

KG
11366
v.997

CXLV		
145		
Plate	Date	Page
10227	Jan 14, '16	1
10228	"	21
10231	Jan 17, '16	21

Harvard Lunar Plates
Measures and Reductions
Martha C. Borton.

10227

Star Measures

1

1	20992	20216	20888	19099
13.1	19070	11627	12926	16993
23.8	69	23	26	87
	89	02	88	39
	<u>13.1925</u>	<u>13.1921</u>	<u>23.8926</u>	<u>23.7998</u>

2				
25.7	19936	19239	19400	19612
7.8	13608	15582	11938	17050
	612	92	34	60
	45	29	398	09
	<u>25.6332</u>	<u>25.6352</u>	<u>4.7462</u>	<u>4.7476</u>

3				
28.9	20178	19808	19500	19786
29.9	10812	19168	15458	13880
	12	.62	60	96
	68	06	486	80
	<u>28.9357</u>	<u>28.9357</u>	<u>24.4035</u>	<u>24.8015</u>

Moon Measures

1		20036	19006
23.3		10828	18233
19.9		38	23
-4		27	18
		<u>19.9195</u>	<u>19.9221</u>

2		19063	19002
23		9596	18482
14.9		92	58
		70	92
		<u>19.9971</u>	<u>19.9959</u>

3		18990	20490
22		19352	15116
15.6		5.9	40
		81	887
		<u>15.7633</u>	<u>15.7625</u>

10227

Star Measures

1

1	20992	20216	20888	19099
13.1	19070	11627	12926	16793
13.8	69	23	26	57
	89	02	88	37
	<u>13.19</u>	<u>13.1921</u>	<u>23.7926</u>	<u>23.7998</u>

2	19936	19239	19700	19612
15.1	13608	15582	11938	17050
9.8	612	92	39	60
	95	29	378	09
	<u>25.6332</u>	<u>25.6352</u>	<u>4.7962</u>	<u>4.7996</u>

3	20178	19808	19500	19786
28.8	10812	19168	15958	13800
29.9	12	62	60	76
	68	06	486	80
	<u>28.9357</u>	<u>28.9357</u>	<u>29.9035</u>	<u>29.9015</u>

Moon Measures

1	20036	19006
23.3	10828	18233
19.9	38	23
-7	27	18
	<u>19.9195</u>	<u>19.9221</u>

2	19063	19002
23	9596	18482
19.9	92	58
	70	92
	<u>19.9971</u>	<u>19.9959</u>

3	18990	20990
22	19352	15116
15.6	5.9	90
	81	987
	<u>15.9633</u>	<u>15.9625</u>

40227

Moon Measures

4	20093	19700
21.6	13722	15997
16	26	82
	76	92
	<u>21.6321</u>	<u>21.6291</u>

5	20129	19500
21.5	15478	13222
16.7	68	7238
	26	609
	<u>21.4652</u>	<u>21.4638</u>

6	19152	20587
21.6	19342	15368
17	42	62
	38	82
	<u>21.4803</u>	<u>21.4781</u>

7		19392	19556
22		18846	10018
18.1		37	08
		48	57
		<u>18.0503</u>	<u>18.0456</u>

8	18702	19538	20200	19560
23	11818	169167	15310	19712
18.6	18	18	02	02
	02	32	18	50
	<u>22.6888</u>	<u>22.6882</u>	<u>18.4898</u>	<u>18.4852</u>

	19926	20079
	15021	19962
	03	52
	18	79
	<u>18.4906</u>	<u>18.4878</u>

10227

Moon Measures

2	20093	19700
21.6	13722	15999
16	26	82
	96	92
	<u>21,6321</u>	<u>21,6291</u>

3	20129	19600
21.5	15978	19282
16.7	68	9238
	26	609
	<u>21,9652</u>	<u>21,9638</u>

6	19152	20587
21.6	19392	15368
17	42	62
	38	82
	<u>21,9803</u>	<u>21,9781</u>

7	19392	19556
22	18896	10018
18.1	39	08
	98	57
	<u>18,0503</u>	<u>18,0956</u>

18	18702	19538	20200	19560
22	11818	16916,7	15310	19912
18.6	18	18	02	02
	02	32	10	50
	<u>22,6889</u>	<u>22,6882</u>	<u>18,9898</u>	<u>18,9802</u>

189296	20079
15021	19962
923	52
48	79
<u>189906</u>	<u>189878</u>

10227

Times Etc

Jan 19'16

Exp. to Stars	6	20		6	32	
M. Moon	6	25	52.1 ✓	6	25	52.3 ✓
Clock fast		6	10.8 ✓			
H. Sid. T.	6	19	71.8 ✓	6-2- + 2 ^h	75 ^m	
H. Long	7	47	31.05 ✓			
G. Sid. T.	11	04	12.73 ✓			
Sid. T. M.H.	19	30	31.45 ✓			
Interval	15	33	41.00 ✓			
Reductions		2	32.96 ✓			
G. M. T.	15	31	08.07 ✓			

From Naut Alman.		R. a.		Loc.		
Moon 15 ^h	3	33	14.38	+ 29	79	12.9
Motion in 1 ^{ms}			2.1262			6.210 ✓
" 31.1340		1	06.20		3	13.3 ✓
Tabular Place	3	34	20.58 ✓	+ 27	22	26.2 ✓

Moon's Age 10 days

Parallax	59	16.26 ✓
Semid.	17	48.9 ✓
C.R.		888.9 ✓
Aug		11.2 ✓
Err 4		-0.6 ✓
R		899.5 ✓
R		1.9282 ✓
ap		-920 ✓
(H+R)		1.8362 ✓
R		3.3716 ✓

$$937 = 12.35$$

$$a = 501.2$$

$$+ 27$$

$$= 477.2$$

10227

Lenses Etc

3

Jun 1916

Exp. to Stars	6	20		6	32	
Moon	6	25	52.1	6	25	52.3
Clock fast		6	10.8			
H. Sid. J	6	19	91.8	6-2	+2 ^h	95 ^m
H. Long	9	99	31.05			
G. Sid. J	11	09	62.95			
Sid. J. M. H.	19	30	31.95			
Internal	15	33	41.00			
Reduction		2	32.96			
G. M. J.	15	31	08.09			

From Naut. Alm		R. A.		Dec.		
Moon 15 ^h	3	33	19.38	+29	19	12.9
Motion in 1 ^m			2.1262			6.210
" " 31.1390		1	06.20		3	13.3
Tubular + Thick	3	34	20.58	+29	22	20.3

Moon's Age

Parallax	59	16.26
Sun's d.	19	98.9
Abg		888.7
Aug		11.2
Ex 9		-0.6
R		899.5
R		1.9282
ap		-920
11 + 12		1.8362
R		3.3716

$$939 = 12.25$$

$$a = 501.2$$

$$+ 29$$

$$= 977.2$$

10227

Plate Center & Constants

9

x	y	x	y	x	y
13,1723	23,7937	3 25	16,05	29 58	10,8
25,6372	09,7958	33	99,72	22 23	10,9
28,9357	29,8025	35	9506	25 03	31,1
316 77122	52 98 16				
22,57073	17,6472	3 31	35,27	29 08	17,8
22	18		-17,67	+2	88,6
-5707	+3528	3 31	17,60	29 11	02,0
315	866,5				
-17,67	164,58				

Plate Center $\{A-3 \ 31 \ 18,$
 $\{D+29 \ 11 \ 00,$

$$\begin{array}{rclclcl}
 x-y & +500x & & -26y & & +1.2x & & -5723 \\
 -593 + 6571 & = & +6026 & - 619 & +5907 & +16 & = & +5723 = 0 \\
 -7302 + 12817 & = & +5515 & - 123 & +4392 & +31 & = & +5723 = 0 \\
 -8495 + 17868 & = & +6023 & - 639 & +5389 & +35 & = & +5729 = +1 \\
 23,3089 + 11651 & & & - 436 & & +28 & & 23,8839
 \end{array}$$

$$\begin{array}{rclclcl}
 x-y & +500y & & +23x & & +1.9y & & -9108 \\
 -3137 + 11897 & = & +8760 & +302 & +9062 & +75 & = & +9107 = -1 \\
 +6136 + 2373 & = & +8509 & +590 & +9099 & +9 & = & +9108 = 0 \\
 -3807 + 12201 & = & +8397 & +666 & +9063 & +75 & = & +9108 = 0 \\
 16,7572 + 8379 & & & +536 & & +32 & & 16,7911
 \end{array}$$

$$\begin{array}{rclclcl}
 \text{Tables } a & = & -.3 & e & = & -.1 & a-e & = & -.2 & b+d & = & -.2 \\
 \text{obs} & & -501.2 & & = & -501.9 & & & = & -.7 & & = & +3
 \end{array}$$

$$\begin{array}{rclclcl}
 0-e & & -500.9 & & -501.8 & & & & & & +5.0
 \end{array}$$

10227

Plate Center + Constants

9

A	γ	X	δ	
13.1923	23.7937	3 25 16.05	29 58.10.8	
25.6392	09.7958	33 99.72	22 23 10.9	
28.9357	29.9025	35 9506	25 03 31.1	
316.77122	52.9916			
3 57473	17.6472	3 31 35.27	29 08 17.9	
32	18	-17.67	+2 99.6	
- 5707	+3528	3 31 17.60	29 11 02.0	
315	966.5			
-17.67	169.28			

Plate Center A - 3 31 18,
 D + 29 11 00.

$$23.3089 + 11651 \quad - 936 \quad + 28 \quad 23.8839$$

$$16.7572 + 8379 \quad + 536 \quad + 32 \quad 16.7911$$

Tables a - .3 e - .1 a - e - .2 d - .2
 Obs

	ξ	η	$\Delta\xi$	-2.7ξ	$+1.6\eta$	-3
1	-08.80	+6.07	-24	+24 = 0	+4 = +4	+1
2	+7.36	-13.88	+23	-12 = +11	-8 = +3	0
3	+7.78	+6.75	+20	-21 = -1	+4 = +3	0
M	+1.88	-1.26		-5	-1	<u>-9</u>

	$\Delta\xi$	-8.3ξ	$+3\xi$	$+10$
+18	-26	= -8	-3 = -7	-1
-70	+60	= -10	+1 = -9	+1
+17	-29	= -12	+2 = -10	0
0	+5		+1	<u>+16</u>

10227

Standard Coordinates

Cape No 509-mg 8.0 Cape No 523-mg 6.6 Cape No 528-mg 6.2

C	3	25	19.10	3	32	98.52	3	39	97.80
L			19.12			98.50		39	97.83
E			19.12			97.87			97.87
Mean	3	25	19.11	3	32	98.51	3	39	97.82
Prec			56.97			56.21			57.27
d	3	25	16.05	3	33	99.72	3	35	96.06
A	3	31	18	3	31	18	3	31	18
d-A	-	05	01.95	+2	26	72	+0	4	27.06
tan d	-	3	01.93	+1	96	72	+2	67	09
log d	2	87	980h	2	16	679	2	42	657
log d	9	95	738	9	96	597	9	95	707
log d	0	94	852h	0	63	970	0	89	088

3	-08	80	08	+4	36	21	+7	77	83
3	-24			+23			+20		
3	13	19	68	26	36	48	29	78	02
3	13	19	23	25	63	72	28	93	57
A-S	-	58	5	-	73	02	-	87	45

C	+27	57	52.0	+22	19	59.1	+25	00	21.9
L			52.3			58.5			22.1
E			51.7						21.8
Mean	27	57	51.9	22	19	58.8	25	00	21.9
Prec	3	19	.9	3	11	.6	+3		09.2
d	28	58	11.8	22	23	109	25	03	31.1
d	+29	11	02	29	11	02	29	11	02
d-b	+47	09	.8	-1	47	51.6	+0	52	29.1
tan d-b	+28	30	0	-6	47	37	+3	17	9.3
log d	3	45	179	3	81	145	3	79	821
log d	0	78	294	1	17	230h	0	82	936

log tan	9	66	81	9	61	78	9	66	98
tan	1	88	90	1	27	97	1	78	18
tan	8	61	03	7	97	76	8	50	39

h ₀	+6	06	66	-13	87	71	+6	75	09
h ₁	+0	04	08	+0	00	89	+0	03	20
h	28	10	77	4	13	18	28	78	29
h	23	79	37	4	77	57	28	40	25
h-h	-	31	37	+6	13	6	-	38	07

10-27

Standard Coordinates

Cape No 529-mg 8.0 Cys 523-mg 6.6 Cape 14-528-mg

C	3	25	19.10	3	32	98.52	3	39	97.80
L			19.12			98.50		39	97.83
E			19.12			97.89			97.89
Mean	3	25	19.11	3	32	98.51	3	39	97.82
Prec			56.99"			56.21"			57.27.29
A	2	25	16.05	3	33	99.72"	3	35	99.06"
A	3	31	18	3	31	18	3	31	18
A-A	-	05	01.95		+ 2	26.72"		+ 09	27.06"
mag			- 361.93"			+ 196.72"			267.09"
log			2.87990"			2.16699"			2.92654"
and			9.95738"			9.96597"			9.95707"
So			D.928224"			0.63970"			0.89088"

So			08.80058"			+ 9.3621"			+ 7.7782"
Si			- 24"			+ 23"			+ 20"
			13.1968"			26.3648"			29.7802"
X			13.1923"			25.6392"			28.9357"
X			- 585"			- 7302"			- 8945"

C			+ 27.59.52.0			+ 22.19.59.1			+ 25.00.21.9
L			52.3			58.5			22.1
E			51.9						21.8
Mean			29.59.51.9			22.19.58.8			25.00.21.9
Prec			318.9"			311.6"			+ 3.09.2"
S			29.58.11.8"			22.23.10.9"			25.03.31.1"
D			+ 29.11.02"			29.11.02			29.11.02
S-D			+ 97.09.8"			- 197.51.6"			+ 0.52.27.1"
Tan S-D			2830.0"			- 69737"			3199.3"
log "			3.95177"			3.81115"			3.99821"
No			0.78279"			1.19230"			0.82936"

log Tan S			9.6681"			9.6198"			9.6698"
S			1.8890"			1.2799"			1.7818"
hi			8.6495"			7.9976"			8.5039"

h ₀			+ 6.0666"			- 13.8771"			+ 6.7509"
h ₁			+ 0.0908"			+ 0.0089"			+ 0.0320"
h			29.1079"			9.1388"			29.7829"
h			23.7937"			9.7959"			27.4025"
h-h			- 31.37"			+ 6.136"			- 38.04"

$A = +1.6$ $B = -1.3$

10227

Moon's

Center

6

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)$	$b - c$
1	23,2990	1,0000	-3	0,0000	3,3670	-76
2	23,0000	-0,2990	-3	0,0897	3,3597	-119
3	22,0000	-1,2990	-2	1,6879	3,3575	-181
4	21,6306	-1,6684	-1	2,7839	3,3539	-177
5	21,4645	-1,8345	0	3,3654	3,3654	-62
6	21,4792	-1,8198	+0	3,3117	3,3717	+1
7	22,0000	-1,2990	+2	1,6849	3,3565	-151
8	22,6883	-0,6107	+3	0,3726	3,3797	+81

	y	$y - y_0$	Δy	$(y - y_0)^2$	R^2	L
1	17,9208	-1,8342	+1	3,3670	+1,80	✓
2	17,9765	-1,8085	+1	3,2703	1,89 (187)	✓
3	15,4629	-1,2921	+0	1,6696	2,25	✓
4	16,0000	-0,7550	+0	0,5700	2,46	✓
5	16,7550	0,0000	0	0,0000	2,70	✓
6	17,0000	+0,2450	-0	0,0600	2,78	✓
7	18,0779	+1,2929	-0	1,6716	3,15	✓
8	18,7892	+1,7342	-1	3,0071	3,41	1610

 $x = 22$ $y = 15,4629$

18,0779

3,35108

 $y_0 = 16,7554$ $y_{min} = 17,9208$ $R = 18,346$ $x_{min} = 21,4645$ $x_0 = 23,2991$

Moon's Center $\begin{cases} x_0 = 23,2990 \\ y_0 = 16,7550 \end{cases}$

	x	$x - \bar{x}$	Δx	$(x - \bar{x})^2$	$(x - \bar{x}) + (y - \bar{y})$	$(y - \bar{y})$
1	23,2990	0.0000	-3	0.0000	3.3690	-76
2	23,0000	-0.2990	-3	0.0894	3.3699	-119
3	22,0000	-1.2990	-2	1.6879	3.3575	-191
4	21,6306	-1.6684	-1	2.7839	3.3539	-177
5	21,4645	-1.8345	0	3.3659	3.3659	-62
6	21,9792	-1.8198	0	3.3117	3.3717	+1
7	22,0000	-1.2990	2	1.6879	3.3565	-151
8	22,6883	-0.6107	3	0.3726	3.8799	+81

 $R = 3.3716$

	y	$y - \bar{y}$	Δy	$(y - \bar{y})^2$	$(x - \bar{x}) + (y - \bar{y})$
1	14,9208	-1.8392	2+1	3.3690	+1.80
2	14,9765	-1.8035	5+1	3.2703	1.89
3	12,7629	-1.2921	1+0	1.6696	2.25
4	16,0000	-0.7550	0+0	0.5700	2.46
5	16,7250	0.0000	0	0.0000	2.70
6	17,0000	+0.2950	-0	0.0600	2.18
7	18,0779	+1.2929	-0	1.6716	3.15
8	18,4872	+1.7372	-1	3.0079	3.91

161°

 $\bar{x} = 22$ $\bar{y} = 15.7627$

18.0479

3.35105

 $\bar{x} = 16.7554$ $\bar{y} = 14.9208$

18.396

 $\bar{x} = 21.9673$ $\bar{y} = 23.2991$

$\bar{x} = 22.2990$
 $\bar{y} = 16.7550$

Formation of Normals.

1 0.0	- 0.0	+ 139.0
2 +0.57	+ 36.0	+ 216.0
3 +1.68	+ 183.0	+ 182.0
4 +1.27	+ 296.0	+ 139.5
5 0.0	+ 113.5	0.0
6 -0.85	- 20	+ 0
7 -1.68	+ 196.0	- 194.5
8 -1.06	- 49.5	+ 180.0
+3.79	+ 824.5	+ 811.5
-3.19	- 51.5	- 194.5
+0.30	+ 773.0	+ 617.0

	-a	-b	Δ Res
-20 Δ a = -10	1 0	+4	-11 "
" " b = -2	2 +3	+4	-8 "
+20 C = -15	3 +13	+3	+1 "
	4 +17	+2	+4 "
	5 +18	0	+3 "
	6 +18	-0	+3 "
	7 +13	-3	-5 "
	8 +6	-3	-12 "

$$+0.30 + 13.61 = -2.82 \Delta$$

$$+L \quad + \quad 0 = -0.20 \Delta$$

$$+13.61 = -2.22 \Delta$$

$$+13.29 = -8.83 + 0.05 = -8.78$$

10227

Conditional Equations

7

1	0,0	-1,83	=	-76	0	-81	=	-81	+5	-6
2	-0,30	-1,81	=	-119	-17	-80	=	-97	-22	-30
3	-1,30	-1,29	=	-141	-74	-57	=	-131	-10	-9
4	-1,67	-0,76	=	-177	-96	-33	=	-129	-78	-77
5	-1,83	0,00	=	-62	-105	0	=	-105	+43	+46
6	-1,82	+0,25	=	+1	-104	+11	=	-93	+97	+97
7	-1,30	+1,29	=	-151	-74	+57	=	-17	-137	-139
8	-0,61	+1,73	=	+81	-35	+76	=	+41	+40	+28
					+ 182 - 219					
					average 47					

$$13.29 + 0.30 = +773.0 - 8.83 \Delta$$

$$+0.30 + 13.61 = +617.0 - 2.92 \Delta$$

$$+ [] + .01 = +17.5$$

$$+13.60 = +599.5$$

$$b = +47.1$$

$$= - .16 \Delta$$

$$13.29 = +773.0 - 13.2 = +759.8$$

$$a = +57.2$$

$$= - .66 \Delta$$

Arc Measured 161°

$$\frac{P}{4} = 1.20$$

$$\frac{\Sigma V}{4} = -9$$

$$\text{In } 4 \quad R \quad 1.87$$

$$-\frac{4}{2} = -2.0 \quad \Delta R = -0.2$$

$$-2RC = -0.79$$

$$\text{Corr} = +.2$$

$$\Delta \delta = +9.11$$

$$\Delta \delta = +0.1$$

$$\Delta R = -0.9$$

$$\Delta a = +0.99$$

$$\Delta \alpha = +0.02$$

10227

Conditional Equations

7

1	0.0	-1.83	= -76	0	-81	= -81	+5
2	-0.30	-1.81	= -119	-17	-20	= -93	-22
3	-1.30	-1.29	= -141	-79	-37	= -131	-10
4	-1.67	-0.76	= -177	-96	-33	= -129	-98
5	-1.83	0.00	= -62	-105	0	= -105	+93
6	-1.52	+0.25	= +1	-109	+11	= -93	+99
7	-1.30	+1.29	= -151	-79	+37	= -17	-139
8	-0.61	+1.73	= +81	-33	+76	= +91	+90

+182 = -19
Average 97

$$13.29 + 0.30 = +773.0$$

$$+0.30 + 13.61 = +617.0$$

$$+L] + .01 = +17.5$$

$$+13.60 = +599.5$$

$$b = +99.1$$

$$13.29 = +773.0 - 13.2 = +759.8$$

$$a = +57.2$$

Arc 14 hours 161°

$$\frac{p}{4} = 1.20$$

$$\frac{2v}{4} = -9$$

$$-\frac{4}{2} = -20 \quad \Delta R = -0.2$$

10227 Morris Mean Position

8

$$\begin{aligned} X_0 & 23,2990^{\circ} \\ & +29^{\circ} \\ & 23,3019^{\circ} \end{aligned}$$

$$\begin{aligned} Y_0 & 16,7550^{\circ} \\ & +22^{\circ} \\ & 16,7572^{\circ} \end{aligned}$$

From Plate Constants

$$X \quad 23.8839^{\circ}$$

$$y \quad 16.7811^{\circ}$$

$$\xi \quad +1.8839^{\circ}$$

$$\eta \quad -1.2589^{\circ}$$

$$\log \zeta \quad 0.27506^{\circ}$$

$$\log \tan \delta \quad 9.6790^{\circ}$$

$$\log \zeta \quad 9.96066^{\circ}$$

$$\zeta^2 \quad 0.5501^{\circ}$$

$$8.50727^{\circ}$$

$$7.0537^{\circ}$$

$$1.80716^{\circ}$$

$$7.2523^{\circ}$$

$$\delta - A \quad +67.17^{\circ}$$

$$\eta_1 + 0.0018^{\circ}$$

$$A \quad 3 \quad 31 \quad 18.0^{\circ}$$

$$\log h_0 \quad 0.10061^{\circ}$$

$$7.30115^{\circ}$$

$$A_0 \quad 3 \quad 32 \quad 22.17^{\circ}$$

$$2.76946^{\circ}$$

$$588.1$$

$$\text{Red} \quad +1.79^{\circ}$$

$$S-D \quad -9 \quad 98.1^{\circ}$$

$$\delta' \quad 3 \quad 32 \quad 23.93^{\circ}$$

$$D \quad +27 \quad 11 \quad 02^{\circ}$$

$$S_0 \quad +29 \quad 01 \quad 13.9^{\circ}$$

$$\text{Red} \quad +12.2^{\circ}$$

$$\delta' + 27 \quad 01 \quad 26.1^{\circ}$$

10227 Moon's Mean Position

8

X_0 23,2990"
 +29"
 23,3019"

Y_0 16,7350"
 +22"
 16,7572"

from Plate Constants

X 23.8839"

Y 16.7711"

Z +1.8839"

W -1.2589"

$\log \epsilon$ 0.21506"

$\log \tan \delta$ 9.6790"

$\cos \delta$ 9.96066"

ϵ 0.5501"

8.50729"

7.0538"

1.80716"

7.2523"

$\alpha - A$ +69.19"

η_1 +0.0018"

A 3 31 18.0"

$\log h$ 0.10061"

7.32115"

T_0 3 32 22.19"

2.76996"

μ_{α} +1.79"

$S.D.$ -9 98.1"

δ' 3 32 23.93"

D +29 11 02"

μ_{δ} +29 01 13.9"

μ_{α} +1.2"

δ' +29 01 26.1"

$$\begin{array}{r} 3 \quad 26 \quad 15.68 \\ 13.99 \\ + 1.69 \\ \hline \end{array}$$

$$\begin{array}{r} 12^\circ \quad 38 \quad 67.06 \\ 58.67 \\ + 836 \\ \hline \end{array}$$

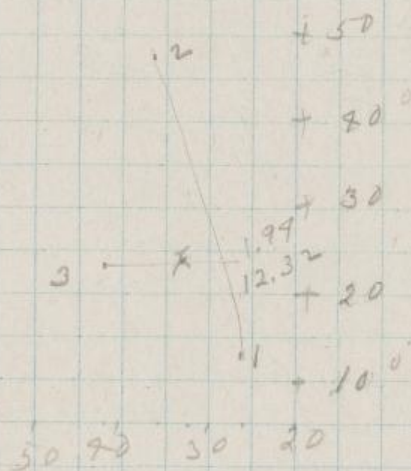
$$\begin{array}{r} 3 \quad 36 \quad 58.43 \\ 56.27 \\ + 2.19 \\ \hline \end{array}$$

$$\begin{array}{r} 77 \quad 31 \quad 29.88 \\ 11.99 \\ + 17.89 \\ \hline \end{array}$$

Wrong
in dec.

$$\begin{array}{r} 3 \quad 42 \quad 31.14 \\ 29.28 \\ + 1.86 \\ \hline \end{array}$$

$$\begin{array}{r} 23 \quad 50 \quad 58.32 \\ 46.75 \\ + 11.87 \\ \hline \end{array}$$



10227 Reduction to Apparent Place 9

$$\begin{array}{rcl}
 H + \alpha & 2 & 09.6 = 31^{\circ} 09.0' \\
 H & 22 & 32.7 \\
 \alpha & 3 & 32.7 \\
 CG & 21 & 18.9 \\
 O + \alpha & 0 & 90.8 = 10^{\circ} 12.0'
 \end{array}
 \quad
 \begin{array}{rcl}
 S & 27 & 01 \quad 13.9 \\
 \log \cos S & & 9.9607 \\
 & & - 0.5151 \\
 & & = 0.4758
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos \alpha & + & 9.9930 \\
 & 9 & 09191 \\
 \sin & & 9.2782 \\
 \tan & & 9.6790 \\
 & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin S & & 9.6097 \\
 \cos H + \alpha & & 9.9329 \\
 & & - 1.3057 \\
 \sin H + \alpha & & 9.7137 \\
 \sec S & & 0.0393 \\
 & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log g' & & 0.9122 \\
 & 9 & 8.6702
 \end{array}$$

$$\begin{array}{rcl}
 \log h' & & 0.8775 \\
 & h & 9.8823
 \end{array}$$

$$\begin{array}{rcl}
 f & + & 9.80 \\
 g & + & 0.47 \\
 h & + & 0.763 \\
 & + & 1.786
 \end{array}$$

$$\begin{array}{rcl}
 g' & + & 8.170 \\
 h' & + & 7.079 \\
 & - & 2.991 \\
 & + & 12.249
 \end{array}$$

10.2.27 Reduction to Apparent Place 9

$$H + \alpha 2 \quad 09.8 = 31^{\circ} 09.0''$$

$$H 22 \quad 32.2''$$

$$\alpha 3 \quad 32.9''$$

$$OG 21 \quad 18.9''$$

$$G + \alpha 0 \quad 90.8'' = 10^{\circ} 12.0''$$

$$\delta 29 \quad 01 \quad 13.9$$

$$\log \cos \delta \quad 9.9607''$$

$$\sim 0.5158''$$

$$\sim 0.9758''$$

$$\log \sin \delta \quad 9.6097''$$

$$\cos H + \alpha \quad 9.9329''$$

$$h \quad 1.3059''$$

$$\sin H + \alpha \quad 9.7137''$$

$$\sec \delta \quad 0.0393$$

$$8.8239$$

$$\log \cos G + \alpha \quad 9.9930''$$

$$g \quad 0.9192''$$

$$\sin \alpha \quad 9.2782''$$

$$\tan \alpha \quad 9.6990''$$

$$8.8239$$

$$\log g' \quad 0.9122''$$

$$g \quad 8.6702''$$

$$\log h' \quad 0.8975''$$

$$h \quad 7.8823''$$

$$f \quad +.980''$$

$$g \quad +.099''$$

$$h \quad +.0763''$$

$$+ 1.786''$$

$$g' + 8.130''$$

$$h' + 7.079''$$

$$\alpha' - 29.91''$$

$$+ 12.219''$$

10227 Lunar Parallax

10

$$\begin{array}{r}
 \alpha' \quad 3 \quad 32 \quad 23.93 \checkmark \\
 \delta \quad 6 \quad 19 \quad 41.7 \checkmark \\
 \delta - \alpha' + 2 \quad 77 \quad 17.77 \checkmark \\
 = + 71 \quad 79 \quad 22.05 \checkmark \\
 \quad \quad + 17 \quad 71.80 \checkmark \\
 + 71 \quad 37 \quad 70.25 \checkmark \\
 9.95727 \checkmark \\
 0.00000 \checkmark \\
 0.12606 \checkmark \\
 \hline
 0.08333 \checkmark
 \end{array}$$

$$\delta \quad 50 \quad 27 \quad 48.5 \checkmark$$

$$\delta \quad 27 \quad 01 \quad 26.1 \checkmark$$

$$\delta - 226 \quad 26 \quad 22.7 \checkmark$$

$$\begin{array}{r}
 9.82670 \checkmark \\
 8.19828 \checkmark \\
 9.67860 \checkmark \\
 0.11283 \checkmark \\
 \hline
 7.78611 \checkmark
 \end{array}$$

$$\delta - \delta' \quad + 21 \quad 00.5 \checkmark$$

$$\delta + 27 \quad 22 \quad 26.6 \checkmark$$

$$\text{Ephd} \quad 27 \quad 22 \quad 26.2 \checkmark$$

$$\text{O-C} \quad + 0.7 \checkmark$$

$$\begin{array}{r}
 \text{Corr. of Plate} \quad + 0.8 \\
 \text{2nd Ord. Ref} \quad 0.0
 \end{array}$$

$$\text{In Corr} \quad + 0.1$$

$$\delta \quad + 27 \quad 22 \quad 26.7$$

$$\text{O-C} \quad + 0.5 \checkmark$$

$$\pi \quad 57 \quad 16.26 \checkmark$$

$$9.86913 \checkmark$$

$$8.19828 \checkmark$$

$$9.82701 \checkmark$$

$$0.04055 \checkmark$$

$$7.93197 \checkmark$$

$$\delta - \alpha' \quad 29 \quad 23.60 \checkmark$$

$$= \quad + 1 \quad 57.57 \checkmark$$

$$\alpha \quad 3 \quad 37 \quad 21.50 \checkmark$$

$$\text{Ephd} \quad 3 \quad 37 \quad 20.58 \checkmark$$

$$\text{O-C} \quad + 0.92 \checkmark$$

$$- 0.03$$

$$+ 0.02$$

$$\alpha \quad 3 \quad 37 \quad 21.52$$

$$+ 0.97$$

10227 Lunar Parallax

10

α' 3 32 23.93⁻
 δ 6 19 91.7⁻
 $\delta - \alpha'$ 2 9.7 17.87⁻
 $= + 91$ 99 22.03⁻
 $+ 19$ 91.80⁻
 $+ 91$ 39 70.23⁻
 9.95727 ⁻
 0.00000 ⁻
 0.12606 ⁻
 0.08333 ⁻

γ 50 27 98.5⁻

δ 29 01 26.1⁻

$\gamma - \delta$ 26 26 22.9⁻

9.82690 ⁻
 8.19828 ⁻
 9.67860 ⁻
 0.11283 ⁻
 7.78611 ⁻

$\delta - \alpha'$ 21 00.5⁻

$\delta + 29$ 22 26.6⁻

$\gamma - \delta$ 29 22 26.2⁻

$\delta - \alpha'$ + 0.9⁻

Corr. of Plate + 0.8
 2nd. Ord. Ref. 0.0

π 39 16.26⁻

9.86913 ⁻

8.19828 ⁻

9.82901 ⁻

0.09055 ⁻

7.93197 ⁻

$\gamma - \alpha'$ 29 23.60⁻

$=$ 1 37.57⁻

α 3 39 21.50⁻

$\gamma - \alpha$ 3 39 20.58⁻

$\delta - \alpha$ + 0.92⁻

- 0.03

10 228

Star Measures

1 18692
 12.5 13952
 23.7 59
 88

23.4737

19506

19298

98

00

23.4795

19992

12935

29

79

23.7043

19508

16532

32

08

23.7029

2 19801

20222

19929

18797

25.0 19951

10561

12918

15188

9.7 50

67

28

90

799

18

28

00

25.035125.03954.70104.6992

2 18970

18949

19372

19570

28.3 16347

11588

16672

13214

29.5 97

82

670

08

62

99

38

68

28.262128.263629.367029.3672

Moon Measures

1

20952

18562

23.3

10758

18252

19.9

38

40

-4

52

69

14.971414.9684

2

19253

19561

23

9319

19472

19.9

29

79

60

63

19.993614.9912

3

10

18872

20322

22

12936

15192

15.5

70

84

16

22

15.987615.9866

10 228

Star Measures

1 18692
 12.5 13932
 23.7 57
 88

129737

19506

19298

98

00

129795

19998

12935

29

79

237093

19508

16532

32

08

237029

2 19801

20222

19929

18499

25.0 19451

10561

12918

15188

9.7 50

67

28

90

799

18

28

00

2503512503959701096992

2 18970

18999

19392

19578

28.3 16397

11588

15672

13219

29.5 97

82

70

08

62

99

38

88

282621282636293670293692

Moon Measures

1
 23.3
 19.9
 -4

20952

18562

10738

18252

38

40

52

69

199719199689

2

19253

19561

23

9319

19472

19.9

29

79

60

63

199936199912

3 15

18828

20322

22

12936

15192

15.5

90

84

16

22

159876159866

10225

Linn. Etc.

13

Jan 19 1/6

Exp. to Stars	6	34		6	46
" " Moon	6	40	03.8	6	40 0.8.1
Clock fast		6	10.8		

H. Sid Time	6	33	53.15	4 - 4 = + 2 59'
H. Long	4	44	31.05	
g. Sid T.	11	18	24.20	
Sid T. M. Moon	19	30	31.45	
Interval	15	47	52.75	
Reduction		2	35.29	
T. M. T.	15	45	17.46	

From Mount Allen

Moon 15"	3	33	17.38 + 24	19	12.9
Motion 1/4"			2.1266		+ 6.197
" 45.2910		+ 1	36.32	+ 4	40.7
Tabular Place	3	34	50.70 + 24	23	53.6

Moon's age

9 days

Parallax 54' 16.10

Semi-d 14' 48.8

P. 888.8

Aug 10.8

km 4 - 0.6

R 899.0

R. 1.9271

ap 923

(1+4)R 1.8348

R 3.3665

934 = 11.9

- 502.8

+ 24

- 478.8

10225

Linnæa etc.

13

Jan 19 '16

Exp. to Stars	6	38	6	86
" Moon	6	70	03.8	6 7.0 0.9.1
Clock fast	6	10.8		

H. Sid Time	6	33	53.15	4 - 5:42" 59"
H. Long.	4	44	31.05	
g. Sid T.	11	18	~~28~~ 20	
Sid T. M. Noon	19	30	31.95	
Interval	15	47	52.75	
Reduction	2	35.29		
G. M. T.	15	45	17.96	

From Mount Alver.

Moon 15"	3	33	17.38 +29	19	12.9
Motion incl ^m			2.1265		+6.192
" 95.2800		+1	36.32	#4	94.7
Tubular Place	3	34	50.70 +29	23	53.6

Motions age

Parallax

Semi

R.

Ang

K₁ 7

R

R

ap₂

(H+R)

R²

9 days	16.10
54	988
19	883.8
	10.8
	-0.6
	8990
	1.9271
	-923
	1.8398
	3.3665

934 = 11.9

- 502.8

+ 2.7

- 478.8

10228		Moon Measures.		12	
<u>4</u>	20179	19561			
21.7	13916	15868			
16	10	58			
	76	61			
	<u>21.6264</u>	<u>21.6302</u>			
<u>5</u>	20246	19526			
21.5	15782	13968			
16.7	78	68			
	39	22			
	<u>21.7761</u>	<u>21.4445</u>			
<u>6</u>	19298	20516			
21.6	19698	15052			
17	700	38			
	49	20			
	<u>21.9579</u>	<u>21.7527</u>			
<u>7</u>		19188	20070		
22		18016	11188		
18.2		17	86		
		92	48		
		<u>18.1173</u>	<u>18.1137</u>		
<u>8</u>	18892	19732	18976	20098	
22.7	10768	18260	13197	15951	
18.7	66	52	99	52	
	992	30	77	109	
	<u>22.8525</u>	<u>22.8525</u>	<u>18.5879</u>	<u>18.5851</u>	

10228		Moon Measures		12
<u>9</u>	20179	19561		
21.7	13916	13868		
16	10	58		
	76	61		
	<u>21.6269</u>	<u>21.6302</u>		
<u>5</u>	20246	19526		
21.5	15782	13968		
16.7	78	68		
	39	22		
	<u>21.9961</u>	<u>21.9995</u>		
<u>6</u>	19298	20516		
21.6	19698	13052		
17	700	38		
	49	20		
	<u>21.9599</u>	<u>21.9527</u>		
<u>7</u>		19188	20090	
22		18016	11188	
18.2		19	86	
		92	98	
		<u>18.1173</u>	<u>18.1137</u>	
<u>8</u>	18992	19732	19976	20098
22.7	10968	18260	13199	13951
18.7	66	52	99	52
	992	30	79	109
	<u>22.8525</u>	<u>21.8628</u>	<u>18.5879</u>	<u>18.5851</u>

10228

Plate Constants.

17

$$\begin{array}{rcl}
 x & 12.8791'' & 25.0398'' & 28.2628'' \\
 y & 13.1968'' & 26.3679'' & 29.7802'' \\
 x-y & -7227'' & -13296'' & -15174''
 \end{array}$$

$$\begin{array}{rcl}
 y & 23.7033'' & 4.7001'' & 24.3658'' \\
 \eta & 27.1078'' & 8.1318'' & 27.7829'' \\
 y-\eta & -7091'' & +5683'' & -7173''
 \end{array}$$

$$\begin{array}{rcl}
 x-3 & +500x & +13.4 & +2.8x & +647 \\
 -7227 + 6237 & = -990 + 308 & = -682 + 35 & = -647 = 0 \\
 -13296 + 12517 & = -779 + 61 & = -718 + 70 & = -648 = -1 \\
 -15174 + 14131 & = -1043 + 317 & = -726 + 79 & = -647 = 0 \\
 23.2793'' & + 11690'' & + 218'' & + 65'' & = 27.5365''
 \end{array}$$

$$\begin{array}{rcl}
 y-\eta & +500y & -12.7x & +3.3y & -7730 \\
 -7091 + 11852 & = +7811 - 159 & = +7652 + 78 & = +7730 = 0 \\
 +5683 + 2350 & = +8033 - 328 & = +7715 + 16 & = +7731 + 1 \\
 -7173 + 12183 & = +8010 - 360 & = +7650 + 80 & = +7730 = 0 \\
 16.8033'' & + 8402'' & - 296'' & + 55'' & = 16.8764''
 \end{array}$$

$$\begin{array}{rcl}
 \text{Tables } a = -.6 & e = -1 & a-e = -.5 & f+d = -2.0 \\
 \text{Obs. } = -502.8 & = -503.3 & = +.5 & = -0.3
 \end{array}$$

$$\begin{array}{rcl}
 O-C & -502.2'' & -502.3'' & +1.7''
 \end{array}$$

10228 Plate Constants

19

$$\begin{array}{rcl}
 X & 12.9791^{\circ} & 25.0395^{\circ} & 28.2628^{\circ} \\
 Y & 13.1968^{\circ} & 26.3679^{\circ} & 29.7802^{\circ} \\
 X-Y & 7229^{\circ} & -13296^{\circ} & -15174^{\circ}
 \end{array}$$

$$\begin{array}{rcl}
 Y & 23.7033^{\circ} & 9.7001^{\circ} & 24.3658^{\circ} \\
 Y & 29.1079^{\circ} & 9.1318^{\circ} & 29.7829^{\circ} \\
 Y-Y & 9091^{\circ} & -5683^{\circ} & -9173^{\circ}
 \end{array}$$

$$\begin{array}{rcl}
 X-Y & 15001 & +1134 & 1281 + 697 \\
 -7227 + 6237 & -990 + 308 & -682 + 35 & -697 = 0 \\
 -13296 + 12517 & -779 + 61 & -718 + 70 & -698 = -1 \\
 -15174 + 14131 & -1043 + 317 & -726 + 79 & -697 = 0 \\
 23.2795^{\circ} + 11690 & + 218 & + 65 & = 27.5365
 \end{array}$$

$$\begin{array}{rcl}
 Y-Y & +5004 & -12.71 & +334 - 7730 \\
 -9091 + 11852 & +7811 - 159 & +7652 + 78 & = 17730.0 \\
 +5683 + 2330 & +8033 - 318 & +7715 + 16 & = 17731.1 \\
 -9173 + 12183 & +8010 - 360 & +7650 + 80 & = 17730.0 \\
 16.8033 + 8902 & - 296 & + 55 & = 16.8969
 \end{array}$$

$$\begin{array}{rcl}
 \text{Tables } a: -.6 & e: -.1 & a-e: -.5 & +d: -.2 \\
 \text{Obs. } : -502.8 & : -503.3 & : +1.5 & : -0.3
 \end{array}$$

$A + 2$
 $B - .6$ 

10228		Moon's Center					15
x		$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)^2$	$b - c$	
1	23.2780	0.0000	-4	0.0000	3.3526	-139	
2	23.0000	-0.2780	-4	0.0775	3.3982	-183	
3	22.0000	-1.2780	-1	1.6335	3.3598	-64	
4	21.6283	-1.6497	-2	2.7222	3.3638	-27	
5	21.9953	-1.8327	0	3.3588	3.3588	-77	
6	21.9538	-1.8242	+0	3.3277	3.3673	+8	
7	22.0000	-1.2780	+3	1.6325	3.3601	-64	
8	22.8525	-0.4255	+3	0.1808	3.3684	+19	

$$R = 3.3665$$

y	$y - y_0$	Δy	$(y - y_0)^2$	L
1 -17.9699	-1.8311 + 11	3.3526	180°	
2 17.9927	-1.8086 + 11	3.2707	189°	
3 15.9871	-1.3139 + 0	0.7263	227°	
4 16.0000	0.8010 + 0	0.6416	277°	
5 16.8010	0.0000 0 0	0.0000	270°	
6 17.0000	+0.1990 - 0	0.0396	276°	
7 18.1155	+1.3175 - 1	1.7276	316°	
8 18.5865	+1.7855 - 1	3.1876	377° 167°	

Approx. Center

$$\begin{aligned}
 x &= 22 & y &= 15.9871 \\
 & & & 18.1155 \\
 & & & 33.6026 \\
 & & y_0 & 16.8013 \\
 y \text{ min} & & & 17.9699 \\
 R & & & 1.8317 \\
 x \text{ min} & & & 21.9753 \\
 x_0 & & & 23.2783
 \end{aligned}$$

$$\text{Moon's Center} \begin{cases} x_0 & 23.2780 \\ y_0 & 16.8010 \end{cases}$$

10228		Morris Center				15
x		$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	23.2780	0.0000	-9	0.0000	3.3526	-1.39
2	23.0000	-0.2780	-9	0.0775	3.3982	-1.83
3	22.0000	-1.2780	-1	1.6335	3.3988	-6.7
4	21.6283	-1.6497	-2	2.7222	3.3638	-2.7
5	21.9953	-1.8327	0	3.3588	3.3588	-7.7
6	21.9538	-1.8282	+0	3.3277	3.3673	+8
7	22.0000	-1.2780	+3	1.6325	3.3601	-6.9
8	22.8525	-0.4255	+3	0.1808	3.3684	+1.9

 $\bar{x} = 3.3665$

y	$y - y_0$	Δy	$(y - y_0)^2$	L
1 -19.9699	-1.8311	+11	3.3526	180°
2 19.9929	-1.8086	+11	3.2707	189
3 15.9871	-1.3139	+0	4.7283	229
4 16.0000	0.8010	+0	0.6416	299
5 16.8010	0.0000	0 0	0.0000	270
6 17.0000	+0.1990	+0	0.0396	276
7 18.1155	+1.3173	+1	1.7276	316
8 18.5865	+1.7855	-1	3.1876	397 167°

Approx. Center

$x = 22$ $y = 15.9871$
 18.1155
 3.36026
 $y_0 = 16.8013$
 $y_{\min} = 19.9699$
 $x = 1.8319$
 $x_{\min} = 21.9953$
 $x_0 = 23.2783$

Morris Center $\left\{ \begin{array}{l} x_0 = 23.2780 \\ y_0 = 16.8010 \end{array} \right.$

Formation of Normals.

1	0.0	0.0	+ 255.0
2	+ 0.51	+ 51.5	+ 332.5
3	+ 0.68	+ 85.5	+ 87.5
4	+ 1.32	+ 99.5	+ 21.5
5	+ 0.0	+ 141.0	0.0
6	- 0.36	- 14.3	+ 15
7	- 1.68	+ 82.0	- 89.0
8	- 0.75	- 8.0	+ 39.0
	+ 2.51	+ 404.5	+ 732.0
	- 2.79	- 22.5	- 89.0
	- 0.28	+ 382.0	+ 648.0

$$- 20.59 = - 10$$

$$- 11.46 = - 3$$

$$+ 11.46 = - 15$$

	- a	- b	0/Res
1	0.0	+ 3	- 10
2	+ 3	+ 3	- 7
3	+ 13	+ 4	+ 2
4	+ 16	+ 2	+ 3
5	+ 18	0	+ 3
6	+ 18	- 1	+ 2
7	+ 13	- 4	- 6
8	+ 9	- 3	- 16

$$- 0.28 + 13.99 = - 2.75 \Delta$$

$$+ [] - 0 = - 0.19 \Delta$$

$$+ 27^{\circ}$$

$$+ 13.99 = - 2.67 \Delta$$

$$+ 12.93 = - 8.56 + 0.5 = - 8.51$$

10228

Conditional Equations

D-C 16 new
0-C

1	0.0	-	1.83	=	-139	0	-86	=	-86	-53	-63
2	-0.28	-	1.81	=	-183	-9	-85	=	-94	-89	-96
3	-1.28	-	1.31	=	67	-39	-64	=	-103	+36	+38
4	-1.65	-	0.80	=	27	-50	-38	=	-88	+61	+69
5	-1.83		0.0	=	77	-56	0	=	-56	-21	-18
6	-1.82	+	0.20	=	8	-56	+9	=	-47	+55	+57
7	-1.28	+	1.31	=	67	-39	+64	=	+25	-89	-95
8	-0.72	+	1.79	=	19	-13	+84	=	+71	-52	-68

$$+12.93 - 0.28 = +382.0 - 8.56 \Delta \times 152 = 309$$

$$- 0.28 + 13.99 = +678.0 - 2.95 \Delta$$

Average 57

$$+ [] - .01 = + 8.3$$

$$= -0.19 \Delta$$

$$+ 13.93 = +656.3$$

$$b = +77.0$$

$$+12.93 = +382.0 + 13.2 = +395.2$$

$$a = +30.6$$

$$-0.66 \Delta$$

Arc measured 167°

$$\frac{p}{h} = .23$$

$$\frac{p}{h} = .19$$

$$Inr = 4 \quad R \quad 1.83$$

$$\frac{-19}{.23} = -82$$

$$\Delta R = -1.0$$

$$-2RC = -0.73$$

$$Err. +0.2$$

$$\Delta b = +0.19 \quad \Delta s = +0.1$$

$$\Delta R = -1.2$$

$$\Delta a = +0.98 \quad \Delta q = +0.02$$

10228

Conditional Equations

16

U-C

1	0.0	-	1.83	=	-139	0	-86	=	-86	-53
2	-0.28	-	1.81	=	-183	-9	-25	=	-99	-89
3	-1.28	-	1.31	=	-67	-39	-69	=	-103	+36
4	-1.65	-	0.80	=	-27	-50	-38	=	-88	+61
5	-1.83		0.0	=	-77	-56	0	=	-56	-21
6	-1.82	+	0.20	=	+8	-56	+9	=	-97	+55
7	-1.28	+	1.31	=	-69	-39	+69	=	+25	-89
8	-0.92	+	1.79	=	+19	-13	+84	=	+71	-52

$$+12.93 - 0.28 = +382.0$$

$$+15.2 = 309$$

$$- 0.28 + 13.99 = +678.0$$

Average 57

$$+ [] - 0.1 = + 8.3$$

$$+13.93 = +656.3$$

$$b = +97.0$$

$$+12.93 = +382.0 + 13.1 = +395.2$$

$$a = +30.6$$

Arc measured 167°

$$\frac{p}{q} = .23$$

$$\frac{24}{11} = 2.19$$

$$\frac{-19}{.23} = -82$$

$$\Delta P = -1.0$$

10228 Moon's Mean Position.

17

$$\begin{array}{r} \chi_0 \ 23.2780^{\circ} \\ + 15^{\circ} \\ \hline 23.2795^{\circ} \end{array}$$

$$\begin{array}{r} \gamma_0 \ 16.8010^{\circ} \\ + 23^{\circ} \\ \hline 16.8033^{\circ} \end{array}$$

From Plate Constants

$$\chi \ 24.5365^{\circ}$$

$$\gamma \ 16.8967^{\circ}$$

$$\xi \ +2.5365^{\circ}$$

$$\eta \ -1.1536^{\circ}$$

$$\log \xi \ 0.80923^{\circ}$$

$$\cos \xi \ 9.96062^{\circ}$$

$$8.50727^{\circ}$$

$$1.93637^{\circ}$$

$$\log \tan \delta \ 9.6793^{\circ}$$

$$\xi^2 \ 0.8085^{\circ}$$

$$\gamma \ 7.0537^{\circ}$$

$$7.5112^{\circ}$$

$$\alpha - A \quad + 86.37^{\circ}$$

$$\eta_1 \ +0.0032^{\circ}$$

$$A \ 3 \ 31 \ 18.00^{\circ}$$

$$\log h_0 \ 0.06326^{\circ}$$

$$7.33113^{\circ}$$

$$\gamma_0 \ 3 \ 32 \ 77.37^{\circ}$$

$$2.732114^{\circ}$$

$$\text{Red} \quad + 1.79^{\circ}$$

$$S-D \quad -8 \ 539.6^{\circ}$$

$$\alpha' \ 3 \ 32 \ 76.16^{\circ}$$

$$D \ 27 \ 11 \ 02.0^{\circ}$$

$$\delta_0 \ 27 \ 2 \ 02.4^{\circ}$$

$$\text{Red} \quad + 12.2^{\circ}$$

$$\delta' \ 27 \ 2 \ 17.6^{\circ}$$

10228 Moon's Mean Position.

17

$$\begin{array}{r} 10 \quad 23 \quad 2780^{\circ} \\ + 15^{\circ} \\ \hline 23 \quad 27 \quad 95^{\circ} \end{array}$$

$$\begin{array}{r} 40 \quad 16.8010^{\circ} \\ + 23^{\circ} \\ \hline 16.8033^{\circ} \end{array}$$

From Plate Constants

$$\chi \quad 29.5365^{\circ}$$

$$\gamma \quad 16.8969^{\circ}$$

$$\xi \quad +2.5365^{\circ}$$

$$\eta \quad -1.1536^{\circ}$$

$$\log \xi \quad 0.90923^{\circ}$$

$$\log \tan \delta \quad 9.6793^{\circ}$$

$$\cos \delta \quad 9.96062^{\circ}$$

$$\xi^2 \quad 0.8085^{\circ}$$

$$8.50729^{\circ}$$

$$7.0537^{\circ}$$

$$1.93637^{\circ}$$

$$7.5112^{\circ}$$

q-A

$$+86.37^{\circ}$$

$$\eta_1 + 0.0032^{\circ}$$

$$A \quad 3 \quad 31 \quad 18.00^{\circ}$$

$$\log h_0 \quad 0.06326^{\circ}$$

$$7.33113^{\circ}$$

$$4_0 \quad 3 \quad 32 \quad 77.37^{\circ}$$

$$2.73211^{\circ}$$

Red

$$+1.79^{\circ}$$

S-D

$$-8 \quad 59.6^{\circ}$$

$$q' \quad 3 \quad 32 \quad 76.16^{\circ}$$

$$D \quad 27 \quad 11 \quad 02.0^{\circ}$$

$$\delta_0 \quad 27 \quad 2 \quad 02.7^{\circ}$$

$$\text{Red} \quad +12.2^{\circ}$$

$$\delta' \quad 27 \quad 2 \quad 17.6^{\circ}$$

10228

Lunar Parallax

18

α' 3 32 46.16 ✓
 δ 6 33 53.15 ✓
 $\alpha' + 3$ 01 06.99 ✓
 $= +75$ 16 47.85 ✓
 $+15$ 39.74 ✓
 α 3 01 03.11 ✓
 9.95727 ✓
 0.00000 ✓
 0.13065 ✓
 0.10792 ✓

π 57 16.10 ✓

9.86913 ✓
 8.19825 ✓
 9.85159 ✓
 0.07067 ✓
 7.95961 ✓

$\alpha - \alpha'$ 31 19.78 ✓

$= +2$ 05.30 ✓

γ 52 2 48.6 ✓

δ 27 02 17.6 ✓

$\gamma - \delta$ 28 00 32.0 ✓

9.82670 ✓
 8.19825 ✓
 9.67177 ✓
 0.10320 ✓
 7.79959 ✓

$\delta - \delta'$ + 21 40.2 ✓

δ 27 23 57.8

α 3 37 51.76 ✓

Ephid 27 23 53.6 ✓

Ephid 3 37 50.70 ✓

W-C + 1.2 ✓

W-C + 0.76 ✓

Corr. of Plate + 0.8
 2nd Order Ref 0.0

- 0.03

In Corr + 0.1

+ 0.02

δ + 27 23 57.9

α 3 37 51.78

W-C + 1.3

+ 0.78

10228

Lunar Parallax

18

χ' 3 32 76.16"
 τ 6 33 53.15"
 $\tau - \chi' + 3$ 01 06.99"
 $= 195$ 16 99.85"
 $+15$ 39.79"
 93 01 05.11"
 9.95727 "
 0.000000 "
 0.13065 "
 0.10792 "

π 59 16.10"

9.86913 "
 8.19825 "
 985159 "
 0.04069 "
 795961 "

$\chi - \lambda'$ 31 19.28"

$=$ 2 05.30"

χ 32 2 78.6"

λ 29 02 19.6"

$\chi - \lambda$ 28 00 32.0"

9.82690 "
 8.19825 "
 9.67179 "
 0.10320 "
 7.79959 "

$\lambda - \lambda'$ 34 20.1"

λ 29 23 54.8"

$\text{Epoch } \lambda$ 29 23 53.6"

W-C +1.2"

Curve of Plate +0.8
 2nd Order Ref 0.0

χ 3 34 51.96"

$\text{Epoch } \chi$ 3 34 50.70"

W-C +0.96"

-0.03

1
12
2

2
26
8

3
30
28

1
72
13

2
21
19

3
20
13

10231

Star Measures.

21

	d	α	d	α
1	19.166	20392	18656	20074
138	10910	18678	11979	17268
237	12	50	71	56
	59	68	48	70
	<u>13.8249</u>	<u>13.8261</u>	<u>23.7475</u>	<u>23.7187</u>

2	20209	20048	19318	20023
261	19050	11209	15688	13636
83	50	09	78	30
	06	36	18	26
	<u>26.1159</u>	<u>26.1171</u>	<u>8.3635</u>	<u>8.3607</u>

3	20636	20668	19668	20242
307	13080	18208	17323	12550
222	76	12	25	50
	20	62	50	42
	<u>30.7570</u>	<u>30.7599</u>	<u>22.2392</u>	<u>22.2308</u>

Moon Measures.

1	20316	20372
72	15021	15680
136	27	62
	16	68
	<u>13.5292</u>	<u>13.5292</u>

2	20398	20262
21	18920	11736
19.1	30	26
	78	62
	<u>17.1453</u>	<u>17.1469</u>

3	19378	20120
20.7	13388	14109
15	86	10
	72	12
	<u>20.5988</u>	<u>20.5990</u>

1
1
2

2
26
8

2
30
22

1
22
13

2
21
9

3
0
3

10231

Star Measures

	d	h	d	h
L	19166	20392	18656	20074
138	10910	18648	11979	17268
237	12	50	71	56
	59	68	98	70
	<u>13.8249</u>	<u>13.8261</u>	<u>23.7475</u>	<u>23.7187</u>

2	20209	20098	19318	20023
261	19850	11209	15688	13636
83	50	09	78	30
	06	36	18	26
	<u>26.1159</u>	<u>26.1171</u>	<u>8.3635</u>	<u>8.3607</u>

3	20636	20668	19668	20242
30.7	13080	18208	17323	12550
22.2	76	12	25	50
	20	62	60	92
	<u>30.7570</u>	<u>30.7599</u>	<u>222392</u>	<u>22.2308</u>

Moon Measures

1	20316	20372
22	15021	15660
136	27	62
	16	68
	<u>135292</u>	<u>135292</u>

2	20374	20262
21	18920	11736
9.1	30	26
	78	62
	<u>19.1953</u>	<u>19.1969</u>

3	19378	20120
0.7	13388	10109
5-	86	10
	72	12
	<u>20.5988</u>	<u>20.5990</u>

Moon Measures.

22

<u>7</u>	19390	20101
20.6	13616	15869
15.2	20	67
	93	01
	<u>20,5779</u>	<u>20,5767</u>

<u>5</u>	19476	20050
20.8	12368	17100
16	66	00
	80	54
	<u>20,7075</u>	<u>20,7099</u>

19756	19936
19800	14870
98	36
46	40
<u>16,9952</u>	<u>16,9900</u>

19202	18797
18139	9802
43	48
96	89
<u>17,4061</u>	<u>17,1021</u>

19168	19800
17672	11277
66	77
69	12
<u>17,1989</u>	<u>17,1967</u>

6
21
16.5

7
22
17.1

8
22.5
17.2
+7

2
12

2
2
1

6
2
1

2
2
1

8
2
1

Known Measures

22

<u>2</u>	19390	20101
20.6	13616	15869
15.2	20	67
	93	01
	<u>205779</u>	<u>205767</u>

<u>2</u>	19996	20050
20.8	12368	17100
16	66	00
	80	59
	<u>207075</u>	<u>207099</u>

<u>6</u>	19756	19936
21	19800	19890
16.5	98	36
	86	90
	<u>169952</u>	<u>169900</u>

<u>2</u>	19202	18797
22	19139	9802
17.1	93	18
	96	89
	<u>174061</u>	<u>171021</u>

<u>8</u>	19168	19800
22.5	17672	11279
17.2	66	79
+7	69	72
	<u>171989</u>	<u>171967</u>

10231

Times etc.

23

Jan 17-16

Exp. to Stars	7	07		7	16	
" " Moon	7	09	70.3 ✓	7	09	70.8 ✓
Clock fast		6	17.0 ✓			
	7	03	23.55 ✓			$\theta - \alpha = -24 \quad 3''$
H. Sid. J.						
H. Long	7	47	31.05 ✓			
q. Sid. J.	8	47	54.60 ✓			
Sid. J. M.M.	19	72	21.12 ✓			
Interval	13	05	33.78 ✓			
Reduction		2	08.69 ✓			
q. M. J.	13	03	27.79 ✓			

from Mant Alm		R. a.		Dec.	
Moon 13 ^h	6	06	20.70 + 26	35	51.9 ✓
Motion w/ ^m			2.2013 ✓		-2.516 ✓
" " 3.7132 ✓			7.57 ✓		-8.60 ✓
Tabular Place	6	06	28.21 ✓ + 26	35	73.3 ✓

Moon's Age	13 days	
Parallax	54'	1.97 ✓
Semi.	14'	75.0 ✓
R		885.0 ✓
Aug		12.3 ✓
Err 2		-0.1 ✓
R		897.2 ✓
R		1.9232 ✓
alt		-920 ✓
(1+2)R		1.8312 ✓
R		3.3533 ✓

937 13.65 ✓

9-502.5 ✓

+27 ✓

-478.5 ✓

10 231

Hermes etc

23

Jan 17-16

Exp. to Stars	7	09		9	16	
" Motor	9	09	9.0.3"	9	09	9.0.8"
Clock fast		6	17.0"			
	7	03	23.55"	8-1	-2"	3"
H. Sid. J.						
H. Long	9	99	31.05"			
9. Sid. J.	8	97	59.60"			
Sid. J. M.H.	19	72	21.12"			
Internal	13	05	33.98"			
Reduction		2	08.69"			
9 M. J	13	03	29.79"			

9. from Mount Alim		R. A.		Dec.	
Moore 13"	6	06	20.70 + 26	35	51.9
Motion w/ m			2.2013"		-8.912
" 3.9132"			7.51"		-8.60"
Internal at Place	6	06	28.21" + 26	35	93.3"

Moore's Age 13 days

Parallax	59'	1.99"
Sum	19'	95.0"
R		883.0"
Ang		12.3"
Err		-0.1"
R		897.2"
R		1923.2"
alt		-920"
11 + 9 R		1,831.2"
R		3,353.3"

939 12.65"

9 = 502.5"

+ 2.7

- 4785"

10231	Plate	Center	Constants	29
x	y	x	y	
13.8255	23.7181	602	42.97	27.26 29.5
26.1165	8.3621	610	13.52	25.21 35.3
30.7557	22.2325	613	05.00	27.19 38.9
370.6977	59.3127	25	60.99	79.61 103.2
23.5659	18.1072	68	40.33	26.70 59.7
22	18		-48.55	-48.5
-1.566	-0.109	67	51.78	26.70 05.9
315	766.5			
-48.55				

Plate Center $\left\{ \begin{array}{l} A \ 6 \ 07 \ 52 \\ D \ +26 \ 70 \ 06 \end{array} \right.$

$$\begin{array}{rcll}
 x - z_1 + 500x & -26.34 & +2.5x & -12935 \\
 +66.11 + 6913 = +13524 - 624 = +12900 - 33 = +12935 & 0 \\
 +32 + 13058 = +13090 - 220 = +12870 + 65 = +12935 & 0 \\
 1935 + 15378 = +13773 - 585 = +12858 + 77 = +12935 & 0 \\
 22.7053 + 11203 = -403 & +56 & 22.1974
 \end{array}$$

$$\begin{array}{rcll}
 y - y_1 + 500y & +21.8x & +9.34 & -9319 \\
 -2998 + 11859 = +8911 + 301 = +9212 + 102 = +9319 & 0 \\
 +4528 + 4181 = +8709 + 569 = +9278 + 36 = 314 & 0 \\
 -2567 + 11116 = +8599 + 670 = +9219 + 95 = 314 & 0 \\
 15.3177 + 7657 = +488 & +66 & 15.2044
 \end{array}$$

Tables $a = +1.9$ $e = +1.4$ $a - e = 0$ $+b+d = +1$
 Obs $= -502.5$ $= -507.3$ $= +1.8$ $= +4.5$
 O - C -502.9 -504.7 $+3.5$

10231	Plate	Center	Constants	29
λ	γ	x	y	
13.8255	23.7181	602	92.97	27.26 29.5
26.1165	8.3621	610	13.52	25.21 35.3
30.7557	22.2325	613	05.00	27.19 38.9
3) 70.6977	59.3127	25	60.99	79.61 103.2
23.5659	18.1072	68	90.33	26.90 59.7
22	18		-78.35	-78.3
-1.566	-0.109	67	31.78	26.90 05.9
31.5	746.5			
-78.55				

Plate Center { A 6 07 52
D +26 90 06

$$\begin{aligned}
 x - \gamma + 500\lambda & \quad -26.37 \quad +2.5\lambda \quad -1293 \\
 +6611 + 6913 & = +13524 - 629 = +12900 + 33 = +12933 \quad 6 \\
 +32 + 13058 & = +13090 - 220 = +12870 + 63 = +12933 \quad 0 \\
 1935 + 13378 & = +13573 - 383 = +12898 + 77 = +12975 \quad 6 \\
 229053 + 11203 & \quad -903 \quad +56 \quad 22.1974
 \end{aligned}$$

$$\begin{aligned}
 \gamma - \eta + 500\lambda & \quad +21.8\lambda \quad +9.1\lambda \quad -9319 \\
 -2998 + 11859 & = +8911 + 301 = +9212 + 142 = +9319 \quad 6 \\
 +9528 + 9181 & = +8709 + 569 = +9278 + 36 = +9314 \quad 0 \\
 -2567 + 11116 & = +8599 + 670 = +9269 + 95 = +9364 \quad 0 \\
 153197 + 7657 & \quad +988 \quad +66 \quad 15.3049
 \end{aligned}$$

$$\begin{aligned}
 \text{Tables } a - \gamma & \quad e - \eta \quad a - e = 0 \quad +b+d = +1 \\
 \text{Obs } & = -502.5 = -509.3 = +1.8 = +9.5
 \end{aligned}$$

	ξ	η	$\Delta\xi$	-2.73	0
1	-8.83	+5.97	-24	+24	= 0
2	+7.11	-10.10	+12	-11	= +1
3	+8.95	+9.77	+22	-24	= -2
M	+0.20	-2.80	0	-1	= <u>-1</u>

	$\Delta\eta$	-34	
	+17	-17	= 0
	-30	+30	= 0
	+12	-13	= -1
	0	+8	= <u>+8</u>

10231

Standard Coordinates

25

Cape Nr 879 Mg 8.2

Cape Nr 896 - Mg 7.6

Cape Nr 903 - Mg 6.7

C	6 01	42.19	6 09	14.24	6 12	04.82
I		42.27		14.26		4.89
E		42.17		14.23		4.82
Mean	6 01	42.21	6 09	14.24	6 12	04.84
Prec	1	0.26		+59.28		60.16
α	6 02	42.47	6 10	13.52	6 13	03.00
λ	6 07	52	6 07	52	6 07	52
$\alpha - \lambda$	- 5	09.53	+ 2	21.52	+ 5	13.00
$\sin(\lambda - \alpha)$	- 3	09.50	+ 1	41.52	+ 3	12.97
$\log u$	2.99	0.66 n	2.15	0.82	2.79	5.50
$\log v$	9.97	8.22	9.95	6.00	9.97	8.94
$\log w$	0.97	6.12 n	0.61	4.06	0.95	1.68
$\log z$	-8.8	3.32	+4.1	1.21	8.97	7.0
$\log t$		+2.4		+1.2		+2.2
$\log s$	13	1.644	26	1.133	30	9.492
$\log x$	13	8.255	26	1.165	30	7.557
$X - \bar{x}$	+ 6	6.19	+ 3	2	- 1	9.35

C	+ 27 26	33.2	+ 25 21	48.7	+ 27 17	56.4
I		32.7		49.3		56.0
E		31.8		49.0		55.6
Mean	+ 27 26	32.6	25 21	48.9	27 17	56.0
Prec		- 3.1		- 13.6		- 17.6
δ	+ 27 26	29.5	25 21	35.3	27 17	38.4
D	26 40	06.	26 40	06.	26 40	06.
$\delta - D$	+ 8 6	23.5	- 1 18	30.7	+ 37	32.4
$\tan(\delta - D)$	+ 27	83.7	+ 77	11.5	+ 20	72.5
$\log u$	3.44	4.62	3.67	3.16 n	3.31	6.79
$\log v$	0.77	5.77	1.00	4.31 n	0.64	7.64
$\log w$	9.7	1.54	9.67	5.7	9.71	1.17
$\log x$	1.8	9.22	1.2	2.81	1.9	0.34
$\log y$	8.6	6.10	7.9	5.72	8.6	6.85
$\log z$	+ 5.9	6.71	- 10.0	9.98	+ 4.4	4.26
$\log t$	+ 0.0	8.58	+ 0.0	0.91	+ 0.0	8.66
$\log s$	24.0	1.29	7.9	0.93	22.4	8.92
$\log x$	2.3	7.181	8.3	6.21	22.2	3.25
$\log y$	- 2.9	4.8	+ 4.5	2.8	- 2.5	6.7

10231

Standard Coordinates

Cape Hu-87³ Mag 8.2 Cape Hu-896 - Mag 7.6 Cape Hu 903 - Mag 6;

α	6 01	92.19	6 09	19.29	6 12	09.82
δ		92.27		19.26		9.89
C		92.17		19.23		9.82
Mean	6 01	92.21	6 09	19.29	6 12	09.89
Proa	1	0.26		1.59.28		60.16
X	6 02	92.97	6 10	13.52	6 13	03.00
A	6 07	52	6 07	52	6 07	52
$\alpha-A$	- 5	07.53	+ 2	21.52	+ 5	13.00
$\sin(AA)$	- 3	09.50	+ 1	91.52	+ 3	12.97
$\log$	2.99	0.66 n	2.10	0.82	2.99	3.50
$\cos$	9.99	8.22	9.99	5.600	9.99	8.99
$\sin$	0.99	6.12 n	0.6	19.06	0.99	1.68
$\log$	- 8.8	3.32	9.1	1.21	8.99	7.0
δ		2.9		+12		+2.2
α	13	16.99	26	11.33	30	9.992
δ	13	82.55	26	11.65	30	75.57
$\alpha-\delta$	+ 6	6.19		+ 3.2		- 1.935
C	+ 27	26.33.2	+ 25	21.98.9	+ 27	19.56.9
L		32.7		99.3		5.6.0
C		31.8		99.0		53.6
Mean	+ 27	26.32.6	25	21.98.9	27	19.56.0
Proa		- 3.1		- 1.3.6		- 17.6
δ	+ 27	26.29.5	25	21.33.3	27	19.38.9
D	26	90.06.	26	90.06.	26	90.06.
$\delta-D$	+ 7	6.23.5	- 1	18.30.7	+ 3	9.32.7
$\sin(\delta-D)$	+ 2	7.83.7		+ 9.711.5		+ 20.72.5
$\log$	3.99	9.62	3.67	3.16 n	3.31	6.8.9
$\log$	0.77	5.77	0.00	9.31 n	0.6	1.76.9
$\log$	9.7	1.59	9.6	7.57	9.7	1.17
δ	1.8	9.22	1.2	2.81	1.9	0.38
$\log$	8.6	6.10	7.9	5.72	8.6	6.85
$\log$	+ 5.9	6.71	- 10.0	9.98	+ 7.9	7.26
$\log$	+ 0.0	8.58	+ 0.0	0.91	+ 0.0	9.66
$\log$	2.9	0.12.9	7.9	0.93	2.2	9.49.2
$\log$	2.3	7.18.1	8.3	6.21	2.2	2.32.5
$\log$	- 2.9	9.8	+ 9.5	2.8		- 2.56.7

A - - 1

B - - 2



10231

Moon's Center.

26

	x	$x-x_0$	Δx	$(x-x_0)^2$	$(x-x_0)+(y-y_0)^2$	$0-c$
1	22,0000	-0,4080	+2	0,1663	3,3617	+81
2	21,0000	-1,4080	+1	1,9819	3,3527	-9
3	20,5989	-1,8091	+0	3,2729	3,3734	+201
4	20,5770	-1,8310	0	3,3526	3,3526	-7
5	20,7062	-1,7018	-1	2,8965	3,3629	+96
6	21,0000	-1,4080	-1	1,9828	3,3644	+111
7	22,0000	-0,4080	-2	0,1667	3,3594	+61
8	22,4080	0,0000	-2	0,0000	3,3496	-37

$$R^2 = 3,3533$$

	y	$y-y_0$	Δy	$(y-y_0)^2$	L
1	13,5292	+1,7878	+3	3,1951	198 ✓
2	14,1961	-1,1709	+2	1,3705	230 ✓
3	15,0000	-0,3170	+1	0,1005	260 ✓
4	15,3170	0,0000	0	0,0000	270 ✓
5	16,0000	+0,6830	-1	0,4664	292 ✓
6	16,4926	+1,1756	-2	1,3816	310 ✓
7	17,1091	+1,7871	-3	3,1927	347 ✓
8	+17,1776	+1,8306	-4	3,3496	0 ✓ 1670

Approx. Center

 $x \approx 22$ $y \approx 13,5292$ $17,1091$ $30,6333$ $y_0 \approx 15,3166$ $y_{max} \approx 17,1476$ $R \approx 1,8310$ $x_{min} \approx 20,5770$ $x_0 \approx 22,4080$ $x \approx 21$ $y \approx 14,1961$ $16,4926$ $30,6387$ $15,3193$

Moon's Center

$$\begin{cases} x_0 & 22,4080 \\ y_0 & 15,3170 \end{cases}$$

1
2
3
4
5
6
7
8

1
2
3
4
5
6
7
8

231

Moon's center.

26

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	22.0000	-0.9080	+1	0.1663	3.2617	+81
2	21.0000	-1.9080	+1	1.9819	3.3527	-9
3	20.5989	-1.8091	+0	3.2727	3.3739	+201
4	20.5770	-1.8310	0	3.3526	3.3526	-7
5	20.7062	-1.7018	-1	2.8965	3.3629	+96
6	21.0000	-1.4080	-1	1.9828	3.2677	+111
7	22.0000	-0.4080	-2	0.1667	3.3579	+61
8	22.7080	0.0000	-2	0.0000	3.3996	-37

 $R = 3.3533$

	y	$y - y_0$	Δy	$(y - y_0)^2$	L
1	13.2292	-1.7878	+3	3.1951	193
2	14.1961	-1.1709	+2	1.3705	230
3	15.0000	-0.3170	+1	0.1005	260
4	15.3170	0.0000	0	0.0000	270
5	16.0000	+0.6830	-1	0.9669	292
6	16.9926	+1.1756	-2	1.3816	310
7	17.1091	+1.7871	-3	3.1927	397
8	+17.1776	+1.8306	-7	3.3796	0

1670

Approx center

 $x = 22$ $y = 13.2292$

17.1091

30.6333

 $y_0 = 15.3166$ $y_{max} = 17.1976$ $R = 1.8310$ $x_{min} = 20.5770$ $x_0 = 22.7080$ $x = 21$ $y = 14.1961$

16.9926

30.6387

15.3193

Moon's center

$$\begin{cases} x_0 = 22.7080 \\ y_0 = 15.3170 \end{cases}$$

Formation of Normals.

1 + 0.73	- 330	- 1450
2 + 1.65	+ 12.5	+ 10.5
3 + 0.58	- 369.0	- 67.5
4 0.0	+ 130	+ 0.0
5 - 1.16	- 163.0	- 65.0
6 - 1.66	- 156.5	- 131.0
7 - 0.73	- 25.0	- 109.0
8 = 0.0	+ 0.0	- 67.5
+ 2.96	+ 25.5	+ 10.5
- 3.55	- 741.5	- 582.0
- 0.59	- 716.0	- 571.5

	+28.	aa	aa	b	+44-	c	c
- 20 Δ a	+ 8	- 11	- 1	+ 11	+ 5.9	+ 44	
- " " b	- 6	- 39	- 8	+ 7	+ 47	+ 12	
+ " " c	+ 8.9	- 51	- 5	+ 2	+ 91	- 5	
		- 51	- 5	0	+ 39	- 7	
		- 48	- 5	- 8	+ 35	- 8	
		- 39	- 8	- 7	+ 33	- 2	
		- 11	- 1	- 11	+ 32	+ 22	
		- 0	- 0	- 11	+ 33	+ 33	

new o-c

+ 20
- 127
+ 84
- 112
+ 27
+ 88
+ 144
+ 81

$$- 0.59 + 13.05 = + 2.20$$

$$+ [] - 0.03 = - .38$$

$$+ 13.02 = + 1.82$$

$$+ 13.81 = - 8.98 + .08 = - 8.90$$

10231

Conditional Equations

27 new
0-0

1 -	0.41	- 1.79	= +81	)	+ 22	+ 83	= +105	- 27	+30
2 -	1.41	- 1.17	= - 9		+ 76	+ 54	= +130	- 139	- 92
3 -	1.81	- 0.32	= +201		+ 97	+ 15	= +112	+ 89	+30
4 -	1.83	0.00	= - 7		+ 98	00	= + 98	- 105	- 66
5 -	1.70	+ 0.68	= +96		+ 92	- 31	= +61	+ 35	+70
6 -	1.41	+ 1.18	= +111		+ 76	- 55	= +21	+ 90	+123
7 -	0.41	+ 1.79	= +61		+ 22	- 83	= - 61	+132	+159
8 0	0.00	+ 1.83	= - 37		0	- 85	= - 85	+ 78	+81
					+ 387 - 268				

$$\begin{aligned}
 13.81 - 0.59 &= -716.0 - 8.98 \\
 -0.59 + 13.05 &= -571.5 + 2.20 \\
 + [] - 1.03 &= -30.6 \\
 + 13.02 &= -602.1
 \end{aligned}$$

$$+ 0.17 \Delta$$

$$b = -46.3$$

$$13.81 = -27 - 716 = -743$$

$$a = -53.8$$

$$-0.69 \Delta$$

Arc Measured 167°

$$\frac{P}{h} = .23$$

$$\frac{z}{h} = +14$$

$$\text{Pr 2} \quad R \quad 1.83$$

$$\frac{+14}{.23} = +61$$

$$\Delta P = +0.8$$

$$-2PC = +2.20$$

$$-0.6$$

$$\Delta C = +0''.31$$

$$\Delta \delta = +0''.2$$

$$\Delta \mu = +1.7$$

$$\Delta \eta = -1.41^s$$

$$\Delta \eta = -0''.05$$

10231

Conditional

Equations

27

C.C.

1 -	0.91	-1.79	+81	}	+22	+83	-1105	+7
2 -	1.91	-1.17	-9		+76	+54	+130	+189
3 -	1.81	-0.32	+201		+97	+15	+112	+89
4 -	1.82	0.00	-7		+98	00	+98	-103
5 -	1.70	+0.68	+96		+92	-31	+61	+33
6 -	1.91	+1.18	+111		+76	-55	+21	+90
7 -	0.91	+1.79	+61		+22	-83	-61	+122
8 0	0.00	+1.83	-37		0	-83	-83	+78
					+389 - 268			

$$\begin{aligned}
 13.81 - 0.59 &= -716.0 \\
 -0.59 + 13.05 &= -271.5 \\
 + [] - 1.03 &= -30.6 \\
 + 13.02 &= -602.1
 \end{aligned}$$

$$b = -46.3$$

$$13.81 = -27 - 716 = -743$$

$$a = -53.8$$

Are measured 167°

$$\frac{R}{h} = .23$$

$$\frac{\Sigma V}{h} = +19$$

$$\frac{+19}{.23} = +61 \quad \Delta R = +0.8$$

10231 Moon's Mean Position.

28

$$X_0 \quad 22.4080^{\circ}$$

$$Y_0 \quad 15.3170^{\circ}$$

$$-27^{\circ}$$

$$-23^{\circ}$$

$$22.4053^{\circ}$$

$$15.3147^{\circ}$$

From Plate constants.

$$X \quad 22.1977^{\circ}$$

$$Y \quad 15.2077^{\circ}$$

$$\xi \quad +.1977^{\circ}$$

$$\eta \quad -2.7956^{\circ}$$

$$\log Z_0 \quad 9.29535^{\circ}$$

$$\log \tan \delta \quad 9.6996^{\circ}$$

$$\log \delta \quad 9.95252^{\circ}$$

$$Z^{\circ} \quad 8.5907^{\circ}$$

$$8.50727^{\circ}$$

$$7.0537^{\circ}$$

$$0.83559^{\circ}$$

$$5.3387$$

$$\delta - A \quad +6.85^{\circ}$$

$$\eta_1 \quad .0000^{\circ}$$

$$A \quad 6 \quad 07 \quad 52.0^{\circ}$$

$$\log H_0 \quad 0.99698^{\circ}$$

$$\alpha_0 \quad 6 \quad 07 \quad 58.65^{\circ}$$

$$\rightarrow 7.33115^{\circ}$$

$$3.11533^{\circ}$$

$$Red \quad +2.62^{\circ}$$

$$S-D \quad -21 \quad 47.2$$

$$\alpha_1 \quad 6 \quad 08 \quad 01.77^{\circ}$$

$$D \quad +26 \quad 40 \quad 06^{\circ}$$

$$S_0 \quad +26 \quad 18 \quad 218^{\circ}$$

$$Red \quad +5.3^{\circ}$$

$$S_1 \quad 26 \quad 18 \quad 271^{\circ}$$

10231 *Micromis* Mean Position.

28

λ_0 22,9080" μ_0 13,317.0"
 -27" -23"
 22,9053" 13,3177"

7 row Plate constants.

 x 22,1977" y 13,2097" ζ +1979" n -27956" $\log \zeta$ 9.29535" $\log \tan \delta$ 9.6996" $\log \delta$ 9.95252" ζ 8.5907"

8.50729"

7.0339"

0.83559"

5.3387

 $\delta - A$ +4.88" n_1 0.000 A 6 07 32.0" $\log h_0$ 0.99698" γ_0 6 07 38.65"

-7.33115"

3.11533"

 Red +2.62" δD -21 99.2 δ_1 6 08 01.77" D +26 40 06" δ_0 +26 18 21.8" Red +5.3" δ_1 26 18 27.1"

10231

Lunar

Parallax

29

α' 6 08 01.87 ✓
 δ 7 03 23.55 ✓
 $\delta - \alpha' - 2$ 07 37.92 ✓
 $= -36$ 9 28.86 ✓
 -11 33.89 ✓
 -30 57 57.91 ✓

$\cos \delta$ 000000 ✓
 9.95727 ✓
 0.06677 ✓
 0.02407 ✓

δ 46° 35' 07.8 ✓
 δ 26 18 27.1 ✓
 $\delta - \alpha$ 20 16 37.7 ✓

9.82690 ✓
 8.19636 ✓
 9.53978 ✓
 0.13883 ✓
 7.70137 ✓

$\delta - \alpha'$ 17 17.0 ✓

δ 26 35 44.1 ✓

$\phi \delta$ 26 35 43.3 ✓

$\phi - \epsilon$ +0.8 ✓

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

Irr Corr +0.2

δ +26 35 44.3

$\phi - \epsilon$ +1.0

π 59' 1.97 ✓

9.86913 ✓

8.19636 ✓

9.71383 ✓

0.04857 ✓

7.82789 ✓

$\delta - \alpha' - 23$ 07.77 ✓

$= -1'$ 32.52 ✓

α 6 06 28.95 ✓

$\epsilon \phi \alpha$ 6 06 28.21 ✓

$\phi - \epsilon$ +0.77 ✓

0.00

-0.05

α 6 06 28.90

+0.69

10231

Lunar

Parallax

29

$\alpha' \quad 6 \quad 08 \quad 01.97 \checkmark$
 $\delta \quad 9 \quad 03 \quad 23.55 \checkmark$
 $\delta - \alpha' - 2 \quad 09 \quad 37.92 \checkmark$
 $= -34 \quad 9 \quad 28.80 \checkmark$
 $\quad \quad -11 \quad 33.89 \checkmark$
 $-30 \quad 57 \quad 57.91 \checkmark$

$\cos \frac{1}{2} \quad 000000 \checkmark$

$4.95727 \checkmark$

$0.06677 \checkmark$

$0.02807 \checkmark$

$\delta \quad 46 \quad 35 \quad 09.8 \checkmark$

$\delta \quad 26 \quad 18 \quad 27.1 \checkmark$

$\delta - \alpha \quad 20 \quad 16 \quad 37.7 \checkmark$

$9.82690 \checkmark$

$8.19636 \checkmark$

$9.53978 \checkmark$

$0.13883 \checkmark$

$7.70137 \checkmark$

$\delta - \alpha' \quad 17 \quad 17.0 \checkmark$

$\delta \quad 26 \quad 33 \quad 99.1 \checkmark$

$\text{Eph} \delta \quad 26 \quad 35 \quad 93.3 \checkmark$

$\text{O-C} \quad +0.8 \checkmark$

Corr of Plate +0.9
 2nd Ord. Ref 0.0

$\pi \quad 59 \quad 1.99 \checkmark$

$9.86913 \checkmark$

$8.19636 \checkmark$

$9.71383 \checkmark$

$0.09857 \checkmark$

$7.82789 \checkmark$

$\delta - \alpha' - 23 \quad 07.77 \checkmark$

$= -1 \quad 13.21.52 \checkmark$

$\alpha \quad 6 \quad 06 \quad 28.95 \checkmark$

$\text{Eph} \alpha \quad 6 \quad 06 \quad 28.21 \checkmark$

$\text{O-C} \quad +0.77 \checkmark$

0.00

