

KG

11366

11020

CLXVIII

168

Plate	Date	Page
11891	Dec. 7. '16	1
11909	" 8 '16	11
11910	" " "	21











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Star Measures

1 19 2 6 2 1 7 3 3 1  
 128 10 3 2 0 22 16 2 8 0  
 19.1 24 8 0  
 6 2 7 3 3 1  
128940 128949

18860 17812  
 17880 880400  
 80 96  
 60 12  
190980 190988

2 18809 18864  
 22 1837071 9298  
 28.6 72 98  
 09 66  
220438 220432

18175 18160  
 11948 14380  
 48 80  
 77 60  
286228 286220

3 18308 16478  
 33.6 12353 12442 41  
 11.1 53 40  
 10 78  
335956 335963

18100 17682  
 17069 870813  
 67 68 18  
 06 82  
111033 111081

Mean

1  
 24  
 11.3

16210 19483  
 13513 12168  
 13 68  
 10 83  
152697 152685

2 16452 16108  
 23.2 14502 8058  
 16 02 58  
 52 08  
231950 231950

3 16352 16586  
 22.9 7041 1590908  
 17.0 40 07  
 52 86  
229312 229322

16352 17630  
 18040 12200  
 40  
 58 20  
168012







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## Star Measures

1

1	19.262	17331
128	10320.2	16280
19.1	24	80
	62	31
	<u>128940</u>	<u>128949</u>

18860	17812
17880	880400
80	96
60	12
<u>190980</u>	<u>190988</u>

2	18809	18864
22	18370.1	9298
28.6	72	98
	09	66
	<u>220438</u>	<u>220432</u>

18775	17160
11948	14380
48	80
77	60
<u>286228</u>	<u>286220</u>

3	18308	16478
136	12353	12442.41
11.1	53	40
	10	78
	<u>335956</u>	<u>335968</u>

18100	17682
17069	8708.68
67	18
06	82
<u>111033</u>	<u>111088</u>

## Mean

1  
24  
11.3

16210	19483
13513	12168
13	68
10	83
<u>152897</u>	<u>152885</u>

2	16452	16108
23.2	14502	8058
16	02	58
	52	08
	<u>231950</u>	<u>231950</u>

3	16352	16586
229	7041	15904.08
17.01	41	07
	52	86
	<u>229312</u>	<u>229322</u>

16352	17620
18141	2210
40	
58	20
<u>164212</u>	







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Moon Measures

2

4	17308	16028
229	7990	15350
17	90	5257
	00	30
	<u>229311</u>	<u>229323</u>

5  
23.0  
17.3

17868	17192
1309093	1195455
96	56
68	92
<u>174775</u>	<u>174763</u>

6	16533	16040
23.2	14197	8300
18.0	97	00
	33	40
	<u>23.2336</u>	<u>23.2340</u>

7  
24  
187

17940	18538
11210	15265
10	57
40	38
<u>186730</u>	<u>186728</u>

8  
248  
188

16390	17235
778788	15844
89	44
90	315
<u>18.8602</u>	<u>18.8609</u>







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Main Measures

2

4	17308	16028
229	7990	15350
17	90	5257
	00	30
	<u>229311</u>	<u>229323</u>

5  
23.1  
7.3

178.68	17192
1309093	119545
96	56
68	92
<u>174775</u>	<u>174763</u>

6	16533	16040
23.2	141.97	8300
18.0	97	00
	29	40
	<u>232336</u>	<u>232340</u>

I  
24  
187

17940	18538
11310	15265
10	57
40	38
<u>186730</u>	<u>186728</u>

8  
248  
188

16390	17235
7787	15844
89	44
90	315
<u>188602</u>	<u>188609</u>







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Date Dec. 7 16.

Times etc

3

Exp. to Stars	03	53		04	05	
" " Moon	03	59	28.8 <sup>h</sup>	03	59	29.0 <sup>h</sup>
Clock fast		11	58.1 <sup>h</sup>			
			S			
H. Sid June	03	47	30.8 <sup>h</sup>			$\pm 1^h 30^m$
H. Saug	04	44	31.05 <sup>h</sup>			
h. Sid June	08	32	01.85 <sup>h</sup>			
h. Sid June M.N.	17	03	41.67 <sup>h</sup>			
Interval	15	28	20.18 <sup>h</sup>			
Reduction		02	32.09 <sup>h</sup>			
S. M.T	15	25	48.09 <sup>h</sup>	15 <sup>h</sup>	43	00 25 <sup>h</sup>

From Naut Alman.

Moon 15 <sup>h</sup>	03	46	01.22 <sup>h</sup>	+24	00	06.1 <sup>h</sup>
Motion 1 <sup>m</sup>			2.2654 <sup>h</sup>			+5.125 <sup>h</sup>
" 25.8015 <sup>h</sup>			58.45 <sup>h</sup>		02	12.2 <sup>h</sup>
Tabular Place	03	46	59.67 <sup>h</sup>	+24	02	18.3 <sup>h</sup>

Moon's age

12.6

$$934'' = 14.8$$

$$a = -502.3$$

$$+24$$

$$-478.3$$

Parallax	55	38.08 <sup>h</sup>
Semi-diam	15	11.2 <sup>h</sup>
R		911.22 <sup>h</sup>
Aug		14.2 <sup>h</sup>
Syl 4.5		-0.7 <sup>h</sup>
R		924.7 <sup>h</sup>
R		1.9822 <sup>h</sup>
(1+a)R		948 <sup>h</sup>
R		1.8874 <sup>h</sup>
R2		3.5-6.23 <sup>h</sup>







Date Dec. 7 '16.

Times etc

3

Exp to Stars	03	53		04	05	
" Moon	03	59	28.8	03	59	29.0
Clock fast		11	58.1			
			5			
H Sid June	03	47	30.8		$\pm 1^h 30^m$	
H Saug	04	44	31.05			
ls Sid June	08	32	01.85			
ls Sid June MN	17	03	41.67			
Interoral	15	28	20.18			
Reduction	15	02	32.09			
ls M.T	15	25	48.09		15 <sup>h</sup> 43 00 25	

From Naut Alman.

Moon 15 <sup>h</sup>	03	46	01.22	+24	00	06.1
Motion 1 <sup>m</sup>			2.2654			+5.125
" 25.8015			58.45		02	12.2
Tabular Place	03	46	59.67	+24	02	18.3

Moon's age

12.6

$$934'' = 148$$

$$\begin{array}{r} a. -502.3 \\ +24 \\ \hline -478.3 \end{array}$$

Parallax	55	38.08
Semi-diam	15	11.2
R		911.2
Aug		14.2
Dist 413		-0.7
R		924.7
R		19822
(1+a)R		-948
R		18874
R2		35623







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## Plate Constants.

4

X	12.8944	22.0435	33.5960
S	12.2661	21.8845	33.9994
X-S	+ .6283	+ .1590	- .4034

y	19.0984	28.6224	11.1032
n	19.0948	29.0884	10.6761
y-n	+ .0036	- .4660	+ .4271

$$\begin{array}{rcl}
 X-S & +500X & +10.28 \\
 +.6283 + 6447 & = 12730 & +195 \\
 +.1590 + 11022 & = 12612 & +392 \\
 -.4034 + 16798 & = 12764 & +113 \\
 248171 + 12408 & & +173^v
 \end{array}
 \begin{array}{rcl}
 +2.3X -12954 \\
 -12925 + 29 & = & -12954 \\
 +50 & = & 12954 \\
 +77 & = & 12954 \\
 +57^v & = & 24.7855^v
 \end{array}$$

$$\begin{array}{rcl}
 y-n & +500y & -10.4X \\
 +.0036 + 9549 & = 9585 & -134 \\
 -.4660 + 14311 & = 9651 & -229 \\
 +.4271 + 5552 & = 9823 & -349 \\
 16.9714 + 8486 & & -258^v
 \end{array}
 \begin{array}{rcl}
 +3y -9508 \\
 +57 & = & 9508 \\
 +86 & = & 9508 \\
 +33 & = & 9507 \\
 +51^v & = & 16.8485^v
 \end{array}$$

Tables

$$a \pm 0.6$$

$$-502.3$$

$$b \pm 0.6$$

$$-503.0$$

$$a-b = 0$$

$$= +0.7$$

$$b+d = 0$$

$$= +0.2$$

$$b-c = -502.9$$

$$-503.6$$

$$+0.2$$







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## Plate Constants.

4

X	12.8944	22.0435	33.5960
S	12.2661	21.8845	33.9994
X-S	+6.283	+1.590	-4.034

y	19.0984	28.6224	11.1032
$\eta$	19.0948	29.0884	10.6761
y- $\eta$	+0.036	-4.660	+4.271

$$\begin{array}{rcl}
 X-S & +500X & +10.28 \\
 +6.283 + 6447 & = 12730 & +195 = 12925 + 29 = 12954 \\
 +1.590 + 11022 & = 12612 & + 292 = 12904 + 501 = 12954 \\
 -4.034 + 16798 & = 12764 & + 113 = 12877 + 77 = 12954 \\
 248171 + 12408 & & +173 + 57 = 24.7855
 \end{array}$$

$$\begin{array}{rcl}
 y-\eta & +500y & -10.4X \\
 +0.036 + 9549 & = 9585 & -13.4 = 9451 + 57 = 9508 \\
 -4.660 + 14311 & = 9651 & -229 = 9422 + 86 = 9508 \\
 +4.271 + 5552 & = 9823 & -349 = 9474 + 33 = 9507 \\
 16.9714 + 8486 & & -258 + 51 = 16.8485
 \end{array}$$

Tables

$$a \pm 0.6$$

$$-502.3$$

$$b \pm 0.6$$

$$-503.0$$

$$c \pm 0.6$$

$$= +0.7$$

$$b+d \pm 0$$

$$= +1.2$$







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Moon's Center

	X	X-X <sub>0</sub>	ΔX	0-C
1	24.0000	-0.8200	0.6724	3.5692 + 69
2	23.1950	-1.6250	2.6406	3.5834 + 211
3	22.9317	-1.8883	3.5656	3.5656 + 33
4	22.9317	-1.8883	3.5656	3.5664 + 46
5	23.0000	-1.8200	3.3124	3.5683 + 60
6	23.2336	-1.5864	2.5223	3.5811 + 188
7	24.0000	-0.8200	0.6724	3.5682 + 59
8	24.8200	-0.0000	0.0000	3.5706 + 83
				3.5623

	Y	Y-Y <sub>0</sub>	ΔY
1	15.2691	-1.7019	-1.28968
2	16.0000	-0.9710	-0.9428
3	16.9710	+0.0000	0.0000
4	17.0000	+0.0290	0.0008
5	17.4769	+0.5059	0.2559
6	18.0000	+1.0290	1.0588
7	18.6726	+1.7016	1.28958
8	18.8605	+1.8895	1.35706

15.2691  
206  
239  
270  
271  
286  
303  
334  
360  
Range 154

Approx center

X = 24    Y = 15.2691  
18.6726  
33.9417  
Y<sub>0</sub> 16.9708

Y max 18.8605

R 1.8897

Com R 1.8874

X min 22.9317

X<sub>0</sub> 24.8200

Moon's Center } X<sub>0</sub> 24.8200  
                              Y<sub>0</sub> 16.9710







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## Moons Center

	$X$	$X - X_0$	$\Delta Y$	$0 - C$
1	24.0000	-0.8200	0.6724	+ 69
2	23.1950	-1.6250	2.6426	+ 21.1
3	22.9317	-1.8883	3.5656	+ 33
4	22.9317	-1.8883	3.5656	+ 41
5	23.0000	-1.8200	3.3124	+ 60
6	23.2386	-1.5864	2.5223	+ 188
7	24.0000	-0.8200	0.6724	+ 59
8	24.8200	-0.0000	0.0000	+ 83
			3.55623	

	4	4-40	25	
1	15.2691	- 1.7019	- 1	2.8968
2	16.0000	- 0.9710	- 0	0.9428
3	16.9700	+ 0.0000	- 0	0.0000
4	17.0000	+ 0.0290	- 0	0.0208
5	17.4769	+ 0.5059	- 1	0.2559
6	18.0000	+ 1.0290	- 0	1.0588
7	18.6726	+ 1.7016	+ 1	2.8958
8	18.8605	+ 1.8895	+ 1	3.5706
				Range 154

Approx center

$$Y = 24 \quad q = 152691$$

1867 26

3 3.94 17

40	1	6	9	7	0	8
----	---	---	---	---	---	---

$y_{\max} = 18.8605$

R 1.8897

Com R 18874

$\chi_{\text{mm}}$	22.9	317
--------------------	------	-----

X <sub>0</sub>	24.8200
----------------	---------

Moons Circle { 80 248200  
40 169710



## normals

1	+ 1.39
2	+ 1.57
3	- 0.00
4	- 0.06
5	- 0.91
6	- 1.63
7	- 1.39
8	- 0
<hr/>	
	+ 2.96
	- 3.99
	- 1.03

-	56.6
-	341.8
-	62.4
-	77.5
-	109.0
-	299.0
-	48.3
-	00
<hr/>	
-	994.6

-	117.0
-	202.0
+	000.0
+	1.2
+	30.0
+	193.0
+	100.2
+	156.0
<hr/>	
+	480.4
-	319.0
+	161.4

- a	- b	- 26	+ ΔC
+ 13	-	7	- 20
+ 26	-	4	- 4
+ 30	+	0	+ 4
+ 30	+	0	+ 4
+ 29	+	2	+ 5
+ 25	+	4	+ 3
+ 13	+	7	- 6
+ 0	+	7	- 19

9m 4.5

12 1.89



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## Conditional Equations

D-C corr. b

1	-0.82	-1.70	= +69	+48	-15	= +33	+36	+16
2	-1.62	-0.97	= +211	+94	-8	= +86	+125	+121
3	-1.89	+0.00	= +33	+110	+10	= +110	-77	-73
4	-1.89	+1.03	= +41	+110	+0	= +110	-69	-65
5	-1.82	+0.50	= +60	+106	+14	= +110	-50	-45
6	-1.59	+1.03	= +188	+92	+19	= +101	+87	+90
7	-0.82	+1.70	= +59	+48	+15	= +63	-4	-10
8	-0.00	+1.89	= +83	+0	+16	= +16	+67	+48
							+315	-200
							av.	64

$$16.95 - 1.03 = -994.6 - 10.45 \Delta$$

$$-1.03 + 11.62 = +161.4 + 2.48 \Delta$$

$$+1.03 - 0.06 = -60.45 - .63 \Delta$$

$$+11.56 = +1009.5 + 1.85$$

$$16.95 = -994.6 + 9.0 = -985.6$$

$$b = +8.7 + 0.16$$

$$a = -58.1 - 0.61$$

$$\frac{p}{m} = .165$$

$$\frac{\Sigma v}{m} = +14.4$$

$$\frac{+144}{16} = +9$$

$$\Delta R = +1.1$$

$$\text{corr.} = +0.35$$

$$\text{True } \Delta R = +0.75$$

$$-2R = -3.77 \quad \Delta = -2R \times \text{corr} = -1.3 \quad = 26$$

$$\Delta b = -0.21(-4) \quad \Delta s = -0.10$$

$$\Delta a = +0.79(+10) \quad \Delta \alpha = +0.03$$







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## Conditional Equations

D-C

6

1	-0.82	-1.70	= +69	+48	-15	= +33	+36
2	-1.62	-0.97	= +211	+94	-8	= +86	+125
3	-1.89	+0.00	= +33	+110	+10	= +110	-77
4	-1.89	+1.13	= +41	+110	+10	= +110	-69
5	-1.82	+0.50	= +60	+106	+14	= +110	-50
6	-1.59	+1.03	= +188	+92	+19	= +101	+87
7	-0.82	+1.70	= +59	+48	+15	= +63	-4
8	-0.00	+1.89	= +83	+0	+16	= +16	+67
						+315	-200

av. 64

$$16.95 - 1.03 = -994.6 - 10.45 \Delta$$

$$-1.03 + 11.62 = +105.14 + 248 \Delta$$

$$+1.03 - 1.06 = -60.45 - 63 \Delta$$

$$+11.576 = +1009.5 + 1.85$$

$$16.95 = -994.6 + 9.0 = -985.6$$

$$\begin{aligned} \mu &= +8.7 \pm 0.16 \\ \alpha &= -58.1 \pm 0.61 \end{aligned}$$

$$\frac{p}{m} = .165$$

$$\frac{\Sigma v}{m} = +14.4$$

$$\frac{+4.4}{16} = +.29$$

$$\Delta R = +1.1$$

$$\text{corr.} \quad +0.35$$

$$\text{True } \Delta R = +0.75$$

$$-2R = -377 \quad \Delta = -2R(\text{corr}) = -13$$

$$\mu = -0.21 \quad \Delta \delta = -0.10$$

$$\alpha = +0.79 \quad \Delta \alpha = +0.03$$







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Mossis Mean Position

7

$$\begin{array}{r} X_0 \quad 24.8200 \\ \quad - 29 \\ \hline 24.8171 \end{array}$$

$$\begin{array}{r} Y_0 \quad 16.9710 \\ \quad + 4 \\ \hline 16.9714 \end{array}$$

From Plate Constants

$$\begin{array}{r} 24.7855 \\ \hline 22. \end{array}$$

$$S \quad +2.7855^{\circ}$$

$$16.8485$$

$$-1.8$$

$$-1.1515^{\circ}$$

$$\log S_1 \quad 0.44490^{\circ}$$

$$\log \cos \delta_0 \quad 9.96160^{\circ}$$

$$8.50724^{\circ}$$

$$\log \sin \alpha - N \quad 1.97606^{\circ}$$

$$(\alpha - A) \quad +94.64^{\circ}$$

$$+01 \quad 34.64^{\circ}$$

$$A \quad 03 \quad 45 \quad 19.78^{\circ}$$

$$\alpha_0 \quad 03 \quad 46 \quad 54.42^{\circ}$$

$$\text{Red} \quad +5.75^{\circ}$$

$$\alpha' \quad 03 \quad 47 \quad 00.17^{\circ}$$

$$\log \tan \delta \quad 9.6431^{\circ}$$

$$\log S_1^2 \quad 0.8898^{\circ}$$

$$7.0534^{\circ}$$

$$\log \eta_1 \quad 7.5863^{\circ}$$

$$\eta_1 \quad +0.0038^{\circ}$$

$$\eta_0 \quad -1.1553^{\circ}$$

$$\log \eta_0 \quad 0.06269^{\circ}$$

$$7.33115^{\circ}$$

$$\log \tan(\delta - \delta_0) \quad 2.73154^{\circ}$$

$$\delta - \delta_0 \quad -538.94^{\circ}$$

$$= \quad -08 \quad 58.9^{\circ}$$

$$\delta \quad +23 \quad 53 \quad 25.0^{\circ}$$

$$\delta_0 \quad +23 \quad 44 \quad 26.1^{\circ}$$

$$\text{Red} \quad +20.7^{\circ}$$

$$\delta' \quad 23 \quad 44 \quad 46.8^{\circ}$$







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Mean Mean Position

7

$$\begin{array}{r} X_0 \quad 248200 \\ \quad \quad - 29 \\ \hline 248171 \end{array}$$

$$\begin{array}{r} Y_0 \quad 16.9710 \\ \quad \quad + 4 \\ \hline 16.9714 \end{array}$$

From Plate Constants

$$\begin{array}{r} 24.7855 \\ 22. \\ \hline \end{array}$$

$$J \quad +2.7855$$

$$16.8485$$

$$18$$

$$-1.1515$$

$$\log S \quad 0.44490$$

$$\log \cos \delta_0 \quad 9.96160$$

$$8.50724$$

$$\log S \sin \alpha - \delta \quad 1.97606$$

$$(\alpha - A) \quad -94.64$$

$$+ 01 \quad 34.64$$

$$A \quad 03 \quad 45 \quad 19.78$$

$$\alpha_0 \quad 03 \quad 46 \quad 54.42$$

$$\text{Red} \quad + 5.75$$

$$\alpha' \quad 03 \quad 47 \quad 00.17$$

$$\log \tan S \quad 9.6401$$

$$\log S^2 \quad 0.8898$$

$$7.0534$$

$$\log \lambda \quad 7.5863$$

$$\lambda_1 + 0.0038$$

$$\lambda_0 - 1.1553$$

$$\log n_0 \quad 0.1269$$

$$7.33115$$

$$\log \tan(S - \delta) \quad 2.73154$$

$$S S \quad - 538.94$$

$$= \quad - 18 \quad 58$$

$$E \quad +23 \quad 53 \quad 25.0$$

$$D_0 \quad +23 \quad 44 \quad 26.4$$

$$\text{Red} \quad +21.7$$

$$D' \quad 23 \quad 44 \quad 46.8$$







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## Lunar Parallax

8

$$\begin{array}{rcl} \alpha' & 03 & 47 & 00.17'' \\ \theta & 03 & 47 & 30.80 \\ \theta - \alpha' & & + & 30.63'' \\ & & + 0.7' & 39.45'' \end{array}$$

$$\begin{array}{rcl} \frac{1}{2}(\alpha - \alpha') & & + & 3.01 \\ \frac{1}{2}(\theta - \theta') & 0.7' & & 36.44 \end{array}$$

$$\begin{array}{rcl} \log & 9.95727'' \\ \log \cos \frac{1}{2}(\alpha - \alpha') & 0.00000'' \\ \sec \theta - \alpha' & 0.00000'' \\ \log \tan X & 9.95727'' \end{array}$$

$$X \quad 42 \quad 11 \quad 09.6''$$

$$\delta' \quad 23 \quad 44 \quad 46.8''$$

$$X - \delta' \quad 18 \quad 26 \quad 22.8''$$

$$\begin{array}{rcl} & 9.82640'' \\ \log \sin \Pi & 8.20905'' \\ \sin X - \delta' & 9.50010'' \\ \csc X & 0.17297'' \\ \sin \delta - \delta' & 7.70861 \end{array}$$

$$\delta - \delta' \quad + 17 \quad 34.5''$$

$$\delta + 24 \quad 02 \quad 21.3''$$

$$\gamma \delta + 24 \quad 02 \quad 18.3''$$

$$O - C \quad + 3.0''$$

$$\text{corr.} \quad + 0.6$$

$$\text{2nd ord. ref.} \quad + 0.0$$

$$\text{2nd. corr.} \quad - 0.1$$

Moon underexposed-

Re-measured - with about same result.  $O - C = +0.93$ 

$$\text{corr } \delta + 24 \quad 02 \quad 21.2$$

$$O - C \quad + 0.29$$

$$\Pi \quad 55 \quad 38.08''$$

$$9.86913''$$

$$\log \sin \Pi \quad 8.20905''$$

$$\log \sin \theta - \alpha' \quad 7.34781''$$

$$\log \sec \delta' \quad 0.03940''$$

$$\sin \alpha - \alpha' \quad 5.46539''$$

$$\alpha - \alpha' \quad + 6.02''$$

$$+ 0.40''$$

$$\alpha \quad 03 \quad 47 \quad 00.57''$$

$$\gamma \alpha \quad 03 \quad 46 \quad 59.67''$$

$$O - C \quad + 0.90''$$

$$\text{corr.} \quad - 0.06$$

$$\text{2nd. Corr.} \quad + 0.03$$

$$\alpha = 03 \quad 47 \quad 0.60$$







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Solar Parallax

8

$\alpha$	03	47	00.17	$\pi$	55	3808
$\theta$	03	47	30.8			
$\theta - \alpha$		+	30.63			9.86913
		+ 07	39.45	$\log \sin \pi$		8.20905
$\frac{1}{2}(\alpha - \alpha')$			+ 3.01	$\sin \theta - \alpha'$		7.34781
$\theta - \alpha'$		07	36.44	$\sin \delta$		0.03940
				$\sin \alpha - \alpha'$		5.46539
$\log$			9.95727			
$\log \cos \frac{1}{2}(\alpha - \alpha')$			0.00000	$\alpha - \alpha'$		+ 0.602
$\sec \theta - \alpha'$			0.00000			
$\log \tan \gamma$			9.95727	-		+ 0.40
$\gamma$	42	11	09.6			
$\delta$	23	44	46.8			
$\gamma - \delta$	18	26	22.8			

			9.82640
$\log \sin \pi$			8.20905
$\sin \gamma - \delta$			9.50010
$\cos \alpha$			0.17297
$\sin \delta - \alpha$			7.70861

$\delta - \alpha$	+ 17	34.5			
$\delta + 24$	02	21.3		$\alpha$	03 47 00.57
$\gamma \delta + 24$	02	18.3		$\gamma \delta \alpha$	03 46 59.67
$0 - \alpha$		+ 3.0		$0 - \alpha$	+ 0.90
corr.		+ 0.6		corr.	- 0.06
2nd ed. up		+ 0.0			
2nd. corr.		- 0.1		2nd. corr.	+ 0.03
Mean Underexposed				$\alpha =$	03 47 0.60
Re-measured with about same result				$0 - \alpha$	+ 0.93
corr $\delta + 24 =$	02	21.2			
$0 - \alpha$		+ 0.9			



































1  
14  
162  
25  
43  
26  
21  
23  
142  
22  
153  
22  
16



11909

## Star Measures

11

1 188.12 16588  
 149 9740 15662  
 16.2 40 62  
 10 88  
149070 149874

2 17630 16045  
 253 13203 1410470  
 45 85 70  
 30 45  
254426 254425

3 18162 17008  
 262 16020 21913839  
 22.2 22 40  
 60 08  
262141 262131

18413 16132  
 15978 8560  
 78 60  
 13 32  
162435 162428

18724 17353  
 13525 12562  
 25 62  
 22 53  
4.5198 4.5209

18671 17540  
 16477.5 9725  
 73 25  
 71 40  
22.2196 22.2185

## Moon Measures

1 17510 16298  
 23 11728 32 12072  
 147 36 72  
 06 90  
225776 225777

3 16130 17652  
 222 1473129 904041  
 16 28 42  
 25 42  
22.1410 22.1398

18134 17796  
 11797 14135  
 97 35  
 30 96  
14.6334 14.6339



1  
14  
162  
25  
43  
26  
21  
23  
142  
22  
153  
22  
16



11909

## Star Measures

11

$\downarrow$  188.12 16588  
 149 9740 15762  
 162 40 62  
 10 88  
149070 149174

$\downarrow$  17630 16045  
 253 13203 10470  
 45 15 70  
 30 45  
254426 254425

$\downarrow$  18162 17018  
 262 16020 21913834  
 222 22 40  
 60 08  
262141 262131

18413 16132  
 15978 8560  
 78 60  
 13 32  
162435 162428

18724 17353  
 13525 12562  
 25 62  
 22 53  
45198 45209

18671 17540  
 16477 9725  
 73 25  
 71 40  
222196 222185

## Moon Measures

$\downarrow$   
 23  
 147  
  
 $\downarrow$  17510 16298  
 227 1172832 12072  
 150 36 72  
 06 90  
225776 225777

$\downarrow$  16130 17652  
 222 1473129 904041  
 16 28 42  
 25 42  
221410 221398

18134 17796  
 11797 14135  
 97 35  
 30 96  
146334 146339



22  
65  
22  
176  
23  
177  
23  
188  
24  
18



11909

Moon Measures

12

4	16752	17636
221	1545961	8913
62	63	15
	42	28
	<u>22.1290</u>	<u>22.1286</u>

5	16390	17598
223	1338841	10579
17	94	79
	80	92
	<u>22.2996</u>	<u>22.2986</u>

2	17054	18330
23	9096	98 16268
78	00	68
	50	24
	<u>17.7953</u>	<u>17.7940</u>

1	16528	16861
23.4	1220509	11185
8.0	13	85
	18	51
	<u>23.4315</u>	<u>23.4330</u>

8	16165	17610
24	15298	99 845863
8.1	00	68
	60	04
	<u>18.0866</u>	<u>18.0859</u>



22  
165  
22  
176  
23  
177  
23  
188  
24  
18



11919

Mean Measures

12

4	167.52	176.36
221	154.5961	89.13
162	63	15
	48	28
	<u>22.1290</u>	<u>22.1286</u>

5	163.90	175.98
223	133.8841	105.89
17	94	79
	80	92
	<u>22.2996</u>	<u>22.2986</u>

2  
23  
178

17054	18330
9096	16268
00	68
50	24
<u>177953</u>	<u>177940</u>

1	185.28	168.61
23.4	122.0509	171.85
18.1	13	55
	18	51
	<u>23.4315</u>	<u>23.4330</u>

8  
24  
18.1

16165	17610
15298	8458
00	68
60	04
<u>18.0866</u>	<u>18.0859</u>







11909

Times Etc

13

Dec. 8 16

Exp to Stars

0 2 21

0 2 33

" " Moon

0 2 27

21.6<sup>v</sup>

0 2 27

21.8<sup>v</sup>

Clock fast

11

59.5<sup>v</sup>

H. Sid Time

0 2

1 5

22.2<sup>v</sup>

- 0 2

23<sup>m</sup>

H. Long

0 4

4 4

31.05<sup>v</sup>

S. S. Time

0 6

5 9

53.25<sup>v</sup>

" " M.N.

1 7

0 7

38.23<sup>v</sup>

Interval

1 3

5 2

15.02<sup>v</sup>

Reduction

0 2

16.34<sup>v</sup>

b. M.T.

1 3

4 9

58.68<sup>v</sup>13.83297<sup>v</sup>

From Naut Almanac

R.A.

Decl.

Moon 13<sup>h</sup>

0 4

3 6

07.64<sup>v</sup> + 25

2 1

48.4<sup>v</sup>motion 1<sup>m</sup>2.2843<sup>v</sup>2 199<sup>v</sup>49.978<sup>v</sup>

0 1

54.16<sup>v</sup>

+ 0 1

49.9<sup>v</sup>

Tabular Place

0 4

2 8

07.80<sup>v</sup> + 25

2 3

38.3<sup>v</sup>

Moon's Age 13.6

934 = 13

a - 503.3

+ 24.

- 479.3

Parallax

55

14.17<sup>v</sup>

Semi-Dian

15

04.6<sup>v</sup>

R

904.6<sup>v</sup>

Aug.

12.2<sup>v</sup>

Syl. 53

- 0.9<sup>v</sup>

R

915.9<sup>v</sup>

R

19633<sup>v</sup>

(1+4) R

- 941<sup>v</sup>

R

1.8692<sup>v</sup>

R 2

3.4939<sup>v</sup>







11909

Lunar Etc

13

Dec 8 16

Exp. to Stars	02	21		02	33
" " Moon	02	27	21.6	02	27 21.8
clock fast		11	59.5		
H. Sid Time	02	15	22.2	-02	23
H. Long	04	44	31.05		
S. S. Time	06	59	53.25		
" " MN	17	07	38.23		
Internal	13	52	13.02		
Reduction	17	02	16.34		
to M.T.	13	49	58.68	13	83297

From Naut Almanac

R.A.

Decl.

Moon 13 <sup>h</sup>	04	36	07.64	+25	21	48.4
Mission 1 <sup>m</sup>			2.2843			2.199
" 49.978		01	54.16	+01		49.9
Sabular Place	04	38	01.80	+25	23	38.3

Means Age 13.6

937 = 13

$$\begin{array}{r}
 -5033 \\
 +24 \\
 \hline
 -479.3
 \end{array}$$

Parallax	55	14.17
Semi-diam	15	0.46
R		9046
Ang		12.2
Sun		0.9
R		915.9
R		19633
(1+4) R		-941
R		1.8692
R		3.4939



37

2

+

1



11909		Plate Center - Constants.						14
14.9072	16.2432	04	34	15.64	25	03	08.8	
25.4425	04.5203	04	40	38.01	23	28	28.2	
26.2136	22.2190	04	41	02.21	25	53	00.5	
3 665.633	3 429825	3 13	55	55.86	3 74	24	37.5	
22.1878	14.3275	04	38	38.62	24	48	12.5	
22.	18.			- 5.82		28	33.2	
- 1878	+ 3.6725	04	38	32.80				
31.	466.5							

$$\text{Plate Center} \left\{ \begin{array}{l} A \quad 04 \quad 38 \quad 32.80 \\ B \quad +25 \quad 16 \quad 45.7 \end{array} \right.$$

$$\begin{aligned} X-S + 500X & - 102.74 & + 3.3X - 9825 \\ + 3987 + 7454 - 11441 & - 1668 - 9773 + 52 - 9825 \\ - 2522 + 12721 = 10199 & - 464 - 9735 + 89 - 9824 \\ - 1092 + 13107 = 12015 & - 2282 - 9733 + 92 = 9825 \\ 23.9972 + 11999 & - 16652 & + 79 = 240560 \end{aligned}$$

$$\begin{aligned} Y-m + 500Y & + 104.4X & + 3.4Y - 9386 \\ - 0348 + 8122 - 7774 + 1556 & 9330 + 55 = 9385 \\ + 4465 + 2260 = 6715 & + 2656 - 9371 + 15 = 9386 \\ - 4534 + 11109 = 6575 & + 2736 = 9311 + 75 = 9386 \\ 16.5162 + 8108 & + 25054 & + 552 = 16.3444 \end{aligned}$$

$$\begin{aligned} \text{Tables} \quad q & - 0.6 & e & - 0.4 & aol & - 0.2 & A+d & + 1.3 \\ & - 503.3 & & - 503.4 & & + 0.1 & & = - 1.7 \\ b-e & - 502.7 & & - 503.0 & & & & + 3.0 \end{aligned}$$







11909		Plate Center - Constants.						14
14.9072	16.2432	04	34	15.64	25	03	08.8	
25.4425	04.5203	04	40	38.01	23	28	28.2	
36.2136	22.2190	04	41	02.21	25	53	06.5	
36.65633	4.29825	313	55	55.86	3174	24	37.5	
22.1878	14.3275	04	38	38.62	24	48	12.5	
22.	18.			- 5.82		28	33.2	
- .1878	+ 3.6725	14	38	32.80				
31	466.5							

Plate Center { A 04 38 32.80  
K +25 16 45.7

$$\begin{aligned}
 & -S + 500X & -10274 & +3.3X - 986 \\
 & +.3987 + 7454 - 11441 - 1668 - 9773 + 52 - 9825 \\
 & -.2522 + 12721 = 10199 - 464 - 9735 + 89 - 9824 \\
 & -1092 + 13107 = 12015 - 2282 = 9733 + 92 = 9825 \\
 & 23.9972 + 11999 & -1665 & +79 = 24.0560
 \end{aligned}$$

$$\begin{aligned}
 & y-m + 500y & +104.4X & +3.4y - 9386 \\
 & -.0348 + 8122 - 7774 + 15556 - 9330 + 55 = 9385 \\
 & +4465 + 2260 = 6715 + 2656 - 9371 + 15 = 9386 \\
 & -4534 + 11109 = 6575 + 2736 = 9311 + 75 = 9386 \\
 & 163162 + 8108 & +2508 & +55 = 16.3444
 \end{aligned}$$

$$\begin{aligned}
 \text{Tables} & & a- & & e- & & a-e- & & A+d- \\
 & & -503.3 & & -503.4 & & +0.1 & & = -1.7
 \end{aligned}$$



$\xi$	$\eta$	$\Delta\xi$	$-2\xi$	$+8\eta$	$+2\xi = -1$
$-7.49$	$-1.75$	$-12$	$+15 = +3$	$-1 = +2 - 1 = +1$	
$+3.69$	$-13.93$	$+19$	$-7 = +12$	$-11 = +1 + 1 = +2$	
$+4.32$	$+4.66$	$+5$	$-.9 = -4$	$+4 = +0 + 1 = +1$	
$\eta + 2.06$	$-1.65$		$-4$	$-1$	$= -6$

$\Delta\eta$	$-3.9\eta$	$+1.5\xi$	$+7$
$-3$	$+7 =$	$+4 -$	$11 = -7$
$-68$	$+55 =$	$-13 +$	$6 = -7$
$+5$	$-18 =$	$-13 +$	$6 = -7$
	$+6$	$+3$	$= +16$

$$+12 = +0.16$$



11909				Standard Coordinates				15-	
Cape no. 679 mg. 63				Cape no. 691 mg. 62				Cape no 693 mg 7.5-	
C	04	33	17.18	04	39	40.18	04	40	03.30
y			17.22			40.14			03.34
E			17.18			40.14			03.27
Mean	04	33	17.19	04	39	40.15	04	40	03.30
Prec.			+58.45			+57.86			+58.91
$\alpha$	04	34	15.64	04	40	38.01	04	41	02.21
A	04	38	32.80	04	38	32.80	04	38	32.80
$\alpha - A$	-	04	17.16	+02		05.21	+	02	29.41
Sin $\alpha - A$			-257.14			+125.21			+149.41
log "	2.41	017	m	2.09	764		2.17	438	
" cos $\delta$	9.95	709		9.96	248		9.95	409	
" $S_0$	0.87	450	m	0.56	736		0.63	571	
$S_0$	-	7.49	03	+3.69	28		+4.32	23	
$S_1$	-	.00	12	+	0019		.00	05	
$S_2$	14.50	85		25.69	47		26.32	28	
X	14.90	72		25.44	25		26.21	36	
X-S	+3.98	7		-	2522		-	.1092	
C	+25	01	11.2	23	26	38.9	25	57	11.7
y			11.1			38.6			11.5
E			10.8			38.6			11.2
Mean	+25	01	11.0	23	26	38.7	25	57	11.5
Prec		+01	57.8		+01	49.5		+01	49.0
$\delta$	+25	03	08.8	23	28	28.2	25	53	00.5
$\rho$	25	16	45.7	25	16	45.7	25	16	45.7
$\delta - \rho$	-	13	36.9	-1	48	17.5	+	36	14.8
tan "			-816.9			-6499.6			+2174.9
log "	2.91	217	m	3.81	289	m	3.33	744	
log $n_0$	0.24	332	m	1.14	404	m	0.66	859	
log $n_1$	9.66	97		9.63	77		9.68	59	
" $S_2$	1.74	90		1.13	47		1.27	14	
" $n_1$	8.47	21		7.82	58		8.01	07	
$n_0$	-1.75	17		-13.93	29		+4.66	22	
$n_1$	+0.02	97		+0.00	67		+0.01	02	
$n$	16.27	80		4.07	38		22.67	24	
y	16.24	32		4.52	03		22.21	90	
y-n	-	03	48	+44	65		-	.4534	







11929

## Standard Coordinates

15"

Cape no. 679 mag 6.3

Cape no. 691 mag 6.2

Cape no. 693 mag 7.5"

C	04	33	17.18	04	39	40.18	04	40	03.30
Y			17.22			40.14			03.34
E			17.18			40.14			03.27
mean	04	33	17.19	04	39	40.15	04	40	03.30
mag			+58.45			+57.86			+58.91
X	04	34	15.64	04	40	38.01	04	41	02.21
A	04	38	32.80	04	38	32.80	04	38	32.80
X-A	-	04	17.16	+02		05.21	+	02	29.41
Sw X-A			-257.14			+125.21			+149.41
mag	2.41	0.17	m	2.09	7.64		2.17	43.8	
Eos	9.95	7.09		9.96	2.48		9.95	4.09	
S <sub>0</sub>	0.87	4.50	m	0.56	7.36		0.63	5.71	
S <sub>0</sub>	-	7.49	0.3	+3.69	2.8		+4.32	2.3	
S <sub>1</sub>	-	.10	1.2	+00	1.9		.01	0.5	
S	14.50	8.5		25.69	4.7		26.32	2.8	
X	14.90	7.2		25.44	2.5		26.21	3.6	
X-S	+3.98	7		-25.22			-1.09	2	

C	+25	01	11.2	23	26	38.9	25	57	11.7
Y			11.1			38.6			11.5
E			10.8			38.6			11.2
mean	+25	01	11.0	23	26	38.7	25	57	11.5
mag			+01	57.8		+01	49.5		+01
S	+25	03	08.8	23	28	28.2	25	53	00.5
S	25	16	45.7	25	16	45.7	25	16	45.7
S <sub>2</sub>	-	1.3	36.9	-1	48	17.5	+	36	14.8
			-816.9			-6499.6			+2174.9
mag	2.91	2.17	m	3.81	2.89	m	3.33	7.44	
mag	0.24	3.32	m	1.14	4.04	m	0.66	8.59	
mag	9.66	9.7		9.63	7.7		9.68	8.59	
S <sub>2</sub>	1.74	9.0		1.13	4.7		1.27	1.4	
mag	8.47	2.1		7.82	5.8		8.01	0.7	
mag	-1.75	5.17		-13.93	2.9		+4.66	2.2	
mag	+0.02	9.7		+0.00	6.7		+0.01	0.2	
mag	16.27	8.0		4.07	3.8		22.67	2.4	
mag	16.24	3.2		4.52	0.3		22.21	9.0	
mag	-0.34	8		+4.46	5		-4.53	3.4	







119.09

Moon Center

16  
0-C

1	23.0000	-0.9990 +2	0.9976	3.4950	+	11
2	22.5776	-1.4214 +2	2.0198	3.4934	-	5
3	22.1404	-1.8586 +0	3.4544	3.5002	+	63
4	x 22.1288	-1.8702 +0	3.4976	3.4976	+	37
5	22.2991	-1.6999 -1	2.8900	3.5076	+	137
6	23.0000	-0.9990 -2	0.9984	3.4954	+	15
7	23.4322	-0.5668 -2	0.3215	3.5109	+	170
8	23.9990	-0.0000 -1	0.0000	3.5048	+	109
				3.4939		

1	14.6336	-1.5804 +1	2.4974	21.20
2	15.0000	-1.2140 +1	1.4736	229
3	16.0000	-0.2140 +0	0.0458	263
4	16.2140	-0.0000 +0	0.0000	270
5	17.0000	+0.7868 -1	0.6176	295
6	17.7943	+1.5803 -1	2.4970	328
7	18.0000	+1.7868 -1	3.1894	342
8	18.0862	+1.8722 -1	3.5048	360

Range 148

$$X = 23 \quad Y = 14.6336$$

$$17.7943$$

$$32.4279$$

$$Y_0 \quad 16.2140$$

$$Y_{\max} \quad 18.0862$$

$$R \quad 1.8722$$

$$\text{Cam R} \quad 18.692$$

$$X_{\min} \quad 22.1288$$

$$X_0 \quad 23.9990$$

$$\text{PMoon Center} \left\{ \begin{array}{l} X_0 \quad 23.9990 \\ Y_0 \quad 16.2140 \end{array} \right.$$







11909

Moon Center

16

0-0

1	23.0000	-0.4998 +2	0.9996	3.4950	+	11
2	22.5776	-1.4214 +2	2.0198	3.4934	+	5
3	22.1404	-1.8586 +0	3.4544	3.5002	+	63
4	22.1288	-1.8702 +0	3.4976	3.4978	+	37
5	22.2991	-1.6999 -1	2.8900	3.5076	+	137
6	23.0000	-0.9880 -2	0.9984	3.4954	+	15
7	23.4322	-0.5668 -2	1.3275	3.5109	+	170
8	23.9990	-0.0000 -2	0.0000	3.5048	+	109
				3.4939		

1	14.6336	-1.5804 +1	2.4974	2120
2	15.0000	-1.2140 +1	1.4736	229
3	16.0000	-0.2140 +0	0.0458	263
4	16.2140	-0.0000 +0	0.0000	270
5	17.0000	+0.7861 -1	0.6176	295
6	17.7943	+1.5803 -1	2.4970	328
7	18.0000	+1.7860 -1	3.1894	342
8	18.0862	+1.8722 -1	3.5048	360

Range 148

$$X = 23 \quad Y = 14.6336$$

$$17.7943$$

$$32.4279$$

$$Y_0 \quad 16.2140$$

$$Y_{max} \quad 18.0862$$

$$R \quad 1.8722$$

$$C_{\text{cor}} R \quad 1.8692$$

$$X_{\text{min}} \quad 22.1288$$

$$X_0 \quad 23.9980$$

$$\text{Moon Center} \left\{ \begin{array}{l} X_0 \quad 23.9990 \\ Y_0 \quad 16.2140 \end{array} \right.$$



## normals

1	+ 1.58
2	+ 1.72
3	+ 0.39
4	+ 0.00
5	- 1.34
6	- 1.58
7	- 1.02
8	- 0.00
<hr/>	
	+ 3.69
	- 3.94
	<hr/>
	- 0.25

-	11.0
+	7.1
-	117.2
-	69.2
-	233.0
-	15.0
-	97.0
-	00.0
<hr/>	
+	7.1
-	542.4
-	<hr/>
-	535.3

-	17.4
+	6.0
-	13.2
-	00.0
+	108.1
+	23.6
+	305.0
+	204.0
<hr/>	
+	646.7
-	30.6
+	<hr/>
+	616.1

- 45

- a	- b	+ DC
+ 30	- 14	- 29 <sup>v</sup>
+ 42	- 11	- 14 <sup>v</sup>
+ 56	- 2	+ 9 <sup>v</sup>
+ 56	- 0	+ 11 <sup>v</sup>
+ 51	+ 7	+ 13 <sup>v</sup>
+ 30	+ 15	- 0
+ 17	+ 16	- 12 <sup>v</sup>
+ 0	+ 17	- 28 <sup>v</sup>



119 0 9

## Conditional Equations

17

1	- 1.00	- 1.58 = + 11	+ 37	- 55 = - 1.8	+ 29
2	- 1.42	- 1.21 = - 5	+ 53	- 42 = + 11	- 16
3	- 1.86	- 0.21 = + 63	+ 69	- 7 = + 62	+ 1
4	- 1.87	- 0.00 = + 37	+ 69	- 0 = + 69	- 32
5	- 1.70	+ 0.79 = + 137	+ 63	+ 27 = + 90	+ 47
6	- 1.00	+ 1.58 = + 15	+ 37	+ 55 = + 92	- 77
7	- 0.57	+ 1.79 = + 170	+ 21	+ 62 = + 83	+ 87
8	- 0.00	+ 1.87 = + 109	+ 0	+ 65 = + 65	+ 44
	- 9.42	+ 3.03		+ 208	- 125
	14.18	- 0.25 = - 535.3	- 9.42		or 42

$$- 0.25 + 13.82 = + 616.1 + 3.03$$

$$+ 0.25 - 0 = - 9.4 - .17$$

$$+ 13.82 = + 606.7 + 2.86$$

$$b = + 43.8 + .21$$

$$+ 14.18 = - 535.3 + 10.9 = - 524.4$$

$$a = - 369 - .067$$

$$\frac{p}{m} = .14$$

$$\frac{\Sigma v}{m} = + 6.5$$

$$\frac{+ 65}{.14} = + 46$$

$$\Delta R = + 0.6$$

$$\text{corr} = + 0.6 \text{ Driscoll } 5.3$$

$$\text{true } \Delta R \neq 0.0 \checkmark$$

$$- 2R = - 3.74 \quad A = - 2R \text{ corr} = - 2.24 \quad - 45$$

$$\Delta f = - 0.47 \quad \Delta S = - 0.21$$

$$\Delta a = + 1.50$$

$$+ 30$$

$$\Delta \alpha = + 0.06$$

+ 37	- 69 = - 32	+ 43	+ 14
+ 52	- 53 = + 5	- 6	- 20
+ 69	- 7 = + 62	+ 1	+ 10
+ 69	- 0 = + 69	- 32	- 21
+ 63	+ 34 = + 97	+ 40	+ 53
+ 37	+ 69 = + 106	- 9	- 91
+ 21	+ 79 = + 100	+ 70	+ 58
+ 0	+ 82 = + 82	+ 27	- 1
		+ 181	- 129
		or 39	







118 19

## Conditional Equations

17

0 - C

1	-1.20	-1.58 = +11	+37	-55 = -18	+29
2	-1.42	-1.21 = -5	+53	-42 = +11	-16
3	-1.86	-0.21 = +63	+69	-7 = +62	+1
4	-1.87	-0.00 = +37	+69	-0 = +69	-32
5	-1.70	+1.79 = +137	+63	+27 = +91	+47
6	-1.10	+1.58 = +15	+37	+55 = +92	-77
7	-0.57	+1.79 = +170	+21	+62 = +83	+87
8	-0.00	+1.87 = +189	+0	+65 = +65	+44

+208 - 125

av 42

$$14.18 - 0.25 = -535.3$$

$$-0.25 + 13.82 = +616.1$$

$$+0.25 - 0 = -139.4$$

$$+13.82 = +606.7$$

$$b = +438$$

$$+14.18 = -535.3 + 109 = -524.4$$

$$a = -369$$

0 - C

+37	-69 = -32	+43
+52	-53 = -1	-6
+69	-7 = +62	+1
+69	-0 = +69	-32
+63	+34 = +97	+40
+37	+69 = +106	-91
+21	+79 = +100	+70
+0	+82 = +82	+27

+181 - 129

av 39

$$\frac{P}{h} = 14$$

$$\frac{EV}{w} = +6.5$$

$$+\frac{62}{.14} = +446$$

$$DR = +0.6$$







11909

Marius Mean Position

18

$$\begin{array}{r} X_0 \quad 23.9990 \\ \quad \quad -18 \\ \hline 23.9972 \quad \checkmark \end{array}$$

$$\begin{array}{r} Y_0 \quad 16.2140 \\ \quad \quad +22 \\ \hline 16.2162 \quad \checkmark \end{array}$$

From Plate Constants

$$\begin{array}{r} 24.8560 \quad \checkmark \\ \quad \quad 22 \\ \hline +2.0560 \quad \checkmark \end{array}$$

$$\begin{array}{r} 16.3444 \\ \quad \quad 18 \\ \hline -1.6556 \quad \checkmark \end{array}$$

$$\begin{array}{r} \log S_0 \quad 0.31302 \quad \checkmark \\ \log C_0 S_0 \quad 9.95705 \quad \checkmark \\ \quad \quad 850724 \\ \hline \log S_0 - N \quad 1.84873 \quad \checkmark \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.6697 \quad \checkmark \\ \log S_1^2 \quad 0.6260 \quad \checkmark \\ \quad \quad 7.0534 \quad \checkmark \\ \log n_1 \quad 7.3491 \quad \checkmark \end{array}$$

$$\begin{array}{r} \alpha - A_1 \quad +70.59 \\ \quad \quad +01 \quad 10.59 \quad \checkmark \\ A \quad 04 \quad 38 \quad 32.80 \quad \checkmark \end{array}$$

$$\begin{array}{r} n_1 \quad +0.0022 \\ n_0 \quad -1.6578 \end{array}$$

$$\alpha_0 \quad 04 \quad 39 \quad 43.39 \quad \checkmark$$

$$\begin{array}{r} \log n_0 \quad 0.21953 \quad \checkmark \\ \quad \quad 7.33175 \\ \log \tan \delta - D \quad 2.88838 \quad \checkmark \end{array}$$

$$\text{Red.} \quad +06.00 \quad \checkmark$$

$$\begin{array}{r} \delta - D \quad -773.36 \quad \checkmark \\ \quad \quad -12 \quad 53.4 \quad \checkmark \\ B \quad +25 \quad 16 \quad 45.7 \quad \checkmark \end{array}$$

$$\alpha' \quad 04 \quad 39 \quad 49.39 \quad \checkmark$$

$$\delta_0 +25 \quad 03 \quad 52.3 \quad \checkmark$$

$$\text{Red} \quad +14.1 \quad \checkmark$$

$$\delta' +25 \quad 04 \quad 06.4 \quad \checkmark$$







11909

Meris Mean Position

18

$$\begin{array}{r}
 Y_1 \quad 239990 \\
 \quad \quad -18 \\
 \hline
 239972
 \end{array}$$

$$\begin{array}{r}
 Y_0 \quad 162140 \\
 \quad \quad +22 \\
 \hline
 162162
 \end{array}$$

From Plate Constants

$$\begin{array}{r}
 24.1560 \\
 \quad \quad 22 \\
 \hline
 +2.0560
 \end{array}$$

$$\begin{array}{r}
 16.3444 \\
 \quad \quad 18 \\
 \hline
 -1.6556
 \end{array}$$

$$\begin{array}{r}
 \log S_0 \quad 0031302 \\
 \log A_0 S_0 \quad 995705 \\
 \hline
 850724 \\
 \log S_0 X-N \quad 1.84873
 \end{array}$$

$$\begin{array}{r}
 \log \mu_0 \quad 9.6697 \\
 \log S_1 \quad 0.6260 \\
 \hline
 7.1534 \\
 \log n_1 \quad 7.3491
 \end{array}$$

$$\begin{array}{r}
 X-A_1 \quad +70.59 \\
 \quad \quad +01 \quad 10.59 \\
 A \quad 04 \quad 38 \quad 32.80
 \end{array}$$

$$\begin{array}{r}
 n_1 \quad +0.0022 \\
 n_0 \quad -1.6578
 \end{array}$$

$$X_0 \quad 04 \quad 39 \quad 43.39$$

$$\begin{array}{r}
 \log n_0 \quad 0.219532 \\
 \hline
 7.33175 \\
 \log \mu_1 \quad 2.88838
 \end{array}$$

$$\text{Red} \quad +06.00$$

$$S-E \quad -773.36$$

$$X' \quad 04 \quad 39 \quad 49.39$$

$$\begin{array}{r}
 -12 \quad 53.4 \\
 +25 \quad 16 \quad 45.7
 \end{array}$$

$$S_0 +25 \quad 03 \quad 52.3$$

$$\text{Red} \quad +14.1$$

$$D' +25 \quad 04 \quad 06.4$$



$$\begin{array}{r}
 1 \quad 04 \quad 37 \quad 17.984 \\
 \underline{12.093} \\
 + 5.891
 \end{array}$$

$$\begin{array}{r}
 22 \quad 48 \quad 02.70 \\
 \underline{47} \quad 48.28 \\
 + 1442
 \end{array}$$

$$\begin{array}{r}
 2 \quad 04 \quad 51 \quad 37.670 \\
 \underline{31.252} \\
 + 6.418
 \end{array}$$

$$\begin{array}{r}
 83 \quad 02 \quad 15.66 \\
 \underline{3.02} \\
 + 12.64
 \end{array}$$

$$\begin{array}{r}
 6.418 \\
 \underline{5.891} \\
 .527
 \end{array}$$

$$\begin{array}{r}
 1442 \\
 \underline{12.64} \\
 1.78
 \end{array}$$

n. P. 45

+40

+35

+30

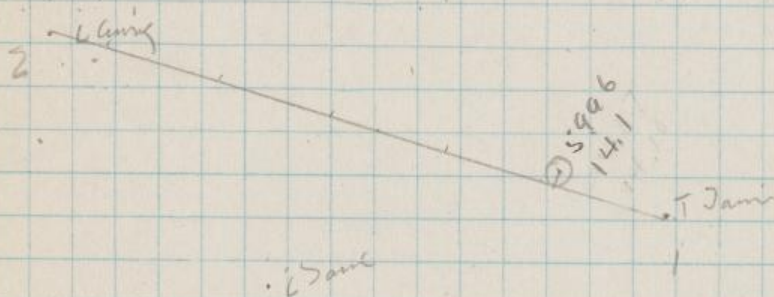
+25

+20

+15

+10

+5



57 49 47 45 43 41 39 37 35 33 31 29 27

04



11909

## Reduction to Apparent Place

19

$H+K$	05	28.6	82	09
$H$	0	48.9		
$\alpha$	04	39.7		
$\zeta$	23	33.7		
$\zeta + \alpha$	28	13.4	63	21

$\delta_0$	25	03.9
$\log \cos \delta_0$	9.9570	
$\log l$	0.2723	
$\log(l)$	0.2293	

$\log \sin \delta_0$	9.6270	
" $\cos H+\alpha$	9.1354	
$\log l$	1.3093	
" $\sin H+\alpha$	9.9959	
" $\sec \delta_0$	0.0430	
	8.8239	

$\log \cos \zeta + \alpha$	9.6518	
$\log \frac{\zeta}{\alpha}$	1.3980	
" $\sin \zeta + \alpha$	9.9512	
" $\tan \delta$	9.6699	
	8.8239	

$\log \delta$	1.0498	
" $\gamma$	9.8430	

$$\delta + 3.814$$

$$\gamma + 0.697$$

$$h + 1.486$$

$$\text{Red} + 5.997$$

$\log h'$	0.0717	
$h$	0.1721	

$g' + 11.215$	
$g' + 1.180$	
$g' + 1.695$	
$\text{Red} + 14.090$	←







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## Reduction to Apparent Place

19

H + $\psi$	05	28.6	82	09	$\delta_0$	25	03.9
H	0	48.9			$\log \cos \delta_0$	9.9570	
$\lambda$	04	39.7			$\log 1$	0.2723	
G	23	33.7			$\log 11$	0.2293	
G + $\lambda$	28	13.4	63	21	0		

$\log \cos G + \lambda$	9.6518		
$\log \frac{r}{\rho}$	1.3980		
$\log \sin G + \lambda$	9.9512		
$\log \cos \delta$	9.6699		
	8.8239		

$\log \delta'$	1.0498		
$\log \frac{r}{\rho}$	9.8430		

$\lambda$	+3.814		
G	+0.697		
$\delta$	+1.486		
Red	+5.997		

$\log \sin \delta_0$	9.6270		
$\log \cos H + \lambda$	9.1354		
$\log h$	1.3093		
$\log H + \lambda$	9.9959		
$\sec \delta_0$	0.0430		
	8.8239		

$\log h'$	0.0717		
$\log h$	0.1721		

$\delta'$	+11.215		
$\delta'$	+1.188		
$\delta$	+1.695		
Red	+14.090		







10909

## Lunar Parallax

20

$\alpha'$	04	39	49.39 <sup>v</sup>
$\theta$	02	15	22.20 <sup>v</sup>
$\theta - \alpha'$	-02	24	27.19 <sup>v</sup>
$=$	-36	06	47.85 <sup>v</sup>
$\frac{1}{2}\alpha - \alpha'$	-	13	19.80 <sup>v</sup>
$\theta - \alpha' - \frac{1}{2}$	-35	53	28.05 <sup>v</sup>

TT 55 14.17

	9.86913 <sup>-</sup>
$\log \sin \Pi$	8.20593 <sup>-</sup>
" $\sin \theta - \alpha'$	9.77039 <sup>-</sup>
" $\sec \theta$	0.04413 <sup>-</sup>
" $\sin \alpha - \alpha'$	7.88958 <sup>-</sup>

 $\alpha - \alpha' - 26' 39.60''$  $= -1 46.64''$ 

$\log \cos \frac{1}{2}\alpha'$	0
$\sec \theta - \alpha' =$	0.09144 <sup>-</sup>
$\log \tan \chi$	0.04871 <sup>-</sup>

 $\chi$  48 12 23.1<sup>-</sup> $\delta'$  25 04 06.4<sup>-</sup> $\chi - \delta'$  23 08 16.7<sup>-</sup>

	9.82648 <sup>-</sup>
$\log \sin \Pi$	8.20593 <sup>-</sup>
$\sin (\chi - \delta')$	9.59433 <sup>-</sup>
$\cos \chi$	0.12752 <sup>-</sup>
$\sin (\delta - \delta')$	7.75418

 $\delta - \delta'$  + 19 31.1<sup>-</sup> $\delta$  25 23 37.5<sup>-</sup> $\chi - \delta$  + 25 23 38.3 $\delta - C$  - 0.8

curr. + 0.8

2nd ord. ref. + 0.0

True Corr. - 0.2

 $\delta = +$  25 23 37.3 $\delta - C =$  - 1.0

$\alpha$	04	38	02.75 <sup>-</sup>
$\chi - \alpha$	04	38	01.80 <sup>-</sup>

 $\delta - C$  + 0.95<sup>-</sup>

curr. - 0.02

True Corr. + 0.06

 $\chi =$  04 38 02.81 $\delta - C$  + 1.01







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## Lunar Parallax

20

$\alpha'$	04	39	49.39
$\theta$	02	15	22.20
$\theta - \alpha'$	-02	24	27.19
$\theta - \alpha'$	-36	06	47.85
$\frac{1}{2} \alpha - \alpha'$	-	13	19.80
$\theta - \alpha' - \frac{1}{2} \alpha$	-35	53	28.05

 $\Pi$  55 14.17

	9.86913
$\log \sin \Pi$	8.20593
$\sin \theta - \alpha'$	9.77039
$\sec \theta$	0.04413
$\sin \alpha - \alpha'$	7.88958

	9.95727
$\log \cos \frac{1}{2} \alpha'$	0
$\cos \alpha' - \frac{1}{2} \alpha'$	0.09144
$\log \tan \alpha'$	0.04871

$\alpha - \alpha'$	-26	39.60
$\theta - \alpha'$	-1	46.64

 $\gamma$  48 12 23.0 $\delta$  25 04 06.4 $\gamma - \delta$  23 08 16.7

	9.82648
$\log \sin \Pi$	8.20593
$\sin (\gamma - \delta)$	9.59433
$\cos \alpha'$	0.12752
$\sin (\delta - \gamma)$	7.75418

 $\delta - \gamma$  19 31.1 $\delta$  25 23 37.5 $\gamma - \delta$  +25 23 38.3 $\alpha - \alpha'$  -0.8

curv. +0.8  
2nd ord ref. +0.0

$\alpha$	04	38	02.75
$\alpha$	04	38	01.80
$\alpha - \alpha'$			+0.95
$\alpha - \alpha'$			-0.02



16040  
10918  
10  
40  
15.5130

16540  
11689  
89  
40  
15.5149



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## Star Measures

21

$\perp$  17932 16280  
 14.8 1067270 1354849  
 16.5 68 50  
 30 80  
14.7261 14.7269

$\Sigma$  18400 16622  
 553 1575358 9268  
 4.8 63 68  
 00 22  
25.2642 25.2646

$\Sigma$  16964 18838  
 26. 1663735 9161  
 22.4 33 61  
 66 38  
26.0329 26.0323

18472 17846  
 13853 12482  
 53 7880  
 78 46  
16.4622 16.4634

17880 17030  
 1046768 14442  
 69 42  
 80 30  
4.7412 4.7412

18373 18520  
 1396564 12926  
 63 26  
 75 20  
22.4410 22.4406

## Moon Measures

$\perp$  16260 17700  
 24 8493 15460  
 14.9 93 62  
 60 00  
14.7767 14.7761  
 Measured 81

$\Sigma$  17106 17308  
 23 1228785 12122  
 15.3 83 24  
 10 08  
15.4823 15.4815

$\Sigma$  16050 16877  
 228 8689 14238  
 16.0 89 38  
 50 77  
22.7361 22.7361







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Star Measures

21

L	179.32	16280
14.8	1067.270	1354849
14.5	68	50
	30	80
	<u>14.7261</u>	<u>14.7269</u>

E	18400	16622
25.3	15753.58	9268
4.8	63	68
	00	22
	<u>25.2642</u>	<u>25.2646</u>

3	16964	18838
26	16637.35	9161
22.4	33	61
	66	38
	<u>26.0829</u>	<u>26.0323</u>

18472	17846
13853	12482
53	78.50
78	46
<u>16.4622</u>	<u>16.4634</u>

17880	17030
104676.8	14442
69	42
80	30
<u>4.7412</u>	<u>4.7412</u>

18373	18520
13965.64	12926
63	26
75	20
<u>22.4410</u>	<u>22.4406</u>

Mean Measures

L	16260	17700
24	8493	15460
14.9	93	62
	60	00
	<u>14.7767</u>	<u>14.7761</u>

E	17104	17308
23	12287.5	12123
15.3	83	24
	10	08
	<u>15.4823</u>	<u>15.4815</u>

3	1605.0	16877
22.8	8689	14238
16.0	89	38
	50	77
	<u>22.7361</u>	<u>22.7361</u>



1  
14  
32  
16  
5  
22  
17  
6  
23  
18  
I  
24  
18  
24  
18



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Mean Measures

22

4	16088	16840
52.7	9620	55 132 9697
16.5	30	98
	88	40
	<u>22.6483</u>	<u>22.6457</u>

5	16120	16962
228	919799	13898
17	01	98
	20	68
	<u>22.6921</u>	<u>22.6933</u>

6	17322	17526
23.3	1432018	10542
18	16	42
	22	30
	<u>23.3004</u>	<u>23.3014</u>

7	17944	16222
24	1412426	1003029
183	28	28
	46	24
	<u>18.3819</u>	<u>18.3805</u>

8	17365	16944
24.5	1282015	11490
18.4	10	90
	70	50
	<u>18.4552</u>	<u>18.4542</u>







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Mean Measure

22

4	16088	16840
22.7	9620.55	13296.97
16.5	30	98
	88	40
	<u>22.6423</u>	<u>22.6457</u>

5	16120	16962
22.8	9197.99	13898
17	01	98
	20	68
	<u>22.6921</u>	<u>22.6933</u>

6	17322	17526
23.3	14320.18	10542
18	16	42
	22	30
	<u>23.3004</u>	<u>23.3014</u>

7	17944	16222
24	14124.26	10030.2
18.3	28	28
	46	24
	<u>18.3819</u>	<u>18.3805</u>

8	17365	16944
24.5	12820.15	11490
18.4	10	90
	70	50
	<u>18.4552</u>	<u>18.4542</u>







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Lines etc

Date Dec 8, 16

Exp. to Stars	02	37		02	49	
" " Moon	02	42	40.5 ✓	02	42	40.8 ✓
Clock fast		11	59.5 ✓			
H. Sid. Time	02	30	41.15 ✓	- 2 <sup>h</sup> 08		
H. Long.	04	44	31.05 ✓			
S. Sid. Time	07	15	12.20 ✓			
" " " M.N.	17	07	38.23 ✓			
Interval	14	07	33.97 ✓			
Reduction		02	18.85 ✓			
S. M.T	14	05	15.12 ✓	14	08	753 ✓

Green Naut. Alm			R.A.		Decl	
Moon 14 <sup>h</sup>	04	38	2470 ✓	+25	23	59.7 ✓
Motion 1 <sup>m</sup>			2.2843 ✓			+ 2.115 ✓
" 5.252 ✓			+12.00 ✓			+ 11.1 ✓
Tabular Place	04	38	3670 ✓	+25	24	10.8 ✓

Moon's Age 13.6

$$934'' = 13.5$$

$$\begin{aligned} a &= -502.9 \\ &+ 24. \\ \hline &-478.9 \end{aligned}$$

Parallax	55	13.91 ✓
Semi-diam	15	04.6 ✓
R.		904.6
Aug.		12.6
Dec 5		-0.8
R		916.4 ✓
R		1.9644 ✓
(1+g) R		- 941 ✓
R		1.8703 ✓
R2		3.4980 ✓







11910

Times etc

Date Dec 8. 16

Exp to Stars	02	37		02	49
" " " " "	02	42	40.5	02	42 40.8
Clock fast		11	59.5		
H Sid Time	02	30	41.15	<del>2</del> - 2	08
H Gang.	04	44	31.05		
H Sid Time	07	15	12.20		
" " " MN	17	07	38.23		
Interval	14	07	33.97		
Reduction		02	18.85		
H M.T	14	05	15.12	14	08753

Green Naut. Alin			R.A.		Decl
Moon 14 <sup>h</sup>	04	38	24.70	+25	23 59.7
Moon 1 <sup>h</sup>			2.2843		2.115
" 5.252			+12.00		11.1
Tabular Place	04	38	36.70	+25	24 10.8

$$934'' = 13.5'$$

$$\begin{aligned} a &= -502.9 \\ &+ 24. \\ \hline &= -478.9 \end{aligned}$$

Moon Age 13.6

Parallax	55	13.91
Semi-diam	15	0.46
R.		904.6
ang		12.6
Dist		-0.8
R		916.4
R		1.9644
(1+u) R		-941
R		1.8703
RZ		3.4980







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## Plate Constants.

24

X	14.7265	25.2644	26.1326
S	14.5085	25.6947	26.3228
X-S	+2.2180	-.4303	-.2902

y	16.4628	4.7412	22.4408
n	16.2780	4.0738	22.6724
y-n	+1.1848	+6.674	-2.316

$$\begin{aligned}
 X-S + 500X & \quad -101y \quad +2.9x -7923 \\
 +2180 + 7363 & = 9543 -1662 = 7881 +43 = 7924 \\
 -4303 + 12632 & = 8329 -479 = 7850 +73 = 7923 \\
 -2902 + 13016 & = 10114 -2266 = 7848 +75 = 7923 \\
 24.5149 + 12257 & \quad -1674 \quad +71 = 247880
 \end{aligned}$$

$$\begin{aligned}
 y-n + 500y & \quad +102.1x \quad +3.7y -11641 \\
 +1848 + 8231 & = 10079 +1503 -11582 +60 = 11642 \\
 +6674 + 2371 & = 9045 +2579 -11624 +17 = 11641 \\
 -2316 + 11220 & = 8904 +2655 = 11559 +82 = 11641 \\
 16.5805 + 8290 & \quad +2500 \quad +61 = 16.5015
 \end{aligned}$$

$$\begin{aligned}
 \text{Tables } a &= -0.3 \\
 &-502.9
 \end{aligned}$$

$$\begin{aligned}
 l &= 0 \\
 &-503.7
 \end{aligned}$$

$$\begin{aligned}
 a-b &= -0.3 \\
 &+0.8
 \end{aligned}$$

$$\begin{aligned}
 f+d &= +1.0 \\
 &-1.1
 \end{aligned}$$

$$\begin{aligned}
 \omega-c &-502.6 \quad -503.7
 \end{aligned}$$

$$+2.1$$







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## Plate Constants.

24

X	14.7265	25.2644	26.1326
S	14.5085	25.6947	26.3228
X-S	+2.180	-4.303	-2902

y	16.4628	4.7412	22.4408
$\eta$	16.2780	4.0738	22.6724
y- $\eta$	+1848	+6674	-2316

-S + 500X	-1013	+291	-7923
2180 + 7363 = 9543	-1662 = 7881	+43 = 7924	
4303 + 12632 = 8329	-479 = 7850	+73 = 7923	
2912 + 13016 = 10114	-2266 = 7848	+75 = 7923	
24.5149 + 12257	-1674	+71 = 24.7880	

y- $\eta$ + 500y	+102.1x	+3.7y	-11641
+1848 + 8231 = 10079	+1503 = 11582	+50 = 1164	
+6674 + 2371 = 9045	+2579 = 11624	+17 = 1164	
-2316 + 11220 = 8904	+2655 = 11559	+82 = 1164	
16.5815 + 8290	+2500	+61 = 16.5015	

Tables	a = -3	b = 0	a-b = -3	f+d = +1.0
	+502.9	-503.7	+0.8	-1.1







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Moon Center

25

0 - c

1	24.0000	-0.5150	+2	0.2650	3.5092	+	112
2	23.0000	-1.5150	+1	1.2949	3.5005	+	25
3	22.7361	-1.7789	+0	3.1648	3.5012	+	32
4	22.6460	-1.8690	+0	3.4932	3.4932	-	48
5	22.6927	-1.8223	-0	3.3208	3.4972	-	8
6	23.3009	-1.2141	-2	1.4745	3.4909	-	71
7	24.0000	-0.5150	-2	0.2652	3.5092	+	112
8	24.5150	-0.0000	-2	0.0000	3.5141	+	161
					3.4980		

165800

1	14.7787	-1.8013	+1	3.2442	1.96
2	15.4819	-1.0981	+1	1.2056	234
3	16.0000	-0.5800	+0	0.3364	252
4	16.5800	-0.0000	+0	0.0000	270
5	17.0000	+0.4200	-0	0.1764	283
6	18.0000	+1.4200	-1	2.0164	379
7	18.3812	+1.8012	-1	3.2440	344
8	18.4547	+1.8747	-1	3.5141	360

Range 1.63

Approx. Center

X = 24

$y$  14.7764  
 18.3812  
 33.1576  
 $y_0$  16.5788

y max 18.4547

R 1.8759

Corn R 1.8703

X min 22.6460

Moon Center  $\left\{ \begin{array}{l} x_0 \ 24.5150 \\ y_0 \ 16.5800 \end{array} \right.$







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Mean Center

25

0 - C

1	24.0000	-0.5150	+2	6.2450	3.5092	+	112
2	23.0000	-1.5150	+1	1.2442	3.5005	+	25
3	22.7361	-1.7789	+	81648	3.5012	+	32
4	22.6460	-1.8690	+	3.4432	3.4932	-	48
5	22.6427	-1.8223	-	3.3208	3.4972	-	8
6	23.3109	-1.2141	-	1.4745	3.4909	-	71
7	24.1000	-0.5150	-	0.2652	3.5092	+	112
8	24.5750	-0.0000	-	0.0000	3.5141	+	161
					3.4980		

1	14.7787	-1.8073	+1	3.2442	197°
2	15.4819	-1.0981	+1	1.2056	242
3	16.0000	-0.5800	-	0.3364	250
4	16.5800	-0.0000	-	0.0000	270
5	17.0000	+0.4200	-	0.1764	284
6	18.0000	+1.4200	-	2.1164	326
7	18.3812	+1.8002	-	3.2440	343
8	18.4547	+1.8747	-1	3.5141	360

Range 163

Approx Center

X = 24

y	14.7764
	18.3812
	33.1576
y <sub>0</sub>	16.5788

ly max	18.4547
R	1.8759
Com R	1.8703
X <sub>lim</sub>	22.6460

Mean Center { X<sub>0</sub> 24.5150  
 { y<sub>0</sub> 16.5800



## normals

1	+ 0.92	- 57.1	- 201.0
2	+ 1.66	- 37.8	- 27.4
3	+ 1.03	- 57.0	- 18.5
4	+ 0.00	+ 90.8	+ 0.0
5	- 0.77	+ 14.5	- 3.3
6	- 1.72	+ 86.0	- 101.0
7	- 0.92	- 57.1	+ 201.0
8	- 0.00	- 00.0	+ 301.0
	+ 3.61	+ 190.5	+ 502.0
	- 3.41	- 209.0	- 351.2
	+ 0.20	- 18.5	+ 150.8

		- 37	
- a	- b	+ AC	
+ 13	- 11	- 35	✓
+ 39	- 7	- 5	✓
+ 46	- 3	+ 6	✓
+ 49	- 0	+ 12	✓
+ 47	+ 2	+ 12	✓
+ 32	+ 8	+ 3	✓
+ 13	+ 11	- 13	✓
+ 0	+ 11	- 26	✓



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## Conditional Equations

26

	-				D	O-C	corr	
1	-0.51	-1.80	= +112	+	1	-20	-19	+131+96
2	-1.51	-1.10	= +25	+	2	-12	-10	+35+30
3	-1.78	-0.58	= +32	+	3	-6	-3	+35+41
4	-1.87	-0.00	= -48	+	3	-0	+3	-51-39
5	-1.82	+0.42	= -8	+	3	+5	+8	-16-4
6	-1.21	+1.42	= -71	+	2	+15	+17	-88-85
7	-0.51	+1.80	= +112	+	1	+20	+21	+91-78
8	-0.00	+1.87	= +161	+	0	+20	+20	+141+115
	-9.21	+2.03						+433-155 ✓
								or 73

$$13.28 + 0.20 = 13.48$$

$$+ 0.10 + 13.74 = +15.08 + 2.03$$

$$+ 0.10 \quad + 0.00 = -0.3 \quad -0.07$$

$$13,74 = +151,1 = +2,10$$

$$A = + 1 \quad 1.0 + 0.15$$

$$13.28 = -18.5 - 2.2 = -20.7$$

$$a = -1,54 - 0,69$$

$$\frac{p}{n} = +.21$$

$$\frac{\Sigma v}{n} = +35$$

$$\frac{+35}{.21} = +1.66$$

$$\Delta R = +2,02$$

corr + 0.5

Line AR + 1.52

$$-2R = -3.74 \quad -2R_{\text{corr}} = -1.87 \quad -37$$

$$\Delta G - 0.28 - 6 \Delta S = -0.1 +$$

$$D\alpha + 1.29_{+26} D\alpha = +0.05$$







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## Conditional Equations

26

O-C

1	-0.51	-1.80	= +112	+	1	-20	-19	+131
2	-1.51	-1.10	= +25	+	2	-12	-10	+35
3	-1.78	-0.58	= +32	+	3	-6	-3	+35
4	-1.87	-0.00	= -48	+	3	-0	+3	-51
5	-1.82	+0.42	= -8	+	3	+5	+8	-16
6	-1.21	+1.42	= -71	+	2	+15	+17	-88
7	-0.51	+1.80	= +112	+	1	+20	+21	+91
8	-0.00	+1.87	= +161	+	0	+20	+20	+141

+433 - 15

or 73

$$13.28 + 0.20 = -18.5$$

$$+ 0.10 + 13.74 = +15.08$$

$$+ 0.10 + 0.08 = -0.3$$

$$13.74 = +15.1$$

$$h = +11.0$$

$$13.28 = -18.5 - 2.2 = -20.7$$

$$a = -1.54$$

$$\frac{P}{n} = +.21$$

$$\frac{E_v}{n} = +35$$

$$\frac{+35}{21} = +1.66$$

$$\Delta R = +2.02$$







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Mean Mean Position.

27

$$\begin{array}{r} X \quad 24.5150 \\ \quad \quad - 1 \\ \hline 24.5149 \end{array}$$

$$\begin{array}{r} y \quad 16.5800 \\ \quad \quad + 5 \\ \hline 16.5805 \end{array}$$

From Plate Constants.

$$\begin{array}{r} 24.7880 \\ 22. \\ \hline S_1 + 2.7880 \end{array}$$

$$\begin{array}{r} 16.5015 \\ 18 \\ \hline -1.4985 \end{array}$$

$$\begin{array}{l} \log S_0 \quad 0.44529 \\ \log \cos \delta \quad 9.95698 \\ \quad \quad 8.50724 \\ \log \sin \delta - N \quad 1.98107 \end{array}$$

$$\begin{array}{l} \log \tan \delta \quad 9.6700 \\ \log S_1 \quad 0.8906 \\ \quad \quad 7.0534 \\ \log \eta \quad 7.6140 \end{array}$$

$$\begin{array}{l} \alpha - A \quad 95.73 \\ \quad \quad 01 \quad 35.73 \\ A \quad 04 \quad 38 \quad 32.80 \end{array}$$

$$\begin{array}{l} \eta_1 \quad 0.0041 \\ \eta_0 \quad -1.5026 \end{array}$$

$$\alpha_0 \quad 04 \quad 40 \quad 08.53$$

$$\begin{array}{l} \log \eta_0 \quad 0.17684 \\ \quad \quad 7.33115 \\ \log \tan \delta - D \quad 2.84569 \end{array}$$

$$\text{Red} \quad +6.00$$

$$\delta - D \quad -70 \quad 0.95$$

$$\alpha' \quad 04 \quad 40 \quad 14.53$$

$$\begin{array}{l} -11 \quad 40.9 \\ \delta + 25 \quad 16 \quad 45.7 \end{array}$$

$$\delta_0 + 25 \quad 05 \quad 04.8$$

$$\text{Red} \quad +14.1$$

$$\delta' + 25 \quad 05 \quad 18.9$$







11910

Mean Mean Position.

27

$$\begin{array}{r} X \quad 24.5150 \\ \quad - 1 \\ \hline 24.5149 \end{array}$$

$$\begin{array}{r} y \quad 16.5800 \\ \quad + 5 \\ \hline 16.5805 \end{array}$$

From Plate Constants.

$$\begin{array}{r} 24.7880 \\ 22. \\ \hline S. + 2.7880 \end{array}$$

$$\begin{array}{r} 16.5015 \\ 18 \\ \hline -1.4985 \end{array}$$

$$\begin{array}{l} \log S_0 \quad 0.44529 \\ \log \cos \delta \quad 9.95698 \\ \quad 8.50724 \\ \log \sin \delta - N \quad 1.98107 \end{array}$$

$$\begin{array}{l} \log \tan \delta \quad 4.6700 \\ \log S_1^2 \quad 0.8906 \\ \quad 7.6534 \\ \log \eta \quad 7.6140 \end{array}$$

$$x-h \quad 95.73$$

$$01 \quad 35.73$$

$$h \quad 04 \quad 38 \quad 32.80$$

$$\eta_0 \quad 04 \quad 40 \quad 18.53$$

$$\text{Red} \quad +6.00$$

$$\delta' \quad 04 \quad 40 \quad 14.53$$

$$\eta_1 \quad 0.0041$$

$$\eta_0 - 1.5026$$

$$\log 3_0 \quad 0.17684 \sim$$

$$7.33715$$

$$\log \tan \delta - D \quad 2.84569 \sim$$

$$\delta - \epsilon \quad -70.0.95$$

$$-11 \quad 40.9$$

$$\epsilon \quad +25 \quad 16 \quad 45.7$$

$$S_0 + 25 \quad 05 \quad 04.8$$

$$\text{Red} \quad +14.1$$

$$\delta' + 25 \quad 05 \quad 18.9$$







11910

## Lunar Parallax

28

$\alpha'$	04	40	14.53 <sup>✓</sup>
$\theta$	02	30	41.15 <sup>✓</sup>
$\theta - \alpha'$	02	09	33.38 <sup>✓</sup>
$=$	-32	23	20.70 <sup>✓</sup>
$1/2 \alpha - \alpha'$	-	12	06.88
$\Delta - \alpha' - "$	-32	11	09.32

 $\Pi$  55- 13.91<sup>✓</sup>

9.86913

 $\log \sin \Pi$  8.20590<sup>✓</sup> $" \sin \theta - \alpha' "$  9.72890<sup>✓</sup> $" \sec \delta$  0.04416<sup>✓</sup> $\sin \alpha - \alpha' "$  7.84809<sup>✓</sup> $\alpha - \alpha' - 24$  13.83<sup>✓</sup> $= - 1$  36.92<sup>✓</sup>

$\log \cos 1/2 (\alpha - \alpha')$	9.95727
$\sec \theta - \alpha' - "$	0.00000
$\log \tan \gamma$	0.02973 <sup>✓</sup>
	46 57 34.6 <sup>✓</sup>
$\delta'$	25 05 18.9 <sup>✓</sup>

 $\gamma - \delta'$  21 52 15.7<sup>✓</sup>

$\log \sin \Pi$	9.85640 <sup>✓</sup>
$\sin (\gamma - \delta')$	8.20590 <sup>✓</sup>
$\csc \gamma$	9.57115 <sup>✓</sup>
$\cos \sec \gamma$	0.13617 <sup>✓</sup>
$\sin \delta - \delta'$	7.73962 <sup>✓</sup>

 $\delta - \delta'$  + 18 52.5<sup>✓</sup> $\delta$  25 24 11.4<sup>✓</sup> $\text{eph } \delta + 25$  24 10.8<sup>✓</sup> $0 - C$  + 0.6<sup>✓</sup>curr. + 0.8<sup>✓</sup>

2nd ord ref. + 0.0

Inv. Corr. - 0.1

Poor image of Moon.

 $\delta = +25$  24 11.3 $0 - C$  + 0.5 $\alpha$  04 38 37.61 $\text{eph } \alpha$  04 38 36.70<sup>✓</sup> $0 - C$  + 0.91

curr. - 0.02

Inv. Corr. + 0.05

 $\alpha =$  04 38 37.66 $0 - C =$  + 0.96







11910

## Lunar Parallax

28

$\alpha$  04 40 14.53  
 $\theta$  02 30 41.15  
 $\theta - \alpha$  02 09 33.38  
 $=$  -32 23 20.70  
 $\frac{1}{2} \alpha - \alpha$  -12 06.88  
 $\theta - \alpha^2$  -32 11 09.32

$\pi$  55" 13.91  
 $9.86413$   
 $\log \sin \pi$  8.20590  
 $\log \sin \theta - \alpha$  9.72890  
 $\log \sec \delta$  0.04416  
 $\sin \alpha - \alpha$  7.84809

$9.95727$   
 $\log \cos \frac{1}{2} \theta - \alpha$  0.00000  
 $\log \theta - \alpha$  0.07246  
 $\log \tan \gamma$  0.02973  
 $46$  57 34.6  
 $\delta$  25 05 18.9  
 $\gamma - \delta$  21 52 15.7

$\gamma - \alpha$  -24 13.83  
 $=$  -1 36.92

$9.82641$   
 $\log \sin \pi$  8.20590  
 $\log \gamma - \delta$  9.57115  
 $\cos \gamma$  0.13617  
 $\sin \delta - \pi$  7.73962

$\delta - \delta$  +18 52.8

$\delta$  25 24 11.4

$\gamma - \delta + 25$  24 10.8

$0 - C$  +0.6  
 $\text{curr.}$  +0.8  
 $\text{2nd ed. ref.}$  +0.0  
 $\text{Im. corr.}$  -0.1

Pro image of Moon

$\delta + 25$  24 11.3

$0 - C$  +0.5

$\alpha$  04 38 37.61

$\gamma - \alpha$  04 38 36.70

$0 - C$  +0.91  
 $\text{curr.}$  -0.02  
 $\text{Im. - corr.}$  +0.05

$\alpha$  04 38 37.66

$0 - C$  +0.96







11911

Reduction to Apparent Place







11710

Reduction to Apparent Place











