

KG
11366
v.991

CXXXIX		
139		
Plate	Date	Page
9733	Nov. 17, '15	1
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Harvard Lunar Plates.
Measures and Reductions
Martha C. Borton.

9733

Star Measures

M

1.

	d	r	d	r
L	18630	17690	12536	18956
11.4	15372	10968	10990	10500
15.1	72	74	80	96
	38	700	50	62
	<u>11.3260</u>	<u>11.3276</u>	<u>15.5552</u>	<u>15.1536</u>

2	19750	20490	20610	20310
28.1	17786	12472	20522	10370
23	82	70	22	70
	58	98		16
	<u>28.1968</u>	<u>28.1974</u>	<u>23.0088</u>	<u>23.0054</u>

3	19802	18518	18522	19684
31.9	10590	17792	16416	11752
10.2	42	98	008	64
	02	22	10	70
	<u>31.9261</u>	<u>31.9277</u>	<u>10.2112</u>	<u>10.2086</u>

Moon Measures

L		19276	18606
23.9		13674	14220
14.6		6268	42
-4		98	592
		<u>145620</u>	<u>145216</u>
2		19952	18582
23		11826	16782
14.9		1621	50
		82	82
		<u>14.8156</u>	<u>14.8164</u>

3	18408	19920
22.8	11052	17308
15	52	48
	20	28
	<u>22.7368</u>	<u>22.7390</u>

7100

Star Measures

	d	r	d	r
L	18630	17690	12536	18956
11.4	15372	10968	10990	10500
15.1	72	79	80	96
	38	100	50	62
	<u>11.3260</u>	<u>11.3276</u>	<u>15.1552</u>	<u>15.1536</u>
2	19750	20490	20610	20310
28.1	17786	12472	20522	10370
23	82	70	22	70
	58	98		16
	<u>28.1968</u>	<u>28.1979</u>	<u>23.0088</u>	<u>23.0059</u>
3	19802	18518	18522	19689
31.9	10590	17792	16916	11752
10.2	42	98	6008	69
	02	22	10	70
	<u>31.9261</u>	<u>31.9277</u>	<u>10.2112</u>	<u>10.2086</u>

Moon Measures

L		19276	18606
13.9		13679	17220
17.6		6268	92
-4		98	592
		<u>14.5620</u>	<u>17.5616</u>
2		19952	18582
23		11826	16782
17.9		1621	50
		82	82
		<u>17.8156</u>	<u>17.8169</u>
3	18408	19920	
22.8	11052	17308	
15	52	18	
	20	28	
	<u>22.7368</u>	<u>22.7390</u>	

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Moon Measures

2

<u>4</u>	18424	18918
22.1	17282	10090
16	82	92
	28	19
	<u>22.1142</u>	<u>22.1176</u>

<u>5</u>	18434	18910
22+	17822	9522
16.7	28	16
-X	48	20
	<u>22.0610</u>	<u>22.0600</u>

<u>6</u>	17430	18916
22.1	15950	10380
17	98	80
	92	18
	<u>22.1482</u>	<u>22.1462</u>

<u>7</u>	17448	17902
22.9	8490	16858
18	92	30
	96	02
	<u>22.8958</u>	<u>22.8938</u>

<u>8</u>		17437	18058
23	16942	16776	7692
18.1	16294	70	887
	8087	26	70
	98	<u>18.0660</u>	<u>18.0620</u>
	<u>18.0656</u>		

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Mean Measures

2

$$\begin{array}{r}
 2 \\
 22.1 \\
 16 \\
 \hline
 18.424 \\
 17282 \\
 82 \\
 28 \\
 \hline
 22.1192
 \end{array}
 \quad
 \begin{array}{r}
 18918 \\
 10090 \\
 92 \\
 19 \\
 \hline
 22.1176
 \end{array}$$

$$\begin{array}{r}
 5 \\
 22+ \\
 16.4 \\
 -8 \\
 \hline
 18934 \\
 17822 \\
 28 \\
 48 \\
 \hline
 22.0610
 \end{array}
 \quad
 \begin{array}{r}
 18910 \\
 9522 \\
 16 \\
 20 \\
 \hline
 22.0600
 \end{array}$$

$$\begin{array}{r}
 6 \\
 22.1 \\
 17 \\
 \hline
 17930 \\
 15950 \\
 98 \\
 92 \\
 \hline
 22.1982
 \end{array}
 \quad
 \begin{array}{r}
 18916 \\
 10380 \\
 80 \\
 18 \\
 \hline
 22.1962
 \end{array}$$

$$\begin{array}{r}
 7 \\
 22.9 \\
 18 \\
 \hline
 17998 \\
 8990 \\
 92 \\
 96 \\
 \hline
 22.8958
 \end{array}
 \quad
 \begin{array}{r}
 17902 \\
 16858 \\
 30 \\
 02 \\
 \hline
 22.8938
 \end{array}$$

$$\begin{array}{r}
 8 \\
 23 \\
 18.1 \\
 \hline
 16992 \\
 16294 \\
 8087 \\
 98 \\
 \hline
 18.0656
 \end{array}
 \quad
 \begin{array}{r}
 17939 \\
 16776 \\
 70 \\
 26 \\
 \hline
 18.0660
 \end{array}
 \quad
 \begin{array}{r}
 17058 \\
 7692 \\
 88 \\
 79 \\
 \hline
 18.0620
 \end{array}$$

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Times & Etc.

3

Nov 17/15

Exp. to Stars	01	10		01	22	
" " Moon	1	16	23.8"	1	16	24.1"
Clock fast		4	0.7"			
H. Sid T.	01	12	23.55	4-d - + 0"		28 ^m
H. Long	7	44	31.05			
G. Sid T.	03	56	59.60			
Sid T. M. N	15	41	51.06			
Interval	14	15	03.54			
Reduction		2	20.08			
G. M. T.	14	12	43.26			

From Naut Alman.

P. A

Dec.

Moon 14 ^h	00	43	45.42	+9	31	26.7
Motion in 1 ^m			+ 1.8983"			13.342"
" 12.7243			24.15"		2	49.9"
Tabular Place	00	42	09.67"	+9	34	16.4"

Moon's age 11 days

Parallax	55'	29.95"
Semid.	15'	07.6"
R		907.6"
Aug.		12.4"
Sin 3		-0.3"
R		919.7"
R		1.9714"
AR		-934"
14AR		1.8780"
R		3.5269"

$$934 = 13.1$$

$$\begin{array}{r} a = -998 \\ \quad 24 \\ \hline -974 \end{array}$$

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Jupiter & Etc.

3

Nov 17 '15

Exp. to Stars	01	10		01	22	
... Moon	1	16	23.8	1	16	24.1
Clock fast		9	0.9			

H. Sid L.	01	12	23.55	4-4	+ 0"	28 ^m
H. Long	7	44	31.05	-		
G. Sid L.	03	56	59.60	-		
Sid L.M.H.	15	41	51.06	-		
Interval	14	15	03.54	-		
Reduction		2	20.08	-		
G.M.T.	14	12	43.46	-		

From Naut Alm.		R A		Dec.	
Moon 14"	00	43	95.92	+9	31 26.7
Motion in 1 ^m			+ 28983"		13.312"
" 12.7293			24.15"		2 99.9"
Jabular Place	00	44	09.67"	+9	34 16.4
			Moon's age	11 days	

934 = 13.1

Parallax	55'	29.95'
Semi d.	15'	07.6"
R		907.6"
aug		12.4"
Err 3		-0.3"
R		919.7"
PR		1.9714"
alt		-939"
144R		1.8780"
R~		3.5269"

$$\begin{array}{r}
 9 = -998 \\
 \underline{24} \\
 -974
 \end{array}$$

2

X	11,3268	28,1971	31,9269
\bar{x}	11,1118	28,8660	32,7102
$x - \bar{x}$	+ 2,150	- 6,689	- 7,833

y	15, 15, 94	23, 0071	10.2099
n	15, 5022	23, 6607	10.1934
$y-n$	-3478	-6436	+165

$$\begin{array}{r} X-3 + 500X + 557Y - 2X - 8635 \\ + 2150 + 5663 = + 7813 + 899 - 8657 - 23 = + 8639 - 1 \\ - 6689 + 19099 = + 7910 + 1281 - 8691 - 56 = 35 0 \\ - 7833 + 15963 = + 8130 + 569 - 8699 - 69 = 35 0 \\ 23990 + 11970 = + 916 - 48 = 24360 \end{array}$$
$$\begin{array}{r}
 y - n \quad + 500y \quad - 57x \quad - 9y \quad - 3970 \\
 - 3778 + 7577 = + 9099 - 676 = + 3453 - 13 = + 3970 = 0 \\
 - 6736 + 11509 = 5068 - 1407 = + 3961 - 21 \quad 70 \quad 0 \\
 + 165 + 5105 = 5270 - 1820 = + 3950 - 9 \quad 41 \quad + 1 \\
 16439748220 = - 13652 - 152 = 167797
 \end{array}$$

9733 Plate Constants

7

$$\begin{array}{rcl}
 X & 11.3268 & 28.1971 & 31.9269 \\
 Y & 11.1118 & 28.8660 & 32.7102 \\
 X-Y & +2150 & -6689 & -7833
 \end{array}$$

$$\begin{array}{rcl}
 y & 15.1599 & 23.0071 & 10.2099 \\
 n & 15.5022 & 23.6507 & 10.1939 \\
 y-n & -3478 & -6936 & +165
 \end{array}$$

$$\begin{array}{rcl}
 X-Y & +500X & +55174 & -2X & -8635 \\
 +2150 + 5663 & = +7813 + 899 & -8657 - 23 & = +8639 & -1 \\
 -6689 + 17099 & = +7910 + 1281 & -8691 - 56 & = 35 & 0 \\
 -7833 + 15963 & = +8130 + 569 & -8699 - 69 & = 35 & 0 \\
 23.9901 + 11.970 & & +916 & -48 & = 24.3607
 \end{array}$$

$$\begin{array}{rcl}
 y-n & +500y & -57X & -9y & -3490 \\
 -3478 + 7577 & = +4099 - 696 & = +3453 - 13 & = +3790 & = 0 \\
 -6936 + 11508 & = 5068 - 1407 & = +3961 - 21 & 90 & 0 \\
 +165 + 5105 & = 5270 - 1820 & = +3950 - 9 & 91 & +1 \\
 16.4397 + 8220 & & -1365 & -15 & = 16.7727
 \end{array}$$

$$\begin{array}{rcl}
 \text{Tables} & a = +.7 & e = -.9 & a-e = +1.6 & 1+d = -.5 \\
 \text{Obs.} & = -498 & = -499.1 & = +1.1 & = +43
 \end{array}$$

A + 3

B + 1.2



9733 Moon's Center

	x	$y - y_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$(y - y_0)^2$	$u - e$
1	23.9380	0.0000	-1	0.0000	3.5284	+ 1.5	
2	23.0000	-0.9380	-1	0.8800	3.5260	- 9	
3	22.7379	-1.2001	-0	1.4402	3.5144	- 125	
4	22.1159	-1.8221	-0	3.3201	3.5138	- 131	
5	22.0605	-1.8775	0	3.5250	3.5250	- 19	
6	22.1972	-1.7908	+0	3.2070	3.5207	- 62	
7	22.8948	-1.0938	+1	1.0893	3.5235	- 34	
8	23.0000	-0.9380	+1	0.8796	3.5170	- 99	

P 3.5269

	y	$x - x_0$	Δy	$(y - y_0)^2$	$(x - x_0)(y - y_0)$	$u - e$	u^2
1	19.5618	-1.8782	-2	3.5284	+180		
2	19.8160	-1.6240	-2	2.6380	210		
3	15.0000	-1.4400	-2	2.0742	220		
4	16.0000	-0.4400	-1	0.1937	256		
5	16.4400	0.0000	0	0.0000	270		
6	17.0000	+0.5600	+1	0.3137	287		
7	18.0000	+1.5600	+2	2.4342	326		
8	18.0638	+1.6238	+2	2.6374	330	150	

Approx. Center

 $x = 23$

y	19.8160
	18.0638
	32.8778
y_0	16.7399
y min	19.5618
y	18.781
x min	22.0605
x_0	23.9386

Moon's Center

$$\left\{ \begin{array}{l} x_0 = 23.9380 \\ y_0 = 16.7400 \end{array} \right.$$

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Moon's center

	x	$y - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)$	$u - c$	5
1	23.9380	0.0000	-1	0.0000	3.5289	+15	
2	23.0000	-0.9380	-1	0.8800	3.5260	-9	
3	22.7379	-1.2001	-0	1.4402	3.5144	-125	
4	22.1159	-1.8221	-0	3.3201	3.5138	-131	
5	-22.0605	-1.8775	0	3.5250	3.5250	-19	
6	22.1972	-1.7908	+0	3.2070	3.5207	-62	
7	22.8998	-1.0938	+1	1.0893	3.5235	-34	
8	23.0000	-0.9380	+1	0.8796	3.5170	-99	

R 3.5269

	y	$y - y_0$	Δy	$(y - y_0)^2$	u	1500
1	19.5618	-1.8782	-2	3.5289	+180	
2	19.8160	-1.6240	-2	2.6380	210	
3	15.0000	-1.4400	-2	2.0742	220	
4	16.0000	-0.4400	-1	0.1937	238	
5	16.9900	0.0000	0	0.0000	270	
6	17.0000	+0.5600	+1	0.3137	287	
7	18.0000	+1.5600	+2	2.4392	326	
8	18.0638	+1.6238	+2	2.6379	330	1500

Approx. center

 $x = 23$ y

19.8160

18.0638

31.8798

 y_0

16.9399

 y min

19.5618

 R

1.8781

 x min

22.0605

 x_0

23.9386

Moon's center

 x_0 23.9380 y_0 16.9900

Formation of Normals

1 + 0.00	- 0.0	- - 28.0
2 + 15.2	+ 8.5	+ 19.5
3 + 17.3	+ 15.0	+ 18.0
4 + 0.80	+ 23.8	+ 57.5
5 + 0.00	+ 35.5	0.0
6 - 1.00	+ 35.0	- 11.0
7 - 16.2	+ 35.5	- 53.0
8 - 15.2	+ 93.0	- 16.05
+ 4.05	+ 59.55	+ 25.20
- 4.14		- 35.25
- 0.09	+ 59.55	- 10.05

		a	b	c
		- 0	- 4	+ 11 ^v
a	+ 10	- 9	- 3	+ 3 ^v
b	+ 2	- 12	- 3	0 ^v
c	+ 15	- 18	- 1	- 4 ^v
		- 19	0	- 7 ^v
		- 18	+ 1	- 2 ^v
		- 10	+ 3	+ 8 ^v
		- 9	+ 3	+ 9 ^v

+9.6

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Conditional Equations

4-e ^{6 new}
0-e

1	-0.00	-1.88	= +	16	-0	+13	=	+13	+2	+13
2	-0.99	-1.62	= -	9	-39	+11	=	-28	+19	+22
3	-1.20	-1.44	= -	125	-50	+10	=	-40	-85	-85
4	-1.82	-0.77	= -	131	-75	+3	=	-72	-59	-63
5	-1.88	0.00	= -	19	-78	0	=	-78	+59	+55
6	-1.79	+0.56	= -	62	-74	+7	=	-78	+12	+10
7	-1.09	+1.56	= -	37	-93	+11	=	-59	+20	+28
8	-0.99	+1.62	= -	99	-39	+11	=	-50	-99	-90
									+112	-193

Average 38

$$+14.35 - 0.09 = +595.5 - 9.61 \Delta$$

$$-0.09 + 13.82 = -100.5 - 1.67 \Delta$$

$$+0.09 - 0 = +3.7$$

$$= 0.12 \Delta$$

$$+13.82 = -96.8 \quad \Delta = -6.9$$

$$+14.35 = +595.5 - 0.6 = +594.9 \quad \Delta = +4.3$$

$$- 0.67 \Delta$$

Arc Measured 150°

$$\frac{P}{h} = 1.55$$

$$\frac{\Delta V}{L} = -10.1$$

$$\text{In } 3 \quad R \quad 1.88$$

$$-2RC = +.75$$

$$\frac{-10.1}{1.55} = -6.5$$

$$\Delta R_1 = -0.8$$

$$\text{corr} = -0.2$$

$$\Delta b = -0.09$$

$$\Delta s = 0.0$$

$$\Delta R = -0.6$$

$$\Delta a = -0.50$$

$$\Delta \alpha = -0.02$$

9733 Conditional Equations 4-C⁶

1 - 0.00 - 1.88 = + 15	- 0 + 13 = + 13	+ 2
2 - 0.99 - 1.62 = - 9	- 39 + 11 = - 28	+ 19
3 - 1.20 - 1.94 = - 125	- 50 + 10 = - 40	- 85
4 - 1.82 - 0.99 = - 131	- 75 + 3 = - 72	- 59
5 - 1.88 - 0.00 = - 19	- 78 0 = - 78	+ 59
6 - 1.79 + 0.56 = - 62	- 79 - 9 = - 78	+ 12
7 - 1.09 + 1.56 = - 39	- 93 - 11 = - 59	+ 20
8 - 0.99 + 1.62 = - 99	- 39 - 11 = - 50	- 99
	+ 112	- 193

Average 3:

$$+19.35 - 0.09 = +595.5$$

$$- 0.09 + 13.82 = -100.5$$

$$+ 0.09 - 0 = +3.7$$

$$+13.82 = -96.8 \quad b = -8.9$$

$$+19.35 = +595.5 - 0.6 = +594.9 \quad a = +41.3$$

Arc measured 150°

$$\frac{13}{h} = -15.5$$

$$\frac{24}{h} = -90.1$$

$$\frac{-10.1}{15.5} = -65 \quad \Delta 12 = -0.8$$

7733 Moon's Mean Position.

7

$$\begin{array}{r} X_0 \ 23.9380^{\circ} \\ +21^{\circ} \\ \hline 23.9701^{\circ} \end{array}$$

$$\begin{array}{r} Y_0 \ 16.9700^{\circ} \\ -3^{\circ} \\ \hline 16.9397^{\circ} \end{array}$$

From Plate Constants.

$$\begin{array}{r} X \ 24.3609^{\circ} \\ Y \ +2.3609^{\circ} \\ \log \xi \ 0.37299^{\circ} \\ \log \eta \ 999.455^{\circ} \\ \xi \ 8.50729^{\circ} \\ \eta \ 1.87120^{\circ} \end{array}$$

$$\delta - A \quad +74.38^{\circ}$$

$$A \ 0.42 \ 31.00^{\circ}$$

$$X_0 \ 0.43 \ 45.37^{\circ}$$

$$\text{Red.} \quad +4.30^{\circ}$$

$$X' \ 4.3 \ 49.68^{\circ}$$

$$\begin{array}{r} \alpha \ 16.7797^{\circ} \\ \eta \ -1.2203^{\circ} \\ \log \tan \delta \ 920.30^{\circ} \\ \xi^2 \ 0.7760^{\circ} \\ \eta^2 \ 7.0537^{\circ} \\ \log \tan \delta \ 7.0020^{\circ} \end{array}$$

$$\eta_1 +.0010^{\circ}$$

$$\eta_0 -1.2213^{\circ}$$

$$\begin{array}{r} \log \eta_0 \ 0.08682^{\circ} \\ 7.33113^{\circ} \\ 2.75567^{\circ} \end{array}$$

$$569.7^{\circ}$$

$$\delta - D \quad -9 \ 29.7^{\circ}$$

$$D + 9 \ 13 \ 07^{\circ}$$

$$\delta \ 9 \ 3 \ 34.3^{\circ}$$

$$\text{Red.} \quad +29.7^{\circ}$$

$$\delta' \ 9 \ 03 \ 64.0^{\circ}$$

9733 Moon's Mean Position.

7

$$\begin{array}{r} \gamma_0 \ 23 \ 93 \ 80'' \\ + 21'' \\ \hline 23 \ 99 \ 01'' \end{array}$$

$$\begin{array}{r} \gamma_0 \ 16 \ 99 \ 00'' \\ - 3'' \\ \hline 16 \ 93 \ 97'' \end{array}$$

From Plate Constants

$$\begin{array}{r} X \ 24 \ 36 \ 09'' \\ \xi + 2 \ 36 \ 09'' \\ \log \xi \ 0 \ 37 \ 299'' \\ \cos \delta \ 999 \ 956'' \\ \hline 8 \ 507 \ 29'' \\ \hline 1 \ 871 \ 29'' \end{array}$$

$$A-A \quad + 74.33''$$

$$A \ 0 \ 42 \ 31.00''$$

$$\gamma_0 \ 0 \ 43 \ 45.38''$$

$$\text{Red} \quad + 4.30''$$

$$\gamma' \ 43 \ 49.68''$$

$$\begin{array}{r} \alpha \ 16 \ 77 \ 27'' \\ \eta - 1 \ 22 \ 03'' \\ \log \tan \delta \ 9 \ 20 \ 30'' \\ \xi^2 \ 0 \ 77 \ 60'' \\ \hline 7 \ 05 \ 39'' \\ \hline 7 \ 00 \ 20'' \end{array}$$

$$\eta_1 + 0 \ 01 \ 0''$$

$$\eta_0 - 1 \ 27 \ 43''$$

$$\begin{array}{r} \log \eta_0 \ 0 \ 08 \ 682'' \\ \hline 7 \ 331 \ 13'' \\ \hline 2 \ 755 \ 68'' \\ \hline 5 \ 67 \ 7'' \end{array}$$

$$\delta - D \quad -9 \ 28.2''$$

$$D + 9 \ 13 \ 07''$$

$$\delta L \ 9 \ 3 \ 34.3''$$

$$\text{Red} \quad + 29.7''$$

$$\delta' \ 9 \ 03 \ 640''$$

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Lunar Parallel

8

α'	0	43	99.69"	π	55'	24.95"
δ	01	12	23.55"			
$\delta - \alpha'$	+	0	28	9.86913		
$=$	+	7.08	33.71"	8.20739		
		2	28.65"	9.09752		
$\delta - \alpha'$	+	7	05	0.00608		
			53.79	7.17707		

9.95727"
 0.00000"
 0.00334"
 9.96061"

$\delta - \alpha'$ 5 10.09"
 = + 20.67"

δ 42 24 18.2
 $\delta + 09$ 03 67.0"
 $\delta - \alpha'$ 33 20 15.2"

9.82640"
 8.20734"
 9.79002"
0.17110"
 7.94486"

$\delta - \alpha'$ 30. 16.7"

δ 09 34 20.7

Ampl. +9. 34 16.4"

$\delta - \alpha'$ +7.3"

Curv. of Plate +0.7
 2nd Order Ref. 0.0

Ins Corr 0.0

$\delta + 09$ 34 20.7

$\delta - \alpha'$ +7.3

δ 00 44 10.37"

Ampl. 0.0 44 09.67"

$\delta - \alpha'$ +0.64"

-0.00

-0.02

α 00 44 10.29

+0.62

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Lunar Parallax

8

$$\begin{array}{rcl}
 \alpha' & 0 & 43 & 99.68'' \\
 \delta & 01 & 12 & 23.55'' \\
 \delta - \alpha' & + & 0 & 28 & 33.92'' \\
 & = & + & 7^{\circ} & 08' & 28.85'' \\
 & & & 2 & 33.96'' \\
 \frac{1}{2} (\delta - \alpha') & + & 7 & 05 & 53.89''
 \end{array}$$

$$\begin{array}{rcl}
 \pi & 55' & 29.95'' \\
 & 9.86913'' \\
 & 8.20739'' \\
 & 9.09282'' \\
 & 0.00608'' \\
 \hline
 & 7.17399''
 \end{array}$$

$$\begin{array}{rcl}
 9.95727'' \\
 0.00000'' \\
 0.00339'' \\
 \hline
 9.96067''
 \end{array}$$

$$\begin{array}{rcl}
 \delta - \alpha' & 5' & 00.98'' \\
 & = & + 20.69''
 \end{array}$$

$$\begin{array}{rcl}
 \delta & 42 & 24 & 18.2'' \\
 \delta + 09 & 03 & 69.0'' \\
 \delta - \delta & 33 & 20 & 95.2''
 \end{array}$$

$$\begin{array}{rcl}
 9.82690'' \\
 8.20739'' \\
 9.79002'' \\
 0.17190'' \\
 \hline
 7.94988''
 \end{array}$$

$$\delta - \delta' \quad 30 \quad 14.7''$$

$$\delta \quad 09 \quad 34 \quad 20.7''$$

$$\alpha \quad 60 \quad 44 \quad 10.34''$$

$$\text{Ann Eph. } \delta \quad +9 \quad 34 \quad 16.4''$$

$$\text{Ann Eph. } \alpha \quad 60 \quad 44 \quad 09.67''$$

$$\delta - \alpha \quad +9.3''$$

$$\delta - \alpha \quad +0.84''$$

$$\begin{array}{rcl}
 \text{Curv of Plate} & + & 0.9 \\
 2^{\text{nd}} \text{ Clicker Ref} & & 0.0
 \end{array}$$

$$-0.00$$

checked
M.P.
5

1
13
17

2
19
28

3
32
17

1
23
17
-1

2
23
17

3
21
10

9758-

Star Measures

11

	d	μ	d	μ
1	19644	19743	17679	19579
15.8	12228	17070	16382	10856
19.1	32	67	89	42
	48	40	68	67
	<u>15.7317</u>	<u>15.7325</u>	<u>17.1293</u>	<u>17.1287</u>
2	18333	19702	18790	18594
194	17508	10598	13282	14098
24.6	12	99	80	102
	36	00	800	610
	<u>19.0823</u>	<u>19.0846</u>	<u>24.5517</u>	<u>24.5498</u>
3	18920	19326	18540	18092
32.7	14516	12226	9926	16650
17.9	22	12218	12	49
	16	26	28	50
	<u>32.3900</u>	<u>32.3896</u>	<u>17.8631</u>	<u>17.8604</u>

Moon Measures

1		18502	19910
23-		14698	13736
19.7		90	20
-4		99	06
		<u>17.3806</u>	<u>17.3820</u>
2		18524	19852
22		12132	16282
17.7		26	72
		32	57
		<u>17.6700</u>	<u>17.6727</u>
3	16638	18822	
21.6	1606268	14406	
15	7768	02	
	40	20	
	<u>21.5571</u>	<u>21.5583</u>	

913.8 - Star Measures

1	2	3	4
185.44	197.43	176.79	195.79
15.8	170.70	16.382	108.58
19.1	69	89	9.2
98	90	68	69
<u>15.7317</u>	<u>15.7325</u>	<u>14.1293</u>	<u>14.1289</u>
2	1970.2	187.90	195.99
19.1	102.98	132.82	190.98
29.6	99	80	102
36	00	800	610
<u>19.0823</u>	<u>19.0896</u>	<u>24.5219</u>	<u>24.5498</u>
3	193.26	185.40	180.92
32.9	132.26	99.26	166.50
17.9	132.18	12	99
16	26	28	50
<u>32.3900</u>	<u>32.3896</u>	<u>19.8631</u>	<u>17.8609</u>

Moon Measures

1	1950.2	1991.0
23-	146.98	137.36
14.7	70	20
-4	79	06
	<u>19.3806</u>	<u>19.3820</u>
2	185.29	198.52
22	121.32	162.82
19.7	26	72
	32	59
	<u>19.6900</u>	<u>19.6929</u>
3	188.22	
21.6	194.06	
15	62	
	40	
	20	
	<u>21.5571</u>	<u>21.5580</u>

5
2
1

3
2
16

6
21
17

7
23
17

8
22
13

9754

Moon Measures.

12

7.	18662	19560
214	17642	10588
16	58	84
	70	60
	<u>21.7004</u>	<u>21.1024</u>

5	18666	18561
214	17830	941207
16.3	42	0207
	90	66
-1	<u>21.0832</u>	<u>21.0840</u>

6	18690	10510
21.2	16258	12972
17	497	68
	714	18
	<u>21.2995</u>	<u>21.2951</u>

7	18662	19150
22	10204	17586
17.8	192	90
	60	48
	<u>17.8462</u>	<u>17.8438</u>

8	17392	99358
22.3	1401623	12732
18	30	30
	418	48
	<u>22.3377</u>	<u>22.3379</u>

975.9

Moon Measures

12

<u>9</u>	18662	19560
211	17662	105 88
16	58	88
	70	60
	<u>21.0009</u>	<u>21.1029</u>

<u>5</u>	18666	18561
211	17830	991207
16.3	42	0207
	90	66
-1	<u>21.0832</u>	<u>21.0890</u>

<u>6</u>	18690	10510
21.2	16258	12972
17	991	68
	719	18
	<u>21.2995</u>	<u>21.2951</u>

<u>7</u>		18662	19150
22		10209	17286
17.8		192	90
		60	48
		<u>17.8462</u>	<u>17.8438</u>

<u>8</u>	17392	19358
22.3	14016	127 67
18	30	30
	418	48
	<u>22.3377</u>	<u>22.3379</u>

9754

Times & Etc.

13

Nov. 18/13 -

Exp. to stars	0	28		00	40	
" " Moon	0	35	29.6	0	35	30.0
Clock fast		4	02.9			

H. Sid Time	0	31	26.9	0 ^h	57 ^m
H. Long	4	44	31.05		
G. Sid T.	5	15	57.95		
Sid T. M Noon	15	45	47.62		
Interval	13	30	10.33		
Reduction		2	12.73		
G. M. T.	13	27	57.60		

From Naut Alman		R. A.		Dec.	
Moon 13 th	01	27	52.17	+19	29 16.6
Motion in 1 ^m			1.9923		+12.027
" 27.9600			54.32	+5	36.3
Tabular Place	01	28	46.49	+14	29 52.9

Moon's Age 11 days

Parallax	54'	59.65
Semid.	15"	00.7
R.		900.7
aug.		12.6
Ln. 2		-01
R.		913.2
R.		1.9576
AR		-936
(14) R		1.8640
R		3.4745

934- 13.5-

A = -502

27

-478

9159

Times & Etc.

13

Nov. 18/12

Exp. to Stars	0	28		00	90	
" Moon	0	35	29.6	0	35	30.0
Clock fast		9	02.9			

H. Sid Time	0	31	26.9	- 4.1	- 0.4	57.7
H. Long	4	44	31.05			
g Sid J	5	15	57.95			
Sid J. M. Noon	15	45	97.62			
g. Interval	13	30	10.33			
Reduction		2	12.73			
g. M. J.	13	27	57.60			

From Naut Alman		11.4.		Dec.		
Moon 13h	01	27	52.17	+19	29	16.6
Motion in 1 st m			1.9923			+12.027
" 22.9600			59.32	+5		36.3
Substar Place	01	28	96.99	+19	27	52.9

Moon's Age 11 days

Parallax	54'	59.6
Semi-d.	15'	00.7
R.		900.7
ang		12.6
ln		-0.1
R.		913.2
R.		1.9576
alt		-936
11 + alt		1.8640
R.		3.7795

939- 12.5-

a = -50.2

29

-478

9759

Plate Center

79

X	Y	X	Y
15.73 21	19.1288	01 25 21.7	13 96 19.7
19.08 39	24.5506	1 27 15.78	15 11 15.0
32.38 98	19.86 17	1 39 41.97	13 51 15.9
3) 67.2053	53.5911	3) 03 86 79.95	41 108 45.6
22.4018	17.8470	1 29 6.48	17 16 15.2
22	18	-12.76	+71.9
- .4018	+1.530	1 28 54.02	17 17 26.6
31	466.5		
12.346	71.9		

Plate Center

A 1 28 54.0
D+14 17 27

X- \bar{x}	+500X	+60.2Y	+2X	-12376
+3629	+7866	+11495	+850	= 12395
+1318	+9572	+10860	+1278	= 12338
-4777	+16195	+11218	+899	= 12312
22.9491	+11.475	+978	+5	= 22.9573

Y-y	+500Y	-62.1X	+2.2Y	-7419
+1301	+7064	+8365	-977	= +7388
-3725	+12275	+8550	-1185	= 7365
+1967	+7431	+9398	-2012	= 7386
16.2426	+8121	-1225	+36	= 16.1739

Tables	a = +.2	e = -.5	a-e = +.7	b+d = +.5
Obs.	= -50.2	= -502.2	= +.2	= +1.9
O-C	-502.2	-501.7		+1.4

7129

Plate Center

#9

X	Y	X	Y
15 73 21	19.1288	01 25 21.7	13 96 19.7
19.08 39	29.55 06	1 27 15.78	15 11 15.6
32.38 98	19.86 17	1 39 91.97	13 51 13.9
67.20 53	53.59 11	3.03 86 19.95	41 108 95.6
22.90 18	17.89 70	1 29 6.98	17 16 15.2
22	15.	-12.76"	+ 71.
- .9018	+ .1530	1 28 59.02	17 17 26.6
31	166.2		
12.396	71.9		

Plate Center

A 1 28 59.6
 D 17 17 27

X- \bar{x}	+500X	+60.24	+2X	-12376
+3629	+7866	+11495	+850	= 12395
+1318	+9572	+10810	+1978	= 12338
-4777	+16195	+11418	+899	= 12312
22.9791	+11.975	+978	+5	= 22.9573

Y-y	+500Y	-62.11	+2.24	-7919
+1301	+7069	+8365	-977	= +7388
-3725	+12275	+8550	-1185	= 7365
+1967	+7431	+9398	-2012	= 7386
16.2826	+8121	-1925	+36	= 16.1739

Tables
Obs.

a = +.2

= -50.2

c = -.5

= -502.2

d - e = +.7

= +.2

b + d = +.5

= +19

ξ	η	$\Delta \xi$	-26ξ	$+13\eta$	-6			
1	-6.63	-7.01	-10	+17	+7	-1	+6	0
2	-3.05	+6.92	-7	+8	+4	+2	+6	0
3	+10.86	-3.37	+35	-28	+7	-1	+6	0
M	+0.96	-1.83	0	-2	-5			-13

$\Delta \eta$	-1.7η	-3ξ	-2
-6	+7 ~ +1	+2 ~ +3	+1
+11	-12 ~ -1	+1 ~ 0	-2
+11	-6 ~ +5	-3 ~ +2	0
0	+3	-3	-2

Standard Coordinates												25-
Cape No 209-Mg 9.1				Cape No 209-Mg 8.3				Cape No 231-Mg 6.9				
C	01	24	33.83	01	26	27.69	01	33	53.83			
L			33.86						53.82			
C			33.83						53.83			
Mean	01	24	33.87	01	26	27.69	01	33	53.83			
Prec.			47.86			48.09			48.14			
d	01	25	21.70	01	27	15.78	01	39	71.97			
A	1	28	54.0	1	28	54.	1	28	54			
d-A		-03	32.30		-01	38.22		+05	77.97			
Sin(94)		-2	12.29		-98.22			+3	47.93			
log u	2.32	69	3 n	1.99	22	0 n	2.54	14	9			
And	9.98	73	3	9.98	75	6	9.98	71	8			
ξ_0	0.82	15	0 n	0.78	40	0 n	1.03	59	1			
ξ_0	-6.62	98		-3.07	80		+10.86	20				
ξ_1		-10			-4			35				
ξ_2	15.36	92		18.95	76		32.86	75				
X	15.73	21		19.08	37		32.38	98				
X- ξ_2	+3.62	9		+1.31	8		-4.77	77				
C	+13	71	34.7	+15	06	35.6	+13	76	71.0			
L			34.6						70.7			
C			34.2						70.4			
Mean	13	71	34.7	15	06	35.6	13	76	70.7			
Prec.		+4	70.3		+4	39.7		+4	35.2			
d	13	76	14.7	15	11	15.0	13	51	15.9			
D	14	17	27.	14	17	27.	14	17	27.			
S-D	-	31	12.3	+53	48.0		-26	11.1				
tans-D	-18	72.3		+32	28.3		-15	71.1				
log u	3.27	23	8 n	3.50	89	7	3.19	62	1 n			
no	0.60	35	3 n	0.87	01	2	0.52	73	6 n			
tans	9.38	93		9.43	37	7	9.39	20				
ξ_0^2	1.67	30		0.96	80		2.07	18				
η_1	8.08	57		7.45	51		8.51	72				
η_0	-8.01	35		+6.92	02		-3.36	79				
η_1	+0.12	2		+0.02	9		+0.03	29				
η	13.99	87		27.92	31		17.66	50				
η	17.12	88		27.55	06		17.86	17				
$\eta-\eta$	+1.30	1		-3.72	5		+1.96	7				

9759 Standard Coordinates				25			
Cape No 209-Mg 9.1				Cape No 209-Mg 8.3			
C	01	24	33.83	01	26	27.69	01 33 53.83
L			33.86				33.83
E			33.83				33.83
Mean	01	24	33.84	01	26	27.69	01 33 53.83
Pre			47.86			98.09	48.14
s	01	25	21.70	01	27	15.73	01 39 41.97
A	1	28	59.0	1	28	59	7 28 59
s-A			-03 32.30			-01 38.22	+05 47.97
sin(18)			-212.29			-98.22	+397.93
log			2.32693 n			1.99220 n	2.54149
and			9.98739			9.98756	9.98718
Fi			0.82150 n			0.98900 n	1.03591
fo			-6.6298			-3.0980	+10.8620
fi			-10			-9	35
g			15.3692			18.9516	32.8675
h			15.7321			19.0834	32.3898
x-g			+36.29			+13.18	-47.77
C	+13	41	39.4	+15	06	35.6	+13.96 41.0
L			39.6				40.7
E			39.2				40.4
Mean	13	41	39.4	15	06	35.6	13 46 40.7
Pre			+4 40.3			+4 39.4	+4 35.2
s	13	46	14.7	15	11	15.0	13 51 15.7
D	+4	17	27	19	17	27	19 17 27
s-D			31 12.3			+53 48.0	-26 11.1
and s-D			-18 72.3			+32 28.3	-15 71.1
log			3.27238 n			3.50897	3.19621 n
no			0.60353 n			0.89012	0.52736 n
and			9.3813			9.43377	9.3720
fo			1.6730			0.9680	2.0718
fi			8.0457			7.4551	8.5172
no			-9.0135			+6.9202	-33.679
ni			+0.122			+0.029	+0.329
h			13.9987			24.9231	18.6650
u			14.1288			24.5506	14.8617
u-n			-1.1301				

A = - .5
B = + .7

7754- Moonis Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) / (y - y_0)$	$(y - y_0)^2$	$(x - x_0)^2 / (y - y_0)^2$
1	22.9970	0.0000	+1	0.0000	3.4663	-	82
2	22.0000	-0.9970	+1	0.8966	3.4627	-	118
3	21.5577	-1.3893	+1	1.9299	3.4751	+	6
4	21.1014	-1.8456	+0	3.4062	3.4652	-	93
5	21.0836	-1.8634	0	3.4723	3.4723	-	22
6	21.2498	-1.7022	-0	2.8975	3.4707	-	38
7	22.0000	-0.9970	-1	0.8970	3.4637	-	108
8	22.3378	-0.6092	-1	0.3713	3.4587	-	158

$$R \sim 3.4795$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	L
1	-14.3813	-1.8617	-1	3.4663	+ 180 ✓
2	14.6412	-1.6018	-1	2.5661	210 ✓
3	15.0000	-1.2430	-1	1.5452	228 ✓
4	16.0000	-0.2430	-0	0.0590	263 ✓
5	16.2430	0.0000	0	0.0000	270 ✓
6	17.0000	+0.7570	+1	0.5732	299 ✓
7	17.8450	+1.6020	+1	2.5667	329 ✓
8	18.0000	+1.7570	+1	3.0874	371 ✓ 1610

Approx Center

$$x = 22$$

$$y =$$

$$14.6412$$

$$17.8450$$

$$32.4862$$

$$y_0 = 16.2431$$

$$y_{min} = 14.3813$$

$$R = 1.8618$$

$$x_{min} = 21.0836$$

$$x_0 = 22.9457$$

$$\text{Plate Center. } \begin{cases} x_0 = 22.9470 \\ y_0 = 16.2430 \end{cases}$$

9154 - Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$(y - y_0)^2$	$(x - x_0)^3$
1	22.9970	0.0000	+1	0.0000	3.9663	-	82
2	22.0000	-0.9970	+1	0.9966	3.9627	-	118
3	21.5577	-1.3893	+1	1.9299	3.9751	+	6
4	21.1014	-1.8456	+0	3.4062	3.9652	-	93
5	-21.0836	-1.8639	0	3.4723	3.9723	-	22
6	21.2998	-1.7022	-0	2.8985	3.9707	-	38
7	22.0000	-0.9970	-1	0.9970	3.9637	-	108
8	22.3378	-0.6092	-1	0.3713	3.9587	-	158

$$R = 3.9795$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	L
1	-19.3813	-1.8617	-1	3.4663	+180
2	19.6412	-1.6018	-1	2.5661	214
3	15.0000	-1.2930	-1	1.6752	228
4	16.0000	-0.2930	0	0.0590	263
5	16.2930	0.0000	0	0.0000	270
6	17.0000	+0.7570	+1	0.5732	299
7	17.8450	+1.6020	+1	2.5667	329
8	18.0000	+1.7570	+1	3.0879	394 1610

Approx Center

$x = 22$	$y =$	19.6412
		17.8450
		32.9862
	y_0	16.2931
	y_{min}	17.3813
	R	1.8618
	x_{min}	21.0836
	x_0	22.9457

Plate Center $\left\{ \begin{array}{l} x_0 22.9970 \\ y_0 16.2930 \end{array} \right.$

Formation of Normals.

1	+ 0.0	+ 0.0	+ 152,
2	+ 1.52	+ 112.0	+ 189
3	+ 1.72	- 8.3	- 7.4
4	+ 0.43	+ 172.0	+ 22.3
5	- 0.0	+ 41.0	00
6	- 1.29	+ 64.5	- 29.0
7	- 1.52	+ 103.0	- 173.0
8	- 1.07	+ 96.5	- 278.0
	<u>+ 3.69</u>	<u>+ 589.0</u>	<u>- 487.4</u>
	<u>- 3.88</u>	<u>- 8.3</u>	<u>+ 363.3</u>
	- .19	+ 580.7	+ 124.1

	a	b	c
	- 6	- 4	+ 41 ✓
a	+ 30	- 28	- 3 + 19 ✓
b	+ 2	- 42	- 2 + 1 ✓
c	+ 45	- 55	- 0 - 10 ✓
		- 56	0 - 11 ✓
		- 51	+ 2 - 7 ✓
		- 28	+ 3 + 20 ✓
		- 18	+ 3 + 30 ✓

+ 19°

9759 Conditional Equations

							0-C	17 ^{new} 0-C
1	0.00	-1.86	= -82	0	+16	= +16	-66	-25 ^v
2	-0.95	-1.60	= -118	-70	+13	= -27	-91	-77 ^v
3	-1.39	-1.24	= +6	-58	+10	= -98	+54	+55 ^v
4	-1.85	0.24	= -93	-77	+2	= -75	-18	-28 ^v
5	-1.86	0.0	= -22	-78	0	= -78	+56	+75 ^v
6	-1.70	+0.76	= -38	-71	-6	= -76	+38	+37 ^v
7	-0.95	+1.60	= -108	-70	-13	= -93	-55	-35 ^v
8	-0.61	+1.76	= -158	-35	-15	= -50	-108	-78 ^v
							+148	-338

Average 61-

$$+13.87 - .19 = +580.7 - 9.31$$

$$- .19 + 13.86 = -124.0 - 0.82$$

$$+ .19 - 0 = +8.0$$

$$-.05$$

$$+13.86 = -116.0$$

$$b = -8.9$$

$$13.87 = +580.7 - 1.6 = +579.1$$

$$a = +41.8$$

$$-0.67$$

Arc Measured 161°

$$\frac{p}{h} = .20$$

$$\frac{\Sigma V}{h} = -29$$

$$Im 2 \quad R \quad 1.86$$

$$-2RC = +2.23$$

$$\frac{-29}{.20} = -120; \Delta R = -15$$

$$Corr = -0.6$$

$$\Delta t = -0.11$$

$$\Delta s = -0.1$$

$$\Delta R = -0.9$$

$$\Delta a = -1.49$$

$$\Delta \gamma = -0.05$$

9754 Conditional Equations

17

6-C

1	0.00	-1.86	= -82	0	+16	= +16	-66
2	-0.92	-1.60	= -118	-90	+13	= -27	-91
3	-1.29	-1.24	= +6	-58	+10	= -98	+59
4	-1.85	0.29	= -93	-77	+2	= -75	-18
5	-1.86	0.0	= -22	-78	0	= -78	+56
6	-1.70	+0.76	= -38	-71	-6	= -67.6	+38
7	-0.95	+1.60	= -108	-90	-13	= -93	-55
8	-0.61	+1.76	= -128	-35	-15	= -50	-108
							+194 = +38

Average 61-

$$+13.87 - 19 = +580.7$$

$$- .19 + 13.86 = +129.0$$

$$+ .19 - 0 = +8.0$$

$$+13.86 = -116.0$$

$$b = -8.9$$

$$13.87 = +580.7 - 1.6 = +579.1$$

$$a = +41.8$$

Are measured 161°

$$\frac{p}{q} = .20$$

$$\frac{2V}{q} = -29$$

$$\frac{-29}{.20} = -120 \quad \Delta R = -120$$

9754- Moon's Mean Position

18

$$\begin{array}{r} \chi_0 \ 22.9470'' \\ + 21'' \\ \hline 22.9491'' \end{array}$$

$$\begin{array}{r} \gamma_0 \ 16.2730'' \\ - 7'' \\ \hline 16.2726'' \end{array}$$

From Plate Constants

$$\chi \ 22.9573''$$

$$\gamma \ 16.2739''$$

$$\xi \ +.9573''$$

$$\eta \ -1.8261''$$

$$\log \ 9.98105''$$

$$\log \tan \delta \ 9.3989''$$

$$\log \ 9.98680''$$

$$\gamma'' \ 9.9621''$$

$$8.50729''$$

$$7.0539''$$

$$1.48701''$$

$$6.4139''$$

by d-A

$$\eta_1 \ +.0003''$$

$$d-A \quad +30.68''$$

log h₀

$$A \ 1 \ 28 \ 54.0''$$

$$0.26160''$$

$$d_0 \ 1 \ 29 \ 24.69''$$

$$7.33115''$$

$$2.93045''$$

$$\text{Red} \quad +4.58''$$

$$\delta-D \quad -14 \ 12.0''$$

$$\alpha' \ 1 \ 29 \ 29.29''$$

$$D \ +14 \ 17 \ 27.0''$$

$$\delta_0 \ +14 \ 03 \ 15.0''$$

$$\text{Red} \quad +29.9''$$

$$\delta' \ +14 \ 03 \ 44.9''$$

9159⁻ *Mathews Mean Position*

28

$$\begin{array}{r} \chi_0 \ 22.9970'' \\ \quad + 21'' \\ \hline 22.9991'' \end{array}$$

$$\begin{array}{r} \gamma_0 \ 16.2920'' \\ \quad - 7'' \\ \hline 16.2926'' \end{array}$$

From Plate Constants

$$\chi \ 22.9573''$$

$$\gamma \ 16.7739''$$

$$\xi \ +.9573''$$

$$\eta \ -1.8261''$$

$$\log \ 29.98105''$$

$$\log \tan \delta \ 9.3989''$$

$$\log \ 29.98680''$$

$$\xi \ 9.9621''$$

$$8.50729''$$

$$7.0539''$$

$$1.98701''$$

$$6.9139''$$

log q-A

$$\eta_1 \ +.0003''$$

$$\chi-A \quad +30.88''$$

log h₀

$$A \ 1 \ 28 \ 54.0''$$

$$0.26160''$$

$$\chi_0 \ 1 \ 29 \ 24.69''$$

$$7.33115''$$

$$2.93095''$$

$$\text{Red} \quad +4.58''$$

$$\delta-D \quad -19 \ 12.0''$$

$$\chi' \ 1 \ 29 \ 29.29''$$

$$D \ +19 \ 17 \ 27.0''$$

$$\delta_0 \ +19 \ 03 \ 15.0''$$

$$\text{Red} \quad +29.9''$$

$$\delta' \ +19 \ 03 \ 44.9''$$

$$\begin{array}{r}
 1 \quad 26 \quad 60.99 \\
 \underline{55.92} \\
 + 4.57
 \end{array}$$

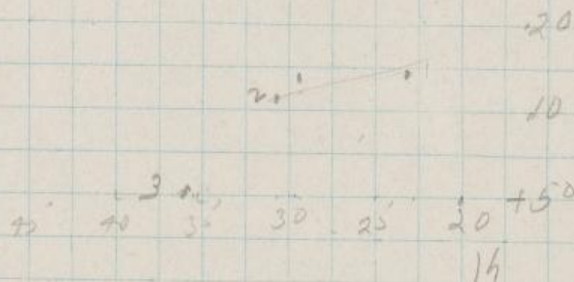
$$\begin{array}{r}
 + 17 \quad 57 \quad 59.0 \\
 \underline{28.83} \\
 + 30.17
 \end{array}$$

$$\begin{array}{r}
 1 \quad 32 \quad 39.96 \\
 \underline{35.90} \\
 + 4.06
 \end{array}$$

$$\begin{array}{r}
 11 \quad 42 \quad 55.0 \\
 \underline{25.7} \\
 + 29.6
 \end{array}$$

$$\begin{array}{r}
 1 \quad 37 \quad 7.91 \\
 \underline{0.38} \\
 + 7.53
 \end{array}$$

$$\begin{array}{r}
 5 \quad 03 \quad 56.7 \\
 \underline{28.4} \\
 + 28.3
 \end{array}$$



9754 Reduction to Apparent Place 19

$$H + \alpha \quad 3 \quad 37.9 = 55^{\circ} \quad 38.5^{\circ} \delta \quad +14 \quad 03 \quad 15.0$$

$$H \quad 2 \quad 08.5$$

$$\alpha \quad 1 \quad 29.4 \quad \cancel{29.7}$$

$$G \quad 22 \quad 59.0$$

$$G + \alpha \quad 0 \quad 28.7 = 7^{\circ} \quad 06.0$$

$$\log \cos \delta \quad 9.9868$$

$$\alpha \quad 0.6626$$

$$H' \quad 0.6799$$

$$\log \cos G + \alpha \quad 9.9967$$

$$q \quad 1.3599$$

$$\sin \quad 9.0920$$

$$\tan \delta \quad 9.3985$$

$$8.8239$$

$$\log \sin \delta \quad 9.3853$$

$$\cos H + \alpha \quad 9.7516$$

$$h \quad 1.2999$$

$$\sin (H + \alpha) \quad 9.7167$$

$$\sec \delta \quad 0.0132$$

$$8.8239$$

$$\log (q') \quad 1.3566$$

$$(q) \quad 8.6743$$

$$h' \quad 0.4368$$

$$h \quad 0.0537$$

$$f + \quad 3.398$$

$$q + \quad 0.097$$

$$h + \quad 1.131$$

$$+ \quad 7.376$$

$$q' + \quad 22.73$$

$$h' + \quad 2.739$$

$$i + \quad 49.61$$

$$+ \quad 29.925$$

9754 Reduction to Apparent Place 17

$$H + \alpha \quad 3 \quad 37.9 : 55^{\circ} \quad 35.5^{\circ} \delta \quad +14 \quad 03 \quad 15.0$$

$$H \quad 2 \quad 08.5$$

$$\alpha \quad 1 \quad 29.9 \quad 29.7$$

$$C \quad 22 \quad 59.0$$

$$C + \alpha \quad 0 \quad 28.9 : 7^{\circ} \quad 06.0$$

$$\log \cos \delta \quad 7.9568$$

$$L \quad 0.6626$$

$$H' \quad 0.6799$$

$$\log \sin \delta \quad 9.3853$$

$$\cos H + \alpha \quad 9.7516$$

$$L \quad 1.2999$$

$$\sin (H + \alpha) \quad 9.7167$$

$$\sec \delta \quad 0.0132$$

$$8.8239$$

$$\log \cos C + \alpha \quad 9.9767$$

$$q \quad 1.3599$$

$$\sin \alpha \quad 9.0920$$

$$\tan \delta \quad 9.3985$$

$$8.8239$$

$$\log (q') \quad 1.3566$$

$$(q) \quad 8.6793$$

$$h' \quad 0.4368$$

$$h \quad 0.0537$$

$$f + \quad 3.398$$

$$q' - \quad 0.097$$

$$h \quad +1.131$$

$$+9.576$$

$$q' + \quad 22.73$$

$$h' + \quad 2.737$$

$$i \quad +49.61$$

$$+29.925$$

9754 Sumar Parallax

20

α' 1 29 29.27^h
 δ 0 31 26.9^m
 $\theta - \alpha'$ - 58 02.37^s
 $= - 140 30 35.55^s
 K_2 - 5 15.86^s
 $- 14 35 59.51^s$$

9.95727^h
 0.00000^h
0.01426^h
 9.97153^h

$\delta + 43 07 29.0^h$
 $\delta + 14 03 49.9^h$
 $\gamma - \delta + 29 03 39.1^h$

9.82670^h
 8.20702^h
 9.68680^h
0.16522^h
 7.88204^h

$\delta - \delta' + 26'' 12.1^h$

δ 14 29 57.8^h
 Ephd + 14 29 52.9^h
 O-C + 4.1^h

Curve of Plate - 0.1

2nd Order Ref. 0.0

In Corr - 0.1

$\delta + 14 29 56.9^h$
 O-C + 4.0

π 5.9' 59.65^h

9.86713^h
 8.20702^h
 9.39889^h
8.01406^h
 7.48610^h

$\delta - \alpha'$ - 10 31.72^h

$= - 42.12^h$

α 01 28 47.15^h

Ephd 01 28 46.79^h

O-C + 0.65^h

- 0.07

α 01 28 47.10^h

+ 0.61

9754 Lumar Parallax

20

α' 1 29 29.28"
 τ 0 31 26.9"
 $\delta - \alpha'$ - 58 02.37"
 $\epsilon - 190$ 30 35.85"
 κ - 14 25 57.54"

π 5.9' 57.65"

9.86913
 1.20702"
 9.39889"
~~8.07806~~
 7.48659"

9.95727"
 0.00000"
~~0.07424~~
 9.97153"

$\mu - \alpha'$ - 10 31.72"

ϵ - 72.12"

γ 43 07 29.0"

$\delta + 14$ 03 49.9"

$\gamma - \delta + 29$ 03 39.1"

9.82690"
 8.20702"
 9.68890"
~~0.16522~~
 7.88209"

$\delta - \gamma + 20$ 12.1"

δ 14 29 57.0"

κ 01 28 47.15"

$\epsilon - \delta + 14$ 29 52.9"

$\epsilon - \kappa$ 01 28 46.99"

$\delta - \epsilon$ + 9.1"

$\delta - \kappa$ + 0.66"

Curv of Plate - 0.1

+ 0.09

2nd Order Ref 0.0

Checked and
 found

Star remeasured

19870

16002

00

69

18888

17280

72

8887

20746

15570

66

99

23.5178

18952

14112

08

56

15.5156

18268

13089

72

70

15.5200

19608

19779

70

10

15.5162

9782

Star Measures

21

1	18180	18800	17956	16758
22.4	19300	12680	13324	11402
4.6	02	72	20	96
	60	02	64	58
	<u>22.3871</u>	<u>22.3875</u>	<u>4.8638</u>	<u>4.4690</u>
				17258
2	18608	18158	18389	12028
22.4	19570	12172	13592	20
4.6	70	70	92	58
	04	92	86	
	<u>22.4036</u>	<u>22.4029</u>	<u>29.4799</u>	<u>24.4766</u>
3	17800	16850	18299	18678
12.9	18892	15738	8718	18258
4.9	88	42	10	58
	778	30	98	78
	<u>12.88906</u>	<u>12.8902</u>	<u>9.9589</u>	<u>4.9576</u>

Moon Measures

1	20320	18060	17338	19322
	15158	13214	12190	19500
	52	08	90	496
	28	56	50	24
	<u>23.5179</u>	<u>23.5152</u>	<u>15.5209</u>	<u>15.5174</u>
2			20.294	15.936
24			10676	15000
12.9			878	00
			96	80
			<u>15.9620</u>	<u>15.9564</u>
3	18900	16876		
24.3	15199	10228		
17	865	22		
	02	70		
	<u>24.3756</u>	<u>24.3756</u>		

9782

Star Measures

21

1	18180	18800	17956	16758
21.4	19300	12688	13329	11902
9.6	02	76	20	96
	60	02	69	58
	<u>223871</u>	<u>223872</u>	<u>9.8638</u>	<u>9.4690</u>
				17258
2	18688	18158	18389	12028
24	19570	12172	13590	20
29.6	70	70	92	58
	09	92	86	
	<u>28.9036</u>	<u>22.9029</u>	<u>29.9799</u>	<u>24.9766</u>
3	17800	16850	18299	18678
12.9	188902	15738	8718	18258
29.9	888	92	10	58
	778	30	98	78
	<u>12.88906</u>	<u>12.8902</u>	<u>9.9589</u>	<u>9.9576</u>

Moon Measures

1	20330	18060	17338	19322
	15158	13219	12190	19500
	32	08	90	496
	28	56	50	29
	<u>23.5179</u>	<u>23.5152</u>	<u>15.5209</u>	<u>15.5179</u>
2			20299	15936
24			10676	15000
12.9			698	00
			96	98
			<u>15.9620</u>	<u>15.9569</u>
2	18900	16976		
29.3	15199	10228		
17	9615	22		
	02	70		
	<u>29.3756</u>	<u>29.3756</u>		

7
2
17
+
5
29
18
6
24
18
4
2
18
8
2
18
4
15
11
5
31
27

9782

Moon Measures

22

2	18918	16462
24.3	15158	10226
17.2	60	22
+	20	62
	<u>24.3760</u>	<u>24.3762</u>

5	18002	16386
29.2	17778	7652
18	72	56
	00	99
	<u>29.4226</u>	<u>29.1260</u>

6	17810	17232
24	15966	9086
18.1	60	92
	19	28
	<u>18.1898</u>	<u>18.1860</u>

7	17908	17118
23	9952	15586
18.9	98	82
	898	18
	<u>18.8950</u>	<u>18.8966</u>

8	17998	17100
22.6	8902	16198
18.9	8909	50
	50	100
	<u>18.9097</u>	<u>18.9099</u>

4th star

y

x

15.3	18416	17908	18058	17682
11.6	13000	12488	15031	10710
	09	196	31	06
	22	02	52	68
	<u>11.4616</u>	<u>11.9792</u>	<u>15.3025</u>	<u>15.3036</u>
5	18930	19568	19780	19307
31.7	17924	10552	12830	15958
27.1	20	56	39	50
	70	68	70	00

9782

Moon Measures

22

2	18918	16462
24.3	15158	10226
11.2	60	22
+	20	62
	<u>243760</u>	<u>243762</u>

5	18002	16386
1.2	17778	7652
18	72	56
	00	99
	<u>241226</u>	<u>241260</u>

6	17810	17232
24	15966	9086
18.1	60	92
	19	28
	<u>181898</u>	<u>181860</u>

7	17908	17118
23	9952	10586
18.9	98	82
	898	18
	<u>188950</u>	<u>188966</u>

8	17998	17100
22.6	8902	16198
18.9	8909	50
	50	100
	<u>189097</u>	<u>189099</u>

4th Star

15.3	18916	17908	18058	17682
11.6	13600	12408	15031	10710
	09	196	31	06
	22	02	52	68
	<u>169816</u>	<u>9792</u>	<u>153025</u>	<u>153036</u>
5	18930	19568	19980	19309
11	17924	10552	12830	15958
27.1	20	56	39	50
	70	68	70	00

9782

Times + Etc.

23

Nov. 22 '15

Exp. to Stars	5	20	05	32
" " Moon	5	25	70.2	5 25 70.9
Clock fast	7	19.8		

H. Sid J.	5	21	25.5	4-α = + 0 ^h 22 ^m
H. Long	4	44	31.05	-
g. Sid J.	10	05	56.55	-
Sid J. M. H.	16	01	33.85	-
Interval	18	07	22.70	-
Reduction		2	57.65	-
g. M. J.	18	01	25.05	-

From Naut alim.

R.A.

Dec.

Moon 18 ^h	4	59	05.50	+26	79	01.7
Motion 1 ^m			2.2094			1.589
" 1.4175			3.13			2.3
Tabular Place	4	59	08.63	+26	79	09.0

Moon's Age 16 days.

Parallax	53	59.53
Sun's	14	77.3
R.		887.3
Aug.		13.7
Err 4		-0.6
R.		897.1
R.		1.9230
alt.		-919
1st R.		1.8311
12		3.3530

934 = 15

92	-501.7
	24
	-477.7

9752

Times + Etc.

23

Nov. 22 '15

Mantall 11

Expt. Stars	5	20	05	32	
" Moon	5	25	90.2	5	25 90.9
Clock fast		9	19.8		

H. Red J.	5	29	25.5	- 4 - 1 - + 0 ^h 22 ^m
H. Long	9	29	31.5	-
9 Sid J	10	65	56.55	-
Sid J M. H.	16	01	33.85	-
Interval	18	09	22.90	-
Reduction		2	56.69	-
G.M. J.	18	01	25.08	-

From Mant all

R.A.

Dec

Moon 18 ^h	9	59	05.50	+ 26	99	01.7
Motion 1 ^m			2.2094			1.581
" 1.9175			3.13			2.3
Tabular Place	9	59	08.63	+ 26	19	09.0

Moon's Age 16 days.

Parallax	53	59.53
Sun's	19	79.3
H.		889.3
Ang		15.7
Kr		- 0.6
H.		817.1
H.		19230
alt.		- 919
17th 11.		18311
11 ^m		33530

934 - 15

95	- 501.7
	24
	- 477.7

Proper Motion

740

ξ	η	$\Delta \xi$	- 4.75	δ/η	0
1 -6.98	-6.51	-16	+33	+17	-1 = +16
2 +10.25	+9.81	+50	-48	+2	+1 = +1
3 +0.49	-13.87	+2	-2	0	-1 = -1
4 +1.57	+7.14	+2	-7	-35	+1 = -4
5 -9.53	-13.38	-62	+45	-17	0 = -17
M +0.64	-0.63		-3	0	-3
	$\Delta \eta$	-54	-1.95	+5	
	-15	+33	+18	+10	+8 +13
	+78	-79	-1	+14	+13 +18
	-62	+69	+7	+1	+8 +13
	+10	-36	-26	+2	-24 -19
	-87	+67	-20	+13	-33 -29
	0	+3	-1		+7

9782

Plate Center

29

γ	γ	α	δ	
22.3873	4.7639	4 58 38.83	27 51	20.9
23.4030	24.4780	4 59 18.96	27 39	92.7
12.8896	4.9580	4 52 57.17	24 55	12.2
3) 58.6799	33.8999	3) 12 169 11996	75 190	75.8
19.2266	11.2999	4 56 58.32	25 47	05.3
22	18	+ 1 25.96	+ 52	05.3
+2.7739	+6.7001	4 58 29.28	+26 39	10.8
31	466.5			
1 25.96	+ 52 05.5			
15.3030	11.9809	Plate Center { A 4 58 29.05 D +26 39 11.0		
31.6646	27.0997			

$X-\gamma$	+500X	+32.8 γ	+1.7X	-10887
-482	+1199	=+10712+196	=10858	+08 = +10896 +9
-1653	+11701	=+10098+803	=10857	+90 = 891 +7
-19235	+6795	=+10700+162	=10862	+22 = 889 -3
+2831	+7651	=+10482+376	=10858	+26 = 889 -3
-5892	+15832	=+9990+889	=10829	+39 = 883 -4
22.5797	+11272	+560	38	= 22.6730
$\gamma-\eta$	+500 γ	-31.4X	+97	-9955
3394	+2232	=+5626-703	=+4923	+18 = +4941 = -19
-6662	+12239	=+5577-735	=4892	+98 = + 90 = -15
+2876	+2479	=+5355-705	=4950	+20 = + 70 = +15
-351	+5790	=+5389-981	=4908	+46 = + 54 = -1
-7693	+13550	=+5857-999	=9863	+108 = + 71 = +16
17.0797	8537	-708	68	= 17.3689

Tables a = -.3 e = -.3 a-e = 0 b+d = -0
 lbs -501.7 = -509. = +2.3 = -1.7

O-C -501.4 -503.7 -1.4

ape no 719-m98.0

7 53 27.62
 27.65
 27.60

7 53 27.62
 55.29

7 57 22.91

7 58 29

- 9 01 08

- 291 08

2.38215n

9.95735

0.89378n

- 6.9785

16

199

153030

+ 2834

25 97 93

9.5

9.1

05 97 93

1 299

3 98 331

6 39 110

- 50 373

- 30 37.6

3.98258n

68

5

9

115

115155

117807

- 357

ape no 790-m96.0

5 03 28.39
 28.35

5 03 28.39

56.93

5 04 24.77

7 58 29.00

+ 06 00.77

+ 360.13

2.55719

7.94624

1.01067

+ 10.2988

+ 50

+ 32.2538

31.6696

+ 5892

+ 27.59 12.7

12.0

12.0

27 59 12.2

11 13.1

27 55 25.3

26 39 11.0

+ 1 16 19.3

+ 4575.1

3.66090

0.99155

9.7283

20.213

8.7990

+ 7.8062

+ 0.0630

27.8692

27.0997

9782	Plate	Center				29
7	7	x	d			
22.3873	4.7639	4 58 38.83	29 21	20.9		
23 4030	24.4780	4 59 18.96	27 39	92.7		
12.8896	9.9580	4 52 57.17	29 55	12.2		
57.6799	33.8999	3112 169 11996	75 190	75.8		
19.2266	11.2999	4 56 38.32	25 47	05.3		
32	18	+ 1 25.96	+ 52	05.5		
42.7739	+6.7001	4 58 29.28	126 39	14.8		
31	466.2					
1 25.96	+ 52 05.5					

15.3030 11.9809
31.6646 27.0997

Plate { A 4 58 29.0
Center { D+26 39 11.0

X-3 + 500 X - + 32.84 + 1.7X - 1088
- 482 + 11199 = +10712 + 186 - 10858 + 38 = +10896 + 9
- 1653 + 11701 = +10048 + 803 - 10857 + 90 = 891 + 9
+ 9253 + 6795 = +10700 + 162 - 10862 + 22 = 839 - 3
+ 2831 + 7651 = +10982 + 376 - 10858 + 26 = 889 - 3
- 5892 + 15832 = +9940 + 889 - 10829 + 34 = 895 - 4
22.5897 + 11.272 + 560 38 = 22.6730
7.11 + 5.004 - 31.9X + 94 = - 9950
+ 3394 + 2222 = +5616 - 703 = +9923 + 18 = +9991 = -15
- 6662 + 12239 = +5577 - 732 = 4845 + 78 = 4923 = -1
+ 2876 + 2989 = 1335 - 905 = 9950 + 20 = 9970 = +1
- 351 + 5790 = 13389 - 981 = 9908 + 96 = 9994 = -1
- 7693 + 13550 = +5857 - 999 = 9863 + 108 = 9971 = +1
17.0797 + 8837.2 - 708 68 = 17.3689

Tables 8-8-1 P.P. 00 = -3 a.e. = 0 b.r.d. = -0
lbs -501.7 = -509. = +2.3 = -1.7

0208.P
0E00. +
0908.PE
7990.72
EP27.-
2075

Cape No 719-Mg 8.0

7 53 27.62
 27.65
 27.60
 7 53 27.62
 55.29
 7 54 22.91
 7 58 24
 - 7 01.09
 - 241.08
 2.38246n
 9.95937
 0.89377n

- 6.9785
 - 16
 15.0199
 15.3030
 + 2834

+25 97 9.3
 9.5
 9.1
 25 97 9.3
 1 24.4
 25 98 33.7
 26 39 11.0
 - 50 37.3
 - 30 37.5
 3.48254n
 0.81368n

9.6895
 1.6875
 8.7254

- 6.5445
 + 0.0266
 12.5155
 11.7809
 - 351

Cape No 740-Mg 6.0

5 03 28.34
 28.35
 28.34
 5 03 28.34
 56.43
 5 04 24.77
 7 58 24.00
 + 06 00.77
 + 360.73
 2.55719
 9.94624
 1.01067

+ 10.2488
 + 50
 + 32.2538
 31.6646
 + 5892

+ 27 57 12.7
 12.0
 12.0
 27 57 12.2
 + 1 12.5
 27 55 25.3 247
 26 39 11.0
 + 1 16 14.3 13.7
 + 4575.1 9574.5
 3.66040 3.66034
 0.99155 0.99149

9.7243
 2.0213
 8.7990

+ 9.8072 9.8060
 + 0.0630 + 0.0630
 27.8702 27.8690
 27.0997 27.0997
 - 7705 - 7693

9782 Standard Coordinates				Page 25-			
Cape No 725-Mg8.2				Cape No 726-Mg6.5			
C	04 57 43.75	04 58 22.77	4 52 02.13				
L	43.83	22.80	2.16				
E	43.82	22.76	2.17				
Mean	04 57 43.79	04 58 22.78	4 52 02.17				
Pre	55.13	56.28	55.03				
α	04 58 38.92	04 59 19.02	4 52 57.17				
A	7 58 29.0	7 58 29.0	7 58 29.0				
ΔA	+ 17.92	+ 0 55.02	- 5 26.83				
Sim "	+ 17.92	+ 55.02	- 3 26.80				
log "	1.17377	1.74052	2.51728 ⁿ				
log "	9.95778	9.97762	9.95756				
" 70	9.63879	0.19538	0.97908 ⁿ				
Σ	+ 0.4353	+ 1.5689	- 9.5297				
Σ	+ 2	+ 2	- 62				
Σ	22.7355	123.5683	12.7681				
Σ	22.3873	23.9030	12.8876				
$\Sigma - \Sigma$	- 782	- 0.1653	+ 7255				
E	+ 24 50 01.3	27 33 23.0	24 53 43.8				
L	01.1	23.8	46.0				
E	49 59.9	23.5	45.6				
Mean	24 50 01.3	27 33 23.7	24 53 45.8				
Pre	+ 1 18.2	+ 1 19.8	+ 1 26.5				
δ	24 51 19.5	27 34 42.8	24 55 12.3				
D	26 39 11.0	26 39 11.0	26 39 11.0				
S-D	- 1 47 51.5	+ 0 55 31.8	- 1 43 58.7				
am "	- 67 73.6	+ 33 32.0	- 62 40.6				
log "	3.81045 ⁿ	3.52274	3.79522 ⁿ				
" 70	1.14230 ⁿ	0.85386	1.12638 ⁿ				
Stand	9.6659	9.7179	9.6671				
" 70	9.2773	0.3908	1.9582				
Σ	5.9968	7.1620	8.6787				
- 13.8756							
No	- 13.8677	+ 7.1427	- 13.3773				
h	+ 0.0001	+ 0.0015	+ 0.0477				
h	4.1245	25.1782	4.6704				
h	4.4639	24.4780	4.9580				
(2y-h)	+ 339.4	- 6662	+ 2878				

9782		Standard Coordinates		25-	
Cape No- 725-Mg 8.2		Cape No- 726-Mg 6.5		Cape 717-Mg 3	
C	09 57 43.75	09 58 22.77	9 52	02.13	
L	43.83	22.80		2.16	
E	43.82	22.76		2.14	
Mean	09 57 43.79	09 58 22.78	9 52	02.17	
True	55.13	56.28		55.03	
δ	09 58 38.92	09 59 19.82	9 52	57.49	
A	7 58 29.0	7 58 29.0	7 58	29.0	
$\delta-A$	+19.92	+0.5502	-5	26.83	
Sum "	+19.92	+55.02		-326.90	
ρ	1.17377	1.74052	2.51928	n	
$\cos \delta$	9.95778	9.97762	9.95756		
$\rho \cos \delta$	9.63679	0.19538	0.97908	n	
τ	+0.4353	+1.56883	-9.5288		
τ_{10}	+2	+22	-62		
δ_1	22.9358	123.56635	12.8880		
δ_2	22.3873	23.9030	12.8896		
δ_3	-7.82	-0.1653	+72.55		
C	+29 50 01.3	27 33 23.02	29 53	45.8	
L	01.1	23.57		46.0	
E	99 59.9	23.5		45.6	
Mean	29 50 01.3	27 33 23.9	29 53	45.8	
True	+1 12.4	+1 19.8	+1	26.5	
δ	29 51 18.5	27 39 42.8	29 55	12.3	
D	26 39 11.0	26 39 10.0	26 39	11.0	
$\delta-D$	-1 47 57.5	+0.55 31.8	-1 43	58.7	
Sum "	-69 83.6	+33 32.0	-62	40.6	
ρ	3.81089	3.52274	3.79522	n	
$\cos \delta$	1.19200	0.85386	1.12638	n	
$\rho \cos \delta$	9.6654	9.71179	9.6671		
δ_2	9.2728	0.3908	1.9582		
δ_1	5.9968	7.1620	8.6788		
δ_3	-13.8756				
δ_4	-13.8834	+8.1427	-13.3773		
δ_5	+0.0001	+0.0015	+0.0977		
δ_6	9.1395	2.51982	9.6704		
δ_7	9.9639	29.9780	9.9580		
$(\delta_1 - \delta_2)$	33.88	6.663	6		

A 0
B p.3

9782 Moon's Center

26

	X	$x - x_0$	Δx	$x - x_0^2$	$(x - x_0)^2 + (y - y_0)^2$	
1	23,5163	+0,9713	0	0,9439	3,3711	+ 181
2	29,0000	+1,4550	↓	2,1170	3,3442	- 88
3	29,3756	+1,8306		3,3511	3,3570	+ 90
4	+29,3761	+1,8311		3,3530	3,3530	0
5	29,1293	+1,5793		2,4992	3,3461	- 69
6	29,0000	+1,4550		2,1170	3,3456	- 77
7	23,0000	+0,4550		0,2070	3,3360	- 170
8	22,5950	+0,0000		0,0000	3,3412	- 118

 $R = 3,3530$

	X	$y - y_0$	Δy	$(y - y_0)^2$	
1	15,5189	-1,5581	- 0	2,4277	+ 188 ✓
2	15,9692	-1,4078	- 0	1,2272	127 ✓
3	17,0000	-0,0770	- 0	0,0059	90 + 92
4	17,0770	+0,0000	+ 0	0,0000	90
5	18,0000	+0,9230	+ 0	0,8519	60 ✓
6	18,1857	+1,1084	+ 0	1,2286	53 ✓
7	18,8458	+1,7688	+ 1	3,1290	17 ✓
8	+18,9078	+1,8278	+ 1	3,3412	0 198°

Approx. Center

X 29	y 15,9692
	18,1857
	37,1546
y_0	17,0773
y_{max}	18,9078
R	1,8275
x_{max}	29,3761
x_0	22,5486

Moon's Center

 $x_0 22,5450$ $y_0 17,0770$ 

7782 Moon's Center

26

	X	$x \cdot x_0$	Δx	$1 \cdot x_0$	$(x \cdot x_0) + (y \cdot y_0)$	
1	23.5163	+0.9713	0	0.9939	3.3711	+181
2	29.0000	-1.9550	↓	2.1170	3.3992	-88
3	24.3756	+1.8306		3.3511	3.3570	+40
4	+24.3761	+1.8311		3.3530	3.3530	0
5	29.1273	+1.5793		2.9992	3.3461	-69
6	29.0850	-1.9550		2.1170	3.3956	-79
7	23.0000	-0.9550		0.2070	3.3360	-170
8	22.5950	-0.0000		0.0000	3.3412	-118

R = 3.3530

	X	$y \cdot y_0$	Δy	$(y \cdot y_0)$	
1	15.5189	-1.5581	-0	29.277	+198
2	15.9672	-1.6078	-0	1.2272	127
3	17.0000	-0.0770	-0	0.0059	190+
4	17.0770	+0.0000	0	0.0000	90
5	18.0000	+0.9220	0	0.8519	60
6	18.1859	+1.1084	0	1.2286	23
7	18.8458	+1.7688	1	3.1290	14
8	+18.9098	+1.8278	1	3.3712	0

198°

Approp. Center

X	29
Y	15.9672
	18.1859
	37.1596
Y ₀	17.0773
Y _{max}	18.9098
R	1.8275
X _{max}	29.3761
X ₀	22.5956

Moon's Center

X ₀	22.5950
Y ₀	17.0770

Formation of Normals.

1 - 151	+ 1755	- 271.0
2 - 161	- 127.5	+ 97.5
3 - 619	+ 73+	- 30.
4 + 0.0	0.0	0.0
5 + 145	- 109.0	- 63.5
6 + 161	- 107.5	- 82.0
7 + 179	- 76.5	- 30.0
8 + 0.0	- 0.0	- 216.0
+ 4.85	+ 248.5	+ 97.5
- 32.6	- 420.5	- 665.5
+ 1.59	- 172.0	- 568.0

	a	b	c
a + 9	+ 9	- 3	- 9 ^v
b + 2	+ 13	- 2	- 4 ^v
c - 15	+ 16	- 0	+ 1 ^v
	+ 16	+ 0	+ 1 ^v
	+ 14	+ 2	+ 1 ^v
	+ 13	+ 2	0 ^v
	+ 7	+ 7	- 7 ^v
	+ 0	+ 7	- 11 ^v

+27°

$$+1.59 + 12.21 = +2.88$$

$$+ [] + 1.17 = +1.09$$

$$+ 12.09 = +1.89$$

$$14.58 = +9.56 - 0.29 = +9.32$$

9782

Conditional Equations

 $\begin{matrix} 27_{\text{new}} \\ 0-c \end{matrix}$

$+ 0.97 - 1.56 = +181$	$- 7 + 71 = +64$	$+117 +108$
$+ 1.45 - 1.11 = -88$	$- 10 + 51 = +41$	$-129 -133$
$+ 1.83 - 0.08 = +40$	$- 13 + 4 = -9$	$+49 +50$
$+ 1.83 + 0.00 = 0$	$- 13 - 0 = -13$	$+13 +14$
$+ 1.58 + 0.92 = -69$	$- 11 - 82 = -93$	$-16 -15$
$+ 1.45 + 1.11 = -74$	$- 10 - 51 = -61$	$-13 -13$
$+ 0.95 + 1.77 = -170$	$- 3 - 81 = -84$	$-86 -93$
$+ 0.00 + 1.83 = -118$	$- 0 - 83 = -83$	$-35 -46$

$$+ 179 - 279$$

Average 57

$$14.58 + 1.59 = -172.0 + 9.56$$

$$+ 1.59 + 12.21 = -568.0 + 2.88$$

$$+ 1.59 + 0.17 = -18.8$$

$$+ 0.15 \Delta$$

$$+ 12.09 = -579.2$$

$$b = -43.5$$

$$14.58 \pm -172 + 72 = -100$$

$$a = -6.9$$

$$+ 0.64$$

Arc Measured 178°

$$P \quad 1.45$$

$$\frac{\Sigma V}{h} = -12.5$$

$$In \quad R \quad 1.83$$

$$-2RC = -0.73$$

$$\frac{-12.5}{1.45} = -8.6$$

$$\Delta R = -1.1$$

$$\Delta b = -0.11$$

$$\Delta \delta = -0.1$$

$$\text{Corr} = +0.2$$

$$\Delta R = -1.3$$

$$\Delta a = -0.47$$

$$\Delta \alpha = -0.02$$

9782

Conditional Equations. 27

1	+	0.97	-	1.56	:	+	181		-	7	+	71	:	+	69	+	117
2	+	1.95	-	1.11	:	-	88		-	10	+	51	:	+	91	-	129
3	+	1.83	-	0.08	:	+	40		-	13	+	4	:	-	9	+	99
4	+	1.83	+	0.00	:		0		-	13	-	0	:	-	13	+	13
5	+	1.58	+	0.92	:	-	69		-	11	-	92	:	-	53	-	16
6	+	1.95	+	1.11	:	-	79		-	10	-	51	:	-	61	-	13
7	+	0.95	+	1.77	:	-	170		-	3	-	81	:	-	89	-	86
8	+	0.00	+	1.83	:	-	118		-	0	-	83	:	-	83	-	30

$$+ 179 - 279$$

Average 57

$$14.58 + 1.59 = -172.0$$

$$+ 1.59 + 12.21 = -568.0$$

$$+ 1.59 + 0.17 = -18.8$$

$$+ 12.04 = -599.2$$

$$b = -95.5$$

$$14.58 \pm -172 + 72 = -100$$

$$a = -6.9$$

Arc Measured 198°

$$\frac{B}{4} = 195^\circ$$

$$\frac{54}{17} = -12.5^\circ$$

$$\frac{-12.5}{195} = -86$$

$$\text{O.P.} = -1.1$$

9782

Moon's Mean Position

28

$$\begin{array}{r} \gamma_0 \ 22.5950'' \\ \quad -3'' \\ \hline 22.5947'' \end{array}$$

$$\begin{array}{r} \gamma_0 \ 17.0770'' \\ \quad -23'' \\ \hline 17.0747'' \end{array}$$

From Plate Constants

$$\chi \ 22.6930''$$

$$\eta \ 17.3689''$$

$$\xi \ +0.6930''$$

$$\eta \ -.6311''$$

$$\begin{array}{r} \log \xi \ 9.80821'' \\ \cos \delta \ 9.95153'' \\ \hline 8.50727'' \\ \hline 1.34944'' \end{array}$$

$$\begin{array}{r} \log \tan \delta \ 9.6993'' \\ \xi \ 9.6167'' \\ \hline 7.0537'' \\ \hline 6.3691'' \end{array}$$

$$\alpha - A \quad 22.36''$$

$$\eta_1 \ +0.0002''$$

$$A \ 7 \ 58 \ 27.0''$$

$$\log \eta_0 \ 9.80024''$$

$$\gamma_0 \ 7 \ 58 \ 46.36''$$

$$\begin{array}{r} 7.33115'' \\ \hline 2.46909'' \end{array}$$

$$\text{Red} \quad +5.57''$$

$$\delta - D \quad -7 \ 57.5''$$

$$\alpha' \ 7 \ 58 \ 57.93''$$

$$D \ 26 \ 39 \ 11.0''$$

$$\delta_0 \ 26 \ 37 \ 16.6''$$

$$\text{Red} \quad +13.2''$$

$$\delta' \ 26 \ 37 \ 29.7''$$

9782 Moon's Mean Position 28

$$\begin{array}{r} \gamma_0 \ 22.5950'' \\ - 3'' \\ \hline 22.5947'' \end{array}$$

$$\begin{array}{r} \gamma_0 \ 17.0770'' \\ - 23'' \\ \hline 17.0747'' \end{array}$$

From Plate Constants

$$X \ 22.6930''$$

$$Y \ 17.3689''$$

$$\xi + 0.6930''$$

$$\eta - .6311''$$

$$\log \xi \ 9.80821''$$

$$\log \tan \delta \ 9.6993''$$

$$\cos \delta \ 9.95153''$$

$$\xi - 9.6169''$$

$$8.50729''$$

$$7.0539''$$

$$1.39999''$$

$$6.3691''$$

$$X - A \ 22.36''$$

$$\eta_1 + 0.0002''$$

$$A \ 9 \ 58 \ 29.0''$$

$$\log h_0 \ 98.0029''$$

$$T_0 \ 9 \ 58 \ 46.36''$$

$$7.33115''$$

$$2.46909''$$

$$Red \ + 5.57''$$

$$S D \ - 9 \ 59.5''$$

$$X' \ 9 \ 58 \ 57.93''$$

$$D \ 26 \ 39 \ 11.0''$$

$$S_0 \ 26 \ 39 \ 16.5''$$

$$Red \ + 13.2''$$

$$S' \ 26 \ 39 \ 29.7''$$

$$\begin{array}{r}
 9 \quad 51 \quad 33.21 \\
 \underline{27.35} \\
 58.6
 \end{array}$$

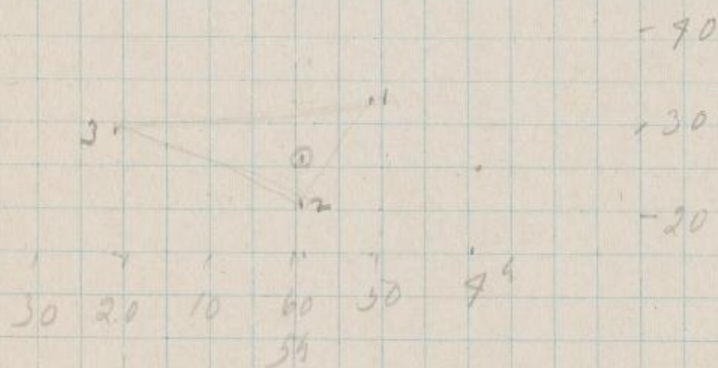
$$\begin{array}{r}
 33 \quad 01 \quad 70.7 \\
 \underline{57.74} \\
 13.56
 \end{array}$$

$$\begin{array}{r}
 4 \quad 58 \quad 6.21 \\
 \underline{0.89} \\
 5.37
 \end{array}$$

$$\begin{array}{r}
 21^{\circ} \quad 28 \quad 23.6 \\
 \underline{9.8} \\
 13.97
 \end{array}$$

$$\begin{array}{r}
 5 \quad 20 \quad 60.71 \\
 \underline{55.05} \\
 5.66
 \end{array}$$

$$\begin{array}{r}
 28 \quad 32 \quad 22.2 \\
 \underline{12.1} \\
 10.1
 \end{array}$$



7782

Reduction to Apparent Place

29

$$H + \alpha \quad 6 \quad 50.9 \quad 2 \quad 402^{\circ} \quad 43.5^{\circ} \quad S + 26^{\circ} \quad 34 \quad 16.5$$

$$H \quad 1 \quad 52.1$$

$$\alpha \quad 7 \quad 58.8$$

$$G \quad 23 \quad 02.1$$

$$G + \alpha \quad 7 \quad 00.9 \quad 2 \quad 60^{\circ} \quad 13.5$$

$$\log \cos S \quad 9.9515$$

$$i \quad 0.6115$$

$$(u) \quad 0.5630$$

$$\log \cos G + \alpha \quad 9.6960$$

$$g \quad 1.3647$$

$$\sin \quad 9.9385$$

$$\tan S \quad 9.6989$$

$$8.8239$$

$$\log \sin S \quad 9.6506$$

$$\cos H + \alpha \quad 9.3730 \quad n$$

$$h \quad 1.3023$$

$$\sin \quad 9.9892$$

$$\sec S \quad 0.0785$$

$$8.8239$$

$$\log g' \quad 1.0607$$

$$g \quad 9.8257$$

$$h' \quad 0.2959 \quad n$$

$$h \quad 0.1639$$

$$f + 3.741$$

$$g + 0.669$$

$$h + 1.759$$

$$+ 5.569$$

$$g' + 11.79$$

$$h' + 1.976$$

$$i' + 3.656$$

$$+ 13.170$$

9782

Reduction to Apparent Place

29

$$\begin{array}{rcl}
 H + \alpha & 6 & 50.9 = 902^\circ 13.5' S + 26^\circ 39' 16.5' \\
 H & 1 & 52.1 \\
 \alpha & 9 & 58.8 \\
 G & 23 & 02.1 \\
 G + \alpha & 9 & 00.9 = 60^\circ 13.5'
 \end{array}$$

$$\log \cos \delta 9.9515$$

$$\alpha 0.6115$$

$$(H) 0.5630$$

$$\log \cos G + \alpha 9.6960$$

$$g 1.3699$$

$$\sin " 9.9385$$

$$\tan \delta 9.6989$$

$$8.8239$$

$$\log \sin \delta 9.6506$$

$$\cos H + \alpha 9.3930 n$$

$$h 1.3023$$

$$\sin " 9.9892$$

$$\sec \delta 0.0985$$

$$8.8239$$

$$\log g' 1.0607$$

$$g 9.8257$$

$$L' 0.2959 n$$

$$h 0.1639$$

$$f + 3.771$$

$$g + 0.669$$

$$h + 1.259$$

$$+ 5.569$$

$$g' + 11.99$$

$$h' + 1.976$$

$$\alpha' + 3.656$$

$$+ 13.170$$

9782 Lunar Parallax

30

α'	4	58	51.98	π	53	59.53
δ	5	21	23.5			
α'		22	33.57		9.86913	
$=$	+50	38	23.55		8.19609	
(δ)		+2	11.95		8.99277	
	5	36	11.60		0.07971	
					7.10702	

9.95727
 0.00000
 0.00208
 9.95935

$\alpha - \alpha'$ $\delta' 23'' 90$
 $=$ + 17.59

$\delta 42 19 20.8$

$\delta 26 37 29.7$

$\delta 15 44 51.1$

9.82670
 8.19609
 9.43361
 0.17179
 7.62784

$\delta - \delta' 19 35.5$

$\delta 26 49 05.2$

$\alpha 4 59 09.52$

Ephd + 26 49 07.0

Ephd 4 59 08.63

W-C + 1.2

W-C + 0.89

Corr. of plate + 0.3

- 0.01

2nd slider ref 0.0

Ins Corr - 0.1

- 0.02

$\delta + 26 49 05.1$

$\alpha 4 59 09.50$

W-C + 1.1

+ 0.87

7782 Lunar Parallax

30

λ'	4	58	51.98	π	53	59.53
δ	5	21	25.5			
λ'		22	33.57	9.86713		
$= +50$		38	23.55	8.19609		
δ		12	11.95	8.99299		
	5	36	11.60	0.09991		
				7.10702		

9.95727

0.00000

0.00208

9.95935

 λ' 7 23.90 δ 17.59 λ 42 19 20.8 δ 26 39 29.7

1

 δ 15 49 51.1

9.82690

8.19609

9.43361

0.17179

7.62789

 $\lambda - \delta'$ 19 35.5 δ 26 49 05.2 λ 4 59 09.52

Ephd + 26 49 07.0

Ephd 4 59 08.63

W-C + 1.2

W-C + 0.89

Error of Plate + 0.3

- 0.01

2nd Order ref 0.0

