

U.S.U.



CACHE COUNTY
GRAVEL PIT

82 0020

1974

Weatherproof
Field Book

Book 2-74

"Rite in the Rain" paper

32 pages

BOOK No

4⁵/₈" x 7¹/₄"

2-74

CURVE FORMULAS

$$T = R \tan \frac{1}{2} I$$

$$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin. } \frac{1}{2} D}$$

$$\text{Sin. } \frac{1}{2} D = \frac{50}{R}$$

$$\text{Sin. } \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$$

$$R = T \cot. \frac{1}{2} I$$

$$R = \frac{50}{\text{Sin. } \frac{1}{2} D}$$

$$E = R \text{ ex. sec } \frac{1}{2} I$$

$$E = T \tan \frac{1}{2} I$$

$$\text{Chord def.} = \frac{\text{chord}^2}{R}$$

$$\text{No. chords} = \frac{I}{D}$$

$$\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$$

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

RIGHT ANGLE TRIANGLES. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. 10. $10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25.25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875 = \text{Base}$.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574 d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{1}{3} d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3 , etc. are the discrepancies of various results from the mean, and if $\sum d^2$ = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean = $\pm 0.6745 \sqrt{\frac{\sum d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

INCHES IN DECIMALS OF A FOOT

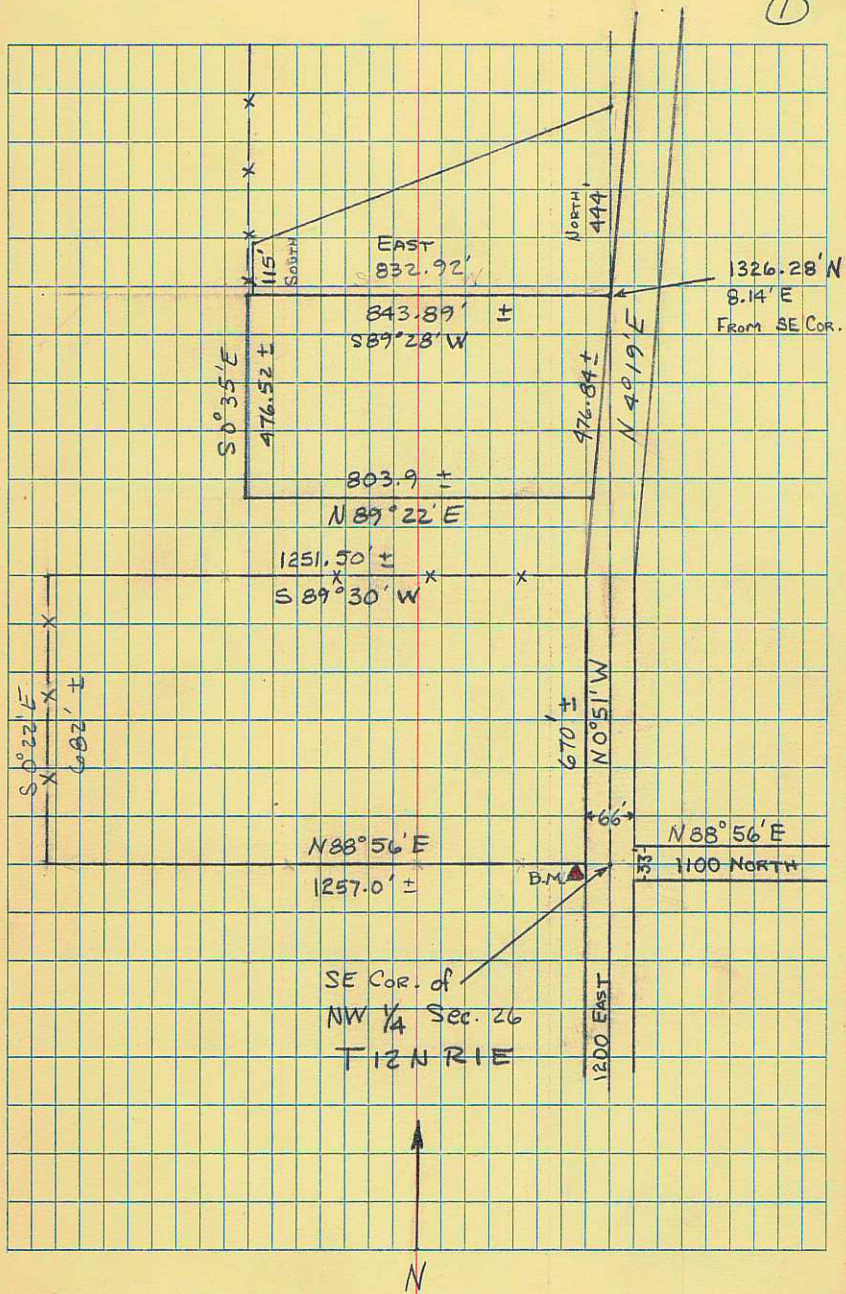
1-16	3-32	$\frac{1}{8}$	3-16	$\frac{1}{4}$	5-16	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1367	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

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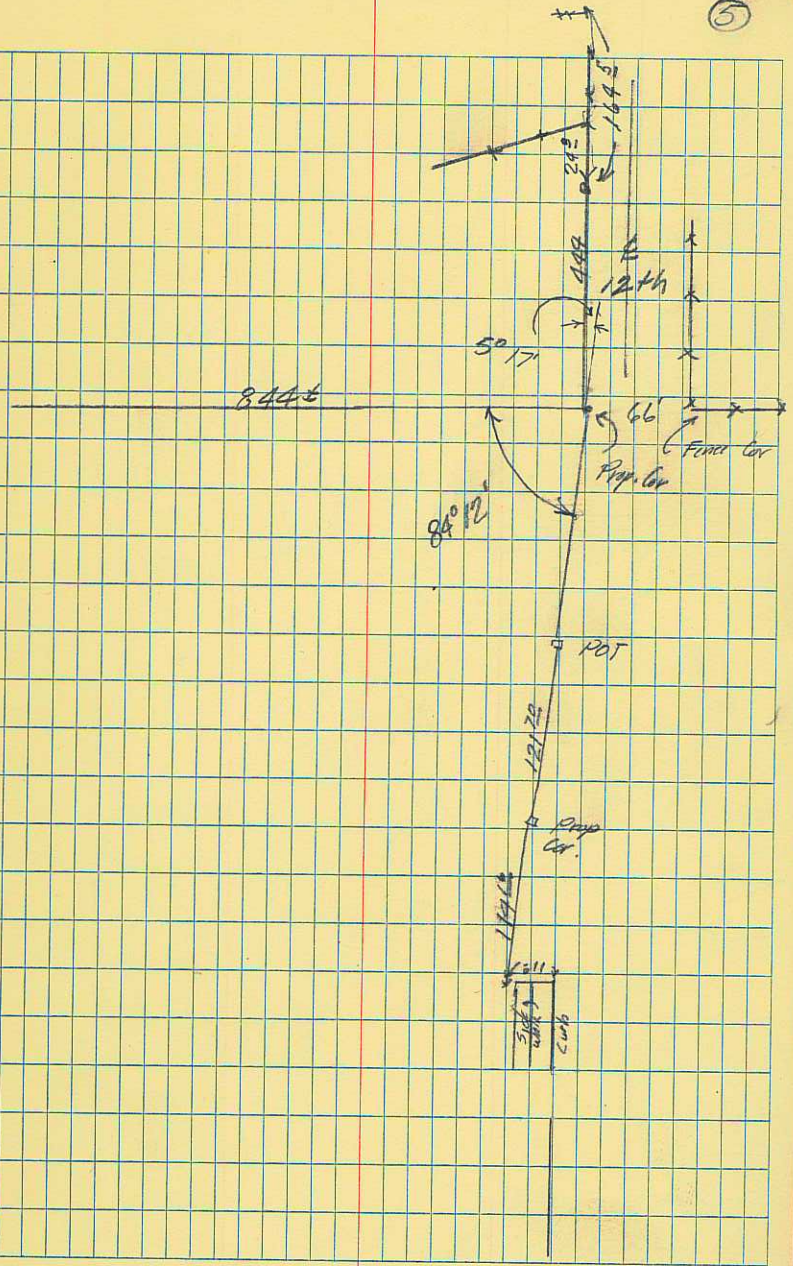
502

B.M. Elev. 4782.32 USU # 8



④

⑤



⑧

0

ELEV.
4694.0

0-(s1)

4694.5

1

4693.5

1-(s1)

4694.0

1-(s2)

4694.5

⑨

10

1-(53)

ELEV
4695.0

2-

4693.0

2-(51)

4693.5

2-(52)

4694.0

2-(53)

4694.5

11

12

2-(6A)

ELEV
4695.0

3

4692.5

3-(51)

4693.0

3-(52)

4693.5

3-(53)

4694.0

13

(17)

3-(54)

ELEV

4694.5

3-(54+76)

4694.87

4

4692.0

4-(51)

4692.5

4-(52)

4693.0

4-(53)

4693.5

(5)

16

4-(54)

ELEV.
4694.0

5

4691.5

5-(51)

4692.0

5-(52)

4692.5

5-(53)

4693.0

17

(18)

5-(54)

ELEV

4693.5

6

4691

6-(51)

4691.5

6-(52)

4692.0

6-(53)

4692.5

(19)

A large grid on page 19, mostly blank with some faint markings.

(20)

7

ELEV.
4690.5

7-(S1)

4691.0

7-(S2)

4691.5

	B.S.	H.I. Elev	F.S.	Elev
B.M.			9 ⁰¹	4721.26
T.P.	3 ⁸⁹	4730.27	9 ³¹	4726.38
T.P.	0 ⁹⁶	4735.69	12 ²⁶	4734.73
T.P.	0 ⁴⁸	4746.99	12 ⁶²	4746.51
			5 ³⁶	4753.78
T.P.	0 ⁹²	4759.14	12 ⁷²	4758.17
T.P.	0 ⁴²	4770.89	12 ⁶²	4770.99
			3 ⁸²	
B.M.	0 ⁷⁹	4783.11		4782.32

(21)

Date: - 4-12-74

TI Payne

Ward

very cold, windy

NW INSIDE CORNER OF CONCRETE DRAIN INLET

SW FENCE CORNER LOGAN CITY GRAVEL PIT

SE Property corner

2" brass disc, North east corner of sidewalk

LISU # 8

HI
Elev.

Elev.

TP	0.96	4708.10	12 ⁵³	4707.24	
T.P.	0.06	4719.77	12 ³³	4719.71	
4-4-S			3 ³	4728.8	C 34.8
4-3-S			6 ⁵	4725.6	C 32.1
3-Pit Limb			+0 ⁷	4732.8	C 38.0
3-4-S			4 ⁴	4727.7	C 38.2
3-3-S			5 ⁵	4726.6	C 32.6
2-4-S			+0 ⁵	4732.6	C 37.6
2-3-S			6 ²	4725.8	C 31.3
2-2-S			5 ²	4726.2	C 32.2
T.P.	5 ⁴⁹	4732.08	3 ⁶³	4726.39	
3-2-S			3 ⁷	4726.3	C 32.8
3-1-S			4 ²	4725.1	C 32.1
3			6 ²	4723.8	C 31.3
2-1-S			3 ⁸	4726.2	C 32.7
2			4 ²	4725.3	C 32.3
1-3-S			1 ²	4729.0	C 34.0
1-2-S			3 ⁸	4726.2	C 32.2 ^{32.7}
1-1-S			+1 ⁴	4731.1	C 37.1
1-			4 ⁰	4725.4	C 32.9
0-1-S			+6 ⁷	96.7 4729.3	42.2 C 28.2
0			5 ^{7A}	4724.3	C 30.3
B.M.	8 ⁷⁶	4730.02		4721.26	

- GRAVEL PIT FLOOR ELEVATIONS -
FINISHED GRADE

	4691.5	4691.0	4690.5	7
		4691.5	4691.0	6
	4692.5	4692.0	4691.5	5
4693.5	4693.0	4692.5	4692.0	4
4694.0	4693.5	4693.0	4692.5	3
4694.5	4694.0	4693.5	4693.0	2
4695.0	4694.5	4694.0	4693.5	1
	4695.0	4694.5	4694.0	0

4694.87

(29)

HI

FKU

Prop. Line				
7-1		8.1	4679.5	F 11.0
7-0		7.1	4678.5	F 11.5
6-1		8.7	4678.9	F 11.6
6-0		3.2	4684.4	F 7.1
6-0		2.4	4685.2	F 6.8
TP	3.25	4687.56	11.9 ⁷	4684.2 ³¹
4-1		0.4	4695.9	C 3.4
4-0		1.8	4694.5	C 2.5
5-0		5.8	4690.5	F 1.0
5-15		2.8	4693.5	C 1.5
TP	0.07	4696.28	11.89	4696.21
6-35		9.7	4698.4	C 5.9
5-25		11.9	4696.2	C 1.7
5-35		3.3	4704.8	C 11.8

470810

(25)

(26)

B.M.	8 ¹⁷	4784.71	2 ⁴⁶	4782.25
TP	11 ⁷⁹	4777.51	0 ⁹⁷	4776.54
TP	12 ⁴³	4766.18	0 ⁴¹	4765.77
TP	11.50	4756.68	2.93	4753.75
TP	12.00	4745.81	0.63	4745.18
TP		4733.96 ← (12.74)	0.15	4733.81
B.M.	11.59	4724.96 ³	2.74	4722.22 ^{4721.22}
TP	17.46	4713.91 ²	0.54	4713.37 ²
TP	11.35	4701.44	0.99	4700.45
B.M.			5.58	4690.09
TP	10.15	4690.67		
TP			2.04	4688.52 ⁵
		4687.56		

(27)

USU B.M. #3 ELEV. 4782.32

B.M. - Fence Corner - Logan City Gravel pit

Top of D.I.

Base of ^{Fence} cmt. post, 2nd post East from corner

Oct. 22 1974 Cold + Clear

(28)

TP	10 ³⁶	2 ¹⁰	4696.52
Bm	8⁵⁸	4698 ⁶²	4690.09
TP		4 ²	4725.62
O		5 ⁶	
BM	8 ⁷⁰	4729 ³²	4721.22

Rt floor

Rt Limits

3 ⁷⁰	3	2	1	(29)
924	920	915	910	7 4690.5
922	2 ¹¹ 925	15 ⁴ 920	912	6 4691.0
934	2 ⁵ C 11 ⁵ 930	2 ³ C 3 ⁸ 920	4 ⁷ C 1 ² 920	5 7 ² F 0 ⁸ 4691.5
934	C 6 ² 930	-3 ⁴ C 8 ⁷ 930	2 ² C 3 ² 925	4 ⁴ C 2 ⁵⁰ 4692.0
947	6 ⁴ C 6 ³ 940	3 ⁷ C 3 ² 930	4 ⁰ C 3 ² 930	3 ⁶ C 3 ¹⁴ 4692.5
943	+1 C 3 ⁶ 943	4 ² C 3 ¹² 940	4 ² C 3 ¹⁶ 940	3 ⁰ C 3 ²⁵ 2 4 ⁴ C 3 ²² 4693.0
954		3 ⁹ C 3 ¹⁵ 945	3 ² C 3 ²² 940	1 9 ⁵ 25 ²² 31 ²² 4693.5
				5 ⁰ 24 ²² 30 ²² 4694.0

(30)

193

3+13	28 ²	54.5
45	11 ³	70.9
boundary 7+00	10 ⁴	72.3
4+31	13 ⁰	63.7
boundary 6+00	9 ¹⁰	73.7
boundary 5+00	14 ²	68.1
boundary 2+00	22 ⁰	59.8
↑ 4 ³	19 ¹	63.6
boundary 1+00	7 ²	75.4
3+46	4 ⁴	78.3
45	6 ⁵	76.2
4+64.5	5 ²	76.9
0+00		
3+00.5 15' from w bank	11.6	71.1
↑ 3+50.5	3.3	79.4
45	4.0	78.7
4+64.5	4.0	78.7
East Bank 0+00		
BM	0.40	4782.72
		4782.32
	2" disk, 12' East end of Side walk	

(31)

ward

2-26-75

Williams

Richardson

STATION	+	HI	-	ELEV.	CUT - FILL +
3100 2100 1100N 700			52	21.9	
400N 2400N			25	24.6	
310N 3110N 1100			35	23.6	
			49	22.2	
			122	14.2	
			132	14.1	
0100 1100N			32	24.1	C74 1112
2100N 310N 3115N 0100			22	24.3	
			32	23.3	
			62	20.2	
			111	16.0	
BM	5.88	4227.10	5.88	4221.22	* Top
TP	1.57	4227.19	10.46	4225.52	
3N boundary			52	30.9	
TP	0.29	4236.08	11.65	4235.72	
2N boundary			30 + bank	37A	0648 972
TP	0.62	4246.44	12.28	4246.82	4246.82 x
1N boundary			50' to bank	43.9	
0100			50' to w bank	51.8	C799 1199
TP	0.47	4259.10	12.37	4259.23	
15 0.25			50' to w bank	58.9	
East boundary			15' to bank	65.0	
TP	0.20	4271.60	11.32	4271.40	
		4282.72			

DATE -										
X -	C78 ⁴	C62 ²	C91	F95	F10 ⁵	C18				
φ -	925	920	915	910	905	900				
	1191				7700					
	C80 ⁷	C90			F99	F02				
	1211	925	920	915	910	905				
	(2783)				6700					
	C70 ⁴	C02	F03	C19	C01	C16	C11 ⁶			
	935	930	925	920	915	910	905	(1+53)		
					5700					
	C17 ³	F03	C01	C00	C21	C32	C13 ⁶			
	942	935	930	925	920	915	910	(1+62)		
					4700					
	C33 ⁷	C7L	C0 ²	C14		C16 ⁸	C22 ²	C15 ⁴		
	945	940	935	930	925	920	915	+44		
					3700					
	C35 ⁶	C21 ⁵	C20 ⁵	C15	C27 ³	C32 ¹	C21 ⁵	C30 ⁴		
	950	945	940	935	930	925	920	915		
					2700					
	C68 ¹	C32 ³	C31 ⁵	C313	C311	C30 ⁶	C29 ⁷	C22 ²	C22 ¹	
	955	950	945	940	935	930	925	920	915	
					1700					
	C80 ²	C44 ¹	C39 ¹	C30 ¹	C30 ⁸	C30 ³	C27 ⁷	C27 ⁸		
	960	955	950	945	940	935	930	925	920	
	1214	3446			0700					
	C82 ²	C76 ⁶	C70 ²	C64 ⁴	C51 ⁹	C50 ⁴	C44 ³	C38 ²		
	1241	113 ⁴	105 ²	96 ²	86 ³	75 ²	66 ²	57 ²		
			1/2"	1/2"	Boundary					

34
STATION

+

HI

-

ELEV.

CUT...
FILL out

2+51 Fink

20³ 06.1

2+44W

19⁵ 06.9

2 N
3+00

12² 13.5

2+86N

19[±] 07.3

2+72N

15[±] 10.6

2 N
2+00

12.9 13.5

TP 2+00 & 5.49
on hub,

4226.43 10.47 4220.94

25

16⁹ 14.5

35

2+00

15[±] 16.0

3+25

6+00

25

5+00

19 29.5

4+00

12⁰ 18.9

4+33

4+00

20^L 11.3

55

5[±] 25.9

45

3+00

6⁹ 24.5

45

8[±] 23.2

2+00

0[±] 30.6

25

+7[±] 39.1

15

0+00

+2[±] 33.6

35

4^L 27.3

25

5[±] 26.0

15

6^L 25.3

1+00 00

on ground

6.2 25.2

TP

7.08

4431.41

277

4224.33

4227.10

35

1.0

0.1

0.2

33.0

6

39.0

+1.8

45.0

12.1

19.0

11

(36)

5100		11 ⁴	91.6
5100 ^{IN}		10 ⁴	92.6
1+30		7 ⁰	96.0
6100 1+53N		8 ⁴	94.6
1+77N		5 ^L	98.0
5100 1+53N		0 ⁹	02.1
4100 ^{IN}		9 ³	93.7
3+00 ¹⁵		8 ⁹	94.1
2+00 ¹⁵		8 ⁰	95.0
12 ⁵		9 ⁵	93.5
3+00 ³⁵		1 ⁹	01.1
4 ⁵		+ 8 ⁰	11.0
3 ⁵		10 ³	92.7
2 ⁵		9 ⁹	93.1
1 ⁵		10 ⁶	92.4
4+00 on Ground		8 ⁹	94.1
TP	0.30	4702.97	
TP		12.73	4702.67
		12.75	4702.65
3+00 ^{IN}		6 ⁶	08.8
TP	2.18	4715.40	13.21
2+14N Fence		23 ²	03.2
1+62		21 ⁸	04.6
4+00		11 ³	15.1

4726.93

(37)

BM	2nd post from cor	6.32	4690.09*
TP	7.17	4696.42	2.63
	↑ 1+15	10	90.9
	7+00 IN	0.1	91.8
	(1N	10.2	81.9
	6+00	9.8	82.1
	7+00 50N	12.3	79.6
	7+30±	12.0	79.9
	7+00	11.1	80.2
	7+00 ¹⁵	9.9	82.0
TP	0.48	4691.88	11.57
		7.6	4691.40
	7+00 ²⁵	1.8	01.2
	6+00 ³⁵	0.9	02.1
	3+60 ⁵	9.0	94.0
	35	9.8	93.2
	25	11.4	91.6
	15	9.6	93.4
5+00			4702.97

(59)

0+00	C 30 ⁺	1+00	31 ⁺
1 s	C 39 ⁺	1 s	
2 s	C 45 ⁺	2 s	
3 s		3 s	
4 s		4 s	
1 N	C 30 ⁺	1 N	30 ⁺
2 N	C 30 ⁺	2 N	29 ⁺
3 N	C 27 ⁺	3 N	22 ⁺
4 N		3-15 N	22 ⁺

(60)

60

$$\begin{array}{r}
 480.4 \\
 .987 \\
 \hline
 336.28 \\
 38432 \\
 43236 \\
 \hline
 474.1548 \\
 379.05 \\
 \hline
 95.10
 \end{array}$$

$$\begin{array}{r}
 476.52 \\
 129.06 \\
 \hline
 604.58 \\
 474.15 \\
 \hline
 110.43
 \end{array}$$

61

$$\begin{array}{r}
 390.98 \\
 972 \\
 341 \\
 \hline
 972 \\
 8748 \\
 2916 \\
 \hline
 379.052 \\
 108.04 \\
 95.10 \\
 \hline
 12.96
 \end{array}$$

$\angle 89^{\circ}03'$
 798.01

4721.26
8.76
4730.02

4735.69
9.31
4726.38
3.89

4766.18
11.74
4777.92

4730.02
3.63
4726.39
5.69

4730.27
89-28

4730.27
9.01
4721.26

4738.08

4732.08
12.37

4770.89
12.72

89-28
0-35

4758.17

89-63

179-60
90-03

4-19

4753.75
12.43

4766.18
89-28
4-19
85-09

4735.67

4759.14
5.36

4753.78

4783.11
12.62

4759.14
12.63

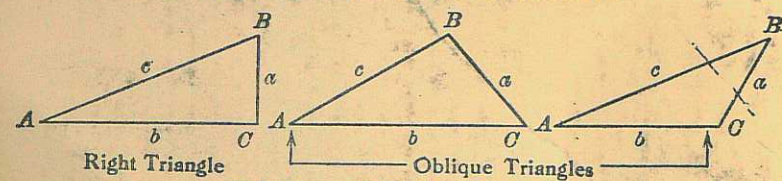
4746.51

4746.99
12.26

4770.49

4734.73

TRIGONOMETRIC FORMULAS



Solution of Right Triangles

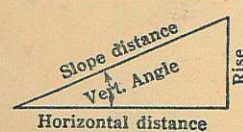
For Angle A, $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\text{cosec} = \frac{c}{a}$

Given	Required	Formula
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B$, $c = \sqrt{a^2 + b^2} = a \sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B$, $b = \sqrt{(c+a)(c-a)} = c \sqrt{1 - \frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90^\circ - A$, $b = a \cot A$, $c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90^\circ - A$, $a = b \tan A$, $c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90^\circ - A$, $a = c \sin A$, $b = c \cos A$

Solution of Oblique Triangles

Given	Required	Formula
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$, $C = 180^\circ - (A + B)$, $c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$, $C = 180^\circ - (A + B)$, $c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180^\circ - C$, $\tan \frac{1}{2}(A - B) = \frac{(a - b) \tan \frac{1}{2}(A + B)}{a + b}$, $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a + b + c}{2}$, $\sin \frac{1}{2}A = \sqrt{\frac{(s - b)(s - c)}{bc}}$, $\sin \frac{1}{2}B = \sqrt{\frac{(s - a)(s - c)}{ac}}$, $C = 180^\circ - (A + B)$
a, b, c	Area	$s = \frac{a + b + c}{2}$, $\text{area} = \sqrt{s(s - a)(s - b)(s - c)}$
A, b, c	Area	$\text{area} = \frac{bc \sin A}{2}$
A, B, C, a	Area	$\text{area} = \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10'. Since $\cos 5^\circ 10' = .9959$, horizontal distance = $319.4 \times .9959 = 318.09$ ft. Horizontal distance also = Slope distance minus slope distance times (1 - cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. $\cos 5^\circ 10' = .9959$, $1 - .9959 = .0041$. $319.4 \times .0041 = 1.31$. $319.4 - 1.31 = 318.09$ ft.

When the rise is known, the horizontal distance is approximately the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance = $302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.