

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
9 34	+10.8	-21.5	9 39	+10.6	-21.2	9 56	-5.3		1978	m		ft.	m	
9 45	+10.9	-21.4	9 51	+10.7	-21.1	10 08	-5.2		VENUS	2.4	-2.8	8.0	1.0	-1.8
9 56	+11.0	-21.3	10 03	+10.8	-21.0	10 20	-5.1	Jan. 1-July 20		2.6	-2.9	8.6	1.5	-2.2
10 08	+11.1	-21.2	10 15	+10.9	-20.9	10 33	-5.0	0	42 + 0.1	2.8	-3.0	9.2	2.0	-2.5
10 21	+11.2	-21.1	10 27	+11.0	-20.8	10 46	-4.9			3.0	-3.1	9.8	2.5	-2.8
10 34	+11.3	-21.0	10 40	+11.1	-20.7	11 00	-4.8	July 21-Sept. 2		3.2	-3.2	10.5	3.0	-3.0
10 47	+11.4	-20.9	10 54	+11.2	-20.6	11 14	-4.7	0	47 + 0.2	3.4	-3.3	11.2	See table	
11 01	+11.5	-20.8	11 08	+11.3	-20.5	11 29	-4.6			3.6	-3.4	11.9	+	
11 15	+11.6	-20.7	11 23	+11.4	-20.4	11 45	-4.5	Sept. 3-Sept. 29		3.8	-3.5	12.6	m	
11 30	+11.7	-20.6	11 38	+11.5	-20.3	12 01	-4.4	0	46 + 0.3	4.0	-3.6	13.3	20	-7.9
11 46	+11.8	-20.5	12 10	+11.6	-20.2	12 18	-4.4			4.3	-3.7	14.1	22	-8.3
12 02	+11.9	-20.4	12 28	+11.7	-20.1	12 35	-4.3	Sept. 30-Oct. 14		4.5	-3.8	14.9	24	-8.6
12 19	+12.0	-20.3	12 46	+11.9	-19.9	12 54	-4.2	0	41 + 0.4	4.7	-3.9	15.7	26	-9.0
12 37	+12.1	-20.2	13 05	+12.0	-19.8	13 13	-4.1	0	11 + 0.5	5.0	-4.0	16.5	28	-9.3
12 55	+12.2	-20.1	13 24	+12.1	-19.7	13 33	-4.0			5.2	-4.1	17.4		
13 14	+12.3	-20.0	13 45	+12.2	-19.6	13 54	-3.9	Oct. 15-Oct. 22		5.5	-4.2	18.3	30	-9.6
13 35	+12.4	-19.9	14 07	+12.3	-19.5	14 16	-3.8	0	6 + 0.5	5.8	-4.3	19.1	32	-10.0
13 56	+12.5	-19.8	14 30	+12.4	-19.4	14 40	-3.7			6.1	-4.4	20.1	34	-10.3
14 18	+12.6	-19.7	14 54	+12.5	-19.3	15 04	-3.6	Oct. 23-Nov. 25		6.3	-4.5	21.0	36	-10.6
14 42	+12.7	-19.6	15 19	+12.6	-19.2	15 30	-3.5	0	20 + 0.6	6.6	-4.6	22.0	38	-10.8
15 06	+12.8	-19.5	15 46	+12.7	-19.1	15 57	-3.4		31 + 0.7	6.9	-4.7	22.9		
15 32	+12.9	-19.4	16 14	+12.8	-19.0	16 26	-3.3	Nov. 26-Dec. 3		7.2	-4.8	23.9	40	-11.1
15 59	+13.0	-19.3	16 44	+12.9	-18.9	16 56	-3.2	0	6 + 0.6	7.5	-4.9	24.9	42	-11.4
16 28	+13.1	-19.2	17 15	+13.0	-18.8	17 28	-3.1			7.9	-5.0	26.0	44	-11.7
16 59	+13.2	-19.1	17 48	+13.1	-18.7	18 02	-3.0	Oct. 4-Dec. 19		8.2	-5.1	27.1	46	-11.9
17 32	+13.3	-19.0	18 24	+13.2	-18.6	18 38	-2.9	0	12 + 0.7	8.5	-5.2	28.1	48	-12.2
18 06	+13.4	-18.9	19 01	+13.3	-18.5	19 17	-2.8		22 + 0.8	8.8	-5.3	29.2	ft.	
18 42	+13.5	-18.8	19 42	+13.4	-18.4	19 58	-2.7	Nov. 26-Dec. 3		9.2	-5.4	30.4	2	-1.4
19 21	+13.6	-18.7	20 25	+13.5	-18.3	20 42	-2.6	0	6 + 0.5	9.5	-5.5	31.5	4	-1.9
20 03	+13.7	-18.6	21 11	+13.6	-18.2	21 28	-2.5		20 + 0.6	9.9	-5.6	32.7	6	-2.4
20 48	+13.8	-18.5	22 00	+13.7	-18.1	22 19	-2.4	Dec. 4-Dec. 19		10.3	-5.7	33.9	8	-2.7
21 35	+13.9	-18.4	22 54	+13.8	-18.0	23 13	-2.3	0	31 + 0.7	10.6	-5.8	35.1	10	-3.1
22 26	+14.0	-18.3	23 51	+13.9	-17.9	24 11	-2.2			11.0	-5.9	36.3	See table	
23 22	+14.1	-18.2	24 53	+14.0	-17.8	25 14	-2.1	Dec. 20-Dec. 31		11.4	-6.0	37.6	+	
24 21	+14.2	-18.1	26 00	+14.1	-17.7	26 22	-2.0	0	11 + 0.4	11.8	-6.1	38.9	ft.	
25 26	+14.3	-18.0	27 13	+14.2	-17.6	27 36	-1.9		41 + 0.5	12.2	-6.2	40.1	12	-6.2
26 36	+14.4	-17.9	28 33	+14.3	-17.5	28 56	-1.8	Dec. 20-Dec. 31		12.6	-6.3	41.5	14	-6.3
27 52	+14.5	-17.8	30 00	+14.4	-17.4	30 24	-1.7	0	46 + 0.3	13.0	-6.4	42.8	16	-6.4
29 15	+14.6	-17.7	31 35	+14.5	-17.3	32 00	-1.6			13.4	-6.5	44.2	18	-6.5
30 46	+14.7	-17.6	33 20	+14.6	-17.2	33 45	-1.5	Jan. 1-Mar. 22		13.8	-6.6	45.5	20	-6.6
32 26	+14.8	-17.5	35 17	+14.7	-17.1	35 40	-1.4	0	41 + 0.2	14.2	-6.7	46.9	22	-6.7
34 17	+14.9	-17.4	37 26	+14.8	-17.0	37 48	-1.3		75 + 0.1	14.7	-6.8	48.4	24	-6.8
36 20	+15.0	-17.3	39 50	+14.9	-16.9	40 08	-1.2	Mar. 23-Dec. 31		15.1	-6.9	49.8	26	-6.9
38 36	+15.1	-17.2	42 31	+15.0	-16.8	42 44	-1.1	0	60 + 0.1	15.5	-7.0	51.3	28	-7.0
41 08	+15.2	-17.1	45 31	+15.1	-16.7	45 36	-1.0			16.0	-7.1	52.8	30	-7.1
43 59	+15.3	-17.0	48 55	+15.2	-16.6	48 47	-0.9			16.5	-7.2	54.3	32	-7.2
47 10	+15.4	-16.9	52 44	+15.3	-16.5	52 18	-0.8			16.9	-7.3	55.8	34	-7.3
50 46	+15.5	-16.8	57 02	+15.4	-16.4	56 11	-0.7			17.4	-7.4	57.4	36	-7.4
54 49	+15.6	-16.7	61 51	+15.5	-16.3	60 28	-0.6			17.9	-7.5	58.9	38	-7.5
59 23	+15.7	-16.6	67 17	+15.6	-16.2	65 08	-0.5			18.4	-7.6	60.5	40	-7.6
64 30	+15.8	-16.5	73 16	+15.7	-16.1	70 11	-0.4			18.8	-7.7	62.1	42	-7.7
70 12	+15.9	-16.4	79 43	+15.8	-16.0	75 34	-0.3			19.3	-7.8	63.8	44	-7.8
76 26	+16.0	-16.3	86 32	+15.9	-15.9	81 13	-0.2			19.8	-7.9	65.4	46	-7.9
83 05	+16.1	-16.2	90 00			87 03	-0.1			20.4	-8.0	67.1	48	-8.0
90 00						90 00	0.0			20.9	-8.1	68.8	50	-8.1
										21.4	-8.2	70.5	52	-8.2

App. Alt. = Apparent altitude = Sextant altitude corrected for index error and dip.
 For daylight observations of Venus, see page 260.

Separate tables are given of the second correction for the Sun, for stars and planets (on pages A2 and A3), and for the Moon (on pages xxxiv and xxxv). For the Sun, values are given for both lower and upper limbs, for two periods of the year. The star tables are used for the planets, but additional corrections (page A2) are required for Venus and Mars. The Moon tables are in two parts: the main correction is a function of apparent altitude only and is tabulated for the lower limb (30' must be subtracted to obtain the correction for the upper limb); the other, which is given for both lower and upper limbs, depends also on the horizontal parallax, which has to be taken from the daily pages.

An additional correction, given on page A4, is required for the change in the refraction, due to variations of pressure and temperature from the adopted standard conditions; it may generally be ignored for altitudes greater than 10°, except possibly in extreme conditions. The correction tables for the Sun, stars, and planets are in two parts; only those for altitudes greater than 10° are reprinted on the bookmark.

14. *Critical tables.* Some of the altitude correction tables are arranged as critical tables. In these an interval of apparent altitude (or height of eye) corresponds to a single value of the correction; no interpolation is required. At a "critical" entry the upper of the two possible values of the correction is to be taken. For example, in the table of dip, a correction of -4'.1 corresponds to all values of the height of eye from 5.3 to 5.5 metres (17.5 to 18.3 feet) inclusive.

15. *Examples.* The following examples illustrate the use of the altitude correction tables; the sextant altitudes given are assumed to be taken on 1978 January 22 with a marine sextant at height 5.4 metres (18 feet), temperature -3°C. and pressure 982 mb., the Moon sights being taken at about 10^h G.M.T.

	SUN lower limb	SUN upper limb	MOON lower limb	MOON upper limb	VENUS	Polaris
Sextant altitude	21 19.7	3 20.2	33 27.6	26 06.7	4 32.6	49 36.5
Dip, height 5.4 metres (18 feet)	-4.1	-4.1	-4.1	-4.1	-4.1	-4.1
Main correction	+13.8	-29.6	+57.4	+60.5	-10.8	-0.8
-30' for upper limb (Moon)	—	—	—	-30.0	—	—
L, U correction for Moon	—	—	+1.0	+1.4	—	—
Additional correction for Venus	—	—	—	—	+0.1	—
Additional refraction correction	-0.1	-0.3	0.0	-0.1	-0.3	0.0
Corrected sextant altitude	21 29.3	2 46.2	34 21.9	26 34.4	4 17.5	49 31.6

The main corrections have been taken out with apparent altitude (sextant altitude corrected for dip) as argument, interpolating where possible. These refinements are rarely necessary.

16. *Basis of the corrections.* The table for the dip of the sea horizon is based on the formula:
 Correction for dip = -1'.76√(height of eye in metres) = -0'.97√(height of eye in feet)

The mean refraction, given explicitly in the correction table for the stars and planets and incorporated into those for the Sun and Moon, is based on Garfinkel's theory and is for a temperature of 10°C. (50°F.) and a pressure of 1010 mb. (29.83 inches). The additional corrections for variations of temperature and pressure from these adopted means are also based on Garfinkel's theory; there is no significant difference between the various theories to the accuracy given.

The correction table for the Sun includes the effects of semi-diameter and parallax, as well as the mean refraction; no correction for irradiation is included.

The additional corrections for Venus and Mars allow for parallax and phase, and are given by $p \cos H - k \cos \theta$, where H is the altitude, θ the angle at the planet between the vertical and the Sun: p and k are, for Venus, for 1978:

	Jan. 1	July 23	Sept. 10	Oct. 3	Oct. 19	Nov. 30	Dec. 15	Dec. 31
p	0.1	0.2	0.3	0.4	0.5	0.4	0.3	
k	0.0	0.1	0.2	0.3	0.4	0.3	0.2	