

Table Selections

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Increments and Corrections

Use from any *Nautical Almanac*, or download from starpath.com/HBS

Altitude Corrections

ALTITUDE CORRECTION TABLES 0°-10°-SUN, STARS, PLANETS A₃

App. Alt.	OCT.-MAR. SUN		APR.-SEPT.		STARS PLANETS	App. Alt.	OCT.-MAR. SUN		APR.-SEPT.		STARS PLANETS
	Lower Limb	Upper Limb	Lower Limb	Upper Limb			Lower Limb	Upper Limb	Lower Limb	Upper Limb	
0 00	-18.2	50.5	-18.4	50.2	-34.5	3 30	+ 3.3	-29.0	+ 3.1	-28.7	-13.0
03	17.5	49.8	17.8	49.6	33.8	35	3.6	28.7	3.3	28.5	12.7
06	16.9	49.2	17.1	48.9	33.2	40	3.8	28.5	3.5	28.3	12.5
09	16.3	48.6	16.5	48.3	32.6	45	4.0	28.3	3.7	28.1	12.3
12	15.7	48.0	15.9	47.7	32.0	50	4.2	28.1	3.9	27.9	12.1
15	15.1	47.4	15.3	47.1	31.4	3 55	4.4	27.9	4.1	27.7	11.9
0 18	-14.5	46.8	-14.8	46.6	-30.8	4 00	+ 4.5	-27.8	+ 4.3	-27.5	-11.8
21	14.0	46.3	14.2	46.0	30.3	05	4.7	27.6	4.5	27.3	11.6
24	13.5	45.8	13.7	45.5	29.8	10	4.9	27.4	4.6	27.2	11.4
27	12.9	45.2	13.2	45.0	29.2	15	5.1	27.2	4.8	27.0	11.2
30	12.4	44.7	12.7	44.5	28.7	20	5.2	27.1	5.0	26.8	11.1
33	11.9	44.2	12.2	44.0	28.2	25	5.4	26.9	5.1	26.7	10.9
0 36	-11.5	43.8	-11.7	43.5	-27.8	4 30	+ 5.6	-26.7	+ 5.3	-26.5	-10.7
39	11.0	43.3	11.2	43.0	27.3	35	5.7	26.6	5.5	26.3	10.6
42	10.5	42.8	10.8	42.6	26.8	40	5.9	26.4	5.6	26.2	10.4
45	10.1	42.4	10.3	42.1	26.4	45	6.0	26.3	5.8	26.0	10.3
48	9.6	41.9	9.9	41.7	25.9	50	6.2	26.1	5.9	25.9	10.1
51	9.2	41.5	9.5	41.3	25.5	4 55	6.3	26.0	6.0	25.8	10.0
0 54	- 8.8	-41.1	- 9.1	-40.9	-25.1	5 00	+ 6.4	-25.9	+ 6.2	-25.6	- 9.9
0 57	8.4	40.7	8.7	40.5	24.7	05	6.6	25.7	6.3	25.5	9.7
1 00	8.0	40.3	8.3	40.1	24.3	10	6.7	25.6	6.4	25.4	9.6
03	7.7	40.0	7.9	39.7	24.0	15	6.8	25.5	6.6	25.2	9.5
06	7.3	39.6	7.5	39.3	23.6	20	6.9	25.4	6.7	25.1	9.4
09	6.9	39.2	7.2	39.0	23.2	25	7.1	25.2	6.8	25.0	9.2
1 12	- 6.6	-38.9	- 6.8	-38.6	-22.9	5 30	+ 7.2	-25.1	+ 6.9	-24.9	- 9.1
15	6.2	38.5	6.5	38.3	22.5	35	7.3	25.0	7.0	24.8	9.0
18	5.9	38.2	6.2	38.0	22.2	40	7.4	24.9	7.2	24.6	8.9
21	5.6	37.9	5.8	37.6	21.9	45	7.5	24.8	7.3	24.5	8.8
24	5.3	37.6	5.5	37.3	21.6	50	7.6	24.7	7.4	24.4	8.7
27	4.9	37.2	5.2	37.0	21.2	5 55	7.7	24.6	7.5	24.3	8.6
1 30	- 4.6	-36.9	- 4.9	-36.7	-20.9	6 00	+ 7.8	-24.5	+ 7.6	-24.2	- 8.5
35	4.2	36.5	4.4	36.2	20.5	10	8.0	24.3	7.8	24.0	8.3
40	3.7	36.0	4.0	35.8	20.0	20	8.2	24.1	8.0	23.8	8.1
45	3.2	35.5	3.5	35.3	19.5	30	8.4	23.9	8.1	23.7	7.9
50	2.8	35.1	3.1	34.9	19.1	40	8.6	23.7	8.3	23.5	7.7
1 55	2.4	34.7	2.6	34.4	18.7	6 50	8.7	23.6	8.5	23.3	7.6
2 00	- 2.0	-34.3	- 2.2	-34.0	-18.3	7 00	+ 8.9	-23.4	+ 8.6	-23.2	- 7.4
05	1.6	33.9	1.8	33.6	17.9	10	9.1	23.2	8.8	23.0	7.2
10	1.2	33.5	1.5	33.3	17.5	20	9.2	23.1	9.0	22.8	7.1
15	0.9	33.2	1.1	32.9	17.2	30	9.3	23.0	9.1	22.7	7.0
20	0.5	32.8	0.8	32.6	16.8	40	9.5	22.8	9.2	22.6	6.8
25	- 0.2	32.5	0.4	32.2	16.5	7 50	9.6	22.7	9.4	22.4	6.7
2 30	+ 0.2	-32.1	- 0.1	-31.9	-16.1	8 00	+ 9.7	-22.6	+ 9.5	-22.3	- 6.6
35	0.5	31.8	+ 0.2	31.6	15.8	10	9.9	22.4	9.6	22.2	6.4
40	0.8	31.5	0.5	31.3	15.5	20	10.0	22.3	9.7	22.1	6.3
45	1.1	31.2	0.8	31.0	15.2	30	10.1	22.2	9.8	22.0	6.2
50	1.4	30.9	1.1	30.7	14.9	40	10.2	22.1	10.0	21.8	6.1
2 55	1.6	30.7	1.4	30.4	14.7	8 50	10.3	22.0	10.1	21.7	6.0
3 00	+ 1.9	-30.4	+ 1.7	-30.1	-14.4	9 00	+10.4	-21.9	+10.2	-21.6	- 5.9
05	2.2	30.1	1.9	29.9	14.1	10	10.5	21.8	10.3	21.5	5.8
10	2.4	29.9	2.1	29.7	13.9	20	10.6	21.7	10.4	21.4	5.7
15	2.6	29.7	2.4	29.4	13.7	30	10.7	21.6	10.5	21.3	5.6
20	2.9	29.4	2.6	29.2	13.4	40	10.8	21.5	10.6	21.2	5.5
25	3.1	29.2	2.9	28.9	13.2	9 50	10.9	21.4	10.6	21.2	5.4
3 30	+ 3.3	-29.0	+ 3.1	-28.7	-13.0	10 00	+11.0	-21.3	+10.7	-21.1	- 5.3

A2 ALTITUDE CORRECTION TABLES 10°-90°—SUN, STARS, PLANETS

OCT.—MAR. SUN			APR.—SEPT.			STARS AND PLANETS				DIP				
App. Alt.	Lower Limb	Upper Limb	App. Alt.	Lower Limb	Upper Limb	App. Alt.	Corr ⁿ	App. Alt.	Additional Corr ⁿ	Ht. of Eye	Corr ⁿ	Ht. of Eye	Ht. of Eye	Corr ⁿ
°	'		°	'		°	'			m		ft.	m	'
9 34	+10.8	-21.5	9 39	+10.6	-21.2	9 56	-5.3		1982	2.4	-2.8	8.0	1.0	-1.8
9 45	+10.9	-21.4	9 51	+10.7	-21.1	10 08	-5.2		VENUS	2.6	-2.9	8.6	1.5	-2.2
9 56	+11.0	-21.3	10 03	+10.8	-21.0	10 20	-5.1		Jan. 1-Jan. 3	2.8	-3.0	9.2	2.0	-2.5
10 08	+11.1	-21.2	10 15	+10.9	-20.9	10 33	-5.0		°	3.0	-3.1	9.8	2.5	-2.8
10 21	+11.2	-21.1	10 27	+11.0	-20.8	10 46	-4.9		0 + 0.5	3.2	-3.2	10.5	3.0	-3.0
10 34	+11.3	-21.0	10 40	+11.1	-20.7	11 00	-4.8		6 + 0.6	3.4	-3.3	11.2	See table ←	
10 47	+11.4	-20.9	10 54	+11.2	-20.6	11 14	-4.7		20 + 0.7	3.6	-3.4	11.9		
11 01	+11.5	-20.8	11 08	+11.3	-20.5	11 29	-4.6		31 + 0.7	3.8	-3.4	12.6	m	
11 15	+11.6	-20.7	11 23	+11.4	-20.4	11 45	-4.5		Jan. 4-Feb. 7	4.0	-3.5	13.3	20	-7.9
11 30	+11.7	-20.6	11 38	+11.5	-20.3	12 01	-4.4		°	4.3	-3.6	14.1	22	-8.3
11 46	+11.8	-20.5	11 54	+11.6	-20.2	12 18	-4.3		0 + 0.6	4.5	-3.7	14.9	24	-8.6
12 02	+11.9	-20.4	12 10	+11.7	-20.1	12 35	-4.2		4 + 0.7	4.7	-3.8	15.7	26	-9.0
12 19	+12.0	-20.3	12 28	+11.8	-20.0	12 54	-4.1		12 + 0.8	5.0	-4.0	16.5	28	-9.3
12 37	+12.1	-20.2	12 46	+11.9	-19.9	13 13	-4.0		22 + 0.8	5.2	-4.1	17.4		
12 55	+12.2	-20.1	13 05	+12.0	-19.8	13 33	-3.9		Feb. 8-Feb. 14	5.5	-4.2	18.3	30	-9.6
13 14	+12.3	-20.0	13 24	+12.1	-19.7	13 54	-3.8		°	5.8	-4.3	19.1	32	-10.0
13 35	+12.4	-19.9	13 45	+12.2	-19.6	14 16	-3.7		0 + 0.5	6.1	-4.4	20.1	34	-10.3
13 56	+12.5	-19.8	14 07	+12.3	-19.5	14 40	-3.6		6 + 0.6	6.3	-4.5	21.0	36	-10.6
14 18	+12.6	-19.7	14 30	+12.4	-19.4	15 04	-3.5		20 + 0.7	6.6	-4.6	22.0	38	-10.8
14 42	+12.7	-19.6	14 54	+12.5	-19.3	15 30	-3.4		31 + 0.7	6.9	-4.7	22.9		
15 06	+12.8	-19.5	15 19	+12.6	-19.2	15 57	-3.3		Feb. 15-Mar. 2	7.2	-4.7	23.9	40	-11.1
15 32	+12.9	-19.4	15 46	+12.7	-19.1	16 26	-3.2		°	7.5	-4.8	24.9	42	-11.4
15 59	+13.0	-19.3	16 14	+12.8	-19.0	16 56	-3.1		0 + 0.4	7.9	-4.9	26.0	44	-11.7
16 28	+13.1	-19.2	16 44	+12.9	-18.9	17 28	-3.0		11 + 0.5	8.2	-5.0	27.1	46	-11.9
16 59	+13.2	-19.1	17 15	+13.0	-18.8	18 02	-2.9		41 + 0.5	8.5	-5.1	28.1	48	-12.2
17 32	+13.3	-19.0	17 48	+13.1	-18.7	18 38	-2.8		Mar. 3-Mar. 28	8.8	-5.2	29.2		
18 06	+13.4	-18.9	18 24	+13.2	-18.6	19 17	-2.7		°	9.2	-5.3	30.4	ft.	
18 42	+13.5	-18.8	19 01	+13.3	-18.5	19 58	-2.6		0 + 0.3	9.5	-5.4	31.5	2	-1.4
19 21	+13.6	-18.7	19 42	+13.4	-18.4	20 42	-2.5		46 + 0.3	9.9	-5.5	32.7	4	-1.9
20 03	+13.7	-18.6	20 25	+13.5	-18.3	21 28	-2.4		Mar. 29-May 12	10.3	-5.6	33.9	6	-2.4
20 48	+13.8	-18.5	21 11	+13.6	-18.2	22 19	-2.3		°	10.6	-5.7	35.1	8	-2.7
21 35	+13.9	-18.4	22 00	+13.7	-18.1	23 13	-2.2		0 + 0.2	11.0	-5.8	36.3	10	-3.1
22 26	+14.0	-18.3	22 54	+13.8	-18.0	24 11	-2.1		47 + 0.2	11.4	-5.9	37.6	See table ←	
23 22	+14.1	-18.2	23 51	+13.9	-17.9	25 14	-2.0		May 13-Dec. 31	11.8	-6.0	38.9		
24 21	+14.2	-18.1	24 53	+14.0	-17.8	26 22	-1.9		°	12.2	-6.1	40.1	ft.	
25 26	+14.3	-18.0	26 00	+14.1	-17.7	27 36	-1.8		0 + 0.1	12.6	-6.2	41.5	70	-8.1
26 36	+14.4	-17.9	27 13	+14.2	-17.6	28 56	-1.7		42 + 0.1	13.0	-6.3	42.8	75	-8.4
27 52	+14.5	-17.8	28 33	+14.3	-17.5	30 24	-1.6		MARS	13.4	-6.4	44.2	80	-8.7
29 15	+14.6	-17.7	30 00	+14.4	-17.4	32 00	-1.5		Jan. 1-Jan. 30	13.8	-6.5	45.5	85	-8.9
30 46	+14.7	-17.6	31 35	+14.5	-17.3	33 45	-1.4		°	14.2	-6.6	46.9	90	-9.2
32 26	+14.8	-17.5	33 20	+14.6	-17.2	35 40	-1.3		0 + 0.1	14.7	-6.7	48.4	95	-9.5
34 17	+14.9	-17.4	35 17	+14.7	-17.1	37 48	-1.2		60 + 0.1	15.1	-6.8	49.8		
36 20	+15.0	-17.3	37 26	+14.8	-17.0	40 08	-1.1		Jan. 31-June 18	15.5	-6.9	51.3	100	-9.7
38 36	+15.1	-17.2	39 50	+14.9	-16.9	42 44	-1.0		°	16.0	-7.0	52.8	105	-9.9
41 08	+15.2	-17.1	42 31	+15.0	-16.8	45 36	-0.9		0 + 0.2	16.5	-7.1	54.3	110	-10.2
43 59	+15.3	-17.0	45 31	+15.1	-16.7	48 47	-0.8		41 + 0.1	16.9	-7.2	55.8	115	-10.4
47 10	+15.4	-16.9	48 55	+15.2	-16.6	52 18	-0.7		75 + 0.1	17.4	-7.3	57.4	120	-10.6
50 46	+15.5	-16.8	52 44	+15.3	-16.5	56 11	-0.6		June 19-Dec. 31	17.9	-7.4	58.9	125	-10.8
54 49	+15.6	-16.7	57 02	+15.4	-16.4	60 28	-0.5		°	18.4	-7.5	60.5		
59 23	+15.7	-16.6	61 51	+15.5	-16.3	65 08	-0.4		0 + 0.1	18.8	-7.6	62.1	130	-11.1
64 30	+15.8	-16.5	67 17	+15.6	-16.2	70 11	-0.3		60 + 0.1	19.3	-7.7	63.8	135	-11.3
70 12	+15.9	-16.4	73 16	+15.7	-16.1	75 34	-0.2			19.8	-7.8	65.4	140	-11.5
76 26	+16.0	-16.3	79 43	+15.8	-16.0	81 13	-0.1			20.4	-7.9	67.1	145	-11.7
83 05	+16.1	-16.2	86 32	+15.9	-15.9	87 03	0.0			20.9	-8.0	68.8	150	-11.9
90 00			90 00			90 00	0.0			21.4	-8.1	70.5	155	-12.1

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.

ALTITUDE CORRECTION TABLES 0°-35°—MOON

App. Alt.	0°-4°	5°-9°	10°-14°	15°-19°	20°-24°	25°-29°	30°-34°	App. Alt.
	Corr ⁿ	Corr ⁿ	Corr ⁿ	Corr ⁿ	Corr ⁿ	Corr ⁿ	Corr ⁿ	
00	0 33.8	5 58.2	10 62.1	15 62.8	20 62.2	25 60.8	30 58.9	00
10	35.9	58.5	62.2	62.8	62.1	60.8	58.8	10
20	37.8	58.7	62.2	62.8	62.1	60.7	58.8	20
30	39.6	58.9	62.3	62.8	62.1	60.7	58.7	30
40	41.2	59.1	62.3	62.8	62.0	60.6	58.6	40
50	42.6	59.3	62.4	62.7	62.0	60.6	58.5	50
00	1 44.0	6 59.5	11 62.4	16 62.7	21 62.0	26 60.5	31 58.5	00
10	45.2	59.7	62.4	62.7	61.9	60.4	58.4	10
20	46.3	59.9	62.5	62.7	61.9	60.4	58.3	20
30	47.3	60.0	62.5	62.7	61.9	60.3	58.2	30
40	48.3	60.2	62.5	62.7	61.8	60.3	58.2	40
50	49.2	60.3	62.6	62.7	61.8	60.2	58.1	50
00	2 50.0	7 60.5	12 62.6	17 62.7	22 61.7	27 60.1	32 58.0	00
10	50.8	60.6	62.6	62.6	61.7	60.1	57.9	10
20	51.4	60.7	62.6	62.6	61.6	60.0	57.8	20
30	52.1	60.9	62.7	62.6	61.6	59.9	57.8	30
40	52.7	61.0	62.7	62.6	61.5	59.9	57.7	40
50	53.3	61.1	62.7	62.6	61.5	59.8	57.6	50
00	3 53.8	8 61.2	13 62.7	18 62.5	23 61.5	28 59.7	33 57.5	00
10	54.3	61.3	62.7	62.5	61.4	59.7	57.4	10
20	54.8	61.4	62.7	62.5	61.4	59.6	57.4	20
30	55.2	61.5	62.8	62.5	61.3	59.6	57.3	30
40	55.6	61.6	62.8	62.4	61.3	59.5	57.2	40
50	56.0	61.6	62.8	62.4	61.2	59.4	57.1	50
00	4 56.4	9 61.7	14 62.8	19 62.4	24 61.2	29 59.3	34 57.0	00
10	56.7	61.8	62.8	62.3	61.1	59.3	56.9	10
20	57.1	61.9	62.8	62.3	61.1	59.2	56.9	20
30	57.4	61.9	62.8	62.3	61.0	59.1	56.8	30
40	57.7	62.0	62.8	62.2	60.9	59.1	56.7	40
50	57.9	62.1	62.8	62.2	60.9	59.0	56.6	50
H.P.	L U	L U	L U	L U	L U	L U	L U	H.P.
54.0	0.3 0.9	0.3 0.9	0.4 1.0	0.5 1.1	0.6 1.2	0.7 1.3	0.9 1.5	54.0
54.3	0.7 1.1	0.7 1.2	0.7 1.2	0.8 1.3	0.9 1.4	1.1 1.5	1.2 1.7	54.3
54.6	1.1 1.4	1.1 1.4	1.1 1.4	1.2 1.5	1.3 1.6	1.4 1.7	1.5 1.8	54.6
54.9	1.4 1.6	1.5 1.6	1.5 1.6	1.6 1.7	1.6 1.8	1.8 1.9	1.9 2.0	54.9
55.2	1.8 1.8	1.8 1.8	1.9 1.9	1.9 1.9	2.0 2.0	2.1 2.1	2.2 2.2	55.2
55.5	2.2 2.0	2.2 2.0	2.3 2.1	2.3 2.1	2.4 2.2	2.4 2.3	2.5 2.4	55.5
55.8	2.6 2.2	2.6 2.2	2.6 2.3	2.7 2.3	2.7 2.4	2.8 2.4	2.9 2.5	55.8
56.1	3.0 2.4	3.0 2.5	3.0 2.5	3.0 2.5	3.1 2.6	3.1 2.6	3.2 2.7	56.1
56.4	3.4 2.7	3.4 2.7	3.4 2.7	3.4 2.7	3.4 2.8	3.5 2.8	3.5 2.9	56.4
56.7	3.7 2.9	3.7 2.9	3.8 2.9	3.8 2.9	3.8 3.0	3.8 3.0	3.9 3.0	56.7
57.0	4.1 3.1	4.1 3.1	4.1 3.1	4.1 3.1	4.2 3.1	4.2 3.2	4.2 3.2	57.0
57.3	4.5 3.3	4.5 3.3	4.5 3.3	4.5 3.3	4.5 3.3	4.5 3.4	4.6 3.4	57.3
57.6	4.9 3.5	4.9 3.5	4.9 3.5	4.9 3.5	4.9 3.5	4.9 3.5	4.9 3.6	57.6
57.9	5.3 3.8	5.3 3.8	5.2 3.8	5.2 3.7	5.2 3.7	5.2 3.7	5.2 3.7	57.9
58.2	5.6 4.0	5.6 4.0	5.6 4.0	5.6 4.0	5.6 3.9	5.6 3.9	5.6 3.9	58.2
58.5	6.0 4.2	6.0 4.2	6.0 4.2	6.0 4.2	6.0 4.1	5.9 4.1	5.9 4.1	58.5
58.8	6.4 4.4	6.4 4.4	6.4 4.4	6.3 4.4	6.3 4.3	6.3 4.3	6.2 4.2	58.8
59.1	6.8 4.6	6.8 4.6	6.7 4.6	6.7 4.6	6.7 4.5	6.6 4.5	6.6 4.4	59.1
59.4	7.2 4.8	7.1 4.8	7.1 4.8	7.1 4.8	7.0 4.7	7.0 4.7	6.9 4.6	59.4
59.7	7.5 5.1	7.5 5.0	7.5 5.0	7.5 5.0	7.4 4.9	7.3 4.8	7.2 4.7	59.7
60.0	7.9 5.3	7.9 5.3	7.9 5.2	7.8 5.2	7.8 5.1	7.7 5.0	7.6 4.9	60.0
60.3	8.3 5.5	8.3 5.5	8.2 5.4	8.2 5.4	8.1 5.3	8.0 5.2	7.9 5.1	60.3
60.6	8.7 5.7	8.7 5.7	8.6 5.7	8.6 5.6	8.5 5.5	8.4 5.4	8.2 5.3	60.6
60.9	9.1 5.9	9.0 5.9	9.0 5.9	8.9 5.8	8.8 5.7	8.7 5.6	8.6 5.4	60.9
61.2	9.5 6.2	9.4 6.1	9.4 6.1	9.3 6.0	9.2 5.9	9.1 5.8	8.9 5.6	61.2
61.5	9.8 6.4	9.8 6.3	9.7 6.3	9.7 6.2	9.5 6.1	9.4 5.9	9.2 5.8	61.5

DIP			
Ht. of Eye	Corr ⁿ	Ht. of Eye	Ht. of Eye
m	ft.	m	ft.
2.4	-2.8	8.0	9.5
2.6	-2.9	8.6	9.9
2.8	-3.0	9.2	10.3
3.0	-3.1	9.8	10.6
3.2	-3.2	10.5	11.0
3.4	-3.3	11.2	11.4
3.6	-3.4	11.9	11.8
3.8	-3.5	12.6	12.2
4.0	-3.6	13.3	12.6
4.3	-3.7	14.1	13.0
4.5	-3.8	14.9	13.4
4.7	-3.9	15.7	13.8
5.0	-4.0	16.5	14.2
5.2	-4.1	17.4	14.7
5.5	-4.2	18.3	15.1
5.8	-4.3	19.1	15.5
6.1	-4.4	20.1	16.0
6.3	-4.5	21.0	16.5
6.6	-4.6	22.0	16.9
6.9	-4.7	22.9	17.4
7.2	-4.8	23.9	17.9
7.5	-4.9	24.9	18.4
7.9	-5.0	26.0	18.8
8.2	-5.1	27.1	19.3
8.5	-5.2	28.1	19.8
8.8	-5.3	29.2	20.4
9.2	-5.4	30.4	20.9
9.5	-5.4	31.5	21.4

MOON CORRECTION
TABLE

The correction is in two parts; the first correction is taken from the upper part of the table with argument apparent altitude, and the second from the lower part, with argument H.P., in the same column as that from which the first correction was taken. Separate corrections are given in the lower part for lower (L) and upper (U) limbs. All corrections are to be **added** to apparent altitude, but 30' is to be **subtracted** from the altitude of the upper limb.

For corrections for pressure and temperature see page A4.

For bubble sextant observations ignore dip, take the mean of upper and lower limb corrections and subtract 15' from the altitude.

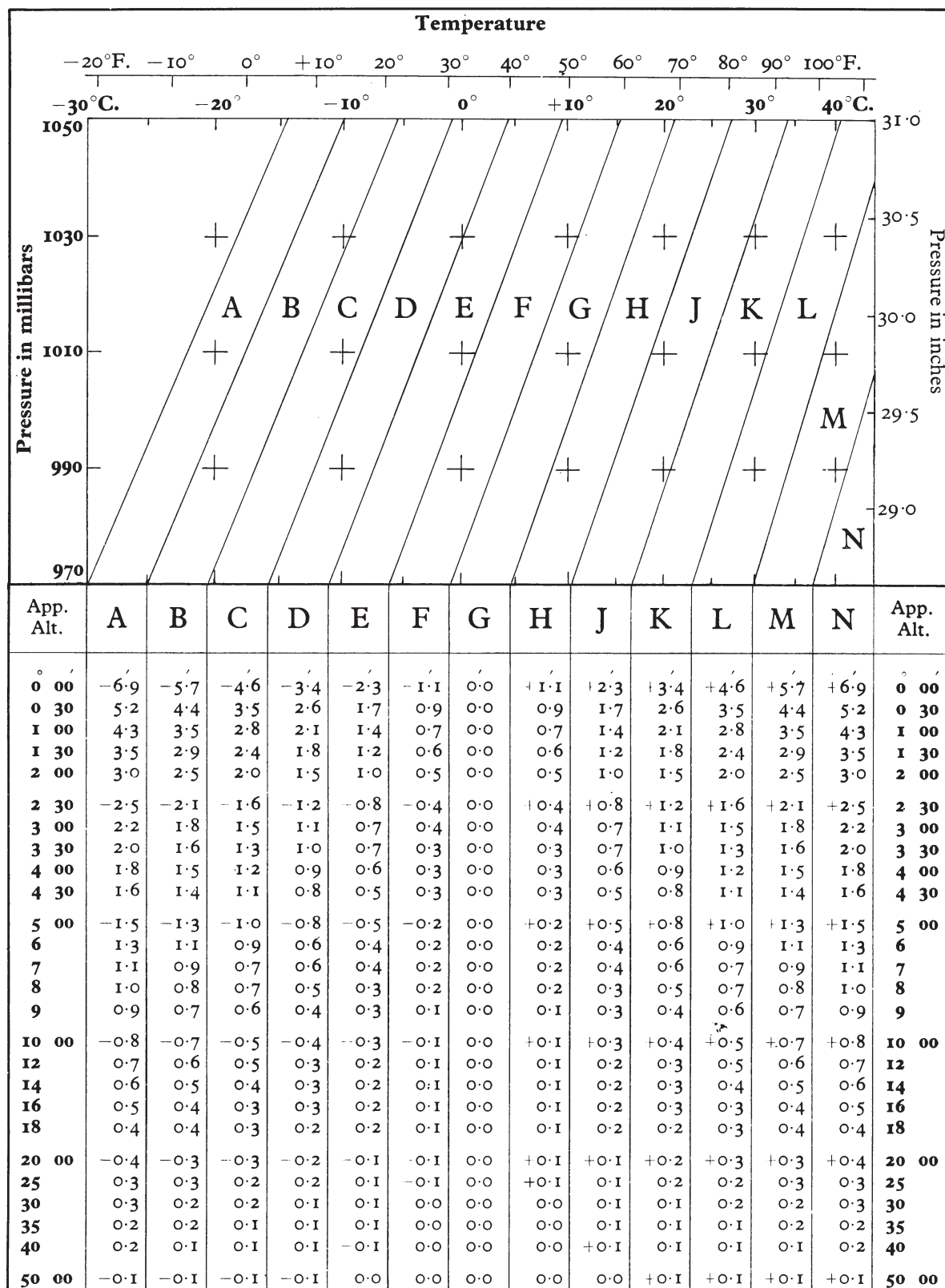
App. Alt. = Apparent altitude
Sextant altitude corrected for index error and dip.

ALTITUDE CORRECTION TABLES 35°-90°—MOON

App. Alt.	35-39 Corr ⁿ	40-44 Corr ⁿ	45-49 Corr ⁿ	50-54 Corr ⁿ	55-59 Corr ⁿ	60-64 Corr ⁿ	65-69 Corr ⁿ	70-74 Corr ⁿ	75-79 Corr ⁿ	80-84 Corr ⁿ	85-89 Corr ⁿ	App. Alt.
00	35 56.5	40 53.7	45 50.5	50 46.9	55 43.1	60 38.9	65 34.6	70 30.1	75 25.3	80 20.5	85 15.6	00
10	56.4	53.6	50.4	46.8	42.9	38.8	34.4	29.9	25.2	20.4	15.5	10
20	56.3	53.5	50.2	46.7	42.8	38.7	34.3	29.7	25.0	20.2	15.3	20
30	56.2	53.4	50.1	46.5	42.7	38.5	34.1	29.6	24.9	20.0	15.1	30
40	56.2	53.3	50.0	46.4	42.5	38.4	34.0	29.4	24.7	19.9	15.0	40
50	56.1	53.2	49.9	46.3	42.4	38.2	33.8	29.3	24.5	19.7	14.8	50
00	36 56.0	41 53.1	46 49.8	51 46.2	56 42.3	61 38.1	66 33.7	71 29.1	76 24.4	81 19.6	86 14.6	00
10	55.9	53.0	49.7	46.0	42.1	37.9	33.5	29.0	24.2	19.4	14.5	10
20	55.8	52.8	49.5	45.9	42.0	37.8	33.4	28.8	24.1	19.2	14.3	20
30	55.7	52.7	49.4	45.8	41.8	37.7	33.2	28.7	23.9	19.1	14.1	30
40	55.6	52.6	49.3	45.7	41.7	37.5	33.1	28.5	23.8	18.9	14.0	40
50	55.5	52.5	49.2	45.5	41.6	37.4	32.9	28.3	23.6	18.7	13.8	50
00	37 55.4	42 52.4	47 49.1	52 45.4	57 41.4	62 37.2	67 32.8	72 28.2	77 23.4	82 18.6	87 13.7	00
10	55.3	52.3	49.0	45.3	41.3	37.1	32.6	28.0	23.3	18.4	13.5	10
20	55.2	52.2	48.8	45.2	41.2	36.9	32.5	27.9	23.1	18.2	13.3	20
30	55.1	52.1	48.7	45.0	41.0	36.8	32.3	27.7	22.9	18.1	13.2	30
40	55.0	52.0	48.6	44.9	40.9	36.6	32.2	27.6	22.8	17.9	13.0	40
50	55.0	51.9	48.5	44.8	40.8	36.5	32.0	27.4	22.6	17.8	12.8	50
00	38 54.9	43 51.8	48 48.4	53 44.6	58 40.6	63 36.4	68 31.9	73 27.2	78 22.5	83 17.6	88 12.7	00
10	54.8	51.7	48.2	44.5	40.5	36.2	31.7	27.1	22.3	17.4	12.5	10
20	54.7	51.6	48.1	44.4	40.3	36.1	31.6	26.9	22.1	17.3	12.3	20
30	54.6	51.5	48.0	44.2	40.2	35.9	31.4	26.8	22.0	17.1	12.2	30
40	54.5	51.4	47.9	44.1	40.1	35.8	31.3	26.6	21.8	16.9	12.0	40
50	54.4	51.2	47.8	44.0	39.9	35.6	31.1	26.5	21.7	16.8	11.8	50
00	39 54.3	44 51.1	49 47.6	54 43.9	59 39.8	64 35.5	69 31.0	74 26.3	79 21.5	84 16.6	89 11.7	00
10	54.2	51.0	47.5	43.7	39.6	35.3	30.8	26.1	21.3	16.5	11.5	10
20	54.1	50.9	47.4	43.6	39.5	35.2	30.7	26.0	21.2	16.3	11.4	20
30	54.0	50.8	47.3	43.5	39.4	35.0	30.5	25.8	21.0	16.1	11.2	30
40	53.9	50.7	47.2	43.3	39.2	34.9	30.4	25.7	20.9	16.0	11.0	40
50	53.8	50.6	47.0	43.2	39.1	34.7	30.2	25.5	20.7	15.8	10.9	50
H.P.	L U	L U	L U	L U	L U	L U	L U	L U	L U	L U	L U	H.P.
54.0	1.1 1.7	1.3 1.9	1.5 2.1	1.7 2.4	2.0 2.6	2.3 2.9	2.6 3.2	2.9 3.5	3.2 3.8	3.5 4.1	3.8 4.5	54.0
54.3	1.4 1.8	1.6 2.0	1.8 2.2	2.0 2.5	2.3 2.7	2.5 3.0	2.8 3.2	3.0 3.5	3.3 3.8	3.6 4.1	3.9 4.4	54.3
54.6	1.7 2.0	1.9 2.2	2.1 2.4	2.3 2.6	2.5 2.8	2.7 3.0	3.0 3.3	3.2 3.5	3.5 3.8	3.7 4.1	4.0 4.3	54.6
54.9	2.0 2.2	2.2 2.3	2.3 2.5	2.5 2.7	2.7 2.9	2.9 3.1	3.2 3.3	3.4 3.5	3.6 3.8	3.9 4.0	4.1 4.3	54.9
55.2	2.3 2.3	2.5 2.4	2.6 2.6	2.8 2.8	3.0 2.9	3.2 3.1	3.4 3.3	3.6 3.5	3.8 3.7	4.0 4.0	4.2 4.2	55.2
55.5	2.7 2.5	2.8 2.6	2.9 2.7	3.1 2.9	3.2 3.0	3.4 3.2	3.6 3.4	3.7 3.5	3.9 3.7	4.1 3.9	4.3 4.1	55.5
55.8	3.0 2.6	3.1 2.7	3.2 2.8	3.3 3.0	3.5 3.1	3.6 3.3	3.8 3.4	3.9 3.6	4.1 3.7	4.2 3.9	4.4 4.0	55.8
56.1	3.3 2.8	3.4 2.9	3.5 3.0	3.6 3.1	3.7 3.2	3.8 3.3	4.0 3.4	4.1 3.6	4.2 3.7	4.4 3.8	4.5 4.0	56.1
56.4	3.6 2.9	3.7 3.0	3.8 3.1	3.9 3.2	3.9 3.3	4.0 3.4	4.1 3.5	4.3 3.6	4.4 3.7	4.5 3.8	4.6 3.9	56.4
56.7	3.9 3.1	4.0 3.1	4.1 3.2	4.1 3.3	4.2 3.3	4.3 3.4	4.3 3.5	4.4 3.6	4.5 3.7	4.6 3.8	4.7 3.8	56.7
57.0	4.3 3.2	4.3 3.3	4.3 3.3	4.4 3.4	4.4 3.4	4.5 3.5	4.5 3.5	4.6 3.6	4.7 3.6	4.7 3.7	4.8 3.8	57.0
57.3	4.6 3.4	4.6 3.4	4.6 3.4	4.6 3.5	4.7 3.5	4.7 3.5	4.7 3.6	4.8 3.6	4.8 3.6	4.8 3.7	4.9 3.7	57.3
57.6	4.9 3.6	4.9 3.6	4.9 3.6	4.9 3.6	4.9 3.6	4.9 3.6	4.9 3.6	4.9 3.6	5.0 3.6	5.0 3.6	5.0 3.6	57.6
57.9	5.2 3.7	5.2 3.7	5.2 3.7	5.2 3.7	5.2 3.7	5.1 3.6	5.1 3.6	5.1 3.6	5.1 3.6	5.1 3.6	5.1 3.6	57.9
58.2	5.5 3.9	5.5 3.8	5.5 3.8	5.4 3.8	5.4 3.7	5.4 3.7	5.3 3.7	5.3 3.6	5.2 3.6	5.2 3.5	5.2 3.5	58.2
58.5	5.9 4.0	5.8 4.0	5.8 3.9	5.7 3.9	5.6 3.8	5.6 3.8	5.5 3.7	5.5 3.6	5.4 3.6	5.3 3.5	5.3 3.4	58.5
58.8	6.2 4.2	6.1 4.1	6.0 4.1	6.0 4.0	5.9 3.9	5.8 3.8	5.7 3.7	5.6 3.6	5.5 3.5	5.4 3.5	5.3 3.4	58.8
59.1	6.5 4.3	6.4 4.3	6.3 4.2	6.2 4.1	6.1 4.0	6.0 3.9	5.9 3.8	5.8 3.6	5.7 3.5	5.6 3.4	5.4 3.3	59.1
59.4	6.8 4.5	6.7 4.4	6.6 4.3	6.5 4.2	6.4 4.1	6.2 3.9	6.1 3.8	6.0 3.7	5.8 3.5	5.7 3.4	5.5 3.2	59.4
59.7	7.1 4.6	7.0 4.5	6.9 4.4	6.8 4.3	6.6 4.1	6.5 4.0	6.3 3.8	6.2 3.7	6.0 3.5	5.8 3.3	5.6 3.2	59.7
60.0	7.5 4.8	7.3 4.7	7.2 4.5	7.0 4.4	6.9 4.2	6.7 4.0	6.5 3.9	6.3 3.7	6.1 3.5	5.9 3.3	5.7 3.1	60.0
60.3	7.8 5.0	7.6 4.8	7.5 4.7	7.3 4.5	7.1 4.3	6.9 4.1	6.7 3.9	6.5 3.7	6.3 3.5	6.0 3.2	5.8 3.0	60.3
60.6	8.1 5.1	7.9 5.0	7.7 4.8	7.6 4.6	7.3 4.4	7.1 4.2	6.9 3.9	6.7 3.7	6.4 3.4	6.2 3.2	5.9 2.9	60.6
60.9	8.4 5.3	8.2 5.1	8.0 4.9	7.8 4.7	7.6 4.5	7.3 4.2	7.1 4.0	6.8 3.7	6.6 3.4	6.3 3.2	6.0 2.9	60.9
61.2	8.7 5.4	8.5 5.2	8.3 5.0	8.1 4.8	7.8 4.5	7.6 4.3	7.3 4.0	7.0 3.7	6.7 3.4	6.4 3.1	6.1 2.8	61.2
61.5	9.1 5.6	8.8 5.4	8.6 5.1	8.3 4.9	8.1 4.6	7.8 4.3	7.5 4.0	7.2 3.7	6.9 3.4	6.5 3.1	6.2 2.7	61.5

A₄ ALTITUDE CORRECTION TABLES—ADDITIONAL CORRECTIONS

ADDITIONAL REFRACTION CORRECTIONS FOR NON-STANDARD CONDITIONS



The graph is entered with arguments temperature and pressure to find a zone letter; using as arguments this zone letter and apparent altitude (sextant altitude corrected for dip), a correction is taken from the table. This correction is to be applied to the sextant altitude in addition to the corrections for standard conditions (for the Sun, stars and planets from page A2 and for the Moon from pages xxxiv and xxxv).

POLARIS (POLE STAR) TABLES, 1982

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. ARIES	0°- 9°	10°- 19°	20°- 29°	30°- 39°	40°- 49°	50°- 59°	60°- 69°	70°- 79°	80°- 89°	90°- 99°	100°- 109°	110°- 119°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
0	0 18.1	0 14.0	0 11.3	0 10.0	0 10.2	0 12.0	0 15.1	0 19.6	0 25.4	0 32.1	0 39.7	0 47.8
1	17.7	13.7	11.1	09.9	10.3	12.2	15.5	20.2	26.0	32.8	40.5	48.6
2	17.2	13.4	10.9	09.9	10.4	12.5	15.9	20.7	26.6	33.6	41.3	49.5
3	16.8	13.0	10.7	09.9	10.6	12.8	16.3	21.2	27.3	34.3	42.1	50.3
4	16.3	12.7	10.6	09.9	10.7	13.1	16.8	21.8	28.0	35.0	42.9	51.1
5	0 15.9	0 12.5	0 10.4	0 09.9	0 10.9	0 13.4	0 17.2	0 22.4	0 28.6	0 35.8	0 43.7	0 52.0
6	15.5	12.2	10.3	09.9	11.1	13.7	17.7	22.9	29.3	36.6	44.5	52.8
7	15.1	11.9	10.2	10.0	11.3	14.0	18.2	23.5	30.0	37.3	45.3	53.7
8	14.7	11.7	10.1	10.1	11.5	14.4	18.6	24.1	30.7	38.1	46.1	54.5
9	14.4	11.5	10.1	10.1	11.7	14.7	19.1	24.7	31.4	38.9	47.0	55.4
10	0 14.0	0 11.3	0 10.0	0 10.2	0 12.0	0 15.1	0 19.6	0 25.4	0 32.1	0 39.7	0 47.8	0 56.2
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
0	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.3	0.3	0.2	0.2
10	.5	.6	.6	.6	.6	.6	.5	.4	.4	.3	.3	.3
20	.5	.6	.6	.6	.6	.6	.5	.5	.4	.4	.3	.3
30	.6	.6	.6	.6	.6	.6	.5	.5	.5	.4	.4	.4
40	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
45	.6	.6	.6	.6	.6	.6	.6	.6	.6	.5	.5	.5
50	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
55	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7
60	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.8	.8
62	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
64	.7	.6	.6	.6	.6	.6	.7	.7	.8	.8	.9	0.9
66	.7	.6	.6	.6	.6	.6	.7	.8	.8	.9	0.9	1.0
68	0.7	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.0
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
Jan.	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6
Feb.	.6	.6	.7	.7	.7	.7	.8	.8	.8	.8	.8	.8
Mar.	.5	.5	.6	.6	.7	.7	.7	.8	.8	.9	.9	.9
Apr.	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.9
May	.2	.2	.3	.3	.4	.5	.5	.6	.7	.7	.8	.9
June	.2	.2	.2	.2	.3	.3	.4	.5	.5	.6	.7	.8
July	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6
Aug.	.3	.3	.3	.2	.2	.2	.2	.3	.3	.3	.4	.4
Sept.	.5	.5	.4	.4	.3	.3	.3	.3	.3	.3	.3	.3
Oct.	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3
Nov.	0.9	0.8	.8	.7	.6	.6	.5	.5	.4	.4	.3	.3
Dec.	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.4
Lat.	AZIMUTH											
0	0.4	0.3	0.1	0.0	359.8	359.7	359.6	359.5	359.4	359.3	359.2	359.2
20	0.4	0.3	0.1	0.0	359.8	359.7	359.5	359.4	359.3	359.2	359.2	359.1
40	0.5	0.3	0.2	0.0	359.8	359.6	359.4	359.3	359.2	359.1	359.0	358.9
50	0.6	0.4	0.2	0.0	359.7	359.5	359.3	359.1	359.0	358.9	358.8	358.7
55	0.7	0.5	0.2	0.0	359.7	359.5	359.2	359.0	358.9	358.7	358.6	358.6
60	0.8	0.5	0.2	0.0	359.7	359.4	359.1	358.9	358.7	358.6	358.4	358.4
65	0.9	0.6	0.3	359.9	359.6	359.3	359.0	358.7	358.5	358.3	358.2	358.1

$$\text{Latitude} = \text{Apparent altitude (corrected for refraction)} - 1^\circ + a_0 + a_1 + a_2$$

The table is entered with L.H.A. Aries to determine the column to be used; each column refers to a range of 10° . a_0 is taken, with mental interpolation, from the upper table with the units of L.H.A. Aries in degrees as argument; a_1 , a_2 are taken, without interpolation, from the second and third tables with arguments latitude and month respectively. a_0 , a_1 , a_2 are always positive. The final table gives the azimuth of *Polaris*.

POLARIS (POLE STAR) TABLES, 1982

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. ARIES	120°- 129°	130°- 139°	140°- 149°	150°- 159°	160°- 169°	170°- 179°	180°- 189°	190°- 199°	200°- 209°	210°- 219°	220°- 229°	230°- 239°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
0	0 56.2	1 04.8	1 13.1	1 21.0	1 28.2	1 34.5	1 39.7	1 43.7	1 46.4	1 47.6	1 47.4	1 45.7
1	57.1	05.6	13.9	21.7	28.8	35.1	40.2	44.0	46.6	47.7	47.3	45.5
2	57.9	06.4	14.7	22.5	29.5	35.6	40.6	44.4	46.7	47.7	47.2	45.2
3	58.8	07.3	15.5	23.2	30.2	36.2	41.0	44.7	46.9	47.7	47.0	44.9
4	0 59.7	08.1	16.3	23.9	30.8	36.7	41.5	44.9	47.0	47.7	46.9	44.6
5	1 00.5	1 09.0	1 17.1	1 24.7	1 31.4	1 37.2	1 41.9	1 45.2	1 47.2	1 47.7	1 46.7	1 44.3
6	01.4	09.8	17.9	25.4	32.1	37.8	42.3	45.5	47.3	47.7	46.6	44.0
7	02.2	10.6	18.7	26.1	32.7	38.3	42.7	45.7	47.4	47.6	46.4	43.7
8	03.1	11.4	19.4	26.8	33.3	38.8	43.0	46.0	47.5	47.6	46.2	43.4
9	03.9	12.3	20.2	27.5	33.9	39.2	43.4	46.2	47.6	47.5	45.9	43.0
10	1 04.8	1 13.1	1 21.0	1 28.2	1 34.5	1 39.7	1 43.7	1 46.4	1 47.6	1 47.4	1 45.7	1 42.6
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
0	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.5
10	.2	.3	.3	.3	.4	.5	.5	.6	.6	.6	.6	.6
20	.3	.3	.4	.4	.4	.5	.5	.6	.6	.6	.6	.6
30	.4	.4	.4	.4	.5	.5	.6	.6	.6	.6	.6	.6
40	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
45	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6
50	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6
55	.7	.7	.7	.7	.6	.6	.6	.6	.6	.6	.6	.6
60	.8	.8	.8	.7	.7	.7	.6	.6	.6	.6	.6	.6
62	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
64	0.9	0.9	.9	.8	.8	.7	.7	.6	.6	.6	.6	.6
66	1.0	1.0	0.9	.9	.8	.7	.7	.6	.6	.6	.6	.6
68	1.0	1.0	1.0	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.7
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
Jan.	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Feb.	.8	.8	.7	.7	.7	.6	.6	.6	.5	.5	.5	.5
Mar.	0.9	0.9	0.9	0.9	0.8	.8	.7	.7	.6	.6	.5	.5
Apr.	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6
May	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	.8	.7
June	.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9
July	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Aug.	.5	.6	.6	.7	.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0
Sept.	.4	.4	.5	.5	.6	.6	.7	.7	.8	0.8	0.9	0.9
Oct.	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8
Nov.	.3	.2	.2	.2	.3	.3	.3	.4	.4	.5	.6	.6
Dec.	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4
Lat.	AZIMUTH											
0	359.2	359.2	359.2	359.3	359.4	359.5	359.6	359.7	359.9	0.0	0.2	0.3
20	359.1	359.2	359.2	359.3	359.4	359.5	359.6	359.7	359.9	0.0	0.2	0.3
40	358.9	359.0	359.0	359.1	359.2	359.3	359.5	359.7	359.8	0.0	0.2	0.4
50	358.7	358.8	358.8	358.9	359.1	359.2	359.4	359.6	359.8	0.0	0.2	0.5
55	358.6	358.6	358.7	358.8	359.0	359.1	359.3	359.6	359.8	0.0	0.3	0.5
60	358.4	358.4	358.5	358.6	358.8	359.0	359.2	359.5	359.8	0.0	0.3	0.6
65	358.1	358.1	358.2	358.4	358.6	358.8	359.1	359.4	359.7	0.0	0.4	0.7

ILLUSTRATION

On 1982 April 21 at G.M.T.

23^h 18^m 56^s in longitudeW. 37° 14' the apparent altitude
(corrected for refraction), H_0 , of
Polaris was 49° 31' 6".

From the daily pages: 0

G.H.A. Aries (23^h) 194 41.0Increment (18^m 56^s) 4 44.8

Longitude (west) -37 14

L.H.A. Aries

162 12

 H_0 a_0 (argument 162° 12') 49 31.6 a_1 (lat. 50° approx.) 0.6 a_2 (April) 1.0

Sum -1° = Lat. = 50 02.8

POLARIS (POLE STAR) TABLES, 1982

FOR DETERMINING LATITUDE FROM SEXTANT ALTITUDE AND FOR AZIMUTH

L.H.A. ARIES	240° - 249°	250° - 259°	260° - 269°	270° - 279°	280° - 289°	290° - 299°	300° - 309°	310° - 319°	320° - 329°	330° - 339°	340° - 349°	350° - 359°
	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0	a_0
0	1 42·6	1 38·2	1 32·7	1 26·1	1 18·6	1 10·6	1 02·2	0 53·7	0 45·3	0 37·3	0 30·0	0 23·5
1	42·3	37·7	32·1	25·4	17·9	09·8	01·3	52·8	44·5	36·5	29·3	22·9
2	41·9	37·2	31·4	24·6	17·1	08·9	1 00·5	52·0	43·6	35·8	28·6	22·3
3	41·5	36·7	30·8	23·9	16·3	08·1	0 59·6	51·1	42·8	35·0	27·9	21·8
4	41·0	36·1	30·1	23·2	15·5	07·3	58·8	50·3	42·0	34·3	27·3	21·2
5	1 40·6	1 35·6	1 29·5	1 22·4	1 14·7	1 06·4	0 57·9	0 49·4	0 41·2	0 33·5	0 26·6	0 20·7
6	40·2	35·0	28·8	21·7	13·9	05·6	57·1	48·6	40·4	32·8	26·0	20·1
7	39·7	34·5	28·1	20·9	13·1	04·7	56·2	47·8	39·6	32·1	25·3	19·6
8	39·2	33·9	27·5	20·2	12·2	03·9	55·4	46·9	38·9	31·4	24·7	19·1
9	38·7	33·3	26·8	19·4	11·4	03·0	54·5	46·1	38·1	30·7	24·1	18·6
10	1 38·2	1 32·7	1 26·1	1 18·6	1 10·6	1 02·2	0 53·7	0 45·3	0 37·3	0 30·0	0 23·5	0 18·1
Lat.	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1	a_1
0	0·5	0·4	0·3	0·3	0·2	0·2	0·2	0·2	0·2	0·3	0·4	0·4
10	·5	·4	·4	·3	·3	·3	·2	·3	·3	·3	·4	·5
20	·5	·5	·4	·4	·3	·3	·3	·3	·4	·4	·4	·5
30	·5	·5	·5	·4	·4	·4	·4	·4	·4	·4	·5	·5
40	0·6	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·5	0·6
45	·6	·6	·6	·5	·5	·5	·5	·5	·5	·6	·6	·6
50	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6	·6
55	·6	·6	·7	·7	·7	·7	·7	·7	·7	·7	·6	·6
60	·7	·7	·7	·7	·8	·8	·8	·8	·8	·7	·7	·7
62	0·7	0·7	0·7	0·8	0·8	0·8	0·8	0·8	0·8	0·8	0·7	0·7
64	·7	·7	·8	·8	·9	0·9	0·9	0·9	·9	·8	·8	·7
66	·7	·8	·8	·9	0·9	1·0	1·0	1·0	0·9	·9	·8	·7
68	0·7	0·8	0·9	0·9	1·0	1·0	1·0	1·0	1·0	0·9	0·9	0·8
Month	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2	a_2
Jan.	0·5	0·5	0·5	0·5	0·6	0·6	0·6	0·6	0·6	0·6	0·6	0·6
Feb.	·4	·4	·4	·4	·4	·4	·4	·4	·5	·5	·5	·6
Mar.	·5	·4	·4	·3	·3	·3	·3	·3	·3	·3	·4	·4
Apr.	0·5	0·5	0·4	0·4	0·3	0·3	0·2	0·2	0·2	0·2	0·2	0·3
May	·7	·6	·5	·5	·4	·3	·3	·2	·2	·2	·2	·2
June	·8	·7	·7	·6	·5	·4	·4	·3	·3	·2	·2	·2
July	0·9	0·9	0·8	0·7	0·7	0·6	0·5	0·5	0·4	0·3	0·3	0·2
Aug.	1·0	·9	·9	·9	·8	·8	·7	·6	·6	·5	·4	·4
Sept.	0·9	·9	·9	·9	·9	·9	·8	·8	·7	·7	·6	·6
Oct.	0·8	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·9	0·8	0·8	0·8
Nov.	·7	·7	·8	·8	·9	·9	·9	1·0	1·0	1·0	0·9	0·9
Dec.	0·5	0·6	0·6	0·7	0·8	0·8	0·9	0·9	1·0	1·0	1·0	1·0
Lat.	AZIMUTH											
0	0·4	0·5	0·6	0·7	0·8	0·8	0·8	0·8	0·8	0·7	0·6	0·5
20	0·5	0·6	0·7	0·8	0·8	0·9	0·9	0·9	0·8	0·7	0·7	0·5
40	0·6	0·7	0·8	0·9	1·0	1·1	1·1	1·0	1·0	0·9	0·8	0·7
50	0·7	0·8	1·0	1·1	1·2	1·3	1·3	1·2	1·2	1·1	1·0	0·8
55	0·7	0·9	1·1	1·2	1·3	1·4	1·4	1·4	1·3	1·2	1·1	0·9
60	0·8	1·1	1·3	1·4	1·5	1·6	1·6	1·6	1·5	1·4	1·2	1·0
65	1·0	1·2	1·5	1·7	1·8	1·9	1·9	1·9	1·8	1·7	1·5	1·2

$$\text{Latitude} = \text{Apparent altitude (corrected for refraction)} - 1^\circ + a_0 + a_1 + a_2$$

The table is entered with L.H.A. Aries to determine the column to be used; each column refers to a range of 10° . a_0 is taken, with mental interpolation, from the upper table with the units of L.H.A. Aries in degrees as argument; a_1 , a_2 are taken, without interpolation, from the second and third tables with arguments latitude and month respectively. a_0 , a_1 , a_2 are always positive. The final table gives the azimuth of *Polaris*.

TABLES FOR INTERPOLATING SUNRISE, MOONRISE, ETC.

TABLE I—FOR LATITUDE

Tabular Interval			Difference between the times for consecutive latitudes															
10°	5°	2°	5 ^m	10 ^m	15 ^m	20 ^m	25 ^m	30 ^m	35 ^m	40 ^m	45 ^m	50 ^m	55 ^m	60 ^m	1 ^h 05 ^m	1 ^h 10 ^m	1 ^h 15 ^m	1 ^h 20 ^m
0° 30'	0° 15'	0° 06'	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	h m	h m	h m	h m
1 00	0 30	0 12	0 0 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	0 02	0 02	0 02	0 02
1 30	0 45	0 18	0 1 1	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2	0 05	0 05	0 05	0 05
2 00	1 00	0 24	1 1 2	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	2 3 3	0 07	0 07	0 07	0 07
2 30	1 15	0 30	1 2 3	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	3 4 4	0 10	0 10	0 10	0 10
3 00	1 30	0 36	1 2 4	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	4 5 5	0 12	0 13	0 13	0 13
3 30	1 45	0 42	1 3 4	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	5 6 6	0 15	0 15	0 16	0 16
4 00	2 00	0 48	1 3 5	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	6 7 7	0 18	0 18	0 19	0 19
4 30	2 15	0 54	2 3 5	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	7 8 8	0 20	0 21	0 22	0 22
5 00	2 30	1 00	2 4 6	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	8 9 9	0 23	0 24	0 25	0 26
5 30	2 45	1 06	2 4 7	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	9 10 10	0 26	0 27	0 28	0 29
6 00	3 00	1 12	2 5 7	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	10 11 11	0 29	0 30	0 31	0 32
6 30	3 15	1 18	3 5 8	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	11 12 12	0 32	0 33	0 34	0 36
7 00	3 30	1 24	3 6 9	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	12 13 13	0 36	0 37	0 38	0 40
7 30	3 45	1 30	3 6 10	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	13 14 14	0 39	0 41	0 42	0 44
8 00	4 00	1 36	3 7 10	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	14 15 15	0 43	0 44	0 46	0 48
8 30	4 15	1 42	4 7 11	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	15 16 16	0 47	0 48	0 51	0 53
9 00	4 30	1 48	4 8 12	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	16 17 17	0 51	0 53	0 56	0 58
9 30	4 45	1 54	4 8 13	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	17 18 18	0 55	0 58	1 01	1 04
10 00	5 00	2 00	4 9 13	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	18 19 19	1 00	1 04	1 08	1 12
			5 9 14	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	19 20 20	1 05	1 10	1 15	1 20
			5 10 15	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	20 21 21	1 10	1 15	1 20	1 25

Table I is for interpolating the L.M.T. of sunrise, twilight, moonrise, etc., for latitude. It is to be entered, in the appropriate column on the left, with the difference between true latitude and the nearest tabular latitude which is *less* than the true latitude; and with the argument at the top which is the nearest value of the difference between the times for the tabular latitude and the next higher one; the correction so obtained is applied to the time for the tabular latitude; the sign of the correction can be seen by inspection. It is to be noted that the interpolation is not linear, so that when using this table it is essential to take out the tabular phenomenon for the latitude *less* than the true latitude.

TABLE II—FOR LONGITUDE

Long. East or West	Difference between the times for given date and preceding date (for east longitude) or for given date and following date (for west longitude)											
	10 ^m	20 ^m	30 ^m	40 ^m	50 ^m	60 ^m	1 ^h + 10 ^m	1 ^h + 20 ^m	1 ^h + 30 ^m	2 ^h 10 ^m	2 ^h 20 ^m	2 ^h 30 ^m
0°	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m	m m m
10	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
20	0 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1
30	1 1 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2
40	1 2 2	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3	3 3 3
50	1 2 3	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4
60	1 3 4	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5	5 5 5
70	1 3 5	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6	6 6 6
80	1 4 6	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7	7 7 7
90	1 4 7	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8	8 8 8
100	1 5 7	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9	9 9 9
110	1 5 8	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10	10 10 10
120	1 6 8	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11	11 11 11
130	1 6 9	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12	12 12 12
140	1 7 10	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13	13 13 13
150	1 7 11	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14	14 14 14
160	1 8 12	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15	15 15 15
170	1 8 13	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16	16 16 16
180	1 9 14	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17	17 17 17

Table II is for interpolating the L.M.T. of moonrise, moonset and the Moon's meridian passage for longitude. It is entered with longitude and with the difference between the times for the given date and for the preceding date (in east longitudes) or following date (in west longitudes). The correction is normally *added* for west longitudes and *subtracted* for east longitudes, but if, as occasionally happens, the times become earlier each day instead of later, the signs of the corrections must be reversed.

CONVERSION OF ARC TO TIME

0°-59°		60°-119°		120°-179°		180°-239°		240°-299°		300°-359°		0° 00	0° 25	0° 50	0° 75
a	h m	a	h m	a	h m	a	h m	a	h m	a	h m	h m s	m s	m s	m s
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00	0	0 00	0 01	0 03
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04	1	0 04	0 05	0 07
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08	2	0 08	0 09	0 11
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12	3	0 12	0 13	0 15
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16	4	0 16	0 17	0 19
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20	5	0 20	0 21	0 23
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24	6	0 24	0 25	0 27
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28	7	0 28	0 29	0 31
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32	8	0 32	0 33	0 35
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36	9	0 36	0 37	0 39
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40	10	0 40	0 41	0 43
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44	11	0 44	0 45	0 47
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48	12	0 48	0 49	0 51
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52	13	0 52	0 53	0 55
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56	14	0 56	0 57	0 59
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00	15	1 00	1 01	1 03
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04	16	1 04	1 05	1 07
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08	17	1 08	1 09	1 11
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12	18	1 12	1 13	1 15
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16	19	1 16	1 17	1 19
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20	20	1 20	1 21	1 23
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24	21	1 24	1 25	1 27
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28	22	1 28	1 29	1 31
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32	23	1 32	1 33	1 35
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36	24	1 36	1 37	1 39
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40	25	1 40	1 41	1 43
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44	26	1 44	1 45	1 47
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48	27	1 48	1 49	1 51
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52	28	1 52	1 53	1 55
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56	29	1 56	1 57	1 59
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00	30	2 00	2 01	2 03
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04	31	2 04	2 05	2 07
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08	32	2 08	2 09	2 11
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12	33	2 12	2 13	2 15
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16	34	2 16	2 17	2 19
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20	35	2 20	2 21	2 23
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24	36	2 24	2 25	2 27
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28	37	2 28	2 29	2 31
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32	38	2 32	2 33	2 35
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36	39	2 36	2 37	2 39
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40	40	2 40	2 41	2 43
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44	41	2 44	2 45	2 47
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48	42	2 48	2 49	2 51
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52	43	2 52	2 53	2 55
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56	44	2 56	2 57	2 59
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00	45	3 00	3 01	3 03
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04	46	3 04	3 05	3 07
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08	47	3 08	3 09	3 11
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12	48	3 12	3 13	3 15
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16	49	3 16	3 17	3 19
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20	50	3 20	3 21	3 23
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24	51	3 24	3 25	3 27
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28	52	3 28	3 29	3 31
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32	53	3 32	3 33	3 35
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36	54	3 36	3 37	3 39
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40	55	3 40	3 41	3 43
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44	56	3 44	3 45	3 47
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48	57	3 48	3 49	3 51
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52	58	3 52	3 53	3 55
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56	59	3 56	3 57	3 59

The above table is for converting expressions in arc to their equivalent in time ; its main use in this Almanac is for the conversion of longitude for application to L.M.T. (added if west, subtracted if east) to give G.M.T. or vice versa, particularly in the case of sunrise, sunset, etc.

	ARIES		VENUS -3.4		MARS +0.5		JUPITER -1.8		SATURN +1.0		STARS		
G.M.T.	G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.	
3	00	280 41.5	213 16.8 N20	17.8	88 02.8 S	5 42.3	71 53.3 S10	29.6	85 16.9 S	3 50.5	Acamar	315 36.5 S40	22.4
	01	295 43.9	228 16.2	18.3	103 04.2	42.8	86 55.8	29.6	100 19.3	50.5	Achernar	335 44.4 S57	19.3
	02	310 46.4	243 15.5	18.9	118 05.7	43.2	101 58.2	29.7	115 21.7	50.6	Acrux	173 36.0 S63	00.3
	03	325 48.8	258 14.9	19.4	133 07.1	43.7	117 00.6	29.7	130 24.1	50.6	Adhara	255 31.5 S28	56.9
	04	340 51.3	273 14.2	20.0	148 08.6	44.2	132 03.0	29.7	145 26.5	50.6	Aldebaran	291 16.9 N16	28.4
05	355 53.8	288 13.6	20.5	163 10.0	44.7	147 05.5	29.7	160 28.9	50.7				
06	10 56.2	303 12.9 N20	21.0	178 11.5 S	5 45.2	162 07.9 S10	29.8	175 31.3 S	3 50.7	Alioth	166 41.3 N56	03.7	
07	25 58.7	318 12.3	21.6	193 12.9	45.7	177 10.3	29.8	190 33.7	50.7	Alkaid	153 17.3 N49	24.4	
S 08	41 01.2	333 11.6	22.1	208 14.4	46.1	192 12.8	29.8	205 36.2	50.8	Al Na'ir	28 13.0 S47	02.6	
A 09	56 03.6	348 11.0	22.6	223 15.8	46.6	207 15.2	29.8	220 38.6	50.8	Alnilam	276 10.7 S	1 12.8	
T 10	71 06.1	3 10.3	23.2	238 17.3	47.1	222 17.6	29.9	235 41.0	50.8	Alphard	218 19.6 S	8 34.9	
U 11	86 08.6	18 09.7	23.7	253 18.7	47.6	237 20.0	29.9	250 43.4	50.9				
R 12	101 11.0	33 09.0 N20	24.2	268 20.2 S	5 48.1	252 22.5 S10	29.9	265 45.8 S	3 50.9	Alphecca	126 30.8 N26	46.6	
D 13	116 13.5	48 08.4	24.8	283 21.6	48.6	267 24.9	29.9	280 48.2	50.9	Alpheratz	358 08.0 N28	59.4	
A 14	131 16.0	63 07.7	25.3	298 23.1	49.0	282 27.3	30.0	295 50.6	51.0	Altair	62 31.0 N	8 49.3	
Y 15	146 18.4	78 07.0	25.8	313 24.5	49.5	297 29.8	30.0	310 53.0	51.0	Ankaa	353 38.9 S42	23.9	
16	161 20.9	93 06.4	26.3	328 26.0	50.0	312 32.2	30.0	325 55.4	51.0	Antares	112 55.0 S26	23.6	
17	176 23.3	108 05.7	26.9	343 27.4	50.5	327 34.6	30.0	340 57.9	51.1				
18	191 25.8	123 05.1 N20	27.4	358 28.8 S	5 51.0	342 37.0 S10	30.1	356 00.3 S	3 51.1	Arcturus	146 17.2 N19	16.6	
19	206 28.3	138 04.4	27.9	13 30.3	51.5	357 39.5	30.1	11 02.7	51.2	Atria	108 17.6 S68	59.9	
20	221 30.7	153 03.8	28.4	28 31.7	51.9	12 41.9	30.1	26 05.1	51.2	Avior	234 28.3 S59	27.3	
21	236 33.2	168 03.1	29.0	43 33.2	52.4	27 44.3	30.1	41 07.5	51.2	Bellatrix	278 57.7 N	6 20.0	
22	251 35.7	183 02.4	29.5	58 34.6	52.9	42 46.7	30.2	56 09.9	51.3	Betelgeuse	271 27.2 N	7 24.3	
23	266 38.1	198 01.8	30.0	73 36.0	53.4	57 49.2	30.2	71 12.3	51.3				
4	00	281 40.6	213 01.1 N20	30.5	88 37.5 S	5 53.9	72 51.6 S10	30.2	86 14.7 S	3 51.3	Canopus	264 07.2 S52	41.1
	01	296 43.1	228 00.5	31.1	103 38.9	54.4	87 54.0	30.3	101 17.1	51.4	Copella	281 09.9 N45	58.8
	02	311 45.5	242 59.8	31.6	118 40.4	54.9	102 56.4	30.3	116 19.5	51.4	Deneb	49 47.2 N	84.5 12.9
	03	326 48.0	257 59.1	32.1	133 41.8	55.3	117 58.9	30.3	131 21.9	51.4	Denebola	182 57.8 N14	40.4
	04	341 50.5	272 58.5	32.6	148 43.2	55.8	133 01.3	30.3	146 24.4	51.5	Diphda	349 19.6 S18	04.9
05	356 52.9	287 57.8	33.1	163 44.7	56.3	148 03.7	30.4	161 26.8	51.5				
06	11 55.4	302 57.2 N20	33.6	178 46.1 S	5 56.8	163 06.1 S10	30.4	176 29.2 S	3 51.5	Dubhe	194 20.8 N61	51.1	
07	26 57.8	317 56.5	34.2	193 47.5	57.3	178 08.5	30.4	191 31.6	51.6	Elmath	278 42.9 N28	35.5	
08	42 00.3	332 55.8	34.7	208 49.0	57.8	193 11.0	30.4	206 34.0	51.6	Eltanin	90 56.6 N51	29.6	
S 09	57 02.7	347 55.2	35.2	223 50.4	58.3	208 13.4	30.5	221 36.4	51.6	Enif	34 10.1 N	9 47.6	
U 10	72 05.2	2 54.5	35.7	238 51.8	58.7	223 15.8	30.5	236 38.8	51.7	Fomalhaut	15 49.8 S29	42.8	
N 11	87 07.7	17 53.8	36.2	253 53.3	59.2	238 18.2	30.5	251 41.2	51.7				
D 12	102 10.2	32 53.2 N20	36.7	268 54.7 S	5 59.7	253 20.6 S10	30.6	266 43.6 S	3 51.7	Gacrux	172 27.4 S57	01.1	
A 13	117 12.6	47 52.5	37.2	283 56.1	6 00.2	268 23.1	30.6	281 46.0	51.8	Gienah	176 16.7 S17	26.7	
Y 14	132 15.1	62 51.8	37.7	298 57.6	00.7	283 25.5	30.6	296 48.4	51.8	Hadar	149 21.4 S60	17.5	
15	147 17.6	77 51.2	38.2	313 59.0	01.2	298 27.9	30.6	311 50.8	51.8	Hamal	328 27.2 N23	22.6	
16	162 20.0	92 50.5	38.7	329 00.4	01.7	313 30.3	30.7	326 53.2	51.9	Kaus Aust.	84 14.8 S34	23.6	
17	177 22.5	107 49.8	39.2	344 01.9	02.2	328 32.7	30.7	341 55.6	51.9				
18	192 24.9	122 49.2 N20	39.8	359 03.3 S	6 02.6	343 35.2 S10	30.7	356 58.1 S	3 52.0	Kochab	137 18.3 N74	14.0	
19	207 27.4	137 48.5	40.3	14 04.7	03.1	358 37.6	30.8	12 00.5	52.0	Markab	14 01.8 N15	06.5	
20	222 29.9	152 47.8	40.8	29 06.2	03.6	13 40.0	30.8	27 02.9	52.0	Menkar	314 40.0 N	4 01.2	
21	237 32.3	167 47.2	41.3	44 07.6	04.1	28 42.4	30.8	42 05.3	52.1	Menkent	148 35.4 S36	17.1	
22	252 34.8	182 46.5	41.8	59 09.0	04.6	43 44.8	30.8	57 07.7	52.1	Miaplacidus	221 45.5 S69	38.8	
23	267 37.3	197 45.8	42.3	74 10.4	05.1	58 47.2	30.9	72 10.1	52.1				
5	00	282 39.7	212 45.2 N20	42.8	89 11.9 S	6 05.6	73 49.7 S10	30.9	87 12.5 S	3 52.2	Mirfak	309 14.7 N49	47.1
	01	297 42.2	227 44.5	43.3	104 13.3	06.1	88 52.1	30.9	102 14.9	52.2	Nunki	76 27.2 S26	19.1
	02	312 44.7	242 43.8	43.8	119 14.7	06.5	103 54.5	31.0	117 17.3	52.2	Peacock	53 55.8 S56	47.4
	03	327 47.1	257 43.2	44.2	134 16.2	07.0	118 56.9	31.0	132 19.7	52.3	Pollux	243 57.0 N28	04.2
	04	342 49.6	272 42.5	44.7	149 17.6	07.5	133 59.3	31.0	147 22.1	52.3	Procyon	245 24.8 N	5 16.3
05	357 52.1	287 41.8	45.2	164 19.0	08.0	149 01.7	31.1	162 24.5	52.3				
06	12 54.5	302 41.1 N20	45.7	179 20.4 S	6 08.5	164 04.2 S10	31.1	177 26.9 S	3 52.4	Rasalhague	96 28.1 N12	34.4	
07	27 57.0	317 40.5	46.2	194 21.9	09.0	179 06.6	31.1	192 29.3	52.4	Regulus	208 08.9 N12	03.3	
08	42 59.4	332 39.8	46.7	209 23.3	09.5	194 09.0	31.1	207 31.7	52.5	Rigel	281 35.1 S	8 13.3	
M 09	58 01.9	347 39.1	47.2	224 24.7	10.0	209 11.4	31.2	222 34.1	52.5	Rigel Kent.	140 23.8 S60	45.9	
O 10	73 04.4	2 38.4	47.7	239 26.1	10.5	224 13.8	31.2	237 36.5	52.5	Sabik	102 39.4 S15	42.2	
N 11	88 06.8	17 37.8	48.2	254 27.5	10.9	239 16.2	31.2	252 38.9	52.6				
D 12	103 09.3	32 37.1 N20	48.7	269 29.0 S	6 11.4	254 18.6 S10	31.3	267 41.3 S	3 52.6	Schedar	350 07.6 N56	26.1	
A 13	118 11.8	47 36.4	49.2	284 30.4	11.9	269 21.1	31.3	282 43.7	52.6	Shaula	96 53.6 S37	05.5	
Y 14	133 14.2	62 35.7	49.6	299 31.8	12.4	284 23.5	31.3	297 46.1	52.7	Sirius	258 54.9 S16	41.5	
15	148 16.7	77 35.1	50.1	314 33.2	12.9	299 25.9	31.4	312 48.5	52.7	Spica	158 56.2 S11	04.1	
16	163 19.2	92 34.4	50.6	329 34.6	13.4	314 28.3	31.4	327 50.9	52.7	Suhail	223 10.3 S43	21.8	
17	178 21.6	107 33.7	51.1	344 36.1	13.9	329 30.7	31.4	342 53.3	52.8				
18	193 24.1	122 33.0 N20	51.6	359 37.5 S	6 14.4	344 33.1 S10	31.4	357 55.7 S	3 52.8	Vega	80 54.6 N38	46.1	
19	208 26.6	137 32.4	52.1	14 38.9	14.9	359 35.5	31.5	12 58.2	52.9	Zuben'ubi	137 31.5 S15	58.1	
20	223 29.0	152 31.7	52.5	29 40.3	15.4	14 37.9	31.5	28 00.6	52.9				
21	238 31.5	167 31.0	53.0	44 41.7	15.9	29 40.4	31.5	43 03.0	52.9		S.H.A.	Mer. Poss.	
22	253 33.9	182 30.3	53.5	59 43.2	16.3	44 42.8	31.6	58 05.4	53.0	Venus	291 20.5 S	9 48	
23	268 36.4	197 29.6	54.0	74 44.6	16.8	59 45.2	31.6	73 07.8	53.0	Mars	166 56.9 S	18 04	
										Jupiter	151 11.0 N	19 05	
										Saturn	164 34.1 S	18 12	
Mer. Pass.	5 12.4	v -0.7	d 0.5	v 1.4	d 0.5	v 2.4	d 0.0	v 2.4	d 0.0				

1982 JULY 3, 4, 5 (SAT., SUN., MON.)

G.M.T.		SUN		MOON				Lat.	Twilight		Sunrise	Moonrise								
		G.H.A.	Dec.	G.H.A.	<i>v</i>	Dec.	<i>d</i>		H.P.	Naut.		Civil	3	4	5	6				
^d	^h								[°]	^h	^m	^h	^m	^h	^m	^h	^m	^h	^m	
3	00	178	59.6	N23	00.3	37	15.8	13.2	S17	50.0	7.4	54.2	N 72	□	□	□	■	■	■	
	01	193	59.5	23	00.1	51	48.0	13.1	17	57.4	7.3	54.2	N 70	□	□	□	■	■	■	
	02	208	59.4	22	59.9	66	20.1	13.1	18	04.7	7.2	54.2	68	□	□	□	20 31	■	■	
	03	223	59.3	..	59.7	80	52.2	13.1	18	11.9	7.1	54.2	66	////	////	00 39	19 49	21 18	22 31	
	04	238	59.2		59.5	95	24.3	13.1	18	19.0	7.0	54.2	64	////	////	01 46	19 21	20 39	21 44	
	05	253	59.0		59.3	109	56.4	13.0	18	26.0	7.0	54.2	62	////	////	02 20	19 00	20 12	21 14	
	06	268	58.9	N22	59.1	124	28.4	13.0	S18	33.0	6.8	54.1	60	////	01 10	02 45	18 42	19 51	20 51	
	07	283	58.8		58.9	139	00.4	12.9	18	39.8	6.8	54.1	N 58	////	01 52	03 04	18 28	19 34	20 32	
	08	298	58.7		58.7	153	32.3	12.9	18	46.6	6.7	54.1	56	////	02 20	03 21	18 15	19 20	20 17	
	09	313	58.6	..	58.5	168	04.2	12.9	18	53.3	6.6	54.1	54	01 04	02 41	03 34	18 05	19 07	20 03	
	10	328	58.5		58.4	182	36.1	12.8	18	59.9	6.6	54.1	52	01 43	02 58	03 46	17 55	18 56	19 52	
	11	343	58.4		58.2	197	07.9	12.8	19	06.5	6.4	54.1	50	02 09	03 13	03 57	17 47	18 47	19 42	
	12	358	58.2	N22	58.0	211	39.7	12.8	S19	12.9	6.4	54.1	45	02 53	03 42	04 19	17 29	18 26	19 20	
	13	13	58.1		57.8	226	11.5	12.7	19	19.3	6.2	54.1	N 40	03 22	04 04	04 36	17 14	18 10	19 03	
	14	28	58.0		57.5	240	43.2	12.7	19	25.5	6.2	54.1	35	03 45	04 21	04 51	17 01	17 56	18 48	
	15	43	57.9	..	57.3	255	14.9	12.7	19	31.7	6.1	54.1	30	04 03	04 36	05 03	16 51	17 44	18 35	
	16	58	57.8		57.1	269	46.6	12.6	19	37.8	6.0	54.1	20	04 31	05 00	05 25	16 32	17 23	18 14	
	17	73	57.7		56.9	284	18.2	12.6	19	43.8	6.0	54.1	N 10	04 54	05 20	05 43	16 16	17 05	17 55	
	18	88	57.5	N22	56.7	298	49.8	12.6	S19	49.8	5.8	54.1	0	05 12	05 38	06 01	16 01	16 49	17 37	
	19	103	57.4		56.5	313	21.4	12.5	19	55.6	5.7	54.1	S 10	05 29	05 55	06 18	15 46	16 32	17 20	
	20	118	57.3		56.3	327	52.9	12.5	20	01.3	5.7	54.1	20	05 44	06 12	06 36	15 31	16 15	17 01	
	21	133	57.2	..	56.1	342	24.4	12.5	20	07.0	5.6	54.1	30	06 00	06 30	06 56	15 13	15 54	16 40	
	22	148	57.1		55.9	356	55.9	12.4	20	12.6	5.4	54.0	35	06 09	06 40	07 08	15 02	15 42	16 27	
23	163	57.0		55.7	11	27.3	12.4	20	18.0	5.4	54.0	40	06 18	06 52	07 22	14 50	15 29	16 13		
4	00	178	56.9	N22	55.5	25	58.7	12.4	S20	23.4	5.3	54.0	45	06 28	07 05	07 39	14 36	15 13	15 56	
01	193	56.8		55.3	40	30.1	12.3	20	28.7	5.2	54.0	S 50	06 39	07 21	07 59	14 19	14 53	15 35		
02	208	56.6		55.1	55	01.4	12.3	20	33.9	5.1	54.0	52	06 44	07 28	08 08	14 11	14 44	15 25		
03	223	56.5	..	54.9	69	32.7	12.3	20	39.0	5.0	54.0	54	06 50	07 36	08 19	14 02	14 33	15 13		
04	238	56.4		54.7	84	04.0	12.2	20	44.0	4.9	54.0	56	06 56	07 44	08 31	13 52	14 22	15 00		
05	253	56.3		54.4	98	35.2	12.2	20	48.9	4.8	54.0	58	07 02	07 54	08 45	13 40	14 08	14 45		
06	268	56.2	N22	54.2	113	06.4	12.2	S20	53.7	4.7	54.0	S 60	07 09	08 05	09 02	13 27	13 52	14 27		
07	283	56.1		54.0	127	37.6	12.1	20	58.4	4.7	54.0	Lat.								
08	298	56.0		53.8	142	08.7	12.1	21	03.1	4.5	54.0	Sunset								
09	313	55.9	..	53.6	156	39.8	12.1	21	07.6	4.4	54.0	Twilight								
10	328	55.7		53.4	171	10.9	12.0	21	12.0	4.4	54.0	Civil								
11	343	55.6		53.2	185	41.9	12.1	21	16.4	4.2	54.0	Naut.								
12	358	55.5	N22	52.9	200	13.0	12.0	S21	20.6	4.1	54.0	3								
13	13	55.4		52.7	214	44.0	11.9	21	24.7	4.1	54.0	4								
14	28	55.3		52.5	229	14.9	12.0	21	28.8	3.9	54.0	5								
15	43	55.2	..	52.3	243	45.9	11.9	21	32.7	3.9	54.0	6								
16	58	55.1		52.1	258	16.8	11.8	21	36.6	3.7	54.0	N 72								
17	73	55.0		51.8	272	47.6	11.9	21	40.3	3.7	54.0	N 70								
18	88	54.9	N22	51.6	287	18.5	11.8	S21	44.0	3.5	54.0	68								
19	103	54.7		51.4	301	49.3	11.8	21	47.5	3.5	54.0	□								
20	118	54.6		51.2	316	20.1	11.8	21	51.0	3.3	54.0	□								
21	133	54.5	..	51.0	330	50.9	11.7	21	54.3	3.3	54.0	23 24								
22	148	54.4		50.7	345	21.6	11.8	21	57.6	3.1	54.0	66								
23	163	54.3		50.5	359	52.4	11.7	22	00.7	3.1	54.0	22 21								
5	00	178	54.2	N22	50.3	14	23.1	11.6	S22	03.8	2.9	54.0	62							
01	193	54.1		50.1	28	53.7	11.7	22	06.7	2.8	54.0	21 47								
02	208	54.0		49.8	43	24.4	11.6	22	09.5	2.8	54.0	22 56								
03	223	53.9	..	49.6	57	55.0	11.6	22	12.3	2.6	54.0	N 58								
04	238	53.8		49.4	72	25.6	11.6	22	14.9	2.5	54.0	21 03								
05	253	53.6		49.2	86	56.2	11.6	22	17.4	2.4	54.0	22 15								
06	268	53.5	N22	48.9	101	26.8	11.6	S22	19.8	2.4	54.0	20 47								
07	283	53.4		48.7	115	57.4	11.5	22	22.2	2.2	54.0	21 48								
08	298	53.3		48.5	130	27.9	11.5	22	24.4	2.1	54.0	21 27								
09	313	53.2	..	48.2	144	58.4	11.5	22	26.5	2.0	54.0	23 02								
10	328	53.1		48.0	159	28.9	11.5	22	28.5	1.9	54.0	21 10								
11	343	53.0		47.8	173	59.4	11.4	22	30.4	1.8	54.0	17 17								
12	358	52.9	N22	47.5	188	29.8	11.5	S22	32.2	1.7	54.0	17 51								
13	13	52.8		47.3	203	00.3	11.4	22	33.9	1.6	54.0	18 14								
14	28	52.7		47.1	217	30.7	11.4	22	35.5	1.5	54.0	18 24								
15	43	52.6	..	46.8	232	01.1	11.4	22	37.0	1.3	54.0	17 39								
16	58	52.5		46.6	246	31.5	11.4	22	38.3	1.3	54.0	18 00								
17	73	52.4		46.4	261	01.9	11.3	22	39.6	1.2	54.0	18 28								
18	88	52.2	N22	46.1	275	32.2	11.4	S22	40.8	1.0	54.0	17 08								
19	103	52.1		45.9	290	02.6	11.4	22	41.8	1.0	54.0	17 29								
20	118	52.0		45.6	304	33.0	11.3	22	42.8	0.8	54.0	16 41								
21	133	51.9	..	45.4	319	03.3	11.3	22	43.6	0.8	54.0	16 33								
22	148	51.8		45.2	333	33.6	11.3	22	44.4	0.6	54.0	16 24								
23	163	51.7		44.9	348	03.9	11.3	22	45.0	0.5	54.0	17 13								
		S.D.	15.8	<i>d</i>	0.2	S.D.	14.7	14.7	14.7											
		Day										SUN		Mer.		MOON				
												Eqn. of Time	00 ^h	12 ^h	Pass.	Upper	Lower	Age	Phase	
												^m	^s	^m	^s	^h	^m	^h	^m	^d
		3											04 01	04 07	12 04	22 13	09 49	12	☉	
		4											04 12	04 18	12 04	23 01	10 36	13		
		5											04 23	04 28	12 04	23 49	11 25	14		

1982 JULY 6, 7, 8 (TUES., WED., THURS.)

	ARIES	VENUS -3.4	MARS +0.5	JUPITER -1.7	SATURN +1.0	STARS			
G.M.T.	G.H.A.	G.H.A. Dec.	G.H.A. Dec.	G.H.A. Dec.	G.H.A. Dec.	Name	S.H.A.	Dec.	
TUESDAY	6 00	283 38.9	212 29.0 N20 54.4	89 46.0 S 6 17.3	74 47.6 S10 31.6	88 10.2 S 3 53.0	Acamar	315 36.5 S40 22.4	
	01	298 41.3	227 28.3 54.9	104 47.4 17.8	89 50.0 31.7	103 12.6 53.1	Achernar	335 44.4 S57 19.3	
	02	313 43.8	242 27.6 55.4	119 48.8 18.3	104 52.4 31.7	118 15.0 53.1	Acrux	173 36.0 S63 00.3	
	03	328 46.3	257 26.9 .. 55.9	134 50.2 .. 18.8	119 54.8 .. 31.7	133 17.4 .. 53.2	Adhara	255 31.5 S28 56.8	
	04	343 48.7	272 26.2 56.3	149 51.6 19.3	134 57.2 31.8	148 19.8 53.2	Aldebaran	291 16.8 N16 28.4	
	05	358 51.2	287 25.6 56.8	164 53.1 19.8	149 59.6 31.8	163 22.2 53.2			
	06	13 53.7	302 24.9 N20 57.3	179 54.5 S 6 20.3	165 02.0 S10 31.8	178 24.6 S 3 53.3	Alioth	166 41.3 N56 03.7	
	07	28 56.1	317 24.2 57.8	194 55.9 20.8	180 04.4 31.9	193 27.0 53.3	Alkaid	153 17.3 N49 24.4	
	08	43 58.6	332 23.5 58.2	209 57.3 21.3	195 06.8 31.9	208 29.4 53.3	Al Na'ir	28 13.0 S47 02.6	
	09	59 01.0	347 22.8 .. 58.7	224 58.7 .. 21.8	210 09.3 .. 31.9	223 31.8 .. 53.4	Alnilam	276 10.7 S 1 12.7	
	10	74 03.5	2 22.1 59.2	240 00.1 22.3	225 11.7 32.0	238 34.2 53.4	Alphard	218 19.6 S 8 34.9	
	11	89 06.0	17 21.5 20 59.6	255 01.5 22.7	240 14.1 32.0	253 36.6 53.5			
	12	104 08.4	32 20.8 N21 00.1	270 02.9 S 6 23.2	255 16.5 S10 32.0	268 39.0 S 3 53.5	Alphecca	126 30.8 N26 46.6	
	13	119 10.9	47 20.1 00.6	285 04.3 23.7	270 18.9 32.1	283 41.4 53.5	Alpheratz	358 07.9 N28 59.4	
	14	134 13.4	62 19.4 01.0	300 05.7 24.2	285 21.3 32.1	298 43.8 53.6	Altair	62 31.0 N 8 49.3	
	15	149 15.8	77 18.7 .. 01.5	315 07.2 .. 24.7	300 23.7 .. 32.1	313 46.2 .. 53.6	Ankaa	353 38.9 S42 23.9	
	16	164 18.3	92 18.0 01.9	330 08.6 25.2	315 26.1 32.2	328 48.6 53.7	Antares	112 55.0 S26 23.6	
	17	179 20.8	107 17.3 02.4	345 10.0 25.7	330 28.5 32.2	343 51.0 53.7			
	18	194 23.2	122 16.7 N21 02.9	0 11.4 S 6 26.2	345 30.9 S10 32.2	358 53.4 S 3 53.7	Arcturus	146 17.2 N19 16.6	
	19	209 25.7	137 16.0 03.3	15 12.8 26.7	0 33.3 32.3	13 55.8 53.8	Atria	108 17.6 S68 59.9	
	20	224 28.2	152 15.3 03.8	30 14.2 27.2	15 35.7 32.3	28 58.2 53.8	Avior	234 28.3 S59 27.2	
	21	239 30.6	167 14.6 .. 04.2	45 15.6 .. 27.7	30 38.1 .. 32.3	44 00.5 .. 53.8	Bellatrix	278 57.7 N 6 20.0	
	22	254 33.1	182 13.9 04.7	60 17.0 28.2	45 40.5 32.4	59 02.9 53.9	Betelgeuse	271 27.2 N 7 24.3	
	23	269 35.5	197 13.2 05.1	75 18.4 28.7	60 42.9 32.4	74 05.3 53.9			
WEDNESDAY	7 00	284 38.0	212 12.5 N21 05.6	90 19.8 S 6 29.2	75 45.3 S10 32.4	89 07.7 S 3 54.0	Canopus	264 07.2 S52 41.1	
	01	299 40.5	227 11.8 06.1	105 21.2 29.7	90 47.7 32.5	104 10.1 54.0	Capella	281 09.9 N45 58.8	
	02	314 42.9	242 11.1 06.5	120 22.6 30.2	105 50.1 32.5	119 12.5 54.0	Deneb	49 47.2 N45 12.9	
	03	329 45.4	257 10.4 .. 07.0	135 24.0 .. 30.6	120 52.5 .. 32.5	134 14.9 .. 54.1	Denebola	182 57.8 N14 40.4	
	04	344 47.9	272 09.8 07.4	150 25.4 31.1	135 54.9 32.6	149 17.3 54.1	Diphda	349 19.6 S18 04.9	
	05	359 50.3	287 09.1 07.9	165 26.8 31.6	150 57.3 32.6	164 19.7 54.2			
	06	14 52.8	302 08.4 N21 08.3	180 28.2 S 6 32.1	165 59.7 S10 32.6	179 22.1 S 3 54.2	Dubhe	194 20.8 N61 51.1	
	07	29 55.3	317 07.7 08.8	195 29.6 32.6	181 02.1 32.7	194 24.5 54.2	Elnath	278 42.9 N28 35.5	
	08	44 57.7	332 07.0 09.2	210 31.0 33.1	196 04.5 32.7	209 26.9 54.3	Eltanin	90 56.6 N51 29.6	
	09	60 00.2	347 06.3 .. 09.6	225 32.4 .. 33.6	211 06.9 .. 32.8	224 29.3 .. 54.3	Enif	34 10.1 N 9 47.6	
	10	75 02.7	2 05.6 10.1	240 33.8 34.1	226 09.3 32.8	239 31.7 54.4	Fomalhaut	15 49.8 S29 42.8	
	11	90 05.1	17 04.9 10.5	255 35.2 34.6	241 11.7 32.8	254 34.1 54.4			
	12	105 07.6	32 04.2 N21 11.0	270 36.6 S 6 35.1	256 14.1 S10 32.9	269 36.5 S 3 54.4	Gacrux	172 27.5 S57 01.1	
	13	120 10.0	47 03.5 11.4	285 38.0 35.6	271 16.5 32.9	284 38.9 54.5	Gienah	176 16.7 S17 26.7	
	14	135 12.5	62 02.8 11.9	300 39.4 36.1	286 18.9 32.9	299 41.3 54.5	Hadar	149 21.4 S60 17.5	
	15	150 15.0	77 02.1 .. 12.3	315 40.8 .. 36.6	301 21.3 .. 33.0	314 43.7 .. 54.6	Hamal	328 27.6 N23 22.6	
	16	165 17.4	92 01.4 12.7	330 42.2 37.1	316 23.7 33.0	329 46.1 54.6	Kaus Aust.	84 14.8 S34 23.6	
	17	180 19.9	107 00.7 13.2	345 43.6 37.6	331 26.1 33.0	344 48.5 54.6			
	18	195 22.4	122 00.0 N21 13.6	0 45.0 S 6 38.1	346 28.5 S10 33.1	359 50.9 S 3 54.7	Kochab	137 18.4 N74 14.0	
	19	210 24.8	136 59.3 14.0	15 46.4 38.6	1 30.9 33.1	14 53.3 54.7	Markab	14 01.7 N15 06.5	
	20	225 27.3	151 58.6 14.5	30 47.8 39.1	16 33.3 33.1	29 55.7 54.8	Menkar	314 40.0 N 4 01.2	
	21	240 29.8	166 57.9 .. 14.9	45 49.2 .. 39.6	31 35.7 .. 33.2	44 58.1 .. 54.8	Menkent	148 35.4 S36 17.1	
	22	255 32.2	181 57.2 15.3	60 50.6 40.1	46 38.1 33.2	60 00.4 54.8	Miaplacidus	221 45.5 S69 38.8	
	23	270 34.7	196 56.5 15.8	75 52.0 40.6	61 40.5 33.3	75 02.8 54.9			
THURSDAY	8 00	285 37.1	211 55.8 N21 16.2	90 53.3 S 6 41.1	76 42.9 S10 33.3	90 05.2 S 3 54.9	Mirfak	309 14.6 N49 47.7	
	01	300 39.6	226 55.1 16.6	105 54.7 41.6	91 45.3 33.3	105 07.6 55.0	Nunki	76 27.2 S26 19.1	
	02	315 42.1	241 54.4 17.1	120 56.1 42.1	106 47.7 33.4	120 10.0 55.0	Peacock	53 55.8 S56 47.4	
	03	330 44.5	256 53.7 .. 17.5	135 57.5 .. 42.6	121 50.1 .. 33.4	135 12.4 .. 55.0	Pollux	243 57.0 N28 04.2	
	04	345 47.0	271 53.0 17.9	150 58.9 43.1	136 52.5 33.4	150 14.8 55.1	Procyon	245 24.8 N 5 16.3	
	05	0 49.5	286 52.3 18.3	166 00.3 43.6	151 54.9 33.5	165 17.2 55.1			
	06	15 51.9	301 51.6 N21 18.8	181 01.7 S 6 44.1	166 57.3 S10 33.5	180 19.6 S 3 55.2	Rasalhague	96 28.1 N12 34.4	
	07	30 54.4	316 50.9 19.2	196 03.1 44.6	181 59.7 33.6	195 22.0 55.2	Regulus	208 08.9 N12 03.3	
	08	45 56.9	331 50.2 19.6	211 04.5 45.1	197 02.1 33.6	210 24.4 55.2	Rigel	281 35.1 S 8 13.3	
	09	60 59.3	346 49.5 .. 20.0	226 05.9 .. 45.6	212 04.5 .. 33.6	225 26.8 .. 55.3	Rigel Kent.	140 23.9 S60 45.9	
	10	76 01.8	1 48.8 20.5	241 07.2 46.1	227 06.8 33.7	240 29.2 55.3	Sabik	102 39.4 S15 42.2	
	11	91 04.3	16 48.1 20.9	256 08.6 46.6	242 09.2 33.7	255 31.6 55.4			
	12	106 06.7	31 47.4 N21 21.3	271 10.0 S 6 47.0	257 11.6 S10 33.7	270 34.0 S 3 55.4	Schedar	350 07.6 N56 26.1	
	13	121 09.2	46 46.7 21.7	286 11.4 47.5	272 14.0 33.8	285 36.3 55.4	Shaula	96 53.6 S37 05.5	
	14	136 11.6	61 46.0 22.1	301 12.8 48.0	287 16.4 33.8	300 38.7 55.5	Sirius	258 54.9 S16 41.5	
	15	151 14.1	76 45.3 .. 22.6	316 14.2 .. 48.5	302 18.8 .. 33.9	315 41.1 .. 55.5	Spica	158 56.2 S11 04.1	
	16	166 16.6	91 44.6 23.0	331 15.6 49.0	317 21.2 33.9	330 43.5 55.6	Suhail	223 10.3 S43 21.7	
	17	181 19.0	106 43.9 23.4	346 16.9 49.5	332 23.6 33.9	345 45.9 55.6			
	18	196 21.5	121 43.2 N21 23.8	1 18.3 S 6 50.0	347 26.0 S10 34.0	0 48.3 S 3 55.7	Vega	80 54.5 N38 46.1	
	19	211 24.0	136 42.5 24.2	16 19.7 50.5	2 28.4 34.0	15 50.7 55.7	Zuben'ubi	137 31.5 S15 58.1	
	20	226 26.4	151 41.7 24.6	31 21.1 51.0	17 30.8 34.1	30 53.1 55.7			
	21	241 28.9	166 41.0 .. 25.0	46 22.5 .. 51.5	32 33.2 .. 34.1	45 55.5 .. 55.8			
	22	256 31.4	181 40.3 25.4	61 23.9 52.0	47 35.5 34.1	60 57.9 55.8	Venus	287 34.5 9 52	
	23	271 33.8	196 39.6 25.8	76 25.2 52.5	62 37.9 34.2	76 00.3 55.9	Mars	165 41.8 17 57	
						Jupiter	151 07.3 18 54		
						Saturn	164 29.7 18 01		
Mer. Pass.	h m 5 00.6	v -0.7 d 0.4	v 1.4 d 0.5	v 2.4 d 0.0	v 2.4 d 0.0				

1982 JULY 6, 7, 8 (TUES., WED., THURS.)

G.M.T.	SUN				MOON				Lat.	Twilight		Sunrise	Moonrise			
	G.H.A.		Dec.	H.P.	G.H.A.	v	Dec.	d'		Naut.	Civil		6	7	8	9
TUESDAY	00	178 51.6 N22 44.7	2 34.2 11.3	S22 45.5	0.4	54.0	N 72	□	□	□	■	■	■	■		
	01	193 51.5 44.4	17 04.5 11.3	22 45.9	0.3	54.0	N 70	□	□	□	■	■	■	00 49		
	02	208 51.4 44.2	31 34.8 11.3	22 46.2	0.2	54.0	68	□	□	□	■	■	00 18	{ 00 33 }		
	03	223 51.3 44.0	46 05.1 11.3	22 46.4	0.1	54.0	66	///	///	00 56	23 11	23 26	23 32	23 33		
	04	238 51.2 43.7	60 35.4 11.3	22 46.5	0.0	54.0	64	///	///	01 53	22 28	22 54	23 09	23 17		
	05	253 51.1 43.5	75 05.7 11.2	22 46.5	0.1	54.0	62	///	///	02 25	21 59	22 30	22 50	23 04		
	06	268 51.0 N22 43.2	89 35.9 11.3	S22 46.4	0.3	54.0	60	///	01 18	02 49	21 37	22 11	22 35	22 52		
	07	283 50.9 43.0	104 06.2 11.3	22 46.1	0.3	54.1	N 58	///	01 58	03 08	21 19	21 55	22 22	22 43		
	08	298 50.8 42.7	118 36.5 11.2	22 45.8	0.4	54.1	56	///	02 24	03 24	21 04	21 42	22 11	22 34		
	09	313 50.7 42.5	133 06.7 11.3	22 45.4	0.6	54.1	54	01 12	02 45	03 37	20 51	21 30	22 01	22 26		
	10	328 50.6 42.2	147 37.0 11.2	22 44.8	0.7	54.1	52	01 48	03 01	03 49	20 40	21 20	21 52	22 19		
	11	343 50.5 42.0	162 07.2 11.3	22 44.1	0.7	54.1	50	02 13	03 16	03 59	20 30	21 10	21 44	22 13		
	12	358 50.3 N22 41.7	176 37.5 11.2	S22 43.4	0.9	54.1	45	02 55	03 44	04 21	20 08	20 51	21 28	21 59		
	13	13 50.2 41.5	191 07.7 11.3	22 42.5	1.0	54.1	N 40	03 24	04 05	04 38	19 51	20 35	21 14	21 48		
	14	28 50.1 41.2	205 38.0 11.2	22 41.5	1.1	54.1	35	03 47	04 23	04 52	19 37	20 21	21 02	21 39		
	15	43 50.0 41.0	220 08.2 11.3	22 40.4	1.2	54.1	30	04 05	04 38	05 05	19 24	20 10	20 52	21 30		
	16	58 49.9 40.7	234 38.5 11.3	22 39.2	1.3	54.1	20	04 33	05 02	05 26	19 03	19 50	20 34	21 16		
	17	73 49.8 40.5	249 08.8 11.2	22 37.9	1.4	54.1	N 10	04 54	05 21	05 44	18 44	19 32	20 18	21 03		
	18	88 49.7 N22 40.2	263 39.0 11.3	S22 36.5	1.5	54.1	0	05 13	05 39	06 01	18 27	19 16	20 04	20 51		
	19	103 49.6 40.0	278 09.3 11.3	22 35.0	1.7	54.1	S 10	05 29	05 55	06 18	18 09	18 59	19 49	20 39		
	20	118 49.5 39.7	292 39.6 11.3	22 33.3	1.7	54.1	20	05 45	06 12	06 36	17 51	18 42	19 34	20 26		
	21	133 49.4 39.5	307 09.9 11.3	22 31.6	1.8	54.1	30	06 00	06 30	06 56	17 29	18 21	19 16	20 11		
	22	148 49.3 39.2	321 40.2 11.3	22 29.8	2.0	54.1	35	06 09	06 40	07 08	17 17	18 10	19 05	20 03		
	23	163 49.2 38.9	336 10.5 11.3	22 27.8	2.1	54.1	40	06 18	06 51	07 22	17 02	17 56	18 53	19 53		
WEDNESDAY	00	178 49.1 N22 38.7	350 40.8 11.3	S22 25.7	2.1	54.2	45	06 27	07 04	07 38	16 45	17 40	18 39	19 41		
	01	193 49.0 38.4	5 11.1 11.3	22 23.6	2.3	54.2	S 50	06 38	07 19	07 57	16 24	17 20	18 22	19 27		
	02	208 48.9 38.2	19 41.4 11.3	22 21.3	2.4	54.2	52	06 43	07 27	08 07	16 13	17 10	18 13	19 20		
	03	223 48.8 37.9	34 11.7 11.4	22 18.9	2.5	54.2	54	06 49	07 34	08 17	16 02	17 00	18 04	19 13		
	04	238 48.7 37.6	48 42.1 11.3	22 16.4	2.5	54.2	56	06 54	07 43	08 29	15 49	16 48	17 54	19 05		
	05	253 48.6 37.4	63 12.4 11.4	22 13.9	2.7	54.2	58	07 01	07 52	08 43	15 34	16 34	17 42	18 56		
	06	268 48.5 N22 37.1	77 42.8 11.4	S22 11.2	2.8	54.2	S 60	07 08	08 03	08 59	15 16	16 17	17 28	18 45		
	07	283 48.4 36.9	92 13.2 11.4	22 08.4	2.9	54.2	Lat.		Sunset		Moonset					
	08	298 48.3 36.6	106 43.6 11.4	22 05.5	3.1	54.2	Civil		Naut.		6	7	8	9		
	09	313 48.2 36.3	121 14.0 11.4	22 02.4	3.1	54.2	$^{\circ}$ $'$ $''$		$^{\circ}$ $'$ $''$		$^{\circ}$ $'$ $''$	$^{\circ}$ $'$ $''$	$^{\circ}$ $'$ $''$	$^{\circ}$ $'$ $''$		
	10	328 48.1 36.1	135 44.4 11.4	21 59.3	3.2	54.2	N 72	□	□	□	■	■	■	■		
	11	343 48.0 35.8	150 14.8 11.5	21 56.1	3.3	54.2	N 70	□	□	□	■	■	■	03 54		
	12	358 47.9 N22 35.5	164 45.3 11.4	S21 52.8	3.4	54.2	68	□	□	□	■	■	■	04 40		
	13	13 47.8 35.3	179 15.7 11.5	21 49.4	3.6	54.3	66	23 10	///	///	01 07	02 09	03 36	05 09		
	14	28 47.7 35.0	193 46.2 11.5	21 45.8	3.6	54.3	64	22 15	///	///	01 54	02 52	04 07	05 32		
	15	43 47.6 34.7	208 16.7 11.5	21 42.2	3.7	54.3	62	21 43	///	///	02 25	03 21	04 31	05 49		
	16	58 47.5 34.5	222 47.2 11.6	21 38.5	3.9	54.3	60	21 19	22 49	///	02 48	03 43	04 49	06 04		
	17	73 47.4 34.2	237 17.8 11.5	21 34.6	3.9	54.3	N 58	21 01	22 10	///	03 06	04 00	05 05	06 16		
	18	88 47.3 N22 33.9	251 48.3 11.6	S21 30.7	4.1	54.3	56	20 45	21 44	///	03 22	04 15	05 18	06 27		
	19	103 47.2 33.7	266 18.9 11.6	21 26.6	4.1	54.3	54	20 32	21 24	22 55	03 35	04 28	05 30	06 37		
	20	118 47.1 33.4	280 49.5 11.6	21 22.5	4.3	54.3	52	20 20	21 08	22 20	03 46	04 39	05 40	06 45		
	21	133 47.0 33.1	295 20.1 11.6	21 18.2	4.3	54.3	50	20 10	20 53	21 56	03 57	04 49	05 49	06 53		
	22	148 46.9 32.8	309 50.7 11.7	21 13.9	4.5	54.3	45	19 49	20 25	21 14	04 18	05 10	06 08	07 08		
	23	163 46.8 32.6	324 21.4 11.7	21 09.4	4.5	54.4	N 40	19 32	20 04	20 45	04 36	05 27	06 23	07 22		
THURSDAY	00	178 46.7 N22 32.3	338 52.1 11.7	S21 04.9	4.7	54.4	35	19 17	19 46	20 23	04 50	05 42	06 36	07 33		
	01	193 46.6 32.0	353 22.8 11.7	21 00.2	4.7	54.4	30	19 05	19 32	20 05	05 03	05 54	06 47	07 42		
	02	208 46.5 31.7	7 53.5 11.7	20 55.5	4.9	54.4	20	18 44	19 08	19 37	05 25	06 15	07 07	07 59		
	03	223 46.4 31.5	22 24.2 11.8	20 50.6	4.9	54.4	N 10	18 25	18 48	19 15	05 44	06 33	07 23	08 13		
	04	238 46.3 31.2	36 55.0 11.8	20 45.7	5.1	54.4	0	18 08	18 31	18 57	06 01	06 50	07 39	08 27		
	05	253 46.2 30.9	51 25.8 11.8	20 40.6	5.1	54.4	S 10	17 52	18 14	18 41	06 19	07 07	07 55	08 40		
	06	268 46.1 N22 30.6	65 56.6 11.8	S20 35.5	5.3	54.4	20	17 34	17 58	18 25	06 38	07 26	08 11	08 54		
	07	283 46.0 30.4	80 27.4 11.9	20 30.2	5.3	54.4	30	17 14	17 40	18 09	06 59	07 46	08 30	09 10		
	08	298 45.9 30.1	94 58.3 11.9	20 24.9	5.5	54.5	35	17 02	17 30	18 01	07 12	07 59	08 41	09 20		
	09	313 45.8 29.8	109 29.2 11.9	20 19.4	5.5	54.5	40	16 48	17 18	17 52	07 26	08 13	08 54	09 30		
	10	328 45.7 29.5	124 00.1 11.9	20 13.9	5.6	54.5	45	16 32	17 06	17 43	07 44	08 29	09 09	09 43		
	11	343 45.6 29.2	138 31.0 12.0	20 08.3	5.8	54.5	S 50	16 12	16 50	17 31	08 05	08 49	09 27	09 58		
	12	358 45.5 N22 28.9	153 02.0 12.0	S20 02.5	5.8	54.5	52	16 03	16 43	17 27	08 15	08 59	09 35	10 05		
	13	13 45.4 28.7	167 33.0 12.0	19 56.7	5.9	54.5	54	15 53	16 36	17 21	08 27	09 10	09 45	10 13		
	14	28 45.4 28.4	182 04.0 12.0	19 50.8	6.0	54.5	56	15 41	16 27	17 16	08 40	09 22	09 56	10 21		
	15	43 45.3 28.1	196 35.0 12.1	19 44.8	6.1	54.5	58	15 27	16 17	17 09	08 55	09 37	10 08	10 31		
	16	58 45.2 27.8	211 06.1 12.1	19 38.7	6.2	54.6	S 60	15 11	16 07	17 02	09 13	09 53	10 22	10 42		
	17	73 45.1 27.5	225 37.2 12.1	19 32.5	6.3	54.6	SUN		MOON							
	18	88 45.0 N22 27.2	240 08.3 12.2	S19 26.2	6.4	54.6	Eqn. of Time		Mer.		Mer. Pass.		Age			
	19	103 44.9 27.0	254 39.5 12.1	19 19.8	6.5	54.6	00 ^h 12 ^h		Pass.		Upper Lower		Phase			
	20	118 44.8 26.7	269 10.6 12.3	19 13.3	6.5	54.6	6	m s	m s	h m	h m	h m	d			
	21	133 44.7 26.4	283 41.9 12.2	19 06.8	6.7	54.6	7	04 33	04 38	12 05	24 39	12 14	15			
	22	148 44.6 26.1	298 13.1 12.3	19 00.1	6.8	54.6	8	04 43	04 48	12 05	00 39	13 03	16	○		
	23	163 44.5 25.8	312 44.4 12.2	18 53.3	6.8	54.7		04 53	04 58	12 05	01 27	13 51	17			
	S.D. 15.8	d 0.3	S.D. 14.7	14.8	14.9											

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	ARIES	VENUS −3.4	MARS +0.5	JUPITER −1.7	SATURN +1.0	STARS		
G.M.T.	G.H.A.	G.H.A. Dec.	G.H.A. Dec.	G.H.A. Dec.	G.H.A. Dec.	Name	S.H.A.	Dec.
9 ^{d h}	00 286 36.3	211 38.9 N21 26.3	91 26.6 S 6 53.0	77 40.3 S10 34.2	91 02.6 S 3 55.9	Acamar	315 36.5 S40 22.3	
	01 301 38.8	226 38.2 26.7	106 28.0 53.5	92 42.7 34.3	106 05.0 55.9	Achernar	335 44.3 S57 19.3	
	02 316 41.2	241 37.5 27.1	121 29.4 54.0	107 45.1 34.3	121 07.4 56.0	Acrux	173 36.0 S63 00.3	
	03 331 43.7	256 36.8 ·· 27.5	136 30.8 ·· 54.5	122 47.5 ·· 34.3	136 09.8 ·· 56.0	Adhara	255 31.5 S28 56.8	
	04 346 46.1	271 36.1 27.9	151 32.1 55.0	137 49.9 34.4	151 12.2 56.1	Aldebaran	291 16.8 N16 28.4	
	05 1 48.6	286 35.4 28.3	166 33.5 55.6	152 52.3 34.4	166 14.6 56.1			
	06 16 51.1	301 34.6 N21 28.7	181 34.9 S 6 56.1	167 54.6 S10 34.5	181 17.0 S 3 56.2	Alioth	166 41.4 N56 03.7	
	07 31 53.5	316 33.9 29.1	196 36.3 56.6	182 57.0 34.5	196 19.4 56.2	Alkaid	153 17.4 N49 24.4	
	08 46 56.0	331 33.2 29.5	211 37.6 57.1	197 59.4 34.5	211 21.8 56.2	Al Na'ir	28 12.9 S47 02.6	
	F 09 61 58.5	346 32.5 ·· 29.9	226 39.0 ·· 57.6	213 01.8 ·· 34.6	226 24.1 ·· 56.3	Alnilam	276 10.7 S 1 12.7	
R 10 77 00.9	1 31.8 30.3	241 40.4 58.1	228 04.2 34.6	241 26.5 56.3	Alphard	218 19.6 S 8 34.9		
I 11 92 03.4	16 31.1 30.7	256 41.8 58.6	243 06.6 34.7	256 28.9 56.4				
D 12 107 05.9	31 30.4 N21 31.1	271 43.1 S 6 59.1	258 09.0 S10 34.7	271 31.3 S 3 56.4	Alphecca	126 30.8 N26 46.6		
A 13 122 08.3	46 29.7 31.5	286 44.5 6 59.6	273 11.3 34.7	286 33.7 56.5	Alpheratz	358 07.9 N28 59.4		
Y 14 137 10.8	61 28.9 31.9	301 45.9 7 00.1	288 13.7 34.8	301 36.1 56.5	Altair	62 31.0 N 8 49.3		
15 152 13.2	76 28.2 ·· 32.3	316 47.3 ·· 00.6	303 16.1 ·· 34.8	316 38.5 ·· 56.5	Ankaa	353 38.9 S42 23.9		
16 167 15.7	91 27.5 32.6	331 48.6 01.1	318 18.5 34.9	331 40.9 56.6	Antares	112 55.0 S26 23.6		
17 182 18.2	106 26.8 33.0	346 50.0 01.6	333 20.9 34.9	346 43.3 56.6				
18 197 20.6	121 26.1 N21 33.4	1 51.4 S 7 02.1	348 23.3 S10 34.9	1 45.6 S 3 56.7	Arcturus	146 17.2 N19 16.6		
19 212 23.1	136 25.4 33.8	16 52.8 02.6	3 25.7 35.0	16 48.0 56.7	Atria	108 17.6 S68 59.9		
20 227 25.6	151 24.6 34.2	31 54.1 03.1	18 28.0 35.0	31 50.4 56.8	Avior	234 28.3 S59 27.2		
21 242 28.0	166 23.9 ·· 34.6	46 55.5 ·· 03.6	33 30.4 ·· 35.1	46 52.8 ·· 56.8	Bellatrix	278 57.7 N 6 20.1		
22 257 30.5	181 23.2 35.0	61 56.9 04.1	48 32.8 35.1	61 55.2 56.8	Betelgeuse	271 27.2 N 7 24.3		
23 272 33.0	196 22.5 35.4	76 58.2 04.6	63 35.2 35.2	76 57.6 56.9				
10 ⁰⁰	00 287 35.4	211 21.8 N21 35.7	91 59.6 S 7 05.1	78 37.6 S10 35.2	92 00.0 S 3 56.9	Canopus	264 07.2 S52 41.1	
	01 302 37.9	226 21.1 36.1	107 01.0 05.6	93 39.9 35.2	107 02.3 57.0	Capella	281 09.8 N45 58.8	
	02 317 40.4	241 20.3 36.5	122 02.3 06.1	108 42.3 35.3	122 04.7 57.0	Deneb	49 47.2 N45 12.9	
	03 332 42.8	256 19.6 ·· 36.9	137 03.7 ·· 06.6	123 44.7 ·· 35.3	137 07.1 ·· 57.1	Denebola	182 57.9 N14 40.4	
	04 347 45.3	271 18.9 37.3	152 05.1 07.1	138 47.1 35.4	152 09.5 57.1	Diphda	349 19.5 S18 04.9	
	05 2 47.7	286 18.2 37.6	167 06.4 07.6	153 49.5 35.4	167 11.9 57.2			
	06 17 50.2	301 17.4 N21 38.0	182 07.8 S 7 08.1	168 51.8 S10 35.5	182 14.3 S 3 57.2	Dubhe	194 20.9 N61 51.1	
	07 32 52.7	316 16.7 38.4	197 09.2 08.6	183 54.2 35.5	197 16.7 57.2	Elnath	278 42.9 N28 35.5	
	S 08 47 55.1	331 16.0 38.8	212 10.5 09.1	198 56.6 35.5	212 19.0 57.3	Eltanin	90 56.6 N51 29.6	
	A 09 62 57.6	346 15.3 ·· 39.2	227 11.9 ·· 09.6	213 59.0 ·· 35.6	227 21.4 ·· 57.3	Enif	34 10.1 N 9 47.6	
T 10 78 00.1	1 14.6 39.5	242 13.3 10.1	229 01.4 35.6	242 23.8 57.4	Fomalhaut	15 49.8 S29 42.8		
U 11 93 02.5	16 13.8 39.9	257 14.6 10.6	244 03.7 35.7	257 26.2 57.4				
R 12 108 05.0	31 13.1 N21 40.3	272 16.0 S 7 11.1	259 06.1 S10 35.7	272 28.6 S 3 57.5	Gacrux	172 27.5 S57 01.1		
D 13 123 07.5	46 12.4 40.6	287 17.4 11.6	274 08.5 35.8	287 31.0 57.5	Gienah	176 16.7 S17 26.6		
A 14 138 09.9	61 11.7 41.0	302 18.7 12.1	289 10.9 35.8	302 33.4 57.5	Hadar	149 21.4 S60 17.5		
Y 15 153 12.4	76 10.9 ·· 41.4	317 20.1 ·· 12.7	304 13.3 ·· 35.8	317 35.7 ·· 57.6	Hamal	328 27.6 N23 22.6		
16 168 14.9	91 10.2 41.7	332 21.4 13.2	319 15.6 35.9	332 38.1 57.6	Kaus Aust.	84 14.7 S34 23.6		
17 183 17.3	106 09.5 42.1	347 22.8 13.7	334 18.0 35.9	347 40.5 57.7				
18 198 19.8	121 08.8 N21 42.5	2 24.2 S 7 14.2	349 20.4 S10 36.0	2 42.9 S 3 57.7	Kochab	137 18.4 N74 14.0		
19 213 22.2	136 08.0 42.8	17 25.5 14.7	4 22.8 36.0	17 45.3 57.8	Markab	14 01.7 N15 06.5		
20 228 24.7	151 07.3 43.2	32 26.9 15.2	19 25.1 36.1	32 47.7 57.8	Menkar	314 40.0 N 4 01.2		
21 243 27.2	166 06.6 ·· 43.6	47 28.2 ·· 15.7	34 27.5 ·· 36.1	47 50.0 ·· 57.9	Menkent	148 35.4 S36 17.1		
22 258 29.6	181 05.9 43.9	62 29.6 16.2	49 29.9 36.1	62 52.4 57.9	Miaplacidus	221 45.6 S69 38.8		
23 273 32.1	196 05.1 44.3	77 31.0 16.7	64 32.3 36.2	77 54.8 57.9				
11 ⁰⁰	00 288 34.6	211 04.4 N21 44.7	92 32.3 S 7 17.2	79 34.6 S10 36.2	92 57.2 S 3 58.0	Mirfak	309 14.6 N49 47.7	
	01 303 37.0	226 03.7 45.0	107 33.7 17.7	94 37.0 36.3	107 59.6 58.0	Nunki	76 27.2 S26 19.1	
	02 318 39.5	241 03.0 45.4	122 35.0 18.2	109 39.4 36.3	123 02.0 58.1	Peacock	53 55.8 S56 47.4	
	03 333 42.0	256 02.2 ·· 45.7	137 36.4 ·· 18.7	124 41.8 ·· 36.4	138 04.3 ·· 58.1	Pollux	243 57.0 N28 04.2	
	04 348 44.4	271 01.5 46.1	152 37.7 19.2	139 44.1 36.4	153 06.7 58.2	Procyon	245 24.8 N 5 16.3	
	05 3 46.9	286 00.8 46.4	167 39.1 19.7	154 46.5 36.5	168 09.1 58.2			
	06 18 49.3	301 00.0 N21 46.8	182 40.5 S 7 20.2	169 48.9 S10 36.5	183 11.5 S 3 58.3	Rasalhague	96 28.1 N12 34.4	
	07 33 51.8	315 59.3 47.1	197 41.8 20.7	184 51.3 36.6	198 13.9 58.3	Regulus	208 08.9 N12 03.4	
	08 48 54.3	330 58.6 47.5	212 43.2 21.3	199 53.6 36.6	213 16.2 58.4	Rigel	281 35.1 S 8 13.3	
	S 09 63 56.7	345 57.8 ·· 47.8	227 44.5 ·· 21.8	214 56.0 ·· 36.6	228 18.6 ·· 58.4	Rigel Kent.	140 23.9 S60 45.9	
U 10 78 59.2	0 57.1 48.2	242 45.9 22.3	229 58.4 36.7	243 21.0 58.4	Sabik	102 39.4 S15 42.2		
N 11 94 01.7	15 56.4 48.5	257 47.2 22.8	245 00.7 36.7	258 23.4 58.5				
D 12 109 04.1	30 55.7 N21 48.9	272 48.6 S 7 23.3	260 03.1 S10 36.8	273 25.8 S 3 58.5	Schedar	350 07.5 N56 26.1		
A 13 124 06.6	45 54.9 49.2	287 49.9 23.8	275 05.5 36.8	288 28.2 58.6	Shaula	96 53.6 S37 05.5		
Y 14 139 09.1	60 54.2 49.6	302 51.3 24.3	290 07.9 36.9	303 30.5 58.6	Sirius	258 54.9 S16 41.5		
15 154 11.5	75 53.5 ·· 49.9	317 52.6 ·· 24.8	305 10.2 ·· 36.9	318 32.9 ·· 58.7	Spica	158 56.2 S11 04.1		
16 169 14.0	90 52.7 50.3	332 54.0 25.3	320 12.6 37.0	333 35.3 58.7	Suhail	223 10.3 S43 21.7		
17 184 16.5	105 52.0 50.6	347 55.3 25.8	335 15.0 37.0	348 37.7 58.8				
18 199 18.9	120 51.3 N21 51.0	2 56.7 S 7 26.3	350 17.3 S10 37.1	3 40.1 S 3 58.8	Vega	80 54.5 N38 46.1		
19 214 21.4	135 50.5 51.3	17 58.0 26.8	5 19.7 37.1	18 42.4 58.9	Zuben'ubi	137 31.5 S15 58.1		
20 229 23.8	150 49.8 51.6	32 59.4 27.3	20 22.1 37.1	33 44.8 58.9				
21 244 26.3	165 49.1 ·· 52.0	48 00.7 ·· 27.9	35 24.5 ·· 37.2	48 47.2 ·· 59.0				
22 259 28.8	180 48.3 52.3	63 02.1 28.4	50 26.8 37.2	63 49.6 59.0	Venus	283 46.3 9 55		
23 274 31.2	195 47.6 52.7	78 03.4 28.9	65 29.2 37.3	78 52.0 59.0	Mars	164 24.2 17 50		
					Jupiter	151 02.1 18 43		
					Saturn	164 24.5 17 49		
Mer. Pass.	4 48.8 ^{h m}	v · 0.7 d 0.4	v 1.4 d 0.5	v 2.4 d 0.0	v 2.4 d 0.0		S.H.A. ^{h m}	Mer. Pass. ^{h m}

1982 JULY 9, 10, 11 (FRI., SAT., SUN.)

		SUN		MOON				Lat.	Twilight		Sunrise	Moonrise				
G.M.T.		G.H.A.	Dec.	G.H.A.	<i>v</i>	Dec.	<i>d</i>	H.P.	Naut.	Civil		9	10	11	12	
^d ^h		[°] [']	[°] [']	[°] [']	[°] [']	[°] [']	[°] [']	[°] [']	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	
9 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23	F R I D A Y	178 44.4	N22 25.5	327 15.6	12.4	S18 46.5	6.9 54.7	N 72	□	□	□	00 49	00 55	{ ⁰⁰ ₂₃ ²¹ ₅₅ }	23 40	
		193 44.3	25.2	341 47.0	12.3	18 39.6	7.0 54.7	N 70	□	□	□	{ ⁰⁰ ₂₃ ⁵¹ ₅₅ }	00 19	23 46	{ ⁰⁰ ₂₃ ⁰¹ ₄₈ }	23 37
		208 44.2	24.9	356 18.3	12.4	18 32.6	7.1 54.7	68	□	□	□	23 33	23 33	23 32	23 31	
		223 44.1	24.6	10 49.7	12.4	18 25.5	7.2 54.7	64	□	□	□	02 00	23 17	23 23	23 26	
		238 44.0	24.3	25 21.1	12.4	18 18.3	7.3 54.7	62	□	□	□	02 31	23 04	23 13	23 21	
		253 43.9	24.0	39 52.5	12.5	18 11.0	7.4 54.7	60	□	□	□	01 27	02 54	22 52	23 16	
		268 43.8	N22 23.8	54 24.0	12.5	S18 03.6	7.4 54.8	N 58	□	□	□	02 04	03 12	22 43	22 59	
		283 43.7	23.5	68 55.5	12.5	17 56.2	7.6 54.8	56	□	□	□	02 29	03 27	22 34	22 52	
		298 43.7	23.2	83 27.0	12.5	17 48.6	7.6 54.8	54	01 20	02 49	03 40	22 26	22 47	23 05	23 22	
		313 43.6	22.9	97 58.5	12.6	17 41.0	7.7 54.8	52	01 54	03 05	03 52	22 19	22 42	23 02	23 22	
		328 43.5	22.6	112 30.1	12.6	17 33.3	7.8 54.8	50	02 17	03 19	04 02	22 13	22 37	22 59	23 20	
		343 43.4	22.3	127 01.7	12.6	17 25.5	7.9 54.8	45	02 58	03 46	04 23	21 59	22 28	22 53	23 18	
		358 43.3	N22 22.0	141 33.3	12.7	S17 17.6	7.9 54.9	N 40	03 27	04 07	04 40	21 48	22 19	22 48	23 16	
		13 43.2	21.7	156 05.0	12.7	17 09.7	8.0 54.9	35	03 49	04 25	04 54	21 39	22 12	22 44	23 15	
		28 43.1	21.4	170 36.7	12.7	17 01.7	8.2 54.9	30	04 06	04 39	05 06	21 30	22 06	22 40	23 13	
		43 43.0	21.1	185 08.4	12.8	16 53.5	8.2 54.9	20	04 34	05 03	05 27	21 16	21 55	22 33	23 11	
		58 42.9	20.8	199 40.2	12.7	16 45.3	8.2 54.9	N 10	04 55	05 22	05 45	21 03	21 46	22 28	23 09	
		73 42.8	20.5	214 11.9	12.8	16 37.1	8.4 54.9	0	05 13	05 39	06 02	20 51	21 37	22 22	23 07	
		88 42.7	N22 20.2	228 43.7	12.9	S16 28.7	8.4 55.0	S 10	05 29	05 55	06 18	20 39	21 28	22 16	23 05	
		103 42.6	19.9	243 15.6	12.8	16 20.3	8.6 55.0	20	05 45	06 12	06 36	20 26	21 18	22 10	23 03	
		118 42.6	19.6	257 47.4	12.9	16 11.7	8.6 55.0	30	06 00	06 30	06 56	20 11	21 07	22 04	23 01	
		21 133 42.5	19.3	272 19.3	12.9	16 03.1	8.6 55.0	35	06 08	06 39	07 07	20 03	21 01	22 00	23 00	
		22 148 42.4	18.9	286 51.2	12.9	15 54.5	8.8 55.0	40	06 17	06 50	07 21	19 53	20 54	21 55	22 58	
		23 163 42.3	18.6	301 23.1	13.0	15 45.7	8.8 55.0	45	06 26	07 03	07 36	19 41	20 45	21 50	22 57	
10 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23	S A T U R D A Y	178 42.2	N22 18.3	315 55.1	13.0	S15 36.9	8.9 55.1	S 50	06 37	07 18	07 56	19 27	20 35	21 44	22 54	
		193 42.1	18.0	330 27.1	13.0	15 28.0	9.0 55.1	52	06 42	07 25	08 05	19 20	20 30	21 41	22 54	
		208 42.0	17.7	344 59.1	13.0	15 19.0	9.0 55.1	54	06 47	07 32	08 15	19 13	20 25	21 38	22 52	
		223 41.9	17.4	359 31.1	13.1	15 10.0	9.1 55.1	56	06 53	07 41	08 27	19 05	20 19	21 34	22 51	
		238 41.8	17.1	14 03.2	13.1	15 00.9	9.2 55.1	58	06 59	07 50	08 40	18 56	20 12	21 30	22 50	
		253 41.7	16.8	28 35.3	13.1	14 51.7	9.3 55.2	S 60	07 05	08 01	08 56	18 45	20 05	21 26	22 49	
		268 41.7	N22 16.5	43 07.4	13.1	S14 42.4	9.3 55.2		Lat.	Sunset	Twilight		Moonset			
		283 41.6	16.2	57 39.5	13.2	14 33.1	9.4 55.2				Civil	Naut.	9	10	11	12
		298 41.5	15.9	72 11.7	13.2	14 23.7	9.5 55.2									
		313 41.4	15.5	86 43.9	13.2	14 14.2	9.6 55.2									
		328 41.3	15.2	101 16.1	13.2	14 04.6	9.6 55.2									
		343 41.2	14.9	115 48.3	13.3	13 55.0	9.7 55.3	N 72	□	□	□	□	h m	h m	h m	h m
		358 41.1	N22 14.6	130 20.6	13.3	S13 45.3	9.7 55.3	N 70	□	□	□	□	h m	h m	h m	h m
		13 41.0	14.3	144 52.9	13.3	13 35.6	9.9 55.3	68	□	□	□	□	03 54	06 01	07 54	09 41
		28 40.9	14.0	159 25.2	13.3	13 25.7	9.8 55.3	66	22 56	□	□	□	04 40	06 26	08 08	09 48
		43 40.9	13.7	173 57.5	13.3	13 15.9	10.0 55.4	64	22 08	□	□	□	05 09	06 44	08 19	09 53
		58 40.8	13.3	188 29.8	13.4	13 05.9	10.0 55.4	62	21 38	□	□	□	05 32	07 00	08 28	09 58
		73 40.7	13.0	203 02.2	13.4	12 55.9	10.1 55.4	60	21 16	22 40	□	□	05 49	07 12	08 36	10 02
		88 40.6	N22 12.7	217 34.6	13.4	S12 45.8	10.1 55.4	N 58	20 57	22 05	□	□	06 04	07 23	08 43	10 05
		103 40.5	12.4	232 07.0	13.4	12 35.7	10.2 55.4	56	20 42	21 40	□	□	06 16	07 32	08 49	10 08
		20 118 40.4	12.1	246 39.4	13.4	12 25.5	10.3 55.5	54	20 29	21 21	22 48	□	06 27	07 40	08 55	10 11
		21 133 40.3	11.7	261 11.8	13.5	12 15.2	10.3 55.5	52	20 18	21 05	22 15	22 48	06 37	07 47	08 59	10 13
		22 148 40.3	11.4	275 44.3	13.5	12 04.9	10.4 55.5	50	20 08	20 51	21 52	22 15	06 45	07 53	09 04	10 15
		23 163 40.2	11.1	290 16.8	13.4	11 54.5	10.5 55.5	45	20 08	20 51	21 52	22 15	06 53	07 59	09 08	10 17
11 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23	S U N D A Y	178 40.1	N22 10.8	304 49.2	13.5	S11 44.0	10.5 55.5	N 40	19 30	20 03	20 43	07 22	08 22	09 23	10 25	
		193 40.0	10.5	319 21.7	13.6	11 33.5	10.6 55.6	35	19 16	19 46	20 21	07 33	08 30	09 29	10 28	
		208 39.9	10.1	333 54.3	13.5	11 22.9	10.6 55.6	30	19 04	19 31	20 04	07 42	08 38	09 34	10 31	
		223 39.8	09.8	348 26.8	13.5	11 12.3	10.7 55.6	20	18 43	19 08	19 37	07 59	08 51	09 43	10 36	
		238 39.7	09.5	2 59.3	13.6	11 01.6	10.7 55.6	N 10	18 25	18 48	19 15	08 13	09 02	09 51	10 40	
		253 39.7	09.2	17 31.9	13.6	10 50.9	10.8 55.7	0	18 09	18 31	18 57	08 27	09 13	09 59	10 44	
		268 39.6	N22 08.8	32 04.5	13.6	S10 40.1	10.9 55.7	S 10	17 52	18 15	18 41	08 40	09 24	10 06	10 47	
		283 39.5	08.5	46 37.1	13.6	10 29.2	10.9 55.7	20	17 35	17 59	18 26	08 54	09 35	10 14	10 51	
		298 39.4	08.2	61 09.7	13.6	10 18.3	11.0 55.7	30	17 15	17 41	18 11	09 10	09 47	10 22	10 56	
		313 39.3	07.8	75 42.3	13.6	10 07.3	11.0 55.8	35	17 03	17 31	18 03	09 20	09 55	10 27	10 58	
		328 39.2	07.5	90 14.9	13.6	9 56.3	11.1 55.8	40	16 50	17 20	17 54	09 30	10 03	10 33	11 01	
		343 39.2	07.2	104 47.5	13.7	9 45.2	11.1 55.8	45	16 34	17 08	17 44	09 43	10 13	10 39	11 04	
		358 39.1	N22 06.9	119 20.2	13.6	S 9 34.1	11.2 55.8	S 50	16 15	16 53	17 34	09 58	10 24	10 47	11 08	
		13 39.0	06.5	133 52.8	13.7	9 22.9	11.2 55.9	52	16 06	16 46	17 29	10 05	10 30	10 51	11 10	
		28 38.9	06.2	148 25.5	13.7	9 11.7	11.3 55.9	54	15 56	16 38	17 24	10 13	10 35	10 55	11 12	
		43 38.8	05.9	162 58.2	13.6	9 00.4	11.3 55.9	56	15 44	16 30	17 18	10 21	10 42	10 59	11 14	
		58 38.7	05.5	177 30.8	13.7	8 49.1	11.4 55.9	58	15 31	16 21	17 12	10 31	10 49	11 04	11 17	
		73 38.7	05.2	192 03.5	13.7	8 37.7	11.4 56.0	S 60	15 15	16 10	17 05	10 42	10 57	11 09	11 19	
		88 38.6	N22 04.9	206 36.2	13.7	S 8 26.3	11.5 56.0									
		19 103 38.5	04.5	221 08.9	13.7	8 14.8	11.5 56.0									
		20 118 38.4	04.2	235 41.6	13.7	8 03.3	11.5 56.0									
		21 133 38.3	03.8	250 14.3	13.7	7 51.8	11.7 56.1									
		22 148 38.2	03.5	264 47.0	13.7	7 40.1	11.6 56.1									
		23 163 38.2	03.2	279 19.7	13.7	7 28.5	11.7 56.1									
		S.D. 15.8	<i>d</i> 0.3	S.D. 14.9	15.1	15.2										
								Day	SUN		MOON					
									Eqn. of Time		Mer.	Mer. Pass.		Age	Phase	
									00 ^h 12 ^h		Pass.	Upper	Lower			
									^m ^s	^m ^s	^h ^m	^h ^m	^h ^m	^d		
								9	05 02	05 07	12 05	02 15	14 39	18		
								10	05 11	05 15	12 05	03 02	15 25	19		
								11	05 19	05 24	12 05	03 48	16 10	20		

1982 JULY 12, 13, 14 (MON., TUES., WED.)

		ARIES		VENUS -3.3		MARS +0.6		JUPITER -1.7		SATURN +1.0		STARS			
G.M.T.		G.H.A.		G.H.A. Dec.		G.H.A. Dec.		G.H.A. Dec.		G.H.A. Dec.		Name		S.H.A. Dec.	
MONDAY	12 ^h 00 ^m	289 33.7	210 46.8 N21	53.0	93 04.8 S	7 29.4	80 31.6 S10	37.3	93 54.3 S	3 59.1	Acamar	315 36.4	S40 22.3		
	01	304 36.2	225 46.1	53.3	108 06.1	29.9	95 33.9	37.4	108 56.7	59.1	Achernar	335 44.3	S57 19.3		
	02	319 38.6	240 45.4	53.7	123 07.4	30.4	110 36.3	37.4	123 59.1	59.2	Acrux	173 36.0	S63 00.3		
	03	334 41.1	255 44.6	54.0	138 08.8	30.9	125 38.7	37.5	139 01.5	59.2	Adhara	255 31.5	S28 56.8		
	04	349 43.6	270 43.9	54.3	153 10.1	31.4	140 41.0	37.5	154 03.8	59.3	Aldebaran	291 16.8	N16 28.4		
	05	4 46.0	285 43.2	54.7	168 11.5	31.9	155 43.4	37.6	169 06.2	59.3					
	06	19 48.5	300 42.4 N21	55.0	183 12.8 S	7 32.4	170 45.8 S10	37.6	184 08.6 S	3 59.4	Alioth	166 41.4	N56 03.7		
	07	34 51.0	315 41.7	55.3	198 14.2	32.9	185 48.1	37.7	199 11.0	59.4	Alkaid	153 17.4	N49 24.4		
	08	49 53.4	330 40.9	55.6	213 15.5	33.4	200 50.5	37.7	214 13.4	59.5	Al Na'ir	28 12.9	S47 02.6		
	09	64 55.9	345 40.2	56.0	228 16.9	34.0	215 52.9	37.8	229 15.7	59.5	Alnilam	276 10.7	S 1 12.7		
	10	79 58.3	0 39.5	56.3	243 18.2	34.5	230 55.2	37.8	244 18.1	59.6	Alphard	218 19.6	S 8 34.9		
	11	95 00.8	15 38.7	56.6	258 19.5	35.0	245 57.6	37.9	259 20.5	59.6					
	12	110 03.3	30 38.0 N21	56.9	273 20.9 S	7 35.5	261 00.0 S10	37.9	274 22.9 S	3 59.7	Alphecca	126 30.8	N26 46.6		
	13	125 05.7	45 37.2	57.3	288 22.2	36.0	276 02.3	38.0	289 25.2	59.7	Alpheratz	358 07.9	N28 59.4		
	14	140 08.2	60 36.5	57.6	303 23.6	36.5	291 04.7	38.0	304 27.6	59.7	Altair	62 30.9	N 8 49.3		
	15	155 10.7	75 35.8	57.9	318 24.9	37.0	306 07.0	38.1	319 30.0	59.8	Ankaa	353 38.8	S42 23.9		
	16	170 13.1	90 35.0	58.2	333 26.2	37.5	321 09.4	38.1	334 32.4	59.8	Antares	112 55.0	S26 23.6		
	17	185 15.6	105 34.3	58.5	348 27.6	38.0	336 11.8	38.2	349 34.8	59.9					
	18	200 18.1	120 33.5 N21	58.9	3 28.9 S	7 38.5	351 14.1 S10	38.2	4 37.1 S	3 59.9	Arcturus	146 17.2	N19 16.6		
	19	215 20.5	135 32.8	59.2	18 30.2	39.1	6 16.5	38.2	19 39.5	4 00.0	Atria	108 17.7	S68 59.9		
	20	230 23.0	150 32.1	59.5	33 31.6	39.6	21 18.9	38.3	34 41.9	00.0	Avior	234 28.4	S59 27.2		
	21	245 25.4	165 31.3	21 59.8	48 32.9	40.1	36 21.2	38.3	49 44.3	00.1	Bellatrix	278 57.1	N 6 20.1		
	22	260 27.9	180 30.6	22 00.1	63 34.3	40.6	51 23.6	38.4	64 46.6	00.1	Betelgeuse	271 27.2	N 7 24.3		
	23	275 30.4	195 29.8	00.7	78 35.6	41.1	66 25.9	38.4	79 49.0	00.2					
TUESDAY	13 ^h 00 ^m	290 32.8	210 29.1 N22	00.4	93 36.9 S	7 41.6	81 28.3 S10	38.5	94 51.4 S	4 00.2	Canopus	264 07.2	S52 41.1		
	01	305 35.3	225 28.3	01.0	108 38.3	42.1	96 30.7	38.5	109 53.8	00.3	Capella	281 09.8	N45 58.7		
	02	320 37.8	240 27.6	01.4	123 39.6	42.6	111 33.0	38.6	124 56.1	00.3	Deneb	49 47.2	N45 13.0		
	03	335 40.2	255 26.8	01.7	138 40.9	43.1	126 35.4	38.6	139 58.5	00.4	Denebola	182 57.9	N14 40.4		
	04	350 42.7	270 26.1	02.0	153 42.3	43.7	141 37.7	38.7	155 00.9	00.4	Diphda	349 19.5	S18 04.9		
	05	5 45.2	285 25.4	02.3	168 43.6	44.2	156 40.1	38.7	170 03.3	00.5					
	06	20 47.6	300 24.6 N22	02.6	183 44.9 S	7 44.7	171 42.5 S10	38.8	185 05.6 S	4 00.5	Dubhe	194 20.9	N61 51.1		
	07	35 50.1	315 23.9	02.9	198 46.3	45.2	186 44.8	38.8	200 08.0	00.6	Elnath	278 42.9	N28 35.5		
	08	50 52.6	330 23.1	03.2	213 47.6	45.7	201 47.2	38.9	215 10.4	00.6	Eltanin	90 56.6	N51 29.6		
	09	65 55.0	345 22.4	03.5	228 48.9	46.2	216 49.5	38.9	230 12.8	00.7	Enif	34 10.1	N 9 47.6		
	10	80 57.5	0 21.6	03.8	243 50.3	46.7	231 51.9	39.0	245 15.1	00.7	Fomalhaut	15 49.8	S29 42.8		
	11	95 59.9	15 20.9	04.1	258 51.6	47.2	246 54.3	39.0	260 17.5	00.8					
	12	111 02.4	30 20.1 N22	04.4	273 52.9 S	7 47.7	261 56.6 S10	39.1	275 19.9 S	4 00.8	Gacrux	172 27.5	S57 01.1		
	13	126 04.9	45 19.4	04.7	288 54.2	48.3	276 59.0	39.1	290 22.3	00.9	Gienah	176 16.8	S17 26.6		
	14	141 07.3	60 18.6	05.0	303 55.6	48.8	292 01.3	39.2	305 24.6	00.9	Hadar	149 21.5	S60 17.5		
	15	156 09.8	75 17.9	05.3	318 56.9	49.3	307 03.7	39.2	320 27.0	00.9	Hamal	328 27.6	N23 22.6		
	16	171 12.3	90 17.1	05.6	333 58.2	49.8	322 06.0	39.3	335 29.4	01.0	Kaus Aust.	84 14.7	S34 23.6		
	17	186 14.7	105 16.4	05.9	348 59.6	50.3	337 08.4	39.4	350 31.7	01.0					
	18	201 17.2	120 15.6 N22	06.2	4 00.9 S	7 50.8	352 10.8 S10	39.4	5 34.1 S	4 01.1	Kochab	137 18.5	N74 14.0		
	19	216 19.7	135 14.9	06.4	19 02.2	51.3	7 13.1	39.5	20 36.5	01.1	Markab	14 01.7	N15 06.5		
	20	231 22.1	150 14.1	06.7	34 03.5	51.8	22 15.5	39.5	35 38.9	01.2	Menkar	314 39.9	N 4 01.2		
	21	246 24.6	165 13.4	07.0	49 04.9	52.4	37 17.8	39.6	50 41.2	01.2	Menkent	148 35.4	S36 17.1		
	22	261 27.1	180 12.6	07.3	64 06.2	52.9	52 20.2	39.6	65 43.6	01.3	Miaplacidus	221 45.6	S69 38.8		
	23	276 29.5	195 11.9	07.6	79 07.5	53.4	67 22.5	39.7	80 46.0	01.3					
WEDNESDAY	14 ^h 00 ^m	291 32.0	210 11.1 N22	07.9	94 08.8 S	7 53.9	82 24.9 S10	39.7	95 48.4 S	4 01.4	Mirfak	309 14.6	N49 47.7		
	01	306 34.4	225 10.4	08.2	109 10.2	54.4	97 27.2	39.8	110 50.7	01.4	Nunki	76 27.2	S26 19.1		
	02	321 36.9	240 09.6	08.5	124 11.5	54.9	112 29.6	39.8	125 53.1	01.5	Peacock	53 55.7	S56 47.5		
	03	336 39.4	255 08.9	08.7	139 12.8	55.4	127 32.0	39.9	140 55.5	01.5	Pollux	243 57.0	N28 04.2		
	04	351 41.8	270 08.1	09.0	154 14.1	56.0	142 34.3	39.9	155 57.8	01.6	Procyon	245 24.8	N 5 16.3		
	05	6 44.3	285 07.4	09.3	169 15.4	56.5	157 36.7	40.0	171 00.2	01.6					
	06	21 46.8	300 06.6 N22	09.6	184 16.8 S	7 57.0	172 39.0 S10	40.0	186 02.6 S	4 01.7	Rasalhague	96 28.1	N12 34.4		
	07	36 49.2	315 05.8	09.9	199 18.1	57.5	187 41.4	40.1	201 05.0	01.7	Regulus	208 08.9	N12 03.4		
	08	51 51.7	330 05.1	10.1	214 19.4	58.0	202 43.7	40.1	216 07.3	01.8	Rigel	281 35.1	S 8 13.2		
	09	66 54.2	345 04.3	10.4	229 20.7	58.5	217 46.1	40.2	231 09.7	01.8	Rigil Kent.	140 23.9	S60 45.9		
	10	81 56.6	0 03.6	10.7	244 22.0	59.0	232 48.4	40.2	246 12.1	01.9	Sabik	102 39.4	S15 42.2		
	11	96 59.1	15 02.8	11.0	259 23.4	7 59.6	247 50.8	40.3	261 14.4	01.9					
	12	112 01.5	30 02.1 N22	11.2	274 24.7 S	8 00.1	262 53.1 S10	40.3	276 16.8 S	4 02.0	Schedar	350 07.5	N56 26.1		
	13	127 04.0	45 01.3	11.5	289 26.0	00.6	277 55.5	40.4	291 19.2	02.0	Shaula	96 53.6	S37 05.5		
	14	142 06.5	60 00.6	11.8	304 27.3	01.1	292 57.8	40.4	306 21.5	02.1	Sirius	258 54.9	S16 41.5		
	15	157 08.9	74 59.8	12.0	319 28.6	01.6	308 00.2	40.5	321 23.9	02.1	Spica	158 56.2	S11 04.1		
	16	172 11.4	89 59.0	12.3	334 29.9	02.1	323 02.5	40.6	336 26.3	02.2	Suhail	223 10.3	S43 21.7		
	17	187 13.9	104 58.3	12.6	349 31.3	02.6	338 04.9	40.6	351 28.7	02.2					
	18	202 16.3	119 57.5 N22	12.9	4 32.6 S	8 03.2	353 07.2 S10	40.7	6 31.0 S	4 02.3	Vega	80 54.5	N38 46.1		
	19	217 18.8	134 56.8	13.1	19 33.9	03.7	8 09.6	40.7	21 33.4	02.3	Zuben'ubi	137 31.5	S15 58.1		
	20	232 21.3	149 56.0	13.4	34 35.2	04.2	23 11.9	40.8	36 35.8	02.4					
	21	247 23.7	164 55.3	13.6	49 36.5	04.7	38 14.3	40.8	51 38.1	02.4					
	22	262 26.2	179 54.5	13.9	64 37.8	05.2	53 16.6	40.9	66 40.5	02.5	Venus	279 56.2	9 59		
	23	277 28.7	194 53.7	14.2	79 39.1	05.7	68 19.0	40.9	81 42.9	02.5	Mars	163 04.1	17 44		
Mer. Pass.		4 37.1	<i>v</i> -0.7	<i>d</i> 0.3	<i>v</i> 1.3	<i>d</i> 0.5	<i>v</i> 2.4	<i>d</i> 0.1	<i>v</i> 2.4	<i>d</i> 0.0	Jupiter	150 55.5	18 31		
											Saturn	164 18.5	17 38		

1982 JULY 12, 13, 14 (MON., TUES., WED.)

G.M.T.	SUN		MOON					Lat.	Twilight		Sunrise	Moonrise			
	G.H.A.		Dec.	G.H.A.	v	Dec.	d	H.P.	Naut.	Civil	Sunrise	12	13	14	15
	<i>d</i>	<i>h</i>										<i>h</i>	<i>m</i>	<i>h</i>	<i>m</i>
12 M O N D A Y	00	178 38.1 N22 02.8	293 52.4 13.7 S	7 16.8 11.7 56.1	N 72	□	□	□	23 40	23 22	23 03	22 39			
	01	193 38.0 02.5	308 25.1 13.7	7 05.1 11.8 56.2	N 70	□	□	□	23 37	23 25	23 13	23 00			
	02	208 37.9 02.2	322 57.8 13.7	6 53.3 11.8 56.2	68	□	□	□	23 34	23 28	23 22	23 16			
	03	223 37.8 01.8	337 30.5 13.6	6 41.5 11.9 56.2	66	////	////	01 24	23 31	23 30	23 29	23 29			
	04	238 37.8 01.5	352 03.1 13.7	6 29.6 11.9 56.2	64	////	////	02 08	23 29	23 32	23 36	23 41			
	05	253 37.7 01.1	6 35.8 13.7	6 17.7 11.9 56.3	62	////	00 25	02 37	23 27	23 34	23 41	23 50			
	06	268 37.6 N22 00.8	21 08.5 13.7 S	6 05.8 12.0 56.3	60	////	01 37	02 59	23 26	23 35	23 46	23 59			
	07	283 37.5 00.4	35 41.2 13.7	5 53.8 12.0 56.3	N 58	////	02 10	03 17	23 24	23 37	23 50	24 06			
	08	298 37.4 22 00.1	50 13.9 13.6	5 41.8 12.1 56.4	56	00 24	02 34	03 31	23 23	23 38	23 54	24 12			
	09	313 37.4 21 59.8	64 46.5 13.7	5 29.7 12.1 56.4	54	01 29	02 53	03 44	23 22	23 39	23 57	24 18			
	10	328 37.3 59.4	79 19.2 13.6	5 17.6 12.1 56.4	52	02 00	03 09	03 55	23 21	23 40	24 00	00 00			
	11	343 37.2 59.1	93 51.8 13.7	5 05.5 12.2 56.4	50	02 22	03 22	04 05	23 20	23 41	24 03	00 03			
13 T U E S D A Y	00	358 37.1 N21 58.7	108 24.5 13.6 S	4 53.3 12.1 56.5	N 40	03 30	04 10	04 42	23 16	23 44	24 14	00 14			
	01	13 37.0 58.4	122 57.1 13.6	4 41.2 12.3 56.5	35	03 51	04 27	04 56	23 15	23 46	24 19	00 19			
	02	28 37.0 58.0	137 29.7 13.6	4 28.9 12.2 56.5	30	04 08	04 41	05 08	23 13	23 47	24 23	00 23			
	03	43 36.9 57.7	152 02.3 13.6	4 16.7 12.3 56.5	20	04 35	05 04	05 28	23 11	23 49	24 29	00 29			
	04	58 36.8 57.3	166 34.9 13.6	4 04.4 12.3 56.6	N 10	04 56	05 23	05 46	23 09	23 51	24 36	00 36			
	05	73 36.7 57.0	181 07.5 13.6	3 52.1 12.4 56.6	0	05 14	05 40	06 02	23 07	23 53	24 41	00 41			
	06	88 36.6 N21 56.6	195 40.1 13.5 S	3 39.7 12.4 56.6	S 10	05 30	05 56	06 18	23 05	23 55	24 47	00 47			
	07	103 36.6 56.3	210 12.6 13.5	3 27.3 12.4 56.7	20	05 44	06 12	06 35	23 03	23 57	24 53	00 53			
	08	118 36.5 55.9	224 45.1 13.5	3 14.9 12.4 56.7	30	05 59	06 29	06 55	23 01	24 00	00 00	01 01			
	09	133 36.4 55.6	239 17.6 13.5	3 02.5 12.5 56.7	35	06 07	06 39	07 06	23 00	24 01	00 01	01 05			
	10	148 36.3 55.2	253 50.1 13.5	2 50.0 12.4 56.8	40	06 16	06 49	07 19	22 58	24 03	00 03	01 10			
	11	163 36.3 54.9	268 22.6 13.5	2 37.6 12.5 56.8	45	06 25	07 02	07 35	22 57	24 05	00 05	01 15			
14 W E D N E S D A Y	00	178 36.2 N21 54.5	282 55.1 13.4 S	2 25.1 12.6 56.8	S 50	06 35	07 16	07 54	22 54	24 07	00 07	01 22			
	01	193 36.1 54.2	297 27.5 13.4	2 12.5 12.5 56.8	52	06 40	07 23	08 02	22 54	24 08	00 08	01 25			
	02	208 36.0 53.8	311 59.9 13.4	2 00.0 12.6 56.9	54	06 45	07 30	08 12	22 52	24 09	00 09	01 28			
	03	223 36.0 53.4	326 32.3 13.3	1 47.4 12.6 56.9	56	06 50	07 38	08 24	22 51	24 10	00 10	01 32			
	04	238 35.9 53.1	341 04.6 13.4	1 34.8 12.6 56.9	58	06 56	07 47	08 37	22 50	24 12	00 12	01 36			
	05	253 35.8 52.7	355 37.0 13.3	1 22.2 12.7 57.0	S 60	07 03	07 58	08 52	22 49	24 13	00 13	01 41			
	06	268 35.7 N21 52.4	10 09.3 13.3 S	1 09.5 12.6 57.0	Lat.	Sunset	Twilight		Moonset						
	07	283 35.6 52.0	24 41.6 13.2	0 56.9 12.7 57.0	Civil	Naut.	12	13	14	15					
	08	298 35.6 51.7	39 13.8 13.2	0 44.2 12.7 57.1	0	0	0	0	0	0	0	0			
	09	313 35.5 51.3	53 46.0 13.2	0 31.5 12.7 57.1	N 72	□	□	□	09 33	11 28	13 26	15 35			
	10	328 35.4 50.9	68 18.2 13.2	0 18.8 12.7 57.1	N 70	□	□	□	09 41	11 28	13 18	15 16			
	11	343 35.3 50.6	82 50.4 13.1 S	0 06.1 12.8 57.2	68	□	□	□	09 48	11 28	13 12	15 01			
12	358 35.3 N21 50.2	97 22.5 13.1 N	0 06.7 12.7 57.2	66	22 43	////	////	09 53	11 28	13 06	14 50				
13	13 35.2 49.9	111 54.6 13.1	0 19.4 12.8 57.2	64	22 01	////	////	09 58	11 28	13 02	14 40				
14	28 35.1 49.5	126 26.7 13.0	0 32.2 12.8 57.3	62	21 32	23 34	////	10 02	11 28	12 58	14 31				
15	43 35.0 49.1	140 58.7 13.0	0 45.0 12.8 57.3	60	21 11	22 32	////	10 05	11 29	12 54	14 24				
16	58 35.0 48.8	155 30.7 12.9	0 57.8 12.8 57.3	N 58	20 54	21 59	////	10 08	11 29	12 51	14 18				
17	73 34.9 48.4	170 02.6 12.9	1 10.6 12.8 57.4	56	20 39	21 36	23 37	10 11	11 29	12 49	14 12				
18	88 34.8 N21 48.0	184 34.5 12.9 N	1 23.4 12.8 57.4	54	20 27	21 17	22 40	10 13	11 29	12 46	14 07				
19	103 34.8 47.7	199 06.4 12.8	1 36.2 12.8 57.4	52	20 16	21 02	22 10	10 15	11 29	12 44	14 03				
20	118 34.7 47.3	213 38.2 12.8	1 49.0 12.8 57.5	50	20 06	20 48	21 48	10 17	11 29	12 42	13 59				
21	133 34.6 46.9	228 10.0 12.8	2 01.8 12.9 57.5	45	19 46	20 22	21 09	10 22	11 29	12 38	13 50				
22	148 34.5 46.6	242 41.8 12.7	2 14.7 12.8 57.5	N 40	19 29	20 01	20 41	10 25	11 29	12 34	13 42				
23	163 34.5 46.2	257 13.5 12.6	2 27.5 12.8 57.5	35	19 15	19 44	20 20	10 28	11 29	12 31	13 36				
15 T H U R S D A Y	00	178 34.4 N21 45.8	271 45.1 12.6 N	2 40.3 12.9 57.6	30	19 03	19 30	20 03	10 31	11 29	12 29	13 31			
	01	193 34.3 45.4	286 16.7 12.6	2 53.2 12.8 57.6	20	18 43	19 07	19 36	10 36	11 29	12 24	13 21			
	02	208 34.2 45.1	300 48.3 12.5	3 06.0 12.9 57.6	N 10	18 26	18 48	19 15	10 40	11 29	12 20	13 13			
	03	223 34.2 44.7	315 19.8 12.4	3 18.9 12.8 57.7	0	18 09	18 32	18 57	10 44	11 29	12 16	13 05			
	04	238 34.1 44.3	329 51.2 12.5	3 31.7 12.8 57.7	S 10	17 53	18 16	18 42	10 47	11 29	12 12	12 58			
	05	253 34.0 44.0	344 22.7 12.3	3 44.5 12.9 57.7	20	17 36	18 00	18 27	10 51	11 29	12 08	12 49			
	06	268 34.0 N21 43.6	358 54.0 12.3 N	3 57.4 12.8 57.8	30	17 17	17 42	18 12	10 56	11 29	12 03	12 40			
	07	283 33.9 43.2	13 25.3 12.3	4 10.2 12.8 57.8	35	17 05	17 33	18 04	10 58	11 29	12 01	12 35			
	08	298 33.8 42.8	27 56.6 12.2	4 23.0 12.9 57.9	40	16 52	17 22	17 56	11 01	11 29	11 58	12 29			
	09	313 33.8 42.5	42 27.8 12.1	4 35.9 12.8 57.9	45	16 37	17 10	17 47	11 04	11 29	11 54	12 21			
	10	328 33.7 42.1	56 58.9 12.1	4 48.7 12.8 57.9	S 50	16 18	16 55	17 36	11 08	11 29	11 50	12 13			
	11	343 33.6 41.7	71 30.0 12.0	5 01.5 12.8 58.0	52	16 09	16 49	17 32	11 10	11 29	11 48	12 09			
16 F R I D A Y	00	358 33.5 N21 41.3	86 01.0 12.0 N	5 14.3 12.7 58.0	54	15 59	16 41	17 27	11 12	11 29	11 46	12 05			
	01	13 33.5 41.0	100 32.0 11.9	5 27.0 12.8 58.0	56	15 48	16 33	17 21	11 14	11 29	11 44	12 00			
	02	28 33.4 40.6	115 02.9 11.9	5 39.8 12.8 58.1	58	15 35	16 24	17 15	11 17	11 29	11 41	11 55			
	03	43 33.3 40.2	129 33.8 11.8	5 52.6 12.7 58.1	S 60	15 20	16 14	17 09	11 19	11 29	11 38	11 49			
	04	58 33.3 39.8	144 04.6 11.7	6 05.3 12.7 58.1	Day	SUN		MOON		Mer. Pass.		Age			
	05	73 33.2 39.4	158 35.3 11.6	6 18.0 12.7 58.2	Eqn. of Time	Mer. Pass.	Mer. Pass.	Upper	Lower	Age	Phase				
	06	88 33.1 N21 39.1	173 05.9 11.6 N	6 30.7 12.7 58.2	00 ^h	12 ^h	Pass.								
	07	103 33.1 38.7	187 36.5 11.6	6 43.4 12.7 58.2	<i>m</i>	<i>s</i>	<i>h</i>	<i>m</i>	<i>h</i>	<i>m</i>	<i>d</i>				
	08	118 33.0 38.3	202 07.1 11.4	6 56.1 12.7 58.3	05 28	05 31	12 06	04 33	16 55	21					
	09	133 33.0 37.9	216 37.5 11.4	7 08.8 12.6 58.3	05 35	05 39	12 06	05 18	17 41	22					
	10	148 32.9 37.5	231 07.9 11.4	7 21.4 12.6 58.3	05 42	05 46	12 06	06 05	18 29	23					
	11	163 32.8 37.1	245 38.3 11.2	7 34.0 12.6 58.4	12	SUN		MOON		Mer. Pass.		Age			
12	S.D. 15.8 d 0.4	S.D. 15.4 15.6 15.8			Eqn. of Time	Mer. Pass.	Mer. Pass.	Upper	Lower	Age	Phase				

1982 JULY 15, 16, 17 (THURS., FRI., SAT.)

G.M.T.	ARIES		VENUS -3.3		MARS +0.6		JUPITER -1.7		SATURN +1.0		STARS		
	G.H.A.		G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.
15													
00	292 31.1		209 53.0 N22	14.4	94 40.5 S	8 06.2	83 21.3 S10	41.0	96 45.2 S	4 02.6	Acamar	315 36.4 S40	22.3
01	307 33.6		224 52.2	14.7	109 41.8	06.8	98 23.7	41.0	111 47.6	02.6	Achernar	335 44.3 S57	19.3
02	322 36.0		239 51.5	15.0	124 43.1	07.3	113 26.0	41.1	126 50.0	02.7	Acrux	173 36.1 S63	00.3
03	337 38.5		254 50.7	15.2	139 44.4	07.8	128 28.4	41.1	141 52.3	02.7	Adhara	255 31.5 S28	56.8
04	352 41.0		269 49.9	15.5	154 45.7	08.3	143 30.7	41.2	156 54.7	02.8	Aldebaran	291 16.8 N16	28.4
05	7 43.4		284 49.2	15.7	169 47.0	08.8	158 33.0	41.3	171 57.1	02.8			
06	22 45.9		299 48.4 N22	16.0	184 48.3 S	8 09.3	173 35.4 S10	41.3	186 59.4 S	4 02.9	Alioth	166 41.4 N56	03.7
07	37 48.4		314 47.7	16.2	199 49.6	09.9	188 37.7	41.4	202 01.8	02.9	Alkaid	153 17.4 N49	24.4
08	52 50.8		329 46.9	16.5	214 50.9	10.4	203 40.1	41.4	217 04.2	03.0	Al Na'ir	28 12.9 S47	02.7
09	67 53.3		344 46.1	16.7	229 52.3	10.9	218 42.4	41.5	232 06.5	03.0	Alnilam	276 10.7 S	1 12.7
10	82 55.8		359 45.4	17.0	244 53.6	11.4	233 44.8	41.5	247 08.9	03.1	Alphard	218 19.6 S	8 34.9
11	97 58.2		14 44.6	17.2	259 54.9	11.9	248 47.1	41.6	262 11.3	03.2			
12	113 00.7		29 43.9 N22	17.5	274 56.2 S	8 12.4	263 49.5 S10	41.6	277 13.6 S	4 03.2	Alphecca	126 30.8 N26	46.6
13	128 03.2		44 43.1	17.7	289 57.5	13.0	278 51.8	41.7	292 16.0	03.3	Alpheratz	358 07.9 N28	59.4
14	143 05.6		59 42.3	18.0	304 58.8	13.5	293 54.2	41.8	307 18.4	03.3	Altair	62 30.9 N	8 49.3
15	158 08.1		74 41.6	18.2	320 00.1	14.0	308 56.5	41.8	322 20.7	03.4	Ankaa	353 38.8 S42	23.9
16	173 10.5		89 40.8	18.5	335 01.4	14.5	323 58.8	41.9	337 23.1	03.4	Antares	112 55.0 S26	23.6
17	188 13.0		104 40.0	18.7	350 02.7	15.0	339 01.2	41.9	352 25.5	03.5			
18	203 15.5		119 39.3 N22	18.9	5 04.0 S	8 15.5	354 03.5 S10	42.0	7 27.8 S	4 03.5	Arcturus	146 17.2 N19	16.6
19	218 17.9		134 38.5	19.2	20 05.3	16.1	9 05.9	42.0	22 30.2	03.6	Atria	108 17.7 S69	00.0
20	233 20.4		149 37.7	19.4	35 06.6	16.6	24 08.2	42.1	37 32.6	03.6	Avior	234 28.4 S59	27.2
21	248 22.9		164 37.0	19.7	50 07.9	17.1	39 10.6	42.1	52 34.9	03.7	Bellatrix	278 57.7 N	6 20.1
22	263 25.3		179 36.2	19.9	65 09.2	17.6	54 12.9	42.2	67 37.3	03.7	Betelgeuse	271 27.2 N	7 24.3
23	278 27.8		194 35.4	20.1	80 10.5	18.1	69 15.2	42.3	82 39.7	03.8			
16													
00	293 30.3		209 34.7 N22	20.4	95 11.8 S	8 18.6	84 17.6 S10	42.3	97 42.0 S	4 03.8	Canopus	264 07.2 S52	41.1
01	308 32.7		224 33.9	20.6	110 13.1	19.2	99 19.9	42.4	112 44.4	03.9	Capella	281 09.8 N45	58.7
02	323 35.2		239 33.1	20.8	125 14.4	19.7	114 22.3	42.4	127 46.8	03.9	Deneb	49 47.2 N45	13.0
03	338 37.6		254 32.4	21.1	140 15.7	20.2	129 24.6	42.5	142 49.1	04.0	Denebola	182 57.9 N14	40.4
04	353 40.1		269 31.6	21.3	155 17.0	20.7	144 26.9	42.5	157 51.5	04.0	Diphda	349 19.5 S18	04.9
05	8 42.6		284 30.8	21.5	170 18.3	21.2	159 29.3	42.6	172 53.9	04.1			
06	23 45.0		299 30.1 N22	21.8	185 19.6 S	8 21.8	174 31.6 S10	42.7	187 56.2 S	4 04.1	Dubhe	194 20.9 N61	51.1
07	38 47.5		314 29.3	22.0	200 20.9	22.3	189 34.0	42.7	202 58.6	04.2	Elnath	278 42.8 N28	35.5
08	53 50.0		329 28.5	22.2	215 22.2	22.8	204 36.3	42.8	218 00.9	04.2	Eltanin	90 56.6 N51	29.6
09	68 52.4		344 27.8	22.4	230 23.5	23.3	219 38.6	42.8	233 03.3	04.3	Enif	34 10.0 N	9 47.6
10	83 54.9		359 27.0	22.7	245 24.8	23.8	234 41.0	42.9	248 05.7	04.3	Fomalhaut	15 49.7 S29	42.8
11	98 57.4		14 26.2	22.9	260 26.1	24.3	249 43.3	42.9	263 08.0	04.4			
12	113 59.8		29 25.5 N22	23.1	275 27.4 S	8 24.9	264 45.6 S10	43.0	278 10.4 S	4 04.5	Gacrux	172 27.5 S57	01.1
13	129 02.3		44 24.7	23.3	290 28.7	25.4	279 48.0	43.1	293 12.8	04.5	Gienah	176 16.8 S17	26.6
14	144 04.8		59 23.9	23.6	305 30.0	25.9	294 50.3	43.1	308 15.1	04.6	Hadar	149 21.5 S60	17.5
15	159 07.2		74 23.2	23.8	320 31.3	26.4	309 52.7	43.2	323 17.5	04.6	Hamal	328 27.5 N23	22.6
16	174 09.7		89 22.4	24.0	335 32.6	26.9	324 55.0	43.2	338 19.9	04.7	Kaus Aust.	84 14.7 S34	23.6
17	189 12.1		104 21.6	24.2	350 33.9	27.5	339 57.3	43.3	353 22.2	04.7			
18	204 14.6		119 20.9 N22	24.4	5 35.2 S	8 28.0	354 59.7 S10	43.4	8 24.6 S	4 04.8	Kochab	137 18.5 N74	14.0
19	219 17.1		134 20.1	24.6	20 36.5	28.5	10 02.0	43.4	23 26.9	04.8	Markab	14 01.7 N15	06.6
20	234 19.5		149 19.3	24.9	35 37.8	29.0	25 04.3	43.5	38 29.3	04.9	Menkar	314 39.9 N	4 01.2
21	249 22.0		164 18.5	25.1	50 39.1	29.5	40 06.7	43.5	53 31.7	04.9	Menkent	148 35.5 S36	17.1
22	264 24.5		179 17.8	25.3	65 40.3	30.1	55 09.0	43.6	68 34.0	05.0	Miaplacidus	221 45.6 S69	38.8
23	279 26.9		194 17.0	25.5	80 41.6	30.6	70 11.3	43.6	83 36.4	05.0			
17													
00	294 29.4		209 16.2 N22	25.7	95 42.9 S	8 31.1	85 13.7 S10	43.7	98 38.7 S	4 05.1	Mirfak	309 14.5 N49	47.7
01	309 31.9		224 15.4	25.9	110 44.2	31.6	100 16.0	43.8	113 41.1	05.1	Nunki	76 27.2 S26	19.1
02	324 34.3		239 14.7	26.1	125 45.5	32.1	115 18.3	43.8	128 43.5	05.2	Peacock	53 55.7 S56	47.5
03	339 36.8		254 13.9	26.3	140 46.8	32.6	130 20.7	43.9	143 45.8	05.3	Pollux	243 57.0 N28	04.2
04	354 39.3		269 13.1	26.5	155 48.1	33.2	145 23.0	43.9	158 48.2	05.3	Procyon	245 24.8 N	5 16.3
05	9 41.7		284 12.4	26.7	170 49.4	33.7	160 25.3	44.0	173 50.6	05.4			
06	24 44.2		299 11.6 N22	26.9	185 50.7 S	8 34.2	175 27.7 S10	44.1	188 52.9 S	4 05.4	Rasalhague	96 28.1 N12	34.5
07	39 46.6		314 10.8	27.1	200 52.0	34.7	190 30.0	44.1	203 55.3	05.5	Regulus	208 08.9 N12	03.4
08	54 49.1		329 10.0	27.3	215 53.2	35.2	205 32.3	44.2	218 57.6	05.5	Rigel	281 35.1 S	8 13.2
09	69 51.6		344 09.3	27.5	230 54.5	35.8	220 34.7	44.2	234 00.0	05.6	Rigel Kent.	140 23.9 S60	45.9
10	84 54.0		359 08.5	27.7	245 55.8	36.3	235 37.0	44.3	249 02.4	05.6	Sabik	102 39.4 S15	42.2
11	99 56.5		14 07.7	27.9	260 57.1	36.8	250 39.3	44.4	264 04.7	05.7			
12	114 59.0		29 06.9 N22	28.1	275 58.4 S	8 37.3	265 41.7 S10	44.4	279 07.1 S	4 05.7	Schedar	350 07.5 N56	26.2
13	130 01.4		44 06.2	28.3	290 59.7	37.9	280 44.0	44.5	294 09.4	05.8	Shaula	96 53.6 S37	05.5
14	145 03.9		59 05.4	28.5	306 00.9	38.4	295 46.3	44.5	309 11.8	05.8	Sirius	258 54.9 S16	41.5
15	160 06.4		74 04.6	28.7	321 02.2	38.9	310 48.7	44.6	324 14.1	05.9	Spica	158 56.2 S11	04.1
16	175 08.8		89 03.8	28.9	336 03.5	39.4	325 51.0	44.7	339 16.5	06.0	Suhail	223 10.3 S43	21.7
17	190 11.3		104 03.1	29.1	351 04.8	39.9	340 53.3	44.7	354 18.9	06.0			
18	205 13.8		119 02.3 N22	29.3	6 06.1 S	8 40.5	355 55.6 S10	44.8	9 21.2 S	4 06.1	Vega	80 54.5 N38	46.1
19	220 16.2		134 01.5	29.5	21 07.4	41.0	10 58.0	44.8	24 23.6	06.1	Zuben'ubi	137 31.5 S15	58.1
20	235 18.7		149 00.7	29.7	36 08.6	41.5	26 00.3	44.9	39 25.9	06.2			
21	250 21.1		163 59.9	29.9	51 09.9	42.0	41 02.6	45.0	54 28.3	06.2			
22	265 23.6		178 59.2	30.0	66 11.2	42.5	56 05.0	45.0	69 30.7	06.3	Venus	276 04.4	10 02
23	280 26.1		193 58.4	30.2	81 12.5	43.1	71 07.3	45.1	84 33.0	06.3	Mars	161 41.6	17 38
											Jupiter	150 47.3	18 20
											Saturn	164 11.8	17 26
Mer. Pass.	4 25.3		v -0.8 d 0.2		v 1.3 d 0.5		v 2.3 d 0.1		v 2.4 d 0.1				

1982 JULY 15, 16, 17 (THURS., FRI., SAT.)

		SUN		MOON				Lat.	Twilight		Sunrise	Moonrise					
G.M.T.		G.H.A.	Dec.	G.H.A.	<i>U</i>	Dec.	<i>d</i>	H.P.	Naut.	Civil		15	16	17	18		
^d ^h									[°]	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m		
15	00	178	32.7 N21	260	08.5	11.2 N	7 46.6	12.5	58.4	N 72	□	□	□	22 39	21 56	□	□
	01	193	32.7	274	38.7	11.1	7 59.1	12.6	58.4	N 70	□	□	□	23 00	22 40	21 44	□
	02	208	32.6	289	08.8	11.0	8 11.7	12.5	58.5	68	□	□	□	23 16	23 09	22 59	□
	03	223	32.5 ..	303	38.8	11.0	8 24.2	12.4	58.5	66	////	////	01 38	23 29	23 31	23 37	23 54
	04	238	32.5	318	08.8	10.9	8 36.6	12.5	58.5	64	////	////	02 17	23 41	23 49	24 04	00 04
	05	253	32.4	332	38.7	10.8	8 49.1	12.4	58.6	62	////	00 54	02 44	23 50	24 03	00 03	00 24
	06	268	32.4	347	08.5	10.8	8 49.1	12.4	58.6	60	////	01 47	03 05	23 59	24 16	00 16	00 42
	07	283	32.3	347	08.5	10.7 N	9 01.5	12.4	58.6	N 58	////	02 17	03 21	24 06	00 06	00 27	00 56
	08	298	32.3	1 38.2	10.7	9 13.9	12.3	58.6	56	00 50	02 40	03 36	24 12	00 12	00 36	01 08	01 38
	09	313	32.2	16 07.9	10.6	9 26.2	12.3	58.7	54	01 38	02 58	03 48	24 18	00 18	00 44	01 19	01 49
T	10	328	32.1 ..	30 37.5	10.5	9 38.5	12.3	58.7	52	02 06	03 13	03 59	00 00	00 23	00 52	01 29	01 59
	11	343	32.1	45 07.0	10.4	9 50.8	12.2	58.7	50	02 27	03 26	04 08	00 03	00 28	00 59	01 37	02 07
	12	358	32.0	59 36.4	10.3	10 03.0	12.2	58.8	45	03 05	03 52	04 28	00 09	00 39	01 13	01 56	02 26
	13	358	31.9 N21	74 05.7	10.3	N10 15.2	12.2	58.8	N 40	03 32	04 12	04 44	00 14	00 47	01 25	02 11	02 41
	14	13 31.9	31.7	88 35.0	10.1	10 27.4	12.1	58.8	35	03 53	04 29	04 58	00 19	00 55	01 36	02 24	02 54
	15	28 31.8	31.3	103 04.1	10.1	10 39.5	12.0	58.9	30	04 10	04 42	05 09	00 23	01 01	01 45	02 35	03 05
	16	43 31.7 ..	30.9	117 33.2	10.0	10 51.5	12.1	58.9	20	04 36	05 05	05 29	00 29	01 13	02 01	02 54	03 24
	17	58 31.7	30.5	132 02.2	9.9	11 03.6	11.9	59.0	N 10	04 57	05 24	05 46	00 36	01 23	02 14	03 11	03 41
	18	73 31.6	30.1	146 31.1	9.9	11 15.5	12.0	59.0	0	05 14	05 40	06 02	00 41	01 32	02 28	03 27	03 57
	19	88 31.5 N21	29.7	161 00.0	9.7	N11 27.5	11.8	59.0	S 10	05 30	05 56	06 18	00 47	01 42	02 41	03 43	04 13
D	20	103 31.5	29.3	175 28.7	9.7	11 39.3	11.9	59.1	20	05 44	06 11	06 35	00 53	01 53	02 55	04 00	04 30
	21	118 31.4	28.9	189 57.4	9.5	11 51.2	11.7	59.1	30	05 59	06 28	06 54	01 01	02 04	03 11	04 20	04 50
	22	133 31.3 ..	28.5	204 25.9	9.5	12 02.9	11.7	59.1	35	06 06	06 38	07 05	01 05	02 11	03 21	04 31	05 01
	23	148 31.3	28.1	218 54.4	9.4	12 14.6	11.7	59.2	40	06 15	06 48	07 18	01 10	02 19	03 32	04 45	05 15
	24	163 31.2	27.7	233 22.8	9.3	12 26.3	11.6	59.2	45	06 23	07 00	07 33	01 15	02 29	03 44	05 00	05 30
	25	178 31.2 N21	27.3	247 51.1	9.2	N12 37.9	11.5	59.2	S 50	06 33	07 14	07 51	01 22	02 40	04 00	05 20	05 50
	26	193 31.1	26.9	262 19.3	9.1	12 49.4	11.5	59.3	52	06 38	07 20	08 00	01 25	02 45	04 08	05 29	05 59
	27	208 31.0	26.5	276 47.4	9.0	13 00.9	11.4	59.3	54	06 43	07 28	08 09	01 28	02 51	04 16	05 40	06 10
	28	223 31.0 ..	26.1	291 15.4	8.9	13 12.3	11.4	59.3	56	06 48	07 35	08 20	01 32	02 57	04 25	05 51	06 21
	29	238 30.9	25.7	305 43.3	8.8	13 23.7	11.3	59.4	58	06 54	07 44	08 33	01 36	03 05	04 36	06 05	06 35
F	30	253 30.9	25.3	320 11.1	8.7	13 35.0	11.2	59.4	S 60	07 00	07 54	08 47	01 41	03 13	04 48	06 21	06 51
	31	268 30.8 N21	24.9	334 38.8	8.7	N13 46.2	11.2	59.4	Lat.		Twilight		Moonset				
	32	283 30.7	24.5	349 06.5	8.5	13 57.4	11.1	59.5	Sunset	Civil	Naut.	15	16	17	18		
	33	298 30.7	24.1	3 34.0	8.4	14 08.5	11.0	59.5	[°]	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	^h ^m	
	34	313 30.6 ..	23.7	18 01.4	8.4	14 19.5	10.9	59.5	N 72	□	□	□	15 35	18 10	□	□	
	35	328 30.5	23.3	32 28.8	8.2	14 30.4	10.9	59.6	N 70	□	□	□	15 16	17 28	20 25	□	
	36	343 30.5	22.9	46 56.0	8.1	14 41.3	10.8	59.6	68	□	□	□	15 01	17 00	19 11	□	
	37	358 30.4 N21	22.5	61 23.1	8.1	N14 52.1	10.7	59.6	66	22 30	////	////	14 50	16 39	18 34	20 27	
	38	13 30.4	22.0	75 50.2	7.9	15 02.8	10.6	59.6	64	21 53	////	////	14 40	16 22	18 08	19 48	
	39	28 30.3	21.6	90 17.1	7.9	15 13.4	10.5	59.7	62	21 26	23 12	////	14 31	16 09	17 48	19 21	
R	40	43 30.3 ..	21.2	104 44.0	7.7	15 23.9	10.5	59.7	60	21 06	22 23	////	14 24	15 57	17 31	19 00	
	41	58 30.2	20.8	119 10.7	7.7	15 34.4	10.4	59.7	N 58	20 49	21 53	////	14 18	15 47	17 18	18 43	
	42	73 30.1	20.4	133 37.4	7.5	15 44.8	10.3	59.8	56	20 35	21 31	23 17	14 12	15 38	17 06	18 29	
	43	88 30.1 N21	20.0	148 03.9	7.5	N15 55.1	10.2	59.8	54	20 23	21 13	22 32	14 07	15 31	16 55	18 16	
	44	103 30.0	19.6	162 30.4	7.3	16 05.3	10.1	59.8	52	20 13	20 58	22 04	14 03	15 24	16 46	18 05	
	45	118 30.0	19.2	176 56.7	7.2	16 15.4	10.0	59.9	50	20 03	20 45	21 43	13 59	15 18	16 38	17 55	
	46	133 29.9 ..	18.8	191 22.9	7.2	16 25.4	10.0	59.9	45	19 43	20 19	21 06	13 50	15 04	16 20	17 35	
	47	148 29.8	18.3	205 49.1	7.0	16 35.4	9.8	59.9	N 40	19 27	19 59	20 39	13 42	14 53	16 06	17 18	
	48	163 29.8	17.9	220 15.1	7.0	16 45.2	9.8	60.0	35	19 14	19 43	20 18	13 36	14 44	15 54	17 04	
	49	178 29.7 N21	17.5	234 41.1	6.8	N16 55.0	9.6	60.0	30	19 02	19 29	20 02	13 31	14 36	15 44	16 52	
S	50	193 29.7	17.1	249 06.9	6.7	17 04.6	9.5	60.0	20	18 43	19 07	19 35	13 21	14 22	15 25	16 31	17 41
	51	208 29.6	16.7	263 32.6	6.7	17 14.1	9.5	60.0	N 10	18 25	18 48	19 15	13 13	14 10	15 10	16 13	17 23
	52	223 29.6 ..	16.3	277 58.3	6.5	17 23.6	9.3	60.1	0	18 10	18 32	18 58	13 05	13 58	14 55	15 56	17 06
	53	238 29.5	15.8	292 23.8	6.5	17 32.9	9.3	60.1	S 10	17 54	18 16	18 42	12 58	13 47	14 41	15 40	16 50
	54	253 29.4	15.4	306 49.3	6.3	17 42.2	9.1	60.1	20	17 37	18 01	18 28	12 49	13 35	14 25	15 22	16 32
	55	268 29.4 N21	15.0	321 14.6	6.2	N17 51.3	9.0	60.2	30	17 18	17 44	18 13	12 40	13 21	14 07	15 01	16 11
	56	283 29.3	14.6	335 39.8	6.2	18 00.3	8.9	60.2	35	17 07	17 35	18 06	12 35	13 13	13 57	14 49	15 59
	57	298 29.3	14.2	350 05.0	6.0	18 09.2	8.8	60.2	40	16 54	17 24	17 58	12 29	13 04	13 45	14 35	15 45
	58	313 29.2 ..	13.7	4 30.0	5.9	18 18.0	8.7	60.2	45	16 39	17 12	17 49	12 21	12 53	13 31	14 18	15 28
	59	328 29.2	13.3	18 54.9	5.9	18 26.7	8.6	60.3	S 50	16 21	16 58	17 39	12 13	12 40	13 14	13 58	15 08
T	60	343 29.1	12.9	33 19.8	5.7	18 35.3	8.4	60.3	52	16 13	16 52	17 34	12 09	12 35	13 07	13 49	14 59
	61	358 29.1 N21	12.5	47 44.5	5.7	N18 43.7	8.3	60.3	54	16 03	16 45	17 30	12 05	12 28	12 58	13 38	14 48
	62	13 29.0	12.1	62 09.2	5.5	18 52.0	8.2	60.3	56	15 52	16 37	17 25	12 00	12 21	12 48	13 26	14 36
	63	28 28.9	11.6	76 33.7													

1982 JULY 18, 19, 20 (SUN., MON., TUES.)

	ARIES			VENUS −3.3			MARS +0.6			JUPITER −1.7			SATURN +1.0			STARS		
G.M.T.	G.H.A.		Dec.	G.H.A.		Dec.	G.H.A.		Dec.	G.H.A.		Dec.	G.H.A.		Dec.	Name	S.H.A.	Dec.
18 ^d 00 01 02 03 04 05 06 07 08 S U N D A Y	295	28.5	208 57.6 N22 30.4	96	13.8 S 8 43.6	86 09.6 S10 45.1	99	35.4 S 4 06.4	Acamar	315	36.4 S40 22.3							
	310	31.0	223 56.8 30.6	111	15.0 44.1	101 11.9 45.2	114	37.7 06.5	Achernar	335	44.2 S57 19.3							
	325	33.5	238 56.1 30.8	126	16.3 44.6	116 14.3 45.3	129	40.1 06.5	Acrux	173	36.1 S63 00.3							
	340	35.9	253 55.3 31.0	141	17.6 45.1	131 16.6 45.3	144	42.4 06.6	Adhara	255	31.5 S28 56.8							
	355	38.4	268 54.5 31.1	156	18.9 45.7	146 18.9 45.4	159	44.8 06.6	Aldebaran	291	16.8 N16 28.4							
	10	40.9	283 53.7 31.3	171	20.2 46.2	161 21.2 45.5	174	47.2 06.7										
	25	43.3	298 52.9 N22 31.5	186	21.4 S 8 46.7	176 23.6 S10 45.5	189	49.5 S 4 06.7	Alioth	166	41.4 N56 03.7							
	40	45.8	313 52.2 31.7	201	22.7 47.2	191 25.9 45.6	204	51.9 06.8	Alkaid	153	17.4 N49 24.4							
	55	48.2	328 51.4 31.8	216	24.0 47.8	206 28.2 45.6	219	54.2 06.8	Al Na'ir	28	12.9 S47 02.7							
	70	50.7	343 50.6 32.0	231	25.3 48.3	221 30.6 45.7	234	56.6 06.9	Anilam	276	10.6 S 1 12.7							
	85	53.2	358 49.8 32.2	246	26.5 48.8	236 32.9 45.8	249	58.9 06.9	Alphard	218	19.6 S 8 34.9							
	100	55.6	13 49.0 32.4	261	27.8 49.3	251 35.2 45.8	265	01.3 07.0										
	115	58.1	28 48.3 N22 32.5	276	29.1 S 8 49.8	266 37.5 S10 45.9	280	03.7 S 4 07.1	Alphecca	126	30.8 N26 46.6							
	131	00.6	43 47.5 32.7	291	30.4 50.4	281 39.9 46.0	295	06.0 07.1	Alpheratz	358	07.8 N28 59.4							
	146	03.0	58 46.7 32.9	306	31.6 50.9	296 42.2 46.0	310	08.4 07.2	Altair	62	30.9 N 8 49.3							
	161	05.5	73 45.9 33.0	321	32.9 51.4	311 44.5 46.1	325	10.7 07.2	Ankaa	353	38.8 S42 23.9							
	176	08.0	88 45.1 33.2	336	34.2 51.9	326 46.8 46.1	340	13.1 07.3	Antares	112	55.0 S26 23.6							
	191	10.4	103 44.4 33.4	351	35.5 52.5	341 49.1 46.2	355	15.4 07.3										
	206	12.9	118 43.6 N22 33.5	6 36.7 S 8 53.0	356	51.5 S10 46.3	10 17.8 S 4 07.4			Arcturus	146	17.2 N19 16.6						
	221	15.4	133 42.8 33.7	21 38.0 53.5	11 53.8 46.3	25 20.1 07.4			Atria	108	17.7 S69 00.0							
	236	17.8	148 42.0 33.9	36 39.3 54.0	26 56.1 46.4	40 22.5 07.5			Avior	234	28.4 S59 27.2							
	251	20.3	163 41.2 34.0	51 40.5 54.5	41 58.4 46.5	55 24.9 07.6			Bellatrix	278	57.6 N 6 20.1							
	266	22.7	178 40.4 34.2	66 41.8 55.1	57 00.8 46.5	70 27.2 07.6			Betelgeuse	271	27.2 N 7 24.3							
281	25.2	193 39.7 34.3	81 43.1 55.6	72 03.1 46.6	85 29.6 07.7													
19 ^d 00 01 02 03 04 05 06 07 08 M O N D A Y	296	27.7	208 38.9 N22 34.5	96	44.3 S 8 56.1	87 05.4 S10 46.6	100	31.9 S 4 07.7	Canopus	264	07.2 S52 41.0							
	311	30.1	223 38.1 34.7	111	45.6 56.6	102 07.7 46.7	115	34.3 07.8	Capella	281	09.8 N45 58.7							
	326	32.6	238 37.3 34.8	126	46.9 57.2	117 10.0 46.8	130	36.6 07.8	Deneb	49	47.1 N45 13.0							
	341	35.1	253 36.5 35.0	141	48.2 57.7	132 12.4 46.8	145	39.0 07.9	Denebola	182	57.9 N14 40.4							
	356	37.5	268 35.7 35.1	156	49.4 58.2	147 14.7 46.9	160	41.3 08.0	Diphda	349	19.5 S18 04.9							
	11	40.0	283 35.0 35.3	171	50.7 58.7	162 17.0 47.0	175	43.7 08.0										
	26	42.5	298 34.2 N22 35.4	186	52.0 S 8 59.3	177 19.3 S10 47.0	190	46.0 S 4 08.1	Dubhe	194	20.9 N61 51.1							
	41	44.9	313 33.4 35.6	201	53.2 8 59.8	192 21.6 47.1	205	48.4 08.1	Elnath	278	42.8 N28 35.5							
	56	47.4	328 32.6 35.7	216	54.5 9 00.3	207 24.0 47.2	220	50.7 08.2	Eltanin	90	56.6 N51 29.6							
	71	49.9	343 31.8 35.9	231	55.7 00.8	222 26.3 47.2	235	53.1 08.2	Enif	34	10.0 N 9 47.6							
	86	52.3	358 31.0 36.0	246	57.0 01.4	237 28.6 47.3	250	55.5 08.3	Fomalhaut	15	49.7 S29 42.8							
	101	54.8	13 30.2 36.2	261	58.3 01.9	252 30.9 47.4	265	57.8 08.4										
	116	57.2	28 29.5 N22 36.3	276	59.5 S 9 02.4	267 33.2 S10 47.4	281	00.2 S 4 08.4	Gacrux	172	27.5 S57 01.1							
	131	59.7	43 28.7 36.4	292	00.8 02.9	282 35.5 47.5	296	02.5 08.5	Gienah	176	16.8 S17 26.6							
	147	02.2	58 27.9 36.6	307	02.1 03.4	297 37.9 47.6	311	04.9 08.5	Hadar	149	21.5 S60 17.5							
	162	04.6	73 27.1 36.7	322	03.3 04.0	312 40.2 47.6	326	07.2 08.6	Hamal	328	27.5 N23 22.6							
	177	07.1	88 26.3 36.9	337	04.6 04.5	327 42.5 47.7	341	09.6 08.6	Kaus Aust.	84	14.7 S34 23.6							
	192	09.6	103 25.5 37.0	352	05.9 05.0	342 44.8 47.7	356	11.9 08.7										
	207	12.0	118 24.7 N22 37.1	7 07.1 S 9 05.5	357	47.1 S10 47.8	11 14.3 S 4 08.8			Kochab	137	18.6 N74 14.0						
	222	14.5	133 24.0 37.3	22 08.4 06.1	12 49.4 47.9	26 16.6 08.8			Markab	14	01.7 N15 06.6							
	237	17.0	148 23.2 37.4	37 09.6 06.6	27 51.8 47.9	41 19.0 08.9			Menkar	314	39.9 N 4 01.3							
	252	19.4	163 22.4 37.6	52 10.9 07.1	42 54.1 48.0	56 21.3 08.9			Menkent	148	35.5 S36 17.1							
	267	21.9	178 21.6 37.7	67 12.2 07.6	57 56.4 48.1	71 23.7 09.0			Miaplacidus	221	45.6 S69 38.8							
282	24.3	193 20.8 37.8	82 13.4 08.2	72 58.7 48.1	86 26.0 09.0													
20 ^d 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23	297	26.8	208 20.0 N22 38.0	97	14.7 S 9 08.7	88 01.0 S10 48.2	101	28.4 S 4 09.1	Mirfak	309	14.5 N49 47.7							
	312	29.3	223 19.2 38.1	112	15.9 09.2	103 03.3 48.3	116	30.7 09.2	Nunki	76	27.2 S26 19.1							
	327	31.7	238 18.4 38.2	127	17.2 09.7	118 05.6 48.3	131	33.1 09.2	Peacock	53	55.7 S56 47.5							
	342	34.2	253 17.7 38.3	142	18.4 10.3	133 08.0 48.4	146	35.4 09.3	Pollux	243	57.0 N28 04.2							
	357	36.7	268 16.9 38.5	157	19.7 10.8	148 10.3 48.5	161	37.8 09.3	Procyon	245	24.8 N 5 16.3							
	12	39.1	283 16.1 38.6	172	21.0 11.3	163 12.6 48.5	176	40.1 09.4										
	27	41.6	298 15.3 N22 38.7	187	22.2 S 9 11.8	178 14.9 S10 48.6	191	42.5 S 4 09.4	Rasalhague	96	28.1 N12 34.5							
	42	44.1	313 14.5 38.8	202	23.5 12.4	193 17.2 48.7	206	44.8 09.5	Regulus	208	08.9 N12 03.4							
	57	46.5	328 13.7 39.0	217	24.7 12.9	208 19.5 48.7	221	47.2 09.6	Rigel	281	35.0 S 8 13.2							
	72	49.0	343 12.9 39.1	232	26.0 13.4	223 21.8 48.8	236	49.5 09.6	Rigel Kent.	140	23.9 S60 45.9							
	87	51.5	358 12.1 39.2	247	27.2 13.9	238 24.2 48.9	251	51.9 09.7	Sabik	102	39.4 S15 42.2							
	102	53.9	13 11.3 39.3	262	28.5 14.5	253 26.5 48.9	266	54.2 09.7										
	117	56.4	28 10.5 N22 39.4	277	29.7 S 9 15.0	268 28.8 S10 49.0	281	56.6 S 4 09.8	Schedar	350	07.4 N56 26.2							
	132	58.8	43 09.8 39.6	292	31.0 15.5	283 31.1 49.1	296	58.9 09.8	Shaula	96	53.6 S37 05.5							
	148	01.3	58 09.0 39.7	307	32.2 16.0	298 33.4 49.1	312	01.3 09.9	Sirius	258	54.9 S16 41.5							
	163	03.8	73 08.2 39.8	322	33.5 16.6	313 35.7 49.2	327	03.6 10.0	Spica	158	56.2 S11 04.1							
	178	06.2	88 07.4 39.9	337	34.7 17.1	328 38.0 49.3	342	06.0 10.0	Suhail	223	10.3 S43 21.7							
	193	08.7	103 06.6 40.0	352	36.0 17.6	343 40.3 49.3	357	08.3 10.1										
	208	11.2	118 05.8 N22 40.1	7 37.2 S 9 18.2	358	42.6 S10 49.4	12 10.7 S 4 10.1			Vega	80	54.5 N38 46.1						
	223	13.6	133 05.0 40.2	22 38.5 18.7	13 44.9 49.5	27 13.0 10.2			Zuben'ubi	137	31.5 S15 58.1							
	238	16.1	148 04.2 40.3	37 39.7 19.2	28 47.3 49.5	42 15.4 10.3												
	253	18.6	163 03.4 40.5	52 41.0 19.7	43 49.6 49.6	57 17.7 10.3												
	268	21.0	178 02.6 40.6	67 42.2 20.3	58 51.9 49.7	72 20.1 10.4			Venus	272	11.2 10 06							
283	23.5	193 01.8 40.7	82 43.5 20.8	73 54.2 49.7	87 22.4 10.4			Mars	160	16.7 17 32								
								Jupiter	150	37.7 18 09								
								Saturn	164	04.2 17 15								
Mer. Pass.	4 13.5	v -0.8 d 0.1	v 1.3 d 0.5	v 2.3 d 0.1	v 2.4 d 0.1													

1982 JULY 18, 19, 20 (SUN., MON., TUES.)

		SUN		MOON					Lat.	Twilight		Sunrise	Moonrise							
G.M.T.		G.H.A.	Dec.	G.H.A.	<i>v</i>	Dec.	<i>d</i>	H.P.		Naut.	Civil		18	19	20	21				
^d	^h	[°]	[']	[°]	[']	[°]	[']	[°]	[°]	^h	^m	^h	^m	^h	^m	^h	^m			
18	00	178	28.4	N21	07.3	220	34.0	4.5	N20	15.4	6.8	60.6	N 72							
	01	193	28.4		06.9	234	57.5	4.4	20	22.2	6.6	60.6	N 70							
	02	208	28.3		06.5	249	20.9	4.4	20	28.8	6.5	60.7	68	////	////	00 41				
	03	223	28.3	..	06.1	263	44.3	4.3	20	35.3	6.4	60.7	66	////	////	01 51	23 54			
	04	238	28.2		05.6	278	07.6	4.1	20	41.7	6.2	60.7	64	////	////	02 26	00 04			
	05	253	28.2		05.2	292	30.7	4.1	20	47.9	6.1	60.7	62	////	01 13	02 51	00 24			
	06	268	28.1	N21	04.8	306	53.8	4.1	N20	54.0	5.9	60.7	60	////	01 57	03 11	00 42			
	07	283	28.1		04.3	321	16.9	3.9	20	59.9	5.8	60.8	N 58	////	02 25	03 27	00 56			
	08	298	28.0		03.9	335	39.8	3.9	21	05.7	5.6	60.8	56	01 07	02 46	03 40	01 08			
	09	313	28.0	..	03.4	350	02.7	3.8	21	11.3	5.5	60.8	54	01 47	03 03	03 52	01 19			
	S U N	10	328	27.9		03.0	4	25.5	3.7	21	16.8	5.4	60.8	52	02 13	03 18	04 02	01 29		
		11	343	27.9		02.6	18	48.2	3.6	21	22.2	5.1	60.8	50	02 33	03 30	04 12	01 37		
		12	358	27.8	N21	02.1	33	10.8	3.6	N21	27.3	5.1	60.8	45	03 09	03 55	04 31	01 56		
		13	13	27.8		01.7	47	33.4	3.5	21	32.4	4.8	60.9	N 40	03 35	04 15	04 46	02 11		
		14	28	27.7		01.3	61	55.9	3.5	21	37.2	4.7	60.9	35	03 56	04 31	05 00	02 24		
		15	43	27.7	..	00.8	76	18.4	3.3	21	41.9	4.6	60.9	30	04 12	04 44	05 11	02 35		
		16	58	27.6	21	00.4	90	40.7	3.3	21	46.5	4.4	60.9	20	04 38	05 06	05 30	02 54		
		17	73	27.6	20	59.9	105	03.0	3.3	21	50.9	4.2	60.9	N 10	04 58	05 24	05 47	03 11		
		18	88	27.5	N20	59.5	119	25.3	3.2	N21	55.1	4.1	60.9	0	05 15	05 41	06 03	03 27		
		19	103	27.5		59.0	133	47.5	3.1	21	59.2	3.9	60.9	S 10	05 30	05 56	06 18	03 43		
		20	118	27.4		58.6	148	09.6	3.1	22	03.1	3.7	61.0	20	05 44	06 11	06 34	04 00		
		21	133	27.4	..	58.2	162	31.7	3.0	22	06.8	3.6	61.0	30	05 58	06 27	06 53	04 20		
	22	148	27.3		57.7	176	53.7	3.0	22	10.4	3.4	61.0	35	06 05	06 36	07 04	04 31			
	23	163	27.3		57.3	191	15.7	2.9	22	13.8	3.3	61.0	40	06 13	06 46	07 16	04 45			
19	00	178	27.2	N20	56.8	205	37.6	2.8	N22	17.1	3.1	61.0	S 50	06 31	07 11	07 48	05 20			
	01	193	27.2		56.4	219	59.4	2.9	22	20.2	2.9	61.0	52	06 35	07 18	07 57	05 29			
	02	208	27.1		55.9	234	21.3	2.7	22	23.1	2.7	61.0	54	06 40	07 24	08 06	05 40			
	03	223	27.1	..	55.5	248	43.0	2.8	22	25.8	2.6	61.0	56	06 45	07 32	08 16	05 51			
	04	238	27.1		55.0	263	04.8	2.7	22	28.4	2.4	61.0	58	06 50	07 40	08 28	06 05			
	05	253	27.0		54.6	277	26.5	2.6	22	30.8	2.3	61.1	S 60	06 56	07 50	08 42	06 21			
	06	268	27.0	N20	54.1	291	48.1	2.7	N22	33.1	2.0	61.1								
	07	283	26.9		53.7	306	09.8	2.6	22	35.1	1.9	61.1	Lat.	Sunset	Twilight		Moonset			
	08	298	26.9		53.2	320	31.4	2.5	22	37.0	1.8	61.1			Civil	Naut.	18	19	20	21
	09	313	26.8	..	52.8	334	52.9	2.6	22	38.8	1.5	61.1								
	10	328	26.8		52.3	349	14.5	2.5	22	40.3	1.4	61.1	^h	^m	^h	^m	^h	^m	^h	^m
	11	343	26.7		51.9	3	36.0	2.5	22	41.7	1.2	61.1	N 72							
	12	358	26.7	N20	51.4	17	57.5	2.5	N22	42.9	1.0	61.1	N 70							
	13	13	26.7		51.0	32	19.0	2.4	22	43.9	0.9	61.1	68	23 21	////	////			23 22	23 06
	14	28	26.6		50.5	46	40.4	2.5	22	44.8	0.7	61.1	66	22 18	////	////	20 27	21 50	22 24	22 36
	15	43	26.6	..	50.1	61	01.9	2.4	22	45.5	0.5	61.1	64	21 44	////	////	19 48	21 06	21 50	22 13
	16	58	26.5		49.6	75	23.3	2.4	22	46.0	0.3	61.1	62	21 20	22 55	////	19 21	20 36	21 25	21 54
	17	73	26.5		49.2	89	44.7	2.4	22	46.3	0.2	61.1	60	21 00	22 13	////	19 00	20 14	21 06	21 39
	18	88	26.4	N20	48.7	104	06.1	2.5	N22	46.5	0.0	61.1	N 58	20 45	21 46	////	18 43	19 55	20 49	21 26
	19	103	26.4		48.2	118	27.6	2.4	22	46.5	0.2	61.1	56	20 31	21 25	23 01	18 29	19 40	20 35	21 15
	20	118	26.4		47.8	132	49.0	2.4	22	46.3	0.4	61.1	54	20 19	21 08	22 23	18 16	19 27	20 23	21 05
	21	133	26.3	..	47.3	147	10.4	2.4	22	45.9	0.5	61.1	52	20 09	20 54	21 58	18 05	19 15	20 12	20 56
	22	148	26.3		46.9	161	31.8	2.4	22	45.4	0.8	61.1	50	20 00	20 41	21 38	17 55	19 05	20 03	20 48
	23	163	26.2		46.4	175	53.2	2.4	22	44.6	0.8	61.1	45	19 41	20 16	21 02	17 35	18 44	19 43	20 31
20	00	178	26.2	N20	46.0	190	14.6	2.5	N22	43.8	1.1	61.1	N 40	19 26	19 57	20 36	17 18	18 26	19 26	20 17
	01	193	26.2		45.5	204	36.1	2.4	22	42.7	1.3	61.1	35	19 12	19 41	20 16	17 04	18 11	19 12	20 06
	02	208	26.1		45.0	218	57.5	2.5	22	41.4	1.4	61.1	30	19 01	19 28	20 00	16 52	17 59	19 00	19 55
	03	223	26.1	..	44.6	233	19.0	2.5	22	40.0	1.6	61.1	20	18 42	19 06	19 34	16 31	17 37	18 40	19 37
	04	238	26.0		44.1	247	40.5	2.5	22	38.4	1.7	61.1	N 10	18 25	18 48	19 14	16 13	17 18	18 21	19 21
	05	253	26.0		43.6	262	02.0	2.5	22	36.7	2.0	61.1	0	18 10	18 32	18 58	15 56	17 00	18 04	19 06
	06	268	26.0	N20	43.2	276	23.5	2.6	N22	34.7	2.1	61.1	S 10	17 54	18 17	18 43	15 40	16 43	17 47	18 52
	07	283	25.9		42.7	290	45.1	2.6	22	32.6	2.2	61.1	20	17 38	18 02	18 29	15 22	16 23	17 29	18 35
	08	298	25.9		42.2	305	06.7	2.6	22	30.4	2.5	61.1	30	17 20	17 46	18 15	15 01	16 02	17 08	18 17
	09	313	25.8	..	41.8	319	28.3	2.6	22	27.9	2.6	61.1	35	17 09	17 36	18 07	14 49	15 49	16 55	18 06
	10	328	25.8		41.3	333	49.9	2.7	22	25.3	2.8	61.1	40	16 57	17 26	18 00	14 35	15 34	16 41	17 54
	11	343	25.8		40.9	348	11.6	2.7	22	22.5	3.0	61.1	45	16 42	17 15	17 51	14 18	15 16	16 24	17 39
	12	358	25.7	N20	40.4	2	33.3	2.8	N22	19.5	3.1	61.1	S 50	16 25	17 01	17 42	13 58	14 54	16 03	17 21
	13	13	25.7		39.9	16	55.1	2.8	22	16.4	3.3	61.1	52	16 16	16 55	17 37	13 49	14 44	15 53	17 12
	14	28	25.7		39.4	31	16.9	2.8	22	13.1	3.5	61.1	54	16 07	16 48	17 33	13 38	14 32	15 42	17 02
	15	43	25.6	..	39.0	45	38.7	2.9	22	09.6	3.6	61.0	56	15 57	16 41	17 28	13 26	14 19	15 29	16 52
	16	58	25.6		38.5	60	00.6	2.9	22	06.0	3.8	61.0								

1982 JULY 21, 22, 23 (WED., THURS., FRI.)

		ARIES		VENUS −3.3		MARS +0.7		JUPITER −1.6		SATURN +1.0		STARS						
G.M.T.		G.H.A.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	G.H.A.	Dec.	Name	S.H.A.	Dec.			
21 W E D N E S D A Y	00	298 26.0	208 01.1	N22 40.8	97 44.7 S	9 21.3	88 56.5 S10	49.8	102 24.8 S	4 10.5	Acamar	315 36.3 S40	22.3					
	01	313 28.4	223 00.3	40.9	112 46.0	21.8	103 58.8	49.9	117 27.1	10.6	Achernar	335 44.2 S57	19.3					
	02	328 30.9	237 59.5	41.0	127 47.2	22.4	119 01.1	50.0	132 29.5	10.6	Acrux	173 36.1 S63	00.3					
	03	343 33.3	252 58.7	41.1	142 48.5	22.9	134 03.4	50.0	147 31.8	10.7	Adhara	255 31.5 S28	56.8					
	04	358 35.8	267 57.9	41.2	157 49.7	23.4	149 05.7	50.1	162 34.1	10.7	Aldebaran	291 16.7 N16	28.4					
	05	13 38.3	282 57.1	41.3	172 51.0	23.9	164 08.0	50.2	177 36.5	10.8								
	06	28 40.7	297 56.3	N22 41.4	187 52.2 S	9 24.5	179 10.3 S10	50.2	192 38.8 S	4 10.8	Alioth	166 41.4 N56	03.7					
	07	43 43.2	312 55.5	41.5	202 53.5	25.0	194 12.6	50.3	207 41.2	10.9	Alkaid	153 17.4 N49	24.4					
	08	58 45.7	327 54.7	41.6	217 54.7	25.5	209 14.9	50.4	222 43.5	11.0	Al Na'ir	28 12.8 S47	02.7					
	09	73 48.1	342 53.9	41.7	232 55.9	26.0	224 17.2	50.4	237 45.9	11.0	Alnilam	276 10.6 S 1	12.7					
	10	88 50.6	357 53.1	41.8	247 57.2	26.6	239 19.6	50.5	252 48.2	11.1	Alphard	218 19.6 S 8	34.8					
	11	103 53.1	12 52.3	41.9	262 58.4	27.1	254 21.9	50.6	267 50.6	11.1								
	12	118 55.5	27 51.5	N22 41.9	277 59.7 S	9 27.6	269 24.2 S10	50.6	282 52.9 S	4 11.2	Alphecca	126 30.8 N26	46.7					
	13	133 58.0	42 50.7	42.0	293 00.9	28.2	284 26.5	50.7	297 55.3	11.3	Alpheratz	358 07.8 N28	59.5					
	14	149 00.4	57 49.9	42.1	308 02.2	28.7	299 28.8	50.8	312 57.6	11.3	Altair	62 30.9 N 8	49.3					
	15	164 02.9	72 49.1	42.2	323 03.4	29.2	314 31.1	50.8	328 00.0	11.4	Ankaa	353 38.7 S42	23.9					
	16	179 05.4	87 48.4	42.3	338 04.6	29.7	329 33.4	50.9	343 02.3	11.4	Antares	112 55.0 S26	23.6					
	17	194 07.8	102 47.6	42.4	353 05.9	30.3	344 35.7	51.0	358 04.6	11.5								
	18	209 10.3	117 46.8	N22 42.5	8 07.1 S	9 30.8	359 38.0 S10	51.1	13 07.0 S	4 11.6	Arcturus	146 17.2 N19	16.6					
	19	224 12.8	132 46.0	42.6	23 08.4	31.3	14 40.3	51.1	28 09.3	11.6	Atria	108 17.7 S69	00.0					
	20	239 15.2	147 45.2	42.6	38 09.6	31.8	29 42.6	51.2	43 11.7	11.7	Avior	234 28.4 S59	27.2					
	21	254 17.7	162 44.4	42.7	53 10.8	32.4	44 44.9	51.3	58 14.0	11.7	Bellatrix	278 57.6 N 6	20.1					
	22	269 20.2	177 43.6	42.8	68 12.1	32.9	59 47.2	51.3	73 16.4	11.8	Betelgeuse	271 27.2 N 7	24.3					
	23	284 22.6	192 42.8	42.9	83 13.3	33.4	74 49.5	51.4	88 18.7	11.9								
22	00	299 25.1	207 42.0	N22 43.0	98 14.6 S	9 34.0	89 51.8 S10	51.5	103 21.1 S	4 11.9	Canopus	264 07.1 S52	41.0					
	01	314 27.6	222 41.2	43.0	113 15.8	34.5	104 54.1	51.5	118 23.4	12.0	Capella	281 09.7 N45	58.7					
	02	329 30.0	237 40.4	43.1	128 17.0	35.0	119 56.4	51.6	133 25.7	12.0	Deneb	49 47.1 N45	13.0					
	03	344 32.5	252 39.6	43.2	143 18.3	35.5	134 58.7	51.7	148 28.1	12.1	Denebola	182 57.9 N14	40.4					
	04	359 34.9	267 38.8	43.3	158 19.5	36.1	150 01.0	51.8	163 30.4	12.2	Diphda	349 19.4 S18	04.9					
	05	14 37.4	282 38.0	43.3	173 20.7	36.6	165 03.3	51.8	178 32.8	12.2								
	06	29 39.9	297 37.2	N22 43.4	188 22.0 S	9 37.1	180 05.6 S10	51.9	193 35.1 S	4 12.3	Dubhe	194 20.9 N61	51.1					
	07	44 42.3	312 36.4	43.5	203 23.2	37.6	195 07.9	52.0	208 37.5	12.3	Elnath	278 42.8 N28	35.5					
	08	59 44.8	327 35.6	43.5	218 24.4	38.2	210 10.2	52.0	223 39.8	12.4	Eltanin	90 56.7 N51	29.6					
	09	74 47.3	342 34.8	43.6	233 25.7	38.7	225 12.5	52.1	238 42.1	12.5	Enif	34 10.0 N 9	47.6					
	10	89 49.7	357 34.0	43.7	248 26.9	39.2	240 14.8	52.2	253 44.5	12.5	Fomalhaut	15 49.7 S29	42.8					
	11	104 52.2	12 33.2	43.7	263 28.1	39.8	255 17.1	52.3	268 46.8	12.6								
	12	119 54.7	27 32.4	N22 43.8	278 29.4 S	9 40.3	270 19.4 S10	52.3	283 49.2 S	4 12.7	Gacrux	172 27.6 S57	01.1					
	13	134 57.1	42 31.6	43.9	293 30.6	40.8	285 21.7	52.4	298 51.5	12.7	Gienah	176 16.8 S17	26.6					
	14	149 59.6	57 30.8	43.9	308 31.8	41.3	300 24.0	52.5	313 53.9	12.8	Hadar	149 21.5 S60	17.5					
	15	165 02.1	72 30.0	44.0	323 33.1	41.9	315 26.3	52.5	328 56.2	12.8	Hamal	328 27.5 N23	22.7					
	16	180 04.5	87 29.2	44.1	338 34.3	42.4	330 28.6	52.6	343 58.5	12.9	Kaus Aust.	84 14.7 S34	23.6					
	17	195 07.0	102 28.4	44.1	353 35.5	42.9	345 30.9	52.7	359 00.9	13.0								
	18	210 09.4	117 27.6	N22 44.2	8 36.8 S	9 43.5	0 33.2 S10	52.8	14 03.2 S	4 13.0	Kochab	137 18.6 N74	14.0					
	19	225 11.9	132 26.8	44.2	23 38.0	44.0	15 35.5	52.8	29 05.6	13.1	Markab	14 01.6 N15	06.6					
	20	240 14.4	147 26.0	44.3	38 39.2	44.5	30 37.8	52.9	44 07.9	13.1	Menkar	314 39.9 N 4	01.3					
	21	255 16.8	162 25.2	44.3	53 40.4	45.0	45 40.1	53.0	59 10.3	13.2	Menkent	148 35.5 S36	17.1					
	22	270 19.3	177 24.4	44.4	68 41.7	45.6	60 42.4	53.1	74 12.6	13.3	Miaplacidus	221 45.6 S69	38.7					
	23	285 21.8	192 23.6	44.5	83 42.9	46.1	75 44.7	53.1	89 14.9	13.3								
23	00	300 24.2	207 22.8	N22 44.5	98 44.1 S	9 46.6	90 47.0 S10	53.2	104 17.3 S	4 13.4	Mirfak	309 14.5 N49	47.7					
	01	315 26.7	222 22.0	44.6	113 45.3	47.2	105 49.2	53.3	119 19.6	13.4	Nunki	76 27.2 S26	19.1					
	02	330 29.2	237 21.2	44.6	128 46.6	47.7	120 51.5	53.3	134 22.0	13.5	Peacock	53 55.7 S56	47.5					
	03	345 31.6	252 20.4	44.7	143 47.8	48.2	135 53.8	53.4	149 24.3	13.6	Pollux	243 56.9 N28	04.2					
	04	0 34.1	267 19.6	44.7	158 49.0	48.7	150 56.1	53.5	164 26.6	13.6	Procyon	245 24.8 N 5	16.3					
	05	15 36.5	282 18.8	44.7	173 50.2	49.3	165 58.4	53.6	179 29.0	13.7								
	06	30 39.0	297 18.0	N22 44.8	188 51.5 S	9 49.8	181 00.7 S10	53.6	194 31.3 S	4 13.8	Rasalhague	96 28.1 N12	34.5					
	07	45 41.5	312 17.2	44.8	203 52.7	50.3	196 03.0	53.7	209 33.7	13.8	Regulus	208 08.9 N12	03.4					
	08	60 43.9	327 16.4	44.9	218 53.9	50.9	211 05.3	53.8	224 36.0	13.9	Rigel	281 35.0 S 8	13.2					
	09	75 46.4	342 15.6	44.9	233 55.1	51.4	226 07.6	53.9	239 38.3	13.9	Rigil Kent.	140 24.0 S60	45.9					
	10	90 48.9	357 14.8	45.0	248 56.4	51.9	241 09.9	53.9	254 40.7	14.0	Sabik	102 39.4 S15	42.2					
	11	105 51.3	12 14.0	45.0	263 57.6	52.5	256 12.2	54.0	269 43.0	14.1								
	12	120 53.8	27 13.2	N22 45.0	278 58.8 S	9 53.0	271 14.5 S10	54.1	284 45.4 S	4 14.1	Schedar	350 07.4 N56	26.2					
	13	135 56.3	42 12.4	45.1	294 00.0	53.5	286 16.8	54.1	299 47.7	14.2	Shaula	96 53.6 S37	05.5					
	14	150 58.7	57 11.6	45.1	309 01.3	54.0	301 19.1	54.2	314 50.0	14.3	Sirius	258 54.9 S16	41.4					
	15	166 01.2	72 10.8	45.1	324 02.5	54.6	316 21.3	54.3	329 52.4	14.3	Spica	158 56.2 S11	04.1					
	16	181 03.7	87 10.0	45.2	339 03.7	55.1	331 23.6	54.4	344 54.7	14.4	Suhail	223 10.3 S43	21.7					
	17	196 06.1	102 09.2	45.2	354 04.9	55.6	346 25.9	54.4	359 57.0	14.4								
	18	211 08.6	117 08.4	N22 45.2	9 06.1 S	9 56.2	1 28.2 S10	54.5	14 59.4 S	4 14.5	Vega	80 54.5 N38	46.1					
	19	226 11.0	132 07.6	45.3	24 07.3	56.7	16 30.5	54.6	30 01.7	14.6	Zuben'ubi	137 31.5 S15	58.1					
	20	241 13.5	147 06.8	45.3	39 08.6	57.2	31 32.8	54.7	45 04.1	14.6								
	21	256 16.0	162 06.0	45.3	54 09.8	57.8	46 35.1	54.7	60 06.4	14.7								
	22	271 18.4	177 05.2	45.4	69 11.0	58.3	61 37.4	54.8	75 08.7	14.8								
	23	286 20.9	192 04.4	45.4	84 12.2	58.8	76 39.7	54.9	90 11.1	14.8								
Mer. Pass.		4 01.7	v	0.8	d	0.1	v	1.2	d	0.5	v	2.3	d	0.1	v	2.3	d	0.1

1982 JULY 21, 22, 23 (WED., THURS., FRI.)

G.M.T.		SUN		MOON				Lat.	Twilight		Sunrise	Moonrise								
		G.H.A.	Dec.	G.H.A.	<i>V</i>	Dec.	<i>d</i>		H.P.	Naut.		Civil	21	22	23	24				
d	h							°	h	m	h	m	h	m	h	m	h	m		
21	00	178	25.3 N20	34.7	174	57.7	3.4	N21	31.1	5.1	60.9	N 72	□	□	□	□	05 08	07 29		
	01	193	25.3	34.3	189	20.1	3.5	21	26.0	5.3	60.9	N 70	□	□	□	03 08	05 37			
	02	208	25.2	33.8	203	42.6	3.5	21	20.7	5.4	60.9	68	////	////	01 11	01 28	03 52	05 59		
	03	223	25.2	33.3	218	05.1	3.6	21	15.3	5.5	60.9	66	////	////	02 04	02 25	04 22	06 16		
	04	238	25.2	32.8	232	27.7	3.7	21	09.8	5.7	60.9	64	////	////	02 35	02 59	04 43	06 29		
	05	253	25.1	32.3	246	50.4	3.8	21	04.1	5.9	60.9	62	////	01 29	02 58	03 23	05 01	06 41		
	06	268	25.1	N20	31.9	261	13.2	3.8	N20	58.2	6.0	60.8	60	////	02 06	03 17	03 43	05 15	06 51	
	07	283	25.1	31.4	275	36.0	3.9	20	52.2	6.1	60.8	N 58	////	02 32	03 32	03 59	05 28	06 59	08 28	
	08	298	25.0	30.9	289	58.9	4.0	20	46.1	6.3	60.8	56	01 21	02 52	03 45	04 12	05 38	07 06	08 32	
	09	313	25.0	30.4	304	21.9	4.1	20	39.8	6.5	60.8	54	01 56	03 09	03 56	04 24	05 48	07 13	08 36	
	10	328	25.0	30.0	318	45.0	4.1	20	33.3	6.6	60.8	52	02 20	03 22	04 06	04 35	05 56	07 19	08 39	
	11	343	24.9	29.5	333	08.1	4.3	20	26.7	6.7	60.7	50	02 39	03 34	04 15	04 44	06 04	07 24	08 43	
	12	358	24.9	N20	29.0	347	31.4	4.3	N20	20.0	6.9	60.7	45	03 14	03 59	04 34	05 03	06 19	07 36	08 50
	13	1	24.9	28.5	1	54.7	4.4	20	13.1	7.0	60.7	N 40	03 39	04 18	04 49	05 19	06 32	07 45	08 55	
	14	28	24.8	28.0	16	18.1	4.5	20	06.1	7.1	60.7	35	03 58	04 33	05 02	05 32	06 43	07 53	09 00	
	15	43	24.8	27.5	30	41.6	4.6	19	59.0	7.3	60.7	30	04 14	04 46	05 13	05 44	06 53	08 00	09 05	
	16	58	24.8	27.1	45	05.2	4.6	19	51.7	7.4	60.6	20	04 39	05 08	05 32	06 04	07 10	08 13	09 12	
	17	73	24.7	26.6	59	28.8	4.8	19	44.3	7.6	60.6	N 10	04 59	05 25	05 48	06 21	07 24	08 23	09 19	
	18	88	24.7	N20	26.1	73	52.6	4.8	N19	36.7	7.7	60.6	0	05 15	05 41	06 03	06 37	07 37	08 33	09 25
	19	103	24.7	25.6	88	16.4	5.0	19	29.0	7.8	60.6	S 10	05 30	05 55	06 18	06 54	07 51	08 43	09 31	
	20	118	24.6	25.1	102	40.4	5.0	19	21.2	7.9	60.6	20	05 43	06 10	06 34	07 11	08 05	08 54	09 37	
	21	133	24.6	24.6	117	04.4	5.2	19	13.3	8.1	60.5	30	05 57	06 26	06 52	07 30	08 21	09 06	09 45	
	22	148	24.6	24.1	131	28.6	5.2	19	05.2	8.2	60.5	35	06 04	06 35	07 02	07 42	08 31	09 13	09 49	
	23	163	24.6	23.6	145	52.8	5.3	18	57.0	8.3	60.5	40	06 11	06 44	07 14	07 55	08 42	09 21	09 54	
											45	06 19	06 56	07 28	08 11	08 54	09 30	10 00		
22	00	178	24.5 N20	23.2	160	17.1	5.5	N18	48.7	8.4	60.5	S 50	06 29	07 09	07 45	08 30	09 09	09 41	10 06	
	01	193	24.5	22.7	174	41.6	5.5	18	40.3	8.6	60.4	52	06 33	07 15	07 53	08 39	09 17	09 46	10 09	
	02	208	24.5	22.2	189	06.1	5.6	18	31.7	8.7	60.4	54	06 37	07 21	08 02	08 49	09 24	09 51	10 13	
	03	223	24.4	21.7	203	30.7	5.7	18	23.0	8.8	60.4	56	06 42	07 28	08 12	09 00	09 33	09 57	10 16	
	04	238	24.4	21.2	217	55.4	5.8	18	14.2	8.9	60.3	58	06 47	07 36	08 24	09 13	09 43	10 04	10 20	
	05	253	24.4	20.7	232	20.2	5.9	18	05.3	9.0	60.3	S 60	06 52	07 45	08 37	09 28	09 55	10 12	10 25	
	06	268	24.4 N20	20.2	246	45.1	6.1	N17	56.3	9.1	60.3									
	07	283	24.3	19.7	261	10.2	6.1	17	47.2	9.3	60.3									
	08	298	24.3	19.2	275	35.3	6.2	17	37.9	9.3	60.2	Lat.	Sunset	Twilight		Moonset				
	09	313	24.3	18.7	290	00.5	6.3	17	28.6	9.5	60.2			Civil	Naut.	21	22	23	24	
	10	328	24.3	18.2	304	25.8	6.5	17	19.1	9.5	60.2									
	11	343	24.2	17.7	318	51.3	6.5	17	09.6	9.7	60.1									
	12	358	24.2 N20	17.2	333	16.8	6.6	N16	59.9	9.8	60.1	°	h	h	h	h	h	h	h	
	13	1	24.2	16.8	347	42.4	6.7	16	50.1	9.8	60.1	N 72	□	□	□	□	23 51	23 20	22 58	
	14	28	24.1	16.3	2	08.1	6.9	16	40.3	10.0	60.1	N 70	□	□	□	□	23 51	23 20	22 51	
	15	43	24.1	15.8	16	34.0	6.9	16	30.3	10.0	60.0	68	22 55	////	////	23 06	22 57	22 51	22 45	
	16	58	24.1	15.3	30	59.9	7.1	16	20.3	10.2	60.0	66	22 06	////	////	22 36	22 39	22 40	22 40	
	17	73	24.1	14.8	45	26.0	7.1	16	10.1	10.2	60.0	64	21 35	////	////	22 13	22 24	22 31	22 35	
	18	88	24.0 N20	14.3	59	52.1	7.3	N15	59.9	10.3	59.9	62	21 12	22 40	////	21 54	22 12	22 23	22 31	
	19	103	24.0	13.8	74	18.4	7.3	15	49.6	10.5	59.9	60	20 54	22 04	////	21 39	22 01	22 16	22 28	
	20	118	24.0	13.3	88	44.7	7.5	15	39.1	10.5	59.9	N 58	20 39	21 39	////	21 26	21 52	22 10	22 25	
	21	133	24.0	12.8	103	11.2	7.5	15	28.6	10.5	59.8	56	20 26	21 19	22 48	21 15	21 44	22 05	22 22	
	22	148	24.0	12.3	117	37.7	7.7	15	18.1	10.7	59.8	54	20 15	21 03	22 15	21 05	21 36	22 00	22 20	
	23	163	23.9	11.8	132	04.4	7.7	15	07.4	10.8	59.8	52	20 06	20 49	21 51	20 56	21 30	21 56	22 18	
											50	19 57	20 37	21 33	20 48	21 24	21 52	22 16		
											45	19 38	20 13	20 58	20 31	21 11	21 43	22 11		
23	00	178	23.9 N20	11.3	146	31.1	7.9	N14	56.6	10.8	59.7	N 40	19 23	19 55	20 33	20 17	21 00	21 36	22 08	
	01	193	23.9	10.7	160	58.0	8.0	14	45.8	10.9	59.7	35	19 11	19 39	20 14	20 06	20 51	21 30	22 05	
	02	208	23.9	10.2	175	25.0	8.0	14	34.9	11.0	59.7	30	19 00	19 26	19 58	19 55	20 43	21 24	22 02	
	03	223	23.8	09.7	189	52.0	8.2	14	23.9	11.0	59.6	20	18 41	19 05	19 33	19 37	20 29	21 15	21 57	
	04	238	23.8	09.2	204	19.2	8.3	14	12.9	11.2	59.6	N 10	18 25	18 47	19 14	19 21	20 16	21 06	21 52	
	05	253	23.8	08.7	218	46.5	8.4	14	01.7	11.2	59.6	0	18 10	18 32	18 58	19 06	20 05	20 58	21 48	
	06	268	23.8 N20	08.2	233	13.9	8.4	N13	50.5	11.2	59.5	S 10	17 55	18 17	18 43	18 52	19 53	20 50	21 44	
	07	283	23.8	07.7	247	41.3	8.6	13	39.3	11.4	59.5	20	17 39	18 03	18 30	18 35	19 40	20 41	21 39	
	08	298	23.7	07.2	262	08.9	8.7	13	27.9	11.4	59.5	30	17 21	17 47	18 16	18 17	19 25	20 31	21 34	
	09	313	23.7	06.7	276	36.6	8.7	13	16.5	11.5	59.4	35	17 11	17 38	18 09	18 06	19 17	20 26	21 31	
	10	328	23.7	06.2	291	04.3	8.9	13	05.0											

