

KG

11366

m1022

CLXX

170



11932

11997

11998

11532

Star Measures

	d	α	d	α	
1	20820		19942		19462
21.1	19848	14028	11650		17401
9.8	420	20	48		00
	98	12604	26		42
	<u>21.1403</u>	<u>21.1420</u>	<u>4.8278</u>		<u>4.8272</u>
2	20756	20259	20192		18978
22.4	16912	19111	12204		16870
20.8	02	15	08		78
	61	58	40		70
	<u>22.3850</u>	<u>22.3854</u>	<u>20.7934</u>		<u>20.7898</u>
3	20180	20750	20124		20301
26.9	11400	19540	15744		19626
11.6	04	30	44		26
	79	50	06		290
	<u>26.8777</u>	<u>26.8785</u>	<u>11.9361</u>		<u>11.4331</u>

Moon Measures

23.1		20292	20039
19.6		13460	17159
- 04		61	61
		88	39
		<u>14.7129</u>	<u>14.7121</u>
2		19251	20048
24		10478	18876
19.9		84	36
		59	82
		<u>14.8808</u>	<u>14.8797</u>
3	19962	20088	
24.1	17780	12310	
11.5	32	00	
	68	98	
	<u>24.2232</u>	<u>24.2210</u>	

Good Plates

11532

Star Measure

	d	1	d	3	1
1	20728		19992		19162
21.1	19848		11650		17901
9.8	920		48		00
	98		26		42
	<u>21.1903</u>		<u>9.8278</u>		<u>4.8272</u>
2	20756		20192		18978
12.4	16912		13209		16870
20.8	02		08		78
	61		90		70
	<u>22.3850</u>		<u>20.7939</u>		<u>20.7898</u>
3	20180		201028		20301
26.9	11900		13799		19626
11.6	04		49		26
	79		06		290
	<u>26.8777</u>		<u>11.9361</u>		<u>11.9331</u>

Moon Measure

23.1		20292	20039
17.6		13460	17159
-4		61	61
		88	39
		<u>19.7129</u>	<u>19.7121</u>
2		19251	20098
2.4		10988	18896
119.9		89	36
		59	92
		<u>19.8808</u>	<u>19.8797</u>
3	19962	20088	
24.1	17780	12310	
11.57	32	00	
	68	98	
	<u>24.2232</u>	<u>24.2210</u>	

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Moon Measures

2

<u>7</u>	20380	18082	20172
24.9	10548	17882	10362
16	52	78	59
	88	86	78
	<u>24.9890</u>	<u>24.9898</u>	<u>24.9820</u>

<u>5</u>	13881	13246
25.1	13288	13898
16.5	02	92
+X	<u>25.0676</u>	<u>25.0649</u>

<u>6</u>	13909	13252
25.1	822	13300
17	24	00
	<u>25.0086</u>	<u>25.0068</u>

<u>7</u>	20366	20340
24.3	16882	13851
18	68	49
	70	44
	<u>24.3507</u>	<u>24.3507</u>

<u>8</u>	19977
24	17860
18.2	50
	84
	<u>18.2129</u>

29986
12098
100
84
<u>18.2119</u>

1193 2

Moon Measures

2

<u>4</u>	20380	18082	20172
24.9	10588	17888	10362
16	52	78	59
	88	86	78
	<u>24.9890</u>	<u>24.9798</u>	<u>24.9820</u>

<u>5</u>	13881	13246
25.1	13808	13898
16.5	02	92
+X	<u>25.0676</u>	<u>25.0649</u>

<u>6</u>	13909	13232
25.1	822	13300
17	29	00
	<u>25.0086</u>	<u>25.0068</u>

<u>7</u>	20366	20340
24.3	16882	13851
18	68	49
	70	49
	<u>24.3507</u>	<u>24.3507</u>

<u>8</u>	19977	
24	17860	
18.2	50	→
	89	
	<u>18.2129</u>	

19986
12095
100
89
<u>18.2119</u>

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Times Etc.

5

6

Dec 12 1916 ✓

Exp. to the Stars	8	55			9	07	
..... Moon	9	01	07.9		9	01	08.1 ✓
clock fast		12	06.6	✓			
	8	49	01.8	✓			
H. Sid. Time							
H. Long	4	44	31.05	✓	4-4	2	+0 ^m 30 ^m ✓
g. Sid. T.	13	33	32.45	✓			
Sid. T. M. Norm	17	23	29.76	✓			
Interval	20	10	07.99	✓			
Reduction		3	18.25	✓			
G. M. T.	20	6	49.74	✓			

From Mount Allen.

R. a

Dec.

Moon - 20 ^h	8	19	14.35	✓	+18	29	31.1	✓
Motion 1 ^m			1975-1				-9.272	✓
..... 6.8290			13.49	✓		1	3.3	✓
Tabular Place	8	19	27.84	✓	18	23	27.8	✓

Moon's Age 18 days

Pallax	59	05.19	✓
Semid	14	45.9	✓
R	88	5.9	✓
ang		12.8	✓
Art (5)		-0.8	
K	89	7.9	✓
R	19	27.8	✓
alt		-9.25	✓
1+9/K		1.8323	✓
R-		3.3573	✓

934 19.22 ✓

$$a = -509.4$$

$$\frac{128}{-480.4}$$

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James Etc.

63

Dec 12 1916

Exp. to the stars	8	55			9	07	
... Moon	9	01	07.9		1	01	08.1
clock fast		12	06.6				
	8	99	01.9				
H. Sid time							
H. Long	9	44	31.05		+ - 4	30	30
g sid J.	13	33	32.95				
sid J. M. Moon	17	23	29.76				
Interval	20	10	07.99				
Reduction		3	18.25				
g M J.	20	6	59.79				

From Mount Allen		R ^a		Rec.		
Moon - 20 ^h	8	19	19.35	+18	29	31.1
Motion in 1 ^m			1975.1			7.272
... 6.829.0			13.49		1	3.3
Tabular Place	8	19	27.84	18	23	27.8

Moon's Age 18 days

Parallax	59	05.19	✓
Semid	19	95.9	✓
R	88	5.9	✓
ang.		12.8	✓
2.0 (1.5)		-0.8	
R	89	7.9	✓
R	19	29.8	✓
app.		-9.25	✓
174/R	1,8	323	✓
R	3	3573	✓

939 19.22

$$a = -509.9$$

$$\begin{array}{r} 129 \\ -480.9 \end{array}$$

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Plato Center and Constants

8

x	y	z	δ	τ
21.1911	4.8260			
22.3852	20.7918	8 18	33.7	+18 36 9.18
26.8781	11.8376			

22	18	-11.9	-21.72.3
- 3852	-2.7916	8 18 21.5	+18 14 27.5
312	266.5		

Center { A 8 18 20
 D +18 18 30
 +79.09 +9.91 -126.11

X-3 +500X + 79.09

+1590 + 10571 = +12161 + 357 = +12518 + 93 = +12611 0
- 222 + 11193 = 10971 + 1572 = 12543 + 48 = 12611 0
-1793 + 13439 = 11646 + 896 = 12542 + 118 = 12610 -1
23.2370 + 11617 ✓ +1224 ✓ +102 ✓ 23.2672 ✓

Y-4 +500Y - 71X +3.64 - 8935

+8005 + 2913 = +10918 - 1500 = +8918 + 17 = + 8935
+ 53 + 10396 = 10449 - 1589 = +8860 + 76 = + 8935
+3086 + 5717 = 10803 - 1909 = +8894 - 91 = + 8935
16.5757 + 8273 ✓ - 1650 ✓ +59 ✓ 16.3201 ✓

Tables a = -.6 e = -.6 a-c = 0 b+d = -1
 Obs = -507.4 = -503.6 = -.8 = -3.
 10-c = -503.8 -503.0 = -2.0

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Plate Center and Constants

7

x y
 21.19 11 9.8260
 22.38 52 20.7918
 26.87 81 11.9396

8 18 33.9 + 18 36 9.8

22 18
 - 3852 - 27916
312 76615

- 11.9 - 21.92.3
 8 18 21.5 + 18 19 27.5

X-3 +500X

Center { A 8 18 20
 { D +18 19 30
 79.09 +9.91 -1261.
 + 357 = +12518 + 95 +12611
 + 1592 = 12513 + 98 = 12611
 + 896 = 12992 + 118 = 12610
 + 1229 + 102 23.2672

23.2390 + 11619

Y-4 +500Y

71.1 +3.64 - 893.
 - 1500 = +8918 + 17 = + 8935
 - 1589 = +8860 + 75 = + 8935
 - 1909 = +8899 + 91 = + 8935
 - 1650 +59 16.320

16.5959 + 8273

Tables $a = -.6$ $e = -.6$ $a \cdot e = 0$ $b+d = -1$
 Obs $= -507.4$ $= -503.6$ $= -.8$ $= -3.$

Cum Err

3	4	Δ 7	-2.3 7	-14	+2
-1.02	-13.97	-5	+2	-3	+1 = -2
+0.71	+2.79	0	-1	-1	-0 = -1
+5.06	-7.08	+9	-12	-3	+1 = -2
M +1.28	-1.68	0	-3	0	-1 = 0

Δ 4	-3.94	-435	+11
-63	+47	-16	+4 = -12
+0	-9	-9	-2 = -11
-13	+29	+11	-22 = -11
0	+6	-6	= +11
			= +0.5

11932	Standard	Coordinates	1903.5	1900	5
Cape No. 1169-Mg 6.8	Cape No. 1170-Mg 5.7	Cape No. 1173-Mg 6.2			
C 08 16 52.66	08 17 38.31	8 20 10.29			
L 52.67	38.37	10.31			
E 52.62	38.31	10.31			
Mean 08 16 52.69	08 17 38.32	8 20 10.30			
Proc 54.37	55.05	54.73			
α 08 17 47.01	08 18 33.37	8 21 07.73			
A 2 18 20	2 18 20	8 18 20			
$\alpha-A$ - 32.99	+ 13.37	+ 2 47.73			
$\sin(\alpha-A)$ - 32.99	+ 13.37	+ 167.73			
$\log n$ 1.51838 n	1.12613	2.21677			
$\log s$ 9.98189	9.97669	9.97989			
$\log \sigma$ 0.00751 n	9.61006	0.70385			
γ_0 - 1.0174	+ 0.4074	+ 5.0565			
γ_1 - 5	0	+ 9			
γ 20.9821	22.7074	27.0574			
X 21.1811	22.3852	26.8781			
X- γ + 15.90	- 2.22	- 1.793			
C + 16 28 53.8	+ 18 39 12.2	+ 17 22 32.5			
L 53.0	12.1	32.7			
E 53.6	11.7	32.4			
Mean 16 28 53.8	18 39 12.0	17 22 32.5			
Proc - 3 0.9	- 3 2.2	- 3 6.8			
δ + 16 25 52.9	+ 18 36 9.8	+ 17 19 26.0			
D + 18 17 30	18 17 30	18 17 30			
$\delta-D$ - 1 48 37.1	+ 21 39.8	- 5.5 04.0			
$\tan(\delta-D)$ - 6.519.3	+ 12.998	- 33.073			
$\log n$ 3.81420 n	3.11387	3.51907			
$\log \sigma$ 1.19535 n	0.44502	0.85022			
$\log \tan \delta$ 9.4697	9.5271	9.4971			
$\log \gamma$ 0.0150	9.2201	1.9077			
$\log \eta$ 6.5381	5.8006	7.9352			
η_0 - 13.9798	+ 2.7862	- 7.0830			
η_1 + 0.0003	+ 0.0001	+ 0.0090			
η 7.0255	20.7863	10.9260			
η 9.8260	2.07916	1.19376			
$\eta-n$ + 8.005	+ 5.3	+ 5.086			

11932	Standard	Coordinates	1702	1703	5
Cape No. 1169 - Mg 6.8	Cape No. 1170 - Mg 5.7	Cape No. 1173 - Mg 6.2			
C 08 16 52.66	08 18 38.31	8 20 10.29			
I 52.69	38.39	10.31			
E 52.62	38.31	10.31			
Mean 08 16 52.69	08 17 38.32	8 20 10.30			
Proc 59.37	55.05	59.73			
S 08 17 47.01	08 18 33.37	8 21 09.73			
A 8 18 20	8 18 20	8 18 20			
S-A - 32.99	+ 13.37	+ 2 99.73			
Sen (S-A) - 32.99	+ 13.37	+ 169.73			
log 1.51838 n	1.12613	2.21677			
log 9.98189	9.97669	9.97989			
log 0.00751 n	9.61006	0.70385			
30 - 1.0179	+ 0.4079	+ 5.0565			
31 - 5	0	+ 9			
32 20 98 21	22 70 79	27 05 79			
X 21 19 11	22 38 52	26 87 81			
X-3 + 1590	- 222	- 1793			
C + 16 28 53.8	+ 18 39 12.2	+ 17 22 32.5			
I 58.0	12.1	32.7			
E 53.6	11.7	32.9			
Mean 16 28 53.8	18 39 12.0	17 22 32.5			
Proc -3 0.9	-3 2.2	-3 6.8			
S + 16 25 52.9	+ 18 36 9.8	+ 17 19 26.0			
D + 18 19 30	18 19 30	18 19 30			
S-D -1 48 37.1	+ 21 39.8	- 5.5 09.0			
Tand (S-D) - 65.19.3	+ 12 99.8	- 33 09.3			
log 3.81420 n	3.11387	3.51907			
log 1.19535 n	0.99502	0.85022			
log 9.9697	9.5271	9.9991			
log 0.0150	9.2201	1.9077			
log 6.5381	5.8006	7.9552			
log -13.9798	+ 27862	- 7.0830			
log + 0.0003	+ 0.0001	+ 0.0090			
log 9.0255	20.7863	10.9260			
log 9.8260	20.7916	11.7376			
log + 8.005	+ 53	+ 5.086			

A 0

B = 7.6

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Moon's Center

	X	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)^2$	O - e
1	23.2330	0.0000	0	0.0000	3.3621	+48
2	24.0000	+0.7670	0	0.5883	3.3639	+66
3	24.2221	+0.9891	0	0.9783	3.3687	+114
4	24.9809	+1.7479	0	3.0551	3.3632	+41
5	25.0663	+1.8333	0	3.3610	3.3610	+37
6	25.0077	+1.7747	0	3.1495	3.3556	-17
7	24.3507	+1.1177	0	1.2492	3.3635	+62
8	24.0000	+0.7670	0	0.5883	3.3639	+66

 $\bar{x} = 3.3573$

	Y	$y - y_0$	Δy	$(y - y_0)^2$	L
1	14.7125	-1.8335	-1	3.3621	180 ^u
2	14.8801	-1.6659	-1	2.7756	155 ^u
3	15.0000	-1.5460	-1	2.3909	147 ^u
4	16.0000	-0.5460	-0	0.2981	107 ^u
5	16.5960	0.0000	0	0.0000	90 ^u
6	17.0000	+0.5460	+0	0.2981	76 ^u
7	18.0000	+1.5460	+1	2.1143	37 ^u
8	18.2119	+1.6659	+1	2.7756	25 ^u 155 ^u

Approx. Center

 $x = 24$ $y =$

14.8801

18.2119

33.0920

 y_0

16.5960

 y_{min}

14.7125

 R

1.8335

1.8323

 x_{max}

25.0663

 T_0

23.2328

Center

$$\begin{cases} x_0 & 23.2330 \\ y_0 & 16.5960 \end{cases}$$

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Moon's Center

6

	X	$X - X_0$	ΔX	$(X - X_0)^2$	$(X - X_0) + (Y - Y_0)^2$	O-C
1	23.2330	0.0000	0	0.0000	3.3621	+98
2	24.0000	+0.7670	0	0.5883	3.3639	+66
3	24.2221	+0.9891	0	0.9783	3.3687	+119
4	24.9809	+1.7479	0	3.0551	3.3332	+91
5	25.0663	+1.8333	0	3.3610	3.3610	+37
6	25.0077	+1.7797	0	3.1495	3.3556	-17
7	24.3307	+1.1177	0	1.2492	3.3635	+62
8	24.0000	+0.7670	0	0.5883	3.3639	+66

112 3.3573

	Y	$Y - Y_0$	ΔY	$(Y - Y_0)^2$	$\angle$
1	19.7125	+1.8335	-1	3.3621	180
2	19.8801	+1.6659	-1	2.7756	155
3	15.0000	+1.5960	-1	2.3909	147
4	16.0000	+0.5960	-0	0.2981	107
5	16.5960	0.0000	0	0.0000	90
6	17.0000	+0.9540	+0	0.2061	76
7	18.0000	+1.8540	+1	2.1193	37
8	18.2119	+1.6659	+1	2.7756	25 155°

Approx. Center

Y = 24

Y =

19.8801

18.2119

33.0920

Y₀

16.5960

Y_{min}

19.7125

R

1.8335

1.8323

X_{max}

25.0663

Y₀

23.2328

Center

$$\begin{cases} X_0 & 23.2330 \\ Y_0 & 16.5960 \end{cases}$$

Formation of Normals.

1 - 0.0	+ 0.0	- 880
2 - 128	+ 510	- 109.5
3 - 154	+ 113.0	- 176.5
4 - 096	- 715	+ 225
5 + 00	+ 675	00
6 + 080	- 300	- 75
7 + 162	+ 695	+ 900
8 + 129	+ 510	+ 110.5
+ 371	+ 352.0	+ 223.0
- 378	- 101.5	- 381.5
- 0.07	+ 250.5	- 158.5

				-37		
	a	b	c	new		
a	+25	+0	+9	-28	-1	
b	-5	+19	+8	-10	+22	
c	-37	+27	+8	-2	+75	+180
		+44	+3	+10	-71	
		+46	0	+9	+11	
		+44	-2	+6	-41	
		+28	-7	-16	+40	
		+19	-8	-26	+36	

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Conditional Equations

7

b-c

1	+ 0.0	- 1.83	= + 48	+ 0	+ 21	= + 21	+ 27
2	+ 0.77	- 1.66	= + 66	+ 15	+ 19	= + 34	+ 32
3	+ 0.99	- 1.55	= + 118	+ 19	+ 18	= + 37	+ 77
4	+ 1.75	- 0.55	= - 51	+ 34	+ 6	= + 40	- 81
5	+ 1.83	0.00	= + 37	+ 35	+ 10	= + 45	+ 2
6	+ 1.77	+ 0.45	= - 17	+ 34	- 5	= + 29	- 76
7	+ 1.12	+ 1.45	= + 62	+ 22	- 16	= + 6	+ 56
8	+ 0.77	+ 1.67	= + 66	+ 15	- 19	= - 4	+ 62
					+ 25.6	= - 127	

$$+12.97 - 0.07 = +25.05 + 9.00 \Delta \text{Average } 48$$

$$- 0.07 + 13.92 = -158.5 - 2.02 \Delta$$

$$+ [] - 0 = +1.7$$

$$- .18 \Delta$$

$$+ 13.92 = -157.1$$

$$b = -11.3$$

$$+12.97 = +250.5 - .8 = +249.7$$

$$a = +19.2$$

$$+ 0.69 \Delta$$

Arc Measured 155°

$$\frac{P}{h} = .17$$

$$\frac{\Sigma V}{h} = + 16.1$$

$$\text{In } 5^\circ \quad h = 1.83$$

$$\frac{+16.1}{.17} = +95$$

$$\Delta P = +1.2^\circ$$

$$- 2PC = -1.83$$

$$\text{Corr } + 0.5^\circ$$

$$\Delta P = +0.7^\circ$$

$$\Delta b = +0.26$$

$$\Delta s = +0.1$$

$$\Delta a = -1.26$$

$$\Delta q = -0.09$$

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Conditional Equations

7

0-C

1	+ 0.0	- 1.83	= + 98	+ 0	+ 21	= + 21	+ 27
2	+ 0.77	- 1.66	= + 66	+ 15	+ 19	= + 34	+ 32
3	+ 0.99	- 1.55	= + 119	+ 19	+ 18	= + 37	+ 77
4	+ 1.75	- 0.55	= - 91	+ 39	+ 6	= + 45	- 81
5	+ 1.83	0.00	= + 37	+ 35	+ 0	= + 35	+ 2
6	+ 1.77	+ 0.45	= - 17	+ 39	+ 5	= + 44	- 96
7	+ 1.12	+ 1.75	= + 62	+ 22	- 16	= + 6	+ 56
8	+ 0.77	+ 1.67	= + 66	+ 15	- 19	= - 4	+ 62
					+ 25.6	= 127	

$$+12.97 - 0.07 = +12.90$$

Average 98

$$-0.07 + 13.92 = +13.85$$

$$+13.85 - 0 = +13.85$$

$$+13.92 = +13.92$$

$$b = -11.3$$

$$+12.97 = +12.90 - 0.8 = +12.10$$

$$a = +19.2$$

Arc Measured 155°

$$\frac{P}{h} = .17$$

$$\frac{\Sigma V}{h} = +16.1$$

$$\frac{+16.1}{.17} = +95 \quad \Delta P = +1.2$$

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Moon's Mean Position

$$\begin{array}{r} X_0 \quad 23.2330 \\ \quad + 10 \checkmark \\ \hline 23.2340 \checkmark \end{array}$$

$$\begin{array}{r} Y_0 \quad 16.5460 \\ \quad - 6 \checkmark \\ \hline 16.5454 \checkmark \end{array}$$

From Plate Constants

$$X \quad 23.2672 \checkmark$$

$$Y \quad 16.3201 \checkmark$$

$$Z \quad +1.2672 \checkmark$$

$$h \quad -1.6799 \checkmark$$

$$\log \gamma \quad 0.10285 \checkmark$$

$$\log \tan \delta \quad 9.5724 \checkmark$$

$$\cos \delta \quad 9.97819 \checkmark$$

$$\gamma \quad 2.02057 \checkmark$$

$$8.50727$$

$$7.0539$$

$$1.61746 \checkmark$$

$$6.7715 \checkmark$$

$$\sqrt{-A} \quad 41.77$$

$$h \quad +0.0006 \checkmark$$

$$A \quad 8 \quad 18 \quad 20.00 \checkmark$$

$$\log h_0 \quad 0.22547 h \checkmark$$

$$S_0 \quad 8 \quad 19 \quad 01.77 \checkmark$$

$$7.33115 \checkmark$$

$$2.89429 h - 783.9 \checkmark$$

$$Red \quad +5.70 \checkmark$$

$$S-D \quad -13 \quad 03.9 \checkmark$$

$$S' \quad 8 \quad 19 \quad 6.87 \checkmark$$

$$D \quad +18 \quad 17 \quad 30.0 \checkmark$$

$$S_0 \quad 18 \quad 01 \quad 26.1 \checkmark$$

$$Red \quad -15.1 \checkmark$$

$$S' \quad 18 \quad 01 \quad 11.0 \checkmark$$

11932

Morn's Mean Position

8

$$\begin{array}{r}
 X_0 \quad 23.2330 \\
 +10'' \\
 \hline
 23.2390''
 \end{array}$$

$$\begin{array}{r}
 Y_0 \quad 16.5960 \\
 -6'' \\
 \hline
 16.5954''
 \end{array}$$

From Plate Constants

$$X \quad 23.2672''$$

$$Y \quad 16.3201''$$

$$Z \quad +1.2872''$$

$$h \quad -1.6779''$$

$$\log Z \quad 0.10286''$$

$$\log \tan \delta \quad 9.5128''$$

$$\log \delta \quad 9.97819''$$

$$+202058''$$

$$8.50729''$$

$$7.0539''$$

$$1.61998''$$

$$6.7718''$$

$$X-A \quad 91.99''$$

$$h \quad +0.0006''$$

$$A \quad 8 \quad 18 \quad 20.00'' \quad \log h_0 \quad 0.22579''$$

$$7.33115''$$

$$Y_0 \quad 8 \quad 19 \quad 01.79''$$

$$289929'' - 783.9''$$

$$\text{Red} \quad +5.90''$$

$$\delta-D \quad -13 \quad 03.9''$$

$$X' \quad 8 \quad 19 \quad 48.9''$$

$$D \quad +18 \quad 19 \quad 30.0''$$

$$\delta_0 \quad 18 \quad 01 \quad 26.1''$$

$$\text{Red} \quad -15.1''$$

$$\delta' \quad 18 \quad 01 \quad 11.0''$$

$$\begin{array}{r} 8 \quad 18 \quad 38,77 \\ 33,38 \\ \hline + 5,39 \end{array}$$

$$\begin{array}{r} + 18^0 \quad 33^- \quad 57,60 \\ 36 \quad 9,70 \\ \hline - 15,13 \end{array}$$

11932

Reduction to Apparent Place

9

 $H + \alpha 8 \quad 51.9 \quad 132 \quad 58.5 \quad S \quad 18 \quad 01 \quad 26$
 $H \quad 0 \quad 32.9$
 $L \quad 8 \quad 19.0$
 $G + 23 \quad 37.1$
 $G + K \quad 7 \quad 53.1 \quad 118^0 \quad 16.5$
 $\log \cos \delta \quad 9.9782$
 $+ 0.1020$
 $- 0.0802$
 $\log \cos (G + \alpha) \quad 9.6754 \quad h$
 $q \quad 1.7052$
 $\sin \quad 9.9448$
 $\tan \delta \quad 9.5118$
 8.8239
 $\log \sin \delta \quad 9.9900$
 $\cos (H + \alpha) \quad 9.8336 \quad h$
 $h \quad 1.3103$
 $\sin \quad 9.8693$
 $\sec \delta \quad 0.0218$
 8.8239
 $\log q' \quad 1.0806 \quad h$
 $q \quad 9.6857$
 $h' \quad 0.6339 \quad h$
 $h \quad 0.0203$
 $L + 3.863$
 $G + 0.785$
 $h + 1.098$
 $+ 5.396$
 $g' - 120.9$
 $h' - 430.5$
 $v + 1.203$
 $- 15.192$

11932

Reduction to Apparent Place

9

$$H + L 8 \quad 57.9 \quad 13.2 \quad 58.5^\circ \quad S \quad 18^\circ 01' 26''$$

$$H \quad 0 \quad 32.9$$

$$L \quad 8 \quad 19.0$$

$$G + L 23 \quad 39.1$$

$$G + L 7 \quad 53.1 \quad 118^\circ \quad 16.5^\circ$$

$$\log \cos 9.9782$$

$$+ 0.1020$$

$$= 0.0802$$

$$\log \cos(G+L) 9.6759 \text{ h}$$

$$9 \quad 19.052$$

$$\sin \quad 9.9498$$

$$\tan \quad 9.5118$$

$$8.8239$$

$$\log \sin 9.9900$$

$$\cos(H+L) 9.8336 \text{ h}$$

$$h \quad 1.3103$$

$$\sin \quad 9.8693$$

$$\sec \quad 0.0218$$

$$8.8239$$

$$\log q' 1.0806 \text{ h}$$

$$9.6857$$

f

$$h' 0.6339 \text{ h}$$

$$h \quad 0.0203$$

$$f + 3.863$$

$$g + 0.985$$

$$h + 1.098$$

$$+ 5.396$$

$$g' - 120.9$$

$$h' - 9.305$$

$$v + 1.203$$

$$- 15.192$$

11932

Lunar Parallax

10

δ 8 19 6.88 ✓
 δ 8 99 01.9 ✓
 $\delta - \delta' + 0$ 29 54.56 ✓
 $=$ 7 28 38.70 ✓
 $\frac{1}{2}(\delta - \delta')$ 2 47.6 ✓
 7 25 53.8 ✓

9.95727
 0.00000
 0.00367 ✓
 9.96094 ✓

δ 72 25 37.0 ✓
 $\delta + 18$ 01 11.0 ✓
 $\delta - \delta$ 27 27 26.0 ✓

9.82670
 8.19680 ✓
 9.61618 ✓
 0.17092 ✓
 9.81030 ✓

$\delta - \delta'$ + 22 12.7

δ 18 23 23.7 ✓

Eph δ 18 23 27.8 ✓

O-C - 4.1

Ann Ann + 0.5
 2nd Order Ref. 0.0

Irr Corr - 0.1

δ + 18 23 23.8

O-C + 7.0

τ 54 05.79 ✓

9.86913
 8.19680 ✓
 9.11439 ✓
 0.02277 ✓
 7.20309 ✓

$\sqrt{\delta}$ 5 29.28

= + 21.95 ✓

τ 8 19 28.79 ✓

Eph τ 8 19 27.89 ✓

O-C + 0.95

0.00

- 0.07

τ 8 19 28.75

+ 0.91

11932

Lunar Parallax

10

$$\begin{array}{r}
 \delta' \quad 8 \quad 19 \quad 0.88'' \\
 \delta \quad 8 \quad 99 \quad 01.9'' \\
 \delta - \delta' + 0 \quad 29 \quad 59 \quad 56'' \\
 = \quad 7 \quad 28 \quad 38.90'' \\
 \delta(\delta - \delta') \quad 2 \quad 99.6'' \\
 \quad 7 \quad 25 \quad 53.8''
 \end{array}$$

$$T_1 \quad 54 \quad 05.19''$$

$$\begin{array}{r}
 9.86913 \\
 8.19680'' \\
 9.11939'' \\
 0.02277'' \\
 \hline
 720309''
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 0.00367'' \\
 \hline
 9.96094''
 \end{array}$$

$$\delta - \delta' \quad 5'' \quad 29.28''$$

$$= \quad 21.95''$$

$$\delta \quad 92 \quad 25'' \quad 37.0''$$

$$\delta \quad +18 \quad 01'' \quad 11.0''$$

$$\delta - \delta \quad 29 \quad 29'' \quad 26.0''$$

$$\begin{array}{r}
 9.82670 \\
 8.19680'' \\
 9.61618'' \\
 0.17092'' \\
 \hline
 9.81030''
 \end{array}$$

$$\delta - \delta' \quad 22 \quad 12.7''$$

$$\delta \quad 18 \quad 23'' \quad 23.7''$$

$$\delta \quad 8 \quad 19'' \quad 28.72''$$

$$\text{eph } \delta \quad 18 \quad 23'' \quad 27.8''$$

$$\text{eph } \delta \quad 8 \quad 19'' \quad 27.85''$$

$$O-C \quad -4.9''$$

$$O-C \quad +0.25''$$

$$\text{Circ. Err.} \quad +0.5''$$

$$0.00$$

$$2^{\text{nd}} \text{ Order Ref.} \quad 0.0$$

11998

Star Measures.

Run 5

1	19598	19020	20532	19948
12.3	18866	11780	13677	16800
17.7	68	58	47	02
	99	002	38	94
	<u>12.2731</u>	<u>12.2753</u>	<u>17.6859</u>	<u>17.6855</u>

3	19688	19700	20360	20208
17.4	15490	13872	15256	15308
9.6	88	72	52	00
	60	98	60	08
	<u>27.4176</u>	<u>27.4174</u>	<u>9.5106</u>	<u>9.5096</u>

2	19812	19874	19992	18839
26.7	13058	16620	14140	19679
29.6	58	20	38	80
	08	50	98	26
	<u>28.6751</u>	<u>28.6755</u>	<u>29.5858</u>	<u>29.5896</u>

Moon Measures.

1		20090	19726
24.5		11200	18630
14.9		90	18
-7		080	20
		<u>14.8901</u>	<u>19.8903</u>

2	20551	19980	20086
23.9	12508	17562	12052
15	06	62	48
	42	76	86
	<u>23.8036</u>	<u>23.8084</u>	<u>23.8036</u>

3		20032	19768
23		19760	15038
15.6		82	48
		34	60
		<u>15.5272</u>	<u>15.5276</u>

Good plate - trailed star images.

11998

Star Measures.

1	19578	19020	20532	19998
12.3	16866	11780	13677	16800
17.7	68	58	77	02
	79	002	38	94
	<u>12.2731</u>	<u>12.2753</u>	<u>176859</u>	<u>17.6855</u>
2	19688	19700	20360	20208
27.9	15490	13872	15256	15308
9.6	88	72	52	00
	60	98	60	08
	<u>27.4176</u>	<u>27.4174</u>	<u>9.5106</u>	<u>9.5096</u>
2	19812	19874	19992	18839
28.7	13058	16620	14140	19679
29.6	58	20	38	80
	08	50	98	26
	<u>28.6751</u>	<u>28.6755</u>	<u>29.5858</u>	<u>29.5896</u>

Moon Measures.

1			20090	19726
24.9			11200	18630
19.9			90	18
-1			080	20
			<u>14.8901</u>	<u>19.8903</u>
2	20551	19980	20086	
23.9	12398	17562	12052	
15	06	62	98	
	42	76	86	
	<u>23.8036</u>	<u>23.8084</u>	<u>23.8036</u>	
3			20032	19768
23			19760	15038
15.6			82	48
			39	60
			<u>15.5272</u>	<u>15.5276</u>

11998

x

Moon Measures

d

4 20226
 22.7 13942
 16 38
 21

22.6783

19200

15976

80

02

22.6777

5 20242
 22.6 15479
 16.8 71
 -x 32

22.4762

19178

13930

20

74

22.4750

6 19240
 22.6 17450
 17 50
 36

22.4788

20168

17944

72

62

22.4778

7 19269
 22.8 10986
 18 86
 58

22.8275

20131

18922

408

33

22.8283

8
 23
 18.2

19952

17694

88

3.2

18.2271

19978

12188

778

72

15.2211

11998

x

Moon Measures

y

4 20226
 22.7 13942
 16 38
 21

22.1783

19200
 15976
 80
 02

22.6777

5 20242
 22.6 15979
 16.8 71
 -x 32

22.4762

19178
 13930
 20
 79

22.4750

6 19240
 22.6 17950
 17 50
 36

22.4788

20168
 19944
 92
 62

22.4778

7 19269
 22.8 10986
 18 86
 58

22.8275

20131
 18922
 908
 33

22.8283

8
 23
 18.2

19932
 17699
 88
 32

18.2241

19938
 12188
 78
 92

15.2211

11977

Times Etc.

13

Dec. 29 '16

Exp. Stars	2	05	35	2	17
Moon	2	11	05.2	2	11 05.5
Clock fast		12	37.9		
	1	58	30.75		$\phi - \alpha = + 2^{\circ} 47'$

H. Sid Time

H. Long

G. Sid T.

Sid. J. M. Mon

External

Reduction

G. M. T.

7	44	31.05	
6	43	01.50	
18	30	23.96	
12	12	35.54	
	2	00.02	
12	10	35.52	

From North Am.

P. A.

Dec.

Moon 12h	23	11	21.89	-0	18	15.9
Motion m/m			2.1143			+15.2685
10.5920			22.39		+2	41.7
Tabular Place	23	11	44.28	-0	15	34.2

Moon's age 5 days.

Parallax	59	06.65
Semi-d.	16	8.0
H		968.0
Aug		9.2
Dist (5)		-0.8
H		976.4
H		2.0930
alt		-1001
$(1+a)/R$		7.9929
H		3.9716

93.4 8.58

$a - 502.2$
 $+ 2.4$
 $- 478.2$

11397

Times Etc.

13

Dec. 29 '16

Eph. Stars	2	05		2	17	
" " Moon	2	11	05.2	2	11	05.5
Clock fast		12	39.9			
	1	58	30.75			$\Phi - \lambda = + 2^{\circ} 97^m$
11 Sid Time						
H. Long	4	44	31.35			
9 Sid J.	6	43	01.50			
Sid J. M. Norm	18	30	25.96			
External	12	12	35.37			
Reductions		2	00.02			
9 M. J.	12	10	35.32			

From Nant Alm.		R. G.		Dec.	
Moon 12	23	11	21.89	-0	18 15.9
Motion m/h			2.1173		+15.2685
" 10.5920			22.39		+2 91.7
Tabular Place	23	11	44.28	-0	15 37.2

Moons age 5 days.

Parallax	59	0.6.63
Semid.	16	8.0
R.		968.0
Ang		9.2
Dist (5)		-0.8
R		976.4
R		2.0930
alt		-1.001
(1+0)/R		1.9929
R		3.9716

937 8.5

$$\begin{array}{r}
 a - 502.2 \\
 + 2.7 \\
 \hline
 - 478.2
 \end{array}$$

12.277.2
26.6753
27.7175

1716857
29.3852
9.3101

11998

Plate Center & Constants

	α	γ	δ
(1) 12.2792	17.6857	23 03 27.3	-0 95 02.3
(3) 27.9175	9.5101		
(2) 26.6753	29.5852		
		+ 5 11.2	+ 2 26.5
22	18		
+ 9.7258	+ 0.3192	23 08 38.5	- 0 92 35.8
32	46.5		

Center { A 23 08 40
- 0 92 36

$X-Z$	+500X	+102.0Y	+2.2X	-11282
+3303	+6137	= +9940	+1815	= +11255 + 27 = +11282 0
-5750	+13338	= 8188	+3033	= 11223 + 59 = 11282 0
-3962	+13709	= 10297	+976	= 11223 + 60 = 11283 +1
27.8692	+12.235	+1731	+59	27.7730 -11

$Y-Z$	+500Y	-94.6X	+5.9Y	-7795
+8	+8893	= +8851	-1150	= +7692 + 109 = +7795 0
-7650	+14792	= 10143	-2528	= 7622 + 174 = 96 +1
+5575	+9753	= 10330	-2594	= 7739 + 56 = 95 0
16.8768	+8438	-2313	+99	16.7195 -1

Tables a = -1.1 d = -3.4 a+d = +2.3 b+d = -6.6
 Obs = -502.2 = -505.9 = +3.7 = -8.0
 b-e = -501.1 = -502.5 = -1.4

11998

Plate Center & Constants

X	Y	X	Y
(1) 12.2792	17.6857	23 03 27.3	-0 95 02.3
(3) 27.9175	9.5101		
(2) 26.6753	29.5852		
		+ 5 11.2	+ 2 26.5
<u>22</u>	<u>18</u>		
+ 9.7258	+ 0.3192	23 08 38.5	-0 92 35.8
<u>22</u>	<u>966.2</u>		
+			

Center { A 23 08 40
- 0 92 36

X-Z	+500X	+102.6Y	+1.2X	-1128.2
+330.3	+6137	= +9980	+1815	= +11255
-5750	+13338	= 8188	+3035	= 11223
-3962	+13709	= 10297	+976	= 11223
29.9692	+12.235	+1731	+54	29.7980
				-11

Y-Z	+500Y	-99.6X	+5.94	-779
+8	+8893	= +8857	-1160	= +7692
-9650	+19792	= 10193	-2524	= 7622
+5575	+7755	= 10330	-2594	= 7789
16.8768	+8938	-2315	+99	16.7195
				-1

Tables a = -1.1 x - 0 = -3.4 a + c = +2.3 b + d = -6.6
 bbs = -502.2 = -505.9 = +3.7 = -8.0

Curv Curv

ξ	η	$\Delta \xi$	-2.93	-0.34	-3
-10.05	-0.31	-26	+29 = +3	+0 ~ +3	
+5.19	+12.05	+22	-15 = +7	-7 ~ +3	
+5.76	-9.05	+17	-17 ~ 0	+0 ~ +3	
$M = +2.77$	-1.3	0	-8	0	$= -11 = -0.107$

$\Delta \eta$	-3.94	-0.53	-6
-0	+1 = +1	+3 = +6	
+5.6	-9.7 = +9	-2 = +7	
-26	+35 = +9	-3 = +6	
0	+5	-1	$= -2 = -0.1$

Standard Coordinates

15-

Cape No	3217-M979	Cape No	3271-M977	Cape No	3299-M971
C	23 02 38.01	23 10 32.11	23 10 49.97		
L	38.09	32.16	30.02		
E	38.05	32.16	49.97		
Mean	23 02 38.05	23 10 32.14	23 10 49.99		
Prece	49.23	49.23	49.31		
A	23 03 27.28	23 11 21.37	23 11 39.30		
A	23 08 40	23 08 40	23 08 40		
A-A	-5 12.72	+2 41.37	+02 59.30		
S-A	-3 12.69	+16 1.37	+17 9.29		
log u	2.49512 n	2.20782	2.25356		
log v	9.99996	9.99995	9.99997		
log w	1.00232 n	0.71501	0.76057		
z ₀	-10.0535	+5 18.81	+5 76.20		
z ₁	-26	+22	+17		
z ₂	1 194.39	27 190.3	27 76.37		
X	12 274.2	26 675.3	27 417.5		
X-z ₁	+ 330.3	- 515.0	- 346.2		
C	- 0 50 13.11	+ 0 45 51.0	- 1 58 09.0		
L	13.9	50.9	9.0		
E	13.5	50.7	9.0		
Mean	- 0 50 13.2	+ 0 45 50.9	- 1 58 9.0		
Prece	+5 10.9	+5 13.0	+5 13.5		
δ	- 0 45 02.3	+ 0 51 03.9	- 1 52 55.5		
D	- 0 42 36	- 0 42 36	- 0 42 36		
S-D	- 2 26.3	+ 1 33 39.9	- 1 10 19.5		
tan δ-D	- 176.3	+ 5621.3	- 7220.1		
log u	2.16527 n	3.79983	3.62532		
log v	9.99639 n	1.08098	0.93644		
log w	8.1176 n	8.1719+	8.5166 n		
z ₂	2004.6	17300	15211		
z ₁	7175.6	6655.3	70911		
z ₀	- 0.3136	+ 120497	- 90462		
z ₁	- 0.0015	+ 0.0005	- 0.0012		
z ₂	1.76849	300502	8.9526		
z ₃	1.76857	295852	9.5101		
(z ₂ -z ₁)	+ 8	- 4630	+ 5575		

Standard Coordinates

15-

Cape Mr	3217-149 7.7	Cape Mr	3291-149 7.7	Cape Mr	3299-149
C	23 02 38.01	23 10 32.11	23 10 32.11	23 10 32.11	23 10 32.11
L	38.09	32.16	32.16	32.16	32.16
E	38.05	32.16	32.16	32.16	32.16
Mean	23 02 38.05	23 10 32.14	23 10 32.14	23 10 32.14	23 10 32.14
Prece	99.23	99.23	99.23	99.23	99.23
A	23 03 27.28	23 11 21.37	23 11 21.37	23 11 21.37	23 11 21.37
A	23 08 90	23 08 90	23 08 90	23 08 90	23 08 90
A-A	-5 1272	+2 81.37	+02 59.30	+02 59.30	+02 59.30
S-A	-3 12.69	+161.37	+179.29	+179.29	+179.29
log	2.99512 n	2.20782	2.25356	2.25356	2.25356
log	9.99996	9.99995	9.99997	9.99997	9.99997
log	1.00232 n	0.71501	0.76057	0.76057	0.76057
log	-10.0535	+5.1881	+5.7620	+5.7620	+5.7620
log	-2.6	+22	+17	+17	+17
log	11.7139	27.1903	27.7637	27.7637	27.7637
log	12.2742	26.6753	27.9175	27.9175	27.9175
X-Z	+3303	-5150	-3962	-3962	-3962

C	-0 50 13.11	+0 95 51.0	-1 58 09.0	-1 58 09.0	-1 58 09.0
L	12.9	50.9	9.0	9.0	9.0
E	13.5	50.7	9.0	9.0	9.0
Mean	-0 50 13.2	+0 95 50.9	-1 58 9.0	-1 58 9.0	-1 58 9.0
Prece	+5 10.9	+5 13.0	+5 13.5	+5 13.5	+5 13.5
A	-0 95 02.3	+0 51 03.9	-1 52 55.5	-1 52 55.5	-1 52 55.5
D	-0 92 36	-0 92 36	-0 92 36	-0 92 36	-0 92 36
S-D	-2 26.3	+1 33 39.9	-1 10 19.0	-1 10 19.0	-1 10 19.0
1/2(S-D)	-176.3	+5621.3	-9220.1	-9220.1	-9220.1
log	2.16529 n	3.79983	3.62532	3.62532	3.62532
log	9.99639 n	7.08098	0.95697	0.95697	0.95697
log	8.1176 n	8.1719	8.5166 n	8.5166 n	8.5166 n
log	2.0086	1.7300	1.5211	1.5211	1.5211
log	7.1756	6.6553	7.0911	7.0911	7.0911
log	-0.3136	+12.0797	-9.0962	-9.0962	-9.0962
log	-0.0015	+0.0005	-0.0012	-0.0012	-0.0012
log	17.6899	30.0502	8.9526	8.9526	8.9526
log	17.6857	29.5852	9.5101	9.5101	9.5101
(Y-H)	+8	-9630	+5575	+5575	+5575

A + 6.2

B + 1.9

11998

Moon's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^3$	$(x - x_0)^4$
1	-27.7650	0.0000	12	0.0000	3.9371	-328
2	23.8060	-0.6590	11	0.4357	3.9491	-208
3	23.0000	-1.4650	8	2.1486	3.9625	+74
4	22.6780	-1.7870	5	3.1951	3.9593	-106
5	+22.4756	-1.9894	0	3.9577	3.9577	-122
6	22.4783	-1.9867	1	3.9466	3.9625	-74
7	22.8279	-1.6371	7	3.6778	3.9461	-238
8	23.0000	-1.4650	8	2.1439	3.9634	-65

	y	$y - y_0$	Δy	$(y - y_0)^2$	$(y - y_0)^3$	$(y - y_0)^4$
1	-19.8902	-1.9838	4	3.9371	3.9716	180
2	13.0000	-1.8740	4	3.5134	1.9	160
3	15.5274	-1.3466	2	3.8139		130
4	16.0000	-0.8790	2	0.7642		117
5	16.8740	-0.0000	0	0.0000		90
6	17.0000	+0.1260	0	0.6159		86
7	18.0000	+1.1260	2	1.2683		54
8	18.2226	+1.3486	3	1.8195		50

Approx. Center

Arc. 130

 $x = 23$ $y = 13.5274$

18.2226

33.7500

16.8750

approx. y_0 17.8902 x_0 19.8902 x 22.4756 x_0 24.4604

R 1.9929

center x_0 24.4650
 y_0 16.8780

11998

Moons Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	
1	-29.9650	0.0000	-12	0.0000	3.7371	-328
2	23.8060	-0.6590	11	0.9357	3.9491	-208
3	23.0000	-1.4650	8	2.1486	3.7625	+74
4	22.6780	-1.7870	5	3.1951	3.9593	-106
5	+22.9756	-1.9899	0	3.9577	3.9577	-122
6	22.9783	-1.9867	+1	3.9466	3.9625	-74
7	22.8279	-1.6371	+7	3.6778	3.9461	-238
8	23.0000	+1.4650	+8	2.1439	3.7639	-62

	y	$y - y_0$	Δy	$(y - y_0)^2$	$(x - x_0)(y - y_0)$	
1	-19.8902	-1.9888	-9	3.9371	3.7371	180
2	15.0000	-1.8790	-9	3.5139	3.5139	160
3	15.5279	-1.3466	-2	3.8139	3.8139	130
4	16.0000	-0.8790	-2	0.7692	0.7692	117
5	16.8790	-0.0000	0	0.0000	0.0000	90
6	17.0000	+0.1260	+0	0.0159	0.0159	86
7	18.0000	+1.1260	+2	1.2683	1.2683	59
8	18.2226	+1.3486	+3	1.8195	1.8195	50 15

Approx. Center

$x = 23$

$y = 15.5279$

18.2226

33.7500

16.8750

$y_{\min} = 19.8902$

$R = 1.9898$

$x_{\min} = 22.9756$

$x_0 = 29.9604$

$R = 1.9929$

$$\text{center } \begin{pmatrix} x_0 \\ y_0 \end{pmatrix} = \begin{pmatrix} 29.9650 \\ 16.8790 \end{pmatrix}$$

Formation of Normals

①
corr

1	- 00	- 06	+ 0	+ 683.0	- 37
2	+ 123	+ 148	+ 12	+ 721.0	- 32
3	+ 198	+ 134	+ 25	+ 123	- 23
4	+ 156	+ 2200	+ 31	+ 1070	- 19
5	+ 00	+ 2770	+ 34	+ 00	- 0
6	- 026	+ 1810	+ 34	- 115	+ 22
7	- 185	+ 7020	+ 19	- 2770	+ 19
8	- 199	+ 1210	+ 23	- 1110	+ 23
	+ 4.77	+ 1983.0	+ 178	+ 1334.0	+ 104
	- 7.10	- 1780		- 399.5	+ 64
	+ .67	+ 1305.0		+ 934.5	- 70

①

- 70.0
+ 898.5

	a	b	c	new e-e
a	- 23	+ 0	+ 16	- 24
b	- 8	+ 15	+ 15	- 10
c	- 70	+ 39	+ 11	+ 5
		+ 81	+ 7	+ 8
		+ 46	+ 0	+ 6
		+ 86	- 1	+ 5
		+ 38	- 9	- 11
		+ 34	- 11	- 17

0.33

$$+0.67 + 15.13 = -3.76 \Delta$$

$$+ [] + .02 = -0.33 \Delta$$

$$+ 15.11 = -3.13 \Delta$$

$$+ 19.50 = -11.01 \Delta - 0.14 \Delta = -11.15 \Delta$$

11998

Conditional Equation

+17 = corr

7

0-c

1	.00	-	1.98	-	-343	0	-	108	=	-108	-237
2	-0.66	-	1.87	-	-223	-93	-	102	=	-195	-80
3	-1.47	-	1.35	-	-91	-95	-	74	=	-169	+78
4	-1.79	-	0.87	-	-123	-116	-	47	=	-163	+60
5	-1.99	-	0.00	-	-139	-129	-	0	=	-129	-10
6	-1.99	+	0.13	-	-91	-129	+	7	=	-122	+31
7	-1.69	+	1.13	-	-243	-117	+	62	=	-55	-190
8	-1.197	+	1.23	-	-82	-95	+	74	=	-21	-61
										+109	-638

+17x8 = +136

$$19.50 + 0.67 = +1305.0 \quad +1 + 243 = 502$$

-11.01 Δ

$$+0.67 + 15.13 = +899.5 \quad -3.46 Δ$$

$$+2.3 + .02 = +44.8$$

-0.21 Δ

$$+15.11 = +849.7$$

$$b = +56.0$$

$$+19.50 = -32.6 + 1305.0 = 1267.4 \quad a = +65.0$$

11998

-0.57 Δ

Arc Measured 1300

$$p_h = .09$$

$$\frac{\Sigma v}{h} = -32.1$$

$$R = 5 \quad R \quad 1.99 \quad - \frac{32.1}{.09} = -735.7 \quad \Delta R = -4.9$$

$$-2PC = -1.99$$

$$\text{Corr} +.5$$

$$\Delta R = -4.9$$

$$\Delta b = +0.9$$

$$\Delta d = +0.2$$

$$\Delta a = +1.17$$

$$\Delta q = +0.09$$

11998

Conventional Equations

7

0-c

1	0.0	-	1.98	-	- 395	0	-	108	-	-108	-239
2	- 0.66	-	1.87	-	- 225	-93	-	102	-	-195	-60
3	- 1.97	-	1.35	-	- 91	-178	-	79	-	-169	+108
4	- 1.79	-	0.87	-	- 125	-176	-	97	-	-176	+60
5	- 1.99	-	0.00	-	- 139	-104	-	0	-	-104	+28
6	- 1.99	+	0.13	-	- 91	-104	+	7	-	-107	+68
7	- 1.69	+	1.13	-	- 295	-177	+	62	-	-59	-176
8	- 1.97	+	1.35	-	- 82	-170	+	79	-	-27	-24

+ 409 - 638

+ 1788 = + 1360 = 75

$$19.50 + 0.67 = +1305.0 \quad + 1 + 2830 = 302$$

$$+ 0.67 + 15.13 = + 999.5 \quad + 177.5$$

$$+ 2.3 + .02 = + 99.8$$

$$+ 15.11 = + 829.7 \quad 200 = + 58.0$$

$$+ 19.50 = 3426 + 1305.0 = 126719 \quad a = + 65.0$$

11998.1

are measured 1300

$$\frac{p}{h} = .09$$

$$\frac{\Sigma v}{h} = -32.4$$

$$= \frac{32.4}{.09} = -735.7 \quad \Delta R = -19.9$$

11998

Moon's Mean Position

$$\begin{array}{rcl}
 X_0 & = & 24.9650'' \\
 & & +32'' \\
 & & 24.9682''
 \end{array}
 \qquad
 \begin{array}{rcl}
 Y_0 & = & 16.8740'' \\
 & & +27'' \\
 & & 16.8767''
 \end{array}$$

From Plate Constants

$$\begin{array}{rcl}
 X & 24.7920'' & Y & 16.7198'' \\
 Z & +2.7720'' & W & -1.2805''
 \end{array}$$

$$\begin{array}{rcl}
 \log \tau & 0.43807'' & \log \tan \delta & 8.1843'' \\
 \text{Cust} & 9.99995'' & \tau^2 & 0.8765'' \\
 & 8.50729 & & 7.0539 \\
 & 193088'' & & 6.1192''
 \end{array}$$

$$\begin{array}{rcl}
 d-A & +8529'' & W_1 & -0.0001''
 \end{array}$$

$$\begin{array}{rcl}
 A & 23 \ 08 \ 40.00 & \log h_0 & 0.10735'' \\
 & & & 7.33115''
 \end{array}$$

$$\begin{array}{rcl}
 d_0 & 23 \ 10 \ 05.29'' & & 2.77620'' -597.3
 \end{array}$$

$$\begin{array}{rcl}
 Red & +3.60'' & S-D & -9 \ 57.3
 \end{array}$$

$$\begin{array}{rcl}
 T^1 & 23 \ 10 \ 08.89'' & D & -0 \ 42 \ 36.0''
 \end{array}$$

$$\begin{array}{rcl}
 S_0 & -0 \ 52 \ 33.3''
 \end{array}$$

$$\begin{array}{rcl}
 Red & +23.8''
 \end{array}$$

$$\begin{array}{rcl}
 S_1 & 0 \ 52 \ 09.5''
 \end{array}$$

11998

Mars Mean Position

$$\begin{array}{rcl}
 X_0 & 29.9650'' & Y_0 \quad 16.8790'' \\
 & +32'' & \quad +27'' \\
 & 29.9682'' & 16.8767''
 \end{array}$$

From Plate Constants

$$\begin{array}{rcl}
 X & 29.7920'' & Y \quad 16.7198'' \\
 Z & +2.7930'' & H \quad -1.2805'' \\
 \log z & 0.43827'' & \log \tan \delta & 8.1843'' \\
 \text{Cust} & 9.99995'' & Z & 0.8765'' \\
 & 8.50729 & Y & 7.0039'' \\
 & 1.93088'' & & 6.1198''
 \end{array}$$

$$A \quad +8529'' \quad H_1 \quad -1.0001''$$

$$A \quad 23 \quad 08 \quad 90.00 \quad \log h_0 \quad 0.10735''$$

$$Y_0 \quad 23 \quad 10 \quad 05.29'' \quad 7.33115''$$

$$\text{Red} \quad +3.60''$$

$$T_1 \quad 23 \quad 10 \quad 08.89''$$

$$\text{Red-D} \quad -9 \quad 57.3$$

$$D \quad -0 \quad 92 \quad 36.0''$$

$$D_0 \quad -0 \quad 52 \quad 33.3''$$

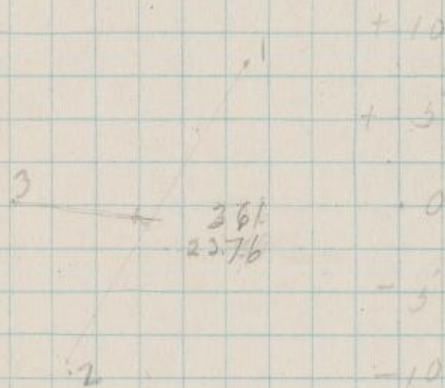
$$\text{Red} \quad +23.5''$$

$$D_1 \quad 0 \quad 52 \quad 09.5''$$

$$\begin{array}{r}
 23 \quad 7 \quad 33.18 \\
 \underline{29.64} \\
 + 3.89 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 +8 \quad 15 \quad 76.83 \\
 + \quad \quad \underline{49.65} \\
 + 267.8
 \end{array}$$

$$\begin{array}{r}
 23 \quad 11 \quad 33.23 \\
 \underline{29.52} \\
 + 3.71 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 -9 \quad 32 \quad 22.60 \\
 - \quad \quad \underline{43.58} \\
 + 20.98
 \end{array}$$

$$\begin{array}{r}
 23 \quad 12 \quad 52.25 \\
 \underline{48.62} \\
 + 3.63 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 +2 \quad 89 \quad 98.97 \\
 + \quad \quad \underline{23.30} \\
 + 251.7
 \end{array}$$



15 13 11 9 7 5

11997 Reduction to Apparent Place

$$\begin{array}{rcl}
 H + \alpha & 22 & 40.5 = 390 \quad 7.5'' \\
 H & 23 & 30.7 \quad \delta = 0 \quad 52.5'' \\
 \alpha & 23 & 10.1 \\
 G & 23 & 35.5 \quad \log \cos d \quad 99999 \\
 G + \alpha & 22 & 85.6 = 391 \quad 27.0 \quad \mu = 0.0552 \\
 & & \quad \quad \quad \mu = 0.0561
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(G + \alpha) & 99767 \\
 g & 1.9258 \\
 \sin \mu & 95037 \quad n \\
 \tan \delta & 8.1873 \quad n \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin d & 8.1873 \quad n \\
 \cos(H + \alpha) & 99733 \\
 h & 1.3109 \\
 \sin(H + \alpha) & 95318 \quad n \\
 \sec \delta & 0.0001 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log g' & 1.9025'' \\
 g & 7.9377
 \end{array}$$

$$\begin{array}{rcl}
 h' & 9.9680 \quad n \\
 h & 9.6662 \quad n
 \end{array}$$

$$\begin{array}{rcl}
 R + & 7.057 \\
 g + & 0.009 \\
 h - & 0.464 \\
 + & 3.602
 \end{array}$$

$$\begin{array}{rcl}
 g' + & 25.26 \\
 h' - & 0.299 \\
 \mu - & 1.135 \\
 + & 23.828
 \end{array}$$

11997 Reduction to Apparent Place

$$H + K = 22 \quad 40.5 = 390 \quad 7.5''$$

$$H = 23 \quad 30.7$$

$$K = 23 \quad 10.1$$

$$L = 23 \quad 35.5$$

$$W + K = 22 \quad 95.6 = 341 \quad 29.0$$

$$\delta = 0 \quad 52.5''$$

$$\log \cos \delta = 9.99999$$

$$u = 0.0562$$

$$v = 0.0361$$

$$\log \cos (C + K) = 9.9767$$

$$q = 1.9258$$

$$\sin u = 9.5037 \quad n$$

$$\tan u = 8.1883 \quad n$$

$$8.8239$$

$$\log \sec \delta = 8.1893 \quad n$$

$$\cos (H + K) = 9.9733$$

$$h = 1.3109$$

$$\sin (H + K) = 9.5318 \quad n$$

$$\sec \delta = 0.0001$$

$$8.8239$$

$$\log q' = 1.9025$$

$$g = 7.9377$$

$$h' = 9.9680 \quad n$$

$$h = 9.6662 \quad n$$

$$f + 9.057$$

$$g + 0.009$$

$$h - 0.969$$

$$+ 3.602$$

$$g' + 25.26$$

$$h' - 0.299$$

$$v - 1.135$$

$$123.828$$

11998

Lunar Parallax

10

α	23	10	08.89 ^v	π	59	06.20 ^v
δ	22	12	00.70 ^v			
$\delta - \alpha'$	3	01	51.81		9.86913	
$=$	45	27	57.15		8.23531 ^v	
$\delta(\alpha') =$	15		35.02 ^v		9.85298 ^v	
δ	45	12	22.93 ^v		0.00000	
					7.95772 ^v	
				$\delta - \alpha'$	31	10.09 ^v
				$=$	+ 2	4.67 ^v

δ	52	08	17.8 ^v
$\delta - \alpha$	52	09.5 ^v	
$\delta - \alpha'$	00	27.3 ^v	

9.82670
8.23536 ^v
9.90239 ^v
0.10265 ^v
8.06675 ^v

$\delta - \alpha'$	+ 40	05.9 ^v
--------------------	------	-------------------

δ	- 0	12	07.1 ^v
----------	-----	----	-------------------

α	23	12	13.56 ^v
----------	----	----	--------------------

$\delta - \alpha$	- 0	12	08.6 ^v
-------------------	-----	----	-------------------

$\delta - \alpha$	23	12	12.75 ^v
-------------------	----	----	--------------------

$\delta - \alpha$	+ 4.5
Cumulative Corr	- 0.1
2nd Order Ref	0.0

$\delta - \alpha$	+ 0.81 ^v
	- 0.08

Final Corr	+ 0.2
------------	-------

	+ 0.09
--	--------

δ	- 0	12	03.9
----------	-----	----	------

α	23	12	13.60
----------	----	----	-------

$\delta - \alpha$	+ 4.7
-------------------	-------

	+ 0.85
--	--------

11998

Lunar Parallax

λ'	23	10.	08.89"	π	59	06.20"
δ	25	12	00.70"			
$\lambda - \lambda'$	3	01	51.80		9.86913	
$=$	95	27	57.15		8.23534	
$\lambda(\lambda') =$	95	15	35.02		9.85298	
	95	12	22.93		0.00000	
					7.95792	
					0.00000	
					0.15208	
					0.10935	

$\lambda - \lambda'$	31	10.09
$=$	2	9.67

λ	52	08	17.8
δ	-0	52	09.5
$\delta - \delta'$	3	00	27.3

9.82690
8.23536
9.90239
0.10265
8.06675

$\delta - \delta'$	40	059
--------------------	----	-----

δ	-	12	09.4	α	23	12	13.56
----------	---	----	------	----------	----	----	-------

Ephd	-0	12	08.6	Eph1	23	12	12.75
------	----	----	------	------	----	----	-------

O-C	+7.2	O-C	+0.82
Cur. Corr	-0.1		-0.07
2nd Order Ref	0.0		

11997

Star Measures

	d		d		d
1	18928	20352	19388	19426	
12.2	17384	11912	12318	16458	
17.7	92	08	12	62	
	29	52	78	20	
	<u>12.1390</u>	<u>12.1548</u>	<u>17.7067</u>	<u>17.7036</u>	
2	20262	20058	20436	20272	
26.6	19878	15460	19168	16540	
29.6	78	62	58	38	
	70	48	28	60	
	<u>26.5389</u>	<u>26.5408</u>	<u>29.6268</u>	<u>29.6272</u>	
3	20220	20388	19224	19298	
27.3	17112	13502	13688	14808	
9.6	12	06	88	04	
	18	84	24	86	
	<u>27.3108</u>	<u>27.3718</u>	<u>9.5536</u>	<u>9.5519</u>	

Moon Measures

29		20528	20468
14.6		15448	15258
		38	58
		18	70
		<u>17.5082</u>	<u>17.5088</u>
23.5		19531	20162
14.3		14632	15040
-4		30	38
		22	60
		<u>14.4896</u>	<u>14.4878</u>
3	19798	19638	
23.4	16110	13391	
15	08	49	
	94	42	
	<u>23.3685</u>	<u>23.3704</u>	

Fairly good

11997

Star Measures

d	~	d	~
18928	20352	19388	19926
12.6 17389	11918	12318	16958
17.7 92	08	12	62
29	52	78	20
<u>12.1590</u>	<u>12.1598</u>	<u>17.7067</u>	<u>17.7036</u>
2 20262	20058	20936	20272
26.6 19878	15960	19168	16590
24.6 78	62	98	38
70	98	28	60
<u>26.5389</u>	<u>26.5408</u>	<u>29.6268</u>	<u>29.6272</u>
3 20228	20388	19224	19298
27.3 17112	13502	13688	14808
9.6 12	06	88	04
18	84	24	86
<u>27.3108</u>	<u>27.3118</u>	<u>9.5536</u>	<u>9.5519</u>

Moon Measures

1/			20528	20268
29			15498	15258
19.6			38	58
			18	70
			<u>19.5082</u>	<u>19.5088</u>
2/			19531	20162
29.2			19632	15040
19.2			30	38
-4			22	60
			<u>19.4896</u>	<u>19.4878</u>
3/	19788	19638		
23.4	16110	13391		
15	08	99		
	99	92		
	<u>23.3685</u>	<u>23.3709</u>		

11997

Moon Measures.

22

3
22
15.4

20178 20630
15736 75086
30 88
68 30
15.4981 15.4957

5
218 19992 19800
16 11779 17529
66 37
98 794
22.7728 22.7739

6
21.7 19508 20798
16.7 12368 17898
70 00
0.8 792
22.7139 22.7103

7
22 20098 20014 19920
17.5 19970 17880 15008
68 92 08
10.8 08 12
17.5134 17.5025 17.5090

8
23.4 20236 19992 20372
18 16070 14366 16402
68 74 02
38 38 78
23.4167 23.4131 23.4172

11997

Moon Measures.

21

2
23
13.4

20178	20630
15736	75086
30	88
68	30
<u>154941</u>	<u>154957</u>

5	19992	19800
228	11772	17529
16	66	37
	98	799
	<u>22.7728</u>	<u>22.7739</u>

6	19508	20798
22.7	12368	17898
167	70	00
	08	792
	<u>22.7139</u>	<u>22.7103</u>

7	20098	20019	19920
23	19970	19980	15008
17.5	68	92	08
	108	08	12
	<u>17.5134</u>	<u>17.5025</u>	<u>17.5090</u>

8	20236	19992	20272
23.4	16070	19066	16402
18	68	74	02
	38	38	78
	<u>23.4167</u>	<u>23.4134</u>	<u>23.4172</u>

R. G. Cam. 2337 Mg. 81

5 03 26.88 28 50 1.5

Puc. 1 34.68 2 ..8

900 5 5 1.56 28 52 2.3

Puc. 53.01 1 8.0

1914 5 3 54.57 28 53 10.3

~~990.20920~~

1.7916

975.9

990

985.9

9710

9790

9710

800

990

51.00

1.9916

500.8

139328

380

99739328

1.9916

990

179244

79664

9758878

2.0920

524.8

167360

83680

41840

107600

1097.88160

Old R = 2.0920

1098

1.9822

R

1.9916

997

1.8919

11998

Dimes Etc

23

Dec 29 96

Cy to Stars	2	19		2	31	
" " Moon	2	27	35.5 ^v	2	27	35.7 ^v
Clock fast		12	37.9 ^v			
H. Sed Time	2	12	00.7 ^v	5-9-+ 3 ^h 0 ^m		
H. Long	7	74	31.05 ^v			
9. Sed T.	6	56	31.75 ^v			
Red T. Moon	18	30	25.96 ^v			
Interval	12	26	05.79 ^v			
Reduction		2	2.23 ^v			
9 M. J	12	24	03.56 ^v			

From West Min.			P. A.			Dec.
Moon 12 ^h	23	11	21.89	-0	18	15.9 ^v
Motion in 1 ^m			2.119 ^v			15.267 ^v
" 27.0593			50.86	+6		7.3 ^v
Tabular Place	23	12	12.75 ^v	-0	12	8.6 ^v

Moon's Age - 5 days

Parallax	59	6.20 ^v
Semid.	16	7.9 ^v
H.	96	7.9 ^v
Aug.		8.8 ^v
ln. (5)		-0.8 ^v
H.		975.9 ^v
H.		2.0920 ^v
alt.		-997 ^v
(1+9)/H		19.923 ^v
H.		3.969 ^v

939 8.18^va - 500.8^v

+24

476.8^v

93

11998

Times Etc

23

Dec 29 '16

G. to stars	2	19		2	31
" " Moon	2	29	35.5"	2	27 35.7"
Clock fast		12	39.9"		
H. Sid time	2	12	00.7"	8-4-+ 3" 0"	
H. Long	7	79	31.05"		
g Sid T	6	56	31.75"		
Red T. Moon	18	30	25.96"		
Interval	12	26	05.79"		
Reduction		2	223"		
g H. T	12	29	03.56"		

From Hunt Allen	R. A.		Dec.	
Moon 12"	23	11	21.89 - 0	18 15.9"
Motion in 1"			2.119"	12.267"
" " 29.0593			50.86	+6 7.3"
Tubular Place	23	12	12.75" - 0	12 8.6"

Moon Age 5 days

Parallax	59	6.20"
Semid	16	7.9"
H.	96	7.9"
Aug		8.8"
Pr. (5)		-0.8"
H.		975.9"
H.		20920"
alt.		-997"
(119/11)		19923"
11"		39699"

939 8.18"

a: -500.8"

+24

976.8"

93

11994

Plate Constants

27

$$\begin{array}{rclcl}
 x & 12.1549 & 26.5396 & 27.3113 \\
 y & 11.9939 & 27.1903 & 27.7637 \\
 x-3 & + 2105 & - 6507 & - 9327
 \end{array}$$

$$\begin{array}{rclcl}
 y & 17.7051 & 29.6270 & 9.5525 \\
 y & 17.6899 & 30.0502 & 8.9526 \\
 y-y & + 202 & - 4232 & + 5999
 \end{array}$$

$$\begin{array}{rclcl}
 x-3 & +500x & +118y & +.8x & -10281 \\
 +2105 & +6077 & =+8182 & +2089 & =+10271 +10 = +10281 0 \\
 -6507 & +13270 & = 6763 & +3996 & = 10259 +21 = 10280 -1 \\
 -9529 & +13656 & = 9132 & +1127 & = 10259 +22 = 10281 0 \\
 23,7093 & +11852 & +1995 & +19 & 24,0578 \\
 & 8 & & & +53
 \end{array}$$

$$\begin{array}{rclcl}
 y-y & +500y & -110.5x & +5.9y & -7809 \\
 +202 & +8853 & =+9053 & -1393 & =+7712 +96 = +7808 -1 \\
 -4202 & +13813 & = 10581 & -2932 & = 7649 +160 = 7809 0 \\
 +5999 & +7776 & = 10775 & -2018 & = 7757 +52 = 7809 0 \\
 16,8798 & +8290 & -2649 & +89 & 16,2697 \\
 & 3 & & & -3
 \end{array}$$

$$\begin{array}{rclcl}
 \text{Tables} & a = -2.1 & e = -9 & a-e = +1.9 & b+d = -7.3 \\
 \text{Obs} & -500.8 & -505.8 & = +9.6 & = -7.5 \\
 b-e & -498.7 & -501.7 & & -0.2
 \end{array}$$

11999

Plate Constants

27

$$\begin{array}{rclcl}
 x & 12.1579 & 26.5396 & 27.3113 \\
 y & 11.9939 & 27.1903 & 27.7637 \\
 x-y & +2105 & -6507 & -9529
 \end{array}$$

$$\begin{array}{rclcl}
 y & 17.7051 & 29.6270 & 9.5525 \\
 y & 17.6899 & 30.0502 & 8.9526 \\
 y-y & +202 & -9232 & +5999
 \end{array}$$

$$\begin{array}{rclcl}
 x-y & +500y & +115y & +.8x & -1028 \\
 +2105 & +6077 & = +8182 & +2089 & = +10271 + 10 = +10281 \\
 -6507 & +13270 & = 6763 & +3996 & = 10259 + 21 = 10280 \\
 -9529 & +13656 & = 9122 & +1127 & = 10259 + 22 = 10281 \\
 23,7093 & +11,852 & +1995 & +19 & 29,0578 \\
 & & & & +5
 \end{array}$$

$$\begin{array}{rclcl}
 y-y & +500y & -110.5x & +5.8y & -7809 \\
 +202 & +8853 & = +9055 - 1395 & = +7712 + 96 & = +7808 \\
 -9232 & +19813 & = 10581 - 2932 & = 7649 + 160 & = 7809 \\
 +5999 & +9776 & = 10775 - 2018 & = 7757 + 52 & = 7809 \\
 16,9796 & +8280 & -2649 & +89 & 16,2697
 \end{array}$$

$$\begin{array}{rclcl}
 \text{Tables} & a = -2.1 & e = -9 & a-e = +41.9 & b+d = -7.3 \\
 \text{Obs} & -500.8 & -505.9 & = +9.6 & = -7.5
 \end{array}$$

$A = +7.5$ $B = +1.7$

11997		Moon's Center					25
1	X	$X - X_0$	ΔX	$(X - X_0)^2$	$(X - X_0) + (Y - Y_0)$	$O - C$	
7	24.0000	+0.2970	-15	0.0873	3.9674	-25	
2	23.7030	0.0000	-15	0.0000	3.9585	-114	
3	22.3694	-1.3336	-11	1.7814	3.9665	-34	
4	22.0000	-1.7030	-8	2.9028	3.9705	+6	
5	21.7731	-1.9299	-4	3.7261	3.9547	-152	
6	21.7121	-1.9809	0	3.9637	3.9637	-62	
7	22.0000	-1.7030	+8	3.8975	3.9654	-45	
8	22.4199	-1.2881	+11	1.6564	3.9729	+30	

$$R^2 = 3.9699$$

$$O - C = +17$$

1	Y	$Y - Y_0$	ΔY	$(Y - Y_0)^2$	$\angle$	
1	14.5085	-1.9695	3	3.8801	171	✓
2	14.9887	-1.9893	3	3.9585	180	
3	15.0000	-1.9780	2	2.1851	222	
4	15.7799	-1.0331	2	1.0677	239	
5	16.0000	-0.7780	1	0.2286	256	✓
6	16.4780	0.0000	0	0.0000	270	✓
7	17.5112	+1.0332	2	1.0679	301	
8	18.0000	+1.5220	3	2.3263	320	149°

Approx Center

$$X = 23$$

$$Y = 15.9779$$

$$17.5112$$

$$3.29561$$

$$Y_0 = 16.4780$$

$$Y_{\text{mean}} = 14.9887$$

$$R = 1.9893$$

$$1.9923$$

$$X_{\text{mean}} = 21.7121$$

$$23.7031$$

$$\text{Center} \begin{cases} X_0 & 23.7030 \\ Y_0 & 16.4780 \end{cases}$$

11997

Moon's Center

25'

i	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)^2$	O-C
1	24,0000	+0.2870	-15	0.0873	3,9677	-25
2	23,7030	0.0000	-15	0.0000	3,9585	-119
3	22,3699	-1.3336	-11	1.7819	3,9665	-39
4	22,0000	-1.7030	-8	2.9028	3,9705	+6
5	21,7731	-1.9299	-9	3.7261	3,9597	-152
6	21,7121	-1.9909	0	3.9637	3,9637	-62
7	22,0000	-1.7030	+8	3.8975	3,9659	-95
8	22,9179	-1.2881	+11	1.6564	3,9729	+30

 $R = 3.9699$

i	y	$y - y_0$	Δy	$(y - y_0)^2$	$\angle$
1	17.5085	-1.9695	-3	3.8801	171
2	17.9887	-1.9893	-3	3.9585	180
3	15.0000	-1.9780	-2	2.1851	222
4	15.9999	-1.0331	-2	1.0677	239
5	16.0000	-0.9780	-1	0.2286	256
6	16.9780	0.0000	0	0.0000	270
7	17.5112	+1.0332	+2	1.0679	301
8	18.0000	+1.5220	+3	2.3265	320

1490.

Approx Center

 $x = 23$ $y = 15.9999$

17.5112

3.29561

 y_0 16.9780 y_{mean} 17.9887 R 1.9893

1.9923

 x_{min} 21.7121

23.7031

Center $\left\{ \begin{array}{l} x_0 \quad 23.7030 \\ y_0 \quad 16.9780 \end{array} \right.$

Formation of Uranus

						err
1	-0.59	-	7.5	-5	+ 79.0	+ 34
2	0		0	0	+ 28.65	+ 34
2	+ 197	+	45.0	+ 23	+ 50.5	+ 25
4	+ 17.5	-	10.0	+ 29	- 6.0	+ 17
5	+ 0.96	+	29.40	+ 33	+ 7.30	+ 8
6	+ 0	+	123.5	+ 34	+ 0	0
7	- 17.5	+	76.5	+ 29	- 76.5	- 8
8	- 196	-	38.5	+ 22	+ 75.6	- 26
	+ 4.68	+	53.90	+ 65	+ 32.46	- 84
	- 4.30	-	56.0		- 52.5	
	+ 0.38	+	483.0		+ 472.1	
		+	16.5		- 84	
		+	648		+ 388.1	

	a	b	c	new b-c
a	- 21	- 6	+ 24	- 22 ^v
b	- 12	0	+ 24	- 16 ^v
c	- 80	+ 28	+ 18	+ 6 ^v
		+ 36	+ 12	+ 8 ^v
		+ 41	+ 6	+ 7 ^v
		+ 42	0	+ 2 ^v
		+ 36	- 12	- 16 ^v
		+ 27	- 18	- 31 ^v

$$+ 0.38 + 17.71 = - 9.90 \Delta$$

$$+ \Sigma 7 + 0 = - 0.20 \Delta$$

$$+ 17.71 = - 9.20 \Delta$$

$$+ 18.01 = - 9.67 + 0.11 = - 9.53$$

11994

Conditional Equations

26

0-c

err = -17

1	+0.30	-1.97	= -25	+11	-58"	= -39	+18
2	0.0	-1.99	= -114	0	-58	= -58	-63
3	-1.33	-1.48	= -34	-34	-38	= -72	+38
4	-1.70	-1.03	= +6	-93	= 26	= -69	+75
5	-1.93	-0.48	= -152	-49	-12	= -65	-94
6	-1.99	0.00	= -62	-51	0	= -51	-11
7	-1.70	+1.03	= -45	-43	+26	= -17	-28
8	-1.29	+1.52	= +30	-33	+39	= +16	+27
					+141	= 203	
					+192	= 181	

$$18.01 + 0.38 = +483.0 + 1648.0$$

$$+ 0.38 + 14.71 = +472.1 + 388.1$$

$$\text{Average } 48 = 93$$

$$+ [] + 101 = + 13.7$$

$$- 0.29 \Delta$$

$$+ 14.70 = + 344.4$$

$$b = + 2.54$$

$$18.01 = + 648.0 - 09.4 = + 638.6$$

$$a = + 35.4$$

$$- .53 \Delta$$

Arc Measured 189

$$\frac{p}{h} = -.145$$

$$\frac{e.v.}{h} = -7.7$$

$$\text{In } 5^{\circ} \text{ OP } 1.99$$

$$\frac{-7.7}{.145} = -53.2$$

$$\Delta P = -0.7$$

$$-2PC = -1.99$$

$$\text{Corr} = +0.5$$

$$\Delta P = -1.2$$

$$\Delta b = + 0.6$$

$$\Delta s = + 0.3$$

$$\Delta q = + 1.06$$

$$\Delta q = + 0.09$$

11994

Conditional Equations

26

err = -17

0.0

1	+0.30	-1.97	= -25	+11	-50	= -39 +18
2	0.0	-1.99	= -119	0	-56	= -51 -63
3	-1.33	-1.98	= -39	+38	-38	= -72 +38
4	-1.70	-1.03	= +6	-93	= 26	= -69 +75
5	-1.93	-0.98	= -152	-99	-12	= -68 -91
6	-1.99	0.00	= -62	+51	0	= +51 -11
7	-1.70	+1.03	= -93	+93	+26	= -17 -25
8	-1.29	+1.52	= +30	+33	+39	= +16 +29

+141 - 203

+192 - 181

$$18.01 + 0.38 = +483.0 - 1648.0$$

$$+0.38 + 14.71 = +472.1 + 388.1$$

Average ~~18~~ = 93

$$+L \quad] + 10.1 = +13.7$$

$$+14.70 = +384.4$$

$$4 = +25.4$$

$$18.01 = +648.0 - 09.9 = +638.6$$

$$2 = +35.8$$

Arc Measured 199

$$\frac{P}{h} = -1.45$$

$$\frac{E}{h} = -7.7$$

$$\frac{-7.7}{-1.45} = -53.2 \quad \Delta P = -0.7$$

11997 Morris Mean Position 27

$$\begin{aligned} X_0 & 23.7030^{\vee} \\ & +18^{\vee} \\ & 23.7048^{\vee} \end{aligned}$$

$$\begin{aligned} Y_0 & 16.9780^{\vee} \\ & +13^{\vee} \\ & 16.9793^{\vee} \end{aligned}$$

From Plate Constants

$$X \quad 24.0583^{\vee}$$

$$Y \quad 16.2699^{\vee}$$

$$Z \quad +2.0583^{\vee}$$

$$h \quad -1.7306^{\vee}$$

$$\log \xi \quad 0.31351^{\vee}$$

$$\log \tan \delta \quad 81.798^{\vee}$$

$$\cos \delta \quad 9.99999^{\vee}$$

$$\xi^2 \quad 0.6270^{\vee}$$

$$8.50729^{\vee}$$

$$7.0539^{\vee}$$

$$1.80533^{\vee}$$

$$5.8600^{\vee}$$

$$\delta - A \quad +64.02^{\vee}$$

$$\eta \quad -0.0001^{\vee}$$

$$A \quad 23 \quad 08 \quad 40.00^{\vee}$$

$$\eta_0 \quad -1.7290^{\vee}$$

$$q_0 \quad 23 \quad 09 \quad 44.02^{\vee}$$

$$\log q_0 \quad 0.23815^{\vee}$$

$$\text{Red.} \quad +3.60^{\vee}$$

$$\begin{aligned} & 7.33115^{\vee} \\ & 2.90700^{\vee} - 897.2^{\vee} \end{aligned}$$

$$q_1 \quad 23 \quad 09 \quad -47.62^{\vee}$$

$$\delta - D \quad -13 \quad 27.2^{\vee}$$

$$D \quad -0 \quad 12 \quad 36.0^{\vee}$$

$$S_0 \quad -0 \quad 56 \quad 03.2^{\vee}$$

$$\text{Red.} \quad +23.8^{\vee}$$

$$\delta_1 \quad -0 \quad 35 \quad 39.4^{\vee}$$

11997 Moon's Mean Position 27

$$\begin{array}{r} \lambda_0 \quad 23.7030^{\circ} \\ + 18^{\circ} \\ 23.7048^{\circ} \end{array}$$

$$\begin{array}{r} \gamma_0 \quad 16.9780^{\circ} \\ + 13^{\circ} \\ 16.9793^{\circ} \end{array}$$

From Plate Constants

$$\lambda \quad 24.0583^{\circ}$$

$$\gamma \quad 16.2889^{\circ}$$

$$\xi \quad +2.0583^{\circ}$$

$$\eta \quad -1.7302^{\circ}$$

$$\log \xi \quad 0.31391^{\circ}$$

$$\log \tan \delta \quad 81.798^{\circ}$$

$$\cos \delta \quad 9.99999^{\circ}$$

$$\xi^{\circ} \quad 0.6270^{\circ}$$

$$8.50729^{\circ}$$

$$\gamma^{\circ} \quad 7.0539^{\circ}$$

$$1.80533^{\circ}$$

$$5.86004^{\circ}$$

$$\delta - A \quad +69.04^{\circ}$$

$$\eta \quad -0.0001^{\circ}$$

$$A \quad 23 \quad 08 \quad 40.00^{\circ}$$

$$\eta_0 \quad -1.7290^{\circ}$$

$$\gamma_0 \quad 23 \quad 09 \quad 49.04^{\circ}$$

$$\log h_0 \quad 0.23815^{\circ}$$

$$7.33115^{\circ}$$

$$\text{Red} \quad +3.60^{\circ}$$

$$2.90700^{\circ} - 847.2^{\circ}$$

$$\gamma' \quad 23 \quad 09 \quad 47.62^{\circ}$$

$$\delta - D \quad -13 \quad 27.2^{\circ}$$

$$D \quad -0 \quad 42 \quad 36.0^{\circ}$$

$$\delta_0 \quad -0 \quad 56 \quad 03.2^{\circ}$$

$$\text{Red} \quad +23.8^{\circ}$$

$$\delta' - 0 \quad 55 \quad 39.8^{\circ}$$

11997

Lunar Parallax

α' 23 09 97.62^v
 δ 1 58 30.75^v
 $\delta - \alpha'$ + 2 48 42.83^v
 $=$ + 42 10 42.15^v
 $\frac{1}{2}(\gamma + \eta)$ 14 20.8^v
 α 41 36 01.3^v

9.95727
 0.00000
 0.12847

 0.08579

γ 50 37 9.2

$\delta - 0$ 55 39.4^v

$\delta - \alpha$ 51 32 48.6^v

9.82640
 8.23537^v
 9.89383^v
 0.11186^v

 8.06748^v

$\delta - \alpha'$ + 40 09.3^v

$\delta - 0$ 15 30.1^v

$\text{Eph} \delta - 0$ 15 39.2^v

$0 - C$ + 7.1
 Curr. Corr + 0.5^v
 Ref. Corr 0.0

$\text{In Corr} =$ + 0.3

$\delta - 0$ 15 29.8

$0 - C$ + 7.7

π 59 6.55^v

9.86913^v

8.23538^v

9.82701^v

0.00000^v

7.93151^v

$\delta - \alpha'$ 29 21.72^v

$=$ + 1 57.45^v

α 23 11 95.07^v

$\text{Eph} \alpha$ 23 11 97.28^v

$0 - C$ + 0.79^v
 + 0.00

+ 0.07

α 23 11 95.11

+ 0.83

11977

Lunar Parallax

λ^1 23 09 97.62"
 λ 1 5.8 30.95"
 $\delta - \lambda^1$ +2 98 92.83"
 $=$ +92 19 92.15"
 $\lambda^1(11)$ 19 20.8"
 λ 41 56 01.3"

9.95727"

0.00000

0.12897

0.08579

λ 50 39 9.2

$\delta - 0$ 55 39.5

$\delta - \lambda$ 51 30 98.6

9.82690

2.23537

9.89389

0.11188

8.06798

$\delta - \lambda^1$ 40 09.3

$\delta - 0$ 15 30.1

Eph $\delta - 0$ 15 39.2

O-C

+ 7.1

Circ Corr

+ 0.5

Ref Corr

0.0

Ins Corr = + 0.3

$\delta - 0$ 15 29.8

O-C + 7.9

π 59 6.65"

9.86913

8.23537

9.82701

0.00000

7.93151

$\lambda - \lambda^1$ 29 27.72

$=$ + 1 57.95

λ 23 11 95.07

Eph λ 23 11 99.28

O-C

+ 0.79

+ 0.00

λ 23 11 95.11

+ 0.83

