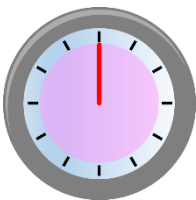
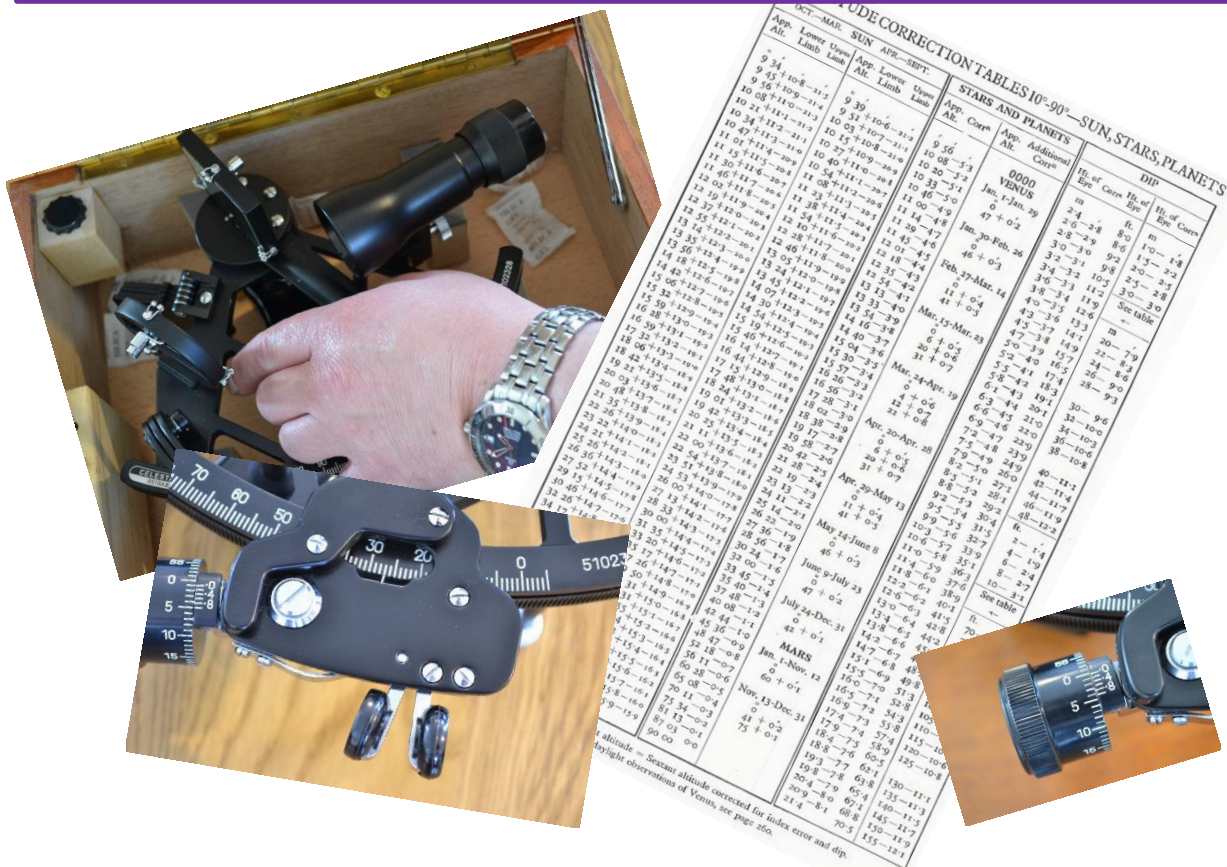


Master (Yachts)

Celestial Navigation

Lesson 1.9

Finding the True Altitude of the Sun, Moon, Planets and Stars



Note

Knowledge of how to apply the corrections to be made to the Sextant Altitude to obtain the True Altitude of a body is essential for conducting any celestial observation.

Lesson 1.9

Finding the True Altitude of the Sun, Moon, Planets and Stars



You **MUST** have a sextant and a copy of a current Nautical Almanac to practice obtaining the True Altitude of any celestial body as detailed in this Lesson. The Nautical Almanac which accompanies this Course must be consulted to follow the worked examples in this Lesson.

Note that the year of the Nautical Almanac is for the fictitious year 0000 - this is shown on the daily pages. This is the Almanac that has been adopted for examination purposes.

YOU NEED TO WORK THROUGH THE FOLLOWING EXAMPLES WITH THE ALTITUDE CORRECTION TABLES A2, A3 AND THE ALTITUDE CORRECTION TABLES FOR THE MOON (which are located at the BACK of the Nautical Almanac).

Sun

The Sun's correction table is found on the first page of the almanac (Tables A2 and A3) and corrects for *mean refraction*, *semi-diameter* and *parallax*. The tables are arranged as critical entry tables as described for the Dip Table. For example, if the apparent altitude was $51^{\circ} 08'$ (LL) the correction will be $+15.5'$ (October to March).

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
0 34	+10.8	-21.5	0 39	+10.6	-21.2	9 56	-5.3	0000		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			10 03			10 20		Jan. 1-Jan. 29		2.6	-2.9	8.6	1.5	-2.2
										2.8		9.2	2.0	-2.5
43 59	+15.2	-17.1	45 31	+15.0	-16.8	48 47	-0.9	0		16.9	-7.2	55.8	115	-10.4
47 10	+15.3	-17.0	48 55	+15.1	-16.7	52 18	-0.8	60 + 0.1		17.4	-7.3	57.4	120	-10.6
50 46	+15.4	-16.9	52 44	+15.2	-16.6	56 11	-0.7			17.9	-7.4	58.9	125	-10.8
54 49	+15.5	-16.8	57 02	+15.3	-16.5	60 28	-0.6	Nov. 13-Dec. 31		18.4	-7.5	60.5		
59 23	+15.6	-16.7	61 51	+15.4	-16.4	65 08	-0.5	0		18.8	-7.6	62.1	130	-11.1
	+15.7	-16.6		+15.5	-16.3		-0.4	41 + 0.2			-7.7			

App. Alt.
51° 08'

App. Alt.
 $51^{\circ} 08'$

Fig. 1 - Critical entry nature of the Altitude Correction Tables (A2 and A3).

Example 1

The Sextant Altitude of the Sun's LL was $48^{\circ} 56.3'$. IE $1.2'$ was on the arc. HE 7.2 m. Date 18th June 0000. Find the True Altitude.

Solution

Sextant Altitude Sun (LL)	$48^{\circ} 56.3'$
IE (On)	$-1.2'$
Observed Altitude Sun (LL)	$48^{\circ} 55.1'$
Dip (HE 7.2 m)	$-4.7'$
Apparent Altitude Sun (LL)	$48^{\circ} 50.4'$
Total Correction	$+15.1'$
<u>TRUE ALTITUDE Sun</u>	<u>$49^{\circ} 05.5'$</u>

Stars and planets

The correction table is found on the first page of the Nautical Almanac (Tables A2 and A3). Again it is a critical entry table. Note that additional corrections for planets are given for some dates and some apparent altitudes. These correct for parallax when its value can no longer be considered negligible.

Example 2

The Sextant Altitude of the star PROCYON was $57^{\circ} 18.9'$. IE $1.0'$ was off the arc. HE 6.5 m. Find the True Altitude.

Solution

Sextant Altitude *	$57^{\circ} 18.9'$
IE (Off)	$+1.0'$
Observed Altitude *	$57^{\circ} 19.9'$
Dip (HE 6.5 m)	$-4.5'$
Apparent Altitude *	$57^{\circ} 15.4'$
Total Correction	$-0.6'$
<u>TRUE ALTITUDE *</u>	<u>$57^{\circ} 14.8'$</u>

Example 3

The Sextant Altitude of Venus on 21st December 0000 was $38^{\circ} 06.5'$. IE $0.5'$ was off the arc. HE 5.0 m. Find the True Altitude.

Solution

Sextant Altitude Venus	$38^{\circ} 06.5'$
IE (Off)	$+0.5'$
Observed Altitude Venus	$38^{\circ} 07.0'$
Dip (HE 5.0 m)	$-3.9'$
Apparent Altitude Venus	$38^{\circ} 03.1'$
Total correction	$-1.2'$
	$38^{\circ} 01.9'$
Additional Correction	$+0.1'$
<u>TRUE ALTITUDE Venus</u>	<u>$38^{\circ} 02.0'$</u>

Moon's Total Correction table

This is found on the last pages of the Nautical Almanac and is in two parts. The main correction in the upper part of the table corrects for *refraction*, *semi-diameter* and *parallax*, using mean values. See copy in Appendix 2.

Interpolation is required to obtain the accuracy to within one decimal place.

The second correction allows for *variations in the semi-diameter and parallax*, both of which depend upon the horizontal parallax. Two values are given, one for LL and one for UL observations.

All corrections for the Moon are additive to the apparent altitude but those for the UL observations have had 30' added to them to maintain them positive.

This 30' must therefore be subtracted from the final result.

Example 4

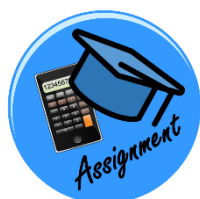
The Sextant Altitude of the Moon's LL was $16^{\circ} 58.2'$. IE 0.8' was off the arc. HE 5.4 m. UT 1400 on 26th June 0000. Find the True Altitude.

Solution

Sextant Altitude Moon (LL)	$16^{\circ} 58.2'$
IE (Off)	$+0.8'$
Observed Altitude Moon (LL)	$16^{\circ} 59.0'$
Dip (HE 5.4 m)	$-4.1'$
Apparent Altitude Moon (LL)	$16^{\circ} 54.9'$
1 st correction	$+62.7'$
	$17^{\circ} 57.6'$
2 nd correction (HP 59.6')	$+7.5'$
	$18^{\circ} 05.1'$
-30' (Not applicable)	Nil
TRUE ALTITUDE Moon	$18^{\circ} 05.1'$



Complete the Tutorial Exercise that accompanies this Lesson.



YOU MUST NOW COMPLETE THE TUTOR MARKED ASSIGNMENT FOR MODULE 1.

Appendix 1

Altitude correction Tables A2 and A3 for the Sun, planets and Stars

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	0000	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-Jan. 29	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	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	47 + 0.2	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	Jan. 30-Feb. 26	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	3.4	-3.3	11.2	See table	
11 01	+11.5	-20.8	11 08	+11.3	-20.5	11 29	-4.6	46 + 0.3	3.6	-3.4	11.9	←	
11 15	+11.6	-20.7	11 23	+11.4	-20.4	11 45	-4.5	Feb. 27-Mar. 14	3.8	-3.5	12.6	m	
11 30	+11.7	-20.6	11 38	+11.5	-20.3	12 01	-4.4	0	4.0	-3.6	13.3	20	-7.9
11 46	+11.8	-20.5	11 54	+11.6	-20.2	12 18	-4.3	11 + 0.4	4.3	-3.7	14.1	22	-8.3
12 02	+11.9	-20.4	12 10	+11.7	-20.1	12 35	-4.2	41 + 0.5	4.5	-3.8	14.9	24	-8.6
12 19	+12.0	-20.3	12 28	+11.8	-20.0	12 54	-4.1	Mar. 15-Mar. 23	4.7	-3.9	15.7	26	-9.0
12 37	+12.1	-20.2	12 46	+11.9	-19.9	13 13	-4.0	0	5.0	-4.0	16.5	28	-9.3
12 55	+12.2	-20.1	13 05	+12.0	-19.8	13 33	-3.9	6 + 0.5	5.2	-4.1	17.4		
13 14	+12.3	-20.0	13 24	+12.1	-19.7	13 54	-3.8	20 + 0.6	5.5	-4.2	18.3	30	-9.6
13 35	+12.4	-19.9	13 45	+12.2	-19.6	14 16	-3.7	31 + 0.7	5.8	-4.3	19.1	32	-10.0
13 56	+12.5	-19.8	14 07	+12.3	-19.5	14 40	-3.6	Mar. 24-Apr. 19	6.1	-4.4	20.1	34	-10.3
14 18	+12.6	-19.7	14 30	+12.4	-19.4	15 04	-3.5	0	6.3	-4.5	21.0	36	-10.6
14 42	+12.7	-19.6	14 54	+12.5	-19.3	15 30	-3.4	4 + 0.6	6.6	-4.6	22.0	38	-10.8
15 06	+12.8	-19.5	15 19	+12.6	-19.2	15 57	-3.3	12 + 0.7	6.9	-4.7	22.9		
15 32	+12.9	-19.4	15 46	+12.7	-19.1	16 26	-3.2	22 + 0.8	7.2	-4.8	23.9	40	-11.1
15 59	+13.0	-19.3	16 14	+12.8	-19.0	16 56	-3.1	Apr. 20-Apr. 28	7.5	-4.9	24.9	42	-11.4
16 28	+13.1	-19.2	16 44	+12.9	-18.9	17 28	-3.0	0	7.9	-5.0	26.0	44	-11.7
16 59	+13.2	-19.1	17 15	+13.0	-18.8	18 02	-2.9	6 + 0.5	8.2	-5.1	27.1	46	-11.9
17 32	+13.3	-19.0	17 48	+13.1	-18.7	18 38	-2.8	20 + 0.6	8.5	-5.2	28.1	48	-12.2
18 06	+13.4	-18.9	18 24	+13.2	-18.6	19 17	-2.7	31 + 0.7	8.8	-5.3	29.2	ft.	
18 42	+13.5	-18.8	19 01	+13.3	-18.5	19 58	-2.6	Apr. 29-May 13	9.2	-5.4	30.4	2	-1.4
19 21	+13.6	-18.7	19 42	+13.4	-18.4	20 42	-2.5	0	9.5	-5.5	31.5	4	-1.9
20 03	+13.7	-18.6	20 25	+13.5	-18.3	21 28	-2.4	11 + 0.4	9.9	-5.6	32.7	6	-2.4
20 48	+13.8	-18.5	21 11	+13.6	-18.2	22 19	-2.3	41 + 0.5	10.3	-5.7	33.9	8	-2.7
21 35	+13.9	-18.4	22 00	+13.7	-18.1	23 13	-2.2	May 14-June 8	10.6	-5.8	35.1	10	-3.1
22 26	+14.0	-18.3	22 54	+13.8	-18.0	24 11	-2.1	0	11.0	-5.9	36.3	See table	
23 22	+14.1	-18.2	23 51	+13.9	-17.9	25 14	-2.0	46 + 0.3	11.4	-6.0	37.6	←	
24 21	+14.2	-18.1	24 53	+14.0	-17.8	26 22	-1.9	June 9-July 23	11.8	-6.1	38.9	ft.	
25 26	+14.3	-18.0	26 00	+14.1	-17.7	27 36	-1.8	0	12.2	-6.2	40.1	70	-8.1
26 36	+14.4	-17.9	27 13	+14.2	-17.6	28 56	-1.7	47 + 0.2	12.6	-6.3	41.5	75	-8.4
27 52	+14.5	-17.8	28 33	+14.3	-17.5	30 24	-1.6	July 24-Dec. 31	13.0	-6.4	42.8	80	-8.7
29 15	+14.6	-17.7	30 00	+14.4	-17.4	32 00	-1.5	0	13.4	-6.5	44.2	85	-8.9
30 46	+14.7	-17.6	31 35	+14.5	-17.3	33 45	-1.4	42 + 0.1	13.8	-6.6	45.5	90	-9.2
32 26	+14.8	-17.5	33 20	+14.6	-17.2	35 40	-1.3	Nov. 13-Dec. 31	14.2	-6.7	46.9	95	-9.5
34 17	+14.9	-17.4	35 17	+14.7	-17.1	37 48	-1.2	0	14.7	-6.8	48.4		
36 20	+15.0	-17.3	37 26	+14.8	-17.0	40 08	-1.1	41 + 0.2	15.1	-6.9	49.8	100	-9.7
38 36	+15.1	-17.2	39 50	+14.9	-16.9	42 44	-1.0	75 + 0.1	15.5	-7.0	51.3	105	-9.9
41 08	+15.2	-17.1	42 31	+15.0	-16.8	45 36	-0.9	Jan. 1-Nov. 12	16.0	-7.1	52.8	110	-10.2
43 59	+15.3	-17.0	45 31	+15.1	-16.7	48 47	-0.8	0	16.5	-7.2	54.3	115	-10.4
47 10	+15.4	-16.9	48 55	+15.2	-16.6	52 18	-0.7	60 + 0.1	16.9	-7.3	55.8	120	-10.6
50 46	+15.5	-16.8	52 44	+15.3	-16.5	56 11	-0.6	Nov. 13-Dec. 31	17.4	-7.4	57.4	125	-10.8
54 49	+15.6	-16.7	57 02	+15.4	-16.4	60 28	-0.5	0	17.9	-7.5	58.9		
59 23	+15.7	-16.6	61 51	+15.5	-16.3	65 08	-0.4	41 + 0.2	18.4	-7.6	60.5	130	-11.1
64 30	+15.8	-16.5	67 17	+15.6	-16.2	70 11	-0.3	75 + 0.1	18.8	-7.7	62.1	135	-11.3
70 12	+15.9	-16.4	73 16	+15.7	-16.1	75 34	-0.2		19.3	-7.8	63.8	140	-11.5
76 26	+16.0	-16.3	79 43	+15.8	-16.0	81 13	-0.1		19.8	-7.9	65.4	145	-11.7
83 05	+16.1	-16.2	86 32	+15.9	-15.9	87 03	0.0		20.4	-8.0	67.1	150	-11.9
90 00			90 00			90 00			20.9	-8.1	68.8	155	-12.1
									21.4		70.5		

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

For daylight observations of Venus, see page 260.

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

App. Alt.	OCT.-MAR. SUN		APR.-SEPT.		STARS PLANETS
	Lower Limb	Upper Limb	Lower Limb	Upper Limb	
0 00	-18.2	-50.5	-18.4	-50.2	-34.5
03	17.5	49.8	17.8	49.6	33.8
06	16.9	49.2	17.1	48.9	33.2
09	16.3	48.6	16.5	48.3	32.6
12	15.7	48.0	15.9	47.7	32.0
15	15.1	47.4	15.3	47.1	31.4
0 18	-14.5	-46.8	-14.8	-46.6	-30.8
21	14.0	46.3	14.2	46.0	30.3
24	13.5	45.8	13.7	45.5	29.8
27	12.9	45.2	13.2	45.0	29.2
30	12.4	44.7	12.7	44.5	28.7
33	11.9	44.2	12.2	44.0	28.2
0 36	-11.5	-43.8	-11.7	-43.5	-27.8
39	11.0	43.3	11.2	43.0	27.3
42	10.5	42.8	10.8	42.6	26.8
45	10.1	42.4	10.3	42.1	26.4
48	9.6	41.9	9.9	41.7	25.9
51	9.2	41.5	9.5	41.3	25.5
0 54	- 8.8	-41.1	- 9.1	-40.9	-25.1
0 57	8.4	40.7	8.7	40.5	24.7
1 00	8.0	40.3	8.3	40.1	24.3
03	7.7	40.0	7.9	39.7	24.0
06	7.3	39.6	7.5	39.3	23.6
09	6.9	39.2	7.2	39.0	23.2
1 12	- 6.6	-38.9	- 6.8	-38.6	-22.9
15	6.2	38.5	6.5	38.3	22.5
18	5.9	38.2	6.2	38.0	22.2
21	5.6	37.9	5.8	37.6	21.9
24	5.3	37.6	5.5	37.3	21.6
27	4.9	37.2	5.2	37.0	21.2
1 30	- 4.6	-36.9	- 4.9	-36.7	-20.9
35	4.2	36.5	4.4	36.2	20.5
40	3.7	36.0	4.0	35.8	20.0
45	3.2	35.5	3.5	35.3	19.5
50	2.8	35.1	3.1	34.9	19.1
1 55	2.4	34.7	2.6	34.4	18.7
2 00	- 2.0	-34.3	- 2.2	-34.0	-18.3
05	1.6	33.9	1.8	33.6	17.9
10	1.2	33.5	1.5	33.3	17.5
15	0.9	33.2	1.1	32.9	17.2
20	0.5	32.8	0.8	32.6	16.8
25	- 0.2	32.5	0.4	32.2	16.5
2 30	+ 0.2	-32.1	- 0.1	-31.9	-16.1
35	0.5	31.8	+ 0.2	31.6	15.8
40	0.8	31.5	0.5	31.3	15.5
45	1.1	31.2	0.8	31.0	15.2
50	1.4	30.9	1.1	30.7	14.9
2 55	1.6	30.7	1.4	30.4	14.7
3 00	+ 1.9	-30.4	+ 1.7	-30.1	-14.4
05	2.2	30.1	1.9	29.9	14.1
10	2.4	29.9	2.1	29.7	13.9
15	2.6	29.7	2.4	29.4	13.7
20	2.9	29.4	2.6	29.2	13.4
25	3.1	29.2	2.9	28.9	13.2
3 30	+ 3.3	-29.0	+ 3.1	-28.7	-13.0

App. Alt.	OCT.-MAR. SUN		APR.-SEPT.		STARS PLANETS
	Lower Limb	Upper Limb	Lower Limb	Upper Limb	
3 30	+ 3.3	-29.0	+ 3.1	-28.7	-13.0
35	3.6	28.7	3.3	28.5	12.7
40	3.8	28.5	3.5	28.3	12.5
45	4.0	28.3	3.7	28.1	12.3
50	4.2	28.1	3.9	27.9	12.1
3 55	4.4	27.9	4.1	27.7	11.9
4 00	+ 4.5	-27.8	+ 4.3	-27.5	-11.8
05	4.7	27.6	4.5	27.3	11.6
10	4.9	27.4	4.6	27.2	11.4
15	5.1	27.2	4.8	27.0	11.2
20	5.2	27.1	5.0	26.8	11.1
25	5.4	26.9	5.1	26.7	10.9
4 30	+ 5.6	-26.7	+ 5.3	-26.5	-10.7
35	5.7	26.6	5.5	26.3	10.6
40	5.9	26.4	5.6	26.2	10.4
45	6.0	26.3	5.8	26.0	10.3
50	6.2	26.1	5.9	25.9	10.1
4 55	6.3	26.0	6.0	25.8	10.0
5 00	+ 6.4	-25.9	+ 6.2	-25.6	- 9.9
05	6.6	25.7	6.3	25.5	9.7
10	6.7	25.6	6.4	25.4	9.6
15	6.8	25.5	6.6	25.2	9.5
20	6.9	25.4	6.7	25.1	9.4
25	7.1	25.2	6.8	25.0	9.2
5 30	+ 7.2	-25.1	+ 6.9	-24.9	- 9.1
35	7.3	25.0	7.0	24.8	9.0
40	7.4	24.9	7.2	24.6	8.9
45	7.5	24.8	7.3	24.5	8.8
50	7.6	24.7	7.4	24.4	8.7
5 55	7.7	24.6	7.5	24.3	8.6
6 00	+ 7.8	-24.5	+ 7.6	-24.2	- 8.5
10	8.0	24.3	7.8	24.0	8.3
20	8.2	24.1	8.0	23.8	8.1
30	8.4	23.9	8.1	23.7	7.9
40	8.6	23.7	8.3	23.5	7.7
6 50	8.7	23.6	8.5	23.3	7.6
7 00	+ 8.9	-23.4	+ 8.6	-23.2	- 7.4
10	9.1	23.2	8.8	23.0	7.2
20	9.2	23.1	9.0	22.8	7.1
30	9.3	23.0	9.1	22.7	7.0
40	9.5	22.8	9.2	22.6	6.8
7 50	9.6	22.7	9.4	22.4	6.7
8 00	+ 9.7	-22.6	+ 9.5	-22.3	- 6.6
10	9.9	22.4	9.6	22.2	6.4
20	10.0	22.3	9.7	22.1	6.3
30	10.1	22.2	9.8	22.0	6.2
40	10.2	22.1	10.0	21.8	6.1
8 50	10.3	22.0	10.1	21.7	6.0
9 00	+ 10.4	-21.9	+ 10.2	-21.6	- 5.9
10	10.5	21.8	10.3	21.5	5.8
20	10.6	21.7	10.4	21.4	5.7
30	10.7	21.6	10.5	21.3	5.6
40	10.8	21.5	10.6	21.2	5.5
9 50	10.9	21.4	10.6	21.2	5.4
10 00	+ 11.0	-21.3	+ 10.7	-21.1	- 5.3

Additional corrections for temperature and pressure are given on the following page.
For bubble sextant observations ignore dip and use the star corrections for Sun, planets, and stars.

Appendix 2

Altitude correction for the Moon

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 ^a	Corr ^a	Corr ^a	Corr ^a	Corr ^a	Corr ^a	Corr ^a	
00	33.8	58.2	62.1	62.8	62.2	60.8	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	44.0	59.5	62.4	62.7	61.9	60.5	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	50.0	60.5	62.6	62.7	61.7	60.1	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	53.8	61.2	62.7	62.5	61.5	59.7	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	56.4	61.7	62.8	62.4	61.2	59.3	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 ^a	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 5.2	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