



## THE NAUTICAL ALMANAC

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# July 08, 09, 10 (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn		Stars				
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec		
0	286°24.1		219°15.1	N17°17.2	279°42.8	S00°42.4	351°21.5	S21°45.5	344°36.3	S20°26.6		Alpheratz	357°38.4	29°12.0	
1	301°26.5		234°16.4	17.3	294°43.9	41.9	6°24.3	45.6	359°39.0	26.7		Ankaa	353°10.7	-42°11.5	
2	316°29.0		249°17.8	17.4	309°45.0	41.4	21°27.1	45.7	14°41.6	26.7		Schedar	349°34.9	56°38.6	
3	331°31.4		264°19.1	· · 17.5	324°46.1	· · 40.9	36°29.9	· · 45.7	29°44.3	· · 26.7		Diphda	348°50.9	-17°52.4	
4	346°33.9		279°20.5	17.6	339°47.3	40.3	51°32.7	45.8	44°46.9	26.8		Achernar	335°23.1	-57°07.8	
5	1°36.4		294°21.9	17.7	354°48.4	39.8	66°35.5	45.8	59°49.6	26.8		Hamal	327°55.3	23°33.3	
6	16°38.8		309°23.2	N17°17.8	9°49.5	S00°39.3	81°38.3	S21°45.9	74°52.2	S20°26.9		Polaris	315°52.7	89°20.6	
7	31°41.3		324°24.6	17.9	24°50.6	38.8	96°41.1	46.0	89°54.9	26.9		Acamar	315°14.8	-40°13.3	
8	46°43.8		339°25.9	18.0	39°51.8	38.3	111°43.9	46.0	104°57.5	26.9		Menkar	314°10.1	4°10.1	
9	61°46.2		354°27.2	· · 18.1	54°52.9	· · 37.8	126°46.7	· · 46.1	120°00.2	· · 27.0		Mirfak	308°33.7	49°55.7	
10	76°48.7		9°28.6	18.2	69°54.0	37.3	141°49.5	46.1	135°02.8	27.0		Aldebaran	290°44.0	16°32.9	
11	91°51.2		24°29.9	18.3	84°55.2	36.8	156°52.3	46.2	150°05.5	27.1		Rigel	281°07.7	-8°10.7	
12	106°53.6		39°31.3	N17°18.4	99°56.3	S00°36.3	171°55.1	S21°46.3	165°08.1	S20°27.1		Capella	280°27.7	46°00.9	
13	121°56.1		54°32.6	18.5	114°57.4	35.8	186°57.9	46.3	180°10.8	27.1		Bellatrix	278°27.1	6°22.0	
14	136°58.6		69°33.9	18.6	129°58.6	35.3	202°00.7	46.4	195°13.4	27.2		Elnath	278°06.8	28°37.3	
15	152°01.0		84°35.2	· · 18.7	144°59.7	· · 34.7	217°03.5	· · 46.4	210°16.1	· · 27.2		Alnilam	275°41.7	-1°11.4	
16	167°03.5		99°36.6	18.8	160°00.8	34.2	232°06.3	46.5	225°18.7	27.3		Betelgeuse	270°56.3	7°24.6	
17	182°05.9		114°37.9	18.9	175°02.0	33.7	247°09.1	46.6	240°21.4	27.3		Canopus	263°54.5	-52°42.4	
18	197°08.4		129°39.2	N17°19.0	190°03.1	S00°33.2	262°11.9	S21°46.6	255°24.0	S20°27.4		Sirius	258°29.8	-16°44.7	
19	212°10.9		144°40.5	19.1	205°04.2	32.7	277°14.7	46.7	270°26.7	27.4		Adhara	255°09.1	-29°00.0	
20	227°13.3		159°41.8	19.2	220°05.4	32.2	292°17.5	46.7	285°29.3	27.4		Procyon	244°55.0	5°10.3	
21	242°15.8		174°43.1	· · 19.3	235°06.5	· · 31.7	307°20.3	· · 46.8	300°32.0	· · 27.5		Pollux	243°22.1	27°58.6	
22	257°18.3		189°44.4	19.4	250°07.6	31.2	322°23.1	46.9	315°34.6	27.5		Avior	234°16.7	-59°34.6	
23	272°20.7		204°45.8	19.5	265°08.8	30.7	337°25.9	46.9	330°37.3	27.6		Suhail	222°49.3	-43°31.0	
Mer.pass.:04:54		v1.4 d0.1 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.1							
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	287°23.2		219°47.1	N17°19.6	280°09.9	S00°30.2	352°28.7	S21°47.0	345°39.9	S20°27.6		Miaplacidus	221°39.6	-69°48.2	
1	302°25.7		234°48.4	19.8	295°11.0	29.7	7°31.5	47.0	0°42.6	27.6		Alphard	217°51.6	-8°44.8	
2	317°28.1		249°49.6	19.9	310°12.2	29.2	22°34.3	47.1	15°45.2	27.7		Regulus	207°38.6	11°52.2	
3	332°30.6		264°50.9	· · 20.0	325°13.3	· · 28.7	37°37.1	· · 47.2	30°47.9	· · 27.7		Dubhe	193°46.0	61°38.8	
4	347°33.1		279°52.2	20.1	340°14.4	28.2	52°39.9	47.2	45°50.5	27.8		Denebola	182°28.8	14°27.7	
5	2°35.5		294°53.5	20.2	355°15.6	27.7	67°42.7	47.3	60°53.2	27.8		Gienah	175°47.4	-17°39.3	
6	17°38.0		309°54.8	N17°20.3	10°16.7	S00°27.1	82°45.5	S21°47.3	75°55.8	S20°27.8		Acrux	173°04.1	-63°12.9	
7	32°40.4		324°56.1	20.4	25°17.8	26.6	97°48.3	47.4	90°58.5	27.9		Gacrux	171°55.6	-57°13.8	
8	47°42.9		339°57.4	20.6	40°19.0	26.1	112°51.1	47.5	106°01.1	27.9		Alioth	166°16.3	55°51.3	
9	62°45.4		354°58.6	· · 20.7	55°20.1	· · 25.6	127°53.9	· · 47.5	121°03.8	· · 28.0		Spica	158°26.1	-11°16.0	
10	77°47.8		9°59.9	20.8	70°21.3	25.1	142°56.7	47.6	136°06.4	28.0		Alkaid	152°54.9	49°13.1	
11	92°50.3		25°01.2	20.9	85°22.4	24.6	157°59.5	47.6	151°09.1	28.1		Hadar	148°40.8	-60°28.4	
12	107°52.8		40°02.5	N17°21.0	100°23.5	S00°24.1	173°02.3	S21°47.7	166°11.7	S20°28.1		Menkent	148°01.7	-36°28.3	
13	122°55.2		55°03.7	21.2	115°24.7	23.6	188°05.1	47.7	181°14.4	28.1		Arcturus	145°51.2	19°04.8	
14	137°57.7		70°05.0	21.3	130°25.8	23.1	203°07.9	47.8	196°17.0	28.2		Rigil Kent.	139°44.9	-60°55.3	
15	153°00.2		85°06.2	· · 21.4	145°27.0	· · 22.6	218°10.7	· · 47.9	211°19.7	· · 28.2		Kochab	137°19.5	74°04.7	
16	168°02.6		100°07.5	21.5	160°28.1	22.1	233°13.5	47.9	226°22.3	28.3		Zuben'ubi	136°59.9	-16°07.5	
17	183°05.1		115°08.8	21.7	175°29.2	21.6	248°16.3	48.0	241°25.0	28.3		Alphecca	126°06.6	26°39.0	
18	198°07.5		130°10.0	N17°21.8	190°30.4	S00°21.1	263°19.1	S21°48.0	256°27.6	S20°28.3		Antares	112°20.0	-26°28.6	
19	213°10.0		145°11.3	21.9	205°31.5	20.6	278°21.9	48.1	271°30.3	28.4		Atria	107°16.9	-69°03.9	
20	228°12.5		160°12.5	22.0	220°32.7	20.1	293°24.7	48.2	286°32.9	28.4		Sabik	102°06.6	-15°44.9	
21	243°14.9		175°13.7	· · 22.2	235°33.8	· · 19.6	308°27.5	· · 48.2	301°35.6	· · 28.5		Shaula	96°14.9	-37°07.0	
22	258°17.4		190°15.0	22.3	250°35.0	19.1	323°30.3	48.3	316°38.2	28.5		Rasalhague	96°01.6	12°32.9	
23	273°19.9		205°16.2	22.4	265°36.1	18.6	338°33.1	48.3	331°40.9	28.5		Eltanin	90°43.4	51°29.3	
Mer.pass.:04:50		v1.3 d0.1 m-4.5		v1.1 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.1							
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	288°22.3		220°17.5	N17°22.6	280°37.2	S00°18.1	353°35.9	S21°48.4	346°43.5	S20°28.6		Kaus Aust.	83°36.9	-34°22.4	
1	303°24.8		235°18.7	22.7	295°38.4	17.6	8°38.7	48.5	1°46.2	28.6		Vega	80°35.2	38°48.3	
2	318°27.3		250°19.9	22.8	310°39.5	17.1	23°41.5	48.5	16°48.8	28.7		Nunki	75°51.9	-26°16.2	
3	333°29.7		265°21.2	· · 22.9	325°40.7	· · 16.6	38°44.3	· · 48.6	31°51.5	· · 28.7		Altair	62°03.1	8°55.4	
4	348°32.2		280°22.4	23.1	340°41.8	16.1	53°47.2	48.6	46°54.1	28.8		Peacock	53°10.9	-56°40.0	
5	3°34.7		295°23.6	23.2	355°43.0	15.6	68°50.0	48.7	61°56.8	28.8		Deneb	49°27.8	45°21.1	
6	18°37.1		310°24.8	N17°23.3	10°44.1	S00°15.1	83°52.8	S21°48.8	76°59.4	S20°28.8		Enif	33°42.1	9°58.1	
7	33°39.6		325°26.0	23.5	25°45.3	14.6	98°55.6	48.8	92°02.1	28.9		Al Na'ir	27°37.2	-46°51.5	
8	48°42.0		340°27.3	23.6	40°46.4	14.1	113°58.4	48.9	107°04.7	28.9		Fomalhaut	15°18.4	-29°30.7	
9	63°44.5		355°28.5	· · 23.7	55°47.6	· · 13.6	129°01.2	· · 48.9	122°07.4	· · 29.0		Scheat	13°48.5	28°11.5	
10	78°47.0		10°29.7	23.9	70°48.7	13.1	144°04.0	49.0	137°10.0	29.0		Markab	13°33.3	15°18.8	
11	93°49.4		25°30.9	24.0	85°49.9	12.6	159°06.8	49.1	152°12.7	29.0					
12	108°51.9		40°32.1	N17°24.2	100°51.0	S00°12.1	174°09.6	S21°49.1	167°15.3	S20°29.1		Jul 08 Wed	SHA	Mer.pass	
13	123°54.4		55°33.3	24.3	115°52.2	11.6	189°12.4	49.2	182°18.0	29.1		Venus	292°51.0	09:22	
14	138°56.8		70°34.5	24.4	130°53.3	11.1	204°15.2	49.2	197°20.6	29.2		Mars	353°18.7	05:21	
15	153°59.3		85°35.7	· · 24.6	145°54.5	· · 10.6	219°18.0	· · 49.3	212°23.3	· · 29.2		Jupiter	64°57.4	00:34	
16	169°01.8		100°36.9	24.7	160°55.6	10.1	234°20.8	49.4	227°25.9	29.2		Saturn	58°12.3	01:01	
17	184°04.2		115°38.1	24.9	175°56.8	09.6	249°23.6	49.4	242°28.6	29.3					
18	199°06.7		130°39.3	N17°25.0	190°57.9	S00°09.1	264°26.4	S21°49.5	257°31.2	S20°29.3		Jul 09 Thu	SHA	Mer.pass	
19	214°09.1		145°40.5	25.1	205°59.1	08.6	279°29.2	49.5	272°33.9	29.4		Venus	292°23.9	09:20	
20	229°11.6		160°41.6	25.3	221°00.2	08.1	294°32.0	49.6	287°36.5	29.4		Mars	352°46.7	05:19	
21	244°14.1		175°42.8	· · 25.4	236°01.4	· · 07.6	309°34.8	· · 49.6	302°39.2	· · 29.5		Jupiter	65°05.5	00:30	
22	259°16.5		190°44.0	25.6	251°02.5	07.1	324°37.6	49.7	317°41.8	29.5		Saturn	58°16.7	00:57	
23	274°19.0		205°45.2	25.7	266°03.7	06.6	339°40.4	49.8	332°44.5	29.5					
Mer.pass.:04:46		v1.2 d0.1 m-4.5		v1.1 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1							
											Horizontal parallax				
											Venus:		0.3		
											Mars:		0.2		

h		Sun		Moon			
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°43.3	N22°26.5	322°11.8	11.2'	S18°34.0	8.5'	56.0'
1	193°43.2	26.2	336°42.1	11.3'	18°25.4	8.6'	56.0'
2	208°43.1	25.9	351°12.4	11.4'	18°16.7	8.7'	56.0'
3	223°43.0	· · 25.6	5°42.8	11.4'	18°08.0	8.8'	55.9'
4	238°43.0	25.3	20°13.3	11.5'	17°59.2	8.9'	55.9'
5	253°42.9	25.1	34°43.9	11.6'	17°50.3	8.9'	55.9'
6	268°42.8	N22°24.8	49°14.5	11.7'	S17°41.3	9.0'	55.8'
7	283°42.7	24.5	63°45.3	11.8'	17°32.2	9.1'	55.8'
8	298°42.6	24.2	78°16.1	11.9'	17°23.1	9.2'	55.8'
9	313°42.5	· · 23.9	92°47.0	12.0'	17°13.9	9.2'	55.8'
10	328°42.4	23.6	107°18.0	12.0'	17°04.6	9.3'	55.7'
11	343°42.3	23.3	121°49.1	12.1'	16°55.3	9.4'	55.7'
12	358°42.2	N22°23.0	136°20.2	12.2'	S16°45.9	9.5'	55.7'
13	13°42.1	22.7	150°51.5	12.3'	16°36.4	9.5'	55.7'
14	28°42.0	22.4	165°22.8	12.4'	16°26.8	9.6'	55.6'
15	43°41.9	· · 22.1	179°54.2	12.5'	16°17.2	9.7'	55.6'
16	58°41.8	21.8	194°25.7	12.5'	16°07.5	9.7'	55.6'
17	73°41.7	21.5	208°57.3	12.6'	15°57.7	9.8'	55.6'
18	88°41.6	N22°21.2	223°28.9	12.7'	S15°47.9	9.9'	55.5'
19	103°41.6	20.9	238°00.7	12.8'	15°38.0	9.9'	55.5'
20	118°41.5	20.6	252°32.5	12.8'	15°28.1	10.0'	55.5'
21	133°41.4	· · 20.3	267°04.4	12.9'	15°18.1	10.0'	55.5'
22	148°41.3	20.0	281°36.3	13.0'	15°08.0	10.1'	55.5'
23	163°41.2	19.7	296°08.4	13.1'	14°57.9	10.2'	55.4'
SD.=15.7		d=-0.3	S.D.=15.2				
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°41.1	N22°19.4	310°40.5	13.2'	S14°47.7	10.2'	55.4'
1	193°41.0	19.1	325°12.7	13.2'	14°37.5	10.3'	55.4'
2	208°40.9	18.8	339°45.0	13.3'	14°27.2	10.3'	55.4'
3	223°40.8	· · 18.5	354°17.3	13.4'	14°16.9	10.4'	55.3'
4	238°40.7	18.2	8°49.7	13.5'	14°06.5	10.4'	55.3'
5	253°40.6	17.9	23°22.2	13.5'	13°56.0	10.5'	55.3'
6	268°40.6	N22°17.6	37°54.8	13.6'	S13°45.5	10.5'	55.3'
7	283°40.5	17.3	52°27.4	13.7'	13°34.9	10.6'	55.2'
8	298°40.4	16.9	67°00.1	13.7'	13°24.3	10.6'	55.2'
9	313°40.3	· · 16.6	81°32.9	13.8'	13°13.7	10.7'	55.2'
10	328°40.2	16.3	96°05.7	13.9'	13°03.0	10.7'	55.2'
11	343°40.1	16.0	110°38.6	13.9'	12°52.2	10.8'	55.2'
12	358°40.0	N22°15.7	125°11.6	14.0'	S12°41.4	10.8'	55.1'
13	13°39.9	15.4	139°44.6	14.1'	12°30.6	10.9'	55.1'
14	28°39.8	15.1	154°17.8	14.1'	12°19.7	10.9'	55.1'
15	43°39.8	· · 14.8	168°50.9	14.2'	12°08.8	10.9'	55.1'
16	58°39.7	14.5	183°24.2	14.3'	11°57.8	11.0'	55.1'
17	73°39.6	14.1	197°57.5	14.3'	11°46.8	11.0'	55.0'
18	88°39.5	N22°13.8	212°30.8	14.4'	S11°35.8	11.1'	55.0'
19	103°39.4	13.5	227°04.3	14.5'	11°24.7	11.1'	55.0'
20	118°39.3	13.2	241°37.8	14.5'	11°13.5	11.1'	55.0'
21	133°39.2	· · 12.9	256°11.3	14.6'	11°02.4	11.2'	55.0'
22	148°39.1	12.6	270°44.9	14.6'	10°51.2	11.2'	54.9'
23	163°39.1	12.2	285°18.6	14.7'	10°39.9	11.3'	54.9'
SD.=15.7		d=-0.3	S.D.=15.0				
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°39.0	N22°11.9	299°52.3	14.8'	S10°28.6	11.3'	54.9'
1	193°38.9	11.6	314°26.1	14.8'	10°17.3	11.3'	54.9'
2	208°38.8	11.3	328°59.9	14.9'	10°06.0	11.4'	54.9'
3	223°38.7	· · 11.0	343°33.8	14.9'	09°54.6	11.4'	54.8'
4	238°38.6	10.6	358°07.7	15.0'	09°43.2	11.4'	54.8'
5	253°38.5	10.3	12°41.7	15.0'	09°31.8	11.5'	54.8'
6	268°38.5	N22°10.0	27°15.8	15.1'	S09°20.3	11.5'	54.8'
7	283°38.4	09.7	41°49.9	15.1'	09°08.8	11.5'	54.8'
8	298°38.3	09.3	56°24.0	15.2'	08°57.3	11.5'	54.8'
9	313°38.2	· · 09.0	70°58.2	15.2'	08°45.7	11.6'	54.7'
10	328°38.1	08.7	85°32.5	15.3'	08°34.1	11.6'	54.7'
11	343°38.0	08.4	100°06.8	15.3'	08°22.5	11.6'	54.7'
12	358°37.9	N22°08.0	114°41.1	15.4'	S08°10.9	11.6'	54.7'
13	13°37.9	07.7	129°15.5	15.4'	07°59.2	11.7'	54.7'
14	28°37.8	07.4	143°49.9	15.5'	07°47.5	11.7'	54.7'
15	43°37.7	· · 07.0	158°24.4	15.5'	07°35.8	11.7'	54.6'
16	58°37.6	06.7	172°58.9	15.5'	07°24.1	11.7'	54.6'
17	73°37.5	06.4	187°33.5	15.6'	07°12.3	11.8'	54.6'
18	88°37.4	N22°06.1	202°08.1	15.6'	S07°00.6	11.8'	54.6'
19	103°37.4	05.7	216°42.7	15.7'	06°48.8	11.8'	54.6'
20	118°37.3	05.4	231°17.4	15.7'	06°36.9	11.8'	54.6'
21	133°37.2	· · 05.1	245°52.1	15.7'	06°25.1	11.8'	54.6'
22	148°37.1	04.7	260°26.9	15.8'	06°13.3	11.9'	54.5'
23	163°37.0	04.4	275°01.6	15.8'	06°01.4	11.9'	54.5'
SD.=15.7		d=-0.3	S.D.=14.9				

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

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

Day	Sun			Moon		
	Eqn.of Time		Mer.	Mer.Pass.		Age
	00 <sup>h</sup>	12 <sup>h</sup>	Pass	Upper	Lower	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	
08	05:07	05:11	12:05	02:36	15:00	17(88%)
09	05:16	05:20	12:05	03:24	15:46	18(81%)
10	05:24	05:28	12:05	04:08	16:29	19(73%)

July 11, 12, 13 (Sat., Sun., Mon.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sat	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec		SHA	Dec	
0	289°21.5	220°46.3	N17°25.9	281°04.8	S00°06.1		354°43.2	S21°49.8		347°47.1	S20°29.6					Alpheratz	357°38.3 29°12.0	
1	304°23.9	235°47.5	26.0	296°06.0	05.6		9°46.0	49.9		2°49.8	29.6					Ankaa	353°10.7 -42°11.5	
2	319°26.4	250°48.7	26.2	311°07.1	05.1		24°48.8	49.9		17°52.4	29.7					Schedar	349°34.9 56°38.6	
3	334°28.9	265°49.8	· · 26.3	326°08.3	· · 04.6		39°51.6	· · 50.0		32°55.1	· · 29.7					Diphda	348°50.9 -17°52.4	
4	349°31.3	280°51.0	26.5	341°09.4	04.1		54°54.4	50.1		47°57.7	29.7					Achernar	335°23.1 -57°07.8	
5	4°33.8	295°52.2	26.6	356°10.6	03.6		69°57.2	50.1		63°00.4	29.8					Hamal	327°55.3 23°33.3	
6	19°36.3	310°53.3	N17°26.8	11°11.7	S00°03.1		85°00.0	S21°50.2		78°03.0	S20°29.8					Polaris	315°51.4 89°20.6	
7	34°38.7	325°54.5	26.9	26°12.9	02.6		100°02.8	50.2		93°05.7	29.9					Acamar	315°14.8 -40°13.2	
8	49°41.2	340°55.6	27.1	41°14.1	02.1		115°05.6	50.3		108°08.3	29.9					Menkar	314°10.1 4°10.1	
9	64°43.6	355°56.8	· · 27.2	56°15.2	· · 01.6		130°08.5	· · 50.4		123°11.0	· · 29.9					Mirfak	308°33.6 49°55.7	
10	79°46.1	10°57.9	27.4	71°16.4	01.1		145°11.3	50.4		138°13.6	30.0					Aldebaran	290°44.0 16°32.9	
11	94°48.6	25°59.1	27.5	86°17.5	00.6		160°14.1	50.5		153°16.3	30.0					Rigel	281°07.6 -8°10.7	
12	109°51.0	41°00.2	N17°27.7	101°18.7	S00°00.1		175°16.9	S21°50.5		168°18.9	S20°30.1					Capella	280°27.6 46°00.9	
13	124°53.5	56°01.4	27.8	116°19.9	N00°00.3		190°19.7	50.6		183°21.6	30.1					Bellatrix	278°27.1 6°22.0	
14	139°56.0	71°02.5	28.0	131°21.0	00.8		205°22.5	50.7		198°24.2	30.2					Elnath	278°06.8 28°37.3	
15	154°58.4	86°03.6	· · 28.1	146°22.2	· · 01.3		220°25.3	· · 50.7		213°26.9	· · 30.2					Alnilam	275°41.7 -1°11.4	
16	170°00.9	101°04.8	28.3	161°23.3	01.8		235°28.1	50.8		228°29.6	30.2					Betelgeuse	270°56.3 7°24.6	
17	185°03.4	116°05.9	28.5	176°24.5	02.3		250°30.9	50.8		243°32.2	30.3					Canopus	263°54.5 -52°42.4	
18	200°05.8	131°07.0	N17°28.6	191°25.7	N00°02.8		265°33.7	S21°50.9		258°34.9	S20°30.3					Sirius	258°29.8 -16°44.7	
19	215°08.3	146°08.1	28.8	206°26.8	03.3		280°36.5	50.9		273°37.5	30.4					Adhara	255°09.1 -29°00.0	
20	230°10.8	161°09.3	28.9	221°28.0	03.8		295°39.3	51.0		288°40.2	30.4					Procyon	244°55.0 5°10.4	
21	245°13.2	176°10.4	· · 29.1	236°29.1	· · 04.3		310°42.1	· · 51.1		303°42.8	· · 30.4					Pollux	243°22.1 27°58.6	
22	260°15.7	191°11.5	29.2	251°30.3	04.8		325°44.9	51.1		318°45.5	30.5					Avior	234°16.7 -59°34.6	
23	275°18.1	206°12.6	29.4	266°31.5	05.3		340°47.7	51.2		333°48.1	30.5					Suhail	222°49.3 -43°31.0	
Mer.pass.:04:42			v1.2 d0.1 m-4.5			v1.2 d0.5 m-0.7			v2.8 d-0.1 m-2.6			v2.7 d-0.0 m0.1						
Sun	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	290°20.6	221°13.7	N17°29.6	281°32.6	N00°05.8		355°50.5	S21°51.2		348°50.8	S20°30.6					Miaplacidus	221°39.6 -69°48.2	
1	305°23.1	236°14.8	29.7	296°33.8	06.3		10°53.3	51.3		3°53.4	30.6					Alphard	217°51.6 -8°44.8	
2	320°25.5	251°15.9	29.9	311°35.0	06.8		25°56.1	51.4		18°56.1	30.7					Regulus	207°38.6 11°52.2	
3	335°28.0	266°17.1	· · 30.1	326°36.1	· · 07.3		40°58.9	· · 51.4		33°58.7	· · 30.7					Dubhe	193°46.0 61°38.8	
4	350°30.5	281°18.2	30.2	341°37.3	07.7		56°01.7	51.5		49°01.4	30.7					Denebola	182°28.8 14°27.7	
5	5°32.9	296°19.3	30.4	356°38.4	08.2		71°04.5	51.5		64°04.0	30.8					Gienah	175°47.4 -17°39.3	
6	20°35.4	311°20.4	N17°30.6	11°39.6	N00°08.7		86°07.3	S21°51.6		79°06.7	S20°30.8					Acrux	173°04.1 -63°12.9	
7	35°37.9	326°21.4	30.7	26°40.8	09.2		101°10.2	51.7		94°09.3	30.9					Gacrux	171°55.6 -57°13.8	
8	50°40.3	341°22.5	30.9	41°41.9	09.7		116°13.0	51.7		109°12.0	30.9					Alioth	166°16.4 55°51.3	
9	65°42.8	356°23.6	· · 31.0	56°43.1	· · 10.2		131°15.8	· · 51.8		124°14.6	· · 30.9					Spica	158°26.1 -11°16.0	
10	80°45.2	11°24.7	31.2	71°44.3	10.7		146°18.6	51.8		139°17.3	31.0					Alkaid	152°54.9 49°13.1	
11	95°47.7	26°25.8	31.4	86°45.4	11.2		161°21.4	51.9		154°19.9	31.0					Hadar	148°40.9 -60°28.4	
12	110°50.2	41°26.9	N17°31.6	101°46.6	N00°11.7		176°24.2	S21°52.0		169°22.6	S20°31.1					Menkent	148°01.7 -36°28.3	
13	125°52.6	56°28.0	31.7	116°47.8	12.2		191°27.0	52.0		184°25.3	31.1					Arcturus	145°51.2 19°04.8	
14	140°55.1	71°29.0	31.9	131°48.9	12.7		206°29.8	52.1		199°27.9	31.1					Rigel Kent.	139°44.9 -60°55.3	
15	155°57.6	86°30.1	· · 32.1	146°50.1	· · 13.1		221°32.6	· · 52.1		214°30.6	· · 31.2					Kochab	137°19.5 74°04.7	
16	171°00.0	101°31.2	32.2	161°51.3	13.6		236°35.4	52.2		229°33.2	31.2					Zuben'ubi	136°59.9 -16°07.5	
17	186°02.5	116°32.3	32.4	176°52.5	14.1		251°38.2	52.2		244°35.9	31.3					Alphecca	126°06.6 26°39.0	
18	201°05.0	131°33.3	N17°32.6	191°53.6	N00°14.6		266°41.0	S21°52.3		259°38.5	S20°31.3					Antares	112°20.0 -26°28.6	
19	216°07.4	146°34.4	32.7	206°54.8	15.1		281°43.8	52.4		274°41.2	31.4					Atria	107°16.9 -69°03.9	
20	231°09.9	161°35.5	32.9	221°56.0	15.6		296°46.6	52.4		289°43.8	31.4					Sabik	102°06.6 -15°44.9	
21	246°12.4	176°36.5	· · 33.1	236°57.1	· · 16.1		311°49.4	· · 52.5		304°46.5	· · 31.4					Shaula	96°14.9 -37°07.0	
22	261°14.8	191°37.6	33.3	251°58.3	16.6		326°52.2	52.5		319°49.1	31.5					Rasalhague	96°01.6 12°32.9	
23	276°17.3	206°38.6	33.4	266°59.5	17.1		341°55.0	52.6		334°51.8	31.5					Eltanin	90°43.4 51°29.3	
Mer.pass.:04:38			v1.1 d0.2 m-4.5			v1.2 d0.5 m-0.7			v2.8 d-0.1 m-2.6			v2.7 d-0.0 m0.1						
Mon	GHA	GHA	Dec	GHA	Dec		GHA	Dec		GHA	Dec		GHA	Dec				
0	291°19.7	221°39.7	N17°33.6	282°00.7	N00°17.5		356°57.8	S21°52.7		349°54.4	S20°31.6					Kaus Aust.	83°36.9 -34°22.4	
1	306°22.2	236°40.7	33.8	297°01.8	18.0		12°00.6	52.7		4°57.1	31.6					Vega	80°35.2 38°48.3	
2	321°24.7	251°41.8	34.0	312°03.0	18.5		27°03.5	52.8		19°59.7	31.6					Nunki	75°51.9 -26°16.2	
3	336°27.1	266°42.8	· · 34.1	327°04.2	· · 19.0		42°06.3	· · 52.8		35°02.4	· · 31.7					Altair	62°03.1 8°55.4	
4	351°29.6	281°43.9	34.3	342°05.4	19.5		57°09.1	52.9		50°05.1	31.7					Peacock	53°10.9 -56°40.0	
5	6°32.1	296°44.9	34.5	357°06.5	20.0		72°11.9	52.9		65°07.7	31.8					Deneb	49°27.7 45°21.1	
6	21°34.5	311°46.0	N17°34.7	12°07.7	N00°20.5		87°14.7	S21°53.0		80°10.4	S20°31.8					Enif	33°42.1 9°58.1	
7	36°37.0	326°47.0	34.9	27°08.9	21.0		102°10°											



h								Moon							
Sun															
Sat	GHA	Dec		GHA	$\nu$	Dec	d	HP							
0	178°36.9	N22°04.0		289°36.5	15.8'	S05°49.5	11.9'	54.5'							
1	193°36.9	03.7		304°11.3	15.9'	05°37.6	11.9'	54.5'							
2	208°36.8	03.4		318°46.2	15.9'	05°25.7	11.9'	54.5'							
3	223°36.7	· · 03.0		333°21.1	15.9'	05°13.7	11.9'	54.5'							
4	238°36.6	02.7		347°56.1	16.0'	05°01.8	12.0'	54.5'							
5	253°36.5	02.4		2°31.1	16.0'	04°49.8	12.0'	54.5'							
6	268°36.5	N22°02.0		17°06.1	16.0'	S04°37.9	12.0'	54.5'							
7	283°36.4	01.7		31°41.1	16.1'	04°25.9	12.0'	54.4'							
8	298°36.3	01.3		46°16.2	16.1'	04°13.9	12.0'	54.4'							
9	313°36.2	· · 01.0		60°51.3	16.1'	04°01.9	12.0'	54.4'							
10	328°36.1	00.7		75°26.4	16.1'	03°49.8	12.0'	54.4'							
11	343°36.1	00.3		90°01.5	16.2'	03°37.8	12.0'	54.4'							
12	358°36.0	N22°00.0		104°36.7	16.2'	S03°25.8	12.0'	54.4'							
13	13°35.9	21°59.6		119°11.9	16.2'	03°13.7	12.1'	54.4'							
14	28°35.8	59.3		133°47.1	16.2'	03°01.7	12.1'	54.4'							
15	43°35.7	· · 58.9		148°22.3	16.2'	02°49.6	12.1'	54.4'							
16	58°35.7	58.6		162°57.6	16.3'	02°37.5	12.1'	54.4'							
17	73°35.6	58.2		177°32.8	16.3'	02°25.5	12.1'	54.4'							
18	88°35.5	N21°57.9		192°08.1	16.3'	S02°13.4	12.1'	54.3'							
19	103°35.4	57.6		206°43.4	16.3'	02°01.3	12.1'	54.3'							
20	118°35.3	57.2		221°18.7	16.3'	01°49.2	12.1'	54.3'							
21	133°35.3	· · 56.9		235°54.0	16.3'	01°37.1	12.1'	54.3'							
22	148°35.2	56.5		250°29.4	16.3'	01°25.0	12.1'	54.3'							
23	163°35.1	56.2		265°04.7	16.4'	01°12.9	12.1'	54.3'							
SD.=15.7 d=-0.3								S.D.=14.8							
Sun	GHA	Dec		GHA	$\nu$	Dec	d	HP							
0	178°35.0	N21°55.8		279°40.1	16.4'	S01°00.8	12.1'	54.3'							
1	193°34.9	55.4		294°15.5	16.4'	00°48.7	12.1'	54.3'							
2	208°34.9	55.1		308°50.8	16.4'	00°36.6	12.1'	54.3'							
3	223°34.8	· · 54.7		323°26.2	16.4'	00°24.6	12.1'	54.3'							
4	238°34.7	54.4		338°01.6	16.4'	00°12.5	12.1'	54.3'							
5	253°34.6	54.0		352°37.0	16.4'	S00°00.4	12.1'	54.3'							
6	268°34.6	N21°53.7		7°12.4	16.4'	N00°11.7	12.1'	54.3'							
7	283°34.5	53.3		21°47.8	16.4'	00°23.8	12.1'	54.3'							
8	298°34.4	53.0		36°23.2	16.4'	00°35.9	12.1'	54.3'							
9	313°34.3	· · 52.6		50°58.7	16.4'	00°48.0	12.1'	54.3'							
10	328°34.3	52.3		65°34.1	16.4'	01°00.1	12.1'	54.3'							
11	343°34.2	51.9		80°09.5	16.4'	01°12.1	12.1'	54.3'							
12	358°34.1	N21°51.5		94°44.9	16.4'	N01°24.2	12.1'	54.3'							
13	13°34.0	51.2		109°20.3	16.4'	01°36.3	12.1'	54.3'							
14	28°34.0	50.8		123°55.7	16.4'	01°48.3	12.1'	54.3'							
15	43°33.9	· · 50.5		138°31.1	16.4'	02°00.4	12.0'	54.2'							
16	58°33.8	50.1		153°06.5	16.4'	02°12.4	12.0'	54.2'							
17	73°33.7	49.7		167°41.9	16.4'	02°24.4	12.0'	54.2'							
18	88°33.7	N21°49.4		182°17.3	16.4'	N02°36.5	12.0'	54.2'							
19	103°33.6	49.0		196°52.7	16.4'	02°48.5	12.0'	54.2'							
20	118°33.5	48.6		211°28.1	16.4'	03°00.5	12.0'	54.2'							
21	133°33.4	· · 48.3		226°03.4	16.4'	03°12.5	12.0'	54.2'							
22	148°33.4	47.9		240°38.8	16.3'	03°24.4	12.0'	54.2'							
23	163°33.3	47.5		255°14.1	16.3'	03°36.4	12.0'	54.2'							
SD.=15.7 d=-0.4								S.D.=14.8							
Mon	GHA	Dec		GHA	$\nu$	Dec	d	HP							
0	178°33.2	N21°47.2		269°49.5	16.3'	N03°48.4	11.9'	54.2'							
1	193°33.1	46.8		284°24.8	16.3'	04°00.3	11.9'	54.3'							
2	208°33.1	46.4		299°00.1	16.3'	04°12.2	11.9'	54.3'							
3	223°33.0	· · 46.1		313°35.4	16.3'	04°24.1	11.9'	54.3'							
4	238°32.9	45.7		328°10.6	16.3'	04°36.0	11.9'	54.3'							
5	253°32.9	45.3		342°45.9	16.2'	04°47.9	11.9'	54.3'							
6	268°32.8	N21°45.0		357°21.1	16.2'	N04°59.8	11.9'	54.3'							
7	283°32.7	44.6		11°56.3	16.2'	05°11.6	11.8'	54.3'							
8	298°32.6	44.2		26°31.5	16.2'	05°23.4	11.8'	54.3'							
9	313°32.6	· · 43.8		41°06.7	16.2'	05°35.2	11.8'	54.3'							
10	328°32.5	43.5		55°41.8	16.1'	05°47.0	11.8'	54.3'							
11	343°32.4	43.1		70°16.9	16.1'	05°58.8	11.8'	54.3'							
12	358°32.4	N21°42.7		84°52.0	16.1'	N06°10.5	11.7'	54.3'							
13	13°32.3	42.4		99°27.1	16.1'	06°22.3	11.7'	54.3'							
14	28°32.2	42.0		114°02.1	16.0'	06°34.0	11.7'	54.3'							
15	43°32.2	· · 41.6		128°37.1	16.0'	06°45.6	11.7'	54.3'							
16	58°32.1	41.2		143°12.1	16.0'	06°57.3	11.6'	54.3'							
17	73°32.0	40.8		157°47.1	15.9'	07°08.9	11.6'	54.3'							
18	88°31.9	N21°40.5		172°22.0	15.9'	N07°20.6	11.6'	54.3'							
19	103°31.9	40.1		186°56.9	15.9'	07°32.1	11.6'	54.3'							
20	118°31.8	39.7		201°31.8	15.8'	07°43.7	11.5'	54.3'							
21	133°31.7	· · 39.3		216°06.6	15.8'	07°55.2	11.5'	54.3'							
22	148°31.7	38.9		230°41.4	15.8'	08°06.7	11.5'	54.4'							
23	163°31.6	38.6		245°16.1	15.7'	08°18.2	11.5'	54.4'							
SD.=15.7 d=-0.4								S.D.=14.8							

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

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