01.5	·· 39.8	332°01.6	·· 38.9	339°49.7	·· 41.3
10	305°29.2	333°05.3	44.7	252°02.5	40.2	347°03.5	38.7	354°51.9	41.2
11	320°31.6	348°04.8	43.6	267°03.5	40.5	2°05.4	38.6	9°54.1	41.1
12	335°34.1	3°04.2	S12°42.5	282°04.5	N20°40.9	17°07.3	S16°38.4	24°56.2	S18°41.1
13	350°36.6	18°03.7	41.5	297°05.5	41.2	32°09.2	38.2	39°58.4	41.0
14	5°39.0	33°03.1	40.4	312°06.4	41.6	47°11.1	38.1	55°00.6	40.9
15	20°41.5	48°02.6	·· 39.4	327°07.4	·· 41.9	62°13.0	·· 37.9	70°02.8	·· 40.9
16	35°44.0	63°02.0	38.3	342°08.4	42.3	77°14.8	37.7	85°05.0	40.8
17	50°46.4	78°01.5	37.2	357°09.4	42.6	92°16.7	37.6	100°07.2	40.7
18	65°48.9	93°01.0	S12°36.2	12°10.3	N20°43.0	107°18.6	S16°37.4	115°09.4	S18°40.6
19	80°51.3	108°00.4	35.1	27°11.3	43.3	122°20.5	37.2	130°11.5	40.6
20	95°53.8	122°59.9	34.0	42°12.3	43.7	137°22.4	37.1	145°13.7	40.5
21	110°56.3	137°59.3	·· 33.0	57°13.3	·· 44.0	152°24.3	·· 36.9	160°15.9	·· 40.4
22	125°58.7	152°58.8	31.9	72°14.3	44.4	167°26.2	36.7	175°18.1	40.4
23	141°01.2	167°58.2	30.8	87°15.2	44.7	182°28.1	36.6	190°20.3	40.3
Mer.pass.	13:37	ν -0.6′	d -1.1′	m -3.93	ν 1.0′	d 0.4′	m 0.85	ν 1.9′	d -0.2′ m -1.98	ν 2.2′	d -0.1′ m 0.72

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	156°03.7	182°57.7	S12°29.7	102°16.2	N20°45.0	197°30.0	S16°36.4	205°22.5	S18°40.2
1	171°06.1	197°57.2	28.7	117°17.2	45.4	212°31.9	36.2	220°24.7	40.2
2	186°08.6	212°56.6	27.6	132°18.2	45.7	227°33.8	36.1	235°26.8	40.1
3	201°11.1	227°56.1	·· 26.5	147°19.1	·· 46.1	242°35.7	·· 35.9	250°29.0	·· 40.0
4	216°13.5	242°55.5	25.5	162°20.1	46.4	257°37.5	35.7	265°31.2	40.0
5	231°16.0	257°55.0	24.4	177°21.1	46.8	272°39.4	35.6	280°33.4	39.9
6	246°18.4	272°54.4	S12°23.3	192°22.1	N20°47.1	287°41.3	S16°35.4	295°35.6	S18°39.8
7	261°20.9	287°53.9	22.2	207°23.0	47.5	302°43.2	35.2	310°37.8	39.8
8	276°23.4	302°53.4	21.2	222°24.0	47.8	317°45.1	35.1	325°40.0	39.7
9	291°25.8	317°52.8	·· 20.1	237°25.0	·· 48.2	332°47.0	·· 34.9	340°42.1	·· 39.6
10	306°28.3	332°52.3	19.0	252°26.0	48.5	347°48.9	34.7	355°44.3	39.6
11	321°30.8	347°51.8	17.9	267°26.9	48.8	2°50.8	34.6	10°46.5	39.5
12	336°33.2	2°51.2	S12°16.9	282°27.9	N20°49.2	17°52.7	S16°34.4	25°48.7	S18°39.4
13	351°35.7	17°50.7	15.8	297°28.9	49.5	32°54.6	34.2	40°50.9	39.4
14	6°38.2	32°50.1	14.7	312°29.8	49.9	47°56.5	34.1	55°53.1	39.3
15	21°40.6	47°49.6	·· 13.6	327°30.8	·· 50.2	62°58.4	·· 33.9	70°55.3	·· 39.2
16	36°43.1	62°49.1	12.5	342°31.8	50.6	78°00.3	33.7	85°57.4	39.2
17	51°45.6	77°48.5	11.5	357°32.8	50.9	93°02.1	33.6	100°59.6	39.1
18	66°48.0	92°48.0	S12°10.4	12°33.7	N20°51.2	108°04.0	S16°33.4	116°01.8	S18°39.0
19	81°50.5	107°47.5	09.3	27°34.7	51.6	123°05.9	33.2	131°04.0	39.0
20	96°52.9	122°46.9	08.2	42°35.7	51.9	138°07.8	33.1	146°06.2	38.9
21	111°55.4	137°46.4	·· 07.1	57°36.7	·· 52.3	153°09.7	·· 32.9	161°08.4	·· 38.8
22	126°57.9	152°45.9	06.1	72°37.6	52.6	168°11.6	32.8	176°10.6	38.8
23	142°00.3	167°45.3	05.0	87°38.6	52.9	183°13.5	32.6	191°12.8	38.7
Mer.pass.	13:34	ν -0.5′	d -1.1′	m -3.93	ν 1.0′	d 0.3′	m 0.86	ν 1.9′	d -0.2′ m -1.98	ν 2.2′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.8
Schedar	349°35.0	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°23.0	-57°08.1
Hamal	327°54.9	23°33.6
Polaris	315°37.5	89°21.4
Acamar	315°14.3	-40°13.6
Menkar	314°09.5	4°10.1
Mirfak	308°32.8	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.4	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.3	7°24.5
Canopus	263°53.5	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.4	-59°34.8
Suhail	222°48.1	-43°31.2
Miaplacidus	221°37.9	-69°48.3
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.9	14°27.2
Gienah	175°46.5	-17°39.5
Acrux	173°02.9	-63°12.8
Gacrux	171°54.6	-57°13.7
Alioth	166°15.4	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.3	49°12.3
Hadar	148°40.0	-60°28.2
Menkent	148°01.1	-36°28.3
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.2	-60°55.0
Kochab	137°19.5	74°03.9
Zuben'ubi	136°59.4	-16°07.7
Alphecca	126°06.4	26°38.4
Antares	112°19.7	-26°28.6
Atria	107°16.8	-69°03.6
Sabik	102°06.5	-15°45.0
Shaula	96°14.8	-37°07.0
Rasalhague	96°01.6	12°32.5
Eltanin	90°43.9	51°28.9
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.6	38°47.9
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.2	-56°40.0
Deneb	49°28.3	45°21.1
Enif	33°42.2	9°58.1
Al Na'ir	27°37.4	-46°51.6
Fomalhaut	15°18.4	-29°30.8
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°19.0

Feb 24 Wed	SHA	Mer.pass
Venus	29°18.9	11:47
Mars	307°23.7	17:13
Jupiter	41°53.9	10:55
Saturn	49°32.3	10:24

Feb 25 Thu	SHA	Mer.pass
Venus	28°06.3	11:48
Mars	306°48.2	17:11
Jupiter	41°40.1	10:52
Saturn	49°25.5	10:20

Feb 26 Fri	SHA	Mer.pass
Venus	26°54.0	11:49
Mars	306°12.5	17:10
Jupiter	41°26.3	10:49
Saturn	49°18.8	10:17

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°41.5	S09°27.5	38°26.8	7.9′	N24°24.0	-3.4′	56.6′
1	191°41.6	26.6	52°53.8	7.9′	24°20.6	-3.5′	56.7′
2	206°41.7	25.7	67°20.7	7.9′	24°17.0	-3.7′	56.7′
3	221°41.8	·· 24.8	81°47.6	7.9′	24°13.3	-3.8′	56.7′
4	236°41.9	23.9	96°14.5	7.9′	24°09.5	-4.0′	56.8′
5	251°42.0	22.9	110°41.4	7.9′	24°05.5	-4.1′	56.8′
6	266°42.1	S09°22.0	125°08.3	7.9′	N24°01.4	-4.3′	56.8′
7	281°42.2	21.1	139°35.2	7.9′	23°57.1	-4.4′	56.9′
8	296°42.3	20.1	154°02.1	7.9′	23°52.7	-4.5′	56.9′
9	311°42.4	·· 19.2	168°29.0	7.9′	23°48.2	-4.7′	56.9′
10	326°42.5	18.3	182°55.9	7.9′	23°43.5	-4.8′	57.0′
11	341°42.6	17.4	197°22.8	7.9′	23°38.7	-5.0′	57.0′
12	356°42.6	S09°16.4	211°49.6	7.9′	N23°33.7	-5.1′	57.0′
13	11°42.7	15.5	226°16.5	7.9′	23°28.6	-5.3′	57.1′
14	26°42.8	14.6	240°43.4	7.9′	23°23.3	-5.4′	57.1′
15	41°42.9	·· 13.7	255°10.3	7.9′	23°17.9	-5.5′	57.1′
16	56°43.0	12.7	269°37.2	7.9′	23°12.4	-5.7′	57.2′
17	71°43.1	11.8	284°04.1	7.9′	23°06.7	-5.8′	57.2′
18	86°43.2	S09°10.9	298°31.0	7.9′	N23°00.9	-6.0′	57.2′
19	101°43.3	10.0	312°57.9	7.9′	22°54.9	-6.1′	57.3′
20	116°43.4	09.0	327°24.9	7.9′	22°48.8	-6.2′	57.3′
21	131°43.5	·· 08.1	341°51.8	7.9′	22°42.6	-6.4′	57.3′
22	146°43.6	07.2	356°18.7	8.0′	22°36.2	-6.5′	57.4′
23	161°43.7	06.2	10°45.7	8.0′	22°29.7	-6.7′	57.4′
	SD = 16.2′	d = -0.9′	SD = 15.4′				

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°43.8	S09°05.3	25°12.7	8.0′	N22°23.1	-6.8′	57.4′
1	191°43.9	04.4	39°39.6	8.0′	22°16.3	-6.9′	57.5′
2	206°44.0	03.5	54°06.6	8.0′	22°09.3	-7.1′	57.5′
3	221°44.1	·· 02.5	68°33.7	8.0′	22°02.3	-7.2′	57.5′
4	236°44.2	01.6	83°00.7	8.1′	21°55.1	-7.3′	57.6′
5	251°44.3	09°00.7	97°27.7	8.1′	21°47.8	-7.5′	57.6′
6	266°44.4	S08°59.7	111°54.8	8.1′	N21°40.3	-7.6′	57.6′
7	281°44.5	58.8	126°21.9	8.1′	21°32.7	-7.7′	57.7′
8	296°44.6	57.9	140°49.0	8.1′	21°24.9	-7.9′	57.7′
9	311°44.7	·· 56.9	155°16.1	8.2′	21°17.1	-8.0′	57.7′
10	326°44.8	56.0	169°43.3	8.2′	21°09.1	-8.1′	57.8′
11	341°44.9	55.1	184°10.5	8.2′	21°00.9	-8.3′	57.8′
12	356°45.0	S08°54.1	198°37.7	8.2′	N20°52.7	-8.4′	57.8′
13	11°45.1	53.2	213°04.9	8.2′	20°44.3	-8.5′	57.9′
14	26°45.2	52.3	227°32.1	8.3′	20°35.7	-8.7′	57.9′
15	41°45.3	·· 51.3	241°59.4	8.3′	20°27.1	-8.8′	57.9′
16	56°45.4	50.4	256°26.7	8.3′	20°18.3	-8.9′	58.0′
17	71°45.5	49.5	270°54.0	8.3′	20°09.4	-9.0′	58.0′
18	86°45.6	S08°48.5	285°21.4	8.4′	N20°00.3	-9.2′	58.0′
19	101°45.7	47.6	299°48.7	8.4′	19°51.2	-9.3′	58.0′
20	116°45.8	46.7	314°16.2	8.4′	19°41.9	-9.4′	58.1′
21	131°45.9	·· 45.7	328°43.6	8.5′	19°32.5	-9.5′	58.1′
22	146°46.0	44.8	343°11.0	8.5′	19°22.9	-9.7′	58.1′
23	161°46.2	43.9	357°38.5	8.5′	19°13.3	-9.8′	58.2′
	SD = 16.2′	d = -0.9′	SD = 15.7′				

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°46.3	S08°42.9	12°06.1	8.6′	N19°03.5	-9.9′	58.2′
1	191°46.4	42.0	26°33.6	8.6′	18°53.6	-10.0′	58.2′
2	206°46.5	41.1	41°01.2	8.6′	18°43.6	-10.1′	58.3′
3	221°46.6	·· 40.1	55°28.8	8.6′	18°33.4	-10.3′	58.3′
4	236°46.7	39.2	69°56.5	8.7′	18°23.2	-10.4′	58.3′
5	251°46.8	38.3	84°24.2	8.7′	18°12.8	-10.5′	58.4′
6	266°46.9	S08°37.3	98°51.9	8.7′	N18°02.3	-10.6′	58.4′
7	281°47.0	36.4	113°19.6	8.8′	17°51.7	-10.7′	58.4′
8	296°47.1	35.5	127°47.4	8.8′	17°41.0	-10.8′	58.4′
9	311°47.2	·· 34.5	142°15.2	8.8′	17°30.1	-10.9′	58.5′
10	326°47.3	33.6	156°43.1	8.9′	17°19.2	-11.1′	58.5′
11	341°47.4	32.6	171°10.9	8.9′	17°08.1	-11.2′	58.5′
12	356°47.5	S08°31.7	185°38.9	8.9′	N16°57.0	-11.3′	58.6′
13	11°47.6	30.8	200°06.8	9.0′	16°45.7	-11.4′	58.6′
14	26°47.7	29.8	214°34.8	9.0′	16°34.3	-11.5′	58.6′
15	41°47.9	·· 28.9	229°02.8	9.1′	16°22.8	-11.6′	58.6′
16	56°48.0	28.0	243°30.9	9.1′	16°11.2	-11.7′	58.7′
17	71°48.1	27.0	257°58.9	9.1′	15°59.5	-11.8′	58.7′
18	86°48.2	S08°26.1	272°27.1	9.2′	N15°47.7	-11.9′	58.7′
19	101°48.3	25.1	286°55.2	9.2′	15°35.8	-12.0′	58.8′
20	116°48.4	24.2	301°23.4	9.2′	15°23.8	-12.1′	58.8′
21	131°48.5	·· 23.3	315°51.6	9.3′	15°11.7	-12.2′	58.8′
22	146°48.6	22.3	330°19.9	9.3′	14°59.5	-12.3′	58.8′
23	161°48.7	21.4	344°48.2	9.3′	14°47.2	-12.4′	58.9′
	SD = 16.1′	d = -0.9′	SD = 15.9′				

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°	05:32	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	07:21	17:07	17:55	18:50
62°	05:38	06:30	07:15	17:13	17:58	18:49
60°	05:39	06:27	07:10	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	17:29	18:05	18:46
52°	05:41	06:20	06:54	17:33	18:07	18:46
50°	05:41	06:19	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	19:02
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	19:31
35°	04:47	05:17	05:43	18:42	19:08	19:39
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	19:35	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°	03:16	04:17	05:02	19:22	20:07	21:07

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

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 13-15 87-98%
24	13:14	13:09	12:13	22:15	09:48	
25	13:05	13:00	12:13	23:10	10:43	
26	12:55	12:50	12:13	–:–	11:37	

DUT1 = UT1-UTC = -0.1690 sec ΔT = TT-UT1 = +69.3530 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	157°02.8	182°44.8	S12°03.9	102°39.6	N20°53.3	198°15.4	S16°32.4	206°14.9	S18°38.6
1	172°05.3	197°44.3	02.8	117°40.5	53.6	213°17.3	32.3	221°17.1	38.6
2	187°07.7	212°43.7	01.7	132°41.5	54.0	228°19.2	32.1	236°19.3	38.5
3	202°10.2	227°43.2	12°00.6	147°42.5	·· 54.3	243°21.1	·· 31.9	251°21.5	·· 38.4
4	217°12.7	242°42.7	11°59.6	162°43.4	54.7	258°23.0	31.8	266°23.7	38.4
5	232°15.1	257°42.2	58.5	177°44.4	55.0	273°24.9	31.6	281°25.9	38.3
6	247°17.6	272°41.6	S11°57.4	192°45.4	N20°55.3	288°26.8	S16°31.4	296°28.1	S18°38.2
7	262°20.1	287°41.1	56.3	207°46.4	55.7	303°28.6	31.3	311°30.3	38.2
8	277°22.5	302°40.6	55.2	222°47.3	56.0	318°30.5	31.1	326°32.4	38.1
9	292°25.0	317°40.0	·· 54.1	237°48.3	·· 56.4	333°32.4	·· 30.9	341°34.6	·· 38.0
10	307°27.4	332°39.5	53.0	252°49.3	56.7	348°34.3	30.8	356°36.8	38.0
11	322°29.9	347°39.0	51.9	267°50.2	57.0	3°36.2	30.6	11°39.0	37.9
12	337°32.4	2°38.5	S11°50.9	282°51.2	N20°57.4	18°38.1	S16°30.4	26°41.2	S18°37.8
13	352°34.8	17°37.9	49.8	297°52.2	57.7	33°40.0	30.3	41°43.4	37.8
14	7°37.3	32°37.4	48.7	312°53.1	58.0	48°41.9	30.1	56°45.6	37.7
15	22°39.8	47°36.9	·· 47.6	327°54.1	·· 58.4	63°43.8	·· 29.9	71°47.8	·· 37.7
16	37°42.2	62°36.4	46.5	342°55.1	58.7	78°45.7	29.8	86°49.9	37.6
17	52°44.7	77°35.8	45.4	357°56.0	59.1	93°47.6	29.6	101°52.1	37.5
18	67°47.2	92°35.3	S11°44.3	12°57.0	N20°59.4	108°49.5	S16°29.4	116°54.3	S18°37.5
19	82°49.6	107°34.8	43.2	27°58.0	20°59.7	123°51.4	29.3	131°56.5	37.4
20	97°52.1	122°34.3	42.1	42°58.9	21°00.1	138°53.3	29.1	146°58.7	37.3
21	112°54.5	137°33.7	·· 41.0	57°59.9	·· 00.4	153°55.2	·· 28.9	162°00.9	·· 37.3
22	127°57.0	152°33.2	39.9	73°00.9	00.7	168°57.1	28.8	177°03.1	37.2
23	142°59.5	167°32.7	38.8	88°01.8	01.1	183°59.0	28.6	192°05.3	37.1
Mer.pass.	13:30	ν -0.5′	d -1.1′	m -3.93	ν 1.0′	d 0.3′	m 0.88	ν 1.9′	d -0.2′ m -1.98	ν 2.2′	d -0.1′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	158°01.9	182°32.2	S11°37.7	103°02.8	N21°01.4	199°00.9	S16°28.4	207°07.5	S18°37.1
1	173°04.4	197°31.7	36.6	118°03.8	01.8	214°02.8	28.3	222°09.6	37.0
2	188°06.9	212°31.1	35.5	133°04.7	02.1	229°04.6	28.1	237°11.8	36.9
3	203°09.3	227°30.6	·· 34.4	148°05.7	·· 02.4	244°06.5	·· 27.9	252°14.0	·· 36.9
4	218°11.8	242°30.1	33.3	163°06.7	02.8	259°08.4	27.8	267°16.2	36.8
5	233°14.3	257°29.6	32.2	178°07.6	03.1	274°10.3	27.6	282°18.4	36.7
6	248°16.7	272°29.1	S11°31.1	193°08.6	N21°03.4	289°12.2	S16°27.4	297°20.6	S18°36.7
7	263°19.2	287°28.5	30.0	208°09.5	03.8	304°14.1	27.3	312°22.8	36.6
8	278°21.7	302°28.0	28.9	223°10.5	04.1	319°16.0	27.1	327°25.0	36.5
9	293°24.1	317°27.5	·· 27.8	238°11.5	·· 04.4	334°17.9	·· 26.9	342°27.2	·· 36.5
10	308°26.6	332°27.0	26.7	253°12.4	04.8	349°19.8	26.8	357°29.3	36.4
11	323°29.0	347°26.5	25.6	268°13.4	05.1	4°21.7	26.6	12°31.5	36.3
12	338°31.5	2°25.9	S11°24.5	283°14.4	N21°05.4	19°23.6	S16°26.4	27°33.7	S18°36.3
13	353°34.0	17°25.4	23.4	298°15.3	05.8	34°25.5	26.3	42°35.9	36.2
14	8°36.4	32°24.9	22.3	313°16.3	06.1	49°27.4	26.1	57°38.1	36.1
15	23°38.9	47°24.4	·· 21.2	328°17.2	·· 06.4	64°29.3	·· 25.9	72°40.3	·· 36.1
16	38°41.4	62°23.9	20.1	343°18.2	06.8	79°31.2	25.8	87°42.5	36.0
17	53°43.8	77°23.4	19.0	358°19.2	07.1	94°33.1	25.6	102°44.7	35.9
18	68°46.3	92°22.9	S11°17.9	13°20.1	N21°07.4	109°35.0	S16°25.4	117°46.9	S18°35.9
19	83°48.8	107°22.3	16.8	28°21.1	07.8	124°36.9	25.3	132°49.1	35.8
20	98°51.2	122°21.8	15.7	43°22.1	08.1	139°38.8	25.1	147°51.2	35.7
21	113°53.7	137°21.3	·· 14.6	58°23.0	·· 08.4	154°40.7	·· 24.9	162°53.4	·· 35.7
22	128°56.1	152°20.8	13.5	73°24.0	08.8	169°42.6	24.8	177°55.6	35.6
23	143°58.6	167°20.3	12.4	88°24.9	09.1	184°44.5	24.6	192°57.8	35.5
Mer.pass.	13:26	ν -0.5′	d -1.1′	m -3.93	ν 1.0′	d 0.3′	m 0.89	ν 1.9′	d -0.2′ m -1.98	ν 2.2′	d -0.1′ m 0.73

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	159°01.1	182°19.8	S11°11.2	103°25.9	N21°09.4	199°46.4	S16°24.4	208°00.0	S18°35.5
1	174°03.5	197°19.3	10.1	118°26.9	09.8	214°48.3	24.3	223°02.2	35.4
2	189°06.0	212°18.8	09.0	133°27.8	10.1	229°50.2	24.1	238°04.4	35.3
3	204°08.5	227°18.3	·· 07.9	148°28.8	·· 10.4	244°52.1	·· 23.9	253°06.6	·· 35.3
4	219°10.9	242°17.7	06.8	163°29.7	10.8	259°54.0	23.8	268°08.8	35.2
5	234°13.4	257°17.2	05.7	178°30.7	11.1	274°55.9	23.6	283°11.0	35.1
6	249°15.9	272°16.7	S11°04.6	193°31.7	N21°11.4	289°57.8	S16°23.4	298°13.2	S18°35.1
7	264°18.3	287°16.2	03.5	208°32.6	11.8	304°59.6	23.3	313°15.3	35.0
8	279°20.8	302°15.7	02.3	223°33.6	12.1	320°01.5	23.1	328°17.5	34.9
9	294°23.3	317°15.2	·· 01.2	238°34.5	·· 12.4	335°03.4	·· 22.9	343°19.7	·· 34.9
10	309°25.7	332°14.7	11°00.1	253°35.5	12.7	350°05.3	22.8	358°21.9	34.8
11	324°28.2	347°14.2	10°59.0	268°36.4	13.1	5°07.2	22.6	13°24.1	34.7
12	339°30.6	2°13.7	S10°57.9	283°37.4	N21°13.4	20°09.1	S16°22.4	28°26.3	S18°34.7
13	354°33.1	17°13.2	56.8	298°38.4	13.7	35°11.0	22.3	43°28.5	34.6
14	9°35.6	32°12.7	55.7	313°39.3	14.1	50°12.9	22.1	58°30.7	34.5
15	24°38.0	47°12.2	·· 54.5	328°40.3	·· 14.4	65°14.8	·· 21.9	73°32.9	·· 34.5
16	39°40.5	62°11.7	53.4	343°41.2	14.7	80°16.7	21.8	88°35.1	34.4
17	54°43.0	77°11.2	52.3	358°42.2	15.1	95°18.6	21.6	103°37.3	34.3
18	69°45.4	92°10.6	S10°51.2	13°43.1	N21°15.4	110°20.5	S16°21.4	118°39.5	S18°34.3
19	84°47.9	107°10.1	50.1	28°44.1	15.7	125°22.4	21.3	133°41.6	34.2
20	99°50.4	122°09.6	48.9	43°45.1	16.0	140°24.3	21.1	148°43.8	34.2
21	114°52.8	137°09.1	·· 47.8	58°46.0	·· 16.4	155°26.2	·· 20.9	163°46.0	·· 34.1
22	129°55.3	152°08.6	46.7	73°47.0	16.7	170°28.1	20.8	178°48.2	34.0
23	144°57.7	167°08.1	45.6	88°47.9	17.0	185°30.0	20.6	193°50.4	34.0
Mer.pass.	13:22	ν -0.5′	d -1.1′	m -3.93	ν 1.0′	d 0.3′	m 0.91	ν 1.9′	d -0.2′ m -1.98	ν 2.2′	d -0.1′ m 0.73

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.8
Schedar	349°35.0	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°23.0	-57°08.1
Hamal	327°54.9	23°33.6
Polaris	315°39.0	89°21.4
Acamar	315°14.4	-40°13.6
Menkar	314°09.5	4°10.1
Mirfak	308°32.8	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.4	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.7	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.5	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.4	-59°34.8
Suhail	222°48.2	-43°31.2
Miaplacidus	221°37.9	-69°48.3
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.9	14°27.2
Gienah	175°46.5	-17°39.5
Acrux	173°02.9	-63°12.8
Gacrux	171°54.5	-57°13.7
Alioth	166°15.4	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.2	49°12.3
Hadar	148°40.0	-60°28.2
Menkent	148°01.1	-36°28.3
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.2	-60°55.0
Kochab	137°19.4	74°03.9
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.4
Antares	112°19.7	-26°28.6
Atria	107°16.8	-69°03.6
Sabik	102°06.4	-15°45.0
Shaula	96°14.7	-37°07.0
Rasalhague	96°01.5	12°32.5
Eltanin	90°43.8	51°28.9
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.5	38°47.9
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.2	-56°40.0
Deneb	49°28.3	45°21.1
Enif	33°42.2	9°58.1
Al Na'ir	27°37.4	-46°51.6
Fomalhaut	15°18.4	-29°30.8
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°18.9

Feb 27 Sat	SHA	Mer.pass
Venus	25°42.0	11:49
Mars	305°36.8	17:08
Jupiter	41°12.6	10:46
Saturn	49°12.1	10:14

Feb 28 Sun	SHA	Mer.pass
Venus	24°30.2	11:50
Mars	305°00.9	17:07
Jupiter	40°58.9	10:43
Saturn	49°05.5	10:10

Mar 01 Mon	SHA	Mer.pass
Venus	23°18.7	11:51
Mars	304°24.8	17:05
Jupiter	40°45.3	10:40
Saturn	48°58.9	10:07

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°48.8	S08°20.4	359°16.5	9.4′	N14°34.8	-12.5′	58.9′
1	191°49.0	19.5	13°44.9	9.4′	14°22.3	-12.6′	58.9′
2	206°49.1	18.6	28°13.3	9.4′	14°09.8	-12.7′	58.9′
3	221°49.2	·· 17.6	42°41.7	9.5′	13°57.1	-12.8′	59.0′
4	236°49.3	16.7	57°10.1	9.5′	13°44.3	-12.8′	59.0′
5	251°49.4	15.7	71°38.6	9.5′	13°31.5	-12.9′	59.0′
6	266°49.5	S08°14.8	86°07.2	9.6′	N13°18.5	-13.0′	59.0′
7	281°49.6	13.9	100°35.7	9.6′	13°05.5	-13.1′	59.1′
8	296°49.7	12.9	115°04.3	9.6′	12°52.4	-13.2′	59.1′
9	311°49.8	·· 12.0	129°32.9	9.7′	12°39.2	-13.3′	59.1′
10	326°50.0	11.0	144°01.6	9.7′	12°26.0	-13.4′	59.1′
11	341°50.1	10.1	158°30.3	9.7′	12°12.6	-13.4′	59.2′
12	356°50.2	S08°09.1	172°59.0	9.7′	N11°59.2	-13.5′	59.2′
13	11°50.3	08.2	187°27.8	9.8′	11°45.7	-13.6′	59.2′
14	26°50.4	07.3	201°56.5	9.8′	11°32.1	-13.7′	59.2′
15	41°50.5	·· 06.3	216°25.3	9.8′	11°18.4	-13.7′	59.2′
16	56°50.6	05.4	230°54.2	9.9′	11°04.7	-13.8′	59.3′
17	71°50.8	04.4	245°23.1	9.9′	10°50.9	-13.9′	59.3′
18	86°50.9	S08°03.5	259°52.0	9.9′	N10°37.0	-13.9′	59.3′
19	101°51.0	02.5	274°20.9	10.0′	10°23.0	-14.0′	59.3′
20	116°51.1	01.6	288°49.8	10.0′	10°09.0	-14.1′	59.4′
21	131°51.2	08°00.7	303°18.8	10.0′	09°54.9	-14.1′	59.4′
22	146°51.3	07°59.7	317°47.8	10.0′	09°40.8	-14.2′	59.4′
23	161°51.4	58.8	332°16.9	10.1′	09°26.6	-14.3′	59.4′
	SD = 16.1′	d = -0.9′		SD = 16.1′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°51.6	S07°57.8	346°45.9	10.1′	N09°12.3	-14.3′	59.4′
1	191°51.7	56.9	1°15.0	10.1′	08°58.0	-14.4′	59.4′
2	206°51.8	55.9	15°44.1	10.1′	08°43.6	-14.4′	59.5′
3	221°51.9	·· 55.0	30°13.2	10.2′	08°29.2	-14.5′	59.5′
4	236°52.0	54.0	44°42.4	10.2′	08°14.6	-14.6′	59.5′
5	251°52.1	53.1	59°11.6	10.2′	08°00.1	-14.6′	59.5′
6	266°52.3	S07°52.2	73°40.8	10.2′	N07°45.5	-14.7′	59.5′
7	281°52.4	51.2	88°10.0	10.2′	07°30.8	-14.7′	59.6′
8	296°52.5	50.3	102°39.2	10.3′	07°16.1	-14.8′	59.6′
9	311°52.6	·· 49.3	117°08.5	10.3′	07°01.3	-14.8′	59.6′
10	326°52.7	48.4	131°37.8	10.3′	06°46.5	-14.9′	59.6′
11	341°52.9	47.4	146°07.1	10.3′	06°31.7	-14.9′	59.6′
12	356°53.0	S07°46.5	160°36.4	10.3′	N06°16.8	-14.9′	59.6′
13	11°53.1	45.5	175°05.7	10.3′	06°01.9	-15.0′	59.6′
14	26°53.2	44.6	189°35.0	10.4′	05°46.9	-15.0′	59.7′
15	41°53.3	·· 43.6	204°04.4	10.4′	05°31.9	-15.1′	59.7′
16	56°53.4	42.7	218°33.8	10.4′	05°16.8	-15.1′	59.7′
17	71°53.6	41.7	233°03.2	10.4′	05°01.7	-15.1′	59.7′
18	86°53.7	S07°40.8	247°32.6	10.4′	N04°46.6	-15.2′	59.7′
19	101°53.8	39.8	262°02.0	10.4′	04°31.4	-15.2′	59.7′
20	116°53.9	38.9	276°31.4	10.4′	04°16.3	-15.2′	59.7′
21	131°54.0	·· 37.9	291°00.9	10.4′	04°01.0	-15.2′	59.7′
22	146°54.2	37.0	305°30.3	10.5′	03°45.8	-15.3′	59.8′
23	161°54.3	36.0	319°59.8	10.5′	03°30.5	-15.3′	59.8′
	SD = 16.1′	d = -0.9′		SD = 16.2′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°54.4	S07°35.1	334°29.2	10.5′	N03°15.2	-15.3′	59.8′
1	191°54.5	34.1	348°58.7	10.5′	02°59.9	-15.3′	59.8′
2	206°54.7	33.2	3°28.2	10.5′	02°44.6	-15.4′	59.8′
3	221°54.8	·· 32.2	17°57.6	10.5′	02°29.2	-15.4′	59.8′
4	236°54.9	31.3	32°27.1	10.5′	02°13.8	-15.4′	59.8′
5	251°55.0	30.3	46°56.6	10.5′	01°58.5	-15.4′	59.8′
6	266°55.1	S07°29.4	61°26.1	10.5′	N01°43.0	-15.4′	59.8′
7	281°55.3	28.4	75°55.6	10.5′	01°27.6	-15.4′	59.8′
8	296°55.4	27.5	90°25.1	10.5′	01°12.2	-15.4′	59.9′
9	311°55.5	·· 26.5	104°54.6	10.5′	00°56.8	-15.4′	59.9′
10	326°55.6	25.6	119°24.1	10.5′	00°41.3	-15.5′	59.9′
11	341°55.8	24.6	133°53.6	10.5′	00°25.8	-15.5′	59.9′
12	356°55.9	S07°23.7	148°23.1	10.5′	N00°10.4	-15.5′	59.9′
13	11°56.0	22.7	162°52.6	10.5′	S00°05.1	15.5′	59.9′
14	26°56.1	21.8	177°22.1	10.5′	00°20.5	15.5′	59.9′
15	41°56.3	·· 20.8	191°51.5	10.5′	00°36.0	15.5′	59.9′
16	56°56.4	19.9	206°21.0	10.5′	00°51.5	15.5′	59.9′
17	71°56.5	18.9	220°50.5	10.5′	01°06.9	15.5′	59.9′
18	86°56.6	S07°18.0	235°19.9	10.4′	S01°22.4	15.5′	59.9′
19	101°56.8	17.0	249°49.4	10.4′	01°37.9	15.4′	59.9′
20	116°56.9	16.1	264°18.8	10.4′	01°53.3	15.4′	59.9′
21	131°57.0	·· 15.1	278°48.2	10.4′	02°08.7	15.4′	59.9′
22	146°57.1	14.2	293°17.7	10.4′	02°24.2	15.4′	59.9′
23	161°57.3	13.2	307°47.1	10.4′	02°39.6	15.4′	59.9′
	SD = 16.1′	d = -0.9′		SD = 16.3′			

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

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 16-18 100-96%
27	12:45	12:39	12:13	00:03	12:29	
28	12:34	12:28	12:12	00:55	13:20	
01	12:22	12:16	12:12	01:46	14:11	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	160°00.2	182°07.6	S10°44.5	103°48.9	N21°17.3	200°31.9	S16°20.4	208°52.6	S18°33.9
1	175°02.7	197°07.1	43.3	118°49.8	17.7	215°33.8	20.3	223°54.8	33.8
2	190°05.1	212°06.6	42.2	133°50.8	18.0	230°35.7	20.1	238°57.0	33.8
3	205°07.6	227°06.1	·· 41.1	148°51.7	·· 18.3	245°37.6	·· 19.9	253°59.2	·· 33.7
4	220°10.1	242°05.6	40.0	163°52.7	18.7	260°39.5	19.8	269°01.4	33.6
5	235°12.5	257°05.1	38.8	178°53.6	19.0	275°41.4	19.6	284°03.6	33.6
6	250°15.0	272°04.6	S10°37.7	193°54.6	N21°19.3	290°43.3	S16°19.4	299°05.8	S18°33.5
7	265°17.5	287°04.1	36.6	208°55.6	19.6	305°45.2	19.3	314°08.0	33.4
8	280°19.9	302°03.6	35.5	223°56.5	20.0	320°47.1	19.1	329°10.2	33.4
9	295°22.4	317°03.1	·· 34.3	238°57.5	·· 20.3	335°49.0	·· 18.9	344°12.3	·· 33.3
10	310°24.9	332°02.6	33.2	253°58.4	20.6	350°50.9	18.8	359°14.5	33.2
11	325°27.3	347°02.1	32.1	268°59.4	20.9	5°52.8	18.6	14°16.7	33.2
12	340°29.8	2°01.6	S10°31.0	284°00.3	N21°21.3	20°54.7	S16°18.4	29°18.9	S18°33.1
13	355°32.2	17°01.1	29.8	299°01.3	21.6	35°56.6	18.3	44°21.1	33.0
14	10°34.7	32°00.7	28.7	314°02.2	21.9	50°58.5	18.1	59°23.3	33.0
15	25°37.2	47°00.2	·· 27.6	329°03.2	·· 22.2	66°00.4	·· 17.9	74°25.5	·· 32.9
16	40°39.6	61°59.7	26.4	344°04.1	22.6	81°02.3	17.8	89°27.7	32.8
17	55°42.1	76°59.2	25.3	359°05.1	22.9	96°04.2	17.6	104°29.9	32.8
18	70°44.6	91°58.7	S10°24.2	14°06.0	N21°23.2	111°06.1	S16°17.4	119°32.1	S18°32.7
19	85°47.0	106°58.2	23.1	29°07.0	23.5	126°08.0	17.3	134°34.3	32.6
20	100°49.5	121°57.7	21.9	44°07.9	23.8	141°09.9	17.1	149°36.5	32.6
21	115°52.0	136°57.2	·· 20.8	59°08.9	·· 24.2	156°11.8	·· 16.9	164°38.7	·· 32.5
22	130°54.4	151°56.7	19.7	74°09.8	24.5	171°13.7	16.8	179°40.9	32.4
23	145°56.9	166°56.2	18.5	89°10.8	24.8	186°15.6	16.6	194°43.1	32.4
Mer.pass.	13:18	ν -0.5′	d -1.1′	m -3.93	ν 1.0′	d 0.3′	m 0.92	ν 1.9′	d -0.2′ m -1.98	ν 2.2′	d -0.1′ m 0.73

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	160°59.4	181°55.7	S10°17.4	104°11.7	N21°25.1	201°17.5	S16°16.4	209°45.2	S18°32.3
1	176°01.8	196°55.2	16.3	119°12.7	25.5	216°19.4	16.3	224°47.4	32.3
2	191°04.3	211°54.7	15.1	134°13.6	25.8	231°21.3	16.1	239°49.6	32.2
3	206°06.7	226°54.2	·· 14.0	149°14.6	·· 26.1	246°23.2	·· 15.9	254°51.8	·· 32.1
4	221°09.2	241°53.7	12.8	164°15.5	26.4	261°25.1	15.8	269°54.0	32.1
5	236°11.7	256°53.3	11.7	179°16.5	26.7	276°27.0	15.6	284°56.2	32.0
6	251°14.1	271°52.8	S10°10.6	194°17.4	N21°27.1	291°28.9	S16°15.4	299°58.4	S18°31.9
7	266°16.6	286°52.3	09.4	209°18.4	27.4	306°30.8	15.3	315°00.6	31.9
8	281°19.1	301°51.8	08.3	224°19.3	27.7	321°32.7	15.1	330°02.8	31.8
9	296°21.5	316°51.3	·· 07.2	239°20.3	·· 28.0	336°34.6	·· 14.9	345°05.0	·· 31.7
10	311°24.0	331°50.8	06.0	254°21.2	28.3	351°36.5	14.8	0°07.2	31.7
11	326°26.5	346°50.3	04.9	269°22.2	28.7	6°38.4	14.6	15°09.4	31.6
12	341°28.9	1°49.8	S10°03.7	284°23.1	N21°29.0	21°40.4	S16°14.4	30°11.6	S18°31.5
13	356°31.4	16°49.3	02.6	299°24.1	29.3	36°42.3	14.3	45°13.8	31.5
14	11°33.8	31°48.9	01.5	314°25.0	29.6	51°44.2	14.1	60°16.0	31.4
15	26°36.3	46°48.4	10°00.3	329°26.0	·· 29.9	66°46.1	·· 13.9	75°18.2	·· 31.3
16	41°38.8	61°47.9	09°59.2	344°26.9	30.3	81°48.0	13.8	90°20.4	31.3
17	56°41.2	76°47.4	58.0	359°27.8	30.6	96°49.9	13.6	105°22.6	31.2
18	71°43.7	91°46.9	S09°56.9	14°28.8	N21°30.9	111°51.8	S16°13.4	120°24.8	S18°31.1
19	86°46.2	106°46.4	55.8	29°29.7	31.2	126°53.7	13.3	135°27.0	31.1
20	101°48.6	121°45.9	54.6	44°30.7	31.5	141°55.6	13.1	150°29.2	31.0
21	116°51.1	136°45.5	·· 53.5	59°31.6	·· 31.9	156°57.5	·· 12.9	165°31.3	·· 30.9
22	131°53.6	151°45.0	52.3	74°32.6	32.2	171°59.4	12.8	180°33.5	30.9
23	146°56.0	166°44.5	51.2	89°33.5	32.5	187°01.3	12.6	195°35.7	30.8
Mer.pass.	13:14	ν -0.5′	d -1.1′	m -3.93	ν 0.9′	d 0.3′	m 0.94	ν 1.9′	d -0.2′ m -1.99	ν 2.2′	d -0.1′ m 0.73

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	161°58.5	181°44.0	S09°50.0	104°34.5	N21°32.8	202°03.2	S16°12.4	210°37.9	S18°30.8
1	177°01.0	196°43.5	48.9	119°35.4	33.1	217°05.1	12.3	225°40.1	30.7
2	192°03.4	211°43.0	47.8	134°36.3	33.4	232°07.0	12.1	240°42.3	30.6
3	207°05.9	226°42.6	·· 46.6	149°37.3	·· 33.8	247°08.9	·· 11.9	255°44.5	·· 30.6
4	222°08.3	241°42.1	45.5	164°38.2	34.1	262°10.8	11.8	270°46.7	30.5
5	237°10.8	256°41.6	44.3	179°39.2	34.4	277°12.7	11.6	285°48.9	30.4
6	252°13.3	271°41.1	S09°43.2	194°40.1	N21°34.7	292°14.6	S16°11.4	300°51.1	S18°30.4
7	267°15.7	286°40.6	42.0	209°41.1	35.0	307°16.5	11.3	315°53.3	30.3
8	282°18.2	301°40.2	40.9	224°42.0	35.3	322°18.4	11.1	330°55.5	30.2
9	297°20.7	316°39.7	·· 39.7	239°43.0	·· 35.6	337°20.3	·· 10.9	345°57.7	·· 30.2
10	312°23.1	331°39.2	38.6	254°43.9	36.0	352°22.2	10.8	0°59.9	30.1
11	327°25.6	346°38.7	37.4	269°44.8	36.3	7°24.1	10.6	16°02.1	30.0
12	342°28.1	1°38.2	S09°36.3	284°45.8	N21°36.6	22°26.0	S16°10.4	31°04.3	S18°30.0
13	357°30.5	16°37.8	35.1	299°46.7	36.9	37°27.9	10.3	46°06.5	29.9
14	12°33.0	31°37.3	34.0	314°47.7	37.2	52°29.8	10.1	61°08.7	29.8
15	27°35.5	46°36.8	·· 32.8	329°48.6	·· 37.5	67°31.7	·· 09.9	76°10.9	·· 29.8
16	42°37.9	61°36.3	31.7	344°49.5	37.8	82°33.7	09.8	91°13.1	29.7
17	57°40.4	76°35.9	30.5	359°50.5	38.2	97°35.6	09.6	106°15.3	29.6
18	72°42.8	91°35.4	S09°29.4	14°51.4	N21°38.5	112°37.5	S16°09.4	121°17.5	S18°29.6
19	87°45.3	106°34.9	28.2	29°52.4	38.8	127°39.4	09.3	136°19.7	29.5
20	102°47.8	121°34.4	27.1	44°53.3	39.1	142°41.3	09.1	151°21.9	29.5
21	117°50.2	136°34.0	·· 25.9	59°54.2	·· 39.4	157°43.2	·· 08.9	166°24.1	·· 29.4
22	132°52.7	151°33.5	24.7	74°55.2	39.7	172°45.1	08.8	181°26.3	29.3
23	147°55.2	166°33.0	23.6	89°56.1	40.0	187°47.0	08.6	196°28.5	29.3
Mer.pass.	13:10	ν -0.5′	d -1.1′	m -3.93	ν 0.9′	d 0.3′	m 0.95	ν 1.9′	d -0.2′ m -1.99	ν 2.2′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.8
Schedar	349°35.0	56°39.2
Diphda	348°50.7	-17°52.5
Achernar	335°23.0	-57°08.1
Hamal	327°54.9	23°33.6
Polaris	315°40.4	89°21.4
Acamar	315°14.4	-40°13.6
Menkar	314°09.6	4°10.1
Mirfak	308°32.9	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.4	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.6	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.4	-59°34.8
Suhail	222°48.2	-43°31.2
Miaplacidus	221°37.9	-69°48.3
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.8	14°27.2
Gienah	175°46.5	-17°39.5
Acrux	173°02.9	-63°12.8
Gacrux	171°54.5	-57°13.7
Alioth	166°15.3	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.2	49°12.3
Hadar	148°40.0	-60°28.2
Menkent	148°01.0	-36°28.3
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.2	-60°55.1
Kochab	137°19.4	74°03.9
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.4
Antares	112°19.7	-26°28.6
Atria	107°16.7	-69°03.6
Sabik	102°06.4	-15°45.0
Shaula	96°14.7	-37°07.0
Rasalhague	96°01.5	12°32.5
Eltanin	90°43.8	51°28.9
Kaus Aust.	83°36.8	-34°22.4
Vega	80°35.5	38°47.9
Nunki	75°51.8	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.2	-56°39.9
Deneb	49°28.3	45°21.1
Enif	33°42.2	9°58.1
Al Na'ir	27°37.4	-46°51.6
Fomalhaut	15°18.4	-29°30.8
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°18.9

Mar 02 Tue	SHA	Mer.pass
Venus	22°07.4	11:52
Mars	303°48.7	17:04
Jupiter	40°31.7	10:37
Saturn	48°52.4	10:03

Mar 03 Wed	SHA	Mer.pass
Venus	20°56.4	11:53
Mars	303°12.4	17:02
Jupiter	40°18.2	10:33
Saturn	48°45.9	10:00

Mar 04 Thu	SHA	Mer.pass
Venus	19°45.5	11:53
Mars	302°36.0	17:01
Jupiter	40°04.7	10:30
Saturn	48°39.4	09:56

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°57.4	S07°12.2	322°16.4	10.4′	S02°55.0	15.4′	59.9′
1	191°57.5	11.3	336°45.8	10.4′	03°10.3	15.4′	59.9′
2	206°57.6	10.3	351°15.2	10.3′	03°25.7	15.3′	59.9′
3	221°57.8	·· 09.4	5°44.5	10.3′	03°41.1	15.3′	59.9′
4	236°57.9	08.4	20°13.8	10.3′	03°56.4	15.3′	59.9′
5	251°58.0	07.5	34°43.1	10.3′	04°11.7	15.3′	59.9′
6	266°58.1	S07°06.5	49°12.4	10.3′	S04°27.0	15.3′	59.9′
7	281°58.3	05.6	63°41.7	10.2′	04°42.2	15.2′	59.9′
8	296°58.4	04.6	78°10.9	10.2′	04°57.4	15.2′	59.9′
9	311°58.5	·· 03.7	92°40.2	10.2′	05°12.6	15.2′	59.9′
10	326°58.7	02.7	107°09.4	10.2′	05°27.8	15.1′	59.9′
11	341°58.8	01.7	121°38.5	10.2′	05°42.9	15.1′	59.9′
12	356°58.9	S07°00.8	136°07.7	10.1′	S05°58.0	15.1′	59.9′
13	11°59.0	06°59.8	150°36.8	10.1′	06°13.1	15.0′	59.9′
14	26°59.2	58.9	165°05.9	10.1′	06°28.1	15.0′	59.9′
15	41°59.3	·· 57.9	179°35.0	10.0′	06°43.1	14.9′	59.9′
16	56°59.4	57.0	194°04.0	10.0′	06°58.0	14.9′	59.9′
17	71°59.6	56.0	208°33.1	10.0′	07°12.9	14.9′	59.9′
18	86°59.7	S06°55.0	223°02.0	10.0′	S07°27.8	14.8′	59.9′
19	101°59.8	54.1	237°31.0	9.9′	07°42.6	14.8′	59.9′
20	117°00.0	53.1	251°59.9	9.9′	07°57.4	14.7′	59.9′
21	132°00.1	·· 52.2	266°28.8	9.9′	08°12.1	14.7′	59.9′
22	147°00.2	51.2	280°57.7	9.8′	08°26.8	14.6′	59.9′
23	162°00.3	50.3	295°26.5	9.8′	08°41.4	14.6′	59.9′
	SD = 16.1′	d = -1.0′	SD = 16.3′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°00.5	S06°49.3	309°55.3	9.8′	S08°56.0	14.5′	59.9′
1	192°00.6	48.3	324°24.0	9.7′	09°10.5	14.5′	59.9′
2	207°00.7	47.4	338°52.8	9.7′	09°25.0	14.4′	59.9′
3	222°00.9	·· 46.4	353°21.4	9.6′	09°39.4	14.3′	59.9′
4	237°01.0	45.5	7°50.1	9.6′	09°53.7	14.3′	59.9′
5	252°01.1	44.5	22°18.7	9.6′	10°08.0	14.2′	59.8′
6	267°01.3	S06°43.5	36°47.3	9.5′	S10°22.2	14.2′	59.8′
7	282°01.4	42.6	51°15.8	9.5′	10°36.4	14.1′	59.8′
8	297°01.5	41.6	65°44.3	9.4′	10°50.5	14.0′	59.8′
9	312°01.7	·· 40.7	80°12.7	9.4′	11°04.5	14.0′	59.8′
10	327°01.8	39.7	94°41.1	9.4′	11°18.4	13.9′	59.8′
11	342°01.9	38.7	109°09.5	9.3′	11°32.3	13.8′	59.8′
12	357°02.1	S06°37.8	123°37.8	9.3′	S11°46.1	13.7′	59.8′
13	12°02.2	36.8	138°06.0	9.2′	11°59.9	13.7′	59.8′
14	27°02.3	35.9	152°34.3	9.2′	12°13.6	13.6′	59.8′
15	42°02.5	·· 34.9	167°02.5	9.1′	12°27.1	13.5′	59.8′
16	57°02.6	33.9	181°30.6	9.1′	12°40.7	13.4′	59.7′
17	72°02.7	33.0	195°58.7	9.0′	12°54.1	13.4′	59.7′
18	87°02.9	S06°32.0	210°26.7	9.0′	S13°07.5	13.3′	59.7′
19	102°03.0	31.1	224°54.7	8.9′	13°20.7	13.2′	59.7′
20	117°03.1	30.1	239°22.7	8.9′	13°33.9	13.1′	59.7′
21	132°03.3	·· 29.1	253°50.6	8.8′	13°47.0	13.0′	59.7′
22	147°03.4	28.2	268°18.4	8.8′	14°00.1	12.9′	59.7′
23	162°03.5	27.2	282°46.2	8.7′	14°13.0	12.8′	59.7′
	SD = 16.1′	d = -1.0′	SD = 16.3′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°03.7	S06°26.3	297°13.9	8.7′	S14°25.8	12.8′	59.7′
1	192°03.8	25.3	311°41.6	8.6′	14°38.6	12.7′	59.6′
2	207°04.0	24.3	326°09.3	8.6′	14°51.2	12.6′	59.6′
3	222°04.1	·· 23.4	340°36.9	8.5′	15°03.8	12.5′	59.6′
4	237°04.2	22.4	355°04.4	8.5′	15°16.3	12.4′	59.6′
5	252°04.4	21.4	9°31.9	8.4′	15°28.7	12.3′	59.6′
6	267°04.5	S06°20.5	23°59.4	8.4′	S15°40.9	12.2′	59.6′
7	282°04.6	19.5	38°26.8	8.3′	15°53.1	12.1′	59.6′
8	297°04.8	18.6	52°54.1	8.3′	16°05.2	12.0′	59.6′
9	312°04.9	·· 17.6	67°21.4	8.2′	16°17.2	11.9′	59.5′
10	327°05.1	16.6	81°48.6	8.2′	16°29.1	11.8′	59.5′
11	342°05.2	15.7	96°15.8	8.1′	16°40.8	11.7′	59.5′
12	357°05.3	S06°14.7	110°42.9	8.1′	S16°52.5	11.6′	59.5′
13	12°05.5	13.7	125°10.0	8.0′	17°04.1	11.4′	59.5′
14	27°05.6	12.8	139°37.0	8.0′	17°15.5	11.3′	59.5′
15	42°05.7	·· 11.8	154°04.0	7.9′	17°26.8	11.2′	59.5′
16	57°05.9	10.8	168°30.9	7.9′	17°38.1	11.1′	59.4′
17	72°06.0	09.9	182°57.7	7.8′	17°49.2	11.0′	59.4′
18	87°06.2	S06°08.9	197°24.5	7.7′	S18°00.2	10.9′	59.4′
19	102°06.3	07.9	211°51.3	7.7′	18°11.1	10.8′	59.4′
20	117°06.4	07.0	226°18.0	7.6′	18°21.9	10.7′	59.4′
21	132°06.6	·· 06.0	240°44.6	7.6′	18°32.5	10.5′	59.4′
22	147°06.7	05.0	255°11.2	7.5′	18°43.0	10.4′	59.3′
23	162°06.9	04.1	269°37.7	7.5′	18°53.5	10.3′	59.3′
	SD = 16.1′	d = -1.0′	SD = 16.3′				

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	06:16	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	19:22	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°	03:58	04:47	05:25	18:57	19:36	20:23
58°	03:49	04:41	05:22	19:00	19:41	20:33
S 60°	03:37	04:34	05:18	19:04	19:48	20:44

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

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 19-21 90-73%
02	12:10	12:04	12:12	02:36	15:02	
03	11:58	11:52	12:12	03:28	15:54	
04	11:45	11:39	12:12	04:20	16:48	

DUT1 = UT1-UTC = -0.1719 sec ΔT = TT-UT1 = +69.3559 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	162°57.6	181°32.5	S09°22.4	104°57.1	N21°40.4	202°48.9	S16°08.4	211°30.7	S18°29.2
1	178°00.1	196°32.1	21.3	119°58.0	40.7	217°50.8	08.3	226°32.9	29.1
2	193°02.6	211°31.6	20.1	134°58.9	41.0	232°52.7	08.1	241°35.1	29.1
3	208°05.0	226°31.1	·· 19.0	149°59.9	·· 41.3	247°54.6	·· 07.9	256°37.3	·· 29.0
4	223°07.5	241°30.6	17.8	165°00.8	41.6	262°56.5	07.8	271°39.5	28.9
5	238°09.9	256°30.2	16.7	180°01.8	41.9	277°58.4	07.6	286°41.7	28.9
6	253°12.4	271°29.7	S09°15.5	195°02.7	N21°42.2	293°00.3	S16°07.4	301°43.9	S18°28.8
7	268°14.9	286°29.2	14.3	210°03.6	42.5	308°02.2	07.3	316°46.1	28.7
8	283°17.3	301°28.7	13.2	225°04.6	42.8	323°04.1	07.1	331°48.3	28.7
9	298°19.8	316°28.3	·· 12.0	240°05.5	·· 43.2	338°06.0	·· 06.9	346°50.5	·· 28.6
10	313°22.3	331°27.8	10.9	255°06.5	43.5	353°08.0	06.8	1°52.7	28.5
11	328°24.7	346°27.3	09.7	270°07.4	43.8	8°09.9	06.6	16°54.9	28.5
12	343°27.2	1°26.9	S09°08.5	285°08.3	N21°44.1	23°11.8	S16°06.4	31°57.1	S18°28.4
13	358°29.7	16°26.4	07.4	300°09.3	44.4	38°13.7	06.3	46°59.3	28.4
14	13°32.1	31°25.9	06.2	315°10.2	44.7	53°15.6	06.1	62°01.4	28.3
15	28°34.6	46°25.5	·· 05.1	330°11.1	·· 45.0	68°17.5	·· 05.9	77°03.6	·· 28.2
16	43°37.1	61°25.0	03.9	345°12.1	45.3	83°19.4	05.8	92°05.8	28.2
17	58°39.5	76°24.5	02.7	0°13.0	45.6	98°21.3	05.6	107°08.0	28.1
18	73°42.0	91°24.0	S09°01.6	15°13.9	N21°45.9	113°23.2	S16°05.4	122°10.2	S18°28.0
19	88°44.4	106°23.6	09°00.4	30°14.9	46.2	128°25.1	05.3	137°12.4	28.0
20	103°46.9	121°23.1	08°59.2	45°15.8	46.6	143°27.0	05.1	152°14.6	27.9
21	118°49.4	136°22.6	·· 58.1	60°16.8	·· 46.9	158°28.9	·· 05.0	167°16.8	·· 27.8
22	133°51.8	151°22.2	56.9	75°17.7	47.2	173°30.8	04.8	182°19.0	27.8
23	148°54.3	166°21.7	55.7	90°18.6	47.5	188°32.7	04.6	197°21.2	27.7
Mer.pass.	13:06	ν -0.5′	d -1.2′	m -3.93	ν 0.9′	d 0.3′	m 0.97	ν 1.9′	d -0.2′ m -1.99	ν 2.2′	d -0.1′ m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	163°56.8	181°21.2	S08°54.6	105°19.6	N21°47.8	203°34.7	S16°04.5	212°23.4	S18°27.6
1	178°59.2	196°20.8	53.4	120°20.5	48.1	218°36.6	04.3	227°25.6	27.6
2	194°01.7	211°20.3	52.2	135°21.4	48.4	233°38.5	04.1	242°27.8	27.5
3	209°04.2	226°19.9	·· 51.1	150°22.4	·· 48.7	248°40.4	·· 04.0	257°30.0	·· 27.5
4	224°06.6	241°19.4	49.9	165°23.3	49.0	263°42.3	03.8	272°32.2	27.4
5	239°09.1	256°18.9	48.7	180°24.2	49.3	278°44.2	03.6	287°34.4	27.3
6	254°11.6	271°18.5	S08°47.6	195°25.2	N21°49.6	293°46.1	S16°03.5	302°36.6	S18°27.3
7	269°14.0	286°18.0	46.4	210°26.1	49.9	308°48.0	03.3	317°38.8	27.2
8	284°16.5	301°17.5	45.2	225°27.0	50.2	323°49.9	03.1	332°41.0	27.1
9	299°18.9	316°17.1	·· 44.1	240°28.0	·· 50.5	338°51.8	·· 03.0	347°43.2	·· 27.1
10	314°21.4	331°16.6	42.9	255°28.9	50.8	353°53.7	02.8	2°45.5	27.0
11	329°23.9	346°16.1	41.7	270°29.8	51.1	8°55.6	02.6	17°47.7	26.9
12	344°26.3	1°15.7	S08°40.6	285°30.8	N21°51.5	23°57.6	S16°02.5	32°49.9	S18°26.9
13	359°28.8	16°15.2	39.4	300°31.7	51.8	38°59.5	02.3	47°52.1	26.8
14	14°31.3	31°14.8	38.2	315°32.6	52.1	54°01.4	02.1	62°54.3	26.7
15	29°33.7	46°14.3	·· 37.0	330°33.5	·· 52.4	69°03.3	·· 02.0	77°56.5	·· 26.7
16	44°36.2	61°13.8	35.9	345°34.5	52.7	84°05.2	01.8	92°58.7	26.6
17	59°38.7	76°13.4	34.7	0°35.4	53.0	99°07.1	01.6	108°00.9	26.6
18	74°41.1	91°12.9	S08°33.5	15°36.3	N21°53.3	114°09.0	S16°01.5	123°03.1	S18°26.5
19	89°43.6	106°12.5	32.4	30°37.3	53.6	129°10.9	01.3	138°05.3	26.4
20	104°46.1	121°12.0	31.2	45°38.2	53.9	144°12.8	01.1	153°07.5	26.4
21	119°48.5	136°11.5	·· 30.0	60°39.1	·· 54.2	159°14.7	·· 01.0	168°09.7	·· 26.3
22	134°51.0	151°11.1	28.8	75°40.1	54.5	174°16.6	00.8	183°11.9	26.2
23	149°53.4	166°10.6	27.7	90°41.0	54.8	189°18.6	00.6	198°14.1	26.2
Mer.pass.	13:02	ν -0.5′	d -1.2′	m -3.93	ν 0.9′	d 0.3′	m 0.98	ν 1.9′	d -0.2′ m -1.99	ν 2.2′	d -0.1′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	164°55.9	181°10.2	S08°26.5	105°41.9	N21°55.1	204°20.5	S16°00.5	213°16.3	S18°26.1
1	179°58.4	196°09.7	25.3	120°42.9	55.4	219°22.4	00.3	228°18.5	26.0
2	195°00.8	211°09.3	24.1	135°43.8	55.7	234°24.3	00.1	243°20.7	26.0
3	210°03.3	226°08.8	·· 23.0	150°44.7	·· 56.0	249°26.2	16°00.0	258°22.9	·· 25.9
4	225°05.8	241°08.3	21.8	165°45.6	56.3	264°28.1	15°59.8	273°25.1	25.9
5	240°08.2	256°07.9	20.6	180°46.6	56.6	279°30.0	59.6	288°27.3	25.8
6	255°10.7	271°07.4	S08°19.4	195°47.5	N21°56.9	294°31.9	S15°59.5	303°29.5	S18°25.7
7	270°13.2	286°07.0	18.2	210°48.4	57.2	309°33.8	59.3	318°31.7	25.7
8	285°15.6	301°06.5	17.1	225°49.4	57.5	324°35.8	59.1	333°33.9	25.6
9	300°18.1	316°06.1	·· 15.9	240°50.3	·· 57.8	339°37.7	·· 59.0	348°36.1	·· 25.5
10	315°20.5	331°05.6	14.7	255°51.2	58.1	354°39.6	58.8	3°38.3	25.5
11	330°23.0	346°05.2	13.5	270°52.1	58.4	9°41.5	58.6	18°40.5	25.4
12	345°25.5	1°04.7	S08°12.3	285°53.1	N21°58.7	24°43.4	S15°58.5	33°42.7	S18°25.3
13	0°27.9	16°04.2	11.2	300°54.0	59.0	39°45.3	58.3	48°44.9	25.3
14	15°30.4	31°03.8	10.0	315°54.9	59.3	54°47.2	58.1	63°47.1	25.2
15	30°32.9	46°03.3	·· 08.8	330°55.8	·· 59.6	69°49.1	·· 58.0	78°49.3	·· 25.2
16	45°35.3	61°02.9	07.6	345°56.8	21°59.9	84°51.0	57.8	93°51.5	25.1
17	60°37.8	76°02.4	06.4	0°57.7	22°00.2	99°53.0	57.6	108°53.7	25.0
18	75°40.3	91°02.0	S08°05.3	15°58.6	N22°00.5	114°54.9	S15°57.5	123°55.9	S18°25.0
19	90°42.7	106°01.5	04.1	30°59.5	00.8	129°56.8	57.3	138°58.1	24.9
20	105°45.2	121°01.1	02.9	46°00.5	01.1	144°58.7	57.1	154°00.3	24.8
21	120°47.7	136°00.6	·· 01.7	61°01.4	·· 01.4	160°00.6	·· 57.0	169°02.5	·· 24.8
22	135°50.1	151°00.2	08°00.5	76°02.3	01.7	175°02.5	56.8	184°04.7	24.7
23	150°52.6	165°59.7	07°59.3	91°03.2	02.0	190°04.4	56.6	199°06.9	24.6
Mer.pass.	12:58	ν -0.5′	d -1.2′	m -3.93	ν 0.9′	d 0.3′	m 0.99	ν 1.9′	d -0.2′ m -1.99	ν 2.2′	d -0.1′ m 0.73

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.7
Schedar	349°35.0	56°39.1
Diphda	348°50.7	-17°52.5
Achernar	335°23.1	-57°08.1
Hamal	327°54.9	23°33.6
Polaris	315°41.5	89°21.4
Acamar	315°14.4	-40°13.6
Menkar	314°09.6	4°10.1
Mirfak	308°32.9	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.9
Capella	280°26.5	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.8	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.6	-52°42.7
Sirius	258°28.8	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.4	-59°34.8
Suhail	222°48.2	-43°31.2
Miaplacidus	221°38.0	-69°48.3
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.8	14°27.2
Gienah	175°46.5	-17°39.6
Acrux	173°02.8	-63°12.8
Gacrux	171°54.5	-57°13.8
Alioth	166°15.3	55°50.6
Spica	158°25.3	-11°16.3
Alkaid	152°54.2	49°12.3
Hadar	148°39.9	-60°28.2
Menkent	148°01.0	-36°28.3
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.1	-60°55.1
Kochab	137°19.3	74°03.9
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.4
Antares	112°19.6	-26°28.6
Atria	107°16.7	-69°03.6
Sabik	102°06.4	-15°45.0
Shaula	96°14.7	-37°07.0
Rasalhague	96°01.5	12°32.5
Eltanin	90°43.8	51°28.9
Kaus Aust.	83°36.8	-34°22.4
Vega	80°35.5	38°47.9
Nunki	75°51.8	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.2	-56°39.9
Deneb	49°28.3	45°21.1
Enif	33°42.2	9°58.1
Al Na'ir	27°37.3	-46°51.6
Fomalhaut	15°18.4	-29°30.8
Scheat	13°48.6	28°11.7
Markab	13°33.3	15°18.9

Mar 05 Fri	SHA	Mer.pass
Venus	18°34.9	11:54
Mars	301°59.4	16:59
Jupiter	39°51.3	10:27
Saturn	48°33.0	09:53

Mar 06 Sat	SHA	Mer.pass
Venus	17°24.5	11:55
Mars	301°22.8	16:58
Jupiter	39°37.9	10:24
Saturn	48°26.7	09:49

Mar 07 Sun	SHA	Mer.pass
Venus	16°14.3	11:56
Mars	300°46.0	16:56
Jupiter	39°24.6	10:21
Saturn	48°20.4	09:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°07.0	S06°03.1	284°04.2	7.4′	S19°03.8	10.2′	59.3′
1	192°07.1	02.2	298°30.6	7.4′	19°13.9	10.0′	59.3′
2	207°07.3	01.2	312°57.0	7.3′	19°24.0	9.9′	59.3′
3	222°07.4	06°00.2	327°23.3	7.3′	19°33.9	9.8′	59.3′
4	237°07.6	05°59.3	341°49.6	7.2′	19°43.7	9.7′	59.2′
5	252°07.7	58.3	356°15.8	7.2′	19°53.4	9.5′	59.2′
6	267°07.8	S05°57.3	10°42.0	7.1′	S20°02.9	9.4′	59.2′
7	282°08.0	56.4	25°08.1	7.1′	20°12.3	9.3′	59.2′
8	297°08.1	55.4	39°34.2	7.0′	20°21.6	9.2′	59.2′
9	312°08.3	·· 54.4	54°00.2	7.0′	20°30.8	9.0′	59.2′
10	327°08.4	53.5	68°26.2	6.9′	20°39.8	8.9′	59.1′
11	342°08.6	52.5	82°52.1	6.9′	20°48.7	8.8′	59.1′
12	357°08.7	S05°51.5	97°18.0	6.8′	S20°57.4	8.6′	59.1′
13	12°08.8	50.5	111°43.8	6.8′	21°06.0	8.5′	59.1′
14	27°09.0	49.6	126°09.6	6.7′	21°14.5	8.3′	59.1′
15	42°09.1	·· 48.6	140°35.3	6.7′	21°22.8	8.2′	59.1′
16	57°09.3	47.6	155°01.0	6.6′	21°31.1	8.1′	59.0′
17	72°09.4	46.7	169°26.6	6.6′	21°39.1	7.9′	59.0′
18	87°09.6	S05°45.7	183°52.2	6.5′	S21°47.0	7.8′	59.0′
19	102°09.7	44.7	198°17.8	6.5′	21°54.8	7.6′	59.0′
20	117°09.8	43.8	212°43.3	6.5′	22°02.5	7.5′	59.0′
21	132°10.0	·· 42.8	227°08.7	6.4′	22°10.0	7.4′	58.9′
22	147°10.1	41.8	241°34.2	6.4′	22°17.3	7.2′	58.9′
23	162°10.3	40.9	255°59.5	6.3′	22°24.5	7.1′	58.9′
	SD = 16.1′	d = -1.0′		SD = 16.2′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°10.4	S05°39.9	270°24.9	6.3′	S22°31.6	6.9′	58.9′
1	192°10.6	38.9	284°50.2	6.3′	22°38.5	6.8′	58.9′
2	207°10.7	38.0	299°15.5	6.2′	22°45.3	6.6′	58.8′
3	222°10.9	·· 37.0	313°40.7	6.2′	22°51.9	6.5′	58.8′
4	237°11.0	36.0	328°05.9	6.2′	22°58.3	6.3′	58.8′
5	252°11.1	35.0	342°31.0	6.1′	23°04.7	6.2′	58.8′
6	267°11.3	S05°34.1	356°56.2	6.1′	S23°10.8	6.0′	58.8′
7	282°11.4	33.1	11°21.3	6.1′	23°16.9	5.9′	58.8′
8	297°11.6	32.1	25°46.3	6.0′	23°22.7	5.7′	58.7′
9	312°11.7	·· 31.2	40°11.4	6.0′	23°28.4	5.6′	58.7′
10	327°11.9	30.2	54°36.4	6.0′	23°34.0	5.4′	58.7′
11	342°12.0	29.2	69°01.3	6.0′	23°39.4	5.3′	58.7′
12	357°12.2	S05°28.3	83°26.3	5.9′	S23°44.7	5.1′	58.7′
13	12°12.3	27.3	97°51.2	5.9′	23°49.8	4.9′	58.6′
14	27°12.5	26.3	112°16.1	5.9′	23°54.7	4.8′	58.6′
15	42°12.6	·· 25.3	126°41.0	5.9′	23°59.5	4.6′	58.6′
16	57°12.8	24.4	141°05.9	5.8′	24°04.1	4.5′	58.6′
17	72°12.9	23.4	155°30.7	5.8′	24°08.6	4.3′	58.6′
18	87°13.0	S05°22.4	169°55.5	5.8′	S24°12.9	4.2′	58.5′
19	102°13.2	21.5	184°20.3	5.8′	24°17.1	4.0′	58.5′
20	117°13.3	20.5	198°45.1	5.8′	24°21.1	3.8′	58.5′
21	132°13.5	·· 19.5	213°09.9	5.8′	24°25.0	3.7′	58.5′
22	147°13.6	18.5	227°34.7	5.8′	24°28.7	3.5′	58.5′
23	162°13.8	17.6	241°59.4	5.7′	24°32.2	3.4′	58.4′
	SD = 16.1′	d = -1.0′		SD = 16.1′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°13.9	S05°16.6	256°24.2	5.7′	S24°35.6	3.2′	58.4′
1	192°14.1	15.6	270°48.9	5.7′	24°38.8	3.1′	58.4′
2	207°14.2	14.6	285°13.6	5.7′	24°41.8	2.9′	58.4′
3	222°14.4	·· 13.7	299°38.4	5.7′	24°44.7	2.7′	58.3′
4	237°14.5	12.7	314°03.1	5.7′	24°47.5	2.6′	58.3′
5	252°14.7	11.7	328°27.8	5.7′	24°50.0	2.4′	58.3′
6	267°14.8	S05°10.8	342°52.5	5.7′	S24°52.5	2.3′	58.3′
7	282°15.0	09.8	357°17.2	5.7′	24°54.7	2.1′	58.3′
8	297°15.1	08.8	11°42.0	5.7′	24°56.8	1.9′	58.2′
9	312°15.3	·· 07.8	26°06.7	5.7′	24°58.8	1.8′	58.2′
10	327°15.4	06.9	40°31.4	5.7′	25°00.5	1.6′	58.2′
11	342°15.6	05.9	54°56.2	5.8′	25°02.1	1.5′	58.2′
12	357°15.7	S05°04.9	69°20.9	5.8′	S25°03.6	1.3′	58.2′
13	12°15.9	03.9	83°45.7	5.8′	25°04.9	1.1′	58.1′
14	27°16.0	03.0	98°10.4	5.8′	25°06.0	1.0′	58.1′
15	42°16.2	·· 02.0	112°35.2	5.8′	25°07.0	0.8′	58.1′
16	57°16.3	01.0	127°00.0	5.8′	25°07.8	0.7′	58.1′
17	72°16.5	05°00.0	141°24.9	5.8′	25°08.5	0.5′	58.1′
18	87°16.6	S04°59.1	155°49.7	5.9′	S25°09.0	0.3′	58.0′
19	102°16.8	58.1	170°14.6	5.9′	25°09.4	0.2′	58.0′
20	117°16.9	57.1	184°39.4	5.9′	25°09.5	0.0′	58.0′
21	132°17.1	·· 56.1	199°04.4	5.9′	25°09.6	-0.1′	58.0′
22	147°17.2	55.2	213°29.3	6.0′	25°09.4	-0.3′	58.0′
23	162°17.4	54.2	227°54.2	6.0′	25°09.1	-0.4′	57.9′
	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	07:10	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	06:50	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	06:02	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	06:00	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	05:58	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	18:23	18:45	19:11
30°	05:02	05:30	05:54	18:27	18:52	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	19:55
52°	04:21	05:02	05:37	18:44	19:19	20:00
54°	04:14	04:58	05:35	18:47	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	19:33	20:23
S 60°	03:47	04:42	05:26	18:55	19:38	20:33

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

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 22-24 62-40%
05	11:32	11:25	12:11	05:16	17:44	
06	11:18	11:11	12:11	06:13	18:42	
07	11:04	10:57	12:11	07:11	19:41	

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	165°55.0	180°59.3	S07°58.2	106°04.2	N22°02.3	205°06.3	S15°56.5	214°09.1	S18°24.6
1	180°57.5	195°58.8	57.0	121°05.1	02.6	220°08.2	56.3	229°11.4	24.5
2	196°00.0	210°58.4	55.8	136°06.0	02.9	235°10.2	56.1	244°13.6	24.5
3	211°02.4	225°57.9	·· 54.6	151°06.9	·· 03.2	250°12.1	·· 56.0	259°15.8	·· 24.4
4	226°04.9	240°57.5	53.4	166°07.9	03.5	265°14.0	55.8	274°18.0	24.3
5	241°07.4	255°57.0	52.2	181°08.8	03.8	280°15.9	55.6	289°20.2	24.3
6	256°09.8	270°56.6	S07°51.0	196°09.7	N22°04.0	295°17.8	S15°55.5	304°22.4	S18°24.2
7	271°12.3	285°56.1	49.9	211°10.6	04.3	310°19.7	55.3	319°24.6	24.1
8	286°14.8	300°55.7	48.7	226°11.6	04.6	325°21.6	55.1	334°26.8	24.1
9	301°17.2	315°55.2	·· 47.5	241°12.5	·· 04.9	340°23.6	·· 55.0	349°29.0	·· 24.0
10	316°19.7	330°54.8	46.3	256°13.4	05.2	355°25.5	54.8	4°31.2	23.9
11	331°22.2	345°54.3	45.1	271°14.3	05.5	10°27.4	54.6	19°33.4	23.9
12	346°24.6	0°53.9	S07°43.9	286°15.2	N22°05.8	25°29.3	S15°54.5	34°35.6	S18°23.8
13	1°27.1	15°53.5	42.7	301°16.2	06.1	40°31.2	54.3	49°37.8	23.8
14	16°29.5	30°53.0	41.5	316°17.1	06.4	55°33.1	54.1	64°40.0	23.7
15	31°32.0	45°52.6	·· 40.3	331°18.0	·· 06.7	70°35.0	·· 54.0	79°42.2	·· 23.6
16	46°34.5	60°52.1	39.2	346°18.9	07.0	85°36.9	53.8	94°44.4	23.6
17	61°36.9	75°51.7	38.0	1°19.9	07.3	100°38.9	53.6	109°46.6	23.5
18	76°39.4	90°51.2	S07°36.8	16°20.8	N22°07.6	115°40.8	S15°53.5	124°48.8	S18°23.4
19	91°41.9	105°50.8	35.6	31°21.7	07.9	130°42.7	53.3	139°51.0	23.4
20	106°44.3	120°50.3	34.4	46°22.6	08.2	145°44.6	53.1	154°53.2	23.3
21	121°46.8	135°49.9	·· 33.2	61°23.5	·· 08.5	160°46.5	·· 53.0	169°55.5	·· 23.3
22	136°49.3	150°49.5	32.0	76°24.5	08.7	175°48.4	52.8	184°57.7	23.2
23	151°51.7	165°49.0	30.8	91°25.4	09.0	190°50.3	52.6	199°59.9	23.1
	Mer.pass. 12:54	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.01	ν 1.9′	d -0.2′ m -2.00	ν 2.2′	d -0.1′ m 0.73
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	166°54.2	180°48.6	S07°29.6	106°26.3	N22°09.3	205°52.3	S15°52.5	215°02.1	S18°23.1
1	181°56.7	195°48.1	28.4	121°27.2	09.6	220°54.2	52.3	230°04.3	23.0
2	196°59.1	210°47.7	27.2	136°28.1	09.9	235°56.1	52.2	245°06.5	22.9
3	212°01.6	225°47.2	·· 26.0	151°29.1	·· 10.2	250°58.0	·· 52.0	260°08.7	·· 22.9
4	227°04.0	240°46.8	24.8	166°30.0	10.5	265°59.9	51.8	275°10.9	22.8
5	242°06.5	255°46.4	23.7	181°30.9	10.8	281°01.8	51.7	290°13.1	22.7
6	257°09.0	270°45.9	S07°22.5	196°31.8	N22°11.1	296°03.8	S15°51.5	305°15.3	S18°22.7
7	272°11.4	285°45.5	21.3	211°32.7	11.4	311°05.7	51.3	320°17.5	22.6
8	287°13.9	300°45.0	20.1	226°33.6	11.7	326°07.6	51.2	335°19.7	22.6
9	302°16.4	315°44.6	·· 18.9	241°34.6	·· 11.9	341°09.5	·· 51.0	350°21.9	·· 22.5
10	317°18.8	330°44.2	17.7	256°35.5	12.2	356°11.4	50.8	5°24.1	22.4
11	332°21.3	345°43.7	16.5	271°36.4	12.5	11°13.3	50.7	20°26.3	22.4
12	347°23.8	0°43.3	S07°15.3	286°37.3	N22°12.8	26°15.2	S15°50.5	35°28.6	S18°22.3
13	2°26.2	15°42.8	14.1	301°38.2	13.1	41°17.2	50.3	50°30.8	22.2
14	17°28.7	30°42.4	12.9	316°39.2	13.4	56°19.1	50.2	65°33.0	22.2
15	32°31.1	45°42.0	·· 11.7	331°40.1	·· 13.7	71°21.0	·· 50.0	80°35.2	·· 22.1
16	47°33.6	60°41.5	10.5	346°41.0	14.0	86°22.9	49.8	95°37.4	22.1
17	62°36.1	75°41.1	09.3	1°41.9	14.3	101°24.8	49.7	110°39.6	22.0
18	77°38.5	90°40.7	S07°08.1	16°42.8	N22°14.5	116°26.7	S15°49.5	125°41.8	S18°21.9
19	92°41.0	105°40.2	06.9	31°43.7	14.8	131°28.7	49.3	140°44.0	21.9
20	107°43.5	120°39.8	05.7	46°44.7	15.1	146°30.6	49.2	155°46.2	21.8
21	122°45.9	135°39.3	·· 04.5	61°45.6	·· 15.4	161°32.5	·· 49.0	170°48.4	·· 21.7
22	137°48.4	150°38.9	03.3	76°46.5	15.7	176°34.4	48.8	185°50.6	21.7
23	152°50.9	165°38.5	02.1	91°47.4	16.0	191°36.3	48.7	200°52.8	21.6
	Mer.pass. 12:50	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.02	ν 1.9′	d -0.2′ m -2.00	ν 2.2′	d -0.1′ m 0.73
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	167°53.3	180°38.0	S07°00.9	106°48.3	N22°16.3	206°38.2	S15°48.5	215°55.0	S18°21.6
1	182°55.8	195°37.6	06°59.7	121°49.2	16.5	221°40.2	48.3	230°57.3	21.5
2	197°58.3	210°37.2	58.5	136°50.1	16.8	236°42.1	48.2	245°59.5	21.4
3	213°00.7	225°36.7	·· 57.3	151°51.1	·· 17.1	251°44.0	·· 48.0	261°01.7	·· 21.4
4	228°03.2	240°36.3	56.1	166°52.0	17.4	266°45.9	47.8	276°03.9	21.3
5	243°05.6	255°35.9	54.9	181°52.9	17.7	281°47.8	47.7	291°06.1	21.2
6	258°08.1	270°35.4	S06°53.7	196°53.8	N22°18.0	296°49.8	S15°47.5	306°08.3	S18°21.2
7	273°10.6	285°35.0	52.5	211°54.7	18.3	311°51.7	47.3	321°10.5	21.1
8	288°13.0	300°34.6	51.3	226°55.6	18.5	326°53.6	47.2	336°12.7	21.1
9	303°15.5	315°34.1	·· 50.1	241°56.5	·· 18.8	341°55.5	·· 47.0	351°14.9	·· 21.0
10	318°18.0	330°33.7	48.9	256°57.5	19.1	356°57.4	46.8	6°17.1	20.9
11	333°20.4	345°33.3	47.7	271°58.4	19.4	11°59.3	46.7	21°19.3	20.9
12	348°22.9	0°32.8	S06°46.5	286°59.3	N22°19.7	27°01.3	S15°46.5	36°21.6	S18°20.8
13	3°25.4	15°32.4	45.2	302°00.2	20.0	42°03.2	46.3	51°23.8	20.7
14	18°27.8	30°32.0	44.0	317°01.1	20.2	57°05.1	46.2	66°26.0	20.7
15	33°30.3	45°31.5	·· 42.8	332°02.0	·· 20.5	72°07.0	·· 46.0	81°28.2	·· 20.6
16	48°32.8	60°31.1	41.6	347°02.9	20.8	87°08.9	45.9	96°30.4	20.6
17	63°35.2	75°30.7	40.4	2°03.8	21.1	102°10.9	45.7	111°32.6	20.5
18	78°37.7	90°30.2	S06°39.2	17°04.7	N22°21.4	117°12.8	S15°45.5	126°34.8	S18°20.4
19	93°40.1	105°29.8	38.0	32°05.7	21.7	132°14.7	45.4	141°37.0	20.4
20	108°42.6	120°29.4	36.8	47°06.6	21.9	147°16.6	45.2	156°39.2	20.3
21	123°45.1	135°28.9	·· 35.6	62°07.5	·· 22.2	162°18.5	·· 45.0	171°41.4	·· 20.2
22	138°47.5	150°28.5	34.4	77°08.4	22.5	177°20.5	44.9	186°43.7	20.2
23	153°50.0	165°28.1	33.2	92°09.3	22.8	192°22.4	44.7	201°45.9	20.1
	Mer.pass. 12:46	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.04	ν 1.9′	d -0.2′ m -2.00	ν 2.2′	d -0.1′ m 0.73

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.7
Schedar	349°35.0	56°39.1
Diphda	348°50.7	-17°52.5
Achernar	335°23.1	-57°08.1
Hamal	327°54.9	23°33.6
Polaris	315°42.6	89°21.4
Acamar	315°14.4	-40°13.6
Menkar	314°09.6	4°10.1
Mirfak	308°32.9	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.5	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.6	-52°42.7
Sirius	258°28.9	-16°44.9
Adhara	255°08.1	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.5	-59°34.8
Suhail	222°48.2	-43°31.2
Miaplacidus	221°38.0	-69°48.4
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.8	14°27.2
Gienah	175°46.5	-17°39.6
Acrux	173°02.8	-63°12.8
Gacrux	171°54.5	-57°13.8
Alioth	166°15.3	55°50.6
Spica	158°25.3	-11°16.3
Alkaid	152°54.2	49°12.3
Hadar	148°39.9	-60°28.3
Menkent	148°01.0	-36°28.3
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.1	-60°55.1
Kochab	137°19.2	74°03.9
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.4
Antares	112°19.6	-26°28.6
Atria	107°16.6	-69°03.6
Sabik	102°06.4	-15°45.0
Shaula	96°14.6	-37°07.0
Rasalhague	96°01.5	12°32.5
Eltanin	90°43.7	51°28.9
Kaus Aust.	83°36.8	-34°22.4
Vega	80°35.5	38°47.9
Nunki	75°51.8	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.1	-56°39.9
Deneb	49°28.2	45°21.1
Enif	33°42.1	9°58.1
Al Na'ir	27°37.3	-46°51.6
Fomalhaut	15°18.3	-29°30.8
Scheat	13°48.5	28°11.7
Markab	13°33.3	15°18.9

Mar 08 Mon	SHA	Mer.pass
Venus	15°04.2	11:56
Mars	300°09.1	16:55
Jupiter	39°11.3	10:18
Saturn	48°14.1	09:42

Mar 09 Tue	SHA	Mer.pass
Venus	13°54.4	11:57
Mars	299°32.1	16:53
Jupiter	38°58.1	10:15
Saturn	48°07.9	09:38

Mar 10 Wed	SHA	Mer.pass
Venus	12°44.7	11:58
Mars	298°55.0	16:52
Jupiter	38°44.9	10:12
Saturn	48°01.7	09:35

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.5	S04°53.2	242°19.2	6.0′	S25°08.7	-0.6′	57.9′
1	192°17.7	52.2	256°44.3	6.0′	25°08.1	-0.8′	57.9′
2	207°17.9	51.3	271°09.3	6.1′	25°07.3	-0.9′	57.9′
3	222°18.0	·· 50.3	285°34.4	6.1′	25°06.4	-1.1′	57.9′
4	237°18.2	49.3	299°59.5	6.2′	25°05.3	-1.2′	57.8′
5	252°18.3	48.3	314°24.7	6.2′	25°04.1	-1.4′	57.8′
6	267°18.5	S04°47.4	328°49.8	6.2′	S25°02.7	-1.5′	57.8′
7	282°18.6	46.4	343°15.1	6.3′	25°01.2	-1.7′	57.8′
8	297°18.8	45.4	357°40.3	6.3′	24°59.5	-1.8′	57.7′
9	312°18.9	·· 44.4	12°05.7	6.4′	24°57.7	-2.0′	57.7′
10	327°19.1	43.5	26°31.0	6.4′	24°55.7	-2.1′	57.7′
11	342°19.2	42.5	40°56.4	6.4′	24°53.5	-2.3′	57.7′
12	357°19.4	S04°41.5	55°21.9	6.5′	S24°51.2	-2.4′	57.7′
13	12°19.5	40.5	69°47.4	6.5′	24°48.8	-2.6′	57.6′
14	27°19.7	39.6	84°12.9	6.6′	24°46.2	-2.7′	57.6′
15	42°19.9	·· 38.6	98°38.5	6.6′	24°43.4	-2.9′	57.6′
16	57°20.0	37.6	113°04.2	6.7′	24°40.6	-3.0′	57.6′
17	72°20.2	36.6	127°29.9	6.8′	24°37.5	-3.2′	57.6′
18	87°20.3	S04°35.6	141°55.6	6.8′	S24°34.3	-3.3′	57.5′
19	102°20.5	34.7	156°21.4	6.9′	24°31.0	-3.5′	57.5′
20	117°20.6	33.7	170°47.3	6.9′	24°27.5	-3.6′	57.5′
21	132°20.8	·· 32.7	185°13.2	7.0′	24°23.9	-3.8′	57.5′
22	147°20.9	31.7	199°39.2	7.0′	24°20.1	-3.9′	57.5′
23	162°21.1	30.8	214°05.3	7.1′	24°16.2	-4.1′	57.4′
	SD = 16.1′	d = -1.0′	SD = 15.8′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°21.2	S04°29.8	228°31.4	7.2′	S24°12.1	-4.2′	57.4′
1	192°21.4	28.8	242°57.5	7.2′	24°07.9	-4.3′	57.4′
2	207°21.6	27.8	257°23.8	7.3′	24°03.6	-4.5′	57.4′
3	222°21.7	·· 26.8	271°50.1	7.4′	23°59.1	-4.6′	57.3′
4	237°21.9	25.9	286°16.4	7.4′	23°54.5	-4.8′	57.3′
5	252°22.0	24.9	300°42.9	7.5′	23°49.8	-4.9′	57.3′
6	267°22.2	S04°23.9	315°09.4	7.6′	S23°44.9	-5.0′	57.3′
7	282°22.3	22.9	329°35.9	7.6′	23°39.9	-5.2′	57.3′
8	297°22.5	22.0	344°02.6	7.7′	23°34.7	-5.3′	57.2′
9	312°22.7	·· 21.0	358°29.3	7.8′	23°29.4	-5.4′	57.2′
10	327°22.8	20.0	12°56.1	7.9′	23°24.0	-5.6′	57.2′
11	342°23.0	19.0	27°22.9	7.9′	23°18.4	-5.7′	57.2′
12	357°23.1	S04°18.0	41°49.9	8.0′	S23°12.8	-5.8′	57.2′
13	12°23.3	17.1	56°16.9	8.1′	23°06.9	-5.9′	57.1′
14	27°23.4	16.1	70°43.9	8.2′	23°01.0	-6.1′	57.1′
15	42°23.6	·· 15.1	85°11.1	8.2′	22°54.9	-6.2′	57.1′
16	57°23.8	14.1	99°38.3	8.3′	22°48.7	-6.3′	57.1′
17	72°23.9	13.1	114°05.6	8.4′	22°42.4	-6.4′	57.1′
18	87°24.1	S04°12.2	128°33.0	8.5′	S22°36.0	-6.6′	57.0′
19	102°24.2	11.2	143°00.5	8.5′	22°29.4	-6.7′	57.0′
20	117°24.4	10.2	157°28.0	8.6′	22°22.7	-6.8′	57.0′
21	132°24.6	·· 09.2	171°55.6	8.7′	22°15.9	-6.9′	57.0′
22	147°24.7	08.2	186°23.3	8.8′	22°09.0	-7.0′	57.0′
23	162°24.9	07.3	200°51.1	8.9′	22°01.9	-7.2′	56.9′
	SD = 16.1′	d = -1.0′	SD = 15.7′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.0	S04°06.3	215°19.0	8.9′	S21°54.8	-7.3′	56.9′
1	192°25.2	05.3	229°46.9	9.0′	21°47.5	-7.4′	56.9′
2	207°25.4	04.3	244°14.9	9.1′	21°40.1	-7.5′	56.9′
3	222°25.5	·· 03.3	258°43.0	9.2′	21°32.6	-7.6′	56.9′
4	237°25.7	02.4	273°11.2	9.3′	21°24.9	-7.7′	56.8′
5	252°25.8	01.4	287°39.5	9.3′	21°17.2	-7.8′	56.8′
6	267°26.0	S04°00.4	302°07.8	9.4′	S21°09.4	-8.0′	56.8′
7	282°26.2	03°59.4	316°36.2	9.5′	21°01.4	-8.1′	56.8′
8	297°26.3	58.4	331°04.7	9.6′	20°53.4	-8.2′	56.7′
9	312°26.5	·· 57.5	345°33.3	9.7′	20°45.2	-8.3′	56.7′
10	327°26.6	56.5	0°02.0	9.8′	20°36.9	-8.4′	56.7′
11	342°26.8	55.5	14°30.8	9.8′	20°28.5	-8.5′	56.7′
12	357°27.0	S03°54.5	28°59.6	9.9′	S20°20.1	-8.6′	56.7′
13	12°27.1	53.5	43°28.6	10.0′	20°11.5	-8.7′	56.6′
14	27°27.3	52.6	57°57.6	10.1′	20°02.8	-8.8′	56.6′
15	42°27.4	·· 51.6	72°26.7	10.2′	19°54.0	-8.9′	56.6′
16	57°27.6	50.6	86°55.8	10.3′	19°45.1	-9.0′	56.6′
17	72°27.8	49.6	101°25.1	10.3′	19°36.2	-9.1′	56.6′
18	87°27.9	S03°48.6	115°54.5	10.4′	S19°27.1	-9.2′	56.5′
19	102°28.1	47.6	130°23.9	10.5′	19°17.9	-9.3′	56.5′
20	117°28.3	46.7	144°53.4	10.6′	19°08.7	-9.4′	56.5′
21	132°28.4	·· 45.7	159°23.0	10.7′	18°59.3	-9.4′	56.5′
22	147°28.6	44.7	173°52.7	10.8′	18°49.9	-9.5′	56.5′
23	162°28.7	43.7	188°22.4	10.8′	18°40.3	-9.6′	56.4′
	SD = 16.1′	d = -1.0′	SD = 15.5′				

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

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 25-27 29-12%
08	10:50	10:42	12:11	08:10	20:38	
09	10:35	10:27	12:10	09:06	21:33	
10	10:20	10:12	12:10	10:00	22:25	

DUT1 = UT1-UTC = -0.1710 sec ΔT = TT-UT1 = +69.3550 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	168°52.5	180°27.7	S06°32.0	107°10.2	N22°23.1	207°24.3	S15°44.5	216°48.1	S18°20.1
1	183°54.9	195°27.2	30.8	122°11.1	23.3	222°26.2	44.4	231°50.3	20.0
2	198°57.4	210°26.8	29.6	137°12.0	23.6	237°28.1	44.2	246°52.5	19.9
3	213°59.9	225°26.4	·· 28.3	152°12.9	·· 23.9	252°30.1	·· 44.0	261°54.7	·· 19.9
4	229°02.3	240°25.9	27.1	167°13.9	24.2	267°32.0	43.9	276°56.9	19.8
5	244°04.8	255°25.5	25.9	182°14.8	24.5	282°33.9	43.7	291°59.1	19.7
6	259°07.2	270°25.1	S06°24.7	197°15.7	N22°24.7	297°35.8	S15°43.5	307°01.3	S18°19.7
7	274°09.7	285°24.7	23.5	212°16.6	25.0	312°37.7	43.4	322°03.5	19.6
8	289°12.2	300°24.2	22.3	227°17.5	25.3	327°39.7	43.2	337°05.8	19.6
9	304°14.6	315°23.8	·· 21.1	242°18.4	·· 25.6	342°41.6	·· 43.0	352°08.0	·· 19.5
10	319°17.1	330°23.4	19.9	257°19.3	25.9	357°43.5	42.9	7°10.2	19.4
11	334°19.6	345°23.0	18.7	272°20.2	26.1	12°45.4	42.7	22°12.4	19.4
12	349°22.0	0°22.5	S06°17.4	287°21.1	N22°26.4	27°47.3	S15°42.5	37°14.6	S18°19.3
13	4°24.5	15°22.1	16.2	302°22.0	26.7	42°49.3	42.4	52°16.8	19.3
14	19°27.0	30°21.7	15.0	317°22.9	27.0	57°51.2	42.2	67°19.0	19.2
15	34°29.4	45°21.3	·· 13.8	332°23.8	·· 27.2	72°53.1	·· 42.0	82°21.2	·· 19.1
16	49°31.9	60°20.8	12.6	347°24.7	27.5	87°55.0	41.9	97°23.5	19.1
17	64°34.4	75°20.4	11.4	2°25.7	27.8	102°56.9	41.7	112°25.7	19.0
18	79°36.8	90°20.0	S06°10.2	17°26.6	N22°28.1	117°58.9	S15°41.5	127°27.9	S18°18.9
19	94°39.3	105°19.6	08.9	32°27.5	28.4	133°00.8	41.4	142°30.1	18.9
20	109°41.7	120°19.1	07.7	47°28.4	28.6	148°02.7	41.2	157°32.3	18.8
21	124°44.2	135°18.7	·· 06.5	62°29.3	·· 28.9	163°04.6	·· 41.1	172°34.5	·· 18.8
22	139°46.7	150°18.3	05.3	77°30.2	29.2	178°06.6	40.9	187°36.7	18.7
23	154°49.1	165°17.9	04.1	92°31.1	29.5	193°08.5	40.7	202°38.9	18.6
Mer.pass.	12:42	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.05	ν 1.9′	d -0.2′ m -2.00	ν 2.2′	d -0.1′ m 0.73

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	169°51.6	180°17.4	S06°02.9	107°32.0	N22°29.7	208°10.4	S15°40.6	217°41.2	S18°18.6
1	184°54.1	195°17.0	01.7	122°32.9	30.0	223°12.3	40.4	232°43.4	18.5
2	199°56.5	210°16.6	06°00.4	137°33.8	30.3	238°14.2	40.2	247°45.6	18.5
3	214°59.0	225°16.2	05°59.2	152°34.7	·· 30.6	253°16.2	·· 40.1	262°47.8	·· 18.4
4	230°01.5	240°15.8	58.0	167°35.6	30.8	268°18.1	39.9	277°50.0	18.3
5	245°03.9	255°15.3	56.8	182°36.5	31.1	283°20.0	39.7	292°52.2	18.3
6	260°06.4	270°14.9	S05°55.6	197°37.4	N22°31.4	298°21.9	S15°39.6	307°54.4	S18°18.2
7	275°08.9	285°14.5	54.4	212°38.3	31.7	313°23.9	39.4	322°56.6	18.1
8	290°11.3	300°14.1	53.1	227°39.2	31.9	328°25.8	39.2	337°58.9	18.1
9	305°13.8	315°13.7	·· 51.9	242°40.1	·· 32.2	343°27.7	·· 39.1	353°01.1	·· 18.0
10	320°16.2	330°13.2	50.7	257°41.0	32.5	358°29.6	38.9	8°03.3	18.0
11	335°18.7	345°12.8	49.5	272°41.9	32.7	13°31.5	38.7	23°05.5	17.9
12	350°21.2	0°12.4	S05°48.3	287°42.9	N22°33.0	28°33.5	S15°38.6	38°07.7	S18°17.8
13	5°23.6	15°12.0	47.0	302°43.8	33.3	43°35.4	38.4	53°09.9	17.8
14	20°26.1	30°11.6	45.8	317°44.7	33.6	58°37.3	38.2	68°12.1	17.7
15	35°28.6	45°11.1	·· 44.6	332°45.6	·· 33.8	73°39.2	·· 38.1	83°14.4	·· 17.7
16	50°31.0	60°10.7	43.4	347°46.5	34.1	88°41.2	37.9	98°16.6	17.6
17	65°33.5	75°10.3	42.2	2°47.4	34.4	103°43.1	37.7	113°18.8	17.5
18	80°36.0	90°09.9	S05°40.9	17°48.3	N22°34.7	118°45.0	S15°37.6	128°21.0	S18°17.5
19	95°38.4	105°09.5	39.7	32°49.2	34.9	133°46.9	37.4	143°23.2	17.4
20	110°40.9	120°09.0	38.5	47°50.1	35.2	148°48.9	37.3	158°25.4	17.3
21	125°43.3	135°08.6	·· 37.3	62°51.0	·· 35.5	163°50.8	·· 37.1	173°27.6	·· 17.3
22	140°45.8	150°08.2	36.1	77°51.9	35.7	178°52.7	36.9	188°29.9	17.2
23	155°48.3	165°07.8	34.8	92°52.8	36.0	193°54.6	36.8	203°32.1	17.2
Mer.pass.	12:38	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.06	ν 1.9′	d -0.2′ m -2.00	ν 2.2′	d -0.1′ m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	170°50.7	180°07.4	S05°33.6	107°53.7	N22°36.3	208°56.6	S15°36.6	218°34.3	S18°17.1
1	185°53.2	195°07.0	32.4	122°54.6	36.5	223°58.5	36.4	233°36.5	17.0
2	200°55.7	210°06.5	31.2	137°55.5	36.8	239°00.4	36.3	248°38.7	17.0
3	215°58.1	225°06.1	·· 29.9	152°56.4	·· 37.1	254°02.3	·· 36.1	263°40.9	·· 16.9
4	231°00.6	240°05.7	28.7	167°57.3	37.3	269°04.3	35.9	278°43.2	16.9
5	246°03.1	255°05.3	27.5	182°58.2	37.6	284°06.2	35.8	293°45.4	16.8
6	261°05.5	270°04.9	S05°26.3	197°59.1	N22°37.9	299°08.1	S15°35.6	308°47.6	S18°16.7
7	276°08.0	285°04.5	25.1	213°00.0	38.2	314°10.0	35.4	323°49.8	16.7
8	291°10.5	300°04.1	23.8	228°00.9	38.4	329°12.0	35.3	338°52.0	16.6
9	306°12.9	315°03.6	·· 22.6	243°01.8	·· 38.7	344°13.9	·· 35.1	353°54.2	·· 16.6
10	321°15.4	330°03.2	21.4	258°02.7	39.0	359°15.8	34.9	8°56.4	16.5
11	336°17.8	345°02.8	20.2	273°03.6	39.2	14°17.7	34.8	23°58.7	16.4
12	351°20.3	0°02.4	S05°18.9	288°04.5	N22°39.5	29°19.7	S15°34.6	39°00.9	S18°16.4
13	6°22.8	15°02.0	17.7	303°05.4	39.8	44°21.6	34.4	54°03.1	16.3
14	21°25.2	30°01.6	16.5	318°06.3	40.0	59°23.5	34.3	69°05.3	16.2
15	36°27.7	45°01.2	·· 15.3	333°07.2	·· 40.3	74°25.4	·· 34.1	84°07.5	·· 16.2
16	51°30.2	60°00.7	14.0	348°08.1	40.6	89°27.4	34.0	99°09.7	16.1
17	66°32.6	75°00.3	12.8	3°09.0	40.8	104°29.3	33.8	114°12.0	16.1
18	81°35.1	89°59.9	S05°11.6	18°09.9	N22°41.1	119°31.2	S15°33.6	129°14.2	S18°16.0
19	96°37.6	104°59.5	10.3	33°10.8	41.4	134°33.2	33.5	144°16.4	15.9
20	111°40.0	119°59.1	09.1	48°11.7	41.6	149°35.1	33.3	159°18.6	15.9
21	126°42.5	134°58.7	·· 07.9	63°12.6	·· 41.9	164°37.0	·· 33.1	174°20.8	·· 15.8
22	141°44.9	149°58.3	06.7	78°13.4	42.1	179°38.9	33.0	189°23.0	15.8
23	156°47.4	164°57.9	05.4	93°14.3	42.4	194°40.9	32.8	204°25.3	15.7
Mer.pass.	12:35	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.08	ν 1.9′	d -0.2′ m -2.01	ν 2.2′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.3
Ankaa	353°10.7	-42°11.7
Schedar	349°35.0	56°39.1
Diphda	348°50.7	-17°52.5
Achernar	335°23.1	-57°08.1
Hamal	327°54.9	23°33.6
Polaris	315°43.9	89°21.4
Acamar	315°14.4	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°32.9	49°56.2
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.5	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.6	-52°42.7
Sirius	258°28.9	-16°44.9
Adhara	255°08.2	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.5	-59°34.8
Suhail	222°48.2	-43°31.2
Miaplacidus	221°38.0	-69°48.4
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.2
Denebola	182°27.8	14°27.2
Gienah	175°46.5	-17°39.6
Acrux	173°02.8	-63°12.9
Gacrux	171°54.5	-57°13.8
Alioth	166°15.3	55°50.6
Spica	158°25.3	-11°16.3
Alkaid	152°54.1	49°12.3
Hadar	148°39.9	-60°28.3
Menkent	148°01.0	-36°28.3
Arcturus	145°50.5	19°04.2
Rigil Kent.	139°44.1	-60°55.1
Kochab	137°19.2	74°03.9
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.2	26°38.4
Antares	112°19.6	-26°28.6
Atria	107°16.5	-69°03.6
Sabik	102°06.3	-15°45.0
Shaula	96°14.6	-37°07.0
Rasalhague	96°01.5	12°32.5
Eltanin	90°43.7	51°28.9
Kaus Aust.	83°36.7	-34°22.4
Vega	80°35.4	38°47.9
Nunki	75°51.8	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.1	-56°39.9
Deneb	49°28.2	45°21.1
Enif	33°42.1	9°58.1
Al Na'ir	27°37.3	-46°51.6
Fomalhaut	15°18.3	-29°30.8
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 11 Thu	SHA	Mer.pass
Venus	11°35.2	11:58
Mars	298°17.7	16:50
Jupiter	38°31.8	10:09
Saturn	47°55.6	09:31

Mar 12 Fri	SHA	Mer.pass
Venus	10°25.8	11:59
Mars	297°40.4	16:49
Jupiter	38°18.8	10:06
Saturn	47°49.6	09:28

Mar 13 Sat	SHA	Mer.pass
Venus	9°16.6	12:00
Mars	297°02.9	16:47
Jupiter	38°05.8	10:03
Saturn	47°43.6	09:24

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°28.9	S03°42.7	202°52.3	10.9′	S18°30.7	-9.7′	56.4′
1	192°29.1	41.8	217°22.2	11.0′	18°21.0	-9.8′	56.4′
2	207°29.2	40.8	231°52.2	11.1′	18°11.2	-9.9′	56.4′
3	222°29.4	·· 39.8	246°22.3	11.2′	18°01.3	-10.0′	56.4′
4	237°29.6	38.8	260°52.5	11.3′	17°51.4	-10.0′	56.3′
5	252°29.7	37.8	275°22.7	11.3′	17°41.3	-10.1′	56.3′
6	267°29.9	S03°36.8	289°53.1	11.4′	S17°31.2	-10.2′	56.3′
7	282°30.0	35.9	304°23.5	11.5′	17°21.0	-10.3′	56.3′
8	297°30.2	34.9	318°54.0	11.6′	17°10.7	-10.4′	56.3′
9	312°30.4	·· 33.9	333°24.6	11.7′	17°00.4	-10.4′	56.2′
10	327°30.5	32.9	347°55.2	11.7′	16°49.9	-10.5′	56.2′
11	342°30.7	31.9	2°26.0	11.8′	16°39.4	-10.6′	56.2′
12	357°30.9	S03°30.9	16°56.8	11.9′	S16°28.8	-10.7′	56.2′
13	12°31.0	30.0	31°27.7	12.0′	16°18.2	-10.7′	56.2′
14	27°31.2	29.0	45°58.7	12.1′	16°07.4	-10.8′	56.1′
15	42°31.4	·· 28.0	60°29.7	12.1′	15°56.6	-10.9′	56.1′
16	57°31.5	27.0	75°00.9	12.2′	15°45.8	-10.9′	56.1′
17	72°31.7	26.0	89°32.1	12.3′	15°34.8	-11.0′	56.1′
18	87°31.9	S03°25.0	104°03.3	12.4′	S15°23.8	-11.1′	56.1′
19	102°32.0	24.1	118°34.7	12.4′	15°12.8	-11.1′	56.0′
20	117°32.2	23.1	133°06.1	12.5′	15°01.6	-11.2′	56.0′
21	132°32.3	·· 22.1	147°37.6	12.6′	14°50.5	-11.3′	56.0′
22	147°32.5	21.1	162°09.2	12.7′	14°39.2	-11.3′	56.0′
23	162°32.7	20.1	176°40.9	12.7′	14°27.9	-11.4′	56.0′
	SD = 16.1′	d = -1.0′	SD = 15.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°32.8	S03°19.1	191°12.6	12.8′	S14°16.5	-11.4′	55.9′
1	192°33.0	18.2	205°44.4	12.9′	14°05.1	-11.5′	55.9′
2	207°33.2	17.2	220°16.3	12.9′	13°53.6	-11.5′	55.9′
3	222°33.3	·· 16.2	234°48.2	13.0′	13°42.0	-11.6′	55.9′
4	237°33.5	15.2	249°20.2	13.1′	13°30.4	-11.7′	55.9′
5	252°33.7	14.2	263°52.3	13.2′	13°18.8	-11.7′	55.8′
6	267°33.8	S03°13.2	278°24.5	13.2′	S13°07.1	-11.8′	55.8′
7	282°34.0	12.2	292°56.7	13.3′	12°55.3	-11.8′	55.8′
8	297°34.2	11.3	307°29.0	13.4′	12°43.5	-11.9′	55.8′
9	312°34.3	·· 10.3	322°01.3	13.4′	12°31.6	-11.9′	55.8′
10	327°34.5	09.3	336°33.7	13.5′	12°19.7	-12.0′	55.7′
11	342°34.7	08.3	351°06.2	13.6′	12°07.8	-12.0′	55.7′
12	357°34.8	S03°07.3	5°38.8	13.6′	S11°55.8	-12.0′	55.7′
13	12°35.0	06.3	20°11.4	13.7′	11°43.7	-12.1′	55.7′
14	27°35.2	05.4	34°44.1	13.7′	11°31.6	-12.1′	55.7′
15	42°35.3	·· 04.4	49°16.8	13.8′	11°19.5	-12.2′	55.6′
16	57°35.5	03.4	63°49.6	13.9′	11°07.3	-12.2′	55.6′
17	72°35.7	02.4	78°22.5	13.9′	10°55.1	-12.3′	55.6′
18	87°35.8	S03°01.4	92°55.4	14.0′	S10°42.8	-12.3′	55.6′
19	102°36.0	03°00.4	107°28.4	14.0′	10°30.5	-12.3′	55.6′
20	117°36.2	02°59.4	122°01.4	14.1′	10°18.2	-12.4′	55.6′
21	132°36.4	·· 58.5	136°34.5	14.2′	10°05.8	-12.4′	55.5′
22	147°36.5	57.5	151°07.7	14.2′	09°53.4	-12.4′	55.5′
23	162°36.7	56.5	165°40.9	14.3′	09°41.0	-12.5′	55.5′
	SD = 16.1′	d = -1.0′	SD = 15.3′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°36.9	S02°55.5	180°14.2	14.3′	S09°28.5	-12.5′	55.5′
1	192°37.0	54.5	194°47.5	14.4′	09°16.0	-12.5′	55.5′
2	207°37.2	53.5	209°20.9	14.4′	09°03.5	-12.6′	55.4′
3	222°37.4	·· 52.5	223°54.3	14.5′	08°50.9	-12.6′	55.4′
4	237°37.5	51.6	238°27.8	14.5′	08°38.3	-12.6′	55.4′
5	252°37.7	50.6	253°01.3	14.6′	08°25.7	-12.7′	55.4′
6	267°37.9	S02°49.6	267°34.9	14.6′	S08°13.0	-12.7′	55.4′
7	282°38.0	48.6	282°08.5	14.7′	08°00.3	-12.7′	55.3′
8	297°38.2	47.6	296°42.2	14.7′	07°47.6	-12.7′	55.3′
9	312°38.4	·· 46.6	311°16.0	14.8′	07°34.9	-12.8′	55.3′
10	327°38.6	45.6	325°49.7	14.8′	07°22.2	-12.8′	55.3′
11	342°38.7	44.7	340°23.6	14.9′	07°09.4	-12.8′	55.3′
12	357°38.9	S02°43.7	354°57.4	14.9′	S06°56.6	-12.8′	55.3′
13	12°39.1	42.7	9°31.4	15.0′	06°43.8	-12.8′	55.2′
14	27°39.2	41.7	24°05.3	15.0′	06°30.9	-12.9′	55.2′
15	42°39.4	·· 40.7	38°39.3	15.0′	06°18.1	-12.9′	55.2′
16	57°39.6	39.7	53°13.4	15.1′	06°05.2	-12.9′	55.2′
17	72°39.7	38.7	67°47.5	15.1′	05°52.3	-12.9′	55.2′
18	87°39.9	S02°37.8	82°21.6	15.2′	S05°39.4	-12.9′	55.1′
19	102°40.1	36.8	96°55.7	15.2′	05°26.5	-12.9′	55.1′
20	117°40.3	35.8	111°30.0	15.2′	05°13.6	-12.9′	55.1′
21	132°40.4	·· 34.8	126°04.2	15.3′	05°00.6	-13.0′	55.1′
22	147°40.6	33.8	140°38.5	15.3′	04°47.7	-13.0′	55.1′
23	162°40.8	32.8	155°12.8	15.4′	04°34.7	-13.0′	55.1′
	SD = 16.1′	d = -1.0′	SD = 15.1′				

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

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 28-0 6-0%
11	10:04	09:57	12:10	10:50	23:14	
12	09:49	09:41	12:10	11:37	23:59	
13	09:33	09:24	12:09	12:21	–:–	

DUT1 = UT1-UTC = -0.1716 sec ΔT = TT-UT1 = +69.3556 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	171°49.9	179°57.4	S05°04.2	108°15.2	N22°42.7	209°42.8	S15°32.6	219°27.5	S18°15.6
1	186°52.3	194°57.0	03.0	123°16.1	42.9	224°44.7	32.5	234°29.7	15.6
2	201°54.8	209°56.6	01.7	138°17.0	43.2	239°46.6	32.3	249°31.9	15.5
3	216°57.3	224°56.2	05°00.5	153°17.9	·· 43.5	254°48.6	·· 32.1	264°34.1	·· 15.5
4	231°59.7	239°55.8	04°59.3	168°18.8	43.7	269°50.5	32.0	279°36.4	15.4
5	247°02.2	254°55.4	58.1	183°19.7	44.0	284°52.4	31.8	294°38.6	15.3
6	262°04.7	269°55.0	S04°56.8	198°20.6	N22°44.3	299°54.4	S15°31.6	309°40.8	S18°15.3
7	277°07.1	284°54.6	55.6	213°21.5	44.5	314°56.3	31.5	324°43.0	15.2
8	292°09.6	299°54.2	54.4	228°22.4	44.8	329°58.2	31.3	339°45.2	15.2
9	307°12.1	314°53.8	·· 53.1	243°23.3	·· 45.0	345°00.1	·· 31.2	354°47.4	·· 15.1
10	322°14.5	329°53.3	51.9	258°24.2	45.3	0°02.1	31.0	9°49.7	15.0
11	337°17.0	344°52.9	50.7	273°25.1	45.6	15°04.0	30.8	24°51.9	15.0
12	352°19.4	359°52.5	S04°49.5	288°26.0	N22°45.8	30°05.9	S15°30.7	39°54.1	S18°14.9
13	7°21.9	14°52.1	48.2	303°26.9	46.1	45°07.9	30.5	54°56.3	14.9
14	22°24.4	29°51.7	47.0	318°27.8	46.4	60°09.8	30.3	69°58.5	14.8
15	37°26.8	44°51.3	·· 45.8	333°28.7	·· 46.6	75°11.7	·· 30.2	85°00.8	·· 14.7
16	52°29.3	59°50.9	44.5	348°29.6	46.9	90°13.7	30.0	100°03.0	14.7
17	67°31.8	74°50.5	43.3	3°30.5	47.1	105°15.6	29.8	115°05.2	14.6
18	82°34.2	89°50.1	S04°42.1	18°31.3	N22°47.4	120°17.5	S15°29.7	130°07.4	S18°14.6
19	97°36.7	104°49.7	40.8	33°32.2	47.7	135°19.4	29.5	145°09.6	14.5
20	112°39.2	119°49.3	39.6	48°33.1	47.9	150°21.4	29.3	160°11.9	14.4
21	127°41.6	134°48.9	·· 38.4	63°34.0	·· 48.2	165°23.3	·· 29.2	175°14.1	·· 14.4
22	142°44.1	149°48.5	37.1	78°34.9	48.4	180°25.2	29.0	190°16.3	14.3
23	157°46.5	164°48.0	35.9	93°35.8	48.7	195°27.2	28.8	205°18.5	14.3
Mer.pass.	12:31	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.09	ν 1.9′	d -0.2′ m -2.01	ν 2.2′	d -0.1′ m 0.73

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	172°49.0	179°47.6	S04°34.7	108°36.7	N22°48.9	210°29.1	S15°28.7	220°20.7	S18°14.2
1	187°51.5	194°47.2	33.4	123°37.6	49.2	225°31.0	28.5	235°23.0	14.1
2	202°53.9	209°46.8	32.2	138°38.5	49.5	240°33.0	28.4	250°25.2	14.1
3	217°56.4	224°46.4	·· 31.0	153°39.4	·· 49.7	255°34.9	·· 28.2	265°27.4	·· 14.0
4	232°58.9	239°46.0	29.7	168°40.3	50.0	270°36.8	28.0	280°29.6	14.0
5	248°01.3	254°45.6	28.5	183°41.2	50.2	285°38.7	27.9	295°31.8	13.9
6	263°03.8	269°45.2	S04°27.3	198°42.1	N22°50.5	300°40.7	S15°27.7	310°34.1	S18°13.8
7	278°06.3	284°44.8	26.0	213°42.9	50.7	315°42.6	27.5	325°36.3	13.8
8	293°08.7	299°44.4	24.8	228°43.8	51.0	330°44.5	27.4	340°38.5	13.7
9	308°11.2	314°44.0	·· 23.5	243°44.7	·· 51.3	345°46.5	·· 27.2	355°40.7	·· 13.7
10	323°13.7	329°43.6	22.3	258°45.6	51.5	0°48.4	27.0	10°42.9	13.6
11	338°16.1	344°43.2	21.1	273°46.5	51.8	15°50.3	26.9	25°45.2	13.5
12	353°18.6	359°42.8	S04°19.8	288°47.4	N22°52.0	30°52.3	S15°26.7	40°47.4	S18°13.5
13	8°21.0	14°42.4	18.6	303°48.3	52.3	45°54.2	26.5	55°49.6	13.4
14	23°23.5	29°42.0	17.4	318°49.2	52.5	60°56.1	26.4	70°51.8	13.4
15	38°26.0	44°41.6	·· 16.1	333°50.1	·· 52.8	75°58.1	·· 26.2	85°54.0	·· 13.3
16	53°28.4	59°41.2	14.9	348°51.0	53.0	91°00.0	26.1	100°56.3	13.2
17	68°30.9	74°40.8	13.7	3°51.8	53.3	106°01.9	25.9	115°58.5	13.2
18	83°33.4	89°40.4	S04°12.4	18°52.7	N22°53.6	121°03.9	S15°25.7	131°00.7	S18°13.1
19	98°35.8	104°40.0	11.2	33°53.6	53.8	136°05.8	25.6	146°02.9	13.1
20	113°38.3	119°39.6	09.9	48°54.5	54.1	151°07.7	25.4	161°05.1	13.0
21	128°40.8	134°39.2	·· 08.7	63°55.4	·· 54.3	166°09.7	·· 25.2	176°07.4	·· 12.9
22	143°43.2	149°38.8	07.5	78°56.3	54.6	181°11.6	25.1	191°09.6	12.9
23	158°45.7	164°38.4	06.2	93°57.2	54.8	196°13.5	24.9	206°11.8	12.8
Mer.pass.	12:27	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.10	ν 1.9′	d -0.2′ m -2.01	ν 2.2′	d -0.1′ m 0.73

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	173°48.1	179°38.0	S04°05.0	108°58.1	N22°55.1	211°15.5	S15°24.7	221°14.0	S18°12.8
1	188°50.6	194°37.6	03.8	123°58.9	55.3	226°17.4	24.6	236°16.3	12.7
2	203°53.1	209°37.2	02.5	138°59.8	55.6	241°19.3	24.4	251°18.5	12.6
3	218°55.5	224°36.8	·· 01.3	154°00.7	·· 55.8	256°21.3	·· 24.3	266°20.7	·· 12.6
4	233°58.0	239°36.4	04°00.0	169°01.6	56.1	271°23.2	24.1	281°22.9	12.5
5	249°00.5	254°36.0	03°58.8	184°02.5	56.3	286°25.1	23.9	296°25.1	12.5
6	264°02.9	269°35.6	S03°57.6	199°03.4	N22°56.6	301°27.1	S15°23.8	311°27.4	S18°12.4
7	279°05.4	284°35.2	56.3	214°04.3	56.8	316°29.0	23.6	326°29.6	12.3
8	294°07.9	299°34.8	55.1	229°05.2	57.1	331°30.9	23.4	341°31.8	12.3
9	309°10.3	314°34.4	·· 53.8	244°06.0	·· 57.3	346°32.9	·· 23.3	356°34.0	·· 12.2
10	324°12.8	329°34.0	52.6	259°06.9	57.6	1°34.8	23.1	11°36.3	12.2
11	339°15.3	344°33.6	51.4	274°07.8	57.8	16°36.7	22.9	26°38.5	12.1
12	354°17.7	359°33.2	S03°50.1	289°08.7	N22°58.1	31°38.7	S15°22.8	41°40.7	S18°12.0
13	9°20.2	14°32.8	48.9	304°09.6	58.3	46°40.6	22.6	56°42.9	12.0
14	24°22.6	29°32.4	47.6	319°10.5	58.6	61°42.5	22.4	71°45.2	11.9
15	39°25.1	44°32.0	·· 46.4	334°11.4	·· 58.8	76°44.5	·· 22.3	86°47.4	·· 11.9
16	54°27.6	59°31.6	45.1	349°12.2	59.1	91°46.4	22.1	101°49.6	11.8
17	69°30.0	74°31.2	43.9	4°13.1	59.3	106°48.3	22.0	116°51.8	11.7
18	84°32.5	89°30.8	S03°42.7	19°14.0	N22°59.6	121°50.3	S15°21.8	131°54.1	S18°11.7
19	99°35.0	104°30.4	41.4	34°14.9	22°59.8	136°52.2	21.6	146°56.3	11.6
20	114°37.4	119°30.0	40.2	49°15.8	23°00.1	151°54.1	21.5	161°58.5	11.6
21	129°39.9	134°29.6	·· 38.9	64°16.7	·· 00.3	166°56.1	·· 21.3	177°00.7	·· 11.5
22	144°42.4	149°29.2	37.7	79°17.5	00.6	181°58.0	21.1	192°03.0	11.4
23	159°44.8	164°28.8	36.4	94°18.4	00.8	196°59.9	21.0	207°05.2	11.4
Mer.pass.	12:23	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.3′	m 1.12	ν 1.9′	d -0.2′ m -2.01	ν 2.2′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.7
Schedar	349°35.0	56°39.1
Diphda	348°50.8	-17°52.5
Achernar	335°23.1	-57°08.1
Hamal	327°55.0	23°33.6
Polaris	315°45.2	89°21.4
Acamar	315°14.4	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°32.9	49°56.2
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.5	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°28.9	-16°44.9
Adhara	255°08.2	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°20.9	27°58.5
Avior	234°15.5	-59°34.9
Suhail	222°48.2	-43°31.2
Miaplacidus	221°38.0	-69°48.4
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°12.9
Gacrux	171°54.5	-57°13.8
Alioth	166°15.3	55°50.6
Spica	158°25.3	-11°16.3
Alkaid	152°54.1	49°12.3
Hadar	148°39.8	-60°28.3
Menkent	148°01.0	-36°28.3
Arcturus	145°50.5	19°04.2
Rigil Kent.	139°44.0	-60°55.1
Kochab	137°19.1	74°03.9
Zuben'ubi	136°59.2	-16°07.7
Alphecca	126°06.2	26°38.4
Antares	112°19.5	-26°28.6
Atria	107°16.5	-69°03.6
Sabik	102°06.3	-15°45.0
Shaula	96°14.6	-37°07.0
Rasalhague	96°01.4	12°32.5
Eltanin	90°43.7	51°28.8
Kaus Aust.	83°36.7	-34°22.4
Vega	80°35.4	38°47.9
Nunki	75°51.7	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.1	-56°39.9
Deneb	49°28.2	45°21.1
Enif	33°42.1	9°58.1
Al Na'ir	27°37.3	-46°51.6
Fomalhaut	15°18.3	-29°30.8
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 14 Sun	SHA	Mer.pass
Venus	8°07.6	12:01
Mars	296°25.4	16:46
Jupiter	37°52.9	10:00
Saturn	47°37.6	09:21

Mar 15 Mon	SHA	Mer.pass
Venus	6°58.6	12:01
Mars	295°47.7	16:45
Jupiter	37°40.1	09:57
Saturn	47°31.7	09:17

Mar 16 Tue	SHA	Mer.pass
Venus	5°49.8	12:02
Mars	295°09.9	16:43
Jupiter	37°27.3	09:54
Saturn	47°25.9	09:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		177°40.9	S02°31.8	169°47.1	15.4′	S04°21.7	-13.0′	55.0′
1		192°41.1	30.8	184°21.5	15.4′	04°08.7	-13.0′	55.0′
2		207°41.3	29.9	198°56.0	15.5′	03°55.7	-13.0′	55.0′
3		222°41.5	·· 28.9	213°30.4	15.5′	03°42.7	-13.0′	55.0′
4		237°41.6	27.9	228°04.9	15.5′	03°29.7	-13.0′	55.0′
5		252°41.8	26.9	242°39.4	15.5′	03°16.7	-13.0′	55.0′
6		267°42.0	S02°25.9	257°13.9	15.6′	S03°03.6	-13.0′	54.9′
7		282°42.1	24.9	271°48.5	15.6′	02°50.6	-13.0′	54.9′
8		297°42.3	23.9	286°23.1	15.6′	02°37.6	-13.0′	54.9′
9		312°42.5	·· 23.0	300°57.7	15.7′	02°24.5	-13.0′	54.9′
10		327°42.7	22.0	315°32.4	15.7′	02°11.5	-13.0′	54.9′
11		342°42.8	21.0	330°07.1	15.7′	01°58.5	-13.0′	54.9′
12		357°43.0	S02°20.0	344°41.8	15.7′	S01°45.4	-13.0′	54.8′
13		12°43.2	19.0	359°16.5	15.8′	01°32.4	-13.0′	54.8′
14		27°43.4	18.0	13°51.3	15.8′	01°19.4	-13.0′	54.8′
15		42°43.5	·· 17.0	28°26.0	15.8′	01°06.3	-13.0′	54.8′
16		57°43.7	16.0	43°00.8	15.8′	00°53.3	-13.0′	54.8′
17		72°43.9	15.1	57°35.7	15.8′	00°40.3	-13.0′	54.8′
18		87°44.0	S02°14.1	72°10.5	15.9′	S00°27.2	-13.0′	54.8′
19		102°44.2	13.1	86°45.3	15.9′	00°14.2	-13.0′	54.7′
20		117°44.4	12.1	101°20.2	15.9′	S00°01.2	-13.0′	54.7′
21		132°44.6	·· 11.1	115°55.1	15.9′	N00°11.8	13.0′	54.7′
22		147°44.7	10.1	130°30.0	15.9′	00°24.8	13.0′	54.7′
23		162°44.9	09.1	145°04.9	15.9′	00°37.8	13.0′	54.7′
		SD = 16.1′	d = -1.0′	SD = 15.0′				

Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		177°45.1	S02°08.1	159°39.9	15.9′	N00°50.7	13.0′	54.7′
1		192°45.3	07.2	174°14.8	16.0′	01°03.7	13.0′	54.6′
2		207°45.4	06.2	188°49.8	16.0′	01°16.7	12.9′	54.6′
3		222°45.6	·· 05.2	203°24.7	16.0′	01°29.6	12.9′	54.6′
4		237°45.8	04.2	217°59.7	16.0′	01°42.5	12.9′	54.6′
5		252°46.0	03.2	232°34.7	16.0′	01°55.4	12.9′	54.6′
6		267°46.1	S02°02.2	247°09.7	16.0′	N02°08.3	12.9′	54.6′
7		282°46.3	01.2	261°44.7	16.0′	02°21.2	12.9′	54.6′
8		297°46.5	02°00.2	276°19.7	16.0′	02°34.1	12.9′	54.6′
9		312°46.7	01°59.3	290°54.7	16.0′	02°47.0	12.8′	54.5′
10		327°46.8	58.3	305°29.8	16.0′	02°59.8	12.8′	54.5′
11		342°47.0	57.3	320°04.8	16.0′	03°12.6	12.8′	54.5′
12		357°47.2	S01°56.3	334°39.8	16.0′	N03°25.4	12.8′	54.5′
13		12°47.4	55.3	349°14.9	16.0′	03°38.2	12.8′	54.5′
14		27°47.5	54.3	3°49.9	16.0′	03°51.0	12.7′	54.5′
15		42°47.7	·· 53.3	18°24.9	16.0′	04°03.7	12.7′	54.5′
16		57°47.9	52.3	33°00.0	16.0′	04°16.4	12.7′	54.4′
17		72°48.1	51.3	47°35.0	16.0′	04°29.1	12.7′	54.4′
18		87°48.2	S01°50.4	62°10.0	16.0′	N04°41.8	12.6′	54.4′
19		102°48.4	49.4	76°45.1	16.0′	04°54.4	12.6′	54.4′
20		117°48.6	48.4	91°20.1	16.0′	05°07.0	12.6′	54.4′
21		132°48.8	·· 47.4	105°55.1	16.0′	05°19.6	12.6′	54.4′
22		147°48.9	46.4	120°30.2	16.0′	05°32.2	12.5′	54.4′
23		162°49.1	45.4	135°05.2	16.0′	05°44.8	12.5′	54.4′
		SD = 16.1′	d = -1.0′	SD = 14.9′				

Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		177°49.3	S01°44.4	149°40.2	16.0′	N05°57.3	12.5′	54.4′
1		192°49.5	43.4	164°15.2	16.0′	06°09.8	12.5′	54.3′
2		207°49.7	42.5	178°50.2	16.0′	06°22.2	12.4′	54.3′
3		222°49.8	·· 41.5	193°25.2	16.0′	06°34.7	12.4′	54.3′
4		237°50.0	40.5	208°00.1	16.0′	06°47.1	12.4′	54.3′
5		252°50.2	39.5	222°35.1	16.0′	06°59.4	12.3′	54.3′
6		267°50.4	S01°38.5	237°10.1	15.9′	N07°11.8	12.3′	54.3′
7		282°50.5	37.5	251°45.0	15.9′	07°24.1	12.3′	54.3′
8		297°50.7	36.5	266°19.9	15.9′	07°36.3	12.2′	54.3′
9		312°50.9	·· 35.5	280°54.8	15.9′	07°48.6	12.2′	54.3′
10		327°51.1	34.5	295°29.7	15.9′	08°00.8	12.2′	54.2′
11		342°51.2	33.6	310°04.6	15.9′	08°12.9	12.1′	54.2′
12		357°51.4	S01°32.6	324°39.5	15.9′	N08°25.1	12.1′	54.2′
13		12°51.6	31.6	339°14.3	15.8′	08°37.2	12.1′	54.2′
14		27°51.8	30.6	353°49.2	15.8′	08°49.2	12.0′	54.2′
15		42°52.0	·· 29.6	8°24.0	15.8′	09°01.2	12.0′	54.2′
16		57°52.1	28.6	22°58.8	15.8′	09°13.2	11.9′	54.2′
17		72°52.3	27.6	37°33.6	15.8′	09°25.1	11.9′	54.2′
18		87°52.5	S01°26.6	52°08.3	15.7′	N09°37.0	11.9′	54.2′
19		102°52.7	25.6	66°43.0	15.7′	09°48.9	11.8′	54.2′
20		117°52.9	24.7	81°17.7	15.7′	10°00.7	11.8′	54.2′
21		132°53.0	·· 23.7	95°52.4	15.7′	10°12.5	11.7′	54.2′
22		147°53.2	22.7	110°27.1	15.6′	10°24.2	11.7′	54.2′
23		162°53.4	21.7	125°01.7	15.6′	10°35.9	11.6′	54.1′
		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	19:04	20:30
N 70°	04:07	05:21	06:22	17:58	18:59	20:15
68°	04:18	05:25	06:20	17:59	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	19:45
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°	04:55	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	06:11	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	18:24	18:57	19:38
54°	04:34	05:16	05:52	18:25	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 Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	07:29	07:05	06:40	19:10	21:02	22:59
N 70°	07:25	07:08	06:51	19:10	20:54	22:41
68°	07:22	07:11	06:59	19:10	20:48	22:27
66°	07:19	07:13	07:06	19:11	20:43	22:16
64°	07:17	07:15	07:12	19:11	20:38	22:06
62°	07:15	07:16	07:17	19:11	20:35	21:58
60°	07:13	07:17	07:22	19:11	20:31	21:51
N 58°	07:12	07:19	07:26	19:11	20:28	21:45
56°	07:10	07:20	07:29	19:11	20:26	21:40
54°	07:09	07:21	07:33	19:12	20:23	21:35
52°	07:08	07:22	07:36	19:12	20:21	21:31
50°	07:07	07:23	07:38	19:12	20:19	21:27
45°	07:05	07:24	07:44	19:12	20:15	21:18
N 40°	07:03	07:26	07:49	19:12	20:12	21:11
35°	07:01	07:27	07:54	19:12	20:09	21:05
30°	07:00	07:29	07:57	19:12	20:06	21:00
20°	06:57	07:31	08:04	19:13	20:02	20:51
N 10°	06:55	07:33	08:10	19:13	19:58	20:43
0°	06:53	07:34	08:15	19:13	19:54	20:35
S 10°	06:51	07:36	08:21	19:13	19:50	20:28
20°	06:49	07:38	08:27	19:13	19:46	20:20
30°	06:46	07:40	08:34	19:13	19:42	20:11
35°	06:45	07:42	08:38	19:13	19:39	20:06
40°	06:43	07:43	08:43	19:13	19:37	20:00
45°	06:41	07:45	08:48	19:14	19:33	19:54
S 50°	06:39	07:47	08:54	19:14	19:29	19:45
52°	06:38	07:48	08:57	19:14	19:27	19:42
54°	06:37	07:49	09:01	19:14	19:25	19:38
56°	06:35	07:50	09:04	19:14	19:23	19:33
58°	06:34	07:51	09:08	19:14	19:21	19:28
S 60°	06:32	07:53	09:13	19:14	19:18	19:23

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 0-6%
14	09:16	09:08	12:09	13:03	00:42	
15	09:00	08:51	12:09	13:44	01:24	
16	08:43	08:34	12:09	14:25	02:05	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	174°47.3	179°28.4	S03°35.2	109°19.3	N23°01.1	212°01.9	S15°20.8	222°07.4	S18°11.3
1	189°49.8	194°28.0	34.0	124°20.2	01.3	227°03.8	20.6	237°09.6	11.3
2	204°52.2	209°27.6	32.7	139°21.1	01.6	242°05.8	20.5	252°11.9	11.2
3	219°54.7	224°27.2	·· 31.5	154°22.0	·· 01.8	257°07.7	·· 20.3	267°14.1	·· 11.2
4	234°57.1	239°26.8	30.2	169°22.8	02.1	272°09.6	20.2	282°16.3	11.1
5	249°59.6	254°26.4	29.0	184°23.7	02.3	287°11.6	20.0	297°18.5	11.0
6	265°02.1	269°26.0	S03°27.7	199°24.6	N23°02.5	302°13.5	S15°19.8	312°20.8	S18°11.0
7	280°04.5	284°25.6	26.5	214°25.5	02.8	317°15.4	19.7	327°23.0	10.9
8	295°07.0	299°25.2	25.3	229°26.4	03.0	332°17.4	19.5	342°25.2	10.9
9	310°09.5	314°24.8	·· 24.0	244°27.3	·· 03.3	347°19.3	·· 19.3	357°27.4	·· 10.8
10	325°11.9	329°24.4	22.8	259°28.1	03.5	2°21.3	19.2	12°29.7	10.7
11	340°14.4	344°24.0	21.5	274°29.0	03.8	17°23.2	19.0	27°31.9	10.7
12	355°16.9	359°23.6	S03°20.3	289°29.9	N23°04.0	32°25.1	S15°18.8	42°34.1	S18°10.6
13	10°19.3	14°23.2	19.0	304°30.8	04.3	47°27.1	18.7	57°36.3	10.6
14	25°21.8	29°22.8	17.8	319°31.7	04.5	62°29.0	18.5	72°38.6	10.5
15	40°24.2	44°22.4	·· 16.5	334°32.5	·· 04.7	77°30.9	·· 18.4	87°40.8	·· 10.4
16	55°26.7	59°22.1	15.3	349°33.4	05.0	92°32.9	18.2	102°43.0	10.4
17	70°29.2	74°21.7	14.0	4°34.3	05.2	107°34.8	18.0	117°45.2	10.3
18	85°31.6	89°21.3	S03°12.8	19°35.2	N23°05.5	122°36.8	S15°17.9	132°47.5	S18°10.3
19	100°34.1	104°20.9	11.6	34°36.1	05.7	137°38.7	17.7	147°49.7	10.2
20	115°36.6	119°20.5	10.3	49°37.0	06.0	152°40.6	17.5	162°51.9	10.2
21	130°39.0	134°20.1	·· 09.1	64°37.8	·· 06.2	167°42.6	·· 17.4	177°54.1	·· 10.1
22	145°41.5	149°19.7	07.8	79°38.7	06.4	182°44.5	17.2	192°56.4	10.0
23	160°44.0	164°19.3	06.6	94°39.6	06.7	197°46.4	17.1	207°58.6	10.0
Mer.pass.	12:19	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.2′	m 1.13	ν 1.9′	d -0.2′ m -2.02	ν 2.2′	d -0.1′ m 0.73

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	175°46.4	179°18.9	S03°05.3	109°40.5	N23°06.9	212°48.4	S15°16.9	223°00.8	S18°09.9
1	190°48.9	194°18.5	04.1	124°41.3	07.2	227°50.3	16.7	238°03.1	09.9
2	205°51.4	209°18.1	02.8	139°42.2	07.4	242°52.3	16.6	253°05.3	09.8
3	220°53.8	224°17.7	·· 01.6	154°43.1	·· 07.6	257°54.2	·· 16.4	268°07.5	·· 09.7
4	235°56.3	239°17.3	03°00.3	169°44.0	07.9	272°56.1	16.2	283°09.7	09.7
5	250°58.7	254°16.9	02°59.1	184°44.9	08.1	287°58.1	16.1	298°12.0	09.6
6	266°01.2	269°16.5	S02°57.8	199°45.7	N23°08.4	303°00.0	S15°15.9	313°14.2	S18°09.6
7	281°03.7	284°16.2	56.6	214°46.6	08.6	318°02.0	15.7	328°16.4	09.5
8	296°06.1	299°15.8	55.3	229°47.5	08.8	333°03.9	15.6	343°18.6	09.5
9	311°08.6	314°15.4	·· 54.1	244°48.4	·· 09.1	348°05.8	·· 15.4	358°20.9	·· 09.4
10	326°11.1	329°15.0	52.8	259°49.3	09.3	3°07.8	15.3	13°23.1	09.3
11	341°13.5	344°14.6	51.6	274°50.1	09.6	18°09.7	15.1	28°25.3	09.3
12	356°16.0	359°14.2	S02°50.3	289°51.0	N23°09.8	33°11.7	S15°14.9	43°27.6	S18°09.2
13	11°18.5	14°13.8	49.1	304°51.9	10.0	48°13.6	14.8	58°29.8	09.2
14	26°20.9	29°13.4	47.8	319°52.8	10.3	63°15.5	14.6	73°32.0	09.1
15	41°23.4	44°13.0	·· 46.6	334°53.6	·· 10.5	78°17.5	·· 14.4	88°34.2	·· 09.0
16	56°25.8	59°12.6	45.4	349°54.5	10.7	93°19.4	14.3	103°36.5	09.0
17	71°28.3	74°12.2	44.1	4°55.4	11.0	108°21.4	14.1	118°38.7	08.9
18	86°30.8	89°11.9	S02°42.9	19°56.3	N23°11.2	123°23.3	S15°14.0	133°40.9	S18°08.9
19	101°33.2	104°11.5	41.6	34°57.1	11.5	138°25.2	13.8	148°43.2	08.8
20	116°35.7	119°11.1	40.4	49°58.0	11.7	153°27.2	13.6	163°45.4	08.8
21	131°38.2	134°10.7	·· 39.1	64°58.9	·· 11.9	168°29.1	·· 13.5	178°47.6	·· 08.7
22	146°40.6	149°10.3	37.9	79°59.8	12.2	183°31.1	13.3	193°49.9	08.6
23	161°43.1	164°09.9	36.6	95°00.7	12.4	198°33.0	13.1	208°52.1	08.6
Mer.pass.	12:15	ν -0.4′	d -1.2′	m -3.92	ν 0.9′	d 0.2′	m 1.14	ν 1.9′	d -0.2′ m -2.02	ν 2.2′	d -0.1′ m 0.73

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°45.6	179°09.5	S02°35.4	110°01.5	N23°12.6	213°35.0	S15°13.0	223°54.3	S18°08.5
1	191°48.0	194°09.1	34.1	125°02.4	12.9	228°36.9	12.8	238°56.5	08.5
2	206°50.5	209°08.7	32.8	140°03.3	13.1	243°38.8	12.7	253°58.8	08.4
3	221°53.0	224°08.3	·· 31.6	155°04.2	·· 13.3	258°40.8	·· 12.5	269°01.0	·· 08.3
4	236°55.4	239°08.0	30.3	170°05.0	13.6	273°42.7	12.3	284°03.2	08.3
5	251°57.9	254°07.6	29.1	185°05.9	13.8	288°44.7	12.2	299°05.5	08.2
6	267°00.3	269°07.2	S02°27.8	200°06.8	N23°14.0	303°46.6	S15°12.0	314°07.7	S18°08.2
7	282°02.8	284°06.8	26.6	215°07.7	14.3	318°48.6	11.8	329°09.9	08.1
8	297°05.3	299°06.4	25.3	230°08.5	14.5	333°50.5	11.7	344°12.2	08.1
9	312°07.7	314°06.0	·· 24.1	245°09.4	·· 14.7	348°52.4	·· 11.5	359°14.4	·· 08.0
10	327°10.2	329°05.6	22.8	260°10.3	15.0	3°54.4	11.3	14°16.6	07.9
11	342°12.7	344°05.2	21.6	275°11.1	15.2	18°56.3	11.2	29°18.8	07.9
12	357°15.1	359°04.9	S02°20.3	290°12.0	N23°15.4	33°58.3	S15°11.0	44°21.1	S18°07.8
13	12°17.6	14°04.5	19.1	305°12.9	15.7	49°00.2	10.9	59°23.3	07.8
14	27°20.1	29°04.1	17.8	320°13.8	15.9	64°02.2	10.7	74°25.5	07.7
15	42°22.5	44°03.7	·· 16.6	335°14.6	·· 16.1	79°04.1	·· 10.5	89°27.8	·· 07.7
16	57°25.0	59°03.3	15.3	350°15.5	16.4	94°06.0	10.4	104°30.0	07.6
17	72°27.5	74°02.9	14.1	5°16.4	16.6	109°08.0	10.2	119°32.2	07.5
18	87°29.9	89°02.5	S02°12.8	20°17.3	N23°16.8	124°09.9	S15°10.0	134°34.5	S18°07.5
19	102°32.4	104°02.1	11.6	35°18.1	17.1	139°11.9	09.9	149°36.7	07.4
20	117°34.8	119°01.8	10.3	50°19.0	17.3	154°13.8	09.7	164°38.9	07.4
21	132°37.3	134°01.4	·· 09.1	65°19.9	·· 17.5	169°15.8	·· 09.6	179°41.2	·· 07.3
22	147°39.8	149°01.0	07.8	80°20.7	17.7	184°17.7	09.4	194°43.4	07.3
23	162°42.2	164°00.6	06.6	95°21.6	18.0	199°19.7	09.2	209°45.6	07.2
Mer.pass.	12:11	ν -0.4′	d -1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.15	ν 1.9′	d -0.2′ m -2.02	ν 2.2′	d -0.1′ m 0.73

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.7
Schedar	349°35.1	56°39.1
Diphda	348°50.8	-17°52.5
Achernar	335°23.1	-57°08.1
Hamal	327°55.0	23°33.6
Polaris	315°46.3	89°21.4
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°32.9	49°56.2
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.5	46°01.2
Bellatrix	278°26.2	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.4	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°28.9	-16°44.9
Adhara	255°08.2	-29°00.3
Procyon	244°53.9	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.5	-59°34.9
Suhail	222°48.2	-43°31.3
Miaplacidus	221°38.1	-69°48.4
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°12.9
Gacrux	171°54.5	-57°13.8
Alioth	166°15.3	55°50.6
Spica	158°25.3	-11°16.3
Alkaid	152°54.1	49°12.3
Hadar	148°39.8	-60°28.3
Menkent	148°00.9	-36°28.3
Arcturus	145°50.5	19°04.2
Rigil Kent.	139°44.0	-60°55.1
Kochab	137°19.1	74°03.9
Zuben'ubi	136°59.2	-16°07.7
Alphecca	126°06.2	26°38.4
Antares	112°19.5	-26°28.6
Atria	107°16.4	-69°03.6
Sabik	102°06.3	-15°45.0
Shaula	96°14.6	-37°07.0
Rasalhague	96°01.4	12°32.5
Eltanin	90°43.6	51°28.8
Kaus Aust.	83°36.7	-34°22.4
Vega	80°35.4	38°47.9
Nunki	75°51.7	-26°16.2
Altair	62°03.1	8°55.3
Peacock	53°11.0	-56°39.9
Deneb	49°28.2	45°21.1
Enif	33°42.1	9°58.1
Al Na'ir	27°37.3	-46°51.6
Fomalhaut	15°18.3	-29°30.8
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 17 Wed	SHA	Mer.pass
Venus	4°41.1	12:02
Mars	294°32.0	16:42
Jupiter	37°14.6	09:51
Saturn	47°20.1	09:10

Mar 18 Thu	SHA	Mer.pass
Venus	3°32.5	12:03
Mars	293°54.0	16:40
Jupiter	37°02.0	09:48
Saturn	47°14.4	09:07

Mar 19 Fri	SHA	Mer.pass
Venus	2°24.0	12:04
Mars	293°16.0	16:39
Jupiter	36°49.4	09:44
Saturn	47°08.7	09:03

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°53.6	S01°20.7	139°36.3	15.6′	N10°47.6	11.6′	54.1′
1	192°53.7	19.7	154°10.9	15.6′	10°59.2	11.6′	54.1′
2	207°53.9	18.7	168°45.5	15.5′	11°10.7	11.5′	54.1′
3	222°54.1	·· 17.7	183°20.0	15.5′	11°22.2	11.5′	54.1′
4	237°54.3	16.7	197°54.5	15.5′	11°33.7	11.4′	54.1′
5	252°54.5	15.8	212°29.0	15.4′	11°45.1	11.4′	54.1′
6	267°54.6	S01°14.8	227°03.4	15.4′	N11°56.4	11.3′	54.1′
7	282°54.8	13.8	241°37.8	15.4′	12°07.8	11.3′	54.1′
8	297°55.0	12.8	256°12.2	15.3′	12°19.0	11.2′	54.1′
9	312°55.2	·· 11.8	270°46.5	15.3′	12°30.2	11.2′	54.1′
10	327°55.4	10.8	285°20.9	15.3′	12°41.4	11.1′	54.1′
11	342°55.5	09.8	299°55.1	15.2′	12°52.5	11.1′	54.1′
12	357°55.7	S01°08.8	314°29.4	15.2′	N13°03.6	11.0′	54.1′
13	12°55.9	07.8	329°03.6	15.2′	13°14.6	10.9′	54.1′
14	27°56.1	06.9	343°37.8	15.1′	13°25.5	10.9′	54.1′
15	42°56.3	·· 05.9	358°11.9	15.1′	13°36.4	10.8′	54.1′
16	57°56.4	04.9	12°46.0	15.1′	13°47.2	10.8′	54.1′
17	72°56.6	03.9	27°20.1	15.0′	13°58.0	10.7′	54.1′
18	87°56.8	S01°02.9	41°54.1	15.0′	N14°08.7	10.7′	54.1′
19	102°57.0	01.9	56°28.1	14.9′	14°19.4	10.6′	54.0′
20	117°57.2	01°00.9	71°02.0	14.9′	14°30.0	10.6′	54.0′
21	132°57.3	00°59.9	85°35.9	14.9′	14°40.6	10.5′	54.0′
22	147°57.5	58.9	100°09.8	14.8′	14°51.1	10.4′	54.0′
23	162°57.7	58.0	114°43.6	14.8′	15°01.5	10.4′	54.0′
	SD = 16.1′	d = -1.0′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°57.9	S00°57.0	129°17.4	14.7′	N15°11.9	10.3′	54.0′
1	192°58.1	56.0	143°51.1	14.7′	15°22.2	10.2′	54.0′
2	207°58.2	55.0	158°24.8	14.6′	15°32.4	10.2′	54.0′
3	222°58.4	·· 54.0	172°58.4	14.6′	15°42.6	10.1′	54.0′
4	237°58.6	53.0	187°32.1	14.6′	15°52.7	10.1′	54.0′
5	252°58.8	52.0	202°05.6	14.5′	16°02.8	10.0′	54.0′
6	267°59.0	S00°51.0	216°39.1	14.5′	N16°12.8	9.9′	54.0′
7	282°59.1	50.0	231°12.6	14.4′	16°22.7	9.9′	54.0′
8	297°59.3	49.1	245°46.0	14.4′	16°32.5	9.8′	54.0′
9	312°59.5	·· 48.1	260°19.4	14.3′	16°42.3	9.7′	54.0′
10	327°59.7	47.1	274°52.7	14.3′	16°52.0	9.7′	54.0′
11	342°59.9	46.1	289°26.0	14.2′	17°01.7	9.6′	54.0′
12	358°00.1	S00°45.1	303°59.2	14.2′	N17°11.3	9.5′	54.0′
13	13°00.2	44.1	318°32.4	14.1′	17°20.8	9.4′	54.0′
14	28°00.4	43.1	333°05.5	14.1′	17°30.2	9.4′	54.0′
15	43°00.6	·· 42.1	347°38.6	14.0′	17°39.6	9.3′	54.0′
16	58°00.8	41.1	2°11.6	14.0′	17°48.9	9.2′	54.1′
17	73°01.0	40.2	16°44.6	13.9′	17°58.1	9.1′	54.1′
18	88°01.1	S00°39.2	31°17.5	13.9′	N18°07.3	9.1′	54.1′
19	103°01.3	38.2	45°50.4	13.8′	18°16.3	9.0′	54.1′
20	118°01.5	37.2	60°23.2	13.8′	18°25.3	8.9′	54.1′
21	133°01.7	·· 36.2	74°55.9	13.7′	18°34.3	8.8′	54.1′
22	148°01.9	35.2	89°28.6	13.7′	18°43.1	8.8′	54.1′
23	163°02.1	34.2	104°01.3	13.6′	18°51.9	8.7′	54.1′
	SD = 16.1′	d = -1.0′	SD = 14.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°02.2	S00°33.2	118°33.9	13.5′	N19°00.6	8.6′	54.1′
1	193°02.4	32.2	133°06.4	13.5′	19°09.2	8.5′	54.1′
2	208°02.6	31.3	147°38.9	13.4′	19°17.7	8.5′	54.1′
3	223°02.8	·· 30.3	162°11.4	13.4′	19°26.2	8.4′	54.1′
4	238°03.0	29.3	176°43.7	13.3′	19°34.5	8.3′	54.1′
5	253°03.2	28.3	191°16.1	13.3′	19°42.8	8.2′	54.1′
6	268°03.3	S00°27.3	205°48.3	13.2′	N19°51.0	8.1′	54.1′
7	283°03.5	26.3	220°20.5	13.1′	19°59.2	8.0′	54.1′
8	298°03.7	25.3	234°52.7	13.1′	20°07.2	8.0′	54.1′
9	313°03.9	·· 24.3	249°24.8	13.0′	20°15.1	7.9′	54.1′
10	328°04.1	23.3	263°56.8	13.0′	20°23.0	7.8′	54.1′
11	343°04.3	22.4	278°28.8	12.9′	20°30.8	7.7′	54.2′
12	358°04.4	S00°21.4	293°00.7	12.9′	N20°38.5	7.6′	54.2′
13	13°04.6	20.4	307°32.5	12.8′	20°46.1	7.5′	54.2′
14	28°04.8	19.4	322°04.3	12.7′	20°53.6	7.4′	54.2′
15	43°05.0	·· 18.4	336°36.1	12.7′	21°01.1	7.3′	54.2′
16	58°05.2	17.4	351°07.8	12.6′	21°08.4	7.2′	54.2′
17	73°05.4	16.4	5°39.4	12.6′	21°15.6	7.2′	54.2′
18	88°05.5	S00°15.4	20°11.0	12.5′	N21°22.8	7.1′	54.2′
19	103°05.7	14.4	34°42.5	12.4′	21°29.9	7.0′	54.2′
20	118°05.9	13.5	49°13.9	12.4′	21°36.8	6.9′	54.2′
21	133°06.1	·· 12.5	63°45.3	12.3′	21°43.7	6.8′	54.2′
22	148°06.3	11.5	78°16.6	12.3′	21°50.5	6.7′	54.3′
23	163°06.5	10.5	92°47.9	12.2′	21°57.2	6.6′	54.3′
	SD = 16.1′	d = -1.0′	SD = 14.7′				

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	18:10	19:12	20:29
68°	04:04	05:12	06:08	18:10	19:06	20:15
66°	04:14	05:17	06:08	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	05:38	06:07	18:10	18:39	19:14
N 40°	05:08	05:40	06:07	18:10	18:37	19:09
35°	05:12	05:41	06:06	18:10	18:35	19:05
30°	05:15	05:42	06:06	18:10	18:34	19:02
20°	05:18	05:44	06:06	18:11	18:33	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	19:09
40°	05:02	05:34	06:01	18:14	18:41	19:13
45°	04:56	05:31	06:00	18:15	18:45	19:19
S 50°	04:48	05:26	05:59	18:16	18:48	19:27
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	18:58	19:45
S 60°	04:23	05:14	05:56	18:19	19:01	19:51

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

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 4-6 12-26%
17	08:26	08:17	12:08	15:07	02:46	
18	08:08	08:00	12:08	15:51	03:29	
19	07:51	07:42	12:08	16:37	04:13	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	177°44.7	179°00.2	S02°05.3	110°22.5	N23°18.2	214°21.6	S15°09.1	224°47.9	S18°07.1
1	192°47.2	193°59.8	04.0	125°23.4	18.4	229°23.5	08.9	239°50.1	07.1
2	207°49.6	208°59.4	02.8	140°24.2	18.7	244°25.5	08.8	254°52.3	07.0
3	222°52.1	223°59.1	·· 01.5	155°25.1	·· 18.9	259°27.4	·· 08.6	269°54.6	·· 07.0
4	237°54.6	238°58.7	02°00.3	170°26.0	19.1	274°29.4	08.4	284°56.8	06.9
5	252°57.0	253°58.3	01°59.0	185°26.8	19.3	289°31.3	08.3	299°59.0	06.9
6	267°59.5	268°57.9	S01°57.8	200°27.7	N23°19.6	304°33.3	S15°08.1	315°01.3	S18°06.8
7	283°02.0	283°57.5	56.5	215°28.6	19.8	319°35.2	07.9	330°03.5	06.7
8	298°04.4	298°57.1	55.3	230°29.5	20.0	334°37.2	07.8	345°05.7	06.7
9	313°06.9	313°56.7	·· 54.0	245°30.3	·· 20.2	349°39.1	·· 07.6	0°08.0	·· 06.6
10	328°09.3	328°56.4	52.8	260°31.2	20.5	4°41.1	07.5	15°10.2	06.6
11	343°11.8	343°56.0	51.5	275°32.1	20.7	19°43.0	07.3	30°12.4	06.5
12	358°14.3	358°55.6	S01°50.3	290°32.9	N23°20.9	34°44.9	S15°07.1	45°14.7	S18°06.5
13	13°16.7	13°55.2	49.0	305°33.8	21.2	49°46.9	07.0	60°16.9	06.4
14	28°19.2	28°54.8	47.7	320°34.7	21.4	64°48.8	06.8	75°19.1	06.3
15	43°21.7	43°54.4	·· 46.5	335°35.5	·· 21.6	79°50.8	·· 06.6	90°21.4	·· 06.3
16	58°24.1	58°54.0	45.2	350°36.4	21.8	94°52.7	06.5	105°23.6	06.2
17	73°26.6	73°53.7	44.0	5°37.3	22.1	109°54.7	06.3	120°25.8	06.2
18	88°29.1	88°53.3	S01°42.7	20°38.2	N23°22.3	124°56.6	S15°06.2	135°28.1	S18°06.1
19	103°31.5	103°52.9	41.5	35°39.0	22.5	139°58.6	06.0	150°30.3	06.1
20	118°34.0	118°52.5	40.2	50°39.9	22.7	155°00.5	05.8	165°32.5	06.0
21	133°36.4	133°52.1	·· 39.0	65°40.8	·· 22.9	170°02.5	·· 05.7	180°34.8	·· 05.9
22	148°38.9	148°51.7	37.7	80°41.6	23.2	185°04.4	05.5	195°37.0	05.9
23	163°41.4	163°51.4	36.4	95°42.5	23.4	200°06.4	05.3	210°39.2	05.8
Mer.pass.	12:07	ν -0.4′	d -1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.17	ν 1.9′	d -0.2′ m -2.03	ν 2.2′	d -0.1′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	178°43.8	178°51.0	S01°35.2	110°43.4	N23°23.6	215°08.3	S15°05.2	225°41.5	S18°05.8
1	193°46.3	193°50.6	33.9	125°44.2	23.8	230°10.3	05.0	240°43.7	05.7
2	208°48.8	208°50.2	32.7	140°45.1	24.1	245°12.2	04.9	255°45.9	05.7
3	223°51.2	223°49.8	·· 31.4	155°46.0	·· 24.3	260°14.2	·· 04.7	270°48.2	·· 05.6
4	238°53.7	238°49.4	30.2	170°46.8	24.5	275°16.1	04.5	285°50.4	05.5
5	253°56.2	253°49.1	28.9	185°47.7	24.7	290°18.1	04.4	300°52.6	05.5
6	268°58.6	268°48.7	S01°27.7	200°48.6	N23°25.0	305°20.0	S15°04.2	315°54.9	S18°05.4
7	284°01.1	283°48.3	26.4	215°49.4	25.2	320°22.0	04.1	330°57.1	05.4
8	299°03.6	298°47.9	25.1	230°50.3	25.4	335°23.9	03.9	345°59.4	05.3
9	314°06.0	313°47.5	·· 23.9	245°51.2	·· 25.6	350°25.9	·· 03.7	1°01.6	·· 05.3
10	329°08.5	328°47.1	22.6	260°52.0	25.8	5°27.8	03.6	16°03.8	05.2
11	344°10.9	343°46.8	21.4	275°52.9	26.1	20°29.8	03.4	31°06.1	05.1
12	359°13.4	358°46.4	S01°20.1	290°53.8	N23°26.3	35°31.7	S15°03.2	46°08.3	S18°05.1
13	14°15.9	13°46.0	18.9	305°54.6	26.5	50°33.7	03.1	61°10.5	05.0
14	29°18.3	28°45.6	17.6	320°55.5	26.7	65°35.6	02.9	76°12.8	05.0
15	44°20.8	43°45.2	·· 16.3	335°56.4	·· 26.9	80°37.5	·· 02.8	91°15.0	·· 04.9
16	59°23.3	58°44.8	15.1	350°57.2	27.2	95°39.5	02.6	106°17.2	04.9
17	74°25.7	73°44.5	13.8	5°58.1	27.4	110°41.4	02.4	121°19.5	04.8
18	89°28.2	88°44.1	S01°12.6	20°59.0	N23°27.6	125°43.4	S15°02.3	136°21.7	S18°04.8
19	104°30.7	103°43.7	11.3	35°59.8	27.8	140°45.4	02.1	151°24.0	04.7
20	119°33.1	118°43.3	10.1	51°00.7	28.0	155°47.3	02.0	166°26.2	04.6
21	134°35.6	133°42.9	·· 08.8	66°01.6	·· 28.2	170°49.3	·· 01.8	181°28.4	·· 04.6
22	149°38.1	148°42.6	07.5	81°02.4	28.5	185°51.2	01.6	196°30.7	04.5
23	164°40.5	163°42.2	06.3	96°03.3	28.7	200°53.2	01.5	211°32.9	04.5
Mer.pass.	12:03	ν -0.4′	d -1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.18	ν 1.9′	d -0.2′ m -2.03	ν 2.2′	d -0.1′ m 0.73

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	179°43.0	178°41.8	S01°05.0	111°04.2	N23°28.9	215°55.1	S15°01.3	226°35.1	S18°04.4
1	194°45.4	193°41.4	03.8	126°05.0	29.1	230°57.1	01.1	241°37.4	04.4
2	209°47.9	208°41.0	02.5	141°05.9	29.3	245°59.0	01.0	256°39.6	04.3
3	224°50.4	223°40.6	·· 01.3	156°06.7	·· 29.5	261°01.0	·· 00.8	271°41.9	·· 04.2
4	239°52.8	238°40.3	01°00.0	171°07.6	29.8	276°02.9	00.7	286°44.1	04.2
5	254°55.3	253°39.9	00°58.7	186°08.5	30.0	291°04.9	00.5	301°46.3	04.1
6	269°57.8	268°39.5	S00°57.5	201°09.3	N23°30.2	306°06.8	S15°00.3	316°48.6	S18°04.1
7	285°00.2	283°39.1	56.2	216°10.2	30.4	321°08.8	00.2	331°50.8	04.0
8	300°02.7	298°38.7	55.0	231°11.1	30.6	336°10.7	15°00.0	346°53.0	04.0
9	315°05.2	313°38.4	·· 53.7	246°11.9	·· 30.8	351°12.7	14°59.9	1°55.3	·· 03.9
10	330°07.6	328°38.0	52.4	261°12.8	31.0	6°14.6	59.7	16°57.5	03.9
11	345°10.1	343°37.6	51.2	276°13.6	31.3	21°16.6	59.5	31°59.8	03.8
12	0°12.6	358°37.2	S00°49.9	291°14.5	N23°31.5	36°18.5	S14°59.4	47°02.0	S18°03.7
13	15°15.0	13°36.8	48.7	306°15.4	31.7	51°20.5	59.2	62°04.2	03.7
14	30°17.5	28°36.5	47.4	321°16.2	31.9	66°22.4	59.1	77°06.5	03.6
15	45°19.9	43°36.1	·· 46.2	336°17.1	·· 32.1	81°24.4	·· 58.9	92°08.7	·· 03.6
16	60°22.4	58°35.7	44.9	351°18.0	32.3	96°26.3	58.7	107°11.0	03.5
17	75°24.9	73°35.3	43.6	6°18.8	32.5	111°28.3	58.6	122°13.2	03.5
18	90°27.3	88°34.9	S00°42.4	21°19.7	N23°32.8	126°30.2	S14°58.4	137°15.4	S18°03.4
19	105°29.8	103°34.6	41.1	36°20.5	33.0	141°32.2	58.2	152°17.7	03.4
20	120°32.3	118°34.2	39.9	51°21.4	33.2	156°34.2	58.1	167°19.9	03.3
21	135°34.7	133°33.8	·· 38.6	66°22.3	·· 33.4	171°36.1	·· 57.9	182°22.2	·· 03.2
22	150°37.2	148°33.4	37.3	81°23.1	33.6	186°38.1	57.8	197°24.4	03.2
23	165°39.7	163°33.0	36.1	96°24.0	33.8	201°40.0	57.6	212°26.6	03.1
Mer.pass.	11:59	ν -0.4′	d -1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.19	ν 2.0′	d -0.2′ m -2.03	ν 2.2′	d -0.1′ m 0.73

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.7
Schedar	349°35.0	56°39.1
Diphda	348°50.8	-17°52.5
Achernar	335°23.1	-57°08.0
Hamal	327°55.0	23°33.6
Polaris	315°47.2	89°21.3
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°33.0	49°56.2
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°28.9	-16°44.9
Adhara	255°08.2	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.6	-59°34.9
Suhail	222°48.2	-43°31.3
Miaplacidus	221°38.1	-69°48.4
Alphard	217°50.5	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°12.9
Gacrux	171°54.4	-57°13.8
Alioth	166°15.2	55°50.7
Spica	158°25.3	-11°16.3
Alkaid	152°54.1	49°12.4
Hadar	148°39.8	-60°28.3
Menkent	148°00.9	-36°28.3
Arcturus	145°50.5	19°04.2
Rigil Kent.	139°44.0	-60°55.1
Kochab	137°19.1	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.5
Antares	112°19.5	-26°28.6
Atria	107°16.4	-69°03.6
Sabik	102°06.3	-15°45.0
Shaula	96°14.5	-37°07.0
Rasalhague	96°01.4	12°32.5
Eltanin	90°43.6	51°28.8
Kaus Aust.	83°36.7	-34°22.4
Vega	80°35.4	38°47.9
Nunki	75°51.7	-26°16.2
Altair	62°03.1	8°55.3
Peacock	53°11.0	-56°39.9
Deneb	49°28.2	45°21.0
Enif	33°42.1	9°58.1
Al Na'ir	27°37.3	-46°51.5
Fomalhaut	15°18.3	-29°30.8
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 20 Sat	SHA	Mer.pass
Venus	1°15.5	12:04
Mars	292°37.8	16:38
Jupiter	36°36.9	09:41
Saturn	47°03.2	08:59

Mar 21 Sun	SHA	Mer.pass
Venus	0°07.1	12:05
Mars	291°59.5	16:36
Jupiter	36°24.5	09:38
Saturn	46°57.6	08:56

Mar 22 Mon	SHA	Mer.pass
Venus	358°58.8	12:06
Mars	291°21.2	16:35
Jupiter	36°12.1	09:35
Saturn	46°52.2	08:52

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°06.6	S00°09.5	107°19.1	12.1′	N22°03.8	6.5′	54.3′
1	193°06.8	08.5	121°50.2	12.1′	22°10.3	6.4′	54.3′
2	208°07.0	07.5	136°21.3	12.0′	22°16.7	6.3′	54.3′
3	223°07.2	·· 06.5	150°52.3	12.0′	22°23.0	6.2′	54.3′
4	238°07.4	05.6	165°23.3	11.9′	22°29.2	6.1′	54.3′
5	253°07.6	04.6	179°54.2	11.8′	22°35.3	6.0′	54.3′
6	268°07.8	S00°03.6	194°25.0	11.8′	N22°41.3	5.9′	54.4′
7	283°07.9	02.6	208°55.8	11.7′	22°47.2	5.8′	54.4′
8	298°08.1	01.6	223°26.5	11.7′	22°53.0	5.7′	54.4′
9	313°08.3	S00°00.6	237°57.2	11.6′	22°58.7	5.6′	54.4′
10	328°08.5	N00°00.4	252°27.8	11.5′	23°04.3	5.5′	54.4′
11	343°08.7	01.4	266°58.3	11.5′	23°09.8	5.4′	54.4′
12	358°08.9	N00°02.4	281°28.8	11.4′	N23°15.2	5.3′	54.4′
13	13°09.0	03.3	295°59.2	11.4′	23°20.5	5.2′	54.5′
14	28°09.2	04.3	310°29.6	11.3′	23°25.7	5.1′	54.5′
15	43°09.4	·· 05.3	324°59.9	11.2′	23°30.7	5.0′	54.5′
16	58°09.6	06.3	339°30.2	11.2′	23°35.7	4.9′	54.5′
17	73°09.8	07.3	354°00.3	11.1′	23°40.5	4.7′	54.5′
18	88°10.0	N00°08.3	8°30.5	11.1′	N23°45.3	4.6′	54.5′
19	103°10.2	09.3	23°00.5	11.0′	23°49.9	4.5′	54.6′
20	118°10.3	10.3	37°30.6	11.0′	23°54.5	4.4′	54.6′
21	133°10.5	·· 11.2	52°00.5	10.9′	23°58.9	4.3′	54.6′
22	148°10.7	12.2	66°30.4	10.8′	24°03.2	4.2′	54.6′
23	163°10.9	13.2	81°00.2	10.8′	24°07.4	4.1′	54.6′
	SD = 16.1′	d = -1.0′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°11.1	N00°14.2	95°30.0	10.7′	N24°11.4	4.0′	54.6′
1	193°11.3	15.2	109°59.8	10.7′	24°15.4	3.9′	54.7′
2	208°11.5	16.2	124°29.4	10.6′	24°19.3	3.7′	54.7′
3	223°11.6	·· 17.2	138°59.1	10.6′	24°23.0	3.6′	54.7′
4	238°11.8	18.2	153°28.6	10.5′	24°26.6	3.5′	54.7′
5	253°12.0	19.1	167°58.1	10.5′	24°30.1	3.4′	54.7′
6	268°12.2	N00°20.1	182°27.6	10.4′	N24°33.5	3.3′	54.8′
7	283°12.4	21.1	196°57.0	10.3′	24°36.8	3.2′	54.8′
8	298°12.6	22.1	211°26.3	10.3′	24°39.9	3.0′	54.8′
9	313°12.8	·· 23.1	225°55.6	10.2′	24°43.0	2.9′	54.8′
10	328°12.9	24.1	240°24.9	10.2′	24°45.9	2.8′	54.8′
11	343°13.1	25.1	254°54.1	10.1′	24°48.7	2.7′	54.9′
12	358°13.3	N00°26.1	269°23.2	10.1′	N24°51.3	2.6′	54.9′
13	13°13.5	27.0	283°52.3	10.0′	24°53.9	2.4′	54.9′
14	28°13.7	28.0	298°21.3	10.0′	24°56.3	2.3′	54.9′
15	43°13.9	·· 29.0	312°50.3	9.9′	24°58.6	2.2′	55.0′
16	58°14.1	30.0	327°19.3	9.9′	25°00.8	2.1′	55.0′
17	73°14.2	31.0	341°48.2	9.8′	25°02.9	1.9′	55.0′
18	88°14.4	N00°32.0	356°17.0	9.8′	N25°04.8	1.8′	55.0′
19	103°14.6	33.0	10°45.8	9.8′	25°06.6	1.7′	55.1′
20	118°14.8	34.0	25°14.6	9.7′	25°08.3	1.6′	55.1′
21	133°15.0	·· 34.9	39°43.3	9.7′	25°09.9	1.4′	55.1′
22	148°15.2	35.9	54°11.9	9.6′	25°11.3	1.3′	55.1′
23	163°15.4	36.9	68°40.6	9.6′	25°12.6	1.2′	55.2′
	SD = 16.1′	d = 1.0′	SD = 14.9′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°15.6	N00°37.9	83°09.2	9.5′	N25°13.8	1.1′	55.2′
1	193°15.7	38.9	97°37.7	9.5′	25°14.8	0.9′	55.2′
2	208°15.9	39.9	112°06.2	9.5′	25°15.8	0.8′	55.2′
3	223°16.1	·· 40.9	126°34.6	9.4′	25°16.6	0.7′	55.3′
4	238°16.3	41.9	141°03.1	9.4′	25°17.2	0.5′	55.3′
5	253°16.5	42.8	155°31.4	9.3′	25°17.8	0.4′	55.3′
6	268°16.7	N00°43.8	169°59.8	9.3′	N25°18.2	0.3′	55.3′
7	283°16.9	44.8	184°28.1	9.3′	25°18.4	0.1′	55.4′
8	298°17.1	45.8	198°56.3	9.2′	25°18.6	0.0′	55.4′
9	313°17.2	·· 46.8	213°24.6	9.2′	25°18.6	-0.1′	55.4′
10	328°17.4	47.8	227°52.8	9.2′	25°18.5	-0.3′	55.4′
11	343°17.6	48.8	242°20.9	9.1′	25°18.2	-0.4′	55.5′
12	358°17.8	N00°49.7	256°49.1	9.1′	N25°17.8	-0.5′	55.5′
13	13°18.0	50.7	271°17.1	9.1′	25°17.3	-0.7′	55.5′
14	28°18.2	51.7	285°45.2	9.0′	25°16.7	-0.8′	55.6′
15	43°18.4	·· 52.7	300°13.2	9.0′	25°15.9	-0.9′	55.6′
16	58°18.5	53.7	314°41.2	9.0′	25°15.0	-1.1′	55.6′
17	73°18.7	54.7	329°09.2	8.9′	25°13.9	-1.2′	55.6′
18	88°18.9	N00°55.7	343°37.2	8.9′	N25°12.7	-1.3′	55.7′
19	103°19.1	56.6	358°05.1	8.9′	25°11.4	-1.5′	55.7′
20	118°19.3	57.6	12°33.0	8.9′	25°09.9	-1.6′	55.7′
21	133°19.5	·· 58.6	27°00.9	8.8′	25°08.3	-1.7′	55.8′
22	148°19.7	00°59.6	41°28.7	8.8′	25°06.6	-1.9′	55.8′
23	163°19.9	01°00.6	55°56.5	8.8′	25°04.7	-2.0′	55.8′
	SD = 16.0′	d = 1.0′	SD = 15.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:13	04:44	05:52	18:24	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	05:58	18:18	19:03	19:57
60°	04:27	05:17	05:58	18:17	18:59	19:50
N 58°	04:33	05:20	05:59	18:17	18:56	19:43
56°	04:38	05:22	05:59	18:16	18:53	19:38
54°	04:43	05:24	06:00	18:16	18:51	19:33
52°	04:47	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	06:03	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	18:10	18:37	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	19:27
56°	04:42	05:26	06:03	18:10	18:47	19:31
58°	04:37	05:24	06:03	18:10	18:49	19:36
S 60°	04:31	05:21	06:03	18:10	18:51	19:41

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

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 7-9 35-54%
20	07:33	07:25	12:07	17:25	05:00	
21	07:16	07:07	12:07	18:15	05:50	
22	06:58	06:49	12:07	19:08	06:41	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	180°42.1	178°32.7	S00°34.8	111°24.9	N23°34.0	216°42.0	S14°57.4	227°28.9	S18°03.1
1	195°44.6	193°32.3	33.6	126°25.7	34.2	231°43.9	57.3	242°31.1	03.0
2	210°47.0	208°31.9	32.3	141°26.6	34.4	246°45.9	57.1	257°33.4	03.0
3	225°49.5	223°31.5	·· 31.0	156°27.4	·· 34.7	261°47.8	·· 57.0	272°35.6	·· 02.9
4	240°52.0	238°31.1	29.8	171°28.3	34.9	276°49.8	56.8	287°37.8	02.9
5	255°54.4	253°30.8	28.5	186°29.2	35.1	291°51.7	56.6	302°40.1	02.8
6	270°56.9	268°30.4	S00°27.3	201°30.0	N23°35.3	306°53.7	S14°56.5	317°42.3	S18°02.7
7	285°59.4	283°30.0	26.0	216°30.9	35.5	321°55.7	56.3	332°44.6	02.7
8	301°01.8	298°29.6	24.8	231°31.7	35.7	336°57.6	56.2	347°46.8	02.6
9	316°04.3	313°29.2	·· 23.5	246°32.6	·· 35.9	351°59.6	·· 56.0	2°49.0	·· 02.6
10	331°06.8	328°28.9	22.2	261°33.4	36.1	7°01.5	55.8	17°51.3	02.5
11	346°09.2	343°28.5	21.0	276°34.3	36.3	22°03.5	55.7	32°53.5	02.5
12	1°11.7	358°28.1	S00°19.7	291°35.2	N23°36.5	37°05.4	S14°55.5	47°55.8	S18°02.4
13	16°14.2	13°27.7	18.5	306°36.0	36.7	52°07.4	55.4	62°58.0	02.4
14	31°16.6	28°27.4	17.2	321°36.9	36.9	67°09.3	55.2	78°00.3	02.3
15	46°19.1	43°27.0	·· 15.9	336°37.7	·· 37.2	82°11.3	·· 55.0	93°02.5	·· 02.2
16	61°21.5	58°26.6	14.7	351°38.6	37.4	97°13.3	54.9	108°04.7	02.2
17	76°24.0	73°26.2	13.4	6°39.5	37.6	112°15.2	54.7	123°07.0	02.1
18	91°26.5	88°25.8	S00°12.2	21°40.3	N23°37.8	127°17.2	S14°54.6	138°09.2	S18°02.1
19	106°28.9	103°25.5	10.9	36°41.2	38.0	142°19.1	54.4	153°11.5	02.0
20	121°31.4	118°25.1	09.6	51°42.0	38.2	157°21.1	54.2	168°13.7	02.0
21	136°33.9	133°24.7	·· 08.4	66°42.9	·· 38.4	172°23.0	·· 54.1	183°16.0	·· 01.9
22	151°36.3	148°24.3	07.1	81°43.8	38.6	187°25.0	53.9	198°18.2	01.9
23	166°38.8	163°23.9	05.9	96°44.6	38.8	202°27.0	53.8	213°20.4	01.8
Mer.pass.	11:55	ν -0.4′	d -1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.20	ν 2.0′	d -0.2′ m -2.03	ν 2.2′	d -0.1′ m 0.73

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	181°41.3	178°23.6	S00°04.6	111°45.5	N23°39.0	217°28.9	S14°53.6	228°22.7	S18°01.8
1	196°43.7	193°23.2	03.3	126°46.3	39.2	232°30.9	53.4	243°24.9	01.7
2	211°46.2	208°22.8	02.1	141°47.2	39.4	247°32.8	53.3	258°27.2	01.6
3	226°48.7	223°22.4	S00°00.8	156°48.0	·· 39.6	262°34.8	·· 53.1	273°29.4	·· 01.6
4	241°51.1	238°22.1	N00°00.4	171°48.9	39.8	277°36.7	53.0	288°31.7	01.5
5	256°53.6	253°21.7	01.7	186°49.7	40.0	292°38.7	52.8	303°33.9	01.5
6	271°56.0	268°21.3	N00°03.0	201°50.6	N23°40.2	307°40.7	S14°52.6	318°36.1	S18°01.4
7	286°58.5	283°20.9	04.2	216°51.5	40.4	322°42.6	52.5	333°38.4	01.4
8	302°01.0	298°20.5	05.5	231°52.3	40.6	337°44.6	52.3	348°40.6	01.3
9	317°03.4	313°20.2	·· 06.7	246°53.2	·· 40.8	352°46.5	·· 52.2	3°42.9	·· 01.3
10	332°05.9	328°19.8	08.0	261°54.0	41.0	7°48.5	52.0	18°45.1	01.2
11	347°08.4	343°19.4	09.3	276°54.9	41.2	22°50.5	51.8	33°47.4	01.2
12	2°10.8	358°19.0	N00°10.5	291°55.7	N23°41.4	37°52.4	S14°51.7	48°49.6	S18°01.1
13	17°13.3	13°18.7	11.8	306°56.6	41.6	52°54.4	51.5	63°51.9	01.0
14	32°15.8	28°18.3	13.0	321°57.5	41.8	67°56.3	51.4	78°54.1	01.0
15	47°18.2	43°17.9	·· 14.3	336°58.3	·· 42.0	82°58.3	·· 51.2	93°56.3	·· 00.9
16	62°20.7	58°17.5	15.6	351°59.2	42.2	98°00.2	51.0	108°58.6	00.9
17	77°23.1	73°17.1	16.8	7°00.0	42.4	113°02.2	50.9	124°00.8	00.8
18	92°25.6	88°16.8	N00°18.1	22°00.9	N23°42.6	128°04.2	S14°50.7	139°03.1	S18°00.8
19	107°28.1	103°16.4	19.3	37°01.7	42.8	143°06.1	50.6	154°05.3	00.7
20	122°30.5	118°16.0	20.6	52°02.6	43.0	158°08.1	50.4	169°07.6	00.7
21	137°33.0	133°15.6	·· 21.9	67°03.4	·· 43.2	173°10.0	·· 50.2	184°09.8	·· 00.6
22	152°35.5	148°15.3	23.1	82°04.3	43.4	188°12.0	50.1	199°12.1	00.6
23	167°37.9	163°14.9	24.4	97°05.1	43.6	203°14.0	49.9	214°14.3	00.5
Mer.pass.	11:51	ν -0.4′	d -1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.21	ν 2.0′	d -0.2′ m -2.04	ν 2.2′	d -0.1′ m 0.73

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	182°40.4	178°14.5	N00°25.6	112°06.0	N23°43.8	218°15.9	S14°49.8	229°16.5	S18°00.4
1	197°42.9	193°14.1	26.9	127°06.9	44.0	233°17.9	49.6	244°18.8	00.4
2	212°45.3	208°13.7	28.2	142°07.7	44.2	248°19.9	49.4	259°21.0	00.3
3	227°47.8	223°13.4	·· 29.4	157°08.6	·· 44.4	263°21.8	·· 49.3	274°23.3	·· 00.3
4	242°50.3	238°13.0	30.7	172°09.4	44.6	278°23.8	49.1	289°25.5	00.2
5	257°52.7	253°12.6	32.0	187°10.3	44.8	293°25.7	49.0	304°27.8	00.2
6	272°55.2	268°12.2	N00°33.2	202°11.1	N23°45.0	308°27.7	S14°48.8	319°30.0	S18°00.1
7	287°57.6	283°11.9	34.5	217°12.0	45.2	323°29.7	48.6	334°32.3	00.1
8	303°00.1	298°11.5	35.7	232°12.8	45.4	338°31.6	48.5	349°34.5	00.0
9	318°02.6	313°11.1	·· 37.0	247°13.7	·· 45.6	353°33.6	·· 48.3	4°36.8	18°00.0
10	333°05.0	328°10.7	38.3	262°14.5	45.8	8°35.5	48.2	19°39.0	17°59.9
11	348°07.5	343°10.4	39.5	277°15.4	46.0	23°37.5	48.0	34°41.3	59.9
12	3°10.0	358°10.0	N00°40.8	292°16.2	N23°46.2	38°39.5	S14°47.9	49°43.5	S17°59.8
13	18°12.4	13°09.6	42.0	307°17.1	46.4	53°41.4	47.7	64°45.8	59.7
14	33°14.9	28°09.2	43.3	322°17.9	46.6	68°43.4	47.5	79°48.0	59.7
15	48°17.4	43°08.8	·· 44.6	337°18.8	·· 46.8	83°45.4	·· 47.4	94°50.2	·· 59.6
16	63°19.8	58°08.5	45.8	352°19.6	47.0	98°47.3	47.2	109°52.5	59.6
17	78°22.3	73°08.1	47.1	7°20.5	47.2	113°49.3	47.1	124°54.7	59.5
18	93°24.8	88°07.7	N00°48.3	22°21.3	N23°47.3	128°51.2	S14°46.9	139°57.0	S17°59.5
19	108°27.2	103°07.3	49.6	37°22.2	47.5	143°53.2	46.7	154°59.2	59.4
20	123°29.7	118°07.0	50.9	52°23.1	47.7	158°55.2	46.6	170°01.5	59.4
21	138°32.1	133°06.6	·· 52.1	67°23.9	·· 47.9	173°57.1	·· 46.4	185°03.7	·· 59.3
22	153°34.6	148°06.2	53.4	82°24.8	48.1	188°59.1	46.3	200°06.0	59.3
23	168°37.1	163°05.8	54.6	97°25.6	48.3	204°01.1	46.1	215°08.2	59.2
Mer.pass.	11:47	ν -0.4′	d 1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.22	ν 2.0′	d -0.2′ m -2.04	ν 2.2′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.7
Schedar	349°35.0	56°39.1
Diphda	348°50.7	-17°52.5
Achernar	335°23.1	-57°08.0
Hamal	327°55.0	23°33.6
Polaris	315°48.1	89°21.3
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°33.0	49°56.2
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.8	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°28.9	-16°45.0
Adhara	255°08.2	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.6	-59°34.9
Suhail	222°48.2	-43°31.3
Miaplacidus	221°38.1	-69°48.4
Alphard	217°50.6	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°12.9
Gacrux	171°54.4	-57°13.9
Alioth	166°15.2	55°50.7
Spica	158°25.3	-11°16.3
Alkaid	152°54.1	49°12.4
Hadar	148°39.8	-60°28.3
Menkent	148°00.9	-36°28.4
Arcturus	145°50.5	19°04.2
Rigil Kent.	139°44.0	-60°55.2
Kochab	137°19.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.5
Antares	112°19.5	-26°28.6
Atria	107°16.3	-69°03.6
Sabik	102°06.2	-15°45.0
Shaula	96°14.5	-37°07.0
Rasalhague	96°01.4	12°32.5
Eltanin	90°43.6	51°28.8
Kaus Aust.	83°36.6	-34°22.4
Vega	80°35.3	38°47.9
Nunki	75°51.7	-26°16.2
Altair	62°03.1	8°55.3
Peacock	53°11.0	-56°39.9
Deneb	49°28.1	45°21.0
Enif	33°42.1	9°58.1
Al Na'ir	27°37.2	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 23 Tue	SHA	Mer.pass
Venus	357°50.5	12:06
Mars	290°42.7	16:33
Jupiter	35°59.8	09:32
Saturn	46°46.8	08:49

Mar 24 Wed	SHA	Mer.pass
Venus	356°42.3	12:07
Mars	290°04.2	16:32
Jupiter	35°47.7	09:29
Saturn	46°41.4	08:45

Mar 25 Thu	SHA	Mer.pass
Venus	355°34.1	12:07
Mars	289°25.6	16:31
Jupiter	35°35.5	09:26
Saturn	46°36.1	08:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun			Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°20.1	N01°01.6	70°24.3	8.8′	N25°02.7	-2.1′	55.9′
1	193°20.2	02.6	84°52.1	8.8′	25°00.6	-2.3′	55.9′
2	208°20.4	03.5	99°19.9	8.7′	24°58.3	-2.4′	55.9′
3	223°20.6	·· 04.5	113°47.6	8.7′	24°55.9	-2.6′	56.0′
4	238°20.8	05.5	128°15.3	8.7′	24°53.3	-2.7′	56.0′
5	253°21.0	06.5	142°43.0	8.7′	24°50.6	-2.8′	56.0′
6	268°21.2	N01°07.5	157°10.7	8.7′	N24°47.8	-3.0′	56.1′
7	283°21.4	08.5	171°38.4	8.7′	24°44.9	-3.1′	56.1′
8	298°21.6	09.5	186°06.1	8.6′	24°41.8	-3.2′	56.1′
9	313°21.7	·· 10.4	200°33.7	8.6′	24°38.5	-3.4′	56.2′
10	328°21.9	11.4	215°01.3	8.6′	24°35.1	-3.5′	56.2′
11	343°22.1	12.4	229°29.0	8.6′	24°31.6	-3.7′	56.2′
12	358°22.3	N01°13.4	243°56.6	8.6′	N24°28.0	-3.8′	56.3′
13	13°22.5	14.4	258°24.2	8.6′	24°24.2	-3.9′	56.3′
14	28°22.7	15.4	272°51.8	8.6′	24°20.2	-4.1′	56.3′
15	43°22.9	·· 16.4	287°19.4	8.6′	24°16.2	-4.2′	56.4′
16	58°23.1	17.3	301°46.9	8.6′	24°12.0	-4.3′	56.4′
17	73°23.3	18.3	316°14.5	8.6′	24°07.6	-4.5′	56.4′
18	88°23.4	N01°19.3	330°42.1	8.6′	N24°03.1	-4.6′	56.5′
19	103°23.6	20.3	345°09.6	8.6′	23°58.5	-4.8′	56.5′
20	118°23.8	21.3	359°37.2	8.6′	23°53.7	-4.9′	56.5′
21	133°24.0	·· 22.3	14°04.7	8.6′	23°48.8	-5.0′	56.6′
22	148°24.2	23.2	28°32.3	8.6′	23°43.8	-5.2′	56.6′
23	163°24.4	24.2	42°59.9	8.6′	23°38.6	-5.3′	56.6′
	SD = 16.0′	d = 1.0′	SD = 15.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.6	N01°25.2	57°27.4	8.6′	N23°33.3	-5.4′	56.7′
1	193°24.8	26.2	71°55.0	8.6′	23°27.9	-5.6′	56.7′
2	208°24.9	27.2	86°22.5	8.6′	23°22.3	-5.7′	56.8′
3	223°25.1	·· 28.2	100°50.1	8.6′	23°16.6	-5.9′	56.8′
4	238°25.3	29.2	115°17.6	8.6′	23°10.7	-6.0′	56.8′
5	253°25.5	30.1	129°45.2	8.6′	23°04.7	-6.1′	56.9′
6	268°25.7	N01°31.1	144°12.8	8.6′	N22°58.6	-6.3′	56.9′
7	283°25.9	32.1	158°40.4	8.6′	22°52.3	-6.4′	56.9′
8	298°26.1	33.1	173°07.9	8.6′	22°45.9	-6.5′	57.0′
9	313°26.3	·· 34.1	187°35.5	8.6′	22°39.4	-6.7′	57.0′
10	328°26.5	35.1	202°03.1	8.6′	22°32.7	-6.8′	57.0′
11	343°26.6	36.0	216°30.7	8.6′	22°25.9	-6.9′	57.1′
12	358°26.8	N01°37.0	230°58.4	8.6′	N22°19.0	-7.1′	57.1′
13	13°27.0	38.0	245°26.0	8.6′	22°11.9	-7.2′	57.2′
14	28°27.2	39.0	259°53.6	8.7′	22°04.7	-7.3′	57.2′
15	43°27.4	·· 40.0	274°21.3	8.7′	21°57.3	-7.5′	57.2′
16	58°27.6	41.0	288°48.9	8.7′	21°49.9	-7.6′	57.3′
17	73°27.8	41.9	303°16.6	8.7′	21°42.3	-7.7′	57.3′
18	88°28.0	N01°42.9	317°44.3	8.7′	N21°34.5	-7.9′	57.3′
19	103°28.2	43.9	332°12.0	8.7′	21°26.6	-8.0′	57.4′
20	118°28.4	44.9	346°39.7	8.7′	21°18.6	-8.1′	57.4′
21	133°28.5	·· 45.9	1°07.5	8.7′	21°10.5	-8.3′	57.5′
22	148°28.7	46.9	15°35.2	8.8′	21°02.2	-8.4′	57.5′
23	163°28.9	47.8	30°03.0	8.8′	20°53.9	-8.5′	57.5′
	SD = 16.0′	d = 1.0′	SD = 15.5′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.1	N01°48.8	44°30.7	8.8′	N20°45.3	-8.6′	57.6′
1	193°29.3	49.8	58°58.5	8.8′	20°36.7	-8.8′	57.6′
2	208°29.5	50.8	73°26.4	8.8′	20°27.9	-8.9′	57.7′
3	223°29.7	·· 51.8	87°54.2	8.8′	20°19.0	-9.0′	57.7′
4	238°29.9	52.7	102°22.0	8.9′	20°10.0	-9.2′	57.7′
5	253°30.1	53.7	116°49.9	8.9′	20°00.8	-9.3′	57.8′
6	268°30.2	N01°54.7	131°17.8	8.9′	N19°51.5	-9.4′	57.8′
7	283°30.4	55.7	145°45.7	8.9′	19°42.1	-9.5′	57.8′
8	298°30.6	56.7	160°13.6	8.9′	19°32.6	-9.7′	57.9′
9	313°30.8	·· 57.7	174°41.6	9.0′	19°23.0	-9.8′	57.9′
10	328°31.0	58.6	189°09.5	9.0′	19°13.2	-9.9′	58.0′
11	343°31.2	01°59.6	203°37.5	9.0′	19°03.3	-10.0′	58.0′
12	358°31.4	N02°00.6	218°05.5	9.0′	N18°53.3	-10.1′	58.0′
13	13°31.6	01.6	232°33.6	9.1′	18°43.1	-10.3′	58.1′
14	28°31.8	02.6	247°01.6	9.1′	18°32.9	-10.4′	58.1′
15	43°31.9	·· 03.5	261°29.7	9.1′	18°22.5	-10.5′	58.2′
16	58°32.1	04.5	275°57.8	9.1′	18°12.0	-10.6′	58.2′
17	73°32.3	05.5	290°25.9	9.1′	18°01.4	-10.7′	58.2′
18	88°32.5	N02°06.5	304°54.0	9.2′	N17°50.7	-10.8′	58.3′
19	103°32.7	07.5	319°22.2	9.2′	17°39.8	-11.0′	58.3′
20	118°32.9	08.5	333°50.4	9.2′	17°28.9	-11.1′	58.3′
21	133°33.1	·· 09.4	348°18.6	9.2′	17°17.8	-11.2′	58.4′
22	148°33.3	10.4	2°46.8	9.2′	17°06.6	-11.3′	58.4′
23	163°33.5	11.4	17°15.1	9.3′	16°55.3	-11.4′	58.5′
	SD = 16.0′	d = 1.0′	SD = 15.7′				

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	04:38	05:40	18:35	19:38	21:01
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°	04:17	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°	04:35	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	05:22	05:54	18:20	18:52	19:30
45°	04:52	05:26	05:56	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	05:39	06:01	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	19:27
S 60°	04:39	05:29	06:10	18:01	18:42	19:31

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

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 10-12 64-82%
23	06:40	06:31	12:07	20:02	07:35	
24	06:22	06:13	12:06	20:55	08:28	
25	06:04	05:54	12:06	21:48	09:22	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	183°39.5	178°05.5	N00°55.9	112°26.5	N23°48.5	219°03.0	S14°45.9	230°10.5	S17°59.2
1	198°42.0	193°05.1	57.2	127°27.3	48.7	234°05.0	45.8	245°12.7	59.1
2	213°44.5	208°04.7	58.4	142°28.2	48.9	249°07.0	45.6	260°15.0	59.1
3	228°46.9	223°04.3	00°59.7	157°29.0	·· 49.1	264°08.9	·· 45.5	275°17.2	·· 59.0
4	243°49.4	238°03.9	01°00.9	172°29.9	49.3	279°10.9	45.3	290°19.5	58.9
5	258°51.9	253°03.6	02.2	187°30.7	49.5	294°12.9	45.2	305°21.7	58.9
6	273°54.3	268°03.2	N01°03.5	202°31.6	N23°49.6	309°14.8	S14°45.0	320°24.0	S17°58.8
7	288°56.8	283°02.8	04.7	217°32.4	49.8	324°16.8	44.8	335°26.2	58.8
8	303°59.2	298°02.4	06.0	232°33.3	50.0	339°18.7	44.7	350°28.5	58.7
9	319°01.7	313°02.1	·· 07.2	247°34.1	·· 50.2	354°20.7	·· 44.5	5°30.7	·· 58.7
10	334°04.2	328°01.7	08.5	262°35.0	50.4	9°22.7	44.4	20°33.0	58.6
11	349°06.6	343°01.3	09.8	277°35.8	50.6	24°24.6	44.2	35°35.2	58.6
12	4°09.1	358°00.9	N01°11.0	292°36.7	N23°50.8	39°26.6	S14°44.0	50°37.5	S17°58.5
13	19°11.6	13°00.6	12.3	307°37.5	51.0	54°28.6	43.9	65°39.7	58.5
14	34°14.0	28°00.2	13.5	322°38.4	51.2	69°30.5	43.7	80°42.0	58.4
15	49°16.5	42°59.8	·· 14.8	337°39.2	·· 51.3	84°32.5	·· 43.6	95°44.2	·· 58.4
16	64°19.0	57°59.4	16.1	352°40.1	51.5	99°34.5	43.4	110°46.5	58.3
17	79°21.4	72°59.0	17.3	7°40.9	51.7	114°36.4	43.2	125°48.7	58.3
18	94°23.9	87°58.7	N01°18.6	22°41.7	N23°51.9	129°38.4	S14°43.1	140°51.0	S17°58.2
19	109°26.4	102°58.3	19.8	37°42.6	52.1	144°40.4	42.9	155°53.2	58.1
20	124°28.8	117°57.9	21.1	52°43.4	52.3	159°42.3	42.8	170°55.5	58.1
21	139°31.3	132°57.5	·· 22.4	67°44.3	·· 52.5	174°44.3	·· 42.6	185°57.7	·· 58.0
22	154°33.7	147°57.2	23.6	82°45.1	52.7	189°46.3	42.5	201°00.0	58.0
23	169°36.2	162°56.8	24.9	97°46.0	52.8	204°48.2	42.3	216°02.2	57.9
Mer.pass.	11:43	ν -0.4′	d 1.3′	m -3.92	ν 0.9′	d 0.2′	m 1.24	ν 2.0′	d -0.2′ m -2.04	ν 2.2′	d -0.1′ m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	184°38.7	177°56.4	N01°26.1	112°46.8	N23°53.0	219°50.2	S14°42.1	231°04.5	S17°57.9
1	199°41.1	192°56.0	27.4	127°47.7	53.2	234°52.2	42.0	246°06.7	57.8
2	214°43.6	207°55.7	28.7	142°48.5	53.4	249°54.1	41.8	261°09.0	57.8
3	229°46.1	222°55.3	·· 29.9	157°49.4	·· 53.6	264°56.1	·· 41.7	276°11.2	·· 57.7
4	244°48.5	237°54.9	31.2	172°50.2	53.8	279°58.1	41.5	291°13.5	57.7
5	259°51.0	252°54.5	32.4	187°51.1	53.9	295°00.0	41.4	306°15.7	57.6
6	274°53.5	267°54.1	N01°33.7	202°51.9	N23°54.1	310°02.0	S14°41.2	321°18.0	S17°57.6
7	289°55.9	282°53.8	35.0	217°52.8	54.3	325°04.0	41.0	336°20.2	57.5
8	304°58.4	297°53.4	36.2	232°53.6	54.5	340°05.9	40.9	351°22.5	57.5
9	320°00.9	312°53.0	·· 37.5	247°54.5	·· 54.7	355°07.9	·· 40.7	6°24.8	·· 57.4
10	335°03.3	327°52.6	38.7	262°55.3	54.9	10°09.9	40.6	21°27.0	57.4
11	350°05.8	342°52.3	40.0	277°56.2	55.0	25°11.9	40.4	36°29.3	57.3
12	5°08.2	357°51.9	N01°41.2	292°57.0	N23°55.2	40°13.8	S14°40.2	51°31.5	S17°57.3
13	20°10.7	12°51.5	42.5	307°57.8	55.4	55°15.8	40.1	66°33.8	57.2
14	35°13.2	27°51.1	43.8	322°58.7	55.6	70°17.8	39.9	81°36.0	57.2
15	50°15.6	42°50.8	·· 45.0	337°59.5	·· 55.8	85°19.7	·· 39.8	96°38.3	·· 57.1
16	65°18.1	57°50.4	46.3	353°00.4	56.0	100°21.7	39.6	111°40.5	57.0
17	80°20.6	72°50.0	47.5	8°01.2	56.1	115°23.7	39.5	126°42.8	57.0
18	95°23.0	87°49.6	N01°48.8	23°02.1	N23°56.3	130°25.6	S14°39.3	141°45.0	S17°56.9
19	110°25.5	102°49.2	50.1	38°02.9	56.5	145°27.6	39.1	156°47.3	56.9
20	125°28.0	117°48.9	51.3	53°03.8	56.7	160°29.6	39.0	171°49.5	56.8
21	140°30.4	132°48.5	·· 52.6	68°04.6	·· 56.9	175°31.6	·· 38.8	186°51.8	·· 56.8
22	155°32.9	147°48.1	53.8	83°05.5	57.0	190°33.5	38.7	201°54.0	56.7
23	170°35.3	162°47.7	55.1	98°06.3	57.2	205°35.5	38.5	216°56.3	56.7
Mer.pass.	11:40	ν -0.4′	d 1.3′	m -3.92	ν 0.8′	d 0.2′	m 1.25	ν 2.0′	d -0.2′ m -2.05	ν 2.3′	d -0.1′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	185°37.8	177°47.4	N01°56.4	113°07.1	N23°57.4	220°37.5	S14°38.4	231°58.6	S17°56.6
1	200°40.3	192°47.0	57.6	128°08.0	57.6	235°39.4	38.2	247°00.8	56.6
2	215°42.7	207°46.6	01°58.9	143°08.8	57.7	250°41.4	38.0	262°03.1	56.5
3	230°45.2	222°46.2	02°00.1	158°09.7	·· 57.9	265°43.4	·· 37.9	277°05.3	·· 56.5
4	245°47.7	237°45.8	01.4	173°10.5	58.1	280°45.3	37.7	292°07.6	56.4
5	260°50.1	252°45.5	02.6	188°11.4	58.3	295°47.3	37.6	307°09.8	56.4
6	275°52.6	267°45.1	N02°03.9	203°12.2	N23°58.5	310°49.3	S14°37.4	322°12.1	S17°56.3
7	290°55.1	282°44.7	05.2	218°13.1	58.6	325°51.3	37.3	337°14.3	56.3
8	305°57.5	297°44.3	06.4	233°13.9	58.8	340°53.2	37.1	352°16.6	56.2
9	321°00.0	312°44.0	·· 07.7	248°14.7	·· 59.0	355°55.2	·· 36.9	7°18.9	·· 56.2
10	336°02.5	327°43.6	08.9	263°15.6	59.2	10°57.2	36.8	22°21.1	56.1
11	351°04.9	342°43.2	10.2	278°16.4	59.3	25°59.2	36.6	37°23.4	56.1
12	6°07.4	357°42.8	N02°11.4	293°17.3	N23°59.5	41°01.1	S14°36.5	52°25.6	S17°56.0
13	21°09.8	12°42.5	12.7	308°18.1	59.7	56°03.1	36.3	67°27.9	56.0
14	36°12.3	27°42.1	14.0	323°19.0	23°59.9	71°05.1	36.2	82°30.1	55.9
15	51°14.8	42°41.7	·· 15.2	338°19.8	24°00.0	86°07.0	·· 36.0	97°32.4	·· 55.9
16	66°17.2	57°41.3	16.5	353°20.6	00.2	101°09.0	35.8	112°34.6	55.8
17	81°19.7	72°40.9	17.7	8°21.5	00.4	116°11.0	35.7	127°36.9	55.7
18	96°22.2	87°40.6	N02°19.0	23°22.3	N24°00.6	131°13.0	S14°35.5	142°39.2	S17°55.7
19	111°24.6	102°40.2	20.3	38°23.2	00.7	146°14.9	35.4	157°41.4	55.6
20	126°27.1	117°39.8	21.5	53°24.0	00.9	161°16.9	35.2	172°43.7	55.6
21	141°29.6	132°39.4	·· 22.8	68°24.9	·· 01.1	176°18.9	·· 35.1	187°45.9	·· 55.5
22	156°32.0	147°39.0	24.0	83°25.7	01.3	191°20.9	34.9	202°48.2	55.5
23	171°34.5	162°38.7	25.3	98°26.5	01.4	206°22.8	34.7	217°50.4	55.4
Mer.pass.	11:36	ν -0.4′	d 1.3′	m -3.92	ν 0.8′	d 0.2′	m 1.26	ν 2.0′	d -0.2′ m -2.05	ν 2.3′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.6
Schedar	349°35.0	56°39.1
Diphda	348°50.7	-17°52.5
Achernar	335°23.1	-57°08.0
Hamal	327°55.0	23°33.6
Polaris	315°49.1	89°21.3
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°33.0	49°56.2
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°40.9	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°28.9	-16°44.9
Adhara	255°08.2	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.6	-59°34.9
Suhail	222°48.3	-43°31.3
Miaplacidus	221°38.2	-69°48.4
Alphard	217°50.6	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°12.9
Gacrux	171°54.4	-57°13.9
Alioth	166°15.2	55°50.7
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.4
Hadar	148°39.7	-60°28.3
Menkent	148°00.9	-36°28.4
Arcturus	145°50.5	19°04.2
Rigil Kent.	139°43.9	-60°55.2
Kochab	137°19.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.1	26°38.5
Antares	112°19.5	-26°28.6
Atria	107°16.2	-69°03.6
Sabik	102°06.2	-15°45.0
Shaula	96°14.5	-37°07.0
Rasalhague	96°01.3	12°32.5
Eltanin	90°43.6	51°28.8
Kaus Aust.	83°36.6	-34°22.4
Vega	80°35.3	38°47.9
Nunki	75°51.6	-26°16.2
Altair	62°03.1	8°55.3
Peacock	53°10.9	-56°39.9
Deneb	49°28.1	45°21.0
Enif	33°42.1	9°58.1
Al Na'ir	27°37.2	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 26 Fri	SHA	Mer.pass
Venus	354°25.9	12:08
Mars	288°46.9	16:29
Jupiter	35°23.5	09:23
Saturn	46°30.9	08:38

Mar 27 Sat	SHA	Mer.pass
Venus	353°17.7	12:09
Mars	288°08.2	16:28
Jupiter	35°11.5	09:19
Saturn	46°25.8	08:34

Mar 28 Sun	SHA	Mer.pass
Venus	352°09.5	12:09
Mars	287°29.3	16:27
Jupiter	34°59.7	09:16
Saturn	46°20.7	08:31

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.7	N02°12.4	31°43.3	9.3′	N16°43.9	-11.5′	58.5′
1	193°33.8	13.4	46°11.6	9.3′	16°32.4	-11.6′	58.5′
2	208°34.0	14.3	60°39.9	9.3′	16°20.8	-11.7′	58.6′
3	223°34.2	·· 15.3	75°08.3	9.4′	16°09.1	-11.8′	58.6′
4	238°34.4	16.3	89°36.6	9.4′	15°57.2	-11.9′	58.6′
5	253°34.6	17.3	104°05.0	9.4′	15°45.3	-12.0′	58.7′
6	268°34.8	N02°18.3	118°33.4	9.4′	N15°33.3	-12.1′	58.7′
7	283°35.0	19.2	133°01.9	9.4′	15°21.1	-12.3′	58.8′
8	298°35.2	20.2	147°30.3	9.5′	15°08.9	-12.4′	58.8′
9	313°35.4	·· 21.2	161°58.8	9.5′	14°56.5	-12.5′	58.8′
10	328°35.5	22.2	176°27.3	9.5′	14°44.1	-12.6′	58.9′
11	343°35.7	23.2	190°55.8	9.5′	14°31.5	-12.6′	58.9′
12	358°35.9	N02°24.1	205°24.3	9.6′	N14°18.9	-12.7′	58.9′
13	13°36.1	25.1	219°52.9	9.6′	14°06.1	-12.8′	59.0′
14	28°36.3	26.1	234°21.4	9.6′	13°53.3	-12.9′	59.0′
15	43°36.5	·· 27.1	248°50.0	9.6′	13°40.3	-13.0′	59.0′
16	58°36.7	28.1	263°18.6	9.6′	13°27.3	-13.1′	59.1′
17	73°36.9	29.0	277°47.3	9.7′	13°14.2	-13.2′	59.1′
18	88°37.1	N02°30.0	292°15.9	9.7′	N13°01.0	-13.3′	59.1′
19	103°37.3	31.0	306°44.6	9.7′	12°47.7	-13.4′	59.2′
20	118°37.4	32.0	321°13.3	9.7′	12°34.3	-13.5′	59.2′
21	133°37.6	·· 33.0	335°42.0	9.7′	12°20.8	-13.6′	59.2′
22	148°37.8	33.9	350°10.7	9.7′	12°07.2	-13.6′	59.3′
23	163°38.0	34.9	4°39.5	9.8′	11°53.6	-13.7′	59.3′
	SD = 16.0′	d = 1.0′	SD = 16.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.2	N02°35.9	19°08.2	9.8′	N11°39.9	-13.8′	59.3′
1	193°38.4	36.9	33°37.0	9.8′	11°26.0	-13.9′	59.4′
2	208°38.6	37.8	48°05.8	9.8′	11°12.2	-14.0′	59.4′
3	223°38.8	·· 38.8	62°34.6	9.8′	10°58.2	-14.1′	59.4′
4	238°39.0	39.8	77°03.4	9.8′	10°44.1	-14.1′	59.5′
5	253°39.2	40.8	91°32.2	9.8′	10°30.0	-14.2′	59.5′
6	268°39.3	N02°41.8	106°01.1	9.9′	N10°15.8	-14.3′	59.5′
7	283°39.5	42.7	120°29.9	9.9′	10°01.5	-14.3′	59.6′
8	298°39.7	43.7	134°58.8	9.9′	09°47.2	-14.4′	59.6′
9	313°39.9	·· 44.7	149°27.7	9.9′	09°32.8	-14.5′	59.6′
10	328°40.1	45.7	163°56.6	9.9′	09°18.3	-14.6′	59.7′
11	343°40.3	46.6	178°25.5	9.9′	09°03.7	-14.6′	59.7′
12	358°40.5	N02°47.6	192°54.4	9.9′	N08°49.1	-14.7′	59.7′
13	13°40.7	48.6	207°23.4	9.9′	08°34.4	-14.8′	59.8′
14	28°40.9	49.6	221°52.3	9.9′	08°19.6	-14.8′	59.8′
15	43°41.1	·· 50.6	236°21.3	10.0′	08°04.8	-14.9′	59.8′
16	58°41.2	51.5	250°50.2	10.0′	07°50.0	-14.9′	59.8′
17	73°41.4	52.5	265°19.2	10.0′	07°35.0	-15.0′	59.9′
18	88°41.6	N02°53.5	279°48.1	10.0′	N07°20.0	-15.0′	59.9′
19	103°41.8	54.5	294°17.1	10.0′	07°05.0	-15.1′	59.9′
20	118°42.0	55.4	308°46.1	10.0′	06°49.9	-15.2′	60.0′
21	133°42.2	·· 56.4	323°15.1	10.0′	06°34.7	-15.2′	60.0′
22	148°42.4	57.4	337°44.1	10.0′	06°19.5	-15.3′	60.0′
23	163°42.6	58.4	352°13.0	10.0′	06°04.3	-15.3′	60.0′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°42.8	N02°59.3	6°42.0	10.0′	N05°49.0	-15.4′	60.1′
1	193°42.9	03°00.3	21°11.0	10.0′	05°33.6	-15.4′	60.1′
2	208°43.1	01.3	35°40.0	10.0′	05°18.2	-15.4′	60.1′
3	223°43.3	·· 02.3	50°09.0	10.0′	05°02.8	-15.5′	60.1′
4	238°43.5	03.3	64°38.0	10.0′	04°47.3	-15.5′	60.2′
5	253°43.7	04.2	79°07.0	10.0′	04°31.8	-15.6′	60.2′
6	268°43.9	N03°05.2	93°36.0	10.0′	N04°16.2	-15.6′	60.2′
7	283°44.1	06.2	108°05.0	10.0′	04°00.6	-15.6′	60.2′
8	298°44.3	07.2	122°33.9	10.0′	03°45.0	-15.7′	60.3′
9	313°44.5	·· 08.1	137°02.9	10.0′	03°29.3	-15.7′	60.3′
10	328°44.7	09.1	151°31.9	10.0′	03°13.6	-15.7′	60.3′
11	343°44.8	10.1	166°00.9	10.0′	02°57.9	-15.8′	60.3′
12	358°45.0	N03°11.1	180°29.8	9.9′	N02°42.1	-15.8′	60.3′
13	13°45.2	12.0	194°58.7	9.9′	02°26.3	-15.8′	60.4′
14	28°45.4	13.0	209°27.7	9.9′	02°10.5	-15.8′	60.4′
15	43°45.6	·· 14.0	223°56.6	9.9′	01°54.7	-15.9′	60.4′
16	58°45.8	15.0	238°25.5	9.9′	01°38.8	-15.9′	60.4′
17	73°46.0	15.9	252°54.4	9.9′	01°23.0	-15.9′	60.4′
18	88°46.2	N03°16.9	267°23.3	9.9′	N01°07.1	-15.9′	60.5′
19	103°46.4	17.9	281°52.2	9.9′	00°51.2	-15.9′	60.5′
20	118°46.5	18.8	296°21.1	9.8′	00°35.3	-15.9′	60.5′
21	133°46.7	·· 19.8	310°49.9	9.8′	00°19.3	-15.9′	60.5′
22	148°46.9	20.8	325°18.7	9.8′	N00°03.4	-16.0′	60.5′
23	163°47.1	21.8	339°47.5	9.8′	S00°12.6	16.0′	60.5′
	SD = 16.0′	d = 1.0′	SD = 16.4′				

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

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 13-15 89-99%
26	05:45	05:36	12:06	22:41	10:15	
27	05:27	05:18	12:05	23:32	11:07	
28	05:09	05:00	12:05	–:–	11:58	

DUT1 = UT1-UTC = -0.1723 sec ΔT = TT-UT1 = +69.3563 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	186°36.9	177°38.3	N02°26.5	113°27.4	N24°01.6	221°24.8	S14°34.6	232°52.7	S17°55.4
1	201°39.4	192°37.9	27.8	128°28.2	01.8	236°26.8	34.4	247°55.0	55.3
2	216°41.9	207°37.5	29.0	143°29.1	01.9	251°28.8	34.3	262°57.2	55.3
3	231°44.3	222°37.2	·· 30.3	158°29.9	·· 02.1	266°30.7	·· 34.1	277°59.5	·· 55.2
4	246°46.8	237°36.8	31.6	173°30.7	02.3	281°32.7	34.0	293°01.7	55.2
5	261°49.3	252°36.4	32.8	188°31.6	02.5	296°34.7	33.8	308°04.0	55.1
6	276°51.7	267°36.0	N02°34.1	203°32.4	N24°02.6	311°36.7	S14°33.6	323°06.2	S17°55.1
7	291°54.2	282°35.6	35.3	218°33.3	02.8	326°38.6	33.5	338°08.5	55.0
8	306°56.7	297°35.3	36.6	233°34.1	03.0	341°40.6	33.3	353°10.8	55.0
9	321°59.1	312°34.9	·· 37.8	248°34.9	·· 03.1	356°42.6	·· 33.2	8°13.0	·· 54.9
10	337°01.6	327°34.5	39.1	263°35.8	03.3	11°44.6	33.0	23°15.3	54.9
11	352°04.1	342°34.1	40.4	278°36.6	03.5	26°46.5	32.9	38°17.5	54.8
12	7°06.5	357°33.8	N02°41.6	293°37.5	N24°03.6	41°48.5	S14°32.7	53°19.8	S17°54.8
13	22°09.0	12°33.4	42.9	308°38.3	03.8	56°50.5	32.6	68°22.1	54.7
14	37°11.4	27°33.0	44.1	323°39.1	04.0	71°52.5	32.4	83°24.3	54.7
15	52°13.9	42°32.6	·· 45.4	338°40.0	·· 04.2	86°54.4	·· 32.2	98°26.6	·· 54.6
16	67°16.4	57°32.2	46.6	353°40.8	04.3	101°56.4	32.1	113°28.8	54.6
17	82°18.8	72°31.9	47.9	8°41.7	04.5	116°58.4	31.9	128°31.1	54.5
18	97°21.3	87°31.5	N02°49.1	23°42.5	N24°04.7	132°00.4	S14°31.8	143°33.3	S17°54.5
19	112°23.8	102°31.1	50.4	38°43.3	04.8	147°02.3	31.6	158°35.6	54.4
20	127°26.2	117°30.7	51.7	53°44.2	05.0	162°04.3	31.5	173°37.9	54.4
21	142°28.7	132°30.3	·· 52.9	68°45.0	·· 05.2	177°06.3	·· 31.3	188°40.1	·· 54.3
22	157°31.2	147°30.0	54.2	83°45.9	05.3	192°08.3	31.1	203°42.4	54.3
23	172°33.6	162°29.6	55.4	98°46.7	05.5	207°10.2	31.0	218°44.6	54.2
Mer.pass.	11:32	ν -0.4′	d 1.3′	m -3.92	ν 0.8′	d 0.2′	m 1.27	ν 2.0′	d -0.2′	m -2.05	ν 2.3′	d -0.1′	m 0.73

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	187°36.1	177°29.2	N02°56.7	113°47.5	N24°05.7	222°12.2	S14°30.8	233°46.9	S17°54.2
1	202°38.5	192°28.8	57.9	128°48.4	05.8	237°14.2	30.7	248°49.2	54.1
2	217°41.0	207°28.4	02°59.2	143°49.2	06.0	252°16.2	30.5	263°51.4	54.1
3	232°43.5	222°28.1	03°00.4	158°50.1	·· 06.2	267°18.2	·· 30.4	278°53.7	·· 54.0
4	247°45.9	237°27.7	01.7	173°50.9	06.3	282°20.1	30.2	293°56.0	54.0
5	262°48.4	252°27.3	02.9	188°51.7	06.5	297°22.1	30.1	308°58.2	53.9
6	277°50.9	267°26.9	N03°04.2	203°52.6	N24°06.6	312°24.1	S14°29.9	324°00.5	S17°53.9
7	292°53.3	282°26.5	05.5	218°53.4	06.8	327°26.1	29.7	339°02.7	53.8
8	307°55.8	297°26.2	06.7	233°54.2	07.0	342°28.1	29.6	354°05.0	53.8
9	322°58.3	312°25.8	·· 08.0	248°55.1	·· 07.1	357°30.0	·· 29.4	9°07.3	·· 53.7
10	338°00.7	327°25.4	09.2	263°55.9	07.3	12°32.0	29.3	24°09.5	53.7
11	353°03.2	342°25.0	10.5	278°56.8	07.5	27°34.0	29.1	39°11.8	53.6
12	8°05.7	357°24.6	N03°11.7	293°57.6	N24°07.6	42°36.0	S14°29.0	54°14.0	S17°53.6
13	23°08.1	12°24.3	13.0	308°58.4	07.8	57°38.0	28.8	69°16.3	53.5
14	38°10.6	27°23.9	14.2	323°59.3	07.9	72°39.9	28.7	84°18.6	53.5
15	53°13.0	42°23.5	·· 15.5	339°00.1	·· 08.1	87°41.9	·· 28.5	99°20.8	·· 53.4
16	68°15.5	57°23.1	16.7	354°00.9	08.3	102°43.9	28.3	114°23.1	53.4
17	83°18.0	72°22.7	18.0	9°01.8	08.4	117°45.9	28.2	129°25.4	53.3
18	98°20.4	87°22.4	N03°19.2	24°02.6	N24°08.6	132°47.9	S14°28.0	144°27.6	S17°53.3
19	113°22.9	102°22.0	20.5	39°03.5	08.8	147°49.8	27.9	159°29.9	53.2
20	128°25.4	117°21.6	21.7	54°04.3	08.9	162°51.8	27.7	174°32.1	53.2
21	143°27.8	132°21.2	·· 23.0	69°05.1	·· 09.1	177°53.8	·· 27.6	189°34.4	·· 53.1
22	158°30.3	147°20.8	24.3	84°06.0	09.2	192°55.8	27.4	204°36.7	53.1
23	173°32.8	162°20.5	25.5	99°06.8	09.4	207°57.8	27.3	219°38.9	53.0
Mer.pass.	11:28	ν -0.4′	d 1.3′	m -3.92	ν 0.8′	d 0.2′	m 1.28	ν 2.0′	d -0.2′	m -2.06	ν 2.3′	d -0.1′	m 0.73

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	188°35.2	177°20.1	N03°26.8	114°07.6	N24°09.6	222°59.7	S14°27.1	234°41.2	S17°53.0
1	203°37.7	192°19.7	28.0	129°08.5	09.7	238°01.7	26.9	249°43.5	52.9
2	218°40.1	207°19.3	29.3	144°09.3	09.9	253°03.7	26.8	264°45.7	52.9
3	233°42.6	222°18.9	·· 30.5	159°10.1	·· 10.0	268°05.7	·· 26.6	279°48.0	·· 52.8
4	248°45.1	237°18.5	31.8	174°11.0	10.2	283°07.7	26.5	294°50.2	52.8
5	263°47.5	252°18.2	33.0	189°11.8	10.3	298°09.6	26.3	309°52.5	52.7
6	278°50.0	267°17.8	N03°34.3	204°12.7	N24°10.5	313°11.6	S14°26.2	324°54.8	S17°52.7
7	293°52.5	282°17.4	35.5	219°13.5	10.7	328°13.6	26.0	339°57.0	52.6
8	308°54.9	297°17.0	36.8	234°14.3	10.8	343°15.6	25.9	354°59.3	52.6
9	323°57.4	312°16.6	·· 38.0	249°15.2	·· 11.0	358°17.6	·· 25.7	10°01.6	·· 52.5
10	338°59.9	327°16.3	39.3	264°16.0	11.1	13°19.6	25.6	25°03.8	52.5
11	354°02.3	342°15.9	40.5	279°16.8	11.3	28°21.5	25.4	40°06.1	52.4
12	9°04.8	357°15.5	N03°41.8	294°17.7	N24°11.4	43°23.5	S14°25.2	55°08.4	S17°52.4
13	24°07.3	12°15.1	43.0	309°18.5	11.6	58°25.5	25.1	70°10.6	52.3
14	39°09.7	27°14.7	44.3	324°19.3	11.8	73°27.5	24.9	85°12.9	52.3
15	54°12.2	42°14.3	·· 45.5	339°20.2	·· 11.9	88°29.5	·· 24.8	100°15.2	·· 52.2
16	69°14.6	57°14.0	46.8	354°21.0	12.1	103°31.5	24.6	115°17.4	52.2
17	84°17.1	72°13.6	48.0	9°21.8	12.2	118°33.4	24.5	130°19.7	52.1
18	99°19.6	87°13.2	N03°49.3	24°22.7	N24°12.4	133°35.4	S14°24.3	145°21.9	S17°52.1
19	114°22.0	102°12.8	50.5	39°23.5	12.5	148°37.4	24.2	160°24.2	52.0
20	129°24.5	117°12.4	51.8	54°24.3	12.7	163°39.4	24.0	175°26.5	52.0
21	144°27.0	132°12.0	·· 53.0	69°25.2	·· 12.8	178°41.4	·· 23.9	190°28.7	·· 51.9
22	159°29.4	147°11.7	54.3	84°26.0	13.0	193°43.4	23.7	205°31.0	51.9
23	174°31.9	162°11.3	55.5	99°26.8	13.1	208°45.3	23.5	220°33.3	51.8
Mer.pass.	11:24	ν -0.4′	d 1.3′	m -3.92	ν 0.8′	d 0.2′	m 1.29	ν 2.0′	d -0.2′	m -2.06	ν 2.3′	d -0.0′	m 0.73

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.6
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.5
Achernar	335°23.1	-57°08.0
Hamal	327°55.0	23°33.6
Polaris	315°50.0	89°21.3
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.1
Mirfak	308°33.0	49°56.1
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.3	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.7	-59°34.9
Suhail	222°48.3	-43°31.3
Miaplacidus	221°38.2	-69°48.4
Alphard	217°50.6	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°13.0
Gacrux	171°54.4	-57°13.9
Alioth	166°15.2	55°50.7
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.4
Hadar	148°39.7	-60°28.4
Menkent	148°00.9	-36°28.4
Arcturus	145°50.5	19°04.3
Rigil Kent.	139°43.9	-60°55.2
Kochab	137°18.9	74°04.0
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.1	26°38.5
Antares	112°19.4	-26°28.6
Atria	107°16.2	-69°03.6
Sabik	102°06.2	-15°45.0
Shaula	96°14.5	-37°07.0
Rasalhague	96°01.3	12°32.5
Eltanin	90°43.5	51°28.9
Kaus Aust.	83°36.6	-34°22.4
Vega	80°35.3	38°47.9
Nunki	75°51.6	-26°16.2
Altair	62°03.1	8°55.3
Peacock	53°10.9	-56°39.9
Deneb	49°28.1	45°21.0
Enif	33°42.1	9°58.1
Al Na'ir	27°37.2	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.5	28°11.6
Markab	13°33.3	15°18.9

Mar 29 Mon	SHA	Mer.pass
Venus	351°01.3	12:10
Mars	286°50.4	16:25
Jupiter	34°47.9	09:13
Saturn	46°15.8	08:27

Mar 30 Tue	SHA	Mer.pass
Venus	349°53.1	12:10
Mars	286°11.5	16:24
Jupiter	34°36.1	09:10
Saturn	46°10.8	08:24

Mar 31 Wed	SHA	Mer.pass
Venus	348°44.8	12:11
Mars	285°32.4	16:23
Jupiter	34°24.5	09:07
Saturn	46°06.0	08:20

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°47.3	N03°22.7	354°16.3	9.8′	S00°28.5	16.0′	60.6′
1	193°47.5	23.7	8°45.1	9.8′	00°44.5	16.0′	60.6′
2	208°47.7	24.7	23°13.9	9.7′	01°00.5	16.0′	60.6′
3	223°47.9	·· 25.7	37°42.6	9.7′	01°16.4	16.0′	60.6′
4	238°48.1	26.6	52°11.3	9.7′	01°32.4	16.0′	60.6′
5	253°48.2	27.6	66°40.0	9.7′	01°48.4	16.0′	60.6′
6	268°48.4	N03°28.6	81°08.7	9.6′	S02°04.4	16.0′	60.6′
7	283°48.6	29.6	95°37.3	9.6′	02°20.3	16.0′	60.6′
8	298°48.8	30.5	110°06.0	9.6′	02°36.3	15.9′	60.7′
9	313°49.0	·· 31.5	124°34.5	9.6′	02°52.2	15.9′	60.7′
10	328°49.2	32.5	139°03.1	9.5′	03°08.1	15.9′	60.7′
11	343°49.4	33.4	153°31.7	9.5′	03°24.1	15.9′	60.7′
12	358°49.6	N03°34.4	168°00.2	9.5′	S03°40.0	15.9′	60.7′
13	13°49.8	35.4	182°28.6	9.5′	03°55.9	15.9′	60.7′
14	28°49.9	36.4	196°57.1	9.4′	04°11.7	15.8′	60.7′
15	43°50.1	·· 37.3	211°25.5	9.4′	04°27.6	15.8′	60.7′
16	58°50.3	38.3	225°53.9	9.4′	04°43.4	15.8′	60.7′
17	73°50.5	39.3	240°22.3	9.3′	04°59.2	15.8′	60.7′
18	88°50.7	N03°40.3	254°50.6	9.3′	S05°15.0	15.7′	60.7′
19	103°50.9	41.2	269°18.9	9.3′	05°30.7	15.7′	60.7′
20	118°51.1	42.2	283°47.1	9.2′	05°46.5	15.7′	60.8′
21	133°51.3	·· 43.2	298°15.3	9.2′	06°02.1	15.7′	60.8′
22	148°51.5	44.1	312°43.5	9.1′	06°17.8	15.6′	60.8′
23	163°51.6	45.1	327°11.7	9.1′	06°33.4	15.6′	60.8′
	SD = 16.0′	d = 1.0′	SD = 16.5′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.8	N03°46.1	341°39.8	9.1′	S06°49.0	15.5′	60.8′
1	193°52.0	47.0	356°07.8	9.0′	07°04.5	15.5′	60.8′
2	208°52.2	48.0	10°35.9	9.0′	07°20.1	15.5′	60.8′
3	223°52.4	·· 49.0	25°03.8	8.9′	07°35.5	15.4′	60.8′
4	238°52.6	50.0	39°31.8	8.9′	07°50.9	15.4′	60.8′
5	253°52.8	50.9	53°59.7	8.9′	08°06.3	15.3′	60.8′
6	268°53.0	N03°51.9	68°27.5	8.8′	S08°21.6	15.3′	60.8′
7	283°53.2	52.9	82°55.3	8.8′	08°36.9	15.2′	60.8′
8	298°53.3	53.8	97°23.1	8.7′	08°52.1	15.2′	60.8′
9	313°53.5	·· 54.8	111°50.8	8.7′	09°07.3	15.1′	60.8′
10	328°53.7	55.8	126°18.5	8.6′	09°22.4	15.0′	60.8′
11	343°53.9	56.7	140°46.1	8.6′	09°37.4	15.0′	60.8′
12	358°54.1	N03°57.7	155°13.7	8.5′	S09°52.4	14.9′	60.8′
13	13°54.3	58.7	169°41.3	8.5′	10°07.3	14.9′	60.8′
14	28°54.5	03°59.7	184°08.8	8.4′	10°22.2	14.8′	60.8′
15	43°54.7	04°00.6	198°36.2	8.4′	10°37.0	14.7′	60.8′
16	58°54.8	01.6	213°03.6	8.3′	10°51.7	14.7′	60.8′
17	73°55.0	02.6	227°30.9	8.3′	11°06.4	14.6′	60.8′
18	88°55.2	N04°03.5	241°58.2	8.2′	S11°21.0	14.5′	60.7′
19	103°55.4	04.5	256°25.4	8.2′	11°35.5	14.4′	60.7′
20	118°55.6	05.5	270°52.6	8.1′	11°49.9	14.4′	60.7′
21	133°55.8	·· 06.4	285°19.8	8.1′	12°04.3	14.3′	60.7′
22	148°56.0	07.4	299°46.9	8.0′	12°18.6	14.2′	60.7′
23	163°56.2	08.4	314°13.9	8.0′	12°32.8	14.1′	60.7′
	SD = 16.0′	d = 1.0′	SD = 16.6′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.3	N04°09.3	328°40.9	7.9′	S12°46.9	14.0′	60.7′
1	193°56.5	10.3	343°07.8	7.9′	13°01.0	14.0′	60.7′
2	208°56.7	11.3	357°34.6	7.8′	13°14.9	13.9′	60.7′
3	223°56.9	·· 12.2	12°01.5	7.8′	13°28.8	13.8′	60.7′
4	238°57.1	13.2	26°28.2	7.7′	13°42.6	13.7′	60.7′
5	253°57.3	14.2	40°54.9	7.6′	13°56.3	13.6′	60.7′
6	268°57.5	N04°15.1	55°21.6	7.6′	S14°09.9	13.5′	60.6′
7	283°57.7	16.1	69°48.2	7.5′	14°23.4	13.4′	60.6′
8	298°57.8	17.1	84°14.7	7.5′	14°36.8	13.3′	60.6′
9	313°58.0	·· 18.0	98°41.2	7.4′	14°50.1	13.2′	60.6′
10	328°58.2	19.0	113°07.6	7.4′	15°03.3	13.1′	60.6′
11	343°58.4	20.0	127°34.0	7.3′	15°16.4	13.0′	60.6′
12	358°58.6	N04°20.9	142°00.3	7.3′	S15°29.4	12.9′	60.6′
13	13°58.8	21.9	156°26.5	7.2′	15°42.3	12.8′	60.6′
14	28°59.0	22.9	170°52.7	7.1′	15°55.1	12.7′	60.5′
15	43°59.2	·· 23.8	185°18.9	7.1′	16°07.8	12.6′	60.5′
16	58°59.3	24.8	199°45.0	7.0′	16°20.4	12.5′	60.5′
17	73°59.5	25.8	214°11.0	7.0′	16°32.8	12.4′	60.5′
18	88°59.7	N04°26.7	228°37.0	6.9′	S16°45.2	12.2′	60.5′
19	103°59.9	27.7	243°02.9	6.9′	16°57.4	12.1′	60.5′
20	119°00.1	28.7	257°28.7	6.8′	17°09.6	12.0′	60.5′
21	134°00.3	·· 29.6	271°54.5	6.7′	17°21.6	11.9′	60.4′
22	149°00.5	30.6	286°20.3	6.7′	17°33.5	11.8′	60.4′
23	164°00.6	31.6	300°46.0	6.6′	17°45.2	11.6′	60.4′
	SD = 16.0′	d = 1.0′	SD = 16.6′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	01:59	03:52	05:06	19:06	20:20	22:19
N 70°	02:35	04:07	05:12	18:59	20:05	21:40
68°	03:00	04:19	05:17	18:54	19:53	21:13
66°	03:19	04:28	05:21	18:49	19:43	20:54
64°	03:33	04:36	05:25	18:46	19:35	20:38
62°	03:46	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	05:36	18:35	19:12	19:59
54°	04:18	05:02	05:37	18:32	19:08	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	05:50	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	18:52
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	19:02
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	17:45	18:24	19:09
S 60°	04:55	05:43	06:25	17:43	18:24	19:13

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

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 16-18 100-93%
29	04:51	04:42	12:05	00:24	12:50	
30	04:33	04:24	12:04	01:16	13:43	
31	04:15	04:06	12:04	02:10	14:38	○

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	189°34.4	177°10.9	N03°56.8	114°27.7	N24°13.3	223°47.3	S14°23.4	235°35.5	S17°51.8
1	204°36.8	192°10.5	58.0	129°28.5	13.4	238°49.3	23.2	250°37.8	51.7
2	219°39.3	207°10.1	03°59.3	144°29.3	13.6	253°51.3	23.1	265°40.1	51.7
3	234°41.8	222°09.7	04°00.5	159°30.2	·· 13.7	268°53.3	·· 22.9	280°42.3	·· 51.6
4	249°44.2	237°09.4	01.8	174°31.0	13.9	283°55.3	22.8	295°44.6	51.6
5	264°46.7	252°09.0	03.0	189°31.8	14.0	298°57.3	22.6	310°46.9	51.5
6	279°49.1	267°08.6	N04°04.3	204°32.7	N24°14.2	313°59.2	S14°22.5	325°49.1	S17°51.5
7	294°51.6	282°08.2	05.5	219°33.5	14.3	329°01.2	22.3	340°51.4	51.4
8	309°54.1	297°07.8	06.8	234°34.3	14.5	344°03.2	22.2	355°53.7	51.4
9	324°56.5	312°07.4	·· 08.0	249°35.2	·· 14.6	359°05.2	·· 22.0	10°55.9	·· 51.3
10	339°59.0	327°07.0	09.3	264°36.0	14.8	14°07.2	21.8	25°58.2	51.3
11	355°01.5	342°06.7	10.5	279°36.8	14.9	29°09.2	21.7	41°00.5	51.2
12	10°03.9	357°06.3	N04°11.8	294°37.7	N24°15.1	44°11.2	S14°21.5	56°02.7	S17°51.2
13	25°06.4	12°05.9	13.0	309°38.5	15.2	59°13.1	21.4	71°05.0	51.1
14	40°08.9	27°05.5	14.3	324°39.3	15.4	74°15.1	21.2	86°07.3	51.1
15	55°11.3	42°05.1	·· 15.5	339°40.2	·· 15.5	89°17.1	·· 21.1	101°09.6	·· 51.0
16	70°13.8	57°04.7	16.7	354°41.0	15.7	104°19.1	20.9	116°11.8	51.0
17	85°16.3	72°04.3	18.0	9°41.8	15.8	119°21.1	20.8	131°14.1	50.9
18	100°18.7	87°04.0	N04°19.2	24°42.7	N24°16.0	134°23.1	S14°20.6	146°16.4	S17°50.9
19	115°21.2	102°03.6	20.5	39°43.5	16.1	149°25.1	20.5	161°18.6	50.8
20	130°23.6	117°03.2	21.7	54°44.3	16.3	164°27.1	20.3	176°20.9	50.8
21	145°26.1	132°02.8	·· 23.0	69°45.1	·· 16.4	179°29.0	·· 20.2	191°23.2	·· 50.8
22	160°28.6	147°02.4	24.2	84°46.0	16.6	194°31.0	20.0	206°25.4	50.7
23	175°31.0	162°02.0	25.5	99°46.8	16.7	209°33.0	19.8	221°27.7	50.7
Mer.pass.	11:20	ν -0.4′ d 1.2′	m -3.92	ν 0.8′	d 0.2′ m 1.30	ν 2.0′	d -0.2′ m -2.06	ν 2.3′	d -0.0′ m 0.72

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	190°33.5	177°01.6	N04°26.7	114°47.6	N24°16.9	224°35.0	S14°19.7	236°30.0	S17°50.6
1	205°36.0	192°01.3	28.0	129°48.5	17.0	239°37.0	19.5	251°32.2	50.6
2	220°38.4	207°00.9	29.2	144°49.3	17.2	254°39.0	19.4	266°34.5	50.5
3	235°40.9	222°00.5	·· 30.4	159°50.1	·· 17.3	269°41.0	·· 19.2	281°36.8	·· 50.5
4	250°43.4	237°00.1	31.7	174°51.0	17.4	284°43.0	19.1	296°39.0	50.4
5	265°45.8	251°59.7	32.9	189°51.8	17.6	299°44.9	18.9	311°41.3	50.4
6	280°48.3	266°59.3	N04°34.2	204°52.6	N24°17.7	314°46.9	S14°18.8	326°43.6	S17°50.3
7	295°50.7	281°58.9	35.4	219°53.4	17.9	329°48.9	18.6	341°45.9	50.3
8	310°53.2	296°58.6	36.7	234°54.3	18.0	344°50.9	18.5	356°48.1	50.2
9	325°55.7	311°58.2	·· 37.9	249°55.1	·· 18.2	359°52.9	·· 18.3	11°50.4	·· 50.2
10	340°58.1	326°57.8	39.2	264°55.9	18.3	14°54.9	18.2	26°52.7	50.1
11	356°00.6	341°57.4	40.4	279°56.8	18.5	29°56.9	18.0	41°54.9	50.1
12	11°03.1	356°57.0	N04°41.6	294°57.6	N24°18.6	44°58.9	S14°17.9	56°57.2	S17°50.0
13	26°05.5	11°56.6	42.9	309°58.4	18.7	60°00.9	17.7	71°59.5	50.0
14	41°08.0	26°56.2	44.1	324°59.3	18.9	75°02.9	17.6	87°01.8	49.9
15	56°10.5	41°55.8	·· 45.4	340°00.1	·· 19.0	90°04.8	·· 17.4	102°04.0	·· 49.9
16	71°12.9	56°55.4	46.6	355°00.9	19.2	105°06.8	17.2	117°06.3	49.8
17	86°15.4	71°55.1	47.9	10°01.7	19.3	120°08.8	17.1	132°08.6	49.8
18	101°17.9	86°54.7	N04°49.1	25°02.6	N24°19.4	135°10.8	S14°16.9	147°10.8	S17°49.7
19	116°20.3	101°54.3	50.4	40°03.4	19.6	150°12.8	16.8	162°13.1	49.7
20	131°22.8	116°53.9	51.6	55°04.2	19.7	165°14.8	16.6	177°15.4	49.6
21	146°25.2	131°53.5	·· 52.8	70°05.1	·· 19.9	180°16.8	·· 16.5	192°17.7	·· 49.6
22	161°27.7	146°53.1	54.1	85°05.9	20.0	195°18.8	16.3	207°19.9	49.6
23	176°30.2	161°52.7	55.3	100°06.7	20.1	210°20.8	16.2	222°22.2	49.5
Mer.pass.	11:16	ν -0.4′ d 1.2′	m -3.91	ν 0.8′	d 0.1′ m 1.31	ν 2.0′	d -0.2′ m -2.07	ν 2.3′	d -0.0′ m 0.72

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	191°32.6	176°52.3	N04°56.6	115°07.5	N24°20.3	225°22.8	S14°16.0	237°24.5	S17°49.5
1	206°35.1	191°51.9	57.8	130°08.4	20.4	240°24.8	15.9	252°26.7	49.4
2	221°37.6	206°51.6	04°59.0	145°09.2	20.6	255°26.8	15.7	267°29.0	49.4
3	236°40.0	221°51.2	05°00.3	160°10.0	·· 20.7	270°28.7	·· 15.6	282°31.3	·· 49.3
4	251°42.5	236°50.8	01.5	175°10.8	20.8	285°30.7	15.4	297°33.6	49.3
5	266°45.0	251°50.4	02.8	190°11.7	21.0	300°32.7	15.3	312°35.8	49.2
6	281°47.4	266°50.0	N05°04.0	205°12.5	N24°21.1	315°34.7	S14°15.1	327°38.1	S17°49.2
7	296°49.9	281°49.6	05.2	220°13.3	21.3	330°36.7	15.0	342°40.4	49.1
8	311°52.4	296°49.2	06.5	235°14.2	21.4	345°38.7	14.8	357°42.7	49.1
9	326°54.8	311°48.8	·· 07.7	250°15.0	·· 21.5	0°40.7	·· 14.7	12°44.9	·· 49.0
10	341°57.3	326°48.4	09.0	265°15.8	21.7	15°42.7	14.5	27°47.2	49.0
11	356°59.7	341°48.0	10.2	280°16.6	21.8	30°44.7	14.3	42°49.5	48.9
12	12°02.2	356°47.6	N05°11.4	295°17.5	N24°21.9	45°46.7	S14°14.2	57°51.7	S17°48.9
13	27°04.7	11°47.3	12.7	310°18.3	22.1	60°48.7	14.0	72°54.0	48.8
14	42°07.1	26°46.9	13.9	325°19.1	22.2	75°50.7	13.9	87°56.3	48.8
15	57°09.6	41°46.5	·· 15.2	340°19.9	·· 22.3	90°52.7	·· 13.7	102°58.6	·· 48.7
16	72°12.1	56°46.1	16.4	355°20.8	22.5	105°54.7	13.6	118°00.8	48.7
17	87°14.5	71°45.7	17.6	10°21.6	22.6	120°56.7	13.4	133°03.1	48.7
18	102°17.0	86°45.3	N05°18.9	25°22.4	N24°22.7	135°58.7	S14°13.3	148°05.4	S17°48.6
19	117°19.5	101°44.9	20.1	40°23.2	22.9	151°00.7	13.1	163°07.7	48.6
20	132°21.9	116°44.5	21.4	55°24.1	23.0	166°02.6	13.0	178°09.9	48.5
21	147°24.4	131°44.1	·· 22.6	70°24.9	·· 23.1	181°04.6	·· 12.8	193°12.2	·· 48.5
22	162°26.9	146°43.7	23.8	85°25.7	23.3	196°06.6	12.7	208°14.5	48.4
23	177°29.3	161°43.3	25.1	100°26.5	23.4	211°08.6	12.5	223°16.8	48.4
Mer.pass.	11:12	ν -0.4′ d 1.2′	m -3.91	ν 0.8′	d 0.1′ m 1.32	ν 2.0′	d -0.2′ m -2.07	ν 2.3′	d -0.0′ m 0.72

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.6
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°08.0
Hamal	327°55.0	23°33.6
Polaris	315°50.6	89°21.3
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.1
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.3	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.7	-59°34.9
Suhail	222°48.3	-43°31.3
Miaplacidus	221°38.3	-69°48.5
Alphard	217°50.6	-8°45.1
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.3
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.7	-63°13.0
Gacrux	171°54.4	-57°13.9
Alioth	166°15.2	55°50.7
Spica	158°25.2	-11°16.3
Alkaid	152°54.0	49°12.4
Hadar	148°39.7	-60°28.4
Menkent	148°00.9	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.9	-60°55.2
Kochab	137°18.9	74°04.0
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.5
Antares	112°19.4	-26°28.7
Atria	107°16.1	-69°03.6
Sabik	102°06.2	-15°45.0
Shaula	96°14.4	-37°07.0
Rasalhague	96°01.3	12°32.5
Eltanin	90°43.5	51°28.9
Kaus Aust.	83°36.6	-34°22.3
Vega	80°35.3	38°47.9
Nunki	75°51.6	-26°16.2
Altair	62°03.0	8°55.3
Peacock	53°10.9	-56°39.8
Deneb	49°28.1	45°21.0
Enif	33°42.0	9°58.1
Al Na'ir	27°37.2	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.5	28°11.6
Markab	13°33.2	15°18.9

Apr 01 Thu	SHA	Mer.pass
Venus	347°36.5	12:12
Mars	284°53.3	16:21
Jupiter	34°13.0	09:04
Saturn	46°01.2	08:16

Apr 02 Fri	SHA	Mer.pass
Venus	346°28.1	12:12
Mars	284°14.1	16:20
Jupiter	34°01.5	09:00
Saturn	45°56.5	08:13

Apr 03 Sat	SHA	Mer.pass
Venus	345°19.7	12:13
Mars	283°34.9	16:19
Jupiter	33°50.1	08:57
Saturn	45°51.8	08:09

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°00.8	N04°32.5	315°11.6	6.6′	S17°56.9	11.5′	60.4′
1	194°01.0	33.5	329°37.2	6.5′	18°08.4	11.4′	60.4′
2	209°01.2	34.5	344°02.7	6.5′	18°19.8	11.3′	60.3′
3	224°01.4	·· 35.4	358°28.2	6.4′	18°31.1	11.1′	60.3′
4	239°01.6	36.4	12°53.6	6.4′	18°42.2	11.0′	60.3′
5	254°01.8	37.3	27°18.9	6.3′	18°53.2	10.9′	60.3′
6	269°01.9	N04°38.3	41°44.2	6.3′	S19°04.1	10.8′	60.3′
7	284°02.1	39.3	56°09.5	6.2′	19°14.9	10.6′	60.2′
8	299°02.3	40.2	70°34.7	6.1′	19°25.5	10.5′	60.2′
9	314°02.5	·· 41.2	84°59.9	6.1′	19°36.0	10.3′	60.2′
10	329°02.7	42.2	99°24.9	6.0′	19°46.3	10.2′	60.2′
11	344°02.9	43.1	113°50.0	6.0′	19°56.5	10.1′	60.2′
12	359°03.1	N04°44.1	128°15.0	5.9′	S20°06.6	9.9′	60.1′
13	14°03.2	45.1	142°39.9	5.9′	20°16.5	9.8′	60.1′
14	29°03.4	46.0	157°04.8	5.8′	20°26.3	9.6′	60.1′
15	44°03.6	·· 47.0	171°29.7	5.8′	20°36.0	9.5′	60.1′
16	59°03.8	47.9	185°54.5	5.8′	20°45.5	9.4′	60.0′
17	74°04.0	48.9	200°19.2	5.7′	20°54.8	9.2′	60.0′
18	89°04.2	N04°49.9	214°44.0	5.7′	S21°04.1	9.1′	60.0′
19	104°04.4	50.8	229°08.6	5.6′	21°13.1	8.9′	60.0′
20	119°04.5	51.8	243°33.2	5.6′	21°22.0	8.8′	60.0′
21	134°04.7	·· 52.8	257°57.8	5.5′	21°30.8	8.6′	59.9′
22	149°04.9	53.7	272°22.4	5.5′	21°39.4	8.5′	59.9′
23	164°05.1	54.7	286°46.9	5.5′	21°47.9	8.3′	59.9′
	SD = 16.0′	d = 1.0′	SD = 16.5′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°05.3	N04°55.6	301°11.3	5.4′	S21°56.2	8.2′	59.9′
1	194°05.5	56.6	315°35.7	5.4′	22°04.4	8.0′	59.8′
2	209°05.7	57.6	330°00.1	5.3′	22°12.4	7.9′	59.8′
3	224°05.8	·· 58.5	344°24.4	5.3′	22°20.3	7.7′	59.8′
4	239°06.0	04°59.5	358°48.8	5.3′	22°28.0	7.5′	59.8′
5	254°06.2	05°00.4	13°13.0	5.2′	22°35.5	7.4′	59.7′
6	269°06.4	N05°01.4	27°37.3	5.2′	S22°42.9	7.2′	59.7′
7	284°06.6	02.4	42°01.5	5.2′	22°50.1	7.1′	59.7′
8	299°06.8	03.3	56°25.7	5.2′	22°57.2	6.9′	59.6′
9	314°07.0	·· 04.3	70°49.8	5.1′	23°04.1	6.7′	59.6′
10	329°07.1	05.2	85°13.9	5.1′	23°10.8	6.6′	59.6′
11	344°07.3	06.2	99°38.0	5.1′	23°17.4	6.4′	59.6′
12	359°07.5	N05°07.2	114°02.1	5.0′	S23°23.9	6.3′	59.5′
13	14°07.7	08.1	128°26.2	5.0′	23°30.1	6.1′	59.5′
14	29°07.9	09.1	142°50.2	5.0′	23°36.2	5.9′	59.5′
15	44°08.1	·· 10.0	157°14.2	5.0′	23°42.2	5.8′	59.5′
16	59°08.2	11.0	171°38.2	5.0′	23°47.9	5.6′	59.4′
17	74°08.4	12.0	186°02.1	5.0′	23°53.5	5.4′	59.4′
18	89°08.6	N05°12.9	200°26.1	4.9′	S23°59.0	5.3′	59.4′
19	104°08.8	13.9	214°50.0	4.9′	24°04.3	5.1′	59.3′
20	119°09.0	14.8	229°14.0	4.9′	24°09.4	4.9′	59.3′
21	134°09.2	·· 15.8	243°37.9	4.9′	24°14.3	4.8′	59.3′
22	149°09.3	16.7	258°01.8	4.9′	24°19.1	4.6′	59.3′
23	164°09.5	17.7	272°25.7	4.9′	24°23.7	4.4′	59.2′
	SD = 16.0′	d = 1.0′	SD = 16.3′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.7	N05°18.7	286°49.6	4.9′	S24°28.1	4.3′	59.2′
1	194°09.9	19.6	301°13.5	4.9′	24°32.4	4.1′	59.2′
2	209°10.1	20.6	315°37.3	4.9′	24°36.5	3.9′	59.1′
3	224°10.3	·· 21.5	330°01.2	4.9′	24°40.5	3.8′	59.1′
4	239°10.4	22.5	344°25.1	4.9′	24°44.2	3.6′	59.1′
5	254°10.6	23.4	358°49.0	4.9′	24°47.8	3.4′	59.0′
6	269°10.8	N05°24.4	13°12.9	4.9′	S24°51.3	3.3′	59.0′
7	284°11.0	25.4	27°36.8	4.9′	24°54.5	3.1′	59.0′
8	299°11.2	26.3	42°00.7	4.9′	24°57.6	2.9′	59.0′
9	314°11.4	·· 27.3	56°24.6	4.9′	25°00.6	2.8′	58.9′
10	329°11.5	28.2	70°48.5	4.9′	25°03.3	2.6′	58.9′
11	344°11.7	29.2	85°12.5	5.0′	25°05.9	2.4′	58.9′
12	359°11.9	N05°30.1	99°36.4	5.0′	S25°08.4	2.3′	58.8′
13	14°12.1	31.1	114°00.4	5.0′	25°10.6	2.1′	58.8′
14	29°12.3	32.0	128°24.4	5.0′	25°12.7	1.9′	58.8′
15	44°12.5	·· 33.0	142°48.4	5.0′	25°14.6	1.8′	58.7′
16	59°12.6	34.0	157°12.4	5.0′	25°16.4	1.6′	58.7′
17	74°12.8	34.9	171°36.4	5.1′	25°18.0	1.4′	58.7′
18	89°13.0	N05°35.9	186°00.5	5.1′	S25°19.4	1.3′	58.7′
19	104°13.2	36.8	200°24.6	5.1′	25°20.6	1.1′	58.6′
20	119°13.4	37.8	214°48.8	5.2′	25°21.7	0.9′	58.6′
21	134°13.5	·· 38.7	229°12.9	5.2′	25°22.6	0.8′	58.6′
22	149°13.7	39.7	243°37.1	5.2′	25°23.4	0.6′	58.5′
23	164°13.9	40.6	258°01.3	5.3′	25°24.0	0.4′	58.5′
	SD = 16.0′	d = 1.0′	SD = 16.1′				

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

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 19-21 85-66%
01	03:57	03:48	12:04	03:06	15:35	
02	03:39	03:30	12:03	04:05	16:35	
03	03:21	03:12	12:03	05:05	17:35	

DUT1 = UT1-UTC = -0.1745 sec ΔT = TT-UT1 = +69.3585 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	192°31.8	176°42.9	N05°26.3	115°27.4	N24°23.5	226°10.6	S14°12.4	238°19.0	S17°48.3
1	207°34.2	191°42.5	27.5	130°28.2	23.7	241°12.6	12.2	253°21.3	48.3
2	222°36.7	206°42.2	28.8	145°29.0	23.8	256°14.6	12.1	268°23.6	48.2
3	237°39.2	221°41.8	·· 30.0	160°29.9	·· 23.9	271°16.6	·· 11.9	283°25.9	·· 48.2
4	252°41.6	236°41.4	31.2	175°30.7	24.1	286°18.6	11.8	298°28.1	48.1
5	267°44.1	251°41.0	32.5	190°31.5	24.2	301°20.6	11.6	313°30.4	48.1
6	282°46.6	266°40.6	N05°33.7	205°32.3	N24°24.3	316°22.6	S14°11.5	328°32.7	S17°48.0
7	297°49.0	281°40.2	35.0	220°33.1	24.5	331°24.6	11.3	343°35.0	48.0
8	312°51.5	296°39.8	36.2	235°34.0	24.6	346°26.6	11.2	358°37.2	48.0
9	327°54.0	311°39.4	·· 37.4	250°34.8	·· 24.7	1°28.6	·· 11.0	13°39.5	·· 47.9
10	342°56.4	326°39.0	38.7	265°35.6	24.9	16°30.6	10.9	28°41.8	47.9
11	357°58.9	341°38.6	39.9	280°36.4	25.0	31°32.6	10.7	43°44.1	47.8
12	13°01.4	356°38.2	N05°41.1	295°37.3	N24°25.1	46°34.6	S14°10.6	58°46.4	S17°47.8
13	28°03.8	11°37.8	42.4	310°38.1	25.2	61°36.6	10.4	73°48.6	47.7
14	43°06.3	26°37.4	43.6	325°38.9	25.4	76°38.6	10.3	88°50.9	47.7
15	58°08.7	41°37.0	·· 44.8	340°39.7	·· 25.5	91°40.6	·· 10.1	103°53.2	·· 47.6
16	73°11.2	56°36.6	46.1	355°40.6	25.6	106°42.6	09.9	118°55.5	47.6
17	88°13.7	71°36.2	47.3	10°41.4	25.8	121°44.6	09.8	133°57.7	47.5
18	103°16.1	86°35.8	N05°48.5	25°42.2	N24°25.9	136°46.6	S14°09.6	149°00.0	S17°47.5
19	118°18.6	101°35.4	49.8	40°43.0	26.0	151°48.6	09.5	164°02.3	47.4
20	133°21.1	116°35.0	51.0	55°43.9	26.1	166°50.6	09.3	179°04.6	47.4
21	148°23.5	131°34.6	·· 52.2	70°44.7	·· 26.3	181°52.6	·· 09.2	194°06.9	·· 47.4
22	163°26.0	146°34.2	53.5	85°45.5	26.4	196°54.6	09.0	209°09.1	47.3
23	178°28.5	161°33.9	54.7	100°46.3	26.5	211°56.6	08.9	224°11.4	47.3
Mer.pass.	11:08	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.33	ν 2.0′	d -0.2′ m -2.07	ν 2.3′	d -0.0′ m 0.72
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	193°30.9	176°33.5	N05°55.9	115°47.2	N24°26.6	226°58.6	S14°08.7	239°13.7	S17°47.2
1	208°33.4	191°33.1	57.2	130°48.0	26.8	242°00.6	08.6	254°16.0	47.2
2	223°35.8	206°32.7	58.4	145°48.8	26.9	257°02.6	08.4	269°18.2	47.1
3	238°38.3	221°32.3	05°59.6	160°49.6	·· 27.0	272°04.6	·· 08.3	284°20.5	·· 47.1
4	253°40.8	236°31.9	06°00.9	175°50.4	27.1	287°06.6	08.1	299°22.8	47.0
5	268°43.2	251°31.5	02.1	190°51.3	27.3	302°08.6	08.0	314°25.1	47.0
6	283°45.7	266°31.1	N06°03.3	205°52.1	N24°27.4	317°10.6	S14°07.8	329°27.4	S17°46.9
7	298°48.2	281°30.7	04.5	220°52.9	27.5	332°12.6	07.7	344°29.6	46.9
8	313°50.6	296°30.3	05.8	235°53.7	27.6	347°14.6	07.5	359°31.9	46.8
9	328°53.1	311°29.9	·· 07.0	250°54.6	·· 27.8	2°16.6	·· 07.4	14°34.2	·· 46.8
10	343°55.6	326°29.5	08.2	265°55.4	27.9	17°18.6	07.2	29°36.5	46.8
11	358°58.0	341°29.1	09.5	280°56.2	28.0	32°20.6	07.1	44°38.8	46.7
12	14°00.5	356°28.7	N06°10.7	295°57.0	N24°28.1	47°22.6	S14°06.9	59°41.0	S17°46.7
13	29°03.0	11°28.3	11.9	310°57.8	28.2	62°24.6	06.8	74°43.3	46.6
14	44°05.4	26°27.9	13.2	325°58.7	28.4	77°26.6	06.6	89°45.6	46.6
15	59°07.9	41°27.5	·· 14.4	340°59.5	·· 28.5	92°28.6	·· 06.5	104°47.9	·· 46.5
16	74°10.3	56°27.1	15.6	356°00.3	28.6	107°30.6	06.3	119°50.2	46.5
17	89°12.8	71°26.7	16.8	11°01.1	28.7	122°32.6	06.2	134°52.4	46.4
18	104°15.3	86°26.3	N06°18.1	26°01.9	N24°28.9	137°34.6	S14°06.0	149°54.7	S17°46.4
19	119°17.7	101°25.9	19.3	41°02.8	29.0	152°36.6	05.9	164°57.0	46.3
20	134°20.2	116°25.5	20.5	56°03.6	29.1	167°38.6	05.7	179°59.3	46.3
21	149°22.7	131°25.1	·· 21.7	71°04.4	·· 29.2	182°40.6	·· 05.6	195°01.6	·· 46.3
22	164°25.1	146°24.7	23.0	86°05.2	29.3	197°42.6	05.4	210°03.9	46.2
23	179°27.6	161°24.3	24.2	101°06.1	29.5	212°44.6	05.3	225°06.1	46.2
Mer.pass.	11:04	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.34	ν 2.0′	d -0.2′ m -2.08	ν 2.3′	d -0.0′ m 0.72
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	194°30.1	176°23.9	N06°25.4	116°06.9	N24°29.6	227°46.6	S14°05.1	240°08.4	S17°46.1
1	209°32.5	191°23.5	26.7	131°07.7	29.7	242°48.6	05.0	255°10.7	46.1
2	224°35.0	206°23.1	27.9	146°08.5	29.8	257°50.6	04.8	270°13.0	46.0
3	239°37.5	221°22.7	·· 29.1	161°09.3	·· 29.9	272°52.6	·· 04.7	285°15.3	·· 46.0
4	254°39.9	236°22.3	30.3	176°10.2	30.0	287°54.6	04.5	300°17.5	45.9
5	269°42.4	251°21.9	31.6	191°11.0	30.2	302°56.6	04.4	315°19.8	45.9
6	284°44.8	266°21.5	N06°32.8	206°11.8	N24°30.3	317°58.6	S14°04.2	330°22.1	S17°45.9
7	299°47.3	281°21.0	34.0	221°12.6	30.4	333°00.6	04.1	345°24.4	45.8
8	314°49.8	296°20.6	35.2	236°13.4	30.5	348°02.6	03.9	0°26.7	45.8
9	329°52.2	311°20.2	·· 36.5	251°14.2	·· 30.6	3°04.7	·· 03.8	15°29.0	·· 45.7
10	344°54.7	326°19.8	37.7	266°15.1	30.7	18°06.7	03.6	30°31.2	45.7
11	359°57.2	341°19.4	38.9	281°15.9	30.9	33°08.7	03.5	45°33.5	45.6
12	14°59.6	356°19.0	N06°40.1	296°16.7	N24°31.0	48°10.7	S14°03.3	60°35.8	S17°45.6
13	30°02.1	11°18.6	41.4	311°17.5	31.1	63°12.7	03.2	75°38.1	45.5
14	45°04.6	26°18.2	42.6	326°18.3	31.2	78°14.7	03.0	90°40.4	45.5
15	60°07.0	41°17.8	·· 43.8	341°19.2	·· 31.3	93°16.7	·· 02.9	105°42.7	·· 45.5
16	75°09.5	56°17.4	45.0	356°20.0	31.4	108°18.7	02.7	120°44.9	45.4
17	90°11.9	71°17.0	46.2	11°20.8	31.6	123°20.7	02.6	135°47.2	45.4
18	105°14.4	86°16.6	N06°47.5	26°21.6	N24°31.7	138°22.7	S14°02.4	150°49.5	S17°45.3
19	120°16.9	101°16.2	48.7	41°22.4	31.8	153°24.7	02.3	165°51.8	45.3
20	135°19.3	116°15.8	49.9	56°23.3	31.9	168°26.7	02.1	180°54.1	45.2
21	150°21.8	131°15.4	·· 51.1	71°24.1	·· 32.0	183°28.7	·· 02.0	195°56.4	·· 45.2
22	165°24.3	146°15.0	52.3	86°24.9	32.1	198°30.7	01.9	210°58.6	45.1
23	180°26.7	161°14.6	53.6	101°25.7	32.2	213°32.7	01.7	226°00.9	45.1
Mer.pass.	11:00	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.35	ν 2.0′	d -0.1′ m -2.08	ν 2.3′	d -0.0′ m 0.72

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.7	-42°11.6
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°08.0
Hamal	327°55.0	23°33.6
Polaris	315°51.1	89°21.3
Acamar	315°14.5	-40°13.5
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.1
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.3	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.7	-59°34.9
Suhail	222°48.3	-43°31.3
Miaplacidus	221°38.3	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.7	-63°13.0
Gacrux	171°54.4	-57°13.9
Alioth	166°15.2	55°50.7
Spica	158°25.2	-11°16.3
Alkaid	152°54.0	49°12.4
Hadar	148°39.7	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.9	-60°55.2
Kochab	137°18.9	74°04.0
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.5
Antares	112°19.4	-26°28.7
Atria	107°16.1	-69°03.6
Sabik	102°06.2	-15°45.0
Shaula	96°14.4	-37°07.0
Rasalhague	96°01.3	12°32.5
Eltanin	90°43.5	51°28.9
Kaus Aust.	83°36.5	-34°22.3
Vega	80°35.2	38°47.9
Nunki	75°51.6	-26°16.2
Altair	62°03.0	8°55.3
Peacock	53°10.8	-56°39.8
Deneb	49°28.0	45°21.0
Enif	33°42.0	9°58.1
Al Na'ir	27°37.2	-46°51.5
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.5	28°11.6
Markab	13°33.2	15°18.9

Apr 04 Sun	SHA	Mer.pass
Venus	344°11.2	12:13
Mars	282°55.6	16:17
Jupiter	33°38.8	08:54
Saturn	45°47.3	08:06

Apr 05 Mon	SHA	Mer.pass
Venus	343°02.5	12:14
Mars	282°16.2	16:16
Jupiter	33°27.7	08:51
Saturn	45°42.8	08:02

Apr 06 Tue	SHA	Mer.pass
Venus	341°53.8	12:15
Mars	281°36.8	16:15
Jupiter	33°16.6	08:48
Saturn	45°38.4	07:58

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		179°14.1	N05°41.6	272°25.6	5.3′	S25°24.4	0.3′	58.5′
1		194°14.3	42.5	286°49.9	5.3′	25°24.6	0.1′	58.4′
2		209°14.5	43.5	301°14.2	5.4′	25°24.7	-0.1′	58.4′
3		224°14.6	·· 44.4	315°38.6	5.4′	25°24.7	-0.2′	58.4′
4		239°14.8	45.4	330°03.0	5.5′	25°24.4	-0.4′	58.3′
5		254°15.0	46.4	344°27.5	5.5′	25°24.0	-0.6′	58.3′
6		269°15.2	N05°47.3	358°52.0	5.6′	S25°23.5	-0.7′	58.3′
7		284°15.4	48.3	13°16.6	5.6′	25°22.8	-0.9′	58.3′
8		299°15.5	49.2	27°41.2	5.7′	25°21.9	-1.0′	58.2′
9		314°15.7	·· 50.2	42°05.8	5.7′	25°20.8	-1.2′	58.2′
10		329°15.9	51.1	56°30.5	5.8′	25°19.6	-1.4′	58.2′
11		344°16.1	52.1	70°55.3	5.8′	25°18.3	-1.5′	58.1′
12		359°16.3	N05°53.0	85°20.1	5.9′	S25°16.8	-1.7′	58.1′
13		14°16.4	54.0	99°45.0	5.9′	25°15.1	-1.8′	58.1′
14		29°16.6	54.9	114°09.9	6.0′	25°13.2	-2.0′	58.0′
15		44°16.8	·· 55.9	128°34.9	6.0′	25°11.3	-2.1′	58.0′
16		59°17.0	56.8	142°59.9	6.1′	25°09.1	-2.3′	58.0′
17		74°17.2	57.8	157°25.0	6.2′	25°06.8	-2.5′	57.9′
18		89°17.3	N05°58.7	171°50.2	6.2′	S25°04.4	-2.6′	57.9′
19		104°17.5	05°59.7	186°15.4	6.3′	25°01.8	-2.8′	57.9′
20		119°17.7	06°00.6	200°40.7	6.4′	24°59.0	-2.9′	57.9′
21		134°17.9	·· 01.6	215°06.1	6.4′	24°56.1	-3.1′	57.8′
22		149°18.1	02.5	229°31.5	6.5′	24°53.1	-3.2′	57.8′
23		164°18.2	03.5	243°57.0	6.6′	24°49.8	-3.4′	57.8′
		SD = 16.0′	d = 1.0′		SD = 15.9′			
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		179°18.4	N06°04.4	258°22.6	6.6′	S24°46.5	-3.5′	57.7′
1		194°18.6	05.4	272°48.3	6.7′	24°43.0	-3.6′	57.7′
2		209°18.8	06.3	287°14.0	6.8′	24°39.4	-3.8′	57.7′
3		224°19.0	·· 07.3	301°39.8	6.9′	24°35.6	-3.9′	57.6′
4		239°19.1	08.2	316°05.6	6.9′	24°31.6	-4.1′	57.6′
5		254°19.3	09.2	330°31.6	7.0′	24°27.6	-4.2′	57.6′
6		269°19.5	N06°10.1	344°57.6	7.1′	S24°23.3	-4.4′	57.6′
7		284°19.7	11.1	359°23.7	7.2′	24°19.0	-4.5′	57.5′
8		299°19.9	12.0	13°49.9	7.3′	24°14.5	-4.6′	57.5′
9		314°20.0	·· 13.0	28°16.1	7.3′	24°09.8	-4.8′	57.5′
10		329°20.2	13.9	42°42.4	7.4′	24°05.1	-4.9′	57.4′
11		344°20.4	14.9	57°08.9	7.5′	24°00.2	-5.0′	57.4′
12		359°20.6	N06°15.8	71°35.4	7.6′	S23°55.1	-5.2′	57.4′
13		14°20.7	16.7	86°01.9	7.7′	23°49.9	-5.3′	57.4′
14		29°20.9	17.7	100°28.6	7.7′	23°44.6	-5.4′	57.3′
15		44°21.1	·· 18.6	114°55.3	7.8′	23°39.2	-5.6′	57.3′
16		59°21.3	19.6	129°22.2	7.9′	23°33.6	-5.7′	57.3′
17		74°21.5	20.5	143°49.1	8.0′	23°27.9	-5.8′	57.2′
18		89°21.6	N06°21.5	158°16.1	8.1′	S23°22.1	-6.0′	57.2′
19		104°21.8	22.4	172°43.2	8.2′	23°16.1	-6.1′	57.2′
20		119°22.0	23.4	187°10.4	8.3′	23°10.0	-6.2′	57.2′
21		134°22.2	·· 24.3	201°37.6	8.4′	23°03.8	-6.3′	57.1′
22		149°22.4	25.3	216°05.0	8.4′	22°57.5	-6.5′	57.1′
23		164°22.5	26.2	230°32.4	8.5′	22°51.0	-6.6′	57.1′
		SD = 16.0′	d = 0.9′		SD = 15.7′			
Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		179°22.7	N06°27.2	244°59.9	8.6′	S22°44.4	-6.7′	57.0′
1		194°22.9	28.1	259°27.6	8.7′	22°37.7	-6.8′	57.0′
2		209°23.1	29.0	273°55.3	8.8′	22°30.9	-6.9′	57.0′
3		224°23.2	·· 30.0	288°23.1	8.9′	22°24.0	-7.1′	57.0′
4		239°23.4	30.9	302°50.9	9.0′	22°16.9	-7.2′	56.9′
5		254°23.6	31.9	317°18.9	9.1′	22°09.7	-7.3′	56.9′
6		269°23.8	N06°32.8	331°47.0	9.2′	S22°02.5	-7.4′	56.9′
7		284°23.9	33.8	346°15.1	9.2′	21°55.1	-7.5′	56.8′
8		299°24.1	34.7	0°43.4	9.3′	21°47.6	-7.6′	56.8′
9		314°24.3	·· 35.6	15°11.7	9.4′	21°39.9	-7.7′	56.8′
10		329°24.5	36.6	29°40.1	9.5′	21°32.2	-7.8′	56.8′
11		344°24.7	37.5	44°08.7	9.6′	21°24.4	-7.9′	56.7′
12		359°24.8	N06°38.5	58°37.3	9.7′	S21°16.4	-8.0′	56.7′
13		14°25.0	39.4	73°06.0	9.8′	21°08.4	-8.2′	56.7′
14		29°25.2	40.4	87°34.8	9.9′	21°00.2	-8.3′	56.7′
15		44°25.4	·· 41.3	102°03.6	10.0′	20°52.0	-8.4′	56.6′
16		59°25.5	42.2	116°32.6	10.1′	20°43.6	-8.5′	56.6′
17		74°25.7	43.2	131°01.7	10.2′	20°35.1	-8.6′	56.6′
18		89°25.9	N06°44.1	145°30.8	10.2′	S20°26.6	-8.7′	56.6′
19		104°26.1	45.1	160°00.1	10.3′	20°17.9	-8.8′	56.5′
20		119°26.2	46.0	174°29.4	10.4′	20°09.2	-8.8′	56.5′
21		134°26.4	·· 47.0	188°58.8	10.5′	20°00.3	-8.9′	56.5′
22		149°26.6	47.9	203°28.3	10.6′	19°51.4	-9.0′	56.5′
23		164°26.8	48.8	217°58.0	10.7′	19°42.3	-9.1′	56.4′
		SD = 16.0′	d = 0.9′		SD = 15.6′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	03:14	04:34	19:35	20:56	–:–
N 70°	01:44	03:35	04:44	19:24	20:34	22:31
68°	02:21	03:50	04:52	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	05:09	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	05:17	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°	04:28	05:03	05:33	18:33	19:03	19:39
N 40°	04:38	05:10	05:38	18:28	18:56	19:29
35°	04:45	05:16	05:41	18:25	18:50	19:21
30°	04:52	05:20	05:45	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	18:07	18:55

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

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 55-33%
04	03:04	02:55	12:03	06:05	18:34	
05	02:46	02:38	12:03	07:03	19:30	
06	02:29	02:21	12:02	07:57	20:23	

DUT1 = UT1-UTC = -0.1746 sec ΔT = TT-UT1 = +69.3586 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	195°29.2	176°14.2	N06°54.8	116°26.5	N24°32.3	228°34.7	S14°01.6	241°03.2	S17°45.1
1	210°31.7	191°13.8	56.0	131°27.3	32.5	243°36.8	01.4	256°05.5	45.0
2	225°34.1	206°13.4	57.2	146°28.2	32.6	258°38.8	01.3	271°07.8	45.0
3	240°36.6	221°12.9	·· 58.4	161°29.0	·· 32.7	273°40.8	·· 01.1	286°10.1	·· 44.9
4	255°39.1	236°12.5	06°59.7	176°29.8	32.8	288°42.8	01.0	301°12.4	44.9
5	270°41.5	251°12.1	07°00.9	191°30.6	32.9	303°44.8	00.8	316°14.6	44.8
6	285°44.0	266°11.7	N07°02.1	206°31.4	N24°33.0	318°46.8	S14°00.7	331°16.9	S17°44.8
7	300°46.4	281°11.3	03.3	221°32.3	33.1	333°48.8	00.5	346°19.2	44.7
8	315°48.9	296°10.9	04.5	236°33.1	33.2	348°50.8	00.4	1°21.5	44.7
9	330°51.4	311°10.5	·· 05.8	251°33.9	·· 33.3	3°52.8	·· 00.2	16°23.8	·· 44.7
10	345°53.8	326°10.1	07.0	266°34.7	33.4	18°54.8	14°00.1	31°26.1	44.6
11	0°56.3	341°09.7	08.2	281°35.5	33.6	33°56.8	13°59.9	46°28.4	44.6
12	15°58.8	356°09.3	N07°09.4	296°36.3	N24°33.7	48°58.8	S13°59.8	61°30.6	S17°44.5
13	31°01.2	11°08.9	10.6	311°37.2	33.8	64°00.9	59.6	76°32.9	44.5
14	46°03.7	26°08.5	11.8	326°38.0	33.9	79°02.9	59.5	91°35.2	44.4
15	61°06.2	41°08.0	·· 13.1	341°38.8	·· 34.0	94°04.9	·· 59.3	106°37.5	·· 44.4
16	76°08.6	56°07.6	14.3	356°39.6	34.1	109°06.9	59.2	121°39.8	44.4
17	91°11.1	71°07.2	15.5	11°40.4	34.2	124°08.9	59.0	136°42.1	44.3
18	106°13.6	86°06.8	N07°16.7	26°41.2	N24°34.3	139°10.9	S13°58.9	151°44.4	S17°44.3
19	121°16.0	101°06.4	17.9	41°42.1	34.4	154°12.9	58.7	166°46.7	44.2
20	136°18.5	116°06.0	19.1	56°42.9	34.5	169°14.9	58.6	181°48.9	44.2
21	151°20.9	131°05.6	·· 20.4	71°43.7	·· 34.6	184°16.9	·· 58.4	196°51.2	·· 44.1
22	166°23.4	146°05.2	21.6	86°44.5	34.7	199°18.9	58.3	211°53.5	44.1
23	181°25.9	161°04.8	22.8	101°45.3	34.8	214°21.0	58.1	226°55.8	44.0
	Mer.pass. 10:56	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.36	ν 2.0′	d -0.1′ m -2.09	ν 2.3′	d -0.0′ m 0.72
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	196°28.3	176°04.3	N07°24.0	116°46.1	N24°34.9	229°23.0	S13°58.0	241°58.1	S17°44.0
1	211°30.8	191°03.9	25.2	131°47.0	35.1	244°25.0	57.8	257°00.4	44.0
2	226°33.3	206°03.5	26.4	146°47.8	35.2	259°27.0	57.7	272°02.7	43.9
3	241°35.7	221°03.1	·· 27.6	161°48.6	·· 35.3	274°29.0	·· 57.6	287°05.0	·· 43.9
4	256°38.2	236°02.7	28.8	176°49.4	35.4	289°31.0	57.4	302°07.3	43.8
5	271°40.7	251°02.3	30.1	191°50.2	35.5	304°33.0	57.3	317°09.5	43.8
6	286°43.1	266°01.9	N07°31.3	206°51.0	N24°35.6	319°35.0	S13°57.1	332°11.8	S17°43.7
7	301°45.6	281°01.5	32.5	221°51.8	35.7	334°37.1	57.0	347°14.1	43.7
8	316°48.0	296°01.0	33.7	236°52.7	35.8	349°39.1	56.8	2°16.4	43.7
9	331°50.5	311°00.6	·· 34.9	251°53.5	·· 35.9	4°41.1	·· 56.7	17°18.7	·· 43.6
10	346°53.0	326°00.2	36.1	266°54.3	36.0	19°43.1	56.5	32°21.0	43.6
11	1°55.4	340°59.8	37.3	281°55.1	36.1	34°45.1	56.4	47°23.3	43.5
12	16°57.9	355°59.4	N07°38.5	296°55.9	N24°36.2	49°47.1	S13°56.2	62°25.6	S17°43.5
13	32°00.4	10°59.0	39.7	311°56.7	36.3	64°49.1	56.1	77°27.9	43.4
14	47°02.8	25°58.6	41.0	326°57.5	36.4	79°51.1	55.9	92°30.1	43.4
15	62°05.3	40°58.1	·· 42.2	341°58.4	·· 36.5	94°53.2	·· 55.8	107°32.4	·· 43.4
16	77°07.8	55°57.7	43.4	356°59.2	36.6	109°55.2	55.6	122°34.7	43.3
17	92°10.2	70°57.3	44.6	12°00.0	36.7	124°57.2	55.5	137°37.0	43.3
18	107°12.7	85°56.9	N07°45.8	27°00.8	N24°36.8	139°59.2	S13°55.3	152°39.3	S17°43.2
19	122°15.2	100°56.5	47.0	42°01.6	36.9	155°01.2	55.2	167°41.6	43.2
20	137°17.6	115°56.1	48.2	57°02.4	37.0	170°03.2	55.1	182°43.9	43.1
21	152°20.1	130°55.6	·· 49.4	72°03.2	·· 37.1	185°05.3	·· 54.9	197°46.2	·· 43.1
22	167°22.5	145°55.2	50.6	87°04.1	37.2	200°07.3	54.8	212°48.5	43.1
23	182°25.0	160°54.8	51.8	102°04.9	37.3	215°09.3	54.6	227°50.8	43.0
	Mer.pass. 10:52	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.37	ν 2.0′	d -0.1′ m -2.09	ν 2.3′	d -0.0′ m 0.71
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	197°27.5	175°54.4	N07°53.0	117°05.7	N24°37.4	230°11.3	S13°54.5	242°53.1	S17°43.0
1	212°29.9	190°54.0	54.2	132°06.5	37.5	245°13.3	54.3	257°55.3	42.9
2	227°32.4	205°53.6	55.5	147°07.3	37.6	260°15.3	54.2	272°57.6	42.9
3	242°34.9	220°53.1	·· 56.7	162°08.1	·· 37.7	275°17.3	·· 54.0	287°59.9	·· 42.8
4	257°37.3	235°52.7	57.9	177°08.9	37.8	290°19.4	53.9	303°02.2	42.8
5	272°39.8	250°52.3	07°59.1	192°09.8	37.9	305°21.4	53.7	318°04.5	42.8
6	287°42.3	265°51.9	N08°00.3	207°10.6	N24°38.0	320°23.4	S13°53.6	333°06.8	S17°42.7
7	302°44.7	280°51.5	01.5	222°11.4	38.1	335°25.4	53.4	348°09.1	42.7
8	317°47.2	295°51.0	02.7	237°12.2	38.2	350°27.4	53.3	3°11.4	42.6
9	332°49.6	310°50.6	·· 03.9	252°13.0	·· 38.3	5°29.4	·· 53.1	18°13.7	·· 42.6
10	347°52.1	325°50.2	05.1	267°13.8	38.4	20°31.5	53.0	33°16.0	42.6
11	2°54.6	340°49.8	06.3	282°14.6	38.5	35°33.5	52.9	48°18.3	42.5
12	17°57.0	355°49.4	N08°07.5	297°15.4	N24°38.6	50°35.5	S13°52.7	63°20.6	S17°42.5
13	32°59.5	10°48.9	08.7	312°16.3	38.6	65°37.5	52.6	78°22.9	42.4
14	48°02.0	25°48.5	09.9	327°17.1	38.7	80°39.5	52.4	93°25.2	42.4
15	63°04.4	40°48.1	·· 11.1	342°17.9	·· 38.8	95°41.5	·· 52.3	108°27.4	·· 42.3
16	78°06.9	55°47.7	12.3	357°18.7	38.9	110°43.6	52.1	123°29.7	42.3
17	93°09.4	70°47.3	13.5	12°19.5	39.0	125°45.6	52.0	138°32.0	42.3
18	108°11.8	85°46.8	N08°14.7	27°20.3	N24°39.1	140°47.6	S13°51.8	153°34.3	S17°42.2
19	123°14.3	100°46.4	15.9	42°21.1	39.2	155°49.6	51.7	168°36.6	42.2
20	138°16.8	115°46.0	17.1	57°21.9	39.3	170°51.6	51.5	183°38.9	42.1
21	153°19.2	130°45.6	·· 18.3	72°22.8	·· 39.4	185°53.7	·· 51.4	198°41.2	·· 42.1
22	168°21.7	145°45.2	19.5	87°23.6	39.5	200°55.7	51.2	213°43.5	42.1
23	183°24.1	160°44.7	20.7	102°24.4	39.6	215°57.7	51.1	228°45.8	42.0
	Mer.pass. 10:48	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.38	ν 2.0′	d -0.1′ m -2.09	ν 2.3′	d -0.0′ m 0.71

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.6	-42°11.6
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.9
Hamal	327°55.0	23°33.6
Polaris	315°51.8	89°21.3
Acamar	315°14.5	-40°13.4
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.9
Capella	280°26.6	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.9	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.3	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.0	27°58.5
Avior	234°15.7	-59°34.9
Suhail	222°48.3	-43°31.3
Miaplacidus	221°38.3	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.7	-63°13.0
Gacrux	171°54.4	-57°13.9
Alioth	166°15.2	55°50.7
Spica	158°25.2	-11°16.3
Alkaid	152°54.0	49°12.4
Hadar	148°39.7	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.2
Kochab	137°18.8	74°04.0
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.5
Antares	112°19.4	-26°28.7
Atria	107°16.0	-69°03.6
Sabik	102°06.1	-15°45.0
Shaula	96°14.4	-37°07.0
Rasalhague	96°01.3	12°32.5
Eltanin	90°43.4	51°28.9
Kaus Aust.	83°36.5	-34°22.3
Vega	80°35.2	38°47.9
Nunki	75°51.5	-26°16.2
Altair	62°03.0	8°55.3
Peacock	53°10.8	-56°39.8
Deneb	49°28.0	45°21.0
Enif	33°42.0	9°58.1
Al Na'ir	27°37.1	-46°51.5
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.4	28°11.6
Markab	13°33.2	15°18.9

Apr 07 Wed	SHA	Mer.pass
Venus	340°45.0	12:15
Mars	280°57.3	16:13
Jupiter	33°05.5	08:45
Saturn	45°34.0	07:55

Apr 08 Thu	SHA	Mer.pass
Venus	339°36.0	12:16
Mars	280°17.8	16:12
Jupiter	32°54.6	08:41
Saturn	45°29.8	07:51

Apr 09 Fri	SHA	Mer.pass
Venus	338°26.9	12:17
Mars	279°38.2	16:11
Jupiter	32°43.8	08:38
Saturn	45°25.6	07:47

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°26.9	N06°49.8	232°27.6	10.8′	S19°33.2	-9.2′	56.4′
1	194°27.1	50.7	246°57.4	10.9′	19°24.0	-9.3′	56.4′
2	209°27.3	51.7	261°27.3	11.0′	19°14.7	-9.4′	56.4′
3	224°27.5	·· 52.6	275°57.3	11.0′	19°05.3	-9.5′	56.3′
4	239°27.6	53.5	290°27.3	11.1′	18°55.8	-9.6′	56.3′
5	254°27.8	54.5	304°57.4	11.2′	18°46.2	-9.7′	56.3′
6	269°28.0	N06°55.4	319°27.7	11.3′	S18°36.6	-9.7′	56.3′
7	284°28.2	56.3	333°58.0	11.4′	18°26.8	-9.8′	56.2′
8	299°28.3	57.3	348°28.4	11.5′	18°17.0	-9.9′	56.2′
9	314°28.5	·· 58.2	2°58.8	11.6′	18°07.1	-10.0′	56.2′
10	329°28.7	06°59.2	17°29.4	11.6′	17°57.1	-10.1′	56.2′
11	344°28.9	07°00.1	32°00.0	11.7′	17°47.1	-10.1′	56.1′
12	359°29.0	N07°01.0	46°30.8	11.8′	S17°36.9	-10.2′	56.1′
13	14°29.2	02.0	61°01.6	11.9′	17°26.7	-10.3′	56.1′
14	29°29.4	02.9	75°32.5	12.0′	17°16.4	-10.4′	56.1′
15	44°29.5	·· 03.9	90°03.5	12.1′	17°06.0	-10.4′	56.0′
16	59°29.7	04.8	104°34.5	12.1′	16°55.6	-10.5′	56.0′
17	74°29.9	05.7	119°05.7	12.2′	16°45.1	-10.6′	56.0′
18	89°30.1	N07°06.7	133°36.9	12.3′	S16°34.5	-10.7′	56.0′
19	104°30.2	07.6	148°08.2	12.4′	16°23.8	-10.7′	55.9′
20	119°30.4	08.5	162°39.6	12.5′	16°13.1	-10.8′	55.9′
21	134°30.6	·· 09.5	177°11.1	12.5′	16°02.3	-10.9′	55.9′
22	149°30.8	10.4	191°42.6	12.6′	15°51.5	-10.9′	55.9′
23	164°30.9	11.3	206°14.3	12.7′	15°40.5	-11.0′	55.9′
	SD = 16.0′	d = 0.9′	SD = 15.4′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.1	N07°12.3	220°46.0	12.8′	S15°29.6	-11.1′	55.8′
1	194°31.3	13.2	235°17.7	12.9′	15°18.5	-11.1′	55.8′
2	209°31.4	14.1	249°49.6	12.9′	15°07.4	-11.2′	55.8′
3	224°31.6	·· 15.1	264°21.5	13.0′	14°56.2	-11.2′	55.8′
4	239°31.8	16.0	278°53.5	13.1′	14°45.0	-11.3′	55.7′
5	254°32.0	17.0	293°25.6	13.1′	14°33.7	-11.3′	55.7′
6	269°32.1	N07°17.9	307°57.7	13.2′	S14°22.3	-11.4′	55.7′
7	284°32.3	18.8	322°30.0	13.3′	14°10.9	-11.5′	55.7′
8	299°32.5	19.8	337°02.3	13.4′	13°59.5	-11.5′	55.7′
9	314°32.7	·· 20.7	351°34.6	13.4′	13°48.0	-11.6′	55.6′
10	329°32.8	21.6	6°07.1	13.5′	13°36.4	-11.6′	55.6′
11	344°33.0	22.6	20°39.6	13.6′	13°24.8	-11.7′	55.6′
12	359°33.2	N07°23.5	35°12.1	13.6′	S13°13.1	-11.7′	55.6′
13	14°33.3	24.4	49°44.8	13.7′	13°01.4	-11.8′	55.6′
14	29°33.5	25.4	64°17.5	13.8′	12°49.6	-11.8′	55.5′
15	44°33.7	·· 26.3	78°50.2	13.8′	12°37.8	-11.9′	55.5′
16	59°33.9	27.2	93°23.1	13.9′	12°25.9	-11.9′	55.5′
17	74°34.0	28.1	107°56.0	14.0′	12°14.0	-12.0′	55.5′
18	89°34.2	N07°29.1	122°28.9	14.0′	S12°02.0	-12.0′	55.5′
19	104°34.4	30.0	137°02.0	14.1′	11°50.0	-12.0′	55.4′
20	119°34.5	30.9	151°35.1	14.1′	11°38.0	-12.1′	55.4′
21	134°34.7	·· 31.9	166°08.2	14.2′	11°25.9	-12.1′	55.4′
22	149°34.9	32.8	180°41.4	14.3′	11°13.8	-12.2′	55.4′
23	164°35.0	33.7	195°14.7	14.3′	11°01.6	-12.2′	55.4′
	SD = 16.0′	d = 0.9′	SD = 15.2′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°35.2	N07°34.7	209°48.0	14.4′	S10°49.4	-12.2′	55.3′
1	194°35.4	35.6	224°21.4	14.4′	10°37.1	-12.3′	55.3′
2	209°35.6	36.5	238°54.8	14.5′	10°24.9	-12.3′	55.3′
3	224°35.7	·· 37.5	253°28.3	14.6′	10°12.5	-12.4′	55.3′
4	239°35.9	38.4	268°01.9	14.6′	10°00.2	-12.4′	55.3′
5	254°36.1	39.3	282°35.5	14.7′	09°47.8	-12.4′	55.2′
6	269°36.2	N07°40.2	297°09.1	14.7′	S09°35.4	-12.5′	55.2′
7	284°36.4	41.2	311°42.8	14.8′	09°22.9	-12.5′	55.2′
8	299°36.6	42.1	326°16.6	14.8′	09°10.4	-12.5′	55.2′
9	314°36.7	·· 43.0	340°50.4	14.9′	08°57.9	-12.6′	55.2′
10	329°36.9	44.0	355°24.3	14.9′	08°45.3	-12.6′	55.2′
11	344°37.1	44.9	9°58.2	15.0′	08°32.8	-12.6′	55.1′
12	359°37.2	N07°45.8	24°32.1	15.0′	S08°20.2	-12.6′	55.1′
13	14°37.4	46.7	39°06.1	15.1′	08°07.5	-12.7′	55.1′
14	29°37.6	47.7	53°40.2	15.1′	07°54.9	-12.7′	55.1′
15	44°37.7	·· 48.6	68°14.3	15.1′	07°42.2	-12.7′	55.1′
16	59°37.9	49.5	82°48.4	15.2′	07°29.5	-12.7′	55.0′
17	74°38.1	50.4	97°22.6	15.2′	07°16.7	-12.8′	55.0′
18	89°38.3	N07°51.4	111°56.8	15.3′	S07°04.0	-12.8′	55.0′
19	104°38.4	52.3	126°31.1	15.3′	06°51.2	-12.8′	55.0′
20	119°38.6	53.2	141°05.4	15.3′	06°38.4	-12.8′	55.0′
21	134°38.8	·· 54.1	155°39.8	15.4′	06°25.6	-12.8′	55.0′
22	149°38.9	55.1	170°14.1	15.4′	06°12.7	-12.9′	54.9′
23	164°39.1	56.0	184°48.6	15.5′	05°59.9	-12.9′	54.9′
	SD = 16.0′	d = 0.9′	SD = 15.1′				

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

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 25-27 24-9%
07	02:12	02:04	12:02	08:48	21:12	
08	01:56	01:47	12:02	09:35	21:57	
09	01:39	01:31	12:02	10:19	22:40	

DUT1 = UT1-UTC = -0.1758 sec ΔT = TT-UT1 = +69.3598 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	198°26.6	175°44.3	N08°21.9	117°25.2	N24°39.7	230°59.7	S13°51.0	243°48.1	S17°42.0
1	213°29.1	190°43.9	23.1	132°26.0	39.8	246°01.7	50.8	258°50.4	41.9
2	228°31.5	205°43.5	24.3	147°26.8	39.9	261°03.8	50.7	273°52.7	41.9
3	243°34.0	220°43.0	·· 25.5	162°27.6	·· 39.9	276°05.8	·· 50.5	288°55.0	·· 41.8
4	258°36.5	235°42.6	26.7	177°28.4	40.0	291°07.8	50.4	303°57.3	41.8
5	273°38.9	250°42.2	27.9	192°29.2	40.1	306°09.8	50.2	318°59.6	41.8
6	288°41.4	265°41.8	N08°29.1	207°30.1	N24°40.2	321°11.8	S13°50.1	334°01.9	S17°41.7
7	303°43.9	280°41.3	30.3	222°30.9	40.3	336°13.9	49.9	349°04.2	41.7
8	318°46.3	295°40.9	31.5	237°31.7	40.4	351°15.9	49.8	4°06.5	41.6
9	333°48.8	310°40.5	·· 32.7	252°32.5	·· 40.5	6°17.9	·· 49.7	19°08.8	·· 41.6
10	348°51.3	325°40.1	33.9	267°33.3	40.6	21°19.9	49.5	34°11.1	41.6
11	3°53.7	340°39.6	35.1	282°34.1	40.7	36°21.9	49.4	49°13.3	41.5
12	18°56.2	355°39.2	N08°36.3	297°34.9	N24°40.7	51°24.0	S13°49.2	64°15.6	S17°41.5
13	33°58.6	10°38.8	37.5	312°35.7	40.8	66°26.0	49.1	79°17.9	41.4
14	49°01.1	25°38.4	38.7	327°36.5	40.9	81°28.0	48.9	94°20.2	41.4
15	64°03.6	40°37.9	·· 39.8	342°37.3	·· 41.0	96°30.0	·· 48.8	109°22.5	·· 41.3
16	79°06.0	55°37.5	41.0	357°38.2	41.1	111°32.1	48.6	124°24.8	41.3
17	94°08.5	70°37.1	42.2	12°39.0	41.2	126°34.1	48.5	139°27.1	41.3
18	109°11.0	85°36.6	N08°43.4	27°39.8	N24°41.3	141°36.1	S13°48.3	154°29.4	S17°41.2
19	124°13.4	100°36.2	44.6	42°40.6	41.4	156°38.1	48.2	169°31.7	41.2
20	139°15.9	115°35.8	45.8	57°41.4	41.4	171°40.1	48.1	184°34.0	41.1
21	154°18.4	130°35.4	·· 47.0	72°42.2	·· 41.5	186°42.2	·· 47.9	199°36.3	·· 41.1
22	169°20.8	145°34.9	48.2	87°43.0	41.6	201°44.2	47.8	214°38.6	41.1
23	184°23.3	160°34.5	49.4	102°43.8	41.7	216°46.2	47.6	229°40.9	41.0
Mer.pass. 10:44		ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.39	ν 2.0′	d -0.1′ m -2.10	ν 2.3′	d -0.0′ m 0.71

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	199°25.7	175°34.1	N08°50.6	117°44.6	N24°41.8	231°48.2	S13°47.5	244°43.2	S17°41.0
1	214°28.2	190°33.6	51.8	132°45.4	41.9	246°50.3	47.3	259°45.5	40.9
2	229°30.7	205°33.2	53.0	147°46.3	41.9	261°52.3	47.2	274°47.8	40.9
3	244°33.1	220°32.8	·· 54.1	162°47.1	·· 42.0	276°54.3	·· 47.0	289°50.1	·· 40.9
4	259°35.6	235°32.3	55.3	177°47.9	42.1	291°56.3	46.9	304°52.4	40.8
5	274°38.1	250°31.9	56.5	192°48.7	42.2	306°58.4	46.8	319°54.7	40.8
6	289°40.5	265°31.5	N08°57.7	207°49.5	N24°42.3	322°00.4	S13°46.6	334°57.0	S17°40.7
7	304°43.0	280°31.1	08°58.9	222°50.3	42.4	337°02.4	46.5	349°59.3	40.7
8	319°45.5	295°30.6	09°00.1	237°51.1	42.4	352°04.4	46.3	5°01.6	40.7
9	334°47.9	310°30.2	·· 01.3	252°51.9	·· 42.5	7°06.5	·· 46.2	20°03.9	·· 40.6
10	349°50.4	325°29.8	02.5	267°52.7	42.6	22°08.5	46.0	35°06.2	40.6
11	4°52.9	340°29.3	03.7	282°53.5	42.7	37°10.5	45.9	50°08.5	40.5
12	19°55.3	355°28.9	N09°04.8	297°54.3	N24°42.8	52°12.5	S13°45.8	65°10.8	S17°40.5
13	34°57.8	10°28.5	06.0	312°55.2	42.9	67°14.6	45.6	80°13.1	40.5
14	50°00.2	25°28.0	07.2	327°56.0	42.9	82°16.6	45.5	95°15.4	40.4
15	65°02.7	40°27.6	·· 08.4	342°56.8	·· 43.0	97°18.6	·· 45.3	110°17.7	·· 40.4
16	80°05.2	55°27.2	09.6	357°57.6	43.1	112°20.6	45.2	125°20.0	40.3
17	95°07.6	70°26.7	10.8	12°58.4	43.2	127°22.7	45.0	140°22.3	40.3
18	110°10.1	85°26.3	N09°12.0	27°59.2	N24°43.3	142°24.7	S13°44.9	155°24.6	S17°40.3
19	125°12.6	100°25.9	13.1	43°00.0	43.3	157°26.7	44.7	170°26.9	40.2
20	140°15.0	115°25.4	14.3	58°00.8	43.4	172°28.8	44.6	185°29.2	40.2
21	155°17.5	130°25.0	·· 15.5	73°01.6	·· 43.5	187°30.8	·· 44.5	200°31.5	·· 40.1
22	170°20.0	145°24.5	16.7	88°02.4	43.6	202°32.8	44.3	215°33.8	40.1
23	185°22.4	160°24.1	17.9	103°03.2	43.6	217°34.8	44.2	230°36.1	40.1
Mer.pass. 10:41		ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.40	ν 2.0′	d -0.1′ m -2.10	ν 2.3′	d -0.0′ m 0.71

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	200°24.9	175°23.7	N09°19.1	118°04.0	N24°43.7	232°36.9	S13°44.0	245°38.4	S17°40.0
1	215°27.3	190°23.2	20.2	133°04.8	43.8	247°38.9	43.9	260°40.7	40.0
2	230°29.8	205°22.8	21.4	148°05.7	43.9	262°40.9	43.7	275°43.0	39.9
3	245°32.3	220°22.4	·· 22.6	163°06.5	·· 44.0	277°43.0	·· 43.6	290°45.3	·· 39.9
4	260°34.7	235°21.9	23.8	178°07.3	44.0	292°45.0	43.5	305°47.6	39.9
5	275°37.2	250°21.5	25.0	193°08.1	44.1	307°47.0	43.3	320°49.9	39.8
6	290°39.7	265°21.1	N09°26.1	208°08.9	N24°44.2	322°49.0	S13°43.2	335°52.2	S17°39.8
7	305°42.1	280°20.6	27.3	223°09.7	44.3	337°51.1	43.0	350°54.5	39.7
8	320°44.6	295°20.2	28.5	238°10.5	44.3	352°53.1	42.9	5°56.8	39.7
9	335°47.1	310°19.7	·· 29.7	253°11.3	·· 44.4	7°55.1	·· 42.7	20°59.1	·· 39.7
10	350°49.5	325°19.3	30.9	268°12.1	44.5	22°57.2	42.6	36°01.4	39.6
11	5°52.0	340°18.9	32.0	283°12.9	44.6	37°59.2	42.5	51°03.7	39.6
12	20°54.5	355°18.4	N09°33.2	298°13.7	N24°44.6	53°01.2	S13°42.3	66°06.0	S17°39.5
13	35°56.9	10°18.0	34.4	313°14.5	44.7	68°03.2	42.2	81°08.4	39.5
14	50°59.4	25°17.5	35.6	328°15.3	44.8	83°05.3	42.0	96°10.7	39.5
15	66°01.8	40°17.1	·· 36.7	343°16.1	·· 44.8	98°07.3	·· 41.9	111°13.0	·· 39.4
16	81°04.3	55°16.7	37.9	358°17.0	44.9	113°09.3	41.7	126°15.3	39.4
17	96°06.8	70°16.2	39.1	13°17.8	45.0	128°11.4	41.6	141°17.6	39.3
18	111°09.2	85°15.8	N09°40.3	28°18.6	N24°45.1	143°13.4	S13°41.5	156°19.9	S17°39.3
19	126°11.7	100°15.3	41.4	43°19.4	45.1	158°15.4	41.3	171°22.2	39.3
20	141°14.2	115°14.9	42.6	58°20.2	45.2	173°17.5	41.2	186°24.5	39.2
21	156°16.6	130°14.4	·· 43.8	73°21.0	·· 45.3	188°19.5	·· 41.0	201°26.8	·· 39.2
22	171°19.1	145°14.0	45.0	88°21.8	45.4	203°21.5	40.9	216°29.1	39.2
23	186°21.6	160°13.6	46.1	103°22.6	45.4	218°23.6	40.8	231°31.4	39.1
Mer.pass. 10:37		ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.41	ν 2.0′	d -0.1′ m -2.11	ν 2.3′	d -0.0′ m 0.71

Stars	SHA	Dec
Alpheratz	357°38.3	29°12.2
Ankaa	353°10.6	-42°11.6
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.9
Hamal	327°55.0	23°33.6
Polaris	315°52.5	89°21.3
Acamar	315°14.5	-40°13.4
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.8
Capella	280°26.7	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.5	7°24.5
Canopus	263°53.9	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.3	-29°00.3
Procyon	244°54.0	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°15.8	-59°34.9
Suhail	222°48.3	-43°31.3
Miaplacidus	221°38.4	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.3	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°13.0
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.7
Spica	158°25.2	-11°16.3
Alkaid	152°54.0	49°12.4
Hadar	148°39.7	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.2
Kochab	137°18.8	74°04.0
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°16.0	-69°03.7
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.0
Rasalhague	96°01.2	12°32.5
Eltanin	90°43.4	51°28.9
Kaus Aust.	83°36.5	-34°22.3
Vega	80°35.2	38°47.9
Nunki	75°51.5	-26°16.2
Altair	62°03.0	8°55.3
Peacock	53°10.7	-56°39.8
Deneb	49°28.0	45°21.0
Enif	33°42.0	9°58.1
Al Na'ir	27°37.1	-46°51.5
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.4	28°11.6
Markab	13°33.2	15°18.9

Apr 10 Sat	SHA	Mer.pass
Venus	337°17.7	12:17
Mars	278°58.6	16:09
Jupiter	32°33.1	08:35
Saturn	45°21.5	07:44

Apr 11 Sun	SHA	Mer.pass
Venus	336°08.3	12:18
Mars	278°18.9	16:08
Jupiter	32°22.5	08:32
Saturn	45°17.5	07:40

Apr 12 Mon	SHA	Mer.pass
Venus	334°58.8	12:19
Mars	277°39.2	16:07
Jupiter	32°12.0	08:28
Saturn	45°13.5	07:36

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.3	N07°56.9	199°23.0	15.5′	S05°47.0	-12.9′	54.9′
1	194°39.4	57.8	213°57.5	15.5′	05°34.1	-12.9′	54.9′
2	209°39.6	58.8	228°32.1	15.6′	05°21.2	-12.9′	54.9′
3	224°39.8	07°59.7	243°06.6	15.6′	05°08.3	-12.9′	54.9′
4	239°39.9	08°00.6	257°41.2	15.6′	04°55.4	-12.9′	54.9′
5	254°40.1	01.5	272°15.8	15.7′	04°42.4	-13.0′	54.8′
6	269°40.3	N08°02.5	286°50.5	15.7′	S04°29.5	-13.0′	54.8′
7	284°40.4	03.4	301°25.2	15.7′	04°16.5	-13.0′	54.8′
8	299°40.6	04.3	315°59.9	15.8′	04°03.5	-13.0′	54.8′
9	314°40.8	·· 05.2	330°34.7	15.8′	03°50.5	-13.0′	54.8′
10	329°40.9	06.2	345°09.5	15.8′	03°37.5	-13.0′	54.8′
11	344°41.1	07.1	359°44.3	15.8′	03°24.5	-13.0′	54.7′
12	359°41.3	N08°08.0	14°19.1	15.9′	S03°11.5	-13.0′	54.7′
13	14°41.4	08.9	28°54.0	15.9′	02°58.5	-13.0′	54.7′
14	29°41.6	09.8	43°28.8	15.9′	02°45.5	-13.0′	54.7′
15	44°41.7	·· 10.8	58°03.7	15.9′	02°32.4	-13.0′	54.7′
16	59°41.9	11.7	72°38.7	15.9′	02°19.4	-13.0′	54.7′
17	74°42.1	12.6	87°13.6	16.0′	02°06.4	-13.0′	54.7′
18	89°42.2	N08°13.5	101°48.6	16.0′	S01°53.3	-13.0′	54.6′
19	104°42.4	14.5	116°23.6	16.0′	01°40.3	-13.0′	54.6′
20	119°42.6	15.4	130°58.6	16.0′	01°27.2	-13.0′	54.6′
21	134°42.7	·· 16.3	145°33.6	16.0′	01°14.2	-13.0′	54.6′
22	149°42.9	17.2	160°08.7	16.1′	01°01.2	-13.0′	54.6′
23	164°43.1	18.1	174°43.7	16.1′	00°48.1	-13.0′	54.6′
	SD = 16.0′	d = 0.9′		SD = 15.0′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.2	N08°19.0	189°18.8	16.1′	S00°35.1	-13.0′	54.6′
1	194°43.4	20.0	203°53.9	16.1′	00°22.1	-13.0′	54.6′
2	209°43.6	20.9	218°29.0	16.1′	S00°09.0	-13.0′	54.5′
3	224°43.7	·· 21.8	233°04.1	16.1′	N00°04.0	13.0′	54.5′
4	239°43.9	22.7	247°39.2	16.1′	00°17.0	13.0′	54.5′
5	254°44.0	23.6	262°14.4	16.2′	00°30.0	13.0′	54.5′
6	269°44.2	N08°24.6	276°49.5	16.2′	N00°43.0	13.0′	54.5′
7	284°44.4	25.5	291°24.7	16.2′	00°56.0	13.0′	54.5′
8	299°44.5	26.4	305°59.9	16.2′	01°09.0	13.0′	54.5′
9	314°44.7	·· 27.3	320°35.0	16.2′	01°22.0	13.0′	54.4′
10	329°44.9	28.2	335°10.2	16.2′	01°35.0	13.0′	54.4′
11	344°45.0	29.1	349°45.4	16.2′	01°47.9	12.9′	54.4′
12	359°45.2	N08°30.1	4°20.6	16.2′	N02°00.9	12.9′	54.4′
13	14°45.4	31.0	18°55.8	16.2′	02°13.8	12.9′	54.4′
14	29°45.5	31.9	33°31.0	16.2′	02°26.7	12.9′	54.4′
15	44°45.7	·· 32.8	48°06.2	16.2′	02°39.6	12.9′	54.4′
16	59°45.8	33.7	62°41.4	16.2′	02°52.5	12.9′	54.4′
17	74°46.0	34.6	77°16.6	16.2′	03°05.4	12.9′	54.4′
18	89°46.2	N08°35.6	91°51.8	16.2′	N03°18.2	12.8′	54.3′
19	104°46.3	36.5	106°27.0	16.2′	03°31.1	12.8′	54.3′
20	119°46.5	37.4	121°02.2	16.2′	03°43.9	12.8′	54.3′
21	134°46.6	·· 38.3	135°37.4	16.2′	03°56.7	12.8′	54.3′
22	149°46.8	39.2	150°12.6	16.2′	04°09.5	12.8′	54.3′
23	164°47.0	40.1	164°47.8	16.2′	04°22.3	12.7′	54.3′
	SD = 16.0′	d = 0.9′		SD = 14.9′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°47.1	N08°41.0	179°23.0	16.2′	N04°35.0	12.7′	54.3′
1	194°47.3	41.9	193°58.2	16.2′	04°47.7	12.7′	54.3′
2	209°47.5	42.9	208°33.3	16.2′	05°00.4	12.7′	54.3′
3	224°47.6	·· 43.8	223°08.5	16.2′	05°13.1	12.7′	54.3′
4	239°47.8	44.7	237°43.7	16.1′	05°25.8	12.6′	54.2′
5	254°47.9	45.6	252°18.8	16.1′	05°38.4	12.6′	54.2′
6	269°48.1	N08°46.5	266°54.0	16.1′	N05°51.0	12.6′	54.2′
7	284°48.3	47.4	281°29.1	16.1′	06°03.6	12.6′	54.2′
8	299°48.4	48.3	296°04.2	16.1′	06°16.1	12.5′	54.2′
9	314°48.6	·· 49.2	310°39.3	16.1′	06°28.6	12.5′	54.2′
10	329°48.7	50.2	325°14.4	16.1′	06°41.1	12.5′	54.2′
11	344°48.9	51.1	339°49.5	16.1′	06°53.6	12.4′	54.2′
12	359°49.1	N08°52.0	354°24.5	16.0′	N07°06.0	12.4′	54.2′
13	14°49.2	52.9	8°59.6	16.0′	07°18.4	12.4′	54.2′
14	29°49.4	53.8	23°34.6	16.0′	07°30.8	12.3′	54.2′
15	44°49.5	·· 54.7	38°09.6	16.0′	07°43.2	12.3′	54.1′
16	59°49.7	55.6	52°44.6	16.0′	07°55.5	12.3′	54.1′
17	74°49.8	56.5	67°19.6	16.0′	08°07.7	12.2′	54.1′
18	89°50.0	N08°57.4	81°54.6	15.9′	N08°20.0	12.2′	54.1′
19	104°50.2	58.3	96°29.5	15.9′	08°32.2	12.2′	54.1′
20	119°50.3	08°59.2	111°04.4	15.9′	08°44.3	12.1′	54.1′
21	134°50.5	09°00.2	125°39.3	15.9′	08°56.5	12.1′	54.1′
22	149°50.6	01.1	140°14.2	15.9′	09°08.6	12.1′	54.1′
23	164°50.8	02.0	154°49.0	15.8′	09°20.6	12.0′	54.1′
	SD = 15.9′	d = 0.9′		SD = 14.8′			

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:31	04:01	20:05	21:37	–:–
N 70°	–:–	02:59	04:15	19:50	21:07	–:–
68°	01:31	03:20	04:26	19:39	20:45	22:40
66°	02:10	03:36	04:35	19:29	20:29	21:58
64°	02:36	03:50	04:43	19:21	20:15	21:30
62°	02:56	04:01	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	04:37	05:12	18:51	19:27	20:10
50°	04:00	04:42	05:15	18:48	19:22	20:03
45°	04:16	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°	04:45	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	18:57
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	18:01	18:35
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	17:12	17:51	18:37
S 60°	05:23	06:11	06:54	17:07	17:49	18:37

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	05:50	05:26	05:01	16:43	18:35	20:30
N 70°	05:44	05:26	05:09	16:46	18:30	20:16
68°	05:39	05:27	05:15	16:48	18:26	20:04
66°	05:34	05:27	05:20	16:51	18:23	19:55
64°	05:31	05:28	05:25	16:53	18:20	19:48
62°	05:27	05:28	05:29	16:54	18:18	19:41
60°	05:25	05:28	05:32	16:55	18:16	19:35
N 58°	05:22	05:29	05:35	16:57	18:14	19:30
56°	05:20	05:29	05:38	16:58	18:12	19:26
54°	05:18	05:29	05:40	16:59	18:11	19:22
52°	05:16	05:29	05:43	17:00	18:09	19:19
50°	05:14	05:30	05:45	17:00	18:08	19:15
45°	05:11	05:30	05:49	17:02	18:05	19:08
N 40°	05:07	05:30	05:53	17:04	18:03	19:03
35°	05:05	05:31	05:56	17:05	18:01	18:58
30°	05:02	05:31	05:59	17:06	18:00	18:53
20°	04:58	05:31	06:04	17:08	17:57	18:46
N 10°	04:55	05:32	06:09	17:10	17:54	18:39
0°	04:51	05:32	06:13	17:11	17:52	18:33
S 10°	04:48	05:33	06:17	17:13	17:50	18:27
20°	04:44	05:33	06:22	17:14	17:47	18:20
30°	04:40	05:34	06:27	17:16	17:44	18:13
35°	04:37	05:34	06:30	17:17	17:43	18:09
40°	04:35	05:35	06:34	17:18	17:41	18:04
45°	04:31	05:35	06:38	17:19	17:39	17:58
S 50°	04:28	05:36	06:43	17:21	17:36	17:51
52°	04:26	05:36	06:45	17:21	17:35	17:48
54°	04:24	05:36	06:48	17:22	17:33	17:45
56°	04:22	05:36	06:50	17:23	17:32	17:41
58°	04:19	05:37	06:54	17:24	17:31	17:37
S 60°	04:17	05:37	06:57	17:25	17:29	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 28-0 4-0%
10	01:23	01:15	12:01	11:01	23:22	
11	01:07	00:59	12:01	11:42	–:–	
12	00:51	00:44	12:01	12:23	00:03	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	201°24.0	175°13.1	N09°47.3	118°23.4	N24°45.5	233°25.6	S13°40.6	246°33.7	S17°39.1
1	216°26.5	190°12.7	48.5	133°24.2	45.6	248°27.6	40.5	261°36.0	39.0
2	231°28.9	205°12.2	49.7	148°25.0	45.6	263°29.7	40.3	276°38.3	39.0
3	246°31.4	220°11.8	·· 50.8	163°25.8	·· 45.7	278°31.7	·· 40.2	291°40.6	·· 39.0
4	261°33.9	235°11.3	52.0	178°26.6	45.8	293°33.7	40.0	306°42.9	38.9
5	276°36.3	250°10.9	53.2	193°27.4	45.8	308°35.8	39.9	321°45.2	38.9
6	291°38.8	265°10.4	N09°54.3	208°28.2	N24°45.9	323°37.8	S13°39.8	336°47.5	S17°38.8
7	306°41.3	280°10.0	55.5	223°29.0	46.0	338°39.8	39.6	351°49.8	38.8
8	321°43.7	295°09.6	56.7	238°29.8	46.0	353°41.9	39.5	6°52.1	38.8
9	336°46.2	310°09.1	·· 57.9	253°30.7	·· 46.1	8°43.9	·· 39.3	21°54.5	·· 38.7
10	351°48.7	325°08.7	09°59.0	268°31.5	46.2	23°45.9	39.2	36°56.8	38.7
11	6°51.1	340°08.2	10°00.2	283°32.3	46.3	38°48.0	39.0	51°59.1	38.7
12	21°53.6	355°07.8	N10°01.4	298°33.1	N24°46.3	53°50.0	S13°38.9	67°01.4	S17°38.6
13	36°56.1	10°07.3	02.5	313°33.9	46.4	68°52.0	38.8	82°03.7	38.6
14	51°58.5	25°06.9	03.7	328°34.7	46.5	83°54.1	38.6	97°06.0	38.5
15	67°01.0	40°06.4	·· 04.9	343°35.5	·· 46.5	98°56.1	·· 38.5	112°08.3	·· 38.5
16	82°03.4	55°06.0	06.0	358°36.3	46.6	113°58.1	38.3	127°10.6	38.5
17	97°05.9	70°05.5	07.2	13°37.1	46.7	129°00.2	38.2	142°12.9	38.4
18	112°08.4	85°05.1	N10°08.4	28°37.9	N24°46.7	144°02.2	S13°38.1	157°15.2	S17°38.4
19	127°10.8	100°04.6	09.5	43°38.7	46.8	159°04.2	37.9	172°17.5	38.3
20	142°13.3	115°04.2	10.7	58°39.5	46.8	174°06.3	37.8	187°19.8	38.3
21	157°15.8	130°03.7	·· 11.9	73°40.3	·· 46.9	189°08.3	·· 37.6	202°22.1	·· 38.3
22	172°18.2	145°03.3	13.0	88°41.1	47.0	204°10.4	37.5	217°24.5	38.2
23	187°20.7	160°02.8	14.2	103°41.9	47.0	219°12.4	37.4	232°26.8	38.2
Mer.pass.	10:33	ν -0.4′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.42	ν 2.0′	d -0.1′ m -2.11	ν 2.3′	d -0.0′ m 0.70

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	202°23.2	175°02.4	N10°15.3	118°42.7	N24°47.1	234°14.4	S13°37.2	247°29.1	S17°38.2
1	217°25.6	190°01.9	16.5	133°43.5	47.2	249°16.5	37.1	262°31.4	38.1
2	232°28.1	205°01.5	17.7	148°44.3	47.2	264°18.5	36.9	277°33.7	38.1
3	247°30.6	220°01.0	·· 18.8	163°45.1	·· 47.3	279°20.5	·· 36.8	292°36.0	·· 38.0
4	262°33.0	235°00.6	20.0	178°45.9	47.4	294°22.6	36.7	307°38.3	38.0
5	277°35.5	250°00.1	21.2	193°46.7	47.4	309°24.6	36.5	322°40.6	38.0
6	292°37.9	264°59.7	N10°22.3	208°47.5	N24°47.5	324°26.7	S13°36.4	337°42.9	S17°37.9
7	307°40.4	279°59.2	23.5	223°48.3	47.5	339°28.7	36.2	352°45.2	37.9
8	322°42.9	294°58.8	24.6	238°49.1	47.6	354°30.7	36.1	7°47.5	37.9
9	337°45.3	309°58.3	·· 25.8	253°50.0	·· 47.7	9°32.8	·· 36.0	22°49.9	·· 37.8
10	352°47.8	324°57.9	27.0	268°50.8	47.7	24°34.8	35.8	37°52.2	37.8
11	7°50.3	339°57.4	28.1	283°51.6	47.8	39°36.8	35.7	52°54.5	37.7
12	22°52.7	354°56.9	N10°29.3	298°52.4	N24°47.8	54°38.9	S13°35.5	67°56.8	S17°37.7
13	37°55.2	9°56.5	30.4	313°53.2	47.9	69°40.9	35.4	82°59.1	37.7
14	52°57.7	24°56.0	31.6	328°54.0	48.0	84°43.0	35.2	98°01.4	37.6
15	68°00.1	39°55.6	·· 32.7	343°54.8	·· 48.0	99°45.0	·· 35.1	113°03.7	·· 37.6
16	83°02.6	54°55.1	33.9	358°55.6	48.1	114°47.0	35.0	128°06.0	37.6
17	98°05.0	69°54.7	35.1	13°56.4	48.1	129°49.1	34.8	143°08.3	37.5
18	113°07.5	84°54.2	N10°36.2	28°57.2	N24°48.2	144°51.1	S13°34.7	158°10.7	S17°37.5
19	128°10.0	99°53.8	37.4	43°58.0	48.3	159°53.2	34.6	173°13.0	37.4
20	143°12.4	114°53.3	38.5	58°58.8	48.3	174°55.2	34.4	188°15.3	37.4
21	158°14.9	129°52.8	·· 39.7	73°59.6	·· 48.4	189°57.2	·· 34.3	203°17.6	·· 37.4
22	173°17.4	144°52.4	40.8	89°00.4	48.4	204°59.3	34.1	218°19.9	37.3
23	188°19.8	159°51.9	42.0	104°01.2	48.5	220°01.3	34.0	233°22.2	37.3
Mer.pass.	10:29	ν -0.5′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.43	ν 2.0′	d -0.1′ m -2.12	ν 2.3′	d -0.0′ m 0.70

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	203°22.3	174°51.5	N10°43.1	119°02.0	N24°48.5	235°03.4	S13°33.9	248°24.5	S17°37.3
1	218°24.8	189°51.0	44.3	134°02.8	48.6	250°05.4	33.7	263°26.8	37.2
2	233°27.2	204°50.5	45.4	149°03.6	48.7	265°07.4	33.6	278°29.1	37.2
3	248°29.7	219°50.1	·· 46.6	164°04.4	·· 48.7	280°09.5	·· 33.4	293°31.5	·· 37.1
4	263°32.2	234°49.6	47.7	179°05.2	48.8	295°11.5	33.3	308°33.8	37.1
5	278°34.6	249°49.2	48.9	194°06.0	48.8	310°13.6	33.2	323°36.1	37.1
6	293°37.1	264°48.7	N10°50.0	209°06.8	N24°48.9	325°15.6	S13°33.0	338°38.4	S17°37.0
7	308°39.5	279°48.2	51.2	224°07.6	48.9	340°17.7	32.9	353°40.7	37.0
8	323°42.0	294°47.8	52.3	239°08.4	49.0	355°19.7	32.7	8°43.0	37.0
9	338°44.5	309°47.3	·· 53.5	254°09.2	·· 49.0	10°21.7	·· 32.6	23°45.3	·· 36.9
10	353°46.9	324°46.9	54.6	269°10.0	49.1	25°23.8	32.5	38°47.7	36.9
11	8°49.4	339°46.4	55.8	284°10.8	49.1	40°25.8	32.3	53°50.0	36.9
12	23°51.9	354°45.9	N10°56.9	299°11.6	N24°49.2	55°27.9	S13°32.2	68°52.3	S17°36.8
13	38°54.3	9°45.5	58.1	314°12.4	49.2	70°29.9	32.0	83°54.6	36.8
14	53°56.8	24°45.0	10°59.2	329°13.2	49.3	85°32.0	31.9	98°56.9	36.7
15	68°59.3	39°44.5	11°00.4	344°14.0	·· 49.4	100°34.0	·· 31.8	113°59.2	·· 36.7
16	84°01.7	54°44.1	01.5	359°14.8	49.4	115°36.0	31.6	129°01.5	36.7
17	99°04.2	69°43.6	02.7	14°15.6	49.5	130°38.1	31.5	144°03.9	36.6
18	114°06.7	84°43.2	N11°03.8	29°16.4	N24°49.5	145°40.1	S13°31.4	159°06.2	S17°36.6
19	129°09.1	99°42.7	05.0	44°17.2	49.6	160°42.2	31.2	174°08.5	36.6
20	144°11.6	114°42.2	06.1	59°18.0	49.6	175°44.2	31.1	189°10.8	36.5
21	159°14.0	129°41.8	·· 07.2	74°18.8	·· 49.7	190°46.3	·· 30.9	204°13.1	·· 36.5
22	174°16.5	144°41.3	08.4	89°19.6	49.7	205°48.3	30.8	219°15.4	36.5
23	189°19.0	159°40.8	09.5	104°20.4	49.8	220°50.4	30.7	234°17.7	36.4
Mer.pass.	10:25	ν -0.5′	d 1.2′	m -3.91	ν 0.8′	d 0.1′	m 1.44	ν 2.0′	d -0.1′ m -2.12	ν 2.3′	d -0.0′ m 0.70

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.2
Ankaa	353°10.6	-42°11.6
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.9
Hamal	327°55.0	23°33.6
Polaris	315°53.0	89°21.2
Acamar	315°14.5	-40°13.4
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.8
Capella	280°26.7	46°01.2
Bellatrix	278°26.3	6°22.0
Elnath	278°05.9	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°53.9	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.3	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°15.8	-59°34.9
Suhail	222°48.4	-43°31.3
Miaplacidus	221°38.4	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°13.0
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.3
Alkaid	152°54.0	49°12.4
Hadar	148°39.6	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.2
Kochab	137°18.8	74°04.0
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°15.9	-69°03.7
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.0
Rasalhague	96°01.2	12°32.5
Eltanin	90°43.4	51°28.9
Kaus Aust.	83°36.5	-34°22.3
Vega	80°35.2	38°47.9
Nunki	75°51.5	-26°16.2
Altair	62°02.9	8°55.3
Peacock	53°10.7	-56°39.8
Deneb	49°28.0	45°21.0
Enif	33°42.0	9°58.1
Al Na'ir	27°37.1	-46°51.4
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.4	28°11.6
Markab	13°33.2	15°18.9

Apr 13 Tue	SHA	Mer.pass
Venus	333°49.1	12:19
Mars	276°59.4	16:06
Jupiter	32°01.6	08:25
Saturn	45°09.7	07:33

Apr 14 Wed	SHA	Mer.pass
Venus	332°39.2	12:20
Mars	276°19.6	16:04
Jupiter	31°51.3	08:22
Saturn	45°05.9	07:29

Apr 15 Thu	SHA	Mer.pass
Venus	331°29.2	12:21
Mars	275°39.7	16:03
Jupiter	31°41.1	08:19
Saturn	45°02.2	07:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.0	N09°02.9	169°23.9	15.8′	N09°32.7	12.0′	54.1′
1	194°51.1	03.8	183°58.7	15.8′	09°44.6	11.9′	54.1′
2	209°51.3	04.7	198°33.4	15.8′	09°56.6	11.9′	54.1′
3	224°51.4	·· 05.6	213°08.2	15.7′	10°08.5	11.9′	54.1′
4	239°51.6	06.5	227°42.9	15.7′	10°20.3	11.8′	54.0′
5	254°51.7	07.4	242°17.6	15.7′	10°32.1	11.8′	54.0′
6	269°51.9	N09°08.3	256°52.3	15.6′	N10°43.9	11.7′	54.0′
7	284°52.1	09.2	271°26.9	15.6′	10°55.6	11.7′	54.0′
8	299°52.2	10.1	286°01.5	15.6′	11°07.3	11.6′	54.0′
9	314°52.4	·· 11.0	300°36.1	15.6′	11°19.0	11.6′	54.0′
10	329°52.5	11.9	315°10.7	15.5′	11°30.6	11.5′	54.0′
11	344°52.7	12.8	329°45.2	15.5′	11°42.1	11.5′	54.0′
12	359°52.8	N09°13.7	344°19.7	15.5′	N11°53.6	11.4′	54.0′
13	14°53.0	14.6	358°54.1	15.4′	12°05.0	11.4′	54.0′
14	29°53.1	15.6	13°28.5	15.4′	12°16.4	11.3′	54.0′
15	44°53.3	·· 16.5	28°02.9	15.4′	12°27.8	11.3′	54.0′
16	59°53.5	17.4	42°37.3	15.3′	12°39.1	11.2′	54.0′
17	74°53.6	18.3	57°11.6	15.3′	12°50.3	11.2′	54.0′
18	89°53.8	N09°19.2	71°45.9	15.2′	N13°01.5	11.1′	54.0′
19	104°53.9	20.1	86°20.1	15.2′	13°12.7	11.1′	54.0′
20	119°54.1	21.0	100°54.3	15.2′	13°23.8	11.0′	54.0′
21	134°54.2	·· 21.9	115°28.5	15.1′	13°34.8	11.0′	54.0′
22	149°54.4	22.8	130°02.6	15.1′	13°45.8	10.9′	54.0′
23	164°54.5	23.7	144°36.7	15.1′	13°56.7	10.9′	54.0′
	SD = 15.9′	d = 0.9′	SD = 14.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.7	N09°24.6	159°10.8	15.0′	N14°07.6	10.8′	54.0′
1	194°54.9	25.5	173°44.8	15.0′	14°18.4	10.8′	53.9′
2	209°55.0	26.4	188°18.8	14.9′	14°29.1	10.7′	53.9′
3	224°55.2	·· 27.3	202°52.7	14.9′	14°39.8	10.6′	53.9′
4	239°55.3	28.2	217°26.6	14.8′	14°50.5	10.6′	53.9′
5	254°55.5	29.1	232°00.4	14.8′	15°01.1	10.5′	53.9′
6	269°55.6	N09°30.0	246°34.2	14.8′	N15°11.6	10.5′	53.9′
7	284°55.8	30.9	261°08.0	14.7′	15°22.0	10.4′	53.9′
8	299°55.9	31.8	275°41.7	14.7′	15°32.4	10.3′	53.9′
9	314°56.1	·· 32.7	290°15.4	14.6′	15°42.7	10.3′	53.9′
10	329°56.2	33.6	304°49.0	14.6′	15°53.0	10.2′	53.9′
11	344°56.4	34.5	319°22.6	14.5′	16°03.2	10.1′	53.9′
12	359°56.5	N09°35.4	333°56.1	14.5′	N16°13.3	10.1′	53.9′
13	14°56.7	36.3	348°29.6	14.4′	16°23.4	10.0′	53.9′
14	29°56.8	37.2	3°03.1	14.4′	16°33.4	9.9′	53.9′
15	44°57.0	·· 38.0	17°36.5	14.4′	16°43.3	9.9′	53.9′
16	59°57.1	38.9	32°09.8	14.3′	16°53.2	9.8′	53.9′
17	74°57.3	39.8	46°43.1	14.3′	17°03.0	9.7′	53.9′
18	89°57.5	N09°40.7	61°16.4	14.2′	N17°12.7	9.7′	53.9′
19	104°57.6	41.6	75°49.6	14.2′	17°22.4	9.6′	53.9′
20	119°57.8	42.5	90°22.7	14.1′	17°31.9	9.5′	53.9′
21	134°57.9	·· 43.4	104°55.9	14.1′	17°41.4	9.4′	53.9′
22	149°58.1	44.3	119°28.9	14.0′	17°50.9	9.4′	53.9′
23	164°58.2	45.2	134°01.9	14.0′	18°00.2	9.3′	53.9′
	SD = 15.9′	d = 0.9′	SD = 14.7′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°58.4	N09°46.1	148°34.9	13.9′	N18°09.5	9.2′	53.9′
1	194°58.5	47.0	163°07.8	13.9′	18°18.7	9.1′	53.9′
2	209°58.7	47.9	177°40.6	13.8′	18°27.9	9.1′	53.9′
3	224°58.8	·· 48.8	192°13.4	13.7′	18°36.9	9.0′	53.9′
4	239°59.0	49.7	206°46.2	13.7′	18°45.9	8.9′	53.9′
5	254°59.1	50.6	221°18.9	13.6′	18°54.8	8.8′	53.9′
6	269°59.3	N09°51.5	235°51.5	13.6′	N19°03.7	8.7′	53.9′
7	284°59.4	52.4	250°24.1	13.5′	19°12.4	8.7′	53.9′
8	299°59.6	53.2	264°56.7	13.5′	19°21.1	8.6′	53.9′
9	314°59.7	·· 54.1	279°29.1	13.4′	19°29.6	8.5′	53.9′
10	329°59.9	55.0	294°01.6	13.4′	19°38.2	8.4′	53.9′
11	345°00.0	55.9	308°33.9	13.3′	19°46.6	8.3′	54.0′
12	0°00.2	N09°56.8	323°06.3	13.3′	N19°54.9	8.3′	54.0′
13	15°00.3	57.7	337°38.5	13.2′	20°03.2	8.2′	54.0′
14	30°00.5	58.6	352°10.8	13.2′	20°11.3	8.1′	54.0′
15	45°00.6	09°59.5	6°42.9	13.1′	20°19.4	8.0′	54.0′
16	60°00.8	10°00.4	21°15.0	13.1′	20°27.4	7.9′	54.0′
17	75°00.9	01.3	35°47.1	13.0′	20°35.3	7.8′	54.0′
18	90°01.0	N10°02.2	50°19.1	12.9′	N20°43.1	7.7′	54.0′
19	105°01.2	03.0	64°51.0	12.9′	20°50.9	7.6′	54.0′
20	120°01.3	03.9	79°22.9	12.8′	20°58.5	7.6′	54.0′
21	135°01.5	·· 04.8	93°54.7	12.8′	21°06.1	7.5′	54.0′
22	150°01.6	05.7	108°26.5	12.7′	21°13.5	7.4′	54.0′
23	165°01.8	06.6	122°58.2	12.7′	21°20.9	7.3′	54.0′
	SD = 15.9′	d = 0.9′	SD = 14.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:06	03:44	20:20	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	03:38	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	04:24	05:01	19:00	19:38	20:26
52°	03:45	04:30	05:05	18:56	19:32	20:17
50°	03:53	04:35	05:09	18:53	19:27	20:09
45°	04:10	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	18:04	18:25	18:49
S 10°	05:18	05:42	06:04	17:57	18:18	18:43
20°	05:23	05:48	06:11	17:50	18:12	18:38
30°	05:27	05:54	06:19	17:41	18:06	18:34
35°	05:28	05:58	06:23	17:37	18:02	18:32
40°	05:29	06:01	06:28	17:32	17:59	18:31
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	17:04	17:43	18:29
S 60°	05:30	06:18	07:01	16:59	17:41	18:29

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

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 1-3 1-7%
13	00:36	00:29	12:00	13:05	00:44	
14	00:21	00:14	12:00	13:47	01:26	
15	00:07	00:01	12:00	14:32	02:10	

DUT1 = UT1-UTC = -0.1780 sec ΔT = TT-UT1 = +69.3620 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	204°21.4	174°40.4	N11°10.7	119°21.2	N24°49.8	235°52.4	S13°30.5	249°20.1	S17°36.4
1	219°23.9	189°39.9	11.8	134°22.0	49.9	250°54.5	30.4	264°22.4	36.3
2	234°26.4	204°39.4	13.0	149°22.8	49.9	265°56.5	30.2	279°24.7	36.3
3	249°28.8	219°39.0	·· 14.1	164°23.6	·· 50.0	280°58.5	·· 30.1	294°27.0	·· 36.3
4	264°31.3	234°38.5	15.2	179°24.4	50.0	296°00.6	30.0	309°29.3	36.2
5	279°33.8	249°38.0	16.4	194°25.2	50.1	311°02.6	29.8	324°31.6	36.2
6	294°36.2	264°37.6	N11°17.5	209°26.0	N24°50.1	326°04.7	S13°29.7	339°34.0	S17°36.2
7	309°38.7	279°37.1	18.7	224°26.8	50.1	341°06.7	29.6	354°36.3	36.1
8	324°41.1	294°36.6	19.8	239°27.6	50.2	356°08.8	29.4	9°38.6	36.1
9	339°43.6	309°36.1	·· 20.9	254°28.4	·· 50.2	11°10.8	·· 29.3	24°40.9	·· 36.1
10	354°46.1	324°35.7	22.1	269°29.2	50.3	26°12.9	29.1	39°43.2	36.0
11	9°48.5	339°35.2	23.2	284°30.0	50.3	41°14.9	29.0	54°45.5	36.0
12	24°51.0	354°34.7	N11°24.3	299°30.8	N24°50.4	56°17.0	S13°28.9	69°47.9	S17°36.0
13	39°53.5	9°34.3	25.5	314°31.6	50.4	71°19.0	28.7	84°50.2	35.9
14	54°55.9	24°33.8	26.6	329°32.4	50.5	86°21.1	28.6	99°52.5	35.9
15	69°58.4	39°33.3	·· 27.8	344°33.2	·· 50.5	101°23.1	·· 28.5	114°54.8	·· 35.8
16	85°00.9	54°32.8	28.9	359°34.0	50.6	116°25.2	28.3	129°57.1	35.8
17	100°03.3	69°32.4	30.0	14°34.8	50.6	131°27.2	28.2	144°59.4	35.8
18	115°05.8	84°31.9	N11°31.2	29°35.6	N24°50.6	146°29.3	S13°28.0	160°01.8	S17°35.7
19	130°08.3	99°31.4	32.3	44°36.4	50.7	161°31.3	27.9	175°04.1	35.7
20	145°10.7	114°31.0	33.4	59°37.2	50.7	176°33.4	27.8	190°06.4	35.7
21	160°13.2	129°30.5	·· 34.6	74°38.0	·· 50.8	191°35.4	·· 27.6	205°08.7	·· 35.6
22	175°15.6	144°30.0	35.7	89°38.8	50.8	206°37.5	27.5	220°11.0	35.6
23	190°18.1	159°29.5	36.8	104°39.6	50.9	221°39.5	27.4	235°13.4	35.6
Mer.pass.	10:21	ν -0.5′	d 1.1′	m -3.91	ν 0.8′	d 0.0′	m 1.45	ν 2.0′	d -0.1′ m -2.12	ν 2.3′	d -0.0′ m 0.70

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	205°20.6	174°29.1	N11°38.0	119°40.4	N24°50.9	236°41.6	S13°27.2	250°15.7	S17°35.5
1	220°23.0	189°28.6	39.1	134°41.2	50.9	251°43.6	27.1	265°18.0	35.5
2	235°25.5	204°28.1	40.2	149°42.0	51.0	266°45.7	26.9	280°20.3	35.5
3	250°28.0	219°27.6	·· 41.3	164°42.8	·· 51.0	281°47.7	·· 26.8	295°22.6	·· 35.4
4	265°30.4	234°27.2	42.5	179°43.6	51.1	296°49.8	26.7	310°25.0	35.4
5	280°32.9	249°26.7	43.6	194°44.4	51.1	311°51.8	26.5	325°27.3	35.4
6	295°35.4	264°26.2	N11°44.7	209°45.2	N24°51.2	326°53.9	S13°26.4	340°29.6	S17°35.3
7	310°37.8	279°25.7	45.9	224°46.0	51.2	341°55.9	26.3	355°31.9	35.3
8	325°40.3	294°25.2	47.0	239°46.8	51.2	356°58.0	26.1	10°34.2	35.3
9	340°42.8	309°24.8	·· 48.1	254°47.6	·· 51.3	12°00.0	·· 26.0	25°36.6	·· 35.2
10	355°45.2	324°24.3	49.2	269°48.4	51.3	27°02.1	25.9	40°38.9	35.2
11	10°47.7	339°23.8	50.4	284°49.2	51.4	42°04.1	25.7	55°41.2	35.1
12	25°50.1	354°23.3	N11°51.5	299°50.0	N24°51.4	57°06.2	S13°25.6	70°43.5	S17°35.1
13	40°52.6	9°22.8	52.6	314°50.8	51.4	72°08.2	25.4	85°45.8	35.1
14	55°55.1	24°22.4	53.7	329°51.6	51.5	87°10.3	25.3	100°48.2	35.0
15	70°57.5	39°21.9	·· 54.9	344°52.4	·· 51.5	102°12.3	·· 25.2	115°50.5	·· 35.0
16	86°00.0	54°21.4	56.0	359°53.2	51.5	117°14.4	25.0	130°52.8	35.0
17	101°02.5	69°20.9	57.1	14°54.0	51.6	132°16.4	24.9	145°55.1	34.9
18	116°04.9	84°20.4	N11°58.2	29°54.8	N24°51.6	147°18.5	S13°24.8	160°57.5	S17°34.9
19	131°07.4	99°20.0	11°59.4	44°55.6	51.7	162°20.5	24.6	175°59.8	34.9
20	146°09.9	114°19.5	12°00.5	59°56.4	51.7	177°22.6	24.5	191°02.1	34.8
21	161°12.3	129°19.0	·· 01.6	74°57.2	·· 51.7	192°24.7	·· 24.4	206°04.4	·· 34.8
22	176°14.8	144°18.5	02.7	89°58.0	51.8	207°26.7	24.2	221°06.7	34.8
23	191°17.3	159°18.0	03.8	104°58.8	51.8	222°28.8	24.1	236°09.1	34.7
Mer.pass.	10:17	ν -0.5′	d 1.1′	m -3.91	ν 0.8′	d 0.0′	m 1.46	ν 2.1′	d -0.1′ m -2.13	ν 2.3′	d -0.0′ m 0.70

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	206°19.7	174°17.5	N12°05.0	119°59.6	N24°51.8	237°30.8	S13°24.0	251°11.4	S17°34.7
1	221°22.2	189°17.1	06.1	135°00.4	51.9	252°32.9	23.8	266°13.7	34.7
2	236°24.6	204°16.6	07.2	150°01.2	51.9	267°34.9	23.7	281°16.0	34.6
3	251°27.1	219°16.1	·· 08.3	165°02.0	·· 51.9	282°37.0	·· 23.5	296°18.4	·· 34.6
4	266°29.6	234°15.6	09.4	180°02.8	52.0	297°39.0	23.4	311°20.7	34.6
5	281°32.0	249°15.1	10.5	195°03.6	52.0	312°41.1	23.3	326°23.0	34.5
6	296°34.5	264°14.6	N12°11.7	210°04.4	N24°52.0	327°43.2	S13°23.1	341°25.3	S17°34.5
7	311°37.0	279°14.2	12.8	225°05.2	52.1	342°45.2	23.0	356°27.7	34.5
8	326°39.4	294°13.7	13.9	240°06.0	52.1	357°47.3	22.9	11°30.0	34.4
9	341°41.9	309°13.2	·· 15.0	255°06.8	·· 52.1	12°49.3	·· 22.7	26°32.3	·· 34.4
10	356°44.4	324°12.7	16.1	270°07.6	52.2	27°51.4	22.6	41°34.6	34.4
11	11°46.8	339°12.2	17.2	285°08.4	52.2	42°53.4	22.5	56°37.0	34.3
12	26°49.3	354°11.7	N12°18.3	300°09.2	N24°52.2	57°55.5	S13°22.3	71°39.3	S17°34.3
13	41°51.7	9°11.2	19.5	315°10.0	52.3	72°57.6	22.2	86°41.6	34.3
14	56°54.2	24°10.7	20.6	330°10.8	52.3	87°59.6	22.1	101°43.9	34.2
15	71°56.7	39°10.2	·· 21.7	345°11.6	·· 52.3	103°01.7	·· 21.9	116°46.3	·· 34.2
16	86°59.1	54°09.8	22.8	0°12.4	52.4	118°03.7	21.8	131°48.6	34.2
17	102°01.6	69°09.3	23.9	15°13.2	52.4	133°05.8	21.7	146°50.9	34.1
18	117°04.1	84°08.8	N12°25.0	30°14.0	N24°52.4	148°07.8	S13°21.5	161°53.2	S17°34.1
19	132°06.5	99°08.3	26.1	45°14.8	52.5	163°09.9	21.4	176°55.6	34.1
20	147°09.0	114°07.8	27.2	60°15.6	52.5	178°12.0	21.3	191°57.9	34.0
21	162°11.5	129°07.3	·· 28.3	75°16.4	·· 52.5	193°14.0	·· 21.1	207°00.2	·· 34.0
22	177°13.9	144°06.8	29.5	90°17.2	52.5	208°16.1	21.0	222°02.5	34.0
23	192°16.4	159°06.3	30.6	105°18.0	52.6	223°18.1	20.9	237°04.9	33.9
Mer.pass.	10:13	ν -0.5′	d 1.1′	m -3.90	ν 0.8′	d 0.0′	m 1.47	ν 2.1′	d -0.1′ m -2.13	ν 2.3′	d -0.0′ m 0.69

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.2
Ankaa	353°10.6	-42°11.5
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.9
Hamal	327°55.0	23°33.6
Polaris	315°53.2	89°21.2
Acamar	315°14.5	-40°13.4
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.8
Capella	280°26.7	46°01.2
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°53.9	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°15.8	-59°34.9
Suhail	222°48.4	-43°31.3
Miaplacidus	221°38.5	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°13.1
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.3
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.3
Kochab	137°18.8	74°04.0
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°15.9	-69°03.7
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.0
Rasalhague	96°01.2	12°32.6
Eltanin	90°43.4	51°28.9
Kaus Aust.	83°36.4	-34°22.3
Vega	80°35.1	38°47.9
Nunki	75°51.5	-26°16.2
Altair	62°02.9	8°55.3
Peacock	53°10.7	-56°39.8
Deneb	49°27.9	45°21.0
Enif	33°41.9	9°58.1
Al Na'ir	27°37.1	-46°51.4
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.4	28°11.6
Markab	13°33.2	15°18.9

Apr 16 Fri	SHA	Mer.pass
Venus	330°18.9	12:22
Mars	274°59.8	16:02
Jupiter	31°31.0	08:15
Saturn	44°58.6	07:22

Apr 17 Sat	SHA	Mer.pass
Venus	329°08.5	12:22
Mars	274°19.9	16:00
Jupiter	31°21.0	08:12
Saturn	44°55.1	07:18

Apr 18 Sun	SHA	Mer.pass
Venus	327°57.8	12:23
Mars	273°39.9	15:59
Jupiter	31°11.1	08:09
Saturn	44°51.7	07:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		180°01.9	N10°07.5	137°29.9	12.6′	N21°28.2	7.2′	54.0′
1		195°02.1	08.4	152°01.5	12.6′	21°35.4	7.1′	54.0′
2		210°02.2	09.3	166°33.1	12.5′	21°42.5	7.0′	54.0′
3		225°02.4	·· 10.1	181°04.6	12.4′	21°49.5	6.9′	54.0′
4		240°02.5	11.0	195°36.0	12.4′	21°56.4	6.8′	54.0′
5		255°02.7	11.9	210°07.4	12.3′	22°03.2	6.7′	54.0′
6		270°02.8	N10°12.8	224°38.7	12.3′	N22°09.9	6.6′	54.1′
7		285°03.0	13.7	239°10.0	12.2′	22°16.5	6.5′	54.1′
8		300°03.1	14.6	253°41.2	12.2′	22°23.0	6.4′	54.1′
9		315°03.3	·· 15.5	268°12.4	12.1′	22°29.4	6.3′	54.1′
10		330°03.4	16.3	282°43.5	12.1′	22°35.7	6.2′	54.1′
11		345°03.5	17.2	297°14.6	12.0′	22°42.0	6.1′	54.1′
12		0°03.7	N10°18.1	311°45.6	12.0′	N22°48.1	6.0′	54.1′
13		15°03.8	19.0	326°16.5	11.9′	22°54.1	5.9′	54.1′
14		30°04.0	19.9	340°47.4	11.8′	23°00.0	5.8′	54.1′
15		45°04.1	·· 20.8	355°18.3	11.8′	23°05.8	5.7′	54.1′
16		60°04.3	21.6	9°49.1	11.7′	23°11.5	5.6′	54.1′
17		75°04.4	22.5	24°19.8	11.7′	23°17.1	5.5′	54.2′
18		90°04.6	N10°23.4	38°50.5	11.6′	N23°22.6	5.4′	54.2′
19		105°04.7	24.3	53°21.1	11.6′	23°28.0	5.3′	54.2′
20		120°04.8	25.2	67°51.7	11.5′	23°33.3	5.2′	54.2′
21		135°05.0	·· 26.0	82°22.2	11.5′	23°38.5	5.1′	54.2′
22		150°05.1	26.9	96°52.7	11.4′	23°43.6	5.0′	54.2′
23		165°05.3	27.8	111°23.1	11.4′	23°48.5	4.9′	54.2′
		SD = 15.9′	d = 0.9′	SD = 14.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°05.4	N10°28.7	125°53.5	11.3′	N23°53.4	4.7′	54.2′
1	195°05.6	29.6	140°23.8	11.3′	23°58.1	4.6′	54.2′
2	210°05.7	30.4	154°54.1	11.2′	24°02.8	4.5′	54.3′
3	225°05.8	·· 31.3	169°24.3	11.2′	24°07.3	4.4′	54.3′
4	240°06.0	32.2	183°54.5	11.1′	24°11.7	4.3′	54.3′
5	255°06.1	33.1	198°24.6	11.1′	24°16.0	4.2′	54.3′
6	270°06.3	N10°34.0	212°54.7	11.0′	N24°20.2	4.1′	54.3′
7	285°06.4	34.8	227°24.7	11.0′	24°24.3	4.0′	54.3′
8	300°06.6	35.7	241°54.6	10.9′	24°28.3	3.9′	54.3′
9	315°06.7	·· 36.6	256°24.6	10.9′	24°32.1	3.7′	54.3′
10	330°06.8	37.5	270°54.5	10.8′	24°35.9	3.6′	54.4′
11	345°07.0	38.3	285°24.3	10.8′	24°39.5	3.5′	54.4′
12	0°07.1	N10°39.2	299°54.1	10.7′	N24°43.0	3.4′	54.4′
13	15°07.3	40.1	314°23.8	10.7′	24°46.4	3.3′	54.4′
14	30°07.4	41.0	328°53.5	10.7′	24°49.6	3.2′	54.4′
15	45°07.6	·· 41.8	343°23.2	10.6′	24°52.8	3.0′	54.4′
16	60°07.7	42.7	357°52.8	10.6′	24°55.8	2.9′	54.4′
17	75°07.8	43.6	12°22.3	10.5′	24°58.8	2.8′	54.5′
18	90°08.0	N10°44.5	26°51.9	10.5′	N25°01.6	2.7′	54.5′
19	105°08.1	45.3	41°21.3	10.4′	25°04.2	2.6′	54.5′
20	120°08.3	46.2	55°50.8	10.4′	25°06.8	2.4′	54.5′
21	135°08.4	·· 47.1	70°20.2	10.4′	25°09.2	2.3′	54.5′
22	150°08.5	48.0	84°49.5	10.3′	25°11.6	2.2′	54.5′
23	165°08.7	48.8	99°18.9	10.3′	25°13.8	2.1′	54.6′
	SD = 15.9′	d = 0.9′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.8	N10°49.7	113°48.1	10.2′	N25°15.8	2.0′	54.6′
1	195°09.0	50.6	128°17.4	10.2′	25°17.8	1.8′	54.6′
2	210°09.1	51.5	142°46.6	10.2′	25°19.6	1.7′	54.6′
3	225°09.2	·· 52.3	157°15.8	10.1′	25°21.3	1.6′	54.6′
4	240°09.4	53.2	171°44.9	10.1′	25°22.9	1.5′	54.7′
5	255°09.5	54.1	186°14.0	10.1′	25°24.4	1.3′	54.7′
6	270°09.6	N10°54.9	200°43.0	10.0′	N25°25.7	1.2′	54.7′
7	285°09.8	55.8	215°12.1	10.0′	25°26.9	1.1′	54.7′
8	300°09.9	56.7	229°41.1	10.0′	25°28.0	1.0′	54.7′
9	315°10.1	·· 57.6	244°10.0	9.9′	25°28.9	0.8′	54.8′
10	330°10.2	58.4	258°39.0	9.9′	25°29.8	0.7′	54.8′
11	345°10.3	10°59.3	273°07.9	9.9′	25°30.5	0.6′	54.8′
12	0°10.5	N11°00.2	287°36.8	9.8′	N25°31.1	0.5′	54.8′
13	15°10.6	01.0	302°05.6	9.8′	25°31.5	0.3′	54.8′
14	30°10.8	01.9	316°34.4	9.8′	25°31.8	0.2′	54.9′
15	45°10.9	·· 02.8	331°03.2	9.8′	25°32.0	0.1′	54.9′
16	60°11.0	03.6	345°32.0	9.7′	25°32.1	-0.1′	54.9′
17	75°11.2	04.5	0°00.7	9.7′	25°32.0	-0.2′	54.9′
18	90°11.3	N11°05.4	14°29.4	9.7′	N25°31.8	-0.3′	54.9′
19	105°11.4	06.2	28°58.1	9.7′	25°31.5	-0.4′	55.0′
20	120°11.6	07.1	43°26.8	9.6′	25°31.1	-0.6′	55.0′
21	135°11.7	·· 08.0	57°55.4	9.6′	25°30.5	-0.7′	55.0′
22	150°11.8	08.8	72°24.1	9.6′	25°29.8	-0.8′	55.0′
23	165°12.0	09.7	86°52.7	9.6′	25°29.0	-1.0′	55.1′
	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	22:34	–:–
N 70°	–:–	02:19	03:45	20:17	21:46	–:–
68°	–:–	02:48	04:00	20:02	21:16	–:–
66°	01:22	03:09	04:12	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	04:44	19:17	20:01	20:58
56°	03:16	04:09	04:49	19:11	19:52	20:45
54°	03:28	04:16	04:54	19:06	19:45	20:33
52°	03:37	04:23	04:59	19:01	19:38	20:23
50°	03:46	04:28	05:03	18:57	19:32	20:15
45°	04:04	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	18:03	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	17:46	18:23
52°	05:36	06:15	06:49	17:09	17:43	18:23
54°	05:36	06:17	06:53	17:05	17:41	18:22
56°	05:36	06:19	06:58	17:01	17:39	18:22
58°	05:36	06:22	07:02	16:56	17:36	18:21
S 60°	05:37	06:25	07:08	16:50	17:33	18:21

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

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 13-28%
16	00:08	00:15	12:00	15:19	02:56	
17	00:22	00:29	12:00	16:09	03:44	
18	00:35	00:42	11:59	17:00	04:34	

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	207°18.9	174°05.8	N12°31.7	120°18.8	N24°52.6	238°20.2	S13°20.7	252°07.2	S17°33.9
1	222°21.3	189°05.3	32.8	135°19.6	52.6	253°22.3	20.6	267°09.5	33.9
2	237°23.8	204°04.8	33.9	150°20.4	52.7	268°24.3	20.5	282°11.8	33.8
3	252°26.2	219°04.3	·· 35.0	165°21.2	·· 52.7	283°26.4	·· 20.3	297°14.2	·· 33.8
4	267°28.7	234°03.9	36.1	180°22.0	52.7	298°28.4	20.2	312°16.5	33.8
5	282°31.2	249°03.4	37.2	195°22.8	52.7	313°30.5	20.1	327°18.8	33.7
6	297°33.6	264°02.9	N12°38.3	210°23.6	N24°52.8	328°32.6	S13°19.9	342°21.1	S17°33.7
7	312°36.1	279°02.4	39.4	225°24.4	52.8	343°34.6	19.8	357°23.5	33.7
8	327°38.6	294°01.9	40.5	240°25.2	52.8	358°36.7	19.6	12°25.8	33.6
9	342°41.0	309°01.4	·· 41.6	255°25.9	·· 52.8	13°38.7	·· 19.5	27°28.1	·· 33.6
10	357°43.5	324°00.9	42.7	270°26.7	52.9	28°40.8	19.4	42°30.5	33.6
11	12°46.0	339°00.4	43.8	285°27.5	52.9	43°42.9	19.2	57°32.8	33.5
12	27°48.4	353°59.9	N12°44.9	300°28.3	N24°52.9	58°44.9	S13°19.1	72°35.1	S17°33.5
13	42°50.9	8°59.4	46.0	315°29.1	52.9	73°47.0	19.0	87°37.4	33.5
14	57°53.4	23°58.9	47.1	330°29.9	53.0	88°49.0	18.8	102°39.8	33.4
15	72°55.8	38°58.4	·· 48.2	345°30.7	·· 53.0	103°51.1	·· 18.7	117°42.1	·· 33.4
16	87°58.3	53°57.9	49.3	0°31.5	53.0	118°53.2	18.6	132°44.4	33.4
17	103°00.7	68°57.4	50.4	15°32.3	53.0	133°55.2	18.4	147°46.8	33.3
18	118°03.2	83°56.9	N12°51.5	30°33.1	N24°53.1	148°57.3	S13°18.3	162°49.1	S17°33.3
19	133°05.7	98°56.4	52.6	45°33.9	53.1	163°59.4	18.2	177°51.4	33.3
20	148°08.1	113°55.9	53.7	60°34.7	53.1	179°01.4	18.1	192°53.7	33.2
21	163°10.6	128°55.4	·· 54.8	75°35.5	·· 53.1	194°03.5	·· 17.9	207°56.1	·· 33.2
22	178°13.1	143°54.9	55.9	90°36.3	53.1	209°05.6	17.8	222°58.4	33.2
23	193°15.5	158°54.4	57.0	105°37.1	53.2	224°07.6	17.7	238°00.7	33.2
Mer.pass.	10:09	ν -0.5′	d 1.1′	m -3.90	ν 0.8′	d 0.0′	m 1.48	ν 2.1′	d -0.1′ m -2.14	ν 2.3′	d -0.0′ m 0.69

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	208°18.0	173°53.9	N12°58.1	120°37.9	N24°53.2	239°09.7	S13°17.5	253°03.1	S17°33.1
1	223°20.5	188°53.4	12°59.2	135°38.7	53.2	254°11.7	17.4	268°05.4	33.1
2	238°22.9	203°52.9	13°00.3	150°39.5	53.2	269°13.8	17.3	283°07.7	33.1
3	253°25.4	218°52.4	·· 01.4	165°40.3	·· 53.2	284°15.9	·· 17.1	298°10.1	·· 33.0
4	268°27.9	233°51.9	02.4	180°41.1	53.3	299°17.9	17.0	313°12.4	33.0
5	283°30.3	248°51.4	03.5	195°41.9	53.3	314°20.0	16.9	328°14.7	33.0
6	298°32.8	263°50.9	N13°04.6	210°42.7	N24°53.3	329°22.1	S13°16.7	343°17.0	S17°32.9
7	313°35.2	278°50.4	05.7	225°43.5	53.3	344°24.1	16.6	358°19.4	32.9
8	328°37.7	293°49.9	06.8	240°44.3	53.3	359°26.2	16.5	13°21.7	32.9
9	343°40.2	308°49.4	·· 07.9	255°45.1	·· 53.4	14°28.3	·· 16.3	28°24.0	·· 32.8
10	358°42.6	323°48.9	09.0	270°45.9	53.4	29°30.3	16.2	43°26.4	32.8
11	13°45.1	338°48.3	10.1	285°46.7	53.4	44°32.4	16.1	58°28.7	32.8
12	28°47.6	353°47.8	N13°11.2	300°47.5	N24°53.4	59°34.5	S13°15.9	73°31.0	S17°32.7
13	43°50.0	8°47.3	12.2	315°48.2	53.4	74°36.5	15.8	88°33.4	32.7
14	58°52.5	23°46.8	13.3	330°49.0	53.4	89°38.6	15.7	103°35.7	32.7
15	73°55.0	38°46.3	·· 14.4	345°49.8	·· 53.5	104°40.7	·· 15.5	118°38.0	·· 32.6
16	88°57.4	53°45.8	15.5	0°50.6	53.5	119°42.7	15.4	133°40.4	32.6
17	103°59.9	68°45.3	16.6	15°51.4	53.5	134°44.8	15.3	148°42.7	32.6
18	119°02.3	83°44.8	N13°17.7	30°52.2	N24°53.5	149°46.9	S13°15.1	163°45.0	S17°32.5
19	134°04.8	98°44.3	18.8	45°53.0	53.5	164°48.9	15.0	178°47.4	32.5
20	149°07.3	113°43.8	19.8	60°53.8	53.5	179°51.0	14.9	193°49.7	32.5
21	164°09.7	128°43.3	·· 20.9	75°54.6	·· 53.6	194°53.1	·· 14.7	208°52.0	·· 32.5
22	179°12.2	143°42.8	22.0	90°55.4	53.6	209°55.1	14.6	223°54.4	32.4
23	194°14.7	158°42.2	23.1	105°56.2	53.6	224°57.2	14.5	238°56.7	32.4
Mer.pass.	10:05	ν -0.5′	d 1.1′	m -3.90	ν 0.8′	d 0.0′	m 1.49	ν 2.1′	d -0.1′ m -2.14	ν 2.3′	d -0.0′ m 0.69

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	209°17.1	173°41.7	N13°24.2	120°57.0	N24°53.6	239°59.3	S13°14.4	253°59.0	S17°32.4
1	224°19.6	188°41.2	25.2	135°57.8	53.6	255°01.3	14.2	269°01.4	32.3
2	239°22.1	203°40.7	26.3	150°58.6	53.6	270°03.4	14.1	284°03.7	32.3
3	254°24.5	218°40.2	·· 27.4	165°59.4	·· 53.6	285°05.5	·· 14.0	299°06.0	·· 32.3
4	269°27.0	233°39.7	28.5	181°00.2	53.7	300°07.6	13.8	314°08.4	32.2
5	284°29.5	248°39.2	29.6	196°01.0	53.7	315°09.6	13.7	329°10.7	32.2
6	299°31.9	263°38.7	N13°30.6	211°01.8	N24°53.7	330°11.7	S13°13.6	344°13.0	S17°32.2
7	314°34.4	278°38.1	31.7	226°02.6	53.7	345°13.8	13.4	359°15.4	32.1
8	329°36.8	293°37.6	32.8	241°03.4	53.7	0°15.8	13.3	14°17.7	32.1
9	344°39.3	308°37.1	·· 33.9	256°04.2	·· 53.7	15°17.9	·· 13.2	29°20.0	·· 32.1
10	359°41.8	323°36.6	34.9	271°05.0	53.7	30°20.0	13.0	44°22.4	32.1
11	14°44.2	338°36.1	36.0	286°05.7	53.7	45°22.1	12.9	59°24.7	32.0
12	29°46.7	353°35.6	N13°37.1	301°06.5	N24°53.7	60°24.1	S13°12.8	74°27.1	S17°32.0
13	44°49.2	8°35.0	38.2	316°07.3	53.8	75°26.2	12.7	89°29.4	32.0
14	59°51.6	23°34.5	39.2	331°08.1	53.8	90°28.3	12.5	104°31.7	31.9
15	74°54.1	38°34.0	·· 40.3	346°08.9	·· 53.8	105°30.3	·· 12.4	119°34.1	·· 31.9
16	89°56.6	53°33.5	41.4	1°09.7	53.8	120°32.4	12.3	134°36.4	31.9
17	104°59.0	68°33.0	42.5	16°10.5	53.8	135°34.5	12.1	149°38.7	31.8
18	120°01.5	83°32.5	N13°43.5	31°11.3	N24°53.8	150°36.6	S13°12.0	164°41.1	S17°31.8
19	135°04.0	98°31.9	44.6	46°12.1	53.8	165°38.6	11.9	179°43.4	31.8
20	150°06.4	113°31.4	45.7	61°12.9	53.8	180°40.7	11.7	194°45.7	31.8
21	165°08.9	128°30.9	·· 46.7	76°13.7	·· 53.8	195°42.8	·· 11.6	209°48.1	·· 31.7
22	180°11.3	143°30.4	47.8	91°14.5	53.8	210°44.8	11.5	224°50.4	31.7
23	195°13.8	158°29.9	48.9	106°15.3	53.8	225°46.9	11.4	239°52.8	31.7
Mer.pass.	10:01	ν -0.5′	d 1.1′	m -3.90	ν 0.8′	d 0.0′	m 1.49	ν 2.1′	d -0.1′ m -2.15	ν 2.3′	d -0.0′ m 0.69

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.2
Ankaa	353°10.6	-42°11.5
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.9
Hamal	327°55.0	23°33.6
Polaris	315°53.4	89°21.2
Acamar	315°14.5	-40°13.4
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.8
Capella	280°26.7	46°01.2
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.0	-52°42.7
Sirius	258°29.0	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°15.9	-59°34.9
Suhail	222°48.4	-43°31.3
Miaplacidus	221°38.5	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.6
Acrux	173°02.8	-63°13.1
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.5
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.3
Kochab	137°18.8	74°04.1
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°15.8	-69°03.7
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.0
Rasalhague	96°01.2	12°32.6
Eltanin	90°43.3	51°28.9
Kaus Aust.	83°36.4	-34°22.3
Vega	80°35.1	38°47.9
Nunki	75°51.4	-26°16.1
Altair	62°02.9	8°55.3
Peacock	53°10.6	-56°39.8
Deneb	49°27.9	45°21.0
Enif	33°41.9	9°58.1
Al Na'ir	27°37.0	-46°51.4
Fomalhaut	15°18.2	-29°30.6
Scheat	13°48.4	28°11.6
Markab	13°33.2	15°18.9

Apr 19 Mon	SHA	Mer.pass
Venus	326°47.0	12:24
Mars	272°59.9	15:58
Jupiter	31°01.3	08:06
Saturn	44°48.3	07:10

Apr 20 Tue	SHA	Mer.pass
Venus	325°35.9	12:25
Mars	272°19.9	15:57
Jupiter	30°51.7	08:02
Saturn	44°45.1	07:07

Apr 21 Wed	SHA	Mer.pass
Venus	324°24.6	12:26
Mars	271°39.9	15:55
Jupiter	30°42.1	07:59
Saturn	44°41.9	07:03

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°12.1	N11°10.6	101°21.2	9.6′	N25°28.0	-1.1′	55.1′
1	195°12.2	11.4	115°49.8	9.5′	25°26.9	-1.2′	55.1′
2	210°12.4	12.3	130°18.4	9.5′	25°25.7	-1.4′	55.1′
3	225°12.5	·· 13.2	144°46.9	9.5′	25°24.3	-1.5′	55.2′
4	240°12.7	14.0	159°15.4	9.5′	25°22.8	-1.6′	55.2′
5	255°12.8	14.9	173°43.9	9.5′	25°21.2	-1.8′	55.2′
6	270°12.9	N11°15.7	188°12.4	9.5′	N25°19.4	-1.9′	55.2′
7	285°13.1	16.6	202°40.9	9.5′	25°17.6	-2.0′	55.3′
8	300°13.2	17.5	217°09.3	9.4′	25°15.5	-2.1′	55.3′
9	315°13.3	·· 18.3	231°37.8	9.4′	25°13.4	-2.3′	55.3′
10	330°13.5	19.2	246°06.2	9.4′	25°11.1	-2.4′	55.3′
11	345°13.6	20.1	260°34.6	9.4′	25°08.7	-2.5′	55.4′
12	0°13.7	N11°20.9	275°03.0	9.4′	N25°06.2	-2.7′	55.4′
13	15°13.9	21.8	289°31.5	9.4′	25°03.5	-2.8′	55.4′
14	30°14.0	22.6	303°59.9	9.4′	25°00.7	-2.9′	55.5′
15	45°14.1	·· 23.5	318°28.2	9.4′	24°57.7	-3.1′	55.5′
16	60°14.3	24.4	332°56.6	9.4′	24°54.7	-3.2′	55.5′
17	75°14.4	25.2	347°25.0	9.4′	24°51.5	-3.3′	55.5′
18	90°14.5	N11°26.1	1°53.4	9.4′	N24°48.1	-3.5′	55.6′
19	105°14.7	26.9	16°21.8	9.4′	24°44.6	-3.6′	55.6′
20	120°14.8	27.8	30°50.1	9.4′	24°41.0	-3.7′	55.6′
21	135°14.9	·· 28.7	45°18.5	9.4′	24°37.3	-3.9′	55.7′
22	150°15.1	29.5	59°46.9	9.4′	24°33.4	-4.0′	55.7′
23	165°15.2	30.4	74°15.2	9.4′	24°29.4	-4.1′	55.7′
	SD = 15.9′	d = 0.9′	SD = 15.0′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.3	N11°31.2	88°43.6	9.4′	N24°25.3	-4.3′	55.7′
1	195°15.4	32.1	103°12.0	9.4′	24°21.1	-4.4′	55.8′
2	210°15.6	32.9	117°40.4	9.4′	24°16.7	-4.5′	55.8′
3	225°15.7	·· 33.8	132°08.7	9.4′	24°12.1	-4.7′	55.8′
4	240°15.8	34.7	146°37.1	9.4′	24°07.5	-4.8′	55.9′
5	255°16.0	35.5	161°05.5	9.4′	24°02.7	-4.9′	55.9′
6	270°16.1	N11°36.4	175°33.9	9.4′	N23°57.8	-5.0′	55.9′
7	285°16.2	37.2	190°02.3	9.4′	23°52.7	-5.2′	56.0′
8	300°16.4	38.1	204°30.7	9.4′	23°47.6	-5.3′	56.0′
9	315°16.5	·· 38.9	218°59.1	9.4′	23°42.2	-5.4′	56.0′
10	330°16.6	39.8	233°27.5	9.4′	23°36.8	-5.6′	56.1′
11	345°16.7	40.6	247°55.9	9.4′	23°31.2	-5.7′	56.1′
12	0°16.9	N11°41.5	262°24.3	9.4′	N23°25.5	-5.8′	56.1′
13	15°17.0	42.3	276°52.7	9.4′	23°19.7	-6.0′	56.2′
14	30°17.1	43.2	291°21.2	9.5′	23°13.7	-6.1′	56.2′
15	45°17.3	·· 44.0	305°49.6	9.5′	23°07.7	-6.2′	56.2′
16	60°17.4	44.9	320°18.1	9.5′	23°01.4	-6.3′	56.3′
17	75°17.5	45.7	334°46.6	9.5′	22°55.1	-6.5′	56.3′
18	90°17.6	N11°46.6	349°15.1	9.5′	N22°48.6	-6.6′	56.3′
19	105°17.8	47.5	3°43.6	9.5′	22°42.0	-6.7′	56.4′
20	120°17.9	48.3	18°12.1	9.5′	22°35.3	-6.9′	56.4′
21	135°18.0	·· 49.2	32°40.6	9.5′	22°28.4	-7.0′	56.4′
22	150°18.2	50.0	47°09.2	9.6′	22°21.4	-7.1′	56.5′
23	165°18.3	50.9	61°37.7	9.6′	22°14.3	-7.2′	56.5′
	SD = 15.9′	d = 0.9′	SD = 15.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.4	N11°51.7	76°06.3	9.6′	N22°07.1	-7.4′	56.5′
1	195°18.5	52.5	90°34.9	9.6′	21°59.7	-7.5′	56.6′
2	210°18.7	53.4	105°03.5	9.6′	21°52.2	-7.6′	56.6′
3	225°18.8	·· 54.2	119°32.1	9.6′	21°44.6	-7.7′	56.6′
4	240°18.9	55.1	134°00.7	9.7′	21°36.9	-7.9′	56.7′
5	255°19.0	55.9	148°29.4	9.7′	21°29.0	-8.0′	56.7′
6	270°19.2	N11°56.8	162°58.0	9.7′	N21°21.0	-8.1′	56.8′
7	285°19.3	57.6	177°26.7	9.7′	21°12.9	-8.2′	56.8′
8	300°19.4	58.5	191°55.4	9.7′	21°04.7	-8.4′	56.8′
9	315°19.5	11°59.3	206°24.2	9.7′	20°56.3	-8.5′	56.9′
10	330°19.7	12°00.2	220°52.9	9.8′	20°47.8	-8.6′	56.9′
11	345°19.8	01.0	235°21.6	9.8′	20°39.2	-8.7′	56.9′
12	0°19.9	N12°01.9	249°50.4	9.8′	N20°30.5	-8.8′	57.0′
13	15°20.0	02.7	264°19.2	9.8′	20°21.7	-9.0′	57.0′
14	30°20.2	03.6	278°48.0	9.8′	20°12.7	-9.1′	57.1′
15	45°20.3	·· 04.4	293°16.9	9.8′	20°03.6	-9.2′	57.1′
16	60°20.4	05.2	307°45.7	9.9′	19°54.4	-9.3′	57.1′
17	75°20.5	06.1	322°14.6	9.9′	19°45.1	-9.4′	57.2′
18	90°20.7	N12°06.9	336°43.5	9.9′	N19°35.7	-9.6′	57.2′
19	105°20.8	07.8	351°12.4	9.9′	19°26.1	-9.7′	57.2′
20	120°20.9	08.6	5°41.3	9.9′	19°16.5	-9.8′	57.3′
21	135°21.0	·· 09.5	20°10.2	10.0′	19°06.7	-9.9′	57.3′
22	150°21.2	10.3	34°39.2	10.0′	18°56.8	-10.0′	57.4′
23	165°21.3	11.1	49°08.2	10.0′	18°46.8	-10.1′	57.4′
	SD = 15.9′	d = 0.8′	SD = 15.4′				

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

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

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 37-57%
19	00:48	00:55	11:59	17:52	05:26	
20	01:01	01:08	11:59	18:45	06:18	
21	01:14	01:20	11:59	19:36	07:11	

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	210°16.3	173°29.3	N13°49.9	121°16.1	N24°53.8	240°49.0	S13°11.2	254°55.1	S17°31.6
1	225°18.7	188°28.8	51.0	136°16.9	53.8	255°51.1	11.1	269°57.4	31.6
2	240°21.2	203°28.3	52.1	151°17.7	53.9	270°53.1	11.0	284°59.8	31.6
3	255°23.7	218°27.8	·· 53.1	166°18.5	·· 53.9	285°55.2	·· 10.8	300°02.1	·· 31.5
4	270°26.1	233°27.2	54.2	181°19.3	53.9	300°57.3	10.7	315°04.4	31.5
5	285°28.6	248°26.7	55.3	196°20.1	53.9	315°59.4	10.6	330°06.8	31.5
6	300°31.1	263°26.2	N13°56.3	211°20.8	N24°53.9	331°01.4	S13°10.5	345°09.1	S17°31.5
7	315°33.5	278°25.7	57.4	226°21.6	53.9	346°03.5	10.3	0°11.5	31.4
8	330°36.0	293°25.1	58.4	241°22.4	53.9	1°05.6	10.2	15°13.8	31.4
9	345°38.4	308°24.6	13°59.5	256°23.2	·· 53.9	16°07.7	·· 10.1	30°16.1	·· 31.4
10	0°40.9	323°24.1	14°00.6	271°24.0	53.9	31°09.7	09.9	45°18.5	31.3
11	15°43.4	338°23.6	01.6	286°24.8	53.9	46°11.8	09.8	60°20.8	31.3
12	30°45.8	353°23.0	N14°02.7	301°25.6	N24°53.9	61°13.9	S13°09.7	75°23.2	S17°31.3
13	45°48.3	8°22.5	03.7	316°26.4	53.9	76°16.0	09.5	90°25.5	31.2
14	60°50.8	23°22.0	04.8	331°27.2	53.9	91°18.0	09.4	105°27.8	31.2
15	75°53.2	38°21.5	·· 05.9	346°28.0	·· 53.9	106°20.1	·· 09.3	120°30.2	·· 31.2
16	90°55.7	53°20.9	06.9	1°28.8	53.9	121°22.2	09.2	135°32.5	31.2
17	105°58.2	68°20.4	08.0	16°29.6	53.9	136°24.3	09.0	150°34.9	31.1
18	121°00.6	83°19.9	N14°09.0	31°30.4	N24°53.9	151°26.4	S13°08.9	165°37.2	S17°31.1
19	136°03.1	98°19.4	10.1	46°31.2	53.9	166°28.4	08.8	180°39.5	31.1
20	151°05.6	113°18.8	11.1	61°32.0	53.9	181°30.5	08.6	195°41.9	31.0
21	166°08.0	128°18.3	·· 12.2	76°32.8	·· 53.9	196°32.6	·· 08.5	210°44.2	·· 31.0
22	181°10.5	143°17.8	13.3	91°33.6	53.9	211°34.7	08.4	225°46.6	31.0
23	196°12.9	158°17.2	14.3	106°34.4	53.9	226°36.7	08.3	240°48.9	31.0
Mer.pass.	09:57	ν -0.5′	d 1.1′	m -3.90	ν 0.8′	d 0.0′	m 1.50	ν 2.1′	d -0.1′ m -2.15	ν 2.3′	d -0.0′ m 0.68

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	211°15.4	173°16.7	N14°15.4	121°35.1	N24°53.9	241°38.8	S13°08.1	255°51.2	S17°30.9
1	226°17.9	188°16.2	16.4	136°35.9	53.9	256°40.9	08.0	270°53.6	30.9
2	241°20.3	203°15.6	17.5	151°36.7	53.9	271°43.0	07.9	285°55.9	30.9
3	256°22.8	218°15.1	·· 18.5	166°37.5	·· 53.9	286°45.1	·· 07.8	300°58.3	·· 30.8
4	271°25.3	233°14.6	19.6	181°38.3	53.9	301°47.1	07.6	316°00.6	30.8
5	286°27.7	248°14.0	20.6	196°39.1	53.9	316°49.2	07.5	331°02.9	30.8
6	301°30.2	263°13.5	N14°21.7	211°39.9	N24°53.9	331°51.3	S13°07.4	346°05.3	S17°30.8
7	316°32.7	278°13.0	22.7	226°40.7	53.9	346°53.4	07.2	1°07.6	30.7
8	331°35.1	293°12.4	23.8	241°41.5	53.9	1°55.5	07.1	16°10.0	30.7
9	346°37.6	308°11.9	·· 24.8	256°42.3	·· 53.9	16°57.5	·· 07.0	31°12.3	·· 30.7
10	1°40.1	323°11.4	25.9	271°43.1	53.9	31°59.6	06.9	46°14.7	30.6
11	16°42.5	338°10.8	26.9	286°43.9	53.9	47°01.7	06.7	61°17.0	30.6
12	31°45.0	353°10.3	N14°27.9	301°44.7	N24°53.9	62°03.8	S13°06.6	76°19.3	S17°30.6
13	46°47.4	8°09.8	29.0	316°45.5	53.9	77°05.9	06.5	91°21.7	30.6
14	61°49.9	23°09.2	30.0	331°46.3	53.9	92°07.9	06.3	106°24.0	30.5
15	76°52.4	38°08.7	·· 31.1	346°47.1	·· 53.9	107°10.0	·· 06.2	121°26.4	·· 30.5
16	91°54.8	53°08.1	32.1	1°47.8	53.9	122°12.1	06.1	136°28.7	30.5
17	106°57.3	68°07.6	33.2	16°48.6	53.9	137°14.2	06.0	151°31.1	30.4
18	121°59.8	83°07.1	N14°34.2	31°49.4	N24°53.9	152°16.3	S13°05.8	166°33.4	S17°30.4
19	137°02.2	98°06.5	35.2	46°50.2	53.9	167°18.4	05.7	181°35.8	30.4
20	152°04.7	113°06.0	36.3	61°51.0	53.8	182°20.4	05.6	196°38.1	30.4
21	167°07.2	128°05.4	·· 37.3	76°51.8	·· 53.8	197°22.5	·· 05.5	211°40.4	·· 30.3
22	182°09.6	143°04.9	38.4	91°52.6	53.8	212°24.6	05.3	226°42.8	30.3
23	197°12.1	158°04.4	39.4	106°53.4	53.8	227°26.7	05.2	241°45.1	30.3
Mer.pass.	09:53	ν -0.5′	d 1.1′	m -3.90	ν 0.8′	d -0.0′	m 1.51	ν 2.1′	d -0.1′ m -2.16	ν 2.3′	d -0.0′ m 0.68

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	212°14.5	173°03.8	N14°40.4	121°54.2	N24°53.8	242°28.8	S13°05.1	256°47.5	S17°30.2
1	227°17.0	188°03.3	41.5	136°55.0	53.8	257°30.9	05.0	271°49.8	30.2
2	242°19.5	203°02.7	42.5	151°55.8	53.8	272°32.9	04.8	286°52.2	30.2
3	257°21.9	218°02.2	·· 43.5	166°56.6	·· 53.8	287°35.0	·· 04.7	301°54.5	·· 30.2
4	272°24.4	233°01.7	44.6	181°57.4	53.8	302°37.1	04.6	316°56.9	30.1
5	287°26.9	248°01.1	45.6	196°58.2	53.8	317°39.2	04.4	331°59.2	30.1
6	302°29.3	263°00.6	N14°46.6	211°59.0	N24°53.8	332°41.3	S13°04.3	347°01.5	S17°30.1
7	317°31.8	278°00.0	47.7	226°59.7	53.8	347°43.4	04.2	2°03.9	30.1
8	332°34.3	292°59.5	48.7	242°00.5	53.7	2°45.4	04.1	17°06.2	30.0
9	347°36.7	307°58.9	·· 49.7	257°01.3	·· 53.7	17°47.5	·· 03.9	32°08.6	·· 30.0
10	2°39.2	322°58.4	50.8	272°02.1	53.7	32°49.6	03.8	47°10.9	30.0
11	17°41.7	337°57.8	51.8	287°02.9	53.7	47°51.7	03.7	62°13.3	29.9
12	32°44.1	352°57.3	N14°52.8	302°03.7	N24°53.7	62°53.8	S13°03.6	77°15.6	S17°29.9
13	47°46.6	7°56.7	53.9	317°04.5	53.7	77°55.9	03.4	92°18.0	29.9
14	62°49.0	22°56.2	54.9	332°05.3	53.7	92°58.0	03.3	107°20.3	29.9
15	77°51.5	37°55.7	·· 55.9	347°06.1	·· 53.7	108°00.0	·· 03.2	122°22.7	·· 29.8
16	92°54.0	52°55.1	56.9	2°06.9	53.7	123°02.1	03.1	137°25.0	29.8
17	107°56.4	67°54.6	58.0	17°07.7	53.6	138°04.2	02.9	152°27.4	29.8
18	122°58.9	82°54.0	N14°59.0	32°08.5	N24°53.6	153°06.3	S13°02.8	167°29.7	S17°29.8
19	138°01.4	97°53.5	15°00.0	47°09.3	53.6	168°08.4	02.7	182°32.1	29.7
20	153°03.8	112°52.9	01.1	62°10.1	53.6	183°10.5	02.6	197°34.4	29.7
21	168°06.3	127°52.4	·· 02.1	77°10.9	·· 53.6	198°12.6	·· 02.4	212°36.8	·· 29.7
22	183°08.8	142°51.8	03.1	92°11.6	53.6	213°14.7	02.3	227°39.1	29.6
23	198°11.2	157°51.3	04.1	107°12.4	53.6	228°16.7	02.2	242°41.5	29.6
Mer.pass.	09:49	ν -0.5′	d 1.0′	m -3.90	ν 0.8′	d -0.0′	m 1.52	ν 2.1′	d -0.1′ m -2.16	ν 2.3′	d -0.0′ m 0.68

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.2
Ankaa	353°10.6	-42°11.5
Schedar	349°35.0	56°39.0
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.0	23°33.6
Polaris	315°53.7	89°21.2
Acamar	315°14.5	-40°13.4
Menkar	314°09.6	4°10.2
Mirfak	308°33.1	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.8
Capella	280°26.7	46°01.2
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.0	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°15.9	-59°34.9
Suhail	222°48.4	-43°31.3
Miaplacidus	221°38.6	-69°48.5
Alphard	217°50.6	-8°45.2
Regulus	207°37.5	11°51.8
Dubhe	193°44.4	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.1
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.5
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.3
Kochab	137°18.7	74°04.1
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°15.8	-69°03.7
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.0
Rasalhague	96°01.2	12°32.6
Eltanin	90°43.3	51°28.9
Kaus Aust.	83°36.4	-34°22.3
Vega	80°35.1	38°47.9
Nunki	75°51.4	-26°16.1
Altair	62°02.9	8°55.3
Peacock	53°10.6	-56°39.8
Deneb	49°27.9	45°21.0
Enif	33°41.9	9°58.1
Al Na'ir	27°37.0	-46°51.4
Fomalhaut	15°18.1	-29°30.6
Scheat	13°48.4	28°11.6
Markab	13°33.1	15°18.9

Apr 22 Thu	SHA	Mer.pass
Venus	323°13.1	12:26
Mars	270°59.8	15:54
Jupiter	30°32.7	07:56
Saturn	44°38.8	06:59

Apr 23 Fri	SHA	Mer.pass
Venus	322°01.3	12:27
Mars	270°19.7	15:53
Jupiter	30°23.4	07:52
Saturn	44°35.8	06:56

Apr 24 Sat	SHA	Mer.pass
Venus	320°49.3	12:28
Mars	269°39.6	15:52
Jupiter	30°14.2	07:49
Saturn	44°32.9	06:52

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun			Moon				
h Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.4	N12°12.0	63°37.2	10.0′	N18°36.7	-10.2′	57.4′
1	195°21.5	12.8	78°06.2	10.0′	18°26.4	-10.4′	57.5′
2	210°21.7	13.7	92°35.3	10.1′	18°16.1	-10.5′	57.5′
3	225°21.8	·· 14.5	107°04.3	10.1′	18°05.6	-10.6′	57.6′
4	240°21.9	15.3	121°33.4	10.1′	17°55.0	-10.7′	57.6′
5	255°22.0	16.2	136°02.5	10.1′	17°44.4	-10.8′	57.6′
6	270°22.1	N12°17.0	150°31.6	10.1′	N17°33.6	-10.9′	57.7′
7	285°22.3	17.9	165°00.8	10.2′	17°22.7	-11.0′	57.7′
8	300°22.4	18.7	179°29.9	10.2′	17°11.7	-11.1′	57.8′
9	315°22.5	·· 19.5	193°59.1	10.2′	17°00.5	-11.2′	57.8′
10	330°22.6	20.4	208°28.3	10.2′	16°49.3	-11.3′	57.8′
11	345°22.7	21.2	222°57.5	10.2′	16°38.0	-11.4′	57.9′
12	0°22.9	N12°22.0	237°26.7	10.2′	N16°26.6	-11.5′	57.9′
13	15°23.0	22.9	251°56.0	10.3′	16°15.0	-11.6′	58.0′
14	30°23.1	23.7	266°25.3	10.3′	16°03.4	-11.7′	58.0′
15	45°23.2	·· 24.5	280°54.5	10.3′	15°51.6	-11.8′	58.0′
16	60°23.3	25.4	295°23.8	10.3′	15°39.8	-11.9′	58.1′
17	75°23.5	26.2	309°53.1	10.3′	15°27.8	-12.0′	58.1′
18	90°23.6	N12°27.0	324°22.5	10.3′	N15°15.8	-12.1′	58.2′
19	105°23.7	27.9	338°51.8	10.4′	15°03.7	-12.2′	58.2′
20	120°23.8	28.7	353°21.2	10.4′	14°51.4	-12.3′	58.2′
21	135°23.9	·· 29.6	7°50.6	10.4′	14°39.1	-12.4′	58.3′
22	150°24.1	30.4	22°20.0	10.4′	14°26.7	-12.5′	58.3′
23	165°24.2	31.2	36°49.4	10.4′	14°14.1	-12.6′	58.4′
	SD = 15.9′	d = 0.8′	SD = 15.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°24.3	N12°32.0	51°18.8	10.4′	N14°01.5	-12.7′	58.4′
1	195°24.4	32.9	65°48.2	10.4′	13°48.8	-12.8′	58.4′
2	210°24.5	33.7	80°17.7	10.5′	13°36.0	-12.9′	58.5′
3	225°24.6	·· 34.5	94°47.1	10.5′	13°23.1	-13.0′	58.5′
4	240°24.8	35.4	109°16.6	10.5′	13°10.1	-13.1′	58.6′
5	255°24.9	36.2	123°46.1	10.5′	12°57.0	-13.2′	58.6′
6	270°25.0	N12°37.0	138°15.5	10.5′	N12°43.9	-13.3′	58.6′
7	285°25.1	37.9	152°45.0	10.5′	12°30.6	-13.3′	58.7′
8	300°25.2	38.7	167°14.6	10.5′	12°17.3	-13.4′	58.7′
9	315°25.3	·· 39.5	181°44.1	10.5′	12°03.8	-13.5′	58.8′
10	330°25.5	40.4	196°13.6	10.5′	11°50.3	-13.6′	58.8′
11	345°25.6	41.2	210°43.1	10.5′	11°36.7	-13.7′	58.8′
12	0°25.7	N12°42.0	225°12.7	10.5′	N11°23.1	-13.8′	58.9′
13	15°25.8	42.8	239°42.2	10.6′	11°09.3	-13.8′	58.9′
14	30°25.9	43.7	254°11.8	10.6′	10°55.5	-13.9′	59.0′
15	45°26.0	·· 44.5	268°41.3	10.6′	10°41.6	-14.0′	59.0′
16	60°26.2	45.3	283°10.9	10.6′	10°27.6	-14.1′	59.0′
17	75°26.3	46.1	297°40.5	10.6′	10°13.5	-14.1′	59.1′
18	90°26.4	N12°47.0	312°10.0	10.6′	N09°59.4	-14.2′	59.1′
19	105°26.5	47.8	326°39.6	10.6′	09°45.2	-14.3′	59.2′
20	120°26.6	48.6	341°09.2	10.6′	09°30.9	-14.4′	59.2′
21	135°26.7	·· 49.4	355°38.7	10.6′	09°16.5	-14.4′	59.2′
22	150°26.8	50.3	10°08.3	10.6′	09°02.1	-14.5′	59.3′
23	165°27.0	51.1	24°37.9	10.6′	08°47.6	-14.6′	59.3′
	SD = 15.9′	d = 0.8′	SD = 15.9′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°27.1	N12°51.9	39°07.5	10.6′	N08°33.1	-14.6′	59.3′
1	195°27.2	52.7	53°37.0	10.6′	08°18.4	-14.7′	59.4′
2	210°27.3	53.6	68°06.6	10.6′	08°03.7	-14.8′	59.4′
3	225°27.4	·· 54.4	82°36.1	10.6′	07°49.0	-14.8′	59.5′
4	240°27.5	55.2	97°05.7	10.6′	07°34.2	-14.9′	59.5′
5	255°27.6	56.0	111°35.2	10.5′	07°19.3	-14.9′	59.5′
6	270°27.7	N12°56.8	126°04.8	10.5′	N07°04.3	-15.0′	59.6′
7	285°27.9	57.7	140°34.3	10.5′	06°49.3	-15.1′	59.6′
8	300°28.0	58.5	155°03.9	10.5′	06°34.3	-15.1′	59.6′
9	315°28.1	12°59.3	169°33.4	10.5′	06°19.2	-15.2′	59.7′
10	330°28.2	13°00.1	184°02.9	10.5′	06°04.0	-15.2′	59.7′
11	345°28.3	00.9	198°32.4	10.5′	05°48.8	-15.3′	59.7′
12	0°28.4	N13°01.8	213°01.9	10.5′	N05°33.5	-15.3′	59.8′
13	15°28.5	02.6	227°31.3	10.5′	05°18.2	-15.4′	59.8′
14	30°28.6	03.4	242°00.8	10.4′	05°02.8	-15.4′	59.9′
15	45°28.7	·· 04.2	256°30.3	10.4′	04°47.4	-15.5′	59.9′
16	60°28.9	05.0	270°59.7	10.4′	04°32.0	-15.5′	59.9′
17	75°29.0	05.9	285°29.1	10.4′	04°16.5	-15.5′	60.0′
18	90°29.1	N13°06.7	299°58.5	10.4′	N04°00.9	-15.6′	60.0′
19	105°29.2	07.5	314°27.9	10.4′	03°45.3	-15.6′	60.0′
20	120°29.3	08.3	328°57.2	10.3′	03°29.7	-15.7′	60.1′
21	135°29.4	·· 09.1	343°26.6	10.3′	03°14.0	-15.7′	60.1′
22	150°29.5	09.9	357°55.9	10.3′	02°58.3	-15.7′	60.1′
23	165°29.6	10.7	12°25.2	10.3′	02°42.6	-15.8′	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°	–:–	01:28	03:14	20:46	22:38	–:–
68°	–:–	02:11	03:33	20:26	21:51	–:–
66°	–:–	02:39	03:48	20:11	21:21	–:–
64°	01:17	03:00	04:01	19:58	21:00	22:48
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	19:30	20:16	21:18
56°	02:57	03:52	04:34	19:23	20:06	21:02
54°	03:10	04:01	04:41	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	20:26
45°	03:52	04:30	05:02	18:56	19:27	20:06
N 40°	04:07	04:42	05:11	18:47	19:15	19:50
35°	04:20	04:52	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	17:53	18:14	18:39
20°	05:25	05:51	06:13	17:43	18:05	18:31
30°	05:32	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	16:57	17:32	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	18:09
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 Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	09:33	12:31	14:56	06:52	05:41	05:05
N 70°	10:27	12:51	15:03	05:56	05:19	04:55
68°	11:00	13:07	15:08	05:22	05:02	04:46
66°	11:23	13:19	15:13	04:58	04:48	04:39
64°	11:42	13:29	15:17	04:38	04:36	04:33
62°	11:57	13:38	15:20	04:22	04:26	04:28
60°	12:09	13:45	15:23	04:09	04:17	04:24
N 58°	12:20	13:52	15:26	03:57	04:10	04:20
56°	12:29	13:58	15:28	03:47	04:03	04:16
54°	12:37	14:03	15:30	03:38	03:57	04:13
52°	12:45	14:07	15:32	03:30	03:52	04:10
50°	12:51	14:12	15:34	03:23	03:47	04:07
45°	13:06	14:21	15:38	03:07	03:36	04:01
N 40°	13:17	14:28	15:41	02:54	03:27	03:56
35°	13:27	14:34	15:43	02:44	03:19	03:52
30°	13:36	14:40	15:46	02:34	03:12	03:48
20°	13:51	14:50	15:50	02:17	03:00	03:42
N 10°	14:03	14:58	15:53	02:03	02:50	03:36
0°	14:15	15:06	15:57	01:49	02:40	03:30
S 10°	14:27	15:14	16:00	01:35	02:30	03:24
20°	14:40	15:22	16:03	01:20	02:19	03:18
30°	14:55	15:32	16:07	01:03	02:06	03:11
35°	15:03	15:37	16:10	00:53	01:59	03:07
40°	15:13	15:43	16:12	00:41	01:51	03:02
45°	15:24	15:51	16:15	00:27	01:41	02:57
S 50°	15:37	15:59	16:19	00:11	01:29	02:50
52°	15:43	16:03	16:21	00:03	01:24	02:47
54°	15:50	16:07	16:22	·· ··	01:18	02:44
56°	15:58	16:12	16:24	·· ··	01:11	02:40
58°	16:06	16:17	16:27	·· ··	01:03	02:36
S 60°	16:16	16:23	16:29	·· ··	00:54	02:32

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 67-86%
22	01:26	01:31	11:58	20:28	08:02	
23	01:37	01:43	11:58	21:18	08:53	
24	01:48	01:54	11:58	22:09	09:43	

DUT1 = UT1-UTC = -0.1800 sec ΔT = TT-UT1 = +69.3640 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	213°13.7	172°50.7	N15°05.1	122°13.2	N24°53.5	243°18.8	S13°02.1	257°43.8	S17°29.6
1	228°16.1	187°50.1	06.2	137°14.0	53.5	258°20.9	01.9	272°46.1	29.6
2	243°18.6	202°49.6	07.2	152°14.8	53.5	273°23.0	01.8	287°48.5	29.5
3	258°21.1	217°49.0	·· 08.2	167°15.6	·· 53.5	288°25.1	·· 01.7	302°50.8	·· 29.5
4	273°23.5	232°48.5	09.2	182°16.4	53.5	303°27.2	01.6	317°53.2	29.5
5	288°26.0	247°47.9	10.2	197°17.2	53.5	318°29.3	01.4	332°55.5	29.5
6	303°28.5	262°47.4	N15°11.3	212°18.0	N24°53.4	333°31.4	S13°01.3	347°57.9	S17°29.4
7	318°30.9	277°46.8	12.3	227°18.8	53.4	348°33.5	01.2	3°00.2	29.4
8	333°33.4	292°46.3	13.3	242°19.6	53.4	3°35.5	01.1	18°02.6	29.4
9	348°35.9	307°45.7	·· 14.3	257°20.4	·· 53.4	18°37.6	·· 00.9	33°04.9	·· 29.4
10	3°38.3	322°45.2	15.3	272°21.2	53.4	33°39.7	00.8	48°07.3	29.3
11	18°40.8	337°44.6	16.3	287°22.0	53.4	48°41.8	00.7	63°09.6	29.3
12	33°43.3	352°44.0	N15°17.4	302°22.7	N24°53.3	63°43.9	S13°00.6	78°12.0	S17°29.3
13	48°45.7	7°43.5	18.4	317°23.5	53.3	78°46.0	00.4	93°14.3	29.2
14	63°48.2	22°42.9	19.4	332°24.3	53.3	93°48.1	00.3	108°16.7	29.2
15	78°50.6	37°42.4	·· 20.4	347°25.1	·· 53.3	108°50.2	·· 00.2	123°19.0	·· 29.2
16	93°53.1	52°41.8	21.4	2°25.9	53.3	123°52.3	00.1	138°21.4	29.2
17	108°55.6	67°41.2	22.4	17°26.7	53.2	138°54.4	13°00.0	153°23.8	29.1
18	123°58.0	82°40.7	N15°23.4	32°27.5	N24°53.2	153°56.5	S12°59.8	168°26.1	S17°29.1
19	139°00.5	97°40.1	24.4	47°28.3	53.2	168°58.6	59.7	183°28.5	29.1
20	154°03.0	112°39.6	25.4	62°29.1	53.2	184°00.6	59.6	198°30.8	29.1
21	169°05.4	127°39.0	·· 26.5	77°29.9	·· 53.2	199°02.7	·· 59.5	213°33.2	·· 29.0
22	184°07.9	142°38.4	27.5	92°30.7	53.1	214°04.8	59.3	228°35.5	29.0
23	199°10.4	157°37.9	28.5	107°31.5	53.1	229°06.9	59.2	243°37.9	29.0
Mer.pass.	09:45	ν -0.6′	d 1.0′	m -3.90	ν 0.8′	d -0.0′	m 1.53	ν 2.1′	d -0.1′ m -2.17	ν 2.3′	d -0.0′ m 0.67
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	214°12.8	172°37.3	N15°29.5	122°32.3	N24°53.1	244°09.0	S12°59.1	258°40.2	S17°29.0
1	229°15.3	187°36.8	30.5	137°33.1	53.1	259°11.1	59.0	273°42.6	28.9
2	244°17.8	202°36.2	31.5	152°33.8	53.1	274°13.2	58.8	288°44.9	28.9
3	259°20.2	217°35.6	·· 32.5	167°34.6	·· 53.0	289°15.3	·· 58.7	303°47.3	·· 28.9
4	274°22.7	232°35.1	33.5	182°35.4	53.0	304°17.4	58.6	318°49.6	28.9
5	289°25.1	247°34.5	34.5	197°36.2	53.0	319°19.5	58.5	333°52.0	28.8
6	304°27.6	262°33.9	N15°35.5	212°37.0	N24°53.0	334°21.6	S12°58.3	348°54.3	S17°28.8
7	319°30.1	277°33.4	36.5	227°37.8	52.9	349°23.7	58.2	3°56.7	28.8
8	334°32.5	292°32.8	37.5	242°38.6	52.9	4°25.8	58.1	18°59.0	28.8
9	349°35.0	307°32.2	·· 38.5	257°39.4	·· 52.9	19°27.9	·· 58.0	34°01.4	·· 28.7
10	4°37.5	322°31.7	39.5	272°40.2	52.9	34°30.0	57.9	49°03.7	28.7
11	19°39.9	337°31.1	40.5	287°41.0	52.8	49°32.1	57.7	64°06.1	28.7
12	34°42.4	352°30.5	N15°41.5	302°41.8	N24°52.8	64°34.2	S12°57.6	79°08.5	S17°28.7
13	49°44.9	7°30.0	42.5	317°42.6	52.8	79°36.3	57.5	94°10.8	28.6
14	64°47.3	22°29.4	43.5	332°43.4	52.8	94°38.3	57.4	109°13.2	28.6
15	79°49.8	37°28.8	·· 44.5	347°44.1	·· 52.7	109°40.4	·· 57.2	124°15.5	·· 28.6
16	94°52.2	52°28.3	45.5	2°44.9	52.7	124°42.5	57.1	139°17.9	28.6
17	109°54.7	67°27.7	46.5	17°45.7	52.7	139°44.6	57.0	154°20.2	28.5
18	124°57.2	82°27.1	N15°47.5	32°46.5	N24°52.6	154°46.7	S12°56.9	169°22.6	S17°28.5
19	139°59.6	97°26.5	48.5	47°47.3	52.6	169°48.8	56.8	184°24.9	28.5
20	155°02.1	112°26.0	49.5	62°48.1	52.6	184°50.9	56.6	199°27.3	28.5
21	170°04.6	127°25.4	·· 50.4	77°48.9	·· 52.6	199°53.0	·· 56.5	214°29.7	·· 28.4
22	185°07.0	142°24.8	51.4	92°49.7	52.5	214°55.1	56.4	229°32.0	28.4
23	200°09.5	157°24.3	52.4	107°50.5	52.5	229°57.2	56.3	244°34.4	28.4
Mer.pass.	09:42	ν -0.6′	d 1.0′	m -3.90	ν 0.8′	d -0.0′	m 1.53	ν 2.1′	d -0.1′ m -2.17	ν 2.4′	d -0.0′ m 0.67
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	215°12.0	172°23.7	N15°53.4	122°51.3	N24°52.5	244°59.3	S12°56.1	259°36.7	S17°28.4
1	230°14.4	187°23.1	54.4	137°52.1	52.4	260°01.4	56.0	274°39.1	28.3
2	245°16.9	202°22.5	55.4	152°52.9	52.4	275°03.5	55.9	289°41.4	28.3
3	260°19.4	217°22.0	·· 56.4	167°53.7	·· 52.4	290°05.6	·· 55.8	304°43.8	·· 28.3
4	275°21.8	232°21.4	57.4	182°54.4	52.4	305°07.7	55.7	319°46.1	28.3
5	290°24.3	247°20.8	58.4	197°55.2	52.3	320°09.8	55.5	334°48.5	28.2
6	305°26.7	262°20.2	N15°59.3	212°56.0	N24°52.3	335°11.9	S12°55.4	349°50.9	S17°28.2
7	320°29.2	277°19.7	16°00.3	227°56.8	52.3	350°14.0	55.3	4°53.2	28.2
8	335°31.7	292°19.1	01.3	242°57.6	52.2	5°16.1	55.2	19°55.6	28.2
9	350°34.1	307°18.5	·· 02.3	257°58.4	·· 52.2	20°18.2	·· 55.1	34°57.9	·· 28.1
10	5°36.6	322°17.9	03.3	272°59.2	52.2	35°20.3	54.9	50°00.3	28.1
11	20°39.1	337°17.3	04.3	288°00.0	52.1	50°22.4	54.8	65°02.7	28.1
12	35°41.5	352°16.8	N16°05.2	303°00.8	N24°52.1	65°24.5	S12°54.7	80°05.0	S17°28.1
13	50°44.0	7°16.2	06.2	318°01.6	52.1	80°26.6	54.6	95°07.4	28.0
14	65°46.5	22°15.6	07.2	333°02.4	52.0	95°28.7	54.4	110°09.7	28.0
15	80°48.9	37°15.0	·· 08.2	348°03.2	·· 52.0	110°30.8	·· 54.3	125°12.1	·· 28.0
16	95°51.4	52°14.4	09.2	3°04.0	52.0	125°32.9	54.2	140°14.4	28.0
17	110°53.8	67°13.9	10.1	18°04.7	51.9	140°35.0	54.1	155°16.8	27.9
18	125°56.3	82°13.3	N16°11.1	33°05.5	N24°51.9	155°37.1	S12°54.0	170°19.2	S17°27.9
19	140°58.8	97°12.7	12.1	48°06.3	51.9	170°39.2	53.8	185°21.5	27.9
20	156°01.2	112°12.1	13.1	63°07.1	51.8	185°41.3	53.7	200°23.9	27.9
21	171°03.7	127°11.5	·· 14.0	78°07.9	·· 51.8	200°43.4	·· 53.6	215°26.2	·· 27.8
22	186°06.2	142°10.9	15.0	93°08.7	51.8	215°45.5	53.5	230°28.6	27.8
23	201°08.6	157°10.4	16.0	108°09.5	51.7	230°47.6	53.4	245°31.0	27.8
Mer.pass.	09:38	ν -0.6′	d 1.0′	m -3.90	ν 0.8′	d -0.0′	m 1.54	ν 2.1′	d -0.1′ m -2.18	ν 2.4′	d -0.0′ m 0.67

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.2
Ankaa	353°10.6	-42°11.5
Schedar	349°34.9	56°38.9
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.0	23°33.6
Polaris	315°54.0	89°21.2
Acamar	315°14.5	-40°13.4
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.8
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.5
Alnilam	275°41.0	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.0	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°15.9	-59°34.9
Suhail	222°48.4	-43°31.3
Miaplacidus	221°38.6	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.4	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.1
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.5
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.8	-60°55.3
Kochab	137°18.7	74°04.1
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°15.8	-69°03.7
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.0
Rasalhague	96°01.1	12°32.6
Eltanin	90°43.3	51°28.9
Kaus Aust.	83°36.4	-34°22.3
Vega	80°35.1	38°47.9
Nunki	75°51.4	-26°16.1
Altair	62°02.9	8°55.3
Peacock	53°10.6	-56°39.8
Deneb	49°27.9	45°21.0
Enif	33°41.9	9°58.1
Al Na'ir	27°37.0	-46°51.4
Fomalhaut	15°18.1	-29°30.6
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

Apr 25 Sun	SHA	Mer.pass
Venus	319°37.0	12:29
Mars	268°59.5	15:50
Jupiter	30°05.1	07:46
Saturn	44°30.1	06:48

Apr 26 Mon	SHA	Mer.pass
Venus	318°24.5	12:30
Mars	268°19.4	15:49
Jupiter	29°56.2	07:42
Saturn	44°27.4	06:44

Apr 27 Tue	SHA	Mer.pass
Venus	317°11.7	12:31
Mars	267°39.3	15:48
Jupiter	29°47.4	07:39
Saturn	44°24.8	06:41

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		180°29.7	N13°11.6	26°54.5	10.3′	N02°26.8	-15.8′	60.2′
1		195°29.8	12.4	41°23.7	10.2′	02°11.0	-15.8′	60.2′
2		210°29.9	13.2	55°52.9	10.2′	01°55.2	-15.9′	60.3′
3		225°30.1	·· 14.0	70°22.1	10.2′	01°39.4	-15.9′	60.3′
4		240°30.2	14.8	84°51.3	10.1′	01°23.5	-15.9′	60.3′
5		255°30.3	15.6	99°20.5	10.1′	01°07.6	-15.9′	60.3′
6		270°30.4	N13°16.4	113°49.6	10.1′	N00°51.6	-16.0′	60.4′
7		285°30.5	17.3	128°18.7	10.1′	00°35.7	-16.0′	60.4′
8		300°30.6	18.1	142°47.7	10.0′	00°19.7	-16.0′	60.4′
9		315°30.7	·· 18.9	157°16.7	10.0′	N00°03.7	-16.0′	60.5′
10		330°30.8	19.7	171°45.7	10.0′	S00°12.3	-16.0′	60.5′
11		345°30.9	20.5	186°14.7	9.9′	00°28.3	-16.0′	60.5′
12		0°31.0	N13°21.3	200°43.6	9.9′	S00°44.3	-16.0′	60.5′
13		15°31.1	22.1	215°12.5	9.8′	01°00.4	-16.1′	60.6′
14		30°31.2	22.9	229°41.3	9.8′	01°16.5	-16.1′	60.6′
15		45°31.3	·· 23.7	244°10.2	9.8′	01°32.5	-16.1′	60.6′
16		60°31.4	24.5	258°38.9	9.7′	01°48.6	-16.1′	60.6′
17		75°31.5	25.3	273°07.7	9.7′	02°04.7	-16.1′	60.7′
18		90°31.6	N13°26.2	287°36.4	9.7′	S02°20.7	-16.1′	60.7′
19		105°31.8	27.0	302°05.0	9.6′	02°36.8	-16.1′	60.7′
20		120°31.9	27.8	316°33.6	9.6′	02°52.9	-16.1′	60.7′
21		135°32.0	·· 28.6	331°02.2	9.5′	03°09.0	-16.1′	60.8′
22		150°32.1	29.4	345°30.7	9.5′	03°25.0	-16.1′	60.8′
23		165°32.2	30.2	359°59.2	9.4′	03°41.1	-16.1′	60.8′
		SD = 15.9′	d = 0.8′	SD = 16.4′				
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		180°32.3	N13°31.0	14°27.6	9.4′	S03°57.1	16.0′	60.8′
1		195°32.4	31.8	28°56.0	9.3′	04°13.2	16.0′	60.9′
2		210°32.5	32.6	43°24.3	9.3′	04°29.2	16.0′	60.9′
3		225°32.6	·· 33.4	57°52.6	9.2′	04°45.2	16.0′	60.9′
4		240°32.7	34.2	72°20.8	9.2′	05°01.2	16.0′	60.9′
5		255°32.8	35.0	86°49.0	9.1′	05°17.2	16.0′	60.9′
6		270°32.9	N13°35.8	101°17.1	9.1′	S05°33.1	15.9′	61.0′
7		285°33.0	36.6	115°45.2	9.0′	05°49.1	15.9′	61.0′
8		300°33.1	37.4	130°13.2	9.0′	06°05.0	15.9′	61.0′
9		315°33.2	·· 38.2	144°41.2	8.9′	06°20.9	15.9′	61.0′
10		330°33.3	39.0	159°09.1	8.9′	06°36.7	15.8′	61.0′
11		345°33.4	39.8	173°37.0	8.8′	06°52.5	15.8′	61.0′
12		0°33.5	N13°40.6	188°04.8	8.7′	S07°08.3	15.8′	61.1′
13		15°33.6	41.4	202°32.5	8.7′	07°24.1	15.7′	61.1′
14		30°33.7	42.2	217°00.2	8.6′	07°39.8	15.7′	61.1′
15		45°33.8	·· 43.0	231°27.8	8.6′	07°55.5	15.6′	61.1′
16		60°33.9	43.8	245°55.4	8.5′	08°11.1	15.6′	61.1′
17		75°34.0	44.6	260°22.9	8.4′	08°26.7	15.6′	61.1′
18		90°34.1	N13°45.4	274°50.3	8.4′	S08°42.3	15.5′	61.1′
19		105°34.2	46.2	289°17.7	8.3′	08°57.8	15.5′	61.2′
20		120°34.3	47.0	303°45.0	8.2′	09°13.2	15.4′	61.2′
21		135°34.4	·· 47.8	318°12.3	8.2′	09°28.6	15.4′	61.2′
22		150°34.5	48.6	332°39.4	8.1′	09°44.0	15.3′	61.2′
23		165°34.6	49.4	347°06.5	8.0′	09°59.3	15.2′	61.2′
		SD = 15.9′	d = 0.8′	SD = 16.6′				
Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		180°34.7	N13°50.2	1°33.6	8.0′	S10°14.5	15.2′	61.2′
1		195°34.8	51.0	16°00.6	7.9′	10°29.7	15.1′	61.2′
2		210°34.9	51.8	30°27.5	7.8′	10°44.8	15.1′	61.2′
3		225°35.0	·· 52.6	44°54.3	7.8′	10°59.9	15.0′	61.2′
4		240°35.1	53.4	59°21.1	7.7′	11°14.9	14.9′	61.2′
5		255°35.2	54.2	73°47.8	7.6′	11°29.8	14.9′	61.2′
6		270°35.3	N13°55.0	88°14.5	7.6′	S11°44.7	14.8′	61.3′
7		285°35.4	55.8	102°41.0	7.5′	11°59.5	14.7′	61.3′
8		300°35.5	56.6	117°07.5	7.4′	12°14.2	14.6′	61.3′
9		315°35.6	·· 57.3	131°33.9	7.4′	12°28.8	14.6′	61.3′
10		330°35.7	58.1	146°00.3	7.3′	12°43.4	14.5′	61.3′
11		345°35.8	58.9	160°26.6	7.2′	12°57.8	14.4′	61.3′
12		0°35.9	N13°59.7	174°52.8	7.1′	S13°12.2	14.3′	61.3′
13		15°36.0	14°00.5	189°18.9	7.1′	13°26.5	14.2′	61.3′
14		30°36.0	01.3	203°45.0	7.0′	13°40.7	14.1′	61.3′
15		45°36.1	·· 02.1	218°11.0	6.9′	13°54.9	14.0′	61.3′
16		60°36.2	02.9	232°36.9	6.8′	14°08.9	14.0′	61.3′
17		75°36.3	03.7	247°02.7	6.8′	14°22.9	13.9′	61.3′
18		90°36.4	N14°04.5	261°28.5	6.7′	S14°36.7	13.8′	61.3′
19		105°36.5	05.2	275°54.2	6.6′	14°50.5	13.7′	61.3′
20		120°36.6	06.0	290°19.8	6.5′	15°04.2	13.6′	61.3′
21		135°36.7	·· 06.8	304°45.4	6.5′	15°17.7	13.5′	61.3′
22		150°36.8	07.6	319°10.8	6.4′	15°31.2	13.4′	61.3′
23		165°36.9	08.4	333°36.2	6.3′	15°44.5	13.2′	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°	–:–	00:49	02:58	21:01	23:27	–:–
68°	–:–	01:50	03:20	20:39	22:12	–:–
66°	–:–	02:23	03:36	20:22	21:37	–:–
64°	00:43	02:47	03:50	20:08	21:12	23:31
62°	01:37	03:06	04:02	19:56	20:53	22:25
60°	02:07	03:21	04:11	19:46	20:37	21:52
N 58°	02:29	03:34	04:20	19:37	20:24	21:29
56°	02:47	03:44	04:27	19:30	20:13	21:11
54°	03:02	03:54	04:34	19:23	20:03	20:56
52°	03:14	04:02	04:40	19:17	19:55	20:43
50°	03:25	04:10	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	18:04	18:30
30°	05:33	06:01	06:26	17:29	17:54	18:22
35°	05:37	06:07	06:33	17:23	17:49	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	18:06
54°	05:51	06:32	07:10	16:45	17:22	18:04
56°	05:52	06:36	07:15	16:39	17:19	18:02
58°	05:54	06:40	07:22	16:33	17:14	18:00
S 60°	05:56	06:45	07:30	16:25	17:10	17:59

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

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 13-15 93-100%
25	01:59	02:04	11:58	23:00	10:34	
26	02:09	02:14	11:58	23:54	11:26	
27	02:19	02:23	11:58	–:–	12:21	

DUT1 = UT1-UTC = -0.1827 sec ΔT = TT-UT1 = +69.3667 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°11.1	172°09.8	N16°17.0	123°10.3	N24°51.7	245°49.8	S12°53.2	260°33.3	S17°27.8
1	231°13.6	187°09.2	17.9	138°11.1	51.6	260°51.9	53.1	275°35.7	27.8
2	246°16.0	202°08.6	18.9	153°11.9	51.6	275°54.0	53.0	290°38.0	27.7
3	261°18.5	217°08.0	·· 19.9	168°12.7	·· 51.6	290°56.1	·· 52.9	305°40.4	·· 27.7
4	276°21.0	232°07.4	20.8	183°13.5	51.5	305°58.2	52.8	320°42.8	27.7
5	291°23.4	247°06.8	21.8	198°14.3	51.5	321°00.3	52.6	335°45.1	27.7
6	306°25.9	262°06.3	N16°22.8	213°15.0	N24°51.5	336°02.4	S12°52.5	350°47.5	S17°27.6
7	321°28.3	277°05.7	23.8	228°15.8	51.4	351°04.5	52.4	5°49.8	27.6
8	336°30.8	292°05.1	24.7	243°16.6	51.4	6°06.6	52.3	20°52.2	27.6
9	351°33.3	307°04.5	·· 25.7	258°17.4	·· 51.3	21°08.7	·· 52.2	35°54.6	·· 27.6
10	6°35.7	322°03.9	26.7	273°18.2	51.3	36°10.8	52.0	50°56.9	27.5
11	21°38.2	337°03.3	27.6	288°19.0	51.3	51°12.9	51.9	65°59.3	27.5
12	36°40.7	352°02.7	N16°28.6	303°19.8	N24°51.2	66°15.0	S12°51.8	81°01.7	S17°27.5
13	51°43.1	7°02.1	29.5	318°20.6	51.2	81°17.1	51.7	96°04.0	27.5
14	66°45.6	22°01.5	30.5	333°21.4	51.1	96°19.2	51.6	111°06.4	27.5
15	81°48.1	37°01.0	·· 31.5	348°22.2	·· 51.1	111°21.3	·· 51.5	126°08.7	·· 27.4
16	96°50.5	52°00.4	32.4	3°23.0	51.1	126°23.4	51.3	141°11.1	27.4
17	111°53.0	66°59.8	33.4	18°23.8	51.0	141°25.5	51.2	156°13.5	27.4
18	126°55.5	81°59.2	N16°34.3	33°24.6	N24°51.0	156°27.7	S12°51.1	171°15.8	S17°27.4
19	141°57.9	96°58.6	35.3	48°25.3	50.9	171°29.8	51.0	186°18.2	27.3
20	157°00.4	111°58.0	36.3	63°26.1	50.9	186°31.9	50.9	201°20.6	27.3
21	172°02.8	126°57.4	·· 37.2	78°26.9	·· 50.9	201°34.0	·· 50.7	216°22.9	·· 27.3
22	187°05.3	141°56.8	38.2	93°27.7	50.8	216°36.1	50.6	231°25.3	27.3
23	202°07.8	156°56.2	39.1	108°28.5	50.8	231°38.2	50.5	246°27.6	27.2
Mer.pass.	09:34	ν -0.6′	d 1.0′	m -3.89	ν 0.8′	d -0.0′	m 1.55	ν 2.1′	d -0.1′ m -2.18	ν 2.4′	d -0.0′ m 0.67

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°10.2	171°55.6	N16°40.1	123°29.3	N24°50.7	246°40.3	S12°50.4	261°30.0	S17°27.2
1	232°12.7	186°55.0	41.0	138°30.1	50.7	261°42.4	50.3	276°32.4	27.2
2	247°15.2	201°54.4	42.0	153°30.9	50.6	276°44.5	50.1	291°34.7	27.2
3	262°17.6	216°53.8	·· 43.0	168°31.7	·· 50.6	291°46.6	·· 50.0	306°37.1	·· 27.2
4	277°20.1	231°53.2	43.9	183°32.5	50.5	306°48.7	49.9	321°39.5	27.1
5	292°22.6	246°52.6	44.9	198°33.3	50.5	321°50.8	49.8	336°41.8	27.1
6	307°25.0	261°52.0	N16°45.8	213°34.1	N24°50.5	336°53.0	S12°49.7	351°44.2	S17°27.1
7	322°27.5	276°51.4	46.8	228°34.8	50.4	351°55.1	49.6	6°46.6	27.1
8	337°30.0	291°50.8	47.7	243°35.6	50.4	6°57.2	49.4	21°48.9	27.0
9	352°32.4	306°50.2	·· 48.7	258°36.4	·· 50.3	21°59.3	·· 49.3	36°51.3	·· 27.0
10	7°34.9	321°49.6	49.6	273°37.2	50.3	37°01.4	49.2	51°53.7	27.0
11	22°37.3	336°49.0	50.6	288°38.0	50.2	52°03.5	49.1	66°56.0	27.0
12	37°39.8	351°48.4	N16°51.5	303°38.8	N24°50.2	67°05.6	S12°49.0	81°58.4	S17°27.0
13	52°42.3	6°47.8	52.4	318°39.6	50.1	82°07.7	48.9	97°00.8	26.9
14	67°44.7	21°47.2	53.4	333°40.4	50.1	97°09.8	48.7	112°03.1	26.9
15	82°47.2	36°46.6	·· 54.3	348°41.2	·· 50.0	112°12.0	·· 48.6	127°05.5	·· 26.9
16	97°49.7	51°46.0	55.3	3°42.0	50.0	127°14.1	48.5	142°07.9	26.9
17	112°52.1	66°45.4	56.2	18°42.8	49.9	142°16.2	48.4	157°10.2	26.8
18	127°54.6	81°44.8	N16°57.2	33°43.6	N24°49.9	157°18.3	S12°48.3	172°12.6	S17°26.8
19	142°57.1	96°44.2	58.1	48°44.3	49.8	172°20.4	48.1	187°15.0	26.8
20	157°59.5	111°43.6	16°59.0	63°45.1	49.8	187°22.5	48.0	202°17.3	26.8
21	173°02.0	126°43.0	17°00.0	78°45.9	·· 49.7	202°24.6	·· 47.9	217°19.7	·· 26.8
22	188°04.5	141°42.4	00.9	93°46.7	49.7	217°26.7	47.8	232°22.1	26.7
23	203°06.9	156°41.8	01.9	108°47.5	49.6	232°28.9	47.7	247°24.4	26.7
Mer.pass.	09:30	ν -0.6′	d 1.0′	m -3.89	ν 0.8′	d -0.0′	m 1.56	ν 2.1′	d -0.1′ m -2.19	ν 2.4′	d -0.0′ m 0.66

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°09.4	171°41.2	N17°02.8	123°48.3	N24°49.6	247°31.0	S12°47.6	262°26.8	S17°26.7
1	233°11.8	186°40.6	03.7	138°49.1	49.5	262°33.1	47.4	277°29.2	26.7
2	248°14.3	201°39.9	04.7	153°49.9	49.5	277°35.2	47.3	292°31.5	26.7
3	263°16.8	216°39.3	·· 05.6	168°50.7	·· 49.4	292°37.3	·· 47.2	307°33.9	·· 26.6
4	278°19.2	231°38.7	06.5	183°51.5	49.4	307°39.4	47.1	322°36.3	26.6
5	293°21.7	246°38.1	07.5	198°52.3	49.3	322°41.6	47.0	337°38.6	26.6
6	308°24.2	261°37.5	N17°08.4	213°53.1	N24°49.3	337°43.7	S12°46.9	352°41.0	S17°26.6
7	323°26.6	276°36.9	09.3	228°53.9	49.2	352°45.8	46.8	7°43.4	26.5
8	338°29.1	291°36.3	10.3	243°54.6	49.2	7°47.9	46.6	22°45.7	26.5
9	353°31.6	306°35.7	·· 11.2	258°55.4	·· 49.1	22°50.0	·· 46.5	37°48.1	·· 26.5
10	8°34.0	321°35.1	12.1	273°56.2	49.1	37°52.1	46.4	52°50.5	26.5
11	23°36.5	336°34.4	13.1	288°57.0	49.0	52°54.2	46.3	67°52.8	26.5
12	38°38.9	351°33.8	N17°14.0	303°57.8	N24°49.0	67°56.4	S12°46.2	82°55.2	S17°26.4
13	53°41.4	6°33.2	14.9	318°58.6	48.9	82°58.5	46.1	97°57.6	26.4
14	68°43.9	21°32.6	15.8	333°59.4	48.8	98°00.6	45.9	113°00.0	26.4
15	83°46.3	36°32.0	·· 16.8	349°00.2	·· 48.8	113°02.7	·· 45.8	128°02.3	·· 26.4
16	98°48.8	51°31.4	17.7	4°01.0	48.7	128°04.8	45.7	143°04.7	26.4
17	113°51.3	66°30.8	18.6	19°01.8	48.7	143°06.9	45.6	158°07.1	26.3
18	128°53.7	81°30.1	N17°19.5	34°02.6	N24°48.6	158°09.1	S12°45.5	173°09.4	S17°26.3
19	143°56.2	96°29.5	20.5	49°03.4	48.6	173°11.2	45.4	188°11.8	26.3
20	158°58.7	111°28.9	21.4	64°04.1	48.5	188°13.3	45.2	203°14.2	26.3
21	174°01.1	126°28.3	·· 22.3	79°04.9	·· 48.4	203°15.4	·· 45.1	218°16.6	·· 26.3
22	189°03.6	141°27.7	23.2	94°05.7	48.4	218°17.5	45.0	233°18.9	26.2
23	204°06.1	156°27.1	24.1	109°06.5	48.3	233°19.7	44.9	248°21.3	26.2
Mer.pass.	09:26	ν -0.6′	d 0.9′	m -3.89	ν 0.8′	d -0.1′	m 1.56	ν 2.1′	d -0.1′ m -2.20	ν 2.4′	d -0.0′ m 0.66

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.2
Ankaa	353°10.6	-42°11.5
Schedar	349°34.9	56°38.9
Diphda	348°50.7	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.0	23°33.5
Polaris	315°53.9	89°21.2
Acamar	315°14.5	-40°13.4
Menkar	314°09.6	4°10.2
Mirfak	308°33.1	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.0	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°16.0	-59°34.9
Suhail	222°48.5	-43°31.3
Miaplacidus	221°38.6	-69°48.5
Alphard	217°50.7	-8°45.2
Regulus	207°37.6	11°51.8
Dubhe	193°44.5	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.1
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.5
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.7	-60°55.3
Kochab	137°18.7	74°04.1
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.5
Antares	112°19.2	-26°28.7
Atria	107°15.7	-69°03.7
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.0
Rasalhague	96°01.1	12°32.6
Eltanin	90°43.3	51°28.9
Kaus Aust.	83°36.3	-34°22.3
Vega	80°35.0	38°48.0
Nunki	75°51.4	-26°16.1
Altair	62°02.8	8°55.3
Peacock	53°10.5	-56°39.8
Deneb	49°27.8	45°21.0
Enif	33°41.9	9°58.1
Al Na'ir	27°37.0	-46°51.4
Fomalhaut	15°18.1	-29°30.6
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

Apr 28 Wed	SHA	Mer.pass
Venus	315°58.7	12:32
Mars	266°59.2	15:46
Jupiter	29°38.7	07:36
Saturn	44°22.2	06:37

Apr 29 Thu	SHA	Mer.pass
Venus	314°45.4	12:33
Mars	266°19.1	15:45
Jupiter	29°30.1	07:32
Saturn	44°19.8	06:33

Apr 30 Fri	SHA	Mer.pass
Venus	313°31.8	12:34
Mars	265°38.9	15:44
Jupiter	29°21.6	07:29
Saturn	44°17.4	06:29

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.0	N14°09.2	348°01.5	6.2′	S15°57.8	13.1′	61.3′
1	195°37.1	10.0	2°26.8	6.2′	16°10.9	13.0′	61.3′
2	210°37.2	10.8	16°51.9	6.1′	16°23.9	12.9′	61.2′
3	225°37.3	·· 11.5	31°17.0	6.0′	16°36.9	12.8′	61.2′
4	240°37.4	12.3	45°42.1	5.9′	16°49.7	12.7′	61.2′
5	255°37.4	13.1	60°07.0	5.9′	17°02.3	12.6′	61.2′
6	270°37.5	N14°13.9	74°31.9	5.8′	S17°14.9	12.4′	61.2′
7	285°37.6	14.7	88°56.7	5.7′	17°27.4	12.3′	61.2′
8	300°37.7	15.5	103°21.4	5.7′	17°39.7	12.2′	61.2′
9	315°37.8	·· 16.2	117°46.1	5.6′	17°51.9	12.1′	61.2′
10	330°37.9	17.0	132°10.7	5.5′	18°04.0	11.9′	61.2′
11	345°38.0	17.8	146°35.2	5.4′	18°15.9	11.8′	61.2′
12	0°38.1	N14°18.6	160°59.6	5.4′	S18°27.7	11.7′	61.2′
13	15°38.2	19.4	175°24.0	5.3′	18°39.4	11.6′	61.1′
14	30°38.3	20.1	189°48.3	5.2′	18°51.0	11.4′	61.1′
15	45°38.4	·· 20.9	204°12.5	5.2′	19°02.4	11.3′	61.1′
16	60°38.4	21.7	218°36.7	5.1′	19°13.7	11.1′	61.1′
17	75°38.5	22.5	233°00.8	5.0′	19°24.8	11.0′	61.1′
18	90°38.6	N14°23.3	247°24.8	5.0′	S19°35.8	10.9′	61.1′
19	105°38.7	24.0	261°48.8	4.9′	19°46.7	10.7′	61.1′
20	120°38.8	24.8	276°12.7	4.8′	19°57.4	10.6′	61.0′
21	135°38.9	·· 25.6	290°36.5	4.8′	20°08.0	10.4′	61.0′
22	150°39.0	26.4	305°00.3	4.7′	20°18.4	10.3′	61.0′
23	165°39.1	27.2	319°24.0	4.6′	20°28.7	10.1′	61.0′
	SD = 15.9′	d = 0.8′	SD = 16.7′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.2	N14°27.9	333°47.6	4.6′	S20°38.8	10.0′	61.0′
1	195°39.2	28.7	348°11.2	4.5′	20°48.8	9.8′	61.0′
2	210°39.3	29.5	2°34.7	4.5′	20°58.6	9.7′	60.9′
3	225°39.4	·· 30.3	16°58.2	4.4′	21°08.3	9.5′	60.9′
4	240°39.5	31.0	31°21.6	4.4′	21°17.8	9.4′	60.9′
5	255°39.6	31.8	45°44.9	4.3′	21°27.1	9.2′	60.9′
6	270°39.7	N14°32.6	60°08.2	4.2′	S21°36.3	9.0′	60.9′
7	285°39.8	33.4	74°31.5	4.2′	21°45.4	8.9′	60.8′
8	300°39.8	34.1	88°54.7	4.1′	21°54.3	8.7′	60.8′
9	315°39.9	·· 34.9	103°17.8	4.1′	22°03.0	8.6′	60.8′
10	330°40.0	35.7	117°40.9	4.0′	22°11.5	8.4′	60.8′
11	345°40.1	36.4	132°03.9	4.0′	22°19.9	8.2′	60.8′
12	0°40.2	N14°37.2	146°26.9	4.0′	S22°28.1	8.1′	60.7′
13	15°40.3	38.0	160°49.9	3.9′	22°36.2	7.9′	60.7′
14	30°40.4	38.8	175°12.8	3.9′	22°44.1	7.7′	60.7′
15	45°40.4	·· 39.5	189°35.7	3.8′	22°51.8	7.6′	60.7′
16	60°40.5	40.3	203°58.5	3.8′	22°59.4	7.4′	60.6′
17	75°40.6	41.1	218°21.3	3.8′	23°06.7	7.2′	60.6′
18	90°40.7	N14°41.8	232°44.0	3.7′	S23°13.9	7.0′	60.6′
19	105°40.8	42.6	247°06.8	3.7′	23°21.0	6.9′	60.6′
20	120°40.9	43.4	261°29.4	3.7′	23°27.8	6.7′	60.5′
21	135°40.9	·· 44.1	275°52.1	3.6′	23°34.5	6.5′	60.5′
22	150°41.0	44.9	290°14.7	3.6′	23°41.0	6.3′	60.5′
23	165°41.1	45.7	304°37.3	3.6′	23°47.4	6.2′	60.5′
	SD = 15.9′	d = 0.8′	SD = 16.6′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.2	N14°46.4	318°59.9	3.6′	S23°53.5	6.0′	60.4′
1	195°41.3	47.2	333°22.5	3.5′	23°59.5	5.8′	60.4′
2	210°41.3	48.0	347°45.0	3.5′	24°05.3	5.6′	60.4′
3	225°41.4	·· 48.7	2°07.5	3.5′	24°11.0	5.4′	60.3′
4	240°41.5	49.5	16°30.0	3.5′	24°16.4	5.3′	60.3′
5	255°41.6	50.3	30°52.5	3.5′	24°21.7	5.1′	60.3′
6	270°41.7	N14°51.0	45°15.0	3.5′	S24°26.8	4.9′	60.3′
7	285°41.8	51.8	59°37.5	3.5′	24°31.7	4.7′	60.2′
8	300°41.8	52.6	73°59.9	3.5′	24°36.4	4.5′	60.2′
9	315°41.9	·· 53.3	88°22.4	3.4′	24°40.9	4.4′	60.2′
10	330°42.0	54.1	102°44.8	3.4′	24°45.3	4.2′	60.1′
11	345°42.1	54.8	117°07.3	3.4′	24°49.5	4.0′	60.1′
12	0°42.2	N14°55.6	131°29.7	3.4′	S24°53.5	3.8′	60.1′
13	15°42.2	56.4	145°52.2	3.5′	24°57.3	3.6′	60.0′
14	30°42.3	57.1	160°14.6	3.5′	25°00.9	3.5′	60.0′
15	45°42.4	·· 57.9	174°37.1	3.5′	25°04.4	3.3′	60.0′
16	60°42.5	58.6	188°59.5	3.5′	25°07.7	3.1′	59.9′
17	75°42.5	14°59.4	203°22.0	3.5′	25°10.7	2.9′	59.9′
18	90°42.6	N15°00.2	217°44.5	3.5′	S25°13.6	2.7′	59.9′
19	105°42.7	00.9	232°07.0	3.5′	25°16.4	2.5′	59.8′
20	120°42.8	01.7	246°29.6	3.6′	25°18.9	2.4′	59.8′
21	135°42.9	·· 02.4	260°52.1	3.6′	25°21.3	2.2′	59.8′
22	150°42.9	03.2	275°14.7	3.6′	25°23.5	2.0′	59.7′
23	165°43.0	04.0	289°37.3	3.6′	25°25.4	1.8′	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°	–:–	–:–	02:42	21:17	–:–	–:–
68°	–:–	01:25	03:06	20:52	22:38	–:–
66°	–:–	02:06	03:25	20:33	21:53	–:–
64°	–:–	02:34	03:40	20:17	21:24	–:–
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	04:28	19:28	20:10	21:04
52°	03:06	03:56	04:34	19:22	20:00	20:50
50°	03:17	04:04	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	05:03	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	17:02	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	17:17	17:58
56°	05:57	06:42	07:21	16:33	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 Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	▬	▬	▬	02:25	▬	▬
N 70°	▬	▬	▬	03:10	▬	▬
68°	·· ··	00:30	▬	03:41	02:53	▬
66°	23:37	▬	▬	04:04	03:47	▬
64°	23:05	·· ··	01:15	04:22	04:20	04:19
62°	22:42	·· ··	00:35	04:37	04:44	05:00
60°	22:23	·· ··	00:07	04:49	05:03	05:28
N 58°	22:07	23:46	·· ··	05:00	05:20	05:50
56°	21:54	23:28	·· ··	05:10	05:34	06:08
54°	21:43	23:13	·· ··	05:19	05:46	06:23
52°	21:33	23:00	·· ··	05:26	05:56	06:36
50°	21:24	22:49	·· ··	05:33	06:06	06:48
45°	21:05	22:26	23:38	05:48	06:26	07:12
N 40°	20:50	22:07	23:17	06:00	06:42	07:32
35°	20:37	21:51	23:00	06:11	06:56	07:48
30°	20:26	21:38	22:45	06:20	07:08	08:02
20°	20:07	21:15	22:20	06:36	07:29	08:26
N 10°	19:50	20:55	21:59	06:50	07:47	08:47
0°	19:35	20:36	21:39	07:04	08:04	09:06
S 10°	19:20	20:18	21:19	07:17	08:21	09:25
20°	19:04	19:58	20:57	07:31	08:39	09:46
30°	18:45	19:36	20:33	07:47	09:00	10:10
35°	18:35	19:23	20:18	07:57	09:12	10:25
40°	18:22	19:08	20:02	08:08	09:27	10:41
45°	18:08	18:50	19:42	08:21	09:44	11:01
S 50°	17:51	18:28	19:16	08:37	10:05	11:25
52°	17:43	18:18	19:04	08:44	10:15	11:37
54°	17:34	18:06	18:51	08:52	10:26	11:51
56°	17:24	17:52	18:35	09:02	10:39	12:06
58°	17:12	17:37	18:16	09:12	10:54	12:25
S 60°	16:59	17:18	17:52	09:25	11:12	12:48

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 16-18 99-88%
28	02:28	02:32	11:57	00:50	13:19	
29	02:37	02:41	11:57	01:49	14:20	
30	02:45	02:49	11:57	02:51	15:22	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°08.5	171°26.4	N17°25.1	124°07.3	N24°48.3	248°21.8	S12°44.8	263°23.7	S17°26.2
1	234°11.0	186°25.8	26.0	139°08.1	48.2	263°23.9	44.7	278°26.0	26.2
2	249°13.4	201°25.2	26.9	154°08.9	48.2	278°26.0	44.6	293°28.4	26.2
3	264°15.9	216°24.6	·· 27.8	169°09.7	·· 48.1	293°28.1	·· 44.4	308°30.8	·· 26.1
4	279°18.4	231°24.0	28.7	184°10.5	48.0	308°30.3	44.3	323°33.2	26.1
5	294°20.8	246°23.3	29.6	199°11.3	48.0	323°32.4	44.2	338°35.5	26.1
6	309°23.3	261°22.7	N17°30.6	214°12.1	N24°47.9	338°34.5	S12°44.1	353°37.9	S17°26.1
7	324°25.8	276°22.1	31.5	229°12.9	47.9	353°36.6	44.0	8°40.3	26.1
8	339°28.2	291°21.5	32.4	244°13.6	47.8	8°38.7	43.9	23°42.6	26.0
9	354°30.7	306°20.8	·· 33.3	259°14.4	·· 47.7	23°40.9	·· 43.8	38°45.0	·· 26.0
10	9°33.2	321°20.2	34.2	274°15.2	47.7	38°43.0	43.6	53°47.4	26.0
11	24°35.6	336°19.6	35.1	289°16.0	47.6	53°45.1	43.5	68°49.8	26.0
12	39°38.1	351°19.0	N17°36.0	304°16.8	N24°47.6	68°47.2	S12°43.4	83°52.1	S17°26.0
13	54°40.6	6°18.3	36.9	319°17.6	47.5	83°49.3	43.3	98°54.5	25.9
14	69°43.0	21°17.7	37.9	334°18.4	47.4	98°51.5	43.2	113°56.9	25.9
15	84°45.5	36°17.1	·· 38.8	349°19.2	·· 47.4	113°53.6	·· 43.1	128°59.3	·· 25.9
16	99°47.9	51°16.5	39.7	4°20.0	47.3	128°55.7	43.0	144°01.6	25.9
17	114°50.4	66°15.8	40.6	19°20.8	47.2	143°57.8	42.8	159°04.0	25.9
18	129°52.9	81°15.2	N17°41.5	34°21.6	N24°47.2	159°00.0	S12°42.7	174°06.4	S17°25.8
19	144°55.3	96°14.6	42.4	49°22.4	47.1	174°02.1	42.6	189°08.8	25.8
20	159°57.8	111°14.0	43.3	64°23.1	47.1	189°04.2	42.5	204°11.1	25.8
21	175°00.3	126°13.3	·· 44.2	79°23.9	·· 47.0	204°06.3	·· 42.4	219°13.5	·· 25.8
22	190°02.7	141°12.7	45.1	94°24.7	46.9	219°08.5	42.3	234°15.9	25.8
23	205°05.2	156°12.1	46.0	109°25.5	46.9	234°10.6	42.2	249°18.3	25.7
Mer.pass.	09:22	ν -0.6′	d 0.9′	m -3.89	ν 0.8′	d -0.1′	m 1.57	ν 2.1′	d -0.1′ m -2.20	ν 2.4′	d -0.0′ m 0.66

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°07.7	171°11.4	N17°46.9	124°26.3	N24°46.8	249°12.7	S12°42.1	264°20.6	S17°25.7
1	235°10.1	186°10.8	47.8	139°27.1	46.7	264°14.8	41.9	279°23.0	25.7
2	250°12.6	201°10.2	48.7	154°27.9	46.7	279°17.0	41.8	294°25.4	25.7
3	265°15.1	216°09.5	·· 49.6	169°28.7	·· 46.6	294°19.1	·· 41.7	309°27.8	·· 25.7
4	280°17.5	231°08.9	50.5	184°29.5	46.5	309°21.2	41.6	324°30.1	25.6
5	295°20.0	246°08.3	51.4	199°30.3	46.5	324°23.3	41.5	339°32.5	25.6
6	310°22.4	261°07.6	N17°52.3	214°31.1	N24°46.4	339°25.5	S12°41.4	354°34.9	S17°25.6
7	325°24.9	276°07.0	53.2	229°31.9	46.3	354°27.6	41.3	9°37.3	25.6
8	340°27.4	291°06.4	54.1	244°32.6	46.3	9°29.7	41.2	24°39.6	25.6
9	355°29.8	306°05.7	·· 55.0	259°33.4	·· 46.2	24°31.8	·· 41.0	39°42.0	·· 25.5
10	10°32.3	321°05.1	55.8	274°34.2	46.1	39°34.0	40.9	54°44.4	25.5
11	25°34.8	336°04.5	56.7	289°35.0	46.1	54°36.1	40.8	69°46.8	25.5
12	40°37.2	351°03.8	N17°57.6	304°35.8	N24°46.0	69°38.2	S12°40.7	84°49.2	S17°25.5
13	55°39.7	6°03.2	58.5	319°36.6	45.9	84°40.3	40.6	99°51.5	25.5
14	70°42.2	21°02.6	17°59.4	334°37.4	45.9	99°42.5	40.5	114°53.9	25.5
15	85°44.6	36°01.9	18°00.3	349°38.2	·· 45.8	114°44.6	·· 40.4	129°56.3	·· 25.4
16	100°47.1	51°01.3	01.2	4°39.0	45.7	129°46.7	40.3	144°58.7	25.4
17	115°49.6	66°00.6	02.1	19°39.8	45.6	144°48.9	40.1	160°01.0	25.4
18	130°52.0	81°00.0	N18°03.0	34°40.6	N24°45.6	159°51.0	S12°40.0	175°03.4	S17°25.4
19	145°54.5	95°59.4	03.8	49°41.4	45.5	174°53.1	39.9	190°05.8	25.4
20	160°56.9	110°58.7	04.7	64°42.2	45.4	189°55.2	39.8	205°08.2	25.3
21	175°59.4	125°58.1	·· 05.6	79°42.9	·· 45.4	204°57.4	·· 39.7	220°10.6	·· 25.3
22	191°01.9	140°57.4	06.5	94°43.7	45.3	219°59.5	39.6	235°12.9	25.3
23	206°04.3	155°56.8	07.4	109°44.5	45.2	235°01.6	39.5	250°15.3	25.3
Mer.pass.	09:18	ν -0.6′	d 0.9′	m -3.89	ν 0.8′	d -0.1′	m 1.58	ν 2.1′	d -0.1′ m -2.21	ν 2.4′	d -0.0′ m 0.65

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°06.8	170°56.2	N18°08.2	124°45.3	N24°45.1	250°03.8	S12°39.4	265°17.7	S17°25.3
1	236°09.3	185°55.5	09.1	139°46.1	45.1	265°05.9	39.3	280°20.1	25.3
2	251°11.7	200°54.9	10.0	154°46.9	45.0	280°08.0	39.1	295°22.5	25.2
3	266°14.2	215°54.2	·· 10.9	169°47.7	·· 44.9	295°10.2	·· 39.0	310°24.8	·· 25.2
4	281°16.7	230°53.6	11.8	184°48.5	44.9	310°12.3	38.9	325°27.2	25.2
5	296°19.1	245°52.9	12.6	199°49.3	44.8	325°14.4	38.8	340°29.6	25.2
6	311°21.6	260°52.3	N18°13.5	214°50.1	N24°44.7	340°16.5	S12°38.7	355°32.0	S17°25.2
7	326°24.1	275°51.7	14.4	229°50.9	44.6	355°18.7	38.6	10°34.4	25.1
8	341°26.5	290°51.0	15.3	244°51.7	44.6	10°20.8	38.5	25°36.7	25.1
9	356°29.0	305°50.4	·· 16.1	259°52.4	·· 44.5	25°22.9	·· 38.4	40°39.1	·· 25.1
10	11°31.4	320°49.7	17.0	274°53.2	44.4	40°25.1	38.3	55°41.5	25.1
11	26°33.9	335°49.1	17.9	289°54.0	44.3	55°27.2	38.1	70°43.9	25.1
12	41°36.4	350°48.4	N18°18.7	304°54.8	N24°44.3	70°29.3	S12°38.0	85°46.3	S17°25.1
13	56°38.8	5°47.8	19.6	319°55.6	44.2	85°31.5	37.9	100°48.6	25.0
14	71°41.3	20°47.1	20.5	334°56.4	44.1	100°33.6	37.8	115°51.0	25.0
15	86°43.8	35°46.5	·· 21.4	349°57.2	·· 44.0	115°35.7	·· 37.7	130°53.4	·· 25.0
16	101°46.2	50°45.8	22.2	4°58.0	43.9	130°37.9	37.6	145°55.8	25.0
17	116°48.7	65°45.2	23.1	19°58.8	43.9	145°40.0	37.5	160°58.2	25.0
18	131°51.2	80°44.5	N18°24.0	34°59.6	N24°43.8	160°42.1	S12°37.4	176°00.6	S17°25.0
19	146°53.6	95°43.9	24.8	50°00.4	43.7	175°44.3	37.3	191°02.9	24.9
20	161°56.1	110°43.2	25.7	65°01.2	43.6	190°46.4	37.2	206°05.3	24.9
21	176°58.5	125°42.6	·· 26.5	80°02.0	·· 43.6	205°48.5	·· 37.0	221°07.7	·· 24.9
22	192°01.0	140°41.9	27.4	95°02.7	43.5	220°50.7	36.9	236°10.1	24.9
23	207°03.5	155°41.3	28.3	110°03.5	43.4	235°52.8	36.8	251°12.5	24.9
Mer.pass.	09:14	ν -0.6′	d 0.9′	m -3.89	ν 0.8′	d -0.1′	m 1.59	ν 2.1′	d -0.1′ m -2.21	ν 2.4′	d -0.0′ m 0.65

Stars	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.5	-42°11.5
Schedar	349°34.9	56°38.9
Diphda	348°50.6	-17°52.3
Achernar	335°23.1	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°53.6	89°21.2
Acamar	315°14.5	-40°13.3
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.1
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.1	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°16.0	-59°34.9
Suhail	222°48.5	-43°31.3
Miaplacidus	221°38.7	-69°48.5
Alphard	217°50.7	-8°45.2
Regulus	207°37.6	11°51.8
Dubhe	193°44.5	61°38.4
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.1
Gacrux	171°54.4	-57°14.0
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.5
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.7	-60°55.3
Kochab	137°18.7	74°04.1
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.6
Antares	112°19.2	-26°28.7
Atria	107°15.7	-69°03.7
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.0
Rasalhague	96°01.1	12°32.6
Eltanin	90°43.2	51°28.9
Kaus Aust.	83°36.3	-34°22.3
Vega	80°35.0	38°48.0
Nunki	75°51.3	-26°16.1
Altair	62°02.8	8°55.3
Peacock	53°10.5	-56°39.8
Deneb	49°27.8	45°21.0
Enif	33°41.8	9°58.1
Al Na'ir	27°36.9	-46°51.4
Fomalhaut	15°18.1	-29°30.6
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

May 01 Sat	SHA	Mer.pass
Venus	312°17.9	12:35
Mars	264°58.8	15:43
Jupiter	29°13.3	07:26
Saturn	44°15.1	06:25

May 02 Sun	SHA	Mer.pass
Venus	311°03.8	12:36
Mars	264°18.7	15:41
Jupiter	29°05.0	07:22
Saturn	44°13.0	06:22

May 03 Mon	SHA	Mer.pass
Venus	309°49.4	12:37
Mars	263°38.5	15:40
Jupiter	28°57.0	07:19
Saturn	44°10.9	06:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.1	N15°04.7	303°59.9	3.7′	S25°27.3	1.6′	59.7′
1	195°43.2	05.5	318°22.6	3.7′	25°28.9	1.5′	59.6′
2	210°43.2	06.2	332°45.3	3.7′	25°30.4	1.3′	59.6′
3	225°43.3	·· 07.0	347°08.0	3.8′	25°31.6	1.1′	59.6′
4	240°43.4	07.7	1°30.8	3.8′	25°32.7	0.9′	59.5′
5	255°43.5	08.5	15°53.6	3.8′	25°33.6	0.7′	59.5′
6	270°43.5	N15°09.2	30°16.4	3.9′	S25°34.4	0.6′	59.5′
7	285°43.6	10.0	44°39.3	3.9′	25°34.9	0.4′	59.4′
8	300°43.7	10.7	59°02.3	4.0′	25°35.3	0.2′	59.4′
9	315°43.8	·· 11.5	73°25.2	4.0′	25°35.5	0.0′	59.3′
10	330°43.8	12.2	87°48.3	4.1′	25°35.5	-0.2′	59.3′
11	345°43.9	13.0	102°11.3	4.1′	25°35.4	-0.3′	59.3′
12	0°44.0	N15°13.7	116°34.5	4.2′	S25°35.1	-0.5′	59.2′
13	15°44.1	14.5	130°57.7	4.2′	25°34.6	-0.7′	59.2′
14	30°44.1	15.2	145°20.9	4.3′	25°33.9	-0.8′	59.2′
15	45°44.2	·· 16.0	159°44.2	4.4′	25°33.0	-1.0′	59.1′
16	60°44.3	16.7	174°07.6	4.4′	25°32.0	-1.2′	59.1′
17	75°44.3	17.5	188°31.0	4.5′	25°30.8	-1.4′	59.1′
18	90°44.4	N15°18.2	202°54.5	4.6′	S25°29.5	-1.5′	59.0′
19	105°44.5	19.0	217°18.1	4.6′	25°27.9	-1.7′	59.0′
20	120°44.6	19.7	231°41.7	4.7′	25°26.2	-1.9′	58.9′
21	135°44.6	·· 20.5	246°05.4	4.8′	25°24.4	-2.0′	58.9′
22	150°44.7	21.2	260°29.2	4.8′	25°22.3	-2.2′	58.9′
23	165°44.8	22.0	274°53.0	4.9′	25°20.2	-2.4′	58.8′
	SD = 15.9′	d = 0.8′	SD = 16.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.8	N15°22.7	289°16.9	5.0′	S25°17.8	-2.5′	58.8′
1	195°44.9	23.5	303°40.9	5.1′	25°15.3	-2.7′	58.8′
2	210°45.0	24.2	318°05.0	5.2′	25°12.6	-2.8′	58.7′
3	225°45.1	·· 25.0	332°29.2	5.2′	25°09.7	-3.0′	58.7′
4	240°45.1	25.7	346°53.4	5.3′	25°06.7	-3.2′	58.6′
5	255°45.2	26.5	1°17.7	5.4′	25°03.6	-3.3′	58.6′
6	270°45.3	N15°27.2	15°42.1	5.5′	S25°00.2	-3.5′	58.6′
7	285°45.3	27.9	30°06.6	5.6′	24°56.8	-3.6′	58.5′
8	300°45.4	28.7	44°31.2	5.7′	24°53.1	-3.8′	58.5′
9	315°45.5	·· 29.4	58°55.9	5.8′	24°49.3	-3.9′	58.5′
10	330°45.5	30.2	73°20.6	5.8′	24°45.4	-4.1′	58.4′
11	345°45.6	30.9	87°45.5	5.9′	24°41.3	-4.2′	58.4′
12	0°45.7	N15°31.6	102°10.4	6.0′	S24°37.1	-4.4′	58.3′
13	15°45.7	32.4	116°35.4	6.1′	24°32.7	-4.5′	58.3′
14	30°45.8	33.1	131°00.6	6.2′	24°28.1	-4.7′	58.3′
15	45°45.9	·· 33.9	145°25.8	6.3′	24°23.4	-4.8′	58.2′
16	60°45.9	34.6	159°51.1	6.4′	24°18.6	-5.0′	58.2′
17	75°46.0	35.3	174°16.5	6.5′	24°13.6	-5.1′	58.2′
18	90°46.1	N15°36.1	188°42.0	6.6′	S24°08.5	-5.3′	58.1′
19	105°46.1	36.8	203°07.6	6.7′	24°03.3	-5.4′	58.1′
20	120°46.2	37.6	217°33.3	6.8′	23°57.9	-5.5′	58.0′
21	135°46.3	·· 38.3	231°59.2	6.9′	23°52.3	-5.7′	58.0′
22	150°46.3	39.0	246°25.1	7.0′	23°46.6	-5.8′	58.0′
23	165°46.4	39.8	260°51.1	7.1′	23°40.8	-5.9′	57.9′
	SD = 15.9′	d = 0.7′	SD = 16.0′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.5	N15°40.5	275°17.2	7.2′	S23°34.9	-6.1′	57.9′
1	195°46.5	41.2	289°43.4	7.3′	23°28.8	-6.2′	57.9′
2	210°46.6	42.0	304°09.7	7.4′	23°22.6	-6.3′	57.8′
3	225°46.7	·· 42.7	318°36.2	7.5′	23°16.3	-6.5′	57.8′
4	240°46.7	43.4	333°02.7	7.6′	23°09.8	-6.6′	57.7′
5	255°46.8	44.2	347°29.3	7.7′	23°03.2	-6.7′	57.7′
6	270°46.8	N15°44.9	1°56.1	7.8′	S22°56.5	-6.8′	57.7′
7	285°46.9	45.6	16°22.9	8.0′	22°49.7	-7.0′	57.6′
8	300°47.0	46.4	30°49.9	8.1′	22°42.7	-7.1′	57.6′
9	315°47.0	·· 47.1	45°16.9	8.2′	22°35.6	-7.2′	57.6′
10	330°47.1	47.8	59°44.1	8.3′	22°28.4	-7.3′	57.5′
11	345°47.2	48.6	74°11.4	8.4′	22°21.1	-7.4′	57.5′
12	0°47.2	N15°49.3	88°38.7	8.5′	S22°13.6	-7.6′	57.5′
13	15°47.3	50.0	103°06.2	8.6′	22°06.1	-7.7′	57.4′
14	30°47.3	50.7	117°33.8	8.7′	21°58.4	-7.8′	57.4′
15	45°47.4	·· 51.5	132°01.5	8.8′	21°50.6	-7.9′	57.3′
16	60°47.5	52.2	146°29.3	8.9′	21°42.7	-8.0′	57.3′
17	75°47.5	52.9	160°57.2	9.0′	21°34.7	-8.1′	57.3′
18	90°47.6	N15°53.7	175°25.2	9.1′	S21°26.6	-8.2′	57.2′
19	105°47.6	54.4	189°53.4	9.2′	21°18.4	-8.3′	57.2′
20	120°47.7	55.1	204°21.6	9.3′	21°10.1	-8.4′	57.2′
21	135°47.8	·· 55.8	218°49.9	9.4′	21°01.7	-8.5′	57.1′
22	150°47.8	56.6	233°18.4	9.6′	20°53.1	-8.6′	57.1′
23	165°47.9	57.3	247°46.9	9.7′	20°44.5	-8.7′	57.1′
	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°	–:–	00:53	02:52	21:06	23:16	–:–
66°	–:–	01:48	03:13	20:44	22:12	–:–
64°	–:–	02:20	03:30	20:27	21:38	–:–
62°	00:46	02:43	03:43	20:13	21:14	23:20
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	04:14	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	20:57
50°	03:11	03:58	04:34	19:20	19:57	20:45
45°	03:35	04:15	04:48	19:07	19:40	20:20
N 40°	03:54	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	18:13
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	17:51
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 Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	▬	▬	▬	▬
66°	▬	▬	04:47	▬	▬	07:07
64°	03:14	03:54	03:56	04:32	06:00	07:58
62°	02:08	03:01	03:24	05:38	06:52	08:29
60°	01:33	02:29	03:00	06:13	07:24	08:52
N 58°	01:08	02:05	02:41	06:38	07:48	09:11
56°	00:48	01:46	02:25	06:59	08:07	09:27
54°	00:31	01:30	02:11	07:16	08:23	09:40
52°	00:16	01:16	01:59	07:30	08:37	09:52
50°	00:04	01:03	01:48	07:43	08:49	10:02
45°	·· ··	00:38	01:26	08:09	09:14	10:24
N 40°	·· ··	00:18	01:08	08:29	09:34	10:41
35°	·· ··	00:01	00:52	08:47	09:50	10:55
30°	23:46	·· ··	00:39	09:01	10:04	11:08
20°	23:22	·· ··	00:17	09:27	10:28	11:29
N 10°	23:00	23:57	·· ··	09:48	10:49	11:48
0°	22:40	23:39	·· ··	10:08	11:09	12:05
S 10°	22:20	23:20	·· ··	10:29	11:28	12:22
20°	21:59	23:01	·· ··	10:50	11:49	12:40
30°	21:34	22:38	23:41	11:15	12:12	13:01
35°	21:20	22:24	23:29	11:30	12:26	13:13
40°	21:03	22:09	23:16	11:47	12:42	13:27
45°	20:42	21:50	23:01	12:07	13:01	13:44
S 50°	20:17	21:27	22:42	12:33	13:25	14:04
52°	20:05	21:16	22:32	12:45	13:37	14:13
54°	19:51	21:03	22:22	12:59	13:49	14:24
56°	19:34	20:49	22:11	13:16	14:04	14:36
58°	19:15	20:32	21:57	13:36	14:22	14:50
S 60°	18:50	20:11	21:42	14:00	14:43	15:06

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 19-21 80-59%
01	02:52	02:56	11:57	03:54	16:24	
02	02:59	03:03	11:57	04:55	17:24	
03	03:06	03:09	11:57	05:52	18:19	

DUT1 = UT1-UTC = -0.1825 sec ΔT = TT-UT1 = +69.3665 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°05.9	170°40.6	N18°29.1	125°04.3	N24°43.3	250°55.0	S12°36.7	266°14.8	S17°24.9
1	237°08.4	185°39.9	30.0	140°05.1	43.2	265°57.1	36.6	281°17.2	24.8
2	252°10.9	200°39.3	30.9	155°05.9	43.2	280°59.2	36.5	296°19.6	24.8
3	267°13.3	215°38.6	·· 31.7	170°06.7	·· 43.1	296°01.4	·· 36.4	311°22.0	·· 24.8
4	282°15.8	230°38.0	32.6	185°07.5	43.0	311°03.5	36.3	326°24.4	24.8
5	297°18.3	245°37.3	33.4	200°08.3	42.9	326°05.6	36.2	341°26.8	24.8
6	312°20.7	260°36.7	N18°34.3	215°09.1	N24°42.8	341°07.8	S12°36.1	356°29.2	S17°24.7
7	327°23.2	275°36.0	35.1	230°09.9	42.8	356°09.9	36.0	11°31.5	24.7
8	342°25.7	290°35.4	36.0	245°10.7	42.7	11°12.0	35.8	26°33.9	24.7
9	357°28.1	305°34.7	·· 36.8	260°11.5	·· 42.6	26°14.2	·· 35.7	41°36.3	·· 24.7
10	12°30.6	320°34.0	37.7	275°12.2	42.5	41°16.3	35.6	56°38.7	24.7
11	27°33.0	335°33.4	38.5	290°13.0	42.4	56°18.5	35.5	71°41.1	24.7
12	42°35.5	350°32.7	N18°39.4	305°13.8	N24°42.3	71°20.6	S12°35.4	86°43.5	S17°24.7
13	57°38.0	5°32.1	40.2	320°14.6	42.3	86°22.7	35.3	101°45.8	24.6
14	72°40.4	20°31.4	41.1	335°15.4	42.2	101°24.9	35.2	116°48.2	24.6
15	87°42.9	35°30.7	·· 41.9	350°16.2	·· 42.1	116°27.0	·· 35.1	131°50.6	·· 24.6
16	102°45.4	50°30.1	42.8	5°17.0	42.0	131°29.2	35.0	146°53.0	24.6
17	117°47.8	65°29.4	43.6	20°17.8	41.9	146°31.3	34.9	161°55.4	24.6
18	132°50.3	80°28.7	N18°44.5	35°18.6	N24°41.8	161°33.4	S12°34.8	176°57.8	S17°24.6
19	147°52.8	95°28.1	45.3	50°19.4	41.8	176°35.6	34.7	192°00.2	24.5
20	162°55.2	110°27.4	46.2	65°20.2	41.7	191°37.7	34.5	207°02.6	24.5
21	177°57.7	125°26.8	·· 47.0	80°21.0	·· 41.6	206°39.9	·· 34.4	222°04.9	·· 24.5
22	193°00.2	140°26.1	47.9	95°21.8	41.5	221°42.0	34.3	237°07.3	24.5
23	208°02.6	155°25.4	48.7	110°22.5	41.4	236°44.1	34.2	252°09.7	24.5
Mer.pass.	09:10	ν -0.7′	d 0.9′	m -3.89	ν 0.8′	d -0.1′	m 1.59	ν 2.1′	d -0.1′ m -2.22	ν 2.4′	d -0.0′ m 0.65

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°05.1	170°24.8	N18°49.5	125°23.3	N24°41.3	251°46.3	S12°34.1	267°12.1	S17°24.5
1	238°07.5	185°24.1	50.4	140°24.1	41.2	266°48.4	34.0	282°14.5	24.4
2	253°10.0	200°23.4	51.2	155°24.9	41.2	281°50.6	33.9	297°16.9	24.4
3	268°12.5	215°22.8	·· 52.1	170°25.7	·· 41.1	296°52.7	·· 33.8	312°19.3	·· 24.4
4	283°14.9	230°22.1	52.9	185°26.5	41.0	311°54.8	33.7	327°21.6	24.4
5	298°17.4	245°21.4	53.7	200°27.3	40.9	326°57.0	33.6	342°24.0	24.4
6	313°19.9	260°20.8	N18°54.6	215°28.1	N24°40.8	341°59.1	S12°33.5	357°26.4	S17°24.4
7	328°22.3	275°20.1	55.4	230°28.9	40.7	357°01.3	33.4	12°28.8	24.3
8	343°24.8	290°19.4	56.2	245°29.7	40.6	12°03.4	33.3	27°31.2	24.3
9	358°27.3	305°18.7	·· 57.1	260°30.5	·· 40.5	27°05.6	·· 33.2	42°33.6	·· 24.3
10	13°29.7	320°18.1	57.9	275°31.3	40.4	42°07.7	33.0	57°36.0	24.3
11	28°32.2	335°17.4	58.7	290°32.1	40.4	57°09.8	32.9	72°38.4	24.3
12	43°34.6	350°16.7	N18°59.6	305°32.8	N24°40.3	72°12.0	S12°32.8	87°40.8	S17°24.3
13	58°37.1	5°16.1	19°00.4	320°33.6	40.2	87°14.1	32.7	102°43.1	24.3
14	73°39.6	20°15.4	01.2	335°34.4	40.1	102°16.3	32.6	117°45.5	24.2
15	88°42.0	35°14.7	·· 02.0	350°35.2	·· 40.0	117°18.4	·· 32.5	132°47.9	·· 24.2
16	103°44.5	50°14.0	02.9	5°36.0	39.9	132°20.6	32.4	147°50.3	24.2
17	118°47.0	65°13.4	03.7	20°36.8	39.8	147°22.7	32.3	162°52.7	24.2
18	133°49.4	80°12.7	N19°04.5	35°37.6	N24°39.7	162°24.9	S12°32.2	177°55.1	S17°24.2
19	148°51.9	95°12.0	05.3	50°38.4	39.6	177°27.0	32.1	192°57.5	24.2
20	163°54.4	110°11.3	06.2	65°39.2	39.5	192°29.1	32.0	207°59.9	24.2
21	178°56.8	125°10.7	·· 07.0	80°40.0	·· 39.4	207°31.3	·· 31.9	223°02.3	·· 24.1
22	193°59.3	140°10.0	07.8	95°40.8	39.3	222°33.4	31.8	238°04.7	24.1
23	209°01.8	155°09.3	08.6	110°41.6	39.3	237°35.6	31.7	253°07.1	24.1
Mer.pass.	09:06	ν -0.7′	d 0.8′	m -3.89	ν 0.8′	d -0.1′	m 1.60	ν 2.1′	d -0.1′ m -2.22	ν 2.4′	d -0.0′ m 0.64

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	224°04.2	170°08.6	N19°09.4	125°42.4	N24°39.2	252°37.7	S12°31.6	268°09.4	S17°24.1
1	239°06.7	185°08.0	10.3	140°43.1	39.1	267°39.9	31.5	283°11.8	24.1
2	254°09.1	200°07.3	11.1	155°43.9	39.0	282°42.0	31.4	298°14.2	24.1
3	269°11.6	215°06.6	·· 11.9	170°44.7	·· 38.9	297°44.2	·· 31.2	313°16.6	·· 24.0
4	284°14.1	230°05.9	12.7	185°45.5	38.8	312°46.3	31.1	328°19.0	24.0
5	299°16.5	245°05.2	13.5	200°46.3	38.7	327°48.5	31.0	343°21.4	24.0
6	314°19.0	260°04.6	N19°14.3	215°47.1	N24°38.6	342°50.6	S12°30.9	358°23.8	S17°24.0
7	329°21.5	275°03.9	15.2	230°47.9	38.5	357°52.8	30.8	13°26.2	24.0
8	344°23.9	290°03.2	16.0	245°48.7	38.4	12°54.9	30.7	28°28.6	24.0
9	359°26.4	305°02.5	·· 16.8	260°49.5	·· 38.3	27°57.1	·· 30.6	43°31.0	·· 24.0
10	14°28.9	320°01.8	17.6	275°50.3	38.2	42°59.2	30.5	58°33.4	23.9
11	29°31.3	335°01.2	18.4	290°51.1	38.1	58°01.4	30.4	73°35.8	23.9
12	44°33.8	350°00.5	N19°19.2	305°51.9	N24°38.0	73°03.5	S12°30.3	88°38.2	S17°23.9
13	59°36.3	4°59.8	20.0	320°52.7	37.9	88°05.7	30.2	103°40.5	23.9
14	74°38.7	19°59.1	20.8	335°53.5	37.8	103°07.8	30.1	118°42.9	23.9
15	89°41.2	34°58.4	·· 21.6	350°54.2	·· 37.7	118°10.0	·· 30.0	133°45.3	·· 23.9
16	104°43.6	49°57.7	22.4	5°55.0	37.6	133°12.1	29.9	148°47.7	23.9
17	119°46.1	64°57.0	23.2	20°55.8	37.5	148°14.3	29.8	163°50.1	23.8
18	134°48.6	79°56.4	N19°24.0	35°56.6	N24°37.4	163°16.4	S12°29.7	178°52.5	S17°23.8
19	149°51.0	94°55.7	24.8	50°57.4	37.3	178°18.6	29.6	193°54.9	23.8
20	164°53.5	109°55.0	25.6	65°58.2	37.2	193°20.7	29.5	208°57.3	23.8
21	179°56.0	124°54.3	·· 26.4	80°59.0	·· 37.1	208°22.9	·· 29.4	223°59.7	·· 23.8
22	194°58.4	139°53.6	27.2	95°59.8	37.0	223°25.0	29.3	239°02.1	23.8
23	210°00.9	154°52.9	28.0	111°00.6	36.9	238°27.2	29.2	254°04.5	23.8
Mer.pass.	09:02	ν -0.7′	d 0.8′	m -3.89	ν 0.8′	d -0.1′	m 1.61	ν 2.1′	d -0.1′ m -2.23	ν 2.4′	d -0.0′ m 0.64

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.5	-42°11.4
Schedar	349°34.9	56°38.9
Diphda	348°50.6	-17°52.3
Achernar	335°23.1	-57°07.8
Hamal	327°54.9	23°33.6
Polaris	315°53.6	89°21.1
Acamar	315°14.5	-40°13.3
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.1	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.1
Pollux	243°21.1	27°58.5
Avior	234°16.0	-59°34.9
Suhail	222°48.5	-43°31.3
Miaplacidus	221°38.7	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.5	61°38.5
Denebola	182°27.8	14°27.2
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.1
Gacrux	171°54.5	-57°14.1
Alioth	166°15.2	55°50.8
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.5
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.7	74°04.1
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.6
Antares	112°19.2	-26°28.7
Atria	107°15.6	-69°03.7
Sabik	102°06.0	-15°45.0
Shaula	96°14.1	-37°07.0
Rasalhague	96°01.1	12°32.6
Eltanin	90°43.2	51°28.9
Kaus Aust.	83°36.3	-34°22.3
Vega	80°35.0	38°48.0
Nunki	75°51.3	-26°16.1
Altair	62°02.8	8°55.3
Peacock	53°10.4	-56°39.8
Deneb	49°27.8	45°21.0
Enif	33°41.8	9°58.2
Al Na'ir	27°36.9	-46°51.4
Fomalhaut	15°18.0	-29°30.6
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

May 04 Tue	SHA	Mer.pass
Venus	308°34.7	12:38
Mars	262°58.4	15:39
Jupiter	28°49.0	07:15
Saturn	44°08.9	06:14

May 05 Wed	SHA	Mer.pass
Venus	307°19.7	12:39
Mars	262°18.3	15:38
Jupiter	28°41.2	07:12
Saturn	44°07.0	06:10

May 06 Thu	SHA	Mer.pass
Venus	306°04.4	12:40
Mars	261°38.1	15:36
Jupiter	28°33.5	07:08
Saturn	44°05.2	06:06

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.9	N15°58.0	262°15.6	9.8′	S20°35.8	-8.8′	57.0′
1	195°48.0	58.7	276°44.4	9.9′	20°26.9	-8.9′	57.0′
2	210°48.1	15°59.5	291°13.2	10.0′	20°18.0	-9.0′	57.0′
3	225°48.1	16°00.2	305°42.2	10.1′	20°09.0	-9.1′	56.9′
4	240°48.2	00.9	320°11.3	10.2′	19°59.9	-9.2′	56.9′
5	255°48.2	01.6	334°40.5	10.3′	19°50.7	-9.3′	56.9′
6	270°48.3	N16°02.3	349°09.7	10.4′	S19°41.4	-9.4′	56.8′
7	285°48.3	03.1	3°39.1	10.5′	19°32.0	-9.5′	56.8′
8	300°48.4	03.8	18°08.6	10.6′	19°22.5	-9.6′	56.8′
9	315°48.5	·· 04.5	32°38.2	10.7′	19°12.9	-9.7′	56.7′
10	330°48.5	05.2	47°07.9	10.8′	19°03.3	-9.7′	56.7′
11	345°48.6	05.9	61°37.7	10.9′	18°53.5	-9.8′	56.7′
12	0°48.6	N16°06.7	76°07.6	11.0′	S18°43.7	-9.9′	56.6′
13	15°48.7	07.4	90°37.6	11.1′	18°33.8	-10.0′	56.6′
14	30°48.7	08.1	105°07.7	11.2′	18°23.8	-10.1′	56.6′
15	45°48.8	·· 08.8	119°37.9	11.3′	18°13.7	-10.1′	56.5′
16	60°48.8	09.5	134°08.2	11.4′	18°03.6	-10.2′	56.5′
17	75°48.9	10.2	148°38.6	11.5′	17°53.3	-10.3′	56.5′
18	90°49.0	N16°11.0	163°09.0	11.6′	S17°43.0	-10.4′	56.4′
19	105°49.0	11.7	177°39.6	11.7′	17°32.7	-10.4′	56.4′
20	120°49.1	12.4	192°10.3	11.8′	17°22.2	-10.5′	56.4′
21	135°49.1	·· 13.1	206°41.1	11.9′	17°11.7	-10.6′	56.3′
22	150°49.2	13.8	221°11.9	12.0′	17°01.1	-10.7′	56.3′
23	165°49.2	14.5	235°42.9	12.1′	16°50.4	-10.7′	56.3′
	SD = 15.9′	d = 0.7′	SD = 15.6′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.3	N16°15.3	250°14.0	12.1′	S16°39.7	-10.8′	56.3′
1	195°49.3	16.0	264°45.1	12.2′	16°28.9	-10.9′	56.2′
2	210°49.4	16.7	279°16.3	12.3′	16°18.1	-10.9′	56.2′
3	225°49.4	·· 17.4	293°47.7	12.4′	16°07.1	-11.0′	56.2′
4	240°49.5	18.1	308°19.1	12.5′	15°56.1	-11.1′	56.1′
5	255°49.5	18.8	322°50.6	12.6′	15°45.1	-11.1′	56.1′
6	270°49.6	N16°19.5	337°22.2	12.7′	S15°34.0	-11.2′	56.1′
7	285°49.6	20.2	351°53.8	12.8′	15°22.8	-11.2′	56.0′
8	300°49.7	20.9	6°25.6	12.8′	15°11.5	-11.3′	56.0′
9	315°49.7	·· 21.7	20°57.4	12.9′	15°00.2	-11.4′	56.0′
10	330°49.8	22.4	35°29.4	13.0′	14°48.9	-11.4′	56.0′
11	345°49.8	23.1	50°01.4	13.1′	14°37.5	-11.5′	55.9′
12	0°49.9	N16°23.8	64°33.5	13.2′	S14°26.0	-11.5′	55.9′
13	15°49.9	24.5	79°05.6	13.3′	14°14.5	-11.6′	55.9′
14	30°50.0	25.2	93°37.9	13.3′	14°02.9	-11.6′	55.8′
15	45°50.0	·· 25.9	108°10.2	13.4′	13°51.3	-11.7′	55.8′
16	60°50.1	26.6	122°42.6	13.5′	13°39.6	-11.7′	55.8′
17	75°50.1	27.3	137°15.1	13.6′	13°27.9	-11.8′	55.8′
18	90°50.2	N16°28.0	151°47.7	13.6′	S13°16.2	-11.8′	55.7′
19	105°50.2	28.7	166°20.3	13.7′	13°04.3	-11.9′	55.7′
20	120°50.3	29.4	180°53.1	13.8′	12°52.5	-11.9′	55.7′
21	135°50.3	·· 30.1	195°25.8	13.9′	12°40.6	-12.0′	55.7′
22	150°50.4	30.8	209°58.7	13.9′	12°28.6	-12.0′	55.6′
23	165°50.4	31.5	224°31.6	14.0′	12°16.6	-12.0′	55.6′
	SD = 15.9′	d = 0.7′	SD = 15.3′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.5	N16°32.2	239°04.6	14.1′	S12°04.6	-12.1′	55.6′
1	195°50.5	32.9	253°37.7	14.1′	11°52.5	-12.1′	55.6′
2	210°50.6	33.6	268°10.9	14.2′	11°40.4	-12.2′	55.5′
3	225°50.6	·· 34.3	282°44.1	14.3′	11°28.2	-12.2′	55.5′
4	240°50.6	35.0	297°17.3	14.3′	11°16.0	-12.2′	55.5′
5	255°50.7	35.7	311°50.7	14.4′	11°03.8	-12.3′	55.5′
6	270°50.7	N16°36.4	326°24.1	14.5′	S10°51.5	-12.3′	55.4′
7	285°50.8	37.1	340°57.6	14.5′	10°39.2	-12.3′	55.4′
8	300°50.8	37.8	355°31.1	14.6′	10°26.9	-12.4′	55.4′
9	315°50.9	·· 38.5	10°04.7	14.7′	10°14.5	-12.4′	55.4′
10	330°50.9	39.2	24°38.3	14.7′	10°02.1	-12.4′	55.3′
11	345°51.0	39.9	39°12.0	14.8′	09°49.6	-12.5′	55.3′
12	0°51.0	N16°40.6	53°45.8	14.8′	S09°37.2	-12.5′	55.3′
13	15°51.0	41.3	68°19.6	14.9′	09°24.7	-12.5′	55.3′
14	30°51.1	42.0	82°53.5	14.9′	09°12.1	-12.6′	55.2′
15	45°51.1	·· 42.7	97°27.5	15.0′	08°59.6	-12.6′	55.2′
16	60°51.2	43.4	112°01.4	15.0′	08°47.0	-12.6′	55.2′
17	75°51.2	44.1	126°35.5	15.1′	08°34.4	-12.6′	55.2′
18	90°51.3	N16°44.8	141°09.6	15.1′	S08°21.8	-12.7′	55.2′
19	105°51.3	45.5	155°43.7	15.2′	08°09.1	-12.7′	55.1′
20	120°51.3	46.2	170°17.9	15.2′	07°56.4	-12.7′	55.1′
21	135°51.4	·· 46.9	184°52.2	15.3′	07°43.7	-12.7′	55.1′
22	150°51.4	47.6	199°26.5	15.3′	07°31.0	-12.8′	55.1′
23	165°51.5	48.2	214°00.8	15.4′	07°18.2	-12.8′	55.0′
	SD = 15.8′	d = 0.7′	SD = 15.2′				

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

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 22-24 48-28%
04	03:12	03:14	11:57	06:45	19:10	
05	03:17	03:20	11:57	07:33	19:56	
06	03:22	03:24	11:57	08:18	20:40	

DUT1 = UT1-UTC = -0.1826 sec ΔT = TT-UT1 = +69.3666 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	225°03.4	169°52.2	N19°28.8	126°01.4	N24°36.8	253°29.3	S12°29.1	269°06.9	S17°23.8
1	240°05.8	184°51.5	29.6	141°02.2	36.7	268°31.5	29.0	284°09.3	23.7
2	255°08.3	199°50.9	30.4	156°03.0	36.6	283°33.6	28.9	299°11.7	23.7
3	270°10.7	214°50.2	·· 31.2	171°03.8	·· 36.5	298°35.8	·· 28.7	314°14.1	·· 23.7
4	285°13.2	229°49.5	32.0	186°04.5	36.4	313°37.9	28.6	329°16.5	23.7
5	300°15.7	244°48.8	32.8	201°05.3	36.3	328°40.1	28.5	344°18.9	23.7
6	315°18.1	259°48.1	N19°33.6	216°06.1	N24°36.2	343°42.2	S12°28.4	359°21.3	S17°23.7
7	330°20.6	274°47.4	34.4	231°06.9	36.1	358°44.4	28.3	14°23.7	23.7
8	345°23.1	289°46.7	35.2	246°07.7	36.0	13°46.6	28.2	29°26.1	23.6
9	0°25.5	304°46.0	·· 36.0	261°08.5	·· 35.9	28°48.7	·· 28.1	44°28.5	·· 23.6
10	15°28.0	319°45.3	36.8	276°09.3	35.8	43°50.9	28.0	59°30.9	23.6
11	30°30.5	334°44.6	37.6	291°10.1	35.7	58°53.0	27.9	74°33.2	23.6
12	45°32.9	349°43.9	N19°38.3	306°10.9	N24°35.6	73°55.2	S12°27.8	89°35.6	S17°23.6
13	60°35.4	4°43.2	39.1	321°11.7	35.5	88°57.3	27.7	104°38.0	23.6
14	75°37.9	19°42.5	39.9	336°12.5	35.4	103°59.5	27.6	119°40.4	23.6
15	90°40.3	34°41.8	·· 40.7	351°13.3	·· 35.3	119°01.6	·· 27.5	134°42.8	·· 23.6
16	105°42.8	49°41.1	41.5	6°14.1	35.2	134°03.8	27.4	149°45.2	23.5
17	120°45.2	64°40.4	42.3	21°14.9	35.1	149°06.0	27.3	164°47.6	23.5
18	135°47.7	79°39.7	N19°43.0	36°15.7	N24°35.0	164°08.1	S12°27.2	179°50.0	S17°23.5
19	150°50.2	94°39.0	43.8	51°16.4	34.8	179°10.3	27.1	194°52.4	23.5
20	165°52.6	109°38.4	44.6	66°17.2	34.7	194°12.4	27.0	209°54.8	23.5
21	180°55.1	124°37.7	·· 45.4	81°18.0	·· 34.6	209°14.6	·· 26.9	224°57.2	·· 23.5
22	195°57.6	139°37.0	46.2	96°18.8	34.5	224°16.7	26.8	239°59.6	23.5
23	211°00.0	154°36.3	46.9	111°19.6	34.4	239°18.9	26.7	255°02.0	23.5
Mer.pass.	08:58	ν -0.7′	d 0.8′	m -3.89	ν 0.8′	d -0.1′	m 1.61	ν 2.2′	d -0.1′ m -2.24	ν 2.4′	d -0.0′ m 0.64

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	226°02.5	169°35.6	N19°47.7	126°20.4	N24°34.3	254°21.1	S12°26.6	270°04.4	S17°23.4
1	241°05.0	184°34.9	48.5	141°21.2	34.2	269°23.2	26.5	285°06.8	23.4
2	256°07.4	199°34.1	49.3	156°22.0	34.1	284°25.4	26.4	300°09.2	23.4
3	271°09.9	214°33.4	·· 50.0	171°22.8	·· 34.0	299°27.5	·· 26.3	315°11.6	·· 23.4
4	286°12.3	229°32.7	50.8	186°23.6	33.9	314°29.7	26.2	330°14.0	23.4
5	301°14.8	244°32.0	51.6	201°24.4	33.8	329°31.8	26.1	345°16.4	23.4
6	316°17.3	259°31.3	N19°52.3	216°25.2	N24°33.7	344°34.0	S12°26.0	0°18.8	S17°23.4
7	331°19.7	274°30.6	53.1	231°26.0	33.5	359°36.2	25.9	15°21.2	23.4
8	346°22.2	289°29.9	53.9	246°26.8	33.4	14°38.3	25.8	30°23.6	23.3
9	1°24.7	304°29.2	·· 54.7	261°27.6	·· 33.3	29°40.5	·· 25.7	45°26.0	·· 23.3
10	16°27.1	319°28.5	55.4	276°28.3	33.2	44°42.6	25.6	60°28.4	23.3
11	31°29.6	334°27.8	56.2	291°29.1	33.1	59°44.8	25.5	75°30.8	23.3
12	46°32.1	349°27.1	N19°57.0	306°29.9	N24°33.0	74°47.0	S12°25.4	90°33.2	S17°23.3
13	61°34.5	4°26.4	57.7	321°30.7	32.9	89°49.1	25.3	105°35.6	23.3
14	76°37.0	19°25.7	58.5	336°31.5	32.8	104°51.3	25.2	120°38.0	23.3
15	91°39.5	34°25.0	19°59.2	351°32.3	·· 32.7	119°53.5	·· 25.1	135°40.4	·· 23.3
16	106°41.9	49°24.3	20°00.0	6°33.1	32.5	134°55.6	25.0	150°42.8	23.3
17	121°44.4	64°23.6	00.8	21°33.9	32.4	149°57.8	24.9	165°45.2	23.2
18	136°46.8	79°22.9	N20°01.5	36°34.7	N24°32.3	164°59.9	S12°24.8	180°47.6	S17°23.2
19	151°49.3	94°22.1	02.3	51°35.5	32.2	180°02.1	24.7	195°50.0	23.2
20	166°51.8	109°21.4	03.0	66°36.3	32.1	195°04.3	24.6	210°52.4	23.2
21	181°54.2	124°20.7	·· 03.8	81°37.1	·· 32.0	210°06.4	·· 24.5	225°54.9	·· 23.2
22	196°56.7	139°20.0	04.5	96°37.9	31.9	225°08.6	24.4	240°57.3	23.2
23	211°59.2	154°19.3	05.3	111°38.7	31.7	240°10.8	24.3	255°59.7	23.2
Mer.pass.	08:54	ν -0.7′	d 0.8′	m -3.88	ν 0.8′	d -0.1′	m 1.62	ν 2.2′	d -0.1′ m -2.24	ν 2.4′	d -0.0′ m 0.63

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	227°01.6	169°18.6	N20°06.1	126°39.5	N24°31.6	255°12.9	S12°24.2	271°02.1	S17°23.2
1	242°04.1	184°17.9	06.8	141°40.2	31.5	270°15.1	24.1	286°04.5	23.1
2	257°06.6	199°17.2	07.6	156°41.0	31.4	285°17.2	24.0	301°06.9	23.1
3	272°09.0	214°16.5	·· 08.3	171°41.8	·· 31.3	300°19.4	·· 23.9	316°09.3	·· 23.1
4	287°11.5	229°15.7	09.1	186°42.6	31.2	315°21.6	23.8	331°11.7	23.1
5	302°13.9	244°15.0	09.8	201°43.4	31.1	330°23.7	23.7	346°14.1	23.1
6	317°16.4	259°14.3	N20°10.6	216°44.2	N24°30.9	345°25.9	S12°23.6	1°16.5	S17°23.1
7	332°18.9	274°13.6	11.3	231°45.0	30.8	0°28.1	23.5	16°18.9	23.1
8	347°21.3	289°12.9	12.1	246°45.8	30.7	15°30.2	23.4	31°21.3	23.1
9	2°23.8	304°12.2	·· 12.8	261°46.6	·· 30.6	30°32.4	·· 23.3	46°23.7	·· 23.1
10	17°26.3	319°11.4	13.5	276°47.4	30.5	45°34.6	23.2	61°26.1	23.0
11	32°28.7	334°10.7	14.3	291°48.2	30.3	60°36.7	23.1	76°28.5	23.0
12	47°31.2	349°10.0	N20°15.0	306°49.0	N24°30.2	75°38.9	S12°23.0	91°30.9	S17°23.0
13	62°33.7	4°09.3	15.8	321°49.8	30.1	90°41.1	22.9	106°33.3	23.0
14	77°36.1	19°08.6	16.5	336°50.6	30.0	105°43.2	22.8	121°35.7	23.0
15	92°38.6	34°07.9	·· 17.2	351°51.4	·· 29.9	120°45.4	·· 22.7	136°38.1	·· 23.0
16	107°41.1	49°07.1	18.0	6°52.2	29.7	135°47.6	22.6	151°40.5	23.0
17	122°43.5	64°06.4	18.7	21°53.0	29.6	150°49.7	22.5	166°42.9	23.0
18	137°46.0	79°05.7	N20°19.5	36°53.7	N24°29.5	165°51.9	S12°22.4	181°45.4	S17°23.0
19	152°48.4	94°05.0	20.2	51°54.5	29.4	180°54.1	22.3	196°47.8	23.0
20	167°50.9	109°04.2	20.9	66°55.3	29.3	195°56.3	22.2	211°50.2	22.9
21	182°53.4	124°03.5	·· 21.7	81°56.1	·· 29.1	210°58.4	·· 22.1	226°52.6	·· 22.9
22	197°55.8	139°02.8	22.4	96°56.9	29.0	226°00.6	22.0	241°55.0	22.9
23	212°58.3	154°02.1	23.1	111°57.7	28.9	241°02.8	21.9	256°57.4	22.9
Mer.pass.	08:50	ν -0.7′	d 0.8′	m -3.88	ν 0.8′	d -0.1′	m 1.63	ν 2.2′	d -0.1′ m -2.25	ν 2.4′	d -0.0′ m 0.63

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.5	-42°11.4
Schedar	349°34.8	56°38.9
Diphda	348°50.6	-17°52.3
Achernar	335°23.1	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°53.5	89°21.1
Acamar	315°14.5	-40°13.3
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.5
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.1	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.4	-29°00.3
Procyon	244°54.1	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.1	-59°34.9
Suhail	222°48.5	-43°31.3
Miaplacidus	221°38.8	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.5	61°38.5
Denebola	182°27.8	14°27.3
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.2	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.5
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.7	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.6
Antares	112°19.2	-26°28.7
Atria	107°15.6	-69°03.7
Sabik	102°05.9	-15°45.0
Shaula	96°14.1	-37°07.0
Rasalhague	96°01.1	12°32.6
Eltanin	90°43.2	51°29.0
Kaus Aust.	83°36.2	-34°22.4
Vega	80°35.0	38°48.0
Nunki	75°51.3	-26°16.1
Altair	62°02.8	8°55.3
Peacock	53°10.4	-56°39.8
Deneb	49°27.7	45°21.0
Enif	33°41.8	9°58.2
Al Na'ir	27°36.9	-46°51.4
Fomalhaut	15°18.0	-29°30.6
Scheat	13°48.3	28°11.6
Markab	13°33.0	15°18.9

May 07 Fri	SHA	Mer.pass
Venus	304°48.9	12:41
Mars	260°58.0	15:35
Jupiter	28°26.0	07:05
Saturn	44°03.5	06:03

May 08 Sat	SHA	Mer.pass
Venus	303°33.1	12:42
Mars	260°17.9	15:34
Jupiter	28°18.6	07:02
Saturn	44°01.9	05:59

May 09 Sun	SHA	Mer.pass
Venus	302°17.0	12:43
Mars	259°37.8	15:33
Jupiter	28°11.3	06:58
Saturn	44°00.4	05:55

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.5	N16°48.9	228°35.2	15.4′	S07°05.4	-12.8′	55.0′
1	195°51.5	49.6	243°09.6	15.5′	06°52.7	-12.8′	55.0′
2	210°51.6	50.3	257°44.1	15.5′	06°39.8	-12.8′	55.0′
3	225°51.6	·· 51.0	272°18.6	15.6′	06°27.0	-12.8′	55.0′
4	240°51.7	51.7	286°53.2	15.6′	06°14.2	-12.9′	54.9′
5	255°51.7	52.4	301°27.8	15.6′	06°01.3	-12.9′	54.9′
6	270°51.7	N16°53.1	316°02.4	15.7′	S05°48.4	-12.9′	54.9′
7	285°51.8	53.8	330°37.1	15.7′	05°35.5	-12.9′	54.9′
8	300°51.8	54.4	345°11.8	15.8′	05°22.6	-12.9′	54.9′
9	315°51.9	·· 55.1	359°46.6	15.8′	05°09.7	-12.9′	54.8′
10	330°51.9	55.8	14°21.4	15.8′	04°56.8	-12.9′	54.8′
11	345°51.9	56.5	28°56.2	15.9′	04°43.8	-13.0′	54.8′
12	0°52.0	N16°57.2	43°31.0	15.9′	S04°30.9	-13.0′	54.8′
13	15°52.0	57.9	58°05.9	15.9′	04°17.9	-13.0′	54.8′
14	30°52.1	58.5	72°40.8	16.0′	04°04.9	-13.0′	54.8′
15	45°52.1	·· 59.2	87°15.8	16.0′	03°52.0	-13.0′	54.7′
16	60°52.1	16°59.9	101°50.8	16.0′	03°39.0	-13.0′	54.7′
17	75°52.2	17°00.6	116°25.8	16.0′	03°26.0	-13.0′	54.7′
18	90°52.2	N17°01.3	131°00.8	16.1′	S03°13.0	-13.0′	54.7′
19	105°52.2	02.0	145°35.9	16.1′	03°00.0	-13.0′	54.7′
20	120°52.3	02.6	160°11.0	16.1′	02°47.0	-13.0′	54.7′
21	135°52.3	·· 03.3	174°46.1	16.1′	02°33.9	-13.0′	54.6′
22	150°52.3	04.0	189°21.2	16.2′	02°20.9	-13.0′	54.6′
23	165°52.4	04.7	203°56.4	16.2′	02°07.9	-13.0′	54.6′
	SD = 15.8′	d = 0.7′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.4	N17°05.4	218°31.6	16.2′	S01°54.9	-13.0′	54.6′
1	195°52.4	06.0	233°06.8	16.2′	01°41.9	-13.0′	54.6′
2	210°52.5	06.7	247°42.0	16.2′	01°28.8	-13.0′	54.6′
3	225°52.5	·· 07.4	262°17.2	16.3′	01°15.8	-13.0′	54.5′
4	240°52.5	08.1	276°52.5	16.3′	01°02.8	-13.0′	54.5′
5	255°52.6	08.7	291°27.7	16.3′	00°49.8	-13.0′	54.5′
6	270°52.6	N17°09.4	306°03.0	16.3′	S00°36.7	-13.0′	54.5′
7	285°52.6	10.1	320°38.3	16.3′	00°23.7	-13.0′	54.5′
8	300°52.7	10.8	335°13.6	16.3′	S00°10.7	-13.0′	54.5′
9	315°52.7	·· 11.4	349°49.0	16.3′	N00°02.3	13.0′	54.5′
10	330°52.7	12.1	4°24.3	16.4′	00°15.3	13.0′	54.4′
11	345°52.8	12.8	18°59.7	16.4′	00°28.3	13.0′	54.4′
12	0°52.8	N17°13.5	33°35.0	16.4′	N00°41.3	13.0′	54.4′
13	15°52.8	14.1	48°10.4	16.4′	00°54.2	13.0′	54.4′
14	30°52.9	14.8	62°45.8	16.4′	01°07.2	13.0′	54.4′
15	45°52.9	·· 15.5	77°21.1	16.4′	01°20.2	13.0′	54.4′
16	60°52.9	16.2	91°56.5	16.4′	01°33.1	12.9′	54.4′
17	75°53.0	16.8	106°31.9	16.4′	01°46.1	12.9′	54.3′
18	90°53.0	N17°17.5	121°07.3	16.4′	N01°59.0	12.9′	54.3′
19	105°53.0	18.2	135°42.7	16.4′	02°11.9	12.9′	54.3′
20	120°53.0	18.8	150°18.1	16.4′	02°24.8	12.9′	54.3′
21	135°53.1	·· 19.5	164°53.5	16.4′	02°37.7	12.9′	54.3′
22	150°53.1	20.2	179°28.9	16.4′	02°50.6	12.9′	54.3′
23	165°53.1	20.8	194°04.4	16.4′	03°03.4	12.8′	54.3′
	SD = 15.8′	d = 0.7′	SD = 14.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.2	N17°21.5	208°39.8	16.4′	N03°16.3	12.8′	54.3′
1	195°53.2	22.2	223°15.2	16.4′	03°29.1	12.8′	54.2′
2	210°53.2	22.8	237°50.6	16.4′	03°41.9	12.8′	54.2′
3	225°53.2	·· 23.5	252°26.0	16.4′	03°54.7	12.8′	54.2′
4	240°53.3	24.2	267°01.3	16.4′	04°07.5	12.8′	54.2′
5	255°53.3	24.8	281°36.7	16.4′	04°20.3	12.7′	54.2′
6	270°53.3	N17°25.5	296°12.1	16.4′	N04°33.0	12.7′	54.2′
7	285°53.4	26.2	310°47.5	16.4′	04°45.7	12.7′	54.2′
8	300°53.4	26.8	325°22.8	16.4′	04°58.4	12.7′	54.2′
9	315°53.4	·· 27.5	339°58.2	16.3′	05°11.1	12.6′	54.2′
10	330°53.4	28.1	354°33.5	16.3′	05°23.7	12.6′	54.2′
11	345°53.5	28.8	9°08.9	16.3′	05°36.4	12.6′	54.1′
12	0°53.5	N17°29.5	23°44.2	16.3′	N05°49.0	12.6′	54.1′
13	15°53.5	30.1	38°19.5	16.3′	06°01.5	12.6′	54.1′
14	30°53.5	30.8	52°54.8	16.3′	06°14.1	12.5′	54.1′
15	45°53.6	·· 31.4	67°30.1	16.3′	06°26.6	12.5′	54.1′
16	60°53.6	32.1	82°05.3	16.2′	06°39.1	12.5′	54.1′
17	75°53.6	32.8	96°40.6	16.2′	06°51.6	12.4′	54.1′
18	90°53.6	N17°33.4	111°15.8	16.2′	N07°04.0	12.4′	54.1′
19	105°53.7	34.1	125°51.0	16.2′	07°16.4	12.4′	54.1′
20	120°53.7	34.7	140°26.2	16.2′	07°28.8	12.4′	54.1′
21	135°53.7	·· 35.4	155°01.4	16.2′	07°41.2	12.3′	54.1′
22	150°53.7	36.0	169°36.5	16.1′	07°53.5	12.3′	54.1′
23	165°53.8	36.7	184°11.7	16.1′	08°05.8	12.3′	54.0′
	SD = 15.8′	d = 0.7′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	00:18	–:–	–:–	–:–
N 70°	–:–	–:–	01:45	22:14	–:–	–:–
68°	–:–	–:–	02:23	21:34	–:–	–:–
66°	–:–	01:02	02:49	21:07	23:01	–:–
64°	–:–	01:50	03:09	20:46	22:08	–:–
62°	–:–	02:19	03:26	20:29	21:37	–:–
60°	00:55	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°	02:06	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	17:06	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	07:03	07:48	16:05	16:49	17:36
S 60°	06:19	07:10	07:58	15:54	16:42	17:33

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

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 25-27 20-7%
07	03:26	03:28	11:57	09:01	21:22	
08	03:30	03:31	11:56	09:42	22:02	
09	03:33	03:34	11:56	10:22	22:43	

DUT1 = UT1-UTC = -0.1832 sec ΔT = TT-UT1 = +69.3672 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°00.8	169°01.4	N20°23.9	126°58.5	N24°28.8	256°04.9	S12°21.8	271°59.8	S17°22.9
1	243°03.2	184°00.6	24.6	141°59.3	28.7	271°07.1	21.7	287°02.2	22.9
2	258°05.7	198°59.9	25.3	157°00.1	28.5	286°09.3	21.6	302°04.6	22.9
3	273°08.2	213°59.2	·· 26.0	172°00.9	·· 28.4	301°11.4	·· 21.5	317°07.0	·· 22.9
4	288°10.6	228°58.5	26.8	187°01.7	28.3	316°13.6	21.4	332°09.4	22.9
5	303°13.1	243°57.7	27.5	202°02.5	28.2	331°15.8	21.3	347°11.8	22.9
6	318°15.6	258°57.0	N20°28.2	217°03.3	N24°28.0	346°18.0	S12°21.2	2°14.2	S17°22.8
7	333°18.0	273°56.3	28.9	232°04.1	27.9	1°20.1	21.1	17°16.7	22.8
8	348°20.5	288°55.6	29.7	247°04.9	27.8	16°22.3	21.1	32°19.1	22.8
9	3°22.9	303°54.8	·· 30.4	262°05.7	·· 27.7	31°24.5	·· 21.0	47°21.5	·· 22.8
10	18°25.4	318°54.1	31.1	277°06.5	27.5	46°26.6	20.9	62°23.9	22.8
11	33°27.9	333°53.4	31.8	292°07.3	27.4	61°28.8	20.8	77°26.3	22.8
12	48°30.3	348°52.6	N20°32.6	307°08.0	N24°27.3	76°31.0	S12°20.7	92°28.7	S17°22.8
13	63°32.8	3°51.9	33.3	322°08.8	27.2	91°33.2	20.6	107°31.1	22.8
14	78°35.3	18°51.2	34.0	337°09.6	27.0	106°35.3	20.5	122°33.5	22.8
15	93°37.7	33°50.4	·· 34.7	352°10.4	·· 26.9	121°37.5	·· 20.4	137°35.9	·· 22.8
16	108°40.2	48°49.7	35.4	7°11.2	26.8	136°39.7	20.3	152°38.3	22.7
17	123°42.7	63°49.0	36.1	22°12.0	26.7	151°41.9	20.2	167°40.7	22.7
18	138°45.1	78°48.3	N20°36.8	37°12.8	N24°26.5	166°44.0	S12°20.1	182°43.2	S17°22.7
19	153°47.6	93°47.5	37.6	52°13.6	26.4	181°46.2	20.0	197°45.6	22.7
20	168°50.0	108°46.8	38.3	67°14.4	26.3	196°48.4	19.9	212°48.0	22.7
21	183°52.5	123°46.1	·· 39.0	82°15.2	·· 26.1	211°50.6	·· 19.8	227°50.4	·· 22.7
22	198°55.0	138°45.3	39.7	97°16.0	26.0	226°52.7	19.7	242°52.8	22.7
23	213°57.4	153°44.6	40.4	112°16.8	25.9	241°54.9	19.6	257°55.2	22.7
Mer.pass.	08:47	ν -0.7′	d 0.7′	m -3.88	ν 0.8′	d -0.1′	m 1.63	ν 2.2′	d -0.1′ m -2.25	ν 2.4′	d -0.0′ m 0.63

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°59.9	168°43.9	N20°41.1	127°17.6	N24°25.8	256°57.1	S12°19.5	272°57.6	S17°22.7
1	244°02.4	183°43.1	41.8	142°18.4	25.6	271°59.3	19.4	288°00.0	22.7
2	259°04.8	198°42.4	42.5	157°19.2	25.5	287°01.4	19.3	303°02.4	22.7
3	274°07.3	213°41.6	·· 43.2	172°20.0	·· 25.4	302°03.6	·· 19.2	318°04.9	·· 22.6
4	289°09.8	228°40.9	43.9	187°20.8	25.2	317°05.8	19.1	333°07.3	22.6
5	304°12.2	243°40.2	44.6	202°21.6	25.1	332°08.0	19.0	348°09.7	22.6
6	319°14.7	258°39.4	N20°45.3	217°22.4	N24°25.0	347°10.1	S12°18.9	3°12.1	S17°22.6
7	334°17.2	273°38.7	46.0	232°23.2	24.8	2°12.3	18.9	18°14.5	22.6
8	349°19.6	288°38.0	46.7	247°23.9	24.7	17°14.5	18.8	33°16.9	22.6
9	4°22.1	303°37.2	·· 47.4	262°24.7	·· 24.6	32°16.7	·· 18.7	48°19.3	·· 22.6
10	19°24.5	318°36.5	48.1	277°25.5	24.4	47°18.9	18.6	63°21.8	22.6
11	34°27.0	333°35.7	48.8	292°26.3	24.3	62°21.0	18.5	78°24.2	22.6
12	49°29.5	348°35.0	N20°49.5	307°27.1	N24°24.2	77°23.2	S12°18.4	93°26.6	S17°22.6
13	64°31.9	3°34.3	50.2	322°27.9	24.0	92°25.4	18.3	108°29.0	22.6
14	79°34.4	18°33.5	50.9	337°28.7	23.9	107°27.6	18.2	123°31.4	22.6
15	94°36.9	33°32.8	·· 51.6	352°29.5	·· 23.8	122°29.8	·· 18.1	138°33.8	·· 22.5
16	109°39.3	48°32.0	52.3	7°30.3	23.6	137°31.9	18.0	153°36.2	22.5
17	124°41.8	63°31.3	53.0	22°31.1	23.5	152°34.1	17.9	168°38.6	22.5
18	139°44.3	78°30.5	N20°53.7	37°31.9	N24°23.4	167°36.3	S12°17.8	183°41.1	S17°22.5
19	154°46.7	93°29.8	54.4	52°32.7	23.2	182°38.5	17.7	198°43.5	22.5
20	169°49.2	108°29.1	55.1	67°33.5	23.1	197°40.7	17.6	213°45.9	22.5
21	184°51.7	123°28.3	·· 55.7	82°34.3	·· 23.0	212°42.8	·· 17.5	228°48.3	·· 22.5
22	199°54.1	138°27.6	56.4	97°35.1	22.8	227°45.0	17.4	243°50.7	22.5
23	214°56.6	153°26.8	57.1	112°35.9	22.7	242°47.2	17.3	258°53.1	22.5
Mer.pass.	08:43	ν -0.7′	d 0.7′	m -3.88	ν 0.8′	d -0.1′	m 1.64	ν 2.2′	d -0.1′ m -2.26	ν 2.4′	d -0.0′ m 0.62

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	229°59.0	168°26.1	N20°57.8	127°36.7	N24°22.6	257°49.4	S12°17.3	273°55.6	S17°22.5
1	245°01.5	183°25.3	58.5	142°37.5	22.4	272°51.6	17.2	288°58.0	22.5
2	260°04.0	198°24.6	59.2	157°38.3	22.3	287°53.7	17.1	304°00.4	22.5
3	275°06.4	213°23.8	20°59.8	172°39.1	·· 22.2	302°55.9	·· 17.0	319°02.8	·· 22.5
4	290°08.9	228°23.1	21°00.5	187°39.9	22.0	317°58.1	16.9	334°05.2	22.4
5	305°11.4	243°22.3	01.2	202°40.7	21.9	333°00.3	16.8	349°07.6	22.4
6	320°13.8	258°21.6	N21°01.9	217°41.5	N24°21.7	348°02.5	S12°16.7	4°10.1	S17°22.4
7	335°16.3	273°20.8	02.5	232°42.2	21.6	3°04.7	16.6	19°12.5	22.4
8	350°18.8	288°20.1	03.2	247°43.0	21.5	18°06.8	16.5	34°14.9	22.4
9	5°21.2	303°19.4	·· 03.9	262°43.8	·· 21.3	33°09.0	·· 16.4	49°17.3	·· 22.4
10	20°23.7	318°18.6	04.6	277°44.6	21.2	48°11.2	16.3	64°19.7	22.4
11	35°26.1	333°17.9	05.2	292°45.4	21.0	63°13.4	16.2	79°22.1	22.4
12	50°28.6	348°17.1	N21°05.9	307°46.2	N24°20.9	78°15.6	S12°16.1	94°24.6	S17°22.4
13	65°31.1	3°16.3	06.6	322°47.0	20.8	93°17.8	16.1	109°27.0	22.4
14	80°33.5	18°15.6	07.3	337°47.8	20.6	108°20.0	16.0	124°29.4	22.4
15	95°36.0	33°14.8	·· 07.9	352°48.6	·· 20.5	123°22.1	·· 15.9	139°31.8	·· 22.4
16	110°38.5	48°14.1	08.6	7°49.4	20.3	138°24.3	15.8	154°34.2	22.4
17	125°40.9	63°13.3	09.3	22°50.2	20.2	153°26.5	15.7	169°36.6	22.3
18	140°43.4	78°12.6	N21°09.9	37°51.0	N24°20.1	168°28.7	S12°15.6	184°39.1	S17°22.3
19	155°45.9	93°11.8	10.6	52°51.8	19.9	183°30.9	15.5	199°41.5	22.3
20	170°48.3	108°11.1	11.3	67°52.6	19.8	198°33.1	15.4	214°43.9	22.3
21	185°50.8	123°10.3	·· 11.9	82°53.4	·· 19.6	213°35.3	·· 15.3	229°46.3	·· 22.3
22	200°53.3	138°09.6	12.6	97°54.2	19.5	228°37.4	15.2	244°48.7	22.3
23	215°55.7	153°08.8	13.2	112°55.0	19.3	243°39.6	15.1	259°51.2	22.3
Mer.pass.	08:39	ν -0.7′	d 0.7′	m -3.88	ν 0.8′	d -0.1′	m 1.65	ν 2.2′	d -0.1′ m -2.27	ν 2.4′	d -0.0′ m 0.62

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.5	-42°11.4
Schedar	349°34.8	56°38.9
Diphda	348°50.6	-17°52.3
Achernar	335°23.1	-57°07.7
Hamal	327°54.9	23°33.5
Polaris	315°53.3	89°21.1
Acamar	315°14.5	-40°13.3
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.8	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.1	-52°42.7
Sirius	258°29.1	-16°44.9
Adhara	255°08.5	-29°00.3
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.1	-59°34.9
Suhail	222°48.5	-43°31.3
Miaplacidus	221°38.8	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.5	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.4	-17°39.7
Acrux	173°02.8	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.3
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.7	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.6
Antares	112°19.2	-26°28.7
Atria	107°15.6	-69°03.8
Sabik	102°05.9	-15°45.0
Shaula	96°14.1	-37°07.0
Rasalhague	96°01.1	12°32.6
Eltanin	90°43.2	51°29.0
Kaus Aust.	83°36.2	-34°22.4
Vega	80°35.0	38°48.0
Nunki	75°51.3	-26°16.1
Altair	62°02.7	8°55.3
Peacock	53°10.4	-56°39.8
Deneb	49°27.7	45°21.0
Enif	33°41.8	9°58.2
Al Na'ir	27°36.8	-46°51.3
Fomalhaut	15°18.0	-29°30.6
Scheat	13°48.2	28°11.6
Markab	13°33.0	15°18.9

May 10 Mon	SHA	Mer.pass
Venus	301°00.6	12:45
Mars	258°57.7	15:31
Jupiter	28°04.2	06:55
Saturn	43°59.0	05:51

May 11 Tue	SHA	Mer.pass
Venus	299°43.9	12:46
Mars	258°17.7	15:30
Jupiter	27°57.2	06:51
Saturn	43°57.7	05:47

May 12 Wed	SHA	Mer.pass
Venus	298°27.0	12:47
Mars	257°37.6	15:29
Jupiter	27°50.3	06:48
Saturn	43°56.5	05:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.8	N17°37.4	198°46.8	16.1′	N08°18.0	12.2′	54.0′
1	195°53.8	38.0	213°21.9	16.1′	08°30.2	12.2′	54.0′
2	210°53.8	38.7	227°56.9	16.0′	08°42.4	12.2′	54.0′
3	225°53.8	·· 39.3	242°32.0	16.0′	08°54.6	12.1′	54.0′
4	240°53.9	40.0	257°07.0	16.0′	09°06.7	12.1′	54.0′
5	255°53.9	40.6	271°42.0	16.0′	09°18.8	12.0′	54.0′
6	270°53.9	N17°41.3	286°16.9	15.9′	N09°30.8	12.0′	54.0′
7	285°53.9	41.9	300°51.9	15.9′	09°42.8	12.0′	54.0′
8	300°53.9	42.6	315°26.8	15.9′	09°54.8	11.9′	54.0′
9	315°54.0	·· 43.2	330°01.7	15.9′	10°06.7	11.9′	54.0′
10	330°54.0	43.9	344°36.5	15.8′	10°18.6	11.8′	54.0′
11	345°54.0	44.5	359°11.3	15.8′	10°30.5	11.8′	54.0′
12	0°54.0	N17°45.2	13°46.1	15.8′	N10°42.3	11.8′	54.0′
13	15°54.0	45.8	28°20.9	15.7′	10°54.0	11.7′	54.0′
14	30°54.1	46.5	42°55.6	15.7′	11°05.7	11.7′	54.0′
15	45°54.1	·· 47.1	57°30.3	15.7′	11°17.4	11.6′	53.9′
16	60°54.1	47.8	72°05.0	15.6′	11°29.1	11.6′	53.9′
17	75°54.1	48.4	86°39.6	15.6′	11°40.6	11.5′	53.9′
18	90°54.1	N17°49.0	101°14.2	15.6′	N11°52.2	11.5′	53.9′
19	105°54.2	49.7	115°48.7	15.5′	12°03.7	11.4′	53.9′
20	120°54.2	50.3	130°23.2	15.5′	12°15.1	11.4′	53.9′
21	135°54.2	·· 51.0	144°57.7	15.4′	12°26.5	11.3′	53.9′
22	150°54.2	51.6	159°32.2	15.4′	12°37.9	11.3′	53.9′
23	165°54.2	52.3	174°06.6	15.4′	12°49.2	11.2′	53.9′
	SD = 15.8′	d = 0.7′	SD = 14.7′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.2	N17°52.9	188°40.9	15.3′	N13°00.4	11.2′	53.9′
1	195°54.3	53.5	203°15.3	15.3′	13°11.6	11.1′	53.9′
2	210°54.3	54.2	217°49.6	15.2′	13°22.7	11.1′	53.9′
3	225°54.3	·· 54.8	232°23.8	15.2′	13°33.8	11.0′	53.9′
4	240°54.3	55.5	246°58.0	15.2′	13°44.9	11.0′	53.9′
5	255°54.3	56.1	261°32.2	15.1′	13°55.9	10.9′	53.9′
6	270°54.3	N17°56.7	276°06.3	15.1′	N14°06.8	10.9′	53.9′
7	285°54.3	57.4	290°40.4	15.0′	14°17.7	10.8′	53.9′
8	300°54.4	58.0	305°14.4	15.0′	14°28.5	10.8′	53.9′
9	315°54.4	·· 58.7	319°48.4	14.9′	14°39.2	10.7′	53.9′
10	330°54.4	59.3	334°22.3	14.9′	14°49.9	10.6′	53.9′
11	345°54.4	17°59.9	348°56.2	14.9′	15°00.6	10.6′	53.9′
12	0°54.4	N18°00.6	3°30.1	14.8′	N15°11.1	10.5′	53.9′
13	15°54.4	01.2	18°03.9	14.8′	15°21.7	10.5′	53.9′
14	30°54.4	01.8	32°37.6	14.7′	15°32.1	10.4′	53.9′
15	45°54.5	·· 02.5	47°11.4	14.7′	15°42.5	10.3′	53.9′
16	60°54.5	03.1	61°45.0	14.6′	15°52.8	10.3′	53.9′
17	75°54.5	03.7	76°18.6	14.6′	16°03.1	10.2′	53.9′
18	90°54.5	N18°04.4	90°52.2	14.5′	N16°13.3	10.1′	53.9′
19	105°54.5	05.0	105°25.7	14.5′	16°23.5	10.1′	53.9′
20	120°54.5	05.6	119°59.2	14.4′	16°33.5	10.0′	53.9′
21	135°54.5	·· 06.3	134°32.6	14.4′	16°43.5	9.9′	53.9′
22	150°54.5	06.9	149°06.0	14.3′	16°53.5	9.9′	53.9′
23	165°54.5	07.5	163°39.3	14.3′	17°03.3	9.8′	53.9′
	SD = 15.8′	d = 0.6′	SD = 14.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.6	N18°08.2	178°12.6	14.2′	N17°13.1	9.7′	53.9′
1	195°54.6	08.8	192°45.8	14.2′	17°22.9	9.7′	53.9′
2	210°54.6	09.4	207°18.9	14.1′	17°32.5	9.6′	53.9′
3	225°54.6	·· 10.0	221°52.1	14.1′	17°42.1	9.5′	53.9′
4	240°54.6	10.7	236°25.1	14.0′	17°51.6	9.4′	53.9′
5	255°54.6	11.3	250°58.1	14.0′	18°01.1	9.4′	53.9′
6	270°54.6	N18°11.9	265°31.1	13.9′	N18°10.4	9.3′	53.9′
7	285°54.6	12.6	280°04.0	13.8′	18°19.7	9.2′	53.9′
8	300°54.6	13.2	294°36.8	13.8′	18°29.0	9.1′	53.9′
9	315°54.6	·· 13.8	309°09.6	13.7′	18°38.1	9.1′	53.9′
10	330°54.7	14.4	323°42.3	13.7′	18°47.2	9.0′	53.9′
11	345°54.7	15.1	338°15.0	13.6′	18°56.1	8.9′	53.9′
12	0°54.7	N18°15.7	352°47.6	13.6′	N19°05.1	8.8′	53.9′
13	15°54.7	16.3	7°20.2	13.5′	19°13.9	8.7′	53.9′
14	30°54.7	16.9	21°52.7	13.5′	19°22.6	8.7′	53.9′
15	45°54.7	·· 17.5	36°25.2	13.4′	19°31.3	8.6′	53.9′
16	60°54.7	18.2	50°57.6	13.4′	19°39.9	8.5′	53.9′
17	75°54.7	18.8	65°30.0	13.3′	19°48.4	8.4′	53.9′
18	90°54.7	N18°19.4	80°02.2	13.2′	N19°56.8	8.3′	53.9′
19	105°54.7	20.0	94°34.5	13.2′	20°05.1	8.2′	53.9′
20	120°54.7	20.6	109°06.7	13.1′	20°13.4	8.2′	53.9′
21	135°54.7	·· 21.3	123°38.8	13.1′	20°21.6	8.1′	53.9′
22	150°54.7	21.9	138°10.9	13.0′	20°29.6	8.0′	53.9′
23	165°54.7	22.5	152°42.9	13.0′	20°37.6	7.9′	53.9′
	SD = 15.8′	d = 0.6′	SD = 14.7′				

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

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 28-1 3-0%
10	03:35	03:36	11:56	11:03	23:24	
11	03:37	03:38	11:56	11:46	–:–	
12	03:38	03:39	11:56	12:30	00:07	

DUT1 = UT1-UTC = -0.1833 sec ΔT = TT-UT1 = +69.3673 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230°58.2	168°08.1	N21°13.9	127°55.8	N24°19.2	258°41.8	S12°15.0	274°53.6	S17°22.3
1	246°00.6	183°07.3	14.6	142°56.6	19.1	273°44.0	15.0	289°56.0	22.3
2	261°03.1	198°06.5	15.2	157°57.4	18.9	288°46.2	14.9	304°58.4	22.3
3	276°05.6	213°05.8	·· 15.9	172°58.2	·· 18.8	303°48.4	·· 14.8	320°00.8	·· 22.3
4	291°08.0	228°05.0	16.5	187°59.0	18.6	318°50.6	14.7	335°03.3	22.3
5	306°10.5	243°04.3	17.2	202°59.8	18.5	333°52.8	14.6	350°05.7	22.3
6	321°13.0	258°03.5	N21°17.8	218°00.6	N24°18.3	348°55.0	S12°14.5	5°08.1	S17°22.3
7	336°15.4	273°02.7	18.5	233°01.4	18.2	3°57.1	14.4	20°10.5	22.3
8	351°17.9	288°02.0	19.1	248°02.2	18.0	18°59.3	14.3	35°12.9	22.3
9	6°20.4	303°01.2	·· 19.8	263°03.0	·· 17.9	34°01.5	·· 14.2	50°15.4	·· 22.2
10	21°22.8	318°00.5	20.4	278°03.8	17.8	49°03.7	14.1	65°17.8	22.2
11	36°25.3	332°59.7	21.1	293°04.6	17.6	64°05.9	14.1	80°20.2	22.2
12	51°27.8	347°58.9	N21°21.7	308°05.3	N24°17.5	79°08.1	S12°14.0	95°22.6	S17°22.2
13	66°30.2	2°58.2	22.4	323°06.1	17.3	94°10.3	13.9	110°25.1	22.2
14	81°32.7	17°57.4	23.0	338°06.9	17.2	109°12.5	13.8	125°27.5	22.2
15	96°35.1	32°56.7	·· 23.7	353°07.7	·· 17.0	124°14.7	·· 13.7	140°29.9	·· 22.2
16	111°37.6	47°55.9	24.3	8°08.5	16.9	139°16.9	13.6	155°32.3	22.2
17	126°40.1	62°55.1	25.0	23°09.3	16.7	154°19.1	13.5	170°34.7	22.2
18	141°42.5	77°54.4	N21°25.6	38°10.1	N24°16.6	169°21.2	S12°13.4	185°37.2	S17°22.2
19	156°45.0	92°53.6	26.2	53°10.9	16.4	184°23.4	13.3	200°39.6	22.2
20	171°47.5	107°52.8	26.9	68°11.7	16.3	199°25.6	13.2	215°42.0	22.2
21	186°49.9	122°52.1	·· 27.5	83°12.5	·· 16.1	214°27.8	·· 13.2	230°44.4	·· 22.2
22	201°52.4	137°51.3	28.2	98°13.3	16.0	229°30.0	13.1	245°46.9	22.2
23	216°54.9	152°50.5	28.8	113°14.1	15.8	244°32.2	13.0	260°49.3	22.2
Mer.pass.	08:35	ν -0.8′	d 0.7′	m -3.88	ν 0.8′	d -0.1′	m 1.65	ν 2.2′	d -0.1′ m -2.27	ν 2.4′	d -0.0′ m 0.61

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231°57.3	167°49.8	N21°29.4	128°14.9	N24°15.7	259°34.4	S12°12.9	275°51.7	S17°22.2
1	246°59.8	182°49.0	30.1	143°15.7	15.5	274°36.6	12.8	290°54.1	22.2
2	262°02.3	197°48.2	30.7	158°16.5	15.4	289°38.8	12.7	305°56.6	22.1
3	277°04.7	212°47.5	·· 31.3	173°17.3	·· 15.2	304°41.0	·· 12.6	320°59.0	·· 22.1
4	292°07.2	227°46.7	32.0	188°18.1	15.1	319°43.2	12.5	336°01.4	22.1
5	307°09.6	242°45.9	32.6	203°18.9	14.9	334°45.4	12.4	351°03.8	22.1
6	322°12.1	257°45.2	N21°33.2	218°19.7	N24°14.8	349°47.6	S12°12.4	6°06.3	S17°22.1
7	337°14.6	272°44.4	33.8	233°20.5	14.6	4°49.8	12.3	21°08.7	22.1
8	352°17.0	287°43.6	34.5	248°21.3	14.5	19°52.0	12.2	36°11.1	22.1
9	7°19.5	302°42.8	·· 35.1	263°22.1	·· 14.3	34°54.2	·· 12.1	51°13.5	·· 22.1
10	22°22.0	317°42.1	35.7	278°22.9	14.2	49°56.4	12.0	66°16.0	22.1
11	37°24.4	332°41.3	36.3	293°23.7	14.0	64°58.6	11.9	81°18.4	22.1
12	52°26.9	347°40.5	N21°37.0	308°24.5	N24°13.8	80°00.8	S12°11.8	96°20.8	S17°22.1
13	67°29.4	2°39.8	37.6	323°25.3	13.7	95°03.0	11.7	111°23.2	22.1
14	82°31.8	17°39.0	38.2	338°26.1	13.5	110°05.2	11.7	126°25.7	22.1
15	97°34.3	32°38.2	·· 38.8	353°26.9	·· 13.4	125°07.3	·· 11.6	141°28.1	·· 22.1
16	112°36.7	47°37.4	39.4	8°27.7	13.2	140°09.5	11.5	156°30.5	22.1
17	127°39.2	62°36.7	40.1	23°28.5	13.1	155°11.7	11.4	171°32.9	22.1
18	142°41.7	77°35.9	N21°40.7	38°29.3	N24°12.9	170°13.9	S12°11.3	186°35.4	S17°22.1
19	157°44.1	92°35.1	41.3	53°30.1	12.8	185°16.1	11.2	201°37.8	22.1
20	172°46.6	107°34.3	41.9	68°30.9	12.6	200°18.3	11.1	216°40.2	22.1
21	187°49.1	122°33.6	·· 42.5	83°31.7	·· 12.4	215°20.5	·· 11.0	231°42.6	·· 22.1
22	202°51.5	137°32.8	43.1	98°32.5	12.3	230°22.7	11.0	246°45.1	22.1
23	217°54.0	152°32.0	43.7	113°33.3	12.1	245°24.9	10.9	261°47.5	22.0
Mer.pass.	08:31	ν -0.8′	d 0.6′	m -3.88	ν 0.8′	d -0.2′	m 1.66	ν 2.2′	d -0.1′ m -2.28	ν 2.4′	d -0.0′ m 0.61

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	232°56.5	167°31.2	N21°44.4	128°34.1	N24°12.0	260°27.1	S12°10.8	276°49.9	S17°22.0
1	247°58.9	182°30.4	45.0	143°34.9	11.8	275°29.3	10.7	291°52.4	22.0
2	263°01.4	197°29.7	45.6	158°35.7	11.7	290°31.5	10.6	306°54.8	22.0
3	278°03.9	212°28.9	·· 46.2	173°36.5	·· 11.5	305°33.7	·· 10.5	321°57.2	·· 22.0
4	293°06.3	227°28.1	46.8	188°37.3	11.3	320°35.9	10.4	336°59.6	22.0
5	308°08.8	242°27.3	47.4	203°38.1	11.2	335°38.1	10.4	352°02.1	22.0
6	323°11.2	257°26.6	N21°48.0	218°38.9	N24°11.0	350°40.3	S12°10.3	7°04.5	S17°22.0
7	338°13.7	272°25.8	48.6	233°39.7	10.9	5°42.6	10.2	22°06.9	22.0
8	353°16.2	287°25.0	49.2	248°40.5	10.7	20°44.8	10.1	37°09.4	22.0
9	8°18.6	302°24.2	·· 49.8	263°41.3	·· 10.5	35°47.0	·· 10.0	52°11.8	·· 22.0
10	23°21.1	317°23.4	50.4	278°42.1	10.4	50°49.2	09.9	67°14.2	22.0
11	38°23.6	332°22.7	51.0	293°42.9	10.2	65°51.4	09.8	82°16.6	22.0
12	53°26.0	347°21.9	N21°51.6	308°43.7	N24°10.1	80°53.6	S12°09.8	97°19.1	S17°22.0
13	68°28.5	2°21.1	52.2	323°44.5	09.9	95°55.8	09.7	112°21.5	22.0
14	83°31.0	17°20.3	52.8	338°45.3	09.7	110°58.0	09.6	127°23.9	22.0
15	98°33.4	32°19.5	·· 53.4	353°46.1	·· 09.6	126°00.2	·· 09.5	142°26.4	·· 22.0
16	113°35.9	47°18.7	54.0	8°46.9	09.4	141°02.4	09.4	157°28.8	22.0
17	128°38.4	62°18.0	54.6	23°47.7	09.3	156°04.6	09.3	172°31.2	22.0
18	143°40.8	77°17.2	N21°55.1	38°48.5	N24°09.1	171°06.8	S12°09.2	187°33.7	S17°22.0
19	158°43.3	92°16.4	55.7	53°49.3	08.9	186°09.0	09.2	202°36.1	22.0
20	173°45.7	107°15.6	56.3	68°50.1	08.8	201°11.2	09.1	217°38.5	22.0
21	188°48.2	122°14.8	·· 56.9	83°50.9	·· 08.6	216°13.4	·· 09.0	232°41.0	·· 22.0
22	203°50.7	137°14.0	57.5	98°51.7	08.4	231°15.6	08.9	247°43.4	22.0
23	218°53.1	152°13.2	58.1	113°52.4	08.3	246°17.8	08.8	262°45.8	22.0
Mer.pass.	08:27	ν -0.8′	d 0.6′	m -3.88	ν 0.8′	d -0.2′	m 1.66	ν 2.2′	d -0.1′ m -2.29	ν 2.4′	d -0.0′ m 0.61

Stars	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.5	-42°11.4
Schedar	349°34.8	56°38.9
Diphda	348°50.6	-17°52.3
Achernar	335°23.1	-57°07.7
Hamal	327°54.9	23°33.5
Polaris	315°52.8	89°21.1
Acamar	315°14.5	-40°13.3
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.8	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.1	-52°42.6
Sirius	258°29.1	-16°44.9
Adhara	255°08.5	-29°00.3
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.1	-59°34.9
Suhail	222°48.5	-43°31.3
Miaplacidus	221°38.9	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.4	-17°39.7
Acrux	173°02.9	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.7	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.6
Antares	112°19.2	-26°28.7
Atria	107°15.5	-69°03.8
Sabik	102°05.9	-15°45.0
Shaula	96°14.1	-37°07.0
Rasalhague	96°01.0	12°32.6
Eltanin	90°43.1	51°29.0
Kaus Aust.	83°36.2	-34°22.4
Vega	80°34.9	38°48.0
Nunki	75°51.2	-26°16.1
Altair	62°02.7	8°55.3
Peacock	53°10.3	-56°39.8
Deneb	49°27.7	45°21.1
Enif	33°41.7	9°58.2
Al Na'ir	27°36.8	-46°51.3
Fomalhaut	15°18.0	-29°30.6
Scheat	13°48.2	28°11.6
Markab	13°33.0	15°19.0

May 13 Thu	SHA	Mer.pass
Venus	297°09.9	12:48
Mars	256°57.6	15:27
Jupiter	27°43.6	06:44
Saturn	43°55.4	05:40

May 14 Fri	SHA	Mer.pass
Venus	295°52.4	12:49
Mars	256°17.6	15:26
Jupiter	27°37.1	06:41
Saturn	43°54.4	05:36

May 15 Sat	SHA	Mer.pass
Venus	294°34.8	12:51
Mars	255°37.6	15:25
Jupiter	27°30.7	06:37
Saturn	43°53.5	05:32

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.7	N18°23.1	167°14.8	12.9′	N20°45.5	7.8′	53.9′
1	195°54.7	23.7	181°46.7	12.8′	20°53.3	7.7′	53.9′
2	210°54.7	24.3	196°18.6	12.8′	21°01.1	7.6′	53.9′
3	225°54.8	·· 25.0	210°50.4	12.7′	21°08.7	7.5′	53.9′
4	240°54.8	25.6	225°22.1	12.7′	21°16.2	7.4′	53.9′
5	255°54.8	26.2	239°53.8	12.6′	21°23.7	7.4′	53.9′
6	270°54.8	N18°26.8	254°25.4	12.6′	N21°31.0	7.3′	54.0′
7	285°54.8	27.4	268°57.0	12.5′	21°38.3	7.2′	54.0′
8	300°54.8	28.0	283°28.5	12.5′	21°45.5	7.1′	54.0′
9	315°54.8	·· 28.6	297°59.9	12.4′	21°52.5	7.0′	54.0′
10	330°54.8	29.3	312°31.3	12.3′	21°59.5	6.9′	54.0′
11	345°54.8	29.9	327°02.7	12.3′	22°06.4	6.8′	54.0′
12	0°54.8	N18°30.5	341°33.9	12.2′	N22°13.2	6.7′	54.0′
13	15°54.8	31.1	356°05.2	12.2′	22°19.9	6.6′	54.0′
14	30°54.8	31.7	10°36.3	12.1′	22°26.5	6.5′	54.0′
15	45°54.8	·· 32.3	25°07.5	12.1′	22°33.0	6.4′	54.0′
16	60°54.8	32.9	39°38.5	12.0′	22°39.4	6.3′	54.0′
17	75°54.8	33.5	54°09.5	12.0′	22°45.6	6.2′	54.0′
18	90°54.8	N18°34.1	68°40.5	11.9′	N22°51.8	6.1′	54.0′
19	105°54.8	34.7	83°11.4	11.8′	22°57.9	6.0′	54.0′
20	120°54.8	35.3	97°42.3	11.8′	23°03.9	5.9′	54.0′
21	135°54.8	·· 35.9	112°13.0	11.7′	23°09.8	5.8′	54.0′
22	150°54.8	36.5	126°43.8	11.7′	23°15.5	5.7′	54.1′
23	165°54.8	37.2	141°14.5	11.6′	23°21.2	5.6′	54.1′
	SD = 15.8′	d = 0.6′	SD = 14.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N18°37.8	155°45.1	11.6′	N23°26.8	5.5′	54.1′
1	195°54.8	38.4	170°15.7	11.5′	23°32.2	5.4′	54.1′
2	210°54.8	39.0	184°46.2	11.5′	23°37.6	5.2′	54.1′
3	225°54.8	·· 39.6	199°16.7	11.4′	23°42.8	5.1′	54.1′
4	240°54.8	40.2	213°47.2	11.4′	23°48.0	5.0′	54.1′
5	255°54.8	40.8	228°17.6	11.3′	23°53.0	4.9′	54.1′
6	270°54.8	N18°41.4	242°47.9	11.3′	N23°57.9	4.8′	54.1′
7	285°54.8	42.0	257°18.2	11.2′	24°02.7	4.7′	54.1′
8	300°54.8	42.6	271°48.4	11.2′	24°07.4	4.6′	54.1′
9	315°54.8	·· 43.2	286°18.6	11.1′	24°12.0	4.5′	54.1′
10	330°54.7	43.8	300°48.7	11.1′	24°16.5	4.4′	54.2′
11	345°54.7	44.4	315°18.8	11.1′	24°20.8	4.2′	54.2′
12	0°54.7	N18°45.0	329°48.9	11.0′	N24°25.1	4.1′	54.2′
13	15°54.7	45.6	344°18.9	11.0′	24°29.2	4.0′	54.2′
14	30°54.7	46.2	358°48.9	10.9′	24°33.2	3.9′	54.2′
15	45°54.7	·· 46.7	13°18.8	10.9′	24°37.1	3.8′	54.2′
16	60°54.7	47.3	27°48.6	10.8′	24°40.9	3.7′	54.2′
17	75°54.7	47.9	42°18.5	10.8′	24°44.6	3.6′	54.2′
18	90°54.7	N18°48.5	56°48.3	10.7′	N24°48.1	3.4′	54.2′
19	105°54.7	49.1	71°18.0	10.7′	24°51.6	3.3′	54.3′
20	120°54.7	49.7	85°47.7	10.7′	24°54.9	3.2′	54.3′
21	135°54.7	·· 50.3	100°17.4	10.6′	24°58.1	3.1′	54.3′
22	150°54.7	50.9	114°47.0	10.6′	25°01.2	3.0′	54.3′
23	165°54.7	51.5	129°16.6	10.5′	25°04.1	2.8′	54.3′
	SD = 15.8′	d = 0.6′	SD = 14.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.7	N18°52.1	143°46.1	10.5′	N25°07.0	2.7′	54.3′
1	195°54.7	52.7	158°15.6	10.5′	25°09.7	2.6′	54.3′
2	210°54.7	53.3	172°45.1	10.4′	25°12.3	2.5′	54.3′
3	225°54.6	·· 53.9	187°14.5	10.4′	25°14.8	2.4′	54.3′
4	240°54.6	54.4	201°43.9	10.4′	25°17.1	2.2′	54.4′
5	255°54.6	55.0	216°13.3	10.3′	25°19.4	2.1′	54.4′
6	270°54.6	N18°55.6	230°42.6	10.3′	N25°21.5	2.0′	54.4′
7	285°54.6	56.2	245°11.9	10.3′	25°23.5	1.9′	54.4′
8	300°54.6	56.8	259°41.2	10.2′	25°25.4	1.7′	54.4′
9	315°54.6	·· 57.4	274°10.5	10.2′	25°27.1	1.6′	54.4′
10	330°54.6	58.0	288°39.7	10.2′	25°28.7	1.5′	54.4′
11	345°54.6	58.5	303°08.8	10.2′	25°30.2	1.4′	54.5′
12	0°54.6	N18°59.1	317°38.0	10.1′	N25°31.6	1.2′	54.5′
13	15°54.6	18°59.7	332°07.1	10.1′	25°32.9	1.1′	54.5′
14	30°54.5	19°00.3	346°36.2	10.1′	25°34.0	1.0′	54.5′
15	45°54.5	·· 00.9	1°05.3	10.0′	25°35.0	0.9′	54.5′
16	60°54.5	01.5	15°34.3	10.0′	25°35.9	0.7′	54.5′
17	75°54.5	02.0	30°03.4	10.0′	25°36.6	0.6′	54.5′
18	90°54.5	N19°02.6	44°32.4	10.0′	N25°37.2	0.5′	54.6′
19	105°54.5	03.2	59°01.4	10.0′	25°37.7	0.4′	54.6′
20	120°54.5	03.8	73°30.3	9.9′	25°38.1	0.2′	54.6′
21	135°54.5	·· 04.4	87°59.3	9.9′	25°38.3	0.1′	54.6′
22	150°54.5	04.9	102°28.2	9.9′	25°38.4	-0.0′	54.6′
23	165°54.4	05.5	116°57.1	9.9′	25°38.4	-0.1′	54.6′
	SD = 15.8′	d = 0.6′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°	-:-	-:-	00:51	23:14	-:-	-:-
68°	-:-	-:-	01:52	22:06	-:-	-:-
66°	-:-	-:-	02:25	21:30	-:-	-:-
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	21:33	-:-
N 58°	01:06	02:43	03:37	20:17	21:12	22:52
56°	01:44	02:59	03:49	20:05	20:55	22:12
54°	02:09	03:13	03:59	19:55	20:41	21:46
52°	02:28	03:26	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	17:33	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	17:35
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	08:11	15:41	16:30	17:22

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

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 1-9%
13	03:39	03:39	11:56	13:16	00:53	
14	03:39	03:39	11:56	14:05	01:40	
15	03:39	03:38	11:56	14:55	02:30	

IERS Earth Orientation data as of 08-Dec-2022

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	233°55.6	167°12.4	N21°58.7	128°53.2	N24°08.1	261°20.0	S12°08.7	277°48.2	S17°22.0
1	248°58.1	182°11.7	59.3	143°54.0	07.9	276°22.2	08.7	292°50.7	22.0
2	264°00.5	197°10.9	21°59.8	158°54.8	07.8	291°24.4	08.6	307°53.1	21.9
3	279°03.0	212°10.1	22°00.4	173°55.6	·· 07.6	306°26.6	·· 08.5	322°55.5	·· 21.9
4	294°05.5	227°09.3	01.0	188°56.4	07.4	321°28.9	08.4	337°58.0	21.9
5	309°07.9	242°08.5	01.6	203°57.2	07.3	336°31.1	08.3	353°00.4	21.9
6	324°10.4	257°07.7	N22°02.2	218°58.0	N24°07.1	351°33.3	S12°08.2	8°02.8	S17°21.9
7	339°12.9	272°06.9	02.7	233°58.8	06.9	6°35.5	08.1	23°05.3	21.9
8	354°15.3	287°06.1	03.3	248°59.6	06.8	21°37.7	08.1	38°07.7	21.9
9	9°17.8	302°05.3	·· 03.9	264°00.4	·· 06.6	36°39.9	·· 08.0	53°10.1	·· 21.9
10	24°20.2	317°04.6	04.5	279°01.2	06.4	51°42.1	07.9	68°12.6	21.9
11	39°22.7	332°03.8	05.0	294°02.0	06.3	66°44.3	07.8	83°15.0	21.9
12	54°25.2	347°03.0	N22°05.6	309°02.8	N24°06.1	81°46.5	S12°07.7	98°17.4	S17°21.9
13	69°27.6	2°02.2	06.2	324°03.7	05.9	96°48.7	07.7	113°19.9	21.9
14	84°30.1	17°01.4	06.7	339°04.5	05.8	111°50.9	07.6	128°22.3	21.9
15	99°32.6	32°00.6	·· 07.3	354°05.3	·· 05.6	126°53.2	·· 07.5	143°24.7	·· 21.9
16	114°35.0	46°59.8	07.9	9°06.1	05.4	141°55.4	07.4	158°27.2	21.9
17	129°37.5	61°59.0	08.4	24°06.9	05.3	156°57.6	07.3	173°29.6	21.9
18	144°40.0	76°58.2	N22°09.0	39°07.7	N24°05.1	171°59.8	S12°07.2	188°32.1	S17°21.9
19	159°42.4	91°57.4	09.6	54°08.5	04.9	187°02.0	07.2	203°34.5	21.9
20	174°44.9	106°56.6	10.1	69°09.3	04.8	202°04.2	07.1	218°36.9	21.9
21	189°47.4	121°55.8	·· 10.7	84°10.1	·· 04.6	217°06.4	·· 07.0	233°39.4	·· 21.9
22	204°49.8	136°55.0	11.3	99°10.9	04.4	232°08.6	06.9	248°41.8	21.9
23	219°52.3	151°54.2	11.8	114°11.7	04.2	247°10.8	06.8	263°44.2	21.9
Mer.pass.	08:23	ν -0.8′	d 0.6′	m -3.88	ν 0.8′	d -0.2′	m 1.67	ν 2.2′	d -0.1′ m -2.29	ν 2.4′	d -0.0′ m 0.60

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	234°54.7	166°53.4	N22°12.4	129°12.5	N24°04.1	262°13.1	S12°06.7	278°46.7	S17°21.9
1	249°57.2	181°52.6	12.9	144°13.3	03.9	277°15.3	06.7	293°49.1	21.9
2	264°59.7	196°51.8	13.5	159°14.1	03.7	292°17.5	06.6	308°51.5	21.9
3	280°02.1	211°51.0	·· 14.0	174°14.9	·· 03.6	307°19.7	·· 06.5	323°54.0	·· 21.9
4	295°04.6	226°50.2	14.6	189°15.7	03.4	322°21.9	06.4	338°56.4	21.9
5	310°07.1	241°49.4	15.2	204°16.5	03.2	337°24.1	06.3	353°58.8	21.9
6	325°09.5	256°48.6	N22°15.7	219°17.3	N24°03.0	352°26.3	S12°06.3	9°01.3	S17°21.9
7	340°12.0	271°47.8	16.3	234°18.1	02.9	7°28.6	06.2	24°03.7	21.9
8	355°14.5	286°47.0	16.8	249°18.9	02.7	22°30.8	06.1	39°06.2	21.9
9	10°16.9	301°46.2	·· 17.4	264°19.7	·· 02.5	37°33.0	·· 06.0	54°08.6	·· 21.9
10	25°19.4	316°45.4	17.9	279°20.5	02.3	52°35.2	05.9	69°11.0	21.9
11	40°21.9	331°44.6	18.5	294°21.3	02.2	67°37.4	05.8	84°13.5	21.9
12	55°24.3	346°43.8	N22°19.0	309°22.1	N24°02.0	82°39.6	S12°05.8	99°15.9	S17°21.9
13	70°26.8	1°43.0	19.5	324°22.9	01.8	97°41.9	05.7	114°18.4	21.9
14	85°29.2	16°42.2	20.1	339°23.7	01.6	112°44.1	05.6	129°20.8	21.9
15	100°31.7	31°41.4	·· 20.6	354°24.5	·· 01.5	127°46.3	·· 05.5	144°23.2	·· 21.9
16	115°34.2	46°40.6	21.2	9°25.3	01.3	142°48.5	05.4	159°25.7	21.9
17	130°36.6	61°39.8	21.7	24°26.1	01.1	157°50.7	05.4	174°28.1	21.9
18	145°39.1	76°39.0	N22°22.2	39°26.9	N24°00.9	172°52.9	S12°05.3	189°30.5	S17°21.9
19	160°41.6	91°38.2	22.8	54°27.7	00.8	187°55.2	05.2	204°33.0	21.9
20	175°44.0	106°37.4	23.3	69°28.5	00.6	202°57.4	05.1	219°35.4	21.9
21	190°46.5	121°36.6	·· 23.9	84°29.3	·· 00.4	217°59.6	·· 05.0	234°37.9	·· 21.9
22	205°49.0	136°35.8	24.4	99°30.1	00.2	233°01.8	05.0	249°40.3	21.9
23	220°51.4	151°35.0	24.9	114°30.9	00.1	248°04.0	04.9	264°42.7	21.9
Mer.pass.	08:19	ν -0.8′	d 0.6′	m -3.88	ν 0.8′	d -0.2′	m 1.68	ν 2.2′	d -0.1′ m -2.30	ν 2.4′	d -0.0′ m 0.60

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	235°53.9	166°34.2	N22°25.5	129°31.7	N23°59.9	263°06.2	S12°04.8	279°45.2	S17°21.9
1	250°56.3	181°33.4	26.0	144°32.5	59.7	278°08.5	04.7	294°47.6	21.9
2	265°58.8	196°32.6	26.5	159°33.3	59.5	293°10.7	04.6	309°50.1	21.9
3	281°01.3	211°31.8	·· 27.1	174°34.1	·· 59.3	308°12.9	·· 04.6	324°52.5	·· 21.9
4	296°03.7	226°31.0	27.6	189°34.9	59.2	323°15.1	04.5	339°54.9	21.9
5	311°06.2	241°30.2	28.1	204°35.7	59.0	338°17.3	04.4	354°57.4	21.9
6	326°08.7	256°29.4	N22°28.6	219°36.5	N23°58.8	353°19.6	S12°04.3	9°59.8	S17°21.9
7	341°11.1	271°28.5	29.2	234°37.3	58.6	8°21.8	04.2	25°02.3	21.9
8	356°13.6	286°27.7	29.7	249°38.1	58.4	23°24.0	04.2	40°04.7	21.9
9	11°16.1	301°26.9	·· 30.2	264°38.9	·· 58.3	38°26.2	·· 04.1	55°07.2	·· 21.9
10	26°18.5	316°26.1	30.7	279°39.7	58.1	53°28.5	04.0	70°09.6	21.9
11	41°21.0	331°25.3	31.2	294°40.5	57.9	68°30.7	03.9	85°12.0	21.9
12	56°23.5	346°24.5	N22°31.8	309°41.3	N23°57.7	83°32.9	S12°03.9	100°14.5	S17°21.9
13	71°25.9	1°23.7	32.3	324°42.1	57.5	98°35.1	03.8	115°16.9	21.9
14	86°28.4	16°22.9	32.8	339°42.9	57.3	113°37.3	03.7	130°19.4	21.9
15	101°30.8	31°22.1	·· 33.3	354°43.7	·· 57.2	128°39.6	·· 03.6	145°21.8	·· 21.9
16	116°33.3	46°21.3	33.8	9°44.5	57.0	143°41.8	03.5	160°24.2	21.9
17	131°35.8	61°20.4	34.3	24°45.3	56.8	158°44.0	03.5	175°26.7	21.9
18	146°38.2	76°19.6	N22°34.9	39°46.1	N23°56.6	173°46.2	S12°03.4	190°29.1	S17°21.9
19	161°40.7	91°18.8	35.4	54°46.9	56.4	188°48.5	03.3	205°31.6	21.9
20	176°43.2	106°18.0	35.9	69°47.8	56.2	203°50.7	03.2	220°34.0	21.9
21	191°45.6	121°17.2	·· 36.4	84°48.6	·· 56.1	218°52.9	·· 03.2	235°36.5	·· 21.9
22	206°48.1	136°16.4	36.9	99°49.4	55.9	233°55.1	03.1	250°38.9	21.9
23	221°50.6	151°15.6	37.4	114°50.2	55.7	248°57.4	03.0	265°41.4	21.9
Mer.pass.	08:15	ν -0.8′	d 0.5′	m -3.87	ν 0.8′	d -0.2′	m 1.68	ν 2.2′	d -0.1′ m -2.31	ν 2.4′	d -0.0′ m 0.59

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.4	-42°11.4
Schedar	349°34.8	56°38.9
Diphda	348°50.6	-17°52.3
Achernar	335°23.0	-57°07.7
Hamal	327°54.9	23°33.6
Polaris	315°52.2	89°21.1
Acamar	315°14.5	-40°13.3
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.8	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.5
Canopus	263°54.1	-52°42.6
Sirius	258°29.1	-16°44.9
Adhara	255°08.5	-29°00.3
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.1	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°38.9	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°02.9	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.8	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.6
Antares	112°19.1	-26°28.7
Atria	107°15.5	-69°03.8
Sabik	102°05.9	-15°45.0
Shaula	96°14.1	-37°07.0
Rasalhague	96°01.0	12°32.6
Eltanin	90°43.1	51°29.0
Kaus Aust.	83°36.2	-34°22.4
Vega	80°34.9	38°48.0
Nunki	75°51.2	-26°16.1
Altair	62°02.7	8°55.4
Peacock	53°10.3	-56°39.8
Deneb	49°27.6	45°21.1
Enif	33°41.7	9°58.2
Al Na'ir	27°36.8	-46°51.3
Fomalhaut	15°18.0	-29°30.5
Scheat	13°48.2	28°11.6
Markab	13°33.0	15°19.0

May 16 Sun	SHA	Mer.pass
Venus	293°16.8	12:52
Mars	254°57.6	15:24
Jupiter	27°24.4	06:34
Saturn	43°52.6	05:28

May 17 Mon	SHA	Mer.pass
Venus	291°58.7	12:53
Mars	254°17.7	15:22
Jupiter	27°18.3	06:30
Saturn	43°51.9	05:24

May 18 Tue	SHA	Mer.pass
Venus	290°40.3	12:54
Mars	253°37.8	15:21
Jupiter	27°12.4	06:27
Saturn	43°51.3	05:20

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N19°06.1	131°26.0	9.9′	N25°38.3	-0.3′	54.7′
1	195°54.4	06.7	145°54.8	9.9′	25°38.0	-0.4′	54.7′
2	210°54.4	07.2	160°23.7	9.8′	25°37.6	-0.5′	54.7′
3	225°54.4	·· 07.8	174°52.5	9.8′	25°37.1	-0.7′	54.7′
4	240°54.4	08.4	189°21.4	9.8′	25°36.4	-0.8′	54.7′
5	255°54.4	09.0	203°50.2	9.8′	25°35.6	-0.9′	54.7′
6	270°54.3	N19°09.5	218°19.0	9.8′	N25°34.7	-1.0′	54.8′
7	285°54.3	10.1	232°47.8	9.8′	25°33.7	-1.2′	54.8′
8	300°54.3	10.7	247°16.6	9.8′	25°32.5	-1.3′	54.8′
9	315°54.3	·· 11.3	261°45.3	9.8′	25°31.2	-1.4′	54.8′
10	330°54.3	11.8	276°14.1	9.8′	25°29.8	-1.6′	54.8′
11	345°54.3	12.4	290°42.9	9.8′	25°28.2	-1.7′	54.9′
12	0°54.3	N19°13.0	305°11.6	9.8′	N25°26.5	-1.8′	54.9′
13	15°54.2	13.5	319°40.4	9.7′	25°24.7	-1.9′	54.9′
14	30°54.2	14.1	334°09.1	9.7′	25°22.8	-2.1′	54.9′
15	45°54.2	·· 14.7	348°37.9	9.7′	25°20.7	-2.2′	54.9′
16	60°54.2	15.2	3°06.6	9.7′	25°18.5	-2.3′	55.0′
17	75°54.2	15.8	17°35.3	9.7′	25°16.1	-2.5′	55.0′
18	90°54.2	N19°16.4	32°04.1	9.7′	N25°13.7	-2.6′	55.0′
19	105°54.1	16.9	46°32.8	9.7′	25°11.1	-2.7′	55.0′
20	120°54.1	17.5	61°01.6	9.7′	25°08.4	-2.9′	55.0′
21	135°54.1	·· 18.1	75°30.3	9.7′	25°05.5	-3.0′	55.1′
22	150°54.1	18.6	89°59.0	9.8′	25°02.5	-3.1′	55.1′
23	165°54.1	19.2	104°27.8	9.8′	24°59.4	-3.2′	55.1′
	SD = 15.8′	d = 0.6′		SD = 14.9′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.0	N19°19.8	118°56.6	9.8′	N24°56.2	-3.4′	55.1′
1	195°54.0	20.3	133°25.3	9.8′	24°52.8	-3.5′	55.2′
2	210°54.0	20.9	147°54.1	9.8′	24°49.3	-3.6′	55.2′
3	225°54.0	·· 21.5	162°22.9	9.8′	24°45.7	-3.8′	55.2′
4	240°54.0	22.0	176°51.6	9.8′	24°41.9	-3.9′	55.2′
5	255°53.9	22.6	191°20.4	9.8′	24°38.1	-4.0′	55.2′
6	270°53.9	N19°23.1	205°49.2	9.8′	N24°34.0	-4.1′	55.3′
7	285°53.9	23.7	220°18.1	9.8′	24°29.9	-4.3′	55.3′
8	300°53.9	24.3	234°46.9	9.8′	24°25.6	-4.4′	55.3′
9	315°53.9	·· 24.8	249°15.7	9.8′	24°21.3	-4.5′	55.3′
10	330°53.8	25.4	263°44.6	9.9′	24°16.7	-4.6′	55.4′
11	345°53.8	25.9	278°13.4	9.9′	24°12.1	-4.8′	55.4′
12	0°53.8	N19°26.5	292°42.3	9.9′	N24°07.3	-4.9′	55.4′
13	15°53.8	27.0	307°11.2	9.9′	24°02.4	-5.0′	55.4′
14	30°53.8	27.6	321°40.1	9.9′	23°57.4	-5.1′	55.5′
15	45°53.7	·· 28.2	336°09.0	9.9′	23°52.3	-5.3′	55.5′
16	60°53.7	28.7	350°38.0	10.0′	23°47.0	-5.4′	55.5′
17	75°53.7	29.3	5°06.9	10.0′	23°41.6	-5.5′	55.5′
18	90°53.7	N19°29.8	19°35.9	10.0′	N23°36.1	-5.6′	55.6′
19	105°53.6	30.4	34°04.9	10.0′	23°30.4	-5.8′	55.6′
20	120°53.6	30.9	48°33.9	10.0′	23°24.6	-5.9′	55.6′
21	135°53.6	·· 31.5	63°02.9	10.1′	23°18.7	-6.0′	55.6′
22	150°53.6	32.0	77°32.0	10.1′	23°12.7	-6.1′	55.7′
23	165°53.6	32.6	92°01.0	10.1′	23°06.6	-6.3′	55.7′
	SD = 15.8′	d = 0.6′		SD = 15.0′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.5	N19°33.1	106°30.1	10.1′	N23°00.3	-6.4′	55.7′
1	195°53.5	33.7	120°59.2	10.1′	22°53.9	-6.5′	55.7′
2	210°53.5	34.2	135°28.4	10.2′	22°47.4	-6.6′	55.8′
3	225°53.5	·· 34.8	149°57.5	10.2′	22°40.8	-6.8′	55.8′
4	240°53.4	35.3	164°26.7	10.2′	22°34.0	-6.9′	55.8′
5	255°53.4	35.9	178°55.9	10.2′	22°27.2	-7.0′	55.9′
6	270°53.4	N19°36.4	193°25.1	10.3′	N22°20.2	-7.1′	55.9′
7	285°53.4	37.0	207°54.4	10.3′	22°13.0	-7.2′	55.9′
8	300°53.3	37.5	222°23.7	10.3′	22°05.8	-7.4′	55.9′
9	315°53.3	·· 38.0	236°53.0	10.3′	21°58.5	-7.5′	56.0′
10	330°53.3	38.6	251°22.3	10.3′	21°51.0	-7.6′	56.0′
11	345°53.2	39.1	265°51.6	10.4′	21°43.4	-7.7′	56.0′
12	0°53.2	N19°39.7	280°21.0	10.4′	N21°35.7	-7.8′	56.1′
13	15°53.2	40.2	294°50.4	10.4′	21°27.9	-7.9′	56.1′
14	30°53.2	40.8	309°19.8	10.5′	21°19.9	-8.1′	56.1′
15	45°53.1	·· 41.3	323°49.3	10.5′	21°11.9	-8.2′	56.1′
16	60°53.1	41.8	338°18.8	10.5′	21°03.7	-8.3′	56.2′
17	75°53.1	42.4	352°48.3	10.5′	20°55.4	-8.4′	56.2′
18	90°53.1	N19°42.9	7°17.8	10.6′	N20°47.0	-8.5′	56.2′
19	105°53.0	43.5	21°47.4	10.6′	20°38.5	-8.6′	56.3′
20	120°53.0	44.0	36°17.0	10.6′	20°29.9	-8.7′	56.3′
21	135°53.0	·· 44.5	50°46.6	10.6′	20°21.2	-8.8′	56.3′
22	150°52.9	45.1	65°16.2	10.7′	20°12.3	-9.0′	56.4′
23	165°52.9	45.6	79°45.9	10.7′	20°03.4	-9.1′	56.4′
	SD = 15.8′	d = 0.5′		SD = 15.2′			

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°	–:–	00:51	02:40	21:15	23:11	–:–
62°	–:–	01:42	03:01	20:54	22:15	–:–
60°	–:–	02:12	03:17	20:37	21:43	–:–
N 58°	00:45	02:35	03:31	20:23	21:20	23:16
56°	01:32	02:53	03:43	20:11	21:02	22:24
54°	02:00	03:08	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°	04:08	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	15:47	16:33	17:22
S 60°	06:35	07:28	08:18	15:34	16:24	17:17

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

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 5-7 15-32%
16	03:38	03:37	11:56	15:47	03:21	
17	03:36	03:35	11:56	16:39	04:13	
18	03:34	03:33	11:56	17:30	05:04	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°53.0	166°14.7	N22°37.9	129°51.0	N23°55.5	263°59.6	S12°02.9	280°43.8	S17°21.9
1	251°55.5	181°13.9	38.4	144°51.8	55.3	279°01.8	02.8	295°46.2	21.9
2	266°58.0	196°13.1	38.9	159°52.6	55.1	294°04.0	02.8	310°48.7	21.9
3	282°00.4	211°12.3	·· 39.4	174°53.4	·· 55.0	309°06.3	·· 02.7	325°51.1	·· 21.9
4	297°02.9	226°11.5	39.9	189°54.2	54.8	324°08.5	02.6	340°53.6	21.9
5	312°05.3	241°10.7	40.4	204°55.0	54.6	339°10.7	02.5	355°56.0	21.9
6	327°07.8	256°09.8	N22°40.9	219°55.8	N23°54.4	354°12.9	S12°02.5	10°58.5	S17°21.9
7	342°10.3	271°09.0	41.4	234°56.6	54.2	9°15.2	02.4	26°00.9	21.9
8	357°12.7	286°08.2	41.9	249°57.4	54.0	24°17.4	02.3	41°03.4	21.9
9	12°15.2	301°07.4	·· 42.4	264°58.2	·· 53.8	39°19.6	·· 02.2	56°05.8	·· 21.9
10	27°17.7	316°06.6	42.9	279°59.0	53.6	54°21.9	02.2	71°08.3	21.9
11	42°20.1	331°05.8	43.4	294°59.8	53.5	69°24.1	02.1	86°10.7	21.9
12	57°22.6	346°04.9	N22°43.9	310°00.6	N23°53.3	84°26.3	S12°02.0	101°13.1	S17°21.9
13	72°25.1	1°04.1	44.4	325°01.4	53.1	99°28.5	01.9	116°15.6	21.9
14	87°27.5	16°03.3	44.9	340°02.2	52.9	114°30.8	01.8	131°18.0	21.9
15	102°30.0	31°02.5	·· 45.4	355°03.0	·· 52.7	129°33.0	·· 01.8	146°20.5	·· 21.9
16	117°32.4	46°01.7	45.9	10°03.8	52.5	144°35.2	01.7	161°22.9	21.9
17	132°34.9	61°00.8	46.3	25°04.6	52.3	159°37.5	01.6	176°25.4	21.9
18	147°37.4	76°00.0	N22°46.8	40°05.4	N23°52.1	174°39.7	S12°01.5	191°27.8	S17°21.9
19	162°39.8	90°59.2	47.3	55°06.2	51.9	189°41.9	01.5	206°30.3	21.9
20	177°42.3	105°58.4	47.8	70°07.0	51.7	204°44.2	01.4	221°32.7	21.9
21	192°44.8	120°57.5	·· 48.3	85°07.9	·· 51.6	219°46.4	·· 01.3	236°35.2	·· 21.9
22	207°47.2	135°56.7	48.8	100°08.7	51.4	234°48.6	01.2	251°37.6	21.9
23	222°49.7	150°55.9	49.2	115°09.5	51.2	249°50.9	01.2	266°40.1	21.9
Mer.pass.	08:11	ν -0.8′	d 0.5′	m -3.87	ν 0.8′	d -0.2′	m 1.69	ν 2.2′	d -0.1′ m -2.31	ν 2.4′	d 0.0′ m 0.59
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°52.2	165°55.1	N22°49.7	130°10.3	N23°51.0	264°53.1	S12°01.1	281°42.5	S17°21.9
1	252°54.6	180°54.3	50.2	145°11.1	50.8	279°55.3	01.0	296°45.0	21.9
2	267°57.1	195°53.4	50.7	160°11.9	50.6	294°57.5	00.9	311°47.4	21.9
3	282°59.6	210°52.6	·· 51.1	175°12.7	·· 50.4	309°59.8	·· 00.9	326°49.9	·· 21.9
4	298°02.0	225°51.8	51.6	190°13.5	50.2	325°02.0	00.8	341°52.3	21.9
5	313°04.5	240°51.0	52.1	205°14.3	50.0	340°04.2	00.7	356°54.8	21.9
6	328°06.9	255°50.1	N22°52.6	220°15.1	N23°49.8	355°06.5	S12°00.6	11°57.2	S17°21.9
7	343°09.4	270°49.3	53.0	235°15.9	49.6	10°08.7	00.6	26°59.7	21.9
8	358°11.9	285°48.5	53.5	250°16.7	49.4	25°10.9	00.5	42°02.1	21.9
9	13°14.3	300°47.7	·· 54.0	265°17.5	·· 49.2	40°13.2	·· 00.4	57°04.6	·· 21.9
10	28°16.8	315°46.8	54.4	280°18.3	49.0	55°15.4	00.4	72°07.0	21.9
11	43°19.3	330°46.0	54.9	295°19.1	48.8	70°17.7	00.3	87°09.5	21.9
12	58°21.7	345°45.2	N22°55.4	310°19.9	N23°48.7	85°19.9	S12°00.2	102°11.9	S17°21.9
13	73°24.2	0°44.3	55.8	325°20.7	48.5	100°22.1	00.1	117°14.4	21.9
14	88°26.7	15°43.5	56.3	340°21.5	48.3	115°24.4	00.1	132°16.8	21.9
15	103°29.1	30°42.7	·· 56.8	355°22.4	·· 48.1	130°26.6	12°00.0	147°19.3	·· 21.9
16	118°31.6	45°41.9	57.2	10°23.2	47.9	145°28.8	11°59.9	162°21.7	21.9
17	133°34.1	60°41.0	57.7	25°24.0	47.7	160°31.1	59.8	177°24.2	21.9
18	148°36.5	75°40.2	N22°58.1	40°24.8	N23°47.5	175°33.3	S11°59.8	192°26.6	S17°21.9
19	163°39.0	90°39.4	58.6	55°25.6	47.3	190°35.5	59.7	207°29.1	21.9
20	178°41.4	105°38.5	59.1	70°26.4	47.1	205°37.8	59.6	222°31.5	21.9
21	193°43.9	120°37.7	22°59.5	85°27.2	·· 46.9	220°40.0	·· 59.5	237°34.0	·· 21.9
22	208°46.4	135°36.9	23°00.0	100°28.0	46.7	235°42.3	59.5	252°36.4	21.9
23	223°48.8	150°36.0	00.4	115°28.8	46.5	250°44.5	59.4	267°38.9	21.9
Mer.pass.	08:07	ν -0.8′	d 0.5′	m -3.87	ν 0.8′	d -0.2′	m 1.69	ν 2.2′	d -0.1′ m -2.32	ν 2.4′	d 0.0′ m 0.59
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	238°51.3	165°35.2	N23°00.9	130°29.6	N23°46.3	265°46.7	S11°59.3	282°41.3	S17°21.9
1	253°53.8	180°34.4	01.3	145°30.4	46.1	280°49.0	59.3	297°43.8	21.9
2	268°56.2	195°33.6	01.8	160°31.2	45.9	295°51.2	59.2	312°46.2	22.0
3	283°58.7	210°32.7	·· 02.2	175°32.0	·· 45.7	310°53.5	·· 59.1	327°48.7	·· 22.0
4	299°01.2	225°31.9	02.7	190°32.8	45.5	325°55.7	59.0	342°51.1	22.0
5	314°03.6	240°31.1	03.1	205°33.6	45.3	340°57.9	59.0	357°53.6	22.0
6	329°06.1	255°30.2	N23°03.6	220°34.5	N23°45.1	356°00.2	S11°58.9	12°56.0	S17°22.0
7	344°08.5	270°29.4	04.0	235°35.3	44.9	11°02.4	58.8	27°58.5	22.0
8	359°11.0	285°28.6	04.4	250°36.1	44.7	26°04.7	58.8	43°01.0	22.0
9	14°13.5	300°27.7	·· 04.9	265°36.9	·· 44.5	41°06.9	·· 58.7	58°03.4	·· 22.0
10	29°15.9	315°26.9	05.3	280°37.7	44.3	56°09.1	58.6	73°05.9	22.0
11	44°18.4	330°26.1	05.8	295°38.5	44.1	71°11.4	58.5	88°08.3	22.0
12	59°20.9	345°25.2	N23°06.2	310°39.3	N23°43.9	86°13.6	S11°58.5	103°10.8	S17°22.0
13	74°23.3	0°24.4	06.6	325°40.1	43.7	101°15.9	58.4	118°13.2	22.0
14	89°25.8	15°23.5	07.1	340°40.9	43.5	116°18.1	58.3	133°15.7	22.0
15	104°28.3	30°22.7	·· 07.5	355°41.7	·· 43.3	131°20.3	·· 58.3	148°18.1	·· 22.0
16	119°30.7	45°21.9	07.9	10°42.5	43.1	146°22.6	58.2	163°20.6	22.0
17	134°33.2	60°21.0	08.4	25°43.3	42.9	161°24.8	58.1	178°23.0	22.0
18	149°35.7	75°20.2	N23°08.8	40°44.1	N23°42.7	176°27.1	S11°58.0	193°25.5	S17°22.0
19	164°38.1	90°19.4	09.2	55°44.9	42.4	191°29.3	58.0	208°28.0	22.0
20	179°40.6	105°18.5	09.7	70°45.8	42.2	206°31.6	57.9	223°30.4	22.0
21	194°43.0	120°17.7	·· 10.1	85°46.6	·· 42.0	221°33.8	·· 57.8	238°32.9	·· 22.0
22	209°45.5	135°16.8	10.5	100°47.4	41.8	236°36.0	57.8	253°35.3	22.0
23	224°48.0	150°16.0	10.9	115°48.2	41.6	251°38.3	57.7	268°37.8	22.0
Mer.pass.	08:03	ν -0.8′	d 0.5′	m -3.87	ν 0.8′	d -0.2′	m 1.70	ν 2.2′	d -0.1′ m -2.33	ν 2.5′	d 0.0′ m 0.58

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.4	-42°11.4
Schedar	349°34.7	56°38.9
Diphda	348°50.5	-17°52.3
Achernar	335°23.0	-57°07.7
Hamal	327°54.9	23°33.6
Polaris	315°51.8	89°21.1
Acamar	315°14.5	-40°13.2
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.8	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.6
Sirius	258°29.1	-16°44.9
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.2	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°39.0	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°02.9	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.8	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.6
Antares	112°19.1	-26°28.7
Atria	107°15.5	-69°03.8
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.0
Rasalhague	96°01.0	12°32.6
Eltanin	90°43.1	51°29.0
Kaus Aust.	83°36.2	-34°22.4
Vega	80°34.9	38°48.0
Nunki	75°51.2	-26°16.1
Altair	62°02.7	8°55.4
Peacock	53°10.2	-56°39.8
Deneb	49°27.6	45°21.1
Enif	33°41.7	9°58.2
Al Na'ir	27°36.7	-46°51.3
Fomalhaut	15°17.9	-29°30.5
Scheat	13°48.2	28°11.6
Markab	13°32.9	15°19.0

May 19 Wed	SHA	Mer.pass
Venus	289°21.7	12:56
Mars	252°57.9	15:20
Jupiter	27°06.6	06:23
Saturn	43°50.8	05:16

May 20 Thu	SHA	Mer.pass
Venus	288°02.9	12:57
Mars	252°18.1	15:18
Jupiter	27°00.9	06:20
Saturn	43°50.4	05:12

May 21 Fri	SHA	Mer.pass
Venus	286°43.9	12:58
Mars	251°38.3	15:17
Jupiter	26°55.4	06:16
Saturn	43°50.0	05:08

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.9	N19°46.1	94°15.6	10.7′	N19°54.3	-9.2′	56.4′
1	195°52.8	46.7	108°45.3	10.7′	19°45.1	-9.3′	56.5′
2	210°52.8	47.2	123°15.0	10.8′	19°35.8	-9.4′	56.5′
3	225°52.8	·· 47.7	137°44.8	10.8′	19°26.4	-9.5′	56.5′
4	240°52.8	48.3	152°14.6	10.8′	19°16.9	-9.6′	56.6′
5	255°52.7	48.8	166°44.4	10.9′	19°07.3	-9.7′	56.6′
6	270°52.7	N19°49.3	181°14.3	10.9′	N18°57.6	-9.8′	56.6′
7	285°52.7	49.9	195°44.1	10.9′	18°47.8	-9.9′	56.7′
8	300°52.6	50.4	210°14.1	10.9′	18°37.8	-10.0′	56.7′
9	315°52.6	·· 50.9	224°44.0	11.0′	18°27.8	-10.1′	56.7′
10	330°52.6	51.5	239°13.9	11.0′	18°17.7	-10.2′	56.8′
11	345°52.5	52.0	253°43.9	11.0′	18°07.4	-10.3′	56.8′
12	0°52.5	N19°52.5	268°13.9	11.0′	N17°57.1	-10.4′	56.8′
13	15°52.5	53.1	282°44.0	11.1′	17°46.6	-10.5′	56.9′
14	30°52.4	53.6	297°14.0	11.1′	17°36.1	-10.7′	56.9′
15	45°52.4	·· 54.1	311°44.1	11.1′	17°25.4	-10.8′	56.9′
16	60°52.4	54.6	326°14.2	11.1′	17°14.7	-10.8′	57.0′
17	75°52.3	55.2	340°44.3	11.2′	17°03.8	-10.9′	57.0′
18	90°52.3	N19°55.7	355°14.5	11.2′	N16°52.9	-11.0′	57.0′
19	105°52.3	56.2	9°44.7	11.2′	16°41.8	-11.1′	57.1′
20	120°52.2	56.7	24°14.9	11.2′	16°30.7	-11.2′	57.1′
21	135°52.2	·· 57.3	38°45.1	11.2′	16°19.5	-11.3′	57.1′
22	150°52.2	57.8	53°15.3	11.3′	16°08.1	-11.4′	57.2′
23	165°52.1	58.3	67°45.6	11.3′	15°56.7	-11.5′	57.2′
	SD = 15.8′	d = 0.5′	SD = 15.4′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.1	N19°58.8	82°15.9	11.3′	N15°45.2	-11.6′	57.2′
1	195°52.1	59.3	96°46.2	11.3′	15°33.6	-11.7′	57.3′
2	210°52.0	19°59.9	111°16.5	11.3′	15°21.8	-11.8′	57.3′
3	225°52.0	20°00.4	125°46.8	11.4′	15°10.0	-11.9′	57.4′
4	240°52.0	00.9	140°17.2	11.4′	14°58.1	-12.0′	57.4′
5	255°51.9	01.4	154°47.6	11.4′	14°46.2	-12.1′	57.4′
6	270°51.9	N20°01.9	169°18.0	11.4′	N14°34.1	-12.2′	57.5′
7	285°51.8	02.5	183°48.4	11.4′	14°21.9	-12.2′	57.5′
8	300°51.8	03.0	198°18.9	11.5′	14°09.7	-12.3′	57.5′
9	315°51.8	·· 03.5	212°49.3	11.5′	13°57.4	-12.4′	57.6′
10	330°51.7	04.0	227°19.8	11.5′	13°44.9	-12.5′	57.6′
11	345°51.7	04.5	241°50.3	11.5′	13°32.4	-12.6′	57.6′
12	0°51.7	N20°05.0	256°20.8	11.5′	N13°19.8	-12.7′	57.7′
13	15°51.6	05.5	270°51.3	11.5′	13°07.2	-12.8′	57.7′
14	30°51.6	06.1	285°21.8	11.5′	12°54.4	-12.8′	57.8′
15	45°51.5	·· 06.6	299°52.3	11.6′	12°41.6	-12.9′	57.8′
16	60°51.5	07.1	314°22.9	11.6′	12°28.7	-13.0′	57.8′
17	75°51.5	07.6	328°53.5	11.6′	12°15.7	-13.1′	57.9′
18	90°51.4	N20°08.1	343°24.0	11.6′	N12°02.6	-13.2′	57.9′
19	105°51.4	08.6	357°54.6	11.6′	11°49.5	-13.2′	57.9′
20	120°51.3	09.1	12°25.2	11.6′	11°36.2	-13.3′	58.0′
21	135°51.3	·· 09.6	26°55.8	11.6′	11°22.9	-13.4′	58.0′
22	150°51.3	10.1	41°26.4	11.6′	11°09.5	-13.5′	58.1′
23	165°51.2	10.7	55°57.0	11.6′	10°56.1	-13.5′	58.1′
	SD = 15.8′	d = 0.5′	SD = 15.6′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.2	N20°11.2	70°27.6	11.6′	N10°42.6	-13.6′	58.1′
1	195°51.1	11.7	84°58.3	11.6′	10°29.0	-13.7′	58.2′
2	210°51.1	12.2	99°28.9	11.6′	10°15.3	-13.7′	58.2′
3	225°51.1	·· 12.7	113°59.5	11.6′	10°01.6	-13.8′	58.2′
4	240°51.0	13.2	128°30.1	11.6′	09°47.8	-13.9′	58.3′
5	255°51.0	13.7	143°00.8	11.6′	09°33.9	-13.9′	58.3′
6	270°50.9	N20°14.2	157°31.4	11.6′	N09°19.9	-14.0′	58.4′
7	285°50.9	14.7	172°02.1	11.6′	09°05.9	-14.1′	58.4′
8	300°50.9	15.2	186°32.7	11.6′	08°51.9	-14.1′	58.4′
9	315°50.8	·· 15.7	201°03.3	11.6′	08°37.7	-14.2′	58.5′
10	330°50.8	16.2	215°33.9	11.6′	08°23.5	-14.3′	58.5′
11	345°50.7	16.7	230°04.6	11.6′	08°09.3	-14.3′	58.5′
12	0°50.7	N20°17.2	244°35.2	11.6′	N07°54.9	-14.4′	58.6′
13	15°50.6	17.7	259°05.8	11.6′	07°40.5	-14.4′	58.6′
14	30°50.6	18.2	273°36.4	11.6′	07°26.1	-14.5′	58.7′
15	45°50.5	·· 18.7	288°07.0	11.6′	07°11.6	-14.6′	58.7′
16	60°50.5	19.2	302°37.6	11.6′	06°57.1	-14.6′	58.7′
17	75°50.5	19.7	317°08.2	11.6′	06°42.4	-14.7′	58.8′
18	90°50.4	N20°20.2	331°38.8	11.6′	N06°27.8	-14.7′	58.8′
19	105°50.4	20.7	346°09.3	11.5′	06°13.1	-14.8′	58.8′
20	120°50.3	21.2	0°39.9	11.5′	05°58.3	-14.8′	58.9′
21	135°50.3	·· 21.7	15°10.4	11.5′	05°43.5	-14.9′	58.9′
22	150°50.2	22.2	29°40.9	11.5′	05°28.6	-14.9′	59.0′
23	165°50.2	22.7	44°11.4	11.5′	05°13.7	-15.0′	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	22:44	–:–	–:–
66°	–:–	–:–	02:01	21:55	–:–	–:–
64°	–:–	00:06	02:31	21:25	–:–	–:–
62°	–:–	01:28	02:53	21:02	22:29	–:–
60°	–:–	02:02	03:11	20:44	21:53	–:–
N 58°	00:05	02:27	03:26	20:29	21:28	–:–
56°	01:20	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	04:25	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	18:38	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	16:50	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 Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°		09:35	12:03		04:17	03:33
N 70°	07:27	10:04	12:15	04:39	03:46	03:18
68°	08:17	10:25	12:25	03:49	03:23	03:06
66°	08:48	10:42	12:33	03:17	03:05	02:56
64°	09:11	10:55	12:39	02:53	02:51	02:48
62°	09:29	11:07	12:45	02:34	02:38	02:40
60°	09:44	11:16	12:50	02:18	02:28	02:34
N 58°	09:56	11:25	12:55	02:05	02:18	02:28
56°	10:07	11:32	12:58	01:53	02:10	02:23
54°	10:17	11:38	13:02	01:43	02:03	02:19
52°	10:25	11:44	13:05	01:34	01:56	02:15
50°	10:33	11:49	13:08	01:26	01:50	02:11
45°	10:49	12:01	13:14	01:09	01:38	02:03
N 40°	11:02	12:10	13:19	00:54	01:27	01:56
35°	11:13	12:18	13:24	00:42	01:18	01:50
30°	11:23	12:25	13:28	00:31	01:10	01:45
20°	11:40	12:37	13:34	00:13	00:56	01:36
N 10°	11:54	12:47	13:40	·· ··	00:43	01:28
0°	12:08	12:57	13:46	·· ··	00:31	01:20
S 10°	12:21	13:07	13:51	·· ··	00:20	01:13
20°	12:36	13:17	13:57	·· ··	00:07	01:04
30°	12:52	13:29	14:04	23:53	·· ··	00:55
35°	13:02	13:36	14:07	23:44	·· ··	00:49
40°	13:12	13:43	14:12	23:34	·· ··	00:43
45°	13:25	13:52	14:17	23:23	·· ··	00:35
S 50°	13:40	14:03	14:23	23:09	·· ··	00:27
52°	13:48	14:08	14:25	23:02	·· ··	00:22
54°	13:56	14:13	14:28	22:55	·· ··	00:18
56°	14:04	14:19	14:32	22:47	·· ··	00:13
58°	14:14	14:26	14:35	22:38	·· ··	00:07
S 60°	14:26	14:33	14:39	22:27	·· ··	00:01

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 8-10 42-63%
19	03:32	03:30	11:56	18:20	05:55	
20	03:28	03:27	11:57	19:09	06:44	
21	03:25	03:23	11:57	19:57	07:33	

DUT1 = UT1-UTC = -0.1830 sec ΔT = TT-UT1 = +69.3670 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	239°50.4	165°15.2	N23°11.4	130°49.0	N23°41.4	266°40.5	S11°57.6	283°40.2	S17°22.0
1	254°52.9	180°14.3	11.8	145°49.8	41.2	281°42.8	57.5	298°42.7	22.0
2	269°55.4	195°13.5	12.2	160°50.6	41.0	296°45.0	57.5	313°45.1	22.0
3	284°57.8	210°12.6	·· 12.6	175°51.4	·· 40.8	311°47.3	·· 57.4	328°47.6	·· 22.0
4	300°00.3	225°11.8	13.1	190°52.2	40.6	326°49.5	57.3	343°50.1	22.0
5	315°02.8	240°11.0	13.5	205°53.0	40.4	341°51.8	57.3	358°52.5	22.1
6	330°05.2	255°10.1	N23°13.9	220°53.8	N23°40.2	356°54.0	S11°57.2	13°55.0	S17°22.1
7	345°07.7	270°09.3	14.3	235°54.6	40.0	11°56.3	57.1	28°57.4	22.1
8	0°10.2	285°08.4	14.7	250°55.5	39.8	26°58.5	57.1	43°59.9	22.1
9	15°12.6	300°07.6	·· 15.1	265°56.3	·· 39.6	42°00.8	·· 57.0	59°02.4	·· 22.1
10	30°15.1	315°06.8	15.5	280°57.1	39.3	57°03.0	56.9	74°04.8	22.1
11	45°17.5	330°05.9	16.0	295°57.9	39.1	72°05.3	56.9	89°07.3	22.1
12	60°20.0	345°05.1	N23°16.4	310°58.7	N23°38.9	87°07.5	S11°56.8	104°09.7	S17°22.1
13	75°22.5	0°04.2	16.8	325°59.5	38.7	102°09.8	56.7	119°12.2	22.1
14	90°24.9	15°03.4	17.2	341°00.3	38.5	117°12.0	56.6	134°14.6	22.1
15	105°27.4	30°02.5	·· 17.6	356°01.1	·· 38.3	132°14.2	·· 56.6	149°17.1	·· 22.1
16	120°29.9	45°01.7	18.0	11°01.9	38.1	147°16.5	56.5	164°19.6	22.1
17	135°32.3	60°00.9	18.4	26°02.7	37.9	162°18.7	56.4	179°22.0	22.1
18	150°34.8	75°00.0	N23°18.8	41°03.6	N23°37.7	177°21.0	S11°56.4	194°24.5	S17°22.1
19	165°37.3	89°59.2	19.2	56°04.4	37.5	192°23.2	56.3	209°26.9	22.1
20	180°39.7	104°58.3	19.6	71°05.2	37.2	207°25.5	56.2	224°29.4	22.1
21	195°42.2	119°57.5	·· 20.0	86°06.0	·· 37.0	222°27.7	·· 56.2	239°31.9	·· 22.1
22	210°44.6	134°56.6	20.4	101°06.8	36.8	237°30.0	56.1	254°34.3	22.1
23	225°47.1	149°55.8	20.8	116°07.6	36.6	252°32.3	56.0	269°36.8	22.1
Mer.pass.	07:59	ν -0.8′	d 0.4′	m -3.87	ν 0.8′	d -0.2′	m 1.70	ν 2.2′	d -0.1′ m -2.33	ν 2.5′	d 0.0′ m 0.58

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	240°49.6	164°54.9	N23°21.2	131°08.4	N23°36.4	267°34.5	S11°56.0	284°39.2	S17°22.1
1	255°52.0	179°54.1	21.6	146°09.2	36.2	282°36.8	55.9	299°41.7	22.1
2	270°54.5	194°53.2	22.0	161°10.0	36.0	297°39.0	55.8	314°44.2	22.2
3	285°57.0	209°52.4	·· 22.4	176°10.8	·· 35.8	312°41.3	·· 55.8	329°46.6	·· 22.2
4	300°59.4	224°51.6	22.8	191°11.6	35.5	327°43.5	55.7	344°49.1	22.2
5	316°01.9	239°50.7	23.2	206°12.5	35.3	342°45.8	55.6	359°51.5	22.2
6	331°04.4	254°49.9	N23°23.6	221°13.3	N23°35.1	357°48.0	S11°55.6	14°54.0	S17°22.2
7	346°06.8	269°49.0	23.9	236°14.1	34.9	12°50.3	55.5	29°56.5	22.2
8	1°09.3	284°48.2	24.3	251°14.9	34.7	27°52.5	55.4	44°58.9	22.2
9	16°11.8	299°47.3	·· 24.7	266°15.7	·· 34.5	42°54.8	·· 55.4	60°01.4	·· 22.2
10	31°14.2	314°46.5	25.1	281°16.5	34.3	57°57.0	55.3	75°03.9	22.2
11	46°16.7	329°45.6	25.5	296°17.3	34.0	72°59.3	55.2	90°06.3	22.2
12	61°19.1	344°44.8	N23°25.9	311°18.1	N23°33.8	88°01.5	S11°55.2	105°08.8	S17°22.2
13	76°21.6	359°43.9	26.2	326°18.9	33.6	103°03.8	55.1	120°11.2	22.2
14	91°24.1	14°43.1	26.6	341°19.8	33.4	118°06.1	55.0	135°13.7	22.2
15	106°26.5	29°42.2	·· 27.0	356°20.6	·· 33.2	133°08.3	·· 55.0	150°16.2	·· 22.2
16	121°29.0	44°41.4	27.4	11°21.4	33.0	148°10.6	54.9	165°18.6	22.2
17	136°31.5	59°40.5	27.8	26°22.2	32.7	163°12.8	54.8	180°21.1	22.2
18	151°33.9	74°39.7	N23°28.1	41°23.0	N23°32.5	178°15.1	S11°54.8	195°23.6	S17°22.2
19	166°36.4	89°38.8	28.5	56°23.8	32.3	193°17.3	54.7	210°26.0	22.2
20	181°38.9	104°38.0	28.9	71°24.6	32.1	208°19.6	54.6	225°28.5	22.3
21	196°41.3	119°37.1	·· 29.3	86°25.4	·· 31.9	223°21.9	·· 54.6	240°31.0	·· 22.3
22	211°43.8	134°36.3	29.6	101°26.2	31.6	238°24.1	54.5	255°33.4	22.3
23	226°46.2	149°35.4	30.0	116°27.1	31.4	253°26.4	54.4	270°35.9	22.3
Mer.pass.	07:55	ν -0.8′	d 0.4′	m -3.87	ν 0.8′	d -0.2′	m 1.71	ν 2.3′	d -0.1′ m -2.34	ν 2.5′	d 0.0′ m 0.57

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	241°48.7	164°34.6	N23°30.4	131°27.9	N23°31.2	268°28.6	S11°54.4	285°38.3	S17°22.3
1	256°51.2	179°33.7	30.7	146°28.7	31.0	283°30.9	54.3	300°40.8	22.3
2	271°53.6	194°32.8	31.1	161°29.5	30.8	298°33.1	54.2	315°43.3	22.3
3	286°56.1	209°32.0	·· 31.5	176°30.3	·· 30.6	313°35.4	·· 54.2	330°45.7	·· 22.3
4	301°58.6	224°31.1	31.8	191°31.1	30.3	328°37.7	54.1	345°48.2	22.3
5	317°01.0	239°30.3	32.2	206°31.9	30.1	343°39.9	54.0	0°50.7	22.3
6	332°03.5	254°29.4	N23°32.5	221°32.7	N23°29.9	358°42.2	S11°54.0	15°53.1	S17°22.3
7	347°06.0	269°28.6	32.9	236°33.6	29.7	13°44.4	53.9	30°55.6	22.3
8	2°08.4	284°27.7	33.3	251°34.4	29.4	28°46.7	53.9	45°58.1	22.3
9	17°10.9	299°26.9	·· 33.6	266°35.2	·· 29.2	43°49.0	·· 53.8	61°00.5	·· 22.3
10	32°13.4	314°26.0	34.0	281°36.0	29.0	58°51.2	53.7	76°03.0	22.3
11	47°15.8	329°25.2	34.3	296°36.8	28.8	73°53.5	53.7	91°05.5	22.4
12	62°18.3	344°24.3	N23°34.7	311°37.6	N23°28.6	88°55.7	S11°53.6	106°07.9	S17°22.4
13	77°20.7	359°23.4	35.0	326°38.4	28.3	103°58.0	53.5	121°10.4	22.4
14	92°23.2	14°22.6	35.4	341°39.2	28.1	119°00.3	53.5	136°12.9	22.4
15	107°25.7	29°21.7	·· 35.7	356°40.1	·· 27.9	134°02.5	·· 53.4	151°15.3	·· 22.4
16	122°28.1	44°20.9	36.1	11°40.9	27.7	149°04.8	53.3	166°17.8	22.4
17	137°30.6	59°20.0	36.4	26°41.7	27.4	164°07.1	53.3	181°20.3	22.4
18	152°33.1	74°19.2	N23°36.8	41°42.5	N23°27.2	179°09.3	S11°53.2	196°22.7	S17°22.4
19	167°35.5	89°18.3	37.1	56°43.3	27.0	194°11.6	53.1	211°25.2	22.4
20	182°38.0	104°17.4	37.5	71°44.1	26.8	209°13.9	53.1	226°27.7	22.4
21	197°40.5	119°16.6	·· 37.8	86°44.9	·· 26.5	224°16.1	·· 53.0	241°30.1	·· 22.4
22	212°42.9	134°15.7	38.2	101°45.7	26.3	239°18.4	53.0	256°32.6	22.4
23	227°45.4	149°14.9	38.5	116°46.6	26.1	254°20.6	52.9	271°35.1	22.4
Mer.pass.	07:51	ν -0.9′	d 0.4′	m -3.87	ν 0.8′	d -0.2′	m 1.71	ν 2.3′	d -0.1′ m -2.35	ν 2.5′	d 0.0′ m 0.57

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.4	-42°11.4
Schedar	349°34.7	56°38.9
Diphda	348°50.5	-17°52.3
Achernar	335°23.0	-57°07.7
Hamal	327°54.9	23°33.6
Polaris	315°51.4	89°21.1
Acamar	315°14.5	-40°13.2
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.8	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.6
Sirius	258°29.1	-16°44.9
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.2	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°39.0	-69°48.5
Alphard	217°50.7	-8°45.1
Regulus	207°37.6	11°51.8
Dubhe	193°44.6	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°02.9	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.8	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.6
Antares	112°19.1	-26°28.7
Atria	107°15.5	-69°03.8
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.1
Rasalhague	96°01.0	12°32.6
Eltanin	90°43.1	51°29.0
Kaus Aust.	83°36.1	-34°22.4
Vega	80°34.9	38°48.0
Nunki	75°51.2	-26°16.1
Altair	62°02.7	8°55.4
Peacock	53°10.2	-56°39.8
Deneb	49°27.6	45°21.1
Enif	33°41.7	9°58.2
Al Na'ir	27°36.7	-46°51.3
Fomalhaut	15°17.9	-29°30.5
Scheat	13°48.1	28°11.6
Markab	13°32.9	15°19.0

May 22 Sat	SHA	Mer.pass
Venus	285°24.7	13:00
Mars	250°58.6	15:16
Jupiter	26°50.1	06:12
Saturn	43°49.8	05:04

May 23 Sun	SHA	Mer.pass
Venus	284°05.4	13:01
Mars	250°18.8	15:15
Jupiter	26°44.9	06:09
Saturn	43°49.7	05:01

May 24 Mon	SHA	Mer.pass
Venus	282°45.8	13:02
Mars	249°39.2	15:13
Jupiter	26°39.9	06:05
Saturn	43°49.6	04:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.1	N20°23.2	58°41.9	11.5′	N04°58.7	-15.0′	59.0′
1	195°50.1	23.6	73°12.4	11.4′	04°43.7	-15.1′	59.1′
2	210°50.1	24.1	87°42.8	11.4′	04°28.7	-15.1′	59.1′
3	225°50.0	·· 24.6	102°13.2	11.4′	04°13.6	-15.1′	59.1′
4	240°50.0	25.1	116°43.6	11.4′	03°58.4	-15.2′	59.2′
5	255°49.9	25.6	131°14.0	11.4′	03°43.3	-15.2′	59.2′
6	270°49.9	N20°26.1	145°44.4	11.3′	N03°28.0	-15.3′	59.3′
7	285°49.8	26.6	160°14.7	11.3′	03°12.8	-15.3′	59.3′
8	300°49.8	27.1	174°45.0	11.3′	02°57.5	-15.3′	59.3′
9	315°49.7	·· 27.6	189°15.3	11.3′	02°42.2	-15.4′	59.4′
10	330°49.7	28.0	203°45.6	11.2′	02°26.8	-15.4′	59.4′
11	345°49.6	28.5	218°15.8	11.2′	02°11.4	-15.4′	59.4′
12	0°49.6	N20°29.0	232°46.0	11.2′	N01°56.0	-15.5′	59.5′
13	15°49.5	29.5	247°16.1	11.1′	01°40.5	-15.5′	59.5′
14	30°49.5	30.0	261°46.3	11.1′	01°25.1	-15.5′	59.5′
15	45°49.4	·· 30.5	276°16.4	11.1′	01°09.5	-15.5′	59.6′
16	60°49.4	31.0	290°46.4	11.0′	00°54.0	-15.6′	59.6′
17	75°49.3	31.4	305°16.5	11.0′	00°38.4	-15.6′	59.7′
18	90°49.3	N20°31.9	319°46.5	11.0′	N00°22.9	-15.6′	59.7′
19	105°49.2	32.4	334°16.4	10.9′	N00°07.3	-15.6′	59.7′
20	120°49.2	32.9	348°46.3	10.9′	S00°08.4	15.6′	59.8′
21	135°49.1	·· 33.4	3°16.2	10.8′	00°24.0	15.7′	59.8′
22	150°49.1	33.8	17°46.0	10.8′	00°39.7	15.7′	59.8′
23	165°49.0	34.3	32°15.8	10.7′	00°55.3	15.7′	59.9′
	SD = 15.8′	d = 0.5′	SD = 16.1′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.0	N20°34.8	46°45.6	10.7′	S01°11.0	15.7′	59.9′
1	195°48.9	35.3	61°15.3	10.7′	01°26.7	15.7′	59.9′
2	210°48.9	35.7	75°44.9	10.6′	01°42.4	15.7′	60.0′
3	225°48.8	·· 36.2	90°14.5	10.6′	01°58.2	15.7′	60.0′
4	240°48.8	36.7	104°44.1	10.5′	02°13.9	15.7′	60.0′
5	255°48.7	37.2	119°13.6	10.5′	02°29.6	15.7′	60.1′
6	270°48.7	N20°37.6	133°43.1	10.4′	S02°45.4	15.7′	60.1′
7	285°48.6	38.1	148°12.5	10.4′	03°01.1	15.7′	60.1′
8	300°48.6	38.6	162°41.8	10.3′	03°16.8	15.7′	60.2′
9	315°48.5	·· 39.1	177°11.1	10.2′	03°32.6	15.7′	60.2′
10	330°48.5	39.5	191°40.4	10.2′	03°48.3	15.7′	60.2′
11	345°48.4	40.0	206°09.6	10.1′	04°04.0	15.7′	60.2′
12	0°48.3	N20°40.5	220°38.7	10.1′	S04°19.8	15.7′	60.3′
13	15°48.3	40.9	235°07.8	10.0′	04°35.5	15.7′	60.3′
14	30°48.2	41.4	249°36.8	10.0′	04°51.2	15.7′	60.3′
15	45°48.2	·· 41.9	264°05.8	9.9′	05°06.9	15.7′	60.4′
16	60°48.1	42.4	278°34.6	9.8′	05°22.6	15.7′	60.4′
17	75°48.1	42.8	293°03.5	9.8′	05°38.3	15.7′	60.4′
18	90°48.0	N20°43.3	307°32.2	9.7′	S05°53.9	15.6′	60.4′
19	105°48.0	43.8	322°00.9	9.6′	06°09.6	15.6′	60.5′
20	120°47.9	44.2	336°29.6	9.6′	06°25.2	15.6′	60.5′
21	135°47.9	·· 44.7	350°58.1	9.5′	06°40.8	15.6′	60.5′
22	150°47.8	45.1	5°26.6	9.4′	06°56.3	15.5′	60.6′
23	165°47.7	45.6	19°55.1	9.4′	07°11.9	15.5′	60.6′
	SD = 15.8′	d = 0.5′	SD = 16.3′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.7	N20°46.1	34°23.4	9.3′	S07°27.4	15.5′	60.6′
1	195°47.6	46.5	48°51.7	9.2′	07°42.9	15.5′	60.6′
2	210°47.6	47.0	63°19.9	9.1′	07°58.3	15.4′	60.7′
3	225°47.5	·· 47.5	77°48.1	9.1′	08°13.8	15.4′	60.7′
4	240°47.5	47.9	92°16.1	9.0′	08°29.2	15.4′	60.7′
5	255°47.4	48.4	106°44.1	8.9′	08°44.5	15.3′	60.7′
6	270°47.3	N20°48.8	121°12.0	8.8′	S08°59.8	15.3′	60.8′
7	285°47.3	49.3	135°39.9	8.8′	09°15.1	15.2′	60.8′
8	300°47.2	49.8	150°07.6	8.7′	09°30.3	15.2′	60.8′
9	315°47.2	·· 50.2	164°35.3	8.6′	09°45.5	15.1′	60.8′
10	330°47.1	50.7	179°02.9	8.5′	10°00.6	15.1′	60.8′
11	345°47.1	51.1	193°30.4	8.4′	10°15.7	15.0′	60.9′
12	0°47.0	N20°51.6	207°57.9	8.4′	S10°30.8	15.0′	60.9′
13	15°46.9	52.0	222°25.2	8.3′	10°45.7	14.9′	60.9′
14	30°46.9	52.5	236°52.5	8.2′	11°00.7	14.9′	60.9′
15	45°46.8	·· 52.9	251°19.7	8.1′	11°15.5	14.8′	60.9′
16	60°46.8	53.4	265°46.8	8.0′	11°30.3	14.7′	61.0′
17	75°46.7	53.9	280°13.8	7.9′	11°45.1	14.7′	61.0′
18	90°46.6	N20°54.3	294°40.8	7.8′	S11°59.8	14.6′	61.0′
19	105°46.6	54.8	309°07.6	7.8′	12°14.4	14.6′	61.0′
20	120°46.5	55.2	323°34.4	7.7′	12°29.0	14.5′	61.0′
21	135°46.5	·· 55.7	338°01.0	7.6′	12°43.4	14.4′	61.1′
22	150°46.4	56.1	352°27.6	7.5′	12°57.8	14.3′	61.1′
23	165°46.3	56.6	6°54.1	7.4′	13°12.2	14.3′	61.1′
	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°	–:–	01:14	02:46	21:10	22:45	–:–
60°	–:–	01:53	03:05	20:50	22:03	–:–
N 58°	–:–	02:20	03:20	20:35	21:36	–:–
56°	01:07	02:40	03:33	20:21	21:15	22:51
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°	03:48	04:23	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	18:08	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	16:53	17:33
52°	06:25	07:07	07:46	16:08	16:46	17:29
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 Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
N 72°	14:19	16:39	19:16	03:02	02:33	02:02
N 70°	14:21	16:30	18:52	02:56	02:36	02:14
68°	14:22	16:23	18:33	02:52	02:38	02:23
66°	14:23	16:17	18:19	02:48	02:40	02:31
64°	14:24	16:13	18:07	02:45	02:41	02:38
62°	14:25	16:08	17:57	02:42	02:43	02:44
60°	14:26	16:05	17:48	02:39	02:44	02:49
N 58°	14:27	16:02	17:41	02:37	02:45	02:54
56°	14:27	15:59	17:34	02:35	02:46	02:58
54°	14:28	15:56	17:29	02:33	02:47	03:02
52°	14:28	15:54	17:23	02:32	02:48	03:05
50°	14:29	15:52	17:19	02:30	02:49	03:08
45°	14:30	15:48	17:09	02:27	02:50	03:15
N 40°	14:30	15:44	17:00	02:24	02:51	03:20
35°	14:31	15:41	16:53	02:21	02:53	03:25
30°	14:32	15:38	16:47	02:19	02:54	03:30
20°	14:33	15:33	16:36	02:15	02:55	03:37
N 10°	14:34	15:29	16:27	02:12	02:57	03:44
0°	14:35	15:25	16:18	02:09	02:58	03:50
S 10°	14:36	15:21	16:10	02:06	03:00	03:56
20°	14:37	15:17	16:01	02:02	03:01	04:03
30°	14:38	15:13	15:50	01:58	03:03	04:10
35°	14:38	15:10	15:45	01:56	03:04	04:15
40°	14:39	15:07	15:38	01:53	03:05	04:20
45°	14:40	15:04	15:30	01:50	03:06	04:26
S 50°	14:41	15:00	15:21	01:46	03:08	04:33
52°	14:42	14:58	15:17	01:44	03:09	04:36
54°	14:42	14:56	15:12	01:42	03:09	04:40
56°	14:43	14:54	15:07	01:40	03:10	04:44
58°	14:43	14:52	15:02	01:38	03:11	04:48
S 60°	14:44	14:49	14:55	01:35	03:12	04:53

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 11-13 73-91%
22	03:21	03:18	11:57	20:46	08:22	
23	03:16	03:13	11:57	21:37	09:12	
24	03:11	03:08	11:57	22:31	10:04	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	242°47.9	164°14.0	N23°38.8	131°47.4	N23°25.9	269°22.9	S11°52.8	286°37.6	S17°22.4
1	257°50.3	179°13.1	39.2	146°48.2	25.6	284°25.2	52.8	301°40.0	22.5
2	272°52.8	194°12.3	39.5	161°49.0	25.4	299°27.4	52.7	316°42.5	22.5
3	287°55.2	209°11.4	·· 39.9	176°49.8	·· 25.2	314°29.7	·· 52.6	331°45.0	·· 22.5
4	302°57.7	224°10.6	40.2	191°50.6	25.0	329°32.0	52.6	346°47.4	22.5
5	318°00.2	239°09.7	40.5	206°51.4	24.7	344°34.2	52.5	1°49.9	22.5
6	333°02.6	254°08.8	N23°40.9	221°52.3	N23°24.5	359°36.5	S11°52.5	16°52.4	S17°22.5
7	348°05.1	269°08.0	41.2	236°53.1	24.3	14°38.8	52.4	31°54.8	22.5
8	3°07.6	284°07.1	41.5	251°53.9	24.0	29°41.0	52.3	46°57.3	22.5
9	18°10.0	299°06.3	·· 41.8	266°54.7	·· 23.8	44°43.3	·· 52.3	61°59.8	·· 22.5
10	33°12.5	314°05.4	42.2	281°55.5	23.6	59°45.6	52.2	77°02.3	22.5
11	48°15.0	329°04.5	42.5	296°56.3	23.4	74°47.8	52.2	92°04.7	22.5
12	63°17.4	344°03.7	N23°42.8	311°57.1	N23°23.1	89°50.1	S11°52.1	107°07.2	S17°22.5
13	78°19.9	359°02.8	43.2	326°58.0	22.9	104°52.4	52.0	122°09.7	22.5
14	93°22.4	14°02.0	43.5	341°58.8	22.7	119°54.6	52.0	137°12.1	22.6
15	108°24.8	29°01.1	·· 43.8	356°59.6	·· 22.4	134°56.9	·· 51.9	152°14.6	·· 22.6
16	123°27.3	44°00.2	44.1	12°00.4	22.2	149°59.2	51.8	167°17.1	22.6
17	138°29.7	58°59.4	44.4	27°01.2	22.0	165°01.5	51.8	182°19.5	22.6
18	153°32.2	73°58.5	N23°44.8	42°02.0	N23°21.7	180°03.7	S11°51.7	197°22.0	S17°22.6
19	168°34.7	88°57.6	45.1	57°02.8	21.5	195°06.0	51.7	212°24.5	22.6
20	183°37.1	103°56.8	45.4	72°03.7	21.3	210°08.3	51.6	227°27.0	22.6
21	198°39.6	118°55.9	·· 45.7	87°04.5	·· 21.0	225°10.5	·· 51.5	242°29.4	·· 22.6
22	213°42.1	133°55.1	46.0	102°05.3	20.8	240°12.8	51.5	257°31.9	22.6
23	228°44.5	148°54.2	46.3	117°06.1	20.6	255°15.1	51.4	272°34.4	22.6
Mer.pass.	07:48	ν -0.9′	d 0.3′	m -3.87	ν 0.8′	d -0.2′	m 1.72	ν 2.3′	d -0.1′ m -2.36	ν 2.5′	d 0.0′ m 0.56

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	243°47.0	163°53.3	N23°46.6	132°06.9	N23°20.4	270°17.4	S11°51.4	287°36.9	S17°22.6
1	258°49.5	178°52.5	46.9	147°07.7	20.1	285°19.6	51.3	302°39.3	22.6
2	273°51.9	193°51.6	47.3	162°08.6	19.9	300°21.9	51.2	317°41.8	22.7
3	288°54.4	208°50.7	·· 47.6	177°09.4	·· 19.7	315°24.2	·· 51.2	332°44.3	·· 22.7
4	303°56.8	223°49.9	47.9	192°10.2	19.4	330°26.4	51.1	347°46.7	22.7
5	318°59.3	238°49.0	48.2	207°11.0	19.2	345°28.7	51.1	2°49.2	22.7
6	334°01.8	253°48.1	N23°48.5	222°11.8	N23°18.9	0°31.0	S11°51.0	17°51.7	S17°22.7
7	349°04.2	268°47.3	48.8	237°12.6	18.7	15°33.3	50.9	32°54.2	22.7
8	4°06.7	283°46.4	49.1	252°13.4	18.5	30°35.5	50.9	47°56.6	22.7
9	19°09.2	298°45.5	·· 49.4	267°14.3	·· 18.2	45°37.8	·· 50.8	62°59.1	·· 22.7
10	34°11.6	313°44.7	49.7	282°15.1	18.0	60°40.1	50.8	78°01.6	22.7
11	49°14.1	328°43.8	50.0	297°15.9	17.8	75°42.4	50.7	93°04.1	22.7
12	64°16.6	343°42.9	N23°50.3	312°16.7	N23°17.5	90°44.6	S11°50.6	108°06.5	S17°22.7
13	79°19.0	358°42.1	50.6	327°17.5	17.3	105°46.9	50.6	123°09.0	22.8
14	94°21.5	13°41.2	50.9	342°18.3	17.1	120°49.2	50.5	138°11.5	22.8
15	109°24.0	28°40.3	·· 51.2	357°19.2	·· 16.8	135°51.5	·· 50.5	153°14.0	·· 22.8
16	124°26.4	43°39.5	51.5	12°20.0	16.6	150°53.7	50.4	168°16.4	22.8
17	139°28.9	58°38.6	51.7	27°20.8	16.3	165°56.0	50.3	183°18.9	22.8
18	154°31.3	73°37.7	N23°52.0	42°21.6	N23°16.1	180°58.3	S11°50.3	198°21.4	S17°22.8
19	169°33.8	88°36.9	52.3	57°22.4	15.9	196°00.6	50.2	213°23.9	22.8
20	184°36.3	103°36.0	52.6	72°23.2	15.6	211°02.8	50.2	228°26.3	22.8
21	199°38.7	118°35.1	·· 52.9	87°24.1	·· 15.4	226°05.1	·· 50.1	243°28.8	·· 22.8
22	214°41.2	133°34.2	53.2	102°24.9	15.2	241°07.4	50.1	258°31.3	22.8
23	229°43.7	148°33.4	53.5	117°25.7	14.9	256°09.7	50.0	273°33.8	22.9
Mer.pass.	07:44	ν -0.9′	d 0.3′	m -3.87	ν 0.8′	d -0.2′	m 1.72	ν 2.3′	d -0.1′ m -2.36	ν 2.5′	d 0.0′ m 0.56

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	244°46.1	163°32.5	N23°53.7	132°26.5	N23°14.7	271°12.0	S11°49.9	288°36.3	S17°22.9
1	259°48.6	178°31.6	54.0	147°27.3	14.4	286°14.2	49.9	303°38.7	22.9
2	274°51.1	193°30.8	54.3	162°28.1	14.2	301°16.5	49.8	318°41.2	22.9
3	289°53.5	208°29.9	·· 54.6	177°29.0	·· 14.0	316°18.8	·· 49.8	333°43.7	·· 22.9
4	304°56.0	223°29.0	54.9	192°29.8	13.7	331°21.1	49.7	348°46.2	22.9
5	319°58.5	238°28.2	55.1	207°30.6	13.5	346°23.4	49.7	3°48.6	22.9
6	335°00.9	253°27.3	N23°55.4	222°31.4	N23°13.2	1°25.6	S11°49.6	18°51.1	S17°22.9
7	350°03.4	268°26.4	55.7	237°32.2	13.0	16°27.9	49.5	33°53.6	22.9
8	5°05.8	283°25.5	56.0	252°33.1	12.8	31°30.2	49.5	48°56.1	22.9
9	20°08.3	298°24.7	·· 56.2	267°33.9	·· 12.5	46°32.5	·· 49.4	63°58.6	·· 23.0
10	35°10.8	313°23.8	56.5	282°34.7	12.3	61°34.8	49.4	79°01.0	23.0
11	50°13.2	328°22.9	56.8	297°35.5	12.0	76°37.0	49.3	94°03.5	23.0
12	65°15.7	343°22.1	N23°57.0	312°36.3	N23°11.8	91°39.3	S11°49.3	109°06.0	S17°23.0
13	80°18.2	358°21.2	57.3	327°37.1	11.5	106°41.6	49.2	124°08.5	23.0
14	95°20.6	13°20.3	57.6	342°38.0	11.3	121°43.9	49.1	139°10.9	23.0
15	110°23.1	28°19.4	·· 57.8	357°38.8	·· 11.1	136°46.2	·· 49.1	154°13.4	·· 23.0
16	125°25.6	43°18.6	58.1	12°39.6	10.8	151°48.5	49.0	169°15.9	23.0
17	140°28.0	58°17.7	58.4	27°40.4	10.6	166°50.7	49.0	184°18.4	23.0
18	155°30.5	73°16.8	N23°58.6	42°41.2	N23°10.3	181°53.0	S11°48.9	199°20.9	S17°23.0
19	170°33.0	88°15.9	58.9	57°42.1	10.1	196°55.3	48.9	214°23.3	23.1
20	185°35.4	103°15.1	59.1	72°42.9	09.8	211°57.6	48.8	229°25.8	23.1
21	200°37.9	118°14.2	·· 59.4	87°43.7	·· 09.6	226°59.9	·· 48.8	244°28.3	·· 23.1
22	215°40.3	133°13.3	59.7	102°44.5	09.3	242°02.2	48.7	259°30.8	23.1
23	230°42.8	148°12.4	59.9	117°45.3	09.1	257°04.4	48.6	274°33.3	23.1
Mer.pass.	07:40	ν -0.9′	d 0.3′	m -3.87	ν 0.8′	d -0.2′	m 1.73	ν 2.3′	d -0.1′ m -2.37	ν 2.5′	d 0.0′ m 0.56

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.4	-42°11.3
Schedar	349°34.7	56°38.9
Diphda	348°50.5	-17°52.2
Achernar	335°23.0	-57°07.7
Hamal	327°54.8	23°33.6
Polaris	315°50.7	89°21.0
Acamar	315°14.5	-40°13.2
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.8
Capella	280°26.8	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.6
Sirius	258°29.2	-16°44.9
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.2	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°39.0	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.8
Dubhe	193°44.7	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°02.9	-63°13.2
Gacrux	171°54.5	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.4
Kochab	137°18.8	74°04.2
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.6
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°03.8
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.1
Rasalhague	96°01.0	12°32.6
Eltanin	90°43.1	51°29.0
Kaus Aust.	83°36.1	-34°22.4
Vega	80°34.9	38°48.1
Nunki	75°51.2	-26°16.1
Altair	62°02.6	8°55.4
Peacock	53°10.2	-56°39.8
Deneb	49°27.6	45°21.1
Enif	33°41.6	9°58.2
Al Na'ir	27°36.7	-46°51.3
Fomalhaut	15°17.9	-29°30.5
Scheat	13°48.1	28°11.6
Markab	13°32.9	15°19.0

May 25 Tue	SHA	Mer.pass
Venus	281°26.2	13:04
Mars	248°59.5	15:12
Jupiter	26°35.1	06:02
Saturn	43°49.7	04:53

May 26 Wed	SHA	Mer.pass
Venus	280°06.3	13:05
Mars	248°19.9	15:11
Jupiter	26°30.4	05:58
Saturn	43°49.9	04:49

May 27 Thu	SHA	Mer.pass
Venus	278°46.4	13:07
Mars	247°40.4	15:09
Jupiter	26°25.8	05:54
Saturn	43°50.1	04:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.3	N20°57.0	21°20.5	7.3′	S13°26.4	14.2′	61.1′
1	195°46.2	57.5	35°46.8	7.2′	13°40.6	14.1′	61.1′
2	210°46.1	57.9	50°13.1	7.1′	13°54.7	14.0′	61.1′
3	225°46.1	·· 58.3	64°39.2	7.0′	14°08.7	13.9′	61.1′
4	240°46.0	58.8	79°05.2	6.9′	14°22.7	13.8′	61.2′
5	255°46.0	59.2	93°31.2	6.9′	14°36.5	13.8′	61.2′
6	270°45.9	N20°59.7	107°57.0	6.8′	S14°50.3	13.7′	61.2′
7	285°45.8	21°00.1	122°22.8	6.7′	15°04.0	13.6′	61.2′
8	300°45.8	00.6	136°48.5	6.6′	15°17.5	13.5′	61.2′
9	315°45.7	·· 01.0	151°14.1	6.5′	15°31.0	13.4′	61.2′
10	330°45.6	01.4	165°39.6	6.4′	15°44.4	13.3′	61.2′
11	345°45.6	01.9	180°04.9	6.3′	15°57.7	13.2′	61.2′
12	0°45.5	N21°02.3	194°30.2	6.2′	S16°10.8	13.1′	61.2′
13	15°45.5	02.8	208°55.5	6.1′	16°23.9	13.0′	61.2′
14	30°45.4	03.2	223°20.6	6.0′	16°36.9	12.9′	61.2′
15	45°45.3	·· 03.6	237°45.6	5.9′	16°49.7	12.8′	61.3′
16	60°45.3	04.1	252°10.5	5.8′	17°02.5	12.6′	61.3′
17	75°45.2	04.5	266°35.4	5.7′	17°15.1	12.5′	61.3′
18	90°45.1	N21°05.0	281°00.1	5.6′	S17°27.7	12.4′	61.3′
19	105°45.1	05.4	295°24.7	5.6′	17°40.1	12.3′	61.3′
20	120°45.0	05.8	309°49.3	5.5′	17°52.4	12.2′	61.3′
21	135°44.9	·· 06.3	324°13.8	5.4′	18°04.5	12.0′	61.3′
22	150°44.9	06.7	338°38.1	5.3′	18°16.6	11.9′	61.3′
23	165°44.8	07.1	353°02.4	5.2′	18°28.5	11.8′	61.3′
	SD = 15.8′	d = 0.4′	SD = 16.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.7	N21°07.6	7°26.6	5.1′	S18°40.3	11.7′	61.3′
1	195°44.7	08.0	21°50.7	5.0′	18°52.0	11.5′	61.3′
2	210°44.6	08.4	36°14.7	4.9′	19°03.5	11.4′	61.3′
3	225°44.5	·· 08.9	50°38.6	4.8′	19°14.9	11.3′	61.3′
4	240°44.5	09.3	65°02.5	4.7′	19°26.2	11.1′	61.3′
5	255°44.4	09.7	79°26.2	4.7′	19°37.3	11.0′	61.3′
6	270°44.3	N21°10.2	93°49.9	4.6′	S19°48.3	10.8′	61.3′
7	285°44.3	10.6	108°13.5	4.5′	19°59.1	10.7′	61.3′
8	300°44.2	11.0	122°36.9	4.4′	20°09.8	10.6′	61.3′
9	315°44.1	·· 11.4	137°00.4	4.3′	20°20.4	10.4′	61.3′
10	330°44.1	11.9	151°23.7	4.2′	20°30.8	10.3′	61.3′
11	345°44.0	12.3	165°46.9	4.2′	20°41.1	10.1′	61.3′
12	0°43.9	N21°12.7	180°10.1	4.1′	S20°51.2	10.0′	61.3′
13	15°43.9	13.1	194°33.1	4.0′	21°01.2	9.8′	61.3′
14	30°43.8	13.6	208°56.1	3.9′	21°11.0	9.7′	61.2′
15	45°43.7	·· 14.0	223°19.1	3.8′	21°20.6	9.5′	61.2′
16	60°43.6	14.4	237°41.9	3.8′	21°30.1	9.3′	61.2′
17	75°43.6	14.8	252°04.7	3.7′	21°39.5	9.2′	61.2′
18	90°43.5	N21°15.3	266°27.4	3.6′	S21°48.7	9.0′	61.2′
19	105°43.4	15.7	280°50.0	3.6′	21°57.7	8.9′	61.2′
20	120°43.4	16.1	295°12.6	3.5′	22°06.5	8.7′	61.2′
21	135°43.3	·· 16.5	309°35.0	3.4′	22°15.2	8.5′	61.2′
22	150°43.2	16.9	323°57.5	3.4′	22°23.8	8.4′	61.2′
23	165°43.2	17.4	338°19.8	3.3′	22°32.1	8.2′	61.2′
	SD = 15.8′	d = 0.4′	SD = 16.7′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.1	N21°17.8	352°42.1	3.2′	S22°40.3	8.0′	61.1′
1	195°43.0	18.2	7°04.3	3.2′	22°48.3	7.8′	61.1′
2	210°42.9	18.6	21°26.5	3.1′	22°56.2	7.7′	61.1′
3	225°42.9	·· 19.0	35°48.6	3.1′	23°03.8	7.5′	61.1′
4	240°42.8	19.4	50°10.7	3.0′	23°11.3	7.3′	61.1′
5	255°42.7	19.8	64°32.7	2.9′	23°18.7	7.1′	61.1′
6	270°42.6	N21°20.3	78°54.6	2.9′	S23°25.8	7.0′	61.1′
7	285°42.6	20.7	93°16.5	2.9′	23°32.8	6.8′	61.0′
8	300°42.5	21.1	107°38.4	2.8′	23°39.6	6.6′	61.0′
9	315°42.4	·· 21.5	122°00.2	2.8′	23°46.2	6.4′	61.0′
10	330°42.4	21.9	136°21.9	2.7′	23°52.6	6.2′	61.0′
11	345°42.3	22.3	150°43.7	2.7′	23°58.8	6.1′	61.0′
12	0°42.2	N21°22.7	165°05.3	2.6′	S24°04.9	5.9′	61.0′
13	15°42.1	23.1	179°27.0	2.6′	24°10.8	5.7′	60.9′
14	30°42.1	23.6	193°48.6	2.6′	24°16.5	5.5′	60.9′
15	45°42.0	·· 24.0	208°10.2	2.6′	24°22.0	5.3′	60.9′
16	60°41.9	24.4	222°31.7	2.5′	24°27.3	5.1′	60.9′
17	75°41.8	24.8	236°53.3	2.5′	24°32.4	4.9′	60.9′
18	90°41.8	N21°25.2	251°14.8	2.5′	S24°37.3	4.8′	60.8′
19	105°41.7	25.6	265°36.2	2.5′	24°42.1	4.6′	60.8′
20	120°41.6	26.0	279°57.7	2.4′	24°46.7	4.4′	60.8′
21	135°41.5	·· 26.4	294°19.1	2.4′	24°51.0	4.2′	60.8′
22	150°41.5	26.8	308°40.6	2.4′	24°55.2	4.0′	60.7′
23	165°41.4	27.2	323°02.0	2.4′	24°59.2	3.8′	60.7′
	SD = 15.8′	d = 0.4′	SD = 16.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°	–:–	–:–	00:12	–:–	–:–	–:–
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°	–:–	02:13	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	03:07	03:52	20:03	20:49	21:55
50°	02:22	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°	04:49	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	06:55	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	16:44	17:26
54°	06:32	07:17	07:59	15:55	16:37	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	17:05

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

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 14-16 97-100%
25	03:05	03:02	11:57	23:29	11:00	
26	02:59	02:56	11:57	–:–	11:59	
27	02:52	02:49	11:57	00:30	13:02	

DUT1 = UT1-UTC = -0.1854 sec ΔT = TT-UT1 = +69.3694 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	245°45.3	163°11.6	N24°00.2	132°46.2	N23°08.9	272°06.7	S11°48.6	289°35.7	S17°23.1
1	260°47.7	178°10.7	00.4	147°47.0	08.6	287°09.0	48.5	304°38.2	23.1
2	275°50.2	193°09.8	00.7	162°47.8	08.4	302°11.3	48.5	319°40.7	23.1
3	290°52.7	208°08.9	·· 00.9	177°48.6	·· 08.1	317°13.6	·· 48.4	334°43.2	·· 23.1
4	305°55.1	223°08.1	01.2	192°49.4	07.9	332°15.9	48.4	349°45.7	23.2
5	320°57.6	238°07.2	01.4	207°50.2	07.6	347°18.2	48.3	4°48.2	23.2
6	336°00.1	253°06.3	N24°01.7	222°51.1	N23°07.4	2°20.4	S11°48.3	19°50.6	S17°23.2
7	351°02.5	268°05.4	01.9	237°51.9	07.1	17°22.7	48.2	34°53.1	23.2
8	6°05.0	283°04.6	02.1	252°52.7	06.9	32°25.0	48.1	49°55.6	23.2
9	21°07.5	298°03.7	·· 02.4	267°53.5	·· 06.6	47°27.3	·· 48.1	64°58.1	·· 23.2
10	36°09.9	313°02.8	02.6	282°54.3	06.4	62°29.6	48.0	80°00.6	23.2
11	51°12.4	328°01.9	02.9	297°55.2	06.1	77°31.9	48.0	95°03.0	23.2
12	66°14.8	343°01.1	N24°03.1	312°56.0	N23°05.9	92°34.2	S11°47.9	110°05.5	S17°23.2
13	81°17.3	358°00.2	03.3	327°56.8	05.6	107°36.5	47.9	125°08.0	23.3
14	96°19.8	12°59.3	03.6	342°57.6	05.4	122°38.7	47.8	140°10.5	23.3
15	111°22.2	27°58.4	·· 03.8	357°58.4	·· 05.1	137°41.0	·· 47.8	155°13.0	·· 23.3
16	126°24.7	42°57.6	04.0	12°59.3	04.9	152°43.3	47.7	170°15.5	23.3
17	141°27.2	57°56.7	04.3	28°00.1	04.6	167°45.6	47.7	185°17.9	23.3
18	156°29.6	72°55.8	N24°04.5	43°00.9	N23°04.4	182°47.9	S11°47.6	200°20.4	S17°23.3
19	171°32.1	87°54.9	04.7	58°01.7	04.1	197°50.2	47.6	215°22.9	23.3
20	186°34.6	102°54.0	05.0	73°02.6	03.9	212°52.5	47.5	230°25.4	23.3
21	201°37.0	117°53.2	·· 05.2	88°03.4	·· 03.6	227°54.8	·· 47.5	245°27.9	·· 23.4
22	216°39.5	132°52.3	05.4	103°04.2	03.4	242°57.1	47.4	260°30.4	23.4
23	231°42.0	147°51.4	05.6	118°05.0	03.1	257°59.4	47.3	275°32.9	23.4
Mer.pass.	07:36	ν -0.9′	d 0.3′	m -3.87	ν 0.8′	d -0.2′	m 1.73	ν 2.3′	d -0.1′ m -2.38	ν 2.5′	d 0.0′ m 0.55

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	246°44.4	162°50.5	N24°05.9	133°05.8	N23°02.9	273°01.7	S11°47.3	290°35.3	S17°23.4
1	261°46.9	177°49.7	06.1	148°06.7	02.6	288°04.0	47.2	305°37.8	23.4
2	276°49.3	192°48.8	06.3	163°07.5	02.4	303°06.2	47.2	320°40.3	23.4
3	291°51.8	207°47.9	·· 06.5	178°08.3	·· 02.1	318°08.5	·· 47.1	335°42.8	·· 23.4
4	306°54.3	222°47.0	06.8	193°09.1	01.8	333°10.8	47.1	350°45.3	23.4
5	321°56.7	237°46.1	07.0	208°09.9	01.6	348°13.1	47.0	5°47.8	23.5
6	336°59.2	252°45.3	N24°07.2	223°10.8	N23°01.3	3°15.4	S11°47.0	20°50.2	S17°23.5
7	352°01.7	267°44.4	07.4	238°11.6	01.1	18°17.7	46.9	35°52.7	23.5
8	7°04.1	282°43.5	07.6	253°12.4	00.8	33°20.0	46.9	50°55.2	23.5
9	22°06.6	297°42.6	·· 07.8	268°13.2	·· 00.6	48°22.3	·· 46.8	65°57.7	·· 23.5
10	37°09.1	312°41.7	08.0	283°14.1	00.3	63°24.6	46.8	81°00.2	23.5
11	52°11.5	327°40.9	08.3	298°14.9	23°00.1	78°26.9	46.7	96°02.7	23.5
12	67°14.0	342°40.0	N24°08.5	313°15.7	N22°59.8	93°29.2	S11°46.7	111°05.2	S17°23.5
13	82°16.5	357°39.1	08.7	328°16.5	59.6	108°31.5	46.6	126°07.7	23.6
14	97°18.9	12°38.2	08.9	343°17.3	59.3	123°33.8	46.6	141°10.1	23.6
15	112°21.4	27°37.3	·· 09.1	358°18.2	·· 59.0	138°36.1	·· 46.5	156°12.6	·· 23.6
16	127°23.8	42°36.5	09.3	13°19.0	58.8	153°38.4	46.5	171°15.1	23.6
17	142°26.3	57°35.6	09.5	28°19.8	58.5	168°40.7	46.4	186°17.6	23.6
18	157°28.8	72°34.7	N24°09.7	43°20.6	N22°58.3	183°43.0	S11°46.4	201°20.1	S17°23.6
19	172°31.2	87°33.8	09.9	58°21.5	58.0	198°45.3	46.3	216°22.6	23.6
20	187°33.7	102°32.9	10.1	73°22.3	57.8	213°47.6	46.3	231°25.1	23.6
21	202°36.2	117°32.1	·· 10.3	88°23.1	·· 57.5	228°49.9	·· 46.2	246°27.6	·· 23.7
22	217°38.6	132°31.2	10.5	103°23.9	57.2	243°52.2	46.2	261°30.0	23.7
23	232°41.1	147°30.3	10.7	118°24.7	57.0	258°54.5	46.1	276°32.5	23.7
Mer.pass.	07:32	ν -0.9′	d 0.2′	m -3.87	ν 0.8′	d -0.3′	m 1.74	ν 2.3′	d -0.1′ m -2.38	ν 2.5′	d 0.0′ m 0.55

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	247°43.6	162°29.4	N24°10.9	133°25.6	N22°56.7	273°56.8	S11°46.1	291°35.0	S17°23.7
1	262°46.0	177°28.5	11.1	148°26.4	56.5	288°59.1	46.0	306°37.5	23.7
2	277°48.5	192°27.6	11.3	163°27.2	56.2	304°01.4	46.0	321°40.0	23.7
3	292°51.0	207°26.8	·· 11.5	178°28.0	·· 55.9	319°03.7	·· 45.9	336°42.5	·· 23.7
4	307°53.4	222°25.9	11.6	193°28.9	55.7	334°06.0	45.9	351°45.0	23.7
5	322°55.9	237°25.0	11.8	208°29.7	55.4	349°08.3	45.8	6°47.5	23.8
6	337°58.3	252°24.1	N24°12.0	223°30.5	N22°55.2	4°10.6	S11°45.8	21°50.0	S17°23.8
7	353°00.8	267°23.2	12.2	238°31.3	54.9	19°12.9	45.7	36°52.5	23.8
8	8°03.3	282°22.3	12.4	253°32.2	54.6	34°15.2	45.7	51°54.9	23.8
9	23°05.7	297°21.5	·· 12.6	268°33.0	·· 54.4	49°17.5	·· 45.6	66°57.4	·· 23.8
10	38°08.2	312°20.6	12.8	283°33.8	54.1	64°19.8	45.6	81°59.9	23.8
11	53°10.7	327°19.7	12.9	298°34.6	53.8	79°22.1	45.5	97°02.4	23.8
12	68°13.1	342°18.8	N24°13.1	313°35.4	N22°53.6	94°24.4	S11°45.5	112°04.9	S17°23.9
13	83°15.6	357°17.9	13.3	328°36.3	53.3	109°26.7	45.4	127°07.4	23.9
14	98°18.1	12°17.0	13.5	343°37.1	53.1	124°29.0	45.4	142°09.9	23.9
15	113°20.5	27°16.2	·· 13.7	358°37.9	·· 52.8	139°31.3	·· 45.3	157°12.4	·· 23.9
16	128°23.0	42°15.3	13.8	13°38.7	52.5	154°33.6	45.3	172°14.9	23.9
17	143°25.4	57°14.4	14.0	28°39.6	52.3	169°35.9	45.2	187°17.4	23.9
18	158°27.9	72°13.5	N24°14.2	43°40.4	N22°52.0	184°38.2	S11°45.2	202°19.9	S17°23.9
19	173°30.4	87°12.6	14.3	58°41.2	51.7	199°40.5	45.1	217°22.3	24.0
20	188°32.8	102°11.7	14.5	73°42.0	51.5	214°42.8	45.1	232°24.8	24.0
21	203°35.3	117°10.9	·· 14.7	88°42.9	·· 51.2	229°45.1	·· 45.0	247°27.3	·· 24.0
22	218°37.8	132°10.0	14.9	103°43.7	50.9	244°47.4	45.0	262°29.8	24.0
23	233°40.2	147°09.1	15.0	118°44.5	50.7	259°49.7	44.9	277°32.3	24.0
Mer.pass.	07:28	ν -0.9′	d 0.2′	m -3.86	ν 0.8′	d -0.3′	m 1.74	ν 2.3′	d -0.0′ m -2.39	ν 2.5′	d 0.0′ m 0.54

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.3	-42°11.3
Schedar	349°34.6	56°38.9
Diphda	348°50.5	-17°52.2
Achernar	335°22.9	-57°07.6
Hamal	327°54.8	23°33.6
Polaris	315°49.7	89°21.0
Acamar	315°14.5	-40°13.2
Menkar	314°09.6	4°10.2
Mirfak	308°33.0	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.7
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.6
Sirius	258°29.1	-16°44.9
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.2	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°39.1	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.8
Dubhe	193°44.7	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°02.9	-63°13.2
Gacrux	171°54.6	-57°14.1
Alioth	166°15.3	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.6
Menkent	148°00.8	-36°28.5
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.5
Kochab	137°18.8	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°03.8
Sabik	102°05.8	-15°45.0
Shaula	96°14.0	-37°07.1
Rasalhague	96°01.0	12°32.7
Eltanin	90°43.1	51°29.1
Kaus Aust.	83°36.1	-34°22.4
Vega	80°34.8	38°48.1
Nunki	75°51.1	-26°16.1
Altair	62°02.6	8°55.4
Peacock	53°10.1	-56°39.8
Deneb	49°27.5	45°21.1
Enif	33°41.6	9°58.2
Al Na'ir	27°36.6	-46°51.3
Fomalhaut	15°17.9	-29°30.5
Scheat	13°48.1	28°11.6
Markab	13°32.9	15°19.0

May 28 Fri	SHA	Mer.pass
Venus	277°26.3	13:08
Mars	247°00.9	15:08
Jupiter	26°21.5	05:51
Saturn	43°50.5	04:41

May 29 Sat	SHA	Mer.pass
Venus	276°06.1	13:09
Mars	246°21.4	15:07
Jupiter	26°17.2	05:47
Saturn	43°50.9	04:37

May 30 Sun	SHA	Mer.pass
Venus	274°45.8	13:11
Mars	245°42.0	15:05
Jupiter	26°13.2	05:43
Saturn	43°51.5	04:33

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.3	N21°27.6	337°23.4	2.4′	S25°03.0	3.6′	60.7′
1	195°41.2	28.0	351°44.8	2.4′	25°06.6	3.4′	60.7′
2	210°41.2	28.4	6°06.2	2.4′	25°10.1	3.2′	60.6′
3	225°41.1	·· 28.8	20°27.6	2.4′	25°13.3	3.0′	60.6′
4	240°41.0	29.2	34°49.0	2.4′	25°16.3	2.8′	60.6′
5	255°40.9	29.6	49°10.4	2.4′	25°19.2	2.7′	60.6′
6	270°40.8	N21°30.0	63°31.8	2.4′	S25°21.8	2.5′	60.5′
7	285°40.8	30.4	77°53.3	2.4′	25°24.3	2.3′	60.5′
8	300°40.7	30.8	92°14.7	2.5′	25°26.5	2.1′	60.5′
9	315°40.6	·· 31.2	106°36.2	2.5′	25°28.6	1.9′	60.5′
10	330°40.5	31.6	120°57.6	2.5′	25°30.5	1.7′	60.4′
11	345°40.5	32.0	135°19.1	2.5′	25°32.2	1.5′	60.4′
12	0°40.4	N21°32.4	149°40.6	2.5′	S25°33.7	1.3′	60.4′
13	15°40.3	32.8	164°02.2	2.6′	25°35.0	1.1′	60.3′
14	30°40.2	33.2	178°23.8	2.6′	25°36.1	0.9′	60.3′
15	45°40.1	·· 33.6	192°45.4	2.6′	25°37.1	0.7′	60.3′
16	60°40.1	34.0	207°07.0	2.7′	25°37.8	0.5′	60.2′
17	75°40.0	34.3	221°28.7	2.7′	25°38.3	0.4′	60.2′
18	90°39.9	N21°34.7	235°50.4	2.8′	S25°38.7	0.2′	60.2′
19	105°39.8	35.1	250°12.2	2.8′	25°38.9	-0.0′	60.1′
20	120°39.7	35.5	264°34.0	2.9′	25°38.9	-0.2′	60.1′
21	135°39.7	·· 35.9	278°55.8	2.9′	25°38.7	-0.4′	60.1′
22	150°39.6	36.3	293°17.7	3.0′	25°38.3	-0.6′	60.1′
23	165°39.5	36.7	307°39.7	3.0′	25°37.7	-0.8′	60.0′
	SD = 15.8′	d = 0.4′		SD = 16.6′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.4	N21°37.1	322°01.7	3.1′	S25°36.9	-0.9′	60.0′
1	195°39.3	37.5	336°23.8	3.1′	25°36.0	-1.1′	60.0′
2	210°39.3	37.8	350°45.9	3.2′	25°34.8	-1.3′	59.9′
3	225°39.2	·· 38.2	5°08.1	3.3′	25°33.5	-1.5′	59.9′
4	240°39.1	38.6	19°30.4	3.3′	25°32.0	-1.7′	59.8′
5	255°39.0	39.0	33°52.7	3.4′	25°30.4	-1.9′	59.8′
6	270°38.9	N21°39.4	48°15.1	3.5′	S25°28.5	-2.0′	59.8′
7	285°38.8	39.8	62°37.6	3.5′	25°26.5	-2.2′	59.7′
8	300°38.8	40.1	77°00.1	3.6′	25°24.3	-2.4′	59.7′
9	315°38.7	·· 40.5	91°22.7	3.7′	25°21.9	-2.6′	59.7′
10	330°38.6	40.9	105°45.4	3.8′	25°19.3	-2.7′	59.6′
11	345°38.5	41.3	120°08.2	3.9′	25°16.6	-2.9′	59.6′
12	0°38.4	N21°41.7	134°31.1	3.9′	S25°13.7	-3.1′	59.6′
13	15°38.3	42.0	148°54.0	4.0′	25°10.6	-3.2′	59.5′
14	30°38.3	42.4	163°17.0	4.1′	25°07.4	-3.4′	59.5′
15	45°38.2	·· 42.8	177°40.2	4.2′	25°03.9	-3.6′	59.4′
16	60°38.1	43.2	192°03.4	4.3′	25°00.4	-3.8′	59.4′
17	75°38.0	43.5	206°26.7	4.4′	24°56.6	-3.9′	59.4′
18	90°37.9	N21°43.9	220°50.0	4.5′	S24°52.7	-4.1′	59.3′
19	105°37.8	44.3	235°13.5	4.6′	24°48.6	-4.2′	59.3′
20	120°37.8	44.7	249°37.1	4.7′	24°44.4	-4.4′	59.3′
21	135°37.7	·· 45.0	264°00.8	4.8′	24°40.0	-4.6′	59.2′
22	150°37.6	45.4	278°24.6	4.9′	24°35.4	-4.7′	59.2′
23	165°37.5	45.8	292°48.5	5.0′	24°30.7	-4.9′	59.1′
	SD = 15.8′	d = 0.4′		SD = 16.4′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.4	N21°46.2	307°12.4	5.1′	S24°25.8	-5.0′	59.1′
1	195°37.3	46.5	321°36.5	5.2′	24°20.8	-5.2′	59.1′
2	210°37.2	46.9	336°00.7	5.3′	24°15.6	-5.3′	59.0′
3	225°37.2	·· 47.3	350°25.0	5.4′	24°10.2	-5.5′	59.0′
4	240°37.1	47.6	4°49.4	5.5′	24°04.7	-5.6′	59.0′
5	255°37.0	48.0	19°13.9	5.6′	23°59.1	-5.8′	58.9′
6	270°36.9	N21°48.4	33°38.6	5.7′	S23°53.3	-5.9′	58.9′
7	285°36.8	48.7	48°03.3	5.8′	23°47.4	-6.1′	58.8′
8	300°36.7	49.1	62°28.1	6.0′	23°41.3	-6.2′	58.8′
9	315°36.6	·· 49.5	76°53.1	6.1′	23°35.1	-6.4′	58.8′
10	330°36.5	49.8	91°18.2	6.2′	23°28.7	-6.5′	58.7′
11	345°36.5	50.2	105°43.3	6.3′	23°22.3	-6.6′	58.7′
12	0°36.4	N21°50.6	120°08.6	6.4′	S23°15.6	-6.8′	58.6′
13	15°36.3	50.9	134°34.0	6.5′	23°08.9	-6.9′	58.6′
14	30°36.2	51.3	148°59.6	6.6′	23°01.9	-7.0′	58.6′
15	45°36.1	·· 51.6	163°25.2	6.8′	22°54.9	-7.2′	58.5′
16	60°36.0	52.0	177°51.0	6.9′	22°47.7	-7.3′	58.5′
17	75°35.9	52.4	192°16.9	7.0′	22°40.5	-7.4′	58.4′
18	90°35.8	N21°52.7	206°42.9	7.1′	S22°33.0	-7.5′	58.4′
19	105°35.7	53.1	221°09.0	7.2′	22°25.5	-7.7′	58.4′
20	120°35.7	53.4	235°35.2	7.4′	22°17.8	-7.8′	58.3′
21	135°35.6	·· 53.8	250°01.6	7.5′	22°10.0	-7.9′	58.3′
22	150°35.5	54.2	264°28.0	7.6′	22°02.1	-8.0′	58.2′
23	165°35.4	54.5	278°54.6	7.7′	21°54.1	-8.2′	58.2′
	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	22:34	–:–	–:–
64°	–:–	–:–	02:05	21:52	–:–	–:–
62°	–:–	00:37	02:33	21:24	23:26	–:–
60°	–:–	01:35	02:54	21:02	22:23	–:–
N 58°	–:–	02:06	03:11	20:45	21:51	–:–
56°	00:34	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	03:49	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	17:09	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	07:13	07:53	16:02	16:41	17:24
54°	06:36	07:21	08:03	15:52	16:34	17:19
56°	06:41	07:29	08:14	15:41	16:26	17:14
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 Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°						
N 70°						
68°						
66°						
64°	00:33	02:02	02:10	02:31	03:17	05:18
62°	·· ··	00:55	01:30	03:26	04:24	05:57
60°	·· ··	00:20	01:02	03:59	04:59	06:25
N 58°	23:54	·· ··	00:40	04:23	05:25	06:46
56°	23:34	·· ··	00:23	04:43	05:45	07:03
54°	23:17	·· ··	00:08	04:59	06:02	07:18
52°	23:02	23:55	·· ··	05:13	06:16	07:31
50°	22:50	23:43	·· ··	05:26	06:29	07:42
45°	22:24	23:19	·· ··	05:51	06:54	08:05
N 40°	22:03	23:00	23:45	06:12	07:15	08:24
35°	21:46	22:44	23:31	06:29	07:32	08:40
30°	21:31	22:30	23:19	06:43	07:47	08:53
20°	21:06	22:06	22:59	07:08	08:12	09:16
N 10°	20:44	21:45	22:41	07:30	08:33	09:36
0°	20:23	21:26	22:24	07:50	08:54	09:54
S 10°	20:03	21:06	22:07	08:10	09:14	10:12
20°	19:41	20:46	21:48	08:31	09:35	10:32
30°	19:16	20:22	21:27	08:56	10:00	10:54
35°	19:02	20:07	21:15	09:11	10:14	11:07
40°	18:45	19:51	21:01	09:28	10:31	11:22
45°	18:24	19:31	20:44	09:48	10:51	11:40
S 50°	17:58	19:07	20:23	10:14	11:16	12:02
52°	17:46	18:55	20:13	10:26	11:28	12:12
54°	17:32	18:42	20:02	10:41	11:41	12:24
56°	17:15	18:26	19:49	10:57	11:57	12:37
58°	16:55	18:07	19:34	11:17	12:16	12:53
S 60°	16:31	17:44	19:16	11:42	12:40	13:11

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 17-19 96-83%
28	02:45	02:41	11:57	01:34	14:07	
29	02:38	02:34	11:57	02:39	15:10	
30	02:30	02:25	11:58	03:40	16:09	

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	248°42.7	162°08.2	N24°15.2	133°45.3	N22°50.4	274°52.0	S11°44.9	292°34.8	S17°24.0
1	263°45.2	177°07.3	15.3	148°46.2	50.2	289°54.3	44.8	307°37.3	24.0
2	278°47.6	192°06.4	15.5	163°47.0	49.9	304°56.6	44.8	322°39.8	24.1
3	293°50.1	207°05.5	·· 15.7	178°47.8	·· 49.6	319°58.9	·· 44.8	337°42.3	·· 24.1
4	308°52.6	222°04.7	15.8	193°48.6	49.4	335°01.3	44.7	352°44.8	24.1
5	323°55.0	237°03.8	16.0	208°49.5	49.1	350°03.6	44.7	7°47.3	24.1
6	338°57.5	252°02.9	N24°16.1	223°50.3	N22°48.8	5°05.9	S11°44.6	22°49.8	S17°24.1
7	353°59.9	267°02.0	16.3	238°51.1	48.6	20°08.2	44.6	37°52.3	24.1
8	9°02.4	282°01.1	16.5	253°51.9	48.3	35°10.5	44.5	52°54.8	24.1
9	24°04.9	297°00.2	·· 16.6	268°52.8	·· 48.0	50°12.8	·· 44.5	67°57.3	·· 24.2
10	39°07.3	311°59.3	16.8	283°53.6	47.7	65°15.1	44.4	82°59.7	24.2
11	54°09.8	326°58.5	16.9	298°54.4	47.5	80°17.4	44.4	98°02.2	24.2
12	69°12.3	341°57.6	N24°17.1	313°55.3	N22°47.2	95°19.7	S11°44.3	113°04.7	S17°24.2
13	84°14.7	356°56.7	17.2	328°56.1	46.9	110°22.0	44.3	128°07.2	24.2
14	99°17.2	11°55.8	17.4	343°56.9	46.7	125°24.3	44.2	143°09.7	24.2
15	114°19.7	26°54.9	·· 17.5	358°57.7	·· 46.4	140°26.6	·· 44.2	158°12.2	·· 24.3
16	129°22.1	41°54.0	17.7	13°58.6	46.1	155°29.0	44.2	173°14.7	24.3
17	144°24.6	56°53.1	17.8	28°59.4	45.9	170°31.3	44.1	188°17.2	24.3
18	159°27.1	71°52.3	N24°17.9	44°00.2	N22°45.6	185°33.6	S11°44.1	203°19.7	S17°24.3
19	174°29.5	86°51.4	18.1	59°01.0	45.3	200°35.9	44.0	218°22.2	24.3
20	189°32.0	101°50.5	18.2	74°01.9	45.0	215°38.2	44.0	233°24.7	24.3
21	204°34.4	116°49.6	·· 18.4	89°02.7	·· 44.8	230°40.5	·· 43.9	248°27.2	·· 24.3
22	219°36.9	131°48.7	18.5	104°03.5	44.5	245°42.8	43.9	263°29.7	24.4
23	234°39.4	146°47.8	18.6	119°04.3	44.2	260°45.1	43.8	278°32.2	24.4
Mer.pass.	07:24	ν -0.9′	d 0.2′	m -3.86	ν 0.8′	d -0.3′	m 1.74	ν 2.3′	d -0.0′ m -2.40	ν 2.5′	d 0.0′ m 0.54

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	249°41.8	161°46.9	N24°18.8	134°05.2	N22°44.0	275°47.5	S11°43.8	293°34.7	S17°24.4
1	264°44.3	176°46.0	18.9	149°06.0	43.7	290°49.8	43.7	308°37.2	24.4
2	279°46.8	191°45.2	19.0	164°06.8	43.4	305°52.1	43.7	323°39.7	24.4
3	294°49.2	206°44.3	·· 19.2	179°07.7	·· 43.1	320°54.4	·· 43.7	338°42.2	·· 24.4
4	309°51.7	221°43.4	19.3	194°08.5	42.9	335°56.7	43.6	353°44.7	24.5
5	324°54.2	236°42.5	19.4	209°09.3	42.6	350°59.0	43.6	8°47.2	24.5
6	339°56.6	251°41.6	N24°19.6	224°10.1	N22°42.3	6°01.3	S11°43.5	23°49.7	S17°24.5
7	354°59.1	266°40.7	19.7	239°11.0	42.0	21°03.7	43.5	38°52.2	24.5
8	10°01.6	281°39.8	19.8	254°11.8	41.8	36°06.0	43.4	53°54.7	24.5
9	25°04.0	296°38.9	·· 19.9	269°12.6	·· 41.5	51°08.3	·· 43.4	68°57.2	·· 24.5
10	40°06.5	311°38.1	20.1	284°13.4	41.2	66°10.6	43.4	83°59.7	24.5
11	55°08.9	326°37.2	20.2	299°14.3	41.0	81°12.9	43.3	99°02.2	24.6
12	70°11.4	341°36.3	N24°20.3	314°15.1	N22°40.7	96°15.2	S11°43.3	114°04.7	S17°24.6
13	85°13.9	356°35.4	20.4	329°15.9	40.4	111°17.6	43.2	129°07.2	24.6
14	100°16.3	11°34.5	20.5	344°16.8	40.1	126°19.9	43.2	144°09.7	24.6
15	115°18.8	26°33.6	·· 20.7	359°17.6	·· 39.8	141°22.2	·· 43.1	159°12.2	·· 24.6
16	130°21.3	41°32.7	20.8	14°18.4	39.6	156°24.5	43.1	174°14.7	24.6
17	145°23.7	56°31.8	20.9	29°19.2	39.3	171°26.8	43.1	189°17.2	24.7
18	160°26.2	71°30.9	N24°21.0	44°20.1	N22°39.0	186°29.1	S11°43.0	204°19.7	S17°24.7
19	175°28.7	86°30.1	21.1	59°20.9	38.7	201°31.5	43.0	219°22.2	24.7
20	190°31.1	101°29.2	21.2	74°21.7	38.5	216°33.8	42.9	234°24.7	24.7
21	205°33.6	116°28.3	·· 21.3	89°22.6	·· 38.2	231°36.1	·· 42.9	249°27.2	·· 24.7
22	220°36.0	131°27.4	21.4	104°23.4	37.9	246°38.4	42.8	264°29.7	24.7
23	235°38.5	146°26.5	21.5	119°24.2	37.6	261°40.7	42.8	279°32.2	24.8
Mer.pass.	07:20	ν -0.9′	d 0.1′	m -3.86	ν 0.8′	d -0.3′	m 1.75	ν 2.3′	d -0.0′ m -2.41	ν 2.5′	d 0.0′ m 0.53

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	250°41.0	161°25.6	N24°21.7	134°25.0	N22°37.4	276°43.1	S11°42.8	294°34.7	S17°24.8
1	265°43.4	176°24.7	21.8	149°25.9	37.1	291°45.4	42.7	309°37.2	24.8
2	280°45.9	191°23.8	21.9	164°26.7	36.8	306°47.7	42.7	324°39.7	24.8
3	295°48.4	206°22.9	·· 22.0	179°27.5	·· 36.5	321°50.0	·· 42.6	339°42.2	·· 24.8
4	310°50.8	221°22.1	22.1	194°28.4	36.2	336°52.3	42.6	354°44.7	24.8
5	325°53.3	236°21.2	22.2	209°29.2	36.0	351°54.7	42.5	9°47.2	24.9
6	340°55.8	251°20.3	N24°22.3	224°30.0	N22°35.7	6°57.0	S11°42.5	24°49.7	S17°24.9
7	355°58.2	266°19.4	22.4	239°30.8	35.4	21°59.3	42.5	39°52.2	24.9
8	11°00.7	281°18.5	22.5	254°31.7	35.1	37°01.6	42.4	54°54.7	24.9
9	26°03.2	296°17.6	·· 22.5	269°32.5	·· 34.8	52°04.0	·· 42.4	69°57.2	·· 24.9
10	41°05.6	311°16.7	22.6	284°33.3	34.6	67°06.3	42.3	84°59.7	24.9
11	56°08.1	326°15.8	22.7	299°34.2	34.3	82°08.6	42.3	100°02.2	25.0
12	71°10.5	341°14.9	N24°22.8	314°35.0	N22°34.0	97°10.9	S11°42.3	115°04.7	S17°25.0
13	86°13.0	356°14.0	22.9	329°35.8	33.7	112°13.3	42.2	130°07.2	25.0
14	101°15.5	11°13.2	23.0	344°36.7	33.4	127°15.6	42.2	145°09.7	25.0
15	116°17.9	26°12.3	·· 23.1	359°37.5	·· 33.1	142°17.9	·· 42.1	160°12.2	·· 25.0
16	131°20.4	41°11.4	23.2	14°38.3	32.9	157°20.2	42.1	175°14.7	25.1
17	146°22.9	56°10.5	23.3	29°39.2	32.6	172°22.6	42.1	190°17.2	25.1
18	161°25.3	71°09.6	N24°23.3	44°40.0	N22°32.3	187°24.9	S11°42.0	205°19.7	S17°25.1
19	176°27.8	86°08.7	23.4	59°40.8	32.0	202°27.2	42.0	220°22.2	25.1
20	191°30.3	101°07.8	23.5	74°41.6	31.7	217°29.5	41.9	235°24.7	25.1
21	206°32.7	116°06.9	·· 23.6	89°42.5	·· 31.4	232°31.9	·· 41.9	250°27.2	·· 25.1
22	221°35.2	131°06.0	23.7	104°43.3	31.2	247°34.2	41.9	265°29.7	25.2
23	236°37.7	146°05.1	23.7	119°44.1	30.9	262°36.5	41.8	280°32.2	25.2
Mer.pass.	07:16	ν -0.9′	d 0.1′	m -3.86	ν 0.8′	d -0.3′	m 1.75	ν 2.3′	d -0.0′ m -2.41	ν 2.5′	d 0.0′ m 0.53

Stars

	SHA	Dec
Alpheratz	357°37.9	29°12.2
Ankaa	353°10.3	-42°11.3
Schedar	349°34.6	56°38.9
Diphda	348°50.5	-17°52.2
Achernar	335°22.9	-57°07.6
Hamal	327°54.8	23°33.6
Polaris	315°48.9	89°21.0
Acamar	315°14.5	-40°13.2
Menkar	314°09.5	4°10.2
Mirfak	308°32.9	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.6
Sirius	258°29.1	-16°44.8
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.3	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°39.1	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.8
Dubhe	193°44.7	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.0	-63°13.2
Gacrux	171°54.6	-57°14.1
Alioth	166°15.4	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.0	49°12.6
Hadar	148°39.6	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.5
Kochab	137°18.8	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°14.0	-37°07.1
Rasalhague	96°01.0	12°32.7
Eltanin	90°43.0	51°29.1
Kaus Aust.	83°36.1	-34°22.4
Vega	80°34.8	38°48.1
Nunki	75°51.1	-26°16.1
Altair	62°00.2	8°55.4
Peacock	53°10.1	-56°39.8
Deneb	49°27.5	45°21.1
Enif	33°41.6	9°58.2
Al Na'ir	27°36.6	-46°51.3
Fomalhaut	15°17.8	-29°30.5
Scheat	13°48.1	28°11.6
Markab	13°32.8	15°19.0

May 31 Mon	SHA	Mer.pass
Venus	273°25.5	13:12
Mars	245°02.6	15:04
Jupiter	26°09.3	05:40
Saturn	43°52.1	04:29

Jun 01 Tue	SHA	Mer.pass
Venus	272°05.1	13:14
Mars	244°23.3	15:03
Jupiter	26°05.6	05:36
Saturn	43°52.9	04:25

Jun 02 Wed	SHA	Mer.pass
Venus	270°44.6	13:15
Mars	243°44.1	15:02
Jupiter	26°02.1	05:32
Saturn	43°53.7	04:21

Horizontal parallax	
Venus:	0.1
Mars:	0.1

Sun and Moon

h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.3	N21°54.9	293°21.3	7.8′	S21°45.9	-8.3′	58.2′
1	195°35.2	55.2	307°48.2	7.9′	21°37.6	-8.4′	58.1′
2	210°35.1	55.6	322°15.1	8.1′	21°29.3	-8.5′	58.1′
3	225°35.0	·· 55.9	336°42.2	8.2′	21°20.8	-8.6′	58.0′
4	240°34.9	56.3	351°09.4	8.3′	21°12.2	-8.7′	58.0′
5	255°34.8	56.6	5°36.7	8.4′	21°03.4	-8.8′	58.0′
6	270°34.8	N21°57.0	20°04.1	8.5′	S20°54.6	-8.9′	57.9′
7	285°34.7	57.3	34°31.6	8.7′	20°45.7	-9.0′	57.9′
8	300°34.6	57.7	48°59.3	8.8′	20°36.7	-9.1′	57.8′
9	315°34.5	·· 58.0	63°27.1	8.9′	20°27.5	-9.2′	57.8′
10	330°34.4	58.4	77°55.0	9.0′	20°18.3	-9.3′	57.8′
11	345°34.3	58.7	92°23.0	9.1′	20°08.9	-9.4′	57.7′
12	0°34.2	N21°59.1	106°51.2	9.3′	S19°59.5	-9.5′	57.7′
13	15°34.1	59.4	121°19.4	9.4′	19°50.0	-9.6′	57.6′
14	30°34.0	21°59.8	135°47.8	9.5′	19°40.4	-9.7′	57.6′
15	45°33.9	22°00.1	150°16.3	9.6′	19°30.6	-9.8′	57.6′
16	60°33.8	00.5	164°44.9	9.7′	19°20.8	-9.9′	57.5′
17	75°33.7	00.8	179°13.6	9.8′	19°10.9	-10.0′	57.5′
18	90°33.6	N22°01.2	193°42.4	10.0′	S19°00.9	-10.1′	57.4′
19	105°33.5	01.5	208°11.4	10.1′	18°50.9	-10.2′	57.4′
20	120°33.5	01.8	222°40.5	10.2′	18°40.7	-10.2′	57.4′
21	135°33.4	·· 02.2	237°09.6	10.3′	18°30.5	-10.3′	57.3′
22	150°33.3	02.5	251°38.9	10.4′	18°20.1	-10.4′	57.3′
23	165°33.2	02.9	266°08.3	10.5′	18°09.7	-10.5′	57.2′
	SD = 15.8′	d = 0.4′	SD = 15.9′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°33.1	N22°03.2	280°37.8	10.6′	S17°59.2	-10.6′	57.2′
1	195°33.0	03.5	295°07.5	10.7′	17°48.7	-10.6′	57.2′
2	210°32.9	03.9	309°37.2	10.8′	17°38.0	-10.7′	57.1′
3	225°32.8	·· 04.2	324°07.1	11.0′	17°27.3	-10.8′	57.1′
4	240°32.7	04.6	338°37.0	11.1′	17°16.5	-10.9′	57.1′
5	255°32.6	04.9	353°07.1	11.2′	17°05.7	-10.9′	57.0′
6	270°32.5	N22°05.2	7°37.2	11.3′	S16°54.7	-11.0′	57.0′
7	285°32.4	05.6	22°07.5	11.4′	16°43.7	-11.1′	56.9′
8	300°32.3	05.9	36°37.9	11.5′	16°32.7	-11.1′	56.9′
9	315°32.2	·· 06.2	51°08.4	11.6′	16°21.5	-11.2′	56.9′
10	330°32.1	06.6	65°39.0	11.7′	16°10.3	-11.3′	56.8′
11	345°32.0	06.9	80°09.6	11.8′	15°59.1	-11.3′	56.8′
12	0°31.9	N22°07.2	94°40.4	11.9′	S15°47.7	-11.4′	56.8′
13	15°31.8	07.6	109°11.3	12.0′	15°36.3	-11.5′	56.7′
14	30°31.7	07.9	123°42.3	12.1′	15°24.9	-11.5′	56.7′
15	45°31.6	·· 08.2	138°13.4	12.2′	15°13.4	-11.6′	56.7′
16	60°31.5	08.5	152°44.6	12.3′	15°01.8	-11.6′	56.6′
17	75°31.4	08.9	167°15.9	12.4′	14°50.2	-11.7′	56.6′
18	90°31.3	N22°09.2	181°47.2	12.5′	S14°38.5	-11.7′	56.5′
19	105°31.2	09.5	196°18.7	12.6′	14°26.8	-11.8′	56.5′
20	120°31.1	09.9	210°50.3	12.7′	14°15.0	-11.8′	56.5′
21	135°31.0	·· 10.2	225°21.9	12.8′	14°03.2	-11.9′	56.4′
22	150°30.9	10.5	239°53.7	12.8′	13°51.3	-11.9′	56.4′
23	165°30.8	10.8	254°25.5	12.9′	13°39.3	-12.0′	56.4′
	SD = 15.8′	d = 0.3′	SD = 15.6′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.7	N22°11.2	268°57.5	13.0′	S13°27.4	-12.0′	56.3′
1	195°30.6	11.5	283°29.5	13.1′	13°15.3	-12.1′	56.3′
2	210°30.5	11.8	298°01.6	13.2′	13°03.3	-12.1′	56.3′
3	225°30.5	·· 12.1	312°33.8	13.3′	12°51.1	-12.2′	56.2′
4	240°30.4	12.4	327°06.1	13.4′	12°39.0	-12.2′	56.2′
5	255°30.3	12.8	341°38.4	13.4′	12°26.8	-12.2′	56.2′
6	270°30.2	N22°13.1	356°10.9	13.5′	S12°14.5	-12.3′	56.1′
7	285°30.1	13.4	10°43.4	13.6′	12°02.3	-12.3′	56.1′
8	300°30.0	13.7	25°16.0	13.7′	11°49.9	-12.4′	56.1′
9	315°29.8	·· 14.0	39°48.7	13.8′	11°37.6	-12.4′	56.0′
10	330°29.7	14.4	54°21.4	13.8′	11°25.2	-12.4′	56.0′
11	345°29.6	14.7	68°54.3	13.9′	11°12.7	-12.5′	56.0′
12	0°29.5	N22°15.0	83°27.2	14.0′	S11°00.3	-12.5′	55.9′
13	15°29.4	15.3	98°00.2	14.1′	10°47.8	-12.5′	55.9′
14	30°29.3	15.6	112°33.2	14.1′	10°35.2	-12.6′	55.9′
15	45°29.2	·· 15.9	127°06.4	14.2′	10°22.7	-12.6′	55.8′
16	60°29.1	16.2	141°39.6	14.3′	10°10.1	-12.6′	55.8′
17	75°29.0	16.5	156°12.9	14.3′	09°57.5	-12.7′	55.8′
18	90°28.9	N22°16.9	170°46.2	14.4′	S09°44.8	-12.7′	55.8′
19	105°28.8	17.2	185°19.6	14.5′	09°32.1	-12.7′	55.7′
20	120°28.7	17.5	199°53.1	14.5′	09°19.4	-12.7′	55.7′
21	135°28.6	·· 17.8	214°26.7	14.6′	09°06.7	-12.8′	55.7′
22	150°28.5	18.1	229°00.3	14.7′	08°53.9	-12.8′	55.6′
23	165°28.4	18.4	243°33.9	14.7′	08°41.2	-12.8′	55.6′
	SD = 15.8′	d = 0.3′	SD = 15.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	–:–	–:–	01:12	22:48	–:–	–:–
64°	–:–	–:–	01:57	22:00	–:–	–:–
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	02:44	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	20:43	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	07:16	07:56	15:59	16:39	17:22
54°	06:39	07:24	08:06	15:49	16:31	17:17
56°	06:44	07:32	08:18	15:37	16:23	17:11
58°	06:50	07:41	08:31	15:24	16:14	17:05
S 60°	06:57	07:52	08:47	15:09	16:03	16:59

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

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 20-22 74-53%
31	02:21	02:17	11:58	04:37	17:03	
01	02:12	02:08	11:58	05:28	17:53	
02	02:03	01:58	11:58	06:16	18:38	

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	251°40.1	161°04.3	N24°23.8	134°45.0	N22°30.6	277°38.8	S11°41.8	295°34.7	S17°25.2
1	266°42.6	176°03.4	23.9	149°45.8	30.3	292°41.2	41.7	310°37.2	25.2
2	281°45.0	191°02.5	24.0	164°46.6	30.0	307°43.5	41.7	325°39.7	25.2
3	296°47.5	206°01.6	·· 24.0	179°47.5	·· 29.7	322°45.8	·· 41.7	340°42.3	·· 25.2
4	311°50.0	221°00.7	24.1	194°48.3	29.4	337°48.2	41.6	355°44.8	25.3
5	326°52.4	235°59.8	24.2	209°49.1	29.2	352°50.5	41.6	10°47.3	25.3
6	341°54.9	250°58.9	N24°24.2	224°50.0	N22°28.9	7°52.8	S11°41.5	25°49.8	S17°25.3
7	356°57.4	265°58.0	24.3	239°50.8	28.6	22°55.1	41.5	40°52.3	25.3
8	11°59.8	280°57.1	24.4	254°51.6	28.3	37°57.5	41.5	55°54.8	25.3
9	27°02.3	295°56.2	·· 24.4	269°52.5	·· 28.0	52°59.8	·· 41.4	70°57.3	·· 25.4
10	42°04.8	310°55.4	24.5	284°53.3	27.7	68°02.1	41.4	85°59.8	25.4
11	57°07.2	325°54.5	24.6	299°54.1	27.4	83°04.5	41.4	101°02.3	25.4
12	72°09.7	340°53.6	N24°24.6	314°54.9	N22°27.1	98°06.8	S11°41.3	116°04.8	S17°25.4
13	87°12.1	355°52.7	24.7	329°55.8	26.9	113°09.1	41.3	131°07.3	25.4
14	102°14.6	10°51.8	24.7	344°56.6	26.6	128°11.5	41.2	146°09.8	25.4
15	117°17.1	25°50.9	·· 24.8	359°57.4	·· 26.3	143°13.8	·· 41.2	161°12.3	·· 25.5
16	132°19.5	40°50.0	24.9	14°58.3	26.0	158°16.1	41.2	176°14.8	25.5
17	147°22.0	55°49.1	24.9	29°59.1	25.7	173°18.5	41.1	191°17.3	25.5
18	162°24.5	70°48.2	N24°25.0	44°59.9	N22°25.4	188°20.8	S11°41.1	206°19.9	S17°25.5
19	177°26.9	85°47.3	25.0	60°00.8	25.1	203°23.1	41.1	221°22.4	25.5
20	192°29.4	100°46.5	25.1	75°01.6	24.8	218°25.5	41.0	236°24.9	25.6
21	207°31.9	115°45.6	·· 25.1	90°02.4	·· 24.5	233°27.8	·· 41.0	251°27.4	·· 25.6
22	222°34.3	130°44.7	25.2	105°03.3	24.2	248°30.1	40.9	266°29.9	25.6
23	237°36.8	145°43.8	25.2	120°04.1	24.0	263°32.5	40.9	281°32.4	25.6
Mer.pass.	07:12	ν -0.9′	d 0.1′	m -3.86	ν 0.8′	d -0.3′	m 1.76	ν 2.3′	d -0.0′ m -2.42	ν 2.5′	d 0.0′ m 0.52

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	252°39.3	160°42.9	N24°25.3	135°04.9	N22°23.7	278°34.8	S11°40.9	296°34.9	S17°25.6
1	267°41.7	175°42.0	25.3	150°05.8	23.4	293°37.1	40.8	311°37.4	25.7
2	282°44.2	190°41.1	25.3	165°06.6	23.1	308°39.5	40.8	326°39.9	25.7
3	297°46.6	205°40.2	·· 25.4	180°07.4	·· 22.8	323°41.8	·· 40.8	341°42.4	·· 25.7
4	312°49.1	220°39.3	25.4	195°08.3	22.5	338°44.1	40.7	356°44.9	25.7
5	327°51.6	235°38.4	25.5	210°09.1	22.2	353°46.5	40.7	11°47.5	25.7
6	342°54.0	250°37.5	N24°25.5	225°09.9	N22°21.9	8°48.8	S11°40.7	26°50.0	S17°25.7
7	357°56.5	265°36.7	25.5	240°10.8	21.6	23°51.1	40.6	41°52.5	25.8
8	12°59.0	280°35.8	25.6	255°11.6	21.3	38°53.5	40.6	56°55.0	25.8
9	28°01.4	295°34.9	·· 25.6	270°12.4	·· 21.0	53°55.8	·· 40.5	71°57.5	·· 25.8
10	43°03.9	310°34.0	25.7	285°13.3	20.7	68°58.2	40.5	87°00.0	25.8
11	58°06.4	325°33.1	25.7	300°14.1	20.4	84°00.5	40.5	102°02.5	25.8
12	73°08.8	340°32.2	N24°25.7	315°14.9	N22°20.1	99°02.8	S11°40.4	117°05.0	S17°25.9
13	88°11.3	355°31.3	25.7	330°15.8	19.9	114°05.2	40.4	132°07.5	25.9
14	103°13.7	10°30.4	25.8	345°16.6	19.6	129°07.5	40.4	147°10.0	25.9
15	118°16.2	25°29.5	·· 25.8	0°17.4	·· 19.3	144°09.8	·· 40.3	162°12.6	·· 25.9
16	133°18.7	40°28.6	25.8	15°18.3	19.0	159°12.2	40.3	177°15.1	25.9
17	148°21.1	55°27.8	25.9	30°19.1	18.7	174°14.5	40.3	192°17.6	26.0
18	163°23.6	70°26.9	N24°25.9	45°20.0	N22°18.4	189°16.9	S11°40.2	207°20.1	S17°26.0
19	178°26.1	85°26.0	25.9	60°20.8	18.1	204°19.2	40.2	222°22.6	26.0
20	193°28.5	100°25.1	25.9	75°21.6	17.8	219°21.5	40.2	237°25.1	26.0
21	208°31.0	115°24.2	·· 25.9	90°22.5	·· 17.5	234°23.9	·· 40.1	252°27.6	·· 26.0
22	223°33.5	130°23.3	26.0	105°23.3	17.2	249°26.2	40.1	267°30.1	26.1
23	238°35.9	145°22.4	26.0	120°24.1	16.9	264°28.6	40.1	282°32.7	26.1
Mer.pass.	07:08	ν -0.9′	d 0.0′	m -3.86	ν 0.8′	d -0.3′	m 1.76	ν 2.3′	d -0.0′ m -2.43	ν 2.5′	d 0.0′ m 0.52

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	253°38.4	160°21.5	N24°26.0	135°25.0	N22°16.6	279°30.9	S11°40.0	297°35.2	S17°26.1
1	268°40.9	175°20.6	26.0	150°25.8	16.3	294°33.3	40.0	312°37.7	26.1
2	283°43.3	190°19.7	26.0	165°26.6	16.0	309°35.6	40.0	327°40.2	26.1
3	298°45.8	205°18.8	·· 26.0	180°27.5	·· 15.7	324°37.9	·· 39.9	342°42.7	·· 26.2
4	313°48.2	220°18.0	26.0	195°28.3	15.4	339°40.3	39.9	357°45.2	26.2
5	328°50.7	235°17.1	26.0	210°29.1	15.1	354°42.6	39.9	12°47.7	26.2
6	343°53.2	250°16.2	N24°26.1	225°30.0	N22°14.8	9°45.0	S11°39.8	27°50.3	S17°26.2
7	358°55.6	265°15.3	26.1	240°30.8	14.5	24°47.3	39.8	42°52.8	26.2
8	13°58.1	280°14.4	26.1	255°31.6	14.2	39°49.7	39.8	57°55.3	26.3
9	29°00.6	295°13.5	·· 26.1	270°32.5	·· 13.9	54°52.0	·· 39.7	72°57.8	·· 26.3
10	44°03.0	310°12.6	26.1	285°33.3	13.6	69°54.3	39.7	88°00.3	26.3
11	59°05.5	325°11.7	26.1	300°34.2	13.3	84°56.7	39.7	103°02.8	26.3
12	74°08.0	340°10.8	N24°26.1	315°35.0	N22°13.0	99°59.0	S11°39.6	118°05.3	S17°26.3
13	89°10.4	355°09.9	26.1	330°35.8	12.7	115°01.4	39.6	133°07.9	26.4
14	104°12.9	10°09.1	26.1	345°36.7	12.4	130°03.7	39.6	148°10.4	26.4
15	119°15.4	25°08.2	·· 26.1	0°37.5	·· 12.1	145°06.1	·· 39.5	163°12.9	·· 26.4
16	134°17.8	40°07.3	26.1	15°38.3	11.8	160°08.4	39.5	178°15.4	26.4
17	149°20.3	55°06.4	26.1	30°39.2	11.5	175°10.8	39.5	193°17.9	26.5
18	164°22.7	70°05.5	N24°26.1	45°40.0	N22°11.2	190°13.1	S11°39.4	208°20.4	S17°26.5
19	179°25.2	85°04.6	26.1	60°40.9	10.9	205°15.5	39.4	223°22.9	26.5
20	194°27.7	100°03.7	26.0	75°41.7	10.6	220°17.8	39.4	238°25.5	26.5
21	209°30.1	115°02.8	·· 26.0	90°42.5	·· 10.3	235°20.2	·· 39.3	253°28.0	·· 26.5
22	224°32.6	130°01.9	26.0	105°43.4	10.0	250°22.5	39.3	268°30.5	26.6
23	239°35.1	145°01.0	26.0	120°44.2	09.7	265°24.9	39.3	283°33.0	26.6
Mer.pass.	07:04	ν -0.9′	d 0.0′	m -3.86	ν 0.8′	d -0.3′	m 1.76	ν 2.3′	d -0.0′ m -2.44	ν 2.5′	d 0.0′ m 0.51

Stars	SHA	Dec
Alpheratz	357°37.9	29°12.2
Ankaa	353°10.3	-42°11.3
Schedar	349°34.6	56°38.9
Diphda	348°50.4	-17°52.2
Achernar	335°22.9	-57°07.6
Hamal	327°54.8	23°33.6
Polaris	315°48.3	89°21.0
Acamar	315°14.4	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.9	49°56.0
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.2	-16°44.8
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.3	-59°34.9
Suhail	222°48.6	-43°31.3
Miaplacidus	221°39.2	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.7	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.0	-63°13.2
Gacrux	171°54.6	-57°14.1
Alioth	166°15.4	55°50.9
Spica	158°25.2	-11°16.4
Alkaid	152°54.1	49°12.7
Hadar	148°39.6	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.5
Kochab	137°18.9	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°14.0	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.1
Kaus Aust.	83°36.1	-34°22.4
Vega	80°34.8	38°48.1
Nunki	75°51.1	-26°16.1
Altair	62°02.6	8°55.4
Peacock	53°10.0	-56°39.8
Deneb	49°27.5	45°21.1
Enif	33°41.6	9°58.2
Al Na'ir	27°36.6	-46°51.3
Fomalhaut	15°17.8	-29°30.5
Scheat	13°48.0	28°11.7
Markab	13°32.8	15°19.0

Jun 03 Thu	SHA	Mer.pass
Venus	269°24.1	13:17
Mars	243°04.9	15:00
Jupiter	25°58.7	05:29
Saturn	43°54.6	04:17

Jun 04 Fri	SHA	Mer.pass
Venus	268°03.6	13:18
Mars	242°25.7	14:59
Jupiter	25°55.5	05:25
Saturn	43°55.7	04:13

Jun 05 Sat	SHA	Mer.pass
Venus	266°43.1	13:19
Mars	241°46.6	14:58
Jupiter	25°52.5	05:21
Saturn	43°56.8	04:09

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.3	N22°18.7	258°07.7	14.8′	S08°28.3	-12.8′	55.6′
1	195°28.2	19.0	272°41.5	14.9′	08°15.5	-12.8′	55.6′
2	210°28.1	19.3	287°15.3	14.9′	08°02.7	-12.9′	55.5′
3	225°28.0	·· 19.6	301°49.3	15.0′	07°49.8	-12.9′	55.5′
4	240°27.9	19.9	316°23.2	15.0′	07°36.9	-12.9′	55.5′
5	255°27.8	20.2	330°57.3	15.1′	07°24.0	-12.9′	55.4′
6	270°27.7	N22°20.5	345°31.3	15.1′	S07°11.1	-12.9′	55.4′
7	285°27.6	20.8	0°05.5	15.2′	06°58.2	-13.0′	55.4′
8	300°27.5	21.1	14°39.7	15.2′	06°45.2	-13.0′	55.4′
9	315°27.4	·· 21.5	29°13.9	15.3′	06°32.2	-13.0′	55.3′
10	330°27.3	21.8	43°48.2	15.3′	06°19.3	-13.0′	55.3′
11	345°27.2	22.1	58°22.5	15.4′	06°06.3	-13.0′	55.3′
12	0°27.1	N22°22.4	72°56.9	15.4′	S05°53.2	-13.0′	55.3′
13	15°27.0	22.6	87°31.4	15.5′	05°40.2	-13.0′	55.2′
14	30°26.9	22.9	102°05.9	15.5′	05°27.2	-13.0′	55.2′
15	45°26.8	·· 23.2	116°40.4	15.6′	05°14.1	-13.1′	55.2′
16	60°26.7	23.5	131°15.0	15.6′	05°01.1	-13.1′	55.2′
17	75°26.5	23.8	145°49.6	15.7′	04°48.0	-13.1′	55.1′
18	90°26.4	N22°24.1	160°24.2	15.7′	S04°35.0	-13.1′	55.1′
19	105°26.3	24.4	174°58.9	15.7′	04°21.9	-13.1′	55.1′
20	120°26.2	24.7	189°33.6	15.8′	04°08.8	-13.1′	55.1′
21	135°26.1	·· 25.0	204°08.4	15.8′	03°55.7	-13.1′	55.0′
22	150°26.0	25.3	218°43.2	15.8′	03°42.6	-13.1′	55.0′
23	165°25.9	25.6	233°18.1	15.9′	03°29.5	-13.1′	55.0′
	SD = 15.8′	d = 0.3′	SD = 15.2′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°25.8	N22°25.9	247°52.9	15.9′	S03°16.4	-13.1′	55.0′
1	195°25.7	26.2	262°27.9	15.9′	03°03.3	-13.1′	54.9′
2	210°25.6	26.5	277°02.8	16.0′	02°50.2	-13.1′	54.9′
3	225°25.5	·· 26.8	291°37.8	16.0′	02°37.1	-13.1′	54.9′
4	240°25.4	27.0	306°12.8	16.0′	02°24.0	-13.1′	54.9′
5	255°25.3	27.3	320°47.8	16.1′	02°10.9	-13.1′	54.9′
6	270°25.2	N22°27.6	335°22.9	16.1′	S01°57.8	-13.1′	54.8′
7	285°25.0	27.9	349°58.0	16.1′	01°44.7	-13.1′	54.8′
8	300°24.9	28.2	4°33.1	16.1′	01°31.6	-13.1′	54.8′
9	315°24.8	·· 28.5	19°08.2	16.2′	01°18.5	-13.1′	54.8′
10	330°24.7	28.8	33°43.4	16.2′	01°05.4	-13.1′	54.8′
11	345°24.6	29.0	48°18.6	16.2′	00°52.3	-13.1′	54.7′
12	0°24.5	N22°29.3	62°53.8	16.2′	S00°39.3	-13.1′	54.7′
13	15°24.4	29.6	77°29.0	16.2′	00°26.2	-13.1′	54.7′
14	30°24.3	29.9	92°04.2	16.3′	00°13.1	-13.1′	54.7′
15	45°24.2	·· 30.2	106°39.5	16.3′	S00°00.1	-13.1′	54.7′
16	60°24.1	30.5	121°14.8	16.3′	N00°13.0	13.0′	54.6′
17	75°24.0	30.7	135°50.1	16.3′	00°26.0	13.0′	54.6′
18	90°23.8	N22°31.0	150°25.4	16.3′	N00°39.1	13.0′	54.6′
19	105°23.7	31.3	165°00.7	16.3′	00°52.1	13.0′	54.6′
20	120°23.6	31.6	179°36.0	16.3′	01°05.1	13.0′	54.6′
21	135°23.5	·· 31.8	194°11.4	16.4′	01°18.1	13.0′	54.5′
22	150°23.4	32.1	208°46.7	16.4′	01°31.1	13.0′	54.5′
23	165°23.3	32.4	223°22.1	16.4′	01°44.1	13.0′	54.5′
	SD = 15.8′	d = 0.3′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.2	N22°32.7	237°57.5	16.4′	N01°57.0	12.9′	54.5′
1	195°23.1	32.9	252°32.9	16.4′	02°10.0	12.9′	54.5′
2	210°23.0	33.2	267°08.2	16.4′	02°22.9	12.9′	54.5′
3	225°22.9	·· 33.5	281°43.6	16.4′	02°35.8	12.9′	54.4′
4	240°22.7	33.8	296°19.0	16.4′	02°48.7	12.9′	54.4′
5	255°22.6	34.0	310°54.4	16.4′	03°01.6	12.9′	54.4′
6	270°22.5	N22°34.3	325°29.8	16.4′	N03°14.5	12.9′	54.4′
7	285°22.4	34.6	340°05.2	16.4′	03°27.4	12.8′	54.4′
8	300°22.3	34.8	354°40.7	16.4′	03°40.2	12.8′	54.4′
9	315°22.2	·· 35.1	9°16.1	16.4′	03°53.0	12.8′	54.4′
10	330°22.1	35.4	23°51.5	16.4′	04°05.8	12.8′	54.3′
11	345°22.0	35.6	38°26.9	16.4′	04°18.6	12.8′	54.3′
12	0°21.9	N22°35.9	53°02.3	16.4′	N04°31.3	12.7′	54.3′
13	15°21.7	36.2	67°37.6	16.4′	04°44.0	12.7′	54.3′
14	30°21.6	36.4	82°13.0	16.4′	04°56.7	12.7′	54.3′
15	45°21.5	·· 36.7	96°48.4	16.4′	05°09.4	12.7′	54.3′
16	60°21.4	37.0	111°23.8	16.4′	05°22.1	12.6′	54.3′
17	75°21.3	37.2	125°59.2	16.4′	05°34.7	12.6′	54.3′
18	90°21.2	N22°37.5	140°34.5	16.3′	N05°47.3	12.6′	54.2′
19	105°21.1	37.8	155°09.8	16.3′	05°59.9	12.6′	54.2′
20	120°20.9	38.0	169°45.2	16.3′	06°12.5	12.5′	54.2′
21	135°20.8	·· 38.3	184°20.5	16.3′	06°25.0	12.5′	54.2′
22	150°20.7	38.5	198°55.8	16.3′	06°37.5	12.5′	54.2′
23	165°20.6	38.8	213°31.1	16.3′	06°50.0	12.4′	54.2′
	SD = 15.8′	d = 0.3′	SD = 14.9′				

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

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 23-25 43-25%
03	01:53	01:48	11:58	07:00	19:21	
04	01:43	01:38	11:58	07:41	20:02	
05	01:33	01:27	11:59	08:22	20:42	

June 06, 07, 08 UT (Sun., Mon., Tue.)

DUT1 = UT1-UTC = -0.1837 sec ΔT = TT-UT1 = +69.3677 sec

2021 June 06 to Jun. 08 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	254°37.5	160°00.2	N24°26.0	135°45.0	N22°09.4	280°27.2	S11°39.2	298°35.5	S17°26.6
1	269°40.0	174°59.3	26.0	150°45.9	09.1	295°29.6	39.2	313°38.0	26.6
2	284°42.5	189°58.4	26.0	165°46.7	08.8	310°31.9	39.2	328°40.6	26.6
3	299°44.9	204°57.5	·· 25.9	180°47.6	·· 08.5	325°34.3	·· 39.2	343°43.1	·· 26.7
4	314°47.4	219°56.6	25.9	195°48.4	08.2	340°36.6	39.1	358°45.6	26.7
5	329°49.8	234°55.7	25.9	210°49.2	07.8	355°39.0	39.1	13°48.1	26.7
6	344°52.3	249°54.8	N24°25.9	225°50.1	N22°07.5	10°41.3	S11°39.1	28°50.6	S17°26.7
7	359°54.8	264°53.9	25.9	240°50.9	07.2	25°43.7	39.0	43°53.2	26.7
8	14°57.2	279°53.0	25.8	255°51.7	06.9	40°46.0	39.0	58°55.7	26.8
9	29°59.7	294°52.2	·· 25.8	270°52.6	·· 06.6	55°48.4	·· 39.0	73°58.2	·· 26.8
10	45°02.2	309°51.3	25.8	285°53.4	06.3	70°50.7	38.9	89°00.7	26.8
11	60°04.6	324°50.4	25.8	300°54.3	06.0	85°53.1	38.9	104°03.2	26.8
12	75°07.1	339°49.5	N24°25.7	315°55.1	N22°05.7	100°55.4	S11°38.9	119°05.7	S17°26.9
13	90°09.6	354°48.6	25.7	330°55.9	05.4	115°57.8	38.9	134°08.3	26.9
14	105°12.0	9°47.7	25.7	345°56.8	05.1	131°00.1	38.8	149°10.8	26.9
15	120°14.5	24°46.8	·· 25.6	0°57.6	·· 04.8	146°02.5	·· 38.8	164°13.3	·· 26.9
16	135°17.0	39°45.9	25.6	15°58.5	04.5	161°04.8	38.8	179°15.8	26.9
17	150°19.4	54°45.0	25.6	30°59.3	04.2	176°07.2	38.7	194°18.3	27.0
18	165°21.9	69°44.2	N24°25.5	46°00.1	N22°03.9	191°09.6	S11°38.7	209°20.9	S17°27.0
19	180°24.3	84°43.3	25.5	61°01.0	03.5	206°11.9	38.7	224°23.4	27.0
20	195°26.8	99°42.4	25.5	76°01.8	03.2	221°14.3	38.7	239°25.9	27.0
21	210°29.3	114°41.5	·· 25.4	91°02.6	·· 02.9	236°16.6	·· 38.6	254°28.4	·· 27.1
22	225°31.7	129°40.6	25.4	106°03.5	02.6	251°19.0	38.6	269°30.9	27.1
23	240°34.2	144°39.7	25.3	121°04.3	02.3	266°21.3	38.6	284°33.5	27.1
Mer.pass.	07:00	ν -0.9′	d -0.0′	m -3.86	ν 0.8′	d -0.3′	m 1.77	ν 2.3′	d -0.0′ m -2.45	ν 2.5′	d 0.0′ m 0.51

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	255°36.7	159°38.8	N24°25.3	136°05.2	N22°02.0	281°23.7	S11°38.5	299°36.0	S17°27.1
1	270°39.1	174°37.9	25.2	151°06.0	01.7	296°26.0	38.5	314°38.5	27.1
2	285°41.6	189°37.1	25.2	166°06.8	01.4	311°28.4	38.5	329°41.0	27.2
3	300°44.1	204°36.2	·· 25.1	181°07.7	·· 01.1	326°30.8	·· 38.5	344°43.5	·· 27.2
4	315°46.5	219°35.3	25.1	196°08.5	00.8	341°33.1	38.4	359°46.1	27.2
5	330°49.0	234°34.4	25.0	211°09.4	00.4	356°35.5	38.4	14°48.6	27.2
6	345°51.5	249°33.5	N24°25.0	226°10.2	N22°00.1	11°37.8	S11°38.4	29°51.1	S17°27.3
7	0°53.9	264°32.6	24.9	241°11.0	21°59.8	26°40.2	38.3	44°53.6	27.3
8	15°56.4	279°31.7	24.9	256°11.9	59.5	41°42.6	38.3	59°56.2	27.3
9	30°58.8	294°30.8	·· 24.8	271°12.7	·· 59.2	56°44.9	·· 38.3	74°58.7	·· 27.3
10	46°01.3	309°29.9	24.8	286°13.6	58.9	71°47.3	38.3	90°01.2	27.3
11	61°03.8	324°29.1	24.7	301°14.4	58.6	86°49.6	38.2	105°03.7	27.4
12	76°06.2	339°28.2	N24°24.7	316°15.2	N21°58.3	101°52.0	S11°38.2	120°06.2	S17°27.4
13	91°08.7	354°27.3	24.6	331°16.1	57.9	116°54.4	38.2	135°08.8	27.4
14	106°11.2	9°26.4	24.5	346°16.9	57.6	131°56.7	38.2	150°11.3	27.4
15	121°13.6	24°25.5	·· 24.5	1°17.8	·· 57.3	146°59.1	·· 38.1	165°13.8	·· 27.5
16	136°16.1	39°24.6	24.4	16°18.6	57.0	162°01.4	38.1	180°16.3	27.5
17	151°18.6	54°23.7	24.3	31°19.5	56.7	177°03.8	38.1	195°18.9	27.5
18	166°21.0	69°22.9	N24°24.3	46°20.3	N21°56.4	192°06.2	S11°38.0	210°21.4	S17°27.5
19	181°23.5	84°22.0	24.2	61°21.1	56.1	207°08.5	38.0	225°23.9	27.6
20	196°25.9	99°21.1	24.1	76°22.0	55.7	222°10.9	38.0	240°26.4	27.6
21	211°28.4	114°20.2	·· 24.1	91°22.8	·· 55.4	237°13.2	·· 38.0	255°29.0	·· 27.6
22	226°30.9	129°19.3	24.0	106°23.7	55.1	252°15.6	37.9	270°31.5	27.6
23	241°33.3	144°18.4	23.9	121°24.5	54.8	267°18.0	37.9	285°34.0	27.6
Mer.pass.	06:56	ν -0.9′	d -0.0′	m -3.86	ν 0.8′	d -0.3′	m 1.77	ν 2.4′	d -0.0′ m -2.45	ν 2.5′	d 0.0′ m 0.51

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	256°35.8	159°17.5	N24°23.9	136°25.3	N21°54.5	282°20.3	S11°37.9	300°36.5	S17°27.7
1	271°38.3	174°16.7	23.8	151°26.2	54.2	297°22.7	37.9	315°39.1	27.7
2	286°40.7	189°15.8	23.7	166°27.0	53.8	312°25.1	37.8	330°41.6	27.7
3	301°43.2	204°14.9	·· 23.6	181°27.9	·· 53.5	327°27.4	·· 37.8	345°44.1	·· 27.7
4	316°45.7	219°14.0	23.5	196°28.7	53.2	342°29.8	37.8	0°46.6	27.8
5	331°48.1	234°13.1	23.5	211°29.6	52.9	357°32.2	37.8	15°49.2	27.8
6	346°50.6	249°12.2	N24°23.4	226°30.4	N21°52.6	12°34.5	S11°37.7	30°51.7	S17°27.8
7	1°53.1	264°11.3	23.3	241°31.2	52.3	27°36.9	37.7	45°54.2	27.8
8	16°55.5	279°10.5	23.2	256°32.1	51.9	42°39.3	37.7	60°56.7	27.9
9	31°58.0	294°09.6	·· 23.1	271°32.9	·· 51.6	57°41.6	·· 37.7	75°59.3	·· 27.9
10	47°00.4	309°08.7	23.0	286°33.8	51.3	72°44.0	37.6	91°01.8	27.9
11	62°02.9	324°07.8	23.0	301°34.6	51.0	87°46.4	37.6	106°04.3	27.9
12	77°05.4	339°06.9	N24°22.9	316°35.5	N21°50.7	102°48.7	S11°37.6	121°06.8	S17°28.0
13	92°07.8	354°06.0	22.8	331°36.3	50.3	117°51.1	37.6	136°09.4	28.0
14	107°10.3	9°05.1	22.7	346°37.1	50.0	132°53.5	37.5	151°11.9	28.0
15	122°12.8	24°04.3	·· 22.6	1°38.0	·· 49.7	147°55.8	·· 37.5	166°14.4	·· 28.0
16	137°15.2	39°03.4	22.5	16°38.8	49.4	162°58.2	37.5	181°16.9	28.0
17	152°17.7	54°02.5	22.4	31°39.7	49.1	178°00.6	37.5	196°19.5	28.1
18	167°20.2	69°01.6	N24°22.3	46°40.5	N21°48.7	193°02.9	S11°37.5	211°22.0	S17°28.1
19	182°22.6	84°00.7	22.2	61°41.4	48.4	208°05.3	37.4	226°24.5	28.1
20	197°25.1	98°59.8	22.1	76°42.2	48.1	223°07.7	37.4	241°27.1	28.1
21	212°27.6	113°59.0	·· 22.0	91°43.0	·· 47.8	238°10.1	·· 37.4	256°29.6	·· 28.2
22	227°30.0	128°58.1	21.9	106°43.9	47.5	253°12.4	37.4	271°32.1	28.2
23	242°32.5	143°57.2	21.8	121°44.7	47.1	268°14.8	37.3	286°34.6	28.2
Mer.pass.	06:52	ν -0.9′	d -0.1′	m -3.86	ν 0.8′	d -0.3′	m 1.78	ν 2.4′	d -0.0′ m -2.46	ν 2.5′	d 0.0′ m 0.50

Stars

	SHA	Dec
Alpheratz	357°37.9	29°12.2
Ankaa	353°10.3	-42°11.3
Schedar	349°34.5	56°38.9
Diphda	348°50.4	-17°52.2
Achernar	335°22.9	-57°07.6
Hamal	327°54.8	23°33.6
Polaris	315°47.4	89°21.0
Acamar	315°14.4	-40°13.1
Menkar	314°09.5	4°10.3
Mirfak	308°32.9	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.2	-16°44.8
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.3	-59°34.9
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.2	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.8	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.0	-63°13.2
Gacrux	171°54.6	-57°14.2
Alioth	166°15.4	55°51.0
Spica	158°25.2	-11°16.4
Alkaid	152°54.1	49°12.7
Hadar	148°39.6	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.5
Kochab	137°18.9	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.1	-26°28.7
Atria	107°15.3	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.1
Kaus Aust.	83°36.0	-34°22.4
Vega	80°34.8	38°48.1
Nunki	75°51.1	-26°16.1
Altair	62°02.6	8°55.4
Peacock	53°10.0	-56°39.8
Deneb	49°27.5	45°21.1
Enif	33°41.6	9°58.2
Al Na'ir	27°36.5	-46°51.3
Fomalhaut	15°17.8	-29°30.5
Scheat	13°48.0	28°11.7
Markab	13°32.8	15°19.0

Jun 06 Sun	SHA	Mer.pass
Venus	265°22.6	13:21
Mars	241°07.5	14:56
Jupiter	25°49.7	05:17
Saturn	43°58.0	04:05

Jun 07 Mon	SHA	Mer.pass
Venus	264°02.2	13:22
Mars	240°28.5	14:55
Jupiter	25°47.0	05:14
Saturn	43°59.3	04:01

Jun 08 Tue	SHA	Mer.pass
Venus	262°41.7	13:24
Mars	239°49.5	14:53
Jupiter	25°44.5	05:10
Saturn	44°00.7	03:57

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°20.5	N22°39.1	228°06.4	16.3′	N07°02.4	12.4′	54.2′
1	195°20.4	39.3	242°41.6	16.2′	07°14.8	12.4′	54.2′
2	210°20.3	39.6	257°16.9	16.2′	07°27.2	12.4′	54.1′
3	225°20.1	·· 39.8	271°52.1	16.2′	07°39.6	12.3′	54.1′
4	240°20.0	40.1	286°27.3	16.2′	07°51.9	12.3′	54.1′
5	255°19.9	40.3	301°02.5	16.2′	08°04.2	12.3′	54.1′
6	270°19.8	N22°40.6	315°37.7	16.1′	N08°16.4	12.2′	54.1′
7	285°19.7	40.8	330°12.8	16.1′	08°28.6	12.2′	54.1′
8	300°19.6	41.1	344°48.0	16.1′	08°40.8	12.1′	54.1′
9	315°19.5	·· 41.4	359°23.1	16.1′	08°53.0	12.1′	54.1′
10	330°19.3	41.6	13°58.1	16.1′	09°05.1	12.1′	54.1′
11	345°19.2	41.9	28°33.2	16.0′	09°17.1	12.0′	54.1′
12	0°19.1	N22°42.1	43°08.2	16.0′	N09°29.2	12.0′	54.1′
13	15°19.0	42.4	57°43.2	16.0′	09°41.2	12.0′	54.1′
14	30°18.9	42.6	72°18.2	15.9′	09°53.1	11.9′	54.0′
15	45°18.8	·· 42.8	86°53.1	15.9′	10°05.1	11.9′	54.0′
16	60°18.6	43.1	101°28.1	15.9′	10°16.9	11.8′	54.0′
17	75°18.5	43.3	116°02.9	15.9′	10°28.8	11.8′	54.0′
18	90°18.4	N22°43.6	130°37.8	15.8′	N10°40.6	11.8′	54.0′
19	105°18.3	43.8	145°12.6	15.8′	10°52.3	11.7′	54.0′
20	120°18.2	44.1	159°47.4	15.8′	11°04.1	11.7′	54.0′
21	135°18.1	·· 44.3	174°22.2	15.7′	11°15.7	11.6′	54.0′
22	150°17.9	44.6	188°56.9	15.7′	11°27.4	11.6′	54.0′
23	165°17.8	44.8	203°31.6	15.7′	11°38.9	11.5′	54.0′
	SD = 15.8′	d = 0.3′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°17.7	N22°45.0	218°06.2	15.6′	N11°50.5	11.5′	54.0′
1	195°17.6	45.3	232°40.9	15.6′	12°02.0	11.4′	54.0′
2	210°17.5	45.5	247°15.5	15.5′	12°13.4	11.4′	54.0′
3	225°17.4	·· 45.8	261°50.0	15.5′	12°24.8	11.3′	54.0′
4	240°17.2	46.0	276°24.5	15.5′	12°36.1	11.3′	54.0′
5	255°17.1	46.2	290°59.0	15.4′	12°47.4	11.2′	54.0′
6	270°17.0	N22°46.5	305°33.4	15.4′	N12°58.7	11.2′	54.0′
7	285°16.9	46.7	320°07.8	15.3′	13°09.9	11.1′	53.9′
8	300°16.8	47.0	334°42.1	15.3′	13°21.0	11.1′	53.9′
9	315°16.7	·· 47.2	349°16.4	15.3′	13°32.1	11.0′	53.9′
10	330°16.5	47.4	3°50.7	15.2′	13°43.1	11.0′	53.9′
11	345°16.4	47.7	18°24.9	15.2′	13°54.1	10.9′	53.9′
12	0°16.3	N22°47.9	32°59.1	15.1′	N14°05.0	10.9′	53.9′
13	15°16.2	48.1	47°33.2	15.1′	14°15.9	10.8′	53.9′
14	30°16.1	48.4	62°07.3	15.0′	14°26.7	10.8′	53.9′
15	45°15.9	·· 48.6	76°41.4	15.0′	14°37.5	10.7′	53.9′
16	60°15.8	48.8	91°15.4	14.9′	14°48.2	10.6′	53.9′
17	75°15.7	49.0	105°49.3	14.9′	14°58.8	10.6′	53.9′
18	90°15.6	N22°49.3	120°23.2	14.9′	N15°09.4	10.5′	53.9′
19	105°15.5	49.5	134°57.1	14.8′	15°19.9	10.5′	53.9′
20	120°15.3	49.7	149°30.9	14.8′	15°30.4	10.4′	53.9′
21	135°15.2	·· 50.0	164°04.6	14.7′	15°40.8	10.3′	53.9′
22	150°15.1	50.2	178°38.3	14.7′	15°51.2	10.3′	53.9′
23	165°15.0	50.4	193°12.0	14.6′	16°01.4	10.2′	53.9′
	SD = 15.8′	d = 0.2′	SD = 14.7′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°14.9	N22°50.6	207°45.6	14.6′	N16°11.6	10.1′	53.9′
1	195°14.7	50.9	222°19.2	14.5′	16°21.8	10.1′	53.9′
2	210°14.6	51.1	236°52.7	14.5′	16°31.9	10.0′	53.9′
3	225°14.5	·· 51.3	251°26.1	14.4′	16°41.9	10.0′	53.9′
4	240°14.4	51.5	265°59.5	14.3′	16°51.8	9.9′	53.9′
5	255°14.3	51.8	280°32.9	14.3′	17°01.7	9.8′	53.9′
6	270°14.1	N22°52.0	295°06.1	14.2′	N17°11.5	9.7′	53.9′
7	285°14.0	52.2	309°39.4	14.2′	17°21.3	9.7′	53.9′
8	300°13.9	52.4	324°12.6	14.1′	17°31.0	9.6′	53.9′
9	315°13.8	·· 52.6	338°45.7	14.1′	17°40.6	9.5′	53.9′
10	330°13.7	52.9	353°18.8	14.0′	17°50.1	9.5′	53.9′
11	345°13.5	53.1	7°51.8	14.0′	17°59.6	9.4′	53.9′
12	0°13.4	N22°53.3	22°24.7	13.9′	N18°09.0	9.3′	53.9′
13	15°13.3	53.5	36°57.6	13.8′	18°18.3	9.2′	53.9′
14	30°13.2	53.7	51°30.5	13.8′	18°27.5	9.2′	53.9′
15	45°13.0	·· 53.9	66°03.3	13.7′	18°36.7	9.1′	53.9′
16	60°12.9	54.1	80°36.0	13.7′	18°45.8	9.0′	53.9′
17	75°12.8	54.4	95°08.7	13.6′	18°54.8	8.9′	53.9′
18	90°12.7	N22°54.6	109°41.3	13.6′	N19°03.7	8.9′	53.9′
19	105°12.6	54.8	124°13.9	13.5′	19°12.6	8.8′	53.9′
20	120°12.4	55.0	138°46.4	13.4′	19°21.3	8.7′	53.9′
21	135°12.3	·· 55.2	153°18.8	13.4′	19°30.0	8.6′	53.9′
22	150°12.2	55.4	167°51.2	13.3′	19°38.6	8.5′	53.9′
23	165°12.1	55.6	182°23.5	13.3′	19°47.2	8.4′	53.9′
	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	22:09	–:–
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	06:24	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	17:46
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 Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	01:18	00:47 23:58		17:36	19:54	
N 70°	01:28	01:07	00:38 23:28	17:18	19:15	21:58
68°	01:37	01:23	01:06	17:04	18:49	20:49
66°	01:44	01:36	01:27	16:53	18:29	20:13
64°	01:50	01:46	01:44	16:43	18:13	19:47
62°	01:55	01:56	01:58	16:35	18:00	19:27
60°	01:59	02:04	02:10	16:28	17:49	19:11
N 58°	02:03	02:11	02:20	16:22	17:39	18:58
56°	02:07	02:17	02:29	16:17	17:31	18:46
54°	02:10	02:22	02:37	16:12	17:24	18:36
52°	02:13	02:27	02:44	16:08	17:17	18:27
50°	02:16	02:32	02:51	16:04	17:11	18:19
45°	02:22	02:42	03:05	15:55	16:58	18:02
N 40°	02:27	02:50	03:17	15:48	16:48	17:48
35°	02:31	02:58	03:27	15:42	16:39	17:36
30°	02:35	03:04	03:36	15:37	16:31	17:26
20°	02:41	03:15	03:51	15:28	16:17	17:08
N 10°	02:47	03:25	04:04	15:20	16:05	16:53
0°	02:53	03:34	04:17	15:12	15:54	16:38
S 10°	02:58	03:43	04:30	15:05	15:43	16:24
20°	03:04	03:53	04:43	14:57	15:32	16:09
30°	03:11	04:05	04:59	14:48	15:19	15:52
35°	03:15	04:11	05:08	14:43	15:11	15:42
40°	03:20	04:19	05:19	14:37	15:02	15:30
45°	03:25	04:28	05:31	14:31	14:52	15:17
S 50°	03:31	04:38	05:46	14:23	14:40	15:01
52°	03:34	04:43	05:53	14:19	14:34	14:53
54°	03:38	04:49	06:01	14:15	14:28	14:44
56°	03:41	04:55	06:10	14:10	14:21	14:35
58°	03:45	05:02	06:20	14:05	14:13	14:24
S 60°	03:50	05:10	06:32	14:00	14:05	14:12

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 26-28 17-5%
06	01:22	01:16	11:59	09:03	21:23	
07	01:11	01:05	11:59	09:44	22:06	
08	00:59	00:54	11:59	10:28	22:50	

IERS Earth Orientation data as of 08-Dec-2022

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	257°34.9	158°56.3	N24°21.7	136°45.6	N21°46.8	283°17.2	S11°37.3	301°37.2	S17°28.2
1	272°37.4	173°55.4	21.6	151°46.4	46.5	298°19.5	37.3	316°39.7	28.3
2	287°39.9	188°54.5	21.5	166°47.3	46.2	313°21.9	37.3	331°42.2	28.3
3	302°42.3	203°53.7	·· 21.4	181°48.1	·· 45.8	328°24.3	·· 37.2	346°44.8	·· 28.3
4	317°44.8	218°52.8	21.3	196°49.0	45.5	343°26.7	37.2	1°47.3	28.3
5	332°47.3	233°51.9	21.2	211°49.8	45.2	358°29.0	37.2	16°49.8	28.4
6	347°49.7	248°51.0	N24°21.1	226°50.6	N21°44.9	13°31.4	S11°37.2	31°52.3	S17°28.4
7	2°52.2	263°50.1	20.9	241°51.5	44.5	28°33.8	37.2	46°54.9	28.4
8	17°54.7	278°49.3	20.8	256°52.3	44.2	43°36.2	37.1	61°57.4	28.4
9	32°57.1	293°48.4	·· 20.7	271°53.2	·· 43.9	58°38.5	·· 37.1	76°59.9	·· 28.5
10	47°59.6	308°47.5	20.6	286°54.0	43.6	73°40.9	37.1	92°02.5	28.5
11	63°02.1	323°46.6	20.5	301°54.9	43.2	88°43.3	37.1	107°05.0	28.5
12	78°04.5	338°45.7	N24°20.4	316°55.7	N21°42.9	103°45.7	S11°37.1	122°07.5	S17°28.5
13	93°07.0	353°44.8	20.2	331°56.6	42.6	118°48.0	37.0	137°10.1	28.6
14	108°09.4	8°44.0	20.1	346°57.4	42.3	133°50.4	37.0	152°12.6	28.6
15	123°11.9	23°43.1	·· 20.0	1°58.3	·· 41.9	148°52.8	·· 37.0	167°15.1	·· 28.6
16	138°14.4	38°42.2	19.9	16°59.1	41.6	163°55.2	37.0	182°17.6	28.6
17	153°16.8	53°41.3	19.7	31°59.9	41.3	178°57.5	36.9	197°20.2	28.7
18	168°19.3	68°40.4	N24°19.6	47°00.8	N21°41.0	193°59.9	S11°36.9	212°22.7	S17°28.7
19	183°21.8	83°39.6	19.5	62°01.6	40.6	209°02.3	36.9	227°25.2	28.7
20	198°24.2	98°38.7	19.4	77°02.5	40.3	224°04.7	36.9	242°27.8	28.7
21	213°26.7	113°37.8	·· 19.2	92°03.3	·· 40.0	239°07.0	·· 36.9	257°30.3	·· 28.8
22	228°29.2	128°36.9	19.1	107°04.2	39.6	254°09.4	36.8	272°32.8	28.8
23	243°31.6	143°36.0	19.0	122°05.0	39.3	269°11.8	36.8	287°35.4	28.8
Mer.pass.	06:49	ν -0.9′	d -0.1′	m -3.86	ν 0.8′	d -0.3′	m 1.78	ν 2.4′	d -0.0′ m -2.47	ν 2.5′	d 0.0′ m 0.50

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	258°34.1	158°35.2	N24°18.8	137°05.9	N21°39.0	284°14.2	S11°36.8	302°37.9	S17°28.8
1	273°36.5	173°34.3	18.7	152°06.7	38.7	299°16.6	36.8	317°40.4	28.9
2	288°39.0	188°33.4	18.6	167°07.6	38.3	314°18.9	36.8	332°43.0	28.9
3	303°41.5	203°32.5	·· 18.4	182°08.4	·· 38.0	329°21.3	·· 36.7	347°45.5	·· 28.9
4	318°43.9	218°31.6	18.3	197°09.3	37.7	344°23.7	36.7	2°48.0	28.9
5	333°46.4	233°30.8	18.2	212°10.1	37.3	359°26.1	36.7	17°50.6	29.0
6	348°48.9	248°29.9	N24°18.0	227°10.9	N21°37.0	14°28.5	S11°36.7	32°53.1	S17°29.0
7	3°51.3	263°29.0	17.9	242°11.8	36.7	29°30.8	36.7	47°55.6	29.0
8	18°53.8	278°28.1	17.7	257°12.6	36.4	44°33.2	36.7	62°58.2	29.0
9	33°56.3	293°27.2	·· 17.6	272°13.5	·· 36.0	59°35.6	·· 36.6	78°00.7	·· 29.1
10	48°58.7	308°26.4	17.4	287°14.3	35.7	74°38.0	36.6	93°03.2	29.1
11	64°01.2	323°25.5	17.3	302°15.2	35.4	89°40.4	36.6	108°05.8	29.1
12	79°03.7	338°24.6	N24°17.1	317°16.0	N21°35.0	104°42.8	S11°36.6	123°08.3	S17°29.1
13	94°06.1	353°23.7	17.0	332°16.9	34.7	119°45.1	36.6	138°10.8	29.2
14	109°08.6	8°22.9	16.8	347°17.7	34.4	134°47.5	36.5	153°13.4	29.2
15	124°11.0	23°22.0	·· 16.7	2°18.6	·· 34.0	149°49.9	·· 36.5	168°15.9	·· 29.2
16	139°13.5	38°21.1	16.5	17°19.4	33.7	164°52.3	36.5	183°18.4	29.3
17	154°16.0	53°20.2	16.4	32°20.3	33.4	179°54.7	36.5	198°21.0	29.3
18	169°18.4	68°19.4	N24°16.2	47°21.1	N21°33.0	194°57.1	S11°36.5	213°23.5	S17°29.3
19	184°20.9	83°18.5	16.1	62°22.0	32.7	209°59.4	36.5	228°26.0	29.3
20	199°23.4	98°17.6	15.9	77°22.8	32.4	225°01.8	36.4	243°28.6	29.4
21	214°25.8	113°16.7	·· 15.7	92°23.7	·· 32.0	240°04.2	·· 36.4	258°31.1	·· 29.4
22	229°28.3	128°15.8	15.6	107°24.5	31.7	255°06.6	36.4	273°33.6	29.4
23	244°30.8	143°15.0	15.4	122°25.4	31.4	270°09.0	36.4	288°36.2	29.4
Mer.pass.	06:45	ν -0.9′	d -0.1′	m -3.86	ν 0.8′	d -0.3′	m 1.78	ν 2.4′	d -0.0′ m -2.48	ν 2.5′	d 0.0′ m 0.49

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	259°33.2	158°14.1	N24°15.3	137°26.2	N21°31.0	285°11.4	S11°36.4	303°38.7	S17°29.5
1	274°35.7	173°13.2	15.1	152°27.1	30.7	300°13.8	36.3	318°41.3	29.5
2	289°38.2	188°12.3	14.9	167°27.9	30.4	315°16.1	36.3	333°43.8	29.5
3	304°40.6	203°11.5	·· 14.8	182°28.8	·· 30.0	330°18.5	·· 36.3	348°46.3	·· 29.5
4	319°43.1	218°10.6	14.6	197°29.6	29.7	345°20.9	36.3	3°48.9	29.6
5	334°45.5	233°09.7	14.4	212°30.5	29.3	0°23.3	36.3	18°51.4	29.6
6	349°48.0	248°08.8	N24°14.3	227°31.3	N21°29.0	15°25.7	S11°36.3	33°53.9	S17°29.6
7	4°50.5	263°08.0	14.1	242°32.2	28.7	30°28.1	36.3	48°56.5	29.7
8	19°52.9	278°07.1	13.9	257°33.0	28.3	45°30.5	36.2	63°59.0	29.7
9	34°55.4	293°06.2	·· 13.7	272°33.9	·· 28.0	60°32.9	·· 36.2	79°01.6	·· 29.7
10	49°57.9	308°05.4	13.6	287°34.7	27.7	75°35.3	36.2	94°04.1	29.7
11	65°00.3	323°04.5	13.4	302°35.6	27.3	90°37.6	36.2	109°06.6	29.8
12	80°02.8	338°03.6	N24°13.2	317°36.4	N21°27.0	105°40.0	S11°36.2	124°09.2	S17°29.8
13	95°05.3	353°02.7	13.0	332°37.3	26.7	120°42.4	36.2	139°11.7	29.8
14	110°07.7	8°01.9	12.8	347°38.1	26.3	135°44.8	36.1	154°14.2	29.8
15	125°10.2	23°01.0	·· 12.7	2°39.0	·· 26.0	150°47.2	·· 36.1	169°16.8	·· 29.9
16	140°12.7	38°00.1	12.5	17°39.8	25.6	165°49.6	36.1	184°19.3	29.9
17	155°15.1	52°59.2	12.3	32°40.7	25.3	180°52.0	36.1	199°21.9	29.9
18	170°17.6	67°58.4	N24°12.1	47°41.5	N21°25.0	195°54.4	S11°36.1	214°24.4	S17°29.9
19	185°20.0	82°57.5	11.9	62°42.4	24.6	210°56.8	36.1	229°26.9	30.0
20	200°22.5	97°56.6	11.7	77°43.2	24.3	225°59.2	36.1	244°29.5	30.0
21	215°25.0	112°55.8	·· 11.5	92°44.1	·· 23.9	241°01.6	·· 36.0	259°32.0	·· 30.0
22	230°27.4	127°54.9	11.4	107°44.9	23.6	256°04.0	36.0	274°34.6	30.1
23	245°29.9	142°54.0	11.2	122°45.8	23.3	271°06.3	36.0	289°37.1	30.1
Mer.pass.	06:41	ν -0.9′	d -0.2′	m -3.86	ν 0.8′	d -0.3′	m 1.79	ν 2.4′	d -0.0′ m -2.48	ν 2.5′	d 0.0′ m 0.49

Stars

	SHA	Dec
Alpheratz	357°37.9	29°12.2
Ankaa	353°10.2	-42°11.3
Schedar	349°34.5	56°38.9
Diphda	348°50.4	-17°52.2
Achernar	335°22.8	-57°07.6
Hamal	327°54.7	23°33.6
Polaris	315°46.3	89°21.0
Acamar	315°14.4	-40°13.1
Menkar	314°09.5	4°10.3
Mirfak	308°32.9	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.1
Bellatrix	278°26.4	6°22.0
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.2	-16°44.8
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.3	-59°34.9
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.3	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.8	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.0	-63°13.3
Gacrux	171°54.6	-57°14.2
Alioth	166°15.4	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.7
Hadar	148°39.6	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.5
Kochab	137°18.9	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.1	-26°28.7
Atria	107°15.3	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.1
Kaus Aust.	83°36.0	-34°22.4
Vega	80°34.8	38°48.1
Nunki	75°51.1	-26°16.1
Altair	62°02.5	8°55.4
Peacock	53°10.0	-56°39.8
Deneb	49°27.4	45°21.2
Enif	33°41.5	9°58.3
Al Na'ir	27°36.5	-46°51.3
Fomalhaut	15°17.8	-29°30.5
Scheat	13°48.0	28°11.7
Markab	13°32.8	15°19.0

Jun 09 Wed	SHA	Mer.pass
Venus	261°21.4	13:25
Mars	239°10.6	14:52
Jupiter	25°42.2	05:06
Saturn	44°02.2	03:53

Jun 10 Thu	SHA	Mer.pass
Venus	260°01.1	13:26
Mars	238°31.8	14:51
Jupiter	25°40.1	05:02
Saturn	44°03.8	03:49

Jun 11 Fri	SHA	Mer.pass
Venus	258°40.9	13:28
Mars	237°53.0	14:49
Jupiter	25°38.1	04:58
Saturn	44°05.5	03:45

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°11.9	N22°55.8	196°55.8	13.2′	N19°55.6	8.4′	54.0′
1	195°11.8	56.0	211°28.0	13.1′	20°04.0	8.3′	54.0′
2	210°11.7	56.2	226°00.2	13.1′	20°12.3	8.2′	54.0′
3	225°11.6	·· 56.4	240°32.2	13.0′	20°20.4	8.1′	54.0′
4	240°11.4	56.7	255°04.3	13.0′	20°28.6	8.0′	54.0′
5	255°11.3	56.9	269°36.2	12.9′	20°36.6	7.9′	54.0′
6	270°11.2	N22°57.1	284°08.2	12.9′	N20°44.5	7.8′	54.0′
7	285°11.1	57.3	298°40.0	12.8′	20°52.3	7.8′	54.0′
8	300°11.0	57.5	313°11.8	12.7′	21°00.1	7.7′	54.0′
9	315°10.8	·· 57.7	327°43.5	12.7′	21°07.8	7.6′	54.0′
10	330°10.7	57.9	342°15.2	12.6′	21°15.3	7.5′	54.0′
11	345°10.6	58.1	356°46.8	12.6′	21°22.8	7.4′	54.0′
12	0°10.5	N22°58.3	11°18.4	12.5′	N21°30.2	7.3′	54.0′
13	15°10.3	58.5	25°49.9	12.4′	21°37.5	7.2′	54.0′
14	30°10.2	58.7	40°21.3	12.4′	21°44.7	7.1′	54.0′
15	45°10.1	·· 58.9	54°52.7	12.3′	21°51.8	7.0′	54.0′
16	60°10.0	59.1	69°24.0	12.3′	21°58.8	6.9′	54.0′
17	75°09.8	59.3	83°55.3	12.2′	22°05.7	6.8′	54.0′
18	90°09.7	N22°59.5	98°26.5	12.1′	N22°12.6	6.7′	54.0′
19	105°09.6	59.7	112°57.6	12.1′	22°19.3	6.6′	54.1′
20	120°09.5	22°59.8	127°28.7	12.0′	22°25.9	6.5′	54.1′
21	135°09.3	23°00.0	141°59.7	12.0′	22°32.4	6.4′	54.1′
22	150°09.2	00.2	156°30.7	11.9′	22°38.8	6.3′	54.1′
23	165°09.1	00.4	171°01.6	11.9′	22°45.2	6.2′	54.1′
	SD = 15.7′	d = 0.2′	SD = 14.7′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°09.0	N23°00.6	185°32.4	11.8′	N22°51.4	6.1′	54.1′
1	195°08.8	00.8	200°03.2	11.7′	22°57.5	6.0′	54.1′
2	210°08.7	01.0	214°34.0	11.7′	23°03.5	5.9′	54.1′
3	225°08.6	·· 01.2	229°04.6	11.6′	23°09.4	5.8′	54.1′
4	240°08.5	01.4	243°35.3	11.6′	23°15.2	5.7′	54.1′
5	255°08.3	01.6	258°05.8	11.5′	23°20.9	5.6′	54.1′
6	270°08.2	N23°01.7	272°36.3	11.5′	N23°26.5	5.5′	54.1′
7	285°08.1	01.9	287°06.8	11.4′	23°32.0	5.4′	54.1′
8	300°07.9	02.1	301°37.2	11.4′	23°37.4	5.3′	54.2′
9	315°07.8	·· 02.3	316°07.6	11.3′	23°42.7	5.2′	54.2′
10	330°07.7	02.5	330°37.9	11.2′	23°47.8	5.1′	54.2′
11	345°07.6	02.7	345°08.1	11.2′	23°52.9	4.9′	54.2′
12	0°07.4	N23°02.9	359°38.3	11.1′	N23°57.8	4.8′	54.2′
13	15°07.3	03.0	14°08.4	11.1′	24°02.6	4.7′	54.2′
14	30°07.2	03.2	28°38.5	11.0′	24°07.4	4.6′	54.2′
15	45°07.1	·· 03.4	43°08.6	11.0′	24°12.0	4.5′	54.2′
16	60°06.9	03.6	57°38.6	10.9′	24°16.5	4.4′	54.2′
17	75°06.8	03.8	72°08.5	10.9′	24°20.8	4.3′	54.2′
18	90°06.7	N23°03.9	86°38.4	10.8′	N24°25.1	4.1′	54.2′
19	105°06.6	04.1	101°08.2	10.8′	24°29.2	4.0′	54.3′
20	120°06.4	04.3	115°38.0	10.8′	24°33.3	3.9′	54.3′
21	135°06.3	·· 04.5	130°07.8	10.7′	24°37.2	3.8′	54.3′
22	150°06.2	04.6	144°37.5	10.7′	24°41.0	3.7′	54.3′
23	165°06.0	04.8	159°07.2	10.6′	24°44.7	3.6′	54.3′
	SD = 15.7′	d = 0.2′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°05.9	N23°05.0	173°36.8	10.6′	N24°48.3	3.4′	54.3′
1	195°05.8	05.2	188°06.3	10.5′	24°51.7	3.3′	54.3′
2	210°05.7	05.3	202°35.9	10.5′	24°55.0	3.2′	54.3′
3	225°05.5	·· 05.5	217°05.4	10.4′	24°58.2	3.1′	54.3′
4	240°05.4	05.7	231°34.8	10.4′	25°01.3	3.0′	54.3′
5	255°05.3	05.9	246°04.2	10.4′	25°04.3	2.8′	54.4′
6	270°05.1	N23°06.0	260°33.6	10.3′	N25°07.1	2.7′	54.4′
7	285°05.0	06.2	275°02.9	10.3′	25°09.9	2.6′	54.4′
8	300°04.9	06.4	289°32.2	10.3′	25°12.5	2.5′	54.4′
9	315°04.8	·· 06.5	304°01.5	10.2′	25°15.0	2.4′	54.4′
10	330°04.6	06.7	318°30.7	10.2′	25°17.3	2.2′	54.4′
11	345°04.5	06.9	332°59.9	10.2′	25°19.5	2.1′	54.4′
12	0°04.4	N23°07.0	347°29.0	10.1′	N25°21.7	2.0′	54.4′
13	15°04.2	07.2	1°58.1	10.1′	25°23.6	1.9′	54.5′
14	30°04.1	07.4	16°27.2	10.1′	25°25.5	1.7′	54.5′
15	45°04.0	·· 07.5	30°56.3	10.0′	25°27.2	1.6′	54.5′
16	60°03.9	07.7	45°25.3	10.0′	25°28.9	1.5′	54.5′
17	75°03.7	07.9	59°54.3	10.0′	25°30.3	1.4′	54.5′
18	90°03.6	N23°08.0	74°23.3	9.9′	N25°31.7	1.2′	54.5′
19	105°03.5	08.2	88°52.2	9.9′	25°32.9	1.1′	54.5′
20	120°03.3	08.3	103°21.1	9.9′	25°34.0	1.0′	54.5′
21	135°03.2	·· 08.5	117°50.0	9.9′	25°35.0	0.9′	54.6′
22	150°03.1	08.7	132°18.9	9.8′	25°35.9	0.7′	54.6′
23	165°03.0	08.8	146°47.7	9.8′	25°36.6	0.6′	54.6′
	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°	-:-	-:-	00:27	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	21:24	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 Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°						
N 70°						
68°	00:38					
66°	01:15	00:55		22:11		
64°	01:41	01:40	01:43	21:25	23:05	·· ··
62°	02:02	02:10	02:28	20:56	22:20	23:29
60°	02:19	02:33	02:58	20:33	21:51	22:56
N 58°	02:33	02:52	03:21	20:15	21:28	22:31
56°	02:45	03:07	03:39	20:00	21:10	22:11
54°	02:56	03:21	03:55	19:47	20:55	21:55
52°	03:05	03:32	04:08	19:36	20:42	21:40
50°	03:14	03:43	04:20	19:26	20:30	21:28
45°	03:32	04:05	04:44	19:05	20:06	21:03
N 40°	03:47	04:22	05:04	18:48	19:47	20:42
35°	04:00	04:37	05:20	18:33	19:30	20:25
30°	04:11	04:50	05:35	18:21	19:17	20:11
20°	04:30	05:12	05:59	18:00	18:53	19:46
N 10°	04:46	05:32	06:20	17:42	18:33	19:24
0°	05:02	05:50	06:40	17:25	18:13	19:04
S 10°	05:18	06:08	06:59	17:08	17:54	18:44
20°	05:35	06:27	07:20	16:50	17:34	18:23
30°	05:54	06:50	07:45	16:29	17:11	17:58
35°	06:06	07:03	07:59	16:17	16:57	17:43
40°	06:19	07:19	08:16	16:03	16:41	17:26
45°	06:34	07:37	08:36	15:46	16:22	17:06
S 50°	06:54	08:00	09:02	15:26	15:59	16:40
52°	07:03	08:11	09:14	15:16	15:47	16:28
54°	07:13	08:23	09:28	15:06	15:35	16:14
56°	07:25	08:38	09:44	14:54	15:20	15:57
58°	07:39	08:55	10:04	14:39	15:02	15:38
S 60°	07:55	09:16	10:28	14:23	14:41	15:13

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 29-1 2-0%
09	00:48	00:42	11:59	11:13	23:37	
10	00:36	00:30	12:00	12:01	-:-	
11	00:24	00:17	12:00	12:52	00:26	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	260°32.4	157°53.1	N24°11.0	137°46.6	N21°22.9	286°08.7	S11°36.0	304°39.6	S17°30.1
1	275°34.8	172°52.3	10.8	152°47.5	22.6	301°11.1	36.0	319°42.2	30.1
2	290°37.3	187°51.4	10.6	167°48.3	22.2	316°13.5	36.0	334°44.7	30.2
3	305°39.8	202°50.5	·· 10.4	182°49.2	·· 21.9	331°15.9	·· 36.0	349°47.3	·· 30.2
4	320°42.2	217°49.7	10.2	197°50.0	21.6	346°18.3	35.9	4°49.8	30.2
5	335°44.7	232°48.8	10.0	212°50.9	21.2	1°20.7	35.9	19°52.3	30.3
6	350°47.2	247°47.9	N24°09.8	227°51.7	N21°20.9	16°23.1	S11°35.9	34°54.9	S17°30.3
7	5°49.6	262°47.1	09.6	242°52.6	20.5	31°25.5	35.9	49°57.4	30.3
8	20°52.1	277°46.2	09.4	257°53.4	20.2	46°27.9	35.9	65°00.0	30.3
9	35°54.5	292°45.3	·· 09.2	272°54.3	·· 19.8	61°30.3	·· 35.9	80°02.5	·· 30.4
10	50°57.0	307°44.4	09.0	287°55.1	19.5	76°32.7	35.9	95°05.0	30.4
11	65°59.5	322°43.6	08.8	302°56.0	19.2	91°35.1	35.8	110°07.6	30.4
12	81°01.9	337°42.7	N24°08.6	317°56.8	N21°18.8	106°37.5	S11°35.8	125°10.1	S17°30.4
13	96°04.4	352°41.8	08.3	332°57.7	18.5	121°39.9	35.8	140°12.7	30.5
14	111°06.9	7°41.0	08.1	347°58.5	18.1	136°42.3	35.8	155°15.2	30.5
15	126°09.3	22°40.1	·· 07.9	2°59.4	·· 17.8	151°44.7	·· 35.8	170°17.8	·· 30.5
16	141°11.8	37°39.2	07.7	18°00.2	17.4	166°47.1	35.8	185°20.3	30.6
17	156°14.3	52°38.4	07.5	33°01.1	17.1	181°49.5	35.8	200°22.8	30.6
18	171°16.7	67°37.5	N24°07.3	48°02.0	N21°16.7	196°51.9	S11°35.8	215°25.4	S17°30.6
19	186°19.2	82°36.6	07.1	63°02.8	16.4	211°54.3	35.7	230°27.9	30.6
20	201°21.7	97°35.8	06.8	78°03.7	16.1	226°56.7	35.7	245°30.5	30.7
21	216°24.1	112°34.9	·· 06.6	93°04.5	·· 15.7	241°59.1	·· 35.7	260°33.0	·· 30.7
22	231°26.6	127°34.0	06.4	108°05.4	15.4	257°01.5	35.7	275°35.6	30.7
23	246°29.0	142°33.2	06.2	123°06.2	15.0	272°03.9	35.7	290°38.1	30.8
Mer.pass.	06:37	ν -0.9′	d -0.2′	ν 0.9′	d -0.3′	ν 2.4′	d -0.0′	ν 2.5′	d 0.0′
		m -3.86		m 1.79		m -2.49		m 0.48	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	261°31.5	157°32.3	N24°06.0	138°07.1	N21°14.7	287°06.3	S11°35.7	305°40.6	S17°30.8
1	276°34.0	172°31.4	05.7	153°07.9	14.3	302°08.7	35.7	320°43.2	30.8
2	291°36.4	187°30.6	05.5	168°08.8	14.0	317°11.1	35.7	335°45.7	30.8
3	306°38.9	202°29.7	·· 05.3	183°09.6	·· 13.6	332°13.5	·· 35.7	350°48.3	·· 30.9
4	321°41.4	217°28.9	05.1	198°10.5	13.3	347°15.9	35.6	5°50.8	30.9
5	336°43.8	232°28.0	04.8	213°11.3	12.9	2°18.3	35.6	20°53.4	30.9
6	351°46.3	247°27.1	N24°04.6	228°12.2	N21°12.6	17°20.7	S11°35.6	35°55.9	S17°31.0
7	6°48.8	262°26.3	04.4	243°13.1	12.2	32°23.1	35.6	50°58.4	31.0
8	21°51.2	277°25.4	04.1	258°13.9	11.9	47°25.5	35.6	66°01.0	31.0
9	36°53.7	292°24.5	·· 03.9	273°14.8	·· 11.5	62°27.9	·· 35.6	81°03.5	·· 31.0
10	51°56.1	307°23.7	03.7	288°15.6	11.2	77°30.3	35.6	96°06.1	31.1
11	66°58.6	322°22.8	03.4	303°16.5	10.8	92°32.7	35.6	111°08.6	31.1
12	82°01.1	337°21.9	N24°03.2	318°17.3	N21°10.5	107°35.1	S11°35.6	126°11.2	S17°31.1
13	97°03.5	352°21.1	03.0	333°18.2	10.1	122°37.5	35.6	141°13.7	31.2
14	112°06.0	7°20.2	02.7	348°19.0	09.8	137°40.0	35.5	156°16.3	31.2
15	127°08.5	22°19.4	·· 02.5	3°19.9	·· 09.4	152°42.4	·· 35.5	171°18.8	·· 31.2
16	142°10.9	37°18.5	02.2	18°20.7	09.1	167°44.8	35.5	186°21.4	31.3
17	157°13.4	52°17.6	02.0	33°21.6	08.7	182°47.2	35.5	201°23.9	31.3
18	172°15.9	67°16.8	N24°01.8	48°22.5	N21°08.4	197°49.6	S11°35.5	216°26.4	S17°31.3
19	187°18.3	82°15.9	01.5	63°23.3	08.0	212°52.0	35.5	231°29.0	31.3
20	202°20.8	97°15.1	01.3	78°24.2	07.7	227°54.4	35.5	246°31.5	31.4
21	217°23.3	112°14.2	·· 01.0	93°25.0	·· 07.3	242°56.8	·· 35.5	261°34.1	·· 31.4
22	232°25.7	127°13.3	00.8	108°25.9	07.0	257°59.2	35.5	276°36.6	31.4
23	247°28.2	142°12.5	00.5	123°26.7	06.6	273°01.6	35.5	291°39.2	31.5
Mer.pass.	06:33	ν -0.9′	d -0.2′	ν 0.9′	d -0.3′	ν 2.4′	d -0.0′	ν 2.5′	d 0.0′
		m -3.86		m 1.79		m -2.50		m 0.48	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	262°30.6	157°11.6	N24°00.3	138°27.6	N21°06.3	288°04.0	S11°35.5	306°41.7	S17°31.5
1	277°33.1	172°10.8	24°00.0	153°28.4	05.9	303°06.4	35.4	321°44.3	31.5
2	292°35.6	187°09.9	23°59.8	168°29.3	05.6	318°08.8	35.4	336°46.8	31.5
3	307°38.0	202°09.0	·· 59.5	183°30.2	·· 05.2	333°11.3	·· 35.4	351°49.4	·· 31.6
4	322°40.5	217°08.2	59.2	198°31.0	04.9	348°13.7	35.4	6°51.9	31.6
5	337°43.0	232°07.3	59.0	213°31.9	04.5	3°16.1	35.4	21°54.5	31.6
6	352°45.4	247°06.5	N23°58.7	228°32.7	N21°04.2	18°18.5	S11°35.4	36°57.0	S17°31.7
7	7°47.9	262°05.6	58.5	243°33.6	03.8	33°20.9	35.4	51°59.6	31.7
8	22°50.4	277°04.8	58.2	258°34.4	03.4	48°23.3	35.4	67°02.1	31.7
9	37°52.8	292°03.9	·· 57.9	273°35.3	·· 03.1	63°25.7	·· 35.4	82°04.7	·· 31.8
10	52°55.3	307°03.0	57.7	288°36.2	02.7	78°28.1	35.4	97°07.2	31.8
11	67°57.8	322°02.2	57.4	303°37.0	02.4	93°30.6	35.4	112°09.8	31.8
12	83°00.2	337°01.3	N23°57.1	318°37.9	N21°02.0	108°33.0	S11°35.4	127°12.3	S17°31.8
13	98°02.7	352°00.5	56.9	333°38.7	01.7	123°35.4	35.4	142°14.9	31.9
14	113°05.1	6°59.6	56.6	348°39.6	01.3	138°37.8	35.4	157°17.4	31.9
15	128°07.6	21°58.8	·· 56.3	3°40.4	·· 01.0	153°40.2	·· 35.3	172°20.0	·· 31.9
16	143°10.1	36°57.9	56.1	18°41.3	00.6	168°42.6	35.3	187°22.5	32.0
17	158°12.5	51°57.1	55.8	33°42.2	21°00.2	183°45.0	35.3	202°25.1	32.0
18	173°15.0	66°56.2	N23°55.5	48°43.0	N20°59.9	198°47.4	S11°35.3	217°27.6	S17°32.0
19	188°17.5	81°55.3	55.2	63°43.9	59.5	213°49.9	35.3	232°30.2	32.1
20	203°19.9	96°54.5	55.0	78°44.7	59.2	228°52.3	35.3	247°32.7	32.1
21	218°22.4	111°53.6	·· 54.7	93°45.6	·· 58.8	243°54.7	·· 35.3	262°35.3	·· 32.1
22	233°24.9	126°52.8	54.4	108°46.5	58.5	258°57.1	35.3	277°37.8	32.1
23	248°27.3	141°51.9	54.1	123°47.3	58.1	273°59.5	35.3	292°40.4	32.2
Mer.pass.	06:29	ν -0.9′	d -0.3′	ν 0.9′	d -0.4′	ν 2.4′	d -0.0′	ν 2.5′	d 0.0′
		m -3.86		m 1.80		m -2.51		m 0.47	

Stars	SHA	Dec
Alpheratz	357°37.8	29°12.2
Ankaa	353°10.2	-42°11.3
Schedar	349°34.5	56°38.9
Diphda	348°50.4	-17°52.2
Achernar	335°22.8	-57°07.6
Hamal	327°54.7	23°33.6
Polaris	315°45.2	89°21.0
Acamar	315°14.4	-40°13.1
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.0
Bellatrix	278°26.4	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.2	-16°44.8
Adhara	255°08.5	-29°00.2
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.3	-59°34.8
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.3	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.8	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.1	-63°13.3
Gacrux	171°54.6	-57°14.2
Alioth	166°15.4	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.7
Hadar	148°39.6	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.7	-60°55.5
Kochab	137°19.0	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.1	-26°28.7
Atria	107°15.3	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.1
Kaus Aust.	83°36.0	-34°22.4
Vega	80°34.8	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.5	8°55.4
Peacock	53°09.9	-56°39.8
Deneb	49°27.4	45°21.2
Enif	33°41.5	9°58.3
Al Na'ir	27°36.5	-46°51.3
Fomalhaut	15°17.7	-29°30.5
Scheat	13°48.0	28°11.7
Markab	13°32.8	15°19.0

Jun 12 Sat	SHA	Mer.pass
Venus	257°20.8	13:29
Mars	237°14.2	14:48
Jupiter	25°36.4	04:55
Saturn	44°07.3	03:41

Jun 13 Sun	SHA	Mer.pass
Venus	256°00.8	13:31
Mars	236°35.6	14:47
Jupiter	25°34.8	04:51
Saturn	44°09.1	03:37

Jun 14 Mon	SHA	Mer.pass
Venus	254°41.0	13:32
Mars	235°56.9	14:45
Jupiter	25°33.4	04:47
Saturn	44°11.1	03:33

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°02.8	N23°09.0	161°16.6	9.8′	N25°37.2	0.5′	54.6′
1	195°02.7	09.1	175°45.4	9.8′	25°37.7	0.3′	54.6′
2	210°02.6	09.3	190°14.2	9.8′	25°38.0	0.2′	54.6′
3	225°02.4	·· 09.4	204°42.9	9.7′	25°38.2	0.1′	54.6′
4	240°02.3	09.6	219°11.7	9.7′	25°38.3	-0.0′	54.7′
5	255°02.2	09.7	233°40.4	9.7′	25°38.2	-0.2′	54.7′
6	270°02.0	N23°09.9	248°09.1	9.7′	N25°38.1	-0.3′	54.7′
7	285°01.9	10.1	262°37.8	9.7′	25°37.8	-0.4′	54.7′
8	300°01.8	10.2	277°06.5	9.7′	25°37.3	-0.6′	54.7′
9	315°01.7	·· 10.4	291°35.2	9.7′	25°36.8	-0.7′	54.7′
10	330°01.5	10.5	306°03.9	9.7′	25°36.1	-0.8′	54.7′
11	345°01.4	10.7	320°32.5	9.6′	25°35.2	-1.0′	54.8′
12	0°01.3	N23°10.8	335°01.2	9.6′	N25°34.3	-1.1′	54.8′
13	15°01.1	11.0	349°29.8	9.6′	25°33.2	-1.2′	54.8′
14	30°01.0	11.1	3°58.4	9.6′	25°32.0	-1.3′	54.8′
15	45°00.9	·· 11.2	18°27.1	9.6′	25°30.6	-1.5′	54.8′
16	60°00.7	11.4	32°55.7	9.6′	25°29.2	-1.6′	54.8′
17	75°00.6	11.5	47°24.3	9.6′	25°27.5	-1.7′	54.9′
18	90°00.5	N23°11.7	61°52.9	9.6′	N25°25.8	-1.9′	54.9′
19	105°00.3	11.8	76°21.6	9.6′	25°23.9	-2.0′	54.9′
20	120°00.2	12.0	90°50.2	9.6′	25°21.9	-2.1′	54.9′
21	135°00.1	·· 12.1	105°18.8	9.6′	25°19.8	-2.3′	54.9′
22	150°00.0	12.3	119°47.4	9.6′	25°17.6	-2.4′	54.9′
23	164°59.8	12.4	134°16.1	9.6′	25°15.2	-2.5′	55.0′
	SD = 15.7′	d = 0.2′	SD = 14.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.7	N23°12.5	148°44.7	9.6′	N25°12.7	-2.6′	55.0′
1	194°59.6	12.7	163°13.3	9.6′	25°10.0	-2.8′	55.0′
2	209°59.4	12.8	177°42.0	9.6′	25°07.2	-2.9′	55.0′
3	224°59.3	·· 13.0	192°10.6	9.7′	25°04.3	-3.0′	55.0′
4	239°59.2	13.1	206°39.3	9.7′	25°01.3	-3.2′	55.0′
5	254°59.0	13.2	221°07.9	9.7′	24°58.1	-3.3′	55.1′
6	269°58.9	N23°13.4	235°36.6	9.7′	N24°54.8	-3.4′	55.1′
7	284°58.8	13.5	250°05.3	9.7′	24°51.4	-3.6′	55.1′
8	299°58.6	13.6	264°34.0	9.7′	24°47.9	-3.7′	55.1′
9	314°58.5	·· 13.8	279°02.7	9.7′	24°44.2	-3.8′	55.1′
10	329°58.4	13.9	293°31.5	9.7′	24°40.4	-3.9′	55.1′
11	344°58.2	14.0	308°00.2	9.8′	24°36.4	-4.1′	55.2′
12	359°58.1	N23°14.2	322°29.0	9.8′	N24°32.4	-4.2′	55.2′
13	14°58.0	14.3	336°57.7	9.8′	24°28.2	-4.3′	55.2′
14	29°57.8	14.4	351°26.5	9.8′	24°23.9	-4.4′	55.2′
15	44°57.7	·· 14.6	5°55.3	9.8′	24°19.4	-4.6′	55.2′
16	59°57.6	14.7	20°24.2	9.9′	24°14.8	-4.7′	55.3′
17	74°57.4	14.8	34°53.0	9.9′	24°10.1	-4.8′	55.3′
18	89°57.3	N23°14.9	49°21.9	9.9′	N24°05.3	-4.9′	55.3′
19	104°57.2	15.1	63°50.8	9.9′	24°00.4	-5.1′	55.3′
20	119°57.0	15.2	78°19.7	9.9′	23°55.3	-5.2′	55.3′
21	134°56.9	·· 15.3	92°48.6	10.0′	23°50.1	-5.3′	55.4′
22	149°56.8	15.4	107°17.6	10.0′	23°44.8	-5.4′	55.4′
23	164°56.6	15.6	121°46.6	10.0′	23°39.3	-5.6′	55.4′
	SD = 15.7′	d = 0.1′	SD = 15.0′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°56.5	N23°15.7	136°15.6	10.0′	N23°33.8	-5.7′	55.4′
1	194°56.4	15.8	150°44.6	10.1′	23°28.1	-5.8′	55.4′
2	209°56.3	15.9	165°13.7	10.1′	23°22.3	-5.9′	55.5′
3	224°56.1	·· 16.1	179°42.8	10.1′	23°16.3	-6.1′	55.5′
4	239°56.0	16.2	194°11.9	10.1′	23°10.3	-6.2′	55.5′
5	254°55.9	16.3	208°41.1	10.2′	23°04.1	-6.3′	55.5′
6	269°55.7	N23°16.4	223°10.3	10.2′	N22°57.8	-6.4′	55.5′
7	284°55.6	16.5	237°39.5	10.2′	22°51.4	-6.5′	55.6′
8	299°55.5	16.7	252°08.7	10.3′	22°44.8	-6.7′	55.6′
9	314°55.3	·· 16.8	266°38.0	10.3′	22°38.2	-6.8′	55.6′
10	329°55.2	16.9	281°07.3	10.3′	22°31.4	-6.9′	55.6′
11	344°55.1	17.0	295°36.6	10.4′	22°24.5	-7.0′	55.6′
12	359°54.9	N23°17.1	310°06.0	10.4′	N22°17.5	-7.1′	55.7′
13	14°54.8	17.2	324°35.4	10.4′	22°10.3	-7.2′	55.7′
14	29°54.7	17.3	339°04.8	10.5′	22°03.1	-7.4′	55.7′
15	44°54.5	·· 17.5	353°34.3	10.5′	21°55.7	-7.5′	55.7′
16	59°54.4	17.6	8°03.7	10.5′	21°48.3	-7.6′	55.8′
17	74°54.3	17.7	22°33.3	10.6′	21°40.7	-7.7′	55.8′
18	89°54.1	N23°17.8	37°02.8	10.6′	N21°33.0	-7.8′	55.8′
19	104°54.0	17.9	51°32.4	10.6′	21°25.1	-7.9′	55.8′
20	119°53.8	18.0	66°02.1	10.7′	21°17.2	-8.0′	55.8′
21	134°53.7	·· 18.1	80°31.7	10.7′	21°09.2	-8.2′	55.9′
22	149°53.6	18.2	95°01.4	10.7′	21°01.0	-8.3′	55.9′
23	164°53.4	18.3	109°31.2	10.8′	20°52.8	-8.4′	55.9′
	SD = 15.7′	d = 0.1′	SD = 15.1′				

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

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 2-4 2-12%
12	00:11	00:05	12:00	13:44	01:18	
13	00:01	00:08	12:00	14:35	02:10	
14	00:14	00:20	12:00	15:27	03:01	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	263°29.8	156°51.1	N23°53.9	138°48.2	N20°57.7	289°01.9	S11°35.3	307°42.9	S17°32.2
1	278°32.3	171°50.2	53.6	153°49.0	57.4	304°04.4	35.3	322°45.5	32.2
2	293°34.7	186°49.4	53.3	168°49.9	57.0	319°06.8	35.3	337°48.0	32.3
3	308°37.2	201°48.5	·· 53.0	183°50.7	·· 56.7	334°09.2	·· 35.3	352°50.6	·· 32.3
4	323°39.6	216°47.7	52.7	198°51.6	56.3	349°11.6	35.3	7°53.1	32.3
5	338°42.1	231°46.8	52.4	213°52.5	55.9	4°14.0	35.3	22°55.7	32.4
6	353°44.6	246°46.0	N23°52.1	228°53.3	N20°55.6	19°16.5	S11°35.3	37°58.2	S17°32.4
7	8°47.0	261°45.1	51.9	243°54.2	55.2	34°18.9	35.3	53°00.8	32.4
8	23°49.5	276°44.3	51.6	258°55.0	54.9	49°21.3	35.3	68°03.3	32.5
9	38°52.0	291°43.4	·· 51.3	273°55.9	·· 54.5	64°23.7	·· 35.2	83°05.9	·· 32.5
10	53°54.4	306°42.6	51.0	288°56.8	54.1	79°26.1	35.2	98°08.4	32.5
11	68°56.9	321°41.7	50.7	303°57.6	53.8	94°28.6	35.2	113°11.0	32.6
12	83°59.4	336°40.9	N23°50.4	318°58.5	N20°53.4	109°31.0	S11°35.2	128°13.5	S17°32.6
13	99°01.8	351°40.0	50.1	333°59.3	53.1	124°33.4	35.2	143°16.1	32.6
14	114°04.3	6°39.2	49.8	349°00.2	52.7	139°35.8	35.2	158°18.6	32.6
15	129°06.7	21°38.3	·· 49.5	4°01.1	·· 52.3	154°38.2	·· 35.2	173°21.2	·· 32.7
16	144°09.2	36°37.5	49.2	19°01.9	52.0	169°40.7	35.2	188°23.7	32.7
17	159°11.7	51°36.6	48.9	34°02.8	51.6	184°43.1	35.2	203°26.3	32.7
18	174°14.1	66°35.8	N23°48.6	49°03.6	N20°51.2	199°45.5	S11°35.2	218°28.9	S17°32.8
19	189°16.6	81°34.9	48.3	64°04.5	50.9	214°47.9	35.2	233°31.4	32.8
20	204°19.1	96°34.1	48.0	79°05.4	50.5	229°50.3	35.2	248°34.0	32.8
21	219°21.5	111°33.2	·· 47.7	94°06.2	·· 50.2	244°52.8	·· 35.2	263°36.5	·· 32.9
22	234°24.0	126°32.4	47.4	109°07.1	49.8	259°55.2	35.2	278°39.1	32.9
23	249°26.5	141°31.5	47.1	124°07.9	49.4	274°57.6	35.2	293°41.6	32.9
Mer.pass.	06:25	ν -0.9′	d -0.3′	m -3.86	ν 0.9′	d -0.4′	m 1.80	ν 2.4′	d -0.0′ m -2.52	ν 2.6′	d 0.0′ m 0.47

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	264°28.9	156°30.7	N23°46.8	139°08.8	N20°49.1	290°00.0	S11°35.2	308°44.2	S17°33.0
1	279°31.4	171°29.9	46.4	154°09.7	48.7	305°02.5	35.2	323°46.7	33.0
2	294°33.9	186°29.0	46.1	169°10.5	48.3	320°04.9	35.2	338°49.3	33.0
3	309°36.3	201°28.2	·· 45.8	184°11.4	·· 48.0	335°07.3	·· 35.2	353°51.8	·· 33.1
4	324°38.8	216°27.3	45.5	199°12.3	47.6	350°09.7	35.2	8°54.4	33.1
5	339°41.2	231°26.5	45.2	214°13.1	47.2	5°12.2	35.2	23°56.9	33.1
6	354°43.7	246°25.6	N23°44.9	229°14.0	N20°46.9	20°14.6	S11°35.2	38°59.5	S17°33.1
7	9°46.2	261°24.8	44.5	244°14.8	46.5	35°17.0	35.2	54°02.1	33.2
8	24°48.6	276°24.0	44.2	259°15.7	46.1	50°19.5	35.2	69°04.6	33.2
9	39°51.1	291°23.1	·· 43.9	274°16.6	·· 45.8	65°21.9	·· 35.2	84°07.2	·· 33.2
10	54°53.6	306°22.3	43.6	289°17.4	45.4	80°24.3	35.2	99°09.7	33.3
11	69°56.0	321°21.4	43.3	304°18.3	45.0	95°26.7	35.2	114°12.3	33.3
12	84°58.5	336°20.6	N23°42.9	319°19.2	N20°44.7	110°29.2	S11°35.2	129°14.8	S17°33.3
13	100°01.0	351°19.7	42.6	334°20.0	44.3	125°31.6	35.2	144°17.4	33.4
14	115°03.4	6°18.9	42.3	349°20.9	43.9	140°34.0	35.2	159°20.0	33.4
15	130°05.9	21°18.1	·· 42.0	4°21.7	·· 43.6	155°36.4	·· 35.2	174°22.5	·· 33.4
16	145°08.4	36°17.2	41.6	19°22.6	43.2	170°38.9	35.2	189°25.1	33.5
17	160°10.8	51°16.4	41.3	34°23.5	42.8	185°41.3	35.2	204°27.6	33.5
18	175°13.3	66°15.5	N23°41.0	49°24.3	N20°42.5	200°43.7	S11°35.2	219°30.2	S17°33.5
19	190°15.7	81°14.7	40.6	64°25.2	42.1	215°46.2	35.2	234°32.7	33.6
20	205°18.2	96°13.9	40.3	79°26.1	41.7	230°48.6	35.2	249°35.3	33.6
21	220°20.7	111°13.0	·· 40.0	94°26.9	·· 41.4	245°51.0	·· 35.2	264°37.9	·· 33.6
22	235°23.1	126°12.2	39.6	109°27.8	41.0	260°53.5	35.2	279°40.4	33.7
23	250°25.6	141°11.3	39.3	124°28.6	40.6	275°55.9	35.2	294°43.0	33.7
Mer.pass.	06:21	ν -0.8′	d -0.3′	m -3.86	ν 0.9′	d -0.4′	m 1.80	ν 2.4′	d -0.0′ m -2.52	ν 2.6′	d 0.0′ m 0.46

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	265°28.1	156°10.5	N23°39.0	139°29.5	N20°40.2	290°58.3	S11°35.2	309°45.5	S17°33.7
1	280°30.5	171°09.7	38.6	154°30.4	39.9	306°00.8	35.2	324°48.1	33.8
2	295°33.0	186°08.8	38.3	169°31.2	39.5	321°03.2	35.2	339°50.6	33.8
3	310°35.5	201°08.0	·· 37.9	184°32.1	·· 39.1	336°05.6	·· 35.2	354°53.2	·· 33.8
4	325°37.9	216°07.2	37.6	199°33.0	38.8	351°08.1	35.2	9°55.8	33.9
5	340°40.4	231°06.3	37.2	214°33.8	38.4	6°10.5	35.2	24°58.3	33.9
6	355°42.9	246°05.5	N23°36.9	229°34.7	N20°38.0	21°12.9	S11°35.2	40°00.9	S17°33.9
7	10°45.3	261°04.7	36.6	244°35.6	37.7	36°15.4	35.2	55°03.4	34.0
8	25°47.8	276°03.8	36.2	259°36.4	37.3	51°17.8	35.2	70°06.0	34.0
9	40°50.2	291°03.0	·· 35.9	274°37.3	·· 36.9	66°20.2	·· 35.2	85°08.6	·· 34.0
10	55°52.7	306°02.2	35.5	289°38.2	36.5	81°22.7	35.2	100°11.1	34.1
11	70°55.2	321°01.3	35.2	304°39.0	36.2	96°25.1	35.2	115°13.7	34.1
12	85°57.6	336°00.5	N23°34.8	319°39.9	N20°35.8	111°27.5	S11°35.2	130°16.2	S17°34.1
13	101°00.1	350°59.7	34.4	334°40.7	35.4	126°30.0	35.2	145°18.8	34.2
14	116°02.6	5°58.8	34.1	349°41.6	35.0	141°32.4	35.2	160°21.4	34.2
15	131°05.0	20°58.0	·· 33.7	4°42.5	·· 34.7	156°34.8	·· 35.2	175°23.9	·· 34.2
16	146°07.5	35°57.2	33.4	19°43.3	34.3	171°37.3	35.2	190°26.5	34.3
17	161°10.0	50°56.3	33.0	34°44.2	33.9	186°39.7	35.2	205°29.0	34.3
18	176°12.4	65°55.5	N23°32.7	49°45.1	N20°33.5	201°42.2	S11°35.2	220°31.6	S17°34.3
19	191°14.9	80°54.7	32.3	64°45.9	33.2	216°44.6	35.2	235°34.2	34.4
20	206°17.3	95°53.8	31.9	79°46.8	32.8	231°47.0	35.2	250°36.7	34.4
21	221°19.8	110°53.0	·· 31.6	94°47.7	·· 32.4	246°49.5	·· 35.2	265°39.3	·· 34.4
22	236°22.3	125°52.2	31.2	109°48.5	32.0	261°51.9	35.2	280°41.8	34.5
23	251°24.7	140°51.3	30.8	124°49.4	31.7	276°54.4	35.2	295°44.4	34.5
Mer.pass.	06:17	ν -0.8′	d -0.3′	m -3.86	ν 0.9′	d -0.4′	m 1.80	ν 2.4′	d 0.0′ m -2.53	ν 2.6′	d 0.0′ m 0.46

Stars

	SHA	Dec
Alpheratz	357°37.8	29°12.3
Ankaa	353°10.2	-42°11.3
Schedar	349°34.4	56°38.9
Diphda	348°50.3	-17°52.2
Achernar	335°22.8	-57°07.5
Hamal	327°54.7	23°33.6
Polaris	315°44.2	89°21.0
Acamar	315°14.4	-40°13.1
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.1	-16°44.8
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.3	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.8	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.1	-63°13.3
Gacrux	171°54.7	-57°14.2
Alioth	166°15.4	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.7
Hadar	148°39.7	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.8	-60°55.5
Kochab	137°19.0	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.2
Kaus Aust.	83°36.0	-34°22.4
Vega	80°34.8	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.5	8°55.5
Peacock	53°09.9	-56°39.8
Deneb	49°27.4	45°21.2
Enif	33°41.5	9°58.3
Al Na'ir	27°36.4	-46°51.3
Fomalhaut	15°17.7	-29°30.4
Scheat	13°47.9	28°11.7
Markab	13°32.7	15°19.1

Jun 15 Tue	SHA	Mer.pass
Venus	253°21.3	13:33
Mars	235°18.4	14:44
Jupiter	25°32.2	04:43
Saturn	44°13.1	03:29

Jun 16 Wed	SHA	Mer.pass
Venus	252°01.8	13:35
Mars	234°39.9	14:43
Jupiter	25°31.1	04:39
Saturn	44°15.2	03:24

Jun 17 Thu	SHA	Mer.pass
Venus	250°42.4	13:36
Mars	234°01.4	14:41
Jupiter	25°30.3	04:35
Saturn	44°17.5	03:20

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°53.3	N23°18.4	124°01.0	10.8′	N20°44.4	-8.5′	55.9′
1	194°53.2	18.5	138°30.8	10.8′	20°35.9	-8.6′	56.0′
2	209°53.0	18.7	153°00.6	10.9′	20°27.3	-8.7′	56.0′
3	224°52.9	·· 18.8	167°30.5	10.9′	20°18.6	-8.8′	56.0′
4	239°52.8	18.9	182°00.4	11.0′	20°09.8	-8.9′	56.0′
5	254°52.6	19.0	196°30.4	11.0′	20°00.9	-9.0′	56.1′
6	269°52.5	N23°19.1	211°00.3	11.0′	N19°51.9	-9.1′	56.1′
7	284°52.4	19.2	225°30.4	11.1′	19°42.7	-9.2′	56.1′
8	299°52.2	19.3	240°00.4	11.1′	19°33.5	-9.3′	56.1′
9	314°52.1	·· 19.4	254°30.5	11.1′	19°24.2	-9.4′	56.2′
10	329°52.0	19.5	269°00.7	11.2′	19°14.7	-9.5′	56.2′
11	344°51.8	19.6	283°30.8	11.2′	19°05.2	-9.6′	56.2′
12	359°51.7	N23°19.7	298°01.0	11.2′	N18°55.6	-9.7′	56.2′
13	14°51.6	19.8	312°31.3	11.3′	18°45.8	-9.8′	56.3′
14	29°51.4	19.9	327°01.6	11.3′	18°36.0	-9.9′	56.3′
15	44°51.3	·· 19.9	341°31.9	11.3′	18°26.0	-10.0′	56.3′
16	59°51.2	20.0	356°02.2	11.4′	18°16.0	-10.1′	56.3′
17	74°51.0	20.1	10°32.6	11.4′	18°05.9	-10.2′	56.4′
18	89°50.9	N23°20.2	25°03.0	11.5′	N17°55.6	-10.3′	56.4′
19	104°50.8	20.3	39°33.5	11.5′	17°45.3	-10.4′	56.4′
20	119°50.6	20.4	54°04.0	11.5′	17°34.9	-10.5′	56.4′
21	134°50.5	·· 20.5	68°34.5	11.6′	17°24.3	-10.6′	56.5′
22	149°50.4	20.6	83°05.0	11.6′	17°13.7	-10.7′	56.5′
23	164°50.2	20.7	97°35.6	11.6′	17°03.0	-10.8′	56.5′
	SD = 15.7′	d = 0.1′	SD = 15.3′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.1	N23°20.8	112°06.2	11.7′	N16°52.2	-10.9′	56.5′
1	194°50.0	20.9	126°36.9	11.7′	16°41.3	-11.0′	56.6′
2	209°49.8	21.0	141°07.6	11.7′	16°30.4	-11.1′	56.6′
3	224°49.7	·· 21.0	155°38.3	11.8′	16°19.3	-11.2′	56.6′
4	239°49.5	21.1	170°09.1	11.8′	16°08.1	-11.2′	56.7′
5	254°49.4	21.2	184°39.8	11.8′	15°56.9	-11.3′	56.7′
6	269°49.3	N23°21.3	199°10.6	11.8′	N15°45.5	-11.4′	56.7′
7	284°49.1	21.4	213°41.5	11.9′	15°34.1	-11.5′	56.7′
8	299°49.0	21.5	228°12.4	11.9′	15°22.6	-11.6′	56.8′
9	314°48.9	·· 21.5	242°43.3	11.9′	15°11.0	-11.7′	56.8′
10	329°48.7	21.6	257°14.2	12.0′	14°59.3	-11.8′	56.8′
11	344°48.6	21.7	271°45.2	12.0′	14°47.6	-11.8′	56.8′
12	359°48.5	N23°21.8	286°16.1	12.0′	N14°35.7	-11.9′	56.9′
13	14°48.3	21.9	300°47.2	12.0′	14°23.8	-12.0′	56.9′
14	29°48.2	21.9	315°18.2	12.1′	14°11.8	-12.1′	56.9′
15	44°48.1	·· 22.0	329°49.3	12.1′	13°59.7	-12.2′	57.0′
16	59°47.9	22.1	344°20.3	12.1′	13°47.6	-12.2′	57.0′
17	74°47.8	22.2	358°51.5	12.1′	13°35.3	-12.3′	57.0′
18	89°47.7	N23°22.3	13°22.6	12.2′	N13°23.0	-12.4′	57.0′
19	104°47.5	22.3	27°53.8	12.2′	13°10.6	-12.5′	57.1′
20	119°47.4	22.4	42°24.9	12.2′	12°58.1	-12.5′	57.1′
21	134°47.2	·· 22.5	56°56.2	12.2′	12°45.6	-12.6′	57.1′
22	149°47.1	22.6	71°27.4	12.2′	12°33.0	-12.7′	57.2′
23	164°47.0	22.6	85°58.6	12.3′	12°20.3	-12.8′	57.2′
	SD = 15.7′	d = 0.1′	SD = 15.4′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.8	N23°22.7	100°29.9	12.3′	N12°07.5	-12.8′	57.2′
1	194°46.7	22.8	115°01.2	12.3′	11°54.7	-12.9′	57.3′
2	209°46.6	22.8	129°32.5	12.3′	11°41.8	-13.0′	57.3′
3	224°46.4	·· 22.9	144°03.8	12.3′	11°28.8	-13.0′	57.3′
4	239°46.3	23.0	158°35.1	12.4′	11°15.8	-13.1′	57.3′
5	254°46.2	23.0	173°06.5	12.4′	11°02.7	-13.2′	57.4′
6	269°46.0	N23°23.1	187°37.9	12.4′	N10°49.5	-13.2′	57.4′
7	284°45.9	23.2	202°09.3	12.4′	10°36.2	-13.3′	57.4′
8	299°45.8	23.2	216°40.6	12.4′	10°22.9	-13.4′	57.5′
9	314°45.6	·· 23.3	231°12.1	12.4′	10°09.6	-13.4′	57.5′
10	329°45.5	23.4	245°43.5	12.4′	09°56.1	-13.5′	57.5′
11	344°45.3	23.4	260°14.9	12.4′	09°42.6	-13.6′	57.6′
12	359°45.2	N23°23.5	274°46.3	12.4′	N09°29.1	-13.6′	57.6′
13	14°45.1	23.6	289°17.8	12.5′	09°15.5	-13.7′	57.6′
14	29°44.9	23.6	303°49.3	12.5′	09°01.8	-13.7′	57.6′
15	44°44.8	·· 23.7	318°20.7	12.5′	08°48.1	-13.8′	57.7′
16	59°44.7	23.7	332°52.2	12.5′	08°34.3	-13.8′	57.7′
17	74°44.5	23.8	347°23.7	12.5′	08°20.5	-13.9′	57.7′
18	89°44.4	N23°23.9	1°55.1	12.5′	N08°06.6	-13.9′	57.8′
19	104°44.3	23.9	16°26.6	12.5′	07°52.6	-14.0′	57.8′
20	119°44.1	24.0	30°58.1	12.5′	07°38.6	-14.1′	57.8′
21	134°44.0	·· 24.0	45°29.6	12.5′	07°24.6	-14.1′	57.9′
22	149°43.9	24.1	60°01.1	12.5′	07°10.5	-14.2′	57.9′
23	164°43.7	24.1	74°32.6	12.5′	06°56.3	-14.2′	57.9′
	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°	–:–	–:–	01:32	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	19:06	19:35
N 10°	04:49	05:17	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	06:15	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 Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°		06:51	09:26		02:52	01:58
N 70°		07:30	09:42		02:11	01:39
68°	05:44	07:57	09:56	02:14	01:43	01:24
66°	06:23	08:17	10:06	01:34	01:21	01:12
64°	06:50	08:33	10:15	01:06	01:04	01:01
62°	07:11	08:47	10:23	00:44	00:50	00:52
60°	07:27	08:58	10:29	00:27	00:37	00:44
N 58°	07:41	09:08	10:35	00:12	00:27	00:38
56°	07:53	09:16	10:40	00:00	00:18	00:32
54°	08:04	09:24	10:45	·· ··	00:09	00:26
52°	08:13	09:30	10:49	·· ··	00:02	00:21
50°	08:22	09:36	10:52	23:55	·· ··	00:17
45°	08:39	09:49	11:00	23:41	·· ··	00:07
N 40°	08:54	10:00	11:07	23:29	23:59	·· ··
35°	09:06	10:09	11:13	23:19	23:52	·· ··
30°	09:16	10:17	11:18	23:10	23:46	·· ··
20°	09:34	10:30	11:26	22:55	23:35	·· ··
N 10°	09:50	10:42	11:34	22:41	23:25	·· ··
0°	10:05	10:53	11:41	22:28	23:16	·· ··
S 10°	10:19	11:04	11:48	22:15	23:07	23:58
20°	10:35	11:16	11:55	22:01	22:57	23:53
30°	10:52	11:29	12:04	21:45	22:46	23:47
35°	11:03	11:37	12:09	21:36	22:39	23:43
40°	11:14	11:46	12:14	21:25	22:32	23:39
45°	11:28	11:56	12:20	21:12	22:23	23:35
S 50°	11:45	12:08	12:28	20:57	22:12	23:29
52°	11:53	12:14	12:32	20:50	22:07	23:26
54°	12:02	12:20	12:35	20:42	22:02	23:24
56°	12:11	12:27	12:40	20:32	21:56	23:20
58°	12:22	12:35	12:44	20:22	21:49	23:17
S 60°	12:35	12:44	12:49	20:10	21:41	23:13

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 5-7 19-37%
15	00:27	00:33	12:01	16:16	03:52	
16	00:40	00:46	12:01	17:05	04:41	
17	00:53	00:59	12:01	17:52	05:28	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	266°27.2	155°50.5	N23°30.5	139°50.3	N20°31.3	291°56.8	S11°35.2	310°47.0	S17°34.5
1	281°29.7	170°49.7	30.1	154°51.1	30.9	306°59.2	35.2	325°49.5	34.6
2	296°32.1	185°48.9	29.7	169°52.0	30.5	322°01.7	35.2	340°52.1	34.6
3	311°34.6	200°48.0	·· 29.4	184°52.9	·· 30.2	337°04.1	·· 35.2	355°54.7	·· 34.6
4	326°37.1	215°47.2	29.0	199°53.7	29.8	352°06.6	35.2	10°57.2	34.7
5	341°39.5	230°46.4	28.6	214°54.6	29.4	7°09.0	35.2	25°59.8	34.7
6	356°42.0	245°45.5	N23°28.3	229°55.5	N20°29.0	22°11.4	S11°35.2	41°02.3	S17°34.7
7	11°44.5	260°44.7	27.9	244°56.3	28.7	37°13.9	35.2	56°04.9	34.8
8	26°46.9	275°43.9	27.5	259°57.2	28.3	52°16.3	35.2	71°07.5	34.8
9	41°49.4	290°43.1	·· 27.1	274°58.1	·· 27.9	67°18.8	·· 35.2	86°10.0	·· 34.8
10	56°51.8	305°42.2	26.7	289°58.9	27.5	82°21.2	35.3	101°12.6	34.9
11	71°54.3	320°41.4	26.4	304°59.8	27.1	97°23.6	35.3	116°15.2	34.9
12	86°56.8	335°40.6	N23°26.0	320°00.7	N20°26.8	112°26.1	S11°35.3	131°17.7	S17°34.9
13	101°59.2	350°39.8	25.6	335°01.5	26.4	127°28.5	35.3	146°20.3	35.0
14	117°01.7	5°38.9	25.2	350°02.4	26.0	142°31.0	35.3	161°22.8	35.0
15	132°04.2	20°38.1	·· 24.8	5°03.3	·· 25.6	157°33.4	·· 35.3	176°25.4	·· 35.0
16	147°06.6	35°37.3	24.4	20°04.1	25.3	172°35.9	35.3	191°28.0	35.1
17	162°09.1	50°36.5	24.1	35°05.0	24.9	187°38.3	35.3	206°30.5	35.1
18	177°11.6	65°35.6	N23°23.7	50°05.9	N20°24.5	202°40.8	S11°35.3	221°33.1	S17°35.1
19	192°14.0	80°34.8	23.3	65°06.8	24.1	217°43.2	35.3	236°35.7	35.2
20	207°16.5	95°34.0	22.9	80°07.6	23.7	232°45.6	35.3	251°38.2	35.2
21	222°18.9	110°33.2	·· 22.5	95°08.5	·· 23.4	247°48.1	·· 35.3	266°40.8	·· 35.2
22	237°21.4	125°32.4	22.1	110°09.4	23.0	262°50.5	35.3	281°43.4	35.3
23	252°23.9	140°31.5	21.7	125°10.2	22.6	277°53.0	35.3	296°45.9	35.3
Mer.pass.	06:13	ν -0.8′	d -0.4′	ν 0.9′	d -0.4′	ν 2.4′	d 0.0′	ν 2.6′	d 0.0′
m	-3.86	m	1.81	m	-2.54	m	0.45		

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	267°26.3	155°30.7	N23°21.3	140°11.1	N20°22.2	292°55.4	S11°35.3	311°48.5	S17°35.3
1	282°28.8	170°29.9	20.9	155°12.0	21.8	307°57.9	35.3	326°51.1	35.4
2	297°31.3	185°29.1	20.5	170°12.8	21.4	323°00.3	35.3	341°53.6	35.4
3	312°33.7	200°28.3	·· 20.1	185°13.7	·· 21.1	338°02.8	·· 35.3	356°56.2	·· 35.4
4	327°36.2	215°27.4	19.7	200°14.6	20.7	353°05.2	35.4	11°58.7	35.5
5	342°38.7	230°26.6	19.3	215°15.4	20.3	8°07.7	35.4	27°01.3	35.5
6	357°41.1	245°25.8	N23°18.9	230°16.3	N20°19.9	23°10.1	S11°35.4	42°03.9	S17°35.5
7	12°43.6	260°25.0	18.5	245°17.2	19.5	38°12.6	35.4	57°06.4	35.6
8	27°46.1	275°24.2	18.1	260°18.1	19.2	53°15.0	35.4	72°09.0	35.6
9	42°48.5	290°23.4	·· 17.7	275°18.9	·· 18.8	68°17.5	·· 35.4	87°11.6	·· 35.7
10	57°51.0	305°22.5	17.3	290°19.8	18.4	83°19.9	35.4	102°14.1	35.7
11	72°53.4	320°21.7	16.9	305°20.7	18.0	98°22.4	35.4	117°16.7	35.7
12	87°55.9	335°20.9	N23°16.5	320°21.5	N20°17.6	113°24.8	S11°35.4	132°19.3	S17°35.8
13	102°58.4	350°20.1	16.1	335°22.4	17.2	128°27.3	35.4	147°21.8	35.8
14	118°00.8	5°19.3	15.7	350°23.3	16.8	143°29.7	35.4	162°24.4	35.8
15	133°03.3	20°18.5	·· 15.3	5°24.1	·· 16.5	158°32.2	·· 35.4	177°27.0	·· 35.9
16	148°05.8	35°17.6	14.8	20°25.0	16.1	173°34.6	35.4	192°29.5	35.9
17	163°08.2	50°16.8	14.4	35°25.9	15.7	188°37.1	35.4	207°32.1	35.9
18	178°10.7	65°16.0	N23°14.0	50°26.8	N20°15.3	203°39.5	S11°35.5	222°34.7	S17°36.0
19	193°13.2	80°15.2	13.6	65°27.6	14.9	218°42.0	35.5	237°37.2	36.0
20	208°15.6	95°14.4	13.2	80°28.5	14.5	233°44.4	35.5	252°39.8	36.0
21	223°18.1	110°13.6	·· 12.8	95°29.4	·· 14.1	248°46.9	·· 35.5	267°42.4	·· 36.1
22	238°20.6	125°12.8	12.3	110°30.2	13.8	263°49.4	35.5	282°45.0	36.1
23	253°23.0	140°12.0	11.9	125°31.1	13.4	278°51.8	35.5	297°47.5	36.1
Mer.pass.	06:09	ν -0.8′	d -0.4′	ν 0.9′	d -0.4′	ν 2.4′	d 0.0′	ν 2.6′	d 0.0′
m	-3.86	m	1.81	m	-2.55	m	0.45		

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	268°25.5	155°11.1	N23°11.5	140°32.0	N20°13.0	293°54.3	S11°35.5	312°50.1	S17°36.2
1	283°27.9	170°10.3	11.1	155°32.9	12.6	308°56.7	35.5	327°52.7	36.2
2	298°30.4	185°09.5	10.6	170°33.7	12.2	323°59.2	35.5	342°55.2	36.3
3	313°32.9	200°08.7	·· 10.2	185°34.6	·· 11.8	339°01.6	·· 35.5	357°57.8	·· 36.3
4	328°35.3	215°07.9	09.8	200°35.5	11.4	354°04.1	35.5	13°00.4	36.3
5	343°37.8	230°07.1	09.4	215°36.3	11.0	9°06.5	35.6	28°02.9	36.4
6	358°40.3	245°06.3	N23°08.9	230°37.2	N20°10.7	24°09.0	S11°35.6	43°05.5	S17°36.4
7	13°42.7	260°05.5	08.5	245°38.1	10.3	39°11.5	35.6	58°08.1	36.4
8	28°45.2	275°04.7	08.1	260°39.0	09.9	54°13.9	35.6	73°10.6	36.5
9	43°47.7	290°03.9	·· 07.6	275°39.8	·· 09.5	69°16.4	·· 35.6	88°13.2	·· 36.5
10	58°50.1	305°03.1	07.2	290°40.7	09.1	84°18.8	35.6	103°15.8	36.5
11	73°52.6	320°02.3	06.8	305°41.6	08.7	99°21.3	35.6	118°18.4	36.6
12	88°55.0	335°01.4	N23°06.3	320°42.5	N20°08.3	114°23.8	S11°35.6	133°20.9	S17°36.6
13	103°57.5	350°00.6	05.9	335°43.3	07.9	129°26.2	35.6	148°23.5	36.6
14	119°00.0	4°59.8	05.4	350°44.2	07.5	144°28.7	35.6	163°26.1	36.7
15	134°02.4	19°59.0	·· 05.0	5°45.1	·· 07.2	159°31.1	·· 35.7	178°28.6	·· 36.7
16	149°04.9	34°58.2	04.6	20°45.9	06.8	174°33.6	35.7	193°31.2	36.8
17	164°07.4	49°57.4	04.1	35°46.8	06.4	189°36.0	35.7	208°33.8	36.8
18	179°09.8	64°56.6	N23°03.7	50°47.7	N20°06.0	204°38.5	S11°35.7	223°36.3	S17°36.8
19	194°12.3	79°55.8	03.2	65°48.6	05.6	219°41.0	35.7	238°38.9	36.9
20	209°14.8	94°55.0	02.8	80°49.4	05.2	234°43.4	35.7	253°41.5	36.9
21	224°17.2	109°54.2	·· 02.3	95°50.3	·· 04.8	249°45.9	·· 35.7	268°44.1	·· 36.9
22	239°19.7	124°53.4	01.9	110°51.2	04.4	264°48.4	35.7	283°46.6	37.0
23	254°22.2	139°52.6	01.4	125°52.1	04.0	279°50.8	35.7	298°49.2	37.0
Mer.pass.	06:05	ν -0.8′	d -0.4′	ν 0.9′	d -0.4′	ν 2.5′	d 0.0′	ν 2.6′	d 0.0′
m	-3.86	m	1.81	m	-2.56	m	0.44		

Stars	SHA	Dec
Alpheratz	357°37.8	29°12.3
Ankaa	353°10.1	-42°11.2
Schedar	349°34.4	56°38.9
Diphda	348°50.3	-17°52.1
Achernar	335°22.7	-57°07.5
Hamal	327°54.7	23°33.6
Polaris	315°43.2	89°21.0
Acamar	315°14.4	-40°13.1
Menkar	314°09.4	4°10.3
Mirfak	308°32.8	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.1	-16°44.8
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.4	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.8	61°38.5
Denebola	182°27.9	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.1	-63°13.3
Gacrux	171°54.7	-57°14.2
Alioth	166°15.5	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.7
Hadar	148°39.7	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.8	-60°55.5
Kochab	137°19.0	74°04.3
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.2
Kaus Aust.	83°36.0	-34°22.4
Vega	80°34.8	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.5	8°55.5
Peacock	53°09.9	-56°39.8
Deneb	49°27.4	45°21.2
Enif	33°41.5	9°58.3
Al Na'ir	27°36.4	-46°51.3
Fomalhaut	15°17.7	-29°30.4
Scheat	13°47.9	28°11.7
Markab	13°32.7	15°19.1

Jun 18 Fri	SHA	Mer.pass
Venus	249°23.3	13:37
Mars	233°23.1	14:40
Jupiter	25°29.6	04:31
Saturn	44°19.8	03:16

Jun 19 Sat	SHA	Mer.pass
Venus	248°04.4	13:39
Mars	232°44.8	14:38
Jupiter	25°29.1	04:28
Saturn	44°22.1	03:12

Jun 20 Sun	SHA	Mer.pass
Venus	246°45.7	13:40
Mars	232°06.5	14:37
Jupiter	25°28.8	04:24
Saturn	44°24.6	03:08

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°43.6	N23°24.2	89°04.0	12.5′	N06°42.1	-14.2′	58.0′
1	194°43.4	24.3	103°35.5	12.5′	06°27.9	-14.3′	58.0′
2	209°43.3	24.3	118°07.0	12.5′	06°13.6	-14.3′	58.0′
3	224°43.2	·· 24.4	132°38.5	12.5′	05°59.2	-14.4′	58.0′
4	239°43.0	24.4	147°09.9	12.5′	05°44.8	-14.4′	58.1′
5	254°42.9	24.5	161°41.4	12.4′	05°30.4	-14.5′	58.1′
6	269°42.8	N23°24.5	176°12.8	12.4′	N05°15.9	-14.5′	58.1′
7	284°42.6	24.6	190°44.3	12.4′	05°01.4	-14.6′	58.2′
8	299°42.5	24.6	205°15.7	12.4′	04°46.9	-14.6′	58.2′
9	314°42.4	·· 24.7	219°47.1	12.4′	04°32.3	-14.6′	58.2′
10	329°42.2	24.7	234°18.5	12.4′	04°17.6	-14.7′	58.3′
11	344°42.1	24.8	248°49.9	12.4′	04°03.0	-14.7′	58.3′
12	359°42.0	N23°24.8	263°21.3	12.4′	N03°48.3	-14.7′	58.3′
13	14°41.8	24.8	277°52.6	12.3′	03°33.5	-14.8′	58.4′
14	29°41.7	24.9	292°23.9	12.3′	03°18.8	-14.8′	58.4′
15	44°41.5	·· 24.9	306°55.3	12.3′	03°04.0	-14.8′	58.4′
16	59°41.4	25.0	321°26.6	12.3′	02°49.1	-14.9′	58.5′
17	74°41.3	25.0	335°57.8	12.3′	02°34.2	-14.9′	58.5′
18	89°41.1	N23°25.1	350°29.1	12.2′	N02°19.4	-14.9′	58.5′
19	104°41.0	25.1	5°00.3	12.2′	02°04.4	-14.9′	58.6′
20	119°40.9	25.1	19°31.5	12.2′	01°49.5	-15.0′	58.6′
21	134°40.7	·· 25.2	34°02.7	12.2′	01°34.5	-15.0′	58.6′
22	149°40.6	25.2	48°33.9	12.1′	01°19.5	-15.0′	58.6′
23	164°40.5	25.3	63°05.0	12.1′	01°04.5	-15.0′	58.7′
	SD = 15.7′	d = 0.1′	SD = 15.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.3	N23°25.3	77°36.1	12.1′	N00°49.4	-15.1′	58.7′
1	194°40.2	25.3	92°07.2	12.0′	00°34.4	-15.1′	58.7′
2	209°40.1	25.4	106°38.2	12.0′	00°19.3	-15.1′	58.8′
3	224°39.9	·· 25.4	121°09.2	12.0′	N00°04.2	-15.1′	58.8′
4	239°39.8	25.4	135°40.2	11.9′	S00°10.9	15.1′	58.8′
5	254°39.6	25.5	150°11.1	11.9′	00°26.1	15.1′	58.9′
6	269°39.5	N23°25.5	164°42.0	11.9′	S00°41.2	15.2′	58.9′
7	284°39.4	25.5	179°12.9	11.8′	00°56.4	15.2′	58.9′
8	299°39.2	25.6	193°43.7	11.8′	01°11.5	15.2′	59.0′
9	314°39.1	·· 25.6	208°14.5	11.7′	01°26.7	15.2′	59.0′
10	329°39.0	25.6	222°45.2	11.7′	01°41.9	15.2′	59.0′
11	344°38.8	25.7	237°15.9	11.7′	01°57.1	15.2′	59.0′
12	359°38.7	N23°25.7	251°46.6	11.6′	S02°12.3	15.2′	59.1′
13	14°38.6	25.7	266°17.2	11.6′	02°27.5	15.2′	59.1′
14	29°38.4	25.7	280°47.8	11.5′	02°42.8	15.2′	59.1′
15	44°38.3	·· 25.8	295°18.3	11.5′	02°58.0	15.2′	59.2′
16	59°38.2	25.8	309°48.8	11.4′	03°13.2	15.2′	59.2′
17	74°38.0	25.8	324°19.2	11.4′	03°28.4	15.2′	59.2′
18	89°37.9	N23°25.8	338°49.5	11.3′	S03°43.6	15.2′	59.3′
19	104°37.7	25.9	353°19.9	11.3′	03°58.8	15.2′	59.3′
20	119°37.6	25.9	7°50.1	11.2′	04°14.0	15.2′	59.3′
21	134°37.5	·· 25.9	22°20.3	11.1′	04°29.2	15.2′	59.4′
22	149°37.3	25.9	36°50.5	11.1′	04°44.4	15.2′	59.4′
23	164°37.2	26.0	51°20.6	11.0′	04°59.6	15.2′	59.4′
	SD = 15.7′	d = 0.0′	SD = 16.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.1	N23°26.0	65°50.6	11.0′	S05°14.8	15.2′	59.4′
1	194°36.9	26.0	80°20.6	10.9′	05°30.0	15.1′	59.5′
2	209°36.8	26.0	94°50.5	10.8′	05°45.1	15.1′	59.5′
3	224°36.7	·· 26.0	109°20.3	10.8′	06°00.2	15.1′	59.5′
4	239°36.5	26.0	123°50.1	10.7′	06°15.3	15.1′	59.6′
5	254°36.4	26.1	138°19.8	10.7′	06°30.4	15.1′	59.6′
6	269°36.2	N23°26.1	152°49.5	10.6′	S06°45.5	15.1′	59.6′
7	284°36.1	26.1	167°19.1	10.5′	07°00.6	15.0′	59.6′
8	299°36.0	26.1	181°48.6	10.5′	07°15.6	15.0′	59.7′
9	314°35.8	·· 26.1	196°18.1	10.4′	07°30.6	15.0′	59.7′
10	329°35.7	26.1	210°47.4	10.3′	07°45.6	15.0′	59.7′
11	344°35.6	26.1	225°16.7	10.2′	08°00.5	14.9′	59.7′
12	359°35.4	N23°26.2	239°46.0	10.2′	S08°15.5	14.9′	59.8′
13	14°35.3	26.2	254°15.1	10.1′	08°30.3	14.9′	59.8′
14	29°35.2	26.2	268°44.2	10.0′	08°45.2	14.8′	59.8′
15	44°35.0	·· 26.2	283°13.2	9.9′	09°00.0	14.8′	59.9′
16	59°34.9	26.2	297°42.2	9.9′	09°14.8	14.7′	59.9′
17	74°34.8	26.2	312°11.0	9.8′	09°29.6	14.7′	59.9′
18	89°34.6	N23°26.2	326°39.8	9.7′	S09°44.3	14.7′	59.9′
19	104°34.5	26.2	341°08.5	9.6′	09°58.9	14.6′	60.0′
20	119°34.4	26.2	355°37.1	9.5′	10°13.5	14.6′	60.0′
21	134°34.2	·· 26.2	10°05.7	9.5′	10°28.1	14.5′	60.0′
22	149°34.1	26.2	24°34.1	9.4′	10°42.7	14.5′	60.0′
23	164°33.9	26.2	39°02.5	9.3′	10°57.1	14.4′	60.1′
	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	03:36	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 Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
N 72°	11:39	13:52	16:13	01:25	00:57	00:28
						23:53
N 70°	11:45	13:47	15:57	01:16	00:56	00:36
68°	11:49	13:44	15:45	01:09	00:56	00:42
66°	11:53	13:41	15:35	01:03	00:55	00:47
64°	11:56	13:39	15:26	00:58	00:55	00:52
62°	11:59	13:37	15:19	00:54	00:55	00:56
60°	12:01	13:35	15:13	00:50	00:54	00:59
N 58°	12:03	13:34	15:08	00:46	00:54	01:02
56°	12:05	13:32	15:03	00:43	00:54	01:05
54°	12:07	13:31	14:59	00:40	00:54	01:07
52°	12:08	13:30	14:55	00:38	00:53	01:09
50°	12:10	13:29	14:51	00:36	00:53	01:11
45°	12:13	13:27	14:44	00:30	00:53	01:16
N 40°	12:15	13:25	14:37	00:26	00:53	01:20
35°	12:17	13:24	14:32	00:22	00:52	01:23
30°	12:19	13:22	14:27	00:19	00:52	01:26
20°	12:22	13:20	14:19	00:13	00:52	01:31
N 10°	12:25	13:18	14:12	00:08	00:51	01:35
0°	12:28	13:16	14:06	00:03	00:51	01:39
S 10°	12:31	13:14	13:59	·· ··	00:50	01:43
20°	12:34	13:12	13:53	·· ··	00:50	01:48
30°	12:37	13:10	13:45	·· ··	00:49	01:53
35°	12:39	13:09	13:41	·· ··	00:49	01:56
40°	12:41	13:08	13:36	·· ··	00:48	01:59
45°	12:43	13:06	13:30	·· ··	00:48	02:03
S 50°	12:46	13:04	13:23	·· ··	00:47	02:08
52°	12:48	13:03	13:20	·· ··	00:47	02:10
54°	12:49	13:02	13:17	·· ··	00:47	02:12
56°	12:51	13:01	13:13	·· ··	00:46	02:15
58°	12:52	13:00	13:09	·· ··	00:46	02:18
S 60°	12:54	12:59	13:04	·· ··	00:46	02:21

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 8-10 48-70%
18	01:06	01:12	12:01	18:39	06:16	
19	01:19	01:25	12:01	19:28	07:03	
20	01:32	01:38	12:02	20:18	07:53	

DUT1 = UT1-UTC = -0.1762 sec ΔT = TT-UT1 = +69.3602 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	269°24.6	154°51.8	N23°01.0	140°52.9	N20°03.6	294°53.3	S11°35.8	313°51.8	S17°37.0
1	284°27.1	169°51.0	00.5	155°53.8	03.2	309°55.7	35.8	328°54.3	37.1
2	299°29.5	184°50.2	23°00.1	170°54.7	02.8	324°58.2	35.8	343°56.9	37.1
3	314°32.0	199°49.4	22°59.6	185°55.6	·· 02.5	340°00.7	·· 35.8	358°59.5	·· 37.1
4	329°34.5	214°48.6	59.2	200°56.4	02.1	355°03.1	35.8	14°02.1	37.2
5	344°36.9	229°47.8	58.7	215°57.3	01.7	10°05.6	35.8	29°04.6	37.2
6	359°39.4	244°47.0	N22°58.3	230°58.2	N20°01.3	25°08.1	S11°35.8	44°07.2	S17°37.3
7	14°41.9	259°46.2	57.8	245°59.1	00.9	40°10.5	35.8	59°09.8	37.3
8	29°44.3	274°45.4	57.3	260°59.9	00.5	55°13.0	35.9	74°12.4	37.3
9	44°46.8	289°44.6	·· 56.9	276°00.8	20°00.1	70°15.5	·· 35.9	89°14.9	·· 37.4
10	59°49.3	304°43.8	56.4	291°01.7	19°59.7	85°17.9	35.9	104°17.5	37.4
11	74°51.7	319°43.0	56.0	306°02.6	59.3	100°20.4	35.9	119°20.1	37.4
12	89°54.2	334°42.2	N22°55.5	321°03.4	N19°58.9	115°22.9	S11°35.9	134°22.6	S17°37.5
13	104°56.7	349°41.4	55.0	336°04.3	58.5	130°25.3	35.9	149°25.2	37.5
14	119°59.1	4°40.6	54.6	351°05.2	58.1	145°27.8	35.9	164°27.8	37.6
15	135°01.6	19°39.8	·· 54.1	6°06.1	·· 57.7	160°30.3	·· 36.0	179°30.4	·· 37.6
16	150°04.0	34°39.0	53.6	21°06.9	57.3	175°32.7	36.0	194°32.9	37.6
17	165°06.5	49°38.3	53.2	36°07.8	56.9	190°35.2	36.0	209°35.5	37.7
18	180°09.0	64°37.5	N22°52.7	51°08.7	N19°56.5	205°37.7	S11°36.0	224°38.1	S17°37.7
19	195°11.4	79°36.7	52.2	66°09.6	56.1	220°40.1	36.0	239°40.7	37.7
20	210°13.9	94°35.9	51.7	81°10.5	55.7	235°42.6	36.0	254°43.2	37.8
21	225°16.4	109°35.1	·· 51.3	96°11.3	·· 55.3	250°45.1	·· 36.0	269°45.8	·· 37.8
22	240°18.8	124°34.3	50.8	111°12.2	54.9	265°47.5	36.0	284°48.4	37.8
23	255°21.3	139°33.5	50.3	126°13.1	54.5	280°50.0	36.1	299°51.0	37.9
Mer.pass.	06:01	ν -0.8′	d -0.5′	m -3.86	ν 0.9′	d -0.4′	m 1.81	ν 2.5′	d 0.0′ m -2.56	ν 2.6′	d 0.0′ m 0.44

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	270°23.8	154°32.7	N22°49.8	141°14.0	N19°54.1	295°52.5	S11°36.1	314°53.5	S17°37.9
1	285°26.2	169°31.9	49.3	156°14.8	53.7	310°54.9	36.1	329°56.1	38.0
2	300°28.7	184°31.1	48.9	171°15.7	53.3	325°57.4	36.1	344°58.7	38.0
3	315°31.2	199°30.3	·· 48.4	186°16.6	·· 52.9	340°59.9	·· 36.1	0°01.3	·· 38.0
4	330°33.6	214°29.5	47.9	201°17.5	52.5	356°02.4	36.1	15°03.8	38.1
5	345°36.1	229°28.8	47.4	216°18.3	52.1	11°04.8	36.2	30°06.4	38.1
6	0°38.5	244°28.0	N22°46.9	231°19.2	N19°51.7	26°07.3	S11°36.2	45°09.0	S17°38.1
7	15°41.0	259°27.2	46.5	246°20.1	51.3	41°09.8	36.2	60°11.6	38.2
8	30°43.5	274°26.4	46.0	261°21.0	50.9	56°12.2	36.2	75°14.1	38.2
9	45°45.9	289°25.6	·· 45.5	276°21.9	·· 50.5	71°14.7	·· 36.2	90°16.7	·· 38.3
10	60°48.4	304°24.8	45.0	291°22.7	50.1	86°17.2	36.2	105°19.3	38.3
11	75°50.9	319°24.0	44.5	306°23.6	49.7	101°19.7	36.2	120°21.9	38.3
12	90°53.3	334°23.3	N22°44.0	321°24.5	N19°49.3	116°22.1	S11°36.3	135°24.5	S17°38.4
13	105°55.8	349°22.5	43.5	336°25.4	48.9	131°24.6	36.3	150°27.0	38.4
14	120°58.3	4°21.7	43.0	351°26.2	48.5	146°27.1	36.3	165°29.6	38.4
15	136°00.7	19°20.9	·· 42.5	6°27.1	·· 48.1	161°29.6	·· 36.3	180°32.2	·· 38.5
16	151°03.2	34°20.1	42.0	21°28.0	47.7	176°32.0	36.3	195°34.8	38.5
17	166°05.6	49°19.3	41.5	36°28.9	47.3	191°34.5	36.3	210°37.3	38.6
18	181°08.1	64°18.6	N22°41.0	51°29.8	N19°46.9	206°37.0	S11°36.4	225°39.9	S17°38.6
19	196°10.6	79°17.8	40.5	66°30.6	46.5	221°39.5	36.4	240°42.5	38.6
20	211°13.0	94°17.0	40.0	81°31.5	46.1	236°41.9	36.4	255°45.1	38.7
21	226°15.5	109°16.2	·· 39.5	96°32.4	·· 45.7	251°44.4	·· 36.4	270°47.6	·· 38.7
22	241°18.0	124°15.4	39.0	111°33.3	45.3	266°46.9	36.4	285°50.2	38.7
23	256°20.4	139°14.6	38.5	126°34.2	44.9	281°49.4	36.4	300°52.8	38.8
Mer.pass.	05:57	ν -0.8′	d -0.5′	m -3.86	ν 0.9′	d -0.4′	m 1.82	ν 2.5′	d 0.0′ m -2.57	ν 2.6′	d 0.0′ m 0.43

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	271°22.9	154°13.9	N22°38.0	141°35.0	N19°44.5	296°51.9	S11°36.5	315°55.4	S17°38.8
1	286°25.4	169°13.1	37.5	156°35.9	44.1	311°54.3	36.5	330°58.0	38.9
2	301°27.8	184°12.3	37.0	171°36.8	43.7	326°56.8	36.5	346°00.5	38.9
3	316°30.3	199°11.5	·· 36.5	186°37.7	·· 43.3	341°59.3	·· 36.5	1°03.1	·· 38.9
4	331°32.8	214°10.7	36.0	201°38.6	42.9	357°01.8	36.5	16°05.7	39.0
5	346°35.2	229°10.0	35.5	216°39.4	42.5	12°04.2	36.6	31°08.3	39.0
6	1°37.7	244°09.2	N22°35.0	231°40.3	N19°42.1	27°06.7	S11°36.6	46°10.9	S17°39.0
7	16°40.1	259°08.4	34.5	246°41.2	41.7	42°09.2	36.6	61°13.4	39.1
8	31°42.6	274°07.6	33.9	261°42.1	41.3	57°11.7	36.6	76°16.0	39.1
9	46°45.1	289°06.9	·· 33.4	276°43.0	·· 40.9	72°14.2	·· 36.6	91°18.6	·· 39.2
10	61°47.5	304°06.1	32.9	291°43.8	40.5	87°16.7	36.6	106°21.2	39.2
11	76°50.0	319°05.3	32.4	306°44.7	40.1	102°19.1	36.7	121°23.8	39.2
12	91°52.5	334°04.5	N22°31.9	321°45.6	N19°39.7	117°21.6	S11°36.7	136°26.3	S17°39.3
13	106°54.9	349°03.8	31.4	336°46.5	39.3	132°24.1	36.7	151°28.9	39.3
14	121°57.4	4°03.0	30.8	351°47.4	38.8	147°26.6	36.7	166°31.5	39.4
15	136°59.9	19°02.2	·· 30.3	6°48.2	·· 38.4	162°29.1	·· 36.7	181°34.1	·· 39.4
16	152°02.3	34°01.4	29.8	21°49.1	38.0	177°31.5	36.8	196°36.7	39.4
17	167°04.8	49°00.7	29.3	36°50.0	37.6	192°34.0	36.8	211°39.2	39.5
18	182°07.3	63°59.9	N22°28.7	51°50.9	N19°37.2	207°36.5	S11°36.8	226°41.8	S17°39.5
19	197°09.7	78°59.1	28.2	66°51.8	36.8	222°39.0	36.8	241°44.4	39.5
20	212°12.2	93°58.4	27.7	81°52.7	36.4	237°41.5	36.8	256°47.0	39.6
21	227°14.6	108°57.6	·· 27.2	96°53.5	·· 36.0	252°44.0	·· 36.9	271°49.6	·· 39.6
22	242°17.1	123°56.8	26.6	111°54.4	35.6	267°46.4	36.9	286°52.1	39.7
23	257°19.6	138°56.0	26.1	126°55.3	35.2	282°48.9	36.9	301°54.7	39.7
Mer.pass.	05:54	ν -0.8′	d -0.5′	m -3.86	ν 0.9′	d -0.4′	m 1.82	ν 2.5′	d 0.0′ m -2.58	ν 2.6′	d 0.0′ m 0.43

Stars	SHA	Dec
Alpheratz	357°37.8	29°12.3
Ankaa	353°10.1	-42°11.2
Schedar	349°34.4	56°38.9
Diphda	348°50.3	-17°52.1
Achernar	335°22.7	-57°07.5
Hamal	327°54.6	23°33.6
Polaris	315°42.0	89°20.9
Acamar	315°14.3	-40°13.1
Menkar	314°09.4	4°10.3
Mirfak	308°32.8	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.7	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.4
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.5
Sirius	258°29.1	-16°44.8
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.4	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.1	-63°13.3
Gacrux	171°54.7	-57°14.2
Alioth	166°15.5	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.1	49°12.7
Hadar	148°39.7	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.8	-60°55.5
Kochab	137°19.1	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°03.9
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.2
Kaus Aust.	83°36.0	-34°22.4
Vega	80°34.7	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.5	8°55.5
Peacock	53°09.9	-56°39.8
Deneb	49°27.4	45°21.2
Enif	33°41.4	9°58.3
Al Na'ir	27°36.4	-46°51.3
Fomalhaut	15°17.6	-29°30.4
Scheat	13°47.9	28°11.7
Markab	13°32.7	15°19.1

Jun 21 Mon	SHA	Mer.pass
Venus	245°27.2	13:41
Mars	231°28.3	14:36
Jupiter	25°28.7	04:20
Saturn	44°27.2	03:04

Jun 22 Tue	SHA	Mer.pass
Venus	244°09.0	13:43
Mars	230°50.2	14:34
Jupiter	25°28.7	04:16
Saturn	44°29.8	03:00

Jun 23 Wed	SHA	Mer.pass
Venus	242°51.0	13:44
Mars	230°12.1	14:33
Jupiter	25°29.0	04:12
Saturn	44°32.5	02:56

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.8	N23°26.2	53°30.8	9.2′	S11°11.6	14.4′	60.1′
1	194°33.7	26.2	67°59.0	9.1′	11°25.9	14.3′	60.1′
2	209°33.5	26.2	82°27.1	9.0′	11°40.3	14.3′	60.1′
3	224°33.4	·· 26.2	96°55.1	8.9′	11°54.5	14.2′	60.2′
4	239°33.3	26.2	111°23.0	8.8′	12°08.7	14.1′	60.2′
5	254°33.1	26.2	125°50.9	8.7′	12°22.9	14.1′	60.2′
6	269°33.0	N23°26.2	140°18.6	8.7′	S12°37.0	14.0′	60.2′
7	284°32.9	26.2	154°46.3	8.6′	12°51.0	14.0′	60.2′
8	299°32.7	26.2	169°13.8	8.5′	13°04.9	13.9′	60.3′
9	314°32.6	·· 26.2	183°41.3	8.4′	13°18.8	13.8′	60.3′
10	329°32.5	26.2	198°08.7	8.3′	13°32.7	13.7′	60.3′
11	344°32.3	26.2	212°36.0	8.2′	13°46.4	13.7′	60.3′
12	359°32.2	N23°26.2	227°03.2	8.1′	S14°00.1	13.6′	60.3′
13	14°32.1	26.2	241°30.2	8.0′	14°13.7	13.5′	60.4′
14	29°31.9	26.2	255°57.2	7.9′	14°27.2	13.4′	60.4′
15	44°31.8	·· 26.2	270°24.1	7.8′	14°40.6	13.4′	60.4′
16	59°31.6	26.2	284°50.9	7.7′	14°54.0	13.3′	60.4′
17	74°31.5	26.2	299°17.6	7.6′	15°07.3	13.2′	60.4′
18	89°31.4	N23°26.2	313°44.3	7.5′	S15°20.5	13.1′	60.5′
19	104°31.2	26.2	328°10.8	7.4′	15°33.6	13.0′	60.5′
20	119°31.1	26.1	342°37.2	7.3′	15°46.6	12.9′	60.5′
21	134°31.0	·· 26.1	357°03.5	7.2′	15°59.5	12.8′	60.5′
22	149°30.8	26.1	11°29.7	7.1′	16°12.4	12.7′	60.5′
23	164°30.7	26.1	25°55.8	7.0′	16°25.1	12.6′	60.5′
	SD = 15.7′	d = 0.0′	SD = 16.4′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°30.6	N23°26.1	40°21.8	6.9′	S16°37.7	12.5′	60.6′
1	194°30.4	26.1	54°47.7	6.8′	16°50.3	12.4′	60.6′
2	209°30.3	26.1	69°13.5	6.7′	17°02.7	12.3′	60.6′
3	224°30.2	·· 26.0	83°39.2	6.6′	17°15.1	12.2′	60.6′
4	239°30.0	26.0	98°04.8	6.5′	17°27.3	12.1′	60.6′
5	254°29.9	26.0	112°30.3	6.4′	17°39.4	12.0′	60.6′
6	269°29.8	N23°26.0	126°55.7	6.3′	S17°51.4	11.9′	60.6′
7	284°29.6	26.0	141°21.0	6.2′	18°03.3	11.8′	60.7′
8	299°29.5	26.0	155°46.2	6.1′	18°15.1	11.7′	60.7′
9	314°29.4	·· 25.9	170°11.3	6.0′	18°26.8	11.6′	60.7′
10	329°29.2	25.9	184°36.2	5.9′	18°38.4	11.4′	60.7′
11	344°29.1	25.9	199°01.1	5.8′	18°49.8	11.3′	60.7′
12	359°29.0	N23°25.9	213°25.9	5.7′	S19°01.1	11.2′	60.7′
13	14°28.8	25.8	227°50.6	5.6′	19°12.3	11.1′	60.7′
14	29°28.7	25.8	242°15.2	5.5′	19°23.4	10.9′	60.7′
15	44°28.5	·· 25.8	256°39.7	5.4′	19°34.3	10.8′	60.7′
16	59°28.4	25.8	271°04.1	5.3′	19°45.1	10.7′	60.8′
17	74°28.3	25.7	285°28.4	5.2′	19°55.8	10.6′	60.8′
18	89°28.1	N23°25.7	299°52.5	5.1′	S20°06.4	10.4′	60.8′
19	104°28.0	25.7	314°16.6	5.0′	20°16.8	10.3′	60.8′
20	119°27.9	25.7	328°40.6	4.9′	20°27.1	10.1′	60.8′
21	134°27.7	·· 25.6	343°04.5	4.8′	20°37.2	10.0′	60.8′
22	149°27.6	25.6	357°28.3	4.7′	20°47.2	9.9′	60.8′
23	164°27.5	25.6	11°52.0	4.6′	20°57.1	9.7′	60.8′
	SD = 15.7′	d = -0.0′	SD = 16.5′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.3	N23°25.5	26°15.7	4.5′	S21°06.8	9.6′	60.8′
1	194°27.2	25.5	40°39.2	4.4′	21°16.4	9.4′	60.8′
2	209°27.1	25.5	55°02.6	4.3′	21°25.8	9.3′	60.8′
3	224°26.9	·· 25.4	69°26.0	4.3′	21°35.1	9.1′	60.8′
4	239°26.8	25.4	83°49.2	4.2′	21°44.2	9.0′	60.8′
5	254°26.7	25.4	98°12.4	4.1′	21°53.1	8.8′	60.8′
6	269°26.5	N23°25.3	112°35.5	4.0′	S22°02.0	8.7′	60.8′
7	284°26.4	25.3	126°58.4	3.9′	22°10.6	8.5′	60.8′
8	299°26.3	25.3	141°21.4	3.8′	22°19.1	8.3′	60.8′
9	314°26.1	·· 25.2	155°44.2	3.7′	22°27.4	8.2′	60.8′
10	329°26.0	25.2	170°06.9	3.7′	22°35.6	8.0′	60.8′
11	344°25.9	25.1	184°29.6	3.6′	22°43.6	7.8′	60.8′
12	359°25.7	N23°25.1	198°52.2	3.5′	S22°51.5	7.7′	60.8′
13	14°25.6	25.1	213°14.7	3.4′	22°59.2	7.5′	60.8′
14	29°25.5	25.0	227°37.1	3.4′	23°06.7	7.3′	60.8′
15	44°25.3	·· 25.0	241°59.5	3.3′	23°14.0	7.2′	60.8′
16	59°25.2	24.9	256°21.8	3.2′	23°21.2	7.0′	60.8′
17	74°25.1	24.9	270°44.0	3.2′	23°28.2	6.8′	60.8′
18	89°24.9	N23°24.8	285°06.2	3.1′	S23°35.0	6.7′	60.8′
19	104°24.8	24.8	299°28.3	3.0′	23°41.7	6.5′	60.8′
20	119°24.7	24.7	313°50.3	3.0′	23°48.2	6.3′	60.8′
21	134°24.5	·· 24.7	328°12.3	2.9′	23°54.5	6.1′	60.8′
22	149°24.4	24.7	342°34.2	2.9′	24°00.6	5.9′	60.8′
23	164°24.3	24.6	356°56.0	2.8′	24°06.6	5.8′	60.8′
	SD = 15.7′	d = -0.0′	SD = 16.6′				

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

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 80-95%
21	01:45	01:51	12:02	21:12	08:45	
22	01:58	02:04	12:02	22:11	09:41	
23	02:11	02:17	12:02	23:13	10:41	

DUT1 = UT1-UTC = -0.1747 sec ΔT = TT-UT1 = +69.3587 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	272°22.0	153°55.3	N22°25.6	141°56.2	N19°34.8	297°51.4	S11°36.9	316°57.3	S17°39.7
1	287°24.5	168°54.5	25.0	156°57.1	34.4	312°53.9	36.9	331°59.9	39.8
2	302°27.0	183°53.7	24.5	171°58.0	34.0	327°56.4	37.0	347°02.5	39.8
3	317°29.4	198°53.0	·· 24.0	186°58.8	·· 33.5	342°58.9	·· 37.0	2°05.0	·· 39.9
4	332°31.9	213°52.2	23.4	201°59.7	33.1	358°01.4	37.0	17°07.6	39.9
5	347°34.4	228°51.4	22.9	217°00.6	32.7	13°03.8	37.0	32°10.2	39.9
6	2°36.8	243°50.7	N22°22.4	232°01.5	N19°32.3	28°06.3	S11°37.0	47°12.8	S17°40.0
7	17°39.3	258°49.9	21.8	247°02.4	31.9	43°08.8	37.1	62°15.4	40.0
8	32°41.8	273°49.1	21.3	262°03.3	31.5	58°11.3	37.1	77°18.0	40.1
9	47°44.2	288°48.4	·· 20.7	277°04.1	·· 31.1	73°13.8	·· 37.1	92°20.5	·· 40.1
10	62°46.7	303°47.6	20.2	292°05.0	30.7	88°16.3	37.1	107°23.1	40.1
11	77°49.1	318°46.9	19.6	307°05.9	30.3	103°18.8	37.2	122°25.7	40.2
12	92°51.6	333°46.1	N22°19.1	322°06.8	N19°29.8	118°21.3	S11°37.2	137°28.3	S17°40.2
13	107°54.1	348°45.3	18.6	337°07.7	29.4	133°23.8	37.2	152°30.9	40.2
14	122°56.5	3°44.6	18.0	352°08.6	29.0	148°26.2	37.2	167°33.5	40.3
15	137°59.0	18°43.8	·· 17.5	7°09.4	·· 28.6	163°28.7	·· 37.2	182°36.0	·· 40.3
16	153°01.5	33°43.0	16.9	22°10.3	28.2	178°31.2	37.3	197°38.6	40.4
17	168°03.9	48°42.3	16.4	37°11.2	27.8	193°33.7	37.3	212°41.2	40.4
18	183°06.4	63°41.5	N22°15.8	52°12.1	N19°27.4	208°36.2	S11°37.3	227°43.8	S17°40.4
19	198°08.9	78°40.8	15.3	67°13.0	27.0	223°38.7	37.3	242°46.4	40.5
20	213°11.3	93°40.0	14.7	82°13.9	26.5	238°41.2	37.4	257°49.0	40.5
21	228°13.8	108°39.2	·· 14.1	97°14.7	·· 26.1	253°43.7	·· 37.4	272°51.5	·· 40.6
22	243°16.3	123°38.5	13.6	112°15.6	25.7	268°46.2	37.4	287°54.1	40.6
23	258°18.7	138°37.7	13.0	127°16.5	25.3	283°48.7	37.4	302°56.7	40.6
Mer.pass.	05:50	ν -0.8′	d -0.5′	m -3.86	ν 0.9′	d -0.4′	m 1.82	ν 2.5′	d 0.0′	m -2.59	ν 2.6′	d 0.0′	m 0.42

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°21.2	153°37.0	N22°12.5	142°17.4	N19°24.9	298°51.2	S11°37.4	317°59.3	S17°40.7
1	288°23.6	168°36.2	11.9	157°18.3	24.5	313°53.7	37.5	333°01.9	40.7
2	303°26.1	183°35.5	11.4	172°19.2	24.1	328°56.1	37.5	348°04.5	40.8
3	318°28.6	198°34.7	·· 10.8	187°20.1	·· 23.6	343°58.6	·· 37.5	3°07.1	·· 40.8
4	333°31.0	213°33.9	10.2	202°20.9	23.2	359°01.1	37.5	18°09.6	40.8
5	348°33.5	228°33.2	09.7	217°21.8	22.8	14°03.6	37.6	33°12.2	40.9
6	3°36.0	243°32.4	N22°09.1	232°22.7	N19°22.4	29°06.1	S11°37.6	48°14.8	S17°40.9
7	18°38.4	258°31.7	08.5	247°23.6	22.0	44°08.6	37.6	63°17.4	41.0
8	33°40.9	273°30.9	08.0	262°24.5	21.6	59°11.1	37.6	78°20.0	41.0
9	48°43.4	288°30.2	·· 07.4	277°25.4	·· 21.2	74°13.6	·· 37.7	93°22.6	·· 41.0
10	63°45.8	303°29.4	06.8	292°26.3	20.7	89°16.1	37.7	108°25.2	41.1
11	78°48.3	318°28.7	06.3	307°27.1	20.3	104°18.6	37.7	123°27.7	41.1
12	93°50.8	333°27.9	N22°05.7	322°28.0	N19°19.9	119°21.1	S11°37.7	138°30.3	S17°41.2
13	108°53.2	348°27.2	05.1	337°28.9	19.5	134°23.6	37.8	153°32.9	41.2
14	123°55.7	3°26.4	04.6	352°29.8	19.1	149°26.1	37.8	168°35.5	41.2
15	138°58.1	18°25.7	·· 04.0	7°30.7	·· 18.7	164°28.6	·· 37.8	183°38.1	·· 41.3
16	154°00.6	33°24.9	03.4	22°31.6	18.2	179°31.1	37.8	198°40.7	41.3
17	169°03.1	48°24.2	02.8	37°32.5	17.8	194°33.6	37.9	213°43.3	41.4
18	184°05.5	63°23.4	N22°02.3	52°33.3	N19°17.4	209°36.1	S11°37.9	228°45.8	S17°41.4
19	199°08.0	78°22.7	01.7	67°34.2	17.0	224°38.6	37.9	243°48.4	41.4
20	214°10.5	93°21.9	01.1	82°35.1	16.6	239°41.1	37.9	258°51.0	41.5
21	229°12.9	108°21.2	22°00.5	97°36.0	·· 16.1	254°43.6	·· 38.0	273°53.6	·· 41.5
22	244°15.4	123°20.4	21°59.9	112°36.9	15.7	269°46.1	38.0	288°56.2	41.6
23	259°17.9	138°19.7	59.3	127°37.8	15.3	284°48.6	38.0	303°58.8	41.6
Mer.pass.	05:46	ν -0.8′	d -0.6′	m -3.86	ν 0.9′	d -0.4′	m 1.82	ν 2.5′	d 0.0′	m -2.60	ν 2.6′	d 0.0′	m 0.42

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	274°20.3	153°18.9	N21°58.8	142°38.7	N19°14.9	299°51.1	S11°38.0	319°01.4	S17°41.6
1	289°22.8	168°18.2	58.2	157°39.6	14.5	314°53.6	38.1	334°04.0	41.7
2	304°25.3	183°17.4	57.6	172°40.4	14.0	329°56.1	38.1	349°06.5	41.7
3	319°27.7	198°16.7	·· 57.0	187°41.3	·· 13.6	344°58.6	·· 38.1	4°09.1	·· 41.8
4	334°30.2	213°16.0	56.4	202°42.2	13.2	0°01.1	38.1	19°11.7	41.8
5	349°32.6	228°15.2	55.8	217°43.1	12.8	15°03.6	38.2	34°14.3	41.8
6	4°35.1	243°14.5	N21°55.2	232°44.0	N19°12.4	30°06.1	S11°38.2	49°16.9	S17°41.9
7	19°37.6	258°13.7	54.7	247°44.9	11.9	45°08.6	38.2	64°19.5	41.9
8	34°40.0	273°13.0	54.1	262°45.8	11.5	60°11.1	38.3	79°22.1	42.0
9	49°42.5	288°12.2	·· 53.5	277°46.7	·· 11.1	75°13.6	·· 38.3	94°24.7	·· 42.0
10	64°45.0	303°11.5	52.9	292°47.6	10.7	90°16.1	38.3	109°27.3	42.1
11	79°47.4	318°10.8	52.3	307°48.4	10.3	105°18.6	38.3	124°29.8	42.1
12	94°49.9	333°10.0	N21°51.7	322°49.3	N19°09.8	120°21.1	S11°38.4	139°32.4	S17°42.1
13	109°52.4	348°09.3	51.1	337°50.2	09.4	135°23.6	38.4	154°35.0	42.2
14	124°54.8	3°08.5	50.5	352°51.1	09.0	150°26.1	38.4	169°37.6	42.2
15	139°57.3	18°07.8	·· 49.9	7°52.0	·· 08.6	165°28.6	·· 38.4	184°40.2	·· 42.3
16	154°59.8	33°07.1	49.3	22°52.9	08.1	180°31.1	38.5	199°42.8	42.3
17	170°02.2	48°06.3	48.7	37°53.8	07.7	195°33.6	38.5	214°45.4	42.3
18	185°04.7	63°05.6	N21°48.1	52°54.7	N19°07.3	210°36.2	S11°38.5	229°48.0	S17°42.4
19	200°07.1	78°04.9	47.5	67°55.6	06.9	225°38.7	38.6	244°50.6	42.4
20	215°09.6	93°04.1	46.9	82°56.4	06.5	240°41.2	38.6	259°53.2	42.5
21	230°12.1	108°03.4	·· 46.3	97°57.3	·· 06.0	255°43.7	·· 38.6	274°55.7	·· 42.5
22	245°14.5	123°02.7	45.7	112°58.2	05.6	270°46.2	38.6	289°58.3	42.5
23	260°17.0	138°01.9	45.0	127°59.1	05.2	285°48.7	38.7	305°00.9	42.6
Mer.pass.	05:42	ν -0.7′	d -0.6′	m -3.86	ν 0.9′	d -0.4′	m 1.82	ν 2.5′	d 0.0′	m -2.60	ν 2.6′	d 0.0′	m 0.41

Stars	SHA	Dec
Alpheratz	357°37.7	29°12.3
Ankaa	353°10.1	-42°11.2
Schedar	349°34.3	56°38.9
Diphda	348°50.3	-17°52.1
Achernar	335°22.7	-57°07.5
Hamal	327°54.6	23°33.6
Polaris	315°40.5	89°20.9
Acamar	315°14.3	-40°13.0
Menkar	314°09.4	4°10.3
Mirfak	308°32.7	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.7
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.6	7°24.6
Canopus	263°54.2	-52°42.4
Sirius	258°29.1	-16°44.8
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.7	-43°31.3
Miaplacidus	221°39.4	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.2	-63°13.3
Gacrux	171°54.7	-57°14.2
Alioth	166°15.5	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.2	49°12.7
Hadar	148°39.7	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.4
Rigil Kent.	139°43.8	-60°55.5
Kochab	137°19.1	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.2
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.5	8°55.5
Peacock	53°09.8	-56°39.8
Deneb	49°27.3	45°21.2
Enif	33°41.4	9°58.3
Al Na'ir	27°36.3	-46°51.3
Fomalhaut	15°17.6	-29°30.4
Scheat	13°47.9	28°11.7
Markab	13°32.7	15°19.1

Jun 24 Thu	SHA	Mer.pass
Venus	241°33.2	13:45
Mars	229°34.1	14:31
Jupiter	25°29.4	04:08
Saturn	44°35.3	02:52

Jun 25 Fri	SHA	Mer.pass
Venus	240°15.8	13:46
Mars	228°56.2	14:30
Jupiter	25°30.0	04:04
Saturn	44°38.1	02:48

Jun 26 Sat	SHA	Mer.pass
Venus	238°58.6	13:47
Mars	228°18.3	14:29
Jupiter	25°30.8	04:00
Saturn	44°41.0	02:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.1	N23°24.6	11°17.8	2.7′	S24°12.3	5.6′	60.8′
1	194°24.0	24.5	25°39.6	2.7′	24°17.9	5.4′	60.8′
2	209°23.9	24.5	40°01.3	2.7′	24°23.3	5.2′	60.8′
3	224°23.7	·· 24.4	54°22.9	2.6′	24°28.5	5.0′	60.8′
4	239°23.6	24.4	68°44.5	2.6′	24°33.6	4.8′	60.8′
5	254°23.5	24.3	83°06.1	2.5′	24°38.4	4.7′	60.7′
6	269°23.3	N23°24.2	97°27.6	2.5′	S24°43.1	4.5′	60.7′
7	284°23.2	24.2	111°49.1	2.5′	24°47.5	4.3′	60.7′
8	299°23.1	24.1	126°10.5	2.4′	24°51.8	4.1′	60.7′
9	314°22.9	·· 24.1	140°32.0	2.4′	24°55.9	3.9′	60.7′
10	329°22.8	24.0	154°53.4	2.4′	24°59.8	3.7′	60.7′
11	344°22.7	24.0	169°14.7	2.3′	25°03.6	3.5′	60.7′
12	359°22.5	N23°23.9	183°36.1	2.3′	S25°07.1	3.3′	60.7′
13	14°22.4	23.9	197°57.4	2.3′	25°10.4	3.1′	60.7′
14	29°22.3	23.8	212°18.7	2.3′	25°13.6	3.0′	60.6′
15	44°22.1	·· 23.7	226°40.0	2.3′	25°16.5	2.8′	60.6′
16	59°22.0	23.7	241°01.2	2.3′	25°19.3	2.6′	60.6′
17	74°21.9	23.6	255°22.5	2.3′	25°21.9	2.4′	60.6′
18	89°21.8	N23°23.6	269°43.8	2.3′	S25°24.3	2.2′	60.6′
19	104°21.6	23.5	284°05.0	2.3′	25°26.4	2.0′	60.6′
20	119°21.5	23.4	298°26.3	2.3′	25°28.4	1.8′	60.5′
21	134°21.4	·· 23.4	312°47.5	2.3′	25°30.2	1.6′	60.5′
22	149°21.2	23.3	327°08.8	2.3′	25°31.8	1.4′	60.5′
23	164°21.1	23.2	341°30.0	2.3′	25°33.3	1.2′	60.5′
	SD = 15.7′	d = -0.0′	SD = 16.6′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°21.0	N23°23.2	355°51.3	2.3′	S25°34.5	1.0′	60.5′
1	194°20.8	23.1	10°12.6	2.3′	25°35.5	0.8′	60.5′
2	209°20.7	23.0	24°33.9	2.3′	25°36.3	0.6′	60.4′
3	224°20.6	·· 23.0	38°55.2	2.3′	25°37.0	0.5′	60.4′
4	239°20.4	22.9	53°16.6	2.4′	25°37.4	0.3′	60.4′
5	254°20.3	22.8	67°37.9	2.4′	25°37.7	0.1′	60.4′
6	269°20.2	N23°22.8	81°59.3	2.4′	S25°37.8	-0.1′	60.4′
7	284°20.0	22.7	96°20.7	2.5′	25°37.6	-0.3′	60.3′
8	299°19.9	22.6	110°42.2	2.5′	25°37.3	-0.5′	60.3′
9	314°19.8	·· 22.5	125°03.7	2.5′	25°36.8	-0.7′	60.3′
10	329°19.6	22.5	139°25.2	2.6′	25°36.1	-0.9′	60.3′
11	344°19.5	22.4	153°46.8	2.6′	25°35.2	-1.1′	60.2′
12	359°19.4	N23°22.3	168°08.4	2.7′	S25°34.2	-1.3′	60.2′
13	14°19.3	22.2	182°30.1	2.7′	25°32.9	-1.4′	60.2′
14	29°19.1	22.2	196°51.8	2.8′	25°31.5	-1.6′	60.2′
15	44°19.0	·· 22.1	211°13.6	2.8′	25°29.8	-1.8′	60.1′
16	59°18.9	22.0	225°35.4	2.9′	25°28.0	-2.0′	60.1′
17	74°18.7	21.9	239°57.3	2.9′	25°26.0	-2.2′	60.1′
18	89°18.6	N23°21.9	254°19.2	3.0′	S25°23.8	-2.4′	60.1′
19	104°18.5	21.8	268°41.2	3.1′	25°21.4	-2.6′	60.0′
20	119°18.3	21.7	283°03.3	3.1′	25°18.9	-2.7′	60.0′
21	134°18.2	·· 21.6	297°25.4	3.2′	25°16.1	-2.9′	60.0′
22	149°18.1	21.5	311°47.6	3.3′	25°13.2	-3.1′	60.0′
23	164°17.9	21.5	326°09.9	3.3′	25°10.1	-3.3′	59.9′
	SD = 15.7′	d = -0.1′	SD = 16.5′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.8	N23°21.4	340°32.2	3.4′	S25°06.9	-3.4′	59.9′
1	194°17.7	21.3	354°54.6	3.5′	25°03.4	-3.6′	59.9′
2	209°17.6	21.2	9°17.1	3.6′	24°59.8	-3.8′	59.8′
3	224°17.4	·· 21.1	23°39.7	3.7′	24°56.0	-4.0′	59.8′
4	239°17.3	21.0	38°02.4	3.8′	24°52.0	-4.1′	59.8′
5	254°17.2	20.9	52°25.1	3.8′	24°47.9	-4.3′	59.8′
6	269°17.0	N23°20.9	66°48.0	3.9′	S24°43.6	-4.5′	59.7′
7	284°16.9	20.8	81°10.9	4.0′	24°39.1	-4.6′	59.7′
8	299°16.8	20.7	95°33.9	4.1′	24°34.4	-4.8′	59.7′
9	314°16.6	·· 20.6	109°57.0	4.2′	24°29.6	-5.0′	59.6′
10	329°16.5	20.5	124°20.2	4.3′	24°24.6	-5.1′	59.6′
11	344°16.4	20.4	138°43.5	4.4′	24°19.5	-5.3′	59.6′
12	359°16.3	N23°20.3	153°06.9	4.5′	S24°14.2	-5.5′	59.5′
13	14°16.1	20.2	167°30.4	4.6′	24°08.7	-5.6′	59.5′
14	29°16.0	20.1	181°54.0	4.7′	24°03.1	-5.8′	59.5′
15	44°15.9	·· 20.0	196°17.7	4.8′	23°57.3	-5.9′	59.4′
16	59°15.7	19.9	210°41.5	4.9′	23°51.4	-6.1′	59.4′
17	74°15.6	19.9	225°05.5	5.0′	23°45.3	-6.2′	59.4′
18	89°15.5	N23°19.8	239°29.5	5.1′	S23°39.1	-6.4′	59.3′
19	104°15.3	19.7	253°53.6	5.2′	23°32.7	-6.5′	59.3′
20	119°15.2	19.6	268°17.8	5.3′	23°26.2	-6.7′	59.3′
21	134°15.1	·· 19.5	282°42.2	5.5′	23°19.5	-6.8′	59.2′
22	149°15.0	19.4	297°06.6	5.6′	23°12.7	-7.0′	59.2′
23	164°14.8	19.3	311°31.2	5.7′	23°05.7	-7.1′	59.2′
	SD = 15.7′	d = -0.1′	SD = 16.3′				

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°	07:11	08:08	09:06	15:00	15:57	16:54

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

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 14-16 99-98%
24	02:23	02:30	12:02	–:–	11:45	
25	02:36	02:42	12:03	00:17	12:50	
26	02:49	02:55	12:03	01:21	13:52	

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	275°19.5	153°01.2	N21°44.4	143°00.0	N19°04.8	300°51.2	S11°38.7	320°03.5	S17°42.6
1	290°21.9	168°00.4	43.8	158°00.9	04.3	315°53.7	38.7	335°06.1	42.7
2	305°24.4	182°59.7	43.2	173°01.8	03.9	330°56.2	38.8	350°08.7	42.7
3	320°26.9	197°59.0	·· 42.6	188°02.7	·· 03.5	345°58.7	·· 38.8	5°11.3	·· 42.8
4	335°29.3	212°58.3	42.0	203°03.6	03.1	1°01.2	38.8	20°13.9	42.8
5	350°31.8	227°57.5	41.4	218°04.5	02.6	16°03.7	38.8	35°16.5	42.8
6	5°34.2	242°56.8	N21°40.8	233°05.4	N19°02.2	31°06.3	S11°38.9	50°19.1	S17°42.9
7	20°36.7	257°56.1	40.1	248°06.2	01.8	46°08.8	38.9	65°21.7	42.9
8	35°39.2	272°55.3	39.5	263°07.1	01.4	61°11.3	38.9	80°24.2	43.0
9	50°41.6	287°54.6	·· 38.9	278°08.0	·· 00.9	76°13.8	·· 39.0	95°26.8	·· 43.0
10	65°44.1	302°53.9	38.3	293°08.9	00.5	91°16.3	39.0	110°29.4	43.0
11	80°46.6	317°53.1	37.7	308°09.8	19°00.1	106°18.8	39.0	125°32.0	43.1
12	95°49.0	332°52.4	N21°37.0	323°10.7	N18°59.6	121°21.3	S11°39.1	140°34.6	S17°43.1
13	110°51.5	347°51.7	36.4	338°11.6	59.2	136°23.8	39.1	155°37.2	43.2
14	125°54.0	2°51.0	35.8	353°12.5	58.8	151°26.3	39.1	170°39.8	43.2
15	140°56.4	17°50.2	·· 35.2	8°13.4	·· 58.4	166°28.9	·· 39.2	185°42.4	·· 43.2
16	155°58.9	32°49.5	34.5	23°14.3	57.9	181°31.4	39.2	200°45.0	43.3
17	171°01.4	47°48.8	33.9	38°15.2	57.5	196°33.9	39.2	215°47.6	43.3
18	186°03.8	62°48.1	N21°33.3	53°16.1	N18°57.1	211°36.4	S11°39.2	230°50.2	S17°43.4
19	201°06.3	77°47.3	32.7	68°16.9	56.6	226°38.9	39.3	245°52.8	43.4
20	216°08.7	92°46.6	32.0	83°17.8	56.2	241°41.4	39.3	260°55.4	43.5
21	231°11.2	107°45.9	·· 31.4	98°18.7	·· 55.8	256°43.9	·· 39.3	275°58.0	·· 43.5
22	246°13.7	122°45.2	30.8	113°19.6	55.4	271°46.5	39.4	291°00.5	43.5
23	261°16.1	137°44.4	30.1	128°20.5	54.9	286°49.0	39.4	306°03.1	43.6
Mer.pass.	05:38	ν -0.7′	d -0.6′	m -3.86	ν 0.9′	d -0.4′	m 1.83	ν 2.5′	d 0.0′ m -2.61	ν 2.6′	d 0.0′ m 0.41

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	276°18.6	152°43.7	N21°29.5	143°21.4	N18°54.5	301°51.5	S11°39.4	321°05.7	S17°43.6
1	291°21.1	167°43.0	28.9	158°22.3	54.1	316°54.0	39.5	336°08.3	43.7
2	306°23.5	182°42.3	28.2	173°23.2	53.6	331°56.5	39.5	351°10.9	43.7
3	321°26.0	197°41.6	·· 27.6	188°24.1	·· 53.2	346°59.0	·· 39.5	6°13.5	·· 43.8
4	336°28.5	212°40.8	27.0	203°25.0	52.8	2°01.6	39.6	21°16.1	43.8
5	351°30.9	227°40.1	26.3	218°25.9	52.3	17°04.1	39.6	36°18.7	43.8
6	6°33.4	242°39.4	N21°25.7	233°26.8	N18°51.9	32°06.6	S11°39.6	51°21.3	S17°43.9
7	21°35.9	257°38.7	25.0	248°27.7	51.5	47°09.1	39.7	66°23.9	43.9
8	36°38.3	272°38.0	24.4	263°28.6	51.1	62°11.6	39.7	81°26.5	44.0
9	51°40.8	287°37.3	·· 23.7	278°29.4	·· 50.6	77°14.1	·· 39.7	96°29.1	·· 44.0
10	66°43.2	302°36.5	23.1	293°30.3	50.2	92°16.7	39.8	111°31.7	44.0
11	81°45.7	317°35.8	22.5	308°31.2	49.8	107°19.2	39.8	126°34.3	44.1
12	96°48.2	332°35.1	N21°21.8	323°32.1	N18°49.3	122°21.7	S11°39.8	141°36.9	S17°44.1
13	111°50.6	347°34.4	21.2	338°33.0	48.9	137°24.2	39.9	156°39.5	44.2
14	126°53.1	2°33.7	20.5	353°33.9	48.5	152°26.7	39.9	171°42.1	44.2
15	141°55.6	17°33.0	·· 19.9	8°34.8	·· 48.0	167°29.3	·· 39.9	186°44.7	·· 44.3
16	156°58.0	32°32.3	19.2	23°35.7	47.6	182°31.8	40.0	201°47.3	44.3
17	172°00.5	47°31.5	18.6	38°36.6	47.2	197°34.3	40.0	216°49.9	44.3
18	187°03.0	62°30.8	N21°17.9	53°37.5	N18°46.7	212°36.8	S11°40.0	231°52.4	S17°44.4
19	202°05.4	77°30.1	17.3	68°38.4	46.3	227°39.4	40.1	246°55.0	44.4
20	217°07.9	92°29.4	16.6	83°39.3	45.9	242°41.9	40.1	261°57.6	44.5
21	232°10.4	107°28.7	·· 15.9	98°40.2	·· 45.4	257°44.4	·· 40.1	277°00.2	·· 44.5
22	247°12.8	122°28.0	15.3	113°41.1	45.0	272°46.9	40.2	292°02.8	44.6
23	262°15.3	137°27.3	14.6	128°42.0	44.6	287°49.4	40.2	307°05.4	44.6
Mer.pass.	05:34	ν -0.7′	d -0.6′	m -3.86	ν 0.9′	d -0.4′	m 1.83	ν 2.5′	d 0.0′ m -2.62	ν 2.6′	d 0.0′ m 0.40

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	277°17.7	152°26.6	N21°14.0	143°42.9	N18°44.1	302°52.0	S11°40.2	322°08.0	S17°44.6
1	292°20.2	167°25.9	13.3	158°43.8	43.7	317°54.5	40.3	337°10.6	44.7
2	307°22.7	182°25.2	12.6	173°44.7	43.3	332°57.0	40.3	352°13.2	44.7
3	322°25.1	197°24.4	·· 12.0	188°45.6	·· 42.8	347°59.5	·· 40.3	7°15.8	·· 44.8
4	337°27.6	212°23.7	11.3	203°46.5	42.4	3°02.1	40.4	22°18.4	44.8
5	352°30.1	227°23.0	10.7	218°47.3	41.9	18°04.6	40.4	37°21.0	44.9
6	7°32.5	242°22.3	N21°10.0	233°48.2	N18°41.5	33°07.1	S11°40.4	52°23.6	S17°44.9
7	22°35.0	257°21.6	09.3	248°49.1	41.1	48°09.6	40.5	67°26.2	44.9
8	37°37.5	272°20.9	08.7	263°50.0	40.6	63°12.2	40.5	82°28.8	45.0
9	52°39.9	287°20.2	·· 08.0	278°50.9	·· 40.2	78°14.7	·· 40.5	97°31.4	·· 45.0
10	67°42.4	302°19.5	07.3	293°51.8	39.8	93°17.2	40.6	112°34.0	45.1
11	82°44.8	317°18.8	06.6	308°52.7	39.3	108°19.7	40.6	127°36.6	45.1
12	97°47.3	332°18.1	N21°06.0	323°53.6	N18°38.9	123°22.3	S11°40.7	142°39.2	S17°45.2
13	112°49.8	347°17.4	05.3	338°54.5	38.4	138°24.8	40.7	157°41.8	45.2
14	127°52.2	2°16.7	04.6	353°55.4	38.0	153°27.3	40.7	172°44.4	45.2
15	142°54.7	17°16.0	·· 04.0	8°56.3	·· 37.6	168°29.9	·· 40.8	187°47.0	·· 45.3
16	157°57.2	32°15.3	03.3	23°57.2	37.1	183°32.4	40.8	202°49.6	45.3
17	172°59.6	47°14.6	02.6	38°58.1	36.7	198°34.9	40.8	217°52.2	45.4
18	188°02.1	62°13.9	N21°01.9	53°59.0	N18°36.3	213°37.4	S11°40.9	232°54.8	S17°45.4
19	203°04.6	77°13.2	01.2	68°59.9	35.8	228°40.0	40.9	247°57.4	45.5
20	218°07.0	92°12.5	21°00.6	84°00.8	35.4	243°42.5	41.0	263°00.0	45.5
21	233°09.5	107°11.8	20°59.9	99°01.7	·· 34.9	258°45.0	·· 41.0	278°02.6	·· 45.6
22	248°12.0	122°11.1	59.2	114°02.6	34.5	273°47.6	41.0	293°05.2	45.6
23	263°14.4	137°10.4	58.5	129°03.5	34.1	288°50.1	41.1	308°07.8	45.6
Mer.pass.	05:30	ν -0.7′	d -0.7′	m -3.86	ν 0.9′	d -0.4′	m 1.83	ν 2.5′	d 0.0′ m -2.63	ν 2.6′	d 0.0′ m 0.40

Stars

	SHA	Dec
Alpheratz	357°37.7	29°12.3
Ankaa	353°10.1	-42°11.2
Schedar	349°34.3	56°38.9
Diphda	348°50.2	-17°52.1
Achernar	335°22.6	-57°07.5
Hamal	327°54.6	23°33.6
Polaris	315°39.2	89°20.9
Acamar	315°14.3	-40°13.0
Menkar	314°09.4	4°10.3
Mirfak	308°32.7	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.4
Sirius	258°29.1	-16°44.8
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.7	-43°31.2
Miaplacidus	221°39.5	-69°48.5
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.5	-17°39.7
Acrux	173°03.2	-63°13.3
Gacrux	171°54.7	-57°14.2
Alioth	166°15.5	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.2	49°12.7
Hadar	148°39.7	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.5
Rigil Kent.	139°43.8	-60°55.5
Kochab	137°19.2	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.7
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.7
Eltanin	90°43.0	51°29.2
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.4	8°55.5
Peacock	53°09.8	-56°39.8
Deneb	49°27.3	45°21.3
Enif	33°41.4	9°58.3
Al Na'ir	27°36.3	-46°51.3
Fomalhaut	15°17.6	-29°30.4
Scheat	13°47.8	28°11.7
Markab	13°32.6	15°19.1

Jun 27 Sun	SHA	Mer.pass
Venus	237°41.7	13:49
Mars	227°40.5	14:27
Jupiter	25°31.7	03:56
Saturn	44°44.1	02:39

Jun 28 Mon	SHA	Mer.pass
Venus	236°25.1	13:50
Mars	227°02.8	14:26
Jupiter	25°32.9	03:52
Saturn	44°47.1	02:35

Jun 29 Tue	SHA	Mer.pass
Venus	235°08.8	13:51
Mars	226°25.1	14:24
Jupiter	25°34.2	03:48
Saturn	44°50.3	02:31

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.7	N23°19.2	325°55.9	5.8′	S22°58.6	-7.3′	59.1′
1	194°14.6	19.1	340°20.7	5.9′	22°51.3	-7.4′	59.1′
2	209°14.4	19.0	354°45.6	6.0′	22°43.9	-7.5′	59.1′
3	224°14.3	·· 18.9	9°10.6	6.1′	22°36.4	-7.7′	59.0′
4	239°14.2	18.8	23°35.7	6.3′	22°28.7	-7.8′	59.0′
5	254°14.1	18.7	38°01.0	6.4′	22°21.0	-7.9′	59.0′
6	269°13.9	N23°18.6	52°26.4	6.5′	S22°13.0	-8.1′	58.9′
7	284°13.8	18.4	66°51.9	6.6′	22°05.0	-8.2′	58.9′
8	299°13.7	18.3	81°17.5	6.7′	21°56.8	-8.3′	58.8′
9	314°13.5	·· 18.2	95°43.2	6.9′	21°48.5	-8.4′	58.8′
10	329°13.4	18.1	110°09.1	7.0′	21°40.0	-8.6′	58.8′
11	344°13.3	18.0	124°35.0	7.1′	21°31.5	-8.7′	58.7′
12	359°13.2	N23°17.9	139°01.1	7.2′	S21°22.8	-8.8′	58.7′
13	14°13.0	17.8	153°27.3	7.3′	21°14.0	-8.9′	58.7′
14	29°12.9	17.7	167°53.7	7.5′	21°05.1	-9.0′	58.6′
15	44°12.8	·· 17.6	182°20.1	7.6′	20°56.1	-9.1′	58.6′
16	59°12.6	17.5	196°46.7	7.7′	20°46.9	-9.3′	58.6′
17	74°12.5	17.4	211°13.4	7.8′	20°37.7	-9.4′	58.5′
18	89°12.4	N23°17.2	225°40.2	7.9′	S20°28.3	-9.5′	58.5′
19	104°12.3	17.1	240°07.1	8.1′	20°18.9	-9.6′	58.4′
20	119°12.1	17.0	254°34.2	8.2′	20°09.3	-9.7′	58.4′
21	134°12.0	·· 16.9	269°01.4	8.3′	19°59.6	-9.8′	58.4′
22	149°11.9	16.8	283°28.7	8.4′	19°49.8	-9.9′	58.3′
23	164°11.8	16.7	297°56.1	8.5′	19°39.9	-10.0′	58.3′
	SD = 15.7′	d = -0.1′	SD = 16.1′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.6	N23°16.6	312°23.7	8.7′	S19°29.9	-10.1′	58.3′
1	194°11.5	16.4	326°51.3	8.8′	19°19.9	-10.2′	58.2′
2	209°11.4	16.3	341°19.1	8.9′	19°09.7	-10.3′	58.2′
3	224°11.2	·· 16.2	355°47.0	9.0′	18°59.4	-10.4′	58.1′
4	239°11.1	16.1	10°15.0	9.1′	18°49.1	-10.5′	58.1′
5	254°11.0	16.0	24°43.2	9.3′	18°38.6	-10.5′	58.1′
6	269°10.9	N23°15.8	39°11.4	9.4′	S18°28.1	-10.6′	58.0′
7	284°10.7	15.7	53°39.8	9.5′	18°17.4	-10.7′	58.0′
8	299°10.6	15.6	68°08.3	9.6′	18°06.7	-10.8′	57.9′
9	314°10.5	·· 15.5	82°36.9	9.7′	17°55.9	-10.9′	57.9′
10	329°10.4	15.3	97°05.6	9.8′	17°45.0	-11.0′	57.9′
11	344°10.2	15.2	111°34.5	10.0′	17°34.1	-11.0′	57.8′
12	359°10.1	N23°15.1	126°03.4	10.1′	S17°23.0	-11.1′	57.8′
13	14°10.0	15.0	140°32.5	10.2′	17°11.9	-11.2′	57.8′
14	29°09.9	14.8	155°01.7	10.3′	17°00.7	-11.3′	57.7′
15	44°09.7	·· 14.7	169°31.0	10.4′	16°49.4	-11.3′	57.7′
16	59°09.6	14.6	184°00.4	10.5′	16°38.1	-11.4′	57.6′
17	74°09.5	14.5	198°29.9	10.6′	16°26.7	-11.5′	57.6′
18	89°09.4	N23°14.3	212°59.6	10.7′	S16°15.2	-11.5′	57.6′
19	104°09.2	14.2	227°29.3	10.9′	16°03.7	-11.6′	57.5′
20	119°09.1	14.1	241°59.2	11.0′	15°52.0	-11.7′	57.5′
21	134°09.0	·· 13.9	256°29.1	11.1′	15°40.4	-11.7′	57.4′
22	149°08.8	13.8	270°59.2	11.2′	15°28.6	-11.8′	57.4′
23	164°08.7	13.7	285°29.4	11.3′	15°16.8	-11.9′	57.4′
	SD = 15.7′	d = -0.1′	SD = 15.9′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.6	N23°13.5	299°59.7	11.4′	S15°04.9	-11.9′	57.3′
1	194°08.5	13.4	314°30.1	11.5′	14°53.0	-12.0′	57.3′
2	209°08.3	13.3	329°00.5	11.6′	14°41.0	-12.0′	57.3′
3	224°08.2	·· 13.1	343°31.1	11.7′	14°29.0	-12.1′	57.2′
4	239°08.1	13.0	358°01.8	11.8′	14°16.9	-12.1′	57.2′
5	254°08.0	12.9	12°32.6	11.9′	14°04.8	-12.2′	57.1′
6	269°07.8	N23°12.7	27°03.5	12.0′	S13°52.6	-12.3′	57.1′
7	284°07.7	12.6	41°34.5	12.1′	13°40.3	-12.3′	57.1′
8	299°07.6	12.4	56°05.6	12.2′	13°28.0	-12.3′	57.0′
9	314°07.5	·· 12.3	70°36.8	12.3′	13°15.7	-12.4′	57.0′
10	329°07.4	12.2	85°08.1	12.4′	13°03.3	-12.4′	57.0′
11	344°07.2	12.0	99°39.5	12.5′	12°50.8	-12.5′	56.9′
12	359°07.1	N23°11.9	114°10.9	12.6′	S12°38.3	-12.5′	56.9′
13	14°07.0	11.7	128°42.5	12.7′	12°25.8	-12.6′	56.9′
14	29°06.9	11.6	143°14.2	12.7′	12°13.2	-12.6′	56.8′
15	44°06.7	·· 11.4	157°45.9	12.8′	12°00.6	-12.6′	56.8′
16	59°06.6	11.3	172°17.7	12.9′	11°48.0	-12.7′	56.7′
17	74°06.5	11.1	186°49.7	13.0′	11°35.3	-12.7′	56.7′
18	89°06.4	N23°11.0	201°21.7	13.1′	S11°22.6	-12.8′	56.7′
19	104°06.2	10.9	215°53.8	13.2′	11°09.8	-12.8′	56.6′
20	119°06.1	10.7	230°25.9	13.3′	10°57.0	-12.8′	56.6′
21	134°06.0	·· 10.6	244°58.2	13.3′	10°44.2	-12.9′	56.6′
22	149°05.9	10.4	259°30.5	13.4′	10°31.4	-12.9′	56.5′
23	164°05.7	10.3	274°03.0	13.5′	10°18.5	-12.9′	56.5′
	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°	00:52	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	18:12	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	07:39	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 Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
N 72°	▬	▬	01:43	▬	▬	06:57
N 70°	▬	02:11	01:12	▬	04:42	07:26
68°	▬	01:16	00:49	▬	05:35	07:48
66°	01:08	00:43	00:30	03:46	06:07	08:04
64°	00:21	00:19	00:16	04:33	06:31	08:18
62°	23:59	·· ··	00:03	05:03	06:49	08:29
60°	23:43	23:52	23:58	05:26	07:05	08:39
N 58°	23:29	23:43	23:53	05:44	07:17	08:47
56°	23:18	23:35	23:48	06:00	07:28	08:54
54°	23:07	23:28	23:43	06:13	07:38	09:01
52°	22:58	23:21	23:39	06:24	07:47	09:07
50°	22:50	23:15	23:35	06:34	07:54	09:12
45°	22:32	23:02	23:27	06:56	08:11	09:23
N 40°	22:18	22:52	23:20	07:13	08:24	09:33
35°	22:05	22:42	23:14	07:27	08:35	09:41
30°	21:55	22:34	23:09	07:39	08:45	09:48
20°	21:36	22:20	22:59	08:00	09:02	10:00
N 10°	21:20	22:08	22:51	08:19	09:16	10:10
0°	21:05	21:56	22:44	08:36	09:30	10:20
S 10°	20:49	21:45	22:36	08:52	09:43	10:29
20°	20:33	21:32	22:28	09:10	09:58	10:39
30°	20:14	21:18	22:19	09:31	10:14	10:51
35°	20:03	21:10	22:13	09:43	10:23	10:57
40°	19:50	21:00	22:07	09:56	10:34	11:05
45°	19:35	20:49	22:00	10:12	10:46	11:14
S 50°	19:17	20:36	21:51	10:32	11:01	11:24
52°	19:08	20:29	21:47	10:41	11:08	11:29
54°	18:58	20:22	21:43	10:52	11:16	11:34
56°	18:47	20:14	21:38	11:04	11:25	11:40
58°	18:34	20:05	21:32	11:17	11:35	11:46
S 60°	18:19	19:55	21:26	11:33	11:46	11:54

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 17-19 93-78%
27	03:01	03:07	12:03	02:22	14:50	
28	03:13	03:20	12:03	03:17	15:43	
29	03:26	03:32	12:04	04:08	16:32	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°16.9	152°09.7	N20°57.8	144°04.4	N18°33.6	303°52.6	S11°41.1	323°10.4	S17°45.7
1	293°19.3	167°09.0	57.2	159°05.3	33.2	318°55.2	41.1	338°13.0	45.7
2	308°21.8	182°08.3	56.5	174°06.2	32.7	333°57.7	41.2	353°15.6	45.8
3	323°24.3	197°07.6	·· 55.8	189°07.1	·· 32.3	349°00.2	·· 41.2	8°18.2	·· 45.8
4	338°26.7	212°06.9	55.1	204°08.0	31.9	4°02.8	41.3	23°20.8	45.9
5	353°29.2	227°06.2	54.4	219°08.9	31.4	19°05.3	41.3	38°23.4	45.9
6	8°31.7	242°05.5	N20°53.7	234°09.8	N18°31.0	34°07.8	S11°41.3	53°26.0	S17°45.9
7	23°34.1	257°04.9	53.0	249°10.7	30.5	49°10.4	41.4	68°28.6	46.0
8	38°36.6	272°04.2	52.3	264°11.6	30.1	64°12.9	41.4	83°31.2	46.0
9	53°39.1	287°03.5	·· 51.6	279°12.5	·· 29.7	79°15.4	·· 41.4	98°33.8	·· 46.1
10	68°41.5	302°02.8	51.0	294°13.4	29.2	94°18.0	41.5	113°36.4	46.1
11	83°44.0	317°02.1	50.3	309°14.3	28.8	109°20.5	41.5	128°39.0	46.2
12	98°46.5	332°01.4	N20°49.6	324°15.2	N18°28.3	124°23.0	S11°41.6	143°41.6	S17°46.2
13	113°48.9	347°00.7	48.9	339°16.1	27.9	139°25.6	41.6	158°44.2	46.3
14	128°51.4	2°00.0	48.2	354°17.0	27.4	154°28.1	41.6	173°46.8	46.3
15	143°53.8	16°59.3	·· 47.5	9°17.9	·· 27.0	169°30.6	·· 41.7	188°49.4	·· 46.3
16	158°56.3	31°58.6	46.8	24°18.8	26.6	184°33.2	41.7	203°52.0	46.4
17	173°58.8	46°58.0	46.1	39°19.7	26.1	199°35.7	41.8	218°54.6	46.4
18	189°01.2	61°57.3	N20°45.4	54°20.6	N18°25.7	214°38.2	S11°41.8	233°57.2	S17°46.5
19	204°03.7	76°56.6	44.7	69°21.5	25.2	229°40.8	41.8	248°59.8	46.5
20	219°06.2	91°55.9	44.0	84°22.4	24.8	244°43.3	41.9	264°02.4	46.6
21	234°08.6	106°55.2	·· 43.3	99°23.3	·· 24.3	259°45.8	·· 41.9	279°05.0	·· 46.6
22	249°11.1	121°54.5	42.6	114°24.2	23.9	274°48.4	42.0	294°07.6	46.6
23	264°13.6	136°53.9	41.8	129°25.1	23.4	289°50.9	42.0	309°10.2	46.7
Mer.pass.	05:26	ν -0.7′	d -0.7′	m -3.86	ν 0.9′	d -0.4′	m 1.83	ν 2.5′	d 0.0′	m -2.63	ν 2.6′	d 0.0′	m 0.40

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°16.0	151°53.2	N20°41.1	144°26.0	N18°23.0	304°53.5	S11°42.0	324°12.8	S17°46.7
1	294°18.5	166°52.5	40.4	159°26.9	22.6	319°56.0	42.1	339°15.4	46.8
2	309°20.9	181°51.8	39.7	174°27.8	22.1	334°58.5	42.1	354°18.0	46.8
3	324°23.4	196°51.1	·· 39.0	189°28.7	·· 21.7	350°01.1	·· 42.2	9°20.6	·· 46.9
4	339°25.9	211°50.4	38.3	204°29.6	21.2	5°03.6	42.2	24°23.2	46.9
5	354°28.3	226°49.8	37.6	219°30.5	20.8	20°06.2	42.2	39°25.8	47.0
6	9°30.8	241°49.1	N20°36.9	234°31.4	N18°20.3	35°08.7	S11°42.3	54°28.4	S17°47.0
7	24°33.3	256°48.4	36.2	249°32.3	19.9	50°11.2	42.3	69°31.0	47.0
8	39°35.7	271°47.7	35.4	264°33.2	19.4	65°13.8	42.4	84°33.6	47.1
9	54°38.2	286°47.0	·· 34.7	279°34.1	·· 19.0	80°16.3	·· 42.4	99°36.2	·· 47.1
10	69°40.7	301°46.4	34.0	294°35.0	18.5	95°18.9	42.4	114°38.9	47.2
11	84°43.1	316°45.7	33.3	309°35.9	18.1	110°21.4	42.5	129°41.5	47.2
12	99°45.6	331°45.0	N20°32.6	324°36.8	N18°17.6	125°24.0	S11°42.5	144°44.1	S17°47.3
13	114°48.1	346°44.3	31.9	339°37.7	17.2	140°26.5	42.6	159°46.7	47.3
14	129°50.5	1°43.7	31.1	354°38.6	16.7	155°29.0	42.6	174°49.3	47.4
15	144°53.0	16°43.0	·· 30.4	9°39.5	·· 16.3	170°31.6	·· 42.7	189°51.9	·· 47.4
16	159°55.4	31°42.3	29.7	24°40.4	15.8	185°34.1	42.7	204°54.5	47.4
17	174°57.9	46°41.6	29.0	39°41.3	15.4	200°36.7	42.7	219°57.1	47.5
18	190°00.4	61°41.0	N20°28.2	54°42.2	N18°15.0	215°39.2	S11°42.8	234°59.7	S17°47.5
19	205°02.8	76°40.3	27.5	69°43.1	14.5	230°41.8	42.8	250°02.3	47.6
20	220°05.3	91°39.6	26.8	84°44.0	14.1	245°44.3	42.9	265°04.9	47.6
21	235°07.8	106°38.9	·· 26.1	99°44.9	·· 13.6	260°46.8	·· 42.9	280°07.5	·· 47.7
22	250°10.2	121°38.3	25.3	114°45.8	13.2	275°49.4	43.0	295°10.1	47.7
23	265°12.7	136°37.6	24.6	129°46.7	12.7	290°51.9	43.0	310°12.7	47.8
Mer.pass.	05:22	ν -0.7′	d -0.7′	m -3.86	ν 0.9′	d -0.4′	m 1.83	ν 2.5′	d 0.0′	m -2.64	ν 2.6′	d 0.0′	m 0.39

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°15.2	151°36.9	N20°23.9	144°47.6	N18°12.3	305°54.5	S11°43.0	325°15.3	S17°47.8
1	295°17.6	166°36.3	23.1	159°48.5	11.8	320°57.0	43.1	340°17.9	47.9
2	310°20.1	181°35.6	22.4	174°49.4	11.4	335°59.6	43.1	355°20.5	47.9
3	325°22.5	196°34.9	·· 21.7	189°50.3	·· 10.9	351°02.1	·· 43.2	10°23.1	·· 47.9
4	340°25.0	211°34.3	20.9	204°51.2	10.5	6°04.7	43.2	25°25.7	48.0
5	355°27.5	226°33.6	20.2	219°52.1	10.0	21°07.2	43.3	40°28.3	48.0
6	10°29.9	241°32.9	N20°19.5	234°53.0	N18°09.6	36°09.8	S11°43.3	55°31.0	S17°48.1
7	25°32.4	256°32.3	18.7	249°53.9	09.1	51°12.3	43.3	70°33.6	48.1
8	40°34.9	271°31.6	18.0	264°54.8	08.6	66°14.9	43.4	85°36.2	48.2
9	55°37.3	286°30.9	·· 17.2	279°55.7	·· 08.2	81°17.4	·· 43.4	100°38.8	·· 48.2
10	70°39.8	301°30.3	16.5	294°56.7	07.7	96°20.0	43.5	115°41.4	48.3
11	85°42.3	316°29.6	15.8	309°57.6	07.3	111°22.5	43.5	130°44.0	48.3
12	100°44.7	331°28.9	N20°15.0	324°58.5	N18°06.8	126°25.1	S11°43.6	145°46.6	S17°48.3
13	115°47.2	346°28.3	14.3	339°59.4	06.4	141°27.6	43.6	160°49.2	48.4
14	130°49.7	1°27.6	13.5	355°00.3	05.9	156°30.2	43.7	175°51.8	48.4
15	145°52.1	16°27.0	·· 12.8	10°01.2	·· 05.5	171°32.7	·· 43.7	190°54.4	·· 48.5
16	160°54.6	31°26.3	12.0	25°02.1	05.0	186°35.3	43.7	205°57.0	48.5
17	175°57.0	46°25.6	11.3	40°03.0	04.6	201°37.8	43.8	220°59.6	48.6
18	190°59.5	61°25.0	N20°10.5	55°03.9	N18°04.1	216°40.4	S11°43.8	236°02.2	S17°48.6
19	206°02.0	76°24.3	09.8	70°04.8	03.7	231°42.9	43.9	251°04.8	48.7
20	221°04.4	91°23.7	09.0	85°05.7	03.2	246°45.5	43.9	266°07.4	48.7
21	236°06.9	106°23.0	·· 08.3	100°06.6	·· 02.8	261°48.0	·· 44.0	281°10.1	·· 48.8
22	251°09.4	121°22.3	07.5	115°07.5	02.3	276°50.6	44.0	296°12.7	48.8
23	266°11.8	136°21.7	06.8	130°08.4	01.8	291°53.1	44.1	311°15.3	48.8
Mer.pass.	05:18	ν -0.7′	d -0.7′	m -3.86	ν 0.9′	d -0.5′	m 1.83	ν 2.5′	d 0.0′	m -2.65	ν 2.6′	d 0.0′	m 0.39

Stars	SHA	Dec
Alpheratz	357°37.7	29°12.3
Ankaa	353°10.0	-42°11.2
Schedar	349°34.2	56°38.9
Diphda	348°50.2	-17°52.1
Achernar	335°22.6	-57°07.5
Hamal	327°54.6	23°33.6
Polaris	315°38.1	89°20.9
Acamar	315°14.3	-40°13.0
Menkar	314°09.4	4°10.3
Mirfak	308°32.7	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.4
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.7	-43°31.2
Miaplacidus	221°39.5	-69°48.4
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.7
Acrux	173°03.2	-63°13.3
Gacrux	171°54.8	-57°14.2
Alioth	166°15.5	55°51.0
Spica	158°25.2	-11°16.3
Alkaid	152°54.2	49°12.7
Hadar	148°39.7	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.5
Rigil Kent.	139°43.8	-60°55.6
Kochab	137°19.2	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.8
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.2
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.2
Nunki	75°51.0	-26°16.1
Altair	62°02.4	8°55.5
Peacock	53°09.8	-56°39.8
Deneb	49°27.3	45°21.3
Enif	33°41.4	9°58.3
Al Na'ir	27°36.3	-46°51.3
Fomalhaut	15°17.6	-29°30.4
Scheat	13°47.8	28°11.7
Markab	13°32.6	15°19.1

Jun 30 Wed	SHA	Mer.pass
Venus	233°52.8	13:52
Mars	225°47.5	14:23
Jupiter	25°35.7	03:44
Saturn	44°53.5	02:27

Jul 01 Thu	SHA	Mer.pass
Venus	232°37.1	13:53
Mars	225°10.0	14:21
Jupiter	25°37.4	03:40
Saturn	44°56.8	02:23

Jul 02 Fri	SHA	Mer.pass
Venus	231°21.8	13:54
Mars	224°32.5	14:20
Jupiter	25°39.3	03:36
Saturn	45°00.2	02:19

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°05.6	N23°10.1	288°35.5	13.6′	S10°05.6	-12.9′	56.5′
1	194°05.5	10.0	303°08.1	13.7′	09°52.6	-13.0′	56.4′
2	209°05.4	09.8	317°40.7	13.7′	09°39.7	-13.0′	56.4′
3	224°05.2	·· 09.6	332°13.5	13.8′	09°26.7	-13.0′	56.4′
4	239°05.1	09.5	346°46.3	13.9′	09°13.6	-13.0′	56.3′
5	254°05.0	09.3	1°19.2	14.0′	09°00.6	-13.1′	56.3′
6	269°04.9	N23°09.2	15°52.1	14.0′	S08°47.5	-13.1′	56.3′
7	284°04.8	09.0	30°25.1	14.1′	08°34.4	-13.1′	56.2′
8	299°04.6	08.9	44°58.2	14.2′	08°21.3	-13.1′	56.2′
9	314°04.5	·· 08.7	59°31.4	14.2′	08°08.2	-13.2′	56.2′
10	329°04.4	08.6	74°04.7	14.3′	07°55.0	-13.2′	56.1′
11	344°04.3	08.4	88°38.0	14.4′	07°41.9	-13.2′	56.1′
12	359°04.1	N23°08.2	103°11.3	14.4′	S07°28.7	-13.2′	56.1′
13	14°04.0	08.1	117°44.8	14.5′	07°15.5	-13.2′	56.0′
14	29°03.9	07.9	132°18.3	14.6′	07°02.3	-13.2′	56.0′
15	44°03.8	·· 07.8	146°51.8	14.6′	06°49.0	-13.2′	56.0′
16	59°03.7	07.6	161°25.4	14.7′	06°35.8	-13.3′	55.9′
17	74°03.5	07.4	175°59.1	14.7′	06°22.5	-13.3′	55.9′
18	89°03.4	N23°07.3	190°32.8	14.8′	S06°09.3	-13.3′	55.9′
19	104°03.3	07.1	205°06.6	14.8′	05°56.0	-13.3′	55.8′
20	119°03.2	06.9	219°40.5	14.9′	05°42.7	-13.3′	55.8′
21	134°03.1	·· 06.8	234°14.4	15.0′	05°29.4	-13.3′	55.8′
22	149°02.9	06.6	248°48.4	15.0′	05°16.1	-13.3′	55.7′
23	164°02.8	06.4	263°22.4	15.1′	05°02.8	-13.3′	55.7′
	SD = 15.7′	d = -0.2′	SD = 15.4′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°02.7	N23°06.3	277°56.4	15.1′	S04°49.5	-13.3′	55.7′
1	194°02.6	06.1	292°30.5	15.2′	04°36.2	-13.3′	55.6′
2	209°02.5	05.9	307°04.7	15.2′	04°22.9	-13.3′	55.6′
3	224°02.3	·· 05.8	321°38.9	15.3′	04°09.5	-13.3′	55.6′
4	239°02.2	05.6	336°13.2	15.3′	03°56.2	-13.3′	55.6′
5	254°02.1	05.4	350°47.5	15.3′	03°42.9	-13.3′	55.5′
6	269°02.0	N23°05.2	5°21.8	15.4′	S03°29.5	-13.3′	55.5′
7	284°01.9	05.1	19°56.2	15.4′	03°16.2	-13.3′	55.5′
8	299°01.7	04.9	34°30.6	15.5′	03°02.9	-13.3′	55.4′
9	314°01.6	·· 04.7	49°05.1	15.5′	02°49.5	-13.3′	55.4′
10	329°01.5	04.6	63°39.6	15.5′	02°36.2	-13.3′	55.4′
11	344°01.4	04.4	78°14.1	15.6′	02°22.9	-13.3′	55.4′
12	359°01.3	N23°04.2	92°48.7	15.6′	S02°09.6	-13.3′	55.3′
13	14°01.1	04.0	107°23.3	15.6′	01°56.3	-13.3′	55.3′
14	29°01.0	03.8	121°58.0	15.7′	01°42.9	-13.3′	55.3′
15	44°00.9	·· 03.7	136°32.6	15.7′	01°29.6	-13.3′	55.3′
16	59°00.8	03.5	151°07.4	15.7′	01°16.3	-13.3′	55.2′
17	74°00.7	03.3	165°42.1	15.8′	01°03.0	-13.3′	55.2′
18	89°00.5	N23°03.1	180°16.9	15.8′	S00°49.8	-13.3′	55.2′
19	104°00.4	02.9	194°51.7	15.8′	00°36.5	-13.3′	55.2′
20	119°00.3	02.8	209°26.5	15.9′	00°23.2	-13.3′	55.1′
21	134°00.2	·· 02.6	224°01.4	15.9′	S00°10.0	-13.2′	55.1′
22	149°00.1	02.4	238°36.3	15.9′	N00°03.3	13.2′	55.1′
23	163°59.9	02.2	253°11.2	15.9′	00°16.5	13.2′	55.1′
	SD = 15.7′	d = -0.2′	SD = 15.2′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°59.8	N23°02.0	267°46.1	16.0′	N00°29.7	13.2′	55.0′
1	193°59.7	01.8	282°21.0	16.0′	00°42.9	13.2′	55.0′
2	208°59.6	01.7	296°56.0	16.0′	00°56.1	13.2′	55.0′
3	223°59.5	·· 01.5	311°31.0	16.0′	01°09.3	13.2′	55.0′
4	238°59.4	01.3	326°06.0	16.0′	01°22.4	13.1′	54.9′
5	253°59.2	01.1	340°41.0	16.0′	01°35.6	13.1′	54.9′
6	268°59.1	N23°00.9	355°16.1	16.1′	N01°48.7	13.1′	54.9′
7	283°59.0	00.7	9°51.1	16.1′	02°01.8	13.1′	54.9′
8	298°58.9	00.5	24°26.2	16.1′	02°14.9	13.1′	54.9′
9	313°58.8	·· 00.3	39°01.3	16.1′	02°28.0	13.1′	54.8′
10	328°58.7	00.1	53°36.4	16.1′	02°41.1	13.0′	54.8′
11	343°58.5	23°00.0	68°11.5	16.1′	02°54.1	13.0′	54.8′
12	358°58.4	N22°59.8	82°46.6	16.1′	N03°07.1	13.0′	54.8′
13	13°58.3	59.6	97°21.7	16.1′	03°20.1	13.0′	54.8′
14	28°58.2	59.4	111°56.9	16.1′	03°33.1	12.9′	54.7′
15	43°58.1	·· 59.2	126°32.0	16.1′	03°46.0	12.9′	54.7′
16	58°58.0	59.0	141°07.2	16.1′	03°58.9	12.9′	54.7′
17	73°57.8	58.8	155°42.3	16.2′	04°11.8	12.9′	54.7′
18	88°57.7	N22°58.6	170°17.5	16.2′	N04°24.7	12.9′	54.7′
19	103°57.6	58.4	184°52.6	16.2′	04°37.6	12.8′	54.6′
20	118°57.5	58.2	199°27.8	16.2′	04°50.4	12.8′	54.6′
21	133°57.4	·· 58.0	214°02.9	16.2′	05°03.2	12.8′	54.6′
22	148°57.3	57.8	228°38.1	16.2′	05°16.0	12.7′	54.6′
23	163°57.1	57.6	243°13.2	16.1′	05°28.7	12.7′	54.6′
	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	03:44	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	18:39
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	07:05	07:39	16:29	17:02	17:40
S 50°	06:40	07:21	08:00	16:08	16:47	17:28
52°	06:45	07:29	08:09	15:59	16:39	17:23
54°	06:51	07:37	08:20	15:48	16:31	17:17
56°	06:57	07:45	08:32	15:36	16:23	17:11
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 Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	00:59	00:29	00:04 23:39	09:17	11:18	13:11
N 70°	00:44	00:23	00:05 23:47	09:30	11:21	13:07
68°	00:31	00:18	00:05 23:53	09:41	11:24	13:03
66°	00:21	00:13	00:05 23:58	09:49	11:26	13:00
64°	00:12	00:09	00:06	09:56	11:28	12:57
62°	00:05	00:06	00:06	10:02	11:30	12:55
60°	·· ··	00:03	00:06	10:07	11:31	12:53
N 58°	·· ··	00:00	00:07	10:12	11:33	12:51
56°	23:58	·· ··	00:07	10:16	11:34	12:49
54°	23:56	·· ··	00:07	10:20	11:35	12:48
52°	23:54	·· ··	00:07	10:23	11:36	12:46
50°	23:52	·· ··	00:07	10:26	11:37	12:45
45°	23:48	·· ··	00:08	10:33	11:39	12:43
N 40°	23:45	·· ··	00:08	10:38	11:40	12:40
35°	23:42	·· ··	00:08	10:42	11:41	12:39
30°	23:39	·· ··	00:08	10:47	11:43	12:37
20°	23:35	·· ··	00:09	10:53	11:45	12:34
N 10°	23:31	·· ··	00:09	11:00	11:46	12:32
0°	23:28	·· ··	00:10	11:05	11:48	12:29
S 10°	23:24	·· ··	00:10	11:11	11:50	12:27
20°	23:20	·· ··	00:10	11:17	11:51	12:24
30°	23:16	·· ··	00:11	11:23	11:53	12:22
35°	23:13	·· ··	00:11	11:27	11:54	12:20
40°	23:11	·· ··	00:12	11:31	11:55	12:18
45°	23:07	·· ··	00:12	11:36	11:57	12:16
S 50°	23:03	·· ··	00:12	11:42	11:58	12:14
52°	23:01	·· ··	00:13	11:45	11:59	12:12
54°	22:59	·· ··	00:13	11:48	12:00	12:11
56°	22:57	·· ··	00:13	11:51	12:01	12:10
58°	22:55	·· ··	00:14	11:55	12:02	12:08
S 60°	22:52	·· ··	00:14	11:59	12:03	12:06

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 20-22 69-49%
30	03:38	03:43	12:04	04:55	17:17	
01	03:49	03:55	12:04	05:38	17:59	
02	04:01	04:06	12:04	06:19	18:40	

DUT1 = UT1-UTC = -0.1660 sec ΔT = TT-UT1 = +69.3500 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281°14.3	151°21.0	N20°06.0	145°09.3	N18°01.4	306°55.7	S11°44.1	326°17.9	S17°48.9
1	296°16.8	166°20.4	05.3	160°10.2	00.9	321°58.2	44.2	341°20.5	48.9
2	311°19.2	181°19.7	04.5	175°11.1	00.5	337°00.8	44.2	356°23.1	49.0
3	326°21.7	196°19.1	·· 03.8	190°12.0	18°00.0	352°03.4	·· 44.2	11°25.7	·· 49.0
4	341°24.2	211°18.4	03.0	205°12.9	17°59.6	7°05.9	44.3	26°28.3	49.1
5	356°26.6	226°17.7	02.3	220°13.8	59.1	22°08.5	44.3	41°30.9	49.1
6	11°29.1	241°17.1	N20°01.5	235°14.8	N17°58.7	37°11.0	S11°44.4	56°33.5	S17°49.2
7	26°31.5	256°16.4	00.7	250°15.7	58.2	52°13.6	44.4	71°36.1	49.2
8	41°34.0	271°15.8	20°00.0	265°16.6	57.7	67°16.1	44.5	86°38.8	49.3
9	56°36.5	286°15.1	19°59.2	280°17.5	·· 57.3	82°18.7	·· 44.5	101°41.4	·· 49.3
10	71°38.9	301°14.5	58.4	295°18.4	56.8	97°21.2	44.6	116°44.0	49.4
11	86°41.4	316°13.8	57.7	310°19.3	56.4	112°23.8	44.6	131°46.6	49.4
12	101°43.9	331°13.2	N19°56.9	325°20.2	N17°55.9	127°26.4	S11°44.7	146°49.2	S17°49.4
13	116°46.3	346°12.5	56.2	340°21.1	55.5	142°28.9	44.7	161°51.8	49.5
14	131°48.8	1°11.9	55.4	355°22.0	55.0	157°31.5	44.8	176°54.4	49.5
15	146°51.3	16°11.2	·· 54.6	10°22.9	·· 54.5	172°34.0	·· 44.8	191°57.0	·· 49.6
16	161°53.7	31°10.6	53.8	25°23.8	54.1	187°36.6	44.9	206°59.6	49.6
17	176°56.2	46°09.9	53.1	40°24.7	53.6	202°39.2	44.9	222°02.2	49.7
18	191°58.6	61°09.3	N19°52.3	55°25.6	N17°53.2	217°41.7	S11°44.9	237°04.8	S17°49.7
19	207°01.1	76°08.7	51.5	70°26.5	52.7	232°44.3	45.0	252°07.5	49.8
20	222°03.6	91°08.0	50.8	85°27.5	52.3	247°46.8	45.0	267°10.1	49.8
21	237°06.0	106°07.4	·· 50.0	100°28.4	·· 51.8	262°49.4	·· 45.1	282°12.7	·· 49.9
22	252°08.5	121°06.7	49.2	115°29.3	51.3	277°52.0	45.1	297°15.3	49.9
23	267°11.0	136°06.1	48.4	130°30.2	50.9	292°54.5	45.2	312°17.9	49.9
Mer.pass.	05:14	ν -0.7′	d -0.8′	m -3.87	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.0′ m -2.66	ν 2.6′	d 0.0′ m 0.38

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°13.4	151°05.4	N19°47.7	145°31.1	N17°50.4	307°57.1	S11°45.2	327°20.5	S17°50.0
1	297°15.9	166°04.8	46.9	160°32.0	50.0	322°59.6	45.3	342°23.1	50.0
2	312°18.4	181°04.1	46.1	175°32.9	49.5	338°02.2	45.3	357°25.7	50.1
3	327°20.8	196°03.5	·· 45.3	190°33.8	·· 49.0	353°04.8	·· 45.4	12°28.3	·· 50.1
4	342°23.3	211°02.9	44.5	205°34.7	48.6	8°07.3	45.4	27°31.0	50.2
5	357°25.8	226°02.2	43.8	220°35.6	48.1	23°09.9	45.5	42°33.6	50.2
6	12°28.2	241°01.6	N19°43.0	235°36.5	N17°47.7	38°12.4	S11°45.5	57°36.2	S17°50.3
7	27°30.7	256°00.9	42.2	250°37.4	47.2	53°15.0	45.6	72°38.8	50.3
8	42°33.1	271°00.3	41.4	265°38.4	46.7	68°17.6	45.6	87°41.4	50.4
9	57°35.6	285°59.7	·· 40.6	280°39.3	·· 46.3	83°20.1	·· 45.7	102°44.0	·· 50.4
10	72°38.1	300°59.0	39.8	295°40.2	45.8	98°22.7	45.7	117°46.6	50.5
11	87°40.5	315°58.4	39.1	310°41.1	45.3	113°25.3	45.8	132°49.2	50.5
12	102°43.0	330°57.8	N19°38.3	325°42.0	N17°44.9	128°27.8	S11°45.8	147°51.8	S17°50.6
13	117°45.5	345°57.1	37.5	340°42.9	44.4	143°30.4	45.9	162°54.5	50.6
14	132°47.9	0°56.5	36.7	355°43.8	44.0	158°33.0	45.9	177°57.1	50.6
15	147°50.4	15°55.9	·· 35.9	10°44.7	·· 43.5	173°35.5	·· 46.0	192°59.7	·· 50.7
16	162°52.9	30°55.2	35.1	25°45.6	43.0	188°38.1	46.0	208°02.3	50.7
17	177°55.3	45°54.6	34.3	40°46.5	42.6	203°40.7	46.1	223°04.9	50.8
18	192°57.8	60°54.0	N19°33.5	55°47.4	N17°42.1	218°43.2	S11°46.1	238°07.5	S17°50.8
19	208°00.3	75°53.3	32.7	70°48.4	41.6	233°45.8	46.2	253°10.1	50.9
20	223°02.7	90°52.7	31.9	85°49.3	41.2	248°48.4	46.2	268°12.7	50.9
21	238°05.2	105°52.1	·· 31.1	100°50.2	·· 40.7	263°50.9	·· 46.3	283°15.4	·· 51.0
22	253°07.6	120°51.4	30.3	115°51.1	40.2	278°53.5	46.3	298°18.0	51.0
23	268°10.1	135°50.8	29.5	130°52.0	39.8	293°56.1	46.4	313°20.6	51.1
Mer.pass.	05:10	ν -0.6′	d -0.8′	m -3.87	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.0′ m -2.67	ν 2.6′	d 0.0′ m 0.38

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°12.6	150°50.2	N19°28.7	145°52.9	N17°39.3	308°58.6	S11°46.4	328°23.2	S17°51.1
1	298°15.0	165°49.5	27.9	160°53.8	38.9	324°01.2	46.5	343°25.8	51.2
2	313°17.5	180°48.9	27.1	175°54.7	38.4	339°03.8	46.5	358°28.4	51.2
3	328°20.0	195°48.3	·· 26.3	190°55.6	·· 37.9	354°06.3	·· 46.6	13°31.0	·· 51.3
4	343°22.4	210°47.7	25.5	205°56.5	37.5	9°08.9	46.6	28°33.7	51.3
5	358°24.9	225°47.0	24.7	220°57.5	37.0	24°11.5	46.7	43°36.3	51.3
6	13°27.4	240°46.4	N19°23.9	235°58.4	N17°36.5	39°14.1	S11°46.7	58°38.9	S17°51.4
7	28°29.8	255°45.8	23.1	250°59.3	36.1	54°16.6	46.8	73°41.5	51.4
8	43°32.3	270°45.1	22.3	266°00.2	35.6	69°19.2	46.9	88°44.1	51.5
9	58°34.8	285°44.5	·· 21.5	281°01.1	·· 35.1	84°21.8	·· 46.9	103°46.7	·· 51.5
10	73°37.2	300°43.9	20.7	296°02.0	34.7	99°24.3	47.0	118°49.3	51.6
11	88°39.7	315°43.3	19.9	311°02.9	34.2	114°26.9	47.0	133°52.0	51.6
12	103°42.1	330°42.7	N19°19.1	326°03.8	N17°33.7	129°29.5	S11°47.1	148°54.6	S17°51.7
13	118°44.6	345°42.0	18.3	341°04.7	33.3	144°32.1	47.1	163°57.2	51.7
14	133°47.1	0°41.4	17.5	356°05.7	32.8	159°34.6	47.2	178°59.8	51.8
15	148°49.5	15°40.8	·· 16.7	11°06.6	·· 32.3	174°37.2	·· 47.2	194°02.4	·· 51.8
16	163°52.0	30°40.2	15.8	26°07.5	31.9	189°39.8	47.3	209°05.0	51.9
17	178°54.5	45°39.5	15.0	41°08.4	31.4	204°42.4	47.3	224°07.6	51.9
18	193°56.9	60°38.9	N19°14.2	56°09.3	N17°30.9	219°44.9	S11°47.4	239°10.3	S17°52.0
19	208°59.4	75°38.3	13.4	71°10.2	30.5	234°47.5	47.4	254°12.9	52.0
20	224°01.9	90°37.7	12.6	86°11.1	30.0	249°50.1	47.5	269°15.5	52.1
21	239°04.3	105°37.1	·· 11.8	101°12.0	·· 29.5	264°52.7	·· 47.5	284°18.1	·· 52.1
22	254°06.8	120°36.5	10.9	116°13.0	29.0	279°55.2	47.6	299°20.7	52.1
23	269°09.2	135°35.8	10.1	131°13.9	28.6	294°57.8	47.7	314°23.3	52.2
Mer.pass.	05:06	ν -0.6′	d -0.8′	m -3.87	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.67	ν 2.6′	d 0.0′ m 0.37

Stars	SHA	Dec
Alpheratz	357°37.6	29°12.3
Ankaa	353°10.0	-42°11.2
Schedar	349°34.2	56°38.9
Diphda	348°50.2	-17°52.1
Achernar	335°22.6	-57°07.5
Hamal	327°54.5	23°33.6
Polaris	315°36.8	89°20.9
Acamar	315°14.2	-40°13.0
Menkar	314°09.3	4°10.3
Mirfak	308°32.7	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.4
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.4	-59°34.8
Suhail	222°48.8	-43°31.2
Miaplacidus	221°39.5	-69°48.4
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.3	-63°13.3
Gacrux	171°54.8	-57°14.2
Alioth	166°15.6	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.2	49°12.7
Hadar	148°39.8	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.5
Rigil Kent.	139°43.9	-60°55.6
Kochab	137°19.3	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°05.9	26°38.8
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.5
Peacock	53°09.7	-56°39.8
Deneb	49°27.3	45°21.3
Enif	33°41.4	9°58.3
Al Na'ir	27°36.3	-46°51.3
Fomalhaut	15°17.5	-29°30.4
Scheat	13°47.8	28°11.8
Markab	13°32.6	15°19.1

Jul 03 Sat	SHA	Mer.pass
Venus	230°06.7	13:55
Mars	223°55.0	14:19
Jupiter	25°41.4	03:32
Saturn	45°03.6	02:14

Jul 04 Sun	SHA	Mer.pass
Venus	228°52.0	13:56
Mars	223°17.6	14:17
Jupiter	25°43.6	03:28
Saturn	45°07.1	02:10

Jul 05 Mon	SHA	Mer.pass
Venus	227°37.6	13:57
Mars	222°40.3	14:16
Jupiter	25°46.1	03:24
Saturn	45°10.6	02:06

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.0	N22°57.4	257°48.4	16.1′	N05°41.4	12.7′	54.5′
1	193°56.9	57.2	272°23.5	16.1′	05°54.1	12.7′	54.5′
2	208°56.8	57.0	286°58.7	16.1′	06°06.8	12.6′	54.5′
3	223°56.7	·· 56.8	301°33.8	16.1′	06°19.4	12.6′	54.5′
4	238°56.6	56.6	316°08.9	16.1′	06°32.0	12.6′	54.5′
5	253°56.5	56.4	330°44.0	16.1′	06°44.6	12.5′	54.5′
6	268°56.3	N22°56.2	345°19.1	16.1′	N06°57.1	12.5′	54.5′
7	283°56.2	56.0	359°54.2	16.1′	07°09.6	12.5′	54.4′
8	298°56.1	55.8	14°29.3	16.1′	07°22.1	12.4′	54.4′
9	313°56.0	·· 55.5	29°04.4	16.1′	07°34.5	12.4′	54.4′
10	328°55.9	55.3	43°39.5	16.0′	07°46.9	12.4′	54.4′
11	343°55.8	55.1	58°14.5	16.0′	07°59.3	12.3′	54.4′
12	358°55.7	N22°54.9	72°49.5	16.0′	N08°11.6	12.3′	54.4′
13	13°55.5	54.7	87°24.5	16.0′	08°23.9	12.3′	54.4′
14	28°55.4	54.5	101°59.5	16.0′	08°36.2	12.2′	54.3′
15	43°55.3	·· 54.3	116°34.5	16.0′	08°48.4	12.2′	54.3′
16	58°55.2	54.1	131°09.5	15.9′	09°00.6	12.1′	54.3′
17	73°55.1	53.9	145°44.4	15.9′	09°12.7	12.1′	54.3′
18	88°55.0	N22°53.6	160°19.4	15.9′	N09°24.8	12.1′	54.3′
19	103°54.9	53.4	174°54.3	15.9′	09°36.9	12.0′	54.3′
20	118°54.7	53.2	189°29.1	15.9′	09°48.9	12.0′	54.3′
21	133°54.6	·· 53.0	204°04.0	15.8′	10°00.9	11.9′	54.3′
22	148°54.5	52.8	218°38.8	15.8′	10°12.8	11.9′	54.2′
23	163°54.4	52.6	233°13.6	15.8′	10°24.7	11.8′	54.2′
	SD = 15.7′	d = -0.2′	SD = 14.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.3	N22°52.3	247°48.4	15.7′	N10°36.5	11.8′	54.2′
1	193°54.2	52.1	262°23.1	15.7′	10°48.3	11.8′	54.2′
2	208°54.1	51.9	276°57.9	15.7′	11°00.1	11.7′	54.2′
3	223°54.0	·· 51.7	291°32.6	15.7′	11°11.8	11.7′	54.2′
4	238°53.8	51.5	306°07.2	15.6′	11°23.5	11.6′	54.2′
5	253°53.7	51.2	320°41.9	15.6′	11°35.1	11.6′	54.2′
6	268°53.6	N22°51.0	335°16.5	15.6′	N11°46.7	11.5′	54.2′
7	283°53.5	50.8	349°51.0	15.5′	11°58.2	11.5′	54.2′
8	298°53.4	50.6	4°25.6	15.5′	12°09.7	11.4′	54.2′
9	313°53.3	·· 50.4	19°00.1	15.5′	12°21.1	11.4′	54.1′
10	328°53.2	50.1	33°34.5	15.4′	12°32.5	11.3′	54.1′
11	343°53.1	49.9	48°09.0	15.4′	12°43.8	11.3′	54.1′
12	358°53.0	N22°49.7	62°43.4	15.4′	N12°55.1	11.2′	54.1′
13	13°52.8	49.5	77°17.7	15.3′	13°06.3	11.2′	54.1′
14	28°52.7	49.2	91°52.0	15.3′	13°17.5	11.1′	54.1′
15	43°52.6	·· 49.0	106°26.3	15.2′	13°28.6	11.1′	54.1′
16	58°52.5	48.8	121°00.6	15.2′	13°39.7	11.0′	54.1′
17	73°52.4	48.5	135°34.8	15.2′	13°50.7	11.0′	54.1′
18	88°52.3	N22°48.3	150°08.9	15.1′	N14°01.6	10.9′	54.1′
19	103°52.2	48.1	164°43.0	15.1′	14°12.5	10.8′	54.1′
20	118°52.1	47.8	179°17.1	15.0′	14°23.4	10.8′	54.1′
21	133°52.0	·· 47.6	193°51.2	15.0′	14°34.2	10.7′	54.1′
22	148°51.9	47.4	208°25.1	14.9′	14°44.9	10.7′	54.1′
23	163°51.8	47.1	222°59.1	14.9′	14°55.5	10.6′	54.1′
	SD = 15.7′	d = -0.2′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.6	N22°46.9	237°33.0	14.9′	N15°06.1	10.5′	54.1′
1	193°51.5	46.7	252°06.8	14.8′	15°16.7	10.5′	54.1′
2	208°51.4	46.4	266°40.6	14.8′	15°27.2	10.4′	54.1′
3	223°51.3	·· 46.2	281°14.4	14.7′	15°37.6	10.4′	54.0′
4	238°51.2	46.0	295°48.1	14.7′	15°48.0	10.3′	54.0′
5	253°51.1	45.7	310°21.8	14.6′	15°58.2	10.2′	54.0′
6	268°51.0	N22°45.5	324°55.4	14.6′	N16°08.5	10.2′	54.0′
7	283°50.9	45.2	339°29.0	14.5′	16°18.6	10.1′	54.0′
8	298°50.8	45.0	354°02.5	14.5′	16°28.7	10.0′	54.0′
9	313°50.7	·· 44.8	8°35.9	14.4′	16°38.8	10.0′	54.0′
10	328°50.6	44.5	23°09.4	14.4′	16°48.7	9.9′	54.0′
11	343°50.5	44.3	37°42.7	14.3′	16°58.6	9.8′	54.0′
12	358°50.3	N22°44.0	52°16.0	14.3′	N17°08.5	9.8′	54.0′
13	13°50.2	43.8	66°49.3	14.2′	17°18.2	9.7′	54.0′
14	28°50.1	43.6	81°22.5	14.1′	17°27.9	9.6′	54.0′
15	43°50.0	·· 43.3	95°55.6	14.1′	17°37.5	9.5′	54.0′
16	58°49.9	43.1	110°28.7	14.0′	17°47.1	9.5′	54.0′
17	73°49.8	42.8	125°01.8	14.0′	17°56.6	9.4′	54.0′
18	88°49.7	N22°42.6	139°34.7	13.9′	N18°06.0	9.3′	54.0′
19	103°49.6	42.3	154°07.7	13.9′	18°15.3	9.3′	54.0′
20	118°49.5	42.1	168°40.5	13.8′	18°24.6	9.2′	54.0′
21	133°49.4	·· 41.8	183°13.4	13.8′	18°33.7	9.1′	54.0′
22	148°49.3	41.6	197°46.1	13.7′	18°42.8	9.0′	54.0′
23	163°49.2	41.3	212°18.8	13.6′	18°51.9	8.9′	54.0′
	SD = 15.7′	d = -0.2′	SD = 14.7′				

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

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 23-25 39-22%
03	04:12	04:17	12:04	07:00	19:21	
04	04:23	04:28	12:04	07:42	20:03	
05	04:33	04:39	12:05	08:25	20:47	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	284°11.7	150°35.2	N19°09.3	146°14.8	N17°28.1	310°00.4	S11°47.7	329°26.0	S17°52.2
1	299°14.2	165°34.6	08.5	161°15.7	27.6	325°03.0	47.8	344°28.6	52.3
2	314°16.6	180°34.0	07.7	176°16.6	27.2	340°05.5	47.8	359°31.2	52.3
3	329°19.1	195°33.4	·· 06.8	191°17.5	·· 26.7	355°08.1	·· 47.9	14°33.8	·· 52.4
4	344°21.6	210°32.8	06.0	206°18.4	26.2	10°10.7	47.9	29°36.4	52.4
5	359°24.0	225°32.2	05.2	221°19.4	25.8	25°13.3	48.0	44°39.0	52.5
6	14°26.5	240°31.5	N19°04.4	236°20.3	N17°25.3	40°15.8	S11°48.0	59°41.7	S17°52.5
7	29°29.0	255°30.9	03.5	251°21.2	24.8	55°18.4	48.1	74°44.3	52.6
8	44°31.4	270°30.3	02.7	266°22.1	24.3	70°21.0	48.1	89°46.9	52.6
9	59°33.9	285°29.7	·· 01.9	281°23.0	·· 23.9	85°23.6	·· 48.2	104°49.5	·· 52.7
10	74°36.4	300°29.1	01.1	296°23.9	23.4	100°26.2	48.3	119°52.1	52.7
11	89°38.8	315°28.5	19°00.2	311°24.8	22.9	115°28.7	48.3	134°54.7	52.8
12	104°41.3	330°27.9	N18°59.4	326°25.7	N17°22.5	130°31.3	S11°48.4	149°57.4	S17°52.8
13	119°43.7	345°27.3	58.6	341°26.7	22.0	145°33.9	48.4	165°00.0	52.9
14	134°46.2	0°26.7	57.7	356°27.6	21.5	160°36.5	48.5	180°02.6	52.9
15	149°48.7	15°26.1	·· 56.9	11°28.5	·· 21.0	175°39.1	·· 48.5	195°05.2	·· 53.0
16	164°51.1	30°25.4	56.1	26°29.4	20.6	190°41.6	48.6	210°07.8	53.0
17	179°53.6	45°24.8	55.2	41°30.3	20.1	205°44.2	48.6	225°10.4	53.1
18	194°56.1	60°24.2	N18°54.4	56°31.2	N17°19.6	220°46.8	S11°48.7	240°13.1	S17°53.1
19	209°58.5	75°23.6	53.6	71°32.1	19.1	235°49.4	48.8	255°15.7	53.1
20	225°01.0	90°23.0	52.7	86°33.1	18.7	250°52.0	48.8	270°18.3	53.2
21	240°03.5	105°22.4	·· 51.9	101°34.0	·· 18.2	265°54.5	·· 48.9	285°20.9	·· 53.2
22	255°05.9	120°21.8	51.0	116°34.9	17.7	280°57.1	48.9	300°23.5	53.3
23	270°08.4	135°21.2	50.2	131°35.8	17.3	295°59.7	49.0	315°26.1	53.3
Mer.pass.	05:02	ν -0.6′	d -0.8′	m -3.87	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.68	ν 2.6′	d 0.0′ m 0.37

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	285°10.9	150°20.6	N18°49.4	146°36.7	N17°16.8	311°02.3	S11°49.0	330°28.8	S17°53.4
1	300°13.3	165°20.0	48.5	161°37.6	16.3	326°04.9	49.1	345°31.4	53.4
2	315°15.8	180°19.4	47.7	176°38.6	15.8	341°07.5	49.1	0°34.0	53.5
3	330°18.2	195°18.8	·· 46.8	191°39.5	·· 15.4	356°10.0	·· 49.2	15°36.6	·· 53.5
4	345°20.7	210°18.2	46.0	206°40.4	14.9	11°12.6	49.3	30°39.2	53.6
5	0°23.2	225°17.6	45.1	221°41.3	14.4	26°15.2	49.3	45°41.9	53.6
6	15°25.6	240°17.0	N18°44.3	236°42.2	N17°13.9	41°17.8	S11°49.4	60°44.5	S17°53.7
7	30°28.1	255°16.4	43.4	251°43.1	13.5	56°20.4	49.4	75°47.1	53.7
8	45°30.6	270°15.8	42.6	266°44.1	13.0	71°23.0	49.5	90°49.7	53.8
9	60°33.0	285°15.2	·· 41.7	281°45.0	·· 12.5	86°25.6	·· 49.5	105°52.3	·· 53.8
10	75°35.5	300°14.6	40.9	296°45.9	12.0	101°28.1	49.6	120°55.0	53.9
11	90°38.0	315°14.0	40.0	311°46.8	11.6	116°30.7	49.7	135°57.6	53.9
12	105°40.4	330°13.4	N18°39.2	326°47.7	N17°11.1	131°33.3	S11°49.7	151°00.2	S17°54.0
13	120°42.9	345°12.8	38.3	341°48.6	10.6	146°35.9	49.8	166°02.8	54.0
14	135°45.4	0°12.2	37.5	356°49.5	10.1	161°38.5	49.8	181°05.4	54.1
15	150°47.8	15°11.6	·· 36.6	11°50.5	·· 09.6	176°41.1	·· 49.9	196°08.1	·· 54.1
16	165°50.3	30°11.1	35.8	26°51.4	09.2	191°43.7	50.0	211°10.7	54.2
17	180°52.7	45°10.5	34.9	41°52.3	08.7	206°46.3	50.0	226°13.3	54.2
18	195°55.2	60°09.9	N18°34.1	56°53.2	N17°08.2	221°48.9	S11°50.1	241°15.9	S17°54.3
19	210°57.7	75°09.3	33.2	71°54.1	07.7	236°51.4	50.1	256°18.5	54.3
20	226°00.1	90°08.7	32.3	86°55.1	07.3	251°54.0	50.2	271°21.2	54.4
21	241°02.6	105°08.1	·· 31.5	101°56.0	·· 06.8	266°56.6	·· 50.2	286°23.8	·· 54.4
22	256°05.1	120°07.5	30.6	116°56.9	06.3	281°59.2	50.3	301°26.4	54.4
23	271°07.5	135°06.9	29.8	131°57.8	05.8	297°01.8	50.4	316°29.0	54.5
Mer.pass.	04:58	ν -0.6′	d -0.8′	m -3.87	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.69	ν 2.6′	d 0.0′ m 0.36

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°10.0	150°06.3	N18°28.9	146°58.7	N17°05.3	312°04.4	S11°50.4	331°31.6	S17°54.5
1	301°12.5	165°05.7	28.0	161°59.6	04.9	327°07.0	50.5	346°34.3	54.6
2	316°14.9	180°05.2	27.2	177°00.6	04.4	342°09.6	50.5	1°36.9	54.6
3	331°17.4	195°04.6	·· 26.3	192°01.5	·· 03.9	357°12.2	·· 50.6	16°39.5	·· 54.7
4	346°19.8	210°04.0	25.4	207°02.4	03.4	12°14.8	50.7	31°42.1	54.7
5	1°22.3	225°03.4	24.6	222°03.3	02.9	27°17.3	50.7	46°44.7	54.8
6	16°24.8	240°02.8	N18°23.7	237°04.2	N17°02.5	42°19.9	S11°50.8	61°47.4	S17°54.8
7	31°27.2	255°02.2	22.8	252°05.1	02.0	57°22.5	50.8	76°50.0	54.9
8	46°29.7	270°01.6	22.0	267°06.1	01.5	72°25.1	50.9	91°52.6	54.9
9	61°32.2	285°01.1	·· 21.1	282°07.0	·· 01.0	87°27.7	·· 51.0	106°55.2	·· 55.0
10	76°34.6	300°00.5	20.2	297°07.9	00.5	102°30.3	51.0	121°57.8	55.0
11	91°37.1	314°59.9	19.4	312°08.8	17°00.1	117°32.9	51.1	137°00.5	55.1
12	106°39.6	329°59.3	N18°18.5	327°09.7	N16°59.6	132°35.5	S11°51.1	152°03.1	S17°55.1
13	121°42.0	344°58.7	17.6	342°10.7	59.1	147°38.1	51.2	167°05.7	55.2
14	136°44.5	359°58.1	16.7	357°11.6	58.6	162°40.7	51.3	182°08.3	55.2
15	151°47.0	14°57.6	·· 15.9	12°12.5	·· 58.1	177°43.3	·· 51.3	197°11.0	·· 55.3
16	166°49.4	29°57.0	15.0	27°13.4	57.7	192°45.9	51.4	212°13.6	55.3
17	181°51.9	44°56.4	14.1	42°14.3	57.2	207°48.5	51.5	227°16.2	55.4
18	196°54.3	59°55.8	N18°13.2	57°15.3	N16°56.7	222°51.1	S11°51.5	242°18.8	S17°55.4
19	211°56.8	74°55.3	12.3	72°16.2	56.2	237°53.7	51.6	257°21.4	55.5
20	226°59.3	89°54.7	11.5	87°17.1	55.7	252°56.3	51.6	272°24.1	55.5
21	242°01.7	104°54.1	·· 10.6	102°18.0	·· 55.2	267°58.9	·· 51.7	287°26.7	·· 55.6
22	257°04.2	119°53.5	09.7	117°18.9	54.8	283°01.5	51.8	302°29.3	55.6
23	272°06.7	134°53.0	08.8	132°19.9	54.3	298°04.1	51.8	317°31.9	55.7
Mer.pass.	04:55	ν -0.6′	d -0.9′	m -3.87	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.69	ν 2.6′	d 0.0′ m 0.36

Stars	SHA	Dec
Alpheratz	357°37.6	29°12.3
Ankaa	353°10.0	-42°11.2
Schedar	349°34.2	56°38.9
Diphda	348°50.2	-17°52.1
Achernar	335°22.5	-57°07.5
Hamal	327°54.5	23°33.6
Polaris	315°35.3	89°20.9
Acamar	315°14.2	-40°13.0
Menkar	314°09.3	4°10.3
Mirfak	308°32.6	49°55.9
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.4
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.1
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.2
Miaplacidus	221°39.5	-69°48.4
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.3	-63°13.3
Gacrux	171°54.8	-57°14.2
Alioth	166°15.6	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.2	49°12.7
Hadar	148°39.8	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.5
Rigil Kent.	139°43.9	-60°55.6
Kochab	137°19.3	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.5
Peacock	53°09.7	-56°39.8
Deneb	49°27.3	45°21.3
Enif	33°41.3	9°58.4
Al Na'ir	27°36.2	-46°51.3
Fomalhaut	15°17.5	-29°30.4
Scheat	13°47.8	28°11.8
Markab	13°32.6	15°19.1

Jul 06 Tue	SHA	Mer.pass
Venus	226°23.5	13:58
Mars	222°03.1	14:14
Jupiter	25°48.7	03:19
Saturn	45°14.2	02:02

Jul 07 Wed	SHA	Mer.pass
Venus	225°09.8	13:59
Mars	221°25.9	14:13
Jupiter	25°51.4	03:15
Saturn	45°17.9	01:58

Jul 08 Thu	SHA	Mer.pass
Venus	223°56.3	14:00
Mars	220°48.7	14:11
Jupiter	25°54.4	03:11
Saturn	45°21.6	01:54

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.1	N22°41.1	226°51.5	13.6′	N19°00.8	8.9′	54.0′
1	193°49.0	40.8	241°24.0	13.5′	19°09.7	8.8′	54.0′
2	208°48.9	40.6	255°56.6	13.5′	19°18.5	8.7′	54.0′
3	223°48.8	·· 40.3	270°29.0	13.4′	19°27.2	8.6′	54.0′
4	238°48.6	40.1	285°01.4	13.3′	19°35.8	8.5′	54.1′
5	253°48.5	39.8	299°33.8	13.3′	19°44.4	8.5′	54.1′
6	268°48.4	N22°39.6	314°06.1	13.2′	N19°52.8	8.4′	54.1′
7	283°48.3	39.3	328°38.3	13.2′	20°01.2	8.3′	54.1′
8	298°48.2	39.0	343°10.5	13.1′	20°09.5	8.2′	54.1′
9	313°48.1	·· 38.8	357°42.6	13.0′	20°17.7	8.1′	54.1′
10	328°48.0	38.5	12°14.6	13.0′	20°25.8	8.0′	54.1′
11	343°47.9	38.3	26°46.6	12.9′	20°33.9	8.0′	54.1′
12	358°47.8	N22°38.0	41°18.5	12.9′	N20°41.8	7.9′	54.1′
13	13°47.7	37.7	55°50.4	12.8′	20°49.7	7.8′	54.1′
14	28°47.6	37.5	70°22.2	12.7′	20°57.5	7.7′	54.1′
15	43°47.5	·· 37.2	84°53.9	12.7′	21°05.2	7.6′	54.1′
16	58°47.4	37.0	99°25.6	12.6′	21°12.8	7.5′	54.1′
17	73°47.3	36.7	113°57.2	12.6′	21°20.3	7.4′	54.1′
18	88°47.2	N22°36.4	128°28.8	12.5′	N21°27.7	7.3′	54.1′
19	103°47.1	36.2	143°00.2	12.4′	21°35.0	7.2′	54.1′
20	118°47.0	35.9	157°31.7	12.4′	21°42.2	7.1′	54.1′
21	133°46.9	·· 35.6	172°03.1	12.3′	21°49.4	7.0′	54.1′
22	148°46.8	35.4	186°34.4	12.2′	21°56.4	6.9′	54.1′
23	163°46.7	35.1	201°05.6	12.2′	22°03.3	6.8′	54.1′
	SD = 15.7′	d = -0.3′	SD = 14.7′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.6	N22°34.8	215°36.8	12.1′	N22°10.2	6.7′	54.2′
1	193°46.5	34.6	230°07.9	12.1′	22°16.9	6.6′	54.2′
2	208°46.4	34.3	244°39.0	12.0′	22°23.6	6.5′	54.2′
3	223°46.3	·· 34.0	259°10.0	11.9′	22°30.1	6.4′	54.2′
4	238°46.2	33.8	273°40.9	11.9′	22°36.6	6.3′	54.2′
5	253°46.1	33.5	288°11.8	11.8′	22°42.9	6.2′	54.2′
6	268°46.0	N22°33.2	302°42.6	11.8′	N22°49.2	6.1′	54.2′
7	283°45.9	33.0	317°13.4	11.7′	22°55.3	6.0′	54.2′
8	298°45.8	32.7	331°44.1	11.6′	23°01.4	5.9′	54.2′
9	313°45.7	·· 32.4	346°14.7	11.6′	23°07.3	5.8′	54.2′
10	328°45.6	32.1	0°45.3	11.5′	23°13.1	5.7′	54.2′
11	343°45.5	31.9	15°15.8	11.5′	23°18.9	5.6′	54.2′
12	358°45.4	N22°31.6	29°46.3	11.4′	N23°24.5	5.5′	54.3′
13	13°45.3	31.3	44°16.7	11.3′	23°30.0	5.4′	54.3′
14	28°45.2	31.0	58°47.0	11.3′	23°35.4	5.3′	54.3′
15	43°45.1	·· 30.8	73°17.3	11.2′	23°40.7	5.2′	54.3′
16	58°45.0	30.5	87°47.6	11.2′	23°45.9	5.1′	54.3′
17	73°44.9	30.2	102°17.7	11.1′	23°51.0	5.0′	54.3′
18	88°44.8	N22°29.9	116°47.9	11.1′	N23°56.0	4.9′	54.3′
19	103°44.7	29.6	131°17.9	11.0′	24°00.8	4.7′	54.3′
20	118°44.6	29.4	145°47.9	11.0′	24°05.6	4.6′	54.3′
21	133°44.5	·· 29.1	160°17.9	10.9′	24°10.2	4.5′	54.3′
22	148°44.4	28.8	174°47.8	10.8′	24°14.7	4.4′	54.4′
23	163°44.3	28.5	189°17.6	10.8′	24°19.1	4.3′	54.4′
	SD = 15.7′	d = -0.3′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.2	N22°28.2	203°47.4	10.7′	N24°23.4	4.2′	54.4′
1	193°44.1	27.9	218°17.2	10.7′	24°27.6	4.1′	54.4′
2	208°44.0	27.7	232°46.9	10.6′	24°31.7	3.9′	54.4′
3	223°43.9	·· 27.4	247°16.5	10.6′	24°35.6	3.8′	54.4′
4	238°43.8	27.1	261°46.1	10.5′	24°39.5	3.7′	54.4′
5	253°43.7	26.8	276°15.6	10.5′	24°43.2	3.6′	54.4′
6	268°43.6	N22°26.5	290°45.1	10.4′	N24°46.8	3.5′	54.4′
7	283°43.5	26.2	305°14.6	10.4′	24°50.2	3.4′	54.5′
8	298°43.4	25.9	319°44.0	10.4′	24°53.6	3.2′	54.5′
9	313°43.3	·· 25.6	334°13.3	10.3′	24°56.8	3.1′	54.5′
10	328°43.2	25.3	348°42.6	10.3′	24°59.9	3.0′	54.5′
11	343°43.1	25.1	3°11.9	10.2′	25°02.9	2.9′	54.5′
12	358°43.0	N22°24.8	17°41.1	10.2′	N25°05.8	2.7′	54.5′
13	13°42.9	24.5	32°10.3	10.1′	25°08.6	2.6′	54.5′
14	28°42.8	24.2	46°39.4	10.1′	25°11.2	2.5′	54.6′
15	43°42.7	·· 23.9	61°08.5	10.0′	25°13.7	2.4′	54.6′
16	58°42.6	23.6	75°37.5	10.0′	25°16.1	2.3′	54.6′
17	73°42.5	23.3	90°06.6	10.0′	25°18.3	2.1′	54.6′
18	88°42.5	N22°23.0	104°35.5	9.9′	N25°20.5	2.0′	54.6′
19	103°42.4	22.7	119°04.5	9.9′	25°22.5	1.9′	54.6′
20	118°42.3	22.4	133°33.4	9.9′	25°24.3	1.8′	54.6′
21	133°42.2	·· 22.1	148°02.2	9.8′	25°26.1	1.6′	54.6′
22	148°42.1	21.8	162°31.0	9.8′	25°27.7	1.5′	54.7′
23	163°42.0	21.5	176°59.8	9.8′	25°29.2	1.4′	54.7′
	SD = 15.7′	d = -0.3′	SD = 14.8′				

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	22:10	-:-
56°	-:-	02:25	03:25	20:45	21:44	-:-
54°	01:14	02:45	03:38	20:31	21:24	22:54
52°	01:49	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 Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°						
N 70°						
68°	22:01			20:53		
66°	23:16			19:40		
64°	23:52	23:54	·· ··	19:04	20:43	22:17
62°	00:12	00:19	00:33	18:38	20:04	21:21
60°	00:27	00:39	01:00	18:18	19:37	20:48
N 58°	00:40	00:56	01:22	18:01	19:16	20:23
56°	00:51	01:11	01:39	17:47	18:59	20:04
54°	01:01	01:23	01:54	17:35	18:45	19:48
52°	01:10	01:34	02:07	17:25	18:32	19:34
50°	01:17	01:44	02:18	17:15	18:21	19:21
45°	01:34	02:05	02:42	16:55	17:57	18:56
N 40°	01:48	02:22	03:01	16:39	17:39	18:36
35°	02:00	02:36	03:17	16:26	17:23	18:19
30°	02:10	02:48	03:31	16:14	17:10	18:05
20°	02:28	03:09	03:55	15:54	16:47	17:40
N 10°	02:44	03:28	04:15	15:37	16:27	17:19
0°	02:58	03:45	04:35	15:21	16:09	16:59
S 10°	03:13	04:03	04:54	15:05	15:50	16:39
20°	03:29	04:21	05:15	14:47	15:31	16:18
30°	03:47	04:43	05:39	14:28	15:08	15:54
35°	03:58	04:56	05:53	14:16	14:55	15:39
40°	04:10	05:10	06:09	14:03	14:39	15:22
45°	04:25	05:28	06:29	13:48	14:21	15:02
S 50°	04:43	05:50	06:53	13:29	13:59	14:37
52°	04:51	06:00	07:05	13:20	13:48	14:25
54°	05:01	06:12	07:19	13:10	13:36	14:11
56°	05:12	06:26	07:35	12:58	13:22	13:55
58°	05:24	06:42	07:54	12:46	13:06	13:36
S 60°	05:38	07:01	08:17	12:31	12:46	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 26-28 15-4%
06	04:44	04:49	12:05	09:09	21:33	
07	04:54	04:59	12:05	09:57	22:22	
08	05:03	05:08	12:05	10:47	23:12	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°09.1	149°52.4	N18°07.9	147°20.8	N16°53.8	313°06.7	S11°51.9	332°34.6	S17°55.7
1	302°11.6	164°51.8	07.1	162°21.7	53.3	328°09.3	51.9	347°37.2	55.8
2	317°14.1	179°51.2	06.2	177°22.6	52.8	343°11.9	52.0	2°39.8	55.8
3	332°16.5	194°50.7	·· 05.3	192°23.5	·· 52.3	358°14.5	·· 52.1	17°42.4	·· 55.9
4	347°19.0	209°50.1	04.4	207°24.5	51.9	13°17.1	52.1	32°45.1	55.9
5	2°21.5	224°49.5	03.5	222°25.4	51.4	28°19.7	52.2	47°47.7	56.0
6	17°23.9	239°48.9	N18°02.6	237°26.3	N16°50.9	43°22.3	S11°52.3	62°50.3	S17°56.0
7	32°26.4	254°48.4	01.7	252°27.2	50.4	58°24.9	52.3	77°52.9	56.1
8	47°28.8	269°47.8	00.9	267°28.1	49.9	73°27.5	52.4	92°55.5	56.1
9	62°31.3	284°47.2	18°00.0	282°29.1	·· 49.4	88°30.1	·· 52.4	107°58.2	·· 56.2
10	77°33.8	299°46.7	17°59.1	297°30.0	48.9	103°32.7	52.5	123°00.8	56.2
11	92°36.2	314°46.1	58.2	312°30.9	48.5	118°35.3	52.6	138°03.4	56.3
12	107°38.7	329°45.5	N17°57.3	327°31.8	N16°48.0	133°37.9	S11°52.6	153°06.0	S17°56.3
13	122°41.2	344°45.0	56.4	342°32.7	47.5	148°40.5	52.7	168°08.7	56.4
14	137°43.6	359°44.4	55.5	357°33.7	47.0	163°43.1	52.8	183°11.3	56.4
15	152°46.1	14°43.8	·· 54.6	12°34.6	·· 46.5	178°45.7	·· 52.8	198°13.9	·· 56.5
16	167°48.6	29°43.3	53.7	27°35.5	46.0	193°48.3	52.9	213°16.5	56.5
17	182°51.0	44°42.7	52.8	42°36.4	45.5	208°50.9	53.0	228°19.2	56.6
18	197°53.5	59°42.1	N17°51.9	57°37.4	N16°45.1	223°53.5	S11°53.0	243°21.8	S17°56.6
19	212°56.0	74°41.6	51.0	72°38.3	44.6	238°56.1	53.1	258°24.4	56.7
20	227°58.4	89°41.0	50.1	87°39.2	44.1	253°58.7	53.1	273°27.0	56.7
21	243°00.9	104°40.4	·· 49.2	102°40.1	·· 43.6	269°01.3	·· 53.2	288°29.7	·· 56.8
22	258°03.3	119°39.9	48.3	117°41.0	43.1	284°03.9	53.3	303°32.3	56.8
23	273°05.8	134°39.3	47.4	132°42.0	42.6	299°06.5	53.3	318°34.9	56.9
Mer.pass.	04:51	ν -0.6′	d -0.9′ m -3.87	ν 0.9′	d -0.5′ m 1.84	ν 2.6′	d 0.1′ m -2.70	ν 2.6′	d 0.0′ m 0.35

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°08.3	149°38.8	N17°46.5	147°42.9	N16°42.1	314°09.1	S11°53.4	333°37.5	S17°56.9
1	303°10.7	164°38.2	45.6	162°43.8	41.6	329°11.7	53.5	348°40.2	57.0
2	318°13.2	179°37.6	44.7	177°44.7	41.2	344°14.3	53.5	3°42.8	57.0
3	333°15.7	194°37.1	·· 43.8	192°45.7	·· 40.7	359°16.9	·· 53.6	18°45.4	·· 57.1
4	348°18.1	209°36.5	42.9	207°46.6	40.2	14°19.5	53.7	33°48.0	57.1
5	3°20.6	224°36.0	42.0	222°47.5	39.7	29°22.1	53.7	48°50.7	57.2
6	18°23.1	239°35.4	N17°41.1	237°48.4	N16°39.2	44°24.7	S11°53.8	63°53.3	S17°57.2
7	33°25.5	254°34.8	40.2	252°49.3	38.7	59°27.3	53.9	78°55.9	57.3
8	48°28.0	269°34.3	39.3	267°50.3	38.2	74°30.0	53.9	93°58.5	57.3
9	63°30.5	284°33.7	·· 38.4	282°51.2	·· 37.7	89°32.6	·· 54.0	109°01.2	·· 57.4
10	78°32.9	299°33.2	37.4	297°52.1	37.2	104°35.2	54.1	124°03.8	57.4
11	93°35.4	314°32.6	36.5	312°53.0	36.8	119°37.8	54.1	139°06.4	57.5
12	108°37.8	329°32.1	N17°35.6	327°54.0	N16°36.3	134°40.4	S11°54.2	154°09.0	S17°57.5
13	123°40.3	344°31.5	34.7	342°54.9	35.8	149°43.0	54.2	169°11.7	57.5
14	138°42.8	359°31.0	33.8	357°55.8	35.3	164°45.6	54.3	184°14.3	57.6
15	153°45.2	14°30.4	·· 32.9	12°56.7	·· 34.8	179°48.2	·· 54.4	199°16.9	·· 57.6
16	168°47.7	29°29.9	32.0	27°57.7	34.3	194°50.8	54.4	214°19.6	57.7
17	183°50.2	44°29.3	31.1	42°58.6	33.8	209°53.4	54.5	229°22.2	57.7
18	198°52.6	59°28.8	N17°30.1	57°59.5	N16°33.3	224°56.0	S11°54.6	244°24.8	S17°57.8
19	213°55.1	74°28.2	29.2	73°00.4	32.8	239°58.7	54.6	259°27.4	57.8
20	228°57.6	89°27.7	28.3	88°01.4	32.3	255°01.3	54.7	274°30.1	57.9
21	244°00.0	104°27.1	·· 27.4	103°02.3	·· 31.8	270°03.9	·· 54.8	289°32.7	·· 57.9
22	259°02.5	119°26.6	26.5	118°03.2	31.4	285°06.5	54.8	304°35.3	58.0
23	274°05.0	134°26.0	25.5	133°04.1	30.9	300°09.1	54.9	319°37.9	58.0
Mer.pass.	04:47	ν -0.6′	d -0.9′ m -3.87	ν 0.9′	d -0.5′ m 1.84	ν 2.6′	d 0.1′ m -2.71	ν 2.6′	d 0.0′ m 0.35

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	289°07.4	149°25.5	N17°24.6	148°05.1	N16°30.4	315°11.7	S11°55.0	334°40.6	S17°58.1
1	304°09.9	164°24.9	23.7	163°06.0	29.9	330°14.3	55.0	349°43.2	58.1
2	319°12.3	179°24.4	22.8	178°06.9	29.4	345°16.9	55.1	4°45.8	58.2
3	334°14.8	194°23.8	·· 21.8	193°07.8	·· 28.9	0°19.6	·· 55.2	19°48.5	·· 58.2
4	349°17.3	209°23.3	20.9	208°08.8	28.4	15°22.2	55.3	34°51.1	58.3
5	4°19.7	224°22.7	20.0	223°09.7	27.9	30°24.8	55.3	49°53.7	58.4
6	19°22.2	239°22.2	N17°19.1	238°10.6	N16°27.4	45°27.4	S11°55.4	64°56.3	S17°58.4
7	34°24.7	254°21.7	18.1	253°11.5	26.9	60°30.0	55.5	79°59.0	58.5
8	49°27.1	269°21.1	17.2	268°12.5	26.4	75°32.6	55.5	95°01.6	58.5
9	64°29.6	284°20.6	·· 16.3	283°13.4	·· 25.9	90°35.2	·· 55.6	110°04.2	·· 58.6
10	79°32.1	299°20.0	15.4	298°14.3	25.4	105°37.9	55.7	125°06.8	58.6
11	94°34.5	314°19.5	14.4	313°15.2	24.9	120°40.5	55.7	140°09.5	58.7
12	109°37.0	329°18.9	N17°13.5	328°16.2	N16°24.4	135°43.1	S11°55.8	155°12.1	S17°58.7
13	124°39.4	344°18.4	12.6	343°17.1	23.9	150°45.7	55.9	170°14.7	58.8
14	139°41.9	359°17.9	11.6	358°18.0	23.5	165°48.3	55.9	185°17.4	58.8
15	154°44.4	14°17.3	·· 10.7	13°18.9	·· 23.0	180°50.9	·· 56.0	200°20.0	·· 58.9
16	169°46.8	29°16.8	09.8	28°19.9	22.5	195°53.6	56.1	215°22.6	58.9
17	184°49.3	44°16.3	08.8	43°20.8	22.0	210°56.2	56.1	230°25.2	59.0
18	199°51.8	59°15.7	N17°07.9	58°21.7	N16°21.5	225°58.8	S11°56.2	245°27.9	S17°59.0
19	214°54.2	74°15.2	07.0	73°22.7	21.0	241°01.4	56.3	260°30.5	59.1
20	229°56.7	89°14.6	06.0	88°23.6	20.5	256°04.0	56.3	275°33.1	59.1
21	244°59.2	104°14.1	·· 05.1	103°24.5	·· 20.0	271°06.6	·· 56.4	290°35.8	·· 59.2
22	260°01.6	119°13.6	04.1	118°25.4	19.5	286°09.3	56.5	305°38.4	59.2
23	275°04.1	134°13.0	03.2	133°26.4	19.0	301°11.9	56.6	320°41.0	59.3
Mer.pass.	04:43	ν -0.5′	d -0.9′ m -3.87	ν 0.9′	d -0.5′ m 1.84	ν 2.6′	d 0.1′ m -2.72	ν 2.6′	d 0.1′ m 0.34

Stars	SHA	Dec
Alpheratz	357°37.6	29°12.3
Ankaa	353°09.9	-42°11.2
Schedar	349°34.1	56°39.0
Diphda	348°50.1	-17°52.1
Achernar	335°22.5	-57°07.5
Hamal	327°54.5	23°33.6
Polaris	315°33.8	89°20.9
Acamar	315°14.2	-40°13.0
Menkar	314°09.3	4°10.4
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.4
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.0
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.2
Miaplacidus	221°39.6	-69°48.4
Alphard	217°50.8	-8°45.1
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.5
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.3	-63°13.3
Gacrux	171°54.8	-57°14.2
Alioth	166°15.6	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.2	49°12.7
Hadar	148°39.8	-60°28.7
Menkent	148°00.8	-36°28.6
Arcturus	145°50.4	19°04.5
Rigil Kent.	139°43.9	-60°55.6
Kochab	137°19.4	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.7	-15°45.0
Shaula	96°13.8	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.5
Peacock	53°09.7	-56°39.8
Deneb	49°27.3	45°21.3
Enif	33°41.3	9°58.4
Al Na'ir	27°36.2	-46°51.3
Fomalhaut	15°17.5	-29°30.4
Scheat	13°47.7	28°11.8
Markab	13°32.5	15°19.1

Jul 09 Fri	SHA	Mer.pass
Venus	222°43.2	14:01
Mars	220°11.6	14:10
Jupiter	25°57.5	03:07
Saturn	45°25.4	01:49

Jul 10 Sat	SHA	Mer.pass
Venus	221°30.5	14:02
Mars	219°34.6	14:08
Jupiter	26°00.8	03:03
Saturn	45°29.3	01:45

Jul 11 Sun	SHA	Mer.pass
Venus	220°18.1	14:03
Mars	218°57.6	14:07
Jupiter	26°04.3	02:59
Saturn	45°33.2	01:41

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.9	N22°21.2	191°28.6	9.7′	N25°30.6	1.2′	54.7′
1	193°41.8	20.9	205°57.3	9.7′	25°31.8	1.1′	54.7′
2	208°41.7	20.6	220°26.0	9.7′	25°32.9	1.0′	54.7′
3	223°41.6	·· 20.3	234°54.7	9.6′	25°33.9	0.9′	54.7′
4	238°41.5	20.0	249°23.3	9.6′	25°34.8	0.7′	54.7′
5	253°41.4	19.7	263°52.0	9.6′	25°35.5	0.6′	54.8′
6	268°41.3	N22°19.4	278°20.6	9.6′	N25°36.1	0.5′	54.8′
7	283°41.2	19.1	292°49.1	9.5′	25°36.6	0.3′	54.8′
8	298°41.1	18.8	307°17.7	9.5′	25°36.9	0.2′	54.8′
9	313°41.1	·· 18.5	321°46.2	9.5′	25°37.1	0.1′	54.8′
10	328°41.0	18.2	336°14.7	9.5′	25°37.2	-0.1′	54.8′
11	343°40.9	17.9	350°43.2	9.5′	25°37.1	-0.2′	54.9′
12	358°40.8	N22°17.6	5°11.6	9.4′	N25°36.9	-0.3′	54.9′
13	13°40.7	17.3	19°40.1	9.4′	25°36.6	-0.5′	54.9′
14	28°40.6	16.9	34°08.5	9.4′	25°36.1	-0.6′	54.9′
15	43°40.5	·· 16.6	48°36.9	9.4′	25°35.6	-0.7′	54.9′
16	58°40.4	16.3	63°05.3	9.4′	25°34.8	-0.8′	54.9′
17	73°40.3	16.0	77°33.7	9.4′	25°34.0	-1.0′	55.0′
18	88°40.2	N22°15.7	92°02.0	9.4′	N25°33.0	-1.1′	55.0′
19	103°40.1	15.4	106°30.4	9.3′	25°31.9	-1.2′	55.0′
20	118°40.0	15.1	120°58.7	9.3′	25°30.7	-1.4′	55.0′
21	133°40.0	·· 14.8	135°27.1	9.3′	25°29.3	-1.5′	55.0′
22	148°39.9	14.4	149°55.4	9.3′	25°27.8	-1.6′	55.0′
23	163°39.8	14.1	164°23.7	9.3′	25°26.1	-1.8′	55.1′
	SD = 15.7′	d = -0.3′	SD = 14.9′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.7	N22°13.8	178°52.1	9.3′	N25°24.3	-1.9′	55.1′
1	193°39.6	13.5	193°20.4	9.3′	25°22.4	-2.0′	55.1′
2	208°39.5	13.2	207°48.7	9.3′	25°20.4	-2.2′	55.1′
3	223°39.4	·· 12.9	222°17.0	9.3′	25°18.2	-2.3′	55.1′
4	238°39.3	12.5	236°45.3	9.3′	25°15.9	-2.4′	55.1′
5	253°39.2	12.2	251°13.6	9.3′	25°13.5	-2.6′	55.2′
6	268°39.2	N22°11.9	265°42.0	9.3′	N25°10.9	-2.7′	55.2′
7	283°39.1	11.6	280°10.3	9.3′	25°08.2	-2.8′	55.2′
8	298°39.0	11.3	294°38.6	9.3′	25°05.3	-3.0′	55.2′
9	313°38.9	·· 10.9	309°06.9	9.3′	25°02.4	-3.1′	55.2′
10	328°38.8	10.6	323°35.3	9.3′	24°59.3	-3.2′	55.2′
11	343°38.7	10.3	338°03.6	9.4′	24°56.0	-3.4′	55.3′
12	358°38.6	N22°10.0	352°32.0	9.4′	N24°52.7	-3.5′	55.3′
13	13°38.5	09.6	7°00.3	9.4′	24°49.2	-3.6′	55.3′
14	28°38.5	09.3	21°28.7	9.4′	24°45.5	-3.8′	55.3′
15	43°38.4	·· 09.0	35°57.1	9.4′	24°41.8	-3.9′	55.3′
16	58°38.3	08.7	50°25.5	9.4′	24°37.9	-4.0′	55.4′
17	73°38.2	08.3	64°53.9	9.4′	24°33.9	-4.2′	55.4′
18	88°38.1	N22°08.0	79°22.3	9.4′	N24°29.7	-4.3′	55.4′
19	103°38.0	07.7	93°50.8	9.5′	24°25.4	-4.4′	55.4′
20	118°37.9	07.4	108°19.2	9.5′	24°21.0	-4.5′	55.4′
21	133°37.9	·· 07.0	122°47.7	9.5′	24°16.5	-4.7′	55.4′
22	148°37.8	06.7	137°16.2	9.5′	24°11.8	-4.8′	55.5′
23	163°37.7	06.4	151°44.7	9.5′	24°07.0	-4.9′	55.5′
	SD = 15.7′	d = -0.3′	SD = 15.0′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.6	N22°06.0	166°13.3	9.6′	N24°02.1	-5.1′	55.5′
1	193°37.5	05.7	180°41.8	9.6′	23°57.0	-5.2′	55.5′
2	208°37.4	05.4	195°10.4	9.6′	23°51.8	-5.3′	55.5′
3	223°37.3	·· 05.0	209°39.0	9.6′	23°46.5	-5.4′	55.6′
4	238°37.3	04.7	224°07.7	9.7′	23°41.1	-5.6′	55.6′
5	253°37.2	04.4	238°36.3	9.7′	23°35.5	-5.7′	55.6′
6	268°37.1	N22°04.0	253°05.0	9.7′	N23°29.8	-5.8′	55.6′
7	283°37.0	03.7	267°33.7	9.7′	23°24.0	-5.9′	55.6′
8	298°36.9	03.4	282°02.5	9.8′	23°18.1	-6.1′	55.7′
9	313°36.8	·· 03.0	296°31.2	9.8′	23°12.0	-6.2′	55.7′
10	328°36.8	02.7	311°00.0	9.8′	23°05.8	-6.3′	55.7′
11	343°36.7	02.3	325°28.9	9.9′	22°59.5	-6.4′	55.7′
12	358°36.6	N22°02.0	339°57.7	9.9′	N22°53.1	-6.6′	55.7′
13	13°36.5	01.7	354°26.6	9.9′	22°46.5	-6.7′	55.7′
14	28°36.4	01.3	8°55.5	10.0′	22°39.8	-6.8′	55.8′
15	43°36.4	·· 01.0	23°24.5	10.0′	22°33.0	-6.9′	55.8′
16	58°36.3	00.6	37°53.5	10.0′	22°26.1	-7.0′	55.8′
17	73°36.2	00.3	52°22.5	10.1′	22°19.1	-7.2′	55.8′
18	88°36.1	N22°00.0	66°51.6	10.1′	N22°11.9	-7.3′	55.8′
19	103°36.0	21°59.6	81°20.7	10.1′	22°04.6	-7.4′	55.9′
20	118°35.9	59.3	95°49.8	10.2′	21°57.2	-7.5′	55.9′
21	133°35.9	·· 58.9	110°19.0	10.2′	21°49.7	-7.6′	55.9′
22	148°35.8	58.6	124°48.2	10.2′	21°42.1	-7.7′	55.9′
23	163°35.7	58.2	139°17.4	10.3′	21°34.4	-7.9′	55.9′
	SD = 15.7′	d = -0.3′	SD = 15.1′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°						
68°						
66°	-:-	-:-	01:13	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°	02:18	03:19	04:02	20:08	20:51	21:51
45°	02:59	03:47	04:23	19:47	20:23	21:11
N 40°	03:27	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°	05:13	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	15:56	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	16:21	17:13
S 60°	07:05	08:00	08:55	15:16	16:11	17:06

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

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 29-1 1-1%
09	05:12	05:17	12:05	11:38	-:-	
10	05:21	05:25	12:05	12:31	00:05	
11	05:30	05:34	12:06	13:23	00:57	

DUT1 = UT1-UTC = -0.1550 sec ΔT = TT-UT1 = +69.3390 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	290°06.6	149°12.5	N17°02.3	148°27.3	N16°18.5	316°14.5	S11°56.6	335°43.7	S17°59.3
1	305°09.0	164°12.0	01.3	163°28.2	18.0	331°17.1	56.7	350°46.3	59.4
2	320°11.5	179°11.4	17°00.4	178°29.1	17.5	346°19.7	56.8	5°48.9	59.4
3	335°13.9	194°10.9	16°59.4	193°30.1	·· 17.0	1°22.4	·· 56.8	20°51.5	·· 59.5
4	350°16.4	209°10.4	58.5	208°31.0	16.5	16°25.0	56.9	35°54.2	59.5
5	5°18.9	224°09.9	57.5	223°31.9	16.0	31°27.6	57.0	50°56.8	59.6
6	20°21.3	239°09.3	N16°56.6	238°32.9	N16°15.5	46°30.2	S11°57.0	65°59.4	S17°59.6
7	35°23.8	254°08.8	55.7	253°33.8	15.0	61°32.8	57.1	81°02.1	59.7
8	50°26.3	269°08.3	54.7	268°34.7	14.5	76°35.5	57.2	96°04.7	59.7
9	65°28.7	284°07.7	·· 53.8	283°35.6	·· 14.0	91°38.1	·· 57.3	111°07.3	·· 59.8
10	80°31.2	299°07.2	52.8	298°36.6	13.5	106°40.7	57.3	126°09.9	59.8
11	95°33.7	314°06.7	51.9	313°37.5	13.0	121°43.3	57.4	141°12.6	59.9
12	110°36.1	329°06.2	N16°50.9	328°38.4	N16°12.5	136°46.0	S11°57.5	156°15.2	S17°59.9
13	125°38.6	344°05.6	50.0	343°39.4	12.0	151°48.6	57.5	171°17.8	18°00.0
14	140°41.1	359°05.1	49.0	358°40.3	11.5	166°51.2	57.6	186°20.5	00.0
15	155°43.5	14°04.6	·· 48.1	13°41.2	·· 11.0	181°53.8	·· 57.7	201°23.1	·· 00.1
16	170°46.0	29°04.1	47.1	28°42.1	10.5	196°56.4	57.7	216°25.7	00.1
17	185°48.4	44°03.5	46.2	43°43.1	10.0	211°59.1	57.8	231°28.4	00.2
18	200°50.9	59°03.0	N16°45.2	58°44.0	N16°09.5	227°01.7	S11°57.9	246°31.0	S18°00.2
19	215°53.4	74°02.5	44.2	73°44.9	09.0	242°04.3	58.0	261°33.6	00.3
20	230°55.8	89°02.0	43.3	88°45.9	08.5	257°06.9	58.0	276°36.3	00.3
21	245°58.3	104°01.4	·· 42.3	103°46.8	·· 08.0	272°09.6	·· 58.1	291°38.9	·· 00.4
22	261°00.8	119°00.9	41.4	118°47.7	07.5	287°12.2	58.2	306°41.5	00.4
23	276°03.2	134°00.4	40.4	133°48.6	07.0	302°14.8	58.3	321°44.1	00.5
Mer.pass.	04:39	ν -0.5′	d -0.9′	m -3.88	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.72	ν 2.6′	d 0.1′ m 0.34

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	291°05.7	148°59.9	N16°39.5	148°49.6	N16°06.5	317°17.4	S11°58.3	336°46.8	S18°00.5
1	306°08.2	163°59.4	38.5	163°50.5	06.0	332°20.1	58.4	351°49.4	00.6
2	321°10.6	178°58.8	37.5	178°51.4	05.5	347°22.7	58.5	6°52.0	00.6
3	336°13.1	193°58.3	·· 36.6	193°52.4	·· 05.0	2°25.3	·· 58.5	21°54.7	·· 00.7
4	351°15.6	208°57.8	35.6	208°53.3	04.5	17°28.0	58.6	36°57.3	00.7
5	6°18.0	223°57.3	34.7	223°54.2	04.0	32°30.6	58.7	51°59.9	00.8
6	21°20.5	238°56.8	N16°33.7	238°55.2	N16°03.5	47°33.2	S11°58.8	67°02.6	S18°00.8
7	36°22.9	253°56.3	32.7	253°56.1	03.0	62°35.8	58.8	82°05.2	00.9
8	51°25.4	268°55.7	31.8	268°57.0	02.5	77°38.5	58.9	97°07.8	00.9
9	66°27.9	283°55.2	·· 30.8	283°57.9	·· 02.0	92°41.1	·· 59.0	112°10.5	·· 01.0
10	81°30.3	298°54.7	29.8	298°58.9	01.5	107°43.7	59.0	127°13.1	01.0
11	96°32.8	313°54.2	28.9	313°59.8	01.0	122°46.4	59.1	142°15.7	01.1
12	111°35.3	328°53.7	N16°27.9	329°00.7	N16°00.5	137°49.0	S11°59.2	157°18.4	S18°01.1
13	126°37.7	343°53.2	26.9	344°01.7	16°00.0	152°51.6	59.3	172°21.0	01.2
14	141°40.2	358°52.7	26.0	359°02.6	15°59.5	167°54.2	59.3	187°23.6	01.2
15	156°42.7	13°52.2	·· 25.0	14°03.5	·· 59.0	182°56.9	·· 59.4	202°26.3	·· 01.3
16	171°45.1	28°51.6	24.0	29°04.5	58.5	197°59.5	59.5	217°28.9	01.3
17	186°47.6	43°51.1	23.1	44°05.4	58.0	213°02.1	59.6	232°31.5	01.4
18	201°50.0	58°50.6	N16°22.1	59°06.3	N15°57.5	228°04.8	S11°59.6	247°34.2	S18°01.4
19	216°52.5	73°50.1	21.1	74°07.3	57.0	243°07.4	59.7	262°36.8	01.5
20	231°55.0	88°49.6	20.1	89°08.2	56.5	258°10.0	59.8	277°39.4	01.5
21	246°57.4	103°49.1	·· 19.2	104°09.1	·· 56.0	273°12.7	·· 59.9	292°42.1	·· 01.6
22	261°59.9	118°48.6	18.2	119°10.1	55.4	288°15.3	11°59.9	307°44.7	01.7
23	277°02.4	133°48.1	17.2	134°11.0	54.9	303°17.9	12°00.0	322°47.3	01.7
Mer.pass.	04:35	ν -0.5′	d -1.0′	m -3.88	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.73	ν 2.6′	d 0.1′ m 0.34

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°04.8	148°47.6	N16°16.2	149°11.9	N15°54.4	318°20.6	S12°00.1	337°50.0	S18°01.8
1	307°07.3	163°47.1	15.3	164°12.8	53.9	333°23.2	00.2	352°52.6	01.8
2	322°09.8	178°46.6	14.3	179°13.8	53.4	348°25.8	00.2	7°55.2	01.9
3	337°12.2	193°46.1	·· 13.3	194°14.7	·· 52.9	3°28.5	·· 00.3	22°57.9	·· 01.9
4	352°14.7	208°45.6	12.3	209°15.6	52.4	18°31.1	00.4	38°00.5	02.0
5	7°17.2	223°45.1	11.3	224°16.6	51.9	33°33.7	00.5	53°03.1	02.0
6	22°19.6	238°44.6	N16°10.4	239°17.5	N15°51.4	48°36.4	S12°00.5	68°05.8	S18°02.1
7	37°22.1	253°44.1	09.4	254°18.4	50.9	63°39.0	00.6	83°08.4	02.1
8	52°24.5	268°43.6	08.4	269°19.4	50.4	78°41.6	00.7	98°11.0	02.2
9	67°27.0	283°43.1	·· 07.4	284°20.3	·· 49.9	93°44.3	·· 00.8	113°13.7	·· 02.2
10	82°29.5	298°42.6	06.4	299°21.2	49.4	108°46.9	00.8	128°16.3	02.3
11	97°31.9	313°42.1	05.4	314°22.2	48.9	123°49.5	00.9	143°18.9	02.3
12	112°34.4	328°41.6	N16°04.5	329°23.1	N15°48.4	138°52.2	S12°01.0	158°21.6	S18°02.4
13	127°36.9	343°41.1	03.5	344°24.0	47.8	153°54.8	01.1	173°24.2	02.4
14	142°39.3	358°40.6	02.5	359°25.0	47.3	168°57.5	01.1	188°26.8	02.5
15	157°41.8	13°40.1	·· 01.5	14°25.9	·· 46.8	184°00.1	·· 01.2	203°29.5	·· 02.5
16	172°44.3	28°39.6	16°00.5	29°26.8	46.3	199°02.7	01.3	218°32.1	02.6
17	187°46.7	43°39.1	15°59.5	44°27.8	45.8	214°05.4	01.4	233°34.7	02.6
18	202°49.2	58°38.6	N15°58.5	59°28.7	N15°45.3	229°08.0	S12°01.4	248°37.4	S18°02.7
19	217°51.7	73°38.1	57.5	74°29.6	44.8	244°10.6	01.5	263°40.0	02.7
20	232°54.1	88°37.6	56.6	89°30.6	44.3	259°13.3	01.6	278°42.6	02.8
21	247°56.6	103°37.1	·· 55.6	104°31.5	·· 43.8	274°15.9	·· 01.7	293°45.3	·· 02.8
22	262°59.0	118°36.6	54.6	119°32.4	43.3	289°18.6	01.7	308°47.9	02.9
23	278°01.5	133°36.1	53.6	134°33.4	42.8	304°21.2	01.8	323°50.5	02.9
Mer.pass.	04:31	ν -0.5′	d -1.0′	m -3.88	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.74	ν 2.6′	d 0.1′ m 0.33

Stars	SHA	Dec
Alpheratz	357°37.6	29°12.3
Ankaa	353°09.9	-42°11.2
Schedar	349°34.1	56°39.0
Diphda	348°50.1	-17°52.1
Achernar	335°22.5	-57°07.4
Hamal	327°54.5	23°33.7
Polaris	315°32.4	89°20.9
Acamar	315°14.2	-40°13.0
Menkar	314°09.3	4°10.4
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.1	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.3
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.0
Procyon	244°54.2	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.2
Miaplacidus	221°39.6	-69°48.4
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.3	-63°13.3
Gacrux	171°54.8	-57°14.2
Alioth	166°15.6	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.3	49°12.7
Hadar	148°39.8	-60°28.7
Menkent	148°00.9	-36°28.6
Arcturus	145°50.4	19°04.5
Rigil Kent.	139°43.9	-60°55.6
Kochab	137°19.4	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.7	-15°45.0
Shaula	96°13.8	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.5
Peacock	53°09.7	-56°39.8
Deneb	49°27.2	45°21.3
Enif	33°41.3	9°58.4
Al Na'ir	27°36.2	-46°51.3
Fomalhaut	15°17.5	-29°30.4
Scheat	13°47.7	28°11.8
Markab	13°32.5	15°19.2

Jul 12 Mon	SHA	Mer.pass
Venus	219°06.0	14:04
Mars	218°20.7	14:05
Jupiter	26°07.9	02:55
Saturn	45°37.1	01:37

Jul 13 Tue	SHA	Mer.pass
Venus	217°54.2	14:04
Mars	217°43.9	14:04
Jupiter	26°11.8	02:50
Saturn	45°41.1	01:33

Jul 14 Wed	SHA	Mer.pass
Venus	216°42.8	14:05
Mars	217°07.1	14:02
Jupiter	26°15.7	02:46
Saturn	45°45.1	01:28

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.6	N21°57.9	153°46.7	10.3′	N21°26.5	-8.0′	56.0′
1	193°35.5	57.5	168°16.0	10.4′	21°18.5	-8.1′	56.0′
2	208°35.5	57.2	182°45.3	10.4′	21°10.4	-8.2′	56.0′
3	223°35.4	·· 56.8	197°14.7	10.4′	21°02.2	-8.3′	56.0′
4	238°35.3	56.5	211°44.2	10.5′	20°53.9	-8.4′	56.0′
5	253°35.2	56.1	226°13.6	10.5′	20°45.5	-8.5′	56.1′
6	268°35.2	N21°55.8	240°43.2	10.6′	N20°37.0	-8.6′	56.1′
7	283°35.1	55.4	255°12.7	10.6′	20°28.3	-8.8′	56.1′
8	298°35.0	55.1	269°42.3	10.6′	20°19.6	-8.9′	56.1′
9	313°34.9	·· 54.7	284°11.9	10.7′	20°10.7	-9.0′	56.2′
10	328°34.8	54.4	298°41.6	10.7′	20°01.7	-9.1′	56.2′
11	343°34.8	54.0	313°11.3	10.8′	19°52.7	-9.2′	56.2′
12	358°34.7	N21°53.7	327°41.1	10.8′	N19°43.5	-9.3′	56.2′
13	13°34.6	53.3	342°10.9	10.8′	19°34.2	-9.4′	56.2′
14	28°34.5	52.9	356°40.7	10.9′	19°24.8	-9.5′	56.3′
15	43°34.5	·· 52.6	11°10.6	10.9′	19°15.3	-9.6′	56.3′
16	58°34.4	52.2	25°40.5	11.0′	19°05.7	-9.7′	56.3′
17	73°34.3	51.9	40°10.5	11.0′	18°56.0	-9.8′	56.3′
18	88°34.2	N21°51.5	54°40.5	11.0′	N18°46.2	-9.9′	56.3′
19	103°34.1	51.2	69°10.5	11.1′	18°36.3	-10.0′	56.4′
20	118°34.1	50.8	83°40.6	11.1′	18°26.3	-10.1′	56.4′
21	133°34.0	·· 50.4	98°10.7	11.2′	18°16.2	-10.2′	56.4′
22	148°33.9	50.1	112°40.9	11.2′	18°06.0	-10.3′	56.4′
23	163°33.8	49.7	127°11.1	11.3′	17°55.7	-10.4′	56.4′
	SD = 15.7′	d = -0.3′	SD = 15.3′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.8	N21°49.3	141°41.4	11.3′	N17°45.3	-10.5′	56.5′
1	193°33.7	49.0	156°11.6	11.3′	17°34.9	-10.6′	56.5′
2	208°33.6	48.6	170°42.0	11.4′	17°24.3	-10.7′	56.5′
3	223°33.5	·· 48.2	185°12.4	11.4′	17°13.6	-10.8′	56.5′
4	238°33.5	47.9	199°42.8	11.5′	17°02.8	-10.9′	56.5′
5	253°33.4	47.5	214°13.2	11.5′	16°52.0	-10.9′	56.6′
6	268°33.3	N21°47.1	228°43.7	11.5′	N16°41.1	-11.0′	56.6′
7	283°33.2	46.8	243°14.2	11.6′	16°30.0	-11.1′	56.6′
8	298°33.2	46.4	257°44.8	11.6′	16°18.9	-11.2′	56.6′
9	313°33.1	·· 46.0	272°15.4	11.6′	16°07.7	-11.3′	56.7′
10	328°33.0	45.7	286°46.1	11.7′	15°56.4	-11.4′	56.7′
11	343°33.0	45.3	301°16.8	11.7′	15°45.0	-11.5′	56.7′
12	358°32.9	N21°44.9	315°47.5	11.8′	N15°33.5	-11.5′	56.7′
13	13°32.8	44.6	330°18.3	11.8′	15°22.0	-11.6′	56.7′
14	28°32.7	44.2	344°49.1	11.8′	15°10.4	-11.7′	56.8′
15	43°32.7	·· 43.8	359°19.9	11.9′	14°58.6	-11.8′	56.8′
16	58°32.6	43.4	13°50.8	11.9′	14°46.9	-11.9′	56.8′
17	73°32.5	43.1	28°21.7	11.9′	14°35.0	-12.0′	56.8′
18	88°32.5	N21°42.7	42°52.6	12.0′	N14°23.0	-12.0′	56.8′
19	103°32.4	42.3	57°23.6	12.0′	14°11.0	-12.1′	56.9′
20	118°32.3	41.9	71°54.6	12.0′	13°58.9	-12.2′	56.9′
21	133°32.2	·· 41.6	86°25.7	12.1′	13°46.7	-12.3′	56.9′
22	148°32.2	41.2	100°56.7	12.1′	13°34.4	-12.3′	56.9′
23	163°32.1	40.8	115°27.8	12.1′	13°22.1	-12.4′	57.0′
	SD = 15.7′	d = -0.4′	SD = 15.4′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.0	N21°40.4	129°59.0	12.2′	N13°09.7	-12.5′	57.0′
1	193°32.0	40.1	144°30.2	12.2′	12°57.2	-12.5′	57.0′
2	208°31.9	39.7	159°01.4	12.2′	12°44.7	-12.6′	57.0′
3	223°31.8	·· 39.3	173°32.6	12.3′	12°32.1	-12.7′	57.0′
4	238°31.8	38.9	188°03.9	12.3′	12°19.4	-12.8′	57.1′
5	253°31.7	38.5	202°35.2	12.3′	12°06.6	-12.8′	57.1′
6	268°31.6	N21°38.1	217°06.5	12.3′	N11°53.8	-12.9′	57.1′
7	283°31.6	37.8	231°37.8	12.4′	11°40.9	-13.0′	57.1′
8	298°31.5	37.4	246°09.2	12.4′	11°27.9	-13.0′	57.2′
9	313°31.4	·· 37.0	260°40.6	12.4′	11°14.9	-13.1′	57.2′
10	328°31.3	36.6	275°12.0	12.5′	11°01.8	-13.1′	57.2′
11	343°31.3	36.2	289°43.5	12.5′	10°48.7	-13.2′	57.2′
12	358°31.2	N21°35.8	304°15.0	12.5′	N10°35.5	-13.3′	57.2′
13	13°31.1	35.5	318°46.5	12.5′	10°22.2	-13.3′	57.3′
14	28°31.1	35.1	333°18.0	12.5′	10°08.9	-13.4′	57.3′
15	43°31.0	·· 34.7	347°49.5	12.6′	09°55.5	-13.4′	57.3′
16	58°30.9	34.3	2°21.1	12.6′	09°42.1	-13.5′	57.3′
17	73°30.9	33.9	16°52.7	12.6′	09°28.6	-13.5′	57.4′
18	88°30.8	N21°33.5	31°24.3	12.6′	N09°15.0	-13.6′	57.4′
19	103°30.7	33.1	45°55.9	12.6′	09°01.4	-13.7′	57.4′
20	118°30.7	32.7	60°27.5	12.7′	08°47.8	-13.7′	57.4′
21	133°30.6	·· 32.3	74°59.2	12.7′	08°34.1	-13.8′	57.4′
22	148°30.6	31.9	89°30.8	12.7′	08°20.3	-13.8′	57.5′
23	163°30.5	31.5	104°02.5	12.7′	08°06.5	-13.9′	57.5′
	SD = 15.7′	d = -0.4′	SD = 15.5′				

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

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 4-16%
12	05:37	05:41	12:06	14:14	01:49	
13	05:45	05:48	12:06	15:03	02:38	
14	05:52	05:55	12:06	15:50	03:27	

DUT1 = UT1-UTC = -0.1524 sec ΔT = TT-UT1 = +69.3364 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	293°04.0	148°35.6	N15°52.6	149°34.3	N15°42.3	319°23.8	S12°01.9	338°53.2	S18°03.0
1	308°06.4	163°35.1	51.6	164°35.2	41.7	334°26.5	02.0	353°55.8	03.0
2	323°08.9	178°34.6	50.6	179°36.2	41.2	349°29.1	02.1	8°58.4	03.1
3	338°11.4	193°34.1	·· 49.6	194°37.1	·· 40.7	4°31.8	·· 02.1	24°01.1	·· 03.1
4	353°13.8	208°33.6	48.6	209°38.1	40.2	19°34.4	02.2	39°03.7	03.2
5	8°16.3	223°33.2	47.6	224°39.0	39.7	34°37.0	02.3	54°06.3	03.3
6	23°18.8	238°32.7	N15°46.6	239°39.9	N15°39.2	49°39.7	S12°02.4	69°09.0	S18°03.3
7	38°21.2	253°32.2	45.6	254°40.9	38.7	64°42.3	02.4	84°11.6	03.4
8	53°23.7	268°31.7	44.6	269°41.8	38.2	79°45.0	02.5	99°14.3	03.4
9	68°26.1	283°31.2	·· 43.6	284°42.7	·· 37.7	94°47.6	·· 02.6	114°16.9	·· 03.5
10	83°28.6	298°30.7	42.6	299°43.7	37.1	109°50.2	02.7	129°19.5	03.5
11	98°31.1	313°30.2	41.6	314°44.6	36.6	124°52.9	02.8	144°22.2	03.6
12	113°33.5	328°29.7	N15°40.6	329°45.5	N15°36.1	139°55.5	S12°02.8	159°24.8	S18°03.6
13	128°36.0	343°29.3	39.6	344°46.5	35.6	154°58.2	02.9	174°27.4	03.7
14	143°38.5	358°28.8	38.6	359°47.4	35.1	170°00.8	03.0	189°30.1	03.7
15	158°40.9	13°28.3	·· 37.6	14°48.3	·· 34.6	185°03.5	·· 03.1	204°32.7	·· 03.8
16	173°43.4	28°27.8	36.6	29°49.3	34.1	200°06.1	03.1	219°35.3	03.8
17	188°45.9	43°27.3	35.6	44°50.2	33.6	215°08.8	03.2	234°38.0	03.9
18	203°48.3	58°26.8	N15°34.6	59°51.2	N15°33.0	230°11.4	S12°03.3	249°40.6	S18°03.9
19	218°50.8	73°26.4	33.6	74°52.1	32.5	245°14.0	03.4	264°43.3	04.0
20	233°53.3	88°25.9	32.6	89°53.0	32.0	260°16.7	03.5	279°45.9	04.0
21	248°55.7	103°25.4	·· 31.6	104°54.0	·· 31.5	275°19.3	·· 03.5	294°48.5	·· 04.1
22	263°58.2	118°24.9	30.5	119°54.9	31.0	290°22.0	03.6	309°51.2	04.1
23	279°00.6	133°24.4	29.5	134°55.8	30.5	305°24.6	03.7	324°53.8	04.2
Mer.pass.	04:27	ν -0.5′	d -1.0′	m -3.88	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.74	ν 2.6′	d 0.1′ m 0.33

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	294°03.1	148°24.0	N15°28.5	149°56.8	N15°30.0	320°27.3	S12°03.8	339°56.4	S18°04.2
1	309°05.6	163°23.5	27.5	164°57.7	29.5	335°29.9	03.9	354°59.1	04.3
2	324°08.0	178°23.0	26.5	179°58.6	28.9	350°32.6	03.9	10°01.7	04.3
3	339°10.5	193°22.5	·· 25.5	194°59.6	·· 28.4	5°35.2	·· 04.0	25°04.3	·· 04.4
4	354°13.0	208°22.1	24.5	210°00.5	27.9	20°37.9	04.1	40°07.0	04.4
5	9°15.4	223°21.6	23.5	225°01.5	27.4	35°40.5	04.2	55°09.6	04.5
6	24°17.9	238°21.1	N15°22.4	240°02.4	N15°26.9	50°43.2	S12°04.2	70°12.3	S18°04.6
7	39°20.4	253°20.6	21.4	255°03.3	26.4	65°45.8	04.3	85°14.9	04.6
8	54°22.8	268°20.2	20.4	270°04.3	25.8	80°48.5	04.4	100°17.5	04.7
9	69°25.3	283°19.7	·· 19.4	285°05.2	·· 25.3	95°51.1	·· 04.5	115°20.2	·· 04.7
10	84°27.7	298°19.2	18.4	300°06.1	24.8	110°53.8	04.6	130°22.8	04.8
11	99°30.2	313°18.7	17.4	315°07.1	24.3	125°56.4	04.6	145°25.4	04.8
12	114°32.7	328°18.3	N15°16.3	330°08.0	N15°23.8	140°59.1	S12°04.7	160°28.1	S18°04.9
13	129°35.1	343°17.8	15.3	345°09.0	23.3	156°01.7	04.8	175°30.7	04.9
14	144°37.6	358°17.3	14.3	0°09.9	22.8	171°04.4	04.9	190°33.4	05.0
15	159°40.1	13°16.8	·· 13.3	15°10.8	·· 22.2	186°07.0	·· 05.0	205°36.0	·· 05.0
16	174°42.5	28°16.4	12.3	30°11.8	21.7	201°09.7	05.1	220°38.6	05.1
17	189°45.0	43°15.9	11.2	45°12.7	21.2	216°12.3	05.1	235°41.3	05.1
18	204°47.5	58°15.4	N15°10.2	60°13.7	N15°20.7	231°15.0	S12°05.2	250°43.9	S18°05.2
19	219°49.9	73°15.0	09.2	75°14.6	20.2	246°17.6	05.3	265°46.5	05.2
20	234°52.4	88°14.5	08.2	90°15.5	19.7	261°20.3	05.4	280°49.2	05.3
21	249°54.9	103°14.0	·· 07.1	105°16.5	·· 19.1	276°22.9	·· 05.5	295°51.8	·· 05.3
22	264°57.3	118°13.6	06.1	120°17.4	18.6	291°25.6	05.5	310°54.5	05.4
23	279°59.8	133°13.1	05.1	135°18.3	18.1	306°28.2	05.6	325°57.1	05.4
Mer.pass.	04:23	ν -0.5′	d -1.0′	m -3.88	ν 0.9′	d -0.5′	m 1.84	ν 2.6′	d 0.1′ m -2.75	ν 2.6′	d 0.1′ m 0.32

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	295°02.2	148°12.6	N15°04.1	150°19.3	N15°17.6	321°30.9	S12°05.7	340°59.7	S18°05.5
1	310°04.7	163°12.2	03.0	165°20.2	17.1	336°33.5	05.8	356°02.4	05.5
2	325°07.2	178°11.7	02.0	180°21.2	16.5	351°36.2	05.9	11°05.0	05.6
3	340°09.6	193°11.2	·· 01.0	195°22.1	·· 16.0	6°38.8	·· 05.9	26°07.6	·· 05.6
4	355°12.1	208°10.8	15°00.0	210°23.0	15.5	21°41.5	06.0	41°10.3	05.7
5	10°14.6	223°10.3	14°58.9	225°24.0	15.0	36°44.1	06.1	56°12.9	05.8
6	25°17.0	238°09.9	N14°57.9	240°24.9	N15°14.5	51°46.8	S12°06.2	71°15.6	S18°05.8
7	40°19.5	253°09.4	56.9	255°25.9	13.9	66°49.4	06.3	86°18.2	05.9
8	55°22.0	268°08.9	55.8	270°26.8	13.4	81°52.1	06.4	101°20.8	05.9
9	70°24.4	283°08.5	·· 54.8	285°27.7	·· 12.9	96°54.8	·· 06.4	116°23.5	·· 06.0
10	85°26.9	298°08.0	53.8	300°28.7	12.4	111°57.4	06.5	131°26.1	06.0
11	100°29.4	313°07.6	52.7	315°29.6	11.9	127°00.1	06.6	146°28.8	06.1
12	115°31.8	328°07.1	N14°51.7	330°30.6	N15°11.4	142°02.7	S12°06.7	161°31.4	S18°06.1
13	130°34.3	343°06.6	50.7	345°31.5	10.8	157°05.4	06.8	176°34.0	06.2
14	145°36.7	358°06.2	49.6	0°32.4	10.3	172°08.0	06.8	191°36.7	06.2
15	160°39.2	13°05.7	·· 48.6	15°33.4	·· 09.8	187°10.7	·· 06.9	206°39.3	·· 06.3
16	175°41.7	28°05.3	47.5	30°34.3	09.3	202°13.3	07.0	221°42.0	06.3
17	190°44.1	43°04.8	46.5	45°35.3	08.7	217°16.0	07.1	236°44.6	06.4
18	205°46.6	58°04.4	N14°45.5	60°36.2	N15°08.2	232°18.7	S12°07.2	251°47.2	S18°06.4
19	220°49.1	73°03.9	44.4	75°37.1	07.7	247°21.3	07.3	266°49.9	06.5
20	235°51.5	88°03.4	43.4	90°38.1	07.2	262°24.0	07.3	281°52.5	06.5
21	250°54.0	103°03.0	·· 42.4	105°39.0	·· 06.7	277°26.6	·· 07.4	296°55.2	·· 06.6
22	265°56.5	118°02.5	41.3	120°40.0	06.1	292°29.3	07.5	311°57.8	06.6
23	280°58.9	133°02.1	40.3	135°40.9	05.6	307°32.0	07.6	327°00.4	06.7
Mer.pass.	04:19	ν -0.5′	d -1.0′	m -3.88	ν 0.9′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.76	ν 2.6′	d 0.1′ m 0.32

Stars	SHA	Dec
Alpheratz	357°37.5	29°12.4
Ankaa	353°09.9	-42°11.2
Schedar	349°34.1	56°39.0
Diphda	348°50.1	-17°52.1
Achernar	335°22.4	-57°07.4
Hamal	327°54.4	23°33.7
Polaris	315°31.2	89°20.9
Acamar	315°14.1	-40°12.9
Menkar	314°09.3	4°10.4
Mirfak	308°32.5	49°56.0
Aldebaran	290°43.1	16°33.1
Rigel	281°06.9	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°54.2	-52°42.3
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.0
Procyon	244°54.1	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.2
Miaplacidus	221°39.6	-69°48.4
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.4	-63°13.3
Gacrux	171°54.9	-57°14.2
Alioth	166°15.6	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.3	49°12.7
Hadar	148°39.9	-60°28.7
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°43.9	-60°55.6
Kochab	137°19.5	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.0	-26°28.7
Atria	107°15.3	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.7	-56°39.8
Deneb	49°27.2	45°21.3
Enif	33°41.3	9°58.4
Al Na'ir	27°36.2	-46°51.3
Fomalhaut	15°17.4	-29°30.4
Scheat	13°47.7	28°11.8
Markab	13°32.5	15°19.2

Jul 15 Thu	SHA	Mer.pass
Venus	215°31.6	14:06
Mars	216°30.3	14:01
Jupiter	26°19.9	02:42
Saturn	45°49.2	01:24

Jul 16 Fri	SHA	Mer.pass
Venus	214°20.9	14:07
Mars	215°53.7	13:59
Jupiter	26°24.2	02:38
Saturn	45°53.3	01:20

Jul 17 Sat	SHA	Mer.pass
Venus	213°10.4	14:08
Mars	215°17.0	13:58
Jupiter	26°28.6	02:33
Saturn	45°57.5	01:16

Horizontal parallax	
Venus:	0.1
Mars:	0.1

		Sun			Moon			
h	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.4	N21°31.2	118°34.2	12.7′	N07°52.6	-13.9′	57.5′
1	193°30.4	30.8	133°05.9	12.7′	07°38.7	-13.9′	57.5′
2	208°30.3	30.4	147°37.6	12.7′	07°24.8	-14.0′	57.6′
3	223°30.2	·· 30.0	162°09.4	12.7′	07°10.8	-14.0′	57.6′
4	238°30.2	29.6	176°41.1	12.7′	06°56.8	-14.1′	57.6′
5	253°30.1	29.2	191°12.9	12.8′	06°42.7	-14.1′	57.6′
6	268°30.0	N21°28.8	205°44.6	12.8′	N06°28.6	-14.2′	57.6′
7	283°30.0	28.4	220°16.4	12.8′	06°14.4	-14.2′	57.7′
8	298°29.9	28.0	234°48.1	12.8′	06°00.2	-14.2′	57.7′
9	313°29.9	·· 27.6	249°19.9	12.8′	05°45.9	-14.3′	57.7′
10	328°29.8	27.2	263°51.7	12.8′	05°31.7	-14.3′	57.7′
11	343°29.7	26.8	278°23.5	12.8′	05°17.3	-14.4′	57.8′
12	358°29.7	N21°26.4	292°55.2	12.8′	N05°03.0	-14.4′	57.8′
13	13°29.6	26.0	307°27.0	12.8′	04°48.6	-14.4′	57.8′
14	28°29.5	25.6	321°58.8	12.8′	04°34.2	-14.5′	57.8′
15	43°29.5	·· 25.2	336°30.6	12.8′	04°19.7	-14.5′	57.9′
16	58°29.4	24.8	351°02.3	12.8′	04°05.2	-14.5′	57.9′
17	73°29.4	24.4	5°34.1	12.8′	03°50.7	-14.5′	57.9′
18	88°29.3	N21°24.0	20°05.9	12.8′	N03°36.2	-14.6′	57.9′
19	103°29.2	23.5	34°37.6	12.8′	03°21.6	-14.6′	57.9′
20	118°29.2	23.1	49°09.4	12.7′	03°07.0	-14.6′	58.0′
21	133°29.1	·· 22.7	63°41.1	12.7′	02°52.4	-14.7′	58.0′
22	148°29.1	22.3	78°12.9	12.7′	02°37.7	-14.7′	58.0′
23	163°29.0	21.9	92°44.6	12.7′	02°23.0	-14.7′	58.0′
	SD = 15.7′	d = -0.4′	SD = 15.7′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.9	N21°21.5	107°16.3	12.7′	N02°08.3	-14.7′	58.1′
1	193°28.9	21.1	121°48.0	12.7′	01°53.6	-14.7′	58.1′
2	208°28.8	20.7	136°19.7	12.7′	01°38.9	-14.8′	58.1′
3	223°28.8	·· 20.3	150°51.3	12.7′	01°24.1	-14.8′	58.1′
4	238°28.7	19.9	165°23.0	12.6′	01°09.3	-14.8′	58.1′
5	253°28.7	19.5	179°54.6	12.6′	00°54.6	-14.8′	58.2′
6	268°28.6	N21°19.0	194°26.3	12.6′	N00°39.7	-14.8′	58.2′
7	283°28.5	18.6	208°57.9	12.6′	00°24.9	-14.8′	58.2′
8	298°28.5	18.2	223°29.4	12.6′	N00°10.1	-14.8′	58.2′
9	313°28.4	·· 17.8	238°01.0	12.5′	S00°04.8	14.9′	58.3′
10	328°28.4	17.4	252°32.5	12.5′	00°19.6	14.9′	58.3′
11	343°28.3	17.0	267°04.0	12.5′	00°34.5	14.9′	58.3′
12	358°28.3	N21°16.6	281°35.5	12.5′	S00°49.4	14.9′	58.3′
13	13°28.2	16.1	296°07.0	12.4′	01°04.2	14.9′	58.3′
14	28°28.1	15.7	310°38.4	12.4′	01°19.1	14.9′	58.4′
15	43°28.1	·· 15.3	325°09.8	12.4′	01°34.0	14.9′	58.4′
16	58°28.0	14.9	339°41.2	12.3′	01°48.9	14.9′	58.4′
17	73°28.0	14.5	354°12.5	12.3′	02°03.8	14.9′	58.4′
18	88°27.9	N21°14.0	8°43.8	12.3′	S02°18.7	14.9′	58.5′
19	103°27.9	13.6	23°15.1	12.2′	02°33.6	14.9′	58.5′
20	118°27.8	13.2	37°46.3	12.2′	02°48.5	14.9′	58.5′
21	133°27.8	·· 12.8	52°17.5	12.2′	03°03.4	14.9′	58.5′
22	148°27.7	12.3	66°48.7	12.1′	03°18.3	14.9′	58.5′
23	163°27.7	11.9	81°19.8	12.1′	03°33.2	14.9′	58.6′
	SD = 15.7′	d = -0.4′	SD = 15.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.6	N21°11.5	95°50.9	12.0′	S03°48.0	14.9′	58.6′
1	193°27.5	11.1	110°21.9	12.0′	04°02.9	14.9′	58.6′
2	208°27.5	10.7	124°52.9	12.0′	04°17.8	14.8′	58.6′
3	223°27.4	·· 10.2	139°23.9	11.9′	04°32.6	14.8′	58.7′
4	238°27.4	09.8	153°54.8	11.9′	04°47.5	14.8′	58.7′
5	253°27.3	09.4	168°25.6	11.8′	05°02.3	14.8′	58.7′
6	268°27.3	N21°08.9	182°56.5	11.8′	S05°17.1	14.8′	58.7′
7	283°27.2	08.5	197°27.2	11.7′	05°31.9	14.8′	58.7′
8	298°27.2	08.1	211°57.9	11.7′	05°46.7	14.8′	58.8′
9	313°27.1	·· 07.7	226°28.6	11.6′	06°01.4	14.7′	58.8′
10	328°27.1	07.2	240°59.2	11.6′	06°16.1	14.7′	58.8′
11	343°27.0	06.8	255°29.8	11.5′	06°30.9	14.7′	58.8′
12	358°27.0	N21°06.4	270°00.3	11.5′	S06°45.6	14.7′	58.9′
13	13°26.9	05.9	284°30.8	11.4′	07°00.2	14.6′	58.9′
14	28°26.9	05.5	299°01.2	11.3′	07°14.9	14.6′	58.9′
15	43°26.8	·· 05.1	313°31.5	11.3′	07°29.5	14.6′	58.9′
16	58°26.8	04.6	328°01.8	11.2′	07°44.1	14.6′	58.9′
17	73°26.7	04.2	342°32.0	11.2′	07°58.6	14.5′	59.0′
18	88°26.7	N21°03.8	357°02.2	11.1′	S08°13.2	14.5′	59.0′
19	103°26.6	03.3	11°32.3	11.0′	08°27.7	14.5′	59.0′
20	118°26.6	02.9	26°02.3	11.0′	08°42.1	14.4′	59.0′
21	133°26.5	·· 02.4	40°32.3	10.9′	08°56.5	14.4′	59.0′
22	148°26.5	02.0	55°02.2	10.8′	09°10.9	14.3′	59.1′
23	163°26.4	01.6	69°32.0	10.8′	09°25.3	14.3′	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	21:52	–:–
56°	00:53	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	17:18	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	08:47	15:26	16:19	17:14

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

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 5-7 24-45%
15	05:58	06:01	12:06	16:37	04:14	
16	06:04	06:07	12:06	17:24	05:00	
17	06:10	06:12	12:06	18:12	05:48	

DUT1 = UT1-UTC = -0.1515 sec ΔT = TT-UT1 = +69.3355 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	296°01.4	148°01.6	N14°39.2	150°41.9	N15°05.1	322°34.6	S12°07.7	342°03.1	S18°06.8
1	311°03.8	163°01.2	38.2	165°42.8	04.6	337°37.3	07.8	357°05.7	06.8
2	326°06.3	178°00.7	37.1	180°43.7	04.1	352°39.9	07.8	12°08.3	06.9
3	341°08.8	193°00.3	·· 36.1	195°44.7	·· 03.5	7°42.6	·· 07.9	27°11.0	·· 06.9
4	356°11.2	207°59.8	35.0	210°45.6	03.0	22°45.3	08.0	42°13.6	07.0
5	11°13.7	222°59.4	34.0	225°46.6	02.5	37°47.9	08.1	57°16.3	07.0
6	26°16.2	237°58.9	N14°33.0	240°47.5	N15°02.0	52°50.6	S12°08.2	72°18.9	S18°07.1
7	41°18.6	252°58.5	31.9	255°48.4	01.4	67°53.2	08.3	87°21.5	07.1
8	56°21.1	267°58.0	30.9	270°49.4	00.9	82°55.9	08.4	102°24.2	07.2
9	71°23.6	282°57.6	·· 29.8	285°50.3	15°00.4	97°58.6	·· 08.4	117°26.8	·· 07.2
10	86°26.0	297°57.1	28.8	300°51.3	14°59.9	113°01.2	08.5	132°29.5	07.3
11	101°28.5	312°56.7	27.7	315°52.2	59.3	128°03.9	08.6	147°32.1	07.3
12	116°31.0	327°56.2	N14°26.7	330°53.2	N14°58.8	143°06.5	S12°08.7	162°34.8	S18°07.4
13	131°33.4	342°55.8	25.6	345°54.1	58.3	158°09.2	08.8	177°37.4	07.4
14	146°35.9	357°55.4	24.6	0°55.0	57.8	173°11.9	08.9	192°40.0	07.5
15	161°38.3	12°54.9	·· 23.5	15°56.0	·· 57.2	188°14.5	·· 08.9	207°42.7	·· 07.5
16	176°40.8	27°54.5	22.5	30°56.9	56.7	203°17.2	09.0	222°45.3	07.6
17	191°43.3	42°54.0	21.4	45°57.9	56.2	218°19.9	09.1	237°48.0	07.6
18	206°45.7	57°53.6	N14°20.3	60°58.8	N14°55.7	233°22.5	S12°09.2	252°50.6	S18°07.7
19	221°48.2	72°53.1	19.3	75°59.8	55.1	248°25.2	09.3	267°53.2	07.8
20	236°50.7	87°52.7	18.2	91°00.7	54.6	263°27.9	09.4	282°55.9	07.8
21	251°53.1	102°52.3	·· 17.2	106°01.6	·· 54.1	278°30.5	·· 09.5	297°58.5	·· 07.9
22	266°55.6	117°51.8	16.1	121°02.6	53.6	293°33.2	09.5	313°01.2	07.9
23	281°58.1	132°51.4	15.1	136°03.5	53.0	308°35.8	09.6	328°03.8	08.0
Mer.pass.	04:15	ν -0.5′	d -1.0′	m -3.89	ν 0.9′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.76	ν 2.6′	d 0.1′ m 0.31
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	297°00.5	147°50.9	N14°14.0	151°04.5	N14°52.5	323°38.5	S12°09.7	343°06.4	S18°08.0
1	312°03.0	162°50.5	13.0	166°05.4	52.0	338°41.2	09.8	358°09.1	08.1
2	327°05.5	177°50.1	11.9	181°06.4	51.5	353°43.8	09.9	13°11.7	08.1
3	342°07.9	192°49.6	·· 10.8	196°07.3	·· 50.9	8°46.5	·· 10.0	28°14.4	·· 08.2
4	357°10.4	207°49.2	09.8	211°08.3	50.4	23°49.2	10.1	43°17.0	08.2
5	12°12.8	222°48.8	08.7	226°09.2	49.9	38°51.8	10.1	58°19.6	08.3
6	27°15.3	237°48.3	N14°07.7	241°10.1	N14°49.4	53°54.5	S12°10.2	73°22.3	S18°08.3
7	42°17.8	252°47.9	06.6	256°11.1	48.8	68°57.2	10.3	88°24.9	08.4
8	57°20.2	267°47.4	05.5	271°12.0	48.3	83°59.8	10.4	103°27.6	08.4
9	72°22.7	282°47.0	·· 04.5	286°13.0	·· 47.8	99°02.5	·· 10.5	118°30.2	·· 08.5
10	87°25.2	297°46.6	03.4	301°13.9	47.2	114°05.2	10.6	133°32.9	08.5
11	102°27.6	312°46.1	02.3	316°14.9	46.7	129°07.8	10.7	148°35.5	08.6
12	117°30.1	327°45.7	N14°01.3	331°15.8	N14°46.2	144°10.5	S12°10.7	163°38.1	S18°08.7
13	132°32.6	342°45.3	14°00.2	346°16.8	45.7	159°13.2	10.8	178°40.8	08.7
14	147°35.0	357°44.8	13°59.1	1°17.7	45.1	174°15.9	10.9	193°43.4	08.8
15	162°37.5	12°44.4	·· 58.1	16°18.6	·· 44.6	189°18.5	·· 11.0	208°46.1	·· 08.8
16	177°39.9	27°44.0	57.0	31°19.6	44.1	204°21.2	11.1	223°48.7	08.9
17	192°42.4	42°43.6	55.9	46°20.5	43.6	219°23.9	11.2	238°51.3	08.9
18	207°44.9	57°43.1	N13°54.9	61°21.5	N14°43.0	234°26.5	S12°11.3	253°54.0	S18°09.0
19	222°47.3	72°42.7	53.8	76°22.4	42.5	249°29.2	11.4	268°56.6	09.0
20	237°49.8	87°42.3	52.7	91°23.4	42.0	264°31.9	11.4	283°59.3	09.1
21	252°52.3	102°41.8	·· 51.7	106°24.3	·· 41.4	279°34.5	·· 11.5	299°01.9	·· 09.1
22	267°54.7	117°41.4	50.6	121°25.3	40.9	294°37.2	11.6	314°04.6	09.2
23	282°57.2	132°41.0	49.5	136°26.2	40.4	309°39.9	11.7	329°07.2	09.2
Mer.pass.	04:11	ν -0.4′	d -1.1′	m -3.89	ν 0.9′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.77	ν 2.6′	d 0.1′ m 0.31
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	297°59.7	147°40.6	N13°48.4	151°27.2	N14°39.8	324°42.6	S12°11.8	344°09.8	S18°09.3
1	313°02.1	162°40.1	47.4	166°28.1	39.3	339°45.2	11.9	359°12.5	09.3
2	328°04.6	177°39.7	46.3	181°29.1	38.8	354°47.9	12.0	14°15.1	09.4
3	343°07.1	192°39.3	·· 45.2	196°30.0	·· 38.3	9°50.6	·· 12.1	29°17.8	·· 09.4
4	358°09.5	207°38.9	44.1	211°30.9	37.7	24°53.2	12.1	44°20.4	09.5
5	13°12.0	222°38.4	43.1	226°31.9	37.2	39°55.9	12.2	59°23.1	09.6
6	28°14.4	237°38.0	N13°42.0	241°32.8	N14°36.7	54°58.6	S12°12.3	74°25.7	S18°09.6
7	43°16.9	252°37.6	40.9	256°33.8	36.1	70°01.3	12.4	89°28.3	09.7
8	58°19.4	267°37.2	39.8	271°34.7	35.6	85°03.9	12.5	104°31.0	09.7
9	73°21.8	282°36.7	·· 38.8	286°35.7	·· 35.1	100°06.6	·· 12.6	119°33.6	·· 09.8
10	88°24.3	297°36.3	37.7	301°36.6	34.5	115°09.3	12.7	134°36.3	09.8
11	103°26.8	312°35.9	36.6	316°37.6	34.0	130°12.0	12.8	149°38.9	09.9
12	118°29.2	327°35.5	N13°35.5	331°38.5	N14°33.5	145°14.6	S12°12.9	164°41.6	S18°09.9
13	133°31.7	342°35.1	34.4	346°39.5	32.9	160°17.3	12.9	179°44.2	10.0
14	148°34.2	357°34.6	33.4	1°40.4	32.4	175°20.0	13.0	194°46.8	10.0
15	163°36.6	12°34.2	·· 32.3	16°41.4	·· 31.9	190°22.7	·· 13.1	209°49.5	·· 10.1
16	178°39.1	27°33.8	31.2	31°42.3	31.3	205°25.3	13.2	224°52.1	10.1
17	193°41.6	42°33.4	30.1	46°43.3	30.8	220°28.0	13.3	239°54.8	10.2
18	208°44.0	57°33.0	N13°29.0	61°44.2	N14°30.3	235°30.7	S12°13.4	254°57.4	S18°10.2
19	223°46.5	72°32.6	27.9	76°45.2	29.7	250°33.4	13.5	270°00.1	10.3
20	238°48.9	87°32.1	26.9	91°46.1	29.2	265°36.0	13.6	285°02.7	10.4
21	253°51.4	102°31.7	·· 25.8	106°47.0	·· 28.7	280°38.7	·· 13.7	300°05.4	·· 10.4
22	268°53.9	117°31.3	24.7	121°48.0	28.1	295°41.4	13.7	315°08.0	10.5
23	283°56.3	132°30.9	23.6	136°48.9	27.6	310°44.1	13.8	330°10.6	10.5
Mer.pass.	04:07	ν -0.4′	d -1.1′	m -3.89	ν 0.9′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.77	ν 2.6′	d 0.1′ m 0.30

Stars	SHA	Dec
Alpheratz	357°37.5	29°12.4
Ankaa	353°09.9	-42°11.2
Schedar	349°34.0	56°39.0
Diphda	348°50.1	-17°52.1
Achernar	335°22.4	-57°07.4
Hamal	327°54.4	23°33.7
Polaris	315°29.7	89°20.9
Acamar	315°14.1	-40°12.9
Menkar	314°09.2	4°10.4
Mirfak	308°32.5	49°56.0
Aldebaran	290°43.1	16°33.1
Rigel	281°06.9	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.7
Canopus	263°54.2	-52°42.3
Sirius	258°29.1	-16°44.7
Adhara	255°08.5	-29°00.0
Procyon	244°54.1	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.2
Miaplacidus	221°39.6	-69°48.4
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.4	-63°13.3
Gacrux	171°54.9	-57°14.2
Alioth	166°15.7	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.3	49°12.7
Hadar	148°39.9	-60°28.7
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.0	-60°55.6
Kochab	137°19.5	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°04.0
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.4
Enif	33°41.3	9°58.4
Al Na'ir	27°36.1	-46°51.3
Fomalhaut	15°17.4	-29°30.4
Scheat	13°47.7	28°11.8
Markab	13°32.5	15°19.2

Jul 18 Sun	SHA	Mer.pass
Venus	212°00.2	14:08
Mars	214°40.5	13:56
Jupiter	26°33.2	02:29
Saturn	46°01.7	01:12

Jul 19 Mon	SHA	Mer.pass
Venus	210°50.4	14:09
Mars	214°04.0	13:55
Jupiter	26°38.0	02:25
Saturn	46°05.9	01:07

Jul 20 Tue	SHA	Mer.pass
Venus	209°40.9	14:10
Mars	213°27.5	13:53
Jupiter	26°42.9	02:21
Saturn	46°10.2	01:03

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.4	N21°01.1	84°01.8	10.7′	S09°39.6	14.3′	59.1′
1	193°26.3	00.7	98°31.5	10.6′	09°53.8	14.2′	59.1′
2	208°26.3	21°00.3	113°01.1	10.6′	10°08.1	14.2′	59.1′
3	223°26.3	20°59.8	127°30.6	10.5′	10°22.3	14.1′	59.2′
4	238°26.2	59.4	142°00.1	10.4′	10°36.4	14.1′	59.2′
5	253°26.2	58.9	156°29.5	10.3′	10°50.5	14.0′	59.2′
6	268°26.1	N20°58.5	170°58.9	10.3′	S11°04.5	14.0′	59.2′
7	283°26.1	58.0	185°28.1	10.2′	11°18.5	13.9′	59.2′
8	298°26.0	57.6	199°57.3	10.1′	11°32.4	13.9′	59.3′
9	313°26.0	·· 57.2	214°26.4	10.0′	11°46.3	13.8′	59.3′
10	328°25.9	56.7	228°55.5	9.9′	12°00.1	13.8′	59.3′
11	343°25.9	56.3	243°24.4	9.9′	12°13.9	13.7′	59.3′
12	358°25.8	N20°55.8	257°53.3	9.8′	S12°27.6	13.6′	59.3′
13	13°25.8	55.4	272°22.1	9.7′	12°41.2	13.6′	59.3′
14	28°25.8	54.9	286°50.8	9.6′	12°54.8	13.5′	59.4′
15	43°25.7	·· 54.5	301°19.4	9.5′	13°08.3	13.5′	59.4′
16	58°25.7	54.0	315°47.9	9.5′	13°21.8	13.4′	59.4′
17	73°25.6	53.6	330°16.4	9.4′	13°35.2	13.3′	59.4′
18	88°25.6	N20°53.1	344°44.8	9.3′	S13°48.5	13.2′	59.4′
19	103°25.5	52.7	359°13.0	9.2′	14°01.8	13.2′	59.5′
20	118°25.5	52.2	13°41.2	9.1′	14°14.9	13.1′	59.5′
21	133°25.5	·· 51.8	28°09.3	9.0′	14°28.0	13.0′	59.5′
22	148°25.4	51.3	42°37.4	8.9′	14°41.1	13.0′	59.5′
23	163°25.4	50.9	57°05.3	8.8′	14°54.0	12.9′	59.5′
	SD = 15.7′	d = -0.4′	SD = 16.1′				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.3	N20°50.4	71°33.1	8.7′	S15°06.9	12.8′	59.5′
1	193°25.3	50.0	86°00.9	8.7′	15°19.7	12.7′	59.6′
2	208°25.2	49.5	100°28.5	8.6′	15°32.4	12.6′	59.6′
3	223°25.2	·· 49.0	114°56.1	8.5′	15°45.0	12.5′	59.6′
4	238°25.2	48.6	129°23.6	8.4′	15°57.6	12.5′	59.6′
5	253°25.1	48.1	143°50.9	8.3′	16°10.0	12.4′	59.6′
6	268°25.1	N20°47.7	158°18.2	8.2′	S16°22.4	12.3′	59.6′
7	283°25.0	47.2	172°45.4	8.1′	16°34.7	12.2′	59.7′
8	298°25.0	46.8	187°12.5	8.0′	16°46.8	12.1′	59.7′
9	313°25.0	·· 46.3	201°39.5	7.9′	16°58.9	12.0′	59.7′
10	328°24.9	45.8	216°06.4	7.8′	17°10.9	11.9′	59.7′
11	343°24.9	45.4	230°33.2	7.7′	17°22.8	11.8′	59.7′
12	358°24.8	N20°44.9	244°59.9	7.6′	S17°34.6	11.7′	59.7′
13	13°24.8	44.5	259°26.6	7.5′	17°46.3	11.6′	59.7′
14	28°24.8	44.0	273°53.1	7.4′	17°57.9	11.5′	59.8′
15	43°24.7	·· 43.5	288°19.5	7.3′	18°09.4	11.4′	59.8′
16	58°24.7	43.1	302°45.8	7.2′	18°20.7	11.3′	59.8′
17	73°24.7	42.6	317°12.1	7.1′	18°32.0	11.2′	59.8′
18	88°24.6	N20°42.1	331°38.2	7.0′	S18°43.2	11.0′	59.8′
19	103°24.6	41.7	346°04.2	6.9′	18°54.2	10.9′	59.8′
20	118°24.5	41.2	0°30.2	6.8′	19°05.2	10.8′	59.8′
21	133°24.5	·· 40.7	14°56.0	6.7′	19°16.0	10.7′	59.8′
22	148°24.5	40.3	29°21.8	6.6′	19°26.7	10.6′	59.9′
23	163°24.4	39.8	43°47.4	6.6′	19°37.3	10.5′	59.9′
	SD = 15.7′	d = -0.5′	SD = 16.2′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.4	N20°39.3	58°13.0	6.5′	S19°47.7	10.3′	59.9′
1	193°24.4	38.9	72°38.4	6.4′	19°58.1	10.2′	59.9′
2	208°24.3	38.4	87°03.8	6.3′	20°08.3	10.1′	59.9′
3	223°24.3	·· 37.9	101°29.0	6.2′	20°18.4	10.0′	59.9′
4	238°24.3	37.5	115°54.2	6.1′	20°28.3	9.8′	59.9′
5	253°24.2	37.0	130°19.3	6.0′	20°38.2	9.7′	59.9′
6	268°24.2	N20°36.5	144°44.2	5.9′	S20°47.9	9.6′	59.9′
7	283°24.2	36.0	159°09.1	5.8′	20°57.4	9.4′	59.9′
8	298°24.1	35.6	173°33.9	5.7′	21°06.9	9.3′	60.0′
9	313°24.1	·· 35.1	187°58.6	5.6′	21°16.2	9.2′	60.0′
10	328°24.1	34.6	202°23.2	5.5′	21°25.3	9.0′	60.0′
11	343°24.0	34.1	216°47.7	5.4′	21°34.4	8.9′	60.0′
12	358°24.0	N20°33.7	231°12.1	5.3′	S21°43.2	8.7′	60.0′
13	13°24.0	33.2	245°36.5	5.2′	21°52.0	8.6′	60.0′
14	28°23.9	32.7	260°00.7	5.2′	22°00.6	8.4′	60.0′
15	43°23.9	·· 32.2	274°24.9	5.1′	22°09.0	8.3′	60.0′
16	58°23.9	31.8	288°48.9	5.0′	22°17.3	8.2′	60.0′
17	73°23.8	31.3	303°12.9	4.9′	22°25.5	8.0′	60.0′
18	88°23.8	N20°30.8	317°36.8	4.8′	S22°33.5	7.9′	60.0′
19	103°23.8	30.3	332°00.6	4.7′	22°41.3	7.7′	60.0′
20	118°23.7	29.8	346°24.4	4.6′	22°49.0	7.5′	60.0′
21	133°23.7	·· 29.4	0°48.0	4.6′	22°56.6	7.4′	60.0′
22	148°23.7	28.9	15°11.6	4.5′	23°04.0	7.2′	60.0′
23	163°23.7	28.4	29°35.1	4.4′	23°11.2	7.1′	60.1′
	SD = 15.7′	d = -0.5′	SD = 16.3′				

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

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

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 8-10 57-78%
18	06:14	06:17	12:06	19:03	06:37	
19	06:19	06:21	12:06	19:58	07:30	
20	06:22	06:24	12:06	20:57	08:27	

DUT1 = UT1-UTC = -0.1501 sec ΔT = TT-UT1 = +69.3341 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	298°58.8	147°30.5	N13°22.5	151°49.9	N14°27.1	325°46.8	S12°13.9	345°13.3	S18°10.6
1	314°01.3	162°30.1	21.4	166°50.8	26.5	340°49.4	14.0	0°15.9	10.6
2	329°03.7	177°29.7	20.3	181°51.8	26.0	355°52.1	14.1	15°18.6	10.7
3	344°06.2	192°29.2	·· 19.3	196°52.7	·· 25.5	10°54.8	·· 14.2	30°21.2	·· 10.7
4	359°08.7	207°28.8	18.2	211°53.7	24.9	25°57.5	14.3	45°23.9	10.8
5	14°11.1	222°28.4	17.1	226°54.6	24.4	41°00.1	14.4	60°26.5	10.8
6	29°13.6	237°28.0	N13°16.0	241°55.6	N14°23.9	56°02.8	S12°14.5	75°29.1	S18°10.9
7	44°16.1	252°27.6	14.9	256°56.5	23.3	71°05.5	14.6	90°31.8	10.9
8	59°18.5	267°27.2	13.8	271°57.5	22.8	86°08.2	14.6	105°34.4	11.0
9	74°21.0	282°26.8	·· 12.7	286°58.4	·· 22.3	101°10.9	·· 14.7	120°37.1	·· 11.0
10	89°23.4	297°26.4	11.6	301°59.4	21.7	116°13.5	14.8	135°39.7	11.1
11	104°25.9	312°26.0	10.5	317°00.3	21.2	131°16.2	14.9	150°42.4	11.2
12	119°28.4	327°25.6	N13°09.4	332°01.3	N14°20.7	146°18.9	S12°15.0	165°45.0	S18°11.2
13	134°30.8	342°25.1	08.3	347°02.2	20.1	161°21.6	15.1	180°47.7	11.3
14	149°33.3	357°24.7	07.2	2°03.2	19.6	176°24.3	15.2	195°50.3	11.3
15	164°35.8	12°24.3	·· 06.2	17°04.1	·· 19.0	191°26.9	·· 15.3	210°52.9	·· 11.4
16	179°38.2	27°23.9	05.1	32°05.1	18.5	206°29.6	15.4	225°55.6	11.4
17	194°40.7	42°23.5	04.0	47°06.0	18.0	221°32.3	15.5	240°58.2	11.5
18	209°43.2	57°23.1	N13°02.9	62°07.0	N14°17.4	236°35.0	S12°15.6	256°00.9	S18°11.5
19	224°45.6	72°22.7	01.8	77°07.9	16.9	251°37.7	15.6	271°03.5	11.6
20	239°48.1	87°22.3	13°00.7	92°08.9	16.4	266°40.4	15.7	286°06.2	11.6
21	254°50.6	102°21.9	12°59.6	107°09.8	·· 15.8	281°43.0	·· 15.8	301°08.8	·· 11.7
22	269°53.0	117°21.5	58.5	122°10.8	15.3	296°45.7	15.9	316°11.5	11.7
23	284°55.5	132°21.1	57.4	137°11.7	14.8	311°48.4	16.0	331°14.1	11.8
Mer.pass.	04:03	ν -0.4′	d -1.1′	m -3.89	ν 0.9′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.78	ν 2.6′	d 0.1′ m 0.30

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	299°57.9	147°20.7	N12°56.3	152°12.7	N14°14.2	326°51.1	S12°16.1	346°16.7	S18°11.8
1	315°00.4	162°20.3	55.2	167°13.6	13.7	341°53.8	16.2	1°19.4	11.9
2	330°02.9	177°19.9	54.1	182°14.6	13.1	356°56.5	16.3	16°22.0	12.0
3	345°05.3	192°19.5	·· 53.0	197°15.5	·· 12.6	11°59.1	·· 16.4	31°24.7	·· 12.0
4	0°07.8	207°19.1	51.9	212°16.5	12.1	27°01.8	16.5	46°27.3	12.1
5	15°10.3	222°18.7	50.8	227°17.4	11.5	42°04.5	16.6	61°30.0	12.1
6	30°12.7	237°18.3	N12°49.7	242°18.4	N14°11.0	57°07.2	S12°16.7	76°32.6	S18°12.2
7	45°15.2	252°17.9	48.5	257°19.3	10.4	72°09.9	16.7	91°35.3	12.2
8	60°17.7	267°17.5	47.4	272°20.3	09.9	87°12.6	16.8	106°37.9	12.3
9	75°20.1	282°17.1	·· 46.3	287°21.2	·· 09.4	102°15.3	·· 16.9	121°40.6	·· 12.3
10	90°22.6	297°16.7	45.2	302°22.2	08.8	117°17.9	17.0	136°43.2	12.4
11	105°25.1	312°16.3	44.1	317°23.1	08.3	132°20.6	17.1	151°45.8	12.4
12	120°27.5	327°15.9	N12°43.0	332°24.1	N14°07.8	147°23.3	S12°17.2	166°48.5	S18°12.5
13	135°30.0	342°15.5	41.9	347°25.0	07.2	162°26.0	17.3	181°51.1	12.5
14	150°32.4	357°15.1	40.8	2°26.0	06.7	177°28.7	17.4	196°53.8	12.6
15	165°34.9	12°14.7	·· 39.7	17°26.9	·· 06.1	192°31.4	·· 17.5	211°56.4	·· 12.7
16	180°37.4	27°14.3	38.6	32°27.9	05.6	207°34.1	17.6	226°59.1	12.7
17	195°39.8	42°14.0	37.5	47°28.9	05.1	222°36.7	17.7	242°01.7	12.8
18	210°42.3	57°13.6	N12°36.4	62°29.8	N14°04.5	237°39.4	S12°17.8	257°04.4	S18°12.8
19	225°44.8	72°13.2	35.3	77°30.8	04.0	252°42.1	17.9	272°07.0	12.9
20	240°47.2	87°12.8	34.1	92°31.7	03.4	267°44.8	18.0	287°09.7	12.9
21	255°49.7	102°12.4	·· 33.0	107°32.7	·· 02.9	282°47.5	·· 18.0	302°12.3	·· 13.0
22	270°52.2	117°12.0	31.9	122°33.6	02.3	297°50.2	18.1	317°14.9	13.0
23	285°54.6	132°11.6	30.8	137°34.6	01.8	312°52.9	18.2	332°17.6	13.1
Mer.pass.	03:59	ν -0.4′	d -1.1′	m -3.89	ν 1.0′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.79	ν 2.6′	d 0.1′ m 0.29

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°57.1	147°11.2	N12°29.7	152°35.5	N14°01.3	327°55.6	S12°18.3	347°20.2	S18°13.1
1	315°59.6	162°10.8	28.6	167°36.5	00.7	342°58.3	18.4	2°22.9	13.2
2	331°02.0	177°10.4	27.5	182°37.4	14°00.2	358°00.9	18.5	17°25.5	13.2
3	346°04.5	192°10.1	·· 26.3	197°38.4	13°59.6	13°03.6	·· 18.6	32°28.2	·· 13.3
4	1°06.9	207°09.7	25.2	212°39.3	59.1	28°06.3	18.7	47°30.8	13.3
5	16°09.4	222°09.3	24.1	227°40.3	58.6	43°09.0	18.8	62°33.5	13.4
6	31°11.9	237°08.9	N12°23.0	242°41.2	N13°58.0	58°11.7	S12°18.9	77°36.1	S18°13.5
7	46°14.3	252°08.5	21.9	257°42.2	57.5	73°14.4	19.0	92°38.8	13.5
8	61°16.8	267°08.1	20.8	272°43.1	56.9	88°17.1	19.1	107°41.4	13.6
9	76°19.3	282°07.7	·· 19.6	287°44.1	·· 56.4	103°19.8	·· 19.2	122°44.1	·· 13.6
10	91°21.7	297°07.4	18.5	302°45.0	55.8	118°22.5	19.3	137°46.7	13.7
11	106°24.2	312°07.0	17.4	317°46.0	55.3	133°25.2	19.4	152°49.3	13.7
12	121°26.7	327°06.6	N12°16.3	332°47.0	N13°54.8	148°27.9	S12°19.5	167°52.0	S18°13.8
13	136°29.1	342°06.2	15.2	347°47.9	54.2	163°30.5	19.6	182°54.6	13.8
14	151°31.6	357°05.8	14.0	2°48.9	53.7	178°33.2	19.6	197°57.3	13.9
15	166°34.0	12°05.4	·· 12.9	17°49.8	·· 53.1	193°35.9	·· 19.7	212°59.9	·· 13.9
16	181°36.5	27°05.1	11.8	32°50.8	52.6	208°38.6	19.8	228°02.6	14.0
17	196°39.0	42°04.7	10.7	47°51.7	52.0	223°41.3	19.9	243°05.2	14.0
18	211°41.4	57°04.3	N12°09.6	62°52.7	N13°51.5	238°44.0	S12°20.0	258°07.9	S18°14.1
19	226°43.9	72°03.9	08.4	77°53.6	50.9	253°46.7	20.1	273°10.5	14.2
20	241°46.4	87°03.5	07.3	92°54.6	50.4	268°49.4	20.2	288°13.2	14.2
21	256°48.8	102°03.2	·· 06.2	107°55.5	·· 49.9	283°52.1	·· 20.3	303°15.8	·· 14.3
22	271°51.3	117°02.8	05.1	122°56.5	49.3	298°54.8	20.4	318°18.5	14.3
23	286°53.8	132°02.4	03.9	137°57.5	48.8	313°57.5	20.5	333°21.1	14.4
Mer.pass.	03:56	ν -0.4′	d -1.1′	m -3.90	ν 1.0′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.79	ν 2.6′	d 0.1′ m 0.29

Stars	SHA	Dec
Alpheratz	357°37.5	29°12.4
Ankaa	353°09.8	-42°11.2
Schedar	349°34.0	56°39.0
Diphda	348°50.1	-17°52.0
Achernar	335°22.4	-57°07.4
Hamal	327°54.4	23°33.7
Polaris	315°27.9	89°20.9
Acamar	315°14.1	-40°12.9
Menkar	314°09.2	4°10.4
Mirfak	308°32.5	49°56.0
Aldebaran	290°43.1	16°33.1
Rigel	281°06.8	-8°10.6
Capella	280°26.4	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.4	7°24.7
Canopus	263°54.1	-52°42.3
Sirius	258°29.1	-16°44.7
Adhara	255°08.4	-29°00.0
Procyon	244°54.1	5°10.2
Pollux	243°21.2	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.6	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.4	-63°13.3
Gacrux	171°54.9	-57°14.2
Alioth	166°15.7	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.3	49°12.7
Hadar	148°39.9	-60°28.7
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.0	-60°55.6
Kochab	137°19.6	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.3
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.3
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.4
Enif	33°41.3	9°58.4
Al Na'ir	27°36.1	-46°51.3
Fomalhaut	15°17.4	-29°30.4
Scheat	13°47.7	28°11.8
Markab	13°32.5	15°19.2

Jul 21 Wed	SHA	Mer.pass
Venus	208°31.7	14:10
Mars	212°51.1	13:52
Jupiter	26°48.0	02:16
Saturn	46°14.5	00:59

Jul 22 Thu	SHA	Mer.pass
Venus	207°22.8	14:11
Mars	212°14.7	13:50
Jupiter	26°53.1	02:12
Saturn	46°18.8	00:55

Jul 23 Fri	SHA	Mer.pass
Venus	206°14.1	14:12
Mars	211°38.4	13:49
Jupiter	26°58.5	02:08
Saturn	46°23.1	00:51

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.6	N20°27.9	43°58.5	4.3′	S23°18.3	6.9′	60.1′
1	193°23.6	27.4	58°21.8	4.3′	23°25.2	6.7′	60.1′
2	208°23.6	27.0	72°45.1	4.2′	23°31.9	6.6′	60.1′
3	223°23.5	·· 26.5	87°08.3	4.1′	23°38.5	6.4′	60.1′
4	238°23.5	26.0	101°31.4	4.0′	23°44.9	6.3′	60.1′
5	253°23.5	25.5	115°54.4	4.0′	23°51.2	6.1′	60.1′
6	268°23.5	N20°25.0	130°17.4	3.9′	S23°57.3	5.9′	60.1′
7	283°23.4	24.5	144°40.3	3.8′	24°03.2	5.8′	60.1′
8	298°23.4	24.0	159°03.2	3.8′	24°08.9	5.6′	60.1′
9	313°23.4	·· 23.6	173°25.9	3.7′	24°14.5	5.4′	60.1′
10	328°23.3	23.1	187°48.7	3.7′	24°19.9	5.2′	60.1′
11	343°23.3	22.6	202°11.3	3.6′	24°25.2	5.1′	60.1′
12	358°23.3	N20°22.1	216°34.0	3.6′	S24°30.2	4.9′	60.1′
13	13°23.3	21.6	230°56.5	3.5′	24°35.1	4.7′	60.1′
14	28°23.2	21.1	245°19.0	3.5′	24°39.8	4.5′	60.1′
15	43°23.2	·· 20.6	259°41.5	3.4′	24°44.4	4.4′	60.1′
16	58°23.2	20.1	274°03.9	3.4′	24°48.7	4.2′	60.1′
17	73°23.2	19.6	288°26.2	3.3′	24°52.9	4.0′	60.1′
18	88°23.1	N20°19.1	302°48.5	3.3′	S24°56.9	3.8′	60.1′
19	103°23.1	18.6	317°10.8	3.2′	25°00.7	3.6′	60.1′
20	118°23.1	18.1	331°33.1	3.2′	25°04.4	3.5′	60.1′
21	133°23.1	·· 17.6	345°55.3	3.2′	25°07.8	3.3′	60.1′
22	148°23.0	17.2	0°17.4	3.1′	25°11.1	3.1′	60.1′
23	163°23.0	16.7	14°39.6	3.1′	25°14.2	2.9′	60.0′
	SD = 15.7′	d = -0.5′	SD = 16.4′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.0	N20°16.2	29°01.7	3.1′	S25°17.1	2.7′	60.0′
1	193°23.0	15.7	43°23.7	3.1′	25°19.8	2.5′	60.0′
2	208°22.9	15.2	57°45.8	3.0′	25°22.4	2.4′	60.0′
3	223°22.9	·· 14.7	72°07.8	3.0′	25°24.7	2.2′	60.0′
4	238°22.9	14.2	86°29.8	3.0′	25°26.9	2.0′	60.0′
5	253°22.9	13.7	100°51.8	3.0′	25°28.9	1.8′	60.0′
6	268°22.9	N20°13.2	115°13.8	3.0′	S25°30.7	1.6′	60.0′
7	283°22.8	12.7	129°35.8	3.0′	25°32.3	1.4′	60.0′
8	298°22.8	12.2	143°57.7	3.0′	25°33.7	1.2′	60.0′
9	313°22.8	·· 11.7	158°19.7	3.0′	25°35.0	1.1′	60.0′
10	328°22.8	11.2	172°41.6	2.9′	25°36.0	0.9′	60.0′
11	343°22.7	10.7	187°03.6	3.0′	25°36.9	0.7′	60.0′
12	358°22.7	N20°10.2	201°25.5	3.0′	S25°37.6	0.5′	60.0′
13	13°22.7	09.6	215°47.5	3.0′	25°38.1	0.3′	59.9′
14	28°22.7	09.1	230°09.5	3.0′	25°38.4	0.1′	59.9′
15	43°22.7	·· 08.6	244°31.4	3.0′	25°38.5	-0.1′	59.9′
16	58°22.6	08.1	258°53.4	3.0′	25°38.5	-0.2′	59.9′
17	73°22.6	07.6	273°15.4	3.0′	25°38.2	-0.4′	59.9′
18	88°22.6	N20°07.1	287°37.4	3.0′	S25°37.8	-0.6′	59.9′
19	103°22.6	06.6	301°59.5	3.1′	25°37.2	-0.8′	59.9′
20	118°22.6	06.1	316°21.5	3.1′	25°36.4	-1.0′	59.9′
21	133°22.6	·· 05.6	330°43.6	3.1′	25°35.4	-1.2′	59.9′
22	148°22.5	05.1	345°05.7	3.1′	25°34.2	-1.4′	59.8′
23	163°22.5	04.6	359°27.9	3.2′	25°32.8	-1.5′	59.8′
	SD = 15.7′	d = -0.5′	SD = 16.4′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.5	N20°04.1	13°50.1	3.2′	S25°31.3	-1.7′	59.8′
1	193°22.5	03.6	28°12.3	3.3′	25°29.6	-1.9′	59.8′
2	208°22.5	03.0	42°34.5	3.3′	25°27.7	-2.1′	59.8′
3	223°22.4	·· 02.5	56°56.8	3.3′	25°25.6	-2.3′	59.8′
4	238°22.4	02.0	71°19.2	3.4′	25°23.3	-2.5′	59.8′
5	253°22.4	01.5	85°41.6	3.4′	25°20.8	-2.6′	59.7′
6	268°22.4	N20°01.0	100°04.0	3.5′	S25°18.2	-2.8′	59.7′
7	283°22.4	00.5	114°26.5	3.5′	25°15.4	-3.0′	59.7′
8	298°22.4	20°00.0	128°49.0	3.6′	25°12.4	-3.2′	59.7′
9	313°22.4	19°59.4	143°11.6	3.6′	25°09.3	-3.3′	59.7′
10	328°22.3	58.9	157°34.2	3.7′	25°05.9	-3.5′	59.7′
11	343°22.3	58.4	171°56.9	3.8′	25°02.4	-3.7′	59.6′
12	358°22.3	N19°57.9	186°19.7	3.8′	S24°58.7	-3.9′	59.6′
13	13°22.3	57.4	200°42.6	3.9′	24°54.8	-4.0′	59.6′
14	28°22.3	56.9	215°05.5	4.0′	24°50.8	-4.2′	59.6′
15	43°22.3	·· 56.3	229°28.4	4.0′	24°46.6	-4.4′	59.6′
16	58°22.3	55.8	243°51.5	4.1′	24°42.2	-4.5′	59.5′
17	73°22.2	55.3	258°14.6	4.2′	24°37.7	-4.7′	59.5′
18	88°22.2	N19°54.8	272°37.8	4.3′	S24°33.0	-4.9′	59.5′
19	103°22.2	54.2	287°01.0	4.3′	24°28.1	-5.0′	59.5′
20	118°22.2	53.7	301°24.4	4.4′	24°23.0	-5.2′	59.5′
21	133°22.2	·· 53.2	315°47.8	4.5′	24°17.8	-5.4′	59.4′
22	148°22.2	52.7	330°11.3	4.6′	24°12.5	-5.5′	59.4′
23	163°22.2	52.2	344°34.9	4.7′	24°06.9	-5.7′	59.4′
	SD = 15.7′	d = -0.5′	SD = 16.3′				

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°	–:–	02:08	03:18	20:53	22:02	–:–
N 58°	–:–	02:34	03:33	20:38	21:37	–:–
56°	01:24	02:54	03:46	20:26	21:18	22:45
54°	01:58	03:10	03:57	20:15	21:02	22:13
52°	02:21	03:23	04:07	20:05	20:48	21:50
50°	02:40	03:35	04:16	19:56	20:37	21:32
45°	03:14	03:59	04:35	19:38	20:13	20:58
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	19:00	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	17:11	17:39	18:10
40°	06:11	06:44	07:14	17:00	17:29	18:02
45°	06:19	06:55	07:28	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	16:59	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	07:36	08:23	15:51	16:38	17:28
S 60°	06:51	07:44	08:36	15:38	16:29	17:22

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

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 11-13 87-98%
21	06:26	06:27	12:06	21:59	09:27	
22	06:28	06:29	12:06	23:02	10:31	
23	06:30	06:31	12:07	–:–	11:34	

DUT1 = UT1-UTC = -0.1475 sec ΔT = TT-UT1 = +69.3315 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	301°56.2	147°02.0	N12°02.8	152°58.4	N13°48.2	329°00.2	S12°20.6	348°23.8	S18°14.4
1	316°58.7	162°01.6	01.7	167°59.4	47.7	344°02.9	20.7	3°26.4	14.5
2	332°01.2	177°01.3	12°00.5	183°00.3	47.1	359°05.6	20.8	18°29.0	14.5
3	347°03.6	192°00.9	11°59.4	198°01.3	·· 46.6	14°08.3	·· 20.9	33°31.7	·· 14.6
4	2°06.1	207°00.5	58.3	213°02.2	46.0	29°11.0	21.0	48°34.3	14.6
5	17°08.5	222°00.1	57.2	228°03.2	45.5	44°13.7	21.1	63°37.0	14.7
6	32°11.0	236°59.8	N11°56.0	243°04.1	N13°45.0	59°16.4	S12°21.2	78°39.6	S18°14.7
7	47°13.5	251°59.4	54.9	258°05.1	44.4	74°19.0	21.3	93°42.3	14.8
8	62°15.9	266°59.0	53.8	273°06.0	43.9	89°21.7	21.4	108°44.9	14.9
9	77°18.4	281°58.6	·· 52.6	288°07.0	·· 43.3	104°24.4	·· 21.5	123°47.6	·· 14.9
10	92°20.9	296°58.3	51.5	303°08.0	42.8	119°27.1	21.6	138°50.2	15.0
11	107°23.3	311°57.9	50.4	318°08.9	42.2	134°29.8	21.7	153°52.9	15.0
12	122°25.8	326°57.5	N11°49.2	333°09.9	N13°41.7	149°32.5	S12°21.7	168°55.5	S18°15.1
13	137°28.3	341°57.2	48.1	348°10.8	41.1	164°35.2	21.8	183°58.2	15.1
14	152°30.7	356°56.8	47.0	3°11.8	40.6	179°37.9	21.9	199°00.8	15.2
15	167°33.2	11°56.4	·· 45.8	18°12.7	·· 40.0	194°40.6	·· 22.0	214°03.5	·· 15.2
16	182°35.7	26°56.0	44.7	33°13.7	39.5	209°43.3	22.1	229°06.1	15.3
17	197°38.1	41°55.7	43.6	48°14.7	38.9	224°46.0	22.2	244°08.8	15.3
18	212°40.6	56°55.3	N11°42.4	63°15.6	N13°38.4	239°48.7	S12°22.3	259°11.4	S18°15.4
19	227°43.0	71°54.9	41.3	78°16.6	37.8	254°51.4	22.4	274°14.1	15.4
20	242°45.5	86°54.6	40.2	93°17.5	37.3	269°54.1	22.5	289°16.7	15.5
21	257°48.0	101°54.2	·· 39.0	108°18.5	·· 36.7	284°56.8	·· 22.6	304°19.3	·· 15.6
22	272°50.4	116°53.8	37.9	123°19.4	36.2	299°59.5	22.7	319°22.0	15.6
23	287°52.9	131°53.5	36.8	138°20.4	35.6	315°02.2	22.8	334°24.6	15.7
Mer.pass.	03:52	ν -0.4′	d -1.1′	m -3.90	ν 1.0′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.80	ν 2.6′	d 0.1′ m 0.28

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	302°55.4	146°53.1	N11°35.6	153°21.3	N13°35.1	330°04.9	S12°22.9	349°27.3	S18°15.7
1	317°57.8	161°52.7	34.5	168°22.3	34.5	345°07.6	23.0	4°29.9	15.8
2	333°00.3	176°52.4	33.3	183°23.3	34.0	0°10.3	23.1	19°32.6	15.8
3	348°02.8	191°52.0	·· 32.2	198°24.2	·· 33.5	15°13.0	·· 23.2	34°35.2	·· 15.9
4	3°05.2	206°51.6	31.1	213°25.2	32.9	30°15.7	23.3	49°37.9	15.9
5	18°07.7	221°51.3	29.9	228°26.1	32.4	45°18.4	23.4	64°40.5	16.0
6	33°10.2	236°50.9	N11°28.8	243°27.1	N13°31.8	60°21.1	S12°23.5	79°43.2	S18°16.0
7	48°12.6	251°50.6	27.6	258°28.0	31.3	75°23.8	23.6	94°45.8	16.1
8	63°15.1	266°50.2	26.5	273°29.0	30.7	90°26.5	23.7	109°48.5	16.1
9	78°17.5	281°49.8	·· 25.3	288°30.0	·· 30.2	105°29.2	·· 23.8	124°51.1	·· 16.2
10	93°20.0	296°49.5	24.2	303°30.9	29.6	120°31.9	23.9	139°53.8	16.3
11	108°22.5	311°49.1	23.1	318°31.9	29.1	135°34.6	24.0	154°56.4	16.3
12	123°24.9	326°48.7	N11°21.9	333°32.8	N13°28.5	150°37.3	S12°24.1	169°59.1	S18°16.4
13	138°27.4	341°48.4	20.8	348°33.8	28.0	165°40.0	24.2	185°01.7	16.4
14	153°29.9	356°48.0	19.6	3°34.7	27.4	180°42.8	24.3	200°04.4	16.5
15	168°32.3	11°47.7	·· 18.5	18°35.7	·· 26.8	195°45.5	·· 24.4	215°07.0	·· 16.5
16	183°34.8	26°47.3	17.3	33°36.7	26.3	210°48.2	24.5	230°09.7	16.6
17	198°37.3	41°47.0	16.2	48°37.6	25.7	225°50.9	24.6	245°12.3	16.6
18	213°39.7	56°46.6	N11°15.0	63°38.6	N13°25.2	240°53.6	S12°24.7	260°15.0	S18°16.7
19	228°42.2	71°46.2	13.9	78°39.5	24.6	255°56.3	24.8	275°17.6	16.7
20	243°44.7	86°45.9	12.7	93°40.5	24.1	270°59.0	24.9	290°20.3	16.8
21	258°47.1	101°45.5	·· 11.6	108°41.5	·· 23.5	286°01.7	·· 25.0	305°22.9	·· 16.8
22	273°49.6	116°45.2	10.4	123°42.4	23.0	301°04.4	25.1	320°25.6	16.9
23	288°52.0	131°44.8	09.3	138°43.4	22.4	316°07.1	25.2	335°28.2	17.0
Mer.pass.	03:48	ν -0.4′	d -1.1′	m -3.90	ν 1.0′	d -0.5′	m 1.84	ν 2.7′	d 0.1′ m -2.80	ν 2.6′	d 0.1′ m 0.27

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	303°54.5	146°44.5	N11°08.1	153°44.3	N13°21.9	331°09.8	S12°25.3	350°30.8	S18°17.0
1	318°57.0	161°44.1	07.0	168°45.3	21.3	346°12.5	25.4	5°33.5	17.1
2	333°59.4	176°43.8	05.8	183°46.3	20.8	1°15.2	25.5	20°36.1	17.1
3	349°01.9	191°43.4	·· 04.7	198°47.2	·· 20.2	16°17.9	·· 25.6	35°38.8	·· 17.2
4	4°04.4	206°43.0	03.5	213°48.2	19.7	31°20.6	25.7	50°41.4	17.2
5	19°06.8	221°42.7	02.4	228°49.1	19.1	46°23.3	25.8	65°44.1	17.3
6	34°09.3	236°42.3	N11°01.2	243°50.1	N13°18.6	61°26.0	S12°25.9	80°46.7	S18°17.3
7	49°11.8	251°42.0	11°00.1	258°51.0	18.0	76°28.7	26.0	95°49.4	17.4
8	64°14.2	266°41.6	10°58.9	273°52.0	17.5	91°31.5	26.1	110°52.0	17.4
9	79°16.7	281°41.3	·· 57.8	288°53.0	·· 16.9	106°34.2	·· 26.2	125°54.7	·· 17.5
10	94°19.1	296°40.9	56.6	303°53.9	16.4	121°36.9	26.3	140°57.3	17.6
11	109°21.6	311°40.6	55.5	318°54.9	15.8	136°39.6	26.4	156°00.0	17.6
12	124°24.1	326°40.2	N10°54.3	333°55.8	N13°15.2	151°42.3	S12°26.5	171°02.6	S18°17.7
13	139°26.5	341°39.9	53.1	348°56.8	14.7	166°45.0	26.6	186°05.3	17.7
14	154°29.0	356°39.5	52.0	3°57.8	14.1	181°47.7	26.7	201°07.9	17.8
15	169°31.5	11°39.2	·· 50.8	18°58.7	·· 13.6	196°50.4	·· 26.8	216°10.6	·· 17.8
16	184°33.9	26°38.8	49.7	33°59.7	13.0	211°53.1	26.9	231°13.2	17.9
17	199°36.4	41°38.5	48.5	49°00.6	12.5	226°55.8	27.0	246°15.9	17.9
18	214°38.9	56°38.2	N10°47.4	64°01.6	N13°11.9	241°58.5	S12°27.1	261°18.5	S18°18.0
19	229°41.3	71°37.8	46.2	79°02.6	11.4	257°01.2	27.2	276°21.2	18.0
20	244°43.8	86°37.5	45.0	94°03.5	10.8	272°04.0	27.3	291°23.8	18.1
21	259°46.3	101°37.1	·· 43.9	109°04.5	·· 10.3	287°06.7	·· 27.4	306°26.5	·· 18.1
22	274°48.7	116°36.8	42.7	124°05.4	09.7	302°09.4	27.5	321°29.1	18.2
23	289°51.2	131°36.4	41.6	139°06.4	09.1	317°12.1	27.6	336°31.8	18.3
Mer.pass.	03:44	ν -0.4′	d -1.2′	m -3.90	ν 1.0′	d -0.6′	m 1.84	ν 2.7′	d 0.1′ m -2.81	ν 2.6′	d 0.1′ m 0.26

Stars	SHA	Dec
Alpheratz	357°37.5	29°12.4
Ankaa	353°09.8	-42°11.2
Schedar	349°34.0	56°39.0
Diphda	348°50.0	-17°52.0
Achernar	335°22.3	-57°07.4
Hamal	327°54.4	23°33.7
Polaris	315°26.4	89°20.9
Acamar	315°14.1	-40°12.9
Menkar	314°09.2	4°10.4
Mirfak	308°32.4	49°56.0
Aldebaran	290°43.1	16°33.1
Rigel	281°06.8	-8°10.6
Capella	280°26.4	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.4	7°24.7
Canopus	263°54.1	-52°42.3
Sirius	258°29.0	-16°44.7
Adhara	255°08.4	-29°00.0
Procyon	244°54.1	5°10.2
Pollux	243°21.1	27°58.5
Avior	234°16.5	-59°34.7
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.6	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.4	-63°13.3
Gacrux	171°54.9	-57°14.1
Alioth	166°15.7	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.3	49°12.7
Hadar	148°39.9	-60°28.8
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.0	-60°55.6
Kochab	137°19.6	74°04.4
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.7
Atria	107°15.4	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.8	-37°07.1
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.4
Enif	33°41.2	9°58.4
Al Na'ir	27°36.1	-46°51.3
Fomalhaut	15°17.4	-29°30.4
Scheat	13°47.6	28°11.9
Markab	13°32.4	15°19.2

Jul 24 Sat	SHA	Mer.pass
Venus	205°05.8	14:12
Mars	211°02.2	13:47
Jupiter	27°03.9	02:04
Saturn	46°27.5	00:46

Jul 25 Sun	SHA	Mer.pass
Venus	203°57.7	14:13
Mars	210°26.0	13:46
Jupiter	27°09.6	01:59
Saturn	46°31.9	00:42

Jul 26 Mon	SHA	Mer.pass
Venus	202°50.0	14:13
Mars	209°49.8	13:44
Jupiter	27°15.3	01:55
Saturn	46°36.3	00:38

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.2	N19°51.6	358°58.6	4.8′	S24°01.2	-5.9′	59.4′
1	193°22.1	51.1	13°22.3	4.9′	23°55.4	-6.0′	59.4′
2	208°22.1	50.6	27°46.2	4.9′	23°49.4	-6.2′	59.3′
3	223°22.1	·· 50.1	42°10.1	5.0′	23°43.2	-6.3′	59.3′
4	238°22.1	49.5	56°34.2	5.1′	23°36.9	-6.5′	59.3′
5	253°22.1	49.0	70°58.3	5.2′	23°30.4	-6.6′	59.3′
6	268°22.1	N19°48.5	85°22.5	5.3′	S23°23.8	-6.8′	59.2′
7	283°22.1	47.9	99°46.8	5.4′	23°17.0	-6.9′	59.2′
8	298°22.1	47.4	114°11.2	5.5′	23°10.1	-7.1′	59.2′
9	313°22.1	·· 46.9	128°35.7	5.6′	23°03.1	-7.2′	59.2′
10	328°22.1	46.4	143°00.3	5.7′	22°55.9	-7.4′	59.1′
11	343°22.1	45.8	157°25.1	5.8′	22°48.5	-7.5′	59.1′
12	358°22.0	N19°45.3	171°49.9	5.9′	S22°41.0	-7.6′	59.1′
13	13°22.0	44.8	186°14.8	6.0′	22°33.4	-7.8′	59.1′
14	28°22.0	44.2	200°39.8	6.1′	22°25.6	-7.9′	59.0′
15	43°22.0	·· 43.7	215°04.9	6.2′	22°17.7	-8.0′	59.0′
16	58°22.0	43.2	229°30.2	6.3′	22°09.7	-8.2′	59.0′
17	73°22.0	42.6	243°55.5	6.4′	22°01.5	-8.3′	59.0′
18	88°22.0	N19°42.1	258°20.9	6.5′	S21°53.2	-8.4′	58.9′
19	103°22.0	41.6	272°46.5	6.7′	21°44.7	-8.6′	58.9′
20	118°22.0	41.0	287°12.1	6.8′	21°36.2	-8.7′	58.9′
21	133°22.0	·· 40.5	301°37.9	6.9′	21°27.5	-8.8′	58.8′
22	148°22.0	39.9	316°03.8	7.0′	21°18.7	-8.9′	58.8′
23	163°22.0	39.4	330°29.8	7.1′	21°09.7	-9.1′	58.8′
	SD = 15.7′	d = -0.5′		SD = 16.2′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.0	N19°38.9	344°55.9	7.2′	S21°00.6	-9.2′	58.8′
1	193°22.0	38.3	359°22.1	7.3′	20°51.5	-9.3′	58.7′
2	208°22.0	37.8	13°48.4	7.4′	20°42.2	-9.4′	58.7′
3	223°21.9	·· 37.3	28°14.8	7.5′	20°32.8	-9.5′	58.7′
4	238°21.9	36.7	42°41.4	7.7′	20°23.2	-9.6′	58.6′
5	253°21.9	36.2	57°08.0	7.8′	20°13.6	-9.8′	58.6′
6	268°21.9	N19°35.6	71°34.8	7.9′	S20°03.8	-9.9′	58.6′
7	283°21.9	35.1	86°01.7	8.0′	19°54.0	-10.0′	58.6′
8	298°21.9	34.5	100°28.7	8.1′	19°44.0	-10.1′	58.5′
9	313°21.9	·· 34.0	114°55.8	8.2′	19°33.9	-10.2′	58.5′
10	328°21.9	33.5	129°23.0	8.3′	19°23.7	-10.3′	58.5′
11	343°21.9	32.9	143°50.3	8.4′	19°13.5	-10.4′	58.4′
12	358°21.9	N19°32.4	158°17.7	8.6′	S19°03.1	-10.5′	58.4′
13	13°21.9	31.8	172°45.3	8.7′	18°52.6	-10.6′	58.4′
14	28°21.9	31.3	187°12.9	8.8′	18°42.0	-10.7′	58.3′
15	43°21.9	·· 30.7	201°40.7	8.9′	18°31.4	-10.8′	58.3′
16	58°21.9	30.2	216°08.6	9.0′	18°20.6	-10.9′	58.3′
17	73°21.9	29.6	230°36.6	9.1′	18°09.7	-10.9′	58.2′
18	88°21.9	N19°29.1	245°04.7	9.2′	S17°58.8	-11.0′	58.2′
19	103°21.9	28.5	259°32.9	9.3′	17°47.8	-11.1′	58.2′
20	118°21.9	28.0	274°01.3	9.4′	17°36.6	-11.2′	58.1′
21	133°21.9	·· 27.4	288°29.7	9.5′	17°25.4	-11.3′	58.1′
22	148°21.9	26.9	302°58.3	9.7′	17°14.1	-11.4′	58.1′
23	163°21.9	26.3	317°26.9	9.8′	17°02.8	-11.4′	58.0′
	SD = 15.7′	d = -0.5′		SD = 16.0′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.9	N19°25.8	331°55.7	9.9′	S16°51.3	-11.5′	58.0′
1	193°21.9	25.2	346°24.6	10.0′	16°39.8	-11.6′	58.0′
2	208°21.9	24.7	0°53.5	10.1′	16°28.2	-11.7′	58.0′
3	223°21.9	·· 24.1	15°22.6	10.2′	16°16.5	-11.8′	57.9′
4	238°21.9	23.6	29°51.8	10.3′	16°04.8	-11.8′	57.9′
5	253°21.9	23.0	44°21.1	10.4′	15°52.9	-11.9′	57.9′
6	268°21.9	N19°22.5	58°50.5	10.5′	S15°41.0	-12.0′	57.8′
7	283°21.9	21.9	73°20.0	10.6′	15°29.1	-12.0′	57.8′
8	298°21.9	21.3	87°49.6	10.7′	15°17.1	-12.1′	57.8′
9	313°21.9	·· 20.8	102°19.4	10.8′	15°05.0	-12.2′	57.7′
10	328°21.9	20.2	116°49.2	10.9′	14°52.8	-12.2′	57.7′
11	343°21.9	19.7	131°19.1	11.0′	14°40.6	-12.3′	57.7′
12	358°21.9	N19°19.1	145°49.1	11.1′	S14°28.3	-12.3′	57.6′
13	13°22.0	18.6	160°19.2	11.2′	14°16.0	-12.4′	57.6′
14	28°22.0	18.0	174°49.5	11.3′	14°03.6	-12.5′	57.6′
15	43°22.0	·· 17.4	189°19.8	11.4′	13°51.1	-12.5′	57.5′
16	58°22.0	16.9	203°50.2	11.5′	13°38.6	-12.6′	57.5′
17	73°22.0	16.3	218°20.7	11.6′	13°26.0	-12.6′	57.5′
18	88°22.0	N19°15.8	232°51.3	11.7′	S13°13.4	-12.7′	57.4′
19	103°22.0	15.2	247°22.0	11.8′	13°00.8	-12.7′	57.4′
20	118°22.0	14.6	261°52.8	11.9′	12°48.1	-12.8′	57.4′
21	133°22.0	·· 14.1	276°23.7	12.0′	12°35.3	-12.8′	57.3′
22	148°22.0	13.5	290°54.7	12.1′	12°22.5	-12.8′	57.3′
23	163°22.0	12.9	305°25.7	12.2′	12°09.7	-12.9′	57.2′
	SD = 15.7′	d = -0.6′		SD = 15.8′			

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

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 14-16 100-95%
24	06:31	06:32	12:07	00:04	12:34	
25	06:32	06:32	12:07	01:03	13:30	
26	06:32	06:32	12:07	01:56	14:21	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1455 sec ΔT = TT-UT1 = +69.3295 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	304°53.6	146°36.1	N10°40.4	154°07.4	N13°08.6	332°14.8	S12°27.7	351°34.4	S18°18.3
1	319°56.1	161°35.7	39.2	169°08.3	08.0	347°17.5	27.8	6°37.1	18.4
2	334°58.6	176°35.4	38.1	184°09.3	07.5	2°20.2	27.9	21°39.7	18.4
3	350°01.0	191°35.1	·· 36.9	199°10.2	·· 06.9	17°22.9	·· 28.0	36°42.4	·· 18.5
4	5°03.5	206°34.7	35.7	214°11.2	06.4	32°25.6	28.1	51°45.0	18.5
5	20°06.0	221°34.4	34.6	229°12.2	05.8	47°28.4	28.2	66°47.7	18.6
6	35°08.4	236°34.0	N10°33.4	244°13.1	N13°05.2	62°31.1	S12°28.3	81°50.3	S18°18.6
7	50°10.9	251°33.7	32.2	259°14.1	04.7	77°33.8	28.4	96°53.0	18.7
8	65°13.4	266°33.3	31.1	274°15.1	04.1	92°36.5	28.5	111°55.6	18.7
9	80°15.8	281°33.0	·· 29.9	289°16.0	·· 03.6	107°39.2	·· 28.6	126°58.3	·· 18.8
10	95°18.3	296°32.7	28.8	304°17.0	03.0	122°41.9	28.7	142°00.9	18.8
11	110°20.7	311°32.3	27.6	319°17.9	02.5	137°44.6	28.8	157°03.6	18.9
12	125°23.2	326°32.0	N10°26.4	334°18.9	N13°01.9	152°47.3	S12°28.9	172°06.2	S18°19.0
13	140°25.7	341°31.6	25.2	349°19.9	01.3	167°50.1	29.0	187°08.9	19.0
14	155°28.1	356°31.3	24.1	4°20.8	00.8	182°52.8	29.1	202°11.5	19.1
15	170°30.6	11°31.0	·· 22.9	19°21.8	13°00.2	197°55.5	·· 29.2	217°14.2	·· 19.1
16	185°33.1	26°30.6	21.7	34°22.7	12°59.7	212°58.2	29.3	232°16.8	19.2
17	200°35.5	41°30.3	20.6	49°23.7	59.1	228°00.9	29.4	247°19.5	19.2
18	215°38.0	56°30.0	N10°19.4	64°24.7	N12°58.6	243°03.6	S12°29.5	262°22.1	S18°19.3
19	230°40.5	71°29.6	18.2	79°25.6	58.0	258°06.4	29.6	277°24.8	19.3
20	245°42.9	86°29.3	17.1	94°26.6	57.4	273°09.1	29.7	292°27.4	19.4
21	260°45.4	101°29.0	·· 15.9	109°27.6	·· 56.9	288°11.8	·· 29.8	307°30.1	·· 19.4
22	275°47.9	116°28.6	14.7	124°28.5	56.3	303°14.5	29.9	322°32.7	19.5
23	290°50.3	131°28.3	13.5	139°29.5	55.8	318°17.2	30.0	337°35.4	19.6
Mer.pass.	03:40	ν -0.3′	d -1.2′	m -3.91	ν 1.0′	d -0.6′	m 1.84	ν 2.7′	d 0.1′ m -2.81	ν 2.6′	d 0.1′ m 0.26

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	305°52.8	146°28.0	N10°12.4	154°30.4	N12°55.2	333°19.9	S12°30.1	352°38.0	S18°19.6
1	320°55.2	161°27.6	11.2	169°31.4	54.6	348°22.6	30.2	7°40.7	19.7
2	335°57.7	176°27.3	10.0	184°32.4	54.1	3°25.4	30.3	22°43.3	19.7
3	351°00.2	191°27.0	·· 08.9	199°33.3	·· 53.5	18°28.1	·· 30.4	37°46.0	·· 19.8
4	6°02.6	206°26.6	07.7	214°34.3	53.0	33°30.8	30.5	52°48.6	19.8
5	21°05.1	221°26.3	06.5	229°35.3	52.4	48°33.5	30.6	67°51.3	19.9
6	36°07.6	236°26.0	N10°05.3	244°36.2	N12°51.8	63°36.2	S12°30.7	82°53.9	S18°19.9
7	51°10.0	251°25.6	04.2	259°37.2	51.3	78°38.9	30.8	97°56.6	20.0
8	66°12.5	266°25.3	03.0	274°38.1	50.7	93°41.7	30.9	112°59.2	20.0
9	81°15.0	281°25.0	·· 01.8	289°39.1	·· 50.2	108°44.4	·· 31.0	128°01.9	·· 20.1
10	96°17.4	296°24.6	10°00.6	304°40.1	49.6	123°47.1	31.1	143°04.5	20.1
11	111°19.9	311°24.3	09°59.5	319°41.0	49.0	138°49.8	31.2	158°07.2	20.2
12	126°22.4	326°24.0	N09°58.3	334°42.0	N12°48.5	153°52.5	S12°31.3	173°09.8	S18°20.3
13	141°24.8	341°23.7	57.1	349°43.0	47.9	168°55.3	31.4	188°12.5	20.3
14	156°27.3	356°23.3	55.9	4°43.9	47.4	183°58.0	31.5	203°15.1	20.4
15	171°29.7	11°23.0	·· 54.7	19°44.9	·· 46.8	199°00.7	·· 31.6	218°17.8	·· 20.4
16	186°32.2	26°22.7	53.6	34°45.9	46.2	214°03.4	31.7	233°20.4	20.5
17	201°34.7	41°22.4	52.4	49°46.8	45.7	229°06.1	31.9	248°23.1	20.5
18	216°37.1	56°22.0	N09°51.2	64°47.8	N12°45.1	244°08.9	S12°32.0	263°25.7	S18°20.6
19	231°39.6	71°21.7	50.0	79°48.7	44.5	259°11.6	32.1	278°28.4	20.6
20	246°42.1	86°21.4	48.8	94°49.7	44.0	274°14.3	32.2	293°31.0	20.7
21	261°44.5	101°21.1	·· 47.7	109°50.7	·· 43.4	289°17.0	·· 32.3	308°33.7	·· 20.7
22	276°47.0	116°20.7	46.5	124°51.6	42.9	304°19.7	32.4	323°36.3	20.8
23	291°49.5	131°20.4	45.3	139°52.6	42.3	319°22.5	32.5	338°39.0	20.8
Mer.pass.	03:36	ν -0.3′	d -1.2′	m -3.91	ν 1.0′	d -0.6′	m 1.84	ν 2.7′	d 0.1′ m -2.82	ν 2.7′	d 0.1′ m 0.25

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	306°51.9	146°20.1	N09°44.1	154°53.6	N12°41.7	334°25.2	S12°32.6	353°41.6	S18°20.9
1	321°54.4	161°19.8	42.9	169°54.5	41.2	349°27.9	32.7	8°44.3	21.0
2	336°56.8	176°19.4	41.7	184°55.5	40.6	4°30.6	32.8	23°46.9	21.0
3	351°59.3	191°19.1	·· 40.6	199°56.5	·· 40.0	19°33.3	·· 32.9	38°49.6	·· 21.1
4	7°01.8	206°18.8	39.4	214°57.4	39.5	34°36.1	33.0	53°52.2	21.1
5	22°04.2	221°18.5	38.2	229°58.4	38.9	49°38.8	33.1	68°54.9	21.2
6	37°06.7	236°18.2	N09°37.0	244°59.4	N12°38.4	64°41.5	S12°33.2	83°57.5	S18°21.2
7	52°09.2	251°17.8	35.8	260°00.3	37.8	79°44.2	33.3	99°00.2	21.3
8	67°11.6	266°17.5	34.6	275°01.3	37.2	94°47.0	33.4	114°02.8	21.3
9	82°14.1	281°17.2	·· 33.4	290°02.2	·· 36.7	109°49.7	·· 33.5	129°05.5	·· 21.4
10	97°16.6	296°16.9	32.3	305°03.2	36.1	124°52.4	33.6	144°08.1	21.4
11	112°19.0	311°16.6	31.1	320°04.2	35.5	139°55.1	33.7	159°10.8	21.5
12	127°21.5	326°16.2	N09°29.9	335°05.1	N12°35.0	154°57.8	S12°33.8	174°13.4	S18°21.6
13	142°24.0	341°15.9	28.7	350°06.1	34.4	170°00.6	33.9	189°16.1	21.6
14	157°26.4	356°15.6	27.5	5°07.1	33.8	185°03.3	34.0	204°18.7	21.7
15	172°28.9	11°15.3	·· 26.3	20°08.0	·· 33.3	200°06.0	·· 34.1	219°21.4	·· 21.7
16	187°31.3	26°15.0	25.1	35°09.0	32.7	215°08.7	34.2	234°24.0	21.8
17	202°33.8	41°14.7	23.9	50°10.0	32.1	230°11.5	34.4	249°26.7	21.8
18	217°36.3	56°14.3	N09°22.7	65°10.9	N12°31.6	245°14.2	S12°34.5	264°29.3	S18°21.9
19	232°38.7	71°14.0	21.6	80°11.9	31.0	260°16.9	34.6	279°32.0	21.9
20	247°41.2	86°13.7	20.4	95°12.9	30.4	275°19.6	34.7	294°34.6	22.0
21	262°43.7	101°13.4	·· 19.2	110°13.8	·· 29.9	290°22.4	·· 34.8	309°37.3	·· 22.0
22	277°46.1	116°13.1	18.0	125°14.8	29.3	305°25.1	34.9	324°39.9	22.1
23	292°48.6	131°12.8	16.8	140°15.8	28.8	320°27.8	35.0	339°42.6	22.1
Mer.pass.	03:32	ν -0.3′	d -1.2′	m -3.91	ν 1.0′	d -0.6′	m 1.84	ν 2.7′	d 0.1′ m -2.82	ν 2.7′	d 0.1′ m 0.23

Stars	SHA	Dec
Alpheratz	357°37.5	29°12.4
Ankaa	353°09.8	-42°11.2
Schedar	349°33.9	56°39.0
Diphda	348°50.0	-17°52.0
Achernar	335°22.3	-57°07.4
Hamal	327°54.3	23°33.7
Polaris	315°25.1	89°20.9
Acamar	315°14.0	-40°12.9
Menkar	314°09.2	4°10.4
Mirfak	308°32.4	49°56.0
Aldebaran	290°43.0	16°33.1
Rigel	281°06.8	-8°10.5
Capella	280°26.4	46°01.0
Bellatrix	278°26.1	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.3
Betelgeuse	270°55.4	7°24.7
Canopus	263°54.1	-52°42.3
Sirius	258°29.0	-16°44.6
Adhara	255°08.4	-29°00.0
Procyon	244°54.1	5°10.3
Pollux	243°21.1	27°58.5
Avior	234°16.5	-59°34.6
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.7	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.5	-63°13.2
Gacrux	171°55.0	-57°14.1
Alioth	166°15.7	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.3	49°12.7
Hadar	148°39.9	-60°28.8
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.0	-60°55.6
Kochab	137°19.7	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.4	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.0	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.4
Enif	33°41.2	9°58.4
Al Na'ir	27°36.1	-46°51.3
Fomalhaut	15°17.4	-29°30.4
Scheat	13°47.6	28°11.9
Markab	13°32.4	15°19.2

Jul 27 Tue	SHA	Mer.pass
Venus	201°42.4	14:14
Mars	209°13.7	13:43
Jupiter	27°21.2	01:51
Saturn	46°40.8	00:34

Jul 28 Wed	SHA	Mer.pass
Venus	200°35.2	14:14
Mars	208°37.7	13:41
Jupiter	27°27.1	01:46
Saturn	46°45.2	00:29

Jul 29 Thu	SHA	Mer.pass
Venus	199°28.2	14:15
Mars	208°01.6	13:40
Jupiter	27°33.3	01:42
Saturn	46°49.7	00:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.0	N19°12.4	319°56.9	12.2′	S11°56.8	-12.9′	57.2′
1	193°22.0	11.8	334°28.2	12.3′	11°43.8	-13.0′	57.2′
2	208°22.0	11.2	348°59.5	12.4′	11°30.9	-13.0′	57.1′
3	223°22.0	·· 10.7	3°30.9	12.5′	11°17.8	-13.0′	57.1′
4	238°22.0	10.1	18°02.4	12.6′	11°04.8	-13.1′	57.1′
5	253°22.1	09.5	32°34.0	12.7′	10°51.7	-13.1′	57.0′
6	268°22.1	N19°09.0	47°05.7	12.8′	S10°38.6	-13.2′	57.0′
7	283°22.1	08.4	61°37.5	12.8′	10°25.4	-13.2′	57.0′
8	298°22.1	07.8	76°09.3	12.9′	10°12.2	-13.2′	56.9′
9	313°22.1	·· 07.3	90°41.2	13.0′	09°59.0	-13.2′	56.9′
10	328°22.1	06.7	105°13.2	13.1′	09°45.8	-13.3′	56.9′
11	343°22.1	06.1	119°45.3	13.2′	09°32.5	-13.3′	56.8′
12	358°22.1	N19°05.6	134°17.5	13.2′	S09°19.2	-13.3′	56.8′
13	13°22.1	05.0	148°49.7	13.3′	09°05.9	-13.4′	56.8′
14	28°22.1	04.4	163°22.0	13.4′	08°52.5	-13.4′	56.7′
15	43°22.2	·· 03.8	177°54.4	13.5′	08°39.1	-13.4′	56.7′
16	58°22.2	03.3	192°26.9	13.5′	08°25.7	-13.4′	56.7′
17	73°22.2	02.7	206°59.4	13.6′	08°12.3	-13.4′	56.6′
18	88°22.2	N19°02.1	221°32.0	13.7′	S07°58.9	-13.5′	56.6′
19	103°22.2	01.5	236°04.7	13.7′	07°45.4	-13.5′	56.6′
20	118°22.2	01.0	250°37.4	13.8′	07°31.9	-13.5′	56.6′
21	133°22.2	19°00.4	265°10.2	13.9′	07°18.4	-13.5′	56.5′
22	148°22.2	18°59.8	279°43.1	13.9′	07°04.9	-13.5′	56.5′
23	163°22.2	59.2	294°16.0	14.0′	06°51.4	-13.5′	56.5′
	SD = 15.7′	d = -0.6′	SD = 15.6′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.3	N18°58.6	308°49.0	14.1′	S06°37.8	-13.6′	56.4′
1	193°22.3	58.1	323°22.1	14.1′	06°24.3	-13.6′	56.4′
2	208°22.3	57.5	337°55.2	14.2′	06°10.7	-13.6′	56.4′
3	223°22.3	·· 56.9	352°28.4	14.2′	05°57.1	-13.6′	56.3′
4	238°22.3	56.3	7°01.6	14.3′	05°43.5	-13.6′	56.3′
5	253°22.3	55.7	21°34.9	14.4′	05°29.9	-13.6′	56.3′
6	268°22.3	N18°55.2	36°08.3	14.4′	S05°16.3	-13.6′	56.2′
7	283°22.4	54.6	50°41.7	14.5′	05°02.7	-13.6′	56.2′
8	298°22.4	54.0	65°15.2	14.5′	04°49.1	-13.6′	56.2′
9	313°22.4	·· 53.4	79°48.7	14.6′	04°35.5	-13.6′	56.1′
10	328°22.4	52.8	94°22.3	14.6′	04°21.9	-13.6′	56.1′
11	343°22.4	52.3	108°55.9	14.7′	04°08.2	-13.6′	56.1′
12	358°22.4	N18°51.7	123°29.6	14.7′	S03°54.6	-13.6′	56.0′
13	13°22.5	51.1	138°03.3	14.8′	03°41.0	-13.6′	56.0′
14	28°22.5	50.5	152°37.1	14.8′	03°27.4	-13.6′	56.0′
15	43°22.5	·· 49.9	167°10.9	14.9′	03°13.7	-13.6′	56.0′
16	58°22.5	49.3	181°44.8	14.9′	03°00.1	-13.6′	55.9′
17	73°22.5	48.7	196°18.7	15.0′	02°46.5	-13.6′	55.9′
18	88°22.5	N18°48.1	210°52.6	15.0′	S02°32.9	-13.6′	55.9′
19	103°22.6	47.6	225°26.6	15.0′	02°19.2	-13.6′	55.8′
20	118°22.6	47.0	240°00.7	15.1′	02°05.6	-13.6′	55.8′
21	133°22.6	·· 46.4	254°34.8	15.1′	01°52.0	-13.6′	55.8′
22	148°22.6	45.8	269°08.9	15.2′	01°38.4	-13.6′	55.8′
23	163°22.6	45.2	283°43.0	15.2′	01°24.8	-13.6′	55.7′
	SD = 15.7′	d = -0.6′	SD = 15.4′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.7	N18°44.6	298°17.2	15.2′	S01°11.3	-13.6′	55.7′
1	193°22.7	44.0	312°51.4	15.3′	00°57.7	-13.6′	55.7′
2	208°22.7	43.4	327°25.7	15.3′	00°44.1	-13.5′	55.6′
3	223°22.7	·· 42.8	342°00.0	15.3′	00°30.6	-13.5′	55.6′
4	238°22.7	42.2	356°34.3	15.4′	00°17.1	-13.5′	55.6′
5	253°22.8	41.6	11°08.7	15.4′	S00°03.5	-13.5′	55.6′
6	268°22.8	N18°41.1	25°43.1	15.4′	N00°10.0	13.5′	55.5′
7	283°22.8	40.5	40°17.5	15.4′	00°23.5	13.5′	55.5′
8	298°22.8	39.9	54°51.9	15.5′	00°36.9	13.5′	55.5′
9	313°22.8	·· 39.3	69°26.4	15.5′	00°50.4	13.4′	55.4′
10	328°22.9	38.7	84°00.9	15.5′	01°03.9	13.4′	55.4′
11	343°22.9	38.1	98°35.4	15.5′	01°17.3	13.4′	55.4′
12	358°22.9	N18°37.5	113°09.9	15.6′	N01°30.7	13.4′	55.4′
13	13°22.9	36.9	127°44.5	15.6′	01°44.1	13.4′	55.3′
14	28°23.0	36.3	142°19.1	15.6′	01°57.5	13.4′	55.3′
15	43°23.0	·· 35.7	156°53.7	15.6′	02°10.8	13.3′	55.3′
16	58°23.0	35.1	171°28.3	15.6′	02°24.1	13.3′	55.3′
17	73°23.0	34.5	186°02.9	15.7′	02°37.4	13.3′	55.2′
18	88°23.0	N18°33.9	200°37.6	15.7′	N02°50.7	13.3′	55.2′
19	103°23.1	33.3	215°12.3	15.7′	03°04.0	13.2′	55.2′
20	118°23.1	32.7	229°46.9	15.7′	03°17.2	13.2′	55.2′
21	133°23.1	·· 32.1	244°21.6	15.7′	03°30.4	13.2′	55.2′
22	148°23.1	31.5	258°56.3	15.7′	03°43.6	13.2′	55.1′
23	163°23.2	30.9	273°31.1	15.7′	03°56.8	13.1′	55.1′
	SD = 15.7′	d = -0.6′	SD = 15.2′				

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

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
N 72°	22:52	22:25	21:59	06:31	08:40	10:39
N 70°	22:42	22:22	22:04	06:50	08:48	10:37
68°	22:34	22:21	22:08	07:04	08:53	10:36
66°	22:27	22:19	22:12	07:16	08:58	10:35
64°	22:21	22:18	22:14	07:25	09:02	10:34
62°	22:16	22:17	22:17	07:33	09:05	10:33
60°	22:12	22:16	22:19	07:41	09:08	10:32
N 58°	22:08	22:15	22:21	07:47	09:11	10:32
56°	22:04	22:14	22:23	07:52	09:13	10:31
54°	22:01	22:13	22:25	07:57	09:15	10:31
52°	21:58	22:13	22:26	08:01	09:17	10:30
50°	21:56	22:12	22:27	08:05	09:19	10:30
45°	21:50	22:11	22:30	08:14	09:23	10:29
N 40°	21:45	22:10	22:33	08:21	09:26	10:28
35°	21:41	22:09	22:35	08:27	09:28	10:27
30°	21:38	22:08	22:37	08:32	09:31	10:27
20°	21:31	22:06	22:40	08:41	09:35	10:26
N 10°	21:26	22:05	22:43	08:49	09:38	10:25
0°	21:20	22:04	22:46	08:57	09:42	10:24
S 10°	21:15	22:03	22:49	09:04	09:45	10:23
20°	21:09	22:02	22:52	09:12	09:48	10:22
30°	21:03	22:00	22:55	09:20	09:52	10:21
35°	20:59	21:59	22:57	09:25	09:54	10:21
40°	20:55	21:58	23:00	09:31	09:57	10:20
45°	20:50	21:57	23:02	09:38	09:59	10:19
S 50°	20:44	21:56	23:06	09:45	10:03	10:18
52°	20:41	21:55	23:07	09:49	10:04	10:18
54°	20:38	21:55	23:09	09:53	10:06	10:18
56°	20:35	21:54	23:11	09:57	10:08	10:17
58°	20:31	21:53	23:13	10:02	10:10	10:16
S 60°	20:27	21:52	23:15	10:07	10:12	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 90-74%
27	06:32	06:32	12:07	02:45	15:09	
28	06:31	06:30	12:07	03:31	15:53	
29	06:29	06:28	12:06	04:14	16:35	

DUT1 = UT1-UTC = -0.1444 sec ΔT = TT-UT1 = +69.3284 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	307°51.1	146°12.4	N09°15.6	155°16.7	N12°28.2	335°30.5	S12°35.1	354°45.2	S18°22.2
1	322°53.5	161°12.1	14.4	170°17.7	27.6	350°33.3	35.2	9°47.9	22.3
2	337°56.0	176°11.8	13.2	185°18.7	27.1	5°36.0	35.3	24°50.5	22.3
3	352°58.4	191°11.5	·· 12.0	200°19.6	·· 26.5	20°38.7	·· 35.4	39°53.2	·· 22.4
4	8°00.9	206°11.2	10.8	215°20.6	25.9	35°41.4	35.5	54°55.9	22.4
5	23°03.4	221°10.9	09.6	230°21.6	25.4	50°44.2	35.6	69°58.5	22.5
6	38°05.8	236°10.6	N09°08.4	245°22.5	N12°24.8	65°46.9	S12°35.7	85°01.2	S18°22.5
7	53°08.3	251°10.3	07.2	260°23.5	24.2	80°49.6	35.8	100°03.8	22.6
8	68°10.8	266°10.0	06.0	275°24.5	23.7	95°52.4	35.9	115°06.5	22.6
9	83°13.2	281°09.6	·· 04.8	290°25.4	·· 23.1	110°55.1	·· 36.0	130°09.1	·· 22.7
10	98°15.7	296°09.3	03.7	305°26.4	22.5	125°57.8	36.1	145°11.8	22.7
11	113°18.2	311°09.0	02.5	320°27.4	21.9	141°00.5	36.2	160°14.4	22.8
12	128°20.6	326°08.7	N09°01.3	335°28.3	N12°21.4	156°03.3	S12°36.4	175°17.1	S18°22.8
13	143°23.1	341°08.4	09°00.1	350°29.3	20.8	171°06.0	36.5	190°19.7	22.9
14	158°25.6	356°08.1	08°58.9	5°30.3	20.2	186°08.7	36.6	205°22.4	23.0
15	173°28.0	11°07.8	·· 57.7	20°31.2	·· 19.7	201°11.4	·· 36.7	220°25.0	·· 23.0
16	188°30.5	26°07.5	56.5	35°32.2	19.1	216°14.2	36.8	235°27.7	23.1
17	203°32.9	41°07.2	55.3	50°33.2	18.5	231°16.9	36.9	250°30.3	23.1
18	218°35.4	56°06.9	N08°54.1	65°34.1	N12°18.0	246°19.6	S12°37.0	265°33.0	S18°23.2
19	233°37.9	71°06.6	52.9	80°35.1	17.4	261°22.4	37.1	280°35.6	23.2
20	248°40.3	86°06.3	51.7	95°36.1	16.8	276°25.1	37.2	295°38.3	23.3
21	263°42.8	101°06.0	·· 50.5	110°37.0	·· 16.3	291°27.8	·· 37.3	310°40.9	·· 23.3
22	278°45.3	116°05.7	49.3	125°38.0	15.7	306°30.6	37.4	325°43.6	23.4
23	293°47.7	131°05.4	48.1	140°39.0	15.1	321°33.3	37.5	340°46.2	23.4
Mer.pass.	03:28	ν -0.3′	d -1.2′	m -3.91	ν 1.0′	d -0.6′	m 1.84	ν 2.7′	d 0.1′ m -2.83	ν 2.7′	d 0.1′ m 0.22

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	308°50.2	146°05.0	N08°46.9	155°39.9	N12°14.6	336°36.0	S12°37.6	355°48.9	S18°23.5
1	323°52.7	161°04.7	45.7	170°40.9	14.0	351°38.7	37.7	10°51.5	23.5
2	338°55.1	176°04.4	44.5	185°41.9	13.4	6°41.5	37.8	25°54.2	23.6
3	353°57.6	191°04.1	·· 43.3	200°42.8	·· 12.8	21°44.2	·· 37.9	40°56.8	·· 23.7
4	9°00.1	206°03.8	42.0	215°43.8	12.3	36°46.9	38.1	55°59.5	23.7
5	24°02.5	221°03.5	40.8	230°44.8	11.7	51°49.7	38.2	71°02.1	23.8
6	39°05.0	236°03.2	N08°39.6	245°45.7	N12°11.1	66°52.4	S12°38.3	86°04.8	S18°23.8
7	54°07.4	251°02.9	38.4	260°46.7	10.6	81°55.1	38.4	101°07.4	23.9
8	69°09.9	266°02.6	37.2	275°47.7	10.0	96°57.9	38.5	116°10.1	23.9
9	84°12.4	281°02.3	·· 36.0	290°48.6	·· 09.4	112°00.6	·· 38.6	131°12.7	·· 24.0
10	99°14.8	296°02.0	34.8	305°49.6	08.9	127°03.3	38.7	146°15.4	24.0
11	114°17.3	311°01.7	33.6	320°50.6	08.3	142°06.1	38.8	161°18.0	24.1
12	129°19.8	326°01.4	N08°32.4	335°51.6	N12°07.7	157°08.8	S12°38.9	176°20.7	S18°24.1
13	144°22.2	341°01.1	31.2	350°52.5	07.1	172°11.5	39.0	191°23.3	24.2
14	159°24.7	356°00.8	30.0	5°53.5	06.6	187°14.3	39.1	206°26.0	24.3
15	174°27.2	11°00.5	·· 28.8	20°54.5	·· 06.0	202°17.0	·· 39.2	221°28.7	·· 24.3
16	189°29.6	26°00.2	27.6	35°55.4	05.4	217°19.7	39.3	236°31.3	24.4
17	204°32.1	40°59.9	26.4	50°56.4	04.9	232°22.5	39.5	251°34.0	24.4
18	219°34.5	55°59.6	N08°25.2	65°57.4	N12°04.3	247°25.2	S12°39.6	266°36.6	S18°24.5
19	234°37.0	70°59.3	24.0	80°58.3	03.7	262°27.9	39.7	281°39.3	24.5
20	249°39.5	85°59.0	22.7	95°59.3	03.1	277°30.7	39.8	296°41.9	24.6
21	264°41.9	100°58.8	·· 21.5	111°00.3	·· 02.6	292°33.4	·· 39.9	311°44.6	·· 24.6
22	279°44.4	115°58.5	20.3	126°01.2	02.0	307°36.1	40.0	326°47.2	24.7
23	294°46.9	130°58.2	19.1	141°02.2	01.4	322°38.9	40.1	341°49.9	24.7
Mer.pass.	03:24	ν -0.3′	d -1.2′	m -3.92	ν 1.0′	d -0.6′	m 1.84	ν 2.7′	d 0.1′ m -2.83	ν 2.7′	d 0.1′ m 0.20

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	309°49.3	145°57.9	N08°17.9	156°03.2	N12°00.8	337°41.6	S12°40.2	356°52.5	S18°24.8
1	324°51.8	160°57.6	16.7	171°04.2	12°00.3	352°44.3	40.3	11°55.2	24.8
2	339°54.3	175°57.3	15.5	186°05.1	11°59.7	7°47.1	40.4	26°57.8	24.9
3	354°56.7	190°57.0	·· 14.3	201°06.1	·· 59.1	22°49.8	·· 40.5	42°00.5	·· 25.0
4	9°59.2	205°56.7	13.1	216°07.1	58.6	37°52.5	40.6	57°03.1	25.0
5	25°01.7	220°56.4	11.8	231°08.0	58.0	52°55.3	40.7	72°05.8	25.1
6	40°04.1	235°56.1	N08°10.6	246°09.0	N11°57.4	67°58.0	S12°40.9	87°08.4	S18°25.1
7	55°06.6	250°55.8	09.4	261°10.0	56.8	83°00.8	41.0	102°11.1	25.2
8	70°09.0	265°55.5	08.2	276°10.9	56.3	98°03.5	41.1	117°13.7	25.2
9	85°11.5	280°55.2	·· 07.0	291°11.9	·· 55.7	113°06.2	·· 41.2	132°16.4	·· 25.3
10	100°14.0	295°54.9	05.8	306°12.9	55.1	128°09.0	41.3	147°19.0	25.3
11	115°16.4	310°54.7	04.6	321°13.9	54.5	143°11.7	41.4	162°21.7	25.4
12	130°18.9	325°54.4	N08°03.3	336°14.8	N11°54.0	158°14.4	S12°41.5	177°24.3	S18°25.4
13	145°21.4	340°54.1	02.1	351°15.8	53.4	173°17.2	41.6	192°27.0	25.5
14	160°23.8	355°53.8	08°00.9	6°16.8	52.8	188°19.9	41.7	207°29.6	25.5
15	175°26.3	10°53.5	07°59.7	21°17.7	·· 52.2	203°22.6	·· 41.8	222°32.3	·· 25.6
16	190°28.8	25°53.2	58.5	36°18.7	51.7	218°25.4	41.9	237°34.9	25.7
17	205°31.2	40°52.9	57.3	51°19.7	51.1	233°28.1	42.0	252°37.6	25.7
18	220°33.7	55°52.6	N07°56.0	66°20.6	N11°50.5	248°30.9	S12°42.2	267°40.2	S18°25.8
19	235°36.2	70°52.3	54.8	81°21.6	49.9	263°33.6	42.3	282°42.9	25.8
20	250°38.6	85°52.1	53.6	96°22.6	49.4	278°36.3	42.4	297°45.6	25.9
21	265°41.1	100°51.8	·· 52.4	111°23.6	·· 48.8	293°39.1	·· 42.5	312°48.2	·· 25.9
22	280°43.5	115°51.5	51.2	126°24.5	48.2	308°41.8	42.6	327°50.9	26.0
23	295°46.0	130°51.2	50.0	141°25.5	47.6	323°44.6	42.7	342°53.5	26.0
Mer.pass.	03:20	ν -0.3′	d -1.2′	m -3.92	ν 1.0′	d -0.6′	m 1.83	ν 2.7′	d 0.1′ m -2.84	ν 2.7′	d 0.1′ m 0.18

Stars	SHA	Dec
Alpheratz	357°37.4	29°12.4
Ankaa	353°09.7	-42°11.2
Schedar	349°33.9	56°39.0
Diphda	348°50.0	-17°52.0
Achernar	335°22.2	-57°07.4
Hamal	327°54.3	23°33.7
Polaris	315°23.6	89°20.9
Acamar	315°14.0	-40°12.9
Menkar	314°09.1	4°10.4
Mirfak	308°32.4	49°56.0
Aldebaran	290°43.0	16°33.1
Rigel	281°06.8	-8°10.5
Capella	280°26.4	46°01.0
Bellatrix	278°26.1	6°22.2
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.3
Betelgeuse	270°55.4	7°24.7
Canopus	263°54.1	-52°42.2
Sirius	258°29.0	-16°44.6
Adhara	255°08.4	-28°59.9
Procyon	244°54.1	5°10.3
Pollux	243°21.1	27°58.5
Avior	234°16.5	-59°34.6
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.7	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.5	-63°13.2
Gacrux	171°55.0	-57°14.1
Alioth	166°15.7	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.4	49°12.7
Hadar	148°40.0	-60°28.7
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.1	-60°55.6
Kochab	137°19.7	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.4	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.1	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.4
Enif	33°41.2	9°58.4
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.3	-29°30.4
Scheat	13°47.6	28°11.9
Markab	13°32.4	15°19.2

Jul 30 Fri	SHA	Mer.pass
Venus	198°21.4	14:15
Mars	207°25.7	13:38
Jupiter	27°39.5	01:38
Saturn	46°54.2	00:21

Jul 31 Sat	SHA	Mer.pass
Venus	197°14.9	14:16
Mars	206°49.7	13:36
Jupiter	27°45.8	01:33
Saturn	46°58.7	00:17

Aug 01 Sun	SHA	Mer.pass
Venus	196°08.5	14:16
Mars	206°13.8	13:35
Jupiter	27°52.3	01:29
Saturn	47°03.2	00:12

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.2	N18°30.3	288°05.8	15.7′	N04°09.9	13.1′	55.1′
1	193°23.2	29.7	302°40.5	15.7′	04°23.0	13.1′	55.1′
2	208°23.2	29.1	317°15.3	15.8′	04°36.1	13.0′	55.0′
3	223°23.3	·· 28.4	331°50.0	15.8′	04°49.1	13.0′	55.0′
4	238°23.3	27.8	346°24.8	15.8′	05°02.2	13.0′	55.0′
5	253°23.3	27.2	0°59.6	15.8′	05°15.2	13.0′	55.0′
6	268°23.4	N18°26.6	15°34.3	15.8′	N05°28.1	12.9′	54.9′
7	283°23.4	26.0	30°09.1	15.8′	05°41.0	12.9′	54.9′
8	298°23.4	25.4	44°43.9	15.8′	05°53.9	12.9′	54.9′
9	313°23.4	·· 24.8	59°18.6	15.8′	06°06.8	12.8′	54.9′
10	328°23.5	24.2	73°53.4	15.8′	06°19.6	12.8′	54.9′
11	343°23.5	23.6	88°28.2	15.8′	06°32.4	12.8′	54.8′
12	358°23.5	N18°23.0	103°03.0	15.8′	N06°45.2	12.7′	54.8′
13	13°23.5	22.4	117°37.7	15.8′	06°57.9	12.7′	54.8′
14	28°23.6	21.8	132°12.5	15.8′	07°10.6	12.6′	54.8′
15	43°23.6	·· 21.1	146°47.2	15.7′	07°23.2	12.6′	54.8′
16	58°23.6	20.5	161°22.0	15.7′	07°35.8	12.6′	54.8′
17	73°23.7	19.9	175°56.7	15.7′	07°48.4	12.5′	54.7′
18	88°23.7	N18°19.3	190°31.5	15.7′	N08°01.0	12.5′	54.7′
19	103°23.7	18.7	205°06.2	15.7′	08°13.5	12.5′	54.7′
20	118°23.8	18.1	219°40.9	15.7′	08°25.9	12.4′	54.7′
21	133°23.8	·· 17.5	234°15.6	15.7′	08°38.3	12.4′	54.7′
22	148°23.8	16.8	248°50.3	15.7′	08°50.7	12.3′	54.6′
23	163°23.9	16.2	263°24.9	15.7′	09°03.0	12.3′	54.6′
	SD = 15.7′	d = -0.6′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.9	N18°15.6	277°59.6	15.6′	N09°15.3	12.2′	54.6′
1	193°23.9	15.0	292°34.3	15.6′	09°27.6	12.2′	54.6′
2	208°23.9	14.4	307°08.9	15.6′	09°39.8	12.2′	54.6′
3	223°24.0	·· 13.8	321°43.5	15.6′	09°51.9	12.1′	54.6′
4	238°24.0	13.1	336°18.1	15.6′	10°04.0	12.1′	54.5′
5	253°24.0	12.5	350°52.7	15.6′	10°16.1	12.0′	54.5′
6	268°24.1	N18°11.9	5°27.2	15.5′	N10°28.1	12.0′	54.5′
7	283°24.1	11.3	20°01.8	15.5′	10°40.1	11.9′	54.5′
8	298°24.1	10.7	34°36.3	15.5′	10°52.0	11.9′	54.5′
9	313°24.2	·· 10.0	49°10.8	15.5′	11°03.9	11.8′	54.5′
10	328°24.2	09.4	63°45.2	15.4′	11°15.7	11.8′	54.5′
11	343°24.2	08.8	78°19.7	15.4′	11°27.5	11.7′	54.4′
12	358°24.3	N18°08.2	92°54.1	15.4′	N11°39.2	11.7′	54.4′
13	13°24.3	07.5	107°28.5	15.4′	11°50.9	11.6′	54.4′
14	28°24.4	06.9	122°02.8	15.3′	12°02.6	11.6′	54.4′
15	43°24.4	·· 06.3	136°37.2	15.3′	12°14.1	11.5′	54.4′
16	58°24.4	05.7	151°11.5	15.3′	12°25.7	11.5′	54.4′
17	73°24.5	05.1	165°45.8	15.2′	12°37.1	11.4′	54.4′
18	88°24.5	N18°04.4	180°20.0	15.2′	N12°48.5	11.4′	54.4′
19	103°24.5	03.8	194°54.2	15.2′	12°59.9	11.3′	54.4′
20	118°24.6	03.2	209°28.4	15.2′	13°11.2	11.2′	54.3′
21	133°24.6	·· 02.5	224°02.5	15.1′	13°22.4	11.2′	54.3′
22	148°24.6	01.9	238°36.7	15.1′	13°33.6	11.1′	54.3′
23	163°24.7	01.3	253°10.7	15.0′	13°44.8	11.1′	54.3′
	SD = 15.7′	d = -0.6′	SD = 14.9′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.7	N18°00.7	267°44.8	15.0′	N13°55.8	11.0′	54.3′
1	193°24.8	18°00.0	282°18.8	15.0′	14°06.9	11.0′	54.3′
2	208°24.8	17°59.4	296°52.8	14.9′	14°17.8	10.9′	54.3′
3	223°24.8	·· 58.8	311°26.7	14.9′	14°28.7	10.8′	54.3′
4	238°24.9	58.1	326°00.6	14.9′	14°39.6	10.8′	54.3′
5	253°24.9	57.5	340°34.5	14.8′	14°50.3	10.7′	54.3′
6	268°24.9	N17°56.9	355°08.3	14.8′	N15°01.1	10.7′	54.3′
7	283°25.0	56.2	9°42.1	14.7′	15°11.7	10.6′	54.2′
8	298°25.0	55.6	24°15.8	14.7′	15°22.3	10.5′	54.2′
9	313°25.1	·· 55.0	38°49.5	14.7′	15°32.8	10.5′	54.2′
10	328°25.1	54.3	53°23.2	14.6′	15°43.3	10.4′	54.2′
11	343°25.1	53.7	67°56.8	14.6′	15°53.7	10.3′	54.2′
12	358°25.2	N17°53.1	82°30.3	14.5′	N16°04.0	10.3′	54.2′
13	13°25.2	52.4	97°03.9	14.5′	16°14.3	10.2′	54.2′
14	28°25.3	51.8	111°37.3	14.4′	16°24.5	10.1′	54.2′
15	43°25.3	·· 51.2	126°10.8	14.4′	16°34.6	10.1′	54.2′
16	58°25.4	50.5	140°44.1	14.3′	16°44.7	10.0′	54.2′
17	73°25.4	49.9	155°17.5	14.3′	16°54.6	9.9′	54.2′
18	88°25.4	N17°49.3	169°50.8	14.2′	N17°04.6	9.8′	54.2′
19	103°25.5	48.6	184°24.0	14.2′	17°14.4	9.8′	54.2′
20	118°25.5	48.0	198°57.2	14.1′	17°24.2	9.7′	54.2′
21	133°25.6	·· 47.3	213°30.3	14.1′	17°33.9	9.6′	54.2′
22	148°25.6	46.7	228°03.4	14.0′	17°43.5	9.6′	54.2′
23	163°25.7	46.1	242°36.5	14.0′	17°53.1	9.5′	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	22:46	–:–	–:–
68°	–:–	–:–	02:11	21:58	–:–	–:–
66°	–:–	–:–	02:42	21:27	–:–	–:–
64°	–:–	01:35	03:05	21:05	22:33	–:–
62°	–:–	02:12	03:24	20:47	21:58	–:–
60°	–:–	02:37	03:39	20:32	21:33	–:–
N 58°	01:26	02:57	03:51	20:20	21:13	22:42
56°	02:00	03:13	04:02	20:09	20:58	22:10
54°	02:24	03:27	04:12	20:00	20:44	21:47
52°	02:42	03:39	04:20	19:51	20:33	21:28
50°	02:58	03:49	04:28	19:44	20:22	21:13
45°	03:28	04:10	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	04:52	05:18	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	17:07	17:36	18:09
45°	06:11	06:46	07:18	16:55	17:27	18:02
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	08:06	16:08	16:53	17:41
S 60°	06:37	07:28	08:17	15:57	16:45	17:37

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

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 20-22 65-46%
30	06:27	06:26	12:06	04:56	17:17	
31	06:24	06:23	12:06	05:38	17:59	
01	06:21	06:19	12:06	06:20	18:42	

DUT1 = UT1-UTC = -0.1427 sec ΔT = TT-UT1 = +69.3267 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	310°48.5	145°50.9	N07°48.7	156°26.5	N11°47.1	338°47.3	S12°42.8	357°56.2	S18°26.1
1	325°50.9	160°50.6	47.5	171°27.4	46.5	353°50.0	42.9	12°58.8	26.1
2	340°53.4	175°50.3	46.3	186°28.4	45.9	8°52.8	43.0	28°01.5	26.2
3	355°55.9	190°50.1	·· 45.1	201°29.4	·· 45.3	23°55.5	·· 43.1	43°04.1	·· 26.2
4	10°58.3	205°49.8	43.9	216°30.4	44.8	38°58.2	43.2	58°06.8	26.3
5	26°00.8	220°49.5	42.6	231°31.3	44.2	54°01.0	43.4	73°09.4	26.3
6	41°03.3	235°49.2	N07°41.4	246°32.3	N11°43.6	69°03.7	S12°43.5	88°12.1	S18°26.4
7	56°05.7	250°48.9	40.2	261°33.3	43.0	84°06.5	43.6	103°14.7	26.5
8	71°08.2	265°48.6	39.0	276°34.2	42.4	99°09.2	43.7	118°17.4	26.5
9	86°10.6	280°48.3	·· 37.7	291°35.2	·· 41.9	114°12.0	·· 43.8	133°20.0	·· 26.6
10	101°13.1	295°48.1	36.5	306°36.2	41.3	129°14.7	43.9	148°22.7	26.6
11	116°15.6	310°47.8	35.3	321°37.2	40.7	144°17.4	44.0	163°25.3	26.7
12	131°18.0	325°47.5	N07°34.1	336°38.1	N11°40.1	159°20.2	S12°44.1	178°28.0	S18°26.7
13	146°20.5	340°47.2	32.9	351°39.1	39.6	174°22.9	44.2	193°30.6	26.8
14	161°23.0	355°46.9	31.6	6°40.1	39.0	189°25.7	44.3	208°33.3	26.8
15	176°25.4	10°46.7	·· 30.4	21°41.0	·· 38.4	204°28.4	·· 44.5	223°35.9	·· 26.9
16	191°27.9	25°46.4	29.2	36°42.0	37.8	219°31.1	44.6	238°38.6	26.9
17	206°30.4	40°46.1	28.0	51°43.0	37.2	234°33.9	44.7	253°41.2	27.0
18	221°32.8	55°45.8	N07°26.7	66°44.0	N11°36.7	249°36.6	S12°44.8	268°43.9	S18°27.0
19	236°35.3	70°45.5	25.5	81°44.9	36.1	264°39.4	44.9	283°46.5	27.1
20	251°37.8	85°45.3	24.3	96°45.9	35.5	279°42.1	45.0	298°49.2	27.2
21	266°40.2	100°45.0	·· 23.1	111°46.9	·· 34.9	294°44.9	·· 45.1	313°51.8	·· 27.2
22	281°42.7	115°44.7	21.8	126°47.8	34.4	309°47.6	45.2	328°54.5	27.3
23	296°45.1	130°44.4	20.6	141°48.8	33.8	324°50.3	45.3	343°57.2	27.3
Mer.pass.	03:16	ν -0.3′	d -1.2′	m -3.92	ν 1.0′	d -0.6′	m 1.83	ν 2.7′	d 0.1′ m -2.84	ν 2.7′	d 0.1′ m 0.17
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	311°47.6	145°44.2	N07°19.4	156°49.8	N11°33.2	339°53.1	S12°45.4	358°59.8	S18°27.4
1	326°50.1	160°43.9	18.1	171°50.8	32.6	354°55.8	45.6	14°02.5	27.4
2	341°52.5	175°43.6	16.9	186°51.7	32.0	9°58.6	45.7	29°05.1	27.5
3	356°55.0	190°43.3	·· 15.7	201°52.7	·· 31.5	25°01.3	·· 45.8	44°07.8	·· 27.5
4	11°57.5	205°43.0	14.5	216°53.7	30.9	40°04.1	45.9	59°10.4	27.6
5	26°59.9	220°42.8	13.2	231°54.7	30.3	55°06.8	46.0	74°13.1	27.6
6	42°02.4	235°42.5	N07°12.0	246°55.6	N11°29.7	70°09.5	S12°46.1	89°15.7	S18°27.7
7	57°04.9	250°42.2	10.8	261°56.6	29.1	85°12.3	46.2	104°18.4	27.7
8	72°07.3	265°41.9	09.5	276°57.6	28.6	100°15.0	46.3	119°21.0	27.8
9	87°09.8	280°41.7	·· 08.3	291°58.5	·· 28.0	115°17.8	·· 46.4	134°23.7	·· 27.9
10	102°12.3	295°41.4	07.1	306°59.5	27.4	130°20.5	46.6	149°26.3	27.9
11	117°14.7	310°41.1	05.9	322°00.5	26.8	145°23.3	46.7	164°29.0	28.0
12	132°17.2	325°40.8	N07°04.6	337°01.5	N11°26.2	160°26.0	S12°46.8	179°31.6	S18°28.0
13	147°19.6	340°40.6	03.4	352°02.4	25.7	175°28.8	46.9	194°34.3	28.1
14	162°22.1	355°40.3	02.2	7°03.4	25.1	190°31.5	47.0	209°36.9	28.1
15	177°24.6	10°40.0	07°00.9	22°04.4	·· 24.5	205°34.2	·· 47.1	224°39.6	·· 28.2
16	192°27.0	25°39.8	06°59.7	37°05.4	23.9	220°37.0	47.2	239°42.2	28.2
17	207°29.5	40°39.5	58.5	52°06.3	23.3	235°39.7	47.3	254°44.9	28.3
18	222°32.0	55°39.2	N06°57.2	67°07.3	N11°22.7	250°42.5	S12°47.4	269°47.5	S18°28.3
19	237°34.4	70°38.9	56.0	82°08.3	22.2	265°45.2	47.6	284°50.2	28.4
20	252°36.9	85°38.7	54.8	97°09.3	21.6	280°48.0	47.7	299°52.8	28.4
21	267°39.4	100°38.4	·· 53.5	112°10.2	·· 21.0	295°50.7	·· 47.8	314°55.5	·· 28.5
22	282°41.8	115°38.1	52.3	127°11.2	20.4	310°53.5	47.9	329°58.1	28.5
23	297°44.3	130°37.9	51.1	142°12.2	19.8	325°56.2	48.0	345°00.8	28.6
Mer.pass.	03:12	ν -0.3′	d -1.2′	m -3.93	ν 1.0′	d -0.6′	m 1.83	ν 2.7′	d 0.1′ m -2.84	ν 2.7′	d 0.1′ m 0.17
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	312°46.8	145°37.6	N06°49.8	157°13.1	N11°19.3	340°59.0	S12°48.1	0°03.5	S18°28.7
1	327°49.2	160°37.3	48.6	172°14.1	18.7	356°01.7	48.2	15°06.1	28.7
2	342°51.7	175°37.1	47.4	187°15.1	18.1	11°04.5	48.3	30°08.8	28.8
3	357°54.1	190°36.8	·· 46.1	202°16.1	·· 17.5	26°07.2	·· 48.4	45°11.4	·· 28.8
4	12°56.6	205°36.5	44.9	217°17.0	16.9	41°10.0	48.6	60°14.1	28.9
5	27°59.1	220°36.3	43.7	232°18.0	16.3	56°12.7	48.7	75°16.7	28.9
6	43°01.5	235°36.0	N06°42.4	247°19.0	N11°15.8	71°15.5	S12°48.8	90°19.4	S18°29.0
7	58°04.0	250°35.7	41.2	262°20.0	15.2	86°18.2	48.9	105°22.0	29.0
8	73°06.5	265°35.5	39.9	277°20.9	14.6	101°20.9	49.0	120°24.7	29.1
9	88°08.9	280°35.2	·· 38.7	292°21.9	·· 14.0	116°23.7	·· 49.1	135°27.3	·· 29.1
10	103°11.4	295°34.9	37.5	307°22.9	13.4	131°26.4	49.2	150°30.0	29.2
11	118°13.9	310°34.7	36.2	322°23.9	12.8	146°29.2	49.3	165°32.6	29.2
12	133°16.3	325°34.4	N06°35.0	337°24.8	N11°12.3	161°31.9	S12°49.4	180°35.3	S18°29.3
13	148°18.8	340°34.1	33.8	352°25.8	11.7	176°34.7	49.6	195°37.9	29.3
14	163°21.3	355°33.9	32.5	7°26.8	11.1	191°37.4	49.7	210°40.6	29.4
15	178°23.7	10°33.6	·· 31.3	22°27.8	·· 10.5	206°40.2	·· 49.8	225°43.2	·· 29.5
16	193°26.2	25°33.3	30.0	37°28.7	09.9	221°42.9	49.9	240°45.9	29.5
17	208°28.6	40°33.1	28.8	52°29.7	09.3	236°45.7	50.0	255°48.5	29.6
18	223°31.1	55°32.8	N06°27.6	67°30.7	N11°08.8	251°48.4	S12°50.1	270°51.2	S18°29.6
19	238°33.6	70°32.5	26.3	82°31.7	08.2	266°51.2	50.2	285°53.8	29.7
20	253°36.0	85°32.3	25.1	97°32.6	07.6	281°53.9	50.3	300°56.5	29.7
21	268°38.5	100°32.0	·· 23.8	112°33.6	·· 07.0	296°56.7	·· 50.5	315°59.1	·· 29.8
22	283°41.0	115°31.7	22.6	127°34.6	06.4	311°59.4	50.6	331°01.8	29.8
23	298°43.4	130°31.5	21.4	142°35.6	05.8	327°02.2	50.7	346°04.4	29.9
Mer.pass.	03:08	ν -0.3′	d -1.2′	m -3.93	ν 1.0′	d -0.6′	m 1.83	ν 2.7′	d 0.1′ m -2.85	ν 2.7′	d 0.1′ m 0.19

Stars	SHA	Dec
Alpheratz	357°37.4	29°12.4
Ankaa	353°09.7	-42°11.2
Schedar	349°33.9	56°39.0
Diphda	348°50.0	-17°52.0
Achernar	335°22.2	-57°07.4
Hamal	327°54.3	23°33.7
Polaris	315°22.0	89°20.9
Acamar	315°14.0	-40°12.9
Menkar	314°09.1	4°10.4
Mirfak	308°32.3	49°56.0
Aldebaran	290°43.0	16°33.1
Rigel	281°06.8	-8°10.5
Capella	280°26.3	46°01.0
Bellatrix	278°26.1	6°22.2
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.2
Betelgeuse	270°55.4	7°24.7
Canopus	263°54.1	-52°42.2
Sirius	258°29.0	-16°44.6
Adhara	255°08.4	-28°59.9
Procyon	244°54.1	5°10.3
Pollux	243°21.1	27°58.5
Avior	234°16.5	-59°34.6
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.7	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.6	-17°39.6
Acrux	173°03.5	-63°13.2
Gacrux	171°55.0	-57°14.1
Alioth	166°15.8	55°51.0
Spica	158°25.3	-11°16.3
Alkaid	152°54.4	49°12.7
Hadar	148°40.0	-60°28.7
Menkent	148°00.9	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.1	-60°55.6
Kochab	137°19.8	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.7
Atria	107°15.5	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.1	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.4
Enif	33°41.2	9°58.4
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.3	-29°30.4
Scheat	13°47.6	28°11.9
Markab	13°32.4	15°19.2

Aug 02 Mon	SHA	Mer.pass
Venus	195°02.4	14:17
Mars	205°38.0	13:33
Jupiter	27°58.8	01:25
Saturn	47°07.7	00:08

Aug 03 Tue	SHA	Mer.pass
Venus	193°56.5	14:17
Mars	205°02.2	13:32
Jupiter	28°05.5	01:20
Saturn	47°12.2	00:04

Aug 04 Wed	SHA	Mer.pass
Venus	192°50.8	14:18
Mars	204°26.4	13:30
Jupiter	28°12.2	01:16
Saturn	47°16.7	23:56

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.7	N17°45.4	257°09.5	13.9′	N18°02.6	9.4′	54.2′
1	193°25.7	44.8	271°42.4	13.9′	18°12.0	9.3′	54.2′
2	208°25.8	44.1	286°15.3	13.8′	18°21.3	9.3′	54.2′
3	223°25.8	·· 43.5	300°48.1	13.8′	18°30.6	9.2′	54.2′
4	238°25.9	42.8	315°20.9	13.7′	18°39.8	9.1′	54.2′
5	253°25.9	42.2	329°53.6	13.7′	18°48.9	9.0′	54.2′
6	268°26.0	N17°41.6	344°26.3	13.6′	N18°57.9	8.9′	54.2′
7	283°26.0	40.9	358°58.9	13.6′	19°06.8	8.9′	54.2′
8	298°26.1	40.3	13°31.5	13.5′	19°15.7	8.8′	54.2′
9	313°26.1	·· 39.6	28°04.0	13.4′	19°24.5	8.7′	54.2′
10	328°26.2	39.0	42°36.4	13.4′	19°33.2	8.6′	54.2′
11	343°26.2	38.3	57°08.8	13.3′	19°41.8	8.5′	54.2′
12	358°26.2	N17°37.7	71°41.1	13.3′	N19°50.3	8.5′	54.2′
13	13°26.3	37.0	86°13.4	13.2′	19°58.8	8.4′	54.2′
14	28°26.3	36.4	100°45.6	13.2′	20°07.1	8.3′	54.2′
15	43°26.4	·· 35.7	115°17.8	13.1′	20°15.4	8.2′	54.2′
16	58°26.4	35.1	129°49.9	13.0′	20°23.6	8.1′	54.2′
17	73°26.5	34.4	144°22.0	13.0′	20°31.7	8.0′	54.2′
18	88°26.5	N17°33.8	158°54.0	12.9′	N20°39.8	7.9′	54.2′
19	103°26.6	33.1	173°25.9	12.9′	20°47.7	7.8′	54.2′
20	118°26.6	32.5	187°57.8	12.8′	20°55.5	7.8′	54.2′
21	133°26.7	·· 31.8	202°29.6	12.8′	21°03.3	7.7′	54.2′
22	148°26.7	31.2	217°01.3	12.7′	21°11.0	7.6′	54.2′
23	163°26.8	30.5	231°33.0	12.6′	21°18.5	7.5′	54.2′
	SD = 15.8′	d = -0.6′	SD = 14.8′				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.8	N17°29.9	246°04.7	12.6′	N21°26.0	7.4′	54.2′
1	193°26.9	29.2	260°36.2	12.5′	21°33.4	7.3′	54.2′
2	208°26.9	28.6	275°07.8	12.5′	21°40.7	7.2′	54.2′
3	223°27.0	·· 27.9	289°39.2	12.4′	21°47.9	7.1′	54.2′
4	238°27.0	27.3	304°10.6	12.3′	21°55.0	7.0′	54.2′
5	253°27.1	26.6	318°41.9	12.3′	22°02.0	6.9′	54.2′
6	268°27.1	N17°25.9	333°13.2	12.2′	N22°09.0	6.8′	54.2′
7	283°27.2	25.3	347°44.4	12.2′	22°15.8	6.7′	54.2′
8	298°27.2	24.6	2°15.6	12.1′	22°22.5	6.6′	54.2′
9	313°27.3	·· 24.0	16°46.7	12.0′	22°29.1	6.5′	54.2′
10	328°27.3	23.3	31°17.7	12.0′	22°35.6	6.4′	54.3′
11	343°27.4	22.7	45°48.7	11.9′	22°42.1	6.3′	54.3′
12	358°27.5	N17°22.0	60°19.6	11.9′	N22°48.4	6.2′	54.3′
13	13°27.5	21.3	74°50.5	11.8′	22°54.6	6.1′	54.3′
14	28°27.6	20.7	89°21.3	11.7′	23°00.7	6.0′	54.3′
15	43°27.6	·· 20.0	103°52.0	11.7′	23°06.7	5.9′	54.3′
16	58°27.7	19.4	118°22.7	11.6′	23°12.7	5.8′	54.3′
17	73°27.7	18.7	132°53.3	11.6′	23°18.5	5.7′	54.3′
18	88°27.8	N17°18.0	147°23.9	11.5′	N23°24.2	5.6′	54.3′
19	103°27.8	17.4	161°54.4	11.4′	23°29.8	5.5′	54.3′
20	118°27.9	16.7	176°24.8	11.4′	23°35.2	5.4′	54.3′
21	133°27.9	·· 16.1	190°55.2	11.3′	23°40.6	5.3′	54.3′
22	148°28.0	15.4	205°25.5	11.3′	23°45.9	5.2′	54.4′
23	163°28.1	14.7	219°55.8	11.2′	23°51.1	5.1′	54.4′
	SD = 15.8′	d = -0.7′	SD = 14.8′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.1	N17°14.1	234°26.0	11.2′	N23°56.1	4.9′	54.4′
1	193°28.2	13.4	248°56.1	11.1′	24°01.1	4.8′	54.4′
2	208°28.2	12.7	263°26.2	11.0′	24°05.9	4.7′	54.4′
3	223°28.3	·· 12.1	277°56.3	11.0′	24°10.6	4.6′	54.4′
4	238°28.3	11.4	292°26.3	10.9′	24°15.2	4.5′	54.4′
5	253°28.4	10.7	306°56.2	10.9′	24°19.7	4.4′	54.4′
6	268°28.5	N17°10.1	321°26.1	10.8′	N24°24.1	4.3′	54.4′
7	283°28.5	09.4	335°55.9	10.8′	24°28.4	4.2′	54.5′
8	298°28.6	08.7	350°25.6	10.7′	24°32.5	4.0′	54.5′
9	313°28.6	·· 08.1	4°55.4	10.7′	24°36.6	3.9′	54.5′
10	328°28.7	07.4	19°25.0	10.6′	24°40.5	3.8′	54.5′
11	343°28.7	06.7	33°54.6	10.6′	24°44.3	3.7′	54.5′
12	358°28.8	N17°06.0	48°24.2	10.5′	N24°48.0	3.6′	54.5′
13	13°28.9	05.4	62°53.7	10.5′	24°51.5	3.4′	54.5′
14	28°28.9	04.7	77°23.1	10.4′	24°55.0	3.3′	54.5′
15	43°29.0	·· 04.0	91°52.6	10.4′	24°58.3	3.2′	54.6′
16	58°29.0	03.4	106°21.9	10.3′	25°01.5	3.1′	54.6′
17	73°29.1	02.7	120°51.2	10.3′	25°04.6	3.0′	54.6′
18	88°29.2	N17°02.0	135°20.5	10.2′	N25°07.6	2.8′	54.6′
19	103°29.2	01.3	149°49.7	10.2′	25°10.4	2.7′	54.6′
20	118°29.3	00.7	164°18.9	10.1′	25°13.2	2.6′	54.6′
21	133°29.3	17°00.0	178°48.0	10.1′	25°15.8	2.5′	54.6′
22	148°29.4	16°59.3	193°17.1	10.0′	25°18.2	2.4′	54.7′
23	163°29.5	58.6	207°46.1	10.0′	25°20.6	2.2′	54.7′
	SD = 15.8′	d = -0.7′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°						
N 70°	-:-	-:-	01:44	22:22	-:-	-:-
68°	-:-	-:-	02:26	21:42	-:-	-:-
66°	-:-	00:55	02:54	21:15	23:06	-:-
64°	-:-	01:52	03:15	20:55	22:16	-:-
62°	-:-	02:24	03:32	20:39	21:45	-:-
60°	00:50	02:47	03:46	20:25	21:23	23:13
N 58°	01:41	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	04:54	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	08:10	16:04	16:51	17:42

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

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 23-25 36-20%
02	06:17	06:15	12:06	07:04	19:27	
03	06:13	06:10	12:06	07:51	20:15	
04	06:08	06:05	12:06	08:40	21:05	

DUT1 = UT1-UTC = -0.1399 sec ΔT = TT-UT1 = +69.3239 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	313°45.9	145°31.2	N06°20.1	157°36.5	N11°05.2	342°04.9	S12°50.8	1°07.1	S18°29.9
1	328°48.4	160°31.0	18.9	172°37.5	04.7	357°07.7	50.9	16°09.7	30.0
2	343°50.8	175°30.7	17.6	187°38.5	04.1	12°10.4	51.0	31°12.4	30.0
3	358°53.3	190°30.4	·· 16.4	202°39.5	·· 03.5	27°13.2	·· 51.1	46°15.0	·· 30.1
4	13°55.7	205°30.2	15.1	217°40.4	02.9	42°15.9	51.2	61°17.7	30.1
5	28°58.2	220°29.9	13.9	232°41.4	02.3	57°18.7	51.4	76°20.4	30.2
6	44°00.7	235°29.7	N06°12.7	247°42.4	N11°01.7	72°21.4	S12°51.5	91°23.0	S18°30.3
7	59°03.1	250°29.4	11.4	262°43.4	01.1	87°24.2	51.6	106°25.7	30.3
8	74°05.6	265°29.1	10.2	277°44.3	00.6	102°27.0	51.7	121°28.3	30.4
9	89°08.1	280°28.9	·· 08.9	292°45.3	11°00.0	117°29.7	·· 51.8	136°31.0	·· 30.4
10	104°10.5	295°28.6	07.7	307°46.3	10°59.4	132°32.5	51.9	151°33.6	30.5
11	119°13.0	310°28.4	06.4	322°47.3	58.8	147°35.2	52.0	166°36.3	30.5
12	134°15.5	325°28.1	N06°05.2	337°48.3	N10°58.2	162°38.0	S12°52.1	181°38.9	S18°30.6
13	149°17.9	340°27.9	03.9	352°49.2	57.6	177°40.7	52.3	196°41.6	30.6
14	164°20.4	355°27.6	02.7	7°50.2	57.0	192°43.5	52.4	211°44.2	30.7
15	179°22.9	10°27.3	·· 01.5	22°51.2	·· 56.4	207°46.2	·· 52.5	226°46.9	·· 30.7
16	194°25.3	25°27.1	06°00.2	37°52.2	55.9	222°49.0	52.6	241°49.5	30.8
17	209°27.8	40°26.8	05°59.0	52°53.1	55.3	237°51.7	52.7	256°52.2	30.8
18	224°30.2	55°26.6	N05°57.7	67°54.1	N10°54.7	252°54.5	S12°52.8	271°54.8	S18°30.9
19	239°32.7	70°26.3	56.5	82°55.1	54.1	267°57.2	52.9	286°57.5	30.9
20	254°35.2	85°26.1	55.2	97°56.1	53.5	283°00.0	53.0	302°00.1	31.0
21	269°37.6	100°25.8	·· 54.0	112°57.0	·· 52.9	298°02.7	·· 53.2	317°02.8	·· 31.1
22	284°40.1	115°25.5	52.7	127°58.0	52.3	313°05.5	53.3	332°05.4	31.1
23	299°42.6	130°25.3	51.5	142°59.0	51.7	328°08.2	53.4	347°08.1	31.2
Mer.pass.	03:04	ν -0.3′	d -1.2′	m -3.93	ν 1.0′	d -0.6′	m 1.83	ν 2.8′	d 0.1′ m -2.85	ν 2.7′	d 0.1′ m 0.20

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	314°45.0	145°25.0	N05°50.2	158°00.0	N10°51.2	343°11.0	S12°53.5	2°10.7	S18°31.2
1	329°47.5	160°24.8	49.0	173°00.9	50.6	358°13.8	53.6	17°13.4	31.3
2	344°50.0	175°24.5	47.7	188°01.9	50.0	13°16.5	53.7	32°16.0	31.3
3	359°52.4	190°24.3	·· 46.5	203°02.9	·· 49.4	28°19.3	·· 53.8	47°18.7	·· 31.4
4	14°54.9	205°24.0	45.2	218°03.9	48.8	43°22.0	54.0	62°21.3	31.4
5	29°57.4	220°23.8	44.0	233°04.9	48.2	58°24.8	54.1	77°24.0	31.5
6	44°59.8	235°23.5	N05°42.7	248°05.8	N10°47.6	73°27.5	S12°54.2	92°26.6	S18°31.5
7	60°02.3	250°23.3	41.5	263°06.8	47.0	88°30.3	54.3	107°29.3	31.6
8	75°04.7	265°23.0	40.2	278°07.8	46.4	103°33.0	54.4	122°31.9	31.6
9	90°07.2	280°22.8	·· 39.0	293°08.8	·· 45.9	118°35.8	·· 54.5	137°34.6	·· 31.7
10	105°09.7	295°22.5	37.7	308°09.7	45.3	133°38.6	54.6	152°37.2	31.7
11	120°12.1	310°22.3	36.5	323°10.7	44.7	148°41.3	54.8	167°39.9	31.8
12	135°14.6	325°22.0	N05°35.2	338°11.7	N10°44.1	163°44.1	S12°54.9	182°42.6	S18°31.8
13	150°17.1	340°21.8	34.0	353°12.7	43.5	178°46.8	55.0	197°45.2	31.9
14	165°19.5	355°21.5	32.7	8°13.7	42.9	193°49.6	55.1	212°47.9	32.0
15	180°22.0	10°21.3	·· 31.5	23°14.6	·· 42.3	208°52.3	·· 55.2	227°50.5	·· 32.0
16	195°24.5	25°21.0	30.2	38°15.6	41.7	223°55.1	55.3	242°53.2	32.1
17	210°26.9	40°20.8	29.0	53°16.6	41.1	238°57.8	55.4	257°55.8	32.1
18	225°29.4	55°20.5	N05°27.7	68°17.6	N10°40.5	254°00.6	S12°55.5	272°58.5	S18°32.2
19	240°31.9	70°20.3	26.5	83°18.5	40.0	269°03.4	55.7	288°01.1	32.2
20	255°34.3	85°20.0	25.2	98°19.5	39.4	284°06.1	55.8	303°03.8	32.3
21	270°36.8	100°19.8	·· 24.0	113°20.5	·· 38.8	299°08.9	·· 55.9	318°06.4	·· 32.3
22	285°39.2	115°19.5	22.7	128°21.5	38.2	314°11.6	56.0	333°09.1	32.4
23	300°41.7	130°19.3	21.5	143°22.5	37.6	329°14.4	56.1	348°11.7	32.4
Mer.pass.	03:01	ν -0.3′	d -1.2′	m -3.94	ν 1.0′	d -0.6′	m 1.83	ν 2.8′	d 0.1′ m -2.85	ν 2.7′	d 0.1′ m 0.22

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	315°44.2	145°19.0	N05°20.2	158°23.4	N10°37.0	344°17.1	S12°56.2	3°14.4	S18°32.5
1	330°46.6	160°18.8	18.9	173°24.4	36.4	359°19.9	56.3	18°17.0	32.5
2	345°49.1	175°18.5	17.7	188°25.4	35.8	14°22.7	56.5	33°19.7	32.6
3	0°51.6	190°18.3	·· 16.4	203°26.4	·· 35.2	29°25.4	·· 56.6	48°22.3	·· 32.6
4	15°54.0	205°18.0	15.2	218°27.3	34.6	44°28.2	56.7	63°25.0	32.7
5	30°56.5	220°17.8	13.9	233°28.3	34.0	59°30.9	56.8	78°27.6	32.7
6	45°59.0	235°17.5	N05°12.7	248°29.3	N10°33.4	74°33.7	S12°56.9	93°30.3	S18°32.8
7	61°01.4	250°17.3	11.4	263°30.3	32.9	89°36.5	57.0	108°32.9	32.9
8	76°03.9	265°17.1	10.2	278°31.3	32.3	104°39.2	57.1	123°35.6	32.9
9	91°06.3	280°16.8	·· 08.9	293°32.2	·· 31.7	119°42.0	·· 57.3	138°38.2	·· 33.0
10	106°08.8	295°16.6	07.6	308°33.2	31.1	134°44.7	57.4	153°40.9	33.0
11	121°11.3	310°16.3	06.4	323°34.2	30.5	149°47.5	57.5	168°43.5	33.1
12	136°13.7	325°16.1	N05°05.1	338°35.2	N10°29.9	164°50.2	S12°57.6	183°46.2	S18°33.1
13	151°16.2	340°15.8	03.9	353°36.2	29.3	179°53.0	57.7	198°48.8	33.2
14	166°18.7	355°15.6	02.6	8°37.1	28.7	194°55.8	57.8	213°51.5	33.2
15	181°21.1	10°15.3	·· 01.4	23°38.1	·· 28.1	209°58.5	·· 57.9	228°54.1	·· 33.3
16	196°23.6	25°15.1	05°00.1	38°39.1	27.5	225°01.3	58.1	243°56.8	33.3
17	211°26.1	40°14.9	04°58.8	53°40.1	26.9	240°04.0	58.2	258°59.4	33.4
18	226°28.5	55°14.6	N04°57.6	68°41.1	N10°26.3	255°06.8	S12°58.3	274°02.1	S18°33.4
19	241°31.0	70°14.4	56.3	83°42.0	25.7	270°09.6	58.4	289°04.7	33.5
20	256°33.5	85°14.1	55.1	98°43.0	25.1	285°12.3	58.5	304°07.4	33.5
21	271°35.9	100°13.9	·· 53.8	113°44.0	·· 24.6	300°15.1	·· 58.6	319°10.0	·· 33.6
22	286°38.4	115°13.7	52.5	128°45.0	24.0	315°17.8	58.8	334°12.7	33.6
23	301°40.8	130°13.4	51.3	143°45.9	23.4	330°20.6	58.9	349°15.3	33.7
Mer.pass.	02:57	ν -0.2′	d -1.3′	m -3.94	ν 1.0′	d -0.6′	m 1.83	ν 2.8′	d 0.1′ m -2.86	ν 2.7′	d 0.1′ m 0.23

Stars	SHA	Dec
Alpheratz	357°37.4	29°12.4
Ankaa	353°09.7	-42°11.2
Schedar	349°33.8	56°39.1
Diphda	348°49.9	-17°52.0
Achernar	335°22.2	-57°07.4
Hamal	327°54.3	23°33.7
Polaris	315°20.3	89°20.9
Acamar	315°14.0	-40°12.9
Menkar	314°09.1	4°10.4
Mirfak	308°32.3	49°56.0
Aldebaran	290°43.0	16°33.1
Rigel	281°06.8	-8°10.5
Capella	280°26.3	46°01.0
Bellatrix	278°26.1	6°22.2
Elnath	278°05.6	28°37.4
Alnilam	275°40.8	-1°11.2
Betelgeuse	270°55.3	7°24.7
Canopus	263°54.1	-52°42.2
Sirius	258°29.0	-16°44.6
Adhara	255°08.4	-28°59.9
Procyon	244°54.1	5°10.3
Pollux	243°21.1	27°58.5
Avior	234°16.5	-59°34.6
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.7	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.4
Denebola	182°28.0	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.5	-63°13.2
Gacrux	171°55.0	-57°14.1
Alioth	166°15.8	55°50.9
Spica	158°25.3	-11°16.3
Alkaid	152°54.4	49°12.7
Hadar	148°40.0	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.5	19°04.5
Rigil Kent.	139°44.1	-60°55.6
Kochab	137°19.9	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.0	26°38.8
Antares	112°19.1	-26°28.7
Atria	107°15.5	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.1	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.7	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.3	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.5
Enif	33°41.2	9°58.5
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.3	-29°30.4
Scheat	13°47.6	28°11.9
Markab	13°32.4	15°19.2

Aug 05 Thu	SHA	Mer.pass
Venus	191°45.3	14:18
Mars	203°50.7	13:29
Jupiter	28°19.0	01:11
Saturn	47°21.2	23:51

Aug 06 Fri	SHA	Mer.pass
Venus	190°40.0	14:19
Mars	203°14.9	13:27
Jupiter	28°26.0	01:07
Saturn	47°25.7	23:47

Aug 07 Sat	SHA	Mer.pass
Venus	189°34.9	14:19
Mars	202°39.3	13:26
Jupiter	28°33.0	01:03
Saturn	47°30.2	23:43

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.5	N16°58.0	222°15.1	10.0′	N25°22.8	2.1′	54.7′
1	193°29.6	57.3	236°44.1	9.9′	25°24.9	2.0′	54.7′
2	208°29.7	56.6	251°13.0	9.9′	25°26.9	1.8′	54.7′
3	223°29.7	·· 55.9	265°41.8	9.8′	25°28.7	1.7′	54.7′
4	238°29.8	55.2	280°10.7	9.8′	25°30.5	1.6′	54.8′
5	253°29.8	54.6	294°39.5	9.8′	25°32.1	1.5′	54.8′
6	268°29.9	N16°53.9	309°08.2	9.7′	N25°33.5	1.3′	54.8′
7	283°30.0	53.2	323°36.9	9.7′	25°34.9	1.2′	54.8′
8	298°30.0	52.5	338°05.6	9.6′	25°36.1	1.1′	54.8′
9	313°30.1	·· 51.8	352°34.3	9.6′	25°37.2	1.0′	54.8′
10	328°30.2	51.2	7°02.9	9.6′	25°38.1	0.8′	54.9′
11	343°30.2	50.5	21°31.5	9.6′	25°38.9	0.7′	54.9′
12	358°30.3	N16°49.8	36°00.0	9.5′	N25°39.6	0.6′	54.9′
13	13°30.4	49.1	50°28.5	9.5′	25°40.2	0.4′	54.9′
14	28°30.4	48.4	64°57.0	9.5′	25°40.6	0.3′	54.9′
15	43°30.5	·· 47.8	79°25.5	9.4′	25°40.9	0.2′	54.9′
16	58°30.6	47.1	93°53.9	9.4′	25°41.1	0.0′	55.0′
17	73°30.6	46.4	108°22.3	9.4′	25°41.1	-0.1′	55.0′
18	88°30.7	N16°45.7	122°50.7	9.4′	N25°41.0	-0.2′	55.0′
19	103°30.8	45.0	137°19.1	9.3′	25°40.8	-0.4′	55.0′
20	118°30.8	44.3	151°47.4	9.3′	25°40.4	-0.5′	55.0′
21	133°30.9	·· 43.6	166°15.7	9.3′	25°39.9	-0.6′	55.1′
22	148°31.0	43.0	180°44.0	9.3′	25°39.3	-0.8′	55.1′
23	163°31.0	42.3	195°12.3	9.3′	25°38.6	-0.9′	55.1′
	SD = 15.8′	d = -0.7′	SD = 14.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°31.1	N16°41.6	209°40.5	9.2′	N25°37.7	-1.0′	55.1′
1	193°31.2	40.9	224°08.8	9.2′	25°36.6	-1.2′	55.1′
2	208°31.2	40.2	238°37.0	9.2′	25°35.5	-1.3′	55.2′
3	223°31.3	·· 39.5	253°05.2	9.2′	25°34.2	-1.4′	55.2′
4	238°31.4	38.8	267°33.4	9.2′	25°32.7	-1.6′	55.2′
5	253°31.5	38.1	282°01.6	9.2′	25°31.2	-1.7′	55.2′
6	268°31.5	N16°37.4	296°29.8	9.2′	N25°29.5	-1.8′	55.2′
7	283°31.6	36.8	310°57.9	9.1′	25°27.6	-2.0′	55.3′
8	298°31.7	36.1	325°26.1	9.1′	25°25.7	-2.1′	55.3′
9	313°31.7	·· 35.4	339°54.2	9.1′	25°23.6	-2.2′	55.3′
10	328°31.8	34.7	354°22.3	9.1′	25°21.3	-2.4′	55.3′
11	343°31.9	34.0	8°50.5	9.1′	25°18.9	-2.5′	55.3′
12	358°31.9	N16°33.3	23°18.6	9.1′	N25°16.4	-2.6′	55.4′
13	13°32.0	32.6	37°46.7	9.1′	25°13.8	-2.8′	55.4′
14	28°32.1	31.9	52°14.8	9.1′	25°11.0	-2.9′	55.4′
15	43°32.2	·· 31.2	66°42.9	9.1′	25°08.1	-3.0′	55.4′
16	58°32.2	30.5	81°11.1	9.1′	25°05.0	-3.2′	55.4′
17	73°32.3	29.8	95°39.2	9.1′	25°01.9	-3.3′	55.5′
18	88°32.4	N16°29.1	110°07.3	9.1′	N24°58.5	-3.5′	55.5′
19	103°32.5	28.4	124°35.4	9.1′	24°55.1	-3.6′	55.5′
20	118°32.5	27.7	139°03.5	9.1′	24°51.5	-3.7′	55.5′
21	133°32.6	·· 27.0	153°31.7	9.1′	24°47.8	-3.9′	55.5′
22	148°32.7	26.3	167°59.8	9.1′	24°43.9	-4.0′	55.6′
23	163°32.7	25.6	182°28.0	9.2′	24°39.9	-4.1′	55.6′
	SD = 15.8′	d = -0.7′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.8	N16°24.9	196°56.1	9.2′	N24°35.8	-4.3′	55.6′
1	193°32.9	24.2	211°24.3	9.2′	24°31.6	-4.4′	55.6′
2	208°33.0	23.5	225°52.4	9.2′	24°27.2	-4.5′	55.7′
3	223°33.0	·· 22.8	240°20.6	9.2′	24°22.6	-4.7′	55.7′
4	238°33.1	22.1	254°48.8	9.2′	24°18.0	-4.8′	55.7′
5	253°33.2	21.4	269°17.0	9.2′	24°13.2	-4.9′	55.7′
6	268°33.3	N16°20.7	283°45.3	9.2′	N24°08.3	-5.1′	55.7′
7	283°33.4	20.0	298°13.5	9.3′	24°03.2	-5.2′	55.8′
8	298°33.4	19.3	312°41.8	9.3′	23°58.1	-5.3′	55.8′
9	313°33.5	·· 18.6	327°10.1	9.3′	23°52.7	-5.4′	55.8′
10	328°33.6	17.9	341°38.4	9.3′	23°47.3	-5.6′	55.8′
11	343°33.7	17.2	356°06.7	9.3′	23°41.7	-5.7′	55.9′
12	358°33.7	N16°16.5	10°35.0	9.4′	N23°36.0	-5.8′	55.9′
13	13°33.8	15.8	25°03.4	9.4′	23°30.2	-6.0′	55.9′
14	28°33.9	15.1	39°31.7	9.4′	23°24.2	-6.1′	55.9′
15	43°34.0	·· 14.4	54°00.1	9.4′	23°18.1	-6.2′	55.9′
16	58°34.1	13.7	68°28.6	9.5′	23°11.9	-6.3′	56.0′
17	73°34.1	13.0	82°57.0	9.5′	23°05.6	-6.5′	56.0′
18	88°34.2	N16°12.3	97°25.5	9.5′	N22°59.1	-6.6′	56.0′
19	103°34.3	11.6	111°54.0	9.5′	22°52.5	-6.7′	56.0′
20	118°34.4	10.9	126°22.5	9.6′	22°45.7	-6.9′	56.1′
21	133°34.4	·· 10.2	140°51.1	9.6′	22°38.9	-7.0′	56.1′
22	148°34.5	09.4	155°19.7	9.6′	22°31.9	-7.1′	56.1′
23	163°34.6	08.7	169°48.3	9.6′	22°24.8	-7.2′	56.1′
	SD = 15.8′	d = -0.7′	SD = 15.2′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	01:01	22:58	–:–	–:–
N 70°	–:–	–:–	02:06	22:01	–:–	–:–
68°	–:–	–:–	02:40	21:28	–:–	–:–
66°	–:–	01:25	03:05	21:04	22:40	–:–
64°	–:–	02:07	03:24	20:45	22:00	–:–
62°	–:–	02:35	03:40	20:30	21:34	–:–
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°	02:40	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	04:56	05:22	18:49	19:15	19:45
20°	04:46	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	17:41	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	16:28	17:09	17:54
58°	06:22	07:09	07:53	16:20	17:04	17:51
S 60°	06:25	07:15	08:02	16:10	16:57	17:48

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

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 26-28 13-3%
05	06:02	05:59	12:06	09:31	21:57	
06	05:56	05:52	12:06	10:23	22:50	
07	05:49	05:45	12:06	11:16	23:42	

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	316°43.3	145°13.2	N04°50.0	158°46.9	N10°22.8	345°23.4	S12°59.0	4°18.0	S18°33.7
1	331°45.8	160°12.9	48.8	173°47.9	22.2	0°26.1	59.1	19°20.6	33.8
2	346°48.2	175°12.7	47.5	188°48.9	21.6	15°28.9	59.2	34°23.3	33.9
3	1°50.7	190°12.5	· · 46.2	203°49.9	· · 21.0	30°31.6	· · 59.3	49°25.9	· · 33.9
4	16°53.2	205°12.2	45.0	218°50.8	20.4	45°34.4	59.4	64°28.6	34.0
5	31°55.6	220°12.0	43.7	233°51.8	19.8	60°37.2	59.6	79°31.2	34.0
6	46°58.1	235°11.7	N04°42.5	248°52.8	N10°19.2	75°39.9	S12°59.7	94°33.9	S18°34.1
7	62°00.6	250°11.5	41.2	263°53.8	18.6	90°42.7	59.8	109°36.5	34.1
8	77°03.0	265°11.3	39.9	278°54.8	18.0	105°45.5	12°59.9	124°39.2	34.2
9	92°05.5	280°11.0	· · 38.7	293°55.7	· · 17.4	120°48.2	13°00.0	139°41.8	· · 34.2
10	107°08.0	295°10.8	37.4	308°56.7	16.8	135°51.0	00.1	154°44.5	34.3
11	122°10.4	310°10.5	36.2	323°57.7	16.2	150°53.7	00.2	169°47.1	34.3
12	137°12.9	325°10.3	N04°34.9	338°58.7	N10°15.6	165°56.5	S13°00.4	184°49.8	S18°34.4
13	152°15.3	340°10.1	33.6	353°59.7	15.0	180°59.3	00.5	199°52.4	34.4
14	167°17.8	355°09.8	32.4	9°00.6	14.4	196°02.0	00.6	214°55.1	34.5
15	182°20.3	10°09.6	· · 31.1	24°01.6	· · 13.8	211°04.8	· · 00.7	229°57.8	· · 34.5
16	197°22.7	25°09.4	29.8	39°02.6	13.2	226°07.5	00.8	245°00.4	34.6
17	212°25.2	40°09.1	28.6	54°03.6	12.7	241°10.3	00.9	260°03.1	34.6
18	227°27.7	55°08.9	N04°27.3	69°04.6	N10°12.1	256°13.1	S13°01.1	275°05.7	S18°34.7
19	242°30.1	70°08.6	26.1	84°05.5	11.5	271°15.8	01.2	290°08.4	34.7
20	257°32.6	85°08.4	24.8	99°06.5	10.9	286°18.6	01.3	305°11.0	34.8
21	272°35.1	100°08.2	· · 23.5	114°07.5	· · 10.3	301°21.4	· · 01.4	320°13.7	· · 34.8
22	287°37.5	115°07.9	22.3	129°08.5	09.7	316°24.1	01.5	335°16.3	34.9
23	302°40.0	130°07.7	21.0	144°09.5	09.1	331°26.9	01.6	350°19.0	35.0
Mer.pass. 02:53		ν -0.2′ d -1.3′ m -3.94		ν 1.0′ d -0.6′ m 1.82		ν 2.8′ d 0.1′ m -2.86		ν 2.7′ d 0.1′ m 0.24	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	317°42.5	145°07.5	N04°19.7	159°10.5	N10°08.5	346°29.7	S13°01.7	5°21.6	S18°35.0
1	332°44.9	160°07.2	18.5	174°11.4	07.9	1°32.4	01.9	20°24.3	35.1
2	347°47.4	175°07.0	17.2	189°12.4	07.3	16°35.2	02.0	35°26.9	35.1
3	2°49.8	190°06.8	· · 15.9	204°13.4	· · 06.7	31°37.9	· · 02.1	50°29.6	· · 35.2
4	17°52.3	205°06.5	14.7	219°14.4	06.1	46°40.7	02.2	65°32.2	35.2
5	32°54.8	220°06.3	13.4	234°15.4	05.5	61°43.5	02.3	80°34.9	35.3
6	47°57.2	235°06.1	N04°12.1	249°16.3	N10°04.9	76°46.2	S13°02.4	95°37.5	S18°35.3
7	62°59.7	250°05.8	10.9	264°17.3	04.3	91°49.0	02.6	110°40.2	35.4
8	78°02.2	265°05.6	09.6	279°18.3	03.7	106°51.8	02.7	125°42.8	35.4
9	93°04.6	280°05.4	· · 08.3	294°19.3	· · 03.1	121°54.5	· · 02.8	140°45.5	· · 35.5
10	108°07.1	295°05.1	07.1	309°20.3	02.5	136°57.3	02.9	155°48.1	35.5
11	123°09.6	310°04.9	05.8	324°21.2	01.9	152°00.1	03.0	170°50.8	35.6
12	138°12.0	325°04.7	N04°04.5	339°22.2	N10°01.3	167°02.8	S13°03.1	185°53.4	S18°35.6
13	153°14.5	340°04.5	03.3	354°23.2	00.7	182°05.6	03.3	200°56.1	35.7
14	168°16.9	355°04.2	02.0	9°24.2	10°00.1	197°08.3	03.4	215°58.7	35.7
15	183°19.4	10°04.0	04°00.7	24°25.2	09°59.5	212°11.1	· · 03.5	231°01.4	· · 35.8
16	198°21.9	25°03.8	03°59.5	39°26.2	58.9	227°13.9	03.6	246°04.0	35.8
17	213°24.3	40°03.5	58.2	54°27.1	58.3	242°16.6	03.7	261°06.7	35.9
18	228°26.8	55°03.3	N03°56.9	69°28.1	N09°57.7	257°19.4	S13°03.8	276°09.3	S18°35.9
19	243°29.3	70°03.1	55.7	84°29.1	57.1	272°22.2	03.9	291°12.0	36.0
20	258°31.7	85°02.8	54.4	99°30.1	56.5	287°24.9	04.1	306°14.6	36.1
21	273°34.2	100°02.6	· · 53.1	114°31.1	· · 55.9	302°27.7	· · 04.2	321°17.3	· · 36.1
22	288°36.7	115°02.4	51.9	129°32.0	55.3	317°30.5	04.3	336°19.9	36.2
23	303°39.1	130°02.2	50.6	144°33.0	54.7	332°33.2	04.4	351°22.6	36.2
Mer.pass. 02:49		ν -0.2′ d -1.3′ m -3.95		ν 1.0′ d -0.6′ m 1.82		ν 2.8′ d 0.1′ m -2.86		ν 2.7′ d 0.1′ m 0.25	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	318°41.6	145°01.9	N03°49.3	159°34.0	N09°54.1	347°36.0	S13°04.5	6°25.2	S18°36.3
1	333°44.1	160°01.7	48.0	174°35.0	53.5	2°38.8	04.6	21°27.9	36.3
2	348°46.5	175°01.5	46.8	189°36.0	52.9	17°41.5	04.8	36°30.5	36.4
3	3°49.0	190°01.2	· · 45.5	204°37.0	· · 52.3	32°44.3	· · 04.9	51°33.2	· · 36.4
4	18°51.4	205°01.0	44.2	219°37.9	51.7	47°47.1	05.0	66°35.8	36.5
5	33°53.9	220°00.8	43.0	234°38.9	51.1	62°49.8	05.1	81°38.4	36.5
6	48°56.4	235°00.6	N03°41.7	249°39.9	N09°50.5	77°52.6	S13°05.2	96°41.1	S18°36.6
7	63°58.8	250°00.3	40.4	264°40.9	49.9	92°55.4	05.3	111°43.7	36.6
8	79°01.3	265°00.1	39.2	279°41.9	49.3	107°58.1	05.5	126°46.4	36.7
9	94°03.8	279°59.9	· · 37.9	294°42.9	· · 48.7	123°00.9	· · 05.6	141°49.0	· · 36.7
10	109°06.2	294°59.7	36.6	309°43.8	48.1	138°03.7	05.7	156°51.7	36.8
11	124°08.7	309°59.4	35.3	324°44.8	47.5	153°06.4	05.8	171°54.3	36.8
12	139°11.2	324°59.2	N03°34.1	339°45.8	N09°46.9	168°09.2	S13°05.9	186°57.0	S18°36.9
13	154°13.6	339°59.0	32.8	354°46.8	46.3	183°12.0	06.0	201°59.6	36.9
14	169°16.1	354°58.7	31.5	9°47.8	45.7	198°14.7	06.2	217°02.3	37.0
15	184°18.6	9°58.5	· · 30.3	24°48.7	· · 45.1	213°17.5	· · 06.3	232°04.9	· · 37.0
16	199°21.0	24°58.3	29.0	39°49.7	44.5	228°20.3	06.4	247°07.6	37.1
17	214°23.5	39°58.1	27.7	54°50.7	43.9	243°23.0	06.5	262°10.2	37.1
18	229°25.9	54°57.9	N03°26.4	69°51.7	N09°43.3	258°25.8	S13°06.6	277°12.9	S18°37.2
19	244°28.4	69°57.6	25.2	84°52.7	42.7	273°28.6	06.7	292°15.5	37.2
20	259°30.9	84°57.4	23.9	99°53.7	42.1	288°31.3	06.9	307°18.2	37.3
21	274°33.3	99°57.2	· · 22.6	114°54.6	· · 41.5	303°34.1	· · 07.0	322°20.8	· · 37.3
22	289°35.8	114°57.0	21.3	129°55.6	40.9	318°36.9	07.1	337°23.5	37.4
23	304°38.3	129°56.7	20.1	144°56.6	40.3	333°39.6	07.2	352°26.1	37.5
Mer.pass. 02:45		ν -0.2′ d -1.3′ m -3.95		ν 1.0′ d -0.6′ m 1.82		ν 2.8′ d 0.1′ m -2.86		ν 2.6′ d 0.1′ m 0.26	

Stars	SHA	Dec
Alpheratz	357°37.4	29°12.5
Ankaa	353°09.7	-42°11.2
Schedar	349°33.8	56°39.1
Diphda	348°49.9	-17°52.0
Achernar	335°22.1	-57°07.4
Hamal	327°54.2	23°33.7
Polaris	315°18.8	89°20.9
Acamar	315°13.9	-40°12.9
Menkar	314°09.1	4°10.4
Mirfak	308°32.3	49°56.0
Aldebaran	290°42.9	16°33.1
Rigel	281°06.7	-8°10.5
Capella	280°26.3	46°01.0
Bellatrix	278°26.1	6°22.2
Elnath	278°05.6	28°37.4
Alnilam	275°40.8	-1°11.2
Betelgeuse	270°55.3	7°24.7
Canopus	263°54.0	-52°42.2
Sirius	258°29.0	-16°44.6
Adhara	255°08.4	-28°59.9
Procyon	244°54.1	5°10.3
Pollux	243°21.1	27°58.5
Avior	234°16.4	-59°34.6
Suhail	222°48.8	-43°31.1
Miaplacidus	221°39.7	-69°48.3
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.0	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.6	-63°13.2
Gacrux	171°55.0	-57°14.1
Alioth	166°15.8	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.4	49°12.7
Hadar	148°40.0	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.8	19°04.5
Rigil Kent.	139°44.1	-60°55.6
Kochab	137°19.9	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.5	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.8
Eltanin	90°43.1	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.8	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.3	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.5
Enif	33°41.2	9°58.5
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.3	-29°30.4
Scheat	13°47.6	28°11.9
Markab	13°32.4	15°19.3

Aug 08 Sun	**SHA**	**Mer.pass**
Venus	188°29.9	14:19
Mars	202°03.6	13:24
Jupiter	28°40.0	00:58
Saturn	47°34.7	23:39

Aug 09 Mon	**SHA**	**Mer.pass**
Venus	187°25.0	14:20
Mars	201°28.0	13:22
Jupiter	28°47.2	00:54
Saturn	47°39.2	23:34

Aug 10 Tue	**SHA**	**Mer.pass**
Venus	186°20.3	14:20
Mars	200°52.4	13:21
Jupiter	28°54.4	00:49
Saturn	47°43.6	23:30

Horizontal parallax

Venus: 0.1
Mars: 0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.7	N16°08.0	184°17.0	9.7′	N22°17.6	-7.3′	56.2′
1	193°34.8	07.3	198°45.6	9.7′	22°10.2	-7.5′	56.2′
2	208°34.9	06.6	213°14.3	9.7′	22°02.8	-7.6′	56.2′
3	223°34.9	· · 05.9	227°43.1	9.8′	21°55.2	-7.7′	56.2′
4	238°35.0	05.2	242°11.9	9.8′	21°47.5	-7.8′	56.2′
5	253°35.1	04.5	256°40.7	9.8′	21°39.6	-8.0′	56.3′
6	268°35.2	N16°03.8	271°09.5	9.9′	N21°31.7	-8.1′	56.3′
7	283°35.3	03.0	285°38.4	9.9′	21°23.6	-8.2′	56.3′
8	298°35.3	02.3	300°07.3	9.9′	21°15.4	-8.3′	56.3′
9	313°35.4	· · 01.6	314°36.2	10.0′	21°07.1	-8.4′	56.4′
10	328°35.5	00.9	329°05.2	10.0′	20°58.7	-8.5′	56.4′
11	343°35.6	16°00.2	343°34.2	10.1′	20°50.1	-8.7′	56.4′
12	358°35.7	N15°59.5	358°03.3	10.1′	N20°41.5	-8.8′	56.4′
13	13°35.8	58.8	12°32.4	10.1′	20°32.7	-8.9′	56.5′
14	28°35.8	58.0	27°01.5	10.2′	20°23.8	-9.0′	56.5′
15	43°35.9	· · 57.3	41°30.7	10.2′	20°14.8	-9.1′	56.5′
16	58°36.0	56.6	55°59.9	10.2′	20°05.7	-9.2′	56.5′
17	73°36.1	55.9	70°29.1	10.3′	19°56.5	-9.3′	56.5′
18	88°36.2	N15°55.2	84°58.4	10.3′	N19°47.1	-9.4′	56.6′
19	103°36.3	54.4	99°27.7	10.4′	19°37.7	-9.6′	56.6′
20	118°36.4	53.7	113°57.1	10.4′	19°28.1	-9.7′	56.6′
21	133°36.4	· · 53.0	128°26.5	10.4′	19°18.5	-9.8′	56.6′
22	148°36.5	52.3	142°55.9	10.5′	19°08.7	-9.9′	56.7′
23	163°36.6	51.6	157°25.4	10.5′	18°58.8	-10.0′	56.7′
	SD = 15.8′	d = -0.7′	SD = 15.3′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°36.7	N15°50.9	171°54.9	10.6′	N18°48.8	-10.1′	56.7′
1	193°36.8	50.1	186°24.4	10.6′	18°38.8	-10.2′	56.7′
2	208°36.9	49.4	200°54.0	10.6′	18°28.6	-10.3′	56.7′
3	223°37.0	· · 48.7	215°23.7	10.7′	18°18.3	-10.4′	56.8′
4	238°37.0	48.0	229°53.3	10.7′	18°07.9	-10.5′	56.8′
5	253°37.1	47.2	244°23.0	10.8′	17°57.4	-10.6′	56.8′
6	268°37.2	N15°46.5	258°52.8	10.8′	N17°46.8	-10.7′	56.8′
7	283°37.3	45.8	273°22.6	10.8′	17°36.1	-10.8′	56.9′
8	298°37.4	45.1	287°52.4	10.9′	17°25.3	-10.9′	56.9′
9	313°37.5	· · 44.3	302°22.3	10.9′	17°14.4	-11.0′	56.9′
10	328°37.6	43.6	316°52.2	11.0′	17°03.4	-11.1′	56.9′
11	343°37.7	42.9	331°22.2	11.0′	16°52.3	-11.2′	56.9′
12	358°37.8	N15°42.2	345°52.2	11.0′	N16°41.2	-11.3′	57.0′
13	13°37.8	41.4	0°22.2	11.1′	16°29.9	-11.4′	57.0′
14	28°37.9	40.7	14°52.3	11.1′	16°18.6	-11.4′	57.0′
15	43°38.0	· · 40.0	29°22.4	11.1′	16°07.1	-11.5′	57.0′
16	58°38.1	39.3	43°52.5	11.2′	15°55.6	-11.6′	57.1′
17	73°38.2	38.5	58°22.7	11.2′	15°43.9	-11.7′	57.1′
18	88°38.3	N15°37.8	72°52.9	11.3′	N15°32.2	-11.8′	57.1′
19	103°38.4	37.1	87°23.2	11.3′	15°20.4	-11.9′	57.1′
20	118°38.5	36.3	101°53.5	11.3′	15°08.5	-12.0′	57.1′
21	133°38.6	· · 35.6	116°23.9	11.4′	14°56.6	-12.1′	57.2′
22	148°38.7	34.9	130°54.2	11.4′	14°44.5	-12.1′	57.2′
23	163°38.8	34.2	145°24.6	11.5′	14°32.4	-12.2′	57.2′
	SD = 15.8′	d = -0.7′	SD = 15.5′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.9	N15°33.4	159°55.1	11.5′	N14°20.1	-12.3′	57.2′
1	193°38.9	32.7	174°25.6	11.5′	14°07.8	-12.4′	57.2′
2	208°39.0	32.0	188°56.1	11.6′	13°55.4	-12.5′	57.3′
3	223°39.1	· · 31.2	203°26.7	11.6′	13°43.0	-12.5′	57.3′
4	238°39.2	30.5	217°57.3	11.6′	13°30.5	-12.6′	57.3′
5	253°39.3	29.8	232°27.9	11.7′	13°17.8	-12.7′	57.3′
6	268°39.4	N15°29.0	246°58.5	11.7′	N13°05.2	-12.8′	57.4′
7	283°39.5	28.3	261°29.2	11.7′	12°52.4	-12.8′	57.4′
8	298°39.6	27.6	276°00.0	11.8′	12°39.6	-12.9′	57.4′
9	313°39.7	· · 26.8	290°30.7	11.8′	12°26.7	-13.0′	57.4′
10	328°39.8	26.1	305°01.5	11.8′	12°13.7	-13.0′	57.4′
11	343°39.9	25.4	319°32.3	11.9′	12°00.6	-13.1′	57.5′
12	358°40.0	N15°24.6	334°03.2	11.9′	N11°47.5	-13.2′	57.5′
13	13°40.1	23.9	348°34.1	11.9′	11°34.3	-13.2′	57.5′
14	28°40.2	23.1	3°05.0	11.9′	11°21.1	-13.3′	57.5′
15	43°40.3	· · 22.4	17°35.9	12.0′	11°07.8	-13.4′	57.5′
16	58°40.4	21.7	32°06.9	12.0′	10°54.4	-13.4′	57.6′
17	73°40.5	20.9	46°37.9	12.0′	10°41.0	-13.5′	57.6′
18	88°40.6	N15°20.2	61°08.9	12.0′	N10°27.5	-13.6′	57.6′
19	103°40.7	19.5	75°40.0	12.1′	10°13.9	-13.6′	57.6′
20	118°40.8	18.7	90°11.0	12.1′	10°00.3	-13.7′	57.6′
21	133°40.9	· · 18.0	104°42.1	12.1′	09°46.6	-13.7′	57.7′
22	148°41.0	17.2	119°13.2	12.1′	09°32.9	-13.8′	57.7′
23	163°41.1	16.5	133°44.4	12.2′	09°19.1	-13.8′	57.7′
	SD = 15.8′	d = -0.7′	SD = 15.6′				

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-2%
08	05:41	05:37	12:06	12:08	–:–	
09	05:33	05:29	12:05	12:58	00:33	
10	05:25	05:20	12:05	13:47	01:23	

August 11, 12, 13 UT (Wed., Thu., Fri.)

DUT1 = UT1-UTC = -0.1345 sec ΔT = TT-UT1 = +69.3185 sec

2021 August 11 to Aug. 13 UT

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	319°40.7	144°56.5	N03°18.8	159°57.6	N09°39.7	348°42.4	S13°07.3	7°28.8	S18°37.5
1	334°43.2	159°56.3	17.5	174°58.6	39.1	3°45.2	07.4	22°31.4	37.6
2	349°45.7	174°56.1	16.3	189°59.6	38.5	18°48.0	07.6	37°34.1	37.6
3	4°48.1	189°55.8	·· 15.0	205°00.5	·· 37.9	33°50.7	·· 07.7	52°36.7	·· 37.7
4	19°50.6	204°55.6	13.7	220°01.5	37.3	48°53.5	07.8	67°39.4	37.7
5	34°53.0	219°55.4	12.4	235°02.5	36.7	63°56.3	07.9	82°42.0	37.8
6	49°55.5	234°55.2	N03°11.2	250°03.5	N09°36.1	78°59.0	S13°08.0	97°44.7	S18°37.8
7	64°58.0	249°55.0	09.9	265°04.5	35.5	94°01.8	08.1	112°47.3	37.9
8	80°00.4	264°54.7	08.6	280°05.5	34.9	109°04.6	08.3	127°50.0	37.9
9	95°02.9	279°54.5	·· 07.3	295°06.4	·· 34.3	124°07.3	·· 08.4	142°52.6	·· 38.0
10	110°05.4	294°54.3	06.1	310°07.4	33.7	139°10.1	08.5	157°55.3	38.0
11	125°07.8	309°54.1	04.8	325°08.4	33.1	154°12.9	08.6	172°57.9	38.1
12	140°10.3	324°53.9	N03°03.5	340°09.4	N09°32.5	169°15.6	S13°08.7	188°00.6	S18°38.1
13	155°12.8	339°53.6	02.2	355°10.4	31.9	184°18.4	08.8	203°03.2	38.2
14	170°15.2	354°53.4	03°01.0	10°11.4	31.2	199°21.2	09.0	218°05.9	38.2
15	185°17.7	9°53.2	02°59.7	25°12.4	·· 30.6	214°24.0	·· 09.1	233°08.5	·· 38.3
16	200°20.2	24°53.0	58.4	40°13.3	30.0	229°26.7	09.2	248°11.2	38.3
17	215°22.6	39°52.8	57.1	55°14.3	29.4	244°29.5	09.3	263°13.8	38.4
18	230°25.1	54°52.5	N02°55.9	70°15.3	N09°28.8	259°32.3	S13°09.4	278°16.5	S18°38.4
19	245°27.5	69°52.3	54.6	85°16.3	28.2	274°35.0	09.5	293°19.1	38.5
20	260°30.0	84°52.1	53.3	100°17.3	27.6	289°37.8	09.7	308°21.8	38.5
21	275°32.5	99°51.9	·· 52.0	115°18.3	·· 27.0	304°40.6	·· 09.8	323°24.4	·· 38.6
22	290°34.9	114°51.7	50.7	130°19.2	26.4	319°43.3	09.9	338°27.1	38.6
23	305°37.4	129°51.4	49.5	145°20.2	25.8	334°46.1	10.0	353°29.7	38.7
Mer.pass.	02:41	ν -0.2′	d -1.3′	m -3.95	ν 1.0′	d -0.6′	m 1.82	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.1′ m 0.27

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	320°39.9	144°51.2	N02°48.2	160°21.2	N09°25.2	349°48.9	S13°10.1	8°32.3	S18°38.7
1	335°42.3	159°51.0	46.9	175°22.2	24.6	4°51.7	10.2	23°35.0	38.8
2	350°44.8	174°50.8	45.6	190°23.2	24.0	19°54.4	10.4	38°37.6	38.8
3	5°47.3	189°50.6	·· 44.4	205°24.2	·· 23.4	34°57.2	·· 10.5	53°40.3	·· 38.9
4	20°49.7	204°50.4	43.1	220°25.2	22.8	50°00.0	10.6	68°42.9	38.9
5	35°52.2	219°50.1	41.8	235°26.1	22.2	65°02.7	10.7	83°45.6	39.0
6	50°54.6	234°49.9	N02°40.5	250°27.1	N09°21.6	80°05.5	S13°10.8	98°48.2	S18°39.0
7	65°57.1	249°49.7	39.2	265°28.1	21.0	95°08.3	10.9	113°50.9	39.1
8	80°59.6	264°49.5	38.0	280°29.1	20.4	110°11.1	11.1	128°53.5	39.1
9	96°02.0	279°49.3	·· 36.7	295°30.1	·· 19.8	125°13.8	·· 11.2	143°56.2	·· 39.2
10	111°04.5	294°49.1	35.4	310°31.1	19.1	140°16.6	11.3	158°58.8	39.3
11	126°07.0	309°48.8	34.1	325°32.0	18.5	155°19.4	11.4	174°01.5	39.3
12	141°09.4	324°48.6	N02°32.9	340°33.0	N09°17.9	170°22.1	S13°11.5	189°04.1	S18°39.4
13	156°11.9	339°48.4	31.6	355°34.0	17.3	185°24.9	11.6	204°06.8	39.4
14	171°14.4	354°48.2	30.3	10°35.0	16.7	200°27.7	11.8	219°09.4	39.5
15	186°16.8	9°48.0	·· 29.0	25°36.0	·· 16.1	215°30.5	·· 11.9	234°12.1	·· 39.5
16	201°19.3	24°47.8	27.7	40°37.0	15.5	230°33.2	12.0	249°14.7	39.6
17	216°21.8	39°47.6	26.5	55°38.0	14.9	245°36.0	12.1	264°17.4	39.6
18	231°24.2	54°47.3	N02°25.2	70°38.9	N09°14.3	260°38.8	S13°12.2	279°20.0	S18°39.7
19	246°26.7	69°47.1	23.9	85°39.9	13.7	275°41.5	12.4	294°22.7	39.7
20	261°29.1	84°46.9	22.6	100°40.9	13.1	290°44.3	12.5	309°25.3	39.8
21	276°31.6	99°46.7	·· 21.3	115°41.9	·· 12.5	305°47.1	·· 12.6	324°27.9	·· 39.8
22	291°34.1	114°46.5	20.1	130°42.9	11.9	320°49.9	12.7	339°30.6	39.9
23	306°36.5	129°46.3	18.8	145°43.9	11.3	335°52.6	12.8	354°33.2	39.9
Mer.pass.	02:37	ν -0.2′	d -1.3′	m -3.96	ν 1.0′	d -0.6′	m 1.82	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.1′ m 0.27

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	321°39.0	144°46.1	N02°17.5	160°44.9	N09°10.7	350°55.4	S13°12.9	9°35.9	S18°40.0
1	336°41.5	159°45.8	16.2	175°45.8	10.0	5°58.2	13.1	24°38.5	40.0
2	351°43.9	174°45.6	14.9	190°46.8	09.4	21°00.9	13.2	39°41.2	40.1
3	6°46.4	189°45.4	·· 13.7	205°47.8	·· 08.8	36°03.7	·· 13.3	54°43.8	·· 40.1
4	21°48.9	204°45.2	12.4	220°48.8	08.2	51°06.5	13.4	69°46.5	40.2
5	36°51.3	219°45.0	11.1	235°49.8	07.6	66°09.3	13.5	84°49.1	40.2
6	51°53.8	234°44.8	N02°09.8	250°50.8	N09°07.0	81°12.0	S13°13.6	99°51.8	S18°40.3
7	66°56.2	249°44.6	08.5	265°51.8	06.4	96°14.8	13.8	114°54.4	40.3
8	81°58.7	264°44.4	07.3	280°52.7	05.8	111°17.6	13.9	129°57.1	40.4
9	97°01.2	279°44.2	·· 06.0	295°53.7	·· 05.2	126°20.4	·· 14.0	144°59.7	·· 40.4
10	112°03.6	294°43.9	04.7	310°54.7	04.6	141°23.1	14.1	160°02.4	40.5
11	127°06.1	309°43.7	03.4	325°55.7	04.0	156°25.9	14.2	175°05.0	40.5
12	142°08.6	324°43.5	N02°02.1	340°56.7	N09°03.4	171°28.7	S13°14.3	190°07.6	S18°40.6
13	157°11.0	339°43.3	02°00.8	355°57.7	02.7	186°31.4	14.5	205°10.3	40.6
14	172°13.5	354°43.1	01°59.6	10°58.7	02.1	201°34.2	14.6	220°12.9	40.7
15	187°16.0	9°42.9	·· 58.3	25°59.6	·· 01.5	216°37.0	·· 14.7	235°15.6	·· 40.7
16	202°18.4	24°42.7	57.0	41°00.6	00.9	231°39.8	14.8	250°18.2	40.8
17	217°20.9	39°42.5	55.7	56°01.6	09°00.3	246°42.5	14.9	265°20.9	40.8
18	232°23.4	54°42.3	N01°54.4	71°02.6	N08°59.7	261°45.3	S13°15.1	280°23.5	S18°40.9
19	247°25.8	69°42.1	53.2	86°03.6	59.1	276°48.1	15.2	295°26.2	40.9
20	262°28.3	84°41.8	51.9	101°04.6	58.5	291°50.9	15.3	310°28.8	41.0
21	277°30.7	99°41.6	·· 50.6	116°05.6	·· 57.9	306°53.6	·· 15.4	325°31.5	·· 41.0
22	292°33.2	114°41.4	49.3	131°06.6	57.3	321°56.4	15.5	340°34.1	41.1
23	307°35.7	129°41.2	48.0	146°07.5	56.7	336°59.2	15.6	355°36.8	41.1
Mer.pass.	02:33	ν -0.2′	d -1.3′	m -3.96	ν 1.0′	d -0.6′	m 1.81	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.1′ m 0.28

Stars	SHA	Dec
Alpheratz	357°37.4	29°12.5
Ankaa	353°09.6	-42°11.2
Schedar	349°33.8	56°39.1
Diphda	348°49.9	-17°52.0
Achernar	335°22.1	-57°07.4
Hamal	327°56.2	23°33.7
Polaris	315°17.4	89°20.9
Acamar	315°13.9	-40°12.9
Menkar	314°09.0	4°10.5
Mirfak	308°32.2	49°56.0
Aldebaran	290°42.9	16°33.1
Rigel	281°06.7	-8°10.5
Capella	280°26.2	46°01.0
Bellatrix	278°26.0	6°22.2
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.2
Betelgeuse	270°55.3	7°24.7
Canopus	263°54.0	-52°42.2
Sirius	258°29.0	-16°44.6
Adhara	255°08.4	-28°59.9
Procyon	244°54.0	5°10.3
Pollux	243°21.1	27°58.5
Avior	234°16.4	-59°34.6
Suhail	222°48.8	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.6	-63°13.2
Gacrux	171°55.1	-57°14.1
Alioth	166°15.8	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.4	49°12.7
Hadar	148°40.1	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.2	-60°55.6
Kochab	137°20.0	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.6	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.9
Eltanin	90°43.1	51°29.4
Kaus Aust.	83°35.9	-34°22.4
Vega	80°34.8	38°48.4
Nunki	75°50.9	-26°16.1
Altair	62°02.3	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.5
Enif	33°41.2	9°58.5
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.3	-29°30.4
Scheat	13°47.5	28°11.9
Markab	13°32.4	15°19.3

Aug 11 Wed	SHA	Mer.pass
Venus	185°15.8	14:20
Mars	200°16.9	13:19
Jupiter	29°01.7	00:45
Saturn	47°48.1	23:26

Aug 12 Thu	SHA	Mer.pass
Venus	184°11.4	14:21
Mars	199°41.3	13:18
Jupiter	29°09.0	00:41
Saturn	47°52.5	23:22

Aug 13 Fri	SHA	Mer.pass
Venus	183°07.1	14:21
Mars	199°05.9	13:16
Jupiter	29°16.4	00:36
Saturn	47°56.9	23:18

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°41.2	N15°15.8	148°15.6	12.2′	N09°05.3	-13.9′	57.7′
1	193°41.3	15.0	162°46.8	12.2′	08°51.4	-13.9′	57.7′
2	208°41.4	14.3	177°18.0	12.2′	08°37.4	-14.0′	57.8′
3	223°41.5	·· 13.5	191°49.2	12.3′	08°23.4	-14.0′	57.8′
4	238°41.6	12.8	206°20.4	12.3′	08°09.4	-14.1′	57.8′
5	253°41.7	12.0	220°51.7	12.3′	07°55.3	-14.1′	57.8′
6	268°41.8	N15°11.3	235°23.0	12.3′	N07°41.1	-14.2′	57.8′
7	283°41.9	10.6	249°54.3	12.3′	07°26.9	-14.2′	57.8′
8	298°42.0	09.8	264°25.6	12.3′	07°12.7	-14.3′	57.9′
9	313°42.1	·· 09.1	278°57.0	12.3′	06°58.4	-14.3′	57.9′
10	328°42.2	08.3	293°28.3	12.4′	06°44.1	-14.4′	57.9′
11	343°42.3	07.6	307°59.7	12.4′	06°29.8	-14.4′	57.9′
12	358°42.4	N15°06.8	322°31.0	12.4′	N06°15.4	-14.4′	57.9′
13	13°42.5	06.1	337°02.4	12.4′	06°00.9	-14.5′	58.0′
14	28°42.6	05.3	351°33.8	12.4′	05°46.4	-14.5′	58.0′
15	43°42.7	·· 04.6	6°05.2	12.4′	05°31.9	-14.5′	58.0′
16	58°42.8	03.8	20°36.6	12.4′	05°17.4	-14.6′	58.0′
17	73°42.9	03.1	35°08.1	12.4′	05°02.8	-14.6′	58.0′
18	88°43.0	N15°02.3	49°39.5	12.4′	N04°48.2	-14.6′	58.0′
19	103°43.1	01.6	64°10.9	12.4′	04°33.5	-14.7′	58.1′
20	118°43.2	00.8	78°42.4	12.4′	04°18.9	-14.7′	58.1′
21	133°43.3	15°00.1	93°13.8	12.4′	04°04.2	-14.7′	58.1′
22	148°43.4	14°59.3	107°45.3	12.5′	03°49.4	-14.8′	58.1′
23	163°43.5	58.6	122°16.7	12.5′	03°34.7	-14.8′	58.1′
	SD = 15.8′	d = -0.7′	SD = 15.7′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.6	N14°57.8	136°48.2	12.5′	N03°19.9	-14.8′	58.1′
1	193°43.7	57.1	151°19.6	12.5′	03°05.1	-14.8′	58.2′
2	208°43.8	56.3	165°51.1	12.4′	02°50.2	-14.9′	58.2′
3	223°43.9	·· 55.6	180°22.5	12.4′	02°35.4	-14.9′	58.2′
4	238°44.0	54.8	194°54.0	12.4′	02°20.5	-14.9′	58.2′
5	253°44.1	54.1	209°25.4	12.4′	02°05.6	-14.9′	58.2′
6	268°44.2	N14°53.3	223°56.8	12.4′	N01°50.7	-14.9′	58.2′
7	283°44.3	52.6	238°28.3	12.4′	01°35.8	-14.9′	58.3′
8	298°44.5	51.8	252°59.7	12.4′	01°20.9	-15.0′	58.3′
9	313°44.6	·· 51.1	267°31.1	12.4′	01°05.9	-15.0′	58.3′
10	328°44.7	50.3	282°02.5	12.4′	00°50.9	-15.0′	58.3′
11	343°44.8	49.5	296°33.9	12.4′	00°36.0	-15.0′	58.3′
12	358°44.9	N14°48.8	311°05.3	12.4′	N00°21.0	-15.0′	58.3′
13	13°45.0	48.0	325°36.7	12.4′	N00°06.0	-15.0′	58.4′
14	28°45.1	47.3	340°08.0	12.3′	S00°09.0	15.0′	58.4′
15	43°45.2	·· 46.5	354°39.4	12.3′	00°24.0	15.0′	58.4′
16	58°45.3	45.8	9°10.7	12.3′	00°39.1	15.0′	58.4′
17	73°45.4	45.0	23°42.0	12.3′	00°54.1	15.0′	58.4′
18	88°45.5	N14°44.2	38°13.3	12.3′	S01°09.1	15.0′	58.4′
19	103°45.6	43.5	52°44.6	12.3′	01°24.1	15.0′	58.4′
20	118°45.8	42.7	67°15.8	12.2′	01°39.1	15.0′	58.5′
21	133°45.9	·· 42.0	81°47.1	12.2′	01°54.2	15.0′	58.5′
22	148°46.0	41.2	96°18.3	12.2′	02°09.2	15.0′	58.5′
23	163°46.1	40.4	110°49.5	12.2′	02°24.2	15.0′	58.5′
	SD = 15.8′	d = -0.8′	SD = 15.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.2	N14°39.7	125°20.6	12.1′	S02°39.2	15.0′	58.5′
1	193°46.3	38.9	139°51.8	12.1′	02°54.2	15.0′	58.5′
2	208°46.4	38.2	154°22.9	12.1′	03°09.2	15.0′	58.5′
3	223°46.5	·· 37.4	168°54.0	12.1′	03°24.2	15.0′	58.6′
4	238°46.6	36.6	183°25.0	12.0′	03°39.2	15.0′	58.6′
5	253°46.8	35.9	197°56.0	12.0′	03°54.1	14.9′	58.6′
6	268°46.9	N14°35.1	212°27.0	12.0′	S04°09.1	14.9′	58.6′
7	283°47.0	34.3	226°58.0	11.9′	04°24.0	14.9′	58.6′
8	298°47.1	33.6	241°28.9	11.9′	04°38.9	14.9′	58.6′
9	313°47.2	·· 32.8	255°59.8	11.9′	04°53.8	14.9′	58.6′
10	328°47.3	32.0	270°30.7	11.8′	05°08.7	14.9′	58.7′
11	343°47.4	31.3	285°01.5	11.8′	05°23.6	14.8′	58.7′
12	358°47.5	N14°30.5	299°32.3	11.7′	S05°38.4	14.8′	58.7′
13	13°47.7	29.7	314°03.0	11.7′	05°53.2	14.8′	58.7′
14	28°47.8	29.0	328°33.7	11.7′	06°08.0	14.8′	58.7′
15	43°47.9	·· 28.2	343°04.4	11.6′	06°22.8	14.7′	58.7′
16	58°48.0	27.4	357°35.0	11.6′	06°37.5	14.7′	58.7′
17	73°48.1	26.7	12°05.6	11.5′	06°52.2	14.7′	58.7′
18	88°48.2	N14°25.9	26°36.1	11.5′	S07°06.9	14.7′	58.8′
19	103°48.3	25.1	41°06.6	11.4′	07°21.6	14.6′	58.8′
20	118°48.5	24.4	55°37.0	11.4′	07°36.2	14.6′	58.8′
21	133°48.6	·· 23.6	70°07.4	11.3′	07°50.8	14.5′	58.8′
22	148°48.7	22.8	84°37.8	11.3′	08°05.3	14.5′	58.8′
23	163°48.8	22.1	99°08.1	11.2′	08°19.8	14.5′	58.8′
	SD = 15.8′	d = -0.8′	SD = 16.0′				

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

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	06:46	08:58	11:10	21:35	21:07	20:38
N 70°	06:58	08:59	11:02	21:30	21:10	20:49
68°	07:07	09:01	10:55	21:26	21:12	20:58
66°	07:14	09:02	10:50	21:22	21:14	21:06
64°	07:21	09:02	10:45	21:19	21:16	21:12
62°	07:26	09:03	10:41	21:17	21:17	21:18
60°	07:31	09:04	10:37	21:14	21:19	21:23
N 58°	07:35	09:04	10:34	21:12	21:20	21:28
56°	07:39	09:05	10:31	21:10	21:21	21:32
54°	07:42	09:05	10:29	21:09	21:22	21:35
52°	07:45	09:05	10:27	21:07	21:22	21:38
50°	07:48	09:06	10:25	21:06	21:23	21:41
45°	07:54	09:07	10:20	21:03	21:25	21:48
N 40°	07:59	09:07	10:17	21:00	21:26	21:53
35°	08:03	09:08	10:14	20:58	21:27	21:58
30°	08:06	09:08	10:11	20:56	21:28	22:02
20°	08:13	09:09	10:06	20:52	21:30	22:09
N 10°	08:18	09:10	10:02	20:49	21:32	22:16
0°	08:24	09:11	09:58	20:46	21:33	22:22
S 10°	08:29	09:12	09:55	20:43	21:35	22:28
20°	08:34	09:12	09:51	20:40	21:36	22:34
30°	08:41	09:13	09:46	20:36	21:38	22:41
35°	08:44	09:14	09:44	20:34	21:39	22:46
40°	08:48	09:15	09:41	20:31	21:40	22:50
45°	08:53	09:15	09:38	20:28	21:42	22:56
S 50°	08:59	09:16	09:34	20:25	21:43	23:03
52°	09:01	09:17	09:32	20:23	21:44	23:06
54°	09:04	09:17	09:30	20:22	21:45	23:09
56°	09:07	09:18	09:28	20:20	21:46	23:13
58°	09:10	09:18	09:26	20:17	21:47	23:18
S 60°	09:14	09:19	09:23	20:15	21:48	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 3-5 7-22%
11	05:15	05:11	12:05	14:35	02:11	
12	05:06	05:00	12:05	15:22	02:58	
13	04:55	04:50	12:05	16:10	03:46	

Aries / Venus / Mars / Jupiter / Saturn

Sat	Aries GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn Dec
0	322°38.1	144°41.0	N01°46.7	161°08.5	N08°56.0	352°02.0	S13°15.8	10°39.4	S18°41.2
1	337°40.6	159°40.8	45.5	176°09.5	55.4	7°04.7	15.9	25°42.1	41.2
2	352°43.1	174°40.6	44.2	191°10.5	54.8	22°07.5	16.0	40°44.7	41.3
3	7°45.5	189°40.4	·· 42.9	206°11.5	·· 54.2	37°10.3	·· 16.1	55°47.3	·· 41.3
4	22°48.0	204°40.2	41.6	221°12.5	53.6	52°13.1	16.2	70°50.0	41.4
5	37°50.5	219°40.0	40.3	236°13.5	53.0	67°15.8	16.3	85°52.6	41.4
6	52°52.9	234°39.8	N01°39.0	251°14.4	N08°52.4	82°18.6	S13°16.5	100°55.3	S18°41.5
7	67°55.4	249°39.6	37.8	266°15.4	51.8	97°21.4	16.6	115°57.9	41.5
8	82°57.9	264°39.3	36.5	281°16.4	51.2	112°24.2	16.7	131°00.6	41.6
9	98°00.3	279°39.1	·· 35.2	296°17.4	·· 50.5	127°26.9	·· 16.8	146°03.2	·· 41.6
10	113°02.8	294°38.9	33.9	311°18.4	49.9	142°29.7	16.9	161°05.9	41.7
11	128°05.2	309°38.7	32.6	326°19.4	49.3	157°32.5	17.0	176°08.5	41.7
12	143°07.7	324°38.5	N01°31.3	341°20.4	N08°48.7	172°35.3	S13°17.2	191°11.2	S18°41.8
13	158°10.2	339°38.3	30.0	356°21.4	48.1	187°38.0	17.3	206°13.8	41.8
14	173°12.6	354°38.1	28.8	11°22.3	47.5	202°40.8	17.4	221°16.4	41.9
15	188°15.1	9°37.9	·· 27.5	26°23.3	·· 46.9	217°43.6	·· 17.5	236°19.1	·· 41.9
16	203°17.6	24°37.7	26.2	41°24.3	46.3	232°46.4	17.6	251°21.7	42.0
17	218°20.0	39°37.5	24.9	56°25.3	45.7	247°49.1	17.8	266°24.4	42.0
18	233°22.5	54°37.3	N01°23.6	71°26.3	N08°45.0	262°51.9	S13°17.9	281°27.0	S18°42.1
19	248°25.0	69°37.1	22.3	86°27.3	44.4	277°54.7	18.0	296°29.7	42.1
20	263°27.4	84°36.9	21.1	101°28.3	43.8	292°57.5	18.1	311°32.3	42.2
21	278°29.9	99°36.7	·· 19.8	116°29.3	·· 43.2	308°00.2	·· 18.2	326°35.0	·· 42.2
22	293°32.3	114°36.5	18.5	131°30.2	42.6	323°03.0	18.3	341°37.6	42.3
23	308°34.8	129°36.3	17.2	146°31.2	42.0	338°05.8	18.5	356°40.3	42.3
Mer.pass.	02:29	ν -0.2′	d -1.3′	m -3.96	ν 1.0′	d -0.6′	m 1.81	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.1′ m 0.29

Sun	GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn Dec
0	323°37.3	144°36.1	N01°15.9	161°32.2	N08°41.4	353°08.6	S13°18.6	11°42.9	S18°42.4
1	338°39.7	159°35.9	14.6	176°33.2	40.8	8°11.3	18.7	26°45.5	42.4
2	353°42.2	174°35.7	13.3	191°34.2	40.1	23°14.1	18.8	41°48.2	42.5
3	8°44.7	189°35.4	·· 12.1	206°35.2	·· 39.5	38°16.9	·· 18.9	56°50.8	·· 42.5
4	23°47.1	204°35.2	10.8	221°36.2	38.9	53°19.7	19.0	71°53.5	42.6
5	38°49.6	219°35.0	09.5	236°37.2	38.3	68°22.4	19.2	86°56.1	42.6
6	53°52.1	234°34.8	N01°08.2	251°38.2	N08°37.7	83°25.2	S13°19.3	101°58.8	S18°42.7
7	68°54.5	249°34.6	06.9	266°39.1	37.1	98°28.0	19.4	117°01.4	42.7
8	83°57.0	264°34.4	05.6	281°40.1	36.5	113°30.8	19.5	132°04.1	42.8
9	98°59.5	279°34.2	·· 04.3	296°41.1	·· 35.9	128°33.5	·· 19.6	147°06.7	·· 42.8
10	114°01.9	294°34.0	03.1	311°42.1	35.2	143°36.3	19.8	162°09.3	42.9
11	129°04.4	309°33.8	01.8	326°43.1	34.6	158°39.1	19.9	177°12.0	42.9
12	144°06.8	324°33.6	N01°00.5	341°44.1	N08°34.0	173°41.9	S13°20.0	192°14.6	S18°43.0
13	159°09.3	339°33.4	00°59.2	356°45.1	33.4	188°44.6	20.1	207°17.3	43.0
14	174°11.8	354°33.2	57.9	11°46.1	32.8	203°47.4	20.2	222°19.9	43.1
15	189°14.2	9°33.0	·· 56.6	26°47.0	·· 32.2	218°50.2	·· 20.3	237°22.6	·· 43.1
16	204°16.7	24°32.8	55.3	41°48.0	31.6	233°53.0	20.5	252°25.2	43.2
17	219°19.2	39°32.6	54.1	56°49.0	30.9	248°55.7	20.6	267°27.9	43.2
18	234°21.6	54°32.4	N00°52.8	71°50.0	N08°30.3	263°58.5	S13°20.7	282°30.5	S18°43.3
19	249°24.1	69°32.2	51.5	86°51.0	29.7	279°01.3	20.8	297°33.1	43.3
20	264°26.6	84°32.0	50.2	101°52.0	29.1	294°04.1	20.9	312°35.8	43.4
21	279°29.0	99°31.8	·· 48.9	116°53.0	·· 28.5	309°06.9	·· 21.0	327°38.4	·· 43.4
22	294°31.5	114°31.6	47.6	131°54.0	27.9	324°09.6	21.2	342°41.1	43.5
23	309°34.0	129°31.4	46.3	146°55.0	27.3	339°12.4	21.3	357°43.7	43.5
Mer.pass.	02:25	ν -0.2′	d -1.3′	m -3.97	ν 1.0′	d -0.6′	m 1.81	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.29

Mon	GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn Dec
0	324°36.4	144°31.2	N00°45.0	161°55.9	N08°26.6	354°15.2	S13°21.4	12°46.4	S18°43.6
1	339°38.9	159°31.0	43.8	176°56.9	26.0	9°18.0	21.5	27°49.0	43.6
2	354°41.3	174°30.8	42.5	191°57.9	25.4	24°20.7	21.6	42°51.6	43.7
3	9°43.8	189°30.6	·· 41.2	206°58.9	·· 24.8	39°23.5	·· 21.8	57°54.3	·· 43.7
4	24°46.3	204°30.4	39.9	221°59.9	24.2	54°26.3	21.9	72°56.9	43.8
5	39°48.7	219°30.2	38.6	237°00.9	23.6	69°29.1	22.0	87°59.6	43.8
6	54°51.2	234°30.0	N00°37.3	252°01.9	N08°23.0	84°31.8	S13°22.1	103°02.2	S18°43.9
7	69°53.7	249°29.8	36.0	267°02.9	22.3	99°34.6	22.2	118°04.9	43.9
8	84°56.1	264°29.6	34.8	282°03.9	21.7	114°37.4	22.3	133°07.5	44.0
9	99°58.6	279°29.4	·· 33.5	297°04.8	·· 21.1	129°40.2	·· 22.5	148°10.2	·· 44.0
10	115°01.1	294°29.2	32.2	312°05.8	20.5	144°43.0	22.6	163°12.8	44.1
11	130°03.5	309°29.0	30.9	327°06.8	19.9	159°45.7	22.7	178°15.4	44.1
12	145°06.0	324°28.8	N00°29.6	342°07.8	N08°19.3	174°48.5	S13°22.8	193°18.1	S18°44.2
13	160°08.4	339°28.6	28.3	357°08.8	18.6	189°51.3	22.9	208°20.7	44.2
14	175°10.9	354°28.4	27.0	12°09.8	18.0	204°54.1	23.0	223°23.4	44.3
15	190°13.4	9°28.2	·· 25.7	27°10.8	·· 17.4	219°56.8	·· 23.2	238°26.0	·· 44.3
16	205°15.8	24°28.0	24.5	42°11.8	16.8	234°59.6	23.3	253°28.7	44.4
17	220°18.3	39°27.8	23.2	57°12.8	16.2	250°02.4	23.4	268°31.3	44.4
18	235°20.8	54°27.6	N00°21.9	72°13.8	N08°15.6	265°05.2	S13°23.5	283°33.9	S18°44.5
19	250°23.2	69°27.4	20.6	87°14.7	14.9	280°08.0	23.6	298°36.6	44.5
20	265°25.7	84°27.2	19.3	102°15.7	14.3	295°10.7	23.8	313°39.2	44.6
21	280°28.2	99°27.0	·· 18.0	117°16.7	·· 13.7	310°13.5	·· 23.9	328°41.9	·· 44.6
22	295°30.6	114°26.8	16.7	132°17.7	13.1	325°16.3	24.0	343°44.5	44.7
23	310°33.1	129°26.6	15.4	147°18.7	12.5	340°19.1	24.1	358°47.2	44.7
Mer.pass.	02:21	ν -0.2′	d -1.3′	m -3.97	ν 1.0′	d -0.6′	m 1.81	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.29

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.5
Ankaa	353°09.6	-42°11.2
Schedar	349°33.8	56°39.1
Diphda	348°49.9	-17°52.0
Achernar	335°22.1	-57°07.4
Hamal	327°54.2	23°33.7
Polaris	315°15.9	89°20.9
Acamar	315°13.9	-40°12.9
Menkar	314°09.0	4°10.5
Mirfak	308°32.2	49°56.0
Aldebaran	290°42.9	16°33.1
Rigel	281°06.7	-8°10.5
Capella	280°26.2	46°01.0
Bellatrix	278°26.0	6°22.2
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.2
Betelgeuse	270°55.3	7°24.7
Canopus	263°54.0	-52°42.2
Sirius	258°28.9	-16°44.6
Adhara	255°08.3	-28°59.9
Procyon	244°54.0	5°10.3
Pollux	243°21.0	27°58.5
Avior	234°16.4	-59°34.5
Suhail	222°48.8	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.6	-63°13.2
Gacrux	171°55.1	-57°14.1
Alioth	166°15.8	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.4	49°12.7
Hadar	148°40.1	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.2	-60°55.6
Kochab	137°20.0	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.6	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°00.9	12°32.9
Eltanin	90°43.1	51°29.4
Kaus Aust.	83°35.9	-34°22.5
Vega	80°34.8	38°48.4
Nunki	75°50.9	-26°16.2
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°39.9
Deneb	49°27.2	45°21.5
Enif	33°41.2	9°58.5
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.3	-29°30.4
Scheat	13°47.5	28°11.9
Markab	13°32.3	15°19.3

Aug 14 Sat	SHA	Mer.pass
Venus	182°02.9	14:21
Mars	198°30.4	13:15
Jupiter	29°23.8	00:32
Saturn	48°01.3	23:13

Aug 15 Sun	SHA	Mer.pass
Venus	180°58.8	14:22
Mars	197°54.9	13:13
Jupiter	29°31.3	00:27
Saturn	48°05.6	23:09

Aug 16 Mon	SHA	Mer.pass
Venus	179°54.8	14:22
Mars	197°19.5	13:11
Jupiter	29°38.8	00:23
Saturn	48°09.9	23:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h / Sun / Moon

Sat	h	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0		178°48.9	N14°21.3	113°38.3	11.2′	S08°34.3	14.4′	58.8′
1		193°49.0	20.5	128°08.5	11.1′	08°48.8	14.4′	58.8′
2		208°49.2	19.7	142°38.7	11.1′	09°03.1	14.4′	58.8′
3		223°49.3	·· 19.0	157°08.8	11.0′	09°17.5	14.3′	58.9′
4		238°49.4	18.2	171°38.8	11.0′	09°31.8	14.3′	58.9′
5		253°49.5	17.4	186°08.8	10.9′	09°46.1	14.2′	58.9′
6		268°49.6	N14°16.7	200°38.7	10.9′	S10°00.3	14.2′	58.9′
7		283°49.8	15.9	215°08.5	10.8′	10°14.5	14.1′	58.9′
8		298°49.9	15.1	229°38.3	10.7′	10°28.6	14.1′	58.9′
9		313°50.0	·· 14.3	244°08.1	10.7′	10°42.6	14.0′	58.9′
10		328°50.1	13.6	258°37.8	10.6′	10°56.7	14.0′	58.9′
11		343°50.2	12.8	273°07.4	10.6′	11°10.6	13.9′	58.9′
12		358°50.3	N14°12.0	287°37.0	10.5′	S11°24.5	13.8′	59.0′
13		13°50.5	11.2	302°06.4	10.4′	11°38.4	13.8′	59.0′
14		28°50.6	10.5	316°35.9	10.4′	11°52.2	13.7′	59.0′
15		43°50.7	·· 09.7	331°05.2	10.3′	12°05.9	13.7′	59.0′
16		58°50.8	08.9	345°34.5	10.2′	12°19.6	13.6′	59.0′
17		73°50.9	08.1	0°03.8	10.2′	12°33.2	13.5′	59.0′
18		88°51.1	N14°07.3	14°32.9	10.1′	S12°46.7	13.5′	59.0′
19		103°51.2	06.6	29°02.0	10.0′	13°00.2	13.4′	59.0′
20		118°51.3	05.8	43°31.1	10.0′	13°13.6	13.3′	59.0′
21		133°51.4	·· 05.0	58°00.0	9.9′	13°26.9	13.3′	59.0′
22		148°51.6	04.2	72°28.9	9.8′	13°40.2	13.2′	59.0′
23		163°51.7	03.5	86°57.7	9.7′	13°53.4	13.1′	59.1′
		SD = 15.8′	d = -0.8′		SD = 16.0′			

Sun	h	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0		178°51.8	N14°02.7	101°26.4	9.7′	S14°06.5	13.1′	59.1′
1		193°51.9	01.9	115°55.1	9.6′	14°19.6	13.0′	59.1′
2		208°52.0	01.1	130°23.7	9.5′	14°32.6	12.9′	59.1′
3		223°52.2	14°00.3	144°52.2	9.4′	14°45.4	12.8′	59.1′
4		238°52.3	13°59.6	159°20.7	9.4′	14°58.3	12.7′	59.1′
5		253°52.4	58.8	173°49.0	9.3′	15°11.0	12.7′	59.1′
6		268°52.5	N13°58.0	188°17.3	9.2′	S15°23.7	12.6′	59.1′
7		283°52.7	57.2	202°45.5	9.1′	15°36.2	12.5′	59.1′
8		298°52.8	56.4	217°13.6	9.1′	15°48.7	12.4′	59.1′
9		313°52.9	·· 55.6	231°41.7	9.0′	16°01.1	12.3′	59.1′
10		328°53.0	54.9	246°09.7	8.9′	16°13.4	12.2′	59.1′
11		343°53.2	54.1	260°37.5	8.8′	16°25.6	12.1′	59.1′
12		358°53.3	N13°53.3	275°05.4	8.7′	S16°37.8	12.0′	59.2′
13		13°53.4	52.5	289°33.1	8.6′	16°49.8	11.9′	59.2′
14		28°53.5	51.7	304°00.7	8.6′	17°01.7	11.8′	59.2′
15		43°53.7	·· 50.9	318°28.3	8.5′	17°13.6	11.7′	59.2′
16		58°53.8	50.1	332°55.8	8.4′	17°25.3	11.6′	59.2′
17		73°53.9	49.4	347°23.2	8.3′	17°37.0	11.5′	59.2′
18		88°54.0	N13°48.6	1°50.5	8.2′	S17°48.5	11.4′	59.2′
19		103°54.2	47.8	16°17.7	8.2′	17°59.9	11.3′	59.2′
20		118°54.3	47.0	30°44.9	8.1′	18°11.3	11.2′	59.2′
21		133°54.4	·· 46.2	45°12.0	8.0′	18°22.5	11.1′	59.2′
22		148°54.6	45.4	59°39.0	7.9′	18°33.6	11.0′	59.2′
23		163°54.7	44.6	74°05.9	7.8′	18°44.7	10.9′	59.2′
		SD = 15.8′	d = -0.8′		SD = 16.1′			

Mon	h	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0		178°54.8	N13°43.8	88°32.7	7.7′	S18°55.6	10.8′	59.2′
1		193°54.9	43.0	102°59.4	7.6′	19°06.4	10.7′	59.2′
2		208°55.1	42.3	117°26.1	7.6′	19°17.0	10.6′	59.2′
3		223°55.2	·· 41.5	131°52.6	7.5′	19°27.6	10.5′	59.2′
4		238°55.3	40.7	146°19.1	7.4′	19°38.1	10.3′	59.3′
5		253°55.5	39.9	160°45.5	7.3′	19°48.4	10.2′	59.3′
6		268°55.6	N13°39.1	175°11.8	7.2′	S19°58.6	10.1′	59.3′
7		283°55.7	38.3	189°38.0	7.1′	20°08.7	10.0′	59.3′
8		298°55.8	37.5	204°04.2	7.1′	20°18.7	9.8′	59.3′
9		313°56.0	·· 36.7	218°30.2	7.0′	20°28.5	9.7′	59.3′
10		328°56.1	35.9	232°56.2	6.9′	20°38.2	9.6′	59.3′
11		343°56.2	35.1	247°22.1	6.8′	20°47.8	9.5′	59.3′
12		358°56.4	N13°34.3	261°47.9	6.7′	S20°57.3	9.3′	59.3′
13		13°56.5	33.5	276°13.7	6.6′	21°06.6	9.2′	59.3′
14		28°56.6	32.7	290°39.3	6.6′	21°15.9	9.1′	59.3′
15		43°56.8	·· 32.0	305°04.9	6.5′	21°24.9	8.9′	59.3′
16		58°56.9	31.2	319°30.4	6.4′	21°33.9	8.8′	59.3′
17		73°57.0	30.4	333°55.8	6.3′	21°42.7	8.7′	59.3′
18		88°57.2	N13°29.6	348°21.1	6.2′	S21°51.3	8.5′	59.3′
19		103°57.3	28.8	2°46.3	6.2′	21°59.9	8.4′	59.3′
20		118°57.4	28.0	17°11.5	6.1′	22°08.3	8.3′	59.3′
21		133°57.6	·· 27.2	31°36.6	6.0′	22°16.5	8.1′	59.3′
22		148°57.7	26.4	46°01.6	5.9′	22°24.6	8.0′	59.3′
23		163°57.8	25.6	60°26.5	5.9′	22°32.6	7.8′	59.3′
		SD = 15.8′	d = -0.8′		SD = 16.2′			

Twilight / Sunrise / Sunset

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	–:–	02:26	21:38	–:–	–:–
N 70°	–:–	–:–	02:57	21:08	23:26	–:–
68°	–:–	01:45	03:20	20:46	22:17	–:–
66°	–:–	02:22	03:38	20:28	21:43	–:–
64°	–:–	02:48	03:52	20:14	21:18	23:31
62°	01:33	03:07	04:04	20:03	20:59	22:30
60°	02:07	03:23	04:15	19:53	20:43	21:58
N 58°	02:31	03:36	04:23	19:44	20:31	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	21:03
52°	03:17	04:06	04:44	19:24	20:01	20:50
50°	03:28	04:14	04:50	19:18	19:54	20:39
45°	03:50	04:30	05:02	19:06	19:38	20:17
N 40°	04:07	04:43	05:12	18:57	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°	05:25	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	06:34	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	18:17
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	17:20	18:07
S 60°	06:05	06:54	07:39	16:31	17:16	18:05

Moonrise / Moonset

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

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 6-8 32-54%
14	04:44	04:39	12:05	17:00	04:35	
15	04:33	04:27	12:04	17:52	05:26	
16	04:21	04:15	12:04	18:48	06:20	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	325°35.6	144°26.4	N00°14.1	162°19.7	N08°11.9	355°21.8	S13°24.2	13°49.8	S18°44.8
1	340°38.0	159°26.2	12.9	177°20.7	11.2	10°24.6	24.3	28°52.4	44.8
2	355°40.5	174°26.0	11.6	192°21.7	10.6	25°27.4	24.5	43°55.1	44.9
3	10°42.9	189°25.8	·· 10.3	207°22.7	·· 10.0	40°30.2	·· 24.6	58°57.7	·· 44.9
4	25°45.4	204°25.6	09.0	222°23.7	09.4	55°32.9	24.7	74°00.4	45.0
5	40°47.9	219°25.5	07.7	237°24.6	08.8	70°35.7	24.8	89°03.0	45.0
6	55°50.3	234°25.3	N00°06.4	252°25.6	N08°08.2	85°38.5	S13°24.9	104°05.6	S18°45.1
7	70°52.8	249°25.1	05.1	267°26.6	07.5	100°41.3	25.0	119°08.3	45.1
8	85°55.3	264°24.9	03.8	282°27.6	06.9	115°44.1	25.2	134°10.9	45.2
9	100°57.7	279°24.7	·· 02.6	297°28.6	·· 06.3	130°46.8	·· 25.3	149°13.6	·· 45.2
10	116°00.2	294°24.5	N00°01.3	312°29.6	05.7	145°49.6	25.4	164°16.2	45.2
11	131°02.7	309°24.3	S00°00.0	327°30.6	05.1	160°52.4	25.5	179°18.9	45.3
12	146°05.1	324°24.1	S00°01.3	342°31.6	N08°04.4	175°55.2	S13°25.6	194°21.5	S18°45.3
13	161°07.6	339°23.9	02.6	357°32.6	03.8	190°58.0	25.7	209°24.1	45.4
14	176°10.1	354°23.7	03.9	12°33.6	03.2	206°00.7	25.9	224°26.8	45.4
15	191°12.5	9°23.5	·· 05.2	27°34.5	·· 02.6	221°03.5	·· 26.0	239°29.4	·· 45.5
16	206°15.0	24°23.3	06.5	42°35.5	02.0	236°06.3	26.1	254°32.1	45.5
17	221°17.4	39°23.1	07.8	57°36.5	01.4	251°09.1	26.2	269°34.7	45.6
18	236°19.9	54°22.9	S00°09.0	72°37.5	N08°00.7	266°11.8	S13°26.3	284°37.3	S18°45.6
19	251°22.4	69°22.7	10.3	87°38.5	08°00.1	281°14.6	26.5	299°40.0	45.7
20	266°24.8	84°22.5	11.6	102°39.5	07°59.5	296°17.4	26.6	314°42.6	45.7
21	281°27.3	99°22.3	·· 12.9	117°40.5	·· 58.9	311°20.2	·· 26.7	329°45.3	·· 45.8
22	296°29.8	114°22.1	14.2	132°41.5	58.3	326°23.0	26.8	344°47.9	45.8
23	311°32.2	129°21.9	15.5	147°42.5	57.6	341°25.7	26.9	359°50.6	45.9
	Mer.pass. 02:17	ν -0.2′	d -1.3′	m -3.98	ν 1.0′	d -0.6′	m 1.80	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.30

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	326°34.7	144°21.7	S00°16.8	162°43.5	N07°57.0	356°28.5	S13°27.0	14°53.2	S18°45.9
1	341°37.2	159°21.6	18.1	177°44.5	56.4	11°31.3	27.2	29°55.8	46.0
2	356°39.6	174°21.4	19.4	192°45.4	55.8	26°34.1	27.3	44°58.5	46.0
3	11°42.1	189°21.2	·· 20.6	207°46.4	·· 55.2	41°36.8	·· 27.4	60°01.1	·· 46.1
4	26°44.6	204°21.0	21.9	222°47.4	54.5	56°39.6	27.5	75°03.8	46.1
5	41°47.0	219°20.8	23.2	237°48.4	53.9	71°42.4	27.6	90°06.4	46.2
6	56°49.5	234°20.6	S00°24.5	252°49.4	N07°53.3	86°45.2	S13°27.7	105°09.0	S18°46.2
7	71°51.9	249°20.4	25.8	267°50.4	52.7	101°48.0	27.9	120°11.7	46.3
8	86°54.4	264°20.2	27.1	282°51.4	52.1	116°50.7	28.0	135°14.3	46.3
9	101°56.9	279°20.0	·· 28.4	297°52.4	·· 51.4	131°53.5	·· 28.1	150°17.0	·· 46.4
10	116°59.3	294°19.8	29.7	312°53.4	50.8	146°56.3	28.2	165°19.6	46.4
11	132°01.8	309°19.6	31.0	327°54.4	50.2	161°59.1	28.3	180°22.2	46.5
12	147°04.3	324°19.4	S00°32.3	342°55.4	N07°49.6	177°01.9	S13°28.4	195°24.9	S18°46.5
13	162°06.7	339°19.2	33.5	357°56.3	49.0	192°04.6	28.6	210°27.5	46.6
14	177°09.2	354°19.0	34.8	12°57.3	48.3	207°07.4	28.7	225°30.2	46.6
15	192°11.7	9°18.8	·· 36.1	27°58.3	·· 47.7	222°10.2	·· 28.8	240°32.8	·· 46.7
16	207°14.1	24°18.7	37.4	42°59.3	47.1	237°13.0	28.9	255°35.4	46.7
17	222°16.6	39°18.5	38.7	58°00.3	46.5	252°15.8	29.0	270°38.1	46.8
18	237°19.1	54°18.3	S00°40.0	73°01.3	N07°45.9	267°18.5	S13°29.1	285°40.7	S18°46.8
19	252°21.5	69°18.1	41.3	88°02.3	45.2	282°21.3	29.3	300°43.4	46.8
20	267°24.0	84°17.9	42.6	103°03.3	44.6	297°24.1	29.4	315°46.0	46.9
21	282°26.4	99°17.7	·· 43.9	118°04.3	·· 44.0	312°26.9	·· 29.5	330°48.6	·· 46.9
22	297°28.9	114°17.5	45.1	133°05.3	43.4	327°29.6	29.6	345°51.3	47.0
23	312°31.4	129°17.3	46.4	148°06.3	42.8	342°32.4	29.7	0°53.9	47.0
	Mer.pass. 02:13	ν -0.2′	d 1.3′	m -3.98	ν 1.0′	d -0.6′	m 1.80	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.30

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	327°33.8	144°17.1	S00°47.7	163°07.3	N07°42.1	357°35.2	S13°29.9	15°56.6	S18°47.1
1	342°36.3	159°16.9	49.0	178°08.2	41.5	12°38.0	30.0	30°59.2	47.1
2	357°38.8	174°16.7	50.3	193°09.2	40.9	27°40.8	30.1	46°01.8	47.2
3	12°41.2	189°16.5	·· 51.6	208°10.2	·· 40.3	42°43.5	·· 30.2	61°04.5	·· 47.2
4	27°43.7	204°16.4	52.9	223°11.2	39.6	57°46.3	30.3	76°07.1	47.3
5	42°46.2	219°16.2	54.2	238°12.2	39.0	72°49.1	30.4	91°09.8	47.3
6	57°48.6	234°16.0	S00°55.5	253°13.2	N07°38.4	87°51.9	S13°30.6	106°12.4	S18°47.4
7	72°51.1	249°15.8	56.7	268°14.2	37.8	102°54.7	30.7	121°15.0	47.4
8	87°53.6	264°15.6	58.0	283°15.2	37.2	117°57.4	30.8	136°17.7	47.5
9	102°56.0	279°15.4	00°59.3	298°16.2	·· 36.5	133°00.2	·· 30.9	151°20.3	·· 47.5
10	117°58.5	294°15.2	01°00.6	313°17.2	35.9	148°03.0	31.0	166°22.9	47.6
11	133°00.9	309°15.0	01.9	328°18.2	35.3	163°05.8	31.1	181°25.6	47.6
12	148°03.4	324°14.8	S01°03.2	343°19.2	N07°34.7	178°08.6	S13°31.3	196°28.2	S18°47.7
13	163°05.9	339°14.6	04.5	358°20.1	34.0	193°11.3	31.4	211°30.9	47.7
14	178°08.3	354°14.4	05.8	13°21.1	33.4	208°14.1	31.5	226°33.5	47.8
15	193°10.8	9°14.3	·· 07.1	28°22.1	·· 32.8	223°16.9	·· 31.6	241°36.1	·· 47.8
16	208°13.3	24°14.1	08.4	43°23.1	32.2	238°19.7	31.7	256°38.8	47.9
17	223°15.7	39°13.9	09.6	58°24.1	31.6	253°22.4	31.8	271°41.4	47.9
18	238°18.2	54°13.7	S01°10.9	73°25.1	N07°30.9	268°25.2	S13°32.0	286°44.1	S18°47.9
19	253°20.7	69°13.5	12.2	88°26.1	30.3	283°28.0	32.1	301°46.7	48.0
20	268°23.1	84°13.3	13.5	103°27.1	29.7	298°30.8	32.2	316°49.3	48.0
21	283°25.6	99°13.1	·· 14.8	118°28.1	·· 29.1	313°33.6	·· 32.3	331°52.0	·· 48.1
22	298°28.0	114°12.9	16.1	133°29.1	28.4	328°36.3	32.4	346°54.6	48.1
23	313°30.5	129°12.7	17.4	148°30.1	27.8	343°39.1	32.5	1°57.2	48.2
	Mer.pass. 02:09	ν -0.2′	d 1.3′	m -3.99	ν 1.0′	d -0.6′	m 1.80	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.31

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.5
Ankaa	353°09.6	-42°11.2
Schedar	349°33.7	56°39.1
Diphda	348°49.9	-17°52.0
Achernar	335°22.0	-57°07.4
Hamal	327°54.2	23°33.8
Polaris	315°14.1	89°20.9
Acamar	315°13.8	-40°12.9
Menkar	314°09.0	4°10.5
Mirfak	308°32.2	49°56.0
Aldebaran	290°42.9	16°33.1
Rigel	281°06.7	-8°10.5
Capella	280°26.2	46°01.0
Bellatrix	278°26.0	6°22.2
Elnath	278°05.5	28°37.4
Alnilam	275°40.7	-1°11.2
Betelgeuse	270°55.3	7°24.7
Canopus	263°54.0	-52°42.2
Sirius	258°28.9	-16°44.6
Adhara	255°08.3	-28°59.9
Procyon	244°54.0	5°10.3
Pollux	243°21.0	27°58.5
Avior	234°16.4	-59°34.5
Suhail	222°48.7	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.6	-63°13.2
Gacrux	171°55.1	-57°14.1
Alioth	166°15.8	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.7
Hadar	148°40.1	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.2	-60°55.6
Kochab	137°20.1	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.6	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.2	51°29.4
Kaus Aust.	83°35.9	-34°22.5
Vega	80°34.8	38°48.4
Nunki	75°50.9	-26°16.2
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.5
Enif	33°41.2	9°58.5
Al Na'ir	27°36.0	-46°51.3
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Aug 17 Tue	SHA	Mer.pass
Venus	178°50.9	14:22
Mars	196°44.1	13:10
Jupiter	29°46.3	00:18
Saturn	48°14.2	23:01

Aug 18 Wed	SHA	Mer.pass
Venus	177°47.0	14:23
Mars	196°08.8	13:08
Jupiter	29°53.8	00:14
Saturn	48°18.5	22:56

Aug 19 Thu	SHA	Mer.pass
Venus	176°43.3	14:23
Mars	195°33.4	13:07
Jupiter	30°01.4	00:10
Saturn	48°22.7	22:52

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.0	N13°24.8	74°51.4	5.8′	S22°40.4	7.7′	59.3′
1	193°58.1	24.0	89°16.2	5.7′	22°48.1	7.5′	59.3′
2	208°58.2	23.2	103°40.9	5.6′	22°55.6	7.4′	59.3′
3	223°58.4	·· 22.4	118°05.5	5.6′	23°03.0	7.2′	59.3′
4	238°58.5	21.6	132°30.1	5.5′	23°10.2	7.1′	59.3′
5	253°58.6	20.8	146°54.6	5.4′	23°17.3	6.9′	59.3′
6	268°58.8	N13°20.0	161°19.0	5.4′	S23°24.2	6.8′	59.3′
7	283°58.9	19.2	175°43.4	5.3′	23°31.0	6.6′	59.3′
8	298°59.0	18.4	190°07.7	5.2′	23°37.6	6.5′	59.3′
9	313°59.2	·· 17.6	204°31.9	5.2′	23°44.1	6.3′	59.3′
10	328°59.3	16.8	218°56.1	5.1′	23°50.4	6.1′	59.3′
11	343°59.4	16.0	233°20.2	5.0′	23°56.5	6.0′	59.3′
12	358°59.6	N13°15.2	247°44.2	5.0′	S24°02.5	5.8′	59.3′
13	13°59.7	14.4	262°08.2	4.9′	24°08.4	5.7′	59.3′
14	28°59.9	13.6	276°32.1	4.9′	24°14.0	5.5′	59.3′
15	44°00.0	·· 12.8	290°56.0	4.8′	24°19.5	5.3′	59.3′
16	59°00.1	12.0	305°19.8	4.7′	24°24.9	5.2′	59.3′
17	74°00.3	11.2	319°43.5	4.7′	24°30.1	5.0′	59.3′
18	89°00.4	N13°10.4	334°07.2	4.6′	S24°35.1	4.8′	59.3′
19	104°00.5	09.5	348°30.9	4.6′	24°39.9	4.7′	59.3′
20	119°00.7	08.7	2°54.5	4.5′	24°44.6	4.5′	59.3′
21	134°00.8	·· 07.9	17°18.0	4.5′	24°49.1	4.3′	59.3′
22	149°01.0	07.1	31°41.5	4.5′	24°53.5	4.2′	59.3′
23	164°01.1	06.3	46°05.0	4.4′	24°57.6	4.0′	59.3′
	SD = 15.8′	d = -0.8′	SD = 16.2′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°01.2	N13°05.5	60°28.4	4.4′	S25°01.7	3.8′	59.3′
1	194°01.4	04.7	74°51.8	4.3′	25°05.5	3.7′	59.3′
2	209°01.5	03.9	89°15.1	4.3′	25°09.2	3.5′	59.3′
3	224°01.7	·· 03.1	103°38.4	4.3′	25°12.7	3.3′	59.3′
4	239°01.8	02.3	118°01.7	4.2′	25°16.0	3.1′	59.3′
5	254°01.9	01.5	132°24.9	4.2′	25°19.1	3.0′	59.3′
6	269°02.1	N13°00.7	146°48.1	4.2′	S25°22.1	2.8′	59.3′
7	284°02.2	12°59.9	161°11.3	4.1′	25°24.9	2.6′	59.3′
8	299°02.4	59.0	175°34.4	4.1′	25°27.5	2.5′	59.3′
9	314°02.5	·· 58.2	189°57.6	4.1′	25°30.0	2.3′	59.3′
10	329°02.6	57.4	204°20.7	4.1′	25°32.2	2.1′	59.3′
11	344°02.8	56.6	218°43.7	4.1′	25°34.3	1.9′	59.3′
12	359°02.9	N12°55.8	233°06.8	4.0′	S25°36.3	1.7′	59.3′
13	14°03.1	55.0	247°29.8	4.0′	25°38.0	1.6′	59.3′
14	29°03.2	54.2	261°52.9	4.0′	25°39.6	1.4′	59.2′
15	44°03.4	·· 53.4	276°15.9	4.0′	25°41.0	1.2′	59.2′
16	59°03.5	52.6	290°38.9	4.0′	25°42.2	1.0′	59.2′
17	74°03.6	51.7	305°01.9	4.0′	25°43.2	0.9′	59.2′
18	89°03.8	N12°50.9	319°24.9	4.0′	S25°44.1	0.7′	59.2′
19	104°03.9	50.1	333°47.9	4.0′	25°44.8	0.5′	59.2′
20	119°04.1	49.3	348°10.9	4.0′	25°45.3	0.3′	59.2′
21	134°04.2	·· 48.5	2°33.9	4.0′	25°45.6	0.2′	59.2′
22	149°04.4	47.7	16°56.9	4.0′	25°45.8	-0.0′	59.2′
23	164°04.5	46.9	31°19.9	4.0′	25°45.7	-0.2′	59.2′
	SD = 15.8′	d = -0.8′	SD = 16.2′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°04.6	N12°46.0	45°43.0	4.0′	S25°45.5	-0.4′	59.2′
1	194°04.8	45.2	60°06.0	4.0′	25°45.1	-0.6′	59.2′
2	209°04.9	44.4	74°29.0	4.1′	25°44.6	-0.7′	59.2′
3	224°05.1	·· 43.6	88°52.1	4.1′	25°43.8	-0.9′	59.2′
4	239°05.2	42.8	103°15.2	4.1′	25°42.9	-1.1′	59.1′
5	254°05.4	42.0	117°38.3	4.1′	25°41.8	-1.3′	59.1′
6	269°05.5	N12°41.1	132°01.4	4.1′	S25°40.6	-1.4′	59.1′
7	284°05.7	40.3	146°24.5	4.2′	25°39.1	-1.6′	59.1′
8	299°05.8	39.5	160°47.7	4.2′	25°37.5	-1.8′	59.1′
9	314°06.0	·· 38.7	175°10.9	4.2′	25°35.7	-2.0′	59.1′
10	329°06.1	37.9	189°34.1	4.3′	25°33.8	-2.1′	59.1′
11	344°06.2	37.1	203°57.4	4.3′	25°31.6	-2.3′	59.1′
12	359°06.4	N12°36.2	218°20.7	4.3′	S25°29.3	-2.5′	59.1′
13	14°06.5	35.4	232°44.0	4.4′	25°26.8	-2.7′	59.1′
14	29°06.7	34.6	247°07.4	4.4′	25°24.2	-2.8′	59.0′
15	44°06.8	·· 33.8	261°30.8	4.5′	25°21.3	-3.0′	59.0′
16	59°07.0	33.0	275°54.3	4.5′	25°18.3	-3.2′	59.0′
17	74°07.1	32.1	290°17.8	4.6′	25°15.2	-3.3′	59.0′
18	89°07.3	N12°31.3	304°41.3	4.6′	S25°11.8	-3.5′	59.0′
19	104°07.4	30.5	319°04.9	4.7′	25°08.3	-3.7′	59.0′
20	119°07.6	29.7	333°28.6	4.7′	25°04.6	-3.8′	59.0′
21	134°07.7	·· 28.8	347°52.3	4.8′	25°00.8	-4.0′	59.0′
22	149°07.9	28.0	2°16.1	4.8′	24°56.8	-4.2′	58.9′
23	164°08.0	27.2	16°39.9	4.9′	24°52.6	-4.3′	58.9′
	SD = 15.8′	d = -0.8′	SD = 16.1′				

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

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 65-85%
17	04:08	04:02	12:04	19:48	07:18	
18	03:55	03:48	12:04	20:49	08:18	
19	03:41	03:34	12:04	21:51	09:20	

DUT1 = UT1-UTC = -0.1284 sec ΔT = TT-UT1 = +69.3124 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	328°33.0	144°12.6	S01°18.7	163°31.1	N07°27.2	358°41.9	S13°32.7	16°59.9	S18°48.2
1	343°35.4	159°12.4	20.0	178°32.1	26.6	13°44.7	32.8	32°02.5	48.3
2	358°37.9	174°12.2	21.2	193°33.0	25.9	28°47.5	32.9	47°05.2	48.3
3	13°40.4	189°12.0	·· 22.5	208°34.0	·· 25.3	43°50.2	·· 33.0	62°07.8	·· 48.4
4	28°42.8	204°11.8	23.8	223°35.0	24.7	58°53.0	33.1	77°10.4	48.4
5	43°45.3	219°11.6	25.1	238°36.0	24.1	73°55.8	33.2	92°13.1	48.5
6	58°47.8	234°11.4	S01°26.4	253°37.0	N07°23.4	88°58.6	S13°33.4	107°15.7	S18°48.5
7	73°50.2	249°11.2	27.7	268°38.0	22.8	104°01.4	33.5	122°18.3	48.6
8	88°52.7	264°11.0	29.0	283°39.0	22.2	119°04.1	33.6	137°21.0	48.6
9	103°55.2	279°10.9	·· 30.3	298°40.0	·· 21.6	134°06.9	·· 33.7	152°23.6	·· 48.7
10	118°57.6	294°10.7	31.6	313°41.0	21.0	149°09.7	33.8	167°26.3	48.7
11	134°00.1	309°10.5	32.8	328°42.0	20.3	164°12.5	33.9	182°28.9	48.8
12	149°02.5	324°10.3	S01°34.1	343°43.0	N07°19.7	179°15.3	S13°34.1	197°31.5	S18°48.8
13	164°05.0	339°10.1	35.4	358°44.0	19.1	194°18.0	34.2	212°34.2	48.8
14	179°07.5	354°09.9	36.7	13°45.0	18.5	209°20.8	34.3	227°36.8	48.9
15	194°09.9	9°09.7	·· 38.0	28°46.0	·· 17.8	224°23.6	·· 34.4	242°39.4	·· 48.9
16	209°12.4	24°09.5	39.3	43°46.9	17.2	239°26.4	34.5	257°42.1	49.0
17	224°14.9	39°09.3	40.6	58°47.9	16.6	254°29.2	34.6	272°44.7	49.0
18	239°17.3	54°09.2	S01°41.9	73°48.9	N07°16.0	269°31.9	S13°34.8	287°47.4	S18°49.1
19	254°19.8	69°09.0	43.2	88°49.9	15.3	284°34.7	34.9	302°50.0	49.1
20	269°22.3	84°08.8	44.4	103°50.9	14.7	299°37.5	35.0	317°52.6	49.2
21	284°24.7	99°08.6	·· 45.7	118°51.9	·· 14.1	314°40.3	·· 35.1	332°55.3	·· 49.2
22	299°27.2	114°08.4	47.0	133°52.9	13.5	329°43.0	35.2	347°57.9	49.3
23	314°29.7	129°08.2	48.3	148°53.9	12.8	344°45.8	35.3	3°00.5	49.3
Mer.pass.	02:05	ν -0.2′	d 1.3′	m -3.99	ν 1.0′	d -0.6′	m 1.80	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.31

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	329°32.1	144°08.0	S01°49.6	163°54.9	N07°12.2	359°48.6	S13°35.5	18°03.2	S18°49.4
1	344°34.6	159°07.8	50.9	178°55.9	11.6	14°51.4	35.6	33°05.8	49.4
2	359°37.0	174°07.7	52.2	193°56.9	10.9	29°54.2	35.7	48°08.4	49.5
3	14°39.5	189°07.5	·· 53.5	208°57.9	·· 10.3	44°56.9	·· 35.8	63°11.1	·· 49.5
4	29°42.0	204°07.3	54.8	223°58.9	09.7	59°59.7	35.9	78°13.7	49.6
5	44°44.4	219°07.1	56.0	238°59.9	09.1	75°02.5	36.0	93°16.4	49.6
6	59°46.9	234°06.9	S01°57.3	254°00.9	N07°08.4	90°05.3	S13°36.2	108°19.0	S18°49.6
7	74°49.4	249°06.7	58.6	269°01.8	07.8	105°08.1	36.3	123°21.6	49.7
8	89°51.8	264°06.5	01°59.9	284°02.8	07.2	120°10.8	36.4	138°24.3	49.7
9	104°54.3	279°06.4	02°01.2	299°03.8	·· 06.6	135°13.6	·· 36.5	153°26.9	·· 49.8
10	119°56.8	294°06.2	02.5	314°04.8	05.9	150°16.4	36.6	168°29.5	49.8
11	134°59.2	309°06.0	03.8	329°05.8	05.3	165°19.2	36.7	183°32.2	49.9
12	150°01.7	324°05.8	S02°05.1	344°06.8	N07°04.7	180°22.0	S13°36.9	198°34.8	S18°49.9
13	165°04.2	339°05.6	06.3	359°07.8	04.1	195°24.7	37.0	213°37.4	50.0
14	180°06.6	354°05.4	07.6	14°08.8	03.4	210°27.5	37.1	228°40.1	50.0
15	195°09.1	9°05.2	·· 08.9	29°09.8	·· 02.8	225°30.3	·· 37.2	243°42.7	·· 50.1
16	210°11.5	24°05.0	10.2	44°10.8	02.2	240°33.1	37.3	258°45.3	50.1
17	225°14.0	39°04.9	11.5	59°11.8	01.6	255°35.9	37.4	273°48.0	50.2
18	240°16.5	54°04.7	S02°12.8	74°12.8	N07°00.9	270°38.6	S13°37.6	288°50.6	S18°50.2
19	255°18.9	69°04.5	14.1	89°13.8	07°00.3	285°41.4	37.7	303°53.2	50.3
20	270°21.4	84°04.3	15.4	104°14.8	06°59.7	300°44.2	37.8	318°55.9	50.3
21	285°23.9	99°04.1	·· 16.7	119°15.8	·· 59.0	315°47.0	·· 37.9	333°58.5	·· 50.3
22	300°26.3	114°03.9	17.9	134°16.7	58.4	330°49.8	38.0	349°01.2	50.4
23	315°28.8	129°03.7	19.2	149°17.7	57.8	345°52.5	38.1	4°03.8	50.4
Mer.pass.	02:02	ν -0.2′	d 1.3′	m -3.99	ν 1.0′	d -0.6′	m 1.79	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.32

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330°31.3	144°03.6	S02°20.5	164°18.7	N06°57.2	0°55.3	S13°38.2	19°06.4	S18°50.5
1	345°33.7	159°03.4	21.8	179°19.7	56.5	15°58.1	38.4	34°09.1	50.5
2	0°36.2	174°03.2	23.1	194°20.7	55.9	31°00.9	38.5	49°11.7	50.6
3	15°38.6	189°03.0	·· 24.4	209°21.7	·· 55.3	46°03.6	·· 38.6	64°14.3	·· 50.6
4	30°41.1	204°02.8	25.7	224°22.7	54.7	61°06.4	38.7	79°17.0	50.7
5	45°43.6	219°02.6	26.9	239°23.7	54.0	76°09.2	38.8	94°19.6	50.7
6	60°46.0	234°02.4	S02°28.2	254°24.7	N06°53.4	91°12.0	S13°38.9	109°22.2	S18°50.8
7	75°48.5	249°02.3	29.5	269°25.7	52.8	106°14.8	39.1	124°24.9	50.8
8	90°51.0	264°02.1	30.8	284°26.7	52.1	121°17.5	39.2	139°27.5	50.9
9	105°53.4	279°01.9	·· 32.1	299°27.7	·· 51.5	136°20.3	·· 39.3	154°30.1	·· 50.9
10	120°55.9	294°01.7	33.4	314°28.7	50.9	151°23.1	39.4	169°32.8	50.9
11	135°58.4	309°01.5	34.7	329°29.7	50.3	166°25.9	39.5	184°35.4	51.0
12	151°00.8	324°01.3	S02°36.0	344°30.7	N06°49.6	181°28.7	S13°39.6	199°38.0	S18°51.0
13	166°03.3	339°01.1	37.2	359°31.7	49.0	196°31.4	39.8	214°40.7	51.1
14	181°05.8	354°01.0	38.5	14°32.7	48.4	211°34.2	39.9	229°43.3	51.1
15	196°08.2	9°00.8	·· 39.8	29°33.6	·· 47.7	226°37.0	·· 40.0	244°45.9	·· 51.2
16	211°10.7	24°00.6	41.1	44°34.6	47.1	241°39.8	40.1	259°48.6	51.2
17	226°13.1	39°00.4	42.4	59°35.6	46.5	256°42.6	40.2	274°51.2	51.3
18	241°15.6	54°00.2	S02°43.7	74°36.6	N06°45.9	271°45.3	S13°40.3	289°53.8	S18°51.3
19	256°18.1	69°00.0	45.0	89°37.6	45.2	286°48.1	40.4	304°56.5	51.4
20	271°20.5	83°59.8	46.3	104°38.6	44.6	301°50.9	40.6	319°59.1	51.4
21	286°23.0	98°59.7	·· 47.5	119°39.6	·· 44.0	316°53.7	·· 40.7	335°01.7	·· 51.5
22	301°25.5	113°59.5	48.8	134°40.6	43.3	331°56.4	40.8	350°04.4	51.5
23	316°27.9	128°59.3	50.1	149°41.6	42.7	346°59.2	40.9	5°07.0	51.5
Mer.pass.	01:58	ν -0.2′	d 1.3′	m -4.00	ν 1.0′	d -0.6′	m 1.79	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.32

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.5
Ankaa	353°09.6	-42°11.2
Schedar	349°33.7	56°39.1
Diphda	348°49.8	-17°52.0
Achernar	335°22.0	-57°07.4
Hamal	327°54.1	23°33.8
Polaris	315°12.6	89°20.9
Acamar	315°13.8	-40°12.9
Menkar	314°09.0	4°10.5
Mirfak	308°32.1	49°56.0
Aldebaran	290°42.9	16°33.1
Rigel	281°06.6	-8°10.5
Capella	280°26.1	46°01.0
Bellatrix	278°26.0	6°22.2
Elnath	278°05.5	28°37.4
Alnilam	275°40.7	-1°11.2
Betelgeuse	270°55.2	7°24.7
Canopus	263°53.9	-52°42.2
Sirius	258°28.9	-16°44.6
Adhara	255°08.3	-28°59.9
Procyon	244°54.0	5°10.3
Pollux	243°21.0	27°58.5
Avior	234°16.4	-59°34.5
Suhail	222°48.7	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.6	-63°13.2
Gacrux	171°55.1	-57°14.1
Alioth	166°15.8	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.7
Hadar	148°40.1	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.2	-60°55.6
Kochab	137°20.1	74°04.4
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.1	-26°28.8
Atria	107°15.6	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.2	51°29.4
Kaus Aust.	83°35.9	-34°22.5
Vega	80°34.8	38°48.5
Nunki	75°50.9	-26°16.2
Altair	62°02.4	8°55.6
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.5
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.3
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Aug 20 Fri	SHA	Mer.pass
Venus	175°39.6	14:23
Mars	194°58.1	13:05
Jupiter	30°08.9	00:05
Saturn	48°26.9	22:48

Aug 21 Sat	SHA	Mer.pass
Venus	174°35.9	14:24
Mars	194°22.8	13:03
Jupiter	30°16.5	00:01
Saturn	48°31.1	22:44

Aug 22 Sun	SHA	Mer.pass
Venus	173°32.3	14:24
Mars	193°47.5	13:02
Jupiter	30°24.1	23:52
Saturn	48°35.2	22:40

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		179°08.2	N12°26.4	31°03.8	4.9′	S24°48.3	-4.5′	58.9′
1		194°08.3	25.6	45°27.7	5.0′	24°43.8	-4.7′	58.9′
2		209°08.5	24.7	59°51.7	5.1′	24°39.1	-4.8′	58.9′
3		224°08.6	·· 23.9	74°15.8	5.1′	24°34.3	-5.0′	58.9′
4		239°08.8	23.1	88°39.9	5.2′	24°29.3	-5.1′	58.9′
5		254°08.9	22.3	103°04.1	5.3′	24°24.1	-5.3′	58.9′
6		269°09.1	N12°21.4	117°28.4	5.3′	S24°18.8	-5.5′	58.8′
7		284°09.2	20.6	131°52.7	5.4′	24°13.4	-5.6′	58.8′
8		299°09.4	19.8	146°17.1	5.5′	24°07.8	-5.8′	58.8′
9		314°09.5	·· 18.9	160°41.6	5.6′	24°02.0	-5.9′	58.8′
10		329°09.7	18.1	175°06.2	5.6′	23°56.1	-6.1′	58.8′
11		344°09.8	17.3	189°30.8	5.7′	23°50.0	-6.2′	58.8′
12		359°10.0	N12°16.5	203°55.6	5.8′	S23°43.8	-6.4′	58.7′
13		14°10.1	15.6	218°20.4	5.9′	23°37.4	-6.5′	58.7′
14		29°10.3	14.8	232°45.2	6.0′	23°30.9	-6.7′	58.7′
15		44°10.4	·· 14.0	247°10.2	6.0′	23°24.2	-6.8′	58.7′
16		59°10.6	13.2	261°35.2	6.1′	23°17.4	-7.0′	58.7′
17		74°10.8	12.3	276°00.4	6.2′	23°10.4	-7.1′	58.7′
18		89°10.9	N12°11.5	290°25.6	6.3′	S23°03.3	-7.2′	58.6′
19		104°11.1	10.7	304°50.9	6.4′	22°56.1	-7.4′	58.6′
20		119°11.2	09.8	319°16.3	6.5′	22°48.7	-7.5′	58.6′
21		134°11.4	·· 09.0	333°41.7	6.6′	22°41.1	-7.7′	58.6′
22		149°11.5	08.2	348°07.3	6.7′	22°33.5	-7.8′	58.6′
23		164°11.7	07.3	2°33.0	6.7′	22°25.7	-7.9′	58.6′
		SD = 15.8′	d = -0.8′		SD = 16.1′			

Sat	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°11.8	N12°06.5	103°35.1	7.4′	S21°27.4	-8.8′	58.4′
1		194°12.0	05.7	31°24.5	6.9′	22°09.7	-8.2′	58.5′
2		209°12.1	04.8	45°50.5	7.0′	22°01.5	-8.3′	58.5′
3		224°12.3	·· 04.0	60°16.5	7.1′	21°53.1	-8.5′	58.5′
4		239°12.5	03.2	74°42.6	7.2′	21°44.7	-8.6′	58.5′
5		254°12.6	02.3	89°08.8	7.3′	21°36.1	-8.7′	58.4′
6		269°12.8	N12°01.5	103°35.1	7.4′	S21°27.4	-8.8′	58.4′
7		284°12.9	12°00.7	118°01.5	7.5′	21°18.6	-9.0′	58.4′
8		299°13.1	11°59.8	132°28.0	7.6′	21°09.6	-9.1′	58.4′
9		314°13.2	·· 59.0	146°54.6	7.7′	21°00.5	-9.2′	58.4′
10		329°13.4	58.2	161°21.3	7.8′	20°51.3	-9.3′	58.3′
11		344°13.5	57.3	175°48.1	7.9′	20°42.0	-9.4′	58.3′
12		359°13.7	N11°56.5	190°15.0	8.0′	S20°32.6	-9.5′	58.3′
13		14°13.9	55.7	204°42.0	8.1′	20°23.0	-9.7′	58.3′
14		29°14.0	54.8	219°09.1	8.2′	20°13.4	-9.8′	58.3′
15		44°14.2	·· 54.0	233°36.2	8.3′	20°03.6	-9.9′	58.2′
16		59°14.3	53.2	248°03.5	8.4′	19°53.7	-10.0′	58.2′
17		74°14.5	52.3	262°30.9	8.5′	19°43.8	-10.1′	58.2′
18		89°14.7	N11°51.5	276°58.4	8.6′	S19°33.7	-10.2′	58.2′
19		104°14.8	50.6	291°26.0	8.7′	19°23.5	-10.3′	58.2′
20		119°15.0	49.8	305°53.6	8.8′	19°13.2	-10.4′	58.1′
21		134°15.1	·· 49.0	320°21.4	8.9′	19°02.8	-10.5′	58.1′
22		149°15.3	48.1	334°49.3	9.0′	18°52.3	-10.6′	58.1′
23		164°15.4	47.3	349°17.3	9.1′	18°41.7	-10.7′	58.1′
		SD = 15.8′	d = -0.8′		SD = 16.0′			

Sun	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		179°15.6	N11°46.5	3°45.3	9.2′	S18°31.0	-10.8′	58.0′
1		194°15.8	45.6	18°13.5	9.3′	18°20.2	-10.9′	58.0′
2		209°15.9	44.8	32°41.8	9.4′	18°09.3	-11.0′	58.0′
3		224°16.1	·· 43.9	47°10.2	9.5′	17°58.3	-11.1′	58.0′
4		239°16.2	43.1	61°38.6	9.6′	17°47.2	-11.2′	57.9′
5		254°16.4	42.3	76°07.2	9.7′	17°36.1	-11.2′	57.9′
6		269°16.6	N11°41.4	90°35.9	9.8′	S17°24.8	-11.3′	57.9′
7		284°16.7	40.6	105°04.6	9.9′	17°13.5	-11.4′	57.9′
8		299°16.9	39.7	119°33.5	10.0′	17°02.1	-11.5′	57.8′
9		314°17.0	·· 38.9	134°02.4	10.1′	16°50.6	-11.6′	57.8′
10		329°17.2	38.0	148°31.5	10.1′	16°39.0	-11.7′	57.8′
11		344°17.4	37.2	163°00.6	10.2′	16°27.3	-11.7′	57.8′
12		359°17.5	N11°36.4	177°29.9	10.3′	S16°15.6	-11.8′	57.7′
13		14°17.7	35.5	191°59.2	10.4′	16°03.8	-11.9′	57.7′
14		29°17.9	34.7	206°28.7	10.5′	15°51.9	-12.0′	57.7′
15		44°18.0	·· 33.8	220°58.2	10.6′	15°39.9	-12.0′	57.7′
16		59°18.2	33.0	235°27.8	10.7′	15°27.9	-12.1′	57.6′
17		74°18.3	32.1	249°57.5	10.8′	15°15.8	-12.2′	57.6′
18		89°18.5	N11°31.3	264°27.3	10.9′	S15°03.6	-12.2′	57.6′
19		104°18.7	30.4	278°57.2	11.0′	14°51.4	-12.3′	57.6′
20		119°18.8	29.6	293°27.2	11.1′	14°39.1	-12.4′	57.5′
21		134°19.0	·· 28.8	307°57.3	11.2′	14°26.7	-12.4′	57.5′
22		149°19.2	27.9	322°27.5	11.3′	14°14.3	-12.5′	57.5′
23		164°19.3	27.1	336°57.7	11.3′	14°01.8	-12.6′	57.5′
		SD = 15.8′	d = -0.8′		SD = 15.8′			

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

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

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 12-14 92-100%
20	03:27	03:20	12:03	22:49	10:20	
21	03:13	03:05	12:03	23:44	11:17	
22	02:58	02:50	12:03	–:–	12:10	

DUT1 = UT1-UTC = -0.1256 sec ΔT = TT-UT1 = +69.3096 sec

Aries / Venus / Mars / Jupiter / Saturn

Mon	Aries GHA	Venus GHA	Venus Dec	Mars GHA	Mars Dec	Jupiter GHA	Jupiter Dec	Saturn GHA	Saturn Dec
0	331°30.4	143°59.1	S02°51.4	164°42.6	N06°42.1	2°02.0	S13°41.0	20°09.6	S18°51.6
1	346°32.9	158°58.9	52.7	179°43.6	41.4	17°04.8	41.1	35°12.3	51.6
2	1°35.3	173°58.7	54.0	194°44.6	40.8	32°07.6	41.3	50°14.9	51.7
3	16°37.8	188°58.6	·· 55.3	209°45.6	·· 40.2	47°10.3	·· 41.4	65°17.5	·· 51.7
4	31°40.3	203°58.4	56.5	224°46.6	39.6	62°13.1	41.5	80°20.2	51.8
5	46°42.7	218°58.2	57.8	239°47.6	38.9	77°15.9	41.6	95°22.8	51.8
6	61°45.2	233°58.0	S02°59.1	254°48.6	N06°38.3	92°18.7	S13°41.7	110°25.4	S18°51.9
7	76°47.6	248°57.8	03°00.4	269°49.6	37.7	107°21.5	41.8	125°28.1	51.9
8	91°50.1	263°57.6	01.7	284°50.5	37.0	122°24.2	41.9	140°30.7	52.0
9	106°52.6	278°57.4	·· 03.0	299°51.5	·· 36.4	137°27.0	·· 42.1	155°33.3	·· 52.0
10	121°55.0	293°57.3	04.3	314°52.5	35.8	152°29.8	42.2	170°36.0	52.0
11	136°57.5	308°57.1	05.5	329°53.5	35.1	167°32.6	42.3	185°38.6	52.1
12	152°00.0	323°56.9	S03°06.8	344°54.5	N06°34.5	182°35.3	S13°42.4	200°41.2	S18°52.1
13	167°02.4	338°56.7	08.1	359°55.5	33.9	197°38.1	42.5	215°43.8	52.2
14	182°04.9	353°56.5	09.4	14°56.5	33.3	212°40.9	42.6	230°46.5	52.2
15	197°07.4	8°56.3	·· 10.7	29°57.5	·· 32.6	227°43.7	·· 42.8	245°49.1	·· 52.3
16	212°09.8	23°56.2	12.0	44°58.5	32.0	242°46.5	42.9	260°51.7	52.3
17	227°12.3	38°56.0	13.2	59°59.5	31.4	257°49.2	43.0	275°54.4	52.4
18	242°14.7	53°55.8	S03°14.5	75°00.5	N06°30.7	272°52.0	S13°43.1	290°57.0	S18°52.4
19	257°17.2	68°55.6	15.8	90°01.5	30.1	287°54.8	43.2	305°59.6	52.5
20	272°19.7	83°55.4	17.1	105°02.5	29.5	302°57.6	43.3	321°02.3	52.5
21	287°22.1	98°55.2	·· 18.4	120°03.5	·· 28.8	318°00.4	·· 43.4	336°04.9	·· 52.5
22	302°24.6	113°55.0	19.7	135°04.5	28.2	333°03.1	43.6	351°07.5	52.6
23	317°27.1	128°54.9	21.0	150°05.5	27.6	348°05.9	43.7	6°10.2	52.6
Mer.pass.	01:54	ν -0.2′	d 1.3′	m -4.00	ν 1.0′	d -0.6′	m 1.79	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.32

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°29.5	143°54.7	S03°22.2	165°06.5	N06°26.9	3°08.7	S13°43.8	21°12.8	S18°52.7
1	347°32.0	158°54.5	23.5	180°07.5	26.3	18°11.5	43.9	36°15.4	52.7
2	2°34.5	173°54.3	24.8	195°08.5	25.7	33°14.2	44.0	51°18.0	52.8
3	17°36.9	188°54.1	·· 26.1	210°09.4	·· 25.0	48°17.0	·· 44.1	66°20.7	·· 52.8
4	32°39.4	203°53.9	27.4	225°10.4	24.4	63°19.8	44.2	81°23.3	52.9
5	47°41.9	218°53.8	28.7	240°11.4	23.8	78°22.6	44.4	96°25.9	52.9
6	62°44.3	233°53.6	S03°29.9	255°12.4	N06°23.2	93°25.4	S13°44.5	111°28.6	S18°52.9
7	77°46.8	248°53.4	31.2	270°13.4	22.5	108°28.1	44.6	126°31.2	53.0
8	92°49.2	263°53.2	32.5	285°14.4	21.9	123°30.9	44.7	141°33.8	53.0
9	107°51.7	278°53.0	·· 33.8	300°15.4	·· 21.3	138°33.7	·· 44.8	156°36.5	·· 53.1
10	122°54.2	293°52.8	35.1	315°16.4	20.6	153°36.5	44.9	171°39.1	53.1
11	137°56.6	308°52.7	36.4	330°17.4	20.0	168°39.2	45.0	186°41.7	53.2
12	152°59.1	323°52.5	S03°37.6	345°18.4	N06°19.4	183°42.0	S13°45.2	201°44.4	S18°53.2
13	168°01.6	338°52.3	38.9	0°19.4	18.7	198°44.8	45.3	216°47.0	53.3
14	183°04.0	353°52.1	40.2	15°20.4	18.1	213°47.6	45.4	231°49.6	53.3
15	198°06.5	8°51.9	·· 41.5	30°21.4	·· 17.5	228°50.4	·· 45.5	246°52.2	·· 53.4
16	213°09.0	23°51.7	42.8	45°22.4	16.8	243°53.1	45.6	261°54.9	53.4
17	228°11.4	38°51.5	44.1	60°23.4	16.2	258°55.9	45.7	276°57.5	53.4
18	243°13.9	53°51.4	S03°45.3	75°24.4	N06°15.6	273°58.7	S13°45.8	292°00.1	S18°53.5
19	258°16.3	68°51.2	46.6	90°25.4	14.9	289°01.5	46.0	307°02.8	53.5
20	273°18.8	83°51.0	47.9	105°26.4	14.3	304°04.2	46.1	322°05.4	53.6
21	288°21.3	98°50.8	·· 49.2	120°27.4	·· 13.7	319°07.0	·· 46.2	337°08.0	·· 53.6
22	303°23.7	113°50.6	50.5	135°28.4	13.0	334°09.8	46.3	352°10.6	53.7
23	318°26.2	128°50.4	51.7	150°29.3	12.4	349°12.6	46.4	7°13.3	53.7
Mer.pass.	01:50	ν -0.2′	d 1.3′	m -4.01	ν 1.0′	d -0.6′	m 1.78	ν 2.8′	d 0.1′ m -2.88	ν 2.6′	d 0.0′ m 0.33

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	333°28.7	143°50.3	S03°53.0	165°30.3	N06°11.8	4°15.4	S13°46.5	22°15.9	S18°53.8
1	348°31.1	158°50.1	54.3	180°31.3	11.1	19°18.1	46.6	37°18.5	53.8
2	3°33.6	173°49.9	55.6	195°32.3	10.5	34°20.9	46.8	52°21.2	53.8
3	18°36.1	188°49.7	·· 56.9	210°33.3	·· 09.9	49°23.7	·· 46.9	67°23.8	·· 53.9
4	33°38.5	203°49.5	58.2	225°34.3	09.2	64°26.5	47.0	82°26.4	53.9
5	48°41.0	218°49.3	03°59.4	240°35.3	08.6	79°29.2	47.1	97°29.0	54.0
6	63°43.5	233°49.2	S04°00.7	255°36.3	N06°08.0	94°32.0	S13°47.2	112°31.7	S18°54.0
7	78°45.9	248°49.0	02.0	270°37.3	07.3	109°34.8	47.3	127°34.3	54.1
8	93°48.4	263°48.8	03.3	285°38.3	06.7	124°37.6	47.4	142°36.9	54.1
9	108°50.8	278°48.6	·· 04.6	300°39.3	·· 06.1	139°40.4	·· 47.6	157°39.6	·· 54.2
10	123°53.3	293°48.4	05.8	315°40.3	05.4	154°43.1	47.7	172°42.2	54.2
11	138°55.8	308°48.2	07.1	330°41.3	04.8	169°45.9	47.8	187°44.8	54.2
12	153°58.2	323°48.0	S04°08.4	345°42.3	N06°04.2	184°48.7	S13°47.9	202°47.4	S18°54.3
13	169°00.7	338°47.9	09.7	0°43.3	03.5	199°51.5	48.0	217°50.1	54.3
14	184°03.2	353°47.7	11.0	15°44.3	02.9	214°54.2	48.1	232°52.7	54.4
15	199°05.6	8°47.5	·· 12.2	30°45.3	·· 02.3	229°57.0	·· 48.2	247°55.3	·· 54.4
16	214°08.1	23°47.3	13.5	45°46.3	01.6	244°59.8	48.4	262°58.0	54.5
17	229°10.6	38°47.1	14.8	60°47.3	01.0	260°02.6	48.5	278°00.6	54.5
18	244°13.0	53°46.9	S04°16.1	75°48.3	N06°00.4	275°05.3	S13°48.6	293°03.2	S18°54.5
19	259°15.5	68°46.8	17.4	90°49.3	05°59.7	290°08.1	48.7	308°05.8	54.6
20	274°17.9	83°46.6	18.6	105°50.3	59.1	305°10.9	48.8	323°08.5	54.6
21	289°20.4	98°46.4	·· 19.9	120°51.2	·· 58.5	320°13.7	·· 48.9	338°11.1	·· 54.7
22	304°22.9	113°46.2	21.2	135°52.2	57.8	335°16.5	49.0	353°13.7	54.7
23	319°25.3	128°46.0	22.5	150°53.2	57.2	350°19.2	49.1	8°16.3	54.8
Mer.pass.	01:46	ν -0.2′	d 1.3′	m -4.01	ν 1.0′	d -0.6′	m 1.78	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.33

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.5
Ankaa	353°09.6	-42°11.2
Schedar	349°33.7	56°39.2
Diphda	348°49.8	-17°52.0
Achernar	335°22.0	-57°07.4
Hamal	327°54.1	23°33.8
Polaris	315°11.3	89°20.9
Acamar	315°13.8	-40°12.9
Menkar	314°09.0	4°10.5
Mirfak	308°32.1	49°56.0
Aldebaran	290°42.8	16°33.1
Rigel	281°06.6	-8°10.5
Capella	280°26.1	46°01.0
Bellatrix	278°26.0	6°22.2
Elnath	278°05.5	28°37.4
Alnilam	275°40.7	-1°11.2
Betelgeuse	270°55.2	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°28.9	-16°44.6
Adhara	255°08.3	-28°59.9
Procyon	244°54.0	5°10.3
Pollux	243°21.0	27°58.5
Avior	234°16.4	-59°34.5
Suhail	222°48.7	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.7	-63°13.2
Gacrux	171°55.1	-57°14.1
Alioth	166°15.9	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.7
Hadar	148°40.2	-60°28.7
Menkent	148°01.0	-36°28.6
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.3	-60°55.6
Kochab	137°20.2	74°04.4
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.2	-26°28.8
Atria	107°15.7	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°13.9	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.2	51°29.4
Kaus Aust.	83°35.9	-34°22.5
Vega	80°34.8	38°48.5
Nunki	75°50.9	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.3
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Aug 23 Mon	SHA	Mer.pass
Venus	172°28.7	14:24
Mars	193°12.2	13:00
Jupiter	30°31.6	23:47
Saturn	48°39.2	22:35

Aug 24 Tue	SHA	Mer.pass
Venus	171°25.1	14:25
Mars	192°36.9	12:59
Jupiter	30°39.2	23:43
Saturn	48°43.3	22:31

Aug 25 Wed	SHA	Mer.pass
Venus	170°21.6	14:25
Mars	192°01.7	12:57
Jupiter	30°46.7	23:39
Saturn	48°47.2	22:27

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h Sun Moon

Mon	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°19.5	N11°26.2	351°28.1	11.4′	S13°49.2	-12.6′	57.4′
1	194°19.7	25.4	5°58.5	11.5′	13°36.6	-12.7′	57.4′
2	209°19.8	24.5	20°29.0	11.6′	13°24.0	-12.7′	57.4′
3	224°20.0	·· 23.7	34°59.6	11.7′	13°11.3	-12.8′	57.4′
4	239°20.1	22.8	49°30.3	11.8′	12°58.5	-12.8′	57.3′
5	254°20.3	22.0	64°01.1	11.9′	12°45.6	-12.9′	57.3′
6	269°20.5	N11°21.1	78°32.0	11.9′	S12°32.8	-12.9′	57.3′
7	284°20.6	20.3	93°02.9	12.0′	12°19.8	-13.0′	57.3′
8	299°20.8	19.4	107°33.9	12.1′	12°06.9	-13.0′	57.2′
9	314°21.0	·· 18.6	122°05.1	12.2′	11°53.8	-13.1′	57.2′
10	329°21.1	17.7	136°36.3	12.3′	11°40.8	-13.1′	57.2′
11	344°21.3	16.9	151°07.5	12.3′	11°27.7	-13.2′	57.1′
12	359°21.5	N11°16.0	165°38.9	12.4′	S11°14.5	-13.2′	57.1′
13	14°21.6	15.2	180°10.3	12.5′	11°01.3	-13.2′	57.1′
14	29°21.8	14.3	194°41.8	12.6′	10°48.1	-13.3′	57.1′
15	44°22.0	·· 13.5	209°13.4	12.7′	10°34.8	-13.3′	57.0′
16	59°22.1	12.6	223°45.0	12.7′	10°21.5	-13.3′	57.0′
17	74°22.3	11.8	238°16.8	12.8′	10°08.2	-13.4′	57.0′
18	89°22.5	N11°10.9	252°48.6	12.9′	S09°54.8	-13.4′	57.0′
19	104°22.6	10.1	267°20.5	12.9′	09°41.4	-13.4′	56.9′
20	119°22.8	09.2	281°52.4	13.0′	09°27.9	-13.5′	56.9′
21	134°23.0	·· 08.4	296°24.4	13.1′	09°14.4	-13.5′	56.9′
22	149°23.1	07.5	310°56.5	13.2′	09°00.9	-13.5′	56.8′
23	164°23.3	06.7	325°28.7	13.2′	08°47.4	-13.6′	56.8′
	SD = 15.8′	d = -0.8′	SD = 15.7′				

Tue	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°23.5	N11°05.8	340°00.9	13.3′	S08°33.8	-13.6′	56.8′
1	194°23.7	04.9	354°33.2	13.4′	08°20.2	-13.6′	56.8′
2	209°23.8	04.1	9°05.6	13.4′	08°06.6	-13.6′	56.7′
3	224°24.0	·· 03.2	23°38.0	13.5′	07°53.0	-13.7′	56.7′
4	239°24.2	02.4	38°10.5	13.6′	07°39.3	-13.7′	56.7′
5	254°24.3	01.5	52°43.0	13.6′	07°25.7	-13.7′	56.7′
6	269°24.5	N11°00.7	67°15.6	13.7′	S07°12.0	-13.7′	56.6′
7	284°24.7	10°59.8	81°48.3	13.7′	06°58.3	-13.7′	56.6′
8	299°24.8	58.9	96°21.0	13.8′	06°44.5	-13.7′	56.6′
9	314°25.0	·· 58.1	110°53.8	13.8′	06°30.8	-13.8′	56.5′
10	329°25.2	57.2	125°26.7	13.9′	06°17.0	-13.8′	56.5′
11	344°25.3	56.4	139°59.6	14.0′	06°03.2	-13.8′	56.5′
12	359°25.5	N10°55.5	154°32.5	14.0′	S05°49.4	-13.8′	56.5′
13	14°25.7	54.7	169°05.6	14.1′	05°35.6	-13.8′	56.4′
14	29°25.9	53.8	183°38.6	14.1′	05°21.8	-13.8′	56.4′
15	44°26.0	·· 52.9	198°11.8	14.2′	05°08.0	-13.8′	56.4′
16	59°26.2	52.1	212°44.9	14.2′	04°54.2	-13.8′	56.4′
17	74°26.4	51.2	227°18.2	14.3′	04°40.3	-13.8′	56.3′
18	89°26.5	N10°50.4	241°51.4	14.3′	S04°26.5	-13.8′	56.3′
19	104°26.7	49.5	256°24.8	14.4′	04°12.7	-13.9′	56.3′
20	119°26.9	48.6	270°58.1	14.4′	03°58.8	-13.9′	56.2′
21	134°27.1	·· 47.8	285°31.5	14.5′	03°44.9	-13.9′	56.2′
22	149°27.2	46.9	300°05.0	14.5′	03°31.1	-13.9′	56.2′
23	164°27.4	46.1	314°38.5	14.6′	03°17.2	-13.9′	56.2′
	SD = 15.8′	d = -0.9′	SD = 15.5′				

Wed	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°27.6	N10°45.2	329°12.1	14.6′	S03°03.4	-13.9′	56.1′
1	194°27.8	44.3	343°45.7	14.6′	02°49.5	-13.9′	56.1′
2	209°27.9	43.5	358°19.3	14.7′	02°35.7	-13.9′	56.1′
3	224°28.1	·· 42.6	12°53.0	14.7′	02°21.8	-13.8′	56.1′
4	239°28.3	41.8	27°26.7	14.8′	02°08.0	-13.8′	56.0′
5	254°28.4	40.9	42°00.4	14.8′	01°54.1	-13.8′	56.0′
6	269°28.6	N10°40.0	56°34.2	14.8′	S01°40.3	-13.8′	56.0′
7	284°28.8	39.2	71°08.1	14.9′	01°26.4	-13.8′	55.9′
8	299°29.0	38.3	85°41.9	14.9′	01°12.6	-13.8′	55.9′
9	314°29.1	·· 37.4	100°15.8	14.9′	00°58.8	-13.8′	55.9′
10	329°29.3	36.6	114°49.7	15.0′	00°45.0	-13.8′	55.9′
11	344°29.5	35.7	129°23.7	15.0′	00°31.2	-13.8′	55.8′
12	359°29.7	N10°34.8	143°57.7	15.0′	S00°17.4	-13.8′	55.8′
13	14°29.8	34.0	158°31.7	15.0′	S00°03.6	-13.8′	55.8′
14	29°30.0	33.1	173°05.8	15.1′	N00°10.1	13.7′	55.8′
15	44°30.2	·· 32.2	187°39.8	15.1′	00°23.9	13.7′	55.7′
16	59°30.4	31.4	202°13.9	15.1′	00°37.6	13.7′	55.7′
17	74°30.5	30.5	216°48.1	15.2′	00°51.3	13.7′	55.7′
18	89°30.7	N10°29.6	231°22.2	15.2′	N01°05.0	13.7′	55.7′
19	104°30.9	28.8	245°56.4	15.2′	01°18.7	13.7′	55.6′
20	119°31.1	27.9	260°30.6	15.2′	01°32.3	13.6′	55.6′
21	134°31.2	·· 27.0	275°04.8	15.2′	01°46.0	13.6′	55.6′
22	149°31.4	26.2	289°39.1	15.3′	01°59.6	13.6′	55.6′
23	164°31.6	25.3	304°13.3	15.3′	02°13.2	13.6′	55.5′
	SD = 15.8′	d = -0.9′	SD = 15.3′				

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

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

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 15-17 100-93%
23	02:42	02:34	12:03	00:35	12:59	
24	02:26	02:18	12:02	01:22	13:45	
25	02:10	02:01	12:02	02:07	14:28	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1240 sec ΔT = TT-UT1 = +69.3080 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	334°27.8	143°45.8	S04°23.8	165°54.2	N05°56.5	5°22.0	S13°49.3	23°19.0	S18°54.8
1	349°30.3	158°45.7	25.0	180°55.2	55.9	20°24.8	49.4	38°21.6	54.9
2	4°32.7	173°45.5	26.3	195°56.2	55.3	35°27.6	49.5	53°24.2	54.9
3	19°35.2	188°45.3	·· 27.6	210°57.2	·· 54.6	50°30.3	·· 49.6	68°26.8	·· 54.9
4	34°37.7	203°45.1	28.9	225°58.2	54.0	65°33.1	49.7	83°29.5	55.0
5	49°40.1	218°44.9	30.1	240°59.2	53.4	80°35.9	49.8	98°32.1	55.0
6	64°42.6	233°44.7	S04°31.4	256°00.2	N05°52.7	95°38.7	S13°49.9	113°34.7	S18°55.1
7	79°45.1	248°44.5	32.7	271°01.2	52.1	110°41.4	50.0	128°37.4	55.1
8	94°47.5	263°44.4	34.0	286°02.2	51.5	125°44.2	50.2	143°40.0	55.2
9	109°50.0	278°44.2	·· 35.3	301°03.2	·· 50.8	140°47.0	·· 50.3	158°42.6	·· 55.2
10	124°52.4	293°44.0	36.5	316°04.2	50.2	155°49.8	50.4	173°45.2	55.2
11	139°54.9	308°43.8	37.8	331°05.2	49.6	170°52.5	50.5	188°47.9	55.3
12	154°57.4	323°43.6	S04°39.1	346°06.2	N05°48.9	185°55.3	S13°50.6	203°50.5	S18°55.3
13	169°59.8	338°43.4	40.4	1°07.2	48.3	200°58.1	50.7	218°53.1	55.4
14	185°02.3	353°43.3	41.6	16°08.2	47.6	216°00.9	50.8	233°55.7	55.4
15	200°04.8	8°43.1	·· 42.9	31°09.2	·· 47.0	231°03.6	·· 51.0	248°58.4	·· 55.5
16	215°07.2	23°42.9	44.2	46°10.2	46.4	246°06.4	51.1	264°01.0	55.5
17	230°09.7	38°42.7	45.5	61°11.2	45.7	261°09.2	51.2	279°03.6	55.6
18	245°12.2	53°42.5	S04°46.7	76°12.2	N05°45.1	276°12.0	S13°51.3	294°06.2	S18°55.6
19	260°14.6	68°42.3	48.0	91°13.2	44.5	291°14.7	51.4	309°08.9	55.6
20	275°17.1	83°42.1	49.3	106°14.1	43.8	306°17.5	51.5	324°11.5	55.7
21	290°19.6	98°42.0	·· 50.6	121°15.1	·· 43.2	321°20.3	·· 51.6	339°14.1	·· 55.7
22	305°22.0	113°41.8	51.9	136°16.1	42.6	336°23.1	51.7	354°16.7	55.8
23	320°24.5	128°41.6	53.1	151°17.1	41.9	351°25.8	51.9	9°19.4	55.8
	Mer.pass. 01:42	ν -0.2′	d 1.3′	m -4.02	ν 1.0′	d -0.6′	m 1.78	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.34

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°26.9	143°41.4	S04°54.4	166°18.1	N05°41.3	6°28.6	S13°52.0	24°22.0	S18°55.9
1	350°29.4	158°41.2	55.7	181°19.1	40.6	21°31.4	52.1	39°24.6	55.9
2	5°31.9	173°41.0	57.0	196°20.1	40.0	36°34.2	52.2	54°27.2	55.9
3	20°34.3	188°40.9	·· 58.2	211°21.1	·· 39.4	51°36.9	·· 52.3	69°29.9	·· 56.0
4	35°36.8	203°40.7	04°59.5	226°22.1	38.7	66°39.7	52.4	84°32.5	56.0
5	50°39.3	218°40.5	05°00.8	241°23.1	38.1	81°42.5	52.5	99°35.1	56.1
6	65°41.7	233°40.3	S05°02.1	256°24.1	N05°37.5	96°45.3	S13°52.6	114°37.7	S18°56.1
7	80°44.2	248°40.1	03.3	271°25.1	36.8	111°48.0	52.7	129°40.4	56.2
8	95°46.7	263°39.9	04.6	286°26.1	36.2	126°50.8	52.9	144°43.0	56.2
9	110°49.1	278°39.7	·· 05.9	301°27.1	·· 35.5	141°53.6	·· 53.0	159°45.6	·· 56.2
10	125°51.6	293°39.6	07.2	316°28.1	34.9	156°56.4	53.1	174°48.2	56.3
11	140°54.0	308°39.4	08.4	331°29.1	34.3	171°59.1	53.2	189°50.8	56.3
12	155°56.5	323°39.2	S05°09.7	346°30.1	N05°33.6	187°01.9	S13°53.3	204°53.5	S18°56.4
13	170°59.0	338°39.0	11.0	1°31.1	33.0	202°04.7	53.4	219°56.1	56.4
14	186°01.4	353°38.8	12.2	16°32.1	32.4	217°07.5	53.5	234°58.7	56.5
15	201°03.9	8°38.6	·· 13.5	31°33.1	·· 31.7	232°10.2	·· 53.6	250°01.3	·· 56.5
16	216°06.4	23°38.4	14.8	46°34.1	31.1	247°13.0	53.8	265°04.0	56.5
17	231°08.8	38°38.3	16.1	61°35.1	30.4	262°15.8	53.9	280°06.6	56.6
18	246°11.3	53°38.1	S05°17.3	76°36.1	N05°29.8	277°18.6	S13°54.0	295°09.2	S18°56.6
19	261°13.8	68°37.9	18.6	91°37.1	29.2	292°21.3	54.1	310°11.8	56.7
20	276°16.2	83°37.7	19.9	106°38.0	28.5	307°24.1	54.2	325°14.5	56.7
21	291°18.7	98°37.5	·· 21.2	121°39.0	·· 27.9	322°26.9	·· 54.3	340°17.1	·· 56.8
22	306°21.2	113°37.3	22.4	136°40.0	27.3	337°29.7	54.4	355°19.7	56.8
23	321°23.6	128°37.1	23.7	151°41.0	26.6	352°32.4	54.5	10°22.3	56.8
	Mer.pass. 01:38	ν -0.2′	d 1.3′	m -4.02	ν 1.0′	d -0.6′	m 1.77	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.34

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	336°26.1	143°37.0	S05°25.0	166°42.0	N05°26.0	7°35.2	S13°54.6	25°24.9	S18°56.9
1	351°28.5	158°36.8	26.2	181°43.0	25.3	22°38.0	54.8	40°27.6	56.9
2	6°31.0	173°36.6	27.5	196°44.0	24.7	37°40.8	54.9	55°30.2	57.0
3	21°33.5	188°36.4	·· 28.8	211°45.0	·· 24.1	52°43.5	·· 55.0	70°32.8	·· 57.0
4	36°35.9	203°36.2	30.1	226°46.0	23.4	67°46.3	55.1	85°35.4	57.0
5	51°38.4	218°36.0	31.3	241°47.0	22.8	82°49.1	55.2	100°38.1	57.1
6	66°40.9	233°35.8	S05°32.6	256°48.0	N05°22.1	97°51.9	S13°55.3	115°40.7	S18°57.1
7	81°43.3	248°35.7	33.9	271°49.0	21.5	112°54.6	55.4	130°43.3	57.2
8	96°45.8	263°35.5	35.1	286°50.0	20.9	127°57.4	55.5	145°45.9	57.2
9	111°48.3	278°35.3	·· 36.4	301°51.0	·· 20.2	143°00.2	·· 55.6	160°48.5	·· 57.3
10	126°50.7	293°35.1	37.7	316°52.0	19.6	158°02.9	55.8	175°51.2	57.3
11	141°53.2	308°34.9	39.0	331°53.0	19.0	173°05.7	55.9	190°53.8	57.3
12	156°55.6	323°34.7	S05°40.2	346°54.0	N05°18.3	188°08.5	S13°56.0	205°56.4	S18°57.4
13	171°58.1	338°34.5	41.5	1°55.0	17.7	203°11.3	56.1	220°59.0	57.4
14	187°00.6	353°34.4	42.8	16°56.0	17.0	218°14.0	56.2	236°01.6	57.5
15	202°03.0	8°34.2	·· 44.0	31°57.0	·· 16.4	233°16.8	·· 56.3	251°04.3	·· 57.5
16	217°05.5	23°34.0	45.3	46°58.0	15.8	248°19.6	56.4	266°06.9	57.6
17	232°08.0	38°33.8	46.6	61°59.0	15.1	263°22.4	56.5	281°09.5	57.6
18	247°10.4	53°33.6	S05°47.8	77°00.0	N05°14.5	278°25.1	S13°56.6	296°12.1	S18°57.6
19	262°12.9	68°33.4	49.1	92°01.0	13.8	293°27.9	56.8	311°14.8	57.7
20	277°15.4	83°33.2	50.4	107°02.0	13.2	308°30.7	56.9	326°17.4	57.7
21	292°17.8	98°33.0	·· 51.6	122°03.0	·· 12.6	323°33.4	·· 57.0	341°20.0	·· 57.8
22	307°20.3	113°32.9	52.9	137°03.9	11.9	338°36.2	57.1	356°22.6	57.8
23	322°22.8	128°32.7	54.2	152°04.9	11.3	353°39.0	57.2	11°25.2	57.8
	Mer.pass. 01:34	ν -0.2′	d 1.3′	m -4.03	ν 1.0′	d -0.6′	m 1.77	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.34

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.5
Ankaa	353°09.5	-42°11.2
Schedar	349°33.7	56°39.2
Diphda	348°49.8	-17°52.0
Achernar	335°21.9	-57°07.4
Hamal	327°54.1	23°33.8
Polaris	315°09.9	89°21.0
Acamar	315°13.8	-40°12.9
Menkar	314°08.9	4°10.5
Mirfak	308°32.1	49°56.0
Aldebaran	290°42.8	16°33.1
Rigel	281°06.6	-8°10.5
Capella	280°26.1	46°01.0
Bellatrix	278°25.9	6°22.2
Elnath	278°05.5	28°37.4
Alnilam	275°40.6	-1°11.2
Betelgeuse	270°55.2	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°28.9	-16°44.6
Adhara	255°08.3	-28°59.9
Procyon	244°54.0	5°10.3
Pollux	243°21.0	27°58.5
Avior	234°16.4	-59°34.5
Suhail	222°48.7	-43°31.0
Miaplacidus	221°39.6	-69°48.2
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.3
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.7	-63°13.1
Gacrux	171°55.1	-57°14.1
Alioth	166°15.9	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.7
Hadar	148°40.2	-60°28.7
Menkent	148°01.0	-36°28.5
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.3	-60°55.6
Kochab	137°20.2	74°04.4
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.1	26°38.8
Antares	112°19.2	-26°28.8
Atria	107°15.7	-69°04.1
Sabik	102°05.8	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.2	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.8	38°48.5
Nunki	75°50.9	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Aug 26 Thu	SHA	Mer.pass
Venus	169°18.0	14:25
Mars	191°26.4	12:56
Jupiter	30°54.2	23:34
Saturn	48°51.2	22:23

Aug 27 Fri	SHA	Mer.pass
Venus	168°14.5	14:25
Mars	190°51.2	12:54
Jupiter	31°01.7	23:30
Saturn	48°55.0	22:19

Aug 28 Sat	SHA	Mer.pass
Venus	167°10.9	14:26
Mars	190°16.0	12:52
Jupiter	31°09.1	23:25
Saturn	48°58.9	22:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	Sun			Moon				
h								
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.8	N10°24.4	318°47.6	15.3′	N02°26.8	13.6′	55.5′
1	194°32.0	23.6	333°21.9	15.3′	02°40.3	13.5′	55.5′
2	209°32.1	22.7	347°56.2	15.3′	02°53.9	13.5′	55.5′
3	224°32.3	·· 21.8	2°30.6	15.3′	03°07.4	13.5′	55.4′
4	239°32.5	21.0	17°04.9	15.4′	03°20.9	13.5′	55.4′
5	254°32.7	20.1	31°39.3	15.4′	03°34.3	13.4′	55.4′
6	269°32.8	N10°19.2	46°13.6	15.4′	N03°47.7	13.4′	55.4′
7	284°33.0	18.3	60°48.0	15.4′	04°01.2	13.4′	55.4′
8	299°33.2	17.5	75°22.4	15.4′	04°14.5	13.3′	55.3′
9	314°33.4	·· 16.6	89°56.8	15.4′	04°27.9	13.3′	55.3′
10	329°33.6	15.7	104°31.2	15.4′	04°41.2	13.3′	55.3′
11	344°33.7	14.9	119°05.6	15.4′	04°54.5	13.3′	55.3′
12	359°33.9	N10°14.0	133°40.1	15.4′	N05°07.7	13.2′	55.2′
13	14°34.1	13.1	148°14.5	15.4′	05°21.0	13.2′	55.2′
14	29°34.3	12.2	162°48.9	15.4′	05°34.2	13.2′	55.2′
15	44°34.5	·· 11.4	177°23.4	15.4′	05°47.3	13.1′	55.2′
16	59°34.6	10.5	191°57.8	15.4′	06°00.4	13.1′	55.2′
17	74°34.8	09.6	206°32.3	15.4′	06°13.5	13.1′	55.1′
18	89°35.0	N10°08.7	221°06.7	15.4′	N06°26.6	13.0′	55.1′
19	104°35.2	07.9	235°41.1	15.4′	06°39.6	13.0′	55.1′
20	119°35.4	07.0	250°15.6	15.4′	06°52.6	12.9′	55.1′
21	134°35.5	·· 06.1	264°50.0	15.4′	07°05.5	12.9′	55.0′
22	149°35.7	05.3	279°24.5	15.4′	07°18.4	12.9′	55.0′
23	164°35.9	04.4	293°58.9	15.4′	07°31.3	12.8′	55.0′
	SD = 15.8′	d = -0.9′	SD = 15.1′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.1	N10°03.5	308°33.3	15.4′	N07°44.1	12.8′	55.0′
1	194°36.3	02.6	323°07.8	15.4′	07°56.9	12.7′	55.0′
2	209°36.4	01.7	337°42.2	15.4′	08°09.6	12.7′	54.9′
3	224°36.6	·· 00.9	352°16.6	15.4′	08°22.3	12.7′	54.9′
4	239°36.8	10°00.0	6°51.0	15.4′	08°35.0	12.6′	54.9′
5	254°37.0	09°59.1	21°25.4	15.4′	08°47.6	12.6′	54.9′
6	269°37.2	N09°58.2	35°59.8	15.4′	N09°00.2	12.5′	54.9′
7	284°37.3	57.4	50°34.2	15.4′	09°12.7	12.5′	54.9′
8	299°37.5	56.5	65°08.5	15.3′	09°25.2	12.4′	54.8′
9	314°37.7	·· 55.6	79°42.9	15.3′	09°37.6	12.4′	54.8′
10	329°37.9	54.7	94°17.2	15.3′	09°50.0	12.3′	54.8′
11	344°38.1	53.9	108°51.5	15.3′	10°02.4	12.3′	54.8′
12	359°38.3	N09°53.0	123°25.8	15.3′	N10°14.7	12.2′	54.8′
13	14°38.4	52.1	138°00.1	15.3′	10°26.9	12.2′	54.7′
14	29°38.6	51.2	152°34.4	15.3′	10°39.1	12.1′	54.7′
15	44°38.8	·· 50.3	167°08.6	15.2′	10°51.2	12.1′	54.7′
16	59°39.0	49.5	181°42.9	15.2′	11°03.3	12.0′	54.7′
17	74°39.2	48.6	196°17.1	15.2′	11°15.4	12.0′	54.7′
18	89°39.4	N09°47.7	210°51.3	15.2′	N11°27.4	11.9′	54.7′
19	104°39.5	46.8	225°25.5	15.2′	11°39.3	11.9′	54.6′
20	119°39.7	45.9	239°59.6	15.1′	11°51.2	11.8′	54.6′
21	134°39.9	·· 45.1	254°33.7	15.1′	12°03.0	11.8′	54.6′
22	149°40.1	44.2	269°07.8	15.1′	12°14.8	11.7′	54.6′
23	164°40.3	43.3	283°41.9	15.1′	12°26.5	11.7′	54.6′
	SD = 15.8′	d = -0.9′	SD = 15.0′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.5	N09°42.4	298°16.0	15.0′	N12°38.2	11.6′	54.6′
1	194°40.6	41.5	312°50.0	15.0′	12°49.8	11.5′	54.6′
2	209°40.8	40.6	327°24.0	15.0′	13°01.3	11.5′	54.5′
3	224°41.0	·· 39.8	341°58.0	14.9′	13°12.8	11.4′	54.5′
4	239°41.2	38.9	356°31.9	14.9′	13°24.2	11.4′	54.5′
5	254°41.4	38.0	11°05.8	14.9′	13°35.6	11.3′	54.5′
6	269°41.6	N09°37.1	25°39.7	14.9′	N13°46.9	11.2′	54.5′
7	284°41.8	36.2	40°13.6	14.8′	13°58.2	11.2′	54.5′
8	299°41.9	35.3	54°47.4	14.8′	14°09.4	11.1′	54.5′
9	314°42.1	·· 34.5	69°21.2	14.8′	14°20.5	11.1′	54.5′
10	329°42.3	33.6	83°54.9	14.7′	14°31.5	11.0′	54.4′
11	344°42.5	32.7	98°28.6	14.7′	14°42.5	10.9′	54.4′
12	359°42.7	N09°31.8	113°02.3	14.7′	N14°53.5	10.9′	54.4′
13	14°42.9	30.9	127°36.0	14.6′	15°04.4	10.8′	54.4′
14	29°43.1	30.0	142°09.6	14.6′	15°15.2	10.7′	54.4′
15	44°43.2	·· 29.1	156°43.2	14.5′	15°25.9	10.7′	54.4′
16	59°43.4	28.3	171°16.7	14.5′	15°36.6	10.6′	54.4′
17	74°43.6	27.4	185°50.2	14.5′	15°47.2	10.5′	54.4′
18	89°43.8	N09°26.5	200°23.7	14.4′	N15°57.7	10.5′	54.4′
19	104°44.0	25.6	214°57.1	14.4′	16°08.2	10.4′	54.3′
20	119°44.2	24.7	229°30.5	14.3′	16°18.6	10.3′	54.3′
21	134°44.4	·· 23.8	244°03.9	14.3′	16°28.9	10.3′	54.3′
22	149°44.6	22.9	258°37.2	14.3′	16°39.2	10.2′	54.3′
23	164°44.7	22.0	273°10.4	14.2′	16°49.4	10.1′	54.3′
	SD = 15.8′	d = -0.9′	SD = 14.9′				

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

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

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 87-71%
26	01:53	01:44	12:02	02:50	15:11	
27	01:36	01:27	12:01	03:32	15:53	
28	01:18	01:09	12:01	04:14	16:36	

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	337°25.2	143°32.5	S05°55.5	167°05.9	N05°10.6	8°41.8	S13°57.3	26°27.9	S18°57.9
1	352°27.7	158°32.3	56.7	182°06.9	10.0	23°44.5	57.4	41°30.5	57.9
2	7°30.1	173°32.1	58.0	197°07.9	09.4	38°47.3	57.5	56°33.1	58.0
3	22°32.6	188°31.9	05°59.3	212°08.9	·· 08.7	53°50.1	·· 57.6	71°35.7	·· 58.0
4	37°35.1	203°31.7	06°00.5	227°09.9	08.1	68°52.8	57.8	86°38.3	58.1
5	52°37.5	218°31.6	01.8	242°10.9	07.4	83°55.6	57.9	101°41.0	58.1
6	67°40.0	233°31.4	S06°03.1	257°11.9	N05°06.8	98°58.4	S13°58.0	116°43.6	S18°58.1
7	82°42.5	248°31.2	04.3	272°12.9	06.2	114°01.2	58.1	131°46.2	58.2
8	97°44.9	263°31.0	05.6	287°13.9	05.5	129°03.9	58.2	146°48.8	58.2
9	112°47.4	278°30.8	·· 06.9	302°14.9	·· 04.9	144°06.7	·· 58.3	161°51.4	·· 58.3
10	127°49.9	293°30.6	08.1	317°15.9	04.2	159°09.5	58.4	176°54.0	58.3
11	142°52.3	308°30.4	09.4	332°16.9	03.6	174°12.2	58.5	191°56.7	58.3
12	157°54.8	323°30.2	S06°10.6	347°17.9	N05°02.9	189°15.0	S13°58.6	206°59.3	S18°58.4
13	172°57.3	338°30.0	11.9	2°18.9	02.3	204°17.8	58.7	222°01.9	58.4
14	187°59.7	353°29.9	13.2	17°19.9	01.7	219°20.6	58.8	237°04.5	58.5
15	203°02.2	8°29.7	·· 14.4	32°20.9	·· 01.0	234°23.3	·· 59.0	252°07.1	·· 58.5
16	218°04.6	23°29.5	15.7	47°21.9	05°00.4	249°26.1	59.1	267°09.8	58.5
17	233°07.1	38°29.3	17.0	62°22.9	04°59.7	264°28.9	59.2	282°12.4	58.6
18	248°09.6	53°29.1	S06°18.2	77°23.9	N04°59.1	279°31.6	S13°59.3	297°15.0	S18°58.6
19	263°12.0	68°28.9	19.5	92°24.9	58.5	294°34.4	59.4	312°17.6	58.7
20	278°14.5	83°28.7	20.8	107°25.9	57.8	309°37.2	59.5	327°20.2	58.7
21	293°17.0	98°28.5	·· 22.0	122°26.9	·· 57.2	324°39.9	·· 59.6	342°22.8	·· 58.8
22	308°19.4	113°28.4	23.3	137°27.9	56.5	339°42.7	59.7	357°25.5	58.8
23	323°21.9	128°28.2	24.6	152°28.8	55.9	354°45.5	59.8	12°28.1	58.8
Mer.pass.	01:30	ν -0.2′	d 1.3′	m -4.03	ν 1.0′	d -0.6′	m 1.77	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.35

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	338°24.4	143°28.0	S06°25.8	167°29.8	N04°55.3	9°48.3	S13°59.9	27°30.7	S18°58.9
1	353°26.8	158°27.8	27.1	182°30.8	54.6	24°51.0	14°00.1	42°33.3	58.9
2	8°29.3	173°27.6	28.3	197°31.8	54.0	39°53.8	00.2	57°35.9	59.0
3	23°31.7	188°27.4	·· 29.6	212°32.8	·· 53.3	54°56.6	·· 00.3	72°38.6	·· 59.0
4	38°34.2	203°27.2	30.9	227°33.8	52.7	69°59.3	00.4	87°41.2	59.0
5	53°36.7	218°27.0	32.1	242°34.8	52.0	85°02.1	00.5	102°43.8	59.1
6	68°39.1	233°26.8	S06°33.4	257°35.8	N04°51.4	100°04.9	S14°00.6	117°46.4	S18°59.1
7	83°41.6	248°26.6	34.7	272°36.8	50.8	115°07.6	00.7	132°49.0	59.2
8	98°44.1	263°26.5	35.9	287°37.8	50.1	130°10.4	00.8	147°51.6	59.2
9	113°46.5	278°26.3	·· 37.2	302°38.8	·· 49.5	145°13.2	·· 00.9	162°54.3	·· 59.2
10	128°49.0	293°26.1	38.4	317°39.8	48.8	160°16.0	01.0	177°56.9	59.3
11	143°51.5	308°25.9	39.7	332°40.8	48.2	175°18.7	01.1	192°59.5	59.3
12	158°53.9	323°25.7	S06°41.0	347°41.8	N04°47.5	190°21.5	S14°01.3	208°02.1	S18°59.4
13	173°56.4	338°25.5	42.2	2°42.8	46.9	205°24.3	01.4	223°04.7	59.4
14	188°58.9	353°25.3	43.5	17°43.8	46.3	220°27.0	01.5	238°07.3	59.4
15	204°01.3	8°25.1	·· 44.7	32°44.8	·· 45.6	235°29.8	·· 01.6	253°10.0	·· 59.5
16	219°03.8	23°24.9	46.0	47°45.8	45.0	250°32.6	01.7	268°12.6	59.5
17	234°06.2	38°24.8	47.3	62°46.8	44.3	265°35.3	01.8	283°15.2	59.6
18	249°08.7	53°24.6	S06°48.5	77°47.8	N04°43.7	280°38.1	S14°01.9	298°17.8	S18°59.6
19	264°11.2	68°24.4	49.8	92°48.8	43.0	295°40.9	02.0	313°20.4	59.6
20	279°13.6	83°24.2	51.0	107°49.8	42.4	310°43.6	02.1	328°23.0	59.7
21	294°16.1	98°24.0	·· 52.3	122°50.8	·· 41.8	325°46.4	·· 02.2	343°25.6	·· 59.7
22	309°18.6	113°23.8	53.6	137°51.8	41.1	340°49.2	02.3	358°28.3	59.8
23	324°21.0	128°23.6	54.8	152°52.8	40.5	355°51.9	02.4	13°30.9	59.8
Mer.pass.	01:26	ν -0.2′	d 1.3′	m -4.04	ν 1.0′	d -0.6′	m 1.76	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.35

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	339°23.5	143°23.4	S06°56.1	167°53.8	N04°39.8	10°54.7	S14°02.6	28°33.5	S18°59.8
1	354°26.0	158°23.2	57.3	182°54.7	39.2	25°57.5	02.7	43°36.1	59.9
2	9°28.4	173°23.0	58.6	197°55.7	38.5	41°00.2	02.8	58°38.7	18°59.9
3	24°30.9	188°22.8	06°59.9	212°56.7	·· 37.9	56°03.0	·· 02.9	73°41.3	19°00.0
4	39°33.4	203°22.7	07°01.1	227°57.7	37.3	71°05.8	03.0	88°44.0	00.0
5	54°35.8	218°22.5	02.4	242°58.7	36.6	86°08.5	03.1	103°46.6	00.0
6	69°38.3	233°22.3	S07°03.6	257°59.7	N04°36.0	101°11.3	S14°03.2	118°49.2	S19°00.1
7	84°40.7	248°22.1	04.9	273°00.7	35.3	116°14.1	03.3	133°51.8	00.1
8	99°43.2	263°21.9	06.1	288°01.7	34.7	131°16.9	03.4	148°54.4	00.2
9	114°45.7	278°21.7	·· 07.4	303°02.7	·· 34.0	146°19.6	·· 03.5	163°57.0	·· 00.2
10	129°48.1	293°21.5	08.6	318°03.7	33.4	161°22.4	03.6	178°59.6	00.2
11	144°50.6	308°21.3	09.9	333°04.7	32.8	176°25.2	03.7	194°02.3	00.3
12	159°53.1	323°21.1	S07°11.2	348°05.7	N04°32.1	191°27.9	S14°03.8	209°04.9	S19°00.3
13	174°55.5	338°20.9	12.4	3°06.7	31.5	206°30.7	04.0	224°07.5	00.4
14	189°58.0	353°20.7	13.7	18°07.7	30.8	221°33.5	04.1	239°10.1	00.4
15	205°00.5	8°20.5	·· 14.9	33°08.7	·· 30.2	236°36.2	·· 04.2	254°12.7	·· 00.4
16	220°02.9	23°20.3	16.2	48°09.7	29.5	251°39.0	04.3	269°15.3	00.5
17	235°05.4	38°20.2	17.4	63°10.7	28.9	266°41.7	04.4	284°17.9	00.5
18	250°07.9	53°20.0	S07°18.7	78°11.7	N04°28.2	281°44.5	S14°04.5	299°20.5	S19°00.6
19	265°10.3	68°19.8	19.9	93°12.7	27.6	296°47.3	04.6	314°23.2	00.6
20	280°12.8	83°19.6	21.2	108°13.7	27.0	311°50.0	04.7	329°25.8	00.6
21	295°15.2	98°19.4	·· 22.4	123°14.7	·· 26.3	326°52.8	·· 04.8	344°28.4	·· 00.7
22	310°17.7	113°19.2	23.7	138°15.7	25.7	341°55.6	04.9	359°31.0	00.7
23	325°20.2	128°19.0	25.0	153°16.7	25.0	356°58.3	05.0	14°33.6	00.8
Mer.pass.	01:22	ν -0.2′	d 1.3′	m -4.04	ν 1.0′	d -0.6′	m 1.76	ν 2.8′	d 0.1′ m -2.87	ν 2.6′	d 0.0′ m 0.36

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.5
Ankaa	353°09.5	-42°11.2
Schedar	349°33.6	56°39.2
Diphda	348°49.8	-17°52.0
Achernar	335°21.9	-57°07.4
Hamal	327°54.1	23°33.8
Polaris	315°08.3	89°21.0
Acamar	315°13.7	-40°12.9
Menkar	314°08.9	4°10.5
Mirfak	308°32.0	49°56.0
Aldebaran	290°42.8	16°33.1
Rigel	281°06.6	-8°10.5
Capella	280°26.1	46°01.0
Bellatrix	278°25.9	6°22.2
Elnath	278°05.4	28°37.4
Alnilam	275°40.6	-1°11.2
Betelgeuse	270°55.2	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°28.8	-16°44.6
Adhara	255°08.2	-28°59.8
Procyon	244°54.0	5°10.3
Pollux	243°21.0	27°58.5
Avior	234°16.3	-59°34.5
Suhail	222°48.7	-43°31.0
Miaplacidus	221°39.6	-69°48.1
Alphard	217°50.8	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.2
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.7	-63°13.1
Gacrux	171°55.1	-57°14.0
Alioth	166°15.9	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.7
Hadar	148°40.2	-60°28.7
Menkent	148°01.1	-36°28.5
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.3	-60°55.6
Kochab	137°20.3	74°04.4
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.2	-26°28.7
Atria	107°15.8	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.3	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.8	38°48.5
Nunki	75°50.9	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Aug 29 Sun	SHA	Mer.pass
Venus	166°07.3	14:26
Mars	189°40.7	12:51
Jupiter	31°16.5	23:21
Saturn	49°02.6	22:10

Aug 30 Mon	SHA	Mer.pass
Venus	165°03.6	14:26
Mars	189°05.5	12:49
Jupiter	31°23.9	23:16
Saturn	49°06.3	22:06

Aug 31 Tue	SHA	Mer.pass
Venus	163°59.9	14:27
Mars	188°30.3	12:48
Jupiter	31°31.2	23:12
Saturn	49°10.0	22:02

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.9	N09°21.2	287°43.7	14.2′	N16°59.5	10.0′	54.3′
1	194°45.1	20.3	302°16.8	14.1′	17°09.5	10.0′	54.3′
2	209°45.3	19.4	316°50.0	14.1′	17°19.5	9.9′	54.3′
3	224°45.5	·· 18.5	331°23.1	14.0′	17°29.4	9.8′	54.3′
4	239°45.7	17.6	345°56.1	14.0′	17°39.2	9.7′	54.3′
5	254°45.9	16.7	0°29.1	14.0′	17°48.9	9.7′	54.3′
6	269°46.1	N09°15.8	15°02.1	13.9′	N17°58.6	9.6′	54.3′
7	284°46.2	14.9	29°35.0	13.9′	18°08.2	9.5′	54.3′
8	299°46.4	14.0	44°07.9	13.8′	18°17.7	9.4′	54.3′
9	314°46.6	·· 13.2	58°40.7	13.8′	18°27.1	9.4′	54.2′
10	329°46.8	12.3	73°13.5	13.7′	18°36.5	9.3′	54.2′
11	344°47.0	11.4	87°46.2	13.7′	18°45.8	9.2′	54.2′
12	359°47.2	N09°10.5	102°18.9	13.6′	N18°55.0	9.1′	54.2′
13	14°47.4	09.6	116°51.5	13.6′	19°04.1	9.0′	54.2′
14	29°47.6	08.7	131°24.1	13.5′	19°13.1	9.0′	54.2′
15	44°47.8	·· 07.8	145°56.6	13.5′	19°22.1	8.9′	54.2′
16	59°48.0	06.9	160°29.1	13.4′	19°30.9	8.8′	54.2′
17	74°48.1	06.0	175°01.5	13.4′	19°39.7	8.7′	54.2′
18	89°48.3	N09°05.1	189°33.9	13.3′	N19°48.4	8.6′	54.2′
19	104°48.5	04.2	204°06.2	13.3′	19°57.0	8.5′	54.2′
20	119°48.7	03.3	218°38.5	13.2′	20°05.6	8.4′	54.2′
21	134°48.9	·· 02.4	233°10.7	13.2′	20°14.0	8.4′	54.2′
22	149°49.1	01.5	247°42.8	13.1′	20°22.4	8.3′	54.2′
23	164°49.3	00.7	262°15.0	13.1′	20°30.6	8.2′	54.2′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°49.5	N08°59.8	276°47.0	13.0′	N20°38.8	8.1′	54.2′
1	194°49.7	58.9	291°19.0	13.0′	20°46.9	8.0′	54.2′
2	209°49.9	58.0	305°51.0	12.9′	20°54.9	7.9′	54.2′
3	224°50.1	·· 57.1	320°22.9	12.8′	21°02.8	7.8′	54.2′
4	239°50.2	56.2	334°54.7	12.8′	21°10.6	7.7′	54.2′
5	254°50.4	55.3	349°26.5	12.7′	21°18.4	7.6′	54.2′
6	269°50.6	N08°54.4	3°58.3	12.7′	N21°26.0	7.5′	54.2′
7	284°50.8	53.5	18°30.0	12.6′	21°33.5	7.4′	54.2′
8	299°51.0	52.6	33°01.6	12.6′	21°41.0	7.4′	54.2′
9	314°51.2	·· 51.7	47°33.2	12.5′	21°48.3	7.3′	54.2′
10	329°51.4	50.8	62°04.7	12.5′	21°55.6	7.2′	54.2′
11	344°51.6	49.9	76°36.2	12.4′	22°02.7	7.1′	54.2′
12	359°51.8	N08°49.0	91°07.6	12.4′	N22°09.8	7.0′	54.2′
13	14°52.0	48.1	105°38.9	12.3′	22°16.8	6.9′	54.2′
14	29°52.2	47.2	120°10.2	12.2′	22°23.7	6.8′	54.2′
15	44°52.4	·· 46.3	134°41.5	12.2′	22°30.4	6.7′	54.2′
16	59°52.6	45.4	149°12.7	12.1′	22°37.1	6.6′	54.2′
17	74°52.8	44.5	163°43.8	12.1′	22°43.7	6.5′	54.2′
18	89°52.9	N08°43.6	178°14.9	12.0′	N22°50.1	6.4′	54.2′
19	104°53.1	42.7	192°45.9	12.0′	22°56.5	6.3′	54.2′
20	119°53.3	41.8	207°16.9	11.9′	23°02.8	6.2′	54.2′
21	134°53.5	·· 40.9	221°47.8	11.9′	23°08.9	6.1′	54.3′
22	149°53.7	40.0	236°18.6	11.8′	23°15.0	6.0′	54.3′
23	164°53.9	39.1	250°49.4	11.7′	23°20.9	5.9′	54.3′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.1	N08°38.2	265°20.2	11.7′	N23°26.8	5.7′	54.3′
1	194°54.3	37.3	279°50.9	11.6′	23°32.5	5.6′	54.3′
2	209°54.5	36.4	294°21.5	11.6′	23°38.2	5.5′	54.3′
3	224°54.7	·· 35.5	308°52.1	11.5′	23°43.7	5.4′	54.3′
4	239°54.9	34.6	323°22.6	11.5′	23°49.1	5.3′	54.3′
5	254°55.1	33.7	337°53.1	11.4′	23°54.5	5.2′	54.3′
6	269°55.3	N08°32.8	352°23.5	11.4′	N23°59.7	5.1′	54.3′
7	284°55.5	31.9	6°53.9	11.3′	24°04.8	5.0′	54.3′
8	299°55.7	31.0	21°24.2	11.3′	24°09.8	4.9′	54.3′
9	314°55.9	·· 30.1	35°54.5	11.2′	24°14.6	4.8′	54.3′
10	329°56.1	29.2	50°24.7	11.2′	24°19.4	4.7′	54.3′
11	344°56.3	28.3	64°54.9	11.1′	24°24.0	4.5′	54.4′
12	359°56.5	N08°27.4	79°25.0	11.1′	N24°28.6	4.4′	54.4′
13	14°56.7	26.5	93°55.0	11.0′	24°33.0	4.3′	54.4′
14	29°56.9	25.6	108°25.0	11.0′	24°37.3	4.2′	54.4′
15	44°57.0	·· 24.7	122°55.0	10.9′	24°41.5	4.1′	54.4′
16	59°57.2	23.8	137°24.9	10.9′	24°45.6	4.0′	54.4′
17	74°57.4	22.9	151°54.7	10.8′	24°49.6	3.9′	54.4′
18	89°57.6	N08°22.0	166°24.5	10.8′	N24°53.4	3.7′	54.4′
19	104°57.8	21.1	180°54.3	10.7′	24°57.2	3.6′	54.4′
20	119°58.0	20.2	195°24.0	10.7′	25°00.8	3.5′	54.5′
21	134°58.2	·· 19.2	209°53.7	10.6′	25°04.3	3.4′	54.5′
22	149°58.4	18.3	224°23.3	10.6′	25°07.7	3.3′	54.5′
23	164°58.6	17.4	238°52.8	10.5′	25°10.9	3.1′	54.5′
	SD = 15.8′	d = -0.9′	SD = 14.8′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	–:–	02:17	03:52	20:05	21:37	–:–
N 70°	–:–	02:49	04:07	19:51	21:07	–:–
68°	01:11	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	03:43	04:37	19:22	20:15	21:30
62°	02:48	03:55	04:44	19:15	20:04	21:10
60°	03:05	04:05	04:50	19:09	19:54	20:53
N 58°	03:19	04:13	04:56	19:04	19:46	20:40
56°	03:30	04:21	05:01	18:59	19:39	20:29
54°	03:40	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°	04:12	04:49	05:20	18:41	19:11	19:48
N 40°	04:25	04:58	05:26	18:34	19:02	19:36
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	18:13	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	06:45	17:17	17:53	18:34
56°	05:28	06:11	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	06:57	17:06	17:48	18:36

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

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 21-23 62-43%
29	01:00	00:51	12:01	04:58	17:21	
30	00:42	00:33	12:01	05:44	18:07	
31	00:24	00:14	12:00	06:31	18:56	

DUT1 = UT1-UTC = -0.1193 sec ΔT = TT-UT1 = +69.3033 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	340°22.6	143°18.8	S07°26.2	168°17.7	N04°24.4	12°01.1	S14°05.1	29°36.2	S19°00.8
1	355°25.1	158°18.6	27.5	183°18.7	23.7	27°03.9	05.2	44°38.8	00.8
2	10°27.6	173°18.4	28.7	198°19.7	23.1	42°06.6	05.3	59°41.5	00.9
3	25°30.0	188°18.2	·· 30.0	213°20.6	·· 22.4	57°09.4	·· 05.4	74°44.1	·· 00.9
4	40°32.5	203°18.0	31.2	228°21.6	21.8	72°12.2	05.6	89°46.7	01.0
5	55°35.0	218°17.8	32.5	243°22.6	21.2	87°14.9	05.7	104°49.3	01.0
6	70°37.4	233°17.6	S07°33.7	258°23.6	N04°20.5	102°17.7	S14°05.8	119°51.9	S19°01.0
7	85°39.9	248°17.4	35.0	273°24.6	19.9	117°20.5	05.9	134°54.5	01.1
8	100°42.3	263°17.3	36.2	288°25.6	19.2	132°23.2	06.0	149°57.1	01.1
9	115°44.8	278°17.1	·· 37.5	303°26.6	·· 18.6	147°26.0	·· 06.1	164°59.7	·· 01.2
10	130°47.3	293°16.9	38.7	318°27.6	17.9	162°28.8	06.2	180°02.3	01.2
11	145°49.7	308°16.7	40.0	333°28.6	17.3	177°31.5	06.3	195°05.0	01.2
12	160°52.2	323°16.5	S07°41.2	348°29.6	N04°16.6	192°34.3	S14°06.4	210°07.6	S19°01.3
13	175°54.7	338°16.3	42.5	3°30.6	16.0	207°37.0	06.5	225°10.2	01.3
14	190°57.1	353°16.1	43.7	18°31.6	15.3	222°39.8	06.6	240°12.8	01.4
15	205°59.6	8°15.9	·· 45.0	33°32.6	·· 14.7	237°42.6	·· 06.7	255°15.4	·· 01.4
16	221°02.1	23°15.7	46.2	48°33.6	14.1	252°45.3	06.8	270°18.0	01.4
17	236°04.5	38°15.5	47.5	63°34.6	13.4	267°48.1	06.9	285°20.6	01.5
18	251°07.0	53°15.3	S07°48.7	78°35.6	N04°12.8	282°50.9	S14°07.0	300°23.2	S19°01.5
19	266°09.5	68°15.1	50.0	93°36.6	12.1	297°53.6	07.1	315°25.8	01.5
20	281°11.9	83°14.9	51.2	108°37.6	11.5	312°56.4	07.3	330°28.5	01.6
21	296°14.4	98°14.7	·· 52.5	123°38.6	·· 10.8	327°59.2	·· 07.4	345°31.1	·· 01.6
22	311°16.8	113°14.5	53.7	138°39.6	10.2	343°01.9	07.5	0°33.7	01.7
23	326°19.3	128°14.3	55.0	153°40.6	09.5	358°04.7	07.6	15°36.3	01.7
	Mer.pass. 01:18	ν -0.2′	d 1.3′	m -4.05	ν 1.0′	d -0.6′	m 1.76	ν 2.8′	d 0.1′ m -2.86	ν 2.6′	d 0.0′ m 0.36
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	341°21.8	143°14.1	S07°56.2	168°41.6	N04°08.9	13°07.4	S14°07.7	30°38.9	S19°01.7
1	356°24.2	158°13.9	57.4	183°42.6	08.2	28°10.2	07.8	45°41.5	01.8
2	11°26.7	173°13.7	58.7	198°43.6	07.6	43°13.0	07.9	60°44.1	01.8
3	26°29.2	188°13.5	07°59.9	213°44.5	·· 07.0	58°15.7	·· 08.0	75°46.7	·· 01.9
4	41°31.6	203°13.3	08°01.2	228°45.5	06.3	73°18.5	08.1	90°49.3	01.9
5	56°34.1	218°13.1	02.4	243°46.5	05.7	88°21.3	08.2	105°51.9	01.9
6	71°36.6	233°12.9	S08°03.7	258°47.5	N04°05.0	103°24.0	S14°08.3	120°54.6	S19°02.0
7	86°39.0	248°12.7	04.9	273°48.5	04.4	118°26.8	08.4	135°57.2	02.0
8	101°41.5	263°12.6	06.2	288°49.5	03.7	133°29.5	08.5	150°59.8	02.0
9	116°44.0	278°12.4	·· 07.4	303°50.5	·· 03.1	148°32.3	·· 08.6	166°02.4	·· 02.1
10	131°46.4	293°12.2	08.7	318°51.5	02.4	163°35.1	08.7	181°05.0	02.1
11	146°48.9	308°12.0	09.9	333°52.5	01.8	178°37.8	08.8	196°07.6	02.2
12	161°51.3	323°11.8	S08°11.1	348°53.5	N04°01.1	193°40.6	S14°08.9	211°10.2	S19°02.2
13	176°53.8	338°11.6	12.4	3°54.5	04°00.5	208°43.4	09.0	226°12.8	02.2
14	191°56.3	353°11.4	13.6	18°55.5	03°59.8	223°46.1	09.1	241°15.4	02.3
15	206°58.7	8°11.2	·· 14.9	33°56.5	·· 59.2	238°48.9	·· 09.2	256°18.0	·· 02.3
16	222°01.2	23°11.0	16.1	48°57.5	58.5	253°51.6	09.4	271°20.6	02.4
17	237°03.7	38°10.8	17.4	63°58.5	57.9	268°54.4	09.5	286°23.2	02.4
18	252°06.1	53°10.6	S08°18.6	78°59.5	N03°57.3	283°57.2	S14°09.6	301°25.9	S19°02.4
19	267°08.6	68°10.4	19.8	94°00.5	56.6	298°59.9	09.7	316°28.5	02.5
20	282°11.1	83°10.2	21.1	109°01.5	56.0	314°02.7	09.8	331°31.1	02.5
21	297°13.5	98°10.0	·· 22.3	124°02.5	·· 55.3	329°05.4	·· 09.9	346°33.7	·· 02.5
22	312°16.0	113°09.8	23.6	139°03.5	54.7	344°08.2	10.0	1°36.3	02.6
23	327°18.5	128°09.6	24.8	154°04.5	54.0	359°11.0	10.1	16°38.9	02.6
	Mer.pass. 01:14	ν -0.2′	d 1.2′	m -4.05	ν 1.0′	d -0.6′	m 1.75	ν 2.8′	d 0.1′ m -2.86	ν 2.6′	d 0.0′ m 0.36
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	342°20.9	143°09.4	S08°26.0	169°05.5	N03°53.4	14°13.7	S14°10.2	31°41.5	S19°02.7
1	357°23.4	158°09.2	27.3	184°06.5	52.7	29°16.5	10.3	46°44.1	02.7
2	12°25.8	173°09.0	28.5	199°07.5	52.1	44°19.2	10.4	61°46.7	02.7
3	27°28.3	188°08.8	·· 29.8	214°08.4	·· 51.4	59°22.0	·· 10.5	76°49.3	·· 02.8
4	42°30.8	203°08.6	31.0	229°09.4	50.8	74°24.8	10.6	91°51.9	02.8
5	57°33.2	218°08.4	32.2	244°10.4	50.1	89°27.5	10.7	106°54.5	02.8
6	72°35.7	233°08.2	S08°33.5	259°11.4	N03°49.5	104°30.3	S14°10.8	121°57.1	S19°02.9
7	87°38.2	248°08.0	34.7	274°12.4	48.8	119°33.0	10.9	136°59.7	02.9
8	102°40.6	263°07.8	36.0	289°13.4	48.2	134°35.8	11.0	152°02.4	03.0
9	117°43.1	278°07.6	·· 37.2	304°14.4	·· 47.5	149°38.5	·· 11.1	167°05.0	·· 03.0
10	132°45.6	293°07.4	38.4	319°15.4	46.9	164°41.3	11.2	182°07.6	03.0
11	147°48.0	308°07.2	39.7	334°16.4	46.2	179°44.1	11.3	197°10.2	03.1
12	162°50.5	323°07.0	S08°40.9	349°17.4	N03°45.6	194°46.8	S14°11.4	212°12.8	S19°03.1
13	177°52.9	338°06.8	42.1	4°18.4	44.9	209°49.6	11.5	227°15.4	03.1
14	192°55.4	353°06.6	43.4	19°19.4	44.3	224°52.3	11.6	242°18.0	03.2
15	207°57.9	8°06.4	·· 44.6	34°20.4	·· 43.7	239°55.1	·· 11.7	257°20.6	·· 03.2
16	223°00.3	23°06.2	45.9	49°21.4	43.0	254°57.9	11.8	272°23.2	03.3
17	238°02.8	38°06.0	47.1	64°22.4	42.4	270°00.6	11.9	287°25.8	03.3
18	253°05.3	53°05.8	S08°48.3	79°23.4	N03°41.7	285°03.4	S14°12.1	302°28.4	S19°03.3
19	268°07.7	68°05.6	49.6	94°24.4	41.1	300°06.1	12.2	317°31.0	03.4
20	283°10.2	83°05.4	50.8	109°25.4	40.4	315°08.9	12.3	332°33.6	03.4
21	298°12.7	98°05.2	·· 52.0	124°26.4	·· 39.8	330°11.6	·· 12.4	347°36.2	·· 03.4
22	313°15.1	113°05.0	53.3	139°27.4	39.1	345°14.4	12.5	2°38.8	03.5
23	328°17.6	128°04.8	54.5	154°28.4	38.5	0°17.2	12.6	17°41.4	03.5
	Mer.pass. 01:10	ν -0.2′	d 1.2′	m -4.06	ν 1.0′	d -0.6′	m 1.75	ν 2.8′	d 0.1′ m -2.86	ν 2.6′	d 0.0′ m 0.37

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.6
Ankaa	353°09.5	-42°11.2
Schedar	349°33.6	56°39.2
Diphda	348°49.8	-17°52.0
Achernar	335°21.9	-57°07.4
Hamal	327°54.1	23°33.8
Polaris	315°06.7	89°21.0
Acamar	315°13.7	-40°12.9
Menkar	314°08.9	4°10.5
Mirfak	308°32.0	49°56.0
Aldebaran	290°42.8	16°33.1
Rigel	281°06.6	-8°10.5
Capella	280°26.0	46°01.0
Bellatrix	278°25.9	6°22.2
Elnath	278°05.4	28°37.4
Alnilam	275°40.6	-1°11.2
Betelgeuse	270°55.2	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°28.8	-16°44.6
Adhara	255°08.2	-28°59.8
Procyon	244°53.9	5°10.3
Pollux	243°20.9	27°58.4
Avior	234°16.3	-59°34.5
Suhail	222°48.7	-43°31.0
Miaplacidus	221°39.6	-69°48.1
Alphard	217°50.7	-8°45.0
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.2
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.6
Acrux	173°03.7	-63°13.1
Gacrux	171°55.1	-57°14.0
Alioth	166°15.9	55°50.9
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.7
Hadar	148°40.2	-60°28.7
Menkent	148°01.1	-36°28.5
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.3	-60°55.5
Kochab	137°20.4	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.2	-26°28.7
Atria	107°15.8	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.3	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.9	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Sep 01 Wed	SHA	Mer.pass
Venus	162°56.2	14:27
Mars	187°55.0	12:46
Jupiter	31°38.5	23:08
Saturn	49°13.6	21:58

Sep 02 Thu	SHA	Mer.pass
Venus	161°52.4	14:27
Mars	187°19.8	12:44
Jupiter	31°45.7	23:03
Saturn	49°17.1	21:54

Sep 03 Fri	SHA	Mer.pass
Venus	160°48.5	14:28
Mars	186°44.5	12:43
Jupiter	31°52.8	22:59
Saturn	49°20.6	21:49

Horizontal parallax	
Venus:	0.1
Mars:	0.1

Sun and Moon

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°58.8	N08°16.5	253°22.3	10.5′	N25°14.1	3.0′	54.5′
1	194°59.0	15.6	267°51.8	10.4′	25°17.1	2.9′	54.5′
2	209°59.2	14.7	282°21.2	10.4′	25°20.0	2.8′	54.5′
3	224°59.4	·· 13.8	296°50.6	10.3′	25°22.8	2.7′	54.6′
4	239°59.6	12.9	311°20.0	10.3′	25°25.4	2.5′	54.6′
5	254°59.8	12.0	325°49.3	10.3′	25°28.0	2.4′	54.6′
6	270°00.0	N08°11.1	340°18.5	10.2′	N25°30.4	2.3′	54.6′
7	285°00.2	10.2	354°47.7	10.2′	25°32.7	2.2′	54.6′
8	300°00.4	09.3	9°16.9	10.1′	25°34.8	2.0′	54.6′
9	315°00.6	·· 08.4	23°46.0	10.1′	25°36.9	1.9′	54.6′
10	330°00.8	07.5	38°15.1	10.1′	25°38.8	1.8′	54.7′
11	345°01.0	06.5	52°44.2	10.0′	25°40.6	1.7′	54.7′
12	0°01.2	N08°05.6	67°13.2	10.0′	N25°42.2	1.5′	54.7′
13	15°01.4	04.7	81°42.1	9.9′	25°43.8	1.4′	54.7′
14	30°01.6	03.8	96°11.1	9.9′	25°45.2	1.3′	54.7′
15	45°01.8	·· 02.9	110°40.0	9.9′	25°46.4	1.2′	54.7′
16	60°02.0	02.0	125°08.9	9.8′	25°47.6	1.0′	54.8′
17	75°02.2	01.1	139°37.7	9.8′	25°48.6	0.9′	54.8′
18	90°02.4	N08°00.2	154°06.5	9.8′	N25°49.5	0.8′	54.8′
19	105°02.6	07°59.3	168°35.3	9.7′	25°50.3	0.6′	54.8′
20	120°02.8	58.4	183°04.0	9.7′	25°50.9	0.5′	54.8′
21	135°03.0	·· 57.4	197°32.7	9.7′	25°51.4	0.4′	54.8′
22	150°03.2	56.5	212°01.4	9.6′	25°51.8	0.2′	54.9′
23	165°03.4	55.6	226°30.0	9.6′	25°52.1	0.1′	54.9′
		SD = 15.8′	d = -0.9′		SD = 14.9′		
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°03.6	N07°54.7	240°58.6	9.6′	N25°52.2	-0.0′	54.9′
1	195°03.8	53.8	255°27.2	9.6′	25°52.2	-0.1′	54.9′
2	210°04.0	52.9	269°55.8	9.5′	25°52.0	-0.3′	54.9′
3	225°04.2	·· 52.0	284°24.3	9.5′	25°51.7	-0.4′	55.0′
4	240°04.4	51.1	298°52.9	9.5′	25°51.3	-0.5′	55.0′
5	255°04.6	50.1	313°21.4	9.5′	25°50.8	-0.7′	55.0′
6	270°04.8	N07°49.2	327°49.8	9.5′	N25°50.1	-0.8′	55.0′
7	285°05.0	48.3	342°18.3	9.4′	25°49.3	-0.9′	55.0′
8	300°05.2	47.4	356°46.7	9.4′	25°48.4	-1.1′	55.1′
9	315°05.4	·· 46.5	11°15.1	9.4′	25°47.3	-1.2′	55.1′
10	330°05.6	45.6	25°43.5	9.4′	25°46.1	-1.3′	55.1′
11	345°05.8	44.7	40°11.9	9.4′	25°44.8	-1.5′	55.1′
12	0°06.0	N07°43.8	54°40.2	9.3′	N25°43.3	-1.6′	55.2′
13	15°06.2	42.8	69°08.6	9.3′	25°41.7	-1.7′	55.2′
14	30°06.4	41.9	83°36.9	9.3′	25°39.9	-1.9′	55.2′
15	45°06.6	·· 41.0	98°05.2	9.3′	25°38.1	-2.0′	55.2′
16	60°06.8	40.1	112°33.5	9.3′	25°36.1	-2.1′	55.2′
17	75°07.0	39.2	127°01.8	9.3′	25°33.9	-2.3′	55.3′
18	90°07.2	N07°38.3	141°30.1	9.3′	N25°31.6	-2.4′	55.3′
19	105°07.4	37.3	155°58.4	9.3′	25°29.2	-2.5′	55.3′
20	120°07.6	36.4	170°26.7	9.3′	25°26.7	-2.7′	55.3′
21	135°07.8	·· 35.5	184°54.9	9.3′	25°24.0	-2.8′	55.4′
22	150°08.0	34.6	199°23.2	9.2′	25°21.2	-3.0′	55.4′
23	165°08.2	33.7	213°51.4	9.2′	25°18.2	-3.1′	55.4′
		SD = 15.8′	d = -0.9′		SD = 15.0′		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°08.4	N07°32.8	228°19.7	9.2′	N25°15.1	-3.2′	55.4′
1	195°08.7	31.8	242°47.9	9.2′	25°11.9	-3.4′	55.5′
2	210°08.9	30.9	257°16.1	9.2′	25°08.5	-3.5′	55.5′
3	225°09.1	·· 30.0	271°44.4	9.2′	25°05.1	-3.6′	55.5′
4	240°09.3	29.1	286°12.6	9.2′	25°01.4	-3.8′	55.5′
5	255°09.5	28.2	300°40.8	9.2′	24°57.7	-3.9′	55.6′
6	270°09.7	N07°27.3	315°09.1	9.2′	N24°53.8	-4.0′	55.6′
7	285°09.9	26.3	329°37.3	9.2′	24°49.7	-4.2′	55.6′
8	300°10.1	25.4	344°05.6	9.2′	24°45.6	-4.3′	55.6′
9	315°10.3	·· 24.5	358°33.8	9.3′	24°41.3	-4.4′	55.7′
10	330°10.5	23.6	13°02.1	9.3′	24°36.8	-4.6′	55.7′
11	345°10.7	22.7	27°30.3	9.3′	24°32.3	-4.7′	55.7′
12	0°10.9	N07°21.7	41°58.6	9.3′	N24°27.6	-4.8′	55.7′
13	15°11.1	20.8	56°26.9	9.3′	24°22.7	-5.0′	55.8′
14	30°11.3	19.9	70°55.2	9.3′	24°17.8	-5.1′	55.8′
15	45°11.5	·· 19.0	85°23.5	9.3′	24°12.7	-5.2′	55.8′
16	60°11.7	18.1	99°51.8	9.3′	24°07.5	-5.4′	55.8′
17	75°11.9	17.1	114°20.1	9.3′	24°02.1	-5.5′	55.9′
18	90°12.1	N07°16.2	128°48.4	9.3′	N23°56.6	-5.6′	55.9′
19	105°12.3	15.3	143°16.8	9.4′	23°51.0	-5.8′	55.9′
20	120°12.5	14.4	157°45.1	9.4′	23°45.2	-5.9′	55.9′
21	135°12.7	·· 13.5	172°13.5	9.4′	23°39.3	-6.0′	56.0′
22	150°12.9	12.5	186°41.9	9.4′	23°33.3	-6.2′	56.0′
23	165°13.1	11.6	201°10.3	9.4′	23°27.1	-6.3′	56.0′
		SD = 15.8′	d = -0.9′		SD = 15.1′		

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

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 34-17%
01	00:05	00:05	12:00	07:22	19:47	
02	00:14	00:24	12:00	08:13	20:40	
03	00:34	00:44	11:59	09:06	21:32	

DUT1 = UT1-UTC = -0.1163 sec ΔT = TT-UT1 = +69.3003 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°20.1	143°04.6	S08°55.7	169°29.4	N03°37.8	15°19.9	S14°12.7	32°44.0	S19°03.6
1	358°22.5	158°04.4	57.0	184°30.3	37.2	30°22.7	12.8	47°46.6	03.6
2	13°25.0	173°04.1	58.2	199°31.3	36.5	45°25.4	12.9	62°49.2	03.6
3	28°27.4	188°03.9	08°59.4	214°32.3	·· 35.9	60°28.2	·· 13.0	77°51.8	·· 03.7
4	43°29.9	203°03.7	09°00.7	229°33.3	35.2	75°30.9	13.1	92°54.5	03.7
5	58°32.4	218°03.5	01.9	244°34.3	34.6	90°33.7	13.2	107°57.1	03.7
6	73°34.8	233°03.3	S09°03.1	259°35.3	N03°33.9	105°36.5	S14°13.3	122°59.7	S19°03.8
7	88°37.3	248°03.1	04.4	274°36.3	33.3	120°39.2	13.4	138°02.3	03.8
8	103°39.8	263°02.9	05.6	289°37.3	32.6	135°42.0	13.5	153°04.9	03.8
9	118°42.2	278°02.7	·· 06.8	304°38.3	·· 32.0	150°44.7	·· 13.6	168°07.5	·· 03.9
10	133°44.7	293°02.5	08.0	319°39.3	31.3	165°47.5	13.7	183°10.1	03.9
11	148°47.2	308°02.3	09.3	334°40.3	30.7	180°50.2	13.8	198°12.7	04.0
12	163°49.6	323°02.1	S09°10.5	349°41.3	N03°30.0	195°53.0	S14°13.9	213°15.3	S19°04.0
13	178°52.1	338°01.9	11.7	4°42.3	29.4	210°55.7	14.0	228°17.9	04.0
14	193°54.6	353°01.7	13.0	19°43.3	28.7	225°58.5	14.1	243°20.5	04.1
15	208°57.0	8°01.5	·· 14.2	34°44.3	·· 28.1	241°01.2	·· 14.2	258°23.1	·· 04.1
16	223°59.5	23°01.3	15.4	49°45.3	27.4	256°04.0	14.3	273°25.7	04.1
17	239°01.9	38°01.1	16.7	64°46.3	26.8	271°06.8	14.4	288°28.3	04.2
18	254°04.4	53°00.9	S09°17.9	79°47.3	N03°26.1	286°09.5	S14°14.5	303°30.9	S19°04.2
19	269°06.9	68°00.7	19.1	94°48.3	25.5	301°12.3	14.6	318°33.5	04.3
20	284°09.3	83°00.5	20.3	109°49.3	24.8	316°15.0	14.7	333°36.1	04.3
21	299°11.8	98°00.3	·· 21.6	124°50.3	·· 24.2	331°17.8	·· 14.8	348°38.7	·· 04.3
22	314°14.3	113°00.1	22.8	139°51.2	23.5	346°20.5	14.9	3°41.3	04.4
23	329°16.7	127°59.8	24.0	154°52.2	22.9	1°23.3	15.0	18°43.9	04.4
Mer.pass.	01:06	ν -0.2′	d 1.2′	m -4.07	ν 1.0′	d -0.6′	m 1.75	ν 2.8′	d 0.1′ m -2.85	ν 2.6′	d 0.0′ m 0.37

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°19.2	142°59.6	S09°25.2	169°53.2	N03°22.2	16°26.0	S14°15.1	33°46.5	S19°04.4
1	359°21.7	157°59.4	26.5	184°54.2	21.6	31°28.8	15.2	48°49.1	04.5
2	14°24.1	172°59.2	27.7	199°55.2	20.9	46°31.5	15.3	63°51.7	04.5
3	29°26.6	187°59.0	·· 28.9	214°56.2	·· 20.3	61°34.3	·· 15.4	78°54.3	·· 04.5
4	44°29.0	202°58.8	30.1	229°57.2	19.6	76°37.0	15.5	93°56.9	04.6
5	59°31.5	217°58.6	31.4	244°58.2	19.0	91°39.8	15.6	108°59.5	04.6
6	74°34.0	232°58.4	S09°32.6	259°59.2	N03°18.3	106°42.6	S14°15.7	124°02.1	S19°04.6
7	89°36.4	247°58.2	33.8	275°00.2	17.7	121°45.3	15.8	139°04.7	04.7
8	104°38.9	262°58.0	35.0	290°01.2	17.0	136°48.1	15.9	154°07.3	04.7
9	119°41.4	277°57.8	·· 36.3	305°02.2	·· 16.4	151°50.8	·· 16.0	169°09.9	·· 04.8
10	134°43.8	292°57.6	37.5	320°03.2	15.7	166°53.6	16.1	184°12.5	04.8
11	149°46.3	307°57.4	38.7	335°04.2	15.1	181°56.3	16.2	199°15.1	04.8
12	164°48.8	322°57.2	S09°39.9	350°05.2	N03°14.4	196°59.1	S14°16.3	214°17.7	S19°04.9
13	179°51.2	337°56.9	41.2	5°06.2	13.8	212°01.8	16.4	229°20.3	04.9
14	194°53.7	352°56.7	42.4	20°07.2	13.1	227°04.6	16.5	244°22.9	04.9
15	209°56.2	7°56.5	·· 43.6	35°08.2	·· 12.5	242°07.3	·· 16.6	259°25.5	·· 05.0
16	224°58.6	22°56.3	44.8	50°09.2	11.8	257°10.1	16.7	274°28.1	05.0
17	240°01.1	37°56.1	46.0	65°10.1	11.2	272°12.8	16.8	289°30.7	05.0
18	255°03.5	52°55.9	S09°47.3	80°11.1	N03°10.5	287°15.6	S14°16.9	304°33.3	S19°05.1
19	270°06.0	67°55.7	48.5	95°12.1	09.9	302°18.3	17.0	319°35.9	05.1
20	285°08.5	82°55.5	49.7	110°13.1	09.2	317°21.1	17.1	334°38.5	05.1
21	300°10.9	97°55.3	·· 50.9	125°14.1	·· 08.6	332°23.8	·· 17.2	349°41.1	·· 05.2
22	315°13.4	112°55.1	52.1	140°15.1	07.9	347°26.6	17.3	4°43.7	05.2
23	330°15.9	127°54.8	53.4	155°16.1	07.3	2°29.3	17.4	19°46.3	05.3
Mer.pass.	01:03	ν -0.2′	d 1.2′	m -4.07	ν 1.0′	d -0.6′	m 1.74	ν 2.8′	d 0.1′ m -2.85	ν 2.6′	d 0.0′ m 0.38

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	345°18.3	142°54.6	S09°54.6	170°17.1	N03°06.6	17°32.1	S14°17.5	34°48.9	S19°05.3
1	0°20.8	157°54.4	55.8	185°18.1	06.0	32°34.8	17.6	49°51.5	05.3
2	15°23.3	172°54.2	57.0	200°19.1	05.3	47°37.6	17.7	64°54.1	05.4
3	30°25.7	187°54.0	·· 58.2	215°20.1	·· 04.7	62°40.3	·· 17.8	79°56.7	·· 05.4
4	45°28.2	202°53.8	09°59.4	230°21.1	04.0	77°43.1	17.9	94°59.3	05.4
5	60°30.7	217°53.6	10°00.7	245°22.1	03.4	92°45.8	18.0	110°01.9	05.5
6	75°33.1	232°53.4	S10°01.9	260°23.1	N03°02.7	107°48.6	S14°18.1	125°04.5	S19°05.5
7	90°35.6	247°53.2	03.1	275°24.1	02.1	122°51.3	18.2	140°07.1	05.5
8	105°38.0	262°52.9	04.3	290°25.1	01.4	137°54.1	18.3	155°09.7	05.6
9	120°40.5	277°52.7	·· 05.5	305°26.1	·· 00.8	152°56.8	·· 18.4	170°12.3	·· 05.6
10	135°43.0	292°52.5	06.7	320°27.1	03°00.1	167°59.6	18.5	185°14.9	05.6
11	150°45.4	307°52.3	08.0	335°28.1	02°59.5	183°02.3	18.6	200°17.5	05.7
12	165°47.9	322°52.1	S10°09.2	350°29.0	N02°58.8	198°05.1	S14°18.7	215°20.1	S19°05.7
13	180°50.4	337°51.9	10.4	5°30.0	58.2	213°07.8	18.8	230°22.7	05.7
14	195°52.8	352°51.7	11.6	20°31.0	57.5	228°10.6	18.9	245°25.3	05.8
15	210°55.3	7°51.5	·· 12.8	35°32.0	·· 56.9	243°13.3	·· 19.0	260°27.9	·· 05.8
16	225°57.8	22°51.2	14.0	50°33.0	56.2	258°16.0	19.1	275°30.5	05.9
17	241°00.2	37°51.0	15.2	65°34.0	55.5	273°18.8	19.2	290°33.1	05.9
18	256°02.7	52°50.8	S10°16.5	80°35.0	N02°54.9	288°21.5	S14°19.3	305°35.7	S19°05.9
19	271°05.1	67°50.6	17.7	95°36.0	54.2	303°24.3	19.4	320°38.3	06.0
20	286°07.6	82°50.4	18.9	110°37.0	53.6	318°27.0	19.5	335°40.9	06.0
21	301°10.1	97°50.2	·· 20.1	125°38.0	·· 52.9	333°29.8	·· 19.6	350°43.4	·· 06.0
22	316°12.5	112°50.0	21.3	140°39.0	52.3	348°32.5	19.7	5°46.0	06.1
23	331°15.0	127°49.7	22.5	155°40.0	51.6	3°35.3	19.8	20°48.6	06.1
Mer.pass.	00:59	ν -0.2′	d 1.2′	m -4.08	ν 1.0′	d -0.7′	m 1.74	ν 2.7′	d 0.1′ m -2.85	ν 2.6′	d 0.0′ m 0.38

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.5	-42°11.2
Schedar	349°33.6	56°39.2
Diphda	348°49.8	-17°52.0
Achernar	335°21.9	-57°07.4
Hamal	327°54.0	23°33.8
Polaris	315°05.3	89°21.0
Acamar	315°13.7	-40°12.9
Menkar	314°08.9	4°10.5
Mirfak	308°32.0	49°56.0
Aldebaran	290°42.7	16°33.1
Rigel	281°06.5	-8°10.5
Capella	280°26.0	46°01.0
Bellatrix	278°25.9	6°22.2
Elnath	278°05.4	28°37.4
Alnilam	275°40.6	-1°11.2
Betelgeuse	270°55.1	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°28.8	-16°44.5
Adhara	255°08.2	-28°59.8
Procyon	244°53.9	5°10.3
Pollux	243°20.9	27°58.4
Avior	234°16.3	-59°34.4
Suhail	222°48.7	-43°30.9
Miaplacidus	221°39.6	-69°48.1
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.2
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.1
Gacrux	171°55.2	-57°14.0
Alioth	166°15.9	55°50.8
Spica	158°25.4	-11°16.3
Alkaid	152°54.5	49°12.6
Hadar	148°40.2	-60°28.7
Menkent	148°01.1	-36°28.5
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.4	-60°55.5
Kochab	137°20.4	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.2	-26°28.7
Atria	107°15.8	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.3	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.9	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.2	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Sep 04 Sat	SHA	Mer.pass
Venus	159°44.5	14:28
Mars	186°09.3	12:41
Jupiter	31°59.9	22:54
Saturn	49°24.0	21:45

Sep 05 Sun	SHA	Mer.pass
Venus	158°40.4	14:28
Mars	185°34.0	12:40
Jupiter	32°06.8	22:50
Saturn	49°27.3	21:41

Sep 06 Mon	SHA	Mer.pass
Venus	157°36.3	14:29
Mars	184°58.8	12:38
Jupiter	32°13.7	22:46
Saturn	49°30.6	21:37

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°13.4	N07°10.7	215°38.7	9.4′	N23°20.9	-6.4′	56.1′
1	195°13.6	09.8	230°07.2	9.5′	23°14.4	-6.5′	56.1′
2	210°13.8	08.8	244°35.6	9.5′	23°07.9	-6.7′	56.1′
3	225°14.0	·· 07.9	259°04.1	9.5′	23°01.2	-6.8′	56.1′
4	240°14.2	07.0	273°32.6	9.5′	22°54.4	-6.9′	56.2′
5	255°14.4	06.1	288°01.1	9.5′	22°47.5	-7.1′	56.2′
6	270°14.6	N07°05.2	302°29.7	9.6′	N22°40.5	-7.2′	56.2′
7	285°14.8	04.2	316°58.2	9.6′	22°33.3	-7.3′	56.3′
8	300°15.0	03.3	331°26.8	9.6′	22°26.0	-7.4′	56.3′
9	315°15.2	·· 02.4	345°55.4	9.6′	22°18.5	-7.6′	56.3′
10	330°15.4	01.5	0°24.1	9.7′	22°11.0	-7.7′	56.3′
11	345°15.6	07°00.5	14°52.7	9.7′	22°03.3	-7.8′	56.4′
12	0°15.8	N06°59.6	29°21.4	9.7′	N21°55.5	-7.9′	56.4′
13	15°16.0	58.7	43°50.1	9.7′	21°47.6	-8.1′	56.4′
14	30°16.2	57.8	58°18.9	9.8′	21°39.5	-8.2′	56.5′
15	45°16.5	·· 56.8	72°47.6	9.8′	21°31.3	-8.3′	56.5′
16	60°16.7	55.9	87°16.4	9.8′	21°23.0	-8.4′	56.5′
17	75°16.9	55.0	101°45.2	9.8′	21°14.6	-8.5′	56.5′
18	90°17.1	N06°54.1	116°14.1	9.9′	N21°06.1	-8.7′	56.6′
19	105°17.3	53.1	130°43.0	9.9′	20°57.4	-8.8′	56.6′
20	120°17.5	52.2	145°11.9	9.9′	20°48.6	-8.9′	56.6′
21	135°17.7	·· 51.3	159°40.8	10.0′	20°39.7	-9.0′	56.7′
22	150°17.9	50.4	174°09.8	10.0′	20°30.7	-9.1′	56.7′
23	165°18.1	49.4	188°38.8	10.0′	20°21.6	-9.3′	56.7′
	SD = 15.9′	d = -0.9′	SD = 15.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.3	N06°48.5	203°07.8	10.1′	N20°12.3	-9.4′	56.7′
1	195°18.5	47.6	217°36.8	10.1′	20°03.0	-9.5′	56.8′
2	210°18.7	46.6	232°05.9	10.1′	19°53.5	-9.6′	56.8′
3	225°18.9	·· 45.7	246°35.0	10.1′	19°43.9	-9.7′	56.8′
4	240°19.2	44.8	261°04.2	10.2′	19°34.2	-9.8′	56.9′
5	255°19.4	43.9	275°33.4	10.2′	19°24.3	-9.9′	56.9′
6	270°19.6	N06°42.9	290°02.6	10.2′	N19°14.4	-10.0′	56.9′
7	285°19.8	42.0	304°31.8	10.3′	19°04.4	-10.2′	56.9′
8	300°20.0	41.1	319°01.1	10.3′	18°54.2	-10.3′	57.0′
9	315°20.2	·· 40.2	333°30.4	10.3′	18°43.9	-10.4′	57.0′
10	330°20.4	39.2	347°59.8	10.4′	18°33.6	-10.5′	57.0′
11	345°20.6	38.3	2°29.1	10.4′	18°23.1	-10.6′	57.1′
12	0°20.8	N06°37.4	16°58.5	10.4′	N18°12.5	-10.7′	57.1′
13	15°21.0	36.4	31°28.0	10.5′	18°01.8	-10.8′	57.1′
14	30°21.2	35.5	45°57.4	10.5′	17°51.0	-10.9′	57.1′
15	45°21.5	·· 34.6	60°26.9	10.5′	17°40.1	-11.0′	57.2′
16	60°21.7	33.6	74°56.5	10.6′	17°29.1	-11.1′	57.2′
17	75°21.9	32.7	89°26.1	10.6′	17°18.0	-11.2′	57.2′
18	90°22.1	N06°31.8	103°55.7	10.6′	N17°06.8	-11.3′	57.3′
19	105°22.3	30.9	118°25.3	10.7′	16°55.5	-11.4′	57.3′
20	120°22.5	29.9	132°55.0	10.7′	16°44.1	-11.5′	57.3′
21	135°22.7	·· 29.0	147°24.6	10.7′	16°32.6	-11.6′	57.3′
22	150°22.9	28.1	161°54.4	10.8′	16°21.0	-11.7′	57.4′
23	165°23.1	27.1	176°24.1	10.8′	16°09.3	-11.8′	57.4′
	SD = 15.9′	d = -0.9′	SD = 15.5′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.3	N06°26.2	190°53.9	10.8′	N15°57.5	-11.9′	57.4′
1	195°23.6	25.3	205°23.8	10.9′	15°45.6	-12.0′	57.5′
2	210°23.8	24.3	219°53.6	10.9′	15°33.6	-12.1′	57.5′
3	225°24.0	·· 23.4	234°23.5	10.9′	15°21.5	-12.2′	57.5′
4	240°24.2	22.5	248°53.4	10.9′	15°09.3	-12.3′	57.5′
5	255°24.4	21.5	263°23.4	11.0′	14°57.1	-12.3′	57.6′
6	270°24.6	N06°20.6	277°53.4	11.0′	N14°44.7	-12.4′	57.6′
7	285°24.8	19.7	292°23.4	11.0′	14°32.3	-12.5′	57.6′
8	300°25.0	18.7	306°53.4	11.1′	14°19.8	-12.6′	57.6′
9	315°25.2	·· 17.8	321°23.5	11.1′	14°07.2	-12.7′	57.7′
10	330°25.5	16.9	335°53.6	11.1′	13°54.5	-12.8′	57.7′
11	345°25.7	15.9	350°23.7	11.2′	13°41.7	-12.9′	57.7′
12	0°25.9	N06°15.0	4°53.8	11.2′	N13°28.8	-12.9′	57.8′
13	15°26.1	14.1	19°24.0	11.2′	13°15.9	-13.0′	57.8′
14	30°26.3	13.1	33°54.2	11.2′	13°02.9	-13.1′	57.8′
15	45°26.5	·· 12.2	48°24.5	11.3′	12°49.8	-13.2′	57.8′
16	60°26.7	11.3	62°54.7	11.3′	12°36.6	-13.3′	57.9′
17	75°26.9	10.3	77°25.0	11.3′	12°23.4	-13.3′	57.9′
18	90°27.1	N06°09.4	91°55.3	11.3′	N12°10.0	-13.4′	57.9′
19	105°27.4	08.5	106°25.7	11.4′	11°56.6	-13.5′	57.9′
20	120°27.6	07.5	120°56.0	11.4′	11°43.1	-13.5′	58.0′
21	135°27.8	·· 06.6	135°26.4	11.4′	11°29.6	-13.6′	58.0′
22	150°28.0	05.7	149°56.8	11.4′	11°16.0	-13.7′	58.0′
23	165°28.2	04.7	164°27.3	11.5′	11°02.3	-13.8′	58.0′
	SD = 15.9′	d = -0.9′	SD = 15.7′				

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

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

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 27-29 10-1%
04	00:53	01:03	11:59	09:58	22:24	
05	01:13	01:23	11:59	10:50	23:15	
06	01:33	01:44	11:58	11:40	–:–	

DUT1 = UT1-UTC = -0.1146 sec ΔT = TT-UT1 = +69.2986 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	346°17.5	142°49.5	S10°23.7	170°41.0	N02°51.0	18°38.0	S14°19.9	35°51.2	S19°06.1
1	1°19.9	157°49.3	24.9	185°42.0	50.3	33°40.8	20.0	50°53.8	06.2
2	16°22.4	172°49.1	26.1	200°43.0	49.7	48°43.5	20.1	65°56.4	06.2
3	31°24.9	187°48.9	·· 27.3	215°44.0	·· 49.0	63°46.3	·· 20.2	80°59.0	·· 06.2
4	46°27.3	202°48.7	28.6	230°45.0	48.4	78°49.0	20.3	96°01.6	06.3
5	61°29.8	217°48.5	29.8	245°46.0	47.7	93°51.7	20.4	111°04.2	06.3
6	76°32.3	232°48.2	S10°31.0	260°46.9	N02°47.1	108°54.5	S14°20.5	126°06.8	S19°06.3
7	91°34.7	247°48.0	32.2	275°47.9	46.4	123°57.2	20.6	141°09.4	06.4
8	106°37.2	262°47.8	33.4	290°48.9	45.8	139°00.0	20.7	156°12.0	06.4
9	121°39.6	277°47.6	·· 34.6	305°49.9	·· 45.1	154°02.7	·· 20.8	171°14.6	·· 06.4
10	136°42.1	292°47.4	35.8	320°50.9	44.5	169°05.5	20.9	186°17.2	06.5
11	151°44.6	307°47.2	37.0	335°51.9	43.8	184°08.2	21.0	201°19.8	06.5
12	166°47.0	322°46.9	S10°38.2	350°52.9	N02°43.2	199°11.0	S14°21.0	216°22.4	S19°06.5
13	181°49.5	337°46.7	39.4	5°53.9	42.5	214°13.7	21.1	231°25.0	06.6
14	196°52.0	352°46.5	40.6	20°54.9	41.9	229°16.4	21.2	246°27.6	06.6
15	211°54.4	7°46.3	·· 41.8	35°55.9	·· 41.2	244°19.2	·· 21.3	261°30.2	·· 06.6
16	226°56.9	22°46.1	43.0	50°56.9	40.5	259°21.9	21.4	276°32.7	06.7
17	241°59.4	37°45.8	44.2	65°57.9	39.9	274°24.7	21.5	291°35.3	06.7
18	257°01.8	52°45.6	S10°45.4	80°58.9	N02°39.2	289°27.4	S14°21.6	306°37.9	S19°06.7
19	272°04.3	67°45.4	46.6	95°59.9	38.6	304°30.2	21.7	321°40.5	06.8
20	287°06.7	82°45.2	47.8	111°00.9	37.9	319°32.9	21.8	336°43.1	06.8
21	302°09.2	97°45.0	·· 49.1	126°01.9	·· 37.3	334°35.7	·· 21.9	351°45.7	·· 06.8
22	317°11.7	112°44.8	50.3	141°02.8	36.6	349°38.4	22.0	6°48.3	06.9
23	332°14.1	127°44.5	51.5	156°03.8	36.0	4°41.1	22.1	21°50.9	06.9
Mer.pass.	00:55	ν -0.2′	d 1.2′	m -4.08	ν 1.0′	d -0.7′	m 1.73	ν 2.7′	d 0.1′ m -2.85	ν 2.6′	d 0.0′ m 0.39
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	347°16.6	142°44.3	S10°52.7	171°04.8	N02°35.3	19°43.9	S14°22.2	36°53.5	S19°06.9
1	2°19.1	157°44.1	53.9	186°05.8	34.7	34°46.6	22.3	51°56.1	07.0
2	17°21.5	172°43.9	55.1	201°06.8	34.0	49°49.4	22.4	66°58.7	07.0
3	32°24.0	187°43.7	·· 56.3	216°07.8	·· 33.4	64°52.1	·· 22.5	82°01.3	·· 07.0
4	47°26.5	202°43.4	57.5	231°08.8	32.7	79°54.8	22.6	97°03.9	07.1
5	62°28.9	217°43.2	58.7	246°09.8	32.1	94°57.6	22.7	112°06.5	07.1
6	77°31.4	232°43.0	S10°59.9	261°10.8	N02°31.4	110°00.3	S14°22.8	127°09.0	S19°07.1
7	92°33.9	247°42.8	11°01.1	276°11.8	30.8	125°03.1	22.9	142°11.6	07.2
8	107°36.3	262°42.6	02.3	291°12.8	30.1	140°05.8	23.0	157°14.2	07.2
9	122°38.8	277°42.3	·· 03.5	306°13.8	·· 29.4	155°08.5	·· 23.1	172°16.8	·· 07.2
10	137°41.2	292°42.1	04.7	321°14.8	28.8	170°11.3	23.2	187°19.4	07.3
11	152°43.7	307°41.9	05.8	336°15.8	28.1	185°14.0	23.3	202°22.0	07.3
12	167°46.2	322°41.7	S11°07.0	351°16.8	N02°27.5	200°16.8	S14°23.4	217°24.6	S19°07.3
13	182°48.6	337°41.4	08.2	6°17.8	26.8	215°19.5	23.4	232°27.2	07.4
14	197°51.1	352°41.2	09.4	21°18.7	26.2	230°22.2	23.5	247°29.8	07.4
15	212°53.6	7°41.0	·· 10.6	36°19.7	·· 25.5	245°25.0	·· 23.6	262°32.4	·· 07.4
16	227°56.0	22°40.8	11.8	51°20.7	24.9	260°27.7	23.7	277°35.0	07.5
17	242°58.5	37°40.6	13.0	66°21.7	24.2	275°30.5	23.8	292°37.5	07.5
18	258°01.0	52°40.3	S11°14.2	81°22.7	N02°23.6	290°33.2	S14°23.9	307°40.1	S19°07.5
19	273°03.4	67°40.1	15.4	96°23.7	22.9	305°35.9	24.0	322°42.7	07.6
20	288°05.9	82°39.9	16.6	111°24.7	22.3	320°38.7	24.1	337°45.3	07.6
21	303°08.3	97°39.7	·· 17.8	126°25.7	·· 21.6	335°41.4	·· 24.2	352°47.9	·· 07.6
22	318°10.8	112°39.4	19.0	141°26.7	20.9	350°44.2	24.3	7°50.5	07.7
23	333°13.3	127°39.2	20.2	156°27.7	20.3	5°46.9	24.4	22°53.1	07.7
Mer.pass.	00:51	ν -0.2′	d 1.2′	m -4.09	ν 1.0′	d -0.7′	m 1.73	ν 2.7′	d 0.1′ m -2.84	ν 2.6′	d 0.0′ m 0.39
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	348°15.7	142°39.0	S11°21.4	171°28.7	N02°19.6	20°49.6	S14°24.5	37°55.7	S19°07.7
1	3°18.2	157°38.8	22.6	186°29.7	19.0	35°52.4	24.6	52°58.3	07.8
2	18°20.7	172°38.5	23.8	201°30.7	18.3	50°55.1	24.7	68°00.9	07.8
3	33°23.1	187°38.3	·· 25.0	216°31.7	·· 17.7	65°57.8	·· 24.8	83°03.4	·· 07.8
4	48°25.6	202°38.1	26.1	231°32.7	17.0	81°00.6	24.9	98°06.0	07.9
5	63°28.1	217°37.9	27.3	246°33.6	16.4	96°03.3	25.0	113°08.6	07.9
6	78°30.5	232°37.6	S11°28.5	261°34.6	N02°15.7	111°06.1	S14°25.1	128°11.2	S19°07.9
7	93°33.0	247°37.4	29.7	276°35.6	15.1	126°08.8	25.1	143°13.8	08.0
8	108°35.5	262°37.2	30.9	291°36.6	14.4	141°11.5	25.2	158°16.4	08.0
9	123°37.9	277°37.0	·· 32.1	306°37.6	·· 13.8	156°14.3	·· 25.3	173°19.0	·· 08.0
10	138°40.4	292°36.7	33.3	321°38.6	13.1	171°17.0	25.4	188°21.6	08.1
11	153°42.8	307°36.5	34.5	336°39.6	12.4	186°19.7	25.5	203°24.1	08.1
12	168°45.3	322°36.3	S11°35.7	351°40.6	N02°11.8	201°22.5	S14°25.6	218°26.7	S19°08.1
13	183°47.8	337°36.1	36.8	6°41.6	11.1	216°25.2	25.7	233°29.3	08.2
14	198°50.2	352°35.8	38.0	21°42.6	10.5	231°27.9	25.8	248°31.9	08.2
15	213°52.7	7°35.6	·· 39.2	36°43.6	·· 09.8	246°30.7	·· 25.9	263°34.5	·· 08.2
16	228°55.2	22°35.4	40.4	51°44.6	09.2	261°33.4	26.0	278°37.1	08.3
17	243°57.6	37°35.1	41.6	66°45.6	08.5	276°36.2	26.1	293°39.7	08.3
18	259°00.1	52°34.9	S11°42.8	81°46.6	N02°07.9	291°38.9	S14°26.2	308°42.3	S19°08.3
19	274°02.6	67°34.7	44.0	96°47.5	07.2	306°41.6	26.3	323°44.8	08.4
20	289°05.0	82°34.5	45.1	111°48.5	06.6	321°44.4	26.4	338°47.4	08.4
21	304°07.5	97°34.2	·· 46.3	126°49.5	·· 05.9	336°47.1	·· 26.4	353°50.0	·· 08.4
22	319°10.0	112°34.0	47.5	141°50.5	05.2	351°49.8	26.5	8°52.6	08.5
23	334°12.4	127°33.8	48.7	156°51.5	04.6	6°52.6	26.6	23°55.2	08.5
Mer.pass.	00:47	ν -0.2′	d 1.2′	m -4.09	ν 1.0′	d -0.7′	m 1.72	ν 2.7′	d 0.1′ m -2.84	ν 2.6′	d 0.0′ m 0.39

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.5	-42°11.2
Schedar	349°33.6	56°39.2
Diphda	348°49.8	-17°52.0
Achernar	335°21.8	-57°07.5
Hamal	327°54.0	23°33.8
Polaris	315°04.1	89°21.0
Acamar	315°13.7	-40°12.9
Menkar	314°08.9	4°10.5
Mirfak	308°31.9	49°56.1
Aldebaran	290°42.7	16°33.1
Rigel	281°06.5	-8°10.5
Capella	280°26.0	46°01.0
Bellatrix	278°25.8	6°22.2
Elnath	278°05.4	28°37.4
Alnilam	275°40.6	-1°11.2
Betelgeuse	270°55.1	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°28.8	-16°44.5
Adhara	255°08.2	-28°59.8
Procyon	244°53.9	5°10.3
Pollux	243°20.9	27°58.4
Avior	234°16.3	-59°34.4
Suhail	222°48.7	-43°30.9
Miaplacidus	221°39.6	-69°48.1
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.2
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.1
Gacrux	171°55.2	-57°14.0
Alioth	166°15.9	55°50.8
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.3	-60°28.7
Menkent	148°01.1	-36°28.5
Arcturus	145°50.6	19°04.5
Rigil Kent.	139°44.4	-60°55.5
Kochab	137°20.5	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.2	-26°28.7
Atria	107°15.9	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.0	12°32.9
Eltanin	90°43.3	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.9	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.3	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.0
Markab	13°32.3	15°19.3

Sep 07 Tue	SHA	Mer.pass
Venus	156°32.1	14:29
Mars	184°23.5	12:36
Jupiter	32°20.6	22:41
Saturn	49°33.8	21:33

Sep 08 Wed	SHA	Mer.pass
Venus	155°27.7	14:29
Mars	183°48.2	12:35
Jupiter	32°27.3	22:37
Saturn	49°36.9	21:29

Sep 09 Thu	SHA	Mer.pass
Venus	154°23.2	14:30
Mars	183°12.9	12:33
Jupiter	32°33.9	22:33
Saturn	49°39.9	21:25

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.4	N06°03.8	178°57.7	11.5′	N10°48.5	-13.8′	58.1′
1	195°28.6	02.9	193°28.2	11.5′	10°34.7	-13.9′	58.1′
2	210°28.8	01.9	207°58.7	11.5′	10°20.8	-14.0′	58.1′
3	225°29.1	·· 01.0	222°29.2	11.5′	10°06.9	-14.0′	58.1′
4	240°29.3	06°00.0	236°59.8	11.6′	09°52.8	-14.1′	58.2′
5	255°29.5	05°59.1	251°30.3	11.6′	09°38.8	-14.1′	58.2′
6	270°29.7	N05°58.2	266°00.9	11.6′	N09°24.6	-14.2′	58.2′
7	285°29.9	57.2	280°31.5	11.6′	09°10.4	-14.3′	58.2′
8	300°30.1	56.3	295°02.1	11.6′	08°56.1	-14.3′	58.3′
9	315°30.3	·· 55.4	309°32.7	11.6′	08°41.8	-14.4′	58.3′
10	330°30.5	54.4	324°03.4	11.7′	08°27.5	-14.4′	58.3′
11	345°30.8	53.5	338°34.0	11.7′	08°13.0	-14.5′	58.3′
12	0°31.0	N05°52.6	353°04.7	11.7′	N07°58.5	-14.5′	58.4′
13	15°31.2	51.6	7°35.4	11.7′	07°44.0	-14.6′	58.4′
14	30°31.4	50.7	22°06.1	11.7′	07°29.4	-14.6′	58.4′
15	45°31.6	·· 49.7	36°36.8	11.7′	07°14.8	-14.7′	58.4′
16	60°31.8	48.8	51°07.5	11.7′	07°00.1	-14.7′	58.4′
17	75°32.0	47.9	65°38.2	11.7′	06°45.4	-14.8′	58.5′
18	90°32.3	N05°46.9	80°09.0	11.7′	N06°30.6	-14.8′	58.5′
19	105°32.5	46.0	94°39.7	11.8′	06°15.8	-14.9′	58.5′
20	120°32.7	45.0	109°10.5	11.8′	06°00.9	-14.9′	58.5′
21	135°32.9	·· 44.1	123°41.2	11.8′	05°46.0	-14.9′	58.5′
22	150°33.1	43.2	138°12.0	11.8′	05°31.1	-15.0′	58.6′
23	165°33.3	42.2	152°42.8	11.8′	05°16.1	-15.0′	58.6′
	SD = 15.9′	d = -0.9′	SD = 15.8′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°33.5	N05°41.3	167°13.6	11.8′	N05°01.1	-15.1′	58.6′
1	195°33.8	40.3	181°44.3	11.8′	04°46.1	-15.1′	58.6′
2	210°34.0	39.4	196°15.1	11.8′	04°31.0	-15.1′	58.7′
3	225°34.2	·· 38.5	210°45.9	11.8′	04°15.8	-15.2′	58.7′
4	240°34.4	37.5	225°16.7	11.8′	04°00.7	-15.2′	58.7′
5	255°34.6	36.6	239°47.5	11.8′	03°45.5	-15.2′	58.7′
6	270°34.8	N05°35.6	254°18.3	11.8′	N03°30.3	-15.2′	58.7′
7	285°35.0	34.7	268°49.1	11.8′	03°15.1	-15.3′	58.7′
8	300°35.3	33.8	283°19.8	11.8′	02°59.8	-15.3′	58.8′
9	315°35.5	·· 32.8	297°50.6	11.8′	02°44.5	-15.3′	58.8′
10	330°35.7	31.9	312°21.4	11.8′	02°29.2	-15.3′	58.8′
11	345°35.9	30.9	326°52.2	11.8′	02°13.9	-15.4′	58.8′
12	0°36.1	N05°30.0	341°22.9	11.8′	N01°58.5	-15.4′	58.8′
13	15°36.3	29.1	355°53.7	11.7′	01°43.1	-15.4′	58.9′
14	30°36.6	28.1	10°24.4	11.7′	01°27.8	-15.4′	58.9′
15	45°36.8	·· 27.2	24°55.2	11.7′	01°12.3	-15.4′	58.9′
16	60°37.0	26.2	39°25.9	11.7′	00°56.9	-15.4′	58.9′
17	75°37.2	25.3	53°56.6	11.7′	00°41.5	-15.4′	58.9′
18	90°37.4	N05°24.3	68°27.3	11.7′	N00°26.0	-15.5′	58.9′
19	105°37.6	23.4	82°58.0	11.7′	N00°10.6	-15.5′	59.0′
20	120°37.8	22.5	97°28.7	11.7′	S00°04.9	15.5′	59.0′
21	135°38.1	·· 21.5	111°59.3	11.6′	00°20.3	15.5′	59.0′
22	150°38.3	20.6	126°30.0	11.6′	00°35.8	15.5′	59.0′
23	165°38.5	19.6	141°00.6	11.6′	00°51.3	15.5′	59.0′
	SD = 15.9′	d = -0.9′	SD = 16.0′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.7	N05°18.7	155°31.2	11.6′	S01°06.8	15.5′	59.0′
1	195°38.9	17.7	170°01.8	11.6′	01°22.3	15.5′	59.0′
2	210°39.1	16.8	184°32.4	11.5′	01°37.8	15.5′	59.1′
3	225°39.4	·· 15.8	199°02.9	11.5′	01°53.2	15.5′	59.1′
4	240°39.6	14.9	213°33.5	11.5′	02°08.7	15.5′	59.1′
5	255°39.8	14.0	228°04.0	11.5′	02°24.2	15.5′	59.1′
6	270°40.0	N05°13.0	242°34.4	11.5′	S02°39.7	15.5′	59.1′
7	285°40.2	12.1	257°04.9	11.4′	02°55.1	15.5′	59.1′
8	300°40.4	11.1	271°35.3	11.4′	03°10.6	15.4′	59.1′
9	315°40.7	·· 10.2	286°05.7	11.4′	03°26.0	15.4′	59.1′
10	330°40.9	09.2	300°36.1	11.3′	03°41.4	15.4′	59.2′
11	345°41.1	08.3	315°06.4	11.3′	03°56.9	15.4′	59.2′
12	0°41.3	N05°07.3	329°36.8	11.3′	S04°12.3	15.4′	59.2′
13	15°41.5	06.4	344°07.0	11.3′	04°27.6	15.4′	59.2′
14	30°41.7	05.5	358°37.3	11.2′	04°43.0	15.3′	59.2′
15	45°42.0	·· 04.5	13°07.5	11.2′	04°58.4	15.3′	59.2′
16	60°42.2	03.6	27°37.7	11.1′	05°13.7	15.3′	59.2′
17	75°42.4	02.6	42°07.8	11.1′	05°29.0	15.3′	59.2′
18	90°42.6	N05°01.7	56°37.9	11.1′	S05°44.3	15.3′	59.2′
19	105°42.8	05°00.7	71°08.0	11.0′	05°59.5	15.2′	59.3′
20	120°43.0	04°59.8	85°38.1	11.0′	06°14.7	15.2′	59.3′
21	135°43.3	·· 58.8	100°08.1	11.0′	06°29.9	15.2′	59.3′
22	150°43.5	57.9	114°38.0	10.9′	06°45.1	15.1′	59.3′
23	165°43.7	56.9	129°07.9	10.9′	07°00.2	15.1′	59.3′
	SD = 15.9′	d = -0.9′	SD = 16.1′				

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

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

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 0-2 0-5%
07	01:54	02:04	11:58	12:29	00:04	
08	02:14	02:24	11:58	13:17	00:53	
09	02:35	02:45	11:57	14:06	01:41	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°14.9	142°33.5	S11°49.9	171°52.5	N02°03.9	21°55.3	S14°26.7	38°57.8	S19°08.5
1	4°17.3	157°33.3	51.1	186°53.5	03.3	36°58.0	26.8	54°00.4	08.5
2	19°19.8	172°33.1	52.2	201°54.5	02.6	52°00.8	26.9	69°02.9	08.6
3	34°22.3	187°32.9	·· 53.4	216°55.5	·· 02.0	67°03.5	·· 27.0	84°05.5	·· 08.6
4	49°24.7	202°32.6	54.6	231°56.5	01.3	82°06.2	27.1	99°08.1	08.6
5	64°27.2	217°32.4	55.8	246°57.5	00.7	97°09.0	27.2	114°10.7	08.7
6	79°29.7	232°32.2	S11°57.0	261°58.5	N02°00.0	112°11.7	S14°27.3	129°13.3	S19°08.7
7	94°32.1	247°31.9	58.1	276°59.5	01°59.4	127°14.4	27.4	144°15.9	08.7
8	109°34.6	262°31.7	11°59.3	292°00.4	58.7	142°17.1	27.5	159°18.5	08.8
9	124°37.1	277°31.5	12°00.5	307°01.4	·· 58.0	157°19.9	·· 27.5	174°21.0	·· 08.8
10	139°39.5	292°31.2	01.7	322°02.4	57.4	172°22.6	27.6	189°23.6	08.8
11	154°42.0	307°31.0	02.9	337°03.4	56.7	187°25.3	27.7	204°26.2	08.9
12	169°44.4	322°30.8	S12°04.0	352°04.4	N01°56.1	202°28.1	S14°27.8	219°28.8	S19°08.9
13	184°46.9	337°30.5	05.2	7°05.4	55.4	217°30.8	27.9	234°31.4	08.9
14	199°49.4	352°30.3	06.4	22°06.4	54.8	232°33.5	28.0	249°34.0	09.0
15	214°51.8	7°30.1	·· 07.6	37°07.4	·· 54.1	247°36.3	·· 28.1	264°36.6	·· 09.0
16	229°54.3	22°29.8	08.7	52°08.4	53.5	262°39.0	28.2	279°39.1	09.0
17	244°56.8	37°29.6	09.9	67°09.4	52.8	277°41.7	28.3	294°41.7	09.0
18	259°59.2	52°29.4	S12°11.1	82°10.4	N01°52.1	292°44.5	S14°28.4	309°44.3	S19°09.1
19	275°01.7	67°29.1	12.3	97°11.4	51.5	307°47.2	28.5	324°46.9	09.1
20	290°04.2	82°28.9	13.4	112°12.4	50.8	322°49.9	28.6	339°49.5	09.1
21	305°06.6	97°28.7	·· 14.6	127°13.3	·· 50.2	337°52.6	·· 28.6	354°52.1	·· 09.2
22	320°09.1	112°28.4	15.8	142°14.3	49.5	352°55.4	28.7	9°54.6	09.2
23	335°11.6	127°28.2	17.0	157°15.3	48.9	7°58.1	28.8	24°57.2	09.2
Mer.pass.	00:43	ν -0.2′	d 1.2′	m -4.10	ν 1.0′	d -0.7′	m 1.72	ν 2.7′	d 0.1′ m -2.83	ν 2.6′	d 0.0′ m 0.40

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°14.0	142°28.0	S12°18.1	172°16.3	N01°48.2	23°00.8	S14°28.9	39°59.8	S19°09.3
1	5°16.5	157°27.7	19.3	187°17.3	47.6	38°03.6	29.0	55°02.4	09.3
2	20°18.9	172°27.5	20.5	202°18.3	46.9	53°06.3	29.1	70°05.0	09.3
3	35°21.4	187°27.3	·· 21.7	217°19.3	·· 46.2	68°09.0	·· 29.2	85°07.5	·· 09.4
4	50°23.9	202°27.0	22.8	232°20.3	45.6	83°11.7	29.3	100°10.1	09.4
5	65°26.3	217°26.8	24.0	247°21.3	44.9	98°14.5	29.4	115°12.7	09.4
6	80°28.8	232°26.6	S12°25.2	262°22.3	N01°44.3	113°17.2	S14°29.5	130°15.3	S19°09.4
7	95°31.3	247°26.3	26.3	277°23.3	43.6	128°19.9	29.5	145°17.9	09.5
8	110°33.7	262°26.1	27.5	292°24.3	43.0	143°22.7	29.6	160°20.5	09.5
9	125°36.2	277°25.9	·· 28.7	307°25.2	·· 42.3	158°25.4	·· 29.7	175°23.0	·· 09.5
10	140°38.7	292°25.6	29.8	322°26.2	41.7	173°28.1	29.8	190°25.6	09.6
11	155°41.1	307°25.4	31.0	337°27.2	41.0	188°30.8	29.9	205°28.2	09.6
12	170°43.6	322°25.1	S12°32.2	352°28.2	N01°40.3	203°33.6	S14°30.0	220°30.8	S19°09.6
13	185°46.0	337°24.9	33.3	7°29.2	39.7	218°36.3	30.1	235°33.4	09.7
14	200°48.5	352°24.7	34.5	22°30.2	39.0	233°39.0	30.2	250°35.9	09.7
15	215°51.0	7°24.4	·· 35.7	37°31.2	·· 38.4	248°41.7	·· 30.3	265°38.5	·· 09.7
16	230°53.4	22°24.2	36.8	52°32.2	37.7	263°44.5	30.3	280°41.1	09.8
17	245°55.9	37°24.0	38.0	67°33.2	37.1	278°47.2	30.4	295°43.7	09.8
18	260°58.4	52°23.7	S12°39.2	82°34.2	N01°36.4	293°49.9	S14°30.5	310°46.3	S19°09.8
19	276°00.8	67°23.5	40.3	97°35.2	35.7	308°52.6	30.6	325°48.8	09.8
20	291°03.3	82°23.2	41.5	112°36.2	35.1	323°55.4	30.7	340°51.4	09.9
21	306°05.8	97°23.0	·· 42.7	127°37.1	·· 34.4	338°58.1	·· 30.8	355°54.0	·· 09.9
22	321°08.2	112°22.8	43.8	142°38.1	33.8	354°00.8	30.9	10°56.6	09.9
23	336°10.7	127°22.5	45.0	157°39.1	33.1	9°03.5	31.0	25°59.2	10.0
Mer.pass.	00:39	ν -0.2′	d 1.2′	m -4.11	ν 1.0′	d -0.7′	m 1.72	ν 2.7′	d 0.1′ m -2.83	ν 2.6′	d 0.0′ m 0.40

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	351°13.2	142°22.3	S12°46.1	172°40.1	N01°32.5	24°06.3	S14°31.1	41°01.7	S19°10.0
1	6°15.6	157°22.0	47.3	187°41.1	31.8	39°09.0	31.1	56°04.3	10.0
2	21°18.1	172°21.8	48.5	202°42.1	31.2	54°11.7	31.2	71°06.9	10.1
3	36°20.5	187°21.6	·· 49.6	217°43.1	·· 30.5	69°14.4	·· 31.3	86°09.5	·· 10.1
4	51°23.0	202°21.3	50.8	232°44.1	29.8	84°17.2	31.4	101°12.1	10.1
5	66°25.5	217°21.1	51.9	247°45.1	29.2	99°19.9	31.5	116°14.6	10.1
6	81°27.9	232°20.8	S12°53.1	262°46.1	N01°28.5	114°22.6	S14°31.6	131°17.2	S19°10.2
7	96°30.4	247°20.6	54.3	277°47.1	27.9	129°25.3	31.7	146°19.8	10.2
8	111°32.9	262°20.4	55.4	292°48.1	27.2	144°28.0	31.8	161°22.4	10.2
9	126°35.3	277°20.1	·· 56.6	307°49.0	·· 26.6	159°30.8	·· 31.8	176°25.0	·· 10.3
10	141°37.8	292°19.9	57.7	322°50.0	25.9	174°33.5	31.9	191°27.5	10.3
11	156°40.3	307°19.6	12°58.9	337°51.0	25.2	189°36.2	32.0	206°30.1	10.3
12	171°42.7	322°19.4	S13°00.1	352°52.0	N01°24.6	204°38.9	S14°32.1	221°32.7	S19°10.3
13	186°45.2	337°19.1	01.2	7°53.0	23.9	219°41.7	32.2	236°35.3	10.4
14	201°47.7	352°18.9	02.4	22°54.0	23.3	234°44.4	32.3	251°37.8	10.4
15	216°50.1	7°18.7	·· 03.5	37°55.0	·· 22.6	249°47.1	·· 32.4	266°40.4	·· 10.4
16	231°52.6	22°18.4	04.7	52°56.0	22.0	264°49.8	32.5	281°43.0	10.5
17	246°55.0	37°18.2	05.8	67°57.0	21.3	279°52.5	32.5	296°45.6	10.5
18	261°57.5	52°17.9	S13°07.0	82°58.0	N01°20.6	294°55.3	S14°32.6	311°48.2	S19°10.5
19	277°00.0	67°17.7	08.1	97°59.0	20.0	309°58.0	32.7	326°50.7	10.6
20	292°02.4	82°17.4	09.3	112°59.9	19.3	325°00.7	32.8	341°53.3	10.6
21	307°04.9	97°17.2	·· 10.4	128°00.9	·· 18.7	340°03.4	·· 32.9	356°55.9	·· 10.6
22	322°07.4	112°16.9	11.6	143°01.9	18.0	355°06.1	33.0	11°58.5	10.6
23	337°09.8	127°16.7	12.7	158°02.9	17.4	10°08.9	33.1	27°01.0	10.7
Mer.pass.	00:35	ν -0.2′	d 1.2′	m -4.11	ν 1.0′	d -0.7′	m 1.71	ν 2.7′	d 0.1′ m -2.82	ν 2.6′	d 0.0′ m 0.41

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.5	-42°11.2
Schedar	349°33.6	56°39.2
Diphda	348°49.7	-17°52.0
Achernar	335°21.8	-57°07.5
Hamal	327°54.0	23°33.8
Polaris	315°02.8	89°21.0
Acamar	315°13.6	-40°12.9
Menkar	314°08.8	4°10.5
Mirfak	308°31.9	49°56.1
Aldebaran	290°42.7	16°33.1
Rigel	281°06.5	-8°10.5
Capella	280°25.9	46°01.0
Bellatrix	278°25.8	6°22.2
Elnath	278°05.3	28°37.5
Alnilam	275°40.5	-1°11.2
Betelgeuse	270°55.1	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°28.8	-16°44.5
Adhara	255°08.2	-28°59.8
Procyon	244°53.9	5°10.3
Pollux	243°20.9	27°58.4
Avior	234°16.3	-59°34.4
Suhail	222°48.7	-43°30.9
Miaplacidus	221°39.5	-69°48.1
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.2
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.1
Gacrux	171°55.2	-57°14.0
Alioth	166°15.9	55°50.8
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.3	-60°28.7
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.5
Rigil Kent.	139°44.4	-60°55.5
Kochab	137°20.5	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.2	-26°28.7
Atria	107°15.9	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.4	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.9	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.3	45°21.6
Enif	33°41.2	9°58.5
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 10 Fri	SHA	Mer.pass
Venus	153°18.7	14:30
Mars	182°37.6	12:32
Jupiter	32°40.4	22:28
Saturn	49°42.9	21:20

Sep 11 Sat	SHA	Mer.pass
Venus	152°14.0	14:30
Mars	182°02.3	12:30
Jupiter	32°46.8	22:24
Saturn	49°45.8	21:16

Sep 12 Sun	SHA	Mer.pass
Venus	151°09.1	14:31
Mars	181°27.0	12:29
Jupiter	32°53.1	22:20
Saturn	49°48.6	21:12

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.9	N04°56.0	143°37.8	10.8′	S07°15.3	15.1′	59.3′
1	195°44.1	55.0	158°07.6	10.8′	07°30.4	15.0′	59.3′
2	210°44.4	54.1	172°37.4	10.7′	07°45.4	15.0′	59.3′
3	225°44.6	·· 53.1	187°07.2	10.7′	08°00.4	14.9′	59.3′
4	240°44.8	52.2	201°36.9	10.6′	08°15.3	14.9′	59.3′
5	255°45.0	51.2	216°06.5	10.6′	08°30.2	14.9′	59.3′
6	270°45.2	N04°50.3	230°36.1	10.6′	S08°45.1	14.8′	59.3′
7	285°45.4	49.4	245°05.7	10.5′	08°59.9	14.8′	59.3′
8	300°45.7	48.4	259°35.2	10.5′	09°14.7	14.7′	59.4′
9	315°45.9	·· 47.5	274°04.6	10.4′	09°29.4	14.7′	59.4′
10	330°46.1	46.5	288°34.0	10.4′	09°44.1	14.6′	59.4′
11	345°46.3	45.6	303°03.4	10.3′	09°58.7	14.6′	59.4′
12	0°46.5	N04°44.6	317°32.7	10.2′	S10°13.3	14.5′	59.4′
13	15°46.8	43.7	332°01.9	10.2′	10°27.8	14.5′	59.4′
14	30°47.0	42.7	346°31.1	10.1′	10°42.3	14.4′	59.4′
15	45°47.2	·· 41.8	1°00.2	10.1′	10°56.7	14.3′	59.4′
16	60°47.4	40.8	15°29.3	10.0′	11°11.0	14.3′	59.4′
17	75°47.6	39.9	29°58.3	10.0′	11°25.3	14.2′	59.4′
18	90°47.8	N04°38.9	44°27.3	9.9′	S11°39.5	14.2′	59.4′
19	105°48.1	38.0	58°56.2	9.8′	11°53.7	14.1′	59.4′
20	120°48.3	37.0	73°25.0	9.8′	12°07.8	14.0′	59.4′
21	135°48.5	·· 36.1	87°53.8	9.7′	12°21.8	14.0′	59.4′
22	150°48.7	35.1	102°22.5	9.7′	12°35.7	13.9′	59.4′
23	165°48.9	34.2	116°51.2	9.6′	12°49.6	13.8′	59.4′
	SD = 15.9′	d = -0.9′	SD = 16.2′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.2	N04°33.2	131°19.8	9.5′	S13°03.4	13.7′	59.4′
1	195°49.4	32.3	145°48.3	9.5′	13°17.2	13.7′	59.4′
2	210°49.6	31.3	160°16.8	9.4′	13°30.8	13.6′	59.4′
3	225°49.8	·· 30.4	174°45.2	9.3′	13°44.4	13.5′	59.4′
4	240°50.0	29.4	189°13.6	9.3′	13°57.9	13.4′	59.4′
5	255°50.3	28.5	203°41.8	9.2′	14°11.4	13.4′	59.4′
6	270°50.5	N04°27.5	218°10.0	9.1′	S14°24.7	13.3′	59.4′
7	285°50.7	26.6	232°38.2	9.1′	14°38.0	13.2′	59.4′
8	300°50.9	25.6	247°06.3	9.0′	14°51.2	13.1′	59.4′
9	315°51.1	·· 24.6	261°34.3	8.9′	15°04.3	13.0′	59.4′
10	330°51.4	23.7	276°02.2	8.9′	15°17.3	12.9′	59.4′
11	345°51.6	22.7	290°30.1	8.8′	15°30.2	12.8′	59.4′
12	0°51.8	N04°21.8	304°57.9	8.7′	S15°43.0	12.7′	59.4′
13	15°52.0	20.8	319°25.6	8.7′	15°55.8	12.6′	59.4′
14	30°52.2	19.9	333°53.3	8.6′	16°08.4	12.6′	59.4′
15	45°52.5	·· 18.9	348°20.9	8.5′	16°21.0	12.5′	59.4′
16	60°52.7	18.0	2°48.4	8.4′	16°33.4	12.4′	59.4′
17	75°52.9	17.0	17°15.8	8.4′	16°45.8	12.3′	59.4′
18	90°53.1	N04°16.1	31°43.2	8.3′	S16°58.0	12.2′	59.4′
19	105°53.3	15.1	46°10.5	8.2′	17°10.2	12.1′	59.4′
20	120°53.6	14.2	60°37.7	8.2′	17°22.2	11.9′	59.4′
21	135°53.8	·· 13.2	75°04.9	8.1′	17°34.2	11.8′	59.4′
22	150°54.0	12.3	89°32.0	8.0′	17°46.0	11.7′	59.4′
23	165°54.2	11.3	103°59.0	7.9′	17°57.8	11.6′	59.4′
	SD = 15.9′	d = -1.0′	SD = 16.2′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N04°10.4	118°25.9	7.9′	S18°09.4	11.5′	59.4′
1	195°54.7	09.4	132°52.8	7.8′	18°20.9	11.4′	59.4′
2	210°54.9	08.4	147°19.6	7.7′	18°32.3	11.3′	59.4′
3	225°55.1	·· 07.5	161°46.3	7.6′	18°43.6	11.2′	59.4′
4	240°55.3	06.5	176°13.0	7.6′	18°54.8	11.1′	59.4′
5	255°55.5	05.6	190°39.5	7.5′	19°05.8	10.9′	59.4′
6	270°55.8	N04°04.6	205°06.0	7.4′	S19°16.8	10.8′	59.4′
7	285°56.0	03.7	219°32.5	7.4′	19°27.6	10.7′	59.4′
8	300°56.2	02.7	233°58.8	7.3′	19°38.3	10.6′	59.4′
9	315°56.4	·· 01.8	248°25.1	7.2′	19°48.9	10.5′	59.4′
10	330°56.6	04°00.8	262°51.3	7.1′	19°59.3	10.3′	59.4′
11	345°56.9	03°59.9	277°17.5	7.1′	20°09.6	10.2′	59.4′
12	0°57.1	N03°58.9	291°43.5	7.0′	S20°19.8	10.1′	59.4′
13	15°57.3	57.9	306°09.5	6.9′	20°29.9	9.9′	59.4′
14	30°57.5	57.0	320°35.4	6.9′	20°39.9	9.8′	59.4′
15	45°57.8	·· 56.0	335°01.3	6.8′	20°49.7	9.7′	59.3′
16	60°58.0	55.1	349°27.1	6.7′	20°59.4	9.5′	59.3′
17	75°58.2	54.1	3°52.8	6.6′	21°08.9	9.4′	59.3′
18	90°58.4	N03°53.2	18°18.4	6.6′	S21°18.3	9.3′	59.3′
19	105°58.6	52.2	32°44.0	6.5′	21°27.6	9.1′	59.3′
20	120°58.9	51.3	47°09.5	6.4′	21°36.7	9.0′	59.3′
21	135°59.1	·· 50.3	61°34.9	6.4′	21°45.7	8.9′	59.3′
22	150°59.3	49.3	76°00.3	6.3′	21°54.6	8.7′	59.3′
23	165°59.5	48.4	90°25.6	6.2′	22°03.3	8.6′	59.3′
	SD = 15.9′	d = -1.0′	SD = 16.2′				

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

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

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 11-29%
10	02:56	03:06	11:57	14:56	02:31	
11	03:17	03:27	11:57	15:48	03:22	
12	03:38	03:48	11:56	16:44	04:16	

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	352°12.3	142°16.5	S13°13.9	173°03.9	N01°16.7	25°11.6	S14°33.1	42°03.6	S19°10.7
1	7°14.8	157°16.2	15.0	188°04.9	16.1	40°14.3	33.2	57°06.2	10.7
2	22°17.2	172°16.0	16.2	203°05.9	15.4	55°17.0	33.3	72°08.8	10.8
3	37°19.7	187°15.7	·· 17.3	218°06.9	·· 14.7	70°19.7	·· 33.4	87°11.3	·· 10.8
4	52°22.2	202°15.5	18.5	233°07.9	14.1	85°22.4	33.5	102°13.9	10.8
5	67°24.6	217°15.2	19.6	248°08.9	13.4	100°25.2	33.6	117°16.5	10.8
6	82°27.1	232°15.0	S13°20.8	263°09.8	N01°12.8	115°27.9	S14°33.7	132°19.1	S19°10.9
7	97°29.5	247°14.7	21.9	278°10.8	12.1	130°30.6	33.7	147°21.6	10.9
8	112°32.0	262°14.5	23.1	293°11.8	11.5	145°33.3	33.8	162°24.2	10.9
9	127°34.5	277°14.2	·· 24.2	308°12.8	·· 10.8	160°36.0	·· 33.9	177°26.8	·· 11.0
10	142°36.9	292°14.0	25.4	323°13.8	10.1	175°38.8	34.0	192°29.4	11.0
11	157°39.4	307°13.7	26.5	338°14.8	09.5	190°41.5	34.1	207°31.9	11.0
12	172°41.9	322°13.5	S13°27.7	353°15.8	N01°08.8	205°44.2	S14°34.2	222°34.5	S19°11.0
13	187°44.3	337°13.2	28.8	8°16.8	08.2	220°46.9	34.3	237°37.1	11.1
14	202°46.8	352°13.0	30.0	23°17.8	07.5	235°49.6	34.3	252°39.7	11.1
15	217°49.3	7°12.7	·· 31.1	38°18.8	·· 06.8	250°52.3	·· 34.4	267°42.2	·· 11.1
16	232°51.7	22°12.5	32.2	53°19.7	06.2	265°55.0	34.5	282°44.8	11.2
17	247°54.2	37°12.2	33.4	68°20.7	05.5	280°57.8	34.6	297°47.4	11.2
18	262°56.6	52°12.0	S13°34.5	83°21.7	N01°04.9	296°00.5	S14°34.7	312°50.0	S19°11.2
19	277°59.1	67°11.7	35.7	98°22.7	04.2	311°03.2	34.8	327°52.5	11.2
20	293°01.6	82°11.5	36.8	113°23.7	03.6	326°05.9	34.9	342°55.1	11.3
21	308°04.0	97°11.2	·· 38.0	128°24.7	·· 02.9	341°08.6	·· 34.9	357°57.7	·· 11.3
22	323°06.5	112°11.0	39.1	143°25.7	02.2	356°11.3	35.0	13°00.2	11.3
23	338°09.0	127°10.7	40.2	158°26.7	01.6	11°14.1	35.1	28°02.8	11.4
Mer.pass.	00:31	ν -0.2′	d 1.2′	m -4.12	ν 1.0′	d -0.7′	m 1.71	ν 2.7′	d 0.1′ m -2.82	ν 2.6′	d 0.0′ m 0.41

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	353°11.4	142°10.5	S13°41.4	173°27.7	N01°00.9	26°16.8	S14°35.2	43°05.4	S19°11.4
1	8°13.9	157°10.2	42.5	188°28.7	01°00.3	41°19.5	35.3	58°08.0	11.4
2	23°16.4	172°10.0	43.7	203°29.6	00°59.6	56°22.2	35.4	73°10.5	11.4
3	38°18.8	187°09.7	·· 44.8	218°30.6	·· 59.0	71°24.9	·· 35.4	88°13.1	·· 11.5
4	53°21.3	202°09.5	45.9	233°31.6	58.3	86°27.6	35.5	103°15.7	11.5
5	68°23.8	217°09.2	47.1	248°32.6	57.6	101°30.3	35.6	118°18.3	11.5
6	83°26.2	232°09.0	S13°48.2	263°33.6	N00°57.0	116°33.0	S14°35.7	133°20.8	S19°11.6
7	98°28.7	247°08.7	49.3	278°34.6	56.3	131°35.8	35.8	148°23.4	11.6
8	113°31.1	262°08.5	50.5	293°35.6	55.7	146°38.5	35.9	163°26.0	11.6
9	128°33.6	277°08.2	·· 51.6	308°36.6	·· 55.0	161°41.2	·· 35.9	178°28.5	·· 11.6
10	143°36.1	292°08.0	52.7	323°37.6	54.4	176°43.9	36.0	193°31.1	11.7
11	158°38.5	307°07.7	53.9	338°38.6	53.7	191°46.6	36.1	208°33.7	11.7
12	173°41.0	322°07.5	S13°55.0	353°39.5	N00°53.0	206°49.3	S14°36.2	223°36.2	S19°11.7
13	188°43.5	337°07.2	56.1	8°40.5	52.4	221°52.0	36.3	238°38.8	11.7
14	203°45.9	352°07.0	57.3	23°41.5	51.7	236°54.7	36.4	253°41.4	11.8
15	218°48.4	7°06.7	·· 58.4	38°42.5	·· 51.1	251°57.4	·· 36.4	268°44.0	·· 11.8
16	233°50.9	22°06.4	13°59.5	53°43.5	50.4	267°00.2	36.5	283°46.5	11.8
17	248°53.3	37°06.2	14°00.7	68°44.5	49.8	282°02.9	36.6	298°49.1	11.9
18	263°55.8	52°05.9	S14°01.8	83°45.5	N00°49.1	297°05.6	S14°36.7	313°51.7	S19°11.9
19	278°58.3	67°05.7	02.9	98°46.5	48.4	312°08.3	36.8	328°54.2	11.9
20	294°00.7	82°05.4	04.1	113°47.5	47.8	327°11.0	36.9	343°56.8	11.9
21	309°03.2	97°05.2	·· 05.2	128°48.4	·· 47.1	342°13.7	·· 36.9	358°59.4	·· 12.0
22	324°05.6	112°04.9	06.3	143°49.4	46.5	357°16.4	37.0	14°01.9	12.0
23	339°08.1	127°04.6	07.4	158°50.4	45.8	12°19.1	37.1	29°04.5	12.0
Mer.pass.	00:27	ν -0.3′	d 1.1′	m -4.13	ν 1.0′	d -0.7′	m 1.70	ν 2.7′	d 0.1′ m -2.82	ν 2.6′	d 0.0′ m 0.42

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	354°10.6	142°04.4	S14°08.6	173°51.4	N00°45.1	27°21.8	S14°37.2	44°07.1	S19°12.0
1	9°13.0	157°04.1	09.7	188°52.4	44.5	42°24.5	37.3	59°09.7	12.1
2	24°15.5	172°03.9	10.8	203°53.4	43.8	57°27.2	37.3	74°12.2	12.1
3	39°18.0	187°03.6	·· 11.9	218°54.4	·· 43.2	72°30.0	·· 37.4	89°14.8	·· 12.1
4	54°20.4	202°03.4	13.1	233°55.4	42.5	87°32.7	37.5	104°17.4	12.2
5	69°22.9	217°03.1	14.2	248°56.4	41.9	102°35.4	37.6	119°19.9	12.2
6	84°25.4	232°02.8	S14°15.3	263°57.3	N00°41.2	117°38.1	S14°37.7	134°22.5	S19°12.2
7	99°27.8	247°02.6	16.4	278°58.3	40.5	132°40.8	37.8	149°25.1	12.2
8	114°30.3	262°02.3	17.6	293°59.3	39.9	147°43.5	37.8	164°27.6	12.3
9	129°32.8	277°02.1	·· 18.7	309°00.3	·· 39.2	162°46.2	·· 37.9	179°30.2	·· 12.3
10	144°35.2	292°01.8	19.8	324°01.3	38.6	177°48.9	38.0	194°32.8	12.3
11	159°37.7	307°01.5	20.9	339°02.3	37.9	192°51.6	38.1	209°35.3	12.3
12	174°40.1	322°01.3	S14°22.1	354°03.3	N00°37.2	207°54.3	S14°38.2	224°37.9	S19°12.4
13	189°42.6	337°01.0	23.2	9°04.3	36.6	222°57.0	38.2	239°40.5	12.4
14	204°45.1	352°00.8	24.3	24°05.3	35.9	237°59.7	38.3	254°43.0	12.4
15	219°47.5	7°00.5	·· 25.4	39°06.2	·· 35.3	253°02.4	·· 38.4	269°45.6	·· 12.4
16	234°50.0	22°00.2	26.5	54°07.2	34.6	268°05.1	38.5	284°48.2	12.5
17	249°52.5	37°00.0	27.7	69°08.2	34.0	283°07.8	38.6	299°50.7	12.5
18	264°54.9	51°59.7	S14°28.8	84°09.2	N00°33.3	298°10.5	S14°38.6	314°53.3	S19°12.5
19	279°57.4	66°59.5	29.9	99°10.2	32.6	313°13.2	38.7	329°55.9	12.6
20	294°59.9	81°59.2	31.0	114°11.2	32.0	328°15.9	38.8	344°58.4	12.6
21	310°02.3	96°58.9	·· 32.1	129°12.2	·· 31.3	343°18.7	·· 38.9	0°01.0	·· 12.6
22	325°04.8	111°58.7	33.2	144°13.2	30.7	358°21.4	39.0	15°03.6	12.6
23	340°07.3	126°58.4	34.4	159°14.1	30.0	13°24.1	39.0	30°06.1	12.7
Mer.pass.	00:23	ν -0.3′	d 1.1′	m -4.13	ν 1.0′	d -0.7′	m 1.70	ν 2.7′	d 0.1′ m -2.81	ν 2.6′	d 0.0′ m 0.42

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.5	-42°11.2
Schedar	349°33.5	56°39.3
Diphda	348°49.7	-17°52.0
Achernar	335°21.8	-57°07.5
Hamal	327°54.0	23°33.8
Polaris	315°01.3	89°21.0
Acamar	315°13.6	-40°12.9
Menkar	314°08.8	4°10.5
Mirfak	308°31.9	49°56.1
Aldebaran	290°42.7	16°33.1
Rigel	281°06.5	-8°10.5
Capella	280°25.9	46°01.0
Bellatrix	278°25.8	6°22.2
Elnath	278°05.3	28°37.4
Alnilam	275°40.5	-1°11.2
Betelgeuse	270°55.1	7°24.7
Canopus	263°53.7	-52°42.1
Sirius	258°28.7	-16°44.5
Adhara	255°08.1	-28°59.8
Procyon	244°53.9	5°10.3
Pollux	243°20.9	27°58.4
Avior	234°16.2	-59°34.4
Suhail	222°48.6	-43°30.9
Miaplacidus	221°39.5	-69°48.1
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°45.1	61°38.2
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.1
Gacrux	171°55.2	-57°14.0
Alioth	166°15.9	55°50.8
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.3	-60°28.7
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.5
Rigil Kent.	139°44.4	-60°55.5
Kochab	137°20.6	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.0	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.0	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.4	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.9	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.3	45°21.6
Enif	33°41.2	9°58.6
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 13 Mon	SHA	Mer.pass
Venus	150°04.2	14:31
Mars	180°51.6	12:27
Jupiter	32°59.3	22:15
Saturn	49°51.3	21:08

Sep 14 Tue	SHA	Mer.pass
Venus	148°59.1	14:32
Mars	180°16.2	12:25
Jupiter	33°05.3	22:11
Saturn	49°54.0	21:04

Sep 15 Wed	SHA	Mer.pass
Venus	147°53.8	14:32
Mars	179°40.8	12:24
Jupiter	33°11.3	22:07
Saturn	49°56.5	21:00

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°59.7	N03°47.4	104°50.8	6.2′	S22°11.9	8.4′	59.3′
1	196°00.0	46.5	119°16.0	6.1′	22°20.4	8.3′	59.3′
2	211°00.2	45.5	133°41.1	6.0′	22°28.6	8.1′	59.3′
3	226°00.4	·· 44.6	148°06.1	6.0′	22°36.8	8.0′	59.3′
4	241°00.6	43.6	162°31.1	5.9′	22°44.8	7.9′	59.3′
5	256°00.9	42.6	176°56.0	5.9′	22°52.6	7.7′	59.3′
6	271°01.1	N03°41.7	191°20.9	5.8′	S23°00.3	7.6′	59.2′
7	286°01.3	40.7	205°45.7	5.7′	23°07.9	7.4′	59.2′
8	301°01.5	39.8	220°10.4	5.7′	23°15.3	7.2′	59.2′
9	316°01.7	·· 38.8	234°35.1	5.6′	23°22.5	7.1′	59.2′
10	331°02.0	37.9	248°59.7	5.6′	23°29.6	6.9′	59.2′
11	346°02.2	36.9	263°24.3	5.5′	23°36.6	6.8′	59.2′
12	1°02.4	N03°35.9	277°48.8	5.5′	S23°43.4	6.6′	59.2′
13	16°02.6	35.0	292°13.2	5.4′	23°50.0	6.5′	59.2′
14	31°02.9	34.0	306°37.7	5.4′	23°56.5	6.3′	59.2′
15	46°03.1	·· 33.1	321°02.0	5.3′	24°02.8	6.2′	59.2′
16	61°03.3	32.1	335°26.3	5.3′	24°08.9	6.0′	59.2′
17	76°03.5	31.2	349°50.6	5.2′	24°14.9	5.8′	59.1′
18	91°03.7	N03°30.2	4°14.8	5.2′	S24°20.7	5.7′	59.1′
19	106°04.0	29.2	18°38.9	5.1′	24°26.4	5.5′	59.1′
20	121°04.2	28.3	33°03.1	5.1′	24°31.9	5.3′	59.1′
21	136°04.4	·· 27.3	47°27.1	5.0′	24°37.2	5.2′	59.1′
22	151°04.6	26.4	61°51.2	5.0′	24°42.4	5.0′	59.1′
23	166°04.9	25.4	76°15.2	5.0′	24°47.4	4.8′	59.1′
	SD = 15.9′	d = -1.0′	SD = 16.2′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°05.1	N03°24.4	90°39.1	4.9′	S24°52.3	4.7′	59.1′
1	196°05.3	23.5	105°03.0	4.9′	24°57.0	4.5′	59.1′
2	211°05.5	22.5	119°26.9	4.9′	25°01.5	4.3′	59.1′
3	226°05.7	·· 21.6	133°50.8	4.8′	25°05.8	4.2′	59.0′
4	241°06.0	20.6	148°14.6	4.8′	25°10.0	4.0′	59.0′
5	256°06.2	19.6	162°38.4	4.8′	25°14.0	3.8′	59.0′
6	271°06.4	N03°18.7	177°02.2	4.7′	S25°17.9	3.7′	59.0′
7	286°06.6	17.7	191°25.9	4.7′	25°21.5	3.5′	59.0′
8	301°06.9	16.8	205°49.6	4.7′	25°25.0	3.3′	59.0′
9	316°07.1	·· 15.8	220°13.3	4.7′	25°28.3	3.2′	59.0′
10	331°07.3	14.8	234°37.0	4.7′	25°31.5	3.0′	59.0′
11	346°07.5	13.9	249°00.6	4.6′	25°34.5	2.8′	59.0′
12	1°07.8	N03°12.9	263°24.3	4.6′	S25°37.3	2.6′	58.9′
13	16°08.0	12.0	277°47.9	4.6′	25°40.0	2.5′	58.9′
14	31°08.2	11.0	292°11.5	4.6′	25°42.4	2.3′	58.9′
15	46°08.4	·· 10.0	306°35.1	4.6′	25°44.7	2.1′	58.9′
16	61°08.6	09.1	320°58.7	4.6′	25°46.8	2.0′	58.9′
17	76°08.9	08.1	335°22.2	4.6′	25°48.8	1.8′	58.9′
18	91°09.1	N03°07.2	349°45.8	4.6′	S25°50.6	1.6′	58.9′
19	106°09.3	06.2	4°09.4	4.6′	25°52.2	1.4′	58.9′
20	121°09.5	05.2	18°33.0	4.6′	25°53.6	1.3′	58.9′
21	136°09.8	·· 04.3	32°56.5	4.6′	25°54.9	1.1′	58.8′
22	151°10.0	03.3	47°20.1	4.6′	25°55.9	0.9′	58.8′
23	166°10.2	02.3	61°43.7	4.6′	25°56.9	0.7′	58.8′
	SD = 15.9′	d = -1.0′	SD = 16.1′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°10.4	N03°01.4	76°07.2	4.6′	S25°57.6	0.6′	58.8′
1	196°10.7	03°00.4	90°30.8	4.6′	25°58.2	0.4′	58.8′
2	211°10.9	02°59.5	104°54.4	4.6′	25°58.5	0.2′	58.8′
3	226°11.1	·· 58.5	119°18.0	4.6′	25°58.8	0.0′	58.8′
4	241°11.3	57.5	133°41.7	4.6′	25°58.8	-0.1′	58.8′
5	256°11.5	56.6	148°05.3	4.7′	25°58.7	-0.3′	58.7′
6	271°11.8	N02°55.6	162°29.0	4.7′	S25°58.4	-0.5′	58.7′
7	286°12.0	54.7	176°52.7	4.7′	25°57.9	-0.6′	58.7′
8	301°12.2	53.7	191°16.4	4.7′	25°57.3	-0.8′	58.7′
9	316°12.4	·· 52.7	205°40.1	4.8′	25°56.4	-1.0′	58.7′
10	331°12.7	51.8	220°03.8	4.8′	25°55.5	-1.2′	58.7′
11	346°12.9	50.8	234°27.6	4.8′	25°54.3	-1.3′	58.7′
12	1°13.1	N02°49.8	248°51.4	4.8′	S25°53.0	-1.5′	58.6′
13	16°13.3	48.9	263°15.3	4.9′	25°51.5	-1.7′	58.6′
14	31°13.6	47.9	277°39.2	4.9′	25°49.8	-1.8′	58.6′
15	46°13.8	·· 47.0	292°03.1	5.0′	25°48.0	-2.0′	58.6′
16	61°14.0	46.0	306°27.0	5.0′	25°45.9	-2.2′	58.6′
17	76°14.2	45.0	320°51.0	5.0′	25°43.8	-2.3′	58.6′
18	91°14.4	N02°44.1	335°15.1	5.1′	S25°41.4	-2.5′	58.6′
19	106°14.7	43.1	349°39.1	5.1′	25°38.9	-2.7′	58.5′
20	121°14.9	42.1	4°03.2	5.2′	25°36.2	-2.8′	58.5′
21	136°15.1	·· 41.2	18°27.4	5.2′	25°33.4	-3.0′	58.5′
22	151°15.3	40.2	32°51.6	5.3′	25°30.4	-3.2′	58.5′
23	166°15.6	39.2	47°15.9	5.3′	25°27.2	-3.3′	58.5′
	SD = 15.9′	d = -1.0′	SD = 16.0′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:00	03:51	05:03	18:45	19:57	21:43
N 70°	02:34	04:04	05:09	18:40	19:43	21:12
68°	02:58	04:15	05:14	18:35	19:33	20:49
66°	03:15	04:24	05:17	18:32	19:24	20:32
64°	03:30	04:32	05:21	18:29	19:17	20:19
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	19:32
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	05:36	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	18:55
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	05:32	06:11	17:42	18:21	19:07
S 60°	04:42	05:31	06:12	17:40	18:22	19:11

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

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 6-8 40-63%
13	03:59	04:10	11:56	17:42	05:13	
14	04:20	04:31	11:55	18:43	06:12	
15	04:42	04:52	11:55	19:43	07:13	

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°09.7	141°58.1	S14°35.5	174°15.1	N00°29.3	28°26.8	S14°39.1	45°08.7	S19°12.7
1	10°12.2	156°57.9	36.6	189°16.1	28.7	43°29.5	39.2	60°11.3	12.7
2	25°14.6	171°57.6	37.7	204°17.1	28.0	58°32.2	39.3	75°13.8	12.7
3	40°17.1	186°57.4	·· 38.8	219°18.1	·· 27.4	73°34.9	·· 39.4	90°16.4	·· 12.8
4	55°19.6	201°57.1	39.9	234°19.1	26.7	88°37.6	39.4	105°19.0	12.8
5	70°22.0	216°56.8	41.0	249°20.1	26.1	103°40.3	39.5	120°21.5	12.8
6	85°24.5	231°56.6	S14°42.1	264°21.1	N00°25.4	118°43.0	S14°39.6	135°24.1	S19°12.8
7	100°27.0	246°56.3	43.3	279°22.0	24.7	133°45.7	39.7	150°26.7	12.9
8	115°29.4	261°56.0	44.4	294°23.0	24.1	148°48.4	39.8	165°29.2	12.9
9	130°31.9	276°55.8	·· 45.5	309°24.0	·· 23.4	163°51.1	·· 39.8	180°31.8	·· 12.9
10	145°34.4	291°55.5	46.6	324°25.0	22.8	178°53.8	39.9	195°34.3	12.9
11	160°36.8	306°55.2	47.7	339°26.0	22.1	193°56.5	40.0	210°36.9	13.0
12	175°39.3	321°55.0	S14°48.8	354°27.0	N00°21.4	208°59.2	S14°40.1	225°39.5	S19°13.0
13	190°41.7	336°54.7	49.9	9°28.0	20.8	224°01.9	40.2	240°42.0	13.0
14	205°44.2	351°54.4	51.0	24°29.0	20.1	239°04.6	40.2	255°44.6	13.0
15	220°46.7	6°54.2	·· 52.1	39°29.9	·· 19.5	254°07.3	·· 40.3	270°47.2	·· 13.1
16	235°49.1	21°53.9	53.2	54°30.9	18.8	269°10.0	40.4	285°49.7	13.1
17	250°51.6	36°53.6	54.3	69°31.9	18.1	284°12.7	40.5	300°52.3	13.1
18	265°54.1	51°53.4	S14°55.4	84°32.9	N00°17.5	299°15.4	S14°40.5	315°54.9	S19°13.1
19	280°56.5	66°53.1	56.5	99°33.9	16.8	314°18.1	40.6	330°57.4	13.2
20	295°59.0	81°52.8	57.7	114°34.9	16.2	329°20.8	40.7	346°00.0	13.2
21	311°01.5	96°52.6	·· 58.8	129°35.9	·· 15.5	344°23.5	·· 40.8	1°02.5	·· 13.2
22	326°03.9	111°52.3	14°59.9	144°36.9	14.9	359°26.2	40.9	16°05.1	13.2
23	341°06.4	126°52.0	15°01.0	159°37.8	14.2	14°28.9	40.9	31°07.7	13.3
Mer.pass.	00:19	ν -0.3′	d 1.1′	m -4.14	ν 1.0′	d -0.7′	m 1.69	ν 2.7′	d 0.1′ m -2.81	ν 2.6′	d 0.0′ m 0.43

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°08.9	141°51.8	S15°02.1	174°38.8	N00°13.5	29°31.6	S14°41.0	46°10.2	S19°13.3
1	11°11.3	156°51.5	03.2	189°39.8	12.9	44°34.3	41.1	61°12.8	13.3
2	26°13.8	171°51.2	04.3	204°40.8	12.2	59°37.0	41.2	76°15.3	13.3
3	41°16.2	186°50.9	·· 05.4	219°41.8	·· 11.6	74°39.6	·· 41.2	91°17.9	·· 13.4
4	56°18.7	201°50.7	06.5	234°42.8	10.9	89°42.3	41.3	106°20.5	13.4
5	71°21.2	216°50.4	07.6	249°43.8	10.2	104°45.0	41.4	121°23.0	13.4
6	86°23.6	231°50.1	S15°08.7	264°44.8	N00°09.6	119°47.7	S14°41.5	136°25.6	S19°13.4
7	101°26.1	246°49.9	09.8	279°45.7	08.9	134°50.4	41.5	151°28.2	13.5
8	116°28.6	261°49.6	10.9	294°46.7	08.3	149°53.1	41.6	166°30.7	13.5
9	131°31.0	276°49.3	·· 12.0	309°47.7	·· 07.6	164°55.8	·· 41.7	181°33.3	·· 13.5
10	146°33.5	291°49.0	13.1	324°48.7	06.9	179°58.5	41.8	196°35.8	13.5
11	161°36.0	306°48.8	14.1	339°49.7	06.3	195°01.2	41.9	211°38.4	13.6
12	176°38.4	321°48.5	S15°15.2	354°50.7	N00°05.6	210°03.9	S14°41.9	226°41.0	S19°13.6
13	191°40.9	336°48.2	16.3	9°51.7	05.0	225°06.6	42.0	241°43.5	13.6
14	206°43.4	351°48.0	17.4	24°52.6	04.3	240°09.3	42.1	256°46.1	13.6
15	221°45.8	6°47.7	·· 18.5	39°53.6	·· 03.7	255°12.0	·· 42.2	271°48.6	·· 13.7
16	236°48.3	21°47.4	19.6	54°54.6	03.0	270°14.7	42.2	286°51.2	13.7
17	251°50.7	36°47.1	20.7	69°55.6	02.3	285°17.4	42.3	301°53.8	13.7
18	266°53.2	51°46.9	S15°21.8	84°56.6	N00°01.7	300°20.1	S14°42.4	316°56.3	S19°13.7
19	281°55.7	66°46.6	22.9	99°57.6	01.0	315°22.8	42.5	331°58.9	13.8
20	296°58.1	81°46.3	24.0	114°58.6	N00°00.4	330°25.5	42.5	347°01.4	13.8
21	312°00.6	96°46.0	·· 25.1	129°59.5	S00°00.3	345°28.1	·· 42.6	2°04.0	·· 13.8
22	327°03.1	111°45.8	26.2	145°00.5	01.0	0°30.8	42.7	17°06.5	13.8
23	342°05.5	126°45.5	27.3	160°01.5	01.6	15°33.5	42.8	32°09.1	13.9
Mer.pass.	00:15	ν -0.3′	d 1.1′	m -4.15	ν 1.0′	d -0.7′	m 1.69	ν 2.7′	d 0.1′ m -2.80	ν 2.6′	d 0.0′ m 0.43

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	357°08.0	141°45.2	S15°28.3	175°02.5	S00°02.3	30°36.2	S14°42.8	47°11.7	S19°13.9
1	12°10.5	156°44.9	29.4	190°03.5	02.9	45°38.9	42.9	62°14.2	13.9
2	27°12.9	171°44.7	30.5	205°04.5	03.6	60°41.6	43.0	77°16.8	13.9
3	42°15.4	186°44.4	·· 31.6	220°05.5	·· 04.3	75°44.3	·· 43.1	92°19.3	·· 14.0
4	57°17.8	201°44.1	32.7	235°06.4	04.9	90°47.0	43.1	107°21.9	14.0
5	72°20.3	216°43.8	33.8	250°07.4	05.6	105°49.7	43.2	122°24.5	14.0
6	87°22.8	231°43.6	S15°34.9	265°08.4	S00°06.2	120°52.4	S14°43.3	137°27.0	S19°14.0
7	102°25.2	246°43.3	35.9	280°09.4	06.9	135°55.0	43.4	152°29.6	14.1
8	117°27.7	261°43.0	37.0	295°10.4	07.6	150°57.7	43.4	167°32.1	14.1
9	132°30.2	276°42.7	·· 38.1	310°11.4	·· 08.2	166°00.4	·· 43.5	182°34.7	·· 14.1
10	147°32.6	291°42.4	39.2	325°12.4	08.9	181°03.1	43.6	197°37.2	14.1
11	162°35.1	306°42.2	40.3	340°13.3	09.5	196°05.8	43.7	212°39.8	14.2
12	177°37.6	321°41.9	S15°41.4	355°14.3	S00°10.2	211°08.5	S14°43.7	227°42.3	S19°14.2
13	192°40.0	336°41.6	42.4	10°15.3	10.9	226°11.2	43.8	242°44.9	14.2
14	207°42.5	351°41.3	43.5	25°16.3	11.5	241°13.9	43.9	257°47.5	14.2
15	222°45.0	6°41.0	·· 44.6	40°17.3	·· 12.2	256°16.6	·· 44.0	272°50.0	·· 14.2
16	237°47.4	21°40.8	45.7	55°18.3	12.8	271°19.2	44.0	287°52.6	14.3
17	252°49.9	36°40.5	46.8	70°19.3	13.5	286°21.9	44.1	302°55.1	14.3
18	267°52.3	51°40.2	S15°47.8	85°20.2	S00°14.1	301°24.6	S14°44.2	317°57.7	S19°14.3
19	282°54.8	66°39.9	48.9	100°21.2	14.8	316°27.3	44.3	333°00.2	14.3
20	297°57.3	81°39.6	50.0	115°22.2	15.5	331°30.0	44.3	348°02.8	14.4
21	312°59.7	96°39.4	·· 51.1	130°23.2	·· 16.1	346°32.7	·· 44.4	3°05.4	·· 14.4
22	328°02.2	111°39.1	52.1	145°24.2	16.8	1°35.4	44.5	18°07.9	14.4
23	343°04.7	126°38.8	53.2	160°25.2	17.4	16°38.0	44.5	33°10.5	14.4
Mer.pass.	00:11	ν -0.3′	d 1.1′	m -4.15	ν 1.0′	d 0.7′	m 1.68	ν 2.7′	d 0.1′ m -2.80	ν 2.6′	d 0.0′ m 0.43

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.4	-42°11.2
Schedar	349°33.5	56°39.3
Diphda	348°49.7	-17°52.0
Achernar	335°21.8	-57°07.5
Hamal	327°54.0	23°33.8
Polaris	314°59.9	89°21.0
Acamar	315°13.6	-40°12.9
Menkar	314°08.8	4°10.5
Mirfak	308°31.8	49°56.1
Aldebaran	290°42.6	16°33.1
Rigel	281°06.4	-8°10.5
Capella	280°25.9	46°01.0
Bellatrix	278°25.8	6°22.2
Elnath	278°05.3	28°37.5
Alnilam	275°40.5	-1°11.2
Betelgeuse	270°55.0	7°24.7
Canopus	263°53.7	-52°42.1
Sirius	258°28.7	-16°44.5
Adhara	255°08.1	-28°59.8
Procyon	244°53.8	5°10.3
Pollux	243°20.8	27°58.4
Avior	234°16.2	-59°34.4
Suhail	222°48.6	-43°30.9
Miaplacidus	221°39.5	-69°48.1
Alphard	217°50.7	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.1	61°38.1
Denebola	182°28.1	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.1
Gacrux	171°55.2	-57°14.0
Alioth	166°15.9	55°50.8
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.3	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.5	-60°55.5
Kochab	137°20.6	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.0	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.1	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.4	51°29.5
Kaus Aust.	83°36.0	-34°22.5
Vega	80°34.9	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.6	-56°40.0
Deneb	49°27.3	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 16 Thu	SHA	Mer.pass
Venus	146°48.4	14:32
Mars	179°05.4	12:22
Jupiter	33°17.0	22:02
Saturn	49°59.0	20:56

Sep 17 Fri	SHA	Mer.pass
Venus	145°42.9	14:33
Mars	178°30.0	12:21
Jupiter	33°22.7	21:58
Saturn	50°01.4	20:52

Sep 18 Sat	SHA	Mer.pass
Venus	144°37.2	14:33
Mars	177°54.5	12:19
Jupiter	33°28.2	21:54
Saturn	50°03.7	20:48

Horizontal parallax	
Venus:	0.1
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°15.8	N02°38.3	61°40.2	5.4′	S25°23.9	-3.5′	58.5′
1	196°16.0	37.3	76°04.6	5.4′	25°20.4	-3.7′	58.5′
2	211°16.2	36.4	90°29.0	5.5′	25°16.7	-3.8′	58.4′
3	226°16.5	·· 35.4	104°53.5	5.5′	25°12.9	-4.0′	58.4′
4	241°16.7	34.4	119°18.0	5.6′	25°08.9	-4.1′	58.4′
5	256°16.9	33.5	133°42.6	5.7′	25°04.8	-4.3′	58.4′
6	271°17.1	N02°32.5	148°07.3	5.7′	S25°00.5	-4.5′	58.4′
7	286°17.4	31.5	162°32.0	5.8′	24°56.1	-4.6′	58.4′
8	301°17.6	30.6	176°56.8	5.9′	24°51.4	-4.8′	58.3′
9	316°17.8	·· 29.6	191°21.6	5.9′	24°46.7	-4.9′	58.3′
10	331°18.0	28.6	205°46.5	6.0′	24°41.8	-5.1′	58.3′
11	346°18.3	27.7	220°11.5	6.1′	24°36.7	-5.2′	58.3′
12	1°18.5	N02°26.7	234°36.6	6.1′	S24°31.5	-5.4′	58.3′
13	16°18.7	25.7	249°01.7	6.2′	24°26.1	-5.5′	58.3′
14	31°18.9	24.8	263°26.9	6.3′	24°20.6	-5.7′	58.3′
15	46°19.1	·· 23.8	277°52.2	6.3′	24°14.9	-5.8′	58.2′
16	61°19.4	22.8	292°17.5	6.4′	24°09.1	-6.0′	58.2′
17	76°19.6	21.9	306°42.9	6.5′	24°03.1	-6.1′	58.2′
18	91°19.8	N02°20.9	321°08.4	6.6′	S23°57.0	-6.3′	58.2′
19	106°20.0	20.0	335°34.0	6.7′	23°50.7	-6.4′	58.2′
20	121°20.3	19.0	349°59.7	6.7′	23°44.3	-6.5′	58.2′
21	136°20.5	·· 18.0	4°25.4	6.8′	23°37.8	-6.7′	58.1′
22	151°20.7	17.1	18°51.2	6.9′	23°31.1	-6.8′	58.1′
23	166°20.9	16.1	33°17.1	7.0′	23°24.3	-7.0′	58.1′
	SD = 15.9′	d = -1.0′	SD = 15.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°21.2	N02°15.1	47°43.1	7.1′	S23°17.3	-7.1′	58.1′
1	196°21.4	14.2	62°09.1	7.1′	23°10.2	-7.2′	58.1′
2	211°21.6	13.2	76°35.3	7.2′	23°03.0	-7.4′	58.1′
3	226°21.8	·· 12.2	91°01.5	7.3′	22°55.6	-7.5′	58.0′
4	241°22.1	11.3	105°27.8	7.4′	22°48.1	-7.6′	58.0′
5	256°22.3	10.3	119°54.2	7.5′	22°40.5	-7.8′	58.0′
6	271°22.5	N02°09.3	134°20.7	7.6′	S22°32.7	-7.9′	58.0′
7	286°22.7	08.4	148°47.2	7.7′	22°24.8	-8.0′	58.0′
8	301°23.0	07.4	163°13.9	7.7′	22°16.8	-8.1′	57.9′
9	316°23.2	·· 06.4	177°40.6	7.8′	22°08.6	-8.3′	57.9′
10	331°23.4	05.5	192°07.5	7.9′	22°00.4	-8.4′	57.9′
11	346°23.6	04.5	206°34.4	8.0′	21°52.0	-8.5′	57.9′
12	1°23.9	N02°03.5	221°01.4	8.1′	S21°43.5	-8.6′	57.9′
13	16°24.1	02.6	235°28.5	8.2′	21°34.8	-8.8′	57.9′
14	31°24.3	01.6	249°55.7	8.3′	21°26.1	-8.9′	57.8′
15	46°24.5	02°00.6	264°23.0	8.4′	21°17.2	-9.0′	57.8′
16	61°24.7	01°59.7	278°50.4	8.5′	21°08.2	-9.1′	57.8′
17	76°25.0	58.7	293°17.8	8.6′	20°59.1	-9.2′	57.8′
18	91°25.2	N01°57.7	307°45.4	8.6′	S20°49.8	-9.3′	57.8′
19	106°25.4	56.8	322°13.0	8.7′	20°40.5	-9.4′	57.7′
20	121°25.6	55.8	336°40.8	8.8′	20°31.1	-9.6′	57.7′
21	136°25.9	·· 54.8	351°08.6	8.9′	20°21.5	-9.7′	57.7′
22	151°26.1	53.9	5°36.5	9.0′	20°11.8	-9.8′	57.7′
23	166°26.3	52.9	20°04.5	9.1′	20°02.1	-9.9′	57.7′
	SD = 15.9′	d = -1.0′	SD = 15.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°26.5	N01°51.9	34°32.6	9.2′	S19°52.2	-10.0′	57.7′
1	196°26.8	51.0	49°00.8	9.3′	19°42.2	-10.1′	57.6′
2	211°27.0	50.0	63°29.1	9.4′	19°32.1	-10.2′	57.6′
3	226°27.2	·· 49.0	77°57.5	9.5′	19°21.9	-10.3′	57.6′
4	241°27.4	48.1	92°26.0	9.6′	19°11.6	-10.4′	57.6′
5	256°27.7	47.1	106°54.5	9.7′	19°01.3	-10.5′	57.6′
6	271°27.9	N01°46.1	121°23.2	9.7′	S18°50.8	-10.6′	57.5′
7	286°28.1	45.2	135°51.9	9.8′	18°40.2	-10.7′	57.5′
8	301°28.3	44.2	150°20.8	9.9′	18°29.5	-10.8′	57.5′
9	316°28.6	·· 43.2	164°49.7	10.0′	18°18.8	-10.9′	57.5′
10	331°28.8	42.3	179°18.7	10.1′	18°07.9	-10.9′	57.5′
11	346°29.0	41.3	193°47.8	10.2′	17°57.0	-11.0′	57.4′
12	1°29.2	N01°40.3	208°17.0	10.3′	S17°45.9	-11.1′	57.4′
13	16°29.4	39.3	222°46.3	10.4′	17°34.8	-11.2′	57.4′
14	31°29.7	38.4	237°15.7	10.5′	17°23.6	-11.3′	57.4′
15	46°29.9	·· 37.4	251°45.2	10.6′	17°12.3	-11.4′	57.4′
16	61°30.1	36.4	266°14.7	10.6′	17°00.9	-11.5′	57.3′
17	76°30.3	35.5	280°44.3	10.7′	16°49.5	-11.5′	57.3′
18	91°30.6	N01°34.5	295°14.1	10.8′	S16°38.0	-11.6′	57.3′
19	106°30.8	33.5	309°43.9	10.9′	16°26.4	-11.7′	57.3′
20	121°31.0	32.6	324°13.8	11.0′	16°14.7	-11.8′	57.3′
21	136°31.2	·· 31.6	338°43.8	11.1′	16°02.9	-11.8′	57.2′
22	151°31.5	30.6	353°13.8	11.2′	15°51.1	-11.9′	57.2′
23	166°31.7	29.7	7°44.0	11.2′	15°39.2	-12.0′	57.2′
	SD = 15.9′	d = -1.0′	SD = 15.7′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	02:25	04:06	05:17	18:29	19:39	21:18
N 70°	02:52	04:18	05:21	18:26	19:28	20:52
68°	03:12	04:27	05:24	18:23	19:19	20:33
66°	03:28	04:34	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	18:15	18:56	19:48
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	18:55
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	05:31	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	05:26	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°	04:33	05:21	06:03	17:47	18:29	19:18

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

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 9-11 73-90%
16	05:03	05:14	11:55	20:42	08:13	
17	05:25	05:35	11:54	21:37	09:10	
18	05:46	05:57	11:54	22:28	10:03	

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	358°07.1	141°38.5	S15°54.3	175°26.1	S00°18.1	31°40.7	S14°44.6	48°13.0	S19°14.5
1	13°09.6	156°38.2	55.4	190°27.1	18.8	46°43.4	44.7	63°15.6	14.5
2	28°12.1	171°38.0	56.4	205°28.1	19.4	61°46.1	44.8	78°18.1	14.5
3	43°14.5	186°37.7	·· 57.5	220°29.1	·· 20.1	76°48.8	·· 44.8	93°20.7	·· 14.5
4	58°17.0	201°37.4	58.6	235°30.1	20.7	91°51.5	44.9	108°23.2	14.5
5	73°19.5	216°37.1	15°59.7	250°31.1	21.4	106°54.2	45.0	123°25.8	14.6
6	88°21.9	231°36.8	S16°00.7	265°32.1	S00°22.1	121°56.8	S14°45.1	138°28.3	S19°14.6
7	103°24.4	246°36.5	01.8	280°33.0	22.7	136°59.5	45.1	153°30.9	14.6
8	118°26.8	261°36.2	02.9	295°34.0	23.4	152°02.2	45.2	168°33.4	14.6
9	133°29.3	276°36.0	·· 03.9	310°35.0	·· 24.0	167°04.9	·· 45.3	183°36.0	·· 14.7
10	148°31.8	291°35.7	05.0	325°36.0	24.7	182°07.6	45.3	198°38.6	14.7
11	163°34.2	306°35.4	06.1	340°37.0	25.4	197°10.3	45.4	213°41.1	14.7
12	178°36.7	321°35.1	S16°07.1	355°38.0	S00°26.0	212°12.9	S14°45.5	228°43.7	S19°14.7
13	193°39.2	336°34.8	08.2	10°38.9	26.7	227°15.6	45.6	243°46.2	14.8
14	208°41.6	351°34.5	09.3	25°39.9	27.3	242°18.3	45.6	258°48.8	14.8
15	223°44.1	6°34.3	·· 10.3	40°40.9	·· 28.0	257°21.0	·· 45.7	273°51.3	·· 14.8
16	238°46.6	21°34.0	11.4	55°41.9	28.7	272°23.7	45.8	288°53.9	14.8
17	253°49.0	36°33.7	12.5	70°42.9	29.3	287°26.3	45.8	303°56.4	14.8
18	268°51.5	51°33.4	S16°13.5	85°43.9	S00°30.0	302°29.0	S14°45.9	318°59.0	S19°14.9
19	283°53.9	66°33.1	14.6	100°44.8	30.6	317°31.7	46.0	334°01.5	14.9
20	298°56.4	81°32.8	15.7	115°45.8	31.3	332°34.4	46.1	349°04.1	14.9
21	313°58.9	96°32.5	·· 16.7	130°46.8	·· 32.0	347°37.1	·· 46.1	4°06.6	·· 14.9
22	329°01.3	111°32.2	17.8	145°47.8	32.6	2°39.7	46.2	19°09.2	15.0
23	344°03.8	126°32.0	18.8	160°48.8	33.3	17°42.4	46.3	34°11.7	15.0
Mer.pass.	00:08	ν -0.3′	d 1.1′	m -4.16	ν 1.0′	d 0.7′	m 1.68	ν 2.7′	d 0.1′ m -2.79	ν 2.6′	d 0.0′ m 0.44

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	359°06.3	141°31.7	S16°19.9	175°49.8	S00°33.9	32°45.1	S14°46.3	49°14.3	S19°15.0
1	14°08.7	156°31.4	21.0	190°50.7	34.6	47°47.8	46.4	64°16.8	15.0
2	29°11.2	171°31.1	22.0	205°51.7	35.3	62°50.5	46.5	79°19.4	15.0
3	44°13.7	186°30.8	·· 23.1	220°52.7	·· 35.9	77°53.1	·· 46.6	94°21.9	·· 15.1
4	59°16.1	201°30.5	24.1	235°53.7	36.6	92°55.8	46.6	109°24.5	15.1
5	74°18.6	216°30.2	25.2	250°54.7	37.2	107°58.5	46.7	124°27.0	15.1
6	89°21.1	231°29.9	S16°26.2	265°55.7	S00°37.9	123°01.2	S14°46.8	139°29.6	S19°15.1
7	104°23.5	246°29.6	27.3	280°56.6	38.6	138°03.9	46.8	154°32.1	15.2
8	119°26.0	261°29.3	28.4	295°57.6	39.2	153°06.5	46.9	169°34.7	15.2
9	134°28.4	276°29.1	·· 29.4	310°58.6	·· 39.9	168°09.2	·· 47.0	184°37.2	·· 15.2
10	149°30.9	291°28.8	30.5	325°59.6	40.5	183°11.9	47.0	199°39.8	15.2
11	164°33.4	306°28.5	31.5	341°00.6	41.2	198°14.6	47.1	214°42.3	15.2
12	179°35.8	321°28.2	S16°32.6	356°01.6	S00°41.8	213°17.2	S14°47.2	229°44.9	S19°15.3
13	194°38.3	336°27.9	33.6	11°02.5	42.5	228°19.9	47.2	244°47.4	15.3
14	209°40.8	351°27.6	34.7	26°03.5	43.2	243°22.6	47.3	259°50.0	15.3
15	224°43.2	6°27.3	·· 35.7	41°04.5	·· 43.8	258°25.3	·· 47.4	274°52.5	·· 15.3
16	239°45.7	21°27.0	36.8	56°05.5	44.5	273°27.9	47.5	289°55.1	15.4
17	254°48.2	36°26.7	37.8	71°06.5	45.1	288°30.6	47.5	304°57.6	15.4
18	269°50.6	51°26.4	S16°38.9	86°07.5	S00°45.8	303°33.3	S14°47.6	320°00.2	S19°15.4
19	284°53.1	66°26.1	39.9	101°08.4	46.5	318°36.0	47.7	335°02.7	15.4
20	299°55.5	81°25.8	41.0	116°09.4	47.1	333°38.6	47.7	350°05.3	15.4
21	314°58.0	96°25.5	·· 42.0	131°10.4	·· 47.8	348°41.3	·· 47.8	5°07.8	·· 15.5
22	330°00.5	111°25.2	43.1	146°11.4	48.4	3°44.0	47.9	20°10.4	15.5
23	345°02.9	126°24.9	44.1	161°12.4	49.1	18°46.7	47.9	35°12.9	15.5
Mer.pass.	00:00	ν -0.3′	d 1.1′	m -4.17	ν 1.0′	d 0.7′	m 1.67	ν 2.7′	d 0.1′ m -2.78	ν 2.6′	d 0.0′ m 0.44

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	0°05.4	141°24.7	S16°45.2	176°13.3	S00°49.8	33°49.3	S14°48.0	50°15.4	S19°15.5
1	15°07.9	156°24.4	46.2	191°14.3	50.4	48°52.0	48.1	65°18.0	15.5
2	30°10.3	171°24.1	47.2	206°15.3	51.1	63°54.7	48.1	80°20.5	15.6
3	45°12.8	186°23.8	·· 48.3	221°16.3	·· 51.7	78°57.4	·· 48.2	95°23.1	·· 15.6
4	60°15.3	201°23.5	49.3	236°17.3	52.4	94°00.0	48.3	110°25.6	15.6
5	75°17.7	216°23.2	50.4	251°18.3	53.1	109°02.7	48.3	125°28.2	15.6
6	90°20.2	231°22.9	S16°51.4	266°19.2	S00°53.7	124°05.4	S14°48.4	140°30.7	S19°15.6
7	105°22.7	246°22.6	52.5	281°20.2	54.4	139°08.0	48.5	155°33.3	15.7
8	120°25.1	261°22.3	53.5	296°21.2	55.0	154°10.7	48.5	170°35.8	15.7
9	135°27.6	276°22.0	·· 54.5	311°22.2	·· 55.7	169°13.4	·· 48.6	185°38.4	·· 15.7
10	150°30.0	291°21.7	55.6	326°23.2	56.4	184°16.0	48.7	200°40.9	15.7
11	165°32.5	306°21.4	56.6	341°24.1	57.0	199°18.7	48.7	215°43.5	15.8
12	180°35.0	321°21.1	S16°57.6	356°25.1	S00°57.7	214°21.4	S14°48.8	230°46.0	S19°15.8
13	195°37.4	336°20.8	58.7	11°26.1	58.3	229°24.1	48.9	245°48.5	15.8
14	210°39.9	351°20.5	16°59.7	26°27.1	59.0	244°26.7	48.9	260°51.1	15.8
15	225°42.4	6°20.2	17°00.8	41°28.1	00°59.7	259°29.4	·· 49.0	275°53.6	·· 15.8
16	240°44.8	21°19.9	01.8	56°29.0	01°00.3	274°32.1	49.1	290°56.2	15.9
17	255°47.3	36°19.6	02.8	71°30.0	01.0	289°34.7	49.1	305°58.7	15.9
18	270°49.8	51°19.3	S17°03.9	86°31.0	S01°01.6	304°37.4	S14°49.2	321°01.3	S19°15.9
19	285°52.2	66°19.0	04.9	101°32.0	02.3	319°40.1	49.3	336°03.8	15.9
20	300°54.7	81°18.7	05.9	116°33.0	03.0	334°42.7	49.3	351°06.4	15.9
21	315°57.1	96°18.4	·· 07.0	131°34.0	·· 03.6	349°45.4	·· 49.4	6°08.9	·· 16.0
22	330°59.6	111°18.1	08.0	146°34.9	04.3	4°48.1	49.5	21°11.4	16.0
23	346°02.1	126°17.8	09.0	161°35.9	04.9	19°50.7	49.5	36°14.0	16.0
Mer.pass.	23:56	ν -0.3′	d 1.0′	m -4.18	ν 1.0′	d 0.7′	m 1.67	ν 2.7′	d 0.1′ m -2.78	ν 2.5′	d 0.0′ m 0.45

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.4	-42°11.2
Schedar	349°33.5	56°39.3
Diphda	348°49.7	-17°52.0
Achernar	335°21.8	-57°07.5
Hamal	327°54.0	23°33.9
Polaris	314°58.8	89°21.0
Acamar	315°13.6	-40°12.9
Menkar	314°08.8	4°10.5
Mirfak	308°31.8	49°56.1
Aldebaran	290°42.6	16°33.2
Rigel	281°06.4	-8°10.5
Capella	280°25.8	46°01.0
Bellatrix	278°25.8	6°22.2
Elnath	278°05.3	28°37.5
Alnilam	275°40.5	-1°11.2
Betelgeuse	270°55.0	7°24.7
Canopus	263°53.7	-52°42.1
Sirius	258°28.7	-16°44.5
Adhara	255°08.1	-28°59.8
Procyon	244°53.8	5°10.3
Pollux	243°20.8	27°58.4
Avior	234°16.2	-59°34.4
Suhail	222°48.6	-43°30.9
Miaplacidus	221°39.5	-69°48.1
Alphard	217°50.7	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.0	61°38.1
Denebola	182°28.0	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.8	-63°13.0
Gacrux	171°55.2	-57°14.0
Alioth	166°15.9	55°50.8
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.3	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.5	-60°55.5
Kochab	137°20.6	74°04.3
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.2	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.0	-69°04.1
Sabik	102°05.9	-15°45.0
Shaula	96°14.1	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.4	51°29.5
Kaus Aust.	83°36.1	-34°22.5
Vega	80°35.0	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.7	-56°40.1
Deneb	49°27.3	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 19 Sun	**SHA**	**Mer.pass**
Venus	143°31.4	14:34
Mars	177°19.0	12:17
Jupiter	33°33.6	21:49
Saturn	50°05.9	20:44

Sep 20 Mon	**SHA**	**Mer.pass**
Venus	142°25.4	14:34
Mars	176°43.5	12:16
Jupiter	33°38.8	21:45
Saturn	50°08.0	20:40

Sep 21 Tue	**SHA**	**Mer.pass**
Venus	141°19.2	14:35
Mars	176°07.9	12:14
Jupiter	33°43.9	21:41
Saturn	50°10.0	20:35

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Sun		**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0		181°31.9	N01°28.7	22°14.2	11.3′	S15°27.2	-12.0′	57.2′
1		196°32.1	27.7	36°44.6	11.4′	15°15.1	-12.1′	57.2′
2		211°32.4	26.8	51°15.0	11.5′	15°03.0	-12.2′	57.1′
3		226°32.6	·· 25.8	65°45.5	11.6′	14°50.8	-12.3′	57.1′
4		241°32.8	24.8	80°16.0	11.7′	14°38.6	-12.3′	57.1′
5		256°33.0	23.8	94°46.7	11.7′	14°26.3	-12.4′	57.1′
6		271°33.3	N01°22.9	109°17.4	11.8′	S14°13.9	-12.4′	57.1′
7		286°33.5	21.9	123°48.2	11.9′	14°01.4	-12.5′	57.0′
8		301°33.7	20.9	138°19.1	12.0′	13°48.9	-12.6′	57.0′
9		316°33.9	·· 20.0	152°50.1	12.0′	13°36.4	-12.6′	57.0′
10		331°34.1	19.0	167°21.1	12.1′	13°23.8	-12.7′	57.0′
11		346°34.4	18.0	181°52.2	12.2′	13°11.1	-12.7′	57.0′
12		1°34.6	N01°17.1	196°23.4	12.3′	S12°58.4	-12.8′	56.9′
13		16°34.8	16.1	210°54.7	12.3′	12°45.6	-12.8′	56.9′
14		31°35.0	15.1	225°26.1	12.4′	12°32.8	-12.9′	56.9′
15		46°35.3	·· 14.2	239°57.5	12.5′	12°19.9	-12.9′	56.9′
16		61°35.5	13.2	254°29.0	12.6′	12°06.9	-13.0′	56.8′
17		76°35.7	12.2	269°00.5	12.6′	11°54.0	-13.0′	56.8′
18		91°35.9	N01°11.2	283°32.2	12.7′	S11°40.9	-13.1′	56.8′
19		106°36.2	10.3	298°03.9	12.8′	11°27.9	-13.1′	56.8′
20		121°36.4	09.3	312°35.7	12.8′	11°14.7	-13.2′	56.8′
21		136°36.6	·· 08.3	327°07.5	12.9′	11°01.6	-13.2′	56.7′
22		151°36.8	07.4	341°39.4	13.0′	10°48.4	-13.2′	56.7′
23		166°37.1	06.4	356°11.4	13.0′	10°35.1	-13.3′	56.7′
		SD = 15.9′	d = -1.0′	SD = 15.6′				

Mon	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°37.3	N01°05.4	10°43.5	13.1′	S10°21.8	-13.3′	56.7′
1	196°37.5	04.5	25°15.6	13.2′	10°08.5	-13.4′	56.7′
2	211°37.7	03.5	39°47.8	13.2′	09°55.2	-13.4′	56.6′
3	226°37.9	·· 02.5	54°20.0	13.3′	09°41.8	-13.4′	56.6′
4	241°38.2	01.5	68°52.3	13.4′	09°28.3	-13.5′	56.6′
5	256°38.4	01°00.6	83°24.7	13.4′	09°14.9	-13.5′	56.6′
6	271°38.6	N00°59.6	97°57.1	13.5′	S09°01.4	-13.5′	56.5′
7	286°38.8	58.6	112°29.6	13.5′	08°47.9	-13.6′	56.5′
8	301°39.1	57.7	127°02.1	13.6′	08°34.3	-13.6′	56.5′
9	316°39.3	·· 56.7	141°34.7	13.7′	08°20.7	-13.6′	56.5′
10	331°39.5	55.7	156°07.4	13.7′	08°07.1	-13.6′	56.5′
11	346°39.7	54.7	170°40.1	13.8′	07°53.5	-13.7′	56.4′
12	1°40.0	N00°53.8	185°12.9	13.8′	S07°39.8	-13.7′	56.4′
13	16°40.2	52.8	199°45.7	13.9′	07°26.1	-13.7′	56.4′
14	31°40.4	51.8	214°18.6	13.9′	07°12.4	-13.7′	56.4′
15	46°40.6	·· 50.9	228°51.5	14.0′	06°58.7	-13.8′	56.4′
16	61°40.8	49.9	243°24.5	14.0′	06°44.9	-13.8′	56.3′
17	76°41.1	48.9	257°57.6	14.1′	06°31.2	-13.8′	56.3′
18	91°41.3	N00°48.0	272°30.6	14.1′	S06°17.4	-13.8′	56.3′
19	106°41.5	47.0	287°03.8	14.2′	06°03.6	-13.8′	56.3′
20	121°41.7	46.0	301°37.0	14.2′	05°49.7	-13.8′	56.2′
21	136°42.0	·· 45.0	316°10.2	14.3′	05°35.9	-13.8′	56.2′
22	151°42.2	44.1	330°43.5	14.3′	05°22.1	-13.9′	56.2′
23	166°42.4	43.1	345°16.8	14.4′	05°08.2	-13.9′	56.2′
	SD = 15.9′	d = -1.0′	SD = 15.5′				

Tue	**GHA**	**Dec**	**GHA**	**ν**	**Dec**	**d**	**HP**
0	181°42.6	N00°42.1	359°50.2	14.4′	S04°54.3	-13.9′	56.2′
1	196°42.8	41.2	14°23.6	14.4′	04°40.4	-13.9′	56.1′
2	211°43.1	40.2	28°57.0	14.5′	04°26.5	-13.9′	56.1′
3	226°43.3	·· 39.2	43°30.5	14.5′	04°12.6	-13.9′	56.1′
4	241°43.5	38.2	58°04.0	14.6′	03°58.7	-13.9′	56.1′
5	256°43.7	37.3	72°37.6	14.6′	03°44.8	-13.9′	56.0′
6	271°44.0	N00°36.3	87°11.2	14.6′	S03°30.9	-13.9′	56.0′
7	286°44.2	35.3	101°44.8	14.7′	03°17.0	-13.9′	56.0′
8	301°44.4	34.4	116°18.5	14.7′	03°03.0	-13.9′	56.0′
9	316°44.6	·· 33.4	130°52.2	14.8′	02°49.1	-13.9′	56.0′
10	331°44.8	32.4	145°26.0	14.8′	02°35.2	-13.9′	55.9′
11	346°45.1	31.4	159°59.8	14.8′	02°21.2	-13.9′	55.9′
12	1°45.3	N00°30.5	174°33.6	14.8′	S02°07.3	-13.9′	55.9′
13	16°45.5	29.5	189°07.4	14.9′	01°53.4	-13.9′	55.9′
14	31°45.7	28.5	203°41.3	14.9′	01°39.4	-13.9′	55.8′
15	46°46.0	·· 27.6	218°15.2	14.9′	01°25.5	-13.9′	55.8′
16	61°46.2	26.6	232°49.2	15.0′	01°11.6	-13.9′	55.8′
17	76°46.4	25.6	247°23.1	15.0′	00°57.7	-13.9′	55.8′
18	91°46.6	N00°24.6	261°57.1	15.0′	S00°43.8	-13.9′	55.8′
19	106°46.8	23.7	276°31.1	15.0′	00°29.9	-13.9′	55.7′
20	121°47.1	22.7	291°05.2	15.1′	00°16.0	-13.9′	55.7′
21	136°47.3	·· 21.7	305°39.3	15.1′	S00°02.1	-13.9′	55.7′
22	151°47.5	20.8	320°13.3	15.1′	N00°11.7	13.9′	55.7′
23	166°47.7	19.8	334°47.4	15.1′	00°25.6	13.8′	55.7′
	SD = 15.9′	d = -1.0′	SD = 15.3′				

Lat.	**Twilight** Naut.	Civil	**Sunrise**	**Sunset**	**Twilight** Civil	Naut.
N 72°	02:46	04:21	05:30	18:14	19:23	20:55
N 70°	03:09	04:30	05:33	18:12	19:13	20:34
68°	03:26	04:38	05:35	18:10	19:06	20:17
66°	03:40	04:44	05:36	18:09	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	19:26
54°	04:25	05:07	05:42	18:04	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°	04:55	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	18:53
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	05:20	05:53	17:55	18:28	19:08
54°	04:37	05:18	05:53	17:54	18:30	19:12
56°	04:33	05:16	05:53	17:54	18:32	19:16
58°	04:28	05:14	05:54	17:54	18:34	19:20
S 60°	04:23	05:12	05:54	17:54	18:36	19:26

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

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 12-14 95-100%
19	06:08	06:18	11:54	23:16	10:52	
20	06:29	06:40	11:53	–:–	11:38	
21	06:50	07:01	11:53	00:01	12:22	

DUT1 = UT1-UTC = -0.1092 sec ΔT = TT-UT1 = +69.2932 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	1°04.5	141°17.5	S17°10.1	176°36.9	S01°05.6	34°53.4	S14°49.6	51°16.5	S19°16.0
1	16°07.0	156°17.2	11.1	191°37.9	06.3	49°56.1	49.7	66°19.1	16.0
2	31°09.5	171°16.9	12.1	206°38.9	06.9	64°58.7	49.7	81°21.6	16.1
3	46°11.9	186°16.6	·· 13.1	221°39.8	·· 07.6	80°01.4	·· 49.8	96°24.2	·· 16.1
4	61°14.4	201°16.3	14.2	236°40.8	08.2	95°04.1	49.9	111°26.7	16.1
5	76°16.9	216°16.0	15.2	251°41.8	08.9	110°06.7	49.9	126°29.2	16.1
6	91°19.3	231°15.7	S17°16.2	266°42.8	S01°09.6	125°09.4	S14°50.0	141°31.8	S19°16.1
7	106°21.8	246°15.4	17.2	281°43.8	10.2	140°12.1	50.1	156°34.3	16.2
8	121°24.3	261°15.1	18.3	296°44.7	10.9	155°14.7	50.1	171°36.9	16.2
9	136°26.7	276°14.8	·· 19.3	311°45.7	·· 11.5	170°17.4	·· 50.2	186°39.4	·· 16.2
10	151°29.2	291°14.4	20.3	326°46.7	12.2	185°20.1	50.3	201°42.0	16.2
11	166°31.6	306°14.1	21.3	341°47.7	12.9	200°22.7	50.3	216°44.5	16.2
12	181°34.1	321°13.8	S17°22.4	356°48.7	S01°13.5	215°25.4	S14°50.4	231°47.0	S19°16.3
13	196°36.6	336°13.5	23.4	11°49.6	14.2	230°28.0	50.5	246°49.6	16.3
14	211°39.0	351°13.2	24.4	26°50.6	14.8	245°30.7	50.5	261°52.1	16.3
15	226°41.5	6°12.9	·· 25.4	41°51.6	·· 15.5	260°33.4	·· 50.6	276°54.7	·· 16.3
16	241°44.0	21°12.6	26.4	56°52.6	16.2	275°36.0	50.6	291°57.2	16.3
17	256°46.4	36°12.3	27.5	71°53.6	16.8	290°38.7	50.7	306°59.7	16.4
18	271°48.9	51°12.0	S17°28.5	86°54.5	S01°17.5	305°41.4	S14°50.8	322°02.3	S19°16.4
19	286°51.4	66°11.7	29.5	101°55.5	18.1	320°44.0	50.8	337°04.8	16.4
20	301°53.8	81°11.4	30.5	116°56.5	18.8	335°46.7	50.9	352°07.4	16.4
21	316°56.3	96°11.1	·· 31.5	131°57.5	·· 19.5	350°49.3	·· 51.0	7°09.9	·· 16.4
22	331°58.7	111°10.8	32.5	146°58.4	20.1	5°52.0	51.0	22°12.4	16.5
23	347°01.2	126°10.5	33.6	161°59.4	20.8	20°54.7	51.1	37°15.0	16.5
Mer.pass.	23:52	ν -0.3′	d 1.0′	m -4.18	ν 1.0′	d 0.7′	m 1.66	ν 2.7′	d 0.1′ m -2.77	ν 2.5′	d 0.0′ m 0.45

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	2°03.7	141°10.2	S17°34.6	177°00.4	S01°21.4	35°57.3	S14°51.2	52°17.5	S19°16.5
1	17°06.1	156°09.8	35.6	192°01.4	22.1	51°00.0	51.2	67°20.1	16.5
2	32°08.6	171°09.5	36.6	207°02.4	22.8	66°02.6	51.3	82°22.6	16.5
3	47°11.1	186°09.2	·· 37.6	222°03.3	·· 23.4	81°05.3	·· 51.3	97°25.1	·· 16.5
4	62°13.5	201°08.9	38.6	237°04.3	24.1	96°08.0	51.4	112°27.7	16.6
5	77°16.0	216°08.6	39.6	252°05.3	24.7	111°10.6	51.5	127°30.2	16.6
6	92°18.5	231°08.3	S17°40.6	267°06.3	S01°25.4	126°13.3	S14°51.5	142°32.8	S19°16.6
7	107°20.9	246°08.0	41.7	282°07.3	26.1	141°15.9	51.6	157°35.3	16.6
8	122°23.4	261°07.7	42.7	297°08.2	26.7	156°18.6	51.7	172°37.8	16.6
9	137°25.9	276°07.4	·· 43.7	312°09.2	·· 27.4	171°21.3	·· 51.7	187°40.4	·· 16.7
10	152°28.3	291°07.0	44.7	327°10.2	28.0	186°23.9	51.8	202°42.9	16.7
11	167°30.8	306°06.7	45.7	342°11.2	28.7	201°26.6	51.8	217°45.4	16.7
12	182°33.2	321°06.4	S17°46.7	357°12.1	S01°29.4	216°29.2	S14°51.9	232°48.0	S19°16.7
13	197°35.7	336°06.1	47.7	12°13.1	30.0	231°31.9	52.0	247°50.5	16.7
14	212°38.2	351°05.8	48.7	27°14.1	30.7	246°34.5	52.0	262°53.1	16.8
15	227°40.6	6°05.5	·· 49.7	42°15.1	·· 31.3	261°37.2	·· 52.1	277°55.6	·· 16.8
16	242°43.1	21°05.2	50.7	57°16.1	32.0	276°39.8	52.2	292°58.1	16.8
17	257°45.6	36°04.9	51.7	72°17.0	32.7	291°42.5	52.2	308°00.7	16.8
18	272°48.0	51°04.5	S17°52.7	87°18.0	S01°33.3	306°45.2	S14°52.3	323°03.2	S19°16.8
19	287°50.5	66°04.2	53.7	102°19.0	34.0	321°47.8	52.3	338°05.7	16.8
20	302°53.0	81°03.9	54.7	117°20.0	34.6	336°50.5	52.4	353°08.3	16.9
21	317°55.4	96°03.6	·· 55.7	132°20.9	·· 35.3	351°53.1	·· 52.5	8°10.8	·· 16.9
22	332°57.9	111°03.3	56.7	147°21.9	36.0	6°55.8	52.5	23°13.3	16.9
23	348°00.4	126°03.0	57.7	162°22.9	36.6	21°58.4	52.6	38°15.9	16.9
Mer.pass.	23:48	ν -0.3′	d 1.0′	m -4.19	ν 1.0′	d 0.7′	m 1.66	ν 2.7′	d 0.1′ m -2.77	ν 2.5′	d 0.0′ m 0.46

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	3°02.8	141°02.7	S17°58.7	177°23.9	S01°37.3	37°01.1	S14°52.6	53°18.4	S19°16.9
1	18°05.3	156°02.3	17°59.7	192°24.9	37.9	52°03.7	52.7	68°20.9	17.0
2	33°07.7	171°02.0	18°00.7	207°25.8	38.6	67°06.4	52.8	83°23.5	17.0
3	48°10.2	186°01.7	·· 01.7	222°26.8	·· 39.3	82°09.0	·· 52.8	98°26.0	·· 17.0
4	63°12.7	201°01.4	02.7	237°27.8	39.9	97°11.7	52.9	113°28.6	17.0
5	78°15.1	216°01.1	03.7	252°28.8	40.6	112°14.3	52.9	128°31.1	17.0
6	93°17.6	231°00.8	S18°04.7	267°29.7	S01°41.2	127°17.0	S14°53.0	143°33.6	S19°17.0
7	108°20.1	246°00.4	05.7	282°30.7	41.9	142°19.7	53.1	158°36.2	17.1
8	123°22.5	261°00.1	06.7	297°31.7	42.6	157°22.3	53.1	173°38.7	17.1
9	138°25.0	275°59.8	·· 07.7	312°32.7	·· 43.2	172°25.0	·· 53.2	188°41.2	·· 17.1
10	153°27.5	290°59.5	08.7	327°33.7	43.9	187°27.6	53.2	203°43.8	17.1
11	168°29.9	305°59.2	09.7	342°34.6	44.5	202°30.3	53.3	218°46.3	17.1
12	183°32.4	320°58.8	S18°10.6	357°35.6	S01°45.2	217°32.9	S14°53.4	233°48.8	S19°17.2
13	198°34.8	335°58.5	11.6	12°36.6	45.9	232°35.6	53.4	248°51.4	17.2
14	213°37.3	350°58.2	12.6	27°37.6	46.5	247°38.2	53.5	263°53.9	17.2
15	228°39.8	5°57.9	·· 13.6	42°38.5	·· 47.2	262°40.9	·· 53.5	278°56.4	·· 17.2
16	243°42.2	20°57.6	14.6	57°39.5	47.8	277°43.5	53.6	293°59.0	17.2
17	258°44.7	35°57.2	15.6	72°40.5	48.5	292°46.2	53.7	309°01.5	17.2
18	273°47.2	50°56.9	S18°16.6	87°41.5	S01°49.2	307°48.8	S14°53.7	324°04.0	S19°17.3
19	288°49.6	65°56.6	17.6	102°42.4	49.8	322°51.4	53.8	339°06.6	17.3
20	303°52.1	80°56.3	18.5	117°43.4	50.5	337°54.1	53.8	354°09.1	17.3
21	318°54.6	95°56.0	·· 19.5	132°44.4	·· 51.1	352°56.7	·· 53.9	9°11.6	·· 17.3
22	333°57.0	110°55.6	20.5	147°45.4	51.8	7°59.4	54.0	24°14.2	17.3
23	348°59.5	125°55.3	21.5	162°46.3	52.5	23°02.0	54.0	39°16.7	17.3
Mer.pass.	23:44	ν -0.3′	d 1.0′	m -4.20	ν 1.0′	d 0.7′	m 1.65	ν 2.7′	d 0.1′ m -2.76	ν 2.5′	d 0.0′ m 0.46

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.3
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.5
Hamal	327°54.0	23°33.9
Polaris	314°57.7	89°21.1
Acamar	315°13.6	-40°12.9
Menkar	314°08.8	4°10.5
Mirfak	308°31.8	49°56.1
Aldebaran	290°42.6	16°33.2
Rigel	281°06.4	-8°10.5
Capella	280°25.8	46°01.0
Bellatrix	278°25.7	6°22.2
Elnath	278°05.2	28°37.5
Alnilam	275°40.4	-1°11.2
Betelgeuse	270°55.0	7°24.7
Canopus	263°53.6	-52°42.1
Sirius	258°28.7	-16°44.5
Adhara	255°08.1	-28°59.8
Procyon	244°53.8	5°10.3
Pollux	243°20.8	27°58.4
Avior	234°16.2	-59°34.4
Suhail	222°48.6	-43°30.9
Miaplacidus	221°39.4	-69°48.0
Alphard	217°50.7	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.0	61°38.1
Denebola	182°28.0	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.8	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°15.9	55°50.7
Spica	158°25.5	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.4	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.5	-60°55.5
Kochab	137°20.7	74°04.3
Zuben'ubi	136°59.3	-16°07.8
Alphecca	126°06.3	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.1	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.1	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.5	51°29.5
Kaus Aust.	83°36.1	-34°22.5
Vega	80°35.0	38°48.5
Nunki	75°51.0	-26°16.2
Altair	62°02.4	8°55.7
Peacock	53°09.7	-56°40.1
Deneb	49°27.3	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.4
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 22 Wed	SHA	Mer.pass
Venus	140°12.9	14:35
Mars	175°32.4	12:13
Jupiter	33°48.9	21:37
Saturn	50°12.0	20:31

Sep 23 Thu	SHA	Mer.pass
Venus	139°06.5	14:36
Mars	174°56.7	12:11
Jupiter	33°53.6	21:32
Saturn	50°13.8	20:27

Sep 24 Fri	SHA	Mer.pass
Venus	137°59.8	14:36
Mars	174°21.1	12:10
Jupiter	33°58.3	21:28
Saturn	50°15.6	20:23

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°48.0	N00°18.8	349°21.6	15.2′	N00°39.5	13.8′	55.6′
1	196°48.2	17.8	3°55.7	15.2′	00°53.3	13.8′	55.6′
2	211°48.4	16.9	18°29.9	15.2′	01°07.1	13.8′	55.6′
3	226°48.6	·· 15.9	33°04.1	15.2′	01°20.9	13.8′	55.6′
4	241°48.8	14.9	47°38.3	15.2′	01°34.7	13.8′	55.6′
5	256°49.1	13.9	62°12.5	15.2′	01°48.5	13.8′	55.5′
6	271°49.3	N00°13.0	76°46.8	15.3′	N02°02.2	13.7′	55.5′
7	286°49.5	12.0	91°21.0	15.3′	02°15.9	13.7′	55.5′
8	301°49.7	11.0	105°55.3	15.3′	02°29.7	13.7′	55.5′
9	316°49.9	·· 10.1	120°29.6	15.3′	02°43.4	13.7′	55.4′
10	331°50.2	09.1	135°03.8	15.3′	02°57.0	13.6′	55.4′
11	346°50.4	08.1	149°38.1	15.3′	03°10.7	13.6′	55.4′
12	1°50.6	N00°07.1	164°12.4	15.3′	N03°24.3	13.6′	55.4′
13	16°50.8	06.2	178°46.8	15.3′	03°37.9	13.6′	55.4′
14	31°51.0	05.2	193°21.1	15.3′	03°51.5	13.6′	55.3′
15	46°51.3	·· 04.2	207°55.4	15.3′	04°05.0	13.5′	55.3′
16	61°51.5	03.3	222°29.8	15.3′	04°18.6	13.5′	55.3′
17	76°51.7	02.3	237°04.1	15.3′	04°32.1	13.5′	55.3′
18	91°51.9	N00°01.3	251°38.5	15.4′	N04°45.5	13.4′	55.3′
19	106°52.1	N00°00.3	266°12.8	15.4′	04°59.0	13.4′	55.2′
20	121°52.4	S00°00.6	280°47.2	15.4′	05°12.4	13.4′	55.2′
21	136°52.6	·· 01.6	295°21.5	15.4′	05°25.8	13.3′	55.2′
22	151°52.8	02.6	309°55.9	15.4′	05°39.1	13.3′	55.2′
23	166°53.0	03.6	324°30.2	15.4′	05°52.4	13.3′	55.2′
	SD = 15.9′	d = -1.0′	SD = 15.2′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°53.3	S00°04.5	339°04.6	15.4′	N06°05.7	13.2′	55.1′
1	196°53.5	05.5	353°39.0	15.4′	06°19.0	13.2′	55.1′
2	211°53.7	06.5	8°13.3	15.3′	06°32.2	13.2′	55.1′
3	226°53.9	·· 07.4	22°47.7	15.3′	06°45.4	13.1′	55.1′
4	241°54.1	08.4	37°22.0	15.3′	06°58.5	13.1′	55.1′
5	256°54.4	09.4	51°56.4	15.3′	07°11.6	13.1′	55.1′
6	271°54.6	S00°10.4	66°30.7	15.3′	N07°24.7	13.0′	55.0′
7	286°54.8	11.3	81°05.0	15.3′	07°37.7	13.0′	55.0′
8	301°55.0	12.3	95°39.3	15.3′	07°50.7	12.9′	55.0′
9	316°55.2	·· 13.3	110°13.6	15.3′	08°03.6	12.9′	55.0′
10	331°55.5	14.3	124°47.9	15.3′	08°16.6	12.9′	55.0′
11	346°55.7	15.2	139°22.2	15.3′	08°29.4	12.8′	54.9′
12	1°55.9	S00°16.2	153°56.5	15.3′	N08°42.2	12.8′	54.9′
13	16°56.1	17.2	168°30.8	15.3′	08°55.0	12.7′	54.9′
14	31°56.3	18.1	183°05.0	15.2′	09°07.8	12.7′	54.9′
15	46°56.5	·· 19.1	197°39.3	15.2′	09°20.4	12.6′	54.9′
16	61°56.8	20.1	212°13.5	15.2′	09°33.1	12.6′	54.9′
17	76°57.0	21.1	226°47.7	15.2′	09°45.7	12.6′	54.8′
18	91°57.2	S00°22.0	241°21.9	15.2′	N09°58.2	12.5′	54.8′
19	106°57.4	23.0	255°56.1	15.2′	10°10.7	12.5′	54.8′
20	121°57.6	24.0	270°30.3	15.1′	10°23.2	12.4′	54.8′
21	136°57.9	·· 25.0	285°04.4	15.1′	10°35.6	12.4′	54.8′
22	151°58.1	25.9	299°38.5	15.1′	10°48.0	12.3′	54.8′
23	166°58.3	26.9	314°12.7	15.1′	11°00.3	12.3′	54.7′
	SD = 15.9′	d = 1.0′	SD = 15.0′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°58.5	S00°27.9	328°46.7	15.1′	N11°12.5	12.2′	54.7′
1	196°58.7	28.9	343°20.8	15.0′	11°24.7	12.1′	54.7′
2	211°59.0	29.8	357°54.8	15.0′	11°36.9	12.1′	54.7′
3	226°59.2	·· 30.8	12°28.9	15.0′	11°49.0	12.0′	54.7′
4	241°59.4	31.8	27°02.9	15.0′	12°01.0	12.0′	54.7′
5	256°59.6	32.7	41°36.8	14.9′	12°13.0	11.9′	54.7′
6	271°59.8	S00°33.7	56°10.8	14.9′	N12°24.9	11.9′	54.6′
7	287°00.0	34.7	70°44.7	14.9′	12°36.8	11.8′	54.6′
8	302°00.3	35.7	85°18.6	14.9′	12°48.6	11.8′	54.6′
9	317°00.5	·· 36.6	99°52.5	14.8′	13°00.3	11.7′	54.6′
10	332°00.7	37.6	114°26.3	14.8′	13°12.0	11.6′	54.6′
11	347°00.9	38.6	129°00.1	14.8′	13°23.7	11.6′	54.6′
12	2°01.1	S00°39.6	143°33.9	14.8′	N13°35.2	11.5′	54.5′
13	17°01.4	40.5	158°07.7	14.7′	13°46.8	11.5′	54.5′
14	32°01.6	41.5	172°41.4	14.7′	13°58.2	11.4′	54.5′
15	47°01.8	·· 42.5	187°15.1	14.7′	14°09.6	11.3′	54.5′
16	62°02.0	43.4	201°48.8	14.6′	14°20.9	11.3′	54.5′
17	77°02.2	44.4	216°22.4	14.6′	14°32.2	11.2′	54.5′
18	92°02.4	S00°45.4	230°56.0	14.6′	N14°43.4	11.1′	54.5′
19	107°02.7	46.4	245°29.6	14.5′	14°54.5	11.1′	54.5′
20	122°02.9	47.3	260°03.1	14.5′	15°05.6	11.0′	54.4′
21	137°03.1	·· 48.3	274°36.6	14.5′	15°16.6	10.9′	54.4′
22	152°03.3	49.3	289°10.1	14.4′	15°27.5	10.9′	54.4′
23	167°03.5	50.3	303°43.5	14.4′	15°38.4	10.8′	54.4′
	SD = 15.9′	d = 1.0′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	03:05	04:35	05:44	17:58	19:06	20:35
N 70°	03:24	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°	04:00	04:59	05:46	17:57	18:44	19:42
62°	04:08	05:02	05:47	17:57	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	05:47	17:56	18:33	19:17
54°	04:30	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°	05:01	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	18:56
45°	04:43	05:18	05:47	17:58	18:28	19:02
S 50°	04:36	05:14	05:46	17:59	18:31	19:10
52°	04:33	05:12	05:46	17:59	18:33	19:13
54°	04:29	05:11	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	05:45	18:01	18:43	19:33

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

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 15-17 99-91%
22	07:12	07:22	11:53	00:44	13:05	
23	07:33	07:44	11:52	01:26	13:47	
24	07:54	08:05	11:52	02:09	14:30	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	4°02.0	140°55.0	S18°22.5	177°47.3	S01°53.1	38°04.7	S14°54.1	54°19.2	S19°17.4
1	19°04.4	155°54.7	23.5	192°48.3	53.8	53°07.3	54.1	69°21.7	17.4
2	34°06.9	170°54.3	24.4	207°49.3	54.4	68°10.0	54.2	84°24.3	17.4
3	49°09.3	185°54.0	·· 25.4	222°50.2	·· 55.1	83°12.6	·· 54.2	99°26.8	·· 17.4
4	64°11.8	200°53.7	26.4	237°51.2	55.7	98°15.3	54.3	114°29.3	17.4
5	79°14.3	215°53.4	27.4	252°52.2	56.4	113°17.9	54.4	129°31.9	17.4
6	94°16.7	230°53.1	S18°28.3	267°53.2	S01°57.1	128°20.6	S14°54.4	144°34.4	S19°17.5
7	109°19.2	245°52.7	29.3	282°54.1	57.7	143°23.2	54.5	159°36.9	17.5
8	124°21.7	260°52.4	30.3	297°55.1	58.4	158°25.8	54.5	174°39.5	17.5
9	139°24.1	275°52.1	·· 31.3	312°56.1	·· 59.0	173°28.5	·· 54.6	189°42.0	·· 17.5
10	154°26.6	290°51.8	32.3	327°57.1	01°59.7	188°31.1	54.7	204°44.5	17.5
11	169°29.1	305°51.4	33.2	342°58.0	02°00.4	203°33.8	54.7	219°47.1	17.5
12	184°31.5	320°51.1	S18°34.2	357°59.0	S02°01.0	218°36.4	S14°54.8	234°49.6	S19°17.6
13	199°34.0	335°50.8	35.2	13°00.0	01.7	233°39.1	54.8	249°52.1	17.6
14	214°36.4	350°50.4	36.1	28°01.0	02.3	248°41.7	54.9	264°54.6	17.6
15	229°38.9	5°50.1	·· 37.1	43°01.9	·· 03.0	263°44.4	·· 54.9	279°57.2	·· 17.6
16	244°41.4	20°49.8	38.1	58°02.9	03.7	278°47.0	55.0	294°59.7	17.6
17	259°43.8	35°49.5	39.1	73°03.9	04.3	293°49.6	55.0	310°02.2	17.6
18	274°46.3	50°49.1	S18°40.0	88°04.9	S02°05.0	308°52.3	S14°55.1	325°04.8	S19°17.7
19	289°48.8	65°48.8	41.0	103°05.8	05.6	323°54.9	55.2	340°07.3	17.7
20	304°51.2	80°48.5	42.0	118°06.8	06.3	338°57.6	55.2	355°09.8	17.7
21	319°53.7	95°48.2	·· 42.9	133°07.8	·· 07.0	354°00.2	·· 55.3	10°12.3	·· 17.7
22	334°56.2	110°47.8	43.9	148°08.8	07.6	9°02.8	55.3	25°14.9	17.7
23	349°58.6	125°47.5	44.9	163°09.7	08.3	24°05.5	55.4	40°17.4	17.7
Mer.pass.	23:40	ν -0.3′	d 1.0′	m -4.21	ν 1.0′	d 0.7′	m 1.64	ν 2.6′	d 0.1′ m -2.75	ν 2.5′	d 0.0′ m 0.47

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°01.1	140°47.2	S18°45.8	178°10.7	S02°08.9	39°08.1	S14°55.4	55°19.9	S19°17.8
1	20°03.6	155°46.8	46.8	193°11.7	09.6	54°10.8	55.5	70°22.5	17.8
2	35°06.0	170°46.5	47.7	208°12.7	10.3	69°13.4	55.6	85°25.0	17.8
3	50°08.5	185°46.2	·· 48.7	223°13.6	·· 10.9	84°16.0	·· 55.6	100°27.5	·· 17.8
4	65°10.9	200°45.8	49.7	238°14.6	11.6	99°18.7	55.7	115°30.0	17.8
5	80°13.4	215°45.5	50.6	253°15.6	12.2	114°21.3	55.7	130°32.6	17.8
6	95°15.9	230°45.2	S18°51.6	268°16.6	S02°12.9	129°24.0	S14°55.8	145°35.1	S19°17.9
7	110°18.3	245°44.9	52.6	283°17.5	13.6	144°26.6	55.8	160°37.6	17.9
8	125°20.8	260°44.5	53.5	298°18.5	14.2	159°29.2	55.9	175°40.1	17.9
9	140°23.3	275°44.2	·· 54.5	313°19.5	·· 14.9	174°31.9	·· 55.9	190°42.7	·· 17.9
10	155°25.7	290°43.9	55.4	328°20.4	15.5	189°34.5	56.0	205°45.2	17.9
11	170°28.2	305°43.5	56.4	343°21.4	16.2	204°37.1	56.0	220°47.7	17.9
12	185°30.7	320°43.2	S18°57.3	358°22.4	S02°16.9	219°39.8	S14°56.1	235°50.2	S19°17.9
13	200°33.1	335°42.9	58.3	13°23.4	17.5	234°42.4	56.2	250°52.8	18.0
14	215°35.6	350°42.5	18°59.3	28°24.3	18.2	249°45.1	56.2	265°55.3	18.0
15	230°38.1	5°42.2	19°00.2	43°25.3	·· 18.8	264°47.7	·· 56.3	280°57.8	·· 18.0
16	245°40.5	20°41.9	01.2	58°26.3	19.5	279°50.3	56.3	296°00.3	18.0
17	260°43.0	35°41.5	02.1	73°27.3	20.2	294°53.0	56.4	311°02.9	18.0
18	275°45.4	50°41.2	S19°03.1	88°28.2	S02°20.8	309°55.6	S14°56.4	326°05.4	S19°18.0
19	290°47.9	65°40.9	04.0	103°29.2	21.5	324°58.2	56.5	341°07.9	18.1
20	305°50.4	80°40.5	05.0	118°30.2	22.1	340°00.9	56.5	356°10.4	18.1
21	320°52.8	95°40.2	·· 05.9	133°31.1	·· 22.8	355°03.5	·· 56.6	11°13.0	·· 18.1
22	335°55.3	110°39.9	06.9	148°32.1	23.5	10°06.1	56.6	26°15.5	18.1
23	350°57.8	125°39.5	07.8	163°33.1	24.1	25°08.8	56.7	41°18.0	18.1
Mer.pass.	23:36	ν -0.3′	d 1.0′	m -4.21	ν 1.0′	d 0.7′	m 1.64	ν 2.6′	d 0.1′ m -2.75	ν 2.5′	d 0.0′ m 0.47

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°00.2	140°39.2	S19°08.8	178°34.1	S02°24.8	40°11.4	S14°56.7	56°20.5	S19°18.1
1	21°02.7	155°38.8	09.7	193°35.0	25.4	55°14.0	56.8	71°23.1	18.1
2	36°05.2	170°38.5	10.7	208°36.0	26.1	70°16.7	56.9	86°25.6	18.2
3	51°07.6	185°38.2	·· 11.6	223°37.0	·· 26.7	85°19.3	·· 56.9	101°28.1	·· 18.2
4	66°10.1	200°37.8	12.5	238°38.0	27.4	100°21.9	57.0	116°30.6	18.2
5	81°12.6	215°37.5	13.5	253°38.9	28.1	115°24.6	57.0	131°33.2	18.2
6	96°15.0	230°37.2	S19°14.4	268°39.9	S02°28.7	130°27.2	S14°57.1	146°35.7	S19°18.2
7	111°17.5	245°36.8	15.4	283°40.9	29.4	145°29.8	57.1	161°38.2	18.2
8	126°19.9	260°36.5	16.3	298°41.8	30.0	160°32.4	57.2	176°40.7	18.2
9	141°22.4	275°36.1	·· 17.3	313°42.8	·· 30.7	175°35.1	·· 57.2	191°43.2	·· 18.3
10	156°24.9	290°35.8	18.2	328°43.8	31.4	190°37.7	57.3	206°45.8	18.3
11	171°27.3	305°35.5	19.1	343°44.8	32.0	205°40.3	57.3	221°48.3	18.3
12	186°29.8	320°35.1	S19°20.1	358°45.7	S02°32.7	220°43.0	S14°57.4	236°50.8	S19°18.3
13	201°32.3	335°34.8	21.0	13°46.7	33.3	235°45.6	57.4	251°53.3	18.3
14	216°34.7	350°34.4	21.9	28°47.7	34.0	250°48.2	57.5	266°55.8	18.3
15	231°37.2	5°34.1	·· 22.9	43°48.6	·· 34.7	265°50.9	·· 57.5	281°58.4	·· 18.3
16	246°39.7	20°33.8	23.8	58°49.6	35.3	280°53.5	57.6	297°00.9	18.4
17	261°42.1	35°33.4	24.8	73°50.6	36.0	295°56.1	57.6	312°03.4	18.4
18	276°44.6	50°33.1	S19°25.7	88°51.5	S02°36.6	310°58.7	S14°57.7	327°05.9	S19°18.4
19	291°47.0	65°32.7	26.6	103°52.5	37.3	326°01.4	57.7	342°08.5	18.4
20	306°49.5	80°32.4	27.6	118°53.5	38.0	341°04.0	57.8	357°11.0	18.4
21	321°52.0	95°32.1	·· 28.5	133°54.5	·· 38.6	356°06.6	·· 57.8	12°13.5	·· 18.4
22	336°54.4	110°31.7	29.4	148°55.4	39.3	11°09.2	57.9	27°16.0	18.4
23	351°56.9	125°31.4	30.3	163°56.4	39.9	26°11.9	57.9	42°18.5	18.5
Mer.pass.	23:32	ν -0.3′	d 0.9′	m -4.22	ν 1.0′	d 0.7′	m 1.63	ν 2.6′	d 0.1′ m -2.74	ν 2.5′	d 0.0′ m 0.48

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.6
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.3
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.5
Hamal	327°53.9	23°33.9
Polaris	314°56.5	89°21.1
Acamar	315°13.5	-40°12.9
Menkar	314°08.7	4°10.5
Mirfak	308°31.8	49°56.1
Aldebaran	290°42.6	16°33.2
Rigel	281°06.4	-8°10.5
Capella	280°25.8	46°01.0
Bellatrix	278°25.7	6°22.2
Elnath	278°05.2	28°37.5
Alnilam	275°40.4	-1°11.2
Betelgeuse	270°55.0	7°24.7
Canopus	263°53.6	-52°42.1
Sirius	258°28.7	-16°44.5
Adhara	255°08.1	-28°59.8
Procyon	244°53.8	5°10.3
Pollux	243°20.8	27°58.4
Avior	234°16.1	-59°34.4
Suhail	222°48.6	-43°30.9
Miaplacidus	221°39.4	-69°48.0
Alphard	217°50.6	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.0	61°38.1
Denebola	182°28.0	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.8	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°16.0	55°50.7
Spica	158°25.5	-11°16.3
Alkaid	152°54.6	49°12.6
Hadar	148°40.4	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.5	-60°55.5
Kochab	137°20.7	74°04.2
Zuben'ubi	136°59.3	-16°07.8
Alphecca	126°06.3	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.1	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.1	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.5	51°29.5
Kaus Aust.	83°36.1	-34°22.5
Vega	80°35.0	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.7	-56°40.1
Deneb	49°27.3	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°35.9	-46°51.4
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 25 Sat	SHA	Mer.pass
Venus	136°53.0	14:37
Mars	173°45.4	12:08
Jupiter	34°02.7	21:24
Saturn	50°17.3	20:19

Sep 26 Sun	SHA	Mer.pass
Venus	135°46.1	14:37
Mars	173°09.6	12:07
Jupiter	34°07.0	21:20
Saturn	50°18.8	20:15

Sep 27 Mon	SHA	Mer.pass
Venus	134°38.9	14:38
Mars	172°33.8	12:05
Jupiter	34°11.2	21:16
Saturn	50°20.3	20:11

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°03.7	S00°51.2	318°16.9	14.4′	N15°49.2	10.7′	54.4′
1	197°04.0	52.2	332°50.2	14.3′	15°59.9	10.7′	54.4′
2	212°04.2	53.2	347°23.6	14.3′	16°10.5	10.6′	54.4′
3	227°04.4	·· 54.2	1°56.8	14.2′	16°21.1	10.5′	54.4′
4	242°04.6	55.1	16°30.1	14.2′	16°31.6	10.4′	54.4′
5	257°04.8	56.1	31°03.3	14.2′	16°42.1	10.4′	54.3′
6	272°05.0	S00°57.1	45°36.4	14.1′	N16°52.4	10.3′	54.3′
7	287°05.3	58.0	60°09.6	14.1′	17°02.7	10.2′	54.3′
8	302°05.5	00°59.0	74°42.6	14.0′	17°12.9	10.1′	54.3′
9	317°05.7	01°00.0	89°15.7	14.0′	17°23.1	10.1′	54.3′
10	332°05.9	01.0	103°48.7	14.0′	17°33.1	10.0′	54.3′
11	347°06.1	01.9	118°21.6	13.9′	17°43.1	9.9′	54.3′
12	2°06.3	S01°02.9	132°54.6	13.9′	N17°53.0	9.8′	54.3′
13	17°06.6	03.9	147°27.4	13.8′	18°02.9	9.8′	54.3′
14	32°06.8	04.9	162°00.3	13.8′	18°12.6	9.7′	54.3′
15	47°07.0	·· 05.8	176°33.1	13.7′	18°22.3	9.6′	54.3′
16	62°07.2	06.8	191°05.8	13.7′	18°31.9	9.5′	54.2′
17	77°07.4	07.8	205°38.5	13.7′	18°41.4	9.4′	54.2′
18	92°07.6	S01°08.8	220°11.1	13.6′	N18°50.8	9.3′	54.2′
19	107°07.9	09.7	234°43.8	13.6′	19°00.2	9.3′	54.2′
20	122°08.1	10.7	249°16.3	13.5′	19°09.5	9.2′	54.2′
21	137°08.3	·· 11.7	263°48.8	13.5′	19°18.6	9.1′	54.2′
22	152°08.5	12.6	278°21.3	13.4′	19°27.7	9.0′	54.2′
23	167°08.7	13.6	292°53.7	13.4′	19°36.7	8.9′	54.2′
	SD = 15.9′	d = 1.0′		SD = 14.8′			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°08.9	S01°14.6	307°26.1	13.3′	N19°45.7	8.8′	54.2′
1	197°09.1	15.6	321°58.4	13.3′	19°54.5	8.8′	54.2′
2	212°09.4	16.5	336°30.7	13.2′	20°03.3	8.7′	54.2′
3	227°09.6	·· 17.5	351°03.0	13.2′	20°11.9	8.6′	54.2′
4	242°09.8	18.5	5°35.2	13.1′	20°20.5	8.5′	54.2′
5	257°10.0	19.5	20°07.3	13.1′	20°29.0	8.4′	54.2′
6	272°10.2	S01°20.4	34°39.4	13.0′	N20°37.4	8.3′	54.2′
7	287°10.4	21.4	49°11.4	13.0′	20°45.7	8.2′	54.2′
8	302°10.7	22.4	63°43.4	12.9′	20°53.9	8.1′	54.2′
9	317°10.9	·· 23.4	78°15.4	12.9′	21°02.1	8.0′	54.1′
10	332°11.1	24.3	92°47.3	12.8′	21°10.1	7.9′	54.1′
11	347°11.3	25.3	107°19.1	12.8′	21°18.0	7.8′	54.1′
12	2°11.5	S01°26.3	121°50.9	12.8′	N21°25.9	7.8′	54.1′
13	17°11.7	27.2	136°22.7	12.7′	21°33.6	7.7′	54.1′
14	32°11.9	28.2	150°54.4	12.7′	21°41.3	7.6′	54.1′
15	47°12.2	·· 29.2	165°26.0	12.6′	21°48.8	7.5′	54.1′
16	62°12.4	30.2	179°57.6	12.6′	21°56.3	7.4′	54.1′
17	77°12.6	31.1	194°29.2	12.5′	22°03.7	7.3′	54.1′
18	92°12.8	S01°32.1	209°00.7	12.5′	N22°11.0	7.2′	54.1′
19	107°13.0	33.1	223°32.1	12.4′	22°18.1	7.1′	54.1′
20	122°13.2	34.1	238°03.5	12.4′	22°25.2	7.0′	54.1′
21	137°13.4	·· 35.0	252°34.9	12.3′	22°32.2	6.9′	54.1′
22	152°13.6	36.0	267°06.2	12.3′	22°39.1	6.8′	54.1′
23	167°13.9	37.0	281°37.4	12.2′	22°45.8	6.7′	54.1′
	SD = 15.9′	d = 1.0′		SD = 14.8′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°14.1	S01°37.9	296°08.7	12.2′	N22°52.5	6.6′	54.1′
1	197°14.3	38.9	310°39.8	12.1′	22°59.1	6.5′	54.1′
2	212°14.5	39.9	325°10.9	12.1′	23°05.5	6.4′	54.1′
3	227°14.7	·· 40.9	339°42.0	12.0′	23°11.9	6.3′	54.1′
4	242°14.9	41.8	354°13.0	12.0′	23°18.2	6.2′	54.1′
5	257°15.1	42.8	8°43.9	11.9′	23°24.3	6.1′	54.1′
6	272°15.3	S01°43.8	23°14.8	11.9′	N23°30.4	5.9′	54.1′
7	287°15.6	44.8	37°45.7	11.8′	23°36.3	5.8′	54.1′
8	302°15.8	45.7	52°16.5	11.8′	23°42.1	5.7′	54.1′
9	317°16.0	·· 46.7	66°47.3	11.7′	23°47.9	5.6′	54.1′
10	332°16.2	47.7	81°18.0	11.7′	23°53.5	5.5′	54.1′
11	347°16.4	48.7	95°48.7	11.6′	23°59.0	5.4′	54.2′
12	2°16.6	S01°49.6	110°19.3	11.6′	N24°04.4	5.3′	54.2′
13	17°16.8	50.6	124°49.8	11.5′	24°09.7	5.2′	54.2′
14	32°17.0	51.6	139°20.4	11.5′	24°14.9	5.1′	54.2′
15	47°17.3	·· 52.5	153°50.8	11.4′	24°20.0	5.0′	54.2′
16	62°17.5	53.5	168°21.3	11.4′	24°25.0	4.9′	54.2′
17	77°17.7	54.5	182°51.7	11.3′	24°29.8	4.7′	54.2′
18	92°17.9	S01°55.5	197°22.0	11.3′	N24°34.5	4.6′	54.2′
19	107°18.1	56.4	211°52.3	11.2′	24°39.2	4.5′	54.2′
20	122°18.3	57.4	226°22.5	11.2′	24°43.7	4.4′	54.2′
21	137°18.5	·· 58.4	240°52.7	11.2′	24°48.1	4.3′	54.2′
22	152°18.7	01°59.3	255°22.9	11.1′	24°52.4	4.2′	54.2′
23	167°18.9	02°00.3	269°53.0	11.1′	24°56.6	4.1′	54.2′
	SD = 15.9′	d = 1.0′		SD = 14.8′			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	85-69%
25	08:15	08:25	11:52	02:52	15:14	
26	08:36	08:46	11:51	03:37	16:00	
27	08:56	09:06	11:51	04:24	16:48	

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°59.4	140°31.0	S19°31.3	178°57.4	S02°40.6	41°14.5	S14°58.0	57°21.1	S19°18.5
1	22°01.8	155°30.7	32.2	193°58.3	41.3	56°17.1	58.0	72°23.6	18.5
2	37°04.3	170°30.3	33.1	208°59.3	41.9	71°19.7	58.1	87°26.1	18.5
3	52°06.8	185°30.0	·· 34.1	224°00.3	·· 42.6	86°22.4	·· 58.1	102°28.6	·· 18.5
4	67°09.2	200°29.7	35.0	239°01.2	43.2	101°25.0	58.2	117°31.1	18.5
5	82°11.7	215°29.3	35.9	254°02.2	43.9	116°27.6	58.2	132°33.6	18.5
6	97°14.2	230°29.0	S19°36.8	269°03.2	S02°44.5	131°30.2	S14°58.3	147°36.2	S19°18.6
7	112°16.6	245°28.6	37.8	284°04.2	45.2	146°32.9	58.3	162°38.7	18.6
8	127°19.1	260°28.3	38.7	299°05.1	45.9	161°35.5	58.4	177°41.2	18.6
9	142°21.5	275°27.9	·· 39.6	314°06.1	·· 46.5	176°38.1	·· 58.4	192°43.7	·· 18.6
10	157°24.0	290°27.6	40.5	329°07.1	47.2	191°40.7	58.5	207°46.2	18.6
11	172°26.5	305°27.2	41.5	344°08.0	47.8	206°43.4	58.5	222°48.8	18.6
12	187°28.9	320°26.9	S19°42.4	359°09.0	S02°48.5	221°46.0	S14°58.6	237°51.3	S19°18.6
13	202°31.4	335°26.5	43.3	14°10.0	49.2	236°48.6	58.6	252°53.8	18.7
14	217°33.9	350°26.2	44.2	29°10.9	49.8	251°51.2	58.7	267°56.3	18.7
15	232°36.3	5°25.9	·· 45.1	44°11.9	·· 50.5	266°53.8	·· 58.7	282°58.8	·· 18.7
16	247°38.8	20°25.5	46.0	59°12.9	51.1	281°56.5	58.8	298°01.3	18.7
17	262°41.3	35°25.2	47.0	74°13.8	51.8	296°59.1	58.8	313°03.9	18.7
18	277°43.7	50°24.8	S19°47.9	89°14.8	S02°52.5	312°01.7	S14°58.9	328°06.4	S19°18.7
19	292°46.2	65°24.5	48.8	104°15.8	53.1	327°04.3	58.9	343°08.9	18.7
20	307°48.7	80°24.1	49.7	119°16.8	53.8	342°06.9	59.0	358°11.4	18.7
21	322°51.1	95°23.8	·· 50.6	134°17.7	·· 54.4	357°09.6	·· 59.0	13°13.9	·· 18.8
22	337°53.6	110°23.4	51.5	149°18.7	55.1	12°12.2	59.1	28°16.4	18.8
23	352°56.0	125°23.1	52.4	164°19.7	55.7	27°14.8	59.1	43°19.0	18.8
Mer.pass.	23:28	ν -0.3′	d 0.9′	m -4.23	ν 1.0′	d 0.7′	m 1.63	ν 2.6′	d 0.1′ m -2.73	ν 2.5′	d 0.0′ m 0.48
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	7°58.5	140°22.7	S19°53.4	179°20.6	S02°56.4	42°17.4	S14°59.2	58°21.5	S19°18.8
1	23°01.0	155°22.4	54.3	194°21.6	57.1	57°20.0	59.2	73°24.0	18.8
2	38°03.4	170°22.0	55.2	209°22.6	57.7	72°22.7	59.3	88°26.5	18.8
3	53°05.9	185°21.7	·· 56.1	224°23.5	·· 58.4	87°25.3	·· 59.3	103°29.0	·· 18.8
4	68°08.4	200°21.3	57.0	239°24.5	59.0	102°27.9	59.4	118°31.5	18.8
5	83°10.8	215°21.0	57.9	254°25.5	02°59.7	117°30.5	59.4	133°34.0	18.9
6	98°13.3	230°20.6	S19°58.8	269°26.4	S03°00.4	132°33.1	S14°59.5	148°36.6	S19°18.9
7	113°15.8	245°20.3	19°59.7	284°27.4	01.0	147°35.7	59.5	163°39.1	18.9
8	128°18.2	260°19.9	20°00.6	299°28.4	01.7	162°38.4	59.6	178°41.6	18.9
9	143°20.7	275°19.6	·· 01.5	314°29.3	·· 02.3	177°41.0	·· 59.6	193°44.1	·· 18.9
10	158°23.2	290°19.2	02.4	329°30.3	03.0	192°43.6	59.6	208°46.6	18.9
11	173°25.6	305°18.9	03.3	344°31.3	03.7	207°46.2	59.7	223°49.1	18.9
12	188°28.1	320°18.5	S20°04.2	359°32.2	S03°04.3	222°48.8	S14°59.7	238°51.6	S19°19.0
13	203°30.5	335°18.1	05.1	14°33.2	05.0	237°51.4	59.8	253°54.2	19.0
14	218°33.0	350°17.8	06.0	29°34.2	05.6	252°54.1	59.8	268°56.7	19.0
15	233°35.5	5°17.4	·· 06.9	44°35.1	·· 06.3	267°56.7	·· 59.9	283°59.2	·· 19.0
16	248°37.9	20°17.1	07.8	59°36.1	06.9	282°59.3	14°59.9	299°01.7	19.0
17	263°40.4	35°16.7	08.7	74°37.1	07.6	298°01.9	15°00.0	314°04.2	19.0
18	278°42.9	50°16.4	S20°09.6	89°38.0	S03°08.3	313°04.5	S15°00.0	329°06.7	S19°19.0
19	293°45.3	65°16.0	10.5	104°39.0	08.9	328°07.1	00.1	344°09.2	19.0
20	308°47.8	80°15.7	11.4	119°40.0	09.6	343°09.7	00.1	359°11.7	19.0
21	323°50.3	95°15.3	·· 12.3	134°40.9	·· 10.2	358°12.3	·· 00.2	14°14.3	·· 19.1
22	338°52.7	110°15.0	13.2	149°41.9	10.9	13°15.0	00.2	29°16.8	19.1
23	353°55.2	125°14.6	14.1	164°42.9	11.6	28°17.6	00.2	44°19.3	19.1
Mer.pass.	23:24	ν -0.3′	d 0.9′	m -4.24	ν 1.0′	d 0.7′	m 1.62	ν 2.6′	d 0.0′ m -2.73	ν 2.5′	d 0.0′ m 0.49
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°57.6	140°14.2	S20°15.0	179°43.8	S03°12.2	43°20.2	S15°00.3	59°21.8	S19°19.1
1	24°00.1	155°13.9	15.9	194°44.8	12.9	58°22.8	00.3	74°24.3	19.1
2	39°02.6	170°13.5	16.8	209°45.8	13.5	73°25.4	00.4	89°26.8	19.1
3	54°05.0	185°13.2	·· 17.7	224°46.7	·· 14.2	88°28.0	·· 00.4	104°29.3	·· 19.1
4	69°07.5	200°12.8	18.6	239°47.7	14.8	103°30.6	00.5	119°31.8	19.1
5	84°10.0	215°12.5	19.5	254°48.7	15.5	118°33.2	00.5	134°34.3	19.2
6	99°12.4	230°12.1	S20°20.3	269°49.6	S03°16.2	133°35.8	S15°00.6	149°36.9	S19°19.2
7	114°14.9	245°11.7	21.2	284°50.6	16.8	148°38.4	00.6	164°39.4	19.2
8	129°17.4	260°11.4	22.1	299°51.6	17.5	163°41.1	00.6	179°41.9	19.2
9	144°19.8	275°11.0	·· 23.0	314°52.5	·· 18.1	178°43.7	·· 00.7	194°44.4	·· 19.2
10	159°22.3	290°10.7	23.9	329°53.5	18.8	193°46.3	00.7	209°46.9	19.2
11	174°24.8	305°10.3	24.8	344°54.5	19.5	208°48.9	00.8	224°49.4	19.2
12	189°27.2	320°09.9	S20°25.7	359°55.4	S03°20.1	223°51.5	S15°00.8	239°51.9	S19°19.2
13	204°29.7	335°09.6	26.5	14°56.4	20.8	238°54.1	00.9	254°54.4	19.2
14	219°32.1	350°09.2	27.4	29°57.4	21.4	253°56.7	00.9	269°56.9	19.3
15	234°34.6	5°08.9	·· 28.3	44°58.3	·· 22.1	268°59.3	·· 01.0	284°59.4	·· 19.3
16	249°37.1	20°08.5	29.2	59°59.3	22.7	284°01.9	01.0	300°01.9	19.3
17	264°39.5	35°08.1	30.1	75°00.2	23.4	299°04.5	01.0	315°04.5	19.3
18	279°42.0	50°07.8	S20°30.9	90°01.2	S03°24.1	314°07.1	S15°01.1	330°07.0	S19°19.3
19	294°44.5	65°07.4	31.8	105°02.2	24.7	329°09.7	01.1	345°09.5	19.3
20	309°46.9	80°07.1	32.7	120°03.1	25.4	344°12.3	01.2	0°12.0	19.3
21	324°49.4	95°06.7	·· 33.6	135°04.1	·· 26.0	359°14.9	·· 01.2	15°14.5	·· 19.3
22	339°51.9	110°06.3	34.4	150°05.1	26.7	14°17.5	01.3	30°17.0	19.3
23	354°54.3	125°06.0	35.3	165°06.0	27.3	29°20.2	01.3	45°19.5	19.4
Mer.pass.	23:20	ν -0.4′	d 0.9′	m -4.24	ν 1.0′	d 0.7′	m 1.62	ν 2.6′	d 0.0′ m -2.72	ν 2.5′	d 0.0′ m 0.49

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.3
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.5
Hamal	327°53.9	23°33.9
Polaris	314°55.2	89°21.1
Acamar	315°13.5	-40°12.9
Menkar	314°08.7	4°10.5
Mirfak	308°31.7	49°56.1
Aldebaran	290°42.6	16°33.2
Rigel	281°06.4	-8°10.5
Capella	280°25.7	46°01.0
Bellatrix	278°25.7	6°22.2
Elnath	278°05.2	28°37.5
Alnilam	275°40.4	-1°11.2
Betelgeuse	270°55.0	7°24.7
Canopus	263°53.6	-52°42.1
Sirius	258°28.6	-16°44.5
Adhara	255°08.0	-28°59.8
Procyon	244°53.8	5°10.3
Pollux	243°20.7	27°58.4
Avior	234°16.1	-59°34.4
Suhail	222°48.5	-43°30.9
Miaplacidus	221°39.3	-69°48.0
Alphard	217°50.6	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.0	61°38.1
Denebola	182°28.0	14°27.3
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°16.0	55°50.7
Spica	158°25.5	-11°16.3
Alkaid	152°54.6	49°12.5
Hadar	148°40.4	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.5	-60°55.5
Kochab	137°20.8	74°04.2
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.1	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.1	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.5	51°29.5
Kaus Aust.	83°36.1	-34°22.5
Vega	80°35.0	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.7	-56°40.1
Deneb	49°27.4	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Sep 28 Tue	SHA	Mer.pass
Venus	133°31.7	14:38
Mars	171°58.0	12:03
Jupiter	34°15.1	21:11
Saturn	50°21.7	20:07

Sep 29 Wed	SHA	Mer.pass
Venus	132°24.2	14:39
Mars	171°22.1	12:02
Jupiter	34°18.9	21:07
Saturn	50°23.0	20:03

Sep 30 Thu	SHA	Mer.pass
Venus	131°16.6	14:39
Mars	170°46.2	12:00
Jupiter	34°22.5	21:03
Saturn	50°24.1	19:59

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°19.2	S02°01.3	284°23.1	11.0′	N25°00.6	3.9′	54.2′
1	197°19.4	02.3	298°53.1	11.0′	25°04.6	3.8′	54.2′
2	212°19.6	03.2	313°23.1	10.9′	25°08.4	3.7′	54.2′
3	227°19.8	·· 04.2	327°53.0	10.9′	25°12.1	3.6′	54.3′
4	242°20.0	05.2	342°22.9	10.9′	25°15.7	3.5′	54.3′
5	257°20.2	06.2	356°52.8	10.8′	25°19.1	3.4′	54.3′
6	272°20.4	S02°07.1	11°22.6	10.8′	N25°22.5	3.2′	54.3′
7	287°20.6	08.1	25°52.4	10.7′	25°25.7	3.1′	54.3′
8	302°20.8	09.1	40°22.1	10.7′	25°28.8	3.0′	54.3′
9	317°21.0	·· 10.0	54°51.8	10.7′	25°31.8	2.9′	54.3′
10	332°21.2	11.0	69°21.5	10.6′	25°34.7	2.8′	54.3′
11	347°21.5	12.0	83°51.1	10.6′	25°37.5	2.6′	54.3′
12	2°21.7	S02°13.0	98°20.7	10.6′	N25°40.1	2.5′	54.3′
13	17°21.9	13.9	112°50.3	10.5′	25°42.6	2.4′	54.4′
14	32°22.1	14.9	127°19.8	10.5′	25°45.0	2.3′	54.4′
15	47°22.3	·· 15.9	141°49.2	10.4′	25°47.3	2.1′	54.4′
16	62°22.5	16.9	156°18.7	10.4′	25°49.4	2.0′	54.4′
17	77°22.7	17.8	170°48.1	10.4′	25°51.4	1.9′	54.4′
18	92°22.9	S02°18.8	185°17.5	10.3′	N25°53.3	1.8′	54.4′
19	107°23.1	19.8	199°46.8	10.3′	25°55.1	1.6′	54.4′
20	122°23.3	20.7	214°16.1	10.3′	25°56.7	1.5′	54.4′
21	137°23.5	·· 21.7	228°45.4	10.3′	25°58.2	1.4′	54.5′
22	152°23.8	22.7	243°14.7	10.2′	25°59.6	1.3′	54.5′
23	167°24.0	23.7	257°43.9	10.2′	26°00.9	1.1′	54.5′
	SD = 16.0′	d = 1.0′	SD = 14.8′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°24.2	S02°24.6	272°13.1	10.2′	N26°02.0	1.0′	54.5′
1	197°24.4	25.6	286°42.2	10.1′	26°03.1	0.9′	54.5′
2	212°24.6	26.6	301°11.4	10.1′	26°04.0	0.8′	54.5′
3	227°24.8	·· 27.5	315°40.5	10.1′	26°04.7	0.6′	54.5′
4	242°25.0	28.5	330°09.6	10.1′	26°05.4	0.5′	54.6′
5	257°25.2	29.5	344°38.6	10.0′	26°05.9	0.4′	54.6′
6	272°25.4	S02°30.5	359°07.7	10.0′	N26°06.2	0.3′	54.6′
7	287°25.6	31.4	13°36.7	10.0′	26°06.5	0.1′	54.6′
8	302°25.8	32.4	28°05.7	10.0′	26°06.6	-0.0′	54.6′
9	317°26.0	·· 33.4	42°34.7	9.9′	26°06.6	-0.1′	54.6′
10	332°26.2	34.3	57°03.6	9.9′	26°06.5	-0.3′	54.7′
11	347°26.4	35.3	71°32.5	9.9′	26°06.2	-0.4′	54.7′
12	2°26.7	S02°36.3	86°01.4	9.9′	N26°05.8	-0.5′	54.7′
13	17°26.9	37.3	100°30.3	9.9′	26°05.3	-0.7′	54.7′
14	32°27.1	38.2	114°59.2	9.9′	26°04.6	-0.8′	54.7′
15	47°27.3	·· 39.2	129°28.0	9.8′	26°03.8	-0.9′	54.7′
16	62°27.5	40.2	143°56.9	9.8′	26°02.9	-1.0′	54.8′
17	77°27.7	41.1	158°25.7	9.8′	26°01.9	-1.2′	54.8′
18	92°27.9	S02°42.1	172°54.5	9.8′	N26°00.7	-1.3′	54.8′
19	107°28.1	43.1	187°23.3	9.8′	25°59.4	-1.4′	54.8′
20	122°28.3	44.1	201°52.1	9.8′	25°58.0	-1.6′	54.8′
21	137°28.5	·· 45.0	216°20.9	9.8′	25°56.4	-1.7′	54.9′
22	152°28.7	46.0	230°49.6	9.8′	25°54.7	-1.8′	54.9′
23	167°28.9	47.0	245°18.4	9.7′	25°52.8	-2.0′	54.9′
	SD = 16.0′	d = 1.0′	SD = 14.9′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°29.1	S02°47.9	259°47.1	9.7′	N25°50.9	-2.1′	54.9′
1	197°29.3	48.9	274°15.9	9.7′	25°48.8	-2.2′	55.0′
2	212°29.5	49.9	288°44.6	9.7′	25°46.6	-2.4′	55.0′
3	227°29.7	·· 50.8	303°13.3	9.7′	25°44.2	-2.5′	55.0′
4	242°29.9	51.8	317°42.0	9.7′	25°41.7	-2.6′	55.0′
5	257°30.1	52.8	332°10.7	9.7′	25°39.1	-2.8′	55.0′
6	272°30.4	S02°53.8	346°39.4	9.7′	N25°36.3	-2.9′	55.1′
7	287°30.6	54.7	1°08.1	9.7′	25°33.4	-3.0′	55.1′
8	302°30.8	55.7	15°36.8	9.7′	25°30.4	-3.1′	55.1′
9	317°31.0	·· 56.7	30°05.5	9.7′	25°27.3	-3.3′	55.1′
10	332°31.2	57.6	44°34.2	9.7′	25°24.0	-3.4′	55.2′
11	347°31.4	58.6	59°02.9	9.7′	25°20.6	-3.5′	55.2′
12	2°31.6	S02°59.6	73°31.6	9.7′	N25°17.0	-3.7′	55.2′
13	17°31.8	03°00.6	88°00.3	9.7′	25°13.4	-3.8′	55.2′
14	32°32.0	01.5	102°29.0	9.7′	25°09.6	-3.9′	55.3′
15	47°32.2	·· 02.5	116°57.7	9.7′	25°05.6	-4.1′	55.3′
16	62°32.4	03.5	131°26.4	9.7′	25°01.5	-4.2′	55.3′
17	77°32.6	04.4	145°55.2	9.7′	24°57.3	-4.3′	55.3′
18	92°32.8	S03°05.4	160°23.9	9.7′	N24°53.0	-4.5′	55.4′
19	107°33.0	06.4	174°52.6	9.7′	24°48.5	-4.6′	55.4′
20	122°33.2	07.3	189°21.3	9.7′	24°44.0	-4.7′	55.4′
21	137°33.4	·· 08.3	203°50.1	9.7′	24°39.2	-4.9′	55.4′
22	152°33.6	09.3	218°18.8	9.8′	24°34.4	-5.0′	55.5′
23	167°33.8	10.3	232°47.6	9.8′	24°29.4	-5.1′	55.5′
	SD = 16.0′	d = 1.0′	SD = 15.0′				

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

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 21-23 60-41%
28	09:17	09:27	11:51	05:13	17:38	
29	09:37	09:47	11:50	06:04	18:29	
30	09:56	10:06	11:50	06:55	19:21	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°56.8	140°05.6	S20°36.2	180°07.0	S03°28.0	44°22.8	S15°01.3	60°22.0	S19°19.4
1	24°59.3	155°05.3	37.1	195°08.0	28.7	59°25.4	01.4	75°24.5	19.4
2	40°01.7	170°04.9	37.9	210°08.9	29.3	74°28.0	01.4	90°27.0	19.4
3	55°04.2	185°04.5	·· 38.8	225°09.9	·· 30.0	89°30.6	·· 01.5	105°29.5	·· 19.4
4	70°06.6	200°04.2	39.7	240°10.8	30.6	104°33.2	01.5	120°32.0	19.4
5	85°09.1	215°03.8	40.5	255°11.8	31.3	119°35.8	01.6	135°34.5	19.4
6	100°11.6	230°03.4	S20°41.4	270°12.8	S03°32.0	134°38.4	S15°01.6	150°37.1	S19°19.4
7	115°14.0	245°03.1	42.3	285°13.7	32.6	149°41.0	01.6	165°39.6	19.4
8	130°16.5	260°02.7	43.1	300°14.7	33.3	164°43.6	01.7	180°42.1	19.5
9	145°19.0	275°02.3	·· 44.0	315°15.7	·· 33.9	179°46.2	·· 01.7	195°44.6	·· 19.5
10	160°21.4	290°02.0	44.9	330°16.6	34.6	194°48.8	01.8	210°47.1	19.5
11	175°23.9	305°01.6	45.7	345°17.6	35.2	209°51.4	01.8	225°49.6	19.5
12	190°26.4	320°01.2	S20°46.6	0°18.6	S03°35.9	224°54.0	S15°01.8	240°52.1	S19°19.5
13	205°28.8	335°00.9	47.5	15°19.5	36.6	239°56.6	01.9	255°54.6	19.5
14	220°31.3	350°00.5	48.3	30°20.5	37.2	254°59.2	01.9	270°57.1	19.5
15	235°33.7	5°00.1	·· 49.2	45°21.4	·· 37.9	270°01.8	·· 02.0	285°59.6	·· 19.5
16	250°36.2	19°59.8	50.1	60°22.4	38.5	285°04.4	02.0	301°02.1	19.5
17	265°38.7	34°59.4	50.9	75°23.4	39.2	300°07.0	02.1	316°04.6	19.5
18	280°41.1	49°59.0	S20°51.8	90°24.3	S03°39.8	315°09.6	S15°02.1	331°07.1	S19°19.6
19	295°43.6	64°58.7	52.6	105°25.3	40.5	330°12.2	02.1	346°09.6	19.6
20	310°46.1	79°58.3	53.5	120°26.3	41.2	345°14.8	02.2	1°12.1	19.6
21	325°48.5	94°57.9	·· 54.3	135°27.2	·· 41.8	0°17.4	·· 02.2	16°14.6	·· 19.6
22	340°51.0	109°57.6	55.2	150°28.2	42.5	15°20.0	02.3	31°17.1	19.6
23	355°53.5	124°57.2	56.1	165°29.1	43.1	30°22.6	02.3	46°19.6	19.6
Mer.pass.	23:16	ν -0.4′	d 0.9′	m -4.25	ν 1.0′	d 0.7′	m 1.61	ν 2.6′	d 0.0′	m -2.71	ν 2.5′	d 0.0′	m 0.49

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°55.9	139°56.8	S20°56.9	180°30.1	S03°43.8	45°25.2	S15°02.3	61°22.1	S19°19.6
1	25°58.4	154°56.5	57.8	195°31.1	44.4	60°27.7	02.4	76°24.6	19.6
2	41°00.9	169°56.1	58.6	210°32.0	45.1	75°30.3	02.4	91°27.1	19.6
3	56°03.3	184°55.7	20°59.5	225°33.0	·· 45.8	90°32.9	·· 02.5	106°29.6	·· 19.6
4	71°05.8	199°55.4	21°00.3	240°33.9	46.4	105°35.5	02.5	121°32.1	19.7
5	86°08.2	214°55.0	01.2	255°34.9	47.1	120°38.1	02.5	136°34.6	19.7
6	101°10.7	229°54.6	S21°02.0	270°35.9	S03°47.7	135°40.7	S15°02.6	151°37.2	S19°19.7
7	116°13.2	244°54.2	02.9	285°36.8	48.4	150°43.3	02.6	166°39.7	19.7
8	131°15.6	259°53.9	03.7	300°37.8	49.0	165°45.9	02.7	181°42.2	19.7
9	146°18.1	274°53.5	·· 04.6	315°38.8	·· 49.7	180°48.5	·· 02.7	196°44.7	·· 19.7
10	161°20.6	289°53.1	05.4	330°39.7	50.4	195°51.1	02.7	211°47.2	19.7
11	176°23.0	304°52.8	06.3	345°40.7	51.0	210°53.7	02.8	226°49.7	19.7
12	191°25.5	319°52.4	S21°07.1	0°41.6	S03°51.7	225°56.3	S15°02.8	241°52.2	S19°19.7
13	206°28.0	334°52.0	07.9	15°42.6	52.3	240°58.9	02.8	256°54.7	19.7
14	221°30.4	349°51.6	08.8	30°43.6	53.0	256°01.5	02.9	271°57.2	19.7
15	236°32.9	4°51.3	·· 09.6	45°44.5	·· 53.6	271°04.1	·· 02.9	286°59.7	·· 19.8
16	251°35.4	19°50.9	10.5	60°45.5	54.3	286°06.7	03.0	302°02.2	19.8
17	266°37.8	34°50.5	11.3	75°46.4	55.0	301°09.2	03.0	317°04.7	19.8
18	281°40.3	49°50.2	S21°12.2	90°47.4	S03°55.6	316°11.8	S15°03.0	332°07.2	S19°19.8
19	296°42.7	64°49.8	13.0	105°48.4	56.3	331°14.4	03.1	347°09.7	19.8
20	311°45.2	79°49.4	13.8	120°49.3	56.9	346°17.0	03.1	2°12.2	19.8
21	326°47.7	94°49.0	·· 14.7	135°50.3	·· 57.6	1°19.6	·· 03.2	17°14.7	·· 19.8
22	341°50.1	109°48.7	15.5	150°51.2	58.2	16°22.2	03.2	32°17.2	19.8
23	356°52.6	124°48.3	16.3	165°52.2	58.9	31°24.8	03.2	47°19.7	19.8
Mer.pass.	23:12	ν -0.4′	d 0.9′	m -4.26	ν 1.0′	d 0.7′	m 1.60	ν 2.6′	d 0.0′	m -2.71	ν 2.5′	d 0.0′	m 0.50

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	11°55.1	139°47.9	S21°17.2	180°53.2	S03°59.6	46°27.4	S15°03.3	62°22.2	S19°19.8
1	26°57.5	154°47.5	18.0	195°54.1	04°00.2	61°30.0	03.3	77°24.7	19.8
2	42°00.0	169°47.2	18.8	210°55.1	00.9	76°32.5	03.3	92°27.2	19.9
3	57°02.5	184°46.8	·· 19.7	225°56.0	·· 01.5	91°35.1	·· 03.4	107°29.7	·· 19.9
4	72°04.9	199°46.4	20.5	240°57.0	02.2	106°37.7	03.4	122°32.2	19.9
5	87°07.4	214°46.0	21.3	255°57.9	02.8	121°40.3	03.4	137°34.6	19.9
6	102°09.8	229°45.7	S21°22.2	270°58.9	S04°03.5	136°42.9	S15°03.5	152°37.1	S19°19.9
7	117°12.3	244°45.3	23.0	285°59.9	04.2	151°45.5	03.5	167°39.6	19.9
8	132°14.8	259°44.9	23.8	301°00.8	04.8	166°48.1	03.6	182°42.1	19.9
9	147°17.2	274°44.5	·· 24.6	316°01.8	·· 05.5	181°50.7	·· 03.6	197°44.6	·· 19.9
10	162°19.7	289°44.1	25.5	331°02.7	06.1	196°53.2	03.6	212°47.1	19.9
11	177°22.2	304°43.8	26.3	346°03.7	06.8	211°55.8	03.7	227°49.6	19.9
12	192°24.6	319°43.4	S21°27.1	1°04.7	S04°07.4	226°58.4	S15°03.7	242°52.1	S19°19.9
13	207°27.1	334°43.0	27.9	16°05.6	08.1	242°01.0	03.7	257°54.6	19.9
14	222°29.6	349°42.6	28.8	31°06.6	08.7	257°03.6	03.8	272°57.1	20.0
15	237°32.0	4°42.3	·· 29.6	46°07.5	·· 09.4	272°06.2	·· 03.8	287°59.6	·· 20.0
16	252°34.5	19°41.9	30.4	61°08.5	10.1	287°08.7	03.8	303°02.1	20.0
17	267°37.0	34°41.5	31.2	76°09.4	10.7	302°11.3	03.9	318°04.6	20.0
18	282°39.4	49°41.1	S21°32.0	91°10.4	S04°11.4	317°13.9	S15°03.9	333°07.1	S19°20.0
19	297°41.9	64°40.7	32.9	106°11.4	12.0	332°16.5	04.0	348°09.6	20.0
20	312°44.3	79°40.4	33.7	121°12.3	12.7	347°19.1	04.0	3°12.1	20.0
21	327°46.8	94°40.0	·· 34.5	136°13.3	·· 13.3	2°21.7	·· 04.0	18°14.6	·· 20.0
22	342°49.3	109°39.6	35.3	151°14.2	14.0	17°24.2	04.1	33°17.1	20.0
23	357°51.7	124°39.2	36.1	166°15.2	14.7	32°26.8	04.1	48°19.6	20.0
Mer.pass.	23:09	ν -0.4′	d 0.8′	m -4.27	ν 1.0′	d 0.7′	m 1.60	ν 2.6′	d 0.0′	m -2.70	ν 2.5′	d 0.0′	m 0.50

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.4
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.5
Hamal	327°53.9	23°33.9
Polaris	314°54.1	89°21.1
Acamar	315°13.5	-40°12.9
Menkar	314°08.7	4°10.5
Mirfak	308°31.7	49°56.1
Aldebaran	290°42.5	16°33.2
Rigel	281°06.3	-8°10.5
Capella	280°25.7	46°01.0
Bellatrix	278°25.7	6°22.2
Elnath	278°05.2	28°37.5
Alnilam	275°40.4	-1°11.2
Betelgeuse	270°54.9	7°24.7
Canopus	263°53.5	-52°42.1
Sirius	258°28.6	-16°44.5
Adhara	255°08.0	-28°59.8
Procyon	244°53.7	5°10.3
Pollux	243°20.7	27°58.4
Avior	234°16.1	-59°34.4
Suhail	222°48.5	-43°30.9
Miaplacidus	221°39.3	-69°48.0
Alphard	217°50.6	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.0	61°38.1
Denebola	182°28.0	14°27.2
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°16.0	55°50.7
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.5
Hadar	148°40.4	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.5	-60°55.5
Kochab	137°20.8	74°04.2
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.2	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.1	-37°07.2
Rasalhague	96°01.1	12°32.9
Eltanin	90°43.5	51°29.5
Kaus Aust.	83°36.1	-34°22.5
Vega	80°35.0	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.7	-56°40.1
Deneb	49°27.4	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Oct 01 Fri	SHA	Mer.pass
Venus	130°08.8	14:40
Mars	170°10.2	11:59
Jupiter	34°26.0	20:59
Saturn	50°25.2	19:55

Oct 02 Sat	SHA	Mer.pass
Venus	129°00.9	14:41
Mars	169°34.2	11:57
Jupiter	34°29.2	20:55
Saturn	50°26.2	19:51

Oct 03 Sun	SHA	Mer.pass
Venus	127°52.8	14:41
Mars	168°58.1	11:56
Jupiter	34°32.3	20:51
Saturn	50°27.1	19:47

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		182°34.0	S03°11.2	247°16.4	9.8′	N24°24.3	-5.2′	55.5′
1		197°34.2	12.2	261°45.1	9.8′	24°19.0	-5.4′	55.6′
2		212°34.4	13.2	276°13.9	9.8′	24°13.6	-5.5′	55.6′
3		227°34.6	·· 14.1	290°42.7	9.8′	24°08.1	-5.6′	55.6′
4		242°34.8	15.1	305°11.5	9.8′	24°02.5	-5.8′	55.6′
5		257°35.0	16.1	319°40.4	9.8′	23°56.7	-5.9′	55.7′
6		272°35.2	S03°17.0	334°09.2	9.9′	N23°50.9	-6.0′	55.7′
7		287°35.4	18.0	348°38.1	9.9′	23°44.8	-6.1′	55.7′
8		302°35.6	19.0	3°06.9	9.9′	23°38.7	-6.3′	55.8′
9		317°35.8	·· 19.9	17°35.8	9.9′	23°32.4	-6.4′	55.8′
10		332°36.0	20.9	32°04.7	9.9′	23°26.0	-6.5′	55.8′
11		347°36.2	21.9	46°33.6	9.9′	23°19.5	-6.7′	55.8′
12		2°36.4	S03°22.9	61°02.6	10.0′	N23°12.8	-6.8′	55.9′
13		17°36.6	23.8	75°31.5	10.0′	23°06.0	-6.9′	55.9′
14		32°36.8	24.8	90°00.5	10.0′	22°59.1	-7.0′	55.9′
15		47°37.0	·· 25.8	104°29.5	10.0′	22°52.1	-7.2′	56.0′
16		62°37.2	26.7	118°58.5	10.0′	22°44.9	-7.3′	56.0′
17		77°37.4	27.7	133°27.5	10.0′	22°37.7	-7.4′	56.0′
18		92°37.6	S03°28.7	147°56.6	10.1′	N22°30.2	-7.5′	56.1′
19		107°37.8	29.6	162°25.7	10.1′	22°22.7	-7.7′	56.1′
20		122°38.0	30.6	176°54.8	10.1′	22°15.1	-7.8′	56.1′
21		137°38.2	·· 31.6	191°23.9	10.1′	22°07.3	-7.9′	56.2′
22		152°38.4	32.5	205°53.0	10.2′	21°59.4	-8.0′	56.2′
23		167°38.6	33.5	220°22.2	10.2′	21°51.4	-8.1′	56.2′
		SD = 16.0′	d = 1.0′	SD = 15.1′				

Sat	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		182°38.8	S03°34.5	234°51.3	10.2′	N21°43.2	-8.3′	56.2′
1		197°39.0	35.4	249°20.5	10.2′	21°34.9	-8.4′	56.3′
2		212°39.2	36.4	263°49.8	10.2′	21°26.6	-8.5′	56.3′
3		227°39.4	·· 37.4	278°19.0	10.3′	21°18.1	-8.6′	56.3′
4		242°39.6	38.3	292°48.3	10.3′	21°09.4	-8.7′	56.4′
5		257°39.8	39.3	307°17.6	10.3′	21°00.7	-8.9′	56.4′
6		272°40.0	S03°40.3	321°46.9	10.3′	N20°51.8	-9.0′	56.4′
7		287°40.2	41.2	336°16.2	10.4′	20°42.8	-9.1′	56.5′
8		302°40.4	42.2	350°45.6	10.4′	20°33.7	-9.2′	56.5′
9		317°40.6	·· 43.2	5°15.0	10.4′	20°24.5	-9.3′	56.5′
10		332°40.8	44.1	19°44.4	10.4′	20°15.2	-9.4′	56.6′
11		347°41.0	45.1	34°13.8	10.5′	20°05.8	-9.6′	56.6′
12		2°41.2	S03°46.1	48°43.3	10.5′	N19°56.2	-9.7′	56.6′
13		17°41.4	47.1	63°12.8	10.5′	19°46.5	-9.8′	56.7′
14		32°41.6	48.0	77°42.3	10.5′	19°36.7	-9.9′	56.7′
15		47°41.8	·· 49.0	92°11.8	10.6′	19°26.8	-10.0′	56.7′
16		62°42.0	50.0	106°41.4	10.6′	19°16.8	-10.1′	56.8′
17		77°42.2	50.9	121°11.0	10.6′	19°06.7	-10.2′	56.8′
18		92°42.4	S03°51.9	135°40.6	10.6′	N18°56.5	-10.3′	56.9′
19		107°42.6	52.9	150°10.2	10.7′	18°46.1	-10.5′	56.9′
20		122°42.8	53.8	164°39.9	10.7′	18°35.7	-10.6′	56.9′
21		137°43.0	·· 54.8	179°09.6	10.7′	18°25.1	-10.7′	57.0′
22		152°43.2	55.8	193°39.3	10.7′	18°14.5	-10.8′	57.0′
23		167°43.3	56.7	208°09.1	10.8′	18°03.7	-10.9′	57.0′
		SD = 16.0′	d = 1.0′	SD = 15.3′				

Sun	GHA	GHA	Dec	GHA	ν	Dec	d	HP
0		182°43.5	S03°57.7	222°38.8	10.8′	N17°52.8	-11.0′	57.1′
1		197°43.7	58.7	237°08.6	10.8′	17°41.8	-11.1′	57.1′
2		212°43.9	03°59.6	251°38.4	10.8′	17°30.7	-11.2′	57.1′
3		227°44.1	04°00.6	266°08.3	10.9′	17°19.5	-11.3′	57.2′
4		242°44.3	01.5	280°38.1	10.9′	17°08.2	-11.4′	57.2′
5		257°44.5	02.5	295°08.0	10.9′	16°56.8	-11.5′	57.2′
6		272°44.7	S04°03.5	309°37.9	10.9′	N16°45.3	-11.6′	57.3′
7		287°44.9	04.4	324°07.8	11.0′	16°33.7	-11.7′	57.3′
8		302°45.1	05.4	338°37.8	11.0′	16°22.0	-11.8′	57.3′
9		317°45.3	·· 06.4	353°07.8	11.0′	16°10.2	-11.9′	57.4′
10		332°45.5	07.3	7°37.8	11.0′	15°58.3	-12.0′	57.4′
11		347°45.7	08.3	22°07.8	11.0′	15°46.3	-12.1′	57.4′
12		2°45.9	S04°09.3	36°37.8	11.1′	N15°34.2	-12.2′	57.5′
13		17°46.1	10.2	51°07.9	11.1′	15°22.1	-12.3′	57.5′
14		32°46.3	11.2	65°38.0	11.1′	15°09.8	-12.4′	57.6′
15		47°46.5	·· 12.2	80°08.1	11.1′	14°57.4	-12.5′	57.6′
16		62°46.6	13.1	94°38.2	11.1′	14°44.9	-12.6′	57.6′
17		77°46.8	14.1	109°08.4	11.2′	14°32.4	-12.6′	57.7′
18		92°47.0	S04°15.1	123°38.5	11.2′	N14°19.7	-12.7′	57.7′
19		107°47.2	16.0	138°08.7	11.2′	14°07.0	-12.8′	57.7′
20		122°47.4	17.0	152°38.9	11.2′	13°54.2	-12.9′	57.8′
21		137°47.6	·· 18.0	167°09.2	11.2′	13°41.3	-13.0′	57.8′
22		152°47.8	18.9	181°39.4	11.3′	13°28.3	-13.1′	57.8′
23		167°48.0	19.9	196°09.7	11.3′	13°15.2	-13.2′	57.9′
		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°	04:06	05:19	06:20	17:16	18:17	19:29
68°	04:15	05:22	06:17	17:20	18:15	19:20
66°	04:23	05:23	06:14	17:23	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	17:34	18:09	18:50
52°	04:50	05:29	06:03	17:35	18:08	18:47
50°	04:52	05:29	06:02	17:36	18:08	18:46
45°	04:56	05:30	05:59	17:38	18:08	18:42
N 40°	04:59	05:30	05:57	17:41	18:08	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	18:59
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	18:14	18:49	19:30
54°	04:04	04:48	05:23	18:16	18:52	19:36
56°	03:58	04:44	05:22	18:18	18:56	19:42
58°	03:51	04:40	05:20	18:20	19:00	19:50
S 60°	03:42	04:35	05:17	18:23	19:06	19:58

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

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 32-15%
01	10:16	10:26	11:50	07:47	20:13	
02	10:35	10:45	11:49	08:38	21:03	
03	10:54	11:04	11:49	09:28	21:53	

DUT1 = UT1-UTC = -0.1041 sec ΔT = TT-UT1 = +69.2881 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	12°54.2	139°38.8	S21°36.9	181°16.2	S04°15.3	47°29.4	S15°04.1	63°22.1	S19°20.0
1	27°56.7	154°38.5	37.8	196°17.1	16.0	62°32.0	04.2	78°24.6	20.0
2	42°59.1	169°38.1	38.6	211°18.1	16.6	77°34.6	04.2	93°27.1	20.0
3	58°01.6	184°37.7	·· 39.4	226°19.0	·· 17.3	92°37.1	·· 04.2	108°29.6	·· 20.1
4	73°04.1	199°37.3	40.2	241°20.0	17.9	107°39.7	04.3	123°32.1	20.1
5	88°06.5	214°36.9	41.0	256°20.9	18.6	122°42.3	04.3	138°34.6	20.1
6	103°09.0	229°36.5	S21°41.8	271°21.9	S04°19.2	137°44.9	S15°04.3	153°37.0	S19°20.1
7	118°11.5	244°36.2	42.6	286°22.8	19.9	152°47.5	04.4	168°39.5	20.1
8	133°13.9	259°35.8	43.4	301°23.8	20.6	167°50.0	04.4	183°42.0	20.1
9	148°16.4	274°35.4	·· 44.2	316°24.8	·· 21.2	182°52.6	·· 04.4	198°44.5	·· 20.1
10	163°18.8	289°35.0	45.0	331°25.7	21.9	197°55.2	04.5	213°47.0	20.1
11	178°21.3	304°34.6	45.8	346°26.7	22.5	212°57.8	04.5	228°49.5	20.1
12	193°23.8	319°34.3	S21°46.6	1°27.6	S04°23.2	228°00.4	S15°04.5	243°52.0	S19°20.1
13	208°26.2	334°33.9	47.5	16°28.6	23.8	243°02.9	04.6	258°54.5	20.1
14	223°28.7	349°33.5	48.3	31°29.5	24.5	258°05.5	04.6	273°57.0	20.1
15	238°31.2	4°33.1	·· 49.1	46°30.5	·· 25.1	273°08.1	·· 04.6	288°59.5	·· 20.1
16	253°33.6	19°32.7	49.9	61°31.5	25.8	288°10.7	04.7	304°02.0	20.2
17	268°36.1	34°32.3	50.7	76°32.4	26.5	303°13.2	04.7	319°04.5	20.2
18	283°38.6	49°31.9	S21°51.5	91°33.4	S04°27.1	318°15.8	S15°04.7	334°07.0	S19°20.2
19	298°41.0	64°31.6	52.3	106°34.3	27.8	333°18.4	04.8	349°09.4	20.2
20	313°43.5	79°31.2	53.0	121°35.3	28.4	348°21.0	04.8	4°11.9	20.2
21	328°45.9	94°30.8	·· 53.8	136°36.2	·· 29.1	3°23.5	·· 04.8	19°14.4	·· 20.2
22	343°48.4	109°30.4	54.6	151°37.2	29.7	18°26.1	04.9	34°16.9	20.2
23	358°50.9	124°30.0	55.4	166°38.1	30.4	33°28.7	04.9	49°19.4	20.2
Mer.pass.	23:05	ν -0.4′	d 0.8′	m -4.28	ν 1.0′	d 0.7′	m 1.59	ν 2.6′	d 0.0′ m -2.69	ν 2.5′	d 0.0′ m 0.51

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°53.3	139°29.6	S21°56.2	181°39.1	S04°31.0	48°31.3	S15°04.9	64°21.9	S19°20.2
1	28°55.8	154°29.2	57.0	196°40.0	31.7	63°33.8	05.0	79°24.4	20.2
2	43°58.3	169°28.9	57.8	211°41.0	32.3	78°36.4	05.0	94°26.9	20.2
3	59°00.7	184°28.5	·· 58.6	226°42.0	·· 33.0	93°39.0	·· 05.0	109°29.4	·· 20.2
4	74°03.2	199°28.1	21°59.4	241°42.9	33.7	108°41.5	05.0	124°31.9	20.2
5	89°05.7	214°27.7	22°00.2	256°43.9	34.3	123°44.1	05.1	139°34.3	20.2
6	104°08.1	229°27.3	S22°01.0	271°44.8	S04°35.0	138°46.7	S15°05.1	154°36.8	S19°20.2
7	119°10.6	244°26.9	01.8	286°45.8	35.6	153°49.3	05.1	169°39.3	20.2
8	134°13.1	259°26.5	02.5	301°46.7	36.3	168°51.8	05.2	184°41.8	20.3
9	149°15.5	274°26.1	·· 03.3	316°47.7	·· 36.9	183°54.4	·· 05.2	199°44.3	·· 20.3
10	164°18.0	289°25.8	04.1	331°48.6	37.6	198°57.0	05.2	214°46.8	20.3
11	179°20.4	304°25.4	04.9	346°49.6	38.2	213°59.5	05.3	229°49.3	20.3
12	194°22.9	319°25.0	S22°05.7	1°50.5	S04°38.9	229°02.1	S15°05.3	244°51.8	S19°20.3
13	209°25.4	334°24.6	06.5	16°51.5	39.6	244°04.7	05.3	259°54.3	20.3
14	224°27.8	349°24.2	07.2	31°52.4	40.2	259°07.2	05.4	274°56.7	20.3
15	239°30.3	4°23.8	·· 08.0	46°53.4	·· 40.9	274°09.8	·· 05.4	289°59.2	·· 20.3
16	254°32.8	19°23.4	08.8	61°54.4	41.5	289°12.4	05.4	305°01.7	20.3
17	269°35.2	34°23.0	09.6	76°55.3	42.2	304°14.9	05.4	320°04.2	20.3
18	284°37.7	49°22.6	S22°10.4	91°56.3	S04°42.8	319°17.5	S15°05.5	335°06.7	S19°20.3
19	299°40.2	64°22.3	11.1	106°57.2	43.5	334°20.1	05.5	350°09.2	20.3
20	314°42.6	79°21.9	11.9	121°58.2	44.1	349°22.6	05.5	5°11.7	20.3
21	329°45.1	94°21.5	·· 12.7	136°59.1	·· 44.8	4°25.2	·· 05.6	20°14.2	·· 20.3
22	344°47.5	109°21.1	13.5	152°00.1	45.4	19°27.8	05.6	35°16.6	20.3
23	359°50.0	124°20.7	14.2	167°01.0	46.1	34°30.3	05.6	50°19.1	20.3
Mer.pass.	23:01	ν -0.4′	d 0.8′	m -4.29	ν 1.0′	d 0.7′	m 1.59	ν 2.6′	d 0.0′ m -2.69	ν 2.5′	d 0.0′ m 0.51

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°52.5	139°20.3	S22°15.0	182°02.0	S04°46.7	49°32.9	S15°05.7	65°21.6	S19°20.3
1	29°54.9	154°19.9	15.8	197°02.9	47.4	64°35.5	05.7	80°24.1	20.4
2	44°57.4	169°19.5	16.6	212°03.9	48.1	79°38.0	05.7	95°26.6	20.4
3	59°59.9	184°19.1	·· 17.3	227°04.8	·· 48.7	94°40.6	·· 05.7	110°29.1	·· 20.4
4	75°02.3	199°18.7	18.1	242°05.8	49.4	109°43.2	05.8	125°31.6	20.4
5	90°04.8	214°18.3	18.9	257°06.7	50.0	124°45.7	05.8	140°34.0	20.4
6	105°07.3	229°17.9	S22°19.6	272°07.7	S04°50.7	139°48.3	S15°05.8	155°36.5	S19°20.4
7	120°09.7	244°17.6	20.4	287°08.6	51.3	154°50.9	05.9	170°39.0	20.4
8	135°12.2	259°17.2	21.2	302°09.6	52.0	169°53.4	05.9	185°41.5	20.4
9	150°14.7	274°16.8	·· 21.9	317°10.5	·· 52.6	184°56.0	·· 05.9	200°44.0	·· 20.4
10	165°17.1	289°16.4	22.7	332°11.5	53.3	199°58.5	05.9	215°46.5	20.4
11	180°19.6	304°16.0	23.5	347°12.4	53.9	215°01.1	06.0	230°49.0	20.4
12	195°22.0	319°15.6	S22°24.2	2°13.4	S04°54.6	230°03.7	S15°06.0	245°51.4	S19°20.4
13	210°24.5	334°15.2	25.0	17°14.3	55.3	245°06.2	06.0	260°53.9	20.4
14	225°27.0	349°14.8	25.7	32°15.3	55.9	260°08.8	06.0	275°56.4	20.4
15	240°29.4	4°14.4	·· 26.5	47°16.2	·· 56.6	275°11.4	·· 06.1	290°58.9	·· 20.4
16	255°31.9	19°14.0	27.3	62°17.2	57.2	290°13.9	06.1	306°01.4	20.4
17	270°34.4	34°13.6	28.0	77°18.1	57.9	305°16.5	06.1	321°03.9	20.4
18	285°36.8	49°13.2	S22°28.8	92°19.1	S04°58.5	320°19.0	S15°06.2	336°06.3	S19°20.4
19	300°39.3	64°12.8	29.5	107°20.0	59.2	335°21.6	06.2	351°08.8	20.4
20	315°41.8	79°12.4	30.3	122°21.0	04°59.8	350°24.2	06.2	6°11.3	20.4
21	330°44.2	94°12.0	·· 31.0	137°21.9	05°00.5	5°26.7	·· 06.2	21°13.8	·· 20.5
22	345°46.7	109°11.6	31.8	152°22.9	01.1	20°29.3	06.3	36°16.3	20.5
23	0°49.1	124°11.2	32.5	167°23.8	01.8	35°31.8	06.3	51°18.8	20.5
Mer.pass.	22:57	ν -0.4′	d 0.8′	m -4.30	ν 1.0′	d 0.7′	m 1.58	ν 2.6′	d 0.0′ m -2.68	ν 2.5′	d 0.0′ m 0.52

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.4
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.6
Hamal	327°53.9	23°33.9
Polaris	314°53.2	89°21.1
Acamar	315°13.5	-40°12.9
Menkar	314°08.7	4°10.5
Mirfak	308°31.7	49°56.1
Aldebaran	290°42.5	16°33.2
Rigel	281°06.3	-8°10.5
Capella	280°25.7	46°01.0
Bellatrix	278°25.6	6°22.2
Elnath	278°05.1	28°37.5
Alnilam	275°40.4	-1°11.2
Betelgeuse	270°54.9	7°24.7
Canopus	263°53.5	-52°42.1
Sirius	258°28.6	-16°44.5
Adhara	255°08.0	-28°59.8
Procyon	244°53.7	5°10.3
Pollux	243°20.7	27°58.4
Avior	234°16.0	-59°34.4
Suhail	222°48.5	-43°30.9
Miaplacidus	221°39.3	-69°48.0
Alphard	217°50.6	-8°44.9
Regulus	207°37.6	11°51.8
Dubhe	193°45.0	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°15.9	55°50.7
Spica	158°25.5	-11°16.3
Alkaid	152°54.6	49°12.5
Hadar	148°40.4	-60°28.6
Menkent	148°01.1	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°20.8	74°04.2
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.8
Antares	112°19.3	-26°28.7
Atria	107°16.2	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.9
Eltanin	90°43.6	51°29.5
Kaus Aust.	83°36.1	-34°22.5
Vega	80°35.1	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.8	-56°40.1
Deneb	49°27.4	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Oct 04 Mon	SHA	Mer.pass
Venus	126°44.6	14:42
Mars	168°21.9	11:54
Jupiter	34°35.2	20:46
Saturn	50°27.9	19:43

Oct 05 Tue	SHA	Mer.pass
Venus	125°36.3	14:42
Mars	167°45.8	11:53
Jupiter	34°37.9	20:42
Saturn	50°28.6	19:39

Oct 06 Wed	SHA	Mer.pass
Venus	124°27.8	14:43
Mars	167°09.5	11:51
Jupiter	34°40.4	20:38
Saturn	50°29.1	19:35

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°48.2	S04°20.9	210°39.9	11.3′	N13°02.0	-13.3′	57.9′
1	197°48.4	21.8	225°10.2	11.3′	12°48.8	-13.3′	57.9′
2	212°48.6	22.8	239°40.6	11.3′	12°35.4	-13.4′	58.0′
3	227°48.8	·· 23.7	254°10.9	11.3′	12°22.0	-13.5′	58.0′
4	242°49.0	24.7	268°41.2	11.4′	12°08.5	-13.6′	58.0′
5	257°49.1	25.7	283°11.6	11.4′	11°54.9	-13.7′	58.1′
6	272°49.3	S04°26.6	297°41.9	11.4′	N11°41.3	-13.7′	58.1′
7	287°49.5	27.6	312°12.3	11.4′	11°27.6	-13.8′	58.1′
8	302°49.7	28.6	326°42.7	11.4′	11°13.8	-13.9′	58.2′
9	317°49.9	·· 29.5	341°13.1	11.4′	10°59.9	-14.0′	58.2′
10	332°50.1	30.5	355°43.5	11.4′	10°45.9	-14.0′	58.2′
11	347°50.3	31.5	10°14.0	11.4′	10°31.9	-14.1′	58.3′
12	2°50.5	S04°32.4	24°44.4	11.4′	N10°17.8	-14.2′	58.3′
13	17°50.7	33.4	39°14.8	11.5′	10°03.7	-14.2′	58.3′
14	32°50.9	34.3	53°45.3	11.5′	09°49.4	-14.3′	58.4′
15	47°51.0	·· 35.3	68°15.8	11.5′	09°35.1	-14.4′	58.4′
16	62°51.2	36.3	82°46.2	11.5′	09°20.7	-14.4′	58.4′
17	77°51.4	37.2	97°16.7	11.5′	09°06.3	-14.5′	58.5′
18	92°51.6	S04°38.2	111°47.2	11.5′	N08°51.8	-14.6′	58.5′
19	107°51.8	39.2	126°17.7	11.5′	08°37.3	-14.6′	58.5′
20	122°52.0	40.1	140°48.2	11.5′	08°22.6	-14.7′	58.6′
21	137°52.2	·· 41.1	155°18.6	11.5′	08°08.0	-14.7′	58.6′
22	152°52.4	42.0	169°49.1	11.5′	07°53.2	-14.8′	58.6′
23	167°52.6	43.0	184°19.6	11.5′	07°38.4	-14.9′	58.7′
	SD = 16.0′	d = 1.0′	SD = 15.8′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°52.7	S04°44.0	198°50.1	11.5′	N07°23.6	-14.9′	58.7′
1	197°52.9	44.9	213°20.6	11.5′	07°08.7	-15.0′	58.7′
2	212°53.1	45.9	227°51.1	11.5′	06°53.7	-15.0′	58.8′
3	227°53.3	·· 46.9	242°21.6	11.5′	06°38.7	-15.1′	58.8′
4	242°53.5	47.8	256°52.1	11.5′	06°23.6	-15.1′	58.8′
5	257°53.7	48.8	271°22.6	11.5′	06°08.5	-15.2′	58.9′
6	272°53.9	S04°49.7	285°53.1	11.5′	N05°53.3	-15.2′	58.9′
7	287°54.0	50.7	300°23.6	11.5′	05°38.1	-15.3′	58.9′
8	302°54.2	51.7	314°54.0	11.5′	05°22.9	-15.3′	59.0′
9	317°54.4	·· 52.6	329°24.5	11.5′	05°07.6	-15.3′	59.0′
10	332°54.6	53.6	343°55.0	11.5′	04°52.2	-15.4′	59.0′
11	347°54.8	54.5	358°25.4	11.4′	04°36.8	-15.4′	59.0′
12	2°55.0	S04°55.5	12°55.9	11.4′	N04°21.4	-15.5′	59.1′
13	17°55.2	56.5	27°26.3	11.4′	04°05.9	-15.5′	59.1′
14	32°55.4	57.4	41°56.7	11.4′	03°50.4	-15.5′	59.1′
15	47°55.5	·· 58.4	56°27.1	11.4′	03°34.9	-15.6′	59.2′
16	62°55.7	04°59.4	70°57.5	11.4′	03°19.3	-15.6′	59.2′
17	77°55.9	05°00.3	85°27.9	11.4′	03°03.7	-15.6′	59.2′
18	92°56.1	S05°01.3	99°58.3	11.3′	N02°48.1	-15.7′	59.2′
19	107°56.3	02.2	114°28.6	11.3′	02°32.4	-15.7′	59.3′
20	122°56.5	03.2	128°58.9	11.3′	02°16.7	-15.7′	59.3′
21	137°56.6	·· 04.2	143°29.2	11.3′	02°01.0	-15.7′	59.3′
22	152°56.8	05.1	157°59.5	11.3′	01°45.3	-15.8′	59.3′
23	167°57.0	06.1	172°29.8	11.3′	01°29.5	-15.8′	59.4′
	SD = 16.0′	d = 1.0′	SD = 16.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°57.2	S05°07.0	187°00.1	11.2′	N01°13.7	-15.8′	59.4′
1	197°57.4	08.0	201°30.3	11.2′	00°57.9	-15.8′	59.4′
2	212°57.6	09.0	216°00.5	11.2′	00°42.1	-15.8′	59.4′
3	227°57.7	·· 09.9	230°30.7	11.2′	00°26.2	-15.9′	59.5′
4	242°57.9	10.9	245°00.9	11.1′	N00°10.4	-15.9′	59.5′
5	257°58.1	11.8	259°31.0	11.1′	S00°05.5	15.9′	59.5′
6	272°58.3	S05°12.8	274°01.1	11.1′	S00°21.4	15.9′	59.5′
7	287°58.5	13.7	288°31.2	11.1′	00°37.3	15.9′	59.6′
8	302°58.7	14.7	303°01.2	11.0′	00°53.2	15.9′	59.6′
9	317°58.8	·· 15.7	317°31.3	11.0′	01°09.1	15.9′	59.6′
10	332°59.0	16.6	332°01.3	11.0′	01°25.1	15.9′	59.6′
11	347°59.2	17.6	346°31.2	10.9′	01°41.0	15.9′	59.7′
12	2°59.4	S05°18.5	1°01.2	10.9′	S01°56.9	15.9′	59.7′
13	17°59.6	19.5	15°31.0	10.9′	02°12.9	15.9′	59.7′
14	32°59.8	20.5	30°00.9	10.8′	02°28.8	15.9′	59.7′
15	47°59.9	·· 21.4	44°30.7	10.8′	02°44.7	15.9′	59.7′
16	63°00.1	22.4	59°00.5	10.8′	03°00.7	15.9′	59.8′
17	78°00.3	23.3	73°30.3	10.7′	03°16.6	15.9′	59.8′
18	93°00.5	S05°24.3	88°00.0	10.7′	S03°32.5	15.9′	59.8′
19	108°00.7	25.2	102°29.7	10.6′	03°48.4	15.9′	59.8′
20	123°00.8	26.2	116°59.3	10.6′	04°04.3	15.9′	59.8′
21	138°01.0	·· 27.2	131°28.9	10.5′	04°20.2	15.9′	59.9′
22	153°01.2	28.1	145°58.4	10.5′	04°36.1	15.9′	59.9′
23	168°01.4	29.1	160°27.9	10.5′	04°51.9	15.8′	59.9′
	SD = 16.0′	d = 1.0′	SD = 16.2′				

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°	04:19	05:31	06:32	17:03	18:03	19:15
68°	04:27	05:32	06:28	17:07	18:03	19:07
66°	04:33	05:33	06:24	17:11	18:02	19:02
64°	04:38	05:33	06:21	17:15	18:02	18:57
62°	04:42	05:34	06:18	17:17	18:02	18:53
60°	04:45	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	06:09	17:26	18:01	18:42
52°	04:55	05:34	06:08	17:28	18:02	18:41
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	18:04	18:33
30°	05:04	05:32	05:56	17:41	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	18:06	18:32	19:02
40°	04:28	05:01	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	18:50	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	19:02	19:49
58°	03:41	04:31	05:11	18:27	19:08	19:58
S 60°	03:32	04:25	05:08	18:30	19:13	20:07

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

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 27-0 8-0%
04	11:13	11:22	11:49	10:18	22:42	
05	11:31	11:40	11:48	11:07	23:31	
06	11:49	11:58	11:48	11:56	–:–	

DUT1 = UT1-UTC = -0.1050 sec ΔT = TT-UT1 = +69.2890 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	15°51.6	139°10.8	S22°33.3	182°24.8	S05°02.4	50°34.4	S15°06.3	66°21.2	S19°20.5
1	30°54.1	154°10.5	34.0	197°25.7	03.1	65°36.9	06.3	81°23.7	20.5
2	45°56.5	169°10.1	34.8	212°26.7	03.7	80°39.5	06.4	96°26.2	20.5
3	60°59.0	184°09.7	·· 35.5	227°27.6	·· 04.4	95°42.1	·· 06.4	111°28.7	·· 20.5
4	76°01.5	199°09.3	36.3	242°28.6	05.0	110°44.6	06.4	126°31.2	20.5
5	91°03.9	214°08.9	37.0	257°29.5	05.7	125°47.2	06.4	141°33.6	20.5
6	106°06.4	229°08.5	S22°37.8	272°30.5	S05°06.4	140°49.7	S15°06.5	156°36.1	S19°20.5
7	121°08.9	244°08.1	38.5	287°31.4	07.0	155°52.3	06.5	171°38.6	20.5
8	136°11.3	259°07.7	39.3	302°32.4	07.7	170°54.8	06.5	186°41.1	20.5
9	151°13.8	274°07.3	·· 40.0	317°33.3	·· 08.3	185°57.4	·· 06.5	201°43.6	·· 20.5
10	166°16.3	289°06.9	40.8	332°34.3	09.0	200°59.9	06.6	216°46.0	20.5
11	181°18.7	304°06.5	41.5	347°35.2	09.6	216°02.5	06.6	231°48.5	20.5
12	196°21.2	319°06.1	S22°42.2	2°36.2	S05°10.3	231°05.0	S15°06.6	246°51.0	S19°20.5
13	211°23.6	334°05.7	43.0	17°37.1	10.9	246°07.6	06.6	261°53.5	20.5
14	226°26.1	349°05.3	43.7	32°38.1	11.6	261°10.2	06.7	276°56.0	20.5
15	241°28.6	4°04.9	·· 44.4	47°39.0	·· 12.2	276°12.7	·· 06.7	291°58.4	·· 20.5
16	256°31.0	19°04.5	45.2	62°40.0	12.9	291°15.3	06.7	307°00.9	20.5
17	271°33.5	34°04.1	45.9	77°40.9	13.5	306°17.8	06.7	322°03.4	20.5
18	286°36.0	49°03.7	S22°46.7	92°41.9	S05°14.2	321°20.4	S15°06.8	337°05.9	S19°20.5
19	301°38.4	64°03.3	47.4	107°42.8	14.8	336°22.9	06.8	352°08.4	20.5
20	316°40.9	79°02.9	48.1	122°43.8	15.5	351°25.5	06.8	7°10.8	20.5
21	331°43.4	94°02.5	·· 48.9	137°44.7	·· 16.1	6°28.0	·· 06.8	22°13.3	·· 20.5
22	346°45.8	109°02.1	49.6	152°45.7	16.8	21°30.6	06.9	37°15.8	20.6
23	1°48.3	124°01.7	50.3	167°46.6	17.4	36°33.1	06.9	52°18.3	20.6
Mer.pass.	22:53	ν -0.4′	d 0.8′	m -4.30	ν 0.9′	d 0.7′	m 1.58	ν 2.6′	d 0.0′ m -2.67	ν 2.5′	d 0.0′ m 0.52

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°50.7	139°01.3	S22°51.0	182°47.6	S05°18.1	51°35.7	S15°06.9	67°20.7	S19°20.6
1	31°53.2	154°00.9	51.8	197°48.5	18.8	66°38.2	06.9	82°23.2	20.6
2	46°55.7	169°00.5	52.5	212°49.5	19.4	81°40.8	07.0	97°25.7	20.6
3	61°58.1	184°00.1	·· 53.2	227°50.4	·· 20.1	96°43.3	·· 07.0	112°28.2	·· 20.6
4	77°00.6	198°59.7	54.0	242°51.3	20.7	111°45.9	07.0	127°30.7	20.6
5	92°03.1	213°59.3	54.7	257°52.3	21.4	126°48.4	07.0	142°33.1	20.6
6	107°05.5	228°58.9	S22°55.4	272°53.2	S05°22.0	141°51.0	S15°07.1	157°35.6	S19°20.6
7	122°08.0	243°58.5	56.1	287°54.2	22.7	156°53.5	07.1	172°38.1	20.6
8	137°10.5	258°58.1	56.8	302°55.1	23.3	171°56.0	07.1	187°40.6	20.6
9	152°12.9	273°57.7	·· 57.6	317°56.1	·· 24.0	186°58.6	·· 07.1	202°43.0	·· 20.6
10	167°15.4	288°57.3	58.3	332°57.0	24.6	202°01.1	07.1	217°45.5	20.6
11	182°17.9	303°56.9	59.0	347°58.0	25.3	217°03.7	07.2	232°48.0	20.6
12	197°20.3	318°56.5	S22°59.7	2°58.9	S05°25.9	232°06.2	S15°07.2	247°50.5	S19°20.6
13	212°22.8	333°56.1	23°00.4	17°59.9	26.6	247°08.8	07.2	262°52.9	20.6
14	227°25.2	348°55.7	01.2	33°00.8	27.2	262°11.3	07.2	277°55.4	20.6
15	242°27.7	3°55.3	·· 01.9	48°01.8	·· 27.9	277°13.9	·· 07.3	292°57.9	·· 20.6
16	257°30.2	18°54.9	02.6	63°02.7	28.5	292°16.4	07.3	308°00.4	20.6
17	272°32.6	33°54.5	03.3	78°03.6	29.2	307°19.0	07.3	323°02.8	20.6
18	287°35.1	48°54.1	S23°04.0	93°04.6	S05°29.8	322°21.5	S15°07.3	338°05.3	S19°20.6
19	302°37.6	63°53.7	04.7	108°05.5	30.5	337°24.0	07.3	353°07.8	20.6
20	317°40.0	78°53.2	05.4	123°06.5	31.1	352°26.6	07.4	8°10.3	20.6
21	332°42.5	93°52.8	·· 06.2	138°07.4	·· 31.8	7°29.1	·· 07.4	23°12.7	·· 20.6
22	347°45.0	108°52.4	06.9	153°08.4	32.4	22°31.7	07.4	38°15.2	20.6
23	2°47.4	123°52.0	07.6	168°09.3	33.1	37°34.2	07.4	53°17.7	20.6
Mer.pass.	22:49	ν -0.4′	d 0.7′	m -4.31	ν 0.9′	d 0.7′	m 1.58	ν 2.5′	d 0.0′ m -2.66	ν 2.5′	d 0.0′ m 0.53

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°49.9	138°51.6	S23°08.3	183°10.3	S05°33.7	52°36.7	S15°07.4	68°20.2	S19°20.6
1	32°52.4	153°51.2	09.0	198°11.2	34.4	67°39.3	07.5	83°22.6	20.6
2	47°54.8	168°50.8	09.7	213°12.2	35.0	82°41.8	07.5	98°25.1	20.6
3	62°57.3	183°50.4	·· 10.4	228°13.1	·· 35.7	97°44.4	·· 07.5	113°27.6	·· 20.6
4	77°59.7	198°50.0	11.1	243°14.0	36.3	112°46.9	07.5	128°30.1	20.6
5	93°02.2	213°49.6	11.8	258°15.0	37.0	127°49.5	07.5	143°32.5	20.6
6	108°04.7	228°49.2	S23°12.5	273°15.9	S05°37.6	142°52.0	S15°07.6	158°35.0	S19°20.6
7	123°07.1	243°48.8	13.2	288°16.9	38.3	157°54.5	07.6	173°37.5	20.6
8	138°09.6	258°48.4	13.9	303°17.8	39.0	172°57.1	07.6	188°39.9	20.6
9	153°12.1	273°48.0	·· 14.6	318°18.8	·· 39.6	187°59.6	·· 07.6	203°42.4	·· 20.6
10	168°14.5	288°47.6	15.3	333°19.7	40.3	203°02.1	07.6	218°44.9	20.6
11	183°17.0	303°47.2	16.0	348°20.6	40.9	218°04.7	07.7	233°47.4	20.6
12	198°19.5	318°46.8	S23°16.7	3°21.6	S05°41.6	233°07.2	S15°07.7	248°49.8	S19°20.6
13	213°21.9	333°46.4	17.4	18°22.5	42.2	248°09.8	07.7	263°52.3	20.6
14	228°24.4	348°46.0	18.1	33°23.5	42.9	263°12.3	07.7	278°54.8	20.7
15	243°26.9	3°45.5	·· 18.8	48°24.4	·· 43.5	278°14.8	·· 07.7	293°57.2	·· 20.7
16	258°29.3	18°45.1	19.5	63°25.4	44.2	293°17.4	07.8	308°59.7	20.7
17	273°31.8	33°44.7	20.2	78°26.3	44.8	308°19.9	07.8	324°02.2	20.7
18	288°34.2	48°44.3	S23°20.9	93°27.3	S05°45.5	323°22.4	S15°07.8	339°04.6	S19°20.7
19	303°36.7	63°43.9	21.5	108°28.2	46.1	338°25.0	07.8	354°07.1	20.7
20	318°39.2	78°43.5	22.2	123°29.1	46.8	353°27.5	07.8	9°09.6	20.7
21	333°41.6	93°43.1	·· 22.9	138°30.1	·· 47.4	8°30.0	·· 07.8	24°12.1	·· 20.7
22	348°44.1	108°42.7	23.6	153°31.0	48.1	23°32.6	07.9	39°14.5	20.7
23	3°46.6	123°42.3	24.3	168°32.0	48.7	38°35.1	07.9	54°17.0	20.7
Mer.pass.	22:45	ν -0.4′	d 0.7′	m -4.32	ν 0.9′	d 0.7′	m 1.58	ν 2.5′	d 0.0′ m -2.66	ν 2.5′	d 0.0′ m 0.53

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.4
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.6
Hamal	327°53.9	23°33.9
Polaris	314°52.3	89°21.1
Acamar	315°13.5	-40°12.9
Menkar	314°08.7	4°10.5
Mirfak	308°31.7	49°56.2
Aldebaran	290°42.5	16°33.2
Rigel	281°06.3	-8°10.5
Capella	280°25.6	46°01.0
Bellatrix	278°25.6	6°22.2
Elnath	278°05.1	28°37.5
Alnilam	275°40.3	-1°11.2
Betelgeuse	270°54.9	7°24.7
Canopus	263°53.5	-52°42.1
Sirius	258°28.6	-16°44.5
Adhara	255°08.0	-28°59.8
Procyon	244°53.7	5°10.3
Pollux	243°20.7	27°58.4
Avior	234°16.0	-59°34.4
Suhail	222°48.5	-43°30.9
Miaplacidus	221°39.2	-69°48.0
Alphard	217°50.6	-8°44.9
Regulus	207°37.5	11°51.8
Dubhe	193°44.9	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°16.0	55°50.7
Spica	158°25.5	-11°16.3
Alkaid	152°54.6	49°12.5
Hadar	148°40.4	-60°28.6
Menkent	148°01.2	-36°28.5
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°20.9	74°04.2
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.8
Antares	112°19.4	-26°28.7
Atria	107°16.3	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.9
Eltanin	90°43.6	51°29.5
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.1	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.8	-56°40.1
Deneb	49°27.4	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.1
Markab	13°32.3	15°19.4

Oct 07 Thu	SHA	Mer.pass
Venus	123°19.2	14:44
Mars	166°33.2	11:50
Jupiter	34°42.8	20:34
Saturn	50°29.6	19:31

Oct 08 Fri	SHA	Mer.pass
Venus	122°10.5	14:44
Mars	165°56.8	11:48
Jupiter	34°44.9	20:30
Saturn	50°30.0	19:27

Oct 09 Sat	SHA	Mer.pass
Venus	121°01.7	14:45
Mars	165°20.4	11:47
Jupiter	34°46.9	20:26
Saturn	50°30.3	19:23

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°01.6	S05°30.0	174°57.4	10.4′	S05°07.8	15.8′	59.9′
1	198°01.7	31.0	189°26.8	10.4′	05°23.6	15.8′	59.9′
2	213°01.9	31.9	203°56.2	10.3′	05°39.4	15.8′	59.9′
3	228°02.1	·· 32.9	218°25.5	10.3′	05°55.2	15.8′	60.0′
4	243°02.3	33.9	232°54.8	10.2′	06°10.9	15.7′	60.0′
5	258°02.5	34.8	247°24.0	10.2′	06°26.6	15.7′	60.0′
6	273°02.6	S05°35.8	261°53.2	10.1′	S06°42.3	15.7′	60.0′
7	288°02.8	36.7	276°22.3	10.1′	06°58.0	15.6′	60.0′
8	303°03.0	37.7	290°51.4	10.0′	07°13.6	15.6′	60.0′
9	318°03.2	·· 38.6	305°20.4	10.0′	07°29.2	15.6′	60.0′
10	333°03.3	39.6	319°49.3	9.9′	07°44.8	15.5′	60.1′
11	348°03.5	40.5	334°18.3	9.9′	08°00.3	15.5′	60.1′
12	3°03.7	S05°41.5	348°47.1	9.8′	S08°15.8	15.4′	60.1′
13	18°03.9	42.5	3°15.9	9.7′	08°31.3	15.4′	60.1′
14	33°04.1	43.4	17°44.7	9.7′	08°46.7	15.4′	60.1′
15	48°04.2	·· 44.4	32°13.3	9.6′	09°02.0	15.3′	60.1′
16	63°04.4	45.3	46°42.0	9.6′	09°17.3	15.3′	60.1′
17	78°04.6	46.3	61°10.5	9.5′	09°32.6	15.2′	60.1′
18	93°04.8	S05°47.2	75°39.0	9.4′	S09°47.8	15.2′	60.2′
19	108°04.9	48.2	90°07.5	9.4′	10°03.0	15.1′	60.2′
20	123°05.1	49.1	104°35.9	9.3′	10°18.1	15.1′	60.2′
21	138°05.3	·· 50.1	119°04.2	9.3′	10°33.2	15.0′	60.2′
22	153°05.5	51.0	133°32.4	9.2′	10°48.2	14.9′	60.2′
23	168°05.6	52.0	148°00.6	9.1′	11°03.1	14.9′	60.2′
	SD = 16.0′	d = 1.0′	SD = 16.3′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°05.8	S05°53.0	162°28.7	9.1′	S11°18.0	14.8′	60.2′
1	198°06.0	53.9	176°56.8	9.0′	11°32.8	14.8′	60.2′
2	213°06.2	54.9	191°24.8	8.9′	11°47.6	14.7′	60.2′
3	228°06.3	·· 55.8	205°52.7	8.9′	12°02.2	14.6′	60.2′
4	243°06.5	56.8	220°20.6	8.8′	12°16.9	14.5′	60.2′
5	258°06.7	57.7	234°48.4	8.7′	12°31.4	14.5′	60.2′
6	273°06.9	S05°58.7	249°16.1	8.7′	S12°45.9	14.4′	60.2′
7	288°07.0	05°59.6	263°43.7	8.6′	13°00.3	14.3′	60.2′
8	303°07.2	06°00.6	278°11.3	8.5′	13°14.6	14.2′	60.2′
9	318°07.4	·· 01.5	292°38.8	8.4′	13°28.9	14.2′	60.2′
10	333°07.6	02.5	307°06.3	8.4′	13°43.0	14.1′	60.3′
11	348°07.7	03.4	321°33.6	8.3′	13°57.1	14.0′	60.3′
12	3°07.9	S06°04.4	336°00.9	8.2′	S14°11.1	13.9′	60.3′
13	18°08.1	05.3	350°28.1	8.1′	14°25.0	13.8′	60.3′
14	33°08.3	06.3	4°55.3	8.1′	14°38.9	13.7′	60.3′
15	48°08.4	·· 07.2	19°22.4	8.0′	14°52.6	13.7′	60.3′
16	63°08.6	08.2	33°49.4	7.9′	15°06.3	13.6′	60.3′
17	78°08.8	09.1	48°16.3	7.9′	15°19.8	13.5′	60.3′
18	93°08.9	S06°10.1	62°43.1	7.8′	S15°33.3	13.4′	60.3′
19	108°09.1	11.1	77°09.9	7.7′	15°46.6	13.3′	60.3′
20	123°09.3	12.0	91°36.6	7.6′	15°59.9	13.2′	60.3′
21	138°09.5	·· 13.0	106°03.3	7.6′	16°13.1	13.1′	60.3′
22	153°09.6	13.9	120°29.8	7.5′	16°26.2	13.0′	60.3′
23	168°09.8	14.9	134°56.3	7.4′	16°39.1	12.9′	60.3′
	SD = 16.0′	d = 1.0′	SD = 16.4′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°10.0	S06°15.8	149°22.7	7.3′	S16°52.0	12.8′	60.3′
1	198°10.1	16.8	163°49.0	7.2′	17°04.7	12.6′	60.3′
2	213°10.3	17.7	178°15.3	7.2′	17°17.4	12.5′	60.2′
3	228°10.5	·· 18.7	192°41.4	7.1′	17°29.9	12.4′	60.2′
4	243°10.7	19.6	207°07.5	7.0′	17°42.3	12.3′	60.2′
5	258°10.8	20.6	221°33.5	6.9′	17°54.6	12.2′	60.2′
6	273°11.0	S06°21.5	235°59.5	6.9′	S18°06.8	12.1′	60.2′
7	288°11.2	22.5	250°25.4	6.8′	18°18.9	12.0′	60.2′
8	303°11.3	23.4	264°51.1	6.7′	18°30.9	11.8′	60.2′
9	318°11.5	·· 24.4	279°16.9	6.6′	18°42.7	11.7′	60.2′
10	333°11.7	25.3	293°42.5	6.6′	18°54.4	11.6′	60.2′
11	348°11.8	26.3	308°08.1	6.5′	19°06.0	11.5′	60.2′
12	3°12.0	S06°27.2	322°33.6	6.4′	S19°17.4	11.3′	60.2′
13	18°12.2	28.1	336°59.0	6.3′	19°28.8	11.2′	60.2′
14	33°12.4	29.1	351°24.3	6.3′	19°40.0	11.1′	60.2′
15	48°12.5	·· 30.0	5°49.6	6.2′	19°51.1	10.9′	60.2′
16	63°12.7	31.0	20°14.8	6.1′	20°02.0	10.8′	60.2′
17	78°12.9	31.9	34°39.9	6.1′	20°12.8	10.7′	60.2′
18	93°13.0	S06°32.9	49°05.0	6.0′	S20°23.5	10.5′	60.1′
19	108°13.2	33.8	63°29.9	5.9′	20°34.0	10.4′	60.1′
20	123°13.4	34.8	77°54.9	5.8′	20°44.4	10.3′	60.1′
21	138°13.5	·· 35.7	92°19.7	5.8′	20°54.7	10.1′	60.1′
22	153°13.7	36.7	106°44.5	5.7′	21°04.8	10.0′	60.1′
23	168°13.9	37.6	121°09.2	5.6′	21°14.8	9.8′	60.1′
	SD = 16.0′	d = 1.0′	SD = 16.4′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	04:24	05:43	06:52	16:41	17:49	19:08
N 70°	04:32	05:43	06:44	16:49	17:50	19:01
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	06:29	17:04	17:52	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	05:40	06:20	17:14	17:53	18:39
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°	05:03	05:37	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	18:55	19:36
52°	03:55	04:37	05:11	18:25	18:59	19:42
54°	03:48	04:32	05:09	18:27	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	04:16	04:59	18:37	19:21	20:17

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

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 1-3 0-9%
07	12:06	12:15	11:48	12:46	00:21	
08	12:23	12:32	11:47	13:40	01:13	
09	12:40	12:48	11:47	14:36	02:07	

DUT1 = UT1-UTC = -0.1061 sec ΔT = TT-UT1 = +69.2901 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	18°49.0	138°41.9	S23°25.0	183°32.9	S05°49.4	53°37.6	S15°07.9	69°19.5	S19°20.7
1	33°51.5	153°41.5	25.7	198°33.8	50.0	68°40.2	07.9	84°21.9	20.7
2	48°54.0	168°41.1	26.3	213°34.8	50.7	83°42.7	07.9	99°24.4	20.7
3	63°56.4	183°40.7	·· 27.0	228°35.7	·· 51.3	98°45.2	·· 08.0	114°26.9	·· 20.7
4	78°58.9	198°40.3	27.7	243°36.7	52.0	113°47.8	08.0	129°29.3	20.7
5	94°01.3	213°39.8	28.4	258°37.6	52.6	128°50.3	08.0	144°31.8	20.7
6	109°03.8	228°39.4	S23°29.1	273°38.6	S05°53.3	143°52.8	S15°08.0	159°34.3	S19°20.7
7	124°06.3	243°39.0	29.7	288°39.5	53.9	158°55.4	08.0	174°36.7	20.7
8	139°08.7	258°38.6	30.4	303°40.4	54.6	173°57.9	08.0	189°39.2	20.7
9	154°11.2	273°38.2	·· 31.1	318°41.4	·· 55.2	189°00.4	·· 08.1	204°41.7	·· 20.7
10	169°13.7	288°37.8	31.8	333°42.3	55.9	204°03.0	08.1	219°44.1	20.7
11	184°16.1	303°37.4	32.4	348°43.3	56.5	219°05.5	08.1	234°46.6	20.7
12	199°18.6	318°37.0	S23°33.1	3°44.2	S05°57.2	234°08.0	S15°08.1	249°49.1	S19°20.7
13	214°21.1	333°36.6	33.8	18°45.1	57.8	249°10.5	08.1	264°51.5	20.7
14	229°23.5	348°36.2	34.5	33°46.1	58.5	264°13.1	08.1	279°54.0	20.7
15	244°26.0	3°35.8	·· 35.1	48°47.0	·· 59.1	279°15.6	·· 08.2	294°56.5	·· 20.7
16	259°28.5	18°35.3	35.8	63°48.0	05°59.8	294°18.1	08.2	309°58.9	20.7
17	274°30.9	33°34.9	36.5	78°48.9	06°00.4	309°20.7	08.2	325°01.4	20.7
18	289°33.4	48°34.5	S23°37.1	93°49.8	S06°01.1	324°23.2	S15°08.2	340°03.9	S19°20.7
19	304°35.8	63°34.1	37.8	108°50.8	01.7	339°25.7	08.2	355°06.3	20.7
20	319°38.3	78°33.7	38.5	123°51.7	02.3	354°28.2	08.2	10°08.8	20.7
21	334°40.8	93°33.3	·· 39.1	138°52.7	·· 03.0	9°30.8	·· 08.3	25°11.3	·· 20.7
22	349°43.2	108°32.9	39.8	153°53.6	03.6	24°33.3	08.3	40°13.7	20.7
23	4°45.7	123°32.5	40.5	168°54.5	04.3	39°35.8	08.3	55°16.2	20.7
Mer.pass.	22:41	ν -0.4′	d 0.7′	m -4.33	ν 0.9′	d 0.7′	m 1.58	ν 2.5′	d 0.0′ m -2.65	ν 2.5′	d 0.0′ m 0.54

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	19°48.2	138°32.1	S23°41.1	183°55.5	S06°04.9	54°38.3	S15°08.3	70°18.7	S19°20.7
1	34°50.6	153°31.7	41.8	198°56.4	05.6	69°40.9	08.3	85°21.1	20.7
2	49°53.1	168°31.2	42.5	213°57.4	06.2	84°43.4	08.3	100°23.6	20.7
3	64°55.6	183°30.8	·· 43.1	228°58.3	·· 06.9	99°45.9	·· 08.3	115°26.1	·· 20.7
4	79°58.0	198°30.4	43.8	243°59.2	07.5	114°48.4	08.4	130°28.5	20.7
5	95°00.5	213°30.0	44.4	259°00.2	08.2	129°51.0	08.4	145°31.0	20.7
6	110°03.0	228°29.6	S23°45.1	274°01.1	S06°08.8	144°53.5	S15°08.4	160°33.5	S19°20.7
7	125°05.4	243°29.2	45.7	289°02.1	09.5	159°56.0	08.4	175°35.9	20.7
8	140°07.9	258°28.8	46.4	304°03.0	10.1	174°58.5	08.4	190°38.4	20.7
9	155°10.3	273°28.4	·· 47.0	319°03.9	·· 10.8	190°01.1	·· 08.4	205°40.8	·· 20.7
10	170°12.8	288°28.0	47.7	334°04.9	11.4	205°03.6	08.4	220°43.3	20.7
11	185°15.3	303°27.5	48.4	349°05.8	12.1	220°06.1	08.5	235°45.8	20.7
12	200°17.7	318°27.1	S23°49.0	4°06.7	S06°12.7	235°08.6	S15°08.5	250°48.2	S19°20.7
13	215°20.2	333°26.7	49.7	19°07.7	13.4	250°11.1	08.5	265°50.7	20.7
14	230°22.7	348°26.3	50.3	34°08.6	14.0	265°13.7	08.5	280°53.2	20.7
15	245°25.1	3°25.9	·· 50.9	49°09.6	·· 14.7	280°16.2	·· 08.5	295°55.6	·· 20.7
16	260°27.6	18°25.5	51.6	64°10.5	15.3	295°18.7	08.5	310°58.1	20.7
17	275°30.1	33°25.1	52.2	79°11.4	16.0	310°21.2	08.5	326°00.5	20.7
18	290°32.5	48°24.7	S23°52.9	94°12.4	S06°16.6	325°23.7	S15°08.5	341°03.0	S19°20.7
19	305°35.0	63°24.3	53.5	109°13.3	17.3	340°26.3	08.6	356°05.5	20.7
20	320°37.5	78°23.8	54.2	124°14.2	17.9	355°28.8	08.6	11°07.9	20.7
21	335°39.9	93°23.4	·· 54.8	139°15.2	·· 18.6	10°31.3	·· 08.6	26°10.4	·· 20.7
22	350°42.4	108°23.0	55.5	154°16.1	19.2	25°33.8	08.6	41°12.8	20.7
23	5°44.8	123°22.6	56.1	169°17.1	19.9	40°36.3	08.6	56°15.3	20.7
Mer.pass.	22:37	ν -0.4′	d 0.7′	m -4.34	ν 0.9′	d 0.6′	m 1.58	ν 2.5′	d 0.0′ m -2.64	ν 2.5′	d -0.0′ m 0.54

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	20°47.3	138°22.2	S23°56.7	184°18.0	S06°20.5	55°38.8	S15°08.6	71°17.8	S19°20.7
1	35°49.8	153°21.8	57.4	199°18.9	21.1	70°41.4	08.6	86°20.2	20.7
2	50°52.2	168°21.4	58.0	214°19.9	21.8	85°43.9	08.6	101°22.7	20.7
3	65°54.7	183°21.0	·· 58.6	229°20.8	·· 22.4	100°46.4	·· 08.7	116°25.1	·· 20.7
4	80°57.2	198°20.5	59.3	244°21.7	23.1	115°48.9	08.7	131°27.6	20.7
5	95°59.6	213°20.1	23°59.9	259°22.7	23.7	130°51.4	08.7	146°30.1	20.7
6	111°02.1	228°19.7	S24°00.5	274°23.6	S06°24.4	145°53.9	S15°08.7	161°32.5	S19°20.7
7	126°04.6	243°19.3	01.2	289°24.5	25.0	160°56.5	08.7	176°35.0	20.7
8	141°07.0	258°18.9	01.8	304°25.5	25.7	175°59.0	08.7	191°37.4	20.7
9	156°09.5	273°18.5	·· 02.4	319°26.4	·· 26.3	191°01.5	·· 08.7	206°39.9	·· 20.7
10	171°12.0	288°18.1	03.1	334°27.3	27.0	206°04.0	08.7	221°42.4	20.7
11	186°14.4	303°17.7	03.7	349°28.3	27.6	221°06.5	08.8	236°44.8	20.6
12	201°16.9	318°17.2	S24°04.3	4°29.2	S06°28.3	236°09.0	S15°08.8	251°47.3	S19°20.6
13	216°19.3	333°16.8	05.0	19°30.2	28.9	251°11.5	08.8	266°49.7	20.6
14	231°21.8	348°16.4	05.6	34°31.1	29.6	266°14.0	08.8	281°52.2	20.6
15	246°24.3	3°16.0	·· 06.2	49°32.0	·· 30.2	281°16.6	·· 08.8	296°54.7	·· 20.6
16	261°26.7	18°15.6	06.8	64°33.0	30.9	296°19.1	08.8	311°57.1	20.6
17	276°29.2	33°15.2	07.5	79°33.9	31.5	311°21.6	08.8	326°59.6	20.6
18	291°31.7	48°14.8	S24°08.1	94°34.8	S06°32.1	326°24.1	S15°08.8	342°02.0	S19°20.6
19	306°34.1	63°14.3	08.7	109°35.8	32.8	341°26.6	08.8	357°04.5	20.6
20	321°36.6	78°13.9	09.3	124°36.7	33.4	356°29.1	08.8	12°06.9	20.6
21	336°39.1	93°13.5	·· 09.9	139°37.6	·· 34.1	11°31.6	·· 08.9	27°09.4	·· 20.6
22	351°41.5	108°13.1	10.5	154°38.6	34.7	26°34.1	08.9	42°11.9	20.6
23	6°44.0	123°12.7	11.2	169°39.5	35.4	41°36.6	08.9	57°14.3	20.6
Mer.pass.	22:33	ν -0.4′	d 0.6′	m -4.35	ν 0.9′	d 0.6′	m 1.58	ν 2.5′	d 0.0′ m -2.63	ν 2.5′	d -0.0′ m 0.54

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.4
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.6
Hamal	327°53.9	23°33.9
Polaris	314°51.2	89°21.1
Acamar	315°13.5	-40°12.9
Menkar	314°08.7	4°10.5
Mirfak	308°31.6	49°56.2
Aldebaran	290°42.5	16°33.2
Rigel	281°06.3	-8°10.5
Capella	280°25.6	46°01.0
Bellatrix	278°25.6	6°22.2
Elnath	278°05.1	28°37.5
Alnilam	275°40.3	-1°11.2
Betelgeuse	270°54.9	7°24.7
Canopus	263°53.5	-52°42.1
Sirius	258°28.5	-16°44.5
Adhara	255°07.9	-28°59.8
Procyon	244°53.7	5°10.3
Pollux	243°20.6	27°58.4
Avior	234°16.0	-59°34.4
Suhail	222°48.5	-43°30.9
Miaplacidus	221°39.2	-69°48.0
Alphard	217°50.6	-8°44.9
Regulus	207°37.5	11°51.8
Dubhe	193°44.9	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.7	-17°39.5
Acrux	173°03.7	-63°13.0
Gacrux	171°55.2	-57°13.9
Alioth	166°15.9	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.5
Hadar	148°40.4	-60°28.6
Menkent	148°01.2	-36°28.4
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°20.9	74°04.2
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.3	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.9
Eltanin	90°43.6	51°29.5
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.1	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.8	-56°40.1
Deneb	49°27.4	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 10 Sun	SHA	Mer.pass
Venus	119°52.9	14:46
Mars	164°43.9	11:45
Jupiter	34°48.6	20:22
Saturn	50°30.4	19:20

Oct 11 Mon	SHA	Mer.pass
Venus	118°43.9	14:46
Mars	164°07.3	11:44
Jupiter	34°50.2	20:18
Saturn	50°30.5	19:16

Oct 12 Tue	SHA	Mer.pass
Venus	117°34.9	14:47
Mars	163°30.7	11:42
Jupiter	34°51.5	20:14
Saturn	50°30.5	19:12

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°14.0	S06°38.6	135°33.8	5.6′	S21°24.6	9.7′	60.1′
1	198°14.2	39.5	149°58.4	5.5′	21°34.3	9.5′	60.1′
2	213°14.4	40.5	164°22.9	5.4′	21°43.8	9.4′	60.1′
3	228°14.5	·· 41.4	178°47.3	5.4′	21°53.2	9.2′	60.0′
4	243°14.7	42.4	193°11.7	5.3′	22°02.4	9.1′	60.0′
5	258°14.9	43.3	207°36.0	5.2′	22°11.5	8.9′	60.0′
6	273°15.0	S06°44.3	222°00.2	5.2′	S22°20.4	8.8′	60.0′
7	288°15.2	45.2	236°24.4	5.1′	22°29.2	8.6′	60.0′
8	303°15.3	46.1	250°48.5	5.1′	22°37.9	8.5′	60.0′
9	318°15.5	·· 47.1	265°12.6	5.0′	22°46.3	8.3′	60.0′
10	333°15.7	48.0	279°36.6	4.9′	22°54.6	8.2′	60.0′
11	348°15.8	49.0	294°00.5	4.9′	23°02.8	8.0′	59.9′
12	3°16.0	S06°49.9	308°24.4	4.8′	S23°10.8	7.8′	59.9′
13	18°16.2	50.9	322°48.2	4.8′	23°18.6	7.7′	59.9′
14	33°16.3	51.8	337°12.0	4.7′	23°26.3	7.5′	59.9′
15	48°16.5	·· 52.8	351°35.7	4.7′	23°33.8	7.3′	59.9′
16	63°16.7	53.7	5°59.4	4.6′	23°41.1	7.2′	59.9′
17	78°16.8	54.6	20°23.0	4.6′	23°48.3	7.0′	59.9′
18	93°17.0	S06°55.6	34°46.6	4.5′	S23°55.3	6.8′	59.8′
19	108°17.1	56.5	49°10.2	4.5′	24°02.1	6.7′	59.8′
20	123°17.3	57.5	63°33.7	4.4′	24°08.8	6.5′	59.8′
21	138°17.5	·· 58.4	77°57.1	4.4′	24°15.3	6.3′	59.8′
22	153°17.6	06°59.4	92°20.5	4.4′	24°21.6	6.2′	59.8′
23	168°17.8	07°00.3	106°43.9	4.3′	24°27.8	6.0′	59.8′
	SD = 16.0′	d = 0.9′		SD = 16.4′			

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°18.0	S07°01.2	121°07.2	4.3′	S24°33.8	5.8′	59.7′
1	198°18.1	02.2	135°30.5	4.3′	24°39.6	5.6′	59.7′
2	213°18.3	03.1	149°53.8	4.2′	24°45.3	5.5′	59.7′
3	228°18.4	·· 04.1	164°17.0	4.2′	24°50.7	5.3′	59.7′
4	243°18.6	05.0	178°40.2	4.2′	24°56.0	5.1′	59.7′
5	258°18.8	06.0	193°03.4	4.1′	25°01.2	4.9′	59.6′
6	273°18.9	S07°06.9	207°26.5	4.1′	S25°06.1	4.8′	59.6′
7	288°19.1	07.8	221°49.6	4.1′	25°10.9	4.6′	59.6′
8	303°19.2	08.8	236°12.7	4.1′	25°15.5	4.4′	59.6′
9	318°19.4	·· 09.7	250°35.8	4.1′	25°19.9	4.2′	59.6′
10	333°19.6	10.7	264°58.9	4.0′	25°24.1	4.1′	59.5′
11	348°19.7	11.6	279°21.9	4.0′	25°28.2	3.9′	59.5′
12	3°19.9	S07°12.6	293°44.9	4.0′	S25°32.1	3.7′	59.5′
13	18°20.0	13.5	308°07.9	4.0′	25°35.8	3.5′	59.5′
14	33°20.2	14.4	322°30.9	4.0′	25°39.3	3.3′	59.5′
15	48°20.4	·· 15.4	336°53.9	4.0′	25°42.7	3.2′	59.4′
16	63°20.5	16.3	351°16.9	4.0′	25°45.8	3.0′	59.4′
17	78°20.7	17.3	5°39.9	4.0′	25°48.8	2.8′	59.4′
18	93°20.8	S07°18.2	20°02.9	4.0′	S25°51.6	2.6′	59.4′
19	108°21.0	19.1	34°25.8	4.0′	25°54.2	2.4′	59.4′
20	123°21.1	20.1	48°48.8	4.0′	25°56.7	2.3′	59.3′
21	138°21.3	·· 21.0	63°11.8	4.0′	25°59.0	2.1′	59.3′
22	153°21.5	22.0	77°34.8	4.0′	26°01.1	1.9′	59.3′
23	168°21.6	22.9	91°57.8	4.0′	26°03.0	1.7′	59.3′
	SD = 16.0′	d = 0.9′		SD = 16.3′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°21.8	S07°23.8	106°20.8	4.0′	S26°04.7	1.5′	59.3′
1	198°21.9	24.8	120°43.8	4.0′	26°06.2	1.4′	59.2′
2	213°22.1	25.7	135°06.8	4.0′	26°07.6	1.2′	59.2′
3	228°22.2	·· 26.6	149°29.9	4.1′	26°08.8	1.0′	59.2′
4	243°22.4	27.6	163°52.9	4.1′	26°09.8	0.8′	59.2′
5	258°22.6	28.5	178°16.0	4.1′	26°10.6	0.7′	59.1′
6	273°22.7	S07°29.5	192°39.1	4.1′	S26°11.3	0.5′	59.1′
7	288°22.9	30.4	207°02.3	4.2′	26°11.8	0.3′	59.1′
8	303°23.0	31.3	221°25.4	4.2′	26°12.0	0.1′	59.1′
9	318°23.2	·· 32.3	235°48.6	4.2′	26°12.2	-0.1′	59.1′
10	333°23.3	33.2	250°11.9	4.3′	26°12.1	-0.2′	59.0′
11	348°23.5	34.1	264°35.1	4.3′	26°11.9	-0.4′	59.0′
12	3°23.6	S07°35.1	278°58.4	4.3′	S26°11.4	-0.6′	59.0′
13	18°23.8	36.0	293°21.7	4.4′	26°10.9	-0.8′	59.0′
14	33°23.9	37.0	307°45.1	4.4′	26°10.1	-0.9′	58.9′
15	48°24.1	·· 37.9	322°08.5	4.5′	26°09.1	-1.1′	58.9′
16	63°24.3	38.8	336°32.0	4.5′	26°08.0	-1.3′	58.9′
17	78°24.4	39.8	350°55.4	4.5′	26°06.7	-1.5′	58.9′
18	93°24.6	S07°40.7	5°19.0	4.6′	S26°05.3	-1.6′	58.8′
19	108°24.7	41.6	19°42.6	4.6′	26°03.6	-1.8′	58.8′
20	123°24.9	42.6	34°06.2	4.7′	26°01.8	-2.0′	58.8′
21	138°25.0	·· 43.5	48°29.9	4.8′	25°59.8	-2.1′	58.8′
22	153°25.2	44.4	62°53.7	4.8′	25°57.7	-2.3′	58.7′
23	168°25.3	45.4	77°17.5	4.9′	25°55.4	-2.5′	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	17:37	18:47
68°	04:49	05:53	06:50	16:42	17:38	18:43
66°	04:52	05:52	06:43	16:48	17:40	18:39
64°	04:55	05:50	06:38	16:54	17:42	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	06:26	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	17:56	18:25
30°	05:08	05:35	05:59	17:34	17:58	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°	04:45	05:11	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	05:05	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	18:40	19:22	20:15
S 60°	03:09	04:06	04:50	18:45	19:29	20:26

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

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 4-6 17-37%
10	12:56	13:04	11:47	15:35	03:05	
11	13:12	13:20	11:47	16:36	04:06	
12	13:27	13:35	11:46	17:38	05:07	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	21°46.4	138°12.3	S24°11.8	184°40.4	S06°36.0	56°39.2	S15°08.9	72°16.8	S19°20.6
1	36°48.9	153°11.9	12.4	199°41.4	36.7	71°41.7	08.9	87°19.2	20.6
2	51°51.4	168°11.4	13.0	214°42.3	37.3	86°44.2	08.9	102°21.7	20.6
3	66°53.8	183°11.0	·· 13.6	229°43.2	·· 38.0	101°46.7	·· 08.9	117°24.1	·· 20.6
4	81°56.3	198°10.6	14.2	244°44.2	38.6	116°49.2	08.9	132°26.6	20.6
5	96°58.8	213°10.2	14.8	259°45.1	39.2	131°51.7	08.9	147°29.0	20.6
6	112°01.2	228°09.8	S24°15.5	274°46.0	S06°39.9	146°54.2	S15°08.9	162°31.5	S19°20.6
7	127°03.7	243°09.4	16.1	289°47.0	40.5	161°56.7	08.9	177°34.0	20.6
8	142°06.2	258°09.0	16.7	304°47.9	41.2	176°59.2	09.0	192°36.4	20.6
9	157°08.6	273°08.5	·· 17.3	319°48.8	·· 41.8	192°01.7	·· 09.0	207°38.9	·· 20.6
10	172°11.1	288°08.1	17.9	334°49.8	42.5	207°04.2	09.0	222°41.3	20.6
11	187°13.6	303°07.7	18.5	349°50.7	43.1	222°06.7	09.0	237°43.8	20.6
12	202°16.0	318°07.3	S24°19.1	4°51.6	S06°43.8	237°09.2	S15°09.0	252°46.2	S19°20.6
13	217°18.5	333°06.9	19.7	19°52.6	44.4	252°11.7	09.0	267°48.7	20.6
14	232°20.9	348°06.5	20.3	34°53.5	45.1	267°14.2	09.0	282°51.1	20.6
15	247°23.4	3°06.1	·· 20.9	49°54.4	·· 45.7	282°16.7	·· 09.0	297°53.6	·· 20.6
16	262°25.9	18°05.6	21.5	64°55.3	46.3	297°19.2	09.0	312°56.0	20.6
17	277°28.3	33°05.2	22.1	79°56.3	47.0	312°21.8	09.0	327°58.5	20.6
18	292°30.8	48°04.8	S24°22.7	94°57.2	S06°47.6	327°24.3	S15°09.0	343°00.9	S19°20.6
19	307°33.3	63°04.4	23.3	109°58.1	48.3	342°26.8	09.0	358°03.4	20.6
20	322°35.7	78°04.0	23.9	124°59.1	48.9	357°29.3	09.0	13°05.8	20.6
21	337°38.2	93°03.6	·· 24.5	140°00.0	·· 49.6	12°31.8	·· 09.1	28°08.3	·· 20.6
22	352°40.7	108°03.2	25.1	155°00.9	50.2	27°34.3	09.1	43°10.8	20.6
23	7°43.1	123°02.7	25.7	170°01.9	50.9	42°36.8	09.1	58°13.2	20.6
Mer.pass.	22:29	ν -0.4′	d 0.6′	m -4.36	ν 0.9′	d 0.6′	m 1.58	ν 2.5′	d 0.0′	m -2.63	ν 2.5′	d -0.0′	m 0.55

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	22°45.6	138°02.3	S24°26.3	185°02.8	S06°51.5	57°39.3	S15°09.1	73°15.7	S19°20.6
1	37°48.1	153°01.9	26.9	200°03.7	52.1	72°41.8	09.1	88°18.1	20.6
2	52°50.5	168°01.5	27.4	215°04.7	52.8	87°44.3	09.1	103°20.6	20.6
3	67°53.0	183°01.1	·· 28.0	230°05.6	·· 53.4	102°46.8	·· 09.1	118°23.0	·· 20.6
4	82°55.4	198°00.7	28.6	245°06.5	54.1	117°49.3	09.1	133°25.5	20.5
5	97°57.9	213°00.3	29.2	260°07.5	54.7	132°51.8	09.1	148°27.9	20.5
6	113°00.4	227°59.8	S24°29.8	275°08.4	S06°55.4	147°54.3	S15°09.1	163°30.4	S19°20.5
7	128°02.8	242°59.4	30.4	290°09.3	56.0	162°56.8	09.1	178°32.8	20.5
8	143°05.3	257°59.0	31.0	305°10.2	56.7	177°59.3	09.1	193°35.3	20.5
9	158°07.8	272°58.6	·· 31.5	320°11.2	·· 57.3	193°01.8	·· 09.1	208°37.7	·· 20.5
10	173°10.2	287°58.2	32.1	335°12.1	57.9	208°04.3	09.1	223°40.2	20.5
11	188°12.7	302°57.8	32.7	350°13.0	58.6	223°06.7	09.1	238°42.6	20.5
12	203°15.2	317°57.3	S24°33.3	5°14.0	S06°59.2	238°09.2	S15°09.1	253°45.1	S19°20.5
13	218°17.6	332°56.9	33.9	20°14.9	06°59.9	253°11.7	09.2	268°47.5	20.5
14	233°20.1	347°56.5	34.4	35°15.8	07°00.5	268°14.2	09.2	283°50.0	20.5
15	248°22.6	2°56.1	·· 35.0	50°16.7	·· 01.2	283°16.7	·· 09.2	298°52.4	·· 20.5
16	263°25.0	17°55.7	35.6	65°17.7	01.8	298°19.2	09.2	313°54.9	20.5
17	278°27.5	32°55.3	36.2	80°18.6	02.5	313°21.7	09.2	328°57.3	20.5
18	293°29.9	47°54.9	S24°36.7	95°19.5	S07°03.1	328°24.2	S15°09.2	343°59.8	S19°20.5
19	308°32.4	62°54.4	37.3	110°20.5	03.7	343°26.7	09.2	359°02.2	20.5
20	323°34.9	77°54.0	37.9	125°21.4	04.4	358°29.2	09.2	14°04.7	20.5
21	338°37.3	92°53.6	·· 38.5	140°22.3	·· 05.0	13°31.7	·· 09.2	29°07.1	·· 20.5
22	353°39.8	107°53.2	39.0	155°23.2	05.7	28°34.2	09.2	44°09.5	20.5
23	8°42.3	122°52.8	39.6	170°24.2	06.3	43°36.7	09.2	59°12.0	20.5
Mer.pass.	22:25	ν -0.4′	d 0.6′	m -4.37	ν 0.9′	d 0.6′	m 1.59	ν 2.5′	d 0.0′	m -2.62	ν 2.5′	d -0.0′	m 0.55

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	23°44.7	137°52.4	S24°40.2	185°25.1	S07°07.0	58°39.2	S15°09.2	74°14.4	S19°20.5
1	38°47.2	152°52.0	40.7	200°26.0	07.6	73°41.7	09.2	89°16.9	20.5
2	53°49.7	167°51.5	41.3	215°27.0	08.2	88°44.2	09.2	104°19.3	20.5
3	68°52.1	182°51.1	·· 41.9	230°27.9	·· 08.9	103°46.7	·· 09.2	119°21.8	·· 20.5
4	83°54.6	197°50.7	42.4	245°28.8	09.5	118°49.1	09.2	134°24.2	20.5
5	98°57.0	212°50.3	43.0	260°29.7	10.2	133°51.6	09.2	149°26.7	20.4
6	113°59.5	227°49.9	S24°43.6	275°30.7	S07°10.8	148°54.1	S15°09.2	164°29.1	S19°20.4
7	129°02.0	242°49.5	44.1	290°31.6	11.4	163°56.6	09.2	179°31.6	20.4
8	144°04.4	257°49.0	44.7	305°32.5	12.1	178°59.1	09.2	194°34.0	20.4
9	159°06.9	272°48.6	·· 45.2	320°33.4	·· 12.7	194°01.6	·· 09.2	209°36.5	·· 20.4
10	174°09.4	287°48.2	45.8	335°34.4	13.4	209°04.1	09.2	224°38.9	20.4
11	189°11.8	302°47.8	46.4	350°35.3	14.0	224°06.6	09.2	239°41.4	20.4
12	204°14.3	317°47.4	S24°46.9	5°36.2	S07°14.7	239°09.1	S15°09.2	254°43.8	S19°20.4
13	219°16.8	332°47.0	47.5	20°37.1	15.3	254°11.5	09.2	269°46.2	20.4
14	234°19.2	347°46.6	48.0	35°38.1	15.9	269°14.0	09.2	284°48.7	20.4
15	249°21.7	2°46.1	·· 48.6	50°39.0	·· 16.6	284°16.5	·· 09.2	299°51.1	·· 20.4
16	264°24.2	17°45.7	49.1	65°39.9	17.2	299°19.0	09.2	314°53.6	20.4
17	279°26.6	32°45.3	49.7	80°40.9	17.9	314°21.5	09.2	329°56.0	20.4
18	294°29.1	47°44.9	S24°50.2	95°41.8	S07°18.5	329°24.0	S15°09.3	344°58.5	S19°20.4
19	309°31.5	62°44.5	50.8	110°42.7	19.2	344°26.5	09.3	0°00.9	20.4
20	324°34.0	77°44.1	51.3	125°43.6	19.8	359°29.0	09.3	15°03.4	20.4
21	339°36.5	92°43.7	·· 51.9	140°44.6	·· 20.4	14°31.4	·· 09.3	30°05.8	·· 20.4
22	354°38.9	107°43.2	52.4	155°45.5	21.1	29°33.9	09.3	45°08.2	20.4
23	9°41.4	122°42.8	53.0	170°46.4	21.7	44°36.4	09.3	60°10.7	20.4
Mer.pass.	22:21	ν -0.4′	d 0.6′	m -4.38	ν 0.9′	d 0.6′	m 1.59	ν 2.5′	d 0.0′	m -2.61	ν 2.4′	d -0.0′	m 0.56

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.4
Diphda	348°49.7	-17°52.0
Achernar	335°21.7	-57°07.6
Hamal	327°53.9	23°33.9
Polaris	314°50.2	89°21.2
Acamar	315°13.4	-40°12.9
Menkar	314°08.6	4°10.5
Mirfak	308°31.6	49°56.2
Aldebaran	290°42.5	16°33.2
Rigel	281°06.3	-8°10.5
Capella	280°25.6	46°01.0
Bellatrix	278°25.6	6°22.2
Elnath	278°05.1	28°37.5
Alnilam	275°40.3	-1°11.2
Betelgeuse	270°54.8	7°24.7
Canopus	263°53.4	-52°42.1
Sirius	258°28.5	-16°44.5
Adhara	255°07.9	-28°59.8
Procyon	244°53.6	5°10.3
Pollux	243°20.6	27°58.4
Avior	234°15.9	-59°34.4
Suhail	222°48.4	-43°30.9
Miaplacidus	221°39.1	-69°48.0
Alphard	217°50.5	-8°44.9
Regulus	207°37.5	11°51.8
Dubhe	193°44.9	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.7	-63°12.9
Gacrux	171°55.1	-57°13.9
Alioth	166°15.9	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.5
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°20.9	74°04.1
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.3	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.9
Eltanin	90°43.6	51°29.5
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.1	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.8	-56°40.1
Deneb	49°27.5	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 13 Wed	SHA	Mer.pass
Venus	116°25.8	14:48
Mars	162°54.0	11:41
Jupiter	34°52.7	20:10
Saturn	50°30.3	19:08

Oct 14 Thu	SHA	Mer.pass
Venus	115°16.7	14:48
Mars	162°17.2	11:39
Jupiter	34°53.7	20:06
Saturn	50°30.1	19:04

Oct 15 Fri	SHA	Mer.pass
Venus	114°07.6	14:49
Mars	161°40.4	11:38
Jupiter	34°54.5	20:02
Saturn	50°29.7	19:00

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°25.5	S07°46.3	91°41.3	4.9′	S25°52.9	-2.7′	58.7′
1	198°25.6	47.2	106°05.3	5.0′	25°50.2	-2.8′	58.7′
2	213°25.8	48.2	120°29.3	5.0′	25°47.4	-3.0′	58.7′
3	228°25.9	·· 49.1	134°53.3	5.1′	25°44.4	-3.2′	58.6′
4	243°26.1	50.0	149°17.4	5.2′	25°41.3	-3.3′	58.6′
5	258°26.2	51.0	163°41.6	5.2′	25°37.9	-3.5′	58.6′
6	273°26.4	S07°51.9	178°05.8	5.3′	S25°34.5	-3.6′	58.6′
7	288°26.5	52.8	192°30.2	5.4′	25°30.8	-3.8′	58.5′
8	303°26.7	53.8	206°54.6	5.5′	25°27.0	-4.0′	58.5′
9	318°26.8	·· 54.7	221°19.0	5.5′	25°23.1	-4.1′	58.5′
10	333°27.0	55.6	235°43.5	5.6′	25°18.9	-4.3′	58.5′
11	348°27.1	56.6	250°08.2	5.7′	25°14.6	-4.4′	58.4′
12	3°27.3	S07°57.5	264°32.8	5.8′	S25°10.2	-4.6′	58.4′
13	18°27.4	58.4	278°57.6	5.8′	25°05.6	-4.7′	58.4′
14	33°27.6	07°59.4	293°22.5	5.9′	25°00.9	-4.9′	58.4′
15	48°27.7	08°00.3	307°47.4	6.0′	24°56.0	-5.1′	58.3′
16	63°27.9	01.2	322°12.4	6.1′	24°50.9	-5.2′	58.3′
17	78°28.0	02.2	336°37.5	6.2′	24°45.7	-5.4′	58.3′
18	93°28.2	S08°03.1	351°02.6	6.3′	S24°40.3	-5.5′	58.3′
19	108°28.3	04.0	5°27.9	6.3′	24°34.8	-5.7′	58.2′
20	123°28.5	05.0	19°53.2	6.4′	24°29.2	-5.8′	58.2′
21	138°28.6	·· 05.9	34°18.7	6.5′	24°23.4	-5.9′	58.2′
22	153°28.7	06.8	48°44.2	6.6′	24°17.4	-6.1′	58.2′
23	168°28.9	07.7	63°09.8	6.7′	24°11.4	-6.2′	58.1′
	SD = 16.0′	d = 0.9′	SD = 16.0′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.0	S08°08.7	77°35.5	6.8′	S24°05.1	-6.4′	58.1′
1	198°29.2	09.6	92°01.2	6.9′	23°58.8	-6.5′	58.1′
2	213°29.3	10.5	106°27.1	7.0′	23°52.3	-6.6′	58.1′
3	228°29.5	·· 11.5	120°53.1	7.1′	23°45.6	-6.8′	58.0′
4	243°29.6	12.4	135°19.1	7.1′	23°38.8	-6.9′	58.0′
5	258°29.8	13.3	149°45.3	7.2′	23°31.9	-7.1′	58.0′
6	273°29.9	S08°14.3	164°11.5	7.3′	S23°24.8	-7.2′	58.0′
7	288°30.1	15.2	178°37.9	7.4′	23°17.6	-7.3′	57.9′
8	303°30.2	16.1	193°04.3	7.5′	23°10.3	-7.5′	57.9′
9	318°30.3	·· 17.0	207°30.8	7.6′	23°02.9	-7.6′	57.9′
10	333°30.5	18.0	221°57.5	7.7′	22°55.3	-7.7′	57.9′
11	348°30.6	18.9	236°24.2	7.8′	22°47.6	-7.8′	57.8′
12	3°30.8	S08°19.8	250°51.0	7.9′	S22°39.8	-8.0′	57.8′
13	18°30.9	20.7	265°17.9	8.0′	22°31.8	-8.1′	57.8′
14	33°31.1	21.7	279°44.9	8.1′	22°23.7	-8.2′	57.8′
15	48°31.2	·· 22.6	294°12.0	8.2′	22°15.5	-8.3′	57.7′
16	63°31.4	23.5	308°39.2	8.3′	22°07.2	-8.4′	57.7′
17	78°31.5	24.5	323°06.5	8.4′	21°58.7	-8.6′	57.7′
18	93°31.6	S08°25.4	337°33.9	8.5′	S21°50.2	-8.7′	57.7′
19	108°31.8	26.3	352°01.4	8.6′	21°41.5	-8.8′	57.7′
20	123°31.9	27.2	6°29.0	8.7′	21°32.7	-8.9′	57.6′
21	138°32.1	·· 28.2	20°56.7	8.8′	21°23.8	-9.0′	57.6′
22	153°32.2	29.1	35°24.5	8.9′	21°14.8	-9.1′	57.6′
23	168°32.3	30.0	49°52.4	9.0′	21°05.6	-9.2′	57.6′
	SD = 16.0′	d = 0.9′	SD = 15.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°32.5	S08°30.9	64°20.4	9.1′	S20°56.4	-9.3′	57.5′
1	198°32.6	31.9	78°48.5	9.2′	20°47.0	-9.5′	57.5′
2	213°32.8	32.8	93°16.6	9.3′	20°37.6	-9.6′	57.5′
3	228°32.9	·· 33.7	107°44.9	9.4′	20°28.0	-9.7′	57.5′
4	243°33.0	34.6	122°13.3	9.5′	20°18.4	-9.8′	57.4′
5	258°33.2	35.5	136°41.8	9.6′	20°08.6	-9.9′	57.4′
6	273°33.3	S08°36.5	151°10.3	9.7′	S19°58.7	-10.0′	57.4′
7	288°33.5	37.4	165°39.0	9.8′	19°48.8	-10.1′	57.4′
8	303°33.6	38.3	180°07.8	9.9′	19°38.7	-10.2′	57.3′
9	318°33.7	·· 39.2	194°36.6	10.0′	19°28.5	-10.3′	57.3′
10	333°33.9	40.2	209°05.6	10.1′	19°18.3	-10.4′	57.3′
11	348°34.0	41.1	223°34.7	10.1′	19°07.9	-10.4′	57.3′
12	3°34.2	S08°42.0	238°03.8	10.2′	S18°57.5	-10.5′	57.2′
13	18°34.3	42.9	252°33.0	10.3′	18°46.9	-10.6′	57.2′
14	33°34.4	43.9	267°02.4	10.4′	18°36.3	-10.7′	57.2′
15	48°34.6	·· 44.8	281°31.8	10.5′	18°25.6	-10.8′	57.2′
16	63°34.7	45.7	296°01.3	10.6′	18°14.8	-10.9′	57.2′
17	78°34.8	46.6	310°31.0	10.7′	18°03.9	-11.0′	57.1′
18	93°35.0	S08°47.5	325°00.7	10.8′	S17°53.0	-11.1′	57.1′
19	108°35.1	48.5	339°30.5	10.9′	17°41.9	-11.1′	57.1′
20	123°35.2	49.4	354°00.4	11.0′	17°30.8	-11.2′	57.1′
21	138°35.4	·· 50.3	8°30.3	11.1′	17°19.5	-11.3′	57.0′
22	153°35.5	51.2	23°00.4	11.2′	17°08.3	-11.4′	57.0′
23	168°35.7	52.1	37°30.6	11.3′	16°56.9	-11.4′	57.0′
	SD = 16.0′	d = 0.9′	SD = 15.7′				

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

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

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 7-9 48-70%
13	13:42	13:49	11:46	18:37	06:08	
14	13:56	14:03	11:46	19:33	07:06	
15	14:10	14:17	11:46	20:25	07:59	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	24°43.9	137°42.4	S24°53.5	185°47.3	S07°22.4	59°38.9	S15°09.3	75°13.1	S19°20.4
1	39°46.3	152°42.0	54.0	200°48.3	23.0	74°41.4	09.3	90°15.6	20.3
2	54°48.8	167°41.6	54.6	215°49.2	23.6	89°43.9	09.3	105°18.0	20.3
3	69°51.3	182°41.2	·· 55.1	230°50.1	·· 24.3	104°46.3	·· 09.3	120°20.5	·· 20.3
4	84°53.7	197°40.8	55.7	245°51.0	24.9	119°48.8	09.3	135°22.9	20.3
5	99°56.2	212°40.3	56.2	260°51.9	25.6	134°51.3	09.3	150°25.3	20.3
6	114°58.7	227°39.9	S24°56.7	275°52.9	S07°26.2	149°53.8	S15°09.3	165°27.8	S19°20.3
7	130°01.1	242°39.5	57.3	290°53.8	26.8	164°56.3	09.3	180°30.2	20.3
8	145°03.6	257°39.1	57.8	305°54.7	27.5	179°58.8	09.3	195°32.7	20.3
9	160°06.0	272°38.7	·· 58.4	320°55.6	·· 28.1	195°01.2	·· 09.3	210°35.1	·· 20.3
10	175°08.5	287°38.3	58.9	335°56.6	28.8	210°03.7	09.3	225°37.5	20.3
11	190°11.0	302°37.9	59.4	350°57.5	29.4	225°06.2	09.3	240°40.0	20.3
12	205°13.4	317°37.4	S24°59.9	5°58.4	S07°30.0	240°08.7	S15°09.3	255°42.4	S19°20.3
13	220°15.9	332°37.0	25°00.5	20°59.3	30.7	255°11.2	09.3	270°44.9	20.3
14	235°18.4	347°36.6	01.0	36°00.3	31.3	270°13.6	09.3	285°47.3	20.3
15	250°20.8	2°36.2	·· 01.5	51°01.2	·· 32.0	285°16.1	·· 09.3	300°49.8	·· 20.3
16	265°23.3	17°35.8	02.1	66°02.1	32.6	300°18.6	09.3	315°52.2	20.3
17	280°25.8	32°35.4	02.6	81°03.0	33.2	315°21.1	09.3	330°54.6	20.3
18	295°28.2	47°35.0	S25°03.1	96°04.0	S07°33.9	330°23.6	S15°09.3	345°57.1	S19°20.3
19	310°30.7	62°34.5	03.6	111°04.9	34.5	345°26.0	09.3	0°59.5	20.2
20	325°33.1	77°34.1	04.2	126°05.8	35.2	0°28.5	09.3	16°02.0	20.2
21	340°35.6	92°33.7	·· 04.7	141°06.7	·· 35.8	15°31.0	·· 09.3	31°04.4	·· 20.2
22	355°38.1	107°33.3	05.2	156°07.6	36.4	30°33.5	09.3	46°06.8	20.2
23	10°40.5	122°32.9	05.7	171°08.6	37.1	45°35.9	09.3	61°09.3	20.2
Mer.pass.	22:17	ν -0.4′	d 0.5′	m -4.39	ν 0.9′	d 0.6′	m 1.59	ν 2.5′	d 0.0′ m -2.60	ν 2.4′	d -0.0′ m 0.56

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	25°43.0	137°32.5	S25°06.2	186°09.5	S07°37.7	60°38.4	S15°09.2	76°11.7	S19°20.2
1	40°45.5	152°32.1	06.8	201°10.4	38.4	75°40.9	09.2	91°14.1	20.2
2	55°47.9	167°31.7	07.3	216°11.3	39.0	90°43.4	09.2	106°16.6	20.2
3	70°50.4	182°31.2	·· 07.8	231°12.2	·· 39.6	105°45.8	·· 09.2	121°19.0	·· 20.2
4	85°52.9	197°30.8	08.3	246°13.2	40.3	120°48.3	09.2	136°21.5	20.2
5	100°55.3	212°30.4	08.8	261°14.1	40.9	135°50.8	09.2	151°23.9	20.2
6	115°57.8	227°30.0	S25°09.3	276°15.0	S07°41.6	150°53.3	S15°09.2	166°26.3	S19°20.2
7	131°00.3	242°29.6	09.9	291°15.9	42.2	165°55.7	09.2	181°28.8	20.2
8	146°02.7	257°29.2	10.4	306°16.8	42.8	180°58.2	09.2	196°31.2	20.2
9	161°05.2	272°28.8	·· 10.9	321°17.8	·· 43.5	196°00.7	·· 09.2	211°33.7	·· 20.2
10	176°07.6	287°28.3	11.4	336°18.7	44.1	211°03.2	09.2	226°36.1	20.1
11	191°10.1	302°27.9	11.9	351°19.6	44.8	226°05.6	09.2	241°38.5	20.1
12	206°12.6	317°27.5	S25°12.4	6°20.5	S07°45.4	241°08.1	S15°09.2	256°41.0	S19°20.1
13	221°15.0	332°27.1	12.9	21°21.4	46.0	256°10.6	09.2	271°43.4	20.1
14	236°17.5	347°26.7	13.4	36°22.4	46.7	271°13.0	09.2	286°45.8	20.1
15	251°20.0	2°26.3	·· 13.9	51°23.3	·· 47.3	286°15.5	·· 09.2	301°48.3	·· 20.1
16	266°22.4	17°25.9	14.4	66°24.2	47.9	301°18.0	09.2	316°50.7	20.1
17	281°24.9	32°25.5	14.9	81°25.1	48.6	316°20.5	09.2	331°53.1	20.1
18	296°27.4	47°25.1	S25°15.4	96°26.0	S07°49.2	331°22.9	S15°09.2	346°55.6	S19°20.1
19	311°29.8	62°24.6	15.9	111°27.0	49.9	346°25.4	09.2	1°58.0	20.1
20	326°32.3	77°24.2	16.4	126°27.9	50.5	1°27.9	09.2	17°00.4	20.1
21	341°34.7	92°23.8	·· 16.9	141°28.8	·· 51.1	16°30.3	·· 09.2	32°02.9	·· 20.1
22	356°37.2	107°23.4	17.4	156°29.7	51.8	31°32.8	09.2	47°05.3	20.1
23	11°39.7	122°23.0	17.9	171°30.6	52.4	46°35.3	09.2	62°07.8	20.1
Mer.pass.	22:13	ν -0.4′	d 0.5′	m -4.40	ν 0.9′	d 0.6′	m 1.59	ν 2.5′	d -0.0′ m -2.60	ν 2.4′	d -0.0′ m 0.57

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	26°42.1	137°22.6	S25°18.4	186°31.6	S07°53.0	61°37.7	S15°09.2	77°10.2	S19°20.0
1	41°44.6	152°22.2	18.9	201°32.5	53.7	76°40.2	09.2	92°12.6	20.0
2	56°47.1	167°21.8	19.4	216°33.4	54.3	91°42.7	09.2	107°15.1	20.0
3	71°49.5	182°21.4	·· 19.9	231°34.3	·· 55.0	106°45.1	·· 09.2	122°17.5	·· 20.0
4	86°52.0	197°20.9	20.4	246°35.2	55.6	121°47.6	09.2	137°19.9	20.0
5	101°54.5	212°20.5	20.9	261°36.1	56.2	136°50.1	09.1	152°22.4	20.0
6	116°56.9	227°20.1	S25°21.4	276°37.1	S07°56.9	151°52.5	S15°09.1	167°24.8	S19°20.0
7	131°59.4	242°19.7	21.8	291°38.0	57.5	166°55.0	09.1	182°27.2	20.0
8	147°01.9	257°19.3	22.3	306°38.9	58.1	181°57.5	09.1	197°29.7	20.0
9	162°04.3	272°18.9	·· 22.8	321°39.8	·· 58.8	196°59.9	·· 09.1	212°32.1	·· 20.0
10	177°06.8	287°18.5	23.3	336°40.7	07°59.4	212°02.4	09.1	227°34.5	20.0
11	192°09.2	302°18.1	23.8	351°41.7	08°00.1	227°04.9	09.1	242°37.0	20.0
12	207°11.7	317°17.7	S25°24.3	6°42.6	S08°00.7	242°07.3	S15°09.1	257°39.4	S19°20.0
13	222°14.2	332°17.2	24.7	21°43.5	01.3	257°09.8	09.1	272°41.8	19.9
14	237°16.6	347°16.8	25.2	36°44.4	02.0	272°12.3	09.1	287°44.3	19.9
15	252°19.1	2°16.4	·· 25.7	51°45.3	·· 02.6	287°14.7	·· 09.1	302°46.7	·· 19.9
16	267°21.6	17°16.0	26.2	66°46.2	03.2	302°17.2	09.1	317°49.1	19.9
17	282°24.0	32°15.6	26.7	81°47.2	03.9	317°19.6	09.1	332°51.5	19.9
18	297°26.5	47°15.2	S25°27.1	96°48.1	S08°04.5	332°22.1	S15°09.1	347°54.0	S19°19.9
19	312°29.0	62°14.8	27.6	111°49.0	05.1	347°24.6	09.1	2°56.4	19.9
20	327°31.4	77°14.4	28.1	126°49.9	05.8	2°27.0	09.1	17°58.8	19.9
21	342°33.9	92°14.0	·· 28.6	141°50.8	·· 06.4	17°29.5	·· 09.1	33°01.3	·· 19.9
22	357°36.3	107°13.6	29.0	156°51.7	07.1	32°32.0	09.0	48°03.7	19.9
23	12°38.8	122°13.2	29.5	171°52.6	07.7	47°34.4	09.0	63°06.1	19.9
Mer.pass.	22:10	ν -0.4′	d 0.5′	m -4.41	ν 0.9′	d 0.6′	m 1.59	ν 2.5′	d -0.0′ m -2.59	ν 2.4′	d -0.0′ m 0.57

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.3
Schedar	349°33.5	56°39.4
Diphda	348°49.7	-17°52.0
Achernar	335°21.6	-57°07.6
Hamal	327°53.8	23°33.9
Polaris	314°49.5	89°21.2
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.6	49°56.2
Aldebaran	290°42.4	16°33.2
Rigel	281°06.2	-8°10.5
Capella	280°25.5	46°01.0
Bellatrix	278°25.6	6°22.2
Elnath	278°05.0	28°37.5
Alnilam	275°40.3	-1°11.2
Betelgeuse	270°54.8	7°24.7
Canopus	263°53.4	-52°42.1
Sirius	258°28.5	-16°44.5
Adhara	255°07.9	-28°59.8
Procyon	244°53.6	5°10.3
Pollux	243°20.6	27°58.4
Avior	234°15.9	-59°34.3
Suhail	222°48.4	-43°30.9
Miaplacidus	221°39.1	-69°48.0
Alphard	217°50.5	-8°44.9
Regulus	207°37.5	11°51.8
Dubhe	193°44.9	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.7	-63°12.9
Gacrux	171°55.1	-57°13.8
Alioth	166°15.9	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.4
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°21.0	74°04.1
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.3	-69°04.1
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.9
Eltanin	90°43.7	51°29.4
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.1	38°48.5
Nunki	75°51.1	-26°16.2
Altair	62°02.5	8°55.7
Peacock	53°09.8	-56°40.1
Deneb	49°27.5	45°21.7
Enif	33°41.2	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 16 Sat	SHA	Mer.pass
Venus	112°58.5	14:50
Mars	161°03.5	11:36
Jupiter	34°55.0	19:58
Saturn	50°29.3	18:56

Oct 17 Sun	SHA	Mer.pass
Venus	111°49.5	14:50
Mars	160°26.5	11:35
Jupiter	34°55.4	19:54
Saturn	50°28.7	18:52

Oct 18 Mon	SHA	Mer.pass
Venus	110°40.4	14:51
Mars	159°49.4	11:33
Jupiter	34°55.6	19:50
Saturn	50°28.0	18:48

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.8	S08°53.1	52°00.8	11.3′	S16°45.4	-11.5′	57.0′
1	198°35.9	54.0	66°31.2	11.4′	16°33.9	-11.6′	56.9′
2	213°36.1	54.9	81°01.6	11.5′	16°22.3	-11.7′	56.9′
3	228°36.2	·· 55.8	95°32.1	11.6′	16°10.6	-11.7′	56.9′
4	243°36.3	56.7	110°02.7	11.7′	15°58.9	-11.8′	56.9′
5	258°36.5	57.7	124°33.4	11.8′	15°47.1	-11.9′	56.9′
6	273°36.6	S08°58.6	139°04.2	11.9′	S15°35.2	-11.9′	56.8′
7	288°36.7	08°59.5	153°35.0	11.9′	15°23.3	-12.0′	56.8′
8	303°36.9	09°00.4	168°06.0	12.0′	15°11.3	-12.1′	56.8′
9	318°37.0	·· 01.3	182°37.0	12.1′	14°59.2	-12.1′	56.8′
10	333°37.1	02.2	197°08.1	12.2′	14°47.0	-12.2′	56.7′
11	348°37.3	03.2	211°39.3	12.3′	14°34.8	-12.3′	56.7′
12	3°37.4	S09°04.1	226°10.5	12.3′	S14°22.6	-12.3′	56.7′
13	18°37.5	05.0	240°41.9	12.4′	14°10.3	-12.4′	56.7′
14	33°37.6	05.9	255°13.3	12.5′	13°57.9	-12.4′	56.7′
15	48°37.8	·· 06.8	269°44.8	12.6′	13°45.4	-12.5′	56.6′
16	63°37.9	07.7	284°16.4	12.6′	13°33.0	-12.5′	56.6′
17	78°38.0	08.7	298°48.0	12.7′	13°20.4	-12.6′	56.6′
18	93°38.2	S09°09.6	313°19.7	12.8′	S13°07.8	-12.7′	56.6′
19	108°38.3	10.5	327°51.5	12.9′	12°55.2	-12.7′	56.5′
20	123°38.4	11.4	342°23.4	12.9′	12°42.5	-12.8′	56.5′
21	138°38.6	·· 12.3	356°55.3	13.0′	12°29.7	-12.8′	56.5′
22	153°38.7	13.2	11°27.4	13.1′	12°16.9	-12.8′	56.5′
23	168°38.8	14.1	25°59.4	13.2′	12°04.0	-12.9′	56.5′
	SD = 16.0′	d = 0.9′	SD = 15.5′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°39.0	S09°15.1	40°31.6	13.2′	S11°51.2	-12.9′	56.4′
1	198°39.1	16.0	55°03.8	13.3′	11°38.2	-13.0′	56.4′
2	213°39.2	16.9	69°36.1	13.4′	11°25.2	-13.0′	56.4′
3	228°39.3	·· 17.8	84°08.4	13.4′	11°12.2	-13.1′	56.4′
4	243°39.5	18.7	98°40.9	13.5′	10°59.1	-13.1′	56.4′
5	258°39.6	19.6	113°13.4	13.5′	10°46.0	-13.1′	56.3′
6	273°39.7	S09°20.5	127°45.9	13.6′	S10°32.9	-13.2′	56.3′
7	288°39.8	21.5	142°18.5	13.7′	10°19.7	-13.2′	56.3′
8	303°40.0	22.4	156°51.2	13.7′	10°06.5	-13.3′	56.3′
9	318°40.1	·· 23.3	171°23.9	13.8′	09°53.2	-13.3′	56.2′
10	333°40.2	24.2	185°56.7	13.9′	09°39.9	-13.3′	56.2′
11	348°40.4	25.1	200°29.6	13.9′	09°26.6	-13.4′	56.2′
12	3°40.5	S09°26.0	215°02.5	14.0′	S09°13.2	-13.4′	56.2′
13	18°40.6	26.9	229°35.4	14.0′	08°59.8	-13.4′	56.2′
14	33°40.7	27.8	244°08.5	14.1′	08°46.4	-13.5′	56.1′
15	48°40.9	·· 28.7	258°41.5	14.1′	08°33.0	-13.5′	56.1′
16	63°41.0	29.7	273°14.7	14.2′	08°19.5	-13.5′	56.1′
17	78°41.1	30.6	287°47.9	14.2′	08°06.0	-13.5′	56.1′
18	93°41.2	S09°31.5	302°21.1	14.3′	S07°52.4	-13.6′	56.1′
19	108°41.4	32.4	316°54.4	14.3′	07°38.9	-13.6′	56.0′
20	123°41.5	33.3	331°27.7	14.4′	07°25.3	-13.6′	56.0′
21	138°41.6	·· 34.2	346°01.1	14.4′	07°11.7	-13.6′	56.0′
22	153°41.7	35.1	0°34.5	14.5′	06°58.1	-13.6′	56.0′
23	168°41.8	36.0	15°08.0	14.5′	06°44.4	-13.7′	56.0′
	SD = 16.0′	d = 0.9′	SD = 15.4′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°42.0	S09°36.9	29°41.5	14.6′	S06°30.7	-13.7′	55.9′
1	198°42.1	37.8	44°15.1	14.6′	06°17.1	-13.7′	55.9′
2	213°42.2	38.7	58°48.7	14.7′	06°03.3	-13.7′	55.9′
3	228°42.3	·· 39.6	73°22.4	14.7′	05°49.6	-13.7′	55.9′
4	243°42.5	40.6	87°56.1	14.7′	05°35.9	-13.8′	55.9′
5	258°42.6	41.5	102°29.8	14.8′	05°22.1	-13.8′	55.8′
6	273°42.7	S09°42.4	117°03.6	14.8′	S05°08.4	-13.8′	55.8′
7	288°42.8	43.3	131°37.4	14.9′	04°54.6	-13.8′	55.8′
8	303°42.9	44.2	146°11.3	14.9′	04°40.8	-13.8′	55.8′
9	318°43.1	·· 45.1	160°45.2	14.9′	04°27.0	-13.8′	55.8′
10	333°43.2	46.0	175°19.1	15.0′	04°13.2	-13.8′	55.7′
11	348°43.3	46.9	189°53.1	15.0′	03°59.4	-13.8′	55.7′
12	3°43.4	S09°47.8	204°27.1	15.0′	S03°45.5	-13.8′	55.7′
13	18°43.5	48.7	219°01.1	15.1′	03°31.7	-13.8′	55.7′
14	33°43.7	49.6	233°35.2	15.1′	03°17.9	-13.8′	55.7′
15	48°43.8	·· 50.5	248°09.3	15.1′	03°04.0	-13.9′	55.7′
16	63°43.9	51.4	262°43.4	15.2′	02°50.2	-13.9′	55.6′
17	78°44.0	52.3	277°17.5	15.2′	02°36.3	-13.9′	55.6′
18	93°44.1	S09°53.2	291°51.7	15.2′	S02°22.4	-13.9′	55.6′
19	108°44.3	54.1	306°25.9	15.2′	02°08.6	-13.9′	55.6′
20	123°44.4	55.0	321°00.2	15.3′	01°54.7	-13.9′	55.6′
21	138°44.5	·· 55.9	335°34.4	15.3′	01°40.9	-13.9′	55.5′
22	153°44.6	56.8	350°08.7	15.3′	01°27.0	-13.9′	55.5′
23	168°44.7	57.7	4°43.0	15.3′	01°13.2	-13.9′	55.5′
	SD = 16.0′	d = 0.9′	SD = 15.3′				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00h	12h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	79-93%
16	14:23	14:30	11:46	21:13	08:49	
17	14:36	14:42	11:45	21:58	09:35	
18	14:48	14:54	11:45	22:41	10:19	

DUT1 = UT1-UTC = -0.1053 sec ΔT = TT-UT1 = +69.2893 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	27°41.3	137°12.7	S25°30.0	186°53.6	S08°08.3	62°36.9	S15°09.0	78°08.6	S19°19.9
1	42°43.7	152°12.3	30.4	201°54.5	09.0	77°39.3	09.0	93°11.0	19.8
2	57°46.2	167°11.9	30.9	216°55.4	09.6	92°41.8	09.0	108°13.4	19.8
3	72°48.7	182°11.5	·· 31.4	231°56.3	·· 10.2	107°44.2	·· 09.0	123°15.9	·· 19.8
4	87°51.1	197°11.1	31.8	246°57.2	10.9	122°46.7	09.0	138°18.3	19.8
5	102°53.6	212°10.7	32.3	261°58.1	11.5	137°49.2	09.0	153°20.7	19.8
6	117°56.1	227°10.3	S25°32.8	276°59.0	S08°12.1	152°51.6	S15°09.0	168°23.1	S19°19.8
7	132°58.5	242°09.9	33.2	292°00.0	12.8	167°54.1	09.0	183°25.6	19.8
8	148°01.0	257°09.5	33.7	307°00.9	13.4	182°56.5	09.0	198°28.0	19.8
9	163°03.5	272°09.1	·· 34.2	322°01.8	·· 14.0	197°59.0	·· 09.0	213°30.4	·· 19.8
10	178°05.9	287°08.7	34.6	337°02.7	14.7	213°01.4	09.0	228°32.9	19.8
11	193°08.4	302°08.3	35.1	352°03.6	15.3	228°03.9	08.9	243°35.3	19.8
12	208°10.8	317°07.9	S25°35.5	7°04.5	S08°16.0	243°06.4	S15°08.9	258°37.7	S19°19.7
13	223°13.3	332°07.4	36.0	22°05.4	16.6	258°08.8	08.9	273°40.1	19.7
14	238°15.8	347°07.0	36.4	37°06.4	17.2	273°11.3	08.9	288°42.6	19.7
15	253°18.2	2°06.6	·· 36.9	52°07.3	·· 17.9	288°13.7	·· 08.9	303°45.0	·· 19.7
16	268°20.7	17°06.2	37.3	67°08.2	18.5	303°16.2	08.9	318°47.4	19.7
17	283°23.2	32°05.8	37.8	82°09.1	19.1	318°18.6	08.9	333°49.8	19.7
18	298°25.6	47°05.4	S25°38.3	97°10.0	S08°19.8	333°21.1	S15°08.9	348°52.3	S19°19.7
19	313°28.1	62°05.0	38.7	112°10.9	20.4	348°23.5	08.9	3°54.7	19.7
20	328°30.6	77°04.6	39.1	127°11.8	21.0	3°26.0	08.9	18°57.1	19.7
21	343°33.0	92°04.2	·· 39.6	142°12.7	·· 21.7	18°28.4	·· 08.9	33°59.6	·· 19.7
22	358°35.5	107°03.8	40.0	157°13.7	22.3	33°30.9	08.8	49°02.0	19.7
23	13°38.0	122°03.4	40.5	172°14.6	22.9	48°33.4	08.8	64°04.4	19.6
Mer.pass.	22:06	ν -0.4′	d 0.5′	m -4.42	ν 0.9′	d 0.6′	m 1.60	ν 2.5′	d -0.0′ m -2.58	ν 2.4′	d -0.0′ m 0.58

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	28°40.4	137°03.0	S25°40.9	187°15.5	S08°23.6	63°35.8	S15°08.8	79°06.8	S19°19.6
1	43°42.9	152°02.6	41.4	202°16.4	24.2	78°38.3	08.8	94°09.3	19.6
2	58°45.3	167°02.2	41.8	217°17.3	24.8	93°40.7	08.8	109°11.7	19.6
3	73°47.8	182°01.8	·· 42.3	232°18.2	·· 25.5	108°43.2	·· 08.8	124°14.1	·· 19.6
4	88°50.3	197°01.4	42.7	247°19.1	26.1	123°45.6	08.8	139°16.5	19.6
5	103°52.7	212°01.0	43.1	262°20.0	26.7	138°48.1	08.8	154°19.0	19.6
6	118°55.2	227°00.6	S25°43.6	277°20.9	S08°27.4	153°50.5	S15°08.8	169°21.4	S19°19.6
7	133°57.7	242°00.2	44.0	292°21.9	28.0	168°53.0	08.7	184°23.8	19.6
8	149°00.1	256°59.8	44.5	307°22.8	28.6	183°55.4	08.7	199°26.2	19.6
9	164°02.6	271°59.4	·· 44.9	322°23.7	·· 29.3	198°57.9	·· 08.7	214°28.7	·· 19.5
10	179°05.1	286°58.9	45.3	337°24.6	29.9	214°00.3	08.7	229°31.1	19.5
11	194°07.5	301°58.5	45.8	352°25.5	30.5	229°02.7	08.7	244°33.5	19.5
12	209°10.0	316°58.1	S25°46.2	7°26.4	S08°31.2	244°05.2	S15°08.7	259°35.9	S19°19.5
13	224°12.4	331°57.7	46.6	22°27.3	31.8	259°07.6	08.7	274°38.4	19.5
14	239°14.9	346°57.3	47.1	37°28.2	32.4	274°10.1	08.7	289°40.8	19.5
15	254°17.4	1°56.9	·· 47.5	52°29.1	·· 33.1	289°12.5	·· 08.7	304°43.2	·· 19.5
16	269°19.8	16°56.5	47.9	67°30.0	33.7	304°15.0	08.6	319°45.6	19.5
17	284°22.3	31°56.1	48.3	82°31.0	34.3	319°17.4	08.6	334°48.0	19.5
18	299°24.8	46°55.7	S25°48.8	97°31.9	S08°35.0	334°19.9	S15°08.6	349°50.5	S19°19.4
19	314°27.2	61°55.3	49.2	112°32.8	35.6	349°22.3	08.6	4°52.9	19.4
20	329°29.7	76°54.9	49.6	127°33.7	36.2	4°24.8	08.6	19°55.3	19.4
21	344°32.2	91°54.5	·· 50.0	142°34.6	·· 36.9	19°27.2	·· 08.6	34°57.7	·· 19.4
22	359°34.6	106°54.1	50.5	157°35.5	37.5	34°29.7	08.6	50°00.2	19.4
23	14°37.1	121°53.7	50.9	172°36.4	38.1	49°32.1	08.6	65°02.6	19.4
Mer.pass.	22:02	ν -0.4′	d 0.4′	m -4.43	ν 0.9′	d 0.6′	m 1.60	ν 2.5′	d -0.0′ m -2.57	ν 2.4′	d -0.0′ m 0.58

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	29°39.6	136°53.3	S25°51.3	187°37.3	S08°38.7	64°34.5	S15°08.5	80°05.0	S19°19.4
1	44°42.0	151°52.9	51.7	202°38.2	39.4	79°37.0	08.5	95°07.4	19.4
2	59°44.5	166°52.5	52.1	217°39.1	40.0	94°39.4	08.5	110°09.8	19.4
3	74°46.9	181°52.1	·· 52.6	232°40.0	·· 40.6	109°41.9	·· 08.5	125°12.3	·· 19.4
4	89°49.4	196°51.7	53.0	247°40.9	41.3	124°44.3	08.5	140°14.7	19.3
5	104°51.9	211°51.3	53.4	262°41.9	41.9	139°46.7	08.5	155°17.1	19.3
6	119°54.3	226°50.9	S25°53.8	277°42.8	S08°42.5	154°49.2	S15°08.5	170°19.5	S19°19.3
7	134°56.8	241°50.5	54.2	292°43.7	43.2	169°51.6	08.5	185°22.0	19.3
8	149°59.3	256°50.1	54.6	307°44.6	43.8	184°54.1	08.4	200°24.4	19.3
9	165°01.7	271°49.7	·· 55.0	322°45.5	·· 44.4	199°56.5	·· 08.4	215°26.8	·· 19.3
10	180°04.2	286°49.3	55.4	337°46.4	45.1	214°59.0	08.4	230°29.2	19.3
11	195°06.7	301°48.9	55.8	352°47.3	45.7	230°01.4	08.4	245°31.6	19.3
12	210°09.1	316°48.5	S25°56.3	7°48.2	S08°46.3	245°03.8	S15°08.4	260°34.1	S19°19.3
13	225°11.6	331°48.1	56.7	22°49.1	47.0	260°06.3	08.4	275°36.5	19.2
14	240°14.0	346°47.7	57.1	37°50.0	47.6	275°08.7	08.4	290°38.9	19.2
15	255°16.5	1°47.3	·· 57.5	52°50.9	·· 48.2	290°11.1	·· 08.3	305°41.3	·· 19.2
16	270°19.0	16°46.9	57.9	67°51.8	48.8	305°13.6	08.3	320°43.7	19.2
17	285°21.4	31°46.5	58.3	82°52.7	49.5	320°16.0	08.3	335°46.1	19.2
18	300°23.9	46°46.2	S25°58.7	97°53.6	S08°50.1	335°18.5	S15°08.3	350°48.6	S19°19.2
19	315°26.4	61°45.8	59.1	112°54.5	50.7	350°20.9	08.3	5°51.0	19.2
20	330°28.8	76°45.4	59.5	127°55.4	51.4	5°23.3	08.3	20°53.4	19.2
21	345°31.3	91°45.0	25°59.9	142°56.4	·· 52.0	20°25.8	·· 08.2	35°55.8	·· 19.1
22	0°33.8	106°44.6	26°00.3	157°57.3	52.6	35°28.2	08.2	50°58.2	19.1
23	15°36.2	121°44.2	00.7	172°58.2	53.3	50°30.6	08.2	66°00.7	19.1
Mer.pass.	21:58	ν -0.4′	d 0.4′	m -4.44	ν 0.9′	d 0.6′	m 1.60	ν 2.4′	d -0.0′ m -2.56	ν 2.4′	d -0.0′ m 0.58

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.0
Achernar	335°21.6	-57°07.6
Hamal	327°53.8	23°33.9
Polaris	314°49.0	89°21.2
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.6	49°56.2
Aldebaran	290°42.4	16°33.2
Rigel	281°06.2	-8°10.5
Capella	280°25.5	46°01.0
Bellatrix	278°25.5	6°22.2
Elnath	278°05.0	28°37.5
Alnilam	275°40.3	-1°11.2
Betelgeuse	270°54.8	7°24.7
Canopus	263°53.4	-52°42.1
Sirius	258°28.5	-16°44.6
Adhara	255°07.9	-28°59.8
Procyon	244°53.6	5°10.3
Pollux	243°20.6	27°58.4
Avior	234°15.9	-59°34.3
Suhail	222°48.4	-43°30.9
Miaplacidus	221°39.0	-69°48.0
Alphard	217°50.5	-8°44.9
Regulus	207°37.5	11°51.8
Dubhe	193°44.8	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.7	-63°12.9
Gacrux	171°55.1	-57°13.8
Alioth	166°15.9	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.4
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.4
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°21.0	74°04.1
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.4	-69°04.1
Sabik	102°06.1	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.9
Eltanin	90°43.7	51°29.4
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.2	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°09.9	-56°40.1
Deneb	49°27.5	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.0	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 19 Tue	SHA	Mer.pass
Venus	109°31.5	14:52
Mars	159°12.3	11:32
Jupiter	34°55.6	19:46
Saturn	50°27.3	18:44

Oct 20 Wed	SHA	Mer.pass
Venus	108°22.6	14:52
Mars	158°35.1	11:30
Jupiter	34°55.4	19:42
Saturn	50°26.4	18:41

Oct 21 Thu	SHA	Mer.pass
Venus	107°13.8	14:53
Mars	157°57.8	11:29
Jupiter	34°55.0	19:39
Saturn	50°25.5	18:37

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°44.8	S09°58.7	19°17.4	15.4′	S00°59.3	-13.8′	55.5′
1	198°45.0	09°59.6	33°51.7	15.4′	00°45.5	-13.8′	55.5′
2	213°45.1	10°00.5	48°26.1	15.4′	00°31.6	-13.8′	55.4′
3	228°45.2	·· 01.4	63°00.5	15.4′	00°17.8	-13.8′	55.4′
4	243°45.3	02.3	77°34.9	15.4′	S00°04.0	-13.8′	55.4′
5	258°45.4	03.2	92°09.3	15.4′	N00°09.9	13.8′	55.4′
6	273°45.5	S10°04.1	106°43.7	15.5′	N00°23.7	13.8′	55.4′
7	288°45.6	05.0	121°18.2	15.5′	00°37.5	13.8′	55.4′
8	303°45.8	05.9	135°52.7	15.5′	00°51.3	13.8′	55.3′
9	318°45.9	·· 06.8	150°27.2	15.5′	01°05.0	13.8′	55.3′
10	333°46.0	07.7	165°01.7	15.5′	01°18.8	13.8′	55.3′
11	348°46.1	08.6	179°36.2	15.5′	01°32.6	13.7′	55.3′
12	3°46.2	S10°09.5	194°10.7	15.5′	N01°46.3	13.7′	55.3′
13	18°46.3	10.4	208°45.2	15.5′	02°00.0	13.7′	55.3′
14	33°46.4	11.3	223°19.8	15.5′	02°13.7	13.7′	55.2′
15	48°46.6	·· 12.2	237°54.3	15.6′	02°27.4	13.7′	55.2′
16	63°46.7	13.1	252°28.9	15.6′	02°41.1	13.7′	55.2′
17	78°46.8	14.0	267°03.4	15.6′	02°54.8	13.6′	55.2′
18	93°46.9	S10°14.8	281°38.0	15.6′	N03°08.4	13.6′	55.2′
19	108°47.0	15.7	296°12.6	15.6′	03°22.0	13.6′	55.1′
20	123°47.1	16.6	310°47.1	15.6′	03°35.6	13.6′	55.1′
21	138°47.2	·· 17.5	325°21.7	15.6′	03°49.2	13.6′	55.1′
22	153°47.3	18.4	339°56.3	15.6′	04°02.7	13.5′	55.1′
23	168°47.4	19.3	354°30.9	15.6′	04°16.3	13.5′	55.1′
	SD = 16.0′	d = 0.9′	SD = 15.1′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°47.6	S10°20.2	9°05.5	15.6′	N04°29.8	13.5′	55.1′
1	198°47.7	21.1	23°40.0	15.6′	04°43.3	13.5′	55.0′
2	213°47.8	22.0	38°14.6	15.6′	04°56.7	13.4′	55.0′
3	228°47.9	·· 22.9	52°49.2	15.6′	05°10.1	13.4′	55.0′
4	243°48.0	23.8	67°23.8	15.6′	05°23.5	13.4′	55.0′
5	258°48.1	24.7	81°58.3	15.6′	05°36.9	13.3′	55.0′
6	273°48.2	S10°25.6	96°32.9	15.6′	N05°50.2	13.3′	55.0′
7	288°48.3	26.5	111°07.4	15.5′	06°03.6	13.3′	55.0′
8	303°48.4	27.4	125°42.0	15.5′	06°16.8	13.2′	54.9′
9	318°48.5	·· 28.3	140°16.5	15.5′	06°30.1	13.2′	54.9′
10	333°48.6	29.2	154°51.1	15.5′	06°43.3	13.2′	54.9′
11	348°48.7	30.1	169°25.6	15.5′	06°56.5	13.1′	54.9′
12	3°48.8	S10°31.0	184°00.1	15.5′	N07°09.6	13.1′	54.9′
13	18°49.0	31.9	198°34.6	15.5′	07°22.7	13.1′	54.9′
14	33°49.1	32.7	213°09.1	15.5′	07°35.8	13.0′	54.8′
15	48°49.2	·· 33.6	227°43.6	15.5′	07°48.8	13.0′	54.8′
16	63°49.3	34.5	242°18.0	15.4′	08°01.8	13.0′	54.8′
17	78°49.4	35.4	256°52.5	15.4′	08°14.8	12.9′	54.8′
18	93°49.5	S10°36.3	271°26.9	15.4′	N08°27.7	12.9′	54.8′
19	108°49.6	37.2	286°01.3	15.4′	08°40.6	12.8′	54.8′
20	123°49.7	38.1	300°35.7	15.4′	08°53.4	12.8′	54.8′
21	138°49.8	·· 39.0	315°10.1	15.4′	09°06.2	12.8′	54.7′
22	153°49.9	39.9	329°44.5	15.3′	09°19.0	12.7′	54.7′
23	168°50.0	40.8	344°18.8	15.3′	09°31.7	12.7′	54.7′
	SD = 16.1′	d = 0.9′	SD = 15.0′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°50.1	S10°41.7	358°53.1	15.3′	N09°44.4	12.6′	54.7′
1	198°50.2	42.5	13°27.4	15.3′	09°57.0	12.6′	54.7′
2	213°50.3	43.4	28°01.7	15.3′	10°09.6	12.5′	54.7′
3	228°50.4	·· 44.3	42°36.0	15.2′	10°22.1	12.5′	54.7′
4	243°50.5	45.2	57°10.2	15.2′	10°34.6	12.4′	54.6′
5	258°50.6	46.1	71°44.4	15.2′	10°47.0	12.4′	54.6′
6	273°50.7	S10°47.0	86°18.6	15.2′	N10°59.4	12.3′	54.6′
7	288°50.8	47.9	100°52.8	15.1′	11°11.8	12.3′	54.6′
8	303°50.9	48.8	115°27.0	15.1′	11°24.1	12.2′	54.6′
9	318°51.0	·· 49.7	130°01.1	15.1′	11°36.3	12.2′	54.6′
10	333°51.1	50.5	144°35.2	15.1′	11°48.5	12.1′	54.6′
11	348°51.2	51.4	159°09.2	15.0′	12°00.6	12.1′	54.5′
12	3°51.3	S10°52.3	173°43.3	15.0′	N12°12.7	12.0′	54.5′
13	18°51.4	53.2	188°17.3	15.0′	12°24.7	12.0′	54.5′
14	33°51.5	54.1	202°51.2	14.9′	12°36.7	11.9′	54.5′
15	48°51.6	·· 55.0	217°25.2	14.9′	12°48.6	11.9′	54.5′
16	63°51.7	55.9	231°59.1	14.9′	13°00.4	11.8′	54.5′
17	78°51.8	56.7	246°33.0	14.9′	13°12.2	11.7′	54.5′
18	93°51.9	S10°57.6	261°06.8	14.8′	N13°24.0	11.7′	54.5′
19	108°52.0	58.5	275°40.7	14.8′	13°35.7	11.6′	54.4′
20	123°52.1	10°59.4	290°14.5	14.8′	13°47.3	11.6′	54.4′
21	138°52.2	11°00.3	304°48.2	14.7′	13°58.8	11.5′	54.4′
22	153°52.3	01.2	319°21.9	14.7′	14°10.3	11.4′	54.4′
23	168°52.4	02.0	333°55.6	14.6′	14°21.8	11.4′	54.4′
	SD = 16.1′	d = 0.9′	SD = 14.9′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:18	06:36	07:50	15:38	16:51	18:09
N 70°	05:19	06:30	07:35	15:53	16:58	18:09
68°	05:20	06:24	07:23	16:05	17:03	18:08
66°	05:20	06:20	07:14	16:15	17:08	18:08
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	18:08
56°	05:21	06:04	06:42	16:47	17:25	18:08
54°	05:20	06:01	06:38	16:51	17:27	18:08
52°	05:20	05:59	06:34	16:55	17:29	18:09
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	17:41	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	18:26	18:53
30°	04:23	04:52	05:16	18:13	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	19:27
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°	03:24	04:09	04:45	18:46	19:22	20:08
54°	03:14	04:02	04:40	18:50	19:29	20:17
56°	03:03	03:55	04:35	18:56	19:36	20:29
58°	02:50	03:46	04:30	19:01	19:45	20:42
S 60°	02:34	03:37	04:23	19:08	19:55	20:59

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

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 13-15 97-100%
19	14:59	15:05	11:45	23:23	11:02	
20	15:10	15:15	11:45	–:–	11:44	
21	15:20	15:25	11:45	00:05	12:26	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1061 sec ΔT = TT-UT1 = +69.2901 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	30°38.7	136°43.8	S26°01.1	187°59.1	S08°53.9	65°33.1	S15°08.2	81°03.1	S19°19.1
1	45°41.2	151°43.4	01.5	203°00.0	54.5	80°35.5	08.2	96°05.5	19.1
2	60°43.6	166°43.0	01.8	218°00.9	55.1	95°37.9	08.2	111°07.9	19.1
3	75°46.1	181°42.6	·· 02.2	233°01.8	·· 55.8	110°40.4	·· 08.2	126°10.3	·· 19.1
4	90°48.5	196°42.2	02.6	248°02.7	56.4	125°42.8	08.1	141°12.7	19.1
5	105°51.0	211°41.8	03.0	263°03.6	57.0	140°45.2	08.1	156°15.2	19.1
6	120°53.5	226°41.4	S26°03.4	278°04.5	S08°57.7	155°47.7	S15°08.1	171°17.6	S19°19.0
7	135°55.9	241°41.0	03.8	293°05.4	58.3	170°50.1	08.1	186°20.0	19.0
8	150°58.4	256°40.6	04.2	308°06.3	58.9	185°52.5	08.1	201°22.4	19.0
9	166°00.9	271°40.2	·· 04.6	323°07.2	08°59.5	200°55.0	·· 08.1	216°24.8	·· 19.0
10	181°03.3	286°39.8	04.9	338°08.1	09°00.2	215°57.4	08.0	231°27.2	19.0
11	196°05.8	301°39.4	05.3	353°09.0	00.8	230°59.8	08.0	246°29.7	19.0
12	211°08.3	316°39.1	S26°05.7	8°09.9	S09°01.4	246°02.3	S15°08.0	261°32.1	S19°19.0
13	226°10.7	331°38.7	06.1	23°10.8	02.1	261°04.7	08.0	276°34.5	19.0
14	241°13.2	346°38.3	06.5	38°11.7	02.7	276°07.1	08.0	291°36.9	18.9
15	256°15.7	1°37.9	·· 06.8	53°12.6	·· 03.3	291°09.6	·· 08.0	306°39.3	·· 18.9
16	271°18.1	16°37.5	07.2	68°13.5	03.9	306°12.0	07.9	321°41.7	18.9
17	286°20.6	31°37.1	07.6	83°14.4	04.6	321°14.4	07.9	336°44.1	18.9
18	301°23.0	46°36.7	S26°08.0	98°15.3	S09°05.2	336°16.9	S15°07.9	351°46.6	S19°18.9
19	316°25.5	61°36.3	08.4	113°16.2	05.8	351°19.3	07.9	6°49.0	18.9
20	331°28.0	76°35.9	08.7	128°17.1	06.5	6°21.7	07.9	21°51.4	18.9
21	346°30.4	91°35.5	·· 09.1	143°18.0	·· 07.1	21°24.1	·· 07.8	36°53.8	·· 18.9
22	1°32.9	106°35.1	09.5	158°18.9	07.7	36°26.6	07.8	51°56.2	18.8
23	16°35.4	121°34.8	09.8	173°19.8	08.3	51°29.0	07.8	66°58.6	18.8
Mer.pass.	21:54	ν -0.4′	d 0.4′	m -4.45	ν 0.9′	d 0.6′	m 1.60	ν 2.4′	d -0.0′ m -2.56	ν 2.4′	d -0.0′ m 0.59

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	31°37.8	136°34.4	S26°10.2	188°20.7	S09°09.0	66°31.4	S15°07.8	82°01.0	S19°18.8
1	46°40.3	151°34.0	10.6	203°21.6	09.6	81°33.8	07.8	97°03.5	18.8
2	61°42.8	166°33.6	10.9	218°22.5	10.2	96°36.3	07.8	112°05.9	18.8
3	76°45.2	181°33.2	·· 11.3	233°23.4	·· 10.9	111°38.7	·· 07.7	127°08.3	·· 18.8
4	91°47.7	196°32.8	11.7	248°24.3	11.5	126°41.1	07.7	142°10.7	18.8
5	106°50.1	211°32.4	12.0	263°25.2	12.1	141°43.6	07.7	157°13.1	18.8
6	121°52.6	226°32.0	S26°12.4	278°26.1	S09°12.7	156°46.0	S15°07.7	172°15.5	S19°18.7
7	136°55.1	241°31.6	12.8	293°27.0	13.4	171°48.4	07.7	187°17.9	18.7
8	151°57.5	256°31.3	13.1	308°27.9	14.0	186°50.8	07.6	202°20.3	18.7
9	167°00.0	271°30.9	·· 13.5	323°28.8	·· 14.6	201°53.2	·· 07.6	217°22.7	·· 18.7
10	182°02.5	286°30.5	13.8	338°29.7	15.2	216°55.7	07.6	232°25.2	18.7
11	197°04.9	301°30.1	14.2	353°30.6	15.9	231°58.1	07.6	247°27.6	18.7
12	212°07.4	316°29.7	S26°14.6	8°31.5	S09°16.5	247°00.5	S15°07.6	262°30.0	S19°18.7
13	227°09.9	331°29.3	14.9	23°32.4	17.1	262°02.9	07.5	277°32.4	18.6
14	242°12.3	346°28.9	15.3	38°33.3	17.7	277°05.4	07.5	292°34.8	18.6
15	257°14.8	1°28.6	·· 15.6	53°34.2	·· 18.4	292°07.8	·· 07.5	307°37.2	·· 18.6
16	272°17.3	16°28.2	16.0	68°35.1	19.0	307°10.2	07.5	322°39.6	18.6
17	287°19.7	31°27.8	16.3	83°36.0	19.6	322°12.6	07.5	337°42.0	18.6
18	302°22.2	46°27.4	S26°16.7	98°36.9	S09°20.3	337°15.0	S15°07.4	352°44.4	S19°18.6
19	317°24.6	61°27.0	17.0	113°37.8	20.9	352°17.5	07.4	7°46.9	18.6
20	332°27.1	76°26.6	17.4	128°38.7	21.5	7°19.9	07.4	22°49.3	18.5
21	347°29.6	91°26.3	·· 17.7	143°39.6	·· 22.1	22°22.3	·· 07.4	37°51.7	·· 18.5
22	2°32.0	106°25.9	18.1	158°40.5	22.8	37°24.7	07.4	52°54.1	18.5
23	17°34.5	121°25.5	18.4	173°41.4	23.4	52°27.1	07.3	67°56.5	18.5
Mer.pass.	21:50	ν -0.4′	d 0.4′	m -4.46	ν 0.9′	d 0.6′	m 1.60	ν 2.4′	d -0.0′ m -2.55	ν 2.4′	d -0.0′ m 0.59

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	32°37.0	136°25.1	S26°18.8	188°42.3	S09°24.0	67°29.6	S15°07.3	82°58.9	S19°18.5
1	47°39.4	151°24.7	19.1	203°43.2	24.6	82°32.0	07.3	98°01.3	18.5
2	62°41.9	166°24.4	19.4	218°44.1	25.3	97°34.4	07.3	113°03.7	18.5
3	77°44.4	181°24.0	·· 19.8	233°45.0	·· 25.9	112°36.8	·· 07.3	128°06.1	·· 18.5
4	92°46.8	196°23.6	20.1	248°45.9	26.5	127°39.2	07.2	143°08.5	18.4
5	107°49.3	211°23.2	20.5	263°46.8	27.1	142°41.7	07.2	158°10.9	18.4
6	122°51.8	226°22.8	S26°20.8	278°47.7	S09°27.8	157°44.1	S15°07.2	173°13.3	S19°18.4
7	137°54.2	241°22.4	21.1	293°48.6	28.4	172°46.5	07.2	188°15.8	18.4
8	152°56.7	256°22.1	21.5	308°49.5	29.0	187°48.9	07.1	203°18.2	18.4
9	167°59.1	271°21.7	·· 21.8	323°50.4	·· 29.6	202°51.3	·· 07.1	218°20.6	·· 18.4
10	183°01.6	286°21.3	22.1	338°51.3	30.3	217°53.7	07.1	233°23.0	18.4
11	198°04.1	301°20.9	22.5	353°52.2	30.9	232°56.2	07.1	248°25.4	18.3
12	213°06.5	316°20.6	S26°22.8	8°53.1	S09°31.5	247°58.6	S15°07.1	263°27.8	S19°18.3
13	228°09.0	331°20.2	23.1	23°54.0	32.1	263°01.0	07.0	278°30.2	18.3
14	243°11.5	346°19.8	23.5	38°54.9	32.7	278°03.4	07.0	293°32.6	18.3
15	258°13.9	1°19.4	·· 23.8	53°55.8	·· 33.4	293°05.8	·· 07.0	308°35.0	·· 18.3
16	273°16.4	16°19.0	24.1	68°56.6	34.0	308°08.2	07.0	323°37.4	18.3
17	288°18.9	31°18.7	24.4	83°57.5	34.6	323°10.6	06.9	338°39.8	18.2
18	303°21.3	46°18.3	S26°24.8	98°58.4	S09°35.2	338°13.1	S15°06.9	353°42.2	S19°18.2
19	318°23.8	61°17.9	25.1	113°59.3	35.9	353°15.5	06.9	8°44.6	18.2
20	333°26.2	76°17.5	25.4	129°00.2	36.5	8°17.9	06.9	23°47.0	18.2
21	348°28.7	91°17.2	·· 25.7	144°01.1	·· 37.1	23°20.3	·· 06.8	38°49.4	·· 18.2
22	3°31.2	106°16.8	26.0	159°02.0	37.7	38°22.7	06.8	53°51.9	18.2
23	18°33.6	121°16.4	26.4	174°02.9	38.4	53°25.1	06.8	68°54.3	18.2
Mer.pass.	21:46	ν -0.4′	d 0.3′	m -4.47	ν 0.9′	d 0.6′	m 1.60	ν 2.4′	d -0.0′ m -2.54	ν 2.4′	d -0.0′ m 0.60

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.6	-57°07.6
Hamal	327°53.8	23°33.9
Polaris	314°48.2	89°21.2
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.6	49°56.2
Aldebaran	290°42.4	16°33.2
Rigel	281°06.2	-8°10.5
Capella	280°25.5	46°01.0
Bellatrix	278°25.5	6°22.2
Elnath	278°05.0	28°37.5
Alnilam	275°40.2	-1°11.2
Betelgeuse	270°54.8	7°24.7
Canopus	263°53.3	-52°42.1
Sirius	258°28.5	-16°44.6
Adhara	255°07.8	-28°59.8
Procyon	244°53.6	5°10.3
Pollux	243°20.5	27°58.4
Avior	234°15.8	-59°34.3
Suhail	222°48.4	-43°30.9
Miaplacidus	221°39.0	-69°48.0
Alphard	217°50.5	-8°45.0
Regulus	207°37.4	11°51.8
Dubhe	193°44.8	61°38.0
Denebola	182°28.0	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.7	-63°12.9
Gacrux	171°55.1	-57°13.8
Alioth	166°15.9	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.4
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°21.0	74°04.1
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.4	-69°04.1
Sabik	102°06.1	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.8
Eltanin	90°43.7	51°29.4
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.2	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°09.9	-56°40.1
Deneb	49°27.5	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 22 Fri	SHA	Mer.pass
Venus	106°05.1	14:53
Mars	157°20.4	11:27
Jupiter	34°54.4	19:35
Saturn	50°24.4	18:33

Oct 23 Sat	SHA	Mer.pass
Venus	104°56.5	14:54
Mars	156°42.9	11:26
Jupiter	34°53.6	19:31
Saturn	50°23.2	18:29

Oct 24 Sun	SHA	Mer.pass
Venus	103°48.1	14:55
Mars	156°05.3	11:24
Jupiter	34°52.6	19:27
Saturn	50°21.9	18:25

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.5	S11°02.9	348°29.3	14.6′	N14°33.1	11.3′	54.4′
1	198°52.6	03.8	3°02.9	14.6′	14°44.5	11.2′	54.4′
2	213°52.7	04.7	17°36.5	14.5′	14°55.7	11.2′	54.4′
3	228°52.8	·· 05.6	32°10.0	14.5′	15°06.9	11.1′	54.4′
4	243°52.9	06.5	46°43.5	14.5′	15°18.0	11.0′	54.3′
5	258°53.0	07.3	61°17.0	14.4′	15°29.0	11.0′	54.3′
6	273°53.1	S11°08.2	75°50.4	14.4′	N15°40.0	10.9′	54.3′
7	288°53.2	09.1	90°23.8	14.3′	15°50.9	10.8′	54.3′
8	303°53.2	10.0	104°57.1	14.3′	16°01.8	10.8′	54.3′
9	318°53.3	·· 10.9	119°30.4	14.3′	16°12.5	10.7′	54.3′
10	333°53.4	11.7	134°03.7	14.2′	16°23.2	10.6′	54.3′
11	348°53.5	12.6	148°36.9	14.2′	16°33.9	10.6′	54.3′
12	3°53.6	S11°13.5	163°10.1	14.1′	N16°44.4	10.5′	54.3′
13	18°53.7	14.4	177°43.3	14.1′	16°54.9	10.4′	54.3′
14	33°53.8	15.3	192°16.4	14.1′	17°05.3	10.3′	54.2′
15	48°53.9	·· 16.1	206°49.4	14.0′	17°15.6	10.3′	54.2′
16	63°54.0	17.0	221°22.4	14.0′	17°25.9	10.2′	54.2′
17	78°54.1	17.9	235°55.4	13.9′	17°36.1	10.1′	54.2′
18	93°54.2	S11°18.8	250°28.3	13.9′	N17°46.2	10.0′	54.2′
19	108°54.3	19.6	265°01.2	13.8′	17°56.2	10.0′	54.2′
20	123°54.4	20.5	279°34.1	13.8′	18°06.2	9.9′	54.2′
21	138°54.4	·· 21.4	294°06.9	13.8′	18°16.0	9.8′	54.2′
22	153°54.5	22.3	308°39.6	13.7′	18°25.8	9.7′	54.2′
23	168°54.6	23.2	323°12.3	13.7′	18°35.5	9.6′	54.2′
	SD = 16.1′	d = 0.9′	SD = 14.8′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.7	S11°24.0	337°45.0	13.6′	N18°45.2	9.5′	54.2′
1	198°54.8	24.9	352°17.6	13.6′	18°54.7	9.5′	54.1′
2	213°54.9	25.8	6°50.2	13.5′	19°04.2	9.4′	54.1′
3	228°55.0	·· 26.7	21°22.7	13.5′	19°13.6	9.3′	54.1′
4	243°55.1	27.5	35°55.2	13.4′	19°22.9	9.2′	54.1′
5	258°55.1	28.4	50°27.6	13.4′	19°32.1	9.1′	54.1′
6	273°55.2	S11°29.3	65°00.0	13.3′	N19°41.2	9.0′	54.1′
7	288°55.3	30.2	79°32.3	13.3′	19°50.2	9.0′	54.1′
8	303°55.4	31.0	94°04.6	13.2′	19°59.2	8.9′	54.1′
9	318°55.5	·· 31.9	108°36.9	13.2′	20°08.1	8.8′	54.1′
10	333°55.6	32.8	123°09.1	13.1′	20°16.8	8.7′	54.1′
11	348°55.7	33.6	137°41.2	13.1′	20°25.5	8.6′	54.1′
12	3°55.8	S11°34.5	152°13.3	13.1′	N20°34.1	8.5′	54.1′
13	18°55.8	35.4	166°45.4	13.0′	20°42.6	8.4′	54.1′
14	33°55.9	36.3	181°17.4	13.0′	20°51.0	8.3′	54.1′
15	48°56.0	·· 37.1	195°49.3	12.9′	20°59.4	8.2′	54.1′
16	63°56.1	38.0	210°21.2	12.9′	21°07.6	8.1′	54.1′
17	78°56.2	38.9	224°53.1	12.8′	21°15.7	8.0′	54.0′
18	93°56.3	S11°39.7	239°24.9	12.8′	N21°23.8	7.9′	54.0′
19	108°56.3	40.6	253°56.7	12.7′	21°31.7	7.9′	54.0′
20	123°56.4	41.5	268°28.4	12.7′	21°39.6	7.8′	54.0′
21	138°56.5	·· 42.4	283°00.1	12.6′	21°47.3	7.7′	54.0′
22	153°56.6	43.2	297°31.7	12.6′	21°55.0	7.6′	54.0′
23	168°56.7	44.1	312°03.3	12.5′	22°02.6	7.5′	54.0′
	SD = 16.1′	d = 0.9′	SD = 14.8′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.8	S11°45.0	326°34.8	12.5′	N22°10.0	7.4′	54.0′
1	198°56.8	45.8	341°06.2	12.4′	22°17.4	7.3′	54.0′
2	213°56.9	46.7	355°37.7	12.4′	22°24.7	7.2′	54.0′
3	228°57.0	·· 47.6	10°09.1	12.3′	22°31.8	7.1′	54.0′
4	243°57.1	48.4	24°40.4	12.3′	22°38.9	7.0′	54.0′
5	258°57.2	49.3	39°11.7	12.2′	22°45.9	6.9′	54.0′
6	273°57.2	S11°50.2	53°42.9	12.2′	N22°52.7	6.8′	54.0′
7	288°57.3	51.0	68°14.1	12.1′	22°59.5	6.7′	54.0′
8	303°57.4	51.9	82°45.3	12.1′	23°06.1	6.6′	54.0′
9	318°57.5	·· 52.8	97°16.3	12.1′	23°12.7	6.4′	54.0′
10	333°57.6	53.6	111°47.4	12.0′	23°19.1	6.3′	54.0′
11	348°57.6	54.5	126°18.4	12.0′	23°25.5	6.2′	54.0′
12	3°57.7	S11°55.4	140°49.4	11.9′	N23°31.7	6.1′	54.0′
13	18°57.8	56.2	155°20.3	11.9′	23°37.8	6.0′	54.0′
14	33°57.9	57.1	169°51.1	11.8′	23°43.9	5.9′	54.0′
15	48°57.9	·· 58.0	184°22.0	11.8′	23°49.8	5.8′	54.0′
16	63°58.0	58.8	198°52.8	11.7′	23°55.6	5.7′	54.0′
17	78°58.1	11°59.7	213°23.5	11.7′	24°01.3	5.6′	54.0′
18	93°58.2	S12°00.5	227°54.2	11.6′	N24°06.9	5.5′	54.0′
19	108°58.2	01.4	242°24.8	11.6′	24°12.3	5.4′	54.0′
20	123°58.3	02.3	256°55.4	11.6′	24°17.7	5.3′	54.0′
21	138°58.4	·· 03.1	271°26.0	11.5′	24°23.0	5.1′	54.0′
22	153°58.5	04.0	285°56.5	11.5′	24°28.1	5.0′	54.0′
23	168°58.5	04.9	300°27.0	11.4′	24°33.2	4.9′	54.0′
	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	17:57
68°	05:30	06:35	07:35	15:52	16:52	17:57
66°	05:29	06:29	07:24	16:03	16:58	17:58
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	17:32	18:06
N 40°	05:20	05:51	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	04:22	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	19:35	20:25
56°	02:53	03:47	04:28	19:02	19:44	20:38
58°	02:39	03:38	04:22	19:08	19:53	20:52
S 60°	02:21	03:27	04:15	19:15	20:04	21:11

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

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 16-18 98-90%
22	15:30	15:34	11:44	00:47	13:09	
23	15:39	15:43	11:44	01:32	13:55	
24	15:47	15:51	11:44	02:18	14:42	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1056 sec ΔT = TT-UT1 = +69.2896 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	33°36.1	136°16.0	S26°26.7	189°03.8	S09°39.0	68°27.5	S15°06.8	83°56.7	S19°18.1
1	48°38.6	151°15.7	27.0	204°04.7	39.6	83°29.9	06.7	98°59.1	18.1
2	63°41.0	166°15.3	27.3	219°05.6	40.2	98°32.3	06.7	114°01.5	18.1
3	78°43.5	181°14.9	·· 27.6	234°06.5	·· 40.9	113°34.8	·· 06.7	129°03.9	·· 18.1
4	93°46.0	196°14.6	27.9	249°07.4	41.5	128°37.2	06.7	144°06.3	18.1
5	108°48.4	211°14.2	28.3	264°08.3	42.1	143°39.6	06.7	159°08.7	18.1
6	123°50.9	226°13.8	S26°28.6	279°09.2	S09°42.7	158°42.0	S15°06.6	174°11.1	S19°18.1
7	138°53.4	241°13.4	28.9	294°10.1	43.3	173°44.4	06.6	189°13.5	18.0
8	153°55.8	256°13.1	29.2	309°10.9	44.0	188°46.8	06.6	204°15.9	18.0
9	168°58.3	271°12.7	·· 29.5	324°11.8	·· 44.6	203°49.2	·· 06.6	219°18.3	·· 18.0
10	184°00.7	286°12.3	29.8	339°12.7	45.2	218°51.6	06.5	234°20.7	18.0
11	199°03.2	301°12.0	30.1	354°13.6	45.8	233°54.0	06.5	249°23.1	18.0
12	214°05.7	316°11.6	S26°30.4	9°14.5	S09°46.4	248°56.4	S15°06.5	264°25.5	S19°18.0
13	229°08.1	331°11.2	30.7	24°15.4	47.1	263°58.8	06.5	279°27.9	17.9
14	244°10.6	346°10.8	31.0	39°16.3	47.7	279°01.2	06.4	294°30.3	17.9
15	259°13.1	1°10.5	·· 31.3	54°17.2	·· 48.3	294°03.6	·· 06.4	309°32.7	·· 17.9
16	274°15.5	16°10.1	31.6	69°18.1	48.9	309°06.0	06.4	324°35.1	17.9
17	289°18.0	31°09.7	31.9	84°19.0	49.6	324°08.5	06.3	339°37.5	17.9
18	304°20.5	46°09.4	S26°32.2	99°19.9	S09°50.2	339°10.9	S15°06.3	354°39.9	S19°17.9
19	319°22.9	61°09.0	32.5	114°20.8	50.8	354°13.3	06.3	9°42.3	17.8
20	334°25.4	76°08.6	32.8	129°21.6	51.4	9°15.7	06.3	24°44.7	17.8
21	349°27.9	91°08.3	·· 33.1	144°22.5	·· 52.0	24°18.1	·· 06.2	39°47.1	·· 17.8
22	4°30.3	106°07.9	33.4	159°23.4	52.7	39°20.5	06.2	54°49.5	17.8
23	19°32.8	121°07.5	33.7	174°24.3	53.3	54°22.9	06.2	69°51.9	17.8
Mer.pass.	21:42	ν -0.4′	d 0.3′	m -4.48	ν 0.9′	d 0.6′	m 1.60	ν 2.4′	d -0.0′ m -2.53	ν 2.4′	d -0.0′ m 0.60

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	34°35.2	136°07.2	S26°34.0	189°25.2	S09°53.9	69°25.3	S15°06.2	84°54.3	S19°17.8
1	49°37.7	151°06.8	34.3	204°26.1	54.5	84°27.7	06.1	99°56.7	17.8
2	64°40.2	166°06.4	34.6	219°27.0	55.1	99°30.1	06.1	114°59.1	17.7
3	79°42.6	181°06.1	·· 34.9	234°27.9	·· 55.8	114°32.5	·· 06.1	130°01.5	·· 17.7
4	94°45.1	196°05.7	35.2	249°28.8	56.4	129°34.9	06.1	145°03.9	17.7
5	109°47.6	211°05.4	35.5	264°29.6	57.0	144°37.3	06.0	160°06.3	17.7
6	124°50.0	226°05.0	S26°35.7	279°30.5	S09°57.6	159°39.7	S15°06.0	175°08.7	S19°17.7
7	139°52.5	241°04.6	36.0	294°31.4	58.2	174°42.1	06.0	190°11.1	17.7
8	154°55.0	256°04.3	36.3	309°32.3	58.9	189°44.5	05.9	205°13.5	17.6
9	169°57.4	271°03.9	·· 36.6	324°33.2	09°59.5	204°46.9	·· 05.9	220°15.9	·· 17.6
10	184°59.9	286°03.5	36.9	339°34.1	10°00.1	219°49.3	05.9	235°18.3	17.6
11	200°02.4	301°03.2	37.2	354°35.0	00.7	234°51.7	05.9	250°20.7	17.6
12	215°04.8	316°02.8	S26°37.4	9°35.9	S10°01.3	249°54.1	S15°05.8	265°23.1	S19°17.6
13	230°07.3	331°02.5	37.7	24°36.8	02.0	264°56.5	05.8	280°25.5	17.6
14	245°09.7	346°02.1	38.0	39°37.6	02.6	279°58.9	05.8	295°27.9	17.5
15	260°12.2	1°01.7	·· 38.3	54°38.5	·· 03.2	295°01.3	·· 05.8	310°30.3	·· 17.5
16	275°14.7	16°01.4	38.5	69°39.4	03.8	310°03.7	05.7	325°32.7	17.5
17	290°17.1	31°01.0	38.8	84°40.3	04.4	325°06.1	05.7	340°35.1	17.5
18	305°19.6	46°00.7	S26°39.1	99°41.2	S10°05.1	340°08.5	S15°05.7	355°37.5	S19°17.5
19	320°22.1	61°00.3	39.4	114°42.1	05.7	355°10.9	05.6	10°39.9	17.5
20	335°24.5	76°00.0	39.6	129°43.0	06.3	10°13.3	05.6	25°42.3	17.4
21	350°27.0	90°59.6	·· 39.9	144°43.8	·· 06.9	25°15.7	·· 05.6	40°44.7	·· 17.4
22	5°29.5	105°59.2	40.2	159°44.7	07.5	40°18.1	05.5	55°47.1	17.4
23	20°31.9	120°58.9	40.4	174°45.6	08.1	55°20.4	05.5	70°49.5	17.4
Mer.pass.	21:38	ν -0.4′	d 0.3′	m -4.49	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′ m -2.53	ν 2.4′	d -0.0′ m 0.60

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	35°34.4	135°58.5	S26°40.7	189°46.5	S10°08.8	70°22.8	S15°05.5	85°51.9	S19°17.4
1	50°36.9	150°58.2	41.0	204°47.4	09.4	85°25.2	05.5	100°54.3	17.4
2	65°39.3	165°57.8	41.2	219°48.3	10.0	100°27.6	05.4	115°56.7	17.3
3	80°41.8	180°57.5	·· 41.5	234°49.2	·· 10.6	115°30.0	·· 05.4	130°59.1	·· 17.3
4	95°44.2	195°57.1	41.8	249°50.0	11.2	130°32.4	05.4	146°01.5	17.3
5	110°46.7	210°56.8	42.0	264°50.9	11.9	145°34.8	05.3	161°03.9	17.3
6	125°49.2	225°56.4	S26°42.3	279°51.8	S10°12.5	160°37.2	S15°05.3	176°06.3	S19°17.3
7	140°51.6	240°56.1	42.6	294°52.7	13.1	175°39.6	05.3	191°08.6	17.2
8	155°54.1	255°55.7	42.8	309°53.6	13.7	190°42.0	05.3	206°11.0	17.2
9	170°56.6	270°55.4	·· 43.1	324°54.5	·· 14.3	205°44.4	·· 05.2	221°13.4	·· 17.2
10	185°59.0	285°55.0	43.3	339°55.4	14.9	220°46.8	05.2	236°15.8	17.2
11	201°01.5	300°54.7	43.6	354°56.2	15.6	235°49.2	05.2	251°18.2	17.2
12	216°04.0	315°54.3	S26°43.8	9°57.1	S10°16.2	250°51.6	S15°05.1	266°20.6	S19°17.2
13	231°06.4	330°54.0	44.1	24°58.0	16.8	265°53.9	05.1	281°23.0	17.1
14	246°08.9	345°53.6	44.3	39°58.9	17.4	280°56.3	05.1	296°25.4	17.1
15	261°11.3	0°53.3	·· 44.6	54°59.8	·· 18.0	295°58.7	·· 05.0	311°27.8	·· 17.1
16	276°13.8	15°52.9	44.8	70°00.7	18.6	311°01.1	05.0	326°30.2	17.1
17	291°16.3	30°52.6	45.1	85°01.5	19.3	326°03.5	05.0	341°32.6	17.1
18	306°18.7	45°52.2	S26°45.3	100°02.4	S10°19.9	341°05.9	S15°04.9	356°35.0	S19°17.1
19	321°21.2	60°51.9	45.6	115°03.3	20.5	356°08.3	04.9	11°37.4	17.0
20	336°23.7	75°51.5	45.8	130°04.2	21.1	11°10.7	04.9	26°39.8	17.0
21	351°26.1	90°51.2	·· 46.1	145°05.1	·· 21.7	26°13.1	·· 04.8	41°42.2	·· 17.0
22	6°28.6	105°50.8	46.3	160°06.0	22.3	41°15.4	04.8	56°44.5	17.0
23	21°31.1	120°50.5	46.6	175°06.8	23.0	56°17.8	04.8	71°46.9	17.0
Mer.pass.	21:34	ν -0.4′	d 0.3′	m -4.50	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′ m -2.52	ν 2.4′	d -0.0′ m 0.61

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.6	-57°07.7
Hamal	327°53.8	23°33.9
Polaris	314°47.4	89°21.2
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.5	49°56.2
Aldebaran	290°42.4	16°33.2
Rigel	281°06.2	-8°10.5
Capella	280°25.5	46°01.0
Bellatrix	278°25.5	6°22.2
Elnath	278°05.0	28°37.5
Alnilam	275°40.2	-1°11.2
Betelgeuse	270°54.8	7°24.7
Canopus	263°53.3	-52°42.1
Sirius	258°28.4	-16°44.6
Adhara	255°07.8	-28°59.8
Procyon	244°53.6	5°10.2
Pollux	243°20.5	27°58.4
Avior	234°15.8	-59°34.4
Suhail	222°48.3	-43°30.9
Miaplacidus	221°38.9	-69°48.0
Alphard	217°50.5	-8°45.0
Regulus	207°37.4	11°51.8
Dubhe	193°44.8	61°37.9
Denebola	182°27.9	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.6	-63°12.9
Gacrux	171°55.1	-57°13.8
Alioth	166°15.9	55°50.6
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.4
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.6	-60°55.4
Kochab	137°21.0	74°04.1
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.4	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.8
Eltanin	90°43.7	51°29.4
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.2	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°09.9	-56°40.1
Deneb	49°27.5	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 25 Mon	SHA	Mer.pass
Venus	102°39.9	14:55
Mars	155°27.7	11:23
Jupiter	34°51.4	19:23
Saturn	50°20.6	18:21

Oct 26 Tue	SHA	Mer.pass
Venus	101°31.9	14:56
Mars	154°50.0	11:22
Jupiter	34°50.0	19:19
Saturn	50°19.1	18:17

Oct 27 Wed	SHA	Mer.pass
Venus	100°24.2	14:56
Mars	154°12.1	11:20
Jupiter	34°48.5	19:15
Saturn	50°17.5	18:14

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.6	S12°05.7	314°57.4	11.4′	N24°38.1	4.8′	54.0′
1	198°58.7	06.6	329°27.8	11.4′	24°42.9	4.7′	54.0′
2	213°58.8	07.4	343°58.2	11.3′	24°47.6	4.6′	54.0′
3	228°58.8	·· 08.3	358°28.5	11.3′	24°52.2	4.5′	54.0′
4	243°58.9	09.2	12°58.8	11.2′	24°56.6	4.4′	54.0′
5	258°59.0	10.0	27°29.0	11.2′	25°01.0	4.2′	54.0′
6	273°59.1	S12°10.9	41°59.2	11.2′	N25°05.2	4.1′	54.0′
7	288°59.1	11.7	56°29.3	11.1′	25°09.3	4.0′	54.0′
8	303°59.2	12.6	70°59.5	11.1′	25°13.3	3.9′	54.0′
9	318°59.3	·· 13.5	85°29.6	11.0′	25°17.2	3.8′	54.0′
10	333°59.3	14.3	99°59.6	11.0′	25°21.0	3.7′	54.0′
11	348°59.4	15.2	114°29.6	11.0′	25°24.6	3.5′	54.0′
12	3°59.5	S12°16.0	128°59.6	10.9′	N25°28.2	3.4′	54.0′
13	18°59.6	16.9	143°29.5	10.9′	25°31.6	3.3′	54.1′
14	33°59.6	17.7	157°59.4	10.9′	25°34.9	3.2′	54.1′
15	48°59.7	·· 18.6	172°29.3	10.8′	25°38.1	3.1′	54.1′
16	63°59.8	19.5	186°59.2	10.8′	25°41.1	2.9′	54.1′
17	78°59.8	20.3	201°29.0	10.8′	25°44.0	2.8′	54.1′
18	93°59.9	S12°21.2	215°58.8	10.8′	N25°46.9	2.7′	54.1′
19	109°00.0	22.0	230°28.5	10.7′	25°49.5	2.6′	54.1′
20	124°00.0	22.9	244°58.2	10.7′	25°52.1	2.4′	54.1′
21	139°00.1	·· 23.7	259°27.9	10.7′	25°54.6	2.3′	54.1′
22	154°00.2	24.6	273°57.6	10.6′	25°56.9	2.2′	54.1′
23	169°00.2	25.4	288°27.2	10.6′	25°59.1	2.1′	54.1′
	SD = 16.1′	d = 0.9′	SD = 14.7′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°00.3	S12°26.3	302°56.8	10.6′	N26°01.2	2.0′	54.1′
1	199°00.4	27.1	317°26.4	10.6′	26°03.1	1.8′	54.1′
2	214°00.4	28.0	331°56.0	10.5′	26°05.0	1.7′	54.1′
3	229°00.5	·· 28.9	346°25.5	10.5′	26°06.7	1.6′	54.1′
4	244°00.6	29.7	0°55.0	10.5′	26°08.3	1.5′	54.2′
5	259°00.6	30.6	15°24.5	10.5′	26°09.7	1.3′	54.2′
6	274°00.7	S12°31.4	29°54.0	10.4′	N26°11.1	1.2′	54.2′
7	289°00.8	32.3	44°23.4	10.4′	26°12.3	1.1′	54.2′
8	304°00.8	33.1	58°52.9	10.4′	26°13.3	1.0′	54.2′
9	319°00.9	·· 34.0	73°22.3	10.4′	26°14.3	0.8′	54.2′
10	334°01.0	34.8	87°51.6	10.4′	26°15.1	0.7′	54.2′
11	349°01.0	35.7	102°21.0	10.4′	26°15.9	0.6′	54.2′
12	4°01.1	S12°36.5	116°50.4	10.3′	N26°16.4	0.5′	54.2′
13	19°01.1	37.4	131°19.7	10.3′	26°16.9	0.3′	54.3′
14	34°01.2	38.2	145°49.0	10.3′	26°17.2	0.2′	54.3′
15	49°01.3	·· 39.1	160°18.3	10.3′	26°17.4	0.1′	54.3′
16	64°01.3	39.9	174°47.6	10.3′	26°17.5	-0.1′	54.3′
17	79°01.4	40.8	189°16.9	10.3′	26°17.4	-0.2′	54.3′
18	94°01.4	S12°41.6	203°46.2	10.3′	N26°17.3	-0.3′	54.3′
19	109°01.5	42.4	218°15.4	10.2′	26°17.0	-0.4′	54.3′
20	124°01.6	43.3	232°44.7	10.2′	26°16.5	-0.6′	54.3′
21	139°01.6	·· 44.1	247°13.9	10.2′	26°16.0	-0.7′	54.4′
22	154°01.7	45.0	261°43.1	10.2′	26°15.3	-0.8′	54.4′
23	169°01.7	45.8	276°12.3	10.2′	26°14.5	-0.9′	54.4′
	SD = 16.1′	d = 0.9′	SD = 14.8′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.8	S12°46.7	290°41.5	10.2′	N26°13.5	-1.1′	54.4′
1	199°01.9	47.5	305°10.8	10.2′	26°12.4	-1.2′	54.4′
2	214°01.9	48.4	319°39.9	10.2′	26°11.2	-1.3′	54.4′
3	229°02.0	·· 49.2	334°09.1	10.2′	26°09.9	-1.5′	54.4′
4	244°02.0	50.1	348°38.3	10.2′	26°08.4	-1.6′	54.5′
5	259°02.1	50.9	3°07.5	10.2′	26°06.9	-1.7′	54.5′
6	274°02.1	S12°51.7	17°36.7	10.2′	N26°05.2	-1.8′	54.5′
7	289°02.2	52.6	32°05.9	10.2′	26°03.3	-2.0′	54.5′
8	304°02.3	53.4	46°35.1	10.2′	26°01.3	-2.1′	54.5′
9	319°02.3	·· 54.3	61°04.3	10.2′	25°59.2	-2.2′	54.5′
10	334°02.4	55.1	75°33.4	10.2′	25°57.0	-2.4′	54.6′
11	349°02.4	56.0	90°02.6	10.2′	25°54.7	-2.5′	54.6′
12	4°02.5	S12°56.8	104°31.8	10.2′	N25°52.2	-2.6′	54.6′
13	19°02.5	57.6	119°01.0	10.2′	25°49.6	-2.7′	54.6′
14	34°02.6	58.5	133°30.2	10.2′	25°46.8	-2.9′	54.6′
15	49°02.6	12°59.3	147°59.4	10.2′	25°44.0	-3.0′	54.6′
16	64°02.7	13°00.2	162°28.6	10.2′	25°41.0	-3.1′	54.7′
17	79°02.7	01.0	176°57.8	10.2′	25°37.9	-3.2′	54.7′
18	94°02.8	S13°01.8	191°27.0	10.2′	N25°34.6	-3.4′	54.7′
19	109°02.9	02.7	205°56.3	10.2′	25°31.2	-3.5′	54.7′
20	124°02.9	03.5	220°25.5	10.2′	25°27.7	-3.6′	54.7′
21	139°03.0	·· 04.4	234°54.8	10.3′	25°24.1	-3.8′	54.8′
22	154°03.0	05.2	249°24.0	10.3′	25°20.3	-3.9′	54.8′
23	169°03.1	06.0	263°53.3	10.3′	25°16.5	-4.0′	54.8′
	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	08:22	15:04	16:23	17:43
N 70°	05:41	06:53	08:02	15:24	16:33	17:45
68°	05:40	06:45	07:47	15:40	16:41	17:47
66°	05:38	06:39	07:34	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°	05:34	06:23	07:07	16:20	17:03	17:52
N 58°	05:33	06:19	07:01	16:26	17:08	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	06:09	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	05:49	17:38	18:00	18:25
0°	04:55	05:19	05:41	17:47	18:08	18:33
S 10°	04:45	05:10	05:32	17:56	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	04:38	05:04	18:24	18:51	19:23
40°	03:53	04:28	04:57	18:32	19:01	19:35
45°	03:38	04:16	04:48	18:41	19:12	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°	02:28	03:29	04:14	19:15	20:01	21:03
S 60°	02:08	03:17	04:06	19:23	20:13	21:23

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

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 19-21 84-67%
25	15:54	15:58	11:44	03:06	15:31	
26	16:01	16:04	11:44	03:56	16:22	
27	16:07	16:10	11:44	04:47	17:13	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1041 sec ΔT = TT-UT1 = +69.2881 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	36°33.5	135°50.2	S26°46.8	190°07.7	S10°23.6	71°20.2	S15°04.8	86°49.3	S19°16.9
1	51°36.0	150°49.8	47.0	205°08.6	24.2	86°22.6	04.7	101°51.7	16.9
2	66°38.5	165°49.5	47.3	220°09.5	24.8	101°25.0	04.7	116°54.1	16.9
3	81°40.9	180°49.1	·· 47.5	235°10.4	·· 25.4	116°27.4	·· 04.7	131°56.5	·· 16.9
4	96°43.4	195°48.8	47.8	250°11.2	26.0	131°29.8	04.6	146°58.9	16.9
5	111°45.8	210°48.4	48.0	265°12.1	26.6	146°32.1	04.6	162°01.3	16.9
6	126°48.3	225°48.1	S26°48.2	280°13.0	S10°27.3	161°34.5	S15°04.6	177°03.7	S19°16.8
7	141°50.8	240°47.8	48.5	295°13.9	27.9	176°36.9	04.5	192°06.1	16.8
8	156°53.2	255°47.4	48.7	310°14.8	28.5	191°39.3	04.5	207°08.5	16.8
9	171°55.7	270°47.1	·· 48.9	325°15.6	·· 29.1	206°41.7	·· 04.5	222°10.9	·· 16.8
10	186°58.2	285°46.7	49.2	340°16.5	29.7	221°44.1	04.4	237°13.2	16.8
11	202°00.6	300°46.4	49.4	355°17.4	30.3	236°46.4	04.4	252°15.6	16.7
12	217°03.1	315°46.1	S26°49.6	10°18.3	S10°30.9	251°48.8	S15°04.4	267°18.0	S19°16.7
13	232°05.6	330°45.7	49.9	25°19.2	31.6	266°51.2	04.3	282°20.4	16.7
14	247°08.0	345°45.4	50.1	40°20.0	32.2	281°53.6	04.3	297°22.8	16.7
15	262°10.5	0°45.1	·· 50.3	55°20.9	·· 32.8	296°56.0	·· 04.3	312°25.2	·· 16.7
16	277°13.0	15°44.7	50.5	70°21.8	33.4	311°58.4	04.2	327°27.6	16.6
17	292°15.4	30°44.4	50.8	85°22.7	34.0	327°00.7	04.2	342°30.0	16.6
18	307°17.9	45°44.0	S26°51.0	100°23.6	S10°34.6	342°03.1	S15°04.2	357°32.4	S19°16.6
19	322°20.3	60°43.7	51.2	115°24.4	35.2	357°05.5	04.1	12°34.7	16.6
20	337°22.8	75°43.4	51.4	130°25.3	35.9	12°07.9	04.1	27°37.1	16.6
21	352°25.3	90°43.0	·· 51.6	145°26.2	·· 36.5	27°10.3	·· 04.1	42°39.5	·· 16.6
22	7°27.7	105°42.7	51.9	160°27.1	37.1	42°12.6	04.0	57°41.9	16.5
23	22°30.2	120°42.4	52.1	175°28.0	37.7	57°15.0	04.0	72°44.3	16.5
Mer.pass.	21:30	ν -0.3′	d 0.2′	m -4.51	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′	m -2.51	ν 2.4′	d -0.0′	m 0.61

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	37°32.7	135°42.0	S26°52.3	190°28.8	S10°38.3	72°17.4	S15°03.9	87°46.7	S19°16.5
1	52°35.1	150°41.7	52.5	205°29.7	38.9	87°19.8	03.9	102°49.1	16.5
2	67°37.6	165°41.4	52.7	220°30.6	39.5	102°22.1	03.9	117°51.5	16.5
3	82°40.1	180°41.1	·· 52.9	235°31.5	·· 40.1	117°24.5	·· 03.8	132°53.9	·· 16.4
4	97°42.5	195°40.7	53.1	250°32.3	40.8	132°26.9	03.8	147°56.2	16.4
5	112°45.0	210°40.4	53.4	265°33.2	41.4	147°29.3	03.8	162°58.6	16.4
6	127°47.5	225°40.1	S26°53.6	280°34.1	S10°42.0	162°31.7	S15°03.7	178°01.0	S19°16.4
7	142°49.9	240°39.7	53.8	295°35.0	42.6	177°34.0	03.7	193°03.4	16.4
8	157°52.4	255°39.4	54.0	310°35.8	43.2	192°36.4	03.7	208°05.8	16.3
9	172°54.8	270°39.1	·· 54.2	325°36.7	·· 43.8	207°38.8	·· 03.6	223°08.2	·· 16.3
10	187°57.3	285°38.8	54.4	340°37.6	44.4	222°41.2	03.6	238°10.6	16.3
11	202°59.8	300°38.4	54.6	355°38.5	45.0	237°43.5	03.6	253°12.9	16.3
12	218°02.2	315°38.1	S26°54.8	10°39.4	S10°45.7	252°45.9	S15°03.5	268°15.3	S19°16.3
13	233°04.7	330°37.8	55.0	25°40.2	46.3	267°48.3	03.5	283°17.7	16.2
14	248°07.2	345°37.5	55.2	40°41.1	46.9	282°50.7	03.4	298°20.1	16.2
15	263°09.6	0°37.1	·· 55.4	55°42.0	·· 47.5	297°53.0	·· 03.4	313°22.5	·· 16.2
16	278°12.1	15°36.8	55.6	70°42.9	48.1	312°55.4	03.4	328°24.9	16.2
17	293°14.6	30°36.5	55.8	85°43.7	48.7	327°57.8	03.3	343°27.3	16.2
18	308°17.0	45°36.2	S26°56.0	100°44.6	S10°49.3	343°00.1	S15°03.3	358°29.6	S19°16.1
19	323°19.5	60°35.8	56.2	115°45.5	49.9	358°02.5	03.3	13°32.0	16.1
20	338°21.9	75°35.5	56.4	130°46.4	50.5	13°04.9	03.2	28°34.4	16.1
21	353°24.4	90°35.2	·· 56.6	145°47.2	·· 51.2	28°07.3	·· 03.2	43°36.8	·· 16.1
22	8°26.9	105°34.9	56.8	160°48.1	51.8	43°09.6	03.2	58°39.2	16.1
23	23°29.3	120°34.6	57.0	175°49.0	52.4	58°12.0	03.1	73°41.6	16.0
Mer.pass.	21:26	ν -0.3′	d 0.2′	m -4.52	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′	m -2.50	ν 2.4′	d -0.0′	m 0.62

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	38°31.8	135°34.2	S26°57.2	190°49.8	S10°53.0	73°14.4	S15°03.1	88°43.9	S19°16.0
1	53°34.3	150°33.9	57.4	205°50.7	53.6	88°16.7	03.0	103°46.3	16.0
2	68°36.7	165°33.6	57.5	220°51.6	54.2	103°19.1	03.0	118°48.7	16.0
3	83°39.2	180°33.3	·· 57.7	235°52.5	·· 54.8	118°21.5	·· 03.0	133°51.1	·· 16.0
4	98°41.7	195°33.0	57.9	250°53.3	55.4	133°23.8	02.9	148°53.5	15.9
5	113°44.1	210°32.7	58.1	265°54.2	56.0	148°26.2	02.9	163°55.9	15.9
6	128°46.6	225°32.3	S26°58.3	280°55.1	S10°56.6	163°28.6	S15°02.9	178°58.2	S19°15.9
7	143°49.1	240°32.0	58.5	295°56.0	57.3	178°31.0	02.8	194°00.6	15.9
8	158°51.5	255°31.7	58.7	310°56.8	57.9	193°33.3	02.8	209°03.0	15.9
9	173°54.0	270°31.4	·· 58.8	325°57.7	·· 58.5	208°35.7	·· 02.7	224°05.4	·· 15.8
10	188°56.4	285°31.1	59.0	340°58.6	59.1	223°38.1	02.7	239°07.8	15.8
11	203°58.9	300°30.8	59.2	355°59.4	10°59.7	238°40.4	02.7	254°10.2	15.8
12	219°01.4	315°30.5	S26°59.4	11°00.3	S11°00.3	253°42.8	S15°02.6	269°12.5	S19°15.8
13	234°03.8	330°30.1	59.6	26°01.2	00.9	268°45.2	02.6	284°14.9	15.8
14	249°06.3	345°29.8	59.7	41°02.1	01.5	283°47.5	02.5	299°17.3	15.7
15	264°08.8	0°29.5	26°59.9	56°02.9	·· 02.1	298°49.9	·· 02.5	314°19.7	·· 15.7
16	279°11.2	15°29.2	27°00.1	71°03.8	02.7	313°52.3	02.5	329°22.1	15.7
17	294°13.7	30°28.9	00.2	86°04.7	03.3	328°54.6	02.4	344°24.4	15.7
18	309°16.2	45°28.6	S27°00.4	101°05.5	S11°03.9	343°57.0	S15°02.4	359°26.8	S19°15.6
19	324°18.6	60°28.3	00.6	116°06.4	04.6	358°59.3	02.3	14°29.2	15.6
20	339°21.1	75°28.0	00.8	131°07.3	05.2	14°01.7	02.3	29°31.6	15.6
21	354°23.6	90°27.7	·· 00.9	146°08.2	·· 05.8	29°04.1	·· 02.3	44°34.0	·· 15.6
22	9°26.0	105°27.4	01.1	161°09.0	06.4	44°06.4	02.2	59°36.3	15.6
23	24°28.5	120°27.1	01.3	176°09.9	07.0	59°08.8	02.2	74°38.7	15.5
Mer.pass.	21:22	ν -0.3′	d 0.2′	m -4.53	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′	m -2.50	ν 2.4′	d -0.0′	m 0.62

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.6	-57°07.7
Hamal	327°53.8	23°33.9
Polaris	314°46.8	89°21.3
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.5	49°56.2
Aldebaran	290°42.4	16°33.2
Rigel	281°06.2	-8°10.5
Capella	280°25.4	46°01.0
Bellatrix	278°25.5	6°22.2
Elnath	278°04.9	28°37.5
Alnilam	275°40.2	-1°11.2
Betelgeuse	270°54.7	7°24.7
Canopus	263°53.3	-52°42.1
Sirius	258°28.4	-16°44.6
Adhara	255°07.8	-28°59.8
Procyon	244°53.5	5°10.2
Pollux	243°20.5	27°58.4
Avior	234°15.7	-59°34.4
Suhail	222°48.3	-43°30.9
Miaplacidus	221°38.9	-69°48.0
Alphard	217°50.4	-8°45.0
Regulus	207°37.4	11°51.8
Dubhe	193°44.7	61°37.9
Denebola	182°27.9	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.6	-63°12.9
Gacrux	171°55.1	-57°13.8
Alioth	166°15.9	55°50.5
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.4
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.6	-60°55.3
Kochab	137°21.0	74°04.1
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.4	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.2	-37°07.2
Rasalhague	96°01.2	12°32.8
Eltanin	90°43.7	51°29.4
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.2	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°09.9	-56°40.1
Deneb	49°27.6	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 28 Thu	SHA	Mer.pass
Venus	99°16.6	14:57
Mars	153°34.2	11:19
Jupiter	34°46.7	19:12
Saturn	50°15.8	18:10

Oct 29 Fri	SHA	Mer.pass
Venus	98°09.4	14:58
Mars	152°56.2	11:17
Jupiter	34°44.7	19:08
Saturn	50°14.0	18:06

Oct 30 Sat	SHA	Mer.pass
Venus	97°02.4	14:58
Mars	152°18.0	11:16
Jupiter	34°42.6	19:04
Saturn	50°12.1	18:02

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°03.1	S13°06.9	278°22.6	10.3′	N25°12.4	-4.1′	54.8′
1	199°03.2	07.7	292°51.8	10.3′	25°08.3	-4.3′	54.9′
2	214°03.2	08.5	307°21.1	10.3′	25°04.0	-4.4′	54.9′
3	229°03.3	·· 09.4	321°50.5	10.3′	24°59.7	-4.5′	54.9′
4	244°03.3	10.2	336°19.8	10.3′	24°55.1	-4.6′	54.9′
5	259°03.4	11.0	350°49.1	10.4′	24°50.5	-4.8′	54.9′
6	274°03.4	S13°11.9	5°18.5	10.4′	N24°45.7	-4.9′	55.0′
7	289°03.5	12.7	19°47.9	10.4′	24°40.8	-5.0′	55.0′
8	304°03.5	13.5	34°17.3	10.4′	24°35.8	-5.1′	55.0′
9	319°03.6	·· 14.4	48°46.7	10.4′	24°30.7	-5.3′	55.0′
10	334°03.6	15.2	63°16.1	10.4′	24°25.4	-5.4′	55.1′
11	349°03.6	16.1	77°45.5	10.5′	24°20.0	-5.5′	55.1′
12	4°03.7	S13°16.9	92°15.0	10.5′	N24°14.5	-5.6′	55.1′
13	19°03.7	17.7	106°44.5	10.5′	24°08.9	-5.8′	55.1′
14	34°03.8	18.5	121°14.0	10.5′	24°03.1	-5.9′	55.2′
15	49°03.8	·· 19.4	135°43.5	10.5′	23°57.2	-6.0′	55.2′
16	64°03.9	20.2	150°13.0	10.6′	23°51.2	-6.1′	55.2′
17	79°03.9	21.0	164°42.6	10.6′	23°45.1	-6.2′	55.2′
18	94°04.0	S13°21.9	179°12.2	10.6′	N23°38.9	-6.4′	55.3′
19	109°04.0	22.7	193°41.8	10.6′	23°32.5	-6.5′	55.3′
20	124°04.1	23.5	208°11.4	10.6′	23°26.0	-6.6′	55.3′
21	139°04.1	·· 24.4	222°41.1	10.7′	23°19.4	-6.7′	55.3′
22	154°04.1	25.2	237°10.7	10.7′	23°12.7	-6.9′	55.4′
23	169°04.2	26.0	251°40.4	10.7′	23°05.8	-7.0′	55.4′
	SD = 16.1′	d = 0.8′	SD = 15.0′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.2	S13°26.8	266°10.1	10.7′	N22°58.8	-7.1′	55.4′
1	199°04.3	27.7	280°39.9	10.8′	22°51.7	-7.2′	55.5′
2	214°04.3	28.5	295°09.6	10.8′	22°44.5	-7.3′	55.5′
3	229°04.4	·· 29.3	309°39.4	10.8′	22°37.2	-7.4′	55.5′
4	244°04.4	30.2	324°09.2	10.8′	22°29.8	-7.6′	55.5′
5	259°04.4	31.0	338°39.1	10.9′	22°22.2	-7.7′	55.6′
6	274°04.5	S13°31.8	353°08.9	10.9′	N22°14.5	-7.8′	55.6′
7	289°04.5	32.6	7°38.8	10.9′	22°06.7	-7.9′	55.6′
8	304°04.6	33.5	22°08.7	10.9′	21°58.8	-8.0′	55.7′
9	319°04.6	·· 34.3	36°38.7	11.0′	21°50.8	-8.1′	55.7′
10	334°04.6	35.1	51°08.6	11.0′	21°42.6	-8.3′	55.7′
11	349°04.7	35.9	65°38.6	11.0′	21°34.4	-8.4′	55.7′
12	4°04.7	S13°36.8	80°08.6	11.0′	N21°26.0	-8.5′	55.8′
13	19°04.7	37.6	94°38.7	11.1′	21°17.5	-8.6′	55.8′
14	34°04.8	38.4	109°08.7	11.1′	21°08.9	-8.7′	55.8′
15	49°04.8	·· 39.2	123°38.8	11.1′	21°00.2	-8.8′	55.9′
16	64°04.9	40.1	138°08.9	11.1′	20°51.4	-8.9′	55.9′
17	79°04.9	40.9	152°39.1	11.2′	20°42.4	-9.0′	55.9′
18	94°04.9	S13°41.7	167°09.2	11.2′	N20°33.4	-9.2′	56.0′
19	109°05.0	42.5	181°39.4	11.2′	20°24.2	-9.3′	56.0′
20	124°05.0	43.3	196°09.6	11.2′	20°15.0	-9.4′	56.0′
21	139°05.0	·· 44.2	210°39.9	11.3′	20°05.6	-9.5′	56.1′
22	154°05.1	45.0	225°10.2	11.3′	19°56.1	-9.6′	56.1′
23	169°05.1	45.8	239°40.5	11.3′	19°46.5	-9.7′	56.1′
	SD = 16.1′	d = 0.8′	SD = 15.1′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.1	S13°46.6	254°10.8	11.3′	N19°36.8	-9.8′	56.2′
1	199°05.2	47.4	268°41.1	11.4′	19°27.0	-9.9′	56.2′
2	214°05.2	48.3	283°11.5	11.4′	19°17.1	-10.0′	56.2′
3	229°05.2	·· 49.1	297°41.9	11.4′	19°07.0	-10.1′	56.3′
4	244°05.3	49.9	312°12.3	11.4′	18°56.9	-10.2′	56.3′
5	259°05.3	50.7	326°42.7	11.5′	18°46.7	-10.3′	56.3′
6	274°05.3	S13°51.5	341°13.2	11.5′	N18°36.3	-10.4′	56.4′
7	289°05.4	52.4	355°43.7	11.5′	18°25.9	-10.5′	56.4′
8	304°05.4	53.2	10°14.2	11.5′	18°15.4	-10.6′	56.4′
9	319°05.4	·· 54.0	24°44.8	11.6′	18°04.7	-10.7′	56.5′
10	334°05.5	54.8	39°15.3	11.6′	17°54.0	-10.8′	56.5′
11	349°05.5	55.6	53°45.9	11.6′	17°43.1	-10.9′	56.6′
12	4°05.5	S13°56.4	68°16.5	11.6′	N17°32.2	-11.0′	56.6′
13	19°05.6	57.2	82°47.1	11.6′	17°21.1	-11.1′	56.6′
14	34°05.6	58.1	97°17.8	11.7′	17°10.0	-11.2′	56.7′
15	49°05.6	·· 58.9	111°48.5	11.7′	16°58.7	-11.3′	56.7′
16	64°05.6	13°59.7	126°19.1	11.7′	16°47.4	-11.4′	56.7′
17	79°05.7	14°00.5	140°49.9	11.7′	16°36.0	-11.5′	56.8′
18	94°05.7	S14°01.3	155°20.6	11.8′	N16°24.4	-11.6′	56.8′
19	109°05.7	02.1	169°51.3	11.8′	16°12.8	-11.7′	56.8′
20	124°05.8	02.9	184°22.1	11.8′	16°01.1	-11.8′	56.9′
21	139°05.8	·· 03.7	198°52.9	11.8′	15°49.3	-11.9′	56.9′
22	154°05.8	04.6	213°23.7	11.8′	15°37.3	-12.0′	57.0′
23	169°05.8	05.4	227°54.5	11.8′	15°25.3	-12.1′	57.0′
	SD = 16.1′	d = 0.8′	SD = 15.3′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	05:55	07:16	08:40	14:46	16:09	17:31
N 70°	05:52	07:05	08:17	15:09	16:21	17:34
68°	05:49	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	06:35	07:23	16:03	16:51	17:43
60°	05:41	06:30	07:15	16:12	16:56	17:45
N 58°	05:39	06:26	07:07	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	16:32	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	06:34	16:52	17:23	17:57
N 40°	05:26	05:58	06:26	17:01	17:29	18:01
35°	05:22	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	18:57
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	18:35	19:04	19:39
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°	02:34	03:31	04:14	19:15	19:58	20:56
58°	02:16	03:20	04:06	19:23	20:09	21:14
S 60°	01:54	03:07	03:58	19:31	20:22	21:37

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

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 22-24 58-38%
28	16:12	16:15	11:44	05:38	18:03	
29	16:17	16:19	11:44	06:28	18:53	
30	16:21	16:22	11:44	07:18	19:42	

DUT1 = UT1-UTC = -0.1036 sec ΔT = TT-UT1 = +69.2876 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	39°30.9	135°26.8	S27°01.4	191°10.8	S11°07.6	74°11.2	S15°02.1	89°41.1	S19°15.5
1	54°33.4	150°26.5	01.6	206°11.6	08.2	89°13.5	02.1	104°43.5	15.5
2	69°35.9	165°26.2	01.8	221°12.5	08.8	104°15.9	02.1	119°45.9	15.5
3	84°38.3	180°25.9	·· 01.9	236°13.4	·· 09.4	119°18.2	·· 02.0	134°48.2	·· 15.5
4	99°40.8	195°25.6	02.1	251°14.2	10.0	134°20.6	02.0	149°50.6	15.4
5	114°43.3	210°25.3	02.2	266°15.1	10.6	149°23.0	01.9	164°53.0	15.4
6	129°45.7	225°24.9	S27°02.4	281°16.0	S11°11.2	164°25.3	S15°01.9	179°55.4	S19°15.4
7	144°48.2	240°24.6	02.6	296°16.8	11.8	179°27.7	01.9	194°57.7	15.4
8	159°50.7	255°24.3	02.7	311°17.7	12.4	194°30.0	01.8	210°00.1	15.3
9	174°53.1	270°24.1	·· 02.9	326°18.6	·· 13.1	209°32.4	·· 01.8	225°02.5	·· 15.3
10	189°55.6	285°23.8	03.0	341°19.4	13.7	224°34.8	01.7	240°04.9	15.3
11	204°58.0	300°23.5	03.2	356°20.3	14.3	239°37.1	01.7	255°07.3	15.3
12	220°00.5	315°23.2	S27°03.3	11°21.2	S11°14.9	254°39.5	S15°01.7	270°09.6	S19°15.3
13	235°03.0	330°22.9	03.5	26°22.1	15.5	269°41.8	01.6	285°12.0	15.2
14	250°05.4	345°22.6	03.6	41°22.9	16.1	284°44.2	01.6	300°14.4	15.2
15	265°07.9	0°22.3	·· 03.8	56°23.8	·· 16.7	299°46.6	·· 01.5	315°16.8	·· 15.2
16	280°10.4	15°22.0	03.9	71°24.7	17.3	314°48.9	01.5	330°19.1	15.2
17	295°12.8	30°21.7	04.1	86°25.5	17.9	329°51.3	01.4	345°21.5	15.2
18	310°15.3	45°21.4	S27°04.2	101°26.4	S11°18.5	344°53.6	S15°01.4	0°23.9	S19°15.1
19	325°17.8	60°21.1	04.4	116°27.3	19.1	359°56.0	01.4	15°26.3	15.1
20	340°20.2	75°20.8	04.5	131°28.1	19.7	14°58.3	01.3	30°28.6	15.1
21	355°22.7	90°20.5	·· 04.7	146°29.0	·· 20.3	30°00.7	·· 01.3	45°31.0	·· 15.1
22	10°25.2	105°20.2	04.8	161°29.8	20.9	45°03.1	01.2	60°33.4	15.0
23	25°27.6	120°19.9	04.9	176°30.7	21.5	60°05.4	01.2	75°35.8	15.0
Mer.pass.	21:18	ν -0.3′	d 0.2′	m -4.54	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′ m -2.49	ν 2.4′	d -0.0′ m 0.62

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	40°30.1	135°19.6	S27°05.1	191°31.6	S11°22.1	75°07.8	S15°01.1	90°38.2	S19°15.0
1	55°32.5	150°19.4	05.2	206°32.4	22.7	90°10.1	01.1	105°40.5	15.0
2	70°35.0	165°19.1	05.4	221°33.3	23.3	105°12.5	01.1	120°42.9	14.9
3	85°37.5	180°18.8	·· 05.5	236°34.2	·· 23.9	120°14.8	·· 01.0	135°45.3	·· 14.9
4	100°39.9	195°18.5	05.6	251°35.0	24.6	135°17.2	01.0	150°47.7	14.9
5	115°42.4	210°18.2	05.8	266°35.9	25.2	150°19.5	00.9	165°50.0	14.9
6	130°44.9	225°17.9	S27°05.9	281°36.8	S11°25.8	165°21.9	S15°00.9	180°52.4	S19°14.9
7	145°47.3	240°17.6	06.0	296°37.6	26.4	180°24.2	00.8	195°54.8	14.8
8	160°49.8	255°17.4	06.2	311°38.5	27.0	195°26.6	00.8	210°57.1	14.8
9	175°52.3	270°17.1	·· 06.3	326°39.4	·· 27.6	210°28.9	·· 00.8	225°59.5	·· 14.8
10	190°54.7	285°16.8	06.4	341°40.2	28.2	225°31.3	00.7	241°01.9	14.8
11	205°57.2	300°16.5	06.6	356°41.1	28.8	240°33.6	00.7	256°04.3	14.7
12	220°59.6	315°16.2	S27°06.7	11°42.0	S11°29.4	255°36.0	S15°00.6	271°06.6	S19°14.7
13	236°02.1	330°15.9	06.8	26°42.8	30.0	270°38.3	00.6	286°09.0	14.7
14	251°04.6	345°15.7	06.9	41°43.7	30.6	285°40.7	00.5	301°11.4	14.7
15	266°07.0	0°15.4	·· 07.1	56°44.5	·· 31.2	300°43.0	·· 00.5	316°13.8	·· 14.7
16	281°09.5	15°15.1	07.2	71°45.4	31.8	315°45.4	00.4	331°16.1	14.6
17	296°12.0	30°14.8	07.3	86°46.3	32.4	330°47.7	00.4	346°18.5	14.6
18	311°14.4	45°14.6	S27°07.4	101°47.1	S11°33.0	345°50.1	S15°00.4	1°20.9	S19°14.6
19	326°16.9	60°14.3	07.6	116°48.0	33.6	0°52.4	00.3	16°23.2	14.6
20	341°19.4	75°14.0	07.7	131°48.8	34.2	15°54.8	00.3	31°25.6	14.5
21	356°21.8	90°13.7	·· 07.8	146°49.7	·· 34.8	30°57.1	·· 00.2	46°28.0	·· 14.5
22	11°24.3	105°13.5	07.9	161°50.6	35.4	45°59.5	00.2	61°30.4	14.5
23	26°26.8	120°13.2	08.0	176°51.4	36.0	61°01.8	00.1	76°32.7	14.5
Mer.pass.	21:15	ν -0.3′	d 0.1′	m -4.55	ν 0.9′	d 0.6′	m 1.61	ν 2.4′	d -0.0′ m -2.48	ν 2.4′	d -0.0′ m 0.63

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	41°29.2	135°12.9	S27°08.1	191°52.3	S11°36.6	76°04.2	S15°00.1	91°35.1	S19°14.4
1	56°31.7	150°12.6	08.3	206°53.2	37.2	91°06.5	00.0	106°37.5	14.4
2	71°34.1	165°12.4	08.4	221°54.0	37.8	106°08.9	15°00.0	121°39.8	14.4
3	86°36.6	180°12.1	·· 08.5	236°54.9	·· 38.4	121°11.2	14°59.9	136°42.2	·· 14.4
4	101°39.1	195°11.8	08.6	251°55.7	39.0	136°13.6	59.9	151°44.6	14.3
5	116°41.5	210°11.6	08.7	266°56.6	39.6	151°15.9	59.9	166°47.0	14.3
6	131°44.0	225°11.3	S27°08.8	281°57.5	S11°40.2	166°18.2	S14°59.8	181°49.3	S19°14.3
7	146°46.5	240°11.0	08.9	296°58.3	40.8	181°20.6	59.8	196°51.7	14.3
8	161°48.9	255°10.8	09.0	311°59.2	41.4	196°22.9	59.7	211°54.1	14.3
9	176°51.4	270°10.5	·· 09.1	327°00.0	·· 42.0	211°25.3	·· 59.7	226°56.4	·· 14.2
10	191°53.9	285°10.2	09.2	342°00.9	42.6	226°27.6	59.6	241°58.8	14.2
11	206°56.3	300°10.0	09.3	357°01.8	43.2	241°30.0	59.6	257°01.2	14.2
12	221°58.8	315°09.7	S27°09.4	12°02.6	S11°43.8	256°32.3	S14°59.5	272°03.5	S19°14.2
13	237°01.3	330°09.4	09.5	27°03.5	44.4	271°34.6	59.5	287°05.9	14.1
14	252°03.7	345°09.2	09.6	42°04.3	45.0	286°37.0	59.4	302°08.3	14.1
15	267°06.2	0°08.9	·· 09.7	57°05.2	·· 45.6	301°39.3	·· 59.4	317°10.7	·· 14.1
16	282°08.6	15°08.7	09.8	72°06.0	46.2	316°41.7	59.3	332°13.0	14.1
17	297°11.1	30°08.4	09.9	87°06.9	46.8	331°44.0	59.3	347°15.4	14.0
18	312°13.6	45°08.1	S27°10.0	102°07.8	S11°47.4	346°46.4	S14°59.2	2°17.8	S19°14.0
19	327°16.0	60°07.9	10.1	117°08.6	48.0	1°48.7	59.2	17°20.1	14.0
20	342°18.5	75°07.6	10.2	132°09.5	48.6	16°51.0	59.2	32°22.5	14.0
21	357°21.0	90°07.4	·· 10.3	147°10.3	·· 49.2	31°53.4	·· 59.1	47°24.9	·· 13.9
22	12°23.4	105°07.1	10.4	162°11.2	49.8	46°55.7	59.1	62°27.2	13.9
23	27°25.9	120°06.8	10.5	177°12.1	50.4	61°58.1	59.0	77°29.6	13.9
Mer.pass.	21:11	ν -0.3′	d 0.1′	m -4.56	ν 0.9′	d 0.6′	m 1.61	ν 2.3′	d -0.0′ m -2.47	ν 2.4′	d -0.0′ m 0.63

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.6	-57°07.7
Hamal	327°53.8	23°33.9
Polaris	314°46.5	89°21.3
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.5	49°56.2
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.4	46°01.1
Bellatrix	278°25.5	6°22.2
Elnath	278°04.9	28°37.5
Alnilam	275°40.2	-1°11.2
Betelgeuse	270°54.7	7°24.7
Canopus	263°53.2	-52°42.1
Sirius	258°28.4	-16°44.6
Adhara	255°07.8	-28°59.8
Procyon	244°53.5	5°10.2
Pollux	243°20.5	27°58.4
Avior	234°15.7	-59°34.4
Suhail	222°48.3	-43°30.9
Miaplacidus	221°38.8	-69°48.0
Alphard	217°50.4	-8°45.0
Regulus	207°37.4	11°51.8
Dubhe	193°44.7	61°37.9
Denebola	182°27.9	14°27.2
Gienah	175°46.6	-17°39.5
Acrux	173°03.6	-63°12.9
Gacrux	171°55.0	-57°13.8
Alioth	166°15.9	55°50.5
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.4
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.6	-60°55.3
Kochab	137°21.0	74°04.0
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.4	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.4	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.2
Rasalhague	96°01.2	12°32.8
Eltanin	90°43.8	51°29.4
Kaus Aust.	83°36.2	-34°22.5
Vega	80°35.2	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°10.0	-56°40.1
Deneb	49°27.6	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.5
Fomalhaut	15°17.2	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Oct 31 Sun	SHA	Mer.pass
Venus	95°55.8	14:59
Mars	151°39.8	11:15
Jupiter	34°40.2	19:00
Saturn	50°10.2	17:58

Nov 01 Mon	SHA	Mer.pass
Venus	94°49.6	14:59
Mars	151°01.5	11:13
Jupiter	34°37.7	18:57
Saturn	50°08.1	17:55

Nov 02 Tue	SHA	Mer.pass
Venus	93°43.7	14:59
Mars	150°23.1	11:12
Jupiter	34°35.0	18:53
Saturn	50°05.9	17:51

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.9	S14°06.2	242°25.4	11.9′	N15°13.2	-12.2′	57.0′
1	199°05.9	07.0	256°56.2	11.9′	15°01.1	-12.3′	57.1′
2	214°05.9	07.8	271°27.1	11.9′	14°48.8	-12.4′	57.1′
3	229°05.9	·· 08.6	285°58.0	11.9′	14°36.4	-12.5′	57.1′
4	244°06.0	09.4	300°28.9	11.9′	14°24.0	-12.5′	57.2′
5	259°06.0	10.2	314°59.8	11.9′	14°11.4	-12.6′	57.2′
6	274°06.0	S14°11.0	329°30.8	11.9′	N13°58.8	-12.7′	57.3′
7	289°06.0	11.8	344°01.7	12.0′	13°46.1	-12.8′	57.3′
8	304°06.1	12.7	358°32.7	12.0′	13°33.3	-12.9′	57.3′
9	319°06.1	·· 13.5	13°03.7	12.0′	13°20.4	-13.0′	57.4′
10	334°06.1	14.3	27°34.6	12.0′	13°07.5	-13.0′	57.4′
11	349°06.1	15.1	42°05.6	12.0′	12°54.4	-13.1′	57.5′
12	4°06.1	S14°15.9	56°36.6	12.0′	N12°41.3	-13.2′	57.5′
13	19°06.2	16.7	71°07.7	12.0′	12°28.1	-13.3′	57.5′
14	34°06.2	17.5	85°38.7	12.0′	12°14.8	-13.4′	57.6′
15	49°06.2	·· 18.3	100°09.7	12.0′	12°01.4	-13.4′	57.6′
16	64°06.2	19.1	114°40.7	12.0′	11°48.0	-13.5′	57.7′
17	79°06.3	19.9	129°11.8	12.0′	11°34.4	-13.6′	57.7′
18	94°06.3	S14°20.7	143°42.8	12.1′	N11°20.8	-13.7′	57.7′
19	109°06.3	21.5	158°13.9	12.1′	11°07.2	-13.7′	57.8′
20	124°06.3	22.3	172°44.9	12.1′	10°53.4	-13.8′	57.8′
21	139°06.3	·· 23.1	187°16.0	12.1′	10°39.6	-13.9′	57.9′
22	154°06.3	23.9	201°47.1	12.1′	10°25.7	-14.0′	57.9′
23	169°06.4	24.7	216°18.1	12.1′	10°11.7	-14.0′	57.9′
	SD = 16.1′	d = 0.8′	SD = 15.6′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.4	S14°25.5	230°49.2	12.1′	N09°57.7	-14.1′	58.0′
1	199°06.4	26.3	245°20.2	12.1′	09°43.6	-14.2′	58.0′
2	214°06.4	27.1	259°51.3	12.1′	09°29.4	-14.2′	58.0′
3	229°06.4	·· 27.9	274°22.4	12.1′	09°15.2	-14.3′	58.1′
4	244°06.5	28.7	288°53.4	12.1′	09°00.9	-14.4′	58.1′
5	259°06.5	29.5	303°24.5	12.0′	08°46.5	-14.4′	58.2′
6	274°06.5	S14°30.3	317°55.5	12.0′	N08°32.1	-14.5′	58.2′
7	289°06.5	31.1	332°26.6	12.0′	08°17.6	-14.6′	58.2′
8	304°06.5	31.9	346°57.6	12.0′	08°03.0	-14.6′	58.3′
9	319°06.5	·· 32.7	1°28.6	12.0′	07°48.4	-14.7′	58.3′
10	334°06.5	33.5	15°59.7	12.0′	07°33.7	-14.7′	58.4′
11	349°06.6	34.3	30°30.7	12.0′	07°19.0	-14.8′	58.4′
12	4°06.6	S14°35.1	45°01.7	12.0′	N07°04.2	-14.9′	58.4′
13	19°06.6	35.9	59°32.7	12.0′	06°49.3	-14.9′	58.5′
14	34°06.6	36.7	74°03.6	12.0′	06°34.4	-15.0′	58.5′
15	49°06.6	·· 37.5	88°34.6	12.0′	06°19.4	-15.0′	58.6′
16	64°06.6	38.3	103°05.6	11.9′	06°04.4	-15.1′	58.6′
17	79°06.6	39.1	117°36.5	11.9′	05°49.4	-15.1′	58.6′
18	94°06.6	S14°39.9	132°07.4	11.9′	N05°34.2	-15.2′	58.7′
19	109°06.7	40.7	146°38.3	11.9′	05°19.1	-15.2′	58.7′
20	124°06.7	41.5	161°09.2	11.9′	05°03.9	-15.3′	58.8′
21	139°06.7	·· 42.2	175°40.1	11.8′	04°48.6	-15.3′	58.8′
22	154°06.7	43.0	190°10.9	11.8′	04°33.3	-15.4′	58.8′
23	169°06.7	43.8	204°41.7	11.8′	04°17.9	-15.4′	58.9′
	SD = 16.1′	d = 0.8′	SD = 15.8′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.7	S14°44.6	219°12.5	11.8′	N04°02.5	-15.4′	58.9′
1	199°06.7	45.4	233°43.3	11.8′	03°47.1	-15.5′	58.9′
2	214°06.7	46.2	248°14.1	11.7′	03°31.6	-15.5′	59.0′
3	229°06.7	·· 47.0	262°44.8	11.7′	03°16.1	-15.6′	59.0′
4	244°06.7	47.8	277°15.5	11.7′	03°00.5	-15.6′	59.1′
5	259°06.7	48.6	291°46.2	11.6′	02°44.9	-15.6′	59.1′
6	274°06.7	S14°49.4	306°16.8	11.6′	N02°29.3	-15.7′	59.1′
7	289°06.8	50.1	320°47.4	11.6′	02°13.7	-15.7′	59.2′
8	304°06.8	50.9	335°18.0	11.6′	01°58.0	-15.7′	59.2′
9	319°06.8	·· 51.7	349°48.6	11.5′	01°42.2	-15.8′	59.2′
10	334°06.8	52.5	4°19.1	11.5′	01°26.5	-15.8′	59.3′
11	349°06.8	53.3	18°49.6	11.5′	01°10.7	-15.8′	59.3′
12	4°06.8	S14°54.1	33°20.0	11.4′	N00°54.9	-15.8′	59.4′
13	19°06.8	54.9	47°50.4	11.4′	00°39.1	-15.9′	59.4′
14	34°06.8	55.7	62°20.8	11.3′	00°23.2	-15.9′	59.4′
15	49°06.8	·· 56.4	76°51.2	11.3′	N00°07.3	-15.9′	59.5′
16	64°06.8	57.2	91°21.5	11.3′	S00°08.6	-15.9′	59.5′
17	79°06.8	58.0	105°51.7	11.2′	00°24.5	-15.9′	59.5′
18	94°06.8	S14°58.8	120°21.9	11.2′	S00°40.4	-16.0′	59.6′
19	109°06.8	14°59.6	134°52.1	11.1′	00°56.4	-16.0′	59.6′
20	124°06.8	15°00.4	149°22.2	11.1′	01°12.4	-16.0′	59.6′
21	139°06.8	·· 01.1	163°52.3	11.0′	01°28.3	-16.0′	59.7′
22	154°06.8	01.9	178°22.4	11.0′	01°44.3	-16.0′	59.7′
23	169°06.8	02.7	192°52.4	10.9′	02°00.3	-16.0′	59.7′
	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	14:28	15:55	17:18
N 70°	06:03	07:17	08:31	14:54	16:09	17:23
68°	05:59	07:06	08:12	15:14	16:20	17:27
66°	05:56	06:57	07:56	15:30	16:29	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	07:14	16:12	16:54	17:41
56°	05:43	06:28	07:07	16:19	16:59	17:43
54°	05:41	06:23	07:01	16:25	17:03	17:45
52°	05:40	06:19	06:55	16:31	17:07	17:47
50°	05:38	06:16	06:50	16:37	17:11	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	19:29
40°	03:44	04:20	04:49	18:39	19:08	19:44
45°	03:27	04:07	04:39	18:49	19:22	20:01
S 50°	03:04	03:50	04:26	19:02	19:38	20:25
52°	02:53	03:42	04:20	19:08	19:46	20:36
54°	02:39	03:33	04:14	19:14	19:56	20:50
56°	02:24	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	02:58	03:50	19:39	20:32	21:52

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

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 25-27 29-11%
31	16:23	16:25	11:44	08:06	20:30	
01	16:26	16:26	11:44	08:54	21:18	
02	16:27	16:27	11:44	09:42	22:07	

DUT1 = UT1-UTC = -0.1055 sec ΔT = TT-UT1 = +69.2895 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	42°28.4	135°06.6	S27°10.6	192°12.9	S11°51.0	77°00.4	S14°59.0	92°32.0	S19°13.9
1	57°30.8	150°06.3	10.7	207°13.8	51.6	92°02.7	58.9	107°34.3	13.8
2	72°33.3	165°06.1	10.8	222°14.6	52.2	107°05.1	58.9	122°36.7	13.8
3	87°35.7	180°05.8	·· 10.9	237°15.5	·· 52.8	122°07.4	·· 58.8	137°39.1	·· 13.8
4	102°38.2	195°05.6	10.9	252°16.3	53.4	137°09.7	58.8	152°41.4	13.8
5	117°40.7	210°05.3	11.0	267°17.2	54.0	152°12.1	58.7	167°43.8	13.7
6	132°43.1	225°05.1	S27°11.1	282°18.0	S11°54.6	167°14.4	S14°58.7	182°46.2	S19°13.7
7	147°45.6	240°04.8	11.2	297°18.9	55.2	182°16.8	58.6	197°48.5	13.7
8	162°48.1	255°04.6	11.3	312°19.8	55.8	197°19.1	58.6	212°50.9	13.7
9	177°50.5	270°04.3	·· 11.4	327°20.6	·· 56.4	212°21.4	·· 58.5	227°53.3	·· 13.6
10	192°53.0	285°04.1	11.4	342°21.5	57.0	227°23.8	58.5	242°55.6	13.6
11	207°55.5	300°03.8	11.5	357°22.3	57.6	242°26.1	58.4	257°58.0	13.6
12	222°57.9	315°03.6	S27°11.6	12°23.2	S11°58.2	257°28.4	S14°58.4	273°00.4	S19°13.6
13	238°00.4	330°03.4	11.7	27°24.0	58.8	272°30.8	58.3	288°02.7	13.5
14	253°02.9	345°03.1	11.7	42°24.9	11°59.4	287°33.1	58.3	303°05.1	13.5
15	268°05.3	0°02.9	·· 11.8	57°25.7	12°00.0	302°35.4	·· 58.2	318°07.4	·· 13.5
16	283°07.8	15°02.6	11.9	72°26.6	00.6	317°37.8	58.2	333°09.8	13.5
17	298°10.2	30°02.4	12.0	87°27.4	01.2	332°40.1	58.1	348°12.2	13.4
18	313°12.7	45°02.1	S27°12.0	102°28.3	S12°01.7	347°42.4	S14°58.1	3°14.5	S19°13.4
19	328°15.2	60°01.9	12.1	117°29.2	02.3	2°44.8	58.0	18°16.9	13.4
20	343°17.6	75°01.7	12.2	132°30.0	02.9	17°47.1	58.0	33°19.3	13.4
21	358°20.1	90°01.4	·· 12.3	147°30.9	·· 03.5	32°49.4	·· 57.9	48°21.6	·· 13.3
22	13°22.6	105°01.2	12.3	162°31.7	04.1	47°51.8	57.9	63°24.0	13.3
23	28°25.0	120°01.0	12.4	177°32.6	04.7	62°54.1	57.8	78°26.4	13.3
Mer.pass.	21:07	ν -0.3′	d 0.1′	m -4.58	ν 0.9′	d 0.6′	m 1.61	ν 2.3′	d -0.0′ m -2.47	ν 2.4′	d -0.0′ m 0.64
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	43°27.5	135°00.7	S27°12.5	192°33.4	S12°05.3	77°56.4	S14°57.8	93°28.7	S19°13.3
1	58°30.0	150°00.5	12.5	207°34.3	05.9	92°58.8	57.7	108°31.1	13.2
2	73°32.4	165°00.3	12.6	222°35.1	06.5	108°01.1	57.7	123°33.4	13.2
3	88°34.9	180°00.0	·· 12.6	237°36.0	·· 07.1	123°03.4	·· 57.6	138°35.8	·· 13.2
4	103°37.3	194°59.8	12.7	252°36.8	07.7	138°05.7	57.6	153°38.2	13.2
5	118°39.8	209°59.6	12.8	267°37.7	08.3	153°08.1	57.5	168°40.5	13.1
6	133°42.3	224°59.3	S27°12.8	282°38.5	S12°08.9	168°10.4	S14°57.5	183°42.9	S19°13.1
7	148°44.7	239°59.1	12.9	297°39.4	09.5	183°12.7	57.4	198°45.3	13.1
8	163°47.2	254°58.9	12.9	312°40.2	10.1	198°15.1	57.4	213°47.6	13.1
9	178°49.7	269°58.6	·· 13.0	327°41.1	·· 10.7	213°17.4	·· 57.3	228°50.0	·· 13.0
10	193°52.1	284°58.4	13.0	342°41.9	11.3	228°19.7	57.3	243°52.3	13.0
11	208°54.6	299°58.2	13.1	357°42.8	11.9	243°22.0	57.2	258°54.7	13.0
12	223°57.1	314°58.0	S27°13.2	12°43.6	S12°12.5	258°24.4	S14°57.1	273°57.1	S19°13.0
13	238°59.5	329°57.7	13.2	27°44.5	13.0	273°26.7	57.1	288°59.4	12.9
14	254°02.0	344°57.5	13.3	42°45.3	13.6	288°29.0	57.0	304°01.8	12.9
15	269°04.5	359°57.3	·· 13.3	57°46.2	·· 14.2	303°31.3	·· 57.0	319°04.1	·· 12.9
16	284°06.9	14°57.1	13.4	72°47.0	14.8	318°33.7	56.9	334°06.5	12.9
17	299°09.4	29°56.8	13.4	87°47.9	15.4	333°36.0	56.9	349°08.9	12.8
18	314°11.8	44°56.6	S27°13.5	102°48.7	S12°16.0	348°38.3	S14°56.8	4°11.2	S19°12.8
19	329°14.3	59°56.4	13.5	117°49.6	16.6	3°40.6	56.8	19°13.6	12.8
20	344°16.8	74°56.2	13.5	132°50.4	17.2	18°43.0	56.7	34°15.9	12.7
21	359°19.2	89°56.0	·· 13.6	147°51.3	·· 17.8	33°45.3	·· 56.7	49°18.3	·· 12.7
22	14°21.7	104°55.8	13.6	162°52.1	18.4	48°47.6	56.6	64°20.7	12.7
23	29°24.2	119°55.5	13.7	177°53.0	19.0	63°49.9	56.6	79°23.0	12.7
Mer.pass.	21:03	ν -0.2′	d 0.1′	m -4.59	ν 0.9′	d 0.6′	m 1.61	ν 2.3′	d -0.1′ m -2.46	ν 2.4′	d -0.0′ m 0.64
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°26.6	134°55.3	S27°13.7	192°53.8	S12°19.6	78°52.3	S14°56.5	94°25.4	S19°12.6
1	59°29.1	149°55.1	13.8	207°54.7	20.2	93°54.6	56.5	109°27.7	12.6
2	74°31.6	164°54.9	13.8	222°55.5	20.7	108°56.9	56.4	124°30.1	12.6
3	89°34.0	179°54.7	·· 13.8	237°56.4	·· 21.3	123°59.2	·· 56.4	139°32.5	·· 12.6
4	104°36.5	194°54.5	13.9	252°57.2	21.9	139°01.6	56.3	154°34.8	12.5
5	119°39.0	209°54.3	13.9	267°58.1	22.5	154°03.9	56.2	169°37.2	12.5
6	134°41.4	224°54.1	S27°13.9	282°58.9	S12°23.1	169°06.2	S14°56.2	184°39.5	S19°12.5
7	149°43.9	239°53.8	14.0	297°59.7	23.7	184°08.5	56.1	199°41.9	12.5
8	164°46.3	254°53.6	14.0	313°00.6	24.3	199°10.8	56.1	214°44.2	12.4
9	179°48.8	269°53.4	·· 14.0	328°01.4	·· 24.9	214°13.2	·· 56.0	229°46.6	·· 12.4
10	194°51.3	284°53.2	14.1	343°02.3	25.5	229°15.5	56.0	244°49.0	12.4
11	209°53.7	299°53.0	14.1	358°03.1	26.1	244°17.8	55.9	259°51.3	12.3
12	224°56.2	314°52.8	S27°14.1	13°04.0	S12°26.7	259°20.1	S14°55.9	274°53.7	S19°12.3
13	239°58.7	329°52.6	14.2	28°04.8	27.2	274°22.4	55.8	289°56.0	12.3
14	255°01.1	344°52.4	14.2	43°05.7	27.8	289°24.8	55.7	304°58.4	12.3
15	270°03.6	359°52.2	·· 14.2	58°06.5	·· 28.4	304°27.1	·· 55.7	320°00.7	·· 12.2
16	285°06.1	14°52.0	14.2	73°07.4	29.0	319°29.4	55.6	335°03.1	12.2
17	300°08.5	29°51.8	14.3	88°08.2	29.6	334°31.7	55.6	350°05.5	12.2
18	315°11.0	44°51.6	S27°14.3	103°09.1	S12°30.2	349°34.0	S14°55.5	5°07.8	S19°12.2
19	330°13.4	59°51.4	14.3	118°09.9	30.8	4°36.3	55.5	20°10.2	12.1
20	345°15.9	74°51.2	14.3	133°10.7	31.4	19°38.7	55.4	35°12.5	12.1
21	0°18.4	89°51.0	·· 14.3	148°11.6	·· 32.0	34°41.0	·· 55.4	50°14.9	·· 12.1
22	15°20.8	104°50.8	14.4	163°12.4	32.5	49°43.3	55.3	65°17.2	12.0
23	30°23.3	119°50.6	14.4	178°13.3	33.1	64°45.6	55.2	80°19.6	12.0
Mer.pass.	20:59	ν -0.2′	d 0.0′	m -4.60	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.45	ν 2.4′	d -0.0′ m 0.64

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.7
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.6	-57°07.7
Hamal	327°53.8	23°33.9
Polaris	314°46.2	89°21.3
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.5	49°56.2
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.4	46°01.1
Bellatrix	278°25.4	6°22.2
Elnath	278°04.9	28°37.5
Alnilam	275°40.2	-1°11.2
Betelgeuse	270°54.7	7°24.7
Canopus	263°53.2	-52°42.2
Sirius	258°28.4	-16°44.6
Adhara	255°07.7	-28°59.9
Procyon	244°53.5	5°10.2
Pollux	243°20.4	27°58.4
Avior	234°15.7	-59°34.4
Suhail	222°48.2	-43°30.9
Miaplacidus	221°38.8	-69°48.0
Alphard	217°50.4	-8°45.0
Regulus	207°37.4	11°51.7
Dubhe	193°44.7	61°37.9
Denebola	182°27.9	14°27.1
Gienah	175°46.6	-17°39.5
Acrux	173°03.6	-63°12.9
Gacrux	171°55.0	-57°13.8
Alioth	166°15.9	55°50.5
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.3
Hadar	148°40.4	-60°28.5
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.6	-60°55.3
Kochab	137°21.0	74°04.0
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.4	26°38.7
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.2
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.8	51°29.4
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.2	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°10.0	-56°40.1
Deneb	49°27.6	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.6
Fomalhaut	15°17.3	-29°30.5
Scheat	13°47.5	28°12.2
Markab	13°32.3	15°19.4

Nov 03 Wed	SHA	Mer.pass
Venus	92°38.2	15:00
Mars	149°44.6	11:11
Jupiter	34°32.0	18:49
Saturn	50°03.6	17:47

Nov 04 Thu	SHA	Mer.pass
Venus	91°33.2	15:00
Mars	149°05.9	11:09
Jupiter	34°28.9	18:45
Saturn	50°01.2	17:43

Nov 05 Fri	SHA	Mer.pass
Venus	90°28.7	15:01
Mars	148°27.2	11:08
Jupiter	34°25.6	18:42
Saturn	49°58.7	17:40

Horizontal parallax	
Venus:	0.2
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.8	S15°03.5	207°22.3	10.9′	S02°16.4	16.0′	59.8′
1	199°06.8	04.3	221°52.2	10.8′	02°32.4	16.0′	59.8′
2	214°06.8	05.0	236°22.0	10.8′	02°48.4	16.0′	59.8′
3	229°06.8	·· 05.8	250°51.8	10.7′	03°04.4	16.0′	59.9′
4	244°06.8	06.6	265°21.5	10.7′	03°20.4	16.0′	59.9′
5	259°06.8	07.4	279°51.2	10.6′	03°36.5	16.0′	59.9′
6	274°06.8	S15°08.2	294°20.9	10.6′	S03°52.5	16.0′	60.0′
7	289°06.8	08.9	308°50.4	10.5′	04°08.5	16.0′	60.0′
8	304°06.8	09.7	323°19.9	10.5′	04°24.5	16.0′	60.0′
9	319°06.8	·· 10.5	337°49.4	10.4′	04°40.5	16.0′	60.1′
10	334°06.8	11.3	352°18.8	10.3′	04°56.5	16.0′	60.1′
11	349°06.8	12.1	6°48.1	10.3′	05°12.5	16.0′	60.1′
12	4°06.8	S15°12.8	21°17.4	10.2′	S05°28.5	16.0′	60.1′
13	19°06.8	13.6	35°46.6	10.1′	05°44.5	15.9′	60.2′
14	34°06.8	14.4	50°15.7	10.1′	06°00.4	15.9′	60.2′
15	49°06.8	·· 15.2	64°44.8	10.0′	06°16.3	15.9′	60.2′
16	64°06.8	15.9	79°13.8	9.9′	06°32.3	15.9′	60.3′
17	79°06.8	16.7	93°42.8	9.9′	06°48.1	15.9′	60.3′
18	94°06.8	S15°17.5	108°11.7	9.8′	S07°04.0	15.8′	60.3′
19	109°06.8	18.2	122°40.5	9.7′	07°19.8	15.8′	60.3′
20	124°06.7	19.0	137°09.2	9.7′	07°35.7	15.8′	60.4′
21	139°06.7	·· 19.8	151°37.9	9.6′	07°51.4	15.8′	60.4′
22	154°06.7	20.6	166°06.5	9.5′	08°07.2	15.7′	60.4′
23	169°06.7	21.3	180°35.0	9.4′	08°22.9	15.7′	60.4′
	SD = 16.1′	d = 0.8′	SD = 16.3′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.7	S15°22.1	195°03.4	9.4′	S08°38.6	15.6′	60.5′
1	199°06.7	22.9	209°31.8	9.3′	08°54.2	15.6′	60.5′
2	214°06.7	23.6	224°00.1	9.2′	09°09.8	15.6′	60.5′
3	229°06.7	·· 24.4	238°28.3	9.1′	09°25.4	15.5′	60.5′
4	244°06.7	25.2	252°56.5	9.1′	09°40.9	15.5′	60.5′
5	259°06.7	26.0	267°24.5	9.0′	09°56.4	15.4′	60.6′
6	274°06.7	S15°26.7	281°52.5	8.9′	S10°11.8	15.4′	60.6′
7	289°06.6	27.5	296°20.4	8.8′	10°27.2	15.3′	60.6′
8	304°06.6	28.3	310°48.2	8.7′	10°42.5	15.3′	60.6′
9	319°06.6	·· 29.0	325°16.0	8.7′	10°57.8	15.2′	60.7′
10	334°06.6	29.8	339°43.6	8.6′	11°13.0	15.2′	60.7′
11	349°06.6	30.6	354°11.2	8.5′	11°28.2	15.1′	60.7′
12	4°06.6	S15°31.3	8°38.7	8.4′	S11°43.3	15.0′	60.7′
13	19°06.6	32.1	23°06.1	8.3′	11°58.3	15.0′	60.7′
14	34°06.6	32.9	37°33.4	8.2′	12°13.3	14.9′	60.7′
15	49°06.6	·· 33.6	52°00.7	8.1′	12°28.2	14.8′	60.8′
16	64°06.5	34.4	66°27.8	8.1′	12°43.1	14.8′	60.8′
17	79°06.5	35.1	80°54.9	8.0′	12°57.9	14.7′	60.8′
18	94°06.5	S15°35.9	95°21.8	7.9′	S13°12.6	14.6′	60.8′
19	109°06.5	36.7	109°48.7	7.8′	13°27.2	14.6′	60.8′
20	124°06.5	37.4	124°15.5	7.7′	13°41.7	14.5′	60.8′
21	139°06.5	·· 38.2	138°42.2	7.6′	13°56.2	14.4′	60.9′
22	154°06.4	39.0	153°08.8	7.5′	14°10.6	14.3′	60.9′
23	169°06.4	39.7	167°35.3	7.4′	14°24.9	14.2′	60.9′
	SD = 16.1′	d = 0.8′	SD = 16.5′				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.4	S15°40.5	182°01.7	7.3′	S14°39.1	14.1′	60.9′
1	199°06.4	41.2	196°28.1	7.2′	14°53.3	14.1′	60.9′
2	214°06.4	42.0	210°54.3	7.1′	15°07.3	14.0′	60.9′
3	229°06.4	·· 42.8	225°20.5	7.1′	15°21.3	13.9′	60.9′
4	244°06.3	43.5	239°46.5	7.0′	15°35.2	13.8′	60.9′
5	259°06.3	44.3	254°12.5	6.9′	15°48.9	13.7′	60.9′
6	274°06.3	S15°45.0	268°38.3	6.8′	S16°02.6	13.6′	61.0′
7	289°06.3	45.8	283°04.1	6.7′	16°16.2	13.5′	61.0′
8	304°06.3	46.5	297°29.8	6.6′	16°29.6	13.4′	61.0′
9	319°06.2	·· 47.3	311°55.4	6.5′	16°43.0	13.3′	61.0′
10	334°06.2	48.1	326°20.9	6.4′	16°56.3	13.2′	61.0′
11	349°06.2	48.8	340°46.3	6.3′	17°09.4	13.0′	61.0′
12	4°06.2	S15°49.6	355°11.6	6.2′	S17°22.5	12.9′	61.0′
13	19°06.2	50.3	9°36.8	6.1′	17°35.4	12.8′	61.0′
14	34°06.1	51.1	24°01.9	6.0′	17°48.2	12.7′	61.0′
15	49°06.1	·· 51.8	38°26.9	5.9′	18°00.9	12.6′	61.0′
16	64°06.1	52.6	52°51.9	5.8′	18°13.5	12.5′	61.0′
17	79°06.1	53.3	67°16.7	5.7′	18°25.9	12.3′	61.0′
18	94°06.1	S15°54.1	81°41.4	5.7′	S18°38.3	12.2′	61.0′
19	109°06.0	54.8	96°06.1	5.6′	18°50.5	12.1′	61.0′
20	124°06.0	55.6	110°30.6	5.5′	19°02.6	12.0′	61.0′
21	139°06.0	·· 56.3	124°55.1	5.4′	19°14.5	11.8′	61.0′
22	154°06.0	57.1	139°19.5	5.3′	19°26.4	11.7′	61.0′
23	169°05.9	57.8	153°43.8	5.2′	19°38.0	11.6′	61.0′
	SD = 16.1′	d = 0.8′	SD = 16.6′				

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°	06:08	07:17	08:24	15:02	16:09	17:17
66°	06:04	07:07	08:07	15:19	16:19	17:22
64°	06:01	06:58	07:52	15:34	16:28	17:25
62°	05:57	06:51	07:40	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	07:21	16:05	16:48	17:35
56°	05:49	06:33	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	05:29	05:51	17:36	17:58	18:23
0°	04:54	05:19	05:40	17:47	18:08	18:33
S 10°	04:41	05:07	05:29	17:58	18:20	18:46
20°	04:27	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	19:13	19:53	20:44
54°	02:31	03:26	04:08	19:20	20:02	20:59
56°	02:13	03:15	04:00	19:28	20:14	21:17
58°	01:52	03:03	03:51	19:37	20:26	21:39
S 60°	01:23	02:48	03:42	19:47	20:42	22:10

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

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 28-1 5-0%
03	16:27	16:27	11:44	10:32	22:58	
04	16:27	16:26	11:44	11:24	23:52	
05	16:26	16:25	11:44	12:20	–:–	

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°25.8	134°50.4	S27°14.4	193°14.1	S12°33.7	79°47.9	S14°55.2	95°21.9	S19°12.0
1	60°28.2	149°50.2	14.4	208°15.0	34.3	94°50.2	55.1	110°24.3	12.0
2	75°30.7	164°50.1	14.4	223°15.8	34.9	109°52.5	55.1	125°26.6	11.9
3	90°33.2	179°49.9	·· 14.4	238°16.6	·· 35.5	124°54.9	·· 55.0	140°29.0	·· 11.9
4	105°35.6	194°49.7	14.4	253°17.5	36.1	139°57.2	55.0	155°31.4	11.9
5	120°38.1	209°49.5	14.5	268°18.3	36.7	154°59.5	54.9	170°33.7	11.8
6	135°40.6	224°49.3	S27°14.5	283°19.2	S12°37.3	170°01.8	S14°54.9	185°36.1	S19°11.8
7	150°43.0	239°49.1	14.5	298°20.0	37.8	185°04.1	54.8	200°38.4	11.8
8	165°45.5	254°48.9	14.5	313°20.9	38.4	200°06.4	54.7	215°40.8	11.8
9	180°47.9	269°48.7	·· 14.5	328°21.7	·· 39.0	215°08.7	·· 54.7	230°43.1	·· 11.7
10	195°50.4	284°48.6	14.5	343°22.5	39.6	230°11.1	54.6	245°45.5	11.7
11	210°52.9	299°48.4	14.5	358°23.4	40.2	245°13.4	54.6	260°47.8	11.7
12	225°55.3	314°48.2	S27°14.5	13°24.2	S12°40.8	260°15.7	S14°54.5	275°50.2	S19°11.7
13	240°57.8	329°48.0	14.5	28°25.1	41.4	275°18.0	54.5	290°52.5	11.6
14	256°00.3	344°47.8	14.5	43°25.9	42.0	290°20.3	54.4	305°54.9	11.6
15	271°02.7	359°47.7	·· 14.5	58°26.7	·· 42.5	305°22.6	·· 54.3	320°57.2	·· 11.6
16	286°05.2	14°47.5	14.5	73°27.6	43.1	320°24.9	54.3	335°59.6	11.5
17	301°07.7	29°47.3	14.5	88°28.4	43.7	335°27.2	54.2	351°01.9	11.5
18	316°10.1	44°47.1	S27°14.5	103°29.3	S12°44.3	350°29.5	S14°54.2	6°04.3	S19°11.5
19	331°12.6	59°47.0	14.5	118°30.1	44.9	5°31.8	54.1	21°06.6	11.5
20	346°15.1	74°46.8	14.5	133°30.9	45.5	20°34.2	54.0	36°09.0	11.4
21	1°17.5	89°46.6	·· 14.5	148°31.8	·· 46.1	35°36.5	·· 54.0	51°11.4	·· 11.4
22	16°20.0	104°46.4	14.5	163°32.6	46.6	50°38.8	53.9	66°13.7	11.4
23	31°22.4	119°46.3	14.5	178°33.5	47.2	65°41.1	53.9	81°16.1	11.3
Mer.pass.	20:55	ν -0.2′	d 0.0′	m -4.61	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.44	ν 2.4′	d -0.0′ m 0.65

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°24.9	134°46.1	S27°14.5	193°34.3	S12°47.8	80°43.4	S14°53.8	96°18.4	S19°11.3
1	61°27.4	149°45.9	14.5	208°35.1	48.4	95°45.7	53.7	111°20.8	11.3
2	76°29.8	164°45.8	14.5	223°36.0	49.0	110°48.0	53.7	126°23.1	11.3
3	91°32.3	179°45.6	·· 14.5	238°36.8	·· 49.6	125°50.3	·· 53.6	141°25.5	·· 11.2
4	106°34.8	194°45.4	14.4	253°37.7	50.1	140°52.6	53.6	156°27.8	11.2
5	121°37.2	209°45.3	14.4	268°38.5	50.7	155°54.9	53.5	171°30.2	11.2
6	136°39.7	224°45.1	S27°14.4	283°39.3	S12°51.3	170°57.2	S14°53.5	186°32.5	S19°11.1
7	151°42.2	239°44.9	14.4	298°40.2	51.9	185°59.5	53.4	201°34.9	11.1
8	166°44.6	254°44.8	14.4	313°41.0	52.5	201°01.8	53.3	216°37.2	11.1
9	181°47.1	269°44.6	·· 14.4	328°41.9	·· 53.1	216°04.1	·· 53.3	231°39.6	·· 11.1
10	196°49.6	284°44.5	14.4	343°42.7	53.7	231°06.4	53.2	246°41.9	11.0
11	211°52.0	299°44.3	14.3	358°43.5	54.2	246°08.7	53.2	261°44.3	11.0
12	226°54.5	314°44.1	S27°14.3	13°44.4	S12°54.8	261°11.1	S14°53.1	276°46.6	S19°11.0
13	241°56.9	329°44.0	14.3	28°45.2	55.4	276°13.4	53.0	291°48.9	10.9
14	256°59.4	344°43.8	14.3	43°46.0	56.0	291°15.7	53.0	306°51.3	10.9
15	272°01.9	359°43.7	·· 14.2	58°46.9	·· 56.6	306°18.0	·· 52.9	321°53.6	·· 10.9
16	287°04.3	14°43.5	14.2	73°47.7	57.1	321°20.3	52.9	336°56.0	10.8
17	302°06.8	29°43.4	14.2	88°48.5	57.7	336°22.6	52.8	351°58.3	10.8
18	317°09.3	44°43.2	S27°14.2	103°49.4	S12°58.3	351°24.9	S14°52.7	7°00.7	S19°10.8
19	332°11.7	59°43.1	14.1	118°50.2	58.9	6°27.2	52.7	22°03.0	10.8
20	347°14.2	74°42.9	14.1	133°51.1	12°59.5	21°29.5	52.6	37°05.4	10.7
21	2°16.7	89°42.8	·· 14.1	148°51.9	13°00.1	36°31.8	·· 52.5	52°07.7	·· 10.7
22	17°19.1	104°42.6	14.1	163°52.7	00.6	51°34.1	52.5	67°10.1	10.7
23	32°21.6	119°42.5	14.0	178°53.6	01.2	66°36.4	52.4	82°12.4	10.6
Mer.pass.	20:51	ν -0.2′	d -0.0′	m -4.62	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.44	ν 2.4′	d -0.0′ m 0.65

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	47°24.1	134°42.3	S27°14.0	193°54.4	S13°01.8	81°38.7	S14°52.4	97°14.8	S19°10.6
1	62°26.5	149°42.2	14.0	208°55.2	02.4	96°41.0	52.3	112°17.1	10.6
2	77°29.0	164°42.0	13.9	223°56.1	03.0	111°43.3	52.2	127°19.5	10.5
3	92°31.4	179°41.9	·· 13.9	238°56.9	·· 03.5	126°45.6	·· 52.2	142°21.8	·· 10.5
4	107°33.9	194°41.8	13.9	253°57.7	04.1	141°47.9	52.1	157°24.2	10.5
5	122°36.4	209°41.6	13.8	268°58.6	04.7	156°50.2	52.1	172°26.5	10.5
6	137°38.8	224°41.5	S27°13.8	283°59.4	S13°05.3	171°52.5	S14°52.0	187°28.8	S19°10.4
7	152°41.3	239°41.4	13.8	299°00.2	05.9	186°54.8	51.9	202°31.2	10.4
8	167°43.8	254°41.2	13.7	314°01.1	06.5	201°57.1	51.9	217°33.5	10.4
9	182°46.2	269°41.1	·· 13.7	329°01.9	·· 07.0	216°59.4	·· 51.8	232°35.9	·· 10.3
10	197°48.7	284°40.9	13.6	344°02.7	07.6	232°01.7	51.7	247°38.2	10.3
11	212°51.2	299°40.8	13.6	359°03.6	08.2	247°03.9	51.7	262°40.6	10.3
12	227°53.6	314°40.7	S27°13.5	14°04.4	S13°08.8	262°06.2	S14°51.6	277°42.9	S19°10.2
13	242°56.1	329°40.6	13.5	29°05.2	09.4	277°08.5	51.6	292°45.3	10.2
14	257°58.6	344°40.4	13.5	44°06.1	09.9	292°10.8	51.5	307°47.6	10.2
15	273°01.0	359°40.3	·· 13.4	59°06.9	·· 10.5	307°13.1	·· 51.4	322°50.0	·· 10.2
16	288°03.5	14°40.2	13.4	74°07.7	11.1	322°15.4	51.4	337°52.3	10.1
17	303°05.9	29°40.0	13.3	89°08.6	11.7	337°17.7	51.3	352°54.6	10.1
18	318°08.4	44°39.9	S27°13.3	104°09.4	S13°12.2	352°20.0	S14°51.2	7°57.0	S19°10.1
19	333°10.9	59°39.8	13.2	119°10.2	12.8	7°22.3	51.2	22°59.3	10.0
20	348°13.3	74°39.7	13.2	134°11.0	13.4	22°24.6	51.1	38°01.7	10.0
21	3°15.8	89°39.5	·· 13.1	149°11.9	·· 14.0	37°26.9	·· 51.0	53°04.0	·· 10.0
22	18°18.3	104°39.4	13.1	164°12.7	14.6	52°29.2	51.0	68°06.4	09.9
23	33°20.7	119°39.3	13.0	179°13.5	15.1	67°31.5	50.9	83°08.7	09.9
Mer.pass.	20:47	ν -0.1′	d -0.0′	m -4.63	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.43	ν 2.3′	d -0.0′ m 0.65

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.7
Hamal	327°53.8	23°34.0
Polaris	314°45.7	89°21.3
Acamar	315°13.4	-40°13.0
Menkar	314°08.6	4°10.5
Mirfak	308°31.5	49°56.3
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.4	46°01.1
Bellatrix	278°25.4	6°22.2
Elnath	278°04.9	28°37.5
Alnilam	275°40.1	-1°11.2
Betelgeuse	270°54.7	7°24.7
Canopus	263°53.2	-52°42.2
Sirius	258°28.3	-16°44.6
Adhara	255°07.7	-28°59.9
Procyon	244°53.5	5°10.2
Pollux	243°20.4	27°58.4
Avior	234°15.6	-59°34.4
Suhail	222°48.2	-43°30.9
Miaplacidus	221°38.7	-69°48.0
Alphard	217°50.4	-8°45.0
Regulus	207°37.3	11°51.7
Dubhe	193°44.6	61°37.9
Denebola	182°27.9	14°27.1
Gienah	175°46.5	-17°39.5
Acrux	173°03.5	-63°12.9
Gacrux	171°55.0	-57°13.8
Alioth	166°15.8	55°50.5
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.3
Hadar	148°40.3	-60°28.4
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.5	-60°55.3
Kochab	137°21.1	74°04.0
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.4	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.2
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.8	51°29.4
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.5
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°10.0	-56°40.1
Deneb	49°27.6	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.6
Fomalhaut	15°17.3	-29°30.5
Scheat	13°47.6	28°12.2
Markab	13°32.3	15°19.4

Nov 06 Sat	SHA	Mer.pass
Venus	89°24.7	15:01
Mars	147°48.3	11:06
Jupiter	34°22.1	18:38
Saturn	49°56.2	17:36

Nov 07 Sun	SHA	Mer.pass
Venus	88°21.2	15:01
Mars	147°09.4	11:05
Jupiter	34°18.5	18:34
Saturn	49°53.5	17:32

Nov 08 Mon	SHA	Mer.pass
Venus	87°18.3	15:01
Mars	146°30.3	11:04
Jupiter	34°14.6	18:31
Saturn	49°50.7	17:28

Horizontal parallax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.9	S15°58.6	168°08.0	5.1′	S19°49.6	11.4′	61.0′
1	199°05.9	15°59.3	182°32.1	5.0′	20°01.0	11.3′	61.0′
2	214°05.9	16°00.1	196°56.1	4.9′	20°12.3	11.1′	61.0′
3	229°05.8	·· 00.8	211°20.0	4.8′	20°23.4	11.0′	61.0′
4	244°05.8	01.6	225°43.9	4.8′	20°34.4	10.9′	61.0′
5	259°05.8	02.3	240°07.6	4.7′	20°45.3	10.7′	61.0′
6	274°05.7	S16°03.1	254°31.3	4.6′	S20°56.0	10.6′	61.0′
7	289°05.7	03.8	268°54.9	4.5′	21°06.6	10.4′	61.0′
8	304°05.7	04.6	283°18.4	4.4′	21°17.0	10.3′	61.0′
9	319°05.7	·· 05.3	297°41.8	4.3′	21°27.2	10.1′	61.0′
10	334°05.6	06.1	312°05.1	4.3′	21°37.3	9.9′	61.0′
11	349°05.6	06.8	326°28.4	4.2′	21°47.3	9.8′	61.0′
12	4°05.6	S16°07.5	340°51.5	4.1′	S21°57.1	9.6′	61.0′
13	19°05.5	08.3	355°14.6	4.0′	22°06.7	9.5′	61.0′
14	34°05.5	09.0	9°37.6	3.9′	22°16.2	9.3′	61.0′
15	49°05.5	·· 09.8	24°00.6	3.9′	22°25.5	9.1′	61.0′
16	64°05.4	10.5	38°23.5	3.8′	22°34.6	9.0′	60.9′
17	79°05.4	11.3	52°46.3	3.7′	22°43.6	8.8′	60.9′
18	94°05.4	S16°12.0	67°09.0	3.7′	S22°52.4	8.6′	60.9′
19	109°05.4	12.7	81°31.6	3.6′	23°01.1	8.5′	60.9′
20	124°05.3	13.5	95°54.2	3.5′	23°09.5	8.3′	60.9′
21	139°05.3	·· 14.2	110°16.7	3.5′	23°17.8	8.1′	60.9′
22	154°05.3	15.0	124°39.2	3.4′	23°26.0	8.0′	60.9′
23	169°05.2	15.7	139°01.6	3.3′	23°33.9	7.8′	60.9′
	SD = 16.1′	d = 0.7′	SD = 16.6′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.2	S16°16.4	153°23.9	3.3′	S23°41.7	7.6′	60.9′
1	199°05.2	17.2	167°46.2	3.2′	23°49.3	7.4′	60.8′
2	214°05.1	17.9	182°08.4	3.2′	23°56.7	7.3′	60.8′
3	229°05.1	·· 18.6	196°30.6	3.1′	24°04.0	7.1′	60.8′
4	244°05.0	19.4	210°52.7	3.1′	24°11.1	6.9′	60.8′
5	259°05.0	20.1	225°14.8	3.0′	24°18.0	6.7′	60.8′
6	274°05.0	S16°20.9	239°36.8	3.0′	S24°24.7	6.5′	60.8′
7	289°04.9	21.6	253°58.7	2.9′	24°31.2	6.3′	60.7′
8	304°04.9	22.3	268°20.7	2.9′	24°37.5	6.2′	60.7′
9	319°04.9	·· 23.1	282°42.5	2.8′	24°43.7	6.0′	60.7′
10	334°04.8	23.8	297°04.4	2.8′	24°49.7	5.8′	60.7′
11	349°04.8	24.5	311°26.2	2.8′	24°55.4	5.6′	60.7′
12	4°04.8	S16°25.3	325°47.9	2.7′	S25°01.0	5.4′	60.7′
13	19°04.7	26.0	340°09.7	2.7′	25°06.4	5.2′	60.6′
14	34°04.7	26.7	354°31.4	2.7′	25°11.7	5.0′	60.6′
15	49°04.6	·· 27.5	8°53.1	2.6′	25°16.7	4.8′	60.6′
16	64°04.6	28.2	23°14.7	2.6′	25°21.5	4.6′	60.6′
17	79°04.6	28.9	37°36.3	2.6′	25°26.2	4.5′	60.6′
18	94°04.5	S16°29.6	51°57.9	2.6′	S25°30.6	4.3′	60.5′
19	109°04.5	30.4	66°19.5	2.6′	25°34.9	4.1′	60.5′
20	124°04.4	31.1	80°41.1	2.6′	25°39.0	3.9′	60.5′
21	139°04.4	·· 31.8	95°02.7	2.5′	25°42.8	3.7′	60.5′
22	154°04.3	32.6	109°24.2	2.5′	25°46.5	3.5′	60.5′
23	169°04.3	33.3	123°45.7	2.5′	25°50.0	3.3′	60.4′
	SD = 16.1′	d = 0.7′	SD = 16.6′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.3	S16°34.0	138°07.3	2.5′	S25°53.3	3.1′	60.4′
1	199°04.2	34.7	152°28.8	2.5′	25°56.4	2.9′	60.4′
2	214°04.2	35.5	166°50.3	2.5′	25°59.3	2.7′	60.4′
3	229°04.1	·· 36.2	181°11.9	2.5′	26°02.0	2.5′	60.3′
4	244°04.1	36.9	195°33.4	2.5′	26°04.5	2.3′	60.3′
5	259°04.0	37.6	209°55.0	2.6′	26°06.9	2.1′	60.3′
6	274°04.0	S16°38.4	224°16.5	2.6′	S26°09.0	1.9′	60.3′
7	289°04.0	39.1	238°38.1	2.6′	26°10.9	1.7′	60.2′
8	304°03.9	39.8	252°59.7	2.6′	26°12.7	1.5′	60.2′
9	319°03.9	·· 40.5	267°21.3	2.6′	26°14.2	1.4′	60.2′
10	334°03.8	41.2	281°42.9	2.7′	26°15.6	1.2′	60.2′
11	349°03.8	42.0	296°04.6	2.7′	26°16.7	1.0′	60.1′
12	4°03.7	S16°42.7	310°26.3	2.7′	S26°17.7	0.8′	60.1′
13	19°03.7	43.4	324°48.0	2.7′	26°18.5	0.6′	60.1′
14	34°03.6	44.1	339°09.7	2.8′	26°19.1	0.4′	60.0′
15	49°03.6	·· 44.8	353°31.5	2.8′	26°19.5	0.2′	60.0′
16	64°03.5	45.6	7°53.3	2.9′	26°19.7	0.0′	60.0′
17	79°03.5	46.3	22°15.2	2.9′	26°19.7	-0.2′	60.0′
18	94°03.4	S16°47.0	36°37.1	2.9′	S26°19.5	-0.4′	59.9′
19	109°03.4	47.7	50°59.0	3.0′	26°19.1	-0.6′	59.9′
20	124°03.3	48.4	65°21.0	3.0′	26°18.6	-0.7′	59.9′
21	139°03.3	·· 49.2	79°43.0	3.1′	26°17.8	-0.9′	59.8′
22	154°03.2	49.9	94°05.1	3.1′	26°16.9	-1.1′	59.8′
23	169°03.2	50.6	108°27.3	3.2′	26°15.7	-1.3′	59.8′
	SD = 16.1′	d = 0.7′	SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	06:30	07:58	09:39	13:47	15:28	16:55
N 70°	06:23	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	15:09	16:10	17:13
64°	06:08	07:06	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	17:26
N 58°	05:58	06:45	07:28	15:58	16:42	17:29
56°	05:55	06:39	07:20	16:07	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	06:04	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°	04:05	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	03:58	04:30	18:58	19:31	20:12
S 50°	02:51	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	03:20	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	21:52
S 60°	01:04	02:38	03:34	19:55	20:52	22:30

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

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 2-4 2-14%
06	16:24	16:22	11:44	13:20	00:49	
07	16:21	16:19	11:44	14:23	01:51	
08	16:17	16:15	11:44	15:27	02:55	

DUT1 = UT1-UTC = -0.1072 sec ΔT = TT-UT1 = +69.2912 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	48°23.2	134°39.2	S27°13.0	194°14.4	S13°15.7	82°33.8	S14°50.9	98°11.0	S19°09.9
1	63°25.7	149°39.1	12.9	209°15.2	16.3	97°36.1	50.8	113°13.4	09.9
2	78°28.1	164°39.0	12.8	224°16.0	16.9	112°38.4	50.7	128°15.7	09.8
3	93°30.6	179°38.8	·· 12.8	239°16.9	·· 17.4	127°40.6	·· 50.7	143°18.1	·· 09.8
4	108°33.1	194°38.7	12.7	254°17.7	18.0	142°42.9	50.6	158°20.4	09.8
5	123°35.5	209°38.6	12.7	269°18.5	18.6	157°45.2	50.5	173°22.8	09.7
6	138°38.0	224°38.5	S27°12.6	284°19.3	S13°19.2	172°47.5	S14°50.5	188°25.1	S19°09.7
7	153°40.4	239°38.4	12.5	299°20.2	19.8	187°49.8	50.4	203°27.4	09.7
8	168°42.9	254°38.3	12.5	314°21.0	20.3	202°52.1	50.3	218°29.8	09.6
9	183°45.4	269°38.2	·· 12.4	329°21.8	·· 20.9	217°54.4	·· 50.3	233°32.1	·· 09.6
10	198°47.8	284°38.1	12.3	344°22.7	21.5	232°56.7	50.2	248°34.5	09.6
11	213°50.3	299°38.0	12.3	359°23.5	22.1	247°59.0	50.1	263°36.8	09.5
12	228°52.8	314°37.9	S27°12.2	14°24.3	S13°22.6	263°01.3	S14°50.1	278°39.1	S19°09.5
13	243°55.2	329°37.8	12.1	29°25.1	23.2	278°03.5	50.0	293°41.5	09.5
14	258°57.7	344°37.7	12.1	44°26.0	23.8	293°05.8	49.9	308°43.8	09.4
15	274°00.2	359°37.5	·· 12.0	59°26.8	·· 24.4	308°08.1	·· 49.9	323°46.2	·· 09.4
16	289°02.6	14°37.5	11.9	74°27.6	24.9	323°10.4	49.8	338°48.5	09.4
17	304°05.1	29°37.4	11.9	89°28.5	25.5	338°12.7	49.7	353°50.8	09.4
18	319°07.5	44°37.3	S27°11.8	104°29.3	S13°26.1	353°15.0	S14°49.7	8°53.2	S19°09.3
19	334°10.0	59°37.2	11.7	119°30.1	26.7	8°17.3	49.6	23°55.5	09.3
20	349°12.5	74°37.1	11.6	134°30.9	27.2	23°19.6	49.5	38°57.9	09.3
21	4°14.9	89°37.0	·· 11.6	149°31.8	·· 27.8	38°21.8	·· 49.5	54°00.2	·· 09.2
22	19°17.4	104°36.9	11.5	164°32.6	28.4	53°24.1	49.4	69°02.5	09.2
23	34°19.9	119°36.8	11.4	179°33.4	29.0	68°26.4	49.3	84°04.9	09.2
Mer.pass.	20:43	ν -0.1′	d -0.1′	m -4.64	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.42	ν 2.3′	d -0.0′ m 0.66
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	49°22.3	134°36.7	S27°11.3	194°34.2	S13°29.5	83°28.7	S14°49.3	99°07.2	S19°09.1
1	64°24.8	149°36.6	11.3	209°35.1	30.1	98°31.0	49.2	114°09.6	09.1
2	79°27.3	164°36.5	11.2	224°35.9	30.7	113°33.3	49.1	129°11.9	09.1
3	94°29.7	179°36.4	·· 11.1	239°36.7	·· 31.3	128°35.5	·· 49.1	144°14.2	·· 09.0
4	109°32.2	194°36.3	11.0	254°37.5	31.8	143°37.8	49.0	159°16.6	09.0
5	124°34.7	209°36.3	10.9	269°38.4	32.4	158°40.1	48.9	174°18.9	09.0
6	139°37.1	224°36.2	S27°10.9	284°39.2	S13°33.0	173°42.4	S14°48.9	189°21.3	S19°08.9
7	154°39.6	239°36.1	10.8	299°40.0	33.6	188°44.7	48.8	204°23.6	08.9
8	169°42.0	254°36.0	10.7	314°40.8	34.1	203°47.0	48.7	219°25.9	08.9
9	184°44.5	269°35.9	·· 10.6	329°41.7	·· 34.7	218°49.2	·· 48.7	234°28.3	·· 08.8
10	199°47.0	284°35.9	10.5	344°42.5	35.3	233°51.5	48.6	249°30.6	08.8
11	214°49.4	299°35.8	10.4	359°43.3	35.8	248°53.8	48.5	264°32.9	08.8
12	229°51.9	314°35.7	S27°10.3	14°44.1	S13°36.4	263°56.1	S14°48.5	279°35.3	S19°08.8
13	244°54.4	329°35.6	10.2	29°45.0	37.0	278°58.4	48.4	294°37.6	08.7
14	259°56.8	344°35.6	10.1	44°45.8	37.6	294°00.6	48.3	309°39.9	08.7
15	274°59.3	359°35.5	·· 10.1	59°46.6	·· 38.1	309°02.9	·· 48.3	324°42.3	·· 08.7
16	290°01.8	14°35.4	10.0	74°47.4	38.7	324°05.2	48.2	339°44.6	08.6
17	305°04.2	29°35.3	09.9	89°48.2	39.3	339°07.5	48.1	354°47.0	08.6
18	320°06.7	44°35.3	S27°09.8	104°49.1	S13°39.8	354°09.8	S14°48.1	9°49.3	S19°08.6
19	335°09.2	59°35.2	09.7	119°49.9	40.4	9°12.0	48.0	24°51.6	08.5
20	350°11.6	74°35.1	09.6	134°50.7	41.0	24°14.3	47.9	39°54.0	08.5
21	5°14.1	89°35.1	·· 09.5	149°51.5	·· 41.6	39°16.6	·· 47.9	54°56.3	·· 08.5
22	20°16.5	104°35.0	09.4	164°52.3	42.1	54°18.9	47.8	69°58.6	08.4
23	35°19.0	119°35.0	09.3	179°53.2	42.7	69°21.2	47.7	85°01.0	08.4
Mer.pass.	20:39	ν -0.1′	d -0.1′	m -4.66	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.41	ν 2.3′	d -0.0′ m 0.66
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°21.5	134°34.9	S27°09.2	194°54.0	S13°43.3	84°23.4	S14°47.7	100°03.3	S19°08.4
1	65°23.9	149°34.8	09.1	209°54.8	43.8	99°25.7	47.6	115°05.6	08.3
2	80°26.4	164°34.8	09.0	224°55.6	44.4	114°28.0	47.5	130°08.0	08.3
3	95°28.9	179°34.7	·· 08.9	239°56.5	·· 45.0	129°30.3	·· 47.4	145°10.3	·· 08.3
4	110°31.3	194°34.7	08.8	254°57.3	45.5	144°32.5	47.4	160°12.6	08.2
5	125°33.8	209°34.6	08.7	269°58.1	46.1	159°34.8	47.3	175°15.0	08.2
6	140°36.3	224°34.6	S27°08.6	284°58.9	S13°46.7	174°37.1	S14°47.2	190°17.3	S19°08.2
7	155°38.7	239°34.5	08.4	299°59.7	47.3	189°39.4	47.2	205°19.6	08.1
8	170°41.2	254°34.5	08.3	315°00.6	47.8	204°41.6	47.1	220°22.0	08.1
9	185°43.7	269°34.4	·· 08.2	330°01.4	·· 48.4	219°43.9	·· 47.0	235°24.3	·· 08.1
10	200°46.1	284°34.4	08.1	345°02.2	49.0	234°46.2	47.0	250°26.6	08.0
11	215°48.6	299°34.3	08.0	0°03.0	49.5	249°48.5	46.9	265°29.0	08.0
12	230°51.0	314°34.3	S27°07.9	15°03.8	S13°50.1	264°50.7	S14°46.8	280°31.3	S19°08.0
13	245°53.5	329°34.2	07.8	30°04.6	50.7	279°53.0	46.7	295°33.6	07.9
14	260°56.0	344°34.2	07.7	45°05.5	51.2	294°55.3	46.7	310°36.0	07.9
15	275°58.4	359°34.1	·· 07.5	60°06.3	·· 51.8	309°57.6	·· 46.6	325°38.3	·· 07.9
16	291°00.9	14°34.1	07.4	75°07.1	52.4	324°59.8	46.5	340°40.6	07.8
17	306°03.4	29°34.1	07.3	90°07.9	52.9	340°02.1	46.5	355°43.0	07.8
18	321°05.8	44°34.0	S27°07.2	105°08.7	S13°53.5	355°04.4	S14°46.4	10°45.3	S19°07.8
19	336°08.3	59°34.0	07.1	120°09.6	54.1	10°06.6	46.3	25°47.6	07.7
20	351°10.8	74°33.9	07.0	135°10.4	54.6	25°08.9	46.2	40°50.0	07.7
21	6°13.2	89°33.9	·· 06.8	150°11.2	·· 55.2	40°11.2	·· 46.2	55°52.3	·· 07.7
22	21°15.7	104°33.9	06.7	165°12.0	55.8	55°13.5	46.1	70°54.6	07.6
23	36°18.1	119°33.8	06.6	180°12.8	56.3	70°15.7	46.0	85°57.0	07.6
Mer.pass.	20:35	ν -0.1′	d -0.1′	m -4.67	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.41	ν 2.3′	d -0.0′ m 0.66

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.4	-42°11.4
Schedar	349°33.5	56°39.5
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.7
Hamal	327°53.8	23°34.0
Polaris	314°45.2	89°21.3
Acamar	315°13.4	-40°13.1
Menkar	314°08.6	4°10.5
Mirfak	308°31.5	49°56.3
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.3	46°01.1
Bellatrix	278°25.4	6°22.2
Elnath	278°04.9	28°37.5
Alnilam	275°40.1	-1°11.2
Betelgeuse	270°54.7	7°24.7
Canopus	263°53.2	-52°42.2
Sirius	258°28.3	-16°44.6
Adhara	255°07.7	-28°59.9
Procyon	244°53.4	5°10.2
Pollux	243°20.4	27°58.3
Avior	234°15.6	-59°34.4
Suhail	222°48.2	-43°30.9
Miaplacidus	221°38.7	-69°48.0
Alphard	217°50.3	-8°45.0
Regulus	207°37.3	11°51.7
Dubhe	193°44.6	61°37.9
Denebola	182°27.8	14°27.1
Gienah	175°46.5	-17°39.5
Acrux	173°03.5	-63°12.9
Gacrux	171°55.0	-57°13.8
Alioth	166°15.8	55°50.5
Spica	158°25.4	-11°16.3
Alkaid	152°54.6	49°12.3
Hadar	148°40.3	-60°28.4
Menkent	148°01.1	-36°28.4
Arcturus	145°50.7	19°04.3
Rigil Kent.	139°44.5	-60°55.3
Kochab	137°21.1	74°04.0
Zuben'ubi	136°59.3	-16°07.7
Alphecca	126°06.3	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.8	51°29.4
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°10.0	-56°40.1
Deneb	49°27.6	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.1	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.3	15°19.4

Nov 09 Tue	SHA	Mer.pass
Venus	86°16.0	15:01
Mars	145°51.2	11:02
Jupiter	34°10.6	18:27
Saturn	49°47.9	17:25

Nov 10 Wed	SHA	Mer.pass
Venus	85°14.4	15:02
Mars	145°11.9	11:01
Jupiter	34°06.4	18:23
Saturn	49°44.9	17:21

Nov 11 Thu	SHA	Mer.pass
Venus	84°13.4	15:02
Mars	144°32.5	11:00
Jupiter	34°02.0	18:20
Saturn	49°41.8	17:17

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°03.1	S16°51.3	122°49.5	3.3′	S26°14.4	-1.5′	59.8′
1	199°03.1	52.0	137°11.8	3.3′	26°12.9	-1.7′	59.7′
2	214°03.0	52.7	151°34.1	3.4′	26°11.3	-1.9′	59.7′
3	229°03.0	·· 53.4	165°56.5	3.5′	26°09.4	-2.0′	59.7′
4	244°02.9	54.2	180°18.9	3.5′	26°07.4	-2.2′	59.6′
5	259°02.9	54.9	194°41.4	3.6′	26°05.1	-2.4′	59.6′
6	274°02.8	S16°55.6	209°04.0	3.7′	S26°02.7	-2.6′	59.6′
7	289°02.8	56.3	223°26.7	3.7′	26°00.1	-2.8′	59.5′
8	304°02.7	57.0	237°49.4	3.8′	25°57.4	-2.9′	59.5′
9	319°02.7	·· 57.7	252°12.3	3.9′	25°54.4	-3.1′	59.5′
10	334°02.6	58.4	266°35.2	4.0′	25°51.3	-3.3′	59.4′
11	349°02.5	59.1	280°58.1	4.1′	25°48.0	-3.5′	59.4′
12	4°02.5	S16°59.8	295°21.2	4.1′	S25°44.6	-3.6′	59.4′
13	19°02.4	17°00.5	309°44.3	4.2′	25°40.9	-3.8′	59.4′
14	34°02.4	01.3	324°07.6	4.3′	25°37.1	-4.0′	59.3′
15	49°02.3	·· 02.0	338°30.9	4.4′	25°33.1	-4.1′	59.3′
16	64°02.3	02.7	352°54.3	4.5′	25°29.0	-4.3′	59.3′
17	79°02.2	03.4	7°17.8	4.6′	25°24.7	-4.5′	59.2′
18	94°02.1	S17°04.1	21°41.4	4.7′	S25°20.2	-4.6′	59.2′
19	109°02.1	04.8	36°05.1	4.8′	25°15.6	-4.8′	59.2′
20	124°02.0	05.5	50°28.8	4.9′	25°10.8	-5.0′	59.1′
21	139°02.0	·· 06.2	64°52.7	5.0′	25°05.8	-5.1′	59.1′
22	154°01.9	06.9	79°16.7	5.1′	25°00.7	-5.3′	59.1′
23	169°01.9	07.6	93°40.8	5.2′	24°55.4	-5.4′	59.0′
	SD = 16.1′	d = 0.7′	SD = 16.3′				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.8	S17°08.3	108°04.9	5.3′	S24°49.9	-5.6′	59.0′
1	199°01.7	09.0	122°29.2	5.4′	24°44.3	-5.8′	59.0′
2	214°01.7	09.7	136°53.6	5.5′	24°38.6	-5.9′	58.9′
3	229°01.6	·· 10.4	151°18.1	5.6′	24°32.7	-6.1′	58.9′
4	244°01.6	11.1	165°42.7	5.7′	24°26.6	-6.2′	58.9′
5	259°01.5	11.8	180°07.4	5.8′	24°20.4	-6.4′	58.8′
6	274°01.4	S17°12.5	194°32.2	5.9′	S24°14.1	-6.5′	58.8′
7	289°01.4	13.2	208°57.1	6.0′	24°07.6	-6.6′	58.8′
8	304°01.3	13.9	223°22.1	6.1′	24°00.9	-6.8′	58.7′
9	319°01.2	·· 14.6	237°47.2	6.2′	23°54.1	-6.9′	58.7′
10	334°01.2	15.3	252°12.4	6.3′	23°47.2	-7.1′	58.7′
11	349°01.1	16.0	266°37.8	6.5′	23°40.2	-7.2′	58.6′
12	4°01.0	S17°16.7	281°03.3	6.6′	S23°32.9	-7.3′	58.6′
13	19°01.0	17.4	295°28.8	6.7′	23°25.6	-7.5′	58.6′
14	34°00.9	18.1	309°54.5	6.8′	23°18.1	-7.6′	58.5′
15	49°00.9	·· 18.8	324°20.3	6.9′	23°10.5	-7.7′	58.5′
16	64°00.8	19.5	338°46.2	7.0′	23°02.8	-7.9′	58.5′
17	79°00.7	20.2	353°12.3	7.1′	22°54.9	-8.0′	58.4′
18	94°00.7	S17°20.9	7°38.4	7.3′	S22°46.9	-8.1′	58.4′
19	109°00.6	21.6	22°04.7	7.4′	22°38.8	-8.3′	58.3′
20	124°00.5	22.3	36°31.0	7.5′	22°30.5	-8.4′	58.3′
21	139°00.5	·· 22.9	50°57.5	7.6′	22°22.1	-8.5′	58.3′
22	154°00.4	23.6	65°24.1	7.7′	22°13.6	-8.6′	58.2′
23	169°00.3	24.3	79°50.8	7.8′	22°05.0	-8.7′	58.2′
	SD = 16.1′	d = 0.7′	SD = 16.1′				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°00.2	S17°25.0	94°17.7	7.9′	S21°56.3	-8.9′	58.2′
1	199°00.2	25.7	108°44.6	8.1′	21°47.4	-9.0′	58.1′
2	214°00.1	26.4	123°11.7	8.2′	21°38.4	-9.1′	58.1′
3	229°00.0	·· 27.1	137°38.8	8.3′	21°29.3	-9.2′	58.1′
4	244°00.0	27.8	152°06.1	8.4′	21°20.1	-9.3′	58.0′
5	258°59.9	28.5	166°33.5	8.5′	21°10.8	-9.4′	58.0′
6	273°59.8	S17°29.1	181°01.1	8.6′	S21°01.4	-9.5′	58.0′
7	288°59.8	29.8	195°28.7	8.8′	20°51.9	-9.6′	57.9′
8	303°59.7	30.5	209°56.4	8.9′	20°42.3	-9.7′	57.9′
9	318°59.6	·· 31.2	224°24.3	9.0′	20°32.5	-9.8′	57.9′
10	333°59.5	31.9	238°52.3	9.1′	20°22.7	-9.9′	57.8′
11	348°59.5	32.6	253°20.4	9.2′	20°12.7	-10.0′	57.8′
12	3°59.4	S17°33.3	267°48.6	9.3′	S20°02.7	-10.1′	57.8′
13	18°59.3	33.9	282°16.9	9.4′	19°52.6	-10.2′	57.7′
14	33°59.3	34.6	296°45.3	9.5′	19°42.3	-10.3′	57.7′
15	48°59.2	·· 35.3	311°13.9	9.7′	19°32.0	-10.4′	57.7′
16	63°59.1	36.0	325°42.5	9.8′	19°21.6	-10.5′	57.6′
17	78°59.0	36.7	340°11.3	9.9′	19°11.1	-10.6′	57.6′
18	93°59.0	S17°37.4	354°40.2	10.0′	S19°00.5	-10.7′	57.6′
19	108°58.9	38.0	9°09.1	10.1′	18°49.8	-10.8′	57.5′
20	123°58.8	38.7	23°38.2	10.2′	18°39.0	-10.9′	57.5′
21	138°58.7	·· 39.4	38°07.4	10.3′	18°28.1	-11.0′	57.5′
22	153°58.7	40.1	52°36.7	10.4′	18°17.2	-11.0′	57.5′
23	168°58.6	40.7	67°06.1	10.5′	18°06.1	-11.1′	57.4′
	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	10:04	13:22	15:15	16:45
N 70°	06:34	07:53	09:20	14:07	15:34	16:53
68°	06:27	07:37	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	07:18	16:09	16:48	17:30
52°	05:54	06:34	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	06:39	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	17:07	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	19:35	20:17
S 50°	02:44	03:34	04:12	19:17	19:56	20:46
52°	02:30	03:24	04:04	19:25	20:05	21:00
54°	02:13	03:13	03:57	19:33	20:16	21:17
56°	01:52	03:01	03:48	19:42	20:29	21:39
58°	01:25	02:46	03:38	19:52	20:44	22:07
S 60°	00:41	02:28	03:26	20:04	21:02	22:57

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

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 5-7 23-44%
09	16:13	16:10	11:44	16:30	03:59	
10	16:07	16:04	11:44	17:28	04:59	
11	16:01	15:58	11:44	18:22	05:56	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	51°20.6	134°33.8	S27°06.5	195°13.6	S13°56.9	85°18.0	S14°46.0	100°59.3	S19°07.6
1	66°23.1	149°33.8	06.3	210°14.5	57.5	100°20.3	45.9	116°01.6	07.5
2	81°25.5	164°33.8	06.2	225°15.3	58.0	115°22.5	45.8	131°04.0	07.5
3	96°28.0	179°33.7	·· 06.1	240°16.1	·· 58.6	130°24.8	·· 45.7	146°06.3	·· 07.5
4	111°30.5	194°33.7	06.0	255°16.9	59.2	145°27.1	45.7	161°08.6	07.4
5	126°32.9	209°33.7	05.8	270°17.7	13°59.7	160°29.3	45.6	176°11.0	07.4
6	141°35.4	224°33.7	S27°05.7	285°18.5	S14°00.3	175°31.6	S14°45.5	191°13.3	S19°07.4
7	156°37.9	239°33.6	05.6	300°19.3	00.9	190°33.9	45.5	206°15.6	07.3
8	171°40.3	254°33.6	05.4	315°20.2	01.4	205°36.1	45.4	221°17.9	07.3
9	186°42.8	269°33.6	·· 05.3	330°21.0	·· 02.0	220°38.4	·· 45.3	236°20.3	·· 07.3
10	201°45.3	284°33.6	05.2	345°21.8	02.6	235°40.7	45.2	251°22.6	07.2
11	216°47.7	299°33.6	05.0	0°22.6	03.1	250°42.9	45.2	266°24.9	07.2
12	231°50.2	314°33.6	S27°04.9	15°23.4	S14°03.7	265°45.2	S14°45.1	281°27.3	S19°07.2
13	246°52.6	329°33.6	04.8	30°24.2	04.2	280°47.5	45.0	296°29.6	07.1
14	261°55.1	344°33.5	04.6	45°25.0	04.8	295°49.7	44.9	311°31.9	07.1
15	276°57.6	359°33.5	·· 04.5	60°25.9	·· 05.4	310°52.0	·· 44.9	326°34.2	·· 07.1
16	292°00.0	14°33.5	04.4	75°26.7	05.9	325°54.3	44.8	341°36.6	07.0
17	307°02.5	29°33.5	04.2	90°27.5	06.5	340°56.5	44.7	356°38.9	07.0
18	322°05.0	44°33.5	S27°04.1	105°28.3	S14°07.1	355°58.8	S14°44.6	11°41.2	S19°07.0
19	337°07.4	59°33.5	03.9	120°29.1	07.6	11°01.1	44.6	26°43.6	06.9
20	352°09.9	74°33.5	03.8	135°29.9	08.2	26°03.3	44.5	41°45.9	06.9
21	7°12.4	89°33.5	·· 03.7	150°30.7	·· 08.8	41°05.6	·· 44.4	56°48.2	·· 06.8
22	22°14.8	104°33.5	03.5	165°31.5	09.3	56°07.9	44.4	71°50.5	06.8
23	37°17.3	119°33.5	03.4	180°32.4	09.9	71°10.1	44.3	86°52.9	06.8
Mer.pass.	20:31	ν -0.0′	d -0.1′	m -4.68	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.40	ν 2.3′	d -0.0′ m 0.67

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	52°19.8	134°33.5	S27°03.2	195°33.2	S14°10.4	86°12.4	S14°44.2	101°55.2	S19°06.7
1	67°22.2	149°33.5	03.1	210°34.0	11.0	101°14.6	44.1	116°57.5	06.7
2	82°24.7	164°33.5	02.9	225°34.8	11.6	116°16.9	44.1	131°59.9	06.7
3	97°27.1	179°33.5	·· 02.8	240°35.6	·· 12.1	131°19.2	·· 44.0	147°02.2	·· 06.6
4	112°29.6	194°33.5	02.6	255°36.4	12.7	146°21.4	43.9	162°04.5	06.6
5	127°32.1	209°33.6	02.5	270°37.2	13.2	161°23.7	43.8	177°06.8	06.6
6	142°34.5	224°33.6	S27°02.3	285°38.0	S14°13.8	176°26.0	S14°43.8	192°09.2	S19°06.5
7	157°37.0	239°33.6	02.2	300°38.8	14.4	191°28.2	43.7	207°11.5	06.5
8	172°39.5	254°33.6	02.0	315°39.7	14.9	206°30.5	43.6	222°13.8	06.5
9	187°41.9	269°33.6	·· 01.9	330°40.5	·· 15.5	221°32.7	·· 43.5	237°16.1	·· 06.4
10	202°44.4	284°33.6	01.7	345°41.3	16.1	236°35.0	43.5	252°18.5	06.4
11	217°46.9	299°33.6	01.6	0°42.1	16.6	251°37.3	43.4	267°20.8	06.4
12	232°49.3	314°33.7	S27°01.4	15°42.9	S14°17.2	266°39.5	S14°43.3	282°23.1	S19°06.3
13	247°51.8	329°33.7	01.3	30°43.7	17.7	281°41.8	43.2	297°25.4	06.3
14	262°54.2	344°33.7	01.1	45°44.5	18.3	296°44.0	43.2	312°27.8	06.3
15	277°56.7	359°33.7	·· 00.9	60°45.3	·· 18.9	311°46.3	·· 43.1	327°30.1	·· 06.2
16	292°59.2	14°33.8	00.8	75°46.1	19.4	326°48.5	43.0	342°32.4	06.2
17	308°01.6	29°33.8	00.6	90°46.9	20.0	341°50.8	42.9	357°34.7	06.1
18	323°04.1	44°33.8	S27°00.4	105°47.7	S14°20.5	356°53.1	S14°42.9	12°37.1	S19°06.1
19	338°06.6	59°33.8	00.3	120°48.6	21.1	11°55.3	42.8	27°39.4	06.1
20	353°09.0	74°33.9	00.1	135°49.4	21.6	26°57.6	42.7	42°41.7	06.0
21	8°11.5	89°33.9	27°00.0	150°50.2	·· 22.2	41°59.8	·· 42.6	57°44.0	·· 06.0
22	23°14.0	104°33.9	26°59.8	165°51.0	22.8	57°02.1	42.5	72°46.4	06.0
23	38°16.4	119°34.0	59.6	180°51.8	23.3	72°04.3	42.5	87°48.7	05.9
Mer.pass.	20:27	ν 0.0′	d -0.1′	m -4.69	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.39	ν 2.3′	d -0.0′ m 0.67

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	53°18.9	134°34.0	S26°59.5	195°52.6	S14°23.9	87°06.6	S14°42.4	102°51.0	S19°05.9
1	68°21.4	149°34.1	59.3	210°53.4	24.4	102°08.9	42.3	117°53.3	05.9
2	83°23.8	164°34.1	59.1	225°54.2	25.0	117°11.1	42.2	132°55.7	05.8
3	98°26.3	179°34.1	·· 59.0	240°55.0	·· 25.6	132°13.4	·· 42.2	147°58.0	·· 05.8
4	113°28.7	194°34.2	58.8	255°55.8	26.1	147°15.6	42.1	163°00.3	05.8
5	128°31.2	209°34.2	58.6	270°56.6	26.7	162°17.9	42.0	178°02.6	05.7
6	143°33.7	224°34.3	S26°58.4	285°57.4	S14°27.2	177°20.1	S14°41.9	193°04.9	S19°05.7
7	158°36.1	239°34.3	58.3	300°58.2	27.8	192°22.4	41.9	208°07.3	05.6
8	173°38.6	254°34.4	58.1	315°59.0	28.3	207°24.6	41.8	223°09.6	05.6
9	188°41.1	269°34.4	·· 57.9	330°59.8	·· 28.9	222°26.9	·· 41.7	238°11.9	·· 05.6
10	203°43.5	284°34.5	57.7	346°00.6	29.5	237°29.1	41.6	253°14.2	05.5
11	218°46.0	299°34.5	57.6	1°01.5	30.0	252°31.4	41.5	268°16.6	05.5
12	233°48.5	314°34.6	S26°57.4	16°02.3	S14°30.6	267°33.6	S14°41.5	283°18.9	S19°05.5
13	248°50.9	329°34.6	57.2	31°03.1	31.1	282°35.9	41.4	298°21.2	05.4
14	263°53.4	344°34.7	57.0	46°03.9	31.7	297°38.1	41.3	313°23.5	05.4
15	278°55.9	359°34.8	·· 56.8	61°04.7	·· 32.2	312°40.4	·· 41.2	328°25.8	·· 05.4
16	293°58.3	14°34.8	56.7	76°05.5	32.8	327°42.6	41.2	343°28.2	05.3
17	309°00.8	29°34.9	56.5	91°06.3	33.3	342°44.9	41.1	358°30.5	05.3
18	324°03.2	44°34.9	S26°56.3	106°07.1	S14°33.9	357°47.1	S14°41.0	13°32.8	S19°05.2
19	339°05.7	59°35.0	56.1	121°07.9	34.5	12°49.4	40.9	28°35.1	05.2
20	354°08.2	74°35.1	55.9	136°08.7	35.0	27°51.6	40.8	43°37.4	05.2
21	9°10.6	89°35.1	·· 55.7	151°09.5	·· 35.6	42°53.9	·· 40.8	58°39.8	·· 05.1
22	24°13.1	104°35.2	55.6	166°10.3	36.1	57°56.1	40.7	73°42.1	05.1
23	39°15.6	119°35.3	55.4	181°11.1	36.7	72°58.4	40.6	88°44.4	05.1
Mer.pass.	20:23	ν 0.0′	d -0.2′	m -4.70	ν 0.8′	d 0.6′	m 1.62	ν 2.3′	d -0.1′ m -2.39	ν 2.3′	d -0.0′ m 0.67

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.5	-42°11.4
Schedar	349°33.5	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.7
Hamal	327°53.8	23°34.0
Polaris	314°45.2	89°21.4
Acamar	315°13.4	-40°13.1
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.3	46°01.1
Bellatrix	278°25.4	6°22.2
Elnath	278°04.8	28°37.5
Alnilam	275°40.1	-1°11.2
Betelgeuse	270°54.6	7°24.7
Canopus	263°53.1	-52°42.2
Sirius	258°28.3	-16°44.6
Adhara	255°07.7	-28°59.9
Procyon	244°53.4	5°10.2
Pollux	243°20.3	27°58.3
Avior	234°15.6	-59°34.4
Suhail	222°48.1	-43°30.9
Miaplacidus	221°38.6	-69°48.0
Alphard	217°50.3	-8°45.0
Regulus	207°37.3	11°51.7
Dubhe	193°44.6	61°37.8
Denebola	182°27.8	14°27.1
Gienah	175°46.5	-17°39.5
Acrux	173°03.5	-63°12.8
Gacrux	171°54.9	-57°13.8
Alioth	166°15.8	55°50.4
Spica	158°25.3	-11°16.3
Alkaid	152°54.6	49°12.3
Hadar	148°40.3	-60°28.4
Menkent	148°01.1	-36°28.4
Arcturus	145°50.6	19°04.3
Rigil Kent.	139°44.5	-60°55.3
Kochab	137°21.0	74°04.0
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.8	51°29.4
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.2	-26°16.2
Altair	62°02.6	8°55.7
Peacock	53°10.0	-56°40.1
Deneb	49°27.7	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.2	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 12 Fri	SHA	Mer.pass
Venus	83°13.2	15:02
Mars	143°53.0	10:58
Jupiter	33°57.4	18:16
Saturn	49°38.7	17:13

Nov 13 Sat	SHA	Mer.pass
Venus	82°13.8	15:02
Mars	143°13.4	10:57
Jupiter	33°52.6	18:12
Saturn	49°35.4	17:10

Nov 14 Sun	SHA	Mer.pass
Venus	81°15.1	15:02
Mars	142°33.7	10:56
Jupiter	33°47.7	18:09
Saturn	49°32.1	17:06

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	Sun		Moon				
h Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.5	S17°41.4	81°35.7	10.6′	S17°55.0	-11.2′	57.4′
1	198°58.4	42.1	96°05.3	10.7′	17°43.8	-11.3′	57.4′
2	213°58.3	42.8	110°35.0	10.8′	17°32.5	-11.4′	57.3′
3	228°58.3	·· 43.5	125°04.8	10.9′	17°21.2	-11.4′	57.3′
4	243°58.2	44.1	139°34.8	11.0′	17°09.8	-11.5′	57.3′
5	258°58.1	44.8	154°04.8	11.1′	16°58.3	-11.6′	57.2′
6	273°58.0	S17°45.5	168°35.0	11.2′	S16°46.7	-11.6′	57.2′
7	288°57.9	46.2	183°05.2	11.3′	16°35.1	-11.7′	57.2′
8	303°57.9	46.8	197°35.5	11.4′	16°23.3	-11.8′	57.1′
9	318°57.8	·· 47.5	212°06.0	11.5′	16°11.6	-11.8′	57.1′
10	333°57.7	48.2	226°36.5	11.6′	15°59.7	-11.9′	57.1′
11	348°57.6	48.8	241°07.1	11.7′	15°47.8	-12.0′	57.0′
12	3°57.5	S17°49.5	255°37.9	11.8′	S15°35.8	-12.0′	57.0′
13	18°57.5	50.2	270°08.7	11.9′	15°23.8	-12.1′	57.0′
14	33°57.4	50.9	284°39.6	12.0′	15°11.7	-12.2′	56.9′
15	48°57.3	·· 51.5	299°10.6	12.1′	14°59.5	-12.2′	56.9′
16	63°57.2	52.2	313°41.7	12.2′	14°47.3	-12.3′	56.9′
17	78°57.1	52.9	328°12.9	12.3′	14°35.0	-12.3′	56.9′
18	93°57.0	S17°53.5	342°44.2	12.4′	S14°22.7	-12.4′	56.8′
19	108°57.0	54.2	357°15.5	12.5′	14°10.3	-12.4′	56.8′
20	123°56.9	54.9	11°47.0	12.5′	13°57.8	-12.5′	56.8′
21	138°56.8	·· 55.5	26°18.5	12.6′	13°45.3	-12.6′	56.7′
22	153°56.7	56.2	40°50.2	12.7′	13°32.8	-12.6′	56.7′
23	168°56.6	56.9	55°21.9	12.8′	13°20.2	-12.7′	56.7′
	SD = 16.2′	d = 0.7′	SD = 15.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.5	S17°57.5	69°53.7	12.9′	S13°07.5	-12.7′	56.7′
1	198°56.5	58.2	84°25.6	13.0′	12°54.8	-12.7′	56.6′
2	213°56.4	58.9	98°57.5	13.0′	12°42.1	-12.8′	56.6′
3	228°56.3	17°59.5	113°29.6	13.1′	12°29.3	-12.8′	56.6′
4	243°56.2	18°00.2	128°01.7	13.2′	12°16.4	-12.9′	56.5′
5	258°56.1	00.8	142°33.9	13.3′	12°03.5	-12.9′	56.5′
6	273°56.0	S18°01.5	157°06.2	13.4′	S11°50.6	-13.0′	56.5′
7	288°55.9	02.2	171°38.5	13.4′	11°37.7	-13.0′	56.5′
8	303°55.8	02.8	186°11.0	13.5′	11°24.6	-13.0′	56.4′
9	318°55.7	·· 03.5	200°43.5	13.6′	11°11.6	-13.1′	56.4′
10	333°55.7	04.1	215°16.0	13.6′	10°58.5	-13.1′	56.4′
11	348°55.6	04.8	229°48.7	13.7′	10°45.4	-13.2′	56.3′
12	3°55.5	S18°05.5	244°21.4	13.8′	S10°32.3	-13.2′	56.3′
13	18°55.4	06.1	258°54.2	13.9′	10°19.1	-13.2′	56.3′
14	33°55.3	06.8	273°27.0	13.9′	10°05.8	-13.3′	56.3′
15	48°55.2	·· 07.4	287°59.9	14.0′	09°52.6	-13.3′	56.2′
16	63°55.1	08.1	302°32.9	14.0′	09°39.3	-13.3′	56.2′
17	78°55.0	08.7	317°06.0	14.1′	09°26.0	-13.3′	56.2′
18	93°54.9	S18°09.4	331°39.1	14.2′	S09°12.7	-13.4′	56.2′
19	108°54.8	10.0	346°12.3	14.2′	08°59.3	-13.4′	56.1′
20	123°54.7	10.7	0°45.5	14.3′	08°45.9	-13.4′	56.1′
21	138°54.7	·· 11.4	15°18.8	14.4′	08°32.5	-13.4′	56.1′
22	153°54.6	12.0	29°52.1	14.4′	08°19.0	-13.5′	56.1′
23	168°54.5	12.7	44°25.6	14.5′	08°05.5	-13.5′	56.0′
	SD = 16.2′	d = 0.7′	SD = 15.5′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.4	S18°13.3	58°59.0	14.5′	S07°52.0	-13.5′	56.0′
1	198°54.3	14.0	73°32.6	14.6′	07°38.5	-13.5′	56.0′
2	213°54.2	14.6	88°06.1	14.6′	07°25.0	-13.6′	56.0′
3	228°54.1	·· 15.3	102°39.8	14.7′	07°11.4	-13.6′	55.9′
4	243°54.0	15.9	117°13.5	14.7′	06°57.9	-13.6′	55.9′
5	258°53.9	16.6	131°47.2	14.8′	06°44.3	-13.6′	55.9′
6	273°53.8	S18°17.2	146°21.0	14.8′	S06°30.6	-13.6′	55.9′
7	288°53.7	17.9	160°54.8	14.9′	06°17.0	-13.6′	55.8′
8	303°53.6	18.5	175°28.7	14.9′	06°03.4	-13.7′	55.8′
9	318°53.5	·· 19.1	190°02.6	15.0′	05°49.7	-13.7′	55.8′
10	333°53.4	19.8	204°36.6	15.0′	05°36.0	-13.7′	55.8′
11	348°53.3	20.4	219°10.6	15.1′	05°22.4	-13.7′	55.7′
12	3°53.2	S18°21.1	233°44.7	15.1′	S05°08.7	-13.7′	55.7′
13	18°53.1	21.7	248°18.8	15.1′	04°55.0	-13.7′	55.7′
14	33°53.0	22.4	262°52.9	15.2′	04°41.2	-13.7′	55.7′
15	48°52.9	·· 23.0	277°27.1	15.2′	04°27.5	-13.7′	55.6′
16	63°52.8	23.7	292°01.3	15.3′	04°13.8	-13.7′	55.6′
17	78°52.7	24.3	306°35.6	15.3′	04°00.0	-13.7′	55.6′
18	93°52.6	S18°24.9	321°09.8	15.3′	S03°46.3	-13.8′	55.6′
19	108°52.5	25.6	335°44.2	15.4′	03°32.5	-13.8′	55.6′
20	123°52.4	26.2	350°18.5	15.4′	03°18.8	-13.8′	55.5′
21	138°52.3	·· 26.9	4°52.9	15.4′	03°05.0	-13.8′	55.5′
22	153°52.2	27.5	19°27.4	15.5′	02°51.3	-13.8′	55.5′
23	168°52.1	28.1	34°01.8	15.5′	02°37.5	-13.8′	55.5′
	SD = 16.2′	d = 0.7′	SD = 15.3′				

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

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

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 8-10 55-75%
12	15:54	15:50	11:44	19:11	06:47	
13	15:46	15:42	11:44	19:57	07:34	
14	15:37	15:33	11:44	20:40	08:19	

DUT1 = UT1-UTC = -0.1080 sec ΔT = TT-UT1 = +69.2920 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°18.0	134°35.4	S26°55.2	196°11.9	S14°37.2	88°00.6	S14°40.5	103°46.7	S19°05.0
1	69°20.5	149°35.4	55.0	211°12.7	37.8	103°02.9	40.4	118°49.0	05.0
2	84°23.0	164°35.5	54.8	226°13.5	38.3	118°05.1	40.4	133°51.4	05.0
3	99°25.4	179°35.6	·· 54.6	241°14.3	·· 38.9	133°07.4	·· 40.3	148°53.7	·· 04.9
4	114°27.9	194°35.7	54.4	256°15.1	39.4	148°09.6	40.2	163°56.0	04.9
5	129°30.3	209°35.8	54.2	271°15.9	40.0	163°11.9	40.1	178°58.3	04.8
6	144°32.8	224°35.8	S26°54.0	286°16.7	S14°40.5	178°14.1	S14°40.0	194°00.6	S19°04.8
7	159°35.3	239°35.9	53.8	301°17.5	41.1	193°16.4	40.0	209°03.0	04.8
8	174°37.7	254°36.0	53.6	316°18.3	41.6	208°18.6	39.9	224°05.3	04.7
9	189°40.2	269°36.1	·· 53.4	331°19.1	·· 42.2	223°20.9	·· 39.8	239°07.6	·· 04.7
10	204°42.7	284°36.2	53.2	346°19.9	42.8	238°23.1	39.7	254°09.9	04.7
11	219°45.1	299°36.3	53.0	1°20.7	43.3	253°25.4	39.6	269°12.2	04.6
12	234°47.6	314°36.4	S26°52.8	16°21.5	S14°43.9	268°27.6	S14°39.6	284°14.5	S19°04.6
13	249°50.1	329°36.5	52.6	31°22.3	44.4	283°29.8	39.5	299°16.9	04.5
14	264°52.5	344°36.6	52.4	46°23.1	45.0	298°32.1	39.4	314°19.2	04.5
15	279°55.0	359°36.7	·· 52.2	61°23.9	·· 45.5	313°34.3	·· 39.3	329°21.5	·· 04.5
16	294°57.5	14°36.7	52.0	76°24.7	46.1	328°36.6	39.2	344°23.8	04.4
17	309°59.9	29°36.8	51.8	91°25.5	46.6	343°38.8	39.2	359°26.1	04.4
18	325°02.4	44°37.0	S26°51.6	106°26.3	S14°47.2	358°41.1	S14°39.1	14°28.5	S19°04.4
19	340°04.8	59°37.1	51.4	121°27.1	47.7	13°43.3	39.0	29°30.8	04.3
20	355°07.3	74°37.2	51.2	136°27.9	48.3	28°45.5	38.9	44°33.1	04.3
21	10°09.8	89°37.3	·· 51.0	151°28.7	·· 48.8	43°47.8	·· 38.8	59°35.4	·· 04.3
22	25°12.2	104°37.4	50.8	166°29.5	49.4	58°50.0	38.7	74°37.7	04.2
23	40°14.7	119°37.5	50.6	181°30.3	49.9	73°52.3	38.7	89°40.0	04.2
Mer.pass.	20:19	ν 0.1′	d -0.2′	m -4.71	ν 0.8′	d 0.6′	m 1.62	ν 2.2′	d -0.1′ m -2.38	ν 2.3′	d -0.0′ m 0.68

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	55°17.2	134°37.6	S26°50.4	196°31.1	S14°50.5	88°54.5	S14°38.6	104°42.4	S19°04.1
1	70°19.6	149°37.7	50.2	211°31.9	51.0	103°56.8	38.5	119°44.7	04.1
2	85°22.1	164°37.8	50.0	226°32.7	51.6	118°59.0	38.4	134°47.0	04.1
3	100°24.6	179°37.9	·· 49.8	241°33.5	·· 52.1	134°01.2	·· 38.3	149°49.3	·· 04.0
4	115°27.0	194°38.1	49.5	256°34.3	52.7	149°03.5	38.3	164°51.6	04.0
5	130°29.5	209°38.2	49.3	271°35.1	53.2	164°05.7	38.2	179°53.9	03.9
6	145°31.9	224°38.3	S26°49.1	286°35.9	S14°53.8	179°08.0	S14°38.1	194°56.2	S19°03.9
7	160°34.4	239°38.4	48.9	301°36.7	54.3	194°10.2	38.0	209°58.6	03.9
8	175°36.9	254°38.5	48.7	316°37.5	54.9	209°12.4	37.9	225°00.9	03.8
9	190°39.3	269°38.7	·· 48.5	331°38.2	·· 55.4	224°14.7	·· 37.8	240°03.2	·· 03.8
10	205°41.8	284°38.8	48.3	346°39.0	55.9	239°16.9	37.8	255°05.5	03.8
11	220°44.3	299°38.9	48.0	1°39.8	56.5	254°19.1	37.7	270°07.8	03.7
12	235°46.7	314°39.1	S26°47.8	16°40.6	S14°57.0	269°21.4	S14°37.6	285°10.1	S19°03.7
13	250°49.2	329°39.2	47.6	31°41.4	57.6	284°23.6	37.5	300°12.4	03.6
14	265°51.7	344°39.3	47.4	46°42.2	58.1	299°25.9	37.4	315°14.8	03.6
15	280°54.1	359°39.5	·· 47.1	61°43.0	·· 58.7	314°28.1	·· 37.3	330°17.1	·· 03.6
16	295°56.6	14°39.6	46.9	76°43.8	59.2	329°30.3	37.3	345°19.4	03.5
17	310°59.1	29°39.7	46.7	91°44.6	14°59.8	344°32.6	37.2	0°21.7	03.5
18	326°01.5	44°39.9	S26°46.5	106°45.4	S15°00.3	359°34.8	S14°37.1	15°24.0	S19°03.5
19	341°04.0	59°40.0	46.3	121°46.2	00.9	14°37.0	37.0	30°26.3	03.4
20	356°06.4	74°40.2	46.0	136°47.0	01.4	29°39.3	36.9	45°28.6	03.4
21	11°08.9	89°40.3	·· 45.8	151°47.8	·· 02.0	44°41.5	·· 36.8	60°31.0	·· 03.3
22	26°11.4	104°40.5	45.6	166°48.6	02.5	59°43.7	36.8	75°33.3	03.3
23	41°13.8	119°40.6	45.3	181°49.4	03.1	74°46.0	36.7	90°35.6	03.3
Mer.pass.	20:16	ν 0.1′	d -0.2′	m -4.72	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′ m -2.37	ν 2.3′	d -0.0′ m 0.68

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°16.3	134°40.7	S26°45.1	196°50.2	S15°03.6	89°48.2	S14°36.6	105°37.9	S19°03.2
1	71°18.8	149°40.9	44.9	211°50.9	04.1	104°50.5	36.5	120°40.2	03.2
2	86°21.2	164°41.1	44.7	226°51.7	04.7	119°52.7	36.4	135°42.5	03.1
3	101°23.7	179°41.2	·· 44.4	241°52.5	·· 05.2	134°54.9	·· 36.3	150°44.8	·· 03.1
4	116°26.2	194°41.4	44.2	256°53.3	05.8	149°57.2	36.3	165°47.1	03.1
5	131°28.6	209°41.5	44.0	271°54.1	06.3	164°59.4	36.2	180°49.5	03.0
6	146°31.1	224°41.7	S26°43.7	286°54.9	S15°06.9	180°01.6	S14°36.1	195°51.8	S19°03.0
7	161°33.6	239°41.9	43.5	301°55.7	07.4	195°03.9	36.0	210°54.1	03.0
8	176°36.0	254°42.0	43.2	316°56.5	08.0	210°06.1	35.9	225°56.4	02.9
9	191°38.5	269°42.2	·· 43.0	331°57.3	·· 08.5	225°08.3	·· 35.8	240°58.7	·· 02.9
10	206°40.9	284°42.3	42.8	346°58.1	09.0	240°10.5	35.7	256°01.0	02.8
11	221°43.4	299°42.5	42.5	1°58.9	09.6	255°12.8	35.7	271°03.3	02.8
12	236°45.9	314°42.7	S26°42.3	16°59.6	S15°10.1	270°15.0	S14°35.6	286°05.6	S19°02.8
13	251°48.3	329°42.9	42.1	32°00.4	10.7	285°17.2	35.5	301°07.9	02.7
14	266°50.8	344°43.0	41.8	47°01.2	11.2	300°19.5	35.4	316°10.3	02.7
15	281°53.3	359°43.2	·· 41.6	62°02.0	·· 11.8	315°21.7	·· 35.3	331°12.6	·· 02.6
16	296°55.7	14°43.4	41.3	77°02.8	12.3	330°23.9	35.2	346°14.9	02.6
17	311°58.2	29°43.6	41.1	92°03.6	12.8	345°26.2	35.1	1°17.2	02.6
18	327°00.7	44°43.7	S26°40.8	107°04.4	S15°13.4	0°28.4	S14°35.1	16°19.5	S19°02.5
19	342°03.1	59°43.9	40.6	122°05.2	13.9	15°30.6	35.0	31°21.8	02.5
20	357°05.6	74°44.1	40.3	137°06.0	14.5	30°32.8	34.9	46°24.1	02.4
21	12°08.0	89°44.3	·· 40.1	152°06.7	·· 15.0	45°35.1	·· 34.8	61°26.4	·· 02.4
22	27°10.5	104°44.5	39.9	167°07.5	15.5	60°37.3	34.7	76°28.7	02.4
23	42°13.0	119°44.7	39.6	182°08.3	16.1	75°39.5	34.6	91°31.0	02.3
Mer.pass.	20:12	ν 0.2′	d -0.2′	m -4.73	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′ m -2.37	ν 2.3′	d -0.0′ m 0.68

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.5	-42°11.4
Schedar	349°33.5	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°45.2	89°21.4
Acamar	315°13.4	-40°13.1
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.3	46°01.1
Bellatrix	278°25.4	6°22.2
Elnath	278°04.8	28°37.5
Alnilam	275°40.1	-1°11.2
Betelgeuse	270°54.6	7°24.7
Canopus	263°53.1	-52°42.2
Sirius	258°28.3	-16°44.6
Adhara	255°07.7	-28°59.9
Procyon	244°53.4	5°10.2
Pollux	243°20.3	27°58.3
Avior	234°15.5	-59°34.4
Suhail	222°48.1	-43°30.9
Miaplacidus	221°38.6	-69°48.0
Alphard	217°50.3	-8°45.0
Regulus	207°37.3	11°51.7
Dubhe	193°44.5	61°37.8
Denebola	182°27.8	14°27.1
Gienah	175°46.5	-17°39.5
Acrux	173°03.4	-63°12.8
Gacrux	171°54.9	-57°13.8
Alioth	166°15.8	55°50.4
Spica	158°25.3	-11°16.3
Alkaid	152°54.6	49°12.3
Hadar	148°40.3	-60°28.4
Menkent	148°01.1	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.5	-60°55.3
Kochab	137°21.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.8	51°29.3
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.2	-26°16.2
Altair	62°02.7	8°55.7
Peacock	53°10.1	-56°40.1
Deneb	49°27.7	45°21.7
Enif	33°41.3	9°58.6
Al Na'ir	27°36.2	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 15 Mon	SHA	Mer.pass
Venus	80°17.3	15:02
Mars	141°53.9	10:55
Jupiter	33°42.6	18:05
Saturn	49°28.7	17:02

Nov 16 Tue	SHA	Mer.pass
Venus	79°20.4	15:01
Mars	141°13.9	10:53
Jupiter	33°37.4	18:02
Saturn	49°25.2	16:59

Nov 17 Wed	SHA	Mer.pass
Venus	78°24.4	15:01
Mars	140°33.8	10:52
Jupiter	33°31.9	17:58
Saturn	49°21.6	16:55

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.0	S18°28.8	48°36.3	15.5′	S02°23.7	-13.8′	55.4′
1	198°51.9	29.4	63°10.8	15.5′	02°10.0	-13.8′	55.4′
2	213°51.8	30.1	77°45.4	15.6′	01°56.2	-13.8′	55.4′
3	228°51.7	·· 30.7	92°19.9	15.6′	01°42.4	-13.8′	55.4′
4	243°51.6	31.3	106°54.5	15.6′	01°28.7	-13.8′	55.4′
5	258°51.5	32.0	121°29.1	15.6′	01°14.9	-13.8′	55.3′
6	273°51.4	S18°32.6	136°03.8	15.7′	S01°01.2	-13.7′	55.3′
7	288°51.3	33.2	150°38.4	15.7′	00°47.4	-13.7′	55.3′
8	303°51.2	33.9	165°13.1	15.7′	00°33.7	-13.7′	55.3′
9	318°51.0	·· 34.5	179°47.8	15.7′	00°19.9	-13.7′	55.3′
10	333°50.9	35.1	194°22.6	15.7′	S00°06.2	-13.7′	55.2′
11	348°50.8	35.8	208°57.3	15.8′	N00°07.5	13.7′	55.2′
12	3°50.7	S18°36.4	223°32.1	15.8′	N00°21.2	13.7′	55.2′
13	18°50.6	37.0	238°06.8	15.8′	00°34.9	13.7′	55.2′
14	33°50.5	37.6	252°41.6	15.8′	00°48.6	13.7′	55.2′
15	48°50.4	·· 38.3	267°16.4	15.8′	01°02.3	13.7′	55.1′
16	63°50.3	38.9	281°51.2	15.8′	01°16.0	13.7′	55.1′
17	78°50.2	39.5	296°26.1	15.8′	01°29.6	13.6′	55.1′
18	93°50.1	S18°40.2	311°00.9	15.8′	N01°43.3	13.6′	55.1′
19	108°50.0	40.8	325°35.7	15.9′	01°56.9	13.6′	55.1′
20	123°49.9	41.4	340°10.6	15.9′	02°10.5	13.6′	55.1′
21	138°49.7	·· 42.0	354°45.4	15.9′	02°24.1	13.6′	55.0′
22	153°49.6	42.7	9°20.3	15.9′	02°37.7	13.6′	55.0′
23	168°49.5	43.3	23°55.2	15.9′	02°51.2	13.5′	55.0′
	SD = 16.2′	d = 0.6′	SD = 15.1′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.4	S18°43.9	38°30.1	15.9′	N03°04.8	13.5′	55.0′
1	198°49.3	44.5	53°04.9	15.9′	03°18.3	13.5′	55.0′
2	213°49.2	45.2	67°39.8	15.9′	03°31.8	13.5′	54.9′
3	228°49.1	·· 45.8	82°14.7	15.9′	03°45.3	13.5′	54.9′
4	243°49.0	46.4	96°49.6	15.9′	03°58.8	13.4′	54.9′
5	258°48.8	47.0	111°24.5	15.9′	04°12.2	13.4′	54.9′
6	273°48.7	S18°47.7	125°59.4	15.9′	N04°25.6	13.4′	54.9′
7	288°48.6	48.3	140°34.3	15.9′	04°39.0	13.4′	54.9′
8	303°48.5	48.9	155°09.1	15.9′	04°52.4	13.3′	54.8′
9	318°48.4	·· 49.5	169°44.0	15.9′	05°05.7	13.3′	54.8′
10	333°48.3	50.1	184°18.9	15.9′	05°19.0	13.3′	54.8′
11	348°48.2	50.7	198°53.7	15.9′	05°32.3	13.3′	54.8′
12	3°48.0	S18°51.4	213°28.6	15.8′	N05°45.6	13.2′	54.8′
13	18°47.9	52.0	228°03.4	15.8′	05°58.8	13.2′	54.8′
14	33°47.8	52.6	242°38.3	15.8′	06°12.0	13.2′	54.7′
15	48°47.7	·· 53.2	257°13.1	15.8′	06°25.2	13.1′	54.7′
16	63°47.6	53.8	271°47.9	15.8′	06°38.3	13.1′	54.7′
17	78°47.5	54.4	286°22.7	15.8′	06°51.4	13.1′	54.7′
18	93°47.3	S18°55.1	300°57.5	15.8′	N07°04.5	13.0′	54.7′
19	108°47.2	55.7	315°32.3	15.8′	07°17.5	13.0′	54.7′
20	123°47.1	56.3	330°07.1	15.8′	07°30.6	13.0′	54.7′
21	138°47.0	·· 56.9	344°41.9	15.7′	07°43.5	12.9′	54.6′
22	153°46.9	57.5	359°16.6	15.7′	07°56.5	12.9′	54.6′
23	168°46.7	58.1	13°51.3	15.7′	08°09.4	12.9′	54.6′
	SD = 16.2′	d = 0.6′	SD = 15.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°46.6	S18°58.7	28°26.0	15.7′	N08°22.2	12.8′	54.6′
1	198°46.5	59.3	43°00.7	15.7′	08°35.1	12.8′	54.6′
2	213°46.4	18°59.9	57°35.4	15.6′	08°47.9	12.7′	54.6′
3	228°46.3	19°00.6	72°10.0	15.6′	09°00.6	12.7′	54.6′
4	243°46.1	01.2	86°44.6	15.6′	09°13.3	12.7′	54.5′
5	258°46.0	01.8	101°19.2	15.6′	09°26.0	12.6′	54.5′
6	273°45.9	S19°02.4	115°53.8	15.6′	N09°38.6	12.6′	54.5′
7	288°45.8	03.0	130°28.4	15.5′	09°51.2	12.5′	54.5′
8	303°45.6	03.6	145°02.9	15.5′	10°03.7	12.5′	54.5′
9	318°45.5	·· 04.2	159°37.4	15.5′	10°16.2	12.5′	54.5′
10	333°45.4	04.8	174°11.9	15.5′	10°28.7	12.4′	54.5′
11	348°45.3	05.4	188°46.4	15.4′	10°41.1	12.4′	54.5′
12	3°45.1	S19°06.0	203°20.8	15.4′	N10°53.4	12.3′	54.4′
13	18°45.0	06.6	217°55.2	15.4′	11°05.8	12.3′	54.4′
14	33°44.9	07.2	232°29.6	15.3′	11°18.0	12.2′	54.4′
15	48°44.8	·· 07.8	247°03.9	15.3′	11°30.2	12.2′	54.4′
16	63°44.6	08.4	261°38.3	15.3′	11°42.4	12.1′	54.4′
17	78°44.5	09.0	276°12.5	15.3′	11°54.5	12.1′	54.4′
18	93°44.4	S19°09.6	290°46.8	15.2′	N12°06.6	12.0′	54.4′
19	108°44.3	10.2	305°21.0	15.2′	12°18.6	12.0′	54.4′
20	123°44.1	10.8	319°55.2	15.2′	12°30.5	11.9′	54.4′
21	138°44.0	·· 11.4	334°29.4	15.1′	12°42.5	11.9′	54.3′
22	153°43.9	12.0	349°03.5	15.1′	12°54.3	11.8′	54.3′
23	168°43.8	12.6	3°37.6	15.1′	13°06.1	11.7′	54.3′
	SD = 16.2′	d = 0.6′	SD = 14.9′				

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

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 11-13 83-95%
15	15:28	15:23	11:45	21:22	09:01	
16	15:18	15:12	11:45	22:03	09:42	
17	15:06	15:01	11:45	22:45	10:24	

DUT1 = UT1-UTC = -0.1085 sec ΔT = TT-UT1 = +69.2925 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	57°15.4	134°44.9	S26°39.4	197°09.1	S15°16.6	90°41.8	S14°34.5	106°33.3	S19°02.3
1	72°17.9	149°45.1	39.1	212°09.9	17.2	105°44.0	34.5	121°35.7	02.2
2	87°20.4	164°45.3	38.9	227°10.7	17.7	120°46.2	34.4	136°38.0	02.2
3	102°22.8	179°45.5	·· 38.6	242°11.5	·· 18.2	135°48.4	·· 34.3	151°40.3	·· 02.2
4	117°25.3	194°45.7	38.4	257°12.2	18.8	150°50.7	34.2	166°42.6	02.1
5	132°27.8	209°45.9	38.1	272°13.0	19.3	165°52.9	34.1	181°44.9	02.1
6	147°30.2	224°46.1	S26°37.8	287°13.8	S15°19.9	180°55.1	S14°34.0	196°47.2	S19°02.0
7	162°32.7	239°46.3	37.6	302°14.6	20.4	195°57.3	33.9	211°49.5	02.0
8	177°35.2	254°46.5	37.3	317°15.4	20.9	210°59.6	33.8	226°51.8	02.0
9	192°37.6	269°46.7	·· 37.1	332°16.2	·· 21.5	226°01.8	·· 33.8	241°54.1	·· 01.9
10	207°40.1	284°46.9	36.8	347°17.0	22.0	241°04.0	33.7	256°56.4	01.9
11	222°42.5	299°47.1	36.6	2°17.7	22.6	256°06.2	33.6	271°58.7	01.8
12	237°45.0	314°47.3	S26°36.3	17°18.5	S15°23.1	271°08.5	S14°33.5	287°01.0	S19°01.8
13	252°47.5	329°47.5	36.0	32°19.3	23.6	286°10.7	33.4	302°03.3	01.8
14	267°49.9	344°47.7	35.8	47°20.1	24.2	301°12.9	33.3	317°05.7	01.7
15	282°52.4	359°48.0	·· 35.5	62°20.9	·· 24.7	316°15.1	·· 33.2	332°08.0	·· 01.7
16	297°54.9	14°48.2	35.3	77°21.7	25.2	331°17.4	33.1	347°10.3	01.6
17	312°57.3	29°48.4	35.0	92°22.5	25.8	346°19.6	33.1	2°12.6	01.6
18	327°59.8	44°48.6	S26°34.7	107°23.2	S15°26.3	1°21.8	S14°33.0	17°14.9	S19°01.6
19	343°02.3	59°48.8	34.5	122°24.0	26.9	16°24.0	32.9	32°17.2	01.5
20	358°04.7	74°49.1	34.2	137°24.8	27.4	31°26.2	32.8	47°19.5	01.5
21	13°07.2	89°49.3	·· 33.9	152°25.6	·· 27.9	46°28.5	·· 32.7	62°21.8	·· 01.4
22	28°09.7	104°49.5	33.7	167°26.4	28.5	61°30.7	32.6	77°24.1	01.4
23	43°12.1	119°49.8	33.4	182°27.1	29.0	76°32.9	32.5	92°26.4	01.4
Mer.pass.	20:08	ν 0.2′	d -0.3′	m -4.75	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′ m -2.36	ν 2.3′	d -0.0′ m 0.69

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	58°14.6	134°50.0	S26°33.1	197°27.9	S15°29.5	91°35.1	S14°32.4	107°28.7	S19°01.3
1	73°17.0	149°50.2	32.9	212°28.7	30.1	106°37.3	32.3	122°31.0	01.3
2	88°19.5	164°50.5	32.6	227°29.5	30.6	121°39.6	32.3	137°33.3	01.2
3	103°22.0	179°50.7	·· 32.3	242°30.3	·· 31.2	136°41.8	·· 32.2	152°35.6	·· 01.2
4	118°24.4	194°51.0	32.1	257°31.1	31.7	151°44.0	32.1	167°37.9	01.2
5	133°26.9	209°51.2	31.8	272°31.8	32.2	166°46.2	32.0	182°40.2	01.1
6	148°29.4	224°51.4	S26°31.5	287°32.6	S15°32.8	181°48.4	S14°31.9	197°42.5	S19°01.1
7	163°31.8	239°51.7	31.2	302°33.4	33.3	196°50.7	31.8	212°44.8	01.0
8	178°34.3	254°51.9	31.0	317°34.2	33.8	211°52.9	31.7	227°47.2	01.0
9	193°36.8	269°52.2	·· 30.7	332°35.0	·· 34.4	226°55.1	·· 31.6	242°49.5	·· 01.0
10	208°39.2	284°52.4	30.4	347°35.7	34.9	241°57.3	31.5	257°51.8	00.9
11	223°41.7	299°52.7	30.1	2°36.5	35.4	256°59.5	31.4	272°54.1	00.9
12	238°44.1	314°53.0	S26°29.9	17°37.3	S15°36.0	272°01.8	S14°31.4	287°56.4	S19°00.8
13	253°46.6	329°53.2	29.6	32°38.1	36.5	287°04.0	31.3	302°58.7	00.8
14	268°49.1	344°53.5	29.3	47°38.9	37.0	302°06.2	31.2	318°01.0	00.7
15	283°51.5	359°53.7	·· 29.0	62°39.6	·· 37.6	317°08.4	·· 31.1	333°03.3	·· 00.7
16	298°54.0	14°54.0	28.7	77°40.4	38.1	332°10.6	31.0	348°05.6	00.7
17	313°56.5	29°54.3	28.5	92°41.2	38.6	347°12.8	30.9	3°07.9	00.6
18	328°58.9	44°54.5	S26°28.2	107°42.0	S15°39.2	2°15.0	S14°30.8	18°10.2	S19°00.6
19	344°01.4	59°54.8	27.9	122°42.8	39.7	17°17.3	30.7	33°12.5	00.5
20	359°03.9	74°55.1	27.6	137°43.5	40.2	32°19.5	30.6	48°14.8	00.5
21	14°06.3	89°55.3	·· 27.3	152°44.3	·· 40.8	47°21.7	·· 30.5	63°17.1	·· 00.5
22	29°08.8	104°55.6	27.0	167°45.1	41.3	62°23.9	30.4	78°19.4	00.4
23	44°11.3	119°55.9	26.7	182°45.9	41.8	77°26.1	30.4	93°21.7	00.4
Mer.pass.	20:04	ν 0.2′	d -0.3′	m -4.76	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′ m -2.35	ν 2.3′	d -0.0′ m 0.69

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	59°13.7	134°56.2	S26°26.5	197°46.6	S15°42.4	92°28.3	S14°30.3	108°24.0	S19°00.3
1	74°16.2	149°56.5	26.2	212°47.4	42.9	107°30.5	30.2	123°26.3	00.3
2	89°18.6	164°56.7	25.9	227°48.2	43.4	122°32.8	30.1	138°28.6	00.3
3	104°21.1	179°57.0	·· 25.6	242°49.0	·· 43.9	137°35.0	·· 30.0	153°30.9	·· 00.2
4	119°23.6	194°57.3	25.3	257°49.7	44.5	152°37.2	29.9	168°33.2	00.2
5	134°26.0	209°57.6	25.0	272°50.5	45.0	167°39.4	29.8	183°35.5	00.1
6	149°28.5	224°57.9	S26°24.7	287°51.3	S15°45.5	182°41.6	S14°29.7	198°37.8	S19°00.1
7	164°31.0	239°58.2	24.4	302°52.1	46.1	197°43.8	29.6	213°40.1	00.0
8	179°33.4	254°58.5	24.1	317°52.8	46.6	212°46.0	29.5	228°42.4	00.0
9	194°35.9	269°58.8	·· 23.8	332°53.6	·· 47.1	227°48.2	·· 29.4	243°44.7	19°00.0
10	209°38.4	284°59.1	23.5	347°54.4	47.7	242°50.5	29.3	258°47.0	18°59.9
11	224°40.8	299°59.4	23.3	2°55.2	48.2	257°52.7	29.3	273°49.3	59.9
12	239°43.3	314°59.7	S26°23.0	17°55.9	S15°48.7	272°54.9	S14°29.2	288°51.6	S18°59.8
13	254°45.8	330°00.0	22.7	32°56.7	49.2	287°57.1	29.1	303°53.9	59.8
14	269°48.2	345°00.3	22.4	47°57.5	49.8	302°59.3	29.0	318°56.2	59.7
15	284°50.7	0°00.6	·· 22.1	62°58.3	·· 50.3	318°01.5	·· 28.9	333°58.5	·· 59.7
16	299°53.1	15°00.9	21.8	77°59.0	50.8	333°03.7	28.8	349°00.8	59.7
17	314°55.6	30°01.2	21.5	92°59.8	51.4	348°05.9	28.7	4°03.1	59.6
18	329°58.1	45°01.5	S26°21.2	108°00.6	S15°51.9	3°08.1	S14°28.6	19°05.4	S18°59.6
19	345°00.5	60°01.8	20.9	123°01.4	52.4	18°10.3	28.5	34°07.7	59.5
20	0°03.0	75°02.1	20.6	138°02.1	52.9	33°12.5	28.4	49°10.0	59.5
21	15°05.5	90°02.5	·· 20.3	153°02.9	·· 53.5	48°14.8	·· 28.3	64°12.3	·· 59.5
22	30°07.9	105°02.8	20.0	168°03.7	54.0	63°17.0	28.2	79°14.6	59.4
23	45°10.4	120°03.1	19.6	183°04.5	54.5	78°19.2	28.1	94°16.9	59.4
Mer.pass.	20:00	ν 0.3′	d -0.3′	m -4.77	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′ m -2.35	ν 2.3′	d -0.0′ m 0.69

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.5	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°45.2	89°21.4
Acamar	315°13.4	-40°13.1
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.3	16°33.2
Rigel	281°06.1	-8°10.5
Capella	280°25.3	46°01.1
Bellatrix	278°25.4	6°22.2
Elnath	278°04.8	28°37.5
Alnilam	275°40.1	-1°11.2
Betelgeuse	270°54.6	7°24.7
Canopus	263°53.1	-52°42.2
Sirius	258°28.3	-16°44.6
Adhara	255°07.6	-28°59.9
Procyon	244°53.4	5°10.2
Pollux	243°20.3	27°58.3
Avior	234°15.5	-59°34.4
Suhail	222°48.1	-43°30.9
Miaplacidus	221°38.5	-69°48.0
Alphard	217°50.3	-8°45.0
Regulus	207°37.2	11°51.7
Dubhe	193°44.5	61°37.8
Denebola	182°27.8	14°27.1
Gienah	175°46.5	-17°39.5
Acrux	173°03.4	-63°12.8
Gacrux	171°54.9	-57°13.8
Alioth	166°15.7	55°50.4
Spica	158°25.3	-11°16.3
Alkaid	152°54.5	49°12.3
Hadar	148°40.2	-60°28.4
Menkent	148°01.0	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.5	-60°55.3
Kochab	137°21.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°04.0
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.9	51°29.3
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.7
Peacock	53°10.1	-56°40.1
Deneb	49°27.7	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.2	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 18 Thu	SHA	Mer.pass
Venus	77°29.4	15:01
Mars	139°53.7	10:51
Jupiter	33°26.3	17:55
Saturn	49°17.9	16:51

Nov 19 Fri	SHA	Mer.pass
Venus	76°35.4	15:00
Mars	139°13.4	10:50
Jupiter	33°20.5	17:51
Saturn	49°14.1	16:48

Nov 20 Sat	SHA	Mer.pass
Venus	75°42.5	15:00
Mars	138°32.9	10:48
Jupiter	33°14.6	17:47
Saturn	49°10.3	16:44

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	Sun		Moon				
h							
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°43.6	S19°13.2	18°11.6	15.0′	N13°17.8	11.7′	54.3′
1	198°43.5	13.8	32°45.6	15.0′	13°29.5	11.6′	54.3′
2	213°43.4	14.4	47°19.6	14.9′	13°41.2	11.6′	54.3′
3	228°43.2	·· 15.0	61°53.6	14.9′	13°52.7	11.5′	54.3′
4	243°43.1	15.6	76°27.5	14.9′	14°04.2	11.4′	54.3′
5	258°43.0	16.2	91°01.3	14.8′	14°15.7	11.4′	54.3′
6	273°42.8	S19°16.8	105°35.2	14.8′	N14°27.1	11.3′	54.2′
7	288°42.7	17.3	120°09.0	14.7′	14°38.4	11.3′	54.2′
8	303°42.6	17.9	134°42.7	14.7′	14°49.7	11.2′	54.2′
9	318°42.4	·· 18.5	149°16.4	14.7′	15°00.9	11.1′	54.2′
10	333°42.3	19.1	163°50.1	14.6′	15°12.0	11.1′	54.2′
11	348°42.2	19.7	178°23.7	14.6′	15°23.1	11.0′	54.2′
12	3°42.0	S19°20.3	192°57.3	14.5′	N15°34.1	10.9′	54.2′
13	18°41.9	20.9	207°30.8	14.5′	15°45.0	10.9′	54.2′
14	33°41.8	21.5	222°04.3	14.5′	15°55.9	10.8′	54.2′
15	48°41.6	·· 22.1	236°37.8	14.4′	16°06.7	10.7′	54.2′
16	63°41.5	22.6	251°11.2	14.4′	16°17.5	10.7′	54.2′
17	78°41.4	23.2	265°44.6	14.3′	16°28.1	10.6′	54.1′
18	93°41.2	S19°23.8	280°17.9	14.3′	N16°38.7	10.5′	54.1′
19	108°41.1	24.4	294°51.2	14.2′	16°49.3	10.5′	54.1′
20	123°41.0	25.0	309°24.4	14.2′	16°59.7	10.4′	54.1′
21	138°40.8	·· 25.6	323°57.6	14.1′	17°10.1	10.3′	54.1′
22	153°40.7	26.2	338°30.7	14.1′	17°20.4	10.2′	54.1′
23	168°40.6	26.7	353°03.8	14.0′	17°30.7	10.2′	54.1′
	SD = 16.2′	d = 0.6′		SD = 14.8′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°40.4	S19°27.3	7°36.8	14.0′	N17°40.8	10.1′	54.1′
1	198°40.3	27.9	22°09.8	13.9′	17°50.9	10.0′	54.1′
2	213°40.1	28.5	36°42.8	13.9′	18°00.9	9.9′	54.1′
3	228°40.0	·· 29.1	51°15.7	13.8′	18°10.9	9.9′	54.1′
4	243°39.9	29.6	65°48.5	13.8′	18°20.7	9.8′	54.1′
5	258°39.7	30.2	80°21.3	13.8′	18°30.5	9.7′	54.1′
6	273°39.6	S19°30.8	94°54.1	13.7′	N18°40.2	9.6′	54.1′
7	288°39.4	31.4	109°26.8	13.7′	18°49.8	9.5′	54.0′
8	303°39.3	31.9	123°59.4	13.6′	18°59.3	9.5′	54.0′
9	318°39.2	·· 32.5	138°32.0	13.6′	19°08.8	9.4′	54.0′
10	333°39.0	33.1	153°04.6	13.5′	19°18.2	9.3′	54.0′
11	348°38.9	33.7	167°37.1	13.5′	19°27.5	9.2′	54.0′
12	3°38.7	S19°34.2	182°09.5	13.4′	N19°36.7	9.1′	54.0′
13	18°38.6	34.8	196°41.9	13.4′	19°45.8	9.0′	54.0′
14	33°38.5	35.4	211°14.3	13.3′	19°54.8	8.9′	54.0′
15	48°38.3	·· 36.0	225°46.6	13.2′	20°03.8	8.9′	54.0′
16	63°38.2	36.5	240°18.8	13.2′	20°12.6	8.8′	54.0′
17	78°38.0	37.1	254°51.0	13.1′	20°21.4	8.7′	54.0′
18	93°37.9	S19°37.7	269°23.2	13.1′	N20°30.1	8.6′	54.0′
19	108°37.7	38.2	283°55.3	13.0′	20°38.7	8.5′	54.0′
20	123°37.6	38.8	298°27.3	13.0′	20°47.2	8.4′	54.0′
21	138°37.5	·· 39.4	312°59.3	12.9′	20°55.6	8.3′	54.0′
22	153°37.3	40.0	327°31.3	12.9′	21°03.9	8.2′	54.0′
23	168°37.2	40.5	342°03.2	12.8′	21°12.2	8.1′	54.0′
	SD = 16.2′	d = 0.6′		SD = 14.8′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°37.0	S19°41.1	356°35.0	12.8′	N21°20.3	8.0′	54.0′
1	198°36.9	41.7	11°06.8	12.7′	21°28.3	7.9′	54.0′
2	213°36.7	42.2	25°38.5	12.7′	21°36.3	7.9′	54.0′
3	228°36.6	·· 42.8	40°10.2	12.6′	21°44.1	7.8′	53.9′
4	243°36.4	43.4	54°41.8	12.6′	21°51.9	7.7′	53.9′
5	258°36.3	43.9	69°13.4	12.5′	21°59.5	7.6′	53.9′
6	273°36.1	S19°44.5	83°45.0	12.5′	N22°07.1	7.5′	53.9′
7	288°36.0	45.0	98°16.4	12.4′	22°14.6	7.4′	53.9′
8	303°35.8	45.6	112°47.9	12.4′	22°21.9	7.3′	53.9′
9	318°35.7	·· 46.2	127°19.3	12.3′	22°29.2	7.2′	53.9′
10	333°35.5	46.7	141°50.6	12.3′	22°36.4	7.1′	53.9′
11	348°35.4	47.3	156°21.9	12.2′	22°43.4	7.0′	53.9′
12	3°35.2	S19°47.8	170°53.1	12.2′	N22°50.4	6.9′	53.9′
13	18°35.1	48.4	185°24.3	12.1′	22°57.2	6.8′	53.9′
14	33°34.9	49.0	199°55.4	12.1′	23°04.0	6.7′	53.9′
15	48°34.8	·· 49.5	214°26.5	12.0′	23°10.7	6.5′	53.9′
16	63°34.6	50.1	228°57.6	12.0′	23°17.2	6.4′	53.9′
17	78°34.5	50.6	243°28.6	11.9′	23°23.6	6.3′	53.9′
18	93°34.3	S19°51.2	257°59.5	11.9′	N23°30.0	6.2′	53.9′
19	108°34.2	51.7	272°30.4	11.9′	23°36.2	6.1′	53.9′
20	123°34.0	52.3	287°01.3	11.8′	23°42.3	6.0′	53.9′
21	138°33.9	·· 52.8	301°32.1	11.8′	23°48.3	5.9′	53.9′
22	153°33.7	53.4	316°02.8	11.7′	23°54.3	5.8′	53.9′
23	168°33.6	54.0	330°33.5	11.7′	24°00.0	5.7′	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	▬	▬	14:36	16:16
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	07:27	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°	06:15	07:02	07:45	15:45	16:28	17:15
54°	06:11	06:55	07:35	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	06:20	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	18:03	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	20:09
45°	02:58	03:43	04:17	19:14	19:49	20:34
S 50°	02:26	03:20	03:59	19:32	20:12	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°	01:19	02:40	03:31	20:01	20:52	22:16
58°	00:29	02:22	03:19	20:13	21:11	23:11
S 60°	–:–	01:59	03:05	20:27	21:34	–:–

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

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 98-100%
18	14:54	14:48	11:45	23:29	11:07	
19	14:42	14:35	11:45	–:–	11:51	
20	14:28	14:21	11:46	00:14	12:38	◯

DUT1 = UT1-UTC = -0.1078 sec ΔT = TT-UT1 = +69.2918 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°12.9	135°03.4	S26°19.3	198°05.2	S15°55.1	93°21.4	S14°28.0	109°19.2	S18°59.3
1	75°15.3	150°03.8	19.0	213°06.0	55.6	108°23.6	27.9	124°21.5	59.3
2	90°17.8	165°04.1	18.7	228°06.8	56.1	123°25.8	27.9	139°23.8	59.2
3	105°20.3	180°04.4	·· 18.4	243°07.5	·· 56.6	138°28.0	·· 27.8	154°26.1	·· 59.2
4	120°22.7	195°04.8	18.1	258°08.3	57.2	153°30.2	27.7	169°28.4	59.2
5	135°25.2	210°05.1	17.8	273°09.1	57.7	168°32.4	27.6	184°30.7	59.1
6	150°27.6	225°05.4	S26°17.5	288°09.9	S15°58.2	183°34.6	S14°27.5	199°33.0	S18°59.1
7	165°30.1	240°05.8	17.2	303°10.6	58.7	198°36.8	27.4	214°35.3	59.0
8	180°32.6	255°06.1	16.9	318°11.4	59.3	213°39.0	27.3	229°37.6	59.0
9	195°35.0	270°06.5	·· 16.6	333°12.2	15°59.8	228°41.2	·· 27.2	244°39.9	·· 58.9
10	210°37.5	285°06.8	16.3	348°12.9	16°00.3	243°43.4	27.1	259°42.2	58.9
11	225°40.0	300°07.1	15.9	3°13.7	00.8	258°45.6	27.0	274°44.5	58.9
12	240°42.4	315°07.5	S26°15.6	18°14.5	S16°01.4	273°47.8	S14°26.9	289°46.8	S18°58.8
13	255°44.9	330°07.8	15.3	33°15.2	01.9	288°50.0	26.8	304°49.1	58.8
14	270°47.4	345°08.2	15.0	48°16.0	02.4	303°52.2	26.7	319°51.3	58.7
15	285°49.8	0°08.5	·· 14.7	63°16.8	·· 02.9	318°54.5	·· 26.6	334°53.6	·· 58.7
16	300°52.3	15°08.9	14.4	78°17.5	03.5	333°56.7	26.5	349°55.9	58.6
17	315°54.8	30°09.3	14.0	93°18.3	04.0	348°58.9	26.4	4°58.2	58.6
18	330°57.2	45°09.6	S26°13.7	108°19.1	S16°04.5	4°01.1	S14°26.3	20°00.5	S18°58.6
19	345°59.7	60°10.0	13.4	123°19.8	05.0	19°03.3	26.2	35°02.8	58.5
20	1°02.1	75°10.4	13.1	138°20.6	05.5	34°05.5	26.1	50°05.1	58.5
21	16°04.6	90°10.7	·· 12.8	153°21.4	·· 06.1	49°07.7	·· 26.0	65°07.4	·· 58.4
22	31°07.1	105°11.1	12.4	168°22.2	06.6	64°09.9	26.0	80°09.7	58.4
23	46°09.5	120°11.5	12.1	183°22.9	07.1	79°12.1	25.9	95°12.0	58.3
Mer.pass.	19:56	ν 0.3′	d -0.3′	m -4.78	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′	m -2.34	ν 2.3′	d -0.0′	m 0.70

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	61°12.0	135°11.8	S26°11.8	198°23.7	S16°07.6	94°14.3	S14°25.8	110°14.3	S18°58.3
1	76°14.5	150°12.2	11.5	213°24.5	08.2	109°16.5	25.7	125°16.6	58.3
2	91°16.9	165°12.6	11.2	228°25.2	08.7	124°18.7	25.6	140°18.9	58.2
3	106°19.4	180°13.0	·· 10.8	243°26.0	·· 09.2	139°20.9	·· 25.5	155°21.2	·· 58.2
4	121°21.9	195°13.3	10.5	258°26.7	09.7	154°23.1	25.4	170°23.5	58.1
5	136°24.3	210°13.7	10.2	273°27.5	10.2	169°25.3	25.3	185°25.8	58.1
6	151°26.8	225°14.1	S26°09.9	288°28.3	S16°10.8	184°27.5	S14°25.2	200°28.1	S18°58.0
7	166°29.2	240°14.5	09.5	303°29.0	11.3	199°29.7	25.1	215°30.4	58.0
8	181°31.7	255°14.9	09.2	318°29.8	11.8	214°31.9	25.0	230°32.7	57.9
9	196°34.2	270°15.3	·· 08.9	333°30.6	·· 12.3	229°34.1	·· 24.9	245°34.9	·· 57.9
10	211°36.6	285°15.7	08.5	348°31.3	12.8	244°36.3	24.8	260°37.2	57.9
11	226°39.1	300°16.1	08.2	3°32.1	13.4	259°38.5	24.7	275°39.5	57.8
12	241°41.6	315°16.5	S26°07.9	18°32.9	S16°13.9	274°40.6	S14°24.6	290°41.8	S18°57.8
13	256°44.0	330°16.9	07.5	33°33.6	14.4	289°42.8	24.5	305°44.1	57.7
14	271°46.5	345°17.3	07.2	48°34.4	14.9	304°45.0	24.4	320°46.4	57.7
15	286°49.0	0°17.7	·· 06.9	63°35.2	·· 15.4	319°47.2	·· 24.3	335°48.7	·· 57.6
16	301°51.4	15°18.1	06.6	78°35.9	16.0	334°49.4	24.2	350°51.0	57.6
17	316°53.9	30°18.5	06.2	93°36.7	16.5	349°51.6	24.1	5°53.3	57.6
18	331°56.4	45°18.9	S26°05.9	108°37.4	S16°17.0	4°53.8	S14°24.0	20°55.6	S18°57.5
19	346°58.8	60°19.3	05.5	123°38.2	17.5	19°56.0	23.9	35°57.9	57.5
20	2°01.3	75°19.7	05.2	138°39.0	18.0	34°58.2	23.8	51°00.2	57.4
21	17°03.7	90°20.1	·· 04.9	153°39.7	·· 18.5	50°00.4	·· 23.7	66°02.5	·· 57.4
22	32°06.2	105°20.6	04.5	168°40.5	19.1	65°02.6	23.6	81°04.7	57.3
23	47°08.7	120°21.0	04.2	183°41.3	19.6	80°04.8	23.5	96°07.0	57.3
Mer.pass.	19:52	ν 0.4′	d -0.3′	m -4.79	ν 0.8′	d 0.5′	m 1.62	ν 2.2′	d -0.1′	m -2.33	ν 2.3′	d -0.0′	m 0.70

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°11.1	135°21.4	S26°03.9	198°42.0	S16°20.1	95°07.0	S14°23.4	111°09.3	S18°57.2
1	77°13.6	150°21.8	03.5	213°42.8	20.6	110°09.2	23.3	126°11.6	57.2
2	92°16.1	165°22.3	03.2	228°43.5	21.1	125°11.4	23.2	141°13.9	57.2
3	107°18.5	180°22.7	·· 02.8	243°44.3	·· 21.6	140°13.6	·· 23.1	156°16.2	·· 57.1
4	122°21.0	195°23.1	02.5	258°45.1	22.2	155°15.8	23.0	171°18.5	57.1
5	137°23.5	210°23.6	02.1	273°45.8	22.7	170°18.0	22.9	186°20.8	57.0
6	152°25.9	225°24.0	S26°01.8	288°46.6	S16°23.2	185°20.2	S14°22.8	201°23.1	S18°57.0
7	167°28.4	240°24.4	01.5	303°47.3	23.7	200°22.3	22.7	216°25.4	56.9
8	182°30.9	255°24.9	01.1	318°48.1	24.2	215°24.5	22.6	231°27.7	56.9
9	197°33.3	270°25.3	·· 00.8	333°48.9	·· 24.7	230°26.7	·· 22.5	246°29.9	·· 56.8
10	212°35.8	285°25.8	00.4	348°49.6	25.3	245°28.9	22.4	261°32.2	56.8
11	227°38.2	300°26.2	26°00.1	3°50.4	25.8	260°31.1	22.3	276°34.5	56.8
12	242°40.7	315°26.6	S25°59.7	18°51.1	S16°26.3	275°33.3	S14°22.2	291°36.8	S18°56.7
13	257°43.2	330°27.1	59.4	33°51.9	26.8	290°35.5	22.1	306°39.1	56.7
14	272°45.6	345°27.6	59.0	48°52.7	27.3	305°37.7	22.0	321°41.4	56.6
15	287°48.1	0°28.0	·· 58.7	63°53.4	·· 27.8	320°39.9	·· 21.9	336°43.7	·· 56.6
16	302°50.6	15°28.5	58.3	78°54.2	28.3	335°42.1	21.8	351°46.0	56.5
17	317°53.0	30°28.9	58.0	93°54.9	28.9	350°44.2	21.7	6°48.3	56.5
18	332°55.5	45°29.4	S25°57.6	108°55.7	S16°29.4	5°46.4	S14°21.6	21°50.5	S18°56.4
19	347°58.0	60°29.8	57.3	123°56.4	29.9	20°48.6	21.5	36°52.8	56.4
20	3°00.4	75°30.3	56.9	138°57.2	30.4	35°50.8	21.4	51°55.1	56.3
21	18°02.9	90°30.8	·· 56.6	153°58.0	·· 30.9	50°53.0	·· 21.3	66°57.4	·· 56.3
22	33°05.4	105°31.3	56.2	168°58.7	31.4	65°55.2	21.2	81°59.7	56.3
23	48°07.8	120°31.7	55.9	183°59.5	31.9	80°57.4	21.1	97°02.0	56.2
Mer.pass.	19:48	ν 0.4′	d -0.3′	m -4.80	ν 0.8′	d 0.5′	m 1.61	ν 2.2′	d -0.1′	m -2.33	ν 2.3′	d -0.0′	m 0.70

Stars	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.5	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°45.0	89°21.4
Acamar	315°13.4	-40°13.1
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.5
Capella	280°25.3	46°01.1
Bellatrix	278°25.3	6°22.2
Elnath	278°04.8	28°37.5
Alnilam	275°40.1	-1°11.2
Betelgeuse	270°54.6	7°24.7
Canopus	263°53.1	-52°42.2
Sirius	258°28.2	-16°44.6
Adhara	255°07.6	-28°59.9
Procyon	244°53.3	5°10.2
Pollux	243°20.3	27°58.3
Avior	234°15.4	-59°34.4
Suhail	222°48.1	-43°30.9
Miaplacidus	221°38.5	-69°48.0
Alphard	217°50.2	-8°45.0
Regulus	207°37.2	11°51.7
Dubhe	193°44.4	61°37.8
Denebola	182°27.8	14°27.1
Gienah	175°46.4	-17°39.5
Acrux	173°03.3	-63°12.8
Gacrux	171°54.8	-57°13.8
Alioth	166°15.7	55°50.4
Spica	158°25.3	-11°16.3
Alkaid	152°54.5	49°12.2
Hadar	148°40.2	-60°28.4
Menkent	148°01.0	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.5	-60°55.3
Kochab	137°21.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°03.9
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.9	51°29.3
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.7
Peacock	53°10.1	-56°40.1
Deneb	49°27.7	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.2	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 21 Sun	SHA	Mer.pass
Venus	74°50.6	14:59
Mars	137°52.4	10:47
Jupiter	33°08.5	17:44
Saturn	49°06.3	16:40

Nov 22 Mon	SHA	Mer.pass
Venus	73°59.8	14:59
Mars	137°11.7	10:46
Jupiter	33°02.3	17:40
Saturn	49°02.3	16:37

Nov 23 Tue	SHA	Mer.pass
Venus	73°10.3	14:58
Mars	136°30.9	10:45
Jupiter	32°55.9	17:37
Saturn	48°58.2	16:33

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°33.4	S19°54.5	345°04.2	11.6′	N24°05.7	5.6′	53.9′
1	198°33.2	55.1	359°34.8	11.6′	24°11.3	5.5′	53.9′
2	213°33.1	55.6	14°05.4	11.5′	24°16.8	5.4′	53.9′
3	228°32.9	·· 56.2	28°35.9	11.5′	24°22.1	5.2′	53.9′
4	243°32.8	56.7	43°06.4	11.5′	24°27.4	5.1′	53.9′
5	258°32.6	57.3	57°36.9	11.4′	24°32.5	5.0′	53.9′
6	273°32.5	S19°57.8	72°07.3	11.4′	N24°37.5	4.9′	53.9′
7	288°32.3	58.4	86°37.7	11.3′	24°42.4	4.8′	53.9′
8	303°32.2	58.9	101°08.0	11.3′	24°47.2	4.7′	53.9′
9	318°32.0	19°59.4	115°38.3	11.2′	24°51.9	4.6′	53.9′
10	333°31.8	20°00.0	130°08.5	11.2′	24°56.5	4.4′	53.9′
11	348°31.7	00.5	144°38.7	11.2′	25°00.9	4.3′	53.9′
12	3°31.5	S20°01.1	159°08.9	11.1′	N25°05.3	4.2′	53.9′
13	18°31.4	01.6	173°39.0	11.1′	25°09.5	4.1′	53.9′
14	33°31.2	02.2	188°09.1	11.1′	25°13.6	4.0′	53.9′
15	48°31.0	·· 02.7	202°39.2	11.0′	25°17.5	3.9′	53.9′
16	63°30.9	03.3	217°09.2	11.0′	25°21.4	3.7′	53.9′
17	78°30.7	03.8	231°39.2	11.0′	25°25.1	3.6′	53.9′
18	93°30.6	S20°04.3	246°09.2	10.9′	N25°28.8	3.5′	53.9′
19	108°30.4	04.9	260°39.1	10.9′	25°32.3	3.4′	53.9′
20	123°30.2	05.4	275°09.0	10.9′	25°35.7	3.3′	53.9′
21	138°30.1	·· 06.0	289°38.8	10.8′	25°38.9	3.1′	53.9′
22	153°29.9	06.5	304°08.7	10.8′	25°42.1	3.0′	53.9′
23	168°29.8	07.0	318°38.5	10.8′	25°45.1	2.9′	53.9′
	SD = 16.2′	d = 0.6′	SD = 14.7′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°29.6	S20°07.6	333°08.2	10.7′	N25°48.0	2.8′	53.9′
1	198°29.4	08.1	347°38.0	10.7′	25°50.8	2.7′	54.0′
2	213°29.3	08.6	2°07.7	10.7′	25°53.4	2.5′	54.0′
3	228°29.1	·· 09.2	16°37.4	10.7′	25°56.0	2.4′	54.0′
4	243°28.9	09.7	31°07.0	10.6′	25°58.4	2.3′	54.0′
5	258°28.8	10.2	45°36.7	10.6′	26°00.7	2.2′	54.0′
6	273°28.6	S20°10.8	60°06.3	10.6′	N26°02.8	2.0′	54.0′
7	288°28.4	11.3	74°35.9	10.6′	26°04.9	1.9′	54.0′
8	303°28.3	11.8	89°05.5	10.5′	26°06.8	1.8′	54.0′
9	318°28.1	·· 12.4	103°35.0	10.5′	26°08.6	1.7′	54.0′
10	333°27.9	12.9	118°04.5	10.5′	26°10.2	1.5′	54.0′
11	348°27.8	13.4	132°34.0	10.5′	26°11.8	1.4′	54.0′
12	3°27.6	S20°14.0	147°03.5	10.5′	N26°13.2	1.3′	54.0′
13	18°27.4	14.5	161°33.0	10.5′	26°14.5	1.2′	54.0′
14	33°27.3	15.0	176°02.5	10.4′	26°15.7	1.0′	54.0′
15	48°27.1	·· 15.5	190°31.9	10.4′	26°16.7	0.9′	54.0′
16	63°26.9	16.1	205°01.3	10.4′	26°17.6	0.8′	54.0′
17	78°26.8	16.6	219°30.8	10.4′	26°18.4	0.7′	54.0′
18	93°26.6	S20°17.1	234°00.2	10.4′	N26°19.1	0.5′	54.0′
19	108°26.4	17.6	248°29.5	10.4′	26°19.6	0.4′	54.1′
20	123°26.3	18.2	262°58.9	10.4′	26°20.0	0.3′	54.1′
21	138°26.1	·· 18.7	277°28.3	10.4′	26°20.3	0.2′	54.1′
22	153°25.9	19.2	291°57.6	10.4′	26°20.5	0.0′	54.1′
23	168°25.7	19.7	306°27.0	10.3′	26°20.5	-0.1′	54.1′
	SD = 16.2′	d = 0.5′	SD = 14.7′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°25.6	S20°20.3	320°56.3	10.3′	N26°20.4	-0.2′	54.1′
1	198°25.4	20.8	335°25.7	10.3′	26°20.2	-0.3′	54.1′
2	213°25.2	21.3	349°55.0	10.3′	26°19.9	-0.5′	54.1′
3	228°25.1	·· 21.8	4°24.4	10.3′	26°19.4	-0.6′	54.1′
4	243°24.9	22.3	18°53.7	10.3′	26°18.8	-0.7′	54.1′
5	258°24.7	22.8	33°23.0	10.3′	26°18.0	-0.9′	54.1′
6	273°24.5	S20°23.4	47°52.3	10.3′	N26°17.2	-1.0′	54.1′
7	288°24.4	23.9	62°21.7	10.3′	26°16.2	-1.1′	54.2′
8	303°24.2	24.4	76°51.0	10.3′	26°15.1	-1.2′	54.2′
9	318°24.0	·· 24.9	91°20.3	10.3′	26°13.9	-1.4′	54.2′
10	333°23.8	25.4	105°49.6	10.3′	26°12.5	-1.5′	54.2′
11	348°23.7	25.9	120°19.0	10.3′	26°11.0	-1.6′	54.2′
12	3°23.5	S20°26.5	134°48.3	10.3′	N26°09.4	-1.7′	54.2′
13	18°23.3	27.0	149°17.6	10.3′	26°07.6	-1.9′	54.2′
14	33°23.1	27.5	163°47.0	10.4′	26°05.8	-2.0′	54.2′
15	48°23.0	·· 28.0	178°16.4	10.4′	26°03.8	-2.1′	54.2′
16	63°22.8	28.5	192°45.7	10.4′	26°01.6	-2.3′	54.3′
17	78°22.6	29.0	207°15.1	10.4′	25°59.4	-2.4′	54.3′
18	93°22.4	S20°29.5	221°44.5	10.4′	N25°57.0	-2.5′	54.3′
19	108°22.3	30.0	236°13.9	10.4′	25°54.5	-2.6′	54.3′
20	123°22.1	30.5	250°43.3	10.4′	25°51.9	-2.8′	54.3′
21	138°21.9	·· 31.0	265°12.7	10.4′	25°49.1	-2.9′	54.3′
22	153°21.7	31.6	279°42.1	10.4′	25°46.2	-3.0′	54.3′
23	168°21.5	32.1	294°11.6	10.5′	25°43.2	-3.1′	54.3′
	SD = 16.2′	d = 0.5′	SD = 14.8′				

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

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

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	98-89%
21	14:14	14:06	11:46	01:02	13:26	
22	13:58	13:50	11:46	01:51	14:16	
23	13:42	13:34	11:46	02:42	15:07	

DUT1 = UT1-UTC = -0.1062 sec ΔT = TT-UT1 = +69.2902 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°10.3	135°32.2	S25°55.5	199°00.2	S16°32.4	95°59.6	S14°21.0	112°04.3	S18°56.2
1	78°12.7	150°32.7	55.2	214°01.0	33.0	111°01.8	20.9	127°06.6	56.1
2	93°15.2	165°33.2	54.8	229°01.7	33.5	126°03.9	20.8	142°08.9	56.1
3	108°17.7	180°33.6	·· 54.4	244°02.5	·· 34.0	141°06.1	·· 20.7	157°11.1	·· 56.0
4	123°20.1	195°34.1	54.1	259°03.3	34.5	156°08.3	20.6	172°13.4	56.0
5	138°22.6	210°34.6	53.7	274°04.0	35.0	171°10.5	20.5	187°15.7	55.9
6	153°25.1	225°35.1	S25°53.4	289°04.8	S16°35.5	186°12.7	S14°20.4	202°18.0	S18°55.9
7	168°27.5	240°35.6	53.0	304°05.5	36.0	201°14.9	20.3	217°20.3	55.9
8	183°30.0	255°36.1	52.6	319°06.3	36.5	216°17.1	20.2	232°22.6	55.8
9	198°32.5	270°36.6	·· 52.3	334°07.0	·· 37.0	231°19.2	·· 20.1	247°24.9	·· 55.8
10	213°34.9	285°37.1	51.9	349°07.8	37.6	246°21.4	20.0	262°27.1	55.7
11	228°37.4	300°37.6	51.6	4°08.5	38.1	261°23.6	19.9	277°29.4	55.7
12	243°39.9	315°38.1	S25°51.2	19°09.3	S16°38.6	276°25.8	S14°19.8	292°31.7	S18°55.6
13	258°42.3	330°38.6	50.8	34°10.0	39.1	291°28.0	19.7	307°34.0	55.6
14	273°44.8	345°39.1	50.5	49°10.8	39.6	306°30.2	19.6	322°36.3	55.5
15	288°47.2	0°39.6	·· 50.1	64°11.5	·· 40.1	321°32.3	·· 19.5	337°38.6	·· 55.5
16	303°49.7	15°40.1	49.7	79°12.3	40.6	336°34.5	19.4	352°40.9	55.4
17	318°52.2	30°40.6	49.4	94°13.1	41.1	351°36.7	19.3	7°43.1	55.4
18	333°54.6	45°41.1	S25°49.0	109°13.8	S16°41.6	6°38.9	S14°19.2	22°45.4	S18°55.3
19	348°57.1	60°41.6	48.6	124°14.6	42.1	21°41.1	19.1	37°47.7	55.3
20	3°59.6	75°42.2	48.3	139°15.3	42.6	36°43.3	19.0	52°50.0	55.3
21	19°02.0	90°42.7	·· 47.9	154°16.1	·· 43.1	51°45.4	·· 18.9	67°52.3	·· 55.2
22	34°04.5	105°43.2	47.5	169°16.8	43.7	66°47.6	18.8	82°54.6	55.2
23	49°07.0	120°43.7	47.2	184°17.6	44.2	81°49.8	18.7	97°56.9	55.1
Mer.pass.	19:44	ν 0.5′	d -0.4′	m -4.81	ν 0.8′	d 0.5′	m 1.61	ν 2.2′	d -0.1′ m -2.32	ν 2.3′	d -0.0′ m 0.70

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	64°09.4	135°44.3	S25°46.8	199°18.3	S16°44.7	96°52.0	S14°18.6	112°59.1	S18°55.1
1	79°11.9	150°44.8	46.4	214°19.1	45.2	111°54.2	18.5	128°01.4	55.0
2	94°14.3	165°45.3	46.0	229°19.8	45.7	126°56.3	18.4	143°03.7	55.0
3	109°16.8	180°45.9	·· 45.7	244°20.6	·· 46.2	141°58.5	·· 18.3	158°06.0	·· 54.9
4	124°19.3	195°46.4	45.3	259°21.3	46.7	157°00.7	18.2	173°08.3	54.9
5	139°21.7	210°46.9	44.9	274°22.1	47.2	172°02.9	18.1	188°10.6	54.8
6	154°24.2	225°47.5	S25°44.5	289°22.8	S16°47.7	187°05.1	S14°18.0	203°12.8	S18°54.8
7	169°26.7	240°48.0	44.2	304°23.6	48.2	202°07.2	17.9	218°15.1	54.7
8	184°29.1	255°48.6	43.8	319°24.3	48.7	217°09.4	17.7	233°17.4	54.7
9	199°31.6	270°49.1	·· 43.4	334°25.1	·· 49.2	232°11.6	·· 17.6	248°19.7	·· 54.7
10	214°34.1	285°49.7	43.0	349°25.8	49.7	247°13.8	17.5	263°22.0	54.6
11	229°36.5	300°50.2	42.7	4°26.6	50.2	262°16.0	17.4	278°24.3	54.6
12	244°39.0	315°50.8	S25°42.3	19°27.3	S16°50.7	277°18.1	S14°17.3	293°26.5	S18°54.5
13	259°41.5	330°51.3	41.9	34°28.1	51.2	292°20.3	17.2	308°28.8	54.5
14	274°43.9	345°51.9	41.5	49°28.8	51.7	307°22.5	17.1	323°31.1	54.4
15	289°46.4	0°52.5	·· 41.1	64°29.6	·· 52.2	322°24.7	·· 17.0	338°33.4	·· 54.4
16	304°48.8	15°53.0	40.8	79°30.3	52.7	337°26.8	16.9	353°35.7	54.3
17	319°51.3	30°53.6	40.4	94°31.0	53.3	352°29.0	16.8	8°38.0	54.3
18	334°53.8	45°54.2	S25°40.0	109°31.8	S16°53.8	7°31.2	S14°16.7	23°40.2	S18°54.2
19	349°56.2	60°54.7	39.6	124°32.5	54.3	22°33.4	16.6	38°42.5	54.2
20	4°58.7	75°55.3	39.2	139°33.3	54.8	37°35.5	16.5	53°44.8	54.1
21	20°01.2	90°55.9	·· 38.9	154°34.0	·· 55.3	52°37.7	·· 16.4	68°47.1	·· 54.1
22	35°03.6	105°56.5	38.5	169°34.8	55.8	67°39.9	16.3	83°49.4	54.0
23	50°06.1	120°57.1	38.1	184°35.5	56.3	82°42.1	16.2	98°51.6	54.0
Mer.pass.	19:40	ν 0.5′	d -0.4′	m -4.82	ν 0.8′	d 0.5′	m 1.61	ν 2.2′	d -0.1′ m -2.31	ν 2.3′	d -0.0′ m 0.71

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	65°08.6	135°57.6	S25°37.7	199°36.3	S16°56.8	97°44.2	S14°16.1	113°53.9	S18°54.0
1	80°11.0	150°58.2	37.3	214°37.0	57.3	112°46.4	16.0	128°56.2	53.9
2	95°13.5	165°58.8	36.9	229°37.8	57.8	127°48.6	15.9	143°58.5	53.9
3	110°16.0	180°59.4	·· 36.5	244°38.5	·· 58.3	142°50.8	·· 15.8	159°00.8	·· 53.8
4	125°18.4	196°00.0	36.2	259°39.2	58.8	157°52.9	15.7	174°03.0	53.8
5	140°20.9	211°00.6	35.8	274°40.0	59.3	172°55.1	15.5	189°05.3	53.7
6	155°23.3	226°01.2	S25°35.4	289°40.7	S16°59.8	187°57.3	S14°15.4	204°07.6	S18°53.7
7	170°25.8	241°01.8	35.0	304°41.5	17°00.3	202°59.5	15.3	219°09.9	53.6
8	185°28.3	256°02.4	34.6	319°42.2	00.8	218°01.6	15.2	234°12.2	53.6
9	200°30.7	271°03.0	·· 34.2	334°43.0	·· 01.3	233°03.8	·· 15.1	249°14.4	·· 53.5
10	215°33.2	286°03.6	33.8	349°43.7	01.8	248°06.0	15.0	264°16.7	53.5
11	230°35.7	301°04.2	33.4	4°44.5	02.3	263°08.1	14.9	279°19.0	53.4
12	245°38.1	316°04.8	S25°33.0	19°45.2	S17°02.8	278°10.3	S14°14.8	294°21.3	S18°53.4
13	260°40.6	331°05.4	32.6	34°45.9	03.3	293°12.5	14.7	309°23.6	53.3
14	275°43.1	346°06.1	32.2	49°46.7	03.8	308°14.7	14.6	324°25.8	53.3
15	290°45.5	1°06.7	·· 31.8	64°47.4	·· 04.3	323°16.8	·· 14.5	339°28.1	·· 53.2
16	305°48.0	16°07.3	31.4	79°48.2	04.8	338°19.0	14.4	354°30.4	53.2
17	320°50.5	31°07.9	31.1	94°48.9	05.3	353°21.2	14.3	9°32.7	53.1
18	335°52.9	46°08.6	S25°30.7	109°49.7	S17°05.8	8°23.3	S14°14.2	24°35.0	S18°53.1
19	350°55.4	61°09.2	30.3	124°50.4	06.3	23°25.5	14.1	39°37.2	53.1
20	5°57.8	76°09.8	29.9	139°51.1	06.8	38°27.7	13.9	54°39.5	53.0
21	21°00.3	91°10.5	·· 29.5	154°51.9	·· 07.3	53°29.8	·· 13.8	69°41.8	·· 53.0
22	36°02.8	106°11.1	29.1	169°52.6	07.8	68°32.0	13.7	84°44.1	52.9
23	51°05.2	121°11.7	28.7	184°53.4	08.2	83°34.2	13.6	99°46.4	52.9
Mer.pass.	19:36	ν 0.6′	d -0.4′	m -4.83	ν 0.7′	d 0.5′	m 1.61	ν 2.2′	d -0.1′ m -2.31	ν 2.3′	d -0.0′ m 0.71

Stars

	SHA	Dec
Alpheratz	357°37.2	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.6	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°45.1	89°21.4
Acamar	315°13.4	-40°13.1
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.2	46°01.1
Bellatrix	278°25.3	6°22.2
Elnath	278°04.8	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.6	7°24.7
Canopus	263°53.1	-52°42.2
Sirius	258°28.2	-16°44.7
Adhara	255°07.6	-28°59.9
Procyon	244°53.3	5°10.2
Pollux	243°20.2	27°58.3
Avior	234°15.4	-59°34.4
Suhail	222°48.0	-43°30.9
Miaplacidus	221°38.4	-69°48.0
Alphard	217°50.2	-8°45.0
Regulus	207°37.2	11°51.7
Dubhe	193°44.4	61°37.8
Denebola	182°27.7	14°27.1
Gienah	175°46.4	-17°39.6
Acrux	173°03.3	-63°12.8
Gacrux	171°54.8	-57°13.8
Alioth	166°15.7	55°50.4
Spica	158°25.3	-11°16.3
Alkaid	152°54.5	49°12.2
Hadar	148°40.2	-60°28.4
Menkent	148°01.0	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.4	-60°55.3
Kochab	137°21.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.6
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°03.9
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.9	51°29.3
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.1	-56°40.1
Deneb	49°27.7	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.2	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 24 Wed	SHA	Mer.pass
Venus	72°21.9	14:57
Mars	135°49.9	10:43
Jupiter	32°49.3	17:33
Saturn	48°54.0	16:29

Nov 25 Thu	SHA	Mer.pass
Venus	71°34.8	14:57
Mars	135°08.9	10:42
Jupiter	32°42.6	17:30
Saturn	48°49.7	16:26

Nov 26 Fri	SHA	Mer.pass
Venus	70°49.1	14:56
Mars	134°27.7	10:41
Jupiter	32°35.7	17:27
Saturn	48°45.4	16:22

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°21.4	S20°32.6	308°41.0	10.5′	N25°40.1	-3.3′	54.4′
1	198°21.2	33.1	323°10.5	10.5′	25°36.8	-3.4′	54.4′
2	213°21.0	33.6	337°40.0	10.5′	25°33.5	-3.5′	54.4′
3	228°20.8	·· 34.1	352°09.5	10.5′	25°29.9	-3.6′	54.4′
4	243°20.6	34.6	6°39.0	10.5′	25°26.3	-3.8′	54.4′
5	258°20.5	35.1	21°08.6	10.6′	25°22.6	-3.9′	54.4′
6	273°20.3	S20°35.6	35°38.2	10.6′	N25°18.7	-4.0′	54.4′
7	288°20.1	36.1	50°07.7	10.6′	25°14.7	-4.1′	54.5′
8	303°19.9	36.6	64°37.4	10.6′	25°10.6	-4.2′	54.5′
9	318°19.7	·· 37.1	79°07.0	10.7′	25°06.3	-4.4′	54.5′
10	333°19.5	37.6	93°36.6	10.7′	25°01.9	-4.5′	54.5′
11	348°19.4	38.1	108°06.3	10.7′	24°57.4	-4.6′	54.5′
12	3°19.2	S20°38.6	122°36.0	10.7′	N24°52.8	-4.7′	54.5′
13	18°19.0	39.1	137°05.7	10.7′	24°48.1	-4.9′	54.6′
14	33°18.8	39.6	151°35.5	10.8′	24°43.2	-5.0′	54.6′
15	48°18.6	·· 40.1	166°05.3	10.8′	24°38.3	-5.1′	54.6′
16	63°18.4	40.6	180°35.1	10.8′	24°33.2	-5.2′	54.6′
17	78°18.3	41.1	195°04.9	10.9′	24°27.9	-5.3′	54.6′
18	93°18.1	S20°41.6	209°34.7	10.9′	N24°22.6	-5.5′	54.6′
19	108°17.9	42.0	224°04.6	10.9′	24°17.1	-5.6′	54.7′
20	123°17.7	42.5	238°34.5	10.9′	24°11.6	-5.7′	54.7′
21	138°17.5	·· 43.0	253°04.5	11.0′	24°05.9	-5.8′	54.7′
22	153°17.3	43.5	267°34.4	11.0′	24°00.1	-5.9′	54.7′
23	168°17.1	44.0	282°04.4	11.0′	23°54.1	-6.0′	54.7′
	SD = 16.2′	d = 0.5′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°17.0	S20°44.5	296°34.4	11.1′	N23°48.1	-6.2′	54.8′
1	198°16.8	45.0	311°04.5	11.1′	23°41.9	-6.3′	54.8′
2	213°16.6	45.5	325°34.6	11.1′	23°35.6	-6.4′	54.8′
3	228°16.4	·· 46.0	340°04.7	11.1′	23°29.2	-6.5′	54.8′
4	243°16.2	46.5	354°34.8	11.2′	23°22.7	-6.6′	54.8′
5	258°16.0	46.9	9°05.0	11.2′	23°16.1	-6.7′	54.9′
6	273°15.8	S20°47.4	23°35.2	11.2′	N23°09.4	-6.9′	54.9′
7	288°15.6	47.9	38°05.5	11.3′	23°02.5	-7.0′	54.9′
8	303°15.4	48.4	52°35.7	11.3′	22°55.5	-7.1′	54.9′
9	318°15.3	·· 48.9	67°06.0	11.3′	22°48.4	-7.2′	54.9′
10	333°15.1	49.4	81°36.4	11.4′	22°41.3	-7.3′	55.0′
11	348°14.9	49.8	96°06.8	11.4′	22°33.9	-7.4′	55.0′
12	3°14.7	S20°50.3	110°37.2	11.4′	N22°26.5	-7.5′	55.0′
13	18°14.5	50.8	125°07.6	11.5′	22°19.0	-7.6′	55.0′
14	33°14.3	51.3	139°38.1	11.5′	22°11.4	-7.8′	55.1′
15	48°14.1	·· 51.8	154°08.6	11.5′	22°03.6	-7.9′	55.1′
16	63°13.9	52.2	168°39.1	11.6′	21°55.7	-8.0′	55.1′
17	78°13.7	52.7	183°09.7	11.6′	21°47.8	-8.1′	55.1′
18	93°13.5	S20°53.2	197°40.3	11.6′	N21°39.7	-8.2′	55.2′
19	108°13.3	53.7	212°10.9	11.7′	21°31.5	-8.3′	55.2′
20	123°13.1	54.2	226°41.6	11.7′	21°23.2	-8.4′	55.2′
21	138°12.9	·· 54.6	241°12.3	11.7′	21°14.8	-8.5′	55.2′
22	153°12.7	55.1	255°43.1	11.8′	21°06.3	-8.6′	55.3′
23	168°12.5	55.6	270°13.9	11.8′	20°57.7	-8.7′	55.3′
	SD = 16.2′	d = 0.5′	SD = 14.9′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°12.4	S20°56.1	284°44.7	11.8′	N20°49.0	-8.8′	55.3′
1	198°12.2	56.5	299°15.5	11.9′	20°40.2	-8.9′	55.3′
2	213°12.0	57.0	313°46.4	11.9′	20°31.2	-9.0′	55.4′
3	228°11.8	·· 57.5	328°17.3	11.9′	20°22.2	-9.1′	55.4′
4	243°11.6	57.9	342°48.3	12.0′	20°13.1	-9.2′	55.4′
5	258°11.4	58.4	357°19.2	12.0′	20°03.9	-9.3′	55.4′
6	273°11.2	S20°58.9	11°50.2	12.0′	N19°54.5	-9.4′	55.5′
7	288°11.0	59.3	26°21.3	12.1′	19°45.1	-9.5′	55.5′
8	303°10.8	20°59.8	40°52.4	12.1′	19°35.6	-9.6′	55.5′
9	318°10.6	21°00.3	55°23.5	12.1′	19°25.9	-9.7′	55.5′
10	333°10.4	00.7	69°54.6	12.2′	19°16.2	-9.8′	55.6′
11	348°10.2	01.2	84°25.8	12.2′	19°06.4	-9.9′	55.6′
12	3°10.0	S21°01.7	98°57.0	12.2′	N18°56.4	-10.0′	55.6′
13	18°09.8	02.1	113°28.2	12.3′	18°46.4	-10.1′	55.7′
14	33°09.6	02.6	127°59.5	12.3′	18°36.3	-10.2′	55.7′
15	48°09.4	·· 03.1	142°30.8	12.3′	18°26.1	-10.3′	55.7′
16	63°09.2	03.5	157°02.1	12.4′	18°15.8	-10.4′	55.7′
17	78°09.0	04.0	171°33.5	12.4′	18°05.4	-10.5′	55.8′
18	93°08.8	S21°04.5	186°04.9	12.4′	N17°54.9	-10.6′	55.8′
19	108°08.6	04.9	200°36.3	12.4′	17°44.3	-10.7′	55.8′
20	123°08.4	05.4	215°07.8	12.5′	17°33.6	-10.8′	55.9′
21	138°08.2	·· 05.8	229°39.2	12.5′	17°22.8	-10.9′	55.9′
22	153°08.0	06.3	244°10.7	12.5′	17°11.9	-11.0′	55.9′
23	168°07.8	06.8	258°42.3	12.6′	17°01.0	-11.0′	56.0′
	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	08:50	▬	▬	14:43	16:13
68°	07:08	08:27	10:04	13:30	15:06	16:25
66°	06:58	08:08	09:26	14:08	15:25	16:35
64°	06:50	07:53	08:59	14:34	15:40	16:43
62°	06:43	07:41	08:39	14:55	15:53	16:51
60°	06:36	07:30	08:22	15:11	16:03	16:57
N 58°	06:30	07:21	08:08	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	15:48	16:29	17:13
52°	06:16	06:58	07:37	15:57	16:36	17:18
50°	06:11	06:52	07:28	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°	00:53	02:28	03:22	20:13	21:07	22:46
58°	–:–	02:08	03:09	20:26	21:29	–:–
S 60°	–:–	01:40	02:53	20:43	21:57	–:–

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

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 20-22 82-65%
24	13:25	13:17	11:47	03:32	15:58	
25	13:08	12:59	11:47	04:22	16:47	
26	12:49	12:40	11:47	05:11	17:35	

DUT1 = UT1-UTC = -0.1053 sec ΔT = TT-UT1 = +69.2893 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	66°07.7	136°12.4	S25°28.3	199°54.1	S17°08.7	98°36.4	S14°13.5	114°48.6	S18°52.8
1	81°10.2	151°13.0	27.9	214°54.8	09.2	113°38.5	13.4	129°50.9	52.8
2	96°12.6	166°13.7	27.5	229°55.6	09.7	128°40.7	13.3	144°53.2	52.7
3	111°15.1	181°14.3	·· 27.1	244°56.3	·· 10.2	143°42.9	·· 13.2	159°55.5	·· 52.7
4	126°17.6	196°15.0	26.7	259°57.1	10.7	158°45.0	13.1	174°57.7	52.6
5	141°20.0	211°15.6	26.3	274°57.8	11.2	173°47.2	13.0	190°00.0	52.6
6	156°22.5	226°16.3	S25°25.9	289°58.5	S17°11.7	188°49.4	S14°12.9	205°02.3	S18°52.5
7	171°24.9	241°16.9	25.4	304°59.3	12.2	203°51.5	12.8	220°04.6	52.5
8	186°27.4	256°17.6	25.0	320°00.0	12.7	218°53.7	12.6	235°06.8	52.4
9	201°29.9	271°18.3	·· 24.6	335°00.7	·· 13.2	233°55.9	·· 12.5	250°09.1	·· 52.4
10	216°32.3	286°18.9	24.2	350°01.5	13.7	248°58.0	12.4	265°11.4	52.3
11	231°34.8	301°19.6	23.8	5°02.2	14.2	264°00.2	12.3	280°13.7	52.3
12	246°37.3	316°20.3	S25°23.4	20°03.0	S17°14.7	279°02.4	S14°12.2	295°16.0	S18°52.2
13	261°39.7	331°20.9	23.0	35°03.7	15.2	294°04.5	12.1	310°18.2	52.2
14	276°42.2	346°21.6	22.6	50°04.4	15.7	309°06.7	12.0	325°20.5	52.1
15	291°44.7	1°22.3	·· 22.2	65°05.2	·· 16.2	324°08.8	·· 11.9	340°22.8	·· 52.1
16	306°47.1	16°23.0	21.8	80°05.9	16.7	339°11.0	11.8	355°25.1	52.0
17	321°49.6	31°23.7	21.4	95°06.6	17.1	354°13.2	11.7	10°27.3	52.0
18	336°52.1	46°24.3	S25°21.0	110°07.4	S17°17.6	9°15.3	S14°11.6	25°29.6	S18°51.9
19	351°54.5	61°25.0	20.6	125°08.1	18.1	24°17.5	11.4	40°31.9	51.9
20	6°57.0	76°25.7	20.1	140°08.9	18.6	39°19.7	11.3	55°34.2	51.8
21	21°59.4	91°26.4	·· 19.7	155°09.6	·· 19.1	54°21.8	·· 11.2	70°36.4	·· 51.8
22	37°01.9	106°27.1	19.3	170°10.3	19.6	69°24.0	11.1	85°38.7	51.7
23	52°04.4	121°27.8	18.9	185°11.1	20.1	84°26.2	11.0	100°41.0	51.7
Mer.pass.	19:32	ν 0.6′	d -0.4′	m -4.84	ν 0.7′	d 0.5′	m 1.61	ν 2.2′	d -0.1′	m -2.30	ν 2.3′	d -0.0′	m 0.71

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	67°06.8	136°28.5	S25°18.5	200°11.8	S17°20.6	99°28.3	S14°10.9	115°43.3	S18°51.7
1	82°09.3	151°29.2	18.1	215°12.5	21.1	114°30.5	10.8	130°45.5	51.6
2	97°11.8	166°29.9	17.7	230°13.3	21.6	129°32.6	10.7	145°47.8	51.6
3	112°14.2	181°30.6	·· 17.3	245°14.0	·· 22.1	144°34.8	·· 10.6	160°50.1	·· 51.5
4	127°16.7	196°31.3	16.8	260°14.7	22.6	159°37.0	10.5	175°52.4	51.5
5	142°19.2	211°32.1	16.4	275°15.5	23.0	174°39.1	10.3	190°54.6	51.4
6	157°21.6	226°32.8	S25°16.0	290°16.2	S17°23.5	189°41.3	S14°10.2	205°56.9	S18°51.4
7	172°24.1	241°33.5	15.6	305°16.9	24.0	204°43.4	10.1	220°59.2	51.3
8	187°26.6	256°34.2	15.2	320°17.7	24.5	219°45.6	10.0	236°01.4	51.3
9	202°29.0	271°34.9	·· 14.8	335°18.4	·· 25.0	234°47.8	·· 09.9	251°03.7	·· 51.2
10	217°31.5	286°35.7	14.3	350°19.1	25.5	249°49.9	09.8	266°06.0	51.2
11	232°33.9	301°36.4	13.9	5°19.9	26.0	264°52.1	09.7	281°08.3	51.1
12	247°36.4	316°37.1	S25°13.5	20°20.6	S17°26.5	279°54.2	S14°09.6	296°10.5	S18°51.1
13	262°38.9	331°37.9	13.1	35°21.3	27.0	294°56.4	09.5	311°12.8	51.0
14	277°41.3	346°38.6	12.7	50°22.1	27.4	309°58.6	09.4	326°15.1	51.0
15	292°43.8	1°39.3	·· 12.2	65°22.8	·· 27.9	325°00.7	·· 09.2	341°17.4	·· 50.9
16	307°46.3	16°40.1	11.8	80°23.5	28.4	340°02.9	09.1	356°19.6	50.9
17	322°48.7	31°40.8	11.4	95°24.3	28.9	355°05.0	09.0	11°21.9	50.8
18	337°51.2	46°41.6	S25°11.0	110°25.0	S17°29.4	10°07.2	S14°08.9	26°24.2	S18°50.8
19	352°53.7	61°42.3	10.5	125°25.7	29.9	25°09.3	08.8	41°26.4	50.7
20	7°56.1	76°43.1	10.1	140°26.4	30.4	40°11.5	08.7	56°28.7	50.7
21	22°58.6	91°43.8	·· 09.7	155°27.2	·· 30.8	55°13.7	·· 08.6	71°31.0	·· 50.6
22	38°01.0	106°44.6	09.3	170°27.9	31.3	70°15.8	08.5	86°33.3	50.6
23	53°03.5	121°45.4	08.8	185°28.6	31.8	85°18.0	08.3	101°35.5	50.5
Mer.pass.	19:28	ν 0.7′	d -0.4′	m -4.84	ν 0.7′	d 0.5′	m 1.61	ν 2.2′	d -0.1′	m -2.30	ν 2.3′	d -0.0′	m 0.71

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	68°06.0	136°46.1	S25°08.4	200°29.4	S17°32.3	100°20.1	S14°08.2	116°37.8	S18°50.5
1	83°08.4	151°46.9	08.0	215°30.1	32.8	115°22.3	08.1	131°40.1	50.4
2	98°10.9	166°47.7	07.6	230°30.8	33.3	130°24.4	08.0	146°42.3	50.4
3	113°13.4	181°48.4	·· 07.1	245°31.6	·· 33.8	145°26.6	·· 07.9	161°44.6	·· 50.3
4	128°15.8	196°49.2	06.7	260°32.3	34.2	160°28.8	07.8	176°46.9	50.3
5	143°18.3	211°50.0	06.3	275°33.0	34.7	175°30.9	07.7	191°49.2	50.2
6	158°20.8	226°50.8	S25°05.8	290°33.7	S17°35.2	190°33.1	S14°07.6	206°51.4	S18°50.2
7	173°23.2	241°51.5	05.4	305°34.5	35.7	205°35.2	07.4	221°53.7	50.1
8	188°25.7	256°52.3	05.0	320°35.2	36.2	220°37.4	07.3	236°56.0	50.1
9	203°28.2	271°53.1	·· 04.6	335°35.9	·· 36.7	235°39.5	·· 07.2	251°58.2	·· 50.0
10	218°30.6	286°53.9	04.1	350°36.6	37.1	250°41.7	07.1	267°00.5	50.0
11	233°33.1	301°54.7	03.7	5°37.4	37.6	265°43.8	07.0	282°02.8	49.9
12	248°35.5	316°55.5	S25°03.3	20°38.1	S17°38.1	280°46.0	S14°06.9	297°05.0	S18°49.9
13	263°38.0	331°56.3	02.8	35°38.8	38.6	295°48.1	06.8	312°07.3	49.8
14	278°40.5	346°57.1	02.4	50°39.6	39.1	310°50.3	06.7	327°09.6	49.8
15	293°42.9	1°57.9	·· 02.0	65°40.3	·· 39.6	325°52.4	·· 06.5	342°11.9	·· 49.7
16	308°45.4	16°58.7	01.5	80°41.0	40.0	340°54.6	06.4	357°14.1	49.7
17	323°47.9	31°59.5	01.1	95°41.7	40.5	355°56.7	06.3	12°16.4	49.6
18	338°50.3	47°00.3	S25°00.7	110°42.5	S17°41.0	10°58.9	S14°06.2	27°18.7	S18°49.6
19	353°52.8	62°01.1	25°00.2	125°43.2	41.5	26°01.0	06.1	42°20.9	49.5
20	8°55.3	77°01.9	24°59.8	140°43.9	42.0	41°03.2	06.0	57°23.2	49.5
21	23°57.7	92°02.8	·· 59.3	155°44.6	·· 42.4	56°05.3	·· 05.9	72°25.5	·· 49.4
22	39°00.2	107°03.6	58.9	170°45.4	42.9	71°07.5	05.7	87°27.7	49.4
23	54°02.6	122°04.4	58.5	185°46.1	43.4	86°09.6	05.6	102°30.0	49.3
Mer.pass.	19:24	ν 0.8′	d -0.4′	m -4.85	ν 0.7′	d 0.5′	m 1.61	ν 2.2′	d -0.1′	m -2.29	ν 2.3′	d -0.0′	m 0.72

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.6	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°45.4	89°21.4
Acamar	315°13.4	-40°13.1
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.2	46°01.1
Bellatrix	278°25.3	6°22.2
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.6	7°24.7
Canopus	263°53.0	-52°42.3
Sirius	258°28.2	-16°44.7
Adhara	255°07.6	-28°59.9
Procyon	244°53.3	5°10.2
Pollux	243°20.2	27°58.3
Avior	234°15.4	-59°34.4
Suhail	222°48.0	-43°30.9
Miaplacidus	221°38.4	-69°48.0
Alphard	217°50.2	-8°45.0
Regulus	207°37.2	11°51.7
Dubhe	193°44.3	61°37.8
Denebola	182°27.7	14°27.1
Gienah	175°46.4	-17°39.6
Acrux	173°03.3	-63°12.8
Gacrux	171°54.8	-57°13.8
Alioth	166°15.7	55°50.4
Spica	158°25.3	-11°16.3
Alkaid	152°54.5	49°12.2
Hadar	148°40.2	-60°28.4
Menkent	148°01.0	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.4	-60°55.3
Kochab	137°21.0	74°03.9
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.5
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°03.9
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.8
Eltanin	90°43.9	51°29.3
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.1	-56°40.1
Deneb	49°27.7	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.2	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 27 Sat	SHA	Mer.pass
Venus	70°04.7	14:55
Mars	133°46.4	10:40
Jupiter	32°28.7	17:23
Saturn	48°40.9	16:18

Nov 28 Sun	SHA	Mer.pass
Venus	69°21.7	14:53
Mars	133°05.0	10:39
Jupiter	32°21.5	17:20
Saturn	48°36.4	16:15

Nov 29 Mon	SHA	Mer.pass
Venus	68°40.1	14:52
Mars	132°23.4	10:38
Jupiter	32°14.2	17:16
Saturn	48°31.8	16:11

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°07.6	S21°07.2	273°13.8	12.6′	N16°49.9	-11.1′	56.0′
1	198°07.4	07.7	287°45.4	12.6′	16°38.8	-11.2′	56.0′
2	213°07.2	08.1	302°17.0	12.6′	16°27.5	-11.3′	56.0′
3	228°07.0	·· 08.6	316°48.6	12.7′	16°16.2	-11.4′	56.1′
4	243°06.7	09.0	331°20.3	12.7′	16°04.8	-11.5′	56.1′
5	258°06.5	09.5	345°52.0	12.7′	15°53.3	-11.6′	56.1′
6	273°06.3	S21°09.9	0°23.7	12.7′	N15°41.8	-11.7′	56.2′
7	288°06.1	10.4	14°55.4	12.8′	15°30.1	-11.7′	56.2′
8	303°05.9	10.8	29°27.2	12.8′	15°18.4	-11.8′	56.2′
9	318°05.7	·· 11.3	43°59.0	12.8′	15°06.5	-11.9′	56.3′
10	333°05.5	11.7	58°30.8	12.8′	14°54.6	-12.0′	56.3′
11	348°05.3	12.2	73°02.6	12.8′	14°42.6	-12.1′	56.3′
12	3°05.1	S21°12.6	87°34.4	12.9′	N14°30.6	-12.2′	56.4′
13	18°04.9	13.1	102°06.3	12.9′	14°18.4	-12.2′	56.4′
14	33°04.7	13.5	116°38.1	12.9′	14°06.2	-12.3′	56.4′
15	48°04.5	·· 14.0	131°10.0	12.9′	13°53.9	-12.4′	56.5′
16	63°04.3	14.4	145°41.9	12.9′	13°41.5	-12.5′	56.5′
17	78°04.1	14.9	160°13.8	12.9′	13°29.0	-12.5′	56.5′
18	93°03.8	S21°15.3	174°45.8	13.0′	N13°16.5	-12.6′	56.6′
19	108°03.6	15.8	189°17.7	13.0′	13°03.8	-12.7′	56.6′
20	123°03.4	16.2	203°49.7	13.0′	12°51.1	-12.8′	56.7′
21	138°03.2	·· 16.7	218°21.7	13.0′	12°38.4	-12.8′	56.7′
22	153°03.0	17.1	232°53.7	13.0′	12°25.5	-12.9′	56.7′
23	168°02.8	17.5	247°25.7	13.0′	12°12.6	-13.0′	56.8′
	SD = 16.2′	d = 0.5′	SD = 15.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°02.6	S21°18.0	261°57.7	13.0′	N11°59.6	-13.1′	56.8′
1	198°02.4	18.4	276°29.7	13.0′	11°46.5	-13.1′	56.8′
2	213°02.2	18.9	291°01.8	13.0′	11°33.4	-13.2′	56.9′
3	228°02.0	·· 19.3	305°33.8	13.0′	11°20.2	-13.3′	56.9′
4	243°01.7	19.7	320°05.8	13.1′	11°06.9	-13.3′	56.9′
5	258°01.5	20.2	334°37.9	13.1′	10°53.6	-13.4′	57.0′
6	273°01.3	S21°20.6	349°10.0	13.1′	N10°40.2	-13.5′	57.0′
7	288°01.1	21.0	3°42.0	13.1′	10°26.7	-13.5′	57.1′
8	303°00.9	21.5	18°14.1	13.1′	10°13.1	-13.6′	57.1′
9	318°00.7	·· 21.9	32°46.2	13.1′	09°59.5	-13.7′	57.1′
10	333°00.5	22.3	47°18.2	13.1′	09°45.9	-13.7′	57.2′
11	348°00.2	22.8	61°50.3	13.1′	09°32.1	-13.8′	57.2′
12	3°00.0	S21°23.2	76°22.4	13.1′	N09°18.3	-13.9′	57.2′
13	17°59.8	23.6	90°54.4	13.1′	09°04.5	-13.9′	57.3′
14	32°59.6	24.1	105°26.5	13.1′	08°50.5	-14.0′	57.3′
15	47°59.4	·· 24.5	119°58.6	13.1′	08°36.6	-14.0′	57.4′
16	62°59.2	24.9	134°30.6	13.1′	08°22.5	-14.1′	57.4′
17	77°59.0	25.4	149°02.7	13.0′	08°08.4	-14.2′	57.4′
18	92°58.7	S21°25.8	163°34.7	13.0′	N07°54.3	-14.2′	57.5′
19	107°58.5	26.2	178°06.8	13.0′	07°40.0	-14.3′	57.5′
20	122°58.3	26.6	192°38.8	13.0′	07°25.8	-14.3′	57.6′
21	137°58.1	·· 27.1	207°10.8	13.0′	07°11.4	-14.4′	57.6′
22	152°57.9	27.5	221°42.8	13.0′	06°57.1	-14.4′	57.6′
23	167°57.6	27.9	236°14.8	13.0′	06°42.6	-14.5′	57.7′
	SD = 16.2′	d = 0.4′	SD = 15.5′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°57.4	S21°28.3	250°46.8	13.0′	N06°28.2	-14.5′	57.7′
1	197°57.2	28.8	265°18.8	13.0′	06°13.6	-14.6′	57.8′
2	212°57.0	29.2	279°50.7	12.9′	05°59.0	-14.6′	57.8′
3	227°56.8	·· 29.6	294°22.7	12.9′	05°44.4	-14.7′	57.8′
4	242°56.6	30.0	308°54.6	12.9′	05°29.7	-14.7′	57.9′
5	257°56.3	30.5	323°26.5	12.9′	05°15.0	-14.8′	57.9′
6	272°56.1	S21°30.9	337°58.4	12.9′	N05°00.2	-14.8′	57.9′
7	287°55.9	31.3	352°30.2	12.8′	04°45.4	-14.9′	58.0′
8	302°55.7	31.7	7°02.1	12.8′	04°30.6	-14.9′	58.0′
9	317°55.5	·· 32.1	21°33.9	12.8′	04°15.7	-14.9′	58.1′
10	332°55.2	32.5	36°05.7	12.8′	04°00.7	-15.0′	58.1′
11	347°55.0	33.0	50°37.5	12.7′	03°45.7	-15.0′	58.1′
12	2°54.8	S21°33.4	65°09.2	12.7′	N03°30.7	-15.1′	58.2′
13	17°54.6	33.8	79°40.9	12.7′	03°15.6	-15.1′	58.2′
14	32°54.3	34.2	94°12.6	12.7′	03°00.5	-15.1′	58.3′
15	47°54.1	·· 34.6	108°44.3	12.6′	02°45.4	-15.2′	58.3′
16	62°53.9	35.0	123°15.9	12.6′	02°30.2	-15.2′	58.4′
17	77°53.7	35.4	137°47.5	12.6′	02°15.0	-15.2′	58.4′
18	92°53.4	S21°35.8	152°19.0	12.5′	N01°59.8	-15.3′	58.4′
19	107°53.2	36.3	166°50.5	12.5′	01°44.5	-15.3′	58.5′
20	122°53.0	36.7	181°22.0	12.4′	01°29.2	-15.3′	58.5′
21	137°52.8	·· 37.1	195°53.5	12.4′	01°13.9	-15.4′	58.6′
22	152°52.5	37.5	210°24.9	12.4′	00°58.5	-15.4′	58.6′
23	167°52.3	37.9	224°56.3	12.3′	00°43.1	-15.4′	58.6′
	SD = 16.2′	d = 0.4′	SD = 15.7′				

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	16:08
68°	07:15	08:36	10:20	13:15	15:00	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	08:46	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	08:14	15:21	16:10	17:00
56°	06:29	07:17	08:02	15:34	16:19	17:06
54°	06:24	07:09	07:51	15:45	16:26	17:11
52°	06:20	07:02	07:41	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	18:56	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	22:16
56°	00:37	02:23	03:19	20:19	21:14	23:05
58°	–:–	02:01	03:04	20:33	21:37	–:–
S 60°	–:–	01:31	02:48	20:50	22:08	–:–

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

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 55-35%
27	12:30	12:20	11:48	05:58	18:22	
28	12:10	12:00	11:48	06:45	19:08	
29	11:50	11:39	11:48	07:31	19:54	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1062 sec ΔT = TT-UT1 = +69.2902 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	69°05.1	137°05.2	S24°58.0	200°46.8	S17°43.9	101°11.8	S14°05.5	117°32.3	S18°49.3
1	84°07.6	152°06.1	57.6	215°47.5	44.4	116°13.9	05.4	132°34.5	49.2
2	99°10.0	167°06.9	57.2	230°48.3	44.8	131°16.1	05.3	147°36.8	49.2
3	114°12.5	182°07.7	·· 56.7	245°49.0	·· 45.3	146°18.2	·· 05.2	162°39.1	·· 49.1
4	129°15.0	197°08.6	56.3	260°49.7	45.8	161°20.4	05.1	177°41.3	49.1
5	144°17.4	212°09.4	55.8	275°50.4	46.3	176°22.5	04.9	192°43.6	49.0
6	159°19.9	227°10.3	S24°55.4	290°51.1	S17°46.8	191°24.7	S14°04.8	207°45.9	S18°49.0
7	174°22.4	242°11.1	54.9	305°51.9	47.2	206°26.8	04.7	222°48.1	48.9
8	189°24.8	257°11.9	54.5	320°52.6	47.7	221°29.0	04.6	237°50.4	48.9
9	204°27.3	272°12.8	·· 54.1	335°53.3	·· 48.2	236°31.1	·· 04.5	252°52.7	·· 48.8
10	219°29.8	287°13.7	53.6	350°54.0	48.7	251°33.3	04.4	267°54.9	48.8
11	234°32.2	302°14.5	53.2	5°54.8	49.1	266°35.4	04.2	282°57.2	48.7
12	249°34.7	317°15.4	S24°52.7	20°55.5	S17°49.6	281°37.6	S14°04.1	297°59.5	S18°48.7
13	264°37.1	332°16.2	52.3	35°56.2	50.1	296°39.7	04.0	313°01.7	48.6
14	279°39.6	347°17.1	51.8	50°56.9	50.6	311°41.9	03.9	328°04.0	48.6
15	294°42.1	2°18.0	·· 51.4	65°57.6	·· 51.1	326°44.0	·· 03.8	343°06.3	·· 48.5
16	309°44.5	17°18.8	51.0	80°58.4	51.5	341°46.2	03.7	358°08.5	48.4
17	324°47.0	32°19.7	50.5	95°59.1	52.0	356°48.3	03.6	13°10.8	48.4
18	339°49.5	47°20.6	S24°50.1	110°59.8	S17°52.5	11°50.5	S14°03.4	28°13.1	S18°48.3
19	354°51.9	62°21.5	49.6	126°00.5	53.0	26°52.6	03.3	43°15.3	48.3
20	9°54.4	77°22.3	49.2	141°01.2	53.4	41°54.7	03.2	58°17.6	48.2
21	24°56.9	92°23.2	·· 48.7	156°02.0	·· 53.9	56°56.9	·· 03.1	73°19.9	·· 48.2
22	39°59.3	107°24.1	48.3	171°02.7	54.4	71°59.0	03.0	88°22.1	48.1
23	55°01.8	122°25.0	47.8	186°03.4	54.9	87°01.2	02.9	103°24.4	48.1
Mer.pass.	19:20	ν 0.8′	d -0.4′	m -4.86	ν 0.7′	d 0.5′	m 1.61	ν 2.1′	d -0.1′ m -2.28	ν 2.3′	d -0.1′ m 0.72

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	70°04.3	137°25.9	S24°47.4	201°04.1	S17°55.3	102°03.3	S14°02.7	118°26.7	S18°48.0
1	85°06.7	152°26.8	46.9	216°04.8	55.8	117°05.5	02.6	133°28.9	48.0
2	100°09.2	167°27.7	46.5	231°05.5	56.3	132°07.6	02.5	148°31.2	47.9
3	115°11.6	182°28.6	·· 46.0	246°06.3	·· 56.8	147°09.7	·· 02.4	163°33.5	·· 47.9
4	130°14.1	197°29.5	45.6	261°07.0	57.2	162°11.9	02.3	178°35.7	47.8
5	145°16.6	212°30.4	45.1	276°07.7	57.7	177°14.0	02.2	193°38.0	47.8
6	160°19.0	227°31.3	S24°44.7	291°08.4	S17°58.2	192°16.2	S14°02.0	208°40.3	S18°47.7
7	175°21.5	242°32.2	44.2	306°09.1	58.6	207°18.3	01.9	223°42.5	47.7
8	190°24.0	257°33.2	43.8	321°09.9	59.1	222°20.5	01.8	238°44.8	47.6
9	205°26.4	272°34.1	·· 43.3	336°10.6	17°59.6	237°22.6	·· 01.7	253°47.0	·· 47.6
10	220°28.9	287°35.0	42.8	351°11.3	18°00.1	252°24.7	01.6	268°49.3	47.5
11	235°31.4	302°35.9	42.4	6°12.0	00.5	267°26.9	01.4	283°51.6	47.5
12	250°33.8	317°36.8	S24°41.9	21°12.7	S18°01.0	282°29.0	S14°01.3	298°53.8	S18°47.4
13	265°36.3	332°37.8	41.5	36°13.4	01.5	297°31.2	01.2	313°56.1	47.4
14	280°38.7	347°38.7	41.0	51°14.1	01.9	312°33.3	01.1	328°58.4	47.3
15	295°41.2	2°39.6	·· 40.6	66°14.9	·· 02.4	327°35.4	·· 01.0	344°00.6	·· 47.3
16	310°43.7	17°40.6	40.1	81°15.6	02.9	342°37.6	00.9	359°02.9	47.2
17	325°46.1	32°41.5	39.7	96°16.3	03.4	357°39.7	00.7	14°05.1	47.2
18	340°48.6	47°42.5	S24°39.2	111°17.0	S18°03.8	12°41.9	S14°00.6	29°07.4	S18°47.1
19	355°51.1	62°43.4	38.7	126°17.7	04.3	27°44.0	00.5	44°09.7	47.1
20	10°53.5	77°44.4	38.3	141°18.4	04.8	42°46.1	00.4	59°11.9	47.0
21	25°56.0	92°45.3	·· 37.8	156°19.2	·· 05.2	57°48.3	·· 00.3	74°14.2	·· 46.9
22	40°58.5	107°46.3	37.4	171°19.9	05.7	72°50.4	00.1	89°16.5	46.9
23	56°00.9	122°47.2	36.9	186°20.6	06.2	87°52.6	00.0	104°18.7	46.8
Mer.pass.	19:17	ν 0.9′	d -0.5′	m -4.87	ν 0.7′	d 0.5′	m 1.61	ν 2.1′	d -0.1′ m -2.28	ν 2.3′	d -0.1′ m 0.72

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°03.4	137°48.2	S24°36.4	201°21.3	S18°06.6	102°54.7	S13°59.9	119°21.0	S18°46.8
1	86°05.9	152°49.2	36.0	216°22.0	07.1	117°56.8	59.8	134°23.2	46.7
2	101°08.3	167°50.1	35.5	231°22.7	07.6	132°59.0	59.7	149°25.5	46.7
3	116°10.8	182°51.1	·· 35.1	246°23.4	·· 08.0	148°01.1	·· 59.5	164°27.8	·· 46.6
4	131°13.2	197°52.1	34.6	261°24.1	08.5	163°03.2	59.4	179°30.0	46.6
5	146°15.7	212°53.1	34.1	276°24.9	09.0	178°05.4	59.3	194°32.3	46.5
6	161°18.2	227°54.0	S24°33.7	291°25.6	S18°09.4	193°07.5	S13°59.2	209°34.6	S18°46.5
7	176°20.6	242°55.0	33.2	306°26.3	09.9	208°09.7	59.1	224°36.8	46.4
8	191°23.1	257°56.0	32.7	321°27.0	10.4	223°11.8	59.0	239°39.1	46.4
9	206°25.6	272°57.0	·· 32.3	336°27.7	·· 10.8	238°13.9	·· 58.8	254°41.3	·· 46.3
10	221°28.0	287°58.0	31.8	351°28.4	11.3	253°16.1	58.7	269°43.6	46.3
11	236°30.5	302°59.0	31.3	6°29.1	11.8	268°18.2	58.6	284°45.9	46.2
12	251°33.0	318°00.0	S24°30.9	21°29.8	S18°12.2	283°20.3	S13°58.5	299°48.1	S18°46.2
13	266°35.4	333°01.0	30.4	36°30.5	12.7	298°22.5	58.4	314°50.4	46.1
14	281°37.9	348°02.0	30.0	51°31.3	13.2	313°24.6	58.2	329°52.6	46.1
15	296°40.4	3°03.0	·· 29.5	66°32.0	·· 13.6	328°26.7	·· 58.1	344°54.9	·· 46.0
16	311°42.8	18°04.0	29.0	81°32.7	14.1	343°28.9	58.0	359°57.2	45.9
17	326°45.3	33°05.0	28.5	96°33.4	14.6	358°31.0	57.9	14°59.4	45.9
18	341°47.7	48°06.0	S24°28.1	111°34.1	S18°15.0	13°33.1	S13°57.7	30°01.7	S18°45.8
19	356°50.2	63°07.0	27.6	126°34.8	15.5	28°35.3	57.6	45°03.9	45.8
20	11°52.7	78°08.1	27.1	141°35.5	16.0	43°37.4	57.5	60°06.2	45.7
21	26°55.1	93°09.1	·· 26.7	156°36.2	·· 16.4	58°39.5	·· 57.4	75°08.5	·· 45.7
22	41°57.6	108°10.1	26.2	171°36.9	16.9	73°41.7	57.3	90°10.7	45.6
23	57°00.1	123°11.1	25.7	186°37.6	17.3	88°43.8	57.1	105°13.0	45.6
Mer.pass.	19:13	ν 1.0′	d -0.5′	m -4.87	ν 0.7′	d 0.5′	m 1.61	ν 2.1′	d -0.1′ m -2.27	ν 2.3′	d -0.1′ m 0.72

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.6	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.7	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°45.9	89°21.5
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.3
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.2	46°01.1
Bellatrix	278°25.3	6°22.2
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.5	7°24.7
Canopus	263°53.0	-52°42.3
Sirius	258°28.2	-16°44.7
Adhara	255°07.6	-29°00.0
Procyon	244°53.3	5°10.2
Pollux	243°20.2	27°58.3
Avior	234°15.3	-59°34.4
Suhail	222°48.0	-43°30.9
Miaplacidus	221°38.3	-69°48.0
Alphard	217°50.2	-8°45.1
Regulus	207°37.1	11°51.7
Dubhe	193°44.3	61°37.8
Denebola	182°27.7	14°27.0
Gienah	175°46.4	-17°39.6
Acrux	173°03.2	-63°12.8
Gacrux	171°54.7	-57°13.8
Alioth	166°15.6	55°50.3
Spica	158°25.2	-11°16.3
Alkaid	152°54.5	49°12.2
Hadar	148°40.1	-60°28.4
Menkent	148°01.0	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.4	-60°55.2
Kochab	137°21.0	74°03.8
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.5
Antares	112°19.4	-26°28.7
Atria	107°16.5	-69°03.9
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.7
Eltanin	90°43.9	51°29.3
Kaus Aust.	83°36.3	-34°22.5
Vega	80°35.3	38°48.4
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.3	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Nov 30 Tue	SHA	Mer.pass
Venus	68°00.1	14:51
Mars	131°41.7	10:36
Jupiter	32°06.7	17:13
Saturn	48°27.2	16:07

Dec 01 Wed	SHA	Mer.pass
Venus	67°21.7	14:49
Mars	130°59.9	10:35
Jupiter	31°59.1	17:09
Saturn	48°22.4	16:04

Dec 02 Thu	SHA	Mer.pass
Venus	66°44.8	14:48
Mars	130°17.9	10:34
Jupiter	31°51.3	17:06
Saturn	48°17.6	16:00

Horizontal parallax	
Venus:	0.3
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°52.1	S21°38.3	239°27.6	12.3′	N00°27.7	-15.4′	58.7′
1	197°51.9	38.7	253°58.9	12.2′	N00°12.3	-15.5′	58.7′
2	212°51.6	39.1	268°30.1	12.2′	S00°03.2	15.5′	58.8′
3	227°51.4	·· 39.5	283°01.3	12.1′	00°18.7	15.5′	58.8′
4	242°51.2	39.9	297°32.4	12.1′	00°34.2	15.5′	58.8′
5	257°51.0	40.3	312°03.5	12.1′	00°49.7	15.5′	58.9′
6	272°50.7	S21°40.7	326°34.6	12.0′	S01°05.2	15.6′	58.9′
7	287°50.5	41.1	341°05.6	12.0′	01°20.8	15.6′	59.0′
8	302°50.3	41.5	355°36.6	11.9′	01°36.4	15.6′	59.0′
9	317°50.1	·· 41.9	10°07.4	11.8′	01°51.9	15.6′	59.0′
10	332°49.8	42.3	24°38.3	11.8′	02°07.5	15.6′	59.1′
11	347°49.6	42.7	39°09.1	11.7′	02°23.1	15.6′	59.1′
12	2°49.4	S21°43.1	53°39.8	11.7′	S02°38.8	15.6′	59.1′
13	17°49.1	43.5	68°10.5	11.6′	02°54.4	15.6′	59.2′
14	32°48.9	43.9	82°41.1	11.6′	03°10.0	15.6′	59.2′
15	47°48.7	·· 44.3	97°11.7	11.5′	03°25.7	15.6′	59.3′
16	62°48.4	44.7	111°42.1	11.4′	03°41.3	15.6′	59.3′
17	77°48.2	45.1	126°12.6	11.4′	03°57.0	15.6′	59.3′
18	92°48.0	S21°45.5	140°42.9	11.3′	S04°12.6	15.6′	59.4′
19	107°47.8	45.9	155°13.2	11.2′	04°28.2	15.6′	59.4′
20	122°47.5	46.3	169°43.5	11.2′	04°43.9	15.6′	59.5′
21	137°47.3	·· 46.7	184°13.6	11.1′	04°59.5	15.6′	59.5′
22	152°47.1	47.1	198°43.7	11.0′	05°15.2	15.6′	59.5′
23	167°46.8	47.5	213°13.8	11.0′	05°30.8	15.6′	59.6′
	SD = 16.2′	d = 0.4′	SD = 16.0′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°46.6	S21°47.8	227°43.7	10.9′	S05°46.4	15.6′	59.6′
1	197°46.4	48.2	242°13.6	10.8′	06°02.0	15.6′	59.6′
2	212°46.1	48.6	256°43.4	10.7′	06°17.6	15.6′	59.7′
3	227°45.9	·· 49.0	271°13.1	10.7′	06°33.2	15.6′	59.7′
4	242°45.7	49.4	285°42.8	10.6′	06°48.8	15.6′	59.8′
5	257°45.4	49.8	300°12.3	10.5′	07°04.3	15.5′	59.8′
6	272°45.2	S21°50.2	314°41.8	10.4′	S07°19.9	15.5′	59.8′
7	287°45.0	50.6	329°11.2	10.3′	07°35.4	15.5′	59.9′
8	302°44.7	50.9	343°40.6	10.2′	07°50.9	15.5′	59.9′
9	317°44.5	·· 51.3	358°09.8	10.2′	08°06.3	15.4′	59.9′
10	332°44.2	51.7	12°39.0	10.1′	08°21.8	15.4′	60.0′
11	347°44.0	52.1	27°08.1	10.0′	08°37.2	15.4′	60.0′
12	2°43.8	S21°52.5	41°37.1	9.9′	S08°52.6	15.4′	60.0′
13	17°43.5	52.8	56°06.0	9.8′	09°07.9	15.3′	60.1′
14	32°43.3	53.2	70°34.8	9.7′	09°23.3	15.3′	60.1′
15	47°43.1	·· 53.6	85°03.5	9.6′	09°38.5	15.3′	60.1′
16	62°42.8	54.0	99°32.1	9.5′	09°53.8	15.2′	60.2′
17	77°42.6	54.4	114°00.7	9.4′	10°09.0	15.2′	60.2′
18	92°42.4	S21°54.7	128°29.1	9.4′	S10°24.2	15.1′	60.2′
19	107°42.1	55.1	142°57.5	9.3′	10°39.3	15.1′	60.3′
20	122°41.9	55.5	157°25.7	9.2′	10°54.4	15.0′	60.3′
21	137°41.6	·· 55.9	171°53.9	9.1′	11°09.4	15.0′	60.3′
22	152°41.4	56.2	186°22.0	9.0′	11°24.4	14.9′	60.4′
23	167°41.2	56.6	200°49.9	8.9′	11°39.4	14.9′	60.4′
	SD = 16.2′	d = 0.4′	SD = 16.3′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°40.9	S21°57.0	215°17.8	8.8′	S11°54.2	14.8′	60.4′
1	197°40.7	57.3	229°45.6	8.7′	12°09.1	14.8′	60.5′
2	212°40.4	57.7	244°13.2	8.6′	12°23.8	14.7′	60.5′
3	227°40.2	·· 58.1	258°40.8	8.5′	12°38.6	14.7′	60.5′
4	242°40.0	58.5	273°08.3	8.4′	12°53.2	14.6′	60.5′
5	257°39.7	58.8	287°35.6	8.3′	13°07.8	14.5′	60.6′
6	272°39.5	S21°59.2	302°02.9	8.1′	S13°22.3	14.5′	60.6′
7	287°39.2	59.6	316°30.0	8.0′	13°36.8	14.4′	60.6′
8	302°39.0	21°59.9	330°57.1	7.9′	13°51.2	14.3′	60.7′
9	317°38.8	22°00.3	345°24.0	7.8′	14°05.5	14.2′	60.7′
10	332°38.5	00.7	359°50.8	7.7′	14°19.8	14.2′	60.7′
11	347°38.3	01.0	14°17.5	7.6′	14°33.9	14.1′	60.7′
12	2°38.0	S22°01.4	28°44.1	7.5′	S14°48.0	14.0′	60.8′
13	17°37.8	01.7	43°10.6	7.4′	15°02.0	13.9′	60.8′
14	32°37.5	02.1	57°37.0	7.3′	15°16.0	13.8′	60.8′
15	47°37.3	·· 02.5	72°03.3	7.2′	15°29.8	13.8′	60.8′
16	62°37.0	02.8	86°29.5	7.1′	15°43.6	13.7′	60.9′
17	77°36.8	03.2	100°55.5	6.9′	15°57.2	13.6′	60.9′
18	92°36.6	S22°03.5	115°21.4	6.8′	S16°10.8	13.5′	60.9′
19	107°36.3	03.9	129°47.3	6.7′	16°24.3	13.4′	60.9′
20	122°36.1	04.3	144°13.0	6.6′	16°37.7	13.3′	61.0′
21	137°35.8	·· 04.6	158°38.6	6.5′	16°51.0	13.2′	61.0′
22	152°35.6	05.0	173°04.1	6.4′	17°04.2	13.1′	61.0′
23	167°35.3	05.3	187°29.4	6.3′	17°17.3	13.0′	61.0′
	SD = 16.2′	d = 0.4′	SD = 16.5′				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
N 72°	07:51	09:51	▬	▬	13:46	15:46
N 70°	07:35	09:12	▬	▬	14:26	16:02
68°	07:22	08:44	10:37	13:00	14:53	16:16
66°	07:11	08:23	09:48	13:50	15:14	16:27
64°	07:01	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	07:13	07:56	15:42	16:24	17:09
52°	06:23	07:06	07:46	15:52	16:32	17:14
50°	06:19	06:59	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	23:35
58°	–:–	01:55	03:01	20:39	21:45	–:–
S 60°	–:–	01:22	02:43	20:56	22:19	–:–

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

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 25-8%
30	11:28	11:17	11:49	08:18	20:43	
01	11:06	10:55	11:49	09:08	21:34	
02	10:44	10:32	11:49	10:01	22:29	

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	72°02.5	138°12.2	S24°25.3	201°38.3	S18°17.8	103°45.9	S13°57.0	120°15.2	S18°45.5
1	87°05.0	153°13.2	24.8	216°39.0	18.3	118°48.1	56.9	135°17.5	45.5
2	102°07.5	168°14.2	24.3	231°39.8	18.7	133°50.2	56.8	150°19.7	45.4
3	117°09.9	183°15.3	·· 23.9	246°40.5	·· 19.2	148°52.3	·· 56.7	165°22.0	·· 45.4
4	132°12.4	198°16.3	23.4	261°41.2	19.7	163°54.5	56.5	180°24.3	45.3
5	147°14.9	213°17.4	22.9	276°41.9	20.1	178°56.6	56.4	195°26.5	45.3
6	162°17.3	228°18.4	S24°22.4	291°42.6	S18°20.6	193°58.7	S13°56.3	210°28.8	S18°45.2
7	177°19.8	243°19.5	22.0	306°43.3	21.0	209°00.9	56.2	225°31.0	45.1
8	192°22.2	258°20.5	21.5	321°44.0	21.5	224°03.0	56.1	240°33.3	45.1
9	207°24.7	273°21.6	·· 21.0	336°44.7	·· 22.0	239°05.1	·· 55.9	255°35.6	·· 45.0
10	222°27.2	288°22.7	20.5	351°45.4	22.4	254°07.2	55.8	270°37.8	45.0
11	237°29.6	303°23.7	20.1	6°46.1	22.9	269°09.4	55.7	285°40.1	44.9
12	252°32.1	318°24.8	S24°19.6	21°46.8	S18°23.3	284°11.5	S13°55.6	300°42.3	S18°44.9
13	267°34.6	333°25.9	19.1	36°47.5	23.8	299°13.6	55.4	315°44.6	44.8
14	282°37.0	348°27.0	18.6	51°48.2	24.3	314°15.8	55.3	330°46.8	44.8
15	297°39.5	3°28.0	·· 18.2	66°48.9	·· 24.7	329°17.9	·· 55.2	345°49.1	·· 44.7
16	312°42.0	18°29.1	17.7	81°49.6	25.2	344°20.0	55.1	0°51.4	44.7
17	327°44.4	33°30.2	17.2	96°50.3	25.6	359°22.1	54.9	15°53.6	44.6
18	342°46.9	48°31.3	S24°16.7	111°51.0	S18°26.1	14°24.3	S13°54.8	30°55.9	S18°44.6
19	357°49.3	63°32.4	16.3	126°51.7	26.5	29°26.4	54.7	45°58.1	44.5
20	12°51.8	78°33.5	15.8	141°52.5	27.0	44°28.5	54.6	61°00.4	44.4
21	27°54.3	93°34.6	·· 15.3	156°53.2	·· 27.5	59°30.7	·· 54.5	76°02.6	·· 44.4
22	42°56.7	108°35.7	14.8	171°53.9	27.9	74°32.8	54.3	91°04.9	44.3
23	57°59.2	123°36.8	14.3	186°54.6	28.4	89°34.9	54.2	106°07.1	44.3
Mer.pass.	19:09	ν 1.0′	d -0.5′	m -4.88	ν 0.7′	d 0.5′	m 1.60	ν 2.1′	d -0.1′ m -2.27	ν 2.3′	d -0.1′ m 0.73

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	73°01.7	138°37.9	S24°13.9	201°55.3	S18°28.8	104°37.0	S13°54.1	121°09.4	S18°44.2
1	88°04.1	153°39.0	13.4	216°56.0	29.3	119°39.2	54.0	136°11.7	44.2
2	103°06.6	168°40.1	12.9	231°56.7	29.7	134°41.3	53.8	151°13.9	44.1
3	118°09.1	183°41.2	·· 12.4	246°57.4	·· 30.2	149°43.4	·· 53.7	166°16.2	·· 44.1
4	133°11.5	198°42.3	11.9	261°58.1	30.7	164°45.5	53.6	181°18.4	44.0
5	148°14.0	213°43.5	11.5	276°58.8	31.1	179°47.7	53.5	196°20.7	44.0
6	163°16.5	228°44.6	S24°11.0	291°59.5	S18°31.6	194°49.8	S13°53.3	211°22.9	S18°43.9
7	178°18.9	243°45.7	10.5	307°00.2	32.0	209°51.9	53.2	226°25.2	43.9
8	193°21.4	258°46.8	10.0	322°00.9	32.5	224°54.0	53.1	241°27.4	43.8
9	208°23.8	273°48.0	·· 09.5	337°01.6	·· 32.9	239°56.2	·· 53.0	256°29.7	·· 43.7
10	223°26.3	288°49.1	09.1	352°02.3	33.4	254°58.3	52.8	271°32.0	43.7
11	238°28.8	303°50.3	08.6	7°03.0	33.8	270°00.4	52.7	286°34.2	43.6
12	253°31.2	318°51.4	S24°08.1	22°03.7	S18°34.3	285°02.5	S13°52.6	301°36.5	S18°43.6
13	268°33.7	333°52.5	07.6	37°04.4	34.7	300°04.7	52.5	316°38.7	43.5
14	283°36.2	348°53.7	07.1	52°05.1	35.2	315°06.8	52.4	331°41.0	43.5
15	298°38.6	3°54.8	·· 06.6	67°05.8	·· 35.6	330°08.9	·· 52.2	346°43.2	·· 43.4
16	313°41.1	18°56.0	06.1	82°06.5	36.1	345°11.0	52.1	1°45.5	43.4
17	328°43.6	33°57.2	05.7	97°07.2	36.6	0°13.1	52.0	16°47.7	43.3
18	343°46.0	48°58.3	S24°05.2	112°07.9	S18°37.0	15°15.3	S13°51.9	31°50.0	S18°43.3
19	358°48.5	63°59.5	04.7	127°08.6	37.5	30°17.4	51.7	46°52.2	43.2
20	13°51.0	79°00.7	04.2	142°09.3	37.9	45°19.5	51.6	61°54.5	43.1
21	28°53.4	94°01.8	·· 03.7	157°10.0	·· 38.4	60°21.6	·· 51.5	76°56.7	·· 43.1
22	43°55.9	109°03.0	03.2	172°10.7	38.8	75°23.8	51.4	91°59.0	43.0
23	58°58.3	124°04.2	02.7	187°11.4	39.3	90°25.9	51.2	107°01.2	43.0
Mer.pass.	19:05	ν 1.1′	d -0.5′	m -4.88	ν 0.7′	d 0.5′	m 1.60	ν 2.1′	d -0.1′ m -2.26	ν 2.3′	d -0.1′ m 0.73

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	74°00.8	139°05.4	S24°02.3	202°12.1	S18°39.7	105°28.0	S13°51.1	122°03.5	S18°42.9
1	89°03.3	154°06.6	01.8	217°12.7	40.2	120°30.1	51.0	137°05.8	42.9
2	104°05.7	169°07.8	01.3	232°13.4	40.6	135°32.2	50.8	152°08.0	42.8
3	119°08.2	184°08.9	·· 00.8	247°14.1	·· 41.1	150°34.4	·· 50.7	167°10.3	·· 42.8
4	134°10.7	199°10.1	24°00.3	262°14.8	41.5	165°36.5	50.6	182°12.5	42.7
5	149°13.1	214°11.3	23°59.8	277°15.5	42.0	180°38.6	50.5	197°14.8	42.6
6	164°15.6	229°12.5	S23°59.3	292°16.2	S18°42.4	195°40.7	S13°50.3	212°17.0	S18°42.6
7	179°18.1	244°13.7	58.8	307°16.9	42.9	210°42.8	50.2	227°19.3	42.5
8	194°20.5	259°15.0	58.3	322°17.6	43.3	225°44.9	50.1	242°21.5	42.5
9	209°23.0	274°16.2	·· 57.8	337°18.3	·· 43.8	240°47.1	·· 50.0	257°23.8	·· 42.4
10	224°25.5	289°17.4	57.4	352°19.0	44.2	255°49.2	49.8	272°26.0	42.4
11	239°27.9	304°18.6	56.9	7°19.7	44.6	270°51.3	49.7	287°28.3	42.3
12	254°30.4	319°19.8	S23°56.4	22°20.4	S18°45.1	285°53.4	S13°49.6	302°30.5	S18°42.3
13	269°32.8	334°21.0	55.9	37°21.1	45.5	300°55.5	49.5	317°32.8	42.2
14	284°35.3	349°22.3	55.4	52°21.8	46.0	315°57.7	49.3	332°35.0	42.1
15	299°37.8	4°23.5	·· 54.9	67°22.5	·· 46.4	330°59.8	·· 49.2	347°37.3	·· 42.1
16	314°40.2	19°24.7	54.4	82°23.2	46.9	346°01.9	49.1	2°39.5	42.0
17	329°42.7	34°26.0	53.9	97°23.9	47.3	1°04.0	49.0	17°41.8	42.0
18	344°45.2	49°27.2	S23°53.4	112°24.6	S18°47.8	16°06.1	S13°48.8	32°44.0	S18°41.9
19	359°47.6	64°28.5	52.9	127°25.3	48.2	31°08.2	48.7	47°46.3	41.9
20	14°50.1	79°29.7	52.4	142°25.9	48.7	46°10.4	48.6	62°48.5	41.8
21	29°52.6	94°31.0	·· 51.9	157°26.6	·· 49.1	61°12.5	·· 48.4	77°50.8	·· 41.8
22	44°55.0	109°32.2	51.4	172°27.3	49.6	76°14.6	48.3	92°53.0	41.7
23	59°57.5	124°33.5	50.9	187°28.0	50.0	91°16.7	48.2	107°55.3	41.6
Mer.pass.	19:01	ν 1.2′	d -0.5′	m -4.89	ν 0.7′	d 0.5′	m 1.60	ν 2.1′	d -0.1′ m -2.26	ν 2.3′	d -0.1′ m 0.73

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.6	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.8	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°46.0	89°21.5
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.2	46°01.1
Bellatrix	278°25.3	6°22.2
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.5	7°24.7
Canopus	263°53.0	-52°42.3
Sirius	258°28.2	-16°44.7
Adhara	255°07.5	-29°00.0
Procyon	244°53.3	5°10.2
Pollux	243°20.2	27°58.3
Avior	234°15.3	-59°34.5
Suhail	222°48.0	-43°31.0
Miaplacidus	221°38.3	-69°48.0
Alphard	217°50.1	-8°45.1
Regulus	207°37.1	11°51.6
Dubhe	193°44.3	61°37.8
Denebola	182°27.7	14°27.0
Gienah	175°46.3	-17°39.6
Acrux	173°03.2	-63°12.8
Gacrux	171°54.7	-57°13.8
Alioth	166°15.6	55°50.3
Spica	158°25.2	-11°16.3
Alkaid	152°54.4	49°12.2
Hadar	148°40.1	-60°28.4
Menkent	148°00.9	-36°28.4
Arcturus	145°50.6	19°04.2
Rigil Kent.	139°44.4	-60°55.2
Kochab	137°20.9	74°03.8
Zuben'ubi	136°59.2	-16°07.8
Alphecca	126°06.3	26°38.5
Antares	112°19.4	-26°28.7
Atria	107°16.4	-69°03.9
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.7
Eltanin	90°43.9	51°29.3
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.6	28°12.2
Markab	13°32.4	15°19.4

Dec 03 Fri	SHA	Mer.pass
Venus	66°09.6	14:46
Mars	129°35.8	10:33
Jupiter	31°43.4	17:03
Saturn	48°12.7	15:57

Dec 04 Sat	SHA	Mer.pass
Venus	65°36.2	14:44
Mars	128°53.6	10:32
Jupiter	31°35.4	16:59
Saturn	48°07.7	15:53

Dec 05 Sun	SHA	Mer.pass
Venus	65°04.6	14:42
Mars	128°11.2	10:31
Jupiter	31°27.2	16:56
Saturn	48°02.7	15:49

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		182°35.1	S22°05.7	201°54.7	6.1′	S17°30.2	12.9′	61.0′
1		197°34.8	06.0	216°19.8	6.0′	17°43.1	12.8′	61.1′
2		212°34.6	06.4	230°44.9	5.9′	17°55.9	12.7′	61.1′
3		227°34.3	·· 06.7	245°09.8	5.8′	18°08.5	12.5′	61.1′
4		242°34.1	07.1	259°34.6	5.7′	18°21.1	12.4′	61.1′
5		257°33.9	07.4	273°59.3	5.6′	18°33.5	12.3′	61.1′
6		272°33.6	S22°07.8	288°23.9	5.5′	S18°45.8	12.2′	61.1′
7		287°33.4	08.1	302°48.3	5.3′	18°58.0	12.1′	61.2′
8		302°33.1	08.5	317°12.7	5.2′	19°10.1	11.9′	61.2′
9		317°32.9	·· 08.8	331°36.9	5.1′	19°22.0	11.8′	61.2′
10		332°32.6	09.2	346°01.0	5.0′	19°33.8	11.7′	61.2′
11		347°32.4	09.5	0°25.0	4.9′	19°45.5	11.6′	61.2′
12		2°32.1	S22°09.9	14°48.9	4.8′	S19°57.1	11.4′	61.2′
13		17°31.9	10.2	29°12.7	4.7′	20°08.5	11.3′	61.2′
14		32°31.6	10.6	43°36.4	4.6′	20°19.8	11.1′	61.3′
15		47°31.4	·· 10.9	58°00.0	4.5′	20°30.9	11.0′	61.3′
16		62°31.1	11.3	72°23.4	4.3′	20°41.9	10.9′	61.3′
17		77°30.9	11.6	86°46.8	4.2′	20°52.8	10.7′	61.3′
18		92°30.6	S22°11.9	101°10.0	4.1′	S21°03.5	10.6′	61.3′
19		107°30.4	12.3	115°33.1	4.0′	21°14.0	10.4′	61.3′
20		122°30.1	12.6	129°56.2	3.9′	21°24.5	10.3′	61.3′
21		137°29.9	·· 13.0	144°19.1	3.8′	21°34.7	10.1′	61.3′
22		152°29.6	13.3	158°41.9	3.7′	21°44.8	10.0′	61.3′
23		167°29.4	13.6	173°04.6	3.6′	21°54.8	9.8′	61.3′
		SD = 16.2′	d = 0.4′		SD = 16.6′			

Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		182°29.1	S22°14.0	187°27.2	3.5′	S22°04.6	9.6′	61.3′
1		197°28.9	14.3	201°49.7	3.4′	22°14.2	9.5′	61.4′
2		212°28.6	14.6	216°12.2	3.3′	22°23.7	9.3′	61.4′
3		227°28.3	·· 15.0	230°34.5	3.2′	22°33.0	9.2′	61.4′
4		242°28.1	15.3	244°56.7	3.1′	22°42.2	9.0′	61.4′
5		257°27.8	15.6	259°18.8	3.0′	22°51.2	8.8′	61.4′
6		272°27.6	S22°16.0	273°40.9	2.9′	S23°00.0	8.6′	61.4′
7		287°27.3	16.3	288°02.8	2.9′	23°08.6	8.5′	61.4′
8		302°27.1	16.6	302°24.7	2.8′	23°17.1	8.3′	61.4′
9		317°26.8	·· 17.0	316°46.4	2.7′	23°25.4	8.1′	61.4′
10		332°26.6	17.3	331°08.1	2.6′	23°33.5	7.9′	61.4′
11		347°26.3	17.6	345°29.7	2.5′	23°41.5	7.8′	61.4′
12		2°26.1	S22°18.0	359°51.2	2.4′	S23°49.2	7.6′	61.4′
13		17°25.8	18.3	14°12.7	2.4′	23°56.8	7.4′	61.4′
14		32°25.5	18.6	28°34.0	2.3′	24°04.2	7.2′	61.4′
15		47°25.3	·· 18.9	42°55.3	2.2′	24°11.4	7.0′	61.4′
16		62°25.0	19.3	57°16.6	2.1′	24°18.5	6.8′	61.4′
17		77°24.8	19.6	71°37.7	2.1′	24°25.3	6.7′	61.4′
18		92°24.5	S22°19.9	85°58.8	2.0′	S24°32.0	6.5′	61.4′
19		107°24.3	20.2	100°19.8	2.0′	24°38.4	6.3′	61.4′
20		122°24.0	20.5	114°40.8	1.9′	24°44.7	6.1′	61.3′
21		137°23.7	·· 20.9	129°01.7	1.8′	24°50.8	5.9′	61.3′
22		152°23.5	21.2	143°22.5	1.8′	24°56.7	5.7′	61.3′
23		167°23.2	21.5	157°43.3	1.7′	25°02.4	5.5′	61.3′
		SD = 16.2′	d = 0.3′		SD = 16.7′			

Sun		GHA	Dec	GHA	ν	Dec	d	HP
0		182°23.0	S22°21.8	172°04.0	1.7′	S25°07.9	5.3′	61.3′
1		197°22.7	22.1	186°24.7	1.6′	25°13.2	5.1′	61.3′
2		212°22.5	22.5	200°45.3	1.6′	25°18.3	4.9′	61.3′
3		227°22.2	·· 22.8	215°05.9	1.6′	25°23.2	4.7′	61.3′
4		242°21.9	23.1	229°26.5	1.5′	25°27.9	4.5′	61.3′
5		257°21.7	23.4	243°47.0	1.5′	25°32.4	4.3′	61.3′
6		272°21.4	S22°23.7	258°07.4	1.4′	S25°36.7	4.1′	61.3′
7		287°21.2	24.0	272°27.9	1.4′	25°40.8	3.9′	61.2′
8		302°20.9	24.3	286°48.3	1.4′	25°44.7	3.7′	61.2′
9		317°20.6	·· 24.7	301°08.7	1.4′	25°48.4	3.5′	61.2′
10		332°20.4	25.0	315°29.1	1.4′	25°51.9	3.3′	61.2′
11		347°20.1	25.3	329°49.4	1.3′	25°55.2	3.1′	61.2′
12		2°19.9	S22°25.6	344°09.8	1.3′	S25°58.3	2.9′	61.2′
13		17°19.6	25.9	358°30.1	1.3′	26°01.2	2.7′	61.2′
14		32°19.3	26.2	12°50.4	1.3′	26°03.8	2.5′	61.1′
15		47°19.1	·· 26.5	27°10.7	1.3′	26°06.3	2.3′	61.1′
16		62°18.8	26.8	41°31.0	1.3′	26°08.6	2.1′	61.1′
17		77°18.5	27.1	55°51.3	1.3′	26°10.6	1.9′	61.1′
18		92°18.3	S22°27.4	70°11.6	1.3′	S26°12.5	1.6′	61.1′
19		107°18.0	27.7	84°31.9	1.3′	26°14.1	1.4′	61.1′
20		122°17.8	28.0	98°52.2	1.3′	26°15.6	1.2′	61.0′
21		137°17.5	·· 28.3	113°12.6	1.3′	26°16.8	1.0′	61.0′
22		152°17.2	28.6	127°32.9	1.4′	26°17.8	0.8′	61.0′
23		167°17.0	28.9	141°53.3	1.4′	26°18.6	0.6′	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°	07:16	08:30	09:58	13:42	15:10	16:24
64°	07:07	08:13	09:24	14:16	15:27	16:33
62°	06:58	07:58	09:00	14:40	15:42	16:42
60°	06:50	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	07:17	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°	05:29	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°	01:07	02:34	03:26	20:16	21:08	22:37
56°	–:–	02:14	03:13	20:29	21:27	–:–
58°	–:–	01:49	02:57	20:44	21:53	–:–
S 60°	–:–	01:14	02:39	21:03	22:30	–:–

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

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 29-1 3-1%
03	10:20	10:08	11:50	10:58	23:29	
04	09:56	09:44	11:50	12:01	–:–	
05	09:32	09:19	11:51	13:06	00:33	

DUT1 = UT1-UTC = -0.1075 sec ΔT = TT-UT1 = +69.2915 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	75°00.0	139°34.7	S23°50.4	202°28.7	S18°50.4	106°18.8	S13°48.1	122°57.5	S18°41.6
1	90°02.4	154°36.0	50.0	217°29.4	50.9	121°20.9	47.9	137°59.8	41.5
2	105°04.9	169°37.3	49.5	232°30.1	51.3	136°23.0	47.8	153°02.0	41.5
3	120°07.3	184°38.5	·· 49.0	247°30.8	·· 51.8	151°25.2	·· 47.7	168°04.3	·· 41.4
4	135°09.8	199°39.8	48.5	262°31.5	52.2	166°27.3	47.5	183°06.5	41.4
5	150°12.3	214°41.1	48.0	277°32.2	52.7	181°29.4	47.4	198°08.8	41.3
6	165°14.7	229°42.4	S23°47.5	292°32.9	S18°53.1	196°31.5	S13°47.3	213°11.0	S18°41.3
7	180°17.2	244°43.7	47.0	307°33.6	53.5	211°33.6	47.2	228°13.3	41.2
8	195°19.7	259°44.9	46.5	322°34.2	54.0	226°35.7	47.0	243°15.5	41.1
9	210°22.1	274°46.2	·· 46.0	337°34.9	·· 54.4	241°37.8	·· 46.9	258°17.8	·· 41.1
10	225°24.6	289°47.5	45.5	352°35.6	54.9	256°40.0	46.8	273°20.0	41.0
11	240°27.1	304°48.8	45.0	7°36.3	55.3	271°42.1	46.7	288°22.3	41.0
12	255°29.5	319°50.1	S23°44.5	22°37.0	S18°55.7	286°44.2	S13°46.5	303°24.5	S18°40.9
13	270°32.0	334°51.4	44.0	37°37.7	56.2	301°46.3	46.4	318°26.8	40.9
14	285°34.5	349°52.7	43.5	52°38.4	56.6	316°48.4	46.3	333°29.0	40.8
15	300°36.9	4°54.1	·· 43.0	67°39.1	·· 57.1	331°50.5	·· 46.1	348°31.3	·· 40.7
16	315°39.4	19°55.4	42.5	82°39.8	57.5	346°52.6	46.0	3°33.5	40.7
17	330°41.8	34°56.7	42.0	97°40.4	58.0	1°54.7	45.9	18°35.8	40.6
18	345°44.3	49°58.0	S23°41.5	112°41.1	S18°58.4	16°56.8	S13°45.7	33°38.0	S18°40.6
19	0°46.8	64°59.3	41.0	127°41.8	58.8	31°59.0	45.6	48°40.3	40.5
20	15°49.2	80°00.7	40.5	142°42.5	59.3	47°01.1	45.5	63°42.5	40.5
21	30°51.7	95°02.0	·· 40.0	157°43.2	18°59.7	62°03.2	·· 45.4	78°44.7	·· 40.4
22	45°54.2	110°03.3	39.5	172°43.9	19°00.1	77°05.3	45.2	93°47.0	40.4
23	60°56.6	125°04.7	39.0	187°44.6	00.6	92°07.4	45.1	108°49.2	40.3
	Mer.pass. 18:57	ν 1.3′	d -0.5′	m -4.89	ν 0.7′	d 0.4′	m 1.60	ν 2.1′	d -0.1′ m -2.25	ν 2.2′	d -0.1′ m 0.73

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	75°59.1	140°06.0	S23°38.5	202°45.3	S19°01.0	107°09.5	S13°45.0	123°51.5	S18°40.2
1	91°01.6	155°07.4	38.0	217°45.9	01.5	122°11.6	44.8	138°53.7	40.2
2	106°04.0	170°08.7	37.5	232°46.6	01.9	137°13.7	44.7	153°56.0	40.1
3	121°06.5	185°10.1	·· 37.0	247°47.3	·· 02.3	152°15.8	·· 44.6	168°58.2	·· 40.1
4	136°09.0	200°11.4	36.5	262°48.0	02.8	167°17.9	44.5	184°00.5	40.0
5	151°11.4	215°12.8	36.0	277°48.7	03.2	182°20.1	44.3	199°02.7	40.0
6	166°13.9	230°14.1	S23°35.5	292°49.4	S19°03.6	197°22.2	S13°44.2	214°05.0	S18°39.9
7	181°16.3	245°15.5	35.0	307°50.1	04.1	212°24.3	44.1	229°07.2	39.8
8	196°18.8	260°16.9	34.4	322°50.7	04.5	227°26.4	43.9	244°09.5	39.8
9	211°21.3	275°18.3	·· 33.9	337°51.4	·· 04.9	242°28.5	·· 43.8	259°11.7	·· 39.7
10	226°23.7	290°19.6	33.4	352°52.1	05.4	257°30.6	43.7	274°13.9	39.7
11	241°26.2	305°21.0	32.9	7°52.8	05.8	272°32.7	43.5	289°16.2	39.6
12	256°28.7	320°22.4	S23°32.4	22°53.5	S19°06.3	287°34.8	S13°43.4	304°18.4	S18°39.6
13	271°31.1	335°23.8	31.9	37°54.2	06.7	302°36.9	43.3	319°20.7	39.5
14	286°33.6	350°25.2	31.4	52°54.8	07.1	317°39.0	43.1	334°22.9	39.4
15	301°36.1	5°26.6	·· 30.9	67°55.5	·· 07.6	332°41.1	·· 43.0	349°25.2	·· 39.4
16	316°38.5	20°28.0	30.4	82°56.2	08.0	347°43.2	42.9	4°27.4	39.3
17	331°41.0	35°29.4	29.9	97°56.9	08.4	2°45.3	42.8	19°29.7	39.3
18	346°43.5	50°30.8	S23°29.4	112°57.6	S19°08.9	17°47.4	S13°42.6	34°31.9	S18°39.2
19	1°45.9	65°32.2	28.9	127°58.3	09.3	32°49.5	42.5	49°34.2	39.2
20	16°48.4	80°33.6	28.4	142°58.9	09.7	47°51.7	42.4	64°36.4	39.1
21	31°50.8	95°35.0	·· 27.9	157°59.6	·· 10.2	62°53.8	·· 42.2	79°38.6	·· 39.0
22	46°53.3	110°36.4	27.4	173°00.3	10.6	77°55.9	42.1	94°40.9	39.0
23	61°55.8	125°37.9	26.9	188°01.0	11.0	92°58.0	42.0	109°43.1	38.9
	Mer.pass. 18:53	ν 1.3′	d -0.5′	m -4.89	ν 0.7′	d 0.4′	m 1.60	ν 2.1′	d -0.1′ m -2.25	ν 2.2′	d -0.1′ m 0.74

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	76°58.2	140°39.3	S23°26.3	203°01.7	S19°11.4	108°00.1	S13°41.8	124°45.4	S18°38.9
1	92°00.7	155°40.7	25.8	218°02.3	11.9	123°02.2	41.7	139°47.6	38.8
2	107°03.2	170°42.2	25.3	233°03.0	12.3	138°04.3	41.6	154°49.9	38.8
3	122°05.6	185°43.6	·· 24.8	248°03.7	·· 12.7	153°06.4	·· 41.4	169°52.1	·· 38.7
4	137°08.1	200°45.0	24.3	263°04.4	13.2	168°08.5	41.3	184°54.4	38.6
5	152°10.6	215°46.5	23.8	278°05.1	13.6	183°10.6	41.2	199°56.6	38.6
6	167°13.0	230°47.9	S23°23.3	293°05.7	S19°14.0	198°12.7	S13°41.0	214°58.8	S18°38.5
7	182°15.5	245°49.4	22.8	308°06.4	14.5	213°14.8	40.9	230°01.1	38.5
8	197°18.0	260°50.8	22.3	323°07.1	14.9	228°16.9	40.8	245°03.3	38.4
9	212°20.4	275°52.3	·· 21.8	338°07.8	·· 15.3	243°19.0	·· 40.6	260°05.6	·· 38.4
10	227°22.9	290°53.8	21.3	353°08.5	15.7	258°21.1	40.5	275°07.8	38.3
11	242°25.3	305°55.2	20.7	8°09.1	16.2	273°23.2	40.4	290°10.1	38.2
12	257°27.8	320°56.7	S23°20.2	23°09.8	S19°16.6	288°25.3	S13°40.2	305°12.3	S18°38.2
13	272°30.3	335°58.2	19.7	38°10.5	17.0	303°27.4	40.1	320°14.5	38.1
14	287°32.7	350°59.6	19.2	53°11.2	17.5	318°29.5	40.0	335°16.8	38.1
15	302°35.2	6°01.1	·· 18.7	68°11.9	·· 17.9	333°31.6	·· 39.8	350°19.0	·· 38.0
16	317°37.7	21°02.6	18.2	83°12.5	18.3	348°33.7	39.7	5°21.3	37.9
17	332°40.1	36°04.1	17.7	98°13.2	18.7	3°35.8	39.6	20°23.5	37.9
18	347°42.6	51°05.6	S23°17.2	113°13.9	S19°19.2	18°37.9	S13°39.4	35°25.8	S18°37.8
19	2°45.1	66°07.1	16.6	128°14.6	19.6	33°40.0	39.3	50°28.0	37.8
20	17°47.5	81°08.6	16.1	143°15.2	20.0	48°42.1	39.2	65°30.2	37.7
21	32°50.0	96°10.1	·· 15.6	158°15.9	·· 20.4	63°44.2	·· 39.0	80°32.5	·· 37.7
22	47°52.4	111°11.6	15.1	173°16.6	20.9	78°46.3	38.9	95°34.7	37.6
23	62°54.9	126°13.1	14.6	188°17.3	21.3	93°48.4	38.8	110°37.0	37.5
	Mer.pass. 18:49	ν 1.4′	d -0.5′	m -4.90	ν 0.7′	d 0.4′	m 1.60	ν 2.1′	d -0.1′ m -2.24	ν 2.2′	d -0.1′ m 0.74

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.5	-42°11.5
Schedar	349°33.6	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.8	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°46.2	89°21.5
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.2	46°01.1
Bellatrix	278°25.3	6°22.1
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.5	7°24.7
Canopus	263°53.0	-52°42.3
Sirius	258°28.2	-16°44.7
Adhara	255°07.5	-29°00.0
Procyon	244°53.2	5°10.1
Pollux	243°20.1	27°58.3
Avior	234°15.3	-59°34.5
Suhail	222°47.9	-43°31.0
Miaplacidus	221°38.2	-69°48.0
Alphard	217°50.1	-8°45.1
Regulus	207°37.1	11°51.6
Dubhe	193°44.2	61°37.8
Denebola	182°27.6	14°27.0
Gienah	175°46.3	-17°39.6
Acrux	173°03.1	-63°12.8
Gacrux	171°54.7	-57°13.8
Alioth	166°15.6	55°50.3
Spica	158°25.2	-11°16.3
Alkaid	152°54.4	49°12.1
Hadar	148°40.1	-60°28.4
Menkent	148°00.9	-36°28.4
Arcturus	145°50.5	19°04.1
Rigil Kent.	139°44.3	-60°55.2
Kochab	137°20.9	74°03.8
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.3	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°16.4	-69°03.9
Sabik	102°06.1	-15°45.0
Shaula	96°14.3	-37°07.1
Rasalhague	96°01.3	12°32.7
Eltanin	90°43.9	51°29.2
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.4	15°19.4

Dec 06 Mon	SHA	Mer.pass
Venus	64°34.8	14:40
Mars	127°28.8	10:30
Jupiter	31°18.9	16:52
Saturn	47°57.6	15:46

Dec 07 Tue	SHA	Mer.pass
Venus	64°06.9	14:38
Mars	126°46.2	10:29
Jupiter	31°10.4	16:49
Saturn	47°52.4	15:42

Dec 08 Wed	SHA	Mer.pass
Venus	63°41.1	14:36
Mars	126°03.4	10:27
Jupiter	31°01.8	16:46
Saturn	47°47.1	15:39

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°16.7	S22°29.2	156°13.7	1.4′	S26°19.3	0.4′	61.0′
1	197°16.4	29.5	170°34.1	1.4′	26°19.7	0.2′	60.9′
2	212°16.2	29.8	184°54.5	1.5′	26°19.9	0.0′	60.9′
3	227°15.9	·· 30.1	199°15.0	1.5′	26°19.9	-0.2′	60.9′
4	242°15.6	30.4	213°35.5	1.6′	26°19.7	-0.4′	60.9′
5	257°15.4	30.7	227°56.1	1.6′	26°19.3	-0.6′	60.8′
6	272°15.1	S22°31.0	242°16.7	1.6′	S26°18.7	-0.8′	60.8′
7	287°14.9	31.3	256°37.3	1.7′	26°17.9	-1.0′	60.8′
8	302°14.6	31.6	270°58.0	1.7′	26°16.9	-1.2′	60.8′
9	317°14.3	·· 31.9	285°18.7	1.8′	26°15.6	-1.4′	60.7′
10	332°14.1	32.2	299°39.5	1.8′	26°14.2	-1.6′	60.7′
11	347°13.8	32.5	314°00.4	1.9′	26°12.6	-1.8′	60.7′
12	2°13.5	S22°32.8	328°21.3	2.0′	S26°10.8	-2.0′	60.7′
13	17°13.3	33.1	342°42.2	2.0′	26°08.8	-2.2′	60.6′
14	32°13.0	33.4	357°03.3	2.1′	26°06.6	-2.4′	60.6′
15	47°12.7	·· 33.7	11°24.4	2.2′	26°04.2	-2.6′	60.6′
16	62°12.5	33.9	25°45.5	2.2′	26°01.6	-2.8′	60.6′
17	77°12.2	34.2	40°06.8	2.3′	25°58.9	-3.0′	60.5′
18	92°11.9	S22°34.5	54°28.1	2.4′	S25°55.9	-3.2′	60.5′
19	107°11.7	34.8	68°49.5	2.5′	25°52.7	-3.4′	60.5′
20	122°11.4	35.1	83°11.0	2.6′	25°49.4	-3.5′	60.4′
21	137°11.1	·· 35.4	97°32.5	2.6′	25°45.8	-3.7′	60.4′
22	152°10.8	35.7	111°54.2	2.7′	25°42.1	-3.9′	60.4′
23	167°10.6	35.9	126°15.9	2.8′	25°38.2	-4.1′	60.3′
		SD = 16.2′	d = 0.3′		SD = 16.6′		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°10.3	S22°36.2	140°37.8	2.9′	S25°34.1	-4.3′	60.3′
1	197°10.0	36.5	154°59.7	3.0′	25°29.8	-4.5′	60.3′
2	212°09.8	36.8	169°21.7	3.1′	25°25.4	-4.6′	60.2′
3	227°09.5	·· 37.1	183°43.8	3.2′	25°20.7	-4.8′	60.2′
4	242°09.2	37.3	198°06.0	3.3′	25°15.9	-5.0′	60.2′
5	257°09.0	37.6	212°28.3	3.4′	25°10.9	-5.2′	60.1′
6	272°08.7	S22°37.9	226°50.7	3.5′	S25°05.8	-5.3′	60.1′
7	287°08.4	38.2	241°13.3	3.6′	25°00.4	-5.5′	60.1′
8	302°08.1	38.4	255°35.9	3.7′	24°54.9	-5.7′	60.0′
9	317°07.9	·· 38.7	269°58.6	3.8′	24°49.3	-5.8′	60.0′
10	332°07.6	39.0	284°21.5	4.0′	24°43.4	-6.0′	60.0′
11	347°07.3	39.3	298°44.4	4.1′	24°37.4	-6.2′	59.9′
12	2°07.1	S22°39.5	313°07.5	4.2′	S24°31.2	-6.3′	59.9′
13	17°06.8	39.8	327°30.7	4.3′	24°24.9	-6.5′	59.9′
14	32°06.5	40.1	341°54.0	4.4′	24°18.4	-6.7′	59.8′
15	47°06.2	·· 40.4	356°17.4	4.5′	24°11.7	-6.8′	59.8′
16	62°06.0	40.6	10°40.9	4.7′	24°04.9	-7.0′	59.8′
17	77°05.7	40.9	25°04.6	4.8′	23°58.0	-7.1′	59.7′
18	92°05.4	S22°41.2	39°28.3	4.9′	S23°50.9	-7.3′	59.7′
19	107°05.2	41.4	53°52.2	5.0′	23°43.6	-7.4′	59.7′
20	122°04.9	41.7	68°16.2	5.1′	23°36.2	-7.6′	59.6′
21	137°04.6	·· 42.0	82°40.4	5.3′	23°28.6	-7.7′	59.6′
22	152°04.3	42.2	97°04.7	5.4′	23°20.9	-7.9′	59.5′
23	167°04.1	42.5	111°29.0	5.5′	23°13.0	-8.0′	59.5′
		SD = 16.2′	d = 0.3′		SD = 16.4′		

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	182°03.8	S22°42.8	125°53.6	5.6′	S23°05.0	-8.1′	59.5′
1	197°03.5	43.0	140°18.2	5.8′	22°56.9	-8.3′	59.4′
2	212°03.2	43.3	154°43.0	5.9′	22°48.6	-8.4′	59.4′
3	227°03.0	·· 43.5	169°07.9	6.0′	22°40.2	-8.5′	59.4′
4	242°02.7	43.8	183°32.9	6.2′	22°31.7	-8.7′	59.3′
5	257°02.4	44.1	197°58.0	6.3′	22°23.0	-8.8′	59.3′
6	272°02.1	S22°44.3	212°23.3	6.4′	S22°14.2	-8.9′	59.2′
7	287°01.9	44.6	226°48.7	6.5′	22°05.2	-9.1′	59.2′
8	302°01.6	44.8	241°14.3	6.7′	21°56.2	-9.2′	59.2′
9	317°01.3	·· 45.1	255°40.0	6.8′	21°47.0	-9.3′	59.1′
10	332°01.0	45.4	270°05.8	6.9′	21°37.7	-9.4′	59.1′
11	347°00.8	45.6	284°31.7	7.1′	21°28.2	-9.5′	59.1′
12	2°00.5	S22°45.9	298°57.8	7.2′	S21°18.7	-9.7′	59.0′
13	17°00.2	46.1	313°23.9	7.3′	21°09.0	-9.8′	59.0′
14	31°59.9	46.4	327°50.3	7.5′	20°59.3	-9.9′	58.9′
15	46°59.7	·· 46.6	342°16.7	7.6′	20°49.4	-10.0′	58.9′
16	61°59.4	46.9	356°43.3	7.7′	20°39.4	-10.1′	58.9′
17	76°59.1	47.1	11°10.0	7.8′	20°29.2	-10.2′	58.8′
18	91°58.8	S22°47.4	25°36.8	8.0′	S20°19.0	-10.3′	58.8′
19	106°58.5	47.6	40°03.8	8.1′	20°08.7	-10.4′	58.7′
20	121°58.3	47.9	54°30.9	8.2′	19°58.3	-10.5′	58.7′
21	136°58.0	·· 48.1	68°58.1	8.4′	19°47.7	-10.6′	58.7′
22	151°57.7	48.4	83°25.5	8.5′	19°37.1	-10.7′	58.6′
23	166°57.4	48.6	97°53.0	8.6′	19°26.4	-10.8′	58.6′
		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	▬	▬	13:25	15:36
N 70°	07:48	09:30	▬	▬	14:13	15:54
68°	07:34	08:59	11:21	12:22	14:43	16:09
66°	07:22	08:36	10:07	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	16:37	17:18
45°	06:14	06:51	07:24	16:18	16:52	17:29
N 40°	06:04	06:38	07:08	16:35	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 Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	▬	▬	▬	▬	▬	▬
N 70°	▬	▬	▬	▬	▬	▬
68°	▬	▬	14:57	▬	▬	17:46
66°	▬	▬	14:10	▬	▬	18:33
64°	▬	13:48	13:39	▬	16:52	19:03
62°	12:43	13:07	13:15	15:45	17:33	19:25
60°	12:03	12:39	12:56	16:25	18:00	19:43
N 58°	11:36	12:17	12:41	16:52	18:22	19:58
56°	11:14	11:59	12:27	17:13	18:39	20:11
54°	10:56	11:44	12:16	17:31	18:54	20:22
52°	10:41	11:31	12:05	17:46	19:07	20:32
50°	10:28	11:19	11:56	17:59	19:18	20:40
45°	10:01	10:55	11:36	18:26	19:41	20:59
N 40°	09:39	10:36	11:20	18:47	20:00	21:14
35°	09:21	10:19	11:07	19:05	20:16	21:26
30°	09:06	10:05	10:55	19:20	20:29	21:37
20°	08:40	09:41	10:35	19:45	20:52	21:56
N 10°	08:18	09:20	10:17	20:07	21:12	22:12
0°	07:57	09:01	10:00	20:28	21:30	22:27
S 10°	07:36	08:41	09:44	20:48	21:48	22:42
20°	07:13	08:20	09:26	21:10	22:07	22:57
30°	06:48	07:56	09:05	21:35	22:30	23:15
35°	06:32	07:42	08:53	21:50	22:43	23:26
40°	06:15	07:25	08:39	22:07	22:57	23:37
45°	05:53	07:05	08:22	22:27	23:15	23:51
S 50°	05:26	06:40	08:02	22:53	23:37	·· ··
52°	05:13	06:28	07:52	23:05	23:47	·· ··
54°	04:58	06:14	07:41	23:19	23:59	·· ··
56°	04:41	05:58	07:28	23:36	·· ··	00:12
58°	04:19	05:39	07:13	23:55	·· ··	00:27
S 60°	03:52	05:15	06:56	·· ··	00:19	00:45

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 2-4 4-19%
06	09:07	08:54	11:51	14:12	01:39	
07	08:41	08:28	11:52	15:15	02:44	
08	08:15	08:02	11:52	16:14	03:45	

DUT1 = UT1-UTC = -0.1071 sec ΔT = TT-UT1 = +69.2911 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°57.4	141°14.6	S23°14.1	203°17.9	S19°21.7	108°50.5	S13°38.6	125°39.2	S18°37.5
1	92°59.8	156°16.1	13.6	218°18.6	22.1	123°52.6	38.5	140°41.4	37.4
2	108°02.3	171°17.7	13.1	233°19.3	22.6	138°54.7	38.4	155°43.7	37.4
3	123°04.8	186°19.2	·· 12.5	248°20.0	·· 23.0	153°56.8	·· 38.2	170°45.9	·· 37.3
4	138°07.2	201°20.7	12.0	263°20.6	23.4	168°58.9	38.1	185°48.2	37.2
5	153°09.7	216°22.2	11.5	278°21.3	23.8	184°01.0	38.0	200°50.4	37.2
6	168°12.2	231°23.8	S23°11.0	293°22.0	S19°24.3	199°03.1	S13°37.8	215°52.6	S18°37.1
7	183°14.6	246°25.3	10.5	308°22.7	24.7	214°05.2	37.7	230°54.9	37.1
8	198°17.1	261°26.9	10.0	323°23.3	25.1	229°07.3	37.6	245°57.1	37.0
9	213°19.6	276°28.4	·· 09.5	338°24.0	·· 25.5	244°09.4	·· 37.4	260°59.4	·· 37.0
10	228°22.0	291°30.0	08.9	353°24.7	26.0	259°11.5	37.3	276°01.6	36.9
11	243°24.5	306°31.5	08.4	8°25.4	26.4	274°13.6	37.2	291°03.8	36.8
12	258°26.9	321°33.1	S23°07.9	23°26.0	S19°26.8	289°15.7	S13°37.0	306°06.1	S18°36.8
13	273°29.4	336°34.6	07.4	38°26.7	27.2	304°17.8	36.9	321°08.3	36.7
14	288°31.9	351°36.2	06.9	53°27.4	27.6	319°19.9	36.8	336°10.6	36.7
15	303°34.3	6°37.8	·· 06.4	68°28.1	·· 28.1	334°22.0	·· 36.6	351°12.8	·· 36.6
16	318°36.8	21°39.4	05.8	83°28.7	28.5	349°24.0	36.5	6°15.0	36.5
17	333°39.3	36°40.9	05.3	98°29.4	28.9	4°26.1	36.4	21°17.3	36.5
18	348°41.7	51°42.5	S23°04.8	113°30.1	S19°29.3	19°28.2	S13°36.2	36°19.5	S18°36.4
19	3°44.2	66°44.1	04.3	128°30.7	29.7	34°30.3	36.1	51°21.8	36.4
20	18°46.7	81°45.7	03.8	143°31.4	30.2	49°32.4	35.9	66°24.0	36.3
21	33°49.1	96°47.3	·· 03.3	158°32.1	·· 30.6	64°34.5	·· 35.8	81°26.2	·· 36.3
22	48°51.6	111°48.9	02.7	173°32.8	31.0	79°36.6	35.7	96°28.5	36.2
23	63°54.1	126°50.5	02.2	188°33.4	31.4	94°38.7	35.5	111°30.7	36.1
Mer.pass.	18:45	ν 1.5′	d -0.5′	m -4.90	ν 0.7′	d 0.4′	m 1.60	ν 2.1′	d -0.1′ m -2.24	ν 2.2′	d -0.1′ m 0.74

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°56.5	141°52.1	S23°01.7	203°34.1	S19°31.8	109°40.8	S13°35.4	126°33.0	S18°36.1
1	93°59.0	156°53.7	01.2	218°34.8	32.3	124°42.9	35.3	141°35.2	36.0
2	109°01.4	171°55.3	00.7	233°35.4	32.7	139°45.0	35.1	156°37.4	36.0
3	124°03.9	186°56.9	23°00.1	248°36.1	·· 33.1	154°47.1	·· 35.0	171°39.7	·· 35.9
4	139°06.4	201°58.5	22°59.6	263°36.8	33.5	169°49.2	34.9	186°41.9	35.8
5	154°08.8	217°00.2	59.1	278°37.4	33.9	184°51.3	34.7	201°44.1	35.8
6	169°11.3	232°01.8	S22°58.6	293°38.1	S19°34.3	199°53.4	S13°34.6	216°46.4	S18°35.7
7	184°13.8	247°03.4	58.1	308°38.8	34.8	214°55.4	34.5	231°48.6	35.7
8	199°16.2	262°05.0	57.6	323°39.5	35.2	229°57.5	34.3	246°50.9	35.6
9	214°18.7	277°06.7	·· 57.0	338°40.1	·· 35.6	244°59.6	·· 34.2	261°53.1	·· 35.5
10	229°21.2	292°08.3	56.5	353°40.8	36.0	260°01.7	34.0	276°55.3	35.5
11	244°23.6	307°10.0	56.0	8°41.5	36.4	275°03.8	33.9	291°57.6	35.4
12	259°26.1	322°11.6	S22°55.5	23°42.1	S19°36.8	290°05.9	S13°33.8	306°59.8	S18°35.4
13	274°28.6	337°13.3	55.0	38°42.8	37.2	305°08.0	33.6	322°02.0	35.3
14	289°31.0	352°14.9	54.4	53°43.5	37.7	320°10.1	33.5	337°04.3	35.2
15	304°33.5	7°16.6	·· 53.9	68°44.1	·· 38.1	335°12.2	·· 33.4	352°06.5	·· 35.2
16	319°35.9	22°18.3	53.4	83°44.8	38.5	350°14.3	33.2	7°08.8	35.1
17	334°38.4	37°19.9	52.9	98°45.5	38.9	5°16.4	33.1	22°11.0	35.1
18	349°40.9	52°21.6	S22°52.4	113°46.1	S19°39.3	20°18.4	S13°32.9	37°13.2	S18°35.0
19	4°43.3	67°23.3	51.8	128°46.8	39.7	35°20.5	32.8	52°15.5	34.9
20	19°45.8	82°25.0	51.3	143°47.5	40.1	50°22.6	32.7	67°17.7	34.9
21	34°48.3	97°26.6	·· 50.8	158°48.1	·· 40.6	65°24.7	·· 32.5	82°19.9	·· 34.8
22	49°50.7	112°28.3	50.3	173°48.8	41.0	80°26.8	32.4	97°22.2	34.8
23	64°53.2	127°30.0	49.7	188°49.5	41.4	95°28.9	32.3	112°24.4	34.7
Mer.pass.	18:41	ν 1.6′	d -0.5′	m -4.90	ν 0.7′	d 0.4′	m 1.59	ν 2.1′	d -0.1′ m -2.23	ν 2.2′	d -0.1′ m 0.74

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	79°55.7	142°31.7	S22°49.2	203°50.1	S19°41.8	110°31.0	S13°32.1	127°26.7	S18°34.6
1	94°58.1	157°33.4	48.7	218°50.8	42.2	125°33.1	32.0	142°28.9	34.6
2	110°00.6	172°35.1	48.2	233°51.5	42.6	140°35.2	31.8	157°31.1	34.5
3	125°03.0	187°36.8	·· 47.7	248°52.1	·· 43.0	155°37.2	·· 31.7	172°33.4	·· 34.5
4	140°05.5	202°38.5	47.1	263°52.8	43.4	170°39.3	31.6	187°35.6	34.4
5	155°08.0	217°40.3	46.6	278°53.4	43.8	185°41.4	31.4	202°37.8	34.3
6	170°10.4	232°42.0	S22°46.1	293°54.1	S19°44.2	200°43.5	S13°31.3	217°40.1	S18°34.3
7	185°12.9	247°43.7	45.6	308°54.8	44.7	215°45.6	31.1	232°42.3	34.2
8	200°15.4	262°45.4	45.1	323°55.4	45.1	230°47.7	31.0	247°44.5	34.2
9	215°17.8	277°47.2	·· 44.5	338°56.1	·· 45.5	245°49.8	·· 30.9	262°46.8	·· 34.1
10	230°20.3	292°48.9	44.0	353°56.8	45.9	260°51.9	30.7	277°49.0	34.0
11	245°22.8	307°50.6	43.5	8°57.4	46.3	275°53.9	30.6	292°51.2	34.0
12	260°25.2	322°52.4	S22°43.0	23°58.1	S19°46.7	290°56.0	S13°30.5	307°53.5	S18°33.9
13	275°27.7	337°54.1	42.4	38°58.8	47.1	305°58.1	30.3	322°55.7	33.9
14	290°30.2	352°55.9	41.9	53°59.4	47.5	321°00.2	30.2	337°57.9	33.8
15	305°32.6	7°57.6	·· 41.4	69°00.1	·· 47.9	336°02.3	·· 30.0	353°00.2	·· 33.7
16	320°35.1	22°59.4	40.9	84°00.7	48.3	351°04.4	29.9	8°02.4	33.7
17	335°37.5	38°01.2	40.3	99°01.4	48.7	6°06.4	29.8	23°04.6	33.6
18	350°40.0	53°02.9	S22°39.8	114°02.1	S19°49.1	21°08.5	S13°29.6	38°06.9	S18°33.6
19	5°42.5	68°04.7	39.3	129°02.7	49.6	36°10.6	29.5	53°09.1	33.5
20	20°44.9	83°06.5	38.8	144°03.4	50.0	51°12.7	29.3	68°11.3	33.4
21	35°47.4	98°08.3	·· 38.2	159°04.0	·· 50.4	66°14.8	·· 29.2	83°13.6	·· 33.4
22	50°49.9	113°10.0	37.7	174°04.7	50.8	81°16.9	29.1	98°15.8	33.3
23	65°52.3	128°11.8	37.2	189°05.4	51.2	96°19.0	28.9	113°18.0	33.3
Mer.pass.	18:37	ν 1.7′	d -0.5′	m -4.89	ν 0.7′	d 0.4′	m 1.59	ν 2.1′	d -0.1′ m -2.23	ν 2.2′	d -0.1′ m 0.74

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.6	56°39.6
Diphda	348°49.7	-17°52.1
Achernar	335°21.8	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°46.9	89°21.5
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.1	46°01.1
Bellatrix	278°25.3	6°22.1
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.5	7°24.6
Canopus	263°53.0	-52°42.3
Sirius	258°28.1	-16°44.7
Adhara	255°07.5	-29°00.0
Procyon	244°53.2	5°10.1
Pollux	243°20.1	27°58.3
Avior	234°15.3	-59°34.5
Suhail	222°47.9	-43°31.0
Miaplacidus	221°38.2	-69°48.1
Alphard	217°50.1	-8°45.1
Regulus	207°37.1	11°51.6
Dubhe	193°44.2	61°37.8
Denebola	182°27.6	14°27.0
Gienah	175°46.3	-17°39.6
Acrux	173°03.1	-63°12.8
Gacrux	171°54.6	-57°13.8
Alioth	166°15.5	55°50.3
Spica	158°25.2	-11°16.4
Alkaid	152°54.4	49°12.1
Hadar	148°40.0	-60°28.4
Menkent	148°00.9	-36°28.4
Arcturus	145°50.5	19°04.1
Rigil Kent.	139°44.3	-60°55.2
Kochab	137°20.9	74°03.8
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.3	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°16.4	-69°03.9
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.3	12°32.7
Eltanin	90°43.9	51°29.2
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.7
Enif	33°41.4	9°58.6
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.4	15°19.4

Dec 09 Thu	SHA	Mer.pass
Venus	63°17.2	14:34
Mars	125°20.6	10:26
Jupiter	30°53.1	16:42
Saturn	47°41.8	15:35

Dec 10 Fri	SHA	Mer.pass
Venus	62°55.6	14:31
Mars	124°37.6	10:25
Jupiter	30°44.3	16:39
Saturn	47°36.4	15:31

Dec 11 Sat	SHA	Mer.pass
Venus	62°36.1	14:28
Mars	123°54.5	10:24
Jupiter	30°35.3	16:36
Saturn	47°31.0	15:28

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°57.2	S22°48.8	112°20.6	8.7′	S19°15.5	-10.9′	58.5′
1	196°56.9	49.1	126°48.3	8.9′	19°04.6	-11.0′	58.5′
2	211°56.6	49.3	141°16.2	9.0′	18°53.6	-11.1′	58.5′
3	226°56.3	·· 49.6	155°44.1	9.1′	18°42.5	-11.2′	58.4′
4	241°56.0	49.8	170°12.3	9.2′	18°31.3	-11.3′	58.4′
5	256°55.8	50.1	184°40.5	9.4′	18°20.0	-11.4′	58.3′
6	271°55.5	S22°50.3	199°08.8	9.5′	S18°08.7	-11.4′	58.3′
7	286°55.2	50.5	213°37.3	9.6′	17°57.2	-11.5′	58.3′
8	301°54.9	50.8	228°05.9	9.7′	17°45.7	-11.6′	58.2′
9	316°54.6	·· 51.0	242°34.6	9.8′	17°34.1	-11.7′	58.2′
10	331°54.4	51.3	257°03.5	10.0′	17°22.4	-11.8′	58.1′
11	346°54.1	51.5	271°32.4	10.1′	17°10.6	-11.8′	58.1′
12	1°53.8	S22°51.7	286°01.5	10.2′	S16°58.8	-11.9′	58.1′
13	16°53.5	52.0	300°30.7	10.3′	16°46.9	-12.0′	58.0′
14	31°53.2	52.2	315°00.0	10.4′	16°34.9	-12.1′	58.0′
15	46°53.0	·· 52.4	329°29.4	10.5′	16°22.8	-12.1′	57.9′
16	61°52.7	52.7	343°59.0	10.7′	16°10.7	-12.2′	57.9′
17	76°52.4	52.9	358°28.6	10.8′	15°58.5	-12.3′	57.9′
18	91°52.1	S22°53.1	12°58.4	10.9′	S15°46.3	-12.3′	57.8′
19	106°51.8	53.4	27°28.3	11.0′	15°33.9	-12.4′	57.8′
20	121°51.5	53.6	41°58.3	11.1′	15°21.6	-12.4′	57.7′
21	136°51.3	·· 53.8	56°28.4	11.2′	15°09.1	-12.5′	57.7′
22	151°51.0	54.0	70°58.6	11.3′	14°56.6	-12.6′	57.7′
23	166°50.7	54.3	85°28.9	11.4′	14°44.1	-12.6′	57.6′
	SD = 16.2′	d = 0.2′	SD = 16.0′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°50.4	S22°54.5	99°59.3	11.5′	S14°31.4	-12.7′	57.6′
1	196°50.1	54.7	114°29.8	11.6′	14°18.8	-12.7′	57.6′
2	211°49.8	54.9	129°00.5	11.7′	14°06.0	-12.8′	57.5′
3	226°49.6	·· 55.2	143°31.2	11.8′	13°53.3	-12.8′	57.5′
4	241°49.3	55.4	158°02.0	11.9′	13°40.4	-12.9′	57.4′
5	256°49.0	55.6	172°33.0	12.0′	13°27.5	-12.9′	57.4′
6	271°48.7	S22°55.8	187°04.0	12.1′	S13°14.6	-13.0′	57.4′
7	286°48.4	56.0	201°35.1	12.2′	13°01.6	-13.0′	57.3′
8	301°48.1	56.3	216°06.3	12.3′	12°48.6	-13.1′	57.3′
9	316°47.9	·· 56.5	230°37.7	12.4′	12°35.6	-13.1′	57.3′
10	331°47.6	56.7	245°09.1	12.5′	12°22.5	-13.1′	57.2′
11	346°47.3	56.9	259°40.6	12.6′	12°09.3	-13.2′	57.2′
12	1°47.0	S22°57.1	274°12.2	12.7′	S11°56.1	-13.2′	57.1′
13	16°46.7	57.4	288°43.9	12.8′	11°42.9	-13.3′	57.1′
14	31°46.4	57.6	303°15.7	12.9′	11°29.6	-13.3′	57.1′
15	46°46.2	·· 57.8	317°47.5	13.0′	11°16.3	-13.3′	57.0′
16	61°45.9	58.0	332°19.5	13.0′	11°03.0	-13.4′	57.0′
17	76°45.6	58.2	346°51.5	13.1′	10°49.7	-13.4′	57.0′
18	91°45.3	S22°58.4	1°23.6	13.2′	S10°36.3	-13.4′	56.9′
19	106°45.0	58.6	15°55.9	13.3′	10°22.8	-13.5′	56.9′
20	121°44.7	58.8	30°28.1	13.4′	10°09.4	-13.5′	56.8′
21	136°44.4	·· 59.1	45°00.5	13.4′	09°55.9	-13.5′	56.8′
22	151°44.2	59.3	59°33.0	13.5′	09°42.4	-13.5′	56.8′
23	166°43.9	59.5	74°05.5	13.6′	09°28.8	-13.6′	56.7′
	SD = 16.2′	d = 0.2′	SD = 15.7′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	181°43.6	S22°59.7	88°38.1	13.7′	S09°15.3	-13.6′	56.7′
1	196°43.3	22°59.9	103°10.8	13.8′	09°01.7	-13.6′	56.7′
2	211°43.0	23°00.1	117°43.5	13.8′	08°48.0	-13.6′	56.6′
3	226°42.7	·· 00.3	132°16.4	13.9′	08°34.4	-13.7′	56.6′
4	241°42.4	00.5	146°49.3	14.0′	08°20.8	-13.7′	56.6′
5	256°42.1	00.7	161°22.2	14.0′	08°07.1	-13.7′	56.5′
6	271°41.9	S23°00.9	175°55.3	14.1′	S07°53.4	-13.7′	56.5′
7	286°41.6	01.1	190°28.4	14.2′	07°39.7	-13.7′	56.5′
8	301°41.3	01.3	205°01.5	14.2′	07°25.9	-13.7′	56.4′
9	316°41.0	·· 01.5	219°34.8	14.3′	07°12.2	-13.8′	56.4′
10	331°40.7	01.7	234°08.1	14.4′	06°58.4	-13.8′	56.4′
11	346°40.4	01.9	248°41.4	14.4′	06°44.6	-13.8′	56.3′
12	1°40.1	S23°02.1	263°14.9	14.5′	S06°30.9	-13.8′	56.3′
13	16°39.8	02.3	277°48.3	14.5′	06°17.1	-13.8′	56.3′
14	31°39.5	02.5	292°21.9	14.6′	06°03.2	-13.8′	56.2′
15	46°39.3	·· 02.7	306°55.5	14.7′	05°49.4	-13.8′	56.2′
16	61°39.0	02.9	321°29.1	14.7′	05°35.6	-13.8′	56.2′
17	76°38.7	03.1	336°02.8	14.8′	05°21.8	-13.8′	56.1′
18	91°38.4	S23°03.3	350°36.6	14.8′	S05°07.9	-13.9′	56.1′
19	106°38.1	03.5	5°10.4	14.9′	04°54.1	-13.9′	56.1′
20	121°37.8	03.6	19°44.3	14.9′	04°40.2	-13.9′	56.0′
21	136°37.5	·· 03.8	34°18.2	15.0′	04°26.3	-13.9′	56.0′
22	151°37.2	04.0	48°52.2	15.0′	04°12.5	-13.9′	56.0′
23	166°36.9	04.2	63°26.2	15.1′	03°58.6	-13.9′	56.0′
	SD = 16.2′	d = 0.2′	SD = 15.5′				

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	16:55
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	07:47	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°	05:57	06:29	06:57	16:49	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	19:54
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	02:30	03:23	20:24	21:17	22:55
56°	–:–	02:08	03:09	20:37	21:38	–:–
58°	–:–	01:41	02:53	20:53	22:06	–:–
S 60°	–:–	00:59	02:34	21:13	22:50	–:–

Lat.	Moonrise Thu	Moonrise Fri	Moonrise Sat	Moonset Thu	Moonset Fri	Moonset Sat
N 72°	15:24	14:23	13:49	19:12	21:52	·· ··
N 70°	14:41	14:05	13:40	19:53	22:09	·· ··
68°	14:12	13:50	13:33	20:21	22:22	·· ··
66°	13:50	13:37	13:27	20:41	22:32	·· ··
64°	13:32	13:27	13:22	20:58	22:41	·· ··
62°	13:18	13:18	13:18	21:11	22:49	·· ··
60°	13:05	13:10	13:14	21:22	22:55	·· ··
N 58°	12:55	13:04	13:10	21:32	23:01	·· ··
56°	12:45	12:58	13:07	21:41	23:06	·· ··
54°	12:37	12:52	13:04	21:48	23:10	·· ··
52°	12:29	12:47	13:02	21:55	23:14	·· ··
50°	12:23	12:43	13:00	22:01	23:18	·· ··
45°	12:08	12:33	12:55	22:14	23:26	·· ··
N 40°	11:56	12:25	12:50	22:25	23:32	·· ··
35°	11:46	12:18	12:47	22:34	23:38	·· ··
30°	11:37	12:12	12:44	22:42	23:43	·· ··
20°	11:21	12:01	12:38	22:55	23:51	·· ··
N 10°	11:07	11:52	12:33	23:07	23:58	·· ··
0°	10:54	11:43	12:28	23:18	·· ··	00:05
S 10°	10:41	11:34	12:24	23:29	·· ··	00:12
20°	10:27	11:25	12:19	23:41	·· ··	00:19
30°	10:11	11:14	12:13	23:54	·· ··	00:27
35°	10:02	11:08	12:10	·· ··	00:01	00:32
40°	09:51	11:00	12:06	·· ··	00:10	00:37
45°	09:39	10:52	12:02	·· ··	00:20	00:43
S 50°	09:23	10:42	11:56	00:08	00:32	00:50
52°	09:16	10:37	11:54	00:16	00:37	00:53
54°	09:08	10:32	11:51	00:25	00:43	00:57
56°	08:59	10:26	11:48	00:35	00:50	01:01
58°	08:48	10:19	11:45	00:46	00:57	01:05
S 60°	08:37	10:12	11:41	00:58	01:06	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 5-7 28-49%
09	07:49	07:35	11:52	17:06	04:41	
10	07:22	07:08	11:53	17:54	05:31	
11	06:54	06:40	11:53	18:39	06:17	

DUT1 = UT1-UTC = -0.1082 sec ΔT = TT-UT1 = +69.2922 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	80°54.8	143°13.6	S22°36.7	204°06.0	S19°51.6	111°21.0	S13°28.8	128°20.3	S18°33.2
1	95°57.3	158°15.4	36.1	219°06.7	52.0	126°23.1	28.6	143°22.5	33.1
2	110°59.7	173°17.2	35.6	234°07.3	52.4	141°25.2	28.5	158°24.7	33.1
3	126°02.2	188°19.0	·· 35.1	249°08.0	·· 52.8	156°27.3	·· 28.4	173°27.0	·· 33.0
4	141°04.6	203°20.8	34.6	264°08.7	53.2	171°29.4	28.2	188°29.2	33.0
5	156°07.1	218°22.6	34.0	279°09.3	53.6	186°31.5	28.1	203°31.4	32.9
6	171°09.6	233°24.5	S22°33.5	294°10.0	S19°54.0	201°33.5	S13°27.9	218°33.7	S18°32.8
7	186°12.0	248°26.3	33.0	309°10.6	54.4	216°35.6	27.8	233°35.9	32.8
8	201°14.5	263°28.1	32.5	324°11.3	54.8	231°37.7	27.7	248°38.1	32.7
9	216°17.0	278°29.9	·· 31.9	339°12.0	·· 55.2	246°39.8	·· 27.5	263°40.4	·· 32.7
10	231°19.4	293°31.8	31.4	354°12.6	55.6	261°41.9	27.4	278°42.6	32.6
11	246°21.9	308°33.6	30.9	9°13.3	56.0	276°43.9	27.2	293°44.8	32.5
12	261°24.4	323°35.4	S22°30.4	24°13.9	S19°56.4	291°46.0	S13°27.1	308°47.1	S18°32.5
13	276°26.8	338°37.3	29.8	39°14.6	56.8	306°48.1	27.0	323°49.3	32.4
14	291°29.3	353°39.1	29.3	54°15.2	57.2	321°50.2	26.8	338°51.5	32.3
15	306°31.8	8°41.0	·· 28.8	69°15.9	·· 57.6	336°52.3	·· 26.7	353°53.8	·· 32.3
16	321°34.2	23°42.8	28.3	84°16.6	58.0	351°54.3	26.5	8°56.0	32.2
17	336°36.7	38°44.7	27.7	99°17.2	58.4	6°56.4	26.4	23°58.2	32.2
18	351°39.1	53°46.6	S22°27.2	114°17.9	S19°58.8	21°58.5	S13°26.2	39°00.5	S18°32.1
19	6°41.6	68°48.4	26.7	129°18.5	59.2	37°00.6	26.1	54°02.7	32.0
20	21°44.1	83°50.3	26.2	144°19.2	19°59.6	52°02.7	26.0	69°04.9	32.0
21	36°46.5	98°52.2	·· 25.6	159°19.8	20°00.0	67°04.7	·· 25.8	84°07.2	·· 31.9
22	51°49.0	113°54.1	25.1	174°20.5	00.4	82°06.8	25.7	99°09.4	31.9
23	66°51.5	128°55.9	24.6	189°21.1	00.8	97°08.9	25.5	114°11.6	31.8
Mer.pass.	18:33	ν 1.8′	d -0.5′	m -4.89	ν 0.7′	d 0.4′	m 1.59	ν 2.1′	d -0.1′ m -2.22	ν 2.2′	d -0.1′ m 0.74

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	81°53.9	143°57.8	S22°24.1	204°21.8	S20°01.2	112°11.0	S13°25.4	129°13.8	S18°31.7
1	96°56.4	158°59.7	23.5	219°22.5	01.6	127°13.1	25.3	144°16.1	31.7
2	111°58.9	174°01.6	23.0	234°23.1	02.0	142°15.1	25.1	159°18.3	31.6
3	127°01.3	189°03.5	·· 22.5	249°23.8	·· 02.4	157°17.2	·· 25.0	174°20.5	·· 31.5
4	142°03.8	204°05.4	22.0	264°24.4	02.8	172°19.3	24.8	189°22.8	31.5
5	157°06.3	219°07.3	21.4	279°25.1	03.2	187°21.4	24.7	204°25.0	31.4
6	172°08.7	234°09.3	S22°20.9	294°25.7	S20°03.6	202°23.4	S13°24.5	219°27.2	S18°31.4
7	187°11.2	249°11.2	20.4	309°26.4	04.0	217°25.5	24.4	234°29.5	31.3
8	202°13.6	264°13.1	19.8	324°27.0	04.4	232°27.6	24.3	249°31.7	31.2
9	217°16.1	279°15.0	·· 19.3	339°27.7	·· 04.8	247°29.7	·· 24.1	264°33.9	·· 31.2
10	232°18.6	294°17.0	18.8	354°28.3	05.2	262°31.7	24.0	279°36.1	31.1
11	247°21.0	309°18.9	18.3	9°29.0	05.6	277°33.8	23.8	294°38.4	31.1
12	262°23.5	324°20.8	S22°17.7	24°29.6	S20°06.0	292°35.9	S13°23.7	309°40.6	S18°31.0
13	277°26.0	339°22.8	17.2	39°30.3	06.3	307°38.0	23.5	324°42.8	30.9
14	292°28.4	354°24.7	16.7	54°30.9	06.7	322°40.0	23.4	339°45.1	30.9
15	307°30.9	9°26.7	·· 16.2	69°31.6	·· 07.1	337°42.1	·· 23.3	354°47.3	·· 30.8
16	322°33.4	24°28.6	15.6	84°32.2	07.5	352°44.2	23.1	9°49.5	30.7
17	337°35.8	39°30.6	15.1	99°32.9	07.9	7°46.3	23.0	24°51.8	30.7
18	352°38.3	54°32.6	S22°14.6	114°33.5	S20°08.3	22°48.3	S13°22.8	39°54.0	S18°30.6
19	7°40.7	69°34.5	14.0	129°34.2	08.7	37°50.4	22.7	54°56.2	30.6
20	22°43.2	84°36.5	13.5	144°34.8	09.1	52°52.5	22.5	69°58.4	30.5
21	37°45.7	99°38.5	·· 13.0	159°35.5	·· 09.5	67°54.6	·· 22.4	85°00.7	·· 30.4
22	52°48.1	114°40.5	12.5	174°36.1	09.9	82°56.6	22.3	100°02.9	30.4
23	67°50.6	129°42.4	11.9	189°36.8	10.3	97°58.7	22.1	115°05.1	30.3
Mer.pass.	18:29	ν 1.9′	d -0.5′	m -4.88	ν 0.7′	d 0.4′	m 1.59	ν 2.1′	d -0.1′ m -2.22	ν 2.2′	d -0.1′ m 0.75

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	82°53.1	144°44.4	S22°11.4	204°37.4	S20°10.7	113°00.8	S13°22.0	130°07.4	S18°30.2
1	97°55.5	159°46.4	10.9	219°38.1	11.1	128°02.9	21.8	145°09.6	30.2
2	112°58.0	174°48.4	10.3	234°38.7	11.4	143°04.9	21.7	160°11.8	30.1
3	128°00.5	189°50.4	·· 09.8	249°39.4	·· 11.8	158°07.0	·· 21.5	175°14.0	·· 30.1
4	143°02.9	204°52.4	09.3	264°40.0	12.2	173°09.1	21.4	190°16.3	30.0
5	158°05.4	219°54.4	08.8	279°40.7	12.6	188°11.2	21.2	205°18.5	29.9
6	173°07.9	234°56.5	S22°08.2	294°41.3	S20°13.0	203°13.2	S13°21.1	220°20.7	S18°29.9
7	188°10.3	249°58.5	07.7	309°42.0	13.4	218°15.3	21.0	235°22.9	29.8
8	203°12.8	265°00.5	07.2	324°42.6	13.8	233°17.4	20.8	250°25.2	29.8
9	218°15.2	280°02.5	·· 06.7	339°43.3	·· 14.2	248°19.4	·· 20.7	265°27.4	·· 29.7
10	233°17.7	295°04.6	06.1	354°43.9	14.6	263°21.5	20.5	280°29.6	29.6
11	248°20.2	310°06.6	05.6	9°44.6	14.9	278°23.6	20.4	295°31.9	29.6
12	263°22.6	325°08.6	S22°05.1	24°45.2	S20°15.3	293°25.7	S13°20.2	310°34.1	S18°29.5
13	278°25.1	340°10.7	04.5	39°45.9	15.7	308°27.7	20.1	325°36.3	29.4
14	293°27.6	355°12.7	04.0	54°46.5	16.1	323°29.8	19.9	340°38.5	29.4
15	308°30.0	10°14.8	·· 03.5	69°47.2	·· 16.5	338°31.9	·· 19.8	355°40.8	·· 29.3
16	323°32.5	25°16.8	03.0	84°47.8	16.9	353°33.9	19.7	10°43.0	29.3
17	338°35.0	40°18.9	02.4	99°48.5	17.3	8°36.0	19.5	25°45.2	29.2
18	353°37.4	55°21.0	S22°01.9	114°49.1	S20°17.6	23°38.1	S13°19.4	40°47.4	S18°29.1
19	8°39.9	70°23.0	01.4	129°49.7	18.0	38°40.1	19.2	55°49.7	29.1
20	23°42.4	85°25.1	00.8	144°50.4	18.4	53°42.2	19.1	70°51.9	29.0
21	38°44.8	100°27.2	22°00.3	159°51.0	·· 18.8	68°44.3	·· 18.9	85°54.1	·· 28.9
22	53°47.3	115°29.3	21°59.8	174°51.7	19.2	83°46.4	18.8	100°56.3	28.9
23	68°49.7	130°31.4	59.3	189°52.3	19.6	98°48.4	18.6	115°58.6	28.8
Mer.pass.	18:25	ν 2.0′	d -0.5′	m -4.87	ν 0.6′	d 0.4′	m 1.59	ν 2.1′	d -0.1′ m -2.21	ν 2.2′	d -0.1′ m 0.75

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.7	56°39.6
Diphda	348°49.7	-17°52.2
Achernar	335°21.8	-57°07.8
Hamal	327°53.8	23°34.0
Polaris	314°47.6	89°21.5
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.1	46°01.2
Bellatrix	278°25.3	6°22.1
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.5	7°24.6
Canopus	263°53.0	-52°42.3
Sirius	258°28.1	-16°44.7
Adhara	255°07.5	-29°00.0
Procyon	244°53.2	5°10.1
Pollux	243°20.1	27°58.3
Avior	234°15.2	-59°34.5
Suhail	222°47.9	-43°31.0
Miaplacidus	221°38.1	-69°48.1
Alphard	217°50.1	-8°45.1
Regulus	207°37.0	11°51.6
Dubhe	193°44.1	61°37.8
Denebola	182°27.6	14°27.0
Gienah	175°46.3	-17°39.6
Acrux	173°03.1	-63°12.8
Gacrux	171°54.6	-57°13.8
Alioth	166°15.5	55°50.3
Spica	158°25.1	-11°16.4
Alkaid	152°54.4	49°12.1
Hadar	148°40.0	-60°28.4
Menkent	148°00.9	-36°28.4
Arcturus	145°50.5	19°04.1
Rigil Kent.	139°44.3	-60°55.2
Kochab	137°20.8	74°03.8
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.2	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°16.4	-69°03.9
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.3	12°32.7
Eltanin	90°43.9	51°29.2
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.4	38°48.3
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.7
Enif	33°41.4	9°58.5
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.4	15°19.4

Dec 12 Sun	SHA	Mer.pass
Venus	62°18.8	14:25
Mars	123°11.2	10:23
Jupiter	30°26.2	16:32
Saturn	47°25.5	15:24

Dec 13 Mon	SHA	Mer.pass
Venus	62°03.9	14:22
Mars	122°27.9	10:22
Jupiter	30°17.0	16:29
Saturn	47°19.9	15:21

Dec 14 Tue	SHA	Mer.pass
Venus	61°51.4	14:19
Mars	121°44.4	10:21
Jupiter	30°07.7	16:26
Saturn	47°14.3	15:17

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°36.6	S23°04.4	78°00.2	15.1′	S03°44.7	-13.9′	55.9′
1	196°36.4	04.6	92°34.3	15.1′	03°30.9	-13.9′	55.9′
2	211°36.1	04.8	107°08.5	15.2′	03°17.0	-13.9′	55.9′
3	226°35.8	·· 05.0	121°42.6	15.2′	03°03.1	-13.9′	55.8′
4	241°35.5	05.2	136°16.9	15.3′	02°49.3	-13.9′	55.8′
5	256°35.2	05.3	150°51.1	15.3′	02°35.4	-13.9′	55.8′
6	271°34.9	S23°05.5	165°25.4	15.3′	S02°21.6	-13.9′	55.7′
7	286°34.6	05.7	179°59.8	15.4′	02°07.7	-13.9′	55.7′
8	301°34.3	05.9	194°34.2	15.4′	01°53.8	-13.8′	55.7′
9	316°34.0	·· 06.1	209°08.6	15.4′	01°40.0	-13.8′	55.7′
10	331°33.7	06.2	223°43.0	15.5′	01°26.2	-13.8′	55.6′
11	346°33.4	06.4	238°17.5	15.5′	01°12.3	-13.8′	55.6′
12	1°33.2	S23°06.6	252°52.0	15.5′	S00°58.5	-13.8′	55.6′
13	16°32.9	06.8	267°26.5	15.6′	00°44.7	-13.8′	55.6′
14	31°32.6	07.0	282°01.1	15.6′	00°30.9	-13.8′	55.5′
15	46°32.3	·· 07.1	296°35.7	15.6′	00°17.1	-13.8′	55.5′
16	61°32.0	07.3	311°10.3	15.6′	S00°03.3	-13.8′	55.5′
17	76°31.7	07.5	325°45.0	15.7′	N00°10.5	13.8′	55.4′
18	91°31.4	S23°07.7	340°19.7	15.7′	N00°24.2	13.7′	55.4′
19	106°31.1	07.8	354°54.3	15.7′	00°38.0	13.7′	55.4′
20	121°30.8	08.0	9°29.1	15.7′	00°51.7	13.7′	55.4′
21	136°30.5	·· 08.2	24°03.8	15.8′	01°05.4	13.7′	55.3′
22	151°30.2	08.3	38°38.6	15.8′	01°19.1	13.7′	55.3′
23	166°29.9	08.5	53°13.3	15.8′	01°32.8	13.7′	55.3′
	SD = 16.2′	d = 0.2′	SD = 15.3′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°29.6	S23°08.7	67°48.1	15.8′	N01°46.4	13.6′	55.3′
1	196°29.3	08.8	82°22.9	15.8′	02°00.1	13.6′	55.2′
2	211°29.0	09.0	96°57.7	15.8′	02°13.7	13.6′	55.2′
3	226°28.8	·· 09.2	111°32.6	15.8′	02°27.3	13.6′	55.2′
4	241°28.5	09.3	126°07.4	15.9′	02°40.9	13.6′	55.2′
5	256°28.2	09.5	140°42.3	15.9′	02°54.5	13.5′	55.1′
6	271°27.9	S23°09.7	155°17.2	15.9′	N03°08.0	13.5′	55.1′
7	286°27.6	09.8	169°52.0	15.9′	03°21.5	13.5′	55.1′
8	301°27.3	10.0	184°26.9	15.9′	03°35.0	13.5′	55.1′
9	316°27.0	·· 10.2	199°01.8	15.9′	03°48.5	13.4′	55.1′
10	331°26.7	10.3	213°36.7	15.9′	04°01.9	13.4′	55.0′
11	346°26.4	10.5	228°11.6	15.9′	04°15.4	13.4′	55.0′
12	1°26.1	S23°10.6	242°46.5	15.9′	N04°28.8	13.4′	55.0′
13	16°25.8	10.8	257°21.4	15.9′	04°42.1	13.3′	55.0′
14	31°25.5	11.0	271°56.4	15.9′	04°55.5	13.3′	54.9′
15	46°25.2	·· 11.1	286°31.3	15.9′	05°08.8	13.3′	54.9′
16	61°24.9	11.3	301°06.2	15.9′	05°22.1	13.3′	54.9′
17	76°24.6	11.4	315°41.1	15.9′	05°35.3	13.2′	54.9′
18	91°24.3	S23°11.6	330°16.0	15.9′	N05°48.5	13.2′	54.9′
19	106°24.0	11.7	344°50.9	15.9′	06°01.7	13.2′	54.8′
20	121°23.7	11.9	359°25.8	15.9′	06°14.9	13.1′	54.8′
21	136°23.4	·· 12.0	14°00.7	15.9′	06°28.0	13.1′	54.8′
22	151°23.1	12.2	28°35.6	15.9′	06°41.1	13.1′	54.8′
23	166°22.8	12.3	43°10.5	15.9′	06°54.2	13.0′	54.8′
	SD = 16.2′	d = 0.2′	SD = 15.1′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°22.5	S23°12.5	57°45.3	15.9′	N07°07.2	13.0′	54.8′
1	196°22.2	12.6	72°20.2	15.9′	07°20.2	13.0′	54.7′
2	211°22.0	12.8	86°55.1	15.8′	07°33.2	12.9′	54.7′
3	226°21.7	·· 12.9	101°29.9	15.8′	07°46.1	12.9′	54.7′
4	241°21.4	13.1	116°04.7	15.8′	07°59.0	12.8′	54.7′
5	256°21.1	13.2	130°39.6	15.8′	08°11.8	12.8′	54.7′
6	271°20.8	S23°13.4	145°14.4	15.8′	N08°24.6	12.8′	54.6′
7	286°20.5	13.5	159°49.1	15.8′	08°37.4	12.7′	54.6′
8	301°20.2	13.7	174°23.9	15.8′	08°50.1	12.7′	54.6′
9	316°19.9	·· 13.8	188°58.7	15.7′	09°02.8	12.6′	54.6′
10	331°19.6	13.9	203°33.4	15.7′	09°15.5	12.6′	54.6′
11	346°19.3	14.1	218°08.1	15.7′	09°28.1	12.6′	54.6′
12	1°19.0	S23°14.2	232°42.8	15.7′	N09°40.6	12.5′	54.5′
13	16°18.7	14.4	247°17.5	15.7′	09°53.1	12.5′	54.5′
14	31°18.4	14.5	261°52.1	15.6′	10°05.6	12.4′	54.5′
15	46°18.1	·· 14.6	276°26.8	15.6′	10°18.0	12.4′	54.5′
16	61°17.8	14.8	291°01.4	15.6′	10°30.4	12.3′	54.5′
17	76°17.5	14.9	305°36.0	15.6′	10°42.8	12.3′	54.5′
18	91°17.2	S23°15.0	320°10.5	15.5′	N10°55.1	12.2′	54.4′
19	106°16.9	15.2	334°45.1	15.5′	11°07.3	12.2′	54.4′
20	121°16.6	15.3	349°19.6	15.5′	11°19.5	12.1′	54.4′
21	136°16.3	·· 15.4	3°54.1	15.5′	11°31.6	12.1′	54.4′
22	151°16.0	15.6	18°28.5	15.4′	11°43.7	12.0′	54.4′
23	166°15.7	15.7	33°02.9	15.4′	11°55.8	12.0′	54.4′
	SD = 16.2′	d = 0.1′	SD = 14.9′				

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

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 8-10 60-78%
12	06:27	06:13	11:54	19:21	07:00	
13	05:59	05:44	11:54	20:02	07:42	
14	05:30	05:16	11:55	20:44	08:23	

DUT1 = UT1-UTC = -0.1092 sec ΔT = TT-UT1 = +69.2932 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	83°52.2	145°33.5	S21°58.7	204°53.0	S20°20.0	113°50.5	S13°18.5	131°00.8	S18°28.7
1	98°54.7	160°35.6	58.2	219°53.6	20.3	128°52.6	18.3	146°03.0	28.7
2	113°57.1	175°37.7	57.7	234°54.3	20.7	143°54.6	18.2	161°05.3	28.6
3	128°59.6	190°39.8	·· 57.1	249°54.9	·· 21.1	158°56.7	·· 18.1	176°07.5	·· 28.6
4	144°02.1	205°41.9	56.6	264°55.5	21.5	173°58.8	17.9	191°09.7	28.5
5	159°04.5	220°44.0	56.1	279°56.2	21.9	189°00.8	17.8	206°11.9	28.4
6	174°07.0	235°46.1	S21°55.6	294°56.8	S20°22.2	204°02.9	S13°17.6	221°14.2	S18°28.4
7	189°09.5	250°48.2	55.0	309°57.5	22.6	219°05.0	17.5	236°16.4	28.3
8	204°11.9	265°50.3	54.5	324°58.1	23.0	234°07.0	17.3	251°18.6	28.2
9	219°14.4	280°52.5	·· 54.0	339°58.8	·· 23.4	249°09.1	·· 17.2	266°20.8	·· 28.2
10	234°16.8	295°54.6	53.4	354°59.4	23.8	264°11.2	17.0	281°23.1	28.1
11	249°19.3	310°56.8	52.9	10°00.0	24.2	279°13.2	16.9	296°25.3	28.1
12	264°21.8	325°58.9	S21°52.4	25°00.7	S20°24.5	294°15.3	S13°16.7	311°27.5	S18°28.0
13	279°24.2	341°01.0	51.9	40°01.3	24.9	309°17.4	16.6	326°29.7	27.9
14	294°26.7	356°03.2	51.3	55°02.0	25.3	324°19.4	16.4	341°32.0	27.9
15	309°29.2	11°05.4	·· 50.8	70°02.6	·· 25.7	339°21.5	·· 16.3	356°34.2	·· 27.8
16	324°31.6	26°07.5	50.3	85°03.2	26.0	354°23.6	16.1	11°36.4	27.7
17	339°34.1	41°09.7	49.7	100°03.9	26.4	9°25.6	16.0	26°38.6	27.7
18	354°36.6	56°11.9	S21°49.2	115°04.5	S20°26.8	24°27.7	S13°15.9	41°40.8	S18°27.6
19	9°39.0	71°14.0	48.7	130°05.2	27.2	39°29.8	15.7	56°43.1	27.5
20	24°41.5	86°16.2	48.2	145°05.8	27.6	54°31.8	15.6	71°45.3	27.5
21	39°44.0	101°18.4	·· 47.6	160°06.4	·· 27.9	69°33.9	·· 15.4	86°47.5	·· 27.4
22	54°46.4	116°20.6	47.1	175°07.1	28.3	84°36.0	15.3	101°49.7	27.4
23	69°48.9	131°22.8	46.6	190°07.7	28.7	99°38.0	15.1	116°52.0	27.3
Mer.pass.	18:22	ν 2.1′	d -0.5′	m -4.86	ν 0.6′	d 0.4′	m 1.58	ν 2.1′	d -0.1′ m -2.21	ν 2.2′	d -0.1′ m 0.75

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	84°51.3	146°25.0	S21°46.0	205°08.4	S20°29.1	114°40.1	S13°15.0	131°54.2	S18°27.2
1	99°53.8	161°27.2	45.5	220°09.0	29.4	129°42.1	14.8	146°56.4	27.2
2	114°56.3	176°29.4	45.0	235°09.6	29.8	144°44.2	14.7	161°58.6	27.1
3	129°58.7	191°31.6	·· 44.5	250°10.3	·· 30.2	159°46.3	·· 14.5	177°00.9	·· 27.0
4	145°01.2	206°33.8	43.9	265°10.9	30.6	174°48.3	14.4	192°03.1	27.0
5	160°03.7	221°36.0	43.4	280°11.6	30.9	189°50.4	14.2	207°05.3	26.9
6	175°06.1	236°38.2	S21°42.9	295°12.2	S20°31.3	204°52.5	S13°14.1	222°07.5	S18°26.8
7	190°08.6	251°40.5	42.3	310°12.8	31.7	219°54.5	13.9	237°09.7	26.8
8	205°11.1	266°42.7	41.8	325°13.5	32.1	234°56.6	13.8	252°12.0	26.7
9	220°13.5	281°44.9	·· 41.3	340°14.1	·· 32.4	249°58.6	·· 13.6	267°14.2	·· 26.7
10	235°16.0	296°47.2	40.8	355°14.7	32.8	265°00.7	13.5	282°16.4	26.6
11	250°18.5	311°49.4	40.2	10°15.4	33.2	280°02.8	13.3	297°18.6	26.5
12	265°20.9	326°51.7	S21°39.7	25°16.0	S20°33.6	295°04.8	S13°13.2	312°20.9	S18°26.5
13	280°23.4	341°53.9	39.2	40°16.6	33.9	310°06.9	13.0	327°23.1	26.4
14	295°25.8	356°56.2	38.6	55°17.3	34.3	325°09.0	12.9	342°25.3	26.3
15	310°28.3	11°58.5	·· 38.1	70°17.9	·· 34.7	340°11.0	·· 12.7	357°27.5	·· 26.3
16	325°30.8	27°00.7	37.6	85°18.6	35.1	355°13.1	12.6	12°29.7	26.2
17	340°33.2	42°03.0	37.1	100°19.2	35.4	10°15.1	12.4	27°32.0	26.1
18	355°35.7	57°05.3	S21°36.5	115°19.8	S20°35.8	25°17.2	S13°12.3	42°34.2	S18°26.1
19	10°38.2	72°07.6	36.0	130°20.5	36.2	40°19.3	12.1	57°36.4	26.0
20	25°40.6	87°09.8	35.5	145°21.1	36.5	55°21.3	12.0	72°38.6	25.9
21	40°43.1	102°12.1	·· 34.9	160°21.7	·· 36.9	70°23.4	·· 11.8	87°40.9	·· 25.9
22	55°45.6	117°14.4	34.4	175°22.4	37.3	85°25.4	11.7	102°43.1	25.8
23	70°48.0	132°16.7	33.9	190°23.0	37.6	100°27.5	11.5	117°45.3	25.8
Mer.pass.	18:18	ν 2.2′	d -0.5′	m -4.85	ν 0.6′	d 0.4′	m 1.58	ν 2.1′	d -0.1′ m -2.20	ν 2.2′	d -0.1′ m 0.75

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	85°50.5	147°19.0	S21°33.4	205°23.6	S20°38.0	115°29.6	S13°11.4	132°47.5	S18°25.7
1	100°53.0	162°21.3	32.8	220°24.3	38.4	130°31.6	11.2	147°49.7	25.6
2	115°55.4	177°23.6	32.3	235°24.9	38.8	145°33.7	11.1	162°52.0	25.6
3	130°57.9	192°26.0	·· 31.8	250°25.5	·· 39.1	160°35.7	·· 10.9	177°54.2	·· 25.5
4	146°00.3	207°28.3	31.3	265°26.2	39.5	175°37.8	10.8	192°56.4	25.4
5	161°02.8	222°30.6	30.7	280°26.8	39.9	190°39.8	10.6	207°58.6	25.4
6	176°05.3	237°32.9	S21°30.2	295°27.4	S20°40.2	205°41.9	S13°10.5	223°00.8	S18°25.3
7	191°07.7	252°35.3	29.7	310°28.1	40.6	220°44.0	10.3	238°03.1	25.2
8	206°10.2	267°37.6	29.1	325°28.7	41.0	235°46.0	10.2	253°05.3	25.2
9	221°12.7	282°40.0	·· 28.6	340°29.3	·· 41.3	250°48.1	·· 10.0	268°07.5	·· 25.1
10	236°15.1	297°42.3	28.1	355°30.0	41.7	265°50.1	09.9	283°09.7	25.0
11	251°17.6	312°44.7	27.6	10°30.6	42.1	280°52.2	09.7	298°11.9	25.0
12	266°20.1	327°47.0	S21°27.0	25°31.2	S20°42.4	295°54.2	S13°09.6	313°14.2	S18°24.9
13	281°22.5	342°49.4	26.5	40°31.9	42.8	310°56.3	09.4	328°16.4	24.8
14	296°25.0	357°51.7	26.0	55°32.5	43.2	325°58.4	09.3	343°18.6	24.8
15	311°27.4	12°54.1	·· 25.5	70°33.1	·· 43.5	341°00.4	·· 09.1	358°20.8	·· 24.7
16	326°29.9	27°56.5	24.9	85°33.7	43.9	356°02.5	09.0	13°23.0	24.7
17	341°32.4	42°58.9	24.4	100°34.4	44.2	11°04.5	08.8	28°25.3	24.6
18	356°34.8	58°01.3	S21°23.9	115°35.0	S20°44.6	26°06.6	S13°08.7	43°27.5	S18°24.5
19	11°37.3	73°03.6	23.4	130°35.6	45.0	41°08.6	08.5	58°29.7	24.5
20	26°39.8	88°06.0	22.8	145°36.3	45.3	56°10.7	08.4	73°31.9	24.4
21	41°42.2	103°08.4	·· 22.3	160°36.9	·· 45.7	71°12.8	·· 08.2	88°34.1	·· 24.3
22	56°44.7	118°10.8	21.8	175°37.5	46.1	86°14.8	08.1	103°36.4	24.3
23	71°47.2	133°13.2	21.2	190°38.1	46.4	101°16.9	07.9	118°38.6	24.2
Mer.pass.	18:14	ν 2.3′	d -0.5′	m -4.84	ν 0.6′	d 0.4′	m 1.58	ν 2.1′	d -0.1′ m -2.20	ν 2.2′	d -0.1′ m 0.75

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.7	56°39.6
Diphda	348°49.7	-17°52.2
Achernar	335°21.8	-57°07.9
Hamal	327°53.8	23°34.0
Polaris	314°48.3	89°21.5
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°06.0	-8°10.6
Capella	280°25.1	46°01.2
Bellatrix	278°25.2	6°22.1
Elnath	278°04.7	28°37.5
Alnilam	275°40.0	-1°11.3
Betelgeuse	270°54.5	7°24.6
Canopus	263°53.0	-52°42.4
Sirius	258°28.1	-16°44.7
Adhara	255°07.5	-29°00.0
Procyon	244°53.2	5°10.1
Pollux	243°20.1	27°58.3
Avior	234°15.2	-59°34.5
Suhail	222°47.8	-43°31.0
Miaplacidus	221°38.1	-69°48.1
Alphard	217°50.0	-8°45.1
Regulus	207°37.0	11°51.6
Dubhe	193°44.1	61°37.7
Denebola	182°27.6	14°27.0
Gienah	175°46.2	-17°39.6
Acrux	173°03.0	-63°12.8
Gacrux	171°54.5	-57°13.8
Alioth	166°15.5	55°50.3
Spica	158°25.1	-11°16.4
Alkaid	152°54.3	49°12.1
Hadar	148°40.0	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.5	19°04.1
Rigil Kent.	139°44.2	-60°55.2
Kochab	137°20.8	74°03.8
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.2	26°38.5
Antares	112°19.3	-26°28.7
Atria	107°16.4	-69°03.8
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.3	12°32.7
Eltanin	90°43.9	51°29.2
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.4	38°48.3
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.6
Enif	33°41.4	9°58.5
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.5	15°19.4

Dec 15 Wed	SHA	Mer.pass
Venus	61°41.2	14:16
Mars	121°00.8	10:20
Jupiter	29°58.3	16:22
Saturn	47°08.6	15:14

Dec 16 Thu	SHA	Mer.pass
Venus	61°33.6	14:12
Mars	120°17.0	10:19
Jupiter	29°48.7	16:19
Saturn	47°02.8	15:10

Dec 17 Fri	SHA	Mer.pass
Venus	61°28.5	14:09
Mars	119°33.1	10:18
Jupiter	29°39.1	16:16
Saturn	46°57.0	15:07

Horizontal parallax	
Venus:	0.4
Mars:	0.1

	h	Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°15.4	S23°15.8	47°37.3	15.4′	N12°07.8	11.9′	54.4′
1	196°15.1	16.0	62°11.7	15.3′	12°19.7	11.9′	54.4′
2	211°14.8	16.1	76°46.0	15.3′	12°31.6	11.8′	54.3′
3	226°14.5	·· 16.2	91°20.3	15.3′	12°43.4	11.8′	54.3′
4	241°14.2	16.4	105°54.6	15.2′	12°55.2	11.7′	54.3′
5	256°13.9	16.5	120°28.8	15.2′	13°06.9	11.7′	54.3′
6	271°13.6	S23°16.6	135°03.0	15.2′	N13°18.6	11.6′	54.3′
7	286°13.3	16.7	149°37.2	15.1′	13°30.2	11.6′	54.3′
8	301°13.0	16.9	164°11.3	15.1′	13°41.7	11.5′	54.3′
9	316°12.7	·· 17.0	178°45.4	15.1′	13°53.2	11.4′	54.3′
10	331°12.4	17.1	193°19.4	15.0′	14°04.7	11.4′	54.2′
11	346°12.1	17.2	207°53.4	15.0′	14°16.1	11.3′	54.2′
12	1°11.8	S23°17.3	222°27.4	14.9′	N14°27.4	11.3′	54.2′
13	16°11.5	17.5	237°01.3	14.9′	14°38.6	11.2′	54.2′
14	31°11.2	17.6	251°35.2	14.9′	14°49.8	11.1′	54.2′
15	46°10.9	·· 17.7	266°09.1	14.8′	15°01.0	11.1′	54.2′
16	61°10.6	17.8	280°42.9	14.8′	15°12.0	11.0′	54.2′
17	76°10.3	17.9	295°16.7	14.7′	15°23.0	10.9′	54.2′
18	91°10.0	S23°18.0	309°50.4	14.7′	N15°34.0	10.9′	54.2′
19	106°09.7	18.2	324°24.1	14.6′	15°44.9	10.8′	54.1′
20	121°09.4	18.3	338°57.7	14.6′	15°55.7	10.7′	54.1′
21	136°09.1	·· 18.4	353°31.3	14.6′	16°06.4	10.7′	54.1′
22	151°08.8	18.5	8°04.9	14.5′	16°17.1	10.6′	54.1′
23	166°08.5	18.6	22°38.4	14.5′	16°27.7	10.5′	54.1′
	SD = 16.2′	d = 0.1′	SD = 14.8′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°08.2	S23°18.7	37°11.8	14.4′	N16°38.2	10.5′	54.1′
1	196°07.9	18.8	51°45.2	14.4′	16°48.7	10.4′	54.1′
2	211°07.6	18.9	66°18.6	14.3′	16°59.1	10.3′	54.1′
3	226°07.3	·· 19.1	80°51.9	14.3′	17°09.4	10.3′	54.1′
4	241°07.0	19.2	95°25.2	14.2′	17°19.7	10.2′	54.1′
5	256°06.7	19.3	109°58.4	14.2′	17°29.9	10.1′	54.1′
6	271°06.4	S23°19.4	124°31.6	14.1′	N17°40.0	10.0′	54.1′
7	286°06.0	19.5	139°04.7	14.1′	17°50.0	10.0′	54.0′
8	301°05.7	19.6	153°37.8	14.0′	18°00.0	9.9′	54.0′
9	316°05.4	·· 19.7	168°10.8	14.0′	18°09.9	9.8′	54.0′
10	331°05.1	19.8	182°43.8	13.9′	18°19.7	9.7′	54.0′
11	346°04.8	19.9	197°16.7	13.9′	18°29.4	9.7′	54.0′
12	1°04.5	S23°20.0	211°49.6	13.8′	N18°39.1	9.6′	54.0′
13	16°04.2	20.1	226°22.4	13.8′	18°48.6	9.5′	54.0′
14	31°03.9	20.2	240°55.2	13.7′	18°58.1	9.4′	54.0′
15	46°03.6	·· 20.3	255°27.9	13.7′	19°07.5	9.3′	54.0′
16	61°03.3	20.4	270°00.6	13.6′	19°16.9	9.2′	54.0′
17	76°03.0	20.5	284°33.2	13.6′	19°26.1	9.2′	54.0′
18	91°02.7	S23°20.6	299°05.8	13.5′	N19°35.3	9.1′	54.0′
19	106°02.4	20.7	313°38.3	13.5′	19°44.4	9.0′	54.0′
20	121°02.1	20.8	328°10.7	13.4′	19°53.4	8.9′	54.0′
21	136°01.8	·· 20.9	342°43.1	13.3′	20°02.3	8.8′	54.0′
22	151°01.5	21.0	357°15.5	13.3′	20°11.1	8.7′	54.0′
23	166°01.2	21.1	11°47.8	13.2′	20°19.8	8.7′	54.0′
	SD = 16.2′	d = 0.1′	SD = 14.8′				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°00.9	S23°21.1	26°20.0	13.2′	N20°28.5	8.6′	54.0′
1	196°00.6	21.2	40°52.2	13.1′	20°37.1	8.5′	53.9′
2	211°00.3	21.3	55°24.3	13.1′	20°45.5	8.4′	53.9′
3	226°00.0	·· 21.4	69°56.4	13.0′	20°53.9	8.3′	53.9′
4	240°59.7	21.5	84°28.4	13.0′	21°02.2	8.2′	53.9′
5	255°59.4	21.6	99°00.4	12.9′	21°10.4	8.1′	53.9′
6	270°59.1	S23°21.7	113°32.3	12.9′	N21°18.5	8.0′	53.9′
7	285°58.8	21.8	128°04.2	12.8′	21°26.6	7.9′	53.9′
8	300°58.5	21.8	142°36.0	12.8′	21°34.5	7.8′	53.9′
9	315°58.1	·· 21.9	157°07.7	12.7′	21°42.3	7.7′	53.9′
10	330°57.8	22.0	171°39.4	12.6′	21°50.1	7.6′	53.9′
11	345°57.5	22.1	186°11.1	12.6′	21°57.7	7.5′	53.9′
12	0°57.2	S23°22.2	200°42.7	12.5′	N22°05.2	7.4′	53.9′
13	15°56.9	22.3	215°14.2	12.5′	22°12.7	7.4′	53.9′
14	30°56.6	22.3	229°45.7	12.4′	22°20.0	7.3′	53.9′
15	45°56.3	·· 22.4	244°17.1	12.4′	22°27.3	7.2′	53.9′
16	60°56.0	22.5	258°48.5	12.3′	22°34.4	7.1′	53.9′
17	75°55.7	22.6	273°19.8	12.3′	22°41.5	7.0′	53.9′
18	90°55.4	S23°22.7	287°51.1	12.2′	N22°48.4	6.9′	53.9′
19	105°55.1	22.7	302°22.3	12.2′	22°55.3	6.7′	53.9′
20	120°54.8	22.8	316°53.5	12.1′	23°02.0	6.6′	53.9′
21	135°54.5	·· 22.9	331°24.6	12.1′	23°08.7	6.5′	53.9′
22	150°54.2	23.0	345°55.6	12.0′	23°15.2	6.4′	53.9′
23	165°53.9	23.0	0°26.7	12.0′	23°21.7	6.3′	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	09:49			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	14:32	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°	–:–	01:37	02:51	21:00	22:16	–:–
S 60°	–:–	00:48	02:31	21:21	23:05	–:–

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
N 72°	11:43			06:05		
N 70°	12:11	11:25		05:39	07:56	
68°	12:32	12:08	11:01	05:19	07:14	09:56
66°	12:49	12:36	12:16	05:03	06:47	08:42
64°	13:03	12:58	12:53	04:51	06:25	08:05
62°	13:15	13:16	13:20	04:40	06:09	07:39
60°	13:25	13:31	13:40	04:31	05:55	07:19
N 58°	13:34	13:44	13:57	04:23	05:43	07:03
56°	13:42	13:54	14:12	04:16	05:32	06:49
54°	13:49	14:04	14:24	04:10	05:23	06:37
52°	13:55	14:13	14:35	04:04	05:15	06:26
50°	14:01	14:21	14:45	03:59	05:08	06:17
45°	14:13	14:37	15:06	03:48	04:53	05:57
N 40°	14:23	14:51	15:23	03:39	04:40	05:41
35°	14:32	15:02	15:37	03:32	04:29	05:28
30°	14:40	15:13	15:49	03:25	04:20	05:16
20°	14:53	15:30	16:11	03:14	04:04	04:56
N 10°	15:05	15:46	16:29	03:03	03:50	04:39
0°	15:16	16:00	16:47	02:54	03:37	04:22
S 10°	15:27	16:15	17:04	02:45	03:24	04:06
20°	15:40	16:31	17:23	02:35	03:11	03:49
30°	15:53	16:49	17:45	02:23	02:55	03:30
35°	16:02	16:59	17:57	02:17	02:46	03:18
40°	16:11	17:12	18:12	02:10	02:36	03:05
45°	16:22	17:26	18:30	02:01	02:23	02:50
S 50°	16:35	17:44	18:52	01:51	02:09	02:31
52°	16:41	17:52	19:02	01:46	02:02	02:22
54°	16:48	18:02	19:14	01:41	01:55	02:12
56°	16:56	18:12	19:28	01:35	01:46	02:01
58°	17:04	18:25	19:44	01:29	01:37	01:48
S 60°	17:14	18:39	20:03	01:21	01:26	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 11-13 85-96%
15	05:02	04:47	11:55	21:27	09:05	
16	04:33	04:18	11:56	22:11	09:49	
17	04:04	03:49	11:56	22:58	10:34	

DUT1 = UT1-UTC = -0.1090 sec ΔT = TT-UT1 = +69.2930 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	86°49.6	148°15.7	S21°20.7	205°38.8	S20°46.8	116°18.9	S13°07.8	133°40.8	S18°24.1
1	101°52.1	163°18.1	20.2	220°39.4	47.1	131°21.0	07.6	148°43.0	24.1
2	116°54.6	178°20.5	19.7	235°40.0	47.5	146°23.0	07.5	163°45.2	24.0
3	131°57.0	193°22.9	·· 19.1	250°40.7	·· 47.9	161°25.1	·· 07.3	178°47.4	·· 23.9
4	146°59.5	208°25.4	18.6	265°41.3	48.2	176°27.1	07.2	193°49.7	23.9
5	162°01.9	223°27.8	18.1	280°41.9	48.6	191°29.2	07.0	208°51.9	23.8
6	177°04.4	238°30.2	S21°17.6	295°42.5	S20°49.0	206°31.2	S13°06.9	223°54.1	S18°23.7
7	192°06.9	253°32.7	17.0	310°43.2	49.3	221°33.3	06.7	238°56.3	23.7
8	207°09.3	268°35.1	16.5	325°43.8	49.7	236°35.3	06.6	253°58.5	23.6
9	222°11.8	283°37.6	·· 16.0	340°44.4	·· 50.0	251°37.4	·· 06.4	269°00.8	·· 23.5
10	237°14.3	298°40.0	15.5	355°45.0	50.4	266°39.5	06.3	284°03.0	23.5
11	252°16.7	313°42.5	14.9	10°45.7	50.7	281°41.5	06.1	299°05.2	23.4
12	267°19.2	328°45.0	S21°14.4	25°46.3	S20°51.1	296°43.6	S13°06.0	314°07.4	S18°23.3
13	282°21.7	343°47.4	13.9	40°46.9	51.5	311°45.6	05.8	329°09.6	23.3
14	297°24.1	358°49.9	13.4	55°47.6	51.8	326°47.7	05.6	344°11.8	23.2
15	312°26.6	13°52.4	·· 12.8	70°48.2	·· 52.2	341°49.7	·· 05.5	359°14.1	·· 23.1
16	327°29.1	28°54.9	12.3	85°48.8	52.5	356°51.8	05.3	14°16.3	23.1
17	342°31.5	43°57.4	11.8	100°49.4	52.9	11°53.8	05.2	29°18.5	23.0
18	357°34.0	58°59.9	S21°11.3	115°50.1	S20°53.2	26°55.9	S13°05.0	44°20.7	S18°23.0
19	12°36.4	74°02.4	10.7	130°50.7	53.6	41°57.9	04.9	59°22.9	22.9
20	27°38.9	89°04.9	10.2	145°51.3	54.0	57°00.0	04.7	74°25.1	22.8
21	42°41.4	104°07.4	·· 09.7	160°51.9	·· 54.3	72°02.0	·· 04.6	89°27.4	·· 22.8
22	57°43.8	119°09.9	09.2	175°52.5	54.7	87°04.1	04.4	104°29.6	22.7
23	72°46.3	134°12.4	08.6	190°53.2	55.0	102°06.1	04.3	119°31.8	22.6
Mer.pass.	18:10	ν 2.4′	d -0.5′	m -4.82	ν 0.6′	d 0.4′	m 1.58	ν 2.1′	d -0.2′ m -2.19	ν 2.2′	d -0.1′ m 0.75

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	87°48.8	149°14.9	S21°08.1	205°53.8	S20°55.4	117°08.2	S13°04.1	134°34.0	S18°22.6
1	102°51.2	164°17.4	07.6	220°54.4	55.7	132°10.2	04.0	149°36.2	22.5
2	117°53.7	179°20.0	07.1	235°55.0	56.1	147°12.3	03.8	164°38.4	22.4
3	132°56.2	194°22.5	·· 06.5	250°55.7	·· 56.4	162°14.3	·· 03.7	179°40.7	·· 22.4
4	147°58.6	209°25.0	06.0	265°56.3	56.8	177°16.4	03.5	194°42.9	22.3
5	163°01.1	224°27.6	05.5	280°56.9	57.1	192°18.4	03.4	209°45.1	22.2
6	178°03.6	239°30.1	S21°05.0	295°57.5	S20°57.5	207°20.5	S13°03.2	224°47.3	S18°22.2
7	193°06.0	254°32.7	04.5	310°58.2	57.9	222°22.5	03.0	239°49.5	22.1
8	208°08.5	269°35.3	03.9	325°58.8	58.2	237°24.6	02.9	254°51.7	22.0
9	223°10.9	284°37.8	·· 03.4	340°59.4	·· 58.6	252°26.6	·· 02.7	269°54.0	·· 22.0
10	238°13.4	299°40.4	02.9	356°00.0	58.9	267°28.7	02.6	284°56.2	21.9
11	253°15.9	314°43.0	02.4	11°00.6	59.3	282°30.7	02.4	299°58.4	21.8
12	268°18.3	329°45.5	S21°01.8	26°01.3	S20°59.6	297°32.8	S13°02.3	315°00.6	S18°21.8
13	283°20.8	344°48.1	01.3	41°01.9	21°00.0	312°34.8	02.1	330°02.8	21.7
14	298°23.3	359°50.7	00.8	56°02.5	00.3	327°36.9	02.0	345°05.0	21.6
15	313°25.7	14°53.3	21°00.3	71°03.1	·· 00.7	342°38.9	·· 01.8	0°07.2	·· 21.6
16	328°28.2	29°55.9	20°59.8	86°03.7	01.0	357°40.9	01.7	15°09.5	21.5
17	343°30.7	44°58.5	59.2	101°04.4	01.4	12°43.0	01.5	30°11.7	21.4
18	358°33.1	60°01.1	S20°58.7	116°05.0	S21°01.7	27°45.0	S13°01.3	45°13.9	S18°21.4
19	13°35.6	75°03.7	58.2	131°05.6	02.1	42°47.1	01.2	60°16.1	21.3
20	28°38.1	90°06.3	57.7	146°06.2	02.4	57°49.1	01.0	75°18.3	21.2
21	43°40.5	105°08.9	·· 57.1	161°06.8	·· 02.8	72°51.2	·· 00.9	90°20.5	·· 21.2
22	58°43.0	120°11.6	56.6	176°07.5	03.1	87°53.2	00.7	105°22.7	21.1
23	73°45.4	135°14.2	56.1	191°08.1	03.4	102°55.3	00.6	120°25.0	21.0
Mer.pass.	18:06	ν 2.5′	d -0.5′	m -4.80	ν 0.6′	d 0.4′	m 1.57	ν 2.0′	d -0.2′ m -2.19	ν 2.2′	d -0.1′ m 0.75

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	88°47.9	150°16.8	S20°55.6	206°08.7	S21°03.8	117°57.3	S13°00.4	135°27.2	S18°21.0
1	103°50.4	165°19.5	55.1	221°09.3	04.1	132°59.4	00.3	150°29.4	20.9
2	118°52.8	180°22.1	54.5	236°09.9	04.5	148°01.4	13°00.1	165°31.6	20.8
3	133°55.3	195°24.7	·· 54.0	251°10.5	·· 04.8	163°03.5	12°59.9	180°33.8	·· 20.8
4	148°57.8	210°27.4	53.5	266°11.2	05.2	178°05.5	59.8	195°36.0	20.7
5	164°00.2	225°30.0	53.0	281°11.8	05.5	193°07.5	59.6	210°38.2	20.6
6	179°02.7	240°32.7	S20°52.5	296°12.4	S21°05.9	208°09.6	S12°59.5	225°40.5	S18°20.6
7	194°05.2	255°35.4	51.9	311°13.0	06.2	223°11.6	59.3	240°42.7	20.5
8	209°07.6	270°38.0	51.4	326°13.6	06.6	238°13.7	59.2	255°44.9	20.4
9	224°10.1	285°40.7	·· 50.9	341°14.2	·· 06.9	253°15.7	·· 59.0	270°47.1	·· 20.4
10	239°12.6	300°43.4	50.4	356°14.9	07.2	268°17.8	58.9	285°49.3	20.3
11	254°15.0	315°46.1	49.9	11°15.5	07.6	283°19.8	58.7	300°51.5	20.2
12	269°17.5	330°48.8	S20°49.3	26°16.1	S21°07.9	298°21.9	S12°58.5	315°53.7	S18°20.2
13	284°19.9	345°51.5	48.8	41°16.7	08.3	313°23.9	58.4	330°56.0	20.1
14	299°22.4	0°54.2	48.3	56°17.3	08.6	328°25.9	58.2	345°58.2	20.0
15	314°24.9	15°56.9	·· 47.8	71°17.9	·· 09.0	343°28.0	·· 58.1	1°00.4	·· 20.0
16	329°27.3	30°59.6	47.3	86°18.6	09.3	358°30.0	57.9	16°02.6	19.9
17	344°29.8	46°02.3	46.7	101°19.2	09.6	13°32.1	57.8	31°04.8	19.8
18	359°32.3	61°05.0	S20°46.2	116°19.8	S21°10.0	28°34.1	S12°57.6	46°07.0	S18°19.8
19	14°34.7	76°07.7	45.7	131°20.4	10.3	43°36.2	57.4	61°09.2	19.7
20	29°37.2	91°10.4	45.2	146°21.0	10.7	58°38.2	57.3	76°11.4	19.6
21	44°39.7	106°13.2	·· 44.7	161°21.6	·· 11.0	73°40.2	·· 57.1	91°13.7	·· 19.6
22	59°42.1	121°15.9	44.2	176°22.2	11.3	88°42.3	57.0	106°15.9	19.5
23	74°44.6	136°18.6	43.6	191°22.8	11.7	103°44.3	56.8	121°18.1	19.4
Mer.pass.	18:02	ν 2.6′	d -0.5′	m -4.78	ν 0.6′	d 0.3′	m 1.57	ν 2.0′	d -0.2′ m -2.18	ν 2.2′	d -0.1′ m 0.76

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.7	56°39.6
Diphda	348°49.8	-17°52.2
Achernar	335°21.9	-57°07.9
Hamal	327°53.8	23°34.0
Polaris	314°48.8	89°21.6
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°05.9	-8°10.6
Capella	280°25.1	46°01.2
Bellatrix	278°25.2	6°22.1
Elnath	278°04.7	28°37.5
Alnilam	275°39.9	-1°11.3
Betelgeuse	270°54.5	7°24.6
Canopus	263°52.9	-52°42.4
Sirius	258°28.1	-16°44.8
Adhara	255°07.5	-29°00.1
Procyon	244°53.2	5°10.1
Pollux	243°20.1	27°58.3
Avior	234°15.2	-59°34.5
Suhail	222°47.8	-43°31.0
Miaplacidus	221°38.1	-69°48.1
Alphard	217°50.0	-8°45.1
Regulus	207°37.0	11°51.6
Dubhe	193°44.0	61°37.7
Denebola	182°27.5	14°27.0
Gienah	175°46.2	-17°39.6
Acrux	173°03.0	-63°12.8
Gacrux	171°54.5	-57°13.8
Alioth	166°15.4	55°50.3
Spica	158°25.1	-11°16.4
Alkaid	152°54.3	49°12.1
Hadar	148°39.9	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.5	19°04.1
Rigil Kent.	139°44.2	-60°55.2
Kochab	137°20.8	74°03.7
Zuben'ubi	136°59.1	-16°07.8
Alphecca	126°06.2	26°38.4
Antares	112°19.3	-26°28.7
Atria	107°16.3	-69°03.8
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.2	12°32.7
Eltanin	90°43.9	51°29.2
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.4	38°48.3
Nunki	75°51.3	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.1
Deneb	49°27.8	45°21.6
Enif	33°41.4	9°58.5
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.5	15°19.4

Dec 18 Sat	SHA	Mer.pass
Venus	61°26.0	14:05
Mars	118°49.1	10:17
Jupiter	29°29.3	16:13
Saturn	46°51.2	15:03

Dec 19 Sun	SHA	Mer.pass
Venus	61°26.1	14:01
Mars	118°05.0	10:16
Jupiter	29°19.4	16:09
Saturn	46°45.2	15:00

Dec 20 Mon	SHA	Mer.pass
Venus	61°28.9	13:56
Mars	117°20.8	10:15
Jupiter	29°09.4	16:06
Saturn	46°39.3	14:56

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.6	S23°23.1	14°57.6	11.9′	N23°28.0	6.2′	53.9′
1	195°53.3	23.2	29°28.5	11.9′	23°34.2	6.1′	53.9′
2	210°53.0	23.2	43°59.4	11.8′	23°40.3	6.0′	53.9′
3	225°52.7	·· 23.3	58°30.2	11.8′	23°46.4	5.9′	53.9′
4	240°52.3	23.4	73°00.9	11.7′	23°52.3	5.8′	53.9′
5	255°52.0	23.4	87°31.6	11.7′	23°58.1	5.7′	53.9′
6	270°51.7	S23°23.5	102°02.3	11.6′	N24°03.7	5.6′	53.9′
7	285°51.4	23.6	116°32.9	11.6′	24°09.3	5.5′	53.9′
8	300°51.1	23.6	131°03.5	11.5′	24°14.8	5.4′	53.9′
9	315°50.8	·· 23.7	145°34.0	11.5′	24°20.2	5.2′	53.9′
10	330°50.5	23.8	160°04.5	11.4′	24°25.4	5.1′	53.9′
11	345°50.2	23.8	174°34.9	11.4′	24°30.5	5.0′	53.9′
12	0°49.9	S23°23.9	189°05.2	11.3′	N24°35.6	4.9′	53.9′
13	15°49.6	24.0	203°35.6	11.3′	24°40.5	4.8′	53.9′
14	30°49.3	24.0	218°05.9	11.2′	24°45.3	4.7′	53.9′
15	45°49.0	·· 24.1	232°36.1	11.2′	24°49.9	4.6′	53.9′
16	60°48.7	24.1	247°06.3	11.2′	24°54.5	4.4′	53.9′
17	75°48.4	24.2	261°36.5	11.1′	24°58.9	4.3′	53.9′
18	90°48.1	S23°24.3	276°06.6	11.1′	N25°03.3	4.2′	53.9′
19	105°47.7	24.3	290°36.7	11.0′	25°07.5	4.1′	53.9′
20	120°47.4	24.4	305°06.7	11.0′	25°11.6	4.0′	53.9′
21	135°47.1	·· 24.4	319°36.7	11.0′	25°15.6	3.9′	53.9′
22	150°46.8	24.5	334°06.6	10.9′	25°19.4	3.7′	53.9′
23	165°46.5	24.5	348°36.6	10.9′	25°23.2	3.6′	53.9′
	SD = 16.2′	d = 0.1′	SD = 14.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.2	S23°24.6	3°06.4	10.8′	N25°26.8	3.5′	53.9′
1	195°45.9	24.6	17°36.3	10.8′	25°30.3	3.4′	53.9′
2	210°45.6	24.7	32°06.1	10.8′	25°33.7	3.3′	53.9′
3	225°45.3	·· 24.7	46°35.9	10.7′	25°37.0	3.1′	53.9′
4	240°45.0	24.8	61°05.6	10.7′	25°40.1	3.0′	53.9′
5	255°44.7	24.8	75°35.3	10.7′	25°43.1	2.9′	54.0′
6	270°44.4	S23°24.9	90°05.0	10.6′	N25°46.0	2.8′	54.0′
7	285°44.1	24.9	104°34.7	10.6′	25°48.8	2.7′	54.0′
8	300°43.7	25.0	119°04.3	10.6′	25°51.4	2.5′	54.0′
9	315°43.4	·· 25.0	133°33.9	10.6′	25°54.0	2.4′	54.0′
10	330°43.1	25.1	148°03.4	10.5′	25°56.4	2.3′	54.0′
11	345°42.8	25.1	162°32.9	10.5′	25°58.7	2.2′	54.0′
12	0°42.5	S23°25.1	177°02.4	10.5′	N26°00.8	2.0′	54.0′
13	15°42.2	25.2	191°31.9	10.5′	26°02.9	1.9′	54.0′
14	30°41.9	25.2	206°01.4	10.4′	26°04.8	1.8′	54.0′
15	45°41.6	·· 25.3	220°30.8	10.4′	26°06.6	1.7′	54.0′
16	60°41.3	25.3	235°00.2	10.4′	26°08.2	1.5′	54.0′
17	75°41.0	25.3	249°29.6	10.4′	26°09.8	1.4′	54.0′
18	90°40.7	S23°25.4	263°59.0	10.4′	N26°11.2	1.3′	54.0′
19	105°40.4	25.4	278°28.3	10.3′	26°12.4	1.2′	54.0′
20	120°40.0	25.5	292°57.7	10.3′	26°13.6	1.0′	54.0′
21	135°39.7	·· 25.5	307°27.0	10.3′	26°14.6	0.9′	54.0′
22	150°39.4	25.5	321°56.3	10.3′	26°15.5	0.8′	54.0′
23	165°39.1	25.6	336°25.6	10.3′	26°16.3	0.6′	54.0′
	SD = 16.2′	d = 0.1′	SD = 14.7′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°38.8	S23°25.6	350°54.8	10.3′	N26°17.0	0.5′	54.1′
1	195°38.5	25.6	5°24.1	10.2′	26°17.5	0.4′	54.1′
2	210°38.2	25.7	19°53.3	10.2′	26°17.9	0.3′	54.1′
3	225°37.9	·· 25.7	34°22.6	10.2′	26°18.1	0.1′	54.1′
4	240°37.6	25.7	48°51.8	10.2′	26°18.3	0.0′	54.1′
5	255°37.3	25.8	63°21.0	10.2′	26°18.3	-0.1′	54.1′
6	270°37.0	S23°25.8	77°50.2	10.2′	N26°18.2	-0.2′	54.1′
7	285°36.7	25.8	92°19.4	10.2′	26°17.9	-0.4′	54.1′
8	300°36.3	25.8	106°48.6	10.2′	26°17.5	-0.5′	54.1′
9	315°36.0	·· 25.9	121°17.8	10.2′	26°17.0	-0.6′	54.1′
10	330°35.7	25.9	135°47.0	10.2′	26°16.4	-0.8′	54.1′
11	345°35.4	25.9	150°16.2	10.2′	26°15.6	-0.9′	54.1′
12	0°35.1	S23°25.9	164°45.4	10.2′	N26°14.8	-1.0′	54.1′
13	15°34.8	26.0	179°14.6	10.2′	26°13.7	-1.1′	54.1′
14	30°34.5	26.0	193°43.8	10.2′	26°12.6	-1.3′	54.2′
15	45°34.2	·· 26.0	208°13.0	10.2′	26°11.3	-1.4′	54.2′
16	60°33.9	26.0	222°42.2	10.2′	26°09.9	-1.5′	54.2′
17	75°33.6	26.0	237°11.4	10.2′	26°08.4	-1.7′	54.2′
18	90°33.3	S23°26.1	251°40.6	10.2′	N26°06.7	-1.8′	54.2′
19	105°32.9	26.1	266°09.8	10.2′	26°05.0	-1.9′	54.2′
20	120°32.6	26.1	280°39.0	10.2′	26°03.0	-2.0′	54.2′
21	135°32.3	·· 26.1	295°08.3	10.2′	26°01.0	-2.2′	54.2′
22	150°32.0	26.1	309°37.5	10.3′	25°58.8	-2.3′	54.2′
23	165°31.7	26.1	324°06.8	10.3′	25°56.5	-2.4′	54.2′
	SD = 16.2′	d = 0.0′	SD = 14.7′				

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°	07:48	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	09:22	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	21:48	–:–
58°	–:–	01:36	02:52	21:03	22:18	–:–
S 60°	–:–	00:46	02:31	21:23	23:09	–:–

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

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 14-16 99-99%
18	03:34	03:20	11:57	23:47	11:22	
19	03:05	02:50	11:57	–:–	12:12	
20	02:35	02:20	11:58	00:38	13:03	

DUT1 = UT1-UTC = -0.1080 sec ΔT = TT-UT1 = +69.2920 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	89°47.1	151°21.4	S20°43.1	206°23.5	S21°12.0	118°46.4	S12°56.7	136°20.3	S18°19.4
1	104°49.5	166°24.1	42.6	221°24.1	12.4	133°48.4	56.5	151°22.5	19.3
2	119°52.0	181°26.9	42.1	236°24.7	12.7	148°50.4	56.4	166°24.7	19.2
3	134°54.4	196°29.6	·· 41.6	251°25.3	·· 13.0	163°52.5	·· 56.2	181°26.9	·· 19.2
4	149°56.9	211°32.4	41.0	266°25.9	13.4	178°54.5	56.0	196°29.1	19.1
5	164°59.4	226°35.2	40.5	281°26.5	13.7	193°56.6	55.9	211°31.3	19.0
6	180°01.8	241°37.9	S20°40.0	296°27.1	S21°14.1	208°58.6	S12°55.7	226°33.6	S18°19.0
7	195°04.3	256°40.7	39.5	311°27.7	14.4	224°00.6	55.6	241°35.8	18.9
8	210°06.8	271°43.5	39.0	326°28.4	14.7	239°02.7	55.4	256°38.0	18.8
9	225°09.2	286°46.3	·· 38.5	341°29.0	·· 15.1	254°04.7	·· 55.2	271°40.2	·· 18.8
10	240°11.7	301°49.1	37.9	356°29.6	15.4	269°06.8	55.1	286°42.4	18.7
11	255°14.2	316°51.9	37.4	11°30.2	15.7	284°08.8	54.9	301°44.6	18.6
12	270°16.6	331°54.7	S20°36.9	26°30.8	S21°16.1	299°10.8	S12°54.8	316°46.8	S18°18.5
13	285°19.1	346°57.5	36.4	41°31.4	16.4	314°12.9	54.6	331°49.0	18.5
14	300°21.5	2°00.3	35.9	56°32.0	16.7	329°14.9	54.5	346°51.2	18.4
15	315°24.0	17°03.1	·· 35.4	71°32.6	·· 17.1	344°17.0	·· 54.3	1°53.5	·· 18.3
16	330°26.5	32°05.9	34.9	86°33.2	17.4	359°19.0	54.1	16°55.7	18.3
17	345°28.9	47°08.7	34.3	101°33.8	17.7	14°21.0	54.0	31°57.9	18.2
18	0°31.4	62°11.6	S20°33.8	116°34.5	S21°18.1	29°23.1	S12°53.8	47°00.1	S18°18.1
19	15°33.9	77°14.4	33.3	131°35.1	18.4	44°25.1	53.7	62°02.3	18.1
20	30°36.3	92°17.2	32.8	146°35.7	18.7	59°27.1	53.5	77°04.5	18.0
21	45°38.8	107°20.1	·· 32.3	161°36.3	·· 19.1	74°29.2	·· 53.3	92°06.7	·· 17.9
22	60°41.3	122°22.9	31.8	176°36.9	19.4	89°31.2	53.2	107°08.9	17.9
23	75°43.7	137°25.8	31.3	191°37.5	19.7	104°33.3	53.0	122°11.1	17.8
Mer.pass.	17:58	ν 2.7′	d -0.5′	m -4.75	ν 0.6′	d 0.3′	m 1.57	ν 2.0′	d -0.2′ m -2.18	ν 2.2′	d -0.1′ m 0.76

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	90°46.2	152°28.6	S20°30.7	206°38.1	S21°20.1	119°35.3	S12°52.9	137°13.3	S18°17.7
1	105°48.7	167°31.5	30.2	221°38.7	20.4	134°37.3	52.7	152°15.6	17.7
2	120°51.1	182°34.3	29.7	236°39.3	20.7	149°39.4	52.6	167°17.8	17.6
3	135°53.6	197°37.2	·· 29.2	251°39.9	·· 21.1	164°41.4	·· 52.4	182°20.0	·· 17.5
4	150°56.0	212°40.1	28.7	266°40.5	21.4	179°43.4	52.2	197°22.2	17.5
5	165°58.5	227°43.0	28.2	281°41.1	21.7	194°45.5	52.1	212°24.4	17.4
6	181°01.0	242°45.8	S20°27.7	296°41.8	S21°22.1	209°47.5	S12°51.9	227°26.6	S18°17.3
7	196°03.4	257°48.7	27.2	311°42.4	22.4	224°49.6	51.8	242°28.8	17.3
8	211°05.9	272°51.6	26.6	326°43.0	22.7	239°51.6	51.6	257°31.0	17.2
9	226°08.4	287°54.5	·· 26.1	341°43.6	·· 23.0	254°53.6	·· 51.4	272°33.2	·· 17.1
10	241°10.8	302°57.4	25.6	356°44.2	23.4	269°55.7	51.3	287°35.4	17.1
11	256°13.3	318°00.3	25.1	11°44.8	23.7	284°57.7	51.1	302°37.6	17.0
12	271°15.8	333°03.2	S20°24.6	26°45.4	S21°24.0	299°59.7	S12°51.0	317°39.9	S18°16.9
13	286°18.2	348°06.2	24.1	41°46.0	24.4	315°01.8	50.8	332°42.1	16.8
14	301°20.7	3°09.1	23.6	56°46.6	24.7	330°03.8	50.6	347°44.3	16.8
15	316°23.2	18°12.0	·· 23.1	71°47.2	·· 25.0	345°05.8	·· 50.5	2°46.5	·· 16.7
16	331°25.6	33°14.9	22.6	86°47.8	25.3	0°07.9	50.3	17°48.7	16.6
17	346°28.1	48°17.9	22.0	101°48.4	25.7	15°09.9	50.2	32°50.9	16.6
18	1°30.5	63°20.8	S20°21.5	116°49.0	S21°26.0	30°11.9	S12°50.0	47°53.1	S18°16.5
19	16°33.0	78°23.7	21.0	131°49.6	26.3	45°14.0	49.8	62°55.3	16.4
20	31°35.5	93°26.7	20.5	146°50.2	26.6	60°16.0	49.7	77°57.5	16.4
21	46°37.9	108°29.6	·· 20.0	161°50.8	·· 27.0	75°18.0	·· 49.5	92°59.7	·· 16.3
22	61°40.4	123°32.6	19.5	176°51.4	27.3	90°20.1	49.4	108°01.9	16.2
23	76°42.9	138°35.6	19.0	191°52.0	27.6	105°22.1	49.2	123°04.1	16.2
Mer.pass.	17:54	ν 2.9′	d -0.5′	m -4.72	ν 0.6′	d 0.3′	m 1.57	ν 2.0′	d -0.2′ m -2.17	ν 2.2′	d -0.1′ m 0.76

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°45.3	153°38.5	S20°18.5	206°52.6	S21°27.9	120°24.1	S12°49.0	138°06.4	S18°16.1
1	106°47.8	168°41.5	18.0	221°53.2	28.3	135°26.2	48.9	153°08.6	16.0
2	121°50.3	183°44.5	17.5	236°53.8	28.6	150°28.2	48.7	168°10.8	16.0
3	136°52.7	198°47.5	·· 16.9	251°54.4	·· 28.9	165°30.2	·· 48.6	183°13.0	·· 15.9
4	151°55.2	213°50.4	16.4	266°55.0	29.2	180°32.3	48.4	198°15.2	15.8
5	166°57.7	228°53.4	15.9	281°55.6	29.6	195°34.3	48.2	213°17.4	15.8
6	182°00.1	243°56.4	S20°15.4	296°56.2	S21°29.9	210°36.3	S12°48.1	228°19.6	S18°15.7
7	197°02.6	258°59.4	14.9	311°56.8	30.2	225°38.4	47.9	243°21.8	15.6
8	212°05.0	274°02.4	14.4	326°57.4	30.5	240°40.4	47.8	258°24.0	15.5
9	227°07.5	289°05.4	·· 13.9	341°58.0	·· 30.8	255°42.4	·· 47.6	273°26.2	·· 15.5
10	242°10.0	304°08.4	13.4	356°58.6	31.2	270°44.5	47.4	288°28.4	15.4
11	257°12.4	319°11.5	12.9	11°59.2	31.5	285°46.5	47.3	303°30.6	15.3
12	272°14.9	334°14.5	S20°12.4	26°59.9	S21°31.8	300°48.5	S12°47.1	318°32.8	S18°15.3
13	287°17.4	349°17.5	11.9	42°00.5	32.1	315°50.5	46.9	333°35.0	15.2
14	302°19.8	4°20.5	11.4	57°01.0	32.4	330°52.6	46.8	348°37.3	15.1
15	317°22.3	19°23.6	·· 10.9	72°01.6	·· 32.8	345°54.6	·· 46.6	3°39.5	·· 15.1
16	332°24.8	34°26.6	10.4	87°02.2	33.1	0°56.6	46.5	18°41.7	15.0
17	347°27.2	49°29.7	09.9	102°02.8	33.4	15°58.7	46.3	33°43.9	14.9
18	2°29.7	64°32.7	S20°09.4	117°03.4	S21°33.7	31°00.7	S12°46.1	48°46.1	S18°14.9
19	17°32.1	79°35.8	08.8	132°04.0	34.0	46°02.7	46.0	63°48.3	14.8
20	32°34.6	94°38.8	08.3	147°04.6	34.3	61°04.8	45.8	78°50.5	14.7
21	47°37.1	109°41.9	·· 07.8	162°05.2	·· 34.7	76°06.8	·· 45.6	93°52.7	·· 14.6
22	62°39.5	124°45.0	07.3	177°05.8	35.0	91°08.8	45.5	108°54.9	14.6
23	77°42.0	139°48.0	06.8	192°06.4	35.3	106°10.8	45.3	123°57.1	14.5
Mer.pass.	17:50	ν 3.0′	d -0.5′	m -4.69	ν 0.6′	d 0.3′	m 1.56	ν 2.0′	d -0.2′ m -2.17	ν 2.2′	d -0.1′ m 0.76

Stars	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.7	56°39.7
Diphda	348°49.8	-17°52.2
Achernar	335°21.9	-57°07.9
Hamal	327°53.8	23°34.0
Polaris	314°49.5	89°21.6
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°05.9	-8°10.6
Capella	280°25.1	46°01.2
Bellatrix	278°25.2	6°22.1
Elnath	278°04.6	28°37.5
Alnilam	275°39.9	-1°11.3
Betelgeuse	270°54.5	7°24.6
Canopus	263°52.9	-52°42.4
Sirius	258°28.1	-16°44.8
Adhara	255°07.4	-29°00.1
Procyon	244°53.1	5°10.1
Pollux	243°20.0	27°58.3
Avior	234°15.2	-59°34.6
Suhail	222°47.8	-43°31.0
Miaplacidus	221°38.0	-69°48.1
Alphard	217°50.0	-8°45.1
Regulus	207°37.0	11°51.6
Dubhe	193°44.0	61°37.7
Denebola	182°27.5	14°27.0
Gienah	175°46.2	-17°39.6
Acrux	173°02.9	-63°12.8
Gacrux	171°54.5	-57°13.8
Alioth	166°15.4	55°50.3
Spica	158°25.1	-11°16.4
Alkaid	152°54.3	49°12.1
Hadar	148°39.9	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.1
Rigil Kent.	139°44.1	-60°55.2
Kochab	137°20.7	74°03.7
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.2	26°38.4
Antares	112°19.3	-26°28.7
Atria	107°16.3	-69°03.8
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.2	12°32.7
Eltanin	90°43.9	51°29.2
Kaus Aust.	83°36.3	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.2	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.0
Deneb	49°27.8	45°21.6
Enif	33°41.4	9°58.5
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.5	15°19.4

Dec 21 Tue	SHA	Mer.pass
Venus	61°34.3	13:52
Mars	116°36.4	10:14
Jupiter	28°59.3	16:03
Saturn	46°33.2	14:52

Dec 22 Wed	SHA	Mer.pass
Venus	61°42.4	13:47
Mars	115°51.9	10:13
Jupiter	28°49.1	15:59
Saturn	46°27.2	14:49

Dec 23 Thu	SHA	Mer.pass
Venus	61°53.2	13:43
Mars	115°07.3	10:12
Jupiter	28°38.8	15:56
Saturn	46°21.0	14:45

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°31.4	S23°26.1	338°36.0	10.3′	N25°54.1	-2.5′	54.3′
1	195°31.1	26.2	353°05.3	10.3′	25°51.6	-2.7′	54.3′
2	210°30.8	26.2	7°34.6	10.3′	25°48.9	-2.8′	54.3′
3	225°30.5	·· 26.2	22°03.9	10.3′	25°46.1	-2.9′	54.3′
4	240°30.2	26.2	36°33.2	10.3′	25°43.2	-3.1′	54.3′
5	255°29.9	26.2	51°02.6	10.4′	25°40.1	-3.2′	54.3′
6	270°29.5	S23°26.2	65°31.9	10.4′	N25°36.9	-3.3′	54.3′
7	285°29.2	26.2	80°01.3	10.4′	25°33.6	-3.4′	54.3′
8	300°28.9	26.2	94°30.7	10.4′	25°30.2	-3.6′	54.3′
9	315°28.6	·· 26.2	109°00.1	10.4′	25°26.6	-3.7′	54.3′
10	330°28.3	26.2	123°29.6	10.5′	25°23.0	-3.8′	54.4′
11	345°28.0	26.2	137°59.0	10.5′	25°19.2	-3.9′	54.4′
12	0°27.7	S23°26.2	152°28.5	10.5′	N25°15.2	-4.1′	54.4′
13	15°27.4	26.2	166°58.0	10.5′	25°11.2	-4.2′	54.4′
14	30°27.1	26.2	181°27.6	10.6′	25°07.0	-4.3′	54.4′
15	45°26.8	·· 26.2	195°57.1	10.6′	25°02.7	-4.4′	54.4′
16	60°26.4	26.2	210°26.7	10.6′	24°58.3	-4.5′	54.4′
17	75°26.1	26.2	224°56.3	10.6′	24°53.7	-4.7′	54.4′
18	90°25.8	S23°26.2	239°26.0	10.7′	N24°49.1	-4.8′	54.5′
19	105°25.5	26.2	253°55.6	10.7′	24°44.3	-4.9′	54.5′
20	120°25.2	26.2	268°25.3	10.7′	24°39.4	-5.0′	54.5′
21	135°24.9	·· 26.2	282°55.1	10.8′	24°34.4	-5.1′	54.5′
22	150°24.6	26.2	297°24.8	10.8′	24°29.2	-5.3′	54.5′
23	165°24.3	26.2	311°54.6	10.8′	24°23.9	-5.4′	54.5′
	SD = 16.3′	d = 0.0′	SD = 14.8′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°24.0	S23°26.2	326°24.4	10.9′	N24°18.6	-5.5′	54.5′
1	195°23.7	26.2	340°54.3	10.9′	24°13.1	-5.6′	54.5′
2	210°23.3	26.2	355°24.2	10.9′	24°07.4	-5.7′	54.6′
3	225°23.0	·· 26.2	9°54.1	11.0′	24°01.7	-5.9′	54.6′
4	240°22.7	26.2	24°24.1	11.0′	23°55.8	-6.0′	54.6′
5	255°22.4	26.2	38°54.1	11.0′	23°49.9	-6.1′	54.6′
6	270°22.1	S23°26.2	53°24.1	11.1′	N23°43.8	-6.2′	54.6′
7	285°21.8	26.2	67°54.2	11.1′	23°37.6	-6.3′	54.6′
8	300°21.5	26.1	82°24.3	11.1′	23°31.2	-6.4′	54.7′
9	315°21.2	·· 26.1	96°54.4	11.2′	23°24.8	-6.5′	54.7′
10	330°20.9	26.1	111°24.6	11.2′	23°18.3	-6.7′	54.7′
11	345°20.6	26.1	125°54.8	11.3′	23°11.6	-6.8′	54.7′
12	0°20.2	S23°26.1	140°25.1	11.3′	N23°04.8	-6.9′	54.7′
13	15°19.9	26.1	154°55.4	11.3′	22°57.9	-7.0′	54.7′
14	30°19.6	26.1	169°25.7	11.4′	22°50.9	-7.1′	54.7′
15	45°19.3	·· 26.0	183°56.1	11.4′	22°43.8	-7.2′	54.8′
16	60°19.0	26.0	198°26.5	11.5′	22°36.6	-7.3′	54.8′
17	75°18.7	26.0	212°57.0	11.5′	22°29.3	-7.4′	54.8′
18	90°18.4	S23°26.0	227°27.5	11.5′	N22°21.8	-7.5′	54.8′
19	105°18.1	26.0	241°58.0	11.6′	22°14.3	-7.7′	54.8′
20	120°17.8	25.9	256°28.6	11.6′	22°06.6	-7.8′	54.8′
21	135°17.5	·· 25.9	270°59.2	11.7′	21°58.9	-7.9′	54.9′
22	150°17.1	25.9	285°29.9	11.7′	21°51.0	-8.0′	54.9′
23	165°16.8	25.9	300°00.6	11.7′	21°43.0	-8.1′	54.9′
	SD = 16.3′	d = -0.0′	SD = 14.9′				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.5	S23°25.8	314°31.3	11.8′	N21°34.9	-8.2′	54.9′
1	195°16.2	25.8	329°02.1	11.8′	21°26.8	-8.3′	54.9′
2	210°15.9	25.8	343°32.9	11.9′	21°18.5	-8.4′	54.9′
3	225°15.6	·· 25.7	358°03.8	11.9′	21°10.1	-8.5′	55.0′
4	240°15.3	25.7	12°34.7	12.0′	21°01.6	-8.6′	55.0′
5	255°15.0	25.7	27°05.7	12.0′	20°53.0	-8.7′	55.0′
6	270°14.7	S23°25.7	41°36.6	12.0′	N20°44.3	-8.8′	55.0′
7	285°14.4	25.6	56°07.7	12.1′	20°35.5	-8.9′	55.0′
8	300°14.0	25.6	70°38.8	12.1′	20°26.6	-9.0′	55.1′
9	315°13.7	·· 25.6	85°09.9	12.2′	20°17.6	-9.1′	55.1′
10	330°13.4	25.5	99°41.1	12.2′	20°08.5	-9.2′	55.1′
11	345°13.1	25.5	114°12.3	12.2′	19°59.3	-9.3′	55.1′
12	0°12.8	S23°25.5	128°43.5	12.3′	N19°50.0	-9.4′	55.1′
13	15°12.5	25.4	143°14.8	12.3′	19°40.6	-9.5′	55.2′
14	30°12.2	25.4	157°46.1	12.4′	19°31.1	-9.6′	55.2′
15	45°11.9	·· 25.3	172°17.5	12.4′	19°21.5	-9.7′	55.2′
16	60°11.6	25.3	186°48.9	12.5′	19°11.9	-9.8′	55.2′
17	75°11.3	25.3	201°20.4	12.5′	19°02.1	-9.9′	55.2′
18	90°10.9	S23°25.2	215°51.9	12.5′	N18°52.2	-10.0′	55.3′
19	105°10.6	25.2	230°23.4	12.6′	18°42.3	-10.0′	55.3′
20	120°10.3	25.1	244°55.0	12.6′	18°32.3	-10.1′	55.3′
21	135°10.0	·· 25.1	259°26.6	12.7′	18°22.1	-10.2′	55.3′
22	150°09.7	25.1	273°58.2	12.7′	18°11.9	-10.3′	55.3′
23	165°09.4	25.0	288°29.9	12.7′	18°01.6	-10.4′	55.4′
	SD = 16.3′	d = -0.0′	SD = 15.0′				

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

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 17-19 97-87%
21	02:06	01:51	11:58	01:29	13:54	
22	01:36	01:21	11:59	02:19	14:44	
23	01:06	00:51	11:59	03:08	15:32	

IERS Earth Orientation data as of 08-Dec-2022

DUT1 = UT1-UTC = -0.1073 sec ΔT = TT-UT1 = +69.2913 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	92°44.5	154°51.1	S20°06.3	207°07.0	S21°35.6	121°12.9	S12°45.2	138°59.3	S18°14.4
1	107°46.9	169°54.2	05.8	222°07.6	35.9	136°14.9	45.0	154°01.5	14.4
2	122°49.4	184°57.3	05.3	237°08.2	36.2	151°16.9	44.8	169°03.7	14.3
3	137°51.9	200°00.4	·· 04.8	252°08.8	·· 36.6	166°19.0	·· 44.7	184°05.9	·· 14.2
4	152°54.3	215°03.5	04.3	267°09.4	36.9	181°21.0	44.5	199°08.1	14.2
5	167°56.8	230°06.6	03.8	282°10.0	37.2	196°23.0	44.3	214°10.3	14.1
6	182°59.3	245°09.7	S20°03.3	297°10.6	S21°37.5	211°25.0	S12°44.2	229°12.5	S18°14.0
7	198°01.7	260°12.8	02.8	312°11.2	37.8	226°27.1	44.0	244°14.7	14.0
8	213°04.2	275°15.9	02.3	327°11.8	38.1	241°29.1	43.9	259°17.0	13.9
9	228°06.6	290°19.0	·· 01.8	342°12.4	·· 38.4	256°31.1	·· 43.7	274°19.2	·· 13.8
10	243°09.1	305°22.1	01.3	357°13.0	38.8	271°33.1	43.5	289°21.4	13.7
11	258°11.6	320°25.2	00.8	12°13.6	39.1	286°35.2	43.4	304°23.6	13.7
12	273°14.0	335°28.4	S20°00.3	27°14.2	S21°39.4	301°37.2	S12°43.2	319°25.8	S18°13.6
13	288°16.5	350°31.5	19°59.8	42°14.8	39.7	316°39.2	43.0	334°28.0	13.5
14	303°19.0	5°34.7	59.3	57°15.4	40.0	331°41.3	42.9	349°30.2	13.5
15	318°21.4	20°37.8	·· 58.8	72°16.0	·· 40.3	346°43.3	·· 42.7	4°32.4	·· 13.4
16	333°23.9	35°40.9	58.3	87°16.6	40.6	1°45.3	42.6	19°34.6	13.3
17	348°26.4	50°44.1	57.8	102°17.2	40.9	16°47.3	42.4	34°36.8	13.3
18	3°28.8	65°47.3	S19°57.3	117°17.8	S21°41.2	31°49.4	S12°42.2	49°39.0	S18°13.2
19	18°31.3	80°50.4	56.8	132°18.4	41.6	46°51.4	42.1	64°41.2	13.1
20	33°33.8	95°53.6	56.3	147°18.9	41.9	61°53.4	41.9	79°43.4	13.0
21	48°36.2	110°56.8	·· 55.8	162°19.5	·· 42.2	76°55.4	·· 41.7	94°45.6	·· 13.0
22	63°38.7	125°59.9	55.3	177°20.1	42.5	91°57.5	41.6	109°47.8	12.9
23	78°41.1	141°03.1	54.8	192°20.7	42.8	106°59.5	41.4	124°50.0	12.8
	Mer.pass. 17:46	ν 3.1′	d -0.5′	m -4.65	ν 0.6′	d 0.3′	m 1.56	ν 2.0′	d -0.2′ m -2.17	ν 2.2′	d -0.1′ m 0.76

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	93°43.6	156°06.3	S19°54.3	207°21.3	S21°43.1	122°01.5	S12°41.2	139°52.2	S18°12.8
1	108°46.1	171°09.5	53.8	222°21.9	43.4	137°03.5	41.1	154°54.4	12.7
2	123°48.5	186°12.7	53.3	237°22.5	43.7	152°05.6	40.9	169°56.6	12.6
3	138°51.0	201°15.9	·· 52.8	252°23.1	·· 44.0	167°07.6	·· 40.7	184°58.8	·· 12.6
4	153°53.5	216°19.1	52.3	267°23.7	44.3	182°09.6	40.6	200°01.0	12.5
5	168°55.9	231°22.3	51.8	282°24.3	44.6	197°11.6	40.4	215°03.2	12.4
6	183°58.4	246°25.5	S19°51.3	297°24.9	S21°44.9	212°13.7	S12°40.3	230°05.4	S18°12.3
7	199°00.9	261°28.7	50.8	312°25.5	45.2	227°15.7	40.1	245°07.6	12.3
8	214°03.3	276°31.9	50.3	327°26.1	45.6	242°17.7	39.9	260°09.8	12.2
9	229°05.8	291°35.2	·· 49.8	342°26.6	·· 45.9	257°19.7	·· 39.8	275°12.1	·· 12.1
10	244°08.3	306°38.4	49.3	357°27.2	46.2	272°21.7	39.6	290°14.3	12.1
11	259°10.7	321°41.6	48.9	12°27.8	46.5	287°23.8	39.4	305°16.5	12.0
12	274°13.2	336°44.9	S19°48.4	27°28.4	S21°46.8	302°25.8	S12°39.3	320°18.7	S18°11.9
13	289°15.6	351°48.1	47.9	42°29.0	47.1	317°27.8	39.1	335°20.9	11.9
14	304°18.1	6°51.4	47.4	57°29.6	47.4	332°29.8	38.9	350°23.1	11.8
15	319°20.6	21°54.6	·· 46.9	72°30.2	·· 47.7	347°31.9	·· 38.8	5°25.3	·· 11.7
16	334°23.0	36°57.9	46.4	87°30.8	48.0	2°33.9	38.6	20°27.5	11.6
17	349°25.5	52°01.1	45.9	102°31.4	48.3	17°35.9	38.4	35°29.7	11.6
18	4°28.0	67°04.4	S19°45.4	117°32.0	S21°48.6	32°37.9	S12°38.3	50°31.9	S18°11.5
19	19°30.4	82°07.7	44.9	132°32.5	48.9	47°39.9	38.1	65°34.1	11.4
20	34°32.9	97°10.9	44.4	147°33.1	49.2	62°42.0	37.9	80°36.3	11.4
21	49°35.4	112°14.2	·· 43.9	162°33.7	·· 49.5	77°44.0	·· 37.8	95°38.5	·· 11.3
22	64°37.8	127°17.5	43.4	177°34.3	49.8	92°46.0	37.6	110°40.7	11.2
23	79°40.3	142°20.8	42.9	192°34.9	50.1	107°48.0	37.4	125°42.9	11.2
	Mer.pass. 17:42	ν 3.2′	d -0.5′	m -4.61	ν 0.6′	d 0.3′	m 1.56	ν 2.0′	d -0.2′ m -2.16	ν 2.2′	d -0.1′ m 0.76

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	94°42.7	157°24.1	S19°42.4	207°35.5	S21°50.4	122°50.1	S12°37.3	140°45.1	S18°11.1
1	109°45.2	172°27.4	41.9	222°36.1	50.7	137°52.1	37.1	155°47.3	11.0
2	124°47.7	187°30.7	41.5	237°36.7	51.0	152°54.1	37.0	170°49.5	10.9
3	139°50.1	202°34.0	·· 41.0	252°37.2	·· 51.3	167°56.1	·· 36.8	185°51.7	·· 10.9
4	154°52.6	217°37.3	40.5	267°37.8	51.6	182°58.1	36.6	200°53.9	10.8
5	169°55.1	232°40.6	40.0	282°38.4	51.9	198°00.2	36.5	215°56.1	10.7
6	184°57.5	247°43.9	S19°39.5	297°39.0	S21°52.2	213°02.2	S12°36.3	230°58.3	S18°10.7
7	200°00.0	262°47.2	39.0	312°39.6	52.5	228°04.2	36.1	246°00.5	10.6
8	215°02.5	277°50.6	38.5	327°40.2	52.8	243°06.2	36.0	261°02.7	10.5
9	230°04.9	292°53.9	·· 38.0	342°40.8	·· 53.1	258°08.2	·· 35.8	276°04.9	·· 10.4
10	245°07.4	307°57.2	37.5	357°41.3	53.4	273°10.2	35.6	291°07.1	10.4
11	260°09.9	323°00.6	37.1	12°41.9	53.7	288°12.3	35.5	306°09.3	10.3
12	275°12.3	338°03.9	S19°36.6	27°42.5	S21°54.0	303°14.3	S12°35.3	321°11.5	S18°10.2
13	290°14.8	353°07.3	36.1	42°43.1	54.3	318°16.3	35.1	336°13.7	10.2
14	305°17.2	8°10.6	35.6	57°43.7	54.6	333°18.3	35.0	351°15.9	10.1
15	320°19.7	23°14.0	·· 35.1	72°44.3	·· 54.9	348°20.3	·· 34.8	6°18.1	·· 10.0
16	335°22.2	38°17.3	34.6	87°44.9	55.1	3°22.4	34.6	21°20.3	09.9
17	350°24.6	53°20.7	34.1	102°45.4	55.4	18°24.4	34.5	36°22.5	09.9
18	5°27.1	68°24.1	S19°33.6	117°46.0	S21°55.7	33°26.4	S12°34.3	51°24.7	S18°09.8
19	20°29.6	83°27.4	33.2	132°46.6	56.0	48°28.4	34.1	66°26.9	09.7
20	35°32.0	98°30.8	32.7	147°47.2	56.3	63°30.4	34.0	81°29.1	09.7
21	50°34.5	113°34.2	·· 32.2	162°47.8	·· 56.6	78°32.4	·· 33.8	96°31.3	·· 09.6
22	65°37.0	128°37.6	31.7	177°48.4	56.9	93°34.5	33.6	111°33.5	09.5
23	80°39.4	143°41.0	31.2	192°48.9	57.2	108°36.5	33.4	126°35.7	09.5
	Mer.pass. 17:38	ν 3.3′	d -0.5′	m -4.56	ν 0.6′	d 0.3′	m 1.56	ν 2.0′	d -0.2′ m -2.16	ν 2.2′	d -0.1′ m 0.76

Stars

	SHA	Dec
Alpheratz	357°37.3	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.7	56°39.7
Diphda	348°49.8	-17°52.2
Achernar	335°21.9	-57°07.9
Hamal	327°53.8	23°34.0
Polaris	314°50.6	89°21.6
Acamar	315°13.4	-40°13.2
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°05.9	-8°10.6
Capella	280°25.1	46°01.2
Bellatrix	278°25.2	6°22.1
Elnath	278°04.6	28°37.5
Alnilam	275°39.9	-1°11.3
Betelgeuse	270°54.4	7°24.6
Canopus	263°52.9	-52°42.4
Sirius	258°28.1	-16°44.8
Adhara	255°07.4	-29°00.1
Procyon	244°53.1	5°10.1
Pollux	243°20.0	27°58.3
Avior	234°15.1	-59°34.6
Suhail	222°47.8	-43°31.1
Miaplacidus	221°38.0	-69°48.1
Alphard	217°50.0	-8°45.1
Regulus	207°36.9	11°51.6
Dubhe	193°43.9	61°37.7
Denebola	182°27.5	14°27.0
Gienah	175°46.2	-17°39.6
Acrux	173°02.9	-63°12.8
Gacrux	171°54.4	-57°13.8
Alioth	166°15.3	55°50.2
Spica	158°25.0	-11°16.4
Alkaid	152°54.2	49°12.1
Hadar	148°39.8	-60°28.4
Menkent	148°00.8	-36°28.4
Arcturus	145°50.4	19°04.1
Rigil Kent.	139°44.1	-60°55.2
Kochab	137°20.7	74°03.7
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.2	26°38.4
Antares	112°19.2	-26°28.7
Atria	107°16.3	-69°03.8
Sabik	102°06.0	-15°45.0
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.2	12°32.7
Eltanin	90°43.9	51°29.1
Kaus Aust.	83°36.2	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.2	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.0
Deneb	49°27.9	45°21.6
Enif	33°41.5	9°58.5
Al Na'ir	27°36.3	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.5	15°19.4

Dec 24 Fri	SHA	Mer.pass
Venus	62°06.6	13:38
Mars	114°22.6	10:11
Jupiter	28°28.4	15:53
Saturn	46°14.8	14:42

Dec 25 Sat	SHA	Mer.pass
Venus	62°22.7	13:33
Mars	113°37.7	10:10
Jupiter	28°17.9	15:50
Saturn	46°08.6	14:38

Dec 26 Sun	SHA	Mer.pass
Venus	62°41.3	13:27
Mars	112°52.7	10:09
Jupiter	28°07.3	15:47
Saturn	46°02.3	14:35

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°09.1	S23°25.0	303°01.7	12.8′	N17°51.2	-10.5′	55.4′
1	195°08.8	24.9	317°33.4	12.8′	17°40.7	-10.6′	55.4′
2	210°08.5	24.9	332°05.2	12.8′	17°30.1	-10.7′	55.4′
3	225°08.2	·· 24.8	346°37.1	12.9′	17°19.5	-10.7′	55.5′
4	240°07.8	24.8	1°09.0	12.9′	17°08.7	-10.8′	55.5′
5	255°07.5	24.7	15°40.9	13.0′	16°57.9	-10.9′	55.5′
6	270°07.2	S23°24.7	30°12.9	13.0′	N16°47.0	-11.0′	55.5′
7	285°06.9	24.6	44°44.8	13.0′	16°36.0	-11.1′	55.5′
8	300°06.6	24.6	59°16.9	13.1′	16°24.9	-11.2′	55.6′
9	315°06.3	·· 24.5	73°48.9	13.1′	16°13.7	-11.2′	55.6′
10	330°06.0	24.5	88°21.0	13.1′	16°02.5	-11.3′	55.6′
11	345°05.7	24.4	102°53.2	13.2′	15°51.2	-11.4′	55.6′
12	0°05.4	S23°24.4	117°25.3	13.2′	N15°39.8	-11.5′	55.7′
13	15°05.1	24.3	131°57.5	13.2′	15°28.3	-11.6′	55.7′
14	30°04.7	24.2	146°29.7	13.3′	15°16.7	-11.6′	55.7′
15	45°04.4	·· 24.2	161°02.0	13.3′	15°05.1	-11.7′	55.7′
16	60°04.1	24.1	175°34.3	13.3′	14°53.4	-11.8′	55.8′
17	75°03.8	24.1	190°06.6	13.4′	14°41.6	-11.9′	55.8′
18	90°03.5	S23°24.0	204°39.0	13.4′	N14°29.7	-11.9′	55.8′
19	105°03.2	24.0	219°11.3	13.4′	14°17.8	-12.0′	55.8′
20	120°02.9	23.9	233°43.8	13.4′	14°05.8	-12.1′	55.9′
21	135°02.6	·· 23.8	248°16.2	13.5′	13°53.7	-12.2′	55.9′
22	150°02.3	23.8	262°48.7	13.5′	13°41.5	-12.2′	55.9′
23	165°02.0	23.7	277°21.1	13.5′	13°29.3	-12.3′	55.9′
	SD = 16.3′	d = -0.0′	SD = 15.1′				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°01.6	S23°23.6	291°53.7	13.5′	N13°17.0	-12.4′	56.0′
1	195°01.3	23.6	306°26.2	13.6′	13°04.7	-12.4′	56.0′
2	210°01.0	23.5	320°58.7	13.6′	12°52.2	-12.5′	56.0′
3	225°00.7	·· 23.4	335°31.3	13.6′	12°39.7	-12.6′	56.0′
4	240°00.4	23.4	350°03.9	13.6′	12°27.2	-12.6′	56.1′
5	255°00.1	23.3	4°36.6	13.6′	12°14.5	-12.7′	56.1′
6	269°59.8	S23°23.2	19°09.2	13.7′	N12°01.8	-12.8′	56.1′
7	284°59.5	23.2	33°41.9	13.7′	11°49.1	-12.8′	56.2′
8	299°59.2	23.1	48°14.6	13.7′	11°36.2	-12.9′	56.2′
9	314°58.9	·· 23.0	62°47.3	13.7′	11°23.4	-13.0′	56.2′
10	329°58.6	22.9	77°20.0	13.7′	11°10.4	-13.0′	56.2′
11	344°58.2	22.9	91°52.7	13.8′	10°57.4	-13.1′	56.3′
12	359°57.9	S23°22.8	106°25.5	13.8′	N10°44.3	-13.1′	56.3′
13	14°57.6	22.7	120°58.3	13.8′	10°31.2	-13.2′	56.3′
14	29°57.3	22.6	135°31.0	13.8′	10°18.0	-13.2′	56.4′
15	44°57.0	·· 22.6	150°03.8	13.8′	10°04.7	-13.3′	56.4′
16	59°56.7	22.5	164°36.6	13.8′	09°51.4	-13.4′	56.4′
17	74°56.4	22.4	179°09.4	13.8′	09°38.1	-13.4′	56.4′
18	89°56.1	S23°22.3	193°42.3	13.8′	N09°24.7	-13.5′	56.5′
19	104°55.8	22.2	208°15.1	13.8′	09°11.2	-13.5′	56.5′
20	119°55.5	22.2	222°48.0	13.8′	08°57.7	-13.6′	56.5′
21	134°55.2	·· 22.1	237°20.8	13.9′	08°44.1	-13.6′	56.6′
22	149°54.8	22.0	251°53.7	13.9′	08°30.5	-13.7′	56.6′
23	164°54.5	21.9	266°26.5	13.9′	08°16.8	-13.7′	56.6′
	SD = 16.3′	d = -0.1′	SD = 15.3′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.2	S23°21.8	280°59.4	13.9′	N08°03.0	-13.8′	56.7′
1	194°53.9	21.7	295°32.2	13.9′	07°49.3	-13.8′	56.7′
2	209°53.6	21.7	310°05.1	13.9′	07°35.4	-13.9′	56.7′
3	224°53.3	·· 21.6	324°38.0	13.9′	07°21.5	-13.9′	56.7′
4	239°53.0	21.5	339°10.9	13.9′	07°07.6	-14.0′	56.8′
5	254°52.7	21.4	353°43.7	13.9′	06°53.6	-14.0′	56.8′
6	269°52.4	S23°21.3	8°16.6	13.9′	N06°39.6	-14.1′	56.8′
7	284°52.1	21.2	22°49.4	13.9′	06°25.6	-14.1′	56.9′
8	299°51.8	21.1	37°22.3	13.8′	06°11.4	-14.2′	56.9′
9	314°51.5	·· 21.0	51°55.1	13.8′	05°57.3	-14.2′	56.9′
10	329°51.1	20.9	66°28.0	13.8′	05°43.1	-14.2′	57.0′
11	344°50.8	20.9	81°00.8	13.8′	05°28.9	-14.3′	57.0′
12	359°50.5	S23°20.8	95°33.6	13.8′	N05°14.6	-14.3′	57.0′
13	14°50.2	20.7	110°06.5	13.8′	05°00.3	-14.4′	57.1′
14	29°49.9	20.6	124°39.3	13.8′	04°45.9	-14.4′	57.1′
15	44°49.6	·· 20.5	139°12.1	13.8′	04°31.5	-14.4′	57.1′
16	59°49.3	20.4	153°44.8	13.8′	04°17.1	-14.5′	57.2′
17	74°49.0	20.3	168°17.6	13.7′	04°02.7	-14.5′	57.2′
18	89°48.7	S23°20.2	182°50.3	13.7′	N03°48.2	-14.5′	57.2′
19	104°48.4	20.1	197°23.1	13.7′	03°33.6	-14.6′	57.3′
20	119°48.1	20.0	211°55.8	13.7′	03°19.1	-14.6′	57.3′
21	134°47.8	·· 19.9	226°28.5	13.7′	03°04.5	-14.6′	57.3′
22	149°47.4	19.8	241°01.1	13.6′	02°49.9	-14.7′	57.4′
23	164°47.1	19.7	255°33.8	13.6′	02°35.2	-14.7′	57.4′
	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	▬	▬	13:03	15:33
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	16:33
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	08:07	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	18:19
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	21:15
S 50°	01:59	03:05	03:49	20:11	20:55	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°	–:–	01:39	02:55	21:05	22:20	–:–
S 60°	–:–	00:49	02:35	21:25	23:10	–:–

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

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 20-22 80-62%
24	00:36	00:21	12:00	03:55	16:18	
25	00:07	00:08	12:00	04:41	17:03	
26	00:23	00:38	12:01	05:26	17:48	

DUT1 = UT1-UTC = -0.1083 sec ΔT = TT-UT1 = +69.2923 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	95°41.9	158°44.4	S19°30.7	207°49.5	S21°57.5	123°38.5	S12°33.3	141°37.9	S18°09.4
1	110°44.3	173°47.8	30.2	222°50.1	57.8	138°40.5	33.1	156°40.1	09.3
2	125°46.8	188°51.2	29.8	237°50.7	58.1	153°42.5	32.9	171°42.3	09.2
3	140°49.3	203°54.6	·· 29.3	252°51.3	·· 58.4	168°44.5	·· 32.8	186°44.5	·· 09.2
4	155°51.7	218°58.0	28.8	267°51.9	58.7	183°46.6	32.6	201°46.7	09.1
5	170°54.2	234°01.4	28.3	282°52.4	58.9	198°48.6	32.4	216°48.9	09.0
6	185°56.7	249°04.8	S19°27.8	297°53.0	S21°59.2	213°50.6	S12°32.3	231°51.1	S18°09.0
7	200°59.1	264°08.2	27.3	312°53.6	59.5	228°52.6	32.1	246°53.3	08.9
8	216°01.6	279°11.7	26.9	327°54.2	21°59.8	243°54.6	31.9	261°55.5	08.8
9	231°04.1	294°15.1	·· 26.4	342°54.8	22°00.1	258°56.6	·· 31.8	276°57.7	·· 08.7
10	246°06.5	309°18.5	25.9	357°55.3	00.4	273°58.7	31.6	291°59.9	08.7
11	261°09.0	324°22.0	25.4	12°55.9	00.7	289°00.7	31.4	307°02.1	08.6
12	276°11.5	339°25.4	S19°24.9	27°56.5	S22°01.0	304°02.7	S12°31.3	322°04.3	S18°08.5
13	291°13.9	354°28.9	24.5	42°57.1	01.3	319°04.7	31.1	337°06.5	08.4
14	306°16.4	9°32.3	24.0	57°57.7	01.5	334°06.7	30.9	352°08.7	08.4
15	321°18.8	24°35.8	·· 23.5	72°58.2	·· 01.8	349°08.7	·· 30.8	7°10.9	·· 08.3
16	336°21.3	39°39.2	23.0	87°58.8	02.1	4°10.7	30.6	22°13.1	08.2
17	351°23.8	54°42.7	22.5	102°59.4	02.4	19°12.8	30.4	37°15.3	08.2
18	6°26.2	69°46.2	S19°22.1	118°00.0	S22°02.7	34°14.8	S12°30.3	52°17.5	S18°08.1
19	21°28.7	84°49.7	21.6	133°00.6	03.0	49°16.8	30.1	67°19.7	08.0
20	36°31.2	99°53.1	21.1	148°01.1	03.3	64°18.8	29.9	82°21.9	07.9
21	51°33.6	114°56.6	·· 20.6	163°01.7	·· 03.5	79°20.8	·· 29.7	97°24.1	·· 07.9
22	66°36.1	130°00.1	20.1	178°02.3	03.8	94°22.8	29.6	112°26.3	07.8
23	81°38.6	145°03.6	19.7	193°02.9	04.1	109°24.8	29.4	127°28.5	07.7
Mer.pass.	17:34	ν 3.4′	d -0.5′	m -4.51	ν 0.6′	d 0.3′	m 1.55	ν 2.0′	d -0.2′ m -2.15	ν 2.2′	d -0.1′ m 0.76

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	96°41.0	160°07.1	S19°19.2	208°03.5	S22°04.4	124°26.9	S12°29.2	142°30.7	S18°07.7
1	111°43.5	175°10.6	18.7	223°04.0	04.7	139°28.9	29.1	157°32.9	07.6
2	126°46.0	190°14.1	18.2	238°04.6	05.0	154°30.9	28.9	172°35.1	07.5
3	141°48.4	205°17.6	·· 17.8	253°05.2	·· 05.2	169°32.9	·· 28.7	187°37.3	·· 07.4
4	156°50.9	220°21.1	17.3	268°05.8	05.5	184°34.9	28.6	202°39.5	07.4
5	171°53.3	235°24.6	16.8	283°06.3	05.8	199°36.9	28.4	217°41.7	07.3
6	186°55.8	250°28.1	S19°16.3	298°06.9	S22°06.1	214°38.9	S12°28.2	232°43.9	S18°07.2
7	201°58.3	265°31.7	15.9	313°07.5	06.4	229°40.9	28.1	247°46.1	07.2
8	217°00.7	280°35.2	15.4	328°08.1	06.7	244°42.9	27.9	262°48.2	07.1
9	232°03.2	295°38.7	·· 14.9	343°08.6	·· 06.9	259°45.0	·· 27.7	277°50.4	·· 07.0
10	247°05.7	310°42.2	14.4	358°09.2	07.2	274°47.0	27.5	292°52.6	06.9
11	262°08.1	325°45.8	14.0	13°09.8	07.5	289°49.0	27.4	307°54.8	06.9
12	277°10.6	340°49.3	S19°13.5	28°10.4	S22°07.8	304°51.0	S12°27.2	322°57.0	S18°06.8
13	292°13.1	355°52.9	13.0	43°11.0	08.1	319°53.0	27.0	337°59.2	06.7
14	307°15.5	10°56.4	12.5	58°11.5	08.3	334°55.0	26.9	353°01.4	06.7
15	322°18.0	26°00.0	·· 12.1	73°12.1	·· 08.6	349°57.0	·· 26.7	8°03.6	·· 06.6
16	337°20.4	41°03.5	11.6	88°12.7	08.9	4°59.0	26.5	23°05.8	06.5
17	352°22.9	56°07.1	11.1	103°13.3	09.2	20°01.0	26.3	38°08.0	06.4
18	7°25.4	71°10.7	S19°10.7	118°13.8	S22°09.4	35°03.1	S12°26.2	53°10.2	S18°06.4
19	22°27.8	86°14.2	10.2	133°14.4	09.7	50°05.1	26.0	68°12.4	06.3
20	37°30.3	101°17.8	09.7	148°15.0	10.0	65°07.1	25.8	83°14.6	06.2
21	52°32.8	116°21.4	·· 09.2	163°15.5	·· 10.3	80°09.1	·· 25.7	98°16.8	·· 06.1
22	67°35.2	131°25.0	08.8	178°16.1	10.5	95°11.1	25.5	113°19.0	06.1
23	82°37.7	146°28.6	08.3	193°16.7	10.8	110°13.1	25.3	128°21.2	06.0
Mer.pass.	17:30	ν 3.5′	d -0.5′	m -4.45	ν 0.6′	d 0.3′	m 1.55	ν 2.0′	d -0.2′ m -2.15	ν 2.2′	d -0.1′ m 0.76

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	97°40.2	161°32.1	S19°07.8	208°17.3	S22°11.1	125°15.1	S12°25.2	143°23.4	S18°05.9
1	112°42.6	176°35.7	07.4	223°17.8	11.4	140°17.1	25.0	158°25.6	05.9
2	127°45.1	191°39.3	06.9	238°18.4	11.6	155°19.1	24.8	173°27.8	05.8
3	142°47.6	206°42.9	·· 06.4	253°19.0	·· 11.9	170°21.1	·· 24.6	188°30.0	·· 05.7
4	157°50.0	221°46.5	06.0	268°19.6	12.2	185°23.1	24.5	203°32.2	05.6
5	172°52.5	236°50.1	05.5	283°20.1	12.5	200°25.2	24.3	218°34.4	05.6
6	187°54.9	251°53.8	S19°05.0	298°20.7	S22°12.7	215°27.2	S12°24.1	233°36.6	S18°05.5
7	202°57.4	266°57.4	04.6	313°21.3	13.0	230°29.2	24.0	248°38.8	05.4
8	217°59.9	282°01.0	04.1	328°21.8	13.3	245°31.2	23.8	263°41.0	05.3
9	233°02.3	297°04.6	·· 03.6	343°22.4	·· 13.6	260°33.2	·· 23.6	278°43.2	·· 05.3
10	248°04.8	312°08.2	03.2	358°23.0	13.8	275°35.2	23.4	293°45.4	05.2
11	263°07.3	327°11.9	02.7	13°23.6	14.1	290°37.2	23.3	308°47.5	05.1
12	278°09.7	342°15.5	S19°02.2	28°24.1	S22°14.4	305°39.2	S12°23.1	323°49.7	S18°05.1
13	293°12.2	357°19.2	01.8	43°24.7	14.6	320°41.2	22.9	338°51.9	05.0
14	308°14.7	12°22.8	01.3	58°25.3	14.9	335°43.2	22.8	353°54.1	04.9
15	323°17.1	27°26.4	·· 00.8	73°25.8	·· 15.2	350°45.2	·· 22.6	8°56.3	·· 04.8
16	338°19.6	42°30.1	19°00.4	88°26.4	15.5	5°47.2	22.4	23°58.5	04.8
17	353°22.1	57°33.7	18°59.9	103°27.0	15.7	20°49.2	22.2	39°00.7	04.7
18	8°24.5	72°37.4	S18°59.5	118°27.6	S22°16.0	35°51.2	S12°22.1	54°02.9	S18°04.6
19	23°27.0	87°41.1	59.0	133°28.1	16.3	50°53.3	21.9	69°05.1	04.5
20	38°29.4	102°44.7	58.5	148°28.7	16.5	65°55.3	21.7	84°07.3	04.5
21	53°31.9	117°48.4	·· 58.1	163°29.3	·· 16.8	80°57.3	·· 21.5	99°09.5	·· 04.4
22	68°34.4	132°52.1	57.6	178°29.8	17.1	95°59.3	21.4	114°11.7	04.3
23	83°36.8	147°55.7	57.1	193°30.4	17.3	111°01.3	21.2	129°13.9	04.3
Mer.pass.	17:26	ν 3.6′	d -0.5′	m -4.39	ν 0.6′	d 0.3′	m 1.55	ν 2.0′	d -0.2′ m -2.15	ν 2.2′	d -0.1′ m 0.76

Stars

	SHA	Dec
Alpheratz	357°37.4	29°12.8
Ankaa	353°09.6	-42°11.5
Schedar	349°33.8	56°39.7
Diphda	348°49.8	-17°52.2
Achernar	335°21.9	-57°07.9
Hamal	327°53.8	23°34.0
Polaris	314°51.6	89°21.6
Acamar	315°13.4	-40°13.3
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°05.9	-8°10.6
Capella	280°25.1	46°01.2
Bellatrix	278°25.2	6°22.1
Elnath	278°04.6	28°37.5
Alnilam	275°39.9	-1°11.3
Betelgeuse	270°54.4	7°24.6
Canopus	263°52.9	-52°42.4
Sirius	258°28.1	-16°44.8
Adhara	255°07.4	-29°00.1
Procyon	244°53.1	5°10.1
Pollux	243°20.0	27°58.3
Avior	234°15.1	-59°34.6
Suhail	222°47.8	-43°31.1
Miaplacidus	221°38.0	-69°48.1
Alphard	217°50.0	-8°45.2
Regulus	207°36.9	11°51.6
Dubhe	193°43.9	61°37.7
Denebola	182°27.5	14°26.9
Gienah	175°46.1	-17°39.7
Acrux	173°02.8	-63°12.9
Gacrux	171°54.4	-57°13.8
Alioth	166°15.3	55°50.2
Spica	158°25.0	-11°16.4
Alkaid	152°54.2	49°12.0
Hadar	148°39.8	-60°28.4
Menkent	148°00.7	-36°28.4
Arcturus	145°50.4	19°04.1
Rigil Kent.	139°44.1	-60°55.2
Kochab	137°20.6	74°03.7
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.2	26°38.4
Antares	112°19.2	-26°28.7
Atria	107°16.2	-69°03.8
Sabik	102°06.0	-15°45.1
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.2	12°32.6
Eltanin	90°43.9	51°29.1
Kaus Aust.	83°36.2	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.2	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.0
Deneb	49°27.9	45°21.6
Enif	33°41.5	9°58.5
Al Na'ir	27°36.4	-46°51.6
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.5	15°19.4

Dec 27 Mon	SHA	Mer.pass
Venus	63°02.5	13:22
Mars	112°07.6	10:08
Jupiter	27°56.6	15:43
Saturn	45°56.0	14:31

Dec 28 Tue	SHA	Mer.pass
Venus	63°26.1	13:16
Mars	111°22.4	10:07
Jupiter	27°45.8	15:40
Saturn	45°49.6	14:28

Dec 29 Wed	SHA	Mer.pass
Venus	63°52.0	13:11
Mars	110°37.1	10:06
Jupiter	27°34.9	15:37
Saturn	45°43.2	14:24

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.8	S23°19.6	270°06.4	13.6′	N02°20.5	-14.7′	57.4′
1	194°46.5	19.5	284°39.0	13.6′	02°05.8	-14.7′	57.5′
2	209°46.2	19.4	299°11.6	13.5′	01°51.1	-14.8′	57.5′
3	224°45.9	·· 19.2	313°44.1	13.5′	01°36.3	-14.8′	57.5′
4	239°45.6	19.1	328°16.6	13.5′	01°21.5	-14.8′	57.6′
5	254°45.3	19.0	342°49.1	13.5′	01°06.7	-14.8′	57.6′
6	269°45.0	S23°18.9	357°21.6	13.4′	N00°51.9	-14.9′	57.6′
7	284°44.7	18.8	11°54.0	13.4′	00°37.0	-14.9′	57.7′
8	299°44.4	18.7	26°26.4	13.4′	00°22.1	-14.9′	57.7′
9	314°44.1	·· 18.6	40°58.8	13.3′	N00°07.2	-14.9′	57.7′
10	329°43.8	18.5	55°31.1	13.3′	S00°07.7	14.9′	57.8′
11	344°43.5	18.4	70°03.4	13.2′	00°22.6	15.0′	57.8′
12	359°43.1	S23°18.3	84°35.6	13.2′	S00°37.6	15.0′	57.8′
13	14°42.8	18.1	99°07.8	13.2′	00°52.5	15.0′	57.9′
14	29°42.5	18.0	113°40.0	13.1′	01°07.5	15.0′	57.9′
15	44°42.2	·· 17.9	128°12.1	13.1′	01°22.5	15.0′	58.0′
16	59°41.9	17.8	142°44.2	13.0′	01°37.5	15.0′	58.0′
17	74°41.6	17.7	157°16.2	13.0′	01°52.5	15.0′	58.0′
18	89°41.3	S23°17.6	171°48.2	12.9′	S02°07.5	15.0′	58.1′
19	104°41.0	17.4	186°20.1	12.9′	02°22.6	15.0′	58.1′
20	119°40.7	17.3	200°52.0	12.8′	02°37.6	15.0′	58.1′
21	134°40.4	·· 17.2	215°23.8	12.8′	02°52.7	15.1′	58.2′
22	149°40.1	17.1	229°55.6	12.7′	03°07.7	15.1′	58.2′
23	164°39.8	16.9	244°27.3	12.7′	03°22.8	15.1′	58.2′
	SD = 16.3′	d = -0.1′	SD = 15.7′				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.5	S23°16.8	258°59.0	12.6′	S03°37.8	15.1′	58.3′
1	194°39.2	16.7	273°30.6	12.6′	03°52.9	15.1′	58.3′
2	209°38.9	16.6	288°02.2	12.5′	04°08.0	15.1′	58.3′
3	224°38.5	·· 16.4	302°33.7	12.4′	04°23.0	15.1′	58.4′
4	239°38.2	16.3	317°05.1	12.4′	04°38.1	15.1′	58.4′
5	254°37.9	16.2	331°36.5	12.3′	04°53.1	15.0′	58.4′
6	269°37.6	S23°16.1	346°07.9	12.3′	S05°08.2	15.0′	58.5′
7	284°37.3	15.9	0°39.1	12.2′	05°23.2	15.0′	58.5′
8	299°37.0	15.8	15°10.3	12.1′	05°38.3	15.0′	58.6′
9	314°36.7	·· 15.7	29°41.4	12.1′	05°53.3	15.0′	58.6′
10	329°36.4	15.5	44°12.5	12.0′	06°08.3	15.0′	58.6′
11	344°36.1	15.4	58°43.5	11.9′	06°23.3	15.0′	58.7′
12	359°35.8	S23°15.3	73°14.4	11.8′	S06°38.3	15.0′	58.7′
13	14°35.5	15.1	87°45.2	11.8′	06°53.3	15.0′	58.7′
14	29°35.2	15.0	102°16.0	11.7′	07°08.2	14.9′	58.8′
15	44°34.9	·· 14.9	116°46.7	11.6′	07°23.2	14.9′	58.8′
16	59°34.6	14.7	131°17.3	11.5′	07°38.1	14.9′	58.8′
17	74°34.3	14.6	145°47.9	11.5′	07°53.0	14.9′	58.9′
18	89°34.0	S23°14.5	160°18.3	11.4′	S08°07.9	14.9′	58.9′
19	104°33.7	14.3	174°48.7	11.3′	08°22.8	14.8′	58.9′
20	119°33.4	14.2	189°19.0	11.2′	08°37.6	14.8′	59.0′
21	134°33.1	·· 14.0	203°49.2	11.1′	08°52.4	14.8′	59.0′
22	149°32.7	13.9	218°19.4	11.1′	09°07.2	14.8′	59.1′
23	164°32.4	13.8	232°49.4	11.0′	09°21.9	14.7′	59.1′
	SD = 16.3′	d = -0.1′	SD = 15.9′				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°32.1	S23°13.6	247°19.4	10.9′	S09°36.7	14.7′	59.1′
1	194°31.8	13.5	261°49.3	10.8′	09°51.3	14.7′	59.2′
2	209°31.5	13.3	276°19.1	10.7′	10°06.0	14.6′	59.2′
3	224°31.2	·· 13.2	290°48.8	10.6′	10°20.6	14.6′	59.2′
4	239°30.9	13.0	305°18.4	10.5′	10°35.2	14.5′	59.3′
5	254°30.6	12.9	319°47.9	10.4′	10°49.7	14.5′	59.3′
6	269°30.3	S23°12.7	334°17.3	10.3′	S11°04.2	14.5′	59.3′
7	284°30.0	12.6	348°46.6	10.2′	11°18.7	14.4′	59.4′
8	299°29.7	12.4	3°15.9	10.1′	11°33.1	14.4′	59.4′
9	314°29.4	·· 12.3	17°45.0	10.0′	11°47.5	14.3′	59.4′
10	329°29.1	12.1	32°14.0	9.9′	12°01.8	14.3′	59.5′
11	344°28.8	12.0	46°43.0	9.8′	12°16.1	14.2′	59.5′
12	359°28.5	S23°11.8	61°11.8	9.7′	S12°30.3	14.2′	59.5′
13	14°28.2	11.7	75°40.5	9.6′	12°44.5	14.1′	59.6′
14	29°27.9	11.5	90°09.2	9.5′	12°58.6	14.1′	59.6′
15	44°27.6	·· 11.4	104°37.7	9.4′	13°12.6	14.0′	59.6′
16	59°27.3	11.2	119°06.1	9.3′	13°26.6	13.9′	59.7′
17	74°27.0	11.1	133°34.4	9.2′	13°40.6	13.9′	59.7′
18	89°26.7	S23°10.9	148°02.6	9.1′	S13°54.4	13.8′	59.7′
19	104°26.4	10.7	162°30.7	9.0′	14°08.3	13.7′	59.8′
20	119°26.1	10.6	176°58.7	8.9′	14°22.0	13.7′	59.8′
21	134°25.8	·· 10.4	191°26.6	8.8′	14°35.7	13.6′	59.8′
22	149°25.5	10.3	205°54.4	8.7′	14°49.3	13.5′	59.9′
23	164°25.2	10.1	220°22.0	8.5′	15°02.8	13.5′	59.9′
	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	19:03	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	03:51	20:11	20:56	22:01
52°	01:35	02:52	03:41	20:22	21:11	22:28
54°	00:50	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 Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
N 72°	·· ··	01:39	04:02	12:12	11:42	11:02
N 70°	·· ··	01:33	03:43	12:13	11:51	11:24
68°	·· ··	01:28	03:28	12:14	11:58	11:40
66°	·· ··	01:24	03:16	12:15	12:05	11:54
64°	·· ··	01:21	03:07	12:15	12:10	12:05
62°	·· ··	01:18	02:58	12:16	12:15	12:15
60°	·· ··	01:15	02:51	12:16	12:19	12:24
N 58°	·· ··	01:13	02:45	12:17	12:23	12:31
56°	·· ··	01:11	02:39	12:17	12:26	12:38
54°	·· ··	01:09	02:35	12:17	12:29	12:43
52°	·· ··	01:07	02:30	12:18	12:32	12:49
50°	·· ··	01:06	02:26	12:18	12:35	12:54
45°	·· ··	01:02	02:18	12:19	12:40	13:04
N 40°	·· ··	01:00	02:10	12:19	12:45	13:13
35°	·· ··	00:57	02:04	12:20	12:49	13:21
30°	·· ··	00:55	01:59	12:20	12:52	13:27
20°	·· ··	00:52	01:50	12:21	12:58	13:39
N 10°	·· ··	00:49	01:42	12:21	13:04	13:49
0°	00:00	00:46	01:34	12:22	13:09	13:59
S 10°	00:02	00:43	01:27	12:22	13:14	14:08
20°	00:04	00:40	01:19	12:23	13:19	14:19
30°	00:06	00:37	01:11	12:23	13:25	14:31
35°	00:07	00:35	01:06	12:24	13:29	14:37
40°	00:08	00:33	01:00	12:24	13:33	14:45
45°	00:10	00:31	00:53	12:25	13:38	14:55
S 50°	00:12	00:28	00:46	12:25	13:43	15:06
52°	00:13	00:27	00:42	12:25	13:46	15:11
54°	00:13	00:25	00:38	12:26	13:49	15:17
56°	00:14	00:24	00:34	12:26	13:52	15:23
58°	00:16	00:22	00:29	12:26	13:56	15:30
S 60°	00:17	00:20	00:24	12:26	14:00	15:39

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 51-30%
27	00:53	01:07	12:01	06:11	18:34	
28	01:22	01:37	12:02	06:57	19:21	
29	01:51	02:06	12:02	07:46	20:13	

DUT1 = UT1-UTC = -0.1101 sec ΔT = TT-UT1 = +69.2941 sec

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	98°39.3	162°59.4	S18°56.7	208°31.0	S22°17.6	126°03.3	S12°21.0	144°16.1	S18°04.2
1	113°41.8	178°03.1	56.2	223°31.5	17.9	141°05.3	20.9	159°18.3	04.1
2	128°44.2	193°06.8	55.8	238°32.1	18.1	156°07.3	20.7	174°20.5	04.0
3	143°46.7	208°10.5	·· 55.3	253°32.7	·· 18.4	171°09.3	·· 20.5	189°22.7	·· 04.0
4	158°49.2	223°14.2	54.8	268°33.2	18.7	186°11.3	20.3	204°24.9	03.9
5	173°51.6	238°17.9	54.4	283°33.8	18.9	201°13.3	20.2	219°27.0	03.8
6	188°54.1	253°21.6	S18°53.9	298°34.4	S22°19.2	216°15.3	S12°20.0	234°29.2	S18°03.7
7	203°56.6	268°25.3	53.5	313°34.9	19.5	231°17.3	19.8	249°31.4	03.7
8	218°59.0	283°29.0	53.0	328°35.5	19.7	246°19.3	19.6	264°33.6	03.6
9	234°01.5	298°32.7	·· 52.6	343°36.1	·· 20.0	261°21.3	·· 19.5	279°35.8	·· 03.5
10	249°03.9	313°36.4	52.1	358°36.6	20.3	276°23.3	19.3	294°38.0	03.4
11	264°06.4	328°40.1	51.6	13°37.2	20.5	291°25.3	19.1	309°40.2	03.4
12	279°08.9	343°43.8	S18°51.2	28°37.8	S22°20.8	306°27.3	S12°19.0	324°42.4	S18°03.3
13	294°11.3	358°47.6	50.7	43°38.3	21.0	321°29.3	18.8	339°44.6	03.2
14	309°13.8	13°51.3	50.3	58°38.9	21.3	336°31.3	18.6	354°46.8	03.1
15	324°16.3	28°55.0	·· 49.8	73°39.5	·· 21.6	351°33.3	·· 18.4	9°49.0	·· 03.1
16	339°18.7	43°58.8	49.4	88°40.0	21.8	6°35.3	18.3	24°51.2	03.0
17	354°21.2	59°02.5	48.9	103°40.6	22.1	21°37.3	18.1	39°53.4	02.9
18	9°23.7	74°06.2	S18°48.5	118°41.2	S22°22.3	36°39.4	S12°17.9	54°55.6	S18°02.9
19	24°26.1	89°10.0	48.0	133°41.7	22.6	51°41.4	17.7	69°57.8	02.8
20	39°28.6	104°13.7	47.5	148°42.3	22.9	66°43.4	17.6	84°59.9	02.7
21	54°31.0	119°17.5	·· 47.1	163°42.9	·· 23.1	81°45.4	·· 17.4	100°02.1	·· 02.6
22	69°33.5	134°21.2	46.6	178°43.4	23.4	96°47.4	17.2	115°04.3	02.6
23	84°36.0	149°25.0	46.2	193°44.0	23.6	111°49.4	17.0	130°06.5	02.5
Mer.pass.	17:23	ν 3.7′	d -0.5′	m -4.32	ν 0.6′	d 0.3′	m 1.54	ν 2.0′	d -0.2′ m -2.14	ν 2.2′	d -0.1′ m 0.76
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	99°38.4	164°28.8	S18°45.7	208°44.6	S22°23.9	126°51.4	S12°16.9	145°08.7	S18°02.4
1	114°40.9	179°32.5	45.3	223°45.1	24.2	141°53.4	16.7	160°10.9	02.3
2	129°43.4	194°36.3	44.8	238°45.7	24.4	156°55.4	16.5	175°13.1	02.3
3	144°45.8	209°40.1	·· 44.4	253°46.2	·· 24.7	171°57.4	·· 16.3	190°15.3	·· 02.2
4	159°48.3	224°43.9	43.9	268°46.8	24.9	186°59.4	16.2	205°17.5	02.1
5	174°50.8	239°47.6	43.5	283°47.4	25.2	202°01.4	16.0	220°19.7	02.0
6	189°53.2	254°51.4	S18°43.0	298°47.9	S22°25.4	217°03.4	S12°15.8	235°21.9	S18°02.0
7	204°55.7	269°55.2	42.6	313°48.5	25.7	232°05.4	15.6	250°24.1	01.9
8	219°58.2	284°59.0	42.1	328°49.1	26.0	247°07.4	15.5	265°26.3	01.8
9	235°00.6	300°02.8	·· 41.7	343°49.6	·· 26.2	262°09.4	·· 15.3	280°28.4	·· 01.7
10	250°03.1	315°06.6	41.2	358°50.2	26.5	277°11.4	15.1	295°30.6	01.7
11	265°05.5	330°10.4	40.8	13°50.7	26.7	292°13.4	14.9	310°32.8	01.6
12	280°08.0	345°14.2	S18°40.4	28°51.3	S22°27.0	307°15.4	S12°14.8	325°35.0	S18°01.5
13	295°10.5	0°18.0	39.9	43°51.9	27.2	322°17.4	14.6	340°37.2	01.5
14	310°12.9	15°21.8	39.5	58°52.4	27.5	337°19.4	14.4	355°39.4	01.4
15	325°15.4	30°25.6	·· 39.0	73°53.0	·· 27.7	352°21.4	·· 14.2	10°41.6	·· 01.3
16	340°17.9	45°29.4	38.6	88°53.6	28.0	7°23.4	14.1	25°43.8	01.2
17	355°20.3	60°33.2	38.1	103°54.1	28.2	22°25.4	13.9	40°46.0	01.2
18	10°22.8	75°37.1	S18°37.7	118°54.7	S22°28.5	37°27.4	S12°13.7	55°48.2	S18°01.1
19	25°25.3	90°40.9	37.2	133°55.2	28.7	52°29.4	13.5	70°50.4	01.0
20	40°27.7	105°44.7	36.8	148°55.8	29.0	67°31.4	13.4	85°52.6	00.9
21	55°30.2	120°48.5	·· 36.4	163°56.4	·· 29.2	82°33.4	·· 13.2	100°54.7	·· 00.9
22	70°32.7	135°52.4	35.9	178°56.9	29.5	97°35.4	13.0	115°56.9	00.8
23	85°35.1	150°56.2	35.5	193°57.5	29.7	112°37.4	12.8	130°59.1	00.7
Mer.pass.	17:19	ν 3.8′	d -0.5′	m -4.25	ν 0.6′	d 0.3′	m 1.54	ν 2.0′	d -0.2′ m -2.14	ν 2.2′	d -0.1′ m 0.77
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	100°37.6	166°00.0	S18°35.0	208°58.0	S22°30.0	127°39.4	S12°12.7	146°01.3	S18°00.6
1	115°40.0	181°03.9	34.6	223°58.6	30.2	142°41.4	12.5	161°03.5	00.6
2	130°42.5	196°07.7	34.1	238°59.1	30.5	157°43.4	12.3	176°05.7	00.5
3	145°45.0	211°11.6	·· 33.7	253°59.7	·· 30.7	172°45.4	·· 12.1	191°07.9	·· 00.4
4	160°47.4	226°15.4	33.3	269°00.3	31.0	187°47.3	12.0	206°10.1	00.3
5	175°49.9	241°19.3	32.8	284°00.8	31.2	202°49.3	11.8	221°12.3	00.3
6	190°52.4	256°23.1	S18°32.4	299°01.4	S22°31.5	217°51.3	S12°11.6	236°14.5	S18°00.2
7	205°54.8	271°27.0	31.9	314°01.9	31.7	232°53.3	11.4	251°16.6	00.1
8	220°57.3	286°30.9	31.5	329°02.5	32.0	247°55.3	11.3	266°18.8	00.0
9	235°59.8	301°34.7	·· 31.1	344°03.1	·· 32.2	262°57.3	·· 11.1	281°21.0	18°00.0
10	251°02.2	316°38.6	30.6	359°03.6	32.5	277°59.3	10.9	296°23.2	17°59.9
11	266°04.7	331°42.5	30.2	14°04.2	32.7	293°01.3	10.7	311°25.4	59.8
12	281°07.2	346°46.3	S18°29.8	29°04.7	S22°33.0	308°03.3	S12°10.5	326°27.6	S17°59.7
13	296°09.6	1°50.2	29.3	44°05.3	33.2	323°05.3	10.4	341°29.8	59.7
14	311°12.1	16°54.1	28.9	59°05.8	33.5	338°07.3	10.2	356°32.0	59.6
15	326°14.5	31°58.0	·· 28.5	74°06.4	·· 33.7	353°09.3	·· 10.0	11°34.2	·· 59.5
16	341°17.0	47°01.9	28.0	89°07.0	33.9	8°11.3	09.8	26°36.4	59.4
17	356°19.5	62°05.8	27.6	104°07.5	34.2	23°13.3	09.7	41°38.5	59.4
18	11°21.9	77°09.7	S18°27.2	119°08.1	S22°34.4	38°15.3	S12°09.5	56°40.7	S17°59.3
19	26°24.4	92°13.6	26.7	134°08.6	34.7	53°17.3	09.3	71°42.9	59.2
20	41°26.9	107°17.4	26.3	149°09.2	34.9	68°19.3	09.1	86°45.1	59.1
21	56°29.3	122°21.3	·· 25.9	164°09.7	·· 35.2	83°21.3	·· 09.0	101°47.3	·· 59.1
22	71°31.8	137°25.3	25.4	179°10.3	35.4	98°23.3	08.8	116°49.5	59.0
23	86°34.3	152°29.2	25.0	194°10.8	35.6	113°25.3	08.6	131°51.7	58.9
Mer.pass.	17:15	ν 3.8′	d -0.4′	m -4.17	ν 0.6′	d 0.2′	m 1.54	ν 2.0′	d -0.2′ m -2.14	ν 2.2′	d -0.1′ m 0.77

Stars	SHA	Dec
Alpheratz	357°37.4	29°12.8
Ankaa	353°09.7	-42°11.5
Schedar	349°33.8	56°39.7
Diphda	348°49.8	-17°52.2
Achernar	335°21.9	-57°07.9
Hamal	327°53.8	23°34.0
Polaris	314°52.5	89°21.6
Acamar	315°13.4	-40°13.3
Menkar	314°08.5	4°10.5
Mirfak	308°31.4	49°56.4
Aldebaran	290°42.2	16°33.2
Rigel	281°05.9	-8°10.7
Capella	280°25.1	46°01.2
Bellatrix	278°25.2	6°22.1
Elnath	278°04.6	28°37.5
Alnilam	275°39.9	-1°11.3
Betelgeuse	270°54.4	7°24.6
Canopus	263°52.9	-52°42.5
Sirius	258°28.1	-16°44.8
Adhara	255°07.4	-29°00.1
Procyon	244°53.1	5°10.1
Pollux	243°20.0	27°58.3
Avior	234°15.1	-59°34.6
Suhail	222°47.7	-43°31.1
Miaplacidus	221°37.9	-69°48.2
Alphard	217°49.9	-8°45.2
Regulus	207°36.9	11°51.6
Dubhe	193°43.9	61°37.7
Denebola	182°27.4	14°26.9
Gienah	175°46.1	-17°39.7
Acrux	173°02.8	-63°12.9
Gacrux	171°54.3	-57°13.8
Alioth	166°15.3	55°50.2
Spica	158°25.0	-11°16.4
Alkaid	152°54.2	49°12.0
Hadar	148°39.7	-60°28.4
Menkent	148°00.7	-36°28.4
Arcturus	145°50.4	19°04.0
Rigil Kent.	139°44.0	-60°55.2
Kochab	137°20.6	74°03.7
Zuben'ubi	136°59.0	-16°07.8
Alphecca	126°06.1	26°38.4
Antares	112°19.2	-26°28.7
Atria	107°16.2	-69°03.8
Sabik	102°06.0	-15°45.1
Shaula	96°14.2	-37°07.1
Rasalhague	96°01.2	12°32.6
Eltanin	90°43.9	51°29.1
Kaus Aust.	83°36.2	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.2	-26°16.2
Altair	62°02.7	8°55.6
Peacock	53°10.2	-56°40.0
Deneb	49°27.9	45°21.6
Enif	33°41.5	9°58.5
Al Na'ir	27°36.4	-46°51.5
Fomalhaut	15°17.4	-29°30.6
Scheat	13°47.7	28°12.2
Markab	13°32.5	15°19.4

Dec 30 Thu	SHA	Mer.pass
Venus	64°20.1	13:05
Mars	109°51.7	10:06
Jupiter	27°24.0	15:34
Saturn	45°36.8	14:21

Dec 31 Fri	SHA	Mer.pass
Venus	64°50.3	12:59
Mars	109°06.1	10:05
Jupiter	27°12.9	15:31
Saturn	45°30.3	14:17

Jan 01 Sat	SHA	Mer.pass
Venus	65°22.5	12:53
Mars	108°20.4	10:04
Jupiter	27°01.8	15:27
Saturn	45°23.7	14:14

Horizontal parallax	
Venus:	0.5
Mars:	0.1

	Sun			Moon				
h								
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.9	S23°09.9	234°49.6	8.4′	S15°16.3	13.4′	59.9′
1	194°24.6	09.8	249°17.0	8.3′	15°29.7	13.3′	60.0′
2	209°24.3	09.6	263°44.3	8.2′	15°43.0	13.2′	60.0′
3	224°24.0	·· 09.5	278°11.5	8.1′	15°56.2	13.1′	60.0′
4	239°23.7	09.3	292°38.6	8.0′	16°09.4	13.1′	60.0′
5	254°23.3	09.1	307°05.6	7.9′	16°22.4	13.0′	60.1′
6	269°23.0	S23°09.0	321°32.4	7.7′	S16°35.4	12.9′	60.1′
7	284°22.7	08.8	335°59.1	7.6′	16°48.3	12.8′	60.1′
8	299°22.4	08.6	350°25.8	7.5′	17°01.1	12.7′	60.2′
9	314°22.1	·· 08.4	4°52.3	7.4′	17°13.8	12.6′	60.2′
10	329°21.8	08.3	19°18.6	7.3′	17°26.4	12.5′	60.2′
11	344°21.5	08.1	33°44.9	7.1′	17°38.9	12.4′	60.2′
12	359°21.2	S23°07.9	48°11.0	7.0′	S17°51.3	12.3′	60.3′
13	14°20.9	07.8	62°37.0	6.9′	18°03.7	12.2′	60.3′
14	29°20.6	07.6	77°02.9	6.8′	18°15.9	12.1′	60.3′
15	44°20.3	·· 07.4	91°28.7	6.7′	18°28.0	12.0′	60.4′
16	59°20.0	07.2	105°54.4	6.5′	18°40.0	11.9′	60.4′
17	74°19.7	07.1	120°19.9	6.4′	18°51.9	11.8′	60.4′
18	89°19.4	S23°06.9	134°45.3	6.3′	S19°03.7	11.7′	60.4′
19	104°19.1	06.7	149°10.6	6.2′	19°15.4	11.6′	60.5′
20	119°18.8	06.5	163°35.8	6.0′	19°26.9	11.4′	60.5′
21	134°18.5	·· 06.3	178°00.8	5.9′	19°38.4	11.3′	60.5′
22	149°18.2	06.2	192°25.7	5.8′	19°49.7	11.2′	60.5′
23	164°17.9	06.0	206°50.5	5.7′	20°00.9	11.1′	60.6′
	SD = 16.3′	d = -0.2′		SD = 16.3′			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°17.6	S23°05.8	221°15.2	5.6′	S20°12.0	11.0′	60.6′
1	194°17.3	05.6	235°39.7	5.4′	20°22.9	10.8′	60.6′
2	209°17.0	05.4	250°04.2	5.3′	20°33.7	10.7′	60.6′
3	224°16.7	·· 05.3	264°28.5	5.2′	20°44.4	10.6′	60.7′
4	239°16.4	05.1	278°52.7	5.1′	20°55.0	10.4′	60.7′
5	254°16.1	04.9	293°16.8	5.0′	21°05.4	10.3′	60.7′
6	269°15.8	S23°04.7	307°40.7	4.8′	S21°15.7	10.2′	60.7′
7	284°15.5	04.5	322°04.5	4.7′	21°25.8	10.0′	60.7′
8	299°15.2	04.3	336°28.3	4.6′	21°35.9	9.9′	60.8′
9	314°14.9	·· 04.1	350°51.9	4.5′	21°45.7	9.7′	60.8′
10	329°14.6	03.9	5°15.3	4.4′	21°55.4	9.6′	60.8′
11	344°14.3	03.8	19°38.7	4.3′	22°05.0	9.4′	60.8′
12	359°14.0	S23°03.6	34°02.0	4.1′	S22°14.4	9.3′	60.8′
13	14°13.8	03.4	48°25.1	4.0′	22°23.7	9.1′	60.9′
14	29°13.5	03.2	62°48.1	3.9′	22°32.8	9.0′	60.9′
15	44°13.2	·· 03.0	77°11.0	3.8′	22°41.8	8.8′	60.9′
16	59°12.9	02.8	91°33.8	3.7′	22°50.6	8.6′	60.9′
17	74°12.6	02.6	105°56.5	3.6′	22°59.3	8.5′	60.9′
18	89°12.3	S23°02.4	120°19.1	3.5′	S23°07.7	8.3′	60.9′
19	104°12.0	02.2	134°41.6	3.4′	23°16.1	8.2′	61.0′
20	119°11.7	02.0	149°04.0	3.3′	23°24.2	8.0′	61.0′
21	134°11.4	·· 01.8	163°26.3	3.2′	23°32.2	7.8′	61.0′
22	149°11.1	01.6	177°48.4	3.1′	23°40.1	7.7′	61.0′
23	164°10.8	01.4	192°10.5	3.0′	23°47.7	7.5′	61.0′
	SD = 16.3′	d = -0.2′		SD = 16.5′			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°10.5	S23°01.2	206°32.5	2.9′	S23°55.2	7.3′	61.0′
1	194°10.2	01.0	220°54.3	2.8′	24°02.5	7.1′	61.0′
2	209°09.9	00.8	235°16.1	2.7′	24°09.6	7.0′	61.0′
3	224°09.6	·· 00.6	249°37.8	2.6′	24°16.6	6.8′	61.1′
4	239°09.3	00.4	263°59.4	2.5′	24°23.4	6.6′	61.1′
5	254°09.0	00.2	278°20.9	2.4′	24°30.0	6.4′	61.1′
6	269°08.7	S23°00.0	292°42.4	2.3′	S24°36.4	6.2′	61.1′
7	284°08.4	22°59.8	307°03.7	2.3′	24°42.6	6.0′	61.1′
8	299°08.1	59.6	321°25.0	2.2′	24°48.6	5.9′	61.1′
9	314°07.8	·· 59.4	335°46.1	2.1′	24°54.5	5.7′	61.1′
10	329°07.5	59.2	350°07.2	2.0′	25°00.2	5.5′	61.1′
11	344°07.2	58.9	4°28.3	2.0′	25°05.6	5.3′	61.1′
12	359°06.9	S22°58.7	18°49.2	1.9′	S25°10.9	5.1′	61.1′
13	14°06.6	58.5	33°10.1	1.8′	25°16.0	4.9′	61.1′
14	29°06.3	58.3	47°30.9	1.8′	25°20.9	4.7′	61.1′
15	44°06.0	·· 58.1	61°51.7	1.7′	25°25.6	4.5′	61.2′
16	59°05.7	57.9	76°12.4	1.6′	25°30.2	4.3′	61.2′
17	74°05.5	57.7	90°33.0	1.6′	25°34.5	4.1′	61.2′
18	89°05.2	S22°57.5	104°53.6	1.5′	S25°38.6	3.9′	61.2′
19	104°04.9	57.2	119°14.1	1.5′	25°42.5	3.7′	61.2′
20	119°04.6	57.0	133°34.6	1.4′	25°46.2	3.5′	61.2′
21	134°04.3	·· 56.8	147°55.0	1.4′	25°49.7	3.3′	61.2′
22	149°04.0	56.6	162°15.4	1.4′	25°53.0	3.1′	61.2′
23	164°03.7	56.4	176°35.8	1.3′	25°56.2	2.9′	61.2′
	SD = 16.3′	d = -0.2′		SD = 16.6′			

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

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 26-28 20-5%
30	02:21	02:35	12:03	08:40	21:08	
31	02:49	03:04	12:03	09:38	22:09	
01	03:18	03:32	12:04	10:41	23:14	

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 2021 May 26

Ecliptic Conjunction = 11:15:02.4 TD (= 11:13:50.1 UT)
Greatest Eclipse = 11:19:52.7 TD (= 11:18:40.3 UT)

Penumbral Magnitude = 1.9540 P. Radius = 1.2981° Gamma = 0.4774
Umbral Magnitude = 1.0095 U. Radius = 0.7719° Axis = 0.4880°

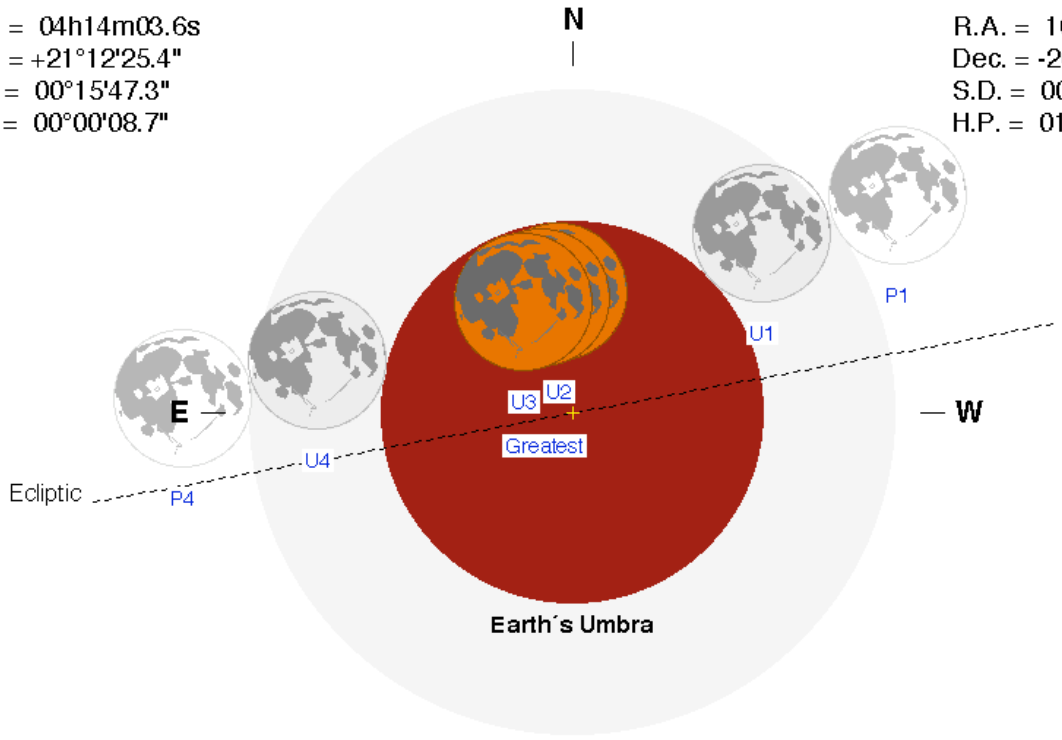
Saros Series = 121 Member = 56 of 84

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 04h14m03.6s
Dec. = +21°12'25.4"
S.D. = 00°15'47.3"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 16h14m37.8s
Dec. = -20°44'14.9"
S.D. = 00°16'42.9"
H.P. = 01°01'20.5"



Eclipse Durations

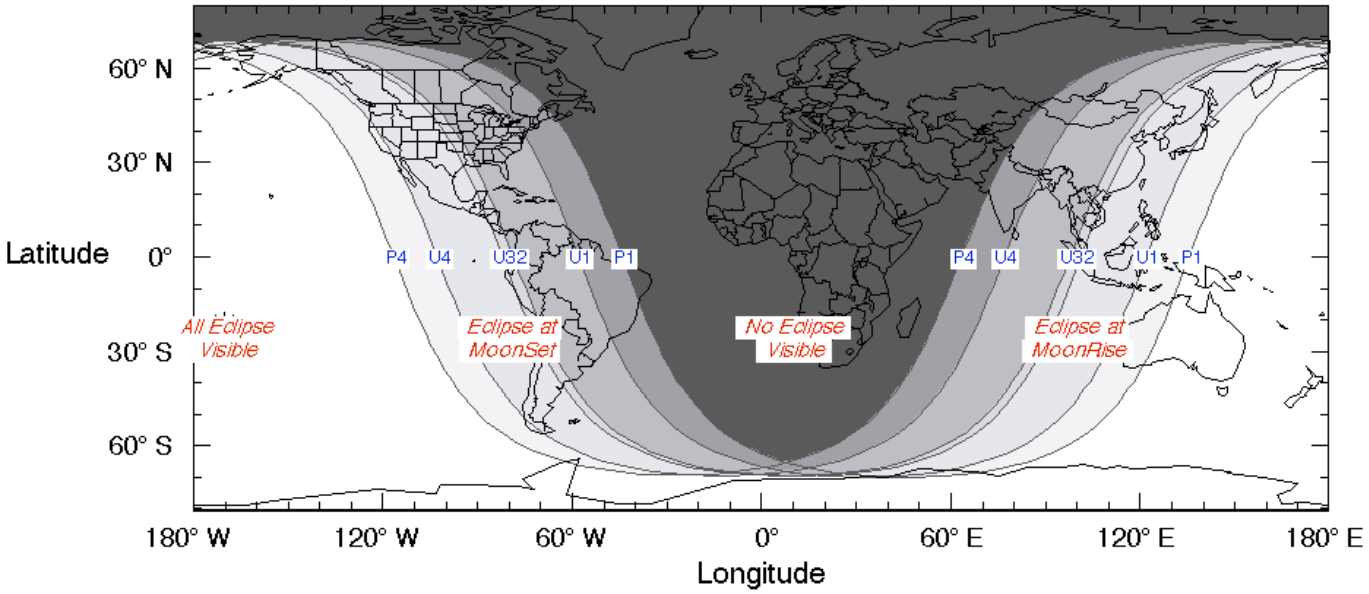
Penumbral = 05h02m02s
Umbral = 03h07m25s
Total = 00h14m30s

ΔT = 72 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html

Eclipse Contacts

P1 = 08:47:39 UT
U1 = 09:44:57 UT
U2 = 11:11:25 UT
U3 = 11:25:55 UT
U4 = 12:52:22 UT
P4 = 13:49:41 UT



2009 Apr 29

Annular Solar Eclipse of 2021 Jun 10

Geocentric Conjunction = 11:00:58.7 UT J.D. = 2459375.959013
Greatest Eclipse = 10:41:51.0 UT J.D. = 2459375.945730

Eclipse Magnitude = 0.9435 Gamma = 0.9152

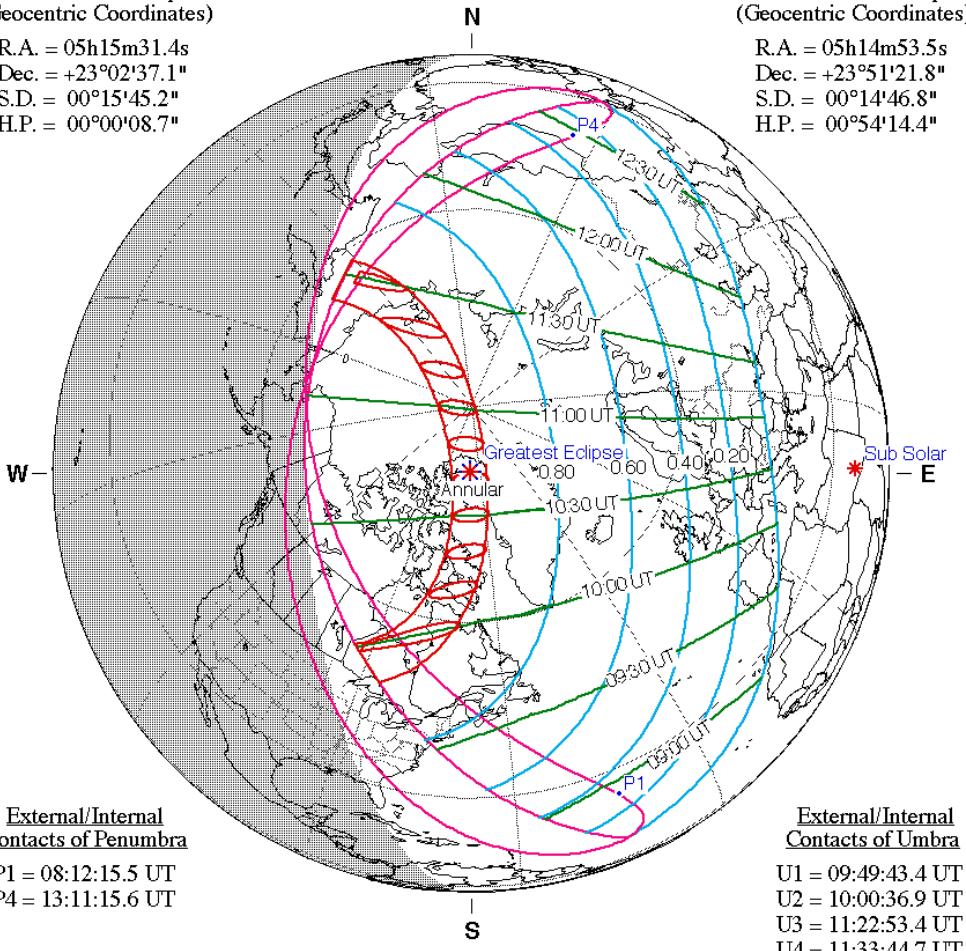
Saros Series = 147 Member = 23 of 80

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 05h15m31.4s
Dec. = +23°02'37.1"
S.D. = 00°15'45.2"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 05h14m53.5s
Dec. = +23°51'21.8"
S.D. = 00°14'46.8"
H.P. = 00°54'14.4"



External/Internal Contacts of Penumbra

P1 = 08:12:15.5 UT
P4 = 13:11:15.6 UT

External/Internal Contacts of Umbra

U1 = 09:49:43.4 UT
U2 = 10:00:36.9 UT
U3 = 11:22:53.4 UT
U4 = 11:33:44.7 UT

Local Circumstances at Greatest Eclipse

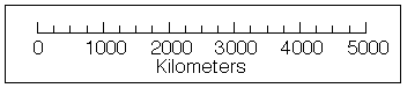
Lat. = 80°48.9'N Sun Alt. = 23.3°
Long. = 066°48.3'W Sun Azm. = 89.8°
Path Width = 527.1 km Duration = 03m51.2s

Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 78.2 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

Geocentric Libration
(Optical + Physical)

l = -2.30°
b = -1.06°
c = -2.93°
Brown Lun. No. = 1218



F. Espenak, NASA's GSFC - Fri, Jul 2,
sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Partial Lunar Eclipse of 2021 Nov 19

Ecliptic Conjunction = 08:58:37.0 TD (= 08:57:24.4 UT)
Greatest Eclipse = 09:04:05.7 TD (= 09:02:53.1 UT)

Penumbral Magnitude = 2.0720 P. Radius = 1.1829° Gamma = -0.4552
Umbral Magnitude = 0.9742 U. Radius = 0.6434° Axis = 0.4104°

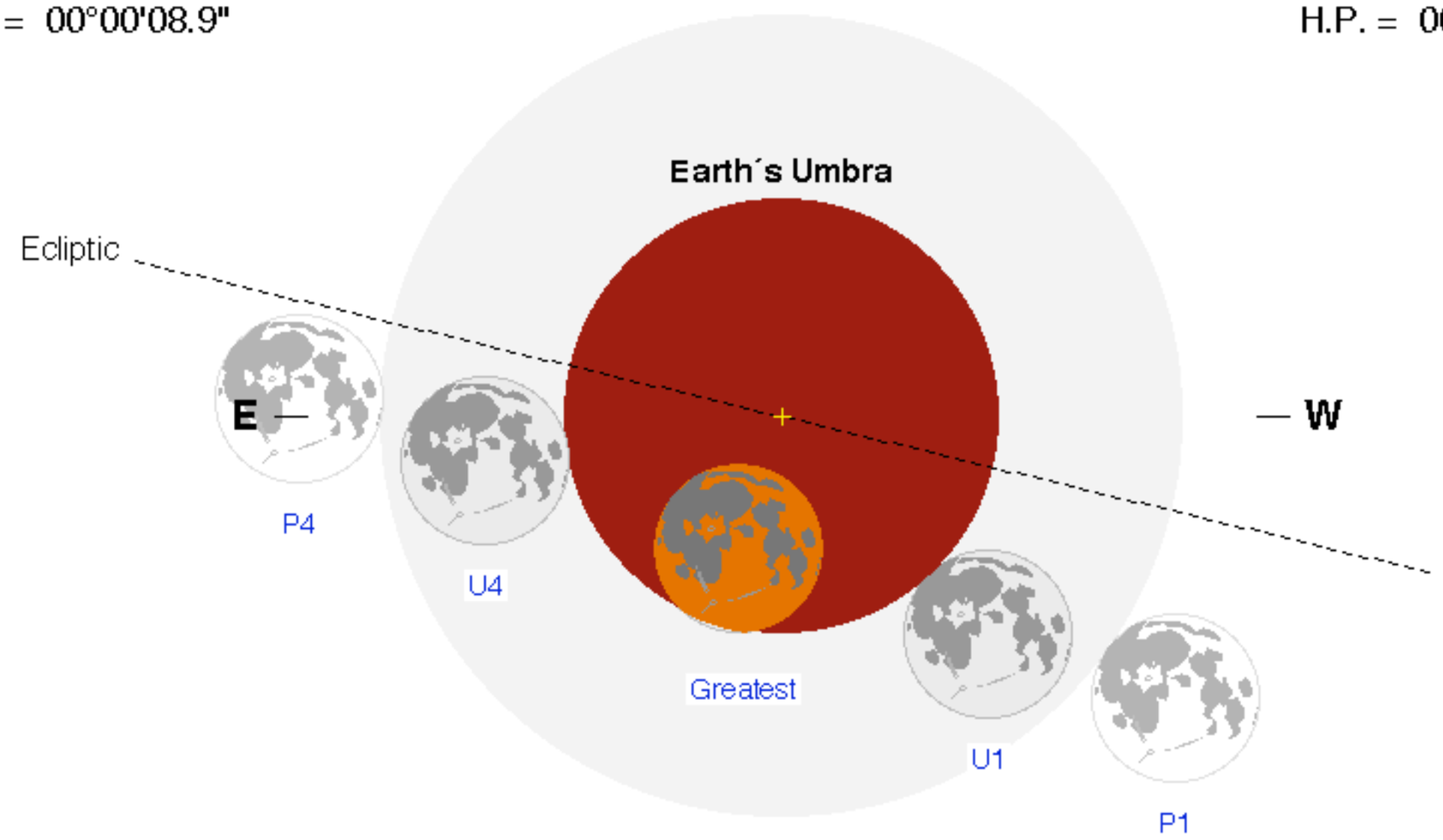
Saros Series = 126 Member = 46 of 72

<u>Sun at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 15h39m50.9s
Dec. = -19°32'33.1"
S.D. = 00°16'11.0"
H.P. = 00°00'08.9"

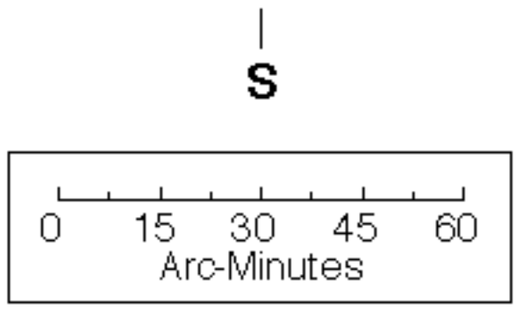
<u>Moon at Greatest Eclipse</u>
(Geocentric Coordinates)

R.A. = 03h40m24.8s
Dec. = +19°09'15.5"
S.D. = 00°14'44.5"
H.P. = 00°54'06.1"



<u>Eclipse Durations</u>

Penumbral = 06h01m29s
Umbral = 03h28m23s

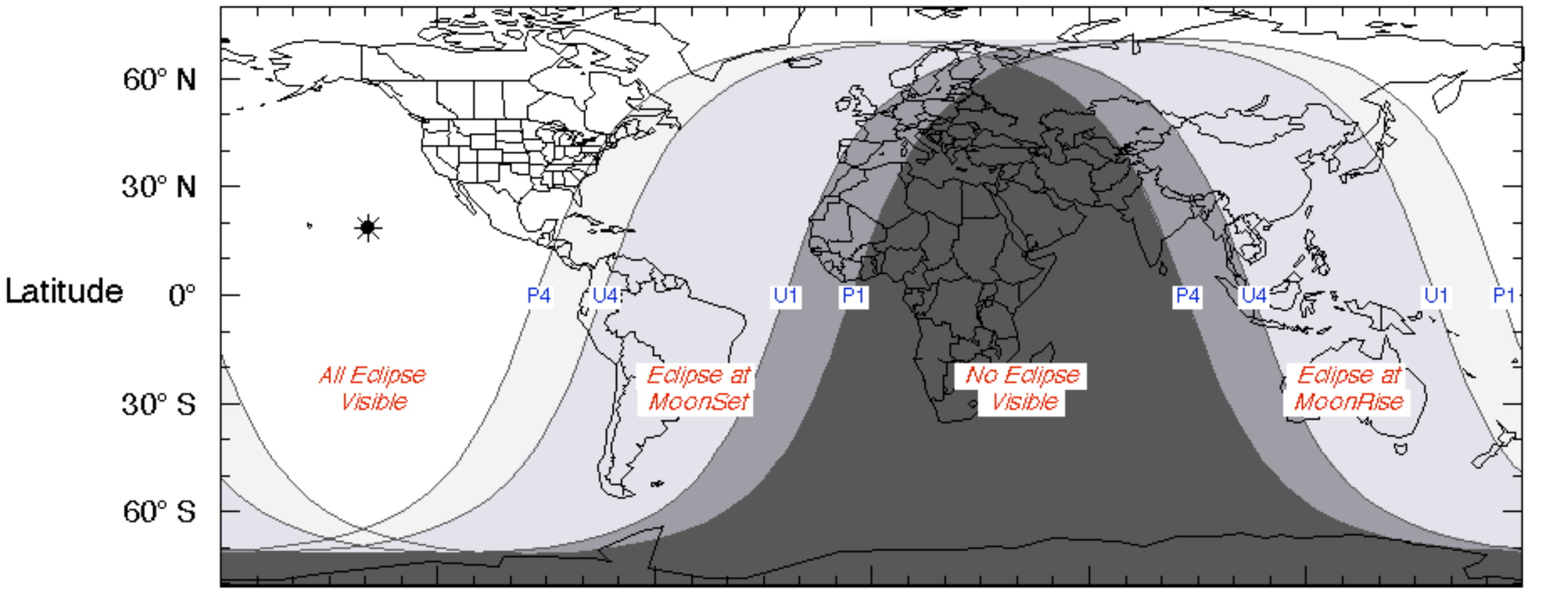


<u>Eclipse Contacts</u>

P1 = 06:02:09 UT
U1 = 07:18:41 UT
U4 = 10:47:04 UT
P4 = 12:03:38 UT

ΔT = 73 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



2009 Apr 29

Total Solar Eclipse of 2021 Dec 04

Geocentric Conjunction = 07:56:04.9 UT J.D. = 2459552.830612
Greatest Eclipse = 07:33:22.5 UT J.D. = 2459552.814844

Eclipse Magnitude = 1.0367 Gamma = -0.9526

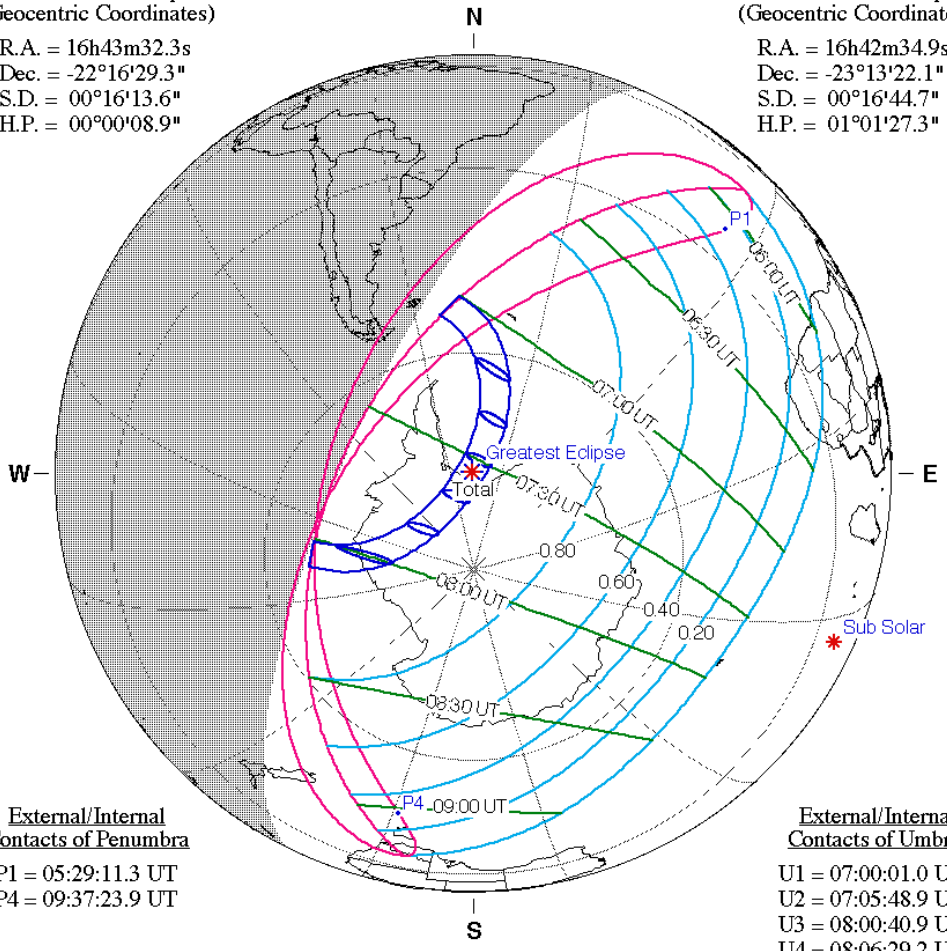
Saros Series = 152 Member = 13 of 70

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 16h43m32.3s
Dec. = -22°16'29.3"
S.D. = 00°16'13.6"
H.P. = 00°00'08.9"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 16h42m34.9s
Dec. = -23°13'22.1"
S.D. = 00°16'44.7"
H.P. = 01°01'27.3"



External/Internal Contacts of Penumbra

P1 = 05:29:11.3 UT
P4 = 09:37:23.9 UT

External/Internal Contacts of Umbra

U1 = 07:00:01.0 UT
U2 = 07:05:48.9 UT
U3 = 08:00:40.9 UT
U4 = 08:06:29.2 UT

Local Circumstances at Greatest Eclipse

Lat. = 76°46.7'S Sun Alt. = 17.2°
Long. = 046°11.9'W Sun Azm. = 114.8°
Path Width = 418.6 km Duration = 01m54.4s

Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 78.8 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

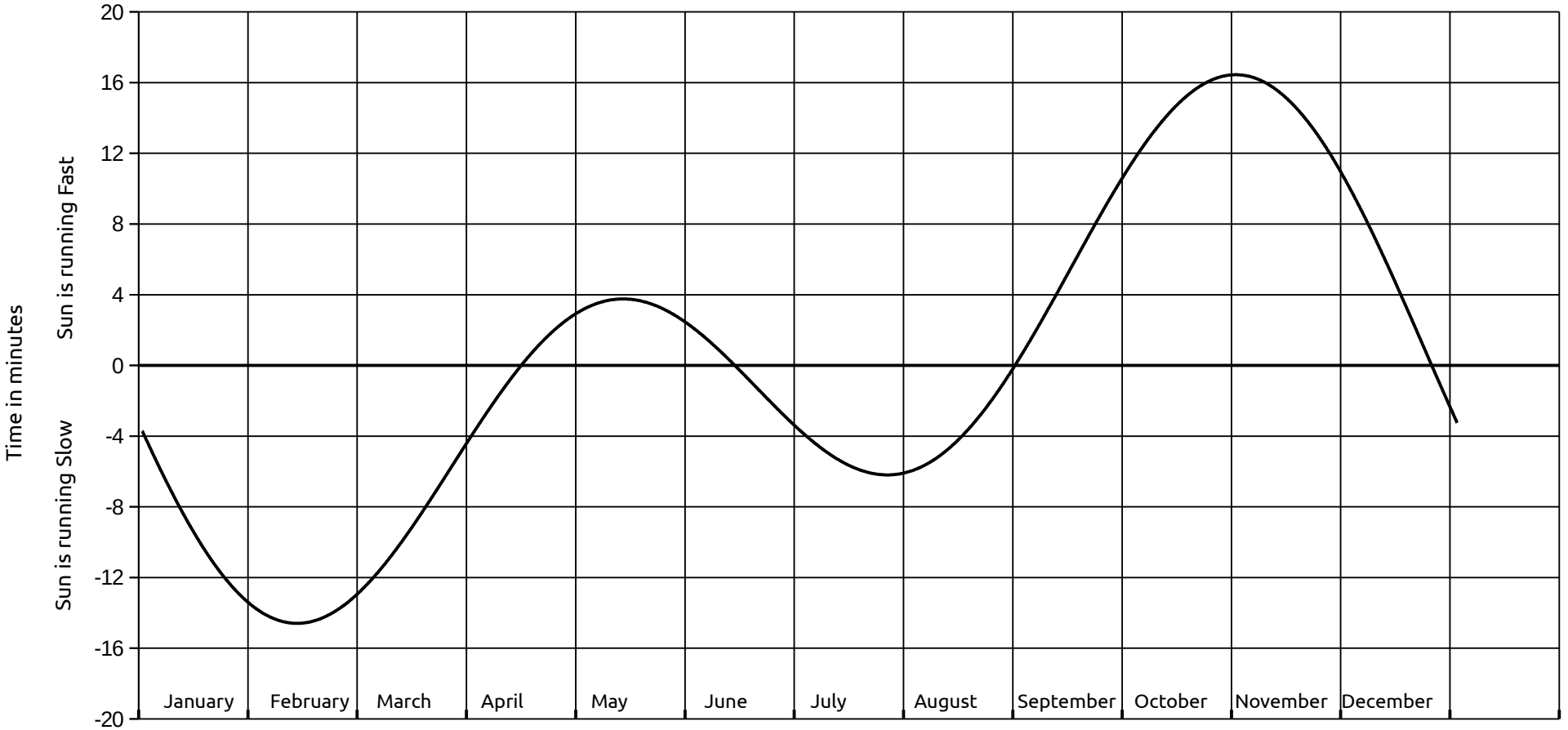
Geocentric Libration
(Optical + Physical)

l = -0.23°
b = 1.26°
c = 6.09°
Brown Lun. No. = 1224

0 1000 2000 3000 4000 5000
Kilometers

F. Espenak, NASA's GSFC - Fri, Jul 2,
sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Equation of Time
for the Sun



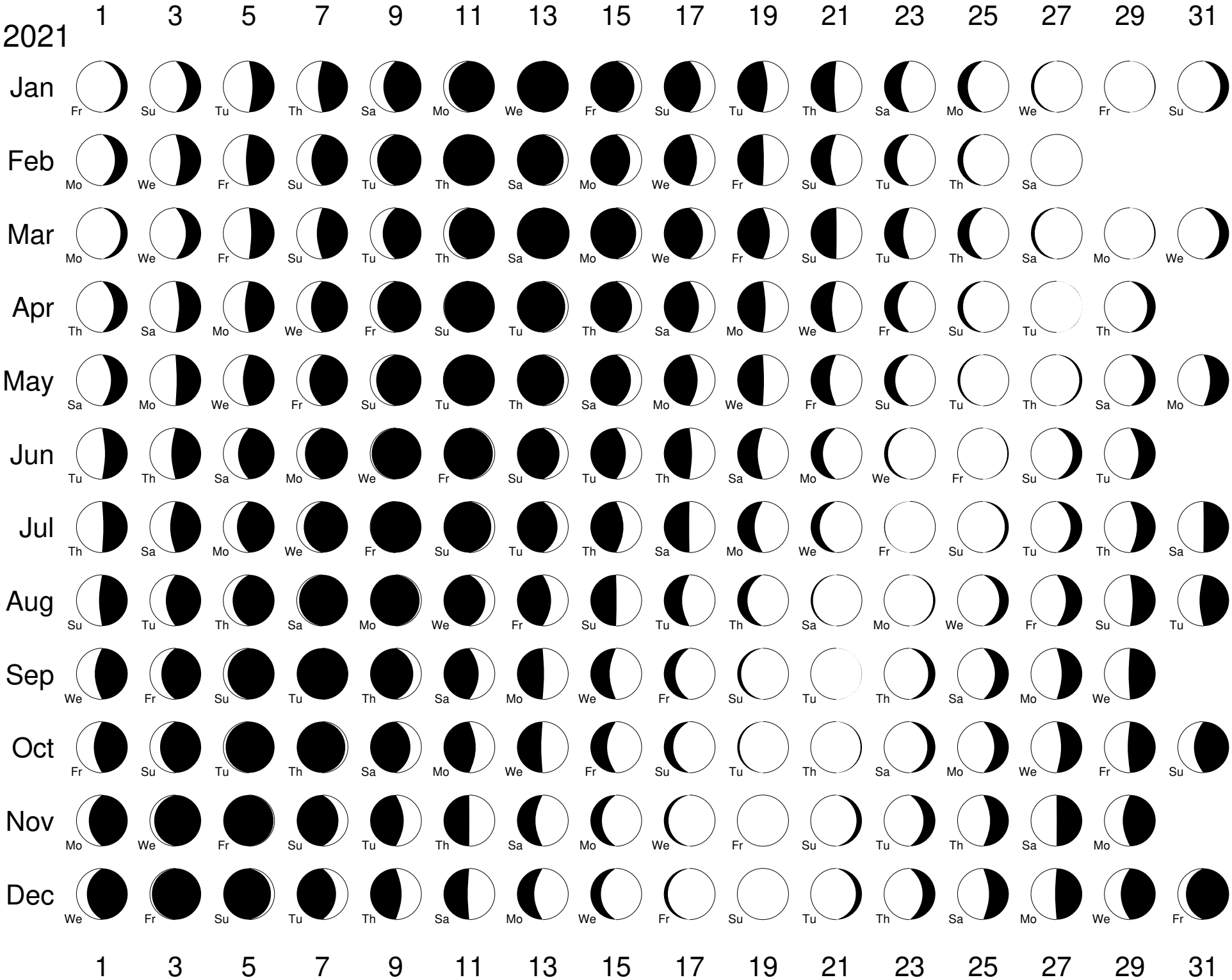
Equation_of_Time_Curve.odt

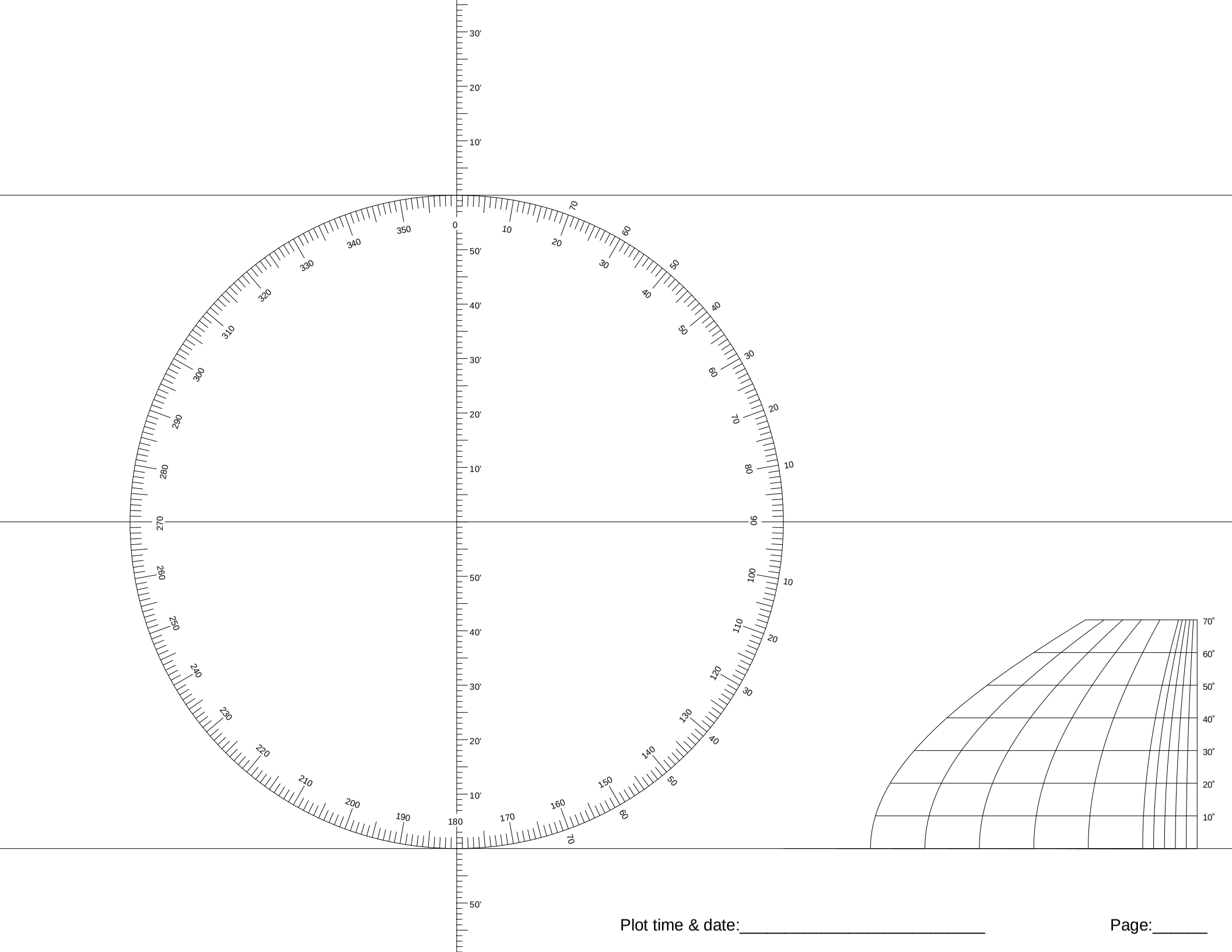
2021 Moon Phases

Date and Time (GMT/Universal Time)

New Moon	First Quarter	Full Moon	Last Quarter
--	--	--	January 06 09:37
January 13 05:00	January 20 21:01	January 28 19:16	February 04 17:37
February 11 19:06	February 19 18:47	February 27 08:17	March 06 01:30
March 13 10:21	March 21 14:40	March 28 18:48	April 04 10:02
April 12 02:31	April 20 06:59	April 27 03:31	May 03 19:50
May 11 19:00	May 19 19:13	May 26 11:14	June 02 07:24
June 10 10:53	June 18 03:54	June 24 18:40	July 01 21:11
July 10 01:17	July 17 10:11	July 24 02:37	July 31 13:16
August 08 13:50	August 15 15:19	August 22 12:02	August 30 07:13
September 07 00:52	September 13 20:39	September 20 23:55	September 29 01:57
October 06 11:05	October 13 03:25	October 20 14:57	October 28 20:05
November 04 21:14	November 11 12:46	November 19 08:57	November 27 12:28
December 04 07:43	December 11 01:35	December 19 04:35	December 27 02:24

Add or subtract your time difference from Greenwich to determine local time and date of Moon phase.


2021
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
Jan Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Feb Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Mar Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We
Apr Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th
May Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Jun Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
Jul Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa
Aug Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su Tu
Sep We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We
Oct Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr Su
Nov Mo We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo
Dec We Fr Su Tu Th Sa Mo We Fr Su Tu Th Sa Mo We Fr
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31



Plot time & date:_____

Page:_____

NAVIGATIONAL STAR CHART

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