

THE NAUTICAL ALMANAC

2026

Author: Andrew BAUER
Original concept from: Enno RODEGERDTS

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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 January 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 Rodergerdts (<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.

¹https://en.wikipedia.org/wiki/Day_length_fluctuations

²<https://hpiers.obspm.fr/eoppc/bul/bulb/explanatory.html>

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

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	100°39.73		180°36.35	S23°37.34	176°46.96	S23°43.20	347°32.27	N21°58.75	103°16.88	S03°35.78		Alpheratz	357°33.98 29°14.22
1	115°42.20		195°35.38	37.22	191°47.34	43.03	2°35.08	58.81	118°19.21	35.72		Ankaa	353°6.36 -42°10.09
2	130°44.66		210°34.41	37.09	206°47.72	42.86	17°37.90	58.86	133°21.54	35.65		Schedar	349°30.11 56°41.11
3	145°47.13		225°33.44	•• 36.96	221°48.10	•• 42.70	32°40.71	•• 58.92	148°23.88	•• 35.59		Diphda	348°46.47 -17°50.73
4	160°49.59		240°32.47	36.83	236°48.47	42.53	47°43.52	58.98	163°26.21	35.52		Achernar	335°19.42 -57°6.53
5	175°52.05		255°31.51	36.70	251°48.85	42.36	62°46.33	59.03	178°28.54	35.46		Hamal	327°50.13 23°35.26
6	190°54.52		270°30.54	S23°36.57	266°49.23	S23°42.19	77°49.14	N21°59.09	193°30.87	S03°35.39		Polaris	313°17.86 89°22.69
7	205°56.98		285°29.57	36.44	281°49.61	42.02	92°51.95	59.15	208°33.21	35.32		Acamar	315°10.90 -40°12.18
8	220°59.45		300°28.61	36.30	296°49.99	41.85	107°54.76	59.20	223°35.54	35.26		Menkar	314°5.09 4°11.53
9	236°1.91		315°27.64	•• 36.16	311°50.37	•• 41.68	122°57.58	•• 59.26	238°37.87	•• 35.19		Mirfak	308°26.73 49°57.40
10	251°4.38		330°26.67	36.03	326°50.75	41.50	138°0.39	59.32	253°40.20	35.13		Aldebaran	290°38.37 16°33.73
11	266°6.84		345°25.71	35.89	341°51.13	41.33	153°3.20	59.38	268°42.54	35.06		Rigel	281°2.76 -8°10.32
12	281°9.30		0°24.74	S23°35.75	356°51.51	S23°41.16	168°6.01	N21°59.43	283°44.87	S03°34.99		Capella	280°20.22 46°1.50
13	296°11.77		15°23.77	35.61	11°51.89	40.99	183°8.82	59.49	298°47.20	34.93		Bellatrix	278°21.67 6°22.39
14	311°14.23		30°22.81	35.46	26°52.27	40.81	198°11.64	59.55	313°49.53	34.86		Elnath	278°0.46 28°37.78
15	326°16.70		45°21.84	•• 35.32	41°52.65	•• 40.64	213°14.45	•• 59.60	328°51.86	•• 34.79		Alnilam	275°36.57 -1°11.13
16	341°19.16		60°20.87	35.18	56°53.03	40.46	228°17.26	59.66	343°54.19	34.73		Betelgeuse	270°50.86 7°24.70
17	356°21.63		75°19.91	35.03	71°53.41	40.29	243°20.07	59.72	358°56.52	34.66		Canopus	263°51.47 -52°42.56
18	11°24.09		90°18.94	S23°34.88	86°53.79	S23°40.11	258°22.89	N21°59.77	13°58.86	S03°34.60		Sirius	258°25.16 -16°45.12
19	26°26.55		105°17.98	34.73	101°54.17	39.94	273°25.70	59.83	29°1.19	34.53		Adhara	255°4.83 -29°0.43
20	41°29.02		120°17.01	34.58	116°54.55	39.76	288°28.51	59.89	44°3.52	34.46		Procyon	244°49.65 5°9.45
21	56°31.48		135°16.05	•• 34.43	131°54.93	•• 39.59	303°31.32	21°59.95	59°5.85	•• 34.40		Pollux	243°15.94 27°57.71
22	71°33.95		150°15.08	34.28	146°55.31	39.41	318°34.14	22°0.00	74°8.18	34.33		Avior	234°13.80 -59°35.43
23	86°36.41		165°14.12	34.13	161°55.69	39.23	333°36.95	0.06	89°10.51	34.26		Suhail	222°45.34 -43°32.13
Mer.pass. 17:15		ν-1.0' d-0.1' m-3.90		ν0.4' d-0.2' m1.12		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.01					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	101°38.88		180°13.15	S23°33.97	176°56.07	S23°39.05	348°39.76	N22°0.12	104°12.84	S03°34.20		Miaplacidus	221°37.34 -69°49.22
1	116°41.34		195°12.19	33.81	191°56.45	38.87	3°42.58	0.17	119°15.17	34.13		Alphard	217°46.70 -8°46.29
2	131°43.80		210°11.22	33.66	206°56.83	38.70	18°45.39	0.23	134°17.50	34.06		Regulus	207°33.36 11°50.29
3	146°46.27		225°10.26	•• 33.50	221°57.21	•• 38.52	33°48.20	•• 0.29	149°19.83	•• 33.99		Dubhe	193°39.71 61°36.32
4	161°48.73		240°9.29	33.34	236°57.59	38.34	48°51.02	0.34	164°22.16	33.93		Denebola	182°24.04 14°25.46
5	176°51.20		255°8.33	33.18	251°57.97	38.16	63°53.83	0.40	179°24.49	33.86		Giennah	175°42.71 -17°41.14
6	191°53.66		270°7.37	S23°33.01	266°58.35	S23°37.97	78°56.64	N22°0.46	194°26.81	S03°33.79		Acrux	172°59.15 -63°14.33
7	206°56.13		285°6.40	32.85	281°58.74	37.79	93°59.46	0.52	209°29.14	33.73		Gacrux	171°50.71 -57°15.29
8	221°58.59		300°5.44	32.68	296°59.12	37.61	109°2.27	0.57	224°31.47	33.66		Alioth	166°12.28 55°48.78
9	237°1.05		315°4.48	•• 32.52	311°59.50	•• 37.43	124°5.09	•• 0.63	239°33.80	•• 33.59		Spica	158°21.51 -11°17.82
10	252°3.52		330°3.51	32.35	326°59.88	37.25	139°7.90	0.69	254°36.13	33.52		Alkaid	152°51.50 49°10.69
11	267°5.98		345°2.55	32.18	342°0.26	37.06	154°10.72	0.74	269°38.46	33.46		Hadar	148°35.09 -60°29.66
12	282°8.45		0°1.59	S23°32.01	357°0.64	S23°36.88	169°13.53	N22°0.80	284°40.79	S03°33.39		Menkent	147°56.81 -36°29.73
13	297°10.91		15°0.62	31.84	12°1.02	36.70	184°16.34	0.86	299°43.12	33.32		Arcturus	145°47.31 19°2.65
14	312°13.38		29°59.66	31.67	27°1.40	36.51	199°19.16	0.91	314°45.44	33.25		Rigel Kent.	139°39.50 -60°56.34
15	327°15.84		44°58.70	•• 31.49	42°1.78	•• 36.33	214°21.97	•• 0.97	329°47.77	•• 33.18		Kochab	137°20.47 74°2.54
16	342°18.30		59°57.74	31.32	57°2.16	36.14	229°24.79	1.03	344°50.10	33.12		Zuben'ubi	136°55.30 -16°8.96
17	357°20.77		74°56.77	31.14	72°2.54	35.95	244°27.60	1.09	359°52.43	33.05		Alphecca	126°3.31 26°37.45
18	12°23.23		89°55.81	S23°30.96	87°2.92	S23°35.77	259°30.42	N22°1.14	14°54.75	S03°32.98		Antares	112°15.15 -26°29.33
19	27°25.70		104°54.85	30.78	102°3.30	35.58	274°33.23	1.20	29°57.08	32.91		Atria	107°9.16 -69°4.28
20	42°28.16		119°53.89	30.60	117°3.68	35.39	289°36.05	1.26	44°59.41	32.84		Sabik	102°2.17 -15°45.42
21	57°30.63		134°52.93	•• 30.42	132°4.06	•• 35.21	304°38.86	•• 1.31	60°1.74	•• 32.78		Shaula	96°9.67 -37°7.31
22	72°33.09		149°51.97	30.24	147°4.44	35.02	319°41.68	1.37	75°4.06	32.71		Rasalhague	95°58.12 12°32.39
23	87°35.55		164°51.00	30.05	162°4.82	34.83	334°44.49	1.43	90°6.39	32.64		Eltanin	90°42.34 51°29.00
Mer.pass. 17:11		ν-1.0' d-0.2' m-3.90		ν0.4' d-0.2' m1.12		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.01					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	102°38.02		179°50.04	S23°29.87	177°5.20	S23°34.64	349°47.31	N22°1.49	105°8.72	S03°32.57		Jan 01 Thu	SHA Mer.pass
1	117°40.48		194°49.08	29.68	192°5.58	34.45	4°50.12	1.54	120°11.04	32.50		Venus	79°56.61 11:58
2	132°42.95		209°48.12	29.49	207°5.96	34.26	19°52.94	1.60	135°13.37	32.43		Mars	76°7.22 12:13
3	147°45.41		224°47.16	•• 29.30	222°6.34	•• 34.07	34°55.76	•• 1.66	150°15.69	•• 32.37		Jupiter	246°52.54 00:50
4	162°47.87		239°46.20	29.11	237°6.73	33.88	49°58.57	1.71	165°18.02	32.30		Saturn	2°37.14 17:04
5	177°50.34		254°45.24	28.92	252°7.11	33.69	65°1.39	1.77	180°20.35	32.23			
6	192°52.80		269°44.28	S23°28.73	267°7.49	S23°33.49	80°4.20	N22°1.83	195°22.67	S03°32.16		Jan 02 Fri	SHA Mer.pass
7	207°55.27		284°43.32	28.53	282°7.87	33.30	95°7.02	1.88	210°25.00	32.09		Venus	78°34.28 12:00
8	222°57.73		299°42.36	28.34	297°8.25	33.11	110°9.84	1.94	225°27.32	32.02		Mars	75°17.20 12:12
9	238°0.20		314°41.40	•• 28.14	312°8.63	•• 32.92	125°12.65	•• 2.00	240°29.65	•• 31.95		Jupiter	247°0.89 00:45
10	253°2.66		329°40.44	27.94	327°9.01	32.72	140°15.47	2.06	255°31.97	31.88		Saturn	2°33.96 17:01
11	268°5.12		344°39.48	27.74</									

h	Sun			Moon				
Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	179°10.05	S23°1.03		36°44.52	2.4'	N26°24.22	6.7'	60.7'
1	194°9.76	0.83		51°5.95	2.3'	26°30.92	6.5'	60.7'
2	209°9.46	0.63		65°27.30	2.3'	26°37.42	6.3'	60.7'
3	224°9.17	· · 0.43		79°48.55	2.2'	26°43.73	6.1'	60.7'
4	239°8.87	0.22		94°9.72	2.1'	26°49.84	5.9'	60.7'
5	254°8.58	23°0.02		108°30.79	2.0'	26°55.75	5.7'	60.7'
6	269°8.29	S22°59.81		122°51.78	1.9'	N27°1.46	5.5'	60.7'
7	284°7.99	59.60		137°12.69	1.8'	27°6.97	5.3'	60.7'
8	299°7.70	59.39		151°33.52	1.8'	27°12.27	5.1'	60.7'
9	314°7.41	· · 59.19		165°54.27	1.7'	27°17.37	4.9'	60.7'
10	329°7.11	58.98		180°14.95	1.6'	27°22.27	4.7'	60.7'
11	344°6.82	58.77		194°35.55	1.5'	27°26.96	4.5'	60.7'
12	359°6.53	S22°58.55		208°56.09	1.5'	N27°31.44	4.3'	60.7'
13	14°6.23	58.34		223°16.57	1.4'	27°35.71	4.1'	60.8'
14	29°5.94	58.13		237°36.98	1.4'	27°39.77	3.9'	60.8'
15	44°5.65	· · 57.92		251°57.34	1.3'	27°43.63	3.6'	60.8'
16	59°5.36	57.70		266°17.64	1.2'	27°47.26	3.4'	60.8'
17	74°5.06	57.49		280°37.88	1.2'	27°50.69	3.2'	60.8'
18	89°4.77	S22°57.27		294°58.08	1.2'	N27°53.90	3.0'	60.8'
19	104°4.48	57.05		309°18.23	1.1'	27°56.89	2.8'	60.8'
20	119°4.19	56.84		323°38.35	1.1'	27°59.67	2.6'	60.8'
21	134°3.90	· · 56.62		337°58.42	1.0'	28°2.23	2.3'	60.8'
22	149°3.61	56.40		352°18.46	1.0'	28°4.58	2.1'	60.8'
23	164°3.31	56.18		6°38.46	1.0'	28°6.71	1.9'	60.8'
SD = 16.3'			d = -0.2'	SD = 16.5'				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	179°3.02	S22°55.96		20°58.44	1.0'	N28°8.61	1.7'	60.8'
1	194°2.73	55.74		35°18.40	0.9'	28°10.30	1.5'	60.8'
2	209°2.44	55.52		49°38.33	0.9'	28°11.77	1.3'	60.8'
3	224°2.15	· · 55.29		63°58.25	0.9'	28°13.03	1.0'	60.8'
4	239°1.86	55.07		78°18.15	0.9'	28°14.06	0.8'	60.8'
5	254°1.57	54.85		92°38.04	0.9'	28°14.87	0.6'	60.8'
6	269°1.28	S22°54.62		106°57.93	0.9'	N28°15.46	0.4'	60.8'
7	284°0.99	54.39		121°17.82	0.9'	28°15.83	0.1'	60.8'
8	299°0.70	54.17		135°37.71	0.9'	28°15.98	-0.1'	60.7'
9	314°0.41	· · 53.94		149°57.60	0.9'	28°15.91	-0.3'	60.7'
10	329°0.12	53.71		164°17.50	0.9'	28°15.62	-0.5'	60.7'
11	343°59.83	53.48		178°37.41	0.9'	28°15.11	-0.7'	60.7'
12	358°59.54	S22°53.25		192°57.34	0.9'	N28°14.38	-0.9'	60.7'
13	13°59.25	53.02		207°17.29	1.0'	28°13.43	-1.2'	60.7'
14	28°58.96	52.79		221°37.26	1.0'	28°12.26	-1.4'	60.7'
15	43°58.67	· · 52.56		235°57.26	1.0'	28°10.87	-1.6'	60.7'
16	58°58.39	52.32		250°17.29	1.1'	28°9.26	-1.8'	60.7'
17	73°58.10	52.09		264°37.36	1.1'	28°7.44	-2.0'	60.7'
18	88°57.81	S22°51.85		278°57.46	1.1'	N28°5.40	-2.3'	60.7'
19	103°57.52	51.62		293°17.61	1.2'	28°3.14	-2.5'	60.7'
20	118°57.23	51.38		307°37.80	1.2'	28°0.67	-2.7'	60.6'
21	133°56.94	· · 51.15		321°58.03	1.3'	27°57.98	-2.9'	60.6'
22	148°56.66	50.91		336°18.32	1.3'	27°55.08	-3.1'	60.6'
23	163°56.37	50.67		350°38.67	1.4'	27°51.97	-3.3'	60.6'
SD = 16.3'			d = -0.2'	SD = 16.6'				
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	178°56.08	S22°50.43		4°59.07	1.5'	N27°48.64	-3.5'	60.6'
1	193°55.79	50.19		19°19.54	1.5'	27°45.10	-3.7'	60.6'
2	208°55.51	49.95		33°40.07	1.6'	27°41.35	-4.0'	60.6'
3	223°55.22	· · 49.71		48°0.67	1.7'	27°37.40	-4.2'	60.6'
4	238°54.93	49.46		62°21.34	1.7'	27°33.23	-4.4'	60.5'
5	253°54.65	49.22		76°42.08	1.8'	27°28.86	-4.6'	60.5'
6	268°54.36	S22°48.98		91°2.91	1.9'	N27°24.29	-4.8'	60.5'
7	283°54.07	48.73		105°23.81	2.0'	27°19.51	-5.0'	60.5'
8	298°53.79	48.49		119°44.80	2.1'	27°14.53	-5.2'	60.5'
9	313°53.50	· · 48.24		134°5.87	2.2'	27°9.35	-5.4'	60.5'
10	328°53.22	47.99		148°27.03	2.3'	27°3.96	-5.6'	60.4'
11	343°52.93	47.74		162°48.29	2.3'	26°58.38	-5.8'	60.4'
12	358°52.65	S22°47.49		177°9.63	2.4'	N26°52.61	-6.0'	60.4'
13	13°52.36	47.25		191°31.08	2.5'	26°46.64	-6.2'	60.4'
14	28°52.08	46.99		205°52.62	2.6'	26°40.48	-6.4'	60.4'
15	43°51.79	· · 46.74		220°14.27	2.8'	26°34.12	-6.5'	60.3'
16	58°51.51	46.49		234°36.02	2.9'	26°27.58	-6.7'	60.3'
17	73°51.22	46.24		248°57.88	3.0'	26°20.85	-6.9'	60.3'
18	88°50.94	S22°45.98		263°19.84	3.1'	N26°13.93	-7.1'	60.3'
19	103°50.65	45.73		277°41.92	3.2'	26°6.83	-7.3'	60.3'
20	118°50.37	45.48		292°4.11	3.3'	25°59.55	-7.5'	60.2'
21	133°50.09	· · 45.22		306°26.41	3.4'	25°52.09	-7.6'	60.2'
22	148°49.80	44.96		320°48.83	3.5'	25°44.44	-7.8'	60.2'
23	163°49.52	44.71		335°11.37	3.7'	25°36.63	-8.0'	60.2'
SD = 16.3'			d = -0.2'	SD = 16.5'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 12-14 91-100%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
01	03:20	03:34	12:04	22:32	09:59	
02	03:48	04:02	12:04	23:39	11:06	
03	04:16	04:29	12:04	--	12:12	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	103°37.16		179°27.03	S23°25.04	177°14.35	S23°29.96	350°54.90	N22°2.85	106°4.51	S03°30.91	Alpheratz	357°33.99	29°14.22
1	118°39.62		194°26.08	24.82	192°14.73	29.76	5°57.72	2.91	121°6.83	30.84	Ankaa	353°6.37	-42°10.08
2	133°42.09		209°25.12	24.60	207°15.11	29.56	21°0.54	2.97	136°9.15	30.77	Schedar	349°30.12	56°41.11
3	148°44.55		224°24.16	•• 24.38	222°15.49	•• 29.36	36°3.36	•• 3.02	151°11.48	•• 30.70	Diphda	348°46.47	-17°50.73
4	163°47.02		239°23.21	24.16	237°15.87	29.16	51°6.17	3.08	166°13.80	30.63	Achernar	335°19.43	-57°6.53
5	178°49.48		254°22.25	23.94	252°16.25	28.95	66°8.99	3.14	181°16.12	30.56	Hamal	327°50.13	23°35.26
6	193°51.95		269°21.30	S23°23.72	267°16.63	S23°28.75	81°11.81	N22°3.19	196°18.44	S03°30.49	Polaris	313°18.82	89°22.71
7	208°54.41		284°20.34	23.49	282°17.02	28.55	96°14.63	3.25	211°20.77	30.42	Acamar	315°10.90	-40°12.19
8	223°56.87		299°19.39	23.27	297°17.40	28.34	111°17.45	3.31	226°23.09	30.35	Menkar	314°5.09	4°11.53
9	238°59.34		314°18.43	•• 23.04	312°17.78	•• 28.14	126°20.26	•• 3.37	241°25.41	•• 30.28	Mirfak	308°26.73	49°57.41
10	254°1.80		329°17.48	22.81	327°18.16	27.93	141°23.08	3.42	256°27.73	30.21	Aldebaran	290°38.37	16°33.73
11	269°4.27		344°16.52	22.58	342°18.54	27.73	156°25.90	3.48	271°30.05	30.14	Rigel	281°2.75	-8°10.32
12	284°6.73		359°15.57	S23°22.35	357°18.92	S23°27.52	171°28.72	N22°3.54	286°32.37	S03°30.07	Capella	280°20.21	46°1.51
13	299°9.19		14°14.61	22.12	12°19.31	27.32	186°31.54	3.59	301°34.70	30.00	Bellatrix	278°21.66	6°22.39
14	314°11.66		29°13.66	21.88	27°19.69	27.11	201°34.35	3.65	316°37.02	29.93	Elnath	278°0.45	28°37.78
15	329°14.12		44°12.71	•• 21.65	42°20.07	•• 26.90	216°37.17	•• 3.71	331°39.34	•• 29.86	Alnilam	275°36.56	-1°11.14
16	344°16.59		59°11.75	21.41	57°20.45	26.69	231°39.99	3.76	346°41.66	29.79	Betelgeuse	270°50.85	7°24.70
17	359°19.05		74°10.80	21.18	72°20.83	26.49	246°42.81	3.82	1°43.98	29.72	Canopus	263°51.47	-52°42.57
18	14°21.52		89°9.85	S23°20.94	87°21.22	S23°26.28	261°45.63	N22°3.88	16°46.30	S03°29.65	Sirius	258°25.15	-16°45.13
19	29°23.98		104°8.89	20.70	102°21.60	26.07	276°48.45	3.93	31°48.62	29.58	Adhara	255°4.82	-29°0.45
20	44°26.44		119°7.94	20.46	117°21.98	25.86	291°51.27	3.99	46°50.94	29.51	Procyon	244°49.63	5°9.44
21	59°28.91		134°6.99	•• 20.22	132°22.36	•• 25.65	306°54.08	•• 4.05	61°53.26	•• 29.43	Pollux	243°15.91	27°57.71
22	74°31.37		149°6.04	19.97	147°22.74	25.44	321°56.90	4.10	76°55.58	29.36	Avior	234°13.79	-59°35.45
23	89°33.84		164°5.08	19.73	162°23.13	25.23	336°59.72	4.16	91°57.90	29.29	Suhail	222°45.32	-43°32.15
Mer.pass. 17:03		ν-1.0' d-0.2' m-3.90				ν0.4' d-0.2' m1.11		ν2.8' d0.1' m-2.68		ν2.3' d-0.1' m1.01			
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	104°36.30		179°4.13	S23°19.48	177°23.51	S23°25.02	352°2.54	N22°4.22	107°0.22	S03°29.22	Miaplacidus	221°37.31	-69°49.24
1	119°38.77		194°3.18	19.23	192°23.89	24.81	7°5.36	4.28	122°2.54	29.15	Alphard	217°46.67	-8°46.30
2	134°41.23		209°2.23	18.99	207°24.27	24.59	22°8.18	4.33	137°4.86	29.08	Regulus	207°33.33	11°50.28
3	149°43.69		224°1.28	•• 18.74	222°24.65	•• 24.38	37°11.00	•• 4.39	152°7.18	•• 29.01	Dubhe	193°39.66	61°36.32
4	164°46.16		239°0.33	18.49	237°25.04	24.17	52°13.82	4.45	167°9.50	28.94	Denebola	182°24.00	14°25.44
5	179°48.62		253°59.38	18.23	252°25.42	23.95	67°16.64	4.50	182°11.81	28.86	Gienah	175°42.67	-17°41.15
6	194°51.09		268°58.43	S23°17.98	267°25.80	S23°23.74	82°19.46	N22°4.56	197°14.13	S03°28.79	Acrux	172°59.10	-63°14.34
7	209°53.55		283°57.48	17.73	282°26.18	23.53	97°22.28	4.62	212°16.45	28.72	Gacrux	171°50.67	-57°15.30
8	224°56.01		298°56.53	17.47	297°26.57	23.31	112°25.10	4.67	227°18.77	28.65	Alioth	166°12.23	55°48.77
9	239°58.48		313°55.58	•• 17.21	312°26.95	•• 23.10	127°27.92	•• 4.73	242°21.09	•• 28.58	Spica	158°21.47	-11°17.83
10	255°0.94		328°54.63	16.95	327°27.33	22.88	142°30.74	4.79	257°23.41	28.51	Alkaid	152°51.47	49°10.67
11	270°3.41		343°53.68	16.70	342°27.71	22.66	157°33.56	4.84	272°25.72	28.43	Hadar	148°35.04	-60°29.66
12	285°5.87		358°52.73	S23°16.43	357°28.10	S23°22.45	172°36.38	N22°4.90	287°28.04	S03°28.36	Menkent	147°56.77	-36°29.74
13	300°8.34		13°51.78	16.17	12°28.48	22.23	187°39.20	4.96	302°30.36	28.29	Arcturus	145°47.28	19°2.63
14	315°10.80		28°50.83	15.91	27°28.86	22.01	202°42.02	5.01	317°32.68	28.22	Rigel Kent.	139°39.45	-60°56.34
15	330°13.26		43°49.88	•• 15.64	42°29.24	•• 21.79	217°44.84	•• 5.07	332°35.00	•• 28.15	Kochab	137°20.41	74°2.53
16	345°15.73		58°48.94	15.38	57°29.63	21.58	232°47.66	5.13	347°37.31	28.07	Zuben'ubi	136°55.27	-16°8.97
17	0°18.19		73°47.99	15.11	72°30.01	21.36	247°50.48	5.18	2°39.63	28.00	Alphecca	126°3.28	26°37.43
18	15°20.66		88°47.04	S23°14.84	87°30.39	S23°21.14	262°53.30	N22°5.24	17°41.95	S03°27.93	Antares	112°15.12	-26°29.33
19	30°23.12		103°46.09	14.57	102°30.77	20.92	277°56.12	5.30	32°44.26	27.86	Atria	107°9.10	-69°4.28
20	45°25.58		118°45.15	14.30	117°31.16	20.70	292°58.94	5.35	47°46.58	27.79	Sabik	102°2.15	-15°45.43
21	60°28.05		133°44.20	•• 14.03	132°31.54	•• 20.48	308°1.76	•• 5.41	62°48.90	•• 27.71	Shaula	96°9.64	-37°7.30
22	75°30.51		148°43.25	13.76	147°31.92	20.25	323°4.58	5.47	77°51.21	27.64	Rasalhague	95°58.10	12°32.38
23	90°32.98		163°42.31	13.48	162°32.31	20.03	338°7.40	5.52	92°53.53	27.57	Eltanin	90°42.33	51°28.98
Mer.pass. 16:59		ν-1.0' d-0.2' m-3.90				ν0.4' d-0.2' m1.10		ν2.8' d0.1' m-2.68		ν2.3' d-0.1' m1.01			
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	105°35.44		178°41.36	S23°13.21	177°32.69	S23°19.81	353°10.22	N22°5.58	107°55.85	S03°27.50	Kaus Aust.	83°31.82	-34°22.32
1	120°37.91		193°40.41	12.93	192°33.07	19.59	8°13.04	5.64	122°58.16	27.42	Vega	80°33.10	38°48.39
2	135°40.37		208°39.47	12.65	207°33.46	19.36	23°15.86	5.69	138°0.48	27.35	Nunki	75°47.11	-26°15.88
3	150°42.83		223°38.52	•• 12.37	222°33.84	•• 19.14	38°18.68	•• 5.75	153°2.79	•• 27.28	Altair	61°59.48	8°56.20
4	165°45.30		238°37.58	12.09	237°34.22	18.92	53°21.50	5.81	168°5.11	27.21	Peacock	53°4.98	-56°39.17
5	180°47.76		253°36.63	11.81	252°34.61	18.69	68°24.32	5.86	183°7.43	27.13	Deneb	49°25.67	45°22.47
6	195°50.23		268°35.69	S23°11.53	267°34.99	S23°18.47	83°27.14	N22°5.92	198°9.74	S03°27.06	Enif	33°38.23	9°59.69
7	210°52.69		283°34.74	11.24	282°35.37	18.24	98°29.96	5.98	213°12.06	26.99	Al Na'ir	27°32.19	-46°50.27
8	225°55.15		298°33.80	10.96	297°35.76	18.02	113°32.78	6.03	228°14.37	26.91	Fomalhaut	15°13.79	-29°29.21
9	240°57.62		313°32.85	•• 10.67	312°36.14	•• 17.79	128°35.60	•• 6.09	243°16.69	•• 26.84	Scheat	13°44.57	28°13.58
10	256°0.08		328°31.91	10.38	327°36.52	17.56	143°38.43	6.15	258°19.00	26.77	Markab	13°29.23	15°20.80
11	271°2.55		343°30.97	10.09	342°								


h	Sun			Moon			
Sun	GHA	Dec		GHA	ν	Dec	d HP
0	178°49.23	S22°44.45		349°34.03	3.8'	N25°28.63	-8.2' 60.2'
1	193°48.95	44.19		3°56.81	3.9'	25°20.47	-8.3' 60.1'
2	208°48.67	43.93		18°19.71	4.0'	25°12.14	-8.5' 60.1'
3	223°48.39	· · 43.67		32°42.74	4.2'	25°3.63	-8.7' 60.1'
4	238°48.10	43.41		47°5.89	4.3'	24°54.97	-8.8' 60.1'
5	253°47.82	43.14		61°29.17	4.4'	24°46.13	-9.0' 60.0'
6	268°47.54	S22°42.88		75°52.58	4.5'	N24°37.14	-9.2' 60.0'
7	283°47.26	42.62		90°16.12	4.7'	24°27.99	-9.3' 60.0'
8	298°46.97	42.35		104°39.80	4.8'	24°18.68	-9.5' 59.9'
9	313°46.69	· · 42.09		119°3.60	4.9'	24°9.21	-9.6' 59.9'
10	328°46.41	41.82		133°27.54	5.1'	23°59.59	-9.8' 59.9'
11	343°46.13	41.55		147°51.61	5.2'	23°49.82	-9.9' 59.9'
12	358°45.85	S22°41.29		162°15.81	5.3'	N23°39.90	-10.1' 59.8'
13	13°45.57	41.02		176°40.15	5.5'	23°29.84	-10.2' 59.8'
14	28°45.29	40.75		191°4.63	5.6'	23°19.63	-10.4' 59.8'
15	43°45.00	· · 40.48		205°29.24	5.8'	23°9.28	-10.5' 59.7'
16	58°44.72	40.21		219°53.99	5.9'	22°58.79	-10.6' 59.7'
17	73°44.44	39.94		234°18.88	6.0'	22°48.16	-10.8' 59.7'
18	88°44.16	S22°39.66		248°43.90	6.2'	N22°37.40	-10.9' 59.7'
19	103°43.88	39.39		263°9.07	6.3'	22°26.50	-11.0' 59.6'
20	118°43.60	39.12		277°34.37	6.4'	22°15.47	-11.2' 59.6'
21	133°43.32	· · 38.84		291°59.81	6.6'	22°4.32	-11.3' 59.6'
22	148°43.04	38.57		306°25.39	6.7'	21°53.03	-11.4' 59.5'
23	163°42.77	38.29		320°51.11	6.9'	21°41.63	-11.5' 59.5'
SD = 16.3'			$d = -0.3'$			SD = 16.4'	

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	178°42.49	S22°38.01		335°16.97	7.0'	N21°30.10	-11.6' 59.5'
1	193°42.21	37.74		349°42.97	7.1'	21°18.45	-11.8' 59.4'
2	208°41.93	37.46		4°9.10	7.3'	21°6.69	-11.9' 59.4'
3	223°41.65	· · 37.18		18°35.38	7.4'	20°54.81	-12.0' 59.4'
4	238°41.37	36.90		33°1.79	7.6'	20°42.82	-12.1' 59.3'
5	253°41.09	36.62		47°28.34	7.7'	20°30.71	-12.2' 59.3'
6	268°40.82	S22°36.34		61°55.03	7.8'	N20°18.50	-12.3' 59.3'
7	283°40.54	36.05		76°21.86	8.0'	20°6.18	-12.4' 59.2'
8	298°40.26	35.77		90°48.82	8.1'	19°53.76	-12.5' 59.2'
9	313°39.98	· · 35.49		105°15.92	8.2'	19°41.24	-12.6' 59.2'
10	328°39.70	35.20		119°43.16	8.4'	19°28.61	-12.7' 59.1'
11	343°39.43	34.92		134°10.53	8.5'	19°15.89	-12.8' 59.1'
12	358°39.15	S22°34.63		148°38.04	8.6'	N19°3.07	-12.9' 59.1'
13	13°38.87	34.34		163°5.68	8.8'	18°50.16	-13.0' 59.0'
14	28°38.60	34.05		177°33.45	8.9'	18°37.16	-13.1' 59.0'
15	43°38.32	· · 33.77		192°1.36	9.0'	18°24.07	-13.2' 59.0'
16	58°38.05	33.48		206°29.40	9.2'	18°10.89	-13.3' 58.9'
17	73°37.77	33.19		220°57.57	9.3'	17°57.63	-13.3' 58.9'
18	88°37.49	S22°32.90		235°25.87	9.4'	N17°44.28	-13.4' 58.8'
19	103°37.22	32.60		249°54.30	9.6'	17°30.86	-13.5' 58.8'
20	118°36.94	32.31		264°22.86	9.7'	17°17.35	-13.6' 58.8'
21	133°36.67	· · 32.02		278°51.55	9.8'	17°3.77	-13.7' 58.7'
22	148°36.39	31.72		293°20.36	9.9'	16°50.11	-13.7' 58.7'
23	163°36.12	31.43		307°49.31	10.1'	16°36.38	-13.8' 58.7'
SD = 16.3'			$d = -0.3'$			SD = 16.2'	

Tue	GHA	Dec		GHA	ν	Dec	d HP
0	178°35.84	S22°31.13		322°18.37	10.2'	N16°22.58	-13.9' 58.6'
1	193°35.57	30.84		336°47.56	10.3'	16°8.71	-13.9' 58.6'
2	208°35.29	30.54		351°16.87	10.4'	15°54.77	-14.0' 58.6'
3	223°35.02	· · 30.24		5°46.31	10.6'	15°40.77	-14.1' 58.5'
4	238°34.75	29.94		20°15.86	10.7'	15°26.70	-14.1' 58.5'
5	253°34.47	29.64		34°45.54	10.8'	15°12.57	-14.2' 58.4'
6	268°34.20	S22°29.34		49°15.33	10.9'	N14°58.39	-14.2' 58.4'
7	283°33.93	29.04		63°45.24	11.0'	14°44.14	-14.3' 58.4'
8	298°33.65	28.74		78°15.27	11.1'	14°29.84	-14.4' 58.3'
9	313°33.38	· · 28.44		92°45.41	11.3'	14°15.48	-14.4' 58.3'
10	328°33.11	28.14		107°15.66	11.4'	14°1.07	-14.5' 58.2'
11	343°32.83	27.83		121°46.03	11.5'	13°46.61	-14.5' 58.2'
12	358°32.56	S22°27.53		136°16.51	11.6'	N13°32.10	-14.6' 58.2'
13	13°32.29	27.22		150°47.10	11.7'	13°17.55	-14.6' 58.1'
14	28°32.02	26.91		165°17.80	11.8'	13°2.95	-14.6' 58.1'
15	43°31.75	· · 26.61		179°48.60	11.9'	12°48.30	-14.7' 58.1'
16	58°31.48	26.30		194°19.51	12.0'	12°33.61	-14.7' 58.0'
17	73°31.20	25.99		208°50.52	12.1'	12°18.88	-14.8' 58.0'
18	88°30.93	S22°25.68		223°21.64	12.2'	N12°4.12	-14.8' 57.9'
19	103°30.66	25.37		237°52.86	12.3'	11°49.31	-14.8' 57.9'
20	118°30.39	25.06		252°24.18	12.4'	11°34.47	-14.9' 57.9'
21	133°30.12	· · 24.75		266°55.60	12.5'	11°19.59	-14.9' 57.8'
22	148°29.85	24.44		281°27.12	12.6'	11°4.68	-14.9' 57.8'
23	163°29.58	24.12		295°58.74	12.7'	10°49.74	-15.0' 57.7'
SD = 16.3'			$d = -0.3'$			SD = 16.0'	

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-91%
04	04:43	04:57	12:05	00:44	13:14	
05	05:10	05:23	12:05	01:43	14:10	
06	05:37	05:50	12:06	02:36	15:01	

January 07, 08, 09 UT (Wed., Thu., Fri.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	106°34.58	178°18.73	S23°6.21	177°41.90	S23°14.34	354°17.92	N22°6.94	108°51.39	S03°25.74						
1	121°37.04	193°17.79	5.91	192°42.28	14.11	9°20.75	7.00	123°53.70	25.66						
2	136°39.51	208°16.85	5.60	207°42.66	13.87	24°23.57	7.05	138°56.02	25.59						
3	151°41.97	223°15.91	•• 5.29	222°43.05	•• 13.64	39°26.39	•• 7.11	153°58.33	•• 25.52						
4	166°44.44	238°14.97	4.98	237°43.43	13.40	54°29.21	7.16	169°0.64	25.44						
5	181°46.90	253°14.03	4.67	252°43.82	13.17	69°32.03	7.22	184°2.95	25.37						
6	196°49.36	268°13.09	S23°4.35	267°44.20	S23°12.93	84°34.86	N22°7.28	199°5.27	S03°25.29						
7	211°51.83	283°12.15	4.04	282°44.59	12.69	99°37.68	7.33	214°7.58	25.22						
8	226°54.29	298°11.21	3.72	297°44.97	12.46	114°40.50	7.39	229°9.89	25.14						
9	241°56.76	313°10.28	•• 3.41	312°45.36	•• 12.22	129°43.32	•• 7.45	244°12.20	•• 25.07						
10	256°59.22	328°9.34	3.09	327°45.74	11.98	144°46.14	7.50	259°14.51	25.00						
11	272°1.68	343°8.40	2.77	342°46.12	11.74	159°48.97	7.56	274°16.82	24.92						
12	287°4.15	358°7.47	S23°2.45	357°46.51	S23°11.50	174°51.79	N22°7.62	289°19.13	S03°24.85						
13	302°6.61	13°6.53	2.13	12°46.89	11.27	189°54.61	7.67	304°21.45	24.77						
14	317°9.08	28°5.59	1.81	27°47.28	11.03	204°57.43	7.73	319°23.76	24.70						
15	332°11.54	43°4.66	•• 1.48	42°47.66	•• 10.79	220°0.25	•• 7.79	334°26.07	•• 24.62						
16	347°14.01	58°3.72	1.16	57°48.05	10.55	235°3.08	7.84	349°28.38	24.55						
17	2°16.47	73°2.79	0.83	72°48.43	10.30	250°5.90	7.90	4°30.69	24.47						
18	17°18.93	88°1.85	S23°0.50	87°48.82	S23°10.06	265°8.72	N22°7.95	19°33.00	S03°24.40						
19	32°21.40	103°0.92	23°0.17	102°49.20	9.82	280°11.54	8.01	34°35.31	24.32						
20	47°23.86	117°59.98	22°59.84	117°49.59	9.58	295°14.37	8.07	49°37.62	24.25						
21	62°26.33	132°59.05	•• 59.51	132°49.97	•• 9.34	310°17.19	•• 8.12	64°39.93	•• 24.17						
22	77°28.79	147°58.11	59.18	147°50.36	9.09	325°20.01	8.18	79°42.24	24.10						
23	92°31.25	162°57.18	58.84	162°50.74	8.85	340°22.83	8.24	94°44.55	24.02						
Mer.pass. 16:51			ν-0.9' d-0.3' m-3.90			ν0.4' d-0.2' m1.09			ν2.8' d0.1' m-2.68			ν2.3' d-0.1' m1.01			
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	107°33.72	177°56.25	S22°58.51	177°51.13	S23°8.61	355°25.66	N22°8.29	109°46.86	S03°23.95						
1	122°36.18	192°55.31	58.17	192°51.52	8.36	10°28.48	8.35	124°49.17	23.87						
2	137°38.65	207°54.38	57.83	207°51.90	8.12	25°31.30	8.40	139°51.48	23.80						
3	152°41.11	222°53.45	•• 57.50	222°52.29	•• 7.87	40°34.12	•• 8.46	154°53.78	•• 23.82						
4	167°43.57	237°52.52	57.16	237°52.67	7.62	55°36.95	8.52	169°56.09	23.64						
5	182°46.04	252°51.58	56.81	252°53.06	7.38	70°39.77	8.57	184°58.40	23.57						
6	197°48.50	267°50.65	S22°56.47	267°53.44	S23°7.13	85°42.59	N22°8.63	200°0.71	S03°23.49						
7	212°50.97	282°49.72	56.13	282°53.83	6.88	100°45.42	8.68	215°3.02	23.42						
8	227°53.43	297°48.79	55.78	297°54.21	6.64	115°48.24	8.74	230°5.33	23.34						
9	242°55.89	312°47.86	•• 55.44	312°54.60	•• 6.39	130°51.06	•• 8.80	245°7.64	•• 23.27						
10	257°58.36	327°46.93	55.09	327°54.99	6.14	145°53.88	8.85	260°9.94	23.19						
11	273°0.82	342°46.00	54.74	342°55.37	5.89	160°56.71	8.91	275°12.25	23.11						
12	288°3.29	357°45.07	S22°54.39	357°55.76	S23°5.64	175°59.53	N22°8.97	290°14.56	S03°23.04						
13	303°5.75	12°44.14	54.04	12°56.14	5.39	191°2.35	9.02	305°16.87	22.96						
14	318°8.22	27°43.21	53.69	27°56.53	5.14	206°5.18	9.08	320°19.17	22.89						
15	333°10.68	42°42.28	•• 53.33	42°56.92	•• 4.89	221°8.00	•• 9.13	335°21.48	•• 22.81						
16	348°13.14	57°41.35	52.98	57°57.30	4.64	236°10.82	9.19	350°23.79	22.73						
17	3°15.61	72°40.42	52.62	72°57.69	4.38	251°13.65	9.25	5°26.10	22.66						
18	18°18.07	87°39.50	S22°52.27	87°58.08	S23°4.13	266°16.47	N22°9.30	20°28.40	S03°22.58						
19	33°20.54	102°38.57	51.91	102°58.46	3.88	281°19.29	9.36	35°30.71	22.50						
20	48°23.00	117°37.64	51.55	117°58.85	3.63	296°22.11	9.41	50°33.02	22.43						
21	63°25.46	132°36.71	•• 51.19	132°59.24	•• 3.37	311°24.94	•• 9.47	65°35.32	•• 22.35						
22	78°27.93	147°35.79	50.82	147°59.62	3.12	326°27.76	9.53	80°37.63	22.28						
23	93°30.39	162°34.86	50.46	163°0.01	2.86	341°30.58	9.58	95°39.94	22.20						
Mer.pass. 16:47			ν-0.9' d-0.3' m-3.90			ν0.4' d-0.2' m1.09			ν2.8' d0.1' m-2.68			ν2.3' d-0.1' m1.02			
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	108°32.86	177°33.94	S22°50.10	178°0.40	S23°2.61	356°33.41	N22°9.64	110°42.24	S03°22.12						
1	123°35.32	192°33.01	49.73	193°0.78	2.35	11°36.23	9.69	125°44.55	22.05						
2	138°37.78	207°32.08	49.36	208°1.17	2.10	26°39.05	9.75	140°46.85	21.97						
3	153°40.25	222°31.16	•• 49.00	223°1.56	•• 1.84	41°41.88	•• 9.81	155°49.16	•• 21.89						
4	168°42.71	237°30.23	48.63	238°1.94	1.58	56°44.70	9.86	170°51.46	21.81						
5	183°45.18	252°29.31	48.26	253°2.33	1.33	71°47.52	9.92	185°53.77	21.74						
6	198°47.64	267°28.39	S22°47.88	268°2.72	S23°1.07	86°50.35	N22°9.97	200°56.07	S03°21.66						
7	213°50.10	282°27.46	47.51	283°3.10	0.81	101°53.17	10.03	215°58.38	21.58						
8	228°52.57	297°26.54	47.14	298°3.49	0.55	116°55.99	10.08	231°0.69	21.51						
9	243°55.03	312°25.61	•• 46.76	313°3.88	•• 0.29	131°58.82	•• 10.14	246°2.99	•• 21.43						
10	258°57.50	327°24.69	46.38	328°4.27	23°0.03	147°1.64	10.20	261°5.29	21.35						
11	273°59.96	342°23.77	46.01	343°4.65	22°59.77	162°4.46	10.25	276°7.60	21.27						
12	289°2.42	357°22.85	S22°45.63	358°5.04	S22°59.51	177°7.29	N22°10.31	291°9.90	S03°21.20						
13	304°4.89	12°21.92	45.25	13°5.43	59.25	192°10.11	10.36	306°12.21	21.12						
14	319°7.35	27°21.00	44.87	28°5.82	58.99	207°12.93	10.42	321°14.51	21.04						
15	334°9.82	42°20.08	•• 44.48	43°6.20	•• 58.73	222°15.76	•• 10.47	336°16.82	•• 20.97						
16	349°12.28	57°19.16	44.10	58°6.59	58.47	237°18.58	10.53	351°19.12	20.89						
17	4°14.75	72°18.24	43.71	73°6.98	58.20	252°21.40	10.59	6°21.42	20.81						
18	19°17.21	87°17.32	S22°43.33	88°7.37	S22°57.94	267°24.23	N22°10.64	21°23.73	S03°20.73						
19	34°19.67	102°16.40	42.94	103°7.75	57.68	282°27.05	10.70	36°26.03	20.65						
20	49°22.14	117°15.48	42.55	118°8.14	57.41	297°29.88	10.75	51°28.33	20.58						
21	64°24.60	132°14.56	•• 42.16	133°8.53	•• 57.15	312°32.70	•• 10.81	66°30.64	•• 20.50						
22	79°27.07	147°13.64	41.77	148°8.92	56.88	327°35.52	10.86	81°32.94	20.42						
23	94°29.53	162°12.72	41.38	163°9.31	56.62	342°38.35	10.92	96°35.24	20.34						
Mer.pass. 16:43			ν-0.9' d-0.4' m-3.90			ν0.4' d-0.3' m1.09			ν2.8' d0.1' m-2.68			ν2.3' d-0.1' m1.02			

Stars		
	SHA	Dec
Alpheratz	357°34.00	29°14.21
Ankaa	353°6.38	-42°10.08
Schedar	349°30.15	56°41.11
Diphda	348°46.48	-17°50.73
Achernar	335°19.46	-57°6.53
Hamal	327°50.15	23°35.26
Polaris	313°20.13	89°22.72
Acamar	315°10.91	-40°12.19
Menkar	314°5.10	4°11.52
Mirfak	308°26.74	49°57.41
Aldebaran	290°38.37	16°33.73
Rigel	281°2.75	-8°10.33
Capella	280°20.21	46°1.52
Bellatrix	278°21.66	6°22.38
Elnath	278°0.55	28°37.79
Alnilam	275°36.56	-1°11.14
Betelgeuse	270°50.85	7°24.70
Canopus	263°51.47	-52°42.59
Sirius	258°25.14	-16°45.14
Adhara	255°4.82	-29°0.46
Procyon	244°49.62	5°9.44
Pollux	243°15.90	27°57.71
Avior	234°13.77	-59°35.46
Suhail	222°45.30	-43°32.16
Miaplacidus	221°37.29	-69°49.26
Alpard	217°46.66	-8°46.31
Regulus	207°33.31	1°10.58
Dubhe	193°39.61	61°36.32
Denebola	182°23.98	14°25.43
Gienah	175°42.65	-17°41.16
Acrux	172°59.06	-63°14.35
Gacrux	171°50.63	-57°15.31
Alioth	166°12.20	55°48.76
Spica	158°21.45	-11°17.84
Alkaid	152°51.43	49°10.66
Hadar	148°35.00	-60°29.67
Menkent	147°56.74	-36°29.75
Arcturus	145°47.25	19°2.62
Rigel Kent.	139°39.41	-60°56.34
Kochab	137°20.35	74°2.51
Zuben'ubi	136°55.25	-16°8.98
Alphecca	126°3.26	26°37.42
Antares	112°15.10	-26°29.33
Atria	107°9.07	-69°4.27
Sabik	102°2.13	-15°45.43
Shaula	96°9.62	-37°7.30
Rasalhague	95°58.09	12°32.37
Eltanin	90°42.31	51°28.96
Kaus Aust.	83°31.81	-34°22.32
Vega	80°33.09	38°48.37
Nunki	75°47.10	-26°15.88
Altair	61°59.48	8°56.19
Peacock	53°4.98	-56°39.16
Deneb	49°25.68	45°22.45
Enif	33°38.24	9°59.68
Al Na'ir	27°32.20	-46°50.27
Fomalhaut	15°13.79	-29°29.20
Scheat	13°44.59	28°13.57
Markab	13°29.24	15°20.79
Jan 07 Wed	SHA	Mer.pass
Venus	71°44.15	12:08
Mars	71°7.32	12:09
Jupiter	247°43.34	00:23
Saturn	2°16.81	16:42
Jan 08 Thu	SHA	Mer.pass
Venus	70°22.53	12:09
Mars	70°17.41	12:08
Jupiter	247°51.94	00:18
Saturn	2°13.14	16:38
Jan 09 Fri	SHA	Mer.pass
Venus	69°1.08	12:10
Mars	69°27.54	12:08
Jupiter	248°0.55	00:14
Saturn	2°9.39	16:35
Horizontal parallax		
	Venus:	0.1
	Mars:	0.1


h	Sun			Moon			
Wed	GHA	Dec		GHA	ν	Dec	d HP
0	178°29.31	S22°23.81		310°30.45	12.8'	N10°34.77	-15.0' 57.7'
1	193°29.04	23.49		325°2.25	12.9'	10°19.77	-15.0' 57.7'
2	208°28.77	23.18		339°34.15	13.0'	10°4.75	-15.1' 57.6'
3	223°28.50	22.86		354°6.13	13.1'	09°49.70	-15.1' 57.6'
4	238°28.23	22.54		8°38.21	13.2'	09°34.62	-15.1' 57.6'
5	253°27.96	22.23		23°10.37	13.3'	09°19.52	-15.1' 57.5'
6	268°27.70	S22°21.91		37°42.63	13.3'	N09°4.40	-15.1' 57.5'
7	283°27.43	21.59		52°14.96	13.4'	08°49.26	-15.2' 57.4'
8	298°27.16	21.27		66°47.38	13.5'	08°34.10	-15.2' 57.4'
9	313°26.89	20.95		81°19.89	13.6'	08°18.93	-15.2' 57.4'
10	328°26.62	20.63		95°52.47	13.7'	08°3.74	-15.2' 57.3'
11	343°26.36	20.30		110°25.14	13.7'	07°48.53	-15.2' 57.3'
12	358°26.09	S22°19.98		124°57.88	13.8'	N07°33.31	-15.2' 57.2'
13	13°25.82	19.66		139°30.70	13.9'	07°18.08	-15.2' 57.2'
14	28°25.55	19.33		154°3.59	14.0'	07°2.84	-15.3' 57.2'
15	43°25.29	19.01		168°36.56	14.0'	06°47.59	-15.3' 57.1'
16	58°25.02	18.68		183°9.60	14.1'	06°32.33	-15.3' 57.1'
17	73°24.75	18.35		197°42.72	14.2'	06°17.06	-15.3' 57.1'
18	88°24.49	S22°18.02		212°15.90	14.3'	N06°1.79	-15.3' 57.0'
19	103°24.22	17.70		226°49.15	14.3'	05°46.51	-15.3' 57.0'
20	118°23.96	17.37		241°22.47	14.4'	05°31.22	-15.3' 56.9'
21	133°23.69	17.04		255°55.85	14.4'	05°15.94	-15.3' 56.9'
22	148°23.43	16.71		270°29.30	14.5'	05°0.65	-15.3' 56.9'
23	163°23.16	16.37		285°2.81	14.6'	04°45.37	-15.3' 56.8'
SD = 16.3'			$d = -0.3'$			SD = 15.7'	

Thu	GHA	Dec		GHA	ν	Dec	d HP
0	178°22.90	S22°16.04		299°36.38	14.6'	N04°30.08	-15.3' 56.8'
1	193°22.63	15.71		314°10.01	14.7'	04°14.80	-15.3' 56.8'
2	208°22.37	15.37		328°43.70	14.7'	03°59.52	-15.3' 56.7'
3	223°22.10	15.04		343°17.45	14.8'	03°44.24	-15.3' 56.7'
4	238°21.84	14.70		357°51.25	14.9'	03°28.97	-15.3' 56.6'
5	253°21.57	14.37		12°25.11	14.9'	03°13.70	-15.3' 56.6'
6	268°21.31	S22°14.03		26°59.02	15.0'	N02°58.44	-15.3' 56.6'
7	283°21.05	13.69		41°32.98	15.0'	02°43.19	-15.2' 56.5'
8	298°20.78	13.36		56°7.00	15.1'	02°27.95	-15.2' 56.5'
9	313°20.52	13.02		70°41.06	15.1'	02°12.72	-15.2' 56.5'
10	328°20.26	12.68		85°15.16	15.2'	01°57.49	-15.2' 56.4'
11	343°20.00	12.34		99°49.32	15.2'	01°42.29	-15.2' 56.4'
12	358°19.73	S22°11.99		114°23.52	15.2'	N01°27.09	-15.2' 56.4'
13	13°19.47	11.65		128°57.76	15.3'	01°11.91	-15.2' 56.3'
14	28°19.21	11.31		143°32.04	15.3'	00°56.74	-15.2' 56.3'
15	43°18.95	10.96		158°6.37	15.4'	00°41.59	-15.1' 56.3'
16	58°18.69	10.62		172°40.73	15.4'	00°26.45	-15.1' 56.2'
17	73°18.43	10.28		187°15.13	15.4'	N00°11.33	-15.1' 56.2'
18	88°18.16	S22°9.93		201°49.57	15.5'	S00°3.77	15.1' 56.2'
19	103°17.90	9.58		216°24.05	15.5'	00°18.85	15.1' 56.1'
20	118°17.64	9.23		230°58.55	15.5'	00°33.91	15.0' 56.1'
21	133°17.38	8.89		245°33.09	15.6'	00°48.95	15.0' 56.1'
22	148°17.12	8.54		260°7.66	15.6'	01°3.96	15.0' 56.0'
23	163°16.86	8.19		274°42.27	15.6'	01°18.96	15.0' 56.0'
SD = 16.3'			$d = -0.3'$			SD = 15.5'	

Fri	GHA	Dec		GHA	ν	Dec	d HP
0	178°16.60	S22°7.84		289°16.90	15.7'	S01°33.93	14.9' 56.0'
1	193°16.34	7.49		303°51.55	15.7'	01°48.88	14.9' 55.9'
2	208°16.08	7.13		318°26.24	15.7'	02°3.80	14.9' 55.9'
3	223°15.83	6.78		333°0.94	15.7'	02°18.70	14.9' 55.9'
4	238°15.57	6.43		347°35.67	15.8'	02°33.57	14.8' 55.8'
5	253°15.31	6.07		2°10.43	15.8'	02°48.41	14.8' 55.8'
6	268°15.05	S22°5.72		16°45.20	15.8'	S03°3.22	14.8' 55.8'
7	283°14.79	5.36		31°20.00	15.8'	03°18.01	14.8' 55.7'
8	298°14.53	5.01		45°54.81	15.8'	03°32.76	14.7' 55.7'
9	313°14.28	4.65		60°29.64	15.8'	03°47.49	14.7' 55.7'
10	328°14.02	4.29		75°4.48	15.9'	04°2.18	14.7' 55.6'
11	343°13.76	3.93		89°39.34	15.9'	04°16.84	14.6' 55.6'
12	358°13.50	S22°3.57		104°14.22	15.9'	S04°31.47	14.6' 55.6'
13	13°13.25	3.21		118°49.10	15.9'	04°46.06	14.6' 55.6'
14	28°12.99	2.85		133°24.00	15.9'	05°0.62	14.5' 55.5'
15	43°12.74	2.49		147°58.91	15.9'	05°15.15	14.5' 55.5'
16	58°12.48	2.13		162°33.82	15.9'	05°29.64	14.5' 55.5'
17	73°12.22	1.76		177°8.74	15.9'	05°44.09	14.4' 55.4'
18	88°11.97	S22°1.40		191°43.67	15.9'	S05°58.51	14.4' 55.4'
19	103°11.71	1.03		206°18.60	15.9'	06°12.89	14.3' 55.4'
20	118°11.46	0.67		220°53.54	15.9'	06°27.23	14.3' 55.4'
21	133°11.20	22°0.30		235°28.48	15.9'	06°41.53	14.3' 55.3'
22	148°10.95	21°59.93		250°3.42	15.9'	06°55.79	14.2' 55.3'
23	163°10.69	59.57		264°38.36	15.9'	07°10.01	14.2' 55.3'
SD = 16.3'			$d = -0.4'$			SD = 15.3'	

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	84-66%
07	06:03	06:16	12:06	03:24	15:47	
08	06:28	06:41	12:07	04:09	16:30	
09	06:54	07:06	12:07	04:51	17:12	


h	Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d HP
0	178°10.44	S21°59.20		279°13.30	15.9'	S07°24.19	14.1' 55.2'
1	193°10.19	58.83		293°48.23	15.9'	07°38.32	14.1' 55.2'
2	208°9.93	58.46		308°23.17	15.9'	07°52.41	14.0' 55.2'
3	223°9.68	58.09	· ·	322°58.10	15.9'	08°6.46	14.0' 55.2'
4	238°9.43	57.72		337°33.02	15.9'	08°20.47	14.0' 55.1'
5	253°9.17	57.34		352°7.94	15.9'	08°34.43	13.9' 55.1'
6	268°8.92	S21°56.97		6°42.84	15.9'	S08°48.35	13.9' 55.1'
7	283°8.67	56.60		21°17.74	15.9'	09°2.21	13.8' 55.1'
8	298°8.41	56.22		35°52.63	15.9'	09°16.04	13.8' 55.0'
9	313°8.16	55.85	· ·	50°27.51	15.9'	09°29.81	13.7' 55.0'
10	328°7.91	55.47		65°2.38	15.9'	09°43.54	13.7' 55.0'
11	343°7.66	55.09		79°37.23	15.8'	09°57.21	13.6' 55.0'
12	358°7.41	S21°54.72		94°12.07	15.8'	S10°10.84	13.6' 54.9'
13	13°7.16	54.34		108°46.89	15.8'	10°24.42	13.5' 54.9'
14	28°6.91	53.96		123°21.69	15.8'	10°37.95	13.5' 54.9'
15	43°6.66	53.58	· ·	137°56.48	15.8'	10°51.42	13.4' 54.9'
16	58°6.41	53.20		152°31.25	15.7'	11°4.84	13.4' 54.9'
17	73°6.16	52.82		167°6.00	15.7'	11°18.21	13.3' 54.8'
18	88°5.91	S21°52.44		181°40.73	15.7'	S11°31.53	13.3' 54.8'
19	103°5.66	52.05		196°15.43	15.7'	11°44.79	13.2' 54.8'
20	118°5.41	51.67		210°50.11	15.7'	11°58.00	13.2' 54.8'
21	133°5.16	51.29	· ·	225°24.77	15.6'	12°11.15	13.1' 54.7'
22	148°4.91	50.90		239°59.41	15.6'	12°24.24	13.0' 54.7'
23	163°4.66	50.52		254°34.01	15.6'	12°37.28	13.0' 54.7'
SD = 16.3'			$d = -0.4'$	SD = 15.1'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	178°4.41	S21°50.13		269°8.59	15.6'	S12°50.26	12.9' 54.7'
1	193°4.16	49.74		283°43.15	15.5'	13°3.19	12.9' 54.7'
2	208°3.92	49.35		298°17.67	15.5'	13°16.05	12.8' 54.6'
3	223°3.67	48.96	· ·	312°52.16	15.5'	13°28.85	12.7' 54.6'
4	238°3.42	48.58		327°26.63	15.4'	13°41.60	12.7' 54.6'
5	253°3.17	48.19		342°1.06	15.4'	13°54.28	12.6' 54.6'
6	268°2.93	S21°47.79		356°35.45	15.4'	S14°6.90	12.6' 54.6'
7	283°2.68	47.40		11°9.82	15.3'	14°19.46	12.5' 54.6'
8	298°2.43	47.01		25°44.15	15.3'	14°31.95	12.4' 54.5'
9	313°2.19	46.62	· ·	40°18.44	15.3'	14°44.38	12.4' 54.5'
10	328°1.94	46.22		54°52.70	15.2'	14°56.75	12.3' 54.5'
11	343°1.70	45.83		69°26.92	15.2'	15°9.05	12.2' 54.5'
12	358°1.45	S21°45.43		84°1.10	15.1'	S15°21.29	12.2' 54.5'
13	13°1.20	45.04		98°35.24	15.1'	15°33.46	12.1' 54.5'
14	28°0.96	44.64		113°9.34	15.1'	15°45.56	12.0' 54.4'
15	43°0.71	44.24	· ·	127°43.41	15.0'	15°57.60	12.0' 54.4'
16	58°0.47	43.85		142°17.43	15.0'	16°9.56	11.9' 54.4'
17	73°0.23	43.45		156°51.40	14.9'	16°21.46	11.8' 54.4'
18	87°59.98	S21°43.05		171°25.34	14.9'	S16°33.29	11.8' 54.4'
19	102°59.74	42.65		185°59.23	14.8'	16°45.04	11.7' 54.4'
20	117°59.50	42.25		200°33.07	14.8'	16°56.73	11.6' 54.4'
21	132°59.25	41.84	· ·	215°6.87	14.8'	17°8.34	11.5' 54.3'
22	147°59.01	41.44		229°40.62	14.7'	17°19.88	11.5' 54.3'
23	162°58.77	41.04		244°14.33	14.7'	17°31.35	11.4' 54.3'
SD = 16.3'			$d = -0.4'$	SD = 14.9'			

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	177°58.52	S21°40.63		258°47.99	14.6'	S17°42.74	11.3' 54.3'
1	192°58.28	40.23		273°21.59	14.6'	17°54.06	11.2' 54.3'
2	207°58.04	39.82		287°55.15	14.5'	18°5.30	11.2' 54.3'
3	222°57.80	39.42	· ·	302°28.66	14.5'	18°16.46	11.1' 54.3'
4	237°57.56	39.01		317°2.12	14.4'	18°27.55	11.0' 54.2'
5	252°57.32	38.60		331°35.53	14.4'	18°38.56	10.9' 54.2'
6	267°57.07	S21°38.19		346°8.88	14.3'	S18°49.49	10.9' 54.2'
7	282°56.83	37.78		0°42.18	14.2'	19°0.35	10.8' 54.2'
8	297°56.59	37.37		15°15.43	14.2'	19°11.12	10.7' 54.2'
9	312°56.35	36.96	· ·	29°48.62	14.1'	19°21.81	10.6' 54.2'
10	327°56.11	36.55		44°21.76	14.1'	19°32.42	10.5' 54.2'
11	342°55.87	36.14		58°54.85	14.0'	19°42.95	10.4' 54.2'
12	357°55.64	S21°35.73		73°27.88	14.0'	S19°53.39	10.4' 54.2'
13	12°55.40	35.31		88°0.85	13.9'	20°3.75	10.3' 54.2'
14	27°55.16	34.90		102°33.76	13.9'	20°14.03	10.2' 54.1'
15	42°54.92	34.48	· ·	117°6.62	13.8'	20°24.22	10.1' 54.1'
16	57°54.68	34.07		131°39.42	13.7'	20°34.33	10.0' 54.1'
17	72°54.44	33.65		146°12.16	13.7'	20°44.34	9.9' 54.1'
18	87°54.20	S21°33.23		160°44.84	13.6'	S20°54.28	9.8' 54.1'
19	102°53.97	32.82		175°17.46	13.6'	21°4.12	9.7' 54.1'
20	117°53.73	32.40		189°50.02	13.5'	21°13.87	9.7' 54.1'
21	132°53.49	31.98	· ·	204°22.53	13.4'	21°23.53	9.6' 54.1'
22	147°53.26	31.56		218°54.97	13.4'	21°33.11	9.5' 54.1'
23	162°53.02	31.14		233°27.35	13.3'	21°42.59	9.4' 54.1'
SD = 16.3'			$d = -0.4'$	SD = 14.8'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	57-37%
10	07:18	07:30	12:08	05:32	17:53	
11	07:42	07:54	12:08	06:14	18:35	
12	08:06	08:17	12:08	06:57	19:19	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	112°29.41		176°6.62	S22°9.51	178°37.83	S22°36.02	1°4.46	N22°14.94	114°22.99	S03°14.50	Alpheratz	357°34.02 29°14.20	
1	127°31.87		191°5.72	9.03	193°38.22	35.72	16°7.29	14.99	129°25.29	14.42	Ankaa	353°6.42 -42°10.08	
2	142°34.34		206°4.83	8.55	208°38.61	35.42	31°10.11	15.04	144°27.58	14.34	Schedar	349°30.20 56°41.10	
3	157°36.80		221°3.94	•• 8.06	223°39.01	•• 35.12	46°12.93	•• 15.10	159°29.87	•• 14.26	Diphda	348°46.51 -17°50.74	
4	172°39.27		236°3.05	7.58	238°39.40	34.82	61°15.76	15.15	174°32.16	14.17	Achernar	335°19.51 -57°6.54	
5	187°41.73		251°2.16	7.10	253°39.79	34.52	76°18.58	15.21	189°34.46	14.09	Hamal	327°50.17 23°35.25	
6	202°44.19		266°1.27	S22°6.61	268°40.19	S22°34.22	91°21.40	N22°15.26	204°36.75	S03°14.01	Polaris	313°22.52 89°22.73	
7	217°46.66		281°0.38	6.12	283°40.58	33.92	106°24.22	15.32	219°39.04	13.93	Acamar	315°10.95 -40°12.21	
8	232°49.12		295°59.49	5.63	298°40.98	33.62	121°27.05	15.37	234°41.33	13.85	Menkar	314°5.12 4°11.51	
9	247°51.59		310°58.60	•• 5.14	313°41.37	•• 33.32	136°29.87	•• 15.42	249°43.62	•• 13.76	Mirfak	308°26.77 49°57.42	
10	262°54.05		325°57.72	4.65	328°41.76	33.01	151°32.69	15.48	264°45.92	13.68	Aldebaran	290°38.38 16°33.72	
11	277°56.52		340°56.83	4.16	343°42.16	32.71	166°35.51	15.53	279°48.21	13.60	Rigel	281°2.76 -8°10.35	
12	292°58.98		355°55.94	S22°3.67	358°42.55	S22°32.41	181°38.34	N22°15.59	294°50.50	S03°13.52	Capella	280°20.22 46°1.53	
13	308°1.44		10°55.05	3.17	13°42.95	32.10	196°41.16	15.64	309°52.79	13.43	Bellatrix	278°21.67 6°22.37	
14	323°3.91		25°54.17	2.68	28°43.34	31.80	211°43.98	15.69	324°55.08	13.35	Elnath	278°0.45 28°37.79	
15	338°6.37		40°53.28	•• 2.18	43°43.74	•• 31.49	226°46.81	•• 15.75	339°57.37	•• 13.27	Alnilam	275°36.56 -1°11.16	
16	353°8.84		55°52.40	1.69	58°44.13	31.19	241°49.63	15.80	354°59.66	13.18	Betelgeuse	270°50.85 7°24.68	
17	8°11.30		70°51.51	1.19	73°44.53	30.88	256°52.45	15.86	10°1.95	13.10	Canopus	263°51.48 -52°42.62	
18	23°13.76		85°50.63	S22°0.69	88°44.92	S22°30.58	271°55.27	N22°15.91	25°4.25	S03°13.02	Sirius	258°25.14 -16°45.17	
19	38°16.23		100°49.74	22°0.19	103°45.32	30.27	286°58.10	15.96	40°6.54	12.94	Adhara	255°4.81 -29°0.49	
20	53°18.69		115°48.86	21°59.68	118°45.71	29.96	302°0.92	16.02	55°8.83	12.85	Procyon	244°49.61 5°9.42	
21	68°21.16		130°47.97	•• 59.18	133°46.11	•• 29.65	317°3.74	•• 16.07	70°11.12	•• 12.77	Pollux	243°15.89 27°57.71	
22	83°23.62		145°47.09	58.67	148°46.50	29.35	332°6.56	16.13	85°13.41	12.69	Avior	234°13.75 -59°35.50	
23	98°26.09		160°46.21	58.17	163°46.90	29.04	347°9.38	16.18	100°15.70	12.60	Suhail	222°45.27 -43°32.20	
Mer.pass. 16:27		ν-0.9' d-0.5' m-3.90		ν0.4' d-0.3' m1.09		ν2.8' d0.1' m-2.68		ν2.3' d-0.1' m1.02					
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	113°28.55		175°45.33	S21°57.66	178°47.29	S22°28.73	2°12.21	N22°16.23	115°17.99	S03°12.52	Miaplacidus	221°37.24 -69°49.30	
1	128°31.01		190°44.44	57.15	193°47.69	28.42	17°15.03	16.29	130°20.28	12.44	Alphard	217°46.63 -8°46.34	
2	143°33.48		205°43.56	56.64	208°48.08	28.11	32°17.85	16.34	145°22.57	12.35	Regulus	207°33.27 11°50.26	
3	158°35.94		220°42.68	•• 56.13	223°48.48	•• 27.80	47°20.67	•• 16.40	160°24.86	•• 12.27	Dubhe	193°39.55 61°36.33	
4	173°38.41		235°41.80	55.62	238°48.87	27.49	62°23.50	16.45	175°27.15	12.19	Denebola	182°23.94 14°25.42	
5	188°40.87		250°40.92	55.11	253°49.27	27.18	77°26.32	16.50	190°29.43	12.10	Gienah	175°42.61 -17°41.18	
6	203°43.34		265°40.04	S21°54.60	268°49.67	S22°26.87	92°29.14	N22°16.56	205°31.72	S03°12.02	Acrux	172°58.97 -63°14.37	
7	218°45.80		280°39.16	54.08	283°50.06	26.55	107°31.96	16.61	220°34.01	11.94	Gacrux	171°50.56 -57°15.33	
8	233°48.26		295°38.28	53.57	298°50.46	26.24	122°34.78	16.66	235°36.30	11.85	Alioth	166°12.13 55°48.75	
9	248°50.73		310°37.40	•• 53.05	313°50.86	•• 25.93	137°37.61	•• 16.72	250°38.59	•• 11.77	Spica	158°21.40 -11°17.86	
10	263°53.19		325°36.52	52.53	328°51.25	25.62	152°40.43	16.77	265°40.88	11.68	Alkaid	152°51.37 49°10.65	
11	278°55.66		340°35.65	52.01	343°51.65	25.30	167°43.25	16.83	280°43.17	11.60	Hadar	148°34.91 -60°29.67	
12	293°58.12		355°34.77	S21°51.49	358°52.04	S22°24.99	182°46.07	N22°16.88	295°45.46	S03°11.52	Menkent	147°56.69 -36°29.76	
13	309°0.58		10°33.89	50.97	13°52.44	24.67	197°48.89	16.93	310°47.74	11.43	Arcturus	145°47.21 19°2.60	
14	324°3.05		25°33.02	50.44	28°52.84	24.36	212°51.71	16.99	325°50.03	11.35	Rigel Kent.	139°39.32 -60°56.34	
15	339°5.51		40°32.14	•• 49.92	43°53.23	•• 24.04	227°54.54	•• 17.04	340°52.32	•• 11.26	Kochab	137°20.24 74°2.50	
16	354°7.98		55°31.26	49.39	58°53.63	23.73	242°57.36	17.09	355°54.61	11.18	Zuben'ubi	136°55.20 -16°8.99	
17	9°10.44		70°30.39	48.87	73°54.03	23.41	258°0.18	17.15	10°56.90	11.10	Alphecca	126°3.22 26°37.39	
18	24°12.91		85°29.51	S21°48.34	88°54.42	S22°23.09	273°3.00	N22°17.20	25°59.18	S03°11.01	Antares	112°15.06 -26°29.34	
19	39°15.37		100°28.64	47.81	103°54.82	22.78	288°5.82	17.25	41°1.47	10.93	Atria	107°8.98 -69°4.25	
20	54°17.83		115°27.77	47.28	118°55.22	22.46	303°8.64	17.31	56°3.76	10.84	Sabik	102°2.10 -15°45.44	
21	69°20.30		130°26.89	•• 46.75	133°55.62	•• 22.14	318°11.47	•• 17.36	71°6.05	•• 10.76	Shaula	96°9.59 -37°7.30	
22	84°22.76		145°26.02	46.22	148°56.01	21.82	333°14.29	17.41	86°8.33	10.67	Rasalhague	95°58.06 12°32.35	
23	99°25.23		160°25.15	45.69	163°56.41	21.50	348°17.11	17.47	101°10.62	10.59	Eltanin	90°42.29 51°28.93	
Mer.pass. 16:23		ν-0.9' d-0.5' m-3.90		ν0.4' d-0.3' m1.09		ν2.8' d0.1' m-2.68		ν2.3' d-0.1' m1.02					
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	114°27.69		175°24.27	S21°45.15	178°56.81	S22°21.18	3°19.93	N22°17.52	116°12.91	S03°10.51	Kaus Aust.	83°31.78 -34°22.31	
1	129°30.15		190°23.40	44.62	193°57.21	20.86	18°22.75	17.57	131°15.19	10.42	Vega	80°33.07 38°48.34	
2	144°32.62		205°22.53	44.08	208°57.60	20.54	33°25.57	17.63	146°17.48	10.34	Nunki	75°47.08 -26°15.87	
3	159°35.08		220°21.66	•• 43.54	223°58.00	•• 20.22	48°28.39	•• 17.68	161°19.77	•• 10.25	Altair	61°59.47 8°56.18	
4	174°37.55		235°20.79	43.00	238°58.40	19.90	63°31.21	17.73	176°22.05	10.17	Peacock	53°4.98 -56°39.14	
5	189°40.01		250°19.92	42.46	253°58.80	19.58	78°34.04	17.79	191°24.34	10.08	Deneb	49°25.69 45°22.43	
6	204°42.48		265°19.05	S21°41.92	268°59.20	S22°19.26	93°36.86	N22°17.84	206°26.63	S03°10.00	Enif	33°38.25 9°59.67	
7	219°44.94		280°18.18	41.38	283°59.59	18.94	108°39.68	17.89	221°28.91	9.91	Al Na'ir	27°32.22 -46°50.25	
8	234°47.40		295°17.31	40.83	298°59.99	18.61	123°42.50	17.95	236°31.20	9.83	Fomalhaut	15°13.81 -29°29.20	
9	249°49.87		310°16.44	•• 40.29	314°0.39	•• 18.29	138°45.32	•• 18.00	251°33.48	•• 9.74	Scheat	13°44.60 28°13.56	
10	264°52.33		325°15.57	39.74	329°0.79	17.97	153°48.14	18.05	266°35.77	9.66	Markab		

h		Sun			Moon			
Tue		GHA	Dec		GHA	ν	Dec	d
0		177°52.78	S21°30.72		247°59.67	13.3'	S21°51.98	9.3'
1		192°52.55	30.29		262°31.92	13.2'	22°1.27	9.2'
2		207°52.31	29.87		277°4.12	13.1'	22°10.48	9.1'
3		222°52.08	· · 29.45		291°36.25	13.1'	22°19.59	9.0'
4		237°51.84	29.02		306°8.32	13.0'	22°28.60	8.9'
5		252°51.61	28.60		320°40.33	12.9'	22°37.51	8.8'
6		267°51.37	S21°28.17		335°12.27	12.9'	S22°46.33	8.7'
7		282°51.14	27.74		349°44.15	12.8'	22°55.06	8.6'
8		297°50.90	27.32		4°15.97	12.8'	23°3.68	8.5'
9		312°50.67	· · 26.89		18°47.72	12.7'	23°12.20	8.4'
10		327°50.44	26.46		33°19.41	12.6'	23°20.63	8.3'
11		342°50.20	26.03		47°51.03	12.6'	23°28.95	8.2'
12		357°49.97	S21°25.60		62°22.59	12.5'	S23°37.17	8.1'
13		12°49.74	25.17		76°54.09	12.4'	23°45.29	8.0'
14		27°49.50	24.74		91°25.52	12.4'	23°53.31	7.9'
15		42°49.27	· · 24.31		105°56.89	12.3'	24°1.22	7.8'
16		57°49.04	23.87		120°28.19	12.2'	24°9.03	7.7'
17		72°48.81	23.44		134°59.43	12.2'	24°16.73	7.6'
18		87°48.58	S21°23.00		149°30.61	12.1'	S24°24.33	7.5'
19		102°48.35	22.57		164°1.72	12.0'	24°31.81	7.4'
20		117°48.12	22.13		178°32.76	12.0'	24°39.20	7.3'
21		132°47.89	· · 21.70		193°3.74	11.9'	24°46.47	7.2'
22		147°47.65	21.26		207°34.66	11.9'	24°53.63	7.1'
23		162°47.42	20.82		222°5.52	11.8'	25°0.68	6.9'
		SD = 16.3' $d = -0.4'$			SD = 14.7'			

Wed		GHA	Dec		GHA	ν	Dec	d
0		177°47.20	S21°20.38		236°36.31	11.7'	S25°7.62	6.8'
1		192°46.97	19.94		251°7.03	11.7'	25°14.45	6.7'
2		207°46.74	19.50		265°37.70	11.6'	25°21.17	6.6'
3		222°46.51	· · 19.06		280°8.30	11.5'	25°27.77	6.5'
4		237°46.28	18.62		294°38.84	11.5'	25°34.26	6.4'
5		252°46.05	18.18		309°9.31	11.4'	25°40.64	6.3'
6		267°45.82	S21°17.73		323°39.73	11.4'	S25°46.90	6.1'
7		282°45.59	17.29		338°10.08	11.3'	25°53.04	6.0'
8		297°45.37	16.85		352°40.37	11.2'	25°59.06	5.9'
9		312°45.14	· · 16.40		7°10.60	11.2'	26°4.97	5.8'
10		327°44.91	15.95		21°40.77	11.1'	26°10.76	5.7'
11		342°44.69	15.51		36°10.88	11.1'	26°16.43	5.5'
12		357°44.46	S21°15.06		50°40.93	11.0'	S26°21.98	5.4'
13		12°44.23	14.61		65°10.92	10.9'	26°27.41	5.3'
14		27°44.01	14.16		79°40.85	10.9'	26°32.72	5.2'
15		42°43.78	· · 13.71		94°10.73	10.8'	26°37.90	5.1'
16		57°43.56	13.26		108°40.55	10.8'	26°42.96	4.9'
17		72°43.33	12.81		123°10.31	10.7'	26°47.90	4.8'
18		87°43.11	S21°12.36		137°40.01	10.6'	S26°52.72	4.7'
19		102°42.88	11.91		152°9.66	10.6'	26°57.40	4.6'
20		117°42.66	11.46		166°39.26	10.5'	27°1.97	4.4'
21		132°42.43	· · 11.00		181°8.80	10.5'	27°6.41	4.3'
22		147°42.21	10.55		195°38.29	10.4'	27°10.72	4.2'
23		162°41.99	10.09		210°7.72	10.4'	27°14.90	4.1'
		SD = 16.3' $d = -0.4'$			SD = 14.7'			

Thu		GHA	Dec		GHA	ν	Dec	d
0		177°41.76	S21°9.64		224°37.10	10.3'	S27°18.95	3.9'
1		192°41.54	9.18		239°6.44	10.3'	27°22.88	3.8'
2		207°41.32	8.72		253°35.72	10.2'	27°26.67	3.7'
3		222°41.10	· · 8.26		268°4.96	10.2'	27°30.34	3.5'
4		237°40.88	7.80		282°34.14	10.1'	27°33.87	3.4'
5		252°40.65	7.35		297°3.28	10.1'	27°37.28	3.3'
6		267°40.43	S21°6.89		311°32.37	10.0'	S27°40.55	3.1'
7		282°40.21	6.42		326°1.42	10.0'	27°43.69	3.0'
8		297°39.99	5.96		340°30.42	10.0'	27°46.70	2.9'
9		312°39.77	· · 5.50		354°59.38	9.9'	27°49.57	2.7'
10		327°39.55	5.04		9°28.30	9.9'	27°52.31	2.6'
11		342°39.33	4.57		23°57.17	9.8'	27°54.91	2.5'
12		357°39.11	S21°4.11		38°26.01	9.8'	S27°57.38	2.3'
13		12°38.89	3.64		52°54.81	9.8'	27°59.71	2.2'
14		27°38.67	3.18		67°23.56	9.7'	28°1.91	2.1'
15		42°38.45	· · 2.71		81°52.29	9.7'	28°3.97	1.9'
16		57°38.24	2.25		96°20.97	9.7'	28°5.89	1.8'
17		72°38.02	1.78		110°49.62	9.6'	28°7.68	1.6'
18		87°37.80	S21°1.31		125°18.24	9.6'	S28°9.33	1.5'
19		102°37.58	0.84		139°46.83	9.6'	28°10.84	1.4'
20		117°37.36	21°0.37		154°15.38	9.5'	28°12.21	1.2'
21		132°37.15	20°59.90		168°43.90	9.5'	28°13.44	1.1'
22		147°36.93	59.43		183°12.40	9.5'	28°14.53	1.0'
23		162°36.71	58.96		197°40.87	9.4'	28°15.48	0.8'
		SD = 16.3' $d = -0.5'$			SD = 14.8'			

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 24-26 29-13%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
13	08:29	08:40	12:09	07:42	20:06	
14	08:51	09:02	12:09	08:30	20:55	
15	09:13	09:24	12:09	09:21	21:47	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	115°26.83		175°3.47	S21°31.98	179°6.38	S22°13.39	4°27.62	N22°18.80	117°7.75	S03°8.46	Alpheratz	357°34.03	29°14.20
1	130°29.30		190°2.61	31.42	194°6.78	13.06	19°30.44	18.85	132°10.04	8.37	Ankaa	353°6.43	-42°10.08
2	145°31.76		205°1.75	30.86	209°7.18	12.73	34°33.26	18.90	147°12.32	8.29	Schedar	349°30.21	56°41.09
3	160°34.22		220°0.89	•• 30.29	224°7.58	•• 12.40	49°36.08	•• 18.95	162°14.60	•• 8.20	Diphda	348°46.51	-17°50.74
4	175°36.69		235°0.03	29.73	239°7.98	12.06	64°38.90	19.01	177°16.89	8.12	Achernar	335°19.54	-57°6.53
5	190°39.15		249°59.17	29.16	254°8.38	11.73	79°41.72	19.06	192°19.17	8.03	Hamal	327°50.17	23°35.25
6	205°41.62		264°58.31	S21°28.59	269°8.78	S22°11.40	94°44.54	N22°19.11	207°21.45	S03°7.94	Polaris	313°23.64	89°22.74
7	220°44.08		279°57.45	28.02	284°9.18	11.07	109°47.36	19.16	222°23.74	7.86	Acamar	315°10.96	-40°12.21
8	235°46.54		294°56.59	27.45	299°9.58	10.73	124°50.18	19.22	237°26.02	7.77	Menkar	314°5.12	4°11.51
9	250°49.01		309°55.73	•• 26.88	314°9.98	•• 10.40	139°53.00	•• 19.27	252°28.30	•• 7.69	Mirfak	308°26.78	49°57.42
10	265°51.47		324°54.88	26.31	329°10.38	10.06	154°55.82	19.32	267°30.58	7.60	Aldebaran	290°38.38	16°33.72
11	280°53.94		339°54.02	25.73	344°10.78	9.73	169°58.64	19.37	282°32.87	7.51	Rigel	281°2.76	-8°10.36
12	295°56.40		354°53.16	S21°25.16	359°11.19	S22°9.40	185°1.46	N22°19.43	297°35.15	S03°7.43	Capella	280°20.21	46°1.53
13	310°58.87		9°52.31	24.58	14°11.59	9.06	200°4.28	19.48	312°37.43	7.34	Bellatrix	278°21.67	6°22.37
14	326°1.33		24°51.45	24.01	29°11.99	8.72	215°7.10	19.53	327°39.71	7.25	Elnath	278°0.45	28°37.79
15	341°3.79		39°50.60	•• 23.43	44°12.39	•• 8.39	230°9.92	•• 19.58	342°41.99	•• 7.17	Alnilam	275°36.56	-1°11.16
16	356°6.26		54°49.74	22.85	59°12.79	8.05	245°12.73	19.64	357°44.28	7.08	Betelgeuse	270°50.84	7°24.68
17	11°8.72		69°48.89	22.27	74°13.19	7.71	260°15.55	19.69	12°46.56	6.99	Canopus	263°51.48	-52°42.64
18	26°11.19		84°48.03	S21°21.69	89°13.59	S22°7.38	275°18.37	N22°19.74	27°48.84	S03°6.91	Sirius	258°25.14	-16°45.18
19	41°13.65		99°47.18	21.10	104°14.00	7.04	290°21.19	19.79	42°51.12	6.82	Adhara	255°4.81	-29°0.51
20	56°16.12		114°46.33	20.52	119°14.40	6.70	305°24.01	19.85	57°53.40	6.73	Procyon	244°49.59	5°9.42
21	71°18.58		129°45.48	•• 19.93	134°14.80	•• 6.36	320°26.83	•• 19.90	72°55.68	•• 6.65	Pollux	243°15.87	27°57.71
22	86°21.04		144°44.62	19.35	149°15.20	6.02	335°29.65	19.95	87°57.96	6.56	Avior	234°13.74	-59°35.52
23	101°23.51		159°43.77	18.76	164°15.60	5.68	350°32.46	20.00	103°0.24	6.47	Suhail	222°45.26	-43°32.22
Mer.pass. 16:16		ν-0.9' d-0.6' m-3.90		ν0.4' d-0.3' m1.09		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.02					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	116°25.97		174°42.92	S21°18.17	179°16.01	S22°5.34	5°35.28	N22°20.06	118°2.52	S03°6.39	Miaplacidus	221°37.22	-69°49.32
1	131°28.44		189°42.07	17.58	194°16.41	5.00	20°38.10	20.11	133°4.80	6.30	Alphard	217°46.61	-8°46.35
2	146°30.90		204°41.22	16.99	209°16.81	4.66	35°40.92	20.16	148°7.09	6.21	Regulus	207°33.25	11°50.26
3	161°33.36		219°40.37	•• 16.40	224°17.21	•• 4.32	50°43.74	•• 20.21	163°9.37	•• 6.13	Dubhe	193°39.51	61°36.33
4	176°35.83		234°39.52	15.81	239°17.62	3.97	65°46.56	20.26	178°11.65	6.04	Denebola	182°23.91	14°25.41
5	191°38.29		249°38.67	15.21	254°18.02	3.63	80°49.37	20.32	193°13.93	5.95	Gienah	175°42.58	-17°41.20
6	206°40.76		264°37.83	S21°14.62	269°18.42	S22°3.29	95°52.19	N22°20.37	208°16.21	S03°5.86	Acrux	172°58.92	-63°14.39
7	221°43.22		279°36.98	14.02	284°18.83	2.95	110°55.01	20.42	223°18.49	5.78	Gacrux	171°50.51	-57°15.34
8	236°45.69		294°36.13	13.43	299°19.23	2.60	125°57.83	20.47	238°20.77	5.69	Alioth	166°12.09	55°48.75
9	251°48.15		309°35.28	•• 12.83	314°19.63	•• 2.26	141°0.64	•• 20.53	253°23.05	•• 5.60	Spica	158°21.37	-11°17.87
10	266°50.61		324°34.44	12.23	329°20.04	1.91	156°3.46	20.58	268°25.32	5.51	Alkaid	152°51.34	49°10.64
11	281°53.08		339°33.59	11.63	344°20.44	1.57	171°6.28	20.63	283°27.60	5.43	Hadar	148°34.86	-60°29.68
12	296°55.54		354°32.75	S21°11.03	359°20.84	S22°1.22	186°9.10	N22°20.68	298°29.88	S03°5.34	Menkent	147°56.65	-36°29.77
13	311°58.01		9°31.90	10.42	14°21.25	0.88	201°11.91	20.73	313°32.16	5.25	Arcturus	145°47.18	19°2.59
14	327°0.47		24°31.06	9.82	29°21.65	0.53	216°14.73	20.79	328°34.44	5.16	Rigel Kent.	139°39.27	-60°56.35
15	342°2.94		39°30.21	•• 9.22	44°22.05	22°0.18	231°17.55	•• 20.84	343°36.72	•• 5.08	Kochab	137°20.18	74°2.49
16	357°5.40		54°29.37	8.61	59°22.46	21°59.84	246°20.37	20.89	358°39.00	4.99	Zuben'ubi	136°55.17	-16°9.00
17	12°7.86		69°28.53	8.00	74°22.86	59.49	261°23.18	20.94	13°41.28	4.90	Alphecca	126°3.19	26°37.38
18	27°10.33		84°27.68	S21°7.39	89°23.27	S21°59.14	276°26.00	N22°20.99	28°43.56	S03°4.81	Antares	112°15.03	-26°29.34
19	42°12.79		99°26.84	6.79	104°23.67	58.79	291°28.82	21.04	43°45.83	4.72	Atria	107°8.92	-69°4.24
20	57°15.26		114°26.00	6.17	119°24.08	58.44	306°31.63	21.10	58°48.11	4.64	Sabik	102°2.07	-15°45.44
21	72°17.72		129°25.16	•• 5.56	134°24.48	•• 58.09	321°34.45	•• 21.15	73°50.39	•• 4.55	Shaula	96°9.56	-37°7.29
22	87°20.18		144°24.32	4.95	149°24.89	57.75	336°37.27	21.20	88°52.67	4.46	Rasalhague	95°58.04	12°32.34
23	102°22.65		159°23.48	4.34	164°25.29	57.40	351°40.08	21.25	103°54.95	4.37	Eltanin	90°42.27	51°28.92
Mer.pass. 16:12		ν-0.9' d-0.6' m-3.90		ν0.4' d-0.3' m1.09		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.03					
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	117°25.11		174°22.64	S21°3.72	179°25.69	S21°57.04	6°42.90	N22°21.30	118°57.22	S03°4.28	Jan 16 Fri	SHA	Mer.pass
1	132°27.58		189°21.80	3.11	194°26.10	56.69	21°45.72	21.35	133°59.50	4.19	Venus	59°36.64	12:20
2	147°30.04		204°20.96	2.49	209°26.50	56.34	36°48.53	21.41	149°1.78	4.11	Mars	63°39.55	12:03
3	162°32.51		219°20.12	•• 1.87	224°26.91	•• 55.99	51°51.35	•• 21.46	164°4.06	•• 4.02	Jupiter	249°0.79	23:38
4	177°34.97		234°19.29	1.25	239°27.32	55.64	66°54.17	21.51	179°6.33	3.93	Saturn	1°40.92	16:09
5	192°37.43		249°18.45	0.63	254°27.72	55.28	81°56.98	21.56	194°8.61	3.84			
6	207°39.90		264°17.61	S21°0.01	269°28.13	S21°54.93	96°59.80	N22°21.61	209°10.89	S03°3.75	Jan 17 Sat	SHA	Mer.pass
7	222°42.36		279°16.78	20°59.39	284°28.53	54.58	112°2.61	21.66	224°13.16	3.66	Venus	58°16.95	12:22
8	237°44.83		294°15.94	58.77	299°28.94	54.22	127°5.43	21.72	239°15.44	3.58	Mars	62°50.03	12:03
9	252°47.29		309°15.10	•• 58.14	314°29.34	•• 53.87	142°8.24	•• 21.77	254°17.72	•• 3.49	Jupiter	249°9.31	23:33
10	267°49.75		324°14.27	57.52	329°29.75	53.51	157°11.06	21.82	269°19.99	3.40	Saturn	1°36.55	16:05
11	282°52.22		339°13.44	56.89	344°30.16								

h		Sun		Moon			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		177°36.50	S20°58.48	212°9.31	9.4'	S28°16.30	0.7' 54.3'
1		192°36.28	58.01	226°37.73	9.4'	28°16.97	0.5' 54.3'
2		207°36.07	57.54	241°6.12	9.4'	28°17.50	0.4' 54.3'
3		222°35.85	• • 57.06	255°34.49	9.4'	28°17.89	0.2' 54.4'
4		237°35.64	56.58	270°2.85	9.3'	28°18.14	0.1' 54.4'
5		252°35.42	56.11	284°31.18	9.3'	28°18.24	-0.0' 54.4'
6		267°35.21	S20°55.63	298°59.49	9.3'	S28°18.21	-0.2' 54.4'
7		282°34.99	55.15	313°27.79	9.3'	28°18.03	-0.3' 54.4'
8		297°34.78	54.68	327°56.07	9.3'	28°17.71	-0.5' 54.4'
9		312°34.57	• • 54.20	342°24.34	9.3'	28°17.25	-0.6' 54.4'
10		327°34.35	53.72	356°52.59	9.2'	28°16.65	-0.7' 54.4'
11		342°34.14	53.24	11°20.83	9.2'	28°15.90	-0.9' 54.5'
12		357°33.93	S20°52.76	25°49.06	9.2'	S28°15.01	-1.0' 54.5'
13		12°33.71	52.27	40°17.29	9.2'	28°13.98	-1.2' 54.5'
14		27°33.50	51.79	54°45.50	9.2'	28°12.80	-1.3' 54.5'
15		42°33.29	• • 51.31	69°13.71	9.2'	28°11.48	-1.5' 54.5'
16		57°33.08	50.82	83°41.92	9.2'	28°10.02	-1.6' 54.5'
17		72°32.87	50.34	98°10.12	9.2'	28°8.42	-1.7' 54.5'
18		87°32.66	S20°49.85	112°38.32	9.2'	S28°6.67	-1.9' 54.6'
19		102°32.45	49.37	127°6.52	9.2'	28°4.77	-2.0' 54.6'
20		117°32.24	48.88	141°34.72	9.2'	28°2.74	-2.2' 54.6'
21		132°32.03	• • 48.39	156°2.93	9.2'	28°0.56	-2.3' 54.6'
22		147°31.82	47.91	170°31.13	9.2'	27°58.24	-2.5' 54.6'
23		162°31.61	47.42	184°59.34	9.2'	27°55.77	-2.6' 54.6'
		SD = 16.3' $d = -0.5'$		SD = 14.8'			

Sat		GHA	Dec	GHA	ν	Dec	d HP
0		177°31.40	S20°46.93	199°27.56	9.2'	S27°53.16	-2.8' 54.6'
1		192°31.19	46.44	213°55.79	9.2'	27°50.41	-2.9' 54.7'
2		207°30.98	45.95	228°24.02	9.2'	27°47.52	-3.0' 54.7'
3		222°30.77	• • 45.46	242°52.27	9.3'	27°44.48	-3.2' 54.7'
4		237°30.57	44.96	257°20.52	9.3'	27°41.30	-3.3' 54.7'
5		252°30.36	44.47	271°48.79	9.3'	27°37.98	-3.5' 54.7'
6		267°30.15	S20°43.98	286°17.07	9.3'	S27°34.52	-3.6' 54.7'
7		282°29.94	43.48	300°45.37	9.3'	27°30.91	-3.7' 54.7'
8		297°29.74	42.99	315°13.69	9.3'	27°27.17	-3.9' 54.8'
9		312°29.53	• • 42.49	329°42.02	9.4'	27°23.28	-4.0' 54.8'
10		327°29.33	42.00	344°10.37	9.4'	27°19.25	-4.2' 54.8'
11		342°29.12	41.50	358°38.75	9.4'	27°15.08	-4.3' 54.8'
12		357°28.91	S20°41.00	13°7.14	9.4'	S27°10.77	-4.5' 54.8'
13		12°28.71	40.50	27°35.56	9.4'	27°6.32	-4.6' 54.8'
14		27°28.51	40.01	42°4.00	9.5'	27°1.72	-4.7' 54.9'
15		42°28.30	• • 39.51	56°32.47	9.5'	26°56.99	-4.9' 54.9'
16		57°28.10	39.01	71°0.96	9.5'	26°52.12	-5.0' 54.9'
17		72°27.89	38.50	85°29.48	9.5'	26°47.12	-5.1' 54.9'
18		87°27.69	S20°38.00	99°58.03	9.6'	S26°41.97	-5.3' 54.9'
19		102°27.49	37.50	114°26.61	9.6'	26°36.68	-5.4' 54.9'
20		117°27.28	37.00	128°55.22	9.6'	26°31.26	-5.6' 55.0'
21		132°27.08	• • 36.49	143°23.86	9.7'	26°25.70	-5.7' 55.0'
22		147°26.88	35.99	157°52.54	9.7'	26°20.01	-5.8' 55.0'
23		162°26.68	35.48	172°21.24	9.7'	26°14.17	-6.0' 55.0'
		SD = 16.3' $d = -0.5'$		SD = 14.9'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		177°26.47	S20°34.98	186°49.99	9.8'	S26°8.21	-6.1' 55.0'
1		192°26.27	34.47	201°18.77	9.8'	26°2.10	-6.2' 55.0'
2		207°26.07	33.96	215°47.58	9.9'	25°55.87	-6.4' 55.1'
3		222°25.87	• • 33.46	230°16.44	9.9'	25°49.50	-6.5' 55.1'
4		237°25.67	32.95	244°45.33	9.9'	25°42.99	-6.6' 55.1'
5		252°25.47	32.44	259°14.26	10.0'	25°36.36	-6.8' 55.1'
6		267°25.27	S20°31.93	273°43.23	10.0'	S25°29.59	-6.9' 55.1'
7		282°25.07	31.42	288°12.24	10.1'	25°22.69	-7.0' 55.1'
8		297°24.87	30.91	302°41.30	10.1'	25°15.66	-7.2' 55.2'
9		312°24.67	• • 30.40	317°10.40	10.1'	25°8.50	-7.3' 55.2'
10		327°24.47	29.88	331°39.54	10.2'	25°1.20	-7.4' 55.2'
11		342°24.28	29.37	346°8.72	10.2'	24°53.78	-7.5' 55.2'
12		357°24.08	S20°28.86	0°37.95	10.3'	S24°46.24	-7.7' 55.2'
13		12°23.88	28.34	15°7.23	10.3'	24°38.56	-7.8' 55.3'
14		27°23.68	27.83	29°36.55	10.4'	24°30.76	-7.9' 55.3'
15		42°23.49	• • 27.31	44°5.92	10.4'	24°22.83	-8.1' 55.3'
16		57°23.29	26.79	58°35.33	10.5'	24°14.78	-8.2' 55.3'
17		72°23.09	26.28	73°4.80	10.5'	24°6.60	-8.3' 55.3'
18		87°22.90	S20°25.76	87°34.31	10.6'	S23°58.29	-8.4' 55.3'
19		102°22.70	25.24	102°3.87	10.6'	23°49.87	-8.5' 55.4'
20		117°22.51	24.72	116°33.48	10.7'	23°41.32	-8.7' 55.4'
21		132°22.31	• • 24.20	131°3.14	10.7'	23°32.65	-8.8' 55.4'
22		147°22.12	23.68	145°32.85	10.8'	23°23.86	-8.9' 55.4'
23		162°21.92	23.16	160°2.62	10.8'	23°14.95	-9.0' 55.4'
		SD = 16.2' $d = -0.5'$		SD = 15.0'			

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 27-0 8-1%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
16	09:34	09:44	12:10	10:13	22:39	
17	09:54	10:04	12:10	11:06	23:32	
18	10:14	10:24	12:10	11:57	—:—	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	118°24.25	174°2.63	S20°48.65	179°35.45	S21°48.50	7°50.47	N22°22.53	119°51.85	S03°2.15			Alpheratz	357°34.04 29°14.19
1	133°26.72	189°1.80	48.00	194°35.85	48.14	22°53.28	22.59	134°54.13	2.06			Ankaa	353°6.44 -42°10.07
2	148°29.18	204°0.98	47.36	209°36.26	47.78	37°56.10	22.64	149°56.40	1.97			Schedar	349°30.23 56°41.09
3	163°31.65	219°0.15	· · 46.72	224°36.67	· · 47.42	52°58.91	· · 22.69	164°58.68	· · 1.88			Diphda	348°46.52 -17°50.74
4	178°34.11	233°59.32	46.07	239°37.08	47.05	68°1.73	22.74	180°0.95	1.79			Achernar	335°19.56 -57°6.53
5	193°36.57	248°58.50	45.43	254°37.49	46.69	83°4.54	22.79	195°3.22	1.70			Hamal	327°50.18 23°35.25
6	208°39.04	263°57.67	S20°44.78	269°37.89	S21°46.33	98°7.35	N22°22.84	210°5.50	S03°1.61			Polaris	313°25.00 89°22.75
7	223°41.50	278°56.85	44.13	284°38.30	45.96	113°10.17	22.89	225°7.77	1.52			Acamar	315°10.97 -40°12.21
8	238°43.97	293°56.03	43.48	299°38.71	45.60	128°12.98	22.94	240°10.05	1.43			Menkar	314°5.13 4°11.51
9	253°46.43	308°55.20	· · 42.83	314°39.12	· · 45.24	143°15.79	· · 22.99	255°12.32	· · 1.34			Mirfak	308°26.79 49°57.43
10	268°48.89	323°54.38	42.18	329°39.53	44.87	158°18.61	23.04	270°14.59	1.25			Aldebaran	290°38.38 16°33.72
11	283°51.36	338°53.56	41.53	344°39.94	44.50	173°21.42	23.09	285°16.87	1.16			Rigel	281°2.76 -8°10.36
12	298°53.82	353°52.73	S20°40.88	359°40.35	S21°44.14	188°24.23	N22°23.14	300°19.14	S03°1.08			Capella	280°20.22 46°1.54
13	313°56.29	8°51.91	40.22	14°40.76	43.77	203°27.05	23.20	315°21.41	0.99			Bellatrix	278°21.67 6°22.37
14	328°58.75	23°51.09	39.57	29°41.17	43.41	218°29.86	23.25	330°23.69	0.89			Elmath	278°0.45 28°37.79
15	344°1.22	38°50.27	· · 38.91	44°41.57	· · 43.04	233°32.67	· · 23.30	345°25.96	· · 0.80			Alnilam	275°36.56 -1°11.17
16	359°3.68	53°49.45	38.25	59°41.98	42.67	248°35.48	23.35	0°28.23	0.71			Betelgeuse	270°50.84 7°24.68
17	14°6.14	68°48.63	37.59	74°42.39	42.30	263°38.30	23.40	15°30.50	0.62			Canopus	263°51.49 -52°42.66
18	29°8.61	83°47.81	S20°36.93	89°42.80	S21°41.93	278°41.11	N22°23.45	30°32.78	S03°0.53			Sirius	258°25.13 -16°45.19
19	44°11.07	98°46.99	36.27	104°43.21	41.57	293°43.92	23.50	45°35.05	0.44			Adhara	255°4.81 -29°0.52
20	59°13.54	113°46.17	35.61	119°43.62	41.20	308°46.73	23.55	60°37.32	0.35			Procyon	244°49.58 5°9.41
21	74°16.00	128°45.36	· · 34.95	134°44.03	· · 40.83	323°49.55	· · 23.60	75°39.59	· · 0.26			Pollux	243°15.86 27°57.71
22	89°18.46	143°44.54	34.28	149°44.44	40.46	338°52.36	23.65	90°41.87	0.17			Avior	234°13.74 -59°35.54
23	104°20.93	158°43.72	33.62	164°44.85	40.09	353°55.17	23.70	105°44.14	0.08			Suhail	222°45.24 -43°32.23
Mer.pass. 16:04		ν-0.8' d-0.6' m-3.90		ν0.4' d-0.4' m1.09		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.03					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	119°23.39	173°42.91	S20°32.95	179°45.26	S21°39.71	8°57.98	N22°23.75	120°46.41	S02°59.99				
1	134°25.86	188°42.09	32.29	194°45.68	39.34	24°0.79	23.80	135°48.68	02°59.90				
2	149°28.32	203°41.28	31.62	209°46.09	38.97	39°3.61	23.85	150°50.95	59.81				
3	164°30.79	218°40.46	· · 30.95	224°46.50	· · 38.60	54°6.42	· · 23.90	165°53.22	· · 59.72				
4	179°33.25	233°39.65	30.28	239°46.91	38.23	69°9.23	23.95	180°55.50	59.63				
5	194°35.71	248°38.83	29.61	254°47.32	37.85	84°12.04	24.00	195°57.77	59.54				
6	209°38.18	263°38.02	S20°28.94	269°47.73	S21°37.48	99°14.85	N22°24.05	211°0.04	S02°59.45				
7	224°40.64	278°37.21	28.26	284°48.14	37.11	114°17.66	24.10	226°2.31	59.36				
8	239°43.11	293°36.40	27.59	299°48.55	36.73	129°20.47	24.15	241°4.58	59.27				
9	254°45.57	308°35.58	· · 26.91	314°48.96	· · 36.36	144°23.28	· · 24.20	256°6.85	· · 59.17				
10	269°48.03	323°34.77	26.24	329°49.38	35.98	159°26.10	24.25	271°9.12	59.08				
11	284°50.50	338°33.96	25.56	344°49.79	35.61	174°28.91	24.30	286°11.39	58.99				
12	299°52.96	353°33.15	S20°24.88	359°50.20	S21°35.23	189°31.72	N22°24.35	301°13.66	S02°58.90				
13	314°55.43	8°32.34	24.20	14°50.61	34.85	204°34.53	24.40	316°15.93	58.81				
14	329°57.89	23°31.53	23.52	29°51.02	34.48	219°37.34	24.45	331°18.20	58.72				
15	345°0.35	38°30.72	· · 22.84	44°51.44	· · 34.10	234°40.15	· · 24.50	346°20.47	· · 58.63				
16	0°2.82	53°29.92	22.15	59°51.85	33.72	249°42.96	24.55	1°22.74	58.54				
17	15°5.28	68°29.11	21.47	74°52.26	33.34	264°45.77	24.60	16°25.01	58.45				
18	30°7.75	83°28.30	S20°20.79	89°52.67	S21°32.96	279°48.58	N22°24.65	31°27.28	S02°58.35				
19	45°10.21	98°27.50	20.10	104°53.09	32.59	294°51.39	24.70	46°29.55	58.26				
20	60°12.68	113°26.69	19.41	119°53.50	32.21	309°54.20	24.75	61°31.82	58.17				
21	75°15.14	128°25.88	· · 18.72	134°53.91	· · 31.83	324°57.01	· · 24.80	76°34.09	· · 58.08				
22	90°17.60	143°25.08	18.04	149°54.33	31.45	339°59.82	24.85	91°36.36	57.99				
23	105°20.07	158°24.27	17.35	164°54.74	31.07	355°2.63	24.90	106°38.63	57.90				
Mer.pass. 16:00		ν-0.8' d-0.7' m-3.90		ν0.4' d-0.4' m1.09		ν2.8' d0.1' m-2.67		ν2.3' d-0.1' m1.03					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	120°22.53	173°23.47	S20°16.65	179°55.15	S21°30.68	10°5.43	N22°24.95	121°40.90	S02°57.80				
1	135°25.00	188°22.67	15.96	194°55.57	30.30	25°8.24	25.00	136°43.17	57.71				
2	150°27.46	203°21.86	15.27	209°55.98	29.92	40°11.05	25.05	151°45.43	57.62				
3	165°29.92	218°21.06	· · 14.57	224°56.39	· · 29.54	55°13.86	· · 25.10	166°47.70	· · 57.53				
4	180°32.39	233°20.26	13.88	239°56.81	29.16	70°16.67	25.15	181°49.97	57.44				
5	195°34.85	248°19.46	13.18	254°57.22	28.77	85°19.48	25.20	196°52.24	57.35				
6	210°37.32	263°18.66	S20°12.49	269°57.64	S21°28.39	100°22.29	N22°25.25	211°54.51	S02°57.25				
7	225°39.78	278°17.86	11.79	284°58.05	28.00	115°25.10	25.30	226°56.78	57.16				
8	240°42.24	293°17.06	11.09	299°58.46	27.62	130°27.90	25.35	241°59.04	57.07				
9	255°44.71	308°16.26	· · 10.39	314°58.88	· · 27.24	145°30.71	· · 25.40	257°1.31	· · 56.98				
10	270°47.17	323°15.46	9.69	329°59.29	26.85	160°33.52	25.44	272°3.58	56.89				
11	285°49.64	338°14.66	8.98	344°59.71	26.46	175°36.33	25.49	287°5.85	56.79				
12	300°52.10	353°13.86	S20°8.28	0°0.12	S21°26.08	190°39.14	N22°25.54	302°8.12	S02°56.70				
13	315°54.57	8°13.06	7.58	15°0.54	25.69	205°41.94	25.59	317°10.38	56.61				
14	330°57.03	23°12.27	6.87	30°0.95	25.31	220°44.75	25.64	332°12.65	56.52				
15	345°59.49	38°11.47	· · 6.16	45°1.37	· · 24.92	235°47.56	· · 25.69	347°14.92	· · 56.42				
16	1°1.96	53°10.68	5.46	60°1.78	24.53	250°50.37	25.74	2°17.18	56.33				
17	16°4.42	68°9.88	4.75	75°2.20	24.14	265°53.17	25.79	17°19.45	56.24				
18	31°6.89	83°9.09	S20°4.04	90°2.62	S21°23.7								


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Mon							
0	177°21.73	S20°22.64	174°32.43	10.9'	S23°5.92	-9.1'	55.5'
1	192°21.53	22.12	189°2.29	10.9'	22°56.78	-9.3'	55.5'
2	207°21.34	21.59	203°32.21	11.0'	22°47.51	-9.4'	55.5'
3	222°21.15	· · 21.07	218°2.18	11.0'	22°38.13	-9.5'	55.5'
4	237°20.95	20.54	232°32.20	11.1'	22°28.63	-9.6'	55.5'
5	252°20.76	20.02	247°2.27	11.1'	22°19.02	-9.7'	55.6'
6	267°20.57	S20°19.49	261°32.40	11.2'	S22°9.30	-9.8'	55.6'
7	282°20.38	18.97	276°2.58	11.2'	21°59.46	-10.0'	55.6'
8	297°20.19	18.44	290°32.81	11.3'	21°49.51	-10.1'	55.6'
9	312°19.99	· · 17.91	305°3.09	11.3'	21°39.45	-10.2'	55.6'
10	327°19.80	17.38	319°33.43	11.4'	21°29.27	-10.3'	55.7'
11	342°19.61	16.85	334°3.83	11.4'	21°18.99	-10.4'	55.7'
12	357°19.42	S20°16.32	348°34.27	11.5'	S21°8.60	-10.5'	55.7'
13	12°19.23	15.79	3°4.77	11.6'	20°58.10	-10.6'	55.7'
14	27°19.04	15.26	17°35.33	11.6'	20°47.50	-10.7'	55.7'
15	42°18.85	· · 14.73	32°5.93	11.7'	20°36.79	-10.8'	55.8'
16	57°18.66	14.20	46°36.59	11.7'	20°25.98	-10.9'	55.8'
17	72°18.48	13.66	61°7.31	11.8'	20°15.06	-11.0'	55.8'
18	87°18.29	S20°13.13	75°38.07	11.8'	S20°4.04	-11.1'	55.8'
19	102°18.10	12.60	90°8.89	11.9'	19°52.91	-11.2'	55.8'
20	117°17.91	12.06	104°39.77	11.9'	19°41.69	-11.3'	55.9'
21	132°17.72	· · 11.52	119°10.69	12.0'	19°30.37	-11.4'	55.9'
22	147°17.54	10.99	133°41.67	12.0'	19°18.94	-11.5'	55.9'
23	162°17.35	10.45	148°12.70	12.1'	19°7.42	-11.6'	55.9'
SD = 16.2' $d = -0.5'$			SD = 15.1'				

Tue	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.16	S20°9.91	162°43.79	12.1'	S18°55.81	-11.7'	55.9'
1	192°16.98	9.37	177°14.92	12.2'	18°44.09	-11.8'	55.9'
2	207°16.79	8.83	191°46.11	12.2'	18°32.29	-11.9'	56.0'
3	222°16.61	· · 8.30	206°17.35	12.3'	18°20.38	-12.0'	56.0'
4	237°16.42	7.75	220°48.64	12.3'	18°8.39	-12.1'	56.0'
5	252°16.24	7.21	235°19.98	12.4'	17°56.30	-12.2'	56.0'
6	267°16.05	S20°6.67	249°51.37	12.4'	S17°44.13	-12.3'	56.0'
7	282°15.87	6.13	264°22.82	12.5'	17°31.86	-12.4'	56.1'
8	297°15.68	5.59	278°54.31	12.5'	17°19.50	-12.4'	56.1'
9	312°15.50	· · 5.04	293°25.85	12.6'	17°7.06	-12.5'	56.1'
10	327°15.32	4.50	307°57.44	12.6'	16°54.53	-12.6'	56.1'
11	342°15.14	3.95	322°29.07	12.7'	16°41.91	-12.7'	56.1'
12	357°14.95	S20°3.41	337°0.76	12.7'	S16°29.21	-12.8'	56.2'
13	12°14.77	2.86	351°32.49	12.8'	16°16.43	-12.9'	56.2'
14	27°14.59	2.31	6°4.27	12.8'	16°3.56	-12.9'	56.2'
15	42°14.41	· · 1.77	20°36.09	12.9'	15°50.61	-13.0'	56.2'
16	57°14.23	1.22	35°7.97	12.9'	15°37.59	-13.1'	56.2'
17	72°14.04	0.67	49°39.88	13.0'	15°24.48	-13.2'	56.3'
18	87°13.86	S20°0.12	64°11.84	13.0'	S15°11.29	-13.3'	56.3'
19	102°13.68	19°59.57	78°43.84	13.0'	14°58.03	-13.3'	56.3'
20	117°13.50	59.02	93°15.89	13.1'	14°44.69	-13.4'	56.3'
21	132°13.32	· · 58.47	107°47.98	13.1'	14°31.27	-13.5'	56.3'
22	147°13.15	57.92	122°20.11	13.2'	14°17.78	-13.6'	56.4'
23	162°12.97	57.36	136°52.28	13.2'	14°4.22	-13.6'	56.4'
SD = 16.2' $d = -0.5'$			SD = 15.3'				

Wed	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	177°12.79	S19°56.81	151°24.50	13.3'	S13°50.59	-13.7'	56.4'
1	192°12.61	56.25	165°56.75	13.3'	13°36.88	-13.8'	56.4'
2	207°12.43	55.70	180°29.04	13.3'	13°23.11	-13.8'	56.5'
3	222°12.25	· · 55.14	195°1.37	13.4'	13°9.26	-13.9'	56.5'
4	237°12.08	54.59	209°33.74	13.4'	12°55.35	-14.0'	56.5'
5	252°11.90	54.03	224°6.14	13.4'	12°41.37	-14.0'	56.5'
6	267°11.72	S19°53.47	238°38.58	13.5'	S12°27.33	-14.1'	56.5'
7	282°11.55	52.92	253°11.05	13.5'	12°13.22	-14.2'	56.6'
8	297°11.37	52.36	267°43.56	13.5'	11°59.05	-14.2'	56.6'
9	312°11.20	· · 51.80	282°16.10	13.6'	11°44.82	-14.3'	56.6'
10	327°11.02	51.24	296°48.68	13.6'	11°30.52	-14.4'	56.6'
11	342°10.85	50.68	311°21.28	13.6'	11°16.16	-14.4'	56.6'
12	357°10.67	S19°50.12	325°53.92	13.7'	S11°1.75	-14.5'	56.7'
13	12°10.50	49.56	340°26.59	13.7'	10°47.28	-14.5'	56.7'
14	27°10.32	48.99	354°59.28	13.7'	10°32.75	-14.6'	56.7'
15	42°10.15	· · 48.43	9°32.01	13.8'	10°18.16	-14.6'	56.7'
16	57°9.98	47.87	24°4.76	13.8'	10°3.52	-14.7'	56.7'
17	72°9.80	47.30	38°37.53	13.8'	09°48.83	-14.7'	56.8'
18	87°9.63	S19°46.74	53°10.33	13.8'	S09°34.08	-14.8'	56.8'
19	102°9.46	46.17	67°43.16	13.8'	09°19.28	-14.8'	56.8'
20	117°9.29	45.60	82°16.01	13.9'	09°4.43	-14.9'	56.8'
21	132°9.12	· · 45.04	96°48.88	13.9'	08°49.53	-14.9'	56.8'
22	147°8.94	44.47	111°21.77	13.9'	08°34.59	-15.0'	56.9'
23	162°8.77	43.90	125°54.69	13.9'	08°19.59	-15.0'	56.9'
SD = 16.2' $d = -0.6'$			SD = 15.4'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	1-3
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	0-5%
19	10:33	10:42	12:11	12:47	00:23	
20	10:51	11:00	12:11	13:35	01:11	
21	11:09	11:17	12:11	14:21	01:58	

January 22, 23, 24 UT (Thu., Fri., Sat.)

h	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	121°21.67	173°4.33	S19°59.76	180°5.11	S21°21.41	11°12.82	N22°26.13	122°35.32	S02°55.59						Alpheratz	357°34.05	29°14.18	
1	136°24.13	188°3.54	59.04	195°5.53	21.02	26°15.62	26.18	137°37.58	55.50						Ankaa	353°6.45	-42°10.07	
2	151°26.60	203°2.75	58.32	210°5.95	20.63	41°18.43	26.23	152°39.85	55.41						Schedar	349°30.26	56°41.08	
3	166°29.06	218°1.96	•• 57.61	225°6.36	•• 20.24	56°21.24	•• 26.28	167°42.11	•• 55.31						Diphda	348°46.53	-17°50.74	
4	181°31.53	233°1.17	56.89	240°6.78	19.84	71°24.04	26.33	182°44.38	55.22						Achernar	335°19.58	-57°6.53	
5	196°33.99	248°0.38	56.16	255°7.20	19.45	86°26.85	26.38	197°46.65	55.13						Hamal	327°50.20	23°35.25	
6	211°36.45	262°59.59	S19°55.44	270°7.62	S21°19.06	101°29.65	N22°26.42	212°48.91	S02°55.03						Polaris	313°26.57	89°22.76	
7	226°38.92	277°58.80	54.72	285°8.03	18.66	116°32.46	26.47	227°51.18	54.94						Acamar	315°10.99	-40°12.22	
8	241°41.38	292°58.01	54.00	300°8.45	18.27	131°35.26	26.52	242°53.44	54.85						Menkar	314°5.14	4°11.51	
9	256°43.85	307°57.23	•• 53.27	315°8.87	•• 17.87	146°38.07	•• 26.57	257°55.71	•• 54.75						Mirfak	308°26.81	49°57.43	
10	271°46.31	322°56.44	52.55	330°9.29	17.48	161°40.87	26.62	272°57.97	54.66						Aldebaran	290°38.39	-16°33.72	
11	286°48.78	337°55.65	51.82	345°9.70	17.08	176°43.68	26.67	288°0.24	54.57						Rigel	281°2.77	-8°10.36	
12	301°51.24	352°54.87	S19°51.09	0°10.12	S21°16.69	191°46.48	N22°26.72	303°2.50	S02°54.47						Capella	280°20.23	46°1.55	
13	316°53.70	7°54.08	50.36	15°10.54	16.29	206°49.29	26.76	318°4.77	54.38						Bellatrix	278°21.67	6°22.37	
14	331°56.17	22°53.30	49.63	30°10.96	15.89	221°52.09	26.81	333°7.03	54.29						Elnath	278°0.46	28°37.80	
15	346°58.63	37°52.52	•• 48.90	45°11.38	•• 15.50	236°54.90	•• 26.86	348°9.30	•• 54.19						Alnilam	275°36.57	-1°11.17	
16	2°1.10	52°51.73	48.17	60°11.80	15.10	251°57.70	26.91	3°11.56	54.10						Betelgeuse	270°50.85	7°24.68	
17	17°3.56	67°50.95	47.44	75°12.21	14.70	267°0.50	26.96	18°13.82	54.01						Canopus	263°51.50	-52°42.67	
18	32°6.02	82°50.17	S19°46.70	90°12.63	S21°14.30	282°3.31	N22°27.01	33°16.09	S02°53.91						Sirius	258°25.14	-16°45.20	
19	47°8.49	97°49.39	45.97	105°13.05	13.90	297°6.11	27.05	48°18.35	53.82						Adhara	255°4.81	-29°0.53	
20	62°10.95	112°48.61	45.23	120°13.47	13.50	312°8.91	27.10	63°20.62	53.73						Procyon	244°49.58	5°9.41	
21	77°13.42	127°47.83	•• 44.50	135°13.89	•• 13.11	327°11.72	•• 27.15	78°22.88	•• 53.63						Pollux	243°15.86	27°57.72	
22	92°15.88	142°47.05	43.76	150°14.31	12.71	342°14.52	27.20	93°25.14	53.54						Avior	234°13.74	-59°35.56	
23	107°18.34	157°46.27	43.02	165°14.73	12.30	357°17.32	27.25	108°27.41	53.44						Suhail	222°45.24	-43°32.25	
Mer.pass.	15:52	ν-0.8' d-0.7' m-3.90		ν0.4' d-0.4' m1.10		ν2.8' d0.0' m-2.66		ν2.3' d-0.1' m1.03							Miaplacidus	221°37.20	-69°49.35	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		Alphard	217°46.58	-8°46.37	
0	122°20.81	172°45.49	S19°42.28	180°15.15	S21°11.90	12°20.13	N22°27.30	123°29.67	S02°53.35						Regulus	207°33.22	11°50.25	
1	137°23.27	187°44.71	41.54	195°15.57	11.50	27°22.93	27.34	138°31.93	53.26						Dubhe	193°39.43	61°36.34	
2	152°25.74	202°43.93	40.80	210°15.99	11.10	42°25.73	27.39	153°34.20	53.16						Denebola	182°23.86	14°25.40	
3	167°28.20	217°43.15	•• 40.05	225°16.41	•• 10.70	57°28.54	•• 27.44	168°36.46	•• 53.07						Giennah	175°42.53	-17°41.22	
4	182°30.66	232°42.38	39.31	240°16.83	10.30	72°31.34	27.49	183°38.72	52.97						Acrux	172°58.84	-63°14.41	
5	197°33.13	247°41.60	38.56	255°17.25	9.89	87°34.14	27.54	198°40.98	52.88						Gacrux	171°50.45	-57°15.37	
6	212°35.59	262°40.82	S19°37.82	270°17.67	S21°9.49	102°36.94	N22°27.58	213°43.25	S02°52.79						Alioth	166°12.01	55°48.74	
7	227°38.06	277°40.05	37.07	285°18.09	9.09	117°39.74	27.63	228°45.51	52.69						Spica	158°21.32	-11°17.89	
8	242°40.52	292°39.27	36.32	300°18.51	8.68	132°42.55	27.68	243°47.77	52.60						Alkaid	152°51.27	49°10.63	
9	257°42.98	307°38.50	•• 35.58	315°18.93	•• 8.28	147°45.35	•• 27.73	258°50.03	•• 52.50						Hadar	148°34.78	-60°29.69	
10	272°45.45	322°37.73	34.83	330°19.35	7.87	162°48.15	27.77	273°52.30	52.41						Menkent	147°56.60	-36°29.79	
11	287°47.91	337°36.95	34.07	345°19.78	7.47	177°50.95	27.82	288°54.56	52.31						Arcturus	145°47.13	19°2.57	
12	302°50.38	352°36.18	S19°33.32	0°20.20	S21°7.06	192°53.75	N22°27.87	303°56.82	S02°52.22						Rigel Kent.	139°39.19	-60°56.36	
13	317°52.84	7°35.41	32.57	15°20.62	6.65	207°56.55	27.92	318°59.08	52.13						Kochab	137°20.05	74°2.47	
14	332°55.30	22°34.64	31.82	30°21.04	6.25	222°59.35	27.96	334°1.34	52.03						Zuben'ubi	136°55.12	-16°9.02	
15	347°57.77	37°33.87	•• 31.06	45°21.46	•• 5.84	238°2.16	•• 28.01	349°3.61	•• 51.94						Alphecca	126°3.14	26°37.36	
16	3°0.23	52°33.09	30.31	60°21.88	5.43	253°4.96	28.06	4°5.87	51.84						Antares	112°14.98	-26°29.35	
17	18°2.70	67°32.33	29.55	75°22.31	5.02	268°7.76	28.11	19°8.13	51.75						Atria	107°8.82	-69°4.23	
18	33°5.16	82°31.56	S19°28.79	90°22.73	S21°4.62	283°10.56	N22°28.16	34°10.39	S02°51.65						Sabik	102°2.03	-15°45.45	
19	48°7.63	97°30.79	28.03	105°23.15	4.21	298°13.36	28.20	49°12.65	51.56						Shaula	96°9.51	-37°7.29	
20	63°10.09	112°30.02	27.27	120°23.57	3.80	313°16.16	28.25	64°14.91	51.46						Rasalhague	95°58.01	12°32.32	
21	78°12.55	127°29.25	•• 26.51	135°24.00	•• 3.39	328°18.96	•• 28.30	79°17.17	•• 51.37						Eltanin	90°42.23	51°28.88	
22	93°15.02	142°28.48	25.75	150°24.42	2.98	343°21.76	28.34	94°19.43	51.27						Kaus Aust.	83°31.72	-34°22.30	
23	108°17.48	157°27.72	24.99	165°24.84	2.57	358°24.56	28.39	109°21.70	51.18						Vega	80°33.03	38°48.29	
Mer.pass.	15:48	ν-0.8' d-0.7' m-3.90		ν0.4' d-0.4' m1.10		ν2.8' d0.0' m-2.66		ν2.3' d-0.1' m1.03							Nunki	75°47.03	-26°15.87	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		Altair	61°59.44	8°56.15	
0	123°19.95	172°26.95	S19°24.23	180°25.26	S21°2.16	13°27.36	N22°28.44	124°23.96	S02°51.08						Peacock	53°4.95	-56°39.10	
1	138°22.41	187°26.18	23.46	195°25.69	1.75	28°30.16	28.49	139°26.22	50.99						Deneb	49°25.68	45°22.38	
2	153°24.87	202°25.42	22.70	210°26.11	1.33	43°32.95	28.53	154°28.48	50.89						Enif	33°38.24	9°59.65	
3	168°27.34	217°24.66	•• 21.93	225°26.53	•• 0.92	58°35.75	•• 28.58	169°30.74	•• 50.80						Al Na'ir	27°32.22	-46°50.23	
4	183°29.80	232°23.89	21.16	240°26.96	0.51	73°38.55	28.63	184°33.00	50.70						Fomalhaut	15°13.82	-29°29.19	
5	198°32.27	247°23.13	20.39	255°27.38	21°0.10	88°41.35	28.68	199°35.26	50.61						Scheat	13°44.62	28°13.54	
6	213°34.73	262°22.36	S19°19.62	270°27.81	S20°59.68	103°44.15	N22°28.72	214°37.52	S02°50.51						Markab	13°29.27	15°20.76	
7	228°37.19	277°21.60	18.85	285°28.23	59.27	118°46.95	28.77	229°39.78	50.42									
8	243°39.66	292°20.84	18.08	300°28.65	58.86	133°49.75	28.82	244°42.04	50.32									
9	258°42.12	307°20.08	•• 17.31	315°29.08	•• 58.44	148°52.54	•• 28.86	259°44.30	•• 50.23									
10	273°44.59	322°19.32	16.54	330°29.50	58.03	163°55.34	28.91	274°46.56	50.13									
11	288°47.05	337°18.56	15.76	345°29.93	57.61	178°58.14	28.96	289°48.82	50.04									
12	303°49.51	352°17.80	S19°14.99	0°30.35	S20°57.20	194°0.94	N22°29.00	304°51.07	S02°49.94									
13	318°51.98	7°17.04	14.21	15°30.78	56.78	209°3.74	29.05	319°53.33	49.85									
14	333°54.44	22°16.28	13.43	30°31.20	56.36	224°6.53	29.10	334°55.59	49.75									
15	348°56.91	37°15.52	•• 12.66	45°31.63	•• 55.95	239°9.33	•• 29.14	349°57.85	•• 49.65									


h	Sun			Moon			
Thu	GHA	Dec		GHA	ν	Dec	d HP
0	177°8.60	S19°43.33		140°27.62	13.9'	S08°4.55	-15.1' 56.9'
1	192°8.43	42.76		155°0.57	14.0'	07°49.47	-15.1' 56.9'
2	207°8.26	42.19		169°33.53	14.0'	07°34.34	-15.2' 56.9'
3	222°8.09	· · 41.62		184°6.52	14.0'	07°19.17	-15.2' 57.0'
4	237°7.92	41.05		198°39.51	14.0'	07°3.96	-15.3' 57.0'
5	252°7.76	40.48		213°12.53	14.0'	06°48.70	-15.3' 57.0'
6	267°7.59	S19°39.91		227°45.55	14.0'	S06°33.41	-15.3' 57.0'
7	282°7.42	39.33		242°18.59	14.0'	06°18.08	-15.4' 57.0'
8	297°7.25	38.76		256°51.63	14.1'	06°2.71	-15.4' 57.1'
9	312°7.08	· · 38.18		271°24.69	14.1'	05°47.30	-15.4' 57.1'
10	327°6.92	37.61		285°57.76	14.1'	05°31.86	-15.5' 57.1'
11	342°6.75	37.03		300°30.83	14.1'	05°16.39	-15.5' 57.1'
12	357°6.58	S19°36.46		315°3.91	14.1'	S05°0.88	-15.5' 57.1'
13	12°6.42	35.88		329°36.99	14.1'	04°45.34	-15.6' 57.2'
14	27°6.25	35.30		344°10.08	14.1'	04°29.77	-15.6' 57.2'
15	42°6.09	· · 34.72		358°43.17	14.1'	04°14.17	-15.6' 57.2'
16	57°5.92	34.15		13°16.26	14.1'	03°58.54	-15.7' 57.2'
17	72°5.76	33.57		27°49.35	14.1'	03°42.89	-15.7' 57.2'
18	87°5.59	S19°32.99		42°22.44	14.1'	S03°27.20	-15.7' 57.3'
19	102°5.43	32.40		56°55.53	14.1'	03°11.50	-15.7' 57.3'
20	117°5.26	31.82		71°28.61	14.1'	02°55.77	-15.8' 57.3'
21	132°5.10	· · 31.24		86°1.69	14.1'	02°40.01	-15.8' 57.3'
22	147°4.94	30.66		100°34.77	14.1'	02°24.24	-15.8' 57.3'
23	162°4.78	30.07		115°7.83	14.1'	02°8.44	-15.8' 57.4'
SD = 16.2'			$d = -0.6'$	SD = 15.5'			

Fri	GHA	Dec		GHA	ν	Dec	d HP
0	177°4.61	S19°29.49		129°40.89	14.1'	S01°52.63	-15.8' 57.4'
1	192°4.45	28.91		144°13.94	14.0'	01°36.79	-15.9' 57.4'
2	207°4.29	28.32		158°46.98	14.0'	01°20.94	-15.9' 57.4'
3	222°4.13	· · 27.73		173°20.01	14.0'	01°5.08	-15.9' 57.4'
4	237°3.97	27.15		187°53.03	14.0'	00°49.19	-15.9' 57.5'
5	252°3.81	26.56		202°26.03	14.0'	00°33.30	-15.9' 57.5'
6	267°3.65	S19°25.97		216°59.01	14.0'	S00°17.39	-15.9' 57.5'
7	282°3.49	25.39		231°31.98	13.9'	S00°1.47	-15.9' 57.5'
8	297°3.33	24.80		246°4.93	13.9'	N00°14.46	15.9' 57.5'
9	312°3.17	· · 24.21		260°37.86	13.9'	00°30.39	15.9' 57.6'
10	327°3.01	23.62		275°10.77	13.9'	00°46.34	16.0' 57.6'
11	342°2.85	23.03		289°43.65	13.9'	01°2.29	16.0' 57.6'
12	357°2.69	S19°22.43		304°16.52	13.8'	N01°18.25	16.0' 57.6'
13	12°2.53	21.84		318°49.36	13.8'	01°34.22	16.0' 57.6'
14	27°2.38	21.25		333°22.17	13.8'	01°50.18	16.0' 57.7'
15	42°2.22	· · 20.66		347°54.96	13.8'	02°6.15	16.0' 57.7'
16	57°2.06	20.06		2°27.71	13.7'	02°22.12	16.0' 57.7'
17	72°1.91	19.47		17°0.44	13.7'	02°38.08	16.0' 57.7'
18	87°1.75	S19°18.87		31°33.14	13.7'	N02°54.05	16.0' 57.7'
19	102°1.60	18.28		46°5.80	13.6'	03°10.01	16.0' 57.8'
20	117°1.44	17.68		60°38.43	13.6'	03°25.97	16.0' 57.8'
21	132°1.28	· · 17.08		75°11.02	13.6'	03°41.93	15.9' 57.8'
22	147°1.13	16.49		89°43.58	13.5'	03°57.87	15.9' 57.8'
23	162°0.98	15.89		104°16.10	13.5'	04°13.81	15.9' 57.8'
SD = 16.2'			$d = -0.6'$	SD = 15.6'			

Sat	GHA	Dec		GHA	ν	Dec	d HP
0	177°0.82	S19°15.29		118°48.58	13.4'	N04°29.74	15.9' 57.9'
1	192°0.67	14.69		133°21.02	13.4'	04°45.66	15.9' 57.9'
2	207°0.52	14.09		147°53.42	13.4'	05°1.57	15.9' 57.9'
3	222°0.36	· · 13.49		162°25.78	13.3'	05°17.47	15.9' 57.9'
4	237°0.21	12.89		176°58.09	13.3'	05°33.35	15.9' 57.9'
5	252°0.06	12.28		191°30.35	13.2'	05°49.21	15.8' 58.0'
6	266°59.91	S19°11.68		206°2.57	13.2'	N06°5.06	15.8' 58.0'
7	281°59.75	11.08		220°34.74	13.1'	06°20.89	15.8' 58.0'
8	296°59.60	10.48		235°6.86	13.1'	06°36.70	15.8' 58.0'
9	311°59.45	· · 9.87		249°38.92	13.0'	06°52.49	15.8' 58.0'
10	326°59.30	9.27		264°10.94	13.0'	07°8.26	15.7' 58.1'
11	341°59.15	8.66		278°42.90	12.9'	07°24.01	15.7' 58.1'
12	356°59.00	S19°8.05		293°14.80	12.8'	N07°39.73	15.7' 58.1'
13	11°58.85	7.45		307°46.65	12.8'	07°55.42	15.7' 58.1'
14	26°58.70	6.84		322°18.44	12.7'	08°11.09	15.6' 58.1'
15	41°58.55	· · 6.23		336°50.17	12.7'	08°26.73	15.6' 58.2'
16	56°58.41	5.62		351°21.84	12.6'	08°42.34	15.6' 58.2'
17	71°58.26	5.01		5°53.45	12.5'	08°57.91	15.5' 58.2'
18	86°58.11	S19°4.40		20°25.00	12.5'	N09°13.46	15.5' 58.2'
19	101°57.96	3.79		34°56.48	12.4'	09°28.97	15.5' 58.2'
20	116°57.82	3.18		49°27.89	12.3'	09°44.44	15.4' 58.3'
21	131°57.67	· · 2.57		63°59.23	12.3'	09°59.88	15.4' 58.3'
22	146°57.52	1.96		78°30.51	12.2'	10°15.28	15.4' 58.3'
23	161°57.38	1.35		93°1.72	12.1'	10°30.64	15.3' 58.3'
SD = 16.2'			$d = -0.6'$	SD = 15.8'			

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

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

Day	Sun			Moon		
	Eqn. of Time		Mer.	Mer. Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	10-27%
22	11:26	11:34	12:12	15:05	02:43	
23	11:42	11:49	12:12	15:50	03:27	
24	11:57	12:04	12:12	16:36	04:13	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	124°19.08		172°8.72	S19°5.61	180°35.46	S20°52.18	14°34.50	N22°29.56	125°18.18	S02°48.79	Alpheratz	357°34.06 29°14.18	
1	139°21.55		187°7.97	4.82	195°35.89	51.76	29°37.29	29.61	140°20.44	48.70	Ankaa	353°6.47 -42°10.07	
2	154°24.01		202°7.22	4.03	210°36.31	51.33	44°40.09	29.66	155°22.69	48.60	Schedar	349°30.28 56°41.08	
3	169°26.48		217°6.47	· · 3.24	225°36.74	· · 50.91	59°42.88	· · 29.70	170°24.95	· · 48.50	Diphda	348°46.54 -17°50.74	
4	184°28.94		232°5.72	2.45	240°37.17	50.49	74°45.68	29.75	185°27.21	48.41	Achernar	335°19.61 -57°6.53	
5	199°31.40		247°4.97	1.66	255°37.59	50.07	89°48.47	29.80	200°29.47	48.31	Hamal	327°50.21 23°35.24	
6	214°33.87		262°4.22	S19°0.87	270°38.02	S20°49.65	104°51.27	N22°29.84	215°31.72	S02°48.21	Polaris	313°28.01 89°22.76	
7	229°36.33		277°3.47	19°0.08	285°38.45	49.22	119°54.06	29.89	230°33.98	48.12	Acamar	315°11.01 -40°12.22	
8	244°38.80		292°2.72	18°59.28	300°38.88	48.80	134°56.86	29.93	245°36.24	48.02	Menkar	314°5.15 4°11.50	
9	259°41.26		307°1.97	· · 58.49	315°39.31	· · 48.37	149°59.65	· · 29.98	260°38.49	· · 47.93	Mirfak	308°26.83 49°57.43	
10	274°43.72		322°1.22	57.69	330°39.73	47.95	165°2.45	30.03	275°40.75	47.83	Aldebaran	290°38.40 16°33.72	
11	289°46.19		337°0.47	56.89	345°40.16	47.52	180°5.24	30.07	290°43.01	47.73	Rigel	281°2.78 -8°10.37	
12	304°48.65		351°59.73	S18°56.09	0°40.59	S20°47.10	195°8.03	N22°30.12	305°45.26	S02°47.64	Capella	280°20.24 46°1.55	
13	319°51.12		6°58.98	55.30	15°41.02	46.67	210°10.83	30.16	320°47.52	47.54	Bellatrix	278°21.68 6°22.36	
14	334°53.58		21°58.24	54.50	30°41.45	46.25	225°13.62	30.21	335°49.78	47.44	Elnath	278°0.47 28°37.80	
15													

h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
0	176°57.23	S19°0.73		107°32.85	12.1'	N10°45.95	15.3'	58.3'
1	191°57.09	19°0.12		122°3.92	12.0'	11°1.23	15.2'	58.4'
2	206°56.94	18°59.50		136°34.91	11.9'	11°16.46	15.2'	58.4'
3	221°56.80	· · 58.89		151°5.82	11.8'	11°31.64	15.1'	58.4'
4	236°56.65	58.27		165°36.66	11.8'	11°46.78	15.1'	58.4'
5	251°56.51	57.66		180°7.42	11.7'	12°1.87	15.0'	58.4'
6	266°56.37	S18°57.04		194°38.10	11.6'	N12°16.90	15.0'	58.5'
7	281°56.22	56.42		209°8.70	11.5'	12°31.89	14.9'	58.5'
8	296°56.08	55.80		223°39.21	11.4'	12°46.82	14.9'	58.5'
9	311°55.94	· · 55.18		238°9.65	11.4'	13°1.70	14.8'	58.5'
10	326°55.80	54.56		252°40.00	11.3'	13°16.52	14.8'	58.5'
11	341°55.65	53.94		267°10.26	11.2'	13°31.29	14.7'	58.6'
12	356°55.51	S18°53.32		281°40.44	11.1'	N13°45.99	14.6'	58.6'
13	11°55.37	52.70		296°10.53	11.0'	14°0.64	14.6'	58.6'
14	26°55.23	52.08		310°40.54	10.9'	14°15.22	14.5'	58.6'
15	41°55.09	· · 51.46		325°10.45	10.8'	14°29.73	14.5'	58.6'
16	56°54.95	50.84		339°40.27	10.7'	14°44.18	14.4'	58.6'
17	71°54.81	50.21		354°10.00	10.6'	14°58.57	14.3'	58.7'
18	86°54.67	S18°49.59		8°39.63	10.5'	N15°12.88	14.2'	58.7'
19	101°54.53	48.96		23°9.17	10.4'	15°27.12	14.2'	58.7'
20	116°54.39	48.34		37°38.61	10.3'	15°41.29	14.1'	58.7'
21	131°54.26	· · 47.71		52°7.96	10.2'	15°55.39	14.0'	58.7'
22	146°54.12	47.08		66°37.21	10.2'	16°9.41	13.9'	58.8'
23	161°53.98	46.46		81°6.36	10.1'	16°23.36	13.9'	58.8'
SD = 16.2' $d = -0.6'$			SD = 15.9'					

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	176°53.84	S18°45.83		95°35.41	9.9'	N16°37.22	13.8'	58.8'
1	191°53.71	45.20		110°4.36	9.8'	16°51.01	13.7'	58.8'
2	206°53.57	44.57		124°33.21	9.7'	17°4.71	13.6'	58.8'
3	221°53.44	· · 43.94		139°1.95	9.6'	17°18.32	13.5'	58.9'
4	236°53.30	43.31		153°30.59	9.5'	17°31.86	13.4'	58.9'
5	251°53.16	42.68		167°59.13	9.4'	17°45.30	13.4'	58.9'
6	266°53.03	S18°42.05		182°27.56	9.3'	N17°58.65	13.3'	58.9'
7	281°52.90	41.42		196°55.88	9.2'	18°11.92	13.2'	58.9'
8	296°52.76	40.79		211°24.10	9.1'	18°25.09	13.1'	58.9'
9	311°52.63	· · 40.15		225°52.21	9.0'	18°38.16	13.0'	59.0'
10	326°52.49	39.52		240°20.21	8.9'	18°51.14	12.9'	59.0'
11	341°52.36	38.88		254°48.10	8.8'	19°4.02	12.8'	59.0'
12	356°52.23	S18°38.25		269°15.88	8.7'	N19°16.80	12.7'	59.0'
13	11°52.10	37.61		283°43.55	8.6'	19°29.48	12.6'	59.0'
14	26°51.96	36.98		298°11.11	8.4'	19°42.06	12.5'	59.0'
15	41°51.83	· · 36.34		312°38.56	8.3'	19°54.53	12.4'	59.1'
16	56°51.70	35.70		327°5.89	8.2'	20°6.89	12.3'	59.1'
17	71°51.57	35.07		341°33.11	8.1'	20°19.15	12.1'	59.1'
18	86°51.44	S18°34.43		356°0.22	8.0'	N20°31.29	12.0'	59.1'
19	101°51.31	33.79		10°27.22	7.9'	20°43.32	11.9'	59.1'
20	116°51.18	33.15		24°54.10	7.8'	20°55.23	11.8'	59.1'
21	131°51.05	· · 32.51		39°20.86	7.7'	21°7.03	11.7'	59.2'
22	146°50.92	31.87		53°47.51	7.5'	21°18.71	11.6'	59.2'
23	161°50.79	31.23		68°14.05	7.4'	21°30.28	11.4'	59.2'
SD = 16.2' $d = -0.6'$			SD = 16.0'					

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	176°50.66	S18°30.59		82°40.47	7.3'	N21°41.71	11.3'	59.2'
1	191°50.53	29.94		97°6.77	7.2'	21°53.03	11.2'	59.2'
2	206°50.41	29.30		111°32.96	7.1'	22°4.22	11.1'	59.2'
3	221°50.28	· · 28.66		125°59.03	7.0'	22°15.28	10.9'	59.3'
4	236°50.15	28.01		140°24.99	6.8'	22°26.21	10.8'	59.3'
5	251°50.03	27.37		154°50.83	6.7'	22°37.01	10.7'	59.3'
6	266°49.90	S18°26.72		169°16.55	6.6'	N22°47.68	10.5'	59.3'
7	281°49.77	26.08		183°42.16	6.5'	22°58.21	10.4'	59.3'
8	296°49.65	25.43		198°7.66	6.4'	23°8.61	10.3'	59.3'
9	311°49.52	· · 24.78		212°33.04	6.3'	23°18.87	10.1'	59.3'
10	326°49.40	24.14		226°58.30	6.2'	23°28.99	10.0'	59.4'
11	341°49.27	23.49		241°23.45	6.0'	23°38.96	9.8'	59.4'
12	356°49.15	S18°22.84		255°48.49	5.9'	N23°48.79	9.7'	59.4'
13	11°49.03	22.19		270°13.41	5.8'	23°58.48	9.5'	59.4'
14	26°48.90	21.54		284°38.22	5.7'	24°8.01	9.4'	59.4'
15	41°48.78	· · 20.89		299°2.92	5.6'	24°17.40	9.2'	59.4'
16	56°48.66	20.24		313°27.50	5.5'	24°26.64	9.1'	59.4'
17	71°48.53	19.59		327°51.98	5.4'	24°35.72	8.9'	59.5'
18	86°48.41	S18°18.93		342°16.34	5.3'	N24°44.65	8.8'	59.5'
19	101°48.29	18.28		356°40.60	5.1'	24°53.42	8.6'	59.5'
20	116°48.17	17.63		11°4.74	5.0'	25°2.03	8.5'	59.5'
21	131°48.05	· · 16.97		25°28.78	4.9'	25°10.49	8.3'	59.5'
22	146°47.93	16.32		39°52.72	4.8'	25°18.78	8.1'	59.5'
23	161°47.81	15.66		54°16.54	4.7'	25°26.90	8.0'	59.5'
SD = 16.2' $d = -0.6'$			SD = 16.1'					

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 7-9 37-59%
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January 28, 29, 30 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	127°16.50	171°15.93	S18°6.51	181°6.55	S20°20.85	17°55.34	N22°32.81	128°0.46	S02°41.77	Alpheratz	357°34.07	29°14.17	
1	142°18.97	186°15.21	5.65	196°6.99	20.40	32°58.12	32.86	143°2.71	41.67	Ankaa	353°6.48	-42°10.06	
2	157°21.43	201°14.50	4.80	211°7.43	19.95	48°0.90	32.90	158°4.96	41.57	Schedar	349°30.30	56°41.07	
3	172°23.89	216°13.79	· · 3.94	226°7.87	· · 19.50	63°3.69	· · 32.94	173°7.21	· · 41.47	Diphda	348°46.55	-17°50.74	
4	187°26.36	231°13.08	3.09	241°8.30	19.05	78°6.47	32.99	188°9.46	41.37	Achernar	335°19.63	-57°6.52	
5	202°28.82	246°12.37	2.23	256°8.74	18.60	93°9.25	33.03	203°11.71	41.27	Hamal	327°50.22	23°35.24	
6	217°31.29	261°11.65	S18°1.37	271°9.18	S20°18.15	108°12.03	N22°33.07	218°13.96	S02°41.17	Polaris	313°29.16	89°22.77	
7	232°33.75	276°10.95	18°0.51	286°9.62	17.70	123°14.81	33.12	233°16.21	41.07	Acamar	315°11.03	-40°12.23	
8	247°36.21	291°10.24	17°59.65	301°10.06	17.25	138°17.59	33.16	248°18.46	40.97	Menkar	314°5.16	4°11.50	
9	262°38.68	306°9.53	· · 58.79	316°10.50	· · 16.80	153°20.38	· · 33.21	263°20.71	· · 40.87	Mirfak	308°26.84	49°57.43	
10	277°41.14	321°8.82	57.93	331°10.93	16.34	168°23.16	33.25	278°22.96	40.77	Aldebaran	290°38.41	16°33.72	
11	292°43.61	336°8.11	57.06	346°11.37	15.89	183°25.94	33.29	293°25.21	40.67	Rigel	281°2.78	-8°10.38	
12	307°46.07	351°7.40	S17°56.20	1°11.81	S20°15.44	198°28.72	N22°33.34	308°27.46	S02°40.57	Capella	280°20.24	46°1.56	
13	322°48.54	6°6.70	55.33	16°12.25	14.98	213°31.50	33.38	323°29.71	40.47	Bellatrix	278°21.68	6°22.36	
14	337°51.00	21°5.99	54.47	31°12.69	14.53	228°34.28	33.42	338°31.96	40.37	Elnath	278°0.47	28°37.80	
15	352°53.46	36°5.29	· · 53.60	46°13.13	· · 14.07	243°37.06	· · 33.47	353°34.20	· · 40.27	Alnilam	275°36.58	-1°11.19	
16	7°55.93	51°4.58	52.73	61°13.57	13.62	258°39.84	33.51	8°36.45	40.17	Betelgeuse	270°50.85	7°24.67	
17	22°58.39	66°3.88	51.87	76°14.01	13.16	273°42.62	33.55	23°38.70	40.07	Canopus	263°51.53	-52°42.70	
18	38°0.86	81°3.17	S17°51.00	91°14.45	S20°12.71	288°45.40	N22°33.60	38°40.95	S02°39.97	Sirius	258°25.14	-16°45.22	
19	53°3.32	96°2.47	50.13	106°14.89	12.25	303°48.18	33.64	53°43.20	39.87	Adhara	255°4.81	-29°0.56	
20	68°5.79	111°1.77	49.26	121°15.33	11.79	318°50.96	33.68	68°45.45	39.77	Procyon	244°49.58	5°9.40	
21	83°8.25	126°1.06	· · 48.38	136°15.77	· · 11.33	333°53.74	· · 33.72	83°47.69	· · 39.67	Pollux	243°15.85	27°57.72	
22	98°10.71	141°0.36	47.51	151°16.21	10.88	348°56.51	33.77	98°49.94	39.57	Avior	234°13.73	-59°35.60	
23	113°13.18	155°59.66	46.64	166°16.65	10.42	3°59.29	33.81	113°52.19	39.47	Suhail	222°45.22	-43°32.29	
Mer.pass. 15:28		ν-0.7' d-0.9' m-3.90		ν0.4' d-0.4' m1.10		ν2.8' d0.0' m-2.64		ν2.3' d-0.1' m1.03		Miaplacidus 221°37.18 -69°49.40			
										Alphard 217°46.56 -8°46.39			
										Regulus 207°33.19 11°50.24			
										Dubhe 193°39.37 61°36.35			
										Denebola 182°23.82 14°25.39			
										Gienah 175°42.49 -17°41.24			
										Acrux 172°58.76 -63°14.44			
										Gacrux 171°50.37 -57°15.40			
										Alioth 166°11.95 55°48.74			
										Spica 158°21.28 -11°17.91			
										Alkaid 152°51.21 49°10.62			
										Hadar 148°34.69 -60°29.71			
										Menkent 147°56.54 -36°29.80			
										Arcturus 145°47.08 19°2.55			
										Rigel Kent. 139°39.10 -60°56.37			
										Kochab 137°19.93 74°2.46			
										Zuben'ubi 136°55.07 -16°9.04			
										Alphecca 126°3.09 26°37.34			
										Antares 112°14.93 -26°29.35			
										Atria 107°8.71 -69°4.22			
										Sabik 102°1.99 -15°45.46			
										Shaula 96°9.46 -37°7.29			
										Rasalhague 95°57.97 12°32.30			
										Eltanin 90°42.19 51°28.85			
										Kaus Aust. 83°31.68 -34°22.29			
										Vega 80°33.00 38°48.27			
										Nunki 75°47.00 -26°15.86			
										Altair 61°59.42 8°56.14			
										Peacock 53°4.92 -56°39.08			
										Deneb 49°25.67 45°22.35			
										Enif 33°38.24 9°59.64			
										Al Na'ir 27°32.23 -46°50.21			
										Fomalhaut 15°13.83 -29°29.18			
										Scheat 13°44.63 28°13.52			
										Markab 13°29.28 15°20.75			
										Jan 28 Wed			
										Venus 43°59.42 12:36			
										Mars 53°50.05 11:55			
										Jupiter 250°38.84 22:44			
										Saturn 0°43.96 15:26			
										Jan 29 Thu			
										Venus 42°43.32 12:37			
										Mars 53°1.45 11:55			
										Jupiter 250°46.43 22:40			
										Saturn 0°38.79 15:22			
										Jan 30 Fri			
										Venus 41°27.53 12:38			
										Mars 52°12.94 11:54			
										Jupiter 250°53.91 22:35			
										Saturn 0°33.57 15:18			
										Horizontal parallax			
										Venus: 0.1			
										Mars: 0.1			
Mer.pass. 15:20		ν-0.7' d-0.9' m-3.90		ν0.4' d-0.5' m1.11		ν2.8' d0.0' m-2.63		ν2.2' d-0.1' m1.03					


h		Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°47.69	S18°15.01	68°40.26	4.6'	N25°34.87	7.8'	59.6'	
1	191°47.57	14.35	83°3.88	4.5'	25°42.66	7.6'	59.6'	
2	206°47.45	13.70	97°27.40	4.4'	25°50.29	7.5'	59.6'	
3	221°47.33	· · 13.04	111°50.82	4.3'	25°57.74	7.3'	59.6'	
4	236°47.21	12.38	126°14.14	4.2'	26°5.03	7.1'	59.6'	
5	251°47.09	11.72	140°37.36	4.1'	26°12.14	6.9'	59.6'	
6	266°46.98	S18°11.06	155°0.48	4.0'	N26°19.08	6.8'	59.6'	
7	281°46.86	10.40	169°23.51	3.9'	26°25.83	6.6'	59.6'	
8	296°46.74	9.74	183°46.45	3.8'	26°32.42	6.4'	59.6'	
9	311°46.63	· · 9.08	198°9.29	3.8'	26°38.82	6.2'	59.7'	
10	326°46.51	8.42	212°32.05	3.7'	26°45.04	6.0'	59.7'	
11	341°46.39	7.76	226°54.72	3.6'	26°51.08	5.9'	59.7'	
12	356°46.28	S18°7.10	241°17.30	3.5'	N26°56.93	5.7'	59.7'	
13	11°46.16	6.43	255°39.80	3.4'	27°2.60	5.5'	59.7'	
14	26°46.05	5.77	270°2.22	3.3'	27°8.08	5.3'	59.7'	
15	41°45.93	· · 5.11	284°24.56	3.3'	27°13.38	5.1'	59.7'	
16	56°45.82	4.44	298°46.83	3.2'	27°18.49	4.9'	59.7'	
17	71°45.71	3.78	313°9.01	3.1'	27°23.40	4.7'	59.7'	
18	86°45.59	S18°3.11	327°31.13	3.0'	N27°28.13	4.5'	59.7'	
19	101°45.48	2.44	341°53.17	3.0'	27°32.66	4.3'	59.7'	
20	116°45.37	1.78	356°15.15	2.9'	27°36.99	4.1'	59.8'	
21	131°45.25	· · 1.11	10°37.06	2.8'	27°41.14	3.9'	59.8'	
22	146°45.14	18°0.44	24°58.91	2.8'	27°45.08	3.7'	59.8'	
23	161°45.03	17°59.77	39°20.70	2.7'	27°48.83	3.6'	59.8'	
SD = 16.2' $d = -0.7'$			SD = 16.2'					

Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°44.92	S17°59.10	53°42.43	2.7'	N27°52.39	3.4'	59.8'	
1	191°44.81	58.43	68°4.11	2.6'	27°55.74	3.2'	59.8'	
2	206°44.70	57.76	82°25.73	2.6'	27°58.89	3.0'	59.8'	
3	221°44.59	· · 57.09	96°47.30	2.5'	28°1.84	2.8'	59.8'	
4	236°44.48	56.42	111°8.83	2.5'	28°4.59	2.5'	59.8'	
5	251°44.37	55.75	125°30.31	2.4'	28°7.14	2.3'	59.8'	
6	266°44.26	S17°55.08	139°51.75	2.4'	N28°9.49	2.1'	59.8'	
7	281°44.15	54.40	154°13.15	2.4'	28°11.63	1.9'	59.8'	
8	296°44.04	53.73	168°34.52	2.3'	28°13.57	1.7'	59.8'	
9	311°43.93	· · 53.06	182°55.86	2.3'	28°15.30	1.5'	59.8'	
10	326°43.83	52.38	197°17.16	2.3'	28°16.83	1.3'	59.8'	
11	341°43.72	51.71	211°38.44	2.3'	28°18.16	1.1'	59.8'	
12	356°43.61	S17°51.03	225°59.69	2.2'	N28°19.27	0.9'	59.8'	
13	11°43.51	50.35	240°20.93	2.2'	28°20.18	0.7'	59.8'	
14	26°43.40	49.68	254°42.15	2.2'	28°20.89	0.5'	59.8'	
15	41°43.29	· · 49.00	269°3.35	2.2'	28°21.38	0.3'	59.8'	
16	56°43.19	48.32	283°24.54	2.2'	28°21.67	0.1'	59.8'	
17	71°43.08	47.64	297°45.72	2.2'	28°21.76	-0.1'	59.8'	
18	86°42.98	S17°46.96	312°6.90	2.2'	N28°21.63	-0.3'	59.9'	
19	101°42.87	46.29	326°28.08	2.2'	28°21.30	-0.5'	59.9'	
20	116°42.77	45.61	340°49.26	2.2'	28°20.76	-0.7'	59.9'	
21	131°42.67	· · 44.92	355°10.44	2.2'	28°20.01	-1.0'	59.9'	
22	146°42.56	44.24	9°31.63	2.2'	28°19.06	-1.2'	59.9'	
23	161°42.46	43.56	23°52.83	2.2'	28°17.89	-1.4'	59.9'	
SD = 16.2' $d = -0.7'$			SD = 16.3'					

Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	176°42.36	S17°42.88	38°14.05	2.2'	N28°16.52	-1.6'	59.9'	
1	191°42.26	42.20	52°35.28	2.3'	28°14.95	-1.8'	59.9'	
2	206°42.15	41.51	66°56.53	2.3'	28°13.17	-2.0'	59.8'	
3	221°42.05	· · 40.83	81°17.81	2.3'	28°11.18	-2.2'	59.8'	
4	236°41.95	40.14	95°39.11	2.3'	28°8.99	-2.4'	59.8'	
5	251°41.85	39.46	110°0.44	2.4'	28°6.59	-2.6'	59.8'	
6	266°41.75	S17°38.77	124°21.80	2.4'	N28°3.98	-2.8'	59.8'	
7	281°41.65	38.09	138°43.20	2.4'	28°1.18	-3.0'	59.8'	
8	296°41.55	37.40	153°4.63	2.5'	27°58.17	-3.2'	59.8'	
9	311°41.45	· · 36.71	167°26.11	2.5'	27°54.95	-3.4'	59.8'	
10	326°41.35	36.03	181°47.63	2.6'	27°51.54	-3.6'	59.8'	
11	341°41.25	35.34	196°9.20	2.6'	27°47.92	-3.8'	59.8'	
12	356°41.16	S17°34.65	210°30.82	2.7'	N27°44.11	-4.0'	59.8'	
13	11°41.06	33.96	224°52.49	2.7'	27°40.09	-4.2'	59.8'	
14	26°40.96	33.27	239°14.22	2.8'	27°35.88	-4.4'	59.8'	
15	41°40.86	· · 32.58	253°36.00	2.8'	27°31.46	-4.6'	59.8'	
16	56°40.77	31.89	267°57.84	2.9'	27°26.86	-4.8'	59.8'	
17	71°40.67	31.20	282°19.75	3.0'	27°22.05	-5.0'	59.8'	
18	86°40.57	S17°30.50	296°41.73	3.0'	N27°17.05	-5.2'	59.8'	
19	101°40.48	29.81	311°3.77	3.1'	27°11.86	-5.4'	59.8'	
20	116°40.38	29.12	325°25.88	3.2'	27°6.48	-5.6'	59.8'	
21	131°40.29	· · 28.42	339°48.07	3.3'	27°0.90	-5.8'	59.8'	
22	146°40.19	27.73	354°10.33	3.3'	26°55.14	-6.0'	59.8'	
23	161°40.10	27.04	8°32.68	3.4'	26°49.18	-6.1'	59.7'	
SD = 16.2' $d = -0.7'$			SD = 16.3'					

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 10-12 70-89%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
28	12:49	12:55	12:13	20:16	07:44	
29	13:00	13:06	12:13	21:20	08:48	
30	13:11	13:15	12:13	22:24	09:53	

January 31, 01, 02 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	130°13.93	170°25.98	S17°2.78	181°38.44	S19°47.51	21°15.19	N22°35.87	130°42.21	S02°34.52	Alpheratz	357°34.07 29°14.17
1	145°16.39	185°25.31	1.86	196°38.89	47.04	36°17.96	35.91	145°44.45	34.42	Ankaa	353°6.48 -42°10.05
2	160°18.85	200°24.63	0.95	211°39.34	46.56	51°20.72	35.95	160°46.69	34.32	Schedar	349°30.31 56°41.07
3	175°21.32	215°23.96	17°0.03	226°39.79	· · 46.08	66°23.49	· · 35.99	175°48.93	· · 34.22	Diphda	348°46.55 -17°50.73
4	190°23.78	230°23.29	16°59.11	241°40.24	45.60	81°26.26	36.03	190°51.18	34.12	Achernar	335°19.65 -57°6.52
5	205°26.25	245°22.62	58.19	256°40.69	45.13	96°29.03	36.08	205°53.42	34.01	Hamal	327°50.22 23°35.24
6	220°28.71	260°21.95	S16°57.27	271°41.14	S19°44.65	111°31.79	N22°36.12	220°55.66	S02°33.91	Polaris	313°30.45 89°22.77
7	235°31.18	275°21.28	56.35	286°41.59	44.17	126°34.56	36.16	235°57.90	33.81	Acamar	315°11.04 -40°12.23
8	250°33.64	290°20.61	55.43	301°42.04	43.69	141°37.33	36.20	251°0.15	33.71	Menkar	314°5.16 4°11.50
9	265°36.10	305°19.94	· · 54.51	316°42.49	· · 43.21	156°40.09	· · 36.24	266°2.39	· · 33.61	Mirfak	308°26.85 49°57.44
10	280°38.57	320°19.27	53.58	331°42.94	42.73	171°42.86	36.28	281°4.63	33.50	Aldebaran	290°38.41 16°33.72
11	295°41.03	335°18.60	52.66	346°43.39	42.25	186°45.63	36.32	296°6.87	33.40	Rigel	281°2.78 -8°10.38
12	310°43.50	350°17.93	S16°51.73	1°43.84	S19°41.77	201°48.39	N22°36.36	311°9.11	S02°33.30	Capella	280°20.24 46°1.56
13	325°45.96	5°17.27	50.81	16°44.29	41.28	216°51.16	36.40	326°11.35	33.20	Bellatrix	278°21.68 6°22.35
14	340°48.42	20°16.60	49.88	31°44.74	40.80	231°53.92	36.44	341°13.60	33.09	Elnath	278°0.47 28°37.80
15	355°50.89	35°15.93	· · 48.95	46°45.19	· · 40.32	246°56.69	· · 36.48	356°15.84	· · 32.99	Alnilam	275°36.58 -1°11.19
16	10°53.35	50°15.27	48.02	61°45.64	39.84	261°59.45	36.52	11°18.08	32.89	Betelgeuse	270°50.85 7°24.66
17	25°55.82	65°14.60	47.09	76°46.09	39.35	277°2.22	36.56	26°20.32	32.79	Canopus	263°51.54 -52°42.71
18	40°58.28	80°13.94	S16°46.16	91°46.54	S19°38.87	292°4.98	N22°36.60	41°22.56	S02°32.68	Sirius	258°25.14 -16°45.23
19	56°0.75	95°13.28	45.23	106°46.99	38.39	307°7.75	36.65	56°24.80	32.58	Adhara	255°4.81 -29°0.57
20	71°3.21	110°12.61	44.30	121°47.45	37.90	322°10.51	36.69	71°27.04	32.48	Procyon	244°49.57 5°9.39
21	86°5.67	125°11.95	· · 43.37	136°47.90	· · 37.42	337°13.27	· · 36.73	86°29.28	· · 32.37	Pollux	243°15.84 27°57.72
22	101°8.14	140°11.29	42.44	151°48.35	36.93	352°16.04	36.77	101°31.52	32.27	Avior	234°13.73 -59°35.62
23	116°10.60	155°10.63	41.50	166°48.80	36.45	7°18.80	36.81	116°33.76	32.17	Suhail	222°45.21 -43°32.31
Mer.pass. 15:17		ν-0.7' d-0.9' m-3.90		ν0.4' d-0.5' m1.11		ν2.8' d0.0' m-2.63		ν2.2' d-0.1' m1.03		Miaplacidus	221°37.18 -69°49.42
										Alphard	217°46.54 -8°46.40
										Regulus	207°33.17 11°50.23
										Dubhe	193°39.33 61°36.35
										Denebola	182°23.80 14°25.38
										Gienah	175°42.46 -17°41.26
										Acrux	172°58.72 -63°14.46
										Gacrux	171°50.34 -57°15.41
										Alioth	166°11.91 55°48.74
										Spica	158°21.25 -11°17.93
										Alkaid	152°51.17 49°10.61
										Hadar	148°34.64 -60°29.72
										Menkent	147°56.50 -36°29.82
										Arcturus	145°47.05 19°2.54
										Rigel Kent.	139°39.04 -60°56.38
										Kochab	137°19.86 74°2.45
										Zuben'ubi	136°55.04 -16°9.05
										Alphecca	126°3.06 26°37.33
										Antares	112°14.90 -26°29.36
										Atria	107°8.64 -69°4.22
										Sabik	102°1.96 -15°45.46
										Shaula	96°9.43 -37°7.29
										Rasalhague	95°57.94 12°32.29
										Eltanin	90°42.17 51°28.84
										Kaus Aust.	83°31.65 -34°22.29
										Vega	80°32.98 38°48.25
										Nunki	75°46.97 -26°15.86
										Altair	61°59.40 8°56.13
										Peacock	53°4.90 -56°39.06
										Deneb	49°25.67 45°22.34
										Enif	33°38.23 9°59.63
										Al Na'ir	27°32.22 -46°50.19
										Fomalhaut	15°13.83 -29°29.17
										Scheat	13°44.63 28°13.51
										Markab	13°29.27 15°20.74
Jan 31 Sat			SHA		Mer.pass						
Venus			40°12.06		12:39						
Mars			51°24.52		11:53						
Jupiter			251°1.26		22:31						
Saturn			0°28.28		15:15						
Feb 01 Sun			SHA		Mer.pass						
Venus			38°56.90		12:40						
Mars			50°36.19		11:52						
Jupiter			251°8.50		22:26						
Saturn			0°22.94		15:11						
Feb 02 Mon			SHA		Mer.pass						
Venus			37°42.06		12:41						
Mars			49°47.96		11:52						
Jupiter			251°15.60		22:22						
Saturn			0°17.54		15:08						
Horizontal parallax											
Venus: 0.1											
Mars: 0.1											
Mer.pass. 15:09		ν-0.6' d-1.0' m-3.91		ν0.5' d-0.5' m1.11		ν2.8' d0.0' m-2.62		ν2.2' d-0.1' m1.03			

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	176°40.00	S17°26.34	22°55.10	3.5'	N26°43.04	-6.3'	59.7'
1	191°39.91	25.64	37°17.60	3.6'	26°36.72	-6.5'	59.7'
2	206°39.82	24.95	51°40.19	3.7'	26°30.21	-6.7'	59.7'
3	221°39.72	· · 24.25	66°2.87	3.8'	26°23.51	-6.9'	59.7'
4	236°39.63	23.55	80°25.63	3.9'	26°16.64	-7.1'	59.7'
5	251°39.54	22.86	94°48.49	3.9'	26°9.58	-7.2'	59.7'
6	266°39.45	S17°22.16	109°11.44	4.0'	N26°2.35	-7.4'	59.7'
7	281°39.36	21.46	123°34.48	4.1'	25°54.94	-7.6'	59.7'
8	296°39.27	20.76	137°57.62	4.2'	25°47.36	-7.8'	59.7'
9	311°39.17	· · 20.06	152°20.86	4.3'	25°39.60	-7.9'	59.6'
10	326°39.08	19.36	166°44.20	4.4'	25°31.67	-8.1'	59.6'
11	341°38.99	18.66	181°7.64	4.5'	25°23.57	-8.3'	59.6'
12	356°38.90	S17°17.96	195°31.18	4.6'	N25°15.31	-8.4'	59.6'
13	11°38.82	17.25	209°54.82	4.8'	25°6.87	-8.6'	59.6'
14	26°38.73	16.55	224°18.58	4.9'	24°58.28	-8.8'	59.6'
15	41°38.64	· · 15.85	238°42.44	5.0'	24°49.51	-8.9'	59.6'
16	56°38.55	15.14	253°6.40	5.1'	24°40.59	-9.1'	59.6'
17	71°38.46	14.44	267°30.48	5.2'	24°31.51	-9.2'	59.5'
18	86°38.37	S17°13.73	281°54.67	5.3'	N24°22.27	-9.4'	59.5'
19	101°38.29	13.03	296°18.97	5.4'	24°12.88	-9.5'	59.5'
20	116°38.20	12.32	310°43.38	5.5'	24°3.33	-9.7'	59.5'
21	131°38.11	· · 11.62	325°7.91	5.6'	23°53.63	-9.8'	59.5'
22	146°38.03	10.91	339°32.55	5.8'	23°43.78	-10.0'	59.5'
23	161°37.94	10.20	353°57.31	5.9'	23°33.78	-10.1'	59.4'
SD = 16.2' $d = -0.7'$			SD = 16.3'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°37.86	S17°9.49	8°22.19	6.0'	N23°23.64	-10.3'	59.4'
1	191°37.77	8.79	22°47.18	6.1'	23°13.35	-10.4'	59.4'
2	206°37.69	8.08	37°12.29	6.2'	23°2.92	-10.6'	59.4'
3	221°37.60	· · 7.37	51°37.51	6.3'	22°52.35	-10.7'	59.4'
4	236°37.52	6.66	66°2.86	6.5'	22°41.64	-10.8'	59.4'
5	251°37.43	5.95	80°28.33	6.6'	22°30.80	-11.0'	59.3'
6	266°37.35	S17°5.24	94°53.91	6.7'	N22°19.82	-11.1'	59.3'
7	281°37.27	4.52	109°19.62	6.8'	22°8.71	-11.2'	59.3'
8	296°37.19	3.81	123°45.44	6.9'	21°57.47	-11.4'	59.3'
9	311°37.10	· · 3.10	138°11.39	7.1'	21°46.11	-11.5'	59.3'
10	326°37.02	2.39	152°37.46	7.2'	21°34.61	-11.6'	59.2'
11	341°36.94	1.67	167°3.64	7.3'	21°23.00	-11.7'	59.2'
12	356°36.86	S17°0.96	181°29.95	7.4'	N21°11.26	-11.9'	59.2'
13	11°36.78	17°0.24	195°56.39	7.6'	20°59.40	-12.0'	59.2'
14	26°36.70	16°59.53	210°22.94	7.7'	20°47.43	-12.1'	59.2'
15	41°36.62	· · 58.81	224°49.61	7.8'	20°35.33	-12.2'	59.1'
16	56°36.54	58.10	239°16.41	7.9'	20°23.13	-12.3'	59.1'
17	71°36.46	57.38	253°43.32	8.0'	20°10.81	-12.4'	59.1'
18	86°36.38	S16°56.66	268°10.36	8.2'	N19°58.39	-12.5'	59.1'
19	101°36.30	55.94	282°37.51	8.3'	19°45.85	-12.6'	59.0'
20	116°36.22	55.23	297°4.79	8.4'	19°33.21	-12.7'	59.0'
21	131°36.14	· · 54.51	311°32.19	8.5'	19°20.47	-12.8'	59.0'
22	146°36.07	53.79	325°59.70	8.6'	19°7.63	-12.9'	59.0'
23	161°35.99	53.07	340°27.34	8.8'	18°54.68	-13.0'	58.9'
SD = 16.2' $d = -0.7'$			SD = 16.2'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°35.91	S16°52.35	354°55.09	8.9'	N18°41.64	-13.1'	58.9'
1	191°35.84	51.63	9°22.96	9.0'	18°28.51	-13.2'	58.9'
2	206°35.76	50.91	23°50.95	9.1'	18°15.28	-13.3'	58.9'
3	221°35.68	· · 50.18	38°19.06	9.2'	18°1.96	-13.4'	58.8'
4	236°35.61	49.46	52°47.28	9.3'	17°48.55	-13.5'	58.8'
5	251°35.53	48.74	67°15.62	9.5'	17°35.05	-13.6'	58.8'
6	266°35.46	S16°48.01	81°44.08	9.6'	N17°21.47	-13.7'	58.8'
7	281°35.38	47.29	96°12.65	9.7'	17°7.80	-13.7'	58.7'
8	296°35.31	46.57	110°41.33	9.8'	16°54.05	-13.8'	58.7'
9	311°35.24	· · 45.84	125°10.13	9.9'	16°40.23	-13.9'	58.7'
10	326°35.16	45.12	139°39.04	10.0'	16°26.32	-14.0'	58.7'
11	341°35.09	44.39	154°8.06	10.1'	16°12.34	-14.1'	58.6'
12	356°35.02	S16°43.66	168°37.19	10.2'	N15°58.29	-14.1'	58.6'
13	11°34.95	42.94	183°6.43	10.4'	15°44.16	-14.2'	58.6'
14	26°34.87	42.21	197°35.78	10.5'	15°29.96	-14.3'	58.6'
15	41°34.80	· · 41.48	212°5.24	10.6'	15°15.70	-14.3'	58.5'
16	56°34.73	40.75	226°34.80	10.7'	15°1.37	-14.4'	58.5'
17	71°34.66	40.02	241°4.48	10.8'	14°46.97	-14.5'	58.5'
18	86°34.59	S16°39.29	255°34.25	10.9'	N14°32.51	-14.5'	58.4'
19	101°34.52	38.56	270°4.14	11.0'	14°17.99	-14.6'	58.4'
20	116°34.45	37.83	284°34.12	11.1'	14°3.42	-14.6'	58.4'
21	131°34.38	· · 37.10	299°4.21	11.2'	13°48.78	-14.7'	58.4'
22	146°34.31	36.37	313°34.40	11.3'	13°34.09	-14.7'	58.3'
23	161°34.24	35.64	328°4.69	11.4'	13°19.34	-14.8'	58.3'
SD = 16.2' $d = -0.7'$			SD = 16.1'				

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Upper Mer.Pass. hh:mm	Lower Mer.Pass. hh:mm	
31	13:20	13:24	12:13	23:25	10:55	
01	13:29	13:33	12:14	—	11:54	
02	13:36	13:40	12:14	00:21	12:47	

February 03, 04, 05 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	133°11.34	169°38.87	S15°54.76	182°11.16	S19°12.23	24°33.92	N22°38.73	133°23.43	S02°27.09			Alpheratz	357°34.08 29°14.16
1	148°13.81	184°38.24	53.79	197°11.62	11.72	39°36.67	38.77	148°25.67	26.98			Ankaa	353°6.49 -42°10.05
2	163°16.27	199°37.60	52.81	212°12.08	11.22	54°39.42	38.81	163°27.90	26.88			Schedar	349°30.33 56°41.06
3	178°18.74	214°36.97	· · 51.84	227°12.54	· · 10.71	69°42.17	· · 38.85	178°30.14	· · 26.77			Diphda	348°46.56 -17°50.73
4	193°21.20	229°36.34	50.86	242°13.00	10.21	84°44.92	38.88	193°32.38	26.67			Achernar	335°19.67 -57°6.51
5	208°23.67	244°35.70	49.89	257°13.47	9.70	99°47.67	38.92	208°34.61	26.56			Hamal	327°50.23 23°35.23
6	223°26.13	259°35.07	S15°48.91	272°13.93	S19°9.20	114°50.42	N22°38.96	223°36.85	S02°26.46			Polaris	313°32.07 89°22.78
7	238°28.59	274°34.44	47.93	287°14.39	8.69	129°53.17	39.00	238°39.08	26.35			Acamar	315°11.05 -40°12.23
8	253°31.06	289°33.81	46.95	302°14.85	8.19	144°55.92	39.04	253°41.32	26.25			Menkar	314°5.17 4°11.50
9	268°33.52	304°33.18	· · 45.97	317°15.31	· · 7.68	159°58.67	· · 39.07	268°43.55	· · 26.14			Mirfak	308°26.87 49°57.44
10	283°35.99	319°32.55	44.99	332°15.77	7.17	175°1.42	39.11	283°45.79	26.04			Aldebaran	290°38.42 16°33.72
11	298°38.45	334°31.92	44.01	347°16.24	6.67	190°4.17	39.15	298°48.02	25.93			Rigel	281°2.79 -8°10.39
12	313°40.91	349°31.29	S15°43.03	2°16.70	S19°6.16	205°6.92	N22°39.19	313°50.26	S02°25.83			Capella	280°20.26 46°1.57
13	328°43.38	4°30.66	42.05	17°17.16	5.65	220°9.67	39.23	328°52.49	25.72			Bellatrix	278°21.69 6°22.35
14	343°45.84	19°30.04	41.06	32°17.62	5.14	235°12.42	39.26	343°54.72	25.62			Elnath	278°0.48 28°37.80
15	358°48.31	34°29.41	· · 40.08	47°18.09	· · 4.64	250°15.17	· · 39.30	358°56.96	· · 25.51			Alnilam	275°36.58 -1°11.19
16	13°50.77	49°28.78	39.10	62°18.55	4.13	265°17.92	39.34	13°59.19	25.41			Betelgeuse	270°50.86 7°24.66
17	28°53.23	64°28.16	38.11	77°19.01	3.62	280°20.66	39.38	29°1.43	25.30			Canopus	263°51.56 -52°42.73
18	43°55.70	79°27.53	S15°37.12	92°19.47	S19°3.11	295°23.41	N22°39.41	44°3.66	S02°25.20			Sirius	258°25.14 -16°45.24
19	58°58.16	94°26.91	36.14	107°19.94	2.60	310°26.16	39.45	59°5.90	25.09			Adhara	255°4.82 -29°0.58
20	74°0.63	109°26.28	35.15	122°20.40	2.09	325°28.90	39.49	74°8.13	24.99			Procyon	244°49.57 5°9.39
21	89°3.09	124°25.66	· · 34.16	137°20.87	· · 1.58	340°31.65	· · 39.53	89°10.36	· · 24.88			Pollux	243°15.83 27°57.72
22	104°5.55	139°25.03	33.17	152°21.33	1.07	355°34.40	39.56	104°12.60	24.78			Avior	234°13.74 -59°35.64
23	119°8.02	154°24.41	32.18	167°21.79	0.55	10°37.14	39.60	119°14.83	24.67			Suhail	222°45.20 -43°32.32
Mer.pass. 15:05		ν-0.6' d-1.0' m-3.91		ν0.5' d-0.5' m1.11		ν2.8' d0.0' m-2.61		ν2.2' d-0.1' m1.03					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	134°10.48	169°23.79	S15°31.19	182°22.26	S19°0.04	25°39.89	N22°39.64	134°17.07	S02°24.57				
1	149°12.95	184°23.17	30.20	197°22.72	18°59.53	40°42.64	39.68	149°19.30	24.46				
2	164°15.41	199°22.55	29.21	212°23.19	59.02	55°45.38	39.71	164°21.53	24.36				
3	179°17.88	214°21.92	· · 28.22	227°23.65	· · 58.50	70°48.13	· · 39.75	179°23.77	· · 24.25				
4	194°20.34	229°21.30	27.22	242°24.12	57.99	85°50.87	39.79	194°26.00	24.14				
5	209°22.80	244°20.68	26.23	257°24.58	57.48	100°53.62	39.83	209°28.23	24.04				
6	224°25.27	259°20.07	S15°25.23	272°25.05	S18°56.96	115°56.36	N22°39.86	224°30.46	S02°23.93				
7	239°27.73	274°19.45	24.24	287°25.51	56.45	130°59.11	39.90	239°32.70	23.83				
8	254°30.20	289°18.83	23.24	302°25.98	55.93	146°1.85	39.94	254°34.93	23.72				
9	269°32.66	304°18.21	· · 22.24	317°26.44	· · 55.42	161°4.59	· · 39.97	269°37.16	· · 23.62				
10	284°35.12	319°17.59	21.24	332°26.91	54.90	176°7.34	40.01	284°39.40	23.51				
11	299°37.59	334°16.98	20.25	347°27.37	54.39	191°10.08	40.05	299°41.63	23.41				
12	314°40.05	349°16.36	S15°19.25	2°27.84	S18°53.87	206°12.82	N22°40.08	314°43.86	S02°23.30				
13	329°42.52	4°15.75	18.25	17°28.31	53.36	221°15.57	40.12	329°46.09	23.19				
14	344°44.98	19°15.13	17.24	32°28.77	52.84	236°18.31	40.16	344°48.33	23.09				
15	359°47.44	34°14.52	· · 16.24	47°29.24	· · 52.32	251°21.05	· · 40.19	359°50.56	· · 22.98				
16	14°49.91	49°13.90	15.24	62°29.71	51.80	266°23.79	40.23	14°52.79	22.88				
17	29°52.37	64°13.29	14.24	77°30.17	51.29	281°26.53	40.27	29°55.02	22.77				
18	44°54.84	79°12.68	S15°13.23	92°30.64	S18°50.77	296°29.28	N22°40.30	44°57.25	S02°22.66				
19	59°57.30	94°12.06	12.23	107°31.11	50.25	311°32.02	40.34	59°59.49	22.56				
20	74°59.76	109°11.45	11.22	122°31.58	49.73	326°34.76	40.38	75°1.72	22.45				
21	90°2.23	124°10.84	· · 10.22	137°32.04	· · 49.21	341°37.50	· · 40.41	90°3.95	· · 22.35				
22	105°4.69	139°10.23	9.21	152°32.51	48.69	356°40.24	40.45	105°6.18	22.24				
23	120°7.16	154°9.62	8.20	167°32.98	48.17	11°42.98	40.49	120°8.41	22.13				
Mer.pass. 15:01		ν-0.6' d-1.0' m-3.91		ν0.5' d-0.5' m1.11		ν2.7' d0.0' m-2.61		ν2.2' d-0.1' m1.03					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	135°9.62	169°9.01	S15°7.19	182°33.45	S18°47.65	26°45.72	N22°40.52	135°10.64	S02°22.03				
1	150°12.08	184°8.40	6.19	197°33.92	47.13	41°48.46	40.56	150°12.88	21.92				
2	165°14.55	199°7.79	5.18	212°34.39	46.61	56°51.20	40.60	165°15.11	21.81				
3	180°17.01	214°7.18	· · 4.17	227°34.85	· · 46.09	71°53.94	· · 40.63	180°17.34	· · 21.71				
4	195°19.48	229°6.58	3.15	242°35.32	45.57	86°56.68	40.67	195°19.57	21				


h	Sun			Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°34.17	S16°34.91	342°35.08	11.5'	N13°4.55	-14.8'	58.3'
1	191°34.11	34.17	357°5.56	11.6'	12°49.70	-14.9'	58.2'
2	206°34.04	33.44	11°36.14	11.7'	12°34.80	-14.9'	58.2'
3	221°33.97	· · 32.71	26°6.82	11.8'	12°19.86	-15.0'	58.2'
4	236°33.90	31.97	40°37.60	11.9'	12°4.87	-15.0'	58.1'
5	251°33.84	31.24	55°8.47	12.0'	11°49.84	-15.1'	58.1'
6	266°33.77	S16°30.50	69°39.43	12.1'	N11°34.77	-15.1'	58.1'
7	281°33.70	29.76	84°10.48	12.1'	11°19.66	-15.2'	58.1'
8	296°33.64	29.03	98°41.62	12.2'	11°4.51	-15.2'	58.0'
9	311°33.57	· · 28.29	113°12.85	12.3'	10°49.32	-15.2'	58.0'
10	326°33.51	27.55	127°44.17	12.4'	10°34.09	-15.3'	58.0'
11	341°33.44	26.81	142°15.57	12.5'	10°18.84	-15.3'	57.9'
12	356°33.38	S16°26.08	156°47.06	12.6'	N10°3.55	-15.3'	57.9'
13	11°33.32	25.34	171°18.64	12.7'	09°48.23	-15.3'	57.9'
14	26°33.25	24.60	185°50.30	12.7'	09°32.88	-15.4'	57.8'
15	41°33.19	· · 23.86	200°22.03	12.8'	09°17.50	-15.4'	57.8'
16	56°33.13	23.12	214°53.85	12.9'	09°2.10	-15.4'	57.8'
17	71°33.06	22.38	229°25.75	13.0'	08°46.67	-15.5'	57.7'
18	86°33.00	S16°21.63	243°57.73	13.1'	N08°31.22	-15.5'	57.7'
19	101°32.94	20.89	258°29.78	13.1'	08°15.74	-15.5'	57.7'
20	116°32.88	20.15	273°1.91	13.2'	08°0.25	-15.5'	57.6'
21	131°32.82	· · 19.41	287°34.11	13.3'	07°44.74	-15.5'	57.6'
22	146°32.76	18.66	302°6.39	13.3'	07°29.21	-15.5'	57.6'
23	161°32.70	17.92	316°38.74	13.4'	07°13.67	-15.6'	57.6'
SD = 16.2' $d = -0.7'$			SD = 15.9'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°32.64	S16°17.18	331°11.16	13.5'	N06°58.11	-15.6'	57.5'
1	191°32.58	16.43	345°43.64	13.6'	06°42.54	-15.6'	57.5'
2	206°32.52	15.68	0°16.20	13.6'	06°26.95	-15.6'	57.5'
3	221°32.46	· · 14.94	14°48.82	13.7'	06°11.36	-15.6'	57.4'
4	236°32.40	14.19	29°21.51	13.8'	05°55.75	-15.6'	57.4'
5	251°32.34	13.45	43°54.26	13.8'	05°40.14	-15.6'	57.4'
6	266°32.28	S16°12.70	58°27.07	13.9'	N05°24.53	-15.6'	57.3'
7	281°32.23	11.95	72°59.95	13.9'	05°8.90	-15.6'	57.3'
8	296°32.17	11.20	87°32.88	14.0'	04°53.28	-15.6'	57.3'
9	311°32.11	· · 10.45	102°5.88	14.1'	04°37.65	-15.6'	57.2'
10	326°32.06	9.70	116°38.93	14.1'	04°22.02	-15.6'	57.2'
11	341°32.00	8.95	131°12.04	14.2'	04°6.39	-15.6'	57.2'
12	356°31.94	S16°8.20	145°45.20	14.2'	N03°50.76	-15.6'	57.1'
13	11°31.89	7.45	160°18.42	14.3'	03°35.13	-15.6'	57.1'
14	26°31.83	6.70	174°51.68	14.3'	03°19.50	-15.6'	57.1'
15	41°31.78	· · 5.95	189°25.01	14.4'	03°3.88	-15.6'	57.0'
16	56°31.72	5.20	203°58.38	14.4'	02°48.27	-15.6'	57.0'
17	71°31.67	4.44	218°31.79	14.5'	02°32.66	-15.6'	57.0'
18	86°31.62	S16°3.69	233°5.26	14.5'	N02°17.07	-15.6'	56.9'
19	101°31.56	2.94	247°38.77	14.6'	02°1.48	-15.6'	56.9'
20	116°31.51	2.18	262°12.33	14.6'	01°45.90	-15.6'	56.9'
21	131°31.46	· · 1.43	276°45.93	14.6'	01°30.33	-15.6'	56.8'
22	146°31.40	16°0.67	291°19.58	14.7'	01°14.78	-15.5'	56.8'
23	161°31.35	15°59.92	305°53.26	14.7'	00°59.23	-15.5'	56.8'
SD = 16.2' $d = -0.7'$			SD = 15.7'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	176°31.30	S15°59.16	320°26.99	14.8'	N00°43.71	-15.5'	56.7'
1	191°31.25	58.41	335°0.75	14.8'	00°28.20	-15.5'	56.7'
2	206°31.20	57.65	349°34.55	14.8'	N00°12.70	-15.5'	56.7'
3	221°31.15	· · 56.89	4°8.39	14.9'	S00°2.77	15.5'	56.6'
4	236°31.10	56.13	18°42.26	14.9'	00°18.23	15.4'	56.6'
5	251°31.05	55.37	33°16.16	14.9'	00°33.66	15.4'	56.6'
6	266°31.00	S15°54.61	47°50.10	15.0'	S00°49.08	15.4'	56.5'
7	281°30.95	53.86	62°24.07	15.0'	01°4.47	15.4'	56.5'
8	296°30.90	53.10	76°58.07	15.0'	01°19.84	15.3'	56.5'
9	311°30.85	· · 52.34	91°32.09	15.1'	01°35.19	15.3'	56.4'
10	326°30.80	51.57	106°6.15	15.1'	01°50.51	15.3'	56.4'
11	341°30.75	50.81	120°40.23	15.1'	02°5.81	15.3'	56.4'
12	356°30.71	S15°50.05	135°14.34	15.1'	S02°21.08	15.2'	56.4'
13	11°30.66	49.29	149°48.47	15.2'	02°36.32	15.2'	56.3'
14	26°30.61	48.53	164°22.62	15.2'	02°51.53	15.2'	56.3'
15	41°30.57	· · 47.76	178°56.79	15.2'	03°6.71	15.2'	56.3'
16	56°30.52	47.00	193°30.99	15.2'	03°21.86	15.1'	56.2'
17	71°30.47	46.23	208°5.20	15.2'	03°36.99	15.1'	56.2'
18	86°30.43	S15°45.47	222°39.43	15.2'	S03°52.07	15.1'	56.2'
19	101°30.38	44.70	237°13.68	15.3'	04°7.13	15.0'	56.1'
20	116°30.34	43.94	251°47.94	15.3'	04°22.15	15.0'	56.1'
21	131°30.29	· · 43.17	266°22.22	15.3'	04°37.13	14.9'	56.1'
22	146°30.25	42.41	280°56.51	15.3'	04°52.08	14.9'	56.0'
23	161°30.21	41.64	295°30.81	15.3'	05°7.00	14.9'	56.0'
SD = 16.2' $d = -0.8'$			SD = 15.5'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	16-18
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-89%
03	13:43	13:46	12:14	01:12	13:36	
04	13:49	13:52	12:14	01:59	14:21	
05	13:55	13:57	12:14	02:43	15:04	

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	136° 8.76	168° 54.53	S14° 42.78	182° 44.74	S18° 35.06	27° 51.40	N22° 41.38	136° 4.17	S02° 19.47	Alpheratz	357° 34.09	29° 14.15
1	151° 11.22	183° 53.94	41.76	197° 45.21	34.53	42° 54.14	41.42	151° 6.40	19.36	Ankaa	353° 6.51	-42° 10.04
2	166° 13.69	198° 53.34	40.73	212° 45.68	34.00	57° 56.87	41.45	166° 8.63	19.25	Schedar	349° 30.36	56° 41.05
3	181° 16.15	213° 52.74	· · 39.70	227° 46.15	· · 33.47	72° 59.60	· · 41.49	181° 10.86	· · 19.14	Diphda	348° 46.57	-17° 50.73
4	196° 18.61	228° 52.15	38.67	242° 46.63	32.94	88° 2.33	41.53	196° 13.09	19.04	Achernar	335° 19.70	-57° 6.51
5	211° 21.08	243° 51.55	37.65	257° 47.10	32.41	103° 5.07	41.56	211° 15.32	18.93	Hamal	327° 50.25	23° 35.23
6	226° 23.54	258° 50.96	S14° 36.62	272° 47.57	S18° 31.88	118° 7.80	N22° 41.60	226° 17.54	S02° 18.82	Polaris	313° 33.66	89° 22.78
7	241° 26.01	273° 50.37	35.59	287° 48.05	31.35	133° 10.53	41.63	241° 19.77	18.72	Acamar	315° 11.07	-40° 12.23
8	256° 28.47	288° 49.77	34.56	302° 48.52	30.81	148° 13.26	41.67	256° 22.00	18.61	Menkar	314° 5.19	4° 11.49
9	271° 30.93	303° 49.18	· · 33.52	317° 48.99	· · 30.28	163° 15.99	· · 41.70	271° 24.23	· · 18.50	Mirfak	308° 26.89	49° 57.44
10	286° 33.40	318° 48.59	32.49	332° 49.47	29.75	178° 18.73	41.74	286° 26.46	18.39	Aldebaran	290° 38.43	16° 33.72
11	301° 35.86	333° 48.00	31.46	347° 49.94	29.22	193° 21.46	41.77	301° 28.69	18.29	Rigel	281° 2.81	-8° 10.39
12	316° 38.33	348° 47.40	S14° 30.43	2° 50.42	S18° 28.68	208° 24.19	N22° 41.81	316° 30.91	S02° 18.18	Capella	280° 20.28	46° 1.57
13	331° 40.79	3° 46.81	29.39	17° 50.89	28.15	223° 26.92	41.84	331° 33.14	18.07	Bellatrix	278° 21.70	6° 22.35
14	346° 43.25	18° 46.22	28.36	32° 51.37	27.62	238° 29.65	41.88	346° 35.37	17.96	Elnath	278° 0.49	28° 37.81
15	1° 45.72	33° 45.63	· · 27.32	47° 51.84	· · 27.08	253° 32.38	· · 41.91	1° 37.60	· · 17.86	Alnilam	275° 36.60	-1° 11.20
16	16° 48.18	48° 45.05	26.28	62° 52.32	26.55	268° 35.11	41.94	16° 39.83	17.75	Betelgeuse	270° 50.87	7° 24.66
17	31° 50.65	63° 44.46	25.25	77° 52.79	26.01	283° 37.84	41.98	31° 42.05	17.64	Canopus	263° 51.57	-52° 42.74
18	46° 53.11	78° 43.87	S14° 24.21	92° 53.27	S18° 25.48	298° 40.56	N22° 42.01	46° 44.28	S02° 17.53	Sirius	258° 25.15	-16° 45.25
19	61° 55.57	93° 43.28	23.17	107° 53.74	24.94	313° 43.29	42.05	61° 46.51	17.43	Adhara	255° 4.83	-29° 0.59
20	76° 58.04	108° 42.69	22.13	122° 54.22	24.41	328° 46.02	42.08	76° 48.74	17.32	Procyon	244° 49.57	5° 9.39
21	92° 0.50	123° 42.11	· · 21.09	137° 54.69	· · 23.87	343° 48.75	· · 42.12	91° 50.96	· · 17.21	Pollux	243° 15.84	27° 57.73
22	107° 2.97	138° 41.52	20.05	152° 55.17	23.33	358° 51.48	42.15	106° 53.19	17.10	Avior	234° 13.75	-59° 35.65
23	122° 5.43	153° 40.94	19.01	167° 55.65	22.80	13° 54.21	42.19	121° 55.42	16.99	Suhail	222° 45.20	-43° 32.34
Mer.pass. 14:53												

h	Sun			Moon				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	176°30.16	S15°40.87		310°5.12	15.3'	S05°21.87	14.8'	56.0'
1	191°30.12	40.10		324°39.45	15.3'	05°36.71	14.8'	56.0'
2	206°30.08	39.34		339°13.78	15.3'	05°51.51	14.8'	55.9'
3	221°30.03	· · 38.57		353°48.12	15.3'	06°6.26	14.7'	55.9'
4	236°29.99	37.80		8°22.47	15.4'	06°20.98	14.7'	55.9'
5	251°29.95	37.03		22°56.82	15.4'	06°35.65	14.6'	55.8'
6	266°29.91	S15°36.26		37°31.17	15.4'	S06°50.28	14.6'	55.8'
7	281°29.87	35.49		52°5.53	15.4'	07°4.87	14.5'	55.8'
8	296°29.83	34.72		66°39.89	15.4'	07°19.42	14.5'	55.7'
9	311°29.79	· · 33.94		81°14.25	15.4'	07°33.92	14.5'	55.7'
10	326°29.75	33.17		95°48.61	15.4'	07°48.37	14.4'	55.7'
11	341°29.71	32.40		110°22.97	15.4'	08°2.77	14.4'	55.7'
12	356°29.67	S15°31.63		124°57.33	15.4'	S08°17.13	14.3'	55.6'
13	11°29.63	30.85		139°31.68	15.3'	08°31.44	14.3'	55.6'
14	26°29.59	30.08		154°6.03	15.3'	08°45.71	14.2'	55.6'
15	41°29.55	· · 29.30		168°40.37	15.3'	08°59.92	14.2'	55.6'
16	56°29.51	28.53		183°14.70	15.3'	09°14.08	14.1'	55.5'
17	71°29.48	27.75		197°49.03	15.3'	09°28.19	14.1'	55.5'
18	86°29.44	S15°26.98		212°23.35	15.3'	S09°42.25	14.0'	55.5'
19	101°29.40	26.20		226°57.66	15.3'	09°56.25	14.0'	55.4'
20	116°29.36	25.42		241°31.96	15.3'	10°10.20	13.9'	55.4'
21	131°29.33	· · 24.65		256°6.24	15.3'	10°24.10	13.8'	55.4'
22	146°29.29	23.87		270°40.52	15.3'	10°37.94	13.8'	55.4'
23	161°29.26	23.09		285°14.77	15.2'	10°51.73	13.7'	55.3'
SD = 16.2'			$d = -0.8'$	SD = 15.3'				

Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	176°29.22	S15°22.31		299°49.02	15.2'	S11°5.46	13.7'	55.3'
1	191°29.19	21.53		314°23.25	15.2'	11°19.13	13.6'	55.3'
2	206°29.15	20.75		328°57.46	15.2'	11°32.74	13.6'	55.3'
3	221°29.12	· · 19.97		343°31.65	15.2'	11°46.30	13.5'	55.2'
4	236°29.08	19.19		358°5.82	15.2'	11°59.80	13.4'	55.2'
5	251°29.05	18.41		12°39.98	15.1'	12°13.23	13.4'	55.2'
6	266°29.02	S15°17.63		27°14.11	15.1'	S12°26.61	13.3'	55.2'
7	281°28.98	16.85		41°48.22	15.1'	12°39.92	13.3'	55.1'
8	296°28.95	16.07		56°22.31	15.1'	12°53.17	13.2'	55.1'
9	311°28.92	· · 15.28		70°56.37	15.0'	13°6.36	13.1'	55.1'
10	326°28.89	14.50		85°30.41	15.0'	13°19.48	13.1'	55.1'
11	341°28.86	13.72		100°4.43	15.0'	13°32.54	13.0'	55.1'
12	356°28.82	S15°12.93		114°38.42	15.0'	S13°45.54	12.9'	55.0'
13	11°28.79	12.15		129°12.38	14.9'	13°58.46	12.9'	55.0'
14	26°28.76	11.36		143°46.31	14.9'	14°11.33	12.8'	55.0'
15	41°28.73	· · 10.58		158°20.21	14.9'	14°24.12	12.7'	55.0'
16	56°28.70	9.79		172°54.09	14.8'	14°36.85	12.7'	54.9'
17	71°28.67	9.01		187°27.93	14.8'	14°49.50	12.6'	54.9'
18	86°28.64	S15°8.22		202°1.74	14.8'	S15°2.09	12.5'	54.9'
19	101°28.61	7.43		216°35.52	14.7'	15°14.61	12.4'	54.9'
20	116°28.59	6.65		231°9.26	14.7'	15°27.06	12.4'	54.9'
21	131°28.56	· · 5.86		245°42.97	14.7'	15°39.43	12.3'	54.8'
22	146°28.53	5.07		260°16.64	14.6'	15°51.73	12.2'	54.8'
23	161°28.50	4.28		274°50.28	14.6'	16°3.96	12.2'	54.8'
SD = 16.2'			$d = -0.8'$	SD = 15.1'				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	176°28.48	S15°3.49		289°23.89	14.6'	S16°16.12	12.1'	54.8'
1	191°28.45	2.70		303°57.45	14.5'	16°28.20	12.0'	54.8'
2	206°28.42	1.91		318°30.98	14.5'	16°40.21	11.9'	54.7'
3	221°28.40	· · 1.12		333°4.47	14.4'	16°52.14	11.9'	54.7'
4	236°28.37	15°0.33		347°37.91	14.4'	17°3.99	11.8'	54.7'
5	251°28.34	14°59.54		2°11.32	14.4'	17°15.77	11.7'	54.7'
6	266°28.32	S14°58.74		16°44.69	14.3'	S17°27.47	11.6'	54.7'
7	281°28.29	57.95		31°18.01	14.3'	17°39.09	11.5'	54.6'
8	296°28.27	57.16		45°51.29	14.2'	17°50.63	11.5'	54.6'
9	311°28.25	· · 56.37		60°24.53	14.2'	18°2.09	11.4'	54.6'
10	326°28.22	55.57		74°57.73	14.1'	18°13.47	11.3'	54.6'
11	341°28.20	54.78		89°30.88	14.1'	18°24.77	11.2'	54.6'
12	356°28.18	S14°53.98		104°3.98	14.1'	S18°35.99	11.1'	54.6'
13	11°28.15	53.19		118°37.04	14.0'	18°47.12	11.1'	54.5'
14	26°28.13	52.39		133°10.05	14.0'	18°58.18	11.0'	54.5'
15	41°28.11	· · 51.60		147°43.02	13.9'	19°9.14	10.9'	54.5'
16	56°28.09	50.80		162°15.93	13.9'	19°20.02	10.8'	54.5'
17	71°28.06	50.00		176°48.80	13.8'	19°30.82	10.7'	54.5'
18	86°28.04	S14°49.20		191°21.62	13.8'	S19°41.53	10.6'	54.5'
19	101°28.02	48.41		205°54.39	13.7'	19°52.15	10.5'	54.5'
20	116°28.00	47.61		220°27.11	13.7'	20°2.68	10.4'	54.4'
21	131°27.98	· · 46.81		234°59.78	13.6'	20°13.13	10.4'	54.4'
22	146°27.96	46.01		249°32.40	13.6'	20°23.49	10.3'	54.4'
23	161°27.94	45.21		264°4.97	13.5'	20°33.75	10.2'	54.4'
SD = 16.2'			$d = -0.8'$	SD = 14.9'				

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

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

February 09, 10, 11 UT (Mon., Tue., Wed.)

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	139°6.17	168°12.86	S13°27.18	183°19.19	S17°56.08	31°7.52	N22°43.82	138°44.45	S02°11.67					Alpheratz	357°34.10 29°14.14		
1	154°8.64	183°12.30	26.11	198°19.67	55.52	46°10.24	43.85	153°46.67	11.56					Ankaa	353°6.52 -42°10.03		
2	169°11.10	198°11.74	25.04	213°20.16	54.97	61°12.95	43.89	168°48.89	11.45					Schedar	349°30.37 56°41.04		
3	184°13.56	213°11.18	· · 23.96	228°20.64	· · 54.41	76°15.66	· · 43.92	183°51.11	· · 11.34					Diphda	348°46.58 -17°50.73		
4	199°16.03	228°10.62	22.88	243°21.13	53.86	91°18.37	43.95	198°53.34	11.23					Achernar	335°19.73 -57°6.50		
5	214°18.49	243°10.06	21.81	258°21.61	53.30	106°21.09	43.98	213°55.56	11.12					Hamal	327°50.26 23°35.22		
6	229°20.96	258°9.50	S13°20.73	273°22.10	S17°52.75	121°23.80	N22°44.02	228°57.78	S02°11.01					Polaris	313°35.03 89°22.78		
7	244°23.42	273°8.94	19.65	288°22.58	52.19	136°26.51	44.05	244°0.00	10.90					Acamar	315°11.09 -40°12.23		
8	259°25.88	288°8.38	18.57	303°23.07	51.64	151°29.22	44.08	259°2.23	10.79					Menkar	314°5.20 4°11.49		
9	274°28.35	303°7.83	· · 17.50	318°23.56	· · 51.08	166°31.93	· · 44.11	274°4.45	· · 10.68					Mirfak	308°26.91 49°57.43		
10	289°30.81	318°7.27	16.42	333°24.04	50.52	181°34.65	44.14	289°6.67	10.57					Aldebaran	290°38.44 16°33.71		
11	304°33.28	333°6.72	15.34	348°24.53	49.97	196°37.36	44.18	304°8.89	10.46					Rigel	281°2.82 -8°10.40		
12	319°35.74	348°6.16	S13°14.26	3°25.02	S17°49.41	211°40.07	N22°44.21	319°11.11	S02°10.35					Capella	280°20.29 46°1.57		
13	334°38.20	3°5.61	13.17	18°25.50	48.85	226°42.78	44.24	334°13.34	10.24					Bellatrix	278°21.71 6°22.35		
14	349°40.67	18°5.05	12.09	33°25.99	48.29	241°45.49	44.27	349°15.56	10.13					Elnath	278°0.50 28°37.80		
15	4°43.13	33°4.50	· · 11.01	48°26.48	· · 47.73	256°48.20	· · 44.30	4°17.78	· · 10.02					Alnilam	275°36.61 -1°11.20		
16	19°45.60	48°3.94	9.93	63°26.96	47.18	271°50.91	44.33	19°20.00	9.91					Betelgeuse	270°50.88 7°24.66		
17	34°48.06	63°3.39	8.84	78°27.45	46.62	286°53.62	44.37	34°22.22	9.80					Canopus	263°51.59 -52°42.75		
18	49°50.53	78°2.84	S13°7.76	93°27.94	S17°46.06	301°56.32	N22°44.40	49°24.44	S02°9.69					Sirius	258°25.16 -16°45.26		
19	64°52.99	93°2.29	6.67	108°28.43	45.50	316°59.03	44.43	64°26.67	9.58					Adhara	255°4.84 -29°0.60		
20	79°55.45	108°1.74	5.59	123°28.91	44.94	332°1.74	44.46	79°28.89	9.47					Procyon	244°49.58 5°9.38		
21	94°57.92	123°1.18	· · 4.50	138°29.40	· · 44.38	347°4.45	· · 44.49	94°31.11	· · 9.36					Pollux	243°15.84 27°57.73		
22	110°0.38	138°0.63	3.41	153°29.89	43.82	2°7.16	44.52	109°33.33	9.25					Avior	234°13.76 -59°35.67		
23	125°2.85	153°0.08	2.33	168°30.38	43.26	17°9.86	44.56	124°35.55	9.14					Suhail	222°45.20 -43°32.36		
Mer.pass. 14:41			ν-0.6' d-1.1' m-3.91			ν0.5' d-0.6' m1.12			ν2.7' d0.0' m-2.58			ν2.2' d-0.1' m1.02					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	140°5.31	167°59.53	S13°1.24	183°30.87	S17°42.69	32°12.57	N22°44.59	139°37.77	S02°9.03					Dubhe	193°39.26 61°36.38		
1	155°7.77	182°58.98	13°0.15	198°31.36	42.13	47°15.28	44.62	154°39.99	8.92					Denebola	182°23.75 14°25.37		
2	170°10.24	197°58.44	12°59.06	213°31.85	41.57	62°17.99	44.65	169°42.21	8.81					Gienah	175°42.41 -17°41.29		
3	185°12.70	212°57.89	· · 57.97	228°32.34	· · 41.01	77°20.69	· · 44.68	184°44.43	· · 8.70					Acrux	172°58.62 -63°14.50		
4	200°15.17	227°57.34	56.88	243°32.83	40.44	92°23.40	44.71	199°46.65	8.59					Gacrux	171°50.25 -57°15.46		
5	215°17.63	242°56.79	55.79	258°33.31	39.88	107°26.10	44.74	214°48.88	8.48					Alioth	166°11.81 55°48.75		
6	230°20.10	257°56.25	S12°54.70	273°33.80	S17°39.32	122°28.81	N22°44.77	229°51.10	S02°8.37					Spica	158°21.19 -11°17.95		
7	245°22.56	272°55.70	53.60	288°34.29	38.75	137°31.51	44.81	244°53.32	8.26					Alkaid	152°51.08 49°10.61		
8	260°25.02	287°55.15	52.51	303°34.78	38.19	152°34.22	44.84	259°55.54	8.15					Hadar	148°34.52 -60°29.75		
9	275°27.49	302°54.61	· · 51.42	318°35.28	· · 37.63	167°36.92	· · 44.87	274°57.76	· · 8.04					Menkent	147°56.42 -36°29.84		
10	290°29.95	317°54.06	50.32	333°35.77	37.06	182°39.63	44.90	289°59.98	7.93					Arcturus	145°46.98 19°2.53		
11	305°32.42	332°53.52	49.23	348°36.26	36.50	197°42.33	44.93	305°2.20	7.82					Rigel Kent.	139°38.92 -60°56.40		
12	320°34.88	347°52.98	S12°48.13	3°36.75	S17°35.93	212°45.03	N22°44.96	320°4.42	S02°7.71					Kochab	137°19.66 74°2.45		
13	335°37.34	2°52.43	47.04	18°37.24	35.37	227°47.74	44.99	335°6.64	7.60					Zuben'ubi	136°54.97 -16°9.07		
14	350°39.81	17°51.89	45.94	33°37.73	34.80	242°50.44	45.02	350°8.86	7.49					Alphecca	126°2.99 26°37.31		
15	5°42.27	32°51.35	· · 44.84	48°38.22	· · 34.23	257°53.14	· · 45.05	5°11.08	· · 7.38					Antares	112°14.83 -26°29.37		
16	20°44.74	47°50.81	43.75	63°38.71	33.67	272°55.85	45.08	20°13.30	7.27					Atria	107°8.48 -69°4.21		
17	35°47.20	62°50.26	42.65	78°39.20	33.10	287°58.55	45.11	35°15.52	7.15					Sabik	102°1.89 -15°45.47		
18	50°49.66	77°49.72	S12°41.55	93°39.70	S17°32.53	303°1.25	N22°45.14	50°17.74	S02°7.04					Shaula	96°9.36 -37°7.28		
19	65°52.13	92°49.18	40.45	108°40.19	31.96	318°3.95	45.18	65°19.95	6.93					Rasalhague	95°57.89 12°32.27		
20	80°54.59	107°48.64	39.35	123°40.68	31.40	333°6.65	45.21	80°22.17	6.82					Eltanin	90°42.10 51°28.80		
21	95°57.06	122°48.10	· · 38.25	138°41.17	· · 30.83	348°9.35	· · 45.24	95°24.39	· · 6.71					Kaus Aust.	83°31.59 -34°22.28		
22	110°59.52	137°47.56	37.15	153°41.66	30.26	3°12.05	45.27	110°26.61	6.60					Vega	80°32.93 38°48.21		
23	126°1.99	152°47.02	36.05	168°42.16	29.69	18°14.75	45.30	125°28.83	6.49					Nunki	75°46.92 -26°15.86		
Mer.pass. 14:37			ν-0.5' d-1.1' m-3.91			ν0.5' d-0.6' m1.12			ν2.7' d0.0' m-2.57			ν2.2' d-0.1' m1.02					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	141°4.45	167°46.49	S12°34.94	183°42.65	S17°29.12	33°17.45	N22°45.33	140°31.05	S02°6.38					Peacock	53°4.86 -56°39.03		
1	156°6.91	182°45.95	33.84	198°43.14	28.55	48°20.15	45.36	155°33.27	6.27					Deneb	49°25.65 45°22.30		
2	171°9.38	197°45.41	32.74	213°43.64	27.98	63°22.85	45.39	170°35.49	6.16					Enif	33°38.23 9°59.61		
3	186°11.84	212°44.87	· · 31.63	228°44.13	· · 27.41	78°25.55	· · 45.42	185°37.71	· · 6.05					Al Na'ir	27°32.21 -46°50.16		
4	201°14.31	227°44.34	30.53	243°44.62	26.84	93°28.25	45.45	200°39.93	5.93					Fomalhaut	15°13.84 -29°29.16		
5	216°16.77	242°43.80	29.42	258°45.12	26.27	108°30.95	45.48	215°42.14	5.82					Scheat	13°44.65 28°13.48		
6	231°19.23	257°43.27	S12°28.32	273°45.61	S17°25.70	123°33.65	N22°45.51	230°44.36	S02°5.71	</							


h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.92	S14°44.41	278°37.48	13.5'	S20°43.93	10.1'	54.4'
1	191°27.90	43.61	293°9.94	13.4'	20°54.01	10.0'	54.4'
2	206°27.89	42.81	307°42.35	13.4'	21°4.01	9.9'	54.4'
3	221°27.87	· · 42.01	322°14.71	13.3'	21°13.91	9.8'	54.4'
4	236°27.85	41.21	336°47.01	13.2'	21°23.71	9.7'	54.3'
5	251°27.83	40.40	351°19.26	13.2'	21°33.42	9.6'	54.3'
6	266°27.82	S14°39.60	5°51.45	13.1'	S21°43.04	9.5'	54.3'
7	281°27.80	38.80	20°23.59	13.1'	21°52.56	9.4'	54.3'
8	296°27.78	38.00	34°55.67	13.0'	22°1.99	9.3'	54.3'
9	311°27.77	· · 37.19	49°27.70	13.0'	22°11.32	9.2'	54.3'
10	326°27.75	36.39	63°59.67	12.9'	22°20.55	9.1'	54.3'
11	341°27.73	35.58	78°31.59	12.9'	22°29.68	9.0'	54.3'
12	356°27.72	S14°34.78	93°3.44	12.8'	S22°38.71	8.9'	54.3'
13	11°27.70	33.97	107°35.25	12.7'	22°47.64	8.8'	54.3'
14	26°27.69	33.17	122°6.99	12.7'	22°56.48	8.7'	54.2'
15	41°27.68	· · 32.36	136°38.68	12.6'	23°5.21	8.6'	54.2'
16	56°27.66	31.55	151°10.31	12.6'	23°13.83	8.5'	54.2'
17	71°27.65	30.75	165°41.88	12.5'	23°22.36	8.4'	54.2'
18	86°27.64	S14°29.94	180°13.40	12.5'	S23°30.78	8.3'	54.2'
19	101°27.62	29.13	194°44.85	12.4'	23°39.10	8.2'	54.2'
20	116°27.61	28.32	209°16.25	12.3'	23°47.31	8.1'	54.2'
21	131°27.60	· · 27.51	223°47.59	12.3'	23°55.42	8.0'	54.2'
22	146°27.59	26.70	238°18.88	12.2'	24°3.42	7.9'	54.2'
23	161°27.57	25.89	252°50.10	12.2'	24°11.32	7.8'	54.2'
SD = 16.2' $d = -0.8'$			SD = 14.8'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.56	S14°25.08	267°21.27	12.1'	S24°19.10	7.7'	54.2'
1	191°27.55	24.27	281°52.38	12.1'	24°26.78	7.6'	54.2'
2	206°27.54	23.46	296°23.43	12.0'	24°34.35	7.5'	54.2'
3	221°27.53	· · 22.65	310°54.42	11.9'	24°41.81	7.3'	54.2'
4	236°27.52	21.84	325°25.35	11.9'	24°49.15	7.2'	54.2'
5	251°27.51	21.03	339°56.23	11.8'	24°56.39	7.1'	54.2'
6	266°27.50	S14°20.21	354°27.04	11.8'	S25°3.52	7.0'	54.2'
7	281°27.49	19.40	8°57.80	11.7'	25°10.53	6.9'	54.2'
8	296°27.49	18.59	23°28.51	11.6'	25°17.43	6.8'	54.1'
9	311°27.48	· · 17.77	37°59.15	11.6'	25°24.21	6.7'	54.1'
10	326°27.47	16.96	52°29.74	11.5'	25°30.88	6.6'	54.1'
11	341°27.46	16.14	67°0.27	11.5'	25°37.43	6.4'	54.1'
12	356°27.45	S14°15.33	81°30.74	11.4'	S25°43.87	6.3'	54.1'
13	11°27.45	14.51	96°1.16	11.4'	25°50.19	6.2'	54.1'
14	26°27.44	13.70	110°31.52	11.3'	25°56.40	6.1'	54.1'
15	41°27.43	· · 12.88	125°1.82	11.2'	26°2.48	6.0'	54.1'
16	56°27.43	12.06	139°32.07	11.2'	26°8.45	5.8'	54.1'
17	71°27.42	11.24	154°2.27	11.1'	26°14.30	5.7'	54.1'
18	86°27.42	S14°10.43	168°32.41	11.1'	S26°20.03	5.6'	54.1'
19	101°27.41	9.61	183°2.49	11.0'	26°25.63	5.5'	54.1'
20	116°27.41	8.79	197°32.52	11.0'	26°31.12	5.4'	54.1'
21	131°27.40	· · 7.97	212°2.50	10.9'	26°36.48	5.2'	54.1'
22	146°27.40	7.15	226°32.42	10.9'	26°41.72	5.1'	54.1'
23	161°27.40	6.33	241°2.29	10.8'	26°46.84	5.0'	54.1'
SD = 16.2' $d = -0.8'$			SD = 14.8'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.39	S14°5.51	255°32.11	10.8'	S26°51.83	4.9'	54.1'
1	191°27.39	4.69	270°1.87	10.7'	26°56.70	4.7'	54.1'
2	206°27.39	3.87	284°31.59	10.7'	27°1.44	4.6'	54.1'
3	221°27.38	· · 3.05	299°1.25	10.6'	27°6.06	4.5'	54.2'
4	236°27.38	2.23	313°30.87	10.6'	27°10.55	4.4'	54.2'
5	251°27.38	1.40	328°0.43	10.5'	27°14.92	4.2'	54.2'
6	266°27.38	S14°0.58	342°29.95	10.5'	S27°19.15	4.1'	54.2'
7	281°27.38	13°59.76	356°59.42	10.4'	27°23.26	4.0'	54.2'
8	296°27.38	58.94	11°28.84	10.4'	27°27.24	3.9'	54.2'
9	311°27.38	· · 58.11	25°58.22	10.3'	27°31.09	3.7'	54.2'
10	326°27.38	57.29	40°27.55	10.3'	27°34.81	3.6'	54.2'
11	341°27.38	56.46	54°56.83	10.2'	27°38.40	3.5'	54.2'
12	356°27.38	S13°55.64	69°26.07	10.2'	S27°41.86	3.3'	54.2'
13	11°27.38	54.81	83°55.27	10.2'	27°45.19	3.2'	54.2'
14	26°27.38	53.99	98°24.42	10.1'	27°48.39	3.1'	54.2'
15	41°27.38	· · 53.16	112°53.53	10.1'	27°51.45	2.9'	54.2'
16	56°27.38	52.33	127°22.61	10.0'	27°54.38	2.8'	54.2'
17	71°27.39	51.51	141°51.64	10.0'	27°57.18	2.7'	54.2'
18	86°27.39	S13°50.68	156°20.63	10.0'	S27°59.84	2.5'	54.2'
19	101°27.39	49.85	170°49.58	9.9'	28°2.37	2.4'	54.2'
20	116°27.39	49.02	185°18.50	9.9'	28°4.76	2.3'	54.2'
21	131°27.40	· · 48.19	199°47.38	9.8'	28°7.02	2.1'	54.3'
22	146°27.40	47.36	214°16.22	9.8'	28°9.14	2.0'	54.3'
23	161°27.41	46.53	228°45.03	9.8'	28°11.13	1.8'	54.3'
SD = 16.2' $d = -0.8'$			SD = 14.8'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 22-24 55-36%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
09	14:08	14:09	12:14	05:36	17:59	
10	14:10	14:10	12:14	06:23	18:47	
11	14:10	14:10	12:14	07:12	19:38	

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	142°3.59		167°33.71	S12°8.31	183°54.53	S17°15.36	34°22.16	N22°46.04	141°24.28	S02°3.71
1	157°6.05		182°33.18	7.19	198°55.03	14.79	49°24.86	46.07	156°26.50	3.60
2	172°8.52		197°32.65	6.07	213°55.53	14.21	64°27.55	46.10	171°28.72	3.48
3	187°10.98		212°32.13	· · 4.96	228°56.02	· · 13.63	79°30.24	· · 46.13	186°30.93	· · 3.37
4	202°13.45		227°31.60	3.84	243°56.52	13.05	94°32.93	46.16	201°33.15	3.26
5	217°15.91		242°31.08	2.72	258°57.02	12.47	109°35.62	46.19	216°35.37	3.15
6	232°18.38		257°30.55	S12°1.60	273°57.52	S17°11.90	124°38.32	N22°46.22	231°37.58	S02°3.04
7	247°20.84		272°30.03	12°0.48	288°58.02	11.32	139°41.01	46.25	246°39.80	2.92
8	262°23.30		287°29.51	11°59.36	303°58.52	10.74	154°43.70	46.28	261°42.02	2.81
9	277°25.77		302°28.98	· · 58.24	318°59.01	· · 10.16	169°46.39	· · 46.31	276°44.23	· · 2.70
10	292°28.23		317°28.46	57.12	333°59.51	9.58	184°49.08	46.34	291°46.45	2.59
11	307°30.70		332°27.94	55.99	349°0.01	9.00	199°51.77	46.36	306°48.67	2.48
12	322°33.16		347°27.42	S11°54.87	4°0.51	S17°8.42	214°54.45	N22°46.39	321°50.88	S02°2.36
13	337°35.62		2°26.90	53.75	19°1.01	7.83	229°57.14	46.42	336°53.10	2.25
14	352°38.09		17°26.38	52.62	34°1.51	7.25	244°59.83	46.45	351°55.31	2.14
15	7°40.55		32°25.85	· · 51.50	49°2.01	· · 6.67	260°2.52	· · 46.48	6°57.53	· · 2.03
16	22°43.02		47°25.33	50.37	64°2.51	6.09	275°5.21	46.51	21°59.75	1.92
17	37°45.48		62°24.82	49.25	79°3.01	5.51	290°7.90	46.54	37°1.96	1.80
18	52°47.95		77°24.30	S11°48.12	94°3.51	S17°4.92	305°10.58	N22°46.57	52°4.18	S02°1.69
19	67°50.41		92°23.78	46.99	109°4.01	4.34	320°13.27	46.59	67°6.39	1.58
20	82°52.87		107°23.26	45.87	124°4.51	3.76	335°15.96	46.62	82°8.61	1.47
21	97°55.34		122°22.74	· · 44.74	139°5.01	· · 3.18	350°18.64	· · 46.65	97°10.82	· · 1.36
22	112°57.80		137°22.22	43.61	154°5.51	2.59	5°21.33	46.68	112°13.04	1.24
23	128°0.27		152°21.71	42.48	169°6.01	2.01	20°24.01	46.71	127°15.26	1.13
Mer.pass. 14:29		ν-0.5' d-1.1' m-3.91		ν0.5' d-0.6' m1.12		ν2.7' d0.0' m-2.56		ν2.2' d-0.1' m1.02		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	143°2.73		167°21.19	S11°41.35	184°6.52	S17°1.42	35°26.70	N22°46.74	142°17.47	S02°1.02
1	158°5.19		182°20.68	40.22	199°7.02	0.84	50°29.38	46.77	157°19.69	0.91
2	173°7.66		197°20.16	39.09	214°7.52	17°0.25	65°32.07	46.79	172°21.90	0.79
3	188°10.12		212°19.65	· · 37.96	229°8.02	16°59.67	80°34.75	· · 46.82	187°24.12	· · 0.68
4	203°12.59		227°19.13	36.83	244°8.52	59.08	95°37.44	46.85	202°26.33	0.57
5	218°15.05		242°18.62	35.69	259°9.02	58.50	110°40.12	46.88	217°28.55	0.46
6	233°17.52		257°18.10	S11°34.56	274°9.53	S16°57.91	125°42.81	N22°46.91	232°30.76	S02°0.34
7	248°19.98		272°17.59	33.43	289°10.03	57.32	140°45.49	46.93	247°32.98	0.23
8	263°22.44		287°17.08	32.29	304°10.53	56.74	155°48.17	46.96	262°35.19	0.12
9	278°24.91		302°16.56	· · 31.16	319°11.04	· · 56.15	170°50.85	· · 46.99	277°37.40	02°0.01
10	293°27.37		317°16.05	30.03	334°11.54	55.56	185°53.54	47.02	292°39.62	01°59.89
11	308°29.84		332°15.54	28.89	349°12.04	54.97	200°56.22	47.05	307°41.83	59.78
12	323°32.30		347°15.03	S11°27.75	4°12.55	S16°54.38	215°58.90	N22°47.07	322°44.05	S01°59.67
13	338°34.76		2°14.52	26.62	19°13.05	53.80	231°1.58	47.10	337°46.26	59.56
14	353°37.23		17°14.01	25.48	34°13.55	53.21	246°4.26	47.13	352°48.48	59.44
15	8°39.69		32°13.50	· · 24.34	49°14.06	· · 52.62	261°6.94	· · 47.16	7°50.69	· · 59.33
16	23°42.16		47°12.99	23.20	64°14.56	52.03	276°9.62	47.19	22°52.90	59.22
17	38°44.62		62°12.48	22.07	79°15.07	51.44	291°12.30	47.21	37°55.12	59.10
18	53°47.09		77°11.97	S11°20.93	94°15.57	S16°50.85	306°14.98	N22°47.24	52°57.33	S01°58.99
19	68°49.55		92°11.47	19.79	109°16.07	50.26	321°17.66	47.27	67°59.55	58.88
20	83°52.01		107°10.96	18.65	124°16.58	49.67	336°20.34	47.30	83°1.76	58.77
21	98°54.48		122°10.45	· · 17.51	139°17.08	· · 49.08	351°23.02	· · 47.32	98°3.97	· · 58.65
22	113°56.94		137°9.94	16.36	154°17.59	48.49	6°25.70	47.35	113°6.19	58.54
23	128°59.41		152°9.44	15.22	169°18.10	47.89	21°28.38	47.38	128°8.40	58.43
Mer.pass. 14:25		ν-0.5' d-1.1' m-3.91		ν0.5' d-0.6' m1.12		ν2.7' d0.0' m-2.56		ν2.2' d-0.1' m1.02		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	144°1.87		167°8.93	S11°14.08	184°18.60	S16°47.30	36°31.06	N22°47.41	143°10.61	S01°58.31
1	159°4.33		182°8.43	12.94	199°19.11	46.71	51°33.73	47.43	158°12.83	58.20
2	174°6.80		197°7.92	11.79	214°19.61	46.12	66°36.41	47.46	173°15.04	58.09
3	189°9.26		212°7.42	· · 10.65	229°20.12	· · 45.52	81°39.09	· · 47.49	188°17.25	· · 57.97
4	204°11.73		227°6.91	9.51	244°20.62	44.93	96°41.76	47.51	203°19.47	57.86
5	219°14.19		242°6.41	8.36	259°21.13	44.34	111°44.44	47.54	218°21.68	57.75
6	234°16.66		257°5.91	S11°7.22	274°21.64	S16°43.74	126°47.12	N22°47.57	233°23.89	S01°57.64
7	249°19.12		272°5.40	6.07	289°22.14	43.15	141°49.79	47.60	248°26.11	57.52
8	264°21.58		287°4.90	4.92	304°22.65	42.56	156°52.47	47.62	263°28.32	57.41
9	279°24.05		302°4.40	· · 3.78	319°23.16	· · 41.96	171°55.14	· · 47.65	278°30.53	· · 57.30
10	294°26.51		317°3.90	2.63	334°23.67	41.37	186°57.82	47.68	293°32.74	57.18
11	309°28.98		332°3.40	1.48	349°24.17	40.77	202°0.49	47.70	308°34.96	57.07
12	324°31.44		347°2.90	S11°0.33	4°24.68	S16°40.18	217°3.17	N22°47.73	323°37.17	S01°56.96
13	339°33.90		2°2.40	10°59.18	19°25.19	39.58	232°5.84	47.76	338°39.38	56.84
14	354°36.37		17°1.90	58.03	34°25.70	38.98	247°8.51	47.78	353°41.59	56.73
15	9°38.83		32°1.40	· · 56.88	49°26.21	· · 38.39	262°11.19	· · 47.81	8°43.81	· · 56.62
16	24°41.30		47°0.90	55.73	64°26.71	37.79	277°13.86	47.84	23°46.02	56.50
17	39°43.76		62°0.40	54.58	79°27.22	37.19	292°16.53	47.86	38°48.23	56.39
18	54°46.23		76°59.90	S10°53.43	94°27.73	S16°36.60	307°19.20	N22°47.89	53°50.44	S01°56.28
19	69°48.69		91°59.40	52.28	109°28.24	36.00	322°21.88	47.92	68°52.65	56.16
20	84°51.15		106°58.91	51.13	124°28.75	35.40	337°24.55	47.94	83°54.87	56.05
21	99°53.62		121°58.41	· · 49.97	139°29.26	· · 34.80	352°27.22	· · 47.97	98°57.08	· · 55.93
22	114°56.08		136°57.91	48.82	154°29.77	34.20	7°29.89	48.00	113°59.29	55.82
23	129°58.55		151°57.42	47.67	169°30.28	33.60	22°32.56	48.02	129°1.50	55.71
Mer.pass. 14:22		ν-0.5' d-1.1' m-3.91		ν0.5' d-0.6' m1.12		ν2.7' d0.0' m-2.55		ν2.2' d-0.1' m1.02		

Stars		
	SHA	Dec
Alpheratz	357°34.10	29°14.13
Ankaa	353°6.53	-42°10.02
Schedar	349°30.38	56°41.03
Diphda	348°46.58	-17°50.73
Achernar	335°19.75	-57°6.49
Hamal	327°50.27	23°35.22
Polaris	313°36.33	89°22.78
Acamar	315°11.11	-40°12.23
Menkar	314°5.21	4°11.49
Mirfak	308°26.92	49°57.43
Aldebaran	290°38.45	16°33.71
Rigel	281°2.82	-8°10.40
Capella	280°20.30	46°1.58
Bellatrix	278°21.72	6°22.34
Elnath	278°0.51	28°37.81
Alnilam	275°36.61	-1°11.21
Betelgeuse	270°50.88	7°24.65
Canopus	263°51.61	-52°42.76
Sirius	258°25.17	-16°45.27
Adhara	255°4.84	-29°0.61
Procyon	244°49.58	5°9.38
Pollux	243°15.84	27°57.73
Avior	234°13.76	-59°35.69
Suhail	222°45.20	-43°32.37
Miaplacidus	221°37.18	-69°49.50
Alphard	217°46.52	-8°46.44
Regulus	207°33.13	11°50.22
Dubhe	193°39.24	61°36.39
Denebola	182°23.73	14°25.36
Gienah	175°42.39	-17°41.30
Acrux	172°58.58	-63°14.52
Gacrux	171°50.22	-57°15.47
Alioth	166°11.78	55°48.75
Spica	158°21.16	-11°17.96
Alkaid	152°51.05	49°10.61
Hadar	148°34.47	-60°29.76
Menkent	147°56.39	-36°29.85
Arcturus	145°46.96	19°2.52
Rigel Kent.	139°38.87	-60°56.41
Kochab	137°19.60	74°2.45
Zuben'ubi	136°54.94	-16°9.08
Alphecca	126°2.97	26°37.30
Antares	112°14.80	-26°29.37
Atria	107°8.41	-69°4.20
Sabik	102°1.87	-15°45.48
Shaula	96°9.32	-37°7.28
Rasalhague	95°57.86	12°32.26
Eltanin	90°42.07	51°28.79
Kaus Aust.	83°31.56	-34°22.28
Vega	80°32.90	38°48.20
Nunki	75°46.90	-26°15.85
Altair	61°59.35	8°56.11
Peacock	53°4.83	-56°39.01
Deneb	49°25.63	45°22.28
Enif	33°38.22	9°59.61
Al Na'ir	27°32.21	-46°50.15
Fomalhaut	15°13.83	-29°29.15
Scheat	13°44.64	28°13.47
Markab	13°29.28	15°20.72
Feb 12 Thu	SHA	Mer.pass
Venus	25°30.12	12:50
Mars	41°50.94	11:44
Jupiter	252°18.57	21:39
Saturn	359°20.69	14:32
Feb 13 Fri	SHA	Mer.pass
Venus	24°18.46	12:51
Mars	41°3.79	11:43
Jupiter	252°23.97	21:34
Saturn	359°14.74	14:29
Feb 14 Sat	SHA	Mer.pass
Venus	23°7.06	12:52
Mars	40°16.73	11:42
Jupiter	252°29.19	21:30
Saturn	359°8.74	14:25
Horizontal parallax		
	Venus:	0.1
	Mars:	0.1

h		Sun		Moon			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		176°27.41	S13°45.71	243°13.81	9.7'	S28°12.98	1.7' 54.3'
1		191°27.41	44.87	257°42.56	9.7'	28°14.69	1.6' 54.3'
2		206°27.42	44.04	272°11.27	9.7'	28°16.27	1.4' 54.3'
3		221°27.42	· · 43.21	286°39.95	9.7'	28°17.71	1.3' 54.3'
4		236°27.43	42.38	301°8.61	9.6'	28°19.00	1.2' 54.3'
5		251°27.44	41.55	315°37.23	9.6'	28°20.17	1.0' 54.3'
6		266°27.44	S13°40.72	330°5.83	9.6'	S28°21.19	0.9' 54.3'
7		281°27.45	39.88	344°34.40	9.5'	28°22.07	0.7' 54.3'
8		296°27.46	39.05	359°2.95	9.5'	28°22.81	0.6' 54.4'
9		311°27.46	· · 38.22	13°31.47	9.5'	28°23.42	0.5' 54.4'
10		326°27.47	37.38	27°59.98	9.5'	28°23.88	0.3' 54.4'
11		341°27.48	36.55	42°28.46	9.5'	28°24.21	0.2' 54.4'
12		356°27.49	S13°35.72	56°56.91	9.4'	S28°24.39	0.0' 54.4'
13		11°27.50	34.88	71°25.36	9.4'	28°24.43	-0.1' 54.4'
14		26°27.51	34.05	85°53.78	9.4'	28°24.33	-0.2' 54.4'
15		41°27.52	· · 33.21	100°22.18	9.4'	28°24.09	-0.4' 54.4'
16		56°27.52	32.37	114°50.57	9.4'	28°23.71	-0.5' 54.5'
17		71°27.53	31.54	129°18.95	9.4'	28°23.19	-0.7' 54.5'
18		86°27.54	S13°30.70	143°47.31	9.4'	S28°22.52	-0.8' 54.5'
19		101°27.56	29.86	158°15.66	9.3'	28°21.71	-0.9' 54.5'
20		116°27.57	29.02	172°44.00	9.3'	28°20.76	-1.1' 54.5'
21		131°27.58	· · 28.19	187°12.33	9.3'	28°19.67	-1.2' 54.5'
22		146°27.59	27.35	201°40.65	9.3'	28°18.44	-1.4' 54.5'
23		161°27.60	26.51	216°8.97	9.3'	28°17.06	-1.5' 54.6'
		SD = 16.2' $d = -0.8'$		SD = 14.8'			

Fri		GHA	Dec	GHA	ν	Dec	d HP
0		176°27.61	S13°25.67	230°37.28	9.3'	S28°15.54	-1.7' 54.6'
1		191°27.63	24.83	245°5.58	9.3'	28°13.88	-1.8' 54.6'
2		206°27.64	23.99	259°33.88	9.3'	28°12.08	-1.9' 54.6'
3		221°27.65	· · 23.15	274°2.18	9.3'	28°10.13	-2.1' 54.6'
4		236°27.66	22.31	288°30.48	9.3'	28°8.04	-2.2' 54.6'
5		251°27.68	21.47	302°58.77	9.3'	28°5.81	-2.4' 54.6'
6		266°27.69	S13°20.63	317°27.07	9.3'	S28°3.43	-2.5' 54.7'
7		281°27.71	19.78	331°55.37	9.3'	28°0.91	-2.7' 54.7'
8		296°27.72	18.94	346°23.68	9.3'	27°58.25	-2.8' 54.7'
9		311°27.74	· · 18.10	0°51.99	9.3'	27°55.45	-2.9' 54.7'
10		326°27.75	17.26	15°20.30	9.3'	27°52.50	-3.1' 54.7'
11		341°27.77	16.41	29°48.63	9.3'	27°49.41	-3.2' 54.7'
12		356°27.78	S13°15.57	44°16.96	9.3'	S27°46.18	-3.4' 54.8'
13		11°27.80	14.73	58°45.30	9.4'	27°42.81	-3.5' 54.8'
14		26°27.82	13.88	73°13.65	9.4'	27°39.30	-3.7' 54.8'
15		41°27.83	· · 13.04	87°42.02	9.4'	27°35.64	-3.8' 54.8'
16		56°27.85	12.19	102°10.39	9.4'	27°31.84	-3.9' 54.8'
17		71°27.87	11.34	116°38.78	9.4'	27°27.90	-4.1' 54.9'
18		86°27.89	S13°10.50	131°7.19	9.4'	S27°23.82	-4.2' 54.9'
19		101°27.90	9.65	145°35.61	9.4'	27°19.60	-4.4' 54.9'
20		116°27.92	8.81	160°4.05	9.5'	27°15.24	-4.5' 54.9'
21		131°27.94	· · 7.96	174°32.51	9.5'	27°10.73	-4.6' 54.9'
22		146°27.96	7.11	189°0.99	9.5'	27°6.09	-4.8' 54.9'
23		161°27.98	6.26	203°29.49	9.5'	27°1.31	-4.9' 55.0'
		SD = 16.2' $d = -0.8'$		SD = 14.9'			

Sat		GHA	Dec	GHA	ν	Dec	d HP
0		176°28.00	S13°5.41	217°58.01	9.5'	S26°56.38	-5.1' 55.0'
1		191°28.02	4.57	232°26.56	9.6'	26°51.32	-5.2' 55.0'
2		206°28.04	3.72	246°55.12	9.6'	26°46.12	-5.3' 55.0'
3		221°28.06	· · 2.87	261°23.72	9.6'	26°40.78	-5.5' 55.0'
4		236°28.08	2.02	275°52.33	9.6'	26°35.30	-5.6' 55.1'
5		251°28.10	1.17	290°20.98	9.7'	26°29.68	-5.8' 55.1'
6		266°28.12	S13°0.32	304°49.65	9.7'	S26°23.93	-5.9' 55.1'
7		281°28.15	12°59.47	319°18.35	9.7'	26°18.04	-6.0' 55.1'
8		296°28.17	58.61	333°47.08	9.8'	26°12.01	-6.2' 55.1'
9		311°28.19	· · 57.76	348°15.84	9.8'	26°5.84	-6.3' 55.2'
10		326°28.21	56.91	2°44.63	9.8'	25°59.54	-6.4' 55.2'
11		341°28.24	56.06	17°13.46	9.9'	25°53.11	-6.6' 55.2'
12		356°28.26	S12°55.21	31°42.31	9.9'	S25°46.54	-6.7' 55.2'
13		11°28.29	54.35	46°11.20	9.9'	25°39.83	-6.8' 55.3'
14		26°28.31	53.50	60°40.13	10.0'	25°32.99	-7.0' 55.3'
15		41°28.33	· · 52.64	75°9.09	10.0'	25°26.02	-7.1' 55.3'
16		56°28.36	51.79	89°38.08	10.0'	25°18.92	-7.2' 55.3'
17		71°28.38	50.94	104°7.12	10.1'	25°11.68	-7.4' 55.3'
18		86°28.41	S12°50.08	118°36.19	10.1'	S25°4.31	-7.5' 55.4'
19		101°28.43	49.23	133°5.29	10.1'	24°56.81	-7.6' 55.4'
20		116°28.46	48.37	147°34.44	10.2'	24°49.18	-7.8' 55.4'
21		131°28.49	· · 47.51	162°3.62	10.2'	24°41.42	-7.9' 55.4'
22		146°28.51	46.66	176°32.85	10.3'	24°33.53	-8.0' 55.5'
23		161°28.54	45.80	191°2.11	10.3'	24°25.51	-8.1' 55.5'
		SD = 16.2' $d = -0.8'$		SD = 15.0'			

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 25-27 28-12%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
12	14:10	14:10	12:14	08:04	20:30	
13	14:10	14:09	12:14	08:56	21:23	
14	14:08	14:07	12:14	09:49	22:14	

February 15, 16, 17 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	145°1.01		166°56.92	S10°46.51	184°30.79	S16°33.00	37°35.23	N22°48.05	144°3.71	S01°55.59
1	160°3.47		181°56.43	45.36	199°31.30	32.41	52°37.90	48.08	159°5.92	55.48
2	175°5.94		196°55.93	44.20	214°31.81	31.81	67°40.57	48.10	174°8.14	55.37
3	190°8.40		211°55.44	· · 43.05	229°32.32	· · 31.21	82°43.24	· · 48.13	189°10.35	· · 55.25
4	205°10.87		226°54.94	41.89	244°32.83	30.60	97°45.91	48.16	204°12.56	55.14
5	220°13.33		241°54.45	40.73	259°33.34	30.00	112°48.58	48.18	219°14.77	55.03
6	235°15.80		256°53.96	S10°39.57	274°33.85	S16°29.40	127°51.24	N22°48.21	234°16.98	S01°54.91
7	250°18.26		271°53.46	38.42	289°34.36	28.80	142°53.91	48.23	249°19.19	54.80
8	265°20.72		286°52.97	37.26	304°34.87	28.20	157°56.58	48.26	264°21.40	54.68
9	280°23.19		301°52.48	· · 36.10	319°35.38	· · 27.60	172°59.25	· · 48.29	279°23.61	· · 54.57
10	295°25.65		316°51.99	34.94	334°35.90	27.00	188°1.91	48.31	294°25.83	54.46
11	310°28.12		331°51.50	33.78	349°36.41	26.39	203°4.58	48.34	309°28.04	54.34
12	325°30.58		346°51.01	S10°32.62	4°36.92	S16°25.79	218°7.25	N22°48.36	324°30.25	S01°54.23
13	340°33.04		1°50.52	31.46	19°37.43	25.19	233°9.91	48.39	339°32.46	54.11
14	355°35.51		16°50.03	30.30	34°37.94	24.58	248°12.58	48.42	354°34.67	54.00
15	10°37.97		31°49.54	· · 29.14	49°38.46	· · 23.98	263°15.25	· · 48.44	9°36.88	· · 53.89
16	25°40.44		46°49.05	27.97	64°38.97	23.38	278°17.91	48.47	24°39.09	53.77
17	40°42.90		61°48.56	26.81	79°39.48	22.77	293°20.57	48.49	39°41.30	53.66
18	55°45.36		76°48.07	S10°25.65	94°40.00	S16°22.17	308°23.24	N22°48.52	54°43.51	S01°53.54
19	70°47.83		91°47.58	24.48	109°40.51	21.56	323°25.90	48.54	69°45.72	53.43
20	85°50.29		106°47.10	23.32	124°41.02	20.96	338°28.57	48.57	84°47.93	53.32
21	100°52.76		121°46.61	· · 22.15	139°41.54	· · 20.35	353°31.23	· · 48.59	99°50.14	· · 53.20
22	115°55.22		136°46.12	20.99	154°42.05	19.75	8°33.89	48.62	114°52.35	53.09
23	130°57.69		151°45.64	19.82	169°42.56	19.14	23°36.56	48.65	129°54.56	52.97
Mer.pass. 14:18			ν-0.5' d-1.2' m-3.91		ν0.5' d-0.6' m1.13		ν2.7' d0.0' m-2.54		ν2.2' d-0.1' m1.02	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	146°0.15		166°45.15	S10°18.66	184°43.08	S16°18.53	38°39.22	N22°48.67	144°56.77	S01°52.86
1	161°2.61		181°44.67	17.49	199°43.59	17.93	53°41.88	48.70	159°58.98	52.74
2	176°5.08		196°44.18	16.32	214°44.11	17.32	68°44.54	48.72	175°1.19	52.63
3	191°7.54		211°43.70	· · 15.16	229°44.62	· · 16.71	83°47.20	· · 48.75	190°3.40	· · 52.52
4	206°10.01		226°43.21	13.99	244°45.14	16.11	98°49.87	48.77	205°5.61	52.40
5	221°12.47		241°42.73	12.82	259°45.65	15.50	113°52.53	48.80	220°7.82	52.29
6	236°14.93		256°42.25	S10°11.65	274°46.17	S16°14.89	128°55.19	N22°48.82	235°10.03	S01°52.17
7	251°17.40		271°41.76	10.48	289°46.68	14.28	143°57.85	48.85	250°12.24	52.06
8	266°19.86		286°41.28	9.31	304°47.20	13.67	159°0.51	48.87	265°14.45	51.94
9	281°22.33		301°40.80	· · 8.14	319°47.71	· · 13.06	174°3.17	· · 48.90	280°16.66	· · 51.83
10	296°24.79		316°40.32	6.97	334°48.23	12.45	189°5.83	48.92	295°18.87	51.71
11	311°27.25		331°39.84	5.80	349°48.75	11.85	204°8.48	48.95	310°21.07	51.60
12	326°29.72		346°39.36	S10°4.63	4°49.26	S16°11.24	219°11.14	N22°48.97	325°23.28	S01°51.49
13	341°32.18		1°38.87	3.46	19°49.78	10.63	234°13.80	49.00	340°25.49	51.37
14	356°34.65		16°38.39	2.28	34°50.30	10.01	249°16.46	49.02	355°27.70	51.26
15	11°37.11		31°37.92	10°1.11	49°50.81	· · 9.40	264°19.12	· · 49.05	10°29.91	· · 51.14
16	26°39.58		46°37.44	09°59.94	64°51.33	8.79	279°21.77	49.07	25°32.12	51.03
17	41°42.04		61°36.96	58.76	79°51.85	8.18	294°24.43	49.10	40°34.33	50.91
18	56°44.50		76°36.48	S09°57.59	94°52.36	S16°7.57	309°27.09	N22°49.12	55°36.54	S01°50.80
19	71°46.97		91°36.00	56.41	109°52.88	6.96	324°29.74	49.14	70°38.75	50.68
20	86°49.43		106°35.52	55.24	124°53.40	6.35	339°32.40	49.17	85°40.95	50.57
21	101°51.90		121°35.05	· · 54.06	139°53.92	· · 5.73	354°35.05	· · 49.19	100°43.16	· · 50.45
22	116°54.36		136°34.57	52.89	154°54.44	5.12	9°37.71	49.22	115°45.37	50.34
23	131°56.82		151°34.09	51.71	169°54.95	4.51	24°40.37	49.24	130°47.58	50.22
Mer.pass. 14:14			ν-0.5' d-1.2' m-3.91		ν0.5' d-0.6' m1.13		ν2.7' d0.0' m-2.54		ν2.2' d-0.1' m1.01	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	146°59.29		166°33.62	S09°50.53	184°55.47	S16°3.89	39°43.02	N22°49.27	145°49.79	S01°50.11
1	162°1.75		181°33.14	49.35	199°55.99	3.28	54°45.67	49.29	160°52.00	49.99
2	177°4.22		196°32.67	48.18	214°56.51	2.67	69°48.33	49.31	175°54.20	49.88
3	192°6.68		211°32.19	· · 47.00	229°57.03	· · 2.05	84°50.98	· · 49.34	190°56.41	· · 49.76
4	207°9.14		226°31.72	45.82	244°57.55	1.44	99°53.63	49.36	205°58.62	49.65
5	222°11.61		241°31.24	44.64	259°58.07	0.82	114°56.29	49.39	221°0.83	49.53
6	237°14.07		256°30.77	S09°43.46	274°58.59	S16°0.21	129°58.94	N22°49.41	236°3.03	S01°49.42
7	252°16.54		271°30.30	42.28	289°59.11	15°59.59	145°1.59	49.44	251°5.24	49.30
8	267°19.00		286°29.82	41.10	304°59.63	58.98	160°4.24	49.46	266°7.45	49.19
9	282°21.47		301°29.35	· · 39.92	320°0.15	· · 58.36	175°6.90	· · 49.48	281°9.66	· · 49.07
10	297°23.93		316°28.88	38.73	335°0.67	57.74	190°9.55	49.51	296°11.87	48.96
11	312°26.39		331°28.41	37.55	350°1.19	57.13	205°12.20	49.53	311°14.07	48.84
12	327°28.86		346°27.93	S09°36.37	5°1.71	S15°56.51	220°14.85	N22°49.56	326°16.28	S01°48.73
13	342°31.32		1°27.46	35.19	20°2.23	55.89	235°17.50	49.58	341°18.49	48.61
14	357°33.79		16°26.99	34.00	35°2.75	55.28	250°20.15	49.60	356°20.69	48.50
15	12°36.25		31°26.52	· · 32.82	50°3.27	· · 54.66	265°22.80	· · 49.63	11°22.90	· · 48.38
16	27°38.71		46°26.05	31.64	65°3.79	54.04	280°25.45	49.65	26°25.11	48.27
17	42°41.18		61°25.58	30.45	80°4.31	53.42	295°28.10	49.67	41°27.32	48.15
18	57°43.64		76°25.11	S09°29.27	95°4.84	S15°52.80	310°30.74	N22°49.70	56°29.52	S01°48.04
19	72°46.11		91°24.65	28.08	110°5.36	52.19	325°33.39	49.72	71°31.73	47.92
20	87°48.57		106°24.18	26.89	125°5.88	51.57	340°36.04	49.74	86°33.94	47.81
21	102°51.03		121°23.71	· · 25.71	140°6.40	· · 50.95	355°38.69	· · 49.77	101°36.14	· · 47.69
22	117°53.50		136°23.24	24.52	155°6.92	50.33	10°41.34	49.79	116°38.35	47.58
23	132°55.96		151°22.78	23.33	170°7.45	49.71	25°43.98	49.81	131°40.56	47.46
Mer.pass. 14:10			ν-0.5' d-1.2' m-3.91		ν0.5' d-0.6' m1.13		ν2.7' d0.0' m-2.53		ν2.2' d-0.1' m1.01	

Stars		
	SHA	Dec
Alpheratz	357°34.10	29°14.13
Ankaa	353°6.53	-42°10.01
Schedar	349°30.40	56°41.02
Diphda	348°46.59	-17°50.72
Achernar	335°19.76	-57°6.48
Hamal	327°50.28	23°35.22
Polaris	313°37.81	89°22.78
Acamar	315°11.12	-40°12.22
Menkar	314°5.22	4°11.49
Mirfak	308°26.94	49°57.43
Aldebaran	290°38.46	16°33.77
Rigel	281°2.83	-8°10.41
Capella	280°20.31	46°1.58
Bellatrix	278°21.73	6°22.34
Elnath	278°0.51	28°37.81
Alnilam	275°36.62	-1°11.21
Betelgeuse	270°50.89	7°24.65
Canopus	263°51.63	-52°42.77
Sirius	258°25.17	-16°45.27
Adhara	255°4.85	-29°0.62
Procyon	244°49.58	5°9.37
Pollux	243°15.84	27°57.73
Avior	234°13.77	-59°35.71
Suhail	222°45.20	-43°32.39
Miaplacidus	221°37.20	-69°49.51
Alphard	217°46.51	-8°46.45
Regulus	207°33.12	11°50.21
Dubhe	193°39.21	61°36.40
Denebola	182°23.71	14°25.36
Gienah	175°42.37	-17°41.32
Acrux	172°58.55	-63°14.54
Gacrux	171°50.19	-57°15.49
Alioth	166°11.75	55°48.75
Spica	158°21.14	-11°17.97
Alkaid	152°51.02	49°10.61
Hadar	148°34.43	-60°29.77
Menkent	147°56.36	-36°29.87
Arcturus	145°46.93	19°2.51
Rigel Kent.	139°38.83	-60°56.42
Kochab	137°19.54	74°2.45
Zuben'ubi	136°54.91	-16°9.09
Alphecca	126°2.94	26°37.29
Antares	112°14.77	-26°29.38
Atria	107°8.35	-69°4.21
Sabik	102°1.84	-15°45.48
Shaula	96°9.29	-37°7.28
Rasalhague	95°57.84	12°32.25
Eltanin	90°42.04	51°28.78
Kaus Aust.	83°31.53	-34°22.28
Vega	80°32.88	38°48.19
Nunki	75°46.87	-26°15.85
Altair	61°59.34	8°56.10
Peacock	53°4.80	-56°39.00
Deneb	49°25.62	45°22.27
Enif	33°38.21	9°59.60
Al Na'ir	27°32.20	-46°50.14
Fomalhaut	15°13.83	-29°29.14
Scheat	13°44.64	28°13.47
Markab	13°29.28	15°20.71
Feb 15 Sun	SHA	Mer.pass
Venus	21°55.91	12:53
Mars	39°29.78	11:42
Jupiter	252°34.22	21:26
Saturn	359°2.70	14:22
Feb 16 Mon	SHA	Mer.pass
Venus	20°45.00	12:53
Mars	38°42.93	11:41
Jupiter	252°39.07	21:22
Saturn	358°56.62	14:18
Feb 17 Tue	SHA	Mer.pass
Venus	19°34.33	12:54
Mars	37°56.18	11:40
Jupiter	252°43.73	21:17
Saturn	358°50.50	14:15
Horizontal parallax		
	Venus:	0.1
	Mars:	0.1

h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
Sun							HP
0	176°28.57	S12°44.94		205°31.42	10.3'	S24°17.37	-8.3'
1	191°28.60	44.09		220°0.77	10.4'	24°9.09	-8.4'
2	206°28.62	43.23		234°30.16	10.4'	24°0.69	-8.5'
3	221°28.65	42.37		248°59.59	10.5'	23°52.17	-8.7'
4	236°28.68	41.51		263°29.06	10.5'	23°43.52	-8.8'
5	251°28.71	40.65		277°58.58	10.6'	23°34.74	-8.9'
6	266°28.74	S12°39.79		292°28.14	10.6'	S23°25.84	-9.0'
7	281°28.77	38.93		306°57.75	10.7'	23°16.82	-9.1'
8	296°28.80	38.07		321°27.40	10.7'	23°7.67	-9.3'
9	311°28.83	37.21		335°57.10	10.7'	22°58.41	-9.4'
10	326°28.86	36.35		350°26.84	10.8'	22°49.02	-9.5'
11	341°28.89	35.49		4°56.62	10.8'	22°39.51	-9.6'
12	356°28.92	S12°34.63		19°26.45	10.9'	S22°29.89	-9.7'
13	11°28.95	33.77		33°56.33	10.9'	22°20.14	-9.9'
14	26°28.98	32.91		48°26.25	11.0'	22°10.28	-10.0'
15	41°29.01	32.04		62°56.22	11.0'	22°0.30	-10.1'
16	56°29.05	31.18		77°26.24	11.1'	21°50.21	-10.2'
17	71°29.08	30.32		91°56.30	11.1'	21°40.00	-10.3'
18	86°29.11	S12°29.46		106°26.41	11.2'	S21°29.67	-10.4'
19	101°29.15	28.59		120°56.57	11.2'	21°19.24	-10.6'
20	116°29.18	27.73		135°26.77	11.3'	21°8.68	-10.7'
21	131°29.21	26.86		149°57.02	11.3'	20°58.02	-10.8'
22	146°29.25	26.00		164°27.32	11.3'	20°47.25	-10.9'
23	161°29.28	25.13		178°57.67	11.4'	20°36.37	-11.0'
SD = 16.2'			$d = -0.9'$			SD = 15.1'	

Mon	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
0	176°29.32	S12°24.27		193°28.06	11.4'	S20°25.38	-11.1'
1	191°29.35	23.40		207°58.50	11.5'	20°14.28	-11.2'
2	206°29.39	22.53		222°28.98	11.5'	20°3.07	-11.3'
3	221°29.42	21.67		236°59.51	11.6'	19°51.76	-11.4'
4	236°29.46	20.80		251°30.09	11.6'	19°40.34	-11.5'
5	251°29.49	19.93		266°0.72	11.7'	19°28.81	-11.6'
6	266°29.53	S12°19.07		280°31.39	11.7'	S19°17.19	-11.7'
7	281°29.57	18.20		295°2.10	11.8'	19°5.46	-11.8'
8	296°29.60	17.33		309°32.87	11.8'	18°53.63	-11.9'
9	311°29.64	16.46		324°3.68	11.9'	18°41.70	-12.0'
10	326°29.68	15.59		338°34.53	11.9'	18°29.67	-12.1'
11	341°29.72	14.72		353°5.43	11.9'	18°17.54	-12.2'
12	356°29.76	S12°13.85		7°36.38	12.0'	S18°5.31	-12.3'
13	11°29.79	12.98		22°7.37	12.0'	17°52.99	-12.4'
14	26°29.83	12.11		36°38.40	12.1'	17°40.57	-12.5'
15	41°29.87	11.24		51°9.48	12.1'	17°28.06	-12.6'
16	56°29.91	10.37		65°40.60	12.2'	17°15.45	-12.7'
17	71°29.95	9.50		80°11.76	12.2'	17°2.76	-12.8'
18	86°29.99	S12°8.63		94°42.97	12.2'	S16°49.97	-12.9'
19	101°30.03	7.76		109°14.22	12.3'	16°37.09	-13.0'
20	116°30.07	6.88		123°45.51	12.3'	16°24.12	-13.1'
21	131°30.12	6.01		138°16.85	12.4'	16°11.06	-13.1'
22	146°30.16	5.14		152°48.22	12.4'	15°57.91	-13.2'
23	161°30.20	4.26		167°19.63	12.5'	15°44.68	-13.3'
SD = 16.2'			$d = -0.9'$			SD = 15.3'	

Tue	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
0	176°30.24	S12°3.39		181°51.09	12.5'	S15°31.37	-13.4'
1	191°30.28	2.52		196°22.58	12.5'	15°17.97	-13.5'
2	206°30.33	1.64		210°54.12	12.6'	15°4.48	-13.6'
3	221°30.37	12°0.77		225°25.69	12.6'	14°50.92	-13.6'
4	236°30.41	11°59.89		239°57.30	12.6'	14°37.27	-13.7'
5	251°30.46	59.02		254°28.94	12.7'	14°23.55	-13.8'
6	266°30.50	S11°58.14		269°0.63	12.7'	S14°9.74	-13.9'
7	281°30.54	57.26		283°32.34	12.8'	13°55.86	-14.0'
8	296°30.59	56.39		298°4.10	12.8'	13°41.91	-14.0'
9	311°30.63	55.51		312°35.89	12.8'	13°27.87	-14.1'
10	326°30.68	54.63		327°7.71	12.9'	13°13.77	-14.2'
11	341°30.72	53.76		341°39.56	12.9'	12°59.59	-14.3'
12	356°30.77	S11°52.88		356°11.45	12.9'	S12°45.34	-14.3'
13	11°30.81	52.00		10°43.37	13.0'	12°31.02	-14.4'
14	26°30.86	51.12		25°15.32	13.0'	12°16.63	-14.5'
15	41°30.91	50.24		39°47.30	13.0'	12°2.17	-14.5'
16	56°30.95	49.37		54°19.32	13.0'	11°47.64	-14.6'
17	71°31.00	48.49		68°51.35	13.1'	11°33.05	-14.7'
18	86°31.05	S11°47.61		83°23.42	13.1'	S11°18.39	-14.7'
19	101°31.10	46.73		97°55.52	13.1'	11°3.67	-14.8'
20	116°31.15	45.85		112°27.64	13.1'	10°48.88	-14.8'
21	131°31.19	44.97		126°59.78	13.2'	10°34.04	-14.9'
22	146°31.24	44.08		141°31.95	13.2'	10°19.13	-15.0'
23	161°31.29	43.20		156°4.15	13.2'	10°4.17	-15.0'
SD = 16.2'			$d = -0.9'$			SD = 15.5'	

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn. of 00 ^h	Time 12 ^h		Mer. Pass. Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	28-0 7-0%
15	14:06	14:04	12:14	10:40	23:04	
16	14:03	14:01	12:14	11:29	23:52	
17	13:59	13:57	12:14	12:16	---	

February 18, 19, 20 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	147°58.43	166°22.31	S09°22.15	185°7.97	S15°49.09	40°46.63	N22°49.84	146°42.76	S01°47.35			Alpheratz	357°34.11 29°14.12
1	163°0.89	181°21.84	20.96	200°8.49	48.47	55°49.28	49.86	161°44.97	47.23			Ankaa	353°6.54 -42°10.01
2	178°3.35	196°21.38	19.77	215°9.02	47.85	70°51.92	49.88	176°47.18	47.11			Schedar	349°30.42 56°41.01
3	193°5.82	211°20.91	•• 18.58	230°9.54	•• 47.23	85°54.57	•• 49.91	191°49.38	•• 47.00			Diphda	348°46.59 -17°50.72
4	208°8.28	226°20.45	17.39	245°10.06	46.60	100°57.21	49.93	206°51.59	46.88			Achernar	335°19.78 -57°6.47
5	223°10.75	241°19.98	16.20	260°10.59	45.98	115°59.86	49.95	221°53.80	46.77			Hamal	327°50.29 23°35.21
6	238°13.21	256°19.52	S09°15.01	275°11.11	S15°45.36	131°2.50	N22°49.98	236°56.00	S01°46.65			Polaris	313°39.47 89°22.78
7	253°15.67	271°19.05	13.82	290°11.63	44.74	146°5.15	50.00	251°58.21	46.54			Acamar	315°11.14 -40°12.22
8	268°18.14	286°18.59	12.63	305°12.16	44.12	161°7.79	50.02	267°0.41	46.42			Menkar	314°5.23 4°11.49
9	283°20.60	301°18.12	•• 11.44	320°12.68	•• 43.49	176°10.43	•• 50.05	282°2.62	•• 46.31			Mirfak	308°26.97 49°57.43
10	298°23.07	316°17.66	10.24	335°13.21	42.87	191°13.08	50.07	297°4.83	46.19			Aldebaran	290°38.47 16°33.71
11	313°25.53	331°17.20	9.05	350°13.73	42.25	206°15.72	50.09	312°7.03	46.07			Rigel	281°2.85 -8°10.41
12	328°27.99	346°16.74	S09°7.86	5°14.26	S15°41.62	221°18.36	N22°50.11	327°9.24	S01°45.96			Capella	280°20.33 46°1.59
13	343°30.46	1°16.27	6.67	20°14.78	41.00	236°21.00	50.14	342°11.44	45.84			Bellatrix	278°21.74 6°22.34
14	358°32.92	16°15.81	5.47	35°15.31	40.38	251°23.65	50.16	357°13.65	45.73			Elnath	278°0.53 28°37.81
15	13°35.39	31°15.35	•• 4.28	50°15.83	•• 39.75	266°26.29	•• 50.18	12°15.85	•• 45.61			Alnilam	275°36.63 -1°11.21
16	28°37.85	46°14.89	3.08	65°16.36	39.13	281°28.93	50.20	27°18.06	45.50			Betelgeuse	270°50.90 7°24.65
17	43°40.31	61°14.43	1.89	80°16.89	38.50	296°31.57	50.23	42°20.26	45.38			Canopus	263°51.65 -52°42.78
18	58°42.78	76°13.97	S09°0.69	95°17.41	S15°37.88	311°34.21	N22°50.25	57°22.47	S01°45.26			Sirius	258°25.18 -16°45.28
19	73°45.24	91°13.51	08°59.50	110°17.94	37.25	326°36.85	50.27	72°24.68	45.15			Adhara	255°4.86 -29°0.63
20	88°47.71	106°13.05	58.30	125°18.46	36.62	341°39.49	50.29	87°26.88	45.03			Procyon	244°49.58 5°9.37
21	103°50.17	121°12.59	•• 57.11	140°18.99	•• 36.00	356°42.13	•• 50.32	102°29.09	•• 44.92			Pollux	243°15.85 27°57.74
22	118°52.64	136°12.13	55.91	155°19.52	35.37	11°44.77	50.34	117°31.29	44.80			Avior	234°13.79 -59°35.72
23	133°55.10	151°11.68	54.71	170°20.04	34.75	26°47.41	50.36	132°33.50	44.68			Suhail	222°45.20 -43°32.40
Mer.pass. 14:06		ν-0.5' d-1.2' m-3.91		ν0.5' d-0.6' m1.13		ν2.6' d0.0' m-2.52		ν2.2' d-0.1' m1.01					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	148°57.56	166°11.22	S08°53.51	185°20.57	S15°34.12	41°50.04	N22°50.38	147°35.70	S01°44.57			Miaplacidus	221°37.21 -69°49.53
1	164°0.03	181°10.76	52.32	200°21.10	33.49	56°52.68	50.41	162°37.91	44.45			Alphard	217°46.51 -8°46.45
2	179°2.49	196°10.30	51.12	215°21.63	32.86	71°55.32	50.43	177°40.11	44.34			Regulus	207°33.11 11°50.21
3	194°4.96	211°9.85	•• 49.92	230°22.15	•• 32.24	86°57.96	•• 50.45	192°42.32	•• 44.22			Dubhe	193°39.19 61°36.41
4	209°7.42	226°9.39	48.72	245°22.68	31.61	102°0.59	50.47	207°44.52	44.10			Denebola	182°23.70 14°25.36
5	224°9.88	241°8.94	47.52	260°23.21	30.98	117°3.23	50.50	222°46.72	43.99			Gienah	175°42.35 -17°41.32
6	239°12.35	256°8.48	S08°46.32	275°23.74	S15°30.35	132°5.87	N22°50.52	237°48.93	S01°43.87			Acrux	172°58.53 -63°14.55
7	254°14.81	271°8.02	45.12	290°24.27	29.72	147°8.50	50.54	252°51.13	43.76			Gacrux	171°50.17 -57°15.51
8	269°17.28	286°7.57	43.92	305°24.80	29.09	162°11.14	50.56	267°53.34	43.64			Alioth	166°11.72 55°48.76
9	284°19.74	301°7.12	•• 42.72	320°25.32	•• 28.46	177°13.77	•• 50.58	282°55.54	•• 43.52			Spica	158°21.12 -11°17.98
10	299°22.20	316°6.66	41.51	335°25.85	27.83	192°16.41	50.60	297°57.75	43.41			Alkaid	152°50.99 49°10.61
11	314°24.67	331°6.21	40.31	350°26.38	27.20	207°19.04	50.63	312°59.95	43.29			Hadar	148°34.40 -60°29.78
12	329°27.13	346°5.75	S08°39.11	5°26.91	S15°26.57	222°21.68	N22°50.65	328°2.16	S01°43.18			Menkent	147°56.34 -36°29.88
13	344°29.60	1°5.30	37.91	20°27.44	25.94	237°24.31	50.67	343°4.36	43.06			Arcturus	145°46.91 19°2.51
14	359°32.06	16°4.85	36.70	35°27.97	25.31	252°26.95	50.69	358°6.56	42.94			Rigel Kent.	139°38.80 -60°56.43
15	14°34.52	31°4.40	•• 35.50	50°28.50	•• 24.68	267°29.58	•• 50.71	13°8.77	•• 42.83			Kochab	137°19.47 74°2.45
16	29°36.99	46°3.94	34.30	65°29.03	24.05	282°32.21	50.73	28°10.97	42.71			Zuben'ubi	136°54.89 -16°9.09
17	44°39.45	61°3.49	33.09	80°29.56	23.42	297°34.85	50.76	43°13.18	42.59			Alphecca	126°2.91 26°37.29
18	59°41.92	76°3.04	S08°31.89	95°30.09	S15°22.79	312°37.48	N22°50.78	58°15.38	S01°42.48			Antares	112°14.74 -26°29.38
19	74°44.38	91°2.59	30.68	110°30.62	22.15	327°40.11	50.80	73°17.58	42.36			Atria	107°8.30 -69°4.21
20	89°46.84	106°2.14	29.47	125°31.15	21.52	342°42.74	50.82	88°19.79	42.24			Sabik	102°1.82 -15°45.49
21	104°49.31	121°1.69	•• 28.27	140°31.68	•• 20.89	357°45.37	•• 50.84	103°21.99	•• 42.13			Shaula	96°9.27 -37°7.28
22	119°51.77	136°1.24	27.06	155°32.22	20.26	12°48.00	50.86	118°24.19	42.01			Rasalhague	95°57.82 12°32.24
23	134°54.24	151°0.79	25.86	170°32.75	19.62	27°50.63	50.88	133°26.40	41.90			Eltanin	90°42.01 51°28.77
Mer.pass. 14:02		ν-0.5' d-1.2' m-3.91		ν0.5' d-0.6' m1.13		ν2.6' d0.0' m-2.51		ν2.2' d-0.1' m1.01					
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	149°56.70	166°0.34	S08°24.65	185°33.28	S15°18.99	42°53.26	N22°50.91	148°28.60	S01°41.78			Kaus Aust.	83°31.51 -34°22.28
1	164°59.16	180°59.89	23.44	200°33.81	18.36	57°55.89	50.93	163°30.80	41.66			Vega	80°32.86 38°48.18
2	180°1.63	195°59.44	22.23	215°34.34	17.72	72°58.52	50.95	178°33.01	41.55			Nunki	75°46.85 -26°15.85
3	195°4.09	210°59.00	•• 21.02	230°34.87	•• 17.09	88°1.15	•• 50.97	193°35.21	•• 41.43			Altair	61°59.32 8°56.09
4	210°6.56	225°58.55	19.82	245°35.41	16.45	103°3.78	50.99	208°37.41	41.31			Peacock	53°4.78 -56°38.99
5	225°9.02	240°58.10	18.61	260°35.94	15.82	118°6.41	51.01	223°39.62	41.20			Deneb	49°25.61 45°22.25
6	240°11.48	255°57.65	S08°17.40	275°36.47	S15°15.18	133°9.04	N22°51.03	238°41.82	S01°41.08			Enif	33°38.20 9°59.59
7	255°13.95	270°57.21	16.19	290°37.00	14.55	148°11.67	51.05	253°44.02	40.96			Al Na'ir	27°32.19 -46°50.13
8	270°16.41	285°56.76	14.98	305°37.54	13.91	163°14.29	51.07	268°46.23	40.85			Fomalhaut	15°13.83 -29°29.13
9	285°18.88	300°56.31	•• 13.77	320°38.07	•• 13.27	178°16.92	•• 51.10	283°48.43	•• 40.73			Scheat	13°44.65 28°13.46
10	300°21.34	315°55.87	12.56										

h	Sun			Moon			
Wed	GHA	Dec		GHA	ν	Dec	d HP
0	176°31.34	S11°42.32		170°36.37	13.2'	S09°49.15	-15.1' 57.2'
1	191°31.39	41.44		185°8.61	13.3'	09°34.07	-15.1' 57.3'
2	206°31.44	40.56		199°40.87	13.3'	09°18.93	-15.2' 57.3'
3	221°31.49	· · 39.67		214°13.15	13.3'	09°3.75	-15.2' 57.3'
4	236°31.54	38.79		228°45.45	13.3'	08°48.50	-15.3' 57.3'
5	251°31.59	37.91		243°17.77	13.3'	08°33.21	-15.3' 57.4'
6	266°31.64	S11°37.02		257°50.10	13.4'	S08°17.87	-15.4' 57.4'
7	281°31.69	36.14		272°22.46	13.4'	08°2.47	-15.4' 57.4'
8	296°31.75	35.26		286°54.83	13.4'	07°47.03	-15.5' 57.4'
9	311°31.80	· · 34.37		301°27.21	13.4'	07°31.54	-15.5' 57.4'
10	326°31.85	33.49		315°59.60	13.4'	07°16.01	-15.6' 57.5'
11	341°31.90	32.60		330°32.01	13.4'	07°0.43	-15.6' 57.5'
12	356°31.96	S11°31.72		345°4.43	13.4'	S06°44.81	-15.7' 57.5'
13	11°32.01	30.83		359°36.87	13.4'	06°29.15	-15.7' 57.5'
14	26°32.06	29.95		14°9.31	13.4'	06°13.44	-15.7' 57.6'
15	41°32.12	· · 29.06		28°41.76	13.5'	05°57.70	-15.8' 57.6'
16	56°32.17	28.17		43°14.21	13.5'	05°41.92	-15.8' 57.6'
17	71°32.22	27.29		57°46.68	13.5'	05°26.10	-15.9' 57.6'
18	86°32.28	S11°26.40		72°19.15	13.5'	S05°10.24	-15.9' 57.6'
19	101°32.33	25.51		86°51.62	13.5'	04°54.35	-15.9' 57.7'
20	116°32.39	24.62		101°24.10	13.5'	04°38.43	-16.0' 57.7'
21	131°32.44	· · 23.73		115°56.58	13.5'	04°22.47	-16.0' 57.7'
22	146°32.50	22.85		130°29.06	13.5'	04°6.49	-16.0' 57.7'
23	161°32.56	21.96		145°1.54	13.5'	03°50.47	-16.0' 57.7'
SD = 16.2'			$d = -0.9'$			SD = 15.6'	

Thu	GHA	Dec		GHA	ν	Dec	d HP
0	176°32.61	S11°21.07		159°34.02	13.5'	S03°34.43	-16.1' 57.8'
1	191°32.67	20.18		174°6.50	13.5'	03°18.36	-16.1' 57.8'
2	206°32.73	19.29		188°38.97	13.5'	03°2.26	-16.1' 57.8'
3	221°32.78	· · 18.40		203°11.44	13.5'	02°46.15	-16.1' 57.8'
4	236°32.84	17.51		217°43.90	13.5'	02°30.00	-16.2' 57.8'
5	251°32.90	16.62		232°16.36	13.5'	02°13.84	-16.2' 57.9'
6	266°32.96	S11°15.73		246°48.81	13.4'	S01°57.65	-16.2' 57.9'
7	281°33.02	14.83		261°21.25	13.4'	01°41.45	-16.2' 57.9'
8	296°33.08	13.94		275°53.69	13.4'	01°25.23	-16.2' 57.9'
9	311°33.13	· · 13.05		290°26.11	13.4'	01°8.99	-16.3' 57.9'
10	326°33.19	12.16		304°58.52	13.4'	00°52.74	-16.3' 58.0'
11	341°33.25	11.27		319°30.91	13.4'	00°36.47	-16.3' 58.0'
12	356°33.31	S11°10.37		334°3.29	13.4'	S00°20.19	-16.3' 58.0'
13	11°33.37	9.48		348°35.65	13.3'	S00°3.90	-16.3' 58.0'
14	26°33.43	8.59		3°8.00	13.3'	N00°12.40	16.3' 58.0'
15	41°33.49	· · 7.69		17°40.33	13.3'	00°28.70	16.3' 58.0'
16	56°33.56	6.80		32°12.64	13.3'	00°45.02	16.3' 58.1'
17	71°33.62	5.90		46°44.93	13.3'	01°1.34	16.3' 58.1'
18	86°33.68	S11°5.01		61°17.20	13.2'	N01°17.67	16.3' 58.1'
19	101°33.74	4.12		75°49.44	13.2'	01°33.99	16.3' 58.1'
20	116°33.80	3.22		90°21.67	13.2'	01°50.32	16.3' 58.1'
21	131°33.87	· · 2.32		104°53.86	13.2'	02°6.65	16.3' 58.2'
22	146°33.93	1.43		119°26.03	13.1'	02°22.98	16.3' 58.2'
23	161°33.99	0.53		133°58.17	13.1'	02°39.31	16.3' 58.2'
SD = 16.2'			$d = -0.9'$			SD = 15.8'	

Fri	GHA	Dec		GHA	ν	Dec	d HP
0	176°34.06	S10°59.64		148°30.28	13.1'	N02°55.63	16.3' 58.2'
1	191°34.12	58.74		163°2.37	13.1'	03°11.95	16.3' 58.2'
2	206°34.18	57.84		177°34.42	13.0'	03°28.26	16.3' 58.2'
3	221°34.25	· · 56.94		192°6.44	13.0'	03°44.56	16.3' 58.3'
4	236°34.31	56.05		206°38.42	12.9'	04°0.85	16.3' 58.3'
5	251°34.38	55.15		221°10.37	12.9'	04°17.13	16.3' 58.3'
6	266°34.44	S10°54.25		235°42.28	12.9'	N04°33.40	16.3' 58.3'
7	281°34.51	53.35		250°14.16	12.8'	04°49.65	16.2' 58.3'
8	296°34.57	52.45		264°46.00	12.8'	05°5.89	16.2' 58.3'
9	311°34.64	· · 51.55		279°17.80	12.8'	05°22.12	16.2' 58.3'
10	326°34.71	50.66		293°49.55	12.7'	05°38.32	16.2' 58.4'
11	341°34.77	49.76		308°21.27	12.7'	05°54.51	16.2' 58.4'
12	356°34.84	S10°48.86		322°52.94	12.6'	N06°10.67	16.1' 58.4'
13	11°34.91	47.96		337°24.56	12.6'	06°26.81	16.1' 58.4'
14	26°34.97	47.05		351°56.14	12.5'	06°42.93	16.1' 58.4'
15	41°35.04	· · 46.15		6°27.68	12.5'	06°59.02	16.1' 58.4'
16	56°35.11	45.25		20°59.16	12.4'	07°15.09	16.0' 58.5'
17	71°35.18	44.35		35°30.60	12.4'	07°31.13	16.0' 58.5'
18	86°35.25	S10°43.45		50°1.98	12.3'	N07°47.13	16.0' 58.5'
19	101°35.32	42.55		64°33.31	12.3'	08°3.11	15.9' 58.5'
20	116°35.39	41.65		79°4.59	12.2'	08°19.05	15.9' 58.5'
21	131°35.46	· · 40.74		93°35.82	12.2'	08°34.96	15.9' 58.5'
22	146°35.53	39.84		108°6.99	12.1'	08°50.84	15.8' 58.5'
23	161°35.60	38.94		122°38.10	12.1'	09°6.67	15.8' 58.5'
SD = 16.2'			$d = -0.9'$			SD = 15.9'	

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

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

Day	Sun		Mer. Pass	Moon	
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February 21, 22, 23 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	150°55.84		165°49.66	S07°55.56	185°46.09	S15°3.70	43°56.28	N22°51.40	149°21.46	S01°38.98
1	165°58.30		180°49.22	54.35	200°46.63	3.06	58°58.91	51.42	164°23.67	38.86
2	181°0.77		195°48.78	53.13	215°47.16	2.42	74°1.53	51.44	179°25.87	38.74
3	196°3.23		210°48.34	· · 51.91	230°47.70	· · 1.78	89°4.15	· · 51.46	194°28.07	· · 38.63
4	211°5.69		225°47.90	50.69	245°48.23	1.14	104°6.77	51.48	209°30.27	38.51
5	226°8.16		240°47.46	49.48	260°48.77	15°0.50	119°9.39	51.50	224°32.47	38.39
6	241°10.62		255°47.03	S07°48.26	275°49.31	S14°59.86	134°12.01	N22°51.52	239°34.68	S01°38.27
7	256°13.09		270°46.59	47.04	290°49.85	59.22	149°14.63	51.54	254°36.88	38.16
8	271°15.55		285°46.15	45.82	305°50.38	58.57	164°17.25	51.56	269°39.08	38.04
9	286°18.01		300°45.71	· · 44.60	320°50.92	· · 57.93	179°19.87	· · 51.58	284°41.28	· · 37.92
10	301°20.48		315°45.27	43.38	335°51.46	57.29	194°22.48	51.60	299°43.48	37.81
11	316°22.94		330°44.84	42.16	350°52.00	56.65	209°25.10	51.62	314°45.68	37.69
12	331°25.41		345°44.40	S07°40.94	5°52.53	S14°56.00	224°27.72	N22°51.64	329°47.88	S01°37.57
13	346°27.87		0°43.96	39.72	20°53.07	55.36	239°30.34	51.66	344°50.08	37.45
14	1°30.33		15°43.53	38.50	35°53.61	54.72	254°32.95	51.68	359°52.29	37.34
15	16°32.80		30°43.09	· · 37.28	50°54.15	· · 54.07	269°35.57	· · 51.70	14°54.49	· · 37.22
16	31°35.26		45°42.66	36.06	65°54.69	53.43	284°38.19	51.72	29°56.69	37.10
17	46°37.73		60°42.22	34.83	80°55.23	52.78	299°40.80	51.74	44°58.89	36.98
18	61°40.19		75°41.79	S07°33.61	95°55.77	S14°52.14	314°43.42	N22°51.76	60°1.09	S01°36.87
19	76°42.65		90°41.35	32.39	110°56.31	51.49	329°46.03	51.78	75°3.29	36.75
20	91°45.12		105°40.92	31.17	125°56.84	50.85	344°48.65	51.80	90°5.49	36.63
21	106°47.58		120°40.48	· · 29.94	140°57.38	· · 50.20	359°51.26	· · 51.82	105°7.69	· · 36.52
22	121°50.05		135°40.05	28.72	155°57.92	49.56	14°53.88	51.84	120°9.89	36.40
23	136°52.51		150°39.62	27.49	170°58.46	48.91	29°56.49	51.85	135°12.09	36.28
Mer.pass. 13:54										
ν -0.4' d-1.2' m-3.91										
ν 0.5' d-0.6' m1.13										
ν 2.6' d0.0' m-2.50										
ν 2.2' d-0.1' m1.01										
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	151°54.97		165°39.18	S07°26.27	185°59.00	S14°48.26	44°59.10	N22°51.87	150°14.29	S01°36.16
1	166°57.44		180°38.75	25.05	200°59.54	47.62	60°1.72	51.89	165°16.49	36.05
2	181°59.90		195°38.32	23.82	216°0.09	46.97	75°4.33	51.91	180°18.69	35.93
3	197°2.37		210°37.89	· · 22.59	231°0.63	· · 46.32	90°6.94	· · 51.93	195°20.89	· · 35.81
4	212°4.83		225°37.45	21.37	246°1.17	45.68	105°9.55	51.95	210°23.09	35.69
5	227°7.30		240°37.02	20.14	261°1.71	45.03	120°12.17	51.97	225°25.29	35.57
6	242°9.76		255°36.59	S07°18.92	276°2.25	S14°44.38	135°14.78	N22°51.99	240°27.50	S01°35.46
7	257°12.22		270°36.16	17.69	291°2.79	43.73	150°17.39	52.01	255°29.70	35.34
8	272°14.69		285°35.73	16.46	306°3.33	43.08	165°20.00	52.03	270°31.90	35.22
9	287°17.15		300°35.30	· · 15.23	321°3.87	· · 42.44	180°22.61	· · 52.04	285°34.10	· · 35.10
10	302°19.62		315°34.87	14.01	336°4.42	41.79	195°25.22	52.06	300°36.30	34.99
11	317°22.08		330°34.44	12.78	351°4.96	41.14	210°27.83	52.08	315°38.49	34.87
12	332°24.54		345°34.01	S07°11.55	6°5.50	S14°40.49	225°30.44	N22°52.10	330°40.69	S01°34.75
13	347°27.01		0°33.58	10.32	21°6.04	39.84	240°33.05	52.12	345°42.89	34.63
14	2°29.47		15°33.15	9.09	36°6.59	39.19	255°35.66	52.14	0°45.09	34.52
15	17°31.94		30°32.73	· · 7.86	51°7.13	· · 38.54	270°38.26	· · 52.16	15°47.29	· · 34.40
16	32°34.40		45°32.30	6.63	66°7.67	37.89	285°40.87	52.17	30°49.49	34.28
17	47°36.86		60°31.87	5.40	81°8.22	37.24	300°43.48	52.19	45°51.69	34.16
18	62°39.33		75°31.44	S07°4.17	96°8.76	S14°36.59	315°46.09	N22°52.21	60°53.89	S01°34.04
19	77°41.79		90°31.02	2.94	111°9.30	35.94	330°48.69	52.23	75°56.09	33.93
20	92°44.26		105°30.59	1.71	126°9.85	35.28	345°51.30	52.25	90°58.29	33.81
21	107°46.72		120°30.16	07°0.48	141°10.39	· · 34.63	0°53.90	· · 52.27	106°0.49	· · 33.69
22	122°49.18		135°29.74	06°59.25	156°10.94	33.98	15°56.51	52.28	121°2.69	33.57
23	137°51.65		150°29.31	58.02	171°11.48	33.33	30°59.12	52.30	136°4.89	33.45
Mer.pass. 13:50										
ν -0.4' d-1.2' m-3.91										
ν 0.5' d-0.6' m1.13										
ν 2.6' d0.0' m-2.49										
ν 2.2' d-0.1' m1.00										
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	152°54.11		165°28.89	S06°56.78	186°12.02	S14°32.68	46°1.72	N22°52.32	151°7.09	S01°33.34
1	167°56.58		180°28.46	55.55	201°12.57	32.02	61°4.33	52.34	166°9.29	33.22
2	182°59.04		195°28.04	54.32	216°13.11	31.37	76°6.93	52.36	181°11.49	33.10
3	198°1.51		210°27.61	· · 53.08	231°13.66	· · 30.72	91°9.53	· · 52.37	196°13.68	· · 32.98
4	213°3.97		225°27.19	51.85	246°14.20	30.06	106°12.14	52.39	211°15.88	32.86
5	228°6.43		240°26.76	50.62	261°14.75	29.41	121°14.74	52.41	226°18.08	32.75
6	243°8.90		255°26.34	S06°49.38	276°15.30	S14°28.76	136°17.34	N22°52.43	241°20.28	S01°32.63
7	258°11.36		270°25.92	48.15	291°15.84	28.10	151°19.95	52.45	256°22.48	32.51
8	273°13.83		285°25.49	46.91	306°16.39	27.45	166°22.55	52.46	271°24.68	32.39
9	288°16.29		300°25.07	· · 45.68	321°16.93	· · 26.79	181°25.15	· · 52.48	286°26.88	· · 32.27
10	303°18.75		315°24.65	44.44	336°17.48	26.14	196°27.75	52.50	301°29.08	32.16
11	318°21.22		330°24.23	43.21	351°18.03	25.48	211°30.35	52.52	316°31.27	32.04
12	333°23.68		345°23.80	S06°41.97	6°18.57	S14°24.83	226°32.95	N22°52.53	331°33.47	S01°31.92
13	348°26.15		0°23.38	40.73	21°19.12	24.17	241°35.55	52.55	346°35.67	31.80
14	3°28.61		15°22.96	39.50	36°19.67	23.51	256°38.15	52.57	1°37.87	31.68
15	18°31.08		30°22.54	· · 38.26	51°20.21	· · 22.86	271°40.75	· · 52.59	16°40.07	· · 31.56
16	33°33.54		45°22.12	37.02	66°20.76	22.20	286°43.35	52.60	31°42.27	31.45
17	48°36.00		60°21.70	35.79	81°21.31	21.54	301°45.95	52.62	46°44.46	31.33
18	63°38.47		75°21.28	S06°34.55	96°21.86	S14°20.89	316°48.55	N22°52.64	61°46.66	S01°31.21
19	78°40.93		90°20.86	33.31	111°22.41	20.23	331°51.15	52.66	76°48.86	31.09
20	93°43.40		105°20.44	32.07	126°22.95	19.57	346°53.75	52.67	91°51.06	30.97
21	108°45.86		120°20.02	· · 30.83	141°23.50	· · 18.92	1°56.34	· · 52.69	106°53.26	· · 30.85
22	123°48.32		135°19.60	29.59	156°24.05	18.26	16°58.94	52.71	121°55.45	30.74
23	138°50.79		150°19.18	28.35	171°24.60	17.60	32°1.54	52.73	136°57.65	30.62
Mer.pass. 13:46										
ν -0.4' d-1.2' m-3.91										
ν 0.5' d-0.7' m1.14										
ν 2.6' d0.0' m-2.49										
ν 2.2' d-0.1' m1.00										

Stars		
	SHA	Dec
Alpheratz	357°34.12	29°14.11
Ankaa	353°6.55	-42°10.00
Schedar	349°30.44	56°40.99
Diphda	348°46.60	-17°50.72
Achernar	335°19.81	-57°6.46
Hamal	327°50.31	23°35.21
Polaris	313°40.98	89°22.77
Acamar	315°11.16	-40°12.22
Menkar	314°5.25	4°11.48
Mirfak	308°26.99	49°57.43
Aldebaran	290°38.49	16°33.77
Rigel	281°2.86	-8°10.41
Capella	280°20.35	46°1.59
Bellatrix	278°21.76	6°22.34
Elnath	278°0.55	28°37.81
Alnilam	275°36.65	-1°11.21
Betelgeuse	270°50.91	7°24.65
Canopus	263°51.68	-52°42.79
Sirius	258°25.20	-16°45.28
Adhara	255°4.88	-29°0.64
Procyon	244°49.59	5°9.37
Pollux	243°15.86	27°57.74
Avior	234°13.81	-59°35.74
Suhail	222°45.21	-43°32.42
Miaplacidus	221°37.22	-69°49.55
Alphard	217°46.52	-8°46.46
Regulus	207°33.11	11°50.21
Dubhe	193°39.18	61°36.43
Denebola	182°23.69	14°25.36
Gienah	175°42.34	-17°41.33
Acrux	172°58.51	-63°14.57
Gacrux	171°50.15	-57°15.52
Alioth	166°11.70	55°48.77
Spica	156°21.10	-11°17.99
Alkaid	152°50.97	49°10.62
Hadar	148°34.37	-60°29.79
Menkent	147°56.32	-36°29.89
Arcturus	145°46.89	19°2.51
Rigel Kent.	139°38.76	-60°56.44
Kochab	137°19.41	74°2.45
Zuben'ubi	136°54.87	-16°9.10
Alphecca	126°2.89	26°37.29
Antares	112°14.72	-26°29.39
Atria	107°8.24	-69°4.21
Sabik	102°1.80	-15°45.49
Shaula	96°9.25	-37°7.28
Rasalhague	95°57.80	12°32.24
Eltanin	90°41.99	51°28.76
Kaus Aust.	83°31.49	-34°22.27
Vega	80°32.84	38°48.17
Nunki	75°46.84	-26°15.85
Altair	61°59.31	8°56.09
Peacock	53°4.77	-56°38.98
Deneb	49°25.60	45°22.24
Enif	33°38.20	9°59.59
Al Na'ir	27°32.19	-46°50.11
Fomalhaut	15°13.83	-29°29.13
Scheat	13°44.65	28°13.45
Markab	13°29.28	15°20.70
Feb 21 Sat	SHA	Mer.pass
Venus	14°53.83	12:57
Mars	34°50.25	11:37
Jupiter	253°0.45	21:01
Saturn	358°25.63	14:01
Feb 22 Sun	SHA	Mer.pass
Venus	13°44.21	12:58
Mars	34°4.03	11:36
Jupiter	253°4.13	20:56
Saturn	358°19.32	13:57
Feb 23 Mon	SHA	Mer.pass
Venus	12°34.77	12:58
Mars	33°17.91	11:35
Jupiter	253°7.61	20:52
Saturn	358°12.97	13:53
Horizontal parallax		
Venus:		0.1
Mars:		0.1


h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		176°35.67	S10°38.03	137°9.15	12.0'	N09°22.47	15.8' 58.6'
1		191°35.74	37.13	151°40.15	11.9'	09°38.22	15.7' 58.6'
2		206°35.81	36.23	166°11.08	11.9'	09°53.94	15.7' 58.6'
3		221°35.88	· · 35.32	180°41.95	11.8'	10°9.61	15.6' 58.6'
4		236°35.95	34.42	195°12.76	11.7'	10°25.24	15.6' 58.6'
5		251°36.02	33.51	209°43.51	11.7'	10°40.82	15.5' 58.6'
6		266°36.09	S10°32.61	224°14.19	11.6'	N10°56.35	15.5' 58.6'
7		281°36.17	31.70	238°44.81	11.5'	11°11.83	15.4' 58.7'
8		296°36.24	30.80	253°15.36	11.5'	11°27.26	15.4' 58.7'
9		311°36.31	· · 29.89	267°45.83	11.4'	11°42.64	15.3' 58.7'
10		326°36.39	28.98	282°16.24	11.3'	11°57.96	15.3' 58.7'
11		341°36.46	28.08	296°46.58	11.3'	12°13.23	15.2' 58.7'
12		356°36.53	S10°27.17	311°16.85	11.2'	N12°28.44	15.2' 58.7'
13		11°36.61	26.26	325°47.05	11.1'	12°43.59	15.1' 58.7'
14		26°36.68	25.36	340°17.17	11.0'	12°58.68	15.0' 58.7'
15		41°36.76	· · 24.45	354°47.21	11.0'	13°13.71	15.0' 58.7'
16		56°36.83	23.54	9°17.18	10.9'	13°28.68	14.9' 58.8'
17		71°36.91	22.63	23°47.08	10.8'	13°43.58	14.8' 58.8'
18		86°36.98	S10°21.72	38°16.89	10.7'	N13°58.41	14.8' 58.8'
19		101°37.06	20.82	52°46.63	10.7'	14°13.17	14.7' 58.8'
20		116°37.13	19.91	67°16.28	10.6'	14°27.87	14.6' 58.8'
21		131°37.21	· · 19.00	81°45.86	10.5'	14°42.49	14.5' 58.8'
22		146°37.29	18.09	96°15.35	10.4'	14°57.03	14.5' 58.8'
23		161°37.36	17.18	110°44.76	10.3'	15°11.51	14.4' 58.8'
		SD = 16.2' $d = -0.9'$		SD = 16.0'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		176°37.44	S10°16.27	125°14.08	10.2'	N15°25.90	14.3' 58.8'
1		191°37.52	15.36	139°43.33	10.2'	15°40.22	14.2' 58.8'
2		206°37.60	14.45	154°12.48	10.1'	15°54.46	14.2' 58.9'
3		221°37.67	· · 13.54	168°41.55	10.0'	16°8.61	14.1' 58.9'
4		236°37.75	12.63	183°10.53	9.9'	16°22.68	14.0' 58.9'
5		251°37.83	11.71	197°39.42	9.8'	16°36.67	13.9' 58.9'
6		266°37.91	S10°10.80	212°8.23	9.7'	N16°50.57	13.8' 58.9'
7		281°37.99	9.89	226°36.94	9.6'	17°4.38	13.7' 58.9'
8		296°38.07	8.98	241°5.57	9.5'	17°18.10	13.6' 58.9'
9		311°38.15	· · 8.07	255°34.10	9.4'	17°31.73	13.5' 58.9'
10		326°38.23	7.15	270°2.54	9.3'	17°45.26	13.4' 58.9'
11		341°38.31	6.24	284°30.89	9.3'	17°58.70	13.3' 58.9'
12		356°38.39	S10°5.33	298°59.14	9.2'	N18°12.05	13.2' 58.9'
13		11°38.47	4.41	313°27.30	9.1'	18°25.29	13.1' 58.9'
14		26°38.55	3.50	327°55.37	9.0'	18°38.44	13.0' 59.0'
15		41°38.63	· · 2.59	342°23.34	8.9'	18°51.48	12.9' 59.0'
16		56°38.71	1.67	356°51.21	8.8'	19°4.42	12.8' 59.0'
17		71°38.80	10°0.76	11°18.99	8.7'	19°17.25	12.7' 59.0'
18		86°38.88	S09°59.84	25°46.68	8.6'	N19°29.98	12.6' 59.0'
19		101°38.96	58.93	40°14.26	8.5'	19°42.59	12.5' 59.0'
20		116°39.04	58.01	54°41.75	8.4'	19°55.10	12.4' 59.0'
21		131°39.13	· · 57.10	69°9.14	8.3'	20°7.50	12.3' 59.0'
22		146°39.21	56.18	83°36.43	8.2'	20°19.78	12.2' 59.0'
23		161°39.29	55.26	98°3.62	8.1'	20°31.94	12.0' 59.0'
		SD = 16.2' $d = -0.9'$		SD = 16.0'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		176°39.38	S09°54.35	112°30.72	8.0'	N20°43.99	11.9' 59.0'
1		191°39.46	53.43	126°57.71	7.9'	20°55.92	11.8' 59.0'
2		206°39.54	52.51	141°24.61	7.8'	21°7.73	11.7' 59.0'
3		221°39.63	· · 51.60	155°51.40	7.7'	21°19.41	11.6' 59.0'
4		236°39.71	50.68	170°18.10	7.6'	21°30.98	11.4' 59.0'
5		251°39.80	49.76	184°44.69	7.5'	21°42.41	11.3' 59.0'
6		266°39.89	S09°48.84	199°11.19	7.4'	N21°53.72	11.2' 59.1'
7		281°39.97	47.92	213°37.59	7.3'	22°4.90	11.0' 59.1'
8		296°40.06	47.01	228°3.89	7.2'	22°15.95	10.9' 59.1'
9		311°40.14	· · 46.09	242°30.09	7.1'	22°26.87	10.8' 59.1'
10		326°40.23	45.17	256°56.19	7.0'	22°37.65	10.6' 59.1'
11		341°40.32	44.25	271°22.19	6.9'	22°48.30	10.5' 59.1'
12		356°40.40	S09°43.33	285°48.09	6.8'	N22°58.81	10.4' 59.1'
13		11°40.49	42.41	300°13.89	6.7'	23°9.18	10.2' 59.1'
14		26°40.58	41.49	314°39.59	6.6'	23°19.41	10.1' 59.1'
15		41°40.67	· · 40.57	329°5.20	6.5'	23°29.50	9.9' 59.1'
16		56°40.75	39.65	343°30.71	6.4'	23°39.45	9.8' 59.1'
17		71°40.84	38.73	357°56.12	6.3'	23°49.25	9.7' 59.1'
18		86°40.93	S09°37.81	12°21.44	6.2'	N23°58.90	9.5' 59.1'
19		101°41.02	36.89	26°46.65	6.1'	24°8.40	9.4' 59.1'
20		116°41.11	35.96	41°11.78	6.0'	24°17.76	9.2' 59.1'
21		131°41.20	· · 35.04	55°36.81	5.9'	24°26.96	9.0' 59.1'
22		146°41.29	34.12	70°1.74	5.8'	24°36.01	8.9' 59.1'
23		161°41.38	33.20	84°26.59	5.7'	24°44.90	8.7' 59.1'
		SD = 16.2' $d = -0.9'$		SD = 16.1'			

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

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

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		14-33%
21	13:37	13:34	12:14	15:22	02:57		
22	13:30	13:26	12:13	16:13	03:47		
23	13:22	13:18	12:13	17:09	04:40		

February 24, 25, 26 UT (Tue., Wed., Thu.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	153°53.25		165°18.76	S06°27.11	186°25.15	S14°16.94	47°4.13	N22°52.74	151°59.85	S01°30.50	Alpheratz	357°34.12	29°14.10
1	168°55.72		180°18.35	25.87	201°25.70	16.28	62°6.73	52.76	167°2.05	30.38	Ankaa	353°6.56	-42°9.99
2	183°58.18		195°17.93	24.63	216°26.25	15.62	77°9.33	52.78	182°4.24	30.26	Schedar	349°30.44	56°40.98
3	199°0.64		210°17.51	· · 23.39	231°26.80	· · 14.96	92°11.92	· · 52.79	197°6.44	· · 30.14	Diphda	348°46.61	-17°50.72
4	214°3.11		225°17.09	22.15	246°27.35	14.30	107°14.52	52.81	212°8.64	30.02	Achernar	335°19.83	-57°6.45
5	229°5.57		240°16.68	20.91	261°27.90	13.64	122°17.11	52.83	227°10.84	29.91	Hamal	327°50.31	23°35.20
6	244°8.04		255°16.26	S06°19.67	276°28.45	S14°12.98	137°19.70	N22°52.84	242°13.03	S01°29.79	Polaris	313°42.15	89°22.77
7	259°10.50		270°15.84	18.43	291°29.00	12.32	152°22.30	52.86	257°15.23	29.67	Acamar	315°11.18	-40°12.22
8	274°12.97		285°15.43	17.19	306°29.55	11.66	167°24.89	52.88	272°17.43	29.55	Menkar	314°5.25	4°11.48
9	289°15.43		300°15.01	· · 15.94	321°30.10	· · 11.00	182°27.49	· · 52.89	287°19.63	· · 29.43	Mirfak	308°27.00	49°57.42
10	304°17.89		315°14.60	14.70	336°30.65	10.34	197°30.08	52.91	302°21.82	29.31	Aldebaran	290°38.50	16°33.71
11	319°20.36		330°14.18	13.46	351°31.20	9.68	212°32.67	52.93	317°24.02	29.19	Rigel	281°2.87	-8°10.42
12	334°22.82		345°13.77	S06°12.22	6°31.75	S14°9.02	227°35.26	N22°52.94	332°26.22	S01°29.08	Capella	280°20.37	46°1.59
13	349°25.29		0°13.35	10.97	21°32.30	8.36	242°37.85	52.96	347°28.42	28.96	Bellatrix	278°21.76	6°22.34
14	4°27.75		15°12.94	9.73	36°32.85	7.70	257°40.45	52.98	2°30.61	28.84	Elnath	278°0.56	28°37.81
15	19°30.21		30°12.52	· · 8.48	51°33.40	· · 7.03	272°43.04	· · 52.99	17°32.81	· · 28.72	Alnilam	275°36.66	-1°11.22
16	34°32.68		45°12.11	7.24	66°33.95	6.37	287°45.63	53.01	32°35.01	28.60	Betelgeuse	270°50.92	7°24.65
17	49°35.14		60°11.70	6.00	81°34.51	5.71	302°48.22	53.03	47°37.20	28.48	Canopus	263°51.70	-52°42.80
18	64°37.61		75°11.28	S06°4.75	96°35.06	S14°5.05	317°50.81	N22°53.04	62°39.40	S01°28.36	Sirius	258°25.21	-16°45.29
19	79°40.07		90°10.87	3.51	111°35.61	4.38	332°53.40	53.06	77°41.60	28.24	Adhara	255°4.89	-29°0.65
20	94°42.54		105°10.46	2.26	126°36.16	3.72	347°55.99	53.08	92°43.79	28.13	Procyon	244°49.60	5°9.36
21	109°45.00		120°10.05	06°1.01	141°36.72	· · 3.06	2°58.58	· · 53.09	107°45.99	· · 28.01	Pollux	243°15.86	27°57.74
22	124°47.46		135°9.63	05°59.77	156°37.27	2.39	18°1.16	53.11	122°48.19	27.89	Avior	234°13.82	-59°35.76
23	139°49.93		150°9.22	58.52	171°37.82	1.73	33°3.75	53.12	137°50.38	27.77	Suhail	222°45.21	-43°32.44
Mer.pass. 13:42		ν-0.4' d-1.2' m-3.91		ν0.5' d-0.7' m1.14		ν2.6' d0.0' m-2.48		ν2.2' d-0.1' m1.00					
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	154°52.39		165°8.81	S05°57.28	186°38.38	S14°1.06	48°6.34	N22°53.14	152°52.58	S01°27.65	Miaplacidus	221°37.24	-69°49.57
1	169°54.86		180°8.40	56.03	201°38.93	14°0.40	63°8.93	53.16	167°54.78	27.53	Alphard	217°46.51	-8°46.47
2	184°57.32		195°7.99	54.78	216°39.48	13°59.73	78°11.52	53.17	182°56.97	27.41	Regulus	207°33.11	11°50.21
3	199°59.79		210°7.58	· · 53.54	231°40.04	· · 59.07	93°14.10	· · 53.19	197°59.17	· · 27.29	Dubhe	193°39.17	61°36.44
4	215°2.25		225°7.17	52.29	246°40.59	58.40	108°16.69	53.20	213°1.36	27.18	Denebola	182°23.68	14°25.36
5	230°4.71		240°6.76	51.04	261°41.14	57.74	123°19.27	53.22	228°3.56	27.06	Gienah	175°42.33	-17°41.34
6	245°7.18		255°6.35	S05°49.79	276°41.70	S13°57.07	138°21.86	N22°53.24	243°5.76	S01°26.94	Acrux	172°58.48	-63°14.59
7	260°9.64		270°5.94	48.54	291°42.25	56.41	153°24.45	53.25	258°7.95	26.82	Gacrux	171°50.12	-57°15.54
8	275°12.11		285°5.53	47.29	306°42.81	55.74	168°27.03	53.27	273°10.15	26.70	Alioth	166°11.68	55°48.78
9	290°14.57		300°5.12	· · 46.05	321°43.36	· · 55.07	183°29.61	· · 53.28	288°12.34	· · 26.58	Spica	158°21.08	-11°17.99
10	305°17.03		315°4.71	44.80	336°43.92	54.41	198°32.20	53.30	303°14.54	26.46	Alkaid	152°50.94	49°10.62
11	320°19.50		330°4.30	43.55	351°44.47	53.74	213°34.78	53.31	318°16.74	26.34	Hadar	148°34.33	-60°29.81
12	335°21.96		345°3.89	S05°42.30	6°45.03	S13°53.07	228°37.37	N22°53.33	333°18.93	S01°26.22	Menkent	147°56.29	-36°29.90
13	350°24.43		0°3.48	41.05	21°45.58	52.40	243°39.95	53.35	348°21.13	26.10	Arcturus	145°46.87	19°2.51
14	5°26.89		15°3.08	39.80	36°46.14	51.74	258°42.53	53.36	3°23.32	25.98	Rigel Kent.	139°38.72	-60°56.45
15	20°29.36		30°2.67	· · 38.55	51°46.69	· · 51.07	273°45.12	· · 5					

h	Sun			Moon				
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	176°41.47	S09°32.28		98°51.34	5.7'	N24°53.64	8.6'	59.1'
1	191°41.56		31.35	113°15.99	5.6'	25°2.22	8.4'	59.1'
2	206°41.65		30.43	127°40.56	5.5'	25°10.65	8.3'	59.1'
3	221°41.74	· ·	29.51	142°5.04	5.4'	25°18.91	8.1'	59.1'
4	236°41.83		28.58	156°29.43	5.3'	25°27.01	7.9'	59.1'
5	251°41.93		27.66	170°53.73	5.2'	25°34.94	7.8'	59.1'
6	266°42.02	S09°26.74		185°17.95	5.1'	N25°42.71	7.6'	59.1'
7	281°42.11		25.81	199°42.08	5.0'	25°50.32	7.4'	59.1'
8	296°42.20		24.89	214°6.13	5.0'	25°57.76	7.3'	59.1'
9	311°42.30	· ·	23.96	228°30.10	4.9'	26°5.03	7.1'	59.1'
10	326°42.39		23.04	242°53.98	4.8'	26°12.12	6.9'	59.1'
11	341°42.48		22.11	257°17.78	4.7'	26°19.05	6.8'	59.2'
12	356°42.58	S09°21.19		271°41.51	4.6'	N26°25.80	6.6'	59.2'
13	11°42.67		20.26	286°5.16	4.6'	26°32.38	6.4'	59.2'
14	26°42.76		19.34	300°28.74	4.5'	26°38.79	6.2'	59.2'
15	41°42.86	· ·	18.41	314°52.24	4.4'	26°45.02	6.1'	59.2'
16	56°42.95		17.48	329°15.67	4.4'	26°51.07	5.9'	59.2'
17	71°43.05		16.56	343°39.03	4.3'	26°56.94	5.7'	59.2'
18	86°43.14	S09°15.63		358°2.32	4.2'	N27°2.63	5.5'	59.2'
19	101°43.24		14.70	12°25.54	4.2'	27°8.14	5.3'	59.2'
20	116°43.33		13.77	26°48.70	4.1'	27°13.47	5.1'	59.2'
21	131°43.43	· ·	12.85	41°11.80	4.0'	27°18.62	5.0'	59.2'
22	146°43.52		11.92	55°34.84	4.0'	27°23.58	4.8'	59.2'
23	161°43.62		10.99	69°57.82	3.9'	27°28.36	4.6'	59.2'
SD = 16.2' $d = -0.9'$			SD = 16.1'					
Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	176°43.72	S09°10.06		84°20.74	3.9'	N27°32.95	4.4'	59.2'
1	191°43.82		9.13	98°43.61	3.8'	27°37.36	4.2'	59.2'
2	206°43.91		8.21	113°6.42	3.8'	27°41.58	4.0'	59.2'
3	221°44.01	· ·	7.28	127°29.18	3.7'	27°45.60	3.8'	59.2'
4	236°44.11		6.35	141°51.90	3.7'	27°49.44	3.7'	59.2'
5	251°44.21		5.42	156°14.57	3.6'	27°53.09	3.5'	59.2'
6	266°44.30	S09°4.49		170°37.20	3.6'	N27°56.55	3.3'	59.2'
7	281°44.40		3.56	184°59.78	3.5'	27°59.82	3.1'	59.2'
8	296°44.50		2.63	199°22.33	3.5'	28°2.90	2.9'	59.2'
9	311°44.60	· ·	1.70	213°44.84	3.5'	28°5.78	2.7'	59.2'
10	326°44.70	09°0.77		228°7.32	3.4'	28°8.47	2.5'	59.2'
11	341°44.80	08°59.84		242°29.76	3.4'	28°10.97	2.3'	59.2'
12	356°44.90	S08°58.91		256°52.18	3.4'	N28°13.27	2.1'	59.2'
13	11°45.00		57.97	271°14.57	3.4'	28°15.38	1.9'	59.1'
14	26°45.10		57.04	285°36.93	3.3'	28°17.29	1.7'	59.1'
15	41°45.20	· ·	56.11	299°59.28	3.3'	28°19.01	1.5'	59.1'
16	56°45.30		55.18	314°21.60	3.3'	28°20.53	1.3'	59.1'
17	71°45.40		54.25	328°43.91	3.3'	28°21.86	1.1'	59.1'
18	86°45.50	S08°53.31		343°6.20	3.3'	N28°22.99	0.9'	59.1'
19	101°45.60		52.38	357°28.49	3.3'	28°23.92	0.7'	59.1'
20	116°45.71		51.45	11°50.76	3.3'	28°24.66	0.5'	59.1'
21	131°45.81	· ·	50.52	26°13.03	3.3'	28°25.20	0.3'	59.1'
22	146°45.91		49.58	40°35.29	3.3'	28°25.54	0.1'	59.1'
23	161°46.01		48.65	54°57.56	3.3'	28°25.69	-0.1'	59.1'
SD = 16.2' $d = -0.9'$			SD = 16.1'					
Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	176°46.12	S08°47.72		69°19.83	3.3'	N28°25.64	-0.2'	59.1'
1	191°46.22		46.78	83°42.10	3.3'	28°25.39	-0.4'	59.1'
2	206°46.32		45.85	98°4.37	3.3'	28°24.95	-0.6'	59.1'
3	221°46.43	· ·	44.91	112°26.66	3.3'	28°24.31	-0.8'	59.1'
4	236°46.53		43.98	126°48.96	3.3'	28°23.47	-1.0'	59.1'
5	251°46.63		43.04	141°11.28	3.3'	28°22.44	-1.2'	59.1'
6	266°46.74	S08°42.11		155°33.61	3.4'	N28°21.21	-1.4'	59.1'
7	281°46.84		41.17	169°55.97	3.4'	28°19.79	-1.6'	59.1'
8	296°46.95		40.24	184°18.34	3.4'	28°18.17	-1.8'	59.1'
9	311°47.05	· ·	39.30	198°40.74	3.4'	28°16.35	-2.0'	59.1'
10	326°47.16		38.37	213°3.17	3.5'	28°14.35	-2.2'	59.1'
11	341°47.26		37.43	227°25.63	3.5'	28°12.14	-2.4'	59.1'
12	356°47.37	S08°36.49		241°48.13	3.5'	N28°9.75	-2.6'	59.1'
13	11°47.48		35.56	256°10.66	3.6'	28°7.16	-2.8'	59.1'
14	26°47.58		34.62	270°33.23	3.6'	28°4.38	-3.0'	59.1'
15	41°47.69	· ·	33.68	284°55.83	3.7'	28°1.40	-3.2'	59.1'
16	56°47.80		32.75	299°18.48	3.7'	27°58.24	-3.4'	59.0'
17	71°47.90		31.81	313°41.18	3.7'	27°54.89	-3.5'	59.0'
18	86°48.01	S08°30.87		328°3.93	3.8'	N27°51.34	-3.7'	59.0'
19	101°48.12		29.93	342°26.72	3.8'	27°47.61	-3.9'	59.0'
20	116°48.23		28.99	356°49.57	3.9'	27°43.69	-4.1'	59.0'
21	131°48.33	· ·	28.06	11°12.47	4.0'	27°39.58	-4.3'	59.0'
22	146°48.44		27.12	25°35.43	4.0'	27°35.29	-4.5'	59.0'
23	161°48.55		26.18	39°58.44	4.1'	27°30.81	-4.7'	59.0'
SD = 16.1' $d = -0.9'$			SD = 16.1'					

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 7-9 44-67%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
24	13:14	13:10	12:13	18:08	05:38	
25	13:05	13:00	12:13	19:11	06:39	
26	12:56	12:51	12:13	20:13	07:42	

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

h	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	156°50.67		164°49.36	S04°57.15	187°5.14	S13°28.89	50°10.13	N22°53.86	154°37.95	S01°21.92	Alpheratz	357°34.12 29°14.10
1	171°53.14		179°48.96	55.89	202°5.70	28.22	65°12.70	53.88	169°40.14	21.81	Ankaa	353°6.56 -42°9.97
2	186°55.60		194°48.56	54.63	217°6.26	27.54	80°15.27	53.89	184°42.34	21.69	Schedar	349°30.45 56°40.97
3	201°58.07		209°48.17	· · 53.37	232°6.82	· · 26.87	95°17.84	· · 53.91	199°44.53	· · 21.57	Diphda	348°46.61 -17°50.71
4	217°0.53		224°47.77	52.11	247°7.38	26.19	110°20.41	53.92	214°46.72	21.45	Achernar	335°19.84 -57°6.44
5	232°3.00		239°47.37	50.85	262°7.95	25.51	125°22.98	53.93	229°48.92	21.33	Hamal	327°50.32 23°35.20
6	247°5.46		254°46.97	S04°49.59	277°8.51	S13°24.84	140°25.55	N22°53.95	244°51.11	S01°21.21	Polaris	313°43.37 89°22.76
7	262°7.92		269°46.57	48.33	292°9.07	24.16	155°28.12	53.96	259°53.30	21.09	Acamar	315°11.19 -40°12.21
8	277°10.39		284°46.18	47.07	307°9.64	23.48	170°30.69	53.98	274°55.50	20.97	Menkar	314°5.26 4°11.48
9	292°12.85		299°45.78	· · 45.81	322°10.20	· · 22.80	185°33.25	· · 53.99	289°57.69	· · 20.85	Mirfak	308°27.02 49°57.42
10	307°15.32		314°45.38	44.55	337°10.76	22.13	200°35.82	54.00	304°59.89	20.73	Aldebaran	290°38.51 16°33.71
11	322°17.78		329°44.99	43.29	352°11.33	21.45	215°38.39	54.02	320°2.08	20.61	Rigel	281°2.88 -8°10.42
12	337°20.24		344°44.59	S04°42.03	7°11.89	S13°20.77	230°40.95	N22°54.03	335°4.27	S01°20.49	Capella	280°20.37 46°1.59
13	352°22.71		359°44.19	40.77	22°12.45	20.09	245°43.52	54.04	350°6.47	20.37	Bellatrix	278°21.77 6°22.33
14	7°25.17		14°43.80	39.50	37°13.02	19.41	260°46.08	54.06	5°8.66	20.25	El Nath	278°0.56 28°37.81
15	22°27.64		29°43.40	· · 38.24	52°13.58	· · 18.73	275°48.65	· · 54.07	20°10.85	· · 20.13	Alnilam	275°36.66 -1°11.22
16	37°30.10		44°43.01	36.98	67°14.15	18.05	290°51.21	54.08	35°13.05	20.01	Betelgeuse	270°50.93 7°24.65
17	52°32.57		59°42.61	35.72	82°14.71	17.37	305°53.78	54.10	50°15.24	19.89	Canopus	263°51.72 -52°42.81
18	67°35.03		74°42.22	S04°34.46	97°15.28	S13°16.69	320°56.34	N22°54.11	65°17.43	S01°19.77	Sirius	258°25.21 -16°45.30
19	82°37.49		89°41.82	33.19	112°15.84	16.01	335°58.91	54.12	80°19.63	19.65	Adhara	255°4.89 -29°0.66
20	97°39.96		104°41.43	31.93	127°16.41	15.33	351°1.47	54.14	95°21.82	19.53	Procyon	244°49.60 5°9.36
21	112°42.42		119°41.03	· · 30.67	142°16.97	· · 14.65	6°4.03	· · 54.15	110°24.01	· · 19.41	Pollux	243°15.86 27°57.74
22	127°44.89		134°40.64	29.40	157°17.54	13.97	21°6.59	54.16	125°26.20	19.29	Avior	234°13.84 -59°35.77
23	142°47.35		149°40.24	28.14	172°18.10	13.29	36°9.16	54.18	140°28.40	19.17	Suhail	222°45.21 -43°32.45
Mer.pass. 13:30		ν-0.4' d-1.3' m-3.91		ν0.6' d-0.7' m1.14		ν2.6' d0.0' m-2.46		ν2.2' d-0.1' m0.99				
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	157°49.81		164°39.85	S04°26.88	187°18.67	S13°12.61	51°11.72	N22°54.19	155°30.59	S01°19.05	Miaplacidus	221°37.25 -69°49.59
1	172°52.28		179°39.46	25.61	202°19.23	11.93	66°14.28	54.20	170°32.78	18.93	Alphard	217°46.51 -8°46.48
2	187°54.74		194°39.06	24.35	217°19.80	11.25	81°16.84	54.22	185°34.98	18.81	Regulus	207°33.10 11°50.21
3	202°57.21		209°38.67	· · 23.09	232°20.37	· · 10.57	96°19.40	· · 54.23	200°37.17	· · 18.69	Dubhe	193°39.15 61°36.45
4	217°59.67		224°38.28	21.82	247°20.93	9.88	111°21.96	54.24	215°39.36	18.57	Denebola	182°23.66 14°25.35
5	233°2.14		239°37.88	20.56	262°21.50	9.20	126°24.52	54.26	230°41.55	18.45	Gienah	175°42.31 -17°41.36
6	248°4.60		254°37.49	S04°19.29	277°22.07	S13°8.52	141°27.08	N22°54.27	245°43.75	S01°18.33	Acrux	172°58.45 -63°14.61
7	263°7.06		269°37.10	18.03	292°22.63	7.84	156°29.64	54.28	260°45.94	18.21	Gacrux	171°50.10 -57°15.56
8	278°9.53		284°36.71	16.76	307°23.20	7.15	171°32.20	54.29	275°48.13	18.09	Alioth	166°11.65 55°48.78
9	293°11.99		299°36.31	· · 15.50	322°23.77	· · 6.47	186°34.76	· · 54.31	290°50.32	· · 17.97	Spica	158°21.06 -11°18.00
10	308°14.46		314°35.92	14.23	337°24.34	5.79	201°37.32	54.32	305°52.52	17.85	Alkaid	152°50.91 49°10.63
11	323°16.92		329°35.53	12.97	352°24.90	5.10	216°39.88	54.33	320°54.71	17.73	Hadar	148°34.28 -60°29.82
12	338°19.38		344°35.14	S04°11.70	7°25.47	S13°4.42	231°42.43	N22°54.34	335°56.90	S01°17.61	Menkent	147°56.26 -36°29.91
13	353°21.85		359°34.75	10.43	22°26.04	3.74	246°44.99	54.36	350°59.09	17.49	Arcturus	145°46.84 19°2.50
14	8°24.31		14°34.36	9.17	37°26.61	3.05	261°47.55	54.37	6°1.28	17.37	Rigel Kent.	139°38.67 -60°56.46
15	23°26.78		29°33.97	· · 7.90	52°27.18	· · 2.37	276°50.10	· · 54.38	21°3.48	· · 17.25	Kochab	137°19.29 74°2.46
16	38°29.24		44°33.58	6.63	67°27.74	1.68	291°52.66	54.39	36°5.67	17.13	Zuben'ubi	136°54.82 -16°9.11
17	53°31.71		59°33.19	5.37	82°28.31	1.00	306°55.21	54.41	51°7.86	17.01	Alphecca	126°2.84 26°37.28
18	68°34.17		74°32.80	S04°4.10	97°28.88	S13°0.31	321°57.77	N22°54.42	66°10.05	S01°16.89	Antares	112°14.66 -26°29.39
19	83°36.63		89°32.41	2.83	112°29.45	12°59.63	337°0.32	54.43	81°12.24	16.77	Atria	107°8.10 -69°4.21
20	98°39.10		104°32.02	1.56	127°30.02	58.94	352°2.88	54.44	96°14.44	16.65	Sabik	102°1.74 -15°45.49
21	113°41.56		119°31.63	04°0.30	142°30.59	· · 58.26	7°5.43	· · 54.46	111°16.63	· · 16.52	Shaula	96°9.18 -37°7.28
22	128°44.03		134°31.24	03°59.03	157°31.16	57.57	22°7.99	54.47	126°18.82	16.40	Rasalhague	95°57.75 12°32.23
23	143°46.49		149°30.85	57.76	172°31.73	56.88	37°10.54	54.48	141°21.01	16.28	Eltanin	90°41.92 51°28.75
Mer.pass. 13:26		ν-0.4' d-1.3' m-3.91		ν0.6' d-0.7' m1.14		ν2.6' d0.0' m-2.45		ν2.2' d-0.1' m0.99				
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	158°48.95		164°30.46	S03°56.49	187°32.30	S12°56.20	52°13.09	N22°54.49	156°23.20	S01°16.16	Kaus Aust.	83°31.43 -34°22.27
1	173°51.42		179°30.07	55.22	202°32.87	55.51	67°15.65	54.51	171°25.40	16.04	Vega	80°32.79 38°48.16
2	188°53.88		194°29.69	53.96	217°33.44	54.82	82°18.20	54.52	186°27.59	15.92	Nunki	75°46.78 -26°15.84
3	203°56.35		209°29.30	· · 52.69	232°34.01	· · 54.14	97°20.75	· · 54.53	201°29.78	· · 15.80	Altair	81°59.27 8°56.08
4	218°58.81		224°28.91	51.42	247°34.58	53.45	112°23.30	54.54	216°31.97	15.68	Peacock	53°4.70 -56°38.95
5	234°1.27		239°28.52	50.15	262°35.15	52.76	127°25.85	54.55	231°34.16	15.56	Deneb	49°25.57 45°22.22
6	249°3.74		254°28.13	S03°48.88	277°35.72	S12°52.07	142°28.41	N22°54.57	246°36.35	S01°15.44	Enif	33°38.17 9°59.58
7	264°6.20		269°27.75	47.61	292°36.29	51.39	157°30.96	54.58	261°38.54	15.32	Al Na'ir	27°32.16 -46°50.08
8	279°8.67		284°27.36	46.34	307°36.87	50.70	172°33.51	54.59	276°40.74	15.20	Fomalhaut	15°13.81 -29°29.11
9	294°11.13		299°26.97	· · 45.07	322°37.44	· · 50.01	187°36.06	· · 54.60	291°42.93	· · 15.08	Scheat	13°44.64 28°13.43
10	309°13.60		314°26.59	43.80	337°38.01	49.32	202°38.61	54.61	306°45.12	14.96	Markab	13°29.27 15°20.69
11	324°16.06		329°26.20	42.53	352°38.58	48.63	217°41.16	54.62	321°47.31	14.84		

h		Sun		Moon			
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	176°48.66	S08°25.24	54°21.52	4.1'	N27°26.14	-4.8'	59.0'
1	191°48.77	24.30	68°44.66	4.2'	27°21.30	-5.0'	59.0'
2	206°48.88	23.36	83°7.87	4.3'	27°16.27	-5.2'	59.0'
3	221°48.99	· · 22.42	97°31.15	4.3'	27°11.06	-5.4'	59.0'
4	236°49.10	21.48	111°54.49	4.4'	27°5.66	-5.6'	59.0'
5	251°49.21	20.54	126°17.90	4.5'	27°0.09	-5.7'	59.0'
6	266°49.32	S08°19.60	140°41.39	4.6'	N26°54.35	-5.9'	58.9'
7	281°49.43	18.66	155°4.96	4.6'	26°48.42	-6.1'	58.9'
8	296°49.54	17.72	169°28.60	4.7'	26°42.32	-6.3'	58.9'
9	311°49.65	· · 16.78	183°52.31	4.8'	26°36.04	-6.4'	58.9'
10	326°49.76	15.84	198°16.11	4.9'	26°29.60	-6.6'	58.9'
11	341°49.87	14.90	212°39.99	5.0'	26°22.98	-6.8'	58.9'
12	356°49.98	S08°13.96	227°3.96	5.0'	N26°16.18	-7.0'	58.9'
13	11°50.10	13.01	241°28.01	5.1'	26°9.23	-7.1'	58.9'
14	26°50.21	12.07	255°52.14	5.2'	26°2.10	-7.3'	58.9'
15	41°50.32	· · 11.13	270°16.36	5.3'	25°54.80	-7.5'	58.9'
16	56°50.43	10.19	284°40.68	5.4'	25°47.35	-7.6'	58.9'
17	71°50.55	9.25	299°5.08	5.5'	25°39.72	-7.8'	58.8'
18	86°50.66	S08°8.30	313°29.58	5.6'	N25°31.94	-7.9'	58.8'
19	101°50.77	7.36	327°54.16	5.7'	25°23.99	-8.1'	58.8'
20	116°50.89	6.42	342°18.85	5.8'	25°15.89	-8.3'	58.8'
21	131°51.00	· · 5.47	356°43.62	5.9'	25°7.63	-8.4'	58.8'
22	146°51.11	4.53	11°8.50	6.0'	24°59.21	-8.6'	58.8'
23	161°51.23	3.59	25°33.47	6.1'	24°50.64	-8.7'	58.8'
SD = 16.1'		$d = -0.9'$	SD = 16.1'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°51.34	S08°2.64	39°58.54	6.2'	N24°41.91	-8.9'	58.8'
1	191°51.46	1.70	54°23.71	6.3'	24°33.04	-9.0'	58.8'
2	206°51.57	08°0.75	68°48.98	6.4'	24°24.01	-9.2'	58.8'
3	221°51.69	07°59.81	83°14.35	6.5'	24°14.84	-9.3'	58.7'
4	236°51.80	58.87	97°39.82	6.6'	24°5.52	-9.5'	58.7'
5	251°51.92	57.92	112°5.40	6.7'	23°56.05	-9.6'	58.7'
6	266°52.03	S07°56.98	126°31.08	6.8'	N23°46.44	-9.7'	58.7'
7	281°52.15	56.03	140°56.86	6.9'	23°36.69	-9.9'	58.7'
8	296°52.27	55.08	155°22.75	7.0'	23°26.80	-10.0'	58.7'
9	311°52.38	· · 54.14	169°48.74	7.1'	23°16.78	-10.2'	58.7'
10	326°52.50	53.19	184°14.84	7.2'	23°6.61	-10.3'	58.7'
11	341°52.62	52.25	198°41.04	7.3'	22°56.31	-10.4'	58.6'
12	356°52.74	S07°51.30	213°7.35	7.4'	N22°45.88	-10.6'	58.6'
13	11°52.85	50.35	227°33.76	7.5'	22°35.32	-10.7'	58.6'
14	26°52.97	49.41	242°0.28	7.6'	22°24.63	-10.8'	58.6'
15	41°53.09	· · 48.46	256°26.91	7.7'	22°13.81	-10.9'	58.6'
16	56°53.21	47.51	270°53.65	7.8'	22°2.86	-11.1'	58.6'
17	71°53.33	46.57	285°20.49	7.9'	21°51.79	-11.2'	58.6'
18	86°53.44	S07°45.62	299°47.44	8.1'	N21°40.60	-11.3'	58.5'
19	101°53.56	44.67	314°14.50	8.2'	21°29.28	-11.4'	58.5'
20	116°53.68	43.72	328°41.66	8.3'	21°17.85	-11.6'	58.5'
21	131°53.80	· · 42.78	343°8.93	8.4'	21°6.30	-11.7'	58.5'
22	146°53.92	41.83	357°36.31	8.5'	20°54.63	-11.8'	58.5'
23	161°54.04	40.88	12°3.80	8.6'	20°42.85	-11.9'	58.5'
SD = 16.1'		$d = -0.9'$	SD = 16.0'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°54.16	S07°39.93	26°31.39	8.7'	N20°30.96	-12.0'	58.5'
1	191°54.28	38.98	40°59.09	8.8'	20°18.96	-12.1'	58.4'
2	206°54.40	38.03	55°26.90	8.9'	20°6.85	-12.2'	58.4'
3	221°54.52	· · 37.08	69°54.81	9.0'	19°54.63	-12.3'	58.4'
4	236°54.64	36.13	84°22.83	9.1'	19°42.31	-12.4'	58.4'
5	251°54.77	35.18	98°50.95	9.2'	19°29.89	-12.5'	58.4'
6	266°54.89	S07°34.23	113°19.18	9.3'	N19°17.36	-12.6'	58.4'
7	281°55.01	33.29	127°47.51	9.4'	19°4.74	-12.7'	58.3'
8	296°55.13	32.33	142°15.95	9.5'	18°52.01	-12.8'	58.3'
9	311°55.25	· · 31.38	156°44.50	9.6'	18°39.20	-12.9'	58.3'
10	326°55.37	30.43	171°13.14	9.7'	18°26.28	-13.0'	58.3'
11	341°55.50	29.48	185°41.89	9.9'	18°13.28	-13.1'	58.3'
12	356°55.62	S07°28.53	200°10.74	10.0'	N18°0.18	-13.2'	58.3'
13	11°55.74	27.58	214°39.70	10.1'	17°46.99	-13.3'	58.2'
14	26°55.87	26.63	229°8.75	10.2'	17°33.72	-13.4'	58.2'
15	41°55.99	· · 25.68	243°37.91	10.3'	17°20.36	-13.4'	58.2'
16	56°56.11	24.73	258°7.16	10.4'	17°6.92	-13.5'	58.2'
17	71°56.24	23.78	272°36.51	10.5'	16°53.39	-13.6'	58.2'
18	86°56.36	S07°22.82	287°5.97	10.6'	N16°39.79	-13.7'	58.1'
19	101°56.49	21.87	301°35.52	10.6'	16°26.10	-13.8'	58.1'
20	116°56.61	20.92	316°5.17	10.7'	16°12.34	-13.8'	58.1'
21	131°56.73	· · 19.97	330°34.91	10.8'	15°58.50	-13.9'	58.1'
22	146°56.86	19.01	345°4.75	10.9'	15°44.59	-14.0'	58.1'
23	161°56.99	18.06	359°34.68	11.0'	15°30.61	-14.1'	58.0'
SD = 16.1'		$d = -0.9'$	SD = 15.9'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 10-12 77-93%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
27	12:45	12:40	12:13	21:14	08:44	
28	12:35	12:29	12:12	22:10	09:42	
01	12:23	12:18	12:12	23:02	10:36	

March 02, 03, 04 UT (Mon., Tue., Wed.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	159°48.09	164°21.19	S03°26.00	187°46.03	S12°39.66	53°14.26	N22°54.77	157°15.79	S01°13.27	Alpheratz	357°34.12 29°14.09
1	174°50.56	179°20.81	24.73	202°46.60	38.97	68°16.81	54.78	172°17.98	13.15	Ankaa	353°6.56 -42°9.96
2	189°53.02	194°20.42	23.46	217°47.18	38.27	83°19.35	54.79	187°20.17	13.03	Schedar	349°30.46 56°40.96
3	204°55.48	209°20.04	· · 22.18	232°47.75	· · 37.58	98°21.89	· · 54.81	202°22.36	· · 12.91	Diphda	348°46.61 -17°50.70
4	219°57.95	224°19.66	20.91	247°48.33	36.89	113°24.44	54.82	217°24.55	12.79	Achernar	335°19.86 -57°6.43
5	235°0.41	239°19.27	19.64	262°48.90	36.20	128°26.98	54.83	232°26.74	12.67	Hamal	327°50.33 23°35.20
6	250°2.88	254°18.89	S03°18.36	277°49.48	S12°35.50	143°29.52	N22°54.84	247°28.93	S01°12.55	Polaris	313°44.87 89°22.76
7	265°5.34	269°18.51	17.09	292°50.05	34.81	158°32.06	54.85	262°31.12	12.43	Acamar	315°11.21 -40°12.20
8	280°7.81	284°18.13	15.82	307°50.63	34.12	173°34.60	54.86	277°33.31	12.31	Menkar	314°5.27 4°11.48
9	295°10.27	299°17.74	· · 14.54	322°51.20	· · 33.42	188°37.14	· · 54.87	292°35.50	· · 12.19	Mirfak	308°27.04 49°57.42
10	310°12.73	314°17.36	13.27	337°51.78	32.73	203°39.69	54.88	307°37.70	12.06	Aldebaran	290°38.52 16°33.71
11	325°15.20	329°16.98	11.99	352°52.35	32.04	218°42.23	54.89	322°39.89	11.94	Rigel	281°2.89 -8°10.42
12	340°17.66	344°16.60	S03°10.72	7°52.93	S12°31.34	233°44.77	N22°54.90	337°42.08	S01°11.82	Capella	280°20.39 46°1.59
13	355°20.13	359°16.21	9.44	22°53.51	30.65	248°47.31	54.91	352°44.27	11.70	Bellatrix	278°21.78 6°22.34
14	10°22.59	14°15.83	8.17	37°54.08	29.95	263°49.84	54.92	7°46.46	11.58	Elnath	278°0.58 28°37.81
15	25°25.05	29°15.45	· · 6.90	52°54.66	· · 29.26	278°52.38	· · 54.94	22°48.65	· · 11.46	Alnilam	275°36.67 -1°11.22
16	40°27.52	44°15.07	5.62	67°55.24	28.56	293°54.92	54.95	37°50.84	11.34	Betelgeuse	270°50.94 7°24.65
17	55°29.98	59°14.69	4.35	82°55.81	27.87	308°57.46	54.96	52°53.03	11.22	Canopus	263°51.74 -52°42.81
18	70°32.45	74°14.31	S03°3.07	97°56.39	S12°27.17	324°0.00	N22°54.97	67°55.22	S01°11.10	Sirius	258°25.22 -16°45.30
19	85°34.91	89°13.93	1.79	112°56.97	26.48	339°2.54	54.98	82°57.40	10.98	Adhara	255°4.91 -29°0.66
20	100°37.37	104°13.55	03°0.52	127°57.55	25.78	354°5.07	54.99	97°59.59	10.86	Procyon	244°49.61 5°9.36
21	115°39.84	119°13.17	02°59.24	142°58.12	· · 25.09	9°7.61	· · 55.00	113°1.78	· · 10.74	Pollux	243°15.87 27°57.75
22	130°42.30	134°12.79	57.97	157°58.70	24.39	24°10.15	55.01	128°3.97	10.61	Avior	234°13.86 -59°35.78
23	145°44.77	149°12.41	56.69	172°59.28	23.69	39°12.68	55.02	143°6.16	10.49	Suhail	222°45.22 -43°32.47
Mer.pass. 13:19		ν-0.4' d-1.3' m-3.92		ν0.6' d-0.7' m1.14		ν2.5' d0.0' m-2.43		ν2.2' d-0.1' m0.99		Miaplacidus	221°37.28 -69°49.61
										Alphard	217°46.51 -8°46.48
										Regulus	207°33.09 11°50.21
										Dubhe	193°39.14 61°36.46
										Denebola	182°23.65 14°25.35
										Gienah	175°42.30 -17°41.37
										Acrux	172°58.43 -63°14.63
										Gacrux	171°50.08 -57°15.58
										Alioth	166°11.62 55°48.79
										Spica	158°21.04 -11°18.01
										Alkaid	152°50.89 49°10.63
										Hadar	148°34.25 -60°29.84
										Menkent	147°56.24 -36°29.92
										Arcturus	145°46.82 19°2.50
										Rigel Kent.	139°38.64 -60°56.47
										Kochab	137°19.23 74°2.46
										Zuben'ubi	136°54.80 -16°9.12
										Alphecca	126°2.82 26°37.28
										Antares	112°14.63 -26°29.40
										Atria	107°8.05 -69°4.21
										Sabik	102°1.72 -15°45.50
										Shaula	96°9.15 -37°7.28
										Rasalhague	95°57.73 12°32.22
										Eltanin	90°41.89 51°28.74
										Kaus Aust.	83°31.40 -34°22.27
										Vega	80°32.77 38°48.15
										Nunki	75°46.76 -26°15.84
										Altair	61°59.25 8°56.08
										Peacock	53°4.67 -56°38.94
										Deneb	49°25.55 45°22.21
										Enif	33°38.16 9°59.58
										Al Na'ir	27°32.14 -46°50.07
										Fomalhaut	15°13.81 -29°29.10
										Scheat	13°44.63 28°13.42
										Markab	13°29.27 15°20.69
Mar 02 Mon			SHA	Mer.pass							
Venus			4°33.10	13:03							
Mars			27°57.94	11:28							
Jupiter			253°26.17	20:24							
Saturn			357°27.70	13:29							
Mar 03 Tue			SHA	Mer.pass							
Venus			3°24.80	13:04							
Mars			27°12.63	11:28							
Jupiter			253°27.99	20:20							
Saturn			357°21.12	13:25							
Mar 04 Wed			SHA	Mer.pass							
Venus			2°16.59	13:04							
Mars			26°27.41	11:27							
Jupiter			253°29.60	20:16							
Saturn			357°14.52	13:22							
Horizontal parallax											
Venus: 0.1											
Mars: 0.1											
Mer.pass. 13:11		ν-0.4' d-1.3' m-3.92		ν0.6' d-0.7' m1.15		ν2.5' d0.0' m-2.42		ν2.2' d-0.1' m0.98			


h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°57.11	S07°17.11	14°4.71	11.1'	N15°16.56	-14.1'	58.0'
1	191°57.24	16.16	28°34.83	11.2'	15°2.44	-14.2'	58.0'
2	206°57.36	15.20	43°5.05	11.3'	14°48.25	-14.3'	58.0'
3	221°57.49	· · 14.25	57°35.35	11.4'	14°34.00	-14.3'	58.0'
4	236°57.61	13.30	72°5.74	11.5'	14°19.68	-14.4'	57.9'
5	251°57.74	12.34	86°36.23	11.6'	14°5.30	-14.4'	57.9'
6	266°57.87	S07°11.39	101°6.80	11.7'	N13°50.86	-14.5'	57.9'
7	281°57.99	10.43	115°37.46	11.7'	13°36.36	-14.6'	57.9'
8	296°58.12	9.48	130°8.21	11.8'	13°21.81	-14.6'	57.9'
9	311°58.25	· · 8.52	144°39.04	11.9'	13°7.20	-14.7'	57.8'
10	326°58.38	7.57	159°9.96	12.0'	12°52.53	-14.7'	57.8'
11	341°58.50	6.61	173°40.96	12.1'	12°37.81	-14.8'	57.8'
12	356°58.63	S07°5.66	188°12.04	12.2'	N12°23.04	-14.8'	57.8'
13	11°58.76	4.70	202°43.21	12.2'	12°8.23	-14.9'	57.8'
14	26°58.89	3.75	217°14.45	12.3'	11°53.36	-14.9'	57.7'
15	41°59.02	· · 2.79	231°45.78	12.4'	11°38.45	-15.0'	57.7'
16	56°59.15	1.84	246°17.18	12.5'	11°23.49	-15.0'	57.7'
17	71°59.28	07°0.88	260°48.66	12.6'	11°8.50	-15.0'	57.7'
18	86°59.40	S06°59.93	275°20.22	12.6'	N10°53.45	-15.1'	57.6'
19	101°59.53	58.97	289°51.85	12.7'	10°38.37	-15.1'	57.6'
20	116°59.66	58.01	304°23.56	12.8'	10°23.25	-15.2'	57.6'
21	131°59.79	· · 57.06	318°55.34	12.9'	10°8.10	-15.2'	57.6'
22	146°59.92	56.10	333°27.19	12.9'	09°52.91	-15.2'	57.6'
23	162°0.05	55.14	347°59.11	13.0'	09°37.68	-15.3'	57.5'
SD = 16.1'		$d = -1.0'$	SD = 15.8'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°0.18	S06°54.18	2°31.10	13.1'	N09°22.42	-15.3'	57.5'
1	192°0.31	53.23	17°3.16	13.1'	09°7.13	-15.3'	57.5'
2	207°0.45	52.27	31°35.29	13.2'	08°51.81	-15.3'	57.5'
3	222°0.58	· · 51.31	46°7.48	13.3'	08°36.46	-15.4'	57.4'
4	237°0.71	50.35	60°39.74	13.3'	08°21.09	-15.4'	57.4'
5	252°0.84	49.40	75°12.07	13.4'	08°5.69	-15.4'	57.4'
6	267°0.97	S06°48.44	89°44.45	13.4'	N07°50.26	-15.4'	57.4'
7	282°1.10	47.48	104°16.90	13.5'	07°34.81	-15.5'	57.3'
8	297°1.24	46.52	118°49.41	13.6'	07°19.34	-15.5'	57.3'
9	312°1.37	· · 45.56	133°21.98	13.6'	07°3.85	-15.5'	57.3'
10	327°1.50	44.60	147°54.61	13.7'	06°48.35	-15.5'	57.3'
11	342°1.63	43.64	162°27.29	13.7'	06°32.82	-15.5'	57.3'
12	357°1.77	S06°42.69	177°0.03	13.8'	N06°17.28	-15.6'	57.2'
13	12°1.90	41.73	191°32.83	13.8'	06°1.72	-15.6'	57.2'
14	27°2.03	40.77	206°5.68	13.9'	05°46.15	-15.6'	57.2'
15	42°2.17	· · 39.81	220°38.58	14.0'	05°30.57	-15.6'	57.2'
16	57°2.30	38.85	235°11.53	14.0'	05°14.98	-15.6'	57.1'
17	72°2.43	37.89	249°44.54	14.1'	04°59.38	-15.6'	57.1'
18	87°2.57	S06°36.93	264°17.59	14.1'	N04°43.77	-15.6'	57.1'
19	102°2.70	35.97	278°50.69	14.1'	04°28.15	-15.6'	57.1'
20	117°2.84	35.01	293°23.84	14.2'	04°12.53	-15.6'	57.0'
21	132°2.97	· · 34.05	307°57.03	14.2'	03°56.91	-15.6'	57.0'
22	147°3.11	33.09	322°30.27	14.3'	03°41.28	-15.6'	57.0'
23	162°3.24	32.12	337°3.55	14.3'	03°25.65	-15.6'	57.0'
SD = 16.1'		$d = -1.0'$	SD = 15.7'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°3.38	S06°31.16	351°36.87	14.4'	N03°10.01	-15.6'	56.9'
1	192°3.51	30.20	6°10.23	14.4'	02°54.38	-15.6'	56.9'
2	207°3.65	29.24	20°43.64	14.4'	02°38.75	-15.6'	56.9'
3	222°3.78	· · 28.28	35°17.08	14.5'	02°23.13	-15.6'	56.9'
4	237°3.92	27.32	49°50.56	14.5'	02°7.50	-15.6'	56.8'
5	252°4.06	26.36	64°24.07	14.6'	01°51.89	-15.6'	56.8'
6	267°4.19	S06°25.39	78°57.63	14.6'	N01°36.28	-15.6'	56.8'
7	282°4.33	24.43	93°31.21	14.6'	01°20.67	-15.6'	56.8'
8	297°4.47	23.47	108°4.83	14.7'	01°5.08	-15.6'	56.7'
9	312°4.60	· · 22.51	122°38.48	14.7'	00°49.50	-15.6'	56.7'
10	327°4.74	21.54	137°12.16	14.7'	00°33.92	-15.6'	56.7'
11	342°4.88	20.58	151°45.87	14.7'	00°18.36	-15.5'	56.7'
12	357°5.02	S06°19.62	166°19.61	14.8'	N00°2.81	-15.5'	56.6'
13	12°5.15	18.65	180°53.38	14.8'	S00°12.72	15.5'	56.6'
14	27°5.29	17.69	195°27.17	14.8'	00°28.24	15.5'	56.6'
15	42°5.43	· · 16.73	210°0.98	14.8'	00°43.74	15.5'	56.5'
16	57°5.57	15.76	224°34.83	14.9'	00°59.22	15.5'	56.5'
17	72°5.71	14.80	239°8.69	14.9'	01°14.68	15.4'	56.5'
18	87°5.85	S06°13.84	253°42.58	14.9'	S01°30.13	15.4'	56.5'
19	102°5.98	12.87	268°16.48	14.9'	01°45.55	15.4'	56.4'
20	117°6.12	11.91	282°50.41	14.9'	02°0.95	15.4'	56.4'
21	132°6.26	· · 10.94	297°24.35	15.0'	02°16.33	15.4'	56.4'
22	147°6.40	9.98	311°58.31	15.0'	02°31.68	15.3'	56.4'
23	162°6.54	9.02	326°32.29	15.0'	02°47.01	15.3'	56.3'
SD = 16.1'		$d = -1.0'$	SD = 15.5'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	13-15
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	97-100%
02	12:12	12:05	12:12	23:50	11:26	
03	11:59	11:53	12:12	—:—	12:12	
04	11:46	11:40	12:12	00:35	12:56	

March 05, 06, 07 UT (Thu., Fri., Sat.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	162°45.50	163°53.97	S01°54.01	188°27.79	S11°49.32	56°16.50	N22°55.47	159°53.41	S01°4.55					Alpheratz	357°34.13	29°14.08		
1	177°47.97	178°53.59	52.73	203°28.38	48.61	71°19.02	55.48	174°55.59	4.43					Ankaa	353°6.57	-42°9.95		
2	192°50.43	193°53.22	51.45	218°28.97	47.90	86°21.54	55.48	189°57.78	4.31					Schedar	349°30.48	56°40.95		
3	207°52.90	208°52.85	•• 50.16	233°29.55	•• 47.20	101°24.05	•• 55.49	204°59.97	•• 4.19					Diphda	348°46.62	-17°50.70		
4	222°55.36	223°52.48	48.88	248°30.14	46.49	116°26.57	55.50	220°2.16	4.07					Achernar	335°19.88	-57°6.41		
5	237°57.82	238°52.10	47.60	263°30.73	45.78	131°29.09	55.51	235°4.34	3.95					Hamal	327°50.34	23°35.19		
6	253°0.29	253°51.73	S01°46.32	278°31.31	S11°45.08	146°31.60	N22°55.52	250°6.53	S01°3.83					Polaris	313°46.34	89°22.75		
7	268°2.75	268°51.36	45.03	293°31.90	44.37	161°34.12	55.52	265°8.72	3.70					Acamar	315°11.23	-40°12.20		
8	283°5.22	283°50.99	43.75	308°32.49	43.66	176°36.63	55.53	280°10.90	3.58					Menkar	314°5.28	4°11.48		
9	298°7.68	298°50.61	•• 42.47	323°33.07	•• 42.95	191°39.15	•• 55.54	295°13.09	•• 3.46					Mirfak	308°27.06	49°57.41		
10	313°10.14	313°50.24	41.19	338°33.66	42.24	206°41.66	55.55	310°15.28	3.34					Aldebaran	290°38.54	16°33.71		
11	328°12.61	328°49.87	39.90	353°34.25	41.53	221°44.18	55.56	325°17.47	3.22					Rigel	281°2.91	-8°10.42		
12	343°15.07	343°49.50	S01°38.62	8°34.84	S11°40.83	236°46.69	N22°55.56	340°19.65	S01°3.10					Capella	280°20.42	46°1.59		
13	358°17.54	358°49.13	37.34	23°35.43	40.12	251°49.20	55.57	355°21.84	2.97					Bellatrix	278°21.80	6°22.34		
14	13°20.00	13°48.76	36.05	38°36.01	39.41	266°51.72	55.58	10°24.03	2.85					Elnath	278°0.60	28°37.81		
15	28°22.46	28°48.39	•• 34.77	53°36.60	•• 38.70	281°54.23	•• 55.59	25°26.21	•• 2.73					Alnilam	275°36.69	-1°11.22		
16	43°24.93	43°48.02	33.49	68°37.19	37.99	296°56.74	55.59	40°28.40	2.61					Betelgeuse	270°50.96	7°24.65		
17	58°27.39	58°47.64	32.20	83°37.78	37.28	311°59.25	55.60	55°30.59	2.49					Canopus	263°51.77	-52°42.82		
18	73°29.86	73°47.27	S01°30.92	98°38.37	S11°36.57	327°1.77	N22°55.61	70°32.78	S01°2.37					Sirius	258°25.24	-16°45.30		
19	88°32.32	88°46.90	29.64	113°38.96	35.86	342°4.28	55.62	85°34.96	2.24					Adhara	255°4.92	-29°0.67		
20	103°34.78	103°46.53	28.35	128°39.55	35.15	357°6.79	55.62	100°37.15	2.12					Procyon	244°49.62	5°9.36		
21	118°37.25	118°46.16	•• 27.07	143°40.13	•• 34.44	12°9.30	•• 55.63	115°39.34	•• 2.00					Pollux	243°15.88	27°57.75		
22	133°39.71	133°45.79	25.78	158°40.72	33.73	27°11.81	55.64	130°41.52	1.88					Avior	234°13.88	-59°35.80		
23	148°42.18	148°45.42	24.50	173°41.31	33.02	42°14.32	55.65	145°43.71	1.76					Suhail	222°45.23	-43°32.48		
Mer.pass. 13:07			ν-0.4' d-1.3' m-3.92			ν0.6' d-0.7' m1.15			ν2.5' d0.0' m-2.41			ν2.2' d-0.1' m0.98						
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	163°44.64	163°45.05	S01°23.22	188°41.90	S11°32.31	57°16.83	N22°55.65	160°45.90	S01°1.64					Miaplacidus	221°37.30	-69°49.62		
1	178°47.10	178°44.68	21.93	203°42.49	31.60	72°19.34	55.66	175°48.08	1.51					Alphard	217°46.52	-8°46.49		
2	193°49.57	193°44.31	20.65	218°43.08	30.88	87°21.85	55.67	190°50.27	1.39					Regulus	207°33.10	11°50.21		
3	208°52.03	208°43.94	•• 19.36	233°43.67	•• 30.17	102°24.35	•• 55.67	205°52.46	•• 1.27					Dubhe	193°39.13	61°36.47		
4	223°54.50	223°43.57	18.08	248°44.26	29.46	117°26.86	55.68	220°54.64	1.15					Denebola	182°23.64	14°25.35		
5	238°56.96	238°43.20	16.79	263°44.85	28.75	132°29.37	55.69	235°56.83	1.03					Gienah	175°42.29	-17°41.37		
6	253°59.42	253°42.83	S01°15.51	278°45.44	S11°28.04	147°31.88	N22°55.70	250°59.02	S01°0.90					Acrux	172°58.42	-63°14.64		
7	269°1.89	268°42.46	14.22	293°46.04	27.32	162°34.38	55.70	266°1.20	0.78					Gacrux	171°50.07	-57°15.59		
8	284°4.35	283°42.09	12.94	308°46.63	26.61	177°36.89	55.71	281°3.39	0.66					Alioth	166°11.61	55°48.80		
9	299°6.82	298°41.72	•• 11.66	323°47.22	•• 25.90	192°39.40	•• 55.72	296°5.58	•• 0.54					Spica	158°21.03	-11°18.02		
10	314°9.28	313°41.35	10.37	338°47.81	25.19	207°41.90	55.72	311°7.76	0.42					Alkaid	152°50.87	49°10.64		
11	329°11.74	328°40.98	9.09	353°48.40	24.47	222°44.41	55.73	326°9.95	0.30					Hadar	148°34.23	-60°29.85		
12	344°14.21	343°40.62	S01°7.80	8°48.99	S11°23.76	237°46.91	N22°55.74	341°12.13	S01°0.17					Menkent	147°56.23	-36°29.93		
13	359°16.67	358°40.25	6.52	23°49.58	23.05	252°49.42	55.74	356°14.32	01°0.05					Arcturus	145°46.81	19°2.50		
14	14°19.14	13°39.88	5.23	38°50.18	22.33	267°51.92	55.75	11°16.51	00°59.93					Rigel Kent.	139°38.61	-60°56.49		
15	29°21.60	28°39.51	•• 3.94	53°50.77	•• 21.62	282°54.42	•• 55.76	26°18.69	•• 59.81					Kochab	137°19.17	74°2.47		
16	44°24.07	43°39.14	2.66	68°51.36	20.90	297°56.93	55.76	41°20.88	59.69					Zuben'ubi	136°54.78	-16°9.13		
17	59°26.53	58°38.77	1.37	83°51.95	20.19	312°59.43	55.77	56°23.07	59.56					Alphecca	126°2.80	26°37.28		
18	74°28.99	73°38.40	S01°0.09	98°52.54	S11°19.48	328°1.93	N22°55.78	71°25.25	S00°59.44					Antares	112°14.62	-26°29.40		
19	89°31.46	88°38.04	00°58.80	113°53.14	18.76	343°4.44	55.78	86°27.44	59.32					Atria	107°8.00	-69°4.21		
20	104°33.92	103°37.67	57.52	128°53.73	18.05	358°6.94	55.79	101°29.62	59.20					Sabik	102°1.70	-15°45.50		
21	119°36.39	118°37.30	•• 56.23	143°54.32	•• 17.33	13°9.44	•• 55.80	116°31.81	•• 59.08					Shaula	96°9.13	-37°7.29		
22	134°38.85	133°36.93	54.95	158°54.92	16.62	28°11.94	55.80	131°33.99	58.95					Rasalhague	95°57.71	12°32.22		
23	149°41.31	148°36.56	53.66	173°55.51	15.90	43°14.44	55.81	146°36.18	58.83					Eltanin	90°41.87	51°28.73		
Mer.pass. 13:03			ν-0.4' d-1.3' m-3.92			ν0.6' d-0.7' m1.15			ν2.5' d0.0' m-2.40			ν2.2' d-0.1' m0.98						
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	164°43.78	163°36.20	S00°52.37	188°56.10	S11°15.18	58°16.94	N22°55.81	161°38.37	S00°58.71					Kaus Aust.	83°31.38	-34°22.27		
1	179°46.24	178°35.83	51.09	203°56.70	14.47	73°19.44	55.82	176°40.55	58.59					Vega	80°32.75	38°48.14		
2	194°48.71	193°35.46	49.80	218°57.29	13.75	88°21.94	55.83	191°42.74	58.47					Nunki	75°46.74	-26°15.84		
3	209°51.17	208°35.09	•• 48.52	233°57.88	•• 13.04	103°24.44	•• 55.83	206°44.92	•• 58.34					Altair	61°59.24	8°56.07		
4	224°53.63	223°34.72	47.23	248°58.48	12.32	118°26.94	55.84	221°47.11	58.22									

h	Sun			Moon				
Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	177°6.68	S06°8.05		341°6.28	15.0'	S03°2.31	15.3'	56.3'
1	192°6.82	7.09		355°40.29	15.0'	03°17.59	15.2'	56.3'
2	207°6.96	6.12		10°14.31	15.0'	03°32.83	15.2'	56.3'
3	222°7.10	· · 5.16		24°48.34	15.0'	03°48.05	15.2'	56.2'
4	237°7.24	4.19		39°22.38	15.1'	04°3.24	15.2'	56.2'
5	252°7.38	3.22		53°56.43	15.1'	04°18.39	15.1'	56.2'
6	267°7.53	S06°2.26		68°30.49	15.1'	S04°33.52	15.1'	56.2'
7	282°7.67	1.29		83°4.56	15.1'	04°48.61	15.1'	56.1'
8	297°7.81	06°0.33		97°38.63	15.1'	05°3.66	15.0'	56.1'
9	312°7.95	05°59.36		112°12.71	15.1'	05°18.68	15.0'	56.1'
10	327°8.09	58.39		126°46.80	15.1'	05°33.67	14.9'	56.1'
11	342°8.23	57.43		141°20.88	15.1'	05°48.62	14.9'	56.0'
12	357°8.38	S05°56.46		155°54.97	15.1'	S06°3.52	14.9'	56.0'
13	12°8.52	55.50		170°29.06	15.1'	06°18.40	14.8'	56.0'
14	27°8.66	54.53		185°3.16	15.1'	06°33.23	14.8'	56.0'
15	42°8.80	· · 53.56		199°37.25	15.1'	06°48.02	14.7'	55.9'
16	57°8.95	52.59		214°11.34	15.1'	07°2.76	14.7'	55.9'
17	72°9.09	51.63		228°45.42	15.1'	07°17.47	14.7'	55.9'
18	87°9.23	S05°50.66		243°19.50	15.1'	S07°32.13	14.6'	55.9'
19	102°9.38	49.69		257°53.58	15.1'	07°46.75	14.6'	55.8'
20	117°9.52	48.72		272°27.65	15.1'	08°1.32	14.5'	55.8'
21	132°9.66	· · 47.76		287°1.72	15.1'	08°15.84	14.5'	55.8'
22	147°9.81	46.79		301°35.78	15.0'	08°30.32	14.4'	55.8'
23	162°9.95	45.82		316°9.83	15.0'	08°44.75	14.4'	55.7'
SD = 16.1'			$d = -1.0'$	SD = 15.4'				

Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	177°10.10	S05°44.85		330°43.87	15.0'	S08°59.13	14.3'	55.7'
1	192°10.24	43.88		345°17.89	15.0'	09°13.46	14.3'	55.7'
2	207°10.39	42.92		359°51.91	15.0'	09°27.74	14.2'	55.7'
3	222°10.53	· · 41.95		14°25.92	15.0'	09°41.97	14.2'	55.6'
4	237°10.68	40.98		28°59.91	15.0'	09°56.14	14.1'	55.6'
5	252°10.82	40.01		43°33.89	15.0'	10°10.26	14.1'	55.6'
6	267°10.97	S05°39.04		58°7.85	14.9'	S10°24.33	14.0'	55.6'
7	282°11.11	38.07		72°41.80	14.9'	10°38.34	14.0'	55.5'
8	297°11.26	37.10		87°15.72	14.9'	10°52.30	13.9'	55.5'
9	312°11.40	· · 36.13		101°49.64	14.9'	11°6.20	13.8'	55.5'
10	327°11.55	35.16		116°23.53	14.9'	11°20.04	13.8'	55.5'
11	342°11.70	34.19		130°57.40	14.9'	11°33.82	13.7'	55.5'
12	357°11.84	S05°33.22		145°31.25	14.8'	S11°47.55	13.7'	55.4'
13	12°11.99	32.25		160°5.08	14.8'	12°1.21	13.6'	55.4'
14	27°12.13	31.28		174°38.89	14.8'	12°14.81	13.5'	55.4'
15	42°12.28	· · 30.31		189°12.68	14.8'	12°28.35	13.5'	55.4'
16	57°12.43	29.34		203°46.44	14.7'	12°41.83	13.4'	55.3'
17	72°12.58	28.37		218°20.18	14.7'	12°55.24	13.3'	55.3'
18	87°12.72	S05°27.40		232°53.89	14.7'	S13°8.59	13.3'	55.3'
19	102°12.87	26.43		247°27.57	14.7'	13°21.88	13.2'	55.3'
20	117°13.02	25.46		262°1.23	14.6'	13°35.10	13.2'	55.2'
21	132°13.17	· · 24.49		276°34.86	14.6'	13°48.25	13.1'	55.2'
22	147°13.32	23.52		291°8.46	14.6'	14°1.33	13.0'	55.2'
23	162°13.46	22.55		305°42.03	14.5'	14°14.35	12.9'	55.2'
SD = 16.1'			$d = -1.0'$	SD = 15.2'				

Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	177°13.61	S05°21.58		320°15.57	14.5'	S14°27.29	12.9'	55.2'
1	192°13.76	20.60		334°49.08	14.5'	14°40.17	12.8'	55.1'
2	207°13.91	19.63		349°22.56	14.4'	14°52.98	12.7'	55.1'
3	222°14.06	· · 18.66		3°56.00	14.4'	15°5.71	12.7'	55.1'
4	237°14.21	17.69		18°29.41	14.4'	15°18.37	12.6'	55.1'
5	252°14.36	16.72		33°2.79	14.3'	15°30.96	12.5'	55.1'
6	267°14.51	S05°15.74		47°36.13	14.3'	S15°43.47	12.4'	55.0'
7	282°14.66	14.77		62°9.44	14.3'	15°55.91	12.4'	55.0'
8	297°14.81	13.80		76°42.71	14.2'	16°8.28	12.3'	55.0'
9	312°14.96	· · 12.83		91°15.94	14.2'	16°20.56	12.2'	55.0'
10	327°15.11	11.85		105°49.14	14.2'	16°32.77	12.1'	55.0'
11	342°15.26	10.88		120°22.30	14.1'	16°44.91	12.1'	54.9'
12	357°15.41	S05°9.91		134°55.42	14.1'	S16°56.96	12.0'	54.9'
13	12°15.56	8.94		149°28.50	14.0'	17°8.93	11.9'	54.9'
14	27°15.71	7.96		164°1.54	14.0'	17°20.83	11.8'	54.9'
15	42°15.86	· · 6.99		178°34.54	14.0'	17°32.64	11.7'	54.9'
16	57°16.01	6.02		193°7.50	13.9'	17°44.37	11.6'	54.8'
17	72°16.16	5.04		207°40.41	13.9'	17°56.02	11.6'	54.8'
18	87°16.31	S05°4.07		222°13.29	13.8'	S18°7.59	11.5'	54.8'
19	102°16.46	3.10		236°46.12	13.8'	18°19.07	11.4'	54.8'
20	117°16.62	2.12		251°18.90	13.7'	18°30.46	11.3'	54.8'
21	132°16.77	· · 1.15		265°51.65	13.7'	18°41.77	11.2'	54.8'
22	147°16.92	05°0.17		280°24.35	13.7'	18°53.00	11.1'	54.7'
23	162°17.07	04°59.20		294°57.00	13.6'	19°4.14	11.0'	54.7'
SD = 16.1'			$d = -1.0'$	SD = 15.0'				

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

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

h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°17.22	S04°58.22	309°29.61	13.6'	S19°15.19	11.0'	54.7'
1	192°17.38	57.25	324°2.17	13.5'	19°26.15	10.9'	54.7'
2	207°17.53	56.28	338°34.69	13.5'	19°37.02	10.8'	54.7'
3	222°17.68	· · 55.30	353°7.16	13.4'	19°47.80	10.7'	54.7'
4	237°17.84	54.33	7°39.58	13.4'	19°58.49	10.6'	54.6'
5	252°17.99	53.35	22°11.95	13.3'	20°9.09	10.5'	54.6'
6	267°18.14	S04°52.38	36°44.28	13.3'	S20°19.60	10.4'	54.6'
7	282°18.30	51.40	51°16.55	13.2'	20°30.02	10.3'	54.6'
8	297°18.45	50.43	65°48.78	13.2'	20°40.34	10.2'	54.6'
9	312°18.60	· · 49.45	80°20.96	13.1'	20°50.56	10.1'	54.6'
10	327°18.76	48.48	94°53.09	13.1'	21°0.69	10.0'	54.5'
11	342°18.91	47.50	109°25.17	13.0'	21°10.73	9.9'	54.5'
12	357°19.06	S04°46.52	123°57.20	13.0'	S21°20.67	9.8'	54.5'
13	12°19.22	45.55	138°29.18	12.9'	21°30.51	9.7'	54.5'
14	27°19.37	44.57	153°1.11	12.9'	21°40.25	9.6'	54.5'
15	42°19.53	· · 43.60	167°32.98	12.8'	21°49.89	9.5'	54.5'
16	57°19.68	42.62	182°4.81	12.8'	21°59.44	9.4'	54.5'
17	72°19.84	41.64	196°36.58	12.7'	22°8.88	9.3'	54.5'
18	87°19.99	S04°40.67	211°8.30	12.7'	S22°18.23	9.2'	54.4'
19	102°20.15	39.69	225°39.98	12.6'	22°27.47	9.1'	54.4'
20	117°20.30	38.71	240°11.59	12.6'	22°36.61	9.0'	54.4'
21	132°20.46	· · 37.74	254°43.16	12.5'	22°45.64	8.9'	54.4'
22	147°20.62	36.76	269°14.67	12.5'	22°54.58	8.8'	54.4'
23	162°20.77	35.78	283°46.14	12.4'	23°3.40	8.7'	54.4'
SD = 16.1'		$d = -1.0'$	SD = 14.9'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°20.93	S04°34.81	298°17.55	12.4'	S23°12.13	8.6'	54.4'
1	192°21.08	33.83	312°48.90	12.3'	23°20.74	8.5'	54.4'
2	207°21.24	32.85	327°20.21	12.3'	23°29.25	8.4'	54.3'
3	222°21.40	· · 31.88	341°51.46	12.2'	23°37.66	8.3'	54.3'
4	237°21.55	30.90	356°22.66	12.1'	23°45.95	8.2'	54.3'
5	252°21.71	29.92	10°53.80	12.1'	23°54.14	8.1'	54.3'
6	267°21.87	S04°28.94	25°24.90	12.0'	S24°2.22	8.0'	54.3'
7	282°22.02	27.96	39°55.94	12.0'	24°10.18	7.9'	54.3'
8	297°22.18	26.99	54°26.92	11.9'	24°18.04	7.7'	54.3'
9	312°22.34	· · 26.01	68°57.86	11.9'	24°25.79	7.6'	54.3'
10	327°22.50	25.03	83°28.74	11.8'	24°33.42	7.5'	54.3'
11	342°22.65	24.05	97°59.58	11.8'	24°40.94	7.4'	54.3'
12	357°22.81	S04°23.07	112°30.35	11.7'	S24°48.35	7.3'	54.3'
13	12°22.97	22.10	127°1.08	11.7'	24°55.64	7.2'	54.3'
14	27°23.13	21.12	141°31.76	11.6'	25°2.82	7.1'	54.2'
15	42°23.29	· · 20.14	156°2.38	11.6'	25°9.88	6.9'	54.2'
16	57°23.45	19.16	170°32.95	11.5'	25°16.83	6.8'	54.2'
17	72°23.60	18.18	185°3.47	11.5'	25°23.66	6.7'	54.2'
18	87°23.76	S04°17.20	199°33.94	11.4'	S25°30.38	6.6'	54.2'
19	102°23.92	16.22	214°4.36	11.4'	25°36.98	6.5'	54.2'
20	117°24.08	15.25	228°34.73	11.3'	25°43.45	6.4'	54.2'
21	132°24.24	· · 14.27	243°5.05	11.3'	25°49.81	6.2'	54.2'
22	147°24.40	13.29	257°35.32	11.2'	25°56.05	6.1'	54.2'
23	162°24.56	12.31	272°5.55	11.2'	26°2.17	6.0'	54.2'
SD = 16.1'		$d = -1.0'$	SD = 14.8'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°24.72	S04°11.33	286°35.72	11.1'	S26°8.17	5.9'	54.2'
1	192°24.88	10.35	301°5.84	11.1'	26°14.05	5.8'	54.2'
2	207°25.04	9.37	315°35.92	11.0'	26°19.80	5.6'	54.2'
3	222°25.20	· · 8.39	330°5.95	11.0'	26°25.44	5.5'	54.2'
4	237°25.36	7.41	344°35.93	10.9'	26°30.95	5.4'	54.2'
5	252°25.52	6.43	359°5.86	10.9'	26°36.33	5.3'	54.2'
6	267°25.68	S04°5.45	13°35.75	10.8'	S26°41.60	5.1'	54.2'
7	282°25.84	4.47	28°5.59	10.8'	26°46.73	5.0'	54.2'
8	297°26.00	3.49	42°35.39	10.8'	26°51.75	4.9'	54.2'
9	312°26.16	· · 2.51	57°5.15	10.7'	26°56.63	4.8'	54.2'
10	327°26.32	1.53	71°34.86	10.7'	27°1.39	4.6'	54.2'
11	342°26.48	04°0.55	86°4.52	10.6'	27°6.03	4.5'	54.2'
12	357°26.64	S03°59.57	100°34.15	10.6'	S27°10.53	4.4'	54.2'
13	12°26.80	58.59	115°3.73	10.5'	27°14.91	4.2'	54.2'
14	27°26.97	57.61	129°33.27	10.5'	27°19.16	4.1'	54.2'
15	42°27.13	· · 56.63	144°2.77	10.5'	27°23.28	4.0'	54.2'
16	57°27.29	55.64	158°32.23	10.4'	27°27.27	3.9'	54.2'
17	72°27.45	54.66	173°1.65	10.4'	27°31.14	3.7'	54.2'
18	87°27.61	S03°53.68	187°31.04	10.3'	S27°34.87	3.6'	54.2'
19	102°27.78	52.70	202°0.38	10.3'	27°38.47	3.5'	54.2'
20	117°27.94	51.72	216°29.69	10.3'	27°41.94	3.3'	54.2'
21	132°28.10	· · 50.74	230°58.96	10.2'	27°45.28	3.2'	54.2'
22	147°28.26	49.76	245°28.20	10.2'	27°48.48	3.1'	54.2'
23	162°28.43	48.78	259°57.40	10.2'	27°51.56	2.9'	54.2'
SD = 16.1'		$d = -1.0'$	SD = 14.8'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 19-21 80-63%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
08	10:51	10:44	12:11	03:28	15:51	
09	10:36	10:29	12:10	04:15	16:39	
10	10:21	10:13	12:10	05:04	17:29	

March 11, 12, 13 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	168°40.33		163°1.17	N01°11.21	189°53.78	S10°5.66	62°15.29	N22°56.23	165°8.05	S00°46.96	Alpheratz	357°34.12 29°14.06
1	183°42.80		178°0.80	12.50	204°54.39	4.93	77°17.75	56.23	180°10.23	46.84	Ankaa	353°6.57 -42°9.93
2	198°45.26		193°0.44	13.78	219°55.00	4.20	92°20.22	56.23	195°12.42	46.71	Schedar	349°30.48 56°40.92
3	213°47.72		208°0.08	•• 15.07	234°55.61	•• 3.46	107°22.68	•• 56.23	210°14.60	•• 46.59	Diphda	348°46.62 -17°50.69
4	228°50.19		222°59.71	16.36	249°56.21	2.73	122°25.15	56.24	225°16.78	46.47	Achernar	335°19.91 -57°6.39
5	243°52.65		237°59.35	17.65	264°56.82	2.00	137°27.61	56.24	240°18.96	46.34	Hamal	327°50.35 23°35.18
6	258°55.12		252°58.99	N01°18.93	279°57.43	S10°1.26	152°30.07	N22°56.24	255°21.15	S00°46.22	Polaris	313°48.58 89°22.73
7	273°57.58		267°58.62	20.22	294°58.04	10°0.53	167°32.54	56.24	270°23.33	46.10	Acamar	315°11.26 -40°12.18
8	289°0.05		282°58.26	21.51	309°58.65	09°59.80	182°35.00	56.25	285°25.51	45.98	Menkar	314°5.30 4°11.48
9	304°2.51		297°57.90	•• 22.80	324°59.26	•• 59.06	197°37.46	•• 56.25	300°27.69	•• 45.85	Mirfak	308°27.09 49°57.40
10	319°4.97		312°57.54	24.08	339°59.87	58.33	212°39.92	56.25	315°29.88	45.73	Aldebaran	290°38.56 16°33.70
11	334°7.44		327°57.17	25.37	355°0.48	57.60	227°42.38	56.25	330°32.06	45.61	Rigel	281°2.93 -8°10.42
12	349°9.90		342°56.81	N01°26.66	10°1.09	S09°56.86	242°44.84	N22°56.25	345°34.24	S00°45.48	Capella	280°20.45 46°1.59
13	4°12.37		357°56.45	27.94	25°1.70	56.13	257°47.30	56.26	0°36.42	45.36	Bellatrix	278°21.82 6°22.33
14	19°14.83		12°56.08	29.23	40°2.31	55.39	272°49.76	56.26	15°38.60	45.24	Elnath	278°0.62 28°37.81
15	34°17.29		27°55.72	•• 30.52	55°2.92	•• 54.66	287°52.22	•• 56.26	30°40.79	•• 45.12	Alnilam	275°36.71 -1°11.22
16	49°19.76		42°55.36	31.81	70°3.53	53.92	302°54.68	56.26	45°42.97	44.99	Betelgeuse	270°50.98 7°24.64
17	64°22.22		57°54.99	33.09	85°4.14	53.19	317°57.14	56.26	60°45.15	44.87	Canopus	263°51.82 -52°42.83
18	79°24.69		72°54.63	N01°34.38	100°4.75	S09°52.45	332°59.60	N22°56.26	75°47.33	S00°44.75	Sirius	258°25.27 -16°45.31
19	94°27.15		87°54.27	35.67	115°5.36	51.72	348°2.06	56.27	90°49.52	44.62	Adhara	255°4.95 -29°0.68
20	109°29.62		102°53.90	36.95	130°5.97	50.98	3°4.52	56.27	105°51.70	44.50	Procyon	244°49.64 5°9.36
21	124°32.08		117°53.54	•• 38.24	145°6.58	•• 50.25	18°6.98	•• 56.27	120°53.88	•• 44.38	Pollux	243°15.90 27°57.76
22	139°34.54		132°53.18	39.53	160°7.19	49.51	33°9.43	56.27	135°56.06	44.26	Avior	234°13.92 -59°35.83
23	154°37.01		147°52.82	40.81	175°7.80	48.77	48°11.89	56.27	150°58.24	44.13	Suhail	222°45.25 -43°32.51
Mer.pass.	12:43		ν-0.4' d1.3' m-3.92		ν0.6' d-0.7' m1.15		ν2.5' d0.0' m-2.36		ν2.2' d-0.1' m0.96		Miaplacidus	221°37.35 -69°49.66
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Alphard	217°46.52 -8°46.50
0	169°39.47		162°52.45	N01°42.10	190°8.41	S09°48.04	63°14.35	N22°56.27	166°0.43	S00°44.01	Regulus	207°33.10 11°50.21
1	184°41.94		177°52.09	43.39	205°9.02	47.30	78°16.80	56.28	181°2.61	43.89	Dubhe	193°39.13 61°36.50
2	199°44.40		192°51.73	44.67	220°9.64	46.57	93°19.26	56.28	196°4.79	43.76	Denebola	182°23.63 14°25.36
3	214°46.86		207°51.36	•• 45.96	235°10.25	•• 45.83	108°21.71	•• 56.28	211°6.97	•• 43.64	Gienah	175°42.27 -17°41.39
4	229°49.33		222°51.00	47.25	250°10.86	45.09	123°24.17	56.28	226°9.15	43.52	Acrux	172°58.38 -63°14.68
5	244°51.79		237°50.64	48.53	265°11.47	44.36	138°26.62	56.28	241°11.34	43.39	Gacrux	171°50.03 -57°15.63
6	259°54.26		252°50.27	N01°49.82	280°12.08	S09°43.62	153°29.08	N22°56.28	256°13.52	S00°43.27	Alioth	166°11.57 55°48.82
7	274°56.72		267°49.91	51.10	295°12.70	42.88	168°31.53	56.28	271°15.70	43.15	Spica	158°21.00 -11°18.03
8	289°59.18		282°49.55	52.39	310°13.31	42.14	183°33.99	56.28	286°17.88	43.03	Alkaid	152°50.83 49°10.65
9	305°1.65		297°49.18	•• 53.68	325°13.92	•• 41.41	198°36.44	•• 56.29	301°20.06	•• 42.90	Hadar	148°34.16 -60°29.88
10	320°4.11		312°48.82	54.96	340°14.53	40.67	213°38.89	56.29	316°22.25	42.78	Menkent	147°56.18 -36°29.95
11	335°6.58		327°48.46	56.25	355°15.15	39.93	228°41.34	56.29	331°24.43	42.66	Arcturus	145°46.77 19°2.50
12	350°9.04		342°48.09	N01°57.54	10°15.76	S09°39.19	243°43.80	N22°56.29	346°26.61	S00°42.53	Rigel Kent.	139°38.54 -60°56.51
13	5°11.51		357°47.73	01°58.82	25°16.37	38.45	258°46.25	56.29	1°28.79	42.41	Kochab	137°19.08 74°2.49
14	20°13.97		12°47.37	02°0.11	40°16.99	37.72	273°48.70	56.29	16°30.97	42.29	Zuben'ubi	136°54.74 -16°9.14
15	35°16.43		27°47.00	•• 1.39	55°17.60	•• 36.98	288°51.15	•• 56.29	31°33.15	•• 42.16	Alphecca	126°2.75 26°37.28
16	50°18.90		42°46.64	2.68	70°18.21	36.24	303°53.60	56.29	46°35.34	42.04	Antares	112°14.56 -26°29.41
17	65°21.36		57°46.28	3.96	85°18.83	35.50	318°56.05	56.29	61°37.52	41.92	Atria	107°7.87 -69°4.22
18	80°23.83		72°45.91	N02°5.25	100°19.44	S09°34.76	333°58.50	N22°56.29	76°39.70	S00°41.80	Sabik	102°1.65 -15°45.50
19	95°26.29		87°45.55	6.54	115°20.06	34.02	349°0.95	56.30	91°41.88	41.67	Shaula	96°9.07 -37°7.28
20	110°28.75		102°45.19	7.82	130°20.67	33.28	4°3.40	56.30	106°44.06	41.55	Rasalhague	95°57.66 12°32.22
21	125°31.22		117°44.82	•• 9.11	145°21.28	•• 32.54	19°5.85	•• 56.30	121°46.24	•• 41.43	Eltanin	90°41.81 51°28.73
22	140°33.68		132°44.46	10.39	160°21.90	31.81	34°8.30	56.30	136°48.42	41.30	Kaus Aust.	83°31.32 -34°22.26
23	155°36.15		147°44.10	11.68	175°22.51	31.07	49°10.75	56.30	151°50.61	41.18	Vega	80°32.69 38°48.14
Mer.pass.	12:39		ν-0.4' d1.3' m-3.92		ν0.6' d-0.7' m1.16		ν2.5' d0.0' m-2.36		ν2.2' d-0.1' m0.96		Nunki	75°46.69 -26°15.83
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Altair	61°59.20 8°56.07
0	170°38.61		162°43.73	N02°12.96	190°23.13	S09°30.33	64°13.19	N22°56.30	166°52.79	S00°41.06	Peacock	53°4.60 -56°38.91
1	185°41.08		177°43.37	14.25	205°23.74	29.59	79°15.64	56.30	181°54.97	40.93	Deneb	49°25.50 45°22.18
2	200°43.54		192°43.01	15.53	220°24.36	28.85	94°18.09	56.30	196°57.15	40.81	Enif	33°38.13 9°59.57
3	215°46.00		207°42.64	•• 16.82	235°24.97	•• 28.11	109°20.53	•• 56.30	211°59.33	•• 40.69	Al Na'ir	27°32.11 -46°50.03
4	230°48.47		222°42.28	18.10	250°25.59	27.37	124°22.98	56.30	227°1.51	40.57	Fomalhaut	15°13.79 -29°29.07
5	245°50.93		237°41.92	19.39	265°26.20	26.62	139°25.43	56.30	242°3.69	40.44	Scheat	13°44.62 28°13.40
6	260°53.40		252°41.55	N02°20.67	280°26.82	S09°25.88	154°27.87	N22°56.30	257°5.87	S00°40.32	Markab	13°29.26 15°20.67
7	275°55.86		267°41.19	21.96	295°27.44	25.14	169°30.32	56.30	272°8.06	40.20	Mar 11 Wed	SHA Mer.pass
8	290°58.32		282°40.82	23.24	310°28.05	24.40	184°32.76	56.30	287°10.24	40.07	Venus	354°20.83 13:08
9	306°0.79		297°40.46	•• 24.53	325°28.67	•• 23.66	199°35.21	•• 56.30	302°12.42	•• 39.95	Mars	21°13.45 11:20
10	321°3.25		312°40.10	25.81	340°29.28	22.92	214°37.65	56.30	317°14.60	39.83	Jupiter	253°34.96 19:48
11	336°5.72		327°39.73	27.10	355°29.90	22.18	229°40.09	56.30	332°16.78	39.70	Saturn	356°27.72 12:58
12	351°8.18		342°39.37	N02°28.38	10°30.52	S09°21.44	244°42.54	N22°56.30	347°18.96	S00°39.58	Mar 12 Thu	SHA Mer.pass
13	6°10.65		357°39.01	29.66	25°31.13	20.70	259°44.98	56.30	2°21.14	39.46	Venus	353°12.98 13:09
14	21°13.11		12°38.64	30.95	40°31.75	19.95	274°47.42	56.30	17°23.32	39.33	Mars	20°28.94 11:19
15	36°15.57		27°38.28	•• 32.23	55°32.37	•• 19.21	289°49.87	•• 56.30	32°25.51	•• 39.21	Jupiter	253°34.87 19:44
16	51°18.04		42°37.91	33.52	70°32.98	18.47	304°52.31	56.30	47°27.69	39.09	Saturn	356°20.95 12:54
17	66°20.50		57°37.55	34.80	85°33.60	17.73	319°54.75	56.30	62°29.87	38.96	Mar 13 Fri	SHA Mer.pass
18	81°22.97		72°37.19	N02°36.08	100°34.22	S09°16.98	334°57.19	N22°56.30	77°32.05	S00°38.84	Venus	352°5.12 13:09
19	96°25.43		87°36.82	37.37	115°34.84	16.24	349°59.63	56.30	92°34.23	38.72	Mars	19°44.52 11:18
20	111°27.89		102°36.46	38.65	130°35.45	15.50	5°2.07	56.30	107°36.41	38.60	Jupiter	253°34.58 19:40
21	126°30.36		117°36.09	•• 39.94	145°36.07	•• 14.76	20°4.51	•• 56.30	122°38.59	•• 38.47	Saturn	356°14.18 12:51
22	141°32.82		132°35.73	41.22	160°36.69	14.01	35°6.95	56.30	137°40.77	38.35	Horizontal parallax	
23	156°35.29		147°35.36	42.50	175°37.31	13.27	50°9.39	56.30	152°42.95	38.23	Venus:	0.1
Mer.pass.	12:35		ν-0.4' d1.3' m-3.92		ν0.6' d-0.7' m1.16		ν2.4' d0.0' m-2.35		ν2.2' d-0.1' m0.96		Mars:	0.1

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°28.59	S03°47.79	274°26.57	10.1'	S27°54.50	2.8'	54.2'
1	192°28.75	46.81	288°55.70	10.1'	27°57.31	2.7'	54.2'
2	207°28.91	45.83	303°24.81	10.1'	27°59.98	2.5'	54.2'
3	222°29.08	· · 44.85	317°53.88	10.0'	28°2.52	2.4'	54.2'
4	237°29.24	43.87	332°22.92	10.0'	28°4.92	2.3'	54.2'
5	252°29.40	42.89	346°51.93	10.0'	28°7.20	2.1'	54.2'
6	267°29.57	S03°41.90	1°20.92	10.0'	S28°9.33	2.0'	54.2'
7	282°29.73	40.92	15°49.87	9.9'	28°11.33	1.9'	54.2'
8	297°29.90	39.94	30°18.80	9.9'	28°13.20	1.7'	54.2'
9	312°30.06	· · 38.96	44°47.71	9.9'	28°14.93	1.6'	54.2'
10	327°30.22	37.97	59°16.59	9.9'	28°16.52	1.5'	54.2'
11	342°30.39	36.99	73°45.44	9.8'	28°17.97	1.3'	54.2'
12	357°30.55	S03°36.01	88°14.28	9.8'	S28°19.29	1.2'	54.2'
13	12°30.72	35.03	102°43.09	9.8'	28°20.47	1.0'	54.2'
14	27°30.88	34.04	117°11.88	9.8'	28°21.52	0.9'	54.3'
15	42°31.05	· · 33.06	131°40.65	9.8'	28°22.43	0.8'	54.3'
16	57°31.21	32.08	146°9.40	9.7'	28°23.19	0.6'	54.3'
17	72°31.38	31.10	160°38.14	9.7'	28°23.82	0.5'	54.3'
18	87°31.54	S03°30.11	175°6.85	9.7'	S28°24.32	0.4'	54.3'
19	102°31.71	29.13	189°35.56	9.7'	28°24.67	0.2'	54.3'
20	117°31.87	28.15	204°4.24	9.7'	28°24.89	0.1'	54.3'
21	132°32.04	· · 27.16	218°32.92	9.7'	28°24.96	-0.1'	54.3'
22	147°32.20	26.18	233°1.58	9.7'	28°24.90	-0.2'	54.3'
23	162°32.37	25.20	247°30.23	9.6'	28°24.70	-0.3'	54.3'
SD = 16.1' $d = -1.0'$			SD = 14.8'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°32.53	S03°24.21	261°58.87	9.6'	S28°24.36	-0.5'	54.3'
1	192°32.70	23.23	276°27.50	9.6'	28°23.87	-0.6'	54.4'
2	207°32.87	22.25	290°56.12	9.6'	28°23.25	-0.8'	54.4'
3	222°33.03	· · 21.26	305°24.74	9.6'	28°22.49	-0.9'	54.4'
4	237°33.20	20.28	319°53.35	9.6'	28°21.59	-1.0'	54.4'
5	252°33.37	19.29	334°21.95	9.6'	28°20.55	-1.2'	54.4'
6	267°33.53	S03°18.31	348°50.55	9.6'	S28°19.37	-1.3'	54.4'
7	282°33.70	17.33	3°19.15	9.6'	28°18.06	-1.5'	54.4'
8	297°33.87	16.34	17°47.75	9.6'	28°16.60	-1.6'	54.4'
9	312°34.03	· · 15.36	32°16.34	9.6'	28°15.00	-1.7'	54.4'
10	327°34.20	14.37	46°44.93	9.6'	28°13.26	-1.9'	54.5'
11	342°34.37	13.39	61°13.53	9.6'	28°11.38	-2.0'	54.5'
12	357°34.53	S03°12.41	75°42.13	9.6'	S28°9.36	-2.2'	54.5'
13	12°34.70	11.42	90°10.73	9.6'	28°7.20	-2.3'	54.5'
14	27°34.87	10.44	104°39.34	9.6'	28°4.90	-2.4'	54.5'
15	42°35.04	· · 9.45	119°7.95	9.6'	28°2.46	-2.6'	54.5'
16	57°35.21	8.47	133°36.57	9.6'	27°59.88	-2.7'	54.5'
17	72°35.37	7.48	148°5.20	9.6'	27°57.17	-2.9'	54.6'
18	87°35.54	S03°6.50	162°33.83	9.6'	S27°54.31	-3.0'	54.6'
19	102°35.71	5.51	177°2.47	9.7'	27°51.31	-3.1'	54.6'
20	117°35.88	4.53	191°31.13	9.7'	27°48.17	-3.3'	54.6'
21	132°36.05	· · 3.54	205°59.80	9.7'	27°44.90	-3.4'	54.6'
22	147°36.21	2.56	220°28.47	9.7'	27°41.48	-3.6'	54.6'
23	162°36.38	1.57	234°57.17	9.7'	27°37.93	-3.7'	54.7'
SD = 16.1' $d = -1.0'$			SD = 14.8'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	177°36.55	S03°0.59	249°25.87	9.7'	S27°34.24	-3.8'	54.7'
1	192°36.72	02°59.60	263°54.60	9.7'	27°30.41	-4.0'	54.7'
2	207°36.89	58.62	278°23.33	9.8'	27°26.44	-4.1'	54.7'
3	222°37.06	· · 57.63	292°52.09	9.8'	27°22.33	-4.2'	54.7'
4	237°37.23	56.65	307°20.86	9.8'	27°18.09	-4.4'	54.7'
5	252°37.40	55.66	321°49.66	9.8'	27°13.70	-4.5'	54.8'
6	267°37.57	S02°54.68	336°18.47	9.8'	S27°9.19	-4.7'	54.8'
7	282°37.74	53.69	350°47.30	9.9'	27°4.53	-4.8'	54.8'
8	297°37.91	52.71	5°16.16	9.9'	26°59.73	-4.9'	54.8'
9	312°38.08	· · 51.72	19°45.04	9.9'	26°54.80	-5.1'	54.8'
10	327°38.25	50.74	34°13.94	9.9'	26°49.74	-5.2'	54.9'
11	342°38.42	49.75	48°42.86	10.0'	26°44.54	-5.3'	54.9'
12	357°38.59	S02°48.76	63°11.82	10.0'	S26°39.20	-5.5'	54.9'
13	12°38.76	47.78	77°40.79	10.0'	26°33.73	-5.6'	54.9'
14	27°38.93	46.79	92°9.79	10.0'	26°28.12	-5.7'	54.9'
15	42°39.10	· · 45.81	106°38.82	10.1'	26°22.38	-5.9'	55.0'
16	57°39.27	44.82	121°7.88	10.1'	26°16.50	-6.0'	55.0'
17	72°39.44	43.83	135°36.97	10.1'	26°10.49	-6.1'	55.0'
18	87°39.61	S02°42.85	150°6.08	10.1'	S26°4.34	-6.3'	55.0'
19	102°39.78	41.86	164°35.23	10.2'	25°58.07	-6.4'	55.1'
20	117°39.95	40.88	179°4.40	10.2'	25°51.66	-6.5'	55.1'
21	132°40.12	· · 39.89	193°33.61	10.2'	25°45.12	-6.7'	55.1'
22	147°40.29	38.90	208°2.85	10.3'	25°38.44	-6.8'	55.1'
23	162°40.46	37.92	222°32.12	10.3'	25°31.64	-6.9'	55.1'
SD = 16.1' $d = -1.0'$			SD = 14.9'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 22-24 54-35%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
11	10:06	09:58	12:10	05:54	18:20	
12	09:50	09:42	12:10	06:46	19:12	
13	09:34	09:26	12:09	07:38	20:04	

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

Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec		
0	171°37.75	162°35.00	N02°43.79	190°37.92	S09°12.53	65°11.83	N22°56.30	167°45.13	S00°38.10	<div>Alpheratz 357°34.12 29°14.06</div> <div>Ankaa 353°6.57 -42°9.91</div> <div>Schedar 349°30.49 56°40.91</div> <div>Diphda 348°46.62 -17°50.68</div> <div>Achernar 335°19.92 -57°6.37</div> <div>Hamal 327°50.36 23°35.18</div> <div>Polaris 313°49.74 89°22.73</div> <div>Acamar 315°11.27 -40°12.17</div> <div>Menkar 314°5.31 4°11.48</div> <div>Mirfak 308°27.11 49°57.39</div> <div>Aldebaran 290°38.57 16°33.70</div> <div>Rigel 281°2.94 -8°10.42</div> <div>Capella 280°20.47 46°1.59</div> <div>Bellatrix 278°21.83 6°22.33</div> <div>Elnath 278°0.63 28°37.81</div> <div>Alnilam 275°36.72 -1°11.22</div> <div>Betelgeuse 270°50.99 7°24.64</div> <div>Canopus 263°51.85 -52°42.84</div> <div>Sirius 258°25.28 -16°45.31</div> <div>Adhara 255°4.96 -29°0.68</div> <div>Procyon 244°49.64 5°9.36</div> <div>Pollux 243°15.91 27°57.76</div> <div>Avior 234°13.95 -59°35.84</div> <div>Suhail 222°45.26 -43°32.52</div> <div>Miaplacidus 221°37.38 -69°49.67</div> <div>Alphard 217°46.52 -8°46.51</div> <div>Regulus 207°33.10 11°50.21</div> <div>Dubhe 193°39.12 61°36.51</div> <div>Denebola 182°23.62 14°25.36</div> <div>Gienah 175°42.26 -17°41.40</div> <div>Acrux 172°58.36 -63°14.70</div> <div>Gacrux 171°50.02 -57°15.64</div> <div>Alioth 166°11.55 55°48.83</div> <div>Spica 158°20.98 -11°18.04</div> <div>Alkaid 152°50.81 49°10.66</div> <div>Hadar 148°34.13 -60°29.89</div> <div>Menkent 147°56.16 -36°29.96</div> <div>Arcturus 145°46.75 19°2.50</div> <div>Rigel Kent. 139°38.50 -60°56.52</div> <div>Kochab 137°19.03 74°2.50</div> <div>Zuben'ubi 136°54.72 -16°9.15</div> <div>Alphecca 126°2.73 26°37.28</div> <div>Antares 112°14.53 -26°29.41</div> <div>Atria 107°7.81 -69°4.22</div> <div>Sabik 102°1.62 -15°45.51</div> <div>Shaula 96°9.03 -37°7.29</div> <div>Rasalhague 95°57.64 12°32.22</div> <div>Eltanin 90°41.77 51°28.72</div> <div>Kaus Aust. 83°31.29 -34°22.26</div> <div>Vega 80°32.67 38°48.13</div> <div>Nunki 75°46.66 -26°15.83</div> <div>Altair 61°59.18 8°56.07</div> <div>Peacock 53°4.56 -56°38.89</div> <div>Deneb 49°25.47 45°22.17</div> <div>Enif 33°38.12 9°59.57</div> <div>Al Na'ir 27°32.09 -46°50.02</div> <div>Fomalhaut 15°13.78 -29°29.06</div> <div>Scheat 13°44.61 28°13.39</div> <div>Markab 13°29.25 15°20.67</div>							
1	186°40.22	177°34.64	45.07	205°38.54	11.78	80°14.27	56.30	182°47.31	37.98								
2	201°42.68	192°34.27	46.35	220°39.16	11.04	95°16.71	56.30	197°49.49	37.86								
3	216°45.14	207°33.91	· · 47.64	235°39.78	· · 10.30	110°19.14	· · 56.30	212°51.68	· · 37.73								
4	231°47.61	222°33.54	48.92	250°40.40	9.55	125°21.58	56.30	227°53.86	37.61								
5	246°50.07	237°33.18	50.20	265°41.02	8.81	140°24.02	56.30	242°56.04	37.49								
6	261°52.54	252°32.81	N02°51.48	280°41.64	S09°8.06	155°26.46	N22°56.30	257°58.22	S00°37.36								
7	276°55.00	267°32.45	52.77	295°42.26	7.32	170°28.89	56.30	273°0.40	37.24								
8	291°57.46	282°32.08	54.05	310°42.87	6.58	185°31.33	56.30	288°2.58	37.12								
9	306°59.93	297°31.72	· · 55.33	325°43.49	· · 5.83	200°33.76	· · 56.29	303°4.76	· · 36.99								
10	322°2.39	312°31.35	56.62	340°44.11	5.09	215°36.20	56.29	318°6.94	36.87								
11	337°4.86	327°30.99	57.90	355°44.73	4.34	230°38.63	56.29	333°9.12	36.75								
12	352°7.32	342°30.62	N02°59.18	10°45.35	S09°3.60	245°41.07	N22°56.29	348°11.30	S00°36.62								
13	7°9.78	357°30.26	03°0.46	25°45.97	2.85	260°43.50	56.29	3°13.48	36.50								
14	22°12.25	12°29.89	1.74	40°46.59	2.11	275°45.94	56.29	18°15.66	36.38								
15	37°14.71	27°29.53	· · 3.03	55°47.21	· · 1.36	290°48.37	· · 56.29	33°17.84	· · 36.26								
16	52°17.18	42°29.16	4.31	70°47.83	09°0.62	305°50.80	56.29	48°20.02	36.13								
17	67°19.64	57°28.80	5.59	85°48.45	08°59.87	320°53.24	56.29	63°22.20	36.01								
18	82°22.11	72°28.43	N03°6.87	100°49.07	S08°59.12	335°55.67	N22°56.29	78°24.38	S00°35.89								
19	97°24.57	87°28.07	8.15	115°49.69	58.38	350°58.10	56.29	93°26.56	35.76								
20	112°27.03	102°27.70	9.43	130°50.32	57.63	6°0.53	56.28	108°28.74	35.64								
21	127°29.50	117°27.34	· · 10.72	145°50.94	· · 56.89	21°2.96	· · 56.28	123°30.92	· · 35.52								
22	142°31.96	132°26.97	12.00	160°51.56	56.14	36°5.40	56.28	138°33.11	35.39								
23	157°34.43	147°26.61	13.28	175°52.18	55.39	51°7.83	56.28	153°35.29	35.27								
Mer.pass. 12:31			ν -0.4' d1.3' m-3.92			ν 0.6' d-0.7' m1.16			ν 2.4' d-0.0' m-2.34			ν 2.2' d-0.1' m0.95					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec								
0	172°36.89	162°26.24	N03°14.56	190°52.80	S08°54.65	66°10.26	N22°56.28	168°37.47	S00°35.15								
1	187°39.35	177°25.88	15.84	205°53.42	53.90	81°12.69	56.28	183°39.65	35.02								
2	202°41.82	192°25.51	17.12	220°54.04	53.15	96°15.12	56.28	198°41.83	34.90								
3	217°44.28	207°25.14	· · 18.40	235°54.67	· · 52.41	111°17.54	· · 56.28	213°44.01	· · 34.78								
4	232°46.75	222°24.78	19.68	250°55.29	51.66	126°19.97	56.27	228°46.19	34.65								
5	247°49.21	237°24.41	20.96	265°55.91	50.91	141°22.40	56.27	243°48.37	34.53								
6	262°51.67	252°24.05	N03°22.24	280°56.53	S08°50.16	156°24.83	N22°56.27	258°50.55	S00°34.41								
7	277°54.14	267°23.68	23.52	295°57.15	49.42	171°27.26	56.27	273°52.73	34.28								
8	292°56.60	282°23.31	24.80	310°57.78	48.67	186°29.69	56.27	288°54.91	34.16								
9	307°59.07	297°22.95	· · 26.08	325°58.40	· · 47.92	201°32.11	· · 56.27	303°57.09	· · 34.04								
10	323°1.53	312°22.58	27.36	340°59.02	47.17	216°34.54	56.26	318°59.27	33.91								
11	338°4.00	327°22.21	28.64	355°59.64	46.42	231°36.96	56.26	334°1.45	33.79								
12	353°6.46	342°21.85	N03°29.92	11°0.27	S08°45.68	246°39.39	N22°56.26	349°3.63	S00°33.67								
13	8°8.92	357°21.48	31.20	26°0.89	44.93	261°41.82	56.26	4°5.81	33.54								
14	23°11.39	12°21.12	32.48	41°1.51	44.18	276°44.24	56.26	19°7.99	33.42								
15	38°13.85	27°20.75	· · 33.76	56°2.14	· · 43.43	291°46.67	· · 56.25	34°10.17	· · 33.30								
16	53°16.32	42°20.38	35.04	71°2.76	42.68	306°49.09	56.25	49°12.35	33.17								
17	68°18.78	57°20.02	36.32	86°3.39	41.93	321°51.51	56.25	64°14.53	33.05								
18	83°21.24	72°19.65	N03°37.60	101°4.01	S08°41.18	336°53.94	N22°56.25	79°16.71	S00°32.93								
19	98°23.71	87°19.28	38.88	116°4.63	40.43	351°56.36	56.25	94°18.89	32.80								
20	113°26.17	102°18.91	40.15	131°5.26	39.68	6°58.78	56.24	109°21.07	32.68								
21	128°28.64	117°18.55	· · 41.43	146°5.88	· · 38.93	22°1.21	· · 56.24	124°23.25	· · 32.56								
22	143°31.10	132°18.18	42.71	161°6.51	38.19	37°3.63	56.24	139°25.43	32.43								
23	158°33.56	147°17.81	43.99	176°7.13	37.44	52°6.05	56.24	154°27.61	32.31								
Mer.pass. 12:27			ν -0.4' d1.3' m-3.92			ν 0.6' d-0.7' m1.16			ν 2.4' d-0.0' m-2.33			ν 2.2' d-0.1' m0.95					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec								
0	173°36.03	162°17.45	N03°45.27	191°7.75	S08°36.69	67°8.47	N22°56.24	169°29.79	S00°32.19								
1	188°38.49	177°17.08	46.54	206°8.38	35.94	82°10.89	56.23	184°31.97	32.06								
2	203°40.96	192°16.71	47.82	221°9.00	35.19	97°13.31	56.23	199°34.15	31.94								
3	218°43.42	207°16.34	· · 49.10	236°9.63	· · 34.44	112°15.74	· · 56.23	214°36.32	· · 31.82								
4	233°45.89	222°15.98	50.38	251°10.25	33.68	127°18.16	56.23	229°38.50	31.69								
5	248°48.35	237°15.61	51.65	266°10.88	32.93	142°20.57	56.22	244°40.68	31.57								
6	263°50.81	252°15.24	N03°52.93	281°11.51	S08°32.18	157°22.99	N22°56.22	259°42.86	S00°31.45								
7	278°53.28	267°14.87	54.21	296°12.13	31.43	172°25.41	56.22	274°45.04	31.33								
8	293°55.74	282°14.50	55.49	311°12.76	30.68	187°27.83	56.22	289°47.22	31.20								
9	308°58.21	297°14.14	· · 56.76	326°13.38	· · 29.93	202°30.25	· · 56.21	304°49.40	· · 31.08								
10	324°0.67	312°13.77	58.04	341°14.01	29.18	217°32.67	56.21	319°51.58	30.96								
11	339°3.13	327°13.40	03°59.32	356°14.63	28.43	232°35.09	56.21	334°53.76	30.83								
12	354°5.60	342°13.03	N04°0.59	11°15.26	S08°27.68	247°37.50	N22°56.21	349°55.94	S00°30.71								
13	9°8.06	357°12.66	1.87	26°15.89	26.93	262°39.92	56.20	4°58.12	30.59								
14	24°10.53	12°12.29	3.15	41°16.51	26.17	277°42.34	56.20	20°0.30	30.46								
15	39°1																

h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
Sat							HP
0	177°40.63	S02°36.93		237°1.43	10.3'	S25°24.71	-7.1'
1	192°40.81	35.94		251°30.77	10.4'	25°17.64	-7.2'
2	207°40.98	34.96		266°0.14	10.4'	25°10.45	-7.3'
3	222°41.15	· · 33.97		280°29.54	10.4'	25°3.12	-7.5'
4	237°41.32	32.98		294°58.99	10.5'	24°55.67	-7.6'
5	252°41.49	32.00		309°28.46	10.5'	24°48.09	-7.7'
6	267°41.66	S02°31.01		323°57.98	10.5'	S24°40.38	-7.8'
7	282°41.84	30.02		338°27.53	10.6'	24°32.54	-8.0'
8	297°42.01	29.04		352°57.11	10.6'	24°24.58	-8.1'
9	312°42.18	· · 28.05		7°26.74	10.7'	24°16.49	-8.2'
10	327°42.35	27.06		21°56.40	10.7'	24°8.28	-8.3'
11	342°42.53	26.08		36°26.10	10.7'	23°59.94	-8.5'
12	357°42.70	S02°25.09		50°55.83	10.8'	S23°51.48	-8.6'
13	12°42.87	24.10		65°25.61	10.8'	23°42.89	-8.7'
14	27°43.04	23.12		79°55.42	10.9'	23°34.18	-8.8'
15	42°43.22	· · 22.13		94°25.28	10.9'	23°25.35	-9.0'
16	57°43.39	21.14		108°55.17	10.9'	23°16.39	-9.1'
17	72°43.56	20.15		123°25.10	11.0'	23°7.32	-9.2'
18	87°43.74	S02°19.17		137°55.07	11.0'	S22°58.12	-9.3'
19	102°43.91	18.18		152°25.09	11.1'	22°48.81	-9.4'
20	117°44.08	17.19		166°55.14	11.1'	22°39.37	-9.6'
21	132°44.26	· · 16.20		181°25.23	11.1'	22°29.82	-9.7'
22	147°44.43	15.22		195°55.36	11.2'	22°20.15	-9.8'
23	162°44.60	14.23		210°25.53	11.2'	22°10.36	-9.9'
SD = 16.1'			$d = -1.0'$	SD = 15.0'			

Sun	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
0	177°44.78	S02°13.24		224°55.74	11.3'	S22°0.45	-10.0'
1	192°44.95	12.25		239°26.00	11.3'	21°50.43	-10.1'
2	207°45.13	11.27		253°56.29	11.3'	21°40.29	-10.3'
3	222°45.30	· · 10.28		268°26.62	11.4'	21°30.04	-10.4'
4	237°45.47	9.29		282°57.00	11.4'	21°19.68	-10.5'
5	252°45.65	8.30		297°27.41	11.5'	21°9.20	-10.6'
6	267°45.82	S02°7.32		311°57.86	11.5'	S20°58.61	-10.7'
7	282°46.00	6.33		326°28.36	11.5'	20°47.91	-10.8'
8	297°46.17	5.34		340°58.89	11.6'	20°37.10	-10.9'
9	312°46.35	· · 4.35		355°29.47	11.6'	20°26.18	-11.0'
10	327°46.52	3.36		10°0.08	11.7'	20°15.15	-11.1'
11	342°46.70	2.38		24°30.73	11.7'	20°4.01	-11.2'
12	357°46.87	S02°1.39		39°1.42	11.7'	S19°52.77	-11.4'
13	12°47.05	02°0.40		53°32.16	11.8'	19°41.42	-11.5'
14	27°47.22	01°59.41		68°2.93	11.8'	19°29.96	-11.6'
15	42°47.40	· · 58.42		82°33.74	11.8'	19°18.39	-11.7'
16	57°47.57	57.44		97°4.58	11.9'	19°6.73	-11.8'
17	72°47.75	56.45		111°35.47	11.9'	18°54.96	-11.9'
18	87°47.92	S01°55.46		126°6.39	12.0'	S18°43.09	-12.0'
19	102°48.10	54.47		140°37.35	12.0'	18°31.11	-12.1'
20	117°48.27	53.48		155°8.35	12.0'	18°19.04	-12.2'
21	132°48.45	· · 52.50		169°39.39	12.1'	18°6.86	-12.3'
22	147°48.63	51.51		184°10.46	12.1'	17°54.59	-12.4'
23	162°48.80	50.52		198°41.56	12.1'	17°42.21	-12.5'
SD = 16.1'			$d = -1.0'$	SD = 15.2'			

Mon	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
0	177°48.98	S01°49.53		213°12.71	12.2'	S17°29.75	-12.6'
1	192°49.15	48.54		227°43.88	12.2'	17°17.18	-12.7'
2	207°49.33	47.55		242°15.10	12.2'	17°4.52	-12.8'
3	222°49.51	· · 46.57		256°46.34	12.3'	16°51.76	-12.8'
4	237°49.68	45.58		271°17.62	12.3'	16°38.91	-12.9'
5	252°49.86	44.59		285°48.93	12.3'	16°25.97	-13.0'
6	267°50.04	S01°43.60		300°20.28	12.4'	S16°12.94	-13.1'
7	282°50.21	42.61		314°51.66	12.4'	15°59.82	-13.2'
8	297°50.39	41.62		329°23.07	12.4'	15°46.60	-13.3'
9	312°50.57	· · 40.64		343°54.51	12.5'	15°33.30	-13.4'
10	327°50.74	39.65		358°25.98	12.5'	15°19.91	-13.5'
11	342°50.92	38.66		12°57.48	12.5'	15°6.43	-13.6'
12	357°51.10	S01°37.67		27°29.01	12.6'	S14°52.87	-13.6'
13	12°51.27	36.68		42°0.57	12.6'	14°39.22	-13.7'
14	27°51.45	35.69		56°32.16	12.6'	14°25.49	-13.8'
15	42°51.63	· · 34.70		71°3.77	12.6'	14°11.67	-13.9'
16	57°51.81	33.71		85°35.41	12.7'	13°57.77	-14.0'
17	72°51.98	32.73		100°7.08	12.7'	13°43.80	-14.1'
18	87°52.16	S01°31.74		114°38.77	12.7'	S13°29.74	-14.1'
19	102°52.34	30.75		129°10.48	12.7'	13°15.60	-14.2'
20	117°52.52	29.76		143°42.22	12.8'	13°1.39	-14.3'
21	132°52.70	· · 28.77		158°13.99	12.8'	12°47.10	-14.4'
22	147°52.87	27.78		172°45.77	12.8'	12°32.73	-14.4'
23	162°53.05	26.79		187°17.58	12.8'	12°18.29	-14.5'
SD = 16.1'			$d = -1.0'$	SD = 15.4'			

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
14	09:17	09:09	12:09	08:29	20:54	
15	09:01	08:53	12:09	09:19	21:43	
16	08:44	08:36	12:09	10:06	22:30	

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

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	174°35.17	162°8.60	N04°15.90	191°22.79	S08°18.65	68°6.48	N22°56.17	170°22.09	S00°29.23	Alpheratz	357°34.12	29°14.05
1	189°37.63	177°8.23	17.17	206°23.41	17.90	83°8.89	56.17	185°24.27	29.11	Ankaa	353°6.57	-42°9.90
2	204°40.09	192°7.86	18.45	221°24.04	17.14	98°11.30	56.16	200°26.45	28.98	Schedar	349°30.50	56°40.90
3	219°42.56	207°7.49	•• 19.72	236°24.67	•• 16.39	113°13.72	•• 56.16	215°28.63	•• 28.86	Diphda	348°46.62	-17°50.67
4	234°45.02	222°7.12	21.00	251°25.30	15.64	128°16.13	56.16	230°30.81	28.74	Achernar	335°19.93	-57°6.36
5	249°47.49	237°6.75	22.27	266°25.93	14.88	143°18.54	56.15	245°32.99	28.61	Hamal	327°50.37	23°35.17
6	264°49.95	252°6.38	N04°23.54	281°26.56	S08°14.13	158°20.95	N22°56.15	260°35.17	S00°28.49	Polaris	313°51.05	89°22.72
7	279°52.41	267°6.01	24.82	296°27.19	13.38	173°23.36	56.15	275°37.35	28.37	Acamar	315°11.28	-40°12.16
8	294°54.88	282°5.64	26.09	311°27.81	12.62	188°25.77	56.14	290°39.53	28.24	Menkar	314°5	

h		Sun		Moon			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°53.23	S01°25.80	201°49.40	12.8'	S12°3.77	-14.6'	57.2'
1	192°53.41	24.82	216°21.25	12.9'	11°49.18	-14.7'	57.3'
2	207°53.59	23.83	230°53.12	12.9'	11°34.53	-14.7'	57.3'
3	222°53.76	· · 22.84	245°25.00	12.9'	11°19.80	-14.8'	57.3'
4	237°53.94	21.85	259°56.90	12.9'	11°5.00	-14.9'	57.4'
5	252°54.12	20.86	274°28.82	12.9'	10°50.13	-14.9'	57.4'
6	267°54.30	S01°19.87	289°0.76	12.9'	S10°35.20	-15.0'	57.4'
7	282°54.48	18.88	303°32.71	13.0'	10°20.20	-15.1'	57.5'
8	297°54.66	17.89	318°4.67	13.0'	10°5.13	-15.1'	57.5'
9	312°54.84	· · 16.90	332°36.65	13.0'	09°50.01	-15.2'	57.5'
10	327°55.02	15.92	347°8.63	13.0'	09°34.82	-15.3'	57.6'
11	342°55.19	14.93	1°40.63	13.0'	09°19.56	-15.3'	57.6'
12	357°55.37	S01°13.94	16°12.64	13.0'	S09°4.25	-15.4'	57.6'
13	12°55.55	12.95	30°44.66	13.0'	08°48.88	-15.4'	57.6'
14	27°55.73	11.96	45°16.69	13.0'	08°33.45	-15.5'	57.7'
15	42°55.91	· · 10.97	59°48.73	13.0'	08°17.97	-15.5'	57.7'
16	57°56.09	9.98	74°20.77	13.0'	08°2.43	-15.6'	57.7'
17	72°56.27	8.99	88°52.82	13.1'	07°46.83	-15.6'	57.8'
18	87°56.45	S01°8.00	103°24.87	13.1'	S07°31.19	-15.7'	57.8'
19	102°56.63	7.01	117°56.92	13.1'	07°15.49	-15.7'	57.8'
20	117°56.81	6.02	132°28.98	13.1'	06°59.74	-15.8'	57.9'
21	132°56.99	· · 5.04	147°1.04	13.1'	06°43.94	-15.8'	57.9'
22	147°57.17	4.05	161°33.10	13.1'	06°28.09	-15.9'	57.9'
23	162°57.35	3.06	176°5.17	13.1'	06°12.20	-15.9'	57.9'
SD = 16.1'		$d = -1.0'$	SD = 15.6'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°57.53	S01°2.07	190°37.22	13.1'	S05°56.26	-16.0'	58.0'
1	192°57.71	1.08	205°9.28	13.1'	05°40.28	-16.0'	58.0'
2	207°57.89	01°0.09	219°41.33	13.0'	05°24.25	-16.1'	58.0'
3	222°58.07	00°59.10	234°13.38	13.0'	05°8.18	-16.1'	58.1'
4	237°58.25	58.11	248°45.43	13.0'	04°52.07	-16.1'	58.1'
5	252°58.43	57.12	263°17.46	13.0'	04°35.93	-16.2'	58.1'
6	267°58.61	S00°56.13	277°49.49	13.0'	S04°19.74	-16.2'	58.1'
7	282°58.79	55.14	292°21.51	13.0'	04°3.52	-16.3'	58.2'
8	297°58.97	54.16	306°53.52	13.0'	03°47.26	-16.3'	58.2'
9	312°59.15	· · 53.17	321°25.52	13.0'	03°30.97	-16.3'	58.2'
10	327°59.33	52.18	335°57.51	13.0'	03°14.65	-16.4'	58.3'
11	342°59.51	51.19	350°29.48	13.0'	02°58.30	-16.4'	58.3'
12	357°59.69	S00°50.20	5°1.44	12.9'	S02°41.92	-16.4'	58.3'
13	12°59.87	49.21	19°33.38	12.9'	02°25.50	-16.4'	58.3'
14	28°0.06	48.22	34°5.31	12.9'	02°9.07	-16.5'	58.4'
15	43°0.24	· · 47.23	48°37.22	12.9'	01°52.60	-16.5'	58.4'
16	58°0.42	46.24	63°9.11	12.9'	01°36.12	-16.5'	58.4'
17	73°0.60	45.25	77°40.98	12.8'	01°19.61	-16.5'	58.4'
18	88°0.78	S00°44.26	92°12.83	12.8'	S01°3.07	-16.6'	58.5'
19	103°0.96	43.27	106°44.65	12.8'	00°46.52	-16.6'	58.5'
20	118°1.14	42.29	121°16.45	12.8'	00°29.95	-16.6'	58.5'
21	133°1.32	· · 41.30	135°48.23	12.8'	S00°13.37	-16.6'	58.6'
22	148°1.51	40.31	150°19.99	12.7'	N00°3.24	16.6'	58.6'
23	163°1.69	39.32	164°51.71	12.7'	00°19.85	16.6'	58.6'
SD = 16.1'		$d = -1.0'$	SD = 15.8'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°1.87	S00°38.33	179°23.41	12.7'	N00°36.48	16.6'	58.6'
1	193°2.05	37.34	193°55.08	12.6'	00°53.12	16.6'	58.7'
2	208°2.23	36.35	208°26.72	12.6'	01°9.77	16.7'	58.7'
3	223°2.42	· · 35.36	222°58.32	12.6'	01°26.43	16.7'	58.7'
4	238°2.60	34.37	237°29.89	12.5'	01°43.09	16.7'	58.7'
5	253°2.78	33.38	252°1.43	12.5'	01°59.76	16.7'	58.7'
6	268°2.96	S00°32.39	266°32.94	12.5'	N02°16.43	16.7'	58.8'
7	283°3.14	31.41	281°4.41	12.4'	02°33.10	16.7'	58.8'
8	298°3.33	30.42	295°35.84	12.4'	02°49.78	16.7'	58.8'
9	313°3.51	· · 29.43	310°7.23	12.4'	03°6.45	16.7'	58.8'
10	328°3.69	28.44	324°38.58	12.3'	03°23.12	16.7'	58.9'
11	343°3.87	27.45	339°9.89	12.3'	03°39.79	16.7'	58.9'
12	358°4.06	S00°26.46	353°41.16	12.2'	N03°56.45	16.7'	58.9'
13	13°4.24	25.47	8°12.38	12.2'	04°13.10	16.6'	58.9'
14	28°4.42	24.48	22°43.56	12.1'	04°29.74	16.6'	58.9'
15	43°4.60	· · 23.49	37°14.69	12.1'	04°46.38	16.6'	59.0'
16	58°4.79	22.50	51°45.78	12.0'	05°3.00	16.6'	59.0'
17	73°4.97	21.52	66°16.82	12.0'	05°19.60	16.6'	59.0'
18	88°5.15	S00°20.53	80°47.81	11.9'	N05°36.19	16.6'	59.0'
19	103°5.33	19.54	95°18.75	11.9'	05°52.77	16.6'	59.1'
20	118°5.52	18.55	109°49.63	11.8'	06°9.32	16.5'	59.1'
21	133°5.70	· · 17.56	124°20.47	11.8'	06°25.86	16.5'	59.1'
22	148°5.88	16.57	138°51.24	11.7'	06°42.37	16.5'	59.1'
23	163°6.07	15.58	153°21.97	11.7'	06°58.86	16.5'	59.1'
SD = 16.1'		$d = -1.0'$	SD = 16.0'				

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

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

Day	Sun		Mer. Pass	Moon		Age 28-0 5-0%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
17	08:27	08:19	12:08	10:53	23:16	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	177°32.58	161°41.70	N05°47.21	192°8.33	S07°24.13	70°59.25	N22°55.83	172°58.96	S00°20.35			Alpheratz	357°34.12 29°14.04
1	192°35.04	176°41.32	48.47	207°8.97	23.36	86°1.64	55.83	188°1.14	20.23			Ankaa	353°6.57 -42°9.89
2	207°37.50	191°40.94	49.73	222°9.61	22.60	101°4.03	55.82	203°3.32	20.10			Schedar	349°30.50 56°40.88
3	222°39.97	206°40.56	· · 50.99	237°10.25	· · 21.84	116°6.41	· · 55.82	218°5.50	· · 19.98			Diphda	348°46.62 -17°50.67
4	237°42.43	221°40.18	52.25	252°10.88	21.08	131°8.80	55.81	233°7.67	19.86			Achernar	335°19.95 -57°6.34
5	252°44.90	236°39.80	53.51	267°11.52	20.32	146°11.18	55.80	248°9.85	19.74			Hamal	327°50.38 23°35.17
6	267°47.36	251°39.43	N05°54.77	282°12.16	S07°19.56	161°13.57	N22°55.80	263°12.03	S00°19.61			Polaris	313°52.21 89°22.70
7	282°49.82	266°39.05	56.03	297°12.80	18.79	176°15.95	55.79	278°14.21	19.49			Acamar	315°11.30 -40°12.16
8	297°52.29	281°38.67	57.29	312°13.43	18.03	191°18.34	55.78	293°16.39	19.37			Menkar	314°5.33 4°11.48
9	312°54.75	296°38.29	· · 58.55	327°14.07	· · 17.27	206°20.72	· · 55.78	308°18.57	· · 19.24			Mirfak	308°27.15 49°57.38
10	327°57.22	311°37.91	05°59.81	342°14.71	16.51	221°23.10	55.77	323°20.74	19.12			Aldebaran	290°38.60 16°33.70
11	342°59.68	326°37.53	06°1.07	357°15.35	15.75	236°25.49	55.76	338°22.92	19.00			Rigel	281°2.98 -8°10.42
12	358°2.15	341°37.15	N06°2.33	12°15.99	S07°14.98	251°27.87	N22°55.76	353°25.10	S00°18.87			Capella	280°20.51 46°1.59
13	13°4.61	356°36.77	3.58	27°16.63	14.22	266°30.25	55.75	8°27.28	18.75			Bellatrix	278°21.87 6°22.33
14	28°7.07	11°36.39	4.84	42°17.27	13.46	281°32.63	55.74	23°29.46	18.63			Elnath	278°0.67 28°37.81
15	43°9.54	26°36.01	· · 6.10	57°17.90	· · 12.69	296°35.01	· · 55.74	38°31.63	· · 18.50			Alnilam	275°36.76 -1°11.22
16	58°12.00	41°35.62	7.36	72°18.54	11.93	311°37.40	55.73	53°33.81	18.38			Betelgeuse	270°51.02 7°24.64
17	73°14.47	56°35.24	8.62	87°19.18	11.17	326°39.78	55.72	68°35.99	18.26			Canopus	263°51.91 -52°42.84
18	88°16.93	71°34.86	N06°9.87	102°19.82	S07°10.41	341°42.16	N22°55.72	83°38.17	S00°18.13			Sirius	258°25.31 -16°45.32
19	103°19.39	86°34.48	11.13	117°20.46	9.64	356°44.54	55.71	98°40.35	18.01			Adhara	255°5.00 -29°0.69
20	118°21.86	101°34.10	12.39	132°21.10	8.88	11°46.92	55.70	113°42.52	17.89			Procyon	244°49.67 5°9.36
21	133°24.32	116°33.72	· · 13.64	147°21.74	· · 8.12	26°49.30	· · 55.70	128°44.70	· · 17.76			Pollux	243°15.94 27°57.77
22	148°26.79	131°33.34	14.90	162°22.38	7.35	41°51.67	55.69	143°46.88	17.64			Avior	234°14.00 -59°35.86
23	163°29.25	146°32.95	16.15	177°23.02	6.59	56°54.05	55.68	158°49.06	17.52			Suhail	222°45.29 -43°32.54
Mer.pass. 12:08		ν-0.4' d1.3' m-3.92			ν0.6' d-0.8' m1.17		ν2.4' d-0.0' m-2.29		ν2.2' d-0.1' m0.93		Miaplacidus		221°37.45 -69°49.70
											Alphard		217°46.54 -8°46.51
											Regulus		207°33.11 11°50.21
											Dubhe		193°39.13 61°36.54
											Denebola		182°23.62 14°25.36
											Gienah		175°42.25 -17°41.41
											Acrux		172°58.35 -63°14.73
											Gacrux		171°50.00 -57°15.68
											Alioth		166°11.53 55°48.86
											Spica		158°20.97 -11°18.05
											Alkaid		152°50.78 49°10.68
											Hadar		148°34.09 -60°29.92
											Menkent		147°56.13 -36°29.98
											Arcturus		145°46.73 19°2.51
											Rigel Kent.		139°38.45 -60°56.55
											Kochab		137°18.93 74°2.52
											Zuben'ubi		136°54.69 -16°9.16
											Alphecca		126°2.69 26°37.29
											Antares		112°14.49 -26°29.42
											Atria		107°7.70 -69°4.23
											Sabik		102°1.58 -15°45.51
											Shaula		96°8.98 -37°7.29
											Rasalhague		95°57.60 12°32.22
											Eltanin		90°41.71 51°28.72
											Kaus Aust.		83°31.24 -34°22.26
											Vega		80°32.62 38°48.13
											Nunki		75°46.62 -26°15.83
											Altair		61°59.14 8°56.07
											Peacock		53°4.50 -56°38.88
											Deneb		49°25.44 45°22.15
											Enif		33°38.10 9°59.56
											Al Na'ir		27°32.06 -46°50.00
											Fomalhaut		15°13.77 -29°29.04
											Scheat		13°44.60 28°13.38
											Markab		13°29.24 15°20.66
											Mar 20 Fri		SHA Mer.pass
											Venus		344°9.12 13:14
											Mars		14°35.76 11:11
											Jupiter		253°26.68 19:13
											Saturn		355°26.39 12:26
											Mar 21 Sat		SHA Mer.pass
											Venus		343°0.86 13:14
											Mars		13°51.95 11:10
											Jupiter		253°24.72 19:09
											Saturn		355°19.52 12:23
											Mar 22 Sun		SHA Mer.pass
											Venus		341°52.50 13:15
											Mars		13°8.21 11:09
											Jupiter		253°22.55 19:05
											Saturn		355°12.65 12:19
											Horizontal parallax		
											Venus:		0.1
											Mars:		0.1
Mer.pass. 12:00		ν-0.4' d1.2' m-3.92			ν0.6' d-0.8' m1.17		ν2.4' d-0.0' m-2.28		ν2.2' d-0.1' m0.92				

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°6.25	S00°14.59	167°52.64	11.6'	N07°15.32	16.4'	59.1'
1	193°6.43	13.60	182°23.25	11.6'	07°31.75	16.4'	59.2'
2	208°6.62	12.62	196°53.80	11.5'	07°48.16	16.4'	59.2'
3	223°6.80	11.63	211°24.29	11.4'	08°4.53	16.3'	59.2'
4	238°6.98	10.64	225°54.72	11.4'	08°20.88	16.3'	59.2'
5	253°7.17	9.65	240°25.09	11.3'	08°37.18	16.3'	59.2'
6	268°7.35	S00°8.66	254°55.39	11.2'	N08°53.46	16.2'	59.3'
7	283°7.53	7.67	269°25.63	11.2'	09°9.69	16.2'	59.3'
8	298°7.72	6.68	283°55.80	11.1'	09°25.89	16.2'	59.3'
9	313°7.90	5.70	298°25.91	11.0'	09°42.04	16.1'	59.3'
10	328°8.09	4.71	312°55.95	11.0'	09°58.15	16.1'	59.3'
11	343°8.27	3.72	327°25.92	10.9'	10°14.22	16.0'	59.3'
12	358°8.45	S00°2.73	341°55.82	10.8'	N10°30.24	16.0'	59.3'
13	13°8.64	1.74	356°25.65	10.8'	10°46.21	15.9'	59.4'
14	28°8.82	S00°0.75	10°55.41	10.7'	11°2.13	15.9'	59.4'
15	43°9.01	N00°0.24	25°25.09	10.6'	11°18.00	15.8'	59.4'
16	58°9.19	1.22	39°54.71	10.5'	11°33.81	15.8'	59.4'
17	73°9.37	2.21	54°24.24	10.5'	11°49.57	15.7'	59.4'
18	88°9.56	N00°3.20	68°53.70	10.4'	N12°5.28	15.6'	59.4'
19	103°9.74	4.19	83°23.08	10.3'	12°20.92	15.6'	59.4'
20	118°9.93	5.18	97°52.39	10.2'	12°36.50	15.5'	59.5'
21	133°10.11	6.17	112°21.61	10.1'	12°52.02	15.5'	59.5'
22	148°10.30	7.16	126°50.75	10.1'	13°7.47	15.4'	59.5'
23	163°10.48	8.14	141°19.82	10.0'	13°22.86	15.3'	59.5'
SD = 16.1'			SD = 16.1'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°10.67	N00°9.13	155°48.80	9.9'	N13°38.18	15.2'	59.5'
1	193°10.85	10.12	170°17.70	9.8'	13°53.43	15.2'	59.5'
2	208°11.03	11.11	184°46.51	9.7'	14°8.61	15.1'	59.5'
3	223°11.22	12.10	199°15.24	9.6'	14°23.71	15.0'	59.5'
4	238°11.40	13.08	213°43.89	9.6'	14°38.74	14.9'	59.5'
5	253°11.59	14.07	228°12.45	9.5'	14°53.69	14.9'	59.6'
6	268°11.77	N00°15.06	242°40.92	9.4'	N15°8.56	14.8'	59.6'
7	283°11.96	16.05	257°9.31	9.3'	15°23.35	14.7'	59.6'
8	298°12.14	17.04	271°37.60	9.2'	15°38.05	14.6'	59.6'
9	313°12.33	18.02	286°5.81	9.1'	15°52.67	14.5'	59.6'
10	328°12.51	19.01	300°33.93	9.0'	16°7.20	14.4'	59.6'
11	343°12.70	20.00	315°1.95	8.9'	16°21.64	14.4'	59.6'
12	358°12.88	N00°20.99	329°29.89	8.8'	N16°36.00	14.3'	59.6'
13	13°13.07	21.98	343°57.73	8.8'	16°50.26	14.2'	59.6'
14	28°13.26	22.96	358°25.48	8.7'	17°4.42	14.1'	59.6'
15	43°13.44	23.95	12°53.14	8.6'	17°18.49	14.0'	59.6'
16	58°13.63	24.94	27°20.70	8.5'	17°32.46	13.9'	59.6'
17	73°13.81	25.93	41°48.17	8.4'	17°46.33	13.8'	59.6'
18	88°14.00	N00°26.92	56°15.55	8.3'	N18°0.09	13.7'	59.6'
19	103°14.18	27.90	70°42.83	8.2'	18°13.75	13.6'	59.7'
20	118°14.37	28.89	85°10.02	8.1'	18°27.31	13.4'	59.7'
21	133°14.55	29.88	99°37.11	8.0'	18°40.76	13.3'	59.7'
22	148°14.74	30.87	114°4.10	7.9'	18°54.10	13.2'	59.7'
23	163°14.93	31.85	128°31.00	7.8'	19°7.32	13.1'	59.7'
SD = 16.1'			SD = 16.2'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°15.11	N00°32.84	142°57.80	7.7'	N19°20.44	13.0'	59.7'
1	193°15.30	33.83	157°24.50	7.6'	19°33.43	12.9'	59.7'
2	208°15.48	34.82	171°51.11	7.5'	19°46.31	12.8'	59.7'
3	223°15.67	35.80	186°17.62	7.4'	19°59.08	12.6'	59.7'
4	238°15.85	36.79	200°44.03	7.3'	20°11.71	12.5'	59.7'
5	253°16.04	37.78	215°10.35	7.2'	20°24.23	12.4'	59.7'
6	268°16.23	N00°38.76	229°36.57	7.1'	N20°36.62	12.3'	59.7'
7	283°16.41	39.75	244°2.69	7.0'	20°48.89	12.1'	59.7'
8	298°16.60	40.74	258°28.71	6.9'	21°1.03	12.0'	59.7'
9	313°16.79	41.73	272°54.64	6.8'	21°13.03	11.9'	59.7'
10	328°16.97	42.71	287°20.47	6.7'	21°24.91	11.7'	59.7'
11	343°17.16	43.70	301°46.21	6.6'	21°36.65	11.6'	59.7'
12	358°17.34	N00°44.69	316°11.84	6.5'	N21°48.25	11.5'	59.7'
13	13°17.53	45.67	330°37.38	6.4'	21°59.72	11.3'	59.7'
14	28°17.72	46.66	345°2.83	6.3'	22°11.05	11.2'	59.7'
15	43°17.90	47.65	359°28.18	6.3'	22°22.24	11.0'	59.7'
16	58°18.09	48.63	13°53.43	6.2'	22°33.28	10.9'	59.7'
17	73°18.28	49.62	28°18.59	6.1'	22°44.18	10.8'	59.7'
18	88°18.46	N00°50.61	42°43.66	6.0'	N22°54.94	10.6'	59.7'
19	103°18.65	51.59	57°8.63	5.9'	23°5.54	10.5'	59.7'
20	118°18.84	52.58	71°33.51	5.8'	23°16.00	10.3'	59.7'
21	133°19.02	53.57	85°58.30	5.7'	23°26.31	10.2'	59.7'
22	148°19.21	54.55	100°22.99	5.6'	23°36.46	10.0'	59.7'
23	163°19.40	55.54	114°47.60	5.5'	23°46.46	9.8'	59.7'
SD = 16.0'			SD = 16.3'				

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

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

Day	Sun		Mer. Pass	Moon		Age 1-3 1-11%
	Eqn. of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
20	07:35	07:26	12:07	13:15	00:50	
21	07:17	07:08	12:07	14:07	01:40	
22	07:00	06:51	12:07	15:02	02:34	

March 23, 24, 25 UT (Mon., Tue., Wed.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	180°29.99	161°14.02	N07°17.38	192°54.53	S06°29.05	73°50.17	N22°55.29	175°35.77	S00°11.48			Alpheratz	357°34.11 29°14.03
1	195°32.45	176°13.63	18.63	207°55.18	28.28	88°52.53	55.28	190°37.94	11.36			Ankaa	353°6.57 -42°9.87
2	210°34.92	191°13.24	19.87	222°55.82	27.51	103°54.90	55.27	205°40.12	11.24			Schedar	349°30.49 56°40.87
3	225°37.38	206°12.85	· · 21.11	237°56.47	· · 26.74	118°57.26	· · 55.26	220°42.30	· · 11.11			Diphda	348°46.62 -17°50.66
4	240°39.85	221°12.46	22.35	252°57.11	25.98	133°59.62	55.25	235°44.48	10.99			Achernar	335°19.96 -57°6.33
5	255°42.31	236°12.07	23.59	267°57.76	25.21	149°1.97	55.24	250°46.65	10.87			Hamal	327°50.38 23°35.16
6	270°44.78	251°11.67	N07°24.84	282°58.41	S06°24.44	164°4.33	N22°55.23	265°48.83	S00°10.74			Polaris	313°52.97 89°22.69
7	285°47.24	266°11.28	26.08	297°59.05	23.67	179°6.69	55.23	280°51.01	10.62			Acamar	315°11.31 -40°12.15
8	300°49.70	281°10.89	27.32	312°59.70	22.90	194°9.05	55.22	295°53.19	10.50			Menkar	314°5.34 4°11.48
9	315°52.17	296°10.50	· · 28.56	328°0.35	· · 22.13	209°11.41	· · 55.21	310°55.36	· · 10.37			Mirfak	308°27.16 49°57.37
10	330°54.63	311°10.10	29.80	343°0.99	21.36	224°13.77	55.20	325°57.54	10.25			Aldebaran	290°38.61 16°33.70
11	345°57.10	326°9.71	31.04	358°1.64	20.59	239°16.12	55.19	340°59.72	10.13			Rigel	281°2.99 -8°10.42
12	0°59.56	341°9.32	N07°32.28	13°2.29	S06°19.82	254°18.48	N22°55.18	356°1.90	S00°10.00			Capella	280°20.53 46°1.58
13	16°2.02	356°8.93	33.52	28°2.94	19.05	269°20.84	55.17	11°4.07	9.88			Bellatrix	278°21.88 6°22.33
14	31°4.49	11°8.53	34.76	43°3.58	18.28	284°23.20	55.16	26°6.25	9.76			Elnath	278°0.68 28°37.80
15	46°6.95	26°8.14	· · 35.99	58°4.23	· · 17.51	299°25.55	· · 55.15	41°8.43	· · 9.64			Alnilam	275°36.77 -1°11.22
16	61°9.42	41°7.74	37.23	73°4.88	16.74	314°27.91	55.14	56°10.61	9.51			Betelgeuse	270°51.03 7°24.64
17	76°11.88	56°7.35	38.47	88°5.53	15.97	329°30.26	55.13	71°12.78	9.39			Canopus	263°51.93 -52°42.84
18	91°14.35	71°6.96	N07°39.71	103°6.18	S06°15.20	344°32.62	N22°55.12	86°14.96	S00°9.27			Sirius	258°25.32 -16°45.32
19	106°16.81	86°6.56	40.95	118°6.82	14.43	359°34.97	55.11	101°17.14	9.14			Adhara	255°5.02 -29°0.69
20	121°19.27	101°6.17	42.18	133°7.47	13.66	14°37.33	55.10	116°19.32	9.02			Procyon	244°49.68 5°9.35
21	136°21.74	116°5.77	· · 43.42	148°8.12	· · 12.89	29°39.68	· · 55.09	131°21.49	· · 8.90			Pollux	243°15.95 27°57.77
22	151°24.20	131°5.38	44.66	163°8.77	12.12	44°42.03	55.08	146°23.67	8.77			Avior	234°14.02 -59°35.87
23	166°26.67	146°4.98	45.89	178°9.42	11.35	59°44.39	55.07	161°25.85	8.65			Suhail	222°45.30 -43°32.55
Mer.pass. 11:56		ν-0.4' d1.2' m-3.92		ν0.6' d-0.8' m1.17		ν2.4' d-0.0' m-2.27		ν2.2' d-0.1' m0.91					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	181°29.13	161°4.58	N07°47.13	193°10.07	S06°10.58	74°46.74	N22°55.06	176°28.03	S00°8.53			Miaplacidus	221°37.48 -69°49.71
1	196°31.59	176°4.19	48.37	208°10.71	9.81	89°49.09	55.05	191°30.20	8.41			Alphard	217°46.55 -8°46.52
2	211°34.06	191°3.79	49.60	223°11.36	9.04	104°51.45	55.04	206°32.38	8.28			Regulus	207°33.11 11°50.21
3	226°36.52	206°3.40	· · 50.84	238°12.01	· · 8.27	119°53.80	· · 55.03	221°34.56	· · 8.16			Dubhe	193°39.14 61°36.55
4	241°38.99	221°3.00	52.07	253°12.66	7.50	134°56.15	55.02	236°36.74	8.04			Denebola	182°23.61 14°25.36
5	256°41.45	236°2.60	53.31	268°13.31	6.73	149°58.50	55.01	251°38.91	7.91			Giennah	175°42.24 -17°41.42
6	271°43.92	251°2.21	N07°54.54	283°13.96	S06°5.96	165°0.85	N22°55.00	266°41.09	S00°7.79			Acrux	172°58.33 -63°14.75
7	286°46.38	266°1.81	55.77	298°14.61	5.19	180°3.20	54.99	281°43.27	7.67			Gacrux	171°49.99 -57°15.69
8	301°48.84	281°1.41	57.01	313°15.26	4.42	195°5.55	54.98	296°45.45	7.54			Alioth	166°11.52 55°48.87
9	316°51.31	296°1.01	· · 58.24	328°15.91	· · 3.65	210°7.90	· · 54.97	311°47.62	· · 7.42			Spica	158°20.95 -11°18.05
10	331°53.77	311°0.62	07°59.47	343°16.56	2.88	225°10.25	54.96	326°49.80	7.30			Alkaid	152°50.76 49°10.69
11	346°56.24	326°0.22	08°0.71	358°17.21	2.10	240°12.60	54.95	341°51.98	7.18			Hadar	148°34.05 -60°29.93
12	1°58.70	340°59.82	N08°1.94	13°17.86	S06°1.33	255°14.95	N22°54.94	356°54.16	S00°7.05			Menkent	147°56.11 -36°29.99
13	17°1.16	355°59.42	3.17	28°18.51	06°0.56	270°17.30	54.93	11°56.33	6.93			Arcturus	145°46.71 19°2.51
14	32°3.63	10°59.02	4.40	43°19.16	05°59.79	285°19.64	54.92	26°58.51	6.81			Rigel Kent.	139°38.42 -60°56.56
15	47°6.09	25°58.62	· · 5.63	58°19.81	· · 59.02	300°21.99	· · 54.91	42°0.69	· · 6.68			Kochab	137°18.90 74°2.53
16	62°8.56	40°58.22	6.86	73°20.46	58.25	315°24.34	54.90	57°2.87	6.56			Zuben'ubi	136°54.67 -16°9.16
17	77°11.02	55°57.82	8.09	88°21.11	57.48	330°26.69	54.89	72°5.04	6.44			Alphecca	126°2.67 26°37.29
18	92°13.49	70°57.42	N08°9.33	103°21.76	S05°56.70	345°29.03	N22°54.88	87°7.22	S00°6.32			Antares	112°14.47 -26°29.42
19	107°15.95	85°57.02	10.56	118°22.41	55.93	0°31.38	54.87	102°9.40	6.19			Atria	107°7.64 -69°4.24
20	122°18.41	100°56.62	11.78	133°23.06	55.16	15°33.73	54.86	117°11.58	6.07			Sabik	102°1.56 -15°45.51
21	137°20.88	115°56.22	· · 13.01	148°23.71	· · 54.39	30°36.07	· · 54.85	132°13.75	· · 5.95			Shaula	96°8.95 -37°7.29
22	152°23.34	130°55.82	14.24	163°24.37	53.62	45°38.42	54.83	147°15.93	5.82			Rasalhague	95°57.57 12°32.22
23	167°25.81	145°55.42	15.47	178°25.02	52.84	60°40.76	54.82	162°18.11	5.70			Eltanin	90°41.68 51°28.73
Mer.pass. 11:52		ν-0.4' d1.2' m-3.92		ν0.6' d-0.8' m1.17		ν2.4' d-0.0' m-2.26		ν2.2' d-0.1' m0.91					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	182°28.27	160°55.02	N08°16.70	193°25.67	S05°52.07	75°43.11	N22°54.81	177°20.28	S00°5.58			Kaus Aust.	83°31.21 -34°22.25
1	197°30.74	175°54.62	17.93	208°26.32	51.30	90°45.45	54.80	192°22.46	5.46			Vega	80°32.59 38°48.13
2	212°33.20	190°54.22	19.16	223°26.97	50.53	105°47.79	54.79	207°24.64	5.33			Nunki	75°46.59 -26°15.82
3	227°35.66	205°53.82	· · 20.38	238°27.62	· · 49.75	120°50.14	· · 54.78	222°26.82	· · 5.21			Altair	61°59.12 8°56.07
4	242°38.13	220°53.42	21.61	253°28.28	48.98	135°52.48	54.77	237°28.99	5.09			Peacock	53°4.47 -56°38.86
5	257°40.59	235°53.01	22.84	268°28.93	48.21	150°54.82	54.76	252°31.17	4.96			Deneb	49°25.41 45°22.15
6	272°43.06	250°52.61	N08°24.06	283°29.58	S05°47.44	165°57.17	N22°54.75	267°33.35	S00°4.84			Enif	33°38.08 9°59.57
7	287°45.52	265°52.21	25.29	298°30.23	46.66	180°59.51	54.74	282°35.53	4.72			Al Na'ir	27°32.05 -46°49.98
8	302°47.98	280°51.81	26.52	313°30.88	45.89	196°1.85	54.72	297°37.70	4.60			Fomalhaut	15°13.75 -29°29.03
9	317°50.45	295°51.40	· · 27.74	328°31.54	· · 45.12	211°4.19	· · 54.71	312°39.88	· · 4.47			Scheat	13°44.59 28°13.37
10	332°52.91	310°51.00	28.97	343°									

h		Sun		Moon				
Mon		GHA	Dec	GHA	ν	Dec	d	HP
0		178°19.58	N00°56.53	129°12.11	5.4'	N23°56.30	9.7'	59.7'
1		193°19.77	57.51	143°36.54	5.3'	24°5.99	9.5'	59.7'
2		208°19.96	58.50	158°0.88	5.3'	24°15.51	9.4'	59.7'
3		223°20.14	00°59.49	172°25.13	5.2'	24°24.88	9.2'	59.7'
4		238°20.33	01°0.47	186°49.30	5.1'	24°34.08	9.0'	59.7'
5		253°20.52	1.46	201°13.38	5.0'	24°43.12	8.9'	59.6'
6		268°20.70	N01°2.44	215°37.38	4.9'	N24°51.99	8.7'	59.6'
7		283°20.89	3.43	230°1.29	4.8'	25°0.70	8.5'	59.6'
8		298°21.08	4.42	244°25.13	4.8'	25°9.24	8.4'	59.6'
9		313°21.27	· · 5.40	258°48.88	4.7'	25°17.61	8.2'	59.6'
10		328°21.45	6.39	273°12.56	4.6'	25°25.81	8.0'	59.6'
11		343°21.64	7.37	287°36.16	4.5'	25°33.83	7.9'	59.6'
12		358°21.83	N01°8.36	301°59.68	4.4'	N25°41.68	7.7'	59.6'
13		13°22.02	9.34	316°23.13	4.4'	25°49.36	7.5'	59.6'
14		28°22.20	10.33	330°46.51	4.3'	25°56.86	7.3'	59.6'
15		43°22.39	· · 11.32	345°9.81	4.2'	26°4.19	7.1'	59.6'
16		58°22.58	12.30	359°33.05	4.2'	26°11.33	7.0'	59.6'
17		73°22.76	13.29	13°56.22	4.1'	26°18.30	6.8'	59.6'
18		88°22.95	N01°14.27	28°19.33	4.0'	N26°25.08	6.6'	59.6'
19		103°23.14	15.26	42°42.37	4.0'	26°31.69	6.4'	59.6'
20		118°23.33	16.24	57°5.34	3.9'	26°38.10	6.2'	59.6'
21		133°23.51	· · 17.23	71°28.26	3.9'	26°44.34	6.1'	59.5'
22		148°23.70	18.21	85°51.12	3.8'	26°50.39	5.9'	59.5'
23		163°23.89	19.20	100°13.93	3.8'	26°56.25	5.7'	59.5'
		SD = 16.0' $d = 1.0'$		SD = 16.3'				

Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		178°24.08	N01°20.18	114°36.68	3.7'	N27°1.93	5.5'	59.5'
1		193°24.27	21.17	128°59.38	3.6'	27°7.42	5.3'	59.5'
2		208°24.45	22.15	143°22.03	3.6'	27°12.72	5.1'	59.5'
3		223°24.64	· · 23.14	157°44.63	3.6'	27°17.83	4.9'	59.5'
4		238°24.83	24.12	172°7.19	3.5'	27°22.75	4.7'	59.5'
5		253°25.02	25.11	186°29.70	3.5'	27°27.48	4.5'	59.5'
6		268°25.20	N01°26.09	200°52.17	3.4'	N27°32.01	4.3'	59.5'
7		283°25.39	27.08	215°14.61	3.4'	27°36.36	4.2'	59.5'
8		298°25.58	28.06	229°37.01	3.4'	27°40.51	4.0'	59.4'
9		313°25.77	· · 29.04	243°59.37	3.3'	27°44.46	3.8'	59.4'
10		328°25.96	30.03	258°21.70	3.3'	27°48.23	3.6'	59.4'
11		343°26.14	31.01	272°44.01	3.3'	27°51.79	3.4'	59.4'
12		358°26.33	N01°32.00	287°6.28	3.3'	N27°55.17	3.2'	59.4'
13		13°26.52	32.98	301°28.54	3.2'	27°58.34	3.0'	59.4'
14		28°26.71	33.97	315°50.77	3.2'	28°1.32	2.8'	59.4'
15		43°26.90	· · 34.95	330°12.98	3.2'	28°4.10	2.6'	59.4'
16		58°27.08	35.93	344°35.18	3.2'	28°6.69	2.4'	59.4'
17		73°27.27	36.92	358°57.37	3.2'	28°9.08	2.2'	59.3'
18		88°27.46	N01°37.90	13°19.54	3.2'	N28°11.27	2.0'	59.3'
19		103°27.65	38.89	27°41.70	3.2'	28°13.26	1.8'	59.3'
20		118°27.84	39.87	42°3.86	3.2'	28°15.06	1.6'	59.3'
21		133°28.02	· · 40.85	56°26.02	3.2'	28°16.66	1.4'	59.3'
22		148°28.21	41.84	70°48.17	3.2'	28°18.06	1.2'	59.3'
23		163°28.40	42.82	85°10.32	3.2'	28°19.26	1.0'	59.3'
		SD = 16.0' $d = 1.0'$		SD = 16.2'				

Wed		GHA	Dec	GHA	ν	Dec	d	HP
0		178°28.59	N01°43.80	99°32.49	3.2'	N28°20.26	0.8'	59.3'
1		193°28.78	44.79	113°54.65	3.2'	28°21.07	0.6'	59.2'
2		208°28.97	45.77	128°16.83	3.2'	28°21.68	0.4'	59.2'
3		223°29.15	· · 46.75	142°39.02	3.2'	28°22.09	0.2'	59.2'
4		238°29.34	47.74	157°1.23	3.2'	28°22.30	0.0'	59.2'
5		253°29.53	48.72	171°23.45	3.2'	28°22.32	-0.2'	59.2'
6		268°29.72	N01°49.70	185°45.69	3.3'	N28°22.14	-0.4'	59.2'
7		283°29.91	50.68	200°7.96	3.3'	28°21.76	-0.6'	59.2'
8		298°30.10	51.67	214°30.25	3.3'	28°21.19	-0.8'	59.1'
9		313°30.29	· · 52.65	228°52.57	3.4'	28°20.42	-1.0'	59.1'
10		328°30.47	53.63	243°14.92	3.4'	28°19.46	-1.2'	59.1'
11		343°30.66	54.62	257°37.30	3.4'	28°18.30	-1.4'	59.1'
12		358°30.85	N01°55.60	271°59.72	3.5'	N28°16.94	-1.5'	59.1'
13		13°31.04	56.58	286°22.18	3.5'	28°15.40	-1.7'	59.1'
14		28°31.23	57.56	300°44.67	3.5'	28°13.66	-1.9'	59.1'
15		43°31.42	· · 58.54	315°7.21	3.6'	28°11.72	-2.1'	59.0'
16		58°31.61	01°59.53	329°29.80	3.6'	28°9.60	-2.3'	59.0'
17		73°31.79	02°0.51	343°52.43	3.7'	28°7.28	-2.5'	59.0'
18		88°31.98	N02°1.49	358°15.12	3.7'	N28°4.78	-2.7'	59.0'
19		103°32.17	2.47	12°37.85	3.8'	28°2.08	-2.9'	59.0'
20		118°32.36	3.45	27°0.65	3.8'	27°59.20	-3.1'	59.0'
21		133°32.55	· · 4.44	41°23.49	3.9'	27°56.13	-3.3'	59.0'
22		148°32.74	5.42	55°46.40	4.0'	27°52.87	-3.4'	58.9'
23		163°32.93	6.40	70°9.37	4.0'	27°49.42	-3.6'	58.9'
		SD = 16.0' $d = 1.0'$		SD = 16.2'				

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

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

March 26, 27, 28 UT (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	183°27.41	160°45.33	N08°46.08	193°41.34	S05°33.51	76°39.27	N22°54.54	178°12.54	S00°2.63	Alpheratz	357°34.10	29°14.03
1	198°29.88	175°44.92	47.30	208°41.99	32.74	91°41.61	54.53	193°14.72	2.51	Ankaa	353°6.56	-42°9.86
2	213°32.34	190°44.52	48.52	223°42.64	31.97	106°43.95	54.52	208°16.90	2.39	Schedar	349°30.48	56°40.86
3	228°34.80	205°44.11	· · 49.74	238°43.30	· · 31.19	121°46.28	· · 54.51	223°19.07	· · 2.26	Diphda	348°46.61	-17°50.65
4	243°37.27	220°43.70	50.96	253°43.95	30.42	136°48.62	54.49	238°21.25	2.14	Achernar	335°19.96	-57°6.31
5	258°39.73	235°43.29	52.18	268°44.61	29.64	151°50.95	54.48	253°23.43	2.02	Hamal	327°50.37	23°35.16
6	273°42.20	250°42.88	N08°53.40	283°45.26	S05°28.87	166°53.28	N22°54.47	268°25.61	S00°1.89	Polaris	313°53.70	89°22.68
7	288°44.66	265°42.48	54.61	298°45.92	28.09	181°55.62	54.46	283°27.78	1.77	Acamar	315°11.32	-40°12.14
8	303°47.12	280°42.07	55.83	313°46.57	27.32	196°57.95	54.45	298°29.96	1.65	Menkar	314°5.34	4°11.48
9	318°49.59	295°41.66	· · 57.05	328°47.23	· · 26.55	212°0.29	· · 54.43	313°32.14	· · 1.53	Mirfak	308°27.16	49°57.36
10	333°52.05	310°41.25	58.27	343°47.88	25.77	227°2.62	54.42	328°34.32	1.40	Aldebaran	290°38.62	16°33.70
11	348°54.52	325°40.84	08°59.48	358°48.54	25.00	242°4.95	54.41	343°36.49	1.28	Rigel	281°3.00	-8°10.42
12	3°56.98	340°40.43	N09°0.70	13°49.19	S05°24.22	257°7.28	N22°54.40	358°38.67	S00°1.16	Capella	280°20.54	46°1.58
13	18°59.45	355°40.02	1.91	28°49.85	23.45	272°9.62	54.38	13°40.85	1.04	Bellatrix	278°21.88	6°22.33
14	34°1.91	10°39.61	3.13	43°50.50	22.67	287°11.95	54.37	28°43.03	0.91	El Nath	278°0.69	28°37.80
15	49°4.37	25°39.20	· · 4.34	58°51.16	· · 21.90	302°14.28	· · 54.36	43°45.20	· · 0.79	Alnilam	275°36.77	-1°11.22
16	64°6.84	40°38.79	5.56	73°51.82	21.12	317°16.61	54.35	58°47.38	0.67	Betelgeuse	270°51.04	7°24.64
17	79°9.30	55°38.38	6.77	88°52.47	20.35	332°18.94	54.34	73°49.56	0.54	Canopus	263°51.96	-52°42.84
18	94°11.77	70°37.97	N09°7.99	103°53.13	S05°19.57	347°21.27	N22°54.32	88°51.73	S00°0.42	Sirius	258°25.33	-16°45.32
19	109°14.23	85°37.56	9.20	118°53.78	18.80	2°23.60	54.31	103°53.91	0.30	Adhara	255°5.03	-29°0.70
20	124°16.70	100°37.15	10.41	133°54.44	18.02	17°25.93	54.30	118°56.09	0.18	Procyon	244°49.69	5°9.35
21	139°19.16	115°36.73	· · 11.63	148°55.10	· · 17.24	32°28.26	· · 54.29	133°58.27	S00°0.05	Pollux	243°15.96	27°57.77
22	154°21.62	130°36.32	12.84	163°55.75	16.47	47°30.59	54.27	149°0.44	N00°0.07	Avior	234°14.05	-59°35.88
23	169°24.09	145°35.91	14.05	178°56.41	15.69	62°32.92	54.26	164°2.62	0.19	Suhail	222°45.31	-43°32.56
Mer.pass. 11:44						ν0.7' d-0.8' m1.17		ν2.3' d-0.0' m-2.25		ν2.2' d-0.1' m0.91		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	184°26.55	160°35.50	N09°15.26	193°57.07	S05°14.92	77°35.24	N22°54.25	179°4.80	N00°0.31	Regulus	207°33.11	11°50.21
1	199°29.02	175°35.08	16.47	208°57.72	14.14	92°37.57	54.23	194°6.98	0.44	Dubhe	193°39.14	61°36.56
2	214°31.48	190°34.67	17.68	223°58.38	13.37	107°39.90	54.22	209°9.15	0.56	Denebola	182°23.60	14°25.36
3	229°33.94	205°34.26	· · 18.89	238°59.04	· · 12.59	122°42.23	· · 54.21	224°11.33	· · 0.68	Gienah	175°42.23	-17°41.43
4	244°36.41	220°33.84	20.10	253°59.69	11.82	137°44.55	54.20	239°13.51	0.80	AcruX	172°58.32	-63°14.77
5	259°38.87	235°33.43	21.31	269°0.35	11.04	152°46.88	54.18	254°15.69	0.93	Gacrux	171°49.97	-57°15.71
6	274°41.34	250°33.02	N09°22.52	284°1.01	S05°10.26	167°49.21	N22°54.17	269°17.86	N00°1.05	Alioth	166°11.51	55°48.88
7	289°43.80	265°32.60	23.73	299°1.66	9.49	182°51.53	54.16	284°20.04	1.17	Spica	158°20.94	-11°18.06
8	304°46.27	280°32.19	24.94	314°2.32	8.71	197°53.86	54.14	299°22.22	1.29	Alkaid	152°50.75	49°10.70
9	319°48.73	295°31.77	· · 26.15	329°2.98	· · 7.93	212°56.18	· · 54.13	314°24.40	· · 1.42	Hadar	148°34.02	-60°29.95
10	334°51.19	310°31.36	27.36	344°3.64	7.16	227°58.51	54.12	329°26.57	1.54	Menkent	147°56.09	-36°30.01
11	349°53.66	325°30.94	28.57	359°4.30	6.38	243°0.83	54.11	344°28.75	1.66	Arcturus	145°46.69	19°2.52
12	4°56.12	340°30.53	N09°29.77	14°4.95	S05°5.61	258°3.16	N22°54.09	359°30.93	N00°1.78	Rigel Kent.	139°38.38	-60°56.58
13	19°58.59	355°30.11	30.98	29°5.61	4.83	273°5.48	54.08	14°33.10	1.91	Kochab	137°18.86	74°2.54
14	35°1.05	10°29.69	32.19	44°6.27	4.05	288°7.80	54.07	29°35.28	2.03	Zuben'ubi	136°54.64	-16°9.17
15	50°3.51	25°29.28	· · 33.39	59°6.93	· · 3.28	303°10.13	· · 54.05	44°37.46	· · 2.15	Alphecca	126°2.65	26°37.30
16	65°5.98	40°28.86	34.60	74°7.59	2.50	318°12.45	54.04	59°39.64	2.27	Antares	112°14.44	-26°29.43
17	80°8.44	55°28.44	35.80	89°8.24	1.72	333°14.77	54.03	74°41.81	2.40	Atria	107°7.57	-69°4.24
18	95°10.91	70°28.02	N09°37.01	104°8.90	S05°0.95	348°17.09	N22°54.01	89°43.99	N00°2.52	Sabik	102°1.53	-15°45.51
19	110°13.37	85°27.61	38.21	119°9.56	05°0.17	3°19.41	54.00	104°46.17	2.64	Shaula	96°8.92	-37°7.29
20	125°15.83	100°27.19	39.42	134°10.22	04°59.39	18°21.74	53.99	119°48.35	2.76	Rasalhague	95°57.54	12°32.22
21	140°18.30	115°26.77	· · 40.62	149°10.88	· · 58.62	33°24.06	· · 53.97	134°50.52	· · 2.89	Eltanin	90°41.65	51°28.73
22	155°20.76	130°26.35	41.82	164°11.54	57.84	48°26.38	53.96	149°52.70	3.01	Kaus Aust.	83°31.18	-34°22.25
23	170°23.23	145°25.93	43.03	179°12.20	57.06	63°28.70	53.94	164°54.88	3.13	Vega	80°32.56	38°48.13
Mer.pass. 11:40						ν0.7' d-0.8' m1.18		ν2.3' d-0.0' m-2.24		ν2.2' d0.1' m0.91		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	185°25.69	160°25.52	N09°44.23	194°12.86	S04°56.28	78°31.02	N22°53.93	179°57.06	N00°3.25	Nunki	75°46.56	-26°15.82
1	200°28.16	175°25.10	45.43	209°13.51	55.51	93°33.34	53.92	194°59.23	3.38	Altair	61°59.09	8°56.07
2	215°30.62	190°24.68	46.63	224°14.17	54.73	108°35.66	53.90	210°1.41	3.50	Peacock	53°4.42	-56°38.85
3	230°33.08	205°24.26	· · 47.83	239°14.83	· · 53.95	123°37.98	· · 53.89	225°3.59	· · 3.62	Deneb	49°25.38	45°22.14
4	245°35.55	220°23.84	49.03	254°15.49	53.18	138°40.30	53.88	240°5.77	3.74	Enif	33°38.06	9°59.57
5	260°38.01	235°23.42	50.23	269°16.15	52.40	153°42.61	53.86	255°7.94	3.87	Al Na'ir	27°32.02	-46°49.96
6	275°40.48	250°23.00	N09°51.43	284°16.81	S04°51.62	168°44.93	N22°53.85	270°10.12	N00°3.99	Fomalhaut	15°13.74	-29°29.02
7	290°42.94	265°22.57	52.63	299°17.47	50.84	183°47.25	53.83	285°12.30	4.11	Scheat	13°44.57	28°13.37
8	305°45.40	280°22.15	53.83	314°18.13	50.07	198°49.57	53.82	300°14.47	4.23	Markab	13°29.21	15°20.66
9	320°47.87	295°21.73	· · 55.03	329°18.79	· · 49.29	213°51.88	· · 53.81	315°16.65	· · 4.36			
10	335°50.33	310°21.31	56.23	344°19.45	48.51	228°54.20	53.79	330°18.83	4.48	Mar 26 Thu	SHA	Mer.pass
11	350°52.80	325°20.89	57.43	359°20.11	47.73	243°56.52	53.78	345°21.01	4.60	Venus	337°17.92	13:17
12	5°55.26	340°20.47	N09°58.63	14°20.77	S04°46.95	258°58.83	N22°53.76	0°23.18	N00°4.72	Mars	10°13.92	11:05
13	20°57.72	355°20.04	09°59.82	29°21.43	46.18	274°1.15	53.75	15°25.36	4.84	Jupiter	253°11.86	18:50
14	36°0.19	10°19.62	10°1.02	44°22.09	45.40	289°3.46	53.74	30°27.54	4.97	Saturn	354°45.13	12:05
15	51°2.65	25°19.20	· · 2.22	59°22.75	· · 44.62	304°5.78	· · 53.72	45°29.72	· · 5.09			
16	66°5.12	40°18.77	3.41	74°23.41	43.84	319°8.09	53.71	60°31.89	5.21	Mar 27 Fri	SHA	Mer.pass
17	81°7.58	55°18.35	4.61	89°24.08	43.07	334°10.41	53.69	75°34.07	5.33	Venus	336°8.94	13:18
18	96°10.05	70°17.93	N10°5.80	104°24.74	S04°42.29	349°12.72	N22°53.68	90°36.25	N00°5.46	Mars	8°47.16	11:03
19	111°12.51	85°17.50	7.00	119°25.40	41.51	4°15.04	53.67	105°38.43	5.58	Jupiter	253°5.33	18:43
20	126°14.97	100°17.08	8.19	134°26.06	40.73	19°17.35	53.65	120°40.60	5.70	Saturn	354°31.36	11:58
21	141°17.44	115°16.65	· · 9.39	149°26.72	· · 39.95	34°19.66	· · 53.64	135°42.78	· · 5.82			
22	156°19.90	130°16.23	10.58	164°27.38	39.17	49°21.98	53.62	150°44.96	5.94	Horizontal parallax	Venus:	0.1
23	171°22.37	145°15.80	11.77	179°28.04	38.40	64°24.29	53.61	165°47.14	6.07		Mars:	0.1
Mer.pass. 11:36						ν0.7' d-0.8' m1.18		ν2.3' d-0.0' m-2.23		ν2.2' d0.1' m0.91		

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.11	N02°7.38	84°32.40	4.1'	N27°45.79	-3.8'	58.9'
1	193°33.30	8.36	98°55.50	4.2'	27°41.98	-4.0'	58.9'
2	208°33.49	9.34	113°18.66	4.2'	27°37.98	-4.2'	58.9'
3	223°33.68	•• 10.33	127°41.90	4.3'	27°33.80	-4.4'	58.9'
4	238°33.87	11.31	142°5.21	4.4'	27°29.44	-4.5'	58.8'
5	253°34.06	12.29	156°28.59	4.5'	27°24.90	-4.7'	58.8'
6	268°34.25	N02°13.27	170°52.04	4.5'	N27°20.18	-4.9'	58.8'
7	283°34.44	14.25	185°15.57	4.6'	27°15.28	-5.1'	58.8'
8	298°34.62	15.23	199°39.18	4.7'	27°10.21	-5.2'	58.8'
9	313°34.81	•• 16.21	214°2.88	4.8'	27°4.96	-5.4'	58.8'
10	328°35.00	17.19	228°26.65	4.9'	26°59.54	-5.6'	58.7'
11	343°35.19	18.17	242°50.51	4.9'	26°53.94	-5.8'	58.7'
12	358°35.38	N02°19.15	257°14.45	5.0'	N26°48.17	-5.9'	58.7'
13	13°35.57	20.13	271°38.48	5.1'	26°42.24	-6.1'	58.7'
14	28°35.76	21.11	286°2.60	5.2'	26°36.13	-6.3'	58.7'
15	43°35.95	•• 22.09	300°26.81	5.3'	26°29.86	-6.4'	58.7'
16	58°36.14	23.07	314°51.11	5.4'	26°23.42	-6.6'	58.6'
17	73°36.32	24.05	329°15.51	5.5'	26°16.81	-6.8'	58.6'
18	88°36.51	N02°25.03	343°39.99	5.6'	N26°10.05	-6.9'	58.6'
19	103°36.70	26.01	358°4.57	5.7'	26°3.12	-7.1'	58.6'
20	118°36.89	26.99	12°29.25	5.8'	25°56.03	-7.2'	58.6'
21	133°37.08	•• 27.97	26°54.03	5.9'	25°48.78	-7.4'	58.6'
22	148°37.27	28.95	41°18.90	6.0'	25°41.37	-7.6'	58.5'
23	163°37.46	29.93	55°43.88	6.1'	25°33.81	-7.7'	58.5'
SD = 16.0'		$d = 1.0'$	SD = 16.1'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.65	N02°30.91	70°8.95	6.2'	N25°26.10	-7.9'	58.5'
1	193°37.84	31.89	84°34.12	6.3'	25°18.23	-8.0'	58.5'
2	208°38.03	32.87	98°59.40	6.4'	25°10.21	-8.2'	58.5'
3	223°38.21	•• 33.85	113°24.78	6.5'	25°2.04	-8.3'	58.5'
4	238°38.40	34.83	127°50.27	6.6'	24°53.72	-8.5'	58.4'
5	253°38.59	35.81	142°15.85	6.7'	24°45.25	-8.6'	58.4'
6	268°38.78	N02°36.79	156°41.55	6.8'	N24°36.64	-8.8'	58.4'
7	283°38.97	37.76	171°7.34	6.9'	24°27.89	-8.9'	58.4'
8	298°39.16	38.74	185°33.25	7.0'	24°18.99	-9.0'	58.4'
9	313°39.35	•• 39.72	199°59.26	7.1'	24°9.95	-9.2'	58.4'
10	328°39.54	40.70	214°25.38	7.2'	24°0.78	-9.3'	58.3'
11	343°39.73	41.68	228°51.60	7.3'	23°51.47	-9.4'	58.3'
12	358°39.92	N02°42.66	243°17.94	7.4'	N23°42.02	-9.6'	58.3'
13	13°40.10	43.63	257°44.38	7.5'	23°32.44	-9.7'	58.3'
14	28°40.29	44.61	272°10.93	7.7'	23°22.72	-9.8'	58.3'
15	43°40.48	•• 45.59	286°37.58	7.8'	23°12.88	-10.0'	58.2'
16	58°40.67	46.57	301°4.35	7.9'	23°2.91	-10.1'	58.2'
17	73°40.86	47.55	315°31.23	8.0'	22°52.80	-10.2'	58.2'
18	88°41.05	N02°48.52	329°58.21	8.1'	N22°42.58	-10.4'	58.2'
19	103°41.24	49.50	344°25.30	8.2'	22°32.23	-10.5'	58.2'
20	118°41.43	50.48	358°52.50	8.3'	22°21.75	-10.6'	58.2'
21	133°41.62	•• 51.46	13°19.82	8.4'	22°11.16	-10.7'	58.1'
22	148°41.81	52.43	27°47.24	8.5'	22°0.45	-10.8'	58.1'
23	163°41.99	53.41	42°14.76	8.6'	21°49.62	-10.9'	58.1'
SD = 16.0'		$d = 1.0'$	SD = 16.0'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°42.18	N02°54.39	56°42.40	8.7'	N21°38.67	-11.1'	58.1'
1	193°42.37	55.36	71°10.14	8.9'	21°27.61	-11.2'	58.1'
2	208°42.56	56.34	85°38.00	9.0'	21°16.44	-11.3'	58.0'
3	223°42.75	•• 57.32	100°5.96	9.1'	21°5.15	-11.4'	58.0'
4	238°42.94	58.29	114°34.03	9.2'	20°53.76	-11.5'	58.0'
5	253°43.13	02°59.27	129°2.20	9.3'	20°42.26	-11.6'	58.0'
6	268°43.32	N03°0.25	143°30.48	9.4'	N20°30.66	-11.7'	58.0'
7	283°43.51	1.22	157°58.87	9.5'	20°18.94	-11.8'	57.9'
8	298°43.70	2.20	172°27.37	9.6'	20°7.13	-11.9'	57.9'
9	313°43.88	•• 3.18	186°55.97	9.7'	19°55.22	-12.0'	57.9'
10	328°44.07	4.15	201°24.67	9.8'	19°43.20	-12.1'	57.9'
11	343°44.26	5.13	215°53.48	9.9'	19°31.09	-12.2'	57.9'
12	358°44.45	N03°6.10	230°22.39	10.0'	N19°18.88	-12.3'	57.9'
13	13°44.64	7.08	244°51.41	10.1'	19°6.58	-12.4'	57.8'
14	28°44.83	8.05	259°20.53	10.2'	18°54.18	-12.5'	57.8'
15	43°45.02	•• 9.03	273°49.75	10.3'	18°41.70	-12.6'	57.8'
16	58°45.21	10.01	288°19.07	10.4'	18°29.12	-12.7'	57.8'
17	73°45.40	10.98	302°48.49	10.5'	18°16.46	-12.8'	57.8'
18	88°45.58	N03°11.96	317°18.02	10.6'	N18°3.70	-12.8'	57.7'
19	103°45.77	12.93	331°47.64	10.7'	17°50.87	-12.9'	57.7'
20	118°45.96	13.91	346°17.36	10.8'	17°37.95	-13.0'	57.7'
21	133°46.15	•• 14.88	0°47.18	10.9'	17°24.94	-13.1'	57.7'
22	148°46.34	15.86	15°17.09	11.0'	17°11.86	-13.2'	57.7'
23	163°46.53	16.83	29°47.10	11.1'	16°58.70	-13.2'	57.6'
SD = 16.0'		$d = 1.0'$	SD = 15.8'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 7-9 52-74%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
26	05:48	05:38	12:06	19:08	06:38	
27	05:29	05:20	12:05	20:05	07:37	
28	05:11	05:02	12:05	20:57	08:31	

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	186°24.83		160°15.38	N10°12.97	194°28.70	S04°37.62	79°26.60	N22°53.59	180°49.31	N00°6.19
1	201°27.29		175°14.95	14.16	209°29.37	36.84	94°28.91	53.58	195°51.49	6.31
2	216°29.76		190°14.52	15.35	224°30.03	36.06	109°31.22	53.56	210°53.67	6.43
3	231°32.22		205°14.10	•• 16.54	239°30.69	•• 35.28	124°33.53	•• 53.55	225°55.85	•• 6.56
4	246°34.69		220°13.67	17.73	254°31.35	34.50	139°35.85	53.53	240°58.02	6.68
5	261°37.15		235°13.24	18.92	269°32.01	33.72	154°38.16	53.52	256°0.20	6.80
6	276°39.61		250°12.82	N10°20.11	284°32.67	S04°32.95	169°40.47	N22°53.50	271°2.38	N00°6.92
7	291°42.08		265°12.39	21.30	299°33.34	32.17	184°42.78	53.49	286°4.56	7.04
8	306°44.54		280°11.96	22.49	314°34.00	31.39	199°45.09	53.48	301°6.73	7.17
9	321°47.01		295°11.53	•• 23.68	329°34.66	•• 30.61	214°47.39	•• 53.46	316°8.91	•• 7.29
10	336°49.47		310°11.10	24.87	344°35.32	29.83	229°49.70	53.45	331°11.09	7.41
11	351°51.93		325°10.67	26.06	359°35.99	29.05	244°52.01	53.43	346°13.27	7.53
12	6°54.40		340°10.24	N10°27.25	14°36.65	S04°28.27	259°54.32	N22°53.42	1°15.44	N00°7.65
13	21°56.86		355°9.81	28.44	29°37.31	27.49	274°56.63	53.40	16°17.62	7.78
14	36°59.33		10°9.38	29.62	44°37.97	26.71	289°58.93	53.39	31°19.80	7.90
15	52°1.79		25°8.95	•• 30.81	59°38.64	•• 25.93	305°1.24	•• 53.37	46°21.98	•• 8.02
16	67°4.26		40°8.52	31.99	74°39.30	25.15	320°3.55	53.35	61°24.15	8.14
17	82°6.72		55°8.09	33.18	89°39.96	24.38	335°5.85	53.34	76°26.33	8.26
18	97°9.18		70°7.66	N10°34.37	104°40.63	S04°23.60	350°8.16	N22°53.32	91°28.51	N00°8.39
19	112°11.65		85°7.23	35.55	119°41.29	22.82	5°10.47	53.31	106°30.69	8.51
20	127°14.11		100°6.80	36.73	134°41.95	22.04	20°12.77	53.29	121°32.86	8.63
21	142°16.58		115°6.37	•• 37.92	149°42.62	•• 21.26	35°15.08	•• 53.28	136°35.04	•• 8.75
22	157°19.04		130°5.94	39.10	164°43.28	20.48	50°17.38	53.26	151°37.22	8.87
23	172°21.50		145°5.50	40.28	179°43.94	19.70	65°19.69	53.25	166°39.40	9.00
Mer.pass. 11:32		ν -0.4' d1.2' m-3.92		ν 0.7' d-0.8' m1.18		ν 2.3' d-0.0' m-2.22		ν 2.2' d0.1' m0.91		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	187°23.97		160°5.07	N10°41.47	194°44.61	S04°18.92	80°21.99	N22°53.23	181°41.57	N00°9.12
1	202°26.43		175°4.64	42.65	209°45.27	18.14	95°24.29	53.22	196°43.75	9.24
2	217°28.90		190°4.20	43.83	224°45.94	17.36	110°26.60	53.20	211°45.93	9.36
3	232°31.36		205°3.77	•• 45.01	239°46.60	•• 16.58	125°28.90	•• 53.19	226°48.11	•• 9.48
4	247°33.82		220°3.34	46.19	254°47.26	15.80	140°31.20	53.17	241°50.28	9.61
5	262°36.29		235°2.90	47.37	269°47.93	15.02	155°33.51	53.15	256°52.46	9.73
6	277°38.75		250°2.47	N10°48.55	284°48.59	S04°14.24	170°35.81	N22°53.14	271°54.64	N00°9.85
7	292°41.22		265°2.03	49.73	299°49.26	13.46	185°38.11	53.12	286°56.82	9.97
8	307°43.68		280°1.60	50.91	314°49.92	12.68	200°40.41	53.11	301°58.99	10.09
9	322°46.14		295°1.16	•• 52.09	329°50.59	•• 11.90	215°42.71	•• 53.09	317°1.17	•• 10.22
10	337°48.61		310°0.73	53.27	344°51.25	11.12	230°45.01	53.07	332°3.35	10.34
11	352°51.07		325°0.29	54.45	359°51.91	10.34	245°47.31	53.06	347°5.53	10.46
12	7°53.54		339°59.85	N10°55.62	14°52.58	S04°9.56	260°49.61	N22°53.04	2°7.71	N00°10.58
13	22°56.00		354°59.42	56.80	29°53.24	8.78	275°51.91	53.03	17°9.88	10.70
14	37°58.46		9°58.98	57.98	44°53.91	8.00	290°54.21	53.01	32°12.06	10.82
15	53°0.93		24°58.54	10°59.15	59°54.57	•• 7.22	305°56.51	•• 52.99	47°14.24	•• 10.95
16	68°3.39		39°58.10	11°0.33	74°55.24	6.44	320°58.81	52.98	62°16.42	11.07
17	83°5.86		54°57.67	1.50	89°55.91	5.66	336°1.11	52.96	77°18.59	11.19
18	98°8.32		69°57.23	N11°2.68	104°56.57	S04°4.88	351°3.41	N22°52.95	92°20.77	N00°11.31
19	113°10.78		84°56.79	3.85	119°57.24	4.10	6°5.71	52.93	107°22.95	11.43
20	128°13.25		99°56.35	5.03	134°57.90	3.32	21°8.00	52.91	122°25.13	11.55
21	143°15.71		114°55.91	•• 6.20	149°58.57	•• 2.53	36°10.30	•• 52.90	137°27.30	•• 11.68
22	158°18.18		129°55.47	7.37	164°59.23	1.75	51°12.60	52.88	152°29.48	11.80
23	173°20.64		144°55.03	8.54	179°59.90	0.97	66°14.90	52.86	167°31.66	11.92
Mer.pass. 11:29		ν -0.4' d1.2' m-3.92		ν 0.7' d-0.8' m1.18		ν 2.3' d-0.0' m-2.22		ν 2.2' d0.1' m0.92		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	188°23.10		159°54.59	N11°9.72	195°0.57	S04°0.19	81°17.19	N22°52.85	182°33.84	N00°12.04
1	203°25.57		174°54.15	10.89	210°1.23	03°59.41	96°19.49	52.83	197°36.02	12.16
2	218°28.03		189°53.71	12.06	225°1.90	58.63	111°21.78	52.82	212°38.19	12.28
3	233°30.50		204°53.27	•• 13.23	240°2.56	•• 57.85	126°24.08	•• 52.80	227°40.37	•• 12.41
4	248°32.96		219°52.83	14.40	255°3.23	57.07	141°26.37	52.78	242°42.55	12.53
5	263°35.42		234°52.38	15.57	270°3.90	56.29	156°28.67	52.77	257°44.73	12.65
6	278°37.89		249°51.94	N11°16.74	285°4.56	S03°55.51	171°30.96	N22°52.75	272°46.90	N00°12.77
7	293°40.35		264°51.50	17.91	300°5.23	54.73	186°33.26	52.73	287°49.08	12.89
8	308°42.82		279°51.06	19.07	315°5.90	53.95	201°35.55	52.72	302°51.26	13.01
9	323°45.28		294°50.61	•• 20.24	330°6.56	•• 53.16	216°37.84	•• 52.70	317°53.44	•• 13.14
10	338°47.74		309°50.17	21.41	345°7.23	52.38	231°40.14	52.68	332°55.62	13.26
11	353°50.21		324°49.73	22.58	0°7.90	51.60	246°42.43	52.66	347°57.79	13.38
12	8°52.67		339°49.28	N11°23.74	15°8.56	S03°50.82	261°44.72	N22°52.65	2°59.97	N00°13.50
13	23°55.14		354°48.84	24.91	30°9.23	50.04	276°47.01	52.63	18°2.15	13.62
14	38°57.60		9°48.39	26.07	45°9.90	49.26	291°49.31	52.61	33°4.33	13.74
15	54°0.06		24°47.95	•• 27.24	60°10.56	•• 48.48	306°51.60	•• 52.60	48°6.50	•• 13.87
16	69°2.53		39°47.50	28.40	75°11.23	47.69	321°53.89	52.58	63°8.68	13.99
17	84°4.99		54°47.06	29.57	90°11.90	46.91	336°56.18	52.56	78°10.86	14.11
18	99°7.46		69°46.61	N11°30.73	105°12.57	S03°46.13	351°58.47	N22°52.55	93°13.04	N00°14.23
19	114°9.92		84°46.16	31.89	120°13.23	45.35	7°0.76	52.53	108°15.22	14.35
20	129°12.38		99°45.72	33.06	135°13.90	44.57	22°3.05	52.51	123°17.39	14.47
21	144°14.85		114°45.27	•• 34.22	150°14.57	•• 43.79	37°5.34	•• 52.49	138°19.57	•• 14.59
22	159°17.31		129°44.82	35.38	165°15.24	43.01	52°7.63	52.48	153°21.75	14.72
23	174°19.78		144°44.37	36.54	180°15.91	42.22	67°9.92	52.46	168°23.93	14.84
Mer.pass. 11:25		ν -0.4' d1.2' m-3.92		ν 0.7' d-0.8' m1.18		ν 2.3' d-0.0' m-2.21		ν 2.2' d0.1' m0.92		

	Stars	
	SHA	Dec
Alpheratz	357°34.09	29°14.03
Ankaa	353°6.55	-42°9.84
Schedar	349°30.48	56°40.85
Diphda	348°46.61	-17°50.64
Achernar	335°19.96	-57°6.29
Hamal	327°50.38	23°35.16
Polaris	313°54.69	89°22.67
Acamar	315°11.33	-40°12.12
Menkar	314°5.34	4°11.48
Mirfak	308°27.17	49°57.36
Aldebaran	290°38.63	16°33.70
Rigel	281°3.01	-8°10.41
Capella	280°20.55	46°1.58
Bellatrix	278°21.89	6°22.33
Elnath	278°0.70	28°37.80
Alnilam	275°36.79	-1°11.22
Betelgeuse	270°51.05	7°24.64
Canopus	263°51.98	-52°42.84
Sirius	258°25.35	-16°45.32
Adhara	255°5.04	-29°0.70
Procyon	244°49.70	5°9.36
Pollux	243°15.97	27°57.77
Avior	234°14.08	-59°35.89
Suhail	222°45.32	-43°32.57
Miaplacidus	221°37.55	-69°49.74
Alphard	217°46.56	-8°46.52
Regulus	207°33.11	11°50.22
Dubhe	193°39.14	61°36.58
Deneb	182°23.60	14°25.37
Gienah	175°42.23	-17°41.44
Acrux	172°58.31	-63°14.79
Gacrux	171°49.97	-57°15.73
Alioth	166°11.50	55°48.89
Spica	158°20.93	-11°18.06
Alkaid	152°50.73	49°10.71
Hadar	148°34.00	-60°29.97
Menkent	147°56.07	-36°30.02
Arcturus	145°46.68	19°2.52
Rigel Kent.	139°38.36	-60°56.59
Kochab	137°18.81	74°2.55
Zuben'ubi	136°54.63	-16°9.17
Alphecca	126°2.63	26°37.30
Antares	112°14.41	-26°29.43
Atria	107°7.52	-69°4.25
Sabik	102°1.50	-15°45.51
Shaula	96°8.89	-37°7.29
Rasalhague	95°57.52	12°32.22
Eltanin	90°41.62	51°28.73
Kaus Aust.	83°31.15	-34°22.25
Vega	80°32.54	38°48.13
Nunki	75°46.53	-26°15.82
Altair	61°59.07	8°56.07
Peacock	53°4.39	-56°38.85
Deneb	49°25.36	45°22.14
Enif	33°38.04	9°59.5


h	Sun			Moon			
Sun	GHA	Dec		GHA	ν	Dec	d HP
0	178°46.72	N03°17.80		44°17.21	11.2'	N16°45.46	-13.3' 57.6'
1	193°46.91	18.78		58°47.41	11.3'	16°32.15	-13.4' 57.6'
2	208°47.09	19.75		73°17.70	11.4'	16°18.76	-13.5' 57.6'
3	223°47.28	· · 20.73		87°48.09	11.5'	16°5.30	-13.5' 57.6'
4	238°47.47	21.70		102°18.57	11.6'	15°51.76	-13.6' 57.5'
5	253°47.66	22.67		116°49.13	11.7'	15°38.16	-13.7' 57.5'
6	268°47.85	N03°23.65		131°19.79	11.7'	N15°24.49	-13.7' 57.5'
7	283°48.04	24.62		145°50.54	11.8'	15°10.75	-13.8' 57.5'
8	298°48.23	25.60		160°21.38	11.9'	14°56.95	-13.9' 57.5'
9	313°48.41	· · 26.57		174°52.30	12.0'	14°43.08	-13.9' 57.4'
10	328°48.60	27.54		189°23.31	12.1'	14°29.15	-14.0' 57.4'
11	343°48.79	28.52		203°54.40	12.2'	14°15.16	-14.0' 57.4'
12	358°48.98	N03°29.49		218°25.58	12.3'	N14°1.11	-14.1' 57.4'
13	13°49.17	30.46		232°56.84	12.3'	13°47.01	-14.2' 57.4'
14	28°49.36	31.43		247°28.18	12.4'	13°32.84	-14.2' 57.4'
15	43°49.55	· · 32.41		261°59.60	12.5'	13°18.62	-14.3' 57.3'
16	58°49.73	33.38		276°31.10	12.6'	13°4.35	-14.3' 57.3'
17	73°49.92	34.35		291°2.68	12.7'	12°50.03	-14.4' 57.3'
18	88°50.11	N03°35.32		305°34.34	12.7'	N12°35.65	-14.4' 57.3'
19	103°50.30	36.30		320°6.08	12.8'	12°21.22	-14.5' 57.3'
20	118°50.49	37.27		334°37.89	12.9'	12°6.75	-14.5' 57.2'
21	133°50.68	· · 38.24		349°9.77	13.0'	11°52.23	-14.6' 57.2'
22	148°50.87	39.21		3°41.73	13.0'	11°37.66	-14.6' 57.2'
23	163°51.05	40.18		18°13.76	13.1'	11°23.05	-14.7' 57.2'
SD = 16.0'			SD = 15.7'				

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	178°51.24	N03°41.16		32°45.86	13.2'	N11°8.40	-14.7' 57.2'
1	193°51.43	42.13		47°18.03	13.2'	10°53.71	-14.7' 57.1'
2	208°51.62	43.10		61°50.27	13.3'	10°38.97	-14.8' 57.1'
3	223°51.81	· · 44.07		76°22.58	13.4'	10°24.20	-14.8' 57.1'
4	238°51.99	45.04		90°54.96	13.4'	10°9.39	-14.8' 57.1'
5	253°52.18	46.01		105°27.40	13.5'	09°54.55	-14.9' 57.1'
6	268°52.37	N03°46.98		119°59.90	13.6'	N09°39.66	-14.9' 57.0'
7	283°52.56	47.95		134°32.47	13.6'	09°24.75	-14.9' 57.0'
8	298°52.75	48.92		149°5.09	13.7'	09°9.80	-15.0' 57.0'
9	313°52.94	· · 49.89		163°37.78	13.7'	08°54.83	-15.0' 57.0'
10	328°53.12	50.86		178°10.53	13.8'	08°39.82	-15.0' 56.9'
11	343°53.31	51.83		192°43.34	13.9'	08°24.78	-15.1' 56.9'
12	358°53.50	N03°52.80		207°16.20	13.9'	N08°9.72	-15.1' 56.9'
13	13°53.69	53.77		221°49.13	14.0'	07°54.63	-15.1' 56.9'
14	28°53.88	54.74		236°22.10	14.0'	07°39.52	-15.1' 56.9'
15	43°54.06	· · 55.71		250°55.13	14.1'	07°24.38	-15.2' 56.8'
16	58°54.25	56.68		265°28.21	14.1'	07°9.23	-15.2' 56.8'
17	73°54.44	57.65		280°1.35	14.2'	06°54.05	-15.2' 56.8'
18	88°54.63	N03°58.62		294°34.53	14.2'	N06°38.85	-15.2' 56.8'
19	103°54.81	03°59.59		309°7.76	14.3'	06°23.63	-15.2' 56.8'
20	118°55.00	04°0.56		323°41.05	14.3'	06°8.40	-15.3' 56.7'
21	133°55.19	· · 1.53		338°14.37	14.4'	05°53.14	-15.3' 56.7'
22	148°55.38	2.50		352°47.75	14.4'	05°37.88	-15.3' 56.7'
23	163°55.57	3.47		7°21.17	14.5'	05°22.60	-15.3' 56.7'
SD = 16.0'			SD = 15.6'				

Tue	GHA	Dec		GHA	ν	Dec	d HP
0	178°55.75	N04°4.44		21°54.63	14.5'	N05°7.31	-15.3' 56.7'
1	193°55.94	5.40		36°28.13	14.5'	04°52.00	-15.3' 56.6'
2	208°56.13	6.37		51°1.68	14.6'	04°36.69	-15.3' 56.6'
3	223°56.32	· · 7.34		65°35.26	14.6'	04°21.37	-15.3' 56.6'
4	238°56.50	8.31		80°8.89	14.7'	04°6.04	-15.3' 56.6'
5	253°56.69	9.28		94°42.55	14.7'	03°50.70	-15.3' 56.6'
6	268°56.88	N04°10.24		109°16.25	14.7'	N03°35.36	-15.3' 56.5'
7	283°57.07	11.21		123°49.98	14.8'	03°20.01	-15.4' 56.5'
8	298°57.25	12.18		138°23.75	14.8'	03°4.66	-15.4' 56.5'
9	313°57.44	· · 13.15		152°57.55	14.8'	02°49.30	-15.4' 56.5'
10	328°57.63	14.11		167°31.38	14.9'	02°33.95	-15.4' 56.5'
11	343°57.81	15.08		182°5.24	14.9'	02°18.60	-15.4' 56.4'
12	358°58.00	N04°16.05		196°39.14	14.9'	N02°3.24	-15.4' 56.4'
13	13°58.19	17.02		211°13.06	14.9'	01°47.89	-15.3' 56.4'
14	28°58.38	17.98		225°47.01	15.0'	01°32.54	-15.3' 56.4'
15	43°58.56	· · 18.95		240°20.98	15.0'	01°17.20	-15.3' 56.4'
16	58°58.75	19.91		254°54.98	15.0'	01°1.86	-15.3' 56.3'
17	73°58.94	20.88		269°29.00	15.0'	00°46.53	-15.3' 56.3'
18	88°59.12	N04°21.85		284°3.05	15.1'	N00°31.21	-15.3' 56.3'
19	103°59.31	22.81		298°37.12	15.1'	00°15.89	-15.3' 56.3'
20	118°59.50	23.78		313°11.21	15.1'	N00°0.59	-15.3' 56.3'
21	133°59.68	· · 24.74		327°45.32	15.1'	S00°14.71	15.3' 56.2'
22	148°59.87	25.71		342°19.45	15.1'	00°29.99	15.3' 56.2'
23	164°0.06	26.68		356°53.59	15.2'	00°45.26	15.3' 56.2'
SD = 16.0'			SD = 15.5'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	10-12
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	83-95%
29	04:53	04:44	12:05	21:45	09:21	
30	04:35	04:26	12:04	22:30	10:08	
31	04:17	04:08	12:04	23:13	10:51	

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

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	189°22.24	159°43.93	N11°37.70	195°16.57	S03°41.44	82°12.20	N22°52.44	183°26.11	N00°14.96			Alpheratz	357°34.09 29°14.02
1	204°24.71	174°43.48	38.86	210°17.24	40.66	97°14.49	52.42	198°28.28	15.08			Ankaa	353°6.55 -42°9.83
2	219°27.17	189°43.03	40.02	225°17.91	39.88	112°16.78	52.41	213°30.46	15.20			Schedar	349°30.48 56°40.84
3	234°29.63	204°42.58	· · 41.18	240°18.58	· · 39.10	127°19.07	· · 52.39	228°32.64	· · 15.32			Diphda	348°46.61 -17°50.63
4	249°32.10	219°42.13	42.34	255°19.25	38.31	142°21.36	52.37	243°34.82	15.44			Achernar	335°19.97 -57°6.28
5	264°34.56	234°41.68	43.50	270°19.92	37.53	157°23.64	52.35	258°37.00	15.57			Hamal	327°50.38 23°35.15
6	279°37.03	249°41.23	N11°44.66	285°20.58	S03°36.75	172°25.93	N22°52.34	273°39.17	N00°15.69			Polaris	313°55.64 89°22.66
7	294°39.49	264°40.78	45.81	300°21.25	35.97	187°28.21	52.32	288°41.35	15.81			Acamar	315°11.34 -40°12.11
8	309°41.95	279°40.33	46.97	315°21.92	35.19	202°30.50	52.30	303°43.53	15.93			Menkar	314°5.35 4°11.48
9	324°44.42	294°39.88	· · 48.13	330°22.59	· · 34.40	217°32.79	· · 52.28	318°45.71	· · 16.05			Mirfak	308°27.19 49°57.35
10	339°46.88	309°39.43	49.28	345°23.26	33.62	232°35.07	52.27	333°47.89	16.17			Aldebaran	290°38.64 16°33.70
11	354°49.35	324°38.98	50.44	0°23.93	32.84	247°37.36	52.25	348°50.06	16.29			Rigel	281°3.02 -8°10.41
12	9°51.81	339°38.52	N11°51.59	15°24.60	S03°32.06	262°39.64	N22°52.23	3°52.24	N00°16.42			Capella	280°20.58 46°1.57
13	24°54.27	354°38.07	52.75	30°25.27	31.28	277°41.93	52.21	18°54.42	16.54			Bellatrix	278°21.91 6°22.33
14	39°56.74	9°37.62	53.90	45°25.94	30.49	292°44.21	52.19	33°56.60	16.66			Elnath	278°0.72 28°37.80
15	54°59.20	24°37.16	· · 55.05	60°26.60	· · 29.71	307°46.49	· · 52.18	48°58.78	· · 16.78			Alnilam	275°36.80 -1°11.22
16	70°1.67	39°36.71	56.21	75°27.27	28.93	322°48.78	52.16	64°0.95	16.90			Betelgeuse	270°51.07 7°24.64
17	85°4.13	54°36.26	57.36	90°27.94	28.15	337°51.06	52.14	79°3.13	17.02			Canopus	263°52.01 -52°42.84
18	100°6.59	69°35.80	N11°58.51	105°28.61	S03°27.36	352°53.34	N22°52.12	94°5.31	N00°17.14			Sirius	258°25.36 -16°45.32
19	115°9.06	84°35.35	11°59.66	120°29.28	26.58	7°55.62	52.10	109°7.49	17.26			Adhara	255°5.06 -29°0.69
20	130°11.52	99°34.89	12°0.81	135°29.95	25.80	22°57.91	52.09	124°9.67	17.39			Procyon	244°49.72 5°9.36
21	145°13.99	114°34.44	· · 1.96	150°30.62	· · 25.02	38°0.19	· · 52.07	139°11.84	· · 17.51			Pollux	243°15.99 27°57.78
22	160°16.45	129°33.98	3.11	165°31.29	24.23	53°2.47	52.05	154°14.02	17.63			Avior	234°14.11 -59°35.89
23	175°18.91	144°33.53	4.26	180°31.96	23.45	68°4.75	52.03	169°16.20	17.75			Suhail	222°45.34 -43°32.57
Mer.pass. 11:21		ν-0.4' d1.2' m-3.92		ν0.7' d-0.8' m1.18		ν2.3' d-0.0' m-2.20		ν2.2' d0.1' m0.92					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	190°21.38	159°33.07	N12°5.41	195°32.63	S03°22.67	83°7.03	N22°52.01	184°18.38	N00°17.87			Miaplacidus	221°37.59 -69°49.75
1	205°23.84	174°32.61	6.56	210°33.30	21.89	98°9.31	51.99	199°20.56	17.99			Alphard	217°46.57 -8°46.52
2	220°26.31	189°32.16	7.71	225°33.97	21.10	113°11.59	51.98	214°22.74	18.11			Regulus	207°33.12 11°50.22
3	235°28.77	204°31.70	· · 8.86	240°34.64	· · 20.32	128°13.87	· · 51.96	229°24.91	· · 18.23			Dubhe	193°39.15 61°36.59
4	250°31.23	219°31.24	10.00	255°35.31	19.54	143°16.15	51.94	244°27.09	18.35			Denebola	182°23.60 14°25.37
5	265°33.70	234°30.78	11.15	270°35.98	18.76	158°18.43	51.92	259°29.27	18.48			Gienah	175°42.23 -17°41.44
6	280°36.16	249°30.33	N12°12.30	285°36.65	S03°17.97	173°20.71	N22°51.90	274°31.45	N00°18.60			Acrux	172°58.32 -63°14.80
7	295°38.63	264°29.87	13.44	300°37.32	17.19	188°22.99	51.88	289°33.63	18.72			Gacrux	171°49.97 -57°15.74
8	310°41.09	279°29.41	14.59	315°37.99	16.41	203°25.27	51.86	304°35.81	18.84			Alioth	166°11.50 55°48.91
9	325°43.55	294°28.95	· · 15.73	330°38.67	· · 15.62	218°27.54	· · 51.85	319°37.98	· · 18.96			Spica	158°20.92 -11°18.07
10	340°46.02	309°28.49	16.88	345°39.34	14.84	233°29.82	51.83	334°40.16	19.08			Alkaid	152°50.72 49°10.73
11	355°48.48	324°28.03	18.02	0°40.01	14.06	248°32.10	51.81	349°42.34	19.20			Hadar	148°33.99 -60°29.98
12	10°50.95	339°27.57	N12°19.16	15°40.68	S03°13.27	263°34.38	N22°51.79	4°44.52	N00°19.32			Menkent	147°56.07 -36°30.03
13	25°53.41	354°27.11	20.30	30°41.35	12.49	278°36.65	51.77	19°46.70	19.44			Arcturus	145°46.67 19°2.53
14	40°55.87	9°26.65	21.45	45°42.02	11.71	293°38.93	51.75	34°48.87	19.56			Rigel Kent.	139°38.34 -60°56.61
15	55°58.34	24°26.19	· · 22.59	60°42.69	· · 10.93	308°41.20	· · 51.73	49°51.05	· · 19.69			Kochab	137°18.78 74°2.57
16	71°0.80	39°25.72	23.73	75°43.36	10.14	323°43.48	51.71	64°53.23	19.81			Zuben'ubi	136°54.62 -16°9.17
17	86°3.27	54°25.26	24.87	90°44.03	9.36	338°45.76	51.69	79°55.41	19.93			Alphecca	126°2.61 26°37.31
18	101°5.73	69°24.80	N12°26.01	105°44.71	S03°8.58	353°48.03	N22°51.68	94°57.59	N00°20.05			Antares	112°14.40 -26°29.44
19	116°8.19	84°24.34	27.15	120°45.38	7.79	8°50.30	51.66	109°59.77	20.17			Atria	107°7.47 -69°4.26
20	131°10.66	99°23.87	28.29	135°46.05	7.01	23°52.58	51.64	125°1.95	20.29			Sabik	102°1.49 -15°45.51
21	146°13.12	114°23.41	· · 29.42	150°46.72	· · 6.23	38°54.85	· · 51.62	140°4.12	· · 20.41			Shaula	96°8.87 -37°7.30
22	161°15.59	129°22.95	30.56	165°47.39	5.44	53°57.13	51.60	155°6.30	20.53			Rasalhague	95°57.50 12°32.22
23	176°18.05	144°22.48	31.70	180°48.06	4.66	68°59.40	51.58	170°8.48	20.65			Eltanin	90°41.59 51°28.73
Mer.pass. 11:17		ν-0.5' d1.1' m-3.92		ν0.7' d-0.8' m1.18		ν2.3' d-0.0' m-2.20		ν2.2' d0.1' m0.92					
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	191°20.51	159°22.02	N12°32.84	195°48.74	S03°3.88	84°1.67	N22°51.56	185°10.66	N00°20.77			Kaus Aust.	83°31.13 -34°22.25
1	206°22.98	174°21.55	33.97	210°49.41	3.09	99°3.95	51.54	200°12.84	20.90			Vega	80°32.51 38°48.13
2	221°25.44	189°21.09	35.11	225°50.08	2.31	114°6.22	51.52	215°15.02	21.02			Nunki	75°46.51 -26°15.82
3	236°27.91	204°20.62	· · 36.24	240°50.75	· · 1.53	129°8.49	· · 51.50	230°17.19	· · 21.14			Altair	61°59.05 8°56.07
4	251°30.37	219°20.15	37.38	255°51.42	0.74	144°10.76	51.48	245°19.37	21.26			Peacock	53°4.36 -56°38.84
5	266°32.83	234°19.69	38.51	270°52.10	02°59.96	159°13.03	51.46	260°21.55	21.38			Deneb	49°25.34 45°22.13
6	281°35.30	249°19.22	N12°39.65	285°52.77	S02°59.18	174°15.31	N22°51.44	275°23.73	N00°21.50			Enif	33°38.03 9°59.57
7	296°37.76	264°18.75	40.78	300°53.44	58.39	189°17.58	51.42	290°25.91	21.62			Al Na'ir	27°31.98 -46°49.94
8	311°40.23	279°18.29	41.91	315°54.11	57.61	204°19.85	51.40	305°28.09	21.74			Fomalhaut	15°13.71 -29°29.00
9	326°42.69	294°17.82	· · 43.04	330°54.79	· · 56.83	219°22.12	· · 51.38	320°30.27	· · 21.86			Scheat	13°44.55 28°13.36
10	341°45.16	309°17.											

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Wed							
0	179°0.25	N04°27.64	11°27.75	15.2'	S01°0.52	15.2'	56.2'
1	194°0.43	28.61	26°1.93	15.2'	01°15.76	15.2'	56.2'
2	209°0.62	29.57	40°36.12	15.2'	01°30.99	15.2'	56.1'
3	224°0.80	· · 30.54	55°10.32	15.2'	01°46.19	15.2'	56.1'
4	239°0.99	31.50	69°44.54	15.2'	02°1.38	15.2'	56.1'
5	254°1.18	32.47	84°18.76	15.2'	02°16.55	15.2'	56.1'
6	269°1.36	N04°33.43	98°53.00	15.2'	S02°31.71	15.1'	56.0'
7	284°1.55	34.39	113°27.24	15.3'	02°46.84	15.1'	56.0'
8	299°1.74	35.36	128°1.49	15.3'	03°1.94	15.1'	56.0'
9	314°1.92	· · 36.32	142°35.75	15.3'	03°17.03	15.1'	56.0'
10	329°2.11	37.29	157°10.02	15.3'	03°32.09	15.0'	56.0'
11	344°2.30	38.25	171°44.29	15.3'	03°47.12	15.0'	55.9'
12	359°2.48	N04°39.21	186°18.56	15.3'	S04°2.13	15.0'	55.9'
13	14°2.67	40.18	200°52.84	15.3'	04°17.12	15.0'	55.9'
14	29°2.85	41.14	215°27.11	15.3'	04°32.07	14.9'	55.9'
15	44°3.04	· · 42.10	230°1.39	15.3'	04°47.00	14.9'	55.9'
16	59°3.23	43.07	244°35.67	15.3'	05°1.89	14.9'	55.8'
17	74°3.41	44.03	259°9.94	15.3'	05°16.76	14.8'	55.8'
18	89°3.60	N04°44.99	273°44.21	15.3'	S05°31.59	14.8'	55.8'
19	104°3.78	45.95	288°18.48	15.3'	05°46.39	14.8'	55.8'
20	119°3.97	46.92	302°52.75	15.3'	06°1.15	14.7'	55.8'
21	134°4.16	· · 47.88	317°27.01	15.3'	06°15.88	14.7'	55.7'
22	149°4.34	48.84	332°1.26	15.2'	06°30.58	14.7'	55.7'
23	164°4.53	49.80	346°35.51	15.2'	06°45.23	14.6'	55.7'
SD = 16.0' $d = 1.0'$							
SD = 15.3'							

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°4.71	N04°50.76	1°9.74	15.2'	S06°59.85	14.6'	55.7'
1	194°4.90	51.73	15°43.97	15.2'	07°14.44	14.5'	55.7'
2	209°5.08	52.69	30°18.19	15.2'	07°28.98	14.5'	55.6'
3	224°5.27	· · 53.65	44°52.39	15.2'	07°43.48	14.5'	55.6'
4	239°5.45	54.61	59°26.59	15.2'	07°57.94	14.4'	55.6'
5	254°5.64	55.57	74°0.77	15.2'	08°12.35	14.4'	55.6'
6	269°5.82	N04°56.53	88°34.93	15.2'	S08°26.73	14.3'	55.6'
7	284°6.01	57.49	103°9.09	15.1'	08°41.06	14.3'	55.5'
8	299°6.19	58.45	117°43.22	15.1'	08°55.34	14.2'	55.5'
9	314°6.38	04°59.41	132°17.34	15.1'	09°9.58	14.2'	55.5'
10	329°6.56	05°0.37	146°51.44	15.1'	09°23.77	14.1'	55.5'
11	344°6.75	1.33	161°25.52	15.1'	09°37.91	14.1'	55.5'
12	359°6.93	N05°2.29	175°59.59	15.0'	S09°52.00	14.0'	55.4'
13	14°7.12	3.25	190°33.63	15.0'	10°6.05	14.0'	55.4'
14	29°7.30	4.21	205°7.65	15.0'	10°20.04	13.9'	55.4'
15	44°7.49	· · 5.17	219°41.65	15.0'	10°33.98	13.9'	55.4'
16	59°7.67	6.13	234°15.63	15.0'	10°47.87	13.8'	55.4'
17	74°7.86	7.09	248°49.58	14.9'	11°1.70	13.8'	55.4'
18	89°8.04	N05°8.05	263°23.51	14.9'	S11°15.48	13.7'	55.3'
19	104°8.23	9.01	277°57.42	14.9'	11°29.21	13.7'	55.3'
20	119°8.41	9.97	292°31.29	14.9'	11°42.88	13.6'	55.3'
21	134°8.60	· · 10.93	307°5.15	14.8'	11°56.49	13.6'	55.3'
22	149°8.78	11.89	321°38.97	14.8'	12°10.04	13.5'	55.3'
23	164°8.96	12.84	336°12.76	14.8'	12°23.54	13.4'	55.2'
SD = 16.0' $d = 1.0'$							
SD = 15.2'							

Fri	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°9.15	N05°13.80	350°46.53	14.7'	S12°36.97	13.4'	55.2'
1	194°9.33	14.76	5°20.26	14.7'	12°50.34	13.3'	55.2'
2	209°9.52	15.72	19°53.97	14.7'	13°3.66	13.2'	55.2'
3	224°9.70	· · 16.68	34°27.64	14.6'	13°16.91	13.2'	55.2'
4	239°9.88	17.63	49°1.28	14.6'	13°30.09	13.1'	55.1'
5	254°10.07	18.59	63°34.89	14.6'	13°43.21	13.1'	55.1'
6	269°10.25	N05°19.55	78°8.46	14.5'	S13°56.27	13.0'	55.1'
7	284°10.44	20.50	92°42.00	14.5'	14°9.26	12.9'	55.1'
8	299°10.62	21.46	107°15.50	14.5'	14°22.18	12.9'	55.1'
9	314°10.80	· · 22.42	121°48.97	14.4'	14°35.04	12.8'	55.1'
10	329°10.99	23.37	136°22.41	14.4'	14°47.82	12.7'	55.0'
11	344°11.17	24.33	150°55.80	14.4'	15°0.54	12.6'	55.0'
12	359°11.35	N05°25.29	165°29.16	14.3'	S15°13.19	12.6'	55.0'
13	14°11.54	26.24	180°2.48	14.3'	15°25.76	12.5'	55.0'
14	29°11.72	27.20	194°35.76	14.2'	15°38.27	12.4'	55.0'
15	44°11.90	· · 28.15	209°9.00	14.2'	15°50.70	12.4'	55.0'
16	59°12.09	29.11	223°42.19	14.2'	16°3.05	12.3'	54.9'
17	74°12.27	30.07	238°15.35	14.1'	16°15.33	12.2'	54.9'
18	89°12.45	N05°31.02	252°48.47	14.1'	S16°27.54	12.1'	54.9'
19	104°12.63	31.98	267°21.55	14.0'	16°39.67	12.1'	54.9'
20	119°12.82	32.93	281°54.58	14.0'	16°51.72	12.0'	54.9'
21	134°13.00	· · 33.89	296°27.57	13.9'	17°3.69	11.9'	54.9'
22	149°13.18	34.84	311°0.52	13.9'	17°15.59	11.8'	54.8'
23	164°13.37	35.79	325°33.42	13.9'	17°27.40	11.7'	54.8'
SD = 16.0' $d = 1.0'$							
SD = 15.1'							

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

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

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

h	Aries			Venus			Mars			Jupiter			Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	192°19.65	159°10.76	N12°59.96	196°4.88	S02°45.07	84°56.13	N22°51.09	186°2.95	N00°23.67						
1	207°22.12	174°10.28	1.08	211°5.56	44.28	99°58.40	51.06	201°5.12	23.79						
2	222°24.58	189°9.81	2.21	226°6.23	43.50	115°0.66	51.04	216°7.30	23.91						
3	237°27.04	204°9.33	· · 3.33	241°6.91	· · 42.72	130°2.93	· · 51.02	231°9.48	· · 24.03						
4	252°29.51	219°8.86	4.45	256°7.58	41.93	145°5.19	51.00	246°11.66	24.15						
5	267°31.97	234°8.38	5.57	271°8.25	41.15	160°7.46	50.98	261°13.84	24.27						
6	282°34.44	249°7.91	N13°6.69	286°8.93	S02°40.36	175°9.72	N22°50.96	276°16.02	N00°24.40						
7	297°36.90	264°7.43	7.81	301°9.60	39.58	190°11.98	50.94	291°18.20	24.52						
8	312°39.36	279°6.95	8.93	316°10.28	38.80	205°14.25	50.92	306°20.38	24.64						
9	327°41.83	294°6.48	· · 10.05	331°10.95	· · 38.01	220°16.51	· · 50.90	321°22.55	· · 24.76						
10	342°44.29	309°6.00	11.17	346°11.63	37.23	235°18.77	50.88	336°24.73	24.88						
11	357°46.76	324°5.52	12.29	1°12.30	36.44	250°21.03	50.86	351°26.91	25.00						
12	12°49.22	339°5.04	N13°13.41	16°12.98	S02°35.66	265°23.29	N22°50.84	6°29.09	N00°25.12						
13	27°51.69	354°4.57	14.52	31°13.65	34.88	280°25.56	50.82	21°31.27	25.24						
14	42°54.15	9°4.09	15.64	46°14.32	34.09	295°27.82	50.80	36°33.45	25.36						
15	57°56.61	24°3.61	· · 16.76	61°15.00	· · 33.31	310°30.08	· · 50.78	51°35.63	· · 25.48						
16	72°59.08	39°3.13	17.87	76°15.67	32.52	325°32.34	50.76	66°37.81	25.60						
17	88°1.54	54°2.65	18.99	91°16.35	31.74	340°34.60	50.73	81°39.99	25.72						
18	103°4.01	69°2.17	N13°20.10	106°17.02	S02°30.95	355°36.86	N22°50.71	96°42.17	N00°25.84						
19	118°6.47	84°1.69	21.21	121°17.70	30.17	10°39.12	50.69	111°44.34	25.96						
20	133°8.93	99°1.21	22.33	136°18.37	29.39	25°41.38	50.67	126°46.52	26.08						
21	148°11.40	114°0.73	· · 23.44	151°19.05	· · 28.60	40°43.64	· · 50.65	141°48.70	· · 26.20						
22	163°13.86	129°0.24	24.55	166°19.72	27.82	55°45.90	50.63	156°50.88	26.32						
23	178°16.33	143°59.76	25.66	181°20.40	27.03	70°48.15	50.61	171°53.06	26.44						
Mer.pass. 11:09			ν-0.5' d1.1' m-3.92			ν0.7' d-0.8' m1.19			ν2.3' d-0.0' m-2.18			ν2.2' d0.1' m0.93			
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	193°18.79	158°59.28	N13°26.77	196°21.08	S02°26.25	85°50.41	N22°50.59	186°55.24	N00°26.56						
1	208°21.25	173°58.80	27.88	211°21.75	25.46	100°52.67	50.57	201°57.42	26.68						
2	223°23.72	188°58.31	28.99	226°22.43	24.68	115°54.93	50.54	216°59.60	26.80						
3	238°26.18	203°57.83	· · 30.10	241°23.10	· · 23.89	130°57.18	· · 50.52	232°1.78	· · 26.92						
4	253°28.65	218°57.35	31.21	256°23.78	23.11	145°59.44	50.50	247°3.96	27.04						
5	268°31.11	233°56.86	32.32	271°24.45	22.33	161°1.70	50.48	262°6.14	27.16						
6	283°33.57	248°56.38	N13°33.43	286°25.13	S02°21.54	176°3.95	N22°50.46	277°8.31	N00°27.28						
7	298°36.04	263°55.89	34.53	301°25.81	20.76	191°6.21	50.44	292°10.49	27.40						
8	313°38.50	278°55.41	35.64	316°26.48	19.97	206°8.46	50.42	307°12.67	27.52						
9	328°40.97	293°54.92	· · 36.74	331°27.16	· · 19.19	221°10.72	· · 50.39	322°14.85	· · 27.64						
10	343°43.43	308°54.43	37.85	346°27.83	18.40	236°12.97	50.37	337°17.03	27.76						
11	358°45.90	323°53.95	38.95	1°28.51	17.62	251°15.23	50.35	352°19.21	27.88						
12	13°48.36	338°53.46	N13°40.06	16°29.19	S02°16.83	266°17.48	N22°50.33	7°21.39	N00°28.00						
13	28°50.82	353°52.97	41.16	31°29.86	16.05	281°19.74	50.31	22°23.57	28.13						
14	43°53.29	8°52.48	42.26	46°30.54	15.26	296°21.99	50.29	37°25.75	28.25						
15	58°55.75	23°52.00	· · 43.37	61°31.22	· · 14.48	311°24.24	· · 50.26	52°27.93	· · 28.37						
16	73°58.22	38°51.51	44.47	76°31.89	13.69	326°26.50	50.24	67°30.11	28.49						
17	89°0.68	53°51.02	45.57	91°32.57	12.91	341°28.75	50.22	82°32.29	28.61						
18	104°3.14	68°50.53	N13°46.67	106°33.25	S02°12.12	356°31.00	N22°50.20	97°34.47	N00°28.73						
19	119°5.61	83°50.04	47.77	121°33.92	11.34	11°33.25	50.18	112°36.65	28.85						
20	134°8.07	98°49.55	48.87	136°34.60	10.56	26°35.51	50.15	127°38.83	28.97						
21	149°10.54	113°49.06	· · 49.97	151°35.28	· · 9.77	41°37.76	· · 50.13	142°41.00	· · 29.09						
22	164°13.00	128°48.57	51.07	166°35.95	8.99	56°40.01	50.11	157°43.18	29.21						
23	179°15.47	143°48.07	52.16	181°36.63	8.20	71°42.26	50.09	172°45.36	29.33						
Mer.pass. 11:05			ν-0.5' d1.1' m-3.92			ν0.7' d-0.8' m1.19			ν2.3' d-0.0' m-2.17			ν2.2' d0.1' m0.93			
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec						
0	194°17.93	158°47.58	N13°53.26	196°37.31	S02°7.42	86°44.51	N22°50.07	187°47.54	N00°29.45						
1	209°20.39	173°47.09	54.36	211°37.98	6.63	101°46.76	50.04	202°49.72	29.57						
2	224°22.86	188°46.60	55.45	226°38.66	5.85	116°49.01	50.02	217°51.90	29.69						
3	239°25.32	203°46.10	· · 56.55	241°39.34	· · 5.06	131°51.26	· · 50.00	232°54.08	· · 29.81						
4	254°27.79	218°45.61	57.64	256°40.02	4.28	146°53.51	49.98	247°56.26	29.93						
5	269°30.25	233°45.12	58.74	271°40.69	3.49	161°55.76	49.96	262°58.44	30.05						
6	284°32.71	248°44.62	N13°59.83	286°41.37	S02°2.71	176°58.01	N22°49.93	278°0.62	N00°30.16						
7	299°35.18	263°44.13	14°0.92	301°42.05	1.92	192°0.26	49.91	293°2.80	30.28						
8	314°37.64	278°43.63	2.02	316°42.73	1.14	207°2.50	49.89	308°4.98	30.40						
9	329°40.11	293°43.14	· · 3.11	331°43.40	02°0.35	222°4.75	· · 49.87	323°7.16	· · 30.52						
10	344°42.57	308°42.64	4.20	346°44.08	01°59.57	237°7.00	49.84	338°9.34	30.64						
11	359°45.03	323°42.15	5.29	1°44.76	58.78	252°9.25	49.82	353°11.52	30.76						
12	14°47.50	338°41.65	N14°6.38	16°45.44	S01°58.00	267°11.49	N22°49.80	8°13.70	N00°30.88						
13	29°49.96	353°41.15	7.47	31°46.11	57.21	282°13.74	49.78	23°15.88	31.00						
14	44°52.43	8°40.65	8.56	46°46.79	56.43	297°15.99	49.75	38°18.06	31.12						
15	59°54.89	23°40.16	· · 9.65	61°47.47	· · 55.64	312°18.23	· · 49.73	53°20.24	· · 31.24						
16	74°57.36	38°39.66	10.73	76°48.15	54.86	327°20.48	49.71	68°22.42	31.36						
17	89°59.82	53°39.16	11.82	91°48.83	54.07	342°22.72	49.68	83°24.60	31.48						
18	105°2.28	68°38.66	N14°12.91	106°49.50	S01°53.29	357°24.97	N22°49.66	98°26.78	N00°31.60						
19	120°4.75	83°38.16	13.99	121°50.18	52.50	12°27.21	49.64	113°28.96	31.72						
20	135°7.21	98°37.66	15.08	136°50.86	51.72	27°29.46	49.62	128°31.14	31.84						
21	150°9.68	113°37.16	· · 16.16	151°51.54	· · 50.93	42°31.70	· · 49.59	143°33.32	· · 31.96						
22	165°12.14	128°36.66	17.25	166°52.22	50.15	57°33.95	49.57	158°35.50	32.08						
23	180°14.60	143°36.16	18.33	181°52.90	49.36	72°36.19	49.55	173°37.68	32.20						
Mer.pass. 11:01			ν-0.5' d1.1' m-3.92			ν0.7' d-0.8' m1.19			ν2.3' d-0.0' m-2.17			ν2.2' d0.1' m0.93			

Stars		
	SHA	Dec
Alpheratz	357°34.08	29°14.01
Ankaa	353°6.55	-42°9.81
Schedar	349°30.48	56°40.82
Diphda	348°46.61	-17°50.63
Achernar	335°19.98	-57°6.26
Hamal	327°50.39	23°35.15
Polaris	313°56.29	89°22.64
Acamar	315°11.35	-40°12.10
Menkar	314°5.36	4°11.48
Mirfak	308°27.20	49°57.34
Aldebaran	290°38.65	16°33.69
Rigel	281°3.04	-8°10.41
Capella	280°20.60	46°1.57
Bellatrix	278°21.92	6°22.33
Elnath	278°0.73	28°37.80
Alnilam	275°36.82	-1°11.22
Betelgeuse	270°51.08	7°24.64
Canopus	263°52.04	-52°42.84
Sirius	258°25.38	-16°45.32
Adhara	255°5.08	-29°0.70
Procyon	244°49.73	5°9.36
Pollux	243°16.01	27°57.78
Avior	234°14.14	-59°35.90
Suhail	222°45.36	-43°32.58
Miaplacidus	221°37.63	-69°49.76
Alphard	217°46.58	-8°46.53
Regulus	207°33.13	11°50.22
Dubhe	193°39.17	61°36.60
Denebola	182°23.61	14°25.38
Gienah	175°42.23	-17°41.45
Acrux	172°58.31	-63°14.82
Gacrux	171°49.97	-57°15.76
Alioth	166°11.50	55°48.92
Spica	158°20.92	-11°18.07
Alkaid	152°50.72	49°10.74
Hadar	148°33.97	-60°30.00
Menkent	147°56.06	-36°30.04
Arcturus	145°46.66	19°2.53
Rigel Kent.	139°38.32	-60°56.62
Kochab	137°18.76	74°2.58
Zuben'ubi	136°54.61	-16°9.18
Alphecca	126°2.60	26°37.32
Antares	112°14.38	-26°29.44
Atria	107°7.42	-69°4.26
Sabik	102°1.47	-15°45.51
Shaula	96°8.84	-37°7.30
Rasalhague	95°57.49	12°32.23
Eltanin	90°41.56	51°28.74
Kaus Aust.	83°31.11	-34°22.25
Vega	80°32.49	38°48.13
Nunki	75°46.49	-26°15.81
Altair	61°59.04	8°56.08
Peacock	53°4.33	-56°38.83
Deneb	49°25.31	45°22.13
Enif	33°38.01	9°59.57
Al Na'ir	27°31.96	-46°49.93
Fomalhaut	15°13.70	-29°28.99
Scheat	13°44.54	28°13.35
Markab	13°29.18	15°20.66
Apr 04 Sat	SHA	Mer.pass
Venus	326°51.10	13:24
Mars	3°45.23	10:55
Jupiter	252°36.48	18:17
Saturn	353°43.29	11:34
Apr 05 Sun	SHA	Mer.pass
Venus	325°40.49	13:24
Mars	3°2.29	10:54
Jupiter	252°31.62	18:14
Saturn	353°36.45	11:31
Apr 06 Mon	SHA	Mer.pass
Venus	324°29.65	13:25
Mars	2°19.38	10:53
Jupiter	252°26.58	18:10
Saturn	353°29.61	11:27
Horizontal parallax		
Venus:		0.1
Mars:		0.1

h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		179°13.55	N05°36.75	340°6.28	13.8'	S17°39.13	11.7' 54.8'
1		194°13.73	37.70	354°39.09	13.8'	17°50.79	11.6' 54.8'
2		209°13.91	38.66	9°11.86	13.7'	18°2.36	11.5' 54.8'
3		224°14.09	· · 39.61	23°44.58	13.7'	18°13.84	11.4' 54.8'
4		239°14.28	40.56	38°17.25	13.6'	18°25.25	11.3' 54.7'
5		254°14.46	41.52	52°49.88	13.6'	18°36.56	11.2' 54.7'
6		269°14.64	N05°42.47	67°22.46	13.5'	S18°47.79	11.1' 54.7'
7		284°14.82	43.42	81°54.99	13.5'	18°58.94	11.1' 54.7'
8		299°15.01	44.38	96°27.48	13.4'	19°10.00	11.0' 54.7'
9		314°15.19	· · 45.33	110°59.91	13.4'	19°20.97	10.9' 54.7'
10		329°15.37	46.28	125°32.30	13.3'	19°31.85	10.8' 54.7'
11		344°15.55	47.23	140°4.64	13.3'	19°42.64	10.7' 54.6'
12		359°15.73	N05°48.19	154°36.93	13.2'	S19°53.34	10.6' 54.6'
13		14°15.91	49.14	169°9.17	13.2'	20°3.94	10.5' 54.6'
14		29°16.10	50.09	183°41.36	13.1'	20°14.46	10.4' 54.6'
15		44°16.28	· · 51.04	198°13.50	13.1'	20°24.88	10.3' 54.6'
16		59°16.46	51.99	212°45.59	13.0'	20°35.21	10.2' 54.6'
17		74°16.64	52.94	227°17.63	13.0'	20°45.45	10.1' 54.6'
18		89°16.82	N05°53.90	241°49.61	12.9'	S20°55.58	10.0' 54.5'
19		104°17.00	54.85	256°21.55	12.9'	21°5.63	9.9' 54.5'
20		119°17.18	55.80	270°53.43	12.8'	21°15.57	9.8' 54.5'
21		134°17.36	· · 56.75	285°25.27	12.8'	21°25.42	9.7' 54.5'
22		149°17.54	57.70	299°57.05	12.7'	21°35.17	9.6' 54.5'
23		164°17.73	58.65	314°28.78	12.7'	21°44.82	9.5' 54.5'
		SD = 16.0' $d = 1.0'$		SD = 14.9'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		179°17.91	N05°59.60	329°0.46	12.6'	S21°54.37	9.4' 54.5'
1		194°18.09	06°0.55	343°32.08	12.6'	22°3.82	9.3' 54.4'
2		209°18.27	1.50	358°3.66	12.5'	22°13.16	9.2' 54.4'
3		224°18.45	· · 2.45	12°35.18	12.5'	22°22.41	9.1' 54.4'
4		239°18.63	3.40	27°6.65	12.4'	22°31.55	9.0' 54.4'
5		254°18.81	4.35	41°38.07	12.4'	22°40.58	8.9' 54.4'
6		269°18.99	N06°5.29	56°9.44	12.3'	S22°49.52	8.8' 54.4'
7		284°19.17	6.24	70°40.75	12.3'	22°58.34	8.7' 54.4'
8		299°19.35	7.19	85°12.01	12.2'	23°7.06	8.6' 54.4'
9		314°19.53	· · 8.14	99°43.22	12.2'	23°15.68	8.5' 54.4'
10		329°19.71	9.09	114°14.38	12.1'	23°24.18	8.4' 54.3'
11		344°19.89	10.04	128°45.49	12.1'	23°32.58	8.3' 54.3'
12		359°20.07	N06°10.98	143°16.54	12.0'	S23°40.87	8.2' 54.3'
13		14°20.25	11.93	157°47.55	12.0'	23°49.05	8.1' 54.3'
14		29°20.43	12.88	172°18.50	11.9'	23°57.12	8.0' 54.3'
15		44°20.61	· · 13.83	186°49.40	11.9'	24°5.07	7.8' 54.3'
16		59°20.79	14.77	201°20.25	11.8'	24°12.92	7.7' 54.3'
17		74°20.96	15.72	215°51.05	11.7'	24°20.65	7.6' 54.3'
18		89°21.14	N06°16.67	230°21.80	11.7'	S24°28.27	7.5' 54.3'
19		104°21.32	17.62	244°52.50	11.6'	24°35.78	7.4' 54.3'
20		119°21.50	18.56	259°23.15	11.6'	24°43.17	7.3' 54.2'
21		134°21.68	· · 19.51	273°53.74	11.6'	24°50.44	7.2' 54.2'
22		149°21.86	20.45	288°24.29	11.5'	24°57.60	7.0' 54.2'
23		164°22.04	21.40	302°54.80	11.5'	25°4.65	6.9' 54.2'
		SD = 16.0' $d = 0.9'$		SD = 14.9'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		179°22.22	N06°22.35	317°25.25	11.4'	S25°11.57	6.8' 54.2'
1		194°22.40	23.29	331°55.65	11.4'	25°18.38	6.7' 54.2'
2		209°22.57	24.24	346°26.01	11.3'	25°25.07	6.6' 54.2'
3		224°22.75	· · 25.18	0°56.32	11.3'	25°31.64	6.5' 54.2'
4		239°22.93	26.13	15°26.58	11.2'	25°38.10	6.3' 54.2'
5		254°23.11	27.07	29°56.80	11.2'	25°44.43	6.2' 54.2'
6		269°23.29	N06°28.02	44°26.97	11.1'	S25°50.64	6.1' 54.2'
7		284°23.46	28.96	58°57.09	11.1'	25°56.73	6.0' 54.2'
8		299°23.64	29.90	73°27.17	11.0'	26°2.69	5.8' 54.2'
9		314°23.82	· · 30.85	87°57.21	11.0'	26°8.54	5.7' 54.2'
10		329°24.00	31.79	102°27.20	10.9'	26°14.26	5.6' 54.1'
11		344°24.18	32.74	116°57.15	10.9'	26°19.86	5.5' 54.1'
12		359°24.35	N06°33.68	131°27.06	10.9'	S26°25.33	5.3' 54.1'
13		14°24.53	34.62	145°56.92	10.8'	26°30.68	5.2' 54.1'
14		29°24.71	35.57	160°26.74	10.8'	26°35.90	5.1' 54.1'
15		44°24.89	· · 36.51	174°56.52	10.7'	26°41.00	5.0' 54.1'
16		59°25.06	37.45	189°26.27	10.7'	26°45.97	4.8' 54.1'
17		74°25.24	38.39	203°55.97	10.7'	26°50.82	4.7' 54.1'
18		89°25.42	N06°39.34	218°25.63	10.6'	S26°55.53	4.6' 54.1'
19		104°25.59	40.28	232°55.26	10.6'	27°0.12	4.5' 54.1'
20		119°25.77	41.22	247°24.85	10.6'	27°4.59	4.3' 54.1'
21		134°25.95	· · 42.16	261°54.40	10.5'	27°8.92	4.2' 54.1'
22		149°26.12	43.10	276°23.92	10.5'	27°13.12	4.1' 54.1'
23		164°26.30	44.04	290°53.40	10.4'	27°17.20	3.9' 54.1'
		SD = 16.0' $d = 0.9'$		SD = 14.8'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 16-18 96-86%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
04	03:06	02:57	12:03	01:22	13:45	
05	02:48	02:40	12:03	02:08	14:32	
06	02:31	02:23	12:02	02:56	15:21	

April 07, 08, 09 UT (Tue., Wed., Thu.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars			
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	195°17.07	158°35.66	N14°19.41	196°53.58	S01°48.58	87°38.43	N22°49.52	188°39.86	N00°32.32			Alpheratz	357°34.07 29°14.01	
1	210°19.53	173°35.16	20.50	211°54.25	47.79	102°40.68	49.50	203°42.04	32.44			Ankaa	353°6.54 -42°9.80	
2	225°22.00	188°34.65	21.58	226°54.93	47.01	117°42.92	49.48	218°44.22	32.56			Schedar	349°30.46 56°40.81	
3	240°24.46	203°34.15	•• 22.66	241°55.61	•• 46.22	132°45.16	•• 49.45	233°46.40	•• 32.68			Diphda	348°46.60 -17°50.62	
4	255°26.93	218°33.65	23.74	256°56.29	45.44	147°47.40	49.43	248°48.58	32.80			Achernar	335°19.98 -57°6.24	
5	270°29.39	233°33.14	24.82	271°56.97	44.65	162°49.64	49.41	263°50.76	32.92			Hamal	327°50.38 23°35.14	
6	285°31.85	248°32.64	N14°25.90	286°57.65	S01°43.87	177°51.88	N22°49.38	278°52.94	N00°33.04			Polaris	313°56.74 89°22.63	
7	300°34.32	263°32.14	26.98	301°58.33	43.08	192°54.13	49.36	293°55.12	33.16			Acamar	315°11.36 -40°12.09	
8	315°36.78	278°31.63	28.05	316°59.01	42.30	207°56.37	49.34	308°57.30	33.28			Menkar	314°5.36 4°11.49	
9	330°39.25	293°31.13	•• 29.13	331°59.69	•• 41.51	222°58.61	•• 49.31	323°59.48	•• 33.40			Mirfak	308°27.21 49°57.33	
10	345°41.71	308°30.62	30.21	347°0.36	40.73	238°0.85	49.29	339°1.66	33.52			Aldebaran	290°38.66 16°33.69	
11	0°44.17	323°30.11	31.28	2°1.04	39.94	253°3.09	49.27	354°3.84	33.64			Rigel	281°3.05 -8°10.41	
12	15°46.64	338°29.61	N14°32.36	17°1.72	S01°39.16	268°5.33	N22°49.24	9°6.02	N00°33.75			Capella	280°20.61 46°1.56	
13	30°49.10	353°29.10	33.43	32°2.40	38.37	283°7.57	49.22	24°8.20	33.87			Bellatrix	278°21.93 6°22.33	
14	45°51.57	8°28.59	34.51	47°3.08	37.59	298°9.81	49.20	39°10.38	33.99			Elnath	278°0.74 28°37.80	
15	60°54.03	23°28.09	•• 35.58	62°3.76	•• 36.80	313°12.04	•• 49.17	54°12.56	•• 34.11			Alnilam	275°36.83 -1°11.22	
16	75°56.49	38°27.58	36.65	77°4.44	36.02	328°14.28	49.15	69°14.74	34.23			Betelgeuse	270°51.09 7°24.64	
17	90°58.96	53°27.07	37.73	92°5.12	35.23	343°16.52	49.12	84°16.92	34.35			Canopus	263°52.06 -52°42.84	
18	106°1.42	68°26.56	N14°38.80	107°5.80	S01°34.45	358°18.76	N22°49.10	99°19.10	N00°34.47			Sirius	258°25.39 -16°45.32	
19	121°3.89	83°26.05	39.87	122°6.48	33.66	13°21.00	49.08	114°21.28	34.59			Adhara	255°5.10 -29°0.70	
20	136°6.35	98°25.54	40.94	137°7.16	32.88	28°23.23	49.05	129°23.46	34.71			Procyon	244°49.74 5°9.36	
21	151°8.82	113°25.03	•• 42.01	152°7.84	•• 32.09	43°25.47	•• 49.03	144°25.64	•• 34.83			Pollux	243°16.02 27°57.78	
22	166°11.28	128°24.52	43.08	167°8.52	31.31	58°27.71	49.01	159°27.82	34.95			Avior	234°14.17 -59°35.91	
23	181°13.74	143°24.01	44.15	182°9.20	30.52	73°29.94	48.98	174°30.00	35.07			Suhail	222°45.37 -43°32.59	
Mer.pass. 10:57		ν-0.5' d1.1' m-3.92			ν0.7' d-0.8' m1.19		ν2.2' d-0.0' m-2.16		ν2.2' d0.1' m0.93					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	196°16.21	158°23.50	N14°45.22	197°9.88	S01°29.74	88°32.18	N22°48.96	189°32.18	N00°35.19					
1	211°18.67	173°22.99	46.28	212°10.56	28.95	103°34.41	48.93	204°34.36	35.31					
2	226°21.14	188°22.48	47.35	227°11.24	28.17	118°36.65	48.91	219°36.54	35.43					
3	241°23.60	203°21.96	•• 48.42	242°11.92	•• 27.38	133°38.88	•• 48.89	234°38.72	•• 35.54					
4	256°26.06	218°21.45	49.48	257°12.60	26.60	148°41.12	48.86	249°40.90	35.66					
5	271°28.53	233°20.94	50.55	272°13.28	25.81	163°43.35	48.84	264°43.08	35.78					
6	286°30.99	248°20.42	N14°51.61	287°13.96	S01°25.03	178°45.59	N22°48.81	279°45.26	N00°35.90					
7	301°33.46	263°19.91	52.68	302°14.64	24.24	193°47.82	48.79	294°47.44	36.02					
8	316°35.92	278°19.39	53.74	317°15.32	23.46	208°50.05	48.76	309°49.62	36.14					
9	331°38.39	293°18.88	•• 54.80	332°16.00	•• 22.67	223°52.29	•• 48.74	324°51.80	•• 36.26					
10	346°40.85	308°18.36	55.86	347°16.68	21.89	238°54.52	48.72	339°53.99	36.38					
11	1°43.31	323°17.85	56.92	2°17.36	21.10	253°56.75	48.69	354°56.17	36.50					
12	16°45.78	338°17.33	N14°57.98	17°18.04	S01°20.32	268°58.99	N22°48.67	9°58.35	N00°36.62					
13	31°48.24	353°16.81	14°59.04	32°18.72	19.53	284°1.22	48.64	25°0.53	36.74					
14	46°50.71	8°16.30	15°0.10	47°19.41	18.75	299°3.45	48.62	40°2.71	36.86					
15	61°53.17	23°15.78	•• 1.16	62°20.09	•• 17.96	314°5.68	•• 48.59	55°4.89	•• 36.97					
16	76°55.63	38°15.26	2.22	77°20.77	17.18	329°7.91	48.57	70°7.07	37.09					
17	91°58.10	53°14.74	3.28	92°21.45	16.39	344°10.14	48.54	85°9.25	37.21					
18	107°0.56	68°14.22	N15°4.33	107°22.13	S01°15.61	359°12.37	N22°48.52	100°11.43	N00°37.33					
19	122°3.03	83°13.70	5.39	122°22.81	14.82	14°14.60	48.49	115°13.61	37.45					
20	137°5.49	98°13.18	6.44	137°23.49	14.04	29°16.83	48.47	130°15.79	37.57					
21	152°7.96	113°12.66	•• 7.50	152°24.17	•• 13.25	44°19.06	•• 48.44	145°17.97	•• 37.69					
22	167°10.42	128°12.14	8.55	167°24.85	12.47	59°21.29	48.42	160°20.15	37.81					
23	182°12.88	143°11.62	9.61	182°25.54	11.68	74°23.52	48.39	175°22.33	37.93					
Mer.pass. 10:53		ν-0.5' d1.1' m-3.92			ν0.7' d-0.8' m1.19		ν2.2' d-0.0' m-2.15		ν2.2' d0.1' m0.93					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	197°15.35	158°11.10	N15°10.66	197°26.22	S01°10.90	89°25.75	N22°48.37	190°24.52	N00°38.04					
1	212°17.81	173°10.58	11.71	212°26.90	10.11	104°27.98	48.34	205°26.70	38.16					
2	227°20.28	188°10.06	12.76	227°27.58	9.33	119°30.21	48.32	220°28.88	38.28					
3	242°22.74	203°9.53	•• 13.81	242°28.26	•• 8.54	134°32.43	•• 48.29	235°31.06	•• 38.40					
4	257°25.20	218°9.01	14.86	257°28.94	7.76	149°34.66	48.27	250°33.24	38.52					
5	272°27.67	233°8.49	15.91	272°29.62	6.97	164°36.89	48.24	265°35.42	38.64					
6	287°30.13	248°7.96	N15°16.96	287°30.31	S01°6.19	179°39.12	N22°48.22	280°37.60	N00°38.76					
7	302°32.60	263°7.44	18.01	302°30.99	5.40	194°41.34	48.19	295°39.78	38.88					
8	317°35.06	278°6.91	19.06	317°31.67	4.62	209°43.57	48.17	310°41.96	38.99					
9	332°37.53	293°6.39	•• 20.11	332°32.35	•• 3.83	224°45.79	•• 48.14	325°44.14	•• 39.11					
10	347°39.99	308°5.86	21.15	347°33.03	3.05	239°48.02	48.12	340°46.33	39.23					
11	2°42.45	323°5.34	22.20	2°33.72	2.26	254°50.25	48.09	355°48.51	39.35					
12	17°44.92	338°4.81	N15°23.24	17°34.40	S01°1.48	269°52.47	N22°48.07	10°50.69	N00°39.47					
13	32°47.38	353°4.28	24.29	32°35.08	01°0.69	284°54.69	48.04	25°52.87	39.59					
14	47°49.85	8°3.76	25.33	47°35.76	00°59.91	299°56.92	48.02	40°55.05	39.71					
15	62°52.31	23°3.23	•• 26.37	62°36.44	•• 59.12	314°59.14	•• 47.99	55°57.23	•• 39.83					
16	77°54.77	38°2.70	27.41	77°37.13	58.34	330°1.37	47.96	70°59.41	39.94					
17	92°57.24	53°2.17	28.46	92°37.81	57.55	345°3.59	47.94	86°1.59	40.06					
18	107°59.70	68°1.64	N15°29.50	107°38.49	S00°56.77	0°5.81	N22°47.91	101°3.78	N00°40.18					
19	123°2.17	83°1.11	30.54	122°39.17	55.98	15°8.04	47.89	116°5.96	40.30					
20	138°4.63	98°0.58	31.58	137°39.86	55.20	30°10.26	47.86	131°8.14	40.42					
21	153°7.10	113°0.05	•• 32.62	152°40.54	•• 54.41	45°12.48	•• 47.84	146°10.32	•• 40.54					
22	168°9.56	127°59.52	33.65	167°41.22	53.63	60°14.70	47.81	161°12.50	40.66					
23	183°12.02	142°58.99	34.69	182°41.90	52.84	75°16.93	47.78	176°14.68	40.77					
Mer.pass. 10:49		ν-0.5' d1.1' m-3.92			ν0.7' d-0.8' m1.19		ν2.2' d-0.0' m-2.15		ν2.2' d0.1' m0.93					
											SHA	Dec		
											Alpheratz	357°34.07 29°14.01		
											Ankaa	353°6.54 -42°9.80		
											Schedar	349°30.46 56°40.81		
											Diphda	348°46.60 -17°50.62		
											Achernar	335°19.98 -57°6.24		
											Hamal	327°50.38 23°35.14		
											Polaris	313°56.74 89°22.63		
											Acamar	315°11.36 -40°12.09		
											Menkar	314°5.36 4°11.49		
											Mirfak	308°27.21 49°57.33		
											Aldebaran	290°38.66 16°33.69		
											Rigel	281°3.05 -8°10.41		
											Capella	280°20.61 46°1.56		
											Bellatrix	278°21.93 6°22.33		
											Elnath	278°0.74 28°37.80		
											Alnilam	275°36.83 -1°11.22		
											Betelgeuse	270°51.09 7°24.64		
											Canopus	263°52.06 -52°42.84		
											Sirius	258°25.39 -16°45.32		
											Adhara	255°5.10 -29°0.70		
											Procyon	244°49.74 5°9.36		
											Pollux	243°16.02 27°57.78		
											Avior	234°14.17 -59°35.91		
											Suhail	222°45.37 -43°32.59		
											Miaplacidus	221°37.67 -69°49.77		
											Alphard	217°46.59 -8°46.53		
											Regulus	207°33.14 11°50.22		
											Dubhe	193°39.19 61°36.61		
											Denebola	182°23.61 14°25.38		
											Gienah	175°42.22 -17°41.45		
											Acrux	172°58.31 -63°14.83		
											Gacrux	171°49.96 -57°15.77		
											Alioth	166°11.50 55°48.94		
											Spica	158°20.91 -11°18.07		
											Alkaid	152°50.71 49°10.75		
											Hadar	148°33.95 -60°30.01		
											Menkent			

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue							
0	179°26.48	N06°44.99	305°22.85	10.4'	S27°21.14	3.8'	54.1'
1	194°26.65	45.93	319°52.27	10.4'	27°24.96	3.7'	54.1'
2	209°26.83	46.87	334°21.65	10.4'	27°28.64	3.6'	54.1'
3	224°27.00	· · 47.81	348°51.00	10.3'	27°32.19	3.4'	54.1'
4	239°27.18	48.75	3°20.32	10.3'	27°35.61	3.3'	54.1'
5	254°27.36	49.69	17°49.61	10.3'	27°38.90	3.2'	54.1'
6	269°27.53	N06°50.63	32°18.88	10.2'	S27°42.06	3.0'	54.1'
7	284°27.71	51.57	46°48.11	10.2'	27°45.08	2.9'	54.1'
8	299°27.88	52.51	61°17.32	10.2'	27°47.97	2.8'	54.1'
9	314°28.06	· · 53.45	75°46.50	10.2'	27°50.73	2.6'	54.1'
10	329°28.23	54.39	90°15.66	10.1'	27°53.36	2.5'	54.1'
11	344°28.41	55.32	104°44.79	10.1'	27°55.85	2.4'	54.1'
12	359°28.58	N06°56.26	119°13.90	10.1'	S27°58.20	2.2'	54.1'
13	14°28.76	57.20	133°42.99	10.1'	28°0.43	2.1'	54.1'
14	29°28.93	58.14	148°12.05	10.0'	28°2.51	2.0'	54.1'
15	44°29.11	06°59.08	162°41.10	10.0'	28°4.47	1.8'	54.1'
16	59°29.28	07°0.02	177°10.12	10.0'	28°6.28	1.7'	54.1'
17	74°29.46	0.95	191°39.13	10.0'	28°7.97	1.5'	54.1'
18	89°29.63	N07°1.89	206°8.12	10.0'	S28°9.51	1.4'	54.1'
19	104°29.81	2.83	220°37.10	10.0'	28°10.92	1.3'	54.1'
20	119°29.98	3.77	235°6.06	9.9'	28°12.20	1.1'	54.1'
21	134°30.16	· · 4.70	249°35.00	9.9'	28°13.34	1.0'	54.1'
22	149°30.33	5.64	264°3.94	9.9'	28°14.34	0.9'	54.1'
23	164°30.50	6.58	278°32.86	9.9'	28°15.21	0.7'	54.1'
SD = 16.0' $d = 0.9'$			SD = 14.8'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°30.68	N07°7.51	293°1.76	9.9'	S28°15.93	0.6'	54.1'
1	194°30.85	8.45	307°30.66	9.9'	28°16.53	0.5'	54.1'
2	209°31.02	9.38	321°59.55	9.9'	28°16.98	0.3'	54.1'
3	224°31.20	· · 10.32	336°28.44	9.9'	28°17.30	0.2'	54.1'
4	239°31.37	11.25	350°57.31	9.9'	28°17.48	0.0'	54.1'
5	254°31.55	12.19	5°26.18	9.9'	28°17.53	-0.1'	54.1'
6	269°31.72	N07°13.12	19°55.05	9.9'	S28°17.44	-0.2'	54.1'
7	284°31.89	14.06	34°23.91	9.9'	28°17.21	-0.4'	54.2'
8	299°32.06	14.99	48°52.77	9.9'	28°16.84	-0.5'	54.2'
9	314°32.24	· · 15.93	63°21.63	9.9'	28°16.34	-0.6'	54.2'
10	329°32.41	16.86	77°50.48	9.9'	28°15.70	-0.8'	54.2'
11	344°32.58	17.80	92°19.34	9.9'	28°14.92	-0.9'	54.2'
12	359°32.76	N07°18.73	106°48.20	9.9'	S28°14.00	-1.1'	54.2'
13	14°32.93	19.66	121°17.06	9.9'	28°12.95	-1.2'	54.2'
14	29°33.10	20.60	135°45.93	9.9'	28°11.76	-1.3'	54.2'
15	44°33.27	· · 21.53	150°14.80	9.9'	28°10.43	-1.5'	54.2'
16	59°33.44	22.46	164°43.68	9.9'	28°8.97	-1.6'	54.2'
17	74°33.62	23.40	179°12.56	9.9'	28°7.36	-1.7'	54.2'
18	89°33.79	N07°24.33	193°41.45	9.9'	S28°5.63	-1.9'	54.2'
19	104°33.96	25.26	208°10.35	9.9'	28°3.75	-2.0'	54.2'
20	119°34.13	26.19	222°39.26	9.9'	28°1.74	-2.1'	54.3'
21	134°34.30	· · 27.12	237°8.18	9.9'	27°59.59	-2.3'	54.3'
22	149°34.47	28.06	251°37.11	9.9'	27°57.31	-2.4'	54.3'
23	164°34.65	28.99	266°6.06	10.0'	27°54.89	-2.6'	54.3'
SD = 16.0' $d = 0.9'$			SD = 14.8'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°34.82	N07°29.92	280°35.02	10.0'	S27°52.33	-2.7'	54.3'
1	194°34.99	30.85	295°3.99	10.0'	27°49.64	-2.8'	54.3'
2	209°35.16	31.78	309°32.98	10.0'	27°46.81	-3.0'	54.3'
3	224°35.33	· · 32.71	324°1.98	10.0'	27°43.84	-3.1'	54.3'
4	239°35.50	33.64	338°31.01	10.0'	27°40.74	-3.2'	54.3'
5	254°35.67	34.57	353°0.05	10.1'	27°37.51	-3.4'	54.4'
6	269°35.84	N07°35.50	7°29.11	10.1'	S27°34.14	-3.5'	54.4'
7	284°36.01	36.43	21°58.19	10.1'	27°30.63	-3.6'	54.4'
8	299°36.18	37.36	36°27.29	10.1'	27°26.99	-3.8'	54.4'
9	314°36.35	· · 38.29	50°56.41	10.1'	27°23.22	-3.9'	54.4'
10	329°36.52	39.22	65°25.56	10.2'	27°19.31	-4.0'	54.4'
11	344°36.69	40.15	79°54.72	10.2'	27°15.27	-4.2'	54.4'
12	359°36.86	N07°41.08	94°23.92	10.2'	S27°11.10	-4.3'	54.5'
13	14°37.03	42.00	108°53.14	10.2'	27°6.79	-4.4'	54.5'
14	29°37.20	42.93	123°22.38	10.3'	27°2.35	-4.6'	54.5'
15	44°37.37	· · 43.86	137°51.65	10.3'	26°57.78	-4.7'	54.5'
16	59°37.54	44.79	152°20.95	10.3'	26°53.08	-4.8'	54.5'
17	74°37.71	45.72	166°50.27	10.4'	26°48.24	-5.0'	54.5'
18	89°37.88	N07°46.64	181°19.63	10.4'	S26°43.28	-5.1'	54.5'
19	104°38.05	47.57	195°49.01	10.4'	26°38.18	-5.2'	54.6'
20	119°38.22	48.50	210°18.42	10.4'	26°32.95	-5.4'	54.6'
21	134°38.39	· · 49.42	224°47.87	10.5'	26°27.59	-5.5'	54.6'
22	149°38.55	50.35	239°17.34	10.5'	26°22.10	-5.6'	54.6'
23	164°38.72	51.28	253°46.85	10.5'	26°16.48	-5.7'	54.6'
SD = 16.0' $d = 0.9'$			SD = 14.8'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 19-21 79-62%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
07	02:14	02:06	12:02	03:46	16:12	
08	01:57	01:49	12:02	04:37	17:03	
09	01:41	01:33	12:02	05:29	17:55	

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

h	Aries		Venus		Mars		Jupiter		Saturn		Stars	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	198°14.49		157°58.46	N15°35.73	197°42.59	S00°52.06	90°19.15	N22°47.76	191°16.86	N00°40.89	Alpheratz	357°34.06 29°14.01
1	213°16.95		172°57.93	36.77	212°43.27	51.27	105°21.37	47.73	206°19.05	41.01	Ankaa	353°6.53 -42°9.78
2	228°19.42		187°57.39	37.80	227°43.95	50.49	120°23.59	47.71	221°21.23	41.13	Schedar	349°30.45 56°40.80
3	243°21.88		202°56.86	•• 38.84	242°44.63	•• 49.70	135°25.81	•• 47.68	236°23.41	•• 41.25	Diphda	348°46.59 -17°50.61
4	258°24.34		217°56.33	39.87	257°45.32	48.92	150°28.03	47.65	251°25.59	41.37	Achernar	335°19.98 -57°6.23
5	273°26.81		232°55.79	40.90	272°46.00	48.13	165°30.25	47.63	266°27.77	41.48	Hamal	327°50.38 23°35.14
6	288°29.27		247°55.26	N15°41.94	287°46.68	S00°47.35	180°32.47	N22°47.60	281°29.95	N00°41.60	Polaris	313°57.25 89°22.61
7	303°31.74		262°54.72	42.97	302°47.37	46.56	195°34.69	47.58	296°32.13	41.72	Acamar	315°11.36 -40°12.08
8	318°34.20		277°54.19	44.00	317°48.05	45.78	210°36.91	47.55	311°34.32	41.84	Menkar	314°5.36 4°11.49
9	333°36.67		292°53.65	•• 45.03	332°48.73	•• 44.99	225°39.13	•• 47.52	326°36.50	•• 41.96	Mirfak	308°27.21 49°57.32
10	348°39.13		307°53.12	46.06	347°49.42	44.21	240°41.35	47.50	341°38.68	42.08	Aldebaran	290°38.66 16°33.69
11	3°41.59		322°52.58	47.09	2°50.10	43.42	255°43.57	47.47	356°40.86	42.19	Rigel	281°3.05 -8°10.41
12	18°44.06		337°52.04	N15°48.12	17°50.78	S00°42.64	270°45.78	N22°47.44	11°43.04	N00°42.31	Capella	280°20.62 46°1.56
13	33°46.52		352°51.51	49.15	32°51.47	41.86	285°48.00	47.42	26°45.23	42.43	Bellatrix	278°21.94 6°22.33
14	48°48.99		7°50.97	50.18	47°52.15	41.07	300°50.22	47.39	41°47.41	42.55	Elnath	278°0.75 28°37.80
15	63°51.45		22°50.43	•• 51.20	62°52.83	•• 40.29	315°52.44	•• 47.36	56°49.59	•• 42.67	Alnilam	275°36.83 -1°11.22
16	78°53.91		37°49.89	52.23	77°53.52	39.50	330°54.65	47.34	71°51.77	42.79	Betelgeuse	270°51.10 7°24.64
17	93°56.38		52°49.35	53.25	92°54.20	38.72	345°56.87	47.31	86°53.95	42.90	Canopus	263°52.09 -52°42.83
18	108°58.84		67°48.81	N15°54.28	107°54.88	S00°37.93	0°59.09	N22°47.28	101°56.13	N00°43.02	Sirius	258°25.40 -16°45.32
19	124°1.31		82°48.27	55.30	122°55.57	37.15	16°1.30	47.26	116°58.32	43.14	Adhara	255°5.11 -29°0.70
20	139°3.77		97°47.73	56.33	137°56.25	36.36	31°3.52	47.23	132°0.50	43.26	Procyon	244°49.75 5°9.36
21	154°6.23		112°47.19	•• 57.35	152°56.93	•• 35.58	46°5.73	•• 47.20	147°2.68	•• 43.38	Pollux	243°16.03 27°57.78
22	169°8.70		127°46.65	58.37	167°57.62	34.79	61°7.95	47.18	162°4.86	43.49	Avior	234°14.20 -59°35.91
23	184°11.16		142°46.11	59.39	182°58.30	34.01	76°10.16	47.15	177°7.04	43.61	Suhail	222°45.39 -43°32.60
Mer.pass. 10:45			ν-0.5' d1.0' m-3.92		ν0.7' d-0.8' m1.20		ν2.2' d-0.0' m-2.14		ν2.2' d0.1' m0.93		Miaplacidus	221°37.71 -69°49.78
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Alphard	217°46.59 -8°46.53
0	199°13.63		157°45.57	N16°0.41	197°58.99	S00°33.22	91°12.38	N22°47.12	192°9.23	N00°43.73	Regulus	207°33.14 11°50.22
1	214°16.09		172°45.02	1.43	212°59.67	32.44	106°14.59	47.10	207°11.41	43.85	Dubhe	193°39.19 61°36.62
2	229°18.56		187°44.48	2.45	228°0.35	31.66	121°16.80	47.07	222°13.59	43.97	Denebola	182°23.60 14°25.38
3	244°21.02		202°43.94	•• 3.47	243°1.04	•• 30.87	136°19.02	•• 47.04	237°15.77	•• 44.08	Gienah	175°42.22 -17°41.46
4	259°23.48		217°43.39	4.49	258°1.72	30.09	151°21.23	47.02	252°17.95	44.20	Acrux	172°58.30 -63°14.85
5	274°25.95		232°42.85	5.51	273°2.41	29.30	166°23.44	46.99	267°20.14	44.32	Gacrux	171°49.96 -57°15.79
6	289°28.41		247°42.30	N16°6.52	288°3.09	S00°28.52	181°25.66	N22°46.96	282°22.32	N00°44.44	Alioth	166°11.49 55°48.95
7	304°30.88		262°41.76	7.54	303°3.77	27.73	196°27.87	46.93	297°24.50	44.56	Spica	158°20.90 -11°18.08
8	319°33.34		277°41.21	8.55	318°4.46	26.95	211°30.08	46.91	312°26.68	44.67	Alkaid	152°50.70 49°10.76
9	334°35.80		292°40.67	•• 9.57	333°5.14	•• 26.16	226°32.29	•• 46.88	327°28.87	•• 44.79	Hadar	148°33.93 -60°30.03
10	349°38.27		307°40.12	10.58	348°5.83	25.38	241°34.51	46.85	342°31.05	44.91	Menkent	147°56.02 -36°30.06
11	4°40.73		322°39.57	11.59	3°6.51	24.60	256°36.72	46.83	357°33.23	45.03	Arcturus	145°46.64 19°2.54
12	19°43.20		337°39.02	N16°12.61	18°7.20	S00°23.81	271°38.93	N22°46.80	12°35.41	N00°45.15	Rigel Kent.	139°38.27 -60°56.65
13	34°45.66		352°38.48	13.62	33°7.88	23.03	286°41.14	46.77	27°37.59	45.26	Kochab	137°18.71 74°2.61
14	49°48.12		7°37.93	14.63	48°8.56	22.24	301°43.35	46.74	42°39.78	45.38	Zuben'ubi	136°54.57 -16°9.18
15	64°50.59		22°37.38	•• 15.64	63°9.25	•• 21.46	316°45.56	•• 46.72	57°41.96	•• 45.50	Alphecca	126°2.56 26°37.33
16	79°53.05		37°36.83	16.65	78°9.93	20.67	331°47.77	46.69	72°44.14	45.62	Antares	112°14.33 -26°29.44
17	94°55.52		52°36.28	17.66	93°10.62	19.89	346°49.98	46.66	87°46.32	45.73	Atria	107°7.31 -69°4.28
18	109°57.98		67°35.73	N16°18.67	108°11.30	S00°19.11	1°52.19	N22°46.63	102°48.51	N00°45.85	Sabik	102°1.42 -15°45.51
19	125°0.45		82°35.18	19.67	123°11.99	18.32	16°54.40	46.61	117°50.69	45.97	Shaula	96°8.78 -37°7.30
20	140°2.91		97°34.63	20.68	138°12.67	17.54	31°56.60	46.58	132°52.87	46.09	Rasalhague	95°57.44 12°32.24
21	155°5.37		112°34.08	•• 21.69	153°13.36	•• 16.75	46°58.81	•• 46.55	147°55.05	•• 46.21	Eltanin	90°41.50 51°28.75
22	170°7.84		127°33.52	22.69	168°14.04	15.97	62°1.02	46.52	162°57.24	46.32	Kaus Aust.	83°31.04 -34°22.25
23	185°10.30		142°32.97	23.69	183°14.73	15.19	77°3.23	46.49	177°59.42	46.44	Vega	80°32.44 38°48.14
Mer.pass. 10:41			ν-0.5' d1.0' m-3.92		ν0.7' d-0.8' m1.20		ν2.2' d-0.0' m-2.13		ν2.2' d0.1' m0.93		Nunki	75°46.43 -26°15.81
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Altair	61°58.98 8°56.08
0	200°12.77		157°32.42	N16°24.70	198°15.41	S00°14.40	92°5.44	N22°46.47	193°1.60	N00°46.56	Peacock	53°4.24 -56°38.81
1	215°15.23		172°31.87	25.70	213°16.10	13.62	107°7.64	46.44	208°3.79	46.68	Deneb	49°25.25 45°22.13
2	230°17.69		187°31.31	26.70	228°16.78	12.83	122°9.85	46.41	223°5.97	46.79	Enif	33°37.97 9°59.58
3	245°20.16		202°30.76	•• 27.71	243°17.47	•• 12.05	137°12.06	•• 46.38	238°8.15	•• 46.91	Al Na'ir	27°31.91 -46°49.90
4	260°22.62		217°30.20	28.71	258°18.15	11.27	152°14.26	46.35	253°10.33	47.03	Fomalhaut	15°13.66 -29°28.96
5	275°25.09		232°29.65	29.71	273°18.84	10.48	167°16.47	46.33	268°12.52	47.15	Scheat	13°44.50 28°13.35
6	290°27.55		247°29.09	N16°30.71	288°19.52	S00°9.70	182°18.68	N22°46.30	283°14.70	N00°47.26	Markab	13°29.14 15°20.66
7	305°30.01		262°28.54	31.71	303°20.21	8.91	197°20.88	46.27	298°16.88	47.38	Apr 10 Fri	
8	320°32.48		277°27.98	32.70	318°20.89	8.13	212°23.09	46.24	313°19.07	47.50	Venus	SHA 319°43.97 Mer.pass 13:29
9	335°34.94		292°27.42	•• 33.70	333°21.58	•• 7.35	227°25.29	•• 46.21	328°21.25	•• 47.62	Mars	359°28.10 10:49
10	350°37.41		307°26.86	34.70	348°22.27	6.56	242°27.50	46.19	343°23.43	47.73	Jupiter	252°4.66 17:56
11	5°39.87		322°26.31	35.69	3°22.95	5.78	257°29.70	46.16	358°25.61	47.85	Saturn	353°2.38 11:13
12	20°42.34		337°25.75	N16°36.69	18°23.64	S00°5.00	272°31.90	N22°46.13	13°27.80	N00°47.97	Apr 11 Sat	
13	35°44.80		352°25.19	37.68	33°24.32	4.21	287°34.11	46.10	28°29.98	48.08	Venus	SHA 318°31.94 Mer.pass 13:29
14	50°47.26		7°24.63	38.68	48°25.01	3.43	302°36.31	46.07	43°32.16	48.20	Mars	358°45.36 10:48
15	65°49.73		22°24.07	•• 39.67	63°25.69	•• 2.64	317°38.51	•• 46.04	58°34.35	•• 48.32	Jupiter	251°58.75 17:53
16	80°52.19		37°23.51	40.66	78°26.38	1.86	332°40.72	46.02	73°36.53	48.44	Saturn	352°55.60 11:10
17	95°54.66		52°22.95	41.65	93°27.06	1.08	347°42.92	45.99	88°38.71	48.55	Apr 12 Sun	
18	110°57.12		67°22.39	N16°42.64	108°27.75	S00°0.29	2°45.12	N22°45.96	103°40.90	N00°48.67	Venus	SHA 317°19.65 Mer.pass 13:30
19	125°59.58		82°21.83	43.63	123°28.44	N00°0.49	17°47.32	45.93	118°43.08	48.79	Mars	358°2.65 10:46
20	141°2.05		97°21.27	44.62	138°29.12	1.27	32°49.52	45.90	133°45.26	48.91	Jupiter	251°52.67 17:49
21	156°4.51		112°20.70	•• 45.61	153°29.81	•• 2.06	47°51.73	•• 45.87	148°47.45	•• 49.02	Saturn	352°48.84 11:06
22	171°6.98		127°20.14	46.60	168°30.49	2.84	62°53.93	45.84	163°49.63	49.14	Horizontal parallax	
23	186°9.44		142°19.58	47.59	183°31.18	3.62	77°56.13	45.82	178°51.81	49.26	Venus:	0.1
Mer.pass. 10:37			ν-0.6' d1.0' m-3.92		ν0.7' d-0.8' m1.20		ν2.2' d-0.0' m-2.13		ν2.2' d0.1' m0.93		Mars:	0.1

h	Sun			Moon			
Fri	GHA	Dec		GHA	ν	Dec	d HP
0	179°38.89	N07°52.20		268°16.39	10.6'	S26°10.74	-5.9' 54.7'
1	194°39.06	53.13		282°45.96	10.6'	26°4.86	-6.0' 54.7'
2	209°39.23	54.05		297°15.57	10.6'	25°58.86	-6.1' 54.7'
3	224°39.39	54.98		311°45.21	10.7'	25°52.73	-6.3' 54.7'
4	239°39.56	55.90		326°14.88	10.7'	25°46.47	-6.4' 54.7'
5	254°39.73	56.83		340°44.59	10.7'	25°40.08	-6.5' 54.7'
6	269°39.90	N07°57.75		355°14.34	10.8'	S25°33.57	-6.6' 54.8'
7	284°40.07	58.68		9°44.12	10.8'	25°26.94	-6.8' 54.8'
8	299°40.23	07°59.60		24°13.94	10.9'	25°20.17	-6.9' 54.8'
9	314°40.40	08°05.52		38°43.79	10.9'	25°13.29	-7.0' 54.8'
10	329°40.57	1.45		53°13.69	10.9'	25°6.27	-7.1' 54.8'
11	344°40.73	2.37		67°43.61	11.0'	24°59.14	-7.3' 54.9'
12	359°40.90	N08°3.29		82°13.58	11.0'	S24°51.88	-7.4' 54.9'
13	14°41.07	4.22		96°43.59	11.0'	24°44.50	-7.5' 54.9'
14	29°41.23	5.14		111°13.63	11.1'	24°36.99	-7.6' 54.9'
15	44°41.40	6.06		125°43.71	11.1'	24°29.37	-7.7' 55.0'
16	59°41.57	6.98		140°13.83	11.2'	24°21.62	-7.9' 55.0'
17	74°41.73	7.91		154°43.99	11.2'	24°13.75	-8.0' 55.0'
18	89°41.90	N08°8.83		169°14.19	11.2'	S24°5.76	-8.1' 55.0'
19	104°42.06	9.75		183°44.43	11.3'	23°57.65	-8.2' 55.0'
20	119°42.23	10.67		198°14.71	11.3'	23°49.42	-8.3' 55.1'
21	134°42.40	11.59		212°45.03	11.4'	23°41.08	-8.5' 55.1'
22	149°42.56	12.51		227°15.39	11.4'	23°32.61	-8.6' 55.1'
23	164°42.73	13.43		241°45.79	11.4'	23°24.03	-8.7' 55.1'

SD = 16.0' $d = 0.9'$

SD = 14.9'

Sat	GHA	Dec		GHA	ν	Dec	d HP
0	179°42.89	N08°14.35		256°16.23	11.5'	S23°15.34	-8.8' 55.2'
1	194°43.06	15.27		270°46.71	11.5'	23°6.52	-8.9' 55.2'
2	209°43.22	16.19		285°17.23	11.6'	22°57.59	-9.0' 55.2'
3	224°43.39	17.11		299°47.79	11.6'	22°48.55	-9.2' 55.2'
4	239°43.55	18.03		314°18.39	11.6'	22°39.39	-9.3' 55.3'
5	254°43.72	18.95		328°49.04	11.7'	22°30.11	-9.4' 55.3'
6	269°43.88	N08°19.87		343°19.72	11.7'	S22°20.73	-9.5' 55.3'
7	284°44.05	20.79		357°50.44	11.8'	22°11.23	-9.6' 55.4'
8	299°44.21	21.71		12°21.20	11.8'	22°1.62	-9.7' 55.4'
9	314°44.37	22.63		26°52.00	11.8'	21°51.90	-9.8' 55.4'
10	329°44.54	23.54		41°22.84	11.9'	21°42.07	-9.9' 55.4'
11	344°44.70	24.46		55°53.73	11.9'	21°32.12	-10.1' 55.5'
12	359°44.87	N08°25.38		70°24.65	12.0'	S21°22.07	-10.2' 55.5'
13	14°45.03	26.30		84°55.61	12.0'	21°11.91	-10.3' 55.5'
14	29°45.19	27.21		99°26.61	12.0'	21°1.65	-10.4' 55.5'
15	44°45.36	28.13		113°57.64	12.1'	20°51.27	-10.5' 55.6'
16	59°45.52	29.05		128°28.72	12.1'	20°40.79	-10.6' 55.6'
17	74°45.68	29.96		142°59.84	12.2'	20°30.20	-10.7' 55.6'
18	89°45.84	N08°30.88		157°30.99	12.2'	S20°19.51	-10.8' 55.7'
19	104°46.01	31.79		172°2.18	12.2'	20°8.71	-10.9' 55.7'
20	119°46.17	32.71		186°33.41	12.3'	19°57.81	-11.0' 55.7'
21	134°46.33	33.63		201°4.68	12.3'	19°46.80	-11.1' 55.8'
22	149°46.50	34.54		215°35.98	12.3'	19°35.70	-11.2' 55.8'
23	164°46.66	35.46		230°7.32	12.4'	19°24.49	-11.3' 55.8'

SD = 16.0' $d = 0.9'$

SD = 15.0'

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	179°46.82	N08°36.37		244°38.70	12.4'	S19°13.18	-11.4' 55.8'
1	194°46.98	37.28		259°10.11	12.4'	19°1.77	-11.5' 55.9'
2	209°47.14	38.20		273°41.55	12.5'	18°50.26	-11.6' 55.9'
3	224°47.30	39.11		288°13.04	12.5'	18°38.65	-11.7' 55.9'
4	239°47.47	40.03		302°44.55	12.5'	18°26.94	-11.8' 56.0'
5	254°47.63	40.94		317°16.10	12.6'	18°15.14	-11.9' 56.0'
6	269°47.79	N08°41.85		331°47.68	12.6'	S18°3.24	-12.0' 56.0'
7	284°47.95	42.76		346°19.30	12.6'	17°51.24	-12.1' 56.1'
8	299°48.11	43.68		0°50.94	12.7'	17°39.15	-12.2' 56.1'
9	314°48.27	44.59		15°22.62	12.7'	17°26.96	-12.3' 56.1'
10	329°48.43	45.50		29°54.33	12.7'	17°14.68	-12.4' 56.2'
11	344°48.59	46.41		44°26.08	12.8'	17°2.31	-12.5' 56.2'
12	359°48.75	N08°47.32		58°57.85	12.8'	S16°49.85	-12.6' 56.2'
13	14°48.91	48.24		73°29.65	12.8'	16°37.29	-12.6' 56.3'
14	29°49.07	49.15		88°1.47	12.9'	16°24.64	-12.7' 56.3'
15	44°49.23	50.06		102°33.33	12.9'	16°11.91	-12.8' 56.3'
16	59°49.39	50.97		117°5.22	12.9'	15°59.08	-12.9' 56.4'
17	74°49.55	51.88		131°37.13	12.9'	15°46.17	-13.0' 56.4'
18	89°49.71	N08°52.79		146°9.06	13.0'	S15°33.17	-13.1' 56.4'
19	104°49.87	53.70		160°41.03	13.0'	15°20.08	-13.2' 56.5'
20	119°50.03	54.61		175°13.01	13.0'	15°6.91	-13.3' 56.5'
21	134°50.19	55.52		189°45.02	13.0'	14°53.65	-13.3' 56.5'
22	149°50.35	56.43		204°17.06	13.1'	14°40.31	-13.4' 56.6'
23	164°50.51	57.33		218°49.11	13.1'	14°26.88	-13.5' 56.6'

SD = 16.0' $d = 0.9'$

SD = 15.2'

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 22-24 52-33%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
10	01:24	01:16	12:01	06:20	18:45	
11	01:08	01:01	12:01	07:09	19:33	
12	00:53	00:45	12:01	07:56	20:20	

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

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	201°11.90	157°19.01	N16°48.57	198°31.87	N00°4.41	92°58.33	N22°45.79	193°54.00	N00°49.37	Alpheratz	357°34.05	29°14.00
1	216°14.37	172°18.45	49.56	213°32.55	5.19	108°0'53	45.76	208°56.18	49.49	Ankaa	353°6.52	-42°9.77
2	231°16.83	187°17.89	50.54	228°33.24	5.97	123°2.73	45.73	223°58.36	49.61	Schedar	349°30.44	56°40.79
3	246°19.30	202°17.32	· · 51.53	243°33.92	· · 6.76	138°4.93	· · 45.70	239°0.55	· · 49.73	Diphda	348°46.58	-17°50.60
4	261°21.76	217°16.75	52.51	258°34.61	7.54	153°7.13	45.67	254°2.73	49.84	Achernar	335°19.98	-57°6.21
5	276°24.22	232°16.19	53.49	273°35.30	8.32	168°9.33	45.64	269°4.91	49.96	Hamal	327°50.38	23°35.14
6	291°26.69	247°15.62	N16°54.48	288°35.98	N00°9.11	183°11.53	N22°45.61	284°7.10	N00°50.08	Polaris	313°57.90	89°22.60
7	306°29.15	262°15.06	55.46	303°36.67	9.89	198°13.72	45.58	299°9.28	50.19	Acamar	315°11.37	-40°12.06
8	321°31.62	277°14.49	56.44	318°37.36	10.67	213°15.92	45.55	314°11.46	50.31	Menkar	314°5.36	4°11.49
9	336°34.08	292°13.92	· · 57.42	333°38.04	· · 11.46	228°18.12	· · 45.53	329°13.65	· · 50.43	Mirfak	308°27.22	49°57.31
10	351°36.54	307°13.35	58.40	348°38.73	12.24	243°20.32	45.50	344°15.83	50.54	Aldebaran	290°38.67	16°33.69
11	6°39.01	322°12.78	16°59.38	3°39.42	13.02	258°22.52	45.47	359°18.01	50.66	Rigel	281°3.06	-8°10.40
12	21°41.47	337°12.21	N17°0.35	18°40.10	N00°13.81	273°24.71	N22°45.44	14°20.20	N00°50.78	Capella	280°20.63	46°1.56
13	36°43.94	352°11.64	1.33	33°40.79	14.59	288°26.91	45.41	29°22.38	50.89	Bellatrix	278°21.95	6°22.34
14	51°46.40	7°11.07	2.31	48°41.48	15.37	303°29.11	45.38	44°24.56	51.01	Elnath	278°0.76	28°37.80
15	66°48.87	22°10.50	· · 3.28	63°42.16	· · 16.16	318°31.30	· · 45.35	59°26.75	· · 51.13	Alnilam	275°36.84	-1°11.21
16	81°51.33	37°9.93	4.26	78°42.85	16.94	333°33.50	45.32	74°28.93	51.25	Betelgeuse	270°51.11	7°24.65
17	96°53.79	52°9.36	5.23	93°43.54	17.72	348°35.69	45.29	89°31.12	51.36	Canopus	263°52.11	-52°42.83
18	111°56.26	67°8.79	N17°6.20	108°44.22	N00°18.50	3°37.89	N22°45.26	104°33.30	N00°51.48	Sirius	258°25.42	-16°45.31
19	126°58.72	82°8.22	7.18	123°44.91	19.29	18°40.08	45.23	119°35.48	51.60	Adhara	255°5.12	-29°0.69
20	142°1.19	97°7.64	8.15	138°45.60	20.07	33°42.28	45.20	134°37.67	51.71	Procyon	244°49.76	5°9.36
21	157°3.65	112°7.07	· · 9.12	153°46.28	· · 20.85	48°44.47	· · 45.17	149°39.85	· · 51.83	Pollux	243°16.04	27°57.78
22	172°6.11	127°6.50	10.09	168°46.97	21.64	63°46.67	45.14	164°42.04	51.95	Avior	234°14.23	-59°35.92
23	187°8.58	142°5.92	11.06	183°47.66	22.42	78°48.86	45.11	179°44.22	52.06	Suhail	222°45.41	-43°32.60
Mer.pass. 10:33		ν-0.6' d1.0' m-3.92		ν0.7' d0.8' m1.20		ν2.2' d-0.0' m-2.12		ν2.2' d0.1' m0.93				
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	202°11.04	157°5.35	N17°12.03	198°48.34	N00°23.20	93°51.06	N22°45.08	194°46.40	N00°52.18	Miaplacidus	221°37.75	-69°49.79
1	217°13.51	172°4.77	12.99	213°49.03	23.98	108°53.25	45.05	209°48.59	52.30	Alphard	217°46.60	-8°46.53
2	232°15.97	187°4.20	13.96	228°49.72	24.77	123°55.44	45.02	224°50.77	52.41	Regulus	207°33.15	11°50.23
3	247°18.43	202°3.62	· · 14.93	243°50.40	· · 25.55	138°57.64	· · 44.99	239°52.96	· · 52.53	Dubhe	193°39.21	61°36.64
4	262°20.90	217°3.05	15.89	258°51.09	26.33	153°59.83	44.96	254°55.14	52.65	Denebola	182°23.61	14°25.39
5	277°23.36	232°2.47	16.86	273°51.78	27.11	169°2.02	44.93	269°57.32	52.76	Gienah	175°42.22	-17°41.46
6	292°25.83	247°1.89	N17°17.82	288°52.47	N00°27.90	184°4.21	N22°44.90	284°59.51	N00°52.88	Acrux	172°58.31	-63°14.87
7	307°28.29	262°1.31	18.78	303°53.15	28.68	199°6.40	44.87	300°1.69	52.99	Gacrux	171°49.96	-57°15.81
8	322°30.75	277°0.73	19.75	318°53.84	29.46	214°8.60	44.84	315°3.88	53.11	Alioth	166°11.49	55°48.96
9	337°33.22	292°0.16	· · 20.71	333°54.53	· · 30.24	229°10.79	· · 44.81	330°6.06	· · 53.23	Spica	158°20.89	-11°18.08
10	352°35.68	306°59.58	21.67	348°55.22	31.03	244°12.98	44.78	345°8.25	53.34	Alkaid	152°50.69	49°10.78
11	7°38.15	321°59.00	22.63	3°55.90	31.81	259°15.17	44.75	0°10.43	53.46	Hadar	148°33.92	-60°30.04
12	22°40.61	336°58.42	N17°23.59	18°56.59	N00°32.59	274°17.36	N22°44.72	15°12.62	N00°53.58	Menkent	147°56.01	-36°30.07
13	37°43.07	351°57.84	24.55	33°57.28	33.37	289°19.55	44.69	30°14.80	53.69	Arcturus	145°46.63	19°2.55
14	52°45.54	6°57.26	25.51	48°57.97	34.16	304°21.74	44.66	45°16.98	53.81	Rigel Kent.	139°38.25	-60°56.66
15	67°48.00	21°56.67	· · 26.46	63°58.65	· · 34.94	319°23.93	· · 44.63	60°19.17	· · 53.93	Kochab	137°18.68	74°2.63
16	82°50.47	36°56.09	27.42	78°59.34	35.72	334°26.12	44.60	75°21.35	54.04	Zuben'ubi	136°54.56	-16°9.19
17	97°52.93	51°55.51	28.37	94°0.03	36.50	349°28.31	44.57	90°23.54	54.16	Alphecca	126°2.55	26°37.34
18	112°55.39	66°54.93	N17°29.33	109°0.72	N00°37.28	4°30.49	N22°44.54	105°25.72	N00°54.27	Antares	112°14.31	-26°29.45
19	127°57.86	81°54.34	30.28	124°1.40	38.07	19°32.68	44.51	120°27.91	54.39	Atria	107°7.26	-69°4.29
20	143°0.32	96°53.76	31.24	139°2.09	38.85	34°34.87	44.48	135°30.09	54.51	Sabik	102°1.40	-15°45.51
21	158°2.79	111°53.17	· · 32.19	154°2.78	· · 39.63	49°37.06	· · 44.45	150°32.28	· · 54.62	Shaula	96°8.76	-37°7.30
22	173°5.25	126°52.59	33.14	169°3.47	40.41	64°39.25	44.42	165°34.46	54.74	Rasalhague	95°57.42	12°32.24
23	188°7.71	141°52.00	34.09	184°4.16	41.19	79°41.43	44.39	180°36.65	54.86	Eltanin	90°41.47	51°28.76
Mer.pass. 10:30		ν-0.6' d1.0' m-3.92		ν0.7' d0.8' m1.20		ν2.2' d-0.0' m-2.11		ν2.2' d0.1' m0.93				
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	203°10.18	156°51.42	N17°35.04	199°4.84	N00°41.98	94°43.62	N22°44.35	195°38.83	N00°54.97	Kaus Aust.	83°31.02	-34°22.25
1	218°12.64	171°50.83	35.99	214°5.53	42.76	109°45.81	44.32	210°41.02	55.09	Vega	80°32.41	38°48.15
2	233°15.11	186°50.25	36.94	229°6.22	43.54	124°47.99	44.29	225°43.20	55.20	Nunki	75°46.41	-26°15.81
3	248°17.57	201°49.66	· · 37.89	244°6.91	· · 44.32	139°50.18	· · 44.26	240°45.39	· · 55.32	Altair	61°58.96	8°56.09
4	263°20.03	216°49.07	38.83	259°7.60	45.10	154°52.37	44.23	255°47.57	55.44	Peacock	53°4.21	-56°38.80
5	278°22.50	231°48.48	39.78	274°8.28	45.88	169°54.55	44.20	270°49.76	55.55	Deneb	49°25.23	45°22.13
6	293°24.96	246°47.90	N17°40.73	289°8.97	N00°46.67	184°56.74	N22°44.17	285°51.94	N00°55.67	Enif	33°37.95	9°59.58
7	308°27.43	261°47.31	41.67	304°9.66	47.45	199°58.92	44.14	300°54.13	55.78	Al Na'ir	27°31.88	-46°49.89
8	323°29.89	276°46.72	42.62	319°10.35	48.23	215°1.11	44.11	315°56.31	55.90	Fomalhaut	15°13.65	-29°28.95
9	338°32.36	291°46.13	· · 43.56	334°11.04	· · 49.01	230°3.29	· · 44.08	330°58.50	· · 56.02	Scheat	13°44.49	28°13.35
10	353°34.82	306°45.54	44.50	349°11.73	49.79	245°5.47	44.04	346°0.68	56.13	Markab	13°29.13	15°20.66
11	8°37.28	321°44.95	45.44	4°12.41	50.57	260°7.66	44.01	1°2.87	56.25			
12	23°39.75	336°44.36	N17°46.38	19°13.10	N00°51.35	275°9.84	N22°43.98	16°5.05	N00°56.36			
13	38°42.21	351°43.76										

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Mon							
0	179°50.67	N08°58.24	233°21.19	13.1'	S14°13.38	-13.6'	56.6'
1	194°50.82	08°59.15	247°53.29	13.1'	13°59.79	-13.7'	56.7'
2	209°50.98	09°0.06	262°25.41	13.1'	13°46.12	-13.7'	56.7'
3	224°51.14	· · 0.97	276°57.55	13.2'	13°32.37	-13.8'	56.7'
4	239°51.30	1.87	291°29.70	13.2'	13°18.54	-13.9'	56.8'
5	254°51.46	2.78	306°1.88	13.2'	13°4.63	-14.0'	56.8'
6	269°51.62	N09°3.69	320°34.07	13.2'	S12°50.65	-14.1'	56.8'
7	284°51.77	4.60	335°6.28	13.2'	12°36.59	-14.1'	56.9'
8	299°51.93	5.50	349°38.50	13.2'	12°22.46	-14.2'	56.9'
9	314°52.09	· · 6.41	4°10.73	13.2'	12°8.25	-14.3'	57.0'
10	329°52.24	7.31	18°42.98	13.3'	11°53.96	-14.4'	57.0'
11	344°52.40	8.22	33°15.24	13.3'	11°39.61	-14.4'	57.0'
12	359°52.56	N09°9.13	47°47.52	13.3'	S11°25.18	-14.5'	57.1'
13	14°52.72	10.03	62°19.80	13.3'	11°10.68	-14.6'	57.1'
14	29°52.87	10.93	76°52.09	13.3'	10°56.11	-14.6'	57.1'
15	44°53.03	· · 11.84	91°24.39	13.3'	10°41.48	-14.7'	57.2'
16	59°53.19	12.74	105°56.70	13.3'	10°26.77	-14.8'	57.2'
17	74°53.34	13.65	120°29.02	13.3'	10°12.00	-14.8'	57.2'
18	89°53.50	N09°14.55	135°1.34	13.3'	S09°57.16	-14.9'	57.3'
19	104°53.65	15.46	149°33.66	13.3'	09°42.26	-15.0'	57.3'
20	119°53.81	16.36	164°5.99	13.3'	09°27.29	-15.0'	57.4'
21	134°53.96	· · 17.26	178°38.32	13.3'	09°12.26	-15.1'	57.4'
22	149°54.12	18.16	193°10.66	13.3'	08°57.17	-15.2'	57.4'
23	164°54.28	19.07	207°42.99	13.3'	08°42.02	-15.2'	57.5'
SD = 15.9' $d = 0.9'$							
SD = 15.4'							
Tue							
0	179°54.43	N09°19.97	222°15.32	13.3'	S08°26.81	-15.3'	57.5'
1	194°54.59	20.87	236°47.66	13.3'	08°11.53	-15.3'	57.5'
2	209°54.74	21.77	251°19.99	13.3'	07°56.20	-15.4'	57.6'
3	224°54.89	· · 22.67	265°52.31	13.3'	07°40.82	-15.4'	57.6'
4	239°55.05	23.58	280°24.63	13.3'	07°25.38	-15.5'	57.7'
5	254°55.20	24.48	294°56.95	13.3'	07°9.88	-15.6'	57.7'
6	269°55.36	N09°25.38	309°29.26	13.3'	S06°54.33	-15.6'	57.7'
7	284°55.51	26.28	324°1.56	13.3'	06°38.72	-15.7'	57.8'
8	299°55.67	27.18	338°33.85	13.3'	06°23.07	-15.7'	57.8'
9	314°55.82	· · 28.08	353°6.13	13.3'	06°7.36	-15.8'	57.8'
10	329°55.97	28.98	7°38.40	13.3'	05°51.61	-15.8'	57.9'
11	344°56.13	29.88	22°10.65	13.2'	05°35.81	-15.8'	57.9'
12	359°56.28	N09°30.77	36°42.90	13.2'	S05°19.96	-15.9'	57.9'
13	14°56.43	31.67	51°15.12	13.2'	05°4.06	-15.9'	58.0'
14	29°56.59	32.57	65°47.34	13.2'	04°48.12	-16.0'	58.0'
15	44°56.74	· · 33.47	80°19.53	13.2'	04°32.14	-16.0'	58.1'
16	59°56.89	34.37	94°51.71	13.2'	04°16.11	-16.1'	58.1'
17	74°57.04	35.27	109°23.87	13.1'	04°0.05	-16.1'	58.1'
18	89°57.20	N09°36.16	123°56.00	13.1'	S03°43.94	-16.1'	58.2'
19	104°57.35	37.06	138°28.12	13.1'	03°27.80	-16.2'	58.2'
20	119°57.50	37.96	153°0.21	13.1'	03°11.62	-16.2'	58.2'
21	134°57.65	· · 38.85	167°32.28	13.0'	02°55.40	-16.3'	58.3'
22	149°57.80	39.75	182°4.32	13.0'	02°39.14	-16.3'	58.3'
23	164°57.96	40.64	196°36.33	13.0'	02°22.86	-16.3'	58.3'
SD = 15.9' $d = 0.9'$							
SD = 15.7'							
Wed							
0	179°58.11	N09°41.54	211°8.32	13.0'	S02°6.54	-16.3'	58.4'
1	194°58.26	42.44	225°40.28	12.9'	01°50.19	-16.4'	58.4'
2	209°58.41	43.33	240°12.21	12.9'	01°33.81	-16.4'	58.5'
3	224°58.56	· · 44.23	254°44.10	12.9'	01°17.40	-16.4'	58.5'
4	239°58.71	45.12	269°15.97	12.8'	01°0.97	-16.5'	58.5'
5	254°58.86	46.01	283°47.80	12.8'	00°44.51	-16.5'	58.6'
6	269°59.01	N09°46.91	298°19.59	12.8'	S00°28.02	-16.5'	58.6'
7	284°59.16	47.80	312°51.35	12.7'	S00°11.52	-16.5'	58.6'
8	299°59.31	48.70	327°23.07	12.7'	N00°5.01	16.5'	58.7'
9	314°59.46	· · 49.59	341°54.75	12.6'	00°21.56	16.6'	58.7'
10	329°59.61	50.48	356°26.39	12.6'	00°38.13	16.6'	58.7'
11	344°59.76	51.37	10°57.98	12.6'	00°54.71	16.6'	58.8'
12	359°59.91	N09°52.27	25°29.54	12.5'	N01°11.31	16.6'	58.8'
13	15°0.06	53.16	40°1.05	12.5'	01°27.93	16.6'	58.8'
14	30°0.21	54.05	54°32.52	12.4'	01°44.56	16.6'	58.9'
15	45°0.36	· · 54.94	69°3.93	12.4'	02°1.20	16.6'	58.9'
16	60°0.51	55.83	83°35.30	12.3'	02°17.84	16.7'	58.9'
17	75°0.66	56.72	98°6.63	12.3'	02°34.50	16.7'	59.0'
18	90°0.81	N09°57.61	112°37.90	12.2'	N02°51.17	16.7'	59.0'
19	105°0.95	58.50	127°9.12	12.2'	03°7.83	16.7'	59.0'
20	120°1.10	09°59.39	141°40.28	12.1'	03°24.51	16.7'	59.1'
21	135°1.25	10°0.28	156°11.39	12.1'	03°41.18	16.7'	59.1'
22	150°1.40	1.17	170°42.45	12.0'	03°57.86	16.7'	59.1'
23	165°1.55	2.06	185°13.45	11.9'	04°14.53	16.7'	59.2'
SD = 15.9' $d = 0.9'$							
SD = 15.9'							

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

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

Day	Sun	
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April 16, 17, 18 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	204°9.32		156°37.22	N17°57.61	199°21.37	N01°0.73	95°36.02	N22°43.60	196°31.28	N00°57.75	Alpheratz	357°34.04	29°14.00
1	219°11.78		171°36.63	58.54	214°22.05	1.51	110°38.20	43.57	211°33.46	57.87	Ankaa	353°6.51	-42°9.75
2	234°14.24		186°36.03	17°59.47	229°22.74	2.29	125°40.38	43.54	226°35.65	57.98	Schedar	349°30.43	56°40.78
3	249°16.71		201°35.43	18°0.40	244°23.43	•• 3.07	140°42.56	•• 43.51	241°37.83	•• 58.10	Diphda	348°46.57	-17°50.59
4	264°19.17		216°34.83	1.33	259°24.12	3.85	155°44.74	43.48	256°40.02	58.21	Achernar	335°19.98	-57°6.19
5	279°21.64		231°34.23	2.25	274°24.81	4.63	170°46.92	43.44	271°42.21	58.33	Hamal	327°50.38	23°35.14
6	294°24.10		246°33.63	N18°3.18	289°25.50	N01°5.41	185°49.10	N22°43.41	286°44.39	N00°58.44	Polaris	313°58.43	89°22.58
7	309°26.56		261°33.03	4.11	304°26.19	6.19	200°51.28	43.38	301°46.58	58.56	Acamar	315°11.38	-40°12.05
8	324°29.03		276°32.43	5.03	319°26.88	6.97	215°53.45	43.35	316°48.76	58.68	Menkar	314°5.37	4°11.49
9	339°31.49		291°31.83	•• 5.96	334°27.57	•• 7.75	230°55.63	•• 43.31	331°50.95	•• 58.79	Mirfak	308°27.23	49°57.30
10	354°33.96		306°31.23	6.88	349°28.26	8.53	245°57.81	43.28	346°53.13	58.91	Aldebaran	290°38.68	16°33.69
11	9°36.42		321°30.63	7.80	4°28.94	9.31	260°59.99	43.25	1°55.32	59.02	Rigel	281°3.08	-8°10.40
12	24°38.88		336°30.03	N18°8.72	19°29.63	N01°10.09	276°2.16	N22°43.22	16°57.51	N00°59.14	Capella	280°20.65	46°1.55
13	39°41.35		351°29.42	9.64	34°30.32	10.87	291°4.34	43.19	31°59.69	59.25	Bellatrix	278°21.96	6°22.34
14	54°43.81		6°28.82	10.56	49°31.01	11.65	306°6.52	43.15	47°1.88	59.37	Elnath	278°0.78	28°37.79
15	69°46.28		21°28.22	•• 11.48	64°31.70	•• 12.43	321°8.69	•• 43.12	62°4.07	•• 59.48	Alnilam	275°36.86	-1°11.21
16	84°48.74		36°27.61	12.40	79°32.39	13.21	336°10.87	43.09	77°6.25	59.60	Betelgeuse	270°51.13	7°24.65
17	99°51.20		51°27.01	13.32	94°33.08	13.99	351°13.04	43.06	92°8.44	59.71	Canopus	263°52.14	-52°42.82
18	114°53.67		66°26.40	N18°14.24	109°33.77	N01°14.77	6°15.22	N22°43.02	107°10.62	N00°59.83	Sirius	258°25.43	-16°45.31
19	129°56.13		81°25.80	15.15	124°34.46	15.55	21°17.39	42.99	122°12.81	00°59.94	Adhara	255°5.14	-29°0.69
20	144°58.60		96°25.19	16.07	139°35.15	16.33	36°19.57	42.96	137°15.00	01°0.06	Procyon	244°49.78	5°9.36
21	160°1.06		111°24.59	•• 16.98	154°35.84	•• 17.11	51°21.74	•• 42.93	152°17.18	•• 0.17	Pollux	243°16.06	27°57.79
22	175°3.52		126°23.98	17.89	169°36.53	17.89	66°23.92	42.89	167°19.37	0.29	Avior	234°14.26	-59°35.92
23	190°5.99		141°23.37	18.81	184°37.22	18.67	81°26.09	42.86	182°21.56	0.40	Suhail	222°45.43	-43°32.61
Mer.pass. 10:22		ν-0.6' d0.9' m-3.92		ν0.7' d0.8' m1.20		ν2.2' d-0.0' m-2.10		ν2.2' d0.1' m0.93					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	205°8.45		156°22.76	N18°19.72	199°37.91	N01°19.45	96°28.27	N22°42.83	197°23.74	N01°0.52	Miaplacidus	221°37.80	-69°49.80
1	220°10.92		171°22.15	20.63	214°38.60	20.23	111°30.44	42.79	212°25.93	0.63	Alphard	217°46.62	-8°46.53
2	235°13.38		186°21.55	21.54	229°39.29	21.01	126°32.61	42.76	227°28.12	0.75	Regulus	207°33.16	11°50.23
3	250°15.84		201°20.94	•• 22.45	244°39.98	•• 21.79	141°34.78	•• 42.73	242°30.30	•• 0.86	Dubhe	193°39.23	61°36.65
4	265°18.31		216°20.33	23.36	259°40.67	22.57	156°36.96	42.70	257°32.49	0.98	Denebola	182°23.61	14°25.39
5	280°20.77		231°19.72	24.27	274°41.36	23.35	171°39.13	42.66	272°34.68	1.09	Gienah	175°42.23	-17°41.47
6	295°23.24		246°19.11	N18°25.17	289°42.04	N01°24.13	186°41.30	N22°42.63	287°36.86	N01°1.21	Acrux	172°58.32	-63°14.88
7	310°25.70		261°18.49	26.08	304°42.73	24.91	201°43.47	42.60	302°39.05	1.32	Gacrux	171°49.97	-57°15.82
8	325°28.17		276°17.88	26.98	319°43.42	25.69	216°45.64	42.56	317°41.24	1.44	Alioth	166°11.49	55°48.98
9	340°30.63		291°17.27	•• 27.89	334°44.11	•• 26.47	231°47.82	•• 42.53	332°43.42	•• 1.55	Spica	158°20.89	-11°18.08
10	355°33.09		306°16.66	28.79	349°44.80	27.25	246°49.99	42.50	347°45.61	1.67	Alkaid	152°50.69	49°10.79
11	10°35.56		321°16.05	29.70	4°45.49	28.03	261°52.16	42.46	2°47.80	1.78	Hadar	148°33.91	-60°30.06
12	25°38.02		336°15.43	N18°30.60	19°46.18	N01°28.81	276°54.33	N22°42.43	17°49.98	N01°1.90	Menkent	147°56.01	-36°30.08
13	40°40.49		351°14.82	31.50	34°46.87	29.58	291°56.50	42.40	32°52.17	2.01	Arcturus	145°46.63	19°2.56
14	55°42.95		6°14.20	32.40	49°47.56	30.36	306°58.67	42.36	47°54.36	2.13	Rigel Kent.	139°38.24	-60°56.68
15	70°45.41		21°13.59	•• 33.30	64°48.25	•• 31.14	322°0.84	•• 42.33	62°56.54	•• 2.24	Kochab	137°18.66	74°2.64
16	85°47.88		36°12.97	34.20	79°48.94	31.92	337°3.01	42.30	77°58.73	2.36	Zuben'ubi	136°54.55	-16°9.19
17	100°50.34		51°12.36	35.09	94°49.63	32.70	352°5.17	42.26	93°0.92	2.47	Alphecca	126°2.54	26°37.35
18	115°52.81		66°11.74	N18°35.99	109°50.32	N01°33.48	7°7.34	N22°42.23	108°3.11	N01°2.59	Antares	112°14.29	-26°29.45
19	130°55.27		81°11.12	36.89	124°51.01	34.26	22°9.51	42.20	123°5.29	2.70	Atria	107°7.22	-69°4.30
20	145°57.73		96°10.51	37.78	139°51.71	35.04	37°11.68	42.16	138°7.48	2.82	Sabik	102°1.38	-15°45.51
21	161°0.20		111°9.89	•• 38.68	154°52.40	•• 35.81	52°13.85	•• 42.13	153°9.67	•• 2.93	Shaula	96°8.74	-37°7.31
22	176°2.66		126°9.27	39.57	169°53.09	36.59	67°16.02	42.09	168°11.85	3.04	Rasalhague	95°57.40	12°32.24
23	191°5.13		141°8.65	40.46	184°53.78	37.37	82°18.18	42.06	183°14.04	3.16	Eltanin	90°41.45	51°28.76
Mer.pass. 10:18		ν-0.6' d0.9' m-3.92		ν0.7' d0.8' m1.21		ν2.2' d-0.0' m-2.09		ν2.2' d0.1' m0.93					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	206°7.59		156°8.03	N18°41.36	199°54.47	N01°38.15	97°20.35	N22°42.03	198°16.23	N01°3.27	Apr 16 Thu	SHA	Mer.pass
1	221°10.05		171°7.41	42.25	214°55.16	38.93	112°22.52	41.99	213°18.42	3.39	Venus	312°27.91	13:34
2	236°12.52		186°6.79	43.14	229°55.85	39.71	127°24.68	41.96	228°20.60	3.50	Mars	355°12.05	10:42
3	251°14.98		201°6.17	•• 44.03	244°56.54	•• 40.49	142°26.85	•• 41.92	243°22.79	•• 3.62	Jupiter	251°26.71	17:35
4	266°17.45		216°5.55	44.92	259°57.23	41.26	157°29.02	41.89	258°24.98	3.73	Saturn	352°21.96	10:52
5	281°19.91		231°4.93	45.80	274°57.92	42.04	172°31.18	41.86	273°27.17	3.85			
6	296°22.37		246°4.31	N18°46.69	289°58.61	N01°42.82	187°33.35	N22°41.82	288°29.35	N01°3.96			
7	311°24.84		261°3.69	47.58	304°59.30	43.60	202°35.51	41.79	303°31.54	4.07			
8	326°27.30		276°3.07	48.46	319°59.99	44.38	217°37.68	41.75	318°33.73	4.19			
9	341°29.77		291°2.44	•• 49.35	335°0.68	•• 45.15	232°39.84	•• 41.72	333°35.92	•• 4.30			
10	356°32.23		306°1.82	50.23	350°1.37	45.93	247°42.01	41.69	348°38.10	4.42			
11	11°34.70		321°1.19	51.11	5°2.06	46.71	262°44.17	41.65	3°40.29	4.53			
12	26°37.16		336°0.57	N18°51.99	20°2.75	N01°47.49	277°46.33	N22°41.62	18°42.48	N01°4.65			
13	41°39.62		350°59°										

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°1.69	N10°2.95	199°44.39	11.9'	N04°31.20	16.7'	59.2'
1	195°1.84	3.84	214°15.27	11.8'	04°47.87	16.7'	59.2'
2	210°1.99	4.73	228°46.09	11.8'	05°4.53	16.7'	59.3'
3	225°2.14	5.62	243°16.84	11.7'	05°21.18	16.6'	59.3'
4	240°2.28	6.50	257°47.54	11.6'	05°37.82	16.6'	59.3'
5	255°2.43	7.39	272°18.17	11.6'	05°54.46	16.6'	59.4'
6	270°2.58	N10°8.28	286°48.73	11.5'	N06°11.08	16.6'	59.4'
7	285°2.72	9.17	301°19.23	11.4'	06°27.68	16.6'	59.4'
8	300°2.87	10.05	315°49.65	11.4'	06°44.27	16.6'	59.4'
9	315°3.01	10.94	330°20.01	11.3'	07°0.84	16.6'	59.5'
10	330°3.16	11.82	344°50.30	11.2'	07°17.39	16.5'	59.5'
11	345°3.31	12.71	359°20.51	11.1'	07°33.92	16.5'	59.5'
12	0°3.45	N10°13.60	13°50.66	11.1'	N07°50.42	16.5'	59.6'
13	15°3.60	14.48	28°20.72	11.0'	08°6.90	16.5'	59.6'
14	30°3.74	15.37	42°50.71	10.9'	08°23.36	16.4'	59.6'
15	45°3.89	16.25	57°20.63	10.8'	08°39.78	16.4'	59.6'
16	60°4.03	17.13	71°50.46	10.8'	08°56.17	16.4'	59.7'
17	75°4.18	18.02	86°20.22	10.7'	09°12.53	16.3'	59.7'
18	90°4.32	N10°18.90	100°49.89	10.6'	N09°28.86	16.3'	59.7'
19	105°4.47	19.79	115°19.49	10.5'	09°45.15	16.3'	59.7'
20	120°4.61	20.67	129°49.00	10.4'	10°1.40	16.2'	59.8'
21	135°4.75	21.55	144°18.42	10.3'	10°17.61	16.2'	59.8'
22	150°4.90	22.43	158°47.76	10.3'	10°33.78	16.1'	59.8'
23	165°5.04	23.32	173°17.02	10.2'	10°49.90	16.1'	59.8'
SD = 15.9'		$d = 0.9'$	SD = 16.1'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°5.19	N10°24.20	187°46.18	10.1'	N11°5.98	16.0'	59.9'
1	195°5.33	25.08	202°15.26	10.0'	11°22.01	16.0'	59.9'
2	210°5.47	25.96	216°44.25	9.9'	11°37.99	15.9'	59.9'
3	225°5.62	26.84	231°13.15	9.8'	11°53.92	15.9'	59.9'
4	240°5.76	27.72	245°41.95	9.7'	12°9.79	15.8'	60.0'
5	255°5.90	28.60	260°10.66	9.6'	12°25.61	15.8'	60.0'
6	270°6.04	N10°29.48	274°39.28	9.5'	N12°41.37	15.7'	60.0'
7	285°6.19	30.36	289°7.81	9.4'	12°57.07	15.6'	60.0'
8	300°6.33	31.24	303°36.23	9.3'	13°12.70	15.6'	60.1'
9	315°6.47	32.12	318°4.56	9.2'	13°28.27	15.5'	60.1'
10	330°6.61	33.00	332°32.80	9.1'	13°43.78	15.4'	60.1'
11	345°6.76	33.88	347°0.93	9.0'	13°59.22	15.4'	60.1'
12	0°6.90	N10°34.76	1°28.97	8.9'	N14°14.58	15.3'	60.1'
13	15°7.04	35.63	15°56.90	8.8'	14°29.87	15.2'	60.2'
14	30°7.18	36.51	30°24.73	8.7'	14°45.09	15.1'	60.2'
15	45°7.32	37.39	44°52.46	8.6'	15°0.23	15.1'	60.2'
16	60°7.46	38.27	59°20.09	8.5'	15°15.29	15.0'	60.2'
17	75°7.60	39.14	73°47.61	8.4'	15°30.27	14.9'	60.2'
18	90°7.74	N10°40.02	88°15.03	8.3'	N15°45.17	14.8'	60.2'
19	105°7.88	40.89	102°42.35	8.2'	15°59.98	14.7'	60.3'
20	120°8.02	41.77	117°9.56	8.1'	16°14.70	14.6'	60.3'
21	135°8.16	42.65	131°36.66	8.0'	16°29.33	14.5'	60.3'
22	150°8.30	43.52	146°3.66	7.9'	16°43.87	14.4'	60.3'
23	165°8.44	44.40	160°30.54	7.8'	16°58.32	14.3'	60.3'
SD = 15.9'		$d = 0.9'$	SD = 16.3'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°8.58	N10°45.27	174°57.33	7.7'	N17°12.67	14.2'	60.3'
1	195°8.72	46.14	189°24.00	7.6'	17°26.92	14.1'	60.4'
2	210°8.86	47.02	203°50.56	7.5'	17°41.06	14.0'	60.4'
3	225°9.00	47.89	218°17.01	7.3'	17°55.11	13.9'	60.4'
4	240°9.14	48.77	232°43.36	7.2'	18°9.05	13.8'	60.4'
5	255°9.28	49.64	247°9.59	7.1'	18°22.88	13.7'	60.4'
6	270°9.42	N10°50.51	261°35.72	7.0'	N18°36.61	13.6'	60.4'
7	285°9.56	51.38	276°1.73	6.9'	18°50.22	13.5'	60.4'
8	300°9.69	52.26	290°27.63	6.8'	19°3.71	13.4'	60.4'
9	315°9.83	53.13	304°53.42	6.7'	19°17.09	13.3'	60.4'
10	330°9.97	54.00	319°19.10	6.6'	19°30.36	13.1'	60.5'
11	345°10.11	54.87	333°44.67	6.5'	19°43.50	13.0'	60.5'
12	0°10.25	N10°55.74	348°10.13	6.3'	N19°56.51	12.9'	60.5'
13	15°10.38	56.61	2°35.48	6.2'	20°9.41	12.8'	60.5'
14	30°10.52	57.48	17°0.72	6.1'	20°22.17	12.6'	60.5'
15	45°10.66	58.35	31°25.84	6.0'	20°34.81	12.5'	60.5'
16	60°10.79	59.22	45°50.86	5.9'	20°47.31	12.4'	60.5'
17	75°10.93	11°0.09	60°15.76	5.8'	20°59.68	12.2'	60.5'
18	90°11.07	N11°0.96	74°40.56	5.7'	N21°11.92	12.1'	60.5'
19	105°11.20	1.83	89°5.24	5.6'	21°24.02	12.0'	60.5'
20	120°11.34	2.70	103°29.82	5.5'	21°35.97	11.8'	60.5'
21	135°11.48	3.56	117°54.29	5.4'	21°47.79	11.7'	60.5'
22	150°11.61	4.43	132°18.65	5.3'	21°59.46	11.5'	60.5'
23	165°11.75	5.30	146°42.90	5.1'	22°10.98	11.4'	60.5'
SD = 15.9'		$d = 0.9'$	SD = 16.5'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	28-1
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	3-1%
16	00:07	00:14	12:00	11:03	23:28	
17	00:21	00:28	12:00	11:54	--:--	
18	00:34	00:41	11:59	12:49	00:21	

April 19, 20, 21 UT (Sun., Mon., Tue.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars			
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	207°6.73	155°53.04	N19°2.51	200°11.04	N01°56.82	98°12.28	N22°41.20	199°8.74	N01°6.02			Alpheratz	357°34.02 29°14.00	
1	222°9.19	170°52.41	3.38	215°11.73	57.59	113°14.44	41.17	214°10.93	6.13			Ankaa	353°6.50 -42°9.74	
2	237°11.66	185°51.78	4.25	230°12.42	58.37	128°16.60	41.13	229°13.11	6.24			Schedar	349°30.41 56°40.77	
3	252°14.12	200°51.15	•• 5.12	245°13.12	•• 59.15	143°18.76	•• 41.10	244°15.30	•• 6.36			Diphda	348°46.56 -17°50.58	
4	267°16.59	215°50.51	5.99	260°13.81	01°59.92	158°20.92	41.06	259°17.49	6.47			Achernar	335°19.98 -57°6.17	
5	282°19.05	230°49.88	6.85	275°14.50	02°0.70	173°23.08	41.03	274°19.68	6.58			Hamal	327°50.37 23°35.13	
6	297°21.51	245°49.25	N19°7.72	290°15.19	N02°1.48	188°25.24	N22°40.99	289°21.87	N01°6.70			Polaris	313°58.51 89°22.57	
7	312°23.98	260°48.61	8.59	305°15.88	2.25	203°27.40	40.96	304°24.06	6.81			Acamar	315°11.38 -40°12.04	
8	327°26.44	275°47.98	9.45	320°16.57	3.03	218°29.55	40.92	319°26.25	6.93			Menkar	314°5.37 4°11.50	
9	342°28.91	290°47.35	•• 10.31	335°17.26	•• 3.81	233°31.71	•• 40.89	334°28.43	•• 7.04			Mirfak	308°27.23 49°57.29	
10	357°31.37	305°46.71	11.18	350°17.95	4.58	248°33.87	40.85	349°30.62	7.15			Aldebaran	290°38.69 16°33.69	
11	12°33.83	320°46.08	12.04	5°18.65	5.36	263°36.03	40.81	4°32.81	7.27			Rigel	281°3.09 -8°10.39	
12	27°36.30	335°45.44	N19°12.90	20°19.34	N02°6.13	278°38.19	N22°40.78	19°35.00	N01°7.38			Capella	280°20.66 46°1.54	
13	42°38.76	350°44.81	13.76	35°20.03	6.91	293°40.34	40.74	34°37.19	7.49			Bellatrix	278°21.97 6°22.34	
14	57°41.23	5°44.17	14.62	50°20.72	7.69	308°42.50	40.71	49°39.38	7.61			Elnath	278°0.79 28°37.79	
15	72°43.69	20°43.53	•• 15.48	65°21.41	•• 8.46	323°44.66	•• 40.67	64°41.57	•• 7.72			Alnilam	275°36.87 -1°11.21	
16	87°46.16	35°42.89	16.34	80°22.10	9.24	338°46.81	40.64	79°43.76	7.84			Betelgeuse	270°51.13 7°24.65	
17	102°48.62	50°42.26	17.19	95°22.79	10.01	353°48.97	40.60	94°45.95	7.95			Canopus	263°52.16 -52°42.82	
18	117°51.08	65°41.62	N19°18.05	110°23.49	N02°10.79	8°51.12	N22°40.57	109°48.13	N01°8.06			Sirius	258°25.45 -16°45.31	
19	132°53.55	80°40.98	18.90	125°24.18	11.57	23°53.28	40.53	124°50.32	8.18			Adhara	255°5.16 -29°0.69	
20	147°56.01	95°40.34	19.76	140°24.87	12.34	38°55.44	40.50	139°52.51	8.29			Procyon	244°49.79 5°9.36	
21	162°58.48	110°39.70	•• 20.61	155°25.56	•• 13.12	53°57.59	•• 40.46	154°54.70	•• 8.40			Pollux	243°16.07 27°57.78	
22	178°0.94	125°39.06	21.46	170°26.25	13.89	68°59.75	40.42	169°56.89	8.52			Avior	234°14.29 -59°35.92	
23	193°3.41	140°38.42	22.32	185°26.94	14.67	84°1.90	40.39	184°59.08	8.63			Suhail	222°45.44 -43°32.61	
Mer.pass. 10:10		ν-0.6' d0.9' m-3.92		ν0.7' d0.8' m1.21		ν2.2' d-0.0' m-2.08		ν2.2' d0.1' m0.93					Miaplacidus	221°37.83 -69°49.81
													Alphard	217°46.63 -8°46.53
													Regulus	207°33.17 11°50.23
													Dubhe	193°39.25 61°36.66
													Denebola	182°23.62 14°25.40
													Gienah	175°42.22 -17°41.47
													Acrux	172°58.32 63°14.90
													Gacrux	171°49.96 -57°15.83
													Alioth	166°11.50 55°48.99
													Spica	158°20.89 -11°18.08
													Alkaid	152°50.69 49°10.81
													Hadar	148°33.89 -60°30.07
													Menkent	147°56.00 -36°30.08
													Arcturus	145°46.62 19°2.56
													Rigel Kent.	139°38.22 -60°56.69
													Kochab	137°18.65 74°2.66
													Zuben'ubi	136°54.54 -16°9.19
													Alphecca	126°2.53 26°37.36
													Antares	112°14.27 -26°29.45
													Atria	107°7.17 -69°4.31
													Sabik	102°1.36 -15°45.51
													Shaula	96°8.71 -37°7.30
													Rasalhague	95°57.38 12°32.25
													Eltanin	90°41.42 51°28.78
													Kaus Aust.	83°30.97 -34°22.25
													Vega	80°32.36 38°48.16
													Nunki	75°46.36 -26°15.80
													Altair	61°58.92 8°56.10
Mer.pass. 10:06		ν-0.6' d0.8' m-3.92		ν0.7' d0.8' m1.21		ν2.2' d-0.0' m-2.08		ν2.2' d0.1' m0.93					Peacock	53°4.14 -56°38.79
													Deneb	49°25.17 45°22.13
													Enif	33°37.91 9°59.59
													Al Na'ir	27°31.84 -46°49.86
													Fomalhaut	15°13.61 -29°28.93
													Scheat	13°44.45 28°13.35
													Markab	13°29.10 15°20.66
Apr 19 Sun		SHA		Mer.pass										
		Venus		308°46.31 13:37										
		Mars		353°4.31 10:39										
		Jupiter		251°5.55 17:25										
		Saturn		352°2.01 10:42										
Apr 20 Mon		SHA		Mer.pass										
		Venus		307°31.91 13:38										
		Mars		352°21.77 10:38										
		Jupiter		250°58.18 17:21										
		Saturn		351°55.40 10:38										
Apr 21 Tue		SHA		Mer.pass										
		Venus		306°17.24 13:39										
		Mars		351°39.23 10:37										
		Jupiter		250°50.67 17:18										
		Saturn		351°48.82 10:35										
Horizontal parallax		Venus:		0.1										
		Mars:		0.1										
Mer.pass. 10:02		ν-0.7' d0.8' m-3.92		ν0.7' d0.8' m1.21		ν2.1' d-0.0' m-2.07		ν2.2' d0.1' m0.93						

h	Sun			Moon			
	Sun	GHA	Dec	GHA	ν	Dec	d
0	180°	11.88	N11°6.17	161°	7.05	5.0'	N22°22.36
1	195°	12.02	7.03	175°	31.09	4.9'	22°33.58
2	210°	12.15	7.90	189°	55.02	4.8'	22°44.65
3	225°	12.29	8.77	204°	18.85	4.7'	22°55.57
4	240°	12.42	9.63	218°	42.58	4.6'	23°6.34
5	255°	12.56	10.50	233°	6.20	4.5'	23°16.94
6	270°	12.69	N11°11.36	247°	29.72	4.4'	N23°27.38
7	285°	12.83	12.23	261°	53.14	4.3'	23°37.66
8	300°	12.96	13.09	276°	16.46	4.2'	23°47.78
9	315°	13.09	13.95	290°	39.68	4.1'	23°57.73
10	330°	13.23	14.82	305°	2.81	4.0'	24°7.51
11	345°	13.36	15.68	319°	25.84	3.9'	24°17.13
12	0°	13.50	N11°16.55	333°	48.78	3.8'	N24°26.57
13	15°	13.63	17.41	348°	11.62	3.8'	24°35.84
14	30°	13.76	18.27	2°	34.37	3.7'	24°44.93
15	45°	13.89	19.13	16°	57.04	3.6'	24°53.85
16	60°	14.03	19.99	31°	19.61	3.5'	25°2.59
17	75°	14.16	20.86	45°	42.10	3.4'	25°11.15
18	90°	14.29	N11°21.72	60°	4.51	3.3'	N25°19.53
19	105°	14.42	22.58	74°	26.83	3.2'	25°27.72
20	120°	14.56	23.44	88°	49.07	3.2'	25°35.73
21	135°	14.69	24.30	103°	11.23	3.1'	25°43.56
22	150°	14.82	25.16	117°	33.32	3.0'	25°51.19
23	165°	14.95	26.02	131°	55.33	2.9'	25°58.64
SD = 15.9'				SD = 16.5'			
$d = 0.9'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°	15.08	N11°26.88	146°	17.27	2.9'	N26°5.90
1	195°	15.21	27.74	160°	39.14	2.8'	26°12.96
2	210°	15.34	28.60	175°	0.94	2.7'	26°19.84
3	225°	15.47	29.45	189°	22.67	2.7'	26°26.52
4	240°	15.61	30.31	203°	44.35	2.6'	26°33.00
5	255°	15.74	31.17	218°	5.96	2.6'	26°39.29
6	270°	15.87	N11°32.03	232°	27.51	2.5'	N26°45.38
7	285°	16.00	32.88	246°	49.01	2.4'	26°51.27
8	300°	16.13	33.74	261°	10.45	2.4'	26°56.96
9	315°	16.26	34.60	275°	31.85	2.3'	27°2.45
10	330°	16.38	35.45	289°	53.19	2.3'	27°7.74
11	345°	16.51	36.31	304°	14.49	2.3'	27°12.82
12	0°	16.64	N11°37.16	318°	35.75	2.2'	N27°17.71
13	15°	16.77	38.02	332°	56.97	2.2'	27°22.39
14	30°	16.90	38.87	347°	18.15	2.1'	27°26.86
15	45°	17.03	39.73	1°	39.30	2.1'	27°31.13
16	60°	17.16	40.58	16°	0.42	2.1'	27°35.19
17	75°	17.29	41.43	30°	21.51	2.1'	27°39.05
18	90°	17.41	N11°42.29	44°	42.57	2.0'	N27°42.70
19	105°	17.54	43.14	59°	3.61	2.0'	27°46.14
20	120°	17.67	43.99	73°	24.63	2.0'	27°49.38
21	135°	17.80	44.84	87°	45.64	2.0'	27°52.40
22	150°	17.92	45.70	102°	6.63	2.0'	27°55.22
23	165°	18.05	46.55	116°	27.61	2.0'	27°57.83
SD = 15.9'				SD = 16.5'			
$d = 0.9'$							

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°	18.18	N11°47.40	130°	48.59	2.0'	N28°0.23
1	195°	18.30	48.25	145°	9.56	2.0'	28°2.42
2	210°	18.43	49.10	159°	30.53	2.0'	28°4.40
3	225°	18.56	49.95	173°	51.50	2.0'	28°6.17
4	240°	18.68	50.80	188°	12.48	2.0'	28°7.73
5	255°	18.81	51.65	202°	33.47	2.0'	28°9.08
6	270°	18.94	N11°52.50	216°	54.47	2.0'	N28°10.23
7	285°	19.06	53.35	231°	15.48	2.0'	28°11.16
8	300°	19.19	54.20	245°	36.51	2.1'	28°11.89
9	315°	19.31	55.04	259°	57.56	2.1'	28°12.40
10	330°	19.44	55.89	274°	18.63	2.1'	28°12.71
11	345°	19.56	56.74	288°	39.74	2.1'	28°12.81
12	0°	19.69	N11°57.59	303°	0.87	2.2'	N28°12.71
13	15°	19.81	58.43	317°	22.03	2.2'	28°12.39
14	30°	19.94	59.28	331°	43.23	2.2'	28°11.87
15	45°	20.06	60.13	346°	4.47	2.3'	28°11.15
16	60°	20.18	60.97	0°	25.75	2.3'	28°10.22
17	75°	20.31	61.82	14°	47.08	2.4'	28°9.08
18	90°	20.43	N12°2.66	29°	8.45	2.4'	N28°7.74
19	105°	20.55	3.51	43°	29.88	2.5'	28°6.20
20	120°	20.68	4.35	57°	51.35	2.5'	28°4.46
21	135°	20.80	5.20	72°	12.89	2.6'	28°2.51
22	150°	20.92	6.04	86°	34.48	2.7'	28°0.36
23	165°	21.05	6.88	100°	56.13	2.7'	27°58.02
SD = 15.9'				SD = 16.4'			
$d = 0.9'$							

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

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

Day	Sun			Moon		
	Eqn.of Time 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 2-4 3-17%
19	00:48	00:54	11:59	13:49	01:19	
20	01:00	01:07	11:59	14:53	02:21	
21	01:13	01:19	11:59	15:58	03:26	

April 22, 23, 24 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	210°4.15		155°6.47	N20°2.95	201°0.86	N02°52.58	100°47.15	N22°38.58	201°46.41	N01°14.15
1	225°6.62		170°5.80	3.75	216°1.55	53.36	115°49.29	38.54	216°48.60	14.27
2	240°9.08		185°5.14	4.56	231°2.25	54.13	130°51.44	38.51	231°50.79	14.38
3	255°11.54		200°4.47	•• 5.36	246°2.94	•• 54.90	145°53.58	•• 38.47	246°52.98	•• 14.49
4	270°14.01		215°3.81	6.17	261°3.63	55.67	160°55.72	38.43	261°55.17	14.60
5	285°16.47		230°3.14	6.97	276°4.32	56.44	175°57.86	38.39	276°57.37	14.71
6	300°18.94		245°2.48	N20°7.77	291°5.02	N02°57.22	191°0.00	N22°38.35	291°59.56	N01°14.83
7	315°21.40		260°1.81	8.57	306°5.71	57.99	206°2.14	38.32	307°1.75	14.94
8	330°23.87		275°1.15	9.37	321°6.40	58.76	221°4.28	38.28	322°3.94	15.05
9	345°26.33		290°0.48	•• 10.17	336°7.09	02°59.53	236°6.42	•• 38.24	337°6.13	•• 15.16
10	0°28.79		304°59.81	10.97	351°7.79	03°0.30	251°8.56	38.20	352°8.32	15.27
11	15°31.26		319°59.14	11.77	6°8.48	1.07	266°10.70	38.16	7°10.52	15.39
12	30°33.72		334°58.48	N20°12.57	21°9.17	N03°1.84	281°12.83	N22°38.12	22°12.71	N01°15.50
13	45°36.19		349°57.81	13.36	36°9.87	2.61	296°14.97	38.09	37°14.90	15.61
14	60°38.65		4°57.14	14.16	51°10.56	3.38	311°17.11	38.05	52°17.09	15.72
15	75°41.11		19°56.47	•• 14.95	66°11.25	•• 4.16	326°19.25	•• 38.01	67°19.28	•• 15.83
16	90°43.58		34°55.80	15.74	81°11.95	4.93	341°21.39	37.97	82°21.48	15.95
17	105°46.04		49°55.13	16.53	96°12.64	5.70	356°23.52	37.93	97°23.67	16.06
18	120°48.51		64°54.46	N20°17.32	111°13.33	N03°6.47	11°25.66	N22°37.89	112°25.86	N01°16.17
19	135°50.97		79°53.79	18.11	126°14.02	7.24	26°27.80	37.85	127°28.05	16.28
20	150°53.44		94°53.11	18.90	141°14.72	8.01	41°29.94	37.82	142°30.25	16.39
21	165°55.90		109°52.44	•• 19.69	156°15.41	•• 8.78	56°32.07	•• 37.78	157°32.44	•• 16.50
22	180°58.36		124°51.77	20.48	171°16.10	9.55	71°34.21	37.74	172°34.63	16.61
23	196°0.83		139°51.10	21.26	186°16.80	10.32	86°36.34	37.70	187°36.82	16.73
Mer.pass. 09:58		ν-0.7' d0.8' m-3.92		ν0.7' d0.8' m1.21		ν2.1' d-0.0' m-2.06		ν2.2' d0.1' m0.93		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	211°3.29		154°50.42	N20°22.05	201°17.49	N03°11.09	101°38.48	N22°37.66	202°39.02	N01°16.84
1	226°5.76		169°49.75	22.83	216°18.18	11.86	116°40.62	37.62	217°41.21	16.95
2	241°8.22		184°49.07	23.62	231°18.88	12.63	131°42.75	37.58	232°43.40	17.06
3	256°10.68		199°48.40	•• 24.40	246°19.57	•• 13.40	146°44.89	•• 37.54	247°45.59	•• 17.17
4	271°13.15		214°47.72	25.18	261°20.26	14.17	161°47.02	37.51	262°47.79	17.28
5	286°15.61		229°47.05	25.96	276°20.96	14.94	176°49.16	37.47	277°49.98	17.39
6	301°18.08		244°46.37	N20°26.74	291°21.65	N03°15.71	191°51.29	N22°37.43	292°52.17	N01°17.51
7	316°20.54		259°45.69	27.52	306°22.34	16.48	206°53.42	37.39	307°54.36	17.62
8	331°23.01		274°45.02	28.30	321°23.03	17.25	221°55.56	37.35	322°56.56	17.73
9	346°25.47		289°44.34	•• 29.07	336°23.73	•• 18.02	236°57.69	•• 37.31	337°58.75	•• 17.84
10	1°27.93		304°43.66	29.85	351°24.42	18.79	251°59.82	37.27	353°0.94	17.95
11	16°30.40		319°42.98	30.62	6°25.11	19.55	267°1.96	37.23	8°3.14	18.06
12	31°32.86		334°42.30	N20°31.40	21°25.81	N03°20.32	282°4.09	N22°37.19	23°5.33	N01°18.17
13	46°35.33		349°41.62	32.17	36°26.50	21.09	297°6.22	37.15	38°7.52	18.28
14	61°37.79		4°40.94	32.94	51°27.19	21.86	312°8.36	37.11	53°9.72	18.40
15	76°40.25		19°40.26	•• 33.71	66°27.89	•• 22.63	327°10.49	•• 37.07	68°11.91	•• 18.51
16	91°42.72		34°39.58	34.48	81°28.58	23.40	342°12.62	37.03	83°14.10	18.62
17	106°45.18		49°38.90	35.25	96°29.27	24.17	357°14.75	36.99	98°16.30	18.73
18	121°47.65		64°38.22	N20°36.02	111°29.97	N03°24.94	12°16.88	N22°36.95	113°18.49	N01°18.84
19	136°50.11		79°37.54	36.79	126°30.66	25.70	27°19.01	36.92	128°20.68	18.95
20	151°52.58		94°36.86	37.55	141°31.35	26.47	42°21.14	36.88	143°22.88	19.06
21	166°55.04		109°36.17	•• 38.32	156°32.05	•• 27.24	57°23.27	•• 36.84	158°25.07	•• 19.17
22	181°57.50		124°35.49	39.08	171°32.74	28.01	72°25.40	36.80	173°27.26	19.28
23	196°59.97		139°34.81	39.85	186°33.43	28.78	87°27.53	36.76	188°29.46	19.39
Mer.pass. 09:54		ν-0.7' d0.8' m-3.92		ν0.7' d0.8' m1.21		ν2.1' d-0.0' m-2.06		ν2.2' d0.1' m0.93		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	212°2.43		154°34.12	N20°40.61	201°34.13	N03°29.55	102°29.66	N22°36.72	203°31.65	N01°19.50
1	227°4.90		169°33.44	41.37	216°34.82	30.31	117°31.79	36.68	218°33.84	19.62
2	242°7.36		184°32.75	42.13	231°35.51	31.08	132°33.92	36.64	233°36.04	19.73
3	257°9.82		199°32.07	•• 42.89	246°36.21	•• 31.85	147°36.05	•• 36.60	248°38.23	•• 19.84
4	272°12.29		214°31.38	43.65	261°36.90	32.62	162°38.18	36.56	263°40.43	19.95
5	287°14.75		229°30.69	44.41	276°37.60	33.38	177°40.31	36.52	278°42.62	20.06
6	302°17.22		244°30.01	N20°45.16	291°38.29	N03°34.15	192°42.44	N22°36.48	293°44.81	N01°20.17
7	317°19.68		259°29.32	45.92	306°38.98	34.92	207°44.57	36.44	308°47.01	20.28
8	332°22.15		274°28.63	46.67	321°39.68	35.69	222°46.69	36.40	323°49.20	20.39
9	347°24.61		289°27.94	•• 47.43	336°40.37	•• 36.45	237°48.82	•• 36.36	338°51.40	•• 20.50
10	2°27.07		304°27.26	48.18	351°41.06	37.22	252°50.95	36.32	353°53.59	20.61
11	17°29.54		319°26.57	48.93	6°41.76	37.99	267°53.08	36.28	8°55.78	20.72
12	32°32.00		334°25.88	N20°49.68	21°42.45	N03°38.75	282°55.20	N22°36.23	23°57.98	N01°20.83
13	47°34.47		349°25.19	50.43	36°43.14	39.52	297°57.33	36.19	39°0.17	20.94
14	62°36.93		4°24.50	51.18	51°43.84	40.29	312°59.46	36.15	54°2.37	21.05
15	77°39.39		19°23.81	•• 51.93	66°44.53	•• 41.05	328°1.58	•• 36.11	69°4.56	•• 21.16
16	92°41.86		34°23.12	52.68	81°45.22	41.82	343°3.71	36.07	84°6.76	21.27
17	107°44.32		49°22.42	53.42	96°45.92	42.59	358°5.83	36.03	99°8.95	21.38
18	122°46.79		64°21.73	N20°54.17	111°46.61	N03°43.35	13°7.96	N22°35.99	114°11.15	N01°21.49
19	137°49.25		79°21.04	54.91	126°47.30	44.12	28°10.08	35.95	129°13.34	21.60
20	152°51.72		94°20.35	55.65	141°48.00	44.89	43°12.21	35.91	144°15.54	21.71
21	167°54.18		109°19.65	•• 56.40	156°48.69	•• 45.65	58°14.33	•• 35.87	159°17.73	•• 21.82
22	182°56.64		124°18.96	57.14	171°49.39	46.42	73°16.46	35.83	174°19.92	21.93
23	197°59.11		139°18.27	57.88	186°50.08	47.18	88°18.58	35.79	189°22.12	22.04
Mer.pass. 09:50		ν-0.7' d0.8' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.05		ν2.2' d0.1' m0.93		

Stars		
	SHA	Dec
Alpheratz	357°34.00	29°14.00
Ankaa	353°6.48	-42°9.72
Schedar	349°30.38	56°40.76
Diphda	348°46.55	-17°50.56
Achernar	335°19.97	-57°6.15
Hamal	327°50.36	23°35.13
Polaris	313°58.50	89°22.55
Acamar	315°11.38	-40°12.02
Menkar	314°5.36	4°11.50
Mirfak	308°27.22	49°57.29
Aldebaran	290°38.69	16°33.69
Rigel	281°3.09	-8°10.39
Capella	280°20.66	46°1.54
Bellatrix	278°21.97	6°22.34
Elnath	278°0.79	28°37.79
Alnilam	275°36.87	-1°11.21
Betelgeuse	270°51.14	7°24.65
Canopus	263°52.18	-52°42.81
Sirius	258°25.45	-16°45.31
Adhara	255°5.17	-29°0.69
Procyon	244°49.79	5°9.36
Pollux	243°16.08	27°57.78
Avior	234°14.32	-59°35.93
Suhail	222°45.46	-43°32.62
Miaplacidus	221°37.88	-69°49.81
Alphard	217°46.63	-8°46.54
Regulus	207°33.17	11°50.23
Dubhe	193°39.26	61°36.67
Denebola	182°23.61	14°25.40
Gienah	175°42.22	-17°41.48
Acrux	172°58.32	-63°14.92
Gacrux	171°49.96	-57°15.85
Alioth	166°11.50	55°49.00
Spica	158°20.88	-11°18.09
Alkaid	152°50.68	49°10.82
Hadar	148°33.87	-60°30.09
Menkent	147°55.98	-36°30.10
Arcturus	145°46.61	19°2.57
Rigil Kent.	139°38.20	-60°56.70
Kochab	137°18.64	74°2.67
Zuben'ubi	136°54.52	-16°9.20
Alphecca	126°2.51	26°37.37
Antares	112°14.24	-26°29.45
Atria	107°7.11	-69°4.32
Sabik	102°1.33	-15°45.51
Shaula	96°8.67	-37°7.31
Rasalhague	95°57.36	12°32.26
Eltanin	90°41.39	51°28.79
Kaus Aust.	83°30.93	-34°22.24
Vega	80°32.33	38°48.17
Nunki	75°46.33	-26°15.80
Altair	61°58.89	8°56.11
Peacock	53°4.09	-56°38.78
Deneb	49°25.14	45°22.14
Enif	33°37.89	9°59.59
Al Na'ir	27°31.80	-46°49.85
Fomalhaut	15°13.59	-29°28.91
Scheat	13°44.43	28°13.35
Markab	13°29.07	15°20.67
Apr 22 Wed	SHA	Mer.pass
Venus	305°2.31	13:40
Mars	350°56.71	10:35
Jupiter	250°43.00	17:14
Saturn	351°42.26	10:31
Apr 23 Thu	SHA	Mer.pass
Venus	303°47.13	13:41
Mars	350°14.20	10:34
Jupiter	250°35.19	17:11
Saturn	351°35.72	10:28
Apr 24 Fri	SHA	Mer.pass
Venus	302°31.69	13:42
Mars	349°31.70	10:33
Jupiter	250°27.23	17:08
Saturn	351°29.22	10:24
Horizontal parallax		
	Venus:	0.1
	Mars:	0.1

h	Sun			Moon			
Wed	GHA	Dec		GHA	ν	Dec	d HP
0	180°21.17	N12°7.73		115°17.85	2.8'	N27°55.47	-2.7' 59.7'
1	195°21.29	8.57		129°39.63	2.9'	27°52.73	-2.9' 59.7'
2	210°21.41	9.41		144°14.9	2.9'	27°49.79	-3.1' 59.7'
3	225°21.54	10.25		158°23.41	3.0'	27°46.66	-3.3' 59.7'
4	240°21.66	11.09		172°45.41	3.1'	27°43.33	-3.5' 59.6'
5	255°21.78	11.93		187°7.49	3.2'	27°39.81	-3.7' 59.6'
6	270°21.90	N12°12.78		201°29.64	3.2'	N27°36.10	-3.9' 59.6'
7	285°22.02	13.62		215°51.88	3.3'	27°32.20	-4.1' 59.6'
8	300°22.14	14.46		230°14.20	3.4'	27°28.10	-4.3' 59.5'
9	315°22.26	15.30		244°36.60	3.5'	27°23.82	-4.5' 59.5'
10	330°22.38	16.14		258°59.09	3.6'	27°19.36	-4.7' 59.5'
11	345°22.50	16.97		273°21.68	3.7'	27°14.70	-4.8' 59.5'
12	0°22.63	N12°17.81		287°44.35	3.8'	N27°9.87	-5.0' 59.4'
13	15°22.75	18.65		302°7.12	3.9'	27°4.85	-5.2' 59.4'
14	30°22.87	19.49		316°29.98	4.0'	26°59.65	-5.4' 59.4'
15	45°22.98	20.33		330°52.95	4.1'	26°54.27	-5.6' 59.4'
16	60°23.10	21.16		345°16.01	4.2'	26°48.72	-5.7' 59.3'
17	75°23.22	22.00		359°39.17	4.3'	26°42.98	-5.9' 59.3'
18	90°23.34	N12°22.84		14°2.43	4.4'	N26°37.07	-6.1' 59.3'
19	105°23.46	23.67		28°25.80	4.5'	26°30.99	-6.3' 59.3'
20	120°23.58	24.51		42°49.28	4.6'	26°24.74	-6.4' 59.2'
21	135°23.70	25.35		57°12.86	4.7'	26°18.32	-6.6' 59.2'
22	150°23.82	26.18		71°36.55	4.8'	26°11.73	-6.8' 59.2'
23	165°23.94	27.02		86°0.35	4.9'	26°4.97	-6.9' 59.2'

SD = 15.9' $d = 0.8'$

SD = 16.3'

Thu	GHA	Dec		GHA	ν	Dec	d HP
0	180°24.05	N12°27.85		100°24.26	5.0'	N25°58.05	-7.1' 59.1'
1	195°24.17	28.68		114°48.29	5.1'	25°50.96	-7.2' 59.1'
2	210°24.29	29.52		129°12.42	5.3'	25°43.72	-7.4' 59.1'
3	225°24.41	30.35		143°36.68	5.4'	25°36.31	-7.6' 59.0'
4	240°24.52	31.18		158°1.04	5.5'	25°28.74	-7.7' 59.0'
5	255°24.64	32.02		172°25.53	5.6'	25°21.02	-7.9' 59.0'
6	270°24.76	N12°32.85		186°50.13	5.7'	N25°13.15	-8.0' 59.0'
7	285°24.87	33.68		201°14.85	5.8'	25°5.12	-8.2' 58.9'
8	300°24.99	34.51		215°39.69	6.0'	24°56.94	-8.3' 58.9'
9	315°25.11	35.34		230°4.64	6.1'	24°48.61	-8.5' 58.9'
10	330°25.22	36.17		244°29.72	6.2'	24°40.13	-8.6' 58.9'
11	345°25.34	37.00		258°54.92	6.3'	24°31.51	-8.8' 58.8'
12	0°25.45	N12°37.83		273°20.24	6.4'	N24°22.74	-8.9' 58.8'
13	15°25.57	38.66		287°45.68	6.6'	24°13.84	-9.0' 58.8'
14	30°25.69	39.49		302°11.25	6.7'	24°4.79	-9.2' 58.7'
15	45°25.80	40.32		316°36.94	6.8'	23°55.60	-9.3' 58.7'
16	60°25.92	41.15		331°2.75	6.9'	23°46.28	-9.5' 58.7'
17	75°26.03	41.98		345°28.68	7.1'	23°36.82	-9.6' 58.7'
18	90°26.14	N12°42.81		359°54.74	7.2'	N23°27.23	-9.7' 58.6'
19	105°26.26	43.63		14°20.92	7.3'	23°17.51	-9.9' 58.6'
20	120°26.37	44.46		28°47.22	7.4'	23°7.66	-10.0' 58.6'
21	135°26.49	45.29		43°13.65	7.6'	22°57.68	-10.1' 58.6'
22	150°26.60	46.11		57°40.20	7.7'	22°47.58	-10.2' 58.5'
23	165°26.71	46.94		72°6.87	7.8'	22°37.35	-10.3' 58.5'

SD = 15.9' $d = 0.8'$

SD = 16.1'

Fri	GHA	Dec		GHA	ν	Dec	d HP
0	180°26.83	N12°47.77		86°33.67	7.9'	N22°27.00	-10.5' 58.5'
1	195°26.94	48.59		101°0.59	8.0'	22°16.53	-10.6' 58.4'
2	210°27.05	49.42		115°27.63	8.2'	22°5.94	-10.7' 58.4'
3	225°27.17	50.24		129°54.80	8.3'	21°55.24	-10.8' 58.4'
4	240°27.28	51.07		144°22.09	8.4'	21°44.42	-10.9' 58.4'
5	255°27.39	51.89		158°49.50	8.5'	21°33.49	-11.0' 58.3'
6	270°27.50	N12°52.71		173°17.04	8.7'	N21°22.44	-11.2' 58.3'
7	285°27.62	53.54		187°44.69	8.8'	21°11.29	-11.3' 58.3'
8	300°27.73	54.36		202°12.47	8.9'	21°0.03	-11.4' 58.2'
9	315°27.84	55.18		216°40.36	9.0'	20°48.66	-11.5' 58.2'
10	330°27.95	56.00		231°8.38	9.1'	20°37.19	-11.6' 58.2'
11	345°28.06	56.82		245°36.51	9.3'	20°25.62	-11.7' 58.2'
12	0°28.17	N12°57.65		260°4.77	9.4'	N20°13.94	-11.8' 58.1'
13	15°28.28	58.47		274°33.14	9.5'	20°2.17	-11.9' 58.1'
14	30°28.39	59.29		289°1.63	9.6'	19°50.30	-12.0' 58.1'
15	45°28.50	60.11		303°30.24	9.7'	19°38.34	-12.1' 58.0'
16	60°28.62	0.93		317°58.96	9.8'	19°26.28	-12.2' 58.0'
17	75°28.73	1.75		332°27.80	10.0'	19°14.12	-12.2' 58.0'
18	90°28.83	N13°2.56		346°56.75	10.1'	N19°1.88	-12.3' 58.0'
19	105°28.94	3.38		1°25.82	10.2'	18°49.55	-12.4' 57.9'
20	120°29.05	4.20		15°55.00	10.3'	18°37.13	-12.5' 57.9'
21	135°29.16	5.02		30°24.29	10.4'	18°24.63	-12.6' 57.9'
22	150°29.27	5.84		44°53.70	10.5'	18°12.04	-12.7' 57.9'
23	165°29.38	6.65		59°23.21	10.6'	17°59.37	-12.7' 57.8'

SD = 15.9' $d = 0.8'$

SD = 15.9'

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

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

Day	Sun			Moon		
	Eqn. of Time		Mer. Pass hh:mm	Mer.Pass.		Age 5-7 27-49%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
22	01:25	01:31	11:58	17:01	04:30	
23	01:36	01:42	11:58	18:00	05:32	
24	01:47	01:53	11:58	18:54	06:28	

April 25, 26, 27 UT (Sat., Sun., Mon.)

	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	213°1.57	154°17.57	N20°58.62	201°50.77	N03°47.95	103°20.71	N22°35.75	204°24.31	N01°22.15	
1	228°4.04	169°16.88	20°59.35	216°51.47	48.72	118°22.83	35.71	219°26.51	22.26	
2	243°6.50	184°16.18	21°0.09	231°52.16	49.48	133°24.95	35.67	234°28.70	22.37	
3	258°8.96	199°15.48	•• 0.83	246°52.85	•• 50.25	148°27.08	•• 35.62	249°30.90	•• 22.48	
4	273°11.43	214°14.79	1.56	261°53.55	51.01	163°29.20	35.58	264°33.09	22.59	
5	288°13.89	229°14.09	2.30	276°54.24	51.78	178°31.32	35.54	279°35.29	22.70	
6	303°16.36	244°13.39	N21°3.03	291°54.94	N03°52.54	193°33.45	N22°35.50	294°37.48	N01°22.81	
7	318°18.82	259°12.70	3.76	306°55.63	53.31	208°35.57	35.46	309°39.68	22.92	
8	333°21.28	274°12.00	4.49	321°56.32	54.07	223°37.69	35.42	324°41.88	23.03	
9	348°23.75	289°11.30	•• 5.22	336°57.02	•• 54.84	238°39.81	•• 35.38	339°44.07	•• 23.14	
10	3°26.21	304°10.60	5.95	351°57.71	55.60	253°41.93	35.34	354°46.27	23.25	
11	18°28.68	319°9.90	6.68	6°58.40	56.37	268°44.05	35.30	9°48.46	23.36	
12	33°31.14	334°9.20	N21°7.41	21°59.10	N03°57.13	283°46.18	N22°35.25	24°50.66	N01°23.47	
13	48°33.60	349°8.50	8.14	36°59.79	57.90	298°48.30	35.21	39°52.85	23.58	
14	63°36.07	4°7.80	8.86	52°0.49	58.66	313°50.42	35.17	54°55.05	23.69	
15	78°38.53	19°7.10	•• 9.59	67°1.18	03°59.43	328°52.54	•• 35.13	69°57.24	•• 23.80	
16	93°41.00	34°6.40	10.31	82°1.87	04°0.19	343°54.66	35.09	84°59.44	23.91	
17	108°43.46	49°5.70	11.03	97°2.57	0.95	358°56.78	35.05	100°1.64	24.02	
18	123°45.93	64°4.99	N21°11.75	112°3.26	N04°1.72	13°58.90	N22°35.00	115°3.83	N01°24.13	
19	138°48.39	79°4.29	12.47	127°3.95	2.48	29°1.02	34.96	130°6.03	24.24	
20	153°50.85	94°3.59	13.19	142°4.65	3.25	44°3.13	34.92	145°8.22	24.35	
21	168°53.32	109°2.89	•• 13.91	157°5.34	•• 4.01	59°5.25	•• 34.88	160°10.42	•• 24.46	
22	183°55.78	124°2.18	14.63	172°6.04	4.77	74°7.37	34.84	175°12.62	24.57	
23	198°58.25	139°1.48	15.34	187°6.73	5.54	89°9.49	34.80	190°14.81	24.68	
Mer.pass. 09:46		ν-0.7' d0.7' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.05		ν2.2' d0.1' m0.93		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	214°0.71	154°0.77	N21°16.06	202°7.42	N04°6.30	104°11.61	N22°34.75	205°17.01	N01°24.79	
1	229°3.17	169°0.07	16.77	217°8.12	7.06	119°13.73	34.71	220°19.20	24.90	
2	244°5.64	183°59.36	17.49	232°8.81	7.83	134°15.84	34.67	235°21.40	25.01	
3	259°8.10	198°58.66	•• 18.20	247°9.51	•• 8.59	149°17.96	•• 34.63	250°23.60	•• 25.12	
4	274°10.57	213°57.95	18.91	262°10.20	9.35	164°20.08	34.59	265°25.79	25.23	
5	289°13.03	228°57.24	19.62	277°10.89	10.12	179°22.20	34.54	280°27.99	25.33	
6	304°15.49	243°56.54	N21°20.33	292°11.59	N04°10.88	194°24.31	N22°34.50	295°30.19	N01°25.44	
7	319°17.96	258°55.83	21.04	307°12.28	11.64	209°26.43	34.46	310°32.38	25.55	
8	334°20.42	273°55.12	21.75	322°12.97	12.41	224°28.55	34.42	325°34.58	25.66	
9	349°22.89	288°54.41	•• 22.45	337°13.67	•• 13.17	239°30.66	•• 34.38	340°36.77	•• 25.77	
10	4°25.35	303°53.70	23.16	352°14.36	13.93	254°32.78	34.33	355°38.97	25.88	
11	19°27.81	318°52.99	23.86	7°15.06	14.69	269°34.89	34.29	10°41.17	25.99	
12	34°30.28	333°52.28	N21°24.57	22°15.75	N04°15.46	284°37.01	N22°34.25	25°43.36	N01°26.10	
13	49°32.74	348°51.57	25.27	37°16.44	16.22	299°39.12	34.21	40°45.56	26.21	
14	64°35.21	3°50.86	25.97	52°17.14	16.98	314°41.24	34.16	55°47.76	26.32	
15	79°37.67	18°50.15	•• 26.67	67°17.83	•• 17.74	329°43.35	•• 34.12	70°49.96	•• 26.43	
16	94°40.13	33°49.44	27.37	82°18.53	18.50	344°45.47	34.08	85°52.15	26.53	
17	109°42.60	48°48.73	28.07	97°19.22	19.27	359°47.58	34.04	100°54.35	26.64	
18	124°45.06	63°48.01	N21°28.77	112°19.91	N04°20.03	14°49.70	N22°33.99	115°56.55	N01°26.75	
19	139°47.53	78°47.30	29.46	127°20.61	20.79	29°51.81	33.95	130°58.74	26.86	
20	154°49.99	93°46.59	30.16	142°21.30	21.55	44°53.92	33.91	146°0.94	26.97	
21	169°52.46	108°45.88	•• 30.85	157°22.00	•• 22.31	59°56.04	•• 33.86	161°3.14	•• 27.08	
22	184°54.92	123°45.16	31.55	172°22.69	23.07	74°58.15	33.82	176°5.34	27.19	
23	199°57.38	138°44.45	32.24	187°23.38	23.83	90°0.26	33.78	191°7.53	27.30	
Mer.pass. 09:42		ν-0.7' d0.7' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.04		ν2.2' d0.1' m0.93		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	214°59.85	153°43.73	N21°32.93	202°24.08	N04°24.60	105°2.37	N22°33.74	206°9.73	N01°27.40	
1	230°2.31	168°43.02	33.62	217°24.77	25.36	120°4.49	33.69	221°11.93	27.51	
2	245°4.78	183°42.30	34.31	232°25.46	26.12	135°6.60	33.65	236°14.12	27.62	
3	260°7.24	198°41.59	•• 35.00	247°26.16	•• 26.88	150°8.71	•• 33.61	251°16.32	•• 27.73	
4	275°9.70	213°40.87	35.69	262°26.85	27.64	165°10.82	33.56	266°18.52	27.84	
5	290°12.17	228°40.15	36.37	277°27.55	28.40	180°12.93	33.52	281°20.72	27.95	
6	305°14.63	243°39.44	N21°37.06	292°28.24	N04°29.16	195°15.04	N22°33.48	296°22.92	N01°28.06	
7	320°17.10	258°38.72	37.74	307°28.93	29.92	210°17.16	33.43	311°25.11	28.16	
8	335°19.56	273°38.00	38.42	322°29.63	30.68	225°19.27	33.39	326°27.31	28.27	
9	350°22.02	288°37.28	•• 39.11	337°30.32	•• 31.44	240°21.38	•• 33.35	341°29.51	•• 28.38	
10	5°24.49	303°36.56	39.79	352°31.02	32.20	255°23.49	33.30	356°31.71	28.49	
11	20°26.95	318°35.84	40.47	7°31.71	32.96	270°25.60	33.26	11°33.90	28.60	
12	35°29.42	333°35.12	N21°41.15	22°32.40	N04°33.72	285°27.71	N22°33.22	26°36.10	N01°28.71	
13	50°31.88	348°34.40	41.82	37°33.10	34.48	300°29.82	33.17	41°38.30	28.81	
14	65°34.34	3°33.68	42.50	52°33.79	35.24	315°31.93	33.13	56°40.50	28.92	
15	80°36.81	18°32.96	•• 43.18	67°34.49	•• 36.00	330°34.03	•• 33.09	71°42.70	•• 29.03	
16	95°39.27	33°32.24	43.85	82°35.18	36.76	345°36.14	33.04	86°44.90	29.14	
17	110°41.74	48°31.52	44.53	97°35.87	37.52	0°38.25	33.00	101°47.09	29.25	
18	125°44.20	63°30.80	N21°45.20	112°36.57	N04°38.28	15°40.36	N22°32.96	116°49.29	N01°29.35	
19	140°46.66	78°30.07	45.87	127°37.26	39.04	30°42.47	32.91	131°51.49	29.46	
20	155°49.13	93°29.35	46.54	142°37.96	39.80	45°44.58	32.87	146°53.69	29.57	
21	170°51.59	108°28.63	•• 47.21	157°38.65	•• 40.56	60°46.68	•• 32.83	161°55.89	•• 29.68	
22	185°54.06	123°27.90	47.88	172°39.34	41.31	75°48.79	32.78	176°58.09	29.79	
23	200°56.52	138°27.18	48.55	187°40.04	42.07	90°50.90	32.74	192°0.28	29.89	
Mer.pass. 09:38		ν-0.7' d0.7' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.03		ν2.2' d0.1' m0.93		

	SHA	Dec
Alpheratz	357°33.98	29°14.00
Ankaa	353°6.46	-42°9.70
Schedar	349°30.36	56°40.76
Diphda	348°46.53	-17°50.55
Achernar	335°19.96	-57°6.13
Hamal	327°50.35	23°35.13
Polaris	313°58.75	89°22.54
Acamar	315°11.38	-40°12.00
Menkar	314°5.36	4°11.51
Mirfak	308°27.22	49°57.28
Aldebaran	290°38.69	-16°33.69
Rigel	281°3.09	-8°10.38
Capella	280°20.67	46°1.53
Bellatrix	278°21.98	6°22.34
Elnath	278°0.79	28°37.79
Alnilam	275°36.87	-1°11.20
Betelgeuse	270°51.14	7°24.65
Canopus	263°52.21	-52°42.80
Sirius	258°25.46	-16°45.30
Adhara	255°5.18	-29°0.68
Procyon	244°49.80	5°9.36
Pollux	243°16.09	27°57.79
Avior	234°14.35	-59°35.93
Suhail	222°45.47	-43°32.62
Miaplacidus	221°37.93	-69°49.82
Alphard	217°46.64	-8°46.53
Regulus	207°33.18	11°50.24
Dubhe	193°39.28	61°36.68
Denebola	182°23.62	14°25.40
Gienah	175°42.22	-17°41.48
Acrux	172°58.33	-63°14.93
Gacrux	171°49.97	-57°15.86
Alioth	166°11.50	55°49.02
Spica	158°20.87	-11°18.09
Alkaid	152°50.67	49°10.83
Hadar	148°33.86	-60°30.10
Menkent	147°55.97	-36°30.11
Arcturus	145°46.60	19°2.57
Rigel Kent.	139°38.18	-60°56.72
Kochab	137°18.63	74°2.69
Zuben'ubi	136°54.51	-16°9.20
Alphecca	126°2.49	26°37.37
Antares	112°14.22	-26°29.46
Atria	107°7.07	-69°4.33
Sabik	102°1.31	-15°45.51
Shaula	96°8.65	-37°7.31
Rasalhague	95°57.34	12°32.26
Eltanin	90°41.37	51°28.79
Kaus Aust.	83°30.90	-34°22.25
Vega	80°32.31	38°48.18
Nunki	75°46.30	-26°15.79
Altair	61°58.87	8°56.11
Peacock	53°4.04	-56°38.78
Deneb	49°25.11	45°22.14
Enif	33°37.86	9°59.60
Al Na'ir	27°31.77	-46°49.84
Fomalhaut	15°13.56	-29°28.90
Scheat	13°44.41	28°13.35
Markab	13°29.05	15°20.67
Apr 25 Sat	SHA	Mer.pass
Venus	301°16.00	13:43
Mars	348°49.20	10:32
Jupiter	250°19.13	17:04
Saturn	351°22.74	10:21
Apr 26 Sun	SHA	Mer.pass

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.49	N13°7.47	73°52.84	10.7'	N17°46.62	-12.8'	57.8'
1	195°29.60	8.29	88°22.57	10.8'	17°33.80	-12.9'	57.8'
2	210°29.71	9.10	102°52.41	10.9'	17°20.89	-13.0'	57.7'
3	225°29.81	9.92	117°22.35	11.1'	17°7.91	-13.1'	57.7'
4	240°29.92	10.73	131°52.40	11.2'	16°54.85	-13.1'	57.7'
5	255°30.03	11.55	146°22.56	11.3'	16°41.72	-13.2'	57.7'
6	270°30.14	N13°12.36	160°52.82	11.4'	N16°28.52	-13.3'	57.6'
7	285°30.24	13.18	175°23.18	11.5'	16°15.25	-13.3'	57.6'
8	300°30.35	13.99	189°53.65	11.6'	16°1.91	-13.4'	57.6'
9	315°30.46	14.80	204°24.21	11.7'	15°48.51	-13.5'	57.6'
10	330°30.56	15.62	218°54.87	11.8'	15°35.04	-13.5'	57.5'
11	345°30.67	16.43	233°25.63	11.9'	15°21.51	-13.6'	57.5'
12	0°30.78	N13°17.24	247°56.49	12.0'	N15°7.91	-13.7'	57.5'
13	15°30.88	18.05	262°27.45	12.0'	14°54.25	-13.7'	57.4'
14	30°30.99	18.86	276°58.49	12.1'	14°40.54	-13.8'	57.4'
15	45°31.09	19.68	291°29.64	12.2'	14°26.76	-13.8'	57.4'
16	60°31.20	20.49	306°0.87	12.3'	14°12.93	-13.9'	57.4'
17	75°31.31	21.30	320°32.20	12.4'	13°59.05	-13.9'	57.3'
18	90°31.41	N13°22.11	335°3.61	12.5'	N13°45.11	-14.0'	57.3'
19	105°31.52	22.92	349°35.11	12.6'	13°31.12	-14.0'	57.3'
20	120°31.62	23.72	4°6.71	12.7'	13°17.08	-14.1'	57.3'
21	135°31.72	24.53	18°38.38	12.8'	13°2.99	-14.1'	57.2'
22	150°31.83	25.34	33°10.15	12.8'	12°48.85	-14.2'	57.2'
23	165°31.93	26.15	47°41.99	12.9'	12°34.66	-14.2'	57.2'
SD = 15.9'			SD = 15.8'				
$d = 0.8'$							

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.04	N13°26.96	62°13.92	13.0'	N12°20.43	-14.3'	57.2'
1	195°32.14	27.76	76°45.93	13.1'	12°6.15	-14.3'	57.1'
2	210°32.24	28.57	91°18.02	13.2'	11°51.84	-14.4'	57.1'
3	225°32.35	29.38	105°50.19	13.2'	11°37.48	-14.4'	57.1'
4	240°32.45	30.18	120°22.44	13.3'	11°23.07	-14.4'	57.0'
5	255°32.55	30.99	134°54.76	13.4'	11°8.64	-14.5'	57.0'
6	270°32.65	N13°31.79	149°27.16	13.5'	N10°54.16	-14.5'	57.0'
7	285°32.76	32.60	163°59.63	13.5'	10°39.65	-14.5'	57.0'
8	300°32.86	33.40	178°32.18	13.6'	10°25.10	-14.6'	56.9'
9	315°32.96	34.21	193°4.79	13.7'	10°10.51	-14.6'	56.9'
10	330°33.06	35.01	207°37.48	13.8'	9°55.90	-14.6'	56.9'
11	345°33.16	35.81	222°10.24	13.8'	9°41.25	-14.7'	56.9'
12	0°33.26	N13°36.62	236°43.06	13.9'	N09°26.57	-14.7'	56.8'
13	15°33.37	37.42	251°15.95	14.0'	9°11.87	-14.7'	56.8'
14	30°33.47	38.22	265°48.90	14.0'	8°57.13	-14.8'	56.8'
15	45°33.57	39.02	280°21.92	14.1'	8°42.37	-14.8'	56.8'
16	60°33.67	39.82	294°54.99	14.1'	8°27.59	-14.8'	56.7'
17	75°33.77	40.62	309°28.13	14.2'	8°12.78	-14.8'	56.7'
18	90°33.87	N13°41.42	324°1.33	14.3'	N07°57.94	-14.9'	56.7'
19	105°33.97	42.22	338°34.59	14.3'	7°43.08	-14.9'	56.7'
20	120°34.07	43.02	353°7.91	14.4'	7°28.21	-14.9'	56.6'
21	135°34.17	43.82	7°41.28	14.4'	7°13.31	-14.9'	56.6'
22	150°34.27	44.62	22°14.70	14.5'	6°58.39	-14.9'	56.6'
23	165°34.36	45.42	36°48.18	14.5'	6°43.46	-15.0'	56.6'
SD = 15.9'			SD = 15.6'				
$d = 0.8'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°34.46	N13°46.22	51°21.71	14.6'	N06°28.51	-15.0'	56.6'
1	195°34.56	47.02	65°55.30	14.6'	6°13.54	-15.0'	56.5'
2	210°34.66	47.81	80°28.93	14.7'	5°58.56	-15.0'	56.5'
3	225°34.76	48.61	95°2.61	14.7'	5°43.57	-15.0'	56.5'
4	240°34.86	49.41	109°36.33	14.8'	5°28.56	-15.0'	56.5'
5	255°34.95	50.20	124°10.11	14.8'	5°13.55	-15.0'	56.4'
6	270°35.05	N13°51.00	138°43.92	14.9'	N04°58.52	-15.0'	56.4'
7	285°35.15	51.79	153°17.78	14.9'	4°43.48	-15.0'	56.4'
8	300°35.25	52.59	167°51.68	14.9'	4°28.44	-15.1'	56.4'
9	315°35.34	53.38	182°25.63	15.0'	4°13.39	-15.1'	56.3'
10	330°35.44	54.18	196°59.61	15.0'	3°58.33	-15.1'	56.3'
11	345°35.54	54.97	211°33.63	15.1'	3°43.27	-15.1'	56.3'
12	0°35.63	N13°55.77	226°7.69	15.1'	N03°28.20	-15.1'	56.3'
13	15°35.73	56.56	240°41.78	15.1'	3°13.14	-15.1'	56.2'
14	30°35.82	57.35	255°15.91	15.2'	02°58.07	-15.1'	56.2'
15	45°35.92	58.14	269°50.07	15.2'	02°42.99	-15.1'	56.2'
16	60°36.01	58.93	284°24.26	15.2'	02°27.92	-15.1'	56.2'
17	75°36.11	59.73	298°58.49	15.3'	02°12.85	-15.1'	56.2'
18	90°36.20	N14°0.52	313°32.74	15.3'	N01°57.78	-15.1'	56.1'
19	105°36.30	1.31	328°7.02	15.3'	01°42.72	-15.1'	56.1'
20	120°36.39	2.10	342°41.33	15.3'	01°27.66	-15.1'	56.1'
21	135°36.49	2.89	357°15.67	15.4'	01°12.60	-15.1'	56.1'
22	150°36.58	3.68	11°50.03	15.4'	00°57.55	-15.0'	56.0'
23	165°36.68	4.46	26°24.41	15.4'	00°42.51	-15.0'	56.0'
SD = 15.9'			SD = 15.4'				
$d = 0.8'$							

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

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

Day	Sun	
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April 28, 29, 30 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	215°58.98		153°26.46	N21°49.22	202°40.73	N04°42.83	105°53.00	N22°32.69	207°2.48	N01°30.00
1	231°1.45		168°25.73	49.88	217°41.42	43.59	120°55.11	32.65	222°4.68	30.11
2	246°3.91		183°25.01	50.55	232°42.12	44.35	135°57.22	32.61	237°6.88	30.22
3	261°6.38		198°24.28	· · 51.21	247°42.81	· · 45.11	150°59.32	· · 32.56	252°9.08	· · 30.33
4	276°8.84		213°23.55	51.87	262°43.51	45.86	166°1.43	32.52	267°11.28	30.43
5	291°11.30		228°22.83	52.54	277°44.20	46.62	181°3.54	32.47	282°13.48	30.54
6	306°13.77		243°22.10	N21°53.20	292°44.89	N04°47.38	196°5.64	N22°32.43	297°15.68	N01°30.65
7	321°16.23		258°21.37	53.86	307°45.59	48.14	211°7.75	32.38	312°17.88	30.76
8	336°18.70		273°20.65	54.51	322°46.28	48.90	226°9.85	32.34	327°20.08	30.86
9	351°21.16		288°19.92	· · 55.17	337°46.98	· · 49.65	241°11.96	· · 32.30	342°22.27	· · 30.97
10	6°23.62		303°19.19	55.83	352°47.67	50.41	256°14.06	32.25	357°24.47	31.08
11	21°26.09		318°18.46	56.48	7°48.36	51.17	271°16.17	32.21	12°26.67	31.19
12	36°28.55		333°17.73	N21°57.14	22°49.06	N04°51.93	286°18.27	N22°32.16	27°28.87	N01°31.30
13	51°31.02		348°17.00	57.79	37°49.75	52.68	301°20.37	32.12	42°31.07	31.40
14	66°33.48		3°16.27	58.44	52°50.45	53.44	316°22.48	32.07	57°33.27	31.51
15	81°35.95		18°15.54	· · 59.09	67°51.14	· · 54.20	331°24.58	· · 32.03	72°35.47	· · 31.62
16	96°38.41		33°14.81	21°59.75	82°51.83	54.95	346°26.68	31.98	87°37.67	31.72
17	111°40.87		48°14.08	22°0.39	97°52.53	55.71	1°28.79	31.94	102°39.87	31.83
18	126°43.34		63°13.35	N22°1.04	112°53.22	N04°56.47	16°30.89	N22°31.90	117°42.07	N01°31.94
19	141°45.80		78°12.61	1.69	127°53.91	57.22	31°32.99	31.85	132°44.27	32.05
20	156°48.27		93°11.88	2.34	142°54.61	57.98	46°35.10	31.81	147°46.47	32.15
21	171°50.73		108°11.15	· · 2.98	157°55.30	· · 58.74	61°37.20	· · 31.76	162°48.67	· · 32.26
22	186°53.19		123°10.42	3.62	172°56.00	04°59.49	76°39.30	31.72	177°50.87	32.37
23	201°55.66		138°9.68	4.27	187°56.69	05°0.25	91°41.40	31.67	192°53.07	32.48
Mer.pass. 09:34		ν-0.7' d0.7' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.03		ν2.2' d0.1' m0.93		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°58.12		153°8.95	N22°4.91	202°57.38	N05°1.00	106°43.50	N22°31.63	207°55.27	N01°32.58
1	232°0.59		168°8.21	5.55	217°58.08	1.76	121°45.60	31.58	222°57.47	32.69
2	247°3.05		183°7.48	6.19	232°58.77	2.52	136°47.70	31.54	237°59.67	32.80
3	262°5.51		198°6.74	· · 6.83	247°59.46	· · 3.27	151°49.81	· · 31.49	253°1.87	· · 32.90
4	277°7.98		213°6.01	7.47	263°0.16	4.03	166°51.91	31.45	268°4.07	33.01
5	292°10.44		228°5.27	8.10	278°0.85	4.78	181°54.01	31.40	283°6.27	33.12
6	307°12.91		243°4.54	N22°8.74	293°1.55	N05°5.54	196°56.11	N22°31.36	298°8.47	N01°33.23
7	322°15.37		258°3.80	9.37	308°2.24	6.29	211°58.21	31.31	313°10.67	33.33
8	337°17.83		273°3.06	10.01	323°2.93	7.05	227°0.31	31.26	328°12.87	33.44
9	352°20.30		288°2.32	· · 10.64	338°3.63	· · 7.80	242°2.40	· · 31.22	343°15.07	· · 33.55
10	7°22.76		303°1.59	11.27	353°4.32	8.56	257°4.50	31.17	358°17.27	33.65
11	22°25.23		318°0.85	11.90	8°5.02	9.31	272°6.60	31.13	13°19.47	33.76
12	37°27.69		333°0.11	N22°12.53	23°5.71	N05°10.07	287°8.70	N22°31.08	28°21.67	N01°33.87
13	52°30.15		347°59.37	13.16	38°6.40	10.82	302°10.80	31.04	43°23.87	33.97
14	67°32.62		2°58.63	13.79	53°7.10	11.58	317°12.90	30.99	58°26.08	34.08
15	82°35.08		17°57.89	· · 14.41	68°7.79	· · 12.33	332°15.00	· · 30.95	73°28.28	· · 34.19
16	97°37.55		32°57.15	15.04	83°8.48	13.09	347°17.09	30.90	88°30.48	34.29
17	112°40.01		47°56.41	15.66	98°9.18	13.84	2°19.19	30.85	103°32.68	34.40
18	127°42.47		62°55.67	N22°16.28	113°9.87	N05°14.59	17°21.29	N22°30.81	118°34.88	N01°34.51
19	142°44.94		77°54.93	16.91	128°10.56	15.35	32°23.39	30.76	133°37.08	34.61
20	157°47.40		92°54.19	17.53	143°11.26	16.10	47°25.48	30.72	148°39.28	34.72
21	172°49.87		107°53.44	· · 18.15	158°11.95	· · 16.85	62°27.58	· · 30.67	163°41.48	· · 34.83
22	187°52.33		122°52.70	18.77	173°12.65	17.61	77°29.68	30.63	178°43.68	34.93
23	202°54.79		137°51.96	19.38	188°13.34	18.36	92°31.77	30.58	193°45.89	35.04
Mer.pass. 09:31		ν-0.7' d0.6' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.02		ν2.2' d0.1' m0.93		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°57.26		152°51.22	N22°20.00	203°14.03	N05°19.11	107°33.87	N22°30.53	208°48.09	N01°35.15
1	232°59.72		167°50.47	20.62	218°14.73	19.87	122°35.96	30.49	223°50.29	35.25
2	248°2.19		182°49.73	21.23	233°15.42	20.62	137°38.06	30.44	238°52.49	35.36
3	263°4.65		197°48.98	· · 21.84	248°16.11	· · 21.37	152°40.16	· · 30.39	253°54.69	· · 35.46
4	278°7.12		212°48.24	22.46	263°16.81	22.13	167°42.25	30.35	268°56.89	35.57
5	293°9.58		227°47.49	23.07	278°17.50	22.88	182°44.35	30.30	283°59.09	35.68
6	308°12.04		242°46.75	N22°23.68	293°18.19	N05°23.63	197°46.44	N22°30.26	299°1.30	N01°35.78
7	323°14.51		257°46.00	24.29	308°18.89	24.38	212°48.53	30.21	314°3.50	35.89
8	338°16.97		272°45.26	24.89	323°19.58	25.14	227°50.63	30.16	329°5.70	36.00
9	353°19.44		287°44.51	· · 25.50	338°20.28	· · 25.89	242°52.72	· · 30.12	344°7.90	· · 36.10
10	8°21.90		302°43.76	26.11	353°20.97	26.64	257°54.82	30.07	359°10.10	36.21
11	23°24.36		317°43.02	26.71	8°21.66	27.39	272°56.91	30.02	14°12.31	36.31
12	38°26.83		332°42.27	N22°27.32	23°22.36	N05°28.14	287°59.00	N22°29.98	29°14.51	N01°36.42
13	53°29.29		347°41.52	27.92	38°23.05	28.90	303°1.10	29.93	44°16.71	36.53
14	68°31.76		2°40.77	28.52	53°23.74	29.65	318°3.19	29.88	59°18.91	36.63
15	83°34.22		17°40.02	· · 29.12	68°24.44	· · 30.40	333°5.28	· · 29.84	74°21.12	· · 36.74
16	98°36.68		32°39.27	29.72	83°25.13	31.15	348°7.37	29.79	89°23.32	36.84
17	113°39.15		47°38.52	30.32	98°25.82	31.90	3°9.47	29.74	104°25.52	36.95
18	128°41.61		62°37.77	N22°30.92	113°26.52	N05°32.65	18°11.56	N22°29.70	119°27.72	N01°37.06
19	143°44.08		77°37.02	31.51	128°27.21	33.40	33°13.65	29.65	134°29.92	37.16
20	158°46.54		92°36.27	32.11	143°27.90	34.15	48°15.74	29.60	149°32.13	37.27
21	173°49.00		107°35.52	· · 32.70	158°28.60	· · 34.91	63°17.83	· · 29.56	164°34.33	· · 37.37
22	188°51.47		122°34.77	33.30	173°29.29	35.66	78°19.92	29.51	179°36.53	37.48
23	203°53.93		137°34.02	33.89	188°29.98	36.41	93°22.02	29.46	194°38.74	37.58
Mer.pass. 09:27		ν-0.7' d0.6' m-3.92		ν0.7' d0.8' m1.22		ν2.1' d-0.0' m-2.02		ν2.2' d0.1' m0.93		

Stars		
	SHA	Dec
Alpheratz	357°33.97	29°13.99
Ankaa	353°6.45	-42°9.69
Schedar	349°30.35	56°40.75
Diphda	348°46.52	-17°50.54
Achernar	335°19.95	-57°6.12
Hamal	327°50.35	23°35.13
Polaris	313°58.98	89°22.52
Acamar	315°11.38	-40°11.99
Menkar	314°5.36	4°11.51
Mirfak	308°27.23	49°57.27
Aldebaran	290°38.70	16°33.69
Rigel	281°3.10	-8°10.38
Capella	280°20.68	46°1.53
Bellatrix	278°21.99	6°22.35
Elnath	278°0.80	28°37.78
Alnilam	275°36.89	-1°11.20
Betelgeuse	270°51.15	7°24.66
Canopus	263°52.23	-52°42.80
Sirius	258°25.48	-16°45.29
Adhara	255°5.20	-29°0.67
Procyon	244°49.82	5°9.37
Pollux	243°16.10	27°57.79
Avior	234°14.38	-59°35.93
Suhail	222°45.50	-43°32.62
Miaplacidus	221°37.97	-69°49.82
Alphard	217°46.65	-8°46.53
Regulus	207°33.19	11°50.24
Dubhe	193°39.30	61°36.69
Denebola	182°23.63	14°25.41
Gienah	175°42.23	-17°41.48
Acrux	172°58.34	-63°14.94
Gacrux	171°49.98	-57°15.88
Alioth	166°11.51	55°49.03
Spica	158°20.87	-11°18.09
Alkaid	152°50.68	49°10.84
Hadar	148°33.86	-60°30.12
Menkent	147°55.97	-36°30.11
Arcturus	145°46.60	19°2.58
Rigel Kent.	139°38.18	-60°56.73
Kochab	137°18.62	74°2.70
Zuben'ubi	136°54.51	-16°9.20
Alphecca	126°2.49	26°37.38
Antares	112°14.21	-26°29.46
Atria	107°7.03	-69°4.34
Sabik	102°1.30	-15°45.51
Shaula	96°8.63	-37°7.32
Rasalhague	95°57.32	12°32.27
Eltanin	90°41.34	51°28.81
Kaus Aust.	83°30.88	-34°22.25
Vega	80°32.29	38°48.19
Nunki	75°46.28	-26°15.79
Altair	61°58.85	8°56.12
Peacock	53°4.01	-56°38.77
Deneb	49°25.09	45°22.14
Enif	33°37.85	9°59.60
Al Na'ir	27°31.75	-46°49.83
Fomalhaut	15°13.55	-29°28.89
Scheat	13°44.39	28°13.35
Markab	13°29.04	15°20.67
Apr 28 Tue	SHA	Mer.pass
Venus	297°27.47	13:47
Mars	346°41.75	10:29
Jupiter	249°54.02	16:54
Saturn	351°3.50	10:10
Apr 29 Wed	SHA	Mer.pass
Venus	296°10.83	13:48
Mars	345°59.26	10:28
Jupiter	249°45.38	16:51
Saturn	350°57.15	10:07
Apr 30 Thu	SHA	Mer.pass
Venus	294°53.96	13:49
Mars	345°16.77	10:27
Jupiter	249°36.61	16:47
Saturn	350°50.83	10:03
Horizontal parallax		
Venus:		0.1
Mars:		0.1


h	Sun			Moon			
Tue	GHA	Dec		GHA	ν	Dec	d HP
0	180°36.77	N14°5.25		40°58.82	15.4'	N00°27.47	-15.0' 56.0'
1	195°36.86	6.04		55°33.24	15.4'	N00°12.45	-15.0' 56.0'
2	210°36.96	6.83		70°7.69	15.5'	S00°2.57	15.0' 56.0'
3	225°37.05	7.62		84°42.16	15.5'	00°17.58	15.0' 55.9'
4	240°37.14	8.40		99°16.64	15.5'	00°32.57	15.0' 55.9'
5	255°37.23	9.19		113°51.14	15.5'	00°47.55	15.0' 55.9'
6	270°37.33	N14°9.98		128°25.66	15.5'	S01°2.52	15.0' 55.9'
7	285°37.42	10.76		143°0.19	15.5'	01°17.47	14.9' 55.9'
8	300°37.51	11.55		157°34.73	15.6'	01°32.41	14.9' 55.8'
9	315°37.60	12.33		172°9.29	15.6'	01°47.33	14.9' 55.8'
10	330°37.69	13.12		186°43.85	15.6'	02°2.24	14.9' 55.8'
11	345°37.79	13.90		201°18.43	15.6'	02°17.13	14.9' 55.8'
12	0°37.88	N14°14.68		215°53.02	15.6'	S02°31.99	14.8' 55.8'
13	15°37.97	15.47		230°27.61	15.6'	02°46.84	14.8' 55.7'
14	30°38.06	16.25		245°2.21	15.6'	03°1.67	14.8' 55.7'
15	45°38.15	17.03		259°36.81	15.6'	03°16.47	14.8' 55.7'
16	60°38.24	17.81		274°11.42	15.6'	03°31.25	14.8' 55.7'
17	75°38.33	18.60		288°46.03	15.6'	03°46.01	14.7' 55.7'
18	90°38.42	N14°19.38		303°20.64	15.6'	S04°0.74	14.7' 55.6'
19	105°38.51	20.16		317°55.26	15.6'	04°15.45	14.7' 55.6'
20	120°38.60	20.94		332°29.87	15.6'	04°30.13	14.7' 55.6'
21	135°38.69	21.72		347°4.48	15.6'	04°44.79	14.6' 55.6'
22	150°38.77	22.50		1°39.09	15.6'	04°59.42	14.6' 55.6'
23	165°38.86	23.28		16°13.70	15.6'	05°14.01	14.6' 55.5'
SD = 15.9'			$d = 0.8'$			SD = 15.3'	

Wed	GHA	Dec		GHA	ν	Dec	d HP
0	180°38.95	N14°24.05		30°48.30	15.6'	S05°28.58	14.5' 55.5'
1	195°39.04	24.83		45°22.90	15.6'	05°43.12	14.5' 55.5'
2	210°39.13	25.61		59°57.49	15.6'	05°57.62	14.5' 55.5'
3	225°39.21	26.39		74°32.07	15.6'	06°12.09	14.4' 55.5'
4	240°39.30	27.16		89°6.65	15.6'	06°26.53	14.4' 55.4'
5	255°39.39	27.94		103°41.21	15.6'	06°40.94	14.4' 55.4'
6	270°39.48	N14°28.72		118°15.77	15.5'	S06°55.31	14.3' 55.4'
7	285°39.56	29.49		132°50.31	15.5'	07°9.64	14.3' 55.4'
8	300°39.65	30.27		147°24.84	15.5'	07°23.94	14.3' 55.4'
9	315°39.74	31.04		161°59.36	15.5'	07°38.20	14.2' 55.3'
10	330°39.82	31.82		176°33.86	15.5'	07°52.41	14.2' 55.3'
11	345°39.91	32.59		191°8.34	15.5'	08°6.59	14.1' 55.3'
12	0°39.99	N14°33.37		205°42.81	15.5'	S08°20.73	14.1' 55.3'
13	15°40.08	34.14		220°17.27	15.4'	08°34.83	14.1' 55.3'
14	30°40.16	34.91		234°51.70	15.4'	08°48.89	14.0' 55.3'
15	45°40.25	35.68		249°26.12	15.4'	09°2.90	14.0' 55.2'
16	60°40.33	36.46		264°0.51	15.4'	09°16.87	13.9' 55.2'
17	75°40.42	37.23		278°34.89	15.4'	09°30.79	13.9' 55.2'
18	90°40.50	N14°38.00		293°9.24	15.3'	S09°44.67	13.8' 55.2'
19	105°40.59	38.77		307°43.57	15.3'	09°58.50	13.8' 55.2'
20	120°40.67	39.54		322°17.87	15.3'	10°12.28	13.7' 55.1'
21	135°40.76	40.31		336°52.15	15.3'	10°26.02	13.7' 55.1'
22	150°40.84	41.08		351°26.41	15.2'	10°39.70	13.6' 55.1'
23	165°40.92	41.85		6°0.64	15.2'	10°53.34	13.6' 55.1'
SD = 15.9'			$d = 0.8'$			SD = 15.1'	

Thu	GHA	Dec		GHA	ν	Dec	d HP
0	180°41.00	N14°42.62		20°34.84	15.2'	S11°6.93	13.5' 55.1'
1	195°41.09	43.39		35°9.01	15.1'	11°20.46	13.5' 55.1'
2	210°41.17	44.15		49°43.16	15.1'	11°33.94	13.4' 55.0'
3	225°41.25	44.92		64°17.27	15.1'	11°47.36	13.4' 55.0'
4	240°41.33	45.69		78°51.35	15.1'	12°0.74	13.3' 55.0'
5	255°41.42	46.45		93°25.41	15.0'	12°14.05	13.3' 55.0'
6	270°41.50	N14°47.22		107°59.43	15.0'	S12°27.31	13.2' 55.0'
7	285°41.58	47.99		122°33.41	15.0'	12°40.51	13.1' 55.0'
8	300°41.66	48.75		137°7.37	14.9'	12°53.66	13.1' 54.9'
9	315°41.74	49.52		151°41.28	14.9'	13°6.74	13.0' 54.9'
10	330°41.82	50.28		166°15.17	14.8'	13°19.77	13.0' 54.9'
11	345°41.90	51.04		180°49.01	14.8'	13°32.73	12.9' 54.9'
12	0°41.98	N14°51.81		195°22.82	14.8'	S13°45.64	12.8' 54.9'
13	15°42.06	52.57		209°56.60	14.7'	13°58.48	12.8' 54.9'
14	30°42.14	53.33		224°30.33	14.7'	14°11.26	12.7' 54.9'
15	45°42.22	54.10		239°4.03	14.7'	14°23.97	12.6' 54.8'
16	60°42.30	54.86		253°37.68	14.6'	14°36.62	12.6' 54.8'
17	75°42.38	55.62		268°11.30	14.6'	14°49.20	12.5' 54.8'
18	90°42.46	N14°56.38		282°44.87	14.5'	S15°1.72	12.4' 54.8'
19	105°42.54	57.14		297°18.40	14.5'	15°14.17	12.4' 54.8'
20	120°42.62	57.90		311°51.89	14.4'	15°26.55	12.3' 54.8'
21	135°42.70	58.66		326°25.34	14.4'	15°38.86	12.2' 54.8'
22	150°42.77	59.42		340°58.74	14.4'	15°51.10	12.2' 54.7'
23	165°42.85	60.18		355°32.10	14.3'	16°3.27	12.1' 54.7'
SD = 15.9'			$d = 0.8'$			SD = 15.0'	

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 11-13 87-97%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
28	02:27	02:32	11:57	21:53	09:32	
29	02:36	02:40	11:57	22:35	10:14	
30	02:44	02:48	11:57	23:18	10:57	

Aries		Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°56.40	152°33.27	N22°34.48	203°30.68	N05°37.16	108°24.11	N22°29.42	209°40.94	N01°37.69
1	233°58.86	167°32.51	35.07	218°31.37	37.91	123°26.20	29.37	224°43.14	37.80
2	249°1.32	182°31.76	35.66	233°32.06	38.66	138°28.29	29.32	239°45.34	37.90
3	264°3.79	197°31.01	· · 36.25	248°32.76	· · 39.41	153°30.38	· · 29.27	254°47.55	· · 38.01
4	279°6.25	212°30.25	36.83	263°33.45	40.16	168°32.47	29.23	269°49.75	38.11
5	294°8.72	227°29.50	37.42	278°34.14	40.91	183°34.56	29.18	284°51.95	38.22
6	309°11.18	242°28.75	N22°38.00	293°34.84	N05°41.66	198°36.65	N22°29.13	299°54.16	N01°38.32
7	324°13.65	257°27.99	38.59	308°35.53	42.41	213°38.73	29.09	314°56.36	38.43
8	339°16.11	272°27.24	39.17	323°36.22	43.16	228°40.82	29.04	329°58.56	38.53
9	354°18.57	287°26.48	· · 39.75	338°36.92	· · 43.91	243°42.91	· · 28.99	345°0.77	· · 38.64
10	9°21.04	302°25.72	40.33	353°37.61	44.65	258°45.00	28.94	0°2.97	38.75
11	24°23.50	317°24.97	40.91	8°38.30	45.40	273°47.09	28.90	15°5.17	38.85
12	39°25.97	332°24.21	N22°41.49	23°39.00	N05°46.15	288°49.18	N22°28.85	30°7.38	N01°38.96
13	54°28.43	347°23.45	42.06	38°39.69	46.90	303°51.26	28.80	45°9.58	39.06
14	69°30.89	2°22.70	42.64	53°40.38	47.65	318°53.35	28.75	60°11.78	39.17
15	84°33.36	17°21.94	· · 43.21	68°41.08	· · 48.40	333°55.44	· · 28.70	75°13.99	· · 39.27
16	99°35.82	32°21.18	43.79	83°41.77	49.15	348°57.53	28.66	90°16.19	39.38
17	114°38.29	47°20.42	44.36	98°42.46	49.90	3°59.61	28.61	105°18.40	39.48
18	129°40.75	62°19.67	N22°44.93	113°43.15	N05°50.64	19°1.70	N22°28.56	120°20.60	N01°39.59
19	144°43.21	77°18.91	45.50	128°43.85	51.39	34°3.79	28.51	135°22.80	39.69
20	159°45.68	92°18.15	46.07	143°44.54	52.14	49°5.87	28.47	150°25.01	39.80
21	174°48.14	107°17.39	· · 46.64	158°45.23	· · 52.89	64°7.96	· · 28.42	165°27.21	· · 39.90
22	189°50.61	122°16.63	47.21	173°45.93	53.64	79°10.04	28.37	180°29.42	40.01
23	204°53.07	137°15.87	47.77	188°46.62	54.38	94°12.13	28.32	195°31.62	40.11
Mer.pass. 09:23		ν-0.8' d0.6' m-3.92		ν0.7' d0.8' m1.23		ν2.1' d-0.0' m-2.01		ν2.2' d0.1' m0.93	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°55.54	152°15.11	N22°48.34	203°47.31	N05°55.13	109°14.22	N22°28.27	210°33.82	N01°40.22
1	234°58.00	167°14.34	48.90	218°48.01	55.88	124°16.30	28.22	225°36.03	40.32
2	250°0.46	182°13.58	49.46	233°48.70	56.63	139°18.39	28.18	240°38.23	40.43
3	265°2.93	197°12.82	· · 50.03	248°49.39	· · 57.37	154°20.47	· · 28.13	255°40.44	· · 40.53
4	280°5.39	212°12.06	50.59	263°50.09	58.12	169°22.56	28.08	270°42.64	40.64
5	295°7.86	227°11.30	51.15	278°50.78	58.87	184°24.64	28.03	285°44.85	40.74
6	310°10.32	242°10.53	N22°51.70	293°51.47	N05°59.61	199°26.72	N22°27.98	3	

	SHA	Dec
Alpheratz	357°33.95	29°13.99
Ankaa	353°6.44	-42°9.67
Schedar	349°30.33	56°40.74
Diphda	348°46.51	-17°50.53
Achernar	335°19.94	-47°6.10
Hamal	327°50.34	23°35.13
Polaris	313°58.91	89°22.51
Acamar	315°11.38	-40°11.98
Menkar	314°5.36	4°11.51
Mirfak	308°27.23	49°57.26
Aldebaran	290°38.70	16°33.69
Rigel	281°3.11	-8°10.37
Capella	280°20.69	46°1.52
Bellatrix	278°21.99	6°22.35
El Nath	278°0.81	28°37.78
Alnilam	275°36.89	-1°11.19
Betelgeuse	270°51.16	7°24.66
Canopus	263°52.25	-52°42.79
Sirius	258°25.49	-16°45.29
Adhara	255°5.21	-29°0.67
Procyon	244°49.83	5°9.37
Pollux	243°16.12	27°57.79
Avior	234°14.41	-59°35.93
Suhail	222°45.51	-43°32.62
Miaplacidus	221°38.01	-69°49.83
Alphard	217°46.67	-8°46.53
Regulus	207°33.21	11°50.25
Dubhe	193°39.33	61°36.70
Denebola	182°23.63	14°25.42
Geniah	175°42.23	-17°41.48
Acrux	172°58.35	-63°14.95
Gacrux	171°49.99	-57°15.89
Alioth	166°11.52	55°49.04
Spica	158°20.87	-11°18.09
Alkaid	152°50.68	49°10.86
Hadar	148°33.86	-60°30.13
Menkent	147°55.97	-36°30.12
Arcturus	145°46.60	19°2.59
Rigel Kent.	139°38.17	-60°56.74
Kochab	137°18.62	74°2.72
Zuben'ubi	136°54.50	-16°9.20
Alphecca	126°2.48	26°37.40
Antares	112°14.20	-26°29.46
Atria	107°7.00	-69°4.35
Sabik	102°1.28	-15°45.51
Shaula	96°8.61	-37°7.32
Rasalhague	95°57.31	12°32.28
Eltanin	90°41.32	51°28.82
Kaus Aust.	83°30.86	34°22.25
Vega	80°32.27	-38°48.20
Nunki	75°46.26	-26°15.79
Altair	61°58.83	8°56.12
Peacock	53°3.98	-56°38.77
Deneb	49°25.06	42°22.15
Enif	33°37.83	9°59.61
Al Na'ir	27°31.73	-46°49.82
Fomalhaut	15°13.53	-29°28.88
Scheat	13°44.37	28°13.35
Markab	13°29.02	15°20.68
May 01 Fri	SHA	Mer.pass
Venus	293°36.87	13:50
Mars	344°34.28	10:25
Jupiter	249°27.71	16:44
Saturn	350°44.54	10:00
May 02 Sat	SHA	Mer.pass
Venus	292°19.57	13:52
Mars	343°51.78	10:24
Jupiter	249°18.68	16:41
Saturn	350°38.29	09:56
May 03 Sun	SHA	Mer.pass
Venus	291°2.07	13:53
Mars	343°9.27	10:23
Jupiter	249°9.53	16:37
Saturn	350°32.07	09:53
Horizontal parallax	Venus:	0.1
	Mars:	0.1


h		Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°42.93	N15°0.94	10°5.42	14.3'	S16°15.36	12.0'	54.7'	
1	195°43.01	1.70	24°38.69	14.2'	16°27.39	12.0'	54.7'	
2	210°43.08	2.45	39°11.91	14.2'	16°39.34	11.9'	54.7'	
3	225°43.16	· · 3.21	53°45.09	14.1'	16°51.21	11.8'	54.7'	
4	240°43.24	3.97	68°18.22	14.1'	17°3.01	11.7'	54.7'	
5	255°43.31	4.72	82°51.30	14.0'	17°14.73	11.6'	54.6'	
6	270°43.39	N15°5.48	97°24.34	14.0'	S17°26.38	11.6'	54.6'	
7	285°43.46	6.23	111°57.33	13.9'	17°37.95	11.5'	54.6'	
8	300°43.54	6.99	126°30.26	13.9'	17°49.44	11.4'	54.6'	
9	315°43.62	· · 7.74	141°3.15	13.8'	18°0.85	11.3'	54.6'	
10	330°43.69	8.50	155°35.99	13.8'	18°12.18	11.2'	54.6'	
11	345°43.77	9.25	170°8.78	13.7'	18°23.42	11.2'	54.6'	
12	0°43.84	N15°10.00	184°41.52	13.7'	S18°34.59	11.1'	54.5'	
13	15°43.92	10.76	199°14.20	13.6'	18°45.67	11.0'	54.5'	
14	30°43.99	11.51	213°46.84	13.6'	18°56.67	10.9'	54.5'	
15	45°44.06	· · 12.26	228°19.42	13.5'	19°7.58	10.8'	54.5'	
16	60°44.14	13.01	242°51.96	13.5'	19°18.40	10.7'	54.5'	
17	75°44.21	13.76	257°24.44	13.4'	19°29.14	10.7'	54.5'	
18	90°44.28	N15°14.52	271°56.86	13.4'	S19°39.79	10.6'	54.5'	
19	105°44.36	15.27	286°29.24	13.3'	19°50.36	10.5'	54.5'	
20	120°44.43	16.02	301°1.56	13.3'	20°0.83	10.4'	54.4'	
21	135°44.50	· · 16.76	315°33.83	13.2'	20°11.21	10.3'	54.4'	
22	150°44.58	17.51	330°6.04	13.2'	20°21.51	10.2'	54.4'	
23	165°44.65	18.26	344°38.20	13.1'	20°31.71	10.1'	54.4'	
SD = 15.9'			SD = 14.9'					

Sat	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°44.72	N15°19.01	359°10.31	13.1'	S20°41.82	10.0'	54.4'	
1	195°44.79	19.76	13°42.36	13.0'	20°51.83	9.9'	54.4'	
2	210°44.86	20.50	28°14.35	12.9'	21°1.75	9.8'	54.4'	
3	225°44.93	· · 21.25	42°46.30	12.9'	21°11.58	9.7'	54.4'	
4	240°45.00	22.00	57°18.19	12.8'	21°21.31	9.6'	54.4'	
5	255°45.08	22.74	71°50.02	12.8'	21°30.94	9.5'	54.3'	
6	270°45.15	N15°23.49	86°21.80	12.7'	S21°40.47	9.4'	54.3'	
7	285°45.22	24.23	100°53.52	12.7'	21°49.91	9.3'	54.3'	
8	300°45.29	24.98	115°25.19	12.6'	21°59.25	9.2'	54.3'	
9	315°45.36	· · 25.72	129°56.80	12.6'	22°8.48	9.1'	54.3'	
10	330°45.43	26.47	144°28.36	12.5'	22°17.62	9.0'	54.3'	
11	345°45.49	27.21	158°59.87	12.4'	22°26.65	8.9'	54.3'	
12	0°45.56	N15°27.95	173°31.31	12.4'	S22°35.58	8.8'	54.3'	
13	15°45.63	28.69	188°2.71	12.3'	22°44.41	8.7'	54.3'	
14	30°45.70	29.44	202°34.05	12.3'	22°53.14	8.6'	54.3'	
15	45°45.77	· · 30.18	217°5.33	12.2'	23°1.76	8.5'	54.2'	
16	60°45.84	30.92	231°36.56	12.2'	23°10.27	8.4'	54.2'	
17	75°45.91	31.66	246°7.74	12.1'	23°18.68	8.3'	54.2'	
18	90°45.97	N15°32.40	260°38.86	12.1'	S23°26.98	8.2'	54.2'	
19	105°46.04	33.14	275°9.93	12.0'	23°35.17	8.1'	54.2'	
20	120°46.11	33.88	289°40.95	12.0'	23°43.26	8.0'	54.2'	
21	135°46.17	· · 34.62	304°11.91	11.9'	23°51.23	7.9'	54.2'	
22	150°46.24	35.35	318°42.82	11.9'	23°59.09	7.8'	54.2'	
23	165°46.31	36.09	333°13.67	11.8'	24°6.85	7.6'	54.2'	
SD = 15.9'			SD = 14.8'					

Sun	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°46.37	N15°36.83	347°44.47	11.8'	S24°14.49	7.5'	54.2'	
1	195°46.44	37.57	2°15.23	11.7'	24°22.02	7.4'	54.2'	
2	210°46.51	38.30	16°45.92	11.6'	24°29.44	7.3'	54.1'	
3	225°46.57	· · 39.04	31°16.57	11.6'	24°36.74	7.2'	54.1'	
4	240°46.64	39.77	45°47.17	11.5'	24°43.93	7.1'	54.1'	
5	255°46.70	40.51	60°17.71	11.5'	24°51.00	7.0'	54.1'	
6	270°46.77	N15°41.24	74°48.21	11.4'	S24°57.96	6.8'	54.1'	
7	285°46.83	41.98	89°18.65	11.4'	25°4.80	6.7'	54.1'	
8	300°46.90	42.71	103°49.05	11.3'	25°11.52	6.6'	54.1'	
9	315°46.96	· · 43.45	118°19.40	11.3'	25°18.13	6.5'	54.1'	
10	330°47.02	44.18	132°49.70	11.3'	25°24.62	6.4'	54.1'	
11	345°47.09	44.91	147°19.95	11.2'	25°30.98	6.2'	54.1'	
12	0°47.15	N15°45.64	161°50.15	11.2'	S25°37.23	6.1'	54.1'	
13	15°47.21	46.37	176°20.31	11.1'	25°43.36	6.0'	54.1'	
14	30°47.28	47.11	190°50.42	11.1'	25°49.37	5.9'	54.1'	
15	45°47.34	· · 47.84	205°20.49	11.0'	25°55.25	5.8'	54.1'	
16	60°47.40	48.57	219°50.51	11.0'	26°1.02	5.6'	54.1'	
17	75°47.46	49.30	234°20.49	10.9'	26°6.66	5.5'	54.0'	
18	90°47.52	N15°50.03	248°50.42	10.9'	S26°12.17	5.4'	54.0'	
19	105°47.59	50.75	263°20.32	10.9'	26°17.57	5.3'	54.0'	
20	120°47.65	51.48	277°50.17	10.8'	26°22.84	5.1'	54.0'	
21	135°47.71	· · 52.21	292°19.98	10.8'	26°27.98	5.0'	54.0'	
22	150°47.77	52.94	306°49.74	10.7'	26°33.00	4.9'	54.0'	
23	165°47.83	53.67	321°19.47	10.7'	26°37.89	4.8'	54.0'	
SD = 15.9'			SD = 14.8'					

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	14-16
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-98%
01	02:52	02:55	11:57	—:—	11:41	
02	02:59	03:02	11:57	00:03	12:27	
03	03:05	03:09	11:57	00:51	13:15	

May 04, 05, 06 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°53.81		151°38.19	N23°14.16	204°20.56	N06°30.86	110°54.06	N22°25.91	212°19.70	N01°45.21
1	236°56.28		166°37.41	14.67	219°21.25	31.60	125°56.14	25.86	227°21.91	45.32
2	251°58.74		181°36.64	15.18	234°21.94	32.34	140°58.21	25.81	242°24.12	45.42
3	267°1.21		196°35.86	•• 15.69	249°22.63	•• 33.08	156°0.29	•• 25.76	257°26.32	•• 45.52
4	282°3.67		211°35.08	16.19	264°23.32	33.82	171°2.36	25.71	272°28.53	45.62
5	297°6.13		226°34.30	16.70	279°24.02	34.56	186°4.43	25.66	287°30.74	45.73
6	312°8.60		241°33.52	N23°17.21	294°24.71	N06°35.30	201°6.51	N22°25.61	302°32.95	N01°45.83
7	327°11.06		256°32.74	17.71	309°25.40	36.04	216°8.58	25.56	317°35.16	45.93
8	342°13.53		271°31.96	18.21	324°26.09	36.78	231°10.66	25.51	332°37.36	46.04
9	357°15.99		286°31.18	•• 18.71	339°26.78	•• 37.52	246°12.73	•• 25.46	347°39.57	•• 46.14
10	12°18.46		301°30.40	19.21	354°27.48	38.26	261°14.80	25.41	2°41.78	46.24
11	27°20.92		316°29.62	19.71	9°28.17	39.00	276°16.87	25.36	17°43.99	46.35
12	42°23.38		331°28.84	N23°20.21	24°28.86	N06°39.74	291°18.95	N22°25.31	32°46.19	N01°46.45
13	57°25.85		346°28.06	20.71	39°29.55	40.48	306°21.02	25.26	47°48.40	46.55
14	72°28.31		1°27.28	21.21	54°30.24	41.22	321°23.09	25.21	62°50.61	46.65
15	87°30.78		16°26.50	•• 21.70	69°30.93	•• 41.96	336°25.16	•• 25.16	77°52.82	•• 46.76
16	102°33.24		31°25.72	22.19	84°31.63	42.70	351°27.24	25.10	92°55.03	46.86
17	117°35.70		46°24.94	22.69	99°32.32	43.44	6°29.31	25.05	107°57.24	46.96
18	132°38.17		61°24.15	N23°23.18	114°33.01	N06°44.18	21°31.38	N22°25.00	122°59.44	N01°47.07
19	147°40.63		76°23.37	23.67	129°33.70	44.92	36°33.45	24.95	138°1.65	47.17
20	162°43.10		91°22.59	24.16	144°34.39	45.66	51°35.52	24.90	153°3.86	47.27
21	177°45.56		106°21.80	•• 24.65	159°35.08	•• 46.39	66°37.59	•• 24.85	168°6.07	•• 47.37
22	192°48.03		121°21.02	25.13	174°35.78	47.13	81°39.66	24.80	183°8.28	47.48
23	207°50.49		136°20.24	25.62	189°36.47	47.87	96°41.73	24.75	198°10.49	47.58
Mer.pass. 09:11										
ν-0.8' d0.5' m-3.92										
ν0.7' d0.7' m1.23										
ν2.1' d-0.1' m-2.00										
ν2.2' d0.1' m0.93										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°52.95		151°19.45	N23°26.11	204°37.16	N06°48.61	111°43.80	N22°24.70	213°12.70	N01°47.68
1	237°55.42		166°18.67	26.59	219°37.85	49.35	126°45.87	24.64	228°14.91	47.78
2	252°57.88		181°17.88	27.07	234°38.54	50.08	141°47.94	24.59	243°17.11	47.89
3	268°0.35		196°17.10	•• 27.55	249°39.23	•• 50.82	156°50.01	•• 24.54	258°19.32	•• 47.99
4	283°2.81		211°16.31	28.03	264°39.92	51.56	171°52.08	24.49	273°21.53	48.09
5	298°5.27		226°15.53	28.51	279°40.62	52.30	186°54.15	24.44	288°23.74	48.19
6	313°7.74		241°14.74	N23°28.99	294°41.31	N06°53.03	201°56.22	N22°24.39	303°25.95	N01°48.29
7	328°10.20		256°13.95	29.47	309°42.00	53.77	216°58.29	24.34	318°28.16	48.40
8	343°12.67		271°13.17	29.94	324°42.69	54.51	232°0.36	24.28	333°30.37	48.50
9	358°15.13		286°12.38	•• 30.42	339°43.38	•• 55.24	247°2.42	•• 24.23	348°32.58	•• 48.60
10	13°17.60		301°11.59	30.89	354°44.07	55.98	262°4.49	24.18	3°34.79	48.70
11	28°20.06		316°10.81	31.36	9°44.76	56.72	277°6.56	24.13	18°37.00	48.81
12	43°22.52		331°10.02	N23°31.83	24°45.45	N06°57.45	292°8.63	N22°24.08	33°39.21	N01°48.91
13	58°24.99		346°9.23	32.30	39°46.15	58.19	307°10.69	24.03	48°41.42	49.01
14	73°27.45		1°8.44	32.77	54°46.84	58.93	322°12.76	23.97	63°43.63	49.11
15	88°29.92		16°7.65	•• 33.24	69°47.53	06°59.66	337°14.83	•• 23.92	78°45.84	•• 49.21
16	103°32.38		31°6.86	33.71	84°48.22	07°0.40	352°16.90	23.87	93°48.05	49.32
17	118°34.85		46°6.07	34.17	99°48.91	1.13	7°18.96	23.82	108°50.26	49.42
18	133°37.31		61°5.28	N23°34.64	114°49.60	N07°1.87	22°21.03	N22°23.77	123°52.47	N01°49.52
19	148°39.77		76°4.49	35.10	129°50.29	2.60	37°23.10	23.71	138°54.68	49.62
20	163°42.24		91°3.70	35.56	144°50.98	3.34	52°25.16	23.66	153°56.89	49.72
21	178°44.70		106°2.91	•• 36.02	159°51.67	•• 4.07	67°27.23	•• 23.61	168°59.10	•• 49.82
22	193°47.17		121°2.12	36.48	174°52.36	4.81	82°29.29	23.56	184°1.31	49.93
23	208°49.63		136°1.33	36.94	189°53.06	5.54	97°31.36	23.51	199°3.52	50.03
Mer.pass. 09:07										
ν-0.8' d0.5' m-3.92										
ν0.7' d0.7' m1.23										
ν2.1' d-0.1' m-1.99										
ν2.2' d0.1' m0.92										
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°52.09		151°0.54	N23°37.40	204°53.75	N07°6.28	112°33.42	N22°23.45	214°5.73	N01°50.13
1	238°54.56		165°59.75	37.86	219°54.44	7.01	127°35.49	23.40	229°7.94	50.23
2	253°57.02		180°58.96	38.31	234°55.13	7.75	142°37.55	23.35	244°10.15	50.33
3	268°59.49		195°58.16	•• 38.77	249°55.82	•• 8.48	157°39.62	•• 23.30	259°12.36	•• 50.43
4	284°1.95		210°57.37	39.22	264°56.51	9.22	172°41.68	23.24	274°14.57	50.54
5	299°4.42		225°56.58	39.67	279°57.20	9.95	187°43.75	23.19	289°16.78	50.64
6	314°6.88		240°55.79	N23°40.12	294°57.89	N07°10.68	202°45.81	N22°23.14	304°18.99	N01°50.74
7	329°9.34		255°54.99	40.57	309°58.58	11.42	217°47.87	23.09	319°21.20	50.84
8	344°11.81		270°54.20	41.02	324°59.27	12.15	232°49.94	23.03	334°23.41	50.94
9	359°14.27		285°53.41	•• 41.47	339°59.96	•• 12.88	247°52.00	•• 22.98	349°25.63	•• 51.04
10	14°16.74		300°52.61	41.91	355°0.65	13.62	262°54.06	22.93	4°27.84	51.14
11	29°19.20		315°51.82	42.36	10°1.34	14.35	277°56.13	22.88	19°30.05	51.24
12	44°21.66		330°51.02	N23°42.80	25°2.03	N07°15.08	292°58.19	N22°22.82	34°32.26	N01°51.35
13	59°24.13		345°50.23	43.24	40°2.72	15.81	308°0.25	22.77	49°34.47	51.45
14	74°26.59		0°49.43	43.68	55°3.42	16.55	323°2.31	22.72	64°36.68	51.55
15	89°29.06		15°48.64	•• 44.12	70°4.11	•• 17.28	338°4.38	•• 22.66	79°38.89	•• 51.65
16	104°31.52		30°47.84	44.56	85°4.80	18.01	353°6.44	22.61	94°41.10	51.75
17	119°33.99		45°47.05	45.00	100°5.49	18.74	8°8.50	22.56	109°43.32	51.85
18	134°36.45		60°46.25	N23°45.44	115°6.18	N07°19.48	23°10.56	N22°22.51	124°45.53	N01°51.95
19	149°38.91		75°45.45	45.87	130°6.87	20.21	38°12.62	22.45	139°47.74	52.05
20	164°41.38		90°44.66	46.31	145°7.56	20.94	53°14.68	22.40	154°49.95	52.15
21	179°43.84		105°43.86	•• 46.74	160°8.25	•• 21.67	68°16.74	•• 22.35	169°52.16	•• 52.26
22	194°46.31		120°43.06	47.17	175°8.94	22.40	83°18.81	22.29	184°54.38	52.36
23	209°48.77		135°42.26	47.60	190°9.63	23.13	98°20.87	22.24	199°56.59	52.46
Mer.pass. 09:03										
ν-0.8' d0.5' m-3.92										
ν0.7' d0.7' m1.23										
ν2.1' d-0.1' m-1.99										
ν2.2' d0.1' m0.92										

Stars		
	SHA	Dec
Alpheratz	357°33.93	29°13.99
Ankaa	353°6.42	-42°9.66
Schedar	349°30.30	56°40.73
Diphda	348°46.50	-17°50.52
Achernar	335°19.93	-57°6.08
Hamal	327°50.33	23°35.13
Polaris	313°58.62	89°22.49
Acamar	315°11.38	-40°11.96
Menkar	314°5.35	4°11.52
Mirfak	308°27.22	49°57.25
Aldebaran	290°38.70	16°33.69
Rigel	281°3.11	-8°10.37
Capella	280°20.70	46°1.51
Bellatrix	278°22.00	6°22.35
Elnath	278°0.81	28°37.77
Alnilam	275°36.90	-1°11.19
Betelgeuse	270°51.17	7°24.66
Canopus	263°52.27	-52°42.78
Sirius	258°25.50	-16°45.29
Adhara	255°5.22	-29°0.67
Procyon	244°49.84	5°9.37
Pollux	243°16.13	27°57.79
Avior	234°14.44	-59°35.93
Suhail	222°45.53	-43°32.62
Miaplacidus	221°38.05	-69°49.83
Alphard	217°46.67	-8°46.53
Regulus	207°33.21	11°50.25
Dubhe	193°39.36	61°36.70
Denebola	182°23.64	14°25.42
Gienah	175°42.23	-17°41.49
Acrux	172°58.36	-63°14.97
Gacrux	171°49.99	-57°15.90
Alioth	166°11.53	55°49.06
Spica	158°20.87	-11°18.09
Alkaid	152°50.68	49°10.87
Hadar	148°33.85	-60°30.14
Menkent	147°55.96	-36°30.13
Arcturus	145°46.59	19°2.60
Rigel Kent.	139°38.16	-60°56.76
Kochab	137°18.63	74°2.74
Zuben'ubi	136°54.49	-16°9.20
Alphecca	126°2.47	26°37.41
Antares	112°14.18	-26°29.46
Atria	107°6.95	-69°4.36
Sabik	102°1.26	-15°45.50
Shaula	96°8.58	-37°7.32
Rasalhague	95°57.29	12°32.29
Eltanin	90°41.30	51°28.83
Kaus Aust.	83°30.84	-34°22.24
Vega	80°32.24	38°48.21
Nunki	75°46.23	-26°15.78
Altair	61°58.80	8°56.13
Peacock	53°3.94	-56°38.76
Deneb	49°25.03	45°22.15
Enif	33°37.80	9°59.62
Al Na'ir	27°31.70	-46°49.81
Fomalhaut	15°13.51	-29°28.87
Scheat	13°44.35	28°13.35
Markab	13°29.00	15°20.68

May 04 Mon	SHA	Mer.pass
Venus	289°44.38	13:54
Mars	342°26.74	10:22
Jupiter	249°0.25	16:34
Saturn	350°25.89	09:49

May 05 Tue	SHA	Mer.pass
Venus	288°26.50	13:55
Mars	341°44.20	10:21
Jupiter	248°50.85	16:31
Saturn	350°19.74	09:46

May 06 Wed	SHA	Mer.pass
Venus	287°8.45	13:57
Mars	341°1.65	10:20
Jupiter	248°41.33	16:28
Saturn	350°13.63	09:42

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.89	N15°54.39	335°49.16	10.7'	S26°42.66	4.6'	54.0'
1	195°47.95	55.12	350°18.82	10.6'	26°47.30	4.5'	54.0'
2	210°48.01	55.84	4°48.43	10.6'	26°51.81	4.4'	54.0'
3	225°48.07	· · 56.57	19°18.01	10.5'	26°56.19	4.3'	54.0'
4	240°48.13	57.29	33°47.56	10.5'	27°0.45	4.1'	54.0'
5	255°48.19	58.02	48°17.07	10.5'	27°4.57	4.0'	54.0'
6	270°48.25	N15°58.74	62°46.55	10.4'	S27°8.57	3.9'	54.0'
7	285°48.31	15°59.46	77°15.99	10.4'	27°12.44	3.7'	54.0'
8	300°48.37	16°0.19	91°45.40	10.4'	27°16.17	3.6'	54.0'
9	315°48.42	· · 0.91	106°14.79	10.4'	27°19.78	3.5'	54.0'
10	330°48.48	1.63	120°44.14	10.3'	27°23.26	3.3'	54.0'
11	345°48.54	2.35	135°13.46	10.3'	27°26.60	3.2'	54.0'
12	0°48.60	N16°3.07	149°42.76	10.3'	S27°29.81	3.1'	54.0'
13	15°48.65	3.80	164°12.03	10.2'	27°32.89	2.9'	54.0'
14	30°48.71	4.52	178°41.28	10.2'	27°35.84	2.8'	54.0'
15	45°48.77	· · 5.24	193°10.50	10.2'	27°38.66	2.7'	54.0'
16	60°48.82	5.95	207°39.69	10.2'	27°41.34	2.5'	54.0'
17	75°48.88	6.67	222°8.87	10.2'	27°43.89	2.4'	54.0'
18	90°48.94	N16°7.39	236°38.02	10.1'	S27°46.30	2.3'	54.0'
19	105°48.99	8.11	251°7.15	10.1'	27°48.59	2.1'	54.0'
20	120°49.05	8.83	265°36.26	10.1'	27°50.74	2.0'	54.0'
21	135°49.10	· · 9.54	280°5.36	10.1'	27°52.75	1.9'	54.0'
22	150°49.16	10.26	294°34.44	10.1'	27°54.63	1.7'	54.0'
23	165°49.21	10.98	309°3.50	10.0'	27°56.37	1.6'	54.0'
SD = 15.9'			$d = 0.7'$			SD = 14.7'	

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.27	N16°11.69	323°32.55	10.0'	S27°57.98	1.5'	54.0'
1	195°49.32	12.41	338°1.58	10.0'	27°59.46	1.3'	54.0'
2	210°49.38	13.12	352°30.60	10.0'	28°0.80	1.2'	54.0'
3	225°49.43	· · 13.84	6°59.62	10.0'	28°2.00	1.1'	54.0'
4	240°49.48	14.55	21°28.62	10.0'	28°3.07	0.9'	54.0'
5	255°49.54	15.26	35°57.61	10.0'	28°4.00	0.8'	54.0'
6	270°49.59	N16°15.97	50°26.59	10.0'	S28°4.80	0.7'	54.0'
7	285°49.64	16.69	64°55.57	10.0'	28°5.46	0.5'	54.0'
8	300°49.70	17.40	79°24.54	10.0'	28°5.99	0.4'	54.0'
9	315°49.75	· · 18.11	93°53.51	10.0'	28°6.38	0.3'	54.0'
10	330°49.80	18.82	108°22.47	10.0'	28°6.63	0.1'	54.0'
11	345°49.85	19.53	122°51.43	10.0'	28°6.75	-0.0'	54.0'
12	0°49.90	N16°20.24	137°20.39	10.0'	S28°6.73	-0.2'	54.0'
13	15°49.95	20.95	151°49.35	10.0'	28°6.58	-0.3'	54.0'
14	30°50.01	21.66	166°18.31	10.0'	28°6.29	-0.4'	54.0'
15	45°50.06	· · 22.37	180°47.28	10.0'	28°5.86	-0.6'	54.0'
16	60°50.11	23.08	195°16.25	10.0'	28°5.30	-0.7'	54.0'
17	75°50.16	23.78	209°45.22	10.0'	28°4.60	-0.8'	54.0'
18	90°50.21	N16°24.49	224°14.20	10.0'	S28°3.77	-1.0'	54.0'
19	105°50.26	25.20	238°43.19	10.0'	28°2.80	-1.1'	54.0'
20	120°50.31	25.90	253°12.18	10.0'	28°1.69	-1.2'	54.0'
21	135°50.36	· · 26.61	267°41.18	10.0'	28°0.45	-1.4'	54.0'
22	150°50.41	27.31	282°10.20	10.0'	27°59.08	-1.5'	54.0'
23	165°50.45	28.02	296°39.22	10.0'	27°57.57	-1.6'	54.0'
SD = 15.9'			$d = 0.7'$			SD = 14.7'	

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.50	N16°28.72	311°8.26	10.1'	S27°55.92	-1.8'	54.0'
1	195°50.55	29.43	325°37.31	10.1'	27°54.14	-1.9'	54.0'
2	210°50.60	30.13	340°6.38	10.1'	27°52.22	-2.1'	54.0'
3	225°50.65	· · 30.83	354°35.46	10.1'	27°50.17	-2.2'	54.1'
4	240°50.70	31.54	9°4.56	10.1'	27°47.99	-2.3'	54.1'
5	255°50.74	32.24	23°33.68	10.1'	27°45.67	-2.5'	54.1'
6	270°50.79	N16°32.94	38°2.81	10.2'	S27°43.21	-2.6'	54.1'
7	285°50.84	33.64	52°31.97	10.2'	27°40.63	-2.7'	54.1'
8	300°50.88	34.34	67°1.14	10.2'	27°37.91	-2.9'	54.1'
9	315°50.93	· · 35.04	81°30.34	10.2'	27°35.05	-3.0'	54.1'
10	330°50.98	35.74	95°59.56	10.2'	27°32.07	-3.1'	54.1'
11	345°51.02	36.44	110°28.81	10.3'	27°28.95	-3.3'	54.1'
12	0°51.07	N16°37.14	124°58.08	10.3'	S27°25.70	-3.4'	54.1'
13	15°51.11	37.84	139°27.37	10.3'	27°22.31	-3.5'	54.1'
14	30°51.16	38.53	153°56.69	10.3'	27°18.80	-3.6'	54.1'
15	45°51.20	· · 39.23	168°26.04	10.4'	27°15.15	-3.8'	54.1'
16	60°51.25	39.93	182°55.42	10.4'	27°11.38	-3.9'	54.2'
17	75°51.29	40.62	197°24.82	10.4'	27°7.47	-4.0'	54.2'
18	90°51.34	N16°41.32	211°54.26	10.5'	S27°3.43	-4.2'	54.2'
19	105°51.38	42.01	226°23.73	10.5'	26°59.26	-4.3'	54.2'
20	120°51.42	42.71	240°53.23	10.5'	26°54.96	-4.4'	54.2'
21	135°51.47	· · 43.40	255°22.76	10.6'	26°50.54	-4.6'	54.2'
22	150°51.51	44.10	269°52.32	10.6'	26°45.98	-4.7'	54.2'
23	165°51.55	44.79	284°21.92	10.6'	26°41.30	-4.8'	54.2'
SD = 15.9'			$d = 0.7'$			SD = 14.7'	

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

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

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 17-19 95-84%
04	03:12	03:14	11:57	01:40	14:05	
05	03:17	03:20	11:57	02:31	14:57	
06	03:22	03:24	11:57	03:22	15:48	

May 07, 08, 09 UT (Thu., Fri., Sat.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	224°51.23	150°41.47	N23°48.03	205°10.32	N07°23.86	113°22.93	N22°22.19	214°58.80	N01°52.56	Alpheratz	357°33.91	29°14.00
1	239°53.70	165°40.67	48.46	220°11.01	24.60	128°24.99	22.13	230°1.01	52.66	Ankaa	353°6.40	-42°9.64
2	254°56.16	180°39.87	48.89	235°11.70	25.33	143°27.05	22.08	245°3.22	52.76	Schedar	349°30.27	56°40.73
3	269°58.63	195°39.07	· · 49.32	250°12.39	· · 26.06	158°29.11	· · 22.03	260°5.44	· · 52.86	Diphda	348°46.48	-17°50.51
4	285°1.09	210°38.27	49.74	265°13.08	26.79	173°31.17	21.97	275°7.65	52.96	Achernar	335°19.92	-57°6.06
5	300°3.56	225°37.47	50.17	280°13.77	27.52	188°33.22	21.92	290°9.86	53.06	Hamal	327°50.31	23°35.13
6	315°6.02	240°36.67	N23°50.59	295°14.46	N07°28.25	203°35.28	N22°21.87	305°12.07	N01°53.16	Polaris	313°58.36	89°22.48
7	330°8.48	255°35.87	51.01	310°15.15	28.98	218°37.34	21.81	320°14.29	53.26	Acamar	315°11.37	-40°11.94
8	345°10.95	270°35.07	51.43	325°15.84	29.71	233°39.40	21.76	335°16.50	53.36	Menkar	314°5.34	4°11.52
9	0°13.41	285°34.27	· · 51.85	340°16.53	· · 30.44	248°41.46	· · 21.70	350°18.71	· · 53.46	Mirfak	308°27.20	49°57.24
10	15°15.88	300°33.47	52.27	355°17.22	31.17	263°43.52	21.65	5°20.92	53.56	Aldebaran	290°38.70	16°33.69
11	30°18.34	315°32.67	52.69	10°17.91	31.90	278°45.58	21.60	20°23.14	53.66	Rigel	281°3.11	-8°10.36
12	45°20.80	330°31.87	N23°53.10	25°18.60	N07°32.63	293°47.63	N22°21.54	35°25.35	N01°53.76	Capella	280°20.70	46°1.50
13	60°23.27	345°31.07	53.52	40°19.29	33.36	308°49.69	21.49	50°27.56	53.86	Bellatrix	278°22.00	6°22.35
14	75°25.73	0°30.27	53.93	55°19.98	34.08	323°51.75	21.44	65°29.78	53.96	Elnath	278°0.81	28°37.77
15	90°28.20	15°29.47	· · 54.34	70°20.67	· · 34.81	338°53.81	· · 21.38	80°31.99	· · 54.06	Alnilam	275°36.90	-1°11.19
16	105°30.66	30°28.67	54.75	85°21.36	35.54	353°55.86	21.33	95°34.20	54.16	Betelgeuse	270°51.17	7°24.66
17	120°33.13	45°27.86	55.16	100°22.05	36.27	8°57.92	21.27	110°36.42	54.26	Canopus	263°52.29	-52°42.77
18	135°35.59	60°27.06	N23°55.57	115°22.73	N07°37.00	23°59.98	N22°21.22	125°38.63	N01°54.36	Sirius	258°25.50	-16°45.28
19	150°38.05	75°26.26	55.98	130°23.42	37.73	39°2.03	21.16	140°40.84	54.47	Adhara	255°5.23	-29°0.66
20	165°40.52	90°25.45	56.39	145°24.11	38.45	54°4.09	21.11	155°43.06	54.57	Procyon	244°49.84	5°9.37
21	180°42.98	105°24.65	· · 56.79	160°24.80	· · 39.18	69°6.15	· · 21.06	170°45.27	· · 54.67	Pollux	243°16.13	27°57.79
22	195°45.45	120°23.85	57.20	175°25.49	39.91	84°8.20	21.00	185°47.48	54.76	Avior	234°14.46	-59°35.93
23	210°47.91	135°23.04	57.60	190°26.18	40.64	99°10.26	20.95	200°49.70	54.86	Suhail	222°45.54	-43°32.63
Mer.pass. 08:59		ν-0.8' d0.4' m-3.92		ν0.7' d0.7' m1.23		ν2.1' d-0.1' m-1.98		ν2.2' d0.1' m0.92		Miaplacidus	221°38.10	-69°49.83
										Alphard	217°46.68	-8°46.53
										Regulus	207°33.22	11°50.25
										Dubhe	193°39.37	61°36.71
										Denebola	182°23.64	14°25.42
										Genah	175°42.23	-17°41.49
										Acrux	172°58.37	-63°14.98
										Gacrux	171°49.99	-57°15.91
										Alioth	166°11.54	55°49.07
										Spica	158°20.87	-11°18.09
										Alkaid	152°50.68	49°10.88
										Hadar	148°33.84	-60°30.16
										Menkent	147°55.95	-36°30.14
										Arcturus	145°46.59	19°2.61
										Rigel Kent.	139°38.15	-60°56.77
										Kochab	137°18.63	74°2.75
										Zuben'ubi	136°54.48	-16°9.20
										Alphecca	126°2.46	26°37.42
										Antares	112°14.16	-26°29.47
										Atria	107°6.91	-69°4.37
										Sabik	102°1.24	-15°45.50
										Shaula	96°8.56	-37°7.32
										Rasalhague	95°57.27	12°32.30
										Eltanin	90°41.27	51°28.85
										Kaus Aust.	83°30.81	-34°22.24
										Vega	80°32.22	38°48.22
										Nunki	75°46.21	-26°15.78
										Altair	61°58.78	8°56.14
										Peacock	53°3.89	-56°38.76
										Deneb	49°25.00	45°22.16
										Enif	33°37.77	9°59.62
										Al Na'ir	27°31.66	-46°49.79
										Fomalhaut	15°13.48	-29°28.86
										Scheat	13°44.32	28°13.36
										Markab	13°28.97	15°20.69
										May 07 Thu	SHA	Mer.pass
										Venus	285°50.23	13:58
										Mars	340°19.08	10:19
										Jupiter	248°31.69	16:24
										Saturn	350°7.56	09:39
										May 08 Fri	SHA	Mer.pass
										Venus	284°31.87	13:59
										Mars	339°36.50	10:18
										Jupiter	248°21.94	16:21
										Saturn	350°1.54	09:35
										May 09 Sat	SHA	Mer.pass
										Venus	283°13.36	14:01
										Mars	338°53.89	10:17
										Jupiter	248°12.07	16:18
										Saturn	349°55.55	09:32
										Horizontal parallax		
										Venus:	0.1	
										Mars:	0.1	
Mer.pass. 08:51		ν-0.8' d0.4' m-3.92		ν0.7' d0.7' m1.24		ν2.1' d-0.1' m-1.97		ν2.2' d0.1' m0.92				

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.59	N16°45.48	298°51.55	10.7'	S26°36.49	-4.9'	54.2'
1	195°51.64	46.18	313°21.22	10.7'	26°31.55	-5.1'	54.3'
2	210°51.68	46.87	327°50.92	10.7'	26°26.49	-5.2'	54.3'
3	225°51.72	· · 47.56	342°20.66	10.8'	26°21.29	-5.3'	54.3'
4	240°51.76	48.25	356°50.44	10.8'	26°15.98	-5.4'	54.3'
5	255°51.80	48.94	11°20.25	10.9'	26°10.53	-5.6'	54.3'
6	270°51.84	N16°49.63	25°50.11	10.9'	S26°4.97	-5.7'	54.3'
7	285°51.89	50.32	40°20.00	10.9'	25°59.27	-5.8'	54.3'
8	300°51.93	51.01	54°49.93	11.0'	25°53.46	-5.9'	54.3'
9	315°51.97	· · 51.70	69°19.90	11.0'	25°47.52	-6.1'	54.4'
10	330°52.01	52.38	83°49.92	11.1'	25°41.45	-6.2'	54.4'
11	345°52.05	53.07	98°19.97	11.1'	25°35.27	-6.3'	54.4'
12	0°52.09	N16°53.76	112°50.07	11.1'	S25°28.96	-6.4'	54.4'
13	15°52.13	54.45	127°20.20	11.2'	25°22.53	-6.5'	54.4'
14	30°52.16	55.13	141°50.38	11.2'	25°15.98	-6.7'	54.4'
15	45°52.20	· · 55.82	156°20.61	11.3'	25°9.31	-6.8'	54.4'
16	60°52.24	56.50	170°50.87	11.3'	25°2.52	-6.9'	54.5'
17	75°52.28	57.19	185°21.18	11.4'	24°55.61	-7.0'	54.5'
18	90°52.32	N16°57.87	199°51.53	11.4'	S24°48.58	-7.1'	54.5'
19	105°52.36	58.55	214°21.93	11.4'	24°41.44	-7.3'	54.5'
20	120°52.39	59.24	228°52.37	11.5'	24°34.18	-7.4'	54.5'
21	135°52.43	16°59.92	243°22.86	11.5'	24°26.80	-7.5'	54.5'
22	150°52.47	17°0.60	257°53.39	11.6'	24°19.30	-7.6'	54.6'
23	165°52.50	1.28	272°23.96	11.6'	24°11.69	-7.7'	54.6'
SD = 15.8'			SD = 14.8'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.54	N17°1.96	286°54.58	11.7'	S24°3.96	-7.8'	54.6'
1	195°52.58	2.65	301°25.25	11.7'	23°56.12	-8.0'	54.6'
2	210°52.61	3.33	315°55.96	11.8'	23°48.16	-8.1'	54.6'
3	225°52.65	· · 4.01	330°26.72	11.8'	23°40.09	-8.2'	54.6'
4	240°52.68	4.68	344°57.52	11.8'	23°31.91	-8.3'	54.7'
5	255°52.72	5.36	359°28.37	11.9'	23°23.62	-8.4'	54.7'
6	270°52.75	N17°6.04	13°59.26	11.9'	S23°15.22	-8.5'	54.7'
7	285°52.79	6.72	28°30.20	12.0'	23°6.70	-8.6'	54.7'
8	300°52.82	7.40	43°1.19	12.0'	22°58.07	-8.7'	54.7'
9	315°52.86	· · 8.07	57°32.22	12.1'	22°49.34	-8.8'	54.8'
10	330°52.89	8.75	72°3.30	12.1'	22°40.50	-9.0'	54.8'
11	345°52.93	9.42	86°34.42	12.2'	22°31.54	-9.1'	54.8'
12	0°52.96	N17°10.10	101°5.59	12.2'	S22°22.48	-9.2'	54.8'
13	15°52.99	10.77	115°36.81	12.3'	22°13.32	-9.3'	54.8'
14	30°53.03	11.45	130°8.07	12.3'	22°4.04	-9.4'	54.9'
15	45°53.06	· · 12.12	144°39.37	12.4'	21°54.67	-9.5'	54.9'
16	60°53.09	12.80	159°10.72	12.4'	21°45.18	-9.6'	54.9'
17	75°53.12	13.47	173°42.12	12.4'	21°35.60	-9.7'	54.9'
18	90°53.15	N17°14.14	188°13.56	12.5'	S21°25.91	-9.8'	55.0'
19	105°53.19	14.81	202°45.04	12.5'	21°16.11	-9.9'	55.0'
20	120°53.22	15.48	217°16.57	12.6'	21°6.22	-10.0'	55.0'
21	135°53.25	· · 16.15	231°48.14	12.6'	20°56.22	-10.1'	55.0'
22	150°53.28	16.82	246°19.76	12.7'	20°46.12	-10.2'	55.1'
23	165°53.31	17.49	260°51.42	12.7'	20°35.92	-10.3'	55.1'
SD = 15.8'			SD = 14.9'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.34	N17°18.16	275°23.12	12.7'	S20°25.62	-10.4'	55.1'
1	195°53.37	18.83	289°54.87	12.8'	20°15.23	-10.5'	55.1'
2	210°53.40	19.50	304°26.65	12.8'	20°4.73	-10.6'	55.2'
3	225°53.43	· · 20.17	318°58.48	12.9'	19°54.14	-10.7'	55.2'
4	240°53.46	20.84	333°30.35	12.9'	19°43.45	-10.8'	55.2'
5	255°53.49	21.50	348°2.27	13.0'	19°32.66	-10.9'	55.2'
6	270°53.52	N17°22.17	2°34.22	13.0'	S19°21.78	-11.0'	55.3'
7	285°53.55	22.83	17°6.21	13.0'	19°10.81	-11.1'	55.3'
8	300°53.57	23.50	31°38.24	13.1'	18°59.74	-11.2'	55.3'
9	315°53.60	· · 24.16	46°10.32	13.1'	18°48.57	-11.3'	55.3'
10	330°53.63	24.83	60°42.43	13.1'	18°37.32	-11.3'	55.4'
11	345°53.66	25.49	75°14.57	13.2'	18°25.97	-11.4'	55.4'
12	0°53.69	N17°26.16	89°46.76	13.2'	S18°14.53	-11.5'	55.4'
13	15°53.71	26.82	104°18.98	13.3'	18°3.00	-11.6'	55.4'
14	30°53.74	27.48	118°51.24	13.3'	17°51.39	-11.7'	55.5'
15	45°53.77	· · 28.14	133°23.54	13.3'	17°39.68	-11.8'	55.5'
16	60°53.79	28.80	147°55.87	13.4'	17°27.88	-11.9'	55.5'
17	75°53.82	29.46	162°28.23	13.4'	17°16.00	-12.0'	55.6'
18	90°53.84	N17°30.12	177°0.63	13.4'	S17°4.03	-12.1'	55.6'
19	105°53.87	30.78	191°33.06	13.5'	16°51.97	-12.1'	55.6'
20	120°53.90	31.44	206°5.52	13.5'	16°39.83	-12.2'	55.6'
21	135°53.92	· · 32.10	220°38.02	13.5'	16°27.60	-12.3'	55.7'
22	150°53.94	32.76	235°10.55	13.6'	16°15.29	-12.4'	55.7'
23	165°53.97	33.42	249°43.11	13.6'	16°2.90	-12.5'	55.7'
SD = 15.8'			SD = 15.0'				

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

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

Day	Sun		Mer. Pass	Moon		Age 20-22 77-59%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
07	03:26	03:28	11:57	04:13	16:38	
08	03:30	03:32	11:56	05:02	17:26	
09	03:33	03:35	11:56	05:49	18:12	

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	227°48.65		149°43.38	N24°15.91	205°59.92	N08°16.10	115°50.75	N22°18.23	217°38.25	N01°59.71
1	242°51.12		164°42.57	16.26	221°0.61	16.82	130°52.79	18.18	232°40.47	59.81
2	257°53.58		179°41.75	16.60	236°1.29	17.54	145°54.84	18.12	247°42.69	01°59.91
3	272°56.05		194°40.94	•• 16.94	251°1.98	•• 18.26	160°56.88	•• 18.06	262°44.91	02°0.01
4	287°58.51		209°40.12	17.28	266°2.67	18.98	175°58.93	18.01	277°47.12	0.11
5	303°0.97		224°39.31	17.62	281°3.36	19.70	191°0.97	17.95	292°49.34	0.20
6	318°3.44		239°38.49	N24°17.96	296°4.04	N08°20.41	206°3.02	N22°17.89	307°51.56	N02°0.30
7	333°5.90		254°37.67	18.30	311°4.73	21.13	221°5.06	17.84	322°53.78	0.40
8	348°8.37		269°36.86	18.63	326°5.42	21.85	236°7.11	17.78	337°56.00	0.50
9	3°10.83		284°36.04	•• 18.97	341°6.11	•• 22.57	251°9.15	•• 17.72	352°58.21	•• 0.59
10	18°13.29		299°35.22	19.30	356°6.79	23.29	266°11.20	17.67	8°0.43	0.69
11	33°15.76		314°34.41	19.63	11°7.48	24.01	281°13.24	17.61	23°2.65	0.79
12	48°18.22		329°33.59	N24°19.97	26°8.17	N08°24.72	296°15.28	N22°17.55	38°4.87	N02°0.89
13	63°20.69		344°32.77	20.30	41°8.85	25.44	311°17.33	17.49	53°7.09	0.99
14	78°23.15		359°31.96	20.62	56°9.54	26.16	326°19.37	17.44	68°9.30	1.08
15	93°25.61		14°31.14	•• 20.95	71°10.23	•• 26.88	341°21.42	•• 17.38	83°11.52	•• 1.18
16	108°28.08		29°30.32	21.28	86°10.91	27.59	356°23.46	17.32	98°13.74	1.28
17	123°30.54		44°29.50	21.60	101°11.60	28.31	11°25.50	17.27	113°15.96	1.37
18	138°33.01		59°28.69	N24°21.93	116°12.29	N08°29.03	26°27.54	N22°17.21	128°18.18	N02°1.47
19	153°35.47		74°27.87	22.25	131°12.98	29.74	41°29.59	17.15	143°20.40	1.57
20	168°37.94		89°27.05	22.57	146°13.66	30.46	56°31.63	17.09	158°22.61	1.67
21	183°40.40		104°26.23	•• 22.89	161°14.35	•• 31.18	71°33.67	•• 17.04	173°24.83	•• 1.76
22	198°42.86		119°25.41	23.21	176°15.04	31.89	86°35.71	16.98	188°27.05	1.86
23	213°45.33		134°24.59	23.53	191°15.72	32.61	101°37.75	16.92	203°29.27	1.96
Mer.pass. 08:47		ν-0.8' d0.3' m-3.92		ν0.7' d0.7' m1.24		ν2.0' d-0.1' m-1.97		ν2.2' d0.1' m0.92		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°47.79		149°23.77	N24°23.85	206°16.41	N08°33.33	116°39.80	N22°16.86	218°31.49	N02°2.06
1	243°50.26		164°22.95	24.16	221°17.10	34.04	131°41.84	16.81	233°33.71	2.15
2	258°52.72		179°22.13	24.48	236°17.78	34.76	146°43.88	16.75	248°35.93	2.25
3	273°55.18		194°21.31	•• 24.79	251°18.47	•• 35.47	161°45.92	•• 16.69	263°38.15	•• 2.35
4	288°57.65		209°20.50	25.10	266°19.16	36.19	176°47.96	16.63	278°40.37	2.44
5	304°0.11		224°19.68	25.41	281°19.84	36.90	191°50.00	16.58	293°42.59	2.54
6	319°2.58		239°18.85	N24°25.72	296°20.53	N08°37.62	206°52.04	N22°16.52	308°44.81	N02°2.64
7	334°5.04		254°18.03	26.03	311°21.21	38.33	221°54.08	16.46	323°47.03	2.73
8	349°7.50		269°17.21	26.34	326°21.90	39.05	236°56.12	16.40	338°49.25	2.83
9	4°9.97		284°16.39	•• 26.64	341°22.59	•• 39.76	251°58.16	•• 16.34	353°51.47	•• 2.93
10	19°12.43		299°15.57	26.95	356°23.27	40.47	267°0.20	16.29	8°53.68	3.02
11	34°14.90		314°14.75	27.25	11°23.96	41.19	282°2.24	16.23	23°55.90	3.12
12	49°17.36		329°13.93	N24°27.55	26°24.65	N08°41.90	297°4.28	N22°16.17	38°58.12	N02°3.22
13	64°19.82		344°13.11	27.85	41°25.33	42.62	312°6.32	16.11	54°0.34	3.31
14	79°22.29		359°12.29	28.15	56°26.02	43.33	327°8.36	16.05	69°2.56	3.41
15	94°24.75		14°11.47	•• 28.45	71°26.70	•• 44.04	342°10.40	•• 16.00	84°4.78	•• 3.51
16	109°27.22		29°10.64	28.75	86°27.39	44.76	357°12.44	15.94	99°7.01	3.60
17	124°29.68		44°9.82	29.05	101°28.08	45.47	12°14.47	15.88	114°9.23	3.70
18	139°32.14		59°9.00	N24°29.34	116°28.76	N08°46.18	27°16.51	N22°15.82	129°11.45	N02°3.80
19	154°34.61		74°8.18	29.64	131°29.45	46.89	42°18.55	15.76	144°13.67	3.89
20	169°37.07		89°7.36	29.93	146°30.13	47.61	57°20.59	15.70	159°15.89	3.99
21	184°39.54		104°6.53	•• 30.22	161°30.82	•• 48.32	72°22.63	•• 15.64	174°18.11	•• 4.09
22	199°42.00		119°5.71	30.51	176°31.51	49.03	87°24.66	15.59	189°20.33	4.18
23	214°44.47		134°4.89	30.80	191°32.19	49.74	102°26.70	15.53	204°22.55	4.28
Mer.pass. 08:43		ν-0.8' d0.3' m-3.92		ν0.7' d0.7' m1.24		ν2.0' d-0.1' m-1.96		ν2.2' d0.1' m0.92		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	229°46.93		149°4.06	N24°31.09	206°32.88	N08°50.46	117°28.74	N22°15.47	219°24.77	N02°4.37
1	244°49.39		164°3.24	31.37	221°33.56	51.17	132°30.77	15.41	234°26.99	4.47
2	259°51.86		179°2.42	31.66	236°34.25	51.88	147°32.81	15.35	249°29.21	4.57
3	274°54.32		194°1.59	•• 31.94	251°34.93	•• 52.59	162°34.85	•• 15.29	264°31.43	•• 4.66
4	289°56.79		209°0.77	32.23	266°35.62	53.30	177°36.88	15.23	279°33.65	4.76
5	304°59.25		223°59.95	32.51	281°36.30	54.01	192°38.92	15.18	294°35.88	4.85
6	320°1.71		238°59.12	N24°32.79	296°36.99	N08°54.72	207°40.96	N22°15.12	309°38.10	N02°4.95
7	335°4.18		253°58.30	33.07	311°37.67	55.43	222°42.99	15.06	324°40.32	5.05
8	350°6.64		268°57.47	33.35	326°38.36	56.14	237°45.03	15.00	339°42.54	5.14
9	5°9.11		283°56.65	•• 33.62	341°39.05	•• 56.85	252°47.06	•• 14.94	354°44.76	•• 5.24
10	20°11.57		298°55.82	33.90	356°39.73	57.56	267°49.10	14.88	9°46.98	5.33
11	35°14.03		313°55.00	34.17	11°40.42	58.27	282°51.13	14.82	24°49.20	5.43
12	50°16.50		328°54.18	N24°34.45	26°41.10	N08°58.98	297°53.17	N22°14.76	39°51.43	N02°5.52
13	65°18.96		343°53.35	34.72	41°41.79	08°59.69	312°55.20	14.70	54°53.65	5.62
14	80°21.43		358°52.53	34.99	56°42.47	09°0.40	327°57.24	14.64	69°55.87	5.72
15	95°23.89		13°51.70	•• 35.26	71°43.16	•• 1.11	342°59.27	•• 14.58	84°58.09	•• 5.81
16	110°26.35		28°50.87	35.53	86°43.84	1.82	358°1.31	14.52	100°0.31	5.91
17	125°28.82		43°50.05	35.80	101°44.53	2.53	13°3.34	14.47	115°2.54	6.00
18	140°31.28		58°49.22	N24°36.06	116°45.21	N09°3.24	28°5.37	N22°14.41	130°4.76	N02°6.10
19	155°33.75		73°48.40	36.33	131°45.90	3.95	43°7.41	14.35	145°6.98	6.19
20	170°36.21		88°47.57	36.59	146°46.58	4.65	58°9.44	14.29	160°9.20	6.29
21	185°38.67		103°46.75	•• 36.85	161°47.27	•• 5.36	73°11.47	•• 14.23	175°11.43	•• 6.38
22	200°41.14		118°45.92	37.11	176°47.95	6.07	88°13.51	14.17	190°13.65	6.48
23	215°43.60		133°45.09	37.37	191°48.63	6.78	103°15.54	14.11	205°15.87	6.57
Mer.pass. 08:39		ν-0.8' d0.3' m-3.92		ν0.7' d0.7' m1.24		ν2.0' d-0.1' m-1.96		ν2.2' d0.1' m0.92		

	SHA	Dec
Alpheratz	357°33.89	29°14.00
Ankaa	353°6.37	-42°9.63
Schedar	349°30.25	56°40.72
Diphda	348°46.46	-17°50.49
Achernar	335°19.90	-57°6.04
Hamal	327°50.30	23°35.13
Polaris	313°58.24	89°22.46
Acamar	315°11.37	-40°11.93
Menkar	314°5.33	4°11.53
Mirfak	308°27.20	49°57.24
Aldebaran	290°38.70	16°33.69
Rigel	281°3.12	-8°10.35
Capella	280°20.70	46°1.50
Bellatrix	278°22.00	6°22.36
Elnath	278°0.82	28°37.77
Alnilam	275°36.90	-1°11.18
Betelgeuse	270°51.17	7°24.66
Canopus	263°52.31	-52°42.76
Sirius	258°25.51	-16°45.27
Adhara	255°5.24	-29°0.65
Procyon	244°49.85	5°9.37
Pollux	243°16.14	27°57.79
Avior	234°14.49	-59°35.92
Suhail	222°45.56	-43°32.62
Miaplacidus	221°38.15	-69°49.83
Alphard	217°46.69	-8°46.53
Regulus	207°33.23	11°50.25
Dubhe	193°39.39	61°36.71
Denebola	182°23.65	14°25.43
Gienah	175°42.24	-17°41.49
Acrux	172°58.38	-63°14.99
Gacrux	171°50.01	-57°15.92
Alioth	166°11.55	55°49.08
Spica	158°20.87	-11°18.09
Alkaid	152°50.68	49°10.90
Hadar	148°33.84	-60°30.17
Menkent	147°55.95	-36°30.14
Arcturus	145°46.58	19°2.61
Rigel Kent.	139°38.14	-60°56.79
Kochab	137°18.63	74°2.77
Zuben'ubi	136°54.47	-16°9.21
Alphecca	126°2.45	26°37.43
Antares	112°14.14	-26°29.47
Atria	107°6.87	-69°4.39
Sabik	102°1.22	-15°45.50
Shaula	96°8.54	-37°7.33
Rasalhague	95°57.25	12°32.30
Eltanin	90°41.25	51°28.86
Kaus Aust.	83°30.78	-34°22.25
Vega	80°32.20	38°48.23
Nunki	75°46.18	-26°15.78
Altair	61°58.76	8°58.15
Peacock	53°3.85	-56°38.76
Deneb	49°24.97	45°22.17
Enif	33°37.75	9°59.63
Al Na'ir	27°31.63	-46°49.79
Fomalhaut	15°13.46	-29°28.84
Scheat	13°44.30	28°13.36
Markab	13°28.95	15°20.70


h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
Sun							HP
0	180°53.99	N17°34.07		264°15.69	13.6'	S15°50.42	-12.6'
1	195°54.02	34.73		278°48.31	13.6'	15°37.86	-12.6'
2	210°54.04	35.39		293°20.95	13.7'	15°25.22	-12.7'
3	225°54.06	· · 36.04		307°53.62	13.7'	15°12.50	-12.8'
4	240°54.09	36.70		322°26.32	13.7'	14°59.70	-12.9'
5	255°54.11	37.35		336°59.05	13.7'	14°46.82	-13.0'
6	270°54.13	N17°38.01		351°31.80	13.8'	S14°33.86	-13.0'
7	285°54.16	38.66		6°4.57	13.8'	14°20.83	-13.1'
8	300°54.18	39.31		20°37.36	13.8'	14°7.72	-13.2'
9	315°54.20	· · 39.97		35°10.18	13.8'	13°54.53	-13.3'
10	330°54.22	40.62		49°43.02	13.9'	13°41.27	-13.3'
11	345°54.24	41.27		64°15.88	13.9'	13°27.93	-13.4'
12	0°54.26	N17°41.92		78°48.76	13.9'	S13°14.52	-13.5'
13	15°54.29	42.57		93°21.66	13.9'	13°1.04	-13.6'
14	30°54.31	43.22		107°54.58	13.9'	12°47.48	-13.6'
15	45°54.33	· · 43.87		122°27.52	14.0'	12°33.86	-13.7'
16	60°54.35	44.52		137°0.47	14.0'	12°20.16	-13.8'
17	75°54.37	45.17		151°33.43	14.0'	12°6.39	-13.8'
18	90°54.39	N17°45.82		166°6.41	14.0'	S11°52.56	-13.9'
19	105°54.41	46.46		180°39.40	14.0'	11°38.65	-14.0'
20	120°54.42	47.11		195°12.41	14.0'	11°24.68	-14.0'
21	135°54.44	· · 47.76		209°45.42	14.0'	11°10.64	-14.1'
22	150°54.46	48.40		224°18.45	14.0'	10°56.54	-14.2'
23	165°54.48	49.05		238°51.48	14.0'	10°42.37	-14.2'
SD = 15.8'			$d = 0.7'$	SD = 15.2'			

Mon	GHA	Dec		GHA	ν	Dec	d
0	180°54.50	N17°49.69		253°24.52	14.0'	S10°28.14	-14.3'
1	195°54.52	50.34		267°57.57	14.1'	10°13.84	-14.4'
2	210°54.53	50.98		282°30.63	14.1'	09°59.48	-14.4'
3	225°54.55	· · 51.62		297°3.69	14.1'	09°45.06	-14.5'
4	240°54.57	52.27		311°36.75	14.1'	09°30.58	-14.5'
5	255°54.59	52.91		326°9.82	14.1'	09°16.04	-14.6'
6	270°54.60	N17°53.55		340°42.89	14.1'	S09°1.44	-14.7'
7	285°54.62	54.19		355°15.96	14.1'	08°46.78	-14.7'
8	300°54.63	54.83		9°49.03	14.1'	08°32.06	-14.8'
9	315°54.65	· · 55.47		24°22.09	14.1'	08°17.29	-14.8'
10	330°54.67	56.11		38°55.15	14.1'	08°2.46	-14.9'
11	345°54.68	56.75		53°28.21	14.1'	07°47.57	-14.9'
12	0°54.70	N17°57.39		68°1.27	14.0'	S07°32.63	-15.0'
13	15°54.71	58.03		82°34.32	14.0'	07°17.64	-15.0'
14	30°54.73	58.67		97°7.36	14.0'	07°2.60	-15.1'
15	45°54.74	· · 59.30		111°40.39	14.0'	06°47.51	-15.1'
16	60°54.75	17°59.94		126°13.41	14.0'	06°32.36	-15.2'
17	75°54.77	18°0.58		140°46.42	14.0'	06°17.17	-15.2'
18	90°54.78	N18°1.21		155°19.42	14.0'	S06°1.92	-15.3'
19	105°54.79	1.85		169°52.40	14.0'	05°46.63	-15.3'
20	120°54.81	2.48		184°25.37	14.0'	05°31.30	-15.4'
21	135°54.82	· · 3.11		198°58.32	13.9'	05°15.91	-15.4'
22	150°54.83	3.75		213°31.26	13.9'	05°0.49	-15.5'
23	165°54.84	4.38		228°4.18	13.9'	04°45.01	-15.5'
SD = 15.8'			$d = 0.6'$	SD = 15.4'			

Tue	GHA	Dec		GHA	ν	Dec	d
0	180°54.86	N18°5.01		242°37.08	13.9'	S04°29.50	-15.6'
1	195°54.87	5.64		257°9.95	13.9'	04°13.94	-15.6'
2	210°54.88	6.28		271°42.81	13.8'	03°58.35	-15.6'
3	225°54.89	· · 6.91		286°15.64	13.8'	03°42.71	-15.7'
4	240°54.90	7.54		300°48.45	13.8'	03°27.04	-15.7'
5	255°54.91	8.17		315°21.23	13.8'	03°11.33	-15.7'
6	270°54.92	N18°8.80		329°53.98	13.7'	S02°55.58	-15.8'
7	285°54.93	9.42		344°26.70	13.7'	02°39.79	-15.8'
8	300°54.94	10.05		358°59.40	13.7'	02°23.97	-15.9'
9	315°54.95	· · 10.68		13°32.06	13.6'	02°8.12	-15.9'
10	330°54.96	11.31		28°4.69	13.6'	01°52.24	-15.9'
11	345°54.97	11.93		42°37.29	13.6'	01°36.32	-15.9'
12	0°54.98	N18°12.56		57°9.85	13.5'	S01°20.38	-16.0'
13	15°54.99	13.18		71°42.37	13.5'	01°4.40	-16.0'
14	30°55.00	13.81		86°14.86	13.4'	00°48.40	-16.0'
15	45°55.00	· · 14.43		100°47.30	13.4'	00°32.37	-16.1'
16	60°55.01	15.06		115°19.71	13.4'	00°16.32	-16.1'
17	75°55.02	15.68		129°52.07	13.3'	S00°0.24	-16.1'
18	90°55.03	N18°16.30		144°24.39	13.3'	N00°15.86	16.1'
19	105°55.03	16.93		158°56.67	13.2'	00°31.99	16.1'
20	120°55.04	17.55		173°28.90	13.2'	00°48.13	16.2'
21	135°55.05	· · 18.17		188°1.08	13.1'	01°4.29	16.2'
22	150°55.05	18.79		202°33.21	13.1'	01°20.47	16.2'
23	165°55.06	19.41		217°5.29	13.0'	01°36.67	16.2'
SD = 15.8'			$d = 0.6'$	SD = 15.7'			

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
10	03:36	03:37	11:56	06:35	18:57	
11	03:38	03:39	11:56	07:20	19:42	
12	03:39	03:40	11:56	08:04	20:27	

May 13, 14, 15 UT (Wed., Thu., Fri.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	230°46.07	148°44.27	N24°37.63	206°49.32	N09°7.49	118°17.57	N22°14.05	220°18.09	N02°6.67						
1	245°48.53	163°43.44	37.89	221°50.00	8.19	133°19.60	13.99	235°20.32	6.76						
2	260°50.99	178°42.61	38.15	236°50.69	8.90	148°21.64	13.93	250°22.54	6.86						
3	275°53.46	193°41.79	•• 38.40	251°51.37	•• 9.61	163°23.67	•• 13.87	265°24.76	•• 6.95						
4	290°55.92	208°40.96	38.66	266°52.06	10.31	178°25.70	13.81	280°26.99	7.05						
5	305°58.39	223°40.13	38.91	281°52.74	11.02	193°27.73	13.75	295°29.21	7.14						
6	321°0.85	238°39.31	N24°39.16	296°53.43	N09°11.73	208°29.76	N22°13.69	310°31.43	N02°7.24						
7	336°3.31	253°38.48	39.41	311°54.11	12.43	223°31.80	13.63	325°33.66	7.33						
8	351°5.78	268°37.65	39.66	326°54.79	13.14	238°33.83	13.57	340°35.88	7.43						
9	6°8.24	283°36.82	•• 39.91	341°55.48	•• 13.85	253°35.86	•• 13.51	355°38.10	•• 7.52						
10	21°10.71	298°36.00	40.15	356°56.16	14.55	268°37.89	13.45	10°40.33	7.62						
11	36°13.17	313°35.17	40.40	11°56.85	15.26	283°39.92	13.39	25°42.55	7.71						
12	51°15.64	328°34.34	N24°40.64	26°57.53	N09°15.96	298°41.95	N22°13.33	40°44.77	N02°7.81						
13	66°18.10	343°33.51	40.89	41°58.22	16.67	313°43.98	13.27	55°47.00	7.90						
14	81°20.56	358°32.68	41.13	56°58.90	17.37	328°46.01	13.21	70°49.22	8.00						
15	96°23.03	13°31.86	•• 41.37	71°59.58	•• 18.08	343°48.04	•• 13.15	85°51.44	•• 8.09						
16	111°25.49	28°31.03	41.61	87°0.27	18.78	358°50.07	13.09	100°53.67	8.19						
17	126°27.96	43°30.20	41.85	102°0.95	19.49	13°52.10	13.03	115°55.89	8.28						
18	141°30.42	58°29.37	N24°42.08	117°1.63	N09°20.19	28°54.13	N22°12.97	130°58.12	N02°8.38						
19	156°32.88	73°28.54	42.32	132°2.32	20.89	43°56.16	12.90	146°0.34	8.47						
20	171°35.35	88°27.71	42.55	147°3.00	21.60	58°58.19	12.84	161°2.57	8.56						
21	186°37.81	103°26.88	•• 42.79	162°3.69	•• 22.30	74°0.22	•• 12.78	176°4.79	•• 8.66						
22	201°40.28	118°26.06	43.02	177°4.37	23.01	89°2.24	12.72	191°7.01	8.75						
23	216°42.74	133°25.23	43.25	192°5.05	23.71	104°4.27	12.66	206°9.24	8.85						
Mer.pass. 08:36			ν-0.8' d0.3' m-3.92			ν0.7' d0.7' m1.24			ν2.0' d-0.1' m-1.95			ν2.2' d0.1' m0.91			
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	231°45.20	148°24.40	N24°43.48	207°5.74	N09°24.41	119°6.30	N22°12.60	221°11.46	N02°8.94						
1	246°47.67	163°23.57	43.71	222°6.42	25.12	134°8.33	12.54	236°13.69	9.04						
2	261°50.13	178°22.74	43.94	237°7.10	25.82	149°10.36	12.48	251°15.91	9.13						
3	276°52.60	193°21.91	•• 44.16	252°7.79	•• 26.52	164°12.38	•• 12.42	266°18.14	•• 9.22						
4	291°55.06	208°21.08	44.39	267°8.47	27.22	179°14.41	12.36	281°20.36	9.32						
5	306°57.52	223°20.25	44.61	282°9.15	27.93	194°16.44	12.30	296°22.59	9.41						
6	321°59.99	238°19.42	N24°44.83	297°9.84	N09°28.63	209°18.47	N22°12.23	311°24.81	N02°9.51						
7	337°2.45	253°18.59	45.05	312°10.52	29.33	224°20.49	12.17	326°27.04	9.60						
8	352°4.92	268°17.76	45.27	327°11.20	30.03	239°22.52	12.11	341°29.26	9.69						
9	7°7.38	283°16.93	•• 45.49	342°11.89	•• 30.73	254°24.55	•• 12.05	356°31.49	•• 9.79						
10	22°9.84	298°16.10	45.71	357°12.57	31.43	269°26.57	11.99	11°33.72	9.88						
11	37°12.31	313°15.27	45.93	12°13.25	32.14	284°28.60	11.93	26°35.94	9.97						
12	52°14.77	328°14.44	N24°46.14	27°13.94	N09°32.84	299°30.63	N22°11.87	41°38.17	N02°10.07						
13	67°17.24	343°13.61	46.35	42°14.62	33.54	314°32.65	11.81	56°40.39	10.16						
14	82°19.70	358°12.78	46.57	57°15.30	34.24	329°34.68	11.74	71°42.62	10.26						
15	97°22.17	13°11.95	•• 46.78	72°15.98	•• 34.94	344°36.70	•• 11.68	86°44.84	•• 10.35						
16	112°24.63	28°11.12	46.99	87°16.67	35.64	359°38.73	11.62	101°47.07	10.44						
17	127°27.09	43°10.29	47.20	102°17.35	36.34	14°40.75	11.56	116°49.30	10.54						
18	142°29.56	58°9.46	N24°47.40	117°18.03	N09°37.04	29°42.78	N22°11.50	131°51.52	N02°10.63						
19	157°32.02	73°8.62	47.61	132°18.72	37.74	44°44.80	11.44	146°53.75	10.72						
20	172°34.49	88°7.79	47.82	147°19.40	38.44	59°46.83	11.37	161°55.97	10.82						
21	187°36.95	103°6.96	•• 48.02	162°20.08	•• 39.14	74°48.85	•• 11.31	176°58.20	•• 10.91						
22	202°39.41	118°6.13	48.22	177°20.76	39.84	89°50.88	11.25	192°0.43	11.00						
23	217°41.88	133°5.30	48.42	192°21.45	40.54	104°52.90	11.19	207°2.65	11.10						
Mer.pass. 08:32			ν-0.8' d0.2' m-3.93			ν0.7' d0.7' m1.25			ν2.0' d-0.1' m-1.95			ν2.2' d0.1' m0.91			
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	232°44.34	148°4.47	N24°48.62	207°22.13	N09°41.23	119°54.93	N22°11.13	222°4.88	N02°11.19						
1	247°46.81	163°3.64	48.82	222°22.81	41.93	134°56.95	11.06	237°7.11	11.28						
2	262°49.27	178°2.81	49.02	237°23.49	42.63	149°58.97	11.00	252°9.33	11.38						
3	277°51.73	193°1.97	•• 49.22	252°24.17	•• 43.33	165°1.00	•• 10.94	267°11.56	•• 11.47						
4	292°54.20	208°1.14	49.41	267°24.86	44.03	180°3.02	10.88	282°13.79	11.56						
5	307°56.66	223°0.31	49.61	282°25.54	44.73	195°5.04	10.82	297°16.02	11.65						
6	322°59.13	237°59.48	N24°49.80	297°26.22	N09°45.42	210°7.07	N22°10.75	312°18.24	N02°11.75						
7	338°1.59	252°58.65	49.99	312°26.90	46.12	225°9.09	10.69	327°20.47	11.84						
8	353°4.05	267°57.82	50.18	327°27.59	46.82	240°11.11	10.63	342°22.70	11.93						
9	8°6.52	282°56.98	•• 50.37	342°28.27	•• 47.52	255°13.13	•• 10.57	357°24.92	•• 12.03						
10	23°8.98	297°56.15	50.56	357°28.95	48.21	270°15.16	10.50	12°27.15	12.12						
11	38°11.45	312°55.32	50.75	12°29.63	48.91	285°17.18	10.44	27°29.38	12.21						
12	53°13.91	327°54.49	N24°50.93	27°30.31	N09°49.61	300°19.20	N22°10.38	42°31.61	N02°12.30						
13	68°16.38	342°53.66	51.12	42°31.00	50.30	315°21.22	10.32	57°33.83	12.40						
14	83°18.84	357°52.82	51.30	57°31.68	51.00	330°23.24	10.25	72°36.06	12.49						
15	98°21.30	12°51.99	•• 51.48	72°32.36	•• 51.69	345°25.27	•• 10.19	87°38.29	•• 12.58						
16	113°23.77	27°51.16	51.66	87°33.04	52.39	0°27.29	10.13	102°40.52	12.67						
17	128°26.23	42°50.33	51.84	102°33.72	53.09	15°29.31	10.07	117°42.75	12.77						
18	143°28.70	57°49.49	N24°52.02	117°34.40	N09°53.78	30°31.33	N22°10.00	132°44.97	N02°12.86						
19	158°31.16	72°48.66	52.20	132°35.09	54.48	45°33.35	9.94	147°47.20	12.95						
20	173°33.62	87°47.83	52.37	147°35.77	55.17	60°35.37	9.88	162°49.43	13.04						
21	188°36.09	102°47.00	•• 52.55	162°36.45	•• 55.87	75°37.39	•• 9.82	177°51.66	•• 13.14						
22	203°38.55	117°46.16	52.72	177°37.13	56.56	90°39.41	9.75	192°53.89	13.23						
23	218°41.02	132°45.33	52.89	192°37.81	57.25	105°41.43	9.69	207°56.12	13.32						
Mer.pass. 08:28			ν-0.8' d0.2' m-3.93			ν0.7' d0.7' m1.25			ν2.0' d-0.1' m-1.95			ν2.2' d0.1' m0.91			

	SHA	Dec
Alpheratz	357°33.87	29°14.00
Ankaa	353°6.36	-42°9.61
Schedar	349°30.22	56°40.71
Diphda	348°46.45	-17°50.48
Achernar	335°19.89	-57°6.03
Hamal	327°50.29	23°35.13
Polaris	313°58.04	89°22.45
Acamar	315°11.36	-40°11.91
Menkar	314°5.33	4°11.53
Mirfak	308°27.20	49°57.23
Aldebaran	290°38.70	16°33.69
Rigel	281°3.12	-8°10.35
Capella	280°20.71	46°1.49
Bellatrix	278°22.00	6°22.36
Elnath	278°0.82	28°37.77
Alnilam	275°36.91	-1°11.17
Betelgeuse	270°51.18	7°24.67
Canopus	263°52.32	-52°42.75
Sirius	258°25.52	-16°45.27
Adhara	255°5.25	-29°0.64
Procyon	244°49.87	5°9.38
Pollux	243°16.16	27°57.79
Avior	234°14.52	-59°35.92
Suhail	222°45.58	-43°32.62
Miaplacidus	221°38.19	-69°49.83
Alphard	217°46.71	-8°46.52
Regulus	207°33.24	11°50.26
Dubhe	193°39.42	61°36.72
Denebola	182°23.66	14°25.43
Gienah	175°42.25	-17°41.49
Acruz	172°58.40	-63°15.00
Gacrux	171°50.02	-57°15.93
Alioth	166°11.57	55°49.09
Spica	158°20.87	-11°18.09
Alkaid	152°50.69	49°10.91
Hadar	148°33.84	-60°30.18
Menkent	147°55.95	-36°30.15
Arcturus	145°46.59	19°2.62
Rigel Kent.	139°38.15	-60°56.80
Kochab	137°18.64	74°2.78
Zuben'ubi	136°54.47	-16°9.21
Alphecca	126°2.45	26°37.44
Antares	112°14.13	-26°29.47
Atria	107°6.85	-69°4.40
Sabik	102°1.21	-15°45.50
Shaula	96°8.52	-37°7.33
Rasalhague	95°57.24	12°32.31
Eltanin	90°41.23	51°28.87
Kaus Aust.	83°30.76	-34°22.25
Vega	80°32.18	38°48.24
Nunki	75°46.16	-26°15.78
Altair	61°58.74	8°56.16
Peacock	53°3.82	-56°38.76
Deneb	49°24.95	45°22.17
Enif	33°37.73	9°59.64
Al Na'ir	27°31.60	-46°49.78
Fomalhaut	15°13.44	-29°28.83
Scheat	13°44.28	28°13.36
Markab	13°28.94	15°20.70
May 13 Wed	SHA	Mer.pass
Venus	277°58.20	14:06
Mars	336°3.25	10:12
Jupiter	247°31.51	16:05
Saturn	349°32.03	09:17
May 14 Thu	SHA	Mer.pass
Venus	276°39.19	14:07
Mars	335°20.53	10:11
Jupiter	247°21.10	16:01
Saturn	349°26.26	09:14
May 15 Fri	SHA	Mer.pass
Venus	275°20.13	14:08
Mars	334°37.79	10:10
Jupiter	247°10.58	15:58
Saturn	349°20.54	09:10
Horizontal parallax		
Venus:		0.1
Mars:		0.1


h		Sun		Moon			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		180°55.07	N18°20.03	231°37.32	13.0'	N01°52.88	16.2' 58.4'
1		195°55.07	20.65	246°9.30	12.9'	02°9.11	16.2' 58.4'
2		210°55.08	21.27	260°41.22	12.9'	02°25.35	16.3' 58.5'
3		225°55.08	· · 21.88	275°13.09	12.8'	02°41.60	16.3' 58.5'
4		240°55.09	22.50	289°44.90	12.7'	02°57.86	16.3' 58.6'
5		255°55.09	23.12	304°16.65	12.7'	03°14.13	16.3' 58.6'
6		270°55.09	N18°23.73	318°48.34	12.6'	N03°30.41	16.3' 58.6'
7		285°55.10	24.35	333°19.96	12.6'	03°46.69	16.3' 58.7'
8		300°55.10	24.97	347°51.53	12.5'	04°2.98	16.3' 58.7'
9		315°55.11	· · 25.58	2°23.03	12.4'	04°19.27	16.3' 58.8'
10		330°55.11	26.19	16°54.46	12.4'	04°35.57	16.3' 58.8'
11		345°55.11	26.81	31°25.83	12.3'	04°51.86	16.3' 58.8'
12		0°55.11	N18°27.42	45°57.13	12.2'	N05°8.15	16.3' 58.9'
13		15°55.12	28.03	60°28.36	12.2'	05°24.44	16.3' 58.9'
14		30°55.12	28.65	74°59.51	12.1'	05°40.73	16.3' 59.0'
15		45°55.12	· · 29.26	89°30.60	12.0'	05°57.00	16.3' 59.0'
16		60°55.12	29.87	104°1.61	11.9'	06°13.28	16.3' 59.0'
17		75°55.12	30.48	118°32.54	11.9'	06°29.54	16.3' 59.1'
18		90°55.13	N18°31.09	133°3.40	11.8'	N06°45.79	16.2' 59.1'
19		105°55.13	31.70	147°34.17	11.7'	07°2.03	16.2' 59.1'
20		120°55.13	32.31	162°4.87	11.6'	07°18.25	16.2' 59.2'
21		135°55.13	· · 32.92	176°35.49	11.5'	07°34.46	16.2' 59.2'
22		150°55.13	33.52	191°6.02	11.4'	07°50.66	16.2' 59.3'
23		165°55.13	34.13	205°36.47	11.4'	08°6.83	16.2' 59.3'
		SD = 15.8' $d = 0.6'$		SD = 15.9'			

Thu		GHA	Dec	GHA	ν	Dec	d HP
0		180°55.13	N18°34.74	220°6.83	11.3'	N08°22.98	16.1' 59.3'
1		195°55.13	35.34	234°37.11	11.2'	08°39.11	16.1' 59.4'
2		210°55.13	35.95	249°7.30	11.1'	08°55.22	16.1' 59.4'
3		225°55.12	· · 36.55	263°37.40	11.0'	09°11.30	16.1' 59.4'
4		240°55.12	37.16	278°7.40	10.9'	09°27.35	16.0' 59.5'
5		255°55.12	37.76	292°37.32	10.8'	09°43.38	16.0' 59.5'
6		270°55.12	N18°38.36	307°7.14	10.7'	N09°59.37	16.0' 59.6'
7		285°55.12	38.97	321°36.86	10.6'	10°15.33	15.9' 59.6'
8		300°55.12	39.57	336°6.49	10.5'	10°31.25	15.9' 59.6'
9		315°55.11	· · 40.17	350°36.02	10.4'	10°47.14	15.8' 59.7'
10		330°55.11	40.77	5°5.46	10.3'	11°2.99	15.8' 59.7'
11		345°55.11	41.37	19°34.79	10.2'	11°18.79	15.8' 59.7'
12		0°55.10	N18°41.97	34°4.02	10.1'	N11°34.56	15.7' 59.8'
13		15°55.10	42.57	48°33.15	10.0'	11°50.28	15.7' 59.8'
14		30°55.10	43.17	63°2.17	9.9'	12°5.95	15.6' 59.8'
15		45°55.09	· · 43.77	77°31.09	9.8'	12°21.58	15.6' 59.9'
16		60°55.09	44.37	91°59.90	9.7'	12°37.15	15.5' 59.9'
17		75°55.08	44.97	106°28.60	9.6'	12°52.67	15.5' 59.9'
18		90°55.08	N18°45.56	120°57.20	9.5'	N13°8.14	15.4' 60.0'
19		105°55.07	46.16	135°25.68	9.4'	13°23.55	15.4' 60.0'
20		120°55.07	46.75	149°54.06	9.3'	13°38.90	15.3' 60.0'
21		135°55.06	· · 47.35	164°22.32	9.1'	13°54.19	15.2' 60.1'
22		150°55.06	47.94	178°50.46	9.0'	14°9.42	15.2' 60.1'
23		165°55.05	48.54	193°18.50	8.9'	14°24.58	15.1' 60.1'
		SD = 15.8' $d = 0.6'$		SD = 16.2'			

Fri		GHA	Dec	GHA	ν	Dec	d HP
0		180°55.04	N18°49.13	207°46.42	8.8'	N14°39.67	15.0' 60.2'
1		195°55.04	49.72	222°14.22	8.7'	14°54.70	15.0' 60.2'
2		210°55.03	50.32	236°41.90	8.6'	15°9.65	14.9' 60.2'
3		225°55.02	· · 50.91	251°9.47	8.4'	15°24.53	14.8' 60.2'
4		240°55.01	51.50	265°36.91	8.3'	15°39.33	14.7' 60.3'
5		255°55.01	52.09	280°4.24	8.2'	15°54.06	14.6' 60.3'
6		270°55.00	N18°52.68	294°31.45	8.1'	N16°8.70	14.6' 60.3'
7		285°54.99	53.27	308°58.53	8.0'	16°23.26	14.5' 60.4'
8		300°54.98	53.86	323°25.49	7.8'	16°37.74	14.4' 60.4'
9		315°54.97	· · 54.45	337°52.33	7.7'	16°52.13	14.3' 60.4'
10		330°54.96	55.04	352°19.04	7.6'	17°6.42	14.2' 60.4'
11		345°54.96	55.62	6°45.63	7.5'	17°20.63	14.1' 60.5'
12		0°54.95	N18°56.21	21°12.10	7.3'	N17°34.74	14.0' 60.5'
13		15°54.94	56.80	35°38.43	7.2'	17°48.76	13.9' 60.5'
14		30°54.93	57.38	50°4.65	7.1'	18°2.67	13.8' 60.5'
15		45°54.92	· · 57.97	64°30.73	7.0'	18°16.49	13.7' 60.6'
16		60°54.91	58.55	78°56.69	6.8'	18°30.20	13.6' 60.6'
17		75°54.90	59.14	93°22.52	6.7'	18°43.80	13.5' 60.6'
18		90°54.88	N18°59.72	107°48.22	6.6'	N18°57.30	13.4' 60.6'
19		105°54.87	19°0.30	122°13.79	6.4'	19°10.69	13.3' 60.7'
20		120°54.86	0.88	136°39.23	6.3'	19°23.96	13.2' 60.7'
21		135°54.85	· · 1.47	151°4.55	6.2'	19°37.12	13.0' 60.7'
22		150°54.84	2.05	165°29.73	6.1'	19°50.15	12.9' 60.7'
23		165°54.83	2.63	179°54.79	5.9'	20°3.07	12.8' 60.7'
		SD = 15.8' $d = 0.6'$		SD = 16.4'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	26-28 20-5%
13	03:40	03:40	11:56	08:50	21:14	
14	03:41	03:40	11:56	09:39	22:05	
15	03:40	03:40	11:56	10:32	23:00	

May 16, 17, 18 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	233°43.48	147°44.50	N24°53.06	207°38.49	N09°57.95	120°43.45	N22°9.63	222°58.35	N02°13.41	Alpheratz	357°33.85 29°14.00
1	248°45.95	162°43.66	53.23	222°39.17	58.64	135°45.47	9.56	238°0.57	13.51	Ankaa	353°6.34 -42°9.60
2	263°48.41	177°42.83	53.40	237°39.85	09°59.34	150°47.49	9.50	253°2.80	13.60	Schedar	349°30.19 56°40.71
3	278°50.87	192°42.00	· · 53.57	252°40.54	10°0.03	165°49.51	· · 9.44	268°5.03	· · 13.69	Diphda	348°46.43 -17°50.47
4	293°53.34	207°41.17	53.73	267°41.22	0.72	180°51.53	9.37	283°7.26	13.78	Achernar	335°19.87 -57°6.01
5	308°55.80	222°40.33	53.90	282°41.90	1.42	195°53.55	9.31	298°9.49	13.87	Hamal	327°50.28 23°35.13
6	323°58.27	237°39.50	N24°54.06	297°42.58	N10°2.11	210°55.57	N22°9.25	313°11.72	N02°13.97	Polaris	313°57.42 89°22.43
7	339°0.73	252°38.67	54.22	312°43.26	2.80	225°57.58	9.18	328°13.95	14.06	Acamar	315°11.36 -40°11.90
8	354°3.19	267°37.83	54.38	327°43.94	3.50	240°59.60	9.12	343°16.18	14.15	Menkar	314°5.32 4°11.54
9	9°5.66	282°37.00	· · 54.54	342°44.62	· · 4.19	256°1.62	· · 9.06	358°18.41	· · 14.24	Mirfak	308°27.18 49°57.22
10	24°8.12	297°36.17	54.70	357°45.30	4.88	271°3.64	8.99	13°20.64	14.33	Aldebaran	290°38.69 16°33.69
11	39°10.59	312°35.33	54.86	12°45.98	5.57	286°5.66	8.93	28°22.87	14.42	Rigel	281°3.12 -8°10.34
12	54°13.05	327°34.50	N24°55.02	27°46.66	N10°6.26	301°7.67	N22°8.87	43°25.10	N02°14.52	Capella	280°20.71 46°1.48
13	69°15.52	342°33.67	55.17	42°47.34	6.96	316°9.69	8.80	58°27.33	14.61	Bellatrix	278°22.01 6°22.36
14	84°17.98	357°32.83	55.32	57°48.03	7.65	331°11.71	8.74	73°29.56	14.70	Elnath	278°0.82 28°37.76
15	99°20.44	12°32.00	· · 55.48	72°48.71	· · 8.34	346°13.73	· · 8.67	88°31.79	· · 14.79	Alnilam	275°36.91 -1°11.17
16	114°22.91	27°31.17	55.63	87°49.39	9.03	1°15.74	8.61	103°34.02	14.88	Betelgeuse	270°51.18 7°24.67
17	129°25.37	42°30.33	55.78	102°50.07	9.72	16°17.76	8.55	118°36.25	14.97	Canopus	263°52.34 -52°42.74
18	144°27.84	57°29.50	N24°55.93	117°50.75	N10°10.41	31°19.78	N22°8.48	133°38.48	N02°15.07	Sirius	258°25.53 -16°45.26
19	159°30.30	72°28.67	56.07	132°51.43	11.10	46°21.79	8.42	148°40.71	15.16	Adhara	255°5.26 -29°0.64
20	174°32.76	87°27.83	56.22	147°52.11	11.79	61°23.81	8.36	163°42.94	15.25	Procyon	244°49.87 5°9.38
21	189°35.23	102°27.00	· · 56.37	162°52.79	· · 12.48	76°25.83	· · 8.29	178°45.17	· · 15.34	Pollux	243°16.17 27°57.78
22	204°37.69	117°26.17	56.51	177°53.47	13.17	91°27.84	8.23	193°47.40	15.43	Avior	234°14.55 -59°35.91
23	219°40.16	132°25.33	56.65	192°54.15	13.86	106°29.86	8.16	208°49.63	15.52	Suhail	222°45.60 -43°32.62
Mer.pass. 08:24		ν-0.8' d0.2' m-3.93		ν0.7' d0.7' m1.25		ν2.0' d-0.1' m-1.94		ν2.2' d0.1' m0.91		Miaplacidus	221°38.23 -69°49.84
										Alphard	217°46.72 -8°46.52
										Regulus	207°33.25 11°50.26
										Dubhe	193°39.45 61°36.73
										Denebola	182°23.66 14°25.44
										Gienah	175°42.25 -17°41.49
										Acrux	172°58.42 -63°15.01
										Gacrux	171°50.03 -57°15.94
										Alioth	166°11.58 55°49.10
										Spica	158°20.87 -11°18.09
										Alkaid	152°50.70 49°10.92
										Hadar	148°33.84 -60°30.20
										Menkent	147°55.95 -36°30.16
										Arcturus	145°46.59 19°2.63
										Rigel Kent.	139°38.14 -60°56.81
										Kochab	137°18.66 74°2.80
										Zuben'ubi	136°54.47 -16°9.20
										Alphecca	126°2.44 26°37.45
										Antares	112°14.12 -26°29.47
										Atria	107°6.82 -69°4.41
										Sabik	102°1.20 -15°45.50
										Shaula	96°8.50 -37°7.33
										Rasalhague	95°57.22 12°32.32
										Eltanin	90°41.21 51°28.89
										Kaus Aust.	83°30.74 -34°22.25
										Vega	80°32.16 38°48.26
										Nunki	75°46.14 -26°15.77
										Altair	61°58.72 8°56.17
										Peacock	53°3.78 -56°38.75
										Deneb	49°24.92 45°22.18
										Enif	33°37.71 9°59.65
										Al Na'ir	27°31.57 -46°49.77
										Fomalhaut	15°13.41 -29°28.82
										Scheat	13°44.26 28°13.37
										Markab	13°28.91 15°20.71
										May 16 Sat	
										Venus	274°1.02 14:10
										Mars	333°55.01 10:09
										Jupiter	246°59.97 15:55
										Saturn	349°14.86 09:07
										May 17 Sun	
										Venus	272°41.88 14:11
										Mars	333°12.21 10:08
										Jupiter	246°49.25 15:52
										Saturn	349°9.24 09:03
										May 18 Mon	
										Venus	271°22.73 14:12
										Mars	332°29.38 10:07
										Jupiter	246°38.44 15:49
										Saturn	349°3.66 09:00
										Horizontal parallax	
										Venus:	0.1
										Mars:	0.1
Mer.pass. 08:16		ν-0.8' d0.1' m-3.93		ν0.7' d0.7' m1.25		ν2.0' d-0.1' m-1.93		ν2.2' d0.1' m0.91			

h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
0	180°54.81	N19°3.21		194°19.72	5.8'	N20°15.87	12.7'	60.8'
1	195°54.80	3.79		208°44.51	5.7'	20°28.54	12.5'	60.8'
2	210°54.79	4.37		223°9.18	5.5'	20°41.08	12.4'	60.8'
3	225°54.77	· · 4.94		237°33.72	5.4'	20°53.49	12.3'	60.8'
4	240°54.76	5.52		251°58.14	5.3'	21°5.77	12.1'	60.8'
5	255°54.75	6.10		266°22.42	5.2'	21°17.92	12.0'	60.9'
6	270°54.73	N19°6.68		280°46.57	5.0'	N21°29.93	11.9'	60.9'
7	285°54.72	7.25		295°10.60	4.9'	21°41.80	11.7'	60.9'
8	300°54.71	7.83		309°34.50	4.8'	21°53.53	11.6'	60.9'
9	315°54.69	· · 8.40		323°58.27	4.6'	22°5.11	11.4'	60.9'
10	330°54.68	8.98		338°21.92	4.5'	22°16.55	11.3'	60.9'
11	345°54.66	9.55		352°45.44	4.4'	22°27.83	11.1'	61.0'
12	0°54.65	N19°10.12		7°8.84	4.3'	N22°38.97	11.0'	61.0'
13	15°54.63	10.70		21°32.11	4.1'	22°49.95	10.8'	61.0'
14	30°54.61	11.27		35°55.26	4.0'	23°0.78	10.7'	61.0'
15	45°54.60	· · 11.84		50°18.29	3.9'	23°11.45	10.5'	61.0'
16	60°54.58	12.41		64°41.19	3.8'	23°21.96	10.3'	61.0'
17	75°54.56	12.98		79°3.98	3.7'	23°32.31	10.2'	61.0'
18	90°54.55	N19°13.55		93°26.65	3.6'	N23°42.49	10.0'	61.1'
19	105°54.53	14.12		107°49.20	3.4'	23°52.51	9.8'	61.1'
20	120°54.51	14.69		122°11.64	3.3'	24°2.35	9.7'	61.1'
21	135°54.50	· · 15.26		136°33.96	3.2'	24°12.03	9.5'	61.1'
22	150°54.48	15.83		150°56.16	3.1'	24°21.53	9.3'	61.1'
23	165°54.46	16.39		165°18.26	3.0'	24°30.86	9.1'	61.1'
SD = 15.8'			$d = 0.6'$	SD = 16.6'				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	180°54.44	N19°16.96		179°40.24	2.9'	N24°40.01	9.0'	61.1'
1	195°54.42	17.53		194°2.12	2.8'	24°48.98	8.8'	61.1'
2	210°54.40	18.09		208°23.89	2.7'	24°57.77	8.6'	61.1'
3	225°54.39	· · 18.66		222°45.56	2.6'	25°6.37	8.4'	61.1'
4	240°54.37	19.22		237°7.12	2.5'	25°14.79	8.2'	61.1'
5	255°54.35	19.79		251°28.58	2.4'	25°23.02	8.0'	61.1'
6	270°54.33	N19°20.35		265°49.95	2.3'	N25°31.07	7.9'	61.1'
7	285°54.31	20.91		280°11.22	2.2'	25°38.92	7.7'	61.1'
8	300°54.29	21.47		294°32.39	2.1'	25°46.58	7.5'	61.1'
9	315°54.27	· · 22.03		308°53.47	2.0'	25°54.04	7.3'	61.2'
10	330°54.25	22.60		323°14.47	1.9'	26°1.31	7.1'	61.2'
11	345°54.22	23.16		337°35.38	1.8'	26°8.39	6.9'	61.2'
12	0°54.20	N19°23.72		351°56.20	1.7'	N26°15.26	6.7'	61.2'
13	15°54.18	24.27		6°16.94	1.7'	26°21.93	6.5'	61.2'
14	30°54.16	24.83		20°37.60	1.6'	26°28.40	6.3'	61.2'
15	45°54.14	· · 25.39		34°58.19	1.5'	26°34.66	6.1'	61.2'
16	60°54.12	25.95		49°18.70	1.4'	26°40.72	5.9'	61.2'
17	75°54.09	26.51		63°39.15	1.4'	26°46.58	5.6'	61.2'
18	90°54.07	N19°27.06		77°59.52	1.3'	N26°52.22	5.4'	61.2'
19	105°54.05	27.62		92°19.83	1.3'	26°57.66	5.2'	61.1'
20	120°54.03	28.17		106°40.09	1.2'	27°2.89	5.0'	61.1'
21	135°54.00	· · 28.73		121°0.28	1.1'	27°7.90	4.8'	61.1'
22	150°53.98	29.28		135°20.41	1.1'	27°12.71	4.6'	61.1'
23	165°53.95	29.83		149°40.50	1.0'	27°17.29	4.4'	61.1'
SD = 15.8'			$d = 0.6'$	SD = 16.7'				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	180°53.93	N19°30.39		164°0.54	1.0'	N27°21.67	4.2'	61.1'
1	195°53.91	30.94		178°20.53	1.0'	27°25.83	3.9'	61.1'
2	210°53.88	31.49		192°40.48	0.9'	27°29.77	3.7'	61.1'
3	225°53.86	· · 32.04		207°0.39	0.9'	27°33.50	3.5'	61.1'
4	240°53.83	32.59		221°20.27	0.8'	27°37.01	3.3'	61.1'
5	255°53.81	33.14		235°40.11	0.8'	27°40.30	3.1'	61.1'
6	270°53.78	N19°33.69		249°59.93	0.8'	N27°43.37	2.9'	61.1'
7	285°53.75	34.24		264°19.72	0.8'	27°46.22	2.6'	61.1'
8	300°53.73	34.79		278°39.50	0.8'	27°48.85	2.4'	61.1'
9	315°53.70	· · 35.34		292°59.25	0.7'	27°51.26	2.2'	61.1'
10	330°53.68	35.88		307°18.99	0.7'	27°53.46	2.0'	61.0'
11	345°53.65	36.43		321°38.73	0.7'	27°55.43	1.7'	61.0'
12	0°53.62	N19°36.98		335°58.45	0.7'	N27°57.18	1.5'	61.0'
13	15°53.60	37.52		350°18.17	0.7'	27°58.70	1.3'	61.0'
14	30°53.57	38.07		4°37.90	0.7'	28°0.01	1.1'	61.0'
15	45°53.54	· · 38.61		18°57.63	0.7'	28°1.10	0.9'	61.0'
16	60°53.51	39.15		33°17.36	0.7'	28°1.96	0.6'	61.0'
17	75°53.48	39.70		47°37.11	0.8'	28°2.61	0.4'	61.0'
18	90°53.46	N19°40.24		61°56.88	0.8'	N28°3.03	0.2'	60.9'
19	105°53.43	40.78		76°16.66	0.8'	28°3.23	-0.0'	60.9'
20	120°53.40	41.32		90°36.47	0.8'	28°3.21	-0.2'	60.9'
21	135°53.37	· · 41.86		104°56.30	0.9'	28°2.97	-0.5'	60.9'
22	150°53.34	42.40		119°16.16	0.9'	28°2.52	-0.7'	60.9'
23	165°53.31	42.94		133°36.06	0.9'	28°1.84	-0.9'	60.9'
SD = 15.8'			$d = 0.6'$	SD = 16.7'				

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

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

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Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°40.90	146°44.49	N25°2.12	208°27.42	N10°47.42	123°8.43	N22°4.97	225°39.04	N02°19.94
1	251°43.37	161°43.66	2.20	223°28.10	48.10	138°10.44	4.90	240°41.27	20.03
2	266°45.83	176°42.83	2.28	238°28.77	48.78	153°12.45	4.83	255°43.51	20.12
3	281°48.30	191°41.99	•• 2.36	253°29.45	•• 49.46	168°14.45	•• 4.77	270°45.74	•• 20.21
4	296°50.76	206°41.16	2.44	268°30.13	50.14	183°16.46	4.70	285°47.98	20.30
5	311°53.23	221°40.33	2.51	283°30.81	50.82	198°18.47	4.63	300°50.21	20.38
6	326°55.69	236°39.50	N25°2.59	298°31.49	N10°51.49	213°20.47	N22°4.57	315°52.45	N02°20.47
7	341°58.15	251°38.66	2.66	313°32.16	52.17	228°22.48	4.50	330°54.68	20.56
8	357°0.62	266°37.83	2.73	328°32.84	52.85	243°24.49	4.43	345°56.92	20.65
9	12°3.08	281°37.00	•• 2.80	343°33.52	•• 53.53	258°26.49	•• 4.37	0°59.16	•• 20.74
10	27°5.55	296°36.16	2.87	358°34.19	54.21	273°28.50	4.30	16°1.39	20.83
11	42°8.01	311°35.33	2.94	13°34.87	54.88	288°30.51	4.23	31°3.63	20.92
12	57°10.48	326°34.50	N25°3.01	28°35.55	N10°55.56	303°32.51	N22°4.17	46°5.86	N02°21.00
13	72°12.94	341°33.67	3.07	43°36.23	56.24	318°34.52	4.10	61°8.10	21.09
14	87°15.40	356°32.84	3.14	58°36.90	56.92	333°36.52	4.03	76°10.34	21.18
15	102°17.87	11°32.00	•• 3.20	73°37.58	•• 57.59	348°38.53	•• 3.97	91°12.57	•• 21.27
16	117°20.33	26°31.17	3.26	88°38.26	58.27	3°40.53	3.90	106°14.81	21.36
17	132°22.80	41°30.34	3.33	103°38.93	58.95	18°42.54	3.83	121°17.05	21.45
18	147°25.26	56°29.51	N25°3.39	118°39.61	N10°59.62	33°44.54	N22°3.77	136°19.28	N02°21.53
19	162°27.73	71°28.68	3.44	133°40.29	11°0.30	48°46.55	3.70	151°21.52	21.62
20	177°30.19	86°27.84	3.50	148°40.96	0.97	63°48.55	3.63	166°23.76	21.71
21	192°32.65	101°27.01	•• 3.56	163°41.64	•• 1.65	78°50.56	•• 3.56	181°25.99	•• 21.80
22	207°35.12	116°26.18	3.61	178°42.32	2.32	93°52.56	3.50	196°28.23	21.89
23	222°37.58	131°25.35	3.67	193°42.99	3.00	108°54.56	3.43	211°30.47	21.98
Mer.pass. 08:12		ν-0.8' d0.1' m-3.93		ν0.7' d0.7' m1.25		ν2.0' d-0.1' m-1.93		ν2.2' d0.1' m0.90	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°40.05	146°24.52	N25°3.72	208°43.67	N11°3.67	123°56.57	N22°3.36	226°32.70	N02°22.06
1	252°42.51	161°23.69	3.77	223°44.35	4.35	138°58.57	3.29	241°34.94	22.15
2	267°44.97	176°22.85	3.82	238°45.02	5.02	154°0.58	3.23	256°37.18	22.24
3	282°47.44	191°22.02	•• 3.87	253°45.70	•• 5.70	169°2.58	•• 3.16	271°39.42	•• 22.33
4	297°49.90	206°21.19	3.91	268°46.38	6.37	184°4.58	3.09	286°41.65	22.42
5	312°52.37	221°20.36	3.96	283°47.05	7.05	199°6.58	3.02	301°43.89	22.50
6	327°54.83	236°19.53	N25°4.01	298°47.73	N11°7.72	214°8.59	N22°2.96	316°46.13	N02°22.59
7	342°57.30	251°18.70	4.05	3					

<https://pypi.org/project/skyalmanac/>

h	Sun			Moon			
Tue	GHA	Dec		GHA	ν	Dec	d HP
0	180°53.28	N19°43.48		147°55.99	1.0'	N28°0.95	-1.1' 60.8'
1	195°53.25	44.02		162°15.97	1.0'	27°59.83	-1.3' 60.8'
2	210°53.22	44.56		176°35.99	1.1'	27°58.51	-1.5' 60.8'
3	225°53.19	45.09		190°56.05	1.1'	27°56.96	-1.8' 60.8'
4	240°53.16	45.63		205°16.17	1.2'	27°55.20	-2.0' 60.8'
5	255°53.13	46.17		219°36.34	1.2'	27°53.22	-2.2' 60.7'
6	270°53.10	N19°46.70		233°56.57	1.3'	N27°51.03	-2.4' 60.7'
7	285°53.07	47.24		248°16.86	1.4'	27°48.63	-2.6' 60.7'
8	300°53.04	47.77		262°37.22	1.4'	27°46.02	-2.8' 60.7'
9	315°53.00	48.30		276°57.64	1.5'	27°43.20	-3.0' 60.7'
10	330°52.97	48.84		291°18.13	1.6'	27°40.16	-3.2' 60.6'
11	345°52.94	49.37		305°38.70	1.6'	27°36.92	-3.4' 60.6'
12	0°52.91	N19°49.90		319°59.34	1.7'	N27°33.47	-3.7' 60.6'
13	15°52.87	50.43		334°20.07	1.8'	27°29.82	-3.9' 60.6'
14	30°52.84	50.96		348°40.87	1.9'	27°25.96	-4.1' 60.5'
15	45°52.81	51.49		3°17.6	2.0'	27°21.90	-4.3' 60.5'
16	60°52.77	52.02		17°22.74	2.1'	27°17.63	-4.5' 60.5'
17	75°52.74	52.55		31°43.81	2.2'	27°13.17	-4.7' 60.5'
18	90°52.71	N19°53.08		46°4.97	2.3'	N27°8.51	-4.9' 60.4'
19	105°52.67	53.61		60°26.23	2.4'	27°3.65	-5.1' 60.4'
20	120°52.64	54.13		74°47.59	2.5'	26°58.60	-5.2' 60.4'
21	135°52.60	54.66		89°9.04	2.6'	26°53.35	-5.4' 60.4'
22	150°52.57	55.19		103°30.60	2.7'	26°47.91	-5.6' 60.3'
23	165°52.53	55.71		117°52.27	2.8'	26°42.28	-5.8' 60.3'
SD = 15.8'			$d = 0.5'$	SD = 16.6'			

Wed	GHA	Dec		GHA	ν	Dec	d HP
0	180°52.50	N19°56.24		132°14.04	2.9'	N26°36.46	-6.0' 60.3'
1	195°52.46	56.76		146°35.93	3.0'	26°30.45	-6.2' 60.3'
2	210°52.43	57.28		160°57.92	3.1'	26°24.26	-6.4' 60.2'
3	225°52.39	57.81		175°20.03	3.2'	26°17.89	-6.6' 60.2'
4	240°52.35	58.33		189°42.26	3.3'	26°11.33	-6.7' 60.2'
5	255°52.32	58.85		204°4.60	3.5'	26°4.59	-6.9' 60.1'
6	270°52.28	N19°59.37		218°27.06	3.6'	N25°57.68	-7.1' 60.1'
7	285°52.24	19°59.89		232°49.64	3.7'	25°50.59	-7.3' 60.1'
8	300°52.21	20°0.41		247°12.34	3.8'	25°43.33	-7.4' 60.1'
9	315°52.17	0.93		261°35.17	4.0'	25°35.90	-7.6' 60.0'
10	330°52.13	1.45		275°58.12	4.1'	25°28.29	-7.8' 60.0'
11	345°52.09	1.97		290°21.20	4.2'	25°20.52	-7.9' 60.0'
12	0°52.06	N20°2.49		304°44.41	4.3'	N25°12.58	-8.1' 59.9'
13	15°52.02	3.00		319°7.75	4.5'	25°4.48	-8.3' 59.9'
14	30°51.98	3.52		333°31.21	4.6'	24°56.22	-8.4' 59.9'
15	45°51.94	4.04		347°54.81	4.7'	24°47.80	-8.6' 59.8'
16	60°51.90	4.55		2°18.54	4.9'	24°39.22	-8.7' 59.8'
17	75°51.86	5.07		16°42.40	5.0'	24°30.48	-8.9' 59.8'
18	90°51.82	N20°5.58		31°6.40	5.1'	N24°21.59	-9.0' 59.8'
19	105°51.78	6.09		45°30.53	5.3'	24°12.55	-9.2' 59.7'
20	120°51.74	6.61		59°54.80	5.4'	24°3.36	-9.3' 59.7'
21	135°51.70	7.12		74°19.20	5.5'	23°54.03	-9.5' 59.7'
22	150°51.66	7.63		88°43.74	5.7'	23°44.55	-9.6' 59.6'
23	165°51.62	8.14		103°8.41	5.8'	23°34.92	-9.8' 59.6'
SD = 15.8'			$d = 0.5'$	SD = 16.4'			

Thu	GHA	Dec		GHA	ν	Dec	d HP
0	180°51.58	N20°8.65		117°33.22	5.9'	N23°25.16	-9.9' 59.6'
1	195°51.54	9.16		131°58.17	6.1'	23°15.26	-10.0' 59.5'
2	210°51.50	9.67		146°23.26	6.2'	23°5.22	-10.2' 59.5'
3	225°51.46	10.18		160°48.49	6.4'	22°55.05	-10.3' 59.5'
4	240°51.42	10.69		175°13.85	6.5'	22°44.74	-10.4' 59.4'
5	255°51.38	11.19		189°39.35	6.6'	22°34.31	-10.6' 59.4'
6	270°51.33	N20°11.70		204°4.99	6.8'	N22°23.74	-10.7' 59.4'
7	285°51.29	12.21		218°30.77	6.9'	22°13.05	-10.8' 59.3'
8	300°51.25	12.71		232°56.69	7.1'	22°2.24	-10.9' 59.3'
9	315°51.21	13.22		247°22.74	7.2'	21°51.31	-11.1' 59.3'
10	330°51.16	13.72		261°48.93	7.3'	21°40.25	-11.2' 59.2'
11	345°51.12	14.23		276°15.26	7.5'	21°29.08	-11.3' 59.2'
12	0°51.08	N20°14.73		290°41.73	7.6'	N21°17.80	-11.4' 59.1'
13	15°51.03	15.23		305°8.33	7.7'	21°6.40	-11.5' 59.1'
14	30°50.99	15.73		319°35.07	7.9'	20°54.89	-11.6' 59.1'
15	45°50.95	16.24		334°1.95	8.0'	20°43.27	-11.7' 59.0'
16	60°50.90	16.74		348°28.96	8.1'	20°31.54	-11.8' 59.0'
17	75°50.86	17.24		2°56.11	8.3'	20°19.71	-11.9' 59.0'
18	90°50.81	N20°17.74		17°23.39	8.4'	N20°7.77	-12.0' 58.9'
19	105°50.77	18.23		31°50.81	8.5'	19°55.74	-12.1' 58.9'
20	120°50.72	18.73		46°18.35	8.7'	19°43.60	-12.2' 58.9'
21	135°50.68	19.23		60°46.03	8.8'	19°31.37	-12.3' 58.8'
22	150°50.63	19.73		75°13.85	8.9'	19°19.04	-12.4' 58.8'
23	165°50.59	20.22		89°41.79	9.1'	19°6.62	-12.5' 58.8'
SD = 15.8'			$d = 0.5'$	SD = 16.2'			

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

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

Day	Sun			Moon		Age 3-5 7-24%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	
19	03:33	03:32	11:56	14:47	02:14	
20	03:30	03:28	11:57	15:50	03:19	
21	03:26	03:24	11:57	16:48	04:20	

May 22, 23, 24 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	239°38.33	145°44.71	N25°4.77	209°16.09	N11°35.82	125°32.57	N22°0.07	228°20.20	N02°26.23			Alpheratz	357°33.79 29°14.01
1	254°40.79	160°43.88	4.76	224°16.76	36.48	140°34.57	22°0.00	243°22.44	26.32			Ankaa	353°6.28 -42°9.56
2	269°43.26	175°43.06	4.75	239°17.43	37.15	155°36.56	21°59.93	258°24.68	26.40			Schedar	349°30.12 56°40.71
3	284°45.72	190°42.23	· · 4.74	254°18.11	· · 37.81	170°38.56	· · 59.87	273°26.92	· · 26.49			Diphda	348°46.38 -17°50.44
4	299°48.18	205°41.40	4.73	269°18.78	38.48	185°40.55	59.80	288°29.16	26.58			Achernar	335°19.82 -57°5.97
5	314°50.65	220°40.58	4.72	284°19.46	39.14	200°42.55	59.73	303°31.41	26.66			Hamal	327°50.24 23°35.14
6	329°53.11	235°39.75	N25°4.70	299°20.13	N11°39.80	215°44.55	N21°59.66	318°33.65	N02°26.75			Polaris	313°56.11 89°22.41
7	344°55.58	250°38.93	4.69	314°20.80	40.47	230°46.54	59.59	333°35.89	26.83			Acamar	315°11.33 -40°11.86
8	359°58.04	265°38.10	4.67	329°21.48	41.13	245°48.54	59.52	348°38.13	26.92			Menkar	314°5.29 4°11.55
9	15°0.50	280°37.28	· · 4.65	344°22.15	· · 41.79	260°50.53	· · 59.45	3°40.38	· · 27.00			Mirfak	308°27.14 49°57.21
10	30°2.97	295°36.45	4.63	359°22.82	42.45	275°52.53	59.38	18°42.62	27.09			Aldebaran	290°38.67 16°33.70
11	45°5.43	310°35.63	4.61	14°23.50	43.12	290°54.52	59.31	33°44.86	27.17			Rigel	281°3.11 -8°10.32
12	60°7.90	325°34.80	N25°4.59	29°24.17	N11°43.78	305°56.52	N21°59.24	48°47.10	N02°27.26			Capella	280°20.69 46°1.47
13	75°10.36	340°33.98	4.57	44°24.84	44.44	320°58.51	59.17	63°49.35	27.34			Bellatrix	278°21.99 6°22.37
14	90°12.83	355°33.15	4.54	59°25.52	45.10	336°0.50	59.10	78°51.59	27.43			Elnath	278°0.81 28°37.76
15	105°15.29	10°32.33	· · 4.52	74°26.19	· · 45.76	351°2.50	· · 59.03	93°53.83	· · 27.51			Alnilam	275°36.90 -1°11.16
16	120°17.75	25°31.50	4.49	89°26.86	46.42	6°4.49	58.96	108°56.08	27.60			Betelgeuse	270°51.17 7°24.68
17	135°20.22	40°30.68	4.46	104°27.54	47.08	21°6.49	58.89	123°58.32	27.68			Canopus	263°52.36 -52°42.71
18	150°22.68	55°29.85	N25°4.43	119°28.21	N11°47.75	36°8.48	N21°58.81	139°0.56	N02°27.77			Sirius	258°25.53 -16°45.25
19	165°25.15	70°29.03	4.40	134°28.88	48.41	51°10.47	58.74	154°2.81	27.85			Adhara	255°5.27 -29°0.62
20	180°27.61	85°28.21	4.37	149°29.56	49.07	66°12.47	58.67	169°5.05	27.94			Procyon	244°49.88 5°9.38
21	195°30.07	100°27.38	· · 4.34	164°30.23	· · 49.73	81°14.46	· · 58.60	184°7.29	· · 28.02			Pollux	243°16.17 27°57.78
22	210°32.54	115°26.56	4.30	179°30.90	50.39	96°16.45	58.53	199°9.54	28.11			Avior	234°14.60 -59°35.91
23	225°35.00	130°25.74	4.27	194°31.58	51.04	111°18.45	58.46	214°11.78	28.19			Suhail	222°45.62 -43°32.62
Mer.pass. 08:00		ν-0.8' d-0.0' m-3.93		ν0.7' d0.7' m1.26		ν2.0' d-0.1' m-1.92		ν2.2' d0.1' m0.90					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	240°37.47	145°24.91	N25°4.23	209°32.25	N11°51.70	126°20.44	N21°58.39	229°14.03	N02°28.28			Miaplacidus	221°38.32 -69°49.84
1	255°39.93	160°24.09	4.19	224°32.92	52.36	141°22.43	58.32	244°16.27	28.36			Alphard	217°46.72 -8°46.52
2	270°42.39	175°23.27	4.15	239°33.59	53.02	156°24.42	58.25	259°18.51	28.45			Regulus	207°33.26 11°50.26
3	285°44.86	190°22.44	· · 4.11	254°34.27	· · 53.68	171°26.42	· · 58.18	274°20.76	· · 28.53			Dubhe	193°39.49 61°36.73
4	300°47.32	205°21.62	4.07	269°34.94	54.34	186°28.41	58.11	289°23.00	28.61			Denebola	182°23.67 14°25.44
5	315°49.79	220°20.80	4.03	284°35.61	55.00	201°30.40	58.04	304°25.25	28.70			Gienah	175°42.26 -17°41.50
6	330°52.25	235°19.98	N25°3.98	299°36.28	N11°55.66	216°32.39	N21°57.97	319°27.49	N02°28.78			Acrux	172°58.44 -63°15.04
7	345°54.72	250°19.16	3.94	314°36.96	56.31	231°34.38	57.90	334°29.74	28.87			Gacrux	171°50.05 -57°15.96
8	0°57.18	265°18.33	3.89	329°37.63	56.97	246°36.38	57.82	349°31.98	28.95			Alioth	166°11.60 55°49.12
9	15°59.64	280°17.51	· · 3.84	344°38.30	· · 57.63	261°38.37	· · 57.75	4°34.22	· · 29.04			Spica	158°20.87 -11°18.09
10	31°2.11	295°16.69	3.79	359°38.97	58.28	276°40.36	57.68	19°36.47	29.12			Alkaid	152°50.71 49°10.94
11	46°4.57	310°15.87	3.74	14°39.64	58.94	291°42.35	57.61	34°38.71	29.20			Hadar	148°33.83 -60°30.22
12	61°7.04	325°15.05	N25°3.69	29°40.32	N11°59.60	306°44.34	N21°57.54	49°40.96	N02°29.29			Menkent	147°55.94 -36°30.17
13	76°9.50	340°14.23	3.64	44°40.99	12°0.25	321°46.33	57.47	64°43.21	29.37			Arcturus	145°46.58 19°2.65
14	91°11.96	355°13.41	3.59	59°41.66	0.91	336°48.32	57.40	79°45.45	29.46			Rigil Kent.	139°38.13 -60°56.84
15	106°14.43	10°12.59	· · 3.53	74°42.33	· · 1.57	351°50.31	· · 57.33	94°47.70	· · 29.54			Kochab	137°18.69 74°2.83
16	121°16.89	25°11.77	3.47	89°43.00	2.22	6°52.30	57.26	109°49.94	29.62			Zuben'ubi	136°54.45 -16°9.21
17	136°19.36	40°10.95	3.42	104°43.68	2.88	21°54.29	57.18	124°52.19	29.71			Alphecca	126°2.42 26°37.47
18	151°21.82	55°10.13	N25°3.36	119°44.35	N12°3.53	36°56.29	N21°57.11	139°54.43	N02°29.79			Antares	112°14.08 -26°29.48
19	166°24.28	70°9.31	3.30	134°45.02	4.19	51°58.28	57.04	154°56.68	29.88			Atria	107°6.74 -69°4.44
20	181°26.75	85°8.49	3.24	149°45.69	4.84	67°0.27	56.97	169°58.92	29.96			Sabik	102°1.16 -15°45.50
21	196°29.21	100°7.67	· · 3.17	164°46.36	· · 5.50	82°2.25	· · 56.90	185°1.17	· · 30.04			Shaula	96°8.45 -37°7.34
22	211°31.68	115°6.85	3.11	179°47.03	6.15	97°4.24	56.83	200°3.42	30.13			Rasalhague	95°57.19 12°32.34
23	226°34.14	130°6.03	3.04	194°47.71	6.81	112°6.23	56.75	215°5.66	30.21			Eltanin	90°41.18 51°28.92
Mer.pass. 07:56		ν-0.8' d-0.0' m-3.93		ν0.7' d0.7' m1.26		ν2.0' d-0.1' m-1.91		ν2.2' d0.1' m0.90					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	241°36.60	145°5.21	N25°2.98	209°48.38	N12°7.46	127°8.22	N21°56.68	230°7.91	N02°30.29			Kaus Aust.	83°30.68 -34°22.25
1	256°39.07	160°4.39	2.91	224°49.05	8.11	142°10.21	56.61	245°10.16	30.38			Vega	80°32.11 38°48.28
2	271°41.53	175°3.57	2.84	239°49.72	8.77	157°12.20	56.54	260°12.40	30.46			Nunki	75°46.09 -26°15.77
3	286°44.00	190°2.75	· · 2.77	254°50.39	· · 9.42	172°14.19	· · 56.47	275°14.65	· · 30.54			Altair	61°58.66 8°56.19
4	301°46.46	205°1.94	2.70	269°51.06	10.07	187°16.18	56.40	290°16.89	30.63			Peacock	53°3.69 -56°38.75
5	316°48.93	220°1.12	2.63	284°51.73	10.73	202°18.17	56.32	305°19.14	30.71			Deneb	49°24.85 45°22.21
6	331°51.39	235°0.30	N25°2.55	299°52.40	N12°11.38	217°20.16	N21°56.25	320°21.39	N02°30.79			Enif	33°37.65 9°59.67
7	346°53.85	249°59.48	2.48	314°53.07	12.03	232°22.14	56.18	335°23.64	30.88			Al Na'ir	27°31.50 -46°49.75
8	1°56.32	264°58.67	2.40	329°53.75	12.68	247°24.13	56.11	350°25.88	30.96			Fomalhaut	15°13.35 -29°28.80
9	16°58.78	279°57.85	· · 2.33	344°54.42	· · 13.33	262°26.12	· · 56.04	5°28.13	· · 31.04			Scheat	13°44.20 28°13.39
10	32°1.25	294°57.03	2.25	359°55									

h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.54	N20°20.72	104°9.86	9.2'	N18°54.11	-12.6'	58.7'
1	195°50.49	21.22	118°38.06	9.3'	18°41.51	-12.7'	58.7'
2	210°50.45	21.71	133°6.40	9.5'	18°28.82	-12.8'	58.6'
3	225°50.40	· · 22.20	147°34.85	9.6'	18°16.05	-12.9'	58.6'
4	240°50.35	22.70	162°3.44	9.7'	18°3.19	-12.9'	58.6'
5	255°50.31	23.19	176°32.15	9.8'	17°50.25	-13.0'	58.5'
6	270°50.26	N20°23.68	191°0.98	10.0'	N17°37.23	-13.1'	58.5'
7	285°50.21	24.17	205°29.94	10.1'	17°24.13	-13.2'	58.5'
8	300°50.16	24.67	219°59.02	10.2'	17°10.96	-13.2'	58.4'
9	315°50.12	· · 25.16	234°28.22	10.3'	16°57.71	-13.3'	58.4'
10	330°50.07	25.65	248°57.54	10.4'	16°44.39	-13.4'	58.4'
11	345°50.02	26.14	263°26.98	10.6'	16°31.00	-13.5'	58.3'
12	0°49.97	N20°26.62	277°56.54	10.7'	N16°17.53	-13.5'	58.3'
13	15°49.92	27.11	292°26.22	10.8'	16°4.01	-13.6'	58.3'
14	30°49.87	27.60	306°56.01	10.9'	15°50.41	-13.7'	58.2'
15	45°49.82	· · 28.09	321°25.92	11.0'	15°36.75	-13.7'	58.2'
16	60°49.77	28.57	335°55.93	11.1'	15°23.03	-13.8'	58.1'
17	75°49.72	29.06	350°26.06	11.2'	15°9.25	-13.8'	58.1'
18	90°49.67	N20°29.54	4°56.31	11.4'	N14°55.40	-13.9'	58.1'
19	105°49.62	30.03	19°26.66	11.5'	14°41.50	-14.0'	58.0'
20	120°49.57	30.51	33°57.12	11.6'	14°27.55	-14.0'	58.0'
21	135°49.52	· · 30.99	48°27.68	11.7'	14°13.54	-14.1'	58.0'
22	150°49.47	31.48	62°58.35	11.8'	13°59.47	-14.1'	57.9'
23	165°49.42	31.96	77°29.13	11.9'	13°45.36	-14.2'	57.9'
SD = 15.8'		$d = 0.5'$	SD = 16.0'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.37	N20°32.44	92°0.01	12.0'	N13°31.20	-14.2'	57.9'
1	195°49.32	32.92	106°30.99	12.1'	13°16.98	-14.3'	57.8'
2	210°49.27	33.40	121°2.07	12.2'	13°2.72	-14.3'	57.8'
3	225°49.21	· · 33.88	135°33.25	12.3'	12°48.42	-14.3'	57.8'
4	240°49.16	34.36	150°4.53	12.4'	12°34.07	-14.4'	57.7'
5	255°49.11	34.84	164°35.90	12.5'	12°19.68	-14.4'	57.7'
6	270°49.06	N20°35.31	179°7.37	12.6'	N12°5.25	-14.5'	57.7'
7	285°49.01	35.79	193°38.93	12.7'	11°50.78	-14.5'	57.6'
8	300°48.95	36.27	208°10.58	12.7'	11°36.27	-14.5'	57.6'
9	315°48.90	· · 36.74	222°42.33	12.8'	11°21.72	-14.6'	57.5'
10	330°48.85	37.22	237°14.16	12.9'	11°7.14	-14.6'	57.5'
11	345°48.79	37.69	251°46.08	13.0'	10°52.53	-14.6'	57.5'
12	0°48.74	N20°38.17	266°18.09	13.1'	N10°37.88	-14.7'	57.4'
13	15°48.68	38.64	280°50.18	13.2'	10°23.20	-14.7'	57.4'
14	30°48.63	39.11	295°22.36	13.3'	10°8.49	-14.7'	57.4'
15	45°48.58	· · 39.58	309°54.61	13.3'	09°53.75	-14.8'	57.3'
16	60°48.52	40.05	324°26.95	13.4'	09°38.99	-14.8'	57.3'
17	75°48.47	40.53	338°59.37	13.5'	09°24.20	-14.8'	57.3'
18	90°48.41	N20°41.00	353°31.87	13.6'	N09°9.38	-14.8'	57.2'
19	105°48.36	41.47	8°4.44	13.6'	08°54.54	-14.9'	57.2'
20	120°48.30	41.93	22°37.09	13.7'	08°39.68	-14.9'	57.2'
21	135°48.24	· · 42.40	37°9.81	13.8'	08°24.80	-14.9'	57.1'
22	150°48.19	42.87	51°42.60	13.9'	08°9.89	-14.9'	57.1'
23	165°48.13	43.34	66°15.47	13.9'	07°54.97	-14.9'	57.1'
SD = 15.8'		$d = 0.5'$	SD = 15.8'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.08	N20°43.80	80°48.40	14.0'	N07°40.03	-15.0'	57.0'
1	195°48.02	44.27	95°21.40	14.1'	07°25.07	-15.0'	57.0'
2	210°47.96	44.73	109°54.47	14.1'	07°10.10	-15.0'	57.0'
3	225°47.91	· · 45.20	124°27.60	14.2'	06°55.12	-15.0'	56.9'
4	240°47.85	45.66	139°0.80	14.3'	06°40.12	-15.0'	56.9'
5	255°47.79	46.13	153°34.06	14.3'	06°25.11	-15.0'	56.9'
6	270°47.73	N20°46.59	168°7.38	14.4'	N06°10.09	-15.0'	56.8'
7	285°47.68	47.05	182°40.76	14.4'	05°55.06	-15.0'	56.8'
8	300°47.62	47.51	197°14.20	14.5'	05°40.02	-15.0'	56.8'
9	315°47.56	· · 47.97	211°47.69	14.5'	05°24.97	-15.1'	56.8'
10	330°47.50	48.43	226°21.24	14.6'	05°9.91	-15.1'	56.7'
11	345°47.44	48.89	240°54.84	14.7'	04°54.85	-15.1'	56.7'
12	0°47.38	N20°49.35	255°28.50	14.7'	N04°39.79	-15.1'	56.7'
13	15°47.32	49.81	270°2.21	14.8'	04°24.72	-15.1'	56.6'
14	30°47.26	50.27	284°35.97	14.8'	04°9.65	-15.1'	56.6'
15	45°47.21	· · 50.72	299°9.77	14.9'	03°54.58	-15.1'	56.6'
16	60°47.15	51.18	313°43.62	14.9'	03°39.51	-15.1'	56.5'
17	75°47.09	51.64	328°17.52	14.9'	03°24.44	-15.1'	56.5'
18	90°47.03	N20°52.09	342°51.47	15.0'	N03°9.37	-15.1'	56.5'
19	105°46.97	52.55	357°25.45	15.0'	02°54.31	-15.1'	56.4'
20	120°46.90	53.00	11°59.48	15.1'	02°39.24	-15.1'	56.4'
21	135°46.84	· · 53.45	26°33.55	15.1'	02°24.18	-15.1'	56.4'
22	150°46.78	53.91	41°7.65	15.1'	02°9.13	-15.0'	56.4'
23	165°46.72	54.36	55°41.80	15.2'	01°54.08	-15.0'	56.3'
SD = 15.8'		$d = 0.5'$	SD = 15.6'				

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

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

Day	Sun		Mer. Pass	Moon		Age 6-8 34-56%
	Eqn.of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
22	03:22	03:20	11:57	17:40	05:14	<

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	242°35.74		144°45.62	N25°1.02	210°4.47	N12°23.08	127°55.92	N21°54.95	231°1.85	N02°32.28
1	257°38.21		159°44.80	0.92	225°5.14	23.73	142°57.91	54.87	246°4.10	32.36
2	272°40.67		174°43.99	0.82	240°5.81	24.38	157°59.90	54.80	261°6.35	32.45
3	287°43.13		189°43.18	· · 0.72	255°6.48	· · 25.03	173°1.88	· · 54.73	276°8.60	· · 32.53
4	302°45.60		204°42.36	0.62	270°7.15	25.68	188°3.87	54.66	291°10.84	32.61
5	317°48.06		219°41.55	0.52	285°7.82	26.32	203°5.85	54.58	306°13.09	32.69
6	332°50.53		234°40.74	N25°0.42	300°8.49	N12°26.97	218°7.84	N21°54.51	321°15.34	N02°32.77
7	347°52.99		249°39.92	0.31	315°9.16	27.62	233°9.82	54.44	336°17.59	32.86
8	2°55.46		264°39.11	0.21	330°9.83	28.26	248°11.81	54.36	351°19.84	32.94
9	17°57.92		279°38.30	· · 0.10	345°10.50	· · 28.91	263°13.79	· · 54.29	6°22.09	· · 33.02
10	33°0.38		294°37.49	24°59.99	0°11.17	29.55	278°15.78	54.22	21°24.34	33.10
11	48°2.85		309°36.68	24°59.88	15°11.84	30.20	293°17.76	54.14	36°26.59	33.18
12	63°5.31		324°35.87	N24°59.77	30°12.51	N12°30.85	308°19.74	N21°54.07	51°28.84	N02°33.27
13	78°7.78		339°35.06	59.66	45°13.18	31.49	323°21.73	54.00	66°31.09	33.35
14	93°10.24		354°34.24	59.55	60°13.85	32.14	338°23.71	53.92	81°33.34	33.43
15	108°12.70		9°33.43	· · 59.43	75°14.51	· · 32.78	353°25.70	· · 53.85	96°35.59	· · 33.51
16	123°15.17		24°32.62	59.32	90°15.18	33.43	8°27.68	53.78	111°37.84	33.59
17	138°17.63		39°31.81	59.20	105°15.85	34.07	23°29.66	53.70	126°40.09	33.67
18	153°20.10		54°31.00	N24°59.08	120°16.52	N12°34.71	38°31.65	N21°53.63	141°42.34	N02°33.75
19	168°22.56		69°30.19	58.96	135°17.19	35.36	53°33.63	53.56	156°44.59	33.84
20	183°25.02		84°29.38	58.84	150°17.86	36.00	68°35.61	53.48	171°46.84	33.92
21	198°27.49		99°28.58	· · 58.72	165°18.53	· · 36.65	83°37.60	· · 53.41	186°49.09	· · 34.00
22	213°29.95		114°27.77	58.60	180°19.20	37.29	98°39.58	53.33	201°51.34	34.08
23	228°32.42		129°26.96	58.47	195°19.87	37.93	113°41.56	53.26	216°53.60	34.16
Mer.pass. 07:48										
ν-0.8' d-0.1' m-3.94										
ν0.7' d0.6' m1.26										
ν2.0' d-0.1' m-1.91										
ν2.2' d0.1' m0.89										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	243°34.88		144°26.15	N24°58.35	210°20.53	N12°38.58	128°43.54	N21°53.19	231°55.85	N02°34.24
1	258°37.34		159°25.34	58.22	225°21.20	39.22	143°45.53	53.11	246°58.10	34.32
2	273°39.81		174°24.53	58.09	240°21.87	39.86	158°47.51	53.04	262°0.35	34.40
3	288°42.27		189°23.73	· · 57.97	255°22.54	· · 40.50	173°49.49	· · 52.96	277°2.60	· · 34.49
4	303°44.74		204°22.92	57.84	270°23.21	41.14	188°51.47	52.89	292°4.85	34.57
5	318°47.20		219°22.11	57.70	285°23.88	41.79	203°53.45	52.82	307°7.10	34.65
6	333°49.66		234°21.30	N24°57.57	300°24.54	N12°42.43	218°55.44	N21°52.74	322°9.35	N02°34.73
7	348°52.13		249°20.50	57.44	315°25.21	43.07	233°57.42	52.67	337°11.61	34.81
8	3°54.59		264°19.69	57.30	330°25.88	43.71	248°59.40	52.59	352°13.86	34.89
9	18°57.06		279°18.89	· · 57.17	345°26.55	· · 44.35	264°1.38	· · 52.52	7°16.11	· · 34.97
10	33°59.52		294°18.08	57.03	0°27.22	44.99	279°3.36	52.44	22°18.36	35.05
11	49°1.99		309°17.27	56.89	15°27.88	45.63	294°5.34	52.37	37°20.61	35.13
12	64°4.45		324°16.47	N24°56.75	30°28.55	N12°46.27	309°7.32	N21°52.30	52°22.87	N02°35.21
13	79°6.91		339°15.66	56.61	45°29.22	46.91	324°9.30	52.22	67°25.12	35.29
14	94°9.38		354°14.86	56.47	60°29.89	47.55	339°11.29	52.15	82°27.37	35.37
15	109°11.84		9°14.05	· · 56.32	75°30.55	· · 48.19	354°13.27	· · 52.07	97°29.62	· · 35.45
16	124°14.31		24°13.25	56.18	90°31.22	48.83	9°15.25	52.00	112°31.88	35.53
17	139°16.77		39°12.45	56.03	105°31.89	49.47	24°17.23	51.92	127°34.13	35.61
18	154°19.23		54°11.64	N24°55.89	120°32.56	N12°50.11	39°19.21	N21°51.85	142°36.38	N02°35.69
19	169°21.70		69°10.84	55.74	135°33.22	50.74	54°21.19	51.77	157°38.64	35.77
20	184°24.16		84°10.04	55.59	150°33.89	51.38	69°23.17	51.70	172°40.89	35.85
21	199°26.63		99°9.23	· · 55.44	165°34.56	· · 52.02	84°25.15	· · 51.62	187°43.14	· · 35.93
22	214°29.09		114°8.43	55.28	180°35.23	52.66	99°27.13	51.55	202°45.39	36.01
23	229°31.55		129°7.63	55.13	195°35.89	53.29	114°29.11	51.47	217°47.65	36.09
Mer.pass. 07:44										
ν-0.8' d-0.1' m-3.94										
ν0.7' d0.6' m1.26										
ν2.0' d-0.1' m-1.90										
ν2.3' d0.1' m0.89										
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	244°34.02		144°6.83	N24°54.98	210°36.56	N12°53.93	129°31.08	N21°51.40	232°49.90	N02°36.17
1	259°36.48		159°6.02	54.82	225°37.23	54.57	144°33.06	51.32	247°52.16	36.25
2	274°38.95		174°5.22	54.66	240°37.89	55.20	159°35.04	51.25	262°54.41	36.33
3	289°41.41		189°4.42	· · 54.51	255°38.56	· · 55.84	174°37.02	· · 51.17	277°56.66	· · 36.41
4	304°43.87		204°3.62	54.35	270°39.23	56.48	189°39.00	51.10	292°58.92	36.49
5	319°46.34		219°2.82	54.19	285°39.89	57.11	204°40.98	51.02	308°1.17	36.57
6	334°48.80		234°2.02	N24°54.02	300°40.56	N12°57.75	219°42.96	N21°50.95	323°3.42	N02°36.65
7	349°51.27		249°1.22	53.86	315°41.23	58.38	234°44.94	50.87	338°5.68	36.73
8	4°53.73		264°0.42	53.70	330°41.89	59.02	249°46.91	50.80	353°7.93	36.81
9	19°56.19		278°59.62	· · 53.53	345°42.56	12°59.65	264°48.89	· · 50.72	8°10.19	· · 36.89
10	34°58.66		293°58.82	53.36	0°43.23	13°0.29	279°50.87	50.65	23°12.44	36.97
11	50°1.12		308°58.02	53.20	15°43.89	0.92	294°52.85	50.57	38°14.70	37.05
12	65°3.59		323°57.22	N24°53.03	30°44.56	N13°1.56	309°54.83	N21°50.49	53°16.95	N02°37.13
13	80°6.05		338°56.42	52.86	45°45.23	2.19	324°56.80	50.42	68°19.21	37.21
14	95°8.52		353°55.63	52.69	60°45.89	2.83	339°58.78	50.34	83°21.46	37.29
15	110°10.98		8°54.83	· · 52.51	75°46.56	· · 3.46	355°0.76	· · 50.27	98°23.72	· · 37.37
16	125°13.44		23°54.03	52.34	90°47.22	4.09	10°2.73	50.19	113°25.97	37.45
17	140°15.91		38°53.23	52.16	105°47.89	4.73	25°4.71	50.12	128°28.23	37.53
18	155°18.37		53°52.44	N24°51.99	120°48.56	N13°5.36	40°6.69	N21°50.04	143°30.48	N02°37.61
19	170°20.84		68°51.64	51.81	135°49.22	5.99	55°8.66	49.96	158°32.74	37.68
20	185°23.30		83°50.84	51.63	150°49.89	6.62	70°10.64	49.89	173°34.99	37.76
21	200°25.76		98°50.05	· · 51.45	165°50.55	· · 7.26	85°12.62	· · 49.81	188°37.25	· · 37.84
22	215°28.23		113°49.25	51.27	180°51.22	7.89	100°14.59	49.74	203°39.50	37.92
23	230°30.69		128°48.46	51.09	195°51.88	8.52	115°16.57	49.66	218°41.76	38.00
Mer.pass. 07:40										
ν-0.8' d-0.2' m-3.94										
ν0.7' d0.6' m1.26										
ν2.0' d-0.1' m-1.90										
ν2.3' d0.1' m0.89										

Stars		
	SHA	Dec
Alpheratz	357°33.77	29°14.02
Ankaa	353°6.26	-42°9.55
Schedar	349°30.09	56°40.70
Diphda	348°46.37	-17°50.43
Achernar	335°19.80	-57°5.96
Hamal	327°50.22	23°35.14
Polaris	313°55.62	89°22.39
Acamar	315°11.32	-40°11.84
Menkar	314°5.28	4°11.56
Mirfak	308°27.13	49°57.20
Aldebaran	290°38.67	16°33.70
Rigel	281°3.11	-8°10.31
Capella	280°20.69	46°1.46
Bellatrix	278°21.99	6°22.38
Elnath	278°0.81	28°37.76
Alnilam	275°36.90	-1°11.15
Betelgeuse	270°51.18	7°24.68
Canopus	263°52.38	-52°42.70
Sirius	258°25.54	-16°45.24
Adhara	255°5.28	-29°0.61
Procyon	244°49.88	5°9.39
Pollux	243°16.18	27°57.78
Avior	234°14.63	-59°35.90
Suhail	222°45.64	-43°32.61
Miaplacidus	221°38.36	-69°49.83
Alphard	217°46.74	-8°46.51
Regulus	207°33.27	11°50.27
Dubhe	193°39.52	61°36.74
Denebola	182°23.68	14°25.45
Gienah	175°42.27	-17°41.50
Acrux	172°58.47	-63°15.04
Gacrux	171°50.07	-57°15.97
Alioth	166°11.62	55°49.13
Spica	158°20.87	-1°18.09
Alkaid	152°50.72	49°10.96
Hadar	148°33.85	-60°30.23
Menkent	147°55.95	-36°30.18
Arcturus	145°46.58	19°2.65
Rigel Kent.	139°38.13	-60°56.85
Kochab	137°18.71	74°2.84
Zuben'ubi	136°54.45	-16°9.21
Alphecca	126°2.42	26°37.48
Antares	112°14.08	-26°29.48
Atria	107°6.72	-69°4.45
Sabik	102°1.15	-15°45.49
Shaula	96°8.44	-37°7.34
Rasalhague	95°57.18	12°32.35
Eltanin	90°41.16	51°28.93
Kaus Aust.	83°30.67	-34°22.25
Vega	80°32.10	38°48.30
Nunki	75°46.07	-26°15.77
Altair	61°58.65	8°56.19
Peacock	53°3.66	-56°38.75
Deneb	49°24.83	45°22.22
Enif	33°37.63	9°59.68
Al Nairz	27°31.47	-46°49.74
Fomalhaut	15°13.33	-29°28.79
Scheat	13°44.18	28°13.39
Markab	13°28.84	15°20.73
May 25 Mon	SHA	Mer.pass
Venus	262°9.87	14:22
Mars	327°28.73	09:59
Jupiter	245°20.18	15:26
Saturn	348°26.11	08:35
May 26 Tue	SHA	Mer.pass
Venus	260°51.27	14:23
Mars	326°45.65	09:58
Jupiter	245°8.66	15:23
Saturn	348°20.97	08:31
May 27 Wed	SHA	Mer.pass
Venus	259°32.81	14:24
Mars	326°2.54	09:57
Jupiter	244°57.07	15:20
Saturn	348°15.88	08:27
Horizontal parallax		
Venus:		0.1
Mars:		0.1

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		180°46.66	N20°54.81	70°15.98	15.2'	N01°39.04	-15.0' 56.3'
1		195°46.60	55.26	84°50.19	15.2'	01°24.01	-15.0' 56.3'
2		210°46.54	55.71	99°24.44	15.3'	01°8.99	-15.0' 56.2'
3		225°46.47	56.16	113°58.72	15.3'	00°53.98	-15.0' 56.2'
4		240°46.41	56.61	128°33.04	15.3'	00°38.98	-15.0' 56.2'
5		255°46.35	57.06	143°7.38	15.4'	00°23.99	-15.0' 56.2'
6		270°46.29	N20°57.51	157°41.75	15.4'	N00°9.01	-15.0' 56.1'
7		285°46.22	57.95	172°16.15	15.4'	S00°5.95	14.9' 56.1'
8		300°46.16	58.40	186°50.57	15.4'	00°20.90	14.9' 56.1'
9		315°46.10	58.84	201°25.02	15.5'	00°35.83	14.9' 56.0'
10		330°46.04	59.29	215°59.49	15.5'	00°50.74	14.9' 56.0'
11		345°45.97	20°59.73	230°33.98	15.5'	01°5.64	14.9' 56.0'
12		0°45.91	N21°0.18	245°8.50	15.5'	S01°20.52	14.9' 56.0'
13		15°45.84	0.62	259°43.03	15.6'	01°35.38	14.8' 55.9'
14		30°45.78	1.06	274°17.58	15.6'	01°50.23	14.8' 55.9'
15		45°45.71	1.51	288°52.15	15.6'	02°5.05	14.8' 55.9'
16		60°45.65	1.95	303°26.74	15.6'	02°19.85	14.8' 55.9'
17		75°45.59	2.39	318°1.34	15.6'	02°34.63	14.8' 55.8'
18		90°45.52	N21°2.83	332°35.95	15.6'	S02°49.38	14.7' 55.8'
19		105°45.45	3.27	347°10.58	15.6'	03°4.11	14.7' 55.8'
20		120°45.39	3.71	1°45.21	15.6'	03°18.82	14.7' 55.8'
21		135°45.32	4.15	16°19.86	15.7'	03°33.50	14.7' 55.7'
22		150°45.26	4.58	30°54.51	15.7'	03°48.15	14.6' 55.7'
23		165°45.19	5.02	45°29.17	15.7'	04°2.78	14.6' 55.7'
		SD = 15.8'		SD = 15.4'			
		$d = 0.5'$					

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		180°45.13	N21°5.46	60°3.84	15.7'	S04°17.37	14.6' 55.7'
1		195°45.06	5.89	74°38.51	15.7'	04°31.94	14.5' 55.6'
2		210°44.99	6.33	89°13.19	15.7'	04°46.48	14.5' 55.6'
3		225°44.93	6.76	103°47.87	15.7'	05°0.99	14.5' 55.6'
4		240°44.86	7.19	118°22.55	15.7'	05°15.47	14.4' 55.6'
5		255°44.79	7.63	132°57.23	15.7'	05°29.91	14.4' 55.5'
6		270°44.72	N21°8.06	147°31.91	15.7'	S05°44.33	14.4' 55.5'
7		285°44.66	8.49	162°6.59	15.7'	05°58.70	14.3' 55.5'
8		300°44.59	8.92	176°41.26	15.7'	06°13.05	14.3' 55.5'
9		315°44.52	9.35	191°15.94	15.7'	06°27.36	14.3' 55.4'
10		330°44.45	9.78	205°50.60	15.7'	06°41.63	14.2' 55.4'
11		345°44.38	10.21	220°25.26	15.7'	06°55.87	14.2' 55.4'
12		0°44.31	N21°10.64	234°59.91	15.6'	S07°10.06	14.2' 55.4'
13		15°44.24	11.07	249°34.56	15.6'	07°24.22	14.1' 55.3'
14		30°44.18	11.50	264°9.19	15.6'	07°38.34	14.1' 55.3'
15		45°44.11	11.92	278°43.82	15.6'	07°52.42	14.0' 55.3'
16		60°44.04	12.35	293°18.43	15.6'	08°6.46	14.0' 55.3'
17		75°43.97	12.78	307°53.03	15.6'	08°20.46	14.0' 55.3'
18		90°43.90	N21°13.20	322°27.61	15.6'	S08°34.41	13.9' 55.2'
19		105°43.83	13.63	337°2.18	15.6'	08°48.32	13.9' 55.2'
20		120°43.76	14.05	351°36.74	15.5'	09°2.19	13.8' 55.2'
21		135°43.69	14.47	6°11.28	15.5'	09°16.01	13.8' 55.2'
22		150°43.62	14.89	20°45.80	15.5'	09°29.79	13.7' 55.2'
23		165°43.54	15.32	35°20.30	15.5'	09°43.52	13.7' 55.1'
		SD = 15.8'		SD = 15.2'			
		$d = 0.4'$					

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		180°43.47	N21°15.74	49°54.78	15.5'	S09°57.20	13.6' 55.1'
1		195°43.40	16.16	64°29.24	15.4'	10°10.84	13.6' 55.1'
2		210°43.33	16.58	79°3.68	15.4'	10°24.43	13.5' 55.1'
3		225°43.26	17.00	93°38.10	15.4'	10°37.96	13.5' 55.1'
4		240°43.19	17.41	108°12.49	15.4'	10°51.45	13.4' 55.0'
5		255°43.11	17.83	122°46.86	15.3'	11°4.88	13.4' 55.0'
6		270°43.04	N21°18.25	137°21.20	15.3'	S11°18.27	13.3' 55.0'
7		285°42.97	18.67	151°55.51	15.3'	11°31.60	13.3' 55.0'
8		300°42.90	19.08	166°29.80	15.3'	11°44.88	13.2' 55.0'
9		315°42.82	19.50	181°4.06	15.2'	11°58.10	13.2' 54.9'
10		330°42.75	19.91	195°38.29	15.2'	12°11.27	13.1' 54.9'
11		345°42.68	20.33	210°12.49	15.2'	12°24.38	13.1' 54.9'
12		0°42.60	N21°20.74	224°46.66	15.1'	S12°37.43	13.0' 54.9'
13		15°42.53	21.15	239°20.80	15.1'	12°50.43	12.9' 54.9'
14		30°42.46	21.56	253°54.91	15.1'	13°3.37	12.9' 54.8'
15		45°42.38	21.98	268°28.98	15.0'	13°16.25	12.8' 54.8'
16		60°42.31	22.39	283°3.01	15.0'	13°29.07	12.8' 54.8'
17		75°42.23	22.80	297°37.02	15.0'	13°41.83	12.7' 54.8'
18		90°42.16	N21°23.21	312°10.98	14.9'	S13°54.52	12.6' 54.8'
19		105°42.08	23.61	326°44.91	14.9'	14°7.16	12.6' 54.8'
20		120°42.01	24.02	341°18.80	14.9'	14°19.73	12.5' 54.7'
21		135°41.93	24.43	355°52.66	14.8'	14°32.24	12.4' 54.7'
22		150°41.86	24.84	10°26.47	14.8'	14°44.68	12.4' 54.7'
23		165°41.78	25.24	25°0.25	14.7'	14°57.06	12.3' 54.7'
		SD = 15.8'		SD = 15.0'			
		$d = 0.4'$					

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

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

May 28, 29, 30 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	245°33.16		143°47.66	N24°50.90	210°52.55	N13°9.15	130°18.55	N21°49.58	233°44.02	N02°38.08
1	260°35.62		158°46.87	50.72	225°53.21	9.78	145°20.52	49.51	248°46.27	38.16
2	275°38.08		173°46.07	50.53	240°53.88	10.41	160°22.50	49.43	263°48.53	38.24
3	290°40.55		188°45.28	•• 50.35	255°54.55	•• 11.04	175°24.47	•• 49.36	278°50.78	•• 38.32
4	305°43.01		203°44.48	50.16	270°55.21	11.67	190°26.45	49.28	293°53.04	38.39
5	320°45.48		218°43.69	49.97	285°55.88	12.30	205°28.42	49.20	308°55.30	38.47
6	335°47.94		233°42.90	N24°49.78	300°56.54	N13°12.93	220°30.40	N21°49.13	323°57.55	N02°38.55
7	350°50.41		248°42.10	49.59	315°57.21	13.56	235°32.38	49.05	338°59.81	38.63
8	5°52.87		263°41.31	49.39	330°57.87	14.19	250°34.35	48.97	354°2.07	38.71
9	20°55.33		278°40.52	•• 49.20	345°58.54	•• 14.82	265°36.33	•• 48.90	9°4.32	•• 38.79
10	35°57.80		293°39.73	49.00	0°59.20	15.45	280°38.30	48.82	24°6.58	38.86
11	51°0.26		308°38.93	48.80	15°59.87	16.08	295°40.27	48.74	39°8.84	38.94
12	66°2.73		323°38.14	N24°48.61	31°0.53	N13°16.71	310°42.25	N21°48.67	54°11.10	N02°39.02
13	81°5.19		338°37.35	48.41	46°1.19	17.34	325°44.22	48.59	69°13.35	39.10
14	96°7.65		353°36.56	48.21	61°1.86	17.96	340°46.20	48.51	84°15.61	39.18
15	111°10.12		8°35.77	•• 48.01	76°2.52	•• 18.59	355°48.17	•• 48.44	99°17.87	•• 39.26
16	126°12.58		23°34.98	47.80	91°3.19	19.22	10°50.15	48.36	114°20.12	39.33
17	141°15.05		38°34.19	47.60	106°3.85	19.85	25°52.12	48.28	129°22.38	39.41
18	156°17.51		53°33.40	N24°47.39	121°4.52	N13°20.47	40°54.09	N21°48.21	144°24.64	N02°39.49
19	171°19.97		68°32.61	47.19	136°5.18	21.10	55°56.07	48.13	159°26.90	39.57
20	186°22.44		83°31.82	46.98	151°5.85	21.73	70°58.04	48.05	174°29.16	39.64
21	201°24.90		98°31.03	•• 46.77	166°6.51	•• 22.35	86°0.01	•• 47.98	189°31.41	•• 39.72
22	216°27.37		113°30.24	46.56	181°7.17	22.98	101°1.99	47.90	204°33.67	39.80
23	231°29.83		128°29.46	46.35	196°7.84	23.61	116°3.96	47.82	219°35.93	39.88
Mer.pass. 07:37		ν-0.8' d-0.2' m-3.94		ν0.7' d0.6' m1.26		ν2.0' d-0.1' m-1.89		ν2.3' d0.1' m0.89		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	246°32.30		143°28.67	N24°46.14	211°8.50	N13°24.23	131°5.93	N21°47.74	234°38.19	N02°39.96
1	261°34.76		158°27.88	45.92	226°9.17	24.86	146°7.91	47.67	249°40.45	40.03
2	276°37.22		173°27.09	45.71	241°9.83	25.48	161°9.88	47.59	264°42.71	40.11
3	291°39.69		188°26.31	•• 45.49	256°10.49	•• 26.11	176°11.85	•• 47.51	279°44.97	•• 40.19
4	306°42.15		203°25.52	45.27	271°11.16	26.73	191°13.82	47.43	294°47.22	40.27
5	321°44.62		218°24.73	45.05	286°11.82	27.35	206°15.80	47.36	309°49.48	40.34
6	336°47.08		233°23.95	N24°44.84	301°12.48	N13°27.98	221°17.77	N21°47.28	324°51.74	N02°40.42
7	351°49.54		248°23.16	44.61	316°13.15	28.60	236°19.74	47.20	339°54.00	40.50
8	6°52.01		263°22.38	44.39	331°13.81	29.23	251°21.71	47.12	354°56.26	40.57
9	21°54.47		278°21.59	•• 44.17	346°14.47	•• 29.85	266°23.68	•• 47.05	9°58.52	•• 40.65
10	36°56.94		293°20.81	43.94	1°15.14	30.47	281°25.65	46.97	25°0.78	40.73
11	51°59.40		308°20.03	43.72	16°15.80	31.10	296°27.63	46.89	40°3.04	40.81
12	67°1.86		323°19.24	N24°43.49	31°16.46	N13°31.72	311°29.60	N21°46.81	55°5.30	N02°40.88
13	82°4.33		338°18.46	43.26	46°17.13	32.34	326°31.57	46.74	70°7.56	40.96
14	97°6.79		353°17.68	43.03	61°17.79	32.96	341°33.54	46.66	85°9.82	41.04
15	112°9.26		8°16.89	•• 42.80	76°18.45	•• 33.58	356°35.51	•• 46.58	100°12.08	•• 41.11
16	127°11.72		23°16.11	42.57	91°19.12	34.21	11°37.48	46.50	115°14.34	41.19
17	142°14.19		38°15.33	42.34	106°19.78	34.83	26°39.45	46.42	130°16.60	41.27
18	157°16.65		53°14.55	N24°42.10	121°20.44	N13°35.45	41°41.42	N21°46.35	145°18.86	N02°41.34
19	172°19.11		68°13.77	41.87	136°21.10	36.07	56°43.39	46.27	160°21.12	41.42
20	187°21.58		83°12.98	41.63	151°21.77	36.69	71°45.36	46.19	175°23.38	41.50
21	202°24.04		98°12.20	•• 41.40	166°22.43	•• 37.31	86°47.33	•• 46.11	190°25.64	•• 41.57
22	217°26.51		113°11.42	41.16	181°23.09	37.93	101°49.30	46.03	205°27.90	41.65
23	232°28.97		128°10.64	40.92	196°23.75	38.55	116°51.27	45.96	220°30.16	41.73
Mer.pass. 07:33		ν-0.8' d-0.2' m-3.94		ν0.7' d0.6' m1.27		ν2.0' d-0.1' m-1.89		ν2.3' d0.1' m0.88		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	247°31.43		143°9.86	N24°40.68	211°24.42	N13°39.17	131°53.24	N21°45.88	235°32.42	N02°41.80
1	262°33.90		158°9.09	40.43	226°25.08	39.79	146°55.21	45.80	250°34.68	41.88
2	277°36.36		173°8.31	40.19	241°25.74	40.41	161°57.18	45.72	265°36.95	41.96
3	292°38.83		188°7.53	•• 39.94	256°26.40	•• 41.03	176°59.15	•• 45.64	280°39.21	•• 42.03
4	307°41.29		203°6.75	39.70	271°27.06	41.65	192°1.12	45.56	295°41.47	42.11
5	322°43.76		218°5.97	39.45	286°27.73	42.26	207°3.09	45.49	310°43.73	42.18
6	337°46.22		233°5.20	N24°39.20	301°28.39	N13°42.88	222°5.06	N21°45.41	325°45.99	N02°42.26
7	352°48.68		248°4.42	38.95	316°29.05	43.50	237°7.03	45.33	340°48.25	42.34
8	7°51.15		263°3.64	38.70	331°29.71	44.12	252°9.00	45.25	355°50.52	42.41
9	22°53.61		278°2.86	•• 38.45	346°30.37	•• 44.74	267°10.97	•• 45.17	10°52.78	•• 42.49
10	37°56.08		293°2.09	38.20	1°31.04	45.35	282°12.94	45.09	25°55.04	42.56
11	52°58.54		308°1.31	37.94	16°31.70	45.97	297°14.90	45.01	40°57.30	42.64
12	68°1.00		323°0.54	N24°37.69	31°32.36	N13°46.59	312°16.87	N21°44.93	55°59.56	N02°42.72
13	83°3.47		337°59.76	37.43	46°33.02	47.20	327°18.84	44.86	71°1.83	42.79
14	98°5.93		352°58.99	37.17	61°33.68	47.82	342°20.81	44.78	86°4.09	42.87
15	113°8.40		7°58.21	•• 36.91	76°34.34	•• 48.43	357°22.78	•• 44.70	101°6.35	•• 42.94
16	128°10.86		22°57.44	36.65	91°35.00	49.05	12°24.74	44.62	116°8.61	43.02
17	143°13.33		37°56.67	36.39	106°35.66	49.67	27°26.71	44.54	131°10.88	43.09
18	158°15.79		52°55.89	N24°36.13	121°36.33	N13°50.28	42°28.68	N21°44.46	146°13.14	N02°43.17
19	173°18.25		67°55.12	35.86	136°36.99	50.90	57°30.65	44.38	161°15.40	43.25
20	188°20.72		82°54.35	35.60	151°37.65	51.51	72°32.61	44.30	176°17.67	43.32
21	203°23.18		97°53.58	•• 35.33	166°38.31	•• 52.12	87°34.58	•• 44.22	191°19.93	•• 43.40
22	218°25.65		112°52.81	35.07	181°38.97	52.74	102°36.55	44.14	206°22.19	43.47
23	233°28.11		127°52.04	34.80	196°39.63	53.35	117°38.52	44.06	221°24.46	43.55
Mer.pass. 07:29		ν-0.8' d-0.2' m-3.94		ν0.7' d0.6' m1.27		ν2.0' d-0.1' m-1.89		ν2.3' d0.1' m0.88		

	Stars	
	SHA	Dec
Alpheratz	357°33.75	29°14.02
Ankaa	353°6.24	-42°9.54
Schedar	349°30.06	56°40.70
Diphda	348°46.35	-17°50.42
Achernar	335°19.78	-57°5.94
Hamal	327°50.21	23°35.14
Polaris	313°54.85	89°22.38
Acamar	315°11.31	-40°11.83
Menkar	314°5.27	4°11.57
Mirfak	308°27.12	49°57.19
Aldebaran	290°38.67	16°33.70
Rigel	281°3.11	-8°10.31
Capella	280°20.69	46°1.46
Bellatrix	278°21.99	6°22.38
Elnath	278°0.81	28°37.76
Alnilam	275°36.90	-1°11.15
Betelgeuse	270°51.18	7°24.68
Canopus	263°52.39	-52°42.69
Sirius	258°25.54	-16°45.23
Adhara	255°5.29	-29°0.60
Procyon	244°49.89	5°9.39
Pollux	243°16.19	27°57.78
Avior	234°14.65	-59°35.89
Suhail	222°45.66	-43°32.60
Miaplacidus	221°38.40	-69°49.83
Alphard	217°46.75	-8°46.51
Regulus	207°33.28	11°50.27
Dubhe	193°39.55	61°36.74
Denebala	182°23.69	14°25.46
Gienah	175°42.28	-17°41.49
Acrux	172°58.49	-63°15.05
Gacrux	171°50.09	-57°15.98
Alioth	166°11.64	55°49.14
Spica	158°20.88	-11°18.09
Alkaid	152°50.73	49°10.97
Hadar	148°33.85	-60°30.24
Menkent	147°55.95	-36°30.18
Arcturus	145°46.59	19°2.66
Rigel Kent.	139°38.14	-60°56.86
Kochab	137°18.74	74°2.86
Zuben'ubi	136°54.45	-16°9.21
Alphecca	126°2.42	26°37.50
Antares	112°14.07	-26°29.48
Atria	107°6.70	-69°4.46
Sabik	102°1.14	-15°45.49
Shaula	96°8.42	-37°7.35
Rasalhague	95°57.17	12°32.36
Eltanin	90°41.15	51°28.95
Kaus Aust.	83°30.65	-34°22.25
Vega	80°32.08	38°48.31
Nunki	75°46.05	-26°15.77
Altair	61°58.63	8°56.21
Peacock	53°3.63	-56°38.75
Deneb	49°24.81	45°22.23
Enif	33°37.61	9°5

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.71	N21°25.65	39°33.98	14.7'	S15°9.37	12.2'	54.7'
1	195°41.63	26.05	54°7.67	14.7'	15°21.61	12.2'	54.7'
2	210°41.55	26.46	68°41.32	14.6'	15°33.79	12.1'	54.6'
3	225°41.48	· · 26.86	83°14.93	14.6'	15°45.90	12.0'	54.6'
4	240°41.40	27.27	97°48.50	14.5'	15°57.94	12.0'	54.6'
5	255°41.32	27.67	112°22.02	14.5'	16°9.90	11.9'	54.6'
6	270°41.25	N21°28.07	126°55.49	14.4'	S16°21.80	11.8'	54.6'
7	285°41.17	28.47	141°28.92	14.4'	16°33.62	11.8'	54.6'
8	300°41.09	28.87	156°2.31	14.3'	16°45.37	11.7'	54.6'
9	315°41.02	· · 29.27	170°35.65	14.3'	16°57.05	11.6'	54.5'
10	330°40.94	29.67	185°8.94	14.2'	17°8.65	11.5'	54.5'
11	345°40.86	30.07	199°42.18	14.2'	17°20.18	11.5'	54.5'
12	0°40.78	N21°30.47	214°15.38	14.1'	S17°31.63	11.4'	54.5'
13	15°40.70	30.86	228°48.52	14.1'	17°43.01	11.3'	54.5'
14	30°40.62	31.26	243°21.62	14.0'	17°54.30	11.2'	54.5'
15	45°40.55	· · 31.66	257°54.67	14.0'	18°5.52	11.1'	54.5'
16	60°40.47	32.05	272°27.66	13.9'	18°16.66	11.1'	54.4'
17	75°40.39	32.45	287°0.61	13.9'	18°27.72	11.0'	54.4'
18	90°40.31	N21°32.84	301°33.50	13.8'	S18°38.69	10.9'	54.4'
19	105°40.23	33.23	316°6.35	13.8'	18°49.59	10.8'	54.4'
20	120°40.15	33.63	330°39.14	13.7'	19°0.40	10.7'	54.4'
21	135°40.07	· · 34.02	345°11.88	13.7'	19°11.13	10.6'	54.4'
22	150°39.99	34.41	359°44.56	13.6'	19°21.77	10.6'	54.4'
23	165°39.91	34.80	14°17.19	13.6'	19°32.33	10.5'	54.4'
SD = 15.8'		$d = 0.4'$	SD = 14.9'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.83	N21°35.19	28°49.77	13.5'	S19°42.80	10.4'	54.3'
1	195°39.75	35.58	43°22.30	13.5'	19°53.19	10.3'	54.3'
2	210°39.67	35.97	57°54.76	13.4'	20°3.49	10.2'	54.3'
3	225°39.59	· · 36.36	72°27.18	13.4'	20°13.70	10.1'	54.3'
4	240°39.50	36.75	86°59.54	13.3'	20°23.82	10.0'	54.3'
5	255°39.42	37.13	101°31.85	13.2'	20°33.85	9.9'	54.3'
6	270°39.34	N21°37.52	116°4.09	13.2'	S20°43.79	9.8'	54.3'
7	285°39.26	37.90	130°36.29	13.1'	20°53.63	9.8'	54.3'
8	300°39.18	38.29	145°8.43	13.1'	21°3.39	9.7'	54.3'
9	315°39.10	· · 38.67	159°40.51	13.0'	21°13.05	9.6'	54.2'
10	330°39.01	39.06	174°12.53	13.0'	21°22.61	9.5'	54.2'
11	345°38.93	39.44	188°44.50	12.9'	21°32.09	9.4'	54.2'
12	0°38.85	N21°39.82	203°16.42	12.9'	S21°41.46	9.3'	54.2'
13	15°38.76	40.20	217°48.27	12.8'	21°50.74	9.2'	54.2'
14	30°38.68	40.59	232°20.07	12.7'	21°59.92	9.1'	54.2'
15	45°38.60	· · 40.97	246°51.82	12.7'	22°9.00	9.0'	54.2'
16	60°38.51	41.35	261°23.50	12.6'	22°17.99	8.9'	54.2'
17	75°38.43	41.72	275°55.13	12.6'	22°26.87	8.8'	54.2'
18	90°38.35	N21°42.10	290°26.70	12.5'	S22°35.66	8.7'	54.2'
19	105°38.26	42.48	304°58.22	12.5'	22°44.34	8.6'	54.1'
20	120°38.18	42.86	319°29.68	12.4'	22°52.92	8.5'	54.1'
21	135°38.09	· · 43.23	334°1.08	12.3'	23°1.39	8.4'	54.1'
22	150°38.01	43.61	348°32.43	12.3'	23°9.77	8.3'	54.1'
23	165°37.93	43.98	3°3.72	12.2'	23°18.03	8.2'	54.1'
SD = 15.8'		$d = 0.4'$	SD = 14.8'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.84	N21°44.36	17°34.95	12.2'	S23°26.20	8.1'	54.1'
1	195°37.75	44.73	32°6.13	12.1'	23°34.25	7.9'	54.1'
2	210°37.67	45.11	46°37.25	12.1'	23°42.20	7.8'	54.1'
3	225°37.58	· · 45.48	61°8.32	12.0'	23°50.04	7.7'	54.1'
4	240°37.50	45.85	75°39.33	12.0'	23°57.77	7.6'	54.1'
5	255°37.41	46.22	90°10.29	11.9'	24°5.40	7.5'	54.1'
6	270°37.33	N21°46.59	104°41.19	11.8'	S24°12.91	7.4'	54.1'
7	285°37.24	46.96	119°12.03	11.8'	24°20.31	7.3'	54.1'
8	300°37.15	47.33	133°42.83	11.7'	24°27.61	7.2'	54.0'
9	315°37.07	· · 47.70	148°13.57	11.7'	24°34.79	7.1'	54.0'
10	330°36.98	48.07	162°44.25	11.6'	24°41.85	7.0'	54.0'
11	345°36.89	48.44	177°14.88	11.6'	24°48.80	6.8'	54.0'
12	0°36.81	N21°48.80	191°45.46	11.5'	S24°55.64	6.7'	54.0'
13	15°36.72	49.17	206°15.99	11.5'	25°2.37	6.6'	54.0'
14	30°36.63	49.53	220°46.47	11.4'	25°8.97	6.5'	54.0'
15	45°36.54	· · 49.90	235°16.89	11.4'	25°15.47	6.4'	54.0'
16	60°36.46	50.26	249°47.27	11.3'	25°21.84	6.3'	54.0'
17	75°36.37	50.63	264°17.59	11.3'	25°28.10	6.1'	54.0'
18	90°36.28	N21°50.99	278°47.87	11.2'	S25°34.23	6.0'	54.0'
19	105°36.19	51.35	293°18.09	11.2'	25°40.25	5.9'	54.0'
20	120°36.10	51.71	307°48.27	11.1'	25°46.15	5.8'	54.0'
21	135°36.01	· · 52.07	322°18.40	11.1'	25°51.93	5.7'	54.0'
22	150°35.92	52.43	336°48.48	11.0'	25°57.59	5.5'	54.0'
23	165°35.83	52.79	351°18.52	11.0'	26°3.13	5.4'	54.0'
SD = 15.8'		$d = 0.4'$	SD = 14.8'				

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

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

Day	Sun			Moon		Age 12-14 90-98%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	
28	02:47	02:43	11:57	22:01	09:39	
29	02:39	02:35	11:57	22:47	10:24	

May 31, 01, 02 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	248°30.57		142°51.26	N24°34.53	211°40.29	N13°53.97	132°40.48	N21°43.98	236°26.72	N02°43.62
1	263°33.04		157°50.49	34.26	226°40.95	54.58	147°42.45	43.91	251°28.98	43.70
2	278°35.50		172°49.72	33.98	241°41.61	55.19	162°44.42	43.83	266°31.25	43.77
3	293°37.97		187°48.95	•• 33.71	256°42.27	•• 55.81	177°46.38	•• 43.75	281°33.51	•• 43.85
4	308°40.43		202°48.18	33.44	271°42.93	56.42	192°48.35	43.67	296°35.77	43.92
5	323°42.90		217°47.42	33.16	286°43.59	57.03	207°50.31	43.59	311°38.04	44.00
6	338°45.36		232°46.65	N24°32.88	301°44.25	N13°57.64	222°52.28	N21°43.51	326°40.30	N02°44.07
7	353°47.82		247°45.88	32.61	316°44.91	58.25	237°54.25	43.43	341°42.57	44.15
8	8°50.29		262°45.11	32.33	331°45.57	58.87	252°56.21	43.35	356°44.83	44.22
9	23°52.75		277°44.34	•• 32.05	346°46.23	13°59.48	267°58.18	•• 43.27	11°47.10	•• 44.30
10	38°55.22		292°43.58	31.76	1°46.89	14°0.09	283°0.14	43.19	26°49.36	44.37
11	53°57.68		307°42.81	31.48	16°47.55	0.70	298°2.11	43.11	41°51.62	44.45
12	69°0.14		322°42.04	N24°31.20	31°48.21	N14°1.31	313°4.07	N21°43.03	56°53.89	N02°44.52
13	84°2.61		337°41.28	30.91	46°48.87	1.92	328°6.04	42.95	71°56.15	44.59
14	99°5.07		352°40.51	30.63	61°49.53	2.53	343°8.01	42.87	86°58.42	44.67
15	114°7.54		7°39.75	•• 30.34	76°50.19	•• 3.14	358°9.97	•• 42.79	102°0.68	•• 44.74
16	129°10.00		22°38.98	30.05	91°50.85	3.75	13°11.93	42.71	117°2.95	44.82
17	144°12.47		37°38.22	29.76	106°51.51	4.36	28°13.90	42.63	132°5.22	44.89
18	159°14.93		52°37.46	N24°29.47	121°52.17	N14°4.97	43°15.86	N21°42.55	147°7.48	N02°44.97
19	174°17.39		67°36.69	29.18	136°52.83	5.58	58°17.83	42.47	162°9.75	45.04
20	189°19.86		82°35.93	28.88	151°53.49	6.19	73°19.79	42.39	177°12.01	45.11
21	204°22.32		97°35.17	•• 28.59	166°54.15	•• 6.79	88°21.76	•• 42.31	192°14.28	•• 45.19
22	219°24.79		112°34.40	28.29	181°54.81	7.40	103°23.72	42.23	207°16.54	45.26
23	234°27.25		127°33.64	28.00	196°55.47	8.01	118°25.69	42.15	222°18.81	45.34
Mer.pass. 07:25										
ν0.8' d-0.3' m-3.95										
ν0.7' d0.6' m1.27										
ν2.0' d-0.1' m-1.88										
ν2.3' d0.1' m0.88										
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	249°29.72		142°32.88	N24°27.70	211°56.13	N14°8.62	133°27.65	N21°42.07	237°21.08	N02°45.41
1	264°32.18		157°32.12	27.40	226°56.79	9.22	148°29.61	41.99	252°23.34	45.49
2	279°34.64		172°31.36	27.10	241°57.44	9.83	163°31.58	41.91	267°25.61	45.56
3	294°37.11		187°30.60	•• 26.80	256°58.10	•• 10.44	178°33.54	•• 41.82	282°27.88	•• 45.63
4	309°39.57		202°29.84	26.49	271°58.76	11.04	193°35.50	41.74	297°30.14	45.71
5	324°42.04		217°29.08	26.19	286°59.42	11.65	208°37.47	41.66	312°32.41	45.78
6	339°44.50		232°28.32	N24°25.89	302°0.08	N14°12.26	223°39.43	N21°41.58	327°34.68	N02°45.85
7	354°46.96		247°27.56	25.58	317°0.74	12.86	238°41.39	41.50	342°36.94	45.93
8	9°49.43		262°26.80	25.27	332°1.40	13.47	253°43.36	41.42	357°39.21	46.00
9	24°51.89		277°26.05	•• 24.96	347°2.05	•• 14.07	268°45.32	•• 41.34	12°41.48	•• 46.07
10	39°54.36		292°25.29	24.65	2°2.71	14.68	283°47.28	41.26	27°43.74	46.15
11	54°56.82		307°24.53	24.34	17°3.37	15.28	298°49.24	41.18	42°46.01	46.22
12	69°59.29		322°23.78	N24°24.03	32°4.03	N14°15.89	313°51.21	N21°41.10	57°48.28	N02°46.29
13	85°1.75		337°23.02	23.72	47°4.69	16.49	328°53.17	41.02	72°50.55	46.37
14	100°4.21		352°22.26	23.40	62°5.35	17.10	343°55.13	40.94	87°52.81	46.44
15	115°6.68		7°21.51	•• 23.09	77°6.00	•• 17.70	358°57.09	•• 40.85	102°55.08	•• 46.51
16	130°9.14		22°20.75	22.77	92°6.66	18.30	13°59.06	40.77	117°57.35	46.59
17	145°11.61		37°20.00	22.45	107°7.32	18.91	29°1.02	40.69	132°59.62	46.66
18	160°14.07		52°19.24	N24°22.13	122°7.98	N14°19.51	44°2.98	N21°40.61	148°1.89	N02°46.73
19	175°16.53		67°18.49	21.81	137°8.63	20.11	59°4.94	40.53	163°4.15	46.81
20	190°19.00		82°17.74	21.49	152°9.29	20.71	74°6.90	40.45	178°6.42	46.88
21	205°21.46		97°16.98	•• 21.17	167°9.95	•• 21.32	89°8.86	•• 40.37	193°8.69	•• 46.95
22	220°23.93		112°16.23	20.84	182°10.61	21.92	104°10.82	40.28	208°10.96	47.03
23	235°26.39		127°15.48	20.52	197°11.26	22.52	119°12.79	40.20	223°13.23	47.10
Mer.pass. 07:21										
ν0.8' d-0.3' m-3.95										
ν0.7' d0.6' m1.27										
ν2.0' d-0.1' m-1.88										
ν2.3' d0.1' m0.88										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	250°28.86		142°14.73	N24°20.19	212°11.92	N14°23.12	134°14.75	N21°40.12	238°15.50	N02°47.17
1	265°31.32		157°13.98	19.87	227°12.58	23.72	149°16.71	40.04	253°17.77	47.24
2	280°33.78		172°13.23	19.54	242°13.24	24.32	164°18.67	39.96	268°20.03	47.32
3	295°36.25		187°12.48	•• 19.21	257°13.89	•• 24.92	179°20.63	•• 39.88	283°22.30	•• 47.39
4	310°38.71		202°11.73	18.88	272°14.55	25.52	194°22.59	39.80	298°24.57	47.46
5	325°41.18		217°10.98	18.55	287°15.21	26.12	209°24.55	39.71	313°26.84	47.53
6	340°43.64		232°10.23	N24°18.21	302°15.86	N14°26.72	224°26.51	N21°39.63	328°29.11	N02°47.61
7	355°46.11		247°9.48	17.88	317°16.52	27.32	239°28.47	39.55	343°31.38	47.68
8	10°48.57		262°8.73	17.54	332°17.18	27.92	254°30.43	39.47	358°33.65	47.75
9	25°51.03		277°7.98	•• 17.21	347°17.83	•• 28.52	269°32.39	•• 39.39	13°35.92	•• 47.82
10	40°53.50		292°7.24	16.87	2°18.49	29.12	284°34.35	39.30	28°38.19	47.90
11	55°55.96		307°6.49	16.53	17°19.15	29.72	299°36.31	39.22	43°40.46	47.97
12	70°58.43		322°5.74	N24°16.19	32°19.80	N14°30.32	314°38.27	N21°39.14	58°42.73	N02°48.04
13	86°0.89		337°5.00	15.85	47°20.46	30.91	329°40.23	39.06	73°45.00	48.11
14	101°3.35		352°4.25	15.51	62°21.12	31.51	344°42.19	38.98	88°47.27	48.18
15	116°5.82		7°3.51	•• 15.16	77°21.77	•• 32.11	359°44.15	•• 38.89	103°49.54	•• 48.26
16	131°8.28		22°2.76	14.82	92°22.43	32.71	14°46.11	38.81	118°51.81	48.33
17	146°10.75		37°2.02	14.47	107°23.09	33.30	29°48.07	38.73	133°54.08	48.40
18	161°13.21		52°1.27	N24°14.13	122°23.74	N14°33.90	44°50.02	N21°38.65	148°56.35	N02°48.47
19	176°15.68		67°0.53	13.78	137°24.40	34.50	59°51.98	38.56	163°58.62	48.54
20	191°18.14		81°59.79	13.43	152°25.05	35.09	74°53.94	38.48	179°0.90	48.61
21	206°20.60		96°59.04	•• 13.08	167°25.71	•• 35.69	89°55.90	•• 38.40	194°3.17	•• 48.69
22	221°23.07		111°58.30	12.73	182°26.36	36.28	104°57.86	38.32	209°5.44	48.76
23	236°25.53		126°57.56	12.37	197°27.02	36.88	119°59.82	38.23	224°7.71	48.83
Mer.pass. 07:17										
ν0.8' d-0.3' m-3.95										
ν0.7' d0.6' m1.27										
ν2.0' d-0.1' m-1.88										
ν2.3' d0.1' m0.87										

Stars		
	SHA	Dec
Alpheratz	357°33.72	29°14.03
Ankaa	353°6.21	-42°9.53
Schedar	349°30.02	56°40.70
Diphda	348°46.33	-17°50.41
Achernar	335°19.76	-57°5.93
Hamal	327°50.19	23°35.14
Polaris	313°53.87	89°22.36
Acamar	315°11.30	-40°11.81
Menkar	314°5.26	4°11.57
Mirfak	308°27.10	49°57.18
Aldebaran	290°38.66	16°33.70
Rigel	281°3.11	-8°10.30
Capella	280°20.68	46°1.45
Bellatrix	278°21.99	6°22.38
Elnath	278°0.80	28°37.75
Alnilam	275°36.90	-1°11.14
Betelgeuse	270°51.17	7°24.68
Canopus	263°52.40	-52°42.68
Sirius	258°25.54	-16°45.23
Adhara	255°5.29	-29°0.59
Procyon	244°49.89	5°9.39
Pollux	243°16.19	27°57.78
Avior	234°14.67	-59°35.88
Suhail	222°45.67	-43°32.60
Miaplacidus	221°38.44	-69°49.83
Alphard	217°46.75	-8°46.51
Regulus	207°33.29	11°50.27
Dubhe	193°39.57	61°36.74
Denebola	182°23.70	14°25.46
Gienah	175°42.28	-17°41.49
Acrux	172°58.50	-63°15.06
Gacrux	171°50.10	-57°15.98
Alioth	166°11.66	55°49.15
Spica	158°20.88	-11°18.09
Alkaid	152°50.74	49°10.98
Hadar	148°33.85	-60°30.25
Menkent	147°55.95	-36°30.19
Arcturus	145°46.59	19°2.67
Rigil Kent.	139°38.14	-60°56.87
Kochab	137°18.77	74°2.87
Zuben'ubi	136°54.45	-16°9.21
Alphecca	126°2.42	26°37.51
Antares	112°14.06	-26°29.48
Atria	107°6.68	-69°4.47
Sabik	102°1.13	-15°45.49
Shaula	96°8.40	-37°7.35
Rasalhague	95°57.15	12°32.37
Eltanin	90°41.14	51°28.97
Kaus Aust.	83°30.63	-34°22.25
Vega	80°32.07	38°48.33
Nunki	75°46.03	-26°15.76
Altair	61°58.61	8°56.22
Peacock	53°3.59	-56°38.75
Deneb	49°24.78	45°22.24
Enif	33°37.59	9°59.70
Al Na'ir	27°31.41	-46°49.73
Fomalhaut	15°13.28	-29°28.77
Scheat	13°44.12	28°13.41
Markab	13°28.79	15°20.75
May 31 Sun	SHA	Mer.pass
Venus	254°20.69	14:29
Mars	323°9.72	09:53
Jupiter	244°9.91	15:07
Saturn	347°56.14	08:13
Jun 01 Mon	SHA	Mer.pass
Venus	253°3.17	14:31
Mars	322°26.41	09:52
Jupiter	243°57.93	15:04
Saturn	347°51.36	08:09
Jun 02 Tue	SHA	Mer.pass
Venus	251°45.87	14:32
Mars	321°43.07	09:51
Jupiter	243°45.89	15:01
Saturn	347°46.64	08:06
Horizontal parallax		
Venus:		0.1
Mars:		0.1


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°35.75	N21°53.15	5°48.51	10.9'	S26°8.54	5.3'	54.0'
1	195°35.66	53.51	20°18.46	10.9'	26°13.83	5.2'	54.0'
2	210°35.57	53.87	34°48.36	10.9'	26°19.00	5.0'	53.9'
3	225°35.48	· · 54.22	49°18.22	10.8'	26°24.05	4.9'	53.9'
4	240°35.39	54.58	63°48.03	10.8'	26°28.97	4.8'	53.9'
5	255°35.30	54.93	78°17.81	10.7'	26°33.76	4.7'	53.9'
6	270°35.21	N21°55.29	92°47.54	10.7'	S26°38.43	4.5'	53.9'
7	285°35.11	55.64	107°17.24	10.7'	26°42.98	4.4'	53.9'
8	300°35.02	56.00	121°46.89	10.6'	26°47.39	4.3'	53.9'
9	315°34.93	· · 56.35	136°16.51	10.6'	26°51.68	4.2'	53.9'
10	330°34.84	56.70	150°46.09	10.5'	26°55.84	4.0'	53.9'
11	345°34.75	57.05	165°15.63	10.5'	26°59.88	3.9'	53.9'
12	0°34.66	N21°57.40	179°45.14	10.5'	S27°3.79	3.8'	53.9'
13	15°34.57	57.75	194°14.61	10.4'	27°7.56	3.6'	53.9'
14	30°34.48	58.10	208°44.05	10.4'	27°11.21	3.5'	53.9'
15	45°34.38	· · 58.45	223°13.46	10.4'	27°14.73	3.4'	53.9'
16	60°34.29	58.80	237°42.83	10.3'	27°18.11	3.3'	53.9'
17	75°34.20	59.15	252°12.18	10.3'	27°21.37	3.1'	53.9'
18	90°34.11	N21°59.49	266°41.50	10.3'	S27°24.50	3.0'	53.9'
19	105°34.01	21°59.84	281°10.78	10.3'	27°27.49	2.9'	53.9'
20	120°33.92	22°0.19	295°40.05	10.2'	27°30.35	2.7'	53.9'
21	135°33.83	· · 0.53	310°9.28	10.2'	27°33.09	2.6'	53.9'
22	150°33.73	0.87	324°38.49	10.2'	27°35.68	2.5'	53.9'
23	165°33.64	1.22	339°7.68	10.2'	27°38.15	2.3'	53.9'
SD = 15.8'			SD = 14.7'				
$d = 0.4'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°33.55	N22°1.56	353°36.84	10.1'	S27°40.48	2.2'	53.9'
1	195°33.45	1.90	8°5.98	10.1'	27°42.68	2.1'	53.9'
2	210°33.36	2.24	22°35.10	10.1'	27°44.75	1.9'	53.9'
3	225°33.27	· · 2.59	37°4.21	10.1'	27°46.68	1.8'	53.9'
4	240°33.17	2.93	51°33.29	10.1'	27°48.48	1.7'	53.9'
5	255°33.08	3.27	66°2.36	10.1'	27°50.14	1.5'	53.9'
6	270°32.98	N22°3.60	80°31.41	10.0'	S27°51.67	1.4'	53.9'
7	285°32.89	3.94	95°0.45	10.0'	27°53.06	1.3'	53.9'
8	300°32.79	4.28	109°29.47	10.0'	27°54.32	1.1'	53.9'
9	315°32.70	· · 4.62	123°58.49	10.0'	27°55.45	1.0'	53.9'
10	330°32.60	4.95	138°27.49	10.0'	27°56.43	0.9'	53.9'
11	345°32.51	5.29	152°56.48	10.0'	27°57.29	0.7'	53.9'
12	0°32.41	N22°5.62	167°25.46	10.0'	S27°58.01	0.6'	53.9'
13	15°32.31	5.96	181°54.44	10.0'	27°58.59	0.4'	53.9'
14	30°32.22	6.29	196°23.41	10.0'	27°59.04	0.3'	53.9'
15	45°32.12	· · 6.62	210°52.38	10.0'	27°59.35	0.2'	53.9'
16	60°32.03	6.96	225°21.34	10.0'	27°59.53	0.0'	53.9'
17	75°31.93	7.29	239°50.30	10.0'	27°59.57	-0.1'	53.9'
18	90°31.83	N22°7.62	254°19.26	10.0'	S27°59.47	-0.2'	53.9'
19	105°31.74	7.95	268°48.22	10.0'	27°59.24	-0.4'	53.9'
20	120°31.64	8.28	283°17.19	10.0'	27°58.87	-0.5'	53.9'
21	135°31.54	· · 8.61	297°46.15	10.0'	27°58.37	-0.6'	53.9'
22	150°31.44	8.94	312°15.12	10.0'	27°57.73	-0.8'	53.9'
23	165°31.35	9.26	326°44.10	10.0'	27°56.96	-0.9'	53.9'
SD = 15.8'			SD = 14.7'				
$d = 0.3'$							

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°31.25	N22°9.59	341°13.08	10.0'	S27°56.05	-1.0'	53.9'
1	195°31.15	9.92	355°42.07	10.0'	27°55.00	-1.2'	53.9'
2	210°31.05	10.24	10°11.07	10.0'	27°53.82	-1.3'	53.9'
3	225°30.95	· · 10.57	24°40.07	10.0'	27°52.51	-1.5'	53.9'
4	240°30.86	10.89	39°9.09	10.0'	27°51.06	-1.6'	53.9'
5	255°30.76	11.21	53°38.13	10.0'	27°49.47	-1.7'	53.9'
6	270°30.66	N22°11.54	68°7.17	10.1'	S27°47.75	-1.9'	53.9'
7	285°30.56	11.86	82°36.23	10.1'	27°45.90	-2.0'	54.0'
8	300°30.46	12.18	97°5.31	10.1'	27°43.91	-2.1'	54.0'
9	315°30.36	· · 12.50	111°34.41	10.1'	27°41.79	-2.3'	54.0'
10	330°30.26	12.82	126°3.52	10.1'	27°39.53	-2.4'	54.0'
11	345°30.16	13.14	140°32.65	10.2'	27°37.14	-2.5'	54.0'
12	0°30.06	N22°13.46	155°1.81	10.2'	S27°34.62	-2.7'	54.0'
13	15°29.96	13.78	169°30.98	10.2'	27°31.96	-2.8'	54.0'
14	30°29.86	14.09	184°0.18	10.2'	27°29.17	-2.9'	54.0'
15	45°29.76	· · 14.41	198°29.40	10.2'	27°26.25	-3.1'	54.0'
16	60°29.66	14.73	212°58.65	10.3'	27°23.19	-3.2'	54.0'
17	75°29.56	15.04	227°27.92	10.3'	27°20.01	-3.3'	54.0'
18	90°29.46	N22°15.36	241°57.22	10.3'	S27°16.69	-3.4'	54.0'
19	105°29.36	15.67	256°26.55	10.4'	27°13.24	-3.6'	54.0'
20	120°29.26	15.98	270°55.91	10.4'	27°9.66	-3.7'	54.0'
21	135°29.16	· · 16.30	285°25.30	10.4'	27°5.95	-3.8'	54.0'
22	150°29.06	16.61	299°54.72	10.5'	27°2.11	-4.0'	54.0'
23	165°28.95	16.92	314°24.17	10.5'	26°58.14	-4.1'	54.0'
SD = 15.8'			SD = 14.7'				
$d = 0.3'$							

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	100-97%
31	02:23	02:19	11:58	—:—	12:01	
01	02:14	02:10	11:58	00:26	12:52	
02	02:05	02:00	11:58	01:18	13:43	

June 03, 04, 05 UT (Wed., Thu., Fri.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	251°28.00	141°56.82	N24°12.02	212°27.68	N14°37.48	135°1.78	N21°38.15	239°9.98	N02°48.90	Alpheratz	357°33.69	29°14.03
1	266°30.46	156°56.08	11.66	227°28.33	38.07	150°3.73	38.07	254°12.25	48.97	Ankaa	353°6.18	-42°9.51
2	281°32.93	171°55.34	11.31	242°28.99	38.66	165°5.69	37.99	269°14.52	49.04	Schedar	349°29.98	56°40.70
3	296°35.39	186°54.60	•• 10.95	257°29.64	•• 39.26	180°7.65	•• 37.90	284°16.80	•• 49.11	Diphda	348°46.30	-17°50.40
4	311°37.85	201°53.86	10.59	272°30.30	39.85	195°9.61	37.82	299°19.07	49.19	Achernar	335°19.73	-57°5.91
5	326°40.32	216°53.12	10.23	287°30.95	40.45	210°11.56	37.74	314°21.34	49.26	Hamal	327°50.16	23°35.15
6	341°42.78	231°52.38	N24°9.87	302°31.61	N14°41.04	225°13.52	N21°37.66	329°23.61	N02°49.33	Polaris	313°52.91	89°22.35
7	356°45.25	246°51.64	9.51	317°32.26	41.63	240°15.48	37.57	344°25.88	49.40	Acamar	315°11.28	-40°11.80
8	11°47.71	261°50.91	9.15	332°32.92	42.23	255°17.44	37.49	359°28.16	49.47	Menkar	314°5.24	4°11.58
9	26°50.17	276°50.17	•• 8.78	347°33.57	•• 42.82	270°19.39	•• 37.41	14°30.43	•• 49.54	Mirfak	308°27.07	49°57.18
10	41°52.64	291°49.43	8.42	2°34.23	43.41	285°21.35	37.32	29°32.70	49.61	Aldebaran	290°38.64	16°33.70
11	56°55.10	306°48.70	8.05	17°34.88	44.00	300°23.31	37.24	44°34.97	49.68	Rigel	281°3.10	-8°10.29
12	71°57.57	321°47.96	N24°7.68	32°35.54	N14°44.60	315°25.26	N21°37.16	59°37.25	N02°49.75	Capella	280°20.67	46°1.44
13	87°0.03	336°47.23	7.31	47°36.19	45.19	330°27.22	37.07	74°39.52	49.82	Bellatrix	278°21.98	6°22.39
14	102°2.50	351°46.49	6.94	62°36.85	45.78	345°29.18	36.99	89°41.79	49.90	Elnath	278°0.79	28°37.75
15	117°4.96	6°45.76	•• 6.57	77°37.50	•• 46.37	0°31.13	•• 36.91	104°44.07	•• 49.97	Alnilam	275°36.89	-1°11.14
16	132°7.42	21°45.02	6.20	92°38.16	46.96	15°33.09	36.82	119°46.34	50.04	Betelgeuse	270°51.17	7°24.69
17	147°9.89	36°44.29	5.83	107°38.81	47.55	30°35.05	36.74	134°48.61	50.11	Canopus	263°52.40	-52°42.66
18	162°12.35	51°43.56	N24°5.45	122°39.46	N14°48.14	45°37.00	N21°36.66	149°50.89	N02°50.18	Sirius	258°25.54	-16°45.22
19	177°14.82	66°42.82	5.08	137°40.12	48.73	60°38.96	36.57	164°53.16	50.25	Adhara	255°5.29	-29°0.58
20	192°17.28	81°42.09	4.70	152°40.77	49.32	75°40.91	36.49	179°55.43	50.32	Procyon	244°49.89	5°9.39
21	207°19.74	96°41.36	•• 4.32	167°41.43	•• 49.91	90°42.87	•• 36.41	194°57.71	•• 50.39	Pollux	243°16.19	27°57.78
22	222°22.21	111°40.63	3.94	182°42.08	50.50	105°44.83	36.32	209°59.98	50.46	Avior	234°14.69	-59°35.88
23	237°24.67	126°39.90	3.56	197°42.74	51.09	120°46.78	36.24	225°2.25	50.53	Suhail	222°45.68	-43°32.60
Mer.pass. 07:13		ν-0.7' d-0.4' m-3.95		ν0.7' d0.6' m1.27		ν2.0' d-0.1' m-1.88		ν2.3' d0.1' m0.87		Miaplacidus	221°38.48	-69°49.82
										Alphard	217°46.76	-8°46.50
										Regulus	207°33.29	11°50.27
										Dubhe	193°39.59	61°36.74
										Denebola	182°23.70	14°25.46
										Genah	175°42.28	-17°41.50
										Acrux	172°58.52	-63°15.07
										Gacrux	171°50.11	-57°15.99
										Alioth	166°11.67	55°49.15
										Spica	158°20.88	-11°18.09
										Alkaid	152°50.75	49°10.99
										Hadar	148°33.86	-60°30.27
										Menkent	147°55.95	-36°30.19
										Arcturus	145°46.59	19°2.68
										Rigel Kent.	139°38.14	-60°56.88
										Kochab	137°18.80	74°2.88
										Zuben'ubi	136°54.44	-16°9.21
										Alphecca	126°2.41	26°37.52
										Antares	112°14.04	-26°29.49
										Atria	107°6.65	-69°4.49
										Sabik	102°1.11	-15°45.49
										Shaula	96°8.38	-37°7.35
										Rasalhague	95°57.14	12°32.38
										Eltanin	90°41.12	51°28.98
										Kaus Aust.	83°30.61	-34°22.25
										Vega	80°32.05	38°48.34
										Nunki	75°46.01	-26°15.76
										Altair	61°58.59	8°56.23
										Peacock	53°3.55	-56°38.75
										Deneb	49°24.75	45°22.26
										Enif	33°37.56	9°59.71
										Al Na'ir	27°31.37	-46°49.72
										Fomalhaut	15°13.25	-29°28.76
										Scheat	13°44.09	28°13.42
										Markab	13°28.76	15°20.76
										Jun 03 Wed		
										Venus	250°28.82	14:33
										Mars	320°59.68	09:50
										Jupiter	243°33.78	14:58
										Saturn	347°41.98	08:02
										Jun 04 Thu		
										Venus	249°12.03	14:34
										Mars	320°16.25	09:49
										Jupiter	243°21.60	14:55
										Saturn	347°37.39	07:58
										Jun 05 Fri		
										Venus	247°55.51	14:35
										Mars	319°32.78	09:48
										Jupiter	243°9.36	14:52
										Saturn	347°32.87	07:55
										Horizontal parallax		
										Venus:		0.1
										Mars:		0.1
Mer.pass. 07:05		ν-0.7' d-0.4' m-3.96		ν0.7' d0.6' m1.28		ν2.0' d-0.1' m-1.87		ν2.3' d0.1' m0.87				

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°28.85	N22°17.23	328°53.65	10.5'	S26°54.04	-4.2'	54.1'
1	195°28.75	17.54	343°23.17	10.6'	26°49.81	-4.4'	54.1'
2	210°28.65	17.85	357°52.72	10.6'	26°45.46	-4.5'	54.1'
3	225°28.55	· · 18.16	12°22.31	10.6'	26°40.97	-4.6'	54.1'
4	240°28.44	18.47	26°51.94	10.7'	26°36.36	-4.7'	54.1'
5	255°28.34	18.78	41°21.60	10.7'	26°31.62	-4.9'	54.1'
6	270°28.24	N22°19.08	55°51.30	10.7'	S26°26.76	-5.0'	54.1'
7	285°28.14	19.39	70°21.04	10.8'	26°21.77	-5.1'	54.1'
8	300°28.03	19.69	84°50.82	10.8'	26°16.65	-5.2'	54.1'
9	315°27.93	· · 20.00	99°20.64	10.9'	26°11.41	-5.4'	54.1'
10	330°27.83	20.30	113°50.50	10.9'	26°6.05	-5.5'	54.1'
11	345°27.72	20.60	128°20.40	10.9'	26°0.56	-5.6'	54.1'
12	0°27.62	N22°20.91	142°50.34	11.0'	S25°54.95	-5.7'	54.2'
13	15°27.52	21.21	157°20.33	11.0'	25°49.21	-5.9'	54.2'
14	30°27.41	21.51	171°50.36	11.1'	25°43.35	-6.0'	54.2'
15	45°27.31	· · 21.81	186°20.44	11.1'	25°37.38	-6.1'	54.2'
16	60°27.20	22.11	200°50.56	11.2'	25°31.28	-6.2'	54.2'
17	75°27.10	22.41	215°20.72	11.2'	25°25.06	-6.3'	54.2'
18	90°26.99	N22°22.71	229°50.94	11.3'	S25°18.72	-6.5'	54.2'
19	105°26.89	23.01	244°21.19	11.3'	25°12.26	-6.6'	54.2'
20	120°26.78	23.30	258°51.50	11.4'	25°5.68	-6.7'	54.2'
21	135°26.68	· · 23.60	273°21.85	11.4'	24°58.99	-6.8'	54.3'
22	150°26.57	23.90	287°52.25	11.4'	24°52.17	-6.9'	54.3'
23	165°26.47	24.19	302°22.70	11.5'	24°45.24	-7.0'	54.3'
SD = 15.8' $d = 0.3'$			SD = 14.7'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°26.36	N22°24.49	316°53.20	11.5'	S24°38.20	-7.2'	54.3'
1	195°26.26	24.78	331°23.75	11.6'	24°31.04	-7.3'	54.3'
2	210°26.15	25.07	345°54.34	11.6'	24°23.76	-7.4'	54.3'
3	225°26.05	· · 25.37	0°24.99	11.7'	24°16.37	-7.5'	54.3'
4	240°25.94	25.66	14°55.68	11.7'	24°8.87	-7.6'	54.3'
5	255°25.83	25.95	29°26.43	11.8'	24°1.25	-7.7'	54.3'
6	270°25.73	N22°26.24	43°57.23	11.8'	S23°53.53	-7.8'	54.4'
7	285°25.62	26.53	58°28.07	11.9'	23°45.69	-7.9'	54.4'
8	300°25.51	26.82	72°58.97	11.9'	23°37.74	-8.1'	54.4'
9	315°25.41	· · 27.11	87°29.92	12.0'	23°29.68	-8.2'	54.4'
10	330°25.30	27.39	102°0.92	12.1'	23°21.51	-8.3'	54.4'
11	345°25.19	27.68	116°31.97	12.1'	23°13.23	-8.4'	54.4'
12	0°25.08	N22°27.97	131°3.08	12.2'	S23°4.85	-8.5'	54.4'
13	15°24.98	28.25	145°34.23	12.2'	22°56.36	-8.6'	54.5'
14	30°24.87	28.54	160°5.44	12.3'	22°47.76	-8.7'	54.5'
15	45°24.76	· · 28.82	174°36.70	12.3'	22°39.05	-8.8'	54.5'
16	60°24.65	29.10	189°8.01	12.4'	22°30.24	-8.9'	54.5'
17	75°24.55	29.39	203°39.37	12.4'	22°21.33	-9.0'	54.5'
18	90°24.44	N22°29.67	218°10.78	12.5'	S22°12.31	-9.1'	54.5'
19	105°24.33	29.95	232°42.24	12.5'	22°3.19	-9.2'	54.6'
20	120°24.22	30.23	247°13.76	12.6'	21°53.97	-9.3'	54.6'
21	135°24.11	· · 30.51	261°45.32	12.6'	21°44.65	-9.4'	54.6'
22	150°24.00	30.79	276°16.94	12.7'	21°35.23	-9.5'	54.6'
23	165°23.89	31.07	290°48.61	12.7'	21°25.70	-9.6'	54.6'
SD = 15.8' $d = 0.3'$			SD = 14.8'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°23.78	N22°31.35	305°20.33	12.8'	S21°16.08	-9.7'	54.6'
1	195°23.67	31.63	319°52.10	12.8'	21°6.36	-9.8'	54.7'
2	210°23.57	31.90	334°23.92	12.9'	20°56.54	-9.9'	54.7'
3	225°23.46	· · 32.18	348°55.79	12.9'	20°46.63	-10.0'	54.7'
4	240°23.35	32.45	3°27.71	13.0'	20°36.61	-10.1'	54.7'
5	255°23.24	32.73	17°59.68	13.0'	20°26.51	-10.2'	54.7'
6	270°23.13	N22°33.00	32°31.70	13.1'	S20°16.31	-10.3'	54.7'
7	285°23.02	33.28	47°3.77	13.1'	20°6.01	-10.4'	54.8'
8	300°22.91	33.55	61°35.88	13.2'	19°55.62	-10.5'	54.8'
9	315°22.79	· · 33.82	76°8.05	13.2'	19°45.14	-10.6'	54.8'
10	330°22.68	34.09	90°40.26	13.3'	19°34.57	-10.7'	54.8'
11	345°22.57	34.36	105°12.52	13.3'	19°23.91	-10.8'	54.8'
12	0°22.46	N22°34.63	119°44.83	13.4'	S19°13.15	-10.8'	54.9'
13	15°22.35	34.90	134°17.18	13.4'	19°2.31	-10.9'	54.9'
14	30°22.24	35.17	148°49.58	13.4'	18°51.38	-11.0'	54.9'
15	45°22.13	· · 35.44	163°22.02	13.5'	18°40.36	-11.1'	54.9'
16	60°22.02	35.71	177°54.51	13.5'	18°29.25	-11.2'	54.9'
17	75°21.90	35.97	192°27.05	13.6'	18°18.06	-11.3'	55.0'
18	90°21.79	N22°36.24	206°59.63	13.6'	S18°6.78	-11.4'	55.0'
19	105°21.68	36.50	221°32.25	13.7'	17°55.42	-11.4'	55.0'
20	120°21.57	36.77	236°4.92	13.7'	17°43.98	-11.5'	55.0'
21	135°21.46	· · 37.03	250°37.63	13.7'	17°32.45	-11.6'	55.0'
22	150°21.34	37.29	265°10.38	13.8'	17°20.83	-11.7'	55.1'
23	165°21.23	37.56	279°43.17	13.8'	17°9.14	-11.8'	55.1'
SD = 15.8' $d = 0.3'$			SD = 14.9'				

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

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

Day	Sun			Moon		
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 18-20 94-82%
03	01:55	01:50	11:58	02:09	14:34	
04	01:45	01:40	11:58	02:58	15:22	
05	01:35	01:30	11:59	03:46	16:09	

Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	254°25.42	141°4.68	N23°43.54	213°14.69	N15°19.62	137°22.47	N21°32.09	241°53.82	N02°53.91
1	269°27.88	156°3.98	43.11	228°15.34	20.19	152°24.42	32.00	256°56.10	53.97
2	284°30.35	171°3.27	42.67	243°15.99	20.77	167°26.37	31.92	271°58.38	54.04
3	299°32.81	186°2.57	· · 42.23	258°16.64	· · 21.35	182°28.32	· · 31.83	287°0.66	· · 54.11
4	314°35.27	201°1.86	41.79	273°17.29	21.92	197°30.27	31.74	302°2.94	54.18
5	329°37.74	216°1.16	41.35	288°17.94	22.49	212°32.22	31.66	317°5.22	54.24
6	344°40.20	231°0.45	N23°40.91	303°18.59	N15°23.07	227°34.17	N21°31.57	332°7.50	N02°54.31
7	359°42.67	245°59.75	40.46	318°19.24	23.64	242°36.11	31.48	347°9.78	54.38
8	14°45.13	260°59.05	40.02	333°19.89	24.22	257°38.06	31.40	2°12.07	54.44
9	29°47.59	275°58.35	· · 39.57	348°20.54	· · 24.79	272°40.01	· · 31.31	17°14.35	· · 54.51
10	44°50.06	290°57.64	39.13	3°21.19	25.36	287°41.96	31.23	32°16.63	54.58
11	59°52.52	305°56.94	38.68	18°21.84	25.93	302°43.91	31.14	47°18.91	54.65
12	74°54.99	320°56.24	N23°38.23	33°22.49	N15°26.51	317°45.86	N21°31.05	62°21.19	N02°54.71
13	89°57.45	335°55.54	37.78	48°23.14	27.08	332°47.81	30.97	77°23.47	54.78
14	104°59.91	350°54.84	37.33	63°23.79	27.65	347°49.76	30.88	92°25.75	54.85
15	120°2.38	5°54.14	· · 36.88	78°24.44	· · 28.22	2°51.71	· · 30.79	107°28.03	· · 54.91
16	135°4.84	20°53.45	36.42	93°25.09	28.79	17°53.65	30.71	122°30.31	54.98
17	150°7.31	35°52.75	35.97	108°25.73	29.36	32°55.60	30.62	137°32.60	55.05
18	165°9.77	50°52.05	N23°35.51	123°26.38	N15°29.94	47°57.55	N21°30.53	152°34.88	N02°55.11
19	180°12.24	65°51.35	35.06	138°27.03	30.51	62°59.50	30.45	167°37.16	55.18
20	195°14.70	80°50.66	34.60	153°27.68	31.08	78°1.45	30.36	182°39.44	55.25
21	210°17.16	95°49.96	· · 34.14	168°28.33	· · 31.65	93°3.39	· · 30.27	197°41.72	· · 55.31
22	225°19.63	110°49.26	33.68	183°28.98	32.22	108°5.34	30.19	212°44.01	55.38
23	240°22.09	125°48.57	33.22	198°29.63	32.79	123°7.29	30.10	227°46.29	55.44
Mer.pass. 07:01		ν-0.7' d-0.4' m-3.96		ν0.7' d0.6' m1.28		ν1.9' d-0.1' m-1.87		ν2.3' d0.1' m0.86	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	255°24.56	140°47.87	N23°32.76	213°30.28	N15°33.35	138°9.24	N21°30.01	242°48.57	N02°55.51
1	270°27.02	155°47.18	32.29	228°30.92	33.92	153°11.18	29.93	257°50.85	55.58
2	285°29.48	170°46.49	31.83	243°31.57	34.49	168°13.13	29.84	272°53.14	55.64
3	300°31.95	185°45.79	· · 31.36	258°32.22	· · 35.06	183°15.08	· · 29.75	287°55.42	· · 55.71
4	315°34.41	200°45.10	30.90	273°32.87	35.63	198°17.03	29.67	302°57.70	55.78
5	330°36.88	215°44.41	30.43	288°33.52	36.20	213°18.97	29.58	317°59.99	55.84
6	345°39.34	230°43.72	N23°29.96	303°34.17	N15°36.76	228°20.92	N21°29.49	333°2.27	N0

Jun 06 Sat	SHA	Mer.pass
Venus	246°39.27	14:36
Mars	318°49.27	09:47
Jupiter	242°57.05	14:49
Saturn	347°28.41	07:51

Jun 07 Sun	SHA	Mer.pass
Venus	245°23.32	14:37
Mars	318°5.72	09:46
Jupiter	242°44.68	14:45
Saturn	347°24.02	07:48

Jun 08 Mon	SHA	Mer.pass
Venus	244°7.67	14:39
Mars	317°22.13	09:45
Jupiter	242°32.25	14:42
Saturn	347°19.69	07:44

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.12	N22°37.82	294°16.00	13.9'	S16°57.36	-11.9'	55.1'
1	195°21.01	38.08	308°48.87	13.9'	16°45.51	-11.9'	55.1'
2	210°20.89	38.34	323°21.78	13.9'	16°33.58	-12.0'	55.2'
3	225°20.78	· · 38.60	337°54.73	14.0'	16°21.56	-12.1'	55.2'
4	240°20.67	38.86	352°27.72	14.0'	16°9.47	-12.2'	55.2'
5	255°20.55	39.12	7°0.74	14.1'	15°57.30	-12.2'	55.2'
6	270°20.44	N22°39.37	21°33.80	14.1'	S15°45.06	-12.3'	55.3'
7	285°20.33	39.63	36°6.90	14.1'	15°32.74	-12.4'	55.3'
8	300°20.21	39.89	50°40.03	14.2'	15°20.34	-12.5'	55.3'
9	315°20.10	· · 40.14	65°13.20	14.2'	15°7.87	-12.5'	55.3'
10	330°19.98	40.40	79°46.40	14.2'	14°55.33	-12.6'	55.4'
11	345°19.87	40.65	94°19.63	14.3'	14°42.71	-12.7'	55.4'
12	0°19.76	N22°40.90	108°52.89	14.3'	S14°30.03	-12.8'	55.4'
13	15°19.64	41.16	123°26.18	14.3'	14°17.27	-12.8'	55.4'
14	30°19.53	41.41	137°59.51	14.4'	14°4.44	-12.9'	55.5'
15	45°19.41	· · 41.66	152°32.86	14.4'	13°51.54	-13.0'	55.5'
16	60°19.30	41.91	167°6.25	14.4'	13°38.57	-13.0'	55.5'
17	75°19.18	42.16	181°39.66	14.4'	13°25.54	-13.1'	55.5'
18	90°19.07	N22°42.41	196°13.09	14.5'	S13°12.44	-13.2'	55.6'
19	105°18.95	42.66	210°46.55	14.5'	12°59.27	-13.2'	55.6'
20	120°18.84	42.91	225°20.04	14.5'	12°46.03	-13.3'	55.6'
21	135°18.72	· · 43.15	239°53.55	14.5'	12°32.73	-13.4'	55.6'
22	150°18.60	43.40	254°27.09	14.6'	12°19.37	-13.4'	55.7'
23	165°18.49	43.65	269°0.64	14.6'	12°5.94	-13.5'	55.7'
SD = 15.8'			SD = 15.0'				
$d = 0.3'$							

Sun	GHA		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°18.37	N22°43.89	283°34.22	14.6'	S11°52.45	-13.6'	55.7'
1	195°18.26	44.13	298°7.82	14.6'	11°38.90	-13.6'	55.7'
2	210°18.14	44.38	312°41.43	14.6'	11°25.28	-13.7'	55.8'
3	225°18.02	· · 44.62	327°15.07	14.7'	11°11.61	-13.7'	55.8'
4	240°17.91	44.86	341°48.72	14.7'	10°57.88	-13.8'	55.8'
5	255°17.79	45.11	356°22.39	14.7'	10°44.09	-13.9'	55.9'
6	270°17.67	N22°45.35	10°56.07	14.7'	S10°30.24	-13.9'	55.9'
7	285°17.56	45.59	25°29.77	14.7'	10°16.33	-14.0'	55.9'
8	300°17.44	45.83	40°3.48	14.7'	10°2.36	-14.0'	56.0'
9	315°17.32	· · 46.06	54°37.20	14.7'	09°48.34	-14.1'	56.0'
10	330°17.20	46.30	69°10.93	14.7'	09°34.27	-14.1'	56.0'
11	345°17.09	46.54	83°44.67	14.8'	09°20.14	-14.2'	56.0'
12	0°16.97	N22°46.78	98°18.43	14.8'	S09°5.96	-14.2'	56.1'
13	15°16.85	47.01	112°52.19	14.8'	08°51.72	-14.3'	56.1'
14	30°16.73	47.25	127°25.95	14.8'	08°37.44	-14.3'	56.1'
15	45°16.62	· · 47.48	141°59.72	14.8'	08°23.10	-14.4'	56.2'
16	60°16.50	47.72	156°33.50	14.8'	08°8.71	-14.4'	56.2'
17	75°16.38	47.95	171°7.27	14.8'	07°54.27	-14.5'	56.2'
18	90°16.26	N22°48.18	185°41.06	14.8'	S07°39.79	-14.5'	56.3'
19	105°16.14	48.42	200°14.84	14.8'	07°25.26	-14.6'	56.3'
20	120°16.02	48.65	214°48.62	14.8'	07°10.68	-14.6'	56.3'
21	135°15.90	· · 48.88	229°22.40	14.8'	06°56.05	-14.7'	56.4'
22	150°15.79	49.11	243°56.17	14.8'	06°41.38	-14.7'	56.4'
23	165°15.67	49.34	258°29.95	14.8'	06°26.66	-14.8'	56.4'
SD = 15.8'			SD = 15.2'				
$d = 0.2'$							

Mon	GHA		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°15.55	N22°49.56	273°3.71	14.8'	S06°11.90	-14.8'	56.5'
1	195°15.43	49.79	287°37.47	14.8'	05°57.10	-14.8'	56.5'
2	210°15.31	50.02	302°11.23	14.7'	05°42.25	-14.9'	56.5'
3	225°15.19	· · 50.25	316°44.97	14.7'	05°27.37	-14.9'	56.6'
4	240°15.07	50.47	331°18.71	14.7'	05°12.44	-15.0'	56.6'
5	255°14.95	50.70	345°52.43	14.7'	04°57.48	-15.0'	56.6'
6	270°14.83	N22°50.92	0°26.15	14.7'	S04°42.47	-15.0'	56.7'
7	285°14.71	51.14	14°59.84	14.7'	04°27.43	-15.1'	56.7'
8	300°14.59	51.37	29°33.53	14.7'	04°12.35	-15.1'	56.7'
9	315°14.47	· · 51.59	44°7.19	14.6'	03°57.24	-15.1'	56.8'
10	330°14.35	51.81	58°40.84	14.6'	03°42.09	-15.2'	56.8'
11	345°14.23	52.03	73°14.47	14.6'	03°26.91	-15.2'	56.8'
12	0°14.11	N22°52.25	87°48.09	14.6'	S03°11.69	-15.2'	56.9'
13	15°13.99	52.47	102°21.67	14.6'	02°56.44	-15.3'	56.9'
14	30°13.87	52.69	116°55.24	14.5'	02°41.16	-15.3'	56.9'
15	45°13.74	· · 52.91	131°28.78	14.5'	02°25.85	-15.3'	57.0'
16	60°13.62	53.12	146°2.30	14.5'	02°10.51	-15.4'	57.0'
17	75°13.50	53.34	160°35.79	14.5'	01°55.15	-15.4'	57.0'
18	90°13.38	N22°53.56	175°9.25	14.4'	S01°39.75	-15.4'	57.1'
19	105°13.26	53.77	189°42.69	14.4'	01°24.33	-15.4'	57.1'
20	120°13.14	53.99	204°16.09	14.4'	01°8.88	-15.5'	57.1'
21	135°13.02	· · 54.20	218°49.46	14.3'	00°53.40	-15.5'	57.2'
22	150°12.89	54.41	233°22.80	14.3'	00°37.91	-15.5'	57.2'
23	165°12.77	54.63	247°56.10	14.3'	00°22.39	-15.5'	57.3'
SD = 15.8'			SD = 15.4'				
$d = 0.2'$							

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

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

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June 09, 10, 11 UT (Tue., Wed., Thu.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	257°22.83	140°15.17	N23°9.29	214°1.32	N16°0.34	139°42.60	N21°25.79	244°38.27	N02°58.63	Alpheratz	357°33.65 29°14.05
1	272°25.30	155°14.51	8.78	229°1.97	0.90	154°44.54	25.70	259°40.56	58.69	Ankaa	353°6.13 -42°9.49
2	287°27.76	170°13.84	8.26	244°2.61	1.45	169°46.48	25.61	274°42.85	58.75	Schedar	349°29.92 56°40.71
3	302°30.22	185°13.17	•• 7.74	259°3.26	•• 2.01	184°48.42	•• 25.52	289°45.14	•• 58.82	Diphda	348°46.26 -17°50.37
4	317°32.69	200°12.51	7.22	274°3.90	2.56	199°50.37	25.43	304°47.43	58.88	Achernar	335°19.68 -57°5.88
5	332°35.15	215°11.84	6.70	289°4.55	3.11	214°52.31	25.34	319°49.71	58.94	Hamal	327°50.13 23°35.16
6	347°37.62	230°11.17	N23°6.18	304°5.19	N16°3.67	229°54.25	N21°25.25	334°52.00	N02°59.01	Polaris	313°51.28 89°22.33
7	2°40.08	245°10.51	5.66	319°5.84	4.22	244°56.19	25.16	349°54.29	59.07	Acamar	315°11.25 -40°11.76
8	17°42.54	260°9.85	5.14	334°6.48	4.78	259°58.13	25.07	4°56.58	59.13	Menkar	314°5.21 4°11.60
9	32°45.01	275°9.18	•• 4.61	349°7.13	•• 5.33	275°0.08	•• 24.98	19°58.87	•• 59.20	Mirfak	308°27.04 49°57.17
10	47°47.47	290°8.52	4.09	4°7.77	5.88	290°2.02	24.90	35°1.16	59.26	Aldebaran	290°38.63 16°33.71
11	62°49.94	305°7.86	3.56	19°8.42	6.43	305°3.96	24.81	50°3.45	59.32	Rigel	281°3.09 -8°10.27
12	77°52.40	320°7.20	N23°3.04	34°9.06	N16°6.99	320°5.90	N21°24.72	65°5.74	N02°59.38	Capella	280°20.65 46°1.43
13	92°54.87	335°6.54	2.51	49°9.70	7.54	335°7.84	24.63	80°8.03	59.45	Bellatrix	278°21.97 6°22.40
14	107°57.33	350°5.87	1.98	64°10.35	8.09	350°9.78	24.54	95°10.32	59.51	Elnath	278°0.78 28°37.75
15	122°59.79	5°5.21	•• 1.45	79°10.99	•• 8.64	5°11.72	•• 24.45	110°12.61	•• 59.57	Alnilam	275°36.89 -1°11.12
16	138°2.26	20°4.56	0.92	94°11.64	9.19	20°13.66	24.36	125°14.90	59.64	Betelgeuse	270°51.16 7°24.70
17	153°4.72	35°3.90	23°0.38	109°12.28	9.74	35°15.61	24.27	140°17.19	59.70	Canopus	263°52.42 -52°42.63
18	168°7.19	50°3.24	N22°59.85	124°12.92	N16°10.29	50°17.55	N21°24.18	155°19.48	N02°59.76	Sirius	258°25.54 -16°45.20
19	183°9.65	65°2.58	59.32	139°13.57	10.84	65°19.49	24.09	170°21.77	59.82	Adhara	255°5.30 -29°0.56
20	198°12.11	80°1.92	58.78	154°14.21	11.39	80°21.43	24.00	185°24.06	59.89	Procyon	244°49.90 5°9.40
21	213°14.58	95°1.27	•• 58.24	169°14.85	•• 11.94	95°23.37	•• 23.91	200°26.35	02°59.95	Pollux	243°16.20 27°57.77
22	228°17.04	110°0.61	57.71	184°15.50	12.49	110°25.31	23.82	215°28.64	03°0.01	Avior	234°14.74 -59°35.85
23	243°19.51	124°59.96	57.17	199°16.14	13.04	125°27.25	23.73	230°30.94	0.07	Suhail	222°45.71 -43°32.58
Mer.pass. 06:49		ν-0.7' d-0.5' m-3.97		ν0.6' d0.6' m1.28		ν1.9' d-0.1' m-1.86		ν2.3' d0.1' m0.85		Miaplacidus	221°38.56 -69°49.81
										Alphard	217°46.78 -8°46.49
										Regulus	207°33.31 11°50.28
										Dubhe	193°39.64 61°36.74
										Denebola	182°23.72 14°25.47
										Gienah	175°42.30 -17°41.49
										Acrux	172°58.58 -63°15.08
										Gacrux	171°50.15 -57°16.00
										Alioth	166°11.71 55°49.17
										Spica	158°20.89 -11°18.08
										Alkaid	152°50.78 49°11.01
										Hadar	148°33.89 -60°30.28
										Menkent	147°55.96 -36°30.20
										Arcturus	145°46.60 19°2.69
										Rigel Kent.	139°38.16 -60°56.90
										Kochab	137°18.85 74°2.91
										Zuben'ubi	136°54.44 -16°9.21
										Alphecca	126°2.42 26°37.54
										Antares	112°14.04 -26°29.49
										Atria	107°6.63 -69°4.51
										Sabik	102°1.09 -15°45.48
										Shaula	96°8.36 -37°7.36
										Rasalhague	95°57.12 12°32.40
										Eltanin	90°41.10 51°29.01
										Kaus Aust.	83°30.58 -34°22.26
										Vega	80°32.03 38°48.37
										Nunki	75°45.97 -26°15.76
										Altair	61°58.55 8°56.25
										Peacock	53°3.48 -56°38.75
										Deneb	49°24.71 45°22.28
										Enif	33°37.52 9°59.73
										Al Na'ir	27°31.31 -46°49.71
										Fomalhaut	15°13.20 -29°28.74
										Scheat	13°44.05 28°13.43
										Markab	13°28.72 15°20.78
Jun 09 Tue		SHA		Mer.pass							
		Venus		242°52.34 14:40							
		Mars		316°38.49 09:43							
		Jupiter		242°19.76 14:39							
		Saturn		347°15.44 07:40							
Jun 10 Wed		SHA		Mer.pass							
		Venus		241°37.33 14:41							
		Mars		315°54.81 09:42							
		Jupiter		242°7.22 14:36							
		Saturn		347°11.26 07:37							
Jun 11 Thu		SHA		Mer.pass							
		Venus		240°22.65 14:42							
		Mars		315°11.10 09:41							
		Jupiter		241°54.62 14:33							
		Saturn		347°7.14 07:33							
		Horizontal parallax									
		Venus:		0.1							
		Mars:		0.1							
Mer.pass. 06:41		ν-0.6' d-0.6' m-3.97		ν0.6' d0.5' m1.28		ν1.9' d-0.1' m-1.85		ν2.3' d0.1' m0.85			

h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°12.65	N22°54.84	262°29.37	14.2'	S00°6.85	-15.6'	57.3'
1	195°12.53	55.05	277°2.60	14.2'	N00°8.72	15.6'	57.3'
2	210°12.41	55.26	291°35.79	14.1'	00°24.30	15.6'	57.4'
3	225°12.28	55.47	306°8.94	14.1'	00°39.90	15.6'	57.4'
4	240°12.16	55.68	320°42.04	14.1'	00°55.52	15.6'	57.4'
5	255°12.04	55.88	335°15.11	14.0'	01°11.15	15.6'	57.5'
6	270°11.92	N22°56.09	349°48.13	14.0'	N01°26.80	15.7'	57.5'
7	285°11.79	56.30	4°21.10	13.9'	01°42.46	15.7'	57.6'
8	300°11.67	56.51	18°54.03	13.9'	01°58.14	15.7'	57.6'
9	315°11.55	56.71	33°26.91	13.8'	02°13.83	15.7'	57.6'
10	330°11.42	56.92	47°59.73	13.8'	02°29.53	15.7'	57.7'
11	345°11.30	57.12	62°32.51	13.7'	02°45.24	15.7'	57.7'
12	0°11.18	N22°57.32	77°5.23	13.7'	N03°0.96	15.7'	57.7'
13	15°11.05	57.52	91°37.90	13.6'	03°16.69	15.7'	57.8'
14	30°10.93	57.73	106°10.51	13.6'	03°32.42	15.7'	57.8'
15	45°10.80	57.93	120°43.07	13.5'	03°48.16	15.7'	57.9'
16	60°10.68	58.13	135°15.56	13.4'	04°3.90	15.7'	57.9'
17	75°10.56	58.33	149°48.00	13.4'	04°19.65	15.7'	57.9'
18	90°10.43	N22°58.53	164°20.37	13.3'	N04°35.40	15.7'	58.0'
19	105°10.31	58.73	178°52.68	13.2'	04°51.14	15.7'	58.0'
20	120°10.18	58.92	193°24.93	13.2'	05°6.89	15.7'	58.0'
21	135°10.06	59.12	207°57.11	13.1'	05°22.63	15.7'	58.1'
22	150°9.93	59.32	222°29.22	13.0'	05°38.37	15.7'	58.1'
23	165°9.81	59.51	237°1.26	13.0'	05°54.11	15.7'	58.2'
SD = 15.8'		$d = 0.2'$	SD = 15.6'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°9.69	N22°59.71	251°33.23	12.9'	N06°9.84	15.7'	58.2'
1	195°9.56	22°59.90	266°5.13	12.8'	06°25.56	15.7'	58.2'
2	210°9.44	23°0.09	280°36.96	12.7'	06°41.28	15.7'	58.3'
3	225°9.31	23°0.29	295°8.71	12.7'	06°56.98	15.7'	58.3'
4	240°9.18	0.48	309°40.38	12.6'	07°12.67	15.7'	58.4'
5	255°9.06	0.67	324°11.97	12.5'	07°28.35	15.7'	58.4'
6	270°8.93	N23°0.86	338°43.49	12.4'	N07°44.02	15.6'	58.4'
7	285°8.81	1.05	353°14.92	12.4'	07°59.67	15.6'	58.5'
8	300°8.68	1.24	7°46.28	12.3'	08°15.30	15.6'	58.5'
9	315°8.56	1.43	22°17.54	12.2'	08°30.91	15.6'	58.6'
10	330°8.43	1.62	36°48.72	12.1'	08°46.50	15.6'	58.6'
11	345°8.30	1.80	51°19.82	12.0'	09°2.07	15.5'	58.6'
12	0°8.18	N23°1.99	65°50.83	11.9'	N09°17.62	15.5'	58.7'
13	15°8.05	2.18	80°21.74	11.8'	09°33.14	15.5'	58.7'
14	30°7.93	2.36	94°52.57	11.7'	09°48.64	15.5'	58.7'
15	45°7.80	2.54	109°23.30	11.6'	10°4.11	15.4'	58.8'
16	60°7.67	2.73	123°53.94	11.5'	10°19.55	15.4'	58.8'
17	75°7.55	2.91	138°24.48	11.4'	10°34.96	15.4'	58.9'
18	90°7.42	N23°3.09	152°54.92	11.3'	N10°50.33	15.3'	58.9'
19	105°7.29	3.27	167°25.27	11.2'	11°5.67	15.3'	58.9'
20	120°7.17	3.46	181°55.52	11.1'	11°20.98	15.3'	59.0'
21	135°7.04	3.64	196°25.66	11.0'	11°36.24	15.2'	59.0'
22	150°6.91	3.81	210°55.70	10.9'	11°51.47	15.2'	59.0'
23	165°6.78	3.99	225°25.64	10.8'	12°6.65	15.1'	59.1'
SD = 15.7'		$d = 0.2'$	SD = 15.9'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°6.66	N23°4.17	239°55.47	10.7'	N12°21.80	15.1'	59.1'
1	195°6.53	4.35	254°25.20	10.6'	12°36.89	15.1'	59.2'
2	210°6.40	4.52	268°54.81	10.5'	12°51.94	15.0'	59.2'
3	225°6.27	4.70	283°24.32	10.4'	13°6.95	15.0'	59.2'
4	240°6.15	4.88	297°53.72	10.3'	13°21.90	14.9'	59.3'
5	255°6.02	5.05	312°23.00	10.2'	13°36.80	14.8'	59.3'
6	270°5.89	N23°5.22	326°52.17	10.1'	N13°51.64	14.8'	59.3'
7	285°5.76	5.40	341°21.23	9.9'	14°6.43	14.7'	59.4'
8	300°5.64	5.57	355°50.16	9.8'	14°21.16	14.7'	59.4'
9	315°5.51	5.74	10°18.99	9.7'	14°35.83	14.6'	59.5'
10	330°5.38	5.91	24°47.69	9.6'	14°50.44	14.5'	59.5'
11	345°5.25	6.08	39°16.27	9.5'	15°4.99	14.5'	59.5'
12	0°5.12	N23°6.25	53°44.73	9.3'	N15°19.47	14.4'	59.6'
13	15°4.99	6.42	68°13.07	9.2'	15°33.88	14.3'	59.6'
14	30°4.86	6.59	82°41.29	9.1'	15°48.22	14.3'	59.6'
15	45°4.74	6.75	97°9.38	9.0'	16°2.49	14.2'	59.7'
16	60°4.61	6.92	111°37.35	8.8'	16°16.69	14.1'	59.7'
17	75°4.48	7.09	126°5.19	8.7'	16°30.81	14.0'	59.7'
18	90°4.35	N23°7.25	140°32.91	8.6'	N16°44.85	14.0'	59.8'
19	105°4.22	7.42	155°0.49	8.5'	16°58.82	13.9'	59.8'
20	120°4.09	7.58	169°27.95	8.3'	17°12.70	13.8'	59.8'
21	135°3.96	7.74	183°55.27	8.2'	17°26.49	13.7'	59.9'
22	150°3.83	7.91	198°22.47	8.1'	17°40.20	13.6'	59.9'
23	165°3.70	8.07	212°49.53	7.9'	17°53.82	13.5'	60.0'
SD = 15.7'		$d = 0.2'$	SD = 16.1'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	////	////	00:28	23:37	////	////
64°	////	////	01:39	22:21	////	////
62°	////	////	02:14	21:46	////	////
60°	////	01:03	02:39	21:21	22:58	////
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	02:53	03:41	20:19	21:07	22:23
50°	02:03	03:07	03:51	20:08	20:52	21:56
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	06:47	07:18	16:41	17:11	17:45
45°	06:24	07:01	07:34	16:24	16:58	17:35
S 50°	06:35	07:16	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	07:40	08:27	15:31	16:18	17:07
58°	06:58	07:50	08:42	15:17	16:08	17:00
S 60°	07:05	08:02	08:59	15:00	15:57	16:53

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 24-26 44-23%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
09	00:51	00:45	11:59	06:42	19:05	
10	00:39	00:33	11:59	07:28	19:52	
11	00:27	00:20	12:00	08:17	20:44	

June 12, 13, 14 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	260°20.25		139°28.56	N22°29.48	214°47.58	N16°39.58	142°2.20	N21°19.25	247°23.35	N03°3.05	Alpheratz	357°33.62	29°14.05
1	275°22.71		154°27.93	28.89	229°48.22	40.12	157°4.14	19.16	262°25.65	3.11	Ankaa	353°6.11	-42°9.48
2	290°25.18		169°27.31	28.30	244°48.86	40.65	172°6.07	19.07	277°27.94	3.17	Schedar	349°29.88	56°40.71
3	305°27.64		184°26.68	· · 27.71	259°49.50	· · 41.19	187°8.01	· · 18.98	292°30.24	· · 3.23	Diphda	348°46.24	-17°50.36
4	320°30.10		199°26.06	27.11	274°50.14	41.72	202°9.94	18.88	307°32.54	3.29	Achernar	335°19.65	-57°5.87
5	335°32.57		214°25.44	26.52	289°50.78	42.25	217°11.88	18.79	322°34.84	3.35	Hamal	327°50.10	23°35.16
6	350°35.03		229°24.81	N22°25.92	304°51.42	N16°42.79	232°13.81	N21°18.70	337°37.14	N03°3.41	Polaris	313°50.10	89°22.32
7	5°37.50		244°24.19	25.33	319°52.06	43.32	247°15.75	18.61	352°39.43	3.47	Acamar	315°11.24	-40°11.75
8	20°39.96		259°23.57	24.73	334°52.70	43.85	262°17.68	18.51	7°41.73	3.53	Menkar	314°5.19	4°11.60
9	35°42.42		274°22.95	· · 24.13	349°53.34	· · 44.38	277°19.62	· · 18.42	22°44.03	· · 3.59	Mirfak	308°27.01	49°57.16
10	50°44.89		289°22.33	23.53	4°53.98	44.91	292°21.55	18.33	37°46.33	3.64	Aldebaran	290°38.62	16°33.71
11	65°47.35		304°21.71	22.93	19°54.62	45.45	307°23.49	18.23	52°48.63	3.70	Rigel	281°3.08	-8°10.27
12	80°49.82		319°21.09	N22°22.33	34°55.26	N16°45.98	322°25.42	N21°18.14	67°50.93	N03°3.76	Capella	280°20.64	46°1.42
13	95°52.28		334°20.47	21.72	49°55.90	46.51	337°27.36	18.05	82°53.22	3.82	Bellatrix	278°21.96	6°22.40
14	110°54.75		349°19.85	21.12	64°56.54	47.04	352°29.29	17.96	97°55.52	3.88	Elnath	278°0.77	28°37.75
15	125°57.21		4°19.23	· · 20.51	79°57.17	· · 47.57	7°31.23	· · 17.86	112°57.82	· · 3.94	Alnilam	275°36.88	-1°11.12
16	140°59.67		19°18.62	19.91	94°57.81	48.10	22°33.16	17.77	128°0.12	4.00	Betelgeuse	270°51.16	7°24.70
17	156°2.14		34°18.00	19.30	109°58.45	48.63	37°35.09	17.68	143°2.42	4.06	Canopus	263°52.42	-52°42.62
18	171°4.60		49°17.39	N22°18.69	124°59.09	N16°49.16	52°37.03	N21°17.58	158°4.72	N03°4.11	Sirius	258°25.54	-16°45.19
19	186°7.07		64°16.77	18.08	139°59.73	49.69	67°38.96	17.49	173°7.02	4.17	Adhara	255°5.31	-29°0.55
20	201°9.53		79°16.16	17.47	155°0.37	50.21	82°40.90	17.40	188°9.32	4.23	Procyon	244°49.90	5°9.40
21	216°11.99		94°15.54	· · 16.86	170°1.01	· · 50.74	97°42.83	· · 17.30	203°11.62	· · 4.29	Pollux	243°16.20	27°57.77
22	231°14.46		109°14.93	16.25	185°1.64	51.27	112°44.76	17.21	218°13.92	4.35	Avior	234°14.75	-59°35.85
23	246°16.92		124°14.32	15.64	200°2.28	51.80	127°46.70	17.12	233°16.22	4.40	Suhail	222°45.72	-43°32.57
Mer.pass. 06:38		ν-0.6' d-0.6' m-3.98		ν0.6' d0.5' m1.28		ν1.9' d-0.1' m-1.85		ν2.3' d0.1' m0.84					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	261°19.39		139°13.71	N22°15.02	215°2.92	N16°52.33	142°48.63	N21°17.02	248°18.52	N03°4.46	Miaplacidus	221°38.59	-69°49.80
1	276°21.85		154°13.10	14.41	230°3.56	52.85	157°50.56	16.93	263°20.82	4.52	Alphard	217°46.78	-8°46.49
2	291°24.32		169°12.48	13.79	245°4.20	53.38	172°52.50	16.84	278°23.12	4.58	Regulus	207°33.32	11°50.28
3	306°26.78		184°11.87	· · 13.17	260°4.84	· · 53.91	187°54.43	· · 16.74	293°25.42	· · 4.64	Dubhe	193°39.67	61°36.74
4	321°29.24		199°11.27	12.55	275°5.47	54.43	202°56.36	16.65	308°27.72	4.69	Denebola	182°23.73	14°25.47
5	336°31.71		214°10.66	11.94	290°6.11	54.96	217°58.29	16.55	323°30.02	4.75	Giennah	175°42.31	-17°41.49
6	351°34.17		229°10.05	N22°11.32	305°6.75	N16°55.49	233°0.23	N21°16.46	338°32.32	N03°4.81	Acrux	172°58.59	-63°15.08
7	6°36.64		244°9.44	10.69	320°7.39	56.01	248°2.16	16.37	353°34.63	4.87	Gacrux	171°50.17	-57°16.00
8	21°39.10		259°8.83	10.07	335°8.03	56.54	263°4.09	16.27	8°36.93	4.93	Alioth	166°11.73	55°49.18
9	36°41.56		274°8.23	· · 9.45	350°8.66	· · 57.06	278°6.03	· · 16.18	23°39.23	· · 4.98	Spica	158°20.90	-11°18.08
10	51°44.03		289°7.62	8.82	5°9.30	57.59	293°7.96	16.09	38°41.53	5.04	Alkaid	152°50.79	49°11.02
11	66°46.49		304°7.02	8.20	20°9.94	58.11	308°9.89	15.99	53°43.83	5.10	Hadar	148°33.90	-60°30.29
12	81°48.96		319°6.41	N22°7.57	35°10.58	N16°58.63	323°11.82	N21°15.90	68°46.13	N03°5.16	Menkent	147°55.96	-36°30.20
13	96°51.42		334°5.81	6.95	50°11.21	59.16	338°13.75	15.80	83°48.44	5.21	Arcturus	145°46.61	19°2.70
14	111°53.89		349°5.21	6.32	65°11.85	16°59.68	353°15.69	15.71	98°50.74	5.27	Rigel Kent.	139°38.17	-60°56.91
15	126°56.35		4°4.60	· · 5.69	80°12.49	17°0.20	8°17.62	· · 15.62	113°53.04	· · 5.33	Kochab	137°18.90	74°2.92
16	141°58.81		19°4.00	5.06	95°13.13	0.73	23°19.55	15.52	128°55.34	5.38	Zuben'ubi	136°54.45	-16°9.20
17	157°1.28		34°3.40	4.43	110°13.76	1.25	38°21.48	15.43	143°57.64	5.44	Alphecca	126°2.42	26°37.55
18	172°3.74		49°2.80	N22°3.79	125°14.40	N17°1.77	53°23.41	N21°15.33	158°59.95	N03°5.50	Antares	112°14.03	-26°29.49
19	187°6.21		64°2.20	3.16	140°15.04	2.29	68°25.35	15.24	174°2.25	5.56	Atria	107°6.62	-69°4.52
20	202°8.67		79°1.60	2.53	155°15.67	2.81	83°27.28	15.14	189°4.55	5.61	Sabik	102°1.09	-15°45.48
21	217°11.14		94°1.00	· · 1.89	170°16.31	· · 3.34	98°29.21	· · 15.05	204°6.85	· · 5.67	Shaula	96°8.35	-37°7.36
22	232°13.60		109°0.40	1.26	185°16.95	3.86	113°31.14	14.96	219°9.16	5.73	Rasalhague	95°57.11	12°32.41
23	247°16.06		123°59.81	0.62	200°17.58	4.38	128°33.07	14.86	234°11.46	5.78	Eltanin	90°41.10	51°29.03
Mer.pass. 06:34		ν-0.6' d-0.6' m-3.98		ν0.6' d0.5' m1.28		ν1.9' d-0.1' m-1.85		ν2.3' d0.1' m0.84					
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	262°18.53		138°59.21	N21°59.98	215°18.22	N17°4.90	143°35.00	N21°14.77	249°13.76	N03°5.84	Jun 12 Fri	SHA	Mer.pass
1	277°20.99		153°58.61	21°59.34	230°18.86	5.42	158°36.93	14.67	264°16.07	5.90	Venus	239°8.31	14:43
2	292°23.46		168°58.02	58.70	245°19.49	5.94	173°38.87	14.58	279°18.37	5.95	Mars	314°27.34	09:40
3	307°25.92		183°57.42	· · 58.06	260°20.13	· · 6.46	188°40.80	· · 14.48	294°20.68	· · 6.01	Jupiter	241°41.96	14:30
4	322°28.39		198°56.83	57.42	275°20.77	6.98	203°42.73	14.39	309°22.98	6.07	Saturn	347°3.10	07:29
5	337°30.85		213°56.23	56.77	290°21.40	7.50	218°44.66	14.29	324°25.28	6.12			
6	352°33.31		228°55.64	N21°56.13	305°22.04	N17°8.01	233°46.59	N21°14.20	339°27.59	N03°6.18	Jun 13 Sat	SHA	Mer.pass
7	7°35.78		243°55.05	55.48	320°22.68	8.53	248°48.52	14.10	354°29.89	6.23	Venus	237°54.32	14:44
8	22°38.24		258°54.46	54.84	335°23.31	9.05	263°50.45	14.01	9°32.20	6.29	Mars	313°43.53	09:39
9	37°40.71		273°53.87	· · 54.19	350°23.95	· · 9.57	278°52.38	· · 13.91	24°34.50	· · 6.35	Jupiter	241°29.24	14:27
10	52°43.17		288°53.28	53.54	5°24.59	10.08	293°54.31	13.82	39°36.80	6.40	Saturn	346°59.13	07:26
11	67°45.63		303°52.69	52.89	20°25.22	10.60	308°56.24	13.72	54°39.11	6.46			
12	82°48.10		318°52.10										

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri							
0	180°3.57	N23°8.23	227°16.46	7.8'	N18°7.35	13.4'	60.0'
1	195°3.44	8.39	241°43.25	7.7'	18°20.78	13.3'	60.0'
2	210°3.31	8.55	256°9.92	7.5'	18°34.12	13.2'	60.1'
3	225°3.18	· · 8.71	270°36.44	7.4'	18°47.36	13.1'	60.1'
4	240°3.05	8.86	285°2.83	7.3'	19°0.50	13.0'	60.1'
5	255°2.92	9.02	299°29.09	7.1'	19°13.54	12.9'	60.1'
6	270°2.79	N23°9.18	313°55.21	7.0'	N19°26.48	12.8'	60.2'
7	285°2.66	9.33	328°21.19	6.8'	19°39.30	12.7'	60.2'
8	300°2.53	9.49	342°47.03	6.7'	19°52.02	12.6'	60.2'
9	315°2.40	· · 9.64	357°12.74	6.6'	20°4.63	12.5'	60.3'
10	330°2.27	9.80	11°38.31	6.4'	20°17.12	12.4'	60.3'
11	345°2.14	9.95	26°3.74	6.3'	20°29.50	12.3'	60.3'
12	0°2.01	N23°10.10	40°29.03	6.2'	N20°41.75	12.1'	60.4'
13	15°1.88	10.26	54°54.18	6.0'	20°53.89	12.0'	60.4'
14	30°1.75	10.41	69°19.19	5.9'	21°5.90	11.9'	60.4'
15	45°1.62	· · 10.56	83°44.06	5.7'	21°17.79	11.8'	60.4'
16	60°1.49	10.71	98°8.80	5.6'	21°29.55	11.6'	60.5'
17	75°1.36	10.86	112°33.39	5.5'	21°41.18	11.5'	60.5'
18	90°1.23	N23°11.00	126°57.85	5.3'	N21°52.68	11.4'	60.5'
19	105°1.09	11.15	141°22.17	5.2'	22°4.04	11.2'	60.6'
20	120°0.96	11.30	155°46.35	5.0'	22°15.26	11.1'	60.6'
21	135°0.83	· · 11.44	170°10.39	4.9'	22°26.35	10.9'	60.6'
22	150°0.70	11.59	184°34.29	4.8'	22°37.29	10.8'	60.6'
23	165°0.57	11.73	198°58.06	4.6'	22°48.09	10.7'	60.7'
SD = 15.7'			SD = 16.4'				

Sat	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	180°0.44	N23°11.88	213°21.69	4.5'	N22°58.74	10.5'	60.7'
1	195°0.31	12.02	227°45.18	4.4'	23°9.24	10.3'	60.7'
2	210°0.17	12.16	242°8.54	4.2'	23°19.59	10.2'	60.7'
3	225°0.04	· · 12.30	256°31.77	4.1'	23°29.79	10.0'	60.8'
4	239°59.91	12.45	270°54.86	4.0'	23°39.83	9.9'	60.8'
5	254°59.78	12.59	285°17.82	3.8'	23°49.71	9.7'	60.8'
6	269°59.65	N23°12.73	299°40.64	3.7'	N23°59.43	9.6'	60.8'
7	284°59.51	12.86	314°3.34	3.6'	24°8.98	9.4'	60.9'
8	299°59.38	13.00	328°25.91	3.4'	24°18.38	9.2'	60.9'
9	314°59.25	· · 13.14	342°48.34	3.3'	24°27.60	9.1'	60.9'
10	329°59.12	13.28	357°10.66	3.2'	24°36.65	8.9'	60.9'
11	344°58.99	13.41	11°32.84	3.1'	24°45.54	8.7'	60.9'
12	359°58.85	N23°13.55	25°54.91	2.9'	N24°54.25	8.5'	61.0'
13	14°58.72	13.68	40°16.85	2.8'	25°2.78	8.4'	61.0'
14	29°58.59	13.82	54°38.67	2.7'	25°11.13	8.2'	61.0'
15	44°58.46	· · 13.95	69°0.37	2.6'	25°19.30	8.0'	61.0'
16	59°58.32	14.08	83°21.96	2.5'	25°27.29	7.8'	61.0'
17	74°58.19	14.21	97°43.43	2.4'	25°35.10	7.6'	61.0'
18	89°58.06	N23°14.35	112°4.78	2.2'	N25°42.72	7.4'	61.1'
19	104°57.92	14.48	126°26.03	2.1'	25°50.15	7.2'	61.1'
20	119°57.79	14.61	140°47.17	2.0'	25°57.39	7.0'	61.1'
21	134°57.66	· · 14.73	155°8.20	1.9'	26°4.44	6.9'	61.1'
22	149°57.53	14.86	169°29.13	1.8'	26°11.29	6.7'	61.1'
23	164°57.39	14.99	183°49.95	1.7'	26°17.95	6.5'	61.1'
SD = 15.7'			SD = 16.6'				

Sun	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°57.26	N23°15.12	198°10.68	1.6'	N26°24.40	6.3'	61.2'
1	194°57.13	15.24	212°31.31	1.5'	26°30.66	6.1'	61.2'
2	209°56.99	15.37	226°51.85	1.4'	26°36.72	5.9'	61.2'
3	224°56.86	· · 15.49	241°12.29	1.4'	26°42.58	5.6'	61.2'
4	239°56.73	15.62	255°32.65	1.3'	26°48.23	5.4'	61.2'
5	254°56.59	15.74	269°52.92	1.2'	26°53.67	5.2'	61.2'
6	269°56.46	N23°15.86	284°13.11	1.1'	N26°58.90	5.0'	61.2'
7	284°56.32	15.98	298°33.22	1.0'	27°3.93	4.8'	61.2'
8	299°56.19	16.11	312°53.26	1.0'	27°8.75	4.6'	61.2'
9	314°56.06	· · 16.23	327°13.22	0.9'	27°13.35	4.4'	61.3'
10	329°55.92	16.35	341°33.11	0.8'	27°17.74	4.2'	61.3'
11	344°55.79	16.46	355°52.93	0.8'	27°21.92	4.0'	61.3'
12	359°55.65	N23°16.58	10°12.69	0.7'	N27°25.88	3.7'	61.3'
13	14°55.52	16.70	24°32.39	0.6'	27°29.62	3.5'	61.3'
14	29°55.39	16.82	38°52.04	0.6'	27°33.15	3.3'	61.3'
15	44°55.25	· · 16.93	53°11.63	0.5'	27°36.46	3.1'	61.3'
16	59°55.12	17.05	67°31.17	0.5'	27°39.55	2.9'	61.3'
17	74°54.98	17.16	81°50.67	0.5'	27°42.42	2.6'	61.3'
18	89°54.85	N23°17.28	96°10.13	0.4'	N27°45.06	2.4'	61.3'
19	104°54.72	17.39	110°29.54	0.4'	27°47.49	2.2'	61.3'
20	119°54.58	17.50	124°48.92	0.4'	27°49.69	2.0'	61.3'
21	134°54.45	· · 17.61	139°8.28	0.3'	27°51.67	1.8'	61.3'
22	149°54.31	17.73	153°27.60	0.3'	27°53.42	1.5'	61.3'
23	164°54.18	17.84	167°46.90	0.3'	27°54.95	1.3'	61.3'
SD = 15.7'			SD = 16.7'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	27-29
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	14-2%
12	00:14	00:08	12:00	09:12	21:41	
13	00:02	00:05	12:00	10:12	22:44	
14	00:11	00:17	12:00	11:17	23:51	

June 15, 16, 17 UT (Mon., Tue., Wed.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	263°17.67	138°45.08	N21°44.37	215°33.48	N17°17.30	144°21.33	N21°12.48	250°9.08	N03°7.18	Alpheratz	357°33.59	29°14.06
1	278°20.13	153°44.50	43.71	230°34.12	17.81	159°23.25	12.39	265°11.39	7.24	Ankaa	353°6.07	-42°9.46
2	293°22.60	168°43.92	43.04	245°34.75	18.32	174°25.18	12.29	280°13.70	7.29	Schedar	349°29.83	56°40.71
3	308°25.06	183°43.34	•• 42.38	260°35.39	•• 18.83	189°27.11	•• 12.20	295°16.00	•• 7.35	Diphda	348°46.21	-17°50.35
4	323°27.53	198°42.76	41.71	275°36.02	19.34	204°29.04	12.10	310°18.31	7.40	Achernar	335°19.62	-57°5.85
5	338°29.99	213°42.18	41.05	290°36.66	19.86	219°30.97	12.01	325°20.62	7.46	Hamal	327°50.07	23°35.17
6	353°32.46	228°41.60	N21°40.38	305°37.29	N17°20.37	234°32.90	N21°11.91	340°22.93	N03°7.51	Polaris	313°48.67	89°22.31
7	8°34.92	243°41.02	39.71	320°37.93	20.88	249°34.83	11.81	355°25.23	7.57	Acamar	315°11.21	-40°11.73
8	23°37.38	258°40.45	39.04	335°38.56	21.39	264°36.76	11.72	10°27.54	7.62	Menkar	314°5.17	4°11.61
9	38°39.85	273°39.87	•• 38.37	350°39.20	•• 21.90	279°38.68	•• 11.62	25°29.85	•• 7.68	Mirfak	308°26.98	49°57.16
10	53°42.31	288°39.30	37.70	5°39.83	22.41	294°40.61	11.53	40°32.16	7.73	Aldebaran	290°38.60	16°33.71
11	68°44.78	303°38.72	37.03	20°40.47	22.92	309°42.54	11.43	55°34.46	7.79	Rigel	281°3.07	-8°10.26
12	83°47.24	318°38.15	N21°36.35	35°41.10	N17°23.43	324°44.47	N21°11.33	70°36.77	N03°7.84	Capella	280°20.62	46°1.41
13	98°49.71	333°37.58	35.68	50°41.74	23.94	339°46.40	11.24	85°39.08	7.90	Bellatrix	278°21.95	6°22.40
14	113°52.17	348°37.00	35.00	65°42.37	24.45	354°48.32	11.14	100°41.39	7.95	Elnath	278°0.75	28°37.75
15	128°54.63	3°36.43	•• 34.33	80°43.00	•• 24.96	9°50.25	•• 11.04	115°43.70	•• 8.00	Anilam	275°36.86	-1°11.11
16	143°57.10	18°35.86	33.65	95°43.64	25.46	24°52.18	10.95	130°46.00	8.06	Betelgeuse	270°51.14	7°24.70
17	158°59.56	33°35.29	32.97	110°44.27	25.97	39°54.11	10.85	145°48.31	8.11	Canopus	263°52.42	-52°42.60
18	174°2.03	48°34.72	N21°32.29	125°44.91	N17°26.48	54°56.04	N21°10.76	160°50.62	N03°8.17	Sirius	258°25.54	-16°45.18
19	189°4.49	63°34.15	31.61	140°45.54	26.99	69°57.96	10.66	175°52.93	8.22	Adhara	255°5.30	-29°0.54
20	204°6.96	78°33.58	30.93	155°46.17	27.49	84°59.89	10.56	190°55.24	8.28	Procyon	244°49.89	5°9.41
21	219°9.42	93°33.01	•• 30.25	170°46.81	•• 28.00	100°1.82	•• 10.47	205°57.55	•• 8.33	Pollux	243°16.19	27°57.77
22	234°11.88	108°32.45	29.57	185°47.44	28.51	115°3.75	10.37	220°59.86	8.38	Avior	234°14.77	-59°35.84
23	249°14.35	123°31.88	28.88	200°48.08	29.01	130°5.67	10.27	236°2.17	8.44	Suhail	222°45.73	-43°32.57
Mer.pass. 06:26		ν-0.6' d-0.7' m-3.98		ν0.6' d0.5' m1.29		ν1.9' d-0.1' m-1.84		ν2.3' d0.1' m0.83		Miaplacidus	221°38.62	-69°49.80
										Alphard	217°46.78	-8°46.49


h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°54.04	N23°17.95	182°6.18	0.3'	N27°56.26	1.1'	61.3'
1	194°53.91	18.05	196°25.45	0.3'	27°57.34	0.9'	61.3'
2	209°53.77	18.16	210°44.70	0.2'	27°58.19	0.6'	61.3'
3	224°53.64	18.27	225°3.95	0.2'	27°58.82	0.4'	61.3'
4	239°53.50	18.38	239°23.19	0.2'	27°59.23	0.2'	61.3'
5	254°53.37	18.48	253°42.44	0.2'	27°59.40	-0.0'	61.3'
6	269°53.23	N23°18.59	268°1.68	0.3'	N27°59.36	-0.3'	61.3'
7	284°53.10	18.69	282°20.94	0.3'	27°59.08	-0.5'	61.3'
8	299°52.96	18.80	296°40.20	0.3'	27°58.59	-0.7'	61.3'
9	314°52.83	18.90	310°59.48	0.3'	27°57.86	-0.9'	61.3'
10	329°52.69	19.00	325°18.79	0.3'	27°56.91	-1.2'	61.3'
11	344°52.56	19.10	339°38.11	0.4'	27°55.74	-1.4'	61.3'
12	359°52.42	N23°19.21	353°57.46	0.4'	N27°54.35	-1.6'	61.3'
13	14°52.29	19.31	8°16.84	0.4'	27°52.73	-1.8'	61.3'
14	29°52.15	19.41	22°36.26	0.5'	27°50.88	-2.1'	61.2'
15	44°52.02	19.50	36°55.72	0.5'	27°48.82	-2.3'	61.2'
16	59°51.88	19.60	51°15.21	0.5'	27°46.53	-2.5'	61.2'
17	74°51.75	19.70	65°34.76	0.6'	27°44.02	-2.7'	61.2'
18	89°51.61	N23°19.80	79°54.35	0.6'	N27°41.30	-2.9'	61.2'
19	104°51.48	19.89	94°14.00	0.7'	27°38.35	-3.2'	61.2'
20	119°51.34	19.99	108°33.70	0.8'	27°35.19	-3.4'	61.2'
21	134°51.20	20.08	122°53.46	0.8'	27°31.81	-3.6'	61.2'
22	149°51.07	20.18	137°13.29	0.9'	27°28.21	-3.8'	61.2'
23	164°50.93	20.27	151°33.19	1.0'	27°24.40	-4.0'	61.1'
SD = 15.7'		$d = 0.1'$	SD = 16.7'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°50.80	N23°20.36	165°53.15	1.0'	N27°20.37	-4.2'	61.1'
1	194°50.66	20.45	180°13.19	1.1'	27°16.13	-4.4'	61.1'
2	209°50.53	20.55	194°33.30	1.2'	27°11.68	-4.7'	61.1'
3	224°50.39	20.64	208°53.50	1.3'	27°7.02	-4.9'	61.1'
4	239°50.25	20.73	223°13.77	1.4'	27°2.16	-5.1'	61.1'
5	254°50.12	20.81	237°34.14	1.5'	26°57.08	-5.3'	61.1'
6	269°49.98	N23°20.90	251°54.59	1.5'	N26°51.80	-5.5'	61.0'
7	284°49.85	20.99	266°15.13	1.6'	26°46.32	-5.7'	61.0'
8	299°49.71	21.08	280°35.77	1.7'	26°40.63	-5.9'	61.0'
9	314°49.57	21.16	294°56.51	1.8'	26°34.75	-6.1'	61.0'
10	329°49.44	21.25	309°17.35	1.9'	26°28.67	-6.3'	61.0'
11	344°49.30	21.33	323°38.29	2.0'	26°22.38	-6.5'	60.9'
12	359°49.17	N23°21.42	337°59.33	2.2'	N26°15.91	-6.7'	60.9'
13	14°49.03	21.50	352°20.48	2.3'	26°9.24	-6.9'	60.9'
14	29°48.89	21.58	6°41.74	2.4'	26°2.38	-7.0'	60.9'
15	44°48.76	21.66	21°3.12	2.5'	25°55.33	-7.2'	60.9'
16	59°48.62	21.74	35°24.60	2.6'	25°48.09	-7.4'	60.8'
17	74°48.48	21.83	49°46.21	2.7'	25°40.67	-7.6'	60.8'
18	89°48.35	N23°21.90	64°7.93	2.8'	N25°33.06	-7.8'	60.8'
19	104°48.21	21.98	78°29.77	3.0'	25°25.27	-8.0'	60.8'
20	119°48.08	22.06	92°51.74	3.1'	25°17.31	-8.1'	60.7'
21	134°47.94	22.14	107°13.83	3.2'	25°9.16	-8.3'	60.7'
22	149°47.80	22.22	121°36.04	3.3'	25°0.84	-8.5'	60.7'
23	164°47.67	22.29	135°58.38	3.5'	24°52.35	-8.7'	60.7'
SD = 15.7'		$d = 0.1'$	SD = 16.7'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°47.53	N23°22.37	150°20.85	3.6'	N24°43.69	-8.8'	60.6'
1	194°47.39	22.44	164°43.45	3.7'	24°34.85	-9.0'	60.6'
2	209°47.26	22.52	179°6.18	3.9'	24°25.86	-9.2'	60.6'
3	224°47.12	22.59	193°29.04	4.0'	24°16.69	-9.3'	60.6'
4	239°46.98	22.66	207°52.04	4.1'	24°7.37	-9.5'	60.5'
5	254°46.85	22.73	222°15.17	4.3'	23°57.88	-9.6'	60.5'
6	269°46.71	N23°22.80	236°38.43	4.4'	N23°48.24	-9.8'	60.5'
7	284°46.57	22.87	251°1.84	4.5'	23°38.44	-9.9'	60.5'
8	299°46.44	22.94	265°25.38	4.7'	23°28.49	-10.1'	60.4'
9	314°46.30	23.01	279°49.06	4.8'	23°18.39	-10.2'	60.4'
10	329°46.16	23.08	294°12.87	5.0'	23°8.15	-10.4'	60.4'
11	344°46.03	23.15	308°36.83	5.1'	22°57.75	-10.5'	60.3'
12	359°45.89	N23°23.21	323°0.93	5.2'	N22°47.21	-10.7'	60.3'
13	14°45.75	23.28	337°25.17	5.4'	22°36.53	-10.8'	60.3'
14	29°45.62	23.35	351°49.55	5.5'	22°25.71	-11.0'	60.2'
15	44°45.48	23.41	6°14.07	5.7'	22°14.76	-11.1'	60.2'
16	59°45.34	23.47	20°38.73	5.8'	22°3.67	-11.2'	60.2'
17	74°45.21	23.54	35°3.53	5.9'	21°52.45	-11.4'	60.1'
18	89°45.07	N23°23.60	49°28.48	6.1'	N21°41.10	-11.5'	60.1'
19	104°44.93	23.66	63°53.57	6.2'	21°29.62	-11.6'	60.1'
20	119°44.79	23.72	78°18.80	6.4'	21°18.02	-11.7'	60.1'
21	134°44.66	23.78	92°44.17	6.5'	21°6.29	-11.8'	60.0'
22	149°44.52	23.84	107°9.68	6.7'	20°54.45	-12.0'	60.0'
23	164°44.38	23.90	121°35.33	6.8'	20°42.48	-12.1'	60.0'
SD = 15.7'		$d = 0.1'$	SD = 16.5'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	0-2 0-5%
15	00:24	00:30	12:01	12:25	—:—	
16	00:37	00:43	12:01	13:32	00:59	
17	00:50	00:56	12:01	14:34	02:04	

June 18, 19, 20 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	266°15.10		138°4.93	N20°54.23	216°19.06	N17°53.43	146°40.01	N21°5.49	252°55.50	N03°11.00
1	281°17.56		153°4.40	53.50	231°19.69	53.92	161°41.93	5.39	267°57.81	11.06
2	296°20.02		168°3.87	52.76	246°20.32	54.41	176°43.86	5.29	283°0.13	11.11
3	311°22.49		183°3.34	•• 52.03	261°20.95	•• 54.90	191°45.78	•• 5.19	298°2.45	•• 11.16
4	326°24.95		198°2.81	51.30	276°21.58	55.39	206°47.70	5.09	313°4.76	11.21
5	341°27.42		213°2.28	50.57	291°22.21	55.88	221°49.62	4.99	328°7.08	11.26
6	356°29.88		228°1.75	N20°49.83	306°22.84	N17°56.36	236°51.55	N21°4.89	343°9.40	N03°11.31
7	11°32.34		243°1.22	49.09	321°23.47	56.85	251°53.47	4.80	358°11.71	11.36
8	26°34.81		258°0.69	48.36	336°24.10	57.34	266°55.39	4.70	13°14.03	11.41
9	41°37.27		273°0.16	•• 47.62	351°24.73	•• 57.83	281°57.32	•• 4.60	28°16.35	•• 11.46
10	56°39.74		287°59.63	46.88	6°25.36	58.32	296°59.24	4.50	43°18.67	11.51
11	71°42.20		302°59.11	46.14	21°25.99	58.80	312°1.16	4.40	58°20.98	11.56
12	86°44.67		317°58.58	N20°45.40	36°26.62	N17°59.29	327°3.08	N21°4.30	73°23.30	N03°11.61
13	101°47.13		332°58.06	44.66	51°27.25	17°59.78	342°5.01	4.20	88°25.62	11.66
14	116°49.59		347°57.53	43.92	66°27.88	18°0.26	357°6.93	4.10	103°27.94	11.71
15	131°52.06		2°57.01	•• 43.18	81°28.51	•• 0.75	12°8.85	•• 4.00	118°30.25	•• 11.76
16	146°54.52		17°56.49	42.43	96°29.14	1.24	27°10.77	3.90	133°32.57	11.81
17	161°56.99		32°55.96	41.69	111°29.77	1.72	42°12.69	3.80	148°34.89	11.86
18	176°59.45		47°55.44	N20°40.94	126°30.40	N18°2.21	57°14.62	N21°3.70	163°37.21	N03°11.91
19	192°1.91		62°54.92	40.19	141°31.03	2.69	72°16.54	3.60	178°39.53	11.96
20	207°4.38		77°54.40	39.45	156°31.66	3.18	87°18.46	3.50	193°41.85	12.01
21	222°6.84		92°53.88	•• 38.70	171°32.29	•• 3.66	102°20.38	•• 3.40	208°44.17	•• 12.06
22	237°9.31		107°53.36	37.95	186°32.92	4.14	117°22.30	3.31	223°46.49	12.11
23	252°11.77		122°52.85	37.20	201°33.55	4.63	132°24.23	3.21	238°48.80	12.16
Mer.pass. 06:14		ν-0.5' d-0.7' m-3.99		ν0.6' d0.5' m1.29		ν1.9' d-0.1' m-1.83		ν2.3' d0.1' m0.82		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	267°14.24		137°52.33	N20°36.45	216°34.18	N18°5.11	147°26.15	N21°3.11	253°51.12	N03°12.21
1	282°16.70		152°51.81	35.69	231°34.81	5.59	162°28.07	3.01	268°53.44	12.26
2	297°19.16		167°51.30	34.94	246°35.44	6.08	177°29.99	2.91	283°55.76	12.31
3	312°21.63		182°50.78	•• 34.19	261°36.07	•• 6.56	192°31.91	•• 2.81	298°58.08	•• 12.36
4	327°24.09		197°50.27	33.43	276°36.70	7.04	207°33.83	2.71	314°0.40	12.40
5	342°26.56		212°49.75	32.68	291°37.33	7.52	222°35.75	2.61	329°2.72	12.45
6	357°29.02		227°49.24	N20°31.92	306°37.96	N18°8.00	237°37.67	N21°2.51	344°5.04	N03°12.50
7	12°31.48		242°48.73	31.16	321°38.59	8.48	252°39.60	2.41	359°7.36	12.55
8	27°33.95		257°48.21	30.41	336°39.22	8.96	267°41.52	2.31	14°9.68	12.60
9	42°36.41		272°47.70	•• 29.65	351°39.84	•• 9.44	282°43.44	•• 2.21	29°12.00	•• 12.65
10	57°38.88		287°47.19	28.89	6°40.47	9.92	297°45.36	2.11	44°14.32	12.70
11	72°41.34		302°46.68	28.13	21°41.10	10.40	312°47.28	2.01	59°16.65	12.75
12	87°43.80		317°46.17	N20°27.36	36°41.73	N18°10.88	327°49.20	N21°1.91	74°18.97	N03°12.80
13	102°46.27		332°45.67	26.60	51°42.36	11.36	342°51.12	1.81	89°21.29	12.84
14	117°48.73		347°45.16	25.84	66°42.99	11.84	357°53.04	1.71	104°23.61	12.89
15	132°51.20		2°44.65	•• 25.07	81°43.62	•• 12.32	12°54.96	•• 1.60	119°25.93	•• 12.94
16	147°53.66		17°44.15	24.31	96°44.25	12.80	27°56.88	1.50	134°28.25	12.99
17	162°56.13		32°43.64	23.54	111°44.87	13.27	42°58.80	1.40	149°30.57	13.04
18	177°58.59		47°43.13	N20°22.77	126°45.50	N18°13.75	58°0.72	N21°1.30	164°32.90	N03°13.09
19	193°1.05		62°42.63	22.01	141°46.13	14.23	73°2.64	1.20	179°35.22	13.13
20	208°3.52		77°42.13	21.24	156°46.76	14.71	88°4.56	1.10	194°37.54	13.18
21	223°5.98		92°41.62	•• 20.47	171°47.39	•• 15.18	103°6.48	•• 1.00	209°39.86	•• 13.23
22	238°8.45		107°41.12	19.70	186°48.02	15.66	118°8.40	0.90	224°42.18	13.28
23	253°10.91		122°40.62	18.93	201°48.64	16.13	133°10.32	0.80	239°44.51	13.33
Mer.pass. 06:10		ν-0.5' d-0.8' m-4.00		ν0.6' d0.5' m1.29		ν1.9' d-0.1' m-1.83		ν2.3' d0.0' m0.82		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	268°13.37		137°40.12	N20°18.15	216°49.27	N18°16.61	148°12.24	N21°0.70	254°46.83	N03°13.37
1	283°15.84		152°39.62	17.38	231°49.90	17.09	163°14.16	0.60	269°49.15	13.42
2	298°18.30		167°39.12	16.61	246°50.53	17.56	178°16.08	0.50	284°51.47	13.47
3	313°20.77		182°38.62	•• 15.83	261°51.16	•• 18.03	193°18.00	•• 0.40	299°53.80	•• 13.52
4	328°23.23		197°38.12	15.06	276°51.79	18.51	208°19.92	0.30	314°56.12	13.57
5	343°25.69		212°37.63	14.28	291°52.41	18.98	223°21.84	0.19	329°58.44	13.61
6	358°28.16		227°37.13	N20°13.50	306°53.04	N18°19.46	238°23.76	N21°0.09	345°0.77	N03°13.66
7	13°30.62		242°36.63	12.72	321°53.67	19.93	253°25.68	20°59.99	0°3.09	13.71
8	28°33.09		257°36.14	11.94	336°54.30	20.40	268°27.60	20°59.89	15°5.41	13.76
9	43°35.55		272°35.64	•• 11.16	351°54.92	•• 20.88	283°29.52	•• 59.79	30°7.74	•• 13.80
10	58°38.02		287°35.15	10.38	6°55.55	21.35	298°31.44	59.69	45°10.06	13.85
11	73°40.48		302°34.66	9.60	21°56.18	21.82	313°33.36	59.59	60°12.39	13.90
12	88°42.94		317°34.17	N20°8.82	36°56.81	N18°22.29	328°35.28	N20°59.49	75°14.71	N03°13.94
13	103°45.41		332°33.67	8.03	51°57.43	22.76	343°37.20	59.39	90°17.04	13.99
14	118°47.87		347°33.18	7.25	66°58.06	23.23	358°39.11	59.28	105°19.36	14.04
15	133°50.34		2°32.69	•• 6.46	81°58.69	•• 23.70	13°41.03	•• 59.18	120°21.68	•• 14.09
16	148°52.80		17°32.20	5.68	96°59.32	24.17	28°42.95	59.08	135°24.01	14.13
17	163°55.26		32°31.71	4.89	111°59.94	24.64	43°44.87	58.98	150°26.33	14.18
18	178°57.73		47°31.23	N20°4.10	127°0.57	N18°25.11	58°46.79	N20°58.88	165°28.66	N03°14.23
19	194°0.19		62°30.74	3.31	142°1.20	25.58	73°48.71	58.78	180°30.98	14.27
20	209°2.66		77°30.25	2.52	157°1.82	26.05	88°50.63	58.68	195°33.31	14.32
21	224°5.12		92°29.77	•• 1.73	172°2.45	•• 26.52	103°52.55	•• 58.57	210°35.64	•• 14.37
22	239°7.58		107°29.28	0.94	187°3.08	26.99	118°54.46	58.47	225°37.96	14.41
23	254°10.05		122°28.80	0.15	202°3.71	27.46	133°56.38	58.37	240°40.29	14.46
Mer.pass. 06:06		ν-0.5' d-0.8' m-4.00		ν0.6' d0.5' m1.29		ν1.9' d-0.1' m-1.83		ν2.3' d0.0' m0.82		

	SHA	Dec
Alpheratz	357°33.56	29°14.07
Ankaa	353°6.04	-42°9.45
Schedar	349°29.79	56°40.72
Diphda	348°46.18	-17°50.34
Achernar	335°19.58	-57°5.83
Hamal	327°50.05	23°35.17
Polaris	313°47.51	89°22.30
Acamar	315°11.19	-40°11.72
Menkar	314°5.14	4°11.62
Mirfak	308°26.95	49°57.16
Aldebaran	290°38.58	16°33.72
Rigel	281°3.05	-8°10.24
Capella	280°20.60	46°1.41
Bellatrix	278°21.93	6°22.41
Elnath	278°0.74	28°37.75
Alnilam	275°36.85	-1°11.10
Betelgeuse	270°51.13	7°24.71
Canopus	263°52.42	-52°42.58
Sirius	258°25.53	-16°45.17
Adhara	255°5.30	-29°0.52
Procyon	244°49.89	5°9.41
Pollux	243°16.19	27°57.77
Avior	234°14.78	-59°35.83
Suhail	222°45.74	-43°32.56
Miaplacidus	221°38.66	-69°49.79
Alphard	217°46.78	-8°46.48
Regulus	207°33.32	11°50.28
Dubhe	193°39.70	61°36.73
Denebola	182°23.74	14°25.48
Gienah	175°42.31	-17°41.49
Acrux	172°58.63	-63°15.09
Gacrux	171°50.19	-57°16.01
Alioth	166°11.76	55°49.18
Spica	158°20.90	-11°18.08
Alkaid	152°50.81	49°11.03
Hadar	148°33.91	-60°30.31
Menkent	147°55.96	-36°30.21
Arcturus	145°46.61	19°2.71
Rigel Kent.	139°38.18	-60°56.93
Kochab	137°18.97	74°2.94
Zuben'ubi	136°54.44	-16°9.21
Alphecca	126°2.41	26°37.57
Antares	112°14.01	-26°29.50
Atria	107°6.58	-69°4.55
Sabik	102°1.06	-15°45.48
Shaula	96°8.31	-37°7.37
Rasalhague	95°57.09	12°32.43
Eltanin	90°41.08	51°29.07
Kaus Aust.	83°30.52	-34°22.26
Vega	80°31.98	38°48.42
Nunki	75°45.91	-26°15.76
Altair	61°58.49	8°56.28
Peacock	53°3.37	-56°38.76
Deneb	49°24.63	45°22.33
Enif	33°37.44	9°59.76
Al Na'ir	27°31.21	-46°49.70
Fomalhaut	15°13.11	-29°28.71</

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.25	N23°23.96	136°1.13	6.9'	N20°30.40	-12.2'	59.9'
1	194°44.11	24.02	150°27.07	7.1'	20°18.21	-12.3'	59.9'
2	209°43.97	24.07	164°53.15	7.2'	20°5.90	-12.4'	59.8'
3	224°43.84	· · 24.13	179°19.36	7.4'	19°53.49	-12.5'	59.8'
4	239°43.70	24.18	193°45.72	7.5'	19°40.97	-12.6'	59.8'
5	254°43.56	24.24	208°12.22	7.6'	19°28.35	-12.7'	59.7'
6	269°43.43	N23°24.29	222°38.86	7.8'	N19°15.62	-12.8'	59.7'
7	284°43.29	24.35	237°5.63	7.9'	19°2.79	-12.9'	59.7'
8	299°43.15	24.40	251°32.54	8.0'	18°49.87	-13.0'	59.6'
9	314°43.01	· · 24.45	265°59.59	8.2'	18°36.85	-13.1'	59.6'
10	329°42.88	24.50	280°26.78	8.3'	18°23.74	-13.2'	59.6'
11	344°42.74	24.55	294°54.10	8.5'	18°10.53	-13.3'	59.5'
12	359°42.60	N23°24.60	309°21.55	8.6'	N17°57.24	-13.4'	59.5'
13	14°42.47	24.65	323°49.14	8.7'	17°43.86	-13.5'	59.5'
14	29°42.33	24.70	338°16.86	8.9'	17°30.40	-13.5'	59.4'
15	44°42.19	· · 24.74	352°44.72	9.0'	17°16.85	-13.6'	59.4'
16	59°42.05	24.79	7°12.70	9.1'	17°3.22	-13.7'	59.3'
17	74°41.92	24.84	21°40.82	9.2'	16°49.52	-13.8'	59.3'
18	89°41.78	N23°24.88	36°9.06	9.4'	N16°35.73	-13.9'	59.3'
19	104°41.64	24.93	50°37.44	9.5'	16°21.87	-13.9'	59.2'
20	119°41.51	24.97	65°5.94	9.6'	16°7.94	-14.0'	59.2'
21	134°41.37	· · 25.01	79°34.56	9.8'	15°53.94	-14.1'	59.1'
22	149°41.23	25.05	94°3.31	9.9'	15°39.88	-14.1'	59.1'
23	164°41.09	25.10	108°32.19	10.0'	15°25.74	-14.2'	59.1'

SD = 15.7' $d = 0.1'$

SD = 16.3'

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.96	N23°25.14	123°1.18	10.1'	N15°11.54	-14.3'	59.0'
1	194°40.82	25.18	137°30.30	10.2'	14°57.28	-14.3'	59.0'
2	209°40.68	25.22	151°59.54	10.4'	14°42.95	-14.4'	59.0'
3	224°40.55	· · 25.26	166°28.90	10.5'	14°28.57	-14.4'	58.9'
4	239°40.41	25.29	180°58.37	10.6'	14°14.13	-14.5'	58.9'
5	254°40.27	25.33	195°27.96	10.7'	13°59.64	-14.5'	58.8'
6	269°40.13	N23°25.37	209°57.67	10.8'	N13°45.09	-14.6'	58.8'
7	284°40.00	25.40	224°27.48	10.9'	13°30.49	-14.6'	58.8'
8	299°39.86	25.44	238°57.42	11.0'	13°15.84	-14.7'	58.7'
9	314°39.72	· · 25.47	253°27.46	11.2'	13°1.14	-14.7'	58.7'
10	329°39.59	25.51	267°57.61	11.3'	12°46.40	-14.8'	58.6'
11	344°39.45	25.54	282°27.87	11.4'	12°31.61	-14.8'	58.6'
12	359°39.31	N23°25.57	296°58.24	11.5'	N12°16.78	-14.9'	58.6'
13	14°39.17	25.60	311°28.71	11.6'	12°1.90	-14.9'	58.5'
14	29°39.04	25.63	325°59.29	11.7'	11°46.99	-15.0'	58.5'
15	44°38.90	· · 25.66	340°29.97	11.8'	11°32.04	-15.0'	58.4'
16	59°38.76	25.69	355°0.75	11.9'	11°17.05	-15.0'	58.4'
17	74°38.63	25.72	9°31.64	12.0'	11°2.03	-15.1'	58.4'
18	89°38.49	N23°25.75	24°2.62	12.1'	N10°46.98	-15.1'	58.3'
19	104°38.35	25.78	38°33.69	12.2'	10°31.89	-15.1'	58.3'
20	119°38.21	25.80	53°4.87	12.3'	10°16.77	-15.1'	58.2'
21	134°38.08	· · 25.83	67°36.14	12.4'	10°1.63	-15.2'	58.2'
22	149°37.94	25.85	82°7.50	12.5'	09°46.46	-15.2'	58.2'
23	164°37.80	25.88	96°38.95	12.5'	09°31.26	-15.2'	58.1'

SD = 15.7' $d = 0.0'$

SD = 16.1'


Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.67	N23°25.90	111°10.49	12.6'	N09°16.04	-15.2'	58.1'
1	194°37.53	25.92	125°42.12	12.7'	09°0.79	-15.3'	58.0'
2	209°37.39	25.95	140°13.84	12.8'	08°45.53	-15.3'	58.0'
3	224°37.25	· · 25.97	154°45.64	12.9'	08°30.24	-15.3'	58.0'
4	239°37.12	25.99	169°17.52	13.0'	08°14.94	-15.3'	57.9'
5	254°36.98	26.01	183°49.49	13.0'	07°59.62	-15.3'	57.9'
6	269°36.84	N23°26.03	198°21.54	13.1'	N07°44.28	-15.4'	57.9'
7	284°36.71	26.05	212°53.67	13.2'	07°28.93	-15.4'	57.8'
8	299°36.57	26.06	227°25.88	13.3'	07°13.56	-15.4'	57.8'
9	314°36.43	· · 26.08	241°58.16	13.4'	06°58.19	-15.4'	57.7'
10	329°36.30	26.10	256°30.52	13.4'	06°42.80	-15.4'	57.7'
11	344°36.16	26.11	271°2.96	13.5'	06°27.40	-15.4'	57.7'
12	359°36.02	N23°26.13	285°35.46	13.6'	N06°12.00	-15.4'	57.6'
13	14°35.89	26.14	300°8.04	13.6'	05°56.59	-15.4'	57.6'
14	29°35.75	26.16	314°40.68	13.7'	05°41.17	-15.4'	57.5'
15	44°35.61	· · 26.17	329°13.39	13.8'	05°25.75	-15.4'	57.5'
16	59°35.47	26.18	343°46.17	13.8'	05°10.33	-15.4'	57.5'
17	74°35.34	26.19	358°19.02	13.9'	04°54.91	-15.4'	57.4'
18	89°35.20	N23°26.20	12°51.93	14.0'	N04°39.48	-15.4'	57.4'
19	104°35.06	26.21	27°24.89	14.0'	04°24.06	-15.4'	57.3'
20	119°34.93	26.22	41°57.92	14.1'	04°8.63	-15.4'	57.3'
21	134°34.79	· · 26.23	56°31.01	14.1'	03°53.21	-15.4'	57.3'
22	149°34.65	26.24	71°4.16	14.2'	03°37.79	-15.4'	57.2'
23	164°34.52	26.24	85°37.36	14.3'	03°22.38	-15.4'	57.2'

SD = 15.7' $d = 0.0'$

SD = 15.8'

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	3-5
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	12-30%
18	01:03	01:10	12:01	15:30	03:03	
19	01:16	01:23	12:01	16:21	03:56	
20	01:29	01:36	12:02	17:07	04:44	

June 21, 22, 23 UT (Sun., Mon., Tue.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	269°12.51	137°28.31	N19°59.36	217°4.33	N18°27.93	148°58.30	N20°58.27	255°42.61	N03°14.51	Alpheratz	357°33.54 29°14.08
1	284°14.98	152°27.83	58.56	232°4.96	28.39	164°0.22	58.17	270°44.94	14.55	Ankaa	353°6.01 -42°9.44
2	299°17.44	167°27.35	57.77	247°5.59	28.86	179°2.14	58.06	285°47.27	14.60	Schedar	349°29.76 56°40.72
3	314°19.90	182°26.87	•• 56.97	262°6.21	•• 29.33	194°4.05	•• 57.96	300°49.59	•• 14.65	Diphda	348°46.16 -17°50.33
4	329°22.37	197°26.38	56.18	277°6.84	29.79	209°5.97	57.86	315°51.92	14.69	Achernar	335°19.55 -57°5.82
5	344°24.83	212°25.90	55.38	292°7.47	30.26	224°7.89	57.76	330°54.24	14.74	Hamal	327°50.03 23°35.18
6	359°27.30	227°25.42	N19°54.58	307°8.09	N18°30.73	239°9.81	N20°57.66	345°56.57	N03°14.78	Polaris	313°46.47 89°22.29
7	14°29.76	242°24.94	53.78	322°8.72	31.19	254°11.73	57.55	0°58.90	14.83	Acamar	315°11.17 -40°11.70
8	29°32.22	257°24.47	52.98	337°9.35	31.66	269°13.64	57.45	16°1.23	14.88	Menkar	314°5.13 4°11.63
9	44°34.69	272°23.99	•• 52.18	352°9.97	•• 32.12	284°15.56	•• 57.35	31°3.55	•• 14.92	Mirfak	308°26.93 49°57.16
10	59°37.15	287°23.51	51.38	7°10.60	32.59	299°17.48	57.25	46°5.88	14.97	Aldebaran	290°38.57 16°33.77
11	74°39.62	302°23.04	50.58	22°11.22	33.05	314°19.40	57.15	61°8.21	15.01	Rigel	281°3.05 -8°10.22
12	89°42.08	317°22.56	N19°49.77	37°11.85	N18°33.51	329°21.31	N20°57.04	76°10.54	N03°15.06	Capella	280°20.59 46°1.41
13	104°44.55	332°22.09	48.97	52°12.48	33.98	344°23.23	56.94	91°12.86	15.10	Bellatrix	278°21.93 6°22.42
14	119°47.01	347°21.61	48.17	67°13.10	34.44	359°25.15	56.84	106°15.19	15.15	Elnath	278°0.73 28°37.75
15	134°49.47	2°21.14	•• 47.36	82°13.73	•• 34.90	14°27.07	•• 56.74	121°17.52	•• 15.20	Alnilam	275°36.85 -1°11.09
16	149°51.94	17°20.67	46.55	97°14.36	35.37	29°28.98	56.63	136°19.85	15.24	Betelgeuse	270°51.13 7°24.72
17	164°54.40	32°20.19	45.75	112°14.98	35.83	44°30.90	56.53	151°22.18	15.29	Canopus	263°52.42 -52°42.57
18	179°56.87	47°19.72	N19°44.94	127°15.61	N18°36.29	59°32.82	N20°56.43	166°24.50	N03°15.33	Sirius	258°25.53 -16°45.16
19	194°59.33	62°19.25	44.13	142°16.23	36.75	74°34.73	56.33	181°26.83	15.38	Adhara	255°5.30 -29°0.51
20	210°1.79	77°18.78	43.32	157°16.86	37.21	89°36.65	56.22	196°29.16	15.42	Procyon	244°49.89 5°9.42
21	225°4.26	92°18.31	•• 42.51	172°17.48	•• 37.67	104°38.57	•• 56.12	211°31.49	•• 15.47	Pollux	243°16.19 27°57.76
22	240°6.72	107°17.85	41.70	187°18.11	38.14	119°40.48	56.02	226°33.82	15.51	Avior	234°14.80 -59°35.81
23	255°9.19	122°17.38	40.88	202°18.74	38.60	134°42.40	55.92	241°36.15	15.56	Suhail	222°45.75 -43°32.55
Mer.pass. 06:02		ν-0.5' d-0.8' m-4.01		ν0.6' d0.5' m1.29		ν1.9' d-0.1' m-1.83		ν2.3' d0.0' m0.81		Miaplacidus	221°38.70 -69°49.78
										Alphard	217°46.79 -8°46.48
										Regulus	207°33.33 11°50.28
										Dubhe	193°39.73 61°36.73
										Denebola	182°23.75 14°25.48
										Gienah	175°42.33 -17°41.49
										Acrux	172°58.67 -63°15.09
										Gacrux	171°50.22 -57°16.01
										Alioth	166°11.78 55°49.18
										Spica	158°20.91 -11°18.08
										Alkaid	152°50.83 49°11.04
										Hadar	148°33.93 -60°30.32
										Menkent	147°55.97 -36°30.22
										Arcturus	145°46.62 19°2.72
										Rigel Kent.	139°38.20 -60°56.94
										Kochab	137°19.01 74°2.95
										Zuben'ubi	136°54.44 -16°9.21
										Alphecca	126°2.42 26°37.58
										Antares	112°14.01 -26°29.50
										Atria	107°6.58 -69°4.57
										Sabik	102°1.06 -15°45.48
										Shaula	96°8.31 -37°7.38
										Rasalhague	95°57.09 12°32.44
										Eltanin	90°41.08 51°29.08
										Kaus Aust.	83°30.51 -34°22.27
										Vega	80°31.98 38°48.44
										Nunki	75°45.90 -26°15.76
										Altair	61°58.48 8°56.29
										Peacock	53°3.35 -56°38.77
										Deneb	49°24.61 45°22.34
										Enif	33°37.42 9°59.77
										Al Na'ir	27°31.18 -46°49.69
										Fomalhaut	15°13.09 -29°28.71
										Scheat	13°43.94 28°13.48
										Markab	13°28.61 15°20.82
										Jun 21 Sun	SHA Mer.pass
										Venus	228°15.80 14:51
										Mars	307°51.82 09:31
										Jupiter	239°45.79 14:02
										Saturn	346°30.10 06:56
										Jun 22 Mon	SHA Mer.pass
										Venus	227°5.26 14:51
										Mars	307°7.71 09:30
										Jupiter	239°32.67 13:59
										Saturn	346°26.83 06:52
										Jun 23 Tue	SHA Mer.pass
										Venus	225°55.13 14:52
										Mars	306°23.57 09:29
										Jupiter	239°19.51 13:56
										Saturn	346°23.63 06:49
										Horizontal parallax	
										Venus:	0.1
										Mars:	0.1
Mer.pass. 05:54		ν-0.4' d-0.8' m-4.01		ν0.6' d0.5' m1.29		ν1.9' d-0.1' m-1.82		ν2.3' d0.0' m0.81			



h	Sun			Moon			
Sun	GHA	Dec		GHA	ν	Dec	d HP
0	179°34.38	N23°26.25		100°10.62	14.3'	N03°6.97	-15.4' 57.2'
1	194°34.24	26.26		114°43.93	14.4'	02°51.58	-15.4' 57.1'
2	209°34.11	26.26		129°17.29	14.4'	02°36.18	-15.4' 57.1'
3	224°33.97	26.27		143°50.71	14.5'	02°20.80	-15.4' 57.0'
4	239°33.83	26.27		158°24.17	14.5'	02°5.43	-15.4' 57.0'
5	254°33.70	26.27		172°57.68	14.6'	01°50.07	-15.3' 57.0'
6	269°33.56	N23°26.27		187°31.23	14.6'	N01°34.72	-15.3' 56.9'
7	284°33.42	26.28		202°4.83	14.6'	01°19.39	-15.3' 56.9'
8	299°33.29	26.28		216°38.48	14.7'	01°4.07	-15.3' 56.9'
9	314°33.15	26.28		231°12.16	14.7'	00°48.76	-15.3' 56.8'
10	329°33.01	26.27		245°45.89	14.8'	00°33.47	-15.3' 56.8'
11	344°32.88	26.27		260°19.66	14.8'	00°18.20	-15.3' 56.8'
12	359°32.74	N23°26.27		274°53.46	14.8'	N00°2.95	-15.2' 56.7'
13	14°32.60	26.27		289°27.30	14.9'	S00°12.29	15.2' 56.7'
14	29°32.47	26.26		304°1.18	14.9'	00°27.50	15.2' 56.6'
15	44°32.33	26.26		318°35.08	14.9'	00°42.70	15.2' 56.6'
16	59°32.20	26.25		333°9.03	15.0'	00°57.87	15.1' 56.6'
17	74°32.06	26.25		347°43.00	15.0'	01°13.02	15.1' 56.5'
18	89°31.92	N23°26.24		2°17.00	15.0'	S01°28.14	15.1' 56.5'
19	104°31.79	26.23		16°51.03	15.1'	01°43.24	15.1' 56.5'
20	119°31.65	26.23		31°25.09	15.1'	01°58.32	15.0' 56.4'
21	134°31.51	26.22		45°59.17	15.1'	02°13.37	15.0' 56.4'
22	149°31.38	26.21		60°33.28	15.1'	02°28.39	15.0' 56.4'
23	164°31.24	26.20		75°7.41	15.2'	02°43.39	15.0' 56.3'
SD = 15.7'			$d = 0.0'$			SD = 15.6'	

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	179°31.11	N23°26.19		89°41.57	15.2'	S02°58.35	14.9' 56.3'
1	194°30.97	26.18		104°15.74	15.2'	03°13.29	14.9' 56.3'
2	209°30.83	26.16		118°49.93	15.2'	03°28.19	14.9' 56.2'
3	224°30.70	26.15		133°24.14	15.2'	03°43.07	14.8' 56.2'
4	239°30.56	26.14		147°58.37	15.2'	03°57.91	14.8' 56.2'
5	254°30.43	26.12		162°32.61	15.3'	04°12.72	14.8' 56.1'
6	269°30.29	N23°26.11		177°6.87	15.3'	S04°27.49	14.7' 56.1'
7	284°30.15	26.09		191°41.14	15.3'	04°42.23	14.7' 56.1'
8	299°30.02	26.07		206°15.42	15.3'	04°56.94	14.7' 56.0'
9	314°29.88	26.06		220°49.72	15.3'	05°11.60	14.6' 56.0'
10	329°29.75	26.04		235°24.02	15.3'	05°26.24	14.6' 56.0'
11	344°29.61	26.02		249°58.33	15.3'	05°40.83	14.6' 56.0'
12	359°29.47	N23°26.00		264°32.65	15.3'	S05°55.39	14.5' 55.9'
13	14°29.34	25.98		279°6.97	15.3'	06°9.90	14.5' 55.9'
14	29°29.20	25.96		293°41.29	15.3'	06°24.38	14.4' 55.9'
15	44°29.07	25.94		308°15.62	15.3'	06°38.81	14.4' 55.8'
16	59°28.93	25.92		322°49.96	15.3'	06°53.20	14.4' 55.8'
17	74°28.80	25.89		337°24.29	15.3'	07°7.55	14.3' 55.8'
18	89°28.66	N23°25.87		351°58.62	15.3'	S07°21.86	14.3' 55.7'
19	104°28.53	25.84		6°32.96	15.3'	07°36.13	14.2' 55.7'
20	119°28.39	25.82		21°7.28	15.3'	07°50.34	14.2' 55.7'
21	134°28.25	25.79		35°41.61	15.3'	08°4.52	14.1' 55.7'
22	149°28.12	25.77		50°15.93	15.3'	08°18.64	14.1' 55.6'
23	164°27.98	25.74		64°50.24	15.3'	08°32.72	14.0' 55.6'
SD = 15.7'			$d = -0.0'$			SD = 15.4'	

Tue	GHA	Dec		GHA	ν	Dec	d HP
0	179°27.85	N23°25.71		79°24.55	15.3'	S08°46.76	14.0' 55.6'
1	194°27.71	25.68		93°58.85	15.3'	09°0.74	13.9' 55.5'
2	209°27.58	25.65		108°33.14	15.3'	09°14.67	13.9' 55.5'
3	224°27.44	25.62		123°7.42	15.3'	09°28.56	13.8' 55.5'
4	239°27.31	25.59		137°41.69	15.3'	09°42.39	13.8' 55.5'
5	254°27.17	25.56		152°15.95	15.2'	09°56.17	13.7' 55.4'
6	269°27.04	N23°25.53		166°50.19	15.2'	S10°9.90	13.7' 55.4'
7	284°26.90	25.49		181°24.42	15.2'	10°23.58	13.6' 55.4'
8	299°26.77	25.46		195°58.63	15.2'	10°37.21	13.6' 55.4'
9	314°26.63	25.42		210°32.83	15.2'	10°50.78	13.5' 55.3'
10	329°26.50	25.39		225°7.00	15.2'	11°4.29	13.5' 55.3'
11	344°26.36	25.35		239°41.16	15.1'	11°17.75	13.4' 55.3'
12	359°26.23	N23°25.32		254°15.30	15.1'	S11°31.15	13.3' 55.3'
13	14°26.09	25.28		268°49.42	15.1'	11°44.49	13.3' 55.2'
14	29°25.96	25.24		283°23.52	15.1'	11°57.78	13.2' 55.2'
15	44°25.82	25.20		297°57.60	15.1'	12°11.01	13.2' 55.2'
16	59°25.69	25.16		312°31.65	15.0'	12°24.18	13.1' 55.2'
17	74°25.55	25.12		327°5.67	15.0'	12°37.28	13.0' 55.1'
18	89°25.42	N23°25.08		341°39.67	15.0'	S12°50.33	13.0' 55.1'
19	104°25.29	25.04		356°13.65	14.9'	13°3.32	12.9' 55.1'
20	119°25.15	25.00		10°47.60	14.9'	13°16.24	12.9' 55.1'
21	134°25.02	24.95		25°21.52	14.9'	13°29.10	12.8' 55.0'
22	149°24.88	24.91		39°55.41	14.9'	13°41.90	12.7' 55.0'
23	164°24.75	24.87		54°29.27	14.8'	13°54.63	12.7' 55.0'
SD = 15.7'			$d = -0.0'$			SD = 15.2'	

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

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		6-8
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		41-61%
21	01:42	01:49	12:02	17:51	05:29		
22	01:56	02:02	12:02	18:33	06:12		
23	02:09	02:15	12:02	19:16	06:54		

June 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	272°9.93		136°55.34	N19°0.07	217°49.33	N19°0.75	151°16.24	N20°50.83	258°30.45	N03°17.68		Alpheratz	357°33.51 29°14.09
1	287°12.39		151°54.90	18°59.22	232°49.95	1.20	166°18.16	50.72	273°32.78	17.73		Ankaa	353°5.99 -42°9.44
2	302°14.85		166°54.47	58.36	247°50.57	1.64	181°20.07	50.62	288°35.12	17.77		Schedar	349°29.73 56°40.73
3	317°17.32		181°54.04	· · 57.51	262°51.20	· · 2.08	196°21.98	· · 50.51	303°37.46	· · 17.81		Diphda	348°46.14 -17°50.32
4	332°19.78		196°53.61	56.65	277°51.82	2.53	211°23.90	50.41	318°39.79	17.85		Achernar	335°19.52 -57°5.81
5	347°22.25		211°53.18	55.80	292°52.44	2.97	226°25.81	50.30	333°42.13	17.89		Hamal	327°50.01 23°35.18
6	2°24.71		226°52.76	N18°54.94	307°53.07	N19°3.41	241°27.72	N20°50.20	348°44.47	N03°17.94		Polaris	313°45.18 89°22.28
7	17°27.18		241°52.33	54.08	322°53.69	3.85	256°29.64	50.09	3°46.80	17.98		Acamar	315°11.15 -40°11.69
8	32°29.64		256°51.90	53.22	337°54.31	4.30	271°31.55	49.99	18°49.14	18.02		Menkar	314°5.11 4°11.64
9	47°32.10		271°51.47	· · 52.36	352°54.93	· · 4.74	286°33.46	· · 49.88	33°51.48	· · 18.06		Mirfak	308°26.90 49°57.15
10	62°34.57		286°51.05	51.50	7°55.56	5.18	301°35.38	49.78	48°53.82	18.10		Aldebaran	290°38.55 16°33.72
11	77°37.03		301°50.62	50.64	22°56.18	5.62	316°37.29	49.67	63°56.15	18.14		Rigel	281°3.04 -8°10.23
12	92°39.50		316°50.20	N18°49.78	37°56.80	N19°6.06	331°39.20	N20°49.56	78°58.49	N03°18.18		Capella	280°20.58 46°1.40
13	107°41.96		331°49.78	48.92	52°57.42	6.50	346°41.12	49.46	94°0.83	18.22		Bellatrix	278°21.92 6°22.42
14	122°44.42		346°49.35	48.05	67°58.05	6.94	1°43.03	49.35	109°3.17	18.27		Elnath	278°0.72 28°37.74
15	137°46.89		1°48.93	· · 47.19	82°58.67	· · 7.38	16°44.94	· · 49.25	124°5.51	· · 18.31		Alnilam	275°36.84 -1°11.09
16	152°49.35		16°48.51	46.33	97°59.29	7.82	31°46.85	49.14	139°7.84	18.35		Betelgeuse	270°51.12 7°24.72
17	167°51.82		31°48.09	45.46	112°59.91	8.26	46°48.77	49.04	154°10.18	18.39		Canopus	263°52.42 -52°42.55
18	182°54.28		46°47.67	N18°44.59	128°0.53	N19°8.70	61°50.68	N20°48.93	169°12.52	N03°18.43		Sirius	258°25.53 -16°45.15
19	197°56.74		61°47.25	43.73	143°1.16	9.13	76°52.59	48.83	184°14.86	18.47		Adhara	255°5.30 -29°0.50
20	212°59.21		76°46.83	42.86	158°1.78	9.57	91°54.51	48.72	199°17.20	18.51		Procyon	244°49.89 5°9.42
21	228°1.67		91°46.42	· · 41.99	173°2.40	· · 10.01	106°56.42	· · 48.61	214°19.54	· · 18.55		Pollux	243°16.19 27°57.76
22	243°4.14		106°46.00	41.12	188°3.02	10.45	121°58.33	48.51	229°21.88	18.59		Avior	234°14.81 -59°35.80
23	258°6.60		121°45.58	40.25	203°3.65	10.88	137°0.24	48.40	244°24.22	18.63		Suhail	222°45.76 -43°32.54
Mer.pass. 05:50		ν-0.4' d-0.9' m-4.02		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.82		ν2.3' d0.0' m0.80				Miaplacidus	221°38.72 -69°49.77
												Alphard	217°46.80 -8°46.47
												Regulus	207°33.34 11°50.29
												Dubhe	193°39.76 61°36.73
												Denebola	182°23.76 14°25.48
												Gienah	175°42.34 -17°41.48
												Acrux	172°58.69 -63°15.09
												Gacrux	171°50.24 -57°16.01
												Alioth	166°11.81 55°49.19
												Spica	158°20.92 -11°18.07
												Alkaid	152°50.85 49°11.04
												Hadar	148°33.95 -60°30.32
												Menkent	147°55.98 -36°30.22
												Arcturus	145°46.63 19°2.72
												Rigil Kent.	139°38.22 -60°56.94
												Kochab	137°19.06 74°2.96
												Zuben'ubi	136°54.45 -16°9.20
												Alphecca	126°2.43 26°37.59
												Antares	112°14.01 -26°29.50
												Atria	107°6.58 -69°4.58
												Sabik	102°1.06 -15°45.47
												Shaula	96°8.31 -37°7.38
												Rasalhague	95°57.09 12°32.45
												Eltanin	90°41.08 51°29.10
												Kaus Aust.	83°30.50 -34°22.27
												Vega	80°31.97 38°48.45
												Nunki	75°45.89 -26°15.76
												Altair	61°58.47 8°56.30
												Peacock	53°3.33 -56°38.77
												Deneb	49°24.60 45°22.36
												Enif	33°37.40 9°59.78
												Al Na'ir	27°31.15 -46°49.69
												Fomalhaut	15°13.07 -29°28.70
												Scheat	13°43.92 28°13.49
												Markab	13°28.59 15°20.83
Jun 24 Wed			SHA		Mer.pass								
			Venus		224°45.41 14:53								
			Mars		305°39.40 09:28								
			Jupiter		239°6.32 13:53								
			Saturn		346°20.52 06:45								
Jun 25 Thu			SHA		Mer.pass								
			Venus		223°36.10 14:53								
			Mars		304°55.20 09:27								
			Jupiter		238°53.09 13:50								
			Saturn		346°17.49 06:41								
Jun 26 Fri			SHA		Mer.pass								
			Venus		222°27.21 14:54								
			Mars		304°10.97 09:26								
			Jupiter		238°39.83 13:47								
			Saturn		346°14.54 06:37								
Horizontal parallax			Venus:		0.1								
			Mars:		0.1								
Mer.pass. 05:43		ν-0.4' d-0.9' m-4.03		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.82		ν2.3' d0.0' m0.80					



h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.61	N23°24.82	69°3.10	14.8'	S14°7.29	12.6'	55.0'
1	194°24.48	24.77	83°36.89	14.8'	14°19.90	12.5'	54.9'
2	209°24.35	24.73	98°10.66	14.7'	14°32.43	12.5'	54.9'
3	224°24.21	· · 24.68	112°44.39	14.7'	14°44.89	12.4'	54.9'
4	239°24.08	24.63	127°18.09	14.7'	14°57.29	12.3'	54.9'
5	254°23.94	24.58	141°51.75	14.6'	15°9.62	12.3'	54.9'
6	269°23.81	N23°24.53	156°25.38	14.6'	S15°21.88	12.2'	54.8'
7	284°23.68	24.48	170°58.97	14.6'	15°34.07	12.1'	54.8'
8	299°23.54	24.43	185°32.52	14.5'	15°46.19	12.0'	54.8'
9	314°23.41	· · 24.38	200°6.03	14.5'	15°58.23	12.0'	54.8'
10	329°23.27	24.33	214°39.51	14.4'	16°10.21	11.9'	54.8'
11	344°23.14	24.27	229°12.95	14.4'	16°22.10	11.8'	54.7'
12	359°23.01	N23°24.22	243°46.34	14.4'	S16°33.93	11.8'	54.7'
13	14°22.87	24.17	258°19.69	14.3'	16°45.68	11.7'	54.7'
14	29°22.74	24.11	272°53.01	14.3'	16°57.36	11.6'	54.7'
15	44°22.61	· · 24.05	287°26.28	14.2'	17°8.95	11.5'	54.7'
16	59°22.47	24.00	301°59.50	14.2'	17°20.48	11.4'	54.6'
17	74°22.34	23.94	316°32.69	14.1'	17°31.92	11.4'	54.6'
18	89°22.21	N23°23.88	331°5.83	14.1'	S17°43.28	11.3'	54.6'
19	104°22.07	23.82	345°38.92	14.0'	17°54.57	11.2'	54.6'
20	119°21.94	23.76	0°11.97	14.0'	18°5.78	11.1'	54.6'
21	134°21.81	· · 23.70	14°44.97	14.0'	18°16.90	11.0'	54.6'
22	149°21.67	23.64	29°17.92	13.9'	18°27.94	11.0'	54.5'
23	164°21.54	23.58	43°50.83	13.9'	18°38.91	10.9'	54.5'
SD = 15.7' $d = -0.0'$			SD = 15.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°21.41	N23°23.52	58°23.69	13.8'	S18°49.78	10.8'	54.5'
1	194°21.27	23.45	72°56.50	13.8'	19°05.58	10.7'	54.5'
2	209°21.14	23.39	87°29.27	13.7'	19°11.29	10.6'	54.5'
3	224°21.01	· · 23.33	102°1.98	13.7'	19°21.91	10.5'	54.5'
4	239°20.88	23.26	116°34.64	13.6'	19°32.45	10.5'	54.4'
5	254°20.74	23.19	131°7.26	13.6'	19°42.90	10.4'	54.4'
6	269°20.61	N23°23.13	145°39.82	13.5'	S19°53.26	10.3'	54.4'
7	284°20.48	23.06	160°12.33	13.5'	20°3.54	10.2'	54.4'
8	299°20.35	22.99	174°44.79	13.4'	20°13.72	10.1'	54.4'
9	314°20.21	· · 22.92	189°17.20	13.4'	20°23.82	10.0'	54.4'
10	329°20.08	22.85	203°49.55	13.3'	20°33.83	9.9'	54.4'
11	344°19.95	22.78	218°21.86	13.2'	20°43.74	9.8'	54.3'
12	359°19.82	N23°22.71	232°54.11	13.2'	S20°53.56	9.7'	54.3'
13	14°19.68	22.64	247°26.30	13.1'	21°3.29	9.6'	54.3'
14	29°19.55	22.57	261°58.45	13.1'	21°12.93	9.5'	54.3'
15	44°19.42	· · 22.50	276°30.54	13.0'	21°22.47	9.4'	54.3'
16	59°19.29	22.42	291°2.57	13.0'	21°31.91	9.3'	54.3'
17	74°19.16	22.35	305°34.55	12.9'	21°41.26	9.3'	54.3'
18	89°19.02	N23°22.27	320°6.48	12.9'	S21°50.52	9.2'	54.3'
19	104°18.89	22.20	334°38.35	12.8'	21°59.67	9.1'	54.2'
20	119°18.76	22.12	349°10.17	12.8'	22°8.73	9.0'	54.2'
21	134°18.63	· · 22.04	3°41.93	12.7'	22°17.69	8.9'	54.2'
22	149°18.50	21.96	18°13.64	12.7'	22°26.55	8.8'	54.2'
23	164°18.37	21.88	32°45.29	12.6'	22°35.31	8.7'	54.2'
SD = 15.7' $d = -0.1'$			SD = 14.9'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°18.23	N23°21.80	47°16.89	12.5'	S22°43.96	8.6'	54.2'
1	194°18.10	21.72	61°48.43	12.5'	22°52.52	8.5'	54.2'
2	209°17.97	21.64	76°19.92	12.4'	23°0.97	8.3'	54.2'
3	224°17.84	· · 21.56	90°51.35	12.4'	23°9.32	8.2'	54.2'
4	239°17.71	21.48	105°22.73	12.3'	23°17.57	8.1'	54.1'
5	254°17.58	21.40	119°54.05	12.3'	23°25.71	8.0'	54.1'
6	269°17.45	N23°21.31	134°25.31	12.2'	S23°33.74	7.9'	54.1'
7	284°17.32	21.23	148°56.53	12.2'	23°41.67	7.8'	54.1'
8	299°17.18	21.14	163°27.68	12.1'	23°49.49	7.7'	54.1'
9	314°17.05	· · 21.06	177°58.78	12.0'	23°57.20	7.6'	54.1'
10	329°16.92	20.97	192°29.83	12.0'	24°4.81	7.5'	54.1'
11	344°16.79	20.88	207°0.82	11.9'	24°12.31	7.4'	54.1'
12	359°16.66	N23°20.79	221°31.76	11.9'	S24°19.69	7.3'	54.1'
13	14°16.53	20.71	236°2.65	11.8'	24°26.97	7.2'	54.1'
14	29°16.40	20.62	250°33.48	11.8'	24°34.13	7.1'	54.1'
15	44°16.27	· · 20.53	265°4.26	11.7'	24°41.18	6.9'	54.1'
16	59°16.14	20.43	279°34.98	11.7'	24°48.12	6.8'	54.0'
17	74°16.01	20.34	294°5.65	11.6'	24°54.95	6.7'	54.0'
18	89°15.88	N23°20.25	308°36.27	11.6'	S25°1.66	6.6'	54.0'
19	104°15.75	20.16	323°6.84	11.5'	25°8.26	6.5'	54.0'
20	119°15.62	20.06	337°37.36	11.5'	25°14.74	6.4'	54.0'
21	134°15.49	· · 19.97	352°7.82	11.4'	25°21.11	6.2'	54.0'
22	149°15.36	19.87	6°38.24	11.4'	25°27.36	6.1'	54.0'
23	164°15.23	19.78	21°8.60	11.3'	25°33.49	6.0'	54.0'
SD = 15.7' $d = -0.1'$			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	□	□	□	□	□	□
64°	////	////	01:33	22:32	////	////
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	03:14	20:51	21:53	////
54°	00:48	02:34	03:29	20:36	21:31	23:17
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	04:47	19:18	19:48	20:24
30°	04:00	04:33	05:00	19:05	19:32	20:06
20°	04:29	04:58	05:22	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:36	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	18:05
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	17:01
S 60°	07:12	08:08	09:06	14:59	15:57	16:54

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

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		9-11
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		70-86%
24	02:22	02:28	12:02	19:59	07:37		
25	02:34	02:41	12:03	20:45	08:22		
26	02:47	02:53	12:03	21:33	09:08		

June 27, 28, 29 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	275°7.34	136°26.08	N17°56.68	218°34.06	N19°31.88	153°33.88	N20°43.17	261°19.02	N03°20.54	Alpheratz	357°33.48	29°14.10
1	290°9.81	151°25.70	55.77	233°34.68	32.30	168°35.79	43.06	276°21.37	20.58	Ankaa	353°5.96	-42°9.43
2	305°12.27	166°25.32	54.87	248°35.30	32.72	183°37.70	42.95	291°23.71	20.61	Schedar	349°29.68	56°40.73
3	320°14.74	181°24.94	· · 53.96	263°35.92	· · 33.14	198°39.61	· · 42.84	306°26.06	· · 20.65	Diphda	348°46.11	-17°50.31
4	335°17.20	196°24.56	53.05	278°36.54	33.56	213°41.52	42.74	321°28.41	20.69	Achernar	335°19.49	-57°5.80
5	350°19.67	211°24.18	52.14	293°37.16	33.98	228°43.43	42.63	336°30.75	20.73	Hamal	327°49.98	23°35.19
6	5°22.13	226°23.81	N17°51.22	308°37.78	N19°34.39	243°45.33	N20°42.52	351°33.10	N03°20.76	Polaris	313°43.69	89°22.27
7	20°24.59	241°23.43	50.31	323°38.40	34.81	258°47.24	42.41	6°35.45	20.80	Acamar	315°11.13	-40°11.68
8	35°27.06	256°23.06	49.40	338°39.02	35.23	273°49.15	42.30	21°37.79	20.84	Menkar	314°5.09	4°11.64
9	50°29.52	271°22.68	· · 48.49	353°39.64	· · 35.65	288°51.06	· · 42.19	36°40.14	· · 20.87	Mirfak	308°26.87	49°57.15
10	65°31.99	286°22.31	47.57	8°40.25	36.06	303°52.97	42.09	51°42.49	20.91	Aldebaran	290°38.54	16°33.73
11	80°34.45	301°21.94	46.66	23°40.87	36.48	318°54.88	41.98	66°44.84	20.95	Rigel	281°3.02	-8°10.22
12	95°36.92	316°21.56	N17°45.74	38°41.49	N19°36.90	333°56.79	N20°41.87	81°47.19	N03°20.98	Capella	280°20.55	46°1.39
13	110°39.38	331°21.19	44.82	53°42.11	37.31	348°58.70	41.76	96°49.53	21.02	Bellatrix	278°21.90	6°22.43
14	125°41.84	346°20.82	43.91	68°42.73	37.73	4°0.61	41.65	111°51.88	21.06	Elnath	278°0.70	28°37.74
15	140°44.31	1°20.45	· · 42.99	83°43.35	· · 38.15	19°2.52	· · 41.54	126°54.23	· · 21.09	Alnilam	275°36.83	-1°11.08
16	155°46.77	16°20.08	42.07	98°43.97	38.56	34°4.42	41.44	141°56.58	21.13	Betelgeuse	270°51.11	7°24.72
17	170°49.24	31°19.71	41.15	113°44.59	38.97	49°6.33	41.33	156°58.93	21.17	Canopus	263°52.41	-52°42.54
18	185°51.70	46°19.35	N17°40.23	128°45.21	N19°39.39	64°8.24	N20°41.22	172°1.28	N03°21.20	Sirius	258°25.52	-16°45.14
19	200°54.16	61°18.98	39.31	143°45.82	39.80	79°10.15	41.11	187°3.63	21.24	Adhara	255°5.29	-29°0.49
20	215°56.63	76°18.61	38.39	158°46.44	40.22	94°12.06	41.00	202°5.98	21.27	Procyon	244°49.89	5°9.42
21	230°59.09	91°18.25	· · 37.47	173°47.06	· · 40.63	109°13.97	· · 40.89	217°8.33	· · 21.31	Pollux	243°16.18	27°57.76
22	246°1.56	106°17.88	36.54	188°47.68	41.04	124°15.88	40.78	232°10.68	21.35	Avior	234°14.82	-59°35.79
23	261°4.02	121°17.52	35.62	203°48.30	41.46	139°17.78	40.68	247°13.03	21.38	Suhail	222°45.77	-43°32.53
Mer.pass. 05:39		ν-0.4' d-0.9' m-4.03		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.82		ν2.3' d0.0' m0.79		Miaplacidus	221°38.75	-69°49.76
										Alphard	217°46.80	-8°46.47
										Regulus	207°33.34	11°50.29
										Dubhe	193°39.78	61°36.72
										Denebola	182°23.76	14°25.49
										Gienah	175°42.34	-17°41.48
										Acrux	172°58.71	-63°15.10
										Gacrux	171°50.25	-57°16.01
										Alioth	166°11.83	55°49.19
										Spica	158°20.92	-11°18.07
										Alkaid	152°50.86	49°11.05
										Hadar	148°33.96	-60°30.33
										Menkent	147°55.99	-36°30.22
										Arcturus	145°46.63	19°2.73
										Rigil Kent.	139°38.23	-60°56.95
										Kochab	137°19.11	74°2.97
										Zuben'ubi	136°54.45	-16°9.20
										Alphecca	126°2.43	26°37.60
										Antares	112°14.00	-26°29.50
										Atria	107°6.58	-69°4.59
										Sabik	102°1.05	-15°45.47
										Shaula	96°8.30	-37°7.38
										Rasalhague	95°57.08	12°32.46
										Eltanin	90°41.07	51°29.12
										Kaus Aust.	83°30.49	-34°22.27
										Vega	80°31.96	38°48.47
										Nunki	75°45.88	-26°15.76
										Altair	61°58.45	8°56.31
										Peacock	53°3.30	-56°38.77
										Deneb	49°24.57	45°22.38
										Enif	33°37.38	9°59.80
										Al Na'ir	27°31.13	-46°49.69
										Fomalhaut	15°13.04	-29°28.69
										Scheat	13°43.89	28°13.50
										Markab	13°28.57	15°20.85
										Jun 27 Sat	SHA	Mer.pass
										Venus	221°18.73	14:55
										Mars	303°26.72	09:25
										Jupiter	238°26.53	13:44
										Saturn	346°11.67	06:34
										Jun 28 Sun	SHA	Mer.pass
										Venus	220°10.67	14:55
										Mars	302°42.43	09:24
										Jupiter	238°13.21	13:41
										Saturn	346°8.89	06:30
										Jun 29 Mon	SHA	Mer.pass
										Venus	219°3.02	14:56
										Mars	301°58.12	09:23
										Jupiter	237°59.85	13:38
										Saturn	346°6.19	06:26
										Horizontal parallax		
										Venus:		0.1
										Mars:		0.1
Mer.pass. 05:31		ν-0.3' d-0.9' m-4.04		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.81		ν2.4' d0.0' m0.78				


h	Sun			Moon				
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	179°15.10	N23°19.68		35°38.91	11.3'	S25°39.50	5.9'	54.0'
1	194°14.97	19.58		50°9.18	11.2'	25°45.40	5.8'	54.0'
2	209°14.84	19.49		64°39.39	11.2'	25°51.17	5.7'	54.0'
3	224°14.71	19.39	· ·	79°9.56	11.1'	25°56.83	5.5'	54.0'
4	239°14.58	19.29		93°39.68	11.1'	26°2.36	5.4'	54.0'
5	254°14.45	19.19		108°9.76	11.0'	26°7.78	5.3'	54.0'
6	269°14.32	N23°19.09		122°39.78	11.0'	S26°13.07	5.2'	54.0'
7	284°14.19	18.98		137°9.76	10.9'	26°18.24	5.0'	54.0'
8	299°14.06	18.88		151°39.70	10.9'	26°23.29	4.9'	54.0'
9	314°13.94	18.78	· ·	166°9.59	10.8'	26°28.21	4.8'	53.9'
10	329°13.81	18.68		180°39.44	10.8'	26°33.01	4.7'	53.9'
11	344°13.68	18.57		195°9.25	10.8'	26°37.69	4.6'	53.9'
12	359°13.55	N23°18.47		209°39.01	10.7'	S26°42.24	4.4'	53.9'
13	14°13.42	18.36		224°8.74	10.7'	26°46.66	4.3'	53.9'
14	29°13.29	18.25		238°38.42	10.6'	26°50.96	4.2'	53.9'
15	44°13.16	18.15	· ·	253°8.06	10.6'	26°55.13	4.0'	53.9'
16	59°13.03	18.04		267°37.67	10.6'	26°59.18	3.9'	53.9'
17	74°12.91	17.93		282°7.24	10.5'	27°3.09	3.8'	53.9'
18	89°12.78	N23°17.82		296°36.77	10.5'	S27°6.88	3.7'	53.9'
19	104°12.65	17.71		311°6.26	10.5'	27°10.54	3.5'	53.9'
20	119°12.52	17.60		325°35.72	10.4'	27°14.08	3.4'	53.9'
21	134°12.39	17.49	· ·	340°5.15	10.4'	27°17.48	3.3'	53.9'
22	149°12.26	17.38		354°34.54	10.4'	27°20.75	3.1'	53.9'
23	164°12.14	17.26		9°3.90	10.3'	27°23.89	3.0'	53.9'
SD = 15.7'			$d = -0.1'$			SD = 14.7'		

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	179°12.01	N23°17.15		23°33.23	10.3'	S27°26.90	2.9'	53.9'
1	194°11.88	17.03		38°2.53	10.3'	27°29.78	2.7'	53.9'
2	209°11.75	16.92		52°31.80	10.2'	27°32.53	2.6'	53.9'
3	224°11.63	16.80	· ·	67°1.04	10.2'	27°35.15	2.5'	53.9'
4	239°11.50	16.69		81°30.26	10.2'	27°37.64	2.4'	53.9'
5	254°11.37	16.57		95°59.45	10.2'	27°39.99	2.2'	53.9'
6	269°11.24	N23°16.45		110°28.62	10.1'	S27°42.21	2.1'	53.9'
7	284°11.12	16.33		124°57.76	10.1'	27°44.29	2.0'	53.9'
8	299°10.99	16.21		139°26.88	10.1'	27°46.25	1.8'	53.9'
9	314°10.86	16.09	· ·	153°55.98	10.1'	27°48.07	1.7'	53.9'
10	329°10.73	15.97		168°25.06	10.1'	27°49.75	1.6'	53.9'
11	344°10.61	15.85		182°54.12	10.0'	27°51.30	1.4'	53.9'
12	359°10.48	N23°15.73		197°23.16	10.0'	S27°52.72	1.3'	53.9'
13	14°10.35	15.61		211°52.19	10.0'	27°54.00	1.1'	53.9'
14	29°10.23	15.48		226°21.20	10.0'	27°55.15	1.0'	53.9'
15	44°10.10	15.36	· ·	240°50.20	10.0'	27°56.16	0.9'	53.9'
16	59°9.97	15.23		255°19.18	10.0'	27°57.04	0.7'	53.9'
17	74°9.85	15.11		269°48.15	10.0'	27°57.78	0.6'	53.9'
18	89°9.72	N23°14.98		284°17.12	10.0'	S27°58.39	0.5'	53.9'
19	104°9.60	14.85		298°46.07	9.9'	27°58.86	0.3'	53.9'
20	119°9.47	14.73		313°15.01	9.9'	27°59.20	0.2'	53.9'
21	134°9.34	14.60	· ·	327°43.95	9.9'	27°59.40	0.1'	53.9'
22	149°9.22	14.47		342°12.88	9.9'	27°59.46	-0.1'	53.9'
23	164°9.09	14.34		356°41.81	9.9'	27°59.39	-0.2'	53.9'
SD = 15.7'			$d = -0.1'$			SD = 14.7'		

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	179°8.97	N23°14.21		11°10.74	9.9'	S27°59.18	-0.3'	53.9'
1	194°8.84	14.08		25°39.66	9.9'	27°58.84	-0.5'	53.9'
2	209°8.72	13.94		40°8.59	9.9'	27°58.36	-0.6'	53.9'
3	224°8.59	13.81	· ·	54°37.51	9.9'	27°57.74	-0.8'	53.9'
4	239°8.46	13.68		69°6.44	9.9'	27°56.99	-0.9'	53.9'
5	254°8.34	13.54		83°35.37	9.9'	27°56.10	-1.0'	53.9'
6	269°8.21	N23°13.41		98°4.30	9.9'	S27°55.08	-1.2'	53.9'
7	284°8.09	13.27		112°33.24	9.9'	27°53.92	-1.3'	54.0'
8	299°7.96	13.14		127°2.19	10.0'	27°52.62	-1.4'	54.0'
9	314°7.84	13.00	· ·	141°31.15	10.0'	27°51.19	-1.6'	54.0'
10	329°7.71	12.86		156°0.11	10.0'	27°49.63	-1.7'	54.0'
11	344°7.59	12.72		170°29.09	10.0'	27°47.93	-1.8'	54.0'
12	359°7.46	N23°12.59		184°58.08	10.0'	S27°46.09	-2.0'	54.0'
13	14°7.34	12.45		199°27.08	10.0'	27°44.12	-2.1'	54.0'
14	29°7.22	12.31		213°56.10	10.0'	27°42.01	-2.2'	54.0'
15	44°7.09	12.16	· ·	228°25.13	10.0'	27°39.77	-2.4'	54.0'
16	59°6.97	12.02		242°54.18	10.1'	27°37.39	-2.5'	54.0'
17	74°6.84	11.88		257°23.24	10.1'	27°34.88	-2.6'	54.0'
18	89°6.72	N23°11.74		271°52.33	10.1'	S27°32.24	-2.8'	54.0'
19	104°6.60	11.59		286°21.44	10.1'	27°29.46	-2.9'	54.0'
20	119°6.47	11.45		300°50.56	10.2'	27°26.55	-3.0'	54.0'
21	134°6.35	11.30	· ·	315°19.71	10.2'	27°23.51	-3.2'	54.0'
22	149°6.22	11.16		329°48.89	10.2'	27°20.33	-3.3'	54.0'
23	164°6.10	11.01		344°18.09	10.2'	27°17.02	-3.4'	54.0'
SD = 15.7'			$d = -0.1'$			SD = 14.7'		

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	12-14
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-99%
27	03:00	03:06	12:03	22:22	09:57	
28	03:12	03:18	12:03	23:14	10:48	
29	03:24	03:30	12:04	—:—	11:39	

June 30, 01, 02 UT (Tue., Wed., Thu.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	278°4.77		136°0.56	N16°49.52	219°18.55	N20°1.27	155°51.24	N20°35.30	264°8.34	N03°23.06		Alpheratz	357°33.45 29°14.11
1	293°7.23		151°0.23	48.56	234°19.17	1.67	170°53.14	35.19	279°10.70	23.10		Ankaa	353°5.93 -42°9.42
2	308°9.70		165°59.90	47.60	249°19.79	2.06	185°55.05	35.07	294°13.06	23.13		Schedar	349°29.64 56°40.74
3	323°12.16		180°59.58	· · 46.64	264°20.40	· · 2.46	200°56.96	· · 34.96	309°15.41	· · 23.16		Diphda	348°46.08 -17°50.30
4	338°14.62		195°59.25	45.68	279°21.02	2.85	215°58.86	34.85	324°17.77	23.19		Achernar	335°19.45 -57°5.79
5	353°17.09		210°58.92	44.72	294°21.64	3.25	231°0.77	34.74	339°20.13	23.23		Hamal	327°49.95 23°35.20
6	8°19.55		225°58.60	N16°43.76	309°22.25	N20°3.64	246°2.67	N20°34.63	354°22.49	N03°23.26		Polaris	313°42.23 89°22.27
7	23°22.02		240°58.28	42.80	324°22.87	4.03	261°4.58	34.52	9°24.84	23.29		Acamar	315°11.10 -40°11.66
8	38°24.48		255°57.95	41.83	339°23.48	4.43	276°6.48	34.41	24°27.20	23.32		Menkar	314°5.07 4°11.65
9	53°26.95		270°57.63	· · 40.87	354°24.10	· · 4.82	291°8.39	· · 34.30	39°29.56	· · 23.36		Mirfak	308°26.84 49°57.15
10	68°29.41		285°57.31	39.91	9°24.72	5.21	306°10.30	34.19	54°31.92	23.39		Aldebaran	290°38.51 16°33.73
11	83°31.87		300°56.99	38.94	24°25.33	5.61	321°12.20	34.08	69°34.28	23.42		Rigel	281°3.01 -8°10.21
12	98°34.34		315°56.67	N16°37.98	39°25.95	N20°6.00	336°14.11	N20°33.96	84°36.64	N03°23.45		Capella	280°20.53 46°1.39
13	113°36.80		330°56.35	37.01	54°26.56	6.39	351°16.01	33.85	99°39.00	23.48		Bellatrix	278°21.89 6°22.43
14	128°39.27		345°56.03	36.04	69°27.18	6.78	6°17.92	33.74	114°41.35	23.52		Elnath	278°0.68 28°37.74
15	143°41.73		0°55.71	· · 35.08	84°27.80	· · 7.17	21°19.82	· · 33.63	129°43.71	· · 23.55		Alnilam	275°36.81 -1°11.07
16	158°44.19		15°55.39	34.11	99°28.41	7.56	36°21.73	33.52	144°46.07	23.58		Betelgeuse	270°51.09 7°24.73
17	173°46.66		30°55.08	33.14	114°29.03	7.95	51°23.63	33.41	159°48.43	23.61		Canopus	263°52.41 -52°42.52
18	188°49.12		45°54.76	N16°32.17	129°29.64	N20°8.34	66°25.54	N20°33.30	174°50.79	N03°23.64		Sirius	258°25.51 -16°45.13
19	203°51.59		60°54.45	31.20	144°30.26	8.73	81°27.44	33.18	189°53.15	23.68		Adhara	255°5.29 -29°0.48
20	218°54.05		75°54.13	30.23	159°30.87	9.12	96°29.35	33.07	204°55.51	23.71		Procyon	244°49.88 5°9.42
21	233°56.52		90°53.82	· · 29.26	174°31.49	· · 9.51	111°31.25	· · 32.96	219°57.87	· · 23.74		Pollux	243°16.18 27°57.75
22	248°58.98		105°53.50	28.29	189°32.11	9.90	126°33.16	32.85	235°0.23	23.77		Avior	234°14.83 -59°35.78
23	264°1.44		120°53.19	27.32	204°32.72	10.29	141°35.06	32.74	250°2.59	23.80		Suhail	222°45.77 -43°32.52
Mer.pass. 05:27		ν-0.3' d-1.0' m-4.05		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.81		ν2.4' d0.0' m0.78					
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	279°3.91		135°52.88	N16°26.34	219°33.34	N20°10.68	156°36.97	N20°32.63	265°4.95	N03°23.83		Denebola	182°23.77 14°25.49
1	294°6.37		150°52.57	25.37	234°33.95	11.06	171°38.87	32.51	280°7.31	23.86		Gienah	175°42.35 -17°41.48
2	309°8.84		165°52.26	24.40	249°34.57	11.45	186°40.78	32.40	295°9.67	23.89		Acrux	172°58.73 -63°15.10
3	324°11.30		180°51.95	· · 23.42	264°35.18	· · 11.84	201°42.68	· · 32.29	310°12.03	· · 23.93		Gacrux	171°50.27 -57°16.02
4	339°13.76		195°51.64	22.45	279°35.80	12.23	216°44.59	32.18	325°14.40	23.96		Alioth	166°11.85 55°49.19
5	354°16.23		210°51.33	21.47	294°36.41	12.61	231°46.49	32.07	340°16.76	23.99		Spica	158°20.93 -11°18.07
6	9°18.69		225°51.03	N16°20.49	309°37.03	N20°13.00	246°48.40	N20°31.96	355°19.12	N03°24.02		Alkaid	152°50.88 49°11.05
7	24°21.16		240°50.72	19.51	324°37.64	13.38	261°50.30	31.84	10°21.48	24.05		Hadar	148°33.97 -60°30.33
8	39°23.62		255°50.41	18.54	339°38.26	13.77	276°52.21	31.73	25°23.84	24.08		Menkent	147°55.99 -36°30.22
9	54°26.09		270°50.11	· · 17.56	354°38.87	· · 14.15	291°54.11	· · 31.62	40°26.20	· · 24.11		Arcturus	145°46.64 19°2.73
10	69°28.55		285°49.80	16.58	9°39.49	14.54	306°56.02	31.51	55°28.57	24.14		Rigil Kent.	139°38.24 -60°56.96
11	84°31.01		300°49.50	15.60	24°40.10	14.92	321°57.92	31.40	70°30.93	24.17		Kochab	137°19.16 74°2.98
12	99°33.48		315°49.20	N16°14.62	39°40.72	N20°15.31	336°59.83	N20°31.28	85°33.29	N03°24.20		Zuben'ubi	136°54.45 -16°9.20
13	114°35.94		330°48.89	13.64	54°41.33	15.69	352°1.73	31.17	100°35.65	24.23		Alphecca	126°2.43 26°37.61
14	129°38.41		345°48.59	12.65	69°41.95	16.07	7°3.63	31.06	115°38.02	24.26		Antares	112°14.00 -26°29.50
15	144°40.87		0°48.29	· · 11.67	84°42.56	· · 16.46	22°5.54	· · 30.95	130°40.38	· · 24.29		Atria	107°6.57 -69°4.60
16	159°43.33		15°47.99	10.69	99°43.18	16.84	37°7.44	30.83	145°42.74	24.32		Sabik	102°1.04 -15°45.47
17	174°45.80		30°47.69	9.70	114°43.79	17.22	52°9.35	30.72	160°45.10	24.35		Shaula	96°8.29 -37°7.39
18	189°48.26		45°47.39	N16°8.72	129°44.41	N20°17.60	67°11.25	N20°30.61	175°47.47	N03°24.38		Rasalhague	95°57.07 12°32.47
19	204°50.73		60°47.10	7.73	144°45.02	17.98	82°13.15	30.50	190°49.83	24.41		Eltanin	90°41.07 51°29.13
20	219°53.19		75°46.80	6.75	159°45.64	18.36	97°15.06	30.38	205°52.19	24.44		Kaus Aust.	83°30.47 -34°22.27
21	234°55.66		90°46.50	· · 5.76	174°46.25	· · 18.75	112°16.96	· · 30.27	220°54.56	· · 24.47		Vega	80°31.96 38°48.49
22	249°58.12		105°46.21	4.78	189°46.87	19.13	127°18.87	30.16	235°56.92	24.50		Nunki	75°45.86 -26°15.76
23	265°0.58		120°45.91	3.79	204°47.48	19.51	142°20.77	30.05	250°59.29	24.53		Altair	61°58.44 8°56.33
Mer.pass. 05:23		ν-0.3' d-1.0' m-4.05		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.81		ν2.4' d0.0' m0.78					
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	280°3.05		135°45.62	N16°2.80	219°48.10	N20°19.89	157°22.67	N20°29.93	266°1.65	N03°24.56		Al Na'ir	27°31.09 -46°49.69
1	295°5.51		150°45.32	1.81	234°48.71	20.27	172°24.58	29.82	281°4.01	24.59		Fomalhaut	15°13.01 -29°28.68
2	310°7.98		165°45.03	16°0.82	249°49.33	20.64	187°26.48	29.71	296°6.38	24.62		Scheat	13°43.86 28°13.51
3	325°10.44		180°44.74	15°59.83	264°49.94	· · 21.02	202°28.39	· · 29.60	311°8.74	· · 24.65		Markab	13°28.54 15°20.86
4	340°12.90		195°44.44	58.84	279°50.55	21.40	217°30.29	29.48	326°11.11	24.68			
5	355°15.37		210°44.15	57.85	294°51.17	21.78	232°32.19	29.37	341°13.47	24.71		Jun 30 Tue	SHA Mer.pass
6	10°17.83		225°43.86	N15°56.86	309°51.78	N20°22.16	247°34.10	N20°29.26	356°15.84	N03°24.74		Venus	217°55.79 14:56
7	25°20.30		240°43.57	55.86	324°52.40	22.54	262°36.00	29.14	11°18.20	24.77		Mars	301°13.79 09:22
8	40°22.76		255°43.29	54.87	339°53.01	22.91	277°37.90	29.03	26°20.57	24.80		Jupiter	237°46.47 13:35
9	55°25.23		270°43.00	· · 53.88	354°53.63	· · 23.29	292°39.81	· · 28.92	41°22.93	· · 24.83		Saturn	346°3.57 06:22
10	70°27.69		285°42.71	52.88	9°								

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue							
0	179°5.98	N23°10.86	358°47.31	10.3'	S27°13.58	-3.6'	54.0'
1	194°5.85	10.71	13°16.56	10.3'	27°10.00	-3.7'	54.0'
2	209°5.73	10.56	27°45.84	10.3'	27°6.30	-3.8'	54.1'
3	224°5.61	10.41	42°15.15	10.3'	27°2.46	-4.0'	54.1'
4	239°5.48	10.26	56°44.49	10.4'	26°58.50	-4.1'	54.1'
5	254°5.36	10.11	71°13.86	10.4'	26°54.40	-4.2'	54.1'
6	269°5.24	N23°9.96	85°43.26	10.4'	S26°50.17	-4.4'	54.1'
7	284°5.12	9.81	100°12.70	10.5'	26°45.81	-4.5'	54.1'
8	299°4.99	9.66	114°42.17	10.5'	26°41.33	-4.6'	54.1'
9	314°4.87	9.50	129°11.67	10.5'	26°36.72	-4.7'	54.1'
10	329°4.75	9.35	143°41.21	10.6'	26°31.97	-4.9'	54.1'
11	344°4.63	9.19	158°10.79	10.6'	26°27.10	-5.0'	54.1'
12	359°4.50	N23°9.04	172°40.40	10.7'	S26°22.11	-5.1'	54.1'
13	14°4.38	8.88	187°10.06	10.7'	26°16.98	-5.2'	54.1'
14	29°4.26	8.72	201°39.75	10.7'	26°11.73	-5.4'	54.1'
15	44°4.14	8.56	216°9.48	10.8'	26°6.36	-5.5'	54.2'
16	59°4.02	8.41	230°39.25	10.8'	26°0.86	-5.6'	54.2'
17	74°3.90	8.25	245°9.07	10.9'	25°55.24	-5.7'	54.2'
18	89°3.77	N23°8.09	259°38.93	10.9'	S25°49.49	-5.9'	54.2'
19	104°3.65	7.92	274°8.83	10.9'	25°43.62	-6.0'	54.2'
20	119°3.53	7.76	288°38.77	11.0'	25°37.62	-6.1'	54.2'
21	134°3.41	7.60	303°8.76	11.0'	25°31.51	-6.2'	54.2'
22	149°3.29	7.44	317°38.80	11.1'	25°25.27	-6.4'	54.2'
23	164°3.17	7.27	332°8.88	11.1'	25°18.91	-6.5'	54.2'
SD = 15.7' $d = -0.1'$			SD = 14.7'				

Wed							
0	179°3.05	N23°7.11	346°39.01	11.2'	S25°12.43	-6.6'	54.2'
1	194°2.93	6.94	1°9.18	11.2'	25°5.83	-6.7'	54.2'
2	209°2.80	6.78	15°39.40	11.3'	24°59.12	-6.8'	54.3'
3	224°2.68	6.61	30°9.67	11.3'	24°52.28	-7.0'	54.3'
4	239°2.56	6.45	44°39.99	11.4'	24°45.33	-7.1'	54.3'
5	254°2.44	6.28	59°10.36	11.4'	24°38.26	-7.2'	54.3'
6	269°2.32	N23°6.11	73°40.78	11.5'	S24°31.07	-7.3'	54.3'
7	284°2.20	5.94	88°11.25	11.5'	24°23.77	-7.4'	54.3'
8	299°2.08	5.77	102°41.77	11.6'	24°16.35	-7.5'	54.3'
9	314°1.96	5.60	117°12.34	11.6'	24°8.82	-7.6'	54.3'
10	329°1.84	5.43	131°42.96	11.7'	24°1.18	-7.8'	54.3'
11	344°1.72	5.26	146°13.63	11.7'	23°53.42	-7.9'	54.4'
12	359°1.60	N23°5.08	160°44.36	11.8'	S23°45.56	-8.0'	54.4'
13	14°1.48	4.91	175°15.13	11.8'	23°37.58	-8.1'	54.4'
14	29°1.37	4.73	189°45.96	11.9'	23°29.49	-8.2'	54.4'
15	44°1.25	4.56	204°16.84	11.9'	23°21.28	-8.3'	54.4'
16	59°1.13	4.38	218°47.78	12.0'	23°12.98	-8.4'	54.4'
17	74°1.01	4.21	233°18.77	12.0'	23°4.56	-8.5'	54.4'
18	89°0.89	N23°4.03	247°49.81	12.1'	S22°56.03	-8.6'	54.4'
19	104°0.77	3.85	262°20.91	12.1'	22°47.40	-8.7'	54.5'
20	119°0.65	3.67	276°52.06	12.2'	22°38.66	-8.8'	54.5'
21	134°0.53	3.50	291°23.26	12.3'	22°29.82	-8.9'	54.5'
22	149°0.41	3.32	305°54.52	12.3'	22°20.88	-9.1'	54.5'
23	164°0.30	3.14	320°25.83	12.4'	22°11.82	-9.2'	54.5'
SD = 15.7' $d = -0.2'$			SD = 14.8'				

Thu							
0	179°0.18	N23°2.95	334°57.19	12.4'	S22°2.67	-9.3'	54.5'
1	194°0.06	2.77	349°28.61	12.5'	21°53.42	-9.4'	54.5'
2	208°59.94	2.59	4°0.08	12.5'	21°44.06	-9.5'	54.5'
3	223°59.82	2.41	18°31.61	12.6'	21°34.60	-9.6'	54.6'
4	238°59.71	2.22	33°3.19	12.6'	21°25.05	-9.7'	54.6'
5	253°59.59	2.04	47°34.83	12.7'	21°15.39	-9.8'	54.6'
6	268°59.47	N23°1.85	62°6.51	12.7'	S21°5.64	-9.9'	54.6'
7	283°59.35	1.67	76°38.26	12.8'	20°55.79	-9.9'	54.6'
8	298°59.24	1.48	91°10.05	12.8'	20°45.84	-10.0'	54.6'
9	313°59.12	1.29	105°41.90	12.9'	20°35.80	-10.1'	54.6'
10	328°59.00	1.10	120°13.80	13.0'	20°25.66	-10.2'	54.7'
11	343°58.89	0.92	134°45.76	13.0'	20°15.43	-10.3'	54.7'
12	358°58.77	N23°0.73	149°17.76	13.1'	S20°5.11	-10.4'	54.7'
13	13°58.65	0.54	163°49.82	13.1'	19°54.69	-10.5'	54.7'
14	28°58.54	0.34	178°21.94	13.2'	19°44.18	-10.6'	54.7'
15	43°58.42	0.15	192°54.10	13.2'	19°33.58	-10.7'	54.7'
16	58°58.30	22°59.96	207°26.32	13.3'	19°22.90	-10.8'	54.8'
17	73°58.19	22°59.77	221°58.58	13.3'	19°12.12	-10.9'	54.8'
18	88°58.07	N22°59.57	236°30.90	13.4'	S19°1.25	-11.0'	54.8'
19	103°57.95	59.38	251°3.27	13.4'	18°50.30	-11.0'	54.8'
20	118°57.84	59.18	265°35.69	13.5'	18°39.26	-11.1'	54.8'
21	133°57.72	58.99	280°8.16	13.5'	18°28.14	-11.2'	54.8'
22	148°57.61	58.79	294°40.67	13.6'	18°16.93	-11.3'	54.8'
23	163°57.49	58.59	309°13.24	13.6'	18°5.64	-11.4'	54.9'
SD = 15.7' $d = -0.2'$			SD = 14.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	□	□	□	□	□	□
N 70°	□	□	□	□	□	□
68°	□	□	□	□	□	□
66°	////	////	00:20	23:40	////	////
64°	////	////	01:41	22:25	////	////
62°	////	////	02:17	21:50	////	////
60°	////	01:03	02:42	21:25	23:02	////
N 58°	////	01:49	03:02	21:05	22:18	////
56°	////	02:17	03:18	20:49	21:50	////
54°	00:58	02:39	03:32	20:35	21:29	23:08
52°	01:40	02:56	03:44	20:23	21:11	22:27
50°	02:06	03:11	03:55	20:12	20:57	22:01
45°	02:51	03:40	04:17	19:50	20:28	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	05:02	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	07:06	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	07:46	08:32	15:35	16:22	17:11
58°	07:03	07:56	08:47	15:21	16:12	17:05
S 60°	07:11	08:07	09:04	15:04	16:01	16:57

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 15-17 100-96%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
30	03:36	03:42	12:04	00:05	12:30	
01	03:48	03:54	12:04	00:55	13:20	
02	03:59	04:05	12:04	01:43	14:07	

Aries		Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281° 2.19	135° 38.76	N15° 38.89	220° 2.83	N20° 28.90	158° 8.36	N20° 27.22	266° 58.43	N03° 25.25
1	296° 4.65	150° 38.48	37.89	235° 3.45	29.27	173° 10.26	27.11	282° 0.80	25.28
2	311° 7.12	165° 38.21	36.89	250° 4.06	29.64	188° 12.16	26.99	297° 3.17	25.31
3	326° 9.58	180° 37.93	•• 35.88	265° 4.68	•• 30.01	203° 14.06	•• 26.88	312° 5.54	•• 25.34
4	341° 12.04	195° 37.66	34.88	280° 5.29	30.38	218° 15.97	26.76	327° 7.91	25.37
5	356° 14.51	210° 37.38	33.87	295° 5.90	30.75	233° 17.87	26.65	342° 10.27	25.39
6	11° 16.97	225° 37.11	N15° 32.86	310° 6.52	N20° 31.12	248° 19.77	N20° 26.54	357° 12.64	N03° 25.42
7	26° 19.44	240° 36.84	31.86	325° 7.13	31.49	263° 21.68	26.42	12° 15.01	25.45
8	41° 21.90	255° 36.57	30.85	340° 7.74	31.86	278° 23.58	26.31	27° 17.38	25.48
9	56° 24.37	270° 36.30	•• 29.84	355° 8.36	•• 32.23	293° 25.48	•• 26.20	42° 19.75	•• 25.50
10	71° 26.83	285° 36.03	28.83	10° 8.97	32.59	308° 27.38	26.08	57° 22.12	25.53
11	86° 29.29	300° 35.76	27.82	25° 9.58	32.96	323° 29.29	25.97	72° 24.49	25.56
12	101° 31.76	315° 35.49	N15° 26.81	40° 10.20	N20° 33.33	338° 31.19	N20° 25.85	87° 26.86	N03° 25.55
13	116° 34.22	330° 35.22	25.80	55° 10.81	33.70	353° 33.09	25.74	102° 29.23	25.61
14	131° 36.69	345° 34.95	24.79	70° 11.42	34.06	8° 34.99	25.63	117° 31.60	25.64
15	146° 39.15	0° 34.68	•• 23.78	85° 12.04	•• 34.43	23° 36.90	•• 25.51	132° 33.97	•• 25.67
16	161° 41.61	15° 34.42	22.76	100° 12.65	34.79	38° 38.80	25.40	147° 36.34	25.69
17	176° 44.08	30° 34.15	21.75	115° 13.26	35.16	53° 40.70	25.28	162° 38.71	25.72
18	191° 46.54	45° 33.89	N15° 20.74	130° 13.88	N20° 35.53	68° 42.60	N20° 25.17	177° 41.08	N03° 25.75
19	206° 49.01	60° 33.62	19.72	145° 14.49	35.89	83° 44.50	25.05	192° 43.45	25.78
20	221° 51.47	75° 33.36	18.71	160° 15.10	36.26	98° 46.41	24.94	207° 45.82	25.80
21	236° 53.93	90° 33.10	•• 17.69	175° 15.71	•• 36.62	113° 48.31	•• 24.83	222° 48.19	•• 25.83
22	251° 56.40	105° 32.84	16.67	190° 16.33	36.98	128° 50.21	24.71	237° 50.56	25.86
23	266° 58.86	120° 32.57	15.66	205° 16.94	37.35	143° 52.11	24.60	252° 52.93	25.88
Mer.pass. 05:15		ν-0.3' d-1.0' m-4.06		ν0.6' d0.4' m1.30		ν1.9' d-0.1' m-1.81		ν2.4' d0.0' m0.77	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282° 1.33	135° 32.31	N15° 14.64	220° 17.55	N20° 37.71	158° 54.01	N20° 24.48	267° 55.30	N03° 25.91
1	297° 3.79	150° 32.05	13.62	235° 18.17	38.07	173° 55.92	24.37	282° 57.67	25.93
2	312° 6.26	165° 31.80	12.60	250° 18.78	38.44	188° 57.82	24.25	298° 0.05	25.96
3	327° 8.72	180° 31.54	•• 11.58	265° 19.39	•• 38.80	203° 59.72	•• 24.14	313° 2.42	•• 25.99
4	342° 11.18	195° 31.28	10.57	280° 20.00	39.16	219° 1.62	24.02	328° 4.79	26.01
5	357° 13.65	210° 31.02	9.54	295° 20.62	39.52	234°			

Jul 03 Fri	SHA	Mer.pass
Venus	214° 36.57	14:58
Mars	299° 0.65	09:19
Jupiter	237° 6.17	13:26
Saturn	345° 56.24	06:11

Jul 04 Sat	SHA	Mer.pass
Venus	213° 30.99	14:58
Mars	298° 16.23	09:18
Jupiter	236° 52.69	13:23
Saturn	345° 53.98	06:07

Jul 05 Sun	SHA	Mer.pass
Venus	212° 25.81	14:58
Mars	297° 31.79	09:17
Jupiter	236° 39.19	13:20
Saturn	345° 51.80	06:04

Horizontal parallax	
Venus:	0.1
Mars:	0.1


h	Sun		Moon				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°57.38	N22°58.40	323°45.85	13.7'	S17°54.27	-11.5'	54.9'
1	193°57.26	58.20	338°18.52	13.7'	17°42.81	-11.5'	54.9'
2	208°57.15	58.00	352°51.23	13.8'	17°31.27	-11.6'	54.9'
3	223°57.03	57.80	7°23.98	13.8'	17°19.65	-11.7'	54.9'
4	238°56.92	57.60	21°56.79	13.8'	17°7.95	-11.8'	55.0'
5	253°56.80	57.40	36°29.64	13.9'	16°56.17	-11.9'	55.0'
6	268°56.69	N22°57.19	51°2.53	13.9'	S16°44.32	-11.9'	55.0'
7	283°56.57	56.99	65°35.47	14.0'	16°32.38	-12.0'	55.0'
8	298°56.46	56.79	80°8.45	14.0'	16°20.38	-12.1'	55.0'
9	313°56.34	56.58	94°41.48	14.1'	16°8.29	-12.2'	55.0'
10	328°56.23	56.38	109°14.55	14.1'	15°56.13	-12.2'	55.1'
11	343°56.12	56.17	123°47.66	14.2'	15°43.90	-12.3'	55.1'
12	358°56.00	N22°55.97	138°20.81	14.2'	S15°31.59	-12.4'	55.1'
13	13°55.89	55.76	152°54.01	14.2'	15°19.22	-12.4'	55.1'
14	28°55.78	55.55	167°27.24	14.3'	15°6.77	-12.5'	55.1'
15	43°55.66	55.34	182°0.52	14.3'	14°54.25	-12.6'	55.2'
16	58°55.55	55.14	196°33.83	14.4'	14°41.66	-12.7'	55.2'
17	73°55.44	54.93	211°7.18	14.4'	14°29.00	-12.7'	55.2'
18	88°55.32	N22°54.72	225°40.57	14.4'	S14°16.28	-12.8'	55.2'
19	103°55.21	54.50	240°13.99	14.5'	14°3.49	-12.9'	55.2'
20	118°55.10	54.29	254°47.45	14.5'	13°50.63	-12.9'	55.3'
21	133°54.98	54.08	269°20.95	14.5'	13°37.70	-13.0'	55.3'
22	148°54.87	53.87	283°54.48	14.6'	13°24.72	-13.1'	55.3'
23	163°54.76	53.65	298°28.04	14.6'	13°11.66	-13.1'	55.3'
SD = 15.7'		$d = -0.2'$	SD = 15.0'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.65	N22°53.44	313°1.64	14.6'	S12°58.55	-13.2'	55.3'
1	193°54.53	53.22	327°35.27	14.7'	12°45.37	-13.2'	55.4'
2	208°54.42	53.01	342°8.92	14.7'	12°32.14	-13.3'	55.4'
3	223°54.31	52.79	356°42.61	14.7'	12°18.84	-13.4'	55.4'
4	238°54.20	52.57	11°16.33	14.7'	12°5.48	-13.4'	55.4'
5	253°54.09	52.36	25°50.08	14.8'	11°52.06	-13.5'	55.4'
6	268°53.98	N22°52.14	40°23.85	14.8'	S11°38.59	-13.5'	55.5'
7	283°53.86	51.92	54°57.65	14.8'	11°25.06	-13.6'	55.5'
8	298°53.75	51.70	69°31.47	14.8'	11°11.47	-13.6'	55.5'
9	313°53.64	51.48	84°5.32	14.9'	10°57.83	-13.7'	55.5'
10	328°53.53	51.25	98°39.20	14.9'	10°44.13	-13.8'	55.5'
11	343°53.42	51.03	113°13.09	14.9'	10°30.38	-13.8'	55.6'
12	358°53.31	N22°50.81	127°47.01	14.9'	S10°16.58	-13.9'	55.6'
13	13°53.20	50.59	142°20.95	15.0'	10°2.73	-13.9'	55.6'
14	28°53.09	50.36	156°54.91	15.0'	09°48.82	-14.0'	55.6'
15	43°52.98	50.14	171°28.89	15.0'	09°34.87	-14.0'	55.7'
16	58°52.87	49.91	186°2.88	15.0'	09°20.86	-14.1'	55.7'
17	73°52.76	49.69	200°36.89	15.0'	09°6.81	-14.1'	55.7'
18	88°52.65	N22°49.46	215°10.92	15.0'	S08°52.70	-14.1'	55.7'
19	103°52.54	49.23	229°44.96	15.1'	08°38.56	-14.2'	55.8'
20	118°52.43	49.00	244°19.02	15.1'	08°24.36	-14.2'	55.8'
21	133°52.32	48.77	258°53.09	15.1'	08°10.12	-14.3'	55.8'
22	148°52.21	48.54	273°27.17	15.1'	07°55.84	-14.3'	55.8'
23	163°52.10	48.31	288°1.26	15.1'	07°41.51	-14.4'	55.9'
SD = 15.7'		$d = -0.2'$	SD = 15.1'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°51.99	N22°48.08	302°35.36	15.1'	S07°27.14	-14.4'	55.9'
1	193°51.88	47.85	317°9.47	15.1'	07°12.73	-14.5'	55.9'
2	208°51.78	47.62	331°43.59	15.1'	06°58.28	-14.5'	55.9'
3	223°51.67	47.38	346°17.71	15.1'	06°43.78	-14.5'	56.0'
4	238°51.56	47.15	0°51.84	15.1'	06°29.25	-14.6'	56.0'
5	253°51.45	46.92	15°25.97	15.1'	06°14.68	-14.6'	56.0'
6	268°51.34	N22°46.68	30°0.10	15.1'	S06°0.07	-14.6'	56.0'
7	283°51.23	46.44	44°34.24	15.1'	05°45.43	-14.7'	56.1'
8	298°51.13	46.21	59°8.38	15.1'	05°30.75	-14.7'	56.1'
9	313°51.02	45.97	73°42.51	15.1'	05°16.03	-14.7'	56.1'
10	328°50.91	45.73	88°16.65	15.1'	05°1.28	-14.8'	56.1'
11	343°50.80	45.49	102°50.78	15.1'	04°46.50	-14.8'	56.2'
12	358°50.70	N22°45.25	117°24.91	15.1'	S04°31.68	-14.8'	56.2'
13	13°50.59	45.01	131°59.03	15.1'	04°16.84	-14.9'	56.2'
14	28°50.48	44.77	146°33.14	15.1'	04°1.96	-14.9'	56.2'
15	43°50.37	44.53	161°7.25	15.1'	03°47.05	-14.9'	56.3'
16	58°50.27	44.29	175°41.35	15.1'	03°32.12	-15.0'	56.3'
17	73°50.16	44.05	190°15.44	15.1'	03°17.15	-15.0'	56.3'
18	88°50.05	N22°43.80	204°49.52	15.1'	S03°2.16	-15.0'	56.3'
19	103°49.95	43.56	219°23.58	15.1'	02°47.15	-15.0'	56.4'
20	118°49.84	43.31	233°57.64	15.0'	02°32.10	-15.1'	56.4'
21	133°49.74	43.07	248°31.67	15.0'	02°17.04	-15.1'	56.4'
22	148°49.63	42.82	263°5.69	15.0'	02°1.95	-15.1'	56.5'
23	163°49.52	42.58	277°39.69	15.0'	01°46.84	-15.1'	56.5'
SD = 15.7'		$d = -0.2'$	SD = 15.2'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	18-20
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	92-78%
03	04:10	04:16	12:04	02:29	14:52	
04	04:21	04:27	12:04	03:14	15:35	
05	04:32	04:37	12:05	03:56	16:18	

July 06, 07, 08 UT (Mon., Tue., Wed.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	283°59.60	135°20.63	N14°25.13	220°46.94	N20°54.73	160°25.27	N20°18.94	269°49.31	N03°27.10			Alpheratz	357°33.41 29°14.13
1	299°2.07	150°20.41	24.09	235°47.55	55.08	175°27.17	18.82	284°51.69	27.12			Ankaa	353°5.87 -42°9.40
2	314°4.53	165°20.18	23.04	250°48.16	55.42	190°29.07	18.71	299°54.07	27.15			Schedar	349°29.58 56°40.76
3	329°7.00	180°19.96	· · 21.99	265°48.77	· · 55.77	205°30.97	· · 18.59	314°56.45	· · 27.17			Diphda	348°46.04 -17°50.28
4	344°9.46	195°19.73	20.95	280°49.38	56.11	220°32.87	18.47	329°58.82	27.19			Achernar	335°19.38 -57°5.77
5	359°11.92	210°19.51	19.90	295°49.99	56.46	235°34.77	18.36	345°1.20	27.22			Hamal	327°49.91 23°35.21
6	14°14.39	225°19.29	N14°18.85	310°50.60	N20°56.80	250°36.67	N20°18.24	0°3.58	N03°27.24			Polaris	313°39.70 89°22.26
7	29°16.85	240°19.06	17.80	325°51.22	57.15	265°38.57	18.12	15°5.96	27.26			Acamar	315°11.06 -40°11.63
8	44°19.32	255°18.84	16.76	340°51.83	57.49	280°40.47	18.01	30°8.34	27.29			Menkar	314°5.03 4°11.67
9	59°21.78	270°18.62	· · 15.71	355°52.44	· · 57.83	295°42.37	· · 17.89	45°10.72	· · 27.31			Mirfak	308°26.78 49°57.15
10	74°24.24	285°18.40	14.66	10°53.05	58.18	310°44.27	17.77	60°13.10	27.33			Aldebaran	290°38.48 16°33.74
11	89°26.71	300°18.18	13.61	25°53.66	58.52	325°46.17	17.66	75°15.48	27.35			Rigel	281°2.98 -8°10.19
12	104°29.17	315°17.96	N14°12.55	40°54.27	N20°58.86	340°48.07	N20°17.54	90°17.87	N03°27.38			Capella	280°20.49 46°1.38
13	119°31.64	330°17.75	11.50	55°54.88	59.20	355°49.97	17.42	105°20.25	27.40			Bellatrix	278°21.86 6°22.45
14	134°34.10	345°17.53	10.45	70°55.49	59.55	10°51.87	17.31	120°22.63	27.42			Elnath	278°0.65 28°37.74
15	149°36.56	0°17.31	· · 9.40	85°56.10	20°59.89	25°53.77	· · 17.19	135°25.01	· · 27.44			Alnilam	275°36.79 -1°11.05
16	164°39.03	15°17.10	8.34	100°56.72	21°0.23	40°55.67	17.07	150°27.39	27.46			Betelgeuse	270°51.07 7°24.74
17	179°41.49	30°16.88	7.29	115°57.33	0.57	55°57.57	16.96	165°29.77	27.49			Canopus	263°52.40 -52°42.49
18	194°43.96	45°16.67	N14°6.24	130°57.94	N21°0.91	70°59.47	N20°16.84	180°32.15	N03°27.51			Sirius	258°25.50 -16°45.11
19	209°46.42	60°16.45	5.18	145°58.55	1.25	86°1.36	16.72	195°34.53	27.53			Adhara	255°5.28 -29°0.45
20	224°48.88	75°16.24	4.13	160°59.16	1.59	101°3.26	16.60	210°36.92	27.55			Procyon	244°49.87 5°9.43
21	239°51.35	90°16.03	· · 3.07	175°59.77	· · 1.93	116°5.16	· · 16.49	225°39.30	· · 27.57			Pollux	243°16.17 27°57.75
22	254°53.81	105°15.82	2.01	191°0.38	2.26	131°7.06	16.37	240°41.68	27.60			Avior	234°14.86 -59°35.74
23	269°56.28	120°15.60	0.96	206°0.99	2.60	146°8.96	16.25	255°44.06	27.62			Suhail	222°45.79 -43°32.49
Mer.pass. 05:03		ν-0.2' d-1.0' m-4.08		ν0.6' d0.3' m1.30		ν1.9' d-0.1' m-1.80		ν2.4' d0.0' m0.75					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	284°58.74	135°15.39	N13°59.90	221°1.60	N21°2.94	161°10.86	N20°16.14	270°46.44	N03°27.64			Miaplacidus	221°38.83 -69°49.72
1	300°1.21	150°15.18	58.84	236°2.21	3.28	176°12.76	16.02	285°48.83	27.66			Alphard	217°46.81 -8°46.45
2	315°3.67	165°14.98	57.78	251°2.82	3.62	191°14.66	15.90	300°51.21	27.68			Regulus	207°33.35 11°50.29
3	330°6.13	180°14.77	· · 56.72	266°3.44	· · 3.95	206°16.56	· · 15.78	315°53.59	· · 27.70			Dubhe	193°39.83 61°36.70
4	345°8.60	195°14.56	55.66	281°4.05	4.29	221°18.46	15.67	330°55.98	27.73			Denebola	182°23.79 14°25.49
5	0°11.06	210°14.35	54.60	296°4.66	4.63	236°20.36	15.55	345°58.36	27.75			Gienah	175°42.37 -17°41.47
6	15°13.53	225°14.15	N13°53.54	311°5.27	N21°4.96	251°22.26	N20°15.43	1°0.74	N03°27.77			Acrux	172°58.79 -63°15.10
7	30°15.99	240°13.94	52.48	326°5.88	5.30	266°24.16	15.31	16°3.13	27.79			Gacrux	171°50.32 -57°16.01
8	45°18.45	255°13.74	51.42	341°6.49	5.63	281°26.06	15.20	31°5.51	27.81			Alioth	166°11.89 55°49.19
9	60°20.92	270°13.53	· · 50.36	356°7.10	· · 5.97	296°27.96	· · 15.08	46°7.89	· · 27.83			Spica	158°20.95 -11°18.06
10	75°23.38	285°13.33	49.30	11°7.71	6.30	311°29.86	14.96	61°10.28	27.85			Alkaid	152°50.91 49°11.06
11	90°25.85	300°13.12	48.23	26°8.32	6.63	326°31.75	14.84	76°12.66	27.87			Hadar	148°34.02 -60°30.34
12	105°28.31	315°12.92	N13°47.17	41°8.93	N21°6.97	341°33.65	N20°14.72	91°15.05	N03°27.89			Menkent	147°56.02 -36°30.22
13	120°30.77	330°12.72	46.10	56°9.54	7.30	356°35.55	14.61	106°17.43	27.92			Arcturus	145°46.65 19°2.74
14	135°33.24	345°12.52	45.04	71°10.15	7.63	11°37.45	14.49	121°19.81	27.94			Rigil Kent.	139°38.29 -60°56.97
15	150°35.70	0°12.32	· · 43.97	86°10.76	· · 7.97	26°39.35	· · 14.37	136°22.20	· · 27.96			Kochab	137°19.25 74°2.99
16	165°38.17	15°12.12	42.91	101°11.37	8.30	41°41.25	14.25	151°24.58	27.98			Zuben'ubi	136°54.47 -16°9.20
17	180°40.63	30°11.92	41.84	116°11.98	8.63	56°43.15	14.13	166°26.97	28.00			Alphecca	126°2.45 26°37.62
18	195°43.09	45°11.72	N13°40.78	131°12.59	N21°8.96	71°45.05	N20°14.02	181°29.35	N03°28.02			Antares	112°14.00 -26°29.51
19	210°45.56	60°11.53	39.71	146°13.21	9.29	86°46.95	13.90	196°31.74	28.04			Atria	107°6.59 -69°4.62
20	225°48.02	75°11.33	38.64	161°13.82	9.63	101°48.84	13.78	211°34.13	28.06			Sabik	102°1.04 -15°45.47
21	240°50.49	90°11.13	· · 37.57	176°14.43	· · 9.96	116°50.74	· · 13.66	226°36.51	· · 28.08			Shaula	96°8.28 -37°7.40
22	255°52.95	105°10.94	36.50	191°15.04	10.29	131°52.64	13.54	241°38.90	28.10			Rasalhague	95°57.07 12°32.49
23	270°55.41	120°10.74	35.43	206°15.65	10.62	146°54.54	13.43	256°41.28	28.12			Eltanin	90°41.08 51°29.16
Mer.pass. 04:59		ν-0.2' d-1.1' m-4.08		ν0.6' d0.3' m1.30		ν1.9' d-0.1' m-1.80		ν2.4' d0.0' m0.75					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	285°57.88	135°10.55	N13°34.36	221°16.26	N21°10.95	161°56.44	N20°13.31	271°43.67	N03°28.14			Kaus Aust.	83°30.46 -34°22.28
1	301°0.34	150°10.36	33.29	236°16.87	11.27	176°58.34	13.19	286°46.06	28.16			Vega	80°31.95 38°48.51
2	316°2.81	165°10.16	32.22	251°17.48	11.60	192°0.24	13.07	301°48.44	28.18			Nunki	75°45.85 -26°15.76
3	331°5.27	180°9.97	· · 31.15	266°18.09	· · 11.93	207°2.14	· · 12.95	316°50.83	· · 28.20			Altair	61°58.42 8°56.34
4	346°7.74	195°9.78	30.08	281°18.70	12.26	222°4.03	12.83	331°53.22	28.22			Peacock	53°3.22 -56°38.80
5	1°10.20	210°9.59	29.01	296°19.31	12.59	237°5.93	12.72	346°55.60	28.24			Deneb	49°24.53 45°22.42
6	16°12.66	225°9.40	N13°27.93	311°19.92	N21°12.91	252°7.83	N20°12.60	1°57.99	N03°28.26			Enif	33°37.33 9°59.83
7	31°15.13	240°9.21	26.86	326°20.53	13.24	267°9.73	12.48	17°0.38	28.28			Al Na'ir	27°31.04 -46°49.69
8	46°17.59	255°9.02	25.79	341°21.14	13.57	282°11.63	12.36	32°2.76	28.30			Fomalhaut	15°12.96 -29°28.68
9	61°20.06	270°8.83	· · 24.71	356°21.75	· · 13.89	297°13.53	· · 12.24	47°5.15	· · 2				

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		178°49.42	N22°42.33	292°13.68	15.0'	S01°31.70	-15.2' 56.5'
1		193°49.31	42.08	306°47.64	14.9'	01°16.55	-15.2' 56.5'
2		208°49.21	41.83	321°21.58	14.9'	01°1.37	-15.2' 56.6'
3		223°49.10	· · 41.58	335°55.50	14.9'	00°46.18	-15.2' 56.6'
4		238°49.00	41.33	350°29.40	14.9'	00°30.97	-15.2' 56.6'
5		253°48.89	41.08	5°3.27	14.8'	00°15.74	-15.2' 56.7'
6		268°48.79	N22°40.83	19°37.12	14.8'	S00°0.50	-15.3' 56.7'
7		283°48.68	40.58	34°10.93	14.8'	N00°14.76	15.3' 56.7'
8		298°48.58	40.32	48°44.72	14.8'	00°30.03	15.3' 56.7'
9		313°48.48	· · 40.07	63°18.48	14.7'	00°45.32	15.3' 56.8'
10		328°48.37	39.81	77°52.20	14.7'	01°0.62	15.3' 56.8'
11		343°48.27	39.56	92°25.89	14.7'	01°15.93	15.3' 56.8'
12		358°48.16	N22°39.30	106°59.55	14.6'	N01°31.24	15.3' 56.9'
13		13°48.06	39.05	121°33.17	14.6'	01°46.57	15.3' 56.9'
14		28°47.96	38.79	136°6.76	14.5'	02°1.91	15.3' 56.9'
15		43°47.85	· · 38.53	150°40.30	14.5'	02°17.25	15.3' 56.9'
16		58°47.75	38.27	165°13.81	14.5'	02°32.60	15.4' 57.0'
17		73°47.65	38.01	179°47.28	14.4'	02°47.96	15.4' 57.0'
18		88°47.54	N22°37.75	194°20.70	14.4'	N03°3.31	15.4' 57.0'
19		103°47.44	37.49	208°54.08	14.3'	03°18.67	15.4' 57.1'
20		118°47.34	37.23	223°27.41	14.3'	03°34.04	15.4' 57.1'
21		133°47.24	· · 36.97	238°0.70	14.2'	03°49.40	15.4' 57.1'
22		148°47.13	36.71	252°33.94	14.2'	04°4.76	15.4' 57.2'
23		163°47.03	36.44	267°7.12	14.1'	04°20.13	15.4' 57.2'
		SD = 15.7' d = -0.2'		SD = 15.4'			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		178°46.93	N22°36.18	281°40.26	14.1'	N04°35.49	15.4' 57.2'
1		193°46.83	35.91	296°13.35	14.0'	04°50.84	15.4' 57.3'
2		208°46.73	35.65	310°46.38	14.0'	05°6.19	15.3' 57.3'
3		223°46.62	· · 35.38	325°19.36	13.9'	05°21.54	15.3' 57.3'
4		238°46.52	35.12	339°52.28	13.9'	05°36.88	15.3' 57.3'
5		253°46.42	34.85	354°25.14	13.8'	05°52.21	15.3' 57.4'
6		268°46.32	N22°34.58	8°57.94	13.7'	N06°7.53	15.3' 57.4'
7		283°46.22	34.31	23°30.69	13.7'	06°22.84	15.3' 57.4'
8		298°46.12	34.04	38°3.37	13.6'	06°38.14	15.3' 57.5'
9		313°46.02	· · 33.77	52°35.98	13.6'	06°53.42	15.3' 57.5'
10		328°45.92	33.50	67°8.54	13.5'	07°8.70	15.3' 57.5'
11		343°45.82	33.23	81°41.02	13.4'	07°23.95	15.2' 57.6'
12		358°45.72	N22°32.96	96°13.44	13.3'	N07°39.19	15.2' 57.6'
13		13°45.62	32.68	110°45.79	13.3'	07°54.42	15.2' 57.6'
14		28°45.52	32.41	125°18.06	13.2'	08°9.62	15.2' 57.7'
15		43°45.42	· · 32.14	139°50.27	13.1'	08°24.80	15.2' 57.7'
16		58°45.32	31.86	154°22.40	13.1'	08°39.96	15.1' 57.7'
17		73°45.22	31.59	168°54.46	13.0'	08°55.10	15.1' 57.8'
18		88°45.12	N22°31.31	183°26.44	12.9'	N09°10.22	15.1' 57.8'
19		103°45.02	31.03	197°58.34	12.8'	09°25.30	15.1' 57.8'
20		118°44.92	30.76	212°30.16	12.7'	09°40.37	15.0' 57.9'
21		133°44.82	· · 30.48	227°1.91	12.7'	09°55.40	15.0' 57.9'
22		148°44.72	30.20	241°33.57	12.6'	10°10.40	15.0' 57.9'
23		163°44.63	29.92	256°5.14	12.5'	10°25.38	14.9' 58.0'
		SD = 15.7' d = -0.3'		SD = 15.6'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		178°44.53	N22°29.64	270°36.63	12.4'	N10°40.32	14.9' 58.0'
1		193°44.43	29.36	285°8.04	12.3'	10°55.23	14.9' 58.0'
2		208°44.33	29.08	299°39.36	12.2'	11°10.10	14.8' 58.1'
3		223°44.23	· · 28.79	314°10.59	12.1'	11°24.93	14.8' 58.1'
4		238°44.14	28.51	328°41.72	12.0'	11°39.73	14.8' 58.1'
5		253°44.04	28.23	343°12.77	12.0'	11°54.49	14.7' 58.2'
6		268°43.94	N22°27.94	357°43.72	11.9'	N12°9.20	14.7' 58.2'
7		283°43.85	27.66	12°14.58	11.8'	12°23.88	14.6' 58.2'
8		298°43.75	27.37	26°45.34	11.7'	12°38.51	14.6' 58.3'
9		313°43.65	· · 27.08	41°16.00	11.6'	12°53.09	14.5' 58.3'
10		328°43.56	26.80	55°46.57	11.5'	13°7.63	14.5' 58.3'
11		343°43.46	26.51	70°17.03	11.4'	13°22.12	14.4' 58.4'
12		358°43.36	N22°26.22	84°47.40	11.3'	N13°36.55	14.4' 58.4'
13		13°43.27	25.93	99°17.66	11.2'	13°50.94	14.3' 58.4'
14		28°43.17	25.64	113°47.81	11.1'	14°5.27	14.3' 58.5'
15		43°43.07	· · 25.35	128°17.87	10.9'	14°19.55	14.2' 58.5'
16		58°42.98	25.06	142°47.81	10.8'	14°33.77	14.2' 58.5'
17		73°42.88	24.77	157°17.65	10.7'	14°47.93	14.1' 58.6'
18		88°42.79	N22°24.48	171°47.37	10.6'	N15°2.03	14.0' 58.6'
19		103°42.69	24.18	186°16.99	10.5'	15°16.07	14.0' 58.6'
20		118°42.60	23.89	200°46.50	10.4'	15°30.04	13.9' 58.7'
21		133°42.50	· · 23.59	215°15.89	10.3'	15°43.95	13.8' 58.7'
22		148°42.41	23.30	229°45.17	10.2'	15°57.80	13.8' 58.7'
23		163°42.31	23.00	244°14.33	10.0'	16°11.57	13.7' 58.8'
		SD = 15.7' d = -0.3'		SD = 15.8'			

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

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

Day	Sun		Mer. Pass	Moon		Age 21-23 69-48%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
06	04:42	04:47	12:05	04:39	17:01	
07	04:52	04:57	12:05	05:23	17:46	
08	05:02	05:07	12:05	06:09	18:34	

July 09, 10, 11 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°57.02		135°6.10	N13°8.54	221°30.90	N21°18.75	162°42.00	N20°10.46	272°40.99	N03°28.60
1	301°59.48		150°5.92	7.45	236°31.51	19.07	177°43.90	10.34	287°43.38	28.62
2	317°1.95		165°5.74	6.37	251°32.12	19.39	192°45.80	10.22	302°45.77	28.64
3	332°4.41		180°5.57	•• 5.29	266°32.73	•• 19.71	207°47.69	•• 10.10	317°48.16	•• 28.66
4	347°6.87		195°5.39	4.20	281°33.34	20.03	222°49.59	9.98	332°50.55	28.67
5	2°9.34		210°5.22	3.12	296°33.95	20.35	237°51.49	9.86	347°52.94	28.69
6	17°11.80		225°5.04	N13°2.03	311°34.56	N21°20.66	252°53.39	N20°9.74	2°55.33	N03°28.71
7	32°14.27		240°4.87	13°0.95	326°35.17	20.98	267°55.28	9.62	17°57.72	28.73
8	47°16.73		255°4.70	12°59.86	341°35.78	21.30	282°57.18	9.50	33°0.11	28.75
9	62°19.19		270°4.53	•• 58.78	356°36.39	•• 21.62	297°59.08	•• 9.38	48°2.50	•• 28.76
10	77°21.66		285°4.36	57.69	11°37.00	21.94	313°0.98	9.26	63°4.89	28.78
11	92°24.12		300°4.19	56.60	26°37.61	22.25	328°2.88	9.14	78°7.29	28.80
12	107°26.59		315°4.02	N12°55.52	41°38.22	N21°22.57	343°4.77	N20°9.03	93°9.68	N03°28.82
13	122°29.05		330°3.85	54.43	56°38.83	22.89	358°6.67	8.91	108°12.07	28.84
14	137°31.52		345°3.68	53.34	71°39.44	23.20	13°8.57	8.79	123°14.46	28.85
15	152°33.98		0°3.51	•• 52.25	86°40.05	•• 23.52	28°10.47	•• 8.67	138°16.85	•• 28.87
16	167°36.44		15°3.34	51.16	101°40.66	23.83	43°12.36	8.55	153°19.25	28.89
17	182°38.91		30°3.18	50.07	116°41.27	24.15	58°14.26	8.43	168°21.64	28.91
18	197°41.37		45°3.01	N12°48.98	131°41.88	N21°24.46	73°16.16	N20°8.31	183°24.03	N03°28.92
19	212°43.84		60°2.85	47.89	146°42.49	24.78	88°18.06	8.19	198°26.42	28.94
20	227°46.30		75°2.68	46.80	161°43.10	25.09	103°19.95	8.07	213°28.82	28.96
21	242°48.76		90°2.52	•• 45.71	176°43.71	•• 25.40	118°21.85	•• 7.95	228°31.21	•• 28.97
22	257°51.23		105°2.36	44.61	191°44.32	25.72	133°23.75	7.83	243°33.60	28.99
23	272°53.69		120°2.19	43.52	206°44.92	26.03	148°25.65	7.71	258°36.00	29.01
Mer.pass. 04:51		ν-0.2' d-1.1' m-4.10		ν0.6' d0.3' m1.30		ν1.9' d-0.1' m-1.80		ν2.4' d0.0' m0.74		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°56.16		135°2.03	N12°42.43	221°45.53	N21°26.34	163°27.54	N20°7.59	273°38.39	N03°29.02
1	302°58.62		150°1.87	41.33	236°46.14	26.65	178°29.44	7.47	288°40.79	29.04
2	318°1.09		165°1.71	40.24	251°46.75	26.97	193°31.34	7.35	303°43.18	29.06
3	333°3.55		180°1.55	•• 39.14	266°47.36	•• 27.28	208°33.23	•• 7.23	318°45.57	•• 29.07
4	348°6.01		195°1.39	38.05	281°47.97	27.59	223°35.13	7.11	333°47.97	29.09
5	3°8.48		210°1.23	36.95	296°48.58	27.90	238°37.03	6.99	348°50.36	29.11
6	18°10.94		225°1.08	N12°35.86	311°49.19	N21°28.21	253°38.93	N20°6.87	3°52.76	N03°29.12
7	33°13.41		240°0.92	34.76	326°49.80	28.52	268°40.82	6.75	18°55.15	29.14
8	48°15.87		255°0.76	33.66	341°50.41	28.83	283°42.72	6.62	33°57.55	29.16
9	63°18.33		270°0.61	•• 32.57	356°51.02	•• 29.14	298°44.62	•• 6.50	48°59.94	•• 29.17
10	78°20.80		285°0.45	31.47	11°51.63	29.45	313°46.51	6.38	64°2.34	29.19
11	93°23.26		300°0.30	30.37	26°52.24	29.76	328°48.41	6.26	79°4.73	29.21
12	108°25.73		315°0.14	N12°29.27	41°52.85	N21°30.06	343°50.31	N20°6.14	94°7.13	N03°29.22
13	123°28.19		329°59.99	28.17	56°53.46	30.37	358°52.21	6.02	109°9.53	29.24
14	138°30.66		344°59.84	27.07	71°54.07	30.68	13°54.10	5.90	124°11.92	29.25
15	153°33.12		359°59.69	•• 25.97	86°54.68	•• 30.99	28°56.00	•• 5.78	139°14.32	•• 29.27
16	168°35.58		14°59.54	24.87	101°55.29	31.29	43°57.90	5.66	154°16.71	29.28
17	183°38.05		29°59.39	23.77	116°55.90	31.60	58°59.79	5.54	169°19.11	29.30
18	198°40.51		44°59.24	N12°22.67	131°56.51	N21°31.91	74°1.69	N20°5.42	184°21.51	N03°29.32
19	213°42.98		59°59.09	21.57	146°57.11	32.21	89°3.59	5.30	199°23.90	29.33
20	228°45.44		74°58.94	20.46	161°57.72	32.52	104°5.48	5.18	214°26.30	29.35
21	243°47.90		89°58.79	•• 19.36	176°58.33	•• 32.82	119°7.38	•• 5.06	229°28.70	•• 29.36
22	258°50.37		104°58.64	18.26	191°58.94	33.13	134°9.28	4.94	244°31.09	29.38
23	273°52.83		119°58.50	17.15	206°59.55	33.43	149°11.17	4.81	259°33.49	29.39
Mer.pass. 04:47		ν-0.2' d-1.1' m-4.10		ν0.6' d0.3' m1.30		ν1.9' d-0.1' m-1.80		ν2.4' d0.0' m0.74		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°55.30		134°58.35	N12°16.05	222°0.16	N21°33.73	164°13.07	N20°4.69	274°35.89	N03°29.41
1	303°57.76		149°58.21	14.94	237°0.77	34.04	179°14.97	4.57	289°38.29	29.42
2	319°0.23		164°58.06	13.84	252°1.38	34.34	194°16.86	4.45	304°40.69	29.44
3	334°2.69		179°57.92	•• 12.73	267°1.99	•• 34.64	209°18.76	•• 4.33	319°43.08	•• 29.45
4	349°5.15		194°57.78	11.63	282°2.60	34.95	224°20.66	4.21	334°45.48	29.47
5	4°7.62		209°57.63	10.52	297°3.21	35.25	239°22.55	4.09	349°47.88	29.48
6	19°10.08		224°57.49	N12°9.41	312°3.82	N21°35.55	254°24.45	N20°3.97	4°50.28	N03°29.50
7	34°12.55		239°57.35	8.31	327°4.43	35.85	269°26.35	3.85	19°52.68	29.51
8	49°15.01		254°57.21	7.20	342°5.04	36.15	284°28.24	3.72	34°55.08	29.53
9	64°17.48		269°57.07	•• 6.09	357°5.65	•• 36.45	299°30.14	•• 3.60	49°57.47	•• 29.54
10	79°19.94		284°56.93	4.98	12°6.26	36.75	314°32.04	3.48	64°59.87	29.56
11	94°22.40		299°56.79	3.87	27°6.86	37.05	329°33.93	3.36	80°2.27	29.57
12	109°24.87		314°56.66	N12°2.76	42°7.47	N21°37.35	344°35.83	N20°3.24	95°4.67	N03°29.59
13	124°27.33		329°56.52	1.65	57°8.08	37.65	359°37.73	3.12	110°7.07	29.60
14	139°29.80		344°56.38	12°0.54	72°8.69	37.95	14°39.62	3.00	125°9.47	29.62
15	154°32.26		359°56.25	11°59.43	87°9.30	•• 38.25	29°41.52	•• 2.87	140°11.87	•• 29.63
16	169°34.73		14°56.11	58.32	102°9.91	38.55	44°43.42	2.75	155°14.27	29.64
17	184°37.19		29°55.98	57.21	117°10.52	38.84	59°45.31	2.63	170°16.67	29.66
18	199°39.65		44°55.84	N11°56.09	132°11.13	N21°39.14	74°47.21	N20°2.51	185°19.07	N03°29.67
19	214°42.12		59°55.71	54.98	147°11.74	39.44	89°49.10	2.39	200°21.47	29.69
20	229°44.58		74°55.58	53.87	162°12.35	39.74	104°51.00	2.27	215°23.87	29.70
21	244°47.05		89°55.44	•• 52.76	177°12.96	•• 40.03	119°52.90	•• 2.14	230°26.28	•• 29.71
22	259°49.51		104°55.31	51.64	192°13.57	40.33	134°54.79	2.02	245°28.68	29.73
23	274°51.97		119°55.18	50.53	207°14.18	40.62	149°56.69	1.90	260°31.08	29.74
Mer.pass. 04:44		ν-0.1' d-1.1' m-4.11		ν0.6' d0.3' m1.30		ν1.9' d-0.1' m-1.80		ν2.4' d0.0' m0.73		

Stars		
	SHA	Dec
Alpheratz	357°33.38	29°14.14
Ankaa	353°5.84	-42°9.40
Schedar	349°29.54	56°40.76
Diphda	348°46.02	-17°50.27
Achernar	335°19.35	-57°5.76
Hamal	327°49.88	23°35.22
Polaris	313°38.15	89°22.25
Acamar	315°11.04	-40°11.62
Menkar	314°5.01	4°11.68
Mirfak	308°26.75	49°57.15
Aldebaran	290°38.46	16°33.74
Rigel	281°2.97	-8°10.18
Capella	280°20.47	46°1.37
Bellatrix	278°21.85	6°22.45
Elnath	278°0.64	28°37.74
Alnilam	275°36.78	-1°11.05
Betelgeuse	270°51.06	7°24.74
Canopus	263°52.39	-52°42.47
Sirius	258°25.49	-16°45.10
Adhara	255°5.27	-29°0.44
Procyon	244°49.87	5°9.44
Pollux	243°16.16	27°57.75
Avior	234°14.86	-59°35.73
Suhail	222°45.80	-43°32.48
Miaplacidus	221°38.85	-69°49.71
Alphard	217°46.81	-8°46.44
Regulus	207°33.36	11°50.29
Dubhe	193°39.86	61°36.70
Denebola	182°23.80	14°25.49
Gienah	175°42.38	-17°41.46
Acrux	172°58.82	-63°15.09
Gacrux	171°50.34	-57°16.01
Alioth	166°11.91	55°49.19
Spica	158°20.96	-11°18.06
Alkaid	152°50.93	49°11.07
Hadar	148°34.04	-60°30.34
Menkent	147°56.03	-36°30.22
Arcturus	145°46.67	19°2.75
Rigel Kent.	139°38.31	-60°56.97
Kochab	137°19.30	74°3.00
Zuben'ubi	136°54.48	-16°9.20
Alphecca	126°2.46	26°37.63
Antares	112°14.01	-26°29.51
Atria	107°6.60	-6°4.63
Sabik	102°1.04	-15°45.46
Shaula	96°8.28	-37°7.40
Rasalhague	95°57.07	12°32.50
Eltanin	90°41.08	51°29.18
Kaus Aust.	83°30.46	-34°22.28
Vega	80°31.95	38°48.53
Nunki	75°45.84	-26°15.76
Altair	61°58.41	8°56.35
Peacock	53°3.20	-56°38.80
Deneb	49°24.51	45°22.44
Enif	33°37.31	9°59.84
Al Na'ir	27°31.02	-46°49.69
Fomalhaut	15°12.94	-29°28.67
Scheat	13°43.80	28°13.55
Markab	13°28.48	15°20.89
Jul 09 Thu	SHA	Mer.pass
Venus	208°9.08	15:00
Mars	294°33.88	09:14
Jupiter	235°44.98	13:08
Saturn	345°43.97	05:48
Jul 10 Fri	SHA	Mer.pass
Venus	207°5.88	15:00
Mars	293°49.38	09:13
Jupiter	235°31.39	13:05
Saturn	345°42.23	05:45
Jul 11 Sat	SHA	Mer.pass
Venus	206°3.05	15:00
Mars	293°4.86	09:12
Jupiter	235°17.77	13:01
Saturn	345°40.59	05:41
Horizontal parallax		
Venus:		0.2
Mars:		0.1

h		Sun		Moon			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		178°42.22	N22°22.71	258°43.38	9.9'	N16°25.27	13.6' 58.8'
1		193°42.13	22.41	273°12.31	9.8'	16°38.90	13.6' 58.8'
2		208°42.03	22.11	287°41.12	9.7'	16°52.46	13.5' 58.9'
3		223°41.94	· · 21.81	302°9.81	9.6'	17°5.94	13.4' 58.9'
4		238°41.84	21.51	316°38.38	9.4'	17°19.34	13.3' 58.9'
5		253°41.75	21.21	331°6.83	9.3'	17°32.66	13.2' 59.0'
6		268°41.66	N22°20.91	345°35.15	9.2'	N17°45.90	13.2' 59.0'
7		283°41.57	20.61	0°3.36	9.1'	17°59.06	13.1' 59.0'
8		298°41.47	20.31	14°31.43	9.0'	18°12.13	13.0' 59.1'
9		313°41.38	· · 20.01	28°59.39	8.8'	18°25.11	12.9' 59.1'
10		328°41.29	19.70	43°27.21	8.7'	18°38.01	12.8' 59.1'
11		343°41.19	19.40	57°54.91	8.6'	18°50.81	12.7' 59.2'
12		358°41.10	N22°19.09	72°22.48	8.4'	N19°3.52	12.6' 59.2'
13		13°41.01	18.79	86°49.92	8.3'	19°16.13	12.5' 59.2'
14		28°40.92	18.48	101°17.24	8.2'	19°28.65	12.4' 59.3'
15		43°40.83	· · 18.18	115°44.42	8.1'	19°41.06	12.3' 59.3'
16		58°40.74	17.87	130°11.47	7.9'	19°53.38	12.2' 59.3'
17		73°40.64	17.56	144°38.39	7.8'	20°5.59	12.1' 59.4'
18		88°40.55	N22°17.25	159°5.18	7.7'	N20°17.70	12.0' 59.4'
19		103°40.46	16.94	173°31.83	7.5'	20°29.69	11.9' 59.4'
20		118°40.37	16.63	187°58.35	7.4'	20°41.58	11.8' 59.4'
21		133°40.28	· · 16.32	202°24.74	7.3'	20°53.36	11.7' 59.5'
22		148°40.19	16.01	216°51.00	7.1'	21°5.02	11.5' 59.5'
23		163°40.10	15.70	231°17.12	7.0'	21°16.57	11.4' 59.5'
		SD = 15.7' $d = -0.3'$		SD = 16.0'			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		178°40.01	N22°15.39	245°43.11	6.9'	N21°28.00	11.3' 59.6'
1		193°39.92	15.07	260°8.96	6.7'	21°39.31	11.2' 59.6'
2		208°39.83	14.76	274°34.67	6.6'	21°50.50	11.1' 59.6'
3		223°39.74	· · 14.44	289°0.26	6.4'	22°1.56	10.9' 59.7'
4		238°39.65	14.13	303°25.70	6.3'	22°12.49	10.8' 59.7'
5		253°39.56	13.81	317°51.01	6.2'	22°23.30	10.7' 59.7'
6		268°39.47	N22°13.50	332°16.19	6.0'	N22°33.98	10.5' 59.7'
7		283°39.38	13.18	346°41.23	5.9'	22°44.52	10.4' 59.8'
8		298°39.29	12.86	1°6.14	5.8'	22°54.93	10.3' 59.8'
9		313°39.21	· · 12.54	15°30.91	5.6'	23°5.20	10.1' 59.8'
10		328°39.12	12.22	29°55.55	5.5'	23°15.33	10.0' 59.9'
11		343°39.03	11.90	44°20.05	5.4'	23°25.33	9.8' 59.9'
12		358°38.94	N22°11.58	58°44.42	5.2'	N23°35.17	9.7' 59.9'
13		13°38.85	11.26	73°8.66	5.1'	23°44.87	9.6' 59.9'
14		28°38.77	10.94	87°32.76	5.0'	23°54.43	9.4' 60.0'
15		43°38.68	· · 10.62	101°56.74	4.8'	24°3.83	9.3' 60.0'
16		58°38.59	10.29	116°20.58	4.7'	24°13.08	9.1' 60.0'
17		73°38.50	9.97	130°44.29	4.6'	24°22.18	8.9' 60.1'
18		88°38.42	N22°9.64	145°7.87	4.5'	N24°31.12	8.8' 60.1'
19		103°38.33	9.32	159°31.33	4.3'	24°39.90	8.6' 60.1'
20		118°38.24	8.99	173°54.65	4.2'	24°48.53	8.5' 60.1'
21		133°38.16	· · 8.67	188°17.85	4.1'	24°56.99	8.3' 60.2'
22		148°38.07	8.34	202°40.93	3.9'	25°5.28	8.1' 60.2'
23		163°37.99	8.01	217°3.88	3.8'	25°13.41	8.0' 60.2'
		SD = 15.7' $d = -0.3'$		SD = 16.2'			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		178°37.90	N22°7.68	231°26.70	3.7'	N25°21.37	7.8' 60.2'
1		193°37.81	7.35	245°49.41	3.6'	25°29.16	7.6' 60.3'
2		208°37.73	7.02	260°11.99	3.5'	25°36.78	7.4' 60.3'
3		223°37.64	· · 6.69	274°34.46	3.3'	25°44.22	7.3' 60.3'
4		238°37.56	6.36	288°56.81	3.2'	25°51.49	7.1' 60.3'
5		253°37.47	6.03	303°19.04	3.1'	25°58.57	6.9' 60.4'
6		268°37.39	N22°5.70	317°41.16	3.0'	N26°5.48	6.7' 60.4'
7		283°37.30	5.36	332°3.17	2.9'	26°12.21	6.5' 60.4'
8		298°37.22	5.03	346°25.07	2.8'	26°18.75	6.4' 60.4'
9		313°37.14	· · 4.69	0°46.86	2.7'	26°25.10	6.2' 60.4'
10		328°37.05	4.36	15°8.55	2.6'	26°31.27	6.0' 60.5'
11		343°36.97	4.02	29°30.13	2.5'	26°37.25	5.8' 60.5'
12		358°36.89	N22°3.69	43°51.61	2.4'	N26°43.04	5.6' 60.5'
13		13°36.80	3.35	58°12.99	2.3'	26°48.63	5.4' 60.5'
14		28°36.72	3.01	72°34.28	2.2'	26°54.03	5.2' 60.5'
15		43°36.64	· · 2.67	86°55.47	2.1'	26°59.24	5.0' 60.6'
16		58°36.55	2.33	101°16.57	2.0'	27°4.24	4.8' 60.6'
17		73°36.47	1.99	115°37.58	1.9'	27°9.05	4.6' 60.6'
18		88°36.39	N22°1.65	129°58.50	1.8'	N27°13.66	4.4' 60.6'
19		103°36.31	1.31	144°19.34	1.8'	27°18.07	4.2' 60.6'
20		118°36.22	0.97	158°40.10	1.7'	27°22.27	4.0' 60.7'
21		133°36.14	· · 0.63	173°0.78	1.6'	27°26.27	3.8' 60.7'
22		148°36.06	22°0.29	187°21.38	1.5'	27°30.06	3.6' 60.7'
23		163°35.98	21°59.94	201°41.91	1.5'	27°33.65	3.4' 60.7'
		SD = 15.7' $d = -0.3'$		SD = 16.4'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 24-26 37-17%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss		hh:mm	hh:mm	
09	05:11	05:16	12:05	07:00	19:27	
10	05:20	05:24	12:05	07:55	20:25	
11	05:28	05:32	12:06	08:57	21:29	

July 12, 13, 14 UT (Sun., Mon., Tue.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	289°54.44	134°55.05	N11°49.41	222°14.79	N21°40.92	164°58.59	N20°1.78	275°33.48	N03°29.75			Alpheratz	357°33.35 29°14.16
1	304°56.90	149°54.92	48.30	237°15.40	41.21	180°0.48	1.66	290°35.88	29.77			Ankaa	353°5.81 -42°9.39
2	319°59.37	164°54.80	47.18	252°16.00	41.51	195°2.38	1.54	305°38.28	29.78			Schedar	349°29.49 56°40.77
3	335°1.83	179°54.67	· · 46.07	267°16.61	· · 41.80	210°4.27	· · 1.41	320°40.68	· · 29.79			Diphda	348°45.99 -17°50.26
4	350°4.30	194°54.54	44.95	282°17.22	42.10	225°6.17	1.29	335°43.09	29.81			Achernar	335°19.31 -57°5.75
5	5°6.76	209°54.41	43.83	297°17.83	42.39	240°8.07	1.17	350°45.49	29.82			Hamal	327°49.85 23°35.23
6	20°9.22	224°54.29	N11°42.71	312°18.44	N21°42.68	255°9.96	N20°1.05	5°47.89	N03°29.83			Polaris	313°36.34 89°22.24
7	35°11.69	239°54.16	41.60	327°19.05	42.98	270°11.86	0.93	20°50.29	29.85			Acamar	315°11.01 -40°11.61
8	50°14.15	254°54.04	40.48	342°19.66	43.27	285°13.75	0.80	35°52.70	29.86			Menkar	314°4.98 4°11.69
9	65°16.62	269°53.91	· · 39.36	357°20.27	· · 43.56	300°15.65	· · 0.68	50°55.10	· · 29.87			Mirfak	308°26.71 49°57.15
10	80°19.08	284°53.79	38.24	12°20.88	43.85	315°17.55	0.56	65°57.50	29.89			Aldebaran	290°38.44 16°33.75
11	95°21.55	299°53.67	37.12	27°21.49	44.14	330°19.44	0.44	80°59.91	29.90			Rigel	281°2.95 -8°10.17
12	110°24.01	314°53.55	N11°36.00	42°22.10	N21°44.43	345°21.34	N20°0.31	96°2.31	N03°29.91			Capella	280°20.44 46°1.37
13	125°26.47	329°53.42	34.88	57°22.71	44.73	0°23.23	0.19	111°4.71	29.93			Bellatrix	278°21.83 6°22.45
14	140°28.94	344°53.30	33.76	72°23.32	45.02	15°25.13	20°0.07	126°7.12	29.94			Elnath	278°0.61 28°37.74
15	155°31.40	359°53.18	· · 32.64	87°23.92	· · 45.31	30°27.03	19°59.95	141°9.52	· · 29.95			Alnilam	275°36.75 -1°11.04
16	170°33.87	14°53.06	31.52	102°24.53	45.60	45°28.92	59.82	156°11.92	29.96			Betelgeuse	270°51.04 7°24.75
17	185°36.33	29°52.94	30.40	117°25.14	45.88	60°30.82	59.70	171°14.33	29.98			Canopus	263°52.38 -52°42.46
18	200°38.80	44°52.83	N11°29.27	132°25.75	N21°46.17	75°32.71	N19°59.58	186°16.73	N03°29.99			Sirius	258°25.47 -16°45.09
19	215°41.26	59°52.71	28.15	147°26.36	46.46	90°34.61	59.46	201°19.14	30.00			Adhara	255°5.26 -29°0.43
20	230°43.72	74°52.59	27.03	162°26.97	46.75	105°36.50	59.33	216°21.54	30.01			Procyon	244°49.85 5°9.44
21	245°46.19	89°52.48	· · 25.90	177°27.58	· · 47.04	120°38.40	· · 59.21	231°23.95	· · 30.02			Pollux	243°16.15 27°57.74
22	260°48.65	104°52.36	24.78	192°28.19	47.32	135°40.30	59.09	246°26.35	30.04			Avior	234°14.86 -59°35.72
23	275°51.12	119°52.25	23.65	207°28.80	47.61	150°42.19	58.97	261°28.76	30.05			Suhail	222°45.80 -43°32.47
Mer.pass. 04:40		ν-0.1' d-1.1' m-4.11		ν0.6' d0.3' m1.31		ν1.9' d-0.1' m-1.80		ν2.4' d0.0' m0.73					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	290°53.58	134°52.13	N11°22.53	222°29.41	N21°47.90	165°44.09	N19°58.84	276°31.16	N03°30.06				
1	305°56.05	149°52.02	21.40	237°30.02	48.18	180°45.98	58.72	291°33.57	30.07				
2	320°58.51	164°51.90	20.28	252°30.63	48.47	195°47.88	58.60	306°35.97	30.08				
3	336°0.97	179°51.79	· · 19.15	267°31.24	· · 48.76	210°49.77	· · 58.48	321°38.38	· · 30.10				
4	351°3.44	194°51.68	18.03	282°31.85	49.04	225°51.67	58.35	336°40.78	30.11				
5	6°5.90	209°51.57	16.90	297°32.46	49.33	240°53.57	58.23	351°43.19	30.12				
6	21°8.37	224°51.46	N11°15.77	312°33.06	N21°49.61	255°55.46	N19°58.11	6°45.60	N03°30.13				
7	36°10.83	239°51.35	14.64	327°33.67	49.90	270°57.36	57.98	21°48.00	30.14				
8	51°13.30	254°51.24	13.52	342°34.28	50.18	285°59.25	57.86	36°50.41	30.15				
9	66°15.76	269°51.13	· · 12.39	357°34.89	· · 50.46	301°1.15	· · 57.74	51°52.82	· · 30.17				
10	81°18.22	284°51.02	11.26	12°35.50	50.75	316°3.04	57.62	66°55.22	30.18				
11	96°20.69	299°50.92	10.13	27°36.11	51.03	331°4.94	57.49	81°57.63	30.19				
12	111°23.15	314°50.81	N11°9.00	42°36.72	N21°51.31	346°6.83	N19°57.37	97°0.04	N03°30.20				
13	126°25.62	329°50.70	7.87	57°37.33	51.59	1°8.73	57.25	112°2.45	30.21				
14	141°28.08	344°50.60	6.74	72°37.94	51.87	16°10.62	57.12	127°4.85	30.22				
15	156°30.54	359°50.50	· · 5.61	87°38.55	· · 52.16	31°12.52	· · 57.00	142°7.26	· · 30.23				
16	171°33.01	14°50.39	4.48	102°39.16	52.44	46°14.42	56.88	157°9.67	30.24				
17	186°35.47	29°50.29	3.35	117°39.77	52.72	61°16.31	56.75	172°12.08	30.25				
18	201°37.94	44°50.19	N11°2.21	132°40.38	N21°53.00	76°18.21	N19°56.63	187°14.48	N03°30.26				
19	216°40.40	59°50.08	11°1.08	147°40.99	53.28	91°20.10	56.51	202°16.89	30.28				
20	231°42.87	74°49.98	10°59.95	162°41.60	53.56	106°22.00	56.38	217°19.30	30.29				
21	246°45.33	89°49.88	· · 58.81	177°42.21	· · 53.84	121°23.89	· · 56.26	232°21.71	· · 30.30				
22	261°47.79	104°49.78	57.68	192°42.81	54.11	136°25.79	56.14	247°24.12	30.31				
23	276°50.26	119°49.68	56.55	207°43.42	54.39	151°27.68	56.01	262°26.53	30.32				
Mer.pass. 04:36		ν-0.1' d-1.1' m-4.12		ν0.6' d0.3' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d0.0' m0.72					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	291°52.72	134°49.58	N10°55.41	222°44.03	N21°54.67	166°29.58	N19°55.89	277°28.94	N03°30.33				
1	306°55.19	149°49.49	54.28	237°44.64	54.95	181°31.47	55.77	292°31.35	30.34				
2	321°57.65	164°49.39	53.14	252°45.25	55.23	196°33.37	55.64	307°33.76	30.35				
3	337°0.12	179°49.29	· · 52.01	267°45.86	· · 55.50	211°35.26	· · 55.52	322°36.17	· · 30.36				
4	352°2.58	194°49.20	50.87	282°46.47	55.78	226°37.16	55.39	337°38.58	30.37				
5	7°5.04	209°49.10	49.74	297°47.08	56.06	241°39.05	55.27	352°40.99	30.38				
6	22°7.51	224°49.00	N10°48.60	312°47.69	N21°56.33	256°40.95	N19°55.15	7°43.40	N03°30.39				
7	37°9.97	239°48.91	47.46	327°48.30	56.61	271°42.84	55.02	22°45.81	30.40				
8	52°12.44	254°48.82	46.32	342°48.91	56.88	286°44.74	54.90	37°48.22	30.41				
9	67°14.90	269°48.72	· · 45.19	357°49.52	· · 57.16	301°46.63	· · 54.78	52°50.63	· · 30.42				
10	82°17.37	284°48.63	44.05	12°50.13	57.43	316°48.53	54.65	67°53.04	30.43				
11	97°19.83	299°48.54	42.91	27°50.74	57.71	331°50.42	54.53	82°55.45	30.44				
12	112°22.29	314°48.45	N10°41.77	42°51.35	N21°57.98	346°52.32	N19°54.40	97°57.86	N03°30.45				
13	127°24.76	329°48.36	40.63	57°51.96	58.25	1°54.22	54.28	113°0.27	30.46				
14	142°27.22	344°48.27	39.49	72°52.57	58.53	16°56.11	54.16	128°2.68	30.47				
15	157°29.69	359°48.18	· · 38.35	87°53.18	· · 58.80	31°58.01	· · 54.03	143°5.09	· · 30.47				
16	172°32.15	14°48.09	37.21	102°53.79	59.07	46°59.90	53.91	158°7.51	30.48				
17	187												

h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.90	N21°59.60	216°2.38	1.4'	N27°37.02	3.2'	60.7'
1	193°35.82	59.25	230°22.77	1.3'	27°40.19	3.0'	60.7'
2	208°35.74	58.91	244°43.11	1.3'	27°43.15	2.7'	60.8'
3	223°35.66	· · 58.56	259°3.38	1.2'	27°45.89	2.5'	60.8'
4	238°35.57	58.21	273°23.60	1.2'	27°48.43	2.3'	60.8'
5	253°35.49	57.86	287°43.76	1.1'	27°50.74	2.1'	60.8'
6	268°35.41	N21°57.52	302°3.87	1.1'	N27°52.85	1.9'	60.8'
7	283°35.33	57.17	316°23.94	1.0'	27°54.74	1.7'	60.8'
8	298°35.25	56.82	330°43.96	1.0'	27°56.41	1.5'	60.8'
9	313°35.18	· · 56.47	345°3.94	0.9'	27°57.87	1.2'	60.8'
10	328°35.10	56.12	359°23.89	0.9'	27°59.11	1.0'	60.9'
11	343°35.02	55.76	13°43.81	0.9'	28°0.13	0.8'	60.9'
12	358°34.94	N21°55.41	28°3.69	0.9'	N28°0.94	0.6'	60.9'
13	13°34.86	55.06	42°23.55	0.8'	28°1.52	0.4'	60.9'
14	28°34.78	54.71	56°43.39	0.8'	28°1.89	0.1'	60.9'
15	43°34.70	· · 54.35	71°3.21	0.8'	28°2.03	-0.1'	60.9'
16	58°34.62	54.00	85°23.01	0.8'	28°1.96	-0.3'	60.9'
17	73°34.55	53.64	99°42.80	0.8'	28°1.67	-0.5'	60.9'
18	88°34.47	N21°53.28	114°2.59	0.8'	N28°1.15	-0.7'	60.9'
19	103°34.39	52.93	128°22.37	0.8'	28°0.42	-1.0'	60.9'
20	118°34.31	52.57	142°42.15	0.8'	27°59.46	-1.2'	60.9'
21	133°34.24	· · 52.21	157°1.93	0.8'	27°58.29	-1.4'	61.0'
22	148°34.16	51.85	171°21.72	0.8'	27°56.90	-1.6'	61.0'
23	163°34.08	51.49	185°41.52	0.8'	27°55.28	-1.8'	61.0'
SD = 15.7' $d = -0.3'$			SD = 16.6'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.01	N21°51.13	200°1.34	0.8'	N27°53.45	-2.1'	61.0'
1	193°33.93	50.77	214°21.17	0.9'	27°51.39	-2.3'	61.0'
2	208°33.85	50.41	228°41.03	0.9'	27°49.12	-2.5'	61.0'
3	223°33.78	· · 50.05	243°0.91	0.9'	27°46.63	-2.7'	61.0'
4	238°33.70	49.69	257°20.82	0.9'	27°43.92	-2.9'	61.0'
5	253°33.63	49.32	271°40.76	1.0'	27°41.00	-3.1'	61.0'
6	268°33.55	N21°48.96	286°0.73	1.0'	N27°37.86	-3.4'	61.0'
7	283°33.48	48.59	300°20.75	1.1'	27°34.50	-3.6'	61.0'
8	298°33.40	48.23	314°40.81	1.1'	27°30.92	-3.8'	61.0'
9	313°33.33	· · 47.86	329°0.91	1.2'	27°27.13	-4.0'	61.0'
10	328°33.25	47.50	343°21.07	1.2'	27°23.13	-4.2'	61.0'
11	343°33.18	47.13	357°41.27	1.3'	27°18.92	-4.4'	61.0'
12	358°33.11	N21°46.76	12°1.53	1.3'	N27°14.49	-4.6'	61.0'
13	13°33.03	46.39	26°21.85	1.4'	27°9.85	-4.8'	61.0'
14	28°32.96	46.02	40°42.24	1.4'	27°5.01	-5.1'	61.0'
15	43°32.88	· · 45.65	55°2.68	1.5'	26°59.95	-5.3'	61.0'
16	58°32.81	45.28	69°23.20	1.6'	26°54.69	-5.5'	61.0'
17	73°32.74	44.91	83°43.79	1.7'	26°49.22	-5.7'	61.0'
18	88°32.67	N21°44.54	98°4.45	1.7'	N26°43.55	-5.9'	61.0'
19	103°32.59	44.17	112°25.19	1.8'	26°37.67	-6.1'	61.0'
20	118°32.52	43.79	126°46.01	1.9'	26°31.60	-6.3'	60.9'
21	133°32.45	· · 43.42	141°6.91	2.0'	26°25.32	-6.5'	60.9'
22	148°32.38	43.05	155°27.90	2.1'	26°18.84	-6.7'	60.9'
23	163°32.30	42.67	169°48.97	2.2'	26°12.17	-6.9'	60.9'
SD = 15.7' $d = -0.4'$			SD = 16.6'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.23	N21°42.29	184°10.14	2.3'	N26°5.30	-7.1'	60.9'
1	193°32.16	41.92	198°31.39	2.4'	25°58.24	-7.3'	60.9'
2	208°32.09	41.54	212°52.75	2.5'	25°50.98	-7.4'	60.9'
3	223°32.02	· · 41.16	227°14.20	2.6'	25°43.53	-7.6'	60.9'
4	238°31.95	40.79	241°35.75	2.7'	25°35.90	-7.8'	60.9'
5	253°31.88	40.41	255°57.40	2.8'	25°28.08	-8.0'	60.9'
6	268°31.81	N21°40.03	270°19.16	2.9'	N25°20.07	-8.2'	60.9'
7	283°31.74	39.65	284°41.02	3.0'	25°11.88	-8.4'	60.8'
8	298°31.67	39.27	299°2.99	3.1'	25°3.51	-8.6'	60.8'
9	313°31.60	· · 38.88	313°25.07	3.2'	24°54.96	-8.7'	60.8'
10	328°31.53	38.50	327°47.26	3.3'	24°46.23	-8.9'	60.8'
11	343°31.46	38.12	342°9.57	3.4'	24°37.33	-9.1'	60.8'
12	358°31.39	N21°37.74	356°31.99	3.5'	N24°28.25	-9.2'	60.8'
13	13°31.32	37.35	10°54.53	3.7'	24°19.00	-9.4'	60.8'
14	28°31.25	36.97	25°17.18	3.8'	24°9.59	-9.6'	60.7'
15	43°31.19	· · 36.58	39°39.96	3.9'	24°0.00	-9.7'	60.7'
16	58°31.12	36.20	54°2.85	4.0'	23°50.26	-9.9'	60.7'
17	73°31.05	35.81	68°25.87	4.1'	23°40.34	-10.1'	60.7'
18	88°30.98	N21°35.42	82°49.01	4.3'	N23°30.27	-10.2'	60.7'
19	103°30.91	35.03	97°12.27	4.4'	23°20.04	-10.4'	60.7'
20	118°30.85	34.65	111°35.66	4.5'	23°9.66	-10.5'	60.6'
21	133°30.78	· · 34.26	125°59.18	4.6'	22°59.12	-10.7'	60.6'
22	148°30.71	33.87	140°22.82	4.8'	22°48.43	-10.8'	60.6'
23	163°30.65	33.48	154°46.59	4.9'	22°37.59	-11.0'	60.6'
SD = 15.7' $d = -0.4'$			SD = 16.6'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 27-0 9-0%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
12	05:36	05:40	12:06	10:03	22:36	
13	05:44	05:48	12:06	11:10	23:43	
14	05:51	05:54	12:06	12:14	—:—	

July 15, 16, 17 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°51.86		134°47.41	N10°28.07	222°58.66	N22°1.24	167°15.06	N19°52.91	278°26.81	N03°30.56
1	307°54.33		149°47.32	26.93	237°59.27	1.51	182°16.95	52.79	293°29.22	30.56
2	322°56.79		164°47.24	25.79	252°59.88	1.77	197°18.85	52.67	308°31.63	30.57
3	337°59.26		179°47.16	•• 24.64	268°0.49	•• 2.04	212°20.74	•• 52.54	323°34.05	•• 30.58
4	353°1.72		194°47.08	23.50	283°1.10	2.31	227°22.64	52.42	338°36.46	30.59
5	8°4.19		209°47.00	22.35	298°1.71	2.58	242°24.53	52.29	353°38.87	30.60
6	23°6.65		224°46.92	N10°21.21	313°2.32	N22°2.85	257°26.43	N19°52.17	8°41.29	N03°30.61
7	38°9.11		239°46.84	20.06	328°2.93	3.11	272°28.32	52.04	23°43.70	30.61
8	53°11.58		254°46.76	18.91	343°3.54	3.38	287°30.22	51.92	38°46.12	30.62
9	68°14.04		269°46.69	•• 17.77	358°4.15	•• 3.64	302°32.11	•• 51.79	53°48.53	•• 30.63
10	83°16.51		284°46.61	16.62	13°4.76	3.91	317°34.01	51.67	68°50.95	30.64
11	98°18.97		299°46.53	15.47	28°5.37	4.18	332°35.90	51.54	83°53.36	30.65
12	113°21.43		314°46.46	N10°14.32	43°5.98	N22°4.44	347°37.80	N19°51.42	98°55.78	N03°30.65
13	128°23.90		329°46.38	13.18	58°6.59	4.71	2°39.69	51.29	113°58.19	30.66
14	143°26.36		344°46.31	12.03	73°7.20	4.97	17°41.59	51.17	129°0.61	30.67
15	158°28.83		359°46.23	•• 10.88	88°7.81	•• 5.23	32°43.48	•• 51.05	144°3.02	•• 30.68
16	173°31.29		14°46.16	9.73	103°8.42	5.50	47°45.38	50.92	159°5.44	30.68
17	188°33.76		29°46.09	8.58	118°9.03	5.76	62°47.27	50.80	174°7.85	30.69
18	203°36.22		44°46.02	N10°7.43	133°9.64	N22°6.02	77°49.17	N19°50.67	189°10.27	N03°30.70
19	218°38.68		59°45.95	6.28	148°10.25	6.29	92°51.06	50.55	204°12.69	30.71
20	233°41.15		74°45.88	5.13	163°10.86	6.55	107°52.96	50.42	219°15.10	30.71
21	248°43.61		89°45.81	•• 3.98	178°11.47	•• 6.81	122°54.85	•• 50.30	234°17.52	•• 30.72
22	263°46.08		104°45.74	2.83	193°12.08	7.07	137°56.74	50.17	249°19.94	30.73
23	278°48.54		119°45.67	1.68	208°12.69	7.33	152°58.64	50.05	264°22.35	30.74
Mer.pass. 04:28		ν-0.1' d-1.1' m-4.13		ν0.6' d0.3' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d0.0' m0.71		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	293°51.00		134°45.60	N10°0.52	223°13.30	N22°7.59	168°0.53	N19°49.92	279°24.77	N03°30.74
1	308°53.47		149°45.53	09°59.37	238°13.91	7.85	183°2.43	49.80	294°27.19	30.75
2	323°55.93		164°45.47	58.22	253°14.52	8.11	198°4.32	49.67	309°29.60	30.76
3	338°58.40		179°45.40	•• 57.07	268°15.13	•• 8.37	213°6.22	•• 49.54	324°32.02	•• 30.76
4	354°0.86		194°45.33	55.91	283°15.74	8.63	228°8.11	49.42	339°34.44	30.77
5	9°3.33		209°45.27	54.76	298°16.35	8.89	243°10.01	49.29	354°36.86	30.78
6	24°5.79		224°45.21	N09°53.61	313°16.96	N22°9.15	258°11.90	N19°49.17	9°39.27	N03°30.78
7	39°8.25		239°45.14	52.45	328°17.57	9.41	273°13.80	49.04	24°41.69	30.79
8	54°10.72		254°45.08	51.30	343°18.18	9.67	288°15.69	48.92	39°44.11	30.80
9	69°13.18		269°45.02	•• 50.14	358°18.79	•• 9.92	303°17.58	•• 48.79	54°46.53	•• 30.80
10	84°15.65		284°44.96	48.99	13°19.40	10.18	318°19.48	48.67	69°48.95	30.81
11	99°18.11		299°44.89	47.83	28°20.01	10.44	333°21.37	48.54	84°51.37	30.82
12	114°20.57		314°44.83	N09°46.67	43°20.62	N22°10.69	348°23.27	N19°48.42	99°53.79	N03°30.82
13	129°23.04		329°44.77	45.52	58°21.23	10.95	3°25.16	48.29	114°56.20	30.83
14	144°25.50		344°44.72	44.36	73°21.85	11.21	18°27.06	48.16	129°58.62	30.83
15	159°27.97		359°44.66	•• 43.20	88°22.46	•• 11.46	33°28.95	•• 48.04	145°1.04	•• 30.84
16	174°30.43		14°44.60	42.05	103°23.07	11.72	48°30.85	47.91	160°3.46	30.85
17	189°32.89		29°44.54	40.89	118°23.68	11.97	63°32.74	47.79	175°5.88	30.85
18	204°35.36		44°44.49	N09°39.73	133°24.29	N22°12.22	78°34.64	N19°47.66	190°8.30	N03°30.86
19	219°37.82		59°44.43	38.57	148°24.90	12.48	93°36.53	47.54	205°10.72	30.86
20	234°40.29		74°44.37	37.41	163°25.51	12.73	108°38.42	47.41	220°13.14	30.87
21	249°42.75		89°44.32	•• 36.26	178°26.12	•• 12.99	123°40.32	•• 47.28	235°15.56	•• 30.87
22	264°45.22		104°44.27	35.10	193°26.73	13.24	138°42.21	47.16	250°17.98	30.88
23	279°47.68		119°44.21	33.94	208°27.34	13.49	153°44.11	47.03	265°20.40	30.88
Mer.pass. 04:24		ν-0.1' d-1.2' m-4.14		ν0.6' d0.3' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d0.0' m0.71		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	294°50.14		134°44.16	N09°32.78	223°27.95	N22°13.74	168°46.00	N19°46.91	280°22.83	N03°30.89
1	309°52.61		149°44.11	31.62	238°28.56	13.99	183°47.90	46.78	295°25.25	30.90
2	324°55.07		164°44.06	30.46	253°29.17	14.25	198°49.79	46.65	310°27.67	30.90
3	339°57.54		179°44.01	•• 29.30	268°29.78	•• 14.50	213°51.68	•• 46.53	325°30.09	•• 30.91
4	355°0.00		194°43.95	28.13	283°30.39	14.75	228°53.58	46.40	340°32.51	30.91
5	10°2.46		209°43.91	26.97	298°31.00	15.00	243°55.47	46.28	355°34.93	30.92
6	25°4.93		224°43.86	N09°25.81	313°31.61	N22°15.25	258°57.37	N19°46.15	10°37.35	N03°30.92
7	40°7.39		239°43.81	24.65	328°32.23	15.50	273°59.26	46.02	25°39.78	30.93
8	55°9.86		254°43.76	23.49	343°32.84	15.75	289°1.16	45.90	40°42.20	30.93
9	70°12.32		269°43.71	•• 22.32	358°33.45	•• 15.99	304°3.05	•• 45.77	55°44.62	•• 30.93
10	85°14.78		284°43.67	21.16	13°34.06	16.24	319°4.94	45.65	70°47.04	30.94
11	100°17.25		299°43.62	20.00	28°34.67	16.49	334°6.84	45.52	85°49.47	30.94
12	115°19.71		314°43.58	N09°18.83	43°35.28	N22°16.74	349°8.73	N19°45.39	100°51.89	N03°30.95
13	130°22.18		329°43.53	17.67	58°35.89	16.99	4°10.63	45.27	115°54.31	30.95
14	145°24.64		344°43.49	16.50	73°36.50	17.23	19°12.52	45.14	130°56.74	30.96
15	160°27.11		359°43.44	•• 15.34	88°37.11	•• 17.48	34°14.42	•• 45.01	145°59.16	•• 30.96
16	175°29.57		14°43.40	14.17	103°37.72	17.73	49°16.31	44.89	161°1.58	30.97
17	190°32.03		29°43.36	13.01	118°38.33	17.97	64°18.20	44.76	176°4.01	30.97
18	205°34.50		44°43.32	N09°11.84	133°38.95	N22°18.22	79°20.10	N19°44.63	191°6.43	N03°30.97
19	220°36.96		59°43.28	10.68	148°39.56	18.46	94°21.99	44.51	206°8.85	30.98
20	235°39.43		74°43.24	9.51	163°40.17	18.71	109°23.89	44.38	221°11.28	30.98
21	250°41.89		89°43.20	•• 8.34	178°40.78	•• 18.95	124°25.78	•• 44.25	236°13.70	•• 30.99
22	265°44.35		104°43.16	7.18	193°41.39	19.20	139°27.68	44.13	251°16.13	30.99
23	280°46.82		119°43.12	6.01	208°42.00	19.44	154°29.57	44.00	266°18.55	30.99
Mer.pass. 04:20		ν-0.1' d-1.2' m-4.15		ν0.6' d0.3' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d0.0' m0.70		

Stars		
	SHA	Dec
Alpheratz	357°33.32	29°14.17
Ankaa	353°5.78	-42°9.38
Schedar	349°29.45	56°40.79
Diphda	348°45.96	-17°50.25
Achernar	335°19.27	-57°5.74
Hamal	327°49.82	23°35.24
Polaris	313°34.78	89°22.24
Acamar	315°10.98	-40°11.60
Menkar	314°4.95	4°11.70
Mirfak	308°26.67	49°57.15
Aldebaran	290°38.41	16°33.75
Rigel	281°2.93	-8°10.16
Capella	280°20.41	46°1.36
Bellatrix	278°21.80	6°22.46
Elnath	278°0.59	28°37.74
Alnilam	275°36.73	-1°11.03
Betelgeuse	270°51.02	7°24.75
Canopus	263°52.36	-52°42.44
Sirius	258°25.46	-16°45.08
Adhara	255°5.25	-29°0.41
Procyon	244°49.84	5°9.44
Pollux	243°16.13	27°57.74
Avior	234°14.87	-59°35.70
Suhail	222°45.80	-43°32.46
Miaplacidus	221°38.89	-69°49.69
Alphard	217°46.80	-8°46.43
Regulus	207°33.35	11°50.29
Dubhe	193°39.88	61°36.68
Denebola	182°23.80	14°25.49
Gienah	175°42.38	-17°41.46
Acrux	172°58.86	-63°15.09
Gacrux	171°50.37	-57°16.01
Alioth	166°11.94	55°49.18
Spica	158°20.96	-11°18.06
Alkaid	152°50.96	49°11.07
Hadar	148°34.07	-60°30.35
Menkent	147°56.04	-36°30.22
Arcturus	145°46.67	19°2.75
Rigel Kent.	139°38.33	-60°56.98
Kochab	137°19.41	74°3.00
Zuben'ubi	136°54.48	-16°9.20
Alphecca	126°2.47	26°37.64
Antares	112°14.00	-26°29.51
Atria	107°6.61	-69°4.66
Sabik	102°1.03	-15°45.46
Shaula	96°8.27	-37°7.41
Rasalhague	95°57.06	12°32.51
Eltanin	90°41.09	51°29.21
Kaus Aust.	83°30.43	-34°22.29
Vega	80°31.94	38°48.56
Nunki	75°45.81	-26°15.76
Altair	61°58.38	8°56.38
Peacock	53°3.14	-56°38.81
Deneb	49°24.48	45°22.48
Enif	33°37.27	9°59.87
Al Na'ir	27°30.95	-46°49.69
Fomalhaut	15°12.88	-29°28.66
Scheat	13°43.74	28°13.58
Markab	13°28.43	15°20.92
Jul 15 Wed	SHA	Mer.pass
Venus	201°55.54	15:01
Mars	290°6.80	09:08
Jupiter	234°23.20	12:49
Saturn	345°34.94	05:25
Jul 16 Thu	SHA	Mer.pass
Venus	200°54.60	15:01
Mars	289°22.30	09:07
Jupiter	234°9.53	12:46
Saturn	345°33.76	05:21
Jul 17 Fri	SHA	Mer.pass
Venus	199°54.02	15:01
Mars	288°37.81	09:06
Jupiter	233°55.86	12:43
Saturn	345°32.68	05:18
Horizontal parallax		
	Venus:	0.2
	Mars:	0.1

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.58	N21°33.09	169°10.49	5.0'	N22°26.60	-11.1'	60.6'
1	193°30.51	32.69	183°34.52	5.2'	22°15.47	-11.3'	60.5'
2	208°30.45	32.30	197°58.68	5.3'	22°4.19	-11.4'	60.5'
3	223°30.38	· · 31.91	212°22.97	5.4'	21°52.78	-11.6'	60.5'
4	238°30.32	31.52	226°47.39	5.6'	21°41.23	-11.7'	60.5'
5	253°30.25	31.12	241°11.94	5.7'	21°29.54	-11.8'	60.5'
6	268°30.19	N21°30.73	255°36.62	5.8'	N21°17.72	-12.0'	60.4'
7	283°30.12	30.33	270°1.43	5.9'	21°5.77	-12.1'	60.4'
8	298°30.06	29.93	284°26.38	6.1'	20°53.69	-12.2'	60.4'
9	313°29.99	· · 29.54	298°51.46	6.2'	20°41.48	-12.3'	60.4'
10	328°29.93	29.14	313°16.67	6.3'	20°29.15	-12.5'	60.3'
11	343°29.87	28.74	327°42.01	6.5'	20°16.70	-12.6'	60.3'
12	358°29.80	N21°28.34	342°7.48	6.6'	N20°4.13	-12.7'	60.3'
13	13°29.74	27.94	356°33.09	6.7'	19°51.44	-12.8'	60.3'
14	28°29.67	27.54	10°58.82	6.9'	19°38.64	-12.9'	60.2'
15	43°29.61	· · 27.14	25°24.69	7.0'	19°25.72	-13.0'	60.2'
16	58°29.55	26.74	39°50.69	7.1'	19°12.70	-13.1'	60.2'
17	73°29.49	26.34	54°16.83	7.3'	18°59.57	-13.2'	60.1'
18	88°29.42	N21°25.94	68°43.09	7.4'	N18°46.33	-13.3'	60.1'
19	103°29.36	25.53	83°9.48	7.5'	18°32.99	-13.4'	60.1'
20	118°29.30	25.13	97°36.00	7.7'	18°19.55	-13.5'	60.1'
21	133°29.24	· · 24.73	112°2.65	7.8'	18°6.01	-13.6'	60.0'
22	148°29.18	24.32	126°29.43	7.9'	17°52.37	-13.7'	60.0'
23	163°29.12	23.92	140°56.34	8.0'	17°38.64	-13.8'	60.0'
SD = 15.7' $d = -0.4'$			SD = 16.5'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°29.05	N21°23.51	155°23.38	8.2'	N17°24.82	-13.9'	59.9'
1	193°28.99	23.10	169°50.54	8.3'	17°10.91	-14.0'	59.9'
2	208°28.93	22.70	184°17.83	8.4'	16°56.91	-14.1'	59.9'
3	223°28.87	· · 22.29	198°45.25	8.5'	16°42.82	-14.2'	59.9'
4	238°28.81	21.88	213°12.78	8.7'	16°28.66	-14.2'	59.8'
5	253°28.75	21.47	227°40.45	8.8'	16°14.41	-14.3'	59.8'
6	268°28.69	N21°21.06	242°8.23	8.9'	N16°0.09	-14.4'	59.8'
7	283°28.63	20.65	256°36.14	9.0'	15°45.68	-14.5'	59.7'
8	298°28.58	20.24	271°4.17	9.1'	15°31.21	-14.5'	59.7'
9	313°28.52	· · 19.82	285°32.32	9.3'	15°16.66	-14.6'	59.7'
10	328°28.46	19.41	300°0.59	9.4'	15°2.04	-14.7'	59.6'
11	343°28.40	19.00	314°28.97	9.5'	14°47.35	-14.8'	59.6'
12	358°28.34	N21°18.58	328°57.48	9.6'	N14°32.60	-14.8'	59.6'
13	13°28.28	18.17	343°26.10	9.7'	14°17.78	-14.9'	59.5'
14	28°28.23	17.76	357°54.83	9.8'	14°2.91	-14.9'	59.5'
15	43°28.17	· · 17.34	12°23.68	10.0'	13°47.97	-15.0'	59.5'
16	58°28.11	16.92	26°52.64	10.1'	13°32.97	-15.1'	59.4'
17	73°28.05	16.51	41°21.72	10.2'	13°17.92	-15.1'	59.4'
18	88°28.00	N21°16.09	55°50.90	10.3'	N13°2.81	-15.2'	59.4'
19	103°27.94	15.67	70°20.20	10.4'	12°47.66	-15.2'	59.3'
20	118°27.88	15.25	84°49.60	10.5'	12°32.45	-15.3'	59.3'
21	133°27.83	· · 14.83	99°19.11	10.6'	12°17.19	-15.3'	59.2'
22	148°27.77	14.41	113°48.72	10.7'	12°1.89	-15.3'	59.2'
23	163°27.72	13.99	128°18.44	10.8'	11°46.55	-15.4'	59.2'
SD = 15.7' $d = -0.4'$			SD = 16.3'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.66	N21°13.57	142°48.26	10.9'	N11°31.16	-15.4'	59.1'
1	193°27.60	13.15	157°18.19	11.0'	11°15.73	-15.5'	59.1'
2	208°27.55	12.73	171°48.21	11.1'	11°0.26	-15.5'	59.1'
3	223°27.50	· · 12.30	186°18.34	11.2'	10°44.76	-15.5'	59.0'
4	238°27.44	11.88	200°48.56	11.3'	10°29.22	-15.6'	59.0'
5	253°27.39	11.45	215°18.88	11.4'	10°13.64	-15.6'	59.0'
6	268°27.33	N21°11.03	229°49.29	11.5'	N09°58.04	-15.6'	58.9'
7	283°27.28	10.60	244°19.80	11.6'	09°42.40	-15.7'	58.9'
8	298°27.23	10.18	258°50.41	11.7'	09°26.74	-15.7'	58.8'
9	313°27.17	· · 9.75	273°21.10	11.8'	09°11.05	-15.7'	58.8'
10	328°27.12	9.32	287°51.88	11.9'	08°55.33	-15.7'	58.8'
11	343°27.07	8.89	302°22.75	12.0'	08°39.59	-15.8'	58.7'
12	358°27.01	N21°8.46	316°53.71	12.0'	N08°23.83	-15.8'	58.7'
13	13°26.96	8.04	331°24.76	12.1'	08°8.05	-15.8'	58.7'
14	28°26.91	7.61	345°55.89	12.2'	07°52.25	-15.8'	58.6'
15	43°26.86	· · 7.17	0°27.10	12.3'	07°36.43	-15.8'	58.6'
16	58°26.81	6.74	14°58.39	12.4'	07°20.60	-15.8'	58.5'
17	73°26.75	6.31	29°29.77	12.5'	07°4.76	-15.9'	58.5'
18	88°26.70	N21°5.88	44°1.22	12.5'	N06°48.90	-15.9'	58.5'
19	103°26.65	5.45	58°32.75	12.6'	06°33.03	-15.9'	58.4'
20	118°26.60	5.01	73°4.36	12.7'	06°17.15	-15.9'	58.4'
21	133°26.55	· · 4.58	87°36.04	12.8'	06°1.27	-15.9'	58.3'
22	148°26.50	4.14	102°7.79	12.8'	05°45.37	-15.9'	58.3'
23	163°26.45	3.71	116°39.62	12.9'	05°29.47	-15.9'	58.3'
SD = 15.7' $d = -0.4'$			SD = 16.1'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 1-3 1-9%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
15	05:58	06:01	12:06	13:14	00:45	
16	06:04	06:07	12:06	14:09	01:42	
17	06:09	06:12	12:06	14:58	02:34	

July 18, 19, 20 UT (Sat., Sun., Mon.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	295°49.28	134°43.08	N09°4.84	223°42.61	N22°19.68	169°31.46	N19°43.87	281°20.98	N03°31.00	Alpheratz	357°33.30 29°14.18
1	310°51.75	149°43.05	3.67	238°43.22	19.93	184°33.36	43.75	296°23.40	31.00	Ankaa	353°5.75 -42°9.38
2	325°54.21	164°43.01	2.51	253°43.83	20.17	199°35.25	43.62	311°25.83	31.00	Schedar	349°29.42 56°40.80
3	340°56.67	179°42.97	•• 1.34	268°44.45	•• 20.41	214°37.15	•• 43.49	326°28.25	•• 31.01	Diphda	348°45.93 -17°50.24
4	355°59.14	194°42.94	09°0.17	283°45.06	20.65	229°39.04	43.37	341°30.68	31.01	Achernar	335°19.24 -57°5.74
5	11°1.60	209°42.90	08°59.00	298°45.67	20.89	244°40.94	43.24	356°33.10	31.01	Hamal	327°49.80 23°35.25
6	26°4.07	224°42.87	N08°57.83	313°46.28	N22°21.13	259°42.83	N19°43.11	11°35.53	N03°31.02	Polaris	313°33.41 89°22.24
7	41°6.53	239°42.84	56.66	328°46.89	21.38	274°44.72	42.99	26°37.95	31.02	Acamar	315°10.95 -40°11.59
8	56°8.99	254°42.81	55.49	343°47.50	21.62	289°46.62	42.86	41°40.38	31.02	Menkar	314°4.93 4°11.71
9	71°11.46	269°42.77	•• 54.32	358°48.11	•• 21.86	304°48.51	•• 42.73	56°42.81	•• 31.03	Mirfak	308°26.65 49°57.15
10	86°13.92	284°42.74	53.15	13°48.73	22.10	319°50.41	42.60	71°45.23	31.03	Aldebaran	290°38.39 16°33.76
11	101°16.39	299°42.71	51.98	28°49.34	22.33	334°52.30	42.48	86°47.66	31.03	Rigel	281°2.91 -8°10.15
12	116°18.85	314°42.68	N08°50.81	43°49.95	N22°22.57	349°54.19	N19°42.35	101°50.09	N03°31.04	Capella	280°20.39 46°1.36
13	131°21.31	329°42.65	49.64	58°50.56	22.81	4°56.09	42.22	116°52.51	31.04	Bellatrix	278°21.79 6°22.47
14	146°23.78	344°42.62	48.47	73°51.17	23.05	19°57.98	42.10	131°54.94	31.04	Elnath	278°0.57 28°37.74
15	161°26.24	359°42.59	•• 47.29	88°51.78	•• 23.29	34°59.88	•• 41.97	146°57.37	•• 31.04	Alnilam	275°36.72 -1°11.02
16	176°28.71	14°42.57	46.12	103°52.39	23.53	50°1.77	41.84	161°59.80	31.05	Betelgeuse	270°51.01 7°24.76
17	191°31.17	29°42.54	44.95	118°53.01	23.76	65°3.67	41.71	177°2.22	31.05	Canopus	263°52.35 -52°42.42
18	206°33.63	44°42.51	N08°43.78	133°53.62	N22°24.00	80°5.56	N19°41.59	192°4.65	N03°31.05	Sirius	258°25.45 -16°45.07
19	221°36.10	59°42.49	42.60	148°54.23	24.24	95°7.45	41.46	207°7.08	31.05	Adhara	255°5.24 -29°0.40
20	236°38.56	74°42.46	41.43	163°54.84	24.47	110°9.35	41.33	222°9.51	31.06	Procyon	244°49.84 5°9.45
21	251°41.03	89°42.44	•• 40.26	178°55.45	•• 24.71	125°11.24	•• 41.20	237°11.94	•• 31.06	Pollux	243°16.13 27°57.74
22	266°43.49	104°42.41	39.08	193°56.06	24.94	140°13.14	41.08	252°14.36	31.06	Avior	234°14.87 -59°35.69
23	281°45.96	119°42.39	37.91	208°56.68	25.18	155°15.03	40.95	267°16.79	31.06	Suhail	222°45.80 -43°32.45
Mer.pass. 04:16		ν-0.0' d-1.2' m-4.16		ν0.6' d0.2' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d0.0' m0.70		Miaplacidus	221°38.91 -69°49.67
										Alphard	217°46.80 -8°46.43
										Regulus	207°33.36 11°50.29
										Dubhe	193°39.89 61°36.67
										Denebola	182°23.81 14°25.49
										Gienah	175°42.39 -17°41.46
										Acrux	172°58.89 -63°15.09
										Gacrux	171°50.39 -57°16.00
										Alioth	166°11.97 55°49.18
										Spica	158°20.97 -11°18.05
										Alkaid	152°50.98 49°11.07
										Hadar	148°34.10 -60°30.35
										Menkent	147°56.05 -36°30.22
										Arcturus	145°46.69 19°2.76
										Rigil Kent.	139°38.36 -60°56.99
										Kochab	137°19.46 74°3.00
										Zuben'ubi	136°54.49 -16°9.19
										Alphecca	126°2.48 26°37.65
										Antares	112°14.01 -26°29.51
										Atria	107°6.63 -69°4.67
										Sabik	102°1.04 -15°45.46
										Shaula	96°8.27 -37°7.42
										Rasalhague	95°57.07 12°32.52
										Eltanin	90°41.10 51°29.22
										Kaus Aust.	83°30.43 -34°22.30
										Vega	80°31.95 38°48.57
										Nunki	75°45.81 -26°15.76
										Altair	61°58.38 8°56.38
										Peacock	53°3.13 -56°38.82
										Deneb	49°24.48 45°22.49
										Enif	33°37.25 9°59.88
										Al Na'ir	27°30.93 -46°49.69
										Fomalhaut	15°12.86 -29°28.66
										Scheat	13°43.73 28°13.59
										Markab	13°28.41 15°20.93
										Jul 18 Sat	SHA Mer.pass
										Venus	198°53.80 15:01
										Mars	287°53.33 09:05
										Jupiter	233°42.18 12:40
										Saturn	345°31.69 05:14
										Jul 19 Sun	SHA Mer.pass
										Venus	197°53.95 15:01
										Mars	287°8.87 09:04
										Jupiter	233°28.50 12:37
										Saturn	345°30.80 05:10
										Jul 20 Mon	SHA Mer.pass
										Venus	196°54.46 15:01
										Mars	286°24.43 09:03
										Jupiter	233°14.82 12:40
										Saturn	345°30.00 05:06
										Horizontal parallax	
										Venus:	0.2
										Mars:	0.1
Mer.pass. 04:08		ν-0.0' d-1.2' m-4.17		ν0.6' d0.2' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d0.0' m0.69			



h	Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d HP
0	178°26.40	N21°3.27		131°11.52	13.0'	N05°13.57	-15.9' 58.2'
1	193°26.35	2.83		145°43.48	13.0'	04°57.67	-15.9' 58.2'
2	208°26.30	2.40		160°15.52	13.1'	04°41.76	-15.9' 58.1'
3	223°26.25	· · 1.96		174°47.62	13.2'	04°25.86	-15.9' 58.1'
4	238°26.20	1.52		189°19.78	13.2'	04°9.96	-15.9' 58.1'
5	253°26.16	1.08		203°52.01	13.3'	03°54.06	-15.9' 58.0'
6	268°26.11	N21°0.64		218°24.30	13.4'	N03°38.16	-15.9' 58.0'
7	283°26.06	21°0.20		232°56.65	13.4'	03°22.27	-15.9' 58.0'
8	298°26.01	20°59.76		247°29.06	13.5'	03°6.39	-15.9' 57.9'
9	313°25.96	· · 59.32		262°1.53	13.5'	02°50.52	-15.9' 57.9'
10	328°25.92	58.87		276°34.05	13.6'	02°34.65	-15.9' 57.8'
11	343°25.87	58.43		291°6.63	13.6'	02°18.80	-15.8' 57.8'
12	358°25.82	N20°57.99		305°39.26	13.7'	N02°2.96	-15.8' 57.8'
13	13°25.78	57.54		320°11.95	13.7'	01°47.13	-15.8' 57.7'
14	28°25.73	57.10		334°44.68	13.8'	01°31.31	-15.8' 57.7'
15	43°25.68	· · 56.65		349°17.47	13.8'	01°15.51	-15.8' 57.6'
16	58°25.64	56.21		3°50.30	13.9'	00°59.73	-15.8' 57.6'
17	73°25.59	55.76		18°23.18	13.9'	00°43.97	-15.7' 57.6'
18	88°25.55	N20°55.31		32°56.11	14.0'	N00°28.22	-15.7' 57.5'
19	103°25.50	54.86		47°29.08	14.0'	N00°12.49	-15.7' 57.5'
20	118°25.46	54.42		62°2.09	14.1'	S00°3.21	15.7' 57.4'
21	133°25.41	· · 53.97		76°35.14	14.1'	00°18.89	15.7' 57.4'
22	148°25.37	53.52		91°8.24	14.1'	00°34.55	15.6' 57.4'
23	163°25.32	53.07		105°41.37	14.2'	00°50.19	15.6' 57.3'
SD = 15.7'			$d = -0.4'$	SD = 15.9'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	178°25.28	N20°52.62		120°14.54	14.2'	S01°5.80	15.6' 57.3'
1	193°25.24	52.16		134°47.74	14.2'	01°21.38	15.6' 57.3'
2	208°25.19	51.71		149°20.98	14.3'	01°36.93	15.5' 57.2'
3	223°25.15	· · 51.26		163°54.26	14.3'	01°52.46	15.5' 57.2'
4	238°25.11	50.81		178°27.56	14.3'	02°7.96	15.5' 57.1'
5	253°25.06	50.35		193°0.90	14.4'	02°23.42	15.4' 57.1'
6	268°25.02	N20°49.90		207°34.26	14.4'	S02°38.86	15.4' 57.1'
7	283°24.98	49.44		222°7.66	14.4'	02°54.26	15.4' 57.0'
8	298°24.94	48.99		236°41.08	14.4'	03°9.63	15.3' 57.0'
9	313°24.90	· · 48.53		251°14.52	14.5'	03°24.97	15.3' 57.0'
10	328°24.85	48.07		265°47.99	14.5'	03°40.27	15.3' 56.9'
11	343°24.81	47.61		280°21.48	14.5'	03°55.53	15.2' 56.9'
12	358°24.77	N20°47.16		294°55.00	14.5'	S04°10.75	15.2' 56.8'
13	13°24.73	46.70		309°28.53	14.6'	04°25.94	15.1' 56.8'
14	28°24.69	46.24		324°2.09	14.6'	04°41.09	15.1' 56.8'
15	43°24.65	· · 45.78		338°35.66	14.6'	04°56.20	15.1' 56.7'
16	58°24.61	45.32		353°9.25	14.6'	05°11.27	15.0' 56.7'
17	73°24.57	44.86		7°42.85	14.6'	05°26.29	15.0' 56.7'
18	88°24.53	N20°44.39		22°16.47	14.6'	S05°41.28	14.9' 56.6'
19	103°24.49	43.93		36°50.10	14.6'	05°56.22	14.9' 56.6'
20	118°24.45	43.47		51°23.74	14.7'	06°11.11	14.9' 56.6'
21	133°24.42	· · 43.00		65°57.40	14.7'	06°25.96	14.8' 56.5'
22	148°24.38	42.54		80°31.06	14.7'	06°40.77	14.8' 56.5'
23	163°24.34	42.07		95°4.73	14.7'	06°55.53	14.7' 56.4'
SD = 15.7'			$d = -0.5'$	SD = 15.6'			

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	178°24.30	N20°41.61		109°38.41	14.7'	S07°10.23	14.7' 56.4'
1	193°24.26	41.14		124°12.09	14.7'	07°24.90	14.6' 56.4'
2	208°24.23	40.68		138°45.78	14.7'	07°39.51	14.6' 56.3'
3	223°24.19	· · 40.21		153°19.47	14.7'	07°54.07	14.5' 56.3'
4	238°24.15	39.74		167°53.17	14.7'	08°8.58	14.5' 56.3'
5	253°24.11	39.27		182°26.87	14.7'	08°23.04	14.4' 56.2'
6	268°24.08	N20°38.80		197°0.56	14.7'	S08°37.44	14.4' 56.2'
7	283°24.04	38.33		211°34.26	14.7'	08°51.80	14.3' 56.2'
8	298°24.01	37.86		226°7.95	14.7'	09°6.10	14.2' 56.1'
9	313°23.97	· · 37.39		240°41.64	14.7'	09°20.34	14.2' 56.1'
10	328°23.93	36.92		255°15.33	14.7'	09°34.53	14.1' 56.1'
11	343°23.90	36.45		269°49.01	14.7'	09°48.66	14.1' 56.0'
12	358°23.86	N20°35.98		284°22.68	14.7'	S10°2.73	14.0' 56.0'
13	13°23.83	35.50		298°56.35	14.7'	10°16.75	14.0' 56.0'
14	28°23.80	35.03		313°30.01	14.6'	10°30.71	13.9' 55.9'
15	43°23.76	· · 34.55		328°3.65	14.6'	10°44.60	13.8' 55.9'
16	58°23.73	34.08		342°37.29	14.6'	10°58.44	13.8' 55.9'
17	73°23.69	33.60		357°10.92	14.6'	11°12.22	13.7' 55.8'
18	88°23.66	N20°33.13		11°44.53	14.6'	S11°25.93	13.7' 55.8'
19	103°23.63	32.65		26°18.13	14.6'	11°39.58	13.6' 55.8'
20	118°23.59	32.17		40°51.72	14.6'	11°53.17	13.5' 55.8'
21	133°23.56	· · 31.69		55°25.29	14.6'	12°6.70	13.5' 55.7'
22	148°23.53	31.21		69°58.84	14.5'	12°20.16	13.4' 55.7'
23	163°23.50	30.74		84°32.38	14.5'	12°33.55	13.3' 55.7'
SD = 15.7'			$d = -0.5'$	SD = 15.4'			

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

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

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h	12 ^h	Pass	Upper	Lower		4-6
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm		17-36%
18	06:14	06:17	12:06	15:44	03:21		
19	06:19	06:21	12:06	16:28	04:06		
20	06:23	06:25	12:06	17:12	04:50		

July 21, 22, 23 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	298°46.69		134°42.02	N07°40.04	224°26.70	N22°36.25	171°47.84	N19°34.66	284°15.99	N03°31.08
1	313°49.16		149°42.02	38.85	239°27.31	36.46	186°49.73	34.53	299°18.43	31.08
2	328°51.62		164°42.03	37.66	254°27.92	36.68	201°51.63	34.40	314°20.87	31.08
3	343°54.09		179°42.04	•• 36.47	269°28.54	•• 36.90	216°53.52	•• 34.27	329°23.31	•• 31.08
4	358°56.55		194°42.05	35.28	284°29.15	37.11	231°55.41	34.15	344°25.74	31.08
5	13°59.02		209°42.06	34.10	299°29.76	37.33	246°57.31	34.02	359°28.18	31.07
6	29°1.48		224°42.07	N07°32.91	314°30.38	N22°37.54	261°59.20	N19°33.89	14°30.62	N03°31.07
7	44°3.94		239°42.08	31.72	329°30.99	37.76	277°1.10	33.76	29°33.06	31.07
8	59°6.41		254°42.10	30.53	344°31.60	37.97	292°2.99	33.63	44°35.49	31.07
9	74°8.87		269°42.11	•• 29.34	359°32.22	•• 38.19	307°4.88	•• 33.50	59°37.93	•• 31.07
10	89°11.34		284°42.12	28.15	14°32.83	38.40	322°6.78	33.37	74°40.37	31.07
11	104°13.80		299°42.14	26.96	29°33.45	38.61	337°8.67	33.24	89°42.81	31.06
12	119°16.26		314°42.15	N07°25.77	44°34.06	N22°38.83	352°10.57	N19°33.11	104°45.25	N03°31.06
13	134°18.73		329°42.16	24.58	59°34.67	39.04	7°12.46	32.98	119°47.69	31.06
14	149°21.19		344°42.18	23.39	74°35.29	39.25	22°14.35	32.85	134°50.12	31.06
15	164°23.66		359°42.20	•• 22.20	89°35.90	•• 39.46	37°16.25	•• 32.72	149°52.56	•• 31.06
16	179°26.12		14°42.21	21.01	104°36.52	39.67	52°18.14	32.59	164°55.00	31.05
17	194°28.58		29°42.23	19.82	119°37.13	39.88	67°20.04	32.46	179°57.44	31.05
18	209°31.05		44°42.25	N07°18.63	134°37.74	N22°40.10	82°21.93	N19°32.33	194°59.88	N03°31.05
19	224°33.51		59°42.27	17.43	149°38.36	40.31	97°23.82	32.20	210°2.32	31.05
20	239°35.98		74°42.29	16.24	164°38.97	40.52	112°25.72	32.07	225°4.76	31.04
21	254°38.44		89°42.31	•• 15.05	179°39.59	•• 40.73	127°27.61	•• 31.94	240°7.20	•• 31.04
22	269°40.91		104°42.33	13.86	194°40.20	40.93	142°29.51	31.81	255°9.64	31.04
23	284°43.37		119°42.35	12.66	209°40.82	41.14	157°31.40	31.68	270°12.08	31.03
Mer.pass. 04:04			ν0.0' d-1.2' m-4.18		ν0.6' d0.2' m1.31		ν1.9' d-0.1' m-1.79		ν2.4' d-0.0' m0.69	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	299°45.83		134°42.37	N07°11.47	224°41.43	N22°41.35	172°33.29	N19°31.55	285°14.52	N03°31.03
1	314°48.30		149°42.39	10.28	239°42.04	41.56	187°35.19	31.42	300°16.96	31.03
2	329°50.76		164°42.42	9.08	254°42.66	41.77	202°37.08	31.29	315°19.40	31.03
3	344°53.23		179°42.44	•• 7.89	269°43.27	•• 41.98	217°38.98	•• 31.17	330°21.85	•• 31.02
4	359°55.69		194°42.47	6.70	284°43.89	42.18	232°40.87	31.04	345°24.29	31.02
5	14°58.15		209°42.49	5.50	299°44.50	42.39	247°42.76	30.91	0°26.73	31.02
6	30°0.62		224°42.52	N07°4.31	314°45.12	N22°42.60	262°44.66	N19°30.78	15°29.17	N03°31.01
7	45°3.08		239°42.54	3.11	329°45.73	42.80	277°46.55	30.65	30°31.61	31.01
8	60°5.55		254°42.57	1.92	344°46.35	43.01	292°48.45	30.51	45°34.05	31.01
9	75°8.01		269°42.60	07°0.73	359°46.96	•• 43.21	307°50.34	•• 30.38	60°36.50	•• 31.00
10	90°10.47		284°42.62	06°59.53	14°47.58	43.42	322°52.23	30.25	75°38.94	31.00
11	105°12.94		299°42.65	58.34	29°48.19	43.62	337°54.13	30.12	90°41.38	31.00
12	120°15.40		314°42.68	N06°57.14	44°48.81	N22°43.83	352°56.02	N19°29.99	105°43.82	N03°30.99
13	135°17.87		329°42.71	55.94	59°49.42	44.03	7°57.92	29.86	120°46.26	30.99
14	150°20.33		344°42.74	54.75	74°50.04	44.23	22°59.81	29.73	135°48.71	30.98
15	165°22.80		359°42.77	•• 53.55	89°50.65	•• 44.44	38°1.71	•• 29.60	150°51.15	•• 30.98
16	180°25.26		14°42.81	52.36	104°51.27	44.64	53°3.60	29.47	165°53.59	30.98
17	195°27.72		29°42.84	51.16	119°51.88	44.84	68°5.49	29.34	180°56.04	30.97
18	210°30.19		44°42.87	N06°49.96	134°52.50	N22°45.04	83°7.39	N19°29.21	195°58.48	N03°30.97
19	225°32.65		59°42.90	48.77	149°53.11	45.24	98°9.28	29.08	211°0.92	30.96
20	240°35.12		74°42.94	47.57	164°53.73	45.45	113°11.18	28.95	226°3.37	30.96
21	255°37.58		89°42.97	•• 46.37	179°54.34	•• 45.65	128°13.07	•• 28.82	241°5.81	•• 30.96
22	270°40.04		104°43.01	45.17	194°54.96	45.85	143°14.96	28.69	256°8.26	30.95
23	285°42.51		119°43.04	43.98	209°55.57	46.05	158°16.86	28.56	271°10.70	30.95
Mer.pass. 04:00			ν0.0' d-1.2' m-4.19		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.79		ν2.4' d-0.0' m0.68	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°44.97		134°43.08	N06°42.78	224°56.19	N22°46.25	173°18.75	N19°28.43	286°13.15	N03°30.94
1	315°47.44		149°43.12	41.58	239°56.80	46.45	188°20.65	28.30	301°15.59	30.94
2	330°49.90		164°43.15	40.38	254°57.42	46.65	203°22.54	28.17	316°18.04	30.93
3	345°52.36		179°43.19	•• 39.18	269°58.04	•• 46.84	218°24.43	•• 28.04	331°20.48	•• 30.93
4	0°54.83		194°43.23	37.98	284°58.65	47.04	233°26.33	27.91	346°22.93	30.92
5	15°57.29		209°43.27	36.78	299°59.27	47.24	248°28.22	27.78	1°25.37	30.92
6	30°59.76		224°43.31	N06°35.58	314°59.88	N22°47.44	263°30.12	N19°27.65	16°27.82	N03°30.91
7	46°2.22		239°43.35	34.39	330°0.50	47.64	278°32.01	27.51	31°30.26	30.91
8	61°4.69		254°43.39	33.19	345°1.11	47.83	293°33.91	27.38	46°32.71	30.90
9	76°7.15		269°43.44	•• 31.99	0°1.73	•• 48.03	308°35.80	•• 27.25	61°35.15	•• 30.90
10	91°9.61		284°43.48	30.79	15°2.35	48.23	323°37.69	27.12	76°37.60	30.89
11	106°12.08		299°43.52	29.59	30°2.96	48.42	338°39.59	26.99	91°40.05	30.89
12	121°14.54		314°43.57	N06°28.39	45°3.58	N22°48.62	353°41.48	N19°26.86	106°42.49	N03°30.88
13	136°17.01		329°43.61	27.18	60°4.19	48.81	8°43.38	26.73	121°44.94	30.88
14	151°19.47		344°43.65	25.98	75°4.81	49.01	23°45.27	26.60	136°47.39	30.87
15	166°21.93		359°43.70	•• 24.78	90°5.43	•• 49.20	38°47.16	•• 26.47	151°49.83	•• 30.87
16	181°24.40		14°43.75	23.58	105°6.04	49.40	53°49.06	26.34	166°52.28	30.86
17	196°26.86		29°43.79	22.38	120°6.66	49.59	68°50.95	26.21	181°54.73	30.86
18	211°29.33		44°43.84	N06°21.18	135°7.27	N22°49.78	83°52.85	N19°26.07	196°57.17	N03°30.85
19	226°31.79		59°43.89	19.98	150°7.89	49.98	98°54.74	25.94	211°59.62	30.84
20	241°34.26		74°43.94	18.78	165°8.51	50.17	113°56.64	25.81	227°2.07	30.84
21	256°36.72		89°43.99	•• 17.57	180°9.12	•• 50.36	128°58.53	•• 25.68	242°4.52	•• 30.83
22	271°39.18		104°44.04	16.37	195°9.74	50.55	144°0.42	25.55	257°6.97	30.83
23	286°41.65		119°44.09	15.17	210°10.36	50.74	159°2.32	25.42	272°9.41	30.82
Mer.pass. 03:56			ν0.0' d-1.2' m-4.20		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.79		ν2.4' d-0.0' m0.68	

Stars		
	SHA	Dec
Alpheratz	357°33.28	29°14.19
Ankaa	353°5.73	-42°9.38
Schedar	349°29.39	56°40.81
Diphda	348°45.92	-17°50.23
Achernar	335°19.21	-57°5.74
Hamal	327°49.77	23°35.25
Polaris	313°31.85	89°22.24
Acamar	315°10.93	-40°11.58
Menkar	314°4.91	4°11.72
Mirfak	308°26.62	49°57.15
Aldebaran	290°38.38	16°33.76
Rigel	281°2.90	-8°10.14
Capella	280°20.37	46°1.36
Bellatrix	278°21.78	6°22.47
Elnath	278°0.55	28°37.74
Alnilam	275°36.71	-1°11.02
Betelgeuse	270°50.99	7°24.76
Canopus	263°52.34	-52°42.41
Sirius	258°25.44	-16°45.06
Adhara	255°5.23	-29°0.39
Procyon	244°49.83	5°9.45
Pollux	243°16.12	27°57.74
Avior	234°14.87	-59°35.67
Suhail	222°45.81	-43°32.43
Miaplacidus	221°38.92	-69°49.66
Alphard	217°46.81	-8°46.42
Regulus	207°33.36	11°50.30
Dubhe	193°39.91	61°36.66
Denebola	182°23.82	14°25.49
Gienah	175°42.41	-17°41.45
Acrux	172°58.92	-63°15.08
Gacrux	171°50.42	-57°16.00
Alioth	166°11.99	55°49.18
Spica	158°20.98	-11°18.05
Alkaid	152°51.00	49°11.07
Hadar	148°34.13	-60°30.35
Menkent	147°56.07	-36°30.22
Arcturus	145°46.70	19°2.76
Rigel Kent.	139°38.39	-60°56.99
Kochab	137°19.52	74°3.01
Zuben'ubi	136°54.50	-16°9.19
Alphecca	126°2.49	26°37.66
Antares	112°14.02	-26°29.51
Atria	107°6.65	-69°4.67
Sabik	102°1.04	-15°45.46
Shaula	96°8.28	-37°7.42
Rasalhague	95°57.07	12°32.53
Eltanin	90°41.11	51°29.24
Kaus Aust.	83°30.44	-34°22.30
Vega	80°31.95	38°48.59
Nunki	75°45.81	-26°15.76
Altair	61°58.37	8°56.39
Peacock	53°3.12	-56°38.83
Deneb	49°24.47	45°22.51
Enif	33°37.24	9°59.89
Al Na'ir	27°30.91	-46°49.70
Fomalhaut	15°12.85	-29°28.66
Scheat	13°43.71	28°13.61
Markab	13°28.39	15°20.94
Jul 21 Tue	SHA	Mer.pass
Venus	195°55.32	15:01
Mars	285°40.00	09:02
Jupiter	233°1.14	12:31
Saturn	345°29.30	05:02
Jul 22 Wed	SHA	Mer.pass
Venus	194°56.54	15:01
Mars	284°55.60	09:01
Jupiter	232°47.46	12:28
Saturn	345°28.69	04:58
Jul 23 Thu	SHA	Mer.pass
Venus	193°58.11	15:01
Mars	284°11.22	09:00
Jupiter	232°33.78	12:25
Saturn	345°28.17	04:54
Horizontal parallax		
	Venus:	0.2
	Mars:	0.1

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue							
0	178°23.47	N20°30.26	99°5.89	14.5'	S12°46.88	13.3'	55.6'
1	193°23.43	29.78	113°39.39	14.5'	13°0.14	13.2'	55.6'
2	208°23.40	29.29	128°12.87	14.5'	13°13.33	13.1'	55.6'
3	223°23.37	· · 28.81	142°46.32	14.4'	13°26.46	13.1'	55.5'
4	238°23.34	28.33	157°19.75	14.4'	13°39.52	13.0'	55.5'
5	253°23.31	27.85	171°53.16	14.4'	13°52.50	12.9'	55.5'
6	268°23.28	N20°27.36	186°26.55	14.4'	S14°5.42	12.8'	55.5'
7	283°23.25	26.88	200°59.91	14.3'	14°18.26	12.8'	55.4'
8	298°23.22	26.39	215°33.24	14.3'	14°31.03	12.7'	55.4'
9	313°23.19	· · 25.91	230°6.55	14.3'	14°43.73	12.6'	55.4'
10	328°23.16	25.42	244°39.83	14.3'	14°56.36	12.6'	55.4'
11	343°23.13	24.94	259°13.09	14.2'	15°8.91	12.5'	55.3'
12	358°23.10	N20°24.45	273°46.31	14.2'	S15°21.39	12.4'	55.3'
13	13°23.07	23.96	288°19.50	14.2'	15°33.79	12.3'	55.3'
14	28°23.05	23.47	302°52.66	14.1'	15°46.12	12.2'	55.2'
15	43°23.02	· · 22.98	317°25.79	14.1'	15°58.37	12.2'	55.2'
16	58°22.99	22.50	331°58.89	14.1'	16°10.54	12.1'	55.2'
17	73°22.96	22.01	346°31.95	14.0'	16°22.63	12.0'	55.2'
18	88°22.93	N20°21.51	1°4.98	14.0'	S16°34.64	11.9'	55.1'
19	103°22.91	21.02	15°37.98	14.0'	16°46.58	11.9'	55.1'
20	118°22.88	20.53	30°10.94	13.9'	16°58.43	11.8'	55.1'
21	133°22.85	· · 20.04	44°43.87	13.9'	17°10.20	11.7'	55.1'
22	148°22.83	19.55	59°16.75	13.9'	17°21.89	11.6'	55.0'
23	163°22.80	19.05	73°49.60	13.8'	17°33.50	11.5'	55.0'
SD = 15.7' $d = -0.5'$			SD = 15.2'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.78	N20°18.56	88°22.42	13.8'	S17°45.02	11.4'	55.0'
1	193°22.75	18.06	102°55.19	13.7'	17°56.47	11.4'	55.0'
2	208°22.73	17.57	117°27.92	13.7'	18°7.82	11.3'	55.0'
3	223°22.70	· · 17.07	132°0.62	13.7'	18°19.09	11.2'	54.9'
4	238°22.68	16.58	146°33.27	13.6'	18°30.28	11.1'	54.9'
5	253°22.65	16.08	161°5.88	13.6'	18°41.37	11.0'	54.9'
6	268°22.63	N20°15.58	175°38.45	13.5'	S18°52.39	10.9'	54.9'
7	283°22.60	15.08	190°10.98	13.5'	19°3.31	10.8'	54.8'
8	298°22.58	14.58	204°43.47	13.4'	19°14.14	10.7'	54.8'
9	313°22.56	· · 14.08	219°15.91	13.4'	19°24.89	10.7'	54.8'
10	328°22.53	13.58	233°48.31	13.4'	19°35.54	10.6'	54.8'
11	343°22.51	13.08	248°20.66	13.3'	19°46.10	10.5'	54.8'
12	358°22.49	N20°12.58	262°52.97	13.3'	S19°56.57	10.4'	54.7'
13	13°22.46	12.08	277°25.23	13.2'	20°6.95	10.3'	54.7'
14	28°22.44	11.58	291°57.45	13.2'	20°17.24	10.2'	54.7'
15	43°22.42	· · 11.08	306°29.62	13.1'	20°27.43	10.1'	54.7'
16	58°22.40	10.57	321°1.74	13.1'	20°37.53	10.0'	54.7'
17	73°22.38	10.07	335°33.82	13.0'	20°47.53	9.9'	54.6'
18	88°22.36	N20°9.56	350°5.85	13.0'	S20°57.44	9.8'	54.6'
19	103°22.34	9.06	4°37.84	12.9'	21°7.25	9.7'	54.6'
20	118°22.31	8.55	19°9.77	12.9'	21°16.96	9.6'	54.6'
21	133°22.29	· · 8.05	33°41.66	12.8'	21°26.58	9.5'	54.6'
22	148°22.27	7.54	48°13.50	12.8'	21°36.10	9.4'	54.6'
23	163°22.25	7.03	62°45.28	12.7'	21°45.52	9.3'	54.5'
SD = 15.7' $d = -0.5'$			SD = 15.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.23	N20°6.52	77°17.02	12.7'	S21°54.83	9.2'	54.5'
1	193°22.22	6.01	91°48.72	12.6'	22°4.05	9.1'	54.5'
2	208°22.20	5.51	106°20.36	12.6'	22°13.17	9.0'	54.5'
3	223°22.18	· · 5.00	120°51.95	12.5'	22°22.18	8.9'	54.5'
4	238°22.16	4.48	135°23.49	12.5'	22°31.10	8.8'	54.5'
5	253°22.14	3.97	149°54.98	12.4'	22°39.91	8.7'	54.4'
6	268°22.12	N20°3.46	164°26.42	12.4'	S22°48.61	8.6'	54.4'
7	283°22.11	2.95	178°57.81	12.3'	22°57.21	8.5'	54.4'
8	298°22.09	2.44	193°29.15	12.3'	23°5.71	8.4'	54.4'
9	313°22.07	· · 1.92	208°0.44	12.2'	23°14.10	8.3'	54.4'
10	328°22.05	1.41	222°31.68	12.2'	23°22.38	8.2'	54.4'
11	343°22.04	0.89	237°2.87	12.1'	23°30.55	8.1'	54.4'
12	358°22.02	N20°0.38	251°34.01	12.1'	S23°38.62	8.0'	54.3'
13	13°22.00	19°59.86	266°5.10	12.0'	23°46.58	7.8'	54.3'
14	28°21.99	59.35	280°36.14	12.0'	23°54.43	7.7'	54.3'
15	43°21.97	· · 58.83	295°7.13	11.9'	24°2.17	7.6'	54.3'
16	58°21.96	58.31	309°38.06	11.9'	24°9.80	7.5'	54.3'
17	73°21.94	57.80	324°8.95	11.8'	24°17.32	7.4'	54.3'
18	88°21.93	N19°57.28	338°39.79	11.8'	S24°24.72	7.3'	54.3'
19	103°21.91	56.76	353°10.58	11.7'	24°32.02	7.2'	54.3'
20	118°21.90	56.24	7°41.31	11.7'	24°39.20	7.1'	54.2'
21	133°21.88	· · 55.72	22°12.00	11.6'	24°46.27	7.0'	54.2'
22	148°21.87	55.20	36°42.64	11.6'	24°53.22	6.8'	54.2'
23	163°21.86	54.68	51°13.23	11.5'	25°0.06	6.7'	54.2'
SD = 15.7' $d = -0.5'$			SD = 14.9'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 7-9 46-65%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
21	06:26	06:28	12:06	17:56	05:33	
22	06:29	06:30	12:07	18:41	06:18	
23	06:31	06:32	12:07	19:28	07:04	

July 24, 25, 26 UT (Fri., Sat., Sun.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	301°44.11	134°44.14	N06°13.97	225°10.97	N22°50.94	174°4.21	N19°25.29	287°11.86	N03°30.81	Alpheratz	357°33.26	29°14.20
1	316°46.58	149°44.19	12.76	240°11.59	51.13	189°6.11	25.16	302°14.31	30.81	Ankaa	353°5.70	-42°9.37
2	331°49.04	164°44.24	11.56	255°12.21	51.32	204°8.00	25.02	317°16.76	30.80	Schedar	349°29.35	56°40.82
3	346°51.50	179°44.29	· · 10.36	270°12.82	· · 51.51	219°9.90	· · 24.89	332°19.21	· · 30.80	Diphda	348°45.89	-17°50.23
4	1°53.97	194°44.35	9.15	285°13.44	51.70	234°11.79	24.76	347°21.66	30.79	Achernar	335°19.17	-57°5.73
5	16°56.43	209°44.40	7.95	300°14.06	51.89	249°13.68	24.63	2°24.11	30.78	Hamal	327°49.75	23°35.26
6	31°58.90	224°44.46	N06°6.75	315°14.67	N22°52.07	264°15.58	N19°24.50	17°26.56	N03°30.78	Polaris	313°30.08	89°22.24
7	47°1.36	239°44.51	5.54	330°15.29	52.26	279°17.47	24.37	32°29.01	30.77	Acamar	315°10.90	-40°11.57
8	62°3.83	254°44.57	4.34	345°15.91	52.45	294°19.37	24.24	47°31.46	30.76	Menkar	314°4.89	4°11.72
9	77°6.29	269°44.62	· · 3.13	0°16.52	· · 52.64	309°21.26	· · 24.10	62°33.91	· · 30.76	Mirfak	308°26.58	49°57.15
10	92°8.75	284°44.68	1.93	15°17.14	52.83	324°23.16	23.97	77°36.36	30.75	Aldebaran	290°38.35	16°33.77
11	107°11.22	299°44.74	06°0.72	30°17.76	53.01	339°25.05	23.84	92°38.81	30.74	Rigel	281°2.88	-8°10.14
12	122°13.68	314°44.80	N05°59.52	45°18.38	N22°53.20	354°26.94	N19°23.71	107°41.26	N03°30.74	Capella	280°20.34	46°1.35
13	137°16.15	329°44.86	58.31	60°18.99	53.39	9°28.84	23.58	122°43.71	30.73	Bellatrix	278°21.76	6°22.48
14	152°18.61	344°44.91	57.11	75°19.61	53.57	24°30.73	23.45	137°46.16	30.72	Elnath	278°0.53	28°37.74
15	167°21.07	359°44.97	· · 55.90	90°20.23	· · 53.76	39°32.63	· · 23.31	152°48.61	· · 30.72	Alnilam	275°36.69	-1°11.01
16	182°23.54	14°45.04	54.70	105°20.84	53.94	54°34.52	23.18	167°51.06	30.71	Betelgeuse	270°50.98	7°24.77
17	197°26.00	29°45.10	53.49	120°21.46	54.13	69°36.42	23.05	182°53.51	30.70	Canopus	263°52.32	-52°42.40
18	212°28.47	44°45.16	N05°52.29	135°22.08	N22°54.31	84°38.31	N19°22.92	197°55.96	N03°30.69	Sirius	258°25.43	-16°45.05
19	227°30.93	59°45.22	51.08	150°22.70	54.50	99°40.20	22.79	212°58.42	30.69	Adhara	255°5.22	-29°0.38
20	242°33.40	74°45.28	49.87	165°23.31	54.68	114°42.10	22.66	228°0.87	30.68	Procyon	244°49.82	5°9.45
21	257°35.86	89°45.35	· · 48.67	180°23.93	· · 54.87	129°43.99	· · 22.52	243°3.32	· · 30.67	Pollux	243°16.11	27°57.73
22	272°38.32	104°45.41	47.46	195°24.55	55.05	144°45.89	22.39	258°5.77	30.66	Avior	234°14.87	-59°35.66
23	287°40.79	119°45.48	46.25	210°25.17	55.23	159°47.78	22.26	273°8.22	30.66	Suhail	222°45.80	-43°32.42
Mer.pass. 03:52		ν0.1' d-1.2' m-4.20		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.79		ν2.4' d-0.0' m0.67		Miaplacidus	221°38.93	-69°49.64
										Alphard	217°46.80	-8°46.42
										Regulus	207°33.36	11°50.29
										Dubhe	193°39.93	61°36.65
										Denebola	182°23.82	14°25.49
										Gienah	175°42.41	-17°41.45
										Acrux	172°58.94	-63°15.07
										Gacrux	171°50.43	-57°15.99
										Alioth	166°12.01	55°49.18
										Spica	158°20.99	-11°18.05
										Alkaid	152°51.02	49°11.07
										Hadar	148°34.14	-60°30.35
										Menkent	147°56.08	-36°30.22
										Arcturus	145°46.71	19°2.76
										Rigel Kent.	139°38.41	-60°56.99
										Kochab	137°19.58	74°3.01
										Zuben'ubi	136°54.51	-16°9.19
										Alphecca	126°2.50	26°37.66
										Antares	112°14.02	-26°29.51
										Atria	107°6.67	-69°4.68
										Sabik	102°1.05	-15°45.46
										Shaula	96°8.28	-37°7.42
										Rasalhague	95°57.08	12°32.54
										Eltanin	90°41.12	51°29.25
										Kaus Aust.	83°30.44	-34°22.30
										Vega	80°31.95	38°48.60
										Nunki	75°45.81	-26°15.76
										Altair	61°58.37	8°56.41
Mer.pass. 03:48		ν0.1' d-1.2' m-4.21		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.79		ν2.5' d-0.0' m0.67		Peacock	53°3.11	-56°38.84
										Deneb	49°24.46	45°22.53
										Enif	33°37.23	9°59.90
										Al Na'ir	27°30.89	-46°49.70
										Fomalhaut	15°12.83	-29°28.65
										Scheat	13°43.69	28°13.62
										Markab	13°28.37	15°20.95
										Jul 24 Fri	SHA	Mer.pass
										Venus	193°0.03	15:01
										Mars	283°26.86	08:59
										Jupiter	232°20.10	12:22
										Saturn	345°27.75	04:50
										Jul 25 Sat	SHA	Mer.pass
										Venus	192°2.29	15:01
										Mars	282°42.53	08:58
										Jupiter	232°6.42	12:19
										Saturn	345°27.42	04:47
										Jul 26 Sun	SHA	Mer.pass
										Venus	191°4.90	15:01
										Mars	281°58.23	08:57
										Jupiter	231°52.75	12:16
										Saturn	345°27.19	04:43
										Horizontal parallax		
										Venus:	0.2	
										Mars:	0.1	
Mer.pass. 03:45		ν0.1' d-1.2' m-4.22		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.66				


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	178°21.84	N19°54.15	65°43.77	11.5'	S25°6.78	6.6'	54.2'
1	193°21.83	53.63	80°14.26	11.4'	25°13.38	6.5'	54.2'
2	208°21.82	53.11	94°44.71	11.4'	25°19.87	6.4'	54.2'
3	223°21.80	•• 52.58	109°15.11	11.3'	25°26.24	6.3'	54.2'
4	238°21.79	52.06	123°45.46	11.3'	25°32.50	6.1'	54.2'
5	253°21.78	51.53	138°15.76	11.3'	25°38.63	6.0'	54.1'
6	268°21.77	N19°51.01	152°46.02	11.2'	S25°44.65	5.9'	54.1'
7	283°21.76	50.48	167°16.23	11.2'	25°50.55	5.8'	54.1'
8	298°21.75	49.96	181°46.39	11.1'	25°56.32	5.7'	54.1'
9	313°21.73	•• 49.43	196°16.51	11.1'	26°01.98	5.5'	54.1'
10	328°21.72	48.90	210°46.58	11.0'	26°07.51	5.4'	54.1'
11	343°21.71	48.37	225°16.61	11.0'	26°12.92	5.3'	54.1'
12	358°21.70	N19°47.84	239°46.60	10.9'	S26°18.21	5.2'	54.1'
13	13°21.69	47.31	254°16.54	10.9'	26°23.37	5.0'	54.1'
14	28°21.68	46.78	268°46.44	10.9'	26°28.42	4.9'	54.1'
15	43°21.67	•• 46.25	283°16.30	10.8'	26°33.33	4.8'	54.1'
16	58°21.67	45.72	297°46.12	10.8'	26°38.13	4.7'	54.1'
17	73°21.66	45.19	312°15.90	10.7'	26°42.80	4.5'	54.1'
18	88°21.65	N19°44.66	326°45.64	10.7'	S26°47.34	4.4'	54.1'
19	103°21.64	44.13	341°15.34	10.7'	26°51.75	4.3'	54.1'
20	118°21.63	43.59	355°45.00	10.6'	26°56.04	4.2'	54.0'
21	133°21.62	•• 43.06	10°14.62	10.6'	27°02.21	4.0'	54.0'
22	148°21.62	42.52	24°44.20	10.5'	27°04.24	3.9'	54.0'
23	163°21.61	41.99	39°13.75	10.5'	27°08.15	3.8'	54.0'
SD = 15.7' $d = -0.5'$			SD = 14.8'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.60	N19°41.45	53°43.27	10.5'	S27°11.93	3.6'	54.0'
1	193°21.59	40.92	68°12.74	10.4'	27°15.58	3.5'	54.0'
2	208°21.59	40.38	82°42.19	10.4'	27°19.10	3.4'	54.0'
3	223°21.58	•• 39.84	97°11.60	10.4'	27°22.49	3.3'	54.0'
4	238°21.58	39.30	111°40.98	10.3'	27°25.75	3.1'	54.0'
5	253°21.57	38.77	126°10.33	10.3'	27°28.88	3.0'	54.0'
6	268°21.56	N19°38.23	140°39.65	10.3'	S27°31.88	2.9'	54.0'
7	283°21.56	37.69	155°8.94	10.3'	27°34.74	2.7'	54.0'
8	298°21.55	37.15	169°38.20	10.2'	27°37.48	2.6'	54.0'
9	313°21.55	•• 36.61	184°7.44	10.2'	27°40.08	2.5'	54.0'
10	328°21.55	36.07	198°36.65	10.2'	27°42.55	2.3'	54.0'
11	343°21.54	35.52	213°5.83	10.2'	27°44.89	2.2'	54.0'
12	358°21.54	N19°34.98	227°34.99	10.1'	S27°47.10	2.1'	54.0'
13	13°21.53	34.44	242°4.12	10.1'	27°49.17	1.9'	54.0'
14	28°21.53	33.89	256°33.23	10.1'	27°51.11	1.8'	54.0'
15	43°21.53	•• 33.35	271°2.32	10.1'	27°52.92	1.7'	54.0'
16	58°21.52	32.81	285°31.40	10.1'	27°54.59	1.5'	54.0'
17	73°21.52	32.26	300°0.45	10.0'	27°56.13	1.4'	54.0'
18	88°21.52	N19°31.71	314°29.48	10.0'	S27°57.53	1.3'	54.0'
19	103°21.52	31.17	328°58.50	10.0'	27°58.80	1.1'	54.0'
20	118°21.52	30.62	343°27.50	10.0'	27°59.93	1.0'	54.0'
21	133°21.51	•• 30.07	357°56.48	10.0'	28°0.93	0.9'	54.0'
22	148°21.51	29.53	12°25.46	10.0'	28°1.79	0.7'	54.0'
23	163°21.51	28.98	26°54.42	9.9'	28°2.52	0.6'	54.0'
SD = 15.7' $d = -0.5'$			SD = 14.7'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.51	N19°28.43	41°23.37	9.9'	S28°3.11	0.5'	54.0'
1	193°21.51	27.88	55°52.30	9.9'	28°3.57	0.3'	54.0'
2	208°21.51	27.33	70°21.23	9.9'	28°3.89	0.2'	54.0'
3	223°21.51	•• 26.78	84°50.15	9.9'	28°4.07	0.0'	54.0'
4	238°21.51	26.23	99°19.07	9.9'	28°4.12	-0.1'	54.0'
5	253°21.51	25.67	113°47.98	9.9'	28°4.03	-0.2'	54.0'
6	268°21.51	N19°25.12	128°16.88	9.9'	S28°3.81	-0.4'	54.0'
7	283°21.51	24.57	142°45.78	9.9'	28°3.45	-0.5'	54.0'
8	298°21.52	24.01	157°14.68	9.9'	28°2.95	-0.6'	54.0'
9	313°21.52	•• 23.46	171°43.58	9.9'	28°2.32	-0.8'	54.0'
10	328°21.52	22.91	186°12.48	9.9'	28°1.55	-0.9'	54.0'
11	343°21.52	22.35	200°41.38	9.9'	28°0.64	-1.0'	54.0'
12	358°21.52	N19°21.79	215°10.28	9.9'	S27°59.60	-1.2'	54.0'
13	13°21.53	21.24	229°39.19	9.9'	27°58.42	-1.3'	54.0'
14	28°21.53	20.68	244°8.10	9.9'	27°57.11	-1.5'	54.0'
15	43°21.53	•• 20.12	258°37.02	9.9'	27°55.66	-1.6'	54.1'
16	58°21.54	19.57	273°5.94	9.9'	27°54.07	-1.7'	54.1'
17	73°21.54	19.01	287°34.88	9.9'	27°52.35	-1.9'	54.1'
18	88°21.54	N19°18.45	302°3.82	10.0'	S27°50.49	-2.0'	54.1'
19	103°21.55	17.89	316°32.77	10.0'	27°48.50	-2.1'	54.1'
20	118°21.55	17.33	331°1.74	10.0'	27°46.37	-2.3'	54.1'
21	133°21.56	•• 16.77	345°30.72	10.0'	27°44.11	-2.4'	54.1'
22	148°21.56	16.21	359°59.71	10.0'	27°41.71	-2.5'	54.1'
23	163°21.57	15.64	14°28.72	10.0'	27°39.17	-2.7'	54.1'
SD = 15.7' $d = -0.5'$			SD = 14.7'				

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

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

Day	Sun		Mer. Pass	Moon		Age 10-12 74-88%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
24	06:33	06:33	12:07	20:18	07:53	
25	06:34	06:34	12:07	21:09	08:43	
26	06:34	06:34	12:07	22:00	09:34	

July 27, 28, 29 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	304°41.53		134°49.38	N04°46.93	225°55.50	N23°3.75	176°20.62	N19°15.76	290°8.58	N03°30.20
1	319°44.00		149°49.47	45.72	240°56.12	3.92	191°22.51	15.63	305°11.04	30.19
2	334°46.46		164°49.57	44.51	255°56.74	4.08	206°24.41	15.49	320°13.51	30.18
3	349°48.93		179°49.67	· · 43.29	270°57.36	· · 4.24	221°26.30	· · 15.36	335°15.97	· · 30.17
4	4°51.39		194°49.76	42.08	285°57.98	4.41	236°28.20	15.23	350°18.43	30.15
5	19°53.85		209°49.86	40.86	300°58.60	4.57	251°30.09	15.09	5°20.89	30.14
6	34°56.32		224°49.96	N04°39.65	315°59.22	N23°4.73	266°31.99	N19°14.96	20°23.35	N03°30.13
7	49°58.78		239°50.05	38.43	330°59.84	4.90	281°33.88	14.83	35°25.81	30.12
8	65°1.25		254°50.15	37.22	346°0.47	5.06	296°35.78	14.69	50°28.27	30.11
9	80°3.71		269°50.25	· · 36.00	1°1.09	· · 5.22	311°37.67	· · 14.56	65°30.73	· · 30.10
10	95°6.18		284°50.35	34.79	16°1.71	5.38	326°39.57	14.43	80°33.20	30.09
11	110°8.64		299°50.45	33.57	31°2.33	5.54	341°41.46	14.29	95°35.66	30.07
12	125°11.10		314°50.55	N04°32.36	46°2.95	N23°5.71	356°43.36	N19°14.16	110°38.12	N03°30.06
13	140°13.57		329°50.65	31.14	61°3.57	5.87	11°45.25	14.02	125°40.58	30.05
14	155°16.03		344°50.76	29.92	76°4.19	6.03	26°47.15	13.89	140°43.05	30.04
15	170°18.50		359°50.86	· · 28.71	91°4.81	· · 6.19	41°49.04	· · 13.76	155°45.51	· · 30.03
16	185°20.96		14°50.96	27.49	106°5.44	6.35	56°50.94	13.62	170°47.97	30.01
17	200°23.42		29°51.07	26.28	121°6.06	6.50	71°52.83	13.49	185°50.43	30.00
18	215°25.89		44°51.17	N04°25.06	136°6.68	N23°6.66	86°54.73	N19°13.36	200°52.90	N03°29.99
19	230°28.35		59°51.28	23.84	151°7.30	6.82	101°56.62	13.22	215°55.36	29.98
20	245°30.82		74°51.38	22.63	166°7.92	6.98	116°58.52	13.09	230°57.82	29.97
21	260°33.28		89°51.49	· · 21.41	181°8.54	· · 7.14	132°0.41	· · 12.95	246°0.29	· · 29.95
22	275°35.75		104°51.59	20.20	196°9.16	7.29	147°2.31	12.82	261°2.75	29.94
23	290°38.21		119°51.70	18.98	211°9.79	7.45	162°4.20	12.69	276°5.22	29.93
Mer.pass. 03:41		ν0.1' d-1.2' m-4.23		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.66		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	305°40.67		134°51.81	N04°17.76	226°10.41	N23°7.61	177°6.10	N19°12.55	291°7.68	N03°29.92
1	320°43.14		149°51.92	16.54	241°11.03	7.76	192°7.99	12.42	306°10.15	29.90
2	335°45.60		164°52.03	15.33	256°11.65	7.92	207°9.89	12.29	321°12.61	29.89
3	350°48.07		179°52.14	· · 14.11	271°12.27	· · 8.08	222°11.78	· · 12.15	336°15.07	· · 29.88
4	5°50.53		194°52.25	12.89	286°12.90	8.23	237°13.68	12.02	351°17.54	29.86
5	20°52.99		209°52.36	11.68	301°13.52	8.39	252°15.57	11.88	6°20.00	29.85
6	35°55.46		224°52.47	N04°10.46	316°14.14	N23°8.54	267°17.47	N19°11.75	21°22.47	N03°29.84
7	50°57.92		239°52.58	9.24	331°14.76	8.69	282°19.36	11.62	36°24.93	29.83
8	66°0.39		254°52.70	8.02	346°15.39	8.85	297°21.26	11.48	51°27.40	29.81
9	81°2.85		269°52.81	· · 6.80	1°16.01	· · 9.00	312°23.15	· · 11.35	66°29.87	· · 29.80
10	96°5.32		284°52.92	5.59	16°16.63	9.15	327°25.05	11.21	81°32.33	29.79
11	111°7.78		299°53.04	4.37	31°17.25	9.31	342°26.95	11.08	96°34.80	29.77
12	126°10.24		314°53.15	N04°3.15	46°17.88	N23°9.46	357°28.84	N19°10.95	111°37.26	N03°29.76
13	141°12.71		329°53.27	1.93	61°18.50	9.61	12°30.74	10.81	126°39.73	29.75
14	156°15.17		344°53.38	04°0.71	76°19.12	9.76	27°32.63	10.68	141°42.20	29.73
15	171°17.64		359°53.50	03°59.50	91°19.74	· · 9.91	42°34.53	· · 10.54	156°44.66	· · 29.72
16	186°20.10		14°53.62	58.28	106°20.37	10.06	57°36.42	10.41	171°47.13	29.71
17	201°22.56		29°53.74	57.06	121°20.99	10.22	72°38.32	10.27	186°49.60	29.69
18	216°25.03		44°53.85	N03°55.84	136°21.61	N23°10.37	87°40.21	N19°10.14	201°52.06	N03°29.68
19	231°27.49		59°53.97	54.62	151°22.24	10.52	102°42.11	10.01	216°54.53	29.66
20	246°29.96		74°54.09	53.40	166°22.86	10.66	117°44.00	9.87	231°57.00	29.65
21	261°32.42		89°54.21	· · 52.18	181°23.48	· · 10.81	132°45.90	· · 9.74	246°59.47	· · 29.64
22	276°34.89		104°54.33	50.96	196°24.11	10.96	147°47.79	9.60	262°1.94	29.62
23	291°37.35		119°54.46	49.75	211°24.73	11.11	162°49.69	9.47	277°4.40	29.61
Mer.pass. 03:37		ν0.1' d-1.2' m-4.24		ν0.6' d0.2' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.65		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	306°39.81		134°54.58	N03°48.53	226°25.35	N23°11.26	177°51.58	N19°9.34	292°6.87	N03°29.59
1	321°42.28		149°54.70	47.31	241°25.98	11.41	192°53.48	9.20	307°9.34	29.58
2	336°44.74		164°54.82	46.09	256°26.60	11.55	207°55.38	9.07	322°11.81	29.57
3	351°47.21		179°54.95	· · 44.87	271°27.22	· · 11.70	222°57.27	· · 8.93	337°14.28	· · 29.55
4	6°49.67		194°55.07	43.65	286°27.85	11.85	237°59.17	8.80	352°16.75	29.54
5	21°52.13		209°55.20	42.43	301°28.47	11.99	253°1.06	8.67	7°19.21	29.52
6	36°54.60		224°55.32	N03°41.21	316°29.09	N23°12.14	268°2.96	N19°8.53	22°21.68	N03°29.51
7	51°57.06		239°55.45	39.99	331°29.72	12.28	283°4.86	8.40	37°24.15	29.49
8	66°59.53		254°55.57	38.77	346°30.34	12.43	298°6.75	8.26	52°26.62	29.48
9	82°1.99		269°55.70	· · 37.55	1°30.97	· · 12.57	313°8.65	· · 8.13	67°29.09	· · 29.46
10	97°4.46		284°55.83	36.33	16°31.59	12.72	328°10.54	7.99	82°31.56	29.45
11	112°6.92		299°55.96	35.11	31°32.21	12.86	343°12.44	7.86	97°34.03	29.43
12	127°9.38		314°56.09	N03°33.89	46°32.84	N23°13.01	358°14.34	N19°7.73	112°36.50	N03°29.42
13	142°11.85		329°56.22	32.67	61°33.46	13.15	13°16.23	7.59	127°38.97	29.40
14	157°14.31		344°56.35	31.45	76°34.09	13.29	28°18.13	7.46	142°41.44	29.39
15	172°16.78		359°56.48	· · 30.23	91°34.71	· · 13.44	43°20.03	· · 7.32	157°43.91	· · 29.37
16	187°19.24		14°56.61	29.01	106°35.34	13.58	58°21.93	7.19	172°46.38	29.36
17	202°21.70		29°56.74	27.78	121°35.96	13.72	73°23.82	7.05	187°48.86	29.34
18	217°24.17		44°56.87	N03°26.56	136°36.59	N23°13.86	88°25.72	N19°6.91	202°51.33	N03°29.33
19	232°26.63		59°57.01	25.34	151°37.21	14.00	103°27.61	6.78	217°53.80	29.31
20	247°29.10		74°57.14	24.12	166°37.84	14.14	118°29.51	6.64	232°56.27	29.30
21	262°31.56		89°57.27	· · 22.90	181°38.46	· · 14.28	133°31.41	· · 6.51	247°58.74	· · 29.28
22	277°34.02		104°57.41	21.68	196°39.09	14.42	148°33.30	6.37	263°1.21	29.26
23	292°36.49		119°57.54	20.46	211°39.71	14.56	163°35.20	6.24	278°3.68	29.25
Mer.pass. 03:33		ν0.1' d-1.2' m-4.25		ν0.6' d0.1' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.65		

	SHA	Dec
Alpheratz	357°33.23	29°14.22
Ankaa	353°5.67	-42°9.37
Schedar	349°29.32	56°40.83
Diphda	348°45.86	-17°50.22
Achernar	335°19.13	-57°5.73
Hamal	327°49.72	23°35.27
Polaris	313°28.36	89°22.24
Acamar	315°10.87	-40°11.56
Menkar	314°4.86	4°11.73
Mirfak	308°26.54	49°57.16
Aldebaran	290°38.33	16°33.77
Rigel	281°2.86	-8°10.13
Capella	280°20.31	46°1.35
Bellatrix	278°21.73	6°22.48
Elnath	278°0.51	28°37.74
Alnilam	275°36.67	-1°11.01
Betelgeuse	270°50.95	7°24.77
Canopus	263°52.30	-52°42.38
Sirius	258°25.41	-16°45.04
Adhara	255°5.20	-29°0.36
Procyon	244°49.80	5°9.46
Pollux	243°16.09	27°57.73
Avior	234°14.86	-59°35.64
Suhail	222°45.80	-43°32.41
Miaplacidus	221°38.94	-69°49.63
Alphard	217°46.80	-8°46.41
Regulus	207°33.36	11°50.29
Dubhe	193°39.94	61°36.63
Denebola	182°23.82	14°25.49
Gienah	175°42.41	-17°41.44
Acrux	172°58.96	-63°15.07
Gacrux	171°50.45	-57°15.99
Alioth	166°12.03	55°49.17
Spica	158°21.00	-11°18.04
Alkaid	152°51.03	49°11.07
Hadar	148°34.16	-60°30.35
Menkent	147°56.08	-36°30.22
Arcturus	145°46.72	19°2.76
Rigil Kent.	139°38.43	-60°56.99
Kochab	137°19.64	74°3.01
Zuben'ubi	136°54.51	-16°9.19
Alphecca	126°2.51	26°37.67
Antares	112°14.03	-26°29.51
Atria	107°6.68	-69°4.69
Sabik	102°1.05	-15°45.46
Shaula	96°8.28	-37°7.43
Rasalhague	95°57.08	12°32.54
Eltanin	90°41.13	51°29.27
Kaus Aust.	83°30.43	-34°22.30
Vega	80°31.95	38°48.62
Nunki	75°45.80	-26°15.76
Altair	61°58.36	8°56.42
Peacock	53°3.09	-56°38.85
Deneb	49°24.45	45°22.55
Enif	33°37.21	9°59.91
Al Na'ir	27°30.87	-46°49.70
Fomalhaut	15°12.80	-29°28.65

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		178°21.57	N19°15.08	28°57.74	10.0'	S27°36.50	-2.8' 54.1'
1		193°21.58	14.52	43°26.79	10.1'	27°33.70	-2.9' 54.1'
2		208°21.59	13.95	57°55.85	10.1'	27°30.76	-3.1' 54.1'
3		223°21.59	· · 13.39	72°24.93	10.1'	27°27.69	-3.2' 54.1'
4		238°21.60	12.83	86°54.03	10.1'	27°24.49	-3.3' 54.1'
5		253°21.61	12.26	101°23.15	10.1'	27°21.15	-3.5' 54.1'
6		268°21.61	N19°11.69	115°52.30	10.2'	S27°17.67	-3.6' 54.1'
7		283°21.62	11.13	130°21.47	10.2'	27°14.07	-3.7' 54.2'
8		298°21.63	10.56	144°50.67	10.2'	27°10.33	-3.9' 54.2'
9		313°21.64	· · 9.99	159°19.89	10.2'	27°6.46	-4.0' 54.2'
10		328°21.64	9.43	173°49.14	10.3'	27°2.46	-4.1' 54.2'
11		343°21.65	8.86	188°18.41	10.3'	26°58.33	-4.3' 54.2'
12		358°21.66	N19°8.29	202°47.72	10.3'	S26°54.06	-4.4' 54.2'
13		13°21.67	7.72	217°17.06	10.4'	26°49.67	-4.5' 54.2'
14		28°21.68	7.15	231°46.42	10.4'	26°45.14	-4.7' 54.2'
15		43°21.69	· · 6.58	246°15.82	10.4'	26°40.49	-4.8' 54.2'
16		58°21.70	6.01	260°45.25	10.5'	26°35.70	-4.9' 54.2'
17		73°21.71	5.44	275°14.72	10.5'	26°30.79	-5.0' 54.2'
18		88°21.72	N19°4.86	289°44.22	10.5'	S26°25.74	-5.2' 54.2'
19		103°21.73	4.29	304°13.76	10.6'	26°20.57	-5.3' 54.3'
20		118°21.74	3.72	318°43.33	10.6'	26°15.28	-5.4' 54.3'
21		133°21.75	· · 3.14	333°12.94	10.6'	26°9.85	-5.6' 54.3'
22		148°21.76	2.57	347°42.58	10.7'	26°4.30	-5.7' 54.3'
23		163°21.78	1.99	2°12.27	10.7'	25°58.62	-5.8' 54.3'
		SD = 15.7' $d = -0.6'$		SD = 14.8'			

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		178°21.79	N19°1.42	16°41.99	10.8'	S25°52.82	-5.9' 54.3'
1		193°21.80	0.84	31°11.76	10.8'	25°46.89	-6.1' 54.3'
2		208°21.81	19°0.26	45°41.56	10.8'	25°40.84	-6.2' 54.3'
3		223°21.82	18°59.69	60°11.41	10.9'	25°34.66	-6.3' 54.3'
4		238°21.84	59.11	74°41.30	10.9'	25°28.36	-6.4' 54.3'
5		253°21.85	58.53	89°11.23	11.0'	25°21.94	-6.5' 54.4'
6		268°21.86	N18°57.95	103°41.21	11.0'	S25°15.39	-6.7' 54.4'
7		283°21.88	57.37	118°11.23	11.1'	25°8.73	-6.8' 54.4'
8		298°21.89	56.79	132°41.29	11.1'	25°1.94	-6.9' 54.4'
9		313°21.91	· · 56.21	147°11.40	11.2'	24°55.03	-7.0' 54.4'
10		328°21.92	55.63	161°41.56	11.2'	24°48.00	-7.1' 54.4'
11		343°21.94	55.05	176°11.76	11.2'	24°40.86	-7.3' 54.4'
12		358°21.95	N18°54.47	190°42.01	11.3'	S24°33.59	-7.4' 54.4'
13		13°21.97	53.89	205°12.31	11.3'	24°26.21	-7.5' 54.5'
14		28°21.98	53.30	219°42.65	11.4'	24°18.71	-7.6' 54.5'
15		43°22.00	· · 52.72	234°13.05	11.4'	24°11.10	-7.7' 54.5'
16		58°22.01	52.13	248°43.49	11.5'	24°3.37	-7.8' 54.5'
17		73°22.03	51.55	263°13.98	11.5'	23°55.52	-8.0' 54.5'
18		88°22.05	N18°50.96	277°44.52	11.6'	S23°47.56	-8.1' 54.5'
19		103°22.06	50.38	292°15.11	11.6'	23°39.49	-8.2' 54.5'
20		118°22.08	49.79	306°45.75	11.7'	23°31.30	-8.3' 54.5'
21		133°22.10	· · 49.21	321°16.44	11.7'	23°23.01	-8.4' 54.6'
22		148°22.12	48.62	335°47.18	11.8'	23°14.60	-8.5' 54.6'
23		163°22.14	48.03	350°17.97	11.8'	23°6.08	-8.6' 54.6'
		SD = 15.7' $d = -0.6'$		SD = 14.8'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		178°22.15	N18°47.44	4°48.82	11.9'	S22°57.45	-8.7' 54.6'
1		193°22.17	46.85	19°19.71	11.9'	22°48.71	-8.8' 54.6'
2		208°22.19	46.26	33°50.66	12.0'	22°39.86	-9.0' 54.6'
3		223°22.21	· · 45.67	48°21.66	12.0'	22°30.91	-9.1' 54.6'
4		238°22.23	45.08	62°52.71	12.1'	22°21.85	-9.2' 54.6'
5		253°22.25	44.49	77°23.81	12.2'	22°12.68	-9.3' 54.7'
6		268°22.27	N18°43.90	91°54.96	12.2'	S22°3.41	-9.4' 54.7'
7		283°22.29	43.31	106°26.17	12.3'	21°54.04	-9.5' 54.7'
8		298°22.31	42.71	120°57.43	12.3'	21°44.56	-9.6' 54.7'
9		313°22.33	· · 42.12	135°28.74	12.4'	21°34.98	-9.7' 54.7'
10		328°22.35	41.53	150°0.10	12.4'	21°25.30	-9.8' 54.7'
11		343°22.37	40.93	164°31.52	12.5'	21°15.51	-9.9' 54.7'
12		358°22.39	N18°40.34	179°2.98	12.5'	S21°5.63	-10.0' 54.8'
13		13°22.42	39.74	193°34.50	12.6'	20°55.64	-10.1' 54.8'
14		28°22.44	39.15	208°6.07	12.6'	20°45.56	-10.2' 54.8'
15		43°22.46	· · 38.55	222°37.70	12.7'	20°35.38	-10.3' 54.8'
16		58°22.48	37.95	237°9.37	12.7'	20°25.11	-10.4' 54.8'
17		73°22.51	37.36	251°41.10	12.8'	20°14.73	-10.5' 54.8'
18		88°22.53	N18°36.76	266°12.88	12.8'	S20°4.27	-10.6' 54.9'
19		103°22.55	36.16	280°44.71	12.9'	19°53.71	-10.7' 54.9'
20		118°22.58	35.56	295°16.59	12.9'	19°43.05	-10.7' 54.9'
21		133°22.60	· · 34.96	309°48.52	13.0'	19°32.30	-10.8' 54.9'
22		148°22.62	34.36	324°20.51	13.0'	19°21.46	-10.9' 54.9'
23		163°22.65	33.76	338°52.54	13.1'	19°10.53	-11.0' 54.9'
		SD = 15.7' $d = -0.6'$		SD = 14.9'			

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

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

Day	Sun		Mer. Pass	Moon		Age 13-15 94-100%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
27	06:34	06:33	12:07	22:51	10:26	

July 30, 31, 01 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	307°38.95		134°57.68	N03°19.24	226°40.34	N23°14.70	178°37.10	N19°6.10	293°6.16	N03°29.23		Alpheratz	357°33.21 29°14.23
1	322°41.42		149°57.82	18.02	241°40.96	14.84	193°38.99	5.97	308°8.63	29.22		Ankaa	353°5.64 -42°9.37
2	337°43.88		164°57.95	16.79	256°41.59	14.98	208°40.89	5.83	323°11.10	29.20		Schedar	349°29.28 56°40.84
3	352°46.35		179°58.09	· · 15.57	271°42.21	· · 15.12	223°42.79	· · 5.69	338°13.57	· · 29.19		Diphda	348°45.84 -17°50.21
4	7°48.81		194°58.23	14.35	286°42.84	15.26	238°44.68	5.56	353°16.05	29.17		Achernar	335°19.09 -57°5.72
5	22°51.27		209°58.37	13.13	301°43.46	15.39	253°46.58	5.42	8°18.52	29.15		Hamal	327°49.69 23°35.28
6	37°53.74		224°58.51	N03°11.91	316°44.09	N23°15.53	268°48.47	N19°5.29	23°20.99	N03°29.14		Polaris	313°26.85 89°22.24
7	52°56.20		239°58.65	10.69	331°44.71	15.67	283°50.37	5.15	38°23.47	29.12		Acamar	315°10.85 -40°11.55
8	67°58.67		254°58.79	9.47	346°45.34	15.80	298°52.27	5.02	53°25.94	29.10		Menkar	314°4.83 4°11.74
9	83°1.13		269°58.93	· · 8.24	1°45.96	· · 15.94	313°54.16	· · 4.88	68°28.41	· · 29.09		Mirfak	308°26.51 49°57.16
10	98°3.59		284°59.07	7.02	16°46.59	16.08	328°56.06	4.74	83°30.89	29.07		Aldebaran	290°38.30 16°33.78
11	113°6.06		299°59.21	5.80	31°47.22	16.21	343°57.95	4.61	98°33.36	29.06		Rigel	281°2.84 -8°10.12
12	128°8.52		314°59.36	N03°4.58	46°47.84	N23°16.35	358°59.85	N19°4.47	113°35.84	N03°29.04		Capella	280°20.28 46°1.35
13	143°10.99		329°59.50	3.36	61°48.47	16.48	14°1.75	4.34	128°38.31	29.02		Bellatrix	278°21.71 6°22.49
14	158°13.45		344°59.64	2.13	76°49.09	16.62	29°3.64	4.20	143°40.78	29.01		Elnath	278°0.48 28°37.74
15	173°15.91		359°59.79	03°0.91	91°49.72	· · 16.75	44°5.54	· · 4.06	158°43.26	· · 28.99		Alnilam	275°36.65 -1°11.00
16	188°18.38		14°59.93	02°59.69	106°50.35	16.88	59°7.44	3.93	173°45.73	28.97		Betelgeuse	270°50.94 7°24.78
17	203°20.84		30°0.08	58.47	121°50.97	17.02	74°9.33	3.79	188°48.21	28.95		Canopus	263°52.29 -52°42.36
18	218°23.31		45°0.23	N02°57.24	136°51.60	N23°17.15	89°11.23	N19°3.66	203°50.68	N03°28.94		Sirius	258°25.40 -16°45.03
19	233°25.77		60°0.37	56.02	151°52.23	17.28	104°13.12	3.52	218°53.16	28.92		Adhara	255°5.19 -29°0.35
20	248°28.24		75°0.52	54.80	166°52.85	17.41	119°15.02	3.39	233°55.63	28.90		Procyon	244°49.79 5°9.46
21	263°30.70		90°0.67	· · 53.58	181°53.48	· · 17.55	134°16.92	· · 3.25	248°58.11	· · 28.89		Pollux	243°16.08 27°57.72
22	278°33.16		105°0.82	52.35	196°54.10	17.68	149°18.81	3.11	264°0.59	28.87		Avior	234°14.86 -59°35.63
23	293°35.63		120°0.97	51.13	211°54.73	17.81	164°20.71	2.98	279°3.06	28.85		Suhail	222°45.80 -43°32.40
Mer.pass. 03:29		ν0.1' d-1.2' m-4.26		ν0.6' d0.1' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.64					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	308°38.09		135°1.12	N02°49.91	226°55.36	N23°17.94	179°22.61	N19°2.84	294°5.54	N03°28.83		Miaplacidus	221°38.95 -69°49.61
1	323°40.56		150°1.27	48.68	241°55.99	18.07	194°24.50	2.71	309°8.01	28.82		Alphard	217°46.79 -8°46.40
2	338°43.02		165°1.42	47.46	256°56.61	18.20	209°26.40	2.57	324°10.49	28.80		Regulus	207°33.35 11°50.29
3	353°45.48		180°1.57	· · 46.24	271°57.24	· · 18.33	224°28.30	· · 2.43	339°12.97	· · 28.78		Dubhe	193°39.94 61°36.62
4	8°47.95		195°1.72	45.02	286°57.87	18.46	239°30.19	2.30	354°15.44	28.76		Denebola	182°23.83 14°25.49
5	23°50.41		210°1.87	43.79	301°58.49	18.59	254°32.09	2.16	9°17.92	28.75		Gienah	175°42.42 -17°41.44
6	38°52.88		225°2.03	N02°42.57	316°59.12	N23°18.72	269°33.98	N19°2.03	24°20.40	N03°28.73		Acrux	172°58.99 -63°15.06
7	53°55.34		240°2.18	41.35	331°59.75	18.84	284°35.88	1.89	39°22.87	28.71		Gacrux	171°50.47 -57°15.98
8	68°57.80		255°2.34	40.12	347°0.38	18.97	299°37.78	1.75	54°25.35	28.69		Alioth	166°12.04 55°49.16
9	84°0.27		270°2.49	· · 38.90	2°1.00	· · 19.10	314°39.67	· · 1.62	69°27.83	· · 28.67		Spica	158°21.00 -11°18.04
10	99°2.73		285°2.65	37.68	17°1.63	19.23	329°41.57	1.48	84°30.31	28.66		Alkaid	152°51.05 49°11.06
11	114°5.20		300°2.80	36.45	32°2.26	19.35	344°43.47	1.34	99°32.78	28.64		Hadar	148°34.19 -60°30.35
12	129°7.66		315°2.96	N02°35.23	47°2.89	N23°19.48	359°45.36	N19°1.21	114°35.26	N03°28.62		Menkent	147°56.10 -36°30.22
13	144°10.13		330°3.12	34.01	62°3.51	19.61	14°47.26	1.07	129°37.74	28.60		Arcturus	145°46.73 19°2.76
14	159°12.59		345°3.27	32.78	77°4.14	19.73	29°49.16	0.94	144°40.22	28.58		Rigil Kent.	139°38.45 -60°56.99
15	174°15.05		0°3.43	· · 31.56	92°4.77	· · 19.86	44°51.05	· · 0.80	159°42.70	· · 28.57		Kochab	137°19.69 74°3.01
16	189°17.52		15°3.59	30.34	107°5.40	19.98	59°52.95	0.66	174°45.18	28.55		Zuben'ubi	136°54.52 -16°9.19
17	204°19.98		30°3.75	29.11	122°6.03	20.11	74°54.85	0.53	189°47.65	28.53		Alphecca	126°2.52 26°37.67
18	219°22.45		45°3.91	N02°27.89	137°6.65	N23°20.23	89°56.74	N19°0.39	204°50.13	N03°28.51		Antares	112°14.03 -26°29.51
19	234°24.91		60°4.07	26.66	152°7.28	20.36	104°58.64	0.25	219°52.61	28.49		Atria	107°6.70 -69°4.70
20	249°27.37		75°4.23	25.44	167°7.91	20.48	120°0.54	0.12	234°55.09	28.47		Sabik	102°1.05 -15°45.46
21	264°29.84		90°4.40	· · 24.22	182°8.54	· · 20.60	135°2.43	18°59.98	249°57.57	· · 28.45		Shaula	96°8.28 -37°7.43
22	279°32.30		105°4.56	22.99	197°9.17	20.73	150°4.33	18°59.84	265°0.05	28.43		Rasalhague	95°57.08 12°32.55
23	294°34.77		120°4.72	21.77	212°9.80	20.85	165°6.23	59.71	280°2.53	28.42		Eltanin	90°41.15 51°29.28
Mer.pass. 03:25		ν0.2' d-1.2' m-4.26		ν0.6' d0.1' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.64					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	309°37.23		135°4.89	N02°20.55	227°10.42	N23°20.97	180°8.12	N18°59.57	295°5.01	N03°28.40		Al Na'ir	27°30.85 -46°49.71
1	324°39.69		150°5.05	19.32	242°11.05	21.09	195°10.02	59.44	310°7.49	28.38		Fomalhaut	15°12.78 -29°28.65
2	339°42.16		165°5.21	18.10	257°11.68	21.21	210°11.92	59.30	325°9.97	28.36		Scheat	13°43.65 28°13.65
3	354°44.62		180°5.38	· · 16.87	272°12.31	· · 21.34	225°13.82	· · 59.16	340°12.45	· · 28.34		Markab	13°28.34 15°20.98
4	9°47.09		195°5.55	15.65	287°12.94	21.46	240°15.71	59.03	355°14.93	28.32			
5	24°49.55		210°5.71	14.42	302°13.57	21.58	255°17.61	58.89	10°17.41	28.30			
6	39°52.01		225°5.88	N02°13.20	317°14.20	N23°21.70	270°19.51	N18°58.75	25°19.89	N03°28.28			
7	54°54.48		240°6.05	11.98	332°14.83	21.82	285°21.40	58.62	40°22.38	28.26			
8	69°56.94		255°6.21	10.75	347°15.46	21.94	300°23.30	58.48	55°24.86	28.24			
9	84°59.41		270°6.38	· · 9.53	2°16.09	· · 22.05	315°25.20	· · 58.34	70°27.34	· · 28.22			
10	100°1.87		285°6.55	8.30	17°16.72	22.17	330°27.09	58.21	85°29.82	28.20			
11	115°4.33		300°6.72	7.08	32°17.35	22.29	345°28.99	58.07	100°32.30	28.18			
12	130°6.80		315°6.89	N02°5.86	47°17.97	N23°22.41	0°30.89	N18°57.93	115°34.78	N03°28.16			
13													

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.67	N18°33.16	353°24.63	13.1'	S18°59.52	-11.1'	54.9'
1	193°22.70	32.56	7°56.76	13.2'	18°48.41	-11.2'	55.0'
2	208°22.72	31.95	22°28.94	13.2'	18°37.21	-11.3'	55.0'
3	223°22.75	· · 31.35	37°1.17	13.3'	18°25.93	-11.4'	55.0'
4	238°22.77	30.75	51°33.46	13.3'	18°14.56	-11.5'	55.0'
5	253°22.80	30.14	66°5.79	13.4'	18°3.10	-11.5'	55.0'
6	268°22.83	N18°29.54	80°38.17	13.4'	S17°51.56	-11.6'	55.0'
7	283°22.85	28.93	95°10.59	13.5'	17°39.94	-11.7'	55.1'
8	298°22.88	28.33	109°43.06	13.5'	17°28.23	-11.8'	55.1'
9	313°22.91	· · 27.72	124°15.58	13.6'	17°16.44	-11.9'	55.1'
10	328°22.93	27.12	138°48.15	13.6'	17°4.57	-11.9'	55.1'
11	343°22.96	26.51	153°20.76	13.7'	16°52.62	-12.0'	55.1'
12	358°22.99	N18°25.90	167°53.42	13.7'	S16°40.59	-12.1'	55.1'
13	13°23.02	25.29	182°26.13	13.7'	16°28.49	-12.2'	55.2'
14	28°23.04	24.69	196°58.87	13.8'	16°16.30	-12.3'	55.2'
15	43°23.07	· · 24.08	211°31.67	13.8'	16°4.04	-12.3'	55.2'
16	58°23.10	23.47	226°4.50	13.9'	15°51.71	-12.4'	55.2'
17	73°23.13	22.86	240°37.38	13.9'	15°39.29	-12.5'	55.2'
18	88°23.16	N18°22.25	255°10.30	14.0'	S15°26.81	-12.6'	55.3'
19	103°23.19	21.63	269°43.26	14.0'	15°14.25	-12.6'	55.3'
20	118°23.22	21.02	284°16.26	14.0'	15°1.62	-12.7'	55.3'
21	133°23.25	· · 20.41	298°49.31	14.1'	14°48.92	-12.8'	55.3'
22	148°23.28	19.80	313°22.39	14.1'	14°36.15	-12.8'	55.3'
23	163°23.31	19.18	327°55.51	14.2'	14°23.31	-12.9'	55.3'
SD = 15.7'		$d = -0.6'$	SD = 15.0'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°23.34	N18°18.57	342°28.67	14.2'	S14°10.40	-13.0'	55.4'
1	193°23.37	17.96	357°1.87	14.2'	13°57.43	-13.0'	55.4'
2	208°23.40	17.34	11°35.11	14.3'	13°44.39	-13.1'	55.4'
3	223°23.44	· · 16.73	26°8.38	14.3'	13°31.28	-13.2'	55.4'
4	238°23.47	16.11	40°41.68	14.3'	13°18.11	-13.2'	55.4'
5	253°23.50	15.49	55°15.03	14.4'	13°4.87	-13.3'	55.5'
6	268°23.53	N18°14.88	69°48.40	14.4'	S12°51.57	-13.4'	55.5'
7	283°23.57	14.26	84°21.81	14.4'	12°38.21	-13.4'	55.5'
8	298°23.60	13.64	98°55.26	14.5'	12°24.79	-13.5'	55.5'
9	313°23.63	· · 13.02	113°28.73	14.5'	12°11.31	-13.5'	55.5'
10	328°23.67	12.40	128°2.24	14.5'	11°57.77	-13.6'	55.5'
11	343°23.70	11.78	142°35.77	14.6'	11°44.18	-13.7'	55.6'
12	358°23.73	N18°11.16	157°9.34	14.6'	S11°30.52	-13.7'	55.6'
13	13°23.77	10.54	171°42.93	14.6'	11°16.81	-13.8'	55.6'
14	28°23.80	9.92	186°16.55	14.6'	11°3.04	-13.8'	55.6'
15	43°23.84	· · 9.30	200°50.20	14.7'	10°49.22	-13.9'	55.6'
16	58°23.87	8.68	215°23.88	14.7'	10°35.35	-13.9'	55.7'
17	73°23.91	8.06	229°57.58	14.7'	10°21.42	-14.0'	55.7'
18	88°23.94	N18°7.43	244°31.30	14.7'	S10°7.44	-14.0'	55.7'
19	103°23.98	6.81	259°5.05	14.8'	09°53.41	-14.1'	55.7'
20	118°24.02	6.19	273°38.82	14.8'	09°39.33	-14.1'	55.7'
21	133°24.05	· · 5.56	288°12.61	14.8'	09°25.21	-14.2'	55.8'
22	148°24.09	4.94	302°46.42	14.8'	09°11.03	-14.2'	55.8'
23	163°24.13	4.31	317°20.25	14.9'	08°56.81	-14.3'	55.8'
SD = 15.7'		$d = -0.6'$	SD = 15.1'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.16	N18°3.68	331°54.11	14.9'	S08°42.54	-14.3'	55.8'
1	193°24.20	3.06	346°27.98	14.9'	08°28.23	-14.4'	55.8'
2	208°24.24	2.43	1°1.86	14.9'	08°13.87	-14.4'	55.9'
3	223°24.28	· · 1.80	15°35.76	14.9'	07°59.47	-14.4'	55.9'
4	238°24.31	1.17	30°9.68	14.9'	07°45.03	-14.5'	55.9'
5	253°24.35	18°0.54	44°43.61	14.9'	07°30.54	-14.5'	55.9'
6	268°24.39	N17°59.92	59°17.56	15.0'	S07°16.02	-14.6'	55.9'
7	283°24.43	59.29	73°51.51	15.0'	07°1.45	-14.6'	56.0'
8	298°24.47	58.66	88°25.48	15.0'	06°46.85	-14.6'	56.0'
9	313°24.51	· · 58.02	102°59.46	15.0'	06°32.21	-14.7'	56.0'
10	328°24.55	57.39	117°33.44	15.0'	06°17.54	-14.7'	56.0'
11	343°24.59	56.76	132°7.44	15.0'	06°2.82	-14.7'	56.0'
12	358°24.63	N17°56.13	146°41.44	15.0'	S05°48.08	-14.8'	56.1'
13	13°24.67	55.50	161°15.45	15.0'	05°33.30	-14.8'	56.1'
14	28°24.71	54.86	175°49.46	15.0'	05°18.49	-14.8'	56.1'
15	43°24.75	· · 54.23	190°23.47	15.0'	05°3.64	-14.9'	56.1'
16	58°24.79	53.59	204°57.49	15.0'	04°48.77	-14.9'	56.1'
17	73°24.83	52.96	219°31.51	15.0'	04°33.86	-14.9'	56.2'
18	88°24.88	N17°52.32	234°5.53	15.0'	S04°18.93	-15.0'	56.2'
19	103°24.92	51.69	248°39.55	15.0'	04°3.96	-15.0'	56.2'
20	118°24.96	51.05	263°13.57	15.0'	03°48.97	-15.0'	56.2'
21	133°25.00	· · 50.41	277°47.59	15.0'	03°33.96	-15.0'	56.3'
22	148°25.05	49.78	292°21.60	15.0'	03°18.92	-15.1'	56.3'
23	163°25.09	49.14	306°55.61	15.0'	03°3.86	-15.1'	56.3'
SD = 15.8'		$d = -0.6'$	SD = 15.2'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 16-18 100-94%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
30	06:29	06:28	12:06	00:27	12:50	
31	06:27	06:25	12:06	01:12	13:34	
01	06:23	06:21	12:06	01:56	14:17	

August 02, 03, 04 UT (Sun., Mon., Tue.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	310°36.37	135°8.98	N01°51.16	227°25.54	N23°23.80	180°53.66	N18°56.29	296°4.58	N03°27.92	Alpheratz	357°33.19	29°14.24
1	325°38.83	150°9.16	49.94	242°26.17	23.91	195°55.55	56.15	311°7.06	27.90	Ankaa	353°5.62	-42°9.37
2	340°41.30	165°9.34	48.71	257°26.80	24.02	210°57.45	56.01	326°9.55	27.88	Schedar	349°29.26	56°40.86
3	355°43.76	180°9.52	· · 47.49	272°27.43	· · 24.14	225°59.35	· · 55.88	341°12.03	· · 27.86	Diphda	348°45.82	-17°50.21
4	10°46.22	195°9.70	46.26	287°28.06	24.25	241°1.25	55.74	356°14.52	27.84	Achernar	335°19.06	-57°5.72
5	25°48.69	210°9.88	45.04	302°28.69	24.36	256°3.14	55.60	11°17.00	27.82	Hamal	327°49.67	23°35.29
6	40°51.15	225°10.06	N01°43.81	317°29.32	N23°24.47	271°5.04	N18°55.47	26°19.49	N03°27.80	Polaris	313°25.41	89°22.24
7	55°53.62	240°10.24	42.59	332°29.95	24.58	286°6.94	55.33	41°21.97	27.77	Acamar	315°10.82	-40°11.54
8	70°56.08	255°10.42	41.36	347°30.58	24.69	301°8.84	55.19	56°24.46	27.75	Menkar	314°4.82	4°11.75
9	85°58.54	270°10.61	· · 40.14	2°31.22	· · 24.80	316°10.73	· · 55.05	71°26.94	· · 27.73	Mirfak	308°26.48	49°57.17
10	101°1.01	285°10.79	38.91	17°31.85	24.91	331°12.63	54.92	86°29.43	27.71	Aldebaran	290°38.29	16°33.78
11	116°3.47	300°10.97	37.69	32°32.48	25.02	346°14.53	54.78	101°31.91	27.69	Rigel	281°2.82	-8°10.11
12	131°5.94	315°11.16	N01°36.46	47°33.11	N23°25.13	1°16.43	N18°54.64	116°34.40	N03°27.67	Capella	280°20.26	46°1.35
13	146°8.40	330°11.34	35.24	62°33.74	25.24	16°18.32	54.50	131°36.89	27.65	Bellatrix	278°21.70	6°22.50
14	161°10.86	345°11.53	34.01	77°34.37	25.35	31°20.22	54.37	146°39.37	27.62	Elnath	278°0.46	28°37.74
15	176°13.33	0°11.71	· · 32.79	92°35.01	· · 25.46	46°22.12	· · 54.23	161°41.86	· · 27.60	Alnilam	275°36.63	-1°10.99
16	191°15.79	15°11.90	31.56	107°35.64	25.57	61°24.02	54.09	176°44.34	27.58	Betelgeuse	270°50.92	7°24.78
17	206°18.26	30°12.09	30.34	122°36.27	25.67	76°25.92	53.95	191°46.83	27.56	Canopus	263°52.27	-52°42.35
18	221°20.72	45°12.27	N01°29.11	137°36.90	N23°25.78	91°27.81	N18°53.82	206°49.32	N03°27.54	Sirius	258°25.39	-16°45.02
19	236°23.18	60°12.46	27.89	152°37.53	25.89	106°29.71	53.68	221°51.81	27.52	Adhara	255°5.18	-29°0.34
20	251°25.65	75°12.65	26.66	167°38.17	25.99	121°31.61	53.54	236°54.29	27.49	Procyon	244°49.78	5°9.47
21	266°28.11	90°12.84	· · 25.44	182°38.80	· · 26.10	136°33.51	· · 53.40	251°56.78	· · 27.47	Pollux	243°16.07	27°57.72
22	281°30.58	105°13.03	24.22	197°39.43	26.21	151°35.40	53.27	266°59.27	27.45	Avior	234°14.86	-59°35.61
23	296°33.04	120°13.22	22.99	212°40.06	26.31	166°37.30	53.13	282°1.75	27.43	Suhail	222°45.80	-43°32.38
Mer.pass. 03:17		ν0.2' d-1.2' m-4.28		ν0.6' d0.1' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.63				
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	311°35.50	135°13.41	N01°21.77	227°40.70	N23°26.42	181°39.20	N18°52.99	297°4.24	N03°27.41	Miaplacidus	221°38.96	-69°49.60
1	326°37.97	150°13.60	20.54	242°41.33	26.52	196°41.10	52.85	312°6.73	27.38	Alphard	217°46.79	-8°46.40
2	341°40.43	165°13.79	19.32	257°41.96	26.63	211°43.00	52.72	327°9.22	27.36	Regulus	207°33.36	11°50.29
3	356°42.90	180°13.99	· · 18.09	272°42.59	· · 26.73	226°44.89	· · 52.58	342°11.71	· · 27.34	Dubhe	193°39.96	61°36.61
4	11°45.36	195°14.18	16.87	287°43.23	26.83	241°46.79	52.44	357°14.20	27.32	Denebola	182°23.84	14°25.49
5	26°47.83	210°14.37	15.64	302°43.86	26.94	256°48.69	52.30	12°16.68	27.29	Gienah	175°42.43	-17°41.43
6	41°50.29	225°14.57	N01°14.42	317°44.49	N23°27.04	271°50.59	N18°52.17	27°19.17	N03°27.27	Acrux	172°59.02	-63°15.05
7	56°52.75	240°14.76	13.19	332°45.13	27.14	286°52.49	52.03	42°21.66	27.25	Gacrux	171°50.49	-57°15.97
8	71°55.22	255°14.96	11.97	347°45.76	27.24	301°54.38	51.89	57°24.15	27.23	Alioth	166°12.06	55°49.16
9	86°57.68	270°15.16	· · 10.74	2°46.39	· · 27.35	316°56.28	· · 51.75	72°26.64	· · 27.20	Spica	158°21.02	-11°18.04
10	102°0.15	285°15.35	9.52	17°47.03	27.45	331°58.18	51.61	87°29.13	27.18	Alkaid	152°51.07	49°11.06
11	117°2.61	300°15.55	8.29	32°47.66	27.55	347°0.08	51.48	102°31.62	27.16	Hadar	148°34.22	-60°30.35
12	132°5.07	315°15.75	N01°7.07	47°48.29	N23°27.65	2°1.98	N18°51.34	117°34.11	N03°27.13	Menkent	147°56.11	-36°30.21
13	147°7.54	330°15.95	5.84	62°48.93	27.75	17°3.88	51.20	132°36.60	27.11	Arcturus	145°46.74	19°2.77
14	162°10.00	345°16.15	4.62	77°49.56	27.85	32°5.77	51.06	147°39.09	27.09	Rigel Kent.	139°38.48	-60°56.99
15	177°12.47	0°16.34	· · 3.39	92°50.20	· · 27.95	47°7.67	· · 50.92	162°41.58	· · 27.06	Kochab	137°19.74	74°3.01
16	192°14.93	15°16.54	2.17	107°50.83	28.05	62°9.57	50.79	177°44.07	27.04	Zuben'ubi	136°54.54	-16°9.18
17	207°17.39	30°16.75	01°0.94	122°51.46	28.15	77°11.47	50.65	192°46.56	27.02	Alphecca	126°2.53	26°37.67
18	222°19.86	45°16.95	N00°59.72	137°52.10	N23°28.25	92°13.37	N18°50.51	207°49.05	N03°26.99	Antares	112°14.04	-26°29.52
19	237°22.32	60°17.15	58.49	152°52.73	28.35	107°15.27	50.37	222°51.54	26.97	Atria	107°6.74	-69°4.71
20	252°24.79	75°17.35	57.27	167°53.37	28.44	122°17.17	50.23	237°54.03	26.95	Sabik	102°1.06	-15°45.46
21	267°27.25	90°17.55	· · 56.04	182°54.00	· · 28.54	137°19.06	· · 50.10	252°56.52	· · 26.92	Shaula	96°8.29	-37°7.44
22	282°29.71	105°17.76	54.82	197°54.64	28.64	152°20.96	49.96	267°59.02	26.90	Rasalhague	95°57.09	12°32.55
23	297°32.18	120°17.96	53.59	212°55.27	28.74	167°22.86	49.82	283°1.51	26.88	Eltanin	90°41.16	51°29.29
Mer.pass. 03:13		ν0.2' d-1.2' m-4.29		ν0.6' d0.1' m1.30		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.62				
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	312°34.64	135°18.17	N00°52.37	227°55.91	N23°28.83	182°24.76	N18°49.68	298°4.00	N03°26.85	Kaus Aust.	83°30.44	-34°22.31
1	327°37.11	150°18.37	51.14	242°56.54	28.93	197°26.66	49.54	313°6.49	26.83	Vega	80°31.97	38°48.64
2	342°39.57	165°18.58	49.92	257°57.18	29.02	212°28.56	49.40	328°8.98	26.81	Nunki	75°45.80	-26°15.77
3	357°42.03	180°18.78	· · 48.69	272°57.81	· · 29.12	227°30.46	· · 49.27	343°11.48	· · 26.78	Altair	61°58.36	-69°56.43
4	12°44.50	195°18.99	47.47	287°58.45	29.21	242°32.35	49.13	358°13.97	26.76	Peacock	53°3.07	-56°38.87
5	27°46.96	210°19.20	46.24	302°59.08	29.31	257°34.25	48.99	13°16.46	26.73	Deneb	49°24.45	45°22.58
6	42°49.43	225°19.41	N00°45.02	317°59.72	N23°29.40	272°36.15	N18°48.85	28°18.95	N03°26.71	Enif	33°37.19	9°59.93
7	57°51.89	240°19.61	43.79	333°0.35	29.50	287°38.05	48.71	43°21.45	26.68	Al Na'ir	27°30.83	-46°49.72
8	72°54.35	255°19.82	42.57	348°0.99	29.59	302°39.95	48.57	58°23.94	26.66	Fomalhaut	15°12.77	-29°28.65
9	87°56.82	270°20.03	· · 41.34	3°1.62	· · 29.69	317°41.85	· · 48.44	73°26.43	· · 26.64	Scheat	13°43.64	28°13.66
10	102°59.28	285°20.24	40.12	18°2.26	29.78	332°43.75	48.30	88°28.93	26.61	Markab	13°28.32	15°20.99
11	118°1.75	300°20.45	38.89	33°2.89	29.87	347°45.65	48.16	103°31.42	26.59			
12												


h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.13	N17°48.50	321°29.61	15.0'	S02°48.77	-15.1'	56.3'
1	193°25.18	47.86	336°3.60	15.0'	02°33.66	-15.1'	56.3'
2	208°25.22	47.22	350°37.58	15.0'	02°18.53	-15.2'	56.4'
3	223°25.27	· · 46.58	5°11.56	15.0'	02°3.38	-15.2'	56.4'
4	238°25.31	45.94	19°45.52	15.0'	01°48.21	-15.2'	56.4'
5	253°25.35	45.30	34°19.48	14.9'	01°33.02	-15.2'	56.4'
6	268°25.40	N17°44.66	48°53.42	14.9'	S01°17.82	-15.2'	56.5'
7	283°25.44	44.02	63°27.34	14.9'	01°2.60	-15.2'	56.5'
8	298°25.49	43.38	78°1.25	14.9'	00°47.36	-15.2'	56.5'
9	313°25.54	· · 42.73	92°35.15	14.9'	00°32.11	-15.3'	56.5'
10	328°25.58	42.09	107°9.02	14.9'	00°16.85	-15.3'	56.5'
11	343°25.63	41.45	121°42.88	14.8'	S00°1.57	-15.3'	56.6'
12	358°25.67	N17°40.80	136°16.72	14.8'	N00°13.71	15.3'	56.6'
13	13°25.72	40.16	150°50.53	14.8'	00°29.01	15.3'	56.6'
14	28°25.77	39.51	165°24.33	14.8'	00°44.31	15.3'	56.6'
15	43°25.82	· · 38.86	179°58.10	14.7'	00°59.63	15.3'	56.7'
16	58°25.86	38.22	194°31.84	14.7'	01°14.94	15.3'	56.7'
17	73°25.91	37.57	209°5.56	14.7'	01°30.27	15.3'	56.7'
18	88°25.96	N17°36.92	223°39.25	14.7'	N01°45.60	15.3'	56.7'
19	103°26.01	36.28	238°12.91	14.6'	02°0.93	15.3'	56.7'
20	118°26.06	35.63	252°46.55	14.6'	02°16.27	15.3'	56.8'
21	133°26.10	· · 34.98	267°20.15	14.6'	02°31.61	15.3'	56.8'
22	148°26.15	34.33	281°53.72	14.5'	02°46.95	15.3'	56.8'
23	163°26.20	33.68	296°27.25	14.5'	03°2.29	15.3'	56.8'
SD = 15.8' $d = -0.6'$			SD = 15.4'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°26.25	N17°33.03	311°0.75	14.5'	N03°17.62	15.3'	56.9'
1	193°26.30	32.38	325°34.22	14.4'	03°32.96	15.3'	56.9'
2	208°26.35	31.73	340°7.65	14.4'	03°48.29	15.3'	56.9'
3	223°26.40	· · 31.07	354°41.04	14.3'	04°3.61	15.3'	56.9'
4	238°26.45	30.42	9°14.38	14.3'	04°18.93	15.3'	56.9'
5	253°26.50	29.77	23°47.69	14.3'	04°34.25	15.3'	57.0'
6	268°26.56	N17°29.11	38°20.96	14.2'	N04°49.55	15.3'	57.0'
7	283°26.61	28.46	52°54.18	14.2'	05°4.85	15.3'	57.0'
8	298°26.66	27.81	67°27.36	14.1'	05°20.13	15.3'	57.0'
9	313°26.71	· · 27.15	82°0.49	14.1'	05°35.40	15.3'	57.1'
10	328°26.76	26.50	96°33.57	14.0'	05°50.66	15.2'	57.1'
11	343°26.82	25.84	111°6.60	14.0'	06°5.91	15.2'	57.1'
12	358°26.87	N17°25.18	125°39.59	13.9'	N06°21.14	15.2'	57.1'
13	13°26.92	24.53	140°12.52	13.9'	06°36.36	15.2'	57.2'
14	28°26.97	23.87	154°45.40	13.8'	06°51.55	15.2'	57.2'
15	43°27.03	· · 23.21	169°18.23	13.8'	07°6.73	15.2'	57.2'
16	58°27.08	22.55	183°51.00	13.7'	07°21.89	15.1'	57.2'
17	73°27.14	21.89	198°23.71	13.7'	07°37.03	15.1'	57.3'
18	88°27.19	N17°21.24	212°56.37	13.6'	N07°52.14	15.1'	57.3'
19	103°27.24	20.58	227°28.96	13.5'	08°7.24	15.1'	57.3'
20	118°27.30	19.91	242°1.50	13.5'	08°22.30	15.0'	57.3'
21	133°27.35	· · 19.25	256°33.97	13.4'	08°37.35	15.0'	57.4'
22	148°27.41	18.59	271°6.39	13.3'	08°52.36	15.0'	57.4'
23	163°27.46	17.93	285°38.73	13.3'	09°7.35	15.0'	57.4'
SD = 15.8' $d = -0.7'$			SD = 15.5'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.52	N17°17.27	300°11.02	13.2'	N09°22.30	14.9'	57.4'
1	193°27.58	16.61	314°43.23	13.1'	09°37.23	14.9'	57.4'
2	208°27.63	15.94	329°15.38	13.1'	09°52.12	14.9'	57.5'
3	223°27.69	· · 15.28	343°47.45	13.0'	10°6.98	14.8'	57.5'
4	238°27.75	14.61	358°19.46	12.9'	10°21.81	14.8'	57.5'
5	253°27.80	13.95	12°51.40	12.9'	10°36.60	14.8'	57.5'
6	268°27.86	N17°13.28	27°23.26	12.8'	N10°51.35	14.7'	57.6'
7	283°27.92	12.62	41°55.04	12.7'	11°6.06	14.7'	57.6'
8	298°27.98	11.95	56°26.75	12.6'	11°20.73	14.6'	57.6'
9	313°28.03	· · 11.29	70°58.39	12.6'	11°35.36	14.6'	57.6'
10	328°28.09	10.62	85°29.94	12.5'	11°49.95	14.5'	57.7'
11	343°28.15	9.95	100°1.42	12.4'	12°4.50	14.5'	57.7'
12	358°28.21	N17°9.28	114°32.81	12.3'	N12°19.00	14.5'	57.7'
13	13°28.27	8.61	129°4.12	12.2'	12°33.45	14.4'	57.7'
14	28°28.33	7.95	143°35.35	12.1'	12°47.85	14.4'	57.8'
15	43°28.39	· · 7.28	158°6.50	12.1'	13°2.20	14.3'	57.8'
16	58°28.45	6.61	172°37.55	12.0'	13°16.50	14.2'	57.8'
17	73°28.51	5.93	187°8.53	11.9'	13°30.75	14.2'	57.8'
18	88°28.57	N17°5.26	201°39.41	11.8'	N13°44.95	14.1'	57.9'
19	103°28.63	4.59	216°10.20	11.7'	13°59.09	14.1'	57.9'
20	118°28.69	3.92	230°40.91	11.6'	14°13.17	14.0'	57.9'
21	133°28.75	· · 3.25	245°11.52	11.5'	14°27.19	14.0'	57.9'
22	148°28.81	2.57	259°42.04	11.4'	14°41.16	13.9'	58.0'
23	163°28.87	1.90	274°12.46	11.3'	14°55.06	13.8'	58.0'
SD = 15.8' $d = -0.7'$			SD = 15.7'				

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

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

Day	Sun		Mer. Pass	Moon		Age 19-21 89-72%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
02	06:19	06:17	12:06	02:39	15:00	
03	06:15	06:13	12:06	03:22	15:44	
04	06:10	06:07	12:06	04:07	16:30	

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August 05, 06, 07 UT (Wed., Thu., Fri.)

h	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	313°33.78	135°23.25	N00°22.98	228°11.17	N23°31.04	183°10.33	N18°46.36	299°3.85	N03°26.26					Alpheratz	357°33.17	29°14.25		
1	328°36.24	150°23.47	21.75	243°11.80	31.13	198°12.23	46.22	314°6.35	26.24					Ankaa	353°5.60	-42°9.37		
2	343°38.71	165°23.69	20.53	258°12.44	31.22	213°14.13	46.08	329°8.84	26.21					Schedar	349°29.23	56°40.87		
3	358°41.17	180°23.91	•• 19.30	273°13.08	•• 31.31	228°16.03	•• 45.94	344°11.34	•• 26.19					Diphda	348°45.81	-17°50.21		
4	13°43.64	195°24.13	18.08	288°13.72	31.39	243°17.93	45.80	359°13.83	26.16					Achernar	335°19.03	-57°5.72		
5	28°46.10	210°24.35	16.86	303°14.35	31.48	258°19.83	45.66	14°16.33	26.13					Hamal	327°49.65	23°35.29		
6	43°48.56	225°24.57	N00°15.63	318°14.99	N23°31.56	273°21.73	N18°45.52	29°18.83	N03°26.11					Polaris	313°23.74	89°22.24		
7	58°51.03	240°24.79	14.41	333°15.63	31.65	288°23.63	45.38	44°21.32	26.08					Acamar	315°10.80	-40°11.54		
8	73°53.49	255°25.01	13.18	348°16.27	31.74	303°25.53	45.24	59°23.82	26.06					Menkar	314°4.80	4°11.75		
9	88°55.96	270°25.24	•• 11.96	3°16.91	•• 31.82	318°27.43	•• 45.11	74°26.32	•• 26.03					Mirfak	308°26.45	49°57.17		
10	103°58.42	285°25.46	10.74	18°17.54	31.90	333°29.33	44.97	89°28.82	26.01					Aldebaran	290°38.27	16°33.79		
11	119°0.89	300°25.69	9.51	33°18.18	31.99	348°31.23	44.83	104°31.31	25.98					Rigel	281°2.80	-8°10.10		
12	134°3.35	315°25.91	N00°8.29	48°18.82	N23°32.07	3°33.13	N18°44.69	119°33.81	N03°25.95					Capella	280°20.23	46°1.34		
13	149°5.81	330°26.14	7.06	63°19.46	32.16	18°35.03	44.55	134°36.31	25.93					Bellatrix	278°21.68	6°22.50		
14	164°8.28	345°26.36	5.84	78°20.10	32.24	33°36.93	44.41	149°38.81	25.90					Elnath	278°0.45	28°37.74		
15	179°10.74	0°26.59	•• 4.62	93°20.73	•• 32.32	48°38.83	•• 44.27	164°41.30	•• 25.87					Alnilam	275°36.62	-1°10.99		
16	194°13.21	15°26.82	3.39	108°21.37	32.40	63°40.72	44.13	179°43.80	25.85					Betelgeuse	270°50.91	7°24.79		
17	209°15.67	30°27.05	2.17	123°22.01	32.49	78°42.62	43.99	194°46.30	25.82					Canopus	263°52.25	-52°42.34		
18	224°18.13	45°27.27	N00°0.94	138°22.65	N23°32.57	93°44.52	N18°43.85	209°48.80	N03°25.80					Sirius	258°25.37	-16°45.01		
19	239°20.60	60°27.50	S00°0.28	153°23.29	32.65	108°46.42	43.71	224°51.30	25.77					Adhara	255°5.17	-29°0.33		
20	254°23.06	75°27.73	1.50	168°23.93	32.73	123°48.32	43.57	239°53.80	25.74					Procyon	244°49.77	5°9.47		
21	269°25.53	90°27.96	•• 2.73	183°24.57	•• 32.81	138°50.22	•• 43.43	254°56.30	•• 25.72					Pollux	243°16.06	27°57.72		
22	284°27.99	105°28.19	3.95	198°25.21	32.89	153°52.12	43.30	269°58.80	25.69					Avior	234°14.85	-59°35.59		
23	299°30.45	120°28.42	5.17	213°25.85	32.97	168°54.02	43.16	285°1.30	25.66					Suhail	222°45.80	-43°32.37		
Mer.pass. 03:05			ν0.2' d-1.2' m-4.31			ν0.6' d0.1' m1.30			ν1.9' d-0.1' m-1.78			ν2.5' d-0.0' m0.61						
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	314°32.92	135°28.66	S00°6.40	228°26.49	N23°33.05	183°55.92	N18°43.02	300°3.79	N03°25.63					Miaplacidus	221°38.96	-69°49.58		
1	329°35.38	150°28.89	7.62	243°27.13	33.13	198°57.82	42.88	315°6.29	25.61					Alphard	217°46.79	-8°46.39		
2	344°37.85	165°29.12	8.84	258°27.77	33.21	213°59.72	42.74	330°8.79	25.58					Regulus	207°33.36	11°50.29		
3	359°40.31	180°29.36	•• 10.07	273°28.40	•• 33.29	229°1.62	•• 42.60	345°11.29	•• 25.55					Dubhe	193°39.97	61°36.60		
4	14°42.78	195°29.59	11.29	288°29.04	33.37	244°3.52	42.46	0°13.79	25.53					Denebola	182°23.85	14°25.49		
5	29°45.24	210°29.82	12.51	303°29.68	33.44	259°5.42	42.32	15°16.29	25.50					Giennah	175°42.44	-17°41.43		
6	44°47.70	225°30.06	S00°13.74	318°30.32	N23°33.52	274°7.32	N18°42.18	30°18.80	N03°25.47					Acrux	172°59.04	-63°15.04		
7	59°50.17	240°30.30	14.96	333°30.96	33.60	289°9.22	42.04	45°21.30	25.44					Gacrux	171°50.51	-57°15.96		
8	74°52.63	255°30.53	16.18	348°31.60	33.68	304°11.12	41.90	60°23.80	25.42					Alioth	166°12.09	55°49.15		
9	89°55.10	270°30.77	•• 17.41	3°32.25	•• 33.75	319°13.02	•• 41.76	75°26.30	•• 25.39					Spica	158°21.03	-11°18.03		
10	104°57.56	285°31.01	18.63	18°32.89	33.83	334°14.92	41.62	90°28.80	25.36					Alkaid	152°51.09	49°11.06		
11	120°0.02	300°31.24	19.85	33°33.53	33.90	349°16.82	41.48	105°31.30	25.33					Hadar	148°34.24	-60°30.34		
12	135°2.49	315°31.48	S00°21.07	48°34.17	N23°33.98	4°18.72	N18°41.34	120°33.80	N03°25.31					Menkent	147°56.13	-36°30.21		
13	150°4.95	330°31.72	22.30	63°34.81	34.05	19°20.63	41.20	135°36.30	25.28					Arcturus	145°46.75	19°2.77		
14	165°7.42	345°31.96	23.52	78°35.45	34.13	34°22.53	41.06	150°38.81	25.25					Rigel Kent.	139°38.51	-60°56.98		
15	180°9.88	0°32.20	•• 24.74	93°36.09	•• 34.20	49°24.43	•• 40.92	165°41.31	•• 25.22					Kochab	137°19.80	74°3.01		
16	195°12.35	15°32.44	25.96	108°36.73	34.28	64°26.33	40.78	180°43.81	25.20					Zuben'ubi	136°54.55	-16°9.18		
17	210°14.81	30°32.68	27.19	123°37.37	34.35	79°28.23	40.64	195°46.31	25.17					Alphecca	126°2.55	26°37.68		
18	225°17.27	45°32.93	S00°28.41	138°38.01	N23°34.42	94°30.13	N18°40.50	210°48.81	N03°25.14					Antares	112°14.06	-26°29.51		
19	240°19.74	60°33.17	29.63	153°38.65	34.50	109°32.03	40.36	225°51.32	25.11					Atria	107°6.77	-69°4.71		
20	255°22.20	75°33.41	30.85	168°39.30	34.57	124°33.93	40.22	240°53.82	25.08					Sabik	102°1.07	-15°45.45		
21	270°24.67	90°33.66	•• 32.08	183°39.94	•• 34.64	139°35.83	•• 40.08	255°56.32	•• 25.06					Shaula	96°8.30	-37°7.44		
22	285°27.13	105°33.90	33.30	198°40.58	34.71	154°37.73	39.95	270°58.83	25.03					Rasalhague	95°57.10	12°32.56		
23	300°29.59	120°34.15	34.52	213°41.22	34.79	169°39.63	39.81	286°1.33	25.00					Eltanin	90°41.18	51°29.30		
Mer.pass. 03:01			ν0.2' d1.2' m-4.32			ν0.6' d0.1' m1.30			ν1.9' d-0.1' m-1.78			ν2.5' d-0.0' m0.61						
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	315°32.06	135°34.39	S00°35.74	228°41.86	N23°34.86	184°41.53	N18°39.67	301°3.83	N03°24.97					Kaus Aust.	83°30.45	-34°22.32		
1	330°34.52	150°34.64	36.96	243°42.50	34.93	199°43.43	39.53	316°6.34	24.94					Vega	80°31.98	38°48.65		
2	345°36.99	165°34.88	38.19	258°43.15	35.00	214°45.33	39.39	331°8.84	24.91					Nunki	75°45.81	-26°15.77		
3	0°39.45	180°35.13	•• 39.41	273°43.79	•• 35.07	229°47.23	•• 39.25	346°11.34	•• 24.88					Altair	61°58.36	8°56.44		
4	15°41.92	195°35.38	40.63	288°44.43	35.14	244°49.13	39.11	1°13.85	24.86					Peacock	53°3.07	-56°38.88		
5	30°44.38	210°35.63	41.85	303°45.07	35.21	259°51.03	38.97	16°16.35	24.83					Deneb	49°24.44	45°22.59		
6	45°46.84	225°35.88	S00°43.07	318°45.72	N23°35.28	274°52.94	N18°38.83	31°18.86	N03°24.80					Enif	33°37.19	9°59.94		
7	60°49.31	240°36.12	44.30	333°46.36	35.35	289°54.84	38.69	46°21.36	24.77					Al Na'ir	27°30.82	-46°49.72		
8	75°51.77	255°36.37	45.52	348°47.00	35.41	304°56.74	38.55	61°23.87	24.74					Fomalhaut	15°12.76	-29°28.65		
9	90°54.24	270°36.63	•• 46.74	3°47.65	•• 35.48	319°58.64	•• 38.41	76°26.37	•• 24.71					Scheat	13°43.62	28°13.67		
10	105°56.70	285°36.88	47.96	18°48.29	35.55	335°0.54	38.27	91°28.88	24.68					Markab	13°28.31	15°21.00		
11	120°59.16	300°37.13	49.18	33°48.93	35.62	350°2.44	38.12	106°31.38	24.65									
12	136°1.63	315°37.38	S00°50.40	48°49.57	N23°35.68	5°4.34	N18°37.98	121°33.89	N03°24.62									
13	151°4.09	330°37.63	51.62	63°50.22	35.75	20°6.24	37.84	136°36.39	24.59									
14	166°6.56	345°37.89	52.84	78°50.86	35.82	35°8.14	37.70	151°38.90	24.57									

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.93	N17°1.23	288°42.79	11.2'	N15°8.90	13.8'	58.0'
1	193°29.00	17°0.55	303°13.02	11.1'	15°22.67	13.7'	58.0'
2	208°29.06	16°59.88	317°43.16	11.0'	15°36.38	13.6'	58.1'
3	223°29.12	· · 59.20	332°13.19	10.9'	15°50.02	13.6'	58.1'
4	238°29.18	58.53	346°43.13	10.8'	16°3.59	13.5'	58.1'
5	253°29.25	57.85	1°12.97	10.7'	16°17.09	13.4'	58.1'
6	268°29.31	N16°57.17	15°42.70	10.6'	N16°30.52	13.4'	58.2'
7	283°29.37	56.50	30°12.33	10.5'	16°43.87	13.3'	58.2'
8	298°29.44	55.82	44°41.86	10.4'	16°57.15	13.2'	58.2'
9	313°29.50	· · 55.14	59°11.28	10.3'	17°10.35	13.1'	58.2'
10	328°29.57	54.46	73°40.60	10.2'	17°23.47	13.0'	58.3'
11	343°29.63	53.78	88°9.81	10.1'	17°36.51	13.0'	58.3'
12	358°29.70	N16°53.10	102°38.91	10.0'	N17°49.47	12.9'	58.3'
13	13°29.76	52.42	117°7.91	9.9'	18°2.35	12.8'	58.3'
14	28°29.83	51.74	131°36.79	9.8'	18°15.14	12.7'	58.4'
15	43°29.89	· · 51.06	146°5.57	9.7'	18°27.84	12.6'	58.4'
16	58°29.96	50.38	160°34.23	9.6'	18°40.45	12.5'	58.4'
17	73°30.02	49.70	175°2.79	9.4'	18°52.97	12.4'	58.4'
18	88°30.09	N16°49.01	189°31.23	9.3'	N19°5.40	12.3'	58.5'
19	103°30.16	48.33	203°59.55	9.2'	19°17.74	12.2'	58.5'
20	118°30.22	47.65	218°27.76	9.1'	19°29.98	12.1'	58.5'
21	133°30.29	· · 46.96	232°55.86	9.0'	19°42.12	12.0'	58.5'
22	148°30.36	46.28	247°23.84	8.9'	19°54.17	11.9'	58.6'
23	163°30.43	45.59	261°51.71	8.7'	20°6.11	11.8'	58.6'
SD = 15.8'		$d = -0.7'$	SD = 15.8'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.49	N16°44.91	276°19.46	8.6'	N20°17.95	11.7'	58.6'
1	193°30.56	44.22	290°47.09	8.5'	20°29.68	11.6'	58.6'
2	208°30.63	43.54	305°14.61	8.4'	20°41.31	11.5'	58.7'
3	223°30.70	· · 42.85	319°42.01	8.3'	20°52.83	11.4'	58.7'
4	238°30.77	42.16	334°9.28	8.2'	21°4.24	11.3'	58.7'
5	253°30.84	41.47	348°36.44	8.0'	21°15.54	11.2'	58.7'
6	268°30.91	N16°40.79	3°3.48	7.9'	N21°26.72	11.1'	58.8'
7	283°30.98	40.10	17°30.40	7.8'	21°37.79	11.0'	58.8'
8	298°31.05	39.41	31°57.21	7.7'	21°48.74	10.8'	58.8'
9	313°31.12	· · 38.72	46°23.89	7.6'	21°59.58	10.7'	58.8'
10	328°31.19	38.03	60°50.45	7.4'	22°10.29	10.6'	58.8'
11	343°31.26	37.34	75°16.89	7.3'	22°20.88	10.5'	58.9'
12	358°31.33	N16°36.65	89°43.21	7.2'	N22°31.34	10.3'	58.9'
13	13°31.40	35.96	104°9.41	7.1'	22°41.68	10.2'	58.9'
14	28°31.47	35.26	118°35.49	7.0'	22°51.89	10.1'	58.9'
15	43°31.54	· · 34.57	133°1.44	6.8'	23°1.97	9.9'	59.0'
16	58°31.61	33.88	147°27.28	6.7'	23°11.92	9.8'	59.0'
17	73°31.69	33.18	161°53.00	6.6'	23°21.73	9.7'	59.0'
18	88°31.76	N16°32.49	176°18.60	6.5'	N23°31.41	9.5'	59.0'
19	103°31.83	31.80	190°44.07	6.4'	23°40.95	9.4'	59.1'
20	118°31.90	31.10	205°9.43	6.2'	23°50.35	9.3'	59.1'
21	133°31.98	· · 30.41	219°34.67	6.1'	23°59.61	9.1'	59.1'
22	148°32.05	29.71	233°59.79	6.0'	24°8.73	9.0'	59.1'
23	163°32.12	29.01	248°24.80	5.9'	24°17.70	8.8'	59.2'
SD = 15.8'		$d = -0.7'$	SD = 16.0'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.20	N16°28.32	262°49.68	5.8'	N24°26.53	8.7'	59.2'
1	193°32.27	27.62	277°14.45	5.7'	24°35.21	8.5'	59.2'
2	208°32.35	26.92	291°39.10	5.5'	24°43.74	8.4'	59.2'
3	223°32.42	· · 26.22	306°3.64	5.4'	24°52.11	8.2'	59.2'
4	238°32.50	25.53	320°28.06	5.3'	25°0.34	8.1'	59.3'
5	253°32.57	24.83	334°52.37	5.2'	25°8.40	7.9'	59.3'
6	268°32.65	N16°24.13	349°16.57	5.1'	N25°16.31	7.8'	59.3'
7	283°32.72	23.43	3°40.65	5.0'	25°24.06	7.6'	59.3'
8	298°32.80	22.73	18°4.62	4.9'	25°31.66	7.4'	59.4'
9	313°32.87	· · 22.03	32°28.48	4.8'	25°39.08	7.3'	59.4'
10	328°32.95	21.33	46°52.24	4.6'	25°46.35	7.1'	59.4'
11	343°33.03	20.62	61°15.88	4.5'	25°53.45	6.9'	59.4'
12	358°33.10	N16°19.92	75°39.42	4.4'	N26°0.38	6.8'	59.4'
13	13°33.18	19.22	90°2.86	4.3'	26°7.14	6.6'	59.5'
14	28°33.26	18.52	104°26.19	4.2'	26°13.73	6.4'	59.5'
15	43°33.34	· · 17.81	118°49.42	4.1'	26°20.15	6.2'	59.5'
16	58°33.41	17.11	133°12.55	4.0'	26°26.39	6.1'	59.5'
17	73°33.49	16.40	147°35.58	3.9'	26°32.46	5.9'	59.5'
18	88°33.57	N16°15.70	161°58.51	3.8'	N26°38.36	5.7'	59.6'
19	103°33.65	14.99	176°21.35	3.7'	26°44.07	5.5'	59.6'
20	118°33.73	14.29	190°44.09	3.7'	26°49.60	5.4'	59.6'
21	133°33.81	· · 13.58	205°6.75	3.6'	26°54.96	5.2'	59.6'
22	148°33.89	12.87	219°29.31	3.5'	27°0.13	5.0'	59.6'
23	163°33.97	12.17	233°51.78	3.4'	27°5.11	4.8'	59.7'
SD = 15.8'		$d = -0.7'$	SD = 16.1'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 22-24 62-40%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
05	06:04	06:01	12:06	04:55	17:21	
06	05:58	05:55	12:06	05:47	18:15	
07	05:51	05:48	12:06	06:45	19:15	

August 08, 09, 10 UT (Sat., Sun., Mon.)

	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	316°31.20	135°40.45	S01°5.05	228°57.30	N23°36.46	185°27.16	N18°36.30	302°3.96	N03°24.27	
1	331°33.66	150°40.71	6.27	243°57.95	36.52	200°29.06	36.16	317°6.47	24.24	
2	346°36.13	165°40.97	7.49	258°58.59	36.59	215°30.96	36.02	332°8.98	24.21	
3	1°38.59	180°41.23	· · 8.71	273°59.24	· · 36.65	230°32.86	· · 35.88	347°11.49	· · 24.18	
4	16°41.06	195°41.49	9.93	288°59.88	36.71	245°34.76	35.74	2°13.99	24.15	
5	31°43.52	210°41.76	11.15	304°0.53	36.77	260°36.66	35.60	17°16.50	24.12	
6	46°45.98	225°42.02	S01°12.37	319°1.17	N23°36.83	275°38.57	N18°35.46	32°19.01	N03°24.09	
7	61°48.45	240°42.28	13.59	334°1.82	36.89	290°40.47	35.32	47°21.52	24.06	
8	76°50.91	255°42.55	14.81	349°2.46	36.95	305°42.37	35.18	62°24.03	24.03	
9	91°53.38	270°42.81	· · 16.03	4°3.11	· · 37.01	320°44.27	· · 35.04	77°26.54	· · 24.00	
10	106°55.84	285°43.07	17.25	19°3.75	37.07	335°46.17	34.90	92°29.05	23.97	
11	121°58.31	300°43.34	18.47	34°4.40	37.13	350°48.07	34.76	107°31.56	23.93	
12	137°0.77	315°43.61	S01°19.69	49°5.05	N23°37.19	5°49.98	N18°34.61	122°34.06	N03°23.90	
13	152°3.23	330°43.87	20.91	64°5.69	37.25	20°51.88	34.47	137°36.57	23.87	
14	167°5.70	345°44.14	22.13	79°6.34	37.31	35°53.78	34.33	152°39.08	23.84	
15	182°8.16	0°44.41	· · 23.35	94°6.98	· · 37.36	50°55.68	· · 34.19	167°41.59	· · 23.81	
16	197°10.63	15°44.68	24.57	109°7.63	37.42	65°57.58	34.05	182°44.10	23.78	
17	212°13.09	30°44.94	25.78	124°8.28	37.48	80°59.49	33.91	197°46.61	23.75	
18	227°15.55	45°45.21	S01°27.00	139°8.92	N23°37.53	96°1.39	N18°33.77	212°49.12	N03°23.72	
19	242°18.02	60°45.48	28.22	154°9.57	37.59	111°3.29	33.63	227°51.63	23.69	
20	257°20.48	75°45.75	29.44	169°10.22	37.65	126°5.19	33.49	242°54.14	23.66	
21	272°22.95	90°46.03	· · 30.66	184°10.86	· · 37.70	141°7.10	· · 33.35	257°56.66	· · 23.62	
22	287°25.41	105°46.30	31.88	199°11.51	37.76	156°9.00	33.21	272°59.17	23.59	
23	302°27.88	120°46.57	33.10	214°12.16	37.81	171°10.90	33.07	288°1.68	23.56	
Mer.pass. 02:53		ν0.3' d1.2' m-4.34		ν0.6' d0.1' m1.29		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.60		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	317°30.34	135°46.84	S01°34.31	229°12.81	N23°37.87	186°12.80	N18°32.93	303°4.19	N03°23.53	
1	332°32.80	150°47.12	35.53	244°13.45	37.92	201°14.70	32.78	318°6.70	23.50	
2	347°35.27	165°47.39	36.75	259°14.10	37.97	216°16.61	32.64	333°9.21	23.47	
3	2°37.73	180°47.66	· · 37.97	274°14.75	· · 38.03	231°18.51	· · 32.50	348°11.72	· · 23.44	
4	17°40.20	195°47.94	39.19	289°15.40	38.08	246°20.41	32.36	3°14.23	23.40	
5	32°42.66	210°48.21	40.40	304°16.04	38.13	261°22.31	32.22	18°16.75	23.37	
6	47°45.13	225°48.49	S01°41.62	319°16.69	N23°38.19	276°24.22	N18°32.08	33°19.26	N03°23.34	
7	62°47.59	240°48.77	42.84	334°17.34	38.24	291°26.12	31.94	48°21.77	23.31	
8	77°50.05	255°49.04	44.06	349°17.99	38.29	306°28.02	31.80	63°24.28	23.28	
9	92°52.52	270°49.32	· · 45.27	4°18.64	· · 38.34	321°29.92	· · 31.66	78°26.80	· · 23.24	
10	107°54.98	285°49.60	46.49	19°19.29	38.39	336°31.83	31.52	93°29.31	23.21	
11	122°57.45	300°49.88	47.71	34°19.94	38.44	351°33.73	31.37	108°31.82	23.18	
12	137°59.91	315°50.16	S01°48.92	49°20.58	N23°38.49	6°35.63	N18°31.23	123°34.34	N03°23.15	
13	153°2.38	330°50.44	50.14	64°21.23	38.54	21°37.53	31.09	138°36.85	23.11	
14	168°4.84	345°50.72	51.36	79°21.88	38.59	36°39.44	30.95	153°39.36	23.08	
15	183°7.30	0°51.00	· · 52.57	94°22.53	· · 38.64	51°41.34	· · 30.81	168°41.88	· · 23.05	
16	198°9.77	15°51.28	53.79	109°23.18	38.69	66°43.24	30.67	183°44.39	23.02	
17	213°12.23	30°51.57	55.01	124°23.83	38.74	81°45.15	30.53	198°46.90	22.98	
18	228°14.70	45°51.85	S01°56.22	139°24.48	N23°38.79	96°47.05	N18°30.39	213°49.42	N03°22.95	
19	243°17.16	60°52.13	57.44	154°25.13	38.84	111°48.95	30.24	228°51.93	22.92	
20	258°19.62	75°52.42	58.66	169°25.78	38.88	126°50.86	30.10	243°54.45	22.89	
21	273°22.09	90°52.70	01°59.87	184°26.43	· · 38.93	141°52.76	· · 29.96	258°56.96	· · 22.85	
22	288°24.55	105°52.99	02°1.09	199°27.08	38.98	156°54.66	29.82	273°59.48	22.82	
23	303°27.02	120°53.27	2.30	214°27.73	39.03	171°56.56	29.68	289°1.99	22.79	
Mer.pass. 02:50		ν0.3' d1.2' m-4.35		ν0.6' d0.1' m1.29		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.59		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	318°29.48	135°53.56	S02°3.52	229°28.38	N23°39.07	186°58.47	N18°29.54	304°4.51	N03°22.76	
1	333°31.95	150°53.85	4.73	244°29.03	39.12	202°0.37	29.40	319°7.02	22.72	
2	348°34.41	165°54.14	5.95	259°29.68	39.16	217°2.27	29.26	334°9.54	22.69	
3	3°36.87	180°54.42	· · 7.16	274°30.33	· · 39.21	232°4.18	· · 29.11	349°12.05	· · 22.66	
4	18°39.34	195°54.71	8.38	289°30.98	39.25	247°6.08	28.97	4°14.57	22.62	
5	33°41.80	210°55.00	9.59	304°31.63	39.30	262°7.98	28.83	19°17.08	22.59	
6	48°44.27	225°55.29	S02°10.81	319°32.28	N23°39.34	277°9.89	N18°28.69	34°19.60	N03°22.56	
7	63°46.73	240°55.58	12.02	334°32.93	39.39	292°11.79	28.55	49°22.12	22.52	
8	78°49.20	255°55.88	13.24	349°33.59	39.43	307°13.69	28.41	64°24.63	22.49	
9	93°51.66	270°56.17	· · 14.45	4°34.24	· · 39.47	322°15.60	· · 28.27	79°27.15	· · 22.46	
10	108°54.12	285°56.46	15.67	19°34.89	39.51	337°17.50	28.12	94°29.66	22.42	
11	123°56.59	300°56.75	16.88	34°35.54	39.56	352°19.41	27.98	109°32.18	22.39	
12	138°59.05	315°57.05	S02°18.10	49°36.19	N23°39.60	7°21.31	N18°27.84	124°34.70	N03°22.35	
13	154°1.52	330°57.34	19.31	64°36.84	39.64	22°23.21	27.70	139°37.22	22.32	
14	169°3.98	345°57.64	20.52	79°37.50	39.68	37°25.12	27.56	154°39.73	22.29	
15	184°6.44	0°57.93	· · 21.74	94°38.15	· · 39.72	52°27.02	· · 27.42	169°42.25	· · 22.25	
16	199°8.91	15°58.23	22.95	109°38.80	39.76	67°28.92	27.27	184°44.77	22.22	
17	214°11.37	30°58.52	24.16	124°39.45	39.80	82°30.83	27.13	199°47.29	22.18	
18	229°13.84	45°58.82	S02°25.38	139°40.11	N23°39.84	97°32.73	N18°26.99	214°49.80	N03°22.15	
19	244°16.30	60°59.12	26.59	154°40.76	39.88	112°34.64	26.85	229°52.32	22.12	
20	259°18.77	75°59.42	27.80	169°41.41	39.92	127°36.54	26.71	244°54.84	22.08	
21	274°21.23	90°59.71	· · 29.02	184°42.06	· · 39.96	142°38.44	· · 26.57	259°57.36	· · 22.05	
22	289°23.69	106°0.01	30.23	199°42.72	40.00	157°40.35	26.42	274°59.88	22.01	
23	304°26.16	121°0.31	31.44	214°43.37	40.04	172°42.25	26.28	290°2.40	21.98	
Mer.pass. 02:46		ν0.3' d1.2' m-4.36		ν0.7' d0.0' m1.29		ν1.9' d-0.1' m-1.78		ν2.5' d-0.0' m0.59		

	SHA	Dec
Alpheratz	357°33.15	29°14.27
Ankaa	353°5.57	-42°9.37
Schedar	349°29.19	56°40.88
Diphda	348°45.78	-17°50.20
Achernar	335°19.00	-57°5.72
Hamal	327°49.62	23°35.30
Polaris	313°21.82	89°22.24
Acamar	315°10.77	-40°11.53
Menkar	314°4.77	4°11.76
Mirfak	308°26.41	49°57.17
Aldebaran	290°38.24	16°33.79
Rigel	281°2.78	-8°10.10
Capella	280°20.20	46°1.34
Bellatrix	278°21.65	6°22.50
Elnath	278°0.42	28°37.74
Alnilam	275°36.59	-1°10.98
Betelgeuse	270°50.88	7°24.79
Canopus	263°52.23	-52°42.33
Sirius	258°25.35	-16°45.01
Adhara	255°5.15	-29°0.32
Procyon	244°49.76	5°9.47
Pollux	243°16.04	27°57.71
Avior	234°14.84	-59°35.58
Suhail	222°45.79	-43°32.36
Miaplacidus	221°38.95	-69°49.57
Alphard	217°46.78	-8°46.39
Regulus	207°33.35	11°50.29
Dubhe	193°39.98	61°36.59
Denebola	182°23.85	14°25.49
Gienah	175°42.44	-17°41.42
Acrux	172°59.05	-63°15.04
Gacrux	171°50.52	-57°15.95
Alioth	166°12.10	55°49.14
Spica	158°21.03	-11°18.03
Alkaid	152°51.11	49°11.05
Hadar	148°34.26	-60°30.34
Menkent	147°56.14	-36°30.20
Arcturus	145°46.76	19°2.77
Rigel Kent.	139°38.53	-60°56.98
Kochab	137°19.87	74°3.00
Zuben'ubi	136°54.55	-16°9.18
Alphecca	126°2.56	26°37.68
Antares	112°14.06	-26°29.51
Atria	107°6.79	-69°4.72
Sabik	102°1.07	-15°45.45
Shaula	96°8.31	-37°7.44
Rasalhague	95°57.11	12°32.57
Eltanin	90°41.19	51°29.31
Kaus Aust.	83°30.44	-34°22.32
Vega	80°31.98	38°48.67
Nunki	75°45.80	-26°15.77
Altair	61°58.35	8°56.45
Peacock	53°3.06	-56°38.89
Deneb	49°24.44	45°22.61
Enif	33°37.17	9°59.95
Al Na'ir	27°30.80	-46°49.73
Fomalhaut	15°12.74	-29°28.65
Scheat	13°43.60	28°13.69
Markab	13°28.29	15°21.01
Aug 08 Sat	SHA	Mer.pass
Venus	179°9.25	14:57
Mars	272°26.10	08:44
Jupiter	228°55.96	11:37
Saturn	345°32.76	03:51
Aug 09 Sun	SHA	Mer

h		Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	178°34.05	N16°11.46		248°14.17	3.3'	N27°9.91	4.6'	59.7'
1	193°34.13	10.75		262°36.48	3.2'	27°14.52	4.4'	59.7'
2	208°34.21	10.04		276°58.70	3.1'	27°18.95	4.2'	59.7'
3	223°34.29	· · 9.33		291°20.84	3.1'	27°23.18	4.0'	59.7'
4	238°34.37	8.62		305°42.91	3.0'	27°27.23	3.9'	59.7'
5	253°34.45	7.91		320°4.90	2.9'	27°31.08	3.7'	59.8'
6	268°34.53	N16°7.20		334°26.82	2.8'	N27°34.74	3.5'	59.8'
7	283°34.61	6.49		348°48.67	2.8'	27°38.20	3.3'	59.8'
8	298°34.69	5.78		3°10.45	2.7'	27°41.47	3.1'	59.8'
9	313°34.78	· · 5.07		17°32.17	2.7'	27°44.54	2.9'	59.8'
10	328°34.86	4.36		31°53.83	2.6'	27°47.42	2.7'	59.8'
11	343°34.94	3.64		46°15.42	2.5'	27°50.10	2.5'	59.9'
12	358°35.02	N16°2.93		60°36.96	2.5'	N27°52.57	2.3'	59.9'
13	13°35.11	2.22		74°58.44	2.4'	27°54.85	2.1'	59.9'
14	28°35.19	1.50		89°19.88	2.4'	27°56.93	1.9'	59.9'
15	43°35.27	· · 0.79		103°41.26	2.3'	27°58.80	1.7'	59.9'
16	58°35.36	16°0.07		118°2.60	2.3'	28°0.47	1.5'	59.9'
17	73°35.44	15°59.36		132°23.89	2.3'	28°1.94	1.3'	60.0'
18	88°35.52	N15°58.64		146°45.15	2.2'	N28°3.20	1.1'	60.0'
19	103°35.61	57.93		161°6.36	2.2'	28°4.26	0.9'	60.0'
20	118°35.69	57.21		175°27.54	2.2'	28°5.11	0.6'	60.0'
21	133°35.78	· · 56.49		189°48.70	2.1'	28°5.76	0.4'	60.0'
22	148°35.86	55.78		204°9.82	2.1'	28°6.21	0.2'	60.0'
23	163°35.95	55.06		218°30.92	2.1'	28°6.44	0.0'	60.0'
SD = 15.8' $d = -0.7'$				SD = 16.3'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°36.04	N15°54.34	232°51.99	2.1'	N28°6.47	-0.2'	60.1'
1	193°36.12	53.62	247°13.05	2.0'	28°6.29	-0.4'	60.1'
2	208°36.21	52.90	261°34.09	2.0'	28°5.90	-0.6'	60.1'
3	223°36.29	· · 52.18	275°55.11	2.0'	28°5.31	-0.8'	60.1'
4	238°36.38	51.46	290°16.13	2.0'	28°4.51	-1.0'	60.1'
5	253°36.47	50.74	304°37.14	2.0'	28°3.50	-1.2'	60.1'
6	268°36.55	N15°50.02	318°58.14	2.0'	N28°2.28	-1.4'	60.1'
7	283°36.64	49.30	333°19.15	2.0'	28°0.85	-1.6'	60.1'
8	298°36.73	48.57	347°40.16	2.0'	27°59.22	-1.8'	60.1'
9	313°36.82	· · 47.85	2°1.17	2.0'	27°57.38	-2.0'	60.2'
10	328°36.91	47.13	16°22.19	2.0'	27°55.33	-2.3'	60.2'
11	343°36.99	46.41	30°43.22	2.0'	27°53.07	-2.5'	60.2'
12	358°37.08	N15°45.68	45°4.27	2.1'	N27°50.60	-2.7'	60.2'
13	13°37.17	44.96	59°25.34	2.1'	27°47.93	-2.9'	60.2'
14	28°37.26	44.23	73°46.42	2.1'	27°45.05	-3.1'	60.2'
15	43°37.35	· · 43.51	88°7.53	2.1'	27°41.97	-3.3'	60.2'
16	58°37.44	42.78	102°28.67	2.2'	27°38.68	-3.5'	60.2'
17	73°37.53	42.06	116°49.84	2.2'	27°35.18	-3.7'	60.2'
18	88°37.62	N15°41.33	131°11.04	2.2'	N27°31.48	-3.9'	60.2'
19	103°37.71	40.60	145°32.27	2.3'	27°27.58	-4.1'	60.2'
20	118°37.80	39.88	159°53.55	2.3'	27°23.47	-4.3'	60.2'
21	133°37.89	· · 39.15	174°14.86	2.4'	27°19.16	-4.5'	60.2'
22	148°37.98	38.42	188°36.22	2.4'	27°14.65	-4.7'	60.3'
23	163°38.07	37.69	202°57.63	2.5'	27°9.94	-4.9'	60.3'
SD = 15.8'				SD = 16.4'			
$d = -0.7'$							

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°38.17	N15°36.96	217°19.08	2.5'	N27°5.02	-5.1'	60.3'
1	193°38.26	36.23	231°40.59	2.6'	26°59.91	-5.3'	60.3'
2	208°38.35	35.50	246°2.15	2.6'	26°54.60	-5.5'	60.3'
3	223°38.44	· · 34.77	260°23.78	2.7'	26°49.09	-5.7'	60.3'
4	238°38.54	34.04	274°45.46	2.7'	26°43.39	-5.9'	60.3'
5	253°38.63	33.31	289°7.20	2.8'	26°37.49	-6.1'	60.3'
6	268°38.72	N15°32.58	303°29.01	2.9'	N26°31.40	-6.3'	60.3'
7	283°38.81	31.85	317°50.89	2.9'	26°25.11	-6.5'	60.3'
8	298°38.91	31.11	332°12.83	3.0'	26°18.64	-6.7'	60.3'
9	313°39.00	· · 30.38	346°34.85	3.1'	26°11.97	-6.9'	60.3'
10	328°39.10	29.65	0°56.94	3.2'	26°5.11	-7.0'	60.3'
11	343°39.19	28.91	15°19.11	3.2'	25°58.07	-7.2'	60.3'
12	358°39.28	N15°28.18	29°41.36	3.3'	N25°50.84	-7.4'	60.3'
13	13°39.38	27.44	44°3.69	3.4'	25°43.43	-7.6'	60.3'
14	28°39.47	26.71	58°26.10	3.5'	25°35.83	-7.8'	60.3'
15	43°39.57	· · 25.97	72°48.60	3.6'	25°28.05	-8.0'	60.3'
16	58°39.67	25.24	87°11.19	3.7'	25°20.09	-8.1'	60.3'
17	73°39.76	24.50	101°33.86	3.8'	25°11.95	-8.3'	60.3'
18	88°39.86	N15°23.76	115°56.62	3.9'	N25°3.64	-8.5'	60.3'
19	103°39.95	23.03	130°19.48	3.9'	24°55.15	-8.7'	60.3'
20	118°40.05	22.29	144°42.42	4.0'	24°46.49	-8.8'	60.3'
21	133°40.15	· · 21.55	159°5.47	4.1'	24°37.65	-9.0'	60.3'
22	148°40.24	20.81	173°28.61	4.2'	24°28.65	-9.2'	60.3'
23	163°40.34	20.07	187°51.85	4.3'	24°19.47	-9.3'	60.3'
SD = 15.8'				SD = 16.4'			
$d = -0.7'$							

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	25-27
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	29-10%
08	05:44	05:40	12:06	07:47	20:19	
09	05:36	05:32	12:06	08:52	21:24	
10	05:27	05:23	12:05	09:56	22:27	

August 11, 12, 13 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	319°28.62		136°0.61	S02°32.65	229°44.02	N23°40.08	187°44.16	N18°26.14	305°4.91	N03°21.94
1	334°31.09		151°0.92	33.87	244°44.68	40.12	202°46.06	26.00	320°7.43	21.91
2	349°33.55		166°1.22	35.08	259°45.33	40.15	217°47.96	25.86	335°9.95	21.87
3	4°36.02		181°1.52	•• 36.29	274°45.99	•• 40.19	232°49.87	•• 25.72	350°12.47	•• 21.84
4	19°38.48		196°1.82	37.50	289°46.64	40.23	247°51.77	25.57	5°14.99	21.80
5	34°40.94		211°2.13	38.71	304°47.29	40.26	262°53.68	25.43	20°17.51	21.77
6	49°43.41		226°2.43	S02°39.93	319°47.95	N23°40.30	277°55.58	N18°25.29	35°20.03	N03°21.73
7	64°45.87		241°2.73	41.14	334°48.60	40.33	292°57.49	25.15	50°22.55	21.70
8	79°48.34		256°3.04	42.35	349°49.26	40.37	307°59.39	25.01	65°25.07	21.66
9	94°50.80		271°3.35	•• 43.56	4°49.91	•• 40.40	323°1.30	•• 24.86	80°27.59	•• 21.63
10	109°53.26		286°3.65	44.77	19°50.57	40.44	338°3.20	24.72	95°30.11	21.59
11	124°55.73		301°3.96	45.98	34°51.22	40.47	353°5.10	24.58	110°32.63	21.56
12	139°58.19		316°4.27	S02°47.19	49°51.88	N23°40.51	8°7.01	N18°24.44	125°35.15	N03°21.52
13	155°0.66		331°4.58	48.40	64°52.53	40.54	23°8.91	24.30	140°37.67	21.49
14	170°3.12		346°4.88	49.61	79°53.19	40.57	38°10.82	24.15	155°40.20	21.45
15	185°5.59		1°5.19	•• 50.82	94°53.84	•• 40.61	53°12.72	•• 24.01	170°42.72	•• 21.42
16	200°8.05		16°5.50	52.03	109°54.50	40.64	68°14.63	23.87	185°45.24	21.38
17	215°10.51		31°5.81	53.24	124°55.15	40.67	83°16.53	23.73	200°47.76	21.35
18	230°12.98		46°6.13	S02°54.45	139°55.81	N23°40.70	98°18.44	N18°23.59	215°50.28	N03°21.31
19	245°15.44		61°6.44	55.66	154°56.46	40.74	113°20.34	23.44	230°52.80	21.28
20	260°17.91		76°6.75	56.87	169°57.12	40.77	128°22.25	23.30	245°55.33	21.24
21	275°20.37		91°7.06	•• 58.08	184°57.78	•• 40.80	143°24.15	•• 23.16	260°57.85	•• 21.20
22	290°22.83		106°7.38	02°59.29	199°58.43	40.83	158°26.06	23.02	276°0.37	21.17
23	305°25.30		121°7.69	03°0.50	214°59.09	40.86	173°27.96	22.88	291°2.89	21.13
Mer.pass. 02:42		ν0.3' d1.2' m-4.37		ν0.7' d0.0' m1.29		ν1.9' d-0.1' m-1.79		ν2.5' d-0.0' m0.58		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	320°27.76		136°8.00	S03°1.71	229°59.75	N23°40.89	188°29.87	N18°22.73	306°5.42	N03°21.10
1	335°30.23		151°8.32	2.92	245°0.40	40.92	203°31.77	22.59	321°7.94	21.06
2	350°32.69		166°8.64	4.13	260°1.06	40.95	218°33.68	22.45	336°10.46	21.02
3	5°35.16		181°8.95	•• 5.34	275°1.72	•• 40.98	233°35.58	•• 22.31	351°12.98	•• 20.99
4	20°37.62		196°9.27	6.55	290°2.37	41.00	248°37.49	22.16	6°15.51	20.95
5	35°40.08		211°9.59	7.75	305°3.03	41.03	263°39.40	22.02	21°18.03	20.91
6	50°42.55		226°9.91	S03°8.96	320°3.69	N23°41.06	278°41.30	N18°21.88	36°20.55	N03°20.88
7	65°45.01		241°10.22	10.17	335°4.35	41.09	293°43.21	21.74	51°23.08	20.84
8	80°47.48		256°10.54	11.38	350°5.00	41.11	308°45.11	21.60	66°25.60	20.80
9	95°49.94		271°10.86	•• 12.58	5°5.66	•• 41.14	323°47.02	•• 21.45	81°28.13	•• 20.77
10	110°52.40		286°11.18	13.79	20°6.32	41.17	338°48.92	21.31	96°30.65	20.73
11	125°54.87		301°11.51	15.00	35°6.98	41.19	353°50.83	21.17	111°33.18	20.69
12	140°57.33		316°11.83	S03°16.21	50°7.64	N23°41.22	8°52.73	N18°21.03	126°35.70	N03°20.66
13	155°59.80		331°12.15	17.41	65°8.29	41.24	23°54.64	20.88	141°38.22	20.62
14	171°2.26		346°12.47	18.62	80°8.95	41.27	38°56.55	20.74	156°40.75	20.58
15	186°4.72		1°12.80	•• 19.83	95°9.61	•• 41.29	53°58.45	•• 20.60	171°43.27	•• 20.55
16	201°7.19		16°13.12	21.03	110°10.27	41.32	69°0.36	20.46	186°45.80	20.51
17	216°9.65		31°13.45	22.24	125°10.93	41.34	84°2.26	20.31	201°48.33	20.47
18	231°12.12		46°13.77	S03°23.45	140°11.59	N23°41.37	99°4.17	N18°20.17	216°50.85	N03°20.44
19	246°14.58		61°14.10	24.65	155°12.25	41.39	114°6.08	20.03	231°53.38	20.40
20	261°17.05		76°14.42	25.86	170°12.91	41.41	129°7.98	19.89	246°55.90	20.36
21	276°19.51		91°14.75	•• 27.06	185°13.57	•• 41.44	144°9.89	•• 19.74	261°58.43	•• 20.32
22	291°21.97		106°15.08	28.27	200°14.23	41.46	159°11.79	19.60	277°0.95	20.29
23	306°24.44		121°15.41	29.47	215°14.89	41.48	174°13.70	19.46	292°3.48	20.25
Mer.pass. 02:38		ν0.3' d1.2' m-4.38		ν0.7' d0.0' m1.29		ν1.9' d-0.1' m-1.79		ν2.5' d-0.0' m0.58		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	321°26.90		136°15.74	S03°30.68	230°15.55	N23°41.50	189°15.61	N18°19.32	307°6.01	N03°20.21
1	336°29.37		151°16.07	31.88	245°16.21	41.52	204°17.51	19.17	322°8.53	20.17
2	351°31.83		166°16.40	33.09	260°16.87	41.54	219°19.42	19.03	337°11.06	20.14
3	6°34.29		181°16.73	•• 34.29	275°17.53	•• 41.56	234°21.33	•• 18.89	352°13.59	•• 20.10
4	21°36.76		196°17.06	35.50	290°18.19	41.58	249°23.23	18.75	7°16.11	20.06
5	36°39.22		211°17.39	36.70	305°18.85	41.60	264°25.14	18.60	22°18.64	20.02
6	51°41.69		226°17.73	S03°37.90	320°19.51	N23°41.62	279°27.04	N18°18.46	37°21.17	N03°19.98
7	66°44.15		241°18.06	39.11	335°20.17	41.64	294°28.95	18.32	52°23.70	19.95
8	81°46.61		256°18.39	40.31	350°20.83	41.66	309°30.86	18.17	67°26.22	19.91
9	96°49.08		271°18.73	•• 41.52	5°21.49	•• 41.68	324°32.76	•• 18.03	82°28.75	•• 19.87
10	111°51.54		286°19.06	42.72	20°22.15	41.70	339°34.67	17.89	97°31.28	19.83
11	126°54.01		301°19.40	43.92	35°22.82	41.72	354°36.58	17.75	112°33.81	19.79
12	141°56.47		316°19.73	S03°45.12	50°23.48	N23°41.73	9°38.48	N18°17.60	127°36.34	N03°19.76
13	156°58.93		331°20.07	46.33	65°24.14	41.75	24°40.39	17.46	142°38.87	19.72
14	172°1.40		346°20.41	47.53	80°24.80	41.77	39°42.30	17.32	157°41.39	19.68
15	187°3.86		1°20.75	•• 48.73	95°25.46	•• 41.79	54°44.21	•• 17.18	172°43.92	•• 19.64
16	202°6.33		16°21.09	49.93	110°26.13	41.80	69°46.11	17.03	187°46.45	19.60
17	217°8.79		31°21.43	51.14	125°26.79	41.82	84°48.02	16.89	202°48.98	19.56
18	232°11.26		46°21.77	S03°52.34	140°27.45	N23°41.83	99°49.93	N18°16.75	217°51.51	N03°19.52
19	247°13.72		61°22.11	53.54	155°28.11	41.85	114°51.83	16.60	232°54.04	19.49
20	262°16.18		76°22.45	54.74	170°28.78	41.86	129°53.74	16.46	247°56.57	19.45
21	277°18.65		91°22.79	•• 55.94	185°29.44	•• 41.88	144°55.65	•• 16.32	262°59.10	•• 19.41
22	292°21.11		106°23.13	57.14	200°30.10	41.89	159°57.56	16.18	278°1.63	19.37
23	307°23.58		121°23.48	58.34	215°30.77	41.91	174°59.46	16.03	293°4.16	19.33
Mer.pass. 02:34		ν0.3' d1.2' m-4.40		ν0.7' d0.0' m1.29		ν1.9' d-0.1' m-1.79		ν2.5' d-0.0' m0.57		

Stars		
	SHA	Dec
Alpheratz	357°33.12	29°14.28
Ankaa	353°5.54	-42°9.37
Schedar	349°29.16	56°40.90
Diphda	348°45.75	-17°50.19
Achernar	335°18.96	-57°5.72
Hamal	327°49.59	23°35.32
Polaris	313°20.10	89°22.25
Acamar	315°10.74	-40°11.52
Menkar	314°4.74	4°11.77
Mirfak	308°26.37	49°57.18
Aldebaran	290°38.21	16°33.80
Rigel	281°2.75	-8°10.09
Capella	280°20.16	46°1.34
Bellatrix	278°21.63	6°22.51
Elnath	278°0.38	28°37.74
Alnilam	275°36.57	-1°10.97
Betelgeuse	270°50.86	7°24.79
Canopus	263°52.21	-52°42.31
Sirius	258°25.33	-16°45.00
Adhara	255°5.13	-29°0.31
Procyon	244°49.74	5°9.47
Pollux	243°16.02	27°57.71
Avior	234°14.83	-59°35.57
Suhail	222°45.78	-43°32.34
Miaplacidus	221°38.96	-69°49.55
Alphard	217°46.77	-8°46.38
Regulus	207°33.34	11°50.29
Dubhe	193°39.97	61°36.57
Denebola	182°23.84	14°25.49
Genah	175°42.44	-17°41.42
Acrux	172°59.07	-63°15.03
Gacrux	171°50.53	-57°15.95
Alioth	166°12.11	55°49.13
Spica	158°21.03	-11°18.03
Alkaid	152°51.12	49°11.05
Hadar	148°34.28	-60°30.34
Menkent	147°56.14	-36°30.20
Arcturus	145°46.77	19°2.77
Rigil Kent.	139°38.55	-60°56.98
Kochab	137°19.92	74°3.00
Zuben'ubi	136°54.56	-16°9.18
Alphecca	126°2.57	26°37.68
Antares	112°14.06	-26°29.51
Atria	107°6.81	-69°4.73
Sabik	102°1.07	-15°45.45
Shaula	96°8.31	-37°7.44
Rasalhague	95°57.11	12°32.57
Eltanin	90°41.21	51°29.32
Kaus Aust.	83°30.44	-34°22.32
Vega	80°31.99	38°48.68
Nunki	75°45.80	-26°15.77
Altair	61°58.35	8°56.46
Peacock	53°3.05	-56°38.90
Deneb	49°24.44	45°22.63
Enif	33°37.16	9°59.96
Al Na'ir	27°30.78	-46°49.73
Fomalhaut	15°12.71	-29°28.65
Scheat	13°43.58	28°13.71
Markab	13°28.27	15°21.02
Aug 11 Tue	SHA	Mer.pass
Venus	176°31.99	14:56
Mars	270°15.40	08:41
Jupiter	228°15.53	11:28
Saturn	345°36.29	03:39
Aug 12 Wed	SHA	Mer.pass
Venus	175°40.24	14:55
Mars	269°31.98	08:40
Jupiter	228°2.11	11:25
Saturn	345°37.65	03:35
Aug 13 Thu	SHA	Mer.pass
Venus	174°48.84	14:55
Mars	268°48.64	08:39
Jupiter	227°48.70	11:22
Saturn	345°39.11	03:31
Horizontal parallax		
Venus:		0.2
Mars:		0.1

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue 0	178°40.44	N15°19.33	202°15.18	4.4'	N24°10.13	-9.5'	60.3'
1	193°40.54	18.59	216°38.62	4.5'	24°0.62	-9.7'	60.2'
2	208°40.63	17.85	231°2.16	4.6'	23°50.96	-9.8'	60.2'
3	223°40.73	· · 17.11	245°25.81	4.7'	23°41.13	-10.0'	60.2'
4	238°40.83	16.37	259°49.56	4.9'	23°31.14	-10.1'	60.2'
5	253°40.93	15.63	274°13.41	5.0'	23°20.99	-10.3'	60.2'
6	268°41.03	N15°14.89	288°37.37	5.1'	N23°10.69	-10.5'	60.2'
7	283°41.13	14.15	303°1.44	5.2'	23°0.23	-10.6'	60.2'
8	298°41.23	13.40	317°25.62	5.3'	22°49.63	-10.8'	60.2'
9	313°41.33	· · 12.66	331°49.91	5.4'	22°38.87	-10.9'	60.2'
10	328°41.43	11.92	346°14.30	5.5'	22°27.97	-11.0'	60.2'
11	343°41.53	11.17	0°38.81	5.6'	22°16.92	-11.2'	60.2'
12	358°41.63	N15°10.43	15°3.43	5.7'	N22°5.72	-11.3'	60.2'
13	13°41.73	9.68	29°28.16	5.8'	21°54.39	-11.5'	60.1'
14	28°41.83	8.94	43°53.00	6.0'	21°42.91	-11.6'	60.1'
15	43°41.93	· · 8.19	58°17.96	6.1'	21°31.30	-11.7'	60.1'
16	58°42.03	7.45	72°43.03	6.2'	21°19.56	-11.9'	60.1'
17	73°42.13	6.70	87°8.21	6.3'	21°7.68	-12.0'	60.1'
18	88°42.23	N15°5.95	101°33.50	6.4'	N20°55.66	-12.1'	60.1'
19	103°42.34	5.20	115°58.92	6.5'	20°43.52	-12.3'	60.1'
20	118°42.44	4.46	130°24.44	6.6'	20°31.26	-12.4'	60.1'
21	133°42.54	· · 3.71	144°50.08	6.8'	20°18.87	-12.5'	60.0'
22	148°42.64	2.96	159°15.83	6.9'	20°6.35	-12.6'	60.0'
23	163°42.75	2.21	173°41.70	7.0'	19°53.72	-12.8'	60.0'
SD = 15.8' $d = -0.7'$			SD = 16.4'				

Wed	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	178°42.85	N15°1.46	188°7.69	7.1'	N19°40.96	-12.9'	60.0'
1	193°42.95	0.71	202°33.78	7.2'	19°28.09	-13.0'	60.0'
2	208°43.06	14°59.96	217°0.00	7.3'	19°15.11	-13.1'	60.0'
3	223°43.16	14°59.21	231°26.32	7.4'	19°2.01	-13.2'	60.0'
4	238°43.27	58.46	245°52.77	7.6'	18°48.81	-13.3'	59.9'
5	253°43.37	57.71	260°19.32	7.7'	18°35.49	-13.4'	59.9'
6	268°43.48	N14°56.95	274°45.99	7.8'	N18°22.07	-13.5'	59.9'
7	283°43.58	56.20	289°12.77	7.9'	18°8.55	-13.6'	59.9'
8	298°43.69	55.45	303°39.67	8.0'	17°54.93	-13.7'	59.9'
9	313°43.79	· · 54.70	318°6.67	8.1'	17°41.20	-13.8'	59.9'
10	328°43.90	53.94	332°33.79	8.2'	17°27.38	-13.9'	59.8'
11	343°44.00	53.19	347°1.02	8.3'	17°13.47	-14.0'	59.8'
12	358°44.11	N14°52.43	1°28.37	8.5'	N16°59.46	-14.1'	59.8'
13	13°44.22	51.68	15°55.82	8.6'	16°45.36	-14.2'	59.8'
14	28°44.32	50.92	30°23.38	8.7'	16°31.17	-14.3'	59.8'
15	43°44.43	· · 50.17	44°51.05	8.8'	16°16.89	-14.4'	59.7'
16	58°44.54	49.41	59°18.83	8.9'	16°2.53	-14.4'	59.7'
17	73°44.64	48.65	73°46.72	9.0'	15°48.09	-14.5'	59.7'
18	88°44.75	N14°47.90	88°14.72	9.1'	N15°33.57	-14.6'	59.7'
19	103°44.86	47.14	102°42.82	9.2'	15°18.96	-14.7'	59.6'
20	118°44.97	46.38	117°11.03	9.3'	15°4.29	-14.8'	59.6'
21	133°45.08	· · 45.62	131°39.34	9.4'	14°49.53	-14.8'	59.6'
22	148°45.18	44.87	146°7.75	9.5'	14°34.71	-14.9'	59.6'
23	163°45.29	44.11	160°36.27	9.6'	14°19.82	-15.0'	59.6'
SD = 15.8' $d = -0.7'$			SD = 16.4'				

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	178°45.40	N14°43.35	175°4.90	9.7'	N14°4.85	-15.0'	59.5'
1	193°45.51	42.59	189°33.62	9.8'	13°49.82	-15.1'	59.5'
2	208°45.62	41.83	204°2.44	9.9'	13°34.73	-15.2'	59.5'
3	223°45.73	· · 41.07	218°31.37	10.0'	13°19.57	-15.2'	59.5'
4	238°45.84	40.31	233°0.39	10.1'	13°4.36	-15.3'	59.4'
5	253°45.95	39.54	247°29.51	10.2'	12°49.08	-15.3'	59.4'
6	268°46.06	N14°38.78	261°58.73	10.3'	N12°33.75	-15.4'	59.4'
7	283°46.17	38.02	276°28.04	10.4'	12°18.37	-15.4'	59.4'
8	298°46.28	37.26	290°57.45	10.5'	12°2.93	-15.5'	59.3'
9	313°46.39	· · 36.49	305°26.95	10.6'	11°47.44	-15.5'	59.3'
10	328°46.51	35.73	319°56.54	10.7'	11°31.90	-15.6'	59.3'
11	343°46.62	34.97	334°26.22	10.8'	11°16.32	-15.6'	59.3'
12	358°46.73	N14°34.20	348°56.00	10.9'	N11°0.69	-15.7'	59.2'
13	13°46.84	33.44	3°25.86	11.0'	10°45.01	-15.7'	59.2'
14	28°46.95	32.67	17°55.81	11.0'	10°29.30	-15.8'	59.2'
15	43°47.07	· · 31.91	32°25.85	11.1'	10°13.55	-15.8'	59.1'
16	58°47.18	31.14	46°55.97	11.2'	09°57.76	-15.8'	59.1'
17	73°47.29	30.38	61°26.18	11.3'	09°41.93	-15.9'	59.1'
18	88°47.41	N14°29.61	75°56.47	11.4'	N09°26.07	-15.9'	59.1'
19	103°47.52	28.84	90°26.85	11.5'	09°10.17	-15.9'	59.0'
20	118°47.63	28.07	104°57.30	11.5'	08°54.25	-16.0'	59.0'
21	133°47.75	· · 27.31	119°27.84	11.6'	08°38.29	-16.0'	59.0'
22	148°47.86	26.54	133°58.45	11.7'	08°22.31	-16.0'	58.9'
23	163°47.98	25.77	148°29.14	11.8'	08°6.31	-16.0'	58.9'
SD = 15.8' $d = -0.8'$			SD = 16.2'				

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

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

Day	Sun		Mer. Pass	Moon
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August 14, 15, 16 UT (Fri., Sat., Sun.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	322°26.04	136°23.82	S03°59.54	230°31.43	N23°41.92	190°1.37	N18°15.89	308°6.69	N03°19.29					Alpheratz	357°33.11	29°14.30		
1	337°28.50	151°24.16	04°0.74	245°32.09	41.93	205°3.28	15.75	323°9.22	19.25					Ankaa	353°5.52	-42°9.37		
2	352°30.97	166°24.51	1.94	260°32.76	41.95	220°5.19	15.60	338°11.75	19.21					Schedar	349°29.13	56°40.91		
3	7°33.43	181°24.85	· · 3.14	275°33.42	· · 41.96	235°7.09	· · 15.46	353°14.28	· · 19.17					Diphda	348°45.74	-17°50.19		
4	22°35.90	196°25.20	4.34	290°34.08	41.97	250°9.00	15.32	8°16.81	19.13					Achernar	335°18.92	-57°5.72		
5	37°38.36	211°25.55	5.54	305°34.75	41.98	265°10.91	15.17	23°19.34	19.09					Hamal	327°49.57	23°35.33		
6	52°40.82	226°25.89	S04°6.74	320°35.41	N23°41.99	280°12.82	N18°15.03	38°21.87	N03°19.06					Polaris	313°18.66	89°22.25		
7	67°43.29	241°26.24	7.94	335°36.08	42.01	295°14.72	14.89	53°24.41	19.02					Acamar	315°10.71	-40°11.52		
8	82°45.75	256°26.59	9.14	350°36.74	42.02	310°16.63	14.75	68°26.94	18.98					Menkar	314°4.72	4°11.78		
9	97°48.22	271°26.94	· · 10.34	5°37.41	· · 42.03	325°18.54	· · 14.60	83°29.47	· · 18.94					Mirfak	308°26.34	49°57.19		
10	112°50.68	286°27.29	11.54	20°38.07	42.04	340°20.45	14.46	98°32.00	18.90					Aldebaran	290°38.19	16°33.80		
11	127°53.14	301°27.64	12.74	35°38.74	42.05	355°22.35	14.32	113°34.53	18.86					Rigel	281°2.73	-8°10.08		
12	142°55.61	316°27.99	S04°13.94	50°39.40	N23°42.06	10°24.26	N18°14.17	128°37.06	N03°18.82					Capella	280°20.13	46°1.34		
13	157°58.07	331°28.34	15.13	65°40.07	42.07	25°26.17	14.03	143°39.60	18.78					Bellatrix	278°21.61	6°22.52		
14	173°0.54	346°28.70	16.33	80°40.73	42.07	40°28.08	13.89	158°42.13	18.74					Elnath	278°0.36	28°37.75		
15	188°3.00	1°29.05	· · 17.53	95°41.40	· · 42.08	55°29.99	· · 13.74	173°44.66	· · 18.70					Alnilam	275°36.55	-1°10.97		
16	203°5.46	16°29.40	18.73	110°42.06	42.09	70°31.90	13.60	188°47.19	18.66					Betelgeuse	270°50.84	7°24.80		
17	218°7.93	31°29.76	19.92	125°42.73	42.10	85°33.80	13.46	203°49.73	18.62					Canopus	263°52.18	-52°42.30		
18	233°10.39	46°30.11	S04°21.12	140°43.40	N23°42.11	100°35.71	N18°13.31	218°52.26	N03°18.58					Sirius	258°25.32	-16°44.99		
19	248°12.86	61°30.47	22.32	155°44.06	42.11	115°37.62	13.17	233°54.79	18.54					Adhara	255°5.12	-29°0.29		
20	263°15.32	76°30.82	23.51	170°44.73	42.12	130°39.53	13.03	248°57.33	18.50					Procyon	244°49.72	5°9.47		
21	278°17.78	91°31.18	· · 24.71	185°45.40	· · 42.13	145°41.44	· · 12.88	263°59.86	· · 18.46					Pollux	243°16.01	27°57.71		
22	293°20.25	106°31.54	25.91	200°46.06	42.13	160°43.35	12.74	279°2.39	18.42					Avior	234°14.82	-59°35.55		
23	308°22.71	121°31.90	27.10	215°46.73	42.14	175°45.25	12.60	294°4.93	18.38					Suhail	222°45.78	-43°32.33		
Mer.pass. 02:30			ν0.3' d1.2' m-4.41			ν0.7' d0.0' m1.28			ν1.9' d-0.1' m-1.79			ν2.5' d-0.0' m0.57						
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	323°25.18	136°32.26	S04°28.30	230°47.40	N23°42.14	190°47.16	N18°12.45	309°7.46	N03°18.34					Regulus	207°33.34	11°50.29		
1	338°27.64	151°32.62	29.49	245°48.06	42.15	205°49.07	12.31	324°10.00	18.29					Dubhe	193°39.98	61°36.56		
2	353°30.10	166°32.98	30.69	260°48.73	42.15	220°50.98	12.17	339°12.53	18.25					Denebola	182°23.85	14°25.48		
3	8°32.57	181°33.34	· · 31.88	275°49.40	· · 42.16	235°52.89	· · 12.02	354°15.06	· · 18.21					Gienah	175°42.45	-17°41.41		
4	23°35.03	196°33.70	33.08	290°50.07	42.16	250°54.80	11.88	9°17.60	18.17					Acrux	172°59.10	-63°15.02		
5	38°37.50	211°34.06	34.27	305°50.73	42.17	265°56.71	11.74	24°20.13	18.13					Gacrux	171°50.56	-57°15.94		
6	53°39.96	226°34.42	S04°35.47	320°51.40	N23°42.17	280°58.61	N18°11.59	39°22.67	N03°18.09					Alioth	166°12.13	55°49.12		
7	68°42.43	241°34.78	36.66	335°52.07	42.17	296°0.52	11.45	54°25.20	18.05					Spica	158°21.04	-11°18.03		
8	83°44.89	256°35.15	37.85	350°52.74	42.18	311°2.43	11.31	69°27.74	18.01					Alkaid	152°51.14	49°11.04		
9	98°47.35	271°35.51	· · 39.05	5°53.41	· · 42.18	326°4.34	· · 11.16	84°30.27	· · 17.97					Hadar	148°34.31	-60°30.34		
10	113°49.82	286°35.88	40.24	20°54.08	42.18	341°6.25	11.02	99°32.81	17.93					Menkent	147°56.16	-36°30.20		
11	128°52.28	301°36.24	41.44	35°54.75	42.18	356°8.16	10.88	114°35.34	17.89					Arcturus	145°46.78	19°2.76		
12	143°54.75	316°36.61	S04°42.63	50°55.41	N23°42.18	11°10.07	N18°10.73	129°37.88	N03°17.84					Rigil Kent.	139°38.58	-60°56.98		
13	158°57.21	331°36.98	43.82	65°56.08	42.18	26°11.98	10.59	144°40.42	17.80					Kochab	137°19.97	74°2.99		
14	173°59.67	346°37.34	45.01	80°56.75	42.19	41°13.89	10.45	159°42.95	17.76					Zuben'ubi	136°54.57	-16°9.18		
15	189°2.14	1°37.71	· · 46.21	95°57.42	· · 42.19	56°15.80	· · 10.30	174°45.49	· · 17.72					Alphecca	126°2.58	26°37.68		
16	204°4.60	16°38.08	47.40	110°58.09	42.19	71°17.71	10.16	189°48.03	17.68					Antares	112°14.08	-26°29.52		
17	219°7.07	31°38.45	48.59	125°58.76	42.19	86°19.62	10.02	204°50.56	17.64					Atria	107°6.85	-69°4.74		
18	234°9.53	46°38.82	S04°49.78	140°59.43	N23°42.19	101°21.53	N18°9.87	219°53.10	N03°17.60					Sabik	102°1.09	-15°45.45		
19	249°11.99	61°39.19	50.97	156°0.10	42.18	116°23.44	9.73	234°55.64	17.55					Shaula	96°8.32	-37°7.45		
20	264°14.46	76°39.56	52.16	171°0.77	42.18	131°25.34	9.58	249°58.17	17.51					Rasalhague	95°57.12	12°32.58		
21	279°16.92	91°39.94	· · 53.36	186°1.44	· · 42.18	146°27.25	· · 9.44	265°0.71	· · 17.47					Eltanin	90°41.23	51°29.33		
22	294°19.39	106°40.31	54.55	201°2.11	42.18	161°29.16	9.30	280°3.25	17.43					Kaus Aust.	83°30.45	-34°22.33		
23	309°21.85	121°40.68	55.74	216°2.78	42.18	176°31.07	9.15	295°5.78	17.39					Vega	80°32.00	38°48.69		
Mer.pass. 02:26			ν0.4' d1.2' m-4.42			ν0.7' d0.0' m1.28			ν1.9' d-0.1' m-1.79			ν2.5' d-0.0' m0.56						
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	324°24.31	136°41.06	S04°56.93	231°3.45	N23°42.18	191°32.98	N18°9.01	310°8.32	N03°17.34					Aug 14 Fri	SHA	Mer.pass		
1	339°26.78	151°41.43	58.12	246°4.12	42.17	206°34.89	8.87	325°10.86	17.30					Venus	173°57.78	14:54		
2	354°29.24	166°41.81	04°59.31	261°4.80	42.17	221°36.80	8.72	340°13.40	17.26					Mars	268°5.39	08:38		
3	9°31.71	181°42.18	05°0.50	276°5.47	· · 42.17	236°38.71	· · 8.58	355°15.94	· · 17.22					Jupiter	227°35.33	11:18		
4	24°34.17	196°42.56	1.69	291°6.14	42.16	251°40.62	8.43	10°18.47	17.18					Saturn	345°40.65	03:27		
5	39°36.63	211°42.94	2.88	306°6.81	42.16	266°42.53	8.29	25°21.01	17.13									
6	54°39.10	226°43.31	S05°4.06	321°7.48	N23°42.15	281°44.44	N18°8.15	40°23.55	N03°17.09									
7	69°41.56	241°43.69	5.25	336°8.15	42.15	296°46.35	8.00	55°26.09	17.05									
8	84°44.03	256°44.07	6.44	351°8.83	42.14	311°48.26	7.86	70°28.63	17.01									
9	99°46.49	271°44.45	· · 7.63	6°9.50	· · 42.14	326°50.17	· · 7.72	85°31.17	· · 16.96									
10	114°48.95	286°44.83	8.82	21°10.17	42.13	341°52.08	7.57	100°33.71	16.92									
11	129°51.42	301°45.21	10.01	36°10.84	42.13	356°54.00	7.43	115°36.25	16.88									
12	144°53.88	316°45.60	S05°11.19	51°11.52	N23°42.12	11°55.91	N18°7.28	130°38.79	N03°16.84									
13	159°56.35	331°45.98	12.38	66°12.19	42.11	26°57.82	7.14	145°41.32	16.79									
14	174°58.81	346°46.36	13.57	81°12.86	42.11	41°59.73	7.00	160°43.86	16.75									
15	190°1.27	1°46.75	· · 14.75	96°13.53	· · 42.10	57°1.64	· · 6.85	175°46.40	· · 16.71									
16	205°3.74	16°47.13	15.94	111°14.21	42.09	72°3.55	6.71	190°48.94	16.67									
17	220°6.20	31°47.51	17.13	126°14.88	42.08	87°5.46	6.57	205°51.48	16.62									
18	235°8.67	46°47.90	S05°18.31	141°15.55	N23°42.07	102°7.37	N18°6.42	220°54.03	N03°16.58									
19	250°11.13	61°48.29	19.50	156°16.23	42.06	117°9.28	6.28	235°56.57	16.54									
20	265°13.59	76°48.67	20.68	171°16.90	42.06	132°11.19	6.13	250°59.11	16.49									
21	280°16.06	91°49.06	· · 21.87	186°17.58	· · 42.05	147°13.10	· · 5.99	266°1.65	· · 16.45</									

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	178°48.09	N14°25.00	162°59.91	11.8'	N07°50.28	-16.1'	58.9'
1	193°48.21	24.23	177°30.75	11.9'	07°34.22	-16.1'	58.8'
2	208°48.32	23.46	192°1.66	12.0'	07°18.15	-16.1'	58.8'
3	223°48.44	· · 22.69	206°32.65	12.1'	07°2.06	-16.1'	58.8'
4	238°48.55	21.92	221°3.71	12.1'	06°45.95	-16.1'	58.7'
5	253°48.67	21.15	235°34.84	12.2'	06°29.83	-16.1'	58.7'
6	268°48.79	N14°20.38	250°6.03	12.3'	N06°13.69	-16.2'	58.7'
7	283°48.90	19.61	264°37.30	12.3'	05°57.54	-16.2'	58.7'
8	298°49.02	18.83	279°8.63	12.4'	05°41.38	-16.2'	58.6'
9	313°49.14	· · 18.06	293°40.03	12.5'	05°25.20	-16.2'	58.6'
10	328°49.25	17.29	308°11.48	12.5'	05°9.03	-16.2'	58.6'
11	343°49.37	16.51	322°43.01	12.6'	04°52.84	-16.2'	58.5'
12	358°49.49	N14°15.74	337°14.59	12.6'	N04°36.65	-16.2'	58.5'
13	13°49.61	14.97	351°46.23	12.7'	04°20.46	-16.2'	58.5'
14	28°49.73	14.19	6°17.93	12.8'	04°4.26	-16.2'	58.4'
15	43°49.84	· · 13.42	20°49.69	12.8'	03°48.07	-16.2'	58.4'
16	58°49.96	12.64	35°21.50	12.9'	03°31.88	-16.2'	58.4'
17	73°50.08	11.87	49°53.37	12.9'	03°15.69	-16.2'	58.3'
18	88°50.20	N14°11.09	64°25.29	13.0'	N02°59.50	-16.2'	58.3'
19	103°50.32	10.31	78°57.27	13.0'	02°43.32	-16.2'	58.3'
20	118°50.44	9.54	93°29.29	13.1'	02°27.14	-16.2'	58.2'
21	133°50.56	· · 8.76	108°1.37	13.1'	02°10.98	-16.2'	58.2'
22	148°50.68	7.98	122°33.49	13.2'	01°54.82	-16.1'	58.2'
23	163°50.80	7.20	137°5.66	13.2'	01°38.68	-16.1'	58.1'

SD = 15.8' $d = -0.8'$

SD = 16.1'

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.92	N14°6.42	151°37.87	13.3'	N01°22.54	-16.1'	58.1'
1	193°51.04	5.64	166°10.13	13.3'	01°6.42	-16.1'	58.1'
2	208°51.16	4.87	180°42.44	13.3'	00°50.32	-16.1'	58.0'
3	223°51.28	· · 4.09	195°14.78	13.4'	00°34.23	-16.1'	58.0'
4	238°51.41	3.31	209°47.17	13.4'	00°18.16	-16.1'	57.9'
5	253°51.53	2.53	224°19.60	13.5'	N00°2.11	-16.0'	57.9'
6	268°51.65	N14°1.74	238°52.06	13.5'	S00°13.92	16.0'	57.9'
7	283°51.77	0.96	253°24.56	13.5'	00°29.93	16.0'	57.8'
8	298°51.89	14°0.18	267°57.10	13.6'	00°45.92	16.0'	57.8'
9	313°52.02	13°59.40	282°29.67	13.6'	01°1.88	15.9'	57.8'
10	328°52.14	58.62	297°2.27	13.6'	01°17.82	15.9'	57.7'
11	343°52.26	57.83	311°34.91	13.7'	01°33.73	15.9'	57.7'
12	358°52.39	N13°57.05	326°7.58	13.7'	S01°49.62	15.9'	57.7'
13	13°52.51	56.27	340°40.27	13.7'	02°5.47	15.8'	57.6'
14	28°52.63	55.48	355°13.00	13.8'	02°21.30	15.8'	57.6'
15	43°52.76	· · 54.70	9°45.75	13.8'	02°37.10	15.8'	57.6'
16	58°52.88	53.92	24°18.53	13.8'	02°52.86	15.7'	57.5'
17	73°53.01	53.13	38°51.34	13.8'	03°8.59	15.7'	57.5'
18	88°53.13	N13°52.34	53°24.16	13.8'	S03°24.28	15.7'	57.5'
19	103°53.26	51.56	67°57.01	13.9'	03°39.94	15.6'	57.4'
20	118°53.38	50.77	82°29.88	13.9'	03°55.57	15.6'	57.4'
21	133°53.51	· · 49.99	97°2.77	13.9'	04°11.15	15.5'	57.4'
22	148°53.63	49.20	111°35.68	13.9'	04°26.70	15.5'	57.3'
23	163°53.76	48.41	126°8.61	13.9'	04°42.21	15.5'	57.3'

SD = 15.8' $d = -0.8'$

SD = 15.8'

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°53.89	N13°47.62	140°41.56	14.0'	S04°57.68	15.4'	57.2'
1	193°54.01	46.84	155°14.52	14.0'	05°13.10	15.4'	57.2'
2	208°54.14	46.05	169°47.49	14.0'	05°28.48	15.3'	57.2'
3	223°54.27	· · 45.26	184°20.48	14.0'	05°43.82	15.3'	57.1'
4	238°54.39	44.47	198°53.48	14.0'	05°59.11	15.2'	57.1'
5	253°54.52	43.68	213°26.49	14.0'	06°14.36	15.2'	57.1'
6	268°54.65	N13°42.89	227°59.51	14.0'	S06°29.56	15.2'	57.0'
7	283°54.78	42.10	242°32.53	14.0'	06°44.71	15.1'	57.0'
8	298°54.90	41.31	257°5.57	14.0'	06°59.81	15.1'	57.0'
9	313°55.03	· · 40.52	271°38.61	14.0'	07°14.87	15.0'	56.9'
10	328°55.16	39.73	286°11.66	14.1'	07°29.87	15.0'	56.9'
11	343°55.29	38.93	300°44.71	14.1'	07°44.82	14.9'	56.9'
12	358°55.42	N13°38.14	315°17.77	14.1'	S07°59.72	14.8'	56.8'
13	13°55.55	37.35	329°50.82	14.1'	08°14.56	14.8'	56.8'
14	28°55.68	36.56	344°23.88	14.1'	08°29.35	14.7'	56.8'
15	43°55.81	· · 35.76	358°56.94	14.1'	08°44.08	14.7'	56.7'
16	58°55.94	34.97	13°30.00	14.1'	08°58.76	14.6'	56.7'
17	73°56.07	34.18	28°3.05	14.1'	09°13.38	14.6'	56.7'
18	88°56.20	N13°33.38	42°36.11	14.0'	S09°27.94	14.5'	56.6'
19	103°56.33	32.59	57°9.16	14.0'	09°42.44	14.4'	56.6'
20	118°56.46	31.79	71°42.20	14.0'	09°56.88	14.4'	56.6'
21	133°56.59	· · 31.00	86°15.24	14.0'	10°11.26	14.3'	56.5'
22	148°56.72	30.20	100°48.27	14.0'	10°25.58	14.3'	56.5'
23	163°56.85	29.40	115°21.29	14.0'	10°39.84	14.2'	56.5'

SD = 15.8' $d = -0.8'$

SD = 15.6'

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 2-4 2-13%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
14	04:48	04:42	12:05	13:34	01:10	
15	04:36	04:30	12:05	14:20	01:57	
16	04:24	04:18	12:04	15:04	02:42	

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	325°23.45		136°50.23	S05°25.42	231°19.60	N23°42.02	192°18.84	N18°5.56	311°9.27	N03°16.32
1	340°25.92		151°50.62	26.61	246°20.27	42.01	207°20.75	5.41	326°11.81	16.28
2	355°28.38		166°51.01	27.79	261°20.95	41.99	222°22.66	5.27	341°14.35	16.23
3	10°30.84		181°51.40	· · 28.97	276°21.62	· · 41.98	237°24.57	· · 5.13	356°16.90	· · 16.19
4	25°33.31		196°51.79	30.16	291°22.30	41.97	252°26.48	4.98	11°19.44	16.15
5	40°35.77		211°52.19	31.34	306°22.98	41.96	267°28.39	4.84	26°21.98	16.10
6	55°38.24		226°52.58	S05°32.52	321°23.65	N23°41.95	282°30.30	N18°4.69	41°24.52	N03°16.06
7	70°40.70		241°52.98	33.71	336°24.33	41.93	297°32.22	4.55	56°27.06	16.02
8	85°43.16		256°53.37	34.89	351°25.00	41.92	312°34.13	4.40	71°29.61	15.97
9	100°45.63		271°53.77	· · 36.07	6°25.68	· · 41.91	327°36.04	· · 4.26	86°32.15	· · 15.93
10	115°48.09		286°54.16	37.25	21°26.35	41.89	342°37.95	4.12	101°34.69	15.88
11	130°50.56		301°54.56	38.44	36°27.03	41.88	357°39.86	3.97	116°37.23	15.84
12	145°53.02		316°54.96	S05°39.62	51°27.71	N23°41.86	12°41.77	N18°3.83	131°39.78	N03°15.80
13	160°55.48		331°55.36	40.80	66°28.38	41.85	27°43.69	3.68	146°42.32	15.75
14	175°57.95		346°55.76	41.98	81°29.06	41.83	42°45.60	3.54	161°44.86	15.71
15	191°0°41		1°56.16	· · 43.16	96°29.74	· · 41.82	57°47.51	· · 3.40	176°47.41	· · 15.66
16	206°2°88		16°56.56	44.34	111°30.42	41.80	72°49.42	3.25	191°49.95	15.62
17	221°5°34		31°56.96	45.52	126°31.09	41.79	87°51.33	3.11	206°52.49	15.57
18	236°7°80		46°57.36	S05°46.70	141°31.77	N23°41.77	102°53.25	N18°2.96	221°55.04	N03°15.53
19	251°10.27		61°57.76	47.88	156°32.45	41.75	117°55.16	2.82	236°57.58	15.49
20	266°12.73		76°58.16	49.06	171°33.13	41.74	132°57.07	2.67	252°0°13	15.44
21	281°15.20		91°58.57	· · 50.24	186°33.80	· · 41.72	147°58.98	· · 2.53	267°2°67	· · 15.40
22	296°17.66		106°58.97	51.42	201°34.48	41.70	163°0°89	2.39	282°5°22	15.35
23	311°20.12		121°59.38	52.59	216°35.16	41.68	178°2°81	2.24	297°7°76	15.31
Mer.pass. 02:18										
ν0.4' d1.2' m-4.44										
ν0.7' d-0.0' m1.28										
ν1.9' d-0.1' m-1.79										
ν2.5' d-0.0' m0.55										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	326°22.59		136°59.78	S05°53.77	231°35.84	N23°41.67	193°4°72	N18°2.10	312°10.31	N03°15.26
1	341°25.05		152°0°19	54.95	246°36.52	41.65	208°6°63	1.95	327°12.85	15.22
2	356°27.52		167°0°60	56.13	261°37.20	41.63	223°8°54	1.81	342°15.40	15.17
3	11°29.98		182°1°01	· · 57.31	276°37.88	· · 41.61	238°10.46	· · 1.66	357°17.94	· · 15.13
4	26°32.44		197°1°41	58.48	291°38.55	41.59	253°12.37	1.52	12°20.49	15.08
5	41°34.91		212°1°82	05°59.66	306°39.23	41.57	268°14.28	1.38	27°23.03	15.04
6	56°37.37		227°2°23	S06°0°84	321°39.91	N23°41.55	283°16.20	N18°1.23	42°25.58	N03°14.99
7	71°39.84		242°2°64	2.01	336°40.59	41.53	298°18.11	1.09	57°28.12	14.95
8	86°42.30		257°3°06	3.19	351°41.27	41.51	313°20.02	0.94	72°30.67	14.90
9	101°44.77		272°3°47	· · 4°36	6°41.95	· · 41.49	328°21.93	· · 0°80	87°33.22	· · 14.86
10	116°47.23		287°3°88	5.54	21°42.63	41.47	343°23.85	0.65	102°35.76	14.81
11	131°49.69		302°4°29	6.71	36°43.31	41.44	358°25.76	0.51	117°38.31	14.77
12	146°52.16		317°4°71	S06°7°89	51°43.99	N23°41.42	13°27.67	N18°0°36	132°40.86	N03°14.72
13	161°54.62		332°5°12	9.06	66°44.67	41.40	28°29.59	0.22	147°43.40	14.68
14	176°57.09		347°5°54	10.24	81°45.36	41.38	43°31.50	18°0°08	162°45.95	14.63
15	191°59.55		2°5°55	· · 11.41	96°46.04	· · 41.35	58°33.41	17°59.93	177°48.50	· · 14.59
16	207°2°01		17°6°37	12.59	111°46.72	41.33	73°35.33	59.79	192°51.04	14.54
17	222°4°48		32°6°79	13.76	126°47.40	41.31	88°37.24	59.64	207°53.59	14.49
18	237°6°94		47°7°21	S06°14°93	141°48.08	N23°41.28	103°39.15	N17°59.50	222°56.14	N03°14.45
19	252°9°41		62°7°63	16.11	156°48.76	41.26	118°41.07	59.35	237°58.69	14.40
20	267°11.87		77°8°05	17.28	171°49.44	41.23	133°42.98	59.21	253°1°23	14.36
21	282°14.33		92°8°47	· · 18.45	186°50.13	· · 41.21	148°44.89	· · 59.06	268°3°78	· · 14.31
22	297°16.80		107°8°89	19.62	201°50.81	41.18	163°46.81	58.92	283°6°33	14.26
23	312°19.26		122°9°31	20.79	216°51.49	41.16	178°48.72	58.77	298°8°88	14.22
Mer.pass. 02:14										
ν0.4' d1.2' m-4.45										
ν0.7' d-0.0' m1.28										
ν1.9' d-0.1' m-1.79										
ν2.5' d-0.0' m0.55										
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	327°21.73		137°9°73	S06°21.97	231°52.17	N23°41.13	193°50.64	N17°58.63	313°11.43	N03°14.17
1	342°24.19		152°10.15	23.14	246°52.86	41.10	208°52.55	58.49	328°13.98	14.13
2	357°26.66		167°10.58	24.31	261°53.54	41.08	223°54.46	58.34	343°16.52	14.08
3	12°29.12		182°11.00	· · 25.48	276°54.22	· · 41.05	238°56.38	· · 58.20	358°19.07	· · 14.03
4	27°31.58		197°11.43	26.65	291°54.91	41.02	253°58.29	58.05	13°21.62	13.99
5	42°34.05		212°11.85	27.82	306°55.59	40.99	269°0°21	57.91	28°24.17	13.94
6	57°36.51		227°12.28	S06°28.99	321°56.27	N23°40.97	284°2°12	N17°57.76	43°26.72	N03°13.89
7	72°38.98		242°12.71	30.16	336°56.96	40.94	299°4°03	57.62	58°29.27	13.85
8	87°41.44		257°13.14	31.33	351°57.64	40.91	314°5°95	57.47	73°31.82	13.80
9	102°43.90		272°13.57	· · 32.49	6°58.32	· · 40.88	329°7°86	· · 57.33	88°34.37	· · 13.75
10	117°46.37		287°13.99	33.66	21°59.01	40.85	344°9°78	57.18	103°36.92	13.71
11	132°48.83		302°14.42	34.83	36°59.69	40.82	359°11.69	57.04	118°39.47	13.66
12	147°51.30		317°14.86	S06°36.00	52°0°38	N23°40.79	14°13.61	N17°56.89	133°42.02	N03°13.61
13	162°53.76		332°15.29	37.17	67°1°06	40.76	29°15.52	56.75	148°44.57	13.57
14	177°56.22		347°15.72	38.33	82°1°75	40.73	44°17.44	56.60	163°47.12	13.52
15	192°58.69		2°16°15	· · 39.50	97°2°43	· · 40.70	59°19.35	· · 56.46	178°49.67	· · 13.47
16	208°1°15		17°16.59	40.67	112°3°12	40.67	74°21.27	56.31	193°52.22	13.43
17	223°3°62		32°17.02	41.83	127°3°80	40.64	89°23.18	56.17	208°54.77	13.38
18	238°6°08		47°17.46	S06°43°00	142°4°49	N23°40.60	104°25.10	N17°56.03	223°57.32	N03°13.33
19	253°8°55		62°17.89	44.17	157°5°17	40.57	119°27.01	55.88	238°59.87	13.29
20	268°11.01		77°18.33	45.33	172°5°86	40.54	134°28.93	55.74	254°2°43	13.24
21	283°13.47		92°18.77	· · 46.50	187°6°55	· · 40.51	149°30.84	· · 55.59	269°4°98	· · 13.19
22	298°15.94		107°19.20	47.66	202°7°23	40.47	164°32.76	55.45	284°7°53	13.14
23	313°18.40		122°19.64	48.83	217°7°92	40.44	179°34.67	55.30	299°10.08	13.10
Mer.pass. 02:10										
ν0.4' d1.2' m-4.46										
ν0.7' d-0.0' m1.28										
ν1.9' d-0.1' m-1.79										
ν2.5' d-0.0' m0.54										

	Stars	
	SHA	Dec
Alpheratz	357°33.10	29°14.31
Ankaa	353°5°50	-42°9°38
Schedar	349°29.11	56°40.93
Diphda	348°45.72	-17°50.19
Achernar	335°18.90	-57°5°73
Hamal	327°49.55	23°35.33
Polaris	313°17.07	89°22.26
Acamar	315°10.69	-40°11.52
Menkar	314°4°70	4°11.78
Mirfak	308°26.31	49°57.19
Aldebaran	290°38.17	16°33.80
Rigel	281°2°72	-8°10.07
Capella	280°20.11	46°1°34
Bellatrix	278°21.59	6°22.52
Elnath	278°0°34	28°37.75
Alnilam	275°36.53	-1°10.96
Betelgeuse	270°50.82	7°24.80
Canopus	263°52.16	-52°42.29
Sirius	258°25.30	-16°44.98
Adhara	255°5°10	-29°0°29
Procyon	244°49.71	5°9°48
Pollux	243°15.99	27°57.70
Avior	234°14.81	-59°35.53
Suhail	222°45.77	-43°32.32
Miaplacidus	221°38.95	-69°49.52
Alphard	217°46.77	-8°46.37

h		Sun		Moon			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°56.98	N13°28.61	129°54.30	14.0'	S10°54.03	14.1'	56.4'
1	193°57.12	27.81	144°27.30	14.0'	11°8.16	14.1'	56.4'
2	208°57.25	27.01	159°0.30	14.0'	11°22.22	14.0'	56.4'
3	223°57.38	· · 26.21	173°33.28	14.0'	11°36.21	13.9'	56.3'
4	238°57.51	25.42	188°6.24	14.0'	11°50.14	13.9'	56.3'
5	253°57.65	24.62	202°39.20	13.9'	12°4.00	13.8'	56.3'
6	268°57.78	N13°23.82	217°12.14	13.9'	S12°17.80	13.7'	56.2'
7	283°57.91	23.02	231°45.06	13.9'	12°31.52	13.7'	56.2'
8	298°58.05	22.22	246°17.97	13.9'	12°45.17	13.6'	56.2'
9	313°58.18	· · 21.42	260°50.86	13.9'	12°58.75	13.5'	56.1'
10	328°58.31	20.62	275°23.73	13.9'	13°12.26	13.4'	56.1'
11	343°58.45	19.82	289°56.58	13.8'	13°25.70	13.4'	56.1'
12	358°58.58	N13°19.02	304°29.41	13.8'	S13°39.06	13.3'	56.0'
13	13°58.72	18.22	319°2.22	13.8'	13°52.35	13.2'	56.0'
14	28°58.85	17.41	333°35.01	13.8'	14°5.56	13.1'	56.0'
15	43°58.99	· · 16.61	348°7.78	13.7'	14°18.70	13.1'	55.9'
16	58°59.12	15.81	2°40.53	13.7'	14°31.76	13.0'	55.9'
17	73°59.26	15.01	17°13.25	13.7'	14°44.75	12.9'	55.9'
18	88°59.40	N13°14.20	31°45.94	13.7'	S14°57.65	12.8'	55.9'
19	103°59.53	13.40	46°18.61	13.6'	15°10.48	12.7'	55.8'
20	118°59.67	12.60	60°51.26	13.6'	15°23.23	12.7'	55.8'
21	133°59.80	· · 11.79	75°23.87	13.6'	15°35.89	12.6'	55.8'
22	148°59.94	10.99	89°56.46	13.6'	15°48.48	12.5'	55.7'
23	164°0.08	10.18	104°29.02	13.5'	16°0.98	12.4'	55.7'
SD = 15.8' $d = -0.8'$			SD = 15.4'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°0.22	N13°9.38	119°1.55	13.5'	S16°13.40	12.3'	55.7'
1	194°0.35	8.57	133°34.05	13.5'	16°25.73	12.3'	55.6'
2	209°0.49	7.77	148°6.53	13.4'	16°37.99	12.2'	55.6'
3	224°0.63	· · 6.96	162°38.96	13.4'	16°50.15	12.1'	55.6'
4	239°0.77	6.15	177°11.37	13.4'	17°2.23	12.0'	55.6'
5	254°0.91	5.34	191°43.75	13.3'	17°14.23	11.9'	55.5'
6	269°1.04	N13°4.54	206°16.09	13.3'	S17°26.14	11.8'	55.5'
7	284°1.18	3.73	220°48.40	13.3'	17°37.96	11.7'	55.5'
8	299°1.32	2.92	235°20.67	13.2'	17°49.69	11.6'	55.5'
9	314°1.46	· · 2.11	249°52.91	13.2'	18°1.33	11.6'	55.4'
10	329°1.60	1.30	264°25.11	13.2'	18°12.88	11.5'	55.4'
11	344°1.74	13°0.49	278°57.28	13.1'	18°24.34	11.4'	55.4'
12	359°1.88	N12°59.68	293°29.41	13.1'	S18°35.71	11.3'	55.3'
13	14°2.02	58.87	308°1.50	13.1'	18°46.99	11.2'	55.3'
14	29°2.16	58.06	322°33.56	13.0'	18°58.17	11.1'	55.3'
15	44°2.30	· · 57.25	337°5.58	13.0'	19°9.26	11.0'	55.3'
16	59°2.44	56.44	351°37.56	12.9'	19°20.26	10.9'	55.2'
17	74°2.58	55.63	6°9.50	12.9'	19°31.16	10.8'	55.2'
18	89°2.72	N12°54.82	20°41.40	12.9'	S19°41.96	10.7'	55.2'
19	104°2.87	54.01	35°13.26	12.8'	19°52.67	10.6'	55.2'
20	119°3.01	53.19	49°45.08	12.8'	20°3.28	10.5'	55.1'
21	134°3.15	· · 52.38	64°16.86	12.7'	20°13.80	10.4'	55.1'
22	149°3.29	51.57	78°48.60	12.7'	20°24.21	10.3'	55.1'
23	164°3.43	50.75	93°20.29	12.7'	20°34.53	10.2'	55.1'
SD = 15.8' $d = -0.8'$			SD = 15.2'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°3.58	N12°49.94	107°51.95	12.6'	S20°44.75	10.1'	55.1'
1	194°3.72	49.13	122°23.56	12.6'	20°54.86	10.0'	55.0'
2	209°3.86	48.31	136°55.13	12.5'	21°4.88	9.9'	55.0'
3	224°4.01	· · 47.50	151°26.66	12.5'	21°14.79	9.8'	55.0'
4	239°4.15	46.68	165°58.14	12.4'	21°24.60	9.7'	55.0'
5	254°4.29	45.87	180°29.59	12.4'	21°34.31	9.6'	54.9'
6	269°4.44	N12°45.05	195°0.98	12.4'	S21°43.91	9.5'	54.9'
7	284°4.58	44.23	209°32.34	12.3'	21°53.41	9.4'	54.9'
8	299°4.72	43.42	224°3.65	12.3'	22°2.81	9.3'	54.9'
9	314°4.87	· · 42.60	238°34.91	12.2'	22°12.10	9.2'	54.9'
10	329°5.01	41.78	253°6.14	12.2'	22°21.28	9.1'	54.8'
11	344°5.16	40.96	267°37.31	12.1'	22°30.35	9.0'	54.8'
12	359°5.30	N12°40.15	282°8.45	12.1'	S22°39.32	8.9'	54.8'
13	14°5.45	39.33	296°39.54	12.0'	22°48.18	8.8'	54.8'
14	29°5.60	38.51	311°10.58	12.0'	22°56.93	8.6'	54.8'
15	44°5.74	· · 37.69	325°41.58	12.0'	23°5.57	8.5'	54.7'
16	59°5.89	36.87	340°12.54	11.9'	23°14.10	8.4'	54.7'
17	74°6.03	36.05	354°43.45	11.9'	23°22.52	8.3'	54.7'
18	89°6.18	N12°35.23	9°14.31	11.8'	S23°30.83	8.2'	54.7'
19	104°6.33	34.41	23°45.13	11.8'	23°39.03	8.1'	54.7'
20	119°6.47	33.59	38°15.91	11.7'	23°47.11	8.0'	54.6'
21	134°6.62	· · 32.77	52°46.64	11.7'	23°55.09	7.9'	54.6'
22	149°6.77	31.95	67°17.33	11.6'	24°2.94	7.7'	54.6'
23	164°6.92	31.12	81°47.97	11.6'	24°10.69	7.6'	54.6'
SD = 15.8' $d = -0.8'$			SD = 15.0'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 5-7 21-39%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
17	04:12	04:06	12:04	15:49	03:27	
18	03:59	03:52	12:04	16:35	04:12	
19	03:46	03:39	12:04	17:22	04:58	

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	328°20.87		137°20.08	S06°49.99	232°8.60	N23°40.40	194°36.59	N17°55.16	314°12.63	N03°13.05
1	343°23.33		152°20.52	51.15	247°9.29	40.37	209°38.50	55.01	329°15.19	13.00
2	358°25.79		167°20.96	52.32	262°9.98	40.34	224°40.42	54.87	344°17.74	12.95
3	13°28.26		182°21.41	· · 53.48	277°10.67	· · 40.30	239°42.33	· · 54.72	359°20.29	· · 12.91
4	28°30.72		197°21.85	54.64	292°11.35	40.27	254°44.25	54.58	14°22.84	12.86
5	43°33.19		212°22.29	55.81	307°12.04	40.23	269°46.16	54.43	29°25.40	12.81
6	58°35.65		227°22.73	S06°56.97	322°12.73	N23°40.19	284°48.08	N17°54.29	44°27.95	N03°12.76
7	73°38.11		242°23.18	58.13	337°13.42	40.16	299°50.00	54.14	59°30.50	12.72
8	88°40.58		257°23.62	06°59.29	352°14.10	40.12	314°51.91	54.00	74°33.05	12.67
9	103°43.04		272°24.07	07°0.45	7°14.79	· · 40.09	329°53.83	· · 53.85	89°35.61	· · 12.62
10	118°45.51		287°24.52	1.61	22°15.48	40.05	344°55.74	53.71	104°38.16	12.57
11	133°47.97		302°24.96	2.77	37°16.17	40.01	359°57.66	53.56	119°40.71	12.52
12	148°50.44		317°25.41	S07°3.93	52°16.86	N23°39.97	14°59.57	N17°53.42	134°43.27	N03°12.48
13	163°52.90		332°25.86	5.09	67°17.55	39.94	30°1.49	53.27	149°45.82	12.43
14	178°55.36		347°26.31	6.25	82°18.24	39.90	45°3.41	53.13	164°48.38	12.38
15	193°57.83		2°26.76	· · 7.41	97°18.92	· · 39.86	60°5.32	· · 52.98	179°50.93	· · 12.33
16	209°0.29		17°27.21	8.57	112°19.61	39.82	75°7.24	52.84	194°53.48	12.28
17	224°2.76		32°27.67	9.73	127°20.30	39.78	90°9.16	52.69	209°56.04	12.23
18	239°5.22		47°28.12	S07°10.89	142°20.99	N23°39.74	105°11.07	N17°52.55	224°58.59	N03°12.19
19	254°7.68		62°28.57	12.05	157°21.68	39.70	120°12.99	52.40	240°1.15	12.14
20	269°10.15		77°29.03	13.21	172°22.37	39.66	135°14.91	52.26	255°3.70	12.09
21	284°12.61		92°29.48	· · 14.36	187°23.06	· · 39.62	150°16.82	· · 52.11	270°6.26	· · 12.04
22	299°15.08		107°29.94	15.52	202°23.75	39.58	165°18.74	51.97	285°8.81	11.99
23	314°17.54		122°30.39	16.68	217°24.44	39.54	180°20.66	51.82	300°11.37	11.94
Mer.pass. 02:06		ν0.4' d1.2' m-4.47		ν0.7' d-0.0' m1.27		ν1.9' d-0.1' m-1.79		ν2.6' d-0.0' m0.54		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	329°20.01		137°30.85	S07°17.83	232°25.14	N23°39.50	195°22.57	N17°51.68	315°13.92	N03°11.89
1	344°22.47		152°31.31	18.99	247°25.83	39.45	210°24.49	51.53	330°16.48	11.85
2	359°24.93		167°31.77	20.15	262°26.52	39.41	225°26.41	51.39	345°19.03	11.80
3	14°27.40		182°32.22	· · 21.30	277°27.21	· · 39.37	240°28.32	· · 51.24	0°21.59	· · 11.75
4	29°29.86		197°32.68	22.46	292°27.90	39.33	255°30.24	51.10	15°24.15	11.70
5	44°32.33		212°33.15	23.61	307°28.59	39.28	270°32.16	50.95	30°26.70	11.65
6	59°34.79		227°33.61	S07°24.77	322°29.28	N23°39.24	285°34.07	N17°50.81	45°29.26	N03°11.60
7	74°37.25		242°34.07	25.92	337°29.98	39.20	300°35.99	50.66	60°31.82	11.55
8	89°39.72		257°34.53	27.07	352°30.67	39.15	315°37.91	50.52	75°34.37	11.50
9	104°42.18		272°35.00	· · 28.23	7°31.36	· · 39.11	330°39.83	· · 50.37	90°36.93	· · 11.45
10	119°44.65		287°35.46	29.38	22°32.05	39.06	345°41.74	50.22	105°39.49	11.40
11	134°47.11		302°35.93	30.53	37°32.75	39.02	0°43.66	50.08	120°42.04	11.36
12	149°49.58		317°36.39	S07°31.69	52°33.44	N23°38.97	15°45.58	N17°49.93	135°44.60	N03°11.31
13	164°52.04		332°36.86	32.84	67°34.13	38.93	30°47.50	49.79	150°47.16	11.26
14	179°54.50		347°37.33	33.99	82°34.83	38.88	45°49.41	49.64	165°49.71	11.21
15	194°56.97		2°37.79	· · 35.14	97°35.52	· · 38.83	60°51.33	· · 49.50	180°52.27	· · 11.16
16	209°59.43		17°38.26	36.29	112°36.21	38.79	75°53.25	49.35	195°54.83	11.11
17	225°1.90		32°38.73	37.44	127°36.91	38.74	90°55.17	49.21	210°57.39	11.06
18	240°4.36		47°39.20	S07°38.59	142°37.60	N23°38.69	105°57.08	N17°49.06	225°59.95	N03°11.01
19	255°6.82		62°39.68	39.74	157°38.29	38.65	120°59.00	48.92	241°2.50	10.96
20	270°9.29		77°40.15	40.89	172°38.99	38.60	136°0.92	48.77	256°5.06	10.91
21	285°11.75		92°40.62	· · 42.04	187°39.68	· · 38.55	151°2.84	· · 48.63	271°7.62	· · 10.86
22	300°14.22		107°41.09	43.19	202°40.38	38.50	166°4.76	48.48	286°10.18	10.81
23	315°16.68		122°41.57	44.34	217°41.07	38.45	181°6.68	48.34	301°12.74	10.76
Mer.pass. 02:02		ν0.5' d1.2' m-4.49		ν0.7' d-0.0' m1.27		ν1.9' d-0.1' m-1.79		ν2.6' d-0.0' m0.53		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330°19.15		137°42.04	S07°45.49	232°41.77	N23°38.40	196°8.59	N17°48.19	316°15.30	N03°10.71
1	345°21.61		152°42.52	46.64	247°42.46	38.35	211°10.51	48.05	331°17.86	10.66
2	0°24.07		167°43.00	47.78	262°43.16	38.30	226°12.43	47.90	346°20.41	10.61
3	15°26.54		182°43.47	· · 48.93	277°43.85	· · 38.25	241°14.35	· · 47.76	1°22.97	· · 10.56
4	30°29.00		197°43.95	50.08	292°44.55	38.20	256°16.27	47.61	16°25.53	10.51
5	45°31.47		212°44.43	51.22	307°45.25	38.15	271°18.19	47.46	31°28.09	10.46
6	60°33.93		227°44.91	S07°52.37	322°45.94	N23°38.10	286°20.11	N17°47.32	46°30.65	N03°10.41
7	75°36.39		242°45.39	53.52	337°46.64	38.05	301°22.02	47.17	61°33.21	10.36
8	90°38.86		257°45.87	54.66	352°47.34	38.00	316°23.94	47.03	76°35.77	10.31
9	105°41.32		272°46.36	· · 55.81	7°48.03	· · 37.95	331°25.86	· · 46.88	91°38.33	· · 10.26
10	120°43.79		287°46.84	56.95	22°48.73	37.90	346°27.78	46.74	106°40.89	10.21
11	135°46.25		302°47.32	58.10	37°49.43	37.84	1°29.70	46.59	121°43.45	10.16
12	150°48.72		317°47.81	S07°59.24	52°50.12	N23°37.79	16°31.62	N17°46.45	136°46.01	N03°10.10
13	165°51.18		332°48.29	08°0.38	67°50.82	37.74	31°33.54	46.30	151°48.57	10.05
14	180°53.64		347°48.78	1.53	82°51.52	37.68	46°35.46	46.16	166°51.14	10.00
15	195°56.11		2°49.26	· · 2.67	97°52.22	· · 37.63	61°37.38	· · 46.01	181°53.70	· · 9.95
16	210°58.57		17°49.75	3.81	112°52.91	37.57	76°39.30	45.87	196°56.26	9.90
17	226°1.04		32°50.24	4.95	127°53.61	37.52	91°41.22	45.72	211°58.82	9.85
18	241°3.50		47°50.73	S08°6.10	142°54.31	N23°37.47	106°43.13	N17°45.57	227°1.38	N03°9.80
19	256°5.96		62°51.22	7.24	157°55.01	37.41	121°45.05	45.43	242°3.94	9.75
20	271°8.43		77°51.71	8.38	172°55.71	37.36	136°46.97	45.28	257°6.50	9.70
21	286°10.89		92°52.20	· · 9.52	187°56.41	· · 37.30	151°48.89	· · 45.14	272°9.07	· · 9.65
22	301°13.36		107°52.69	10.66	202°57.11	37.24	166°50.81	44.99	287°11.63	9.59
23	316°15.82		122°53.19	11.80	217°57.80	37.19	181°52.73	44.85	302°14.19	9.54
Mer.pass. 01:58		ν0.5' d1.1' m-4.50		ν0.7' d-0.0' m1.27		ν1.9' d-0.1' m-1.79		ν2.6' d-0.1' m0.53		

Stars		
	SHA	Dec
Alpheratz	357°33.08	29°14.32
Ankaa	353°5.48	-42°9.38
Schedar	349°29.08	56°40.94
Diphda	348°45.71	-17°50.19
Achernar	335°18.87	-57°5.73
Hamal	327°49.53	23°35.34
Polaris	313°15.29	89°22.26
Acamar	315°10.66	-40°11.52
Menkar	314°4.68	4°11.79
Mirfak	308°26.27	49°57.19
Aldebaran	290°38.14	16°33.81
Rigel	281°2.69	-8°10.07
Capella	280°20.07	46°1.34
Bellatrix	278°21.57	6°22.52
Elnath	278°0.32	28°37.75
Alnilam	275°36.51	-1°10.96
Betelgeuse	270°50.80	7°24.80
Canopus	263°52.14	-52°42.28
Sirius	258°25.28	-16°44.98
Adhara	255°5.08	-29°0.28
Procyon	244°49.70	5°9.48
Pollux	243°15.98	27°57.70
Avior	234°14.79	-59°35.52
Suhail	222°45.76	-43°32.30
Miaplacidus	221°38.94	-69°49.51
Alphard	217°46.76	-8°46.37
Regulus	207°33.33	11°50.29
Dubhe	193°39.99	61°36.53
Denebola	182°23.86	14°25.48
Gienah	175°42.46	-17°41.40
Acrux	172°59.13	-63°15.00
Gacrux	171°50.58	-57°15.92
Alioth	166°12.17	55°49.11
Spica	158°21.06	-11°18.02
Alkaid	152°51.18	49°11.03
Hadar	148°34.35	-60°30.32
Menkent	147°56.19	-36°30.19
Arcturus	145°46.80	19°2.76
Rigel Kent.	139°38.63	-60°56.97
Kochab	137°20.10	74°2.99
Zuben'ubi	136°54.60	-16°9.17
Alphecca	126°2.61	26°37.69
Antares	112°14.10	-26°29.51
Atria	107°6.92	-69°4.74
Sabik	102°1.11	-15°45.45
Shaula	96°8.35	-37°7.45
Rasalhague	95°57.14	12°32.59
Eltanin	90°41.27	51°29.35
Kaus Aust.	83°30.47	-34°22.33
Vega	80°32.03	38°48.71
Nunki	75°45.82	-26°15.78
Altair	61°58.36	8°56.48
Peacock	53°3.06	-56°38.93
Deneb	49°24.45	45°22.68
Enif	33°37.15	9°59.99
Al Na'ir	27°30.76	-46°49.75
Fomalhaut	15°12.68	-29°28.66
Scheat	13°43.55	28°13.74
Markab	13°28.24	15°21.05
Aug 20 Thu	SHA	Mer.pass
Venus	168°59.22	14:50
Mars	263°47.74	08:31
Jupiter	226°15.72	11:00
Saturn	345°51.77	03:03
Aug 21 Fri	SHA	Mer.pass
Venus	168°10.84	14:49
Mars	263°5.13	08:30
Jupiter	226°2.57	10:57
Saturn	345°53.92	02:59
Aug 22 Sat	SHA	Mer.pass
Venus	167°22.90	14:49
Mars	262°22.62	08:29
Jupiter	225°49.45	10:54
Saturn	345°56.15	02:54
Horizontal parallax		
	Venus:	0.2
	Mars:	0.1

h		Sun		Moon				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		179°7.06	N12°30.30	96°18.57	11.6'	S24°18.31	7.5'	54.6'
1		194°7.21	29.48	110°49.12	11.5'	24°25.83	7.4'	54.6'
2		209°7.36	28.66	125°19.63	11.5'	24°33.22	7.3'	54.5'
3		224°7.51	· · 27.83	139°50.10	11.4'	24°40.50	7.2'	54.5'
4		239°7.66	27.01	154°20.52	11.4'	24°47.66	7.0'	54.5'
5		254°7.81	26.19	168°50.90	11.3'	24°54.71	6.9'	54.5'
6		269°7.96	N12°25.36	183°21.24	11.3'	S25°1.64	6.8'	54.5'
7		284°8.10	24.54	197°51.53	11.3'	25°8.44	6.7'	54.5'
8		299°8.25	23.71	212°21.78	11.2'	25°15.13	6.6'	54.5'
9		314°8.40	· · 22.89	226°51.99	11.2'	25°21.70	6.4'	54.4'
10		329°8.55	22.06	241°22.16	11.1'	25°28.15	6.3'	54.4'
11		344°8.70	21.24	255°52.28	11.1'	25°34.47	6.2'	54.4'
12		359°8.85	N12°20.41	270°22.36	11.0'	S25°40.68	6.1'	54.4'
13		14°9.01	19.58	284°52.41	11.0'	25°46.76	6.0'	54.4'
14		29°9.16	18.76	299°22.41	11.0'	25°52.72	5.8'	54.4'
15		44°9.31	· · 17.93	313°52.37	10.9'	25°58.56	5.7'	54.4'
16		59°9.46	17.10	328°22.30	10.9'	26°4.27	5.6'	54.4'
17		74°9.61	16.27	342°52.18	10.8'	26°9.86	5.5'	54.3'
18		89°9.76	N12°15.45	357°22.03	10.8'	S26°15.32	5.3'	54.3'
19		104°9.91	14.62	11°51.84	10.8'	26°20.66	5.2'	54.3'
20		119°10.07	13.79	26°21.61	10.7'	26°25.88	5.1'	54.3'
21		134°10.22	· · 12.96	40°51.34	10.7'	26°30.97	5.0'	54.3'
22		149°10.37	12.13	55°21.04	10.7'	26°35.93	4.8'	54.3'
23		164°10.52	11.30	69°50.70	10.6'	26°40.76	4.7'	54.3'
		SD = 15.8'		$d = -0.8'$		SD = 14.9'		

Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		179°10.68	N12°10.47	84°20.33	10.6'	S26°45.47	4.6'	54.3'
1		194°10.83	9.64	98°49.92	10.6'	26°50.05	4.5'	54.3'
2		209°10.98	8.81	113°19.48	10.5'	26°54.50	4.3'	54.2'
3		224°11.14	· · 7.98	127°49.01	10.5'	26°58.83	4.2'	54.2'
4		239°11.29	7.14	142°18.50	10.5'	27°3.02	4.1'	54.2'
5		254°11.44	6.31	156°47.96	10.4'	27°7.09	3.9'	54.2'
6		269°11.60	N12°5.48	171°17.39	10.4'	S27°11.02	3.8'	54.2'
7		284°11.75	4.65	185°46.79	10.4'	27°14.83	3.7'	54.2'
8		299°11.91	3.82	200°16.17	10.3'	27°18.50	3.5'	54.2'
9		314°12.06	· · 2.98	214°45.51	10.3'	27°22.05	3.4'	54.2'
10		329°12.22	2.15	229°14.82	10.3'	27°25.46	3.3'	54.2'
11		344°12.37	1.31	243°44.11	10.3'	27°28.74	3.2'	54.2'
12		359°12.53	N12°0.48	258°13.37	10.2'	S27°31.89	3.0'	54.2'
13		14°12.68	11°59.65	272°42.61	10.2'	27°34.91	2.9'	54.2'
14		29°12.84	58.81	287°11.82	10.2'	27°37.80	2.8'	54.2'
15		44°12.99	· · 57.98	301°41.01	10.2'	27°40.55	2.6'	54.2'
16		59°13.15	57.14	316°10.17	10.1'	27°43.17	2.5'	54.2'
17		74°13.31	56.30	330°39.32	10.1'	27°45.66	2.4'	54.2'
18		89°13.46	N11°55.47	345°8.44	10.1'	S27°48.01	2.2'	54.1'
19		104°13.62	54.63	359°37.54	10.1'	27°50.23	2.1'	54.1'
20		119°13.78	53.80	14°6.62	10.1'	27°52.31	2.0'	54.1'
21		134°13.93	· · 52.96	28°35.69	10.0'	27°54.27	1.8'	54.1'
22		149°14.09	52.12	43°4.74	10.0'	27°56.08	1.7'	54.1'
23		164°14.25	51.28	57°33.77	10.0'	27°57.77	1.5'	54.1'
		SD = 15.8'		$d = -0.8'$		SD = 14.8'		

Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		179°14.41	N11°50.45	72°2.78	10.0'	S27°59.31	1.4'	54.1'
1		194°14.57	49.61	86°31.79	10.0'	28°0.73	1.3'	54.1'
2		209°14.72	48.77	101°0.77	10.0'	28°2.00	1.1'	54.1'
3		224°14.88	· · 47.93	115°29.75	10.0'	28°3.15	1.0'	54.1'
4		239°15.04	47.09	129°58.71	10.0'	28°4.15	0.9'	54.1'
5		254°15.20	46.25	144°27.67	9.9'	28°5.02	0.7'	54.1'
6		269°15.36	N11°45.41	158°56.61	9.9'	S28°5.76	0.6'	54.1'
7		284°15.52	44.57	173°25.55	9.9'	28°6.36	0.5'	54.1'
8		299°15.68	43.73	187°54.48	9.9'	28°6.82	0.3'	54.1'
9		314°15.84	· · 42.89	202°23.40	9.9'	28°7.15	0.2'	54.1'
10		329°16.00	42.05	216°52.32	9.9'	28°7.34	0.1'	54.1'
11		344°16.16	41.21	231°21.23	9.9'	28°7.40	-0.1'	54.1'
12		359°16.32	N11°40.36	245°50.15	9.9'	S28°7.32	-0.2'	54.1'
13		14°16.48	39.52	260°19.06	9.9'	28°7.10	-0.4'	54.1'
14		29°16.64	38.68	274°47.96	9.9'	28°6.75	-0.5'	54.1'
15		44°16.80	· · 37.84	289°16.87	9.9'	28°6.26	-0.6'	54.1'
16		59°16.96	36.99	303°45.78	9.9'	28°5.64	-0.8'	54.1'
17		74°17.12	36.15	318°14.69	9.9'	28°4.87	-0.9'	54.1'
18		89°17.28	N11°35.31	332°43.61	9.9'	S28°3.98	-1.0'	54.1'
19		104°17.45	34.46	347°12.53	9.9'	28°2.94	-1.2'	54.1'
20		119°17.61	33.62	1°41.45	9.9'	28°1.77	-1.3'	54.1'
21		134°17.77	· · 32.77	16°10.38	9.9'	28°0.47	-1.4'	54.1'
22		149°17.93	31.93	30°39.32	9.9'	27°59.03	-1.6'	54.1'
23		164°18.09	31.08	45°8.27	10.0'	27°57.45	-1.7'	54.1'
		SD = 15.8'		$d = -0.8'$		SD = 14.8'		

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

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

Day	Sun		Mer. Pass	Moon	
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August 23, 24, 25 UT (Sun., Mon., Tue.)

	Aries			Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	331°18.29	137°53.68	S08°12.94	232°58.50	N23°37.13	196°54.65	N17°44.70	317°16.75	N03°9.49			Alpheratz	357°33.06 29°14.33	
1	346°20.75	152°54.18	14.08	247°59.20	37.07	211°56.57	44.56	332°19.31	9.44			Ankaa	353°5.46 -42°9.38	
2	1°23.21	167°54.67	15.22	262°59.90	37.02	226°58.49	44.41	347°21.88	9.39			Schedar	349°29.05 56°40.96	
3	16°25.68	182°55.17	•• 16.36	278°0.60	•• 36.96	242°0.41	•• 44.26	2°24.44	•• 9.34			Diphda	348°45.68 -17°50.18	
4	31°28.14	197°55.66	17.49	293°1.30	36.90	257°2.33	44.12	17°27.00	9.29			Achernar	335°18.84 -57°5.73	
5	46°30.61	212°56.16	18.63	308°2.00	36.84	272°4.25	43.97	32°29.57	9.23			Hamal	327°49.50 23°35.35	
6	61°33.07	227°56.66	S08°19.77	323°2.70	N23°36.78	287°6.17	N17°43.83	47°32.13	N03°9.18			Polaris	313°13.55 89°22.27	
7	76°35.53	242°57.16	20.91	338°3.41	36.72	302°8.09	43.68	62°34.69	9.13			Acamar	315°10.63 -40°11.51	
8	91°38.00	257°57.66	22.04	353°4.11	36.67	317°10.01	43.54	77°37.25	9.08			Menkar	314°4.65 4°11.80	
9	106°40.46	272°58.16	•• 23.18	8°4.81	•• 36.61	332°11.93	•• 43.39	92°39.82	•• 9.03			Mirfak	308°26.23 49°57.20	
10	121°42.93	287°58.66	24.31	23°5.51	36.55	347°13.86	43.25	107°42.38	8.98			Aldebaran	290°38.12 16°33.81	
11	136°45.39	302°59.17	25.45	38°6.21	36.49	2°15.78	43.10	122°44.95	8.92			Rigel	281°2.67 -8°10.07	
12	151°47.86	317°59.67	S08°26.58	53°6.91	N23°36.43	17°17.70	N17°42.95	137°47.51	N03°8.87			Capella	280°20.04 46°1.34	
13	166°50.32	333°0.17	27.72	68°7.61	36.36	32°19.62	42.81	152°50.07	8.82			Bellatrix	278°21.54 6°22.53	
14	181°52.78	348°0.68	28.85	83°8.32	36.30	47°21.54	42.66	167°52.64	8.77			Elnath	278°0.29 28°37.75	
15	196°55.25	3°1.19	•• 29.99	98°9.02	•• 36.24	62°23.46	•• 42.52	182°55.20	•• 8.72			Alnilam	275°36.49 -1°10.96	
16	211°57.71	18°1.69	31.12	113°9.72	36.18	77°25.38	42.37	197°57.77	8.66			Betelgeuse	270°50.78 7°24.81	
17	227°0.18	33°2.20	32.25	128°10.42	36.12	92°27.30	42.23	213°0.33	8.61			Canopus	263°52.11 -52°42.27	
18	242°2.64	48°2.71	S08°33.39	143°11.13	N23°36.06	107°29.22	N17°42.08	228°2.90	N03°8.56			Sirius	258°25.26 -16°44.97	
19	257°5.10	63°3.22	34.52	158°11.83	35.99	122°31.14	41.94	243°5.46	8.51			Adhara	255°5.06 -29°0.27	
20	272°7.57	78°3.73	35.65	173°12.53	35.93	137°33.06	41.79	258°8.03	8.45			Procyon	244°49.68 5°9.48	
21	287°10.03	93°4.24	•• 36.78	188°13.23	•• 35.87	152°34.99	•• 41.64	273°10.59	•• 8.40			Pollux	243°15.95 27°57.69	
22	302°12.50	108°4.75	37.91	203°13.94	35.80	167°36.91	41.50	288°13.16	8.35			Avior	234°14.77 -59°35.51	
23	317°14.96	123°5.26	39.05	218°14.64	35.74	182°38.83	41.35	303°15.72	8.30			Suhail	222°45.75 -43°32.29	
Mer.pass. 01:54				ν0.5' d1.1' m-4.51		ν0.7' d-0.1' m1.27		ν1.9' d-0.1' m-1.79		ν2.6' d-0.1' m0.52				
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	332°17.43	138°5.78	S08°40.18	233°15.35	N23°35.68	197°40.75	N17°41.21	318°18.29	N03°8.25			Dubhe	193°39.99 61°36.51	
1	347°19.89	153°6.29	41.31	248°16.05	35.61	212°42.67	41.06	333°20.85	8.19			Denebola	182°23.86 14°25.48	
2	2°22.35	168°6.80	42.44	263°16.75	35.55	227°44.59	40.92	348°23.42	8.14			Gienah	175°42.46 -17°41.40	
3	17°24.82	183°7.32	•• 43.56	278°17.46	•• 35.48	242°46.52	•• 40.77	3°25.99	•• 8.09			Acrux	172°59.14 -63°14.99	
4	32°27.28	198°7.84	44.69	293°18.16	35.42	257°48.44	40.62	18°28.55	8.03			Gacrux	171°50.59 -57°15.91	
5	47°29.75	213°8.35	45.82	308°18.87	35.35	272°50.36	40.48	33°31.12	7.98			Alioth	166°12.18 55°49.09	
6	62°32.21	228°8.87	S08°46.95	323°19.57	N23°35.29	287°52.28	N17°40.33	48°33.68	N03°7.93			Spica	158°21.07 -11°18.02	
7	77°34.67	243°9.39	48.08	338°20.28	35.22	302°54.20	40.19	63°36.25	7.88			Alkaid	152°51.19 49°11.02	
8	92°37.14	258°9.91	49.21	353°20.98	35.15	317°56.12	40.04	78°38.82	7.82			Hadar	148°34.37 -60°30.32	
9	107°39.60	273°10.43	•• 50.33	8°21.69	•• 35.09	332°58.05	•• 39.90	93°41.38	•• 7.77			Menkent	147°56.19 -36°30.18	
10	122°42.07	288°10.95	51.46	23°22.39	35.02	347°59.97	39.75	108°43.95	7.72			Arcturus	145°46.81 19°2.76	
11	137°44.53	303°11.48	52.58	38°23.10	34.95	3°1.89	39.60	123°46.52	7.66			Rigel Kent.	139°38.65 -60°56.96	
12	152°47.00	318°12.00	S08°53.71	53°23.81	N23°34.88	18°3.81	N17°39.46	138°49.09	N03°7.61			Kochab	137°20.15 74°2.98	
13	167°49.46	333°12.52	54.84	68°24.51	34.81	33°5.74	39.31	153°51.65	7.56			Zuben'ubi	136°54.60 -16°9.17	
14	182°51.92	348°13.05	55.96	83°25.22	34.75	48°7.66	39.17	168°54.22	7.50			Alphecca	126°2.62 26°37.69	
15	197°54.39	3°13.57	•• 57.09	98°25.93	•• 34.68	63°9.58	•• 39.02	183°56.79	•• 7.45			Antares	112°14.11 -26°29.51	
16	212°56.85	18°14.10	58.21	113°26.63	34.61	78°11.50	38.88	198°59.36	7.40			Atria	107°6.94 -69°4.74	
17	227°59.32	33°14.63	08°59.33	128°27.34	34.54	93°13.43	38.73	214°1.92	7.34			Sabik	102°1.12 -15°45.45	
18	243°1.78	48°15.16	S09°0.46	143°28.05	N23°34.47	108°15.35	N17°38.58	229°4.49	N03°7.29			Shaula	96°8.35 -37°7.45	
19	258°4.24	63°15.68	1.58	158°28.75	34.40	123°17.27	38.44	244°7.06	7.24			Rasalhague	95°57.15 12°32.59	
20	273°6.71	78°16.21	2.70	173°29.46	34.33	138°19.20	38.29	259°9.63	7.18			Eltanin	90°41.29 51°29.36	
21	288°9.17	93°16.75	•• 3.82	188°30.17	•• 34.26	153°21.12	•• 38.15	274°12.20	•• 7.13			Kaus Aust.	83°30.48 -34°22.33	
22	303°11.64	108°17.28	4.95	203°30.88	34.19	168°23.04	38.00	289°14.77	7.08			Vega	80°32.04 38°48.72	
23	318°14.10	123°17.81	6.07	218°31.59	34.12	183°24.96	37.85	304°17.33	7.02			Nunki	75°45.82 -26°15.78	
Mer.pass. 01:51				ν0.5' d1.1' m-4.52		ν0.7' d-0.1' m1.26		ν1.9' d-0.1' m-1.79		ν2.6' d-0.1' m0.52				
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	333°16.56	138°18.34	S09°7.19	233°32.29	N23°34.04	198°26.89	N17°37.71	319°19.90	N03°6.97			Peacock	53°3.06 -56°38.93	
1	348°19.03	153°18.88	8.31	248°33.00	33.97	213°28.81	37.56	334°22.47	6.91			Deneb	49°24.45 45°22.69	
2	3°21.49	168°19.41	9.43	263°33.71	33.90	228°30.73	37.42	349°25.04	6.86			Enif	33°37.14 9°59.99	
3	18°23.96	183°19.95	•• 10.55	278°34.42	•• 33.83	243°32.66	•• 37.27	4°27.61	•• 6.81			Al Na'ir	27°30.75 -46°49.76	
4	33°26.42	198°20.48	11.67	293°35.13	33.76	258°34.58	37.13	19°30.18	6.75			Fomalhaut	15°12.67 -29°28.66	
5	48°28.89	213°21.02	12.79	308°35.84	33.68	273°36.50	36.98	34°32.75	6.70			Scheat	13°43.54 28°13.76	
6	63°31.35	228°21.56	S09°13.90	323°36.55	N23°33.61	288°38.43	N17°36.83	49°35.32	N03°6.64			Markab	13°28.23 15°21.06	
7	78°33.81	243°22.10	15.02	338°37.26	33.53	303°40.35	36.69	64°37.89	6.59			Aug 23 Sun		
8	93°36.28	258°22.64	16.14	353°37.97	33.46	318°42.28	36.54	79°40.46	6.54			Venus	166°35.40 14:48	
9	108°38.74	273°23.18	•• 17.26	8°38.68	•• 33.39	333°44.20	•• 36.40	94°43.03	•• 6.48			Mars	261°40.22 08:28	
10	123°41.21	288°23.72	18.37	23°39.39	33.31	348°46.12	36.25	109°45.60	6.43			Jupiter	225°36.37 10:51	
11	138°43.67	303°24.26	19.49	38°40.10	33.24	3°48.05	36.10	124°48.17	6.37			Saturn	345°58.47 02:50	
12	153°46.13	318°24.81	S09°20.61	53°40.81	N23°33.16	18°49.97	N17°35.96	139°50.74	N03°6.32			Aug 24 Mon		
13	168°48.60	333°25.35	21.72	68°41.52	33.09	33°51.89	35.81	154°53.31	6.26			Venus	165°48.35 14:47	
14	183°51.06	348°25.90	22.84	83°42.23	33.01	48°53.82	35.67	169°55.88	6.21			Mars	260°57.92 08:27	
15	198°53.53	3°26.44	•• 23.95	98°42.94	•• 32.93	63°55.74	•• 35.52	184°58.45	•• 6.15			Jupiter	225°23.33 10:48	
16	213°55.99	18°26.99	25.06	113°43.65	32.86	78°57.67	35.38	200°1.02	6.10			Saturn	346°0.86 02:46	
17	228°58.46	33°27.54	26.18	128°44.37	32.78	93°59.59	35.23	215°3.60	6.05			Aug 25 Tue		
18	244°0.92	48°28.09	S09°27.29	143°45.08	N23°32.70	109°1.52	N17°35.08	230°6.17	N03°5.99			Venus	165°1.78 14:46	
19	259°3.38	63°28.64	28.40	158°45.79	32.63	124°3.44	34.94	245°8.74	5.94			Mars	260°15.73 08:25	
20	274°5.85	78°29.19	29.52	173°46.50	32.55	139°5.37	34.79	260°11.31	5.88			Jupiter	225°10.32 10:45	
21	289°8.31	93°29.74	•• 30.63	188°47.21	•• 32.47	154°7.29	•• 34.65	275°13.88	•• 5.83			Saturn	346°3.34 02:42	
22	304°10.78	108°30.29	31.74	203°47.93	32.39	169°9.22	34.50	290°16.45	5.77			Horizontal parallax		
23	319°13.24	123°30.84	32.85	218°48.64	32.31	184°11.14	34.35	305°19.03	5.72			Venus:	0.2	
Mer.pass. 01:47				ν0.5' d1.1' m-4.53		ν0.7' d-0.1' m1.26		ν1.9' d-0.1' m-1.80		ν2.6' d-0.1' m0.51		Mars:		0.1


h		Sun		Moon			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		179°18.26	N11°30.24	59°37.23	10.0'	S27°55.74	-1.8' 54.2'
1		194°18.42	29.39	74°6.19	10.0'	27°53.89	-2.0' 54.2'
2		209°18.58	28.54	88°35.17	10.0'	27°51.91	-2.1' 54.2'
3		224°18.75	· · 27.70	103°4.16	10.0'	27°49.79	-2.3' 54.2'
4		239°18.91	26.85	117°33.17	10.0'	27°47.53	-2.4' 54.2'
5		254°19.07	26.00	132°2.19	10.0'	27°45.15	-2.5' 54.2'
6		269°19.24	N11°25.16	146°31.23	10.1'	S27°42.62	-2.7' 54.2'
7		284°19.40	24.31	161°0.28	10.1'	27°39.96	-2.8' 54.2'
8		299°19.57	23.46	175°29.35	10.1'	27°37.17	-2.9' 54.2'
9		314°19.73	· · 22.61	189°58.44	10.1'	27°34.25	-3.1' 54.2'
10		329°19.89	21.76	204°27.55	10.1'	27°31.19	-3.2' 54.2'
11		344°20.06	20.91	218°56.68	10.2'	27°27.99	-3.3' 54.2'
12		359°20.22	N11°20.06	233°25.83	10.2'	S27°24.67	-3.5' 54.2'
13		14°20.39	19.21	247°55.00	10.2'	27°21.21	-3.6' 54.2'
14		29°20.56	18.36	262°24.20	10.2'	27°17.61	-3.7' 54.2'
15		44°20.72	· · 17.51	276°53.42	10.2'	27°13.89	-3.9' 54.2'
16		59°20.89	16.66	291°22.67	10.3'	27°10.03	-4.0' 54.3'
17		74°21.05	15.81	305°51.94	10.3'	27°6.04	-4.1' 54.3'
18		89°21.22	N11°14.96	320°21.24	10.3'	S27°1.92	-4.3' 54.3'
19		104°21.39	14.11	334°50.56	10.4'	26°57.67	-4.4' 54.3'
20		119°21.55	13.26	349°19.92	10.4'	26°53.29	-4.5' 54.3'
21		134°21.72	· · 12.40	3°49.31	10.4'	26°48.78	-4.6' 54.3'
22		149°21.89	11.55	18°18.72	10.4'	26°44.13	-4.8' 54.3'
23		164°22.05	10.70	32°48.17	10.5'	26°39.36	-4.9' 54.3'
		SD = 15.8'				SD = 14.8'	

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		179°22.22	N11°9.85	47°17.65	10.5'	S26°34.46	-5.0' 54.3'
1		194°22.39	8.99	61°47.16	10.5'	26°29.43	-5.2' 54.3'
2		209°22.56	8.14	76°16.71	10.6'	26°24.27	-5.3' 54.3'
3		224°22.72	· · 7.29	90°46.29	10.6'	26°18.99	-5.4' 54.4'
4		239°22.89	6.43	105°15.90	10.7'	26°13.57	-5.5' 54.4'
5		254°23.06	5.58	119°45.55	10.7'	26°8.03	-5.7' 54.4'
6		269°23.23	N11°4.72	134°15.24	10.7'	S26°2.36	-5.8' 54.4'
7		284°23.40	3.87	148°44.96	10.8'	25°56.57	-5.9' 54.4'
8		299°23.57	3.01	163°14.72	10.8'	25°50.65	-6.0' 54.4'
9		314°23.73	· · 2.16	177°44.52	10.8'	25°44.61	-6.2' 54.4'
10		329°23.90	1.30	192°14.36	10.9'	25°38.44	-6.3' 54.4'
11		344°24.07	11°0.44	206°44.24	10.9'	25°32.15	-6.4' 54.4'
12		359°24.24	N10°59.59	221°14.16	11.0'	S25°25.73	-6.5' 54.5'
13		14°24.41	58.73	235°44.12	11.0'	25°19.20	-6.7' 54.5'
14		29°24.58	57.87	250°14.12	11.0'	25°12.54	-6.8' 54.5'
15		44°24.75	· · 57.01	264°44.16	11.1'	25°5.75	-6.9' 54.5'
16		59°24.92	56.16	279°14.24	11.1'	24°58.85	-7.0' 54.5'
17		74°25.09	55.30	293°44.37	11.2'	24°51.83	-7.1' 54.5'
18		89°25.26	N10°54.44	308°14.54	11.2'	S24°44.68	-7.3' 54.5'
19		104°25.44	53.58	322°44.75	11.3'	24°37.42	-7.4' 54.6'
20		119°25.61	52.72	337°15.01	11.3'	24°30.04	-7.5' 54.6'
21		134°25.78	· · 51.86	351°45.31	11.3'	24°22.54	-7.6' 54.6'
22		149°25.95	51.00	6°15.65	11.4'	24°14.92	-7.7' 54.6'
23		164°26.12	50.14	20°46.04	11.4'	24°7.19	-7.9' 54.6'
		SD = 15.8'				SD = 14.8'	

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		179°26.29	N10°49.28	35°16.48	11.5'	S23°59.34	-8.0' 54.6'
1		194°26.46	48.42	49°46.96	11.5'	23°51.37	-8.1' 54.6'
2		209°26.64	47.56	64°17.49	11.6'	23°43.29	-8.2' 54.7'
3		224°26.81	· · 46.70	78°48.06	11.6'	23°35.09	-8.3' 54.7'
4		239°26.98	45.84	93°18.68	11.7'	23°26.78	-8.4' 54.7'
5		254°27.15	44.98	107°49.35	11.7'	23°18.36	-8.5' 54.7'
6		269°27.33	N10°44.11	122°20.07	11.8'	S23°9.83	-8.6' 54.7'
7		284°27.50	43.25	136°50.83	11.8'	23°1.18	-8.8' 54.7'
8		299°27.67	42.39	151°21.64	11.9'	22°52.43	-8.9' 54.7'
9		314°27.85	· · 41.53	165°52.49	11.9'	22°43.56	-9.0' 54.8'
10		329°28.02	40.66	180°23.40	12.0'	22°34.59	-9.1' 54.8'
11		344°28.19	39.80	194°54.35	12.0'	22°25.50	-9.2' 54.8'
12		359°28.37	N10°38.94	209°25.35	12.0'	S22°16.31	-9.3' 54.8'
13		14°28.54	38.07	223°56.39	12.1'	22°7.01	-9.4' 54.8'
14		29°28.72	37.21	238°27.49	12.1'	21°57.61	-9.5' 54.8'
15		44°28.89	· · 36.34	252°58.63	12.2'	21°48.09	-9.6' 54.9'
16		59°29.07	35.48	267°29.82	12.2'	21°38.48	-9.7' 54.9'
17		74°29.24	34.61	282°1.06	12.3'	21°28.76	-9.8' 54.9'
18		89°29.42	N10°33.75	296°32.35	12.3'	S21°18.93	-9.9' 54.9'
19		104°29.59	32.88	311°3.68	12.4'	21°9.01	-10.0' 54.9'
20		119°29.77	32.02	325°35.06	12.4'	20°58.98	-10.1' 54.9'
21		134°29.94	· · 31.15	340°6.49	12.5'	20°48.85	-10.2' 55.0'
22		149°30.12	30.28	354°37.97	12.5'	20°38.62	-10.3' 55.0'
23		164°30.29	29.42	9°9.49	12.6'	20°28.29	-10.4' 55.0'
		SD = 15.8'				SD = 14.9'	

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

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

Day	Sun		Mer. Pass	Moon		Age 11-13 76-90%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm Lower hh:mm		
23	02:47	02:39	12:03	20:44 08:19		
24	02:31	02:23	12:02	21:34 09:09		
25	02:15	02:07	12:02	22:22 09:58		

August 26, 27, 28 UT (Wed., Thu., Fri.)

h	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	334°15.70	138°31.40	S09°33.96	233°49.35	N23°32.24	199°13.06	N17°34.21	320°21.60	N03°5.66						
1	349°18.17	153°31.95	35.07	248°50.07	32.16	214°14.99	34.06	335°24.17	5.61						
2	4°20.63	168°32.51	36.18	263°50.78	32.08	229°16.91	33.92	350°26.74	5.55						
3	19°23.10	183°33.07	· · 37.29	278°51.49	· · 32.00	244°18.84	· · 33.77	5°29.31	· · 5.50						
4	34°25.56	198°33.62	38.40	293°52.21	31.92	259°20.76	33.62	20°31.89	5.44						
5	49°28.02	213°34.18	39.51	308°52.92	31.84	274°22.69	33.48	35°34.46	5.39						
6	64°30.49	228°34.74	S09°40.62	323°53.63	N23°31.76	289°24.62	N17°33.33	50°37.03	N03°5.33						
7	79°32.95	243°35.30	41.73	338°54.35	31.67	304°26.54	33.19	65°39.61	5.27						
8	94°35.42	258°35.86	42.83	353°55.06	31.59	319°28.47	33.04	80°42.18	5.22						
9	109°37.88	273°36.42	· · 43.94	8°55.78	· · 31.51	334°30.39	· · 32.89	95°44.75	· · 5.16						
10	124°40.34	288°36.99	45.05	23°56.49	31.43	349°32.32	32.75	110°47.33	5.11						
11	139°42.81	303°37.55	46.15	38°57.21	31.35	4°34.24	32.60	125°49.90	5.05						
12	154°45.27	318°38.12	S09°47.26	53°57.92	N23°31.27	19°36.17	N17°32.46	140°52.47	N03°5.00						
13	169°47.74	333°38.68	48.36	68°58.64	31.18	34°38.09	32.31	155°55.05	4.94						
14	184°50.20	348°39.25	49.47	83°59.35	31.10	49°40.02	32.16	170°57.62	4.89						
15	199°52.67	· · 39.82	· · 50.57	99°0.07	· · 31.02	64°41.95	· · 32.02	186°0.20	· · 4.83						
16	214°55.13	18°40.38	51.67	114°0.79	30.93	79°43.87	31.87	201°2.77	4.77						
17	229°57.59	33°40.95	52.78	129°1.50	30.85	94°45.80	31.73	216°5.34	4.72						
18	245°0.06	48°41.52	S09°53.88	144°2.22	N23°30.76	109°47.73	N17°31.58	231°7.92	N03°4.66						
19	260°2.52	63°42.09	54.98	159°2.94	30.68	124°49.65	31.43	246°10.49	4.61						
20	275°4.99	78°42.67	56.09	174°3.65	30.59	139°51.58	31.29	261°13.07	4.55						
21	290°7.45	93°43.24	· · 57.19	189°4.37	· · 30.51	154°53.50	· · 31.14	276°15.64	· · 4.49						
22	305°9.91	108°43.81	58.29	204°5.09	30.42	169°55.43	31.00	291°18.22	4.44						
23	320°12.38	123°44.39	59.39	219°5.80	30.34	184°57.36	30.85	306°20.79	4.38						
Mer.pass. 01:43		ν0.6' d1.1' m-4.55			ν0.7' d-0.1' m1.26			ν1.9' d-0.1' m-1.80			ν2.6' d-0.1' m0.51				

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°14.84	138°44.96	S10°0.49	234°6.52	N23°30.25	199°59.28	N17°30.70	321°23.37	N03°4.33						
1	350°17.31	153°45.54	1.59	249°7.24	30.16	215°1.21	30.56	336°25.94	4.27						
2	5°19.77	168°46.12	2.69	264°7.96	30.08	230°3.14	30.41	351°28.52	4.21						
3	20°22.23	183°46.69	· · 3.79	279°8.68	· · 29.99	245°5.06	· · 30.27	6°31.10	· · 4.16						
4	35°24.70	198°47.27	4.88	294°9.39	29.90	260°6.99	30.12	21°33.67	4.10						
5	50°27.16	213°47.85	5.98	309°10.11	29.82	275°8.92	29.97	36°36.25	4.04						
6	65°29.63	228°48.44	S10°7.08	324°10.83	N23°29.73	290°10.85	N17°29.83	51°38.82	N03°3.99						
7	80°32.09	243°49.02	8.18	339°11.55	29.64	305°12.77	29.68	66°41.40	3.93						
8	95°34.55	258°49.60	9.27	354°12.27	29.55	320°14.70	29.54	81°43.98	3.87						
9	110°37.02	273°50.18	· · 10.37	9°12.99	· · 29.46	335°16.63	· · 29.39	96°46.55	· · 3.82						
10	125°39.48	288°50.77	11.47	24°13.71	29.37	350°18.55	29.24	111°49.13	3.76						
11	140°41.95	303°51.35	12.56	39°14.43	29.28	5°20.48	29.10	126°51.71	3.70						
12	155°44.41	318°51.94	S10°13.66	54°15.15	N23°29.19	20°22.41	N17°28.95	141°54.28	N03°3.65						
13	170°46.88	333°52.53	14.75	69°15.87	29.10	35°24.34	28.80	156°56.86	3.59						
14	185°49.34	348°53.12	15.84	84°16.59	29.01	50°26.26	28.66	171°59.44	3.53						
15	200°51.80	· · 53.71	· · 16.94	99°17.31	· · 28.92	65°28.19	· · 28.51	187°2.02	· · 3.48						
16	215°54.27	18°54.30	18.03	114°18.03	28.83	80°30.12	28.37	202°4.59	3.42						
17	230°56.73	33°54.89	19.12	129°18.75	28.74	95°32.05	28.22	217°7.17	3.36						
18	245°59.20	48°55.48	S10°20.21	144°19.47	N23°28.65	110°33.98	N17°28.07	232°9.75	N03°3.30						
19	261°1.66	63°56.07	21.31	159°20.19	28.56	125°35.90	27.93	247°12.33	3.25						
20	276°4.12	78°56.67	22.40	174°20.92	28.46	140°37.83	27.78	262°14.90	3.19						
21	291°6.59	93°57.26	· · 23.49	189°21.64	· · 28.37	155°39.76	· · 27.64	277°17.48	· · 3.13						
22	306°9.05	108°57.86	24.58	204°22.36	28.28	170°41.69	27.49	292°20.06	3.08						
23	321°11.52	123°58.45	25.67	219°23.08	28.19	185°43.62	27.34	307°22.64	3.02						
Mer.pass. 01:39		ν0.6' d1.1' m-4.56			ν0.7' d-0.1' m1.26			ν1.9' d-0.1' m-1.80			ν2.6' d-0.1' m0.50				

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	336°13.98	138°59.05	S10°26.76	234°23.80	N23°28.09	200°45.55	N17°27.20	322°25.22	N03°2.96						
1	351°16.44	153°59.65	27.84	249°24.53	28.00	215°47.47	27.05	337°27.80	2.90						
2	6°18.91	169°0.25	28.93	264°25.25	27.91	230°49.40	26.90	352°30.37	2.85						
3	21°21.37	184°0.85	· · 30.02	279°25.97	· · 27.81	245°51.33	· · 26.76	7°32.95	· · 2.79						
4	36°23.84	199°1.45	31.11	294°26.70	27.72	260°53.26	26.61	22°35.53	2.73						
5	51°26.30	214°2.06	32.19	309°27.42	27.62	275°55.19	26.47	37°38.11	2.67						
6	66°28.76	229°2.66	S10°33.28	324°28.14	N23°27.53	290°57.12	N17°26.32	52°40.69	N03°2.62						
7	81°31.23	244°3.26	34.37	339°28.87	27.43	305°59.05	26.17	67°43.27	2.56						
8	96°33.69	259°3.87	35.45	354°29.59	27.34	321°0.98	26.03	82°45.85	2.50						
9	111°36.16	274°4.48	· · 36.54	9°30.31	· · 27.24	336°2.90	· · 25.88	97°48.43	· · 2.44						
10	126°38.62	289°5.08	37.62	24°31.04	27.14	351°4.83	25.74	112°51.01	2.38						
11	141°41.08	304°5.69	38.70	39°31.76	27.05	6°6.76	25.59	127°53.59	2.33						
12	156°43.55	319°6.30	S10°39.79	54°32.49	N23°26.95	21°8.69	N17°25.44	142°56.17	N03°2.27						
13	171°46.01	334°6.91	40.87	69°33.21	26.85	36°10.62	25.30	157°58.75	2.21						
14	186°48.48	349°7.52	41.95	84°33.94	26.75	51°12.55	25.15	173°1.33	2.15						
15	201°50.94	· · 8.13	· · 43.03	99°34.66	· · 26.66	66°14.48	· · 25.00	188°3.91	· · 2.09						
16	216°53.40	19°8.75	44.12	114°35.39	26.56	81°16.41	24.86	203°6.49	2.04						
17	231°55.87	34°9.36	45.20	129°36.12	26.46	96°18.34	24.71	218°9.07	1.98						
18	246°58.33	49°9.98	S10°46.28	144°36.84	N23°26.36	111°20.27	N17°24.57	233°11.65	N03°1.92						
19	262°0.80	64°10.59	47.36	159°37.57	26.26	126°22.20	24.42	248°14.23	1.86						
20	277°3.26	79°11.21	48.44	174°38.29	26.16	141°24.13	24.27	263°16.81	1.80						
21	292°5.73	94°11.83	· · 49.52	189°39.02	· · 26.06	156°26.06	· · 24.13	278°19.40	· · 1.74						
22	307°8.19	109°12.45	50.59	204°39.75	25.96	171°27.99	23.98	293°21.98	1.69						
23	322°10.65	124°13.07	51.67	219°40.47	25.86	186°29.92	23.83	308°24.56	1.63						
Mer.pass. 01:35		ν0.6' d1.1' m-4.57			ν0.7' d-0.1' m1.25			ν1.9' d-0.1' m-1.80			ν2.6' d-0.1' m0.50				

Stars		
	SHA	Dec
Alpheratz	357°33.05	29°14.35
Ankaa	353°5.44	-42°9.39
Schedar	349°29.03	56°40.98
Diphda	348°45.67	-17°50.18
Achernar	335°18.80	-57°5.74
Hamal	327°49.48	23°35.36
Polaris	313°12.05	89°22.28
Acamar	315°10.61	-40°11.51
Menkar	314°4.63	4°11.80
Mirfak	308°26.20	49°57.21
Aldebaran	290°38.09	16°33.82
Rigel	281°2.65	-8°10.06
Capella	280°20.00	46°1.34
Bellatrix	278°21.52	6°22.53
Elnath	278°0.26	-28°37.75
Alnilam	275°36.46	-1°10.95
Betelgeuse	270°50.75	7°24.81
Canopus	263°52.08	-52°42.26
Sirius	258°25.24	-16°44.96
Adhara	255°5.04	-29°0.26
Procyon	244°49.66	5°9.48
Pollux	243°15.93	27°57.69
Avior	234°14.76	-59°35.49
Suhail	222°45.74	-43°32.28
Miaplacidus	221°38.91	-69°49.48
Alphard	217°46.74	-8°46.36
Regulus	207°33.32	11°50.28
Dubhe	193°39.99	61°36.50
Denebola	182°23.85	14°25.47
Gienah	175°42.47	-17°41.39
Acrux	172°59.16	-63°14.98
Gacrux	171°50.61	-57°15.90
Alioth	166°12.19	55°49.08
Spica	158°21.07	-11°18.02
Alkaid	152°51.20	49°11.01
Hadar	148°34.39	-60°30.31
Menkent	147°56.20	-36°30.18
Arcturus	145°46.82	19°2.76
Rigel Kent.	139°38.68	-60°56.96
Kochab	137°20.21	74°2.97
Zuben 'ubi	136°54.61	-16°9.16
Alphecca	126°2.63	26°37.69
Antares	112°14.12	-26°29.51
Atria	107°6.98	-69°4.75
Sabik	102°1.12	-15°45.45
Shaula	96°8.36	-37°7.45
Rasalhague	95°57.16	12°32.59
Eltanin	90°41.31	51°29.36
Kaus Aust.	83°30.48	-34°22.34
Vega	80°32.05	38°48.72
Nunki	75°45.83	-26°15.78
Altair	61°58.36	8°56.49
Peacock	53°3.06	-56°38.95
Deneb	49°24.46	45°22.70
Enif	33°37.14	10°0.00
Al Na'ir	27°30.74	-46°49.77
Fomalhaut	15°12.65	-29°28.66
Scheat	13°43.53	28°13.77
Markab	13°28.22	15°21.07
Aug 26 Wed		
	SHA	Mer.pass
Venus	164°15.69	14:45
Mars	259°33.65	08:24
Jupiter	224°57.36	10:42
Saturn	346°5.89	02:38
Aug 27 Thu		
	SHA	Mer.pass
Venus	163°30.12	14:44
Mars	258°51.68	08:23
Jupiter	224°44.44	10:39
Saturn	346°8.53	02:34
Aug 28 Fri		
	SHA	Mer.pass
Venus	162°45.07	14:43
Mars	258°9.82	08:22
Jupiter	224°31.57	10:36
Saturn	346°11.24	02:30
Horizontal parallax		
Venus:	0.3	
Mars:	0.1	

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Wed							
0	179°30.47	N10°28.55	23°41.06	12.6'	S20°17.87	-10.5'	55.0'
1	194°30.65	27.68	38°12.68	12.7'	20°7.34	-10.6'	55.0'
2	209°30.82	26.81	52°44.35	12.7'	19°56.72	-10.7'	55.1'
3	224°31.00	· · 25.95	67°16.06	12.8'	19°46.00	-10.8'	55.1'
4	239°31.18	25.08	81°47.82	12.8'	19°35.19	-10.9'	55.1'
5	254°31.35	24.21	96°19.62	12.9'	19°24.28	-11.0'	55.1'
6	269°31.53	N10°23.34	110°51.48	12.9'	S19°13.28	-11.1'	55.1'
7	284°31.71	22.47	125°23.37	12.9'	19°2.18	-11.2'	55.2'
8	299°31.89	21.60	139°55.31	13.0'	18°51.00	-11.3'	55.2'
9	314°32.06	· · 20.73	154°27.30	13.0'	18°39.72	-11.4'	55.2'
10	329°32.24	19.86	168°59.33	13.1'	18°28.35	-11.5'	55.2'
11	344°32.42	18.99	183°31.41	13.1'	18°16.89	-11.5'	55.2'
12	359°32.60	N10°18.12	198°3.53	13.2'	S18°5.35	-11.6'	55.2'
13	14°32.78	17.25	212°35.69	13.2'	17°53.71	-11.7'	55.3'
14	29°32.95	16.38	227°7.90	13.3'	17°41.99	-11.8'	55.3'
15	44°33.13	· · 15.51	241°40.15	13.3'	17°30.19	-11.9'	55.3'
16	59°33.31	14.63	256°12.44	13.3'	17°18.30	-12.0'	55.3'
17	74°33.49	13.76	270°44.78	13.4'	17°6.32	-12.1'	55.3'
18	89°33.67	N10°12.89	285°17.15	13.4'	S16°54.26	-12.1'	55.4'
19	104°33.85	12.02	299°49.57	13.5'	16°42.12	-12.2'	55.4'
20	119°34.03	11.15	314°22.03	13.5'	16°29.89	-12.3'	55.4'
21	134°34.21	· · 10.27	328°54.53	13.5'	16°17.59	-12.4'	55.4'
22	149°34.39	9.40	343°27.07	13.6'	16°5.21	-12.5'	55.5'
23	164°34.57	8.52	357°59.64	13.6'	15°52.74	-12.5'	55.5'
SD = 15.8' $d = -0.9'$							
SD = 15.0'							

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°34.75	N10°7.65	12°32.26	13.7'	S15°40.20	-12.6'	55.5'
1	194°34.93	6.78	27°4.91	13.7'	15°27.59	-12.7'	55.5'
2	209°35.11	5.90	41°37.60	13.7'	15°14.89	-12.8'	55.5'
3	224°35.29	· · 5.03	56°10.33	13.8'	15°2.12	-12.8'	55.6'
4	239°35.47	4.15	70°43.09	13.8'	14°49.28	-12.9'	55.6'
5	254°35.65	3.28	85°15.89	13.8'	14°36.36	-13.0'	55.6'
6	269°35.83	N10°2.40	99°48.72	13.9'	S14°23.37	-13.1'	55.6'
7	284°36.02	1.53	114°21.59	13.9'	14°10.31	-13.1'	55.6'
8	299°36.20	10°0.65	128°54.50	13.9'	13°57.18	-13.2'	55.7'
9	314°36.38	09°59.77	143°27.43	14.0'	13°43.98	-13.3'	55.7'
10	329°36.56	58.90	158°0.40	14.0'	13°30.70	-13.3'	55.7'
11	344°36.74	58.02	172°33.40	14.0'	13°17.37	-13.4'	55.7'
12	359°36.92	N09°57.14	187°6.43	14.1'	S13°3.96	-13.5'	55.7'
13	14°37.11	56.26	201°39.49	14.1'	12°50.49	-13.5'	55.8'
14	29°37.29	55.39	216°12.58	14.1'	12°36.95	-13.6'	55.8'
15	44°37.47	· · 54.51	230°45.69	14.1'	12°23.35	-13.7'	55.8'
16	59°37.66	53.63	245°18.84	14.2'	12°9.69	-13.7'	55.8'
17	74°37.84	52.75	259°52.02	14.2'	11°55.96	-13.8'	55.9'
18	89°38.02	N09°51.87	274°25.22	14.2'	S11°42.18	-13.8'	55.9'
19	104°38.21	50.99	288°58.44	14.3'	11°28.33	-13.9'	55.9'
20	119°38.39	50.11	303°31.69	14.3'	11°14.42	-14.0'	55.9'
21	134°38.57	· · 49.23	318°4.97	14.3'	11°0.46	-14.0'	55.9'
22	149°38.76	48.35	332°38.27	14.3'	10°46.44	-14.1'	56.0'
23	164°38.94	47.47	347°11.59	14.3'	10°32.36	-14.1'	56.0'
SD = 15.8' $d = -0.9'$							
SD = 15.1'							

Fri	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.12	N09°46.59	1°44.93	14.4'	S10°18.22	-14.2'	56.0'
1	194°39.31	45.71	16°18.29	14.4'	10°4.04	-14.2'	56.0'
2	209°39.49	44.83	30°51.68	14.4'	09°49.79	-14.3'	56.0'
3	224°39.68	· · 43.95	45°25.08	14.4'	09°35.50	-14.3'	56.1'
4	239°39.86	43.07	59°58.50	14.4'	09°21.16	-14.4'	56.1'
5	254°40.05	42.19	74°31.94	14.5'	09°6.76	-14.4'	56.1'
6	269°40.23	N09°41.30	89°5.40	14.5'	S08°52.31	-14.5'	56.1'
7	284°40.42	40.42	103°38.87	14.5'	08°37.82	-14.5'	56.2'
8	299°40.60	39.54	118°12.35	14.5'	08°23.28	-14.6'	56.2'
9	314°40.79	· · 38.66	132°45.85	14.5'	08°8.69	-14.6'	56.2'
10	329°40.98	37.77	147°19.36	14.5'	07°54.06	-14.7'	56.2'
11	344°41.16	36.89	161°52.89	14.5'	07°39.38	-14.7'	56.2'
12	359°41.35	N09°36.01	176°26.42	14.5'	S07°24.66	-14.8'	56.3'
13	14°41.53	35.12	190°59.97	14.6'	07°9.90	-14.8'	56.3'
14	29°41.72	34.24	205°33.52	14.6'	06°55.09	-14.8'	56.3'
15	44°41.91	· · 33.35	220°7.09	14.6'	06°40.25	-14.9'	56.3'
16	59°42.09	32.47	234°40.66	14.6'	06°25.36	-14.9'	56.4'
17	74°42.28	31.58	249°14.23	14.6'	06°10.44	-15.0'	56.4'
18	89°42.47	N09°30.70	263°47.82	14.6'	S05°55.48	-15.0'	56.4'
19	104°42.65	29.81	278°21.40	14.6'	05°40.49	-15.0'	56.4'
20	119°42.84	28.93	292°54.99	14.6'	05°25.46	-15.1'	56.4'
21	134°43.03	· · 28.04	307°28.58	14.6'	05°10.39	-15.1'	56.5'
22	149°43.22	27.15	322°2.18	14.6'	04°55.29	-15.1'	56.5'
23	164°43.40	26.27	336°35.77	14.6'	04°40.16	-15.2'	56.5'
SD = 15.8' $d = -0.9'$							
SD = 15.3'							

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

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

Aries			Venus		Mars		Jupiter		Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	337°13.12	139°13.69	S10°52.75	234°41.20	N23°25.76	201°31.85	N17°23.69	323°27.14	N03°1.57		
1	352°15.58	154°14.31	53.83	249°41.93	25.66	216°33.78	23.54	338°29.72	1.51		
2	7°18.05	169°14.93	54.90	264°42.66	25.56	231°35.71	23.40	353°32.30	1.45		
3	22°20.51	184°15.56	•• 55.98	279°43.38	•• 25.46	246°37.64	•• 23.25	8°34.89	•• 1.39		
4	37°22.97	199°16.18	57.06	294°44.11	25.36	261°39.57	23.10	23°37.47	1.33		
5	52°25.44	214°16.81	58.13	309°44.84	25.26	276°41.50	22.96	38°40.05	1.27		
6	67°27.90	229°17.43	S10°59.20	324°45.57	N23°25.15	291°43.43	N17°22.81	53°42.63	N03°1.22		
7	82°30.37	244°18.06	11°0.28	339°46.30	25.05	306°45.37	22.66	68°45.21	1.16		
8	97°32.83	259°18.69	1.35	354°47.03	24.95	321°47.30	22.52	83°47.80	1.10		
9	112°35.29	274°19.32	•• 2.43	9°47.76	•• 24.85	336°49.23	•• 22.37	98°50.38	•• 1.04		
10	127°37.76	289°19.95	3.50	24°48.48	24.74	351°51.16	22.23	113°52.96	0.98		
11	142°40.22	304°20.58	4.57	39°49.21	24.64	6°53.09	22.08	128°55.55	0.92		
12	157°42.69	319°21.22	S11°5.64	54°49.94	N23°24.53	21°55.02	N17°21.93	143°58.13	N03°0.86		
13	172°45.15	334°21.85	6.71	69°50.67	24.43	36°56.95	21.79	159°0.71	0.80		
14	187°47.61	349°22.49	7.78	84°51.40	24.32	51°58.88	21.64	174°3.30	0.74		
15	202°50.08	4°23.12	•• 8.85	99°52.13	•• 24.22	67°0.81	•• 21.49	189°5.88	•• 0.68		
16	217°52.54	19°23.76	9.92	114°52.86	24.11	82°2.75	21.35	204°8.46	0.63		
17	232°55.01	34°24.40	10.99	129°53.60	24.01	97°4.68	21.20	219°11.05	0.57		
18	247°57.47	49°25.04	S11°12.06	144°54.33	N23°23.90	112°6.61	N17°21.06	234°13.63	N03°0.51		
19	262°59.93	64°25.68	13.13	159°55.06	23.80	127°8.54	20.91	249°16.21	0.45		
20	278°2.40	79°26.32	14.20	174°55.79	23.69	142°10.47	20.76	264°18.80	0.39		
21	293°4.86	94°26.96	•• 15.26	189°56.52	•• 23.58	157°12.40	•• 20.62	279°21.38	•• 0.33		
22	308°7.33	109°27.60	16.33	204°57.25	23.48	172°14.34	20.47	294°23.97	0.27		
23	323°9.79	124°28.24	17.40	219°57.98	23.37	187°16.27	20.32	309°26.55	0.21		
Mer.pass. 01:31			ν0.6' d1.1' m-4.58		ν0.7' d-0.1' m1.25		ν1.9' d-0.1' m-1.80		ν2.6' d-0.1' m0.49		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	338°12.25	139°28.89	S11°18.46	234°58.72	N23°23.26	202°18.20	N17°20.18	324°29.14	N03°0.15		
1	353°14.72	154°29.54	19.53	249°59.45	23.15	217°20.13	20.03	339°31.72	0.09		
2	8°17.18	169°30.18	20.59	265°0.18	23.05	232°22.07	19.88	354°34.31	0.03		
3	23°19.65	184°30.83	•• 21.66	280°0.91	•• 22.94	247°24.00	•• 19.74	9°36.89	02°59.97		
4	38°22.11	199°31.48	22.72	295°1.65	22.83	262°25.93	19.59	24°39.48	02°59.91		
5	53°24.57	214°32.13	23.78	310°2.38	22.72	277°27.86	19.45	39°42.06	59.85		
6	68°27.04	229°32.78	S11°24.84	325°3.11	N23°22.61	292°29.80	N17°19.30	54°44.65	N02°59.79		
7	83°29.										

Aug 29 Sat	SHA	Mer.pass
Venus	162° 0.57	14:42
Mars	257° 28.08	08:21
Jupiter	224° 18.73	10:33
Saturn	346° 14.02	02:26

Aug 30 Sun	SHA	Mer.pass
Venus	161° 16.64	14:41
Mars	256° 46.46	08:20
Jupiter	224° 5.95	10:29
Saturn	346° 16.88	02:22

Aug 31 Mon	SHA	Mer.pass
Venus	160° 33.29	14:40
Mars	256° 4.96	08:19
Jupiter	223° 53.21	10:26
Saturn	346° 19.81	02:18

Horizontal parallax	
Venus:	0.3
Mars:	0.1


h	Sun			Moon			
Sat	GHA	Dec		GHA	ν	Dec	d HP
0	179°43.59	N09°25.38		351°9.36	14.6'	S04°25.00	-15.2' 56.5'
1	194°43.78	24.49		5°42.95	14.6'	04°9.81	-15.2' 56.5'
2	209°43.97	23.61		20°16.54	14.6'	03°54.59	-15.2' 56.6'
3	224°44.16	· · 22.72		34°50.13	14.6'	03°39.35	-15.3' 56.6'
4	239°44.35	21.83		49°23.71	14.6'	03°24.07	-15.3' 56.6'
5	254°44.53	20.94		63°57.28	14.6'	03°8.77	-15.3' 56.6'
6	269°44.72	N09°20.05		78°30.85	14.6'	S02°53.45	-15.3' 56.7'
7	284°44.91	19.16		93°4.41	14.5'	02°38.10	-15.4' 56.7'
8	299°45.10	18.28		107°37.96	14.5'	02°22.74	-15.4' 56.7'
9	314°45.29	· · 17.39		122°11.50	14.5'	02°7.35	-15.4' 56.7'
10	329°45.48	16.50		136°45.02	14.5'	01°51.94	-15.4' 56.7'
11	344°45.67	15.61		151°18.54	14.5'	01°36.51	-15.4' 56.8'
12	359°45.86	N09°14.72		165°52.04	14.5'	S01°21.06	-15.5' 56.8'
13	14°46.05	13.83		180°25.53	14.5'	01°5.60	-15.5' 56.8'
14	29°46.24	12.94		194°59.00	14.5'	00°50.12	-15.5' 56.8'
15	44°46.43	· · 12.05		209°32.46	14.4'	00°34.62	-15.5' 56.8'
16	59°46.62	11.15		224°5.90	14.4'	00°19.12	-15.5' 56.9'
17	74°46.81	10.26		238°39.32	14.4'	S00°3.60	-15.5' 56.9'
18	89°47.00	N09°9.37		253°12.72	14.4'	N00°11.93	15.5' 56.9'
19	104°47.19	8.48		267°46.10	14.4'	00°27.47	15.5' 56.9'
20	119°47.38	7.59		282°19.45	14.3'	00°43.02	15.6' 57.0'
21	134°47.57	· · 6.70		296°52.78	14.3'	00°58.58	15.6' 57.0'
22	149°47.76	5.80		311°26.09	14.3'	01°14.14	15.6' 57.0'
23	164°47.96	4.91		325°59.37	14.3'	01°29.71	15.6' 57.0'
SD = 15.8'			$d = -0.9'$	SD = 15.4'			

Sun	GHA	Dec		GHA	ν	Dec	d HP
0	179°48.15	N09°4.02		340°32.63	14.2'	N01°45.28	15.6' 57.0'
1	194°48.34	3.12		355°5.86	14.2'	02°0.86	15.6' 57.1'
2	209°48.53	2.23		9°39.06	14.2'	02°16.43	15.6' 57.1'
3	224°48.72	· · 1.34		24°12.23	14.1'	02°32.01	15.6' 57.1'
4	239°48.91	09°0.44		38°45.36	14.1'	02°47.59	15.6' 57.1'
5	254°49.11	08°59.55		53°18.47	14.1'	03°3.16	15.6' 57.1'
6	269°49.30	N08°58.65		67°51.54	14.0'	N03°18.73	15.6' 57.2'
7	284°49.49	57.76		82°24.57	14.0'	03°34.30	15.6' 57.2'
8	299°49.68	56.86		96°57.57	14.0'	03°49.86	15.6' 57.2'
9	314°49.88	· · 55.97		111°30.54	13.9'	04°5.42	15.5' 57.2'
10	329°50.07	55.07		126°3.46	13.9'	04°20.96	15.5' 57.2'
11	344°50.26	54.18		140°36.35	13.8'	04°36.50	15.5' 57.3'
12	359°50.46	N08°53.28		155°9.19	13.8'	N04°52.03	15.5' 57.3'
13	14°50.65	52.38		169°41.99	13.8'	05°7.55	15.5' 57.3'
14	29°50.84	51.49		184°14.75	13.7'	05°23.05	15.5' 57.3'
15	44°51.04	· · 50.59		198°47.47	13.7'	05°38.54	15.5' 57.3'
16	59°51.23	49.69		213°20.14	13.6'	05°54.01	15.5' 57.4'
17	74°51.42	48.80		227°52.76	13.6'	06°9.47	15.4' 57.4'
18	89°51.62	N08°47.90		242°25.34	13.5'	N06°24.91	15.4' 57.4'
19	104°51.81	47.00		256°57.86	13.5'	06°40.32	15.4' 57.4'
20	119°52.01	46.10		271°30.34	13.4'	06°55.72	15.4' 57.4'
21	134°52.20	· · 45.20		286°2.77	13.4'	07°11.10	15.4' 57.5'
22	149°52.39	44.31		300°35.14	13.3'	07°26.45	15.3' 57.5'
23	164°52.59	43.41		315°7.46	13.3'	07°41.78	15.3' 57.5'
SD = 15.8'			$d = -0.9'$	SD = 15.6'			

Mon	GHA	Dec		GHA	ν	Dec	d HP
0	179°52.78	N08°42.51		329°39.72	13.2'	N07°57.08	15.3' 57.5'
1	194°52.98	41.61		344°11.93	13.2'	08°12.36	15.2' 57.5'
2	209°53.17	40.71		358°44.08	13.1'	08°27.61	15.2' 57.6'
3	224°53.37	· · 39.81		13°16.18	13.0'	08°42.82	15.2' 57.6'
4	239°53.56	38.91		27°48.21	13.0'	08°58.01	15.2' 57.6'
5	254°53.76	38.01		42°20.19	12.9'	09°13.16	15.1' 57.6'
6	269°53.95	N08°37.11		56°52.10	12.8'	N09°28.28	15.1' 57.6'
7	284°54.15	36.21		71°23.95	12.8'	09°43.37	15.0' 57.7'
8	299°54.35	35.31		85°55.73	12.7'	09°58.42	15.0' 57.7'
9	314°54.54	· · 34.41		100°27.45	12.7'	10°13.42	15.0' 57.7'
10	329°54.74	33.50		114°59.11	12.6'	10°28.39	14.9' 57.7'
11	344°54.93	32.60		129°30.69	12.5'	10°43.32	14.9' 57.7'
12	359°55.13	N08°31.70		144°2.21	12.4'	N10°58.21	14.8' 57.8'
13	14°55.33	30.80		158°33.66	12.4'	11°13.05	14.8' 57.8'
14	29°55.52	29.90		173°5.04	12.3'	11°27.85	14.8' 57.8'
15	44°55.72	· · 28.99		187°36.35	12.2'	11°42.60	14.7' 57.8'
16	59°55.92	28.09		202°7.58	12.2'	11°57.30	14.7' 57.8'
17	74°56.11	27.19		216°38.74	12.1'	12°11.96	14.6' 57.8'
18	89°56.31	N08°26.28		231°9.82	12.0'	N12°26.56	14.6' 57.9'
19	104°56.51	25.38		245°40.83	11.9'	12°41.11	14.5' 57.9'
20	119°56.71	24.48		260°11.76	11.9'	12°55.61	14.4' 57.9'
21	134°56.90	· · 23.57		274°42.61	11.8'	13°10.05	14.4' 57.9'
22	149°57.10	22.67		289°13.38	11.7'	13°24.43	14.3' 57.9'
23	164°57.30	21.76		303°44.08	11.6'	13°38.76	14.3' 58.0'
SD = 15.8'			$d = -0.9'$	SD = 15.7'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	17-19
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	99-91%
29	01:06	00:57	12:01	00:36	12:58	
30	00:47	00:38	12:01	01:20	13:42	
31	00:29	00:19	12:00	02:05	14:29	

September 01, 02, 03 UT (Tue., Wed., Thu.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	340°10.53	140°1.08	S12°8.99	235°34.10	N23°17.76	203°51.04	N17°13.15	326°33.35	N02°57.23			Alpheratz	357°33.03 29°14.37
1	355°12.99	155°1.78	10.03	250°34.84	17.63	218°52.98	13.01	341°35.94	57.17			Ankaa	353°5.42 -42°9.40
2	10°15.46	170°2.48	11.07	265°35.59	17.51	233°54.91	12.86	356°38.53	57.11			Schedar	349°28.99 56°41.00
3	25°17.92	185°3.18	•• 12.11	280°36.33	•• 17.39	248°56.85	•• 12.71	11°41.12	•• 57.04			Diphda	348°45.64 -17°50.18
4	40°20.38	200°3.88	13.14	295°37.07	17.27	263°58.78	12.57	26°43.71	56.98			Achernar	335°18.76 -57°5.75
5	55°22.85	215°4.58	14.18	310°37.82	17.14	279°0.72	12.42	41°46.30	56.92			Hamal	327°49.45 23°35.38
6	70°25.31	230°5.28	S12°15.22	325°38.56	N23°17.02	294°2.66	N17°12.27	56°48.89	N02°56.86			Polaris	313°9.11 89°22.29
7	85°27.78	245°5.99	16.25	340°39.30	16.90	309°4.59	12.13	71°51.48	56.80			Acamar	315°10.56 -40°11.52
8	100°30.24	260°6.69	17.29	355°40.05	16.77	324°6.53	11.98	86°54.07	56.73			Menkar	314°4.59 4°11.81
9	115°32.70	275°7.40	•• 18.32	10°40.79	•• 16.65	339°8.47	•• 11.83	101°56.67	•• 56.67			Mirfak	308°26.14 49°57.22
10	130°35.17	290°8.10	19.36	25°41.54	16.53	354°10.40	11.69	116°59.26	56.61			Aldebaran	290°38.05 16°33.82
11	145°37.63	305°8.81	20.39	40°42.28	16.40	9°12.34	11.54	132°1.85	56.55			Rigel	281°2.61 -8°10.05
12	160°40.10	320°9.52	S12°21.43	55°43.03	N23°16.28	24°14.28	N17°11.40	147°4.44	N02°56.48			Capella	280°19.95 46°1.34
13	175°42.56	335°10.23	22.46	70°43.77	16.15	39°16.22	11.25	162°7.03	56.42			Bellatrix	278°21.48 6°22.54
14	190°45.02	350°10.94	23.49	85°44.52	16.03	54°18.15	11.10	177°9.63	56.36			Elnath	278°0.22 28°37.75
15	205°47.49	5°11.66	•• 24.52	100°45.26	•• 15.90	69°20.09	•• 10.96	192°12.22	•• 56.30			Anilam	275°36.43 -1°10.94
16	220°49.95	20°12.37	25.55	115°46.01	15.77	84°22.03	10.81	207°14.81	56.23			Betelgeuse	270°50.72 7°24.81
17	235°52.42	35°13.08	26.58	130°46.75	15.65	99°23.97	10.66	222°17.40	56.17			Canopus	263°52.03 -52°42.24
18	250°54.88	50°13.80	S12°27.61	145°47.50	N23°15.52	114°25.90	N17°10.52	237°20.00	N02°56.11			Sirius	258°25.21 -16°44.95
19	265°57.35	65°14.52	28.64	160°48.24	15.39	129°27.84	10.37	252°22.59	56.05			Adhara	255°5.01 -29°0.25
20	280°59.81	80°15.24	29.67	175°48.99	15.27	144°29.78	10.22	267°25.18	55.98			Procyon	244°49.63 5°9.48
21	296°2.27	95°15.96	•• 30.70	190°49.74	•• 15.14	159°31.72	•• 10.08	282°27.78	•• 55.92			Pollux	243°15.90 27°57.68
22	311°4.74	110°16.68	31.73	205°50.48	15.01	174°33.65	9.93	297°30.37	55.86			Avior	234°14.72 -59°35.47
23	326°7.20	125°17.40	32.76	220°51.23	14.88	189°35.59	9.78	312°32.96	55.80			Suhail	222°45.72 -43°32.26
Mer.pass. 01:19		ν0.7' d1.0' m-4.62		ν0.7' d-0.1' m1.24		ν1.9' d-0.1' m-1.80		ν2.6' d-0.1' m0.48				Miaplacidus	221°38.88 -69°49.44
												Alphard	217°46.72 -8°46.35
												Regulus	207°33.31 11°50.28
												Dubhe	193°39.99 61°36.47
												Denebola	182°23.86 14°25.47
												Gienah	175°42.48 -17°41.38
												Acrux	172°59.20 -63°14.95
												Gacrux	171°50.64 -57°15.87
												Alioth	166°12.22 55°49.06
												Spica	158°21.09 -11°18.01
												Alkaid	152°51.24 49°11.00
												Hadar	148°34.45 -60°30.29
												Menkent	147°56.24 -36°30.16
												Arcturus	145°46.85 19°2.75
												Rigel Kent.	139°38.74 -60°56.94
												Kochab	137°20.32 74°2.95
												Zuben'ubi	136°54.64 -16°9.16
												Alphecca	126°2.67 26°37.69
												Antares	112°14.16 -26°29.51
												Atria	107°7.07 -69°4.75
												Sabik	102°1.16 -15°45.45
												Shaula	96°8.40 -37°7.46
												Rasalhague	95°57.19 12°32.60
												Eltanin	90°41.36 51°29.37
												Kaus Aust.	83°30.52 -34°22.34
												Vega	80°32.09 38°48.74
												Nunki	75°45.86 -26°15.79
												Altair	61°58.38 8°56.50
												Peacock	53°3.08 -56°38.97
												Deneb	49°24.48 45°22.73
												Enif	33°37.14 10°0.01
												Al Na'ir	27°30.74 -46°49.79
												Fomalhaut	15°12.65 -29°28.67
												Scheat	13°43.52 28°13.79
												Markab	13°28.21 15°21.09
												Sep 01 Tue	SHA Mer.pass
												Venus	159°50.55 14:39
												Mars	255°23.57 08:17
												Jupiter	223°40.51 10:23
												Saturn	346°22.82 02:13
												Sep 02 Wed	SHA Mer.pass
												Venus	159°8.45 14:38
												Mars	254°42.31 08:16
												Jupiter	223°27.86 10:20
												Saturn	346°25.89 02:09
												Sep 03 Thu	SHA Mer.pass
												Venus	158°27.02 14:37
												Mars	254°1.18 08:15
												Jupiter	223°15.26 10:17
												Saturn	346°29.03 02:05
												Horizontal parallax	
												Venus:	0.3
												Mars:	0.1
Mer.pass. 01:11		ν0.8' d1.0' m-4.64		ν0.8' d-0.1' m1.24		ν1.9' d-0.1' m-1.81		ν2.6' d-0.1' m0.47					

h		Sun		Moon			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		179°57.50	N08°20.86	318°14.69	11.5'	N13°53.03	14.2' 58.0'
1		194°57.70	19.95	332°45.21	11.4'	14°7.23	14.1' 58.0'
2		209°57.89	19.05	347°15.66	11.4'	14°21.37	14.1' 58.0'
3		224°58.09	· · 18.14	1°46.02	11.3'	14°35.45	14.0' 58.0'
4		239°58.29	17.24	16°16.29	11.2'	14°49.46	13.9' 58.0'
5		254°58.49	16.33	30°46.48	11.1'	15°3.41	13.9' 58.1'
6		269°58.69	N08°15.43	45°16.58	11.0'	N15°17.28	13.8' 58.1'
7		284°58.89	14.52	59°46.60	10.9'	15°31.09	13.7' 58.1'
8		299°59.09	13.61	74°16.52	10.8'	15°44.82	13.7' 58.1'
9		314°59.28	· · 12.71	88°46.35	10.7'	15°58.48	13.6' 58.1'
10		329°59.48	11.80	103°16.10	10.7'	16°12.06	13.5' 58.1'
11		344°59.68	10.89	117°45.75	10.6'	16°25.57	13.4' 58.2'
12		359°59.88	N08°9.98	132°15.31	10.5'	N16°39.00	13.3' 58.2'
13		15°0.08	9.08	146°44.77	10.4'	16°52.35	13.3' 58.2'
14		30°0.28	8.17	161°14.14	10.3'	17°5.62	13.2' 58.2'
15		45°0.48	· · 7.26	175°43.42	10.2'	17°18.80	13.1' 58.2'
16		60°0.68	6.35	190°12.60	10.1'	17°31.90	13.0' 58.2'
17		75°0.88	5.44	204°41.68	10.0'	17°44.91	12.9' 58.3'
18		90°1.08	N08°4.53	219°10.66	9.9'	N17°57.84	12.8' 58.3'
19		105°1.28	3.62	233°39.55	9.8'	18°10.67	12.7' 58.3'
20		120°1.48	2.71	248°8.34	9.7'	18°23.42	12.7' 58.3'
21		135°1.68	· · 1.80	262°37.03	9.6'	18°36.07	12.6' 58.3'
22		150°1.88	0.89	277°5.62	9.5'	18°48.63	12.5' 58.3'
23		165°2.08	59.98	291°34.11	9.4'	19°1.09	12.4' 58.4'
		SD = 15.8' d = -0.9'		SD = 15.8'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		180°2.28	N07°59.07	306°2.50	9.3'	N19°13.45	12.3' 58.4'
1		195°2.48	58.16	320°30.78	9.2'	19°25.71	12.2' 58.4'
2		210°2.69	57.25	334°58.97	9.1'	19°37.87	12.1' 58.4'
3		225°2.89	· · 56.34	349°27.05	9.0'	19°49.93	12.0' 58.4'
4		240°3.09	55.43	3°55.03	8.9'	20°1.89	11.8' 58.4'
5		255°3.29	54.52	18°22.90	8.8'	20°13.74	11.7' 58.5'
6		270°3.49	N07°53.61	32°50.67	8.7'	N20°25.48	11.6' 58.5'
7		285°3.69	52.70	47°18.34	8.6'	20°37.11	11.5' 58.5'
8		300°3.89	51.78	61°45.90	8.5'	20°48.63	11.4' 58.5'
9		315°4.10	· · 50.87	76°13.36	8.4'	21°0.04	11.3' 58.5'
10		330°4.30	49.96	90°40.71	8.2'	21°11.33	11.2' 58.5'
11		345°4.50	49.05	105°7.96	8.1'	21°22.51	11.1' 58.5'
12		0°4.70	N07°48.13	119°35.10	8.0'	N21°33.57	10.9' 58.6'
13		15°4.91	47.22	134°2.14	7.9'	21°44.51	10.8' 58.6'
14		30°5.11	46.31	148°29.07	7.8'	21°55.33	10.7' 58.6'
15		45°5.31	· · 45.39	162°55.90	7.7'	22°6.02	10.6' 58.6'
16		60°5.51	44.48	177°22.62	7.6'	22°16.60	10.4' 58.6'
17		75°5.72	43.56	191°49.23	7.5'	22°27.04	10.3' 58.6'
18		90°5.92	N07°42.65	206°15.74	7.4'	N22°37.36	10.2' 58.7'
19		105°6.12	41.73	220°42.15	7.3'	22°47.55	10.1' 58.7'
20		120°6.32	40.82	235°8.44	7.2'	22°57.60	9.9' 58.7'
21		135°6.53	· · 39.91	249°34.64	7.1'	23°7.53	9.8' 58.7'
22		150°6.73	38.99	264°0.73	7.0'	23°17.32	9.7' 58.7'
23		165°6.93	38.07	278°26.71	6.9'	23°26.97	9.5' 58.7'
		SD = 15.8' d = -0.9'		SD = 15.9'			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		180°7.14	N07°37.16	292°52.59	6.8'	N23°36.49	9.4' 58.7'
1		195°7.34	36.24	307°18.37	6.7'	23°45.87	9.2' 58.7'
2		210°7.55	35.33	321°44.04	6.6'	23°55.10	9.1' 58.8'
3		225°7.75	· · 34.41	336°9.61	6.5'	24°4.20	8.9' 58.8'
4		240°7.95	33.49	350°35.08	6.4'	24°13.15	8.8' 58.8'
5		255°8.16	32.58	5°0.44	6.3'	24°21.95	8.7' 58.8'
6		270°8.36	N07°31.66	19°25.71	6.2'	N24°30.61	8.5' 58.8'
7		285°8.57	30.74	33°50.87	6.1'	24°39.12	8.4' 58.8'
8		300°8.77	29.83	48°15.94	6.0'	24°47.48	8.2' 58.8'
9		315°8.97	· · 28.91	62°40.91	5.9'	24°55.68	8.1' 58.9'
10		330°9.18	27.99	77°5.78	5.8'	25°3.73	7.9' 58.9'
11		345°9.38	27.07	91°30.55	5.7'	25°11.63	7.7' 58.9'
12		0°9.59	N07°26.15	105°55.22	5.6'	N25°19.37	7.6' 58.9'
13		15°9.79	25.23	120°19.81	5.5'	25°26.96	7.4' 58.9'
14		30°10.00	24.32	134°44.29	5.4'	25°34.38	7.3' 58.9'
15		45°10.20	· · 23.40	149°8.69	5.3'	25°41.64	7.1' 58.9'
16		60°10.41	22.48	163°32.99	5.2'	25°48.74	6.9' 58.9'
17		75°10.61	21.56	177°57.20	5.1'	25°55.68	6.8' 59.0'
18		90°10.82	N07°20.64	192°21.32	5.0'	N26°2.45	6.6' 59.0'
19		105°11.02	19.72	206°45.36	4.9'	26°9.06	6.4' 59.0'
20		120°11.23	18.80	221°9.31	4.9'	26°15.50	6.3' 59.0'
21		135°11.44	· · 17.88	235°33.17	4.8'	26°21.76	6.1' 59.0'
22		150°11.64	16.96	249°56.95	4.7'	26°27.86	5.9' 59.0'
23		165°11.85	16.04	264°20.65	4.6'	26°33.79	5.8' 59.0'
		SD = 15.8' d = -0.9'		SD = 16.0'			

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 20-22 84-65%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
01	00:10	00:00	12:00	02:53	15:18	
02	00:09	00:19	12:00	03:44	16:11	
03	00:29	00:38	11:59	04:39	17:09	

September 04, 05, 06 UT (Fri., Sat., Sun.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°7.94		140°54.21	S13°22.37	236°28.11	N23°8.27	206°10.66	N17°2.61	329°40.18	N02°52.67
1	358°10.41		155°54.99	23.36	251°28.87	8.12	221°12.60	2.46	344°42.78	52.60
2	13°12.87		170°55.77	24.36	266°29.63	7.98	236°14.54	2.32	359°45.38	52.54
3	28°15.34		185°56.56	· · 25.36	281°30.39	· · 7.84	251°16.49	· · 2.17	14°47.98	· · 52.47
4	43°17.80		200°57.34	26.35	296°31.14	7.70	266°18.43	2.03	29°50.58	52.41
5	58°20.27		215°58.13	27.35	311°31.90	7.55	281°20.37	1.88	44°53.18	52.34
6	73°22.73		230°58.92	S13°28.34	326°32.66	N23°7.41	296°22.31	N17°1.73	59°55.78	N02°52.28
7	88°25.19		245°59.71	29.33	341°33.42	7.27	311°24.26	1.59	74°58.38	52.21
8	103°27.66		261°0.50	30.33	356°34.18	7.12	326°26.20	1.44	90°0.98	52.15
9	118°30.12		276°1.29	· · 31.32	11°34.94	· · 6.98	341°28.14	· · 1.29	105°3.58	· · 52.08
10	133°32.59		291°2.08	32.31	26°35.70	6.83	356°30.09	1.15	120°6.18	52.01
11	148°35.05		306°2.88	33.30	41°36.46	6.69	11°32.03	1.00	135°8.78	51.95
12	163°37.51		321°3.67	S13°34.29	56°37.22	N23°6.54	26°33.97	N17°0.86	150°11.38	N02°51.88
13	178°39.98		336°4.47	35.28	71°37.98	6.40	41°35.92	0.71	165°13.98	51.82
14	193°42.44		351°5.27	36.27	86°38.75	6.25	56°37.86	0.56	180°16.58	51.75
15	208°44.91		6°6.07	· · 37.26	101°39.51	· · 6.11	71°39.80	· · 0.42	195°19.18	· · 51.69
16	223°47.37		21°6.87	38.25	116°40.27	5.96	86°41.75	0.27	210°21.78	51.62
17	238°49.84		36°7.67	39.24	131°41.03	5.81	101°43.69	0.12	225°24.38	51.56
18	253°52.30		51°8.47	S13°40.22	146°41.79	N23°5.67	116°45.64	N16°59.98	240°26.98	N02°51.49
19	268°54.76		66°9.28	41.21	161°42.55	5.52	131°47.58	16°59.83	255°29.59	51.43
20	283°57.23		81°10.08	42.19	176°43.32	5.37	146°49.52	59.68	270°32.19	51.36
21	298°59.69		96°10.89	· · 43.18	191°44.08	· · 5.23	161°51.47	· · 59.54	285°34.79	· · 51.29
22	314°2.16		111°11.70	44.16	206°44.84	5.08	176°53.41	59.39	300°37.39	51.23
23	329°4.62		126°12.51	45.15	221°45.61	4.93	191°55.36	59.25	315°39.99	51.16
Mer.pass. 01:07			ν0.8' d1.0' m-4.65		ν0.8' d-0.1' m1.23		ν1.9' d-0.1' m-1.81		ν2.6' d-0.1' m0.46	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°7.09		141°13.32	S13°46.13	236°46.37	N23°4.78	206°57.30	N16°59.10	330°42.59	N02°51.10
1	359°9.55		156°14.13	47.11	251°47.13	4.63	221°59.24	58.95	345°45.20	51.03
2	14°12.01		171°14.94	48.09	266°47.90	4.48	237°1.19	58.81	0°47.80	50.97
3	29°14.48		186°15.76	· · 49.08	281°48.66	· · 4.34	252°3.13	· · 58.66	15°50.40	· · 50.90
4	44°16.94		201°16.57	50.06	296°49.43	4.19	267°5.08	58.51	30°53.00	50.83
5	59°19.41		216°17.39	51.04	311°50.19	4.04	282°7.02	58.37	45°55.60	50.77
6	74°21.87		231°18.21	S13°52.01	326°50.95	N23°3.89	297°8.97	N16°58.22	60°58.21	N02°50.70
7	89°24.33		246°19.03	52.99	341°51.72	3.74	312°10.91	58.08	76°0.81	50.64
8	104°26.80		261°19.85	53.97	356°52.49	3.59	327°12.86	57.93	91°3.41	50.57
9	119°29.26		276°20.67	· · 54.95	11°53.25	· · 3.44	342°14.80	· · 57.78	106°6.02	· · 50.50
10	134°31.73		291°21.50	55.92	26°54.02	3.28	357°16.75	57.64	121°8.62	50.44
11	149°34.19		306°22.32	56.90	41°54.78	3.13	12°18.69	57.49	136°11.22	50.37
12	164°36.66		321°23.15	S13°57.88	56°55.55	N23°2.98	27°20.64	N16°57.34	151°13.82	N02°50.30
13	179°39.12		336°23.98	58.85	71°56.32	2.83	42°22.59	57.20	166°16.43	50.24
14	194°41.58		351°24.81	13°59.82	86°57.08	2.68	57°24.53	57.05	181°19.03	50.17
15	209°44.05		6°25.64	14°0.80	101°57.85	· · 2.53	72°26.48	· · 56.91	196°21.63	· · 50.11
16	224°46.51		21°26.47	1.77	116°58.62	2.37	87°28.42	56.76	211°24.24	50.04
17	239°48.98		36°27.30	2.74	131°59.38	2.22	102°30.37	56.61	226°26.84	49.97
18	254°51.44		51°28.14	S14°3.71	147°0.15	N23°2.07	117°32.32	N16°56.47	241°29.45	N02°49.91
19	269°53.90		66°28.97	4.68	162°0.92	1.91	132°34.26	56.32	256°32.05	49.84
20	284°56.37		81°29.81	5.65	177°1.69	1.76	147°36.21	56.17	271°34.65	49.77
21	299°58.83		96°30.65	· · 6.62	192°2.46	· · 1.61	162°38.15	· · 56.03	286°37.26	· · 49.71
22	315°1.30		111°31.49	7.59	207°3.22	1.45	177°40.10	55.88	301°39.86	49.64
23	330°3.76		126°32.33	8.56	222°3.99	1.30	192°42.05	55.74	316°42.47	49.57
Mer.pass. 01:03			ν0.8' d1.0' m-4.66		ν0.8' d-0.1' m1.23		ν1.9' d-0.1' m-1.81		ν2.6' d-0.1' m0.46	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	345°6.23		141°33.17	S14°9.53	237°4.76	N23°1.14	207°43.99	N16°55.59	331°45.07	N02°49.51
1	0°8.69		156°34.02	10.49	252°5.53	0.99	222°45.94	55.44	346°47.68	49.44
2	15°11.15		171°34.86	11.46	267°6.30	0.83	237°47.89	55.30	1°50.28	49.37
3	30°13.62		186°35.71	· · 12.42	282°7.07	· · 0.68	252°49.83	· · 55.15	16°52.88	· · 49.31
4	45°16.08		201°36.56	13.39	297°7.84	0.52	267°51.78	55.01	31°55.49	49.24
5	60°18.55		216°37.41	14.35	312°8.61	0.37	282°53.73	54.86	46°58.09	49.17
6	75°21.01		231°38.26	S14°15.32	327°9.38	N23°0.21	297°55.68	N16°54.71	62°0.70	N02°49.11
7	90°23.48		246°39.11	16.28	342°10.15	23°0.05	312°57.62	54.57	77°3.30	49.04
8	105°25.94		261°39.96	17.24	357°10.92	22°59.90	327°59.57	54.42	92°5.91	48.97
9	120°28.40		276°40.82	· · 18.20	12°11.69	· · 59.74	343°1.52	· · 54.27	107°8.52	· · 48.90
10	135°30.87		291°41.68	19.16	27°12.47	59.58	358°3.47	54.13	122°11.12	48.84
11	150°33.33		306°42.53	20.12	42°13.24	59.42	13°5.41	53.98	137°13.73	48.77
12	165°35.80		321°43.39	S14°21.08	57°14.01	N22°59.27	28°7.36	N16°53.84	152°16.33	N02°48.70
13	180°38.26		336°44.25	22.04	72°14.78	59.11	43°9.31	53.69	167°18.94	48.64
14	195°40.72		351°45.12	23.00	87°15.55	58.95	58°11.26	53.54	182°21.54	48.57
15	210°43.19		6°45.98	· · 23.95	102°16.33	· · 58.79	73°13.20	· · 53.40	197°24.15	· · 48.50
16	225°45.65		21°46.84	24.91	117°17.10	58.63	88°15.15	53.25	212°26.76	48.43
17	240°48.12		36°47.71	25.87	132°17.87	58.47	103°17.10	53.11	227°29.36	48.37
18	255°50.58		51°48.58	S14°26.82	147°18.64	N22°58.31	118°19.05	N16°52.96	242°31.97	N02°48.30
19	270°53.05		66°49.45	27.78	162°19.42	58.15	133°21.00	52.81	257°34.58	48.23
20	285°55.51		81°50.32	28.73	177°20.19	57.99	148°22.95	52.67	272°37.18	48.16
21	300°57.97		96°51.19	· · 29.68	192°20.97	· · 57.83	163°24.90	· · 52.52	287°39.79	· · 48.10
22	316°0.44		111°52.06	30.64	207°21.74	57.67	178°26.84	52.38	302°42.40	48.03
23	331°2.90		126°52.94	31.59	222°22.52	57.51	193°28.79	52.23	317°45.00	47.96
Mer.pass. 00:59			ν0.8' d1.0' m-4.68		ν0.8' d-0.2' m1.23		ν1.9' d-0.1' m-1.81		ν2.6' d-0.1' m0.45	

Stars		
	SHA	Dec
Alpheratz	357°33.01	29°14.38
Ankaa	353°5.40	-42°9.41
Schedar	349°28.97	56°41.02
Diphda	348°45.63	-17°50.18
Achernar	335°18.73	-57°5.76
Hamal	327°49.42	23°35.38
Polaris	313°7.31	89°22.30
Acamar	315°10.54	-40°11.52
Menkar	314°4.57	4°11.82
Mirfak	308°26.11	49°57.23
Aldebaran	290°38.02	16°33.83
Rigel	281°2.58	-8°10.05
Capella	280°19.91	46°1.34
Bellatrix	278°21.46	6°22.54
Elnath	278°0.19	28°37.75
Alnilam	275°36.40	-1°10.94
Betelgeuse	270°50.69	7°24.81
Canopus	263°52.00	-52°42.24
Sirius	258°25.19	-16°44.95
Adhara	255°4.98	-29°0.24
Procyon	244°49.61	5°9.48
Pollux	243°15.88	27°57.68
Avior	234°14.70	-59°35.46
Suhail	222°45.70	-43°32.25
Miaplacidus	221°38.85	-69°49.43
Alphard	217°46.71	-8°46.35
Regulus	207°33.30	11°50.27
Dubhe	193°39.99	61°36.45
Denebola	182°23.86	14°25.46
Gienah	175°42.48	-17°41.38
Acrux	172°59.20	-63°14.94
Gacrux	171°50.64	-57°15.86
Alioth	166°12.23	55°49.04
Spica	158°21.09	-11°18.00
Alkaid	152°51.25	49°10.99
Hadar	148°34.46	-60°30.28
Menkent	147°56.24	-36°30.16
Arcturus	145°46.85	19°2.75
Rigel Kent.	139°38.75	-60°56.94
Kochab	137°20.37	74°2.95
Zuben'ubi	136°54.65	-16°9.15
Alphecca	126°2.68	26°37.68
Antares	112°14.17	-26°29.51
Atria	107°7.10	-69°4.75
Sabik	102°1.16	-15°45.44
Shaula	96°8.41	-37°7.46
Rasalhague	95°57.20	12°32.61
Eltanin	90°41.38	51°29.38
Kaus Aust.	83°30.52	-34°22.34
Vega	80°32.10	38°48.75
Nunki	75°45.86	-26°15.79
Altair	61°58.39	8°56.50
Peacock	53°3.09	-56°38.97
Deneb	49°24.48	45°22.75
Enif	33°37.14	10°0.02
Al Na'ir	27°30.73	-46°49.80
Fomalhaut	15°12.64	-29°28.67
Scheat	13°43.51	28°13.81
Markab	13°28.20	15°21.10

Sep 04 Fri	SHA	Mer.pass
Venus	157°46.26	14:36
Mars	253°20.17	08:14
Jupiter	223°2.71	10:14
Saturn	346°32.24	02:01

Sep 05 Sat	SHA	Mer.pass
Venus	157°6.23	14:34
Mars	252°39.28	08:12
Jupiter	222°50.22	10:11
Saturn	346°35.51	01:57

Sep 06 Sun	SHA	Mer.pass
Venus	156°26.95	14:33
Mars	251°58.54	08:11
Jupiter	222°37.77	10:08
Saturn	346°38.84	01:53

Horizontal parallax	
Venus:	0.3
Mars:	0.1

h	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
Fri							
0	180°12.05	N07°15.12		278°44.26	4.5'	N26°39.54	5.6'
1	195°12.26	14.20		293°7.80	4.5'	26°45.12	5.4'
2	210°12.47	13.27		307°31.26	4.4'	26°50.52	5.2'
3	225°12.67	· · 12.35		321°54.65	4.3'	26°55.75	5.0'
4	240°12.88	11.43		336°17.96	4.2'	27°0.80	4.9'
5	255°13.09	10.51		350°41.20	4.2'	27°5.67	4.7'
6	270°13.29	N07°9.59		5°4.37	4.1'	N27°10.36	4.5'
7	285°13.50	8.67		19°27.47	4.0'	27°14.87	4.3'
8	300°13.71	7.74		33°50.51	4.0'	27°19.20	4.1'
9	315°13.91	· · 6.82		48°13.48	3.9'	27°23.34	4.0'
10	330°14.12	5.90		62°36.39	3.8'	27°27.30	3.8'
11	345°14.33	4.97		76°59.24	3.8'	27°31.07	3.6'
12	0°14.53	N07°4.05		91°22.03	3.7'	N27°34.66	3.4'
13	15°14.74	3.13		105°44.76	3.7'	27°38.06	3.2'
14	30°14.95	2.20		120°7.44	3.6'	27°41.27	3.0'
15	45°15.16	· · 1.28		134°30.08	3.6'	27°44.30	2.8'
16	60°15.36	07°0.36		148°52.66	3.5'	27°47.13	2.6'
17	75°15.57	06°59.43		163°15.19	3.5'	27°49.78	2.5'
18	90°15.78	N06°58.51		177°37.68	3.4'	N27°52.23	2.3'
19	105°15.99	57.58		192°0.13	3.4'	27°54.50	2.1'
20	120°16.20	56.66		206°22.54	3.4'	27°56.57	1.9'
21	135°16.40	· · 55.73		220°44.92	3.3'	27°58.44	1.7'
22	150°16.61	54.81		235°7.25	3.3'	28°0.13	1.5'
23	165°16.82	53.88		249°29.56	3.3'	28°1.62	1.3'
SD = 15.9'			$d = -0.9'$			SD = 16.1'	

Sat	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
0	180°17.03	N06°52.96		263°51.84	3.2'	N28°2.92	1.1'
1	195°17.24	52.03		278°14.09	3.2'	28°4.02	0.9'
2	210°17.45	51.10		292°36.31	3.2'	28°4.92	0.7'
3	225°17.65	· · 50.18		306°58.51	3.2'	28°5.64	0.5'
4	240°17.86	49.25		321°20.70	3.2'	28°6.15	0.3'
5	255°18.07	48.32		335°42.86	3.2'	28°6.47	0.1'
6	270°18.28	N06°47.40		350°5.02	3.1'	N28°6.59	-0.1'
7	285°18.49	46.47		4°27.16	3.1'	28°6.52	-0.3'
8	300°18.70	45.54		18°49.29	3.1'	28°6.25	-0.5'
9	315°18.91	· · 44.61		33°11.41	3.1'	28°5.78	-0.7'
10	330°19.12	43.69		47°33.54	3.1'	28°5.12	-0.9'
11	345°19.33	42.76		61°55.66	3.1'	28°4.26	-1.1'
12	0°19.54	N06°41.83		76°17.78	3.1'	N28°3.20	-1.3'
13	15°19.74	40.90		90°39.91	3.1'	28°1.95	-1.5'
14	30°19.95	39.97		105°2.04	3.1'	28°0.50	-1.6'
15	45°20.16	· · 39.05		119°24.19	3.2'	27°58.85	-1.8'
16	60°20.37	38.12		133°46.34	3.2'	27°57.01	-2.0'
17	75°20.58	37.19		148°8.51	3.2'	27°54.97	-2.2'
18	90°20.79	N06°36.26		162°30.70	3.2'	N27°52.73	-2.4'
19	105°21.00	35.33		176°52.91	3.2'	27°50.30	-2.6'
20	120°21.21	34.40		191°15.14	3.3'	27°47.68	-2.8'
21	135°21.42	· · 33.47		205°37.39	3.3'	27°44.86	-3.0'
22	150°21.63	32.54		219°59.67	3.3'	27°41.84	-3.2'
23	165°21.85	31.61		234°21.98	3.3'	27°38.64	-3.4'
SD = 15.9'			$d = -0.9'$			SD = 16.2'	

Sun	Sun			Moon			
	GHA	Dec		GHA	ν	Dec	d
0	180°22.06	N06°30.68		248°44.33	3.4'	N27°35.23	-3.6'
1	195°22.27	29.75		263°6.71	3.4'	27°31.64	-3.8'
2	210°22.48	28.82		277°29.12	3.5'	27°27.85	-4.0'
3	225°22.69	· · 27.89		291°51.58	3.5'	27°23.88	-4.2'
4	240°22.90	26.96		306°14.08	3.5'	27°19.71	-4.4'
5	255°23.11	26.02		320°36.62	3.6'	27°15.35	-4.5'
6	270°23.32	N06°25.09		334°59.21	3.6'	N27°10.80	-4.7'
7	285°23.53	24.16		349°21.85	3.7'	27°6.07	-4.9'
8	300°23.74	23.23		3°44.54	3.7'	27°1.14	-5.1'
9	315°23.95	· · 22.30		18°7.28	3.8'	26°56.03	-5.3'
10	330°24.17	21.36		32°30.08	3.9'	26°50.74	-5.5'
11	345°24.38	20.43		46°52.93	3.9'	26°45.26	-5.7'
12	0°24.59	N06°19.50		61°15.85	4.0'	N26°39.59	-5.8'
13	15°24.80	18.57		75°38.82	4.0'	26°33.75	-6.0'
14	30°25.01	17.63		90°1.86	4.1'	26°27.72	-6.2'
15	45°25.22	· · 16.70		104°24.96	4.2'	26°21.51	-6.4'
16	60°25.43	15.77		118°48.14	4.2'	26°15.12	-6.6'
17	75°25.65	14.83		133°11.38	4.3'	26°8.55	-6.7'
18	90°25.86	N06°13.90		147°34.69	4.4'	N26°1.80	-6.9'
19	105°26.07	12.97		161°58.07	4.5'	25°54.88	-7.1'
20	120°26.28	12.03		176°21.53	4.5'	25°47.79	-7.3'
21	135°26.50	· · 11.10		190°45.07	4.6'	25°40.52	-7.4'
22	150°26.71	10.16		205°8.68	4.7'	25°33.08	-7.6'
23	165°26.92	9.23		219°32.37	4.8'	25°25.46	-7.8'
SD = 15.9'			$d = -0.9'$			SD = 16.2'	

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	23-25
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	54-31%
04	00:48	00:58	11:59	05:39	18:10	
05	01:08	01:18	11:59	06:41	19:13	
06	01:28	01:38	11:58	07:44	20:15	

September 07, 08, 09 UT (Mon., Tue., Wed.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	346°5.37	141°53.81	S14°32.54	237°23.29	N22°57.35	208°30.74	N16°52.08	332°47.61	N02°47.89			Alpheratz	357°32.99 29°14.40
1	1°7.83	156°54.69	33.49	252°24.06	57.19	223°32.69	51.94	347°50.22	47.83			Ankaa	353°5.38 -42°9.41
2	16°10.29	171°55.57	34.44	267°24.84	57.03	238°34.64	51.79	2°52.82	47.76			Schedar	349°28.94 56°41.04
3	31°12.76	186°56.45	•• 35.39	282°25.62	•• 56.86	253°36.59	•• 51.65	17°55.43	•• 47.69			Diphda	348°45.61 -17°50.18
4	46°15.22	201°57.33	36.34	297°26.39	56.70	268°38.54	51.50	32°58.04	47.62			Achernar	335°18.70 -57°5.76
5	61°17.69	216°58.21	37.28	312°27.17	56.54	283°40.49	51.35	48°0.65	47.56			Hamal	327°49.40 23°35.40
6	76°20.15	231°59.10	S14°38.23	327°27.94	N22°56.38	298°42.44	N16°51.21	63°3.25	N02°47.49			Polaris	313°5.70 89°22.31
7	91°22.62	246°59.99	39.18	342°28.72	56.21	313°44.39	51.06	78°5.86	47.42			Acamar	315°10.51 -40°11.52
8	106°25.08	262°0.87	40.12	357°29.50	56.05	328°46.34	50.92	93°8.47	47.35			Menkar	314°4.54 4°11.82
9	121°27.54	277°1.76	•• 41.07	12°30.27	•• 55.89	343°48.29	•• 50.77	108°11.08	•• 47.28			Mirfak	308°26.07 49°57.24
10	136°30.01	292°2.65	42.01	27°31.05	55.72	358°50.24	50.62	123°13.69	47.22			Aldebaran	290°37.99 16°33.83
11	151°32.47	307°3.54	42.95	42°31.83	55.56	13°52.19	50.48	138°16.29	47.15			Rigel	281°2.56 -8°10.05
12	166°34.94	322°4.44	S14°43.90	57°32.61	N22°55.40	28°54.14	N16°50.33	153°18.90	N02°47.08			Capella	280°19.87 46°1.34
13	181°37.40	337°5.33	44.84	72°33.38	55.23	43°56.09	50.19	168°21.51	47.01			Bellatrix	278°21.43 6°22.54
14	196°39.86	352°6.23	45.78	87°34.16	55.07	58°58.04	50.04	183°24.12	46.94			Elnath	278°0.16 28°37.75
15	211°42.33	7°7.13	•• 46.72	102°34.94	•• 54.90	73°59.99	•• 49.89	198°26.73	•• 46.88			Alnilam	275°36.37 -1°10.94
16	226°44.79	22°8.03	47.66	117°35.72	54.74	89°1.94	49.75	213°29.34	46.81			Betelgeuse	270°50.66 7°24.82
17	241°47.26	37°8.93	48.60	132°36.50	54.57	104°3.89	49.60	228°31.95	46.74			Canopus	263°51.97 -52°42.23
18	256°49.72	52°9.83	S14°49.54	147°37.28	N22°54.41	119°5.84	N16°49.46	243°34.55	N02°46.67			Sirius	258°25.16 -16°44.95
19	271°52.19	67°10.73	50.48	162°38.06	54.24	134°7.79	49.31	258°37.16	46.60			Adhara	255°4.96 -29°0.24
20	286°54.65	82°11.64	51.41	177°38.84	54.07	149°9.74	49.17	273°39.77	46.53			Procyon	244°49.59 5°9.48
21	301°57.11	97°12.54	•• 52.35	192°39.62	•• 53.91	164°11.69	•• 49.02	288°42.38	•• 46.47			Pollux	243°15.85 27°57.67
22	316°59.58	112°13.45	53.28	207°40.40	53.74	179°13.64	48.87	303°44.99	46.40			Avior	234°14.67 -59°35.45
23	332°2.04	127°14.36	54.22	222°41.18	53.57	194°15.59	48.73	318°47.60	46.33			Suhail	222°45.69 -43°32.24
Mer.pass. 00:55		ν0.9' d1.0' m-4.69		ν0.8' d-0.2' m1.22		ν1.9' d-0.1' m-1.81		ν2.6' d-0.1' m0.45				Miaplacidus	221°38.83 -69°49.42
												Alphard	217°46.69 -8°46.35
												Regulus	207°33.28 11°50.27
												Dubhe	193°39.97 61°36.43
												Denebola	182°23.85 14°25.46
												Gienah	175°42.47 -17°41.38
												Acrux	172°59.20 -63°14.93
												Gacrux	171°50.64 -57°15.85
												Alioth	166°12.23 55°49.03
												Spica	158°21.09 -11°18.00
												Alkaid	152°51.26 49°10.97
												Hadar	148°34.47 -60°30.28
												Menkent	147°56.24 -36°30.15
												Arcturus	145°46.86 19°2.74
												Rigel Kent.	139°38.77 -60°56.93
												Kochab	137°20.42 74°2.93
												Zuben'ubi	136°54.65 -16°9.15
												Alphecca	126°2.69 26°37.68
												Antares	112°14.17 -26°29.51
												Atria	107°7.12 -69°4.75
												Sabik	102°1.17 -15°45.44
												Shaula	96°8.42 -37°7.46
												Rasalhague	95°57.21 12°32.61
												Eltanin	90°41.41 51°29.38
												Kaus Aust.	83°30.53 -34°22.35
												Vega	80°32.12 38°48.75
												Nunki	75°45.87 -26°15.79
												Altair	61°58.39 8°56.51
												Peacock	53°3.09 -56°38.98
												Deneb	49°24.49 45°22.76
												Enif	33°37.13 10°0.03
												Al Na'ir	27°30.72 -46°49.80
												Fomalhaut	15°12.62 -29°28.68
												Scheat	13°43.50 28°13.82
												Markab	13°28.19 15°21.11
												Sep 07 Mon	
												Venus	155°48.45 14:32
												Mars	251°17.92 08:10
												Jupiter	222°25.38 10:05
												Saturn	346°42.24 01:49
												Sep 08 Tue	
												Venus	155°10.77 14:30
												Mars	250°37.45 08:09
												Jupiter	222°13.04 10:02
												Saturn	346°45.70 01:44
												Sep 09 Wed	
												Venus	154°33.94 14:29
												Mars	249°57.12 08:08
												Jupiter	222°0.76 09:58
												Saturn	346°49.23 01:40
												Horizontal parallax	
												Venus:	0.3
												Mars:	0.1
Mer.pass. 00:48		ν0.9' d0.9' m-4.71		ν0.8' d-0.2' m1.22		ν2.0' d-0.1' m-1.82		ν2.6' d-0.1' m0.44					

h	Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°27.13	N06°8.29	233°56.14	4.9'	N25°17.68	-8.0'	59.5'
1	195°27.34	7.36	248°20.00	4.9'	25°9.73	-8.1'	59.5'
2	210°27.56	6.42	262°43.93	5.0'	25°1.61	-8.3'	59.5'
3	225°27.77	· · 5.49	277°7.95	5.1'	24°53.33	-8.4'	59.5'
4	240°27.98	4.55	291°32.06	5.2'	24°44.89	-8.6'	59.5'
5	255°28.20	3.62	305°56.26	5.3'	24°36.28	-8.8'	59.5'
6	270°28.41	N06°2.68	320°20.54	5.4'	N24°27.51	-8.9'	59.5'
7	285°28.62	1.74	334°44.91	5.5'	24°18.58	-9.1'	59.5'
8	300°28.83	06°0.81	349°9.37	5.6'	24°9.49	-9.2'	59.5'
9	315°29.05	05°59.87	3°33.93	5.6'	24°0.25	-9.4'	59.5'
10	330°29.26	58.94	17°58.57	5.7'	23°50.85	-9.6'	59.5'
11	345°29.47	58.00	32°23.31	5.8'	23°41.30	-9.7'	59.4'
12	0°29.69	N05°57.06	46°48.14	5.9'	N23°31.60	-9.9'	59.4'
13	15°29.90	56.12	61°13.07	6.0'	23°21.75	-10.0'	59.4'
14	30°30.11	55.19	75°38.10	6.1'	23°11.75	-10.1'	59.4'
15	45°30.33	· · 54.25	90°3.22	6.2'	23°1.60	-10.3'	59.4'
16	60°30.54	53.31	104°28.43	6.3'	22°51.31	-10.4'	59.4'
17	75°30.76	52.37	118°53.75	6.4'	22°40.88	-10.6'	59.4'
18	90°30.97	N05°51.44	133°19.16	6.5'	N22°30.30	-10.7'	59.4'
19	105°31.18	50.50	147°44.67	6.6'	22°19.59	-10.9'	59.4'
20	120°31.40	49.56	162°10.28	6.7'	22°8.73	-11.0'	59.4'
21	135°31.61	· · 48.62	176°36.00	6.8'	21°57.74	-11.1'	59.4'
22	150°31.83	47.68	191°1.81	6.9'	21°46.62	-11.3'	59.4'
23	165°32.04	46.74	205°27.72	7.0'	21°35.36	-11.4'	59.4'
SD = 15.9'		d = -0.9'	SD = 16.2'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.25	N05°45.80	219°53.73	7.1'	N21°23.97	-11.5'	59.4'
1	195°32.47	44.87	234°19.84	7.2'	21°12.46	-11.6'	59.4'
2	210°32.68	43.93	248°46.05	7.3'	21°0.81	-11.8'	59.4'
3	225°32.90	· · 42.99	263°12.36	7.4'	20°49.04	-11.9'	59.4'
4	240°33.11	42.05	277°38.77	7.5'	20°37.15	-12.0'	59.4'
5	255°33.33	41.11	292°5.29	7.6'	20°25.14	-12.1'	59.3'
6	270°33.54	N05°40.17	306°31.90	7.7'	N20°13.00	-12.3'	59.3'
7	285°33.76	39.23	320°58.62	7.8'	20°0.75	-12.4'	59.3'
8	300°33.97	38.29	335°25.44	7.9'	19°48.38	-12.5'	59.3'
9	315°34.19	· · 37.35	349°52.36	8.0'	19°35.89	-12.6'	59.3'
10	330°34.40	36.41	4°19.38	8.1'	19°23.30	-12.7'	59.3'
11	345°34.62	35.46	18°46.49	8.2'	19°10.59	-12.8'	59.3'
12	0°34.83	N05°34.52	33°13.71	8.3'	N18°57.77	-12.9'	59.3'
13	15°35.05	33.58	47°41.03	8.4'	18°44.85	-13.0'	59.3'
14	30°35.26	32.64	62°8.45	8.5'	18°31.82	-13.1'	59.3'
15	45°35.48	· · 31.70	76°35.97	8.6'	18°18.68	-13.2'	59.3'
16	60°35.69	30.76	91°3.58	8.7'	18°5.45	-13.3'	59.2'
17	75°35.91	29.82	105°31.30	8.8'	17°52.11	-13.4'	59.2'
18	90°36.12	N05°28.87	119°59.11	8.9'	N17°38.68	-13.5'	59.2'
19	105°36.34	27.93	134°27.02	9.0'	17°25.15	-13.6'	59.2'
20	120°36.55	26.99	148°55.03	9.1'	17°11.53	-13.7'	59.2'
21	135°36.77	· · 26.05	163°23.13	9.2'	16°57.81	-13.8'	59.2'
22	150°36.99	25.10	177°51.33	9.3'	16°44.00	-13.9'	59.2'
23	165°37.20	24.16	192°19.62	9.4'	16°30.11	-14.0'	59.2'
SD = 15.9'		d = -0.9'	SD = 16.2'				
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°37.42	N05°23.22	206°48.01	9.5'	N16°16.13	-14.1'	59.1'
1	195°37.63	22.28	221°16.49	9.6'	16°2.06	-14.2'	59.1'
2	210°37.85	21.33	235°45.07	9.7'	15°47.91	-14.2'	59.1'
3	225°38.07	· · 20.39	250°13.74	9.8'	15°33.68	-14.3'	59.1'
4	240°38.28	19.45	264°42.50	9.9'	15°19.36	-14.4'	59.1'
5	255°38.50	18.50	279°11.35	9.9'	15°4.97	-14.5'	59.1'
6	270°38.71	N05°17.56	293°40.29	10.0'	N14°50.51	-14.5'	59.1'
7	285°38.93	16.61	308°9.32	10.1'	14°35.97	-14.6'	59.0'
8	300°39.15	15.67	322°38.44	10.2'	14°21.36	-14.7'	59.0'
9	315°39.36	· · 14.73	337°7.65	10.3'	14°6.67	-14.8'	59.0'
10	330°39.58	13.78	351°36.95	10.4'	13°51.92	-14.8'	59.0'
11	345°39.80	12.84	6°6.33	10.5'	13°37.10	-14.9'	59.0'
12	0°40.01	N05°11.89	20°35.80	10.6'	N13°22.22	-14.9'	59.0'
13	15°40.23	10.95	35°5.35	10.6'	13°7.27	-15.0'	59.0'
14	30°40.45	10.00	49°34.98	10.7'	12°52.26	-15.1'	58.9'
15	45°40.66	· · 9.06	64°4.70	10.8'	12°37.19	-15.1'	58.9'
16	60°40.88	8.11	78°34.50	10.9'	12°22.07	-15.2'	58.9'
17	75°41.10	7.17	93°4.38	11.0'	12°6.88	-15.2'	58.9'
18	90°41.31	N05°6.22	107°34.33	11.0'	N11°51.64	-15.3'	58.9'
19	105°41.53	5.27	122°4.37	11.1'	11°36.35	-15.3'	58.8'
20	120°41.75	4.33	136°34.49	11.2'	11°21.01	-15.4'	58.8'
21	135°41.97	· · 3.38	151°4.68	11.3'	11°5.61	-15.4'	58.8'
22	150°42.18	2.44	165°34.95	11.3'	10°50.17	-15.5'	58.8'
23	165°42.40	1.49	180°5.29	11.4'	10°34.69	-15.5'	58.8'
SD = 15.9'		d = -0.9'	SD = 16.1'				

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

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

Day	Sun		Mer. Pass	Moon		Age 26-28 21-6%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
07	01:49	01:59	11:58	08:45	21:14	
08	02:09	02:19	11:58	09:42	22:09	
09	02:30	02:40	11:57	10:35	23:00	

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

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°2.78		143°0.80	S15°39.13	238°19.72	N22°45.07	210°51.33	N16°41.59	335°55.59	N02°42.93
1	4°5.25		158°1.78	40.02	253°20.51	44.89	225°53.28	41.45	350°58.20	42.86
2	19°7.71		173°2.77	40.92	268°21.30	44.71	240°55.24	41.30	6°0.82	42.79
3	34°10.17		188°3.76	· · 41.82	283°22.10	· · 44.53	255°57.19	· · 41.15	21°3.43	· · 42.72
4	49°12.64		203°4.76	42.71	298°22.89	44.35	270°59.15	41.01	36°6.05	42.65
5	64°15.10		218°5.75	43.61	313°23.68	44.17	286°1.11	40.86	51°8.66	42.58
6	79°17.57		233°6.75	S15°44.50	328°24.48	N22°43.99	301°3.06	N16°40.72	66°11.28	N02°42.51
7	94°20.03		248°7.74	45.39	343°25.27	43.81	316°5.02	40.57	81°13.89	42.44
8	109°22.50		263°8.74	46.29	358°26.07	43.63	331°6.98	40.43	96°16.51	42.37
9	124°24.96		278°9.74	· · 47.18	13°26.86	· · 43.44	346°8.94	· · 40.28	111°19.12	· · 42.30
10	139°27.42		293°10.74	48.07	28°27.66	43.26	1°10.89	40.14	126°21.74	42.23
11	154°29.89		308°11.75	48.96	43°28.45	43.08	16°12.85	39.99	141°24.35	42.16
12	169°32.35		323°12.75	S15°49.85	58°29.25	N22°42.90	31°14.81	N16°39.85	156°26.97	N02°42.09
13	184°34.82		338°13.76	50.73	73°30.04	42.71	46°16.77	39.70	171°29.58	42.02
14	199°37.28		353°14.77	51.62	88°30.84	42.53	61°18.72	39.56	186°32.20	41.95
15	214°39.74		8°15.78	· · 52.51	103°31.64	· · 42.35	76°20.68	· · 39.41	201°34.81	· · 41.87
16	229°42.21		23°16.79	53.39	118°32.43	42.16	91°22.64	39.27	216°37.43	41.80
17	244°44.67		38°17.80	54.28	133°33.23	41.98	106°24.60	39.12	231°40.05	41.73
18	259°47.14		53°18.82	S15°55.16	148°34.03	N22°41.80	121°26.55	N16°38.98	246°42.66	N02°41.66
19	274°49.60		68°19.84	56.05	163°34.83	41.61	136°28.51	38.83	261°45.28	41.59
20	289°52.06		83°20.86	56.93	178°35.62	41.43	151°30.47	38.68	276°47.90	41.52
21	304°54.53		98°21.88	· · 57.81	193°36.42	· · 41.24	166°32.43	· · 38.54	291°50.51	· · 41.45
22	319°56.99		113°22.90	58.69	208°37.22	41.06	181°34.39	38.39	306°53.13	41.38
23	334°59.46		128°23.92	59.57	223°38.02	40.87	196°36.35	38.25	321°55.74	41.31
Mer.pass. 00:44			ν1.0' d0.9' m-4.72		ν0.8' d-0.2' m1.21		ν2.0' d-0.1' m-1.82		ν2.6' d-0.1' m0.44	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°1.92		143°24.95	S16°0.45	238°38.82	N22°40.69	211°38.31	N16°38.10	336°58.36	N02°41.24
1	5°4.38		158°25.98	1.33	253°39.62	40.50	226°40.26	37.96	352°0.98	41.17
2	20°6.85		173°27.01	2.21	268°40.42	40.31	241°42.22	37.81	7°3.59	41.10
3	35°9.31		188°28.04	· · 3.08	283°41.21	· · 40.13	256°44.18	· · 37.67	22°6.21	· · 41.02
4	50°11.78		203°29.07	3.96	298°42.01	39.94	271°46.14	37.52	37°8.83	40.95
5	65°14.24		218°30.10	4.84	313°42.81	39.75	286°48.10	37.38	52°11.45	40.88
6	80°16.70		233°31.14	S16°5.71	328°43.62	N22°39.57	301°50.06	N16°37.23	67°14.06	N02°40.81
7	95°19.17		248°32.18	6.58	343°44.42	39.38	316°52.02	37.09	82°16.68	40.74
8	110°21.63		263°33.22	7.46	358°45.22	39.19	331°53.98	36.94	97°19.30	40.67
9	125°24.10		278°34.26	· · 8.33	13°46.02	· · 39.00	346°55.94	· · 36.80	112°21.91	· · 40.60
10	140°26.56		293°35.30	9.20	28°46.82	38.82	1°57.90	36.65	127°24.53	40.53
11	155°29.02		308°36.35	10.07	43°47.62	38.63	16°59.86	36.51	142°27.15	40.46
12	170°31.49		323°37.39	S16°10.94	58°48.42	N22°38.44	32°1.82	N16°36.36	157°29.77	N02°40.38
13	185°33.95		338°38.44	11.81	73°49.22	38.25	47°3.78	36.22	172°32.39	40.31
14	200°36.42		353°39.49	12.68	88°50.03	38.06	62°5.74	36.07	187°35.00	40.24
15	215°38.88		8°40.54	· · 13.54	103°50.83	· · 37.87	77°7.70	· · 35.93	202°37.62	· · 40.17
16	230°41.34		23°41.60	14.41	118°51.63	37.68	92°9.66	35.78	217°40.24	40.10
17	245°43.81		38°42.65	15.28	133°52.44	37.49	107°11.62	35.64	232°42.86	40.03
18	260°46.27		53°43.71	S16°16.14	148°53.24	N22°37.30	122°13.58	N16°35.49	247°45.48	N02°39.96
19	275°48.74		68°44.77	17.00	163°54.04	37.11	137°15.54	35.35	262°48.09	39.88
20	290°51.20		83°45.83	17.87	178°54.85	36.92	152°17.50	35.20	277°50.71	39.81
21	305°53.66		98°46.89	· · 18.73	193°55.65	· · 36.73	167°19.46	· · 35.06	292°53.33	· · 39.74
22	320°56.13		113°47.95	19.59	208°56.46	36.54	182°21.42	34.91	307°55.95	39.67
23	335°58.59		128°49.02	20.45	223°57.26	36.35	197°23.39	34.77	322°58.57	39.60
Mer.pass. 00:40			ν1.0' d0.9' m-4.73		ν0.8' d-0.2' m1.21		ν2.0' d-0.1' m-1.82		ν2.6' d-0.1' m0.43	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	351°1.06		143°50.09	S16°21.31	238°58.07	N22°36.16	212°25.35	N16°34.62	338°1.19	N02°39.53
1	6°3.52		158°51.16	22.17	253°58.87	35.97	227°27.31	34.48	353°3.81	39.45
2	21°5.98		173°52.23	23.03	268°59.68	35.77	242°29.27	34.33	8°6.43	39.38
3	36°8.45		188°53.30	· · 23.88	284°0.48	· · 35.58	257°31.23	· · 34.19	23°9.04	· · 39.31
4	51°10.91		203°54.38	24.74	299°1.29	35.39	272°33.19	34.04	38°11.66	39.24
5	66°13.38		218°55.45	25.60	314°2.09	35.20	287°35.15	33.90	53°14.28	39.17
6	81°15.84		233°56.53	S16°26.45	329°2.90	N22°35.00	302°37.12	N16°33.75	68°16.90	N02°39.10
7	96°18.30		248°57.61	27.30	344°3.71	34.81	317°39.08	33.61	83°19.52	39.02
8	111°20.77		263°58.69	28.16	359°4.52	34.62	332°41.04	33.46	98°22.14	38.95
9	126°23.23		278°59.78	· · 29.01	14°5.32	· · 34.42	347°43.00	· · 33.32	113°24.76	· · 38.88
10	141°25.70		294°0.86	29.86	29°6.13	34.23	2°44.97	33.17	128°27.38	38.81
11	156°28.16		309°1.95	30.71	44°6.94	34.04	17°46.93	33.03	143°30.00	38.74
12	171°30.62		324°3.04	S16°31.56	59°7.75	N22°33.84	32°48.89	N16°32.88	158°32.62	N02°38.66
13	186°33.09		339°4.13	32.41	74°8.55	33.65	47°50.85	32.74	173°35.24	38.59
14	201°35.55		354°5.23	33.26	89°9.36	33.45	62°52.82	32.60	188°37.86	38.52
15	216°38.02		9°6.32	· · 34.10	104°10.17	· · 33.26	77°54.78	· · 32.45	203°40.48	· · 38.45
16	231°40.48		24°7.42	34.95	119°10.98	33.06	92°56.74	32.31	218°43.10	38.38
17	246°42.94		39°8.52	35.80	134°11.79	32.87	107°58.71	32.16	233°45.72	38.30
18	261°45.41		54°9.62	S16°36.64	149°12.60	N22°32.67	123°0.67	N16°32.02	248°48.34	N02°38.23
19	276°47.87		69°10.72	37.48	164°13.41	32.47	138°2.63	31.87	263°50.96	38.16
20	291°50.34		84°11.82	38.33	179°14.22	32.28	153°4.60	31.73	278°53.58	38.09
21	306°52.80		99°12.93	· · 39.17	194°15.03	· · 32.08	168°6.56	· · 31.58	293°56.20	· · 38.01
22	321°55.26		114°14.04	40.01	209°15.84	31.88	183°8.52	31.44	308°58.82	37.94
23	336°57.73		129°15.15	40.85	224°16.65	31.69	198°10.49	31.29	324°1.45	37.87
Mer.pass. 00:36			ν1.1' d0.9' m-4.74		ν0.8' d-0.2' m1.21		ν2.0' d-0.1' m-1.82		ν2.6' d-0.1' m0.43	


Stars		
	SHA	Dec
Alpheratz	357°32.99	29°14.41
Ankaa	353°5.37	-42°9.42
Schedar	349°28.93	56°41.06
Diphda	348°45.60	-17°50.18
Achernar	335°18.67	-57°5.77
Hamal	327°49.38	23°35.40
Polaris	313°4.41	89°22.33
Acamar	315°10.49	-40°11.52
Menkar	314°4.52	4°11.83
Mirfak	308°26.04	49°57.25
Aldebaran	290°37.97	16°33.84
Rigel	281°2.54	-8°10.04
Capella	280°19.84	46°1.34
Bellatrix	278°21.41	6°22.55
Elnath	278°0.13	28°37.76
Alnilam	275°36.35	-1°10.93
Betelgeuse	270°50.64	7°24.82
Canopus	263°51.94	-52°42.22
Sirius	258°25.14	-16°44.94
Adhara	255°4.94	-29°0.23
Procyon	244°49.57	5°9.48
Pollux	243°15.83	27°57.67
Avior	234°14.65	-59°35.43
Suhail	222°45.67	-43°32.23
Miaplacidus	221°38.81	-69°49.40
Alphard	217°46.68	-8°46.34
Regulus	207°33.27	11°50.27
Dubhe	193°39.96	61°36.42
Denebola	182°23.85	14°25.45
Gienah	175°42.47	-17°41.37
Acrux	172°59.22	-63°14.91
Gacrux	171°50.65	-57°15.84
Alioth	166°12.24	55°49.01
Spica	158°21.10	-11°18.00
Alkaid	152°51.27	49°10.96
Hadar	148°34.49	-60°30.27
Menkent	147°56.26	-36°30.15
Arcturus	145°46.87	19°2.74
Rigil Kent.	139°38.79	-60°56.92
Kochab	137°20.47	74°2.92
Zuben'ubi	136°54.66	-16°9.15
Alphecca	126°2.70	26°37.67
Antares	112°14.19	-26°29.51
Atria	107°7.17	-69°4.75
Sabik	102°1.18	-15°45.44
Shaula	96°8.43	-37°7.46
Rasalhague	95°57.22	12°32.60
Eltanin	90°41.43	51°29.38
Kaus Aust.	83°30.55	-34°22.35
Vega	80°32.14	38°48.76
Nunki	75°45.88	-26°15.79
Altair	61°58.40	8°56.51
Peacock	53°3.10	-56°38.99
Deneb	49°24.51	45°22.77
Enif	33°37.14	10°0.03
Al Na'ir	27°30.72	-46°49.81
Fomalhaut	15°12.62	-29°28.68
Scheat	13°43.50	28°13.83
Markab	13°28.19	15°21.12
Sep 10 Thu	SHA	Mer.pass
Venus	153°58.01	14:27
Mars	249°16.94	08:06
Jupiter	221°48.54	09:55
Saturn	346°52.81	01:36
Sep 11 Fri	SHA	Mer.pass
Venus	153°23.03	14:25
Mars	248°36.90	08:05
Jupiter	221°36.39	09:52
Saturn	346°56.44	01:32
Sep 12 Sat	SHA	Mer.pass
Venus	152°49.03	14:24
Mars	247°57.01	08:04
Jupiter	221°24.29	09:49
Saturn	347°0.13	01:28
Horizontal parallax		
Venus:		0.3
Mars:		0.1

DUT1 = UT1-UTC = +0.1175 sec ΔT = TT-UT1 = +69.0665 sec

h		Sun		Moon			
Thu		GHA	Dec	GHA	ν	Dec	d HP
0		180°42.62	N05°0.54	194°35.70	11.5'	N10°19.16	-15.6' 58.8'
1		195°42.84	04°59.60	209°6.19	11.6'	10°3.58	-15.6' 58.7'
2		210°43.05		223°36.75	11.6'	09°47.97	-15.7' 58.7'
3		225°43.27	· · 57.70	238°7.38	11.7'	09°32.31	-15.7' 58.7'
4		240°43.49	56.75	252°38.08	11.8'	09°16.62	-15.7' 58.7'
5		255°43.71	55.81	267°8.85	11.8'	09°0.89	-15.8' 58.7'
6		270°43.92	N04°54.86	281°39.68	11.9'	N08°45.13	-15.8' 58.6'
7		285°44.14	53.91	296°10.58	12.0'	08°29.33	-15.8' 58.6'
8		300°44.36	52.96	310°41.55	12.0'	08°13.51	-15.9' 58.6'
9		315°44.58	· · 52.02	325°12.57	12.1'	07°57.65	-15.9' 58.6'
10		330°44.79	51.07	339°43.66	12.2'	07°41.76	-15.9' 58.6'
11		345°45.01	50.12	354°14.82	12.2'	07°25.85	-15.9' 58.5'
12		0°45.23	N04°49.17	8°46.03	12.3'	N07°9.92	-16.0' 58.5'
13		15°45.45	48.22	23°17.30	12.3'	06°53.96	-16.0' 58.5'
14		30°45.67	47.27	37°48.63	12.4'	06°37.98	-16.0' 58.5'
15		45°45.89	· · 46.33	52°20.02	12.4'	06°21.97	-16.0' 58.4'
16		60°46.10	45.38	66°51.46	12.5'	06°5.95	-16.0' 58.4'
17		75°46.32	44.43	81°22.96	12.6'	05°49.92	-16.1' 58.4'
18		90°46.54	N04°43.48	95°54.51	12.6'	N05°33.86	-16.1' 58.4'
19		105°46.76	42.53	110°26.11	12.7'	05°17.80	-16.1' 58.3'
20		120°46.98	41.58	124°57.76	12.7'	05°1.72	-16.1' 58.3'
21		135°47.20	· · 40.63	139°29.47	12.8'	04°45.63	-16.1' 58.3'
22		150°47.41	39.68	154°1.22	12.8'	04°29.53	-16.1' 58.3'
23		165°47.63	38.73	168°33.02	12.8'	04°13.42	-16.1' 58.3'
		SD = 15.9' $d = -0.9'$		SD = 16.0'			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		180°47.85	N04°37.78	183°4.87	12.9'	N03°57.30	-16.1' 58.2'
1		195°48.07	36.83	197°36.76	12.9'	03°41.18	-16.1' 58.2'
2		210°48.29	35.88	212°8.69	13.0'	03°25.06	-16.1' 58.2'
3		225°48.51	· · 34.93	226°40.67	13.0'	03°8.93	-16.1' 58.2'
4		240°48.73	33.98	241°12.69	13.1'	02°52.81	-16.1' 58.1'
5		255°48.95	33.03	255°44.75	13.1'	02°36.68	-16.1' 58.1'
6		270°49.17	N04°32.08	270°16.85	13.1'	N02°20.55	-16.1' 58.1'
7		285°49.38	31.13	284°48.99	13.2'	02°4.43	-16.1' 58.1'
8		300°49.60	30.17	299°21.17	13.2'	01°48.32	-16.1' 58.0'
9		315°49.82	· · 29.22	313°53.38	13.2'	01°32.21	-16.1' 58.0'
10		330°50.04	28.27	328°25.63	13.3'	01°16.10	-16.1' 58.0'
11		345°50.26	27.32	342°57.91	13.3'	01°0.01	-16.1' 57.9'
12		0°50.48	N04°26.37	357°30.22	13.3'	N00°43.93	-16.1' 57.9'
13		15°50.70	25.42	12°2.56	13.4'	00°27.86	-16.1' 57.9'
14		30°50.92	24.46	26°34.94	13.4'	N00°11.80	-16.0' 57.9'
15		45°51.14	· · 23.51	41°7.34	13.4'	S00°4.25	16.0' 57.8'
16		60°51.36	22.56	55°39.77	13.5'	00°20.28	16.0' 57.8'
17		75°51.58	21.61	70°12.23	13.5'	00°36.29	16.0' 57.8'
18		90°51.80	N04°20.66	84°44.71	13.5'	S00°52.28	16.0' 57.8'
19		105°52.02	19.70	99°17.22	13.5'	01°8.26	16.0' 57.7'
20		120°52.24	18.75	113°49.75	13.6'	01°24.21	15.9' 57.7'
21		135°52.46	· · 17.80	128°22.31	13.6'	01°40.14	15.9' 57.7'
22		150°52.68	16.84	142°54.88	13.6'	01°56.05	15.9' 57.7'
23		165°52.90	15.89	157°27.48	13.6'	02°11.94	15.9' 57.6'
		SD = 15.9' $d = -1.0'$		SD = 15.9'			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		180°53.12	N04°14.94	172°0.09	13.6'	S02°27.79	15.8' 57.6'
1		195°53.34	13.98	186°32.72	13.6'	02°43.62	15.8' 57.6'
2		210°53.56	13.03	201°5.37	13.7'	02°59.43	15.8' 57.5'
3		225°53.78	· · 12.08	215°38.04	13.7'	03°15.20	15.7' 57.5'
4		240°54.00	11.12	230°10.72	13.7'	03°30.94	15.7' 57.5'
5		255°54.22	10.17	244°43.41	13.7'	03°46.65	15.7' 57.5'
6		270°54.44	N04°9.22	259°16.11	13.7'	S04°2.33	15.6' 57.4'
7		285°54.66	8.26	273°48.83	13.7'	04°17.97	15.6' 57.4'
8		300°54.88	7.31	288°21.56	13.7'	04°33.58	15.6' 57.4'
9		315°55.10	· · 6.35	302°54.29	13.7'	04°49.15	15.5' 57.3'
10		330°55.32	5.40	317°27.03	13.8'	05°4.68	15.5' 57.3'
11		345°55.54	4.44	331°59.79	13.8'	05°20.18	15.5' 57.3'
12		0°55.76	N04°3.49	346°32.54	13.8'	S05°35.63	15.4' 57.3'
13		15°55.98	2.53	1°5.30	13.8'	05°51.04	15.4' 57.2'
14		30°56.20	1.58	15°38.07	13.8'	06°6.42	15.3' 57.2'
15		45°56.42	04°0.62	30°10.84	13.8'	06°21.74	15.3' 57.2'
16		60°56.64	03°59.67	44°43.61	13.8'	06°37.02	15.2' 57.1'
17		75°56.86	58.71	59°16.38	13.8'	06°52.26	15.2' 57.1'
18		90°57.08	N03°57.76	73°49.16	13.8'	S07°7.45	15.1' 57.1'
19		105°57.30	56.80	88°21.93	13.8'	07°22.59	15.1' 57.1'
20		120°57.52	55.85	102°54.70	13.8'	07°37.68	15.0' 57.0'
21		135°57.74	· · 54.89	117°27.46	13.8'	07°52.73	15.0' 57.0'
22		150°57.96	53.93	132°0.22	13.8'	08°7.72	14.9' 57.0'
23		165°58.19	52.98	146°32.98	13.8'	08°22.66	14.9' 56.9'
		SD = 15.9' $d = -1.0'$		SD = 15.7'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 29-1 2-1%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
10	02:50	03:01	11:57	11:24	23:47	
11	03:11	03:22	11:57	12:10	--:-	
12	03:32	03:43	11:56	12:56	00:33	

September 13, 14, 15 UT (Sun., Mon., Tue.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	352°0.19	144°16.26	S16°41.69	239°17.46	N22°31.49	213°12.45	N16°31.15	339°4.07	N02°37.80	Alpheratz	357°32.98 29°14.42
1	7°2.66	159°17.37	42.53	254°18.28	31.29	228°14.42	31.00	354°6.69	37.73	Ankaa	353°5.36 -42°9.43
2	22°5.12	174°18.49	43.36	269°19.09	31.09	243°16.38	30.86	9°9.31	37.65	Schedar	349°28.92 56°41.07
3	37°7.58	189°19.61	· · 44.20	284°19.90	· · 30.90	258°18.34	· · 30.71	24°11.93	· · 37.58	Diphda	348°45.59 -17°50.18
4	52°10.05	204°20.73	45.04	299°20.71	30.70	273°20.31	30.57	39°14.55	37.51	Achernar	335°18.66 -57°5.78
5	67°12.51	219°21.85	45.87	314°21.53	30.50	288°22.27	30.43	54°17.17	37.44	Hamal	327°49.37 23°35.41
6	82°14.98	234°22.97	S16°46.70	329°22.34	N22°30.30	303°24.24	N16°30.28	69°19.79	N02°37.36	Polaris	313°3.04 89°22.33
7	97°17.44	249°24.09	47.54	344°23.15	30.10	318°26.20	30.14	84°22.41	37.29	Acamar	315°10.47 -40°11.52
8	112°19.91	264°25.22	48.37	359°23.97	29.90	333°28.17	29.99	99°25.04	37.22	Menkar	314°4.51 4°11.83
9	127°22.37	279°26.35	· · 49.20	14°24.78	· · 29.70	348°30.13	· · 29.85	114°27.66	· · 37.15	Mirfak	308°26.02 49°57.26
10	142°24.83	294°27.48	50.03	29°25.59	29.50	3°32.10	29.70	129°30.28	37.07	Aldebaran	290°37.95 16°33.84
11	157°27.30	309°28.61	50.86	44°26.41	29.30	18°34.06	29.56	144°32.90	37.00	Rigel	281°2.52 -8°10.04
12	172°29.76	324°29.75	S16°51.69	59°27.22	N22°29.10	33°36.03	N16°29.41	159°35.52	N02°36.93	Capella	280°19.82 46°1.34
13	187°32.23	339°30.89	52.52	74°28.04	28.90	48°37.99	29.27	174°38.15	36.86	Bellatrix	278°21.39 6°22.55
14	202°34.69	354°32.02	53.34	89°28.85	28.70	63°39.96	29.13	189°40.77	36.78	Elnath	278°0.11 28°37.76
15	217°37.15	9°33.16	· · 54.17	104°29.67	· · 28.50	78°41.92	· · 28.98	204°43.39	· · 36.71	Alnilam	275°36.34 -1°10.93
16	232°39.62	24°34.31	54.99	119°30.48	28.30	93°43.89	28.84	219°46.01	36.64	Betelgeuse	270°50.62 7°24.82
17	247°42.08	39°35.45	55.82	134°31.30	28.10	108°45.86	28.69	234°48.63	36.56	Canopus	263°51.92 -52°42.22
18	262°44.55	54°36.60	S16°56.64	149°32.11	N22°27.90	123°47.82	N16°28.55	249°51.26	N02°36.49	Sirius	258°25.12 -16°44.94
19	277°47.01	69°37.75	57.46	164°32.93	27.70	138°49.79	28.40	264°53.88	36.42	Adhara	255°4.92 -29°0.22
20	292°49.47	84°38.90	58.28	179°33.75	27.50	153°51.75	28.26	279°56.50	36.35	Procyon	244°49.55 5°9.48
21	307°51.94	99°40.05	· · 59.10	194°34.56	· · 27.29	168°53.72	· · 28.11	294°59.13	· · 36.27	Pollux	243°15.82 27°57.67
22	322°54.40	114°41.20	16°59.92	209°35.38	27.09	183°55.69	27.97	310°1.75	36.20	Avior	234°14.62 -59°35.42
23	337°56.87	129°42.36	17°0.74	224°36.20	26.89	198°57.65	27.83	325°4.37	36.13	Suhail	222°45.66 -43°32.21
Mer.pass. 00:32		ν1.1' d0.8' m-4.75		ν0.8' d-0.2' m1.20		ν2.0' d-0.1' m-1.83		ν2.6' d-0.1' m0.42		Miaplacidus	221°38.79 -69°49.39
										Alphard	217°46.67 -8°46.34
										Regulus	207°33.27 11°50.26
										Dubhe	193°39.96 61°36.40
										Denebola	182°23.85 14°25.45
										Gienah	175°42.48 -17°41.36
										Acrux	172°59.23 -63°14.90
										Gacrux	171°50.66 -57°15.82
										Alioth	166°12.25 55°49.00
										Spica	158°21.11 -11°18.00
										Alkaid	152°51.29 49°10.95
										Hadar	148°34.52 -60°30.25
										Menkent	147°56.27 -36°30.14
										Arcturus	145°46.88 19°2.73
										Rigel Kent.	139°38.82 -60°56.91
										Kochab	137°20.52 74°2.91
										Zuben'ubi	136°54.68 -16°9.15
										Alphecca	126°2.72 26°37.67
										Antares	112°14.21 -26°29.50
										Atria	107°7.21 -69°4.75
										Sabik	102°1.20 -15°45.44
										Shaula	96°8.46 -37°7.46
										Rasalhague	95°57.24 12°32.61
										Eltanin	90°41.46 51°29.39
										Kaus Aust.	83°30.57 -34°22.35
										Vega	80°32.16 38°48.76
										Nunki	75°45.90 -26°15.79
										Altair	61°58.41 8°56.51
										Peacock	53°3.13 -56°39.00
										Deneb	49°24.52 45°22.78
										Enif	33°37.14 10°0.04
										Al Na'ir	27°30.73 -46°49.83
										Fomalhaut	15°12.62 -29°28.69
										Scheat	13°43.50 28°13.84
										Markab	13°28.19 15°21.12
Sep 13 Sun		SHA		Mer.pass							
		Venus		152°16.07 14:22							
		Mars		247°17.27 08:02							
		Jupiter		221°12.26 09:46							
		Saturn		347°3.87 01:23							
Sep 14 Mon		SHA		Mer.pass							
		Venus		151°44.19 14:20							
		Mars		246°37.69 08:01							
		Jupiter		221°0.29 09:43							
		Saturn		347°7.66 01:19							
Sep 15 Tue		SHA		Mer.pass							
		Venus		151°13.44 14:18							
		Mars		245°58.26 08:00							
		Jupiter		220°48.39 09:40							
		Saturn		347°11.50 01:15							
		Horizontal parallax									
		Venus:		0.3							
		Mars:		0.1							
Mer.pass. 00:24		ν1.2' d0.8' m-4.77		ν0.8' d-0.2' m1.19		ν2.0' d-0.1' m-1.83		ν2.6' d-0.1' m0.42			

h	Sun			Moon				
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	180°58.41	N03°52.02		161°5.73	13.7'	S08°37.54	14.8'	56.9'
1	195°58.63	51.07		175°38.48	13.7'	08°52.37	14.8'	56.9'
2	210°58.85	50.11		190°11.22	13.7'	09°7.15	14.7'	56.8'
3	225°59.07	· · 49.15		204°43.95	13.7'	09°21.87	14.7'	56.8'
4	240°59.29	48.20		219°16.66	13.7'	09°36.53	14.6'	56.8'
5	255°59.51	47.24		233°49.37	13.7'	09°51.13	14.5'	56.8'
6	270°59.73	N03°46.28		248°22.07	13.7'	S10°5.68	14.5'	56.7'
7	285°59.95	45.33		262°54.76	13.7'	10°20.16	14.4'	56.7'
8	301°0.18	44.37		277°27.43	13.7'	10°34.58	14.4'	56.7'
9	316°0.40	· · 43.41		292°0.09	13.6'	10°48.94	14.3'	56.6'
10	331°0.62	42.45		306°32.73	13.6'	11°3.24	14.2'	56.6'
11	346°0.84	41.50		321°5.36	13.6'	11°17.47	14.2'	56.6'
12	1°1.06	N03°40.54		335°37.97	13.6'	S11°31.63	14.1'	56.6'
13	16°1.28	39.58		350°10.56	13.6'	11°45.73	14.0'	56.5'
14	31°1.50	38.62		4°43.14	13.6'	11°59.76	14.0'	56.5'
15	46°1.72	· · 37.66		19°15.70	13.5'	12°13.73	13.9'	56.5'
16	61°1.95	36.71		33°48.23	13.5'	12°27.62	13.8'	56.4'
17	76°2.17	35.75		48°20.75	13.5'	12°41.44	13.8'	56.4'
18	91°2.39	N03°34.79		62°53.24	13.5'	S12°55.20	13.7'	56.4'
19	106°2.61	33.83		77°25.72	13.5'	13°8.88	13.6'	56.4'
20	121°2.83	32.87		91°58.17	13.4'	13°22.48	13.5'	56.3'
21	136°3.05	· · 31.91		106°30.60	13.4'	13°36.02	13.5'	56.3'
22	151°3.28	30.96		121°3.00	13.4'	13°49.48	13.4'	56.3'
23	166°3.50	30.00		135°35.38	13.4'	14°2.86	13.3'	56.2'
SD = 15.9'			$d = -1.0'$	SD = 15.5'				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	181°3.72	N03°29.04		150°7.73	13.3'	S14°16.16	13.2'	56.2'
1	196°3.94	28.08		164°40.05	13.3'	14°29.39	13.1'	56.2'
2	211°4.16	27.12		179°12.35	13.3'	14°42.54	13.1'	56.2'
3	226°4.38	· · 26.16		193°44.62	13.2'	14°55.61	13.0'	56.1'
4	241°4.61	25.20		208°16.86	13.2'	15°8.60	12.9'	56.1'
5	256°4.83	24.24		222°49.08	13.2'	15°21.51	12.8'	56.1'
6	271°5.05	N03°23.28		237°21.26	13.2'	S15°34.34	12.7'	56.0'
7	286°5.27	22.32		251°53.41	13.1'	15°47.08	12.7'	56.0'
8	301°5.49	21.36		266°25.54	13.1'	15°59.74	12.6'	56.0'
9	316°5.72	· · 20.40		280°57.63	13.1'	16°12.32	12.5'	56.0'
10	331°5.94	19.44		295°29.69	13.0'	16°24.81	12.4'	55.9'
11	346°6.16	18.48		310°1.71	13.0'	16°37.21	12.3'	55.9'
12	1°6.38	N03°17.52		324°33.71	13.0'	S16°49.53	12.2'	55.9'
13	16°6.60	16.56		339°5.67	12.9'	17°1.76	12.1'	55.8'
14	31°6.83	15.60		353°37.59	12.9'	17°13.90	12.0'	55.8'
15	46°7.05	· · 14.64		8°9.48	12.9'	17°25.95	12.0'	55.8'
16	61°7.27	13.68		22°41.34	12.8'	17°37.90	11.9'	55.8'
17	76°7.49	12.72		37°13.16	12.8'	17°49.77	11.8'	55.7'
18	91°7.72	N03°11.76		51°44.94	12.7'	S18°1.55	11.7'	55.7'
19	106°7.94	10.80		66°16.69	12.7'	18°13.23	11.6'	55.7'
20	121°8.16	9.84		80°48.40	12.7'	18°24.82	11.5'	55.7'
21	136°8.38	· · 8.88		95°20.07	12.6'	18°36.32	11.4'	55.6'
22	151°8.60	7.92		109°51.71	12.6'	18°47.72	11.3'	55.6'
23	166°8.83	6.95		124°23.30	12.6'	18°59.02	11.2'	55.6'
SD = 15.9'			$d = -1.0'$	SD = 15.3'				

Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	181°9.05	N03°5.99		138°54.86	12.5'	S19°10.23	11.1'	55.6'
1	196°9.27	5.03		153°26.38	12.5'	19°21.34	11.0'	55.5'
2	211°9.49	4.07		167°57.86	12.4'	19°32.35	10.9'	55.5'
3	226°9.72	· · 3.11		182°29.30	12.4'	19°43.26	10.8'	55.5'
4	241°9.94	2.15		197°0.70	12.4'	19°54.07	10.7'	55.5'
5	256°10.16	1.18		211°32.07	12.3'	20°4.78	10.6'	55.4'
6	271°10.38	N03°0.22		226°3.39	12.3'	S20°15.39	10.5'	55.4'
7	286°10.61	02°59.26		240°34.67	12.2'	20°25.90	10.4'	55.4'
8	301°10.83	58.30		255°5.91	12.2'	20°36.31	10.3'	55.4'
9	316°11.05	· · 57.34		269°37.11	12.2'	20°46.61	10.2'	55.3'
10	331°11.27	56.37		284°8.26	12.1'	20°56.80	10.1'	55.3'
11	346°11.50	55.41		298°39.38	12.1'	21°6.90	10.0'	55.3'
12	1°11.72	N02°54.45		313°10.45	12.0'	S21°16.88	9.9'	55.3'
13	16°11.94	53.49		327°41.49	12.0'	21°26.76	9.8'	55.2'
14	31°12.17	52.52		342°12.48	11.9'	21°36.54	9.7'	55.2'
15	46°12.39	· · 51.56		356°43.43	11.9'	21°46.20	9.6'	55.2'
16	61°12.61	50.60		11°14.34	11.9'	21°55.76	9.4'	55.2'
17	76°12.83	49.63		25°45.20	11.8'	22°5.21	9.3'	55.1'
18	91°13.06	N02°48.67		40°16.03	11.8'	S22°14.54	9.2'	55.1'
19	106°13.28	47.71		54°46.81	11.7'	22°23.77	9.1'	55.1'
20	121°13.50	46.74		69°17.55	11.7'	22°32.89	9.0'	55.1'
21	136°13.72	· · 45.78		83°48.25	11.7'	22°41.89	8.9'	55.1'
22	151°13.95	44.82		98°18.90	11.6'	22°50.79	8.8'	55.0'
23	166°14.17	43.85		112°49.52	11.6'	22°59.56	8.7'	55.0'
SD = 15.9'			$d = -1.0'$	SD = 15.2'				

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

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

September 16, 17, 18 UT (Wed., Thu., Fri.)

h	Aries			Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	354°57.61	145°41.50	S17°39.72	240°16.59	N22°16.67	215°34.16	N16°20.77	342°12.99	N02°32.52		
1	10°0.07	160°42.76	40.49	255°17.42	16.46	230°36.13	20.63	357°15.62	32.45		
2	25°2.53	175°44.02	41.26	270°18.25	16.24	245°38.10	20.48	12°18.24	32.38		
3	40°5.00	190°45.29	•• 42.03	285°19.08	•• 16.03	260°40.07	•• 20.34	27°20.87	•• 32.30		
4	55°7.46	205°46.55	42.80	300°19.91	15.81	275°42.05	20.20	42°23.50	32.23		
5	70°9.93	220°47.82	43.56	315°20.75	15.60	290°44.02	20.05	57°26.12	32.15		
6	85°12.39	235°49.09	S17°44.33	330°21.58	N22°15.38	305°45.99	N16°19.91	72°28.75	N02°32.08		
7	100°14.85	250°50.36	45.10	345°22.41	15.17	320°47.97	19.77	87°31.38	32.01		
8	115°17.32	265°51.64	45.86	0°23.24	14.95	335°49.94	19.62	102°34.01	31.93		
9	130°19.78	280°52.91	•• 46.62	15°24.08	•• 14.74	350°51.91	•• 19.48	117°36.63	•• 31.86		
10	145°22.25	295°54.19	47.39	30°24.91	14.52	5°53.89	19.34	132°39.26	31.78		
11	160°24.71	310°55.48	48.15	45°25.74	14.30	20°55.86	19.19	147°41.89	31.71		
12	175°27.18	325°56.76	S17°48.91	60°26.58	N22°14.09	35°57.83	N16°19.05	162°44.52	N02°31.63		
13	190°29.64	340°58.04	49.67	75°27.41	13.87	50°59.81	18.91	177°47.14	31.56		
14	205°32.10	355°59.33	50.43	90°28.25	13.65	66°1.78	18.76	192°49.77	31.48		
15	220°34.57	11°0.62	•• 51.18	105°29.08	•• 13.44	81°3.76	•• 18.62	207°52.40	•• 31.41		
16	235°37.03	26°1.92	51.94	120°29.92	13.22	96°5.73	18.48	222°55.03	31.34		
17	250°39.50	41°3.21	52.70	135°30.75	13.00	111°7.70	18.33	237°57.66	31.26		
18	265°41.96	56°4.51	S17°53.45	150°31.59	N22°12.78	126°9.68	N16°18.19	253°0.28	N02°31.19		
19	280°44.42	71°5.81	54.20	165°32.42	12.56	141°11.65	18.05	268°2.91	31.11		
20	295°46.89	86°7.11	54.96	180°33.26	12.35	156°13.63	17.90	283°5.54	31.04		
21	310°49.35	101°8.41	•• 55.71	195°34.10	•• 12.13	171°15.60	•• 17.76	298°8.17	•• 30.96		
22	325°51.82	116°9.72	56.46	210°34.93	11.91	186°17.58	17.62	313°10.80	30.89		
23	340°54.28	131°11.03	57.21	225°35.77	11.69	201°19.55	17.47	328°13.43	30.81		
Mer.pass. 00:20											
ν1.3' d0.8' m-4.78											
ν0.8' d-0.2' m1.19											
ν2.0' d-0.1' m-1.83											
ν2.6' d-0.1' m0.41											
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°56.74	146°12.34	S17°57.95	240°36.61	N22°11.47	216°21.53	N16°17.33	343°16.05	N02°30.74		
1	10°59.21	161°13.65	58.70	255°37.45	11.25	231°23.50	17.19	358°18.68	30.67		
2	26°1.67	176°14.97	17°59.45	270°38.28	11.03	246°25.48	17.04	13°21.31	30.59		
3	41°4.14	191°16.28	18°0.19	285°39.12	•• 10.81	261°27.45	•• 16.90	28°23.94	•• 30.52		
4	56°6.60	206°17.60	0.94	300°39.96	10.59	276°29.43	16.76	43°26.57	30.44		
5	71°9.07	221°18.92	1.68	315°40.80	10.37	291°31.41	16.62	58°29.20	30.37		
6	86°11.53	236°20.25	S18°2.42	330°41.64	N22°10.15	306°33.38	N16°16.47	73°31.83	N02°30.29		
7	101°13.99	251°21.58	3.16	345°42.48	9.93	321°35.36	16.33	88°34.46	30.22		
8	116°16.46	266°22.90	3.90	0°43.32	9.71	336°37.33	16.19	103°37.08	30.14		
9	131°18.92	281°24.24	•• 4.64	15°44.16	•• 9.49	351°39.31	•• 16.04	118°39.71	•• 30.07		
10	146°21.39	296°25.57	5.38	30°45.00	9.26	6°41.29	15.90	133°42.34	29.99		
11	161°23.85	311°26.90	6.12	45°45.84	9.04	21°43.26	15.76	148°44.97	29.92		
12	176°26.31	326°28.24	S18°6.85	60°46.68	N22°8.82	36°45.24	N16°15.61	163°47.60	N02°29.84		
13	191°28.78	341°29.58	7.59	75°47.52	8.60	51°47.22	15.47	178°50.23	29.77		
14	206°31.24	356°30.93	8.32	90°48.36	8.38	66°49.19	15.33	193°52.86	29.69		
15	221°33.71	11°32.27	•• 9.06	105°49.20	•• 8.15	81°51.17	•• 15.19	208°55.49	•• 29.62		
16	236°36.17	26°33.62	9.79	120°50.04	7.93	96°53.15	15.04	223°58.12	29.54		
17	251°38.64	41°34.97	10.52	135°50.89	7.71	111°55.12	14.90	239°0.75	29.47		
18	266°41.10	56°36.32	S18°11.25	150°51.73	N22°7.48	126°57.10	N16°14.76	254°3.38	N02°29.39		
19	281°43.56	71°37.67	11.98	165°52.57	7.26	141°59.08	14.61	269°6.01	29.32		
20	296°46.03	86°39.03	12.70	180°53.41	7.04	157°1.06	14.47	284°8.64	29.24		
21	311°48.49	101°40.39	•• 13.43	195°54.26	•• 6.81	172°3.03	•• 14.33	299°11.27	•• 29.17		
22	326°50.96	116°41.75	14.15	210°55.10	6.59	187°5.01	14.19	314°13.90	29.09		
23	341°53.42	131°43.12	14.88	225°55.94	6.36	202°6.99	14.04	329°16.53	29.02		
Mer.pass. 00:16											
ν1.3' d0.7' m-4.78											
ν0.8' d-0.2' m1.18											
ν2.0' d-0.1' m-1.83											
ν2.6' d-0.1' m0.41											
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°55.88	146°44.48	S18°15.60	240°56.79	N22°6.14	217°8.97	N16°13.90	344°19.16	N02°28.94		
1	11°58.35	161°45.85	16.32	255°57.63	5.91	232°10.95	13.76	359°21.79	28.87		
2	27°0.81	176°47.22	17.05	270°58.48	5.69	247°12.92	13.61	14°24.42	28.79		
3	42°3.28	191°48.60	•• 17.77	285°59.32	•• 5.46	262°14.90	•• 13.47	29°27.05	•• 28.72		
4	57°5.74	206°49.97	18.48	301°0.17	5.24	277°16.88	13.33	44°29.68	28.64		
5	72°8.21	221°51.35	19.20	316°1.01	5.01	292°18.86	13.19	59°32.31	28.57		
6	87°10.67	236°52.73	S18°19.92	331°1.86	N22°4.79	307°20.84	N16°13.04	74°34.94	N02°28.49		
7	102°13.13	251°54.11	20.64	346°2.70	4.56	322°22.82	12.90	89°37.57	28.42		
8	117°15.60	266°55.50	21.35	1°3.55	4.33	337°24.80	12.76	104°40.20	28.34		
9	132°18.06	281°56.89	•• 22.06	16°4.40	•• 4.11	352°26.78	•• 12.62	119°42.83	•• 28.27		
10	147°20.53	296°58.28	22.78	31°5.24	3.88	7°28.76	12.47	134°45.46	28.19		
11	162°22.99	311°59.67	23.49	46°6.09	3.65	22°30.73	12.33	149°48.10	28.12		
12	177°25.45	327°1.06	S18°24.20	61°6.94	N22°3.43	37°32.71	N16°12.19	164°50.73	N02°28.04		
13	192°27.92	342°2.46	24.91	76°7.79	3.20	52°34.69	12.05	179°53.36	27.97		
14	207°30.38	357°3.86	25.61	91°8.63	2.97	67°36.67	11.90	194°55.99	27.89		
15	222°32.85	12°5.26	•• 26.32	106°9.48	•• 2.74	82°38.65	•• 11.76	209°58.62	•• 27.82		
16	237°35.31	27°6.67	27.03	121°10.33	2.52	97°40.63	11.62	225°1.25	27.74		
17	252°37.77	42°8.08	27.73	136°11.18	2.29	112°42.61	11.48	240°3.88	27.66		
18	267°40.24	57°9.49	S18°28.44	151°12.03	N22°2.06	127°44.59	N16°11.33	255°6.51	N02°27.59		
19	282°42.70	72°10.90	29.14	166°12.88	1.83	142°46.57	11.19	270°9.14	27.51		
20	297°45.17	87°12.31	29.84	181°13.73	1.60	157°48.56	11.05	285°11.78	27.44		
21	312°47.63	102°13.73	•• 30.54	196°14.58	•• 1.37	172°50.54	•• 10.91	300°14.41	•• 27.36		
22	327°50.10	117°15.15	31.24	211°15.43	1.14	187°52.52	10.77	315°17.04	27.29		
23	342°52.56	132°16.57	31.94	226°16.28	0.91	202°54.50	10.62	330°19.67	27.21		
Mer.pass. 00:12											
ν1.4' d0.7' m-4.79											
ν0.8' d-0.2' m1.18											
ν2.0' d-0.1' m-1.84											
ν2.6' d-0.1' m0.40											

	SHA	Dec
Alpheratz	357°32.97	29°14.43
Ankaa	353°5.35	-42°9.44
Schedar	349°28.90	56°41.09
Diphda	348°45.58	-17°50.19
Achernar	335°18.64	-57°5.79
Hamal	327°49.35	23°35.42
Polaris	313°1.48	89°22.35
Acamar	315°10.45	-40°11.53
Menkar	314°4.49	4°11.83
Mirfak	308°25.98	49°57.26
Aldebaran	290°37.93	16°33.84
Rigel	281°2.50	-8°10.04
Capella	280°19.79	46°1.34
Bellatrix	278°21.37	6°22.54
Elnath	278°0.09	28°37.76
Alnilam	275°36.31	-

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°14.39	N02°42.89	127°20.09	11.5'	S23°8.23	8.6'	55.0'
1	196°14.62	41.93	141°50.62	11.5'	23°16.78	8.4'	55.0'
2	211°14.84	40.96	156°21.11	11.4'	23°25.22	8.3'	55.0'
3	226°15.06	· · 40.00	170°51.56	11.4'	23°33.54	8.2'	54.9'
4	241°15.28	39.04	185°21.97	11.4'	23°41.74	8.1'	54.9'
5	256°15.51	38.07	199°52.33	11.3'	23°49.83	8.0'	54.9'
6	271°15.73	N02°37.11	214°22.66	11.3'	S23°57.80	7.9'	54.9'
7	286°15.95	36.14	228°52.94	11.2'	24°5.65	7.7'	54.9'
8	301°16.18	35.18	243°23.19	11.2'	24°13.39	7.6'	54.8'
9	316°16.40	· · 34.21	257°53.39	11.2'	24°21.00	7.5'	54.8'
10	331°16.62	33.25	272°23.55	11.1'	24°28.50	7.4'	54.8'
11	346°16.85	32.29	286°53.68	11.1'	24°35.87	7.3'	54.8'
12	1°17.07	N02°31.32	301°23.76	11.0'	S24°43.13	7.1'	54.8'
13	16°17.29	30.36	315°53.81	11.0'	24°50.26	7.0'	54.7'
14	31°17.51	29.39	330°23.82	11.0'	24°57.27	6.9'	54.7'
15	46°17.74	· · 28.43	344°53.79	10.9'	25°4.16	6.8'	54.7'
16	61°17.96	27.46	359°23.72	10.9'	25°10.92	6.6'	54.7'
17	76°18.18	26.50	13°53.61	10.9'	25°17.57	6.5'	54.7'
18	91°18.41	N02°25.53	28°23.47	10.8'	S25°24.08	6.4'	54.7'
19	106°18.63	24.57	42°53.29	10.8'	25°30.48	6.3'	54.6'
20	121°18.85	23.60	57°23.08	10.7'	25°36.75	6.1'	54.6'
21	136°19.08	· · 22.64	71°52.83	10.7'	25°42.89	6.0'	54.6'
22	151°19.30	21.67	86°22.54	10.7'	25°48.91	5.9'	54.6'
23	166°19.52	20.70	100°52.22	10.6'	25°54.80	5.8'	54.6'
SD = 15.9'			SD = 15.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°19.75	N02°19.74	115°21.87	10.6'	S26°0.57	5.6'	54.6'
1	196°19.97	18.77	129°51.48	10.6'	26°6.21	5.5'	54.5'
2	211°20.19	17.81	144°21.06	10.5'	26°11.72	5.4'	54.5'
3	226°20.42	· · 16.84	158°50.61	10.5'	26°17.10	5.3'	54.5'
4	241°20.64	15.88	173°20.13	10.5'	26°22.35	5.1'	54.5'
5	256°20.86	14.91	187°49.62	10.5'	26°27.48	5.0'	54.5'
6	271°21.09	N02°13.94	202°19.07	10.4'	S26°32.48	4.9'	54.5'
7	286°21.31	12.98	216°48.50	10.4'	26°37.34	4.7'	54.5'
8	301°21.53	12.01	231°17.89	10.4'	26°42.08	4.6'	54.5'
9	316°21.75	· · 11.04	245°47.26	10.3'	26°46.69	4.5'	54.4'
10	331°21.98	10.08	260°16.60	10.3'	26°51.16	4.3'	54.4'
11	346°22.20	9.11	274°45.92	10.3'	26°55.51	4.2'	54.4'
12	1°22.42	N02°8.15	289°15.21	10.3'	S26°59.72	4.1'	54.4'
13	16°22.65	7.18	303°44.47	10.2'	27°3.81	4.0'	54.4'
14	31°22.87	6.21	318°13.71	10.2'	27°7.76	3.8'	54.4'
15	46°23.09	· · 5.25	332°42.93	10.2'	27°11.58	3.7'	54.4'
16	61°23.32	4.28	347°12.12	10.2'	27°15.26	3.6'	54.4'
17	76°23.54	3.31	1°41.29	10.1'	27°18.81	3.4'	54.3'
18	91°23.76	N02°2.34	16°10.44	10.1'	S27°22.23	3.3'	54.3'
19	106°23.99	1.38	30°39.57	10.1'	27°25.52	3.2'	54.3'
20	121°24.21	02°0.41	45°8.68	10.1'	27°28.67	3.0'	54.3'
21	136°24.43	01°59.44	59°37.77	10.1'	27°31.69	2.9'	54.3'
22	151°24.66	58.48	74°6.84	10.1'	27°34.58	2.8'	54.3'
23	166°24.88	57.51	88°35.90	10.0'	27°37.33	2.6'	54.3'
SD = 15.9'			SD = 14.9'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	181°25.10	N01°56.54	103°4.94	10.0'	S27°39.95	2.5'	54.3'
1	196°25.33	55.57	117°33.97	10.0'	27°42.43	2.3'	54.3'
2	211°25.55	54.61	132°2.98	10.0'	27°44.78	2.2'	54.3'
3	226°25.77	· · 53.64	146°31.98	10.0'	27°46.99	2.1'	54.3'
4	241°26.00	52.67	161°0.96	10.0'	27°49.07	1.9'	54.3'
5	256°26.22	51.70	175°29.94	10.0'	27°51.01	1.8'	54.2'
6	271°26.44	N01°50.74	189°58.90	10.0'	S27°52.82	1.7'	54.2'
7	286°26.67	49.77	204°27.86	9.9'	27°54.49	1.5'	54.2'
8	301°26.89	48.80	218°56.80	9.9'	27°56.03	1.4'	54.2'
9	316°27.11	· · 47.83	233°25.74	9.9'	27°57.43	1.3'	54.2'
10	331°27.34	46.86	247°54.67	9.9'	27°58.69	1.1'	54.2'
11	346°27.56	45.90	262°23.60	9.9'	27°59.82	1.0'	54.2'
12	1°27.78	N01°44.93	276°52.52	9.9'	S28°0.82	0.9'	54.2'
13	16°28.00	43.96	291°21.44	9.9'	28°1.67	0.7'	54.2'
14	31°28.23	42.99	305°50.36	9.9'	28°2.40	0.6'	54.2'
15	46°28.45	· · 42.02	320°19.27	9.9'	28°2.98	0.4'	54.2'
16	61°28.67	41.06	334°48.18	9.9'	28°3.43	0.3'	54.2'
17	76°28.90	40.09	349°17.10	9.9'	28°3.74	0.2'	54.2'
18	91°29.12	N01°39.12	3°46.01	9.9'	S28°3.92	0.0'	54.2'
19	106°29.34	38.15	18°14.93	9.9'	28°3.96	-0.1'	54.2'
20	121°29.57	37.18	32°43.85	9.9'	28°3.87	-0.2'	54.2'
21	136°29.79	· · 36.21	47°12.78	9.9'	28°3.64	-0.4'	54.2'
22	151°30.01	35.24	61°41.71	9.9'	28°3.27	-0.5'	54.2'
23	166°30.24	34.27	76°10.65	9.9'	28°2.77	-0.6'	54.2'
SD = 15.9'			SD = 14.8'				

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

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

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 5-7 24-42%
16	04:58	05:08	11:55	16:03	03:38	
17	05:19	05:30	11:55	16:53	04:28	
18	05:40	05:51	11:54	17:44	05:19	

September 19, 20, 21 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	357°55.02		147°18.00	S18°32.64	241°17.13	N22°0.68	217°56.48	N16°10.48	345°22.30	N02°27.14
1	12°57.49		162°19.42	33.33	256°17.98	0.45	232°58.46	10.34	0°24.93	27.06
2	27°59.95		177°20.85	34.03	271°18.83	0.22	248°0.44	10.20	15°27.57	26.99
3	43°2.42		192°22.28	· · 34.72	286°19.68	21°59.99	263°2.42	· · 10.05	30°30.20	· · 26.91
4	58°4.88		207°23.72	35.41	301°20.54	21°59.76	278°4.40	9.91	45°32.83	26.83
5	73°7.34		222°25.15	36.10	316°21.39	59.53	293°6.39	9.77	60°35.46	26.76
6	88°9.81		237°26.59	S18°36.79	331°22.24	N21°59.30	308°8.37	N16°9.63	75°38.09	N02°26.68
7	103°12.27		252°28.04	37.48	346°23.09	59.07	323°10.35	9.49	90°40.73	26.61
8	118°14.74		267°29.48	38.17	1°23.95	58.84	338°12.33	9.34	105°43.36	26.53
9	133°17.20		282°30.93	· · 38.86	16°24.80	· · 58.61	353°14.31	· · 9.20	120°45.99	· · 26.46
10	148°19.67		297°32.38	39.54	31°25.65	58.38	8°16.30	9.06	135°48.62	26.38
11	163°22.13		312°33.83	40.23	46°26.51	58.14	23°18.28	8.92	150°51.26	26.31
12	178°24.59		327°35.28	S18°40.91	61°27.36	N21°57.91	38°20.26	N16°8.78	165°53.89	N02°26.23
13	193°27.06		342°36.74	41.60	76°28.21	57.68	53°22.24	8.63	180°56.52	26.15
14	208°29.52		357°38.20	42.28	91°29.07	57.45	68°24.23	8.49	195°59.15	26.08
15	223°31.99		12°39.66	· · 42.96	106°29.92	· · 57.21	83°26.21	· · 8.35	211°1.79	· · 26.00
16	238°34.45		27°41.13	43.64	121°30.78	56.98	98°28.19	8.21	226°4.42	25.93
17	253°36.91		42°42.59	44.31	136°31.63	56.75	113°30.18	8.07	241°7.05	25.85
18	268°39.38		57°44.06	S18°44.99	151°32.49	N21°56.51	128°32.16	N16°7.92	256°9.69	N02°25.77
19	283°41.84		72°45.54	45.67	166°33.35	56.28	143°34.14	7.78	271°12.32	25.70
20	298°44.31		87°47.01	46.34	181°34.20	56.05	158°36.13	7.64	286°14.95	25.62
21	313°46.77		102°48.49	· · 47.01	196°35.06	· · 55.81	173°38.11	· · 7.50	301°17.58	· · 25.55
22	328°49.24		117°49.97	47.69	211°35.92	55.58	188°40.09	7.36	316°20.22	25.47
23	343°51.70		132°51.45	48.36	226°36.77	55.34	203°42.08	7.21	331°22.85	25.40
Mer.pass. 00:08		ν1.4' d0.7' m-4.80		ν0.9' d-0.2' m1.17		ν2.0' d-0.1' m-1.84		ν2.6' d-0.1' m0.40		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	358°54.16		147°52.94	S18°49.03	241°37.63	N21°55.11	218°44.06	N16°7.07	346°25.48	N02°25.32
1	13°56.63		162°54.42	49.70	256°38.49	54.87	233°46.05	6.93	1°28.12	25.24
2	28°59.09		177°55.92	50.36	271°39.35	54.64	248°48.03	6.79	16°30.75	25.17
3	44°1.56		192°57.41	· · 51.03	286°40.21	· · 54.40	263°50.02	· · 6.65	31°33.38	· · 25.09
4	59°4.02		207°58.90	51.69	301°41.06	54.17	278°52.00	6.51	46°36.02	25.02
5	74°6.48		223°0.40	52.36	316°41.92	53.93	293°53.98	6.36	61°38.65	24.94
6	89°8.95		238°1.90	S18°53.02	331°42.78	N21°53.69	308°55.97	N16°6.22	76°41.28	N02°24.86
7	104°11.41		253°3.41	53.68	346°43.64	53.46	323°57.95	6.08	91°43.92	24.79
8	119°13.88		268°4.91	54.34	1°44.50	53.22	338°59.94	5.94	106°46.55	24.71
9	134°16.34		283°6.42	· · 55.00	16°45.36	· · 52.99	354°1.92	· · 5.80	121°49.19	· · 24.64
10	149°18.81		298°7.93	55.66	31°46.22	52.75	9°3.91	5.66	136°51.82	24.56
11	164°21.27		313°9.45	56.32	46°47.08	52.51	24°5.90	5.52	151°54.45	24.48
12	179°23.73		328°10.96	S18°56.97	61°47.94	N21°52.27	39°7.88	N16°5.37	166°57.09	N02°24.41
13	194°26.20		343°12.48	57.63	76°48.80	52.04	54°9.87	5.23	181°59.72	24.33
14	209°28.66		358°14.00	58.28	91°49.67	51.80	69°11.85	5.09	197°2.36	24.26
15	224°31.13		13°15.53	· · 58.93	106°50.53	· · 51.56	84°13.84	· · 4.95	212°4.99	· · 24.18
16	239°33.59		28°17.06	18°59.59	121°51.39	51.32	99°15.82	4.81	227°7.62	24.10
17	254°36.05		43°18.59	19°0.23	136°52.25	51.08	114°17.81	4.67	242°10.26	24.03
18	269°38.52		58°20.12	S19°0.88	151°53.12	N21°50.85	129°19.80	N16°4.53	257°12.89	N02°23.95
19	284°40.98		73°21.65	1.53	166°53.98	50.61	144°21.78	4.38	272°15.53	23.87
20	299°43.45		88°23.19	2.18	181°54.84	50.37	159°23.77	4.24	287°18.16	23.80
21	314°45.91		103°24.73	· · 2.82	196°55.70	· · 50.13	174°25.76	· · 4.10	302°20.80	· · 23.72
22	329°48.37		118°26.28	3.47	211°56.57	49.89	189°27.74	3.96	317°23.43	23.65
23	344°50.84		133°27.82	4.11	226°57.43	49.65	204°29.73	3.82	332°26.07	23.57
Mer.pass. 00:04		ν1.5' d0.7' m-4.80		ν0.9' d-0.2' m1.17		ν2.0' d-0.1' m-1.84		ν2.6' d-0.1' m0.40		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	359°53.30		148°29.37	S19°4.75	241°58.30	N21°49.41	219°31.72	N16°3.68	347°28.70	N02°23.49
1	14°55.77		163°30.92	5.39	256°59.16	49.17	234°33.71	3.54	2°31.33	23.42
2	29°58.23		178°32.48	6.03	272°0.03	48.93	249°35.69	3.40	17°33.97	23.34
3	45°0.70		193°34.03	· · 6.67	287°0.89	· · 48.69	264°37.68	· · 3.25	32°36.60	· · 23.26
4	60°3.16		208°35.59	7.30	302°1.76	48.45	279°39.67	3.11	47°39.24	23.19
5	75°5.62		223°37.15	7.94	317°2.62	48.21	294°41.66	2.97	62°41.87	23.11
6	90°8.09		238°38.72	S19°8.57	332°3.49	N21°47.97	309°43.64	N16°2.83	77°44.51	N02°23.04
7	105°10.55		253°40.29	9.21	347°4.35	47.73	324°45.63	2.69	92°47.14	22.96
8	120°13.02		268°41.86	9.84	2°5.22	47.49	339°47.62	2.55	107°49.78	22.88
9	135°15.48		283°43.43	· · 10.47	17°6.09	· · 47.24	354°49.61	· · 2.41	122°52.41	· · 22.81
10	150°17.94		298°45.01	11.10	32°6.96	47.00	9°51.60	2.27	137°55.05	22.73
11	165°20.41		313°46.58	11.73	47°7.82	46.76	24°53.59	2.13	152°57.69	22.65
12	180°22.87		328°48.17	S19°12.35	62°8.69	N21°46.52	39°55.57	N16°1.98	168°0.32	N02°22.58
13	195°25.34		343°49.75	12.98	77°9.56	46.28	54°57.56	1.84	183°2.96	22.50
14	210°27.80		358°51.34	13.60	92°10.43	46.03	69°59.55	1.70	198°5.59	22.42
15	225°30.26		13°52.93	· · 14.23	107°11.30	· · 45.79	85°1.54	· · 1.56	213°8.23	· · 22.35
16	240°32.73		28°54.52	14.85	122°12.16	45.55	100°3.53	1.42	228°10.86	22.27
17	255°35.19		43°56.11	15.47	137°13.03	45.30	115°5.52	1.28	243°13.50	22.19
18	270°37.66		58°57.71	S19°16.09	152°13.90	N21°45.06	130°7.51	N16°1.14	258°16.13	N02°22.12
19	285°40.12		73°59.31	16.71	167°14.77	44.82	145°9.50	1.00	273°18.77	22.04
20	300°42.59		89°0.92	17.32	182°15.64	44.57	160°11.49	0.86	288°21.40	21.97
21	315°45.05		104°2.52	· · 17.94	197°16.51	· · 44.33	175°13.48	· · 0.72	303°24.04	· · 21.89
22	330°47.51		119°4.13	18.55	212°17.38	44.09	190°15.47	0.58	318°26.68	21.81
23	345°49.98		134°5.74	19.17	227°18.25	43.84	205°17.46	0.44	333°29.31	21.74
Mer.pass. 23:57		ν1.6' d0.6' m-4.81		ν0.9' d-0.2' m1.16		ν2.0' d-0.1' m-1.84		ν2.6' d-0.1' m0.39		

Stars		
	SHA	Dec
Alpheratz	357°32.96	29°14.44
Ankaa	353°5.34	-42°9.45
Schedar	349°28.88	56°41.11
Diphda	348°45.57	-17°50.19
Achernar	335°18.62	-57°5.80
Hamal	327°49.33	23°35.43
Polaris	312°59.96	89°22.36
Acamar	315°10.42	-40°11.54
Menkar	314°4.47	4°11.83
Mirfak	308°25.95	49°57.27
Aldebaran	290°37.90	16°33.88
Rigel	281°2.47	-8°10.04
Capella	280°19.75	46°1.35
Bellatrix	278°21.34	6°22.55
Elnath	278°0.06	28°37.76
Alnilam	275°36.29	-1°10.93
Betelgeuse	270°50.58	7°24.82
Canopus	263°51.85	-52°42.21
Sirius	258°25.08	-16°44.94
Adhara	255°4.87	-29°0.22
Procyon	244°49.51	5°9.48
Pollux	243°15.77	27°57.65
Avior	234°14.56	-59°35.41
Suhail	222°45.62	-43°32.20
Miaplacidus	221°38.72	-69°49.37
Alphard	217°46.64	-8°46.34
Regulus	207°33.24	11°50.25
Dubhe	193°39.94	61°36.37
Denebola	182°23.84	14°25.44
Gienah	175°42.47	-17°41.36
Acrux	172°59.22	-63°14.87
Gacrux	171°50.66	-57°15.80
Alioth	166°12.27	55°48.97
Spica	158°21.11	-11°18.00
Alkaid	152°51.31	49°10.93
Hadar	148°34.54	-60°30.23
Menkent	147°56.28	-36°30.13
Arcturus	145°46.89	19°2.72
Rigel Kent.	139°38.85	-60°56.89
Kochab	137°20.62	74°2.89
Zuben'ubi	136°54.69	-16°9.14
Alphecca	126°2.74	26°37.66
Antares	112°14.23	-26°29.50
Atria	107°7.28	-69°4.74
Sabik	102°1.22	-15°45.44
Shaula	96°8.48	-37°7.46
Rasalhague	95°57.26	12°32.61
Eltanin	90°41.51	51°29.39
Kaus Aust.	83°30.59	-34°22.35
Vega	80°32.19	38°48.77
Nunki	75°45.92	-26°15.79
Altair	61°58.43	8°56.52
Peacock	53°3.16	-56°39.02
Deneb	49°24.55	45°22.81
Enif	33°37.15	10°0.05
Al Na'ir	27°30.74	-46°49.84
Fomalhaut	15°12.62	-29°28.70
Scheat	13°43.49	28°13.86
Markab	13°28.18	15°21.14
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Sep 19 Sat	SHA	Mer.pass
Venus	149°22.97	14:09
Mars	243°22.11	07:54
Jupiter	220°1.45	09:27
Saturn	347°27.28	00:58
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Sep 20 Sun	SHA	Mer.pass
Venus	148°58.77	14:07
Mars	242°43.47	07:53
Jupiter	219°49.90	09:24
Saturn	347°31.32	00:54
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Sep 21 Mon	SHA	Mer.pass
Venus	148°36.07	14:05
Mars	242°4.99	07:52
Jupiter	219°38.42	09:21
Saturn	347°35.40	00:50
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Horizontal parallax		
Venus:		0.4
Mars:		0.1

h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		181°30.46	N01°33.31	90°39.59	10.0'	S28°2.14	-0.8' 54.2'
1		196°30.68	32.34	105°8.54	10.0'	28°1.36	-0.9' 54.2'
2		211°30.91	31.37	119°37.50	10.0'	28°0.45	-1.0' 54.2'
3		226°31.13	· · 30.40	134°6.48	10.0'	27°59.41	-1.2' 54.2'
4		241°31.35	29.43	148°35.46	10.0'	27°58.23	-1.3' 54.2'
5		256°31.57	28.46	163°4.46	10.0'	27°56.92	-1.4' 54.2'
6		271°31.80	N01°27.49	177°33.46	10.0'	S27°55.47	-1.6' 54.2'
7		286°32.02	26.52	192°2.49	10.0'	27°53.89	-1.7' 54.2'
8		301°32.24	25.55	206°31.53	10.1'	27°52.17	-1.9' 54.2'
9		316°32.47	· · 24.58	221°0.58	10.1'	27°50.32	-2.0' 54.2'
10		331°32.69	23.61	235°29.65	10.1'	27°48.33	-2.1' 54.2'
11		346°32.91	22.64	249°58.74	10.1'	27°46.21	-2.3' 54.2'
12		1°33.14	N01°21.68	264°27.85	10.1'	S27°43.96	-2.4' 54.2'
13		16°33.36	20.71	278°56.97	10.1'	27°41.57	-2.5' 54.2'
14		31°33.58	19.74	293°26.12	10.2'	27°39.05	-2.7' 54.2'
15		46°33.80	· · 18.77	307°55.29	10.2'	27°36.40	-2.8' 54.2'
16		61°34.03	17.80	322°24.48	10.2'	27°33.61	-2.9' 54.2'
17		76°34.25	16.83	336°53.69	10.2'	27°30.69	-3.1' 54.2'
18		91°34.47	N01°15.86	351°22.93	10.3'	S27°27.64	-3.2' 54.2'
19		106°34.70	14.89	5°52.19	10.3'	27°24.46	-3.3' 54.2'
20		121°34.92	13.92	20°21.48	10.3'	27°21.14	-3.4' 54.2'
21		136°35.14	· · 12.95	34°50.80	10.3'	27°17.70	-3.6' 54.2'
22		151°35.36	11.98	49°20.14	10.4'	27°14.12	-3.7' 54.2'
23		166°35.59	11.01	63°49.51	10.4'	27°10.41	-3.8' 54.2'
SD = 15.9' $d = -1.0'$				SD = 14.8'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		181°35.81	N01°10.04	78°18.91	10.4'	S27°6.58	-4.0' 54.2'
1		196°36.03	9.07	92°48.34	10.5'	27°2.61	-4.1' 54.2'
2		211°36.26	8.10	107°17.80	10.5'	26°58.51	-4.2' 54.3'
3		226°36.48	· · 7.13	121°47.29	10.5'	26°54.29	-4.4' 54.3'
4		241°36.70	6.16	136°16.81	10.6'	26°49.93	-4.5' 54.3'
5		256°36.92	5.19	150°46.36	10.6'	26°45.45	-4.6' 54.3'
6		271°37.15	N01°4.21	165°15.95	10.6'	S26°40.84	-4.7' 54.3'
7		286°37.37	3.24	179°45.57	10.7'	26°36.10	-4.9' 54.3'
8		301°37.59	2.27	194°15.22	10.7'	26°31.23	-5.0' 54.3'
9		316°37.81	· · 1.30	208°44.91	10.7'	26°26.24	-5.1' 54.3'
10		331°38.04	01°0.33	223°14.64	10.8'	26°21.12	-5.2' 54.3'
11		346°38.26	00°59.36	237°44.40	10.8'	26°15.88	-5.4' 54.3'
12		1°38.48	N00°58.39	252°14.20	10.8'	S26°10.51	-5.5' 54.3'
13		16°38.70	57.42	266°44.03	10.9'	26°5.01	-5.6' 54.3'
14		31°38.93	56.45	281°13.91	10.9'	25°59.39	-5.7' 54.4'
15		46°39.15	· · 55.48	295°43.82	11.0'	25°53.65	-5.9' 54.4'
16		61°39.37	54.51	310°13.77	11.0'	25°47.78	-6.0' 54.4'
17		76°39.59	53.54	324°43.76	11.0'	25°41.79	-6.1' 54.4'
18		91°39.82	N00°52.57	339°13.79	11.1'	S25°35.68	-6.2' 54.4'
19		106°40.04	51.60	353°43.86	11.1'	25°29.45	-6.4' 54.4'
20		121°40.26	50.62	8°13.97	11.2'	25°23.09	-6.5' 54.4'
21		136°40.48	· · 49.65	22°44.13	11.2'	25°16.62	-6.6' 54.4'
22		151°40.71	48.68	37°14.32	11.2'	25°10.02	-6.7' 54.4'
23		166°40.93	47.71	51°44.56	11.3'	25°3.30	-6.8' 54.5'
SD = 15.9' $d = -1.0'$				SD = 14.8'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		181°41.15	N00°46.74	66°14.83	11.3'	S24°56.47	-7.0' 54.5'
1		196°41.37	45.77	80°45.15	11.4'	24°49.51	-7.1' 54.5'
2		211°41.59	44.80	95°15.52	11.4'	24°42.44	-7.2' 54.5'
3		226°41.82	· · 43.83	109°45.92	11.5'	24°35.25	-7.3' 54.5'
4		241°42.04	42.85	124°16.37	11.5'	24°27.94	-7.4' 54.5'
5		256°42.26	41.88	138°46.87	11.5'	24°20.52	-7.5' 54.5'
6		271°42.48	N00°40.91	153°17.41	11.6'	S24°12.98	-7.7' 54.6'
7		286°42.70	39.94	167°47.99	11.6'	24°5.32	-7.8' 54.6'
8		301°42.93	38.97	182°18.61	11.7'	23°57.55	-7.9' 54.6'
9		316°43.15	· · 38.00	196°49.28	11.7'	23°49.67	-8.0' 54.6'
10		331°43.37	37.03	211°20.00	11.8'	23°41.67	-8.1' 54.6'
11		346°43.59	36.05	225°50.76	11.8'	23°33.56	-8.2' 54.6'
12		1°43.81	N00°35.08	240°21.56	11.8'	S23°25.34	-8.3' 54.6'
13		16°44.04	34.11	254°52.41	11.9'	23°17.01	-8.4' 54.7'
14		31°44.26	33.14	269°23.31	11.9'	23°8.57	-8.6' 54.7'
15		46°44.48	· · 32.17	283°54.25	12.0'	23°0.01	-8.7' 54.7'
16		61°44.70	31.20	298°25.24	12.0'	22°51.35	-8.8' 54.7'
17		76°44.92	30.22	312°56.27	12.1'	22°42.57	-8.9' 54.7'
18		91°45.14	N00°29.25	327°27.34	12.1'	S22°33.69	-9.0' 54.7'
19		106°45.37	28.28	341°58.46	12.2'	22°24.70	-9.1' 54.8'
20		121°45.59	27.31	356°29.63	12.2'	22°15.61	-9.2' 54.8'
21		136°45.81	· · 26.34	11°0.84	12.3'	22°6.40	-9.3' 54.8'
22		151°46.03	25.36	25°32.10	12.3'	21°57.09	-9.4' 54.8'
23		166°46.25	24.39	40°3.40	12.3'	21°47.68	-9.5' 54.8'
SD = 15.9' $d = -1.0'$				SD = 14.9'			

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

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

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 8-10 51-70%
19	06:02	06:13	11:54	18:36	06:10	
20	06:23	06:34	11:53	19:26	07:01	
21	06:45	06:55	11:53	20:14	07:50	

September 22, 23, 24 UT (Tue., Wed., Thu.)

	Aries			Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	0°52.44	149°7.36	S19°19.78	242°19.13	N21°43.60	220°19.45	N16°0.30	348°31.95	N02°21.66			Alpheratz	357°32.96 29°14.45	
1	15°54.91	164°8.98	20.39	257°20.00	43.35	235°21.44	0.15	3°34.58	21.58			Ankaa	353°5.33 -42°9.45	
2	30°57.37	179°10.60	21.00	272°20.87	43.11	250°23.43	16°0.01	18°37.22	21.51			Schedar	349°28.87 56°41.12	
3	45°59.83	194°12.22	•• 21.61	287°21.74	•• 42.86	265°25.42	15°59.87	33°39.86	•• 21.43			Diphda	348°45.56 -17°50.19	
4	61°2.30	209°13.85	22.21	302°22.61	42.62	280°27.41	59.73	48°42.49	21.35			Achernar	335°18.60 -57°5.81	
5	76°4.76	224°15.47	22.82	317°23.49	42.37	295°29.40	59.59	63°45.13	21.28			Hamal	327°49.31 23°35.44	
6	91°7.23	239°17.11	S19°23.42	332°24.36	N21°42.13	310°31.39	N15°59.45	78°47.77	N02°21.20			Polaris	312°58.68 89°22.37	
7	106°9.69	254°18.74	24.02	347°25.23	41.88	325°33.39	59.31	93°50.40	21.12			Acamar	315°10.40 -40°11.54	
8	121°12.15	269°20.38	24.63	2°26.11	41.63	340°35.38	59.17	108°53.04	21.05			Menkar	314°4.45 4°11.84	
9	136°14.62	284°22.02	•• 25.23	17°26.98	•• 41.39	355°37.37	•• 59.03	123°55.67	•• 20.97			Mirfak	308°25.92 49°57.29	
10	151°17.08	299°23.66	25.83	32°27.85	41.14	10°39.36	58.89	138°58.31	20.89			Aldebaran	290°37.88 16°33.85	
11	166°19.55	314°25.31	26.42	47°28.73	40.89	25°41.35	58.75	154°0.95	20.82			Rigel	281°2.45 -8°10.04	
12	181°22.01	329°26.96	S19°27.02	62°29.60	N21°40.65	40°43.34	N15°58.61	169°3.58	N02°20.74			Capella	280°19.72 46°1.35	
13	196°24.48	344°28.61	27.62	77°30.48	40.40	55°45.34	58.47	184°6.22	20.66			Bellatrix	278°21.32 6°22.55	
14	211°26.94	359°30.26	28.21	92°31.35	40.15	70°47.33	58.33	199°8.86	20.59			Elnath	278°0.03 28°37.76	
15	226°29.40	14°31.92	•• 28.80	107°32.23	•• 39.90	85°49.32	•• 58.19	214°11.49	•• 20.51			Anilam	275°36.26 -1°10.93	
16	241°31.87	29°33.58	29.39	122°33.10	39.66	100°51.31	58.05	229°14.13	20.43			Betelgeuse	270°50.55 7°24.82	
17	256°34.33	44°35.24	29.98	137°33.98	39.41	115°53.31	57.91	244°16.77	20.36			Canopus	263°51.82 -52°42.21	
18	271°36.80	59°36.91	S19°30.57	152°34.86	N21°39.16	130°55.30	N15°57.77	259°19.40	N02°20.28			Sirius	258°25.05 -16°44.94	
19	286°39.26	74°38.58	31.16	167°35.73	38.91	145°57.29	57.63	274°22.04	20.20			Adhara	255°4.85 -29°0.22	
20	301°41.72	89°40.25	31.75	182°36.61	38.66	160°59.28	57.49	289°24.68	20.12			Procyon	244°49.49 5°9.48	
21	316°44.19	104°41.92	•• 32.33	197°37.49	•• 38.41	176°1.28	•• 57.35	304°27.32	•• 20.05			Pollux	243°15.74 27°57.65	
22	331°46.65	119°43.60	32.91	212°38.36	38.17	191°3.27	57.21	319°29.95	19.97			Avior	234°14.54 -59°35.40	
23	346°49.12	134°45.28	33.50	227°39.24	37.92	206°5.26	57.07	334°32.59	19.89			Suhail	222°45.60 -43°32.19	
Mer.pass. 23:53			ν1.6' d0.6' m-4.81		ν0.9' d-0.2' m1.16		ν2.0' d-0.1' m-1.85		ν2.6' d-0.1' m0.39					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	1°51.58	149°46.96	S19°34.08	242°40.12	N21°37.67	221°7.26	N15°56.93	349°35.23	N02°19.82			Miaplacidus	221°38.69 -69°49.36	
1	16°54.04	164°48.65	34.66	257°41.00	37.42	236°9.25	56.79	4°37.86	19.74			Alphard	217°46.62 -8°46.34	
2	31°56.51	179°50.34	35.24	272°41.88	37.17	251°11.24	56.65	19°40.50	19.66			Regulus	207°33.23 11°50.25	
3	46°58.97	194°52.03	•• 35.81	287°42.76	•• 36.92	266°13.24	•• 56.51	34°43.14	•• 19.59			Dubhe	193°39.92 61°36.35	
4	62°1.44	209°53.73	36.39	302°43.64	36.67	281°15.23	56.37	49°45.78	19.51			Denebola	182°23.83 14°25.43	
5	77°3.90	224°55.43	36.96	317°44.51	36.42	296°17.23	56.23	64°48.41	19.43			Gienah	175°42.47 -17°41.36	
6	92°6.36	239°57.13	S19°37.54	332°45.39	N21°36.17	311°19.22	N15°56.09	79°51.05	N02°19.36			Acrux	172°59.23 -63°14.86	
7	107°8.83	254°58.83	38.11	347°46.27	35.92	326°21.22	55.95	94°53.69	19.28			Gacrux	171°50.66 -57°15.79	
8	122°11.29	270°0.54	38.68	2°47.16	35.67	341°23.21	55.81	109°56.33	19.20			Alioth	166°12.27 55°48.95	
9	137°13.76	285°2.25	•• 39.25	17°48.04	•• 35.41	356°25.20	•• 55.67	124°58.96	•• 19.12			Spica	158°21.11 -11°18.00	
10	152°16.22	300°3.96	39.82	32°48.92	35.16	11°27.20	55.53	140°1.60	19.05			Alkaid	152°51.31 49°10.91	
11	167°18.69	315°5.68	40.38	47°49.80	34.91	26°29.19	55.39	155°4.24	18.97			Hadar	148°34.55 -60°30.22	
12	182°21.15	330°7.40	S19°40.95	62°50.68	N21°34.66	41°31.19	N15°55.25	170°6.88	N02°18.89			Menkent	147°56.29 -36°30.12	
13	197°23.61	345°9.12	41.51	77°51.56	34.41	56°33.19	55.11	185°9.52	18.82			Arcturus	145°46.90 19°2.72	
14	212°26.08	0°10.84	42.07	92°52.44	34.16	71°35.18	54.97	200°12.15	18.74			Rigel Kent.	139°38.86 -60°56.88	
15	227°28.54	15°12.57	•• 42.63	107°53.33	•• 33.90	86°37.18	•• 54.83	215°14.79	•• 18.66			Kochab	137°20.66 74°2.87	
16	242°31.01	30°14.30	43.19	122°54.21	33.65	101°39.17	54.69	230°17.43	18.59			Zuben'ubi	136°54.69 -16°9.14	
17	257°33.47	45°16.03	43.75	137°55.09	33.40	116°41.17	54.55	245°20.07	18.51			Alphecca	126°2.75 26°37.66	
18	272°35.93	60°17.77	S19°44.31	152°55.97	N21°33.15	131°43.16	N15°54.41	260°22.71	N02°18.43			Antares	112°14.24 -26°29.50	
19	287°38.40	75°19.51	44.86	167°56.86	32.89	146°45.16	54.27	275°25.34	18.35			Atria	107°7.31 -69°4.74	
20	302°40.86	90°21.25	45.42	182°57.74	32.64	161°47.16	54.13	290°27.98	18.28			Sabik	102°1.23 -15°45.44	
21	317°43.33	105°23.00	•• 45.97	197°58.63	•• 32.39	176°49.15	•• 53.99	305°30.62	•• 18.20			Shaula	96°8.50 -37°7.46	
22	332°45.79	120°24.75	46.52	212°59.51	32.13	191°51.15	53.85	320°33.26	18.12			Rasalhague	95°57.28 12°32.61	
23	347°48.25	135°26.50	47.07	228°0.40	31.88	206°53.15	53.71	335°35.90	18.05			Eltanin	90°41.54 51°29.39	
Mer.pass. 23:49			ν1.7' d0.6' m-4.81		ν0.9' d-0.2' m1.15		ν2.0' d-0.1' m-1.85		ν2.6' d-0.1' m0.38					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	2°50.72	150°28.25	S19°47.62	243°1.28	N21°31.63	221°55.14	N15°53.57	350°38.53	N02°17.97			Kaus Aust.	83°30.60 -34°22.35	
1	17°53.18	165°30.01	48.17	258°2.17	31.37	236°57.14	53.43	5°41.17	17.89			Vega	80°32.21 38°48.77	
2	32°55.65	180°31.77	48.71	273°3.05	31.12	251°59.14	53.29	20°43.81	17.81			Nunki	75°45.93 -26°15.80	
3	47°58.11	195°33.54	•• 49.26	288°3.94	•• 30.86	267°1.13	•• 53.15	35°46.45	•• 17.74			Altair	61°58.44 8°58.52	
4	63°0.57	210°35.30	49.80	303°4.82	30.61	282°3.13	53.01	50°49.09	17.66			Peacock	53°3.17 -56°39.02	
5	78°3.04	225°37.07	50.34	318°5.71	30.35	297°5.13	52.88	65°51.73	17.58			Deneb	49°24.56 45°22.81	
6	93°5.50	240°38.85	S19°50.89	333°6.60	N21°30.10	312°7.13	N15°52.74	80°54.37	N02°17.51			Enif	33°37.15 10°0.06	
7	108°7.97	255°40.62	51.42	348°7.48	29.84	327°9.12	52.60	95°57.00	17.43			Al Na'ir	27°30.74 -46°49.85	
8	123°10.43	270°42.40	51.96	3°8.37	29.59	342°11.12	52.46	110°59.64	17.35			Fomalhaut	15°1	

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue 0	181°46.47	N00°23.42	54°34.74	12.4'	S21°38.16	-9.6'	54.9'
1	196°46.69	22.45	69°6.13	12.4'	21°28.54	-9.7'	54.9'
2	211°46.92	21.48	83°37.57	12.5'	21°18.82	-9.8'	54.9'
3	226°47.14	· · 20.50	98°9.05	12.5'	21°8.99	-9.9'	54.9'
4	241°47.36	19.53	112°40.57	12.6'	20°59.06	-10.0'	54.9'
5	256°47.58	18.56	127°12.14	12.6'	20°49.03	-10.1'	55.0'
6	271°47.80	N00°17.59	141°43.75	12.7'	S20°38.90	-10.2'	55.0'
7	286°48.02	16.62	156°15.41	12.7'	20°28.68	-10.3'	55.0'
8	301°48.24	15.64	170°47.11	12.7'	20°18.35	-10.4'	55.0'
9	316°48.46	· · 14.67	185°18.85	12.8'	20°7.92	-10.5'	55.0'
10	331°48.69	13.70	199°50.63	12.8'	19°57.40	-10.6'	55.1'
11	346°48.91	12.73	214°22.46	12.9'	19°46.78	-10.7'	55.1'
12	1°49.13	N00°11.75	228°54.33	12.9'	S19°36.07	-10.8'	55.1'
13	16°49.35	10.78	243°26.24	13.0'	19°25.26	-10.9'	55.1'
14	31°49.57	9.81	257°58.19	13.0'	19°14.35	-11.0'	55.1'
15	46°49.79	· · 8.84	272°30.19	13.0'	19°3.36	-11.1'	55.2'
16	61°50.01	7.86	287°2.22	13.1'	18°52.26	-11.2'	55.2'
17	76°50.23	6.89	301°34.30	13.1'	18°41.08	-11.3'	55.2'
18	91°50.45	N00°5.92	316°6.41	13.2'	S18°29.81	-11.4'	55.2'
19	106°50.67	4.95	330°38.57	13.2'	18°18.44	-11.5'	55.3'
20	121°50.89	3.97	345°10.76	13.2'	18°6.99	-11.5'	55.3'
21	136°51.11	· · 3.00	359°42.99	13.3'	17°55.45	-11.6'	55.3'
22	151°51.33	2.03	14°15.26	13.3'	17°43.82	-11.7'	55.3'
23	166°51.56	1.06	28°47.57	13.3'	17°32.10	-11.8'	55.3'
SD = 15.9'			SD = 15.0'				

Wed	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	181°51.78	N00°0.08	43°19.91	13.4'	S17°20.29	-11.9'	55.4'
1	196°52.00	S00°0.89	57°52.29	13.4'	17°8.40	-12.0'	55.4'
2	211°52.22	1.86	72°24.71	13.5'	16°56.42	-12.1'	55.4'
3	226°52.44	· · 2.83	86°57.16	13.5'	16°44.36	-12.1'	55.4'
4	241°52.66	3.81	101°29.65	13.5'	16°32.22	-12.2'	55.5'
5	256°52.88	4.78	116°2.17	13.6'	16°19.99	-12.3'	55.5'
6	271°53.10	S00°5.75	130°34.73	13.6'	S16°7.68	-12.4'	55.5'
7	286°53.32	6.72	145°7.32	13.6'	15°55.29	-12.5'	55.5'
8	301°53.54	7.70	159°39.94	13.7'	15°42.82	-12.5'	55.6'
9	316°53.76	· · 8.67	174°12.60	13.7'	15°30.27	-12.6'	55.6'
10	331°53.98	9.64	188°45.28	13.7'	15°17.65	-12.7'	55.6'
11	346°54.20	10.62	203°18.00	13.7'	15°4.94	-12.8'	55.6'
12	1°54.42	S00°11.59	217°50.74	13.8'	S14°52.16	-12.9'	55.7'
13	16°54.64	12.56	232°23.52	13.8'	14°39.30	-12.9'	55.7'
14	31°54.86	13.53	246°56.32	13.8'	14°26.36	-13.0'	55.7'
15	46°55.08	· · 14.51	261°29.16	13.9'	14°13.36	-13.1'	55.7'
16	61°55.30	15.48	276°2.02	13.9'	14°0.27	-13.2'	55.8'
17	76°55.52	16.45	290°34.90	13.9'	13°47.12	-13.2'	55.8'
18	91°55.74	S00°17.43	305°7.82	13.9'	S13°33.89	-13.3'	55.8'
19	106°55.95	18.40	319°40.75	14.0'	13°20.59	-13.4'	55.8'
20	121°56.17	19.37	334°13.72	14.0'	13°7.23	-13.4'	55.9'
21	136°56.39	· · 20.34	348°46.70	14.0'	12°53.79	-13.5'	55.9'
22	151°56.61	21.32	3°19.71	14.0'	12°40.28	-13.6'	55.9'
23	166°56.83	22.29	17°52.74	14.1'	12°26.71	-13.6'	55.9'
SD = 15.9'			SD = 15.1'				

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	181°57.05	S00°23.26	32°25.79	14.1'	S12°13.07	-13.7'	56.0'
1	196°57.27	24.24	46°58.87	14.1'	11°59.36	-13.8'	56.0'
2	211°57.49	25.21	61°31.96	14.1'	11°45.59	-13.8'	56.0'
3	226°57.71	· · 26.18	76°5.07	14.1'	11°31.76	-13.9'	56.1'
4	241°57.93	27.15	90°38.20	14.1'	11°17.86	-14.0'	56.1'
5	256°58.15	28.13	105°11.35	14.2'	11°3.90	-14.0'	56.1'
6	271°58.37	S00°29.10	119°44.51	14.2'	S10°49.88	-14.1'	56.1'
7	286°58.58	30.07	134°17.69	14.2'	10°35.80	-14.1'	56.2'
8	301°58.80	31.05	148°50.88	14.2'	10°21.66	-14.2'	56.2'
9	316°59.02	· · 32.02	163°24.09	14.2'	10°7.46	-14.3'	56.2'
10	331°59.24	32.99	177°57.31	14.2'	09°53.20	-14.3'	56.2'
11	346°59.46	33.97	192°30.54	14.2'	09°38.88	-14.4'	56.3'
12	1°59.68	S00°34.94	207°3.79	14.3'	S09°24.52	-14.4'	56.3'
13	16°59.90	35.91	221°37.04	14.3'	09°10.09	-14.5'	56.3'
14	32°0.11	36.89	236°10.30	14.3'	08°55.61	-14.5'	56.4'
15	47°0.33	· · 37.86	250°43.57	14.3'	08°41.08	-14.6'	56.4'
16	62°0.55	38.83	265°16.85	14.3'	08°26.50	-14.6'	56.4'
17	77°0.77	39.80	279°50.14	14.3'	08°11.87	-14.7'	56.4'
18	92°0.99	S00°40.78	294°23.43	14.3'	S07°57.18	-14.7'	56.5'
19	107°1.20	41.75	308°56.73	14.3'	07°42.45	-14.8'	56.5'
20	122°1.42	42.72	323°30.03	14.3'	07°27.67	-14.8'	56.5'
21	137°1.64	· · 43.70	338°3.33	14.3'	07°12.85	-14.9'	56.5'
22	152°1.86	44.67	352°36.63	14.3'	06°57.97	-14.9'	56.6'
23	167°2.08	45.64	7°9.94	14.3'	06°43.06	-15.0'	56.6'
SD = 15.9'			SD = 15.3'				

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

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

Day	Sun		
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September 25, 26, 27 UT (Fri., Sat., Sun.)

h	Aries			Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	3°49.86	151°11.29	S20°0.37	243°22.61	N21°25.47	222°43.10	N15°50.23	351°41.87	N02°16.11			Alpheratz	357°32.95 29°14.46	
1	18°52.32	166°13.12	0.89	258°23.50	25.21	237°45.10	50.09	6°44.51	16.04			Ankaa	353°5.32 -42°9.47	
2	33°54.78	181°14.96	1.40	273°24.39	24.96	252°47.11	49.96	21°47.15	15.96			Schedar	349°28.87 56°41.14	
3	48°57.25	196°16.79	•• 1.91	288°25.29	•• 24.70	267°49.11	•• 49.82	36°49.79	•• 15.88			Diphda	348°45.55 -17°50.20	
4	63°59.71	211°18.63	2.42	303°26.18	24.44	282°51.11	49.68	51°52.43	15.80			Achernar	335°18.58 -57°5.83	
5	79°2.18	226°20.48	2.93	318°27.07	24.18	297°53.11	49.54	66°55.07	15.73			Hamal	327°49.30 23°35.44	
6	94°4.64	241°22.33	S20°3.44	333°27.97	N21°23.92	312°55.11	N15°49.40	81°57.70	N02°15.65			Polaris	312°57.60 89°22.39	
7	109°7.10	256°24.18	3.94	348°28.86	23.66	327°57.11	49.26	97°0.34	15.57			Acamar	315°10.38 -40°11.55	
8	124°9.57	271°26.03	4.44	3°29.75	23.40	342°59.11	49.12	112°2.98	15.49			Menkar	314°4.44 4°11.84	
9	139°12.03	286°27.89	•• 4.95	18°30.65	•• 23.14	358°1.11	•• 48.98	127°5.62	•• 15.42			Mirfak	308°25.90 49°57.30	
10	154°14.50	301°29.75	5.45	33°31.54	22.88	13°3.11	48.85	142°8.26	15.34			Aldebaran	290°37.86 16°33.85	
11	169°16.96	316°31.61	5.95	48°32.44	22.62	28°5.11	48.71	157°10.90	15.26			Rigel	281°2.43 -8°10.04	
12	184°19.42	331°33.48	S20°6.44	63°33.33	N21°22.36	43°7.12	N15°48.57	172°13.54	N02°15.19			Capella	280°19.69 46°1.35	
13	199°21.89	346°35.35	6.94	78°34.23	22.10	58°9.12	48.43	187°16.18	15.11			Bellatrix	278°21.30 6°22.55	
14	214°24.35	1°37.22	7.44	93°35.13	21.83	73°11.12	48.29	202°18.82	15.03			Elnath	278°0.01 28°37.76	
15	229°26.82	16°39.10	•• 7.93	108°36.02	•• 21.57	88°13.12	•• 48.15	217°21.46	•• 14.95			Alnilam	275°36.25 -1°10.93	
16	244°29.28	31°40.98	8.42	123°36.92	21.31	103°15.12	48.02	232°24.10	14.88			Betelgeuse	270°50.53 7°24.82	
17	259°31.74	46°42.86	8.91	138°37.82	21.05	118°17.13	47.88	247°26.74	14.80			Canopus	263°51.79 -52°42.21	
18	274°34.21	61°44.75	S20°9.40	153°38.71	N21°20.79	133°19.13	N15°47.74	262°29.38	N02°14.72			Sirius	258°25.03 -16°44.94	
19	289°36.67	76°46.64	9.89	168°39.61	20.53	148°21.13	47.60	277°32.02	14.64			Adhara	255°4.83 -29°0.21	
20	304°39.14	91°48.53	10.37	183°40.51	20.26	163°23.13	47.46	292°34.66	14.57			Procyon	244°49.47 5°9.48	
21	319°41.60	106°50.42	•• 10.86	198°41.41	•• 20.00	178°25.14	•• 47.32	307°37.30	•• 14.49			Pollux	243°15.72 27°57.65	
22	334°44.06	121°52.32	11.34	213°42.31	19.74	193°27.14	47.19	322°39.94	14.41			Avior	234°14.51 -59°35.39	
23	349°46.53	136°54.22	11.82	228°43.20	19.48	208°29.14	47.05	337°42.58	14.33			Suhail	222°45.58 -43°32.18	
Mer.pass. 23:41				ν1.8' d0.5' m-4.82		ν0.9' d-0.3' m1.14		ν2.0' d-0.1' m-1.86		ν2.6' d-0.1' m0.38		Miaplacidus 221°38.65 -69°49.35		
												Alphard 217°46.61 -8°46.34		
												Regulus 207°33.22 11°50.24		
												Dubhe 193°39.90 61°36.33		
												Denebola 182°23.83 14°25.42		
												Gienah 175°42.47 -17°41.35		
												Acrux 172°59.23 -63°14.84		
												Gacrux 171°50.66 -57°15.77		
												Alioth 166°12.27 55°48.94		
												Spica 158°21.12 -11°17.99		
												Alkaid 152°51.32 49°10.90		
												Hadar 148°34.57 -60°30.21		
												Menkent 147°56.30 -36°30.11		
												Arcturus 145°46.90 19°2.71		
												Rigel Kent. 139°38.89 -60°56.87		
												Kochab 137°20.70 74°2.86		
												Zuben'ubi 136°54.70 -16°9.14		
												Alphecca 126°2.77 26°37.65		
												Antares 112°14.25 -26°29.49		
												Atria 107°7.36 -69°4.73		
												Sabik 102°1.25 -15°45.44		
												Shaula 96°8.52 -37°7.46		
												Rasalhague 95°57.29 12°32.61		
												Eltanin 90°41.56 51°29.39		
												Kaus Aust. 83°30.62 -34°22.36		
												Vega 80°32.23 38°48.77		
												Nunki 75°45.95 -26°15.80		
												Altair 61°58.46 8°56.52		
												Peacock 53°3.19 -56°39.03		
												Deneb 49°24.58 45°22.82		
												Enif 33°37.16 10°0.06		
												Al Na'ir 27°30.75 -46°49.86		
												Fomalhaut 15°12.62 -29°28.72		
												Scheat 13°43.50 28°13.88		
												Markab 13°28.18 15°21.15		
												Sep 25 Fri SHA Mer.pass		
												Venus 147°21.43 13:54		
												Mars 239°32.75 07:46		
												Jupiter 218°53.25 09:08		
												Saturn 347°52.01 00:33		
												Sep 26 Sat SHA Mer.pass		
												Venus 147°7.14 13:50		
												Mars 238°55.11 07:45		
												Jupiter 218°42.16 09:05		
												Saturn 347°56.23 00:29		
												Sep 27 Sun SHA Mer.pass		
												Venus 146°54.71 13:47		
												Mars 238°17.64 07:43		
												Jupiter 218°31.14 09:02		
												Saturn 348°0.48 00:25		
												Horizontal parallax		
												Venus: 0.4		
												Mars: 0.1		
Mer.pass. 23:33				ν2.0' d0.4' m-4.81		ν0.9' d-0.3' m1.13		ν2.0' d-0.1' m-1.86		ν2.6' d-0.1' m0.37				

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	182°2.29	S00°46.62	21°43.24	14.3'	S06°28.09	-15.0'	56.6'
1	197°2.51	47.59	36°16.55	14.3'	06°13.09	-15.0'	56.7'
2	212°2.73	48.56	50°49.85	14.3'	05°58.04	-15.1'	56.7'
3	227°2.95	· · 49.54	65°23.14	14.3'	05°42.96	-15.1'	56.7'
4	242°3.16	50.51	79°56.44	14.3'	05°27.83	-15.2'	56.7'
5	257°3.38	51.48	94°29.73	14.3'	05°12.66	-15.2'	56.8'
6	272°3.60	S00°52.45	109°3.01	14.3'	S04°57.46	-15.2'	56.8'
7	287°3.82	53.43	123°36.28	14.3'	04°42.22	-15.3'	56.8'
8	302°4.03	54.40	138°9.55	14.3'	04°26.95	-15.3'	56.8'
9	317°4.25	· · 55.37	152°42.81	14.2'	04°11.64	-15.3'	56.9'
10	332°4.47	56.35	167°16.06	14.2'	03°56.29	-15.4'	56.9'
11	347°4.68	57.32	181°49.29	14.2'	03°40.92	-15.4'	56.9'
12	2°4.90	S00°58.29	196°22.51	14.2'	S03°25.51	-15.4'	57.0'
13	17°5.12	00°59.27	210°55.72	14.2'	03°10.08	-15.5'	57.0'
14	32°5.34	01°0.24	225°28.92	14.2'	02°54.61	-15.5'	57.0'
15	47°5.55	· · 1.21	240°2.10	14.2'	02°39.12	-15.5'	57.0'
16	62°5.77	2.19	254°35.26	14.1'	02°23.60	-15.5'	57.1'
17	77°5.98	3.16	269°8.40	14.1'	02°8.06	-15.6'	57.1'
18	92°6.20	S01°4.13	283°41.53	14.1'	S01°52.49	-15.6'	57.1'
19	107°6.42	5.10	298°14.63	14.1'	01°36.89	-15.6'	57.1'
20	122°6.63	6.08	312°47.72	14.1'	01°21.28	-15.6'	57.2'
21	137°6.85	· · 7.05	327°20.78	14.0'	01°5.65	-15.7'	57.2'
22	152°7.07	8.02	341°53.82	14.0'	00°49.99	-15.7'	57.2'
23	167°7.28	9.00	356°26.83	14.0'	00°34.32	-15.7'	57.3'
SD = 15.9'			SD = 15.4'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°7.50	S01°9.97	10°59.82	14.0'	S00°18.63	-15.7'	57.3'
1	197°7.71	10.94	25°32.78	13.9'	S00°2.92	-15.7'	57.3'
2	212°7.93	11.92	40°5.72	13.9'	N00°12.80	15.7'	57.3'
3	227°8.15	· · 12.89	54°38.62	13.9'	00°28.54	15.7'	57.4'
4	242°8.36	13.86	69°11.50	13.8'	00°44.28	15.8'	57.4'
5	257°8.58	14.84	83°44.34	13.8'	01°0.04	15.8'	57.4'
6	272°8.79	S01°15.81	98°17.15	13.8'	N01°15.81	15.8'	57.4'
7	287°9.01	16.78	112°49.93	13.7'	01°31.59	15.8'	57.5'
8	302°9.22	17.75	127°22.67	13.7'	01°47.37	15.8'	57.5'
9	317°9.44	· · 18.73	141°55.38	13.7'	02°3.17	15.8'	57.5'
10	332°9.65	19.70	156°28.05	13.6'	02°18.96	15.8'	57.5'
11	347°9.87	20.67	171°0.68	13.6'	02°34.76	15.8'	57.6'
12	2°10.08	S01°21.65	185°33.27	13.6'	N02°50.56	15.8'	57.6'
13	17°10.30	22.62	200°5.83	13.5'	03°6.36	15.8'	57.6'
14	32°10.51	23.59	214°38.34	13.5'	03°22.17	15.8'	57.6'
15	47°10.73	· · 24.56	229°10.81	13.4'	03°37.97	15.8'	57.7'
16	62°10.94	25.54	243°43.23	13.4'	03°53.76	15.8'	57.7'
17	77°11.16	26.51	258°15.61	13.3'	04°9.56	15.8'	57.7'
18	92°11.37	S01°27.48	272°47.95	13.3'	N04°25.34	15.8'	57.7'
19	107°11.59	28.46	287°20.23	13.2'	04°41.12	15.8'	57.8'
20	122°11.80	29.43	301°52.47	13.2'	04°56.90	15.8'	57.8'
21	137°12.02	· · 30.40	316°24.66	13.1'	05°12.66	15.8'	57.8'
22	152°12.23	31.37	330°56.80	13.1'	05°28.41	15.7'	57.8'
23	167°12.44	32.35	345°28.88	13.0'	05°44.15	15.7'	57.9'
SD = 15.9'			SD = 15.6'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°12.66	S01°33.32	0°0.92	13.0'	N05°59.87	15.7'	57.9'
1	197°12.87	34.29	14°32.90	12.9'	06°15.58	15.7'	57.9'
2	212°13.09	35.27	29°4.82	12.9'	06°31.27	15.7'	57.9'
3	227°13.30	· · 36.24	43°36.69	12.8'	06°46.94	15.7'	58.0'
4	242°13.51	37.21	58°8.50	12.8'	07°2.59	15.6'	58.0'
5	257°13.73	38.18	72°40.25	12.7'	07°18.23	15.6'	58.0'
6	272°13.94	S01°39.16	87°11.94	12.6'	N07°33.83	15.6'	58.0'
7	287°14.15	40.13	101°43.57	12.6'	07°49.42	15.6'	58.1'
8	302°14.37	41.10	116°15.14	12.5'	08°4.98	15.5'	58.1'
9	317°14.58	· · 42.07	130°46.65	12.4'	08°20.51	15.5'	58.1'
10	332°14.79	43.05	145°18.09	12.4'	08°36.01	15.5'	58.1'
11	347°15.01	44.02	159°49.47	12.3'	08°51.48	15.4'	58.1'
12	2°15.22	S01°44.99	174°20.77	12.2'	N09°6.92	15.4'	58.2'
13	17°15.43	45.96	188°52.02	12.2'	09°22.33	15.4'	58.2'
14	32°15.65	46.94	203°23.19	12.1'	09°37.70	15.3'	58.2'
15	47°15.86	· · 47.91	217°54.29	12.0'	09°53.04	15.3'	58.2'
16	62°16.07	48.88	232°25.33	12.0'	10°8.34	15.3'	58.3'
17	77°16.28	49.85	246°56.29	11.9'	10°23.60	15.2'	58.3'
18	92°16.50	S01°50.83	261°27.18	11.8'	N10°38.81	15.2'	58.3'
19	107°16.71	51.80	275°57.99	11.7'	10°53.99	15.1'	58.3'
20	122°16.92	52.77	290°28.73	11.7'	11°9.12	15.1'	58.3'
21	137°17.13	· · 53.74	304°59.39	11.6'	11°24.20	15.0'	58.4'
22	152°17.34	54.72	319°29.98	11.5'	11°39.24	15.0'	58.4'
23	167°17.56	55.69	334°0.48	11.4'	11°54.23	14.9'	58.4'
SD = 15.9'			SD = 15.8'				

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

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

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 97-100%
25	08:09	08:20	11:52	23:15	10:52	
26	08:30	08:40	11:51	--:--	11:37	
27	08:51	09:01	11:51	00:00	12:23	

September 28, 29, 30 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	6°47.27		153°31.48	S20°33.55	244°27.60	N21°6.38	225°7.48	N15°40.31	354°52.00	N02°10.53
1	21°49.73		168°33.54	33.95	259°28.52	6.11	240°9.49	40.17	9°54.64	10.45
2	36°52.19		183°35.62	34.36	274°29.43	5.83	255°11.50	40.04	24°57.29	10.37
3	51°54.66		198°37.69	· · 34.76	289°30.35	· · 5.56	270°13.51	· · 39.90	39°59.93	· · 10.29
4	66°57.12		213°39.77	35.16	304°31.26	5.29	285°15.52	39.76	55°2.57	10.22
5	81°59.59		228°41.86	35.55	319°32.17	5.02	300°17.53	39.63	70°5.21	10.14
6	97°2.05		243°43.94	S20°35.95	334°33.09	N21°4.74	315°19.54	N15°39.49	85°7.85	N02°10.06
7	112°4.51		258°46.03	36.34	349°34.00	4.47	330°21.55	39.35	100°10.50	9.98
8	127°6.98		273°48.12	36.74	4°34.92	4.20	345°23.56	39.22	115°13.14	9.91
9	142°9.44		288°50.22	· · 37.13	19°35.84	· · 3.92	0°25.57	· · 39.08	130°15.78	· · 9.83
10	157°11.91		303°52.32	37.52	34°36.75	3.65	15°27.59	38.94	145°18.42	9.75
11	172°14.37		318°54.42	37.90	49°37.67	3.38	30°29.60	38.81	160°21.07	9.67
12	187°16.83		333°56.53	S20°38.29	64°38.59	N21°3.10	45°31.61	N15°38.67	175°23.71	N02°9.59
13	202°19.30		348°58.64	38.67	79°39.50	2.83	60°33.62	38.53	190°26.35	9.52
14	217°21.76		4°0.76	39.06	94°40.42	2.56	75°35.63	38.40	205°28.99	9.44
15	232°24.23		19°2.87	· · 39.44	109°41.34	· · 2.28	90°37.65	· · 38.26	220°31.64	· · 9.36
16	247°26.69		34°5.00	39.82	124°42.26	2.01	105°39.66	38.12	235°34.28	9.28
17	262°29.15		49°7.12	40.19	139°43.17	1.73	120°41.67	37.99	250°36.92	9.21
18	277°31.62		64°9.25	S20°40.57	154°44.09	N21°1.46	135°43.68	N15°37.85	265°39.56	N02°9.13
19	292°34.08		79°11.38	40.94	169°45.01	1.18	150°45.70	37.71	280°42.21	9.05
20	307°36.55		94°13.51	41.32	184°45.93	0.91	165°47.71	37.58	295°44.85	8.97
21	322°39.01		109°15.65	· · 41.69	199°46.85	· · 0.63	180°49.72	· · 37.44	310°47.49	· · 8.89
22	337°41.47		124°17.80	42.06	214°47.77	0.36	195°51.74	37.31	325°50.13	8.82
23	352°43.94		139°19.94	42.43	229°48.69	0.08	210°53.75	37.17	340°52.78	8.74
Mer.pass. 23:29			ν2.1' d0.4' m-4.81		ν0.9' d-0.3' m1.13		ν2.0' d-0.1' m-1.86		ν2.6' d-0.1' m0.36	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	7°46.40		154°22.09	S20°42.79	244°49.61	N20°59.81	225°55.77	N15°37.03	355°55.42	N02°8.66
1	22°48.87		169°24.24	43.16	259°50.53	59.53	240°57.78	36.90	10°58.06	8.58
2	37°51.33		184°26.40	43.52	274°51.45	59.25	255°59.79	36.76	26°0.70	8.50
3	52°53.80		199°28.56	· · 43.88	289°52.37	· · 58.98	271°1.81	· · 36.63	41°3.35	· · 8.43
4	67°56.26		214°30.72	44.24	304°53.30	58.70	286°3.82	36.49	56°5.99	8.35
5	82°58.72		229°32.89	44.60	319°54.22	58.43	301°5.84	36.35	71°8.63	8.27
6	98°1.19		244°35.06	S20°44.95	334°55.14	N20°58.15	316°7.85	N15°36.22	86°11.28	N02°8.19
7	113°3.65		259°37.23	45.13	349°56.06	57.87	331°9.87	36.08	101°13.92	8.12
8	128°6.12		274°39.41	45.66	4°56.98	57.59	346°11.88	35.95	116°16.56	8.04
9	143°8.58		289°41.59	· · 46.01	19°57.91	· · 57.32	1°13.90	· · 35.81	131°19.20	· · 7.96
10	158°11.04		304°43.78	46.36	34°58.83	57.04	16°15.91	35.67	146°21.85	7.88
11	173°13.51		319°45.96	46.70	49°59.75	56.76	31°17.93	35.54	161°24.49	7.80
12	188°15.97		334°48.16	S20°47.05	65°0.68	N20°56.48	46°19.94	N15°35.40	176°27.13	N02°7.73
13	203°18.44		349°50.35	47.39	80°1.60	56.21	61°21.96	35.27	191°29.78	7.65
14	218°20.90		4°52.55	47.74	95°2.53	55.93	76°23.97	35.13	206°32.42	7.57
15	233°23.36		19°54.75	· · 48.08	110°3.45	· · 55.65	91°25.99	· · 35.00	221°35.06	· · 7.49
16	248°25.83		34°56.96	48.41	125°4.38	55.37	106°28.00	34.86	236°37.70	7.42
17	263°28.29		49°59.17	48.75	140°5.30	55.09	121°30.02	34.72	251°40.35	7.34
18	278°30.76		65°1.38	S20°49.09	155°6.23	N20°54.81	136°32.04	N15°34.59	266°42.99	N02°7.26
19	293°33.22		80°3.60	49.42	170°7.16	54.54	151°34.05	34.45	281°45.63	7.18
20	308°35.68		95°5.82	49.75	185°8.08	54.26	166°36.07	34.32	296°48.28	7.10
21	323°38.15		110°8.04	· · 50.08	200°9.01	· · 53.98	181°38.09	· · 34.18	311°50.92	· · 7.03
22	338°40.61		125°10.27	50.41	215°9.94	53.70	196°40.10	34.05	326°53.56	6.95
23	353°43.08		140°12.50	50.74	230°10.86	53.42	211°42.12	33.91	341°56.21	6.87
Mer.pass. 23:25			ν2.2' d0.4' m-4.80		ν0.9' d-0.3' m1.12		ν2.0' d-0.1' m-1.87		ν2.6' d-0.1' m0.36	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	8°45.54		155°14.74	S20°51.06	245°11.79	N20°53.14	226°44.14	N15°33.78	356°58.85	N02°6.79
1	23°48.01		170°16.97	51.38	260°12.72	52.86	241°46.16	33.64	12°1.49	6.72
2	38°50.47		185°19.22	51.71	275°13.65	52.58	256°48.17	33.51	27°4.14	6.64
3	53°52.93		200°21.46	· · 52.02	290°14.57	· · 52.30	271°50.19	· · 33.37	42°6.78	· · 6.56
4	68°55.40		215°23.71	52.34	305°15.50	52.02	286°52.21	33.23	57°9.42	6.48
5	83°57.86		230°25.96	52.66	320°16.43	51.74	301°54.23	33.10	72°12.07	6.40
6	99°0.33		245°28.22	S20°52.97	335°17.36	N20°51.46	316°56.25	N15°32.96	87°14.71	N02°6.33
7	114°2.79		260°30.48	53.28	350°18.29	51.17	331°58.26	32.83	102°17.35	6.25
8	129°5.25		275°32.74	53.60	5°19.22	50.89	347°0.28	32.69	117°20.00	6.17
9	144°7.72		290°35.01	· · 53.90	20°20.15	· · 50.61	2°2.30	· · 32.56	132°22.64	· · 6.09
10	159°10.18		305°37.28	54.21	35°21.08	50.33	17°4.32	32.42	147°25.28	6.02
11	174°12.65		320°39.56	54.52	50°22.01	50.05	32°6.34	32.29	162°27.93	5.94
12	189°15.11		335°41.83	S20°54.82	65°22.95	N20°49.77	47°8.36	N15°32.15	177°30.57	N02°5.86
13	204°17.58		350°44.12	55.12	80°23.88	49.49	62°10.38	32.02	192°33.21	5.78
14	219°20.04		5°46.40	55.42	95°24.81	49.20	77°12.40	31.88	207°35.86	5.70
15	234°22.50		20°48.69	· · 55.72	110°25.74	· · 48.92	92°14.42	· · 31.75	222°38.50	· · 5.63
16	249°24.97		35°50.98	56.02	125°26.67	48.64	107°16.43	31.61	237°41.15	5.55
17	264°27.43		50°53.28	56.31	140°27.61	48.36	122°18.45	31.48	252°43.79	5.47
18	279°29.90		65°55.58	S20°56.60	155°28.54	N20°48.07	137°20.47	N15°31.34	267°46.43	N02°5.39
19	294°32.36		80°57.88	56.89	170°29.47	47.79	152°22.49	31.21	282°49.08	5.32
20	309°34.82		96°0.19	57.18	185°30.41	47.51	167°24.52	31.08	297°51.72	5.24
21	324°37.29		111°2.50	· · 57.47	200°31.34	· · 47.22	182°26.54	· · 30.94	312°54.36	· · 5.16
22	339°39.75		126°4.82	57.75	215°32.27	46.94	197°28.56	30.81	327°57.01	5.08
23	354°42.22		141°7.14	58.04	230°33.21	46.66	212°30.58	30.67	342°59.65	5.00
Mer.pass. 23:21			ν2.2' d0.3' m-4.79		ν0.9' d-0.3' m1.12		ν2.0' d-0.1' m-1.87		ν2.6' d-0.1' m0.35	

	Stars	
	SHA	Dec
Alpheratz	357°32.95	29°14.47
Ankaa	353°5.32	-42°9.48
Schedar	349°28.86	56°41.15
Diphda	348°45.55	-17°50.20
Achernar	335°18.57	-57°5.84
Hamal	327°49.29	23°35.45
Polaris	312°56.37	89°22.40
Acamar	315°10.37	-40°11.56
Menkar	314°4.42	4°11.84
Mirfak	308°25.88	49°57.30
Aldebaran	290°37.84	16°33.85
Rigel	281°2.41	-8°10.04
Capella	280°19.66	46°1.35
Bellatrix	278°21.28	6°22.55
Elnath	277°59.99	28°37.76
Alnilam	275°36.23	-1°10.93
Betelgeuse	270°50.51	7°24.82
Canopus	263°51.76	-52°42.21
Sirius	258°25.02	-16°44.94
Adhara	255°4.81	-29°0.22
Procyon	244°49.45	5°9.47
Pollux	243°15.70	27°57.64
Avior	234°14.48	-59°35.38
Suhail	222°45.56	-43°32.18
Miaplacidus	221°38.61	-69°49.34
Alphard	217°46.60	-8°46.34
Regulus	207°33.21	11°50.24
Dubhe	193°39.90	61°36.32
Denebola	182°23.83	14°25.42
Gienah	175°42.46	-17°41.35
Acrux	172°59.23	-63°14.83
Gacrux	171°50.66	-57°15.76
Alioth	166°12.28	55°48.92
Spica	158°21.12	-11°17.99
Alkaid	152°51.33	49°10.89
Hadar	148°34.58	-60°30.20
Menkent	147°56.30	-36°30.10
Arcturus	145°46.91	19°2.70
Rigel Kent.	139°38.91	-60°56.86
Kochab	137°20.74	74°2.84
Zuben'ubi	136°54.72	-16°9.14
Alphecca	126°2.78	26°37.65
Antares	112°14.27	-26°29.49
Atria	107°7.40	-69°4.73
Sabik	102°1.27	-15°45.44
Shaula	96°8.54	-37°7.45
Rasalhague	95°57.31	12°32.61
Eltanin	90°41.59	51°29.39
Kaus Aust.	83°30.64	-34°22.35
Vega	80°32.25	38°48.77
Nunki	75°45.96	-26°15.80
Altair	61°58.47	8°56.53
Peacock	53°3.22	-56°39.04
Deneb	49°24.60	45°22.83
Enif	33°37.17	10°0.06
Al Na'ir	27°30.76	-46°49.87
Fomalhaut	15°12.63	-29°28.72

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		182°17.77	S01°56.66	348°30.91	11.3'	N12°9.16	14.9' 58.4'
1		197°17.98	57.63	3°1.26	11.3'	12°24.05	14.8' 58.4'
2		212°18.19	58.60	17°31.53	11.2'	12°38.88	14.8' 58.5'
3		227°18.40	01°59.58	32°1.71	11.1'	12°53.65	14.7' 58.5'
4		242°18.61	02°05.55	46°31.81	11.0'	13°8.37	14.7' 58.5'
5		257°18.83	1.52	61°1.83	10.9'	13°23.02	14.6' 58.5'
6		272°19.04	S02°2.49	75°31.76	10.8'	N13°37.62	14.5' 58.5'
7		287°19.25	3.47	90°1.61	10.8'	13°52.16	14.5' 58.5'
8		302°19.46	4.44	104°31.37	10.7'	14°6.63	14.4' 58.6'
9		317°19.67	· · 5.41	119°1.04	10.6'	14°21.03	14.3' 58.6'
10		332°19.88	6.38	133°30.63	10.5'	14°35.37	14.3' 58.6'
11		347°20.09	7.35	148°0.12	10.4'	14°49.63	14.2' 58.6'
12		2°20.30	S02°8.33	162°29.53	10.3'	N15°3.83	14.1' 58.6'
13		17°20.51	9.30	176°58.84	10.2'	15°17.95	14.0' 58.7'
14		32°20.72	10.27	191°28.07	10.1'	15°32.00	14.0' 58.7'
15		47°20.93	· · 11.24	205°57.20	10.0'	15°45.97	13.9' 58.7'
16		62°21.14	12.21	220°26.23	9.9'	15°59.87	13.8' 58.7'
17		77°21.35	13.18	234°55.17	9.8'	16°13.68	13.7' 58.7'
18		92°21.56	S02°14.16	249°24.02	9.8'	N16°27.42	13.6' 58.7'
19		107°21.77	15.13	263°52.77	9.7'	16°41.07	13.6' 58.7'
20		122°21.98	16.10	278°21.43	9.6'	16°54.63	13.5' 58.8'
21		137°22.19	· · 17.07	292°49.99	9.5'	17°8.11	13.4' 58.8'
22		152°22.40	18.04	307°18.45	9.4'	17°21.50	13.3' 58.8'
23		167°22.61	19.01	321°46.82	9.3'	17°34.80	13.2' 58.8'
		SD = 16.0'				SD = 15.9'	
		$d = 1.0'$					

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		182°22.82	S02°19.99	336°15.09	9.2'	N17°48.00	13.1' 58.8'
1		197°23.03	20.96	350°43.25	9.1'	18°1.12	13.0' 58.8'
2		212°23.24	21.93	5°11.32	9.0'	18°14.13	12.9' 58.9'
3		227°23.45	· · 22.90	19°39.29	8.9'	18°27.05	12.8' 58.9'
4		242°23.66	23.87	34°7.16	8.8'	18°39.87	12.7' 58.9'
5		257°23.87	24.84	48°34.93	8.7'	18°52.59	12.6' 58.9'
6		272°24.07	S02°25.81	63°2.60	8.6'	N19°5.21	12.5' 58.9'
7		287°24.28	26.79	77°30.16	8.5'	19°17.72	12.4' 58.9'
8		302°24.49	27.76	91°57.63	8.4'	19°30.13	12.3' 58.9'
9		317°24.70	· · 28.73	106°24.99	8.3'	19°42.42	12.2' 58.9'
10		332°24.91	29.70	120°52.25	8.2'	19°54.61	12.1' 59.0'
11		347°25.12	30.67	135°19.41	8.1'	20°6.69	12.0' 59.0'
12		2°25.32	S02°31.64	149°46.46	8.0'	N20°18.65	11.8' 59.0'
13		17°25.53	32.61	164°13.42	7.9'	20°30.49	11.7' 59.0'
14		32°25.74	33.58	178°40.27	7.7'	20°42.22	11.6' 59.0'
15		47°25.95	· · 34.56	193°7.02	7.6'	20°53.83	11.5' 59.0'
16		62°26.15	35.53	207°33.66	7.5'	21°5.32	11.4' 59.0'
17		77°26.36	36.50	222°0.21	7.4'	21°16.69	11.2' 59.0'
18		92°26.57	S02°37.47	236°26.65	7.3'	N21°27.93	11.1' 59.0'
19		107°26.78	38.44	250°52.98	7.2'	21°39.05	11.0' 59.1'
20		122°26.98	39.41	265°19.22	7.1'	21°50.04	10.9' 59.1'
21		137°27.19	· · 40.38	279°45.36	7.0'	22°0.90	10.7' 59.1'
22		152°27.40	41.35	294°11.39	6.9'	22°11.62	10.6' 59.1'
23		167°27.60	42.32	308°37.32	6.8'	22°22.22	10.5' 59.1'
		SD = 16.0'				SD = 16.0'	
		$d = 1.0'$					

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		182°27.81	S02°43.29	323°3.15	6.7'	N22°32.68	10.3' 59.1'
1		197°28.02	44.26	337°28.88	6.6'	22°43.00	10.2' 59.1'
2		212°28.22	45.23	351°54.51	6.5'	22°53.19	10.0' 59.1'
3		227°28.43	· · 46.20	6°20.04	6.4'	23°3.23	9.9' 59.1'
4		242°28.64	47.17	20°45.47	6.3'	23°13.14	9.8' 59.1'
5		257°28.84	48.14	35°10.80	6.2'	23°22.90	9.6' 59.1'
6		272°29.05	S02°49.12	49°36.04	6.1'	N23°32.52	9.5' 59.2'
7		287°29.25	50.09	64°1.17	6.0'	23°41.99	9.3' 59.2'
8		302°29.46	51.06	78°26.21	5.9'	23°51.31	9.2' 59.2'
9		317°29.66	· · 52.03	92°51.16	5.9'	24°0.48	9.0' 59.2'
10		332°29.87	53.00	107°16.01	5.8'	24°9.50	8.9' 59.2'
11		347°30.08	53.97	121°40.77	5.7'	24°18.37	8.7' 59.2'
12		2°30.28	S02°54.94	136°5.43	5.6'	N24°27.08	8.6' 59.2'
13		17°30.49	55.91	150°30.00	5.5'	24°35.64	8.4' 59.2'
14		32°30.69	56.88	164°54.48	5.4'	24°44.04	8.2' 59.2'
15		47°30.90	· · 57.85	179°18.88	5.3'	24°52.28	8.1' 59.2'
16		62°31.10	58.82	193°43.18	5.2'	25°0.36	7.9' 59.2'
17		77°31.30	02°59.79	208°7.39	5.1'	25°8.28	7.8' 59.2'
18		92°31.51	S03°0.76	222°31.52	5.0'	N25°16.04	7.6' 59.2'
19		107°31.71	1.73	236°55.57	5.0'	25°23.63	7.4' 59.2'
20		122°31.92	2.70	251°19.53	4.9'	25°31.05	7.3' 59.2'
21		137°32.12	· · 3.66	265°43.41	4.8'	25°38.31	7.1' 59.2'
22		152°32.32	4.63	280°7.21	4.7'	25°45.40	6.9' 59.3'
23		167°32.53	5.60	294°30.93	4.6'	25°52.31	6.7' 59.3'
		SD = 16.0'				SD = 16.1'	
		$d = 1.0'$					

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

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

October 01, 02, 03 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars			
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	9°44.68	156°9.46	S20°58.32	245°34.14	N20°46.37	227°32.60	N15°30.54	358°2.29	N02°4.93			Alpheratz	357°32.94 29°14.48	
1	24°47.15	171°11.78	58.60	260°35.08	46.09	242°34.62	30.40	13°4.94	4.85			Ankaa	353°5.32 -42°9.49	
2	39°49.61	186°14.11	58.88	275°36.01	45.81	257°36.64	30.27	28°7.58	4.77			Schedar	349°28.84 56°41.17	
3	54°52.07	201°16.45	· · 59.15	290°36.95	· · 45.52	272°38.66	· · 30.13	43°10.23	· · 4.69			Diphda	348°45.54 -17°50.20	
4	69°54.54	216°18.78	59.43	305°37.89	45.24	287°40.68	30.00	58°12.87	4.62			Achernar	335°18.56 -57°5.85	
5	84°57.00	231°21.12	20°59.70	320°38.82	44.95	302°42.70	29.86	73°15.51	4.54			Hamal	327°49.27 23°35.45	
6	99°59.47	246°23.47	S20°59.97	335°39.76	N20°44.67	317°44.73	N15°29.73	88°18.16	N02°4.46			Polaris	312°54.91 89°22.41	
7	115°1.93	261°25.82	0.24	350°40.70	44.38	332°46.75	29.60	103°20.80	4.38			Acamar	315°10.35 -40°11.57	
8	130°4.39	276°28.17	0.51	5°41.63	44.10	347°48.77	29.46	118°23.45	4.31			Menkar	314°4.40 4°11.84	
9	145°6.86	291°30.52	· · 0.77	20°42.57	· · 43.81	2°50.79	· · 29.33	133°26.09	· · 4.23			Mirfak	308°25.84 49°57.31	
10	160°9.32	306°32.88	1.04	35°43.51	43.53	17°52.81	29.19	148°28.73	4.15			Aldebaran	290°37.82 16°33.85	
11	175°11.79	321°35.24	1.30	50°44.45	43.24	32°54.84	29.06	163°31.38	4.07			Rigel	281°2.39 -8°10.04	
12	190°14.25	336°37.61	S21°1.56	65°45.39	N20°42.96	47°56.86	N15°28.92	178°34.02	N02°3.99			Capella	280°19.63 46°1.36	
13	205°16.72	351°39.98	1.81	80°46.33	42.67	62°58.88	28.79	193°36.67	3.92			Bellatrix	278°21.25 6°22.55	
14	220°19.18	6°42.35	2.07	95°47.26	42.39	78°0.91	28.66	208°39.31	3.84			Elnath	277°59.96 28°37.76	
15	235°21.64	21°44.73	· · 2.32	110°48.20	· · 42.10	93°2.93	· · 28.52	223°41.95	· · 3.76			Alnilam	275°36.20 -1°10.94	
16	250°24.11	36°47.11	2.58	125°49.14	41.81	108°4.95	28.39	238°44.60	3.68			Betelgeuse	270°50.49 7°24.82	
17	265°26.57	51°49.50	2.83	140°50.08	41.53	123°6.98	28.25	253°47.24	3.61			Canopus	263°51.73 -52°42.21	
18	280°29.04	66°51.89	S21°3.08	155°51.02	N20°41.24	138°9.00	N15°28.12	268°49.89	N02°3.53			Sirius	258°24.99 -16°44.94	
19	295°31.50	81°54.28	3.32	170°51.97	40.95	153°11.02	27.99	283°52.53	3.45			Adhara	255°4.78 -29°0.22	
20	310°33.96	96°56.68	3.57	185°52.91	40.67	168°13.05	27.85	298°55.17	3.37			Procyon	244°49.43 5°9.47	
21	325°36.43	111°59.08	· · 3.81	200°53.85	· · 40.38	183°15.07	· · 27.72	313°57.82	· · 3.30			Pollux	243°15.68 27°57.63	
22	340°38.89	127°1.48	4.05	215°54.79	40.09	198°17.10	27.58	329°0.46	3.22			Avior	234°14.44 -59°35.38	
23	355°41.36	142°3.89	4.29	230°55.73	39.81	213°19.12	27.45	344°3.11	3.14			Suhail	222°45.54 -43°32.17	
Mer.pass. 23:17		ν2.3' d0.3' m-4.78		ν0.9' d-0.3' m1.11		ν2.0' d-0.1' m-1.87		ν2.6' d-0.1' m0.35						
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	10°43.82	157°6.30	S21°4.53	245°56.67	N20°39.52	228°21.14	N15°27.32	359°5.75	N02°3.06					
1	25°46.29	172°8.71	4.76	260°57.62	39.23	243°23.17	27.18	14°8.39	2.98					
2	40°48.75	187°11.13	4.99	275°58.56	38.94	258°25.19	27.05	29°11.04	2.91					
3	55°51.21	202°13.55	· · 5.23	290°59.50	· · 38.65	273°27.22	· · 26.92	44°13.68	· · 2.83					
4	70°53.68	217°15.98	5.45	306°0.45	38.37	288°29.24	26.78	59°16.33	2.75					
5	85°56.14	232°18.41	5.68	321°1.39	38.08	303°31.27	26.65	74°18.97	2.67					
6	100°58.61	247°20.84	S21°5.91	336°2.33	N20°37.79	318°33.29	N15°26.52	89°21.62	N02°2.60					
7	116°1.07	262°23.28	6.13	351°3.28	37.50	333°35.32	26.38	104°24.26	2.52					
8	131°3.53	277°25.72	6.35	6°4.22	37.21	348°37.35	26.25	119°26.90	2.44					
9	146°6.00	292°28.16	· · 6.57	21°5.17	· · 36.92	3°39.37	· · 26.11	134°29.55	· · 2.36					
10	161°8.46	307°30.61	6.79	36°6.11	36.64	18°41.40	25.98	149°32.19	2.29					
11	176°10.93	322°33.07	7.01	51°7.06	36.35	33°43.42	25.85	164°34.84	2.21					
12	191°13.39	337°35.52	S21°7.22	66°8.01	N20°36.06	48°45.45	N15°25.71	179°37.48	N02°2.13					
13	206°15.86	352°37.98	7.43	81°8.95	35.77	63°47.48	25.58	194°40.13	2.05					
14	221°18.32	7°40.45	7.64	96°9.90	35.48	78°49.50	25.45	209°42.77	1.98					
15	236°20.78	22°42.91	· · 7.85	111°10.84	· · 35.19	93°51.53	· · 25.32	224°45.41	· · 1.90					
16	251°23.25	37°45.38	8.06	126°11.79	34.90	108°53.56	25.18	239°48.06	1.82					
17	266°25.71	52°47.86	8.26	141°12.74	34.61	123°55.59	25.05	254°50.70	1.74					
18	281°28.18	67°50.34	S21°8.46	156°13.69	N20°34.32	138°57.61	N15°24.92	269°53.35	N02°1.66					
19	296°30.64	82°52.82	8.66	171°14.64	34.03	153°59.64	24.78	284°55.99	1.59					
20	311°33.11	97°55.31	8.86	186°15.58	33.74	169°1.67	24.65	299°58.64	1.51					
21	326°35.57	112°57.80	· · 9.06	201°16.53	· · 33.45	184°3.70	· · 24.52	315°1.28	· · 1.43					
22	341°38.03	128°0.29	9.25	216°17.48	33.16	199°5.72	24.38	330°3.93	1.35					
23	356°40.50	143°2.79	9.45	231°18.43	32.86	214°7.75	24.25	345°6.57	1.28					
Mer.pass. 23:13		ν2.4' d0.2' m-4.77		ν0.9' d-0.3' m1.10		ν2.0' d-0.1' m-1.88		ν2.6' d-0.1' m0.34						
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	11°42.96	158°5.29	S21°9.64	246°19.38	N20°32.57	229°9.78	N15°24.12	0°9.21	N02°1.20					
1	26°45.43	173°7.79	9.83	261°20.33	32.28	244°11.81	23.98	15°11.86	1.12					
2	41°47.89	188°10.30	10.01	276°21.28	31.99	259°13.84	23.85	30°14.50	1.04					
3	56°50.35	203°12.81	· · 10.20	291°22.23	· · 31.70	274°15.87	· · 23.72	45°17.15	· · 0.97					
4	71°52.82	218°15.33	10.38	306°23.18	31.41	289°17.89	23.59	60°19.79	0.89					
5	86°55.28	233°17.85	10.56	321°24.13	31.12	304°19.92	23.45	75°22.44	0.81					
6	101°57.75	248°20.38	S21°10.74	336°25.09	N20°30.82	319°21.95	N15°23.32	90°25.08	N02°0.73					
7	117°0.21	263°22.90	10.92	351°26.04	30.53	334°23.98	23.19	105°27.73	0.66					
8	132°2.68	278°25.43	11.09	6°26.99	30.24	349°26.01	23.06	120°30.37	0.58					
9	147°5.14	293°27.97	· · 11.26	21°27.94	· · 29.95	4°28.04	· · 22.92	135°33.02	· · 0.50					
10	162°7.60	308°30.51	11.43	36°28.90	29.65	19°30.07	22.79	150°35.66	0.42					
11	177°10.07	323°33.05	11.60	51°29.85	29.36	34°32.10	22.66	165°38.30	0.35					
12	192°12.53	338°35.60	S21°11.77	66°30.80	N20°29.07	49°34.13	N15°22.53	180°40.95	N02°0.27					
13	207°15.00	353°38.15	11.93	81°31.76	28.78	64°36.16	22.39	195°43.59	0.19					
14	222°17.46	8°40.70	12.10	96°32.71	28.48	79°38.19	22.26	210°46.24	0.11					
15	237°19.92	23°43.26	· · 12.26	111°33.67	· · 28.19	94°40.22	· · 22.13	225°48.88	· · 0.04					
16	252°22.39	38°45.82	12.42	126°34.62	27.90	109°42.25	22.00	240°51.53	01°59.96					
17	267°24.85	53°48.39	12.57	141°35.58	27.60	124°44.28	21.86	255°54.17	01°59.88					
18	282°27.32	68°50.96	S21°12.73	156°36.53	N20°27.31	139°46.32	N15°21.73	270°56.82	N01°59.80					
19	297°29.78	83°53.53	12.88	171°37.49	27.01	154°48.35	21.60	285°59.46	59.73					
20	312°32.25	98°56.11	13.03	186°38.44	26.72	169°50.38	21.47	301°2.11	59.65					
21	327°34.71	113°58.69	· · 13.18	201°39.40	· · 26.43	184°52.41	· · 21.34	316°4.75	· · 59.57					
22	342°37.17	129°1.28	13.33	216°40.36	26.13	199°54.44	21.20	331°7.40	59.49					
23	357°39.64	144°3.87	13.47	231°41.31	25.84	214°56.47	21.07	346°10.04	59.42					
Mer.pass. 23:09		ν2.5' d0.2' m-4.76		ν1.0' d-0.3' m1.10		ν2.0' d-0.1' m-1.88		ν2.6' d-0.1' m0.33						
												Oct 01 Thu	SHA	Mer.pass
												Venus	146°24.78	13:33
												Mars	235°49.46	07:37
												Jupiter	217°47.92	08:49
												Saturn	348°17.61	00:08
												Oct 02 Fri	SHA	Mer.pass
												Venus	146°22.48	13:29
												Mars	235°12.85	07:36
												Jupiter	217°37.32	08:45
												Saturn	348°21.93	00:04
												Oct 03 Sat	SHA	Mer.pass
												Venus	146°22.33	13:25
												Mars	234°36.42	07:34
												Jupiter	217°26.82	08:42
												Saturn	348°26.25	23:55
												Horizontal parallax		
												Venus:	0.4	
												Mars:	0.1	

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°32.73	S03°6.57	308°54.57	4.6'	N25°59.06	6.6'	59.3'
1	197°32.94	7.54	323°18.13	4.5'	26°5.64	6.4'	59.3'
2	212°33.14	8.51	337°41.62	4.4'	26°12.03	6.2'	59.3'
3	227°33.34	· · 9.48	352°5.04	4.3'	26°18.26	6.0'	59.3'
4	242°33.55	10.45	6°28.39	4.3'	26°24.31	5.9'	59.3'
5	257°33.75	11.42	20°51.67	4.2'	26°30.18	5.7'	59.3'
6	272°33.95	S03°12.39	35°14.88	4.1'	N26°35.87	5.5'	59.3'
7	287°34.15	13.36	49°38.03	4.1'	26°41.38	5.3'	59.3'
8	302°34.36	14.33	64°1.12	4.0'	26°46.71	5.1'	59.3'
9	317°34.56	· · 15.30	78°24.14	4.0'	26°51.86	5.0'	59.3'
10	332°34.76	16.27	92°47.10	3.9'	26°56.83	4.8'	59.3'
11	347°34.96	17.23	107°10.01	3.9'	27°1.61	4.6'	59.3'
12	2°35.17	S03°18.20	121°32.86	3.8'	N27°6.21	4.4'	59.3'
13	17°35.37	19.17	135°55.66	3.7'	27°10.63	4.2'	59.3'
14	32°35.57	20.14	150°18.40	3.7'	27°14.85	4.0'	59.3'
15	47°35.77	· · 21.11	164°41.10	3.7'	27°18.89	3.9'	59.3'
16	62°35.97	22.08	179°3.76	3.6'	27°22.74	3.7'	59.3'
17	77°36.17	23.05	193°26.36	3.6'	27°26.41	3.5'	59.3'
18	92°36.37	S03°24.01	207°48.93	3.5'	N27°29.88	3.3'	59.3'
19	107°36.58	24.98	222°11.46	3.5'	27°33.16	3.1'	59.3'
20	122°36.78	25.95	236°33.95	3.5'	27°36.26	2.9'	59.3'
21	137°36.98	· · 26.92	250°56.41	3.4'	27°39.16	2.7'	59.3'
22	152°37.18	27.89	265°18.83	3.4'	27°41.87	2.5'	59.3'
23	167°37.38	28.86	279°41.22	3.4'	27°44.38	2.3'	59.3'
SD = 16.0'		$d = 1.0'$	SD = 16.2'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°37.58	S03°29.82	294°3.59	3.3'	N27°46.71	2.1'	59.3'
1	197°37.78	30.79	308°25.93	3.3'	27°48.84	1.9'	59.3'
2	212°37.98	31.76	322°48.25	3.3'	27°50.78	1.7'	59.3'
3	227°38.18	· · 32.73	337°10.55	3.3'	27°52.52	1.5'	59.3'
4	242°38.38	33.70	351°32.84	3.3'	27°54.07	1.4'	59.3'
5	257°38.58	34.66	5°55.11	3.3'	27°55.43	1.2'	59.3'
6	272°38.78	S03°35.63	20°17.36	3.2'	N27°56.59	1.0'	59.3'
7	287°38.98	36.60	34°39.61	3.2'	27°57.55	0.8'	59.3'
8	302°39.18	37.57	49°1.85	3.2'	27°58.32	0.6'	59.3'
9	317°39.38	· · 38.53	63°24.09	3.2'	27°58.90	0.4'	59.3'
10	332°39.58	39.50	77°46.32	3.2'	27°59.28	0.2'	59.3'
11	347°39.77	40.47	92°8.56	3.2'	27°59.46	-0.0'	59.3'
12	2°39.97	S03°41.44	106°30.80	3.2'	N27°59.45	-0.2'	59.3'
13	17°40.17	42.40	120°53.04	3.3'	27°59.25	-0.4'	59.3'
14	32°40.37	43.37	135°15.30	3.3'	27°58.84	-0.6'	59.3'
15	47°40.57	· · 44.34	149°37.56	3.3'	27°58.25	-0.8'	59.3'
16	62°40.77	45.31	163°59.84	3.3'	27°57.46	-1.0'	59.3'
17	77°40.96	46.27	178°22.14	3.3'	27°56.47	-1.2'	59.3'
18	92°41.16	S03°47.24	192°44.45	3.3'	N27°55.30	-1.4'	59.3'
19	107°41.36	48.21	207°6.79	3.4'	27°53.92	-1.6'	59.3'
20	122°41.56	49.17	221°29.15	3.4'	27°52.36	-1.8'	59.3'
21	137°41.75	· · 50.14	235°51.53	3.4'	27°50.60	-2.0'	59.3'
22	152°41.95	51.11	250°13.95	3.4'	27°48.65	-2.1'	59.2'
23	167°42.15	52.07	264°36.39	3.5'	27°46.51	-2.3'	59.2'
SD = 16.0'		$d = 1.0'$	SD = 16.2'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°42.35	S03°53.04	278°58.88	3.5'	N27°44.17	-2.5'	59.2'
1	197°42.54	54.01	293°21.39	3.6'	27°41.64	-2.7'	59.2'
2	212°42.74	54.97	307°43.95	3.6'	27°38.93	-2.9'	59.2'
3	227°42.94	· · 55.94	322°6.54	3.6'	27°36.02	-3.1'	59.2'
4	242°43.13	56.90	336°29.18	3.7'	27°32.93	-3.3'	59.2'
5	257°43.33	57.87	350°51.87	3.7'	27°29.64	-3.5'	59.2'
6	272°43.52	S03°58.84	5°14.60	3.8'	N27°26.17	-3.7'	59.2'
7	287°43.72	03°59.80	19°37.39	3.8'	27°22.51	-3.8'	59.2'
8	302°43.92	04°0.77	34°0.22	3.9'	27°18.67	-4.0'	59.2'
9	317°44.11	· · 1.73	48°23.11	3.9'	27°14.64	-4.2'	59.2'
10	332°44.31	2.70	62°46.06	4.0'	27°10.42	-4.4'	59.2'
11	347°44.50	3.66	77°9.06	4.1'	27°6.03	-4.6'	59.2'
12	2°44.70	S04°4.63	91°32.13	4.1'	N27°1.45	-4.8'	59.2'
13	17°44.89	5.60	105°55.25	4.2'	26°56.68	-4.9'	59.2'
14	32°45.09	6.56	120°18.45	4.3'	26°51.74	-5.1'	59.2'
15	47°45.28	· · 7.53	134°41.70	4.3'	26°46.62	-5.3'	59.2'
16	62°45.48	8.49	149°5.03	4.4'	26°41.32	-5.5'	59.2'
17	77°45.67	9.46	163°28.43	4.5'	26°35.84	-5.7'	59.1'
18	92°45.86	S04°10.42	177°51.90	4.5'	N26°30.19	-5.8'	59.1'
19	107°46.06	11.39	192°15.44	4.6'	26°24.36	-6.0'	59.1'
20	122°46.25	12.35	206°39.06	4.7'	26°18.36	-6.2'	59.1'
21	137°46.45	· · 13.32	221°2.75	4.8'	26°12.18	-6.3'	59.1'
22	152°46.64	14.28	235°26.52	4.9'	26°5.84	-6.5'	59.1'
23	167°46.83	15.25	249°50.37	4.9'	25°59.32	-6.7'	59.1'
SD = 16.0'		$d = 1.0'$	SD = 16.2'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	78-57%
01	10:11	10:21	11:50	03:33	16:04	
02	10:30	10:40	11:49	04:35	17:07	
03	10:49	10:59	11:49	05:38	18:09	

October 04, 05, 06 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	12°42.10		159°6.46	S21°13.61	246°42.27	N20°25.54	229°58.51	N15°20.94	1°12.69	N01°59.34
1	27°44.57		174°9.05	13.75	261°43.23	25.25	245°0.54	20.81	16°15.33	59.26
2	42°47.03		189°11.65	13.89	276°44.19	24.95	260°2.57	20.68	31°17.98	59.19
3	57°49.49		204°14.26	•• 14.03	291°45.14	•• 24.66	275°4.60	•• 20.54	46°20.62	•• 59.11
4	72°51.96		219°16.87	14.16	306°46.10	24.36	290°6.64	20.41	61°23.26	59.03
5	87°54.42		234°19.48	14.29	321°47.06	24.07	305°8.67	20.28	76°25.91	58.95
6	102°56.89		249°22.09	S21°14.42	336°48.02	N20°23.77	320°10.70	N15°20.15	91°28.55	N01°58.88
7	117°59.35		264°24.71	14.55	351°48.98	23.48	335°12.73	20.02	106°31.20	58.80
8	133°1.82		279°27.34	14.68	6°49.94	23.18	350°14.77	19.89	121°33.84	58.72
9	148°4.28		294°29.96	•• 14.80	21°50.90	•• 22.88	5°16.80	•• 19.75	136°36.49	•• 58.64
10	163°6.74		309°32.59	14.92	36°51.86	22.59	20°18.84	19.62	151°39.13	58.57
11	178°9.21		324°35.23	15.04	51°52.82	22.29	35°20.87	19.49	166°41.78	58.49
12	193°11.67		339°37.87	S21°15.16	66°53.78	N20°22.00	50°22.90	N15°19.36	181°44.42	N01°58.41
13	208°14.14		354°40.51	15.28	81°54.74	21.70	65°24.94	19.23	196°47.07	58.33
14	223°16.60		9°43.16	15.39	96°55.71	21.40	80°26.97	19.10	211°49.71	58.26
15	238°19.06		24°45.81	•• 15.50	111°56.67	•• 21.11	95°29.01	•• 18.96	226°52.36	•• 58.18
16	253°21.53		39°48.46	15.61	126°57.63	20.81	110°31.04	18.83	241°55.00	58.10
17	268°23.99		54°51.12	15.72	141°58.59	20.51	125°33.08	18.70	256°57.65	58.03
18	283°26.46		69°53.78	S21°15.82	156°59.56	N20°20.21	140°35.11	N15°18.57	272°0.29	N01°57.95
19	298°28.92		84°56.44	15.92	172°0.52	19.92	155°37.15	18.44	287°2.94	57.87
20	313°31.39		99°59.11	16.02	187°1.48	19.62	170°39.18	18.31	302°5.58	57.79
21	328°33.85		115°1.79	•• 16.12	202°2.45	•• 19.32	185°41.22	•• 18.18	317°8.23	•• 57.72
22	343°36.31		130°4.46	16.22	217°3.41	19.02	200°43.25	18.05	332°10.87	57.64
23	358°38.78		145°7.14	16.31	232°4.38	18.73	215°45.29	17.92	347°13.52	57.56
Mer.pass. 23:05										
v2.6' d0.1' m-4.74										
v1.0' d-0.3' m1.09										
v2.0' d-0.1' m-1.88										
v2.6' d-0.1' m0.33										
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°41.24		160°9.83	S21°16.41	247°5.34	N20°18.43	230°47.32	N15°17.78	2°16.16	N01°57.48
1	28°43.71		175°12.52	16.50	262°6.31	18.13	245°49.36	17.65	17°18.81	57.41
2	43°46.17		190°15.21	16.59	277°7.27	17.83	260°51.40	17.52	32°21.45	57.33
3	58°48.63		205°17.90	•• 16.67	292°8.24	•• 17.53	275°53.43	•• 17.39	47°24.09	•• 57.25
4	73°51.10		220°20.60	16.76	307°9.20	17.23	290°55.47	17.26	62°26.74	57.18
5	88°53.56		235°23.31	16.84	322°10.17	16.94	305°57.51	17.13	77°29.38	57.10
6	103°56.03		250°26.02	S21°16.92	337°11.14	N20°16.64	320°59.54	N15°17.00	92°32.03	N01°57.02
7	118°58.49		265°28.73	16.99	352°12.10	16.34	336°1.58	16.87	107°34.67	56.94
8	134°0.96		280°31.44	17.07	7°13.07	16.04	351°3.62	16.74	122°37.32	56.87
9	149°3.42		295°34.16	•• 17.14	22°14.04	•• 15.74	6°5.66	•• 16.61	137°39.96	•• 56.79
10	164°5.88		310°36.88	17.21	37°15.01	15.44	21°7.69	16.48	152°42.61	56.71
11	179°8.35		325°39.61	17.28	52°15.98	15.14	36°9.73	16.35	167°45.25	56.64
12	194°10.81		340°42.34	S21°17.35	67°16.95	N20°14.84	51°11.77	N15°16.21	182°47.90	N01°56.56
13	209°13.28		355°45.08	17.41	82°17.91	14.54	66°13.81	16.08	197°50.54	56.48
14	224°15.74		10°47.81	17.48	97°18.88	14.24	81°15.84	15.95	212°53.19	56.40
15	239°18.20		25°50.56	•• 17.54	112°19.85	•• 13.94	96°17.88	•• 15.82	227°55.83	•• 56.33
16	254°20.67		40°53.30	17.59	127°20.82	13.64	111°19.92	15.69	242°58.48	56.25
17	269°23.13		55°56.05	17.65	142°21.79	13.34	126°21.96	15.56	258°1.12	56.17
18	284°25.60		70°58.81	S21°17.70	157°22.76	N20°13.04	141°24.00	N15°15.43	273°3.77	N01°56.10
19	299°28.06		86°1.56	17.75	172°23.74	12.74	156°26.04	15.30	288°6.41	56.02
20	314°30.52		101°4.32	17.80	187°24.71	12.44	171°28.08	15.17	303°9.06	55.94
21	329°32.99		116°7.09	•• 17.85	202°25.68	•• 12.14	186°30.12	•• 15.04	318°11.70	•• 55.87
22	344°35.45		131°9.86	17.90	217°26.65	11.84	201°32.16	14.91	333°14.35	55.79
23	359°37.92		146°12.63	17.94	232°27.62	11.54	216°34.20	14.78	348°16.99	55.71
Mer.pass. 23:01										
v2.7' d0.1' m-4.72										
v1.0' d-0.3' m1.08										
v2.0' d-0.1' m-1.89										
v2.6' d-0.1' m0.33										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°40.38		161°15.41	S21°17.98	247°28.60	N20°11.23	231°36.24	N15°14.65	3°19.64	N01°55.63
1	29°42.85		176°18.19	18.02	262°29.57	10.93	246°38.28	14.52	18°22.28	55.56
2	44°45.31		191°20.97	18.05	277°30.54	10.63	261°40.32	14.39	33°24.93	55.48
3	59°47.77		206°23.76	•• 18.09	292°31.52	•• 10.33	276°42.36	•• 14.26	48°27.57	•• 55.40
4	74°50.24		221°26.55	18.12	307°32.49	10.03	291°44.40	14.13	63°30.22	55.33
5	89°52.70		236°29.35	18.15	322°33.46	9.73	306°46.44	14.00	78°32.86	55.25
6	104°55.17		251°32.15	S21°18.18	337°34.44	N20°9.42	321°48.48	N15°13.87	93°35.51	N01°55.17
7	119°57.63		266°34.95	18.20	352°35.41	9.12	336°50.52	13.74	108°38.15	55.10
8	135°0.09		281°37.76	18.22	7°36.39	8.82	351°52.56	13.61	123°40.80	55.02
9	150°2.56		296°40.57	•• 18.25	22°37.37	•• 8.52	6°54.60	•• 13.48	138°43.44	•• 54.94
10	165°5.02		311°43.39	18.26	37°38.34	8.21	21°56.64	13.35	153°46.09	54.86
11	180°7.49		326°46.21	18.28	52°39.32	7.91	36°58.69	13.22	168°48.73	54.79
12	195°9.95		341°49.03	S21°18.29	67°40.29	N20°7.61	52°0.73	N15°13.09	183°51.38	N01°54.71
13	210°12.41		356°51.85	18.31	82°41.27	7.31	67°2.77	12.96	198°54.02	54.63
14	225°14.88		11°54.69	18.32	97°42.25	7.00	82°4.81	12.84	213°56.66	54.56
15	240°17.34		26°57.52	•• 18.32	112°43.23	•• 6.70	97°6.85	•• 12.71	228°59.31	•• 54.48
16	255°19.81		42°0.36	18.33	127°44.20	6.40	112°8.90	12.58	244°1.95	54.40
17	270°22.27		57°3.20	18.33	142°45.18	6.09	127°10.94	12.45	259°4.60	54.33
18	285°24.73		72°6.05	S21°18.33	157°46.16	N20°5.79	142°12.98	N15°12.32	274°7.24	N01°54.25
19	300°27.20		87°8.90	18.33	172°47.14	5.48	157°15.03	12.19	289°9.89	54.17
20	315°29.66		102°11.75	18.33	187°48.12	5.18	172°17.07	12.06	304°12.53	54.10
21	330°32.13		117°14.61	•• 18.32	202°49.10	•• 4.88	187°19.11	•• 11.93	319°15.18	•• 54.02
22	345°34.59		132°17.47	18.31	217°50.08	4.57	202°21.16	11.80	334°17.82	53.94
23	0°37.06		147°20.33	18.30	232°51.06	4.27	217°23.20	11.67	349°20.47	53.87
Mer.pass. 22:58										
v2.8' d0.0' m-4.69										
v1.0' d-0.3' m1.08										
v2.0' d-0.1' m-1.89										
v2.6' d-0.1' m0.33										

Stars		
	SHA	Dec
Alpheratz	357°32.94	29°14.49
Ankaa	353°5.31	-42°9.50
Schedar	349°28.83	56°41.19
Diphda	348°45.53	-17°50.21
Achernar	335°18.54	-57°5.86
Hamal	327°49.25	23°35.46
Polaris	312°53.63	89°22.43
Acamar	315°10.33	-40°11.57
Menkar	314°4.38	4°11.84
Mirfak	308°25.81	49°57.32
Aldebaran	290°37.79	16°33.85
Rigel	281°2.36	-8°10.05
Capella	280°19.59	46°1.36
Bellatrix	278°21.23	6°22.55
Elnath	277°59.93	28°37.77
Alnilam	275°36.17	-1°10.94
Betelgeuse	270°50.46	7°24.82
Canopus	263°51.70	-52°42.22
Sirius	258°24.96	-16°44.94
Adhara	255°4.75	-29°0.22
Procyon	244°49.40	5°9.46
Pollux	243°15.64	27°57.63
Avior	234°14.41	-59°35.38
Suhail	222°45.51	-43°32.17
Miaplacidus	221°38.53	-69°49.32
Alphard	217°46.55	-8°46.34
Regulus	207°33.17	11°50.22
Dubhe	193°39.85	61°36.28
Denebola	182°23.81	14°25.40
Gienah	175°42.44	-17°41.35
Acrux	172°59.20	-63°14.81
Gacrux	171°50.64	-57°15.74
Alioth	166°12.27	55°48.89
Spica	158°21.11	-11°17.99
Alkaid	152°51.34	49°10.85
Hadar	148°34.58	-60°30.18
Menkent	147°56.30	-36°30.09
Arcturus	145°46.91	19°2.69
Rigel Kent.	139°38.91	-60°56.84
Kochab	137°20.82	74°2.81
Zuben'ubi	136°54.72	-16°9.13
Alphecca	126°2.80	26°37.63
Antares	112°14.28	-26°29.49
Atria	107°7.45	-69°4.71
Sabik	102°1.28	-15°45.44
Shaula	96°8.55	-37°7.45
Rasalhague	95°57.33	12°32.60
Eltanin	90°41.64	51°29.39
Kaus Aust.	83°30.66	-34°22.35
Vega	80°32.28	38°48.78
Nunki	75°45.98	-26°15.80
Altair	61°58.49	8°56.53
Peacock	53°3.25	-56°39.05
Deneb	49°24.63	45°22.85
Enif	33°37.17	10°0.07
Al Na'ir	27°30.77	-46°49.89
Fomalhaut	15°12.62	-29°28.73
Scheat	13°43.50	28°13.91
Markab	13°28.18	15°21.17
Oct 04 Sun	SHA	Mer.pass
Venus	146°24.36	13:21
Mars	234°0.17	07:33
Jupiter	217°16.40	08:39
Saturn	348°30.58	23:51
Oct 05 Mon	SHA	Mer.pass
Venus	146°28.59	13:17
Mars	233°24.10	07:31
Jupiter	217°6.08	08:36
Saturn	348°34.92	23:47
Oct 06 Tue	SHA	Mer.pass
Venus	146°35.03	13:13
Mars	232°48.21	07:30
Jupiter	216°55.86	08:32
Saturn	348°39.26	23:43
Horizontal parallax		
Venus:	0.5	
Mars:	0.1	


h	Sun		Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°47.03	S04°16.21	264°14.31	5.0'	N25°52.63	-6.9'	59.1'
1	197°47.22	17.18	278°38.32	5.1'	25°45.78	-7.0'	59.1'
2	212°47.41	18.14	293°2.42	5.2'	25°38.76	-7.2'	59.1'
3	227°47.61	· · 19.10	307°26.61	5.3'	25°31.58	-7.3'	59.1'
4	242°47.80	20.07	321°50.88	5.4'	25°24.23	-7.5'	59.1'
5	257°47.99	21.03	336°15.24	5.4'	25°16.72	-7.7'	59.1'
6	272°48.18	S04°22.00	350°39.68	5.5'	N25°9.05	-7.8'	59.1'
7	287°48.38	22.96	5°4.22	5.6'	25°1.22	-8.0'	59.0'
8	302°48.57	23.92	19°28.85	5.7'	24°53.23	-8.1'	59.0'
9	317°48.76	· · 24.89	33°53.57	5.8'	24°45.08	-8.3'	59.0'
10	332°48.95	25.85	48°18.39	5.9'	24°36.78	-8.5'	59.0'
11	347°49.14	26.82	62°43.29	6.0'	24°28.33	-8.6'	59.0'
12	2°49.33	S04°27.78	77°8.30	6.1'	N24°19.73	-8.8'	59.0'
13	17°49.52	28.74	91°33.39	6.2'	24°10.97	-8.9'	59.0'
14	32°49.72	29.71	105°58.59	6.3'	24°2.07	-9.1'	59.0'
15	47°49.91	· · 30.67	120°23.88	6.4'	23°53.02	-9.2'	59.0'
16	62°50.10	31.63	134°49.27	6.5'	23°43.82	-9.3'	59.0'
17	77°50.29	32.59	149°14.75	6.6'	23°34.48	-9.5'	59.0'
18	92°50.48	S04°33.56	163°40.34	6.7'	N23°24.99	-9.6'	58.9'
19	107°50.67	34.52	178°6.02	6.8'	23°15.37	-9.8'	58.9'
20	122°50.86	35.48	192°31.81	6.9'	23°5.60	-9.9'	58.9'
21	137°51.05	· · 36.45	206°57.69	7.0'	22°55.70	-10.0'	58.9'
22	152°51.24	37.41	221°23.68	7.1'	22°45.66	-10.2'	58.9'
23	167°51.43	38.37	235°49.76	7.2'	22°35.49	-10.3'	58.9'
SD = 16.0'			SD = 16.1'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°51.62	S04°39.33	250°15.95	7.3'	N22°25.18	-10.4'	58.9'
1	197°51.81	40.30	264°42.24	7.4'	22°14.74	-10.6'	58.9'
2	212°52.00	41.26	279°8.62	7.5'	22°4.17	-10.7'	58.9'
3	227°52.18	· · 42.22	293°35.11	7.6'	21°53.48	-10.8'	58.9'
4	242°52.37	43.18	308°1.71	7.7'	21°42.65	-10.9'	58.8'
5	257°52.56	44.14	322°28.40	7.8'	21°31.71	-11.1'	58.8'
6	272°52.75	S04°45.11	336°55.19	7.9'	N21°20.64	-11.2'	58.8'
7	287°52.94	46.07	351°22.09	8.0'	21°9.45	-11.3'	58.8'
8	302°53.13	47.03	5°49.09	8.1'	20°58.13	-11.4'	58.8'
9	317°53.31	· · 47.99	20°16.19	8.2'	20°46.70	-11.5'	58.8'
10	332°53.50	48.95	34°43.39	8.3'	20°35.16	-11.7'	58.8'
11	347°53.69	49.91	49°10.69	8.4'	20°23.50	-11.8'	58.8'
12	2°53.88	S04°50.88	63°38.09	8.5'	N20°11.72	-11.9'	58.8'
13	17°54.06	51.84	78°5.59	8.6'	19°59.84	-12.0'	58.7'
14	32°54.25	52.80	92°33.19	8.7'	19°47.84	-12.1'	58.7'
15	47°54.44	· · 53.76	107°0.89	8.8'	19°35.74	-12.2'	58.7'
16	62°54.62	54.72	121°28.69	8.9'	19°23.53	-12.3'	58.7'
17	77°54.81	55.68	135°56.59	9.0'	19°11.22	-12.4'	58.7'
18	92°55.00	S04°56.64	150°24.59	9.1'	N18°58.80	-12.5'	58.7'
19	107°55.18	57.60	164°52.69	9.2'	18°46.28	-12.6'	58.7'
20	122°55.37	58.56	179°20.88	9.3'	18°33.66	-12.7'	58.7'
21	137°55.56	04°59.52	193°49.17	9.4'	18°20.95	-12.8'	58.6'
22	152°55.74	05°0.48	208°17.56	9.5'	18°8.14	-12.9'	58.6'
23	167°55.93	1.44	222°46.04	9.6'	17°55.23	-13.0'	58.6'
SD = 16.0'			SD = 16.1'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°56.11	S05°2.40	237°14.62	9.7'	N17°42.23	-13.1'	58.6'
1	197°56.30	3.36	251°43.30	9.8'	17°29.14	-13.2'	58.6'
2	212°56.48	4.32	266°12.06	9.9'	17°15.95	-13.3'	58.6'
3	227°56.67	· · 5.28	280°40.92	10.0'	17°2.68	-13.4'	58.6'
4	242°56.85	6.24	295°9.88	10.1'	16°49.33	-13.4'	58.6'
5	257°57.04	7.20	309°38.92	10.1'	16°35.89	-13.5'	58.5'
6	272°57.22	S05°8.16	324°8.06	10.2'	N16°22.36	-13.6'	58.5'
7	287°57.40	9.12	338°37.28	10.3'	16°8.76	-13.7'	58.5'
8	302°57.59	10.08	353°6.60	10.4'	15°55.07	-13.8'	58.5'
9	317°57.77	· · 11.04	7°36.00	10.5'	15°41.31	-13.8'	58.5'
10	332°57.96	12.00	22°5.49	10.6'	15°27.46	-13.9'	58.5'
11	347°58.14	12.95	36°35.07	10.7'	15°13.55	-14.0'	58.5'
12	2°58.32	S05°13.91	51°4.74	10.8'	N14°59.56	-14.1'	58.4'
13	17°58.51	14.87	65°34.49	10.8'	14°45.50	-14.1'	58.4'
14	32°58.69	15.83	80°4.32	10.9'	14°31.36	-14.2'	58.4'
15	47°58.87	· · 16.79	94°34.24	11.0'	14°17.16	-14.3'	58.4'
16	62°59.05	17.75	109°4.24	11.1'	14°2.89	-14.3'	58.4'
17	77°59.24	18.70	123°34.32	11.2'	13°48.56	-14.4'	58.4'
18	92°59.42	S05°19.66	138°4.48	11.2'	N13°34.16	-14.5'	58.4'
19	107°59.60	20.62	152°34.72	11.3'	13°19.70	-14.5'	58.3'
20	122°59.78	21.58	167°5.04	11.4'	13°5.18	-14.6'	58.3'
21	137°59.96	· · 22.54	181°35.44	11.5'	12°50.60	-14.6'	58.3'
22	153°0.14	23.49	196°5.91	11.5'	12°35.96	-14.7'	58.3'
23	168°0.33	24.45	210°36.46	11.6'	12°21.27	-14.7'	58.3'
SD = 16.0'			SD = 16.0'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 23-25 45-24%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
04	11:08	11:17	11:49	06:39	19:08	
05	11:26	11:36	11:48	07:36	20:03	
06	11:44	11:53	11:48	08:29	20:53	

October 07, 08, 09 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	15°39.52		162°23.20	S21°18.29	247°52.04	N20°3.96	232°25.24	N15°11.54	4°23.11	N01°53.79
1	30°41.98		177°26.07	18.27	262°53.02	3.66	247°27.29	11.41	19°25.76	53.71
2	45°44.45		192°28.95	18.26	277°54.00	3.35	262°29.33	11.28	34°28.40	53.64
3	60°46.91		207°31.83	•• 18.24	292°54.98	•• 3.05	277°31.38	•• 11.16	49°31.05	•• 53.56
4	75°49.38		222°34.71	18.21	307°55.96	2.74	292°33.42	11.03	64°33.69	53.48
5	90°51.84		237°37.60	18.19	322°56.95	2.44	307°35.47	10.90	79°36.34	53.41
6	105°54.30		252°40.49	S21°18.16	337°57.93	N20°2.13	322°37.51	N15°10.77	94°38.98	N01°53.33
7	120°56.77		267°43.39	18.13	352°58.91	1.83	337°39.56	10.64	109°41.63	53.25
8	135°59.23		282°46.29	18.10	7°59.90	1.52	352°41.60	10.51	124°44.27	53.18
9	151°1.70		297°49.19	•• 18.07	23°0.88	•• 1.22	7°43.65	•• 10.38	139°46.92	•• 53.10
10	166°4.16		312°52.10	18.03	38°1.86	0.91	22°45.69	10.25	154°49.56	53.02
11	181°6.62		327°55.01	18.00	53°2.85	0.61	37°47.74	10.13	169°52.20	52.95
12	196°9.09		342°57.92	S21°17.96	68°3.83	N20°0.30	52°49.78	N15°10.00	184°54.85	N01°52.87
13	211°11.55		358°0.84	17.91	83°4.82	19°59.99	67°51.83	9.87	199°57.49	52.79
14	226°14.02		13°3.76	17.87	98°5.80	19°59.69	82°53.88	9.74	215°0.14	52.72
15	241°16.48		28°6.69	•• 17.82	113°6.79	•• 59.38	97°55.92	•• 9.61	230°2.78	•• 52.64
16	256°18.94		43°9.62	17.77	128°7.77	59.07	112°57.97	9.48	245°5.43	52.56
17	271°21.41		58°12.55	17.72	143°8.76	58.77	128°0.02	9.36	260°8.07	52.49
18	286°23.87		73°15.49	S21°17.67	158°9.75	N19°58.46	143°2.06	N15°9.23	275°10.72	N01°52.41
19	301°26.34		88°18.43	17.61	173°10.73	58.15	158°4.11	9.10	290°13.36	52.33
20	316°28.80		103°21.38	17.55	188°11.72	57.85	173°6.16	8.97	305°16.01	52.26
21	331°31.26		118°24.32	•• 17.49	203°12.71	•• 57.54	188°8.21	•• 8.84	320°18.65	•• 52.18
22	346°33.73		133°27.28	17.43	218°13.69	57.23	203°10.25	8.71	335°21.30	52.10
23	1°36.19		148°30.23	17.36	233°14.68	56.93	218°12.30	8.59	350°23.94	52.03
Mer.pass. 22:54										
v2.9' d-0.0' m-4.67										
v1.0' d-0.3' m1.07										
v2.0' d-0.1' m-1.89										
v2.6' d-0.1' m0.34										
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°38.66		163°33.19	S21°17.29	248°15.67	N19°56.62	233°14.35	N15°8.46	5°26.59	N01°51.95
1	31°41.12		178°36.16	17.22	263°16.66	56.31	248°16.40	8.33	20°29.23	51.88
2	46°43.58		193°39.13	17.15	278°17.65	56.00	263°18.45	8.20	35°31.87	51.80
3	61°46.05		208°42.10	•• 17.07	293°18.64	•• 55.70	278°20.49	•• 8.07	50°34.52	•• 51.72
4	76°48.51		223°45.07	17.00	308°19.63	55.39	293°22.54	7.95	65°37.16	51.65
5	91°50.98		238°48.05	16.92	323°20.62	55.08	308°24.59	7.82	80°39.81	51.57
6	106°53.44		253°51.03	S21°16.84	338°21.61	N19°54.77	323°26.64	N15°7.69	95°42.45	N01°51.49
7	121°55.90		268°54.02	16.75	353°22.60	54.46	338°28.69	7.56	110°45.10	51.42
8	136°58.37		283°57.01	16.66	8°23.59	54.15	353°30.74	7.44	125°47.74	51.34
9	152°0.83		299°0.00	•• 16.58	23°24.58	•• 53.85	8°32.79	•• 7.31	140°50.39	•• 51.26
10	167°3.30		314°3.00	16.48	38°25.57	53.54	23°34.84	7.18	155°53.03	51.19
11	182°5.76		329°6.00	16.39	53°26.57	53.23	38°36.89	7.05	170°55.67	51.11
12	197°8.22		344°9.01	S21°16.29	68°27.56	N19°52.92	53°38.94	N15°6.93	185°58.32	N01°51.04
13	212°10.69		359°12.02	16.20	83°28.55	52.61	68°40.99	6.80	201°0.96	50.96
14	227°13.15		14°15.03	16.10	98°29.55	52.30	83°43.04	6.67	216°3.61	50.88
15	242°15.62		29°18.05	•• 15.99	113°30.54	•• 51.99	98°45.09	•• 6.54	231°6.25	•• 50.81
16	257°18.08		44°21.07	15.89	128°31.53	51.68	113°47.14	6.42	246°8.90	50.73
17	272°20.54		59°24.09	15.78	143°32.53	51.37	128°49.19	6.29	261°11.54	50.65
18	287°23.01		74°27.12	S21°15.67	158°33.52	N19°51.06	143°51.24	N15°6.16	276°14.19	N01°50.58
19	302°25.47		89°30.15	15.56	173°34.52	50.75	158°53.30	6.03	291°16.83	50.50
20	317°27.94		104°33.19	15.44	188°35.51	50.44	173°55.35	5.91	306°19.47	50.43
21	332°30.40		119°36.23	•• 15.32	203°36.51	•• 50.13	188°57.40	•• 5.78	321°22.12	•• 50.35
22	347°32.86		134°39.27	15.20	218°37.50	49.82	203°59.45	5.65	336°24.76	50.27
23	2°35.33		149°42.32	15.08	233°38.50	49.51	219°1.50	5.53	351°27.41	50.20
Mer.pass. 22:50										
v3.0' d-0.1' m-4.64										
v1.0' d-0.3' m1.06										
v2.0' d-0.1' m-1.90										
v2.6' d-0.1' m0.34										
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°37.79		164°45.37	S21°14.96	248°39.50	N19°49.20	234°3.55	N15°5.40	6°30.05	N01°50.12
1	32°40.26		179°48.42	14.83	263°40.49	48.89	249°5.61	5.27	21°32.70	50.05
2	47°42.72		194°51.48	14.70	278°41.49	48.58	264°7.66	5.15	36°35.34	49.97
3	62°45.19		209°54.54	•• 14.57	293°42.49	•• 48.27	279°9.71	•• 5.02	51°37.98	•• 49.89
4	77°47.65		224°57.60	14.43	308°43.49	47.96	294°11.76	4.89	66°40.63	49.82
5	92°50.11		240°0.67	14.30	323°44.48	47.65	309°13.82	4.77	81°43.27	49.74
6	107°52.58		255°3.75	S21°14.16	338°45.48	N19°47.34	324°15.87	N15°4.64	96°45.92	N01°49.67
7	122°55.04		270°6.82	14.02	353°46.48	47.03	339°17.92	4.51	111°48.56	49.59
8	137°57.51		285°9.90	13.87	8°47.48	46.71	354°19.98	4.39	126°51.21	49.51
9	152°59.97		300°12.99	•• 13.73	23°48.48	•• 46.40	9°22.03	•• 4.26	141°53.85	•• 49.44
10	168°2.43		315°16.07	13.58	38°49.48	46.09	24°24.09	4.13	156°56.49	49.36
11	183°4.90		330°19.16	13.43	53°50.48	45.78	39°26.14	4.01	171°59.14	49.29
12	198°7.36		345°22.26	S21°13.27	68°51.48	N19°45.47	54°28.19	N15°3.88	187°1.78	N01°49.21
13	213°9.83		0°25.36	13.12	83°52.48	45.16	69°30.25	3.75	202°4.43	49.13
14	228°12.29		15°28.46	12.96	98°53.48	44.84	84°32.30	3.63	217°7.07	49.06
15	243°14.75		30°31.56	•• 12.80	113°54.48	•• 44.53	99°34.36	•• 3.50	232°9.71	•• 48.98
16	258°17.22		45°34.67	12.64	128°55.49	44.22	114°36.41	3.37	247°12.36	48.91
17	273°19.68		60°37.79	12.47	143°56.49	43.91	129°38.47	3.25	262°15.00	48.83
18	288°22.15		75°40.90	S21°12.30	158°57.49	N19°43.60	144°40.52	N15°3.12	277°17.65	N01°48.76
19	303°24.61		90°44.02	12.13	173°58.49	43.28	159°42.58	3.00	292°20.29	48.68
20	318°27.07		105°47.15	11.96	188°59.50	42.97	174°44.64	2.87	307°22.93	48.60
21	333°29.54		120°50.28	•• 11.78	204°0.50	•• 42.66	189°46.69	•• 2.74	322°25.58	•• 48.53
22	348°32.00		135°53.41	11.61	219°1.50	42.34	204°48.75	2.62	337°28.22	48.45
23	3°34.47		150°56.54	11.43	234°2.51	42.03	219°50.80	2.49	352°30.87	48.38
Mer.pass. 22:46										
v3.1' d-0.1' m-4.60										
v1.0' d-0.3' m1.06										
v2.1' d-0.1' m-1.90										
v2.6' d-0.1' m0.35										

Stars		
	SHA	Dec
Alpheratz	357°32.94	29°14.50
Ankaa	353°5.30	-42°9.51
Schedar	349°28.83	56°41.20
Diphda	348°45.53	-17°50.21
Achernar	335°18.53	-57°5.88
Hamal	327°49.24	23°35.47
Polaris	312°52.70	89°22.45
Acamar	315°10.31	-40°11.58
Menkar	314°4.37	4°11.85
Mirfak	308°25.79	49°57.34
Aldebaran	290°37.77	16°33.86
Rigel	281°2.34	-8°10.05
Capella	280°19.56	46°1.37
Bellatrix	278°21.21	6°22.55
Elnath	277°59.90	28°37.77
Alnilam	275°36.15	-1°10.94
Betelgeuse	270°50.44	7°24.82
Canopus	263°51.67	-52°42.22
Sirius	258°24.94	-16°44.95
Adhara	255°4.73	-29°0.22
Procyon	244°49.38	5°9.46
Pollux	243°15.62	27°57.63
Avior	234°14.37	-59°35.37
Suhail	222°45.49	-43°32.17
Miaplacidus	221°38.49	-69°49.31
Alphard	217°46.54	-8°46.34
Regulus	207°33.15	1°10.52
Dubhe	193°39.83	61°36.26
Denebola	182°23.80	14°25.39
Gienah	175°42.44	-17°41.34
Acrux	172°59.20	-63°14.79
Gacrux	171°50.63	-57°15.73
Alioth	166°12.27	55°48.87
Spica	158°21.11	-11°17.99
Alkaid	152°51.34	49°10.84
Hadar	148°34.59	-60°30.17
Menkent	147°56.30	-36°30.09
Arcturus	145°46.92	19°2.68
Rigel Kent.	139°38.93	-60°56.83
Kochab	137°20.85	74°2.79
Zuben'ubi	136°54.72	-16°9.13
Alphecca	126°2.80	26°37.62
Antares	112°14.29	-26°29.48
Atria	107°7.49	-69°4.71
Sabik	102°1.29	-15°45.44
Shaula	96°8.57	-37°7.45
Rasalhague	95°57.34	12°32.60
Eltanin	90°41.66	51°29.38
Kaus Aust.	83°30.68	-34°22.35
Vega	80°32.30	38°48.77
Nunki	75°46.00	-26°15.80
Altair	61°58.50	8°56.53
Peacock	53°3.27	-56°39.06
Deneb	49°24.65	45°22.85
Enif	33°37.18	10°0.07
Al Na'ir	27°30.78	-46°49.90
Fomalhaut	15°12.63	-29°28.74
Scheat	13°43.50	28°13.92
Markab	13°28.19	15°21.18
Oct 07 Wed	SHA	Mer.pass
Venus	146°43.68	13:08
Mars	232°12.52	07:28
Jupiter	216°45.73	08:29
Saturn	348°43.59	23:38
Oct 08 Thu	SHA	Mer.pass
Venus	146°54.54	13:03
Mars	231°37.02	07:26
Jupiter	216°35.69	08:26
Saturn	348°47.93	23:34
Oct 09 Fri	SHA	Mer.pass
Venus	147°7.57	12:58
Mars	231°1.70	07:25
Jupiter	216°25.76	08:23
Saturn	348°52.26	23:30
Horizontal parallax		
Venus:	0.5	
Mars:	0.1	

h	Sun			Moon				
Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	183°0.51	S05°25.41		225°7.09	11.7'	N12°6.52	-14.8'	58.3'
1	198°0.69	26.37		239°37.78	11.8'	11°51.71	-14.9'	58.2'
2	213°0.87	27.32		254°8.55	11.8'	11°36.86	-14.9'	58.2'
3	228°1.05	28.28		268°39.39	11.9'	11°21.95	-15.0'	58.2'
4	243°1.23	29.24		283°10.30	12.0'	11°7.00	-15.0'	58.2'
5	258°1.41	30.19		297°41.28	12.0'	10°52.00	-15.0'	58.2'
6	273°1.59	S05°31.15		312°12.33	12.1'	N10°36.95	-15.1'	58.2'
7	288°1.77	32.11		326°43.44	12.2'	10°21.86	-15.1'	58.1'
8	303°1.95	33.06		341°14.62	12.2'	10°6.72	-15.2'	58.1'
9	318°2.13	34.02		355°45.86	12.3'	09°51.55	-15.2'	58.1'
10	333°2.31	34.97		10°17.17	12.4'	09°36.33	-15.3'	58.1'
11	348°2.49	35.93		24°48.54	12.4'	09°21.08	-15.3'	58.1'
12	3°2.67	S05°36.89		39°19.97	12.5'	N09°5.79	-15.3'	58.1'
13	18°2.84	37.84		53°51.46	12.5'	08°50.46	-15.4'	58.0'
14	33°3.02	38.80		68°23.01	12.6'	08°35.10	-15.4'	58.0'
15	48°3.20	39.75		82°54.62	12.7'	08°19.71	-15.4'	58.0'
16	63°3.38	40.71		97°26.28	12.7'	08°4.28	-15.5'	58.0'
17	78°3.56	41.66		111°58.00	12.8'	07°48.83	-15.5'	58.0'
18	93°3.74	S05°42.62		126°29.77	12.8'	N07°33.35	-15.5'	58.0'
19	108°3.91	43.57		141°1.60	12.9'	07°17.84	-15.5'	57.9'
20	123°4.09	44.53		155°33.48	12.9'	07°2.30	-15.6'	57.9'
21	138°4.27	45.48		170°5.41	13.0'	06°46.74	-15.6'	57.9'
22	153°4.44	46.44		184°37.38	13.0'	06°31.16	-15.6'	57.9'
23	168°4.62	47.39		199°9.41	13.1'	06°15.55	-15.6'	57.9'
SD = 16.0'						SD = 15.9'		
$d = 1.0'$								

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°4.80	S05°48.35	213°41.49	13.1'	N05°59.93	-15.6'	57.9'
1	198°4.97	49.30	228°13.61	13.2'	05°44.29	-15.7'	57.8'
2	213°5.15	50.26	242°45.77	13.2'	05°28.62	-15.7'	57.8'
3	228°5.33	51.21	257°17.98	13.3'	05°12.95	-15.7'	57.8'
4	243°5.50	52.16	271°50.23	13.3'	04°57.26	-15.7'	57.8'
5	258°5.68	53.12	286°22.52	13.3'	04°41.55	-15.7'	57.8'
6	273°5.85	S05°54.07	300°54.86	13.4'	N04°25.83	-15.7'	57.7'
7	288°6.03	55.02	315°27.23	13.4'	04°10.11	-15.7'	57.7'
8	303°6.20	55.98	329°59.64	13.4'	03°54.37	-15.7'	57.7'
9	318°6.38	56.93	344°32.08	13.5'	03°38.62	-15.8'	57.7'
10	333°6.55	57.88	359°4.57	13.5'	03°22.87	-15.8'	57.7'
11	348°6.73	58.84	13°37.08	13.5'	03°7.11	-15.8'	57.6'
12	3°6.90	S05°59.79	28°9.63	13.6'	N02°51.35	-15.8'	57.6'
13	18°7.08	06°0.74	42°42.21	13.6'	02°35.59	-15.8'	57.6'
14	33°7.25	1.69	57°14.83	13.6'	02°19.82	-15.8'	57.6'
15	48°7.42	2.65	71°47.47	13.7'	02°4.06	-15.8'	57.6'
16	63°7.60	3.60	86°20.14	13.7'	01°48.29	-15.8'	57.5'
17	78°7.77	4.55	100°52.84	13.7'	01°32.53	-15.8'	57.5'
18	93°7.95	S06°5.50	115°25.56	13.7'	N01°16.77	-15.8'	57.5'
19	108°8.12	6.45	129°58.31	13.8'	01°1.01	-15.7'	57.5'
20	123°8.29	7.41	144°31.09	13.8'	00°45.26	-15.7'	57.5'
21	138°8.46	8.36	159°3.88	13.8'	00°29.52	-15.7'	57.4'
22	153°8.64	9.31	173°36.70	13.8'	N00°13.79	-15.7'	57.4'
23	168°8.81	10.26	188°9.54	13.9'	S00°1.94	15.7'	57.4'
SD = 16.0'			SD = 15.8'				
$d = 1.0'$							

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°8.98	S06°11.21	202°42.40	13.9'	S00°17.65	15.7'	57.4'
1	198°9.15	12.16	217°15.27	13.9'	00°33.35	15.7'	57.4'
2	213°9.32	13.11	231°48.17	13.9'	00°49.04	15.7'	57.3'
3	228°9.50	14.06	246°21.08	13.9'	01°4.71	15.7'	57.3'
4	243°9.67	15.01	260°54.00	13.9'	01°20.37	15.6'	57.3'
5	258°9.84	15.96	275°26.94	14.0'	01°36.01	15.6'	57.3'
6	273°10.01	S06°16.91	289°59.89	14.0'	S01°51.63	15.6'	57.3'
7	288°10.18	17.86	304°32.86	14.0'	02°7.23	15.6'	57.2'
8	303°10.35	18.81	319°5.83	14.0'	02°22.82	15.6'	57.2'
9	318°10.52	19.76	333°38.82	14.0'	02°38.38	15.5'	57.2'
10	333°10.69	20.71	348°11.81	14.0'	02°53.91	15.5'	57.2'
11	348°10.86	21.66	2°44.81	14.0'	03°9.43	15.5'	57.1'
12	3°11.03	S06°22.61	17°17.81	14.0'	S03°24.91	15.5'	57.1'
13	18°11.20	23.56	31°50.83	14.0'	03°40.37	15.4'	57.1'
14	33°11.37	24.51	46°23.84	14.0'	03°55.81	15.4'	57.1'
15	48°11.54	25.46	60°56.86	14.0'	04°11.21	15.4'	57.1'
16	63°11.71	26.41	75°29.88	14.0'	04°26.59	15.3'	57.0'
17	78°11.88	27.36	90°2.91	14.0'	04°41.93	15.3'	57.0'
18	93°12.04	S06°28.31	104°35.93	14.0'	S04°57.24	15.3'	57.0'
19	108°12.21	29.25	119°8.95	14.0'	05°12.52	15.2'	57.0'
20	123°12.38	30.20	133°41.97	14.0'	05°27.76	15.2'	56.9'
21	138°12.55	31.15	148°14.99	14.0'	05°42.97	15.2'	56.9'
22	153°12.72	32.10	162°48.00	14.0'	05°58.14	15.1'	56.9'
23	168°12.88	33.05	177°21.01	14.0'	06°13.27	15.1'	56.9'
SD = 16.0'		$d = 1.0'$	SD = 15.6'				

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

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

Day	Sun		
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h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	183°13.05	S06°33.99	191°54.01	14.0'	S06°28.37	15.1'	56.9'
1	198°13.22	34.94	206°27.01	14.0'	06°43.42	15.0'	56.8'
2	213°13.38	35.89	220°59.99	14.0'	06°58.43	15.0'	56.8'
3	228°13.55	· · 36.84	235°32.97	14.0'	07°13.40	14.9'	56.8'
4	243°13.72	37.78	250°5.94	14.0'	07°28.33	14.9'	56.8'
5	258°13.88	38.73	264°38.90	13.9'	07°43.21	14.8'	56.7'
6	273°14.05	S06°39.68	279°11.85	13.9'	S07°58.05	14.8'	56.7'
7	288°14.22	40.62	293°44.78	13.9'	08°12.83	14.7'	56.7'
8	303°14.38	41.57	308°17.70	13.9'	08°27.58	14.7'	56.7'
9	318°14.55	· · 42.52	322°50.61	13.9'	08°42.27	14.6'	56.7'
10	333°14.71	43.46	337°23.50	13.9'	08°56.91	14.6'	56.6'
11	348°14.88	44.41	351°56.38	13.9'	09°11.50	14.5'	56.6'
12	3°15.04	S06°45.35	6°29.24	13.8'	S09°26.04	14.5'	56.6'
13	18°15.21	46.30	21°2.08	13.8'	09°40.52	14.4'	56.6'
14	33°15.37	47.24	35°34.90	13.8'	09°54.96	14.4'	56.5'
15	48°15.54	· · 48.19	50°7.70	13.8'	10°9.33	14.3'	56.5'
16	63°15.70	49.13	64°40.49	13.8'	10°23.65	14.3'	56.5'
17	78°15.86	50.08	79°13.25	13.7'	10°37.91	14.2'	56.5'
18	93°16.03	S06°51.02	93°45.99	13.7'	S10°52.12	14.1'	56.4'
19	108°16.19	51.97	108°18.71	13.7'	11°6.26	14.1'	56.4'
20	123°16.35	52.91	122°51.40	13.7'	11°20.34	14.0'	56.4'
21	138°16.52	· · 53.86	137°24.07	13.6'	11°34.36	14.0'	56.4'
22	153°16.68	54.80	151°56.71	13.6'	11°48.32	13.9'	56.4'
23	168°16.84	55.75	166°29.33	13.6'	12°2.22	13.8'	56.3'
SD = 16.0' $d = 0.9'$			SD = 15.5'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°17.00	S06°56.69	181°1.92	13.6'	S12°16.05	13.8'	56.3'
1	198°17.17	57.63	195°34.49	13.5'	12°29.81	13.7'	56.3'
2	213°17.33	58.58	210°7.02	13.5'	12°43.51	13.6'	56.3'
3	228°17.49	06°59.52	224°39.53	13.5'	12°57.14	13.6'	56.2'
4	243°17.65	07°0.46	239°12.01	13.4'	13°10.70	13.5'	56.2'
5	258°17.81	1.41	253°44.45	13.4'	13°24.19	13.4'	56.2'
6	273°17.97	S07°2.35	268°16.87	13.4'	S13°37.61	13.3'	56.2'
7	288°18.13	3.29	282°49.26	13.4'	13°50.96	13.3'	56.1'
8	303°18.30	4.23	297°21.61	13.3'	14°4.23	13.2'	56.1'
9	318°18.46	· · 5.18	311°53.93	13.3'	14°17.43	13.1'	56.1'
10	333°18.62	6.12	326°26.22	13.3'	14°30.56	13.1'	56.1'
11	348°18.78	7.06	340°58.47	13.2'	14°43.61	13.0'	56.1'
12	3°18.94	S07°8.00	355°30.69	13.2'	S14°56.58	12.9'	56.0'
13	18°19.10	8.94	10°2.87	13.1'	15°9.48	12.8'	56.0'
14	33°19.25	9.89	24°35.02	13.1'	15°22.30	12.7'	56.0'
15	48°19.41	· · 10.83	39°7.13	13.1'	15°35.04	12.7'	56.0'
16	63°19.57	11.77	53°39.21	13.0'	15°47.69	12.6'	55.9'
17	78°19.73	12.71	68°11.25	13.0'	16°0.27	12.5'	55.9'
18	93°19.89	S07°13.65	82°43.25	13.0'	S16°12.76	12.4'	55.9'
19	108°20.05	14.59	97°15.21	12.9'	16°25.17	12.3'	55.9'
20	123°20.21	15.53	111°47.13	12.9'	16°37.50	12.2'	55.8'
21	138°20.36	· · 16.47	126°19.01	12.8'	16°49.74	12.2'	55.8'
22	153°20.52	17.41	140°50.86	12.8'	17°1.89	12.1'	55.8'
23	168°20.68	18.35	155°22.66	12.8'	17°13.96	12.0'	55.8'
SD = 16.0' $d = 0.9'$			SD = 15.4'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.84	S07°19.29	169°54.43	12.7'	S17°25.94	11.9'	55.8'
1	198°20.99	20.23	184°26.15	12.7'	17°37.83	11.8'	55.7'
2	213°21.15	21.17	198°57.83	12.6'	17°49.63	11.7'	55.7'
3	228°21.31	· · 22.11	213°29.47	12.6'	18°1.33	11.6'	55.7'
4	243°21.46	23.05	228°1.07	12.6'	18°12.95	11.5'	55.7'
5	258°21.62	23.99	242°32.63	12.5'	18°24.48	11.4'	55.6'
6	273°21.78	S07°24.93	257°4.14	12.5'	S18°35.91	11.3'	55.6'
7	288°21.93	25.87	271°35.61	12.4'	18°47.24	11.2'	55.6'
8	303°22.09	26.80	286°7.04	12.4'	18°58.49	11.1'	55.6'
9	318°22.24	· · 27.74	300°38.42	12.3'	19°9.63	11.0'	55.6'
10	333°22.40	28.68	315°9.76	12.3'	19°20.68	11.0'	55.5'
11	348°22.55	29.62	329°41.06	12.3'	19°31.63	10.9'	55.5'
12	3°22.71	S07°30.56	344°12.31	12.2'	S19°42.48	10.8'	55.5'
13	18°22.86	31.49	358°43.52	12.2'	19°53.23	10.7'	55.5'
14	33°23.02	32.43	13°14.69	12.1'	20°3.89	10.6'	55.4'
15	48°23.17	· · 33.37	27°45.81	12.1'	20°14.44	10.4'	55.4'
16	63°23.32	34.30	42°16.88	12.0'	20°24.89	10.3'	55.4'
17	78°23.48	35.24	56°47.92	12.0'	20°35.23	10.2'	55.4'
18	93°23.63	S07°36.18	71°18.90	11.9'	S20°45.47	10.1'	55.4'
19	108°23.78	37.11	85°49.85	11.9'	20°55.61	10.0'	55.3'
20	123°23.94	38.05	100°20.74	11.9'	21°5.64	9.9'	55.3'
21	138°24.09	· · 38.99	114°51.60	11.8'	21°15.57	9.8'	55.3'
22	153°24.24	39.92	129°22.40	11.8'	21°25.39	9.7'	55.3'
23	168°24.39	40.86	143°53.17	11.7'	21°35.10	9.6'	55.3'
SD = 16.0' $d = 0.9'$			SD = 15.2'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	0-2
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	1-2%
10	12:52	13:00	11:47	11:33	23:56	
11	13:08	13:16	11:47	12:19	—:—	
12	13:23	13:31	11:46	13:05	00:42	

October 13, 14, 15 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	21°34.34	169°54.88	S20°51.58	250°16.75	N19°18.89	237°21.40	N14°53.43	10°43.81	N01°42.91	<div>Alpheratz 357°32.94 29°14.52</div> <div>Ankaa 353°5.31 -42°9.53</div> <div>Schedar 349°28.83 56°41.23</div> <div>Diphda 348°45.53 -17°50.22</div> <div>Achernar 335°18.53 -57°5.91</div> <div>Hamal 327°49.22 23°35.48</div> <div>Polaris 312°50.64 89°22.47</div> <div>Acamar 315°10.29 -40°11.61</div> <div>Menkar 314°4.35 4°11.84</div> <div>Mirfak 308°25.75 49°57.35</div> <div>Aldebaran 290°37.74 16°33.85</div> <div>Rigel 281°2.30 -8°10.06</div> <div>Capella 280°19.51 46°1.37</div> <div>Bellatrix 278°21.17 6°22.54</div> <div>Elnath 277°59.86 28°37.77</div> <div>Alnilam 275°36.12 -1°10.94</div> <div>Betelgeuse 270°50.40 7°24.81</div> <div>Canopus 263°51.61 -52°42.23</div> <div>Sirius 258°24.90 -16°44.96</div> <div>Adhara 255°4.69 -29°0.23</div> <div>Procyon 244°49.34 5°9.45</div> <div>Pollux 243°15.58 27°57.61</div> <div>Avior 234°14.30 -59°35.37</div> <div>Suhail 222°45.44 -43°32.16</div> <div>Miaplacidus 221°38.39 -69°49.30</div> <div>Alphard 217°46.50 -8°46.35</div> <div>Regulus 207°33.12 11°50.20</div> <div>Dubhe 193°39.79 61°36.23</div> <div>Denebola 182°23.78 14°25.38</div> <div>Gienah 175°42.42 -17°41.34</div> <div>Acrux 172°59.17 -63°14.77</div> <div>Gacrux 171°50.61 -57°15.70</div> <div>Alioth 166°12.26 55°48.84</div> <div>Spica 158°21.11 -11°17.99</div> <div>Alkaid 152°51.35 49°10.81</div> <div>Hadar 148°34.59 -60°30.14</div> <div>Menkent 147°56.31 -36°30.07</div> <div>Arcturus 145°46.93 19°2.66</div> <div>Rigel Kent. 139°38.94 -60°56.80</div> <div>Kochab 137°20.92 74°2.76</div> <div>Zuben'ubi 136°54.73 -16°9.13</div> <div>Alphecca 126°2.83 26°37.61</div> <div>Antares 112°14.32 -26°29.48</div> <div>Atria 107°7.55 -69°4.69</div> <div>Sabik 102°1.32 -15°45.43</div> <div>Shaula 96°8.60 -37°7.44</div> <div>Rasalhague 95°57.37 12°32.60</div> <div>Eltanin 90°41.72 51°29.37</div> <div>Kaus Aust. 83°30.71 -34°22.35</div> <div>Vega 80°32.35 38°48.77</div> <div>Nunki 75°46.03 -26°15.80</div> <div>Altair 61°58.53 8°56.53</div> <div>Peacock 53°3.33 -56°39.07</div> <div>Deneb 49°24.69 45°22.87</div> <div>Enif 33°37.21 10°0.08</div> <div>Al Na'ir 27°30.81 -46°49.92</div> <div>Fomalhaut 15°12.65 -29°28.76</div> <div>Scheat 13°43.52 28°13.93</div> <div>Markab 13°28.20 15°21.18</div> <div>Oct 13 Tue</div> <div>SHA</div> <div>Mer.pass</div> <div>Venus 148°20.54 12:37</div> <div>Mars 228°42.40 07:18</div> <div>Jupiter 215°47.06 08:09</div> <div>Saturn 349°9.47 23:13</div> <div>Oct 14 Wed</div> <div>SHA</div> <div>Mer.pass</div> <div>Venus 148°43.61 12:32</div> <div>Mars 228°8.07 07:17</div> <div>Jupiter 215°37.64 08:06</div> <div>Saturn 349°13.73 23:09</div> <div>Oct 15 Thu</div> <div>SHA</div> <div>Mer.pass</div> <div>Venus 149°8.39 12:26</div> <div>Mars 227°33.94 07:15</div> <div>Jupiter 215°28.34 08:03</div> <div>Saturn 349°17.97 23:05</div> <div>Horizontal parallax</div> <div>Venus: 0.5</div> <div>Mars: 0.1</div>			
1	36°36.81	184°58.27	51.21	265°17.77	18.57	252°23.47	53.31	25°46.45	42.84				
2	51°39.27	200°1.67	50.85	280°18.80	18.25	267°25.54	53.19	40°49.09	42.76				
3	66°41.73	215°5.06	•• 50.48	295°19.84	•• 17.92	282°27.61	•• 53.06	55°51.74	•• 42.69				
4	81°44.20	230°8.46	50.11	310°20.87	17.60	297°29.68	52.94	70°54.38	42.61				
5	96°46.66	245°11.86	49.73	325°21.90	17.28	312°31.75	52.82	85°57.02	42.54				
6	111°49.13	260°15.27	S20°49.35	340°22.93	N19°16.96	327°33.82	N14°52.70	100°59.66	N01°42.47				
7	126°51.59	275°18.68	48.97	355°23.96	16.64	342°35.89	52.58	116°2.30	42.39				
8	141°54.06	290°22.09	48.59	10°24.99	16.32	357°37.96	52.45	131°4.95	42.32				
9	156°56.52	305°25.50	•• 48.21	25°26.03	•• 16.00	12°40.03	•• 52.33	146°7.59	•• 42.24				
10	171°58.98	320°28.92	47.82	40°27.06	15.67	27°42.10	52.21	161°10.23	42.17				
11	187°1.45	335°32.34	47.43	55°28.09	15.35	42°44.18	52.09	176°12.87	42.10				
12	202°3.91	350°35.76	S20°47.03	70°29.12	N19°15.03	57°46.25	N14°51.97	191°15.51	N01°42.02				
13	217°6.38	5°39.19	46.64	85°30.16	14.71	72°48.32	51.85	206°18.16	41.95				
14	232°8.84	20°42.62	46.24	100°31.19	14.39	87°50.39	51.72	221°20.80	41.88				
15	247°11.30	35°46.05	•• 45.84	115°32.23	•• 14.06	102°52.46	•• 51.60	236°23.44	•• 41.80				
16	262°13.77	50°49.49	45.44	130°33.26	13.74	117°54.54	51.48	251°26.08	41.73				
17	277°16.23	65°52.93	45.03	145°34.30	13.42	132°56.61	51.36	266°28.72	41.65				
18	292°18.70	80°56.37	S20°44.63	160°35.33	N19°13.10	147°58.68	N14°51.24	281°31.36	N01°41.58				
19	307°21.16	95°59.82	44.22	175°36.37	12.78	163°0.75	51.12	296°34.00	41.51				
20	322°23.62	111°3.26	43.80	190°37.41	12.45	178°2.83	51.00	311°36.65	41.43				
21	337°26.09	126°6.72	•• 43.39	205°38.44	•• 12.13	193°4.90	•• 50.87	326°39.29	•• 41.36				
22	352°28.55	141°10.17	42.97	220°39.48	11.81	208°6.98	50.75	341°41.93	41.29				
23	7°31.02	156°13.63	42.55	235°40.52	11.48	223°9.05	50.63	356°44.57	41.21				
Mer.pass. 22:30		ν3.4' d-0.4' m-4.43		ν1.0' d-0.3' m1.03		ν2.1' d-0.1' m-1.92		ν2.6' d-0.1' m0.37					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	22°33.48	171°17.09	S20°42.13	250°41.55	N19°11.16	238°11.12	N14°50.51	11°47.21	N01°41.14				
1	37°35.95	186°20.55	41.70	265°42.59	10.84	253°13.20	50.39	26°49.85	41.07				
2	52°38.41	201°24.02	41.27	280°43.63	10.51	268°15.27	50.27	41°52.49	40.99				
3	67°40.87	216°27.49	•• 40.84	295°44.67	•• 10.19	283°17.35	•• 50.15	56°55.13	•• 40.92				
4	82°43.34	231°30.96	40.41	310°45.71	9.87	298°19.42	50.03	71°57.78	40.85				
5	97°45.80	246°34.43	39.97	325°46.75	9.54	313°21.50	49.91	87°0.42	40.77				
6	112°48.27	261°37.91	S20°39.53	340°47.79	N19°9.22	328°23.57	N14°49.78	102°3.06	N01°40.70				
7	127°50.73	276°41.39	39.09	355°48.83	8.90	343°25.65	49.66	117°5.70	40.63				
8	142°53.19	291°44.88	38.65	10°49.87	8.57	358°27.72	49.54	132°8.34	40.55				
9	157°55.66	306°48.36	•• 38.20	25°50.91	•• 8.25	13°29.80	•• 49.42	147°10.98	•• 40.48				
10	172°58.12	321°51.85	37.76	40°51.95	7.93	28°31.87	49.30	162°13.62	40.41				
11	188°0.59	336°55.35	37.31	55°52.99	7.60	43°33.95	49.18	177°16.26	40.33				
12	203°3.05	351°58.84	S20°36.85	70°54.03	N19°7.28	58°36.03	N14°49.06	192°18.90	N01°40.26				
13	218°5.52	7°2.34	36.40	85°55.08	6.95	73°38.10	48.94	207°21.54	40.19				
14	233°7.98	22°5.84	35.94	100°56.12	6.63	88°40.18	48.82	222°24.19	40.11				
15	248°10.44	37°9.34	•• 35.48	115°57.16	•• 6.31	103°42.26	•• 48.70	237°26.83	•• 40.04				
16	263°12.91	52°12.85	35.01	130°58.21	5.98	118°44.33	48.58	252°29.47	39.97				
17	278°15.37	67°16.36	34.55	145°59.25	5.66	133°46.41	48.46	267°32.11	39.89				
18	293°17.84	82°19.87	S20°34.08	161°0.29	N19°5.33	148°48.49	N14°48.34	282°34.75	N01°39.82				
19	308°20.30	97°23.39	33.61	176°1.34	5.01	163°50.57	48.22	297°37.39	39.75				
20	323°22.76	112°26.91	33.13	191°2.38	4.68	178°52.64	48.10	312°40.03	39.68				
21	338°25.23	127°30.43	•• 32.66	206°3.43	•• 4.36	193°54.72	•• 47.98	327°42.67	•• 39.60				
22	353°27.69	142°33.95	32.18	221°4.47	4.03	208°56.80	47.86	342°45.31	39.53				
23	8°30.16	157°37.48	31.70	236°5.52	3.71	223°58.88	47.74	357°47.95	39.46				
Mer.pass. 22:26		ν3.5' d-0.4' m-4.37		ν1.0' d-0.3' m1.02		ν2.1' d-0.1' m-1.92		ν2.6' d-0.1' m0.38					
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	23°32.62	172°41.01	S20°31.21	251°6.56	N19°3.38	239°0.96	N14°47.62	12°50.59	N01°39.38				
1	38°35.08	187°44.54	30.73	266°7.61	3.06	254°3.04	47.50	27°53.23	39.31				
2	53°37.55	202°48.07	30.24	281°8.66	2.73	269°5.12	47.38	42°55.87	39.24				
3	68°40.01	217°51.61	•• 29.75	296°9.71	•• 2.41	284°7.19	•• 47.26	57°58.51	•• 39.17				
4	83°42.48	232°55.15	29.25	311°10.75	2.08	299°9.27	47.14	73°1.15	39.09				
5	98°44.94	247°58.69	28.76	326°11.80	1.76	314°11.35	47.02	88°3.79	39.02				
6	113°47.41	263°2.24	S20°28.26	341°12.85	N19°1.43	329°13.43	N14°46.90	103°6.43	N01°38.95				
7	128°49.87	278°5.79	27.76	356°13.90	1.10	344°15.51	46.78	118°9.07	38.87				
8	143°52.33	293°9.34	27.25	11°14.95	0.78	359°17.59	46.66	133°11.71	38.80				
9	158°54.80	308°12.89	•• 26.75	26°16.00	•• 0.45	14°19.67	•• 46.54	148°14.35	•• 38.73				
10	173°57.26	323°16.45	26.24	41°17.05	19°0.13	29°21.75	46.42	163°16.99	38.66				
11	188°59.73	338°20.00	25.73	56°18.10	18°59.80	44°23.83	46.31	178°19.63	38.58				
12	204°2.19	353°23.57	S20°25.21	71°19.15	N18°59.47	59°25.92	N14°46.19	193°22.27	N01°38.51				
13	219°4.65	8°27.13	24.70	86°20.20	59.15	74°28.00	46.07	2					

h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
Tue								
0	183°24.55	S07°41.79		158°23.89	11.7'	S21°44.71	9.5'	55.2'
1	198°24.70	42.73		172°54.56	11.6'	21°54.20	9.4'	55.2'
2	213°24.85	43.66		187°25.19	11.6'	22°3.59	9.3'	55.2'
3	228°25.00	44.60		201°55.78	11.5'	22°12.86	9.2'	55.2'
4	243°25.15	45.53		216°26.32	11.5'	22°22.02	9.1'	55.1'
5	258°25.30	46.47		230°56.81	11.5'	22°31.07	8.9'	55.1'
6	273°25.45	S07°47.40		245°27.27	11.4'	S22°40.01	8.8'	55.1'
7	288°25.60	48.34		259°57.68	11.4'	22°48.84	8.7'	55.1'
8	303°25.76	49.27		274°28.04	11.3'	22°57.55	8.6'	55.1'
9	318°25.91	50.20		288°58.36	11.3'	23°6.14	8.5'	55.1'
10	333°26.05	51.14		303°28.64	11.2'	23°14.62	8.4'	55.0'
11	348°26.20	52.07		317°58.88	11.2'	23°22.99	8.2'	55.0'
12	3°26.35	S07°53.00		332°29.07	11.2'	S23°31.23	8.1'	55.0'
13	18°26.50	53.94		346°59.23	11.1'	23°39.36	8.0'	55.0'
14	33°26.65	54.87		1°29.34	11.1'	23°47.37	7.9'	55.0'
15	48°26.80	55.80		15°59.41	11.0'	23°55.26	7.8'	54.9'
16	63°26.95	56.73		30°29.43	11.0'	24°3.04	7.7'	54.9'
17	78°27.10	57.67		44°59.42	10.9'	24°10.69	7.5'	54.9'
18	93°27.25	S07°58.60		59°29.37	10.9'	S24°18.22	7.4'	54.9'
19	108°27.39	07°59.53		73°59.28	10.9'	24°25.63	7.3'	54.9'
20	123°27.54	08°0.46		88°29.14	10.8'	24°32.92	7.2'	54.8'
21	138°27.69	1.39		102°58.97	10.8'	24°40.08	7.0'	54.8'
22	153°27.84	2.33		117°28.76	10.8'	24°47.13	6.9'	54.8'
23	168°27.98	3.26		131°58.52	10.7'	24°54.04	6.8'	54.8'
SD = 16.0' $d = 0.9'$								
SD = 15.1'								

Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	183°28.13	S08°4.19		146°28.23	10.7'	S25°0.84	6.7'	54.8'
1	198°28.27	5.12		160°57.91	10.6'	25°7.51	6.5'	54.8'
2	213°28.42	6.05		175°27.55	10.6'	25°14.05	6.4'	54.7'
3	228°28.57	6.98		189°57.16	10.6'	25°20.47	6.3'	54.7'
4	243°28.71	7.91		204°26.73	10.5'	25°26.76	6.2'	54.7'
5	258°28.86	8.84		218°56.27	10.5'	25°32.93	6.0'	54.7'
6	273°29.00	S08°9.77		233°25.78	10.5'	S25°38.97	5.9'	54.7'
7	288°29.15	10.70		247°55.25	10.4'	25°44.88	5.8'	54.7'
8	303°29.29	11.63		262°24.69	10.4'	25°50.66	5.7'	54.6'
9	318°29.44	12.56		276°54.10	10.4'	25°56.32	5.5'	54.6'
10	333°29.58	13.49		291°23.47	10.3'	26°1.84	5.4'	54.6'
11	348°29.73	14.41		305°52.82	10.3'	26°7.24	5.3'	54.6'
12	3°29.87	S08°15.34		320°22.14	10.3'	S26°12.50	5.1'	54.6'
13	18°30.01	16.27		334°51.43	10.3'	26°17.64	5.0'	54.6'
14	33°30.16	17.20		349°20.69	10.2'	26°22.64	4.9'	54.6'
15	48°30.30	18.13		3°49.93	10.2'	26°27.52	4.7'	54.5'
16	63°30.44	19.05		18°19.14	10.2'	26°32.26	4.6'	54.5'
17	78°30.59	19.98		32°48.32	10.2'	26°36.87	4.5'	54.5'
18	93°30.73	S08°20.91		47°17.48	10.1'	S26°41.35	4.3'	54.5'
19	108°30.87	21.84		61°46.62	10.1'	26°45.69	4.2'	54.5'
20	123°31.01	22.76		76°15.73	10.1'	26°49.90	4.1'	54.5'
21	138°31.15	23.69		90°44.82	10.1'	26°53.98	3.9'	54.5'
22	153°31.30	24.62		105°13.89	10.1'	26°57.93	3.8'	54.4'
23	168°31.44	25.54		119°42.94	10.0'	27°1.74	3.7'	54.4'
SD = 16.0' $d = 0.9'$								
SD = 14.9'								

Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	183°31.58	S08°26.47		134°11.98	10.0'	S27°5.42	3.5'	54.4'
1	198°31.72	27.39		148°40.99	10.0'	27°8.97	3.4'	54.4'
2	213°31.86	28.32		163°9.99	10.0'	27°12.38	3.3'	54.4'
3	228°32.00	29.24		177°38.97	10.0'	27°15.66	3.1'	54.4'
4	243°32.14	30.17		192°7.94	10.0'	27°18.80	3.0'	54.4'
5	258°32.28	31.10		206°36.89	9.9'	27°21.81	2.9'	54.4'
6	273°32.42	S08°32.02		221°5.83	9.9'	S27°24.68	2.7'	54.3'
7	288°32.56	32.94		235°34.76	9.9'	27°27.41	2.6'	54.3'
8	303°32.70	33.87		250°3.67	9.9'	27°30.01	2.5'	54.3'
9	318°32.84	34.79		264°32.58	9.9'	27°32.48	2.3'	54.3'
10	333°32.98	35.72		279°1.48	9.9'	27°34.81	2.2'	54.3'
11	348°33.11	36.64		293°30.37	9.9'	27°37.00	2.1'	54.3'
12	3°33.25	S08°37.56		307°59.25	9.9'	S27°39.06	1.9'	54.3'
13	18°33.39	38.49		322°28.12	9.9'	27°40.98	1.8'	54.3'
14	33°33.53	39.41		336°57.00	9.9'	27°42.77	1.7'	54.3'
15	48°33.67	40.33		351°25.86	9.9'	27°44.42	1.5'	54.3'
16	63°33.80	41.26		5°54.73	9.9'	27°45.93	1.4'	54.3'
17	78°33.94	42.18		20°23.59	9.9'	27°47.31	1.2'	54.2'
18	93°34.08	S08°43.10		34°52.46	9.9'	S27°48.55	1.1'	54.2'
19	108°34.21	44.02		49°21.32	9.9'	27°49.66	1.0'	54.2'
20	123°34.35	44.94		63°50.19	9.9'	27°50.63	0.8'	54.2'
21	138°34.49	45.87		78°19.05	9.9'	27°51.46	0.7'	54.2'
22	153°34.62	46.79		92°47.92	9.9'	27°52.16	0.6'	54.2'
23	168°34.76	47.71		107°16.80	9.9'	27°52.72	0.4'	54.2'
SD = 16.0' $d = 0.9'$								
SD = 14.8'								

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

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

October 16, 17, 18 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	24°31.76	174°6.50	S20°18.85	251°31.78	N18°55.55	239°50.90	N14°44.76	13°53.95	N01°37.64	Alpheratz	357°32.94	29°14.53	
1	39°34.22	189°10.09	18.31	266°32.83	55.23	254°52.99	44.64	28°56.59	37.57	Ankaa	353°5.31	-42°9.54	
2	54°36.69	204°13.69	17.76	281°33.89	54.90	269°55.07	44.52	43°59.23	37.50	Schedar	349°28.82	56°41.25	
3	69°39.15	219°17.29	•• 17.21	296°34.94	•• 54.57	284°57.15	•• 44.40	59°1.87	•• 37.43	Diphda	348°45.52	-17°50.23	
4	84°41.62	234°20.89	16.66	311°36.00	54.24	299°59.24	44.29	74°4.50	37.36	Achernar	335°18.52	-57°5.92	
5	99°44.08	249°24.50	16.10	326°37.06	53.92	315°1.32	44.17	89°7.14	37.28	Hamal	327°49.21	23°35.49	
6	114°46.55	264°28.10	S20°15.54	341°38.11	N18°53.59	330°3.41	N14°44.05	104°9.78	N01°37.21	Polaris	312°49.55	89°22.49	
7	129°49.01	279°31.71	14.98	356°39.17	53.26	345°5.49	43.93	119°12.42	37.14	Acamar	315°10.28	-40°11.62	
8	144°51.47	294°35.32	14.42	11°40.23	52.93	0°7.57	43.81	134°15.06	37.07	Menkar	314°4.33	4°11.84	
9	159°53.94	309°38.94	•• 13.85	26°41.29	•• 52.61	15°9.66	•• 43.70	149°17.70	•• 37.00	Mirfak	308°25.72	49°57.36	
10	174°56.40	324°42.55	13.28	41°42.34	52.28	30°11.74	43.58	164°20.34	36.92	Aldebaran	290°37.71	16°33.85	
11	189°58.87	339°46.17	12.71	56°43.40	51.95	45°13.83	43.46	179°22.98	36.85	Rigel	281°2.28	-8°10.06	
12	205°1.33	354°49.79	S20°12.14	71°44.46	N18°51.62	60°15.92	N14°43.34	194°25.62	N01°36.78	Capella	280°19.47	46°1.37	
13	220°3.79	9°53.41	11.56	86°45.52	51.29	75°18.00	43.22	209°28.26	36.71	Bellatrix	278°21.14	6°22.54	
14	235°6.26	24°57.04	10.98	101°46.58	50.97	90°20.09	43.11	224°30.89	36.64	Elnath	277°59.83	28°37.77	
15	250°8.72	40°0.67	•• 10.40	116°47.64	•• 50.64	105°22.17	•• 42.99	239°33.53	•• 36.57	Alnilam	275°36.09	-1°10.95	
16	265°11.19	55°4.30	9.82	131°48.70	50.31	120°24.26	42.87	254°36.17	36.49	Betelgeuse	270°50.37	7°24.81	
17	280°13.65	70°7.93	9.24	146°49.76	49.98	135°26.35	42.75	269°38.81	36.42	Canopus	263°51.57	-52°42.23	
18	295°16.12	85°11.56	S20°8.65	161°50.82	N18°49.65	150°28.43	N14°42.64	284°41.45	N01°36.35	Sirius	258°24.87	-16°44.96	
19	310°18.58	100°15.20	8.06	176°51.88	49.32	165°30.52	42.52	299°44.09	36.28	Adhara	255°4.66	-29°0.23	
20	325°21.04	115°18.84	7.46	191°52.94	48.99	180°32.61	42.40	314°46.73	36.21	Procyon	244°49.31	5°9.45	
21	340°23.51	130°22.48	•• 6.87	206°54.01	•• 48.67	195°34.69	•• 42.28	329°49.36	•• 36.14	Pollux	243°15.55	27°57.61	
22	355°25.97	145°26.12	6.27	221°55.07	48.34	210°36.78	42.17	344°52.00	36.06	Avior	234°14.26	-59°35.37	
23	10°28.44	160°29.77	5.67	236°56.13	48.01	225°38.87	42.05	359°54.64	35.99	Suhail	222°45.41	-43°32.16	
Mer.pass. 22:18		ν3.6' d-0.5' m-4.25		ν1.1' d-0.3' m1.00		ν2.1' d-0.1' m-1.93		ν2.6' d-0.1' m0.39		Miaplacidus 221°38.34 -69°49.30			
										Alphard 217°46.48 -8°46.35			
										Regulus 207°33.10 11°50.20			
										Dubhe 193°39.76 61°36.21			
										Denebola 182°23.77 14°25.37			
										Gienah 175°42.41 -17°41.34			
										Acrux 172°59.15 -63°14.76			
										Gacrux 171°50.59 -57°15.69			
										Alioth 166°12.26 55°48.82			
										Spica 158°21.10 -11°18.00			
										Alkaid 152°51.35 49°10.79			
										Hadar 148°34.58 -60°30.13			
										Menkent 147°56.30 -36°30.06			
										Arcturus 145°46.92 19°2.65			
										Rigel Kent. 139°38.94 -60°56.79			
										Kochab 137°20.95 74°2.75			
										Zuben'ubi 136°54.73 -16°9.13			
										Alphecca 126°2.83 26°37.60			
										Antares 112°14.32 -26°29.47			
										Atria 107°7.57 -69°4.68			
										Sabik 102°1.32 -15°45.43			
										Shaula 96°8.61 -37°7.44			
										Rasalhague 95°57.38 12°32.59			
										Eltanin 90°41.74 51°29.37			
										Kaus Aust. 83°30.72 -34°22.35			
										Vega 80°32.36 38°48.77			
										Nunki 75°46.04 -26°15.80			
										Altair 61°58.54 8°56.53			
										Peacock 53°3.34 -56°39.07			
										Deneb 49°24.70 45°22.87			
										Enif 33°37.21 10°0.08			
										Al Na'ir 27°30.82 -46°49.92			
										Fomalhaut 15°12.65 -29°28.76			
										Scheat 13°43.52 28°13.94			
										Markab 13°28.20 15°21.19			
										Oct 16 Fri SHA Mer.pass			
										Venus 149°34.74 12:21			
										Mars 227°0.02 07:13			
										Jupiter 215°19.14 07:59			
										Saturn 349°22.19 23:00			
										Oct 17 Sat SHA Mer.pass			
										Venus 150°2.51 12:15			
										Mars 226°26.29 07:12			
										Jupiter 215°10.06 07:56			
										Saturn 349°26.38 22:56			
										Oct 18 Sun SHA Mer.pass			
										Venus 150°31.53 12:09			
										Mars 225°52.78 07:10			
										Jupiter 215°1.09 07:53			
										Saturn 349°30.54 22:52			
										Horizontal parallax			
										Venus: 0.5			
										Mars: 0.1			
Mer.pass. 22:10		ν3.7' d-0.7' m-4.11		ν1.1' d-0.3' m0.99		ν2.1' d-0.1' m-1.94		ν2.6' d-0.1' m0.40					

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	183°34.89	S08°48.63	121°45.68	9.9'	S27°53.15	0.3'	54.2'
1	198°35.03	49.55	136°14.57	9.9'	27°53.44	0.2'	54.2'
2	213°35.16	50.47	150°43.47	9.9'	27°53.59	0.0'	54.2'
3	228°35.30	51.39	165°12.37	9.9'	27°53.61	-0.1'	54.2'
4	243°35.43	52.31	179°41.29	9.9'	27°53.49	-0.3'	54.2'
5	258°35.57	53.23	194°10.21	9.9'	27°53.24	-0.4'	54.2'
6	273°35.70	S08°54.15	208°39.15	10.0'	S27°52.85	-0.5'	54.2'
7	288°35.83	55.07	223°8.10	10.0'	27°52.32	-0.7'	54.2'
8	303°35.97	55.99	237°37.07	10.0'	27°51.66	-0.8'	54.1'
9	318°36.10	56.91	252°6.05	10.0'	27°50.87	-0.9'	54.1'
10	333°36.23	57.83	266°35.04	10.0'	27°49.94	-1.1'	54.1'
11	348°36.37	58.74	281°4.06	10.0'	27°48.88	-1.2'	54.1'
12	3°36.50	S08°59.66	295°33.09	10.1'	S27°47.68	-1.3'	54.1'
13	18°36.63	09°05.58	310°2.14	10.1'	27°46.35	-1.5'	54.1'
14	33°36.76	1.50	324°31.21	10.1'	27°44.89	-1.6'	54.1'
15	48°36.89	2.41	339°0.30	10.1'	27°43.29	-1.7'	54.1'
16	63°37.03	3.33	353°29.41	10.1'	27°41.56	-1.9'	54.1'
17	78°37.16	4.25	7°58.55	10.2'	27°39.70	-2.0'	54.1'
18	93°37.29	S09°5.17	22°27.71	10.2'	S27°37.70	-2.1'	54.1'
19	108°37.42	6.08	36°56.89	10.2'	27°35.57	-2.3'	54.1'
20	123°37.55	7.00	51°26.10	10.2'	27°33.31	-2.4'	54.1'
21	138°37.68	7.92	65°55.34	10.3'	27°30.92	-2.5'	54.1'
22	153°37.81	8.83	80°24.60	10.3'	27°28.39	-2.7'	54.1'
23	168°37.94	9.75	94°53.89	10.3'	27°25.74	-2.8'	54.1'
SD = 16.0'			SD = 14.8'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°38.07	S09°10.66	109°23.22	10.4'	S27°22.95	-2.9'	54.1'
1	198°38.20	11.58	123°52.57	10.4'	27°20.03	-3.0'	54.1'
2	213°38.33	12.49	138°21.95	10.4'	27°16.99	-3.2'	54.1'
3	228°38.45	13.41	152°51.36	10.4'	27°13.81	-3.3'	54.1'
4	243°38.58	14.32	167°20.81	10.5'	27°10.50	-3.4'	54.1'
5	258°38.71	15.24	181°50.28	10.5'	27°7.07	-3.6'	54.1'
6	273°38.84	S09°16.15	196°19.80	10.5'	S27°3.51	-3.7'	54.1'
7	288°38.97	17.06	210°49.34	10.6'	26°59.82	-3.8'	54.1'
8	303°39.09	17.98	225°18.92	10.6'	26°56.00	-3.9'	54.1'
9	318°39.22	18.89	239°48.54	10.7'	26°52.05	-4.1'	54.1'
10	333°39.35	19.80	254°18.20	10.7'	26°47.98	-4.2'	54.1'
11	348°39.48	20.72	268°47.89	10.7'	26°43.78	-4.3'	54.1'
12	3°39.60	S09°21.63	283°17.62	10.8'	S26°39.46	-4.4'	54.1'
13	18°39.73	22.54	297°47.39	10.8'	26°35.01	-4.6'	54.1'
14	33°39.85	23.45	312°17.19	10.8'	26°30.43	-4.7'	54.2'
15	48°39.98	24.37	326°47.04	10.9'	26°25.73	-4.8'	54.2'
16	63°40.10	25.28	341°16.93	10.9'	26°20.91	-4.9'	54.2'
17	78°40.23	26.19	355°46.86	11.0'	26°15.96	-5.1'	54.2'
18	93°40.35	S09°27.10	10°16.82	11.0'	S26°10.89	-5.2'	54.2'
19	108°40.48	28.01	24°46.84	11.1'	26°5.70	-5.3'	54.2'
20	123°40.60	28.92	39°16.89	11.1'	26°0.39	-5.4'	54.2'
21	138°40.73	29.83	53°46.99	11.1'	25°54.95	-5.6'	54.2'
22	153°40.85	30.74	68°17.13	11.2'	25°49.40	-5.7'	54.2'
23	168°40.98	31.65	82°47.31	11.2'	25°43.72	-5.8'	54.2'
SD = 16.0'			SD = 14.8'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°41.10	S09°32.56	97°17.54	11.3'	S25°37.92	-5.9'	54.2'
1	198°41.22	33.47	111°47.81	11.3'	25°32.01	-6.0'	54.2'
2	213°41.34	34.38	126°18.13	11.4'	25°25.97	-6.2'	54.2'
3	228°41.47	35.29	140°48.49	11.4'	25°19.82	-6.3'	54.2'
4	243°41.59	36.20	155°18.90	11.5'	25°13.55	-6.4'	54.2'
5	258°41.71	37.11	169°49.35	11.5'	25°7.16	-6.5'	54.3'
6	273°41.83	S09°38.02	184°19.85	11.5'	S25°0.66	-6.6'	54.3'
7	288°41.96	38.92	198°50.39	11.6'	24°54.04	-6.7'	54.3'
8	303°42.08	39.83	213°20.99	11.6'	24°47.31	-6.8'	54.3'
9	318°42.20	40.74	227°51.63	11.7'	24°40.46	-7.0'	54.3'
10	333°42.32	41.65	242°22.31	11.7'	24°33.49	-7.1'	54.3'
11	348°42.44	42.55	256°53.05	11.8'	24°26.42	-7.2'	54.3'
12	3°42.56	S09°43.46	271°23.83	11.8'	S24°19.23	-7.3'	54.3'
13	18°42.68	44.37	285°54.66	11.9'	24°11.92	-7.4'	54.3'
14	33°42.80	45.27	300°25.53	11.9'	24°4.51	-7.5'	54.3'
15	48°42.92	46.18	314°56.46	12.0'	23°56.98	-7.6'	54.4'
16	63°43.04	47.09	329°27.43	12.0'	23°49.35	-7.7'	54.4'
17	78°43.16	47.99	343°58.45	12.1'	23°41.60	-7.9'	54.4'
18	93°43.28	S09°48.90	358°29.52	12.1'	S23°33.75	-8.0'	54.4'
19	108°43.39	49.80	13°0.63	12.2'	23°25.78	-8.1'	54.4'
20	123°43.51	50.71	27°31.80	12.2'	23°17.71	-8.2'	54.4'
21	138°43.63	51.61	42°3.01	12.3'	23°9.53	-8.3'	54.4'
22	153°43.75	52.52	56°34.27	12.3'	23°1.24	-8.4'	54.4'
23	168°43.87	53.42	71°5.58	12.4'	22°52.85	-8.5'	54.5'
SD = 16.0'			SD = 14.8'				

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

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

Day	Sun			Moon		
	Eqn.of Time 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 26-44%
16	14:20	14:26	11:46	16:27	04:01	
17	14:32	14:38	11:45	17:17	04:52	
18	14:44	14:50	11:45	18:06	05:42	

October 19, 20, 21 UT (Mon., Tue., Wed.)

h	Aries			Venus		Mars		Jupiter		Saturn		Stars		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	27°29.18	178°30.79	S19°33.37	252°48.65	N18°31.80	242°21.41	N14°36.38	17°3.86	N01°32.53			Alpheratz	357°32.94 29°14.53	
1	42°31.64	193°34.52	32.65	267°49.73	31.47	257°23.51	36.26	32°6.49	32.46			Ankaa	353°5.31 -42°9.55	
2	57°34.11	208°38.26	31.93	282°50.81	31.14	272°25.61	36.15	47°9.13	32.39			Schedar	349°28.82 56°41.26	
3	72°36.57	223°42.00	•• 31.21	297°51.89	•• 30.80	287°27.71	•• 36.03	62°11.76	•• 32.32			Diphda	348°45.52 -17°50.23	
4	87°39.04	238°45.74	30.49	312°52.97	30.47	302°29.80	35.92	77°14.40	32.25			Achernar	335°18.51 -57°5.93	
5	102°41.50	253°49.49	29.76	327°54.05	30.14	317°31.90	35.81	92°17.03	32.18			Hamal	327°49.20 23°35.49	
6	117°43.96	268°53.23	S19°29.03	342°55.14	N18°29.81	332°34.00	N14°35.69	107°19.67	N01°32.11			Polaris	312°48.72 89°22.51	
7	132°46.43	283°56.98	28.30	357°56.22	29.47	347°36.10	35.58	122°22.30	32.04			Acamar	315°10.26 -40°11.63	
8	147°48.89	299°0.72	27.57	12°57.30	29.14	2°38.20	35.46	137°24.94	31.97			Menkar	314°4.31 4°11.84	
9	162°51.36	314°4.47	•• 26.84	27°58.39	•• 28.81	17°40.30	•• 35.35	152°27.57	•• 31.90			Mirfak	308°25.70 49°57.38	
10	177°53.82	329°8.22	26.10	42°59.47	28.47	32°42.40	35.24	167°30.21	31.83			Aldebaran	290°37.69 16°33.86	
11	192°56.28	344°11.97	25.36	58°0.55	28.14	47°44.50	35.12	182°32.85	31.76			Rigel	281°2.26 -8°10.06	
12	207°58.75	359°15.73	S19°24.62	73°1.64	N18°27.81	62°46.60	N14°35.01	197°35.48	N01°31.69			Capella	280°19.44 46°1.38	
13	223°1.21	14°19.48	23.87	88°2.72	27.47	77°48.70	34.89	212°38.12	31.62			Bellatrix	278°21.12 6°22.54	
14	238°3.68	29°23.23	23.13	103°3.81	27.14	92°50.80	34.78	227°40.75	31.55			Elnath	277°59.80 28°37.77	
15	253°6.14	44°26.99	•• 22.38	118°4.90	•• 26.81	107°52.90	•• 34.67	242°43.38	•• 31.48			Alnilam	275°36.07 -1°10.95	
16	268°8.61	59°30.75	21.63	133°5.98	26.47	122°55.00	34.55	257°46.02	31.42			Betelgeuse	270°50.35 7°24.81	
17	283°11.07	74°34.51	20.88	148°7.07	26.14	137°57.10	34.44	272°48.65	31.35			Canopus	263°51.54 -52°42.24	
18	298°13.53	89°38.27	S19°20.13	163°8.15	N18°25.81	152°59.20	N14°34.33	287°51.29	N01°31.28			Sirius	258°24.85 -16°44.97	
19	313°16.00	104°42.03	19.37	178°9.24	25.47	168°1.30	34.21	302°53.92	31.21			Adhara	255°4.63 -29°0.24	
20	328°18.46	119°45.79	18.61	193°10.33	25.14	183°3.40	34.10	317°56.56	31.14			Procyon	244°49.29 5°9.44	
21	343°20.93	134°49.55	•• 17.85	208°11.42	•• 24.81	198°5.51	•• 33.99	332°59.19	•• 31.07			Pollux	243°15.52 27°57.60	
22	358°23.39	149°53.32	17.09	223°12.51	24.47	213°7.61	33.88	348°1.83	31.00			Avior	234°14.23 -59°35.37	
23	13°25.85	164°57.09	16.32	238°13.59	24.14	228°9.71	33.76	3°4.46	30.93			Suhail	222°45.39 -43°32.16	
Mer.pass. 22:06		ν3.7' d-0.7' m-4.14			ν1.1' d-0.3' m0.98		ν2.1' d-0.1' m-1.94		ν2.6' d-0.1' m0.40					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	28°28.32	180°0.85	S19°15.56	253°14.68	N18°23.80	243°11.81	N14°33.65	18°7.10	N01°30.86			Miaplacidus	221°38.30 -69°49.30	
1	43°30.78	195°4.62	14.79	268°15.77	23.47	258°13.92	33.54	33°9.73	30.79			Alphard	217°46.46 -8°46.36	
2	58°33.25	210°8.39	14.02	283°16.86	23.14	273°16.02	33.42	48°12.37	30.72			Regulus	207°33.08 11°50.19	
3	73°35.71	225°12.16	•• 13.24	298°17.95	•• 22.80	288°18.12	•• 33.31	63°15.00	•• 30.65			Dubhe	193°39.73 61°36.20	
4	88°38.17	240°15.93	12.47	313°19.04	22.47	303°20.22	33.20	78°17.63	30.59			Denebola	182°23.75 14°25.36	
5	103°40.64	255°19.70	11.69	328°20.13	22.13	318°22.33	33.09	93°20.27	30.52			Gienah	175°42.40 -17°41.34	
6	118°43.10	270°23.48	S19°10.91	343°21.23	N18°21.80	333°24.43	N14°32.97	108°22.90	N01°30.45			Acrux	172°59.13 -63°14.75	
7	133°45.57	285°27.25	10.13	358°22.32	21.46	348°26.54	32.86	123°25.54	30.38			Gacrux	171°50.58 -57°15.68	
8	148°48.03	300°31.03	9.35	13°23.41	21.13	3°28.64	32.75	138°28.17	30.31			Alioth	166°12.24 55°48.80	
9	163°50.50	315°34.80	•• 8.56	28°24.50	•• 20.80	18°30.74	•• 32.64	153°30.80	•• 30.24			Spica	158°21.09 -11°18.00	
10	178°52.96	330°38.58	7.77	43°25.59	20.46	33°32.85	32.52	168°33.44	30.17			Alkaid	152°51.35 49°10.77	
11	193°55.42	345°42.36	6.98	58°26.69	20.13	48°34.95	32.41	183°36.07	30.10			Hadar	148°34.58 -60°30.12	
12	208°57.89	0°46.14	S19°6.19	73°27.78	N18°19.79	63°37.06	N14°32.30	198°38.70	N01°30.04			Menkent	147°56.29 -36°30.06	
13	224°0.35	15°49.92	5.40	88°28.87	19.46	78°39.16	32.19	213°41.34	29.97			Arcturus	145°46.92 19°2.64	
14	239°2.82	30°53.70	4.60	103°29.97	19.12	93°41.27	32.07	228°43.97	29.90			Rigel Kent.	139°38.94 -60°56.78	
15	254°5.28	45°57.48	•• 3.81	118°31.06	•• 18.79	108°43.37	•• 31.96	243°46.60	•• 29.83			Kochab	137°20.97 74°2.73	
16	269°7.74	61°1.27	3.01	133°32.16	18.45	123°45.48	31.85	258°49.24	29.76			Zuben'ubi	136°54.73 -16°9.13	
17	284°10.21	76°5.05	2.20	148°33.25	18.12	138°47.58	31.74	273°51.87	29.69			Alphecca	126°2.83 26°37.58	
18	299°12.67	91°8.83	S19°1.40	163°34.35	N18°17.78	153°49.69	N14°31.63	288°54.50	N01°29.62			Antares	112°14.33 -26°29.47	
19	314°15.14	106°12.62	19°0.59	178°35.44	17.45	168°51.80	31.52	303°57.14	29.56			Atria	107°7.60 -69°4.67	
20	329°17.60	121°16.40	18°59.79	193°36.54	17.11	183°53.90	31.40	318°59.77	29.49			Sabik	102°1.33 -15°45.43	
21	344°20.06	136°20.19	•• 58.98	208°37.64	•• 16.78	198°56.01	•• 31.29	334°2.40	•• 29.42			Shaula	96°8.62 -37°7.43	
22	359°22.53	151°23.98	58.16	223°38.73	16.44	213°58.12	31.18	349°5.04	29.35			Rasalhague	95°57.39 12°32.59	
23	14°24.99	166°27.77	57.35	238°39.83	16.11	229°0.22	31.07	4°7.67	29.28			Eltanin	90°41.76 51°29.36	
Mer.pass. 22:02		ν3.8' d-0.8' m-4.23			ν1.1' d-0.3' m0.97		ν2.1' d-0.1' m-1.95		ν2.6' d-0.1' m0.41					
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	29°27.46	181°31.56	S18°56.54	253°40.93	N18°15.77	244°2.33	N14°30.96	19°10.30	N01°29.21			Kaus Aust.	83°30.73 -34°22.35	
1	44°29.92	196°35.35	55.72	268°42.03	15.44	259°4.44	30.85	34°12.94	29.15			Vega	80°32.38 38°48.76	
2	59°32.38	211°39.14	54.90	283°43.13	15.10	274°6.55	30.73	49°15.57	29.08			Nunki	75°46.05 -26°15.80	
3	74°34.85	226°42.93	•• 54.08	298°44.23	•• 14.76	289°8.65	•• 30.62	64°18.20	•• 29.01			Altair	61°58.55 -8°56.53	
4	89°37.31	241°46.72	53.25	313°45.32	14.43	304°10.76	30.51	79°20.83	28.94			Peacock	53°3.36 -56°39.07	
5	104°39.78	256°50.51	52.43	328°46.42	14.09	319°12.87	30.40	94°23.47	28.87			Deneb	49°24.72 45°22.87	
6	119°42.24	271°54.31	S18°51.60	343°47.52	N18°13.76	334°14.98	N14°30.29	109°26.10	N01°28.81			Enif	33°37.22 10°0.08	
7	134°44.71	286°58.10	50.77	358°48.62	13.42	349°17.09	30.18	124°28.73	28.74			Al Na'ir	27°30.83 -46°49.93	
8	149°47.17	302°1.90	49.94	13°49.72	13.09	4°19.20	30.07	139°31.36	28.2					

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		183°43.98	S09°54.32	85°36.93	12.4'	S22°44.35	-8.6' 54.5'
1		198°44.10	55.23	100°8.34	12.5'	22°35.75	-8.7' 54.5'
2		213°44.22	56.13	114°39.79	12.5'	22°27.04	-8.8' 54.5'
3		228°44.33	57.03	129°11.28	12.5'	22°18.23	-8.9' 54.5'
4		243°44.45	57.94	143°42.83	12.6'	22°9.32	-9.0' 54.5'
5		258°44.56	58.84	158°14.42	12.6'	22°0.30	-9.1' 54.6'
6		273°44.68	S09°59.74	172°46.06	12.7'	S21°51.19	-9.2' 54.6'
7		288°44.80	10°0.64	187°17.75	12.7'	21°41.97	-9.3' 54.6'
8		303°44.91	1.55	201°49.48	12.8'	21°32.65	-9.4' 54.6'
9		318°45.02	2.45	216°21.26	12.8'	21°23.23	-9.5' 54.6'
10		333°45.14	3.35	230°53.08	12.9'	21°13.71	-9.6' 54.6'
11		348°45.25	4.25	245°24.95	12.9'	21°4.10	-9.7' 54.7'
12		3°45.37	S10°5.15	259°56.87	13.0'	S20°54.38	-9.8' 54.7'
13		18°45.48	6.05	274°28.83	13.0'	20°44.57	-9.9' 54.7'
14		33°45.59	6.95	289°0.83	13.0'	20°34.66	-10.0' 54.7'
15		48°45.71	7.85	303°32.88	13.1'	20°24.66	-10.1' 54.7'
16		63°45.82	8.75	318°4.98	13.1'	20°14.56	-10.2' 54.7'
17		78°45.93	9.65	332°37.11	13.2'	20°4.37	-10.3' 54.8'
18		93°46.05	S10°10.55	347°9.29	13.2'	S19°54.08	-10.4' 54.8'
19		108°46.16	11.45	1°41.52	13.3'	19°43.71	-10.5' 54.8'
20		123°46.27	12.35	16°13.78	13.3'	19°33.23	-10.6' 54.8'
21		138°46.38	13.24	30°46.09	13.3'	19°22.67	-10.7' 54.8'
22		153°46.49	14.14	45°18.44	13.4'	19°12.02	-10.7' 54.9'
23		168°46.60	15.04	59°50.83	13.4'	19°1.27	-10.8' 54.9'
		SD = 16.0'		SD = 14.9'			
		$d = 0.9'$					
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		183°46.71	S10°15.94	74°23.26	13.5'	S18°50.44	-10.9' 54.9'
1		198°46.82	16.84	88°55.73	13.5'	18°39.51	-11.0' 54.9'
2		213°46.94	17.73	103°28.24	13.5'	18°28.50	-11.1' 55.0'
3		228°47.05	18.63	118°0.78	13.6'	18°17.40	-11.2' 55.0'
4		243°47.15	19.53	132°33.37	13.6'	18°6.22	-11.3' 55.0'
5		258°47.26	20.42	147°5.99	13.7'	17°54.94	-11.4' 55.0'
6		273°47.37	S10°21.32	161°38.66	13.7'	S17°43.58	-11.4' 55.0'
7		288°47.48	22.21	176°11.35	13.7'	17°32.14	-11.5' 55.1'
8		303°47.59	23.11	190°44.09	13.8'	17°20.61	-11.6' 55.1'
9		318°47.70	24.00	205°16.86	13.8'	17°9.00	-11.7' 55.1'
10		333°47.81	24.90	219°49.66	13.8'	16°57.31	-11.8' 55.1'
11		348°47.91	25.79	234°22.50	13.9'	16°45.53	-11.9' 55.2'
12		3°48.02	S10°26.69	248°55.37	13.9'	S16°33.68	-11.9' 55.2'
13		18°48.13	27.58	263°28.27	13.9'	16°21.74	-12.0' 55.2'
14		33°48.24	28.48	278°1.21	14.0'	16°9.72	-12.1' 55.2'
15		48°48.34	29.37	292°34.18	14.0'	15°57.62	-12.2' 55.3'
16		63°48.45	30.26	307°7.18	14.0'	15°45.45	-12.3' 55.3'
17		78°48.56	31.16	321°40.21	14.1'	15°33.20	-12.3' 55.3'
18		93°48.66	S10°32.05	336°13.26	14.1'	S15°20.86	-12.4' 55.3'
19		108°48.77	32.94	350°46.35	14.1'	15°8.46	-12.5' 55.4'
20		123°48.87	33.83	5°19.46	14.1'	14°55.98	-12.6' 55.4'
21		138°48.98	34.73	19°52.60	14.2'	14°43.42	-12.6' 55.4'
22		153°49.08	35.62	34°25.77	14.2'	14°30.79	-12.7' 55.4'
23		168°49.19	36.51	48°58.96	14.2'	14°18.08	-12.8' 55.5'
		SD = 16.1'		SD = 15.0'			
		$d = 0.9'$					
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		183°49.29	S10°37.40	63°32.18	14.2'	S14°5.30	-12.9' 55.5'
1		198°49.39	38.29	78°5.42	14.3'	13°52.45	-12.9' 55.5'
2		213°49.50	39.18	92°38.68	14.3'	13°39.53	-13.0' 55.6'
3		228°49.60	40.07	107°11.97	14.3'	13°26.54	-13.1' 55.6'
4		243°49.70	40.96	121°45.27	14.3'	13°13.48	-13.1' 55.6'
5		258°49.81	41.85	136°18.60	14.3'	13°0.34	-13.2' 55.6'
6		273°49.91	S10°42.74	150°51.95	14.4'	S12°47.14	-13.3' 55.7'
7		288°50.01	43.63	165°25.31	14.4'	12°33.88	-13.3' 55.7'
8		303°50.11	44.52	179°58.69	14.4'	12°20.54	-13.4' 55.7'
9		318°50.22	45.41	194°32.09	14.4'	12°7.14	-13.5' 55.8'
10		333°50.32	46.30	209°5.51	14.4'	11°53.68	-13.5' 55.8'
11		348°50.42	47.18	223°38.94	14.4'	11°40.15	-13.6' 55.8'
12		3°50.52	S10°48.07	238°12.39	14.5'	S11°26.55	-13.7' 55.8'
13		18°50.62	48.96	252°45.84	14.5'	11°12.90	-13.7' 55.9'
14		33°50.72	49.85	267°19.32	14.5'	10°59.18	-13.8' 55.9'
15		48°50.82	50.73	281°52.80	14.5'	10°45.40	-13.8' 55.9'
16		63°50.92	51.62	296°26.29	14.5'	10°31.56	-13.9' 56.0'
17		78°51.02	52.51	310°59.79	14.5'	10°17.66	-14.0' 56.0'
18		93°51.12	S10°53.39	325°33.30	14.5'	S10°3.70	-14.0' 56.0'
19		108°51.22	54.28	340°6.82	14.5'	09°49.68	-14.1' 56.1'
20		123°51.32	55.16	354°40.34	14.5'	09°35.60	-14.1' 56.1'
21		138°51.41	56.05	9°13.87	14.5'	09°21.47	-14.2' 56.1'
22		153°51.51	56.93	23°47.41	14.5'	09°7.28	-14.2' 56.2'
23		168°51.61	57.82	38°20.95	14.5'	08°53.04	-14.3' 56.2'
		SD = 16.1'		SD = 15.1'			
		$d = 0.9'$					

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

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

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h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.71	S10°58.70	52°54.49	14.5'	S08°38.74	-14.4'	56.2'
1	198°51.80	10°59.59	67°28.03	14.5'	08°24.39	-14.4'	56.3'
2	213°51.90	11°0.47	82°15.7	14.5'	08°9.99	-14.5'	56.3'
3	228°52.00	· · 1.35	96°35.11	14.5'	07°55.53	-14.5'	56.3'
4	243°52.09	2.24	111°8.65	14.5'	07°41.03	-14.6'	56.3'
5	258°52.19	3.12	125°42.19	14.5'	07°26.47	-14.6'	56.4'
6	273°52.29	S11°4.00	140°15.72	14.5'	S07°11.87	-14.7'	56.4'
7	288°52.38	4.89	154°49.25	14.5'	06°57.21	-14.7'	56.4'
8	303°52.48	5.77	169°22.77	14.5'	06°42.51	-14.7'	56.5'
9	318°52.57	· · 6.65	183°56.29	14.5'	06°27.77	-14.8'	56.5'
10	333°52.67	7.53	198°29.80	14.5'	06°12.98	-14.8'	56.5'
11	348°52.76	8.41	213°3.30	14.5'	05°58.14	-14.9'	56.6'
12	3°52.85	S11°9.29	227°36.78	14.5'	S05°43.26	-14.9'	56.6'
13	18°52.95	10.17	242°10.26	14.5'	05°28.34	-15.0'	56.6'
14	33°53.04	11.05	256°43.73	14.5'	05°13.37	-15.0'	56.7'
15	48°53.13	· · 11.93	271°17.18	14.4'	04°58.37	-15.0'	56.7'
16	63°53.23	12.81	285°50.61	14.4'	04°43.32	-15.1'	56.7'
17	78°53.32	13.69	300°24.03	14.4'	04°28.24	-15.1'	56.8'
18	93°53.41	S11°14.57	314°57.44	14.4'	S04°13.12	-15.2'	56.8'
19	108°53.50	15.45	329°30.82	14.4'	03°57.96	-15.2'	56.8'
20	123°53.60	16.33	344°4.19	14.3'	03°42.77	-15.2'	56.9'
21	138°53.69	· · 17.21	358°37.53	14.3'	03°27.54	-15.3'	56.9'
22	153°53.78	18.09	13°10.86	14.3'	03°12.27	-15.3'	56.9'
23	168°53.87	18.96	27°44.16	14.3'	02°56.98	-15.3'	57.0'

SD = 16.1' $d = 0.9'$

SD = 15.3'

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.96	S11°19.84	42°17.44	14.3'	S02°41.65	-15.4'	57.0'
1	198°54.05	20.72	56°50.69	14.2'	02°26.29	-15.4'	57.0'
2	213°54.14	21.60	71°23.91	14.2'	02°10.90	-15.4'	57.1'
3	228°54.23	· · 22.47	85°57.11	14.2'	01°55.48	-15.4'	57.1'
4	243°54.32	23.35	100°30.28	14.1'	01°40.03	-15.5'	57.2'
5	258°54.41	24.22	115°3.42	14.1'	01°24.56	-15.5'	57.2'
6	273°54.50	S11°25.10	129°36.53	14.1'	S01°9.06	-15.5'	57.2'
7	288°54.59	25.97	144°9.61	14.0'	00°53.54	-15.5'	57.3'
8	303°54.67	26.85	158°42.65	14.0'	00°37.99	-15.6'	57.3'
9	318°54.76	· · 27.72	173°15.66	14.0'	00°22.43	-15.6'	57.3'
10	333°54.85	28.60	187°48.63	13.9'	S00°6.84	-15.6'	57.4'
11	348°54.94	29.47	202°21.57	13.9'	N00°8.77	15.6'	57.4'
12	3°55.02	S11°30.35	216°54.47	13.9'	N00°24.40	15.6'	57.4'
13	18°55.11	31.22	231°27.32	13.8'	00°40.05	15.7'	57.5'
14	33°55.20	32.09	246°0.14	13.8'	00°55.71	15.7'	57.5'
15	48°55.28	· · 32.97	260°32.92	13.7'	01°11.39	15.7'	57.5'
16	63°55.37	33.84	275°5.65	13.7'	01°27.08	15.7'	57.6'
17	78°55.45	34.71	289°38.34	13.6'	01°42.78	15.7'	57.6'
18	93°55.54	S11°35.58	304°10.98	13.6'	N01°58.50	15.7'	57.6'
19	108°55.62	36.45	318°43.57	13.5'	02°14.23	15.7'	57.7'
20	123°55.71	37.33	333°16.12	13.5'	02°29.96	15.7'	57.7'
21	138°55.79	· · 38.20	347°48.62	13.4'	02°45.71	15.8'	57.7'
22	153°55.88	39.07	2°21.06	13.4'	03°1.46	15.8'	57.8'
23	168°55.96	39.94	16°53.46	13.3'	03°17.21	15.8'	57.8'

SD = 16.1' $d = 0.9'$

SD = 15.5'


Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°56.04	S11°40.81	31°25.80	13.3'	N03°32.97	15.8'	57.8'
1	198°56.13	41.68	45°58.09	13.2'	03°48.74	15.8'	57.9'
2	213°56.21	42.55	60°30.32	13.2'	04°4.50	15.8'	57.9'
3	228°56.29	· · 43.42	75°2.49	13.1'	04°20.26	15.8'	57.9'
4	243°56.38	44.28	89°34.61	13.1'	04°36.03	15.8'	58.0'
5	258°56.46	45.15	104°6.67	13.0'	04°51.79	15.8'	58.0'
6	273°56.54	S11°46.02	118°38.66	12.9'	N05°7.54	15.8'	58.0'
7	288°56.62	46.89	133°10.60	12.9'	05°23.29	15.7'	58.1'
8	303°56.70	47.76	147°42.47	12.8'	05°39.04	15.7'	58.1'
9	318°56.78	· · 48.62	162°14.28	12.7'	05°54.77	15.7'	58.1'
10	333°56.86	49.49	176°46.02	12.7'	06°10.50	15.7'	58.2'
11	348°56.94	50.36	191°17.70	12.6'	06°26.21	15.7'	58.2'
12	3°57.02	S11°51.22	205°49.30	12.5'	N06°41.91	15.7'	58.2'
13	18°57.10	52.09	220°20.84	12.5'	06°57.60	15.7'	58.3'
14	33°57.18	52.96	234°52.31	12.4'	07°13.27	15.7'	58.3'
15	48°57.26	· · 53.82	249°23.70	12.3'	07°28.92	15.6'	58.3'
16	63°57.34	54.69	263°55.03	12.2'	07°44.56	15.6'	58.4'
17	78°57.42	55.55	278°26.28	12.2'	08°0.18	15.6'	58.4'
18	93°57.49	S11°56.42	292°57.45	12.1'	N08°15.77	15.6'	58.4'
19	108°57.57	57.28	307°28.55	12.0'	08°31.34	15.5'	58.5'
20	123°57.65	58.14	321°59.56	11.9'	08°46.88	15.5'	58.5'
21	138°57.73	· · 59.01	336°30.50	11.9'	09°2.40	15.5'	58.5'
22	153°57.80	11°59.87	351°1.36	11.8'	09°17.89	15.5'	58.5'
23	168°57.88	12°0.73	5°32.14	11.7'	09°33.35	15.4'	58.6'

SD = 16.1' $d = 0.9'$

SD = 15.8'

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 12-14 80-94%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
22	15:27	15:31	11:44	21:06	08:44	
23	15:36	15:40	11:44	21:50	09:28	
24	15:44	15:48	11:44	22:37	10:13	

Aries			Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	33°24.01	187°36.21	S17°30.26	255°28.03	N17°43.34	247°25.61	N14°20.55	23°22.74	N01°22.84	
1	48°26.47	202°39.99	29.30	270°29.16	43.01	262°27.74	20.45	38°25.37	22.78	
2	63°28.93	217°43.77	28.33	285°30.29	42.67	277°29.87	20.34	53°27.99	22.71	
3	78°31.40	232°47.55	· · 27.36	300°31.43	· · 42.33	292°32.00	· · 20.24	68°30.62	· · 22.65	
4	93°33.86	247°51.33	26.38	315°32.56	41.99	307°34.13	20.13	83°33.24	22.59	
5	108°36.33	262°55.11	25.41	330°33.70	41.65	322°36.26	20.03	98°35.87	22.52	
6	123°38.79	277°58.88	S17°24.44	345°34.83	N17°41.31	337°38.38	N14°19.92	113°38.50	N01°22.46	
7	138°41.25	293°2.66	23.46	0°35.97	40.96	352°40.51	19.82	128°41.12	22.39	
8	153°43.72	308°6.43	22.49	15°37.10	40.62	7°42.64	19.71	143°43.75	22.33	
9	168°46.18	323°10.21	· · 21.51	30°38.24	· · 40.28	22°44.77	· · 19.61	158°46.37	· · 22.27	
10	183°48.65	338°13.98	20.53	45°39.38	39.94	37°46.90	19.50	173°49.00	22.20	
11	198°51.11	353°17.75	19.55	60°40.52	39.60	52°49.03	19.40	188°51.62	22.14	
12	213°53.57	8°21.52	S17°18.57	75°41.65	N17°39.26	67°51.16	N14°19.30	203°54.25	N01°22.07	
13	228°56.04	23°25.29	17.59	90°42.79	38.92	82°53.29	19.19	218°56.87	22.07	
14	243°58.50	38°29.06	16.61	105°43.93	38.58	97°55.42	19.09	233°59.50	21.95	
15	259°0.97	53°32.82	· · 15.63	120°45.07	· · 38.24	112°57.55	· · 18.98	249°2.12	· · 21.88	
16	274°3.43	68°36.59	14.64	135°46.21	37.90	127°59.69	18.88	264°4.75	21.82	
17	289°5.89	83°40.35	13.66	150°47.35	37.56	143°1.82	18.77	279°7.37	21.75	
18	304°8.36	98°44.11	S17°12.67	165°48.49	N17°37.22	158°3.95	N14°18.67	294°10.00	N01°21.69	
19	319°10.82	113°47.88	11.68	180°49.63	36.88	173°6.08	18.57	309°12.62	21.63	
20	334°13.29	128°51.64	10.70	195°50.77	36.54	188°8.21	18.46	324°15.25	21.56	
21	349°15.75	143°55.40	· · 9.71	210°51.91	· · 36.20	203°10.34	· · 18.36	339°17.87	· · 21.50	
22	4°18.21	158°59.16	8.72	225°53.05	35.86	218°12.48	18.25	354°20.49	21.44	
23	19°20.68	174°2.91	7.73	240°54.19	35.52	233°14.61	18.15	9°23.12	21.37	
Mer.pass. 21:43		ν3.8' d-1.0' m-4.20		ν1.1' d-0.3' m0.93		ν2.1' d-0.1' m-1.97		ν2.6' d-0.1' m0.43		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	34°23.14	189°6.67	S17°6.73	255°55.33	N17°35.18	248°16.74	N14°18.05	24°25.74	N01°21.31	
1	49°25.61	204°10.42	5.74	270°56.48	34.84	263°18.88	17.94	39°28.37	21.25	
2	64°28.07	219°14.18	4.75	285°57.62	34.50	278°21.01	17.84	54°30.99	21.18	
3	79°30.54	234°17.93	· · 3.75	300°58.76	· · 34.16	293°23.14	· · 17.74	69°33.62	· · 21.12	
4	94°33.00	249°21.68	2.76	315°59.91	33.81	308°25.28	17.63	84°36.24	21.06	
5	109°35.46	264°25.43	1.76	331°1.05	33.47	323°27.41	17.53	99°38.86	20.99	
6	124°37.93	279°29.18	S17°0.76	346°2.19	N17°33.13	338°29.55	N14°17.43	114°41.49	N01°20.93	
7										

Oct 25 Sun	SHA	Mer.pass
Venus	154° 12.21	11:27
Mars	222° 4.02	06:58
Jupiter	214° 1.61	07:29
Saturn	349° 58.74	22:23

Oct 26 Mon	SHA	Mer.pass
Venus	154° 43.53	11:21
Mars	221° 32.19	06:56
Jupiter	213° 53.60	07:26
Saturn	350° 2.60	22:18

Oct 27 Tue	SHA	Mer.pass
Venus	155° 14.10	11:15
Mars	221° 0.58	06:54
Jupiter	213° 45.72	07:22
Saturn	350° 6.42	22:14


h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°57.96	S12°1.60	20°2.84	11.6'	N09°48.78	15.4'	58.6'
1	198°58.03	2.46	34°33.45	11.5'	10°4.17	15.4'	58.6'
2	213°58.11	3.32	49°3.98	11.4'	10°19.53	15.3'	58.7'
3	228°58.18	· · 4.18	63°34.42	11.4'	10°34.86	15.3'	58.7'
4	243°58.26	5.04	78°4.77	11.3'	10°50.14	15.2'	58.7'
5	258°58.33	5.90	92°35.04	11.2'	11°5.38	15.2'	58.8'
6	273°58.41	S12°6.77	107°5.21	11.1'	N11°20.59	15.2'	58.8'
7	288°58.48	7.63	121°35.30	11.0'	11°35.75	15.1'	58.8'
8	303°58.55	8.49	136°5.29	10.9'	11°50.86	15.1'	58.8'
9	318°58.63	· · 9.35	150°35.20	10.8'	12°5.93	15.0'	58.9'
10	333°58.70	10.20	165°5.00	10.7'	12°20.95	15.0'	58.9'
11	348°58.77	11.06	179°34.72	10.6'	12°35.92	14.9'	58.9'
12	3°58.85	S12°11.92	194°4.33	10.5'	N12°50.83	14.9'	59.0'
13	18°58.92	12.78	208°33.86	10.4'	13°5.69	14.8'	59.0'
14	33°58.99	13.64	223°3.28	10.3'	13°20.50	14.7'	59.0'
15	48°59.06	· · 14.50	237°32.60	10.2'	13°35.24	14.7'	59.0'
16	63°59.13	15.35	252°1.83	10.1'	13°49.93	14.6'	59.1'
17	78°59.20	16.21	266°30.95	10.0'	14°4.55	14.6'	59.1'
18	93°59.27	S12°17.07	280°59.98	9.9'	N14°19.12	14.5'	59.1'
19	108°59.34	17.92	295°28.90	9.8'	14°33.61	14.4'	59.1'
20	123°59.41	18.78	309°57.71	9.7'	14°48.04	14.4'	59.2'
21	138°59.48	· · 19.64	324°26.43	9.6'	15°2.40	14.3'	59.2'
22	153°59.55	20.49	338°55.03	9.5'	15°16.69	14.2'	59.2'
23	168°59.62	21.35	353°23.54	9.4'	15°30.90	14.1'	59.2'
SD = 16.1'		$d = 0.9'$	SD = 16.0'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°59.69	S12°22.20	7°51.93	9.3'	N15°45.04	14.1'	59.3'
1	198°59.76	23.06	22°20.22	9.2'	15°59.10	14.0'	59.3'
2	213°59.83	23.91	36°48.40	9.1'	16°13.08	13.9'	59.3'
3	228°59.90	· · 24.76	51°16.47	9.0'	16°26.98	13.8'	59.3'
4	243°59.96	25.62	65°44.44	8.9'	16°40.80	13.7'	59.4'
5	259°0.03	26.47	80°12.29	8.7'	16°54.53	13.6'	59.4'
6	274°0.10	S12°27.32	94°40.03	8.6'	N17°8.18	13.6'	59.4'
7	289°0.16	28.18	109°7.66	8.5'	17°21.74	13.5'	59.4'
8	304°0.23	29.03	123°35.18	8.4'	17°35.20	13.4'	59.5'
9	319°0.29	· · 29.88	138°2.59	8.3'	17°48.57	13.3'	59.5'
10	334°0.36	30.73	152°29.88	8.2'	18°1.85	13.2'	59.5'
11	349°0.43	31.58	166°57.06	8.1'	18°15.03	13.1'	59.5'
12	4°0.49	S12°32.43	181°24.13	8.0'	N18°28.11	13.0'	59.5'
13	19°0.56	33.28	195°51.09	7.8'	18°41.09	12.9'	59.6'
14	34°0.62	34.13	210°17.93	7.7'	18°53.96	12.8'	59.6'
15	49°0.68	· · 34.98	224°44.65	7.6'	19°6.73	12.7'	59.6'
16	64°0.75	35.83	239°11.26	7.5'	19°19.39	12.6'	59.6'
17	79°0.81	36.68	253°37.76	7.4'	19°31.94	12.4'	59.6'
18	94°0.87	S12°37.53	268°4.14	7.3'	N19°44.38	12.3'	59.7'
19	109°0.94	38.38	282°30.41	7.2'	19°56.71	12.2'	59.7'
20	124°1.00	39.23	296°56.56	7.0'	20°8.92	12.1'	59.7'
21	139°1.06	· · 40.08	311°22.59	6.9'	20°21.01	12.0'	59.7'
22	154°1.12	40.92	325°48.52	6.8'	20°32.98	11.9'	59.7'
23	169°1.18	41.77	340°14.32	6.7'	20°44.83	11.7'	59.7'
SD = 16.1'		$d = 0.9'$	SD = 16.2'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°1.24	S12°42.62	354°40.01	6.6'	N20°56.56	11.6'	59.8'
1	199°1.30	43.46	9°5.59	6.5'	21°8.16	11.5'	59.8'
2	214°1.37	44.31	23°31.05	6.3'	21°19.63	11.3'	59.8'
3	229°1.43	· · 45.16	37°56.40	6.2'	21°30.97	11.2'	59.8'
4	244°1.49	46.00	52°21.64	6.1'	21°42.18	11.1'	59.8'
5	259°1.54	46.85	66°46.76	6.0'	21°53.25	10.9'	59.8'
6	274°1.60	S12°47.69	81°11.77	5.9'	N22°4.19	10.8'	59.8'
7	289°1.66	48.54	95°36.66	5.8'	22°14.99	10.7'	59.9'
8	304°1.72	49.38	110°1.45	5.7'	22°25.65	10.5'	59.9'
9	319°1.78	· · 50.22	124°26.12	5.6'	22°36.17	10.4'	59.9'
10	334°1.84	51.07	138°50.68	5.5'	22°46.55	10.2'	59.9'
11	349°1.89	51.91	153°15.14	5.3'	22°56.77	10.1'	59.9'
12	4°1.95	S12°52.75	167°39.48	5.2'	N23°6.85	9.9'	59.9'
13	19°2.01	53.59	182°3.72	5.1'	23°16.78	9.8'	59.9'
14	34°2.06	54.44	196°27.84	5.0'	23°26.56	9.6'	59.9'
15	49°2.12	· · 55.28	210°51.87	4.9'	23°36.18	9.5'	60.0'
16	64°2.18	56.12	225°15.79	4.8'	23°45.65	9.3'	60.0'
17	79°2.23	56.96	239°39.60	4.7'	23°54.96	9.2'	60.0'
18	94°2.29	S12°57.80	254°3.31	4.6'	N24°4.11	9.0'	60.0'
19	109°2.34	58.64	268°26.92	4.5'	24°13.10	8.8'	60.0'
20	124°2.40	12°59.48	282°50.43	4.4'	24°21.93	8.7'	60.0'
21	139°2.45	13°0.32	297°13.84	4.3'	24°30.59	8.5'	60.0'
22	154°2.50	1.16	311°37.15	4.2'	24°39.09	8.3'	60.0'
23	169°2.56	2.00	326°0.37	4.1'	24°47.41	8.2'	60.0'
SD = 16.1'		$d = 0.8'$	SD = 16.3'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	15-17
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	98-99%
25	15:52	15:55	11:44	23:27	11:02	
26	15:59	16:02	11:44	--:--	11:54	
27	16:05	16:08	11:44	00:22	12:51	

October 28, 29, 30 UT (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	36°21.42	192°5.14	S16°18.26	256°50.60	N17°18.79	249°59.38	N14°13.15	26°31.61	N01°18.32	Alpheratz	357°32.95	29°14.55
1	51°23.89	207°8.82	17.24	271°51.76	18.45	265°1.53	13.05	41°34.23	18.26	Ankaa	353°5.33	-42°9.59
2	66°26.35	222°12.49	16.21	286°52.92	18.11	280°3.67	12.95	56°36.85	18.20	Schedar	349°28.83	56°41.30
3	81°28.81	237°16.16	•• 15.19	301°54.08	•• 17.77	295°5.82	•• 12.85	71°39.47	•• 18.14	Diphda	348°45.52	-17°50.25
4	96°31.28	252°19.83	14.16	316°55.25	17.42	310°7.96	12.75	86°42.08	18.08	Achernar	335°18.52	-57°5.98
5	111°33.74	267°23.50	13.14	331°56.41	17.08	325°10.10	12.65	101°44.70	18.02	Hamal	327°49.18	23°35.51
6	126°36.21	282°27.16	S16°12.11	346°57.57	N17°16.74	340°12.25	N14°12.55	116°47.32	N01°17.95	Polaris	312°46.52	89°22.56
7	141°38.67	297°30.82	11.09	1°58.73	16.40	355°14.39	12.45	131°49.94	17.89	Acamar	315°10.24	-40°11.67
8	156°41.13	312°34.48	10.06	16°59.90	16.06	10°16.54	12.35	146°52.56	17.83	Menkar	314°4.29	4°11.84
9	171°43.60	327°38.14	•• 9.03	32°1.06	•• 15.71	25°18.69	•• 12.25	161°55.18	•• 17.77	Mirfak	308°25.64	49°57.41
10	186°46.06	342°41.79	8.01	47°2.23	15.37	40°20.83	12.15	176°57.80	17.71	Aldebaran	290°37.64	16°33.86
11	201°48.53	357°45.45	6.98	62°3.39	15.03	55°22.98	12.05	192°0.42	17.65	Rigel	281°2.21	-8°10.08
12	216°50.99	12°49.10	S16°5.95	77°4.55	N17°14.69	70°25.12	N14°11.95	207°3.04	N01°17.59	Capella	280°19.36	46°1.39
13	231°53.46	27°52.75	4.92	92°5.72	14.35	85°27.27	11.85	222°5.66	17.53	Bellatrix	278°21.07	6°22.53
14	246°55.92	42°56.40	3.90	107°6.89	14.00	100°29.42	11.75	237°8.28	17.47	Elath	277°59.74	28°37.77
15	261°58.38	58°0.04	•• 2.87	122°8.05	•• 13.66	115°31.56	•• 11.65	252°10.90	•• 17.41	Alnilam	275°36.01	-1°10.97
16	277°0.85	73°3.68	1.84	137°9.22	13.32	130°33.71	11.55	267°13.52	17.35	Betelgeuse	270°50.29	7°24.79
17	292°3.31	88°7.32	16°0.81	152°10.39	12.98	145°35.86	11.45	282°16.13	17.29	Canopus	263°51.46	-52°42.27
18	307°5.78	103°10.96	S15°59.78	167°11.55	N17°12.63	160°38.01	N14°11.35	297°18.75	N01°17.23	Sirius	258°24.79	-16°44.99
19	322°8.24	118°14.60	58.75	182°12.72	12.29	175°40.15	11.26	312°21.37	17.17	Adhara	255°4.57	-29°0.26
20	337°10.71	133°18.23	57.72	197°13.89	11.95	190°42.30	11.16	327°23.99	17.11	Procyon	244°49.22	5°9.42
21	352°13.17	148°21.86	•• 56.69	212°15.06	•• 11.61	205°44.45	•• 11.06	342°26.61	•• 17.05	Pollux	243°15.44	27°57.59
22	7°15.63	163°25.49	55.66	227°16.23	11.26	220°46.60	10.96	357°29.23	16.99	Avior	234°14.12	-59°35.38
23	22°18.10	178°29.12	54.63	242°17.39	10.92	235°48.75	10.86	12°31.84	16.93	Suhail	222°45.30	-43°32.16
Mer.pass.	21:31	ν3.7' d-1.0' m-4.27		ν1.2' d-0.3' m0.90		ν2.1' d-0.1' m-1.98		ν2.6' d-0.1' m0.44		Miaplacidus	221°38.14	-69°49.29
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	37°20.56	193°32.74	S15°53.60	257°18.56	N17°10.58	250°50.90	N14°10.76	27°34.46	N01°16.87	Alphard	217°46.40	-8°46.37
1	52°23.03	208°36.36	52.57	272°19.73	10.24	265°53.05	10.66	42°37.08	16.81	Regulus	207°33.02	11°50.16
2	67°25.49	223°39.98	51.54	287°20.90	9.90	280°55.20	10.56	57°39.70	16.75	Dubhe	193°39.65	61°36.15
3	82°27.95	238°43.60	•• 50.51	302°22.07	•• 9.55	295°57.35	•• 10.47	72°42.31	•• 16.69	Denebola	182°23.71	14°25.33
4	97°30.42	253°47.21	49.48	317°23.25	9.21	310°59.49	10.37	87°44.93	16.63	Gienah	175°42.36	-17°41.34
5	112°32.88	268°50.82	48.45	332°24.42	8.87	326°1.65	10.27	102°47.55	16.57	Acrux	172°59.06	-63°14.71
6	127°35.35	283°54.43	S15°47.42	347°25.59	N17°8.53	341°3.80	N14°10.17	117°50.17	N01°16.51	Gacrux	171°50.52	-57°15.65
7	142°37.81	298°58.04	46.39	2°26.76	8.18	356°5.95	10.07	132°52.78	16.45	Alioth	166°12.21	55°48.75
8	157°40.28	314°1.65	45.36	17°27.93	7.84	11°8.10	9.97	147°55.40	16.39	Spica	158°21.07	-11°18.00
9	172°42.74	329°5.25	•• 44.33	32°29.11	•• 7.50	26°10.25	•• 9.88	162°58.02	•• 16.33	Alkaid	152°51.34	49°10.72
10	187°45.20	344°8.85	43.30	47°30.28	7.16	41°12.40	9.78	178°0.64	16.27	Hadar	148°34.56	-60°30.08
11	202°47.67	359°12.45	42.27	62°31.45	6.81	56°14.55	9.68	193°3.25	16.21	Menkent	147°56.28	-36°30.04
12	217°50.13	14°16.04	S15°41.24	77°32.63	N17°6.47	71°16.70	N14°9.58	208°5.87	N01°16.15	Arcturus	145°46.91	19°2.61
13	232°52.60	29°19.63	40.20	92°33.80	6.13	86°18.85	9.49	223°8.49	16.09	Rigel Kent.	139°38.93	-60°56.74
14	247°55.06	44°23.22	39.17	107°34.98	5.79	101°21.01	9.39	238°11.10	16.03	Kochab	137°21.02	74°2.67
15	262°57.53	59°26.81	•• 38.14	122°36.15	•• 5.44	116°23.16	•• 9.29	253°13.72	•• 15.97	Zuben'ubi	136°54.72	-16°9.13
16	277°59.99	74°30.40	37.11	137°37.33	5.10	131°25.31	9.19	268°16.34	15.91	Alphecca	126°2.85	26°37.55
17	293°2.45	89°33.98	36.08	152°38.51	4.76	146°27.46	9.10	283°18.95	15.85	Antares	112°14.35	-26°29.46
18	308°4.92	104°37.56	S15°35.05	167°39.68	N17°4.42	161°29.62	N14°9.00	298°21.57	N01°15.79	Atria	107°7.67	-69°4.64
19	323°7.38	119°41.14	34.02	182°40.86	4.07	176°31.77	8.90	313°24.19	15.74	Sabik	102°1.36	-15°45.43
20	338°9.85	134°44.71	32.99	197°42.04	3.73	191°33.92	8.80	328°26.80	15.68	Shaula	96°8.66	-37°7.42
21	353°12.31	149°48.28	•• 31.96	212°43.21	•• 3.39	206°36.08	•• 8.71	343°29.42	•• 15.62	Rasalhague	95°57.42	12°32.57
22	8°14.77	164°51.85	30.92	227°44.39	3.04	221°38.23	8.61	358°32.03	15.56	Eltanin	90°41.83	51°29.34
23	23°17.24	179°55.42	29.89	242°45.57	2.70	236°40.39	8.51	13°34.65	15.50	Kaus Aust.	83°30.77	-34°22.34
Mer.pass.	21:27	ν3.6' d-1.0' m-4.26		ν1.2' d-0.3' m0.89		ν2.1' d-0.1' m-1.99		ν2.6' d-0.1' m0.45		Vega	80°32.43	38°48.75
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Nunki	75°46.09	-26°15.80
0	38°19.70	194°58.98	S15°28.86	257°46.75	N17°2.36	251°42.54	N14°8.42	28°37.26	N01°15.44	Altair	61°58.59	8°56.53
1	53°22.17	210°2.55	27.83	272°47.93	2.02	266°44.70	8.32	43°39.88	15.38	Peacock	53°3.44	-56°39.08
2	68°24.63	225°6.10	26.80	287°49.11	1.67	281°46.85	8.22	58°42.50	15.32	Deneb	49°24.78	45°22.88
3	83°27.10	240°9.66	•• 25.77	302°50.29	•• 1.33	296°49.01	•• 8.13	73°45.11	•• 15.26	Enif	33°37.25	10°0.08
4	98°29.56	255°13.21	24.74	317°51.47	0.99	311°51.16	8.03	88°47.73	15.21	Al Na'ir	27°30.89	-46°49.95
5	113°32.02	270°16.76	23.71	332°52.65	0.65	326°53.32	7.93	103°50.34	15.15	Fomalhaut	15°12.68	-29°28.79
6	128°34.49	285°20.31	S15°22.68	347°53.83	N17°0.30	341°55.47	N14°7.84	118°52.96	N01°15.09	Scheat	13°43.55	28°13.97
7	143°36.95	300°23.86	21.65	2°55.01	16°59.96	356°57.63	7.74	133°55.57	15.03	Markab	13°28.23	15°21.20
8	158°39.42	315°27.40	20.62	17°56.19	16°59.62	11°59.79	7.64	148°58.19	14.97	Oct 28 Wed	SHA	Mer.pass
9	173°41.88	330°30.94	•• 19.59	32°57.38	•• 59.28	27°1.94	•• 7.55	164°0.80	•• 14.91	Venus	155°43.72	11:09
10	188°44.35	345°34.48	18.56	47°58.56	58.93	42°4.10	7.45	179°3.42	14.85	Mars	220°29.18	06:52
11	203°46.81	0°38.01	17.53	62°59.74	58.59	57°6.26	7.35	194°6.03	14.80	Jupiter	213°37.96	07:19
12	218°49.27	15°41.54	S15°16.51	78°0.93	N16°58.25	72°8.41	N14°7.26	209°8.65	N01°14.74	Saturn	350°10.18	22:10
13	233°51.74	30°45.07	15.48	93°21.11	57.90	87°10.57	7.16	224°11.26	14.68	Oct 29 Thu	SHA	Mer.pass
14	248°54.20	45°48.60	14.45	108°3.29	57.56	102°12.73	7.07	239°13.87	14.62	Venus	156°12.18	11:03
15	263°56.67	60°52.12	•• 13.42	123°4.48	•• 57.22	117°14.89	•• 6.97	254°16.49	•• 14.56	Mars	219°58.00	06:50
16	278°59.13	75°55.64	12.39	138°5.66	56.88	132°17.05	6.87	269°19.10	14.51	Jupiter	213°30.33	07:16
17	294°1.59	90°59.16	11.37	153°6.85	56.53	147°19.20	6.78	284°21.72	14.45	Saturn	350°13.90	22:06
18	309°4.06	106°2.67	S15°10.34	168°8.04	N16°56.19	162°21.36	N14°6.68	299°24.33	N01°14.39	Oct 30 Fri	SHA	Mer.pass
19	324°6.52	121°6.19	9.31	183°9.22	55.85	177°23.52	6.59	314°26.95	14.33	Venus	156°39.28	10:57
20	339°8.99	136°9.69	8.28	198°10.41	55.51	192°25.68	6.49	329°29.56	14.27	Mars	219°27.05	06:48
21	354°11.45	151°13.20	•• 7.26	213°11.60	•• 55.16	207°27.84	•• 6.40	344°32.17	•• 14.22	Jupiter	213°22.84	07:12
22	9°13.92	166°16.70	6.23	228°12.78	54.82	222°30.00	6.30	359°34.79	14.16	Saturn	350°17.56	22:02
23	24°16.38	181°20.20	5.21	243°13.97	54.48	237°32.16	6.21	14°37.40	14.10	Horizontal parallax	Venus:	0.5
Mer.pass.	21:23	ν3.6' d-1.0' m-4.20		ν1.2' d-0.3' m0.88		ν2.2' d-0.1' m-1.99		ν2.6' d-0.1' m0.45		Mars:		0.1



h		Sun		Moon				
Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°2.61	S13°2.84	340°23.49	4.0'	N24°55.57	8.0'	60.0'	
1	199°2.66	3.68	354°46.52	3.9'	25°3.56	7.8'	60.0'	
2	214°2.72	4.51	9°9.46	3.8'	25°11.37	7.6'	60.1'	
3	229°2.77	· · 5.35	23°32.31	3.8'	25°19.01	7.5'	60.1'	
4	244°2.82	6.19	37°55.07	3.7'	25°26.47	7.3'	60.1'	
5	259°2.87	7.03	52°17.74	3.6'	25°33.76	7.1'	60.1'	
6	274°2.92	S13°7.86	66°40.33	3.5'	N25°40.86	6.9'	60.1'	
7	289°2.97	8.70	81°2.84	3.4'	25°47.79	6.7'	60.1'	
8	304°3.03	9.53	95°25.27	3.4'	25°54.53	6.6'	60.1'	
9	319°3.08	· · 10.37	109°47.62	3.3'	26°1.09	6.4'	60.1'	
10	334°3.13	11.20	124°9.90	3.2'	26°7.46	6.2'	60.1'	
11	349°3.18	12.04	138°32.10	3.1'	26°13.65	6.0'	60.1'	
12	4°3.22	S13°12.87	152°54.23	3.1'	N26°19.65	5.8'	60.1'	
13	19°3.27	13.71	167°16.29	3.0'	26°25.46	5.6'	60.1'	
14	34°3.32	14.54	181°38.28	2.9'	26°31.08	5.4'	60.1'	
15	49°3.37	· · 15.37	196°0.21	2.9'	26°36.52	5.2'	60.1'	
16	64°3.42	16.21	210°22.08	2.8'	26°41.75	5.0'	60.1'	
17	79°3.47	17.04	224°43.89	2.8'	26°46.80	4.9'	60.1'	
18	94°3.51	S13°17.87	239°5.64	2.7'	N26°51.65	4.7'	60.1'	
19	109°3.56	18.70	253°27.34	2.6'	26°56.31	4.5'	60.1'	
20	124°3.61	19.53	267°48.98	2.6'	27°0.76	4.3'	60.1'	
21	139°3.65	· · 20.37	282°10.58	2.5'	27°5.03	4.1'	60.1'	
22	154°3.70	21.20	296°32.13	2.5'	27°9.09	3.9'	60.1'	
23	169°3.74	22.03	310°53.63	2.5'	27°12.96	3.7'	60.1'	
SD = 16.1'		$d = 0.8'$	SD = 16.4'					

Thu	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°3.79	S13°22.86	325°15.10	2.4'	N27°16.62	3.5'	60.1'	
1	199°3.83	23.69	339°36.52	2.4'	27°20.09	3.3'	60.1'	
2	214°3.88	24.52	353°57.92	2.4'	27°23.35	3.1'	60.1'	
3	229°3.92	· · 25.34	8°19.28	2.3'	27°26.42	2.9'	60.1'	
4	244°3.97	26.17	22°40.60	2.3'	27°29.28	2.7'	60.1'	
5	259°4.01	27.00	37°1.91	2.3'	27°31.94	2.5'	60.1'	
6	274°4.05	S13°27.83	51°23.19	2.3'	N27°34.39	2.3'	60.1'	
7	289°4.10	28.66	65°44.45	2.2'	27°36.65	2.0'	60.1'	
8	304°4.14	29.48	80°5.69	2.2'	27°38.69	1.8'	60.1'	
9	319°4.18	· · 30.31	94°26.91	2.2'	27°40.54	1.6'	60.1'	
10	334°4.22	31.14	108°48.13	2.2'	27°42.18	1.4'	60.1'	
11	349°4.26	31.96	123°9.34	2.2'	27°43.62	1.2'	60.0'	
12	4°4.30	S13°32.79	137°30.54	2.2'	N27°44.85	1.0'	60.0'	
13	19°4.35	33.61	151°51.73	2.2'	27°45.87	0.8'	60.0'	
14	34°4.39	34.44	166°12.93	2.2'	27°46.70	0.6'	60.0'	
15	49°4.43	· · 35.26	180°34.13	2.2'	27°47.31	0.4'	60.0'	
16	64°4.47	36.09	194°55.34	2.2'	27°47.73	0.2'	60.0'	
17	79°4.51	36.91	209°16.56	2.2'	27°47.93	0.0'	60.0'	
18	94°4.54	S13°37.73	223°37.79	2.2'	N27°47.94	-0.2'	60.0'	
19	109°4.58	38.56	237°59.04	2.3'	27°47.74	-0.4'	60.0'	
20	124°4.62	39.38	252°20.30	2.3'	27°47.33	-0.6'	60.0'	
21	139°4.66	· · 40.20	266°41.58	2.3'	27°46.72	-0.8'	60.0'	
22	154°4.70	41.02	281°2.89	2.3'	27°45.91	-1.0'	60.0'	
23	169°4.73	41.85	295°24.23	2.4'	27°44.90	-1.2'	60.0'	
SD = 16.1'		$d = 0.8'$	SD = 16.4'					

Fri	GHA	Dec	GHA	ν	Dec	d	HP	
0	184°4.77	S13°42.67	309°45.60	2.4'	N27°43.68	-1.4'	59.9'	
1	199°4.81	43.49	324°7.00	2.4'	27°42.26	-1.6'	59.9'	
2	214°4.85	44.31	338°28.43	2.5'	27°40.64	-1.8'	59.9'	
3	229°4.88	· · 45.13	352°49.91	2.5'	27°38.82	-2.0'	59.9'	
4	244°4.92	45.95	7°11.43	2.6'	27°36.80	-2.2'	59.9'	
5	259°4.95	46.77	21°32.99	2.6'	27°34.58	-2.4'	59.9'	
6	274°4.99	S13°47.59	35°54.60	2.7'	N27°32.16	-2.6'	59.9'	
7	289°5.02	48.40	50°16.25	2.7'	27°29.54	-2.8'	59.9'	
8	304°5.06	49.22	64°37.97	2.8'	27°26.73	-3.0'	59.9'	
9	319°5.09	· · 50.04	78°59.73	2.8'	27°23.72	-3.2'	59.8'	
10	334°5.12	50.86	93°21.55	2.9'	27°20.51	-3.4'	59.8'	
11	349°5.16	51.68	107°43.44	2.9'	27°17.11	-3.6'	59.8'	
12	4°5.19	S13°52.49	122°5.39	3.0'	N27°13.52	-3.8'	59.8'	
13	19°5.22	53.31	136°27.40	3.1'	27°9.73	-4.0'	59.8'	
14	34°5.25	54.12	150°49.48	3.1'	27°5.76	-4.2'	59.8'	
15	49°5.29	· · 54.94	165°11.63	3.2'	27°1.59	-4.4'	59.8'	
16	64°5.32	55.76	179°33.85	3.3'	26°57.23	-4.5'	59.8'	
17	79°5.35	56.57	193°56.14	3.4'	26°52.69	-4.7'	59.7'	
18	94°5.38	S13°57.38	208°18.52	3.5'	N26°47.96	-4.9'	59.7'	
19	109°5.41	58.20	222°40.97	3.5'	26°43.04	-5.1'	59.7'	
20	124°5.44	59.01	237°3.50	3.6'	26°37.94	-5.3'	59.7'	
21	139°5.47	13°59.83	251°26.12	3.7'	26°32.66	-5.5'	59.7'	
22	154°5.50	14°0.64	265°48.82	3.8'	26°27.20	-5.6'	59.7'	
23	169°5.53	1.45	280°11.60	3.9'	26°21.55	-5.8'	59.6'	
SD = 16.1'		$d = 0.8'$	SD = 16.3'					

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

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

Day	Sun			Moon			
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.			Age 18-20 95-81%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm		
28	16:10	16:13	11:44	01:22	13:53		
29	16:15	16:17	11:44	02:25	14:58		
30	16:19	16:21	11:44	03:30	16:02		

Aries				Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	39°18.84	196°23.70	S15°4.18	258°15.16	N16°54.13	252°34.32	N14°6.11	29°40.01	N01°14.04		
1	54°21.31	211°27.20	3.15	273°16.35	53.79	267°36.48	6.02	44°42.63	13.99		
2	69°23.77	226°30.69	2.13	288°17.54	53.45	282°38.64	5.92	59°45.24	13.93		
3	84°26.24	241°34.18	· · 1.11	303°18.73	· · 53.11	297°40.80	· · 5.83	74°47.85	· · 13.87		
4	99°28.70	256°37.66	15°0.08	318°19.92	52.76	312°42.96	5.73	89°50.47	13.81		
5	114°31.17	271°41.14	14°59.06	333°21.11	52.42	327°45.12	5.64	104°53.08	13.76		
6	129°33.63	286°44.62	S14°58.03	348°22.30	N16°52.08	342°47.28	N14°5.54	119°55.69	N01°13.70		
7	144°36.09	301°48.10	57.01	3°23.49	51.74	357°49.45	5.45	134°58.30	13.64		
8	159°38.56	316°51.57	55.99	18°24.68	51.39	12°51.61	5.35	150°0.92	13.58		
9	174°41.02	331°55.05	· · 54.97	33°25.87	· · 51.05	27°53.77	· · 5.26	165°3.53	· · 13.53		
10	189°43.49	346°58.51	53.95	48°27.07	50.71	42°55.93	5.17	180°6.14	13.47		
11	204°45.95	2°1.98	52.92	63°28.26	50.36	57°58.10	5.07	195°8.75	13.41		
12	219°48.41	17°5.44	S14°51.90	78°29.45	N16°50.02	73°0.26	N14°4.98	210°11.37	N01°13.35		
13	234°50.88	32°8.90	50.88	93°30.64	49.68	88°2.42	4.88	225°13.98	13.30		
14	249°53.34	47°12.35	49.86	108°31.84	49.34	103°4.59	4.79	240°16.59	13.24		
15	264°55.81	62°15.81	· · 48.84	123°33.03	· · 48.99	118°6.75	· · 4.69	255°19.20	· · 13.18		
16	279°58.27	77°19.25	47.82	138°34.23	48.65	133°8.91	4.60	270°21.81	13.13		
17	295°0.74	92°22.70	46.81	153°35.42	48.31	148°11.08	4.51	285°24.43	13.07		
18	310°3.20	107°26.14	S14°45.79	168°36.62	N16°47.97	163°13.24	N14°4.41	300°27.04	N01°13.01		
19	325°5.66	122°29.58	44.77	183°37.81	47.62	178°15.41	4.32	315°29.65	12.96		
20	340°8.13	137°33.02	43.75	198°39.01	47.28	193°17.57	4.23	330°32.26	12.90		
21	355°10.59	152°36.46	· · 42.74	213°40.21	· · 46.94	208°19.74	· · 4.13	345°34.87	· · 12.84		
22	10°13.06	167°39.89	41.72	228°41.40	46.59	223°21.90	4.04	0°37.48	12.79		
23	25°15.52	182°43.31	40.71	243°42.60	46.25	238°24.07	3.95	15°40.10	12.73		
Mer.pass. 21:19		ν3.5' d-1.0' m-4.09		ν1.2' d-0.3' m0.87		ν2.2' d-0.1' m-2.00		ν2.6' d-0.1' m0.46			
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	40°17.98	197°46.74	S14°39.69	258°43.80	N16°45.91	253°26.23	N14°3.85	30°42.71	N01°12.67		
1	55°20.45	212°50.16	38.68	273°45.00	45.57	268°28.40	3.76	45°45.32	12.62		
2	70°22.91	227°53.58	37.66	288°46.20	45.22	283°30.56	3.67	60°47.93	12.56		
3	85°25.38	242°56.99	· · 36.65	303°47.40	· · 44.88	298°32.73	· · 3.57	75°50.54	· · 12.50		
4	100°27.84	258°0.40	35.64	318°48.59	44.54	313°34.90	3.48	90°53.15	12.45		

Oct 31 Sat	SHA	Mer.pass
Venus	157° 4.86	10:52
Mars	218° 56.32	06:46
Jupiter	213° 15.47	07:09
Saturn	350° 21.17	21:58

Nov 01 Sun	SHA	Mer.pass
Venus	157° 28.75	10:46
Mars	218° 25.81	06:45
Jupiter	213° 8.25	07:05
Saturn	350° 24.72	21:53

Nov 02 Mon	SHA	Mer.pass
Venus	157° 50.83	10:41
Mars	217° 55.54	06:43
Jupiter	213° 1.16	07:02
Saturn	350° 28.22	21:49


h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		184°5.56	S14°2.26	294°34.48	4.0'	N26°15.73	-6.0' 59.6'
1		199°5.59	3.07	308°57.44	4.1'	26°9.73	-6.2' 59.6'
2		214°5.61	3.89	323°20.50	4.2'	26°3.55	-6.3' 59.6'
3		229°5.64	· · 4.70	337°43.65	4.2'	25°57.20	-6.5' 59.6'
4		244°5.67	5.51	352°6.90	4.3'	25°50.68	-6.7' 59.6'
5		259°5.70	6.32	6°30.24	4.4'	25°43.99	-6.9' 59.6'
6		274°5.72	S14°7.13	20°53.69	4.5'	N25°37.12	-7.0' 59.5'
7		289°5.75	7.94	35°17.23	4.6'	25°30.09	-7.2' 59.5'
8		304°5.77	8.75	49°40.87	4.7'	25°22.89	-7.4' 59.5'
9		319°5.80	· · 9.55	64°4.62	4.8'	25°15.53	-7.5' 59.5'
10		334°5.83	10.36	78°28.47	5.0'	25°8.00	-7.7' 59.5'
11		349°5.85	11.17	92°52.42	5.1'	25°0.32	-7.8' 59.4'
12		4°5.87	S14°11.98	107°16.48	5.2'	N24°52.47	-8.0' 59.4'
13		19°5.90	12.79	121°40.65	5.3'	24°44.46	-8.2' 59.4'
14		34°5.92	13.59	136°4.92	5.4'	24°36.30	-8.3' 59.4'
15		49°5.95	· · 14.40	150°29.31	5.5'	24°27.98	-8.5' 59.4'
16		64°5.97	15.20	164°53.80	5.6'	24°19.51	-8.6' 59.4'
17		79°5.99	16.01	179°18.41	5.7'	24°10.89	-8.8' 59.3'
18		94°6.01	S14°16.81	193°43.12	5.8'	N24°2.12	-8.9' 59.3'
19		109°6.04	17.62	208°7.95	5.9'	23°53.20	-9.1' 59.3'
20		124°6.06	18.42	222°32.89	6.1'	23°44.13	-9.2' 59.3'
21		139°6.08	· · 19.23	236°57.94	6.2'	23°34.92	-9.4' 59.3'
22		154°6.10	20.03	251°23.11	6.3'	23°25.57	-9.5' 59.2'
23		169°6.12	20.83	265°48.39	6.4'	23°16.08	-9.6' 59.2'
		SD = 16.1' $d = 0.8'$		SD = 16.3'			

Sun		GHA	Dec	GHA	ν	Dec	d HP
0		184°6.14	S14°21.64	280°13.79	6.5'	N23°6.45	-9.8' 59.2'
1		199°6.16	22.44	294°39.30	6.6'	22°56.68	-9.9' 59.2'
2		214°6.18	23.24	309°4.92	6.7'	22°46.77	-10.0' 59.2'
3		229°6.20	· · 24.04	323°30.66	6.9'	22°36.73	-10.2' 59.1'
4		244°6.22	24.84	337°56.52	7.0'	22°26.56	-10.3' 59.1'
5		259°6.24	25.64	352°22.49	7.1'	22°16.26	-10.4' 59.1'
6		274°6.26	S14°26.45	6°48.58	7.2'	N22°5.84	-10.6' 59.1'
7		289°6.27	27.25	21°14.79	7.3'	21°55.28	-10.7' 59.1'
8		304°6.29	28.04	35°41.11	7.4'	21°44.60	-10.8' 59.0'
9		319°6.31	· · 28.84	50°7.54	7.6'	21°33.80	-10.9' 59.0'
10		334°6.33	29.64	64°34.09	7.7'	21°22.88	-11.0' 59.0'
11		349°6.34	30.44	79°0.76	7.8'	21°11.84	-11.2' 59.0'
12		4°6.36	S14°31.24	93°27.54	7.9'	N21°0.68	-11.3' 59.0'
13		19°6.37	32.04	107°54.44	8.0'	20°49.40	-11.4' 58.9'
14		34°6.39	32.83	122°21.45	8.1'	20°38.02	-11.5' 58.9'
15		49°6.40	· · 33.63	136°48.58	8.2'	20°26.52	-11.6' 58.9'
16		64°6.42	34.43	151°15.82	8.4'	20°14.91	-11.7' 58.9'
17		79°6.43	35.22	165°43.17	8.5'	20°3.19	-11.8' 58.9'
18		94°6.45	S14°36.02	180°10.64	8.6'	N19°51.36	-11.9' 58.8'
19		109°6.46	36.81	194°38.22	8.7'	19°39.43	-12.0' 58.8'
20		124°6.47	37.61	209°5.91	8.8'	19°27.40	-12.1' 58.8'
21		139°6.49	· · 38.40	223°33.72	8.9'	19°15.27	-12.2' 58.8'
22		154°6.50	39.20	238°1.63	9.0'	19°3.03	-12.3' 58.7'
23		169°6.51	39.99	252°29.66	9.1'	18°50.70	-12.4' 58.7'
		SD = 16.1' $d = 0.8'$		SD = 16.1'			

Mon		GHA	Dec	GHA	ν	Dec	d HP
0		184°6.52	S14°40.78	266°57.79	9.2'	N18°38.27	-12.5' 58.7'
1		199°6.53	41.58	281°26.04	9.4'	18°25.75	-12.6' 58.7'
2		214°6.54	42.37	295°54.39	9.5'	18°13.14	-12.7' 58.7'
3		229°6.56	· · 43.16	310°22.85	9.6'	18°0.43	-12.8' 58.6'
4		244°6.57	43.95	324°51.42	9.7'	17°47.64	-12.9' 58.6'
5		259°6.58	44.74	339°20.10	9.8'	17°34.76	-13.0' 58.6'
6		274°6.59	S14°45.53	353°48.87	9.9'	N17°21.79	-13.1' 58.6'
7		289°6.59	46.32	8°17.76	10.0'	17°8.74	-13.1' 58.5'
8		304°6.60	47.11	22°46.75	10.1'	16°55.61	-13.2' 58.5'
9		319°6.61	· · 47.90	37°15.84	10.2'	16°42.39	-13.3' 58.5'
10		334°6.62	48.69	51°45.03	10.3'	16°29.10	-13.4' 58.5'
11		349°6.63	49.48	66°14.32	10.4'	16°15.73	-13.4' 58.5'
12		4°6.64	S14°50.27	80°43.71	10.5'	N16°2.28	-13.5' 58.4'
13		19°6.64	51.06	95°13.20	10.6'	15°48.76	-13.6' 58.4'
14		34°6.65	51.84	109°42.79	10.7'	15°35.17	-13.7' 58.4'
15		49°6.66	· · 52.63	124°12.48	10.8'	15°21.50	-13.7' 58.4'
16		64°6.66	53.42	138°42.26	10.9'	15°7.77	-13.8' 58.3'
17		79°6.67	54.20	153°12.14	11.0'	14°53.97	-13.9' 58.3'
18		94°6.67	S14°54.99	167°42.11	11.1'	N14°40.10	-13.9' 58.3'
19		109°6.68	55.77	182°12.17	11.2'	14°26.17	-14.0' 58.3'
20		124°6.68	56.56	196°42.33	11.2'	14°12.17	-14.1' 58.3'
21		139°6.69	· · 57.34	211°12.57	11.3'	13°58.12	-14.1' 58.2'
22		154°6.69	58.13	225°42.90	11.4'	13°44.00	-14.2' 58.2'
23		169°6.69	58.91	240°13.33	11.5'	13°29.82	-14.2' 58.2'
		SD = 16.1' $d = 0.8'$		SD = 16.0'			

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

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

Day	Sun			Moon			
	Eqn.of Time		Mer.	Mer.Pass.			Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm		21-23 71-48%
31	16:22	16:23	11:44	04:33	17:03		
01	16:25	16:25	11:44	05:32	17:59		
02	16:26	16:27	11:44	06:26	18:51		

November 03, 04, 05 UT (Tue., Wed., Thu.)

	Aries			Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	42°16.26	200°27.24	S13°51.82	259°41.77	N16°29.47	255°10.47	N13°59.47	32°47.91	N01°10.03		
1	57°18.73	215°30.50	50.84	274°42.99	29.13	270°12.65	59.38	47°50.52	9.97		
2	72°21.19	230°33.76	49.86	289°44.21	28.79	285°14.82	59.29	62°53.13	9.92		
3	87°23.66	245°37.01	· · 48.89	304°45.43	· · 28.44	300°17.00	· · 59.20	77°55.73	· · 9.86		
4	102°26.12	260°40.26	47.92	319°46.65	28.10	315°19.18	59.11	92°58.34	9.81		
5	117°28.58	275°43.51	46.94	334°47.87	27.76	330°21.36	59.02	108°0.94	9.76		
6	132°31.05	290°46.75	S13°45.97	349°49.09	N16°27.42	345°23.54	N13°58.93	123°3.55	N01°9.70		
7	147°33.51	305°49.99	45.00	4°50.31	27.08	0°25.72	58.84	138°6.15	9.65		
8	162°35.98	320°53.23	44.03	19°51.53	26.73	15°27.90	58.76	153°8.76	9.60		
9	177°38.44	335°56.46	· · 43.06	34°52.75	· · 26.39	30°30.08	· · 58.67	168°11.36	· · 9.54		
10	192°40.90	350°59.68	42.10	49°53.97	26.05	45°32.26	58.58	183°13.97	9.49		
11	207°43.37	6°2.91	41.13	64°55.19	25.71	60°34.44	58.49	198°16.57	9.44		
12	222°45.83	21°6.13	S13°40.17	79°56.42	N16°25.37	75°36.62	N13°58.40	213°19.18	N01°9.38		
13	237°48.30	36°9.35	39.20	94°57.64	25.02	90°38.80	58.31	228°21.78	9.33		
14	252°50.76	51°12.56	38.24	109°58.86	24.68	105°40.98	58.22	243°24.39	9.28		
15	267°53.22	66°15.77	· · 37.28	125°0.09	· · 24.34	120°43.16	· · 58.14	258°26.99	· · 9.22		
16	282°55.69	81°18.98	36.32	140°1.31	24.00	135°45.34	58.05	273°29.60	9.17		
17	297°58.15	96°22.18	35.36	155°2.54	23.66	150°47.52	57.96	288°32.20	9.12		
18	313°0.62	111°25.38	S13°34.40	170°3.76	N16°23.31	165°49.70	N13°57.87	303°34.80	N01°9.06		
19	328°3.08	126°28.57	33.44	185°4.99	22.97	180°51.88	57.78	318°37.41	9.01		
20	343°5.54	141°31.77	32.48	200°6.21	22.63	195°54.07	57.70	333°40.01	8.96		
21	358°8.01	156°34.95	· · 31.53	215°7.44	· · 22.29	210°56.25	· · 57.61	348°42.61	· · 8.91		
22	13°10.47	171°38.14	30.57	230°8.66	21.95	225°58.43	57.52	3°45.22	8.85		
23	28°12.94	186°41.32	29.62	245°9.89	21.61	241°0.62	57.43	18°47.82	8.80		
Mer.pass. 21:07		v3.3' d-1.0' m-4.31			v1.2' d-0.3' m0.83		v2.2' d-0.1' m-2.02		v2.6' d-0.1' m0.47		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	43°15.40	201°44.50	S13°28.67	260°11.12	N16°21.26	256°2.80	N13°57.35	33°50.43	N01°8.75		
1	58°17.87	216°47.67	27.72	275°12.35	20.92	271°4.98	57.26	48°53.03	8.69		
2	73°20.33	231°50.84	26.77	290°13.57	20.58	286°7.17	57.17	63°55.63	8.64		
3	88°22.79	246°54.01	· · 25.82	305°14.80	· · 20.24	301°9.35	· · 57.08	78°58.23	· · 8.59		
4	103°25.26	261°57.17	24.87	320°16.03	19.90	316°11.53	57.00	94°0.84	8.54		
5	118°27.72	277°0.33	23.93	335°17.26	19.56	331°13.72	56.91	109°3.44	8.48		
6	133°30.19	292°3.48	S13°22.98	350°18.49	N16°19.21	346°15.90	N13°56.82	124°6.04	N01°8.43		
7	148°32.65	307°6.63	22.04	5°19.72	18.87	1°18.09	56.74	139°8.65	8.38		
8	163°35.11	322°9.78	21.10	20°20.95	18.53	16°20.27	56.65	154°11.25	8.33		
9	178°37.58	337°12.93	· · 20.15	35°22.18	· · 18.19	31°22.46	· · 56.56	169°13.85	· · 8.28		
10	193°40.04	352°16.07	19.21	50°23.42	17.85	46°24.64	56.48	184°16.45	8.22		
11	208°42.51	7°19.20	18.28	65°24.65	17.51	61°26.83	56.39	199°19.06	8.17		
12	223°44.97	22°22.34	S13°17.34	80°25.88	N16°17.17	76°29.02	N13°56.30	214°21.66	N01°8.12		
13	238°47.43	37°25.47	16.40	95°27.11	16.82	91°31.20	56.22	229°24.26	8.07		
14	253°49.90	52°28.59	15.47	110°28.35	16.48	106°33.39	56.13	244°26.86	8.02		
15	268°52.36	67°31.71	· · 14.53	125°29.58	· · 16.14	121°35.58	· · 56.04	259°29.46	· · 7.96		
16	283°54.83	82°34.83	13.60	140°30.81	15.80	136°37.76	55.96	274°32.06	7.91		
17	298°57.29	97°37.94	12.67	155°32.05	15.46	151°39.95	55.87	289°34.67	7.86		
18	313°59.75	112°41.06	S13°11.74	170°33.28	N16°15.12	166°42.14	N13°55.78	304°37.27	N01°7.81		
19	329°2.22	127°44.16	10.81	185°34.52	14.78	181°44.33	55.70	319°39.87	7.76		
20	344°4.68	142°47.27	9.88	200°35.76	14.44	196°46.51	55.61	334°42.47	7.71		
21	359°7.15	157°50.36	· · 8.96	215°36.99	· · 14.10	211°48.70	· · 55.53	349°45.07	· · 7.65		
22	14°9.61	172°53.46	8.03	230°38.23	13.75	226°50.89	55.44	4°47.67	7.60		
23	29°12.07	187°56.55	7.11	245°39.47	13.41	241°53.08	55.36	19°50.27	7.55		
Mer.pass. 21:04		v3.2' d-1.0' m-4.38			v1.2' d-0.3' m0.82		v2.2' d-0.1' m-2.02		v2.6' d-0.1' m0.48		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°14.54	202°59.64	S13°6.19	260°40.70	N16°13.07	256°55.27	N13°55.27	34°52.87	N01°7.50		
1	59°17.00	218°2.72	5.27	275°41.94	12.73	271°57.46	55.18	49°55.47	7.45		
2	74°19.47	233°5.80	4.35	290°43.18	12.39	286°59.65	55.10	64°58.07	7.40		
3	89°21.93	248°8.88	· · 3.43	305°44.42	· · 12.05	302°1.84	· · 55.01	80°0.67	· · 7.35		
4	104°24.39	263°11.95	2.51	320°45.66	11.71	317°4.03	54.93	95°3.27	7.30		
5	119°26.86	278°15.02	1.60	335°46.90	11.37	332°6.22	54.84	110°5.87	7.25		
6	134°29.32	293°18.09	S13°0.68	350°48.14	N16°11.03	347°8.41	N13°54.76	125°8.47	N01°7.19		
7	149°31.79	308°21.15	12°59.77	5°49.38	10.69	2°10.60	54.67	140°11.07	7.14		
8	164°34.25	323°24.21	58.86	20°50.62	10.34	17°12.79	54.59	155°13.67	7.09		
9	179°36.71	338°27.26	· · 57.95	35°51.86	· · 10.00	32°14.98	· · 54.50	170°16.27	· · 7.04		
10	194°39.18	353°30.31	57.04	50°53.10	9.66	47°17.18	54.42	185°18.87	6.99		
11	209°41.64	8°33.36	56.13	65°54.34	9.32	62°19.37	54.34	200°21.47	6.94		
12	224°44.11	23°36.40	S12°55.23	80°55.59	N16°8.98	77°21.56	N13°54.25	215°24.07	N01°6.89		
13	239°46.57	38°39.44	54.32	95°56.83	8.64	92°23.75	54.17	230°26.67	6.84		
14	254°49.04	53°42.47	53.42	110°58.07	8.30	107°25.94	54.08	245°29.27	6.79		
15	269°51.50	68°45.50	· · 52.52	125°59.32	· · 7.96	122°28.14	· · 54.00	260°31.87	· · 6.74		
16	284°53.96	83°48.53	51.62	141°0.56	7.62	137°30.33	53.91	275°34.47	6.69		
17	299°56.43	98°51.55	50.72	156°1.81	7.28	152°32.52	53.83	290°37.07	6.64		
18	314°58.89	113°54.57	S12°49.82	171°3.05	N16°6.94	167°34.72	N13°53.75	305°39.66	N01°6.59		
19	330°1.36	128°57.59	48.93	186°4.30	6.60	182°36.91	53.66	320°42.26	6.54		
20	345°3.82	144°0.60	48.03	201°5.54	6.26	197°39.11	53.58	335°44.86	6.49		
21	0°6.28	159°3.61	· · 47.14	216°6.79	· · 5.92	212°41.30	· · 53.49	350°47.46	· · 6.44		
22	15°8.75	174°6.61	46.25	231°8.04	5.58	227°43.50	53.41	5°50.06	6.39		
23	30°11.21	189°9.61	45.36	246°9.29	5.24	242°45.69	53.33	20°52.66	6.34		
Mer.pass. 21:00		v3.1' d-0.9' m-4.44			v1.2' d-0.3' m0.81		v2.2' d-0.1' m-2.03		v2.6' d-0.1' m0.48		

Stars		
	SHA	Dec
Alpheratz	357°32.95	29°14.57
Ankaa	353°5.33	-42°9.61
Schedar	349°28.84	56°41.33
Diphda	348°45.52	-17°50.26
Achernar	335°18.51	-57°6.01
Hamal	327°49.16	23°35.52
Polaris	312°45.39	89°22.60
Acamar	315°10.21	-40°11.69
Menkar	314°4.26	4°11.84
Mirfak	308°25.60	49°57.43
Aldebaran	290°37.60	-16°33.86
Rigel	281°2.16	-8°10.09
Capella	280°19.30	46°1.41
Bellatrix	278°21.02	6°22.52
Elnath	277°59.69	28°37.78
Alnilam	275°35.97	-1°10.97
Betelgeuse	270°50.24	7°24.79
Canopus	263°51.40	-52°42.29
Sirius	258°24.74	-16°45.00
Adhara	255°4.51	-29°0.27
Procyon	244°49.17	5°9.41
Pollux	243°15.38	27°57.58
Avior	234°14.04	-59°35.39
Suhail	222°45.24	-43°32.17
Miaplacidus	221°38.04	-69°49.29
Alphard	217°46.34	-8°46.39
Regulus	207°32.97	11°50.15
Dubhe	193°39.57	61°36.12
Denebola	182°23.67	14°25.30
Gienah	175°42.32	-17°41.35
Acrux	172°59.01	-63°14.70
Gacrux	171°50.47	-57°15.64
Alioth	166°12.17	55°48.71
Spica	158°21.04	-11°18.01
Alkaid	152°51.31	49°10.68
Hadar	148°34.53	-60°30.06
Menkent	147°56.26	-36°30.03
Arcturus	145°46.89	19°2.58
Rigel Kent.	139°38.91	-60°56.72
Kochab	137°21.04	74°2.63
Zuben'ubi	136°54.71	-16°9.13
Alphecca	126°2.84	26°37.53

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Tue 0	184°6.70	S14°59.69	254°43.84	11.6'	N13°15.59	-14.3'	58.2'
1	199°6.70	15°04.8	269°14.43	11.7'	13°1.30	-14.3'	58.1'
2	214°6.70	1.26	283°45.11	11.8'	12°46.96	-14.4'	58.1'
3	229°6.70	· · 2.04	298°15.87	11.8'	12°32.57	-14.4'	58.1'
4	244°6.71	2.82	312°46.72	11.9'	12°18.12	-14.5'	58.1'
5	259°6.71	3.60	327°17.64	12.0'	12°3.62	-14.5'	58.1'
6	274°6.71	S15°4.38	341°48.65	12.1'	N11°49.08	-14.6'	58.0'
7	289°6.71	5.16	356°19.74	12.2'	11°34.49	-14.6'	58.0'
8	304°6.71	5.94	10°50.90	12.2'	11°19.85	-14.7'	58.0'
9	319°6.71	· · 6.72	25°22.14	12.3'	11°5.17	-14.7'	58.0'
10	334°6.71	7.50	39°53.45	12.4'	10°50.45	-14.8'	57.9'
11	349°6.71	8.28	54°24.84	12.5'	10°35.69	-14.8'	57.9'
12	4°6.71	S15°9.06	68°56.29	12.5'	N10°20.88	-14.8'	57.9'
13	19°6.70	9.83	83°27.82	12.6'	10°6.04	-14.9'	57.9'
14	34°6.70	10.61	97°59.42	12.7'	09°51.16	-14.9'	57.9'
15	49°6.70	· · 11.39	112°31.09	12.7'	09°36.25	-14.9'	57.8'
16	64°6.70	12.16	127°2.83	12.8'	09°21.30	-15.0'	57.8'
17	79°6.69	12.94	141°34.63	12.9'	09°6.31	-15.0'	57.8'
18	94°6.69	S15°13.72	156°6.50	12.9'	N08°51.30	-15.0'	57.8'
19	109°6.69	14.49	170°38.43	13.0'	08°36.26	-15.1'	57.7'
20	124°6.68	15.27	185°10.42	13.1'	08°21.18	-15.1'	57.7'
21	139°6.68	· · 16.04	199°42.47	13.1'	08°6.08	-15.1'	57.7'
22	154°6.67	16.81	214°14.59	13.2'	07°50.95	-15.2'	57.7'
23	169°6.67	17.59	228°46.76	13.2'	07°35.80	-15.2'	57.7'
SD = 16.1' $d = 0.8'$			SD = 15.9'				

Wed	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.66	S15°18.36	243°18.99	13.3'	N07°20.62	-15.2'	57.6'
1	199°6.66	19.13	257°51.27	13.3'	07°5.42	-15.2'	57.6'
2	214°6.65	19.90	272°23.61	13.4'	06°50.20	-15.2'	57.6'
3	229°6.64	· · 20.68	286°56.00	13.4'	06°34.96	-15.3'	57.6'
4	244°6.64	21.45	301°28.45	13.5'	06°19.70	-15.3'	57.5'
5	259°6.63	22.22	316°0.94	13.5'	06°4.93	-15.3'	57.5'
6	274°6.62	S15°22.99	330°33.48	13.6'	N05°49.13	-15.3'	57.5'
7	289°6.61	23.76	345°6.08	13.6'	05°33.82	-15.3'	57.5'
8	304°6.60	24.53	359°38.71	13.7'	05°18.50	-15.3'	57.5'
9	319°6.60	· · 25.30	10°11.40	13.7'	05°3.16	-15.3'	57.4'
10	334°6.59	26.06	28°44.13	13.8'	04°47.81	-15.4'	57.4'
11	349°6.58	26.83	43°16.90	13.8'	04°32.46	-15.4'	57.4'
12	4°6.57	S15°27.60	57°49.71	13.9'	N04°17.09	-15.4'	57.4'
13	19°6.56	28.37	72°22.56	13.9'	04°1.71	-15.4'	57.3'
14	34°6.55	29.13	86°55.46	13.9'	03°46.33	-15.4'	57.3'
15	49°6.53	· · 29.90	101°28.39	14.0'	03°30.94	-15.4'	57.3'
16	64°6.52	30.67	116°1.35	14.0'	03°15.55	-15.4'	57.3'
17	79°6.51	31.43	130°34.36	14.0'	03°0.15	-15.4'	57.3'
18	94°6.50	S15°32.20	145°7.39	14.1'	N02°44.75	-15.4'	57.2'
19	109°6.49	32.96	159°40.46	14.1'	02°29.35	-15.4'	57.2'
20	124°6.47	33.72	174°13.56	14.1'	02°13.95	-15.4'	57.2'
21	139°6.46	· · 34.49	188°46.69	14.2'	01°58.55	-15.4'	57.2'
22	154°6.45	35.25	203°19.85	14.2'	01°43.16	-15.4'	57.1'
23	169°6.43	36.01	217°53.04	14.2'	01°27.76	-15.4'	57.1'
SD = 16.1' $d = 0.8'$			SD = 15.7'				

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	184°6.42	S15°36.78	232°26.25	14.2'	N01°12.37	-15.4'	57.1'
1	199°6.40	37.54	246°59.49	14.3'	00°56.99	-15.4'	57.1'
2	214°6.39	38.30	261°32.76	14.3'	00°41.61	-15.4'	57.1'
3	229°6.37	· · 39.06	276°6.04	14.3'	00°26.25	-15.4'	57.0'
4	244°6.36	39.82	290°39.35	14.3'	N00°10.89	-15.4'	57.0'
5	259°6.34	40.58	305°12.68	14.3'	S00°4.47	15.3'	57.0'
6	274°6.32	S15°41.34	319°46.03	14.4'	S00°19.80	15.3'	57.0'
7	289°6.31	42.10	334°19.39	14.4'	00°35.13	15.3'	56.9'
8	304°6.29	42.86	348°52.77	14.4'	00°50.45	15.3'	56.9'
9	319°6.27	· · 43.62	3°26.17	14.4'	01°5.75	15.3'	56.9'
10	334°6.25	44.38	17°59.59	14.4'	01°21.03	15.3'	56.9'
11	349°6.24	45.13	32°33.01	14.4'	01°36.30	15.3'	56.9'
12	4°6.22	S15°45.89	47°6.45	14.4'	S01°51.55	15.2'	56.8'
13	19°6.20	46.65	61°39.90	14.5'	02°6.78	15.2'	56.8'
14	34°6.18	47.40	76°13.36	14.5'	02°22.00	15.2'	56.8'
15	49°6.16	· · 48.16	90°46.83	14.5'	02°37.19	15.2'	56.8'
16	64°6.14	48.91	105°20.30	14.5'	02°52.36	15.1'	56.8'
17	79°6.12	49.67	119°53.78	14.5'	03°7.51	15.1'	56.7'
18	94°6.10	S15°50.42	134°27.27	14.5'	S03°22.63	15.1'	56.7'
19	109°6.08	51.18	149°0.76	14.5'	03°37.73	15.1'	56.7'
20	124°6.05	51.93	163°34.25	14.5'	03°52.81	15.0'	56.7'
21	139°6.03	· · 52.68	178°7.75	14.5'	04°7.85	15.0'	56.6'
22	154°6.01	53.43	192°41.25	14.5'	04°22.87	15.0'	56.6'
23	169°5.99	54.19	207°14.74	14.5'	04°37.86	15.0'	56.6'
SD = 16.1' $d = 0.8'$			SD = 15.6'				

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

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

Day	Sun			Moon
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November 06, 07, 08 UT (Fri., Sat., Sun.)

Aries		Venus		Mars		Jupiter		Saturn		Stars	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	45°13.68	204°12.61	S12°44.47	261°10.53	N16°4.90	257°47.89	N13°53.24	35°55.25	N01°6.29	Alpheratz	357°32.96 29°14.57
1	60°16.14	219°15.60	43.58	276°11.78	4.56	272°50.08	53.16	50°57.85	6.24	Ankaa	353°5.34 -42°9.62
2	75°18.60	234°18.59	42.70	291°13.03	4.22	287°52.28	53.08	66°0.45	6.19	Schedar	349°28.85 56°41.34
3	90°21.07	249°21.57	· · 41.81	306°14.28	· · 3.88	302°54.47	· · 52.99	81°3.05	· · 6.14	Diphda	348°45.53 -17°50.27
4	105°23.53	264°24.55	40.93	321°15.53	3.54	317°56.67	52.91	96°5.64	6.09	Achernar	335°18.52 -57°6.02
5	120°26.00	279°27.53	40.05	336°16.78	3.20	332°58.87	52.83	111°8.24	6.04	Hamal	327°49.16 23°35.52
6	135°28.46	294°30.50	S12°39.17	351°18.03	N16°2.86	348°1.06	N13°52.74	126°10.84	N01°5.99	Polaris	312°45.07 89°22.62
7	150°30.92	309°33.47	38.29	6°19.28	2.52	3°3.26	52.66	141°13.44	5.94	Acamar	315°10.21 -40°11.70
8	165°33.39	324°36.44	37.42	21°20.53	2.18	18°5.46	52.58	156°16.03	5.89	Menkar	314°4.26 4°11.83
9	180°35.85	339°39.40	· · 36.54	36°21.78	· · 1.84	33°7.65	· · 52.49	171°18.63	· · 5.84	Mirfak	308°25.59 49°57.44
10	195°38.32	354°42.36	35.67	51°23.04	1.50	48°9.85	52.41	186°21.23	5.79	Aldebaran	290°37.59 16°33.86
11	210°40.78	9°45.31	34.80	66°24.29	1.16	63°12.05	52.33	201°23.82	5.74	Rigel	281°2.15 -8°10.10
12	225°43.24	24°48.26	S12°33.92	81°25.54	N16°0.82	78°14.25	N13°52.25	216°26.42	N01°5.69	Capella	280°19.28 46°1.41
13	240°45.71	39°51.21	33.06	96°26.79	0.48	93°16.45	52.16	231°29.02	5.64	Bellatrix	278°21.01 6°22.52
14	255°48.17	54°54.15	32.19	111°28.05	16°0.14	108°18.65	52.08	246°31.61	5.60	Elnath	277°59.67 28°37.78
15	270°50.64	69°57.09	· · 31.32	126°29.30	15°59.80	123°20.84	· · 52.00	261°34.21	· · 5.55	Alnilam	275°35.96 -1°10.98
16	285°53.10	85°0.02	30.46	141°30.56	59.46	138°23.04	51.92	276°36.80	5.50	Betelgeuse	270°50.23 7°24.78
17	300°55.56	100°2.95	29.59	156°31.81	59.12	153°25.24	51.84	291°39.40	5.45	Canopus	263°51.38 -52°42.30
18	315°58.03	115°5.88	S12°28.73	171°33.07	N15°58.78	168°27.44	N13°51.75	306°42.00	N01°5.40	Sirius	258°24.72 -16°45.01
19	331°0.49	130°8.80	27.87	186°34.32	58.44	183°29.64	51.67	321°44.59	5.35	Adhara	255°4.49 -29°0.28
20	346°2.96	145°11.72	27.02	201°35.58	58.10	198°31.84	51.59	336°47.19	5.30	Procyon	244°49.15 5°9.41
21	1°5.42	160°14.63	· · 26.16	216°36.84	· · 57.76	213°34.04	· · 51.51	351°49.78	· · 5.25	Pollux	243°15.36 27°57.58
22	16°7.88	175°17.55	25.30	231°38.10	57.42	228°36.24	51.43	6°52.38	5.20	Avior	234°14.00 -59°35.39
23	31°10.35	190°20.45	24.45	246°39.35	57.08	243°38.45	51.34	21°54.97	5.16	Suhail	222°45.22 -43°32.17
Mer.pass. 20:56		ν3.0' d-0.9' m-4.50		ν1.2' d-0.3' m0.80		ν2.2' d-0.1' m-2.03		ν2.6' d-0.0' m0.48		Miaplacidus 221°37.99 -69°49.29	
										Alphard 217°46.33 -8°46.39	
										Regulus 207°32.95 11°50.14	
										Dubhe 193°39.54 61°36.11	
										Denebola 182°23.65 14°25.30	
										Gienah 175°42.31 -17°41.35	
										Acrux 172°58.98 -63°14.69	
										Gacrux 171°50.45 -57°15.63	
										Alioth 166°12.16 55°48.69	
										Spica 158°21.03 -11°18.01	
										Alkaid 152°51.31 49°10.67	
										Hadar 148°34.52 -60°30.05	
										Menkent 147°56.25 -36°30.03	
										Arcturus 145°46.89 19°2.57	
										Rigel Kent. 139°38.91 -60°56.71	
										Kochab 137°21.04 74°2.61	
										Zuben'ubi 136°54.70 -16°9.13	
										Alphecca 126°2.85 26°37.51	
										Antares 112°14.35 -26°29.46	
										Atria 107°7.71 -69°4.60	
										Sabik 102°1.37 -15°45.44	
										Shaula 96°8.68 -37°7.41	
										Rasalhague 95°57.44 12°32.55	
										Eltanin 90°41.88 51°29.31	
										Kaus Aust. 83°30.80 -34°22.34	
										Vega 80°32.48 38°48.73	
										Nunki 75°46.12 -26°15.80	
										Altair 61°58.62 8°56.52	
										Peacock 53°3.51 -56°39.08	
										Deneb 49°24.84 45°22.88	
										Enif 33°37.28 10°0.08	
										Al Na'ir 27°30.93 -46°49.97	
										Fomalhaut 15°12.71 -29°28.81	
										Scheat 13°43.58 28°13.98	
										Markab 13°28.25 15°21.20	
										Nov 06 Fri SHA Mer.pass	
										Venus 158°58.93 10:21	
										Mars 215°56.86 06:35	
										Jupiter 212°34.21 06:48	
										Saturn 350°41.58 21:33	
										Nov 07 Sat SHA Mer.pass	
										Venus 159°10.54 10:16	
										Mars 215°27.80 06:33	
										Jupiter 212°27.83 06:44	
										Saturn 350°44.75 21:28	
										Nov 08 Sun SHA Mer.pass	
										Venus 159°19.90 10:12	
										Mars 214°58.99 06:31	
										Jupiter 212°21.61 06:41	
										Saturn 350°47.86 21:24	
										Horizontal parallax	
										Venus 0.5	
										Mars 0.1	
Mer.pass. 20:48		ν2.8' d-0.8' m-4.60		ν1.3' d-0.3' m0.78		ν2.2' d-0.1' m-2.04		ν2.6' d-0.0' m0.49			

h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Fri 0	184°5.96	S15°54.94	221°48.24	14.5'	S04°52.82	14.9'	56.6'
1	199°5.94	55.69	236°21.73	14.5'	05°7.75	14.9'	56.6'
2	214°5.92	56.44	250°55.22	14.5'	05°22.65	14.9'	56.5'
3	229°5.89	· · 57.19	265°28.70	14.5'	05°37.52	14.8'	56.5'
4	244°5.87	57.94	280°2.18	14.5'	05°52.35	14.8'	56.5'
5	259°5.84	58.69	294°35.65	14.5'	06°7.14	14.8'	56.5'
6	274°5.82	S15°59.44	309°9.11	14.5'	S06°21.90	14.7'	56.5'
7	289°5.79	16°0.18	323°42.57	14.4'	06°36.63	14.7'	56.4'
8	304°5.77	0.93	338°16.01	14.4'	06°51.31	14.6'	56.4'
9	319°5.74	· · 1.68	352°49.45	14.4'	07°5.96	14.6'	56.4'
10	334°5.71	2.43	7°22.87	14.4'	07°20.56	14.6'	56.4'
11	349°5.69	3.17	21°56.28	14.4'	07°35.13	14.5'	56.4'
12	4°5.66	S16°3.92	36°29.67	14.4'	S07°49.65	14.5'	56.3'
13	19°5.63	4.66	51°3.05	14.4'	08°4.13	14.4'	56.3'
14	34°5.60	5.41	65°36.42	14.3'	08°18.57	14.4'	56.3'
15	49°5.57	· · 6.15	80°9.77	14.3'	08°32.96	14.3'	56.3'
16	64°5.54	6.90	94°43.10	14.3'	08°47.30	14.3'	56.3'
17	79°5.51	7.64	109°16.41	14.3'	09°1.60	14.2'	56.2'
18	94°5.48	S16°8.38	123°49.70	14.3'	S09°15.85	14.2'	56.2'
19	109°5.45	9.13	138°22.97	14.2'	09°30.05	14.2'	56.2'
20	124°5.42	9.87	152°56.22	14.2'	09°44.20	14.1'	56.2'
21	139°5.39	· · 10.61	167°29.45	14.2'	09°58.30	14.0'	56.2'
22	154°5.36	11.35	182°2.65	14.2'	10°12.35	14.0'	56.1'
23	169°5.33	12.09	196°35.83	14.2'	10°26.34	13.9'	56.1'
SD = 16.1'			SD = 15.4'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°5.30	S16°12.83	211°8.99	14.1'	S10°40.28	13.9'	56.1'
1	199°5.27	13.57	225°42.11	14.1'	10°54.17	13.8'	56.1'
2	214°5.23	14.31	240°15.22	14.1'	11°8.00	13.8'	56.0'
3	229°5.20	· · 15.05	254°48.29	14.0'	11°21.77	13.7'	56.0'
4	244°5.17	15.79	269°21.34	14.0'	11°35.49	13.7'	56.0'
5	259°5.13	16.53	283°54.35	14.0'	11°49.15	13.6'	56.0'
6	274°5.10	S16°17.27	298°27.34	14.0'	S12°2.74	13.5'	56.0'
7	289°5.06	18.00	313°0.30	13.9'	12°16.28	13.5'	55.9'
8	304°5.03	18.74	327°33.22	13.9'	12°29.75	13.4'	55.9'
9	319°4.99	· · 19.47	342°6.12	13.9'	12°43.16	13.3'	55.9'
10	334°4.96	20.21	356°38.97	13.8'	12°56.51	13.3'	55.9'
11	349°4.92	20.95	11°11.80	13.8'	13°9.80	13.2'	55.9'
12	4°4.89	S16°21.68	25°44.59	13.8'	S13°23.01	13.2'	55.9'
13	19°4.85	22.41	40°17.35	13.7'	13°36.16	13.1'	55.8'
14	34°4.81	23.15	54°50.07	13.7'	13°49.25	13.0'	55.8'
15	49°4.77	· · 23.88	69°22.75	13.6'	14°2.26	12.9'	55.8'
16	64°4.74	24.61	83°55.40	13.6'	14°15.21	12.9'	55.8'
17	79°4.70	25.35	98°28.01	13.6'	14°28.08	12.8'	55.8'
18	94°4.66	S16°26.08	113°0.57	13.5'	S14°40.88	12.7'	55.7'
19	109°4.62	26.81	127°33.11	13.5'	14°53.61	12.7'	55.7'
20	124°4.58	27.54	142°5.60	13.5'	15°6.27	12.6'	55.7'
21	139°4.54	· · 28.27	156°38.05	13.4'	15°18.85	12.5'	55.7'
22	154°4.50	29.00	171°10.46	13.4'	15°31.36	12.4'	55.7'
23	169°4.46	29.73	185°42.82	13.3'	15°43.79	12.4'	55.6'
SD = 16.1'			SD = 15.3'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°4.42	S16°30.46	200°15.15	13.3'	S15°56.15	12.3'	55.6'
1	199°4.38	31.19	214°47.43	13.2'	16°8.42	12.2'	55.6'
2	214°4.34	31.91	229°19.67	13.2'	16°20.62	12.1'	55.6'
3	229°4.30	· · 32.64	243°51.87	13.2'	16°32.74	12.0'	55.6'
4	244°4.25	33.37	258°24.02	13.1'	16°44.77	12.0'	55.5'
5	259°4.21	34.10	272°56.13	13.1'	16°56.73	11.9'	55.5'
6	274°4.17	S16°34.82	287°28.19	13.0'	S17°8.60	11.8'	55.5'
7	289°4.12	35.55	302°0.21	13.0'	17°20.38	11.7'	55.5'
8	304°4.08	36.27	316°32.18	12.9'	17°32.09	11.6'	55.5'
9	319°4.04	· · 37.00	331°4.11	12.9'	17°43.70	11.5'	55.4'
10	334°3.99	37.72	345°35.99	12.8'	17°55.23	11.4'	55.4'
11	349°3.95	38.44	0°7.82	12.8'	18°6.67	11.4'	55.4'
12	4°3.90	S16°39.17	14°39.61	12.7'	S18°18.03	11.3'	55.4'
13	19°3.86	39.89	29°11.35	12.7'	18°29.29	11.2'	55.4'
14	34°3.81	40.61	43°43.04	12.6'	18°40.47	11.1'	55.4'
15	49°3.76	· · 41.33	58°14.68	12.6'	18°51.55	11.0'	55.3'
16	64°3.72	42.05	72°46.27	12.5'	19°2.54	10.9'	55.3'
17	79°3.67	42.78	87°17.82	12.5'	19°13.44	10.8'	55.3'
18	94°3.62	S16°43.50	101°49.31	12.4'	S19°24.25	10.7'	55.3'
19	109°3.57	44.22	116°20.76	12.4'	19°34.96	10.6'	55.3'
20	124°3.53	44.93	130°52.16	12.3'	19°45.57	10.5'	55.2'
21	139°3.48	· · 45.65	145°23.51	12.3'	19°56.09	10.4'	55.2'
22	154°3.43	46.37	159°54.81	12.3'	20°6.51	10.3'	55.2'
23	169°3.38	47.09	174°26.06	12.2'	20°16.83	10.2'	55.2'
SD = 16.1'			SD = 15.2'				

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

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

Day	Sun			Moon	
	Eqn.of Time 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Age Lower hh:mm
06	16:24	16:23	11:44	09:30	21:52
07	16:21	16:20	11:44	10:14	22:36
08	16:18	16:16	11:44	10:59	23:23

November 09, 10, 11 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	48°11.09		207°38.08	S11°44.68	262°41.52	N15°40.51	260°26.62	N13°47.45	39°1.98	N01°2.85
1	63°13.55		222°40.79	43.91	277°42.80	40.17	275°28.83	47.38	54°4.57	2.81
2	78°16.02		237°43.50	43.14	292°44.08	39.84	290°31.05	47.30	69°7.16	2.76
3	93°18.48		252°46.20	· · 42.38	307°45.37	· · 39.50	305°33.26	· · 47.22	84°9.75	· · 2.72
4	108°20.95		267°48.90	41.61	322°46.65	39.16	320°35.47	47.15	99°12.34	2.67
5	123°23.41		282°51.60	40.85	337°47.93	38.83	335°37.69	47.07	114°14.93	2.63
6	138°25.87		297°54.29	S11°40.09	352°49.21	N15°38.49	350°39.91	N13°46.99	129°17.51	N01°2.58
7	153°28.34		312°56.97	39.33	7°50.49	38.15	5°42.12	46.92	144°20.10	2.54
8	168°30.80		327°59.66	38.58	22°51.78	37.82	20°44.34	46.84	159°22.69	2.49
9	183°33.27		343°2.33	· · 37.83	37°53.06	· · 37.48	35°46.55	· · 46.76	174°25.28	· · 2.45
10	198°35.73		358°5.01	37.07	52°54.34	37.14	50°48.77	46.69	189°27.87	2.40
11	213°38.20		13°7.68	36.32	67°55.63	36.81	65°50.99	46.61	204°30.45	2.36
12	228°40.66		28°10.35	S11°35.57	82°56.91	N15°36.47	80°53.20	N13°46.53	219°33.04	N01°2.31
13	243°43.12		43°13.01	34.83	97°58.20	36.14	95°55.42	46.46	234°35.63	2.27
14	258°45.59		58°15.67	34.08	112°59.48	35.80	110°57.64	46.38	249°38.22	2.22
15	273°48.05		73°18.32	· · 33.34	128°0.77	· · 35.46	125°59.86	· · 46.30	264°40.80	· · 2.18
16	288°50.52		88°20.97	32.60	143°2.06	35.13	141°2.07	46.23	279°43.39	2.13
17	303°52.98		103°23.62	31.86	158°3.34	34.79	156°4.29	46.15	294°45.98	2.09
18	318°55.44		118°26.26	S11°31.12	173°4.63	N15°34.46	171°6.51	N13°46.08	309°48.56	N01°2.04
19	333°57.91		133°28.90	30.39	188°5.92	34.12	186°8.73	46.00	324°51.15	2.00
20	349°0.37		148°31.54	29.65	203°7.21	33.78	201°10.95	45.93	339°53.74	1.96
21	4°2.84		163°34.17	· · 28.92	218°8.50	· · 33.45	216°13.17	· · 45.85	354°56.32	· · 1.91
22	19°5.30		178°36.80	28.19	233°9.79	33.11	231°15.39	45.78	9°58.91	1.87
23	34°7.76		193°39.42	27.46	248°11.08	32.78	246°17.61	45.70	25°1.50	1.82
Mer.pass. 20:44		ν2.7' d-0.8' m-4.64		ν1.3' d-0.3' m0.77		ν2.2' d-0.1' m-2.05		ν2.6' d-0.0' m0.50		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	49°10.23		208°42.04	S11°26.74	263°12.37	N15°32.44	261°19.83	N13°45.63	40°4.08	N01°1.78
1	64°12.69		223°44.66	26.01	278°13.66	32.11	276°22.05	45.55	55°6.67	1.73
2	79°15.16		238°47.27	25.29	293°14.95	31.77	291°24.27	45.48	70°9.25	1.69
3	94°17.62		253°49.88	· · 24.57	308°16.24	· · 31.43	306°26.49	· · 45.40	85°11.84	· · 1.65
4	109°20.09		268°52.48	23.85	323°17.53	31.10	321°28.71	45.33	100°14.42	1.60
5	124°22.55		283°55.08	23.13	338°18.82	30.76	336°30.93	45.25	115°17.01	1.56
6	139°25.01		298°57.68	S11°22.42	353°20.12	N15°30.43	351°33.15	N13°45.18	130°19.59	N01°1.52
7	154°27.48		314°0.27	21.71	8°21.41	30.09	6°35.38	45.10	145°22.18	1.47
8	169°29.94		329°2.86	21.00	23°22.70	29.76	21°37.60	45.03	160°24.76	1.43
9	184°32.41		344°5.44	· · 20.29	38°24.00	· · 29.42	36°39.82	· · 44.95	175°27.35	· · 1.39
10	199°34.87		359°8.02	19.58	53°25.29	29.09	51°42.04	44.88	190°29.93	1.34
11	214°37.33		14°10.60	18.87	68°26.59	28.75	66°44.27	44.80	205°32.52	1.30
12	229°39.80		29°13.17	S11°18.17	83°27.88	N15°28.42	81°46.49	N13°44.73	220°35.10	N01°1.26
13	244°42.26		44°15.74	17.47	98°29.18	28.08	96°48.71	44.66	235°37.69	1.21
14	259°44.73		59°18.30	16.77	113°30.48	27.75	111°50.94	44.58	250°40.27	1.17
15	274°47.19		74°20.86	· · 16.07	128°31.77	· · 27.42	126°53.16	· · 44.51	265°42.86	· · 1.13
16	289°49.66		89°23.42	15.37	143°33.07	27.08	141°55.39	44.43	280°45.44	1.08
17	304°52.12		104°25.97	14.68	158°34.37	26.75	156°57.61	44.36	295°48.02	1.04
18	319°54.58		119°28.52	S11°13.99	173°35.67	N15°26.41	171°59.84	N13°44.29	310°50.61	N01°1.00
19	334°57.05		134°31.06	13.30	188°36.97	26.08	187°2.06	44.21	325°53.19	0.95
20	349°59.51		149°33.61	12.61	203°38.27	25.74	202°4.29	44.14	340°55.77	0.91
21	5°1.98		164°36.14	· · 11.92	218°39.57	· · 25.41	217°6.51	· · 44.07	355°58.36	· · 0.87
22	20°4.44		179°38.68	11.24	233°40.87	25.07	232°8.74	43.99	11°0.94	0.83
23	35°6.90		194°41.21	10.56	248°42.17	24.74	247°10.96	43.92	26°3.52	0.78
Mer.pass. 20:40		ν2.6' d-0.7' m-4.68		ν1.3' d-0.3' m0.75		ν2.2' d-0.1' m-2.06		ν2.6' d-0.0' m0.50		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°9.37		209°43.73	S11°9.87	263°43.47	N15°24.41	262°13.19	N13°43.85	41°6.11	N01°0.74
1	65°11.83		224°46.25	9.20	278°44.77	24.07	277°15.42	43.78	56°8.69	0.70
2	80°14.30		239°48.77	8.52	293°46.07	23.74	292°17.64	43.70	71°11.27	0.66
3	95°16.76		254°51.28	· · 7.84	308°47.37	· · 23.41	307°19.87	· · 43.63	86°13.85	· · 0.61
4	110°19.23		269°53.79	7.17	323°48.68	23.07	322°22.10	43.56	101°16.44	0.57
5	125°21.69		284°56.30	6.50	338°49.98	22.74	337°24.33	43.48	116°19.02	0.53
6	140°24.15		299°58.80	S11°5.83	353°51.28	N15°22.40	352°26.56	N13°43.41	131°21.60	N01°0.49
7	155°26.62		315°1.30	5.16	8°52.59	22.07	7°28.78	43.34	146°24.18	0.45
8	170°29.08		330°3.79	4.50	23°53.89	21.74	22°31.01	43.27	161°26.76	0.40
9	185°31.55		345°6.28	· · 3.84	38°55.20	· · 21.40	37°33.24	· · 43.20	176°29.34	· · 0.36
10	200°34.01		0°8.77	3.17	53°56.51	21.07	52°35.47	43.12	191°31.93	0.32
11	215°36.47		15°11.25	2.51	68°57.81	20.74	67°37.70	43.05	206°34.51	0.28
12	230°38.94		30°13.73	S11°1.86	83°59.12	N15°20.40	82°39.93	N13°42.98	221°37.09	N01°0.24
13	245°41.40		45°16.20	1.20	99°0.43	20.07	97°42.16	42.91	236°39.67	0.20
14	260°43.87		60°18.68	11°0.55	114°1.73	19.74	112°44.39	42.84	251°42.25	0.15
15	275°46.33		75°21.14	10°59.90	129°3.04	· · 19.40	127°46.62	· · 42.76	266°44.83	· · 0.11
16	290°48.80		90°23.61	59.25	144°4.35	19.07	142°48.85	42.69	281°47.41	0.07
17	305°51.26		105°26.06	58.60	159°5.66	18.74	157°51.08	42.62	296°49.99	0.03
18	320°53.72		120°28.52	S10°57.95	174°6.97	N15°18.41	172°53.31	N13°42.55	311°52.57	N00°59.99
19	335°56.19		135°30.97	57.31	189°8.28	18.07	187°55.55	42.48	326°55.15	00°59.95
20	350°58.65		150°33.42	56.67	204°9.59	17.74	202°57.78	42.41	341°57.73	59.91
21	6°1.12		165°35.86	· · 56.03	219°10.90	· · 17.41	218°0.01	· · 42.34	357°0.31	· · 59.86
22	21°3.58		180°38.30	55.39	234°12.21	17.08	233°2.24	42.27	12°2.89	59.82
23	36°6.04		195°40.74	54.75	249°13.52	16.74	248°4.48	42.20	27°5.47	59.78
Mer.pass. 20:36		ν2.5' d-0.7' m-4.71		ν1.3' d-0.3' m0.74		ν2.2' d-0.1' m-2.06		ν2.6' d-0.0' m0.51		

	Stars	
	SHA	Dec
Alpheratz	357°32.97	29°14.57
Ankaa	353°5.36	-42°9.63
Schedar	349°28.85	56°41.35
Diphda	348°45.53	-17°50.28
Achernar	335°18.53	-57°6.04
Hamal	327°49.16	23°35.53
Polaris	312°44.58	89°22.63
Acamar	315°10.21	-40°11.72
Menkar	314°4.25	4°11.83
Mirfak	308°25.58	49°57.45
Aldebaran	290°37.57	16°33.85
Rigel	281°2.14	-8°10.11
Capella	280°19.26	46°1.41
Bellatrix	278°20.99	6°22.51
Elnath	277°59.66	28°37.78
Alnilam	275°35.94	-1°10.99
Betelgeuse	270°50.21	7°24.78
Canopus	263°51.35	-52°42.32
Sirius	258°24.70	-16°45.02
Adhara	255°4.47	-29°0.30
Procyon	244°49.13	5°9.40
Pollux	237°15.34	27°57.57
Avior	234°13.97	-59°35.40
Suhail	222°45.19	-43°32.18
Miaplacidus	221°37.93	-69°49.30
Alphard	217°46.30	-8°46.40
Regulus	207°32.93	11°50.13
Dubhe	193°39.51	61°36.09
Denebola	182°23.64	14°25.29
Genah	175°42.29	-17°41.35
Acrux	172°58.95	-63°14.68
Gacrux	171°50.42	-57°15.62
Alioth	166°12.15	55°48.67
Spica	158°21.02	-11°18.01
Alkaid	152°51.30	49°10.65
Hadar	148°34.50	-60°30.04
Menkent	147°56.24	-36°30.02
Arcturus	145°46.88	19°2.56
Rigil Kent.	139°38.89	-60°56.70
Kochab	137°21.05	74°2.60
Zuben'ubi	136°54.70	-16°9.13
Alphecca	126°2.85	26°37.50
Antares	112°14.35	-26°29.45
Atria	107°7.72	-69°4.59
Sabik	102°1.37	-15°45.43
Shaula	96°8.68	-37°7.40
Rasalhague	95°57.44	12°32.55
Eltanin	90°41.90	51°29.30
Kaus Aust.	83°30.81	-34°22.33
Vega	80°32.49	38°48.72
Nunki	75°46.13	-26°15.80
Altair	61°58.63	8°56.52
Peacock	53°3.53	-56°39.07
Deneb	49°24.86	45°22.88
Enif	33°37.29	10°0.88
Al Na'ir	27°30.95	-46°49.97
Fomalhaut	15°12.72	-29°28.81
Scheat	13°43.58	28°13.98
Markab	13°28.26	15°21.20
Nov 09 Mon		
Venus	159°26.99	10:

h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		184°3.33	S16°47.81	188°57.26	12.2'	S20°27.05	10.1' 55.2'
1		199°3.28	48.52	203°28.41	12.1'	20°37.17	10.0' 55.2'
2		214°3.23	49.24	217°59.51	12.1'	20°47.20	9.9' 55.1'
3		229°3.18	· · 49.95	232°30.56	12.0'	20°57.12	9.8' 55.1'
4		244°3.13	50.67	247°1.56	12.0'	21°6.93	9.7' 55.1'
5		259°3.08	51.38	261°32.51	11.9'	21°16.65	9.6' 55.1'
6		274°3.02	S16°52.10	276°3.42	11.9'	S21°26.26	9.5' 55.1'
7		289°2.97	52.81	290°34.27	11.8'	21°35.76	9.4' 55.1'
8		304°2.92	53.53	305°5.07	11.8'	21°45.16	9.3' 55.0'
9		319°2.87	· · 54.24	319°35.83	11.7'	21°54.45	9.2' 55.0'
10		334°2.81	54.95	334°6.53	11.7'	22°3.64	9.1' 55.0'
11		349°2.76	55.66	348°37.19	11.6'	22°12.71	9.0' 55.0'
12		4°2.70	S16°56.37	3°7.79	11.6'	S22°21.68	8.9' 55.0'
13		19°2.65	57.08	17°38.35	11.5'	22°30.54	8.7' 55.0'
14		34°2.60	57.79	32°8.86	11.5'	22°39.28	8.6' 54.9'
15		49°2.54	· · 58.50	46°39.32	11.4'	22°47.92	8.5' 54.9'
16		64°2.48	59.21	61°9.73	11.4'	22°56.44	8.4' 54.9'
17		79°2.43	16°59.92	75°40.10	11.3'	23°4.85	8.3' 54.9'
18		94°2.37	S17°0.63	90°10.42	11.3'	S23°13.15	8.2' 54.9'
19		109°2.32	1.34	104°40.69	11.2'	23°21.33	8.1' 54.9'
20		124°2.26	2.05	119°10.91	11.2'	23°29.39	8.0' 54.8'
21		139°2.20	· · 2.75	133°41.09	11.1'	23°37.34	7.8' 54.8'
22		154°2.14	3.46	148°11.22	11.1'	23°45.18	7.7' 54.8'
23		169°2.09	4.16	162°41.31	11.0'	23°52.89	7.6' 54.8'
		SD = 16.1' d = 0.7'		SD = 15.0'			
Tue		GHA	Dec	GHA	ν	Dec	d HP
0		184°2.03	S17°4.87	177°11.35	11.0'	S24°0.49	7.5' 54.8'
1		199°1.97	5.57	191°41.35	11.0'	24°7.97	7.4' 54.8'
2		214°1.91	6.28	206°11.31	10.9'	24°15.33	7.2' 54.8'
3		229°1.85	· · 6.98	220°41.22	10.9'	24°22.57	7.1' 54.7'
4		244°1.79	7.68	235°11.08	10.8'	24°29.69	7.0' 54.7'
5		259°1.73	8.39	249°40.91	10.8'	24°36.69	6.9' 54.7'
6		274°1.67	S17°9.09	264°10.69	10.7'	S24°43.57	6.8' 54.7'
7		289°1.61	9.79	278°40.44	10.7'	24°50.32	6.6' 54.7'
8		304°1.55	10.49	293°10.14	10.7'	24°56.95	6.5' 54.7'
9		319°1.48	· · 11.19	307°39.80	10.6'	25°3.46	6.4' 54.6'
10		334°1.42	11.89	322°9.42	10.6'	25°9.84	6.3' 54.6'
11		349°1.36	12.59	336°39.01	10.5'	25°16.10	6.1' 54.6'
12		4°1.30	S17°13.29	351°8.56	10.5'	S25°22.23	6.0' 54.6'
13		19°1.23	13.99	5°38.07	10.5'	25°28.24	5.9' 54.6'
14		34°1.17	14.69	20°7.54	10.4'	25°34.12	5.8' 54.6'
15		49°1.11	· · 15.39	34°36.98	10.4'	25°39.87	5.6' 54.6'
16		64°1.04	16.08	49°6.39	10.4'	25°45.50	5.5' 54.5'
17		79°0.98	16.78	63°35.76	10.3'	25°51.00	5.4' 54.5'
18		94°0.91	S17°17.48	78°5.09	10.3'	S25°56.36	5.2' 54.5'
19		109°0.85	18.17	92°34.40	10.3'	26°1.60	5.1' 54.5'
20		124°0.78	18.87	107°3.68	10.2'	26°6.71	5.0' 54.5'
21		139°0.71	· · 19.56	121°32.92	10.2'	26°11.69	4.9' 54.5'
22		154°0.65	20.25	136°2.14	10.2'	26°16.55	4.7' 54.5'
23		169°0.58	20.95	150°31.32	10.2'	26°21.26	4.6' 54.5'
		SD = 16.1' d = 0.7'		SD = 14.9'			
Wed		GHA	Dec	GHA	ν	Dec	d HP
0		184°0.51	S17°21.64	165°0.48	10.1'	S26°25.85	4.5' 54.4'
1		199°0.45	22.33	179°29.62	10.1'	26°30.31	4.3' 54.4'
2		214°0.38	23.02	193°58.73	10.1'	26°34.63	4.2' 54.4'
3		229°0.31	· · 23.72	208°27.81	10.1'	26°38.83	4.1' 54.4'
4		244°0.24	24.41	222°56.87	10.0'	26°42.89	3.9' 54.4'
5		259°0.17	25.10	237°25.91	10.0'	26°46.82	3.8' 54.4'
6		274°0.10	S17°25.79	251°54.92	10.0'	S26°50.61	3.7' 54.4'
7		289°0.03	26.48	266°23.92	10.0'	26°54.27	3.5' 54.4'
8		303°59.96	27.16	280°52.90	10.0'	26°57.80	3.4' 54.3'
9		318°59.89	· · 27.85	295°21.86	9.9'	27°1.19	3.3' 54.3'
10		333°59.82	28.54	309°50.80	9.9'	27°4.45	3.1' 54.3'
11		348°59.75	29.23	324°19.73	9.9'	27°7.57	3.0' 54.3'
12		3°59.68	S17°29.91	338°48.64	9.9'	S27°10.56	2.9' 54.3'
13		18°59.60	30.60	353°17.53	9.9'	27°13.42	2.7' 54.3'
14		33°59.53	31.29	7°46.42	9.9'	27°16.14	2.6' 54.3'
15		48°59.46	· · 31.97	22°15.29	9.9'	27°18.72	2.4' 54.3'
16		63°59.39	32.66	36°44.16	9.9'	27°21.17	2.3' 54.3'
17		78°59.31	33.34	51°13.01	9.8'	27°23.48	2.2' 54.2'
18		93°59.24	S17°34.02	65°41.86	9.8'	S27°25.66	2.0' 54.2'
19		108°59.16	34.71	80°10.70	9.8'	27°27.70	1.9' 54.2'
20		123°59.09	35.39	94°39.53	9.8'	27°29.61	1.8' 54.2'
21		138°59.02	· · 36.07	109°8.36	9.8'	27°31.38	1.6' 54.2'
22		153°58.94	36.75	123°37.19	9.8'	27°33.01	1.5' 54.2'
23		168°58.86	37.43	138°6.01	9.8'	27°34.51	1.4' 54.2'
		SD = 16.1' d = 0.7'		SD = 14.8'			

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

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

Day	Sun		Mer. Pass	Moon		Age 0-2 0-3%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
09	16:13	16:11	11:44	11:47	—:—	●
10	16:08	16:05	11:44	12:37	00:12	●
11	16:02	15:59	11:44	13:28	01:02	●

November 12, 13, 14 UT (Thu., Fri., Sat.)

Aries		Venus		Mars		Jupiter		Saturn		Stars			
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	51°8.51	210°43.17	S10°54.12	264°14.83	N15°16.41	263°6.71	N13°42.12	42°8.05	N00°59.74	<div>Alpheratz 357°32.97 29°14.58</div> <div>Ankaa 353°5.36 -42°9.64</div> <div>Schedar 349°28.86 56°41.37</div> <div>Diphda 348°45.53 -17°50.29</div> <div>Achernar 335°18.54 -57°6.05</div> <div>Hamal 327°49.15 23°35.53</div> <div>Polaris 312°44.11 89°22.65</div> <div>Acamar 315°10.20 -40°11.73</div> <div>Menkar 314°4.24 4°11.82</div> <div>Mirfak 308°25.56 49°57.46</div> <div>Aldebaran 290°37.55 16°33.85</div> <div>Rigel 281°2.12 -8°10.11</div> <div>Capella 280°19.23 46°1.42</div> <div>Bellatrix 278°20.97 6°22.50</div> <div>Elmath 277°59.63 28°37.78</div> <div>Alnilam 275°35.92 -1°11.00</div> <div>Betelgeuse 270°50.19 7°24.77</div> <div>Canopus 263°51.32 -52°42.33</div> <div>Sirius 258°24.68 -16°45.03</div> <div>Adhara 255°4.45 -29°0.31</div> <div>Procyon 244°49.10 5°9.39</div> <div>Pollux 243°15.31 27°57.56</div> <div>Avior 234°13.93 -59°35.41</div> <div>Suhail 222°45.16 -43°32.19</div> <div>Miaplacidus 221°37.87 -69°49.30</div> <div>Alphard 217°46.27 -8°46.41</div> <div>Regulus 207°32.90 11°50.12</div> <div>Dubhe 193°39.47 61°36.08</div> <div>Denebola 182°23.61 14°25.27</div> <div>Gienah 175°42.27 -17°41.36</div> <div>Acruz 172°58.91 -63°14.67</div> <div>Gacrux 171°50.39 -57°15.62</div> <div>Alioth 166°12.12 55°48.65</div> <div>Spica 158°21.00 -11°18.02</div> <div>Alkaid 152°51.29 49°10.63</div> <div>Hadar 148°34.47 -60°30.03</div> <div>Menkent 147°56.22 -36°30.02</div> <div>Arcturus 145°46.87 19°2.55</div> <div>Rigel Kent. 139°38.87 -60°56.69</div> <div>Kochab 137°21.05 74°2.58</div> <div>Zuben'ubi 136°54.69 -16°9.13</div> <div>Alphecca 126°2.84 26°37.49</div> <div>Antares 112°14.34 -26°29.45</div> <div>Atria 107°7.71 -69°4.58</div> <div>Sabik 102°1.37 -15°45.43</div> <div>Shaula 96°8.68 -37°7.40</div> <div>Rasalhague 95°57.45 12°32.54</div> <div>Eltanin 90°41.91 51°29.29</div> <div>Kaus Aust. 83°30.81 -34°22.33</div> <div>Vega 80°32.50 38°48.71</div> <div>Nunki 75°46.13 -26°15.79</div> <div>Altair 61°58.64 8°56.51</div> <div>Peacock 53°3.55 -56°39.07</div> <div>Deneb 49°24.88 45°22.88</div> <div>Enif 33°37.30 10°0.08</div> <div>Al Na'ir 27°30.97 -46°49.97</div> <div>Fomalhaut 15°12.73 -29°28.82</div> <div>Scheat 13°43.59 28°13.98</div> <div>Markab 13°28.26 15°21.21</div>			
1	66°10.97	225°45.60	53.49	279°16.15	16.08	278°8.94	42.05	57°10.63	59.70				
2	81°13.44	240°48.02	52.86	294°17.46	15.75	293°11.18	41.98	72°13.21	59.66				
3	96°15.90	255°50.44	•• 52.23	309°18.77	•• 15.42	308°13.41	•• 41.91	87°15.79	•• 59.62				
4	111°18.37	270°52.86	51.60	324°20.09	15.08	323°15.64	41.84	102°18.37	59.58				
5	126°20.83	285°55.27	50.98	339°21.40	14.75	338°17.88	41.77	117°20.95	59.54				
6	141°23.29	300°57.68	S10°50.36	354°22.72	N15°14.42	353°20.11	N13°41.70	132°23.53	N00°59.50				
7	156°25.76	316°0.08	49.74	9°24.03	14.09	8°22.35	41.63	147°26.11	59.46				
8	171°28.22	331°2.49	49.12	24°25.35	13.76	23°24.58	41.56	162°28.68	59.42				
9	186°30.69	346°4.88	•• 48.50	39°26.67	•• 13.42	38°26.82	•• 41.49	177°31.26	•• 59.38				
10	201°33.15	1°7.28	47.89	54°27.98	13.09	53°29.05	41.42	192°33.84	59.34				
11	216°35.62	16°9.67	47.28	69°29.30	12.76	68°31.29	41.35	207°36.42	59.30				
12	231°38.08	31°12.05	S10°46.67	84°30.62	N15°12.43	83°33.53	N13°41.28	222°39.00	N00°59.26				
13	246°40.54	46°14.43	46.06	99°31.94	12.10	98°35.76	41.21	237°41.58	59.22				
14	261°43.01	61°16.81	45.45	114°33.25	11.77	113°38.00	41.14	252°44.15	59.18				
15	276°45.47	76°19.19	•• 44.85	129°34.57	•• 11.44	128°40.24	•• 41.07	267°46.73	•• 59.14				
16	291°47.94	91°21.56	44.25	144°35.89	11.11	143°42.47	41.01	282°49.31	59.10				
17	306°50.40	106°23.92	43.65	159°37.21	10.77	158°44.71	40.94	297°51.89	59.06				
18	321°52.86	121°26.28	S10°43.05	174°38.53	N15°10.44	173°46.95	N13°40.87	312°54.46	N00°59.02				
19	336°55.33	136°28.64	42.45	189°39.85	10.11	188°49.19	40.80	327°57.04	58.98				
20	351°57.79	151°31.00	41.86	204°41.18	9.78	203°51.43	40.73	342°59.62	58.94				
21	7°0.26	166°33.35	•• 41.27	219°42.50	•• 9.45	218°53.66	•• 40.66	358°2.19	•• 58.90				
22	22°2.72	181°35.70	40.68	234°43.82	9.12	233°55.90	40.59	13°4.77	58.86				
23	37°5.19	196°38.04	40.09	249°45.14	8.79	248°58.14	40.52	28°7.35	58.82				
Mer.pass. 20:32		ν2.4' d-0.6' m-4.74		ν1.3' d-0.3' m0.73		ν2.2' d-0.1' m-2.07		ν2.6' d-0.0' m0.51					
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	52°7.65	211°40.38	S10°39.50	264°46.47	N15°8.46	264°0.38	N13°40.45	43°9.92	N00°58.78				
1	67°10.11	226°42.72	38.92	279°47.79	8.13	279°2.62	40.39	58°12.50	58.74				
2	82°12.58	241°45.05	38.33	294°49.12	7.80	294°4.86	40.32	73°15.07	58.70				
3	97°15.04	256°47.38	•• 37.75	309°50.44	•• 7.47	309°7.10	•• 40.25	88°17.65	•• 58.66				
4	112°17.51	271°49.70	37.18	324°51.77	7.14	324°9.34	40.18	103°20.23	58.62				
5	127°19.97	286°52.02	36.60	339°53.09	6.81	339°11.58	40.11	118°22.80	58.58				
6	142°22.43	301°54.34	S10°36.02	354°54.42	N15°6.48	354°13.83	N13°40.05	133°25.38	N00°58.54				
7	157°24.90	316°56.65	35.45	9°55.74	6.15	9°16.07	39.98	148°27.95	58.50				
8	172°27.36	331°58.96	34.88	24°57.07	5.82	24°18.31	39.91	163°30.53	58.47				
9	187°29.83	347°1.27	•• 34.31	39°58.40	•• 5.49	39°20.55	•• 39.84	178°33.10	•• 58.43				
10	202°32.29	2°3.57	33.75	54°59.73	5.16	54°22.79	39.77	193°35.68	58.39				
11	217°34.76	17°5.86	33.18	70°10.66	4.83	69°25.04	39.71	208°38.25	58.35				
12	232°37.22	32°8.16	S10°32.62	85°2.38	N15°4.50	84°27.28	N13°39.64	223°40.83	N00°58.31				
13	247°39.68	47°10.45	32.06	100°3.71	4.17	99°29.52	39.57	238°43.40	58.27				
14	262°42.15	62°12.74	31.50	115°5.04	3.84	114°31.77	39.51	253°45.98	58.23				
15	277°44.61	77°15.02	•• 30.95	130°6.37	•• 3.51	129°34.01	•• 39.44	268°48.55	•• 58.20				
16	292°47.08	92°17.30	30.39	145°7.71	3.18	144°36.25	39.37	283°51.12	58.16				
17	307°49.54	107°19.57	29.84	160°9.04	2.85	159°38.50	39.30	298°53.70	58.12				
18	322°52.00	122°21.84	S10°29.29	175°10.37	N15°2.53	174°40.74	N13°39.24	313°56.27	N00°58.08				
19	337°54.47	137°24.11	28.74	190°11.70	2.20	189°42.99	39.17	328°58.85	58.04				
20	352°56.93	152°26.38	28.19	205°13.03	1.87	204°45.23	39.10	344°1.42	58.01				
21	7°59.40	167°28.64	•• 27.65	220°14.37	•• 1.54	219°47.48	•• 39.04	359°3.99	•• 57.97				
22	23°1.86	182°30.89	27.11	235°15.70	1.21	234°49.72	38.97	14°6.57	57.93				
23	38°4.33	197°33.14	26.57	250°17.04	0.88	249°51.97	38.90	29°9.14	57.89				
Mer.pass. 20:28		ν2.3' d-0.6' m-4.77		ν1.3' d-0.3' m0.72		ν2.2' d-0.1' m-2.07		ν2.6' d-0.0' m0.52					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	53°6.79	212°35.39	S10°26.03	265°18.37	N15°0.55	264°54.21	N13°38.84	44°11.71	N00°57.85				
1	68°9.25	227°37.64	25.49	280°19.71	15°0.23	279°56.46	38.77	59°14.29	57.82				
2	83°11.72	242°39.88	24.96	295°21.04	14°59.90	294°58.71	38.71	74°16.86	57.78				
3	98°14.18	257°42.12	•• 24.43	310°22.38	•• 59.57	310°0.95	•• 38.64	89°19.43	•• 57.74				
4	113°16.65	272°44.35	23.90	325°23.71	59.24	325°3.20	38.57	104°22.00	57.70				
5	128°19.11	287°46.58	23.37	340°25.05	58.91	340°5.45	38.51	119°24.58	57.67				
6	143°21.58	302°48.81	S10°22.84	355°26.39	N14°58.59	355°7.70	N13°38.44	134°27.15	N00°57.63				
7	158°24.04	317°51.03	22.32	10°27.73	58.26	10°9.94	38.38	149°29.72	57.59				
8	173°26.50	332°53.25	21.80	25°29.06	57.93	25°12.19	38.31	164°32.29	57.55				
9	188°28.97	347°55.46	•• 21.28	40°30.40	•• 57.60	40°14.44	•• 38.25	179°34.86	•• 57.52				
10	203°31.43	2°57.68	20.76	55°31.74	57.27	55°16.69	38.18	194°37.43	57.48				
11	218°33.90	17°59.88	20.24	70°33.08	56.95	70°18.94	38.12	209°40.01	57.44				
12	233°36.36	33°2.09	S10°19.73	85°34.42	N14°56.62	85°21.19	N13°38.05	224°42.58	N00°57.41				
13	248°38.82	48°4.29	19.22	100°35.76	56.29	100°23.44	37.99	239°45.15	57.37				
14	263°41.29	63°6.48	18.71	115°37.11	55.97	115°25.69	37.92	254°47.72	57.33				
15	278°43.75	78°8.68	•• 18.20	130°38.45	•• 55.64	130°27.94	•• 37.86	269°50.29	•• 57.30				
16	293°46.22	93°10.87	17.69	145°39.79	55.31	145°30.19	37.79	284°52.86	57.26				
17	308°48.68	108°13.05	17.19	160°41.13	54.98	160°32.44	37.73	299°55.43	57.22				
18	323°51.15	123°15.23	S10°16.69	175°42.48	N14°54.66	175°34.69	N13°37.66	314°58.00	N00°57.19				
19	338°53.61	138°17.41	16.19	190°43.82	54.33	190°36.94	37.60	330°0.57	57.15				
20	353°56.07	153°19.59	15.69	205°45.16	54.00	205°39.19	37.53	345°3.14	57.11				
21	8°58.54	168°21.76	•• 15.19	220°46.51	•• 53.68	220°41.45	•• 37.47	0°5.71	•• 57.08				
22	24°1.00	183°23.92	14.70	235°47.85	53.35	235°43.70	37.41	15°8.28	57.04				
23	39°3.47	198°26.09	14.21	250°49.20	53.02	250°45.95	37.34	30°10.85	57.00				
Mer.pass. 20:24		ν2.2' d-0.5' m-4.80		ν1.3' d-0.3' m0.71		ν2.2' d-0.1' m-2.08		ν2.6' d-0.0' m0.52					
											Nov 12 Thu	SHA	Mer.pass
											Venus	159°34.66	09:56
											Mars	213°6.32	06:22
											Jupiter	211°58.20	06:27
											Saturn	350°59.54	21:08
											Nov 13 Fri	SHA	Mer.pass
											Venus	159°32.73	09:52
											Mars	212°38.82	06:20
											Jupiter	211°52.73	06:23
											Saturn	351°2.27	21:04
											Nov 14 Sat	SHA	Mer.pass
											Venus	159°28.60	09:48
											Mars	212°11.58	06:18
											Jupiter	211°47.42	06:19
											Saturn	351°4.92	21:00

h		Sun		Moon				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		183°58.79	S17°38.11	152°34.84	9.8'	S27°35.87	1.2'	54.2'
1		198°58.71	38.79	167°3.66	9.8'	27°37.10	1.1'	54.2'
2		213°58.63	39.47	181°32.49	9.8'	27°38.19	1.0'	54.2'
3		228°58.56	· · 40.15	196°1.31	9.8'	27°39.14	0.8'	54.2'
4		243°58.48	40.83	210°30.15	9.8'	27°39.96	0.7'	54.1'
5		258°58.40	41.51	224°58.98	9.8'	27°40.64	0.5'	54.1'
6		273°58.32	S17°42.18	239°27.83	9.9'	S27°41.19	0.4'	54.1'
7		288°58.25	42.86	253°56.68	9.9'	27°41.60	0.3'	54.1'
8		303°58.17	43.54	268°25.54	9.9'	27°41.87	0.1'	54.1'
9		318°58.09	· · 44.21	282°54.41	9.9'	27°42.01	0.0'	54.1'
10		333°58.01	44.89	297°23.29	9.9'	27°42.01	-0.1'	54.1'
11		348°57.93	45.56	311°52.18	9.9'	27°41.88	-0.3'	54.1'
12		3°57.85	S17°46.24	326°21.09	9.9'	S27°41.61	-0.4'	54.1'
13		18°57.77	46.91	340°50.01	9.9'	27°41.21	-0.5'	54.1'
14		33°57.68	47.58	355°18.94	10.0'	27°40.68	-0.7'	54.1'
15		48°57.60	· · 48.25	9°47.90	10.0'	27°40.00	-0.8'	54.1'
16		63°57.52	48.93	24°16.87	10.0'	27°39.22	-0.9'	54.1'
17		78°57.44	49.60	38°45.86	10.0'	27°38.26	-1.1'	54.1'
18		93°57.36	S17°50.27	53°14.87	10.0'	S27°37.18	-1.2'	54.1'
19		108°57.27	50.94	67°43.90	10.1'	27°35.97	-1.3'	54.0'
20		123°57.19	51.61	82°12.95	10.1'	27°34.63	-1.5'	54.0'
21		138°57.11	· · 52.28	96°42.03	10.1'	27°33.16	-1.6'	54.0'
22		153°57.02	52.94	111°11.13	10.1'	27°31.55	-1.7'	54.0'
23		168°56.94	53.61	125°40.26	10.2'	27°29.81	-1.9'	54.0'
		SD = 16.1'		$d = 0.7'$		SD = 14.8'		

Fri		GHA	Dec	GHA	ν	Dec	d	HP
0		183°56.85	S17°54.28	140°9.41	10.2'	S27°27.94	-2.0'	54.0'
1		198°56.77	54.95	154°38.59	10.2'	27°25.93	-2.1'	54.0'
2		213°56.68	55.61	169°7.80	10.2'	27°23.80	-2.3'	54.0'
3		228°56.60	· · 56.28	183°37.04	10.3'	27°21.53	-2.4'	54.0'
4		243°56.51	56.94	198°6.31	10.3'	27°19.14	-2.5'	54.0'
5		258°56.42	57.61	212°35.61	10.3'	27°16.61	-2.7'	54.0'
6		273°56.34	S17°58.27	227°4.95	10.4'	S27°13.95	-2.8'	54.0'
7		288°56.25	58.94	241°34.32	10.4'	27°11.16	-2.9'	54.0'
8		303°56.16	17°59.60	256°3.72	10.4'	27°8.25	-3.0'	54.0'
9		318°56.07	18°0.26	270°33.16	10.5'	27°5.20	-3.2'	54.0'
10		333°55.98	0.92	285°2.63	10.5'	27°2.03	-3.3'	54.0'
11		348°55.90	1.59	299°32.14	10.5'	26°58.72	-3.4'	54.0'
12		3°55.81	S18°2.25	314°1.69	10.6'	S26°55.30	-3.6'	54.0'
13		18°55.72	2.91	328°31.28	10.6'	26°51.74	-3.7'	54.0'
14		33°55.63	3.57	343°0.90	10.7'	26°48.06	-3.8'	54.0'
15		48°55.54	· · 4.23	357°30.57	10.7'	26°44.25	-3.9'	54.0'
16		63°55.45	4.89	12°0.28	10.7'	26°40.32	-4.1'	54.0'
17		78°55.35	5.54	26°30.03	10.8'	26°36.26	-4.2'	54.0'
18		93°55.26	S18°6.20	40°59.82	10.8'	S26°32.07	-4.3'	54.0'
19		108°55.17	6.86	55°29.66	10.9'	26°27.77	-4.4'	54.0'
20		123°55.08	7.51	69°59.53	10.9'	26°23.34	-4.6'	54.0'
21		138°54.99	· · 8.17	84°29.46	11.0'	26°18.79	-4.7'	54.0'
22		153°54.89	8.83	98°59.43	11.0'	26°14.11	-4.8'	54.0'
23		168°54.80	9.48	113°29.44	11.1'	26°9.31	-4.9'	54.0'
		SD = 16.2'		$d = 0.7'$		SD = 14.7'		

Sat		GHA	Dec	GHA	ν	Dec	d	HP
0		183°54.71	S18°10.14	127°59.51	11.1'	S26°4.40	-5.0'	54.0'
1		198°54.61	10.79	142°29.61	11.2'	25°59.36	-5.2'	54.0'
2		213°54.52	11.44	156°59.77	11.2'	25°54.20	-5.3'	54.0'
3		228°54.42	· · 12.10	171°29.97	11.3'	25°48.92	-5.4'	54.0'
4		243°54.33	12.75	186°0.23	11.3'	25°43.52	-5.5'	54.0'
5		258°54.23	13.40	200°30.53	11.4'	25°38.01	-5.6'	54.0'
6		273°54.14	S18°14.05	215°0.88	11.4'	S25°32.38	-5.7'	54.0'
7		288°54.04	14.70	229°31.28	11.5'	25°26.63	-5.9'	54.0'
8		303°53.95	15.35	244°1.73	11.5'	25°20.76	-6.0'	54.0'
9		318°53.85	· · 16.00	258°32.24	11.6'	25°14.78	-6.1'	54.0'
10		333°53.75	16.65	273°2.79	11.6'	25°8.69	-6.2'	54.0'
11		348°53.65	17.30	287°33.40	11.7'	25°2.48	-6.3'	54.0'
12		3°53.56	S18°17.94	302°4.05	11.7'	S24°56.15	-6.4'	54.0'
13		18°53.46	18.59	316°34.76	11.8'	24°49.71	-6.5'	54.0'
14		33°53.36	19.24	331°5.53	11.8'	24°43.16	-6.7'	54.0'
15		48°53.26	· · 19.88	345°36.34	11.9'	24°36.50	-6.8'	54.0'
16		63°53.16	20.53	0°7.21	11.9'	24°29.73	-6.9'	54.0'
17		78°53.06	21.17	14°38.13	12.0'	24°22.85	-7.0'	54.1'
18		93°52.96	S18°21.82	29°9.10	12.0'	S24°15.85	-7.1'	54.1'
19		108°52.86	22.46	43°40.13	12.1'	24°8.75	-7.2'	54.1'
20		123°52.76	23.11	58°11.21	12.1'	24°1.54	-7.3'	54.1'
21		138°52.66	· · 23.75	72°42.35	12.2'	23°54.22	-7.4'	54.1'
22		153°52.56	24.39	87°13.53	12.2'	23°46.80	-7.5'	54.1'
23		168°52.46	25.03	101°44.78	12.3'	23°39.26	-7.6'	54.1'
		SD = 16.2'		$d = 0.7'$		SD = 14.7'		

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

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

Day

November 15, 16, 17 UT (Sun., Mon., Tue.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°5.93		213°28.25	S10°13.72	265°50.55	N14°52.70	265°48.20	N13°37.28	45°13.42	N00°56.97
1	60°8.39		228°30.40	13.23	280°51.89	52.37	280°50.46	37.21	60°15.99	56.93
2	84°10.86		243°32.55	12.75	295°53.24	52.05	295°52.71	37.15	75°18.56	56.90
3	99°13.32		258°34.70	•• 12.26	310°54.59	•• 51.72	310°54.96	•• 37.09	90°21.13	•• 56.86
4	114°15.79		273°36.85	11.78	325°55.94	51.39	325°57.22	37.02	105°23.70	56.82
5	129°18.25		288°38.99	11.30	340°57.28	51.07	340°59.47	36.96	120°26.27	56.79
6	144°20.72		303°41.13	S10°10.82	355°58.63	N14°50.74	356°1.73	N13°36.90	135°28.84	N00°56.75
7	159°23.18		318°43.26	10.35	10°59.98	50.42	11°3.98	36.83	150°31.41	56.72
8	174°25.64		333°45.39	9.87	26°1.33	50.09	26°6.24	36.77	165°33.97	56.68
9	189°28.11		348°47.52	•• 9.40	41°2.68	•• 49.77	41°8.49	•• 36.71	180°36.54	•• 56.64
10	204°30.57		3°49.64	8.93	56°4.03	49.44	56°10.75	36.64	195°39.11	56.61
11	219°33.04		18°51.76	8.47	71°5.39	49.12	71°13.00	36.58	210°41.68	56.57
12	234°35.50		33°53.88	S10°8.00	86°6.74	N14°48.79	86°15.26	N13°36.52	225°44.25	N00°56.54
13	249°37.96		48°55.99	7.54	101°8.09	48.47	101°17.52	36.46	240°46.81	56.50
14	264°40.43		63°58.10	7.08	116°9.44	48.14	116°19.77	36.39	255°49.38	56.47
15	279°42.89		79°0.20	•• 6.62	131°10.80	•• 47.82	131°22.03	•• 36.33	270°51.95	•• 56.43
16	294°45.36		94°2.30	6.16	146°12.15	47.49	146°24.29	36.27	285°54.52	56.40
17	309°47.82		109°4.40	5.70	161°13.50	47.17	161°26.54	36.21	300°57.08	56.36
18	324°50.28		124°6.49	S10°5.25	176°14.86	N14°46.84	176°28.80	N13°36.14	315°59.65	N00°56.33
19	339°52.75		139°8.58	4.80	191°16.21	46.52	191°31.06	36.08	331°2.22	56.29
20	354°55.21		154°10.67	4.35	206°17.57	46.19	206°33.32	36.02	346°4.78	56.26
21	9°57.68		169°12.75	•• 3.90	221°18.93	•• 45.87	221°35.58	•• 35.96	1°7.35	•• 56.22
22	25°0.14		184°14.83	3.46	236°20.28	45.54	236°37.84	35.90	16°9.92	56.19
23	40°2.61		199°16.91	3.01	251°21.64	45.22	251°40.10	35.83	31°12.48	56.15
Mer.pass. 20:20		ν2.2' d-0.5' m-4.82			ν1.3' d-0.3' m0.69		ν2.3' d-0.1' m-2.09		ν2.6' d-0.0' m0.53	

Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	55°5.07		214°18.98	S10°2.57	266°23.00	N14°44.90	266°42.35	N13°35.77	46°15.05	N00°56.12
1	70°7.53		229°21.05	2.13	281°24.36	44.57	281°44.61	35.71	61°17.62	56.08
2	85°10.00		244°23.11	1.70	296°25.72	44.25	296°46.87	35.65	76°20.18	56.05
3	100°12.46		259°25.17	•• 1.26	311°27.07	•• 43.93	311°49.14	•• 35.59	91°22.75	•• 56.02
4	115°14.93		274°27.23	0.83	326°28.43	43.60	326°51.40	35.53	106°25.31	55.98
5	130°17.39		289°29.29	0.40	341°29.79	43.28	341°53.66	35.47	121°27.88	55.95
6	145°19.85		304°31.34	S09°59.97	356°31.16	N14°42.95	356°55.92	N13°35.41	136°30.44	N00°55.91
7	160°22.32		319°33.38	09°59.54	11°32.52	42.63	11°58.18	35.34	151°33.01	55.88
8	175°24.78		334°35.43	59.11	26°33.88	42.31	27°0.44	35.28	166°35.57	55.85
9	190°27.25		349°37.47	•• 58.69	41°35.24	•• 41.99	42°2.70	•• 35.22	181°38.14	•• 55.81
10	205°29.71		4°39.50	58.27	56°36.60	41.66	57°4.97	35.16	196°40.70	55.78
11	220°32.18		19°41.54	57.85	71°37.97	41.34	72°7.23	35.10	211°43.27	55.74
12	235°34.64		34°43.57	S09°57.43	86°39.33	N14°41.02	87°9.49	N13°35.04	226°45.83	N00°55.71
13	250°37.10		49°45.59	57.02	101°40.69	40.69	102°11.75	34.98	241°48.40	55.68
14	265°39.57		64°47.61	56.61	116°42.06	40.37	117°14.02	34.92	256°50.96	55.64
15	280°42.03		79°49.63	•• 56.19	131°43.42	•• 40.05	132°16.28	•• 34.86	271°53.52	•• 55.61
16	295°44.50		94°51.65	55.79	146°44.79	39.73	147°18.55	34.80	286°56.09	55.58
17	310°46.96		109°53.66	55.38	161°46.15	39.40	162°20.81	34.74	301°58.65	55.54
18	325°49.42		124°55.67	S09°54.97	176°47.52	N14°39.08	177°23.07	N13°34.68	317°1.22	N00°55.51
19	340°51.89		139°57.67	54.57	191°48.89	38.76	192°25.34	34.62	332°3.78	55.48
20	355°54.35		154°59.67	54.17	206°50.26	38.44	207°27.60	34.56	347°6.34	55.44
21	10°56.82		170°1.67	•• 53.77	221°51.62	•• 38.12	222°29.87	•• 34.50	2°8.90	•• 55.41
22	25°59.28		185°3.66	53.37	236°52.99	37.79	237°32.14	34.44	17°11.47	55.38
23	41°1.74		200°5.65	52.98	251°54.36	37.47	252°34.40	34.38	32°14.03	55.34
Mer.pass. 20:16		ν2.1' d-0.4' m-4.84			ν1.4' d-0.3' m0.68		ν2.3' d-0.1' m-2.09		ν2.6' d-0.0' m0.53	

Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°4.21		215°7.64	S09°52.59	266°55.73	N14°37.15	267°36.67	N13°34.32	47°16.59	N00°55.31
1	71°6.67		230°9.62	52.19	281°57.10	36.83	282°38.93	34.27	62°19.16	55.28
2	86°9.14		245°11.60	51.81	296°58.47	36.51	297°41.20	34.21	77°21.72	55.24
3	101°11.60		260°13.58	•• 51.42	311°59.84	•• 36.19	312°43.47	•• 34.15	92°24.28	•• 55.21
4	116°14.07		275°15.55	51.03	327°1.21	35.87	327°45.74	34.09	107°26.84	55.18
5	131°16.53		290°17.52	50.65	342°2.59	35.55	342°48.00	34.03	122°29.40	55.15
6	146°18.99		305°19.49	S09°50.27	357°3.96	N14°35.22	357°50.27	N13°33.97	137°31.97	N00°55.11
7	161°21.46		320°21.45	49.89	12°5.33	34.90	12°52.54	33.91	152°34.53	55.08
8	176°23.92		335°23.41	49.51	27°6.70	34.58	27°54.81	33.85	167°37.09	55.05
9	191°26.39		350°25.36	•• 49.14	42°8.08	•• 34.26	42°57.08	•• 33.80	182°39.65	•• 55.02
10	206°28.85		5°27.32	48.76	57°9.45	33.94	57°59.35	33.74	197°42.21	54.99
11	221°31.31		20°29.26	48.39	72°10.83	33.62	73°1.62	33.68	212°44.77	54.95
12	236°33.78		35°31.21	S09°48.02	87°12.20	N14°33.30	88°3.88	N13°33.62	227°47.33	N00°54.92
13	251°36.24		50°33.15	47.66	102°13.58	32.98	103°6.15	33.56	242°49.89	54.89
14	266°38.71		65°35.09	47.29	117°14.95	32.66	118°8.42	33.51	257°52.45	54.86
15	281°41.17		80°37.02	•• 46.93	132°16.33	•• 32.34	133°10.70	•• 33.45	272°55.02	•• 54.83
16	296°43.63		95°38.95	46.57	147°17.71	32.02	148°12.97	33.39	287°57.58	54.79
17	311°46.10		110°40.88	46.21	162°19.09	31.70	163°15.24	33.33	303°0.14	54.76
18	326°48.56		125°42.81	S09°45.85	177°20.46	N14°31.38	178°17.51	N13°33.28	318°2.70	N00°54.73
19	341°51.03		140°44.73	45.50	192°21.84	31.06	193°19.78	33.22	333°5.26	54.70
20	356°53.49		155°46.64	45.14	207°23.22	30.74	208°22.05	33.16	348°7.82	54.67
21	11°55.96		170°48.56	•• 44.79	222°24.60	•• 30.42	223°24.32	•• 33.10	3°10.37	•• 54.64
22	26°58.42		185°50.47	44.44	237°25.98	30.10	238°26.60	33.05	18°12.93	54.60
23	42°0.88		200°52.37	44.10	252°27.36	29.79	253°28.87	32.99	33°15.49	54.57
Mer.pass. 20:12		ν2.0' d-0.4' m-4.85			ν1.4' d-0.3' m0.67		ν2.3' d-0.1' m-2.10		ν2.6' d-0.0' m0.54	

Stars		
	SHA	Dec
Alpheratz	357°32.97	29°14.59
Ankaa	353°5.37	-42°9.65
Schedar	349°28.87	56°41.38
Diphda	348°45.53	-17°50.29
Achernar	335°18.55	-57°6.06
Hamal	327°49.15	23°35.53
Polaris	312°43.90	89°22.67
Acamar	315°10.20	-40°11.77
Menkar	314°4.23	4°11.82
Mirfak	308°25.55	49°57.47
Aldebaran	290°37.54	16°33.85
Rigel	281°2.10	-8°10.13
Capella	280°19.20	46°1.43
Bellatrix	278°20.95	6°22.50
Elnath	277°59.61	28°37.78
Alnilam	275°35.90	-1°11.00
Betelgeuse	270°50.16	7°24.77
Canopus	263°51.30	-52°42.34
Sirius	258°24.66	-16°45.04
Adhara	255°4.42	-29°0.32
Procyon	244°49.08	5°9.38
Pollux	243°15.28	27°57.56
Avior	234°13.89	-59°35.42
Suhail	222°45.13	-43°32.20
Miaplacidus	221°37.82	-69°49.31
Alphard	217°46.25	-8°46.42
Regulus	207°32.87	11°50.11
Dubhe	193°39.43	61°36.07
Denebola	182°23.59	14°25.26
Gienah	175°42.24	-17°41.37
Acrux	172°58.87	-63°14.67
Gacrux	171°50.35	-57°15.62
Alioth	166°12.10	55°48.64
Spica	158°20.98	-11°18.03
Alkaid	152°51.27	49°10.61
Hadar	148°34.45	-60°30.02
Menkent	147°56.20	-36°30.02
Arcturus	145°46.86	19°2.53
Rigel Kent.	139°38.85	-60°56.68
Kochab	137°21.04	74°2.56
Zuben'ubi	136°54.68	-16°9.14
Alphecca	126°2.84	26°37.47
Antares	112°14.34	-26°29.45
Atria	107°7.71	-69°4.57
Sabik	102°1.37	-15°45.44
Shaula	96°8.68	-37°7.40
Rasalhague	95°57.45	12°32.53
Eltanin	90°41.93	51°29.27
Kaus Aust.	83°30.82	-34°22.32
Vega	80°32.51	38°48.70
Nunki	75°46.14	-26°15.79
Altair	61°58.64	8°56.51
Peacock	53°3.56	-56°39.07
Deneb	49°24.90	45°22.88
Enif	33°37.31	10°0.08
Al Na'ir	27°30.98	-46°49.98
Fomalhaut	15°12.74	-29°28.82
Scheat	13°43.60	-28°13.99
Markab	13°28.27	15°21.21

h		Sun		Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.35	S18°25.67	116°16.07	12.4'	S23°31.62	-7.7'	54.1'
1	198°52.25	26.31	130°47.42	12.4'	23°23.88	-7.8'	54.1'
2	213°52.15	26.95	145°18.83	12.5'	23°16.03	-8.0'	54.1'
3	228°52.05	· · 27.59	159°50.29	12.5'	23°8.08	-8.1'	54.1'
4	243°51.94	28.23	174°21.80	12.6'	23°0.03	-8.2'	54.1'
5	258°51.84	28.87	188°53.37	12.6'	22°51.87	-8.3'	54.1'
6	273°51.73	S18°29.51	203°24.99	12.7'	S22°43.61	-8.4'	54.2'
7	288°51.63	30.14	217°56.66	12.7'	22°35.25	-8.5'	54.2'
8	303°51.52	30.78	232°28.39	12.8'	22°26.79	-8.6'	54.2'
9	318°51.42	· · 31.41	247°0.17	12.8'	22°18.23	-8.7'	54.2'
10	333°51.31	32.05	261°32.00	12.9'	22°9.58	-8.8'	54.2'
11	348°51.21	32.68	276°3.89	12.9'	22°0.82	-8.9'	54.2'
12	3°51.10	S18°33.32	290°35.83	13.0'	S21°51.96	-9.0'	54.2'
13	18°50.99	33.95	305°7.82	13.0'	21°43.01	-9.0'	54.2'
14	33°50.89	34.59	319°39.87	13.1'	21°33.97	-9.1'	54.2'
15	48°50.78	· · 35.22	334°11.97	13.1'	21°24.82	-9.2'	54.3'
16	63°50.67	35.85	348°44.12	13.2'	21°15.59	-9.3'	54.3'
17	78°50.56	36.48	3°16.32	13.3'	21°6.26	-9.4'	54.3'
18	93°50.45	S18°37.11	17°48.57	13.3'	S20°56.83	-9.5'	54.3'
19	108°50.34	37.74	32°20.87	13.4'	20°47.31	-9.6'	54.3'
20	123°50.23	38.37	46°53.23	13.4'	20°37.71	-9.7'	54.3'
21	138°50.12	· · 39.00	61°25.63	13.5'	20°28.00	-9.8'	54.3'
22	153°50.01	39.63	75°58.09	13.5'	20°18.21	-9.9'	54.3'
23	168°49.90	40.26	90°30.59	13.6'	20°8.33	-10.0'	54.4'
SD = 16.2'		$d = 0.6'$	SD = 14.8'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.79	S18°40.88	105°3.14	13.6'	S19°58.36	-10.1'	54.4'
1	198°49.68	41.51	119°35.75	13.6'	19°48.30	-10.1'	54.4'
2	213°49.57	42.14	134°8.40	13.7'	19°38.16	-10.2'	54.4'
3	228°49.46	· · 42.76	148°41.09	13.7'	19°27.93	-10.3'	54.4'
4	243°49.35	43.39	163°13.84	13.8'	19°17.61	-10.4'	54.4'
5	258°49.23	44.01	177°46.63	13.8'	19°7.20	-10.5'	54.5'
6	273°49.12	S18°44.63	192°19.47	13.9'	S18°56.71	-10.6'	54.5'
7	288°49.01	45.26	206°52.35	13.9'	18°46.14	-10.7'	54.5'
8	303°48.89	45.88	221°25.28	14.0'	18°35.48	-10.7'	54.5'
9	318°48.78	· · 46.50	235°58.25	14.0'	18°24.74	-10.8'	54.5'
10	333°48.67	47.12	250°31.27	14.1'	18°13.91	-10.9'	54.5'
11	348°48.55	47.74	265°4.33	14.1'	18°3.01	-11.0'	54.6'
12	3°48.44	S18°48.37	279°37.43	14.1'	S17°52.02	-11.1'	54.6'
13	18°48.32	48.98	294°10.58	14.2'	17°40.96	-11.1'	54.6'
14	33°48.20	49.60	308°43.76	14.2'	17°29.81	-11.2'	54.6'
15	48°48.09	· · 50.22	323°16.99	14.3'	17°18.59	-11.3'	54.6'
16	63°47.97	50.84	337°50.26	14.3'	17°7.28	-11.4'	54.6'
17	78°47.86	51.46	352°23.56	14.3'	16°55.90	-11.5'	54.7'
18	93°47.74	S18°52.07	6°56.91	14.4'	S16°44.45	-11.5'	54.7'
19	108°47.62	52.69	21°30.29	14.4'	16°32.91	-11.6'	54.7'
20	123°47.50	53.31	36°3.71	14.5'	16°21.30	-11.7'	54.7'
21	138°47.38	· · 53.92	50°37.17	14.5'	16°9.62	-11.8'	54.7'
22	153°47.27	54.54	65°10.66	14.5'	15°57.86	-11.8'	54.8'
23	168°47.15	55.15	79°44.19	14.6'	15°46.03	-11.9'	54.8'
SD = 16.2'		$d = 0.6'$	SD = 14.8'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°47.03	S18°55.76	94°17.75	14.6'	S15°34.13	-12.0'	54.8'
1	198°46.91	56.38	108°51.35	14.6'	15°22.15	-12.0'	54.8'
2	213°46.79	56.99	123°24.98	14.7'	15°10.11	-12.1'	54.9'
3	228°46.67	· · 57.60	137°58.64	14.7'	14°57.99	-12.2'	54.9'
4	243°46.55	58.21	152°32.33	14.7'	14°45.80	-12.3'	54.9'
5	258°46.42	58.82	167°6.05	14.8'	14°33.54	-12.3'	54.9'
6	273°46.30	S18°59.43	181°39.81	14.8'	S14°21.22	-12.4'	54.9'
7	288°46.18	19°0.04	196°13.59	14.8'	14°8.83	-12.5'	55.0'
8	303°46.06	0.65	210°47.39	14.8'	13°56.36	-12.5'	55.0'
9	318°45.94	· · 1.26	225°21.23	14.9'	13°43.84	-12.6'	55.0'
10	333°45.81	1.86	239°55.09	14.9'	13°31.24	-12.7'	55.0'
11	348°45.69	2.47	254°28.97	14.9'	13°18.58	-12.7'	55.1'
12	3°45.57	S19°3.08	269°2.88	14.9'	S13°5.86	-12.8'	55.1'
13	18°45.44	3.68	283°36.82	15.0'	12°53.07	-12.9'	55.1'
14	33°45.32	4.29	298°10.77	15.0'	12°40.22	-12.9'	55.1'
15	48°45.19	· · 4.89	312°44.75	15.0'	12°27.31	-13.0'	55.2'
16	63°45.07	5.50	327°18.74	15.0'	12°14.33	-13.0'	55.2'
17	78°44.94	6.10	341°52.76	15.0'	12°1.30	-13.1'	55.2'
18	93°44.82	S19°6.70	356°26.80	15.1'	S11°48.20	-13.2'	55.2'
19	108°44.69	7.30	11°0.85	15.1'	11°35.04	-13.2'	55.3'
20	123°44.57	7.90	25°34.92	15.1'	11°21.83	-13.3'	55.3'
21	138°44.44	· · 8.51	40°9.00	15.1'	11°8.55	-13.3'	55.3'
22	153°44.31	9.11	54°43.10	15.1'	10°55.22	-13.4'	55.4'
23	168°44.18	9.71	69°17.21	15.1'	10°41.83	-13.4'	55.4'
SD = 16.2'		$d = 0.6'$	SD = 14.9'				

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

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

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	Age 6-8 27-45%
15	15:29	15:24	11:45	16:46	04:23	
16	15:19	15:14	11:45	17:31	05:09	
17	15:08	15:02	11:45	18:15	05:53	

November 18, 19, 20 UT (Wed., Thu., Fri.)

h		Aries		Venus		Mars		Jupiter		Saturn	
Wed		GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0		57°3.35		215°54.28	S09°43.75	267°28.75	N14°29.47	268°31.14	N13°32.93	48°18.05	N00°54.54
1		72°5.81		230°56.18	43.41	282°30.13	29.15	283°33.42	32.88	63°20.61	54.51
2		87°8.28		245°58.07	43.07	297°31.51	28.83	298°35.69	32.82	78°23.17	54.48
3		102°10.74		260°59.97	· · 42.73	312°32.89	· · 28.51	313°37.96	· · 32.76	93°25.73	· · 54.45
4		117°13.20		276°1.86	42.39	327°34.28	28.19	328°40.24	32.71	108°28.29	54.42
5		132°15.67		291°3.74	42.05	342°35.66	27.87	343°42.51	32.65	123°30.85	54.39
6		147°18.13		306°5.63	S09°41.72	357°37.04	N14°27.56	358°44.79	N13°32.59	138°33.40	N00°54.36
7		162°20.60		321°7.51	41.39	12°38.43	27.24	13°47.06	32.54	153°35.96	54.32
8		177°23.06		336°9.38	41.06	27°39.81	26.92	28°49.34	32.48	168°38.52	54.29
9		192°25.52		351°11.25	· · 40.73	42°41.20	· · 26.60	43°51.61	· · 32.43	183°41.08	· · 54.26
10		207°27.99		6°13.12	40.41	57°42.59	26.28	58°53.89	32.37	198°43.64	54.23
11		222°30.45		21°14.99	40.08	72°43.97	25.97	73°56.17	32.31	213°46.19	54.20
12		237°32.92		36°16.85	S09°39.76	87°45.36	N14°25.65	88°58.44	N13°32.26	228°48.75	N00°54.17
13		252°35.38		51°18.71	39.44	102°46.75	25.33	104°0.72	32.20	243°51.31	54.14
14		267°37.84		66°20.57	39.13	117°48.14	25.01	119°3.00	32.15	258°53.86	54.11
15		282°40.31		81°22.42	· · 38.81	132°49.52	· · 24.70	134°5.27	· · 32.09	273°56.42	· · 54.08
16		297°42.77		96°24.27	38.50	147°50.91	24.38	149°7.55	32.04	288°58.98	54.05
17		312°45.24		111°26.11	38.18	162°52.30	24.06	164°9.83	31.98	304°1.53	54.02
18		327°47.70		126°27.96	S09°37.87	177°53.69	N14°23.74	179°12.11	N13°31.93	319°4.09	N00°53.99
19		342°50.16		141°29.80	37.57	192°55.08	23.43	194°14.39	31.87	334°6.65	53.96
20		357°52.63		156°31.63	37.26	207°56.48	23.11	209°16.66	31.82	349°9.20	53.93
21		12°55.09		171°33.46	· · 36.96	222°57.87	· · 22.79	224°18.94	· · 31.76	4°11.76	· · 53.90
22		27°57.56		186°35.29	36.66	237°59.26	22.48	239°21.22	31.71	19°14.31	53.87
23		43°0.02		201°37.12	36.36	253°0.65	22.16	254°23.50	31.65	34°16.87	53.84
Mer.pass. 20:08		ν1.9' d-0.3' m-4.87				ν1.4' d-0.3' m0.65		ν2.3' d-0.1' m-2.10		ν2.6' d-0.0' m0.54	
Thu		GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0		58°2.49		216°38.94	S09°36.06	268°2.05	N14°21.85	269°25.78	N13°31.60	49°19.43	N00°53.81
1		73°4.95		231°40.76	35.76	283°3.44	21.53	284°28.06	31.55	64°21.98	53.78
2		88°7.41		246°42.57	35.47	298°4.83	21.21	299°30.34	31.49	79°24.54	53.75
3		103°9.88		261°44.39	· · 35.18	313°6.23	· · 20.90	314°32.62	· · 31.44	94°27.09	· · 53.72
4		118°12.34		276°46.20	34.89	328°7.62	20.58	329°34.91	31.38	109°29.65	53.69
5		133°14.81		291°48.00	34.60	343°9.02	20.27	344°37.19	31.33	124°32.20	53.66
6		148°17.27		306°49.80	S09°34.31	358°10.42	N14°19.95	359°39.47	N13°31.28	139°34.76	N00°53.64
7		163°19.73		321°51.60	34.03	13°11.81	19.64	14°41.75	31.22	154°37.31	53.61
8		178°22.20		336°53.40	33.74	28°13.21	19.32	29°44.03	31.17	169°39.86	53.58
9		193°24.66		351°55.19	· · 33.46	43°14.61	· · 19.00	44°46.32	· · 31.11	184°42.42	· · 53.55
10		208°27.13		6°56.98	33.18	58°16.01	18.69	59°48.60	31.06	199°44.97	53.52
11		223°29.59		21°58.77	32.91	73°17.41	18.37	74°50.88	31.01	214°47.53	53.49
12		238°32.05		37°0.55	S09°32.63	88°18.80	N14°18.06	89°53.17	N13°30.95	229°50.08	N00°53.46
13		253°34.52		52°2.33	32.36	103°20.20	17.75	104°55.45	30.90	244°52.63	53.43
14		268°36.98		67°4.10	32.09	118°21.60	17.43	119°57.73	30.85	259°55.19	53.40
15		283°39.45		82°5.88	· · 31.82	133°23.01	· · 17.12	135°0.02	· · 30.80	274°57.74	· · 53.38
16		298°41.91		97°7.65	31.55	148°24.41	16.80	150°2.30	30.74	290°0.29	53.35
17		313°44.37		112°9.41	31.29	163°25.81	16.49	165°4.59	30.69	305°2.85	53.32
18		328°46.84		127°11.17	S09°31.03	178°27.21	N14°16.17	180°6.87	N13°30.64	320°5.40	N00°53.29
19		343°49.30		142°12.93	30.77	193°28.61	15.86	195°9.16	30.58	335°7.95	53.26
20		358°51.77		157°14.69	30.51	208°30.02	15.55	210°11.44	30.53	350°10.50	53.23
21		13°54.23		172°16.44	· · 30.25	223°31.42	· · 15.23	225°13.73	· · 30.48	5°13.06	· · 53.21
22		28°56.69		187°18.19	29.99	238°32.83	14.92	240°16.02	30.43	20°15.61	53.18
23		43°59.16		202°19.94	29.74	253°34.23	14.61	255°18.30	30.38	35°18.16	53.15
Mer.pass. 20:05		ν1.8' d-0.3' m-4.88				ν1.4' d-0.3' m0.64		ν2.3' d-0.1' m-2.11		ν2.6' d-0.0' m0.55	
Fri		GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0		59°1.62		217°21.68	S09°29.49	268°35.64	N14°14.29	270°20.59	N13°30.32	50°20.71	N00°53.12
1		74°4.09		232°23.42	29.24	283°37.04	13.98	285°22.88	30.27	65°23.26	53.09
2		89°6.55		247°25.16	28.99	298°38.45	13.67	300°25.16	30.22	80°25.82	53.07
3		104°9.02		262°26.89	· · 28.75	313°39.86	· · 13.35	315°27.45	· · 30.17	95°28.37	· · 53.04
4		119°11.48		277°28.62	28.50	328°41.26	13.04	330°29.74	30.12	110°30.92	53.01
5		134°13.94		292°30.35	28.26	343°42.67	12.73	345°32.03	30.07	125°33.47	52.98
6		149°16.41		307°32.07	S09°28.02	358°44.08	N14°12.41	0°34.32	N13°30.01	140°36.02	N00°52.96
7		164°18.87		322°33.80	27.78	13°45.49	12.10	15°36.61	29.96	155°38.57	52.93
8		179°21.34		337°35.51	27.55	28°46.90	11.79	30°38.89	29.91	170°41.12	52.90
9		194°23.80		352°37.23	· · 27.31	43°48.31	· · 11.48	45°41.18	· · 29.86	185°43.67	· · 52.87
10		209°26.26		7°38.94	27.08	58°49.72	11.16	60°43.47	29.81	200°46.22	52.85
11		224°28.73		22°40.65	26.85	73°51.13	10.85	75°45.76	29.76	215°48.77	52.82
12		239°31.19		37°42.35	S09°26.62	88°52.54	N14°10.54	90°48.05	N13°29.71	230°51.32	N00°52.79
13		254°33.66		52°44.05	26.39	103°53.95	10.23	105°50.35	29.66	245°53.87	52.77
14		269°36.12		67°45.75	26.17	118°55.36	9.92	120°52.64	29.61	260°56.42	52.74
15		284°38.58		82°47.45	· · 25.95	133°56.78	· · 9.61	135°54.93	· · 29.56	275°58.97	· · 52.71
16		299°41.05		97°49.14	25.73	148°58.19	9.29	150°57.22	29.51	291°1.52	52.69
17		314°43.51		112°50.83	25.51	163°59.61	8.98	165°59.51	29.46	306°4.07	52.66
18		329°45.98		127°52.51	S09°25.29	179°1.02	N14°8.67	181°1.80	N13°29.40	321°6.62	N00°52.63
19		344°48.44		142°54.19	25.07	194°2.44	8.36	196°4.10	29.35	336°9.17	52.61
20		359°50.90		157°55.87	24.86	209°3.85	8.05	211°6.39	29.30	351°11.72	52.58
21		14°53.37		172°57.55	· · 24.65	224°5.27	· · 7.74	226°8.68	· · 29.26	6°14.27	· · 52.55
22		29°55.83		187°59.22	24.44	239°6.68	7.43	241°10.97	29.21	21°16.82	52.53
23		44°58.30		203°0.89	24.23	254°8.10	7.12	256°13.27	29.16	36°19.36	52.50
Mer.pass. 20:01		ν1.7' d-0.2' m-4.89				ν1.4' d-0.3' m0.63		ν2.3' d-0.1' m-2.12		ν2.6' d-0.0' m0.55	

Stars		
	SHA	Dec
Alpheratz	357°32.98	29°14.59
Ankaa	353°5.38	-42°9.66
Schedar	349°28.88	56°41.39
Diphda	348°45.54	-17°50.30
Achernar	335°18.56	-57°6.08
Hamal	327°49.15	23°35.54
Polaris	312°43.96	89°22.69
Acamar	315°10.20	-40°11.76
Menkar	314°4.23	4°11.82
Mirfak	308°25.54	49°57.48
Aldebaran	290°37.53	16°33.85
Rigel	281°2.09	-8°10.13
Capella	280°19.19	46°1.44
Bellatrix	278°20.94	6°22.50
Elnath	277°59.59	28°37.78
Alnilam	275°35.88	-1°11.01
Betelgeuse	270°50.15	7°24.77
Canopus	263°51.28	-52°42.36
Sirius	258°24.64	-16°45.05
Adhara	255°4.40	-29°0.33
Procyon	244°49.06	5°9.38
Pollux	243°15.25	27°57.56
Avior	234°13.86	-59°35.43
Suhail	222°45.10	-43°32.20
Miaplacidus	221°37.78	-69°49.31
Alphard	217°46.23	-8°46.43
Regulus	207°32.85	11°50.10
Dubhe	193°39.39	61°36.06
Denebola	182°23.57	14°25.25
Gienah	175°42.22	-17°41.37
Acrux	172°58.84	-63°14.66
Gacrux	171°50.33	-57°15.61
Alioth	166°12.07	55°48.62
Spica	158°20.97	-11°18.03
Alkaid	152°51.25	49°10.60
Hadar	148°34.43	-60°30.01
Menkent	147°56.19	-36°30.01
Arcturus	145°46.85	19°2.52
Rigel Kent.	139°38.83	-60°56.67
Kochab	137°21.03	74°2.54
Zuben'ubi	136°54.67	-16°9.14
Alphecca	126°2.83	26°37.46
Antares	112°14.34	-26°29.45
Atria	107°7.72	-69°4.55
Sabik	102°1.37	-15°45.44
Shaula	96°8.68	-37°7.39
Rasalhague	95°57.45	12°32.52
Eltanin	90°41.94	51°29.26
Kaus Aust.	83°30.82	-34°22.32
Vega	80°32.52	38°48.69
Nunki	75°46.14	-26°15.80
Altair	61°58.66	8°56.50
Peacock	53°3.58	-56°39.07
Deneb	49°24.92	45°22.87
Enif	33°37.32	10°0.07
Al Na'ir	27°30.99	-46°49.98
Fomalhaut	15°12.75	-29°28.83
Scheat	13°43.61	28°13.99
Markab	13°28.28	15°21.20
Nov 18 Wed	SHA	Mer.pass
Venus	158°50.93	09:35
Mars	210°25.40	06:10
Jupiter	211°27.80	06:05
Saturn	351°14.71	20:43
Nov 19 Thu	SHA	Mer.pass
Venus	158°36.46	09:32
Mars	209°59.56	06:07
Jupiter	211°23.30	06:01
Saturn	351°16.94	20:39
Nov 20 Fri	SHA	Mer.pass
Venus	158°20.06	09:29
Mars	209°34.01	06:05
Jupiter	211°18.97	05:58
Saturn	351°19.09	20:35
Horizontal parallax		
	Venus:	0.4
	Mars:	0.1

h		Sun		Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°44.06	S19°10.30	83°51.34	15.1'	S10°28.38	-13.5'	55.4'
1	198°43.93	10.90	98°25.48	15.1'	10°14.88	-13.6'	55.4'
2	213°43.80	11.50	112°59.62	15.2'	10°1.33	-13.6'	55.5'
3	228°43.67	•• 12.10	127°33.78	15.2'	09°47.72	-13.7'	55.5'
4	243°43.54	12.69	142°7.94	15.2'	09°34.05	-13.7'	55.5'
5	258°43.41	13.29	156°42.12	15.2'	09°20.33	-13.8'	55.6'
6	273°43.28	S19°13.89	171°16.30	15.2'	S09°6.56	-13.8'	55.6'
7	288°43.15	14.48	185°50.48	15.2'	08°52.74	-13.9'	55.6'
8	303°43.02	15.08	200°24.67	15.2'	08°38.87	-13.9'	55.6'
9	318°42.89	•• 15.67	214°58.86	15.2'	08°24.95	-14.0'	55.7'
10	333°42.76	16.26	229°33.05	15.2'	08°10.98	-14.0'	55.7'
11	348°42.63	16.85	244°7.24	15.2'	07°56.96	-14.1'	55.7'
12	3°42.49	S19°17.45	258°41.44	15.2'	S07°42.89	-14.1'	55.8'
13	18°42.36	18.04	273°15.63	15.2'	07°28.77	-14.2'	55.8'
14	33°42.23	18.63	287°49.82	15.2'	07°14.61	-14.2'	55.8'
15	48°42.10	•• 19.22	302°24.00	15.2'	07°0.40	-14.3'	55.9'
16	63°41.96	19.81	316°58.18	15.2'	06°46.15	-14.3'	55.9'
17	78°41.83	20.40	331°32.36	15.2'	06°31.85	-14.3'	55.9'
18	93°41.69	S19°20.98	346°6.53	15.2'	S06°17.51	-14.4'	56.0'
19	108°41.56	21.57	0°40.69	15.1'	06°3.13	-14.4'	56.0'
20	123°41.43	22.16	15°14.84	15.1'	05°48.70	-14.5'	56.0'
21	138°41.29	•• 22.75	29°48.97	15.1'	05°34.24	-14.5'	56.1'
22	153°41.15	23.33	44°23.10	15.1'	05°19.73	-14.5'	56.1'
23	168°41.02	23.92	58°57.22	15.1'	05°5.19	-14.6'	56.1'
SD = 16.2'		$d = 0.6'$	SD = 15.1'				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°40.88	S19°24.50	73°31.32	15.1'	S04°50.60	-14.6'	56.2'
1	198°40.75	25.09	88°5.40	15.1'	04°35.98	-14.7'	56.2'
2	213°40.61	25.67	102°39.47	15.0'	04°21.32	-14.7'	56.2'
3	228°40.47	•• 26.25	117°13.52	15.0'	04°6.62	-14.7'	56.3'
4	243°40.33	26.83	131°47.55	15.0'	03°51.89	-14.8'	56.3'
5	258°40.20	27.42	146°21.56	15.0'	03°37.12	-14.8'	56.3'
6	273°40.06	S19°28.00	160°55.55	15.0'	S03°22.32	-14.8'	56.4'
7	288°39.92	28.58	175°29.51	14.9'	03°7.49	-14.9'	56.4'
8	303°39.78	29.16	190°3.46	14.9'	02°52.62	-14.9'	56.4'
9	318°39.64	•• 29.74	204°37.37	14.9'	02°37.73	-14.9'	56.5'
10	333°39.50	30.31	219°11.26	14.9'	02°22.80	-15.0'	56.5'
11	348°39.36	30.89	233°45.12	14.8'	02°7.84	-15.0'	56.6'
12	3°39.22	S19°31.47	248°18.96	14.8'	S01°52.85	-15.0'	56.6'
13	18°39.08	32.05	262°52.76	14.8'	01°37.84	-15.0'	56.6'
14	33°38.94	32.62	277°26.53	14.7'	01°22.80	-15.1'	56.7'
15	48°38.80	•• 33.20	292°0.27	14.7'	01°7.73	-15.1'	56.7'
16	63°38.65	33.77	306°33.97	14.7'	00°52.64	-15.1'	56.7'
17	78°38.51	34.35	321°7.64	14.6'	00°37.52	-15.1'	56.8'
18	93°38.37	S19°34.92	335°41.27	14.6'	S00°22.39	-15.2'	56.8'
19	108°38.23	35.49	350°14.86	14.6'	S00°7.22	-15.2'	56.8'
20	123°38.08	36.06	4°48.42	14.5'	N00°7.96	15.2'	56.9'
21	138°37.94	•• 36.64	19°21.93	14.5'	00°23.16	15.2'	56.9'
22	153°37.80	37.21	33°55.40	14.4'	00°38.39	15.2'	57.0'
23	168°37.65	37.78	48°28.83	14.4'	00°53.63	15.3'	57.0'
SD = 16.2'		$d = 0.6'$	SD = 15.3'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°37.51	S19°38.35	63°2.21	14.3'	N01°8.89	15.3'	57.0'
1	198°37.36	38.92	77°35.55	14.3'	01°24.16	15.3'	57.1'
2	213°37.22	39.49	92°8.83	14.2'	01°39.45	15.3'	57.1'
3	228°37.07	•• 40.05	106°42.07	14.2'	01°54.75	15.3'	57.1'
4	243°36.93	40.62	121°15.26	14.1'	02°10.07	15.3'	57.2'
5	258°36.78	41.19	135°48.40	14.1'	02°25.40	15.3'	57.2'
6	273°36.63	S19°41.75	150°21.48	14.0'	N02°40.74	15.4'	57.3'
7	288°36.49	42.32	164°54.51	14.0'	02°56.09	15.4'	57.3'
8	303°36.34	42.88	179°27.49	13.9'	03°11.45	15.4'	57.3'
9	318°36.19	•• 43.45	194°0.41	13.9'	03°26.82	15.4'	57.4'
10	333°36.04	44.01	208°33.27	13.8'	03°42.19	15.4'	57.4'
11	348°35.89	44.58	223°6.07	13.7'	03°57.57	15.4'	57.5'
12	3°35.75	S19°45.14	237°38.80	13.7'	N04°12.95	15.4'	57.5'
13	18°35.60	45.70	252°11.48	13.6'	04°28.34	15.4'	57.5'
14	33°35.45	46.26	266°44.09	13.5'	04°43.73	15.4'	57.6'
15	48°35.30	•• 46.82	281°16.64	13.5'	04°59.11	15.4'	57.6'
16	63°35.15	47.38	295°49.12	13.4'	05°14.50	15.4'	57.7'
17	78°35.00	47.94	310°21.53	13.3'	05°29.89	15.4'	57.7'
18	93°34.85	S19°48.50	324°53.87	13.3'	N05°45.27	15.4'	57.7'
19	108°34.69	49.06	339°26.14	13.2'	06°0.65	15.4'	57.8'
20	123°34.54	49.62	353°58.34	13.1'	06°16.02	15.4'	57.8'
21	138°34.39	•• 50.17	8°30.47	13.1'	06°31.38	15.4'	57.9'
22	153°34.24	50.73	23°2.52	13.0'	06°46.74	15.3'	57.9'
23	168°34.09	51.28	37°34.49	12.9'	07°2.09	15.3'	57.9'
SD = 16.2'		$d = 0.6'$	SD = 15.6'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 9-11 55-74%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
18	14:56	14:50	11:45	18:57	06:36	
19	14:44	14:37	11:45	19:40	07:19	
20	14:30	14:23	11:46	20:25	08:02	

November 21, 22, 23 UT (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°0.76	218°2.56	S09°24.03	269°9.52	N14°6.81	271°15.56	N13°29.11	51°21.91	N00°52.47
1	75°3.22	233°4.22	23.82	284°10.94	6.50	286°17.86	29.06	66°24.46	52.45
2	90°5.69	248°5.88	23.62	299°12.36	6.19	301°20.15	29.01	81°27.01	52.42
3	105°8.15	263°7.54	· · 23.42	314°13.77	· · 5.88	316°22.45	· · 28.96	96°29.56	· · 52.40
4	120°10.62	278°9.19	23.22	329°15.19	5.57	331°24.74	28.91	111°32.10	52.37
5	135°13.08	293°10.84	23.03	344°16.61	5.26	346°27.04	28.86	126°34.65	52.34
6	150°15.54	308°12.49	S09°22.83	359°18.04	N14°4.95	1°29.33	N13°28.81	141°37.20	N00°52.32
7	165°18.01	323°14.14	22.64	14°19.46	4.64	16°31.63	28.76	156°39.75	52.29
8	180°20.47	338°15.78	22.45	29°20.88	4.33	31°33.92	28.71	171°42.29	52.27
9	195°22.94	353°17.42	· · 22.26	44°22.30	· · 4.02	46°36.22	· · 28.66	186°44.84	· · 52.24
10	210°25.40	8°19.05	22.07	59°23.72	3.71	61°38.52	28.62	201°47.39	52.22
11	225°27.87	23°20.68	21.89	74°25.15	3.40	76°40.81	28.57	216°49.93	52.19
12	240°30.33	38°22.31	S09°21.70	89°26.57	N14°3.09	91°43.11	N13°28.52	231°52.48	N00°52.16
13	255°32.79	53°23.94	21.52	104°28.00	2.79	106°45.41	28.47	246°55.02	52.14
14	270°35.26	68°25.56	21.34	119°29.42	2.48	121°47.71	28.42	261°57.57	52.11
15	285°37.72	83°27.18	· · 21.16	134°30.85	· · 2.17	136°50.01	· · 28.37	277°0.12	· · 52.09
16	300°40.19	98°28.80	20.99	149°32.27	1.86	151°52.30	28.33	292°2.66	52.06
17	315°42.65	113°30.41	20.81	164°33.70	1.55	166°54.60	28.28	307°5.21	52.04
18	330°45.11	128°32.02	S09°20.64	179°35.12	N14°1.24	181°56.90	N13°28.23	322°7.75	N00°52.01
19	345°47.58	143°33.63	20.47	194°36.55	0.94	196°59.20	28.18	337°10.30	51.99
20	0°50.04	158°35.23	20.30	209°37.98	0.63	212°1.50	28.14	352°12.84	51.96
21	15°52.51	173°36.83	· · 20.14	224°39.41	· · 0.32	227°3.80	· · 28.09	7°15.39	· · 51.94
22	30°54.97	188°38.43	19.97	239°40.84	14°0.01	242°6.10	28.04	22°17.93	51.91
23	45°57.43	203°40.03	19.81	254°42.27	13°59.71	257°8.40	27.99	37°20.48	51.89
Mer.pass. 19:57		ν1.7' d-0.2' m-4.89		ν1.4' d-0.3' m0.61		ν2.3' d-0.0' m-2.12		ν2.5' d-0.0' m0.56	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°59.90	218°41.62	S09°19.65	269°43.70	N13°59.40	272°10.70	N13°27.95	52°23.02	N00°51.87
1	76°2.36	233°43.21	19.49	284°45.13	59.09	287°13.00	27.90	67°25.57	51.84
2	91°4.83	248°44.80	19.33	299°46.56	58.78	302°15.31	27.85	82°28.11	51.82
3	106°7.29	263°46.38	· · 19.18	314°47.99	· · 58.48	317°17.61	· · 27.81	97°30.66	· · 51.79
4	121°9.75	278°47.96	19.02	329°49.42	58.17	332°19.91	27.76	112°33.20	51.77
5	136°12.22	293°49.53	18.87	344°50.86	57.86	347°22.21	27.71	127°35.74	51.74
6	151°14.68	308°51.11	S09°18.72	359°52.29	N13°57.56	2°24.51	N13°27.67	142°38.29	N00°51.72
7	166°17.15	323°52.68	18.57	14°53.72	57.25	17°26.82	27.62	157°40.83	51.70
8	181°19.61	338°54.25	18.42	29°55.16	56.95	32°29.12	27.57	172°43.37	51.67
9	196°22.08	353°55.81	· · 18.28	44°56.59	· · 56.64	47°31.42	· · 27.53	187°45.92	· · 51.65
10	211°24.54	8°57.37	18.14	59°58.03	56.33	62°33.73	27.48	202°48.46	51.62
11	226°27.00	23°58.93	18.00	74°59.46	56.03	77°36.03	27.44	217°51.00	51.60
12	241°29.47	39°0.49	S09°17.86	90°0.90	N13°55.72	92°38.34	N13°27.39	232°53.54	N00°51.58
13	256°31.93	54°2.04	17.72	105°2.34	55.42	107°40.64	27.34	247°56.09	51.55
14	271°34.40	69°3.59	17.58	120°3.77	55.11	122°42.95	27.30	262°58.63	51.53
15	286°36.86	84°5.14	· · 17.45	135°5.21	· · 54.81	137°45.25	· · 27.25	278°1.17	· · 51.51
16	301°39.32	99°6.68	17.32	150°6.65	54.50	152°47.56	27.21	293°3.71	51.48
17	316°41.79	114°8.22	17.19	165°8.09	54.20	167°49.86	27.16	308°6.26	51.46
18	331°44.25	129°9.76	S09°17.06	180°9.53	N13°53.89	182°52.17	N13°27.12	323°8.80	N00°51.44
19	346°46.72	144°11.29	16.93	195°10.97	53.59	197°54.48	27.07	338°11.34	51.41
20	1°49.18	159°12.83	16.81	210°12.41	53.28	212°56.78	27.03	353°13.88	51.39
21	16°51.64	174°14.35	· · 16.69	225°13.85	· · 52.98	227°59.09	· · 26.98	8°16.42	· · 51.37
22	31°54.11	189°15.88	16.57	240°15.29	52.67	243°1.40	26.94	23°18.96	51.34
23	46°56.57	204°17.40	16.45	255°16.73	52.37	258°3.71	26.89	38°21.50	51.32
Mer.pass. 19:53		ν1.6' d-0.2' m-4.90		ν1.4' d-0.3' m0.60		ν2.3' d-0.0' m-2.13		ν2.5' d-0.0' m0.56	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	61°59.04	219°18.92	S09°16.33	270°18.18	N13°52.07	273°6.01	N13°26.85	53°24.04	N00°51.30
1	77°1.50	234°20.44	16.21	285°19.62	51.76	288°8.32	26.80	68°26.58	51.28
2	92°3.97	249°21.95	16.10	300°21.06	51.46	303°10.63	26.76	83°29.12	51.25
3	107°6.43	264°23.46	· · 15.99	315°22.51	· · 51.16	318°12.94	· · 26.71	98°31.67	· · 51.23
4	122°8.89	279°24.97	15.88	330°23.95	50.85	333°15.25	26.67	113°34.21	51.21
5	137°11.36	294°26.48	15.77	345°25.40	50.55	348°17.56	26.63	128°36.75	51.19
6	152°13.82	309°27.98	S09°15.66	0°26.84	N13°50.25	3°19.87	N13°26.58	143°39.29	N00°51.16
7	167°16.29	324°29.48	15.56	15°28.29	49.94	18°22.18	26.54	158°41.82	51.14
8	182°18.75	339°30.98	15.45	30°29.74	49.64	33°24.49	26.49	173°44.36	51.12
9	197°21.21	354°32.47	· · 15.35	45°31.18	· · 49.34	48°26.80	· · 26.45	188°46.90	· · 51.10
10	212°23.68	9°33.96	15.25	60°32.63	49.03	63°29.11	26.41	203°49.44	51.08
11	227°26.14	24°35.45	15.15	75°34.08	48.73	78°31.42	26.36	218°51.98	51.05
12	242°28.61	39°36.93	S09°15.06	90°35.53	N13°48.43	93°33.73	N13°26.32	233°54.52	N00°51.03
13	257°31.07	54°38.41	14.96	105°36.98	48.13	108°36.04	26.28	248°57.06	51.01
14	272°33.54	69°39.89	14.87	120°38.43	47.83	123°38.36	26.23	263°59.60	50.99
15	287°36.00	84°41.37	· · 14.78	135°39.88	· · 47.52	138°40.67	· · 26.19	279°2.14	· · 50.97
16	302°38.46	99°42.84	14.69	150°41.33	47.22	153°42.98	26.15	294°4.67	50.95
17	317°40.93	114°44.31	14.60	165°42.78	46.92	168°45.29	26.10	309°7.21	50.92
18	332°43.39	129°45.78	S09°14.52	180°44.23	N13°46.62	183°47.61	N13°26.06	324°9.75	N00°50.90
19	347°45.86	144°47.24	14.43	195°45.69	46.32	198°49.92	26.02	339°12.29	50.88
20	2°48.32	159°48.70	14.35	210°47.14	46.02	213°52.24	25.98	354°14.83	50.86
21	17°50.78	174°50.16	· · 14.27	225°48.59	· · 45.72	228°54.55	· · 25.93	9°17.36	· · 50.84
22	32°53.25	189°51.62	14.19	240°50.05	45.42	243°56.86	25.89	24°19.90	50.82
23	47°55.71	204°53.07	14.12	255°51.50	45.12	258°59.18	25.85	39°22.44	50.80
Mer.pass. 19:49		ν1.5' d-0.1' m-4.90		ν1.4' d-0.3' m0.58		ν2.3' d-0.0' m-2.14		ν2.5' d-0.0' m0.57	

Stars		
	SHA	Dec
Alpheratz	357°32.99	29°14.59
Ankaa	353°5.40	-42°9.67
Schedar	349°28.90	56°41.40
Diphda	348°45.55	-17°50.31
Achernar	335°18.57	-57°6.09
Hamal	327°49.15	23°35.54
Polaris	312°44.00	89°22.71
Acamar	315°10.20	-40°11.77
Menkar	314°4.23	4°11.82
Mirfak	308°25.54	49°57.49
Aldebaran	290°37.52	16°33.85
Rigel	281°2.08	-8°10.14
Capella	280°19.17	46°1.44
Bellatrix	278°20.93	6°22.49
Elnath	277°59.58	28°37.79
Alnilam	275°35.87	-1°11.02
Betelgeuse	270°50.14	7°24.76
Canopus	263°51.26	-52°42.37
Sirius	258°24.62	-16°45.06
Adhara	255°4.39	-29°0.34
Procyon	244°49.04	5°9.37
Pollux	243°15.23	27°57.55
Avior	234°13.82	-59°35.44
Suhail	222°45.07	-43°32.21
Miaplacidus	221°37.72	-69°49.32
Alphard	217°46.21	-8°46.43
Regulus	207°32.83	11°50.09
Dubhe	193°39.35	61°36.05
Denebola	182°23.55	14°25.24
Gienah	175°42.21	-17°41.37
Acrux	172°58.80	-63°14.66
Gacrux	171°50.30	-57°15.61
Alioth	166°12.05	55°48.60
Spica	158°20.96	-11°18.04
Alkaid	152°51.24	49°10.58
Hadar	148°34.41	-60°30.00
Menkent	147°56.17	-36°30.01
Arcturus	145°46.84	19°2.51
Rigel Kent.	139°38.82	-60°56.66
Kochab	137°21.02	74°2.52
Zuben'ubi	136°54.66	-16°9.14
Alphecca	126°2.83	26°37.45
Antares	112°14.34	-26°29.45
Atria	107°7.72	-69°4.54
Sabik	102°1.37	-15°45.44
Shaula	96°8.69	-37°7.39
Rasalhague	95°57.46	12°32.51
Eltanin	90°41.95	51°29.24
Kaus Aust.	83°30.83	-34°22.32
Vega	80°32.54	38°48.68
Nunki	75°46.15	-26°15.79
Altair	61°58.67	8°56.50
Peacock	53°3.61	-56°39.06
Deneb	49°24.94	45°22.86
Enif	33°37.34	10°0.78
Al Na'ir	27°31.02	-46°49.98
Fomalhaut	15°12.76	-29°28.83
Scheat	13°43.63	28°13.99
Markab	13°28.29	15°21.20
Nov 21 Sat	SHA	Mer.pass
Venus	158°1.80	09:27
Mars	209°8.76	06:03
Jupiter	211°14.80	05:54
Saturn	351°21.15	20:31
Nov 22 Sun	SHA	Mer.pass
Venus	157°41.72	09:24
Mars	208°43.80	06:01
Jupiter	211°10.80	05:50
Saturn	351°23.12	20:27
Nov 23 Mon	SHA	Mer.pass
Venus	157°19.89	09:22
Mars	208°19.14	05:58
Jupiter	211°6.98	05:47
Saturn	351°25.01	20:23
Horizontal parallax		
	Venus:	0.4
	Mars:	0.1

h	Sun			Moon				
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	183°33.93	S19°51.84		52°6.39	12.8'	N07°17.42	15.3'	58.0'
1	198°33.78	52.39		66°38.20	12.7'	07°32.75	15.3'	58.0'
2	213°33.63	52.95		81°9.94	12.7'	07°48.06	15.3'	58.1'
3	228°33.47	53.50		95°41.59	12.6'	08°3.35	15.3'	58.1'
4	243°33.32	54.05		110°13.16	12.5'	08°18.63	15.3'	58.1'
5	258°33.16	54.60		124°44.65	12.4'	08°33.89	15.2'	58.2'
6	273°33.01	S19°55.15		139°16.05	12.3'	N08°49.13	15.2'	58.2'
7	288°32.85	55.71		153°47.36	12.2'	09°4.35	15.2'	58.2'
8	303°32.70	56.26		168°18.59	12.1'	09°19.54	15.2'	58.3'
9	318°32.54	56.80		182°49.72	12.0'	09°34.71	15.1'	58.3'
10	333°32.39	57.35		197°20.76	11.9'	09°49.86	15.1'	58.4'
11	348°32.23	57.90		211°51.71	11.9'	10°4.98	15.1'	58.4'
12	3°32.07	S19°58.45		226°22.57	11.8'	N10°20.07	15.1'	58.4'
13	18°31.91	58.99		240°53.33	11.7'	10°35.13	15.0'	58.5'
14	33°31.76	19°59.54		255°23.99	11.6'	10°50.15	15.0'	58.5'
15	48°31.60	20°0.09		269°54.56	11.5'	11°5.15	15.0'	58.6'
16	63°31.44	0.63		284°25.02	11.4'	11°20.11	14.9'	58.6'
17	78°31.28	1.18		298°55.39	11.3'	11°35.03	14.9'	58.6'
18	93°31.12	S20°1.72		313°25.65	11.2'	N11°49.91	14.8'	58.7'
19	108°30.96	2.26		327°55.81	11.1'	12°4.75	14.8'	58.7'
20	123°30.80	2.80		342°25.87	10.9'	12°19.55	14.8'	58.8'
21	138°30.64	3.35		356°55.81	10.8'	12°34.31	14.7'	58.8'
22	153°30.48	3.89		11°25.66	10.7'	12°49.02	14.7'	58.8'
23	168°30.32	4.43		25°55.39	10.6'	13°3.68	14.6'	58.9'
SD = 16.2'			$d = 0.6'$	SD = 15.8'				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	183°30.16	S20°4.97		40°25.02	10.5'	N13°18.29	14.6'	58.9'
1	198°30.00	5.51		54°54.53	10.4'	13°32.85	14.5'	58.9'
2	213°29.84	6.04		69°23.93	10.3'	13°47.36	14.5'	59.0'
3	228°29.68	6.58		83°53.22	10.2'	14°1.82	14.4'	59.0'
4	243°29.51	7.12		98°22.40	10.1'	14°16.21	14.3'	59.1'
5	258°29.35	7.66		112°51.46	9.9'	14°30.55	14.3'	59.1'
6	273°29.19	S20°8.19		127°20.40	9.8'	N14°44.83	14.2'	59.1'
7	288°29.02	8.73		141°49.23	9.7'	14°59.05	14.2'	59.2'
8	303°28.86	9.26		156°17.94	9.6'	15°13.20	14.1'	59.2'
9	318°28.70	9.80		170°46.53	9.5'	15°27.28	14.0'	59.2'
10	333°28.53	10.33		185°15.00	9.3'	15°41.30	13.9'	59.3'
11	348°28.37	10.86		199°43.34	9.2'	15°55.24	13.9'	59.3'
12	3°28.20	S20°11.39		214°11.57	9.1'	N16°9.12	13.8'	59.3'
13	18°28.04	11.92		228°39.67	9.0'	16°22.92	13.7'	59.4'
14	33°27.87	12.46		243°7.65	8.9'	16°36.64	13.6'	59.4'
15	48°27.71	12.99		257°35.50	8.7'	16°50.28	13.6'	59.4'
16	63°27.54	13.52		272°3.23	8.6'	17°3.84	13.5'	59.5'
17	78°27.37	14.04		286°30.83	8.5'	17°17.33	13.4'	59.5'
18	93°27.20	S20°14.57		300°58.31	8.3'	N17°30.72	13.3'	59.6'
19	108°27.04	15.10		315°25.66	8.2'	17°44.03	13.2'	59.6'
20	123°26.87	15.63		329°52.87	8.1'	17°57.25	13.1'	59.6'
21	138°26.70	16.15		344°19.96	8.0'	18°10.38	13.0'	59.7'
22	153°26.53	16.68		358°46.92	7.8'	18°23.41	12.9'	59.7'
23	168°26.36	17.20		13°13.75	7.7'	18°36.35	12.8'	59.7'
SD = 16.2'			$d = 0.5'$	SD = 16.1'				

Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	183°26.19	S20°17.73		27°40.45	7.6'	N18°49.19	12.7'	59.7'
1	198°26.03	18.25		42°7.02	7.4'	19°1.93	12.6'	59.8'
2	213°25.86	18.77		56°33.45	7.3'	19°14.57	12.5'	59.8'
3	228°25.69	19.30		70°59.75	7.2'	19°27.10	12.4'	59.8'
4	243°25.51	19.82		85°25.92	7.0'	19°39.53	12.3'	59.9'
5	258°25.34	20.34		99°51.96	6.9'	19°51.85	12.2'	59.9'
6	273°25.17	S20°20.86		114°17.87	6.8'	N20°4.05	12.1'	59.9'
7	288°25.00	21.38		128°43.64	6.6'	20°16.15	12.0'	60.0'
8	303°24.83	21.90		143°9.28	6.5'	20°28.12	11.9'	60.0'
9	318°24.66	22.42		157°34.78	6.4'	20°39.98	11.7'	60.0'
10	333°24.48	22.93		172°0.15	6.2'	20°51.72	11.6'	60.1'
11	348°24.31	23.45		186°25.39	6.1'	21°3.34	11.5'	60.1'
12	3°24.14	S20°23.97		200°50.50	6.0'	N21°14.83	11.4'	60.1'
13	18°23.96	24.48		215°15.47	5.8'	21°26.20	11.2'	60.1'
14	33°23.79	25.00		229°40.31	5.7'	21°37.43	11.1'	60.2'
15	48°23.62	25.51		244°5.02	5.6'	21°48.54	11.0'	60.2'
16	63°23.44	26.03		258°29.60	5.4'	21°59.51	10.8'	60.2'
17	78°23.27	26.54		272°54.04	5.3'	22°10.34	10.7'	60.2'
18	93°23.09	S20°27.05		287°18.35	5.2'	N22°21.04	10.6'	60.3'
19	108°22.92	27.57		301°42.53	5.1'	22°31.59	10.4'	60.3'
20	123°22.74	28.08		316°6.59	4.9'	22°42.00	10.3'	60.3'
21	138°22.56	28.59		330°30.51	4.8'	22°52.27	10.1'	60.3'
22	153°22.39	29.10		344°54.30	4.7'	23°2.39	10.0'	60.4'
23	168°22.21	29.61		359°17.97	4.5'	23°12.36	9.8'	60.4'
SD = 16.2'			$d = 0.5'$	SD = 16.3'				

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

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

November 24, 25, 26 UT (Tue., Wed., Thu.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°58.18		219°54.52	S09°14.04	270°52.96	N13°44.81	274°1.49	N13°25.81	54°24.97	N00°50.77
1	78°0.64		234°55.97	13.97	285°54.42	44.51	289°3.81	25.77	69°27.51	50.75
2	93°3.11		249°57.41	13.90	300°55.87	44.21	304°6.13	25.72	84°30.05	50.73
3	108°5.57		264°58.85	•• 13.83	315°57.33	•• 43.91	319°8.44	•• 25.68	99°32.58	•• 50.71
4	123°8.03		280°0.29	13.76	330°58.79	43.61	334°10.76	25.64	114°35.12	50.69
5	138°10.50		295°1.73	13.69	346°0.24	43.31	349°13.07	25.60	129°37.66	50.67
6	153°12.96		310°3.16	S09°13.63	1°1.70	N13°43.01	4°15.39	N13°25.56	144°40.19	N00°50.65
7	168°15.43		325°4.59	13.57	16°3.16	42.72	19°17.71	25.52	159°42.73	50.63
8	183°17.89		340°6.02	13.51	31°4.62	42.42	34°20.03	25.47	174°45.26	50.61
9	198°20.35		355°7.44	•• 13.45	46°6.08	•• 42.12	49°22.34	•• 25.43	189°47.80	•• 50.59
10	213°22.82		10°8.86	13.39	61°7.54	41.82	64°24.66	25.39	204°50.34	50.57
11	228°25.28		25°10.28	13.33	76°9.00	41.52	79°26.98	25.35	219°52.87	50.55
12	243°27.75		40°11.70	S09°13.28	91°10.47	N13°41.22	94°29.30	N13°25.31	234°55.41	N00°50.53
13	258°30.21		55°13.11	13.23	106°11.93	40.92	109°31.62	25.27	249°57.94	50.51
14	273°32.68		70°14.52	13.18	121°13.39	40.62	124°33.94	25.23	265°0.48	50.49
15	288°35.14		85°15.93	•• 13.13	136°14.85	•• 40.33	139°36.26	•• 25.19	280°3.01	•• 50.47
16	303°37.60		100°17.33	13.08	151°16.32	40.03	154°38.58	25.15	295°5.54	50.45
17	318°40.07		115°18.73	13.03	166°17.78	39.73	169°40.90	25.11	310°8.08	50.43
18	333°42.53		130°20.13	S09°12.99	181°19.25	N13°39.43	184°43.22	N13°25.07	325°10.61	N00°50.41
19	348°45.00		145°21.53	12.95	196°20.71	39.13	199°45.54	25.03	340°13.15	50.39
20	3°47.46		160°22.92	12.91	211°22.18	38.84	214°47.86	24.99	355°15.68	50.37
21	18°49.93		175°24.31	•• 12.87	226°23.65	•• 38.54	229°50.18	•• 24.95	10°18.21	•• 50.35
22	33°52.39		190°25.70	12.83	241°25.11	38.24	244°52.50	24.91	25°20.75	50.33
23	48°54.85		205°27.08	12.80	256°26.58	37.94	259°54.82	24.87	40°23.28	50.31
Mer.pass. 19:45		ν1.4' d-0.1' m-4.90		ν1.5' d-0.3' m0.57		ν2.3' d-0.0' m-2.14		ν2.5' d-0.0' m0.57		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°57.32		220°28.47	S09°12.76	271°28.05	N13°37.65	274°57.15	N13°24.83	55°25.81	N00°50.29
1	78°59.78		235°29.84	12.73	286°29.52	37.35	289°59.47	24.79	70°28.35	50.27
2	94°2.25		250°31.22	12.70	301°30.99	37.05	305°1.79	24.75	85°30.88	50.25
3	109°4.71		265°32.60	•• 12.67	316°32.46	•• 36.76	320°4.12	•• 24.71	100°33.41	•• 50.24
4	124°7.18		280°33.97	12.64	331°33.93	36.46	335°6.44	24.67	115°35.95	50.22
5	139°9.64		295°35.33	12.62	346°35.40	36.17	350°8.76	24.63	130°38.48	50.20
6	154°12.10		310°36.70	S09°12.60	1°36.87	N13°35.87	5°11.09	N13°24.59	145°41.01	N00°50.18
7	169°14.57		325°38.06	12.57	16°38.34	35.57	20°13.41	24.55	160°43.54	50.16
8	184°17.03		340°39.42	12.55	31°39.82	35.28	35°15.74	24.51	175°46.07	50.14
9	199°19.50		355°40.78	•• 12.54	46°41.29	•• 34.98	50°18.06	•• 24.48	190°48.61	•• 50.12
10	214°21.96		10°42.13	12.52	61°42.76	34.69	65°20.39	24.44	205°51.14	50.10
11	229°24.42		25°43.49	12.50	76°44.24	34.39	80°22.71	24.40	220°53.67	50.09
12	244°26.89		40°44.84	S09°12.49	91°45.71	N13°34.10	95°25.04	N13°24.36	235°56.20	N00°50.07
13	259°29.35		55°46.18	12.48	106°47.19	33.80	110°27.36	24.32	250°58.73	50.05
14	274°31.82		70°47.52	12.47	121°48.66	33.51	125°29.69	24.28	266°1.26	50.03
15	289°34.28		85°48.87	•• 12.46	136°50.14	•• 33.21	140°32.02	•• 24.25	281°3.79	•• 50.01
16	304°36.75		100°50.20	12.45	151°51.62	32.92	155°34.34	24.21	296°6.32	49.99
17	319°39.21		115°51.54	12.45	166°53.10	32.63	170°36.67	24.17	311°8.85	49.98
18	334°41.67		130°52.87	S09°12.44	181°54.57	N13°32.33	185°39.00	N13°24.13	326°11.38	N00°49.96
19	349°44.14		145°54.20	12.44	196°56.05	32.04	200°41.33	24.10	341°13.91	49.94
20	4°46.60		160°55.53	12.44	211°57.53	31.74	215°43.66	24.06	356°16.44	49.92
21	19°49.07		175°56.85	•• 12.44	226°59.01	•• 31.45	230°45.98	•• 24.02	11°18.97	•• 49.91
22	34°51.53		190°58.18	12.45	242°0.49	31.16	245°48.31	23.98	26°21.50	49.89
23	49°54.00		205°59.49	12.45	257°1.97	30.86	260°50.64	23.95	41°24.03	49.87
Mer.pass. 19:41		ν1.4' d-0.0' m-4.91		ν1.5' d-0.3' m0.55		ν2.3' d-0.0' m-2.15		ν2.5' d-0.0' m0.58		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	64°56.46		221°0.81	S09°12.46	272°3.45	N13°30.57	275°52.97	N13°23.91	56°26.56	N00°49.85
1	79°58.92		236°2.13	12.46	287°4.94	30.28	290°55.30	23.87	71°29.09	49.84
2	95°1.39		251°3.44	12.47	302°6.42	29.98	305°57.63	23.84	86°31.62	49.82
3	110°3.85		266°4.74	•• 12.49	317°7.90	•• 29.69	320°59.96	•• 23.80	101°34.15	•• 49.80
4	125°6.32		281°6.05	12.50	332°9.39	29.40	336°2.29	23.76	116°36.68	49.78
5	140°8.78		296°7.35	12.51	347°10.87	29.11	351°4.62	23.73	131°39.21	49.77
6	155°11.25		311°8.65	S09°12.53	2°12.35	N13°28.82	6°6.96	N13°23.69	146°41.73	N00°49.75
7	170°13.71		326°9.95	12.55	17°13.84	28.52	21°9.29	23.65	161°44.26	49.73
8	185°16.17		341°11.25	12.57	32°15.33	28.23	36°11.62	23.62	176°46.79	49.72
9	200°18.64		356°12.54	•• 12.59	47°16.81	•• 27.94	51°13.95	•• 23.58	191°49.32	•• 49.70
10	215°21.10		11°13.83	12.61	62°18.30	27.65	66°16.28	23.54	206°51.85	49.68
11	230°23.57		26°15.12	12.63	77°19.79	27.36	81°18.62	23.51	221°54.37	49.67
12	245°26.03		41°16.40	S09°12.66	92°21.28	N13°27.07	96°20.95	N13°23.47	236°56.90	N00°49.65
13	260°28.50		56°17.68	12.69	107°22.76	26.78	111°23.28	23.44	251°59.43	49.63
14	275°30.96		71°18.96	12.72	122°24.25	26.48	126°25.62	23.40	267°1.96	49.62
15	290°33.42		86°20.24	•• 12.75	137°25.74	•• 26.19	141°27.95	•• 23.37	282°4.48	•• 49.60
16	305°35.89		101°21.51	12.78	152°27.23	25.90	156°30.29	23.33	297°7.01	49.58
17	320°38.35		116°22.78	12.81	167°28.72	25.61	171°32.62	23.30	312°9.54	49.57
18	335°40.82		131°24.05	S09°12.85	182°30.22	N13°25.32	186°34.96	N13°23.26	327°12.06	N00°49.55
19	350°43.28		146°25.32	12.89	197°31.71	25.03	201°37.29	23.23	342°14.59	49.53
20	5°45.75		161°26.58	12.92	212°33.20	24.74	216°39.63	23.19	357°17.11	49.52
21	20°48.21		176°27.84	•• 12.96	227°34.69	•• 24.45	231°41.96	•• 23.16	12°19.64	•• 49.50
22	35°50.67		191°29.10	13.01	242°36.19	24.16	246°44.30	23.12	27°22.17	49.49
23	50°53.14		206°30.36	13.05	257°37.68	23.88	261°46.63	23.09	42°24.69	49.47
Mer.pass. 19:37		ν1.3' d0.0' m-4.91		ν1.5' d-0.3' m0.54		ν2.3' d-0.0' m-2.16		ν2.5' d-0.0' m0.58		

	Stars	
	SHA	Dec
Alpheratz	357°33.00	29°14.59
Ankaa	353°5.41	-42°9.68
Schedar	349°28.90	56°41.41
Diphda	348°45.56	-17°50.31
Achernar	335°18.59	-57°6.10
Hamal	327°49.15	23°35.54
Polaris	312°43.78	89°22.72
Acamar	315°10.20	-40°11.79
Menkar	314°4.22	4°11.81
Mirfak	308°25.53	49°57.50
Aldebaran	290°37.51	-16°33.85
Rigel	281°2.06	-8°10.15
Capella	280°19.15	46°1.45
Bellatrix	278°20.91	6°22.48
Elnath	277°59.56	28°37.78
Alnilam	275°35.86	-1°11.03
Betelgeuse	270°50.12	7°24.75
Canopus	263°51.24	-52°42.39
Sirius	258°24.60	-16°45.08
Adhara	255°4.37	-29°0.36
Procyon	244°49.02	5°9.36
Pollux	243°15.21	27°57.55
Avior	234°13.78	-59°35.45
Suhail	222°45.04	-43°32.23
Miaplacidus	221°37.66	-69°49.33
Alphard	217°46.18	-8°46.45
Regulus	207°32.81	11°50.08
Dubhe	193°39.31	61°36.03
Denebola	182°23.53	14°25.23
Genah	175°42.18	-17°41.38
Acrux	172°58.76	-63°14.66
Gacrux	171°50.26	-57°15.61
Alioth	166°12.03	55°48.59
Spica	158°20.93	-11°18.04
Alkaid	152°51.22	49°10.56
Hadar	148°34.37	-60°29.99
Menkent	147°56.15	-36°30.01
Arcturus	145°46.82	19°2.49
Rigil Kent.	139°38.78	-60°56.65
Kochab	137°21.01	74°2.50
Zuben'ubi	136°54.64	-16°9.14
Alphecca	126°2.82	26°37.43
Antares	112°14.33	-26°29.44
Atria	107°7.71	-69°4.52
Sabik	102°1.36	-15°45.44
Shaula	96°8.69	-37°7.38
Rasalhague	95°57.45	12°32.51
Eltanin	90°41.96	51°29.23
Kaus Aust.	83°30.83	-34°22.31
Vega	80°32.54	38°48.67
Nunki	75°46.16	-26°15.79
Altair	61°58.67	8°56.49
Peacock	53°3.63	-56°39.05
Deneb	49°24.95	45°22.86
Enif	33°37.34	10°0.74
Al Na'ir	27°31.03	-46°49.98
Fomalhaut	15°12.78	-29°28.84
Scheat	13°43.63	28°13.99
Markab	13°28.30	15°2

h		Sun		Moon				
Tue		GHA	Dec	GHA	ν	Dec	d	HP
0		183°22.03	S20°30.12	13°41.51	4.4'	N23°22.18	9.7'	60.4'
1		198°21.86	30.62	28°4.92	4.3'	23°31.85	9.5'	60.4'
2		213°21.68	31.13	42°28.21	4.2'	23°41.36	9.4'	60.5'
3		228°21.50	· · 31.64	56°51.38	4.0'	23°50.71	9.2'	60.5'
4		243°21.32	32.14	71°14.42	3.9'	23°59.90	9.0'	60.5'
5		258°21.14	32.65	85°37.34	3.8'	24°8.93	8.9'	60.5'
6		273°20.96	S20°33.15	100°0.14	3.7'	N24°17.79	8.7'	60.5'
7		288°20.78	33.66	114°22.82	3.6'	24°26.49	8.5'	60.6'
8		303°20.60	34.16	128°45.39	3.4'	24°35.01	8.4'	60.6'
9		318°20.42	· · 34.66	143°7.84	3.3'	24°43.37	8.2'	60.6'
10		333°20.24	35.17	157°30.17	3.2'	24°51.56	8.0'	60.6'
11		348°20.06	35.67	171°52.39	3.1'	24°59.57	7.8'	60.6'
12		3°19.88	S20°36.17	186°14.51	3.0'	N25°7.40	7.7'	60.7'
13		18°19.70	36.67	200°36.51	2.9'	25°15.05	7.5'	60.7'
14		33°19.52	37.17	214°58.41	2.8'	25°22.53	7.3'	60.7'
15		48°19.34	· · 37.67	229°20.20	2.7'	25°29.82	7.1'	60.7'
16		63°19.15	38.16	243°41.89	2.6'	25°36.93	6.9'	60.7'
17		78°18.97	38.66	258°3.48	2.5'	25°43.85	6.7'	60.7'
18		93°18.79	S20°39.16	272°24.98	2.4'	N25°50.58	6.5'	60.7'
19		108°18.60	39.65	286°46.37	2.3'	25°57.13	6.4'	60.8'
20		123°18.42	40.15	301°7.67	2.2'	26°3.48	6.2'	60.8'
21		138°18.24	· · 40.65	315°28.89	2.1'	26°9.64	6.0'	60.8'
22		153°18.05	41.14	329°50.01	2.0'	26°15.61	5.8'	60.8'
23		168°17.87	41.63	344°11.05	2.0'	26°21.38	5.6'	60.8'
		SD = 16.2' d = 0.5'		SD = 16.5'				
Wed		GHA	Dec	GHA	ν	Dec	d	HP
0		183°17.68	S20°42.13	358°32.00	1.9'	N26°26.95	5.4'	60.8'
1		198°17.50	42.62	12°52.87	1.8'	26°32.33	5.2'	60.8'
2		213°17.31	43.11	27°13.67	1.7'	26°37.50	5.0'	60.8'
3		228°17.12	· · 43.60	41°34.39	1.6'	26°42.48	4.8'	60.9'
4		243°16.94	44.09	55°55.04	1.6'	26°47.25	4.6'	60.9'
5		258°16.75	44.58	70°15.62	1.5'	26°51.81	4.4'	60.9'
6		273°16.56	S20°45.07	84°36.13	1.5'	N26°56.17	4.2'	60.9'
7		288°16.38	45.56	98°56.58	1.4'	27°0.33	3.9'	60.9'
8		303°16.19	46.04	113°16.97	1.3'	27°4.27	3.7'	60.9'
9		318°16.00	· · 46.53	127°37.31	1.3'	27°8.01	3.5'	60.9'
10		333°15.81	47.02	141°57.59	1.2'	27°11.54	3.3'	60.9'
11		348°15.62	47.50	156°17.82	1.2'	27°14.86	3.1'	60.9'
12		3°15.43	S20°47.99	170°38.00	1.1'	N27°17.96	2.9'	60.9'
13		18°15.24	48.47	184°58.14	1.1'	27°20.86	2.7'	60.9'
14		33°15.05	48.95	199°18.24	1.1'	27°23.54	2.5'	60.9'
15		48°14.86	· · 49.44	213°38.31	1.0'	27°26.00	2.3'	60.9'
16		63°14.67	49.92	227°58.34	1.0'	27°28.26	2.0'	60.9'
17		78°14.48	50.40	242°18.34	1.0'	27°30.30	1.8'	60.9'
18		93°14.29	S20°50.88	256°38.31	1.0'	N27°32.12	1.6'	60.9'
19		108°14.10	51.36	270°58.26	0.9'	27°33.72	1.4'	60.9'
20		123°13.91	51.84	285°18.20	0.9'	27°35.12	1.2'	60.9'
21		138°13.72	· · 52.32	299°38.11	0.9'	27°36.29	1.0'	60.9'
22		153°13.52	52.80	313°58.02	0.9'	27°37.25	0.7'	60.9'
23		168°13.33	53.28	328°17.91	0.9'	27°37.99	0.5'	60.9'
		SD = 16.2' d = 0.5'		SD = 16.6'				
Thu		GHA	Dec	GHA	ν	Dec	d	HP
0		183°13.14	S20°53.75	342°37.81	0.9'	N27°38.51	0.3'	60.9'
1		198°12.94	54.23	356°57.69	0.9'	27°38.82	0.1'	60.9'
2		213°12.75	54.70	11°17.59	0.9'	27°38.91	-0.1'	60.9'
3		228°12.56	· · 55.18	25°37.49	0.9'	27°38.78	-0.3'	60.9'
4		243°12.36	55.65	39°57.39	0.9'	27°38.43	-0.6'	60.9'
5		258°12.17	56.13	54°17.31	0.9'	27°37.87	-0.8'	60.9'
6		273°11.97	S20°56.60	68°37.25	1.0'	N27°37.09	-1.0'	60.9'
7		288°11.78	57.07	82°57.21	1.0'	27°36.10	-1.2'	60.9'
8		303°11.58	57.54	97°17.19	1.0'	27°34.89	-1.4'	60.9'
9		318°11.39	· · 58.01	111°37.20	1.0'	27°33.46	-1.6'	60.9'
10		333°11.19	58.48	125°57.24	1.1'	27°31.82	-1.9'	60.9'
11		348°10.99	58.95	140°17.31	1.1'	27°29.96	-2.1'	60.9'
12		3°10.80	S20°59.42	154°37.42	1.2'	N27°27.90	-2.3'	60.9'
13		18°10.60	20°59.89	168°57.57	1.2'	27°25.61	-2.5'	60.9'
14		33°10.40	21°0.36	183°17.77	1.2'	27°23.12	-2.7'	60.9'
15		48°10.20	· · 0.82	197°38.01	1.3'	27°20.41	-2.9'	60.9'
16		63°10.01	1.29	211°58.31	1.3'	27°17.50	-3.1'	60.9'
17		78°9.81	1.75	226°18.66	1.4'	27°14.37	-3.3'	60.8'
18		93°9.61	S21°2.22	240°39.06	1.5'	N27°11.03	-3.5'	60.8'
19		108°9.41	2.68	254°59.53	1.5'	27°7.49	-3.7'	60.8'
20		123°9.21	3.14	269°20.06	1.6'	27°3.74	-4.0'	60.8'
21		138°9.01	· · 3.61	283°40.66	1.7'	26°59.79	-4.2'	60.8'
22		153°8.81	4.07	298°1.32	1.7'	26°55.63	-4.4'	60.8'
23		168°8.61	4.53	312°22.06	1.8'	26°51.26	-4.6'	60.8'
		SD = 16.2' d = 0.5'		SD = 16.6'				

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

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

Day	Sun			Moon		
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm Lower hh:mm		Age 15-17 99-97%
24	13:28	13:20	11:47	—:—	11:34	
25	13:11	13:02	11:47	00:06	12:39	
26	12:53	12:43	11:47	01:13	13:46	

November 27, 28, 29 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	65°55.60	221°31.61	S09°13.10	272°39.18	N13°23.59	276°48.97	N13°23.05	57°27.22	N00°49.46			Alpheratz	357°33.00 29°14.60
1	80°58.07	236°32.86	13.14	287°40.67	23.30	291°51.31	23.02	72°29.74	49.44			Ankaa	353°5.41 -42°9.68
2	96°0.53	251°34.11	13.19	302°42.17	23.01	306°53.65	22.98	87°32.27	49.42			Schedar	349°28.91 56°41.42
3	111°3.00	266°35.35	•• 13.24	317°43.66	•• 22.72	321°55.98	•• 22.95	102°34.79	•• 49.41			Diphda	348°45.55 -17°50.32
4	126°5.46	281°36.60	13.29	332°45.16	22.43	336°58.32	22.92	117°37.32	49.39			Achernar	335°18.60 -57°6.11
5	141°7.92	296°37.84	13.34	347°46.66	22.14	352°0.66	22.88	132°39.84	49.38			Hamal	327°49.14 23°35.55
6	156°10.39	311°39.07	S09°13.40	2°48.16	N13°21.86	7°3.00	N13°22.85	147°42.37	N00°49.36			Polaris	312°43.66 89°22.74
7	171°12.85	326°40.31	13.45	17°49.66	21.57	22°5.34	22.81	162°44.89	49.35			Acamar	315°10.20 -40°11.80
8	186°15.32	341°41.54	13.51	32°51.16	21.28	37°7.68	22.78	177°47.41	49.33			Menkar	314°4.21 4°11.81
9	201°17.78	356°42.77	•• 13.57	47°52.66	•• 20.99	52°10.02	•• 22.75	192°49.94	•• 49.32			Mirfak	308°25.51 49°57.51
10	216°20.24	11°44.00	13.63	62°54.16	20.71	67°12.36	22.71	207°52.46	49.30			Aldebaran	290°37.49 16°33.85
11	231°22.71	26°45.22	13.69	77°55.66	20.42	82°14.70	22.68	222°54.99	49.29			Rigel	281°2.04 -8°10.16
12	246°25.17	41°46.45	S09°13.76	92°57.16	N13°20.13	97°17.04	N13°22.65	237°57.51	N00°49.27			Capella	280°19.12 46°1.45
13	261°27.64	56°47.67	13.82	107°58.66	19.84	112°19.38	22.62	253°0.03	49.26			Bellatrix	278°20.89 6°22.48
14	276°30.10	71°48.88	13.89	123°0.16	19.56	127°21.72	22.58	268°2.56	49.24			Elnath	277°59.53 28°37.79
15	291°32.57	86°50.10	•• 13.96	138°1.67	•• 19.27	142°24.06	•• 22.55	283°5.08	•• 49.23			Alnilam	275°35.83 -1°11.03
16	306°35.03	101°51.31	14.03	153°3.17	18.98	157°26.40	22.52	298°7.60	49.21			Betelgeuse	270°50.09 7°24.75
17	321°37.49	116°52.52	14.10	168°4.68	18.70	172°28.74	22.48	313°10.12	49.20			Canopus	263°51.22 -52°42.41
18	336°39.96	131°53.73	S09°14.17	183°6.18	N13°18.41	187°31.09	N13°22.45	328°12.65	N00°49.18			Sirius	258°24.58 -16°45.09
19	351°42.42	146°54.93	14.25	198°7.69	18.13	202°33.43	22.42	343°15.17	49.17			Adhara	255°4.34 -29°0.37
20	6°44.89	161°56.13	14.32	213°9.19	17.84	217°35.77	22.39	358°17.69	49.16			Procyon	244°48.99 5°9.35
21	21°47.35	176°57.33	•• 14.40	228°10.70	•• 17.56	232°38.12	•• 22.36	13°20.21	•• 49.14			Pollux	243°15.17 27°57.54
22	36°49.82	191°58.53	14.48	243°12.21	17.27	247°40.46	22.32	28°22.74	49.13			Avior	234°13.75 -59°35.47
23	51°52.28	206°59.72	14.56	258°13.71	16.99	262°42.80	22.29	43°25.26	49.11			Suhail	222°45.01 -43°32.24
Mer.pass. 19:33		ν1.3' d0.0' m-4.90		ν1.5' d-0.3' m0.52		ν2.3' d-0.0' m-2.16		ν2.5' d-0.0' m0.59					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			Miaplacidus	221°37.61 -69°49.34
0	66°54.74	222°0.92	S09°14.64	273°15.22	N13°16.70	277°45.15	N13°22.26	58°27.78	N00°49.10			Alphard	217°46.15 -8°46.46
1	81°57.21	237°2.10	14.73	288°16.73	16.42	292°47.49	22.23	73°30.30	49.09			Regulus	207°32.77 11°50.07
2	96°59.67	252°3.29	14.81	303°18.24	16.13	307°49.84	22.20	88°32.82	49.07			Dubhe	193°39.26 61°36.02
3	112°2.14	267°4.48	•• 14.90	318°19.75	•• 15.85	322°52.18	•• 22.16	103°35.34	•• 49.06			Denebola	182°23.50 14°25.21
4	127°4.60	282°5.66	14.99	333°21.26	15.56	337°54.53	22.13	118°37.86	49.04			Gienah	175°42.15 -17°41.39
5	142°7.06	297°6.84	15.08	348°22.77	15.28	352°56.87	22.10	133°40.38	49.03			Acrux	172°58.71 -63°14.66
6	157°9.53	312°8.01	S09°15.17	3°24.29	N13°15.00	7°59.22	N13°22.07	148°42.90	N00°49.02			Gacrux	171°50.21 -57°15.61
7	172°11.99	327°9.19	15.26	18°25.80	14.71	23°1.57	22.04	163°45.43	49.00			Alioth	166°11.99 55°48.57
8	187°14.46	342°10.36	15.36	33°27.31	14.43	38°3.91	22.01	178°47.95	48.99			Spica	158°20.91 -11°18.05
9	202°16.92	357°11.53	•• 15.45	48°28.82	•• 14.15	53°6.26	•• 21.98	193°50.47	•• 48.98			Alkaid	152°51.20 49°10.54
10	217°19.39	12°12.70	15.55	63°30.34	13.86	68°8.61	21.95	208°52.99	48.96			Hadar	148°34.33 -60°29.99
11	232°21.85	27°13.86	15.65	78°31.85	13.58	83°10.95	21.92	223°55.51	48.95			Menkent	147°56.12 -36°30.01
12	247°24.31	42°15.02	S09°15.75	93°33.37	N13°13.30	98°13.30	N13°21.89	238°58.02	N00°48.94			Arcturus	145°46.80 19°2.48
13	262°26.78	57°16.18	15.85	108°34.88	13.01	113°15.65	21.86	254°0.54	48.93			Rigil Kent.	139°38.75 -60°56.64
14	277°29.24	72°17.34	15.95	123°36.40	12.73	128°18.00	21.83	269°3.06	48.91			Kochab	137°20.99 74°2.48
15	292°31.71	87°18.50	•• 16.06	138°37.92	•• 12.45	143°20.35	•• 21.80	284°5.58	•• 48.90			Zuben'ubi	136°54.62 -16°9.15
16	307°34.17	102°19.65	16.17	153°39.44	12.17	158°22.70	21.77	299°8.10	48.89			Alphecca	126°2.80 26°37.42
17	322°36.64	117°20.80	16.27	168°40.95	11.89	173°25.05	21.74	314°10.62	48.87			Antares	112°14.31 -26°29.44
18	337°39.10	132°21.94	S09°16.38	183°42.47	N13°11.60	188°27.40	N13°21.71	329°13.14	N00°48.86			Atria	107°7.69 -69°4.51
19	352°41.56	147°23.09	16.49	198°43.99	11.32	203°29.75	21.68	344°15.66	48.85			Sabik	102°1.35 -15°45.44
20	7°44.03	162°24.23	16.61	213°45.51	11.04	218°32.10	21.65	359°18.18	48.84			Shaula	96°8.67 -37°7.37
21	22°46.49	177°25.37	•• 16.72	228°47.03	•• 10.76	233°34.45	•• 21.62	14°20.69	•• 48.82			Rasalhague	95°57.45 12°32.50
22	37°48.96	192°26.51	16.83	243°48.55	10.48	248°36.80	21.59	29°23.21	48.81			Eltanin	90°41.97 51°29.22
23	52°51.42	207°27.65	16.95	258°50.08	10.20	263°39.15	21.56	44°25.73	48.80			Kaus Aust.	83°30.82 -34°22.31
Mer.pass. 19:29		ν1.2' d0.1' m-4.90		ν1.5' d-0.3' m0.51		ν2.3' d-0.0' m-2.17		ν2.5' d-0.0' m0.59					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			Vega	80°32.55 38°48.66
0	67°53.88	222°28.78	S09°17.07	273°51.60	N13°9.92	278°41.50	N13°21.53	59°28.25	N00°48.79			Nunki	75°46.15 -26°15.79
1	82°56.35	237°29.91	17.19	288°53.12	9.64	293°43.85	21.50	74°30.76	48.77			Altair	61°58.67 8°56.49
2	97°58.81	252°31.04	17.31	303°54.65	9.36	308°46.20	21.47	89°33.28	48.76			Peacock	53°3.63 -56°39.05
3	113°1.28	267°32.16	•• 17.43	318°56.17	•• 9.08	323°48.56	•• 21.44	104°35.80	•• 48.75			Deneb	49°24.96 45°22.86
4	128°3.74	282°33.28	17.56	333°57.69	8.80	338°50.91	21.41	119°38.32	48.74			Enif	33°37.34 10°0.07
5	143°6.21	297°34.41	17.68	348°59.22	8.52	353°53.26	21.39	134°40.83	48.73			Al Na'ir	27°31.04 -46°49.98
6	158°8.67	312°35.52	S09°17.81	4°0.75	N13°8.24	8°55.62	N13°21.36	149°43.35	N00°48.72			Fomalhaut	15°12.78 -29°28.84
7	173°11.13	327°36.64	17.94	19°2.27	7.96	23°57.97	21.33	164°45.87	48.70			Scheat	13°43.64 28°13.99
8	188°13.60	342°37.75	18.07	34°3.80	7.68	39°0.32	21.30	179°48.38	48.69			Markab	13°28.30 15°21.20
9	203°16.06	357°38.86	•• 18.20	49°5.33	•• 7.40	54°2.68	•• 21.27	194°50.90	•• 48.68				
10	218°18.53	12°39.97	18.3										

h		Sun		Moon			
Fri		GHA	Dec	GHA	ν	Dec	d HP
0		183°8.41	S21°4.99	326°42.88	1.9'	N26°46.70	-4.8' 60.8'
1		198°8.21	5.45	341°3.77	2.0'	26°41.93	-5.0' 60.7'
2		213°8.01	5.91	355°24.74	2.1'	26°36.97	-5.2' 60.7'
3		228°7.80	· · 6.37	9°45.80	2.1'	26°31.80	-5.4' 60.7'
4		243°7.60	6.82	24°6.94	2.2'	26°26.45	-5.6' 60.7'
5		258°7.40	7.28	38°28.18	2.3'	26°20.89	-5.7' 60.7'
6		273°7.20	S21°7.74	52°49.50	2.4'	N26°15.14	-5.9' 60.7'
7		288°6.99	8.19	67°10.91	2.5'	26°9.20	-6.1' 60.7'
8		303°6.79	8.65	81°32.43	2.6'	26°3.08	-6.3' 60.6'
9		318°6.59	· · 9.10	95°54.04	2.7'	25°56.76	-6.5' 60.6'
10		333°6.38	9.56	110°15.75	2.8'	25°50.25	-6.7' 60.6'
11		348°6.18	10.01	124°37.56	2.9'	25°43.56	-6.9' 60.6'
12		3°5.97	S21°10.46	138°59.48	3.0'	N25°36.69	-7.1' 60.6'
13		18°5.77	10.91	153°21.50	3.1'	25°29.64	-7.2' 60.6'
14		33°5.56	11.36	167°43.63	3.2'	25°22.40	-7.4' 60.5'
15		48°5.36	· · 11.81	182°5.87	3.4'	25°14.99	-7.6' 60.5'
16		63°5.15	12.26	196°28.23	3.5'	25°7.40	-7.8' 60.5'
17		78°4.95	12.71	210°50.69	3.6'	24°59.64	-7.9' 60.5'
18		93°4.74	S21°13.16	225°13.28	3.7'	N24°51.71	-8.1' 60.5'
19		108°4.53	13.61	239°35.97	3.8'	24°43.60	-8.3' 60.4'
20		123°4.33	14.05	253°58.79	3.9'	24°35.33	-8.4' 60.4'
21		138°4.12	· · 14.50	268°21.72	4.1'	24°26.89	-8.6' 60.4'
22		153°3.91	14.95	282°44.78	4.2'	24°18.29	-8.8' 60.4'
23		168°3.70	15.39	297°7.96	4.3'	24°9.52	-8.9' 60.3'
		SD = 16.2' d = 0.5'		SD = 16.6'			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		183°3.49	S21°15.83	311°31.26	4.4'	N24°0.60	-9.1' 60.3'
1		198°3.28	16.28	325°54.68	4.5'	23°51.51	-9.2' 60.3'
2		213°3.08	16.72	340°18.23	4.7'	23°42.27	-9.4' 60.3'
3		228°2.87	· · 17.16	354°41.90	4.8'	23°32.88	-9.5' 60.3'
4		243°2.66	17.60	9°5.70	4.9'	23°23.33	-9.7' 60.2'
5		258°2.45	18.04	23°29.63	5.1'	23°13.64	-9.8' 60.2'
6		273°2.24	S21°18.48	37°53.69	5.2'	N23°3.79	-10.0' 60.2'
7		288°2.03	18.92	52°17.87	5.3'	22°53.80	-10.1' 60.2'
8		303°1.81	19.36	66°42.18	5.4'	22°43.67	-10.3' 60.1'
9		318°1.60	· · 19.80	81°6.63	5.6'	22°33.40	-10.4' 60.1'
10		333°1.39	20.23	95°31.20	5.7'	22°22.98	-10.6' 60.1'
11		348°1.18	20.67	109°55.90	5.8'	22°12.43	-10.7' 60.1'
12		3°0.97	S21°21.11	124°20.74	6.0'	N22°1.75	-10.8' 60.0'
13		18°0.75	21.54	138°45.70	6.1'	21°50.93	-10.9' 60.0'
14		33°0.54	21.98	153°10.80	6.2'	21°39.98	-11.1' 60.0'
15		48°0.33	· · 22.41	167°36.02	6.4'	21°28.91	-11.2' 59.9'
16		63°0.12	22.84	182°1.38	6.5'	21°17.70	-11.3' 59.9'
17		77°59.90	23.27	196°26.87	6.6'	21°6.37	-11.4' 59.9'
18		92°59.69	S21°23.70	210°52.49	6.8'	N20°54.93	-11.6' 59.9'
19		107°59.47	24.14	225°18.24	6.9'	20°43.36	-11.7' 59.8'
20		122°59.26	24.57	239°44.12	7.0'	20°31.67	-11.8' 59.8'
21		137°59.04	· · 24.99	254°10.13	7.1'	20°19.87	-11.9' 59.8'
22		152°58.83	25.42	268°36.27	7.3'	20°7.95	-12.0' 59.8'
23		167°58.61	25.85	283°2.54	7.4'	19°55.92	-12.1' 59.7'
		SD = 16.2' d = 0.4'		SD = 16.5'			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		182°58.40	S21°26.28	297°28.95	7.5'	N19°43.78	-12.2' 59.7'
1		197°58.18	26.70	311°55.48	7.7'	19°31.54	-12.4' 59.7'
2		212°57.96	27.13	326°22.13	7.8'	19°19.19	-12.5' 59.6'
3		227°57.75	· · 27.56	340°48.92	7.9'	19°6.73	-12.6' 59.6'
4		242°57.53	27.98	355°15.84	8.0'	18°54.18	-12.7' 59.6'
5		257°57.31	28.40	9°42.88	8.2'	18°41.52	-12.8' 59.5'
6		272°57.09	S21°28.83	24°10.04	8.3'	N18°28.77	-12.8' 59.5'
7		287°56.88	29.25	38°37.34	8.4'	18°15.93	-12.9' 59.5'
8		302°56.66	29.67	53°4.76	8.5'	18°2.99	-13.0' 59.5'
9		317°56.44	· · 30.09	67°32.30	8.7'	17°49.96	-13.1' 59.4'
10		332°56.22	30.51	81°59.96	8.8'	17°36.84	-13.2' 59.4'
11		347°56.00	30.93	96°27.75	8.9'	17°23.63	-13.3' 59.4'
12		2°55.78	S21°31.35	110°55.66	9.0'	N17°10.34	-13.4' 59.3'
13		17°55.56	31.77	125°23.69	9.1'	16°56.97	-13.5' 59.3'
14		32°55.34	32.18	139°51.84	9.3'	16°43.51	-13.5' 59.3'
15		47°55.12	· · 32.60	154°20.11	9.4'	16°29.98	-13.6' 59.2'
16		62°54.90	33.02	168°48.49	9.5'	16°16.37	-13.7' 59.2'
17		77°54.68	33.43	183°17.00	9.6'	16°2.68	-13.8' 59.2'
18		92°54.46	S21°33.85	197°45.61	9.7'	N15°48.92	-13.8' 59.1'
19		107°54.24	34.26	212°14.35	9.8'	15°35.08	-13.9' 59.1'
20		122°54.01	34.67	226°43.19	10.0'	15°21.18	-14.0' 59.1'
21		137°53.79	· · 35.08	241°12.15	10.1'	15°7.21	-14.0' 59.1'
22		152°53.57	35.50	255°41.22	10.2'	14°53.17	-14.1' 59.0'
23		167°53.35	35.91	270°10.40	10.3'	14°39.07	-14.2' 59.0'
		SD = 16.2' d = 0.4'		SD = 16.3'			

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of 00 ^h	Time 12 ^h		Mer.Pass. Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	18-20 92-74%
27	12:34	12:24	11:48	02:19	14:51	
28	12:14	12:04	11:48	03:22	15:52	
29	11:54	11:43	11:48	04:20	16:46	

November 30, 01, 02 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	68°53.02		222°55.25	S09°20.34	274°28.31	N13°3.24	279°38.03	N13°20.86	60°28.62	N00°48.52
1	83°55.49		237°56.32	20.49	289°29.85	2.97	294°40.39	20.84	75°31.13	48.51
2	98°57.95		252°57.39	20.65	304°31.39	2.69	309°42.75	20.81	90°33.65	48.50
3	114°0.42		267°58.46	•• 20.80	319°32.92	•• 2.42	324°45.11	•• 20.78	105°36.16	•• 48.49
4	129°2.88		282°59.53	20.96	334°34.46	2.14	339°47.47	20.76	120°38.67	48.48
5	144°5.34		298°0.59	21.12	349°36.00	1.87	354°49.83	20.73	135°41.19	48.47
6	159°7.81		313°1.66	S09°21.28	4°37.54	N13°1.59	9°52.19	N13°20.71	150°43.70	N00°48.46
7	174°10.27		328°2.71	21.44	19°39.08	1.32	24°54.55	20.68	165°46.21	48.45
8	189°12.74		343°3.77	21.61	34°40.63	1.04	39°56.92	20.66	180°48.72	48.44
9	204°15.20		358°4.83	•• 21.77	49°42.17	•• 0.77	54°59.28	•• 20.63	195°51.23	•• 48.43
10	219°17.67		13°5.88	21.94	64°43.71	0.50	70°1.64	20.61	210°53.75	48.42
11	234°20.13		28°6.93	22.11	79°45.25	13°0.22	85°4.00	20.58	225°56.26	48.41
12	249°22.59		43°7.98	S09°22.28	94°46.80	N12°59.95	100°6.36	N13°20.55	240°58.77	N00°48.40
13	264°25.06		58°9.02	22.45	109°48.34	59.67	115°8.73	20.53	256°1.28	48.39
14	279°27.52		73°10.07	22.62	124°49.89	59.40	130°11.09	20.50	271°3.79	48.38
15	294°29.99		88°11.11	•• 22.79	139°51.43	•• 59.13	145°13.46	•• 20.48	286°6.30	•• 48.37
16	309°32.45		103°12.15	22.97	154°52.98	58.86	160°15.82	20.46	301°8.82	48.36
17	324°34.91		118°13.18	23.14	169°54.52	58.58	175°18.18	20.43	316°11.33	48.35
18	339°37.38		133°14.22	S09°23.32	184°56.07	N12°58.31	190°20.55	N13°20.41	331°13.84	N00°48.34
19	354°39.84		148°15.25	23.50	199°57.62	58.04	205°22.91	20.38	346°16.35	48.33
20	9°42.31		163°16.28	23.68	214°59.17	57.77	220°25.28	20.36	1°18.86	48.32
21	24°44.77		178°17.31	•• 23.86	230°0.72	•• 57.49	235°27.64	•• 20.33	16°21.37	•• 48.31
22	39°47.23		193°18.33	24.04	245°2.27	57.22	250°30.01	20.31	31°23.88	48.31
23	54°49.70		208°19.36	24.23	260°3.82	56.95	265°32.38	20.29	46°26.39	48.30
Mer.pass. 19:21		ν1.1' d0.2' m-4.89		ν1.5' d-0.3' m0.48		ν2.4' d-0.0' m-2.19		ν2.5' d-0.0' m0.60		
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	69°52.16		223°20.38	S09°24.41	275°5.37	N12°56.68	280°34.74	N13°20.26	61°28.90	N00°48.29
1	84°54.63		238°21.40	24.60	290°6.92	56.41	295°37.11	20.24	76°31.41	48.28
2	99°57.09		253°22.41	24.79	305°8.47	56.14	310°39.48	20.22	91°33.92	48.27
3	114°59.56		268°23.43	•• 24.98	320°10.03	•• 55.87	325°41.84	•• 20.19	106°36.42	•• 48.26
4	130°2.02		283°24.44	25.17	335°11.58	55.60	340°44.21	20.17	121°38.93	48.25
5	145°4.48		298°25.45	25.36	350°13.13	55.33	355°46.58	20.15	136°41.44	48.25
6	160°6.95		313°26.46	S09°25.55	5°14.69	N12°55.06	10°48.95	N13°20.12	151°43.95	N00°48.24
7	175°9.41		328°27.46	25.75	20°16.24	54.79	25°51.32	20.10	166°46.46	48.23
8	190°11.88		343°28.47	25.94	35°17.80	54.52	40°53.69	20.08	181°48.97	48.22
9	205°14.34		358°29.47	•• 26.14	50°19.35	•• 54.25	55°56.06	•• 20.05	196°51.48	•• 48.21
10	220°16.80		13°30.46	26.34	65°20.91	53.98	70°58.43	20.03	211°53.98	48.21
11	235°19.27		28°31.46	26.54	80°22.47	53.71	86°0.80	20.01	226°56.49	48.20
12	250°21.73		43°32.46	S09°26.74	95°24.03	N12°53.44	101°3.17	N13°19.99	241°59.00	N00°48.19
13	265°24.20		58°33.45	26.94	110°25.59	53.17	116°5.54	19.96	257°1.51	48.18
14	280°26.66		73°34.44	27.15	125°27.15	52.91	131°7.91	19.94	272°4.01	48.17
15	295°29.12		88°35.43	•• 27.35	140°28.71	•• 52.64	146°10.28	•• 19.92	287°6.52	•• 48.17
16	310°31.59		103°36.41	27.56	155°30.27	52.37	161°12.65	19.90	302°9.03	48.16
17	325°34.05		118°37.39	27.77	170°31.83	52.10	176°15.02	19.88	317°11.53	48.15
18	340°36.52		133°38.37	S09°27.98	185°33.39	N12°51.84	191°17.40	N13°19.85	332°14.04	N00°48.15
19	355°38.98		148°39.35	28.19	200°34.95	51.57	206°19.77	19.83	347°16.55	48.14
20	10°41.44		163°40.33	28.40	215°36.52	51.30	221°22.14	19.81	2°19.05	48.13
21	25°43.91		178°41.30	•• 28.61	230°38.08	•• 51.03	236°24.51	•• 19.79	17°21.56	•• 48.12
22	40°46.37		193°42.28	28.83	245°39.65	50.77	251°26.89	19.77	32°24.07	48.12
23	55°48.84		208°43.25	29.04	260°41.21	50.50	266°29.26	19.75	47°26.57	48.11
Mer.pass. 19:17		ν1.0' d0.2' m-4.89		ν1.6' d-0.3' m0.46		ν2.4' d-0.0' m-2.19		ν2.5' d-0.0' m0.61		
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	70°51.30		223°44.22	S09°29.26	275°42.78	N12°50.23	281°31.64	N13°19.73	62°29.08	N00°48.10
1	85°53.77		238°45.18	29.48	290°44.34	49.97	296°34.01	19.70	77°31.58	48.10
2	100°56.23		253°46.15	29.70	305°45.91	49.70	311°36.39	19.68	92°34.09	48.09
3	115°58.69		268°47.11	•• 29.92	320°47.48	•• 49.44	326°38.76	•• 19.66	107°36.59	•• 48.08
4	131°1.16		283°48.07	30.14	335°49.05	49.17	341°41.14	19.64	122°39.10	48.08
5	146°3.62		298°49.02	30.36	350°50.61	48.91	356°43.51	19.62	137°41.60	48.07
6	161°6.09		313°49.98	S09°30.59	5°52.18	N12°48.64	11°45.89	N13°19.60	152°44.11	N00°48.06
7	176°8.55		328°50.93	30.81	20°53.75	48.38	26°48.26	19.58	167°46.61	48.06
8	191°11.01		343°51.88	31.04	35°55.32	48.11	41°50.64	19.56	182°49.12	48.05
9	206°13.48		358°52.83	•• 31.27	50°56.90	•• 47.85	56°53.02	•• 19.54	197°51.62	•• 48.04
10	221°15.94		13°53.78	31.50	65°58.47	47.58	71°55.40	19.52	212°54.12	48.04
11	236°18.41		28°54.72	31.73	81°0.04	47.32	86°57.77	19.50	227°56.63	48.03
12	251°20.87		43°55.66	S09°31.96	96°1.61	N12°47.06	102°0.15	N13°19.48	242°59.13	N00°48.03
13	266°23.33		58°56.60	32.19	111°3.19	46.79	117°2.53	19.46	258°1.64	48.02
14	281°25.80		73°57.54	32.43	126°4.76	46.53	132°4.91	19.44	273°4.14	48.02
15	296°28.26		88°58.48	•• 32.67	141°6.34	•• 46.27	147°7.29	•• 19.42	288°6.64	•• 48.01
16	311°30.73		103°59.41	32.90	156°7.91	46.00	162°9.67	19.40	303°9.14	48.00
17	326°33.19		119°0.34	33.14	171°9.49	45.74	177°12.05	19.39	318°11.65	48.00
18	341°35.65		134°1.27	S09°33.38	186°11.07	N12°45.48	192°14.43	N13°19.37	333°14.15	N00°47.99
19	356°38.12		149°2.20	33.62	201°12.64	45.22	207°16.81	19.35	348°16.65	47.99
20	11°40.58		164°3.13	33.86	216°14.22	44.96	222°19.19	19.33	3°19.15	47.98
21	26°43.05		179°4.05	•• 34.11	231°15.80	•• 44.69	237°21.57	•• 19.31	18°21.66	•• 47.98
22	41°45.51		194°4.97	34.35	246°17.38	44.43	252°23.95	19.29	33°24.16	47.97
23	56°47.97		209°5.89	34.60	261°18.96	44.17	267°26.33	19.27	48°26.66	47.97
Mer.pass. 19:13		ν1.0' d0.2' m-4.88		ν1.6' d-0.3' m0.44		ν2.4' d-0.0' m-2.20		ν2.5' d-0.0' m0.61		

	Stars	
	SHA	Dec
Alpheratz	357°33.01	29°14.60
Ankaa	353°5.42	-42°9.69
Schedar	349°28.93	56°41.43
Diphda	348°45.56	-17°50.32
Achernar	335°18.61	-57°6.12
Hamal	327°49.14	23°35.55
Polaris	312°43.98	89°22.76
Acamar	315°10.20	-40°11.81
Menkar	314°4.21	4°11.81
Mirfak	308°25.50	49°57.53
Aldebaran	290°37.47	-16°33.85
Rigel	281°2.03	-8°10.17
Capella	280°19.10	46°1.46
Bellatrix	278°20.87	6°22.48
Elnath	277°59.52	28°37.79
Alnilam	275°35.82	-1°11.04
Betelgeuse	270°50.08	7°24.74
Canopus	263°51.20	-52°42.42
Sirius	258°24.56	-16°45.10
Adhara	255°4.32	-29°0.38
Procyon	244°48.96	5°9.34
Pollux	243°15.15	27°57.54
Avior	234°13.72	-59°35.48
Suhail	222°44.98	-43°32.25
Miaplacidus	221°37.57	-69°49.35
Alphard	217°46.12	-8°46.47
Regulus	207°32.75	11°50.06
Dubhe	193°39.21	61°36.01
Denebola	182°23.47	14°25.20
Genah	175°42.13	-17°41.40
Acrux	172°58.67	-63°14.66
Gacrux	171°50.18	-57°15.61
Alioth	166°11.96	55°48.55
Spica	158°20.89	-11°18.06
Alkaid	152°51.17	49°10.52
Hadar	148°34.30	-60°29.98
Menkent	147°56.10	-36°30.01
Arcturus	145°46.78	19°2.46
Rigel Kent.	139°38.72	-60°56.64
Kochab	137°20.97	74°2.46
Zuben'ubi	136°54.60	-16°9.16
Alphecca	126°2.79	26°37.40
Antares	112°14.30	-26°29.44
Atria	107°7.68	-69°4.50
Sabik	102°1.35	-15°45.45
Shaula	96°8.67	-37°7.37
Rasalhague	95°57.44	12°32.49
Eltanin	90°41.98	51°29.20
Kaus Aust.	83°30.82	-34°22.31
Vega	80°32.55	38°48.64
Nunki	75°46.15	-26°15.79
Altair	61°58.68	8°56.48
Peacock	53°3.64	-56°39.04
Deneb	49°24.98	45°22.85
Enif	33°37.35	10°


h		Sun		Moon			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		182°53.12	S21°36.32	284°39.69	10.4'	N14°24.91	-14.2' 59.0'
1		197°52.90	36.73	299°9.09	10.5'	14°10.68	-14.3' 58.9'
2		212°52.68	37.14	313°38.60	10.6'	13°56.40	-14.3' 58.9'
3		227°52.45	· · 37.54	328°8.21	10.7'	13°42.05	-14.4' 58.9'
4		242°52.23	37.95	342°37.92	10.8'	13°27.65	-14.5' 58.8'
5		257°52.00	38.36	357°7.74	10.9'	13°13.20	-14.5' 58.8'
6		272°51.78	S21°38.76	11°37.65	11.0'	N12°58.70	-14.6' 58.8'
7		287°51.55	39.17	26°7.67	11.1'	12°44.14	-14.6' 58.7'
8		302°51.33	39.57	40°37.79	11.2'	12°29.54	-14.7' 58.7'
9		317°51.10	· · 39.98	55°8.01	11.3'	12°14.88	-14.7' 58.7'
10		332°50.87	40.38	69°38.32	11.4'	12°0.19	-14.7' 58.6'
11		347°50.65	40.78	84°8.72	11.5'	11°45.44	-14.8' 58.6'
12		2°50.42	S21°41.18	98°39.23	11.6'	N11°30.66	-14.8' 58.6'
13		17°50.19	41.58	113°9.82	11.7'	11°15.83	-14.9' 58.5'
14		32°49.97	41.98	127°40.50	11.8'	11°0.96	-14.9' 58.5'
15		47°49.74	· · 42.38	142°11.28	11.9'	10°46.06	-14.9' 58.5'
16		62°49.51	42.78	156°42.14	11.9'	10°31.12	-15.0' 58.4'
17		77°49.28	43.18	171°13.09	12.0'	10°16.14	-15.0' 58.4'
18		92°49.05	S21°43.58	185°44.12	12.1'	N10°1.13	-15.0' 58.4'
19		107°48.82	43.97	200°15.24	12.2'	09°46.09	-15.1' 58.3'
20		122°48.59	44.37	214°46.44	12.3'	09°31.02	-15.1' 58.3'
21		137°48.37	· · 44.76	229°17.72	12.4'	09°15.92	-15.1' 58.3'
22		152°48.14	45.16	243°49.08	12.4'	09°0.79	-15.2' 58.2'
23		167°47.91	45.55	258°20.53	12.5'	08°45.64	-15.2' 58.2'
		SD = 16.2' $d = 0.4'$		SD = 16.1'			

Tue		GHA	Dec	GHA	ν	Dec	d HP
0		182°47.68	S21°45.95	272°52.04	12.6'	N08°30.46	-15.2' 58.2'
1		197°47.44	46.34	287°23.64	12.7'	08°15.25	-15.2' 58.1'
2		212°47.21	46.73	301°55.30	12.7'	08°0.02	-15.2' 58.1'
3		227°46.98	· · 47.12	316°27.05	12.8'	07°44.78	-15.3' 58.1'
4		242°46.75	47.51	330°58.86	12.9'	07°29.51	-15.3' 58.0'
5		257°46.52	47.90	345°30.74	13.0'	07°14.23	-15.3' 58.0'
6		272°46.29	S21°48.29	0°2.69	13.0'	N06°58.92	-15.3' 58.0'
7		287°46.05	48.68	14°34.71	13.1'	06°43.61	-15.3' 57.9'
8		302°45.82	49.06	29°6.79	13.1'	06°28.28	-15.3' 57.9'
9		317°45.59	· · 49.45	43°38.94	13.2'	06°12.93	-15.4' 57.9'
10		332°45.36	49.84	58°11.15	13.3'	05°57.57	-15.4' 57.9'
11		347°45.12	50.22	72°43.42	13.3'	05°42.21	-15.4' 57.8'
12		2°44.89	S21°50.60	87°15.75	13.4'	N05°26.83	-15.4' 57.8'
13		17°44.65	50.99	101°48.14	13.4'	05°11.45	-15.4' 57.8'
14		32°44.42	51.37	116°20.59	13.5'	04°56.06	-15.4' 57.7'
15		47°44.18	· · 51.75	130°53.09	13.6'	04°40.66	-15.4' 57.7'
16		62°43.95	52.13	145°25.65	13.6'	04°25.26	-15.4' 57.7'
17		77°43.71	52.52	159°58.26	13.7'	04°9.85	-15.4' 57.6'
18		92°43.48	S21°52.89	174°30.92	13.7'	N03°54.45	-15.4' 57.6'
19		107°43.24	53.27	189°3.64	13.8'	03°39.04	-15.4' 57.6'
20		122°43.01	53.65	203°36.40	13.8'	03°23.63	-15.4' 57.5'
21		137°42.77	· · 54.03	218°9.21	13.9'	03°8.22	-15.4' 57.5'
22		152°42.53	54.41	232°42.06	13.9'	02°52.82	-15.4' 57.5'
23		167°42.30	54.78	247°14.96	13.9'	02°37.42	-15.4' 57.4'
		SD = 16.2' $d = 0.4'$		SD = 15.9'			

Wed		GHA	Dec	GHA	ν	Dec	d HP
0		182°42.06	S21°55.16	261°47.90	14.0'	N02°22.03	-15.4' 57.4'
1		197°41.82	55.53	276°20.88	14.0'	02°6.64	-15.4' 57.4'
2		212°41.58	55.91	290°53.91	14.1'	01°51.25	-15.4' 57.4'
3		227°41.35	· · 56.28	305°26.97	14.1'	01°35.88	-15.4' 57.3'
4		242°41.11	56.65	320°0.07	14.1'	01°20.51	-15.4' 57.3'
5		257°40.87	57.03	334°33.21	14.2'	01°5.16	-15.3' 57.3'
6		272°40.63	S21°57.40	349°6.38	14.2'	N00°49.81	-15.3' 57.2'
7		287°40.39	57.77	3°39.59	14.2'	00°34.48	-15.3' 57.2'
8		302°40.15	58.14	18°12.83	14.3'	00°19.16	-15.3' 57.2'
9		317°39.91	· · 58.51	32°46.10	14.3'	N00°3.85	-15.3' 57.1'
10		332°39.67	58.87	47°19.40	14.3'	S00°11.44	15.3' 57.1'
11		347°39.43	59.24	61°52.72	14.4'	00°26.71	15.3' 57.1'
12		2°39.19	S21°59.61	76°26.08	14.4'	S00°41.97	15.2' 57.1'
13		17°38.95	21°59.97	90°59.46	14.4'	00°57.21	15.2' 57.0'
14		32°38.71	0.34	105°32.86	14.4'	01°12.43	15.2' 57.0'
15		47°38.47	· · 0.70	120°6.29	14.4'	01°27.63	15.2' 57.0'
16		62°38.22	1.07	134°39.74	14.5'	01°42.80	15.2' 56.9'
17		77°37.98	1.43	149°13.21	14.5'	01°57.96	15.1' 56.9'
18		92°37.74	S22°1.79	163°46.70	14.5'	S02°13.09	15.1' 56.9'
19		107°37.50	2.15	178°20.20	14.5'	02°28.20	15.1' 56.8'
20		122°37.25	2.52	192°53.73	14.5'	02°43.28	15.1' 56.8'
21		137°37.01	· · 2.88	207°27.26	14.6'	02°58.34	15.0' 56.8'
22		152°36.77	3.24	222°0.82	14.6'	03°13.37	15.0' 56.8'
23		167°36.52	3.59	236°34.38	14.6'	03°28.37	15.0' 56.7'
		SD = 16.2' $d = 0.4'$		SD = 15.7'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm	21-23 64-42%
30	11:32	11:22	11:49	05:12	17:36	
01	11:11	11:00	11:49	06:00	18:23	
02	10:48	10:37	11:49	06:45	19:07	

December 03, 04, 05 UT (Thu., Fri., Sat.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	71°50.44		224°6.81	S09°34.84	276°20.54	N12°43.91	282°28.71	N13°19.25	63°29.16	N00°47.96	Alpheratz	357°33.02	29°14.60
1	86°52.90		239°7.72	35.09	291°22.12	43.65	297°31.09	19.24	78°31.66	47.96	Ankaa	353°5.44	-42°9.70
2	101°55.37		254°8.63	35.34	306°23.70	43.39	312°33.48	19.22	93°34.16	47.95	Schedar	349°28.95	56°41.43
3	116°57.83		269°9.55	•• 35.59	321°25.29	•• 43.13	327°35.86	•• 19.20	108°36.67	•• 47.95	Diphda	348°45.57	-17°50.33
4	132°03.00		284°10.45	35.84	336°26.87	42.87	342°38.24	19.18	123°39.17	47.94	Achernar	335°18.63	-57°6.14
5	147°2.76		299°11.36	36.10	351°28.45	42.61	357°40.63	19.16	138°41.67	47.94	Hamal	327°49.15	23°35.55
6	162°5.22		314°12.27	S09°36.35	6°30.04	N12°42.35	12°43.01	N13°19.15	153°44.17	N00°47.93	Polaris	312°44.38	89°22.78
7	177°7.69		329°13.17	36.61	21°31.62	42.09	27°45.39	19.13	168°46.67	47.93	Acamar	315°10.20	-40°11.83
8	192°10.15		344°14.07	36.86	36°33.21	41.83	42°47.78	19.11	183°49.17	47.92	Menkar	314°4.21	4°11.80
9	207°12.62		359°14.97	•• 37.12	51°34.80	•• 41.57	57°50.16	•• 19.09	198°51.67	•• 47.92	Mirfak	308°25.50	49°57.53
10	222°15.08		14°15.86	37.38	66°36.38	41.31	72°52.55	19.08	213°54.17	47.92	Aldebaran	290°37.47	16°33.85
11	237°17.54		29°16.76	37.64	81°37.97	41.05	87°54.93	19.06	228°56.67	47.91	Rigel	281°2.03	-8°10.18
12	252°20.01		44°17.65	S09°37.90	96°39.56	N12°40.80	102°57.32	N13°19.04	243°59.17	N00°47.91	Capella	280°19.09	46°1.47
13	267°22.47		59°18.54	38.17	111°41.15	40.54	117°59.70	19.03	259°1.67	47.90	Bellatrix	278°20.87	6°22.47
14	282°24.94		74°19.43	38.43	126°42.74	40.28	133°2.09	19.01	274°4.17	47.90	Elnath	277°59.51	28°37.79
15	297°27.40		89°20.31	•• 38.69	141°44.33	•• 40.02	148°4.48	•• 18.99	289°6.66	•• 47.89	Alnilam	275°35.81	-1°11.04
16	312°29.86		104°21.20	38.96	156°45.92	39.76	163°6.86	18.98	304°9.16	47.89	Betelgeuse	270°50.07	7°24.74
17	327°32.33		119°22.08	39.23	171°47.51	39.51	178°9.25	18.96	319°11.66	47.89	Canopus	263°51.18	-52°42.44
18	342°34.79		134°22.96	S09°39.50	186°49.10	N12°39.25	193°11.64	N13°18.94	334°14.16	N00°47.88	Sirius	258°24.55	-16°45.11
19	357°37.26		149°23.84	39.77	201°50.70	38.99	208°14.03	18.93	349°16.66	47.88	Adhara	255°4.31	-29°0.40
20	12°39.72		164°24.71	40.04	216°52.29	38.74	223°16.42	18.91	4°19.16	47.88	Procyon	244°48.95	5°9.34
21	27°42.18		179°25.59	•• 40.31	231°53.88	•• 38.48	238°18.80	•• 18.90	19°21.65	•• 47.87	Pollux	243°15.13	27°57.54
22	42°44.65		194°26.46	40.58	246°55.48	38.22	253°21.19	18.88	34°24.15	47.87	Avior	234°13.69	-59°35.49
23	57°47.11		209°27.33	40.86	261°57.07	37.97	268°23.58	18.86	49°26.65	47.87	Suhail	222°44.95	-43°32.26
Mer.pass. 19:09		ν0.9' d0.2' m-4.88		ν1.6' d-0.3' m0.43		ν2.4' d-0.0' m-2.21		ν2.5' d-0.0' m0.62					
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		GHA	Dec
0	72°49.58		224°28.20	S09°41.13	276°58.67	N12°37.71	283°25.97	N13°18.85	64°29.15	N00°47.86	Miaplacidus	221°37.52	-69°49.36
1	87°52.04		239°29.06	41.41	292°0.27	37.46	298°28.36	18.83	79°31.64	47.86	Alphard	217°46.10	-8°46.48
2	102°54.50		254°29.93	41.69	307°1.86	37.20	313°30.75	18.82	94°34.14	47.86	Regulus	207°32.72	11°50.05
3	117°56.97		269°30.79	•• 41.97	322°3.46	•• 36.95	328°33.14	•• 18.80	109°36.64	•• 47.85	Dubhe	193°39.18	61°36.00
4	132°59.43		284°31.65	42.25	337°5.06	36.69	343°35.53	18.79	124°39.14	47.85	Denebola	182°23.45	14°25.19
5	148°1.90		299°32.51	42.53	352°6.66	36.44	358°37.92	18.77	139°41.63	47.85	Gienah	175°42.11	-17°41.40
6	163°4.36		314°33.36	S09°42.81	7°8.26	N12°36.18	13°40.32	N13°18.76	154°44.13	N00°47.85	Acrux	172°58.63	-63°14.65
7	178°6.83		329°34.22	43.09	22°9.86	35.93	28°42.71	18.74	169°46.63	47.84	Gacrux	171°50.15	-57°15.61
8	193°9.29		344°35.07	43.38	37°11.46	35.67	43°45.10	18.73	184°49.12	47.84	Alioth	166°11.93	55°48.54
9	208°11.75		359°35.92	•• 43.67	52°13.06	•• 35.42	58°47.49	•• 18.71	199°51.62	•• 47.84	Spica	158°20.87	-11°18.07
10	223°14.22		14°36.77	43.95	67°14.67	35.17	73°49.88	18.70	214°54.11	47.84	Alkaid	152°51.15	49°10.51
11	238°16.68		29°37.61	44.24	82°16.27	34.91	88°52.28	18.68	229°56.61	47.83	Hadar	148°34.27	-60°29.98
12	253°19.15		44°38.46	S09°44.53	97°17.87	N12°34.66	103°54.67	N13°18.67	244°59.10	N00°47.83	Menkent	147°56.08	-36°30.01
13	268°21.61		59°39.30	44.82	112°19.48	34.41	118°57.06	18.66	260°1.60	47.83	Arcturus	145°46.77	19°2.45
14	283°24.07		74°40.14	45.11	127°21.08	34.16	133°59.46	18.64	275°4.09	47.83	Rigil Kent.	139°38.70	-60°56.63
15	298°26.54		89°40.98	•• 45.41	142°22.69	•• 33.90	149°1.85	•• 18.63	290°6.59	•• 47.82	Kochab	137°20.94	74°2.44
16	313°29.00		104°41.81	45.70	157°24.30	33.65	164°4.25	18.61	305°9.08	47.82	Zuben'ubi	136°54.59	-16°9.16
17	328°31.47		119°42.65	45.99	172°25.90	33.40	179°6.64	18.60	320°11.58	47.82	Alphecca	126°2.79	26°37.39
18	343°33.93		134°43.48	S09°46.29	187°27.51	N12°33.15	194°9.04	N13°18.59	335°14.07	N00°47.82	Antares	112°14.30	-26°29.44
19	358°36.39		149°44.31	46.59	202°29.12	32.90	209°11.43	18.57	350°16.57	47.82	Atria	107°7.67	-69°4.49
20	13°38.86		164°45.14	46.89	217°30.73	32.65	224°13.83	18.56	5°19.06	47.81	Sabik	102°1.34	-15°45.45
21	28°41.32		179°45.97	•• 47.19	232°32.34	•• 32.40	239°16.23	•• 18.55	20°21.55	•• 47.81	Shaula	96°8.67	-37°7.37
22	43°43.79		194°46.79	47.49	247°33.95	32.14	254°18.62	18.53	35°24.05	47.81	Rasalhague	95°57.45	12°32.48
23	58°46.25		209°47.61	47.79	262°35.56	31.89	269°21.02	18.52	50°26.54	47.81	Eltanin	90°41.98	51°29.18
Mer.pass. 19:06		ν0.9' d0.3' m-4.87		ν1.6' d-0.3' m0.41		ν2.4' d-0.0' m-2.21		ν2.5' d-0.0' m0.62					
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		GHA	Dec
0	73°48.72		224°48.43	S09°48.09	277°37.17	N12°31.64	284°23.42	N13°18.51	65°29.04	N00°47.81	Kaus Aust.	83°30.83	-34°22.30
1	88°51.18		239°49.25	48.40	292°38.78	31.39	299°25.81	18.50	80°31.53	47.81	Vega	80°32.56	38°48.63
2	103°53.64		254°50.07	48.70	307°40.40	31.14	314°28.21	18.48	95°34.02	47.81	Nunki	75°46.16	-26°15.79
3	118°56.11		269°50.88	•• 49.01	322°42.01	•• 30.90	329°30.61	•• 18.47	110°36.51	•• 47.81	Altair	61°58.69	8°56.48
4	133°58.57		284°51.70	49.31	337°43.63	30.65	344°33.01	18.46	125°39.01	47.80	Peacock	53°3.67	-56°39.04
5	149°1.04		299°52.51	49.62	352°45.24	30.40	359°35.41	18.45	140°41.50	47.80	Deneb	49°25.00	45°22.84
6	164°3.50		314°53.32	S09°49.93	7°46.86	N12°30.15	14°37.81	N13°18.43	155°43.99	N00°47.80	Enif	33°37.37	10°0.06
7	179°5.96		329°54.12	50.24	22°48.47	29.90	29°40.21	18.42	170°46.48	47.80	Al Na'ir	27°31.07	-46°49.98
8	194°8.43		344°54.93	50.55	37°50.09	29.65	44°42.61	18.41	185°48.98	47.80	Fomalhaut	15°12.80	-29°28.85
9	209°10.89		359°55.73	•• 50.87	52°51.71	•• 29.40	59°45.01	•• 18.40	200°51.47	•• 47.80	Scheat	13°43.66	28°13.99
10	224												

h		Sun		Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	182°36.28	S22°3.95	251°7.96	14.6'	S03°43.35	14.9'	56.7'
1	197°36.04	4.31	265°41.55	14.6'	03°58.29	14.9'	56.7'
2	212°35.79	4.67	280°15.15	14.6'	04°13.20	14.9'	56.6'
3	227°35.55	· · 5.02	294°48.75	14.6'	04°28.09	14.8'	56.6'
4	242°35.30	5.38	309°22.36	14.6'	04°42.93	14.8'	56.6'
5	257°35.06	5.73	323°55.98	14.6'	04°57.75	14.8'	56.6'
6	272°34.81	S22°6.08	338°29.60	14.6'	S05°12.53	14.7'	56.5'
7	287°34.57	6.44	353°3.23	14.6'	05°27.28	14.7'	56.5'
8	302°34.32	6.79	7°36.85	14.6'	05°41.99	14.7'	56.5'
9	317°34.07	· · 7.14	22°10.48	14.6'	05°56.66	14.6'	56.5'
10	332°33.83	7.49	36°44.11	14.6'	06°11.29	14.6'	56.4'
11	347°33.58	7.84	51°17.74	14.6'	06°25.89	14.6'	56.4'
12	2°33.33	S22°8.19	65°51.36	14.6'	S06°40.44	14.5'	56.4'
13	17°33.08	8.54	80°24.98	14.6'	06°54.96	14.5'	56.4'
14	32°32.84	8.88	94°58.60	14.6'	07°9.43	14.4'	56.3'
15	47°32.59	· · 9.23	109°32.20	14.6'	07°23.86	14.4'	56.3'
16	62°32.34	9.58	124°5.81	14.6'	07°38.25	14.3'	56.3'
17	77°32.09	9.92	138°39.40	14.6'	07°52.59	14.3'	56.2'
18	92°31.84	S22°10.27	153°12.99	14.6'	S08°6.89	14.3'	56.2'
19	107°31.59	10.61	167°46.56	14.6'	08°21.14	14.2'	56.2'
20	122°31.34	10.95	182°20.12	14.6'	08°35.35	14.2'	56.2'
21	137°31.09	· · 11.30	196°53.67	14.5'	08°49.51	14.1'	56.1'
22	152°30.85	11.64	211°27.21	14.5'	09°3.62	14.1'	56.1'
23	167°30.59	11.98	226°0.74	14.5'	09°17.68	14.0'	56.1'
SD = 16.2'		$d = 0.4'$	SD = 15.5'				
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	182°30.34	S22°12.32	240°34.24	14.5'	S09°31.68	14.0'	56.1'
1	197°30.09	12.66	255°7.73	14.5'	09°45.64	13.9'	56.0'
2	212°29.84	13.00	269°41.21	14.5'	09°59.55	13.9'	56.0'
3	227°29.59	· · 13.34	284°14.66	14.4'	10°13.40	13.8'	56.0'
4	242°29.34	13.67	298°48.10	14.4'	10°27.20	13.7'	56.0'
5	257°29.09	14.01	313°21.51	14.4'	10°40.95	13.7'	56.0'
6	272°28.84	S22°14.34	327°54.90	14.4'	S10°54.63	13.6'	55.9'
7	287°28.58	14.68	342°28.28	14.3'	11°8.27	13.6'	55.9'
8	302°28.33	15.01	357°1.62	14.3'	11°21.84	13.5'	55.9'
9	317°28.08	· · 15.35	11°34.95	14.3'	11°35.36	13.5'	55.9'
10	332°27.83	15.68	26°8.24	14.3'	11°48.82	13.4'	55.8'
11	347°27.57	16.01	40°41.52	14.2'	12°2.21	13.3'	55.8'
12	2°27.32	S22°16.34	55°14.76	14.2'	S12°15.55	13.3'	55.8'
13	17°27.07	16.67	69°47.98	14.2'	12°28.83	13.2'	55.8'
14	32°26.81	17.00	84°21.17	14.2'	12°42.04	13.1'	55.7'
15	47°26.56	· · 17.33	98°54.33	14.1'	12°55.19	13.1'	55.7'
16	62°26.30	17.66	113°27.45	14.1'	13°8.28	13.0'	55.7'
17	77°26.05	17.99	128°0.55	14.1'	13°21.30	13.0'	55.7'
18	92°25.79	S22°18.31	142°33.62	14.0'	S13°34.25	12.9'	55.7'
19	107°25.54	18.64	157°6.65	14.0'	13°47.14	12.8'	55.6'
20	122°25.28	18.96	171°39.65	14.0'	13°59.96	12.8'	55.6'
21	137°25.03	· · 19.29	186°12.61	13.9'	14°12.71	12.7'	55.6'
22	152°24.77	19.61	200°45.54	13.9'	14°25.39	12.6'	55.6'
23	167°24.51	19.94	215°18.43	13.9'	14°38.01	12.5'	55.5'
SD = 16.2'		$d = 0.3'$	SD = 15.3'				
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°24.26	S22°20.26	229°51.29	13.8'	S14°50.55	12.5'	55.5'
1	197°24.00	20.58	244°24.11	13.8'	15°3.02	12.4'	55.5'
2	212°23.74	20.90	258°56.89	13.7'	15°15.41	12.3'	55.5'
3	227°23.49	· · 21.22	273°29.63	13.7'	15°27.74	12.3'	55.5'
4	242°23.23	21.54	288°2.33	13.7'	15°39.99	12.2'	55.4'
5	257°22.97	21.86	302°35.00	13.6'	15°52.16	12.1'	55.4'
6	272°22.71	S22°22.17	317°7.62	13.6'	S16°4.26	12.0'	55.4'
7	287°22.46	22.49	331°40.20	13.5'	16°16.28	11.9'	55.4'
8	302°22.20	22.81	346°12.74	13.5'	16°28.22	11.9'	55.4'
9	317°21.94	· · 23.12	0°45.23	13.5'	16°40.08	11.8'	55.3'
10	332°21.68	23.44	15°17.69	13.4'	16°51.87	11.7'	55.3'
11	347°21.42	23.75	29°50.10	13.4'	17°3.57	11.6'	55.3'
12	2°21.16	S22°24.06	44°22.46	13.3'	S17°15.19	11.5'	55.3'
13	17°20.90	24.38	58°54.78	13.3'	17°26.73	11.5'	55.3'
14	32°20.64	24.69	73°27.06	13.2'	17°38.19	11.4'	55.2'
15	47°20.38	· · 25.00	87°59.29	13.2'	17°49.56	11.3'	55.2'
16	62°20.12	25.31	102°31.47	13.1'	18°0.85	11.2'	55.2'
17	77°19.86	25.62	117°3.61	13.1'	18°12.05	11.1'	55.2'
18	92°19.60	S22°25.93	131°35.70	13.0'	S18°23.17	11.0'	55.2'
19	107°19.34	26.23	146°7.74	13.0'	18°34.19	10.9'	55.1'
20	122°19.08	26.54	160°39.74	12.9'	18°45.14	10.9'	55.1'
21	137°18.81	· · 26.85	175°11.68	12.9'	18°55.99	10.8'	55.1'
22	152°18.55	27.15	189°43.58	12.8'	19°6.75	10.7'	55.1'
23	167°18.29	27.46	204°15.43	12.8'	19°17.42	10.6'	55.1'
SD = 16.2'		$d = 0.3'$	SD = 15.1'				

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

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

Day	Sun		Mer. Pass	Moon		Age 24-26 32-15%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
03	10:25	10:13	11:50	07:29	19:50	
04	10:01	09:49	11:50	08:12	20:34	
05	09:37	09:25	11:51	08:57	21:20	

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

h	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec
0	74°47.85		225°7.55	S09°55.69	278°16.05	N12°25.71	285°21.05	N13°18.23	66°28.82	N00°47.80	Alpheratz	357°33.03	29°14.60
1	89°50.32		240°8.33	56.02	293°17.68	25.47	300°23.45	18.22	81°31.31	47.80	Ankaa	353°5.46	-42°9.70
2	104°52.78		255°9.10	56.35	308°19.31	25.22	315°25.86	18.22	96°33.80	47.80	Schedar	349°28.96	56°41.44
3	119°55.25		270°9.87	· · 56.68	323°20.94	· · 24.98	330°28.26	· · 18.21	111°36.29	· · 47.80	Diphda	348°45.58	-17°50.34
4	134°57.71		285°10.63	57.01	338°22.57	24.74	345°30.67	18.20	126°38.78	47.80	Achernar	335°18.65	-57°6.15
5	150°0.17		300°11.40	57.35	353°24.20	24.49	0°33.08	18.19	141°41.27	47.80	Hamal	327°49.15	23°35.55
6	165°2.64		315°12.16	S09°57.68	8°25.83	N12°24.25	15°35.48	N13°18.18	156°43.76	N00°47.80	Polaris	312°44.63	89°22.80
7	180°5.10		330°12.93	58.02	23°27.47	24.01	30°37.89	18.17	171°46.24	47.80	Acamar	315°10.21	-40°11.84
8	195°7.57		345°13.69	58.35	38°29.10	23.77	45°40.30	18.16	186°48.73	47.81	Menkar	314°4.21	4°11.80
9	210°10.03		0°14.44	· · 58.69	53°30.73	· · 23.52	60°42.71	· · 18.15	201°51.22	· · 47.81	Mirfak	308°25.50	49°57.54
10	225°12.50		15°15.20	59.03	68°32.37	23.28	75°45.11	18.14	216°53.71	47.81	Aldebaran	290°37.46	16°33.85
11	240°14.96		30°15.96	59.37	83°34.00	23.04	90°47.52	18.13	231°56.19	47.81	Rigel	281°2.02	-8°10.19
12	255°17.42		45°16.71	S09°59.71	98°35.64	N12°22.80	105°49.93	N13°18.12	246°58.68	N00°47.81	Capella	280°19.08	46°1.47
13	270°19.89		60°17.46	10°0.05	113°37.27	22.56	120°52.34	18.11	262°1.17	47.81	Bellatrix	278°20.86	6°22.46
14	285°22.35		75°18.21	0.40	128°38.91	22.32	135°54.75	18.11	277°3.66	47.81	Elnath	277°59.50	28°37.79
15	300°24.82		90°18.95	· · 0.74	143°40.55	· · 22.08	150°57.16	· · 18.10	292°6.14	· · 47.82	Alnilam	275°35.80	-1°11.05
16	315°27.28		105°19.70	1.09	158°42.19	21.83	165°59.57	18.09	307°8.63	47.82	Betelgeuse	270°50.05	7°24.73
17	330°29.74		120°20.44	1.43	173°43.83	21.59	181°1.98	18.08	322°11.12	47.82	Canopus	263°51.17	-52°42.46
18	345°32.21		135°21.19	S10°1.78	188°45.47	N12°21.35	196°4.39	N13°18.07	337°13.60	N00°47.82	Sirius	258°24.53	-16°45.13
19	0°34.67		150°21.93	2.13	203°47.11	21.11	211°6.80	18.07	352°16.09	47.82	Adhara	255°4.29	-29°0.41
20	15°37.14		165°22.66	2.48	218°48.75	20.88	226°9.21	18.06	7°18.57	47.82	Procyon	244°48.93	5°9.33
21	30°39.60		180°23.40	· · 2.83	233°50.39	· · 20.64	241°11.63	· · 18.05	22°21.06	· · 47.83	Pollux	243°15.11	27°57.54
22	45°42.07		195°24.13	3.18	248°52.03	20.40	256°14.04	18.04	37°23.54	47.83	Avior	234°13.65	-59°35.51
23	60°44.53		210°24.87	3.53	263°53.68	20.16	271°16.45	18.04	52°26.03	47.83	Suhail	222°44.93	-43°32.27
Mer.pass. 18:58		ν0.8' d0.3' m-4.86		ν1.6' d-0.2' m0.38		ν2.4' d-0.0' m-2.23		ν2.5' d0.0' m0.63					
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	75°46.99		225°25.60	S10°3.88	278°55.32	N12°19.92	286°18.86	N13°18.03	67°28.51	N00°47.83	Miaplacidus	221°37.47	-69°49.37
1	90°49.46		240°26.33	4.24	293°56.96	19.68	301°21.28	18.02	82°31.00	47.84	Alphard	217°46.08	-8°46.49
2	105°51.92		255°27.05	4.59	308°58.61	19.44	316°23.69	18.01	97°33.48	47.84	Regulus	207°32.70	11°50.04
3	120°54.39		270°27.78	· · 4.95	324°0.26	· · 19.21	331°26.10	· · 18.01	112°35.97	· · 47.84	Dubhe	193°39.14	61°36.00
4	135°56.85		285°28.50	5.31	339°1.90	18.97	346°28.52	18.00	127°38.45	47.84	Denebola	182°23.43	14°25.18
5	150°59.31		300°29.23	5.67	354°3.55	18.73	1°30.93	17.99	142°40.94	47.85	Gienah	175°42.08	-17°41.41
6	166°1.78		315°29.95	S10°6.03	9°5.20	N12°18.49	16°33.35	N13°17.99	157°43.42	N00°47.85	Acrux	172°58.58	-63°14.65
7	181°4.24		330°30.66	6.39	24°6.85	18.26	31°35.76	17.98	172°45.91	47.85	Gacrux	171°50.11	-57°15.61
8	196°6.71		345°31.38	6.75	39°8.50	18.02	46°38.18	17.97	187°48.39	47.85	Alioth	166°11.90	55°48.53
9	211°9.17		0°32.10	· · 7.11	54°10.15	· · 17.79	61°40.59	· · 17.97	202°50.87	· · 47.86	Spica	158°20.85	-11°18.07
10	226°11.64		15°32.81	7.47	69°11.80	17.55	76°43.01	17.96	217°53.36	47.86	Alkaid	152°51.13	49°10.49
11	241°14.10		30°33.52	7.84	84°13.45	17.31	91°45.43	17.96	232°55.84	47.86	Hadar	148°34.24	-60°29.97
12	256°16.56		45°34.23	S10°8.20	99°15.10	N12°17.08	106°47.84	N13°17.95	247°58.32	N00°47.87	Menkent	147°56.06	-36°30.01
13	271°19.03		60°34.94	8.57	114°16.75	16.84	121°50.26	17.94	263°0.80	47.87	Arcturus	145°46.75	19°2.44
14	286°21.49		75°35.64	8.93	129°18.41	16.61	136°52.68	17.94	278°3.29	47.87	Rigil Kent.	139°38.67	-60°56.62
15	301°23.96		90°36.35	· · 9.30	144°20.06	· · 16.37	151°55.09	· · 17.93	293°5.77	· · 47.88	Kochab	137°20.92	74°2.43
16	316°26.42		105°37.05	9.67	159°21.72	16.14	166°57.51	17.93	308°8.25	47.88	Zuben'ubi	136°54.58	-16°9.16
17	331°28.88		120°37.75	10.04	174°23.37	15.90	181°59.93	17.92	323°10.73	47.88	Alphecca	126°2.77	26°37.37
18	346°31.35		135°38.45	S10°10.41	189°25.03	N12°15.67	197°2.35	N13°17.92	338°13.22	N00°47.89	Antares	112°14.29	-26°29.44
19	1°33.81		150°39.15	10.78	204°26.68	15.44	212°4.77	17.91	353°15.70	47.89	Atria	107°7.66	-69°4.47
20	16°36.28		165°39.84	11.16	219°28.34	15.20	227°7.19	17.91	8°18.18	47.90	Sabik	102°1.34	-15°45.45
21	31°38.74		180°40.53	· · 11.53	234°30.00	· · 14.97	242°9.61	· · 17.90	23°20.66	· · 47.90	Shaula	96°8.66	-37°7.36
22	46°41.21		195°41.23	11.90	249°31.66	14.74	257°12.03	17.90	38°23.14	47.90	Rasalhague	95°57.44	12°32.47
23	61°43.67		210°41.92	12.28	264°33.32	14.51	272°14.45	17.89	53°25.62	47.91	Eltanin	90°41.99	51°29.17
Mer.pass. 18:54		ν0.7' d0.4' m-4.85		ν1.6' d-0.2' m0.36		ν2.4' d-0.0' m-2.23		ν2.5' d0.0' m0.63					
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec			
0	76°46.13		225°42.60	S10°12.66	279°34.98	N12°14.27	287°16.87	N13°17.89	68°28.10	N00°47.91	Kaus Aust.	83°30.83	-34°22.30
1	91°48.60		240°43.29	13.03	294°36.64	14.04	302°19.29	17.88	83°30.59	47.92	Vega	80°32.57	38°48.62
2	106°51.06		255°43.98	13.41	309°38.30	13.81	317°21.71	17.88	98°33.07	47.92	Nunki	75°46.16	-26°15.78
3	121°53.53		270°44.66	· · 13.79	324°39.97	· · 13.58	332°24.13	· · 17.87	113°35.55	· · 47.93	Altair	61°58.69	8°56.47
4	136°55.99		285°45.34	14.17	339°41.63	13.35	347°26.55	17.87	128°38.03	47.93	Peacock	53°3.68	-56°39.03
5	151°58.46		300°46.02	14.55	354°43.29	13.12	2°28.98	17.87	143°40.51	47.93	Deneb	49°25.01	45°22.83
6	167°0.92		315°46.70	S10°14.93	9°44.96	N12°12.88	17°31.40	N13°17.86	158°42.99	N00°47.94	Enif	33°37.38	10°0.05
7	182°3.38		330°47.37	15.32	24°46.62	12.65	32°33.82	17.86	173°45.47	47.94	Al Na'ir	27°31.09	-46°49.98
8	197°5.85		345°48.05	15.70	39°48.29	12.42	47°36.24	17.86	188°47.95	47.95	Fomalhaut	15°12.82	-29°28.85
9	212°8.31		0°48.72	· · 16.09	54°49.95	· · 12.19	62°38.67	· · 17.85	203°50.43	· · 47.95	Scheat	13°43.67	28°13.99
10	227°10.78		15°49.39	16.47	69°51.62	11.96	77°41.09	17.85	218°52.90	47.96	Markab	13°28.33	15°21.19
11</													

h	Sun				Moon				
Sun	GHA	Dec			GHA	ν	Dec	d	HP
0	182°18.03	S22°27.76			218°47.23	12.8'	S19°28.00	10.5'	55.1'
1	197°17.77	28.06			233°18.98	12.7'	19°38.49	10.4'	55.0'
2	212°17.50	28.37			247°50.68	12.7'	19°48.88	10.3'	55.0'
3	227°17.24	· · 28.67			262°22.33	12.6'	19°59.18	10.2'	55.0'
4	242°16.98	28.97			276°53.93	12.6'	20°9.39	10.1'	55.0'
5	257°16.71	29.27			291°25.48	12.5'	20°19.50	10.0'	55.0'
6	272°16.45	S22°29.57			305°56.98	12.4'	S20°29.51	9.9'	55.0'
7	287°16.19	29.87			320°28.43	12.4'	20°39.43	9.8'	54.9'
8	302°15.92	30.17			334°59.83	12.3'	20°49.24	9.7'	54.9'
9	317°15.66	· · 30.46			349°31.18	12.3'	20°58.96	9.6'	54.9'
10	332°15.39	30.76			4°2.48	12.2'	21°8.58	9.5'	54.9'
11	347°15.13	31.06			18°33.72	12.2'	21°18.10	9.4'	54.9'
12	2°14.86	S22°31.35			33°4.92	12.1'	S21°27.52	9.3'	54.9'
13	17°14.60	31.64			47°36.06	12.1'	21°36.83	9.2'	54.8'
14	32°14.33	31.94			62°7.15	12.0'	21°46.04	9.1'	54.8'
15	47°14.07	· · 32.23			76°38.19	12.0'	21°55.15	9.0'	54.8'
16	62°13.80	32.52			91°9.18	11.9'	22°4.16	8.9'	54.8'
17	77°13.53	32.81			105°40.12	11.9'	22°13.05	8.8'	54.8'
18	92°13.27	S22°33.10			120°11.01	11.8'	S22°21.85	8.7'	54.8'
19	107°13.00	33.39			134°41.84	11.8'	22°30.53	8.6'	54.7'
20	122°12.73	33.68			149°12.63	11.7'	22°39.11	8.5'	54.7'
21	137°12.47	· · 33.97			163°43.36	11.7'	22°47.58	8.4'	54.7'
22	152°12.20	34.26			178°14.05	11.6'	22°55.94	8.3'	54.7'
23	167°11.93	34.54			192°44.68	11.6'	23°4.19	8.1'	54.7'
SD = 16.2'		$d = 0.3'$				SD = 15.0'			
Mon	GHA	Dec			GHA	ν	Dec	d	HP
0	182°11.66	S22°34.83			207°15.27	11.5'	S23°12.33	8.0'	54.7'
1	197°11.39	35.11			221°45.81	11.5'	23°20.36	7.9'	54.7'
2	212°11.13	35.40			236°16.29	11.4'	23°28.28	7.8'	54.6'
3	227°10.86	· · 35.68			250°46.73	11.4'	23°36.08	7.7'	54.6'
4	242°10.59	35.96			265°17.12	11.3'	23°43.77	7.6'	54.6'
5	257°10.32	36.24			279°47.46	11.3'	23°51.34	7.5'	54.6'
6	272°10.05	S22°36.53			294°17.75	11.2'	S23°58.80	7.3'	54.6'
7	287°9.78	36.81			308°47.99	11.2'	24°6.15	7.2'	54.6'
8	302°9.51	37.09			323°18.19	11.2'	24°13.38	7.1'	54.6'
9	317°9.24	· · 37.36			337°48.34	11.1'	24°20.49	7.0'	54.5'
10	332°8.97	37.64			352°18.45	11.1'	24°27.48	6.9'	54.5'
11	347°8.70	37.92			6°48.51	11.0'	24°34.36	6.8'	54.5'
12	2°8.43	S22°38.20			21°18.52	11.0'	S24°41.12	6.6'	54.5'
13	17°8.16	38.47			35°48.49	10.9'	24°47.75	6.5'	54.5'
14	32°7.89	38.75			50°18.42	10.9'	24°54.27	6.4'	54.5'
15	47°7.62	· · 39.02			64°48.30	10.8'	25°0.66	6.3'	54.5'
16	62°7.35	39.29			79°18.14	10.8'	25°6.94	6.2'	54.5'
17	77°7.07	39.57			93°47.94	10.8'	25°13.09	6.0'	54.4'
18	92°6.80	S22°39.84			108°17.70	10.7'	S25°19.12	5.9'	54.4'
19	107°6.53	40.11			122°47.41	10.7'	25°25.03	5.8'	54.4'
20	122°6.26	40.38			137°17.09	10.6'	25°30.81	5.7'	54.4'
21	137°5.99	· · 40.65			151°46.73	10.6'	25°36.47	5.5'	54.4'
22	152°5.71	40.92			166°16.32	10.6'	25°42.00	5.4'	54.4'
23	167°5.44	41.19			180°45.88	10.5'	25°47.41	5.3'	54.4'
SD = 16.2'		$d = 0.3'$				SD = 14.9'			
Tue	GHA	Dec			GHA	ν	Dec	d	HP
0	182°5.17	S22°41.45			195°15.41	10.5'	S25°52.69	5.2'	54.4'
1	197°4.89	41.72			209°44.90	10.5'	25°57.84	5.0'	54.3'
2	212°4.62	41.99			224°14.35	10.4'	26°2.87	4.9'	54.3'
3	227°4.35	· · 42.25			238°43.77	10.4'	26°7.77	4.8'	54.3'
4	242°4.07	42.51			253°13.15	10.4'	26°12.54	4.6'	54.3'
5	257°3.80	42.78			267°42.51	10.3'	26°17.19	4.5'	54.3'
6	272°3.52	S22°43.04			282°11.83	10.3'	S26°21.70	4.4'	54.3'
7	287°3.25	43.30			296°41.12	10.3'	26°26.09	4.3'	54.3'
8	302°2.97	43.56			311°10.38	10.2'	26°30.34	4.1'	54.3'
9	317°2.70	· · 43.82			325°39.61	10.2'	26°34.47	4.0'	54.3'
10	332°2.42	44.08			340°8.82	10.2'	26°38.47	3.9'	54.3'
11	347°2.15	44.34			354°38.00	10.2'	26°42.33	3.7'	54.2'
12	2°1.87	S22°44.60			9°7.15	10.1'	S26°46.06	3.6'	54.2'
13	17°1.60	44.86			23°36.28	10.1'	26°49.67	3.5'	54.2'
14	32°1.32	45.11			38°5.38	10.1'	26°53.14	3.3'	54.2'
15	47°1.05	· · 45.37			52°34.47	10.1'	26°56.47	3.2'	54.2'
16	62°0.77	45.62			67°3.53	10.0'	26°59.68	3.1'	54.2'
17	77°0.49	45.88			81°32.57	10.0'	27°2.75	2.9'	54.2'
18	92°0.22	S22°46.13			96°1.59	10.0'	S27°5.69	2.8'	54.2'
19	106°59.94	46.38			110°30.60	10.0'	27°8.49	2.7'	54.2'
20	121°59.66	46.63			124°59.59	10.0'	27°11.17	2.5'	54.2'
21	136°59.38	· · 46.88			139°28.56	10.0'	27°13.71	2.4'	54.1'
22	151°59.11	47.13			153°57.52	9.9'	27°16.11	2.3'	54.1'
23	166°58.83	47.38			168°26.46	9.9'	27°18.38	2.1'	54.1'
SD = 16.2'		$d = 0.3'$				SD = 14.8'			

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 27-29 9-1%
	00 ^h	12 ^h		Upper hh:mm	Lower hh:mm	
	mm:ss	mm:ss	mm:ss	mm:ss		
06	09:12	08:59	11:51	09:43	22:07	
07	08:47	08:34	11:51	10:32	22:57	
08	08:21	08:07	11:52	11:22	23:48	

December 09, 10, 11 UT (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°45.27		225°58.61	S10°21.97	280°15.04	N12°8.78	288°15.06	N13°17.81	69°27.59	N00°48.04
1	92°47.74		240°59.25	22.37	295°16.72	8.55	303°17.49	17.81	84°30.07	48.04
2	107°50.20		255°59.90	22.77	310°18.40	8.32	318°19.92	17.81	99°32.55	48.05
3	122°52.67		271°0.54	· · 23.17	325°20.08	· · 8.10	333°22.35	· · 17.81	114°35.02	· · 48.05
4	137°55.13		286°1.18	23.57	340°21.76	7.87	348°24.78	17.81	129°37.50	48.06
5	152°57.60		301°1.82	23.97	355°23.44	7.65	3°27.21	17.81	144°39.98	48.07
6	168°0.06		316°2.46	S10°24.37	10°25.12	N12°7.42	18°29.64	N13°17.81	159°42.45	N00°48.07
7	183°2.52		331°3.09	24.78	25°26.80	7.20	33°32.07	17.81	174°44.93	48.08
8	198°4.99		346°3.73	25.18	40°28.48	6.98	48°34.50	17.81	189°47.40	48.09
9	213°7.45		1°4.36	· · 25.59	55°30.17	· · 6.75	63°36.93	· · 17.81	204°49.88	· · 48.09
10	228°9.92		16°4.99	26.00	70°31.85	6.53	78°39.36	17.80	219°52.35	48.10
11	243°12.38		31°5.62	26.41	85°33.54	6.31	93°41.80	17.80	234°54.83	48.11
12	258°14.85		46°6.25	S10°26.81	100°35.22	N12°6.08	108°44.23	N13°17.80	249°57.30	N00°48.11
13	273°17.31		61°6.87	27.22	115°36.91	5.86	123°46.66	17.80	264°59.78	48.12
14	288°19.77		76°7.50	27.63	130°38.60	5.64	138°49.09	17.80	280°2.25	48.13
15	303°22.24		91°8.12	· · 28.05	145°40.29	· · 5.42	153°51.53	· · 17.80	295°4.72	· · 48.13
16	318°24.70		106°8.74	28.46	160°41.97	5.20	168°53.96	17.80	310°7.20	48.14
17	333°27.17		121°9.36	28.87	175°43.66	4.97	183°56.39	17.80	325°9.67	48.15
18	348°29.63		136°9.97	S10°29.29	190°45.35	N12°4.75	198°58.83	N13°17.80	340°12.15	N00°48.16
19	3°32.09		151°10.59	29.70	205°47.04	4.53	214°1.26	17.81	355°14.62	48.16
20	18°34.56		166°11.20	30.12	220°48.74	4.31	229°3.70	17.81	10°17.09	48.17
21	33°37.02		181°11.82	· · 30.53	235°50.43	· · 4.09	244°6.13	· · 17.81	25°19.57	· · 48.18
22	48°39.49		196°12.43	30.95	250°52.12	3.87	259°8.57	17.81	40°22.04	48.19
23	63°41.95		211°13.04	31.37	265°53.82	3.65	274°11.01	17.81	55°24.51	48.20
Mer.pass. 18:46			ν0.6' d0.4' m-4.83		ν1.7' d-0.2' m0.33		ν2.4' d-0.0' m-2.25		ν2.5' d0.0' m0.64	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°44.42		226°13.64	S10°31.79	280°55.51	N12°3.43	289°13.44	N13°17.81	70°26.98	N00°48.20
1	93°46.88		241°14.25	32.21	295°57.20	3.21	304°15.88	17.81	85°29.46	48.21
2	108°49.34		256°14.85	32.63	310°58.90	2.99	319°18.32	17.81	100°31.93	48.22
3	123°51.81		271°15.46	· · 33.05	326°0.60	· · 2.77	334°20.75	· · 17.81	115°34.40	· · 48.23
4	138°54.27		286°16.06	33.47	341°2.29	2.56	349°23.19	17.82	130°36.87	48.24
5	153°56.74		301°16.66	33.89	356°3.99	2.34	4°25.63	17.82	145°39.34	48.24
6	168°59.20		316°17.26	S10°34.32	11°5.69	N12°2.12	19°28.07	N13°17.82	160°41.82	N00°48.25
7	184°1.67		331°17.85	34.74	26°7.39	1.90	34°30.51	17.82	175°44.29	48.26
8	199°4.13		346°18.45	35.17	41°9.09	1.69	49°32.94	17.82	190°46.76	48.27
9	214°6.59		1°19.04	· · 35.59	56°10.79	· · 1.47	64°35.38	· · 17.83	205°49.23	· · 48.28
10	229°9.06		16°19.63	36.02	71°12.49	1.25	79°37.82	17.83	220°51.70	48.29
11	244°11.52		31°20.22	36.45	86°14.20	1.04	94°40.26	17.83	235°54.17	48.29
12	259°13.99		46°20.81	S10°36.88	101°15.90	N12°0.82	109°42.70	N13°17.83	250°56.64	N00°48.30
13	274°16.45		61°21.40	37.31	116°17.60	0.60	124°45.14	17.84	265°59.11	48.31
14	289°18.91		76°21.98	37.74	131°19.31	0.39	139°47.58	17.84	281°1.58	48.32
15	304°21.38		91°22.56	· · 38.17	146°21.01	· · 0.17	154°50.03	· · 17.84	296°4.05	· · 48.33
16	319°23.84		106°23.15	38.60	161°22.72	11°59.96	169°52.47	17.84	311°6.52	48.34
17	334°26.31		121°23.73	39.03	176°24.43	11°59.74	184°54.91	17.85	326°8.99	48.35
18	349°28.77		136°24.30	S10°39.47	191°26.13	N11°59.53	199°57.35	N13°17.85	341°11.46	N00°48.36
19	4°31.24		151°24.88	39.90	206°27.84	59.31	214°59.79	17.85	356°13.93	48.37
20	19°33.70		166°25.46	40.34	221°29.55	59.10	230°2.24	17.86	11°16.40	48.38
21	34°36.16		181°26.03	· · 40.77	236°31.26	· · 58.89	245°4.68	· · 17.86	26°18.87	· · 48.39
22	49°38.63		196°26.60	41.21	251°32.97	58.67	260°7.12	17.86	41°21.34	48.40
23	64°41.09		211°27.17	41.65	266°34.68	58.46	275°9.57	17.87	56°23.80	48.40
Mer.pass. 18:42			ν0.6' d0.4' m-4.82		ν1.7' d-0.2' m0.31		ν2.4' d0.0' m-2.26		ν2.5' d0.0' m0.65	
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	79°43.56		226°27.74	S10°42.09	281°36.39	N11°58.25	290°12.01	N13°17.87	71°26.27	N00°48.41
1	94°46.02		241°28.31	42.52	296°38.11	58.03	305°14.46	17.88	86°28.74	48.42
2	109°48.49		256°28.88	42.96	311°39.82	57.82	320°16.90	17.88	101°31.21	48.43
3	124°50.95		271°29.44	· · 43.40	326°41.53	· · 57.61	335°19.35	· · 17.88	116°33.68	· · 48.44
4	139°53.41		286°30.00	43.85	341°43.25	57.40	350°21.79	17.89	131°36.14	48.45
5	154°55.88		301°30.56	44.29	356°44.97	57.19	5°24.24	17.89	146°38.61	48.46
6	169°58.34		316°31.12	S10°44.73	11°46.68	N11°56.98	20°26.68	N13°17.90	161°41.08	N00°48.47
7	185°0.81		331°31.68	45.18	26°48.40	56.77	35°29.13	17.90	176°43.55	48.48
8	200°3.27		346°32.24	45.62	41°50.12	56.55	50°31.58	17.91	191°46.01	48.49
9	215°5.73		1°32.79	· · 46.06	56°51.83	· · 56.34	65°34.02	· · 17.91	206°48.48	· · 48.51
10	230°8.20		16°33.35	46.51	71°53.55	56.13	80°36.47	17.92	221°50.95	48.52
11	245°10.66		31°33.90	46.96	86°55.27	55.93	95°38.92	17.92	236°53.41	48.53
12	260°13.13		46°34.45	S10°47.41	101°57.00	N11°55.72	110°41.37	N13°17.93	251°55.88	N00°48.54
13	275°15.59		61°35.00	47.85	116°58.72	55.51	125°43.82	17.93	266°58.35	48.55
14	290°18.06		76°35.55	48.30	132°0.44	55.30	140°46.27	17.94	282°0.81	48.56
15	305°20.52		91°36.09	· · 48.75	147°2.16	· · 55.09	155°48.71	· · 17.95	297°3.28	· · 48.57
16	320°22.98		106°36.64	49.20	162°3.89	54.88	170°51.16	17.95	312°5.74	48.58
17	335°25.45		121°37.18	49.65	177°5.61	54.67	185°53.61	17.96	327°8.21	48.59
18	350°27.91		136°37.72	S10°50.11	192°7.34	N11°54.47	200°56.06	N13°17.96	342°10.67	N00°48.60
19	5°30.38		151°38.26	50.56	207°9.06	54.26	215°58.51	17.97	357°13.14	48.61
20	20°32.84		166°38.80	51.01	222°10.79	54.05	231°0.97	17.98	12°15.60	48.62
21	35°35.31		181°39.33	· · 51.47	237°12.52	· · 53.84	246°3.42	· · 17.98	27°18.07	· · 48.64
22	50°37.77		196°39.87	51.92	252°14.24	53.64	261°5.87	17.99	42°20.53	48.65
23	65°40.23		211°40.40	52.38	267°15.97	53.43	276°8.32	18.00	57°23.00	48.66
Mer.pass. 18:38			ν0.6' d0.4' m-4.81		ν1.7' d-0.2' m0.29		ν2.4' d0.0' m-2.26		ν2.5' d0.0' m0.65	

	Stars	
	SHA	Dec
Alpheratz	357°33.04	29°14.60
Ankaa	353°5.47	-42°9.71
Schedar	349°28.97	56°41.44
Diphda	348°45.59	-17°50.34
Achernar	335°18.67	-57°6.16
Hamal	327°49.15	23°35.55
Polaris	312°44.88	89°22.81
Acamar	315°10.21	-40°11.85
Menkar	314°4.21	4°11.79
Mirfak	308°25.49	49°57.55
Aldebaran	290°37.45	-16°33.84
Rigel	281°2.00	-8°10.20
Capella	280°19.06	46°1.48
Bellatrix	278°20.84	6°22.46
Elnath	277°59.48	28°37.79
Alnilam	275°35.79	-1°11.06
Betelgeuse	270°50.04	7°24.72
Canopus	263°51.15	-52°42.48
Sirius	258°24.52	-16°45.14
Adhara	255°4.27	-29°0.43
Procyon	244°48.91	5°9.32
Pollux	243°15.08	27°57.53
Avior	234°13.62	-59°35.52
Suhail	222°44.90	-43°32.29
Miaplacidus	221°37.42	-69°49.39
Alphard	217°46.05	-8°46.50
Regulus	207°32.67	11°50.03
Dubhe	193°39.09	61°35.99
Denebola	182°23.40	14°25.17
Gienah	175°42.05	-17°41.42
Acrux	172°58.53	-63°14.65
Gacrux	171°50.06	-57°15.61
Alioth	166°11.87	55°48.51
Spica	158°20.82	-11°18.08
Alkaid	152°51.10	49°10.48
Hadar	148°34.20	-60°29.97
Menkent	147°56.03	-36°30.01
Arcturus	145°46.73	19°2.42
Rigil Kent.	139°38.63	-60°56.61
Kochab	137°20.89	74°2.41
Zuben'ubi	136°54.55	-16°9.17
Alphecca	126°2.76	26°37.36
Antares	112°14.27	-26°29.44
Atria	107°7.63	-69°4.46
Sabik	102°1.33	-15°45.45
Shaula	96°8.65	-37°7.35
Rasalhague	95°57.44	12°32.46
Eltanin	90°41.99	51°29.15
Kaus Aust.	83°30.82	-34°22.29
Vega	80°32.57	38°48.61
Nunki	75°46.15	-26°15.78
Altair	61°58.69	8°56.47
Peacock	53°3.69	-56°39.02
Deneb	49°25.02	45°22.83
Enif	33°37.38	10°0.05
Al Na'ir	27°31.10	-46°49.98
Fomalhaut	15°12.82	-29°28.85
Scheat	13°43.68	28°13.98
Markab	13°28.34	15°21.19

h		Sun			Moon				
Wed		GHA	Dec		GHA	ν	Dec	d	HP
0		181°58.55	S22°47.63		182°55.40	9.9'	S27°20.52	2.0'	54.1'
1		196°58.27	47.88		197°24.32	9.9'	27°22.52	1.9'	54.1'
2		211°57.99	48.13		211°53.23	9.9'	27°24.38	1.7'	54.1'
3		226°57.72	· · 48.37		226°22.14	9.9'	27°26.11	1.6'	54.1'
4		241°57.44	48.62		240°51.04	9.9'	27°27.71	1.5'	54.1'
5		256°57.16	48.86		255°19.93	9.9'	27°29.17	1.3'	54.1'
6		271°56.88	S22°49.11		269°48.82	9.9'	S27°30.50	1.2'	54.1'
7		286°56.60	49.35		284°17.70	9.9'	27°31.69	1.1'	54.1'
8		301°56.32	49.59		298°46.58	9.9'	27°32.75	0.9'	54.1'
9		316°56.04	· · 49.83		313°15.46	9.9'	27°33.67	0.8'	54.1'
10		331°55.76	50.08		327°44.35	9.9'	27°34.45	0.7'	54.0'
11		346°55.48	50.32		342°13.23	9.9'	27°35.11	0.5'	54.0'
12		1°55.20	S22°50.55		356°42.12	9.9'	S27°35.62	0.4'	54.0'
13		16°54.92	50.79		11°11.01	9.9'	27°36.00	0.2'	54.0'
14		31°54.64	51.03		25°39.91	9.9'	27°36.25	0.1'	54.0'
15		46°54.36	· · 51.27		40°8.81	9.9'	27°36.36	-0.0'	54.0'
16		61°54.08	51.50		54°37.72	9.9'	27°36.33	-0.2'	54.0'
17		76°53.80	51.74		69°6.64	9.9'	27°36.17	-0.3'	54.0'
18		91°53.51	S22°51.97		83°35.57	9.9'	S27°35.88	-0.4'	54.0'
19		106°53.23	52.21		98°4.51	10.0'	27°35.45	-0.6'	54.0'
20		121°52.95	52.44		112°33.47	10.0'	27°34.88	-0.7'	54.0'
21		136°52.67	· · 52.67		127°2.44	10.0'	27°34.19	-0.8'	54.0'
22		151°52.39	52.90		141°31.42	10.0'	27°33.35	-1.0'	54.0'
23		166°52.10	53.13		156°0.43	10.0'	27°32.39	-1.1'	54.0'
		SD = 16.2'	d = 0.2'		SD = 14.8'				
Thu		GHA	Dec		GHA	ν	Dec	d	HP
0		181°51.82	S22°53.36		170°29.45	10.0'	S27°31.29	-1.2'	54.0'
1		196°51.54	53.59		184°58.49	10.1'	27°30.06	-1.4'	54.0'
2		211°51.26	53.82		199°27.54	10.1'	27°28.69	-1.5'	54.0'
3		226°50.97	· · 54.05		213°56.63	10.1'	27°27.19	-1.6'	53.9'
4		241°50.69	54.28		228°25.73	10.1'	27°25.56	-1.8'	53.9'
5		256°50.41	54.50		242°54.86	10.2'	27°23.80	-1.9'	53.9'
6		271°50.12	S22°54.73		257°24.01	10.2'	S27°21.90	-2.0'	53.9'
7		286°49.84	54.95		271°53.19	10.2'	27°19.87	-2.2'	53.9'
8		301°49.55	55.17		286°22.39	10.2'	27°17.71	-2.3'	53.9'
9		316°49.27	· · 55.40		300°51.62	10.3'	27°15.42	-2.4'	53.9'
10		331°48.99	55.62		315°20.89	10.3'	27°13.00	-2.6'	53.9'
11		346°48.70	55.84		329°50.18	10.3'	27°10.45	-2.7'	53.9'
12		1°48.42	S22°56.06		344°19.50	10.4'	S27°7.77	-2.8'	53.9'
13		16°48.13	56.28		358°48.86	10.4'	27°4.96	-2.9'	53.9'
14		31°47.85	56.50		13°18.25	10.4'	27°2.02	-3.1'	53.9'
15		46°47.56	· · 56.72		27°47.68	10.5'	26°58.95	-3.2'	53.9'
16		61°47.28	56.93		42°17.14	10.5'	26°55.75	-3.3'	53.9'
17		76°46.99	57.15		56°46.64	10.5'	26°52.43	-3.5'	53.9'
18		91°46.71	S22°57.37		71°16.17	10.6'	S26°48.98	-3.6'	53.9'
19		106°46.42	57.58		85°45.75	10.6'	26°45.40	-3.7'	53.9'
20		121°46.13	57.80		100°15.36	10.7'	26°41.70	-3.8'	53.9'
21		136°45.85	· · 58.01		114°45.02	10.7'	26°37.87	-4.0'	53.9'
22		151°45.56	58.22		129°14.71	10.7'	26°33.91	-4.1'	53.9'
23		166°45.27	58.43		143°44.45	10.8'	26°29.83	-4.2'	53.9'
		SD = 16.2'	d = 0.2'		SD = 14.7'				
Fri		GHA	Dec		GHA	ν	Dec	d	HP
0		181°44.99	S22°58.64		158°14.23	10.8'	S26°25.62	-4.3'	53.9'
1		196°44.70	58.85		172°44.05	10.9'	26°21.30	-4.5'	53.9'
2		211°44.41	59.06		187°13.92	10.9'	26°16.85	-4.6'	53.9'
3		226°44.13	· · 59.27		201°43.84	11.0'	26°12.27	-4.7'	53.9'
4		241°43.84	59.48		216°13.80	11.0'	26°7.58	-4.8'	53.9'
5		256°43.55	59.69		230°43.81	11.1'	26°2.76	-4.9'	53.9'
6		271°43.26	S22°59.89		245°13.86	11.1'	S25°57.82	-5.1'	53.9'
7		286°42.98	23°0.10		259°43.96	11.2'	25°52.76	-5.2'	53.9'
8		301°42.69	0.30		274°14.12	11.2'	25°47.59	-5.3'	53.9'
9		316°42.40	· · 0.51		288°44.32	11.3'	25°42.29	-5.4'	53.9'
10		331°42.11	0.71		303°14.57	11.3'	25°36.88	-5.5'	53.9'
11		346°41.82	0.91		317°44.87	11.4'	25°31.35	-5.6'	53.9'
12		1°41.53	S23°1.11		332°15.23	11.4'	S25°25.70	-5.8'	53.9'
13		16°41.24	1.31		346°45.64	11.5'	25°19.93	-5.9'	53.9'
14		31°40.96	1.51		1°16.10	11.5'	25°14.05	-6.0'	53.9'
15		46°40.67	· · 1.71		15°46.61	11.6'	25°8.06	-6.1'	53.9'
16		61°40.38	1.91		30°17.17	11.6'	25°1.95	-6.2'	53.9'
17		76°40.09	2.11		44°47.79	11.7'	24°55.72	-6.3'	53.9'
18		91°39.80	S23°2.30		59°18.47	11.7'	S24°49.39	-6.4'	53.9'
19		106°39.51	2.50		73°49.20	11.8'	24°42.94	-6.6'	53.9'
20		121°39.22	2.70		88°19.98	11.8'	24°36.38	-6.7'	53.9'
21		136°38.93	· · 2.89		102°50.82	11.9'	24°29.71	-6.8'	53.9'
22		151°38.64	3.08		117°21.72	12.0'	24°22.93	-6.9'	53.9'
23		166°38.35	3.28		131°52.67	12.0'	24°16.04	-7.0'	53.9'
		SD = 16.2'	d = 0.2'		SD = 14.7'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass hh:mm	Mer.Pass.		Age 0-2 0-4%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
09	07:54	07:41	11:52	12:14	--:-	
10	07:27	07:14	11:53	13:05	00:39	
11	07:00	06:46	11:53	13:55	01:30	

December 12, 13, 14 UT (Sat., Sun., Mon.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	80°42.70		226°40.93	S10°52.83	282°17.70	N11°53.23	291°10.77	N13°18.00	72°25.46	N00°48.67
1	95°45.16		241°41.46	53.29	297°19.43	53.02	306°13.22	18.01	87°27.93	48.68
2	110°47.63		256°41.99	53.75	312°21.16	52.81	321°15.68	18.02	102°30.39	48.69
3	125°50.09		271°42.52	· · 54.21	327°22.90	· · 52.61	336°18.13	· · 18.02	117°32.85	· · 48.71
4	140°52.55		286°43.05	54.67	342°24.63	52.40	351°20.58	18.03	132°35.32	48.72
5	155°55.02		301°43.57	55.13	357°26.36	52.20	6°23.04	18.04	147°37.78	48.73
6	170°57.48		316°44.09	S10°55.59	12°28.10	N11°52.00	21°25.49	N13°18.05	162°40.24	N00°48.74
7	185°59.95		331°44.61	56.05	27°29.83	51.79	36°27.95	18.05	177°42.71	48.75
8	201°2.41		346°45.13	56.51	42°31.57	51.59	51°30.40	18.06	192°45.17	48.77
9	216°4.88		1°45.65	· · 56.97	57°33.30	· · 51.39	66°32.86	· · 18.07	207°47.63	· · 48.78
10	231°7.34		16°46.17	57.44	72°35.04	51.18	81°35.31	18.08	222°50.09	48.79
11	246°9.80		31°46.68	57.90	87°36.78	50.98	96°37.77	18.09	237°52.56	48.80
12	261°12.27		46°47.20	S10°58.37	102°38.52	N11°50.78	111°40.22	N13°18.09	252°55.02	N00°48.81
13	276°14.73		61°47.71	58.83	117°40.26	50.58	126°42.68	18.10	267°57.48	48.83
14	291°17.20		76°48.22	59.30	132°42.00	50.37	141°45.14	18.11	282°59.94	48.84
15	306°19.66		91°48.73	10°59.77	147°43.74	· · 50.17	156°47.59	· · 18.12	298°2.40	· · 48.85
16	321°22.12		106°49.24	11°0.24	162°45.48	49.97	171°50.05	18.13	313°4.86	48.87
17	336°24.59		121°49.74	0.70	177°47.22	49.77	186°52.51	18.14	328°7.33	48.88
18	351°27.05		136°50.25	S11°1.17	192°48.97	N11°49.57	201°54.97	N13°18.15	343°9.79	N00°48.89
19	6°29.52		151°50.75	1.64	207°50.71	49.37	216°57.42	18.15	358°12.25	48.90
20	21°31.98		166°51.25	2.11	222°52.45	49.17	231°59.88	18.16	13°14.71	48.92
21	36°34.45		181°51.75	· · 2.59	237°54.20	· · 48.97	247°2.34	· · 18.17	28°17.17	· · 48.93
22	51°36.91		196°52.25	3.06	252°55.95	48.77	262°4.80	18.18	43°19.63	48.94
23	66°39.37		211°52.75	3.53	267°57.69	48.57	277°7.26	18.19	58°22.09	48.96
Mer.pass. 18:34		ν0.5' d0.5' m-4.80		ν1.7' d-0.2' m0.27		ν2.5' d0.0' m-2.27		ν2.5' d0.0' m0.66		
Sun	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	81°41.84		226°53.25	S11°4.00	282°59.44	N11°48.37	292°9.72	N13°18.20	73°24.55	N00°48.97
1	96°44.30		241°53.74	4.48	298°1.19	48.17	307°12.18	18.21	88°27.01	48.98
2	111°46.77		256°54.23	4.95	313°2.94	47.98	322°14.64	18.22	103°29.47	49.00
3	126°49.23		271°54.72	· · 5.43	328°4.69	· · 47.78	337°17.10	· · 18.23	118°31.93	· · 49.01
4	141°51.69		286°55.21	5.90	343°6.44	47.58	352°19.56	18.24	133°34.39	49.02
5	156°54.16		301°55.70	6.38	358°8.19	47.38	7°22.03	18.25	148°36.85	49.04
6	171°56.62		316°56.19	S11°6.86	13°9.94	N11°47.19	22°24.49	N13°18.26	163°39.30	N00°49.05
7	186°59.09		331°56.67	7.34	28°11.70	46.99	37°26.95	18.27	178°41.76	49.07
8	202°1.55		346°57.16	7.82	43°13.45	46.79	52°29.41	18.28	193°44.22	49.08
9	217°4.02		1°57.64	· · 8.29	58°15.21	· · 46.60	67°31.88	· · 18.29	208°46.68	· · 49.09
10	232°6.48		16°58.12	8.78	73°16.96	46.40	82°34.34	18.30	223°49.14	49.11
11	247°8.94		31°58.60	9.26	88°18.72	46.20	97°36.80	18.31	238°51.60	49.12
12	262°11.41		46°59.08	S11°9.74	103°20.47	N11°46.01	112°39.27	N13°18.33	253°54.05	N00°49.14
13	277°13.87		61°59.56	10.22	118°22.23	45.81	127°41.73	18.34	268°56.51	49.15
14	292°16.34		77°0.03	10.70	133°23.99	45.62	142°44.20	18.35	283°58.97	49.16
15	307°18.80		92°0.51	· · 11.19	148°25.75	· · 45.43	157°46.66	· · 18.36	299°1.43	· · 49.18
16	322°21.26		107°0.98	11.67	163°27.51	45.23	172°49.13	18.37	314°3.88	49.19
17	337°23.73		122°1.45	12.15	178°29.27	45.04	187°51.59	18.38	329°6.34	49.21
18	352°26.19		137°1.92	S11°12.64	193°31.03	N11°44.84	202°54.06	N13°18.39	344°8.80	N00°49.22
19	7°28.66		152°2.39	13.13	208°32.79	44.65	217°56.52	18.41	359°11.25	49.24
20	22°31.12		167°2.85	13.61	223°34.56	44.46	232°58.99	18.42	14°13.71	49.25
21	37°33.59		182°3.32	· · 14.10	238°36.32	· · 44.27	248°1.46	· · 18.43	29°16.17	· · 49.27
22	52°36.05		197°3.78	14.59	253°38.09	44.07	263°3.92	18.44	44°18.62	49.28
23	67°38.51		212°4.24	15.08	268°39.85	43.88	278°6.39	18.46	59°21.08	49.30
Mer.pass. 18:30		ν0.5' d0.5' m-4.79		ν1.7' d-0.2' m0.25		ν2.5' d0.0' m-2.28		ν2.5' d0.0' m0.66		
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	82°40.98		227°4.70	S11°15.57	283°41.62	N11°43.69	293°8.86	N13°18.47	74°23.54	N00°49.31
1	97°43.44		242°5.16	16.06	298°43.38	43.50	308°11.33	18.48	89°25.99	49.33
2	112°45.91		257°5.62	16.55	313°45.15	43.31	323°13.80	18.49	104°28.45	49.34
3	127°48.37		272°6.08	· · 17.04	328°46.92	· · 43.12	338°16.27	· · 18.51	119°30.90	· · 49.36
4	142°50.83		287°6.53	17.53	343°48.69	42.93	353°18.74	18.52	134°33.36	49.37
5	157°53.30		302°6.99	18.02	358°50.46	42.74	8°21.21	18.53	149°35.81	49.39
6	172°55.76		317°7.44	S11°18.51	13°52.23	N11°42.55	23°23.67	N13°18.54	164°38.27	N00°49.41
7	187°58.23		332°7.89	19.01	28°54.00	42.36	38°26.15	18.56	179°40.72	49.42
8	203°0.69		347°8.34	19.50	43°55.78	42.17	53°28.62	18.57	194°43.17	49.44
9	218°3.15		2°8.79	· · 20.00	58°57.55	· · 41.98	68°31.09	· · 18.58	209°45.63	· · 49.45
10	233°5.62		17°9.23	20.49	73°59.32	41.79	83°33.56	18.60	224°48.08	49.47
11	248°8.08		32°9.68	20.99	89°1.10	41.60	98°36.03	18.61	239°50.54	49.49
12	263°10.55		47°10.12	S11°21.49	104°2.87	N11°41.42	113°38.50	N13°18.63	254°52.99	N00°49.50
13	278°13.01		62°10.56	21.98	119°4.65	41.23	128°40.97	18.64	269°55.44	49.52
14	293°15.48		77°11.00	22.48	134°6.43	41.04	143°43.45	18.65	284°57.90	49.53
15	308°17.94		92°11.44	· · 22.98	149°8.20	· · 40.85	158°45.92	· · 18.67	300°0.35	· · 49.55
16	323°20.40		107°11.88	23.48	164°9.98	40.67	173°48.39	18.68	315°2.80	49.57
17	338°22.87		122°12.32	23.98	179°11.76	40.48	188°50.87	18.70	330°5.26	49.58
18	353°25.33		137°12.75	S11°24.48	194°13.54	N11°40.29	203°53.34	N13°18.71	345°7.71	N00°49.60
19	8°27.80		152°13.19	24.98	209°15.32	40.11	218°55.81	18.73	0°10.16	49.62
20	23°30.26		167°13.62	25.48	224°17.11	39.92	233°58.29	18.74	15°12.61	49.63
21	38°32.72		182°14.05	· · 25.98	239°18.89	· · 39.74	249°0.76	· · 18.76	30°15.07	· · 49.65
22	53°35.19		197°14.48	26.49	254°20.67	39.55	264°3.24	18.77	45°17.52	49.67
23	68°37.65		212°14.91	26.99	269°22.46	39.37	279°5.71	18.79	60°19.97	49.68
Mer.pass. 18:26		ν0.5' d0.5' m-4.78		ν1.8' d-0.2' m0.23		ν2.5' d0.0' m-2.29		ν2.5' d0.0' m0.67		

Stars		
	SHA	Dec
Alpheratz	357°33.04	29°14.60
Ankaa	353°5.48	-42°9.71
Schedar	349°28.99	56°41.45
Diphda	348°45.59	-17°50.34
Achernar	335°18.69	-57°6.16
Hamal	327°49.15	23°35.55
Polaris	312°45.38	89°22.83
Acamar	315°10.22	-40°11.86
Menkar	314°4.20	4°11.79
Mirfak	308°25.49	49°57.56
Aldebaran	290°37.44	16°33.84
Rigel	281°1.99	-8°10.21
Capella	280°19.04	46°1.49
Bellatrix	278°20.83	6°22.45
Elnath	277°59.46	28°37.79
Alnilam	275°35.77	-1°11.07
Betelgeuse	270°50.02	7°24.72
Canopus	263°51.14	-52°42.49
Sirius	258°24.50	-16°45.15
Adhara	255°4.26	-29°0.44
Procyon	244°48.89	5°9.31
Pollux	243°15.06	27°57.53
Avior	234°13.59	-59°35.54
Suhail	222°44.87	-43°32.30
Miaplacidus	221°37.37	-69°49.40
Alphard	217°46.03	-8°46.51
Regulus	207°32.64	11°50.02
Dubhe	193°39.04	61°35.98
Denebola	182°23.37	14°25.16
Gienah	175°42.02	-17°41.43
Acrux	172°58.48	-63°14.66
Gacrux	171°50.02	-57°15.61
Alioth	166°11.83	55°48.50
Spica	158°20.80	-11°18.09
Alkaid	152°51.08	49°10.46
Hadar	148°34.16	-60°29.96
Menkent	147°56.00	-36°30.01
Arcturus	145°46.71	19°2.41
Rigel Kent.	139°38.59	-60°56.61
Kochab	137°20.86	74°2.39
Zuben'ubi	136°54.53	-16°9.17
Alphecca	126°2.74	26°37.34
Antares	112°14.25	-26°29.44
Atria	107°7.60	-69°4.45
Sabik	102°1.31	-15°45.45
Shaula	96°8.64	-37°7.35
Rasalhague	95°57.43	12°32.45
Eltanin	90°41.99	51°29.13
Kaus Aust.	83°30.81	-34°22.29
Vega	80°32.57	38°48.59
Nunki	75°46.15	-26°15.78
Altair	61°58.69	8°56.46
Peacock	53°3.69	-56°39.01
Deneb	49°25.03	45°22.82
Enif	33°37.38	10°0.05
Al Na'ir	27°31.11	-46°49.98
Fomalhaut	15°12.83	-29°28.85
Scheat	13°43.69	28°13.98
Markab	13°28.34	15°21.19
Dec 12 Sat	SHA	Mer.pass
Venus	145°58.24	08:53
Mars	201°35.00	05:10
Jupiter	210°28.07	04:35
Saturn	351°42.76	19:07
Dec 13 Sun	SHA	Mer.pass
Venus	145°11.41	08:52
Mars	201°17.60	05:07
Jupiter	210°27.88	04:31
Saturn	351°42.71	19:03
Dec 14 Mon	SHA	Mer.pass
Venus	144°23.73	08:51
Mars	201°0.64	05:05
Jupiter	210°27.88	04:27
Saturn	351°42.56	18:59
Horizontal parallax		
	Venus:	0.3
	Mars:	0.1

h		Sun		Moon			
Sat		GHA	Dec	GHA	ν	Dec	d HP
0		181°38.06	S23°3.47	146°23.68	12.1'	S24°9.04	-7.1' 53.9'
1		196°37.77	3.66	160°54.74	12.1'	24°1.93	-7.2' 53.9'
2		211°37.47	3.85	175°25.87	12.2'	23°54.72	-7.3' 53.9'
3		226°37.18	· · 4.04	189°57.05	12.2'	23°47.40	-7.4' 53.9'
4		241°36.89	4.23	204°28.29	12.3'	23°39.97	-7.5' 53.9'
5		256°36.60	4.42	218°59.58	12.4'	23°32.44	-7.6' 53.9'
6		271°36.31	S23°4.60	233°30.93	12.4'	S23°24.81	-7.7' 53.9'
7		286°36.02	4.79	248°2.34	12.5'	23°17.07	-7.8' 53.9'
8		301°35.73	4.98	262°33.81	12.5'	23°9.23	-7.9' 53.9'
9		316°35.43	· · 5.16	277°5.34	12.6'	23°1.29	-8.0' 53.9'
10		331°35.14	5.34	291°36.93	12.6'	22°53.24	-8.1' 54.0'
11		346°34.85	5.53	306°8.57	12.7'	22°45.10	-8.2' 54.0'
12		1°34.56	S23°5.71	320°40.27	12.8'	S22°36.86	-8.3' 54.0'
13		16°34.26	5.89	335°12.03	12.8'	22°28.51	-8.4' 54.0'
14		31°33.97	6.07	349°43.85	12.9'	22°20.07	-8.5' 54.0'
15		46°33.68	· · 6.25	4°15.73	12.9'	22°11.54	-8.6' 54.0'
16		61°33.39	6.43	18°47.66	13.0'	22°2.90	-8.7' 54.0'
17		76°33.09	6.61	33°19.65	13.1'	21°54.17	-8.8' 54.0'
18		91°32.80	S23°6.79	47°51.71	13.1'	S21°45.35	-8.9' 54.0'
19		106°32.51	6.96	62°23.81	13.2'	21°36.43	-9.0' 54.0'
20		121°32.21	7.14	76°55.98	13.2'	21°27.42	-9.1' 54.0'
21		136°31.92	· · 7.31	91°28.20	13.3'	21°18.31	-9.2' 54.0'
22		151°31.63	7.49	106°0.48	13.3'	21°9.11	-9.3' 54.0'
23		166°31.33	7.66	120°32.82	13.4'	20°59.82	-9.4' 54.0'
		SD = 16.2' d = 0.2'		SD = 14.7'			
Sun		GHA	Dec	GHA	ν	Dec	d HP
0		181°31.04	S23°7.84	135°5.22	13.5'	S20°50.45	-9.5' 54.0'
1		196°30.74	8.01	149°37.67	13.5'	20°40.98	-9.6' 54.1'
2		211°30.45	8.18	164°10.17	13.6'	20°31.42	-9.6' 54.1'
3		226°30.15	· · 8.35	178°42.74	13.6'	20°21.78	-9.7' 54.1'
4		241°29.86	8.52	193°15.35	13.7'	20°12.04	-9.8' 54.1'
5		256°29.57	8.69	207°48.03	13.7'	20°2.22	-9.9' 54.1'
6		271°29.27	S23°8.86	222°20.76	13.8'	S19°52.32	-10.0' 54.1'
7		286°28.98	9.02	236°53.54	13.8'	19°42.33	-10.1' 54.1'
8		301°28.68	9.19	251°26.38	13.9'	19°32.26	-10.2' 54.1'
9		316°28.38	· · 9.36	265°59.27	13.9'	19°22.10	-10.2' 54.1'
10		331°28.09	9.52	280°32.21	14.0'	19°11.86	-10.3' 54.1'
11		346°27.79	9.68	295°5.21	14.0'	19°1.54	-10.4' 54.1'
12		1°27.50	S23°9.85	309°38.26	14.1'	S18°51.14	-10.5' 54.2'
13		16°27.20	10.01	324°11.36	14.2'	18°40.65	-10.6' 54.2'
14		31°26.91	10.17	338°44.51	14.2'	18°30.09	-10.6' 54.2'
15		46°26.61	· · 10.33	353°17.72	14.3'	18°19.45	-10.7' 54.2'
16		61°26.31	10.49	7°50.97	14.3'	18°8.73	-10.8' 54.2'
17		76°26.02	10.65	22°24.28	14.4'	17°57.93	-10.9' 54.2'
18		91°25.72	S23°10.81	36°57.63	14.4'	S17°47.06	-10.9' 54.2'
19		106°25.42	10.97	51°31.03	14.5'	17°36.11	-11.0' 54.2'
20		121°25.13	11.12	66°4.48	14.5'	17°25.09	-11.1' 54.3'
21		136°24.83	· · 11.28	80°37.98	14.5'	17°13.99	-11.2' 54.3'
22		151°24.53	11.44	95°11.52	14.6'	17°2.82	-11.2' 54.3'
23		166°24.24	11.59	109°45.11	14.6'	16°51.57	-11.3' 54.3'
		SD = 16.2' d = 0.2'		SD = 14.7'			
Mon		GHA	Dec	GHA	ν	Dec	d HP
0		181°23.94	S23°11.74	124°18.75	14.7'	S16°40.25	-11.4' 54.3'
1		196°23.64	11.90	138°52.43	14.7'	16°28.87	-11.5' 54.3'
2		211°23.34	12.05	153°26.16	14.8'	16°17.41	-11.5' 54.3'
3		226°23.05	· · 12.20	167°59.93	14.8'	16°5.88	-11.6' 54.3'
4		241°22.75	12.35	182°33.74	14.9'	15°54.28	-11.7' 54.4'
5		256°22.45	12.50	197°7.59	14.9'	15°42.61	-11.7' 54.4'
6		271°22.15	S23°12.65	211°41.49	14.9'	S15°30.88	-11.8' 54.4'
7		286°21.86	12.80	226°15.43	15.0'	15°19.08	-11.9' 54.4'
8		301°21.56	12.94	240°49.40	15.0'	15°7.21	-11.9' 54.4'
9		316°21.26	· · 13.09	255°23.42	15.1'	14°55.28	-12.0' 54.4'
10		331°20.96	13.24	269°57.47	15.1'	14°43.28	-12.1' 54.5'
11		346°20.66	13.38	284°31.56	15.1'	14°31.22	-12.1' 54.5'
12		1°20.36	S23°13.52	299°5.69	15.2'	S14°19.10	-12.2' 54.5'
13		16°20.06	13.67	313°39.86	15.2'	14°6.91	-12.2' 54.5'
14		31°19.77	13.81	328°14.06	15.2'	13°54.66	-12.3' 54.5'
15		46°19.47	· · 13.95	342°48.29	15.3'	13°42.35	-12.4' 54.5'
16		61°19.17	14.09	357°22.56	15.3'	13°29.98	-12.4' 54.6'
17		76°18.87	14.23	1°56.86	15.3'	13°17.55	-12.5' 54.6'
18		91°18.57	S23°14.37	26°31.19	15.4'	S13°5.06	-12.5' 54.6'
19		106°18.27	14.51	41°5.55	15.4'	12°52.51	-12.6' 54.6'
20		121°17.97	14.65	55°39.95	15.4'	12°39.90	-12.7' 54.6'
21		136°17.67	· · 14.78	70°14.37	15.5'	12°27.24	-12.7' 54.7'
22		151°17.37	14.92	84°48.82	15.5'	12°14.52	-12.8' 54.7'
23		166°17.07	15.05	99°23.29	15.5'	12°1.75	-12.8' 54.7'
		SD = 16.2' d = 0.2'		SD = 14.8'			

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 3-5 8-21%
	Eqn.of 00 ^h mm:ss	Time 12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
12	06:32	06:18	11:54	14:42	02:19	
13	06:04	05:50	11:54	15:28	03:05	
14	05:36	05:21	11:55	16:11	03:49	

Aries		Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	83°40.12	227°15.33	S11°27.49	284°24.24	N11°39.18	294°8.19	N13°18.80	75°22.42	N00°49.70
1	98°42.58	242°15.76	28.00	299°26.03	39.00	309°10.67	18.82	90°24.87	49.72
2	113°45.04	257°16.18	28.50	314°27.81	38.82	324°13.14	18.83	105°27.32	49.73
3	128°47.51	272°16.61	•• 29.01	329°29.60	•• 38.63	339°15.62	•• 18.85	120°29.77	•• 49.75
4	143°49.97	287°17.03	29.51	344°31.39	38.45	354°18.10	18.86	135°32.22	49.77
5	158°52.44	302°17.45	30.02	359°33.18	38.27	9°20.57	18.88	150°34.68	49.79
6	173°54.90	317°17.87	S11°30.53	14°34.97	N11°38.09	24°23.05	N13°18.90	165°37.13	N00°49.80
7	188°57.37	332°18.28	31.04	29°36.76	37.90	39°25.53	18.91	180°39.58	49.82
8	203°59.83	347°18.70	31.55	44°38.55	37.72	54°28.01	18.93	195°42.03	49.84
9	219°2.29	2°19.11	•• 32.05	59°40.34	•• 37.54	69°30.49	•• 18.94	210°44.48	•• 49.86
10	234°4.76	17°19.52	32.56	74°42.13	37.36	84°32.97	18.96	225°46.93	49.87
11	249°7.22	32°19.94	33.07	89°43.93	37.18	99°35.45	18.98	240°49.38	49.89
12	264°9.69	47°20.35	S11°33.59	104°45.72	N11°37.00	114°37.93	N13°18.99	255°51.83	N00°49.91
13	279°12.15	62°20.75	34.10	119°47.52	36.82	129°40.41	19.01	270°54.27	49.93
14	294°14.61	77°21.16	34.61	134°49.31	36.64	144°42.89	19.03	285°56.72	49.95
15	309°17.08	92°21.57	•• 35.12	149°51.11	•• 36.46	159°45.37	•• 19.04	300°59.17	•• 49.96
16	324°19.54	107°21.97	35.63	164°52.91	36.28	174°47.85	19.06	316°1.62	49.98
17	339°22.01	122°22.38	36.15	179°54.71	36.10	189°50.33	19.08	331°4.07	50.00
18	354°24.47	137°22.78	S11°36.66	194°56.50	N11°35.92	204°52.81	N13°19.10	346°6.52	N00°50.02
19	9°26.93	152°23.18	37.18	209°58.30	35.75	219°55.29	19.11	1°8.97	50.04
20	24°29.40	167°23.58	37.69	225°0.11	35.57	234°57.78	19.13	16°11.41	50.06
21	39°31.86	182°23.97	•• 38.21	240°1.91	•• 35.39	250°0.26	•• 19.15	31°13.86	•• 50.07
22	54°34.33	197°24.37	38.72	255°3.71	35.21	265°2.74	19.17	46°16.31	50.09
23	69°36.79	212°24.77	39.24	270°5.51	35.04	280°5.23	19.19	61°18.76	50.11
Mer.pass. 18:22		ν0.4' d0.5' m-4.77		ν1.8' d-0.2' m0.21		ν2.5' d0.0' m-2.29		ν2.5' d0.0' m0.67	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	84°39.26	227°25.16	S11°39.76	285°7.32	N11°34.86	295°7.71	N13°19.20	76°21.20	N00°50.13
1	99°41.72	242°25.55	40.28	300°9.12	34.68	310°10.19	19.22	91°23.65	50.15
2	114°44.18	257°25.94	40.80	315°10.93	34.51	325°12.68	19.24	106°26.10	50.17
3	129°46.65	272°26.33	•• 41.31	330°12.73	•• 34.33	340°15.16	•• 19.26	121°28.55	•• 50.19
4	144°49.11	287°26.72	41.83	345°14.54	34.16	355°17.65	19.28	136°30.99	50.21
5	159°51.58	302°27.11	42.35	0°16.35	33.98	10°20.13	19.30	151°33.44	50.23
6	174°54.04	317°27.49	S11°42.87	15°18.16	N11°33.81	25°22.62	N13°19.31	166°35.89	N00°50.24</


h	Sun		Moon				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	181°16.77	S23°15.19	113°57.80	15.5'	S11°48.92	-12.9'	54.7'
1	196°16.47	15.32	128°32.33	15.6'	11°36.03	-12.9'	54.7'
2	211°16.17	15.45	143°6.88	15.6'	11°23.10	-13.0'	54.8'
3	226°15.87	•• 15.59	157°41.46	15.6'	11°10.11	-13.0'	54.8'
4	241°15.57	15.72	172°16.06	15.6'	10°57.06	-13.1'	54.8'
5	256°15.27	15.85	186°50.68	15.6'	10°43.97	-13.1'	54.8'
6	271°14.97	S23°15.98	201°25.32	15.7'	S10°30.83	-13.2'	54.8'
7	286°14.67	16.11	215°59.98	15.7'	10°17.63	-13.2'	54.9'
8	301°14.37	16.23	230°34.66	15.7'	10°4.39	-13.3'	54.9'
9	316°14.07	•• 16.36	245°9.36	15.7'	09°51.10	-13.3'	54.9'
10	331°13.76	16.49	259°44.08	15.7'	09°37.76	-13.4'	54.9'
11	346°13.46	16.61	274°18.81	15.7'	09°24.37	-13.4'	54.9'
12	1°13.16	S23°16.74	288°53.55	15.8'	S09°10.94	-13.5'	55.0'
13	16°12.86	16.86	303°28.31	15.8'	08°57.46	-13.5'	55.0'
14	31°12.56	16.98	318°3.08	15.8'	08°43.93	-13.6'	55.0'
15	46°12.26	•• 17.11	332°37.86	15.8'	08°30.36	-13.6'	55.0'
16	61°11.96	17.23	347°12.65	15.8'	08°16.75	-13.7'	55.1'
17	76°11.65	17.35	1°47.45	15.8'	08°3.10	-13.7'	55.1'
18	91°11.35	S23°17.47	16°22.26	15.8'	S07°49.40	-13.7'	55.1'
19	106°11.05	17.59	30°57.08	15.8'	07°35.66	-13.8'	55.1'
20	121°10.75	17.71	45°31.90	15.8'	07°21.88	-13.8'	55.2'
21	136°10.45	•• 17.82	60°6.73	15.8'	07°8.06	-13.9'	55.2'
22	151°10.14	17.94	74°41.56	15.8'	06°54.19	-13.9'	55.2'
23	166°9.84	18.06	89°16.39	15.8'	06°40.30	-13.9'	55.2'
SD = 16.2'		$d = 0.1'$	SD = 14.9'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	181°9.54	S23°18.17	103°51.23	15.8'	S06°26.36	-14.0'	55.3'
1	196°9.24	18.28	118°26.06	15.8'	06°12.38	-14.0'	55.3'
2	211°8.93	18.40	133°0.90	15.8'	05°58.37	-14.0'	55.3'
3	226°8.63	•• 18.51	147°35.73	15.8'	05°44.32	-14.1'	55.3'
4	241°8.33	18.62	162°10.56	15.8'	05°30.24	-14.1'	55.4'
5	256°8.02	18.73	176°45.39	15.8'	05°16.12	-14.2'	55.4'
6	271°7.72	S23°18.84	191°20.21	15.8'	S05°1.97	-14.2'	55.4'
7	286°7.42	18.95	205°55.02	15.8'	04°47.78	-14.2'	55.5'
8	301°7.12	19.06	220°29.82	15.8'	04°33.57	-14.2'	55.5'
9	316°6.81	•• 19.17	235°4.62	15.8'	04°19.32	-14.3'	55.5'
10	331°6.51	19.28	249°39.41	15.8'	04°5.04	-14.3'	55.5'
11	346°6.21	19.38	264°14.18	15.8'	03°50.73	-14.3'	55.6'
12	1°5.90	S23°19.49	278°48.94	15.7'	S03°36.38	-14.4'	55.6'
13	16°5.60	19.59	293°23.69	15.7'	03°22.02	-14.4'	55.6'
14	31°5.29	19.69	307°58.43	15.7'	03°7.62	-14.4'	55.7'
15	46°4.99	•• 19.80	322°33.14	15.7'	02°53.19	-14.5'	55.7'
16	61°4.69	19.90	337°7.84	15.7'	02°38.74	-14.5'	55.7'
17	76°4.38	20.00	351°42.52	15.7'	02°24.27	-14.5'	55.7'
18	91°4.08	S23°20.10	6°17.18	15.6'	S02°9.76	-14.5'	55.8'
19	106°3.78	20.20	20°51.82	15.6'	01°55.24	-14.5'	55.8'
20	121°3.47	20.30	35°26.44	15.6'	01°40.69	-14.6'	55.8'
21	136°3.17	•• 20.40	50°1.03	15.6'	01°26.12	-14.6'	55.9'
22	151°2.86	20.49	64°35.60	15.5'	01°11.52	-14.6'	55.9'
23	166°2.56	20.59	79°10.14	15.5'	00°56.91	-14.6'	55.9'
SD = 16.2'		$d = 0.1'$	SD = 15.1'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	181°2.25	S23°20.69	93°44.66	15.5'	S00°42.27	-14.7'	56.0'
1	196°1.95	20.78	108°19.14	15.5'	00°27.62	-14.7'	56.0'
2	211°1.64	20.87	122°53.60	15.4'	S00°12.94	-14.7'	56.0'
3	226°1.34	•• 20.97	137°28.02	15.4'	N00°1.75	14.7'	56.1'
4	241°1.03	21.06	152°2.41	15.4'	00°16.46	14.7'	56.1'
5	256°0.73	21.15	166°36.76	15.3'	00°31.19	14.7'	56.1'
6	271°0.42	S23°21.24	181°11.08	15.3'	N00°45.93	14.8'	56.2'
7	286°0.12	21.33	195°45.37	15.2'	01°0.68	14.8'	56.2'
8	300°59.81	21.42	210°19.61	15.2'	01°15.45	14.8'	56.2'
9	315°59.51	•• 21.51	224°53.82	15.2'	01°30.23	14.8'	56.3'
10	330°59.20	21.60	239°27.98	15.1'	01°45.03	14.8'	56.3'
11	345°58.90	21.68	254°2.10	15.1'	01°59.83	14.8'	56.3'
12	0°58.59	S23°21.77	268°36.18	15.0'	N02°14.64	14.8'	56.4'
13	15°58.29	21.85	283°10.22	15.0'	02°29.47	14.8'	56.4'
14	30°57.98	21.94	297°44.20	14.9'	02°44.30	14.8'	56.4'
15	45°57.68	•• 22.02	312°18.14	14.9'	02°59.14	14.8'	56.5'
16	60°57.37	22.10	326°52.03	14.8'	03°13.99	14.9'	56.5'
17	75°57.07	22.19	341°25.87	14.8'	03°28.84	14.9'	56.5'
18	90°56.76	S23°22.27	355°59.66	14.7'	N03°43.70	14.9'	56.6'
19	105°56.45	22.35	10°33.40	14.7'	03°58.56	14.9'	56.6'
20	120°56.15	22.43	25°7.08	14.6'	04°13.42	14.9'	56.7'
21	135°55.84	•• 22.50	39°40.70	14.6'	04°28.28	14.9'	56.7'
22	150°55.54	22.58	54°14.27	14.5'	04°43.15	14.9'	56.7'
23	165°55.23	22.66	68°47.78	14.4'	04°58.01	14.9'	56.8'
SD = 16.2'		$d = 0.1'$	SD = 15.3'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	08:21	10:49	■	■	13:02	15:30
N 70°	08:02	09:49	■	■	14:02	15:50
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	09:47	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	15:50	16:47
N 58°	06:56	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	08:02	15:49	16:30	17:13
50°	06:33	07:14	07:53	15:58	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	17:40
35°	06:01	06:33	07:01	16:50	17:18	17:50
30°	05:53	06:22	06:49	17:02	17:29	17:59
20°	05:36	06:04	06:28	17:23	17:47	18:15
N 10°	05:20	05:46	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	05:15	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	19:40	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°	00:44	02:28	03:22	20:29	21:24	23:09
56°	////	02:06	03:08	20:43	21:46	////
58°	////	01:37	02:51	21:00	22:15	////
S 60°	////	00:48	02:31	21:20	23:05	////

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 6-8 29-48%
	00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
15	05:07	04:53	11:55	16:53	04:32	
16	04:38	04:24	11:56	17:34	05:13	
17	04:09	03:54	11:56	18:17	05:55	

December 18, 19, 20 UT (Fri., Sat., Sun.)

	Aries		Venus		Mars		Jupiter		Saturn		Stars		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	86°37.53	227°42.48	S12°5.20	286°34.86	N11°26.77	297°7.32	N13°20.21	78°18.47	N00°51.12	<div>Alpheratz 357°33.07 29°14.59</div> <div>Ankaa 353°5.51 -42°9.72</div> <div>Schedar 349°29.04 56°41.45</div> <div>Diphda 348°45.61 -17°50.36</div> <div>Achernar 335°18.73 -57°6.18</div> <div>Hamal 327°49.17 23°35.55</div> <div>Polaris 312°46.95 89°22.86</div> <div>Acamar 315°10.24 -40°11.89</div> <div>Menkar 314°4.21 4°11.78</div> <div>Mirfak 308°25.50 49°57.58</div> <div>Aldebaran 290°37.44 16°33.84</div> <div>Rigel 281°1.99 -8°10.23</div> <div>Capella 280°19.03 46°1.50</div> <div>Bellatrix 278°20.82 6°22.45</div> <div>Elnath 277°59.45 28°37.80</div> <div>Alnilam 275°35.76 -1°11.08</div> <div>Betelgeuse 270°50.01 7°24.71</div> <div>Canopus 263°51.12 -52°42.53</div> <div>Sirius 258°24.48 -16°45.18</div> <div>Adhara 255°4.23 -29°0.47</div> <div>Procyon 244°48.86 5°9.30</div> <div>Pollux 243°15.02 27°57.53</div> <div>Avior 234°13.54 -59°35.57</div> <div>Suhail 222°44.82 -43°32.33</div> <div>Miaplacidus 221°37.30 -69°49.43</div> <div>Alphard 217°45.99 -8°46.53</div> <div>Regulus 207°32.60 11°50.00</div> <div>Dubhe 193°38.96 61°35.97</div> <div>Denebola 182°23.33 14°25.14</div> <div>Gienah 175°41.98 -17°41.45</div> <div>Acrux 172°58.40 -63°14.66</div> <div>Gacrux 171°49.95 -57°15.62</div> <div>Alioth 166°11.77 55°48.47</div> <div>Spica 158°20.76 -11°18.11</div> <div>Alkaid 152°51.02 49°10.43</div> <div>Hadar 148°34.09 -60°29.96</div> <div>Menkent 147°55.96 -36°30.02</div> <div>Arcturus 145°46.67 19°2.38</div> <div>Rigel Kent. 139°38.53 -60°56.60</div> <div>Kochab 137°20.77 74°2.36</div> <div>Zuben'ubi 136°54.50 -16°9.19</div> <div>Alphecca 126°2.71 26°37.31</div> <div>Antares 112°14.23 -26°29.44</div> <div>Atria 107°7.56 -69°4.43</div> <div>Sabik 102°1.30 -15°45.46</div> <div>Shaula 96°8.62 -37°7.34</div> <div>Rasalhague 95°57.42 12°32.42</div> <div>Eltanin 90°41.99 51°29.10</div> <div>Kaus Aust. 83°30.81 -34°22.28</div> <div>Vega 80°32.57 38°48.56</div> <div>Nunki 75°46.15 -26°15.78</div> <div>Altair 61°58.70 8°56.44</div> <div>Peacock 53°3.72 -56°39.00</div> <div>Deneb 49°25.06 45°22.79</div> <div>Enif 33°37.40 10°0.03</div> <div>Al Na'ir 27°31.14 -46°49.97</div> <div>Fomalhaut 15°12.86 -29°28.86</div> <div>Scheat 13°43.72 28°13.97</div> <div>Markab 13°28.37 15°21.18</div>			
1	101°40.00	242°42.80	5.74	301°36.71	26.61	312°9.82	20.23	93°20.91	51.14		SHA	Dec	
2	116°42.46	257°43.13	6.28	316°38.55	26.45	327°12.32	20.26	108°23.35	51.17				
3	131°44.92	272°43.46	•• 6.83	331°40.40	•• 26.29	342°14.82	•• 20.28	123°25.79	•• 51.19				
4	146°47.39	287°43.78	7.37	346°42.24	26.13	357°17.32	20.30	138°28.22	51.21				
5	161°49.85	302°44.11	7.91	1°44.09	25.97	12°19.82	20.33	153°30.66	51.23				
6	176°52.32	317°44.43	S12°8.46	16°45.94	N11°25.81	27°22.32	N13°20.35	168°33.10	N00°51.26				
7	191°54.78	332°44.75	9.00	31°47.79	25.65	42°24.82	20.38	183°35.54	51.28				
8	206°57.24	347°45.07	9.55	46°49.64	25.50	57°27.32	20.40	198°37.98	51.30				
9	221°59.71	2°45.39	•• 10.09	61°51.49	•• 25.34	72°29.83	•• 20.43	213°40.41	•• 51.33				
10	237°2.17	17°45.70	10.64	76°53.34	25.18	87°32.33	20.45	228°42.85	51.35				
11	252°4.64	32°46.02	11.18	91°55.19	25.02	102°34.83	20.48	243°45.29	51.37				
12	267°7.10	47°46.33	S12°11.73	106°57.04	N11°24.87	117°37.34	N13°20.50	258°47.72	N00°51.40				
13	282°9.56	62°46.65	12.28	121°58.90	24.71	132°39.84	20.53	273°50.16	51.42				
14	297°12.03	77°46.96	12.83	137°0.75	24.55	147°42.34	20.55	288°52.60	51.44				
15	312°14.49	92°47.27	•• 13.37	152°2.61	•• 24.40	162°44.85	•• 20.58	303°55.03	•• 51.47				
16	327°16.96	107°47.58	13.92	167°4.47	24.24	177°47.35	20.60	318°57.47	51.49				
17	342°19.42	122°47.89	14.47	182°6.32	24.09	192°49.86	20.63	333°59.91	51.51				
18	357°21.88	137°48.19	S12°15.02	197°8.18	N11°23.93	207°52.36	N13°20.65	349°2.34	N00°51.54				
19	12°24.35	152°48.50	15.57	212°10.04	23.78	222°54.87	20.68	4°4.78	51.56				
20	27°26.81	167°48.80	16.12	227°11.90	23.63	237°57.38	20.71	19°7.21	51.58				
21	42°29.28	182°49.11	•• 16.67	242°13.76	•• 23.47	252°59.88	•• 20.73	34°9.65	•• 51.61				
22	57°31.74	197°49.41	17.22	257°15.62	23.32	268°2.39	20.76	49°12.08	51.63				
23	72°34.21	212°49.71	17.77	272°17.48	23.17	283°4.90	20.78	64°14.52	51.66				
Mer.pass. 18:11	ν0.3' d0.5' m-4.74			ν1.8' d-0.2' m0.16		ν2.5' d0.0' m-2.31		ν2.4' d0.0' m0.68					
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	87°36.67	227°50.01	S12°18.33	287°19.35	N11°23.01	298°7.40	N13°20.81	79°16.95	N00°51.68				
1	102°39.13	242°50.31	18.88	302°21.21	22.86	313°9.91	20.84	94°19.39	51.71				
2	117°41.60	257°50.60	19.43	317°23.08	22.71	328°12.42	20.86	109°21.82	51.73				
3	132°44.06	272°50.90	•• 19.98	332°24.94	•• 22.56	343°14.93	•• 20.89	124°24.26	•• 51.75				
4	147°46.53	287°51.19	20.54	347°26.81	22.41	358°17.44	20.92	139°26.69	51.78				
5	162°48.99	302°51.48	21.09	2°28.68	22.25	13°19.95	20.94	154°29.12	51.80				
6	177°51.45	317°51.78	S12°21.64	17°30.54	N11°22.10	28°22.45	N13°20.97	169°31.56	N00°51.83				
7	192°53.92	332°52.07	22.20	32°32.41	21.95	43°24.96	21.00	184°33.99	51.85				
8	207°56.38	347°52.36	22.75	47°34.28	21.80	58°27.47	21.03	199°36.42	51.88				
9	222°58.85	2°52.64	•• 23.31	62°36.15	•• 21.65	73°29.99	•• 21.05	214°38.86	•• 51.90				
10	238°1.31	17°52.93	23.87	77°38.03	21.50	88°32.50	21.08	229°41.29	51.93				
11	253°3.77	32°53.22	24.42	92°39.90	21.36	103°35.01	21.11	244°43.72	51.95				
12	268°6.24	47°53.50	S12°24.98	107°41.77	N11°21.21	118°37.52	N13°21.14	259°46.16	N00°51.98				
13	283°8.70	62°53.78	25.53	122°43.65	21.06	133°40.03	21.16	274°48.59	52.00				
14	298°11.17	77°54.06	26.09	137°45.52	20.91	148°42.54	21.19	289°51.02	52.03				
15	313°13.63	92°54.34	•• 26.65	152°47.40	•• 20.76	163°45.05	•• 21.22	304°53.45	•• 52.05				
16	328°16.10	107°54.62	27.21	167°49.27	20.62	178°47.57	21.25	319°55.89	52.08				
17	343°18.56	122°54.90	27.77	182°51.15	20.47	193°50.08	21.28	334°58.32	52.10				
18	358°21.02	137°55.18	S12°28.33	197°53.03	N11°20.32	208°52.59	N13°21.31	350°0.75	N00°52.13				
19	13°23.49	152°55.45	28.88	212°54.91	20.18	223°55.11	21.33	5°3.18	52.16				
20	28°25.95	167°55.73	29.44	227°56.79	20.03	238°57.62	21.36	20°5.61	52.18				
21	43°28.42	182°56.00	•• 30.00	242°58.67	•• 19.89	254°0.13	•• 21.39	35°8.04	•• 52.21				
22	58°30.88	197°56.27	30.57	258°0.55	19.74	269°2.65	21.42	50°10.47	52.23				
23	73°33.34	212°56.54	31.13	273°2.43	19.60	284°5.16	21.45	65°12.90	52.26				
Mer.pass. 18:07	ν0.3' d0.6' m-4.73			ν1.9' d-0.2' m0.14		ν2.5' d0.0' m-2.32		ν2.4' d0.0' m0.69					
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	88°35.81	227°56.81	S12°31.69	288°4.32	N11°19.45	299°7.68	N13°21.48	80°15.33	N00°52.28				
1	103°38.27	242°57.08	32.25	303°6.20	19.31	314°10.20	21.51	95°17.77	52.31				
2	118°40.74	257°57.35	32.81	318°8.09	19.16	329°12.71	21.54	110°20.20	52.34				
3	133°43.20	272°57.61	•• 33.37	333°9.97	•• 19.02	344°15.23	•• 21.57	125°22.63	•• 52.36				
4	148°45.66	287°57.88	33.94	348°11.86	18.88	359°17.74	21.60	140°25.06	52.39				
5	163°48.13	302°58.14	34.50	3°13.75	18.74	14°20.26	21.63	155°27.49	52.42				
6	178°50.59	317°58.40	S12°35.06	18°15.64	N11°18.59	29°22.78	N13°21.66	170°29.91	N00°52.44				
7	193°53.06	332°58.66	35.63	33°17.53	18.45	44°25.30	21.69	185°32.34	52.47				
8	208°55.52	347°58.92	36.19	48°19.42	18.31	59°27.81	21.72	200°34.77	52.49				
9	223°57.99	2°59.18	•• 36.75	63°21.31	•• 18.17	74°30.33	•• 21.75	215°37.20	•• 52.52				
10	239°0.45	17°59.43	37.32	78°23.20	18.03	89°32.85	21.78	230°39.63	52.55				
11	254°2.91	32°59.69	37.88	93°25.09	17.89	104°35.37	21.81	245°42.06	52.58				
12	269°5.38	47°59.94	S12°38.45	108°26.99	N11°17.75	119°37.89	N13°21.84	260°44.49	N00°52.60				
13	284°7.84	63°0.20	39.02	123°28.88	17.61	134°40.41	21.87	275°46.92	52.63				
14	299°10.31	78°0.45	39.58	138°30.78	17.47	149°42.93	21.90	290°49.34	52.66				
15	314°12.77	93°0.70	•• 40.15	153°32.68	•• 17.33	164°45.45	•• 21.93	305°51.77	•• 52.68				
16	329°15.23	108°0.95	40.71	168°34.57	17.19	179°47.97	21.96	320°54.20	52.71				
17	344°17.70	123°1.20	41.28	183°36.47	17.05	194°50.49	21.99	335°56.63	52.74				
18	359°20.16	138°1.45	S12°41.85	198°38.37	N11°16.91	209°53.01	N13°22.02	350°59.06	N00°52.76				
19	14°22.63	153°1.69	42.42	213°40.27	16.78	224°55.53	22.06	6°1.48	52.79				
20	29°25.09	168°1.94	42.99	228°42.17	16.64	239°58.05	22.09	21°3.91	52.82				
21	44°27.56	183°2.18	•• 43.55	243°44.07	•• 16.50	255°0.58	•• 22.12	36°6.34	•• 52.85				
22	59°30.02	198°2.42	44.12	258°45.98	16.37	270°3.10	22.15	51°8.76	52.88				
23	74°32.48	213°2.66	44.69	273°47.88	16.23	285°5.62	22.18	66°11.19	52.90				
Mer.pass. 18:03	ν0.3' d0.6' m-4.71			ν1.9' d-0.1' m0.12		ν2.5' d0.0' m-2.33		ν2.4' d0.0' m0.69					
											Dec 18 Fri	SHA	Mer.pass
											Venus	141°4.95	08:49
											Mars	199°57.33	04:53
											Jupiter	210°29.78	04:11
											Saturn	351°40.94	18:44
											Dec 19 Sat	SHA	Mer.pass
											Venus	140°13.34	08:48
											Mars	199°42.68	04:50
											Jupiter	210°30.73	04:07
											Saturn	351°40.28	18:40
											Dec 20 Sun	SHA	Mer.pass
											Venus	139°21.00	08:48
											Mars	199°28.51	04:47
											Jupiter	210°31.87	04:03
											Saturn	351°39.53	18:36
											Horizontal parallax		
											Venus:	0.3	
											Mars:	0.1	

h	Sun			Moon				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	180°54.92	S23°22.73		83°21.22	14.4'	N05°12.88	14.9'	56.8'
1	195°54.62	22.81		97°54.61	14.3'	05°27.74	14.9'	56.8'
2	210°54.31	22.88		112°27.93	14.3'	05°42.59	14.9'	56.9'
3	225°54.00	· · 22.96		127°1.19	14.2'	05°57.45	14.8'	56.9'
4	240°53.70	23.03		141°34.38	14.1'	06°12.29	14.8'	56.9'
5	255°53.39	23.10		156°7.50	14.1'	06°27.13	14.8'	57.0'
6	270°53.08	S23°23.17		170°40.56	14.0'	N06°41.97	14.8'	57.0'
7	285°52.78	23.24		185°13.54	13.9'	06°56.79	14.8'	57.1'
8	300°52.47	23.31		199°46.46	13.8'	07°11.61	14.8'	57.1'
9	315°52.16	· · 23.38		214°19.30	13.8'	07°26.41	14.8'	57.1'
10	330°51.86	23.45		228°52.06	13.7'	07°41.20	14.8'	57.2'
11	345°51.55	23.52		243°24.75	13.6'	07°55.97	14.8'	57.2'
12	0°51.24	S23°23.58		257°57.36	13.5'	N08°10.74	14.7'	57.3'
13	15°50.94	23.65		272°29.90	13.5'	08°25.48	14.7'	57.3'
14	30°50.63	23.71		287°2.35	13.4'	08°40.21	14.7'	57.3'
15	45°50.32	· · 23.78		301°34.72	13.3'	08°54.92	14.7'	57.4'
16	60°50.02	23.84		316°7.01	13.2'	09°9.61	14.7'	57.4'
17	75°49.71	23.90		330°39.21	13.1'	09°24.28	14.6'	57.5'
18	90°49.40	S23°23.96		345°11.33	13.0'	N09°38.93	14.6'	57.5'
19	105°49.09	24.02		359°43.35	12.9'	09°53.55	14.6'	57.5'
20	120°48.79	24.08		14°15.29	12.8'	10°8.15	14.6'	57.6'
21	135°48.48	· · 24.14		28°47.14	12.8'	10°22.73	14.5'	57.6'
22	150°48.17	24.20		43°18.90	12.7'	10°37.27	14.5'	57.7'
23	165°47.86	24.26		57°50.56	12.6'	10°51.79	14.5'	57.7'
SD = 16.2'			$d = 0.1'$	SD = 15.5'				

Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	180°47.56	S23°24.32		72°22.13	12.5'	N11°6.27	14.5'	57.7'
1	195°47.25	24.37		86°53.61	12.4'	11°20.73	14.4'	57.8'
2	210°46.94	24.43		101°24.98	12.3'	11°35.15	14.4'	57.8'
3	225°46.63	· · 24.48		115°56.26	12.2'	11°49.54	14.4'	57.9'
4	240°46.33	24.53		130°27.43	12.1'	12°3.89	14.3'	57.9'
5	255°46.02	24.59		144°58.51	12.0'	12°18.20	14.3'	57.9'
6	270°45.71	S23°24.64		159°29.48	11.9'	N12°32.47	14.2'	58.0'
7	285°45.40	24.69		174°0.34	11.8'	12°46.71	14.2'	58.0'
8	300°45.09	24.74		188°31.10	11.7'	13°0.90	14.1'	58.1'
9	315°44.79	· · 24.79		203°1.76	11.5'	13°15.05	14.1'	58.1'
10	330°44.48	24.84		217°32.30	11.4'	13°29.15	14.1'	58.1'
11	345°44.17	24.88		232°2.74	11.3'	13°43.20	14.0'	58.2'
12	0°43.86	S23°24.93		246°33.06	11.2'	N13°57.21	14.0'	58.2'
13	15°43.55	24.98		261°3.27	11.1'	14°11.17	13.9'	58.3'
14	30°43.24	25.02		275°33.37	11.0'	14°25.07	13.9'	58.3'
15	45°42.94	· · 25.06		290°3.35	10.9'	14°38.92	13.8'	58.3'
16	60°42.63	25.11		304°33.21	10.7'	14°52.72	13.7'	58.4'
17	75°42.32	25.15		319°2.96	10.6'	15°6.46	13.7'	58.4'
18	90°42.01	S23°25.19		333°32.59	10.5'	N15°20.14	13.6'	58.5'
19	105°41.70	25.23		348°2.10	10.4'	15°33.76	13.6'	58.5'
20	120°41.39	25.27		2°31.48	10.3'	15°47.32	13.5'	58.6'
21	135°41.09	· · 25.31		17°0.75	10.1'	16°0.82	13.4'	58.6'
22	150°40.78	25.35		31°29.89	10.0'	16°14.24	13.4'	58.6'
23	165°40.47	25.39		45°58.90	9.9'	16°27.61	13.3'	58.7'
SD = 16.2'			$d = 0.1'$	SD = 15.7'				

Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	180°40.16	S23°25.43		60°27.79	9.8'	N16°40.90	13.2'	58.7'
1	195°39.85	25.46		74°56.56	9.6'	16°54.12	13.1'	58.8'
2	210°39.54	25.50		89°25.19	9.5'	17°7.26	13.1'	58.8'
3	225°39.23	· · 25.53		103°53.70	9.4'	17°20.34	13.0'	58.8'
4	240°38.93	25.57		118°22.07	9.2'	17°33.33	12.9'	58.9'
5	255°38.62	25.60		132°50.31	9.1'	17°46.25	12.8'	58.9'
6	270°38.31	S23°25.63		147°18.43	9.0'	N17°59.08	12.8'	59.0'
7	285°38.00	25.66		161°46.41	8.8'	18°11.83	12.7'	59.0'
8	300°37.69	25.69		176°14.25	8.7'	18°24.50	12.6'	59.0'
9	315°37.38	· · 25.72		190°41.96	8.6'	18°37.08	12.5'	59.1'
10	330°37.07	25.75		205°9.54	8.4'	18°49.57	12.4'	59.1'
11	345°36.76	25.78		219°36.98	8.3'	19°1.97	12.3'	59.2'
12	0°36.45	S23°25.81		234°4.28	8.2'	N19°14.28	12.2'	59.2'
13	15°36.15	25.83		248°31.44	8.0'	19°26.49	12.1'	59.2'
14	30°35.84	25.86		262°58.47	7.9'	19°38.61	12.0'	59.3'
15	45°35.53	· · 25.88		277°25.35	7.7'	19°50.62	11.9'	59.3'
16	60°35.22	25.91		291°52.10	7.6'	20°2.54	11.8'	59.4'
17	75°34.91	25.93		306°18.71	7.5'	20°14.35	11.7'	59.4'
18	90°34.60	S23°25.95		320°45.17	7.3'	N20°26.05	11.6'	59.4'
19	105°34.29	25.97		335°11.50	7.2'	20°37.65	11.5'	59.5'
20	120°33.98	25.99		349°37.68	7.0'	20°49.13	11.4'	59.5'
21	135°33.67	· · 26.01		4°3.72	6.9'	21°0.51	11.3'	59.6'
22	150°33.36	26.03		18°29.63	6.8'	21°11.77	11.1'	59.6'
23	165°33.05	26.05		32°55.38	6.6'	21°22.91	11.0'	59.6'
SD = 16.2'			$d = 0.0'$	SD = 16.0'				

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

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

December 21, 22, 23 UT (Mon., Tue., Wed.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Mon	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	89°34.95		228°2.90	S12°45.26	288°49.78	N11°16.09	300°8.14	N13°22.21	81°13.62	N00°52.93
1	104°37.41		243°3.14	45.83	303°51.69	15.96	315°10.67	22.25	96°16.04	52.96
2	119°39.88		258°3.38	46.40	318°53.59	15.82	330°13.19	22.28	111°18.47	52.99
3	134°42.34		273°3.61	· · 46.97	333°55.50	· · 15.69	345°15.72	· · 22.31	126°20.90	· · 53.01
4	149°44.80		288°3.85	47.54	348°57.41	15.55	0°18.24	22.34	141°23.32	53.04
5	164°47.27		303°4.08	48.11	3°59.32	15.42	15°20.76	22.37	156°25.75	53.07
6	179°49.73		318°4.32	S12°48.69	19°1.23	N11°15.29	30°23.29	N13°22.41	171°28.17	N00°53.10
7	194°52.20		333°4.55	49.26	34°3.14	15.15	45°25.81	22.44	186°30.60	53.13
8	209°54.66		348°4.78	49.83	49°5.05	15.02	60°28.34	22.47	201°33.02	53.16
9	224°57.13		3°5.01	· · 50.40	64°6.96	· · 14.89	75°30.87	· · 22.51	216°35.45	· · 53.18
10	239°59.59		18°5.23	50.98	79°8.87	14.75	90°33.39	22.54	231°37.87	53.21
11	255°2.05		33°5.46	51.55	94°10.79	14.62	105°35.92	22.57	246°40.30	53.24
12	270°4.52		48°5.69	S12°52.12	109°12.70	N11°14.49	120°38.45	N13°22.61	261°42.72	N00°53.27
13	285°6.98		63°5.91	52.70	124°14.62	14.36	135°40.97	22.64	276°45.14	53.30
14	300°9.45		78°6.13	53.27	139°16.54	14.23	150°43.50	22.67	291°47.57	53.33
15	315°11.91		93°6.35	· · 53.84	154°18.45	· · 14.10	165°46.03	· · 22.71	306°49.99	· · 53.36
16	330°14.37		108°6.58	54.42	169°20.37	13.97	180°48.56	22.74	321°52.42	53.39
17	345°16.84		123°6.79	54.99	184°22.29	13.84	195°51.09	22.77	336°54.84	53.41
18	0°19.30		138°7.01	S12°55.57	199°24.21	N11°13.71	210°53.62	N13°22.81	351°57.26	N00°53.44
19	15°21.77		153°7.23	56.14	214°26.13	13.58	225°56.14	22.84	6°59.69	53.47
20	30°24.23		168°7.45	56.72	229°28.05	13.45	240°58.67	22.88	22°2.11	53.50
21	45°26.70		183°7.66	· · 57.30	244°29.98	· · 13.32	256°1.20	· · 22.91	37°4.53	· · 53.53
22	60°29.16		198°7.87	57.87	259°31.90	13.19	271°3.73	22.94	52°6.95	53.56
23	75°31.62		213°8.09	58.45	274°33.83	13.07	286°6.27	22.98	67°9.38	53.59
Mer.pass. 17:59										
ν0.2' d0.6' m-4.70										
ν1.9' d-0.1' m0.10										
ν2.5' d0.0' m-2.34										
ν2.4' d0.0' m0.69										
Tue	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	90°34.09		228°8.30	S12°59.03	289°35.75	N11°12.94	301°8.80	N13°23.01	82°11.80	N00°53.62
1	105°36.55		243°8.51	12°59.60	304°37.68	12.81	316°11.33	23.05	97°14.22	53.65
2	120°39.02		258°8.72	13°0.18	319°39.60	12.69	331°13.86	23.08	112°16.64	53.68
3	135°41.48		273°8.92	· · 0.76	334°41.53	· · 12.56	346°16.39	· · 23.12	127°19.06	· · 53.71
4	150°43.95		288°9.13	1.34	349°43.46	12.43	1°18.92	23.15	142°21.49	53.74
5	165°46.41		303°9.33	1.92	4°45.39	12.31	16°21.46	23.19	157°23.91	53.77
6	180°48.87		318°9.54	S13°2.49	19°47.32	N11°12.18	31°23.99	N13°23.22	172°26.33	N00°53.80
7	195°51.34		333°9.74	3.07	34°49.25	12.06	46°26.52	23.26	187°28.75	53.83
8	210°53.80		348°9.94	3.65	49°51.19	11.94	61°29.05	23.29	202°31.17	53.86
9	225°56.27		3°10.14	· · 4.23	64°53.12	· · 11.81	76°31.59	· · 23.33	217°33.59	· · 53.89
10	240°58.73		18°10.34	4.81	79°55.05	11.69	91°34.12	23.37	232°36.01	53.92
11	256°1.20		33°10.54	5.39	94°56.99	11.56	106°36.66	23.40	247°38.43	53.95
12	271°3.66		48°10.74	S13°5.97	109°58.93	N11°11.44	121°39.19	N13°23.44	262°40.85	N00°53.98
13	286°6.12		63°10.93	6.55	125°0.86	11.32	136°41.73	23.47	277°43.27	54.01
14	301°8.59		78°11.13	7.13	140°2.80	11.20	151°44.26	23.51	292°45.69	54.04
15	316°11.05		93°11.32	· · 7.71	155°4.74	· · 11.08	166°46.80	· · 23.55	307°48.11	· · 54.07
16	331°13.52		108°11.51	8.30	170°6.68	10.95	181°49.33	23.58	322°50.53	54.10
17	346°15.98		123°11.70	8.88	185°8.62	10.83	196°51.87	23.62	337°52.95	54.13
18	1°18.45		138°11.89	S13°9.46	200°10.56	N11°10.71	211°54.41	N13°23.66	352°55.37	N00°54.16
19	16°20.91		153°12.08	10.04	215°12.50	10.59	226°56.94	23.69	7°57.79	54.20
20	31°23.37		168°12.27	10.62	230°14.45	10.47	241°59.48	23.73	23°0.21	54.23
21	46°25.84		183°12.46	· · 11.21	245°16.39	· · 10.35	257°2.02	· · 23.77	38°2.63	· · 54.26
22	61°28.30		198°12.64	11.79	260°18.34	10.23	272°4.56	23.80	53°5.05	54.29
23	76°30.77		213°12.82	12.37	275°20.28	10.12	287°7.10	23.84	68°7.46	54.32
Mer.pass. 17:55										
ν0.2' d0.6' m-4.69										
ν1.9' d-0.1' m0.08										
ν2.5' d0.0' m-2.34										
ν2.4' d0.0' m0.70										
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°33.23		228°13.01	S13°12.96	290°22.23	N11°10.00	302°9.63	N13°23.88	83°9.88	N00°54.35
1	106°35.69		243°13.19	13.54	305°24.18	9.88	317°12.17	23.92	98°12.30	54.38
2	121°38.16		258°13.37	14.12	320°26.13	9.76	332°14.71	23.95	113°14.72	54.41
3	136°40.62		273°13.55	· · 14.71	335°28.08	· · 9.64	347°17.25	· · 23.99	128°17.14	· · 54.45
4	151°43.09		288°13.73	15.29	350°30.03	9.53	2°19.79	24.03	143°19.55	54.48
5	166°45.55		303°13.90	15.88	5°31.98	9.41	17°22.33	24.07	158°21.97	54.51
6	181°48.02		318°14.08	S13°16.46	20°33.93	N11°9.30	32°24.87	N13°24.10	173°24.39	N00°54.54
7	196°50.48		333°14.25	17.05	35°35.88	9.18	47°27.41	24.14	188°26.80	54.57
8	211°52.94		348°14.43	17.63	50°37.84	9.06	62°29.96	24.18	203°29.22	54.61
9	226°55.41		3°14.60	· · 18.22	65°39.79	· · 8.95	77°32.50	· · 24.22	218°31.64	· · 54.64
10	241°57.87		18°14.77	18.80	80°41.75	8.83	92°35.04	24.26	233°34.05	54.67
11	257°0.34		33°14.94	19.39	95°43.71	8.72	107°37.58	24.30	248°36.47	54.70
12	272°2.80		48°15.11	S13°19.98	110°45.66	N11°8.61	122°40.12	N13°24.33	263°38.89	N00°54.73
13	287°5.27		63°15.28	20.56	125°47.62	8.49	137°42.67	24.37	278°41.30	54.77
14	302°7.73		78°15.44	21.15	140°49.58	8.38	152°45.21	24.41	293°43.72	54.80
15	317°10.19		93°15.61	· · 21.74	155°51.54	· · 8.27	167°47.75	· · 24.45	308°46.13	· · 54.83
16	332°12.66		108°15.77	22.32	170°53.51	8.16	182°50.30	24.49	323°48.55	54.86
17	347°15.12		123°15.94	22.91	185°55.47	8.04	197°52.84	24.53	338°50.96	54.90
18	2°17.59		138°16.10	S13°23.50	200°57.43	N11°7.93	212°55.39	N13°24.57	353°53.38	N00°54.93
19	17°20.05		153°16.26	24.09	215°59.40	7.82	227°57.93	24.61	8°55.79	54.96
20	32°22.52		168°16.42	24.68	231°1.36	7.71	243°0.48	24.65	23°58.21	54.99
21	47°24.98		183°16.58	· · 25.26	246°3.33	· · 7.60	258°3.02	· · 24.69	39°0.62	· · 55.03
22	62°27.44		198°16.74	25.85	261°5.29	7.49	273°5.57	24.73	54°3.04	55.06
23	77°29.91		213°16.89	26.44	276°7.26	7.38	288°8.11	24.77	69°5.45	55.09
Mer.pass. 17:51										
ν0.2' d0.6' m-4.68										
ν1.9' d-0.1' m0.05										
ν2.5' d0.0' m-2.35										
ν2.4' d0.0' m0.70										

	Stars	
	SHA	Dec
Alpheratz	357°33.08	29°14.59
Ankaa	353°5.52	-42°9.73
Schedar	349°29.05	56°41.46
Diphda	348°45.62	-17°50.36
Achernar	335°18.75	-57°6.19
Hamal	327°49.17	23°35.55
Polaris	312°47.50	89°22.87
Acamar	315°10.25	-40°11.90
Menkar	314°4.21	4°11.78
Mirfak	308°25.50	49°57.58
Aldebaran	290°37.43	-16°33.84
Rigel	281°1.98	-8°10.24
Capella	280°19.02	46°1.51
Bellatrix	278°20.81	6°22.44
Elnath	277°59.44	28°37.80
Alnilam	275°35.75	-1°11.09
Betelgeuse	270°50.00	7°24.70
Canopus	263°51.11	-52°42.55
Sirius	258°24.47	-16°45.19
Adhara	255°4.22	-29°0.49
Procyon	244°48.84	5°9.29
Pollux	243°15.00	27°57.52
Avior	234°13.52	-59°35.59
Suhail	222°44.80	-43°32.35
Miaplacidus	221°37.25	-69°49.45
Alphard	217°45.96	-8°46.55
Regulus	207°32.58	11°49


h		Sun		Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°32.74	S23°26.07	47°21.00	6.5'	N21°33.93	10.9'	59.7'	
1	195°32.44	26.08	61°46.47	6.3'	21°44.83	10.8'	59.7'	
2	210°32.13	26.10	76°11.80	6.2'	21°55.61	10.7'	59.7'	
3	225°31.82	26.12	90°36.99	6.0'	22°06.27	10.5'	59.8'	
4	240°31.51	26.13	105°2.04	5.9'	22°16.79	10.4'	59.8'	
5	255°31.20	26.14	119°26.94	5.8'	22°27.19	10.3'	59.9'	
6	270°30.89	S23°26.16	133°51.70	5.6'	N22°37.45	10.1'	59.9'	
7	285°30.58	26.17	148°16.32	5.5'	22°47.58	10.0'	59.9'	
8	300°30.27	26.18	162°40.80	5.3'	22°57.57	9.9'	60.0'	
9	315°29.96	26.19	177°5.14	5.2'	23°7.42	9.7'	60.0'	
10	330°29.65	26.20	191°29.33	5.1'	23°17.13	9.6'	60.0'	
11	345°29.34	26.21	205°53.39	4.9'	23°26.70	9.4'	60.1'	
12	0°29.03	S23°26.21	220°17.31	4.8'	N23°36.12	9.3'	60.1'	
13	15°28.72	26.22	234°41.08	4.6'	23°45.40	9.1'	60.1'	
14	30°28.41	26.23	249°4.72	4.5'	23°54.52	9.0'	60.2'	
15	45°28.10	26.23	263°28.23	4.4'	24°3.49	8.8'	60.2'	
16	60°27.79	26.24	277°51.59	4.2'	24°12.31	8.7'	60.2'	
17	75°27.48	26.24	292°14.82	4.1'	24°20.96	8.5'	60.3'	
18	90°27.17	S23°26.24	306°37.92	4.0'	N24°29.46	8.3'	60.3'	
19	105°26.86	26.24	321°0.88	3.8'	24°37.80	8.2'	60.3'	
20	120°26.55	26.24	335°23.71	3.7'	24°45.98	8.0'	60.4'	
21	135°26.24	26.24	349°46.41	3.6'	24°53.99	7.8'	60.4'	
22	150°25.94	26.24	4°8.99	3.4'	25°1.83	7.7'	60.4'	
23	165°25.63	26.24	18°31.43	3.3'	25°9.50	7.5'	60.5'	
SD = 16.3' $d = 0.0'$			SD = 16.3'					

Tue	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°25.32	S23°26.24	32°53.75	3.2'	N25°17.00	7.3'	60.5'	
1	195°25.01	26.24	47°15.94	3.1'	25°24.33	7.1'	60.5'	
2	210°24.70	26.23	61°38.01	2.9'	25°31.48	7.0'	60.5'	
3	225°24.39	26.23	75°59.96	2.8'	25°38.45	6.8'	60.6'	
4	240°24.08	26.22	90°21.79	2.7'	25°45.24	6.6'	60.6'	
5	255°23.77	26.22	104°43.50	2.6'	25°51.85	6.4'	60.6'	
6	270°23.46	S23°26.21	119°5.09	2.5'	N25°58.27	6.2'	60.7'	
7	285°23.15	26.20	133°26.58	2.4'	26°4.51	6.1'	60.7'	
8	300°22.84	26.19	147°47.95	2.3'	26°10.56	5.9'	60.7'	
9	315°22.53	26.18	162°9.21	2.2'	26°16.42	5.7'	60.7'	
10	330°22.22	26.17	176°30.37	2.1'	26°22.09	5.5'	60.8'	
11	345°21.91	26.16	190°51.42	2.0'	26°27.57	5.3'	60.8'	
12	0°21.60	S23°26.15	205°12.37	1.9'	N26°32.85	5.1'	60.8'	
13	15°21.29	26.14	219°33.22	1.8'	26°37.93	4.9'	60.8'	
14	30°20.98	26.12	233°53.98	1.7'	26°42.82	4.7'	60.9'	
15	45°20.67	26.11	248°14.64	1.6'	26°47.51	4.5'	60.9'	
16	60°20.36	26.09	262°35.21	1.5'	26°51.99	4.3'	60.9'	
17	75°20.05	26.08	276°55.69	1.4'	26°56.27	4.1'	60.9'	
18	90°19.74	S23°26.06	291°16.09	1.3'	N27°0.35	3.9'	61.0'	
19	105°19.43	26.04	305°36.40	1.2'	27°4.22	3.7'	61.0'	
20	120°19.12	26.03	319°56.64	1.2'	27°7.89	3.5'	61.0'	
21	135°18.81	26.01	334°16.80	1.1'	27°11.34	3.2'	61.0'	
22	150°18.50	25.99	348°36.89	1.0'	27°14.59	3.0'	61.0'	
23	165°18.19	25.97	2°56.91	1.0'	27°17.62	2.8'	61.1'	
SD = 16.3' $d = -0.0'$			SD = 16.5'					

Wed	GHA	Dec	GHA	ν	Dec	d	HP	
0	180°17.88	S23°25.94	17°16.86	0.9'	N27°20.44	2.6'	61.1'	
1	195°17.57	25.92	31°36.75	0.8'	27°23.05	2.4'	61.1'	
2	210°17.26	25.90	45°56.58	0.8'	27°25.45	2.2'	61.1'	
3	225°16.95	25.87	60°16.35	0.7'	27°27.62	2.0'	61.1'	
4	240°16.64	25.85	74°36.07	0.7'	27°29.59	1.7'	61.2'	
5	255°16.33	25.82	88°55.75	0.6'	27°31.33	1.5'	61.2'	
6	270°16.02	S23°25.80	103°15.37	0.6'	N27°32.86	1.3'	61.2'	
7	285°15.71	25.77	117°34.96	0.5'	27°34.17	1.1'	61.2'	
8	300°15.40	25.74	131°54.51	0.5'	27°35.26	0.9'	61.2'	
9	315°15.09	25.71	146°14.02	0.5'	27°36.13	0.6'	61.2'	
10	330°14.78	25.68	160°33.50	0.5'	27°36.78	0.4'	61.2'	
11	345°14.48	25.65	174°52.96	0.4'	27°37.20	0.2'	61.3'	
12	0°14.17	S23°25.62	189°12.39	0.4'	N27°37.41	-0.0'	61.3'	
13	15°13.86	25.59	203°31.80	0.4'	27°37.40	-0.2'	61.3'	
14	30°13.55	25.55	217°51.20	0.4'	27°37.16	-0.5'	61.3'	
15	45°13.24	25.52	232°10.59	0.4'	27°36.70	-0.7'	61.3'	
16	60°12.93	25.48	246°29.96	0.4'	27°36.02	-0.9'	61.3'	
17	75°12.62	25.45	260°49.34	0.4'	27°35.11	-1.1'	61.3'	
18	90°12.31	S23°25.41	275°8.71	0.4'	N27°33.99	-1.3'	61.3'	
19	105°12.00	25.38	289°28.08	0.4'	27°32.64	-1.6'	61.3'	
20	120°11.69	25.34	303°47.47	0.4'	27°31.07	-1.8'	61.4'	
21	135°11.38	25.30	318°6.86	0.4'	27°29.27	-2.0'	61.4'	
22	150°11.07	25.26	332°26.27	0.4'	27°27.26	-2.2'	61.4'	
23	165°10.76	25.22	346°45.70	0.4'	27°25.02	-2.5'	61.4'	
SD = 16.3' $d = -0.0'$			SD = 16.7'					

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	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	09:02	14:55	15:52	16:49
N 58°	07:00	07:53	08:45	15:12	16:04	16:57
56°	06:53	07:43	08:30	15:27	16:14	17:04
54°	06:47	07:34	08:17	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°	06:24	07:02	07:36	16:22	16:55	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	05:49	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	19:03	19:33
30°	03:55	04:29	04:56	19:01	19:28	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	03:32	04:10	19:47	20:25	21:14
S 50°	01:57	03:03	03:47	20:10	20:54	22:00
52°	01:29	02:47	03:36	20:21	21:10	22:28
54°	00:42	02:29	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	02:32	21:25	23:11	////

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

Day	Sun			Moon		
	Eqn.of Time		Mer. Pass	Mer.Pass.		Age 12-14 87-98%
	00 ^h	12 ^h		Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
21	02:11	01:56	11:58	21:43	09:12	
22	01:41	01:26	11:59	22:48	10:15	
23	01:12	00:57	11:59	23:55	11:21	

December 24, 25, 26 UT (Thu., Fri., Sat.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	92°32.37		228°17.05	S13°27.03	291°9.23	N11°7.27	303°10.66	N13°24.81	84°7.87	N00°55.13
1	107°34.84		243°17.20	27.62	306°11.20	7.16	318°13.21	24.85	99°10.28	55.16
2	122°37.30		258°17.35	28.21	321°13.17	7.05	333°15.75	24.89	114°12.69	55.19
3	137°39.77		273°17.51	· · 28.80	336°15.14	· · 6.94	348°18.30	· · 24.93	129°15.11	· · 55.23
4	152°42.23		288°17.66	29.39	351°17.12	6.84	3°20.85	24.97	144°17.52	55.26
5	167°44.69		303°17.81	29.98	6°19.09	6.73	18°23.40	25.01	159°19.93	55.29
6	182°47.16		318°17.95	S13°30.57	21°21.06	N11°6.62	33°25.94	N13°25.05	174°22.35	N00°55.33
7	197°49.62		333°18.10	31.16	36°23.04	6.52	48°28.49	25.09	189°24.76	55.36
8	212°52.09		348°18.25	31.75	51°25.02	6.41	63°31.04	25.13	204°27.17	55.39
9	227°54.55		3°18.39	· · 32.34	66°26.99	· · 6.30	78°33.59	· · 25.17	219°29.58	· · 55.43
10	242°57.02		18°18.54	32.93	81°28.97	6.20	93°36.14	25.21	234°32.00	55.46
11	257°59.48		33°18.68	33.52	96°30.95	6.09	108°38.69	25.26	249°34.41	55.49
12	273°1.94		48°18.82	S13°34.11	111°32.93	N11°5.99	123°41.24	N13°25.30	264°36.82	N00°55.53
13	288°4.41		63°18.96	34.70	126°34.91	5.88	138°43.79	25.34	279°39.23	55.56
14	303°6.87		78°19.10	35.30	141°36.89	5.78	153°46.34	25.38	294°41.64	55.60
15	318°9.34		93°19.24	· · 35.89	156°38.88	· · 5.68	168°48.89	· · 25.42	309°44.06	· · 55.63
16	333°11.80		108°19.37	36.48	171°40.86	5.57	183°51.45	25.46	324°46.47	55.67
17	348°14.27		123°19.51	37.07	186°42.84	5.47	198°54.00	25.51	339°48.88	55.70
18	3°16.73		138°19.65	S13°37.66	201°44.83	N11°5.37	213°56.55	N13°25.55	354°51.29	N00°55.73
19	18°19.19		153°19.78	38.26	216°46.82	5.27	228°59.10	25.59	9°53.70	55.77
20	33°21.66		168°19.91	38.85	231°48.80	5.17	244°1.66	25.63	24°56.11	55.80
21	48°24.12		183°20.04	· · 39.44	246°50.79	· · 5.06	259°4.21	· · 25.67	39°58.52	· · 55.84
22	63°26.59		198°20.17	40.04	261°52.78	4.96	274°6.76	25.72	55°0.93	55.87
23	78°29.05		213°20.30	40.63	276°54.77	4.86	289°9.32	25.76	70°3.34	55.91
Mer.pass. 17:47		ν0.2' d0.6' m-4.67		ν2.0' d-0.1' m0.03		ν2.5' d0.0' m-2.36		ν2.4' d0.0' m0.70		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	93°31.52		228°20.43	S13°41.22	291°56.76	N11°4.76	304°11.87	N13°25.80	85°5.75	N00°55.94
1	108°33.98		243°20.56	41.82	306°58.76	4.66	319°14.42	25.85	100°8.16	55.98
2	123°36.44		258°20.68	42.41	322°0.75	4.56	334°16.98	25.89	115°10.57	56.01
3	138°38.91		273°20.81	· · 43.00	337°2.74	· · 4.47	349°19.53	· · 25.93	130°12.98	· · 56.05
4	153°41.37		288°20.93	43.60	352°4.74	4.37	4°22.09	25.97	145°15.39	56.08
5	168°43.84		303°21.05	44.19	7°6.73	4.27	19°24.65	26.02	160°17.80	56.12
6	183°46.30		318°21.17	S13°44.79	22°8.73	N11°4.17	34°27.20	N13°26.06	175°20.21	N00°56.15
7	198°48.77		333°21.29	45.38	37°10.73	4.07	49°29.76	26.11	190°22.62	56.19
8	213°51.23		348°21.41	45.98	52°12.73	3.98	64°32.31	26.15	205°25.02	56.22
9	228°53.69		3°21.53	· · 46.57	67°14.73	· · 3.88	79°34.87	· · 26.19	220°27.43	· · 56.26
10	243°56.16		18°21.65	47.17	82°16.73	3.79	94°37.43	26.24	235°29.84	56.29
11	258°58.62		33°21.76	47.76	97°18.73	3.69	109°39.99	26.28	250°32.25	56.33
12	274°1.09		48°21.88	S13°48.36	112°20.73	N11°3.59	124°42.54	N13°26.32	265°34.66	N00°56.37
13	289°3.55		63°21.99	48.95	127°22.74	3.50	139°45.10	26.37	280°37.06	56.40
14	304°6.01		78°22.10	49.55	142°24.74	3.41	154°47.66	26.41	295°39.47	56.44
15	319°8.48		93°22.22	· · 50.14	157°26.75	· · 3.31	169°50.22	· · 26.46	310°41.88	· · 56.47
16	334°10.94		108°22.33	50.74	172°28.75	3.22	184°52.78	26.50	325°44.29	56.51
17	349°13.41		123°22.43	51.34	187°30.76	3.12	199°55.34	26.55	340°46.69	56.55
18	4°15.87		138°22.54	S13°51.93	202°32.77	N11°3.03	214°57.90	N13°26.59	355°49.10	N00°56.58
19	19°18.34		153°22.65	52.53	217°34.78	2.94	230°0.46	26.64	10°51.51	56.62
20	34°20.80		168°22.76	53.13	232°36.79	2.85	245°3.02	26.68	25°53.91	56.65
21	49°23.26		183°22.86	· · 53.72	247°38.80	· · 2.76	260°5.58	· · 26.73	40°56.32	· · 56.69
22	64°25.73		198°22.96	54.32	262°40.81	2.66	275°8.14	26.77	55°58.73	56.73
23	79°28.19		213°23.07	54.92	277°42.82	2.57	290°10.70	26.82	71°1.13	56.76
Mer.pass. 17:43		ν0.1' d0.6' m-4.66		ν2.0' d-0.1' m0.01		ν2.6' d0.0' m-2.36		ν2.4' d0.0' m0.71		
Sat	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	94°30.66		228°23.17	S13°55.51	292°44.84	N11°2.48	305°13.27	N13°26.86	86°3.54	N00°56.80
1	109°33.12		243°23.27	56.11	307°46.85	2.39	320°15.83	26.91	101°5.94	56.84
2	124°35.59		258°23.37	56.71	322°48.87	2.30	335°18.39	26.95	116°8.35	56.87
3	139°38.05		273°23.46	· · 57.31	337°50.89	· · 2.21	350°20.95	· · 27.00	131°10.75	· · 56.91
4	154°40.51		288°23.56	57.90	352°52.90	2.13	5°23.52	27.05	146°13.16	56.95
5	169°42.98		303°23.66	58.50	7°54.92	2.04	20°26.08	27.09	161°15.56	56.98
6	184°45.44		318°23.75	S13°59.10	22°56.94	N11°1.95	35°28.64	N13°27.14	176°17.97	N00°57.02
7	199°47.91		333°23.85	13°59.70	37°58.96	1.86	50°31.21	27.18	191°20.37	57.06
8	214°50.37		348°23.94	14°0.29	53°0.99	1.77	65°33.77	27.23	206°22.78	57.09
9	229°52.83		3°24.03	· · 0.89	68°3.01	· · 1.69	80°36.34	· · 27.28	221°25.18	· · 57.13
10	244°55.30		18°24.12	1.49	83°5.03	1.60	95°38.90	27.32	236°27.59	57.17
11	259°57.76		33°24.21	2.09	98°7.06	1.51	110°41.47	27.37	251°29.99	57.21
12	275°0.23		48°24.30	S14°2.69	113°9.08	N11°1.43	125°44.03	N13°27.42	266°32.40	N00°57.24
13	290°2.69		63°24.38	3.29	128°11.11	1.34	140°46.60	27.46	281°34.80	57.28
14	305°5.16		78°24.47	3.88	143°13.14	1.26	155°49.17	27.51	296°37.20	57.32
15	320°7.62		93°24.56	· · 4.48	158°15.17	· · 1.17	170°51.73	· · 27.56	311°39.61	· · 57.36
16	335°10.08		108°24.64	5.08	173°17.20	1.09	185°54.30	27.60	326°42.01	57.39
17	350°12.55		123°24.72	5.68	188°19.23	1.01	200°56.87	27.65	341°44.41	57.43
18	5°15.01		138°24.80	S14°6.28	203°21.26	N11°0.92	215°59.43	N13°27.70	356°46.81	N00°57.47
19	20°17.48		153°24.88	6.88	218°23.29	0.84	231°2.00	27.75	11°49.22	57.51
20	35°19.94		168°24.96	7.48	233°25.32	0.76	246°4.57	27.79	26°51.62	57.55
21	50°22.40		183°25.04	· · 8.08	248°27.36	· · 0.68	261°7.14	· · 27.84	41°54.02	· · 57.58
22	65°24.87		198°25.12	8.68	263°29.39	0.60	276°9.71	27.89	56°56.42	57.62
23	80°27.33		213°25.20	9.28	278°31.43	0.51	291°12.28	27.94	71°58.83	57.66
Mer.pass. 17:39		ν0.1' d0.6' m-4.65		ν2.0' d-0.1' m-0.01		ν2.6' d0.0' m-2.37		ν2.4' d0.0' m0.71		

	SHA	Dec
Alpheratz	357° 33.08	29° 14.59
Ankaa	353° 5.53	-42° 9.73
Schedar	349° 29.06	56° 41.46
Diphda	348° 45.62	-17° 50.36
Achernar	335° 18.77	-57° 6.19
Hamal	327° 49.17	23° 35.55
Polaris	312° 48.04	89° 22.89
Acamar	315° 10.25	-40° 11.91
Menkar	314° 4.21	4° 11.78
Mirfak	308° 25.50	49° 57.59
Aldebaran	290° 37.42	16° 33.84
Rigel	281° 1.97	-8° 10.25
Capella	280° 19.00	46° 1.52
Bellatrix	278° 20.80	6° 22.43
Elnath	277° 59.43	28° 37.80
Alnilam	275° 35.74	-1° 11.10
Betelgeuse	270° 49.98	7° 24.70
Canopus	263° 51.11	-52° 42.57
Sirius	258° 24.45	-16° 45.21
Adhara	255° 4.20	-29° 0.51
Procyon	244° 48.82	5° 9.28
Pollux	243° 14.98	27° 57.52
Avior	234° 13.49	-59° 35.61
Suhail	222° 44.77	-43° 32.37
Miaplacidus	221° 37.21	-69° 49.46
Alphard	217° 45.93	-8° 46.56
Regulus	207° 32.54	11° 49.98
Dubhe	193° 38.86	61° 35.96
Denebola	182° 23.27	14° 25.11
Gienah	175° 41.92	-17° 41.47
Acrux	172° 58.29	-63° 14.68
Gacrux	171° 49.86	-57° 15.63
Alioth	166° 11.69	55° 48.45
Spica	158° 20.70	-11° 18.13
Alkaid	152° 50.96	49° 10.40
Hadar	148° 33.99	-60° 29.96
Menkent	147° 55.89	-36° 30.03
Arcturus	145° 46.62	19° 2.36
Rigel Kent.	139° 38.43	-60° 56.60
Kochab	137° 20.69	74° 2.32
Zuben'ubi	136° 54.44	-16° 9.20
Alphecca	126° 2.67	26° 37.29
Antares	112° 14.18	-26° 29.44
Atria	107° 7.48	-69° 4.40
Sabik	102° 1.26	-15° 45.46
Shaula	96° 8.58	-37° 7.33
Rasalhague	95° 57.39	12° 32.41
Eltanin	90° 41.98	51° 29.07
Kaus Aust.	83° 30.78	-34° 22.27
Vega	80° 32.56	38° 48.53
Nunki	75° 46.13	-26° 15.77
Altair	61° 58.69	8° 56.43
Peacock	53° 3.72	-56° 38.97
Deneb	49° 25.07	45° 22.78
Enif	33° 37.41	10° 0.03
Al Na'ir	27° 31.16	-46° 49.96
Fomalhaut	15° 12.87	-29° 28.85
Scheat	13° 43.73	28° 13.97
Markab	13° 28.37	15° 21.18

Dec 24 Thu	SHA	Mer.pass
Venus	135° 44.67	08:47
Mars	198° 36.86	04:35
Jupiter	210° 38.29	03:47
Saturn	351° 35.49	18:21

Dec 25 Fri	SHA	Mer.pass
Venus	134° 48.91	08:47
Mars	198° 25.25	04:32
Jupiter	210° 40.35	03:43
Saturn	351° 34.24	18:17

Dec 26 Sat	SHA	Mer.pass
Venus	133° 52.51	08:46
Mars	198° 14.18	04:28
Jupiter	210° 42.61	03:38
Saturn	351° 32.88	18:13

Horizontal parallax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°10.45	S23°25.18	1°5.15	0.5'	N27°22.57	-2.7'	61.4'
1	195°10.14	25.13	15°24.62	0.5'	27°19.89	-2.9'	61.4'
2	210°9.83	25.09	29°44.13	0.5'	27°16.99	-3.1'	61.4'
3	225°9.52	· · 25.05	44°3.67	0.6'	27°13.87	-3.3'	61.4'
4	240°9.21	25.00	58°23.24	0.6'	27°10.54	-3.6'	61.4'
5	255°8.90	24.96	72°42.86	0.7'	27°6.99	-3.8'	61.4'
6	270°8.59	S23°24.91	87°2.52	0.7'	N27°3.22	-4.0'	61.4'
7	285°8.28	24.86	101°22.22	0.8'	26°59.23	-4.2'	61.4'
8	300°7.97	24.82	115°41.98	0.8'	26°55.03	-4.4'	61.4'
9	315°7.67	· · 24.77	130°1.79	0.9'	26°50.61	-4.6'	61.4'
10	330°7.36	24.72	144°21.66	0.9'	26°45.98	-4.8'	61.4'
11	345°7.05	24.67	158°41.59	1.0'	26°41.14	-5.1'	61.4'
12	0°6.74	S23°24.62	173°1.59	1.1'	N26°36.09	-5.3'	61.4'
13	15°6.43	24.57	187°21.65	1.1'	26°30.83	-5.5'	61.4'
14	30°6.12	24.51	201°41.78	1.2'	26°25.36	-5.7'	61.4'
15	45°5.81	· · 24.46	216°1.99	1.3'	26°19.68	-5.9'	61.4'
16	60°5.50	24.41	230°22.27	1.4'	26°13.80	-6.1'	61.4'
17	75°5.19	24.35	244°42.64	1.4'	26°7.71	-6.3'	61.4'
18	90°4.88	S23°24.29	259°3.08	1.5'	N26°1.42	-6.5'	61.4'
19	105°4.57	24.24	273°23.61	1.6'	25°54.93	-6.7'	61.4'
20	120°4.26	24.18	287°44.23	1.7'	25°48.24	-6.9'	61.4'
21	135°3.96	· · 24.12	302°4.94	1.8'	25°41.35	-7.1'	61.4'
22	150°3.65	24.06	316°25.74	1.9'	25°34.27	-7.3'	61.3'
23	165°3.34	24.00	330°46.63	2.0'	25°26.99	-7.5'	61.3'
SD = 16.3'			SD = 16.7'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°3.03	S23°23.94	345°7.63	2.1'	N25°19.52	-7.7'	61.3'
1	195°2.72	23.88	359°28.72	2.2'	25°11.86	-7.9'	61.3'
2	210°2.41	23.82	13°49.92	2.3'	25°4.01	-8.0'	61.3'
3	225°2.10	· · 23.75	28°11.22	2.4'	24°55.97	-8.2'	61.3'
4	240°1.79	23.69	42°32.63	2.5'	24°47.75	-8.4'	61.3'
5	255°1.48	23.62	56°54.15	2.6'	24°39.34	-8.6'	61.3'
6	270°1.17	S23°23.56	71°15.78	2.7'	N24°30.75	-8.8'	61.3'
7	285°0.87	23.49	85°37.52	2.9'	24°21.99	-8.9'	61.3'
8	300°0.56	23.42	99°59.37	3.0'	24°13.04	-9.1'	61.2'
9	315°0.25	· · 23.36	114°21.34	3.1'	24°3.93	-9.3'	61.2'
10	329°59.94	23.29	128°43.43	3.2'	23°54.64	-9.5'	61.2'
11	344°59.63	23.22	143°5.64	3.3'	23°45.18	-9.6'	61.2'
12	359°59.32	S23°23.15	157°27.96	3.4'	N23°35.55	-9.8'	61.2'
13	14°59.01	23.08	171°50.41	3.6'	23°25.75	-10.0'	61.2'
14	29°58.71	23.00	186°12.99	3.7'	23°15.79	-10.1'	61.1'
15	44°58.40	· · 22.93	200°35.68	3.8'	23°5.67	-10.3'	61.1'
16	59°58.09	22.86	214°58.51	3.9'	22°55.39	-10.4'	61.1'
17	74°57.78	22.78	229°21.46	4.1'	22°44.95	-10.6'	61.1'
18	89°57.47	S23°22.71	243°44.53	4.2'	N22°34.36	-10.7'	61.1'
19	104°57.16	22.63	258°7.74	4.3'	22°23.62	-10.9'	61.1'
20	119°56.85	22.55	272°31.07	4.5'	22°12.72	-11.0'	61.0'
21	134°56.55	· · 22.47	286°54.54	4.6'	22°1.68	-11.2'	61.0'
22	149°56.24	22.40	301°18.13	4.7'	21°50.49	-11.3'	61.0'
23	164°55.93	22.32	315°41.86	4.9'	21°39.16	-11.5'	61.0'
SD = 16.3'			SD = 16.7'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.62	S23°22.24	330°5.72	5.0'	N21°27.69	-11.6'	61.0'
1	194°55.31	22.15	344°29.71	5.1'	21°16.08	-11.7'	60.9'
2	209°55.01	22.07	358°53.83	5.3'	21°4.33	-11.9'	60.9'
3	224°54.70	· · 21.99	13°18.09	5.4'	20°52.45	-12.0'	60.9'
4	239°54.39	21.91	27°42.47	5.5'	20°40.44	-12.1'	60.9'
5	254°54.08	21.82	42°7.00	5.7'	20°28.30	-12.3'	60.8'
6	269°53.77	S23°21.74	56°31.65	5.8'	N20°16.04	-12.4'	60.8'
7	284°53.47	21.65	70°56.44	5.9'	20°3.65	-12.5'	60.8'
8	299°53.16	21.56	85°21.36	6.1'	19°51.13	-12.6'	60.8'
9	314°52.85	· · 21.48	99°46.42	6.2'	19°38.50	-12.7'	60.7'
10	329°52.54	21.39	114°11.61	6.3'	19°25.75	-12.9'	60.7'
11	344°52.24	21.30	128°36.93	6.5'	19°12.89	-13.0'	60.7'
12	359°51.93	S23°21.21	143°2.39	6.6'	N18°59.92	-13.1'	60.7'
13	14°51.62	21.12	157°27.97	6.7'	18°46.83	-13.2'	60.6'
14	29°51.31	21.03	171°53.69	6.9'	18°33.64	-13.3'	60.6'
15	44°51.00	· · 20.93	186°19.55	7.0'	18°20.34	-13.4'	60.6'
16	59°50.70	20.84	200°45.53	7.1'	18°6.95	-13.5'	60.5'
17	74°50.39	20.74	215°11.64	7.2'	17°53.45	-13.6'	60.5'
18	89°50.08	S23°20.65	229°37.89	7.4'	N17°39.85	-13.7'	60.5'
19	104°49.78	20.55	244°4.26	7.5'	17°26.15	-13.8'	60.5'
20	119°49.47	20.46	258°30.77	7.6'	17°12.37	-13.9'	60.4'
21	134°49.16	· · 20.36	272°57.40	7.8'	16°58.49	-14.0'	60.4'
22	149°48.85	20.26	287°24.16	7.9'	16°44.52	-14.1'	60.4'
23	164°48.55	20.16	301°51.04	8.0'	16°30.47	-14.1'	60.3'
SD = 16.3'			SD = 16.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	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	15:54	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	16:16	17:06
54°	06:48	07:35	08:19	15:42	16:25	17:12
52°	06:43	07:27	08:07	15:53	16:34	17:17
50°	06:37	07:19	07:58	16:03	16:41	17:23
45°	06:26	07:03	07:37	16:23	16:57	17:34
N 40°	06:15	06:49	07:20	16:40	17:11	17:45
35°	06:06	06:38	07:06	16:54	17:22	17:54
30°	05:57	06:27	06:53	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	18:44	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°	02:44	03:34	04:12	19:48	20:26	21:15
S 50°	01:59	03:04	03:49	20:11	20:55	22:01
52°	01:31	02:49	03:38	20:22	21:11	22:29
54°	00:45	02:31	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	02:34	21:25	23:10	////

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

Day	Sun		Mer. Pass	Moon		Age 15-17 100-94%
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass. Upper hh:mm Lower hh:mm		
24	00:42	00:27	12:00	—:—	12:29	
25	00:12	00:03	12:00	01:02	13:34	
26	00:18	00:32	12:01	02:05	14:34	


December 27, 28, 29 UT (Sun., Mon., Tue.)

h		Aries		Venus		Mars		Jupiter		Saturn		Stars	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec
0	95°29.80	228°25.27	S14°9.88	293°33.47	N11°0.43	306°14.85	N13°27.99	87°1.23	N00°57.70			Alpheratz	357°33.09 29°14.59
1	110°32.26	243°25.35	10.48	308°35.51	0.35	321°17.42	28.03	102°3.63	57.74			Ankaa	353°5.54 -42°9.73
2	125°34.73	258°25.42	11.08	323°37.54	0.27	336°19.99	28.08	117°6.03	57.77			Schedar	349°29.09 56°41.46
3	140°37.19	273°25.49	•• 11.68	338°39.59	•• 0.19	351°22.56	•• 28.13	132°8.43	•• 57.81			Diphda	348°45.63 -17°50.36
4	155°39.65	288°25.56	12.28	353°41.63	0.11	6°25.13	28.18	147°10.83	57.85			Achernar	335°18.79 -57°6.20
5	170°42.12	303°25.63	12.88	8°43.67	0.04	21°27.70	28.23	162°13.23	57.89			Hamal	327°49.17 23°35.56
6	185°44.58	318°25.70	S14°13.48	23°45.71	N10°59.96	36°30.27	N13°28.28	177°15.63	N00°57.93			Polaris	312°49.02 89°22.91
7	200°47.05	333°25.77	14.08	38°47.76	10°59.88	51°32.84	28.33	192°18.03	57.97			Acamar	315°10.26 -40°11.92
8	215°49.51	348°25.83	14.68	53°49.80	59.80	66°35.41	28.38	207°20.44	58.01			Menkar	314°4.21 4°11.77
9	230°51.97	3°25.90	•• 15.28	68°51.85	•• 59.73	81°37.99	•• 28.42	222°22.84	•• 58.04			Mirfak	308°25.50 49°57.60
10	245°54.44	18°25.96	15.88	83°53.90	59.65	96°40.56	28.47	237°25.24	58.08			Aldebaran	290°37.42 16°33.84
11	260°56.90	33°26.03	16.48	98°55.94	59.57	111°43.13	28.52	252°27.64	58.12			Rigel	281°1.96 -8°10.25
12	275°59.37	48°26.09	S14°17.08	113°57.99	N10°59.50	126°45.71	N13°28.57	267°30.04	N00°58.16			Capella	280°18.99 46°1.53
13	291°1.83	63°26.15	17.68	129°0.04	59.42	141°48.28	28.62	282°32.43	58.20			Bellatrix	278°20.79 6°22.43
14	306°4.30	78°26.21	18.28	144°2.09	59.35	156°50.85	28.67	297°34.83	58.24			Elnath	277°59.42 28°37.81
15	321°6.76	93°26.27	•• 18.88	159°4.15	•• 59.27	171°53.43	•• 28.72	312°37.23	•• 58.28			Alnilam	275°35.73 -1°11.11
16	336°9.22	108°26.33	19.48	174°6.20	59.20	186°56.00	28.77	327°39.63	58.32			Betelgeuse	270°49.97 7°24.69
17	351°11.69	123°26.39	20.08	189°8.25	59.12	201°58.58	28.82	342°42.03	58.36			Canopus	263°51.10 -52°42.58
18	6°14.15	138°26.44	S14°20.69	204°10.31	N10°59.05	217°1.15	N13°28.87	357°44.43	N00°58.40			Sirius	258°24.44 -16°45.22
19	21°16.62	153°26.50	21.29	219°12.37	58.98	232°3.73	28.92	12°46.83	58.44			Adhara	255°4.19 -29°0.52
20	36°19.08	168°26.55	21.89	234°14.42	58.91	247°6.30	28.97	27°49.23	58.48			Procyon	244°48.80 5°9.27
21	51°21.54	183°26.60	•• 22.49	249°16.48	•• 58.83	262°8.88	•• 29.02	42°51.63	•• 58.52			Pollux	243°14.95 27°57.52
22	66°24.01	198°26.65	23.09	264°18.54	58.76	277°11.46	29.07	57°54.02	58.56			Avior	234°13.47 -59°35.63
23	81°26.47	213°26.71	23.69	279°20.60	58.69	292°14.03	29.12	72°56.42	58.60			Suhail	222°44.75 -43°32.38
Mer.pass. 17:35		ν0.1' d0.6' m-4.64		ν2.0' d-0.1' m-0.03		ν2.6' d0.0' m-2.38		ν2.4' d0.0' m0.71					
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	96°28.94	228°26.76	S14°24.29	294°22.66	N10°58.62	307°16.61	N13°29.17	87°58.82	N00°58.64				
1	111°31.40	243°26.80	24.89	309°24.72	58.55	322°19.19	29.23	103°1.22	58.68				
2	126°33.86	258°26.85	25.50	324°26.79	58.48	337°21.77	29.28	118°3.61	58.72				
3	141°36.33	273°26.90	•• 26.10	339°28.85	•• 58.41	352°24.34	•• 29.33	133°6.01	•• 58.76				
4	156°38.79	288°26.94	26.70	354°30.92	58.34	7°26.92	29.38	148°8.41	58.80				
5	171°41.26	303°26.99	27.30	9°32.98	58.27	22°29.50	29.43	163°10.80	58.84				
6	186°43.72	318°27.03	S14°27.90	24°35.05	N10°58.20	37°32.08	N13°29.48	178°13.20	N00°58.88				
7	201°46.19	333°27.07	28.50	39°37.12	58.14	52°34.66	29.53	193°15.60	58.92				
8	216°48.65	348°27.11	29.11	54°39.19	58.07	67°37.24	29.58	208°17.99	58.96				
9	231°51.11	3°27.15	•• 29.71	69°41.26	•• 58.00	82°39.82	•• 29.64	223°20.39	•• 59.00				
10	246°53.58	18°27.19	30.31	84°43.33	57.94	97°42.40	29.69	238°22.79	59.04				
11	261°56.04	33°27.23	30.91	99°45.40	57.87	112°44.98	29.74	253°25.18	59.08				
12	276°58.51	48°27.27	S14°31.51	114°47.47	N10°57.80	127°47.56	N13°29.79	268°27.58	N00°59.12				
13	292°0.97	63°27.30	32.11	129°49.55	57.74	142°50.14	29.84	283°29.97	59.16				
14	307°3.43	78°27.34	32.72	144°51.62	57.67	157°52.72	29.90	298°32.37	59.20				
15	322°5.90	93°27.37	•• 33.32	159°53.70	•• 57.61	172°55.31	•• 29.95	313°34.76	•• 59.24				
16	337°8.36	108°27.41	33.92	174°55.78	57.55	187°57.89	30.00	328°37.16	59.28				
17	352°10.83	123°27.44	34.52	189°57.86	57.48	203°0.47	30.05	343°39.55	59.33				
18	7°13.29	138°27.47	S14°35.12	204°59.93	N10°57.42	218°3.05	N13°30.11	358°41.95	N00°59.37				
19	22°15.75	153°27.50	35.73	220°2.02	57.36	233°5.64	30.16	13°44.34	59.41				
20	37°18.22	168°27.53	36.33	235°4.10	57.29	248°8.22	30.21	28°46.74	59.45				
21	52°20.68	183°27.55	•• 36.93	250°6.18	•• 57.23	263°10.80	•• 30.27	43°49.13	•• 59.49				
22	67°23.15	198°27.58	37.53	265°8.26	57.17	278°13.39	30.32	58°51.53	59.53				
23	82°25.61	213°27.61	38.13	280°10.35	57.11	293°15.97	30.37	73°53.92	59.57				
Mer.pass. 17:31		ν0.0' d0.6' m-4.63		ν2.1' d-0.1' m-0.05		ν2.6' d0.1' m-2.38		ν2.4' d0.0' m0.72					
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec				
0	97°28.07	228°27.63	S14°38.74	295°12.43	N10°57.05	308°18.56	N13°30.43	88°56.31	N00°59.62				
1	112°30.54	243°27.65	39.34	310°14.52	56.99	323°21.14	30.48	103°58.71	59.66				
2	127°33.00	258°27.68	39.94	325°16.61	56.93	338°23.73	30.53	119°1.10	59.70				
3	142°35.47	273°27.70	•• 40.54	340°18.69	•• 56.87	353°26.31	•• 30.59	134°3.49	•• 59.74				
4	157°37.93	288°27.72	41.15	355°20.78	56.81	8°28.90	30.64	149°5.89	59.78				
5	172°40.40	303°27.74	41.75	10°22.88	56.75	23°31.49	30.69	164°8.28	59.82				
6	187°42.86	318°27.76	S14°42.35	25°24.97	N10°56.69	38°34.07	N13°30.75	179°10.67	N00°59.87				
7	202°45.32	333°27.77	42.95	40°27.06	56.64	53°36.66	30.80	194°13.06	00°59.91				
8	217°47.79	348°27.79	43.55	55°29.15	56.58	68°39.25	30.86	209°15.46	00°59.95				
9	232°50.25	3°27.80	•• 44.16	70°31.25	•• 56.52	83°41.83	•• 30.91	224°17.85	•• 59.99				
10	247°52.72	18°27.82	44.76	85°33.34	56.47	98°44.42	30.97	239°20.24	0.04				
11	262°55.18	33°27.83	45.36	100°35.44	56.41	113°47.01	31.02	254°22.63	0.08				
12	277°57.64	48°27.84	S14°45.96	115°37.54	N10°56.36	128°49.60	N13°31.07	269°25.02	N01°0.12				
13	293°0.11	63°27.86	46.57	130°39.64	56.30	143°52.19	31.13	284°27.41	0.16				
14	308°2.57	78°27.87	47.17	145°41.74	56.25	158°54.78	31.18	299°29.81	0.21				
15	323°5.04	93°27.87	•• 47.77	160°43.84	•• 56.19	173°57.37	•• 31.24	314°32.20	•• 0.25				
16	338°7.50	108°27.88	48.37	175°45.94	56.14	188°59.96	31.29	329°34.59	0.29				
17	353°9.96	123°27.89	48.97	190°48.04	56.08	204°2.55	31.35	344					

h	Sun			Moon			
	Sun	GHA	Dec	GHA	ν	Dec	d HP
0		179°48.24	S23°20.06	316°18.06	8.1°	N16°16.33	-14.2' 60.3'
1		194°47.93	19.96	330°45.19	8.3°	16°2.11	-14.3' 60.3'
2		209°47.63	19.86	345°12.46	8.4°	15°47.81	-14.4' 60.2'
3		224°47.32	· · 19.76	359°39.84	8.5°	15°33.43	-14.5' 60.2'
4		239°47.01	19.65	14°7.35	8.6°	15°18.98	-14.5' 60.2'
5		254°46.71	19.55	28°34.98	8.8°	15°4.45	-14.6' 60.1'
6		269°46.40	S23°19.45	43°2.73	8.9°	N14°49.85	-14.7' 60.1'
7		284°46.09	19.34	57°30.60	9.0°	14°35.18	-14.7' 60.1'
8		299°45.79	19.23	71°58.59	9.1°	14°20.45	-14.8' 60.0'
9		314°45.48	· · 19.13	86°26.70	9.2°	14°5.65	-14.9' 60.0'
10		329°45.17	19.02	100°54.92	9.3°	13°50.78	-14.9' 60.0'
11		344°44.87	18.91	115°23.26	9.5°	13°35.86	-15.0' 59.9'
12		359°44.56	S23°18.80	129°51.72	9.6°	N13°20.88	-15.0' 59.9'
13		14°44.25	18.69	144°20.28	9.7°	13°5.84	-15.1' 59.9'
14		29°43.95	18.58	158°48.96	9.8°	12°50.75	-15.1' 59.8'
15		44°43.64	· · 18.47	173°17.75	9.9°	12°35.60	-15.2' 59.8'
16		59°43.33	18.35	187°46.65	10.0°	12°20.40	-15.2' 59.8'
17		74°43.03	18.24	202°15.65	10.1°	12°5.16	-15.3' 59.7'
18		89°42.72	S23°18.12	216°44.76	10.2°	N11°49.86	-15.3' 59.7'
19		104°42.42	18.01	231°13.98	10.3°	11°34.52	-15.4' 59.6'
20		119°42.11	17.89	245°43.30	10.4°	11°19.14	-15.4' 59.6'
21		134°41.80	· · 17.78	260°12.73	10.5°	11°3.72	-15.5' 59.6'
22		149°41.50	17.66	274°42.26	10.6°	10°48.26	-15.5' 59.5'
23		164°41.19	17.54	289°11.88	10.7°	10°32.76	-15.5' 59.5'
SD = 16.3' d = -0.1'				SD = 16.4'			
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°40.89	S23°17.42	303°41.61	10.8°	N10°17.22	-15.6' 59.5'	
1	194°40.58	17.30	318°11.43	10.9°	10°1.65	-15.6' 59.4'	
2	209°40.28	17.18	332°41.35	11.0°	09°46.05	-15.6' 59.4'	
3	224°39.97	· · 17.06	347°11.36	11.1°	09°30.42	-15.7' 59.3'	
4	239°39.67	16.93	1°41.47	11.2°	09°14.76	-15.7' 59.3'	
5	254°39.36	16.81	16°11.67	11.3°	08°59.07	-15.7' 59.3'	
6	269°39.06	S23°16.69	30°41.96	11.4°	N08°43.36	-15.7' 59.2'	
7	284°38.75	16.56	45°12.34	11.5°	08°27.62	-15.8' 59.2'	
8	299°38.45	16.44	59°42.80	11.6°	08°11.86	-15.8' 59.2'	
9	314°38.14	· · 16.31	74°13.36	11.6°	07°56.08	-15.8' 59.1'	
10	329°37.84	16.18	88°43.99	11.7°	07°40.28	-15.8' 59.1'	
11	344°37.53	16.05	103°14.71	11.8°	07°24.47	-15.8' 59.0'	
12	359°37.23	S23°15.92	117°45.52	11.9°	N07°8.64	-15.8' 59.0'	
13	14°36.92	15.79	132°16.40	12.0°	06°52.79	-15.9' 59.0'	
14	29°36.62	15.66	146°47.36	12.0°	06°36.93	-15.9' 58.9'	
15	44°36.31	· · 15.53	161°18.40	12.1°	06°21.06	-15.9' 58.9'	
16	59°36.01	15.40	175°49.52	12.2°	06°5.18	-15.9' 58.8'	
17	74°35.70	15.27	190°20.71	12.3°	05°49.30	-15.9' 58.8'	
18	89°35.40	S23°15.13	204°51.97	12.3°	N05°33.40	-15.9' 58.8'	
19	104°35.09	15.00	219°23.30	12.4°	05°17.51	-15.9' 58.7'	
20	119°34.79	14.86	233°54.71	12.5°	05°1.60	-15.9' 58.7'	
21	134°34.49	· · 14.73	248°26.18	12.5°	04°45.70	-15.9' 58.6'	
22	149°34.18	14.59	262°57.72	12.6°	04°29.79	-15.9' 58.6'	
23	164°33.88	14.45	277°29.33	12.7°	04°13.89	-15.9' 58.6'	
SD = 16.3' d = -0.1'				SD = 16.2'			
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.57	S23°14.31	292°1.00	12.7°	N03°57.99	-15.9' 58.5'	
1	194°33.27	14.17	306°32.74	12.8°	03°42.09	-15.9' 58.5'	
2	209°32.97	14.03	321°4.53	12.9°	03°26.19	-15.9' 58.4'	
3	224°32.66	· · 13.89	335°36.39	12.9°	03°10.30	-15.9' 58.4'	
4	239°32.36	13.75	350°8.30	13.0°	02°54.42	-15.9' 58.4'	
5	254°32.06	13.60	4°40.27	13.0°	02°38.55	-15.9' 58.3'	
6	269°31.75	S23°13.46	19°12.30	13.1°	N02°22.68	-15.9' 58.3'	
7	284°31.45	13.32	33°44.38	13.1°	02°6.83	-15.8' 58.3'	
8	299°31.15	13.17	48°16.52	13.2°	01°50.99	-15.8' 58.2'	
9	314°30.84	· · 13.02	62°48.70	13.2°	01°35.16	-15.8' 58.2'	
10	329°30.54	12.88	77°20.94	13.3°	01°19.35	-15.8' 58.1'	
11	344°30.24	12.73	91°53.22	13.3°	01°3.55	-15.8' 58.1'	
12	359°29.93	S23°12.58	106°25.55	13.4°	N00°47.77	-15.8' 58.1'	
13	14°29.63	12.43	120°57.93	13.4°	00°32.01	-15.7' 58.0'	
14	29°29.33	12.28	135°30.35	13.5°	00°16.27	-15.7' 58.0'	
15	44°29.03	· · 12.13	150°2.82	13.5°	N00°0.54	-15.7' 57.9'	
16	59°28.72	11.98	164°35.32	13.5°	S00°15.16	15.7' 57.9'	
17	74°28.42	11.83	179°7.87	13.6°	00°30.83	15.7' 57.9'	
18	89°28.12	S23°11.67	193°40.45	13.6°	S00°46.49	15.6' 57.8'	
19	104°27.82	11.52	208°13.08	13.7°	01°2.12	15.6' 57.8'	
20	119°27.51	11.36	222°45.73	13.7°	01°17.72	15.6' 57.7'	
21	134°27.21	· · 11.21	237°18.43	13.7°	01°33.30	15.5' 57.7'	
22	149°26.91	11.05	251°51.15	13.8°	01°48.84	15.5' 57.7'	
23	164°26.61	10.89	266°23.91	13.8°	02°4.36	15.5' 57.6'	
SD = 16.3' d = -0.1'				SD = 16.0'			

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

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

Day	Sun			Moon			
	Eqn. of Time		Mer.	Mer.Pass.			Age
	00 ^h mm:ss	12 ^h mm:ss	Pass hh:mm	Upper hh:mm	Lower hh:mm		18-20 88-69%
27	00:47	01:02	12:01	03:01	15:28		
28	01:16	01:31	12:02	03:53	16:17		
29	01:46	02:00	12:02	04:41	17:04		

December 30, 31, 01 UT (Wed., Thu., Fri.)

h	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	98°27.21	228°27.91	S14°53.19	296°2.79	N10°55.72	309°20.69	N13°31.74	89°53.71	N01°0.64					Alpheratz	357°33.11 29°14.59			
1	113°29.68	243°27.91	53.79	311°4.90	55.67	324°23.28	31.80	104°56.10	0.68					Ankaa	353°5.56 -42°9.73			
2	128°32.14	258°27.91	54.39	326°7.02	55.62	339°25.87	31.85	119°58.49	0.72					Schedar	349°29.11 56°41.46			
3	143°34.61	273°27.90	•• 54.99	341°9.13	•• 55.58	354°28.46	•• 31.91	135°0.88	•• 0.77					Diphda	348°45.64 -17°50.37			
4	158°37.07	288°27.90	55.60	356°11.24	55.53	9°31.06	31.96	150°3.27	0.81					Achernar	335°18.81 -57°6.20			
5	173°39.53	303°27.89	56.20	11°13.36	55.48	24°33.65	32.02	165°5.65	0.85					Hamal	327°49.18 23°35.55			
6	188°42.00	318°27.89	S14°56.80	26°15.48	N10°55.43	39°36.25	N13°32.08	180°8.04	N01°0.90					Polaris	312°50.13 89°22.92			
7	203°44.46	333°27.88	57.40	41°17.59	55.38	54°38.84	32.13	195°10.43	0.94					Acamar	315°10.27 -40°11.93			
8	218°46.93	348°27.87	58.00	56°19.71	55.34	69°41.44	32.19	210°12.82	0.98					Menkar	314°4.22 4°11.77			
9	233°49.39	3°27.86	•• 58.60	71°21.83	•• 55.29	84°44.03	•• 32.25	225°15.21	•• 1.03					Mirfak	308°25.51 49°57.61			
10	248°51.85	18°27.85	59.21	86°23.95	55.25	99°46.63	32.30	240°17.60	1.07					Aldebaran	290°37.42 16°33.84			
11	263°54.32	33°27.84	14°59.81	101°26.08	55.20	114°49.22	32.36	255°19.98	1.12					Rigel	281°1.96 -8°10.26			
12	278°56.78	48°27.83	S15°0.41	116°28.20	N10°55.15	129°51.82	N13°32.42	270°22.37	N01°1.16					Capella	280°18.99 46°1.53			
13	293°59.25	63°27.82	1.01	131°30.32	55.11	144°54.41	32.48	285°24.76	1.21					Bellatrix	278°20.79 6°22.43			
14	309°1.71	78°27.80	1.61	146°32.45	55.07	159°57.01	32.53	300°27.15	1.25					Elnath	277°59.42 28°37.81			
15	324°4.17	93°27.79	•• 2.21	161°34.57	•• 55.02	174°59.61	•• 32.59	315°29.53	•• 1.29					Alnilam	275°35.73 -1°11.11			
16	339°6.64	108°27.77	2.82	176°36.70	54.98	190°2.21	32.65	330°31.92	1.34					Betelgeuse	270°49.97 7°24.69			
17	354°9.10	123°27.75	3.42	191°38.83	54.94	205°4.80	32.71	345°34.31	1.38					Canopus	263°51.10 -52°42.60			
18	9°11.57	138°27.74	S15°4.02	206°40.96	N10°54.89	220°7.40	N13°32.76	0°36.69	N01°1.43					Sirius	258°24.44 -16°45.23			
19	24°14.03	153°27.72	4.62	221°43.09	54.85	235°10.00	32.82	15°39.08	1.47					Adhara	255°4.19 -29°0.53			
20	39°16.49	168°27.70	5.22	236°45.22	54.81	250°12.60	32.88	30°41.47	1.52					Procyon	244°48.79 5°9.26			
21	54°18.96	183°27.68	•• 5.82	251°47.35	•• 54.77	265°15.20	•• 32.94	45°43.85	•• 1.56					Pollux	243°14.94 27°57.52			
22	69°21.42	198°27.65	6.42	266°49.48	54.73	280°17.80	33.00	60°46.24	1.61					Avior	234°13.46 -59°35.64			
23	84°23.89	213°27.63	7.02	281°51.62	54.69	295°20.40	33.06	75°48.62	1.65					Suhail	222°44.73 -43°32.40			
Mer.pass. 17:23		ν-0.0' d0.6' m-4.60			ν2.1' d-0.0' m-0.10			ν2.6' d0.1' m-2.40			ν2.4' d0.0' m0.72							
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	99°26.35	228°27.61	S15°7.63	296°53.75	N10°54.65	310°23.00	N13°33.11	90°51.01	N01°1.70					Miaplacidus	221°37.15 -69°49.50			
1	114°28.82	243°27.58	8.23	311°55.89	54.61	325°25.60	33.17	105°53.39	1.74					Alphard	217°45.90 -8°46.58			
2	129°31.28	258°27.55	8.83	326°58.03	54.57	340°28.20	33.23	120°55.78	1.79					Regulus	207°32.50 11°49.96			
3	144°33.74	273°27.53	•• 9.43	342°0.17	•• 54.53	355°30.80	•• 33.29	135°58.17	•• 1.83					Dubhe	193°38.78 61°35.96			
4	159°36.21	288°27.50	10.03	357°2.31	54.49	10°33.40	33.35	151°0.55	1.88					Denebola	182°23.22 14°25.09			
5	174°38.67	303°27.47	10.63	12°4.45	54.46	25°36.00	33.41	166°2.93	1.92					Gienah	175°41.87 -17°41.49			
6	189°41.14	318°27.44	S15°11.23	27°6.59	N10°54.42	40°38.60	N13°33.47	181°5.32	N01°1.97					Acrux	172°58.21 -63°14.69			
7	204°43.60	333°27.41	11.83	42°8.73	54.38	55°41.20	33.53	196°7.70	2.01					Gacrux	171°49.78 -57°15.65			
8	219°46.06	348°27.38	12.43	57°10.88	54.35	70°43.81	33.59	211°10.09	2.06					Alioth	166°11.62 55°48.43			
9	234°48.53	3°27.34	•• 13.03	72°13.02	•• 54.31	85°46.41	•• 33.65	226°12.47	•• 2.10					Spica	158°20.65 -11°18.15			
10	249°50.99	18°27.31	13.63	87°15.17	54.28	100°49.01	33.70	241°14.86	2.15					Alkaid	152°50.90 49°10.38			
11	264°53.46	33°27.27	14.23	102°17.32	54.24	115°51.61	33.76	256°17.24	2.20					Hadar	148°33.91 -60°29.96			
12	279°55.92	48°27.24	S15°14.83	117°19.46	N10°54.21	130°54.22	N13°33.82	271°19.62	N01°2.24					Menkent	147°55.84 -36°30.04			
13	294°58.38	63°27.20	15.43	132°21.61	54.17	145°56.82	33.88	286°22.01	2.29					Arcturus	145°46.57 19°2.33			
14	310°0.85	78°27.16	16.03	147°23.76	54.14	160°59.43	33.94	301°24.39	2.33					Rigel Kent.	139°38.36 -60°56.60			
15	325°3.31	93°27.12	•• 16.63	162°25.92	•• 54.11	176°2.03	•• 34.00	316°26.77	•• 2.38					Kochab	137°20.59 74°2.29			
16	340°5.78	108°27.08	17.23	177°28.07	54.07	191°4.64	34.06	331°29.16	2.43					Zuben'ubi	136°54.40 -16°9.21			
17	355°8.24	123°27.04	17.83	192°30.22	54.04	206°7.24	34.12	346°31.54	2.47					Alphecca	126°2.63 26°37.25			
18	10°10.70	138°27.00	S15°18.43	207°32.38	N10°54.01	221°9.85	N13°34.19	1°33.92	N01°2.52					Antares	112°14.15 -26°29.45			
19	25°13.17	153°26.96	19.03	222°34.53	53.98	236°12.45	34.25	16°36.30	2.56					Atria	107°7.41 -69°4.38			
20	40°15.63	168°26.91	19.63	237°36.69	53.95	251°15.06	34.31	31°38.69	2.61					Sabik	102°1.23 -15°45.47			
21	55°18.10	183°26.87	•• 20.23	252°38.85	•• 53.92	266°17.66	•• 34.37	46°41.07	•• 2.66					Shaula	96°8.56 -37°7.33			
22	70°20.56	198°26.82	20.83	267°41.01	53.89	281°20.27	34.43	61°43.45	2.70					Rasalhague	95°57.37 12°32.38			
23	85°23.03	213°26.78	21.43	282°43.17	53.86	296°22.88	34.49	76°45.83	2.75					Eltanin	90°41.96 51°29.03			
Mer.pass. 17:19		ν-0.0' d0.6' m-4.59			ν2.1' d-0.0' m-0.12			ν2.6' d0.1' m-2.40			ν2.4' d0.0' m0.73							
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	100°25.49	228°26.73	S15°22.03	297°45.33	N10°53.83	311°25.48	N13°34.55	91°48.21	N01°2.80					Kaus Aust.	83°30.76 -34°22.27			
1	115°27.95	243°26.68	22.63	312°47.49	53.80	326°28.09	34.61	106°50.59	2.84					Vega	80°32.55 38°48.50			
2	130°30.42	258°26.63	23.22	327°49.65	53.77	341°30.70	34.67	121°52.98	2.89					Nunki	75°46.11 -26°15.77			
3	145°32.88	273°26.58	•• 23.82	342°51.82	•• 53.75	356°33.31	•• 34.73	136°55.36	•• 2.94					Altair	61°58.69 8°56.41			
4	160°35.35	288°26.53	24.42	357°53.99	53.72	11°35.92	34.79	151°57.74	2.98					Peacock	53°3.72 -56°38.96			
5	175°37.81	303°26.48	25.02	12°56.15	53.69	26°38.53	34.86	167°0.12	3.03					Deneb	49°25.09 45°22.75			
6	190°40.27	318°26.42	S15°25.62	27°58.32	N10°53.67	41°41.13	N13°34.92	182°2.50	N01°3.08					Enif				


h	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
Wed 0	179°26.31	S23°10.73	280°56.70	13.8'	S02°19.85	15.5'	57.6'
1	194°26.01	10.58	295°29.52	13.8'	02°35.31	15.4'	57.6'
2	209°25.70	10.42	310°2.36	13.9'	02°50.73	15.4'	57.5'
3	224°25.40	10.26	324°35.23	13.9'	03°6.13	15.4'	57.5'
4	239°25.10	10.09	339°8.13	13.9'	03°21.48	15.3'	57.4'
5	254°24.80	9.93	353°41.05	13.9'	03°36.81	15.3'	57.4'
6	269°24.50	S23°9.77	8°14.00	14.0'	S03°52.09	15.2'	57.4'
7	284°24.20	9.60	22°46.96	14.0'	04°7.34	15.2'	57.3'
8	299°23.90	9.44	37°19.95	14.0'	04°22.55	15.2'	57.3'
9	314°23.60	9.27	51°52.95	14.0'	04°37.72	15.1'	57.3'
10	329°23.29	9.11	66°25.97	14.0'	04°52.85	15.1'	57.2'
11	344°22.99	8.94	80°59.01	14.1'	05°7.94	15.0'	57.2'
12	359°22.69	S23°8.77	95°32.06	14.1'	S05°22.99	15.0'	57.1'
13	14°22.39	8.60	110°5.13	14.1'	05°38.00	15.0'	57.1'
14	29°22.09	8.43	124°38.21	14.1'	05°52.96	14.9'	57.1'
15	44°21.79	8.26	139°11.30	14.1'	06°7.88	14.9'	57.0'
16	59°21.49	8.09	153°44.40	14.1'	06°22.75	14.8'	57.0'
17	74°21.19	7.92	168°17.50	14.1'	06°37.58	14.8'	57.0'
18	89°20.89	S23°7.75	182°50.62	14.1'	S06°52.35	14.7'	56.9'
19	104°20.59	7.57	197°23.74	14.1'	07°7.08	14.7'	56.9'
20	119°20.29	7.40	211°56.87	14.1'	07°21.76	14.6'	56.9'
21	134°19.99	7.22	226°30.00	14.1'	07°36.39	14.6'	56.8'
22	149°19.69	7.05	241°3.14	14.1'	07°50.97	14.5'	56.8'
23	164°19.39	6.87	255°36.27	14.1'	08°5.50	14.5'	56.8'
SD = 16.3' $d = -0.2'$			SD = 15.7'				

Thu	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°19.09	S23°6.69	270°9.41	14.1'	S08°19.98	14.4'	56.7'
1	194°18.79	6.52	284°42.55	14.1'	08°34.40	14.4'	56.7'
2	209°18.50	6.34	299°15.68	14.1'	08°48.77	14.3'	56.6'
3	224°18.20	6.16	313°48.81	14.1'	09°3.08	14.3'	56.6'
4	239°17.90	5.98	328°21.94	14.1'	09°17.34	14.2'	56.6'
5	254°17.60	5.79	342°55.06	14.1'	09°31.54	14.1'	56.5'
6	269°17.30	S23°5.61	357°28.18	14.1'	S09°45.68	14.1'	56.5'
7	284°17.00	5.43	12°1.29	14.1'	09°59.77	14.0'	56.5'
8	299°16.70	5.24	26°34.39	14.1'	10°13.79	14.0'	56.4'
9	314°16.40	5.06	41°7.48	14.1'	10°27.76	13.9'	56.4'
10	329°16.11	4.87	55°40.56	14.1'	10°41.66	13.8'	56.4'
11	344°15.81	4.69	70°13.63	14.1'	10°55.50	13.8'	56.3'
12	359°15.51	S23°4.50	84°46.69	14.0'	S11°9.28	13.7'	56.3'
13	14°15.21	4.31	99°19.73	14.0'	11°23.00	13.7'	56.3'
14	29°14.91	4.12	113°52.76	14.0'	11°36.65	13.6'	56.3'
15	44°14.62	3.93	128°25.78	14.0'	11°50.24	13.5'	56.2'
16	59°14.32	3.74	142°58.78	14.0'	12°3.77	13.5'	56.2'
17	74°14.02	3.55	157°31.76	14.0'	12°17.22	13.4'	56.2'
18	89°13.72	S23°3.36	172°4.72	13.9'	S12°30.61	13.3'	56.1'
19	104°13.43	3.17	186°37.66	13.9'	12°43.93	13.3'	56.1'
20	119°13.13	2.97	201°10.58	13.9'	12°57.18	13.2'	56.1'
21	134°12.83	2.78	215°43.48	13.9'	13°10.37	13.1'	56.0'
22	149°12.54	2.58	230°16.36	13.9'	13°23.48	13.0'	56.0'
23	164°12.24	2.39	244°49.22	13.8'	13°36.52	13.0'	56.0'
SD = 16.3' $d = -0.2'$			SD = 15.5'				

Fri	Sun		Moon				
	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.94	S23°2.19	259°22.05	13.8'	S13°49.49	12.9'	55.9'
1	194°11.65	1.99	273°54.86	13.8'	14°2.39	12.8'	55.9'
2	209°11.35	1.79	288°27.64	13.8'	14°15.21	12.7'	55.9'
3	224°11.05	1.59	303°0.40	13.7'	14°27.96	12.7'	55.9'
4	239°10.76	1.39	317°33.13	13.7'	14°40.64	12.6'	55.8'
5	254°10.46	1.19	332°5.83	13.7'	14°53.24	12.5'	55.8'
6	269°10.17	S23°0.99	346°38.50	13.6'	S15°5.76	12.4'	55.8'
7	284°9.87	0.79	1°11.14	13.6'	15°18.21	12.4'	55.7'
8	299°9.57	0.59	15°43.75	13.6'	15°30.57	12.3'	55.7'
9	314°9.28	0.38	30°16.33	13.5'	15°42.86	12.2'	55.7'
10	329°8.98	0.18	44°48.88	13.5'	15°55.07	12.1'	55.7'
11	344°8.69	22°59.97	59°21.40	13.5'	16°7.20	12.0'	55.6'
12	359°8.39	S22°59.76	73°53.88	13.4'	S16°19.25	12.0'	55.6'
13	14°8.10	59.56	88°26.33	13.4'	16°31.22	11.9'	55.6'
14	29°7.80	59.35	102°58.75	13.4'	16°43.10	11.8'	55.5'
15	44°7.51	59.14	117°31.13	13.3'	16°54.90	11.7'	55.5'
16	59°7.21	58.93	132°3.47	13.3'	17°6.62	11.6'	55.5'
17	74°6.92	58.72	146°35.78	13.3'	17°18.25	11.5'	55.5'
18	89°6.62	S22°58.51	161°8.05	13.2'	S17°29.80	11.5'	55.4'
19	104°6.33	58.30	175°40.28	13.2'	17°41.26	11.4'	55.4'
20	119°6.04	58.08	190°12.47	13.2'	17°52.64	11.3'	55.4'
21	134°5.74	57.87	204°44.63	13.1'	18°3.92	11.2'	55.4'
22	149°5.45	57.66	219°16.74	13.1'	18°15.12	11.1'	55.3'
23	164°5.16	57.44	233°48.82	13.0'	18°26.23	11.0'	55.3'
SD = 16.3' $d = -0.2'$			SD = 15.3'				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 ^h	12 ^h	Pass	Upper	Lower	21-23
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	58-38%
30	02:15	02:29	12:02	05:26	17:48	
31	02:44	02:58	12:03	06:10	18:33	
01	03:12	03:26	12:03	06:55	19:18	