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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	41°17.1	199°08.0	S14°15.5	259°12.7	N16°37.7	254°18.3	N14°01.6	31°45.3	N01°11.3
1	56°19.6	214°11.3	14.5	274°13.9	37.3	269°20.5	01.5	46°47.9	11.3
2	71°22.1	229°14.6	13.5	289°15.1	37.0	284°22.6	01.5	61°50.6	11.2
3	86°24.5	244°18.0	·· 12.5	304°16.3	·· 36.7	299°24.8	·· 01.4	76°53.2	·· 11.2
4	101°27.0	259°21.3	11.5	319°17.5	36.3	314°27.0	01.3	91°55.8	11.1
5	116°29.4	274°24.6	10.5	334°18.7	36.0	329°29.1	01.2	106°58.4	11.1
6	131°31.9	289°28.0	S14°09.6	349°19.9	N16°35.6	344°31.3	N14°01.1	122°01.0	N01°11.0
7	146°34.4	304°31.3	08.6	4°21.1	35.3	359°33.5	01.0	137°03.6	10.9
8	161°36.8	319°34.6	07.6	19°22.3	34.9	14°35.7	00.9	152°06.2	10.9
9	176°39.3	334°37.9	·· 06.6	34°23.6	·· 34.6	29°37.8	·· 00.8	167°08.8	·· 10.8
10	191°41.8	349°41.2	05.6	49°24.8	34.3	44°40.0	00.7	182°11.4	10.8
11	206°44.2	4°44.5	04.6	64°26.0	33.9	59°42.2	00.6	197°14.0	10.7
12	221°46.7	19°47.8	S14°03.6	79°27.2	N16°33.6	74°44.4	N14°00.5	212°16.6	N01°10.7
13	236°49.2	34°51.2	02.6	94°28.4	33.2	89°46.5	00.5	227°19.2	10.6
14	251°51.6	49°54.4	01.6	109°29.6	32.9	104°48.7	00.4	242°21.8	10.6
15	266°54.1	64°57.7	14°00.6	124°30.8	·· 32.6	119°50.9	·· 00.3	257°24.5	·· 10.5
16	281°56.6	80°01.0	13°59.7	139°32.0	32.2	134°53.1	00.2	272°27.1	10.5
17	296°59.0	95°04.3	58.7	154°33.3	31.9	149°55.2	00.1	287°29.7	10.4
18	312°01.5	110°07.6	S13°57.7	169°34.5	N16°31.5	164°57.4	N14°00.0	302°32.3	N01°10.3
19	327°03.9	125°10.9	56.7	184°35.7	31.2	179°59.6	13°59.9	317°34.9	10.3
20	342°06.4	140°14.2	55.7	199°36.9	30.8	195°01.8	59.8	332°37.5	10.2
21	357°08.9	155°17.4	·· 54.8	214°38.1	·· 30.5	210°03.9	·· 59.7	347°40.1	·· 10.2
22	12°11.3	170°20.7	53.8	229°39.3	30.2	225°06.1	59.6	2°42.7	10.1
23	27°13.8	185°24.0	52.8	244°40.6	29.8	240°08.3	59.6	17°45.3	10.1
Mer.pass. 21:11		ν 3.3′ d -1.0′	m -4.25	ν 1.2′ d -0.3′	m 0.85	ν 2.2′ d -0.1′	m -2.01	ν 2.6′ d -0.1′	m 0.47

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	42°16.3	200°27.2	S13°51.8	259°41.8	N16°29.5	255°10.5	N13°59.5	32°47.9	N01°10.0
1	57°18.7	215°30.5	50.8	274°43.0	29.1	270°12.6	59.4	47°50.5	10.0
2	72°21.2	230°33.8	49.9	289°44.2	28.8	285°14.8	59.3	62°53.1	09.9
3	87°23.7	245°37.0	·· 48.9	304°45.4	·· 28.4	300°17.0	·· 59.2	77°55.7	·· 09.9
4	102°26.1	260°40.3	47.9	319°46.6	28.1	315°19.2	59.1	92°58.3	09.8
5	117°28.6	275°43.5	46.9	334°47.9	27.8	330°21.4	59.0	108°00.9	09.8
6	132°31.0	290°46.8	S13°46.0	349°49.1	N16°27.4	345°23.5	N13°58.9	123°03.5	N01°09.7
7	147°33.5	305°50.0	45.0	4°50.3	27.1	0°25.7	58.8	138°06.2	09.6
8	162°36.0	320°53.2	44.0	19°51.5	26.7	15°27.9	58.8	153°08.8	09.6
9	177°38.4	335°56.5	·· 43.1	34°52.8	·· 26.4	30°30.1	·· 58.7	168°11.4	·· 09.5
10	192°40.9	350°59.7	42.1	49°54.0	26.0	45°32.3	58.6	183°14.0	09.5
11	207°43.4	6°02.9	41.1	64°55.2	25.7	60°34.4	58.5	198°16.6	09.4
12	222°45.8	21°06.1	S13°40.2	79°56.4	N16°25.4	75°36.6	N13°58.4	213°19.2	N01°09.4
13	237°48.3	36°09.3	39.2	94°57.6	25.0	90°38.8	58.3	228°21.8	09.3
14	252°50.8	51°12.6	38.2	109°58.9	24.7	105°41.0	58.2	243°24.4	09.3
15	267°53.2	66°15.8	·· 37.3	125°00.1	·· 24.3	120°43.2	·· 58.1	258°27.0	·· 09.2
16	282°55.7	81°19.0	36.3	140°01.3	24.0	135°45.3	58.0	273°29.6	09.2
17	297°58.2	96°22.2	35.4	155°02.5	23.7	150°47.5	58.0	288°32.2	09.1
18	313°00.6	111°25.4	S13°34.4	170°03.8	N16°23.3	165°49.7	N13°57.9	303°34.8	N01°09.1
19	328°03.1	126°28.6	33.4	185°05.0	23.0	180°51.9	57.8	318°37.4	09.0
20	343°05.5	141°31.8	32.5	200°06.2	22.6	195°54.1	57.7	333°40.0	09.0
21	358°08.0	156°35.0	·· 31.5	215°07.4	·· 22.3	210°56.2	·· 57.6	348°42.6	·· 08.9
22	13°10.5	171°38.1	30.6	230°08.7	21.9	225°58.4	57.5	3°45.2	08.9
23	28°12.9	186°41.3	29.6	245°09.9	21.6	241°00.6	57.4	18°47.8	08.8
Mer.pass. 21:07		ν 3.3′ d -1.0′	m -4.31	ν 1.2′ d -0.3′	m 0.83	ν 2.2′ d -0.1′	m -2.02	ν 2.6′ d -0.1′	m 0.47

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	43°15.4	201°44.5	S13°28.7	260°11.1	N16°21.3	256°02.8	N13°57.3	33°50.4	N01°08.7
1	58°17.9	216°47.7	27.7	275°12.3	20.9	271°05.0	57.3	48°53.0	08.7
2	73°20.3	231°50.8	26.8	290°13.6	20.6	286°07.2	57.2	63°55.6	08.6
3	88°22.8	246°54.0	·· 25.8	305°14.8	·· 20.2	301°09.3	·· 57.1	78°58.2	·· 08.6
4	103°25.3	261°57.2	24.9	320°16.0	19.9	316°11.5	57.0	94°00.8	08.5
5	118°27.7	277°00.3	23.9	335°17.3	19.6	331°13.7	56.9	109°03.4	08.5
6	133°30.2	292°03.5	S13°23.0	350°18.5	N16°19.2	346°15.9	N13°56.8	124°06.0	N01°08.4
7	148°32.6	307°06.6	22.0	5°19.7	18.9	1°18.1	56.7	139°08.6	08.4
8	163°35.1	322°09.8	21.1	20°21.0	18.5	16°20.3	56.6	154°11.2	08.3
9	178°37.6	337°12.9	·· 20.2	35°22.2	·· 18.2	31°22.5	·· 56.6	169°13.9	·· 08.3
10	193°40.0	352°16.1	19.2	50°23.4	17.8	46°24.6	56.5	184°16.5	08.2
11	208°42.5	7°19.2	18.3	65°24.6	17.5	61°26.8	56.4	199°19.1	08.2
12	223°45.0	22°22.3	S13°17.3	80°25.9	N16°17.2	76°29.0	N13°56.3	214°21.7	N01°08.1
13	238°47.4	37°25.5	16.4	95°27.1	16.8	91°31.2	56.2	229°24.3	08.1
14	253°49.9	52°28.6	15.5	110°28.3	16.5	106°33.4	56.1	244°26.9	08.0
15	268°52.4	67°31.7	·· 14.5	125°29.6	·· 16.1	121°35.6	·· 56.0	259°29.5	·· 08.0
16	283°54.8	82°34.8	13.6	140°30.8	15.8	136°37.8	56.0	274°32.1	07.9
17	298°57.3	97°37.9	12.7	155°32.0	15.5	151°40.0	55.9	289°34.7	07.9
18	313°59.8	112°41.1	S13°11.7	170°33.3	N16°15.1	166°42.1	N13°55.8	304°37.3	N01°07.8
19	329°02.2	127°44.2	10.8	185°34.5	14.8	181°44.3	55.7	319°39.9	07.8
20	344°04.7	142°47.3	09.9	200°35.8	14.4	196°46.5	55.6	334°42.5	07.7
21	359°07.1	157°50.4	·· 09.0	215°37.0	·· 14.1	211°48.7	·· 55.5	349°45.1	·· 07.7
22	14°09.6	172°53.5	08.0	230°38.2	13.8	226°50.9	55.4	4°47.7	07.6
23	29°12.1	187°56.6	07.1	245°39.5	13.4	241°53.1	55.4	19°50.3	07.6
Mer.pass. 21:04		ν 3.2′ d -1.0′	m -4.38	ν 1.2′ d -0.3′	m 0.82	ν 2.2′ d -0.1′	m -2.02	ν 2.6′ d -0.1′	m 0.48

Stars

	SHA	**Dec**
Alpheratz	357°32.9	29°14.6
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°45.5	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.2	5°09.4
Pollux	243°15.4	27°57.6
Avior	234°14.1	-59°35.4
Suhail	222°45.3	-43°32.2
Miaplacidus	221°38.1	-69°49.3
Alphard	217°46.4	-8°46.4
Regulus	207°33.0	11°50.1
Dubhe	193°39.6	61°36.1
Denebola	182°23.7	14°25.3
Gienah	175°42.3	-17°41.3
Acrux	172°59.0	-63°14.7
Gacrux	171°50.5	-57°15.6
Alioth	166°12.2	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.1
Menkent	147°56.3	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.2	15°21.2

Nov 02 Mon	**SHA**	**Mer.pass**
Venus	157°50.8	10:41
Mars	217°55.5	06:43
Jupiter	213°01.2	07:02
Saturn	350°28.2	21:49

Nov 03 Tue	**SHA**	**Mer.pass**
Venus	158°11.0	10:36
Mars	217°25.5	06:41
Jupiter	212°54.2	06:58
Saturn	350°31.7	21:45

Nov 04 Wed	**SHA**	**Mer.pass**
Venus	158°29.1	10:31
Mars	216°55.7	06:39
Jupiter	212°47.4	06:55
Saturn	350°35.0	21:41

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h — Sun — Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.5	S14°40.8	266°57.8	9.2′	N18°38.3	-12.5′	58.7′
1	199°06.5	41.6	281°26.0	9.4′	18°25.8	-12.6′	58.7′
2	214°06.5	42.4	295°54.4	9.5′	18°13.1	-12.7′	58.7′
3	229°06.6	·· 43.2	310°22.9	9.6′	18°00.4	-12.8′	58.6′
4	244°06.6	44.0	324°51.4	9.7′	17°47.6	-12.9′	58.6′
5	259°06.6	44.7	339°20.1	9.8′	17°34.8	-13.0′	58.6′
6	274°06.6	S14°45.5	353°48.9	9.9′	N17°21.8	-13.1′	58.6′
7	289°06.6	46.3	8°17.8	10.0′	17°08.7	-13.1′	58.5′
8	304°06.6	47.1	22°46.7	10.1′	16°55.6	-13.2′	58.5′
9	319°06.6	·· 47.9	37°15.8	10.2′	16°42.4	-13.3′	58.5′
10	334°06.6	48.7	51°45.0	10.3′	16°29.1	-13.4′	58.5′
11	349°06.6	49.5	66°14.3	10.4′	16°15.7	-13.4′	58.5′
12	4°06.6	S14°50.3	80°43.7	10.5′	N16°02.3	-13.5′	58.4′
13	19°06.6	51.1	95°13.2	10.6′	15°48.8	-13.6′	58.4′
14	34°06.6	51.8	109°42.8	10.7′	15°35.2	-13.7′	58.4′
15	49°06.7	·· 52.6	124°12.5	10.8′	15°21.5	-13.7′	58.4′
16	64°06.7	53.4	138°42.3	10.9′	15°07.8	-13.8′	58.3′
17	79°06.7	54.2	153°12.1	11.0′	14°54.0	-13.9′	58.3′
18	94°06.7	S14°55.0	167°42.1	11.1′	N14°40.1	-13.9′	58.3′
19	109°06.7	55.8	182°12.2	11.2′	14°26.2	-14.0′	58.3′
20	124°06.7	56.6	196°42.3	11.2′	14°12.2	-14.1′	58.3′
21	139°06.7	·· 57.3	211°12.6	11.3′	13°58.1	-14.1′	58.2′
22	154°06.7	58.1	225°42.9	11.4′	13°44.0	-14.2′	58.2′
23	169°06.7	58.9	240°13.3	11.5′	13°29.8	-14.2′	58.2′
	SD = 16.1′	d = 0.8′		SD = 16.0′			

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.7	S14°59.7	254°43.8	11.6′	N13°15.6	-14.3′	58.2′
1	199°06.7	15°00.5	269°14.4	11.7′	13°01.3	-14.3′	58.1′
2	214°06.7	01.3	283°45.1	11.8′	12°47.0	-14.4′	58.1′
3	229°06.7	·· 02.0	298°15.9	11.8′	12°32.6	-14.4′	58.1′
4	244°06.7	02.8	312°46.7	11.9′	12°18.1	-14.5′	58.1′
5	259°06.7	03.6	327°17.6	12.0′	12°03.6	-14.5′	58.1′
6	274°06.7	S15°04.4	341°48.6	12.1′	N11°49.1	-14.6′	58.0′
7	289°06.7	05.2	356°19.7	12.2′	11°34.5	-14.6′	58.0′
8	304°06.7	05.9	10°50.9	12.2′	11°19.9	-14.7′	58.0′
9	319°06.7	·· 06.7	25°22.1	12.3′	11°05.2	-14.7′	58.0′
10	334°06.7	07.5	39°53.4	12.4′	10°50.4	-14.8′	57.9′
11	349°06.7	08.3	54°24.8	12.5′	10°35.7	-14.8′	57.9′
12	4°06.7	S15°09.1	68°56.3	12.5′	N10°20.9	-14.8′	57.9′
13	19°06.7	09.8	83°27.8	12.6′	10°06.0	-14.9′	57.9′
14	34°06.7	10.6	97°59.4	12.7′	09°51.2	-14.9′	57.9′
15	49°06.7	·· 11.4	112°31.1	12.7′	09°36.2	-14.9′	57.8′
16	64°06.7	12.2	127°02.8	12.8′	09°21.3	-15.0′	57.8′
17	79°06.7	12.9	141°34.6	12.9′	09°06.3	-15.0′	57.8′
18	94°06.7	S15°13.7	156°06.5	12.9′	N08°51.3	-15.0′	57.8′
19	109°06.7	14.5	170°38.4	13.0′	08°36.3	-15.1′	57.7′
20	124°06.7	15.3	185°10.4	13.1′	08°21.2	-15.1′	57.7′
21	139°06.7	·· 16.0	199°42.5	13.1′	08°06.1	-15.1′	57.7′
22	154°06.7	16.8	214°14.6	13.2′	07°51.0	-15.2′	57.7′
23	169°06.7	17.6	228°46.8	13.2′	07°35.8	-15.2′	57.7′
	SD = 16.1′	d = 0.8′		SD = 15.9′			

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.7	S15°18.4	243°19.0	13.3′	N07°20.6	-15.2′	57.6′
1	199°06.7	19.1	257°51.3	13.3′	07°05.4	-15.2′	57.6′
2	214°06.7	19.9	272°23.6	13.4′	06°50.2	-15.2′	57.6′
3	229°06.6	·· 20.7	286°56.0	13.4′	06°35.0	-15.3′	57.6′
4	244°06.6	21.4	301°28.4	13.5′	06°19.7	-15.3′	57.5′
5	259°06.6	22.2	316°00.9	13.5′	06°04.4	-15.3′	57.5′
6	274°06.6	S15°23.0	330°33.5	13.6′	N05°49.1	-15.3′	57.5′
7	289°06.6	23.8	345°06.1	13.6′	05°33.8	-15.3′	57.5′
8	304°06.6	24.5	359°38.7	13.7′	05°18.5	-15.3′	57.5′
9	319°06.6	·· 25.3	14°11.4	13.7′	05°03.2	-15.3′	57.4′
10	334°06.6	26.1	28°44.1	13.8′	04°47.8	-15.4′	57.4′
11	349°06.6	26.8	43°16.9	13.8′	04°32.5	-15.4′	57.4′
12	4°06.6	S15°27.6	57°49.7	13.9′	N04°17.1	-15.4′	57.4′
13	19°06.6	28.4	72°22.6	13.9′	04°01.7	-15.4′	57.3′
14	34°06.5	29.1	86°55.5	13.9′	03°46.3	-15.4′	57.3′
15	49°06.5	·· 29.9	101°28.4	14.0′	03°30.9	-15.4′	57.3′
16	64°06.5	30.7	116°01.4	14.0′	03°15.5	-15.4′	57.3′
17	79°06.5	31.4	130°34.4	14.0′	03°00.2	-15.4′	57.3′
18	94°06.5	S15°32.2	145°07.4	14.1′	N02°44.8	-15.4′	57.2′
19	109°06.5	33.0	159°40.5	14.1′	02°29.4	-15.4′	57.2′
20	124°06.5	33.7	174°13.6	14.1′	02°14.0	-15.4′	57.2′
21	139°06.5	·· 34.5	188°46.7	14.2′	01°58.6	-15.4′	57.2′
22	154°06.4	35.3	203°19.8	14.2′	01°43.2	-15.4′	57.1′
23	169°06.4	36.0	217°53.0	14.2′	01°27.8	-15.4′	57.1′
	SD = 16.1′	d = 0.8′		SD = 15.7′			

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

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

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 23-25 48-27%
02	16:26	16:27	11:44	06:26	18:51	
03	16:27	16:27	11:44	07:15	19:39	
04	16:27	16:26	11:44	08:01	20:24	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°14.5	202°59.6	S13°06.2	260°40.7	N16°13.1	256°55.3	N13°55.3	34°52.9	N01°07.5
1	59°17.0	218°02.7	05.3	275°41.9	12.7	271°57.5	55.2	49°55.5	07.4
2	74°19.5	233°05.8	04.3	290°43.2	12.4	286°59.6	55.1	64°58.1	07.4
3	89°21.9	248°08.9	·· 03.4	305°44.4	·· 12.0	302°01.8	·· 55.0	80°00.7	·· 07.3
4	104°24.4	263°12.0	02.5	320°45.7	11.7	317°04.0	54.9	95°03.3	07.3
5	119°26.9	278°15.0	01.6	335°46.9	11.4	332°06.2	54.8	110°05.9	07.2
6	134°29.3	293°18.1	S13°00.7	350°48.1	N16°11.0	347°08.4	N13°54.8	125°08.5	N01°07.2
7	149°31.8	308°21.1	12°59.8	5°49.4	10.7	2°10.6	54.7	140°11.1	07.1
8	164°34.3	323°24.2	58.9	20°50.6	10.3	17°12.8	54.6	155°13.7	07.1
9	179°36.7	338°27.3	·· 58.0	35°51.9	·· 10.0	32°15.0	·· 54.5	170°16.3	·· 07.0
10	194°39.2	353°30.3	57.0	50°53.1	09.7	47°17.2	54.4	185°18.9	07.0
11	209°41.6	8°33.4	56.1	65°54.3	09.3	62°19.4	54.3	200°21.5	06.9
12	224°44.1	23°36.4	S12°55.2	80°55.6	N16°09.0	77°21.6	N13°54.3	215°24.1	N01°06.9
13	239°46.6	38°39.4	54.3	95°56.8	08.6	92°23.8	54.2	230°26.7	06.8
14	254°49.0	53°42.5	53.4	110°58.1	08.3	107°25.9	54.1	245°29.3	06.8
15	269°51.5	68°45.5	·· 52.5	125°59.3	·· 08.0	122°28.1	·· 54.0	260°31.9	·· 06.7
16	284°54.0	83°48.5	51.6	141°00.6	07.6	137°30.3	53.9	275°34.5	06.7
17	299°56.4	98°51.6	50.7	156°01.8	07.3	152°32.5	53.8	290°37.1	06.6
18	314°58.9	113°54.6	S12°49.8	171°03.1	N16°06.9	167°34.7	N13°53.7	305°39.7	N01°06.6
19	330°01.4	128°57.6	48.9	186°04.3	06.6	182°36.9	53.7	320°42.3	06.5
20	345°03.8	144°00.6	48.0	201°05.5	06.3	197°39.1	53.6	335°44.9	06.5
21	0°06.3	159°03.6	·· 47.1	216°06.8	·· 05.9	212°41.3	·· 53.5	350°47.5	·· 06.4
22	15°08.7	174°06.6	46.2	231°08.0	05.6	227°43.5	53.4	5°50.1	06.4
23	30°11.2	189°09.6	45.4	246°09.3	05.2	242°45.7	53.3	20°52.7	06.3
Mer.pass. 21:00		ν 3.1′ d -0.9′	m -4.44	ν 1.2′ d -0.3′	m 0.81	ν 2.2′ d -0.1′	m -2.03	ν 2.6′ d -0.1′	m 0.48

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°13.7	204°12.6	S12°44.5	261°10.5	N16°04.9	257°47.9	N13°53.2	35°55.3	N01°06.3
1	60°16.1	219°15.6	43.6	276°11.8	04.6	272°50.1	53.2	50°57.9	06.2
2	75°18.6	234°18.6	42.7	291°13.0	04.2	287°52.3	53.1	66°00.4	06.2
3	90°21.1	249°21.6	·· 41.8	306°14.3	·· 03.9	302°54.5	·· 53.0	81°03.0	·· 06.1
4	105°23.5	264°24.6	40.9	321°15.5	03.5	317°56.7	52.9	96°05.6	06.1
5	120°26.0	279°27.5	40.1	336°16.8	03.2	332°58.9	52.8	111°08.2	06.0
6	135°28.5	294°30.5	S12°39.2	351°18.0	N16°02.9	348°01.1	N13°52.7	126°10.8	N01°06.0
7	150°30.9	309°33.5	38.3	6°19.3	02.5	3°03.3	52.7	141°13.4	05.9
8	165°33.4	324°36.4	37.4	21°20.5	02.2	18°05.5	52.6	156°16.0	05.9
9	180°35.9	339°39.4	·· 36.5	36°21.8	·· 01.8	33°07.7	·· 52.5	171°18.6	·· 05.8
10	195°38.3	354°42.4	35.7	51°23.0	01.5	48°09.9	52.4	186°21.2	05.8
11	210°40.8	9°45.3	34.8	66°24.3	01.2	63°12.0	52.3	201°23.8	05.7
12	225°43.2	24°48.3	S12°33.9	81°25.5	N16°00.8	78°14.2	N13°52.2	216°26.4	N01°05.7
13	240°45.7	39°51.2	33.1	96°26.8	00.5	93°16.4	52.2	231°29.0	05.6
14	255°48.2	54°54.1	32.2	111°28.0	16°00.1	108°18.6	52.1	246°31.6	05.6
15	270°50.6	69°57.1	·· 31.3	126°29.3	15°59.8	123°20.8	·· 52.0	261°34.2	·· 05.5
16	285°53.1	85°00.0	30.5	141°30.6	59.5	138°23.0	51.9	276°36.8	05.5
17	300°55.6	100°03.0	29.6	156°31.8	59.1	153°25.2	51.8	291°39.4	05.4
18	315°58.0	115°05.9	S12°28.7	171°33.1	N15°58.8	168°27.4	N13°51.8	306°42.0	N01°05.4
19	331°00.5	130°08.8	27.9	186°34.3	58.4	183°29.6	51.7	321°44.6	05.4
20	346°03.0	145°11.7	27.0	201°35.6	58.1	198°31.8	51.6	336°47.2	05.3
21	1°05.4	160°14.6	·· 26.2	216°36.8	·· 57.8	213°34.0	·· 51.5	351°49.8	·· 05.3
22	16°07.9	175°17.5	25.3	231°38.1	57.4	228°36.2	51.4	6°52.4	05.2
23	31°10.3	190°20.5	24.5	246°39.4	57.1	243°38.4	51.3	21°55.0	05.2
Mer.pass. 20:56		ν 3.0′ d -0.9′	m -4.50	ν 1.2′ d -0.3′	m 0.80	ν 2.2′ d -0.1′	m -2.03	ν 2.6′ d -0.0′	m 0.48

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°12.8	205°23.4	S12°23.6	261°40.6	N15°56.7	258°40.6	N13°51.3	36°57.6	N01°05.1
1	61°15.3	220°26.3	22.7	276°41.9	56.4	273°42.8	51.2	52°00.2	05.1
2	76°17.7	235°29.2	21.9	291°43.1	56.1	288°45.1	51.1	67°02.8	05.0
3	91°20.2	250°32.0	·· 21.1	306°44.4	·· 55.7	303°47.3	·· 51.0	82°05.4	·· 05.0
4	106°22.7	265°34.9	20.2	321°45.6	55.4	318°49.5	50.9	97°07.9	04.9
5	121°25.1	280°37.8	19.4	336°46.9	55.0	333°51.7	50.9	112°10.5	04.9
6	136°27.6	295°40.7	S12°18.5	351°48.2	N15°54.7	348°53.9	N13°50.8	127°13.1	N01°04.8
7	151°30.1	310°43.6	17.7	6°49.4	54.4	3°56.1	50.7	142°15.7	04.8
8	166°32.5	325°46.4	16.8	21°50.7	54.0	18°58.3	50.6	157°18.3	04.7
9	181°35.0	340°49.3	·· 16.0	36°52.0	·· 53.7	34°00.5	·· 50.5	172°20.9	·· 04.7
10	196°37.5	355°52.2	15.2	51°53.2	53.4	49°02.7	50.5	187°23.5	04.6
11	211°39.9	10°55.0	14.3	66°54.5	53.0	64°04.9	50.4	202°26.1	04.6
12	226°42.4	25°57.9	S12°13.5	81°55.7	N15°52.7	79°07.1	N13°50.3	217°28.7	N01°04.5
13	241°44.8	41°00.7	12.7	96°57.0	52.3	94°09.3	50.2	232°31.3	04.5
14	256°47.3	56°03.6	11.8	111°58.3	52.0	109°11.5	50.1	247°33.9	04.4
15	271°49.8	71°06.4	·· 11.0	126°59.5	·· 51.7	124°13.7	·· 50.1	262°36.5	·· 04.4
16	286°52.2	86°09.3	10.2	142°00.8	51.3	139°15.9	50.0	277°39.1	04.3
17	301°54.7	101°12.1	09.4	157°02.1	51.0	154°18.1	49.9	292°41.7	04.3
18	316°57.2	116°14.9	S12°08.5	172°03.3	N15°50.6	169°20.3	N13°49.8	307°44.3	N01°04.2
19	331°59.6	131°17.8	07.7	187°04.6	50.3	184°22.5	49.7	322°46.8	04.2
20	347°02.1	146°20.6	06.9	202°05.9	50.0	199°24.7	49.7	337°49.4	04.2
21	2°04.6	161°23.4	·· 06.1	217°07.1	·· 49.6	214°26.9	·· 49.6	352°52.0	·· 04.1
22	17°07.0	176°26.2	05.3	232°08.4	49.3	229°29.1	49.5	7°54.6	04.1
23	32°09.5	191°29.0	04.5	247°09.7	49.0	244°31.3	49.4	22°57.2	04.0
Mer.pass. 20:52		ν 2.9′ d -0.9′	m -4.55	ν 1.3′ d -0.3′	m 0.79	ν 2.2′ d -0.1′	m -2.04	ν 2.6′ d -0.0′	m 0.49

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.3	-42°09.6
Schedar	349°28.8	56°41.3
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°45.2	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.2	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°36.0	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.2	5°09.4
Pollux	243°15.4	27°57.6
Avior	234°14.0	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°38.0	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°33.0	11°50.1
Dubhe	193°39.6	61°36.1
Denebola	182°23.7	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°59.0	-63°14.7
Gacrux	171°50.5	-57°15.6
Alioth	166°12.2	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.1
Menkent	147°56.3	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.6
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.8	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.2	15°21.2

Nov 05 Thu	SHA	Mer.pass
Venus	158°45.1	10:26
Mars	216°26.2	06:37
Jupiter	212°40.7	06:51
Saturn	350°38.3	21:37

Nov 06 Fri	SHA	Mer.pass
Venus	158°58.9	10:21
Mars	215°56.9	06:35
Jupiter	212°34.2	06:48
Saturn	350°41.6	21:33

Nov 07 Sat	SHA	Mer.pass
Venus	159°10.5	10:16
Mars	215°27.8	06:33
Jupiter	212°27.8	06:44
Saturn	350°44.8	21:28

Horizontal parallax	
Venus:	0.5
Mars:	0.1

DUT1 = UT1-UTC = -0.0605 sec ΔT = TT-UT1 = +69.2445 sec

2026 November 05 to Nov. 07 UT

h — Sun — Moon

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.4	S15°36.8	232°26.3	14.2′	N01°12.4	-15.4′	57.1′
1	199°06.4	37.5	246°59.5	14.3′	00°57.0	-15.4′	57.1′
2	214°06.4	38.3	261°32.8	14.3′	00°41.6	-15.4′	57.1′
3	229°06.4	·· 39.1	276°06.0	14.3′	00°26.2	-15.4′	57.0′
4	244°06.4	39.8	290°39.3	14.3′	N00°10.9	-15.4′	57.0′
5	259°06.3	40.6	305°12.7	14.3′	S00°04.5	15.3′	57.0′
6	274°06.3	S15°41.3	319°46.0	14.4′	S00°19.8	15.3′	57.0′
7	289°06.3	42.1	334°19.4	14.4′	00°35.1	15.3′	56.9′
8	304°06.3	42.9	348°52.8	14.4′	00°50.4	15.3′	56.9′
9	319°06.3	·· 43.6	3°26.2	14.4′	01°05.7	15.3′	56.9′
10	334°06.3	44.4	17°59.6	14.4′	01°21.0	15.3′	56.9′
11	349°06.2	45.1	32°33.0	14.4′	01°36.3	15.3′	56.9′
12	4°06.2	S15°45.9	47°06.4	14.4′	S01°51.6	15.2′	56.8′
13	19°06.2	46.6	61°39.9	14.5′	02°06.8	15.2′	56.8′
14	34°06.2	47.4	76°13.4	14.5′	02°22.0	15.2′	56.8′
15	49°06.2	·· 48.2	90°46.8	14.5′	02°37.2	15.2′	56.8′
16	64°06.1	48.9	105°20.3	14.5′	02°52.4	15.1′	56.8′
17	79°06.1	49.7	119°53.8	14.5′	03°07.5	15.1′	56.7′
18	94°06.1	S15°50.4	134°27.3	14.5′	S03°22.6	15.1′	56.7′
19	109°06.1	51.2	149°00.8	14.5′	03°37.7	15.1′	56.7′
20	124°06.1	51.9	163°34.3	14.5′	03°52.8	15.0′	56.7′
21	139°06.0	·· 52.7	178°07.7	14.5′	04°07.9	15.0′	56.6′
22	154°06.0	53.4	192°41.2	14.5′	04°22.9	15.0′	56.6′
23	169°06.0	54.2	207°14.7	14.5′	04°37.9	15.0′	56.6′
	SD = 16.1′	d = 0.8′		SD = 15.6′			

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.0	S15°54.9	221°48.2	14.5′	S04°52.8	14.9′	56.6′
1	199°05.9	55.7	236°21.7	14.5′	05°07.8	14.9′	56.6′
2	214°05.9	56.4	250°55.2	14.5′	05°22.7	14.9′	56.5′
3	229°05.9	·· 57.2	265°28.7	14.5′	05°37.5	14.8′	56.5′
4	244°05.9	57.9	280°02.2	14.5′	05°52.3	14.8′	56.5′
5	259°05.8	58.7	294°35.6	14.5′	06°07.1	14.8′	56.5′
6	274°05.8	S15°59.4	309°09.1	14.5′	S06°21.9	14.7′	56.5′
7	289°05.8	16°00.2	323°42.6	14.4′	06°36.6	14.7′	56.4′
8	304°05.8	00.9	338°16.0	14.4′	06°51.3	14.6′	56.4′
9	319°05.7	·· 01.7	352°49.4	14.4′	07°06.0	14.6′	56.4′
10	334°05.7	02.4	7°22.9	14.4′	07°20.6	14.6′	56.4′
11	349°05.7	03.2	21°56.3	14.4′	07°35.1	14.5′	56.4′
12	4°05.7	S16°03.9	36°29.7	14.4′	S07°49.7	14.5′	56.3′
13	19°05.6	04.7	51°03.1	14.4′	08°04.1	14.4′	56.3′
14	34°05.6	05.4	65°36.4	14.3′	08°18.6	14.4′	56.3′
15	49°05.6	·· 06.2	80°09.8	14.3′	08°33.0	14.3′	56.3′
16	64°05.5	06.9	94°43.1	14.3′	08°47.3	14.3′	56.3′
17	79°05.5	07.6	109°16.4	14.3′	09°01.6	14.2′	56.2′
18	94°05.5	S16°08.4	123°49.7	14.3′	S09°15.9	14.2′	56.2′
19	109°05.5	09.1	138°23.0	14.2′	09°30.1	14.2′	56.2′
20	124°05.4	09.9	152°56.2	14.2′	09°44.2	14.1′	56.2′
21	139°05.4	·· 10.6	167°29.4	14.2′	09°58.3	14.0′	56.2′
22	154°05.4	11.4	182°02.6	14.2′	10°12.3	14.0′	56.1′
23	169°05.3	12.1	196°35.8	14.2′	10°26.3	13.9′	56.1′
	SD = 16.1′	d = 0.8′		SD = 15.4′			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.3	S16°12.8	211°09.0	14.1′	S10°40.3	13.9′	56.1′
1	199°05.3	13.6	225°42.1	14.1′	10°54.2	13.8′	56.1′
2	214°05.2	14.3	240°15.2	14.1′	11°08.0	13.8′	56.0′
3	229°05.2	·· 15.1	254°48.3	14.0′	11°21.8	13.7′	56.0′
4	244°05.2	15.8	269°21.3	14.0′	11°35.5	13.7′	56.0′
5	259°05.1	16.5	283°54.4	14.0′	11°49.1	13.6′	56.0′
6	274°05.1	S16°17.3	298°27.3	14.0′	S12°02.7	13.5′	56.0′
7	289°05.1	18.0	313°00.3	13.9′	12°16.3	13.5′	55.9′
8	304°05.0	18.7	327°33.2	13.9′	12°29.8	13.4′	55.9′
9	319°05.0	·· 19.5	342°06.1	13.9′	12°43.2	13.3′	55.9′
10	334°05.0	20.2	356°39.0	13.8′	12°56.5	13.3′	55.9′
11	349°04.9	20.9	11°11.8	13.8′	13°09.8	13.2′	55.9′
12	4°04.9	S16°21.7	25°44.6	13.8′	S13°23.0	13.2′	55.9′
13	19°04.8	22.4	40°17.3	13.7′	13°36.2	13.1′	55.8′
14	34°04.8	23.1	54°50.1	13.7′	13°49.2	13.0′	55.8′
15	49°04.8	·· 23.9	69°22.7	13.6′	14°02.3	12.9′	55.8′
16	64°04.7	24.6	83°55.4	13.6′	14°15.2	12.9′	55.8′
17	79°04.7	25.3	98°28.0	13.6′	14°28.1	12.8′	55.8′
18	94°04.7	S16°26.1	113°00.6	13.5′	S14°40.9	12.7′	55.7′
19	109°04.6	26.8	127°33.1	13.5′	14°53.6	12.7′	55.7′
20	124°04.6	27.5	142°05.6	13.5′	15°06.3	12.6′	55.7′
21	139°04.5	·· 28.3	156°38.0	13.4′	15°18.9	12.5′	55.7′
22	154°04.5	29.0	171°10.5	13.4′	15°31.4	12.4′	55.7′
23	169°04.5	29.7	185°42.8	13.3′	15°43.8	12.4′	55.6′
	SD = 16.1′	d = 0.7′		SD = 15.3′			

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

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

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Age 26-28 18-5%
05	16:26	16:25	11:44	08:46	21:08	
06	16:24	16:23	11:44	09:30	21:52	
07	16:21	16:20	11:44	10:14	22:36	

November 08, 09, 10 UT (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	47°12.0	206°31.9	S12°03.6	262°10.9	N15°48.6	259°33.6	N13°49.3	37°59.8	N01°04.0
1	62°14.4	221°34.7	02.8	277°12.2	48.3	274°35.8	49.3	53°02.4	03.9
2	77°16.9	236°37.5	02.0	292°13.5	47.9	289°38.0	49.2	68°05.0	03.9
3	92°19.3	251°40.3	·· 01.2	307°14.7	·· 47.6	304°40.2	·· 49.1	83°07.6	·· 03.8
4	107°21.8	266°43.0	12°00.4	322°16.0	47.3	319°42.4	49.0	98°10.2	03.8
5	122°24.3	281°45.8	11°59.6	337°17.3	46.9	334°44.6	48.9	113°12.8	03.7
6	137°26.7	296°48.6	S11°58.8	352°18.6	N15°46.6	349°46.8	N13°48.9	128°15.4	N01°03.7
7	152°29.2	311°51.4	58.0	7°19.8	46.2	4°49.0	48.8	143°18.0	03.6
8	167°31.7	326°54.2	57.2	22°21.1	45.9	19°51.2	48.7	158°20.5	03.6
9	182°34.1	341°57.0	·· 56.4	37°22.4	·· 45.6	34°53.4	·· 48.6	173°23.1	·· 03.5
10	197°36.6	356°59.7	55.6	52°23.7	45.2	49°55.6	48.5	188°25.7	03.5
11	212°39.1	12°02.5	54.8	67°24.9	44.9	64°57.9	48.5	203°28.3	03.4
12	227°41.5	27°05.3	S11°54.0	82°26.2	N15°44.6	80°00.1	N13°48.4	218°30.9	N01°03.4
13	242°44.0	42°08.0	53.2	97°27.5	44.2	95°02.3	48.3	233°33.5	03.4
14	257°46.4	57°10.8	52.5	112°28.7	43.9	110°04.5	48.2	248°36.1	03.3
15	272°48.9	72°13.5	·· 51.7	127°30.0	·· 43.5	125°06.7	·· 48.2	263°38.7	·· 03.3
16	287°51.4	87°16.3	50.9	142°31.3	43.2	140°08.9	48.1	278°41.3	03.2
17	302°53.8	102°19.0	50.1	157°32.6	42.9	155°11.1	48.0	293°43.9	03.2
18	317°56.3	117°21.7	S11°49.3	172°33.9	N15°42.5	170°13.3	N13°47.9	308°46.4	N01°03.1
19	332°58.8	132°24.5	48.5	187°35.1	42.2	185°15.6	47.8	323°49.0	03.1
20	348°01.2	147°27.2	47.8	202°36.4	41.9	200°17.8	47.8	338°51.6	03.0
21	3°03.7	162°29.9	·· 47.0	217°37.7	·· 41.5	215°20.0	·· 47.7	353°54.2	·· 03.0
22	18°06.2	177°32.7	46.2	232°39.0	41.2	230°22.2	47.6	8°56.8	02.9
23	33°08.6	192°35.4	45.4	247°40.2	40.8	245°24.4	47.5	23°59.4	02.9
Mer.pass. 20:48		ν 2.8′	d -0.8′	m -4.60	ν 1.3′	d -0.3′	m 0.78	ν 2.2′	d -0.1′ m -2.04	ν 2.6′	d -0.0′ m 0.49

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	48°11.1	207°38.1	S11°44.7	262°41.5	N15°40.5	260°26.6	N13°47.5	39°02.0	N01°02.9
1	63°13.6	222°40.8	43.9	277°42.8	40.2	275°28.8	47.4	54°04.6	02.8
2	78°16.0	237°43.5	43.1	292°44.1	39.8	290°31.0	47.3	69°07.2	02.8
3	93°18.5	252°46.2	·· 42.4	307°45.4	·· 39.5	305°33.3	·· 47.2	84°09.7	·· 02.7
4	108°20.9	267°48.9	41.6	322°46.6	39.2	320°35.5	47.1	99°12.3	02.7
5	123°23.4	282°51.6	40.9	337°47.9	38.8	335°37.7	47.1	114°14.9	02.6
6	138°25.9	297°54.3	S11°40.1	352°49.2	N15°38.5	350°39.9	N13°47.0	129°17.5	N01°02.6
7	153°28.3	312°57.0	39.3	7°50.5	38.2	5°42.1	46.9	144°20.1	02.5
8	168°30.8	327°59.7	38.6	22°51.8	37.8	20°44.3	46.8	159°22.7	02.5
9	183°33.3	343°02.3	·· 37.8	37°53.1	·· 37.5	35°46.6	·· 46.8	174°25.3	·· 02.4
10	198°35.7	358°05.0	37.1	52°54.3	37.1	50°48.8	46.7	189°27.9	02.4
11	213°38.2	13°07.7	36.3	67°55.6	36.8	65°51.0	46.6	204°30.5	02.4
12	228°40.7	28°10.3	S11°35.6	82°56.9	N15°36.5	80°53.2	N13°46.5	219°33.0	N01°02.3
13	243°43.1	43°13.0	34.8	97°58.2	36.1	95°55.4	46.5	234°35.6	02.3
14	258°45.6	58°15.7	34.1	112°59.5	35.8	110°57.6	46.4	249°38.2	02.2
15	273°48.1	73°18.3	·· 33.3	128°00.8	·· 35.5	125°59.9	·· 46.3	264°40.8	·· 02.2
16	288°50.5	88°21.0	32.6	143°02.1	35.1	141°02.1	46.2	279°43.4	02.1
17	303°53.0	103°23.6	31.9	158°03.3	34.8	156°04.3	46.2	294°46.0	02.1
18	318°55.4	118°26.3	S11°31.1	173°04.6	N15°34.5	171°06.5	N13°46.1	309°48.6	N01°02.0
19	333°57.9	133°28.9	30.4	188°05.9	34.1	186°08.7	46.0	324°51.2	02.0
20	349°00.4	148°31.5	29.7	203°07.2	33.8	201°10.9	45.9	339°53.7	02.0
21	4°02.8	163°34.2	·· 28.9	218°08.5	·· 33.4	216°13.2	·· 45.9	354°56.3	·· 01.9
22	19°05.3	178°36.8	28.2	233°09.8	33.1	231°15.4	45.8	9°58.9	01.9
23	34°07.8	193°39.4	27.5	248°11.1	32.8	246°17.6	45.7	25°01.5	01.8
Mer.pass. 20:44		ν 2.7′	d -0.8′	m -4.64	ν 1.3′	d -0.3′	m 0.77	ν 2.2′	d -0.1′ m -2.05	ν 2.6′	d -0.0′ m 0.50

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	49°10.2	208°42.0	S11°26.7	263°12.4	N15°32.4	261°19.8	N13°45.6	40°04.1	N01°01.8
1	64°12.7	223°44.7	26.0	278°13.7	32.1	276°22.0	45.6	55°06.7	01.7
2	79°15.2	238°47.3	25.3	293°14.9	31.8	291°24.3	45.5	70°09.3	01.7
3	94°17.6	253°49.9	·· 24.6	308°16.2	·· 31.4	306°26.5	·· 45.4	85°11.8	·· 01.6
4	109°20.1	268°52.5	23.9	323°17.5	31.1	321°28.7	45.3	100°14.4	01.6
5	124°22.5	283°55.1	23.1	338°18.8	30.8	336°30.9	45.3	115°17.0	01.6
6	139°25.0	298°57.7	S11°22.4	353°20.1	N15°30.4	351°33.2	N13°45.2	130°19.6	N01°01.5
7	154°27.5	314°00.3	21.7	8°21.4	30.1	6°35.4	45.1	145°22.2	01.5
8	169°29.9	329°02.9	21.0	23°22.7	29.8	21°37.6	45.0	160°24.8	01.4
9	184°32.4	344°05.4	·· 20.3	38°24.0	·· 29.4	36°39.8	·· 45.0	175°27.3	·· 01.4
10	199°34.9	359°08.0	19.6	53°25.3	29.1	51°42.0	44.9	190°29.9	01.3
11	214°37.3	14°10.6	18.9	68°26.6	28.8	66°44.3	44.8	205°32.5	01.3
12	229°39.8	29°13.2	S11°18.2	83°27.9	N15°28.4	81°46.5	N13°44.7	220°35.1	N01°01.3
13	244°42.3	44°15.7	17.5	98°29.2	28.1	96°48.7	44.7	235°37.7	01.2
14	259°44.7	59°18.3	16.8	113°30.5	27.7	111°50.9	44.6	250°40.3	01.2
15	274°47.2	74°20.9	·· 16.1	128°31.8	·· 27.4	126°53.2	·· 44.5	265°42.9	·· 01.1
16	289°49.7	89°23.4	15.4	143°33.1	27.1	141°55.4	44.4	280°45.4	01.1
17	304°52.1	104°26.0	14.7	158°34.4	26.7	156°57.6	44.4	295°48.0	01.0
18	319°54.6	119°28.5	S11°14.0	173°35.7	N15°26.4	171°59.8	N13°44.3	310°50.6	N01°01.0
19	334°57.0	134°31.1	13.3	188°37.0	26.1	187°02.1	44.2	325°53.2	01.0
20	349°59.5	149°33.6	12.6	203°38.3	25.7	202°04.3	44.1	340°55.8	00.9
21	5°02.0	164°36.1	·· 11.9	218°39.6	·· 25.4	217°06.5	·· 44.1	355°58.4	·· 00.9
22	20°04.4	179°38.7	11.2	233°40.9	25.1	232°08.7	44.0	11°00.9	00.8
23	35°06.9	194°41.2	10.6	248°42.2	24.7	247°11.0	43.9	26°03.5	00.8
Mer.pass. 20:40		ν 2.6′	d -0.7′	m -4.68	ν 1.3′	d -0.3′	m 0.75	ν 2.2′	d -0.1′ m -2.06	ν 2.6′	d -0.0′ m 0.50

Stars

	SHA	**Dec**
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.6
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°44.8	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.3	4°11.8
Mirfak	308°25.6	49°57.4
Aldebaran	290°37.6	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.3	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.7	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.4	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°14.0	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°38.0	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.5	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°59.0	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.2	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.7
Hadar	148°34.5	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.4	-26°29.5
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°30.9	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 08 Sun	**SHA**	**Mer.pass**
Venus	159°19.9	10:12
Mars	214°59.0	06:31
Jupiter	212°21.6	06:41
Saturn	350°47.9	21:24

Nov 09 Mon	**SHA**	**Mer.pass**
Venus	159°27.0	10:08
Mars	214°30.4	06:29
Jupiter	212°15.5	06:37
Saturn	350°50.9	21:20

Nov 10 Tue	**SHA**	**Mer.pass**
Venus	159°31.8	10:03
Mars	214°02.1	06:27
Jupiter	212°09.6	06:34
Saturn	350°53.9	21:16

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°04.4	S16°30.5	200°15.1	13.3′	S15°56.1	12.3′	55.6′
1	199°04.4	31.2	214°47.4	13.2′	16°08.4	12.2′	55.6′
2	214°04.3	31.9	229°19.7	13.2′	16°20.6	12.1′	55.6′
3	229°04.3	·· 32.6	243°51.9	13.2′	16°32.7	12.0′	55.6′
4	244°04.3	33.4	258°24.0	13.1′	16°44.8	12.0′	55.5′
5	259°04.2	34.1	272°56.1	13.1′	16°56.7	11.9′	55.5′
6	274°04.2	S16°34.8	287°28.2	13.0′	S17°08.6	11.8′	55.5′
7	289°04.1	35.5	302°00.2	13.0′	17°20.4	11.7′	55.5′
8	304°04.1	36.3	316°32.2	12.9′	17°32.1	11.6′	55.5′
9	319°04.0	·· 37.0	331°04.1	12.9′	17°43.7	11.5′	55.4′
10	334°04.0	37.7	345°36.0	12.8′	17°55.2	11.4′	55.4′
11	349°03.9	38.4	0°07.8	12.8′	18°06.7	11.4′	55.4′
12	4°03.9	S16°39.2	14°39.6	12.7′	S18°18.0	11.3′	55.4′
13	19°03.9	39.9	29°11.3	12.7′	18°29.3	11.2′	55.4′
14	34°03.8	40.6	43°43.0	12.6′	18°40.5	11.1′	55.4′
15	49°03.8	·· 41.3	58°14.7	12.6′	18°51.6	11.0′	55.3′
16	64°03.7	42.1	72°46.3	12.5′	19°02.5	10.9′	55.3′
17	79°03.7	42.8	87°17.8	12.5′	19°13.4	10.8′	55.3′
18	94°03.6	S16°43.5	101°49.3	12.4′	S19°24.2	10.7′	55.3′
19	109°03.6	44.2	116°20.8	12.4′	19°35.0	10.6′	55.3′
20	124°03.5	44.9	130°52.2	12.3′	19°45.6	10.5′	55.2′
21	139°03.5	·· 45.7	145°23.5	12.3′	19°56.1	10.4′	55.2′
22	154°03.4	46.4	159°54.8	12.3′	20°06.5	10.3′	55.2′
23	169°03.4	47.1	174°26.1	12.2′	20°16.8	10.2′	55.2′
	SD = 16.1′	d = 0.7′	SD = 15.2′				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°03.3	S16°47.8	188°57.3	12.2′	S20°27.1	10.1′	55.2′
1	199°03.3	48.5	203°28.4	12.1′	20°37.2	10.0′	55.2′
2	214°03.2	49.2	217°59.5	12.1′	20°47.2	9.9′	55.1′
3	229°03.2	·· 50.0	232°30.6	12.0′	20°57.1	9.8′	55.1′
4	244°03.1	50.7	247°01.6	12.0′	21°06.9	9.7′	55.1′
5	259°03.1	51.4	261°32.5	11.9′	21°16.6	9.6′	55.1′
6	274°03.0	S16°52.1	276°03.4	11.9′	S21°26.3	9.5′	55.1′
7	289°03.0	52.8	290°34.3	11.8′	21°35.8	9.4′	55.1′
8	304°02.9	53.5	305°05.1	11.8′	21°45.2	9.3′	55.0′
9	319°02.9	·· 54.2	319°35.8	11.7′	21°54.5	9.2′	55.0′
10	334°02.8	55.0	334°06.5	11.7′	22°03.6	9.1′	55.0′
11	349°02.8	55.7	348°37.2	11.6′	22°12.7	9.0′	55.0′
12	4°02.7	S16°56.4	3°07.8	11.6′	S22°21.7	8.9′	55.0′
13	19°02.7	57.1	17°38.3	11.5′	22°30.5	8.7′	55.0′
14	34°02.6	57.8	32°08.9	11.5′	22°39.3	8.6′	54.9′
15	49°02.5	·· 58.5	46°39.3	11.4′	22°47.9	8.5′	54.9′
16	64°02.5	59.2	61°09.7	11.4′	22°56.4	8.4′	54.9′
17	79°02.4	16°59.9	75°40.1	11.3′	23°04.9	8.3′	54.9′
18	94°02.4	S17°00.6	90°10.4	11.3′	S23°13.1	8.2′	54.9′
19	109°02.3	01.3	104°40.7	11.2′	23°21.3	8.1′	54.9′
20	124°02.3	02.0	119°10.9	11.2′	23°29.4	8.0′	54.8′
21	139°02.2	·· 02.8	133°41.1	11.1′	23°37.3	7.8′	54.8′
22	154°02.1	03.5	148°11.2	11.1′	23°45.2	7.7′	54.8′
23	169°02.1	04.2	162°41.3	11.0′	23°52.9	7.6′	54.8′
	SD = 16.1′	d = 0.7′	SD = 15.0′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°02.0	S17°04.9	177°11.4	11.0′	S24°00.5	7.5′	54.8′
1	199°02.0	05.6	191°41.4	11.0′	24°08.0	7.4′	54.8′
2	214°01.9	06.3	206°11.3	10.9′	24°15.3	7.2′	54.8′
3	229°01.8	·· 07.0	220°41.2	10.9′	24°22.6	7.1′	54.7′
4	244°01.8	07.7	235°11.1	10.8′	24°29.7	7.0′	54.7′
5	259°01.7	08.4	249°40.9	10.8′	24°36.7	6.9′	54.7′
6	274°01.7	S17°09.1	264°10.7	10.7′	S24°43.6	6.8′	54.7′
7	289°01.6	09.8	278°40.4	10.7′	24°50.3	6.6′	54.7′
8	304°01.5	10.5	293°10.1	10.7′	24°57.0	6.5′	54.7′
9	319°01.5	·· 11.2	307°39.8	10.6′	25°03.5	6.4′	54.6′
10	334°01.4	11.9	322°09.4	10.6′	25°09.8	6.3′	54.6′
11	349°01.4	12.6	336°39.0	10.5′	25°16.1	6.1′	54.6′
12	4°01.3	S17°13.3	351°08.6	10.5′	S25°22.2	6.0′	54.6′
13	19°01.2	14.0	5°38.1	10.5′	25°28.2	5.9′	54.6′
14	34°01.2	14.7	20°07.5	10.4′	25°34.1	5.8′	54.6′
15	49°01.1	·· 15.4	34°37.0	10.4′	25°39.9	5.6′	54.6′
16	64°01.0	16.1	49°06.4	10.4′	25°45.5	5.5′	54.5′
17	79°01.0	16.8	63°35.8	10.3′	25°51.0	5.4′	54.5′
18	94°00.9	S17°17.5	78°05.1	10.3′	S25°56.4	5.2′	54.5′
19	109°00.8	18.2	92°34.4	10.3′	26°01.6	5.1′	54.5′
20	124°00.8	18.9	107°03.7	10.2′	26°06.7	5.0′	54.5′
21	139°00.7	·· 19.6	121°32.9	10.2′	26°11.7	4.9′	54.5′
22	154°00.6	20.3	136°02.1	10.2′	26°16.5	4.7′	54.5′
23	169°00.6	20.9	150°31.3	10.2′	26°21.3	4.6′	54.5′
	SD = 16.1′	d = 0.7′	SD = 14.9′				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 29-1 2-1%
08	16:18	16:16	11:44	10:59	23:23	
09	16:13	16:11	11:44	11:47	–:–	
10	16:08	16:05	11:44	12:37	00:12	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	50°09.4	209°43.7	S11°09.9	263°43.5	N15°24.4	262°13.2	N13°43.8	41°06.1	N01°00.7
1	65°11.8	224°46.3	09.2	278°44.8	24.1	277°15.4	43.8	56°08.7	00.7
2	80°14.3	239°48.8	08.5	293°46.1	23.7	292°17.6	43.7	71°11.3	00.7
3	95°16.8	254°51.3	·· 07.8	308°47.4	·· 23.4	307°19.9	·· 43.6	86°13.9	·· 00.6
4	110°19.2	269°53.8	07.2	323°48.7	23.1	322°22.1	43.6	101°16.4	00.6
5	125°21.7	284°56.3	06.5	338°50.0	22.7	337°24.3	43.5	116°19.0	00.5
6	140°24.2	299°58.8	S11°05.8	353°51.3	N15°22.4	352°26.6	N13°43.4	131°21.6	N01°00.5
7	155°26.6	315°01.3	05.2	8°52.6	22.1	7°28.8	43.3	146°24.2	00.4
8	170°29.1	330°03.8	04.5	23°53.9	21.7	22°31.0	43.3	161°26.8	00.4
9	185°31.5	345°06.3	·· 03.8	38°55.2	·· 21.4	37°33.2	·· 43.2	176°29.3	·· 00.4
10	200°34.0	0°08.8	03.2	53°56.5	21.1	52°35.5	43.1	191°31.9	00.3
11	215°36.5	15°11.3	02.5	68°57.8	20.7	67°37.7	43.1	206°34.5	00.3
12	230°38.9	30°13.7	S11°01.9	83°59.1	N15°20.4	82°39.9	N13°43.0	221°37.1	N01°00.2
13	245°41.4	45°16.2	01.2	99°00.4	20.1	97°42.2	42.9	236°39.7	00.2
14	260°43.9	60°18.7	11°00.5	114°01.7	19.7	112°44.4	42.8	251°42.3	00.2
15	275°46.3	75°21.1	10°59.9	129°03.0	·· 19.4	127°46.6	·· 42.8	266°44.8	·· 00.1
16	290°48.8	90°23.6	59.2	144°04.3	19.1	142°48.9	42.7	281°47.4	00.1
17	305°51.3	105°26.1	58.6	159°05.7	18.7	157°51.1	42.6	296°50.0	00.0
18	320°53.7	120°28.5	S10°58.0	174°07.0	N15°18.4	172°53.3	N13°42.6	311°52.6	N01°00.0
19	335°56.2	135°31.0	57.3	189°08.3	18.1	187°55.5	42.5	326°55.2	00°59.9
20	350°58.7	150°33.4	56.7	204°09.6	17.7	202°57.8	42.4	341°57.7	59.9
21	6°01.1	165°35.9	·· 56.0	219°10.9	·· 17.4	218°00.0	·· 42.3	357°00.3	·· 59.9
22	21°03.6	180°38.3	55.4	234°12.2	17.1	233°02.2	42.3	12°02.9	59.8
23	36°06.0	195°40.7	54.8	249°13.5	16.7	248°04.5	42.2	27°05.5	59.8
Mer.pass. 20:36		ν 2.5′	d -0.7′	m -4.71	ν 1.3′	d -0.3′	m 0.74	ν 2.2′	d -0.1′ m -2.06	ν 2.6′	d -0.0′ m 0.51

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	51°08.5	210°43.2	S10°54.1	264°14.8	N15°16.4	263°06.7	N13°42.1	42°08.1	N00°59.7
1	66°11.0	225°45.6	53.5	279°16.1	16.1	278°08.9	42.1	57°10.6	59.7
2	81°13.4	240°48.0	52.9	294°17.5	15.7	293°11.2	42.0	72°13.2	59.7
3	96°15.9	255°50.4	·· 52.2	309°18.8	·· 15.4	308°13.4	·· 41.9	87°15.8	·· 59.6
4	111°18.4	270°52.9	51.6	324°20.1	15.1	323°15.6	41.8	102°18.4	59.6
5	126°20.8	285°55.3	51.0	339°21.4	14.8	338°17.9	41.8	117°20.9	59.5
6	141°23.3	300°57.7	S10°50.4	354°22.7	N15°14.4	353°20.1	N13°41.7	132°23.5	N00°59.5
7	156°25.8	316°00.1	49.7	9°24.0	14.1	8°22.3	41.6	147°26.1	59.5
8	171°28.2	331°02.5	49.1	24°25.3	13.8	23°24.6	41.6	162°28.7	59.4
9	186°30.7	346°04.9	·· 48.5	39°26.7	·· 13.4	38°26.8	·· 41.5	177°31.3	·· 59.4
10	201°33.2	1°07.3	47.9	54°28.0	13.1	53°29.1	41.4	192°33.8	59.3
11	216°35.6	16°09.7	47.3	69°29.3	12.8	68°31.3	41.4	207°36.4	59.3
12	231°38.1	31°12.1	S10°46.7	84°30.6	N15°12.4	83°33.5	N13°41.3	222°39.0	N00°59.3
13	246°40.5	46°14.4	46.1	99°31.9	12.1	98°35.8	41.2	237°41.6	59.2
14	261°43.0	61°16.8	45.5	114°33.3	11.8	113°38.0	41.1	252°44.2	59.2
15	276°45.5	76°19.2	·· 44.8	129°34.6	·· 11.4	128°40.2	·· 41.1	267°46.7	·· 59.1
16	291°47.9	91°21.6	44.2	144°35.9	11.1	143°42.5	41.0	282°49.3	59.1
17	306°50.4	106°23.9	43.6	159°37.2	10.8	158°44.7	40.9	297°51.9	59.1
18	321°52.9	121°26.3	S10°43.0	174°38.5	N15°10.4	173°46.9	N13°40.9	312°54.5	N00°59.0
19	336°55.3	136°28.6	42.5	189°39.9	10.1	188°49.2	40.8	327°57.0	59.0
20	351°57.8	151°31.0	41.9	204°41.2	09.8	203°51.4	40.7	342°59.6	58.9
21	7°00.3	166°33.3	·· 41.3	219°42.5	·· 09.5	218°53.7	·· 40.7	358°02.2	·· 58.9
22	22°02.7	181°35.7	40.7	234°43.8	09.1	233°55.9	40.6	13°04.8	58.9
23	37°05.2	196°38.0	40.1	249°45.1	08.8	248°58.1	40.5	28°07.3	58.8
Mer.pass. 20:32		ν 2.4′	d -0.6′	m -4.74	ν 1.3′	d -0.3′	m 0.73	ν 2.2′	d -0.1′ m -2.07	ν 2.6′	d -0.0′ m 0.51

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	52°07.6	211°40.4	S10°39.5	264°46.5	N15°08.5	264°00.4	N13°40.5	43°09.9	N00°58.8
1	67°10.1	226°42.7	38.9	279°47.8	08.1	279°02.6	40.4	58°12.5	58.7
2	82°12.6	241°45.0	38.3	294°49.1	07.8	294°04.9	40.3	73°15.1	58.7
3	97°15.0	256°47.4	·· 37.8	309°50.4	·· 07.5	309°07.1	·· 40.2	88°17.7	·· 58.7
4	112°17.5	271°49.7	37.2	324°51.8	07.1	324°09.3	40.2	103°20.2	58.6
5	127°20.0	286°52.0	36.6	339°53.1	06.8	339°11.6	40.1	118°22.8	58.6
6	142°22.4	301°54.3	S10°36.0	354°54.4	N15°06.5	354°13.8	N13°40.0	133°25.4	N00°58.5
7	157°24.9	316°56.7	35.5	9°55.7	06.1	9°16.1	40.0	148°28.0	58.5
8	172°27.4	331°59.0	34.9	24°57.1	05.8	24°18.3	39.9	163°30.5	58.5
9	187°29.8	347°01.3	·· 34.3	39°58.4	·· 05.5	39°20.6	·· 39.8	178°33.1	·· 58.4
10	202°32.3	2°03.6	33.7	54°59.7	05.2	54°22.8	39.8	193°35.7	58.4
11	217°34.8	17°05.9	33.2	70°01.1	04.8	69°25.0	39.7	208°38.3	58.3
12	232°37.2	32°08.2	S10°32.6	85°02.4	N15°04.5	84°27.3	N13°39.6	223°40.8	N00°58.3
13	247°39.7	47°10.4	32.1	100°03.7	04.2	99°29.5	39.6	238°43.4	58.3
14	262°42.1	62°12.7	31.5	115°05.0	03.8	114°31.8	39.5	253°46.0	58.2
15	277°44.6	77°15.0	·· 30.9	130°06.4	·· 03.5	129°34.0	·· 39.4	268°48.6	·· 58.2
16	292°47.1	92°17.3	30.4	145°07.7	03.2	144°36.3	39.4	283°51.1	58.2
17	307°49.5	107°19.6	29.8	160°09.0	02.9	159°38.5	39.3	298°53.7	58.1
18	322°52.0	122°21.8	S10°29.3	175°10.4	N15°02.5	174°40.7	N13°39.2	313°56.3	N00°58.1
19	337°54.5	137°24.1	28.7	190°11.7	02.2	189°43.0	39.2	328°58.8	58.0
20	352°56.9	152°26.4	28.2	205°13.0	01.9	204°45.2	39.1	344°01.4	58.0
21	7°59.4	167°28.6	·· 27.7	220°14.4	·· 01.5	219°47.5	·· 39.0	359°04.0	·· 58.0
22	23°01.9	182°30.9	27.1	235°15.7	01.2	234°49.7	39.0	14°06.6	57.9
23	38°04.3	197°33.1	26.6	250°17.0	00.9	249°52.0	38.9	29°09.1	57.9
Mer.pass. 20:28		ν 2.3′	d -0.6′	m -4.77	ν 1.3′	d -0.3′	m 0.72	ν 2.2′	d -0.1′ m -2.07	ν 2.6′	d -0.0′ m 0.52

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.6
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.0
Hamal	327°49.2	23°35.5
Polaris	312°44.2	89°22.6
Acamar	315°10.2	-40°11.7
Menkar	314°04.2	4°11.8
Mirfak	308°25.6	49°57.5
Aldebaran	290°37.6	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.5	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°13.9	-59°35.4
Suhail	222°45.2	-43°32.2
Miaplacidus	221°37.9	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.5	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.3	-17°41.4
Acrux	172°58.9	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.1	55°48.7
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.6
Hadar	148°34.5	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.6
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.1	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.5	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 11 Wed	SHA	Mer.pass
Venus	159°34.4	09:59
Mars	213°34.1	06:25
Jupiter	212°03.8	06:30
Saturn	350°56.7	21:12

Nov 12 Thu	SHA	Mer.pass
Venus	159°34.7	09:56
Mars	213°06.3	06:22
Jupiter	211°58.2	06:27
Saturn	350°59.5	21:08

Nov 13 Fri	SHA	Mer.pass
Venus	159°32.7	09:52
Mars	212°38.8	06:20
Jupiter	211°52.7	06:23
Saturn	351°02.3	21:04

Horizontal parallax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	184°00.5	S17°21.6	165°00.5	10.1′	S26°25.9	4.5′	54.4′
1	199°00.4	22.3	179°29.6	10.1′	26°30.3	4.3′	54.4′
2	214°00.4	23.0	193°58.7	10.1′	26°34.6	4.2′	54.4′
3	229°00.3	·· 23.7	208°27.8	10.1′	26°38.8	4.1′	54.4′
4	244°00.2	24.4	222°56.9	10.0′	26°42.9	3.9′	54.4′
5	259°00.2	25.1	237°25.9	10.0′	26°46.8	3.8′	54.4′
6	274°00.1	S17°25.8	251°54.9	10.0′	S26°50.6	3.7′	54.4′
7	289°00.0	26.5	266°23.9	10.0′	26°54.3	3.5′	54.4′
8	304°00.0	27.2	280°52.9	10.0′	26°57.8	3.4′	54.3′
9	318°59.9	·· 27.9	295°21.9	9.9′	27°01.2	3.3′	54.3′
10	333°59.8	28.5	309°50.8	9.9′	27°04.4	3.1′	54.3′
11	348°59.7	29.2	324°19.7	9.9′	27°07.6	3.0′	54.3′
12	3°59.7	S17°29.9	338°48.6	9.9′	S27°10.6	2.9′	54.3′
13	18°59.6	30.6	353°17.5	9.9′	27°13.4	2.7′	54.3′
14	33°59.5	31.3	7°46.4	9.9′	27°16.1	2.6′	54.3′
15	48°59.5	·· 32.0	22°15.3	9.9′	27°18.7	2.4′	54.3′
16	63°59.4	32.7	36°44.2	9.9′	27°21.2	2.3′	54.3′
17	78°59.3	33.3	51°13.0	9.8′	27°23.5	2.2′	54.2′
18	93°59.2	S17°34.0	65°41.9	9.8′	S27°25.7	2.0′	54.2′
19	108°59.2	34.7	80°10.7	9.8′	27°27.7	1.9′	54.2′
20	123°59.1	35.4	94°39.5	9.8′	27°29.6	1.8′	54.2′
21	138°59.0	·· 36.1	109°08.4	9.8′	27°31.4	1.6′	54.2′
22	153°58.9	36.8	123°37.2	9.8′	27°33.0	1.5′	54.2′
23	168°58.9	37.4	138°06.0	9.8′	27°34.5	1.4′	54.2′
	SD = 16.1′	d = 0.7′	SD = 14.8′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°58.8	S17°38.1	152°34.8	9.8′	S27°35.9	1.2′	54.2′
1	198°58.7	38.8	167°03.7	9.8′	27°37.1	1.1′	54.2′
2	213°58.6	39.5	181°32.5	9.8′	27°38.2	1.0′	54.2′
3	228°58.6	·· 40.2	196°01.3	9.8′	27°39.1	0.8′	54.2′
4	243°58.5	40.8	210°30.1	9.8′	27°40.0	0.7′	54.1′
5	258°58.4	41.5	224°59.0	9.8′	27°40.6	0.5′	54.1′
6	273°58.3	S17°42.2	239°27.8	9.9′	S27°41.2	0.4′	54.1′
7	288°58.2	42.9	253°56.7	9.9′	27°41.6	0.3′	54.1′
8	303°58.2	43.5	268°25.5	9.9′	27°41.9	0.1′	54.1′
9	318°58.1	·· 44.2	282°54.4	9.9′	27°42.0	0.0′	54.1′
10	333°58.0	44.9	297°23.3	9.9′	27°42.0	-0.1′	54.1′
11	348°57.9	45.6	311°52.2	9.9′	27°41.9	-0.3′	54.1′
12	3°57.8	S17°46.2	326°21.1	9.9′	S27°41.6	-0.4′	54.1′
13	18°57.8	46.9	340°50.0	9.9′	27°41.2	-0.5′	54.1′
14	33°57.7	47.6	355°18.9	10.0′	27°40.7	-0.7′	54.1′
15	48°57.6	·· 48.3	9°47.9	10.0′	27°40.0	-0.8′	54.1′
16	63°57.5	48.9	24°16.9	10.0′	27°39.2	-0.9′	54.1′
17	78°57.4	49.6	38°45.9	10.0′	27°38.3	-1.1′	54.1′
18	93°57.4	S17°50.3	53°14.9	10.0′	S27°37.2	-1.2′	54.1′
19	108°57.3	50.9	67°43.9	10.1′	27°36.0	-1.3′	54.0′
20	123°57.2	51.6	82°13.0	10.1′	27°34.6	-1.5′	54.0′
21	138°57.1	·· 52.3	96°42.0	10.1′	27°33.2	-1.6′	54.0′
22	153°57.0	52.9	111°11.1	10.1′	27°31.6	-1.7′	54.0′
23	168°56.9	53.6	125°40.3	10.2′	27°29.8	-1.9′	54.0′
	SD = 16.1′	d = 0.7′	SD = 14.8′				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°56.9	S17°54.3	140°09.4	10.2′	S27°27.9	-2.0′	54.0′
1	198°56.8	54.9	154°38.6	10.2′	27°25.9	-2.1′	54.0′
2	213°56.7	55.6	169°07.8	10.2′	27°23.8	-2.3′	54.0′
3	228°56.6	·· 56.3	183°37.0	10.3′	27°21.5	-2.4′	54.0′
4	243°56.5	56.9	198°06.3	10.3′	27°19.1	-2.5′	54.0′
5	258°56.4	57.6	212°35.6	10.3′	27°16.6	-2.7′	54.0′
6	273°56.3	S17°58.3	227°04.9	10.4′	S27°13.9	-2.8′	54.0′
7	288°56.2	58.9	241°34.3	10.4′	27°11.2	-2.9′	54.0′
8	303°56.2	17°59.6	256°03.7	10.4′	27°08.2	-3.0′	54.0′
9	318°56.1	18°00.3	270°33.2	10.5′	27°05.2	-3.2′	54.0′
10	333°56.0	00.9	285°02.6	10.5′	27°02.0	-3.3′	54.0′
11	348°55.9	01.6	299°32.1	10.5′	26°58.7	-3.4′	54.0′
12	3°55.8	S18°02.2	314°01.7	10.6′	S26°55.3	-3.6′	54.0′
13	18°55.7	02.9	328°31.3	10.6′	26°51.7	-3.7′	54.0′
14	33°55.6	03.6	343°00.9	10.7′	26°48.1	-3.8′	54.0′
15	48°55.5	·· 04.2	357°30.6	10.7′	26°44.2	-3.9′	54.0′
16	63°55.4	04.9	12°00.3	10.7′	26°40.3	-4.1′	54.0′
17	78°55.4	05.5	26°30.0	10.8′	26°36.3	-4.2′	54.0′
18	93°55.3	S18°06.2	40°59.8	10.8′	S26°32.1	-4.3′	54.0′
19	108°55.2	06.9	55°29.7	10.9′	26°27.8	-4.4′	54.0′
20	123°55.1	07.5	69°59.5	10.9′	26°23.3	-4.6′	54.0′
21	138°55.0	·· 08.2	84°29.5	11.0′	26°18.8	-4.7′	54.0′
22	153°54.9	08.8	98°59.4	11.0′	26°14.1	-4.8′	54.0′
23	168°54.8	09.5	113°29.4	11.1′	26°09.3	-4.9′	54.0′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 2-4 3-12%
11	16:02	15:59	11:44	13:28	01:02	
12	15:55	15:51	11:44	14:19	01:54	
13	15:47	15:43	11:44	15:10	02:45	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	53°06.8	212°35.4	S10°26.0	265°18.4	N15°00.6	264°54.2	N13°38.8	44°11.7	N00°57.9
1	68°09.3	227°37.6	25.5	280°19.7	15°00.2	279°56.5	38.8	59°14.3	57.8
2	83°11.7	242°39.9	25.0	295°21.0	14°59.9	294°58.7	38.7	74°16.9	57.8
3	98°14.2	257°42.1	·· 24.4	310°22.4	·· 59.6	310°01.0	·· 38.6	89°19.4	·· 57.7
4	113°16.6	272°44.4	23.9	325°23.7	59.2	325°03.2	38.6	104°22.0	57.7
5	128°19.1	287°46.6	23.4	340°25.1	58.9	340°05.4	38.5	119°24.6	57.7
6	143°21.6	302°48.8	S10°22.8	355°26.4	N14°58.6	355°07.7	N13°38.4	134°27.1	N00°57.6
7	158°24.0	317°51.0	22.3	10°27.7	58.3	10°09.9	38.4	149°29.7	57.6
8	173°26.5	332°53.2	21.8	25°29.1	57.9	25°12.2	38.3	164°32.3	57.6
9	188°29.0	347°55.5	·· 21.3	40°30.4	·· 57.6	40°14.4	·· 38.2	179°34.9	·· 57.5
10	203°31.4	2°57.7	20.8	55°31.7	57.3	55°16.7	38.2	194°37.4	57.5
11	218°33.9	17°59.9	20.2	70°33.1	56.9	70°18.9	38.1	209°40.0	57.4
12	233°36.4	33°02.1	S10°19.7	85°34.4	N14°56.6	85°21.2	N13°38.1	224°42.6	N00°57.4
13	248°38.8	48°04.3	19.2	100°35.8	56.3	100°23.4	38.0	239°45.1	57.4
14	263°41.3	63°06.5	18.7	115°37.1	56.0	115°25.7	37.9	254°47.7	57.3
15	278°43.8	78°08.7	·· 18.2	130°38.4	·· 55.6	130°27.9	·· 37.9	269°50.3	·· 57.3
16	293°46.2	93°10.9	17.7	145°39.8	55.3	145°30.2	37.8	284°52.9	57.3
17	308°48.7	108°13.1	17.2	160°41.1	55.0	160°32.4	37.7	299°55.4	57.2
18	323°51.1	123°15.2	S10°16.7	175°42.5	N14°54.7	175°34.7	N13°37.7	314°58.0	N00°57.2
19	338°53.6	138°17.4	16.2	190°43.8	54.3	190°36.9	37.6	330°00.6	57.1
20	353°56.1	153°19.6	15.7	205°45.2	54.0	205°39.2	37.5	345°03.1	57.1
21	8°58.5	168°21.8	·· 15.2	220°46.5	·· 53.7	220°41.4	·· 37.5	0°05.7	·· 57.1
22	24°01.0	183°23.9	14.7	235°47.9	53.4	235°43.7	37.4	15°08.3	57.0
23	39°03.5	198°26.1	14.2	250°49.2	53.0	250°46.0	37.3	30°10.9	57.0
Mer.pass. 20:24		ν 2.2′	d -0.5′	m -4.80	ν 1.3′	d -0.3′	m 0.71	ν 2.2′	d -0.1′ m -2.08	ν 2.6′	d -0.0′ m 0.52

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	54°05.9	213°28.2	S10°13.7	265°50.5	N14°52.7	265°48.2	N13°37.3	45°13.4	N00°57.0
1	69°08.4	228°30.4	13.2	280°51.9	52.4	280°50.5	37.2	60°16.0	56.9
2	84°10.9	243°32.6	12.7	295°53.2	52.0	295°52.7	37.2	75°18.6	56.9
3	99°13.3	258°34.7	·· 12.3	310°54.6	·· 51.7	310°55.0	·· 37.1	90°21.1	·· 56.9
4	114°15.8	273°36.8	11.8	325°55.9	51.4	325°57.2	37.0	105°23.7	56.8
5	129°18.3	288°39.0	11.3	340°57.3	51.1	340°59.5	37.0	120°26.3	56.8
6	144°20.7	303°41.1	S10°10.8	355°58.6	N14°50.7	356°01.7	N13°36.9	135°28.8	N00°56.8
7	159°23.2	318°43.3	10.3	11°00.0	50.4	11°04.0	36.8	150°31.4	56.7
8	174°25.6	333°45.4	09.9	26°01.3	50.1	26°06.2	36.8	165°34.0	56.7
9	189°28.1	348°47.5	·· 09.4	41°02.7	·· 49.8	41°08.5	·· 36.7	180°36.5	·· 56.6
10	204°30.6	3°49.6	08.9	56°04.0	49.4	56°10.7	36.6	195°39.1	56.6
11	219°33.0	18°51.8	08.5	71°05.4	49.1	71°13.0	36.6	210°41.7	56.6
12	234°35.5	33°53.9	S10°08.0	86°06.7	N14°48.8	86°15.3	N13°36.5	225°44.2	N00°56.5
13	249°38.0	48°56.0	07.5	101°08.1	48.5	101°17.5	36.5	240°46.8	56.5
14	264°40.4	63°58.1	07.1	116°09.4	48.1	116°19.8	36.4	255°49.4	56.5
15	279°42.9	79°00.2	·· 06.6	131°10.8	·· 47.8	131°22.0	·· 36.3	270°51.9	·· 56.4
16	294°45.4	94°02.3	06.2	146°12.2	47.5	146°24.3	36.3	285°54.5	56.4
17	309°47.8	109°04.4	05.7	161°13.5	47.2	161°26.5	36.2	300°57.1	56.4
18	324°50.3	124°06.5	S10°05.3	176°14.9	N14°46.8	176°28.8	N13°36.1	315°59.7	N00°56.3
19	339°52.7	139°08.6	04.8	191°16.2	46.5	191°31.1	36.1	331°02.2	56.3
20	354°55.2	154°10.7	04.3	206°17.6	46.2	206°33.3	36.0	346°04.8	56.3
21	9°57.7	169°12.8	·· 03.9	221°18.9	·· 45.9	221°35.6	·· 36.0	1°07.4	·· 56.2
22	25°00.1	184°14.8	03.5	236°20.3	45.5	236°37.8	35.9	16°09.9	56.2
23	40°02.6	199°16.9	03.0	251°21.6	45.2	251°40.1	35.8	31°12.5	56.2
Mer.pass. 20:20		ν 2.2′	d -0.5′	m -4.82	ν 1.3′	d -0.3′	m 0.69	ν 2.3′	d -0.1′ m -2.09	ν 2.6′	d -0.0′ m 0.53

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	55°05.1	214°19.0	S10°02.6	266°23.0	N14°44.9	266°42.4	N13°35.8	46°15.0	N00°56.1
1	70°07.5	229°21.0	02.1	281°24.4	44.6	281°44.6	35.7	61°17.6	56.1
2	85°10.0	244°23.1	01.7	296°25.7	44.2	296°46.9	35.7	76°20.2	56.1
3	100°12.5	259°25.2	·· 01.3	311°27.1	·· 43.9	311°49.1	·· 35.6	91°22.7	·· 56.0
4	115°14.9	274°27.2	00.8	326°28.4	43.6	326°51.4	35.5	106°25.3	56.0
5	130°17.4	289°29.3	00.4	341°29.8	43.3	341°53.7	35.5	121°27.9	55.9
6	145°19.9	304°31.3	S10°00.0	356°31.2	N14°43.0	356°55.9	N13°35.4	136°30.4	N00°55.9
7	160°22.3	319°33.4	09°59.5	11°32.5	42.6	11°58.2	35.3	151°33.0	55.9
8	175°24.8	334°35.4	59.1	26°33.9	42.3	27°00.4	35.3	166°35.6	55.8
9	190°27.2	349°37.5	·· 58.7	41°35.2	·· 42.0	42°02.7	·· 35.2	181°38.1	·· 55.8
10	205°29.7	4°39.5	58.3	56°36.6	41.7	57°05.0	35.2	196°40.7	55.8
11	220°32.2	19°41.5	57.9	71°38.0	41.3	72°07.2	35.1	211°43.3	55.7
12	235°34.6	34°43.6	S09°57.4	86°39.3	N14°41.0	87°09.5	N13°35.0	226°45.8	N00°55.7
13	250°37.1	49°45.6	57.0	101°40.7	40.7	102°11.8	35.0	241°48.4	55.7
14	265°39.6	64°47.6	56.6	116°42.1	40.4	117°14.0	34.9	256°51.0	55.6
15	280°42.0	79°49.6	·· 56.2	131°43.4	·· 40.0	132°16.3	·· 34.9	271°53.5	·· 55.6
16	295°44.5	94°51.6	55.8	146°44.8	39.7	147°18.5	34.8	286°56.1	55.6
17	310°47.0	109°53.7	55.4	161°46.2	39.4	162°20.8	34.7	301°58.7	55.5
18	325°49.4	124°55.7	S09°55.0	176°47.5	N14°39.1	177°23.1	N13°34.7	317°01.2	N00°55.5
19	340°51.9	139°57.7	54.6	191°48.9	38.8	192°25.3	34.6	332°03.8	55.5
20	355°54.4	154°59.7	54.2	206°50.3	38.4	207°27.6	34.6	347°06.3	55.4
21	10°56.8	170°01.7	·· 53.8	221°51.6	·· 38.1	222°29.9	·· 34.5	2°08.9	·· 55.4
22	25°59.3	185°03.7	53.4	236°53.0	37.8	237°32.1	34.4	17°11.5	55.4
23	41°01.7	200°05.7	53.0	251°54.4	37.5	252°34.4	34.4	32°14.0	55.3
Mer.pass. 20:16		ν 2.1′	d -0.4′	m -4.84	ν 1.4′	d -0.3′	m 0.68	ν 2.3′	d -0.1′ m -2.09	ν 2.6′	d -0.0′ m 0.53

Stars

	SHA	**Dec**
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.6
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.5	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°43.9	89°22.7
Acamar	315°10.2	-40°11.7
Menkar	314°04.2	4°11.8
Mirfak	308°25.6	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°21.0	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.3	-52°42.3
Sirius	258°24.7	-16°45.0
Adhara	255°04.4	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°13.9	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.8	-69°49.3
Alphard	217°46.3	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.4	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.2	-17°41.4
Acrux	172°58.9	-63°14.7
Gacrux	171°50.4	-57°15.6
Alioth	166°12.1	55°48.6
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.6
Hadar	148°34.5	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.9	-60°56.7
Kochab	137°21.0	74°02.6
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 14 Sat	**SHA**	**Mer.pass**
Venus	159°28.6	09:48
Mars	212°11.6	06:18
Jupiter	211°47.4	06:19
Saturn	351°04.9	21:00

Nov 15 Sun	**SHA**	**Mer.pass**
Venus	159°22.3	09:45
Mars	211°44.6	06:16
Jupiter	211°42.3	06:16
Saturn	351°07.5	20:56

Nov 16 Mon	**SHA**	**Mer.pass**
Venus	159°13.9	09:41
Mars	211°17.9	06:14
Jupiter	211°37.3	06:12
Saturn	351°10.0	20:51

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h — Sun — Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°54.7	S18°10.1	127°59.5	11.1′	S26°04.4	-5.0′	54.0′
1	198°54.6	10.8	142°29.6	11.2′	25°59.4	-5.2′	54.0′
2	213°54.5	11.4	156°59.8	11.2′	25°54.2	-5.3′	54.0′
3	228°54.4	·· 12.1	171°30.0	11.3′	25°48.9	-5.4′	54.0′
4	243°54.3	12.7	186°00.2	11.3′	25°43.5	-5.5′	54.0′
5	258°54.2	13.4	200°30.5	11.4′	25°38.0	-5.6′	54.0′
6	273°54.1	S18°14.0	215°00.9	11.4′	S25°32.4	-5.7′	54.0′
7	288°54.0	14.7	229°31.3	11.5′	25°26.6	-5.9′	54.0′
8	303°53.9	15.4	244°01.7	11.5′	25°20.8	-6.0′	54.0′
9	318°53.8	·· 16.0	258°32.2	11.6′	25°14.8	-6.1′	54.0′
10	333°53.8	16.6	273°02.8	11.6′	25°08.7	-6.2′	54.0′
11	348°53.7	17.3	287°33.4	11.7′	25°02.5	-6.3′	54.0′
12	3°53.6	S18°17.9	302°04.1	11.7′	S24°56.2	-6.4′	54.0′
13	18°53.5	18.6	316°34.8	11.8′	24°49.7	-6.5′	54.0′
14	33°53.4	19.2	331°05.5	11.8′	24°43.2	-6.7′	54.0′
15	48°53.3	·· 19.9	345°36.3	11.9′	24°36.5	-6.8′	54.0′
16	63°53.2	20.5	0°07.2	11.9′	24°29.7	-6.9′	54.0′
17	78°53.1	21.2	14°38.1	12.0′	24°22.8	-7.0′	54.1′
18	93°53.0	S18°21.8	29°09.1	12.0′	S24°15.9	-7.1′	54.1′
19	108°52.9	22.5	43°40.1	12.1′	24°08.8	-7.2′	54.1′
20	123°52.8	23.1	58°11.2	12.1′	24°01.5	-7.3′	54.1′
21	138°52.7	·· 23.7	72°42.3	12.2′	23°54.2	-7.4′	54.1′
22	153°52.6	24.4	87°13.5	12.2′	23°46.8	-7.5′	54.1′
23	168°52.5	25.0	101°44.8	12.3′	23°39.3	-7.6′	54.1′
	SD = 16.2′	d = 0.7′	SD = 14.7′				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°52.4	S18°25.7	116°16.1	12.4′	S23°31.6	-7.7′	54.1′
1	198°52.3	26.3	130°47.4	12.4′	23°23.9	-7.8′	54.1′
2	213°52.1	27.0	145°18.8	12.5′	23°16.0	-8.0′	54.1′
3	228°52.0	·· 27.6	159°50.3	12.5′	23°08.1	-8.1′	54.1′
4	243°51.9	28.2	174°21.8	12.6′	23°00.0	-8.2′	54.1′
5	258°51.8	28.9	188°53.4	12.6′	22°51.9	-8.3′	54.1′
6	273°51.7	S18°29.5	203°25.0	12.7′	S22°43.6	-8.4′	54.2′
7	288°51.6	30.1	217°56.7	12.7′	22°35.3	-8.5′	54.2′
8	303°51.5	30.8	232°28.4	12.8′	22°26.8	-8.6′	54.2′
9	318°51.4	·· 31.4	247°00.2	12.8′	22°18.2	-8.7′	54.2′
10	333°51.3	32.1	261°32.0	12.9′	22°09.6	-8.8′	54.2′
11	348°51.2	32.7	276°03.9	12.9′	22°00.8	-8.9′	54.2′
12	3°51.1	S18°33.3	290°35.8	13.0′	S21°52.0	-9.0′	54.2′
13	18°51.0	34.0	305°07.8	13.0′	21°43.0	-9.0′	54.2′
14	33°50.9	34.6	319°39.9	13.1′	21°34.0	-9.1′	54.2′
15	48°50.8	·· 35.2	334°12.0	13.1′	21°24.8	-9.2′	54.3′
16	63°50.7	35.8	348°44.1	13.2′	21°15.6	-9.3′	54.3′
17	78°50.6	36.5	3°16.3	13.3′	21°06.3	-9.4′	54.3′
18	93°50.5	S18°37.1	17°48.6	13.3′	S20°56.8	-9.5′	54.3′
19	108°50.3	37.7	32°20.9	13.4′	20°47.3	-9.6′	54.3′
20	123°50.2	38.4	46°53.2	13.4′	20°37.7	-9.7′	54.3′
21	138°50.1	·· 39.0	61°25.6	13.5′	20°28.0	-9.8′	54.3′
22	153°50.0	39.6	75°58.1	13.5′	20°18.2	-9.9′	54.3′
23	168°49.9	40.3	90°30.6	13.6′	20°08.3	-10.0′	54.4′
	SD = 16.2′	d = 0.6′	SD = 14.8′				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°49.8	S18°40.9	105°03.1	13.6′	S19°58.4	-10.1′	54.4′
1	198°49.7	41.5	119°35.7	13.6′	19°48.3	-10.1′	54.4′
2	213°49.6	42.1	134°08.4	13.7′	19°38.2	-10.2′	54.4′
3	228°49.5	·· 42.8	148°41.1	13.7′	19°27.9	-10.3′	54.4′
4	243°49.3	43.4	163°13.8	13.8′	19°17.6	-10.4′	54.4′
5	258°49.2	44.0	177°46.6	13.8′	19°07.2	-10.5′	54.5′
6	273°49.1	S18°44.6	192°19.5	13.9′	S18°56.7	-10.6′	54.5′
7	288°49.0	45.3	206°52.3	13.9′	18°46.1	-10.7′	54.5′
8	303°48.9	45.9	221°25.3	14.0′	18°35.5	-10.7′	54.5′
9	318°48.8	·· 46.5	235°58.2	14.0′	18°24.7	-10.8′	54.5′
10	333°48.7	47.1	250°31.3	14.1′	18°13.9	-10.9′	54.5′
11	348°48.6	47.7	265°04.3	14.1′	18°03.0	-11.0′	54.6′
12	3°48.4	S18°48.4	279°37.4	14.1′	S17°52.0	-11.1′	54.6′
13	18°48.3	49.0	294°10.6	14.2′	17°41.0	-11.1′	54.6′
14	33°48.2	49.6	308°43.8	14.2′	17°29.8	-11.2′	54.6′
15	48°48.1	·· 50.2	323°17.0	14.3′	17°18.6	-11.3′	54.6′
16	63°48.0	50.8	337°50.3	14.3′	17°07.3	-11.4′	54.6′
17	78°47.9	51.5	352°23.6	14.3′	16°55.9	-11.5′	54.7′
18	93°47.7	S18°52.1	6°56.9	14.4′	S16°44.4	-11.5′	54.7′
19	108°47.6	52.7	21°30.3	14.4′	16°32.9	-11.6′	54.7′
20	123°47.5	53.3	36°03.7	14.5′	16°21.3	-11.7′	54.7′
21	138°47.4	·· 53.9	50°37.2	14.5′	16°09.6	-11.8′	54.7′
22	153°47.3	54.5	65°10.7	14.5′	15°57.9	-11.8′	54.8′
23	168°47.1	55.1	79°44.2	14.6′	15°46.0	-11.9′	54.8′
	SD = 16.2′	d = 0.6′	SD = 14.8′				

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

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

Day	Sun Eqn.of Time 00h mm:ss	Sun Eqn.of Time 12h mm:ss	Sun Mer. Pass hh:mm	Moon Mer.Pass. Upper hh:mm	Moon Mer.Pass. Lower hh:mm	Moon Age 5-7 19-36%
14	15:39	15:34	11:44	16:00	03:35	
15	15:29	15:24	11:45	16:46	04:23	
16	15:19	15:14	11:45	17:31	05:09	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°04.2	215°07.6	S09°52.6	266°55.7	N14°37.2	267°36.7	N13°34.3	47°16.6	N00°55.3
1	71°06.7	230°09.6	52.2	281°57.1	36.8	282°38.9	34.3	62°19.2	55.3
2	86°09.1	245°11.6	51.8	296°58.5	36.5	297°41.2	34.2	77°21.7	55.2
3	101°11.6	260°13.6	·· 51.4	311°59.8	·· 36.2	312°43.5	·· 34.1	92°24.3	·· 55.2
4	116°14.1	275°15.6	51.0	327°01.2	35.9	327°45.7	34.1	107°26.8	55.2
5	131°16.5	290°17.5	50.6	342°02.6	35.5	342°48.0	34.0	122°29.4	55.1
6	146°19.0	305°19.5	S09°50.3	357°04.0	N14°35.2	357°50.3	N13°34.0	137°32.0	N00°55.1
7	161°21.5	320°21.4	49.9	12°05.3	34.9	12°52.5	33.9	152°34.5	55.1
8	176°23.9	335°23.4	49.5	27°06.7	34.6	27°54.8	33.9	167°37.1	55.0
9	191°26.4	350°25.4	·· 49.1	42°08.1	·· 34.3	42°57.1	·· 33.8	182°39.7	·· 55.0
10	206°28.8	5°27.3	48.8	57°09.5	33.9	57°59.3	33.7	197°42.2	55.0
11	221°31.3	20°29.3	48.4	72°10.8	33.6	73°01.6	33.7	212°44.8	55.0
12	236°33.8	35°31.2	S09°48.0	87°12.2	N14°33.3	88°03.9	N13°33.6	227°47.3	N00°54.9
13	251°36.2	50°33.2	47.7	102°13.6	33.0	103°06.2	33.6	242°49.9	54.9
14	266°38.7	65°35.1	47.3	117°15.0	32.7	118°08.4	33.5	257°52.5	54.9
15	281°41.2	80°37.0	·· 46.9	132°16.3	·· 32.3	133°10.7	·· 33.4	272°55.0	·· 54.8
16	296°43.6	95°39.0	46.6	147°17.7	32.0	148°13.0	33.4	287°57.6	54.8
17	311°46.1	110°40.9	46.2	162°19.1	31.7	163°15.2	33.3	303°00.1	54.8
18	326°48.6	125°42.8	S09°45.9	177°20.5	N14°31.4	178°17.5	N13°33.3	318°02.7	N00°54.7
19	341°51.0	140°44.7	45.5	192°21.8	31.1	193°19.8	33.2	333°05.3	54.7
20	356°53.5	155°46.6	45.1	207°23.2	30.7	208°22.1	33.2	348°07.8	54.7
21	11°56.0	170°48.6	·· 44.8	222°24.6	·· 30.4	223°24.3	·· 33.1	3°10.4	·· 54.6
22	26°58.4	185°50.5	44.4	237°26.0	30.1	238°26.6	33.0	18°12.9	54.6
23	42°00.9	200°52.4	44.1	252°27.4	29.8	253°28.9	33.0	33°15.5	54.6
Mer.pass. 20:12		ν 2.0′	d -0.4′	m -4.85	ν 1.4′	d -0.3′	m 0.67	ν 2.3′	d -0.1′ m -2.10	ν 2.6′	d -0.0′ m 0.54

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	57°03.3	215°54.3	S09°43.8	267°28.7	N14°29.5	268°31.1	N13°32.9	48°18.1	N00°54.5
1	72°05.8	230°56.2	43.4	282°30.1	29.1	283°33.4	32.9	63°20.6	54.5
2	87°08.3	245°58.1	43.1	297°31.5	28.8	298°35.7	32.8	78°23.2	54.5
3	102°10.7	261°00.0	·· 42.7	312°32.9	·· 28.5	313°38.0	·· 32.8	93°25.7	·· 54.4
4	117°13.2	276°01.9	42.4	327°34.3	28.2	328°40.2	32.7	108°28.3	54.4
5	132°15.7	291°03.7	42.1	342°35.7	27.9	343°42.5	32.7	123°30.8	54.4
6	147°18.1	306°05.6	S09°41.7	357°37.0	N14°27.6	358°44.8	N13°32.6	138°33.4	N00°54.4
7	162°20.6	321°07.5	41.4	12°38.4	27.2	13°47.1	32.5	153°36.0	54.3
8	177°23.1	336°09.4	41.1	27°39.8	26.9	28°49.3	32.5	168°38.5	54.3
9	192°25.5	351°11.3	·· 40.7	42°41.2	·· 26.6	43°51.6	·· 32.4	183°41.1	·· 54.3
10	207°28.0	6°13.1	40.4	57°42.6	26.3	58°53.9	32.4	198°43.6	54.2
11	222°30.5	21°15.0	40.1	72°44.0	26.0	73°56.2	32.3	213°46.2	54.2
12	237°32.9	36°16.9	S09°39.8	87°45.4	N14°25.6	88°58.4	N13°32.3	228°48.8	N00°54.2
13	252°35.4	51°18.7	39.4	102°46.7	25.3	104°00.7	32.2	243°51.3	54.1
14	267°37.8	66°20.6	39.1	117°48.1	25.0	119°03.0	32.1	258°53.9	54.1
15	282°40.3	81°22.4	·· 38.8	132°49.5	·· 24.7	134°05.3	·· 32.1	273°56.4	·· 54.1
16	297°42.8	96°24.3	38.5	147°50.9	24.4	149°07.6	32.0	288°59.0	54.1
17	312°45.2	111°26.1	38.2	162°52.3	24.1	164°09.8	32.0	304°01.5	54.0
18	327°47.7	126°28.0	S09°37.9	177°53.7	N14°23.7	179°12.1	N13°31.9	319°04.1	N00°54.0
19	342°50.2	141°29.8	37.6	192°55.1	23.4	194°14.4	31.9	334°06.6	54.0
20	357°52.6	156°31.6	37.3	207°56.5	23.1	209°16.7	31.8	349°09.2	53.9
21	12°55.1	171°33.5	·· 37.0	222°57.9	·· 22.8	224°18.9	·· 31.8	4°11.8	·· 53.9
22	27°57.6	186°35.3	36.7	237°59.3	22.5	239°21.2	31.7	19°14.3	53.9
23	43°00.0	201°37.1	36.4	253°00.7	22.2	254°23.5	31.7	34°16.9	53.8
Mer.pass. 20:08		ν 1.9′	d -0.3′	m -4.87	ν 1.4′	d -0.3′	m 0.65	ν 2.3′	d -0.1′ m -2.10	ν 2.6′	d -0.0′ m 0.54

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	58°02.5	216°38.9	S09°36.1	268°02.0	N14°21.8	269°25.8	N13°31.6	49°19.4	N00°53.8
1	73°04.9	231°40.8	35.8	283°03.4	21.5	284°28.1	31.5	64°22.0	53.8
2	88°07.4	246°42.6	35.5	298°04.8	21.2	299°30.3	31.5	79°24.5	53.8
3	103°09.9	261°44.4	·· 35.2	313°06.2	·· 20.9	314°32.6	·· 31.4	94°27.1	·· 53.7
4	118°12.3	276°46.2	34.9	328°07.6	20.6	329°34.9	31.4	109°29.6	53.7
5	133°14.8	291°48.0	34.6	343°09.0	20.3	344°37.2	31.3	124°32.2	53.7
6	148°17.3	306°49.8	S09°34.3	358°10.4	N14°20.0	359°39.5	N13°31.3	139°34.8	N00°53.6
7	163°19.7	321°51.6	34.0	13°11.8	19.6	14°41.8	31.2	154°37.3	53.6
8	178°22.2	336°53.4	33.7	28°13.2	19.3	29°44.0	31.2	169°39.9	53.6
9	193°24.7	351°55.2	·· 33.5	43°14.6	·· 19.0	44°46.3	·· 31.1	184°42.4	·· 53.5
10	208°27.1	6°57.0	33.2	58°16.0	18.7	59°48.6	31.1	199°45.0	53.5
11	223°29.6	21°58.8	32.9	73°17.4	18.4	74°50.9	31.0	214°47.5	53.5
12	238°32.1	37°00.5	S09°32.6	88°18.8	N14°18.1	89°53.2	N13°31.0	229°50.1	N00°53.5
13	253°34.5	52°02.3	32.4	103°20.2	17.7	104°55.4	30.9	244°52.6	53.4
14	268°37.0	67°04.1	32.1	118°21.6	17.4	119°57.7	30.8	259°55.2	53.4
15	283°39.4	82°05.9	·· 31.8	133°23.0	·· 17.1	135°00.0	·· 30.8	274°57.7	·· 53.4
16	298°41.9	97°07.6	31.6	148°24.4	16.8	150°02.3	30.7	290°00.3	53.3
17	313°44.4	112°09.4	31.3	163°25.8	16.5	165°04.6	30.7	305°02.8	53.3
18	328°46.8	127°11.2	S09°31.0	178°27.2	N14°16.2	180°06.9	N13°30.6	320°05.4	N00°53.3
19	343°49.3	142°12.9	30.8	193°28.6	15.9	195°09.2	30.6	335°08.0	53.3
20	358°51.8	157°14.7	30.5	208°30.0	15.5	210°11.4	30.5	350°10.5	53.2
21	13°54.2	172°16.4	·· 30.2	223°31.4	·· 15.2	225°13.7	·· 30.5	5°13.1	·· 53.2
22	28°56.7	187°18.2	30.0	238°32.8	14.9	240°16.0	30.4	20°15.6	53.2
23	43°59.2	202°19.9	29.7	253°34.2	14.6	255°18.3	30.4	35°18.2	53.2
Mer.pass. 20:05		ν 1.8′	d -0.3′	m -4.88	ν 1.4′	d -0.3′	m 0.64	ν 2.3′	d -0.1′ m -2.11	ν 2.6′	d -0.0′ m 0.55

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°43.9	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.2	7°24.8
Canopus	263°51.3	-52°42.4
Sirius	258°24.6	-16°45.0
Adhara	255°04.4	-29°00.3
Procyon	244°49.1	5°09.4
Pollux	243°15.3	27°57.6
Avior	234°13.9	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.8	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.9	11°50.1
Dubhe	193°39.4	61°36.1
Denebola	182°23.6	14°25.3
Gienah	175°42.2	-17°41.4
Acrux	172°58.8	-63°14.7
Gacrux	171°50.3	-57°15.6
Alioth	166°12.1	55°48.6
Spica	158°21.0	-11°18.0
Alkaid	152°51.3	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.9	19°02.5
Rigil Kent.	139°38.8	-60°56.7
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.6
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.4	12°32.5
Eltanin	90°41.9	51°29.3
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.7	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 17 Tue	SHA	Mer.pass
Venus	159°03.4	09:38
Mars	210°51.5	06:12
Jupiter	211°32.5	06:09
Saturn	351°12.4	20:47

Nov 18 Wed	SHA	Mer.pass
Venus	158°50.9	09:35
Mars	210°25.4	06:10
Jupiter	211°27.8	06:05
Saturn	351°14.7	20:43

Nov 19 Thu	SHA	Mer.pass
Venus	158°36.5	09:32
Mars	209°59.6	06:07
Jupiter	211°23.3	06:01
Saturn	351°16.9	20:39

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°47.0	S18°55.8	94°17.8	14.6′	S15°34.1	-12.0′	54.8′
1	198°46.9	56.4	108°51.3	14.6′	15°22.2	-12.0′	54.8′
2	213°46.8	57.0	123°25.0	14.7′	15°10.1	-12.1′	54.9′
3	228°46.7	·· 57.6	137°58.6	14.7′	14°58.0	-12.2′	54.9′
4	243°46.5	58.2	152°32.3	14.7′	14°45.8	-12.3′	54.9′
5	258°46.4	58.8	167°06.1	14.8′	14°33.5	-12.3′	54.9′
6	273°46.3	S18°59.4	181°39.8	14.8′	S14°21.2	-12.4′	54.9′
7	288°46.2	19°00.0	196°13.6	14.8′	14°08.8	-12.5′	55.0′
8	303°46.1	00.6	210°47.4	14.8′	13°56.4	-12.5′	55.0′
9	318°45.9	·· 01.3	225°21.2	14.9′	13°43.8	-12.6′	55.0′
10	333°45.8	01.9	239°55.1	14.9′	13°31.2	-12.7′	55.0′
11	348°45.7	02.5	254°29.0	14.9′	13°18.6	-12.7′	55.1′
12	3°45.6	S19°03.1	269°02.9	14.9′	S13°05.9	-12.8′	55.1′
13	18°45.4	03.7	283°36.8	15.0′	12°53.1	-12.9′	55.1′
14	33°45.3	04.3	298°10.8	15.0′	12°40.2	-12.9′	55.1′
15	48°45.2	·· 04.9	312°44.7	15.0′	12°27.3	-13.0′	55.2′
16	63°45.1	05.5	327°18.7	15.0′	12°14.3	-13.0′	55.2′
17	78°44.9	06.1	341°52.8	15.0′	12°01.3	-13.1′	55.2′
18	93°44.8	S19°06.7	356°26.8	15.1′	S11°48.2	-13.2′	55.2′
19	108°44.7	07.3	11°00.8	15.1′	11°35.0	-13.2′	55.3′
20	123°44.6	07.9	25°34.9	15.1′	11°21.8	-13.3′	55.3′
21	138°44.4	·· 08.5	40°09.0	15.1′	11°08.6	-13.3′	55.3′
22	153°44.3	09.1	54°43.1	15.1′	10°55.2	-13.4′	55.4′
23	168°44.2	09.7	69°17.2	15.1′	10°41.8	-13.4′	55.4′
	SD = 16.2′	d = 0.6′	SD = 14.9′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°44.1	S19°10.3	83°51.3	15.1′	S10°28.4	-13.5′	55.4′
1	198°43.9	10.9	98°25.5	15.1′	10°14.9	-13.6′	55.4′
2	213°43.8	11.5	112°59.6	15.2′	10°01.3	-13.6′	55.5′
3	228°43.7	·· 12.1	127°33.8	15.2′	09°47.7	-13.7′	55.5′
4	243°43.5	12.7	142°07.9	15.2′	09°34.0	-13.7′	55.5′
5	258°43.4	13.3	156°42.1	15.2′	09°20.3	-13.8′	55.6′
6	273°43.3	S19°13.9	171°16.3	15.2′	S09°06.6	-13.8′	55.6′
7	288°43.2	14.5	185°50.5	15.2′	08°52.7	-13.9′	55.6′
8	303°43.0	15.1	200°24.7	15.2′	08°38.9	-13.9′	55.6′
9	318°42.9	·· 15.7	214°58.9	15.2′	08°24.9	-14.0′	55.7′
10	333°42.8	16.3	229°33.0	15.2′	08°11.0	-14.0′	55.7′
11	348°42.6	16.9	244°07.2	15.2′	07°57.0	-14.1′	55.7′
12	3°42.5	S19°17.4	258°41.4	15.2′	S07°42.9	-14.1′	55.8′
13	18°42.4	18.0	273°15.6	15.2′	07°28.8	-14.2′	55.8′
14	33°42.2	18.6	287°49.8	15.2′	07°14.6	-14.2′	55.8′
15	48°42.1	·· 19.2	302°24.0	15.2′	07°00.4	-14.3′	55.9′
16	63°42.0	19.8	316°58.2	15.2′	06°46.1	-14.3′	55.9′
17	78°41.8	20.4	331°32.4	15.2′	06°31.9	-14.3′	55.9′
18	93°41.7	S19°21.0	346°06.5	15.2′	S06°17.5	-14.4′	56.0′
19	108°41.6	21.6	0°40.7	15.1′	06°03.1	-14.4′	56.0′
20	123°41.4	22.2	15°14.8	15.1′	05°48.7	-14.5′	56.0′
21	138°41.3	·· 22.7	29°49.0	15.1′	05°34.2	-14.5′	56.1′
22	153°41.2	23.3	44°23.1	15.1′	05°19.7	-14.5′	56.1′
23	168°41.0	23.9	58°57.2	15.1′	05°05.2	-14.6′	56.1′
	SD = 16.2′	d = 0.6′	SD = 15.1′				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°40.9	S19°24.5	73°31.3	15.1′	S04°50.6	-14.6′	56.2′
1	198°40.7	25.1	88°05.4	15.1′	04°36.0	-14.7′	56.2′
2	213°40.6	25.7	102°39.5	15.0′	04°21.3	-14.7′	56.2′
3	228°40.5	·· 26.3	117°13.5	15.0′	04°06.6	-14.7′	56.3′
4	243°40.3	26.8	131°47.5	15.0′	03°51.9	-14.8′	56.3′
5	258°40.2	27.4	146°21.6	15.0′	03°37.1	-14.8′	56.3′
6	273°40.1	S19°28.0	160°55.5	15.0′	S03°22.3	-14.8′	56.4′
7	288°39.9	28.6	175°29.5	14.9′	03°07.5	-14.9′	56.4′
8	303°39.8	29.2	190°03.5	14.9′	02°52.6	-14.9′	56.4′
9	318°39.6	·· 29.7	204°37.4	14.9′	02°37.7	-14.9′	56.5′
10	333°39.5	30.3	219°11.3	14.9′	02°22.8	-15.0′	56.5′
11	348°39.4	30.9	233°45.1	14.8′	02°07.8	-15.0′	56.6′
12	3°39.2	S19°31.5	248°19.0	14.8′	S01°52.9	-15.0′	56.6′
13	18°39.1	32.0	262°52.8	14.8′	01°37.8	-15.0′	56.6′
14	33°38.9	32.6	277°26.5	14.7′	01°22.8	-15.1′	56.7′
15	48°38.8	·· 33.2	292°00.3	14.7′	01°07.7	-15.1′	56.7′
16	63°38.7	33.8	306°34.0	14.7′	00°52.6	-15.1′	56.7′
17	78°38.5	34.3	321°07.6	14.6′	00°37.5	-15.1′	56.8′
18	93°38.4	S19°34.9	335°41.3	14.6′	S00°22.4	-15.2′	56.8′
19	108°38.2	35.5	350°14.9	14.6′	S00°07.2	-15.2′	56.8′
20	123°38.1	36.1	4°48.4	14.5′	N00°08.0	15.2′	56.9′
21	138°37.9	·· 36.6	19°21.9	14.5′	00°23.2	15.2′	56.9′
22	153°37.8	37.2	33°55.4	14.4′	00°38.4	15.2′	57.0′
23	168°37.7	37.8	48°28.8	14.4′	00°53.6	15.3′	57.0′
	SD = 16.2′	d = 0.6′	SD = 15.3′				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 8-10 45-65%
17	15:08	15:02	11:45	18:15	05:53	
18	14:56	14:50	11:45	18:57	06:36	
19	14:44	14:37	11:45	19:40	07:19	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	59°01.6	217°21.7	S09°29.5	268°35.6	N14°14.3	270°20.6	N13°30.3	50°20.7	N00°53.1
1	74°04.1	232°23.4	29.2	283°37.0	14.0	285°22.9	30.3	65°23.3	53.1
2	89°06.6	247°25.2	29.0	298°38.4	13.7	300°25.2	30.2	80°25.8	53.1
3	104°09.0	262°26.9	·· 28.7	313°39.9	·· 13.4	315°27.5	·· 30.2	95°28.4	·· 53.0
4	119°11.5	277°28.6	28.5	328°41.3	13.0	330°29.7	30.1	110°30.9	53.0
5	134°13.9	292°30.4	28.3	343°42.7	12.7	345°32.0	30.1	125°33.5	53.0
6	149°16.4	307°32.1	S09°28.0	358°44.1	N14°12.4	0°34.3	N13°30.0	140°36.0	N00°53.0
7	164°18.9	322°33.8	27.8	13°45.5	12.1	15°36.6	30.0	155°38.6	52.9
8	179°21.3	337°35.5	27.5	28°46.9	11.8	30°38.9	29.9	170°41.1	52.9
9	194°23.8	352°37.2	·· 27.3	43°48.3	·· 11.5	45°41.2	·· 29.9	185°43.7	·· 52.9
10	209°26.3	7°38.9	27.1	58°49.7	11.2	60°43.5	29.8	200°46.2	52.8
11	224°28.7	22°40.6	26.8	73°51.1	10.9	75°45.8	29.8	215°48.8	52.8
12	239°31.2	37°42.4	S09°26.6	88°52.5	N14°10.5	90°48.1	N13°29.7	230°51.3	N00°52.8
13	254°33.7	52°44.1	26.4	103°54.0	10.2	105°50.3	29.7	245°53.9	52.8
14	269°36.1	67°45.8	26.2	118°55.4	09.9	120°52.6	29.6	260°56.4	52.7
15	284°38.6	82°47.4	·· 25.9	133°56.8	·· 09.6	135°54.9	·· 29.6	275°59.0	·· 52.7
16	299°41.0	97°49.1	25.7	148°58.2	09.3	150°57.2	29.5	291°01.5	52.7
17	314°43.5	112°50.8	25.5	163°59.6	09.0	165°59.5	29.5	306°04.1	52.7
18	329°46.0	127°52.5	S09°25.3	179°01.0	N14°08.7	181°01.8	N13°29.4	321°06.6	N00°52.6
19	344°48.4	142°54.2	25.1	194°02.4	08.4	196°04.1	29.4	336°09.2	52.6
20	359°50.9	157°55.9	24.9	209°03.9	08.1	211°06.4	29.3	351°11.7	52.6
21	14°53.4	172°57.5	·· 24.6	224°05.3	·· 07.7	226°08.7	·· 29.3	6°14.3	·· 52.6
22	29°55.8	187°59.2	24.4	239°06.7	07.4	241°11.0	29.2	21°16.8	52.5
23	44°58.3	203°00.9	24.2	254°08.1	07.1	256°13.3	29.2	36°19.4	52.5
Mer.pass. 20:01		ν 1.7′ d -0.2′	m -4.89	ν 1.4′ d -0.3′	m 0.63	ν 2.3′ d -0.1′	m -2.12	ν 2.6′ d -0.0′	m 0.55

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°00.8	218°02.6	S09°24.0	269°09.5	N14°06.8	271°15.6	N13°29.1	51°21.9	N00°52.5
1	75°03.2	233°04.2	23.8	284°10.9	06.5	286°17.9	29.1	66°24.5	52.4
2	90°05.7	248°05.9	23.6	299°12.4	06.2	301°20.2	29.0	81°27.0	52.4
3	105°08.2	263°07.5	·· 23.4	314°13.8	·· 05.9	316°22.4	·· 29.0	96°29.6	·· 52.4
4	120°10.6	278°09.2	23.2	329°15.2	05.6	331°24.7	28.9	111°32.1	52.4
5	135°13.1	293°10.8	23.0	344°16.6	05.3	346°27.0	28.9	126°34.7	52.3
6	150°15.5	308°12.5	S09°22.8	359°18.0	N14°04.9	1°29.3	N13°28.8	141°37.2	N00°52.3
7	165°18.0	323°14.1	22.6	14°19.5	04.6	16°31.6	28.8	156°39.7	52.3
8	180°20.5	338°15.8	22.4	29°20.9	04.3	31°33.9	28.7	171°42.3	52.3
9	195°22.9	353°17.4	·· 22.3	44°22.3	·· 04.0	46°36.2	·· 28.7	186°44.8	·· 52.2
10	210°25.4	8°19.1	22.1	59°23.7	03.7	61°38.5	28.6	201°47.4	52.2
11	225°27.9	23°20.7	21.9	74°25.1	03.4	76°40.8	28.6	216°49.9	52.2
12	240°30.3	38°22.3	S09°21.7	89°26.6	N14°03.1	91°43.1	N13°28.5	231°52.5	N00°52.2
13	255°32.8	53°23.9	21.5	104°28.0	02.8	106°45.4	28.5	246°55.0	52.1
14	270°35.3	68°25.6	21.3	119°29.4	02.5	121°47.7	28.4	261°57.6	52.1
15	285°37.7	83°27.2	·· 21.2	134°30.8	·· 02.2	136°50.0	·· 28.4	277°00.1	·· 52.1
16	300°40.2	98°28.8	21.0	149°32.3	01.9	151°52.3	28.3	292°02.7	52.1
17	315°42.6	113°30.4	20.8	164°33.7	01.6	166°54.6	28.3	307°05.2	52.0
18	330°45.1	128°32.0	S09°20.6	179°35.1	N14°01.2	181°56.9	N13°28.2	322°07.8	N00°52.0
19	345°47.6	143°33.6	20.5	194°36.6	00.9	196°59.2	28.2	337°10.3	52.0
20	0°50.0	158°35.2	20.3	209°38.0	00.6	212°01.5	28.1	352°12.8	52.0
21	15°52.5	173°36.8	·· 20.1	224°39.4	·· 00.3	227°03.8	·· 28.1	7°15.4	·· 51.9
22	30°55.0	188°38.4	20.0	239°40.8	14°00.0	242°06.1	28.0	22°17.9	51.9
23	45°57.4	203°40.0	19.8	254°42.3	13°59.7	257°08.4	28.0	37°20.5	51.9
Mer.pass. 19:57		ν 1.7′ d -0.2′	m -4.89	ν 1.4′ d -0.3′	m 0.61	ν 2.3′ d -0.0′	m -2.12	ν 2.5′ d -0.0′	m 0.56

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°59.9	218°41.6	S09°19.6	269°43.7	N13°59.4	272°10.7	N13°27.9	52°23.0	N00°51.9
1	76°02.4	233°43.2	19.5	284°45.1	59.1	287°13.0	27.9	67°25.6	51.8
2	91°04.8	248°44.8	19.3	299°46.6	58.8	302°15.3	27.9	82°28.1	51.8
3	106°07.3	263°46.4	·· 19.2	314°48.0	·· 58.5	317°17.6	·· 27.8	97°30.7	·· 51.8
4	121°09.8	278°48.0	19.0	329°49.4	58.2	332°19.9	27.8	112°33.2	51.8
5	136°12.2	293°49.5	18.9	344°50.9	57.9	347°22.2	27.7	127°35.7	51.7
6	151°14.7	308°51.1	S09°18.7	359°52.3	N13°57.6	2°24.5	N13°27.7	142°38.3	N00°51.7
7	166°17.1	323°52.7	18.6	14°53.7	57.3	17°26.8	27.6	157°40.8	51.7
8	181°19.6	338°54.2	18.4	29°55.2	56.9	32°29.1	27.6	172°43.4	51.7
9	196°22.1	353°55.8	·· 18.3	44°56.6	·· 56.6	47°31.4	·· 27.5	187°45.9	·· 51.6
10	211°24.5	8°57.4	18.1	59°58.0	56.3	62°33.7	27.5	202°48.5	51.6
11	226°27.0	23°58.9	18.0	74°59.5	56.0	77°36.0	27.4	217°51.0	51.6
12	241°29.5	39°00.5	S09°17.9	90°00.9	N13°55.7	92°38.3	N13°27.4	232°53.5	N00°51.6
13	256°31.9	54°02.0	17.7	105°02.3	55.4	107°40.6	27.3	247°56.1	51.6
14	271°34.4	69°03.6	17.6	120°03.8	55.1	122°42.9	27.3	262°58.6	51.5
15	286°36.9	84°05.1	·· 17.5	135°05.2	·· 54.8	137°45.3	·· 27.3	278°01.2	·· 51.5
16	301°39.3	99°06.7	17.3	150°06.6	54.5	152°47.6	27.2	293°03.7	51.5
17	316°41.8	114°08.2	17.2	165°08.1	54.2	167°49.9	27.2	308°06.3	51.5
18	331°44.3	129°09.8	S09°17.1	180°09.5	N13°53.9	182°52.2	N13°27.1	323°08.8	N00°51.4
19	346°46.7	144°11.3	16.9	195°11.0	53.6	197°54.5	27.1	338°11.3	51.4
20	1°49.2	159°12.8	16.8	210°12.4	53.3	212°56.8	27.0	353°13.9	51.4
21	16°51.6	174°14.4	·· 16.7	225°13.9	·· 53.0	227°59.1	·· 27.0	8°16.4	·· 51.4
22	31°54.1	189°15.9	16.6	240°15.3	52.7	243°01.4	26.9	23°19.0	51.3
23	46°56.6	204°17.4	16.4	255°16.7	52.4	258°03.7	26.9	38°21.5	51.3
Mer.pass. 19:53		ν 1.6′ d -0.2′	m -4.90	ν 1.4′ d -0.3′	m 0.60	ν 2.3′ d -0.0′	m -2.13	ν 2.5′ d -0.0′	m 0.56

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.5	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.2	23°35.5
Polaris	312°44.0	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.9
Rigel	281°02.1	-8°10.1
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.8
Canopus	263°51.3	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.4	-29°00.3
Procyon	244°49.0	5°09.4
Pollux	243°15.2	27°57.6
Avior	234°13.8	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.7	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.8	11°50.1
Dubhe	193°39.4	61°36.0
Denebola	182°23.6	14°25.2
Gienah	175°42.2	-17°41.4
Acrux	172°58.8	-63°14.7
Gacrux	171°50.3	-57°15.6
Alioth	166°12.1	55°48.6
Spica	158°21.0	-11°18.0
Alkaid	152°51.2	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.8	-60°56.7
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.7	-16°09.1
Alphecca	126°02.8	26°37.5
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.5	12°32.5
Eltanin	90°41.9	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 20 Fri	SHA	Mer.pass
Venus	158°20.1	09:29
Mars	209°34.0	06:05
Jupiter	211°19.0	05:58
Saturn	351°19.1	20:35

Nov 21 Sat	SHA	Mer.pass
Venus	158°01.8	09:27
Mars	209°08.8	06:03
Jupiter	211°14.8	05:54
Saturn	351°21.2	20:31

Nov 22 Sun	SHA	Mer.pass
Venus	157°41.7	09:24
Mars	208°43.8	06:01
Jupiter	211°10.8	05:50
Saturn	351°23.1	20:27

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°37.5	S19°38.3	63°02.2	14.3′	N01°08.9	15.3′	57.0′
1	198°37.4	38.9	77°35.5	14.3′	01°24.2	15.3′	57.1′
2	213°37.2	39.5	92°08.8	14.2′	01°39.5	15.3′	57.1′
3	228°37.1	·· 40.1	106°42.1	14.2′	01°54.8	15.3′	57.1′
4	243°36.9	40.6	121°15.3	14.1′	02°10.1	15.3′	57.2′
5	258°36.8	41.2	135°48.4	14.1′	02°25.4	15.3′	57.2′
6	273°36.6	S19°41.8	150°21.5	14.0′	N02°40.7	15.4′	57.3′
7	288°36.5	42.3	164°54.5	14.0′	02°56.1	15.4′	57.3′
8	303°36.3	42.9	179°27.5	13.9′	03°11.5	15.4′	57.3′
9	318°36.2	·· 43.4	194°00.4	13.9′	03°26.8	15.4′	57.4′
10	333°36.0	44.0	208°33.3	13.8′	03°42.2	15.4′	57.4′
11	348°35.9	44.6	223°06.1	13.7′	03°57.6	15.4′	57.5′
12	3°35.7	S19°45.1	237°38.8	13.7′	N04°13.0	15.4′	57.5′
13	18°35.6	45.7	252°11.5	13.6′	04°28.3	15.4′	57.5′
14	33°35.4	46.3	266°44.1	13.5′	04°43.7	15.4′	57.6′
15	48°35.3	·· 46.8	281°16.6	13.5′	04°59.1	15.4′	57.6′
16	63°35.1	47.4	295°49.1	13.4′	05°14.5	15.4′	57.7′
17	78°35.0	47.9	310°21.5	13.3′	05°29.9	15.4′	57.7′
18	93°34.8	S19°48.5	324°53.9	13.3′	N05°45.3	15.4′	57.7′
19	108°34.7	49.1	339°26.1	13.2′	06°00.6	15.4′	57.8′
20	123°34.5	49.6	353°58.3	13.1′	06°16.0	15.4′	57.8′
21	138°34.4	·· 50.2	8°30.5	13.1′	06°31.4	15.4′	57.9′
22	153°34.2	50.7	23°02.5	13.0′	06°46.7	15.3′	57.9′
23	168°34.1	51.3	37°34.5	12.9′	07°02.1	15.3′	57.9′
	SD = 16.2′	d = 0.6′	SD = 15.6′				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°33.9	S19°51.8	52°06.4	12.8′	N07°17.4	15.3′	58.0′
1	198°33.8	52.4	66°38.2	12.7′	07°32.7	15.3′	58.0′
2	213°33.6	52.9	81°09.9	12.7′	07°48.1	15.3′	58.1′
3	228°33.5	·· 53.5	95°41.6	12.6′	08°03.4	15.3′	58.1′
4	243°33.3	54.1	110°13.2	12.5′	08°18.6	15.3′	58.1′
5	258°33.2	54.6	124°44.6	12.4′	08°33.9	15.2′	58.2′
6	273°33.0	S19°55.2	139°16.0	12.3′	N08°49.1	15.2′	58.2′
7	288°32.9	55.7	153°47.4	12.2′	09°04.3	15.2′	58.2′
8	303°32.7	56.3	168°18.6	12.1′	09°19.5	15.2′	58.3′
9	318°32.5	·· 56.8	182°49.7	12.0′	09°34.7	15.1′	58.3′
10	333°32.4	57.4	197°20.8	11.9′	09°49.9	15.1′	58.4′
11	348°32.2	57.9	211°51.7	11.9′	10°05.0	15.1′	58.4′
12	3°32.1	S19°58.4	226°22.6	11.8′	N10°20.1	15.1′	58.4′
13	18°31.9	59.0	240°53.3	11.7′	10°35.1	15.0′	58.5′
14	33°31.8	19°59.5	255°24.0	11.6′	10°50.2	15.0′	58.5′
15	48°31.6	20°00.1	269°54.6	11.5′	11°05.1	15.0′	58.6′
16	63°31.4	00.6	284°25.0	11.4′	11°20.1	14.9′	58.6′
17	78°31.3	01.2	298°55.4	11.3′	11°35.0	14.9′	58.6′
18	93°31.1	S20°01.7	313°25.6	11.2′	N11°49.9	14.8′	58.7′
19	108°31.0	02.3	327°55.8	11.1′	12°04.8	14.8′	58.7′
20	123°30.8	02.8	342°25.9	10.9′	12°19.6	14.8′	58.8′
21	138°30.6	·· 03.3	356°55.8	10.8′	12°34.3	14.7′	58.8′
22	153°30.5	03.9	11°25.7	10.7′	12°49.0	14.7′	58.8′
23	168°30.3	04.4	25°55.4	10.6′	13°03.7	14.6′	58.9′
	SD = 16.2′	d = 0.6′	SD = 15.8′				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°30.2	S20°05.0	40°25.0	10.5′	N13°18.3	14.6′	58.9′
1	198°30.0	05.5	54°54.5	10.4′	13°32.9	14.5′	58.9′
2	213°29.8	06.0	69°23.9	10.3′	13°47.4	14.5′	59.0′
3	228°29.7	·· 06.6	83°53.2	10.2′	14°01.8	14.4′	59.0′
4	243°29.5	07.1	98°22.4	10.1′	14°16.2	14.3′	59.1′
5	258°29.4	07.7	112°51.5	9.9′	14°30.6	14.3′	59.1′
6	273°29.2	S20°08.2	127°20.4	9.8′	N14°44.8	14.2′	59.1′
7	288°29.0	08.7	141°49.2	9.7′	14°59.0	14.2′	59.2′
8	303°28.9	09.3	156°17.9	9.6′	15°13.2	14.1′	59.2′
9	318°28.7	·· 09.8	170°46.5	9.5′	15°27.3	14.0′	59.2′
10	333°28.5	10.3	185°15.0	9.3′	15°41.3	13.9′	59.3′
11	348°28.4	10.9	199°43.3	9.2′	15°55.2	13.9′	59.3′
12	3°28.2	S20°11.4	214°11.6	9.1′	N16°09.1	13.8′	59.3′
13	18°28.0	11.9	228°39.7	9.0′	16°22.9	13.7′	59.4′
14	33°27.9	12.5	243°07.6	8.9′	16°36.6	13.6′	59.4′
15	48°27.7	·· 13.0	257°35.5	8.7′	16°50.3	13.6′	59.4′
16	63°27.5	13.5	272°03.2	8.6′	17°03.8	13.5′	59.5′
17	78°27.4	14.0	286°30.8	8.5′	17°17.3	13.4′	59.5′
18	93°27.2	S20°14.6	300°58.3	8.3′	N17°30.7	13.3′	59.6′
19	108°27.0	15.1	315°25.7	8.2′	17°44.0	13.2′	59.6′
20	123°26.9	15.6	329°52.9	8.1′	17°57.2	13.1′	59.6′
21	138°26.7	·· 16.2	344°20.0	8.0′	18°10.4	13.0′	59.7′
22	153°26.5	16.7	358°46.9	7.8′	18°23.4	12.9′	59.7′
23	168°26.4	17.2	13°13.7	7.7′	18°36.3	12.8′	59.7′
	SD = 16.2′	d = 0.5′	SD = 16.1′				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 11-13 74-91%
20	14:30	14:23	11:46	20:25	08:02	
21	14:16	14:08	11:46	21:13	08:48	
22	14:01	13:53	11:46	22:05	09:38	

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

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	61°59.0	219°18.9	S09°16.3	270°18.2	N13°52.1	273°06.0	N13°26.8	53°24.0	N00°51.3
1	77°01.5	234°20.4	16.2	285°19.6	51.8	288°08.3	26.8	68°26.6	51.3
2	92°04.0	249°22.0	16.1	300°21.1	51.5	303°10.6	26.8	83°29.1	51.3
3	107°06.4	264°23.5	·· 16.0	315°22.5	·· 51.2	318°12.9	·· 26.7	98°31.7	·· 51.2
4	122°08.9	279°25.0	15.9	330°24.0	50.9	333°15.2	26.7	113°34.2	51.2
5	137°11.4	294°26.5	15.8	345°25.4	50.5	348°17.6	26.6	128°36.7	51.2
6	152°13.8	309°28.0	S09°15.7	0°26.8	N13°50.2	3°19.9	N13°26.6	143°39.3	N00°51.2
7	167°16.3	324°29.5	15.6	15°28.3	49.9	18°22.2	26.5	158°41.8	51.1
8	182°18.8	339°31.0	15.5	30°29.7	49.6	33°24.5	26.5	173°44.4	51.1
9	197°21.2	354°32.5	·· 15.4	45°31.2	·· 49.3	48°26.8	·· 26.5	188°46.9	·· 51.1
10	212°23.7	9°34.0	15.3	60°32.6	49.0	63°29.1	26.4	203°49.4	51.1
11	227°26.1	24°35.4	15.2	75°34.1	48.7	78°31.4	26.4	218°52.0	51.1
12	242°28.6	39°36.9	S09°15.1	90°35.5	N13°48.4	93°33.7	N13°26.3	233°54.5	N00°51.0
13	257°31.1	54°38.4	15.0	105°37.0	48.1	108°36.0	26.3	248°57.1	51.0
14	272°33.5	69°39.9	14.9	120°38.4	47.8	123°38.4	26.2	263°59.6	51.0
15	287°36.0	84°41.4	·· 14.8	135°39.9	·· 47.5	138°40.7	·· 26.2	279°02.1	·· 51.0
16	302°38.5	99°42.8	14.7	150°41.3	47.2	153°43.0	26.1	294°04.7	50.9
17	317°40.9	114°44.3	14.6	165°42.8	46.9	168°45.3	26.1	309°07.2	50.9
18	332°43.4	129°45.8	S09°14.5	180°44.2	N13°46.6	183°47.6	N13°26.1	324°09.8	N00°50.9
19	347°45.9	144°47.2	14.4	195°45.7	46.3	198°49.9	26.0	339°12.3	50.9
20	2°48.3	159°48.7	14.4	210°47.1	46.0	213°52.2	26.0	354°14.8	50.9
21	17°50.8	174°50.2	·· 14.3	225°48.6	·· 45.7	228°54.5	·· 25.9	9°17.4	·· 50.8
22	32°53.2	189°51.6	14.2	240°50.0	45.4	243°56.9	25.9	24°19.9	50.8
23	47°55.7	204°53.1	14.1	255°51.5	45.1	258°59.2	25.8	39°22.4	50.8
Mer.pass. 19:49		ν 1.5′	d -0.1′	m -4.90	ν 1.4′	d -0.3′	m 0.58	ν 2.3′	d -0.0′ m -2.14	ν 2.5′	d -0.0′ m 0.57

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°58.2	219°54.5	S09°14.0	270°53.0	N13°44.8	274°01.5	N13°25.8	54°25.0	N00°50.8
1	78°00.6	234°56.0	14.0	285°54.4	44.5	289°03.8	25.8	69°27.5	50.8
2	93°03.1	249°57.4	13.9	300°55.9	44.2	304°06.1	25.7	84°30.0	50.7
3	108°05.6	264°58.9	·· 13.8	315°57.3	·· 43.9	319°08.4	·· 25.7	99°32.6	·· 50.7
4	123°08.0	280°00.3	13.8	330°58.8	43.6	334°10.8	25.6	114°35.1	50.7
5	138°10.5	295°01.7	13.7	346°00.2	43.3	349°13.1	25.6	129°37.7	50.7
6	153°13.0	310°03.2	S09°13.6	1°01.7	N13°43.0	4°15.4	N13°25.6	144°40.2	N00°50.7
7	168°15.4	325°04.6	13.6	16°03.2	42.7	19°17.7	25.5	159°42.7	50.6
8	183°17.9	340°06.0	13.5	31°04.6	42.4	34°20.0	25.5	174°45.3	50.6
9	198°20.4	355°07.4	·· 13.4	46°06.1	·· 42.1	49°22.3	·· 25.4	189°47.8	·· 50.6
10	213°22.8	10°08.9	13.4	61°07.5	41.8	64°24.7	25.4	204°50.3	50.6
11	228°25.3	25°10.3	13.3	76°09.0	41.5	79°27.0	25.4	219°52.9	50.5
12	243°27.7	40°11.7	S09°13.3	91°10.5	N13°41.2	94°29.3	N13°25.3	234°55.4	N00°50.5
13	258°30.2	55°13.1	13.2	106°11.9	40.9	109°31.6	25.3	249°57.9	50.5
14	273°32.7	70°14.5	13.2	121°13.4	40.6	124°33.9	25.2	265°00.5	50.5
15	288°35.1	85°15.9	·· 13.1	136°14.9	·· 40.3	139°36.3	·· 25.2	280°03.0	·· 50.5
16	303°37.6	100°17.3	13.1	151°16.3	40.0	154°38.6	25.1	295°05.5	50.4
17	318°40.1	115°18.7	13.0	166°17.8	39.7	169°40.9	25.1	310°08.1	50.4
18	333°42.5	130°20.1	S09°13.0	181°19.2	N13°39.4	184°43.2	N13°25.1	325°10.6	N00°50.4
19	348°45.0	145°21.5	12.9	196°20.7	39.1	199°45.5	25.0	340°13.1	50.4
20	3°47.5	160°22.9	12.9	211°22.2	38.8	214°47.9	25.0	355°15.7	50.4
21	18°49.9	175°24.3	·· 12.9	226°23.6	·· 38.5	229°50.2	·· 24.9	10°18.2	·· 50.4
22	33°52.4	190°25.7	12.8	241°25.1	38.2	244°52.5	24.9	25°20.7	50.3
23	48°54.9	205°27.1	12.8	256°26.6	37.9	259°54.8	24.9	40°23.3	50.3
Mer.pass. 19:45		ν 1.4′	d -0.1′	m -4.90	ν 1.5′	d -0.3′	m 0.57	ν 2.3′	d -0.0′ m -2.14	ν 2.5′	d -0.0′ m 0.57

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°57.3	220°28.5	S09°12.8	271°28.1	N13°37.6	274°57.1	N13°24.8	55°25.8	N00°50.3
1	78°59.8	235°29.8	12.7	286°29.5	37.4	289°59.5	24.8	70°28.3	50.3
2	94°02.2	250°31.2	12.7	301°31.0	37.1	305°01.8	24.7	85°30.9	50.3
3	109°04.7	265°32.6	·· 12.7	316°32.5	·· 36.8	320°04.1	·· 24.7	100°33.4	·· 50.2
4	124°07.2	280°34.0	12.6	331°33.9	36.5	335°06.4	24.7	115°35.9	50.2
5	139°09.6	295°35.3	12.6	346°35.4	36.2	350°08.8	24.6	130°38.5	50.2
6	154°12.1	310°36.7	S09°12.6	1°36.9	N13°35.9	5°11.1	N13°24.6	145°41.0	N00°50.2
7	169°14.6	325°38.1	12.6	16°38.3	35.6	20°13.4	24.6	160°43.5	50.2
8	184°17.0	340°39.4	12.6	31°39.8	35.3	35°15.7	24.5	175°46.1	50.1
9	199°19.5	355°40.8	·· 12.5	46°41.3	·· 35.0	50°18.1	·· 24.5	190°48.6	·· 50.1
10	214°22.0	10°42.1	12.5	61°42.8	34.7	65°20.4	24.4	205°51.1	50.1
11	229°24.4	25°43.5	12.5	76°44.2	34.4	80°22.7	24.4	220°53.7	50.1
12	244°26.9	40°44.8	S09°12.5	91°45.7	N13°34.1	95°25.0	N13°24.4	235°56.2	N00°50.1
13	259°29.4	55°46.2	12.5	106°47.2	33.8	110°27.4	24.3	250°58.7	50.0
14	274°31.8	70°47.5	12.5	121°48.7	33.5	125°29.7	24.3	266°01.3	50.0
15	289°34.3	85°48.9	·· 12.5	136°50.1	·· 33.2	140°32.0	·· 24.2	281°03.8	·· 50.0
16	304°36.7	100°50.2	12.5	151°51.6	32.9	155°34.3	24.2	296°06.3	50.0
17	319°39.2	115°51.5	12.4	166°53.1	32.6	170°36.7	24.2	311°08.9	50.0
18	334°41.7	130°52.9	S09°12.4	181°54.6	N13°32.3	185°39.0	N13°24.1	326°11.4	N00°50.0
19	349°44.1	145°54.2	12.4	196°56.1	32.0	200°41.3	24.1	341°13.9	49.9
20	4°46.6	160°55.5	12.4	211°57.5	31.7	215°43.7	24.1	356°16.4	49.9
21	19°49.1	175°56.9	·· 12.4	226°59.0	·· 31.5	230°46.0	·· 24.0	11°19.0	·· 49.9
22	34°51.5	190°58.2	12.4	242°00.5	31.2	245°48.3	24.0	26°21.5	49.9
23	49°54.0	205°59.5	12.5	257°02.0	30.9	260°50.6	23.9	41°24.0	49.9
Mer.pass. 19:41		ν 1.4′	d -0.0′	m -4.91	ν 1.5′	d -0.3′	m 0.55	ν 2.3′	d -0.0′ m -2.15	ν 2.5′	d -0.0′ m 0.58

Stars

	SHA	Dec
Alpheratz	357°33.0	29°14.6
Ankaa	353°05.4	-42°09.7
Schedar	349°28.9	56°41.4
Diphda	348°45.6	-17°50.3
Achernar	335°18.6	-57°06.1
Hamal	327°49.1	23°35.5
Polaris	312°43.9	89°22.7
Acamar	315°10.2	-40°11.8
Menkar	314°04.2	4°11.8
Mirfak	308°25.5	49°57.5
Aldebaran	290°37.5	16°33.8
Rigel	281°02.1	-8°10.2
Capella	280°19.2	46°01.4
Bellatrix	278°20.9	6°22.5
Elnath	277°59.6	28°37.8
Alnilam	275°35.9	-1°11.0
Betelgeuse	270°50.1	7°24.8
Canopus	263°51.2	-52°42.4
Sirius	258°24.6	-16°45.1
Adhara	255°04.4	-29°00.4
Procyon	244°49.0	5°09.4
Pollux	243°15.2	27°57.6
Avior	234°13.8	-59°35.4
Suhail	222°45.1	-43°32.2
Miaplacidus	221°37.7	-69°49.3
Alphard	217°46.2	-8°46.4
Regulus	207°32.8	11°50.1
Dubhe	193°39.3	61°36.0
Denebola	182°23.5	14°25.2
Gienah	175°42.2	-17°41.4
Acrux	172°58.8	-63°14.7
Gacrux	171°50.3	-57°15.6
Alioth	166°12.0	55°48.6
Spica	158°20.9	-11°18.0
Alkaid	152°51.2	49°10.6
Hadar	148°34.4	-60°30.0
Menkent	147°56.2	-36°30.0
Arcturus	145°46.8	19°02.5
Rigil Kent.	139°38.8	-60°56.7
Kochab	137°21.0	74°02.5
Zuben'ubi	136°54.6	-16°09.1
Alphecca	126°02.8	26°37.4
Antares	112°14.3	-26°29.4
Atria	107°07.7	-69°04.5
Sabik	102°01.4	-15°45.4
Shaula	96°08.7	-37°07.4
Rasalhague	95°57.5	12°32.5
Eltanin	90°42.0	51°29.2
Kaus Aust.	83°30.8	-34°22.3
Vega	80°32.5	38°48.7
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.5
Peacock	53°03.6	-56°39.1
Deneb	49°24.9	45°22.9
Enif	33°37.3	10°00.1
Al Na'ir	27°31.0	-46°50.0
Fomalhaut	15°12.8	-29°28.8
Scheat	13°43.6	28°14.0
Markab	13°28.3	15°21.2

Nov 23 Mon	SHA	Mer.pass
Venus	157°19.9	09:22
Mars	208°19.1	05:58
Jupiter	211°07.0	05:47
Saturn	351°25.0	20:23

Nov 24 Tue	SHA	Mer.pass
Venus	156°56.3	09:19
Mars	207°54.8	05:56
Jupiter	211°03.3	05:43
Saturn	351°26.8	20:19

Nov 25 Wed	SHA	Mer.pass
Venus	156°31.1	09:17
Mars	207°30.7	05:54
Jupiter	210°59.8	05:39
Saturn	351°28.5	20:15

Horizontal parallax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°26.2	S20°17.7	27°40.4	7.6′	N18°49.2	12.7′	59.7′
1	198°26.0	18.3	42°07.0	7.4′	19°01.9	12.6′	59.8′
2	213°25.9	18.8	56°33.4	7.3′	19°14.6	12.5′	59.8′
3	228°25.7	·· 19.3	70°59.8	7.2′	19°27.1	12.4′	59.8′
4	243°25.5	19.8	85°25.9	7.0′	19°39.5	12.3′	59.9′
5	258°25.3	20.3	99°52.0	6.9′	19°51.8	12.2′	59.9′
6	273°25.2	S20°20.9	114°17.9	6.8′	N20°04.1	12.1′	59.9′
7	288°25.0	21.4	128°43.6	6.6′	20°16.1	12.0′	60.0′
8	303°24.8	21.9	143°09.3	6.5′	20°28.1	11.9′	60.0′
9	318°24.7	·· 22.4	157°34.8	6.4′	20°40.0	11.7′	60.0′
10	333°24.5	22.9	172°00.2	6.2′	20°51.7	11.6′	60.1′
11	348°24.3	23.5	186°25.4	6.1′	21°03.3	11.5′	60.1′
12	3°24.1	S20°24.0	200°50.5	6.0′	N21°14.8	11.4′	60.1′
13	18°24.0	24.5	215°15.5	5.8′	21°26.2	11.2′	60.1′
14	33°23.8	25.0	229°40.3	5.7′	21°37.4	11.1′	60.2′
15	48°23.6	·· 25.5	244°05.0	5.6′	21°48.5	11.0′	60.2′
16	63°23.4	26.0	258°29.6	5.4′	21°59.5	10.8′	60.2′
17	78°23.3	26.5	272°54.0	5.3′	22°10.3	10.7′	60.2′
18	93°23.1	S20°27.1	287°18.4	5.2′	N22°21.0	10.6′	60.3′
19	108°22.9	27.6	301°42.5	5.1′	22°31.6	10.4′	60.3′
20	123°22.7	28.1	316°06.6	4.9′	22°42.0	10.3′	60.3′
21	138°22.6	·· 28.6	330°30.5	4.8′	22°52.3	10.1′	60.3′
22	153°22.4	29.1	344°54.3	4.7′	23°02.4	10.0′	60.4′
23	168°22.2	29.6	359°18.0	4.5′	23°12.4	9.8′	60.4′
	SD = 16.2′	d = 0.5′	SD = 16.3′				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°22.0	S20°30.1	13°41.5	4.4′	N23°22.2	9.7′	60.4′
1	198°21.9	30.6	28°04.9	4.3′	23°31.8	9.5′	60.4′
2	213°21.7	31.1	42°28.2	4.2′	23°41.4	9.4′	60.5′
3	228°21.5	·· 31.6	56°51.4	4.0′	23°50.7	9.2′	60.5′
4	243°21.3	32.1	71°14.4	3.9′	23°59.9	9.0′	60.5′
5	258°21.1	32.6	85°37.3	3.8′	24°08.9	8.9′	60.5′
6	273°21.0	S20°33.2	100°00.1	3.7′	N24°17.8	8.7′	60.5′
7	288°20.8	33.7	114°22.8	3.6′	24°26.5	8.5′	60.6′
8	303°20.6	34.2	128°45.4	3.4′	24°35.0	8.4′	60.6′
9	318°20.4	·· 34.7	143°07.8	3.3′	24°43.4	8.2′	60.6′
10	333°20.2	35.2	157°30.2	3.2′	24°51.6	8.0′	60.6′
11	348°20.1	35.7	171°52.4	3.1′	24°59.6	7.8′	60.6′
12	3°19.9	S20°36.2	186°14.5	3.0′	N25°07.4	7.7′	60.7′
13	18°19.7	36.7	200°36.5	2.9′	25°15.1	7.5′	60.7′
14	33°19.5	37.2	214°58.4	2.8′	25°22.5	7.3′	60.7′
15	48°19.3	·· 37.7	229°20.2	2.7′	25°29.8	7.1′	60.7′
16	63°19.2	38.2	243°41.9	2.6′	25°36.9	6.9′	60.7′
17	78°19.0	38.7	258°03.5	2.5′	25°43.9	6.7′	60.7′
18	93°18.8	S20°39.2	272°25.0	2.4′	N25°50.6	6.5′	60.7′
19	108°18.6	39.7	286°46.4	2.3′	25°57.1	6.4′	60.8′
20	123°18.4	40.2	301°07.7	2.2′	26°03.5	6.2′	60.8′
21	138°18.2	·· 40.6	315°28.9	2.1′	26°09.6	6.0′	60.8′
22	153°18.1	41.1	329°50.0	2.0′	26°15.6	5.8′	60.8′
23	168°17.9	41.6	344°11.0	2.0′	26°21.4	5.6′	60.8′
	SD = 16.2′	d = 0.5′	SD = 16.5′				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	d	**HP**
0	183°17.7	S20°42.1	358°32.0	1.9′	N26°27.0	5.4′	60.8′
1	198°17.5	42.6	12°52.9	1.8′	26°32.3	5.2′	60.8′
2	213°17.3	43.1	27°13.7	1.7′	26°37.5	5.0′	60.8′
3	228°17.1	·· 43.6	41°34.4	1.6′	26°42.5	4.8′	60.9′
4	243°16.9	44.1	55°55.0	1.6′	26°47.2	4.6′	60.9′
5	258°16.7	44.6	70°15.6	1.5′	26°51.8	4.4′	60.9′
6	273°16.6	S20°45.1	84°36.1	1.5′	N26°56.2	4.2′	60.9′
7	288°16.4	45.6	98°56.6	1.4′	27°00.3	3.9′	60.9′
8	303°16.2	46.0	113°17.0	1.3′	27°04.3	3.7′	60.9′
9	318°16.0	·· 46.5	127°37.3	1.3′	27°08.0	3.5′	60.9′
10	333°15.8	47.0	141°57.6	1.2′	27°11.5	3.3′	60.9′
11	348°15.6	47.5	156°17.8	1.2′	27°14.9	3.1′	60.9′
12	3°15.4	S20°48.0	170°38.0	1.1′	N27°18.0	2.9′	60.9′
13	18°15.2	48.5	184°58.1	1.1′	27°20.9	2.7′	60.9′
14	33°15.1	49.0	199°18.2	1.1′	27°23.5	2.5′	60.9′
15	48°14.9	·· 49.4	213°38.3	1.0′	27°26.0	2.3′	60.9′
16	63°14.7	49.9	227°58.3	1.0′	27°28.3	2.0′	60.9′
17	78°14.5	50.4	242°18.3	1.0′	27°30.3	1.8′	60.9′
18	93°14.3	S20°50.9	256°38.3	1.0′	N27°32.1	1.6′	60.9′
19	108°14.1	51.4	270°58.3	0.9′	27°33.7	1.4′	60.9′
20	123°13.9	51.8	285°18.2	0.9′	27°35.1	1.2′	60.9′
21	138°13.7	·· 52.3	299°38.1	0.9′	27°36.3	1.0′	60.9′
22	153°13.5	52.8	313°58.0	0.9′	27°37.2	0.7′	60.9′
23	168°13.3	53.3	328°17.9	0.9′	27°38.0	0.5′	60.9′
	SD = 16.2′	d = 0.5′	SD = 16.6′				

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

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

Day	**Sun** Eqn.of Time 00^h mm:ss	12^h mm:ss	Mer. Pass hh:mm	**Moon** Mer.Pass. Upper hh:mm	Lower hh:mm	Age 14-16 96-100%
23	13:45	13:37	11:46	23:03	10:33	◯
24	13:28	13:20	11:47	–:–	11:34	
25	13:11	13:02	11:47	00:06	12:39	