Extracts

[illegible]

Mathematics

C Walker [illegible]

By

by David Ferguson

David

David

Ferguson

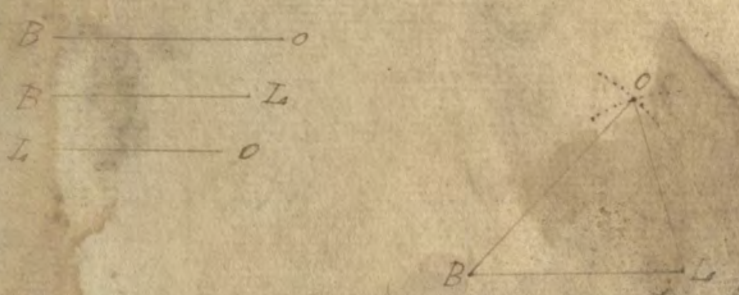
Mistake ~~November the [illegible] 18[illegible]~~

October the [illegible] 182[illegible]

Geometrical Problems

Problem 1

To make a triangle of three given right lines BO. LB. LO [of] which any two must be greater than [the] third fig 42

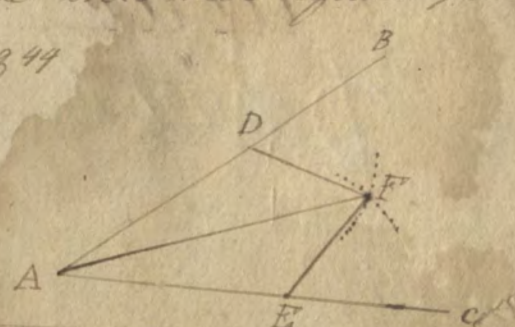


Problem 2

At a point B in a given right line BC to make an angle equal to a given angle ED fig 43

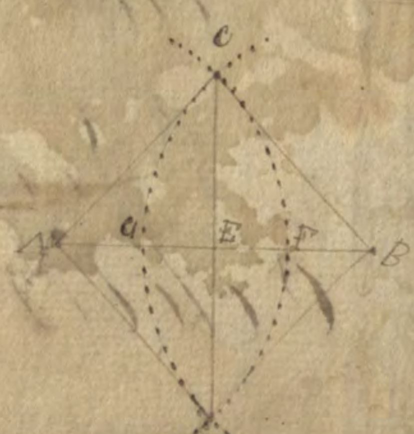
Problem 3d

To bisect or devide into two equal parts any given right lined angle B A C fig 44



[Pro]blem 4th

[To] bisect a right line A B fig 45



Problem 5th

On a given point A in a right line E F to erect [...] fig 46th

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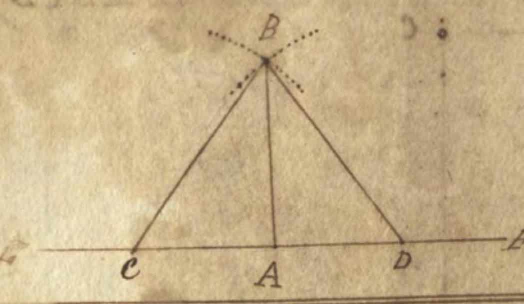
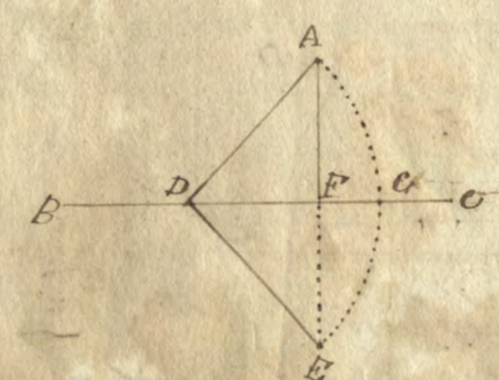


Problem 6th

To raise a perpendicular on the end B of a right line A B fig 47

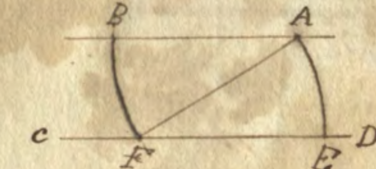
Problem 7th

From a given point A to let fall a perpendicular upon a given line B C fig 48th



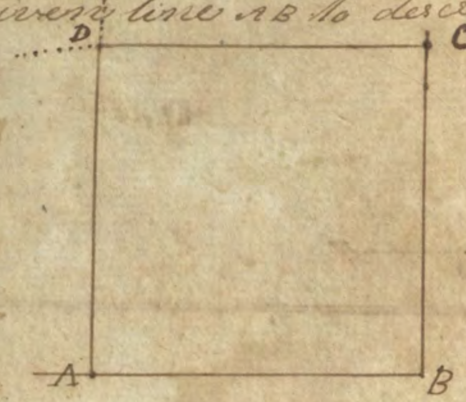
Problem 8th

Thro a given point A to draw a right line A B parallel to a given right line CD fig 49th



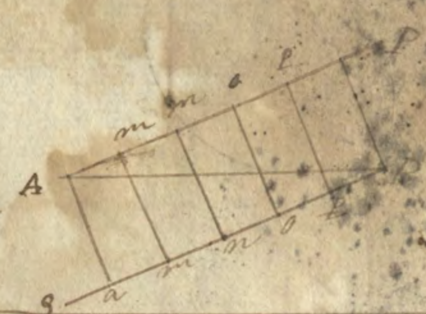
Problem 9th Oct 20th 1826

Upon a given line AB to describe square ABCD fig 50



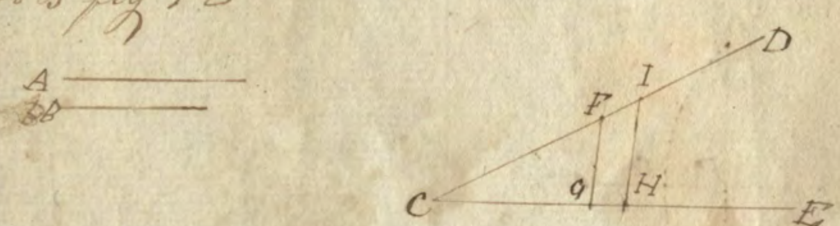
Problem 10th

To devide a given right line AB into any proposed number of equal parts fig 51



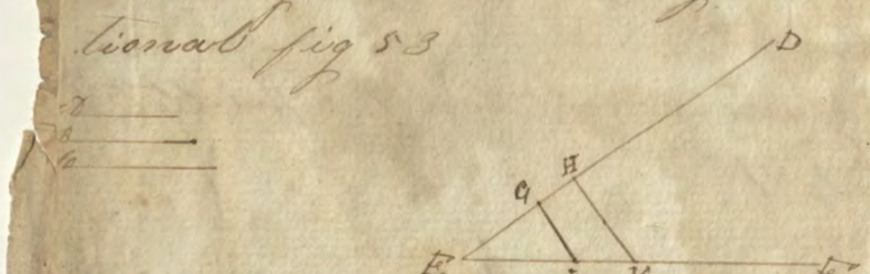
Problem 11th

To find a third proportional to two given right lines AB fig 52



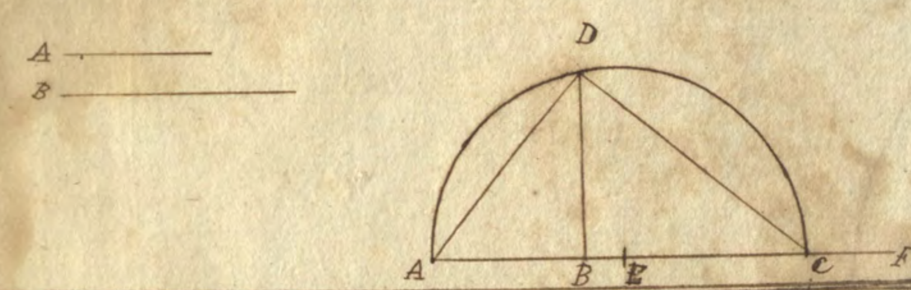
Problem 12th

Three right lines A.B.C given to find a fourth propo tional fig 53



Problem 13th octobe the 21. 1826

Two right lines A and B given to find a mean propor tional fig 54th

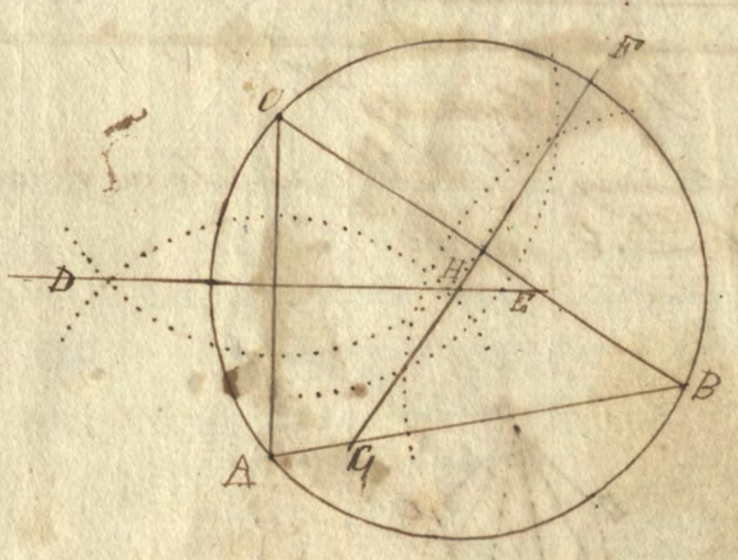


Problem 14th

To devide a right line AB in the point E so that AE Shal have the same proportion to EB as two given lines C and D have fig 55th

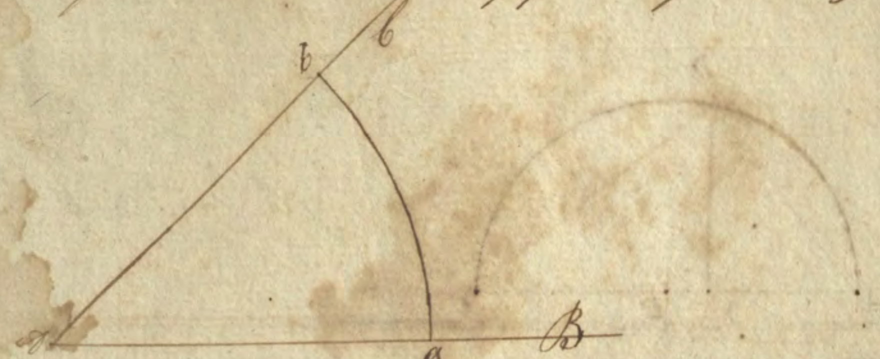
Problem 15th

To discribe a circle about a triangle A.B.C (or which is the same thing) thro any three points A.. B.. C which are not situated in a right line fig 56th



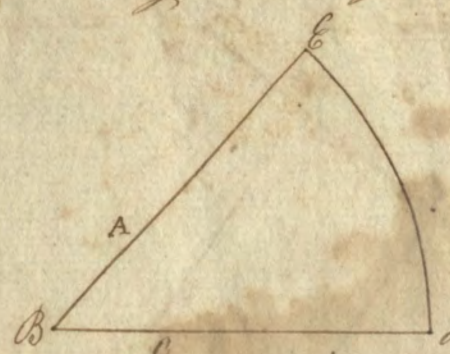
Problem 16th October the 23d 1826

To make an angle of any number of degrees at the point A of the line A.B suppose of 45 degrees fig 57th



Problem 17th

To make a given angle A.B.C fig 58th



Problem 18th

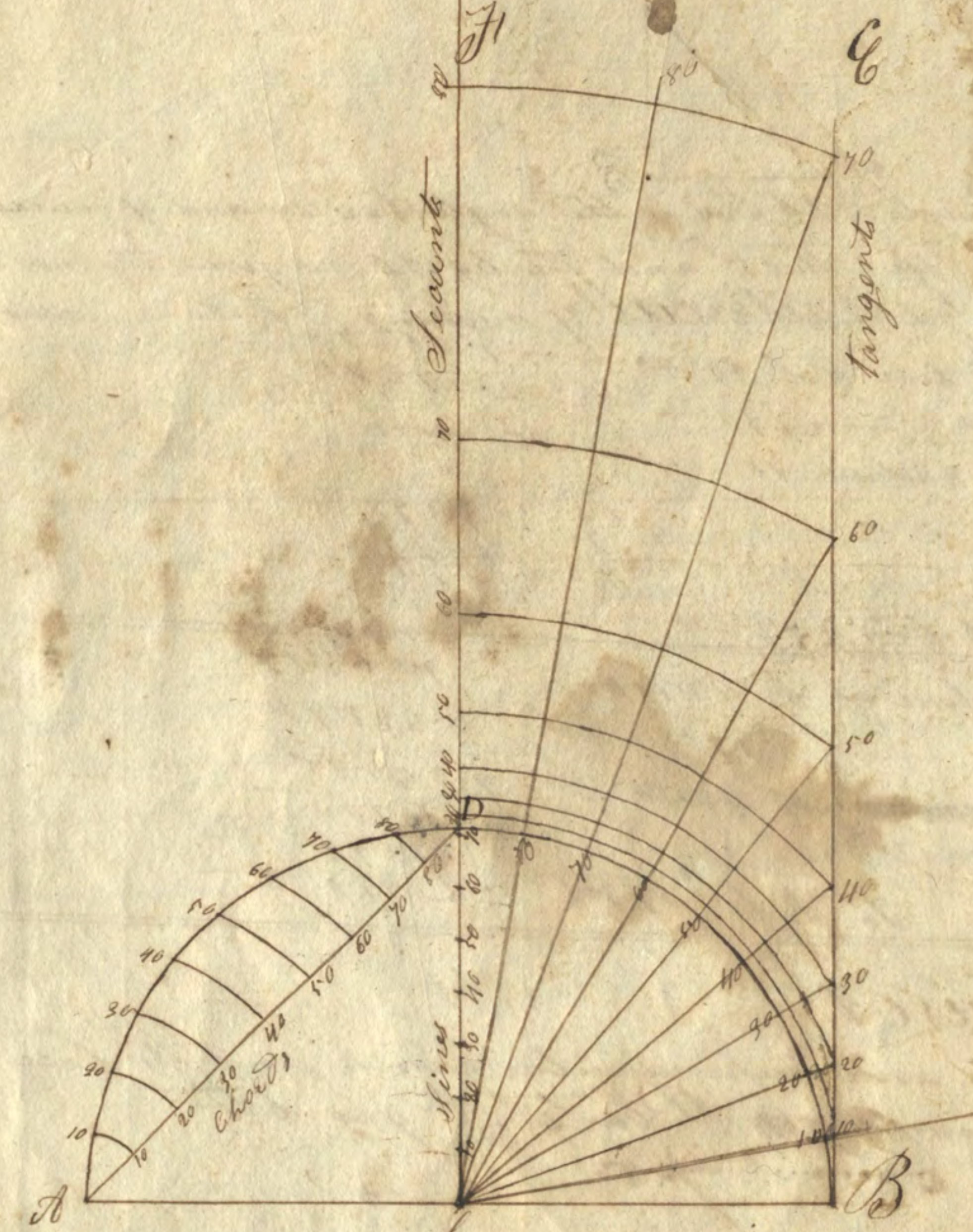
To make a triangle B.C.E equal to a given quadrilateral figure A.B.C.D fig 59th

~~To make~~ Problem 19th

To make a triang. D.F.H equal to a given five sided figure A.B.C.D.E fig 60th

Problem 20th October the 23 1826

To project the lines of Chords Sines tangents and Secants To any radius fig 61th



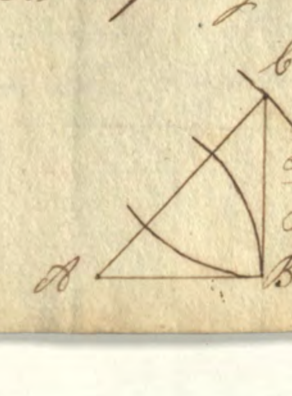
Rectangular Trigonometry

Case 1st

The angles and hypothenuse given to find the base and perpendicular fig 64 plate 5th

In the right angled triangle A.B.C Suppose the angle A 46° 30' and consequently the angle C 43° 30' by Cor. 2 Theo 5 and A.C 250 parts as feet, yards, miles &c required the legs A.B and B.C

by Calculation

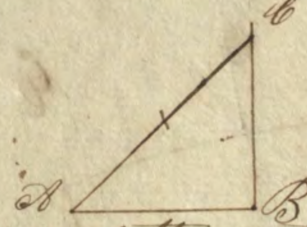


As radius 90° — 10.00000
Is to A.C. 250 — 2.39794
So is the Sine of A 46° 30' 9.86056
To B.C. — 181.3 .... 2.25850

As radius 90 10.00000
Is to A.C 250 2.39794
So is Sine C 43° 30' 9.83781
To A.B 172.1 2.23575

Case 2

The base and angle given to find the perpendicular and hypothe
fig 3



In the triangle A.B.C there is the angle A 42° 20" and of course the angle
C 47° 40" by cor 2 theo 5th and the leg A.B 190 given to find A.B. & A.C
Geometrically making A.C the radius

As the sine of C 47° 40" — 9.86879
 2.27875
Is to A B — 190 — 10.00000
So is the radius 90 —

12.27875
9.86879
2.40996

To A C = 257

As the sine of C 47° 40" — 9.86879
 2.27875
Is to A B — 190 — 9.82830
So is the ~~sine~~ of A 42.20 — 12.10705
9.86879

To B C 175.1 2.23826

Case 3

The angles and perpendicular given to find the base and
hypothenuse ~~fig 4~~ Plate 5th fig 6th

In the triangle A.B.C there is the angle A 40 and consequently the angle
C 50 with B.C 170 given to find A.C and A.B
As ~~the sine of~~ the angle A 40 — 9.80807
Is to B C — 170 2.23045
So is the Radius — 90 10.00000
 12.23045
 9.80807
To A C 264.4 — 2.42238

As radius — 90 10.00000
Is to A C 264.4 2.42226
So is the sine of C 50 9.88425
To A B 202.5 — 2.30651

Case 4th

The base and hypothenuse given to find the angles and
perpendicular Plate 5th fig 7th

 90
 36.52
By cor 2 theo 5th the angle A 53.08
90 — 36.52" 53.08"

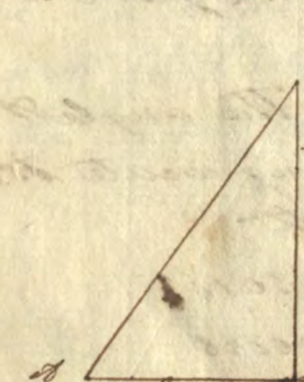
In the triangle A.B.C there is given A.B 300 and A.C 500
the angles A. and C and the perpendicular B.C are required

As A.C. 500 — 2.69897
Is to radius 90 10.00000
So is A B 300 2.47712
12.47712
2.69897
To the sine of C 36.52 9.77815

As radius 90 10.00000
Is to A C. 500 2.69897
So is the sine of A 53.08 9.90301
12.60198
10.00000
To B.C 400 2.60198

Case 5th

The perpendicular and hypothenuse given to find the angles
and base Plate 5th fig 8th
In the triangle A.B.C there is B.C 306 and A.C 370 given
to find the angles A and C and the base A B



As A.C 370 2.56820
Is to radius 90 10.00000
So is B.C. 306 2.48572
12.48572
2.56820
9.91752
To the sine of A 55.48

As R 90
~~Is to~~ 370
So is the S of

90
55.48
145.48
180
145.48
Ang C + 34.12

As Radius 90 10.00000
Is to A.C 370 2.56820
So is the sine of C 34.12 9.74980
To A B 208.12 2.31800

Case 6th

The base and perpendicular given to find the angles
and hypothenuse Plate 5 fig 9th
In the triangle A.B.C there is A.B 225 and B.C 272 given
to find the angles A and C and the hypothenuse A.C

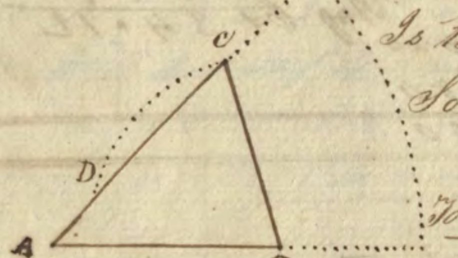
As AB 225   2.35218
Is to radius 90   10.00000
So is BC 272   2.43457
12.43457
2.35218
10.08239
To the tangent of A 50.24"

As radius 90°   10.00000
Is to AB 225   2.35218
So is the secant of 50.24" A 10.19557
2.54775
To AC 353

By the Square root
272 } 225
272 } 225
544 } 1125
1904 } 450
544 } 450
73984 } 50625 Square of AB
73984
{124609 {353 AC
3 } 9
65 } 346
5 } 325
703 } 2109
2109

oblique angular trigonometry

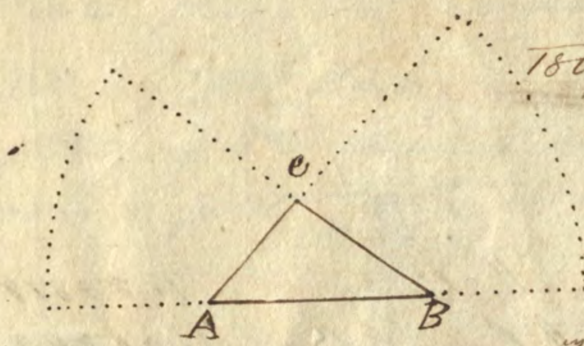
Two sides and an angle opposite to one of them given to find the other angles and side
In the triangle A.B.C there is given A.B 240 the angle A 46°30" and B.C 200 to find the angle C being acute the angle B and the side A.C fig 44 Plate 2th



As B.C 200   2.30103
Is to the sine of A 46.30"   9.86056
So is A.B 240   2.38021
12.24077
2.30103
To the sine of C 60.31   9.93974
As the sine of A 46.30"   9.86056
A 60.31   Is to B.C 200   2.30103
Sum of C 46.30"   So is the sine of 72.59   9.98056
180.00 107.1   12.28159
107.01   9.86056
72.59 Sine of B   To A.C 263.7   2.42103

Case 2d october the 25th 1826.

Two angles and a side given to find the other sides
In the triangle A.B.C there is the angle A 46.30" A.B 230 and the angle B 37.30" given to find the A.C and B.C fig 48th
A 46.30"
B 37.30"
180 from 84 00 gives C 96.00

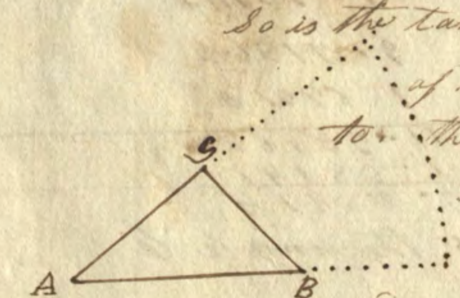


As the sine of C 96.00   9.99761
Is to AB 230   2.36173
So is the sine of B 46.30   9.86056
12.22229
9.99761
To BC 167.8"   2.22468

As the sine of C 96.00   9.99761
Is to A.B 230   2.36173
So is the sine of B 37.30"   9.78445
12.14618
9.99761
To A.C 140.8"   2.14857

Case 3d fig 49th

Two sides and a contained angle given to find the other angle and side
In the triangle A.B.C there is A.B 240 the angle A 36.40 and A.C 180 given to find the angles C and B and the side B.C As the sum of the two sides AB & AC 420   2.62325
Is to the sum of their difference 60   1.77815
So is the tangent of half the sum 71.40   10.47969
of the two unknown angles C B   12.25784
2.62325
to the tangent of half their differ. 23.20   9.63459
half difference 23.20   9.63325

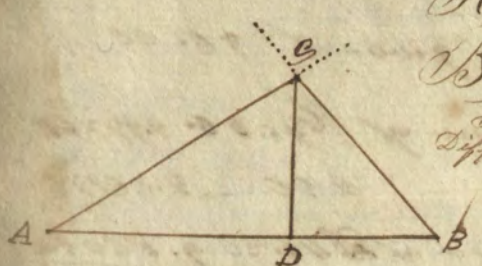


To half the sum of the two angles C&B   71.40
Add half their difference as now found   23.20
The sum is the greatest angle or angle C   95.00
Subtract and you have the least angle or B 48.20
As the sine of C 95   9.99834
Is to AB 240   2.38021
So is the sine of A 36.40   9.77609
12.15630
9.99834
To B.C 143.8   2.15796

Case 4th

The Sides given to find the angles fig 50th
In the triangle A.B.C there is given A.B 64. A. C 47
B. C 34: the angles A B C are required

A C 47
B C 34
Sum 81 ~~difference 13~~
Difference 13



As the base or the longest side A B. 64		1.80618
Is to the Sum of the other sides A C and B C	81	1.90849
So is the difference of those sides	13	1.11394
To the difference of the Segments of the base AD and DB	16.4	3.02243
		1 80618
		1.21625

2)64

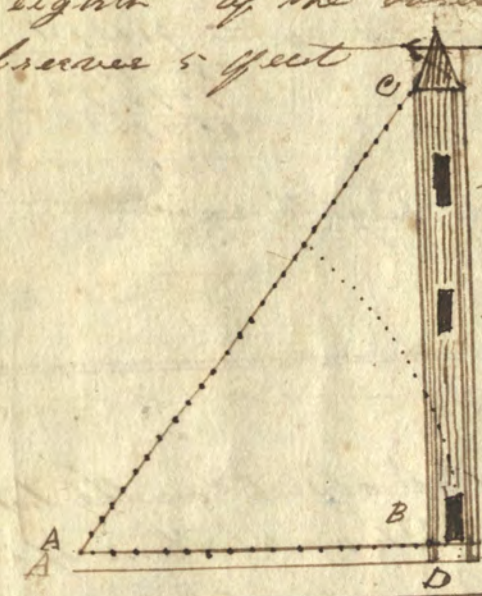
To half the base or to half the sum of the segments AD and BD } 32
2)16.46 Difference
~~Add half there difference now found 8.23~~
There Sum will be there greatest Segment 40.28
Subtract and there difference Will be the least Segment DB } 23.77

As AD	40.23	1.60455
Is to Radius	90	10.00000
So is AC	47	1.67210
		11.67210
		1.60455
To the secant of A	31.08	10.06755
As BC	34	1.53148
Is to the sine of A	31.08	9.71352
So is AC	47	1.67210
		11.38562
		1.53148
To the sine of B 45.37		9.85414

A 31.08
180 76.45 less 103.15 the angle C

Case 1 Of heighths accessible

Plate 5th Fig 19th Problem 1st
To find the heighth of a perpendicular object at one Station Which is on an horizontal plain
A Steeple The angle of altitude 53 degrees
Distance from the observer to the foot of the Steeple or the base 85 feet
Heighth of the observer instrument or of the observer 5 feet

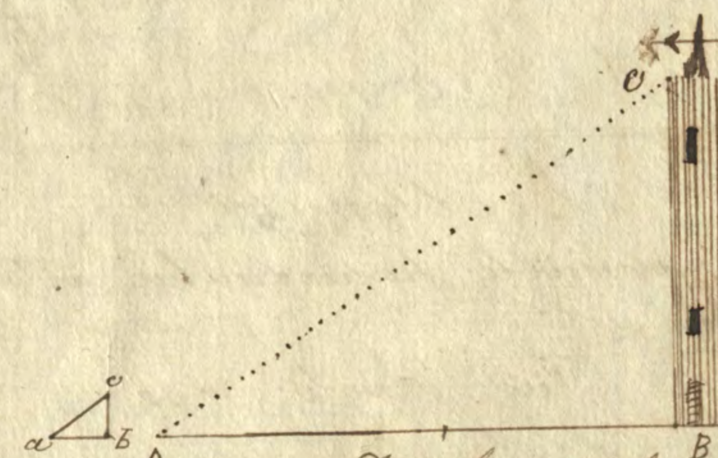


As the sine of C.	37	9.779446
Is to A.B	85	1.92942
So is the sine of A	53.	9.90235
		11.83177
		9.77946
B C 112.8		2.05231

B C 112.8 the heighth of the observer
add DB 5
117.8 or 118 the heighth of the Steeple required

Plate 5th fig 20th Case 2

To find the heighth of a perpendicular object on an horizontal plain by having the length of the given Shadow
A.B the lenghth of the Shadow of the Staff 15 feet
C.B the length of the Staff 10 feet
AB the length of the Shadow of the Steeple or object 135 feet

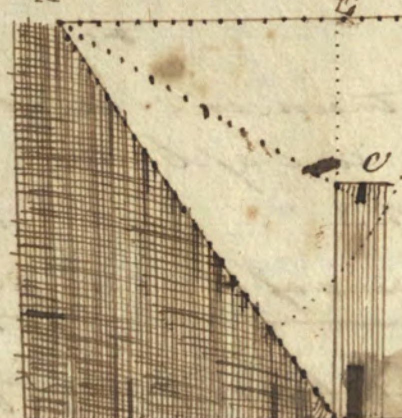


As ab ab A AB
As 15.. 10 ... 135
10
15)1350(90 the Steeples
135
0 heightt required

Problem 3d october the 26th 1826

To take the altitud of a perpendicular object at the foot of a hill from the hills side
Angle to the foot of the object 55·15 Angle to the top of it 31·15" Distance to the foot of it 250 feet

24
34·45"
58·45"
180·
121·15

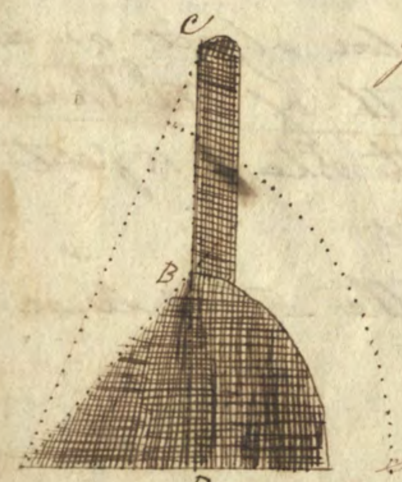


As the sine of C 121·15" 9·93192
Is to AB 250 2·39794
So is the sine of A 24 9·60931
12·00725
9·93192
2·07583

149 feet the heighth required

Problem the 4th

To take the altitud of a perpedicular object on the top of a hill at one Station when the top and bottom of it can be seen from the foot of the hill



given { Angle to the bottom 48·30"
Angle to the top 67·00"
Dist to the foot of the object 136 feet
Required the heighth of the object }

The angle A.C.D the compliment of C.A.C 23·00 C.A.B the difference betwen the two given angles 18·30"

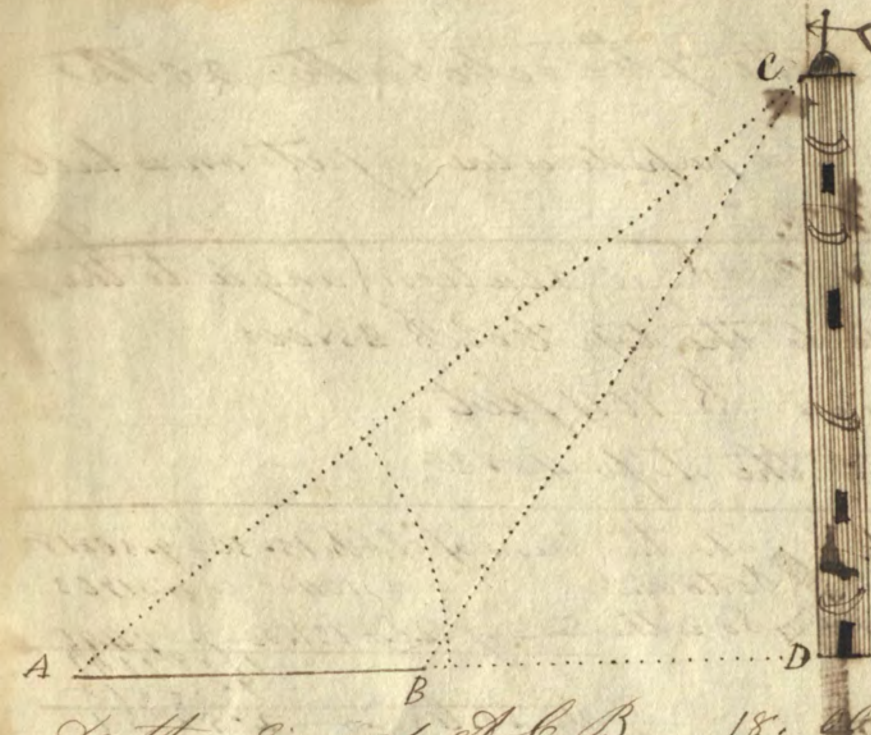
As the sine of C 23 9·59188
Is to A.B. 136 2·13354
So is the sine of C.A.B 18·30 9·50148
11·63502
9·59188
To B C 110·5 or ½ 2·04314

Problem 5th

To take an inaccessible perpendicular altitud on an horizontal plane

given { First Angle 55·00
Stationary distance 87 feet
Second angle 37·00" }

The heighth of the tower C D is required



As the Sine of A.C.B 18·00 9·48998
Is to A. B 87 1·93952
So is the Sine of A 37 9·77946
11·71878
9·48998
Is to BC 169·4 2·22880

As radius 90 10·00000
Is to BC 169·4 2·22891
So is the sine of C.B.D 9·91336
12·14227
10·00000
To D.C 138·8 heighth required 2·14227

Case Problem 6th

Let B C a maypole whose heighth is 100 feet be broke at D the upper part of which D.C falls upon a horizontal plane So that its extremity C is 34 feet from the bottom or foot of the pole
Require the Segments B.D. and D.C

As B.C 100 2·00000
Is to radius 90 10·00000
So is A.B 34 1·53148
11·53148
2·00000
So is the tangent C 18·47 9·53148

As the sine of A.B.D 37·34 9·78510
Is to A.B 34 1·53148
So is radius 90 10·00000
11·53148
9·78510
To A D or D C 55·77/100 1·74638

BC·100
DC·55·77
DB·44·23
as required

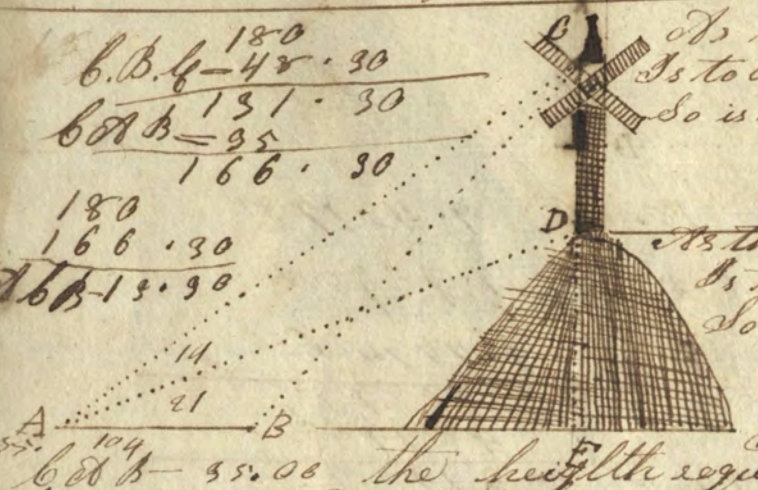
Problem the 7th octobeethe 28th

To take the altitude of a perpendicular object on a hill from a plane beneath it

Plate 5th Fig 4th First Station angle to the foot A.B 21.00 Angle to the top C.A.B 35.00"

Stationary distance A. B 104 feet

Second Station angle to the top 48.30



C.B.E 180 − 48.30 = 131.30

C.A.B 35 → 166.30

180 − 166.30 = A.C.B 13.30

As the Sine of A.C.B 13.30 — 9.36818
Is to A.B. 104 — 2.01703
So is the Sine of A.B.C 131.30 — 9.87446

11.89149
9.36818

To A.C 333.6 — 2.52331

As the Sine of A.D.C 111 — 9.97015
Is to A.C 333.6 — 2.52323
So is the Sine of C.A.D 14 — 9.38368

11.90691
9.97015

To D.C 86.46 — 1.93676 the heighth required

C.A.B — 35.00
D.A.B 21.00
C.A.D — 14

D.A.B 90
C.A.B 35
A.C.B 55
C.A.D 14
69
180
A.D.C 111

Problem 8th

To find the length of an object that stands obliquely On the top of a hill from a plane beneath

Let C.D be a tree whos length is required

This is done at two stations

First Station angle to the foot C.B.D 36.30"

Angle to the top C.B.C 44.30"

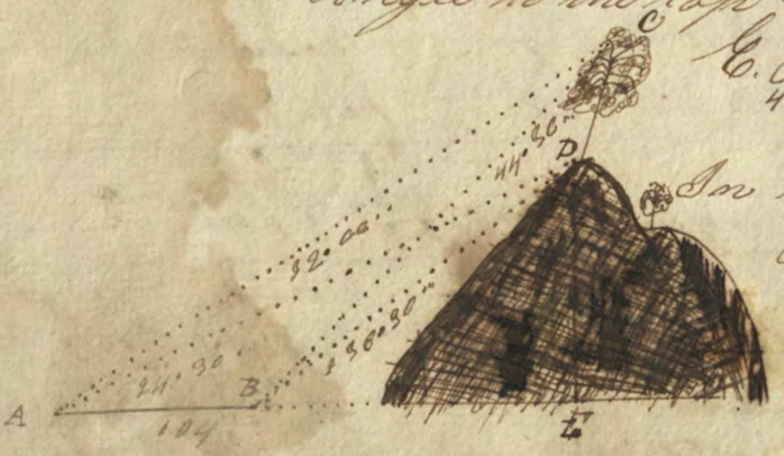
Stationary distance A.B 104 feet

Second Station Angle to the foot C.A.D 24.30"

Angle to the top C.A.C 32.00"

C.B.C — C.A.C — A.C.B
44.30 — 32 — 12.30

In the triangle A.B.C find B.C thus



1st As the Sine of A.C.B 12.30" — 9.33534
Is to A.B 104 — 2.01703
So is the Sine of A — 9.72421

11.74124
9.33534

To B.C 254.7 — 2.40570

2d C.B.D 36.30 — C.A.D 24.30 = 12.00 — 12.00 A.D.B remain

As the Sin of A.D.C 12.00 — 9.31788
Is to A.B 104 — 2.01703
So is the Sine of D.A.B 24.30' — 9.61775

11.63476
9.31788

To D.B 207.4 — 2.31688

C.B.C 44.30 — C.B.D 36.30 = 8 — C.B.D 8.00"

In the triangle C.B.D there is given C.B 254.7 D.B 207.4 and the angle C.B.D 8.00 to find D.C

~~D.opp B.D.C + B.C.D.~~

As the Sum of the two Sides B.C and D.B 462.1

207.4
254.7

Is to their difference

254.7
207.4
47.3 Differ

So is the tangent of half the two unknown angles

180
8 Angle B
172 Sum of the unknown angles
86 half Sum

to the tangent of half their Difference

~~Sum of the Sides~~
~~Difference of the Sides~~

Sum of the two Sides 462.1 — 2.66474
Difference of the Sides 47.3 — 1.67456
half Difference of the two unknown angle 86 — 11.15536

10.83022
2.66474
10.16548

Tangent of half their difference 55.40

add 55.40 + 86 = 141.40 a Angle B.D.C

Subtract 86 − 55.40 = 30.20 angle B.C.D

As the Sine of B.C.D 30.20 — 9.70332
Is to B.D 207.4 — 2.31681
So is the Sine of C.B.D 8.00 — 9.14356

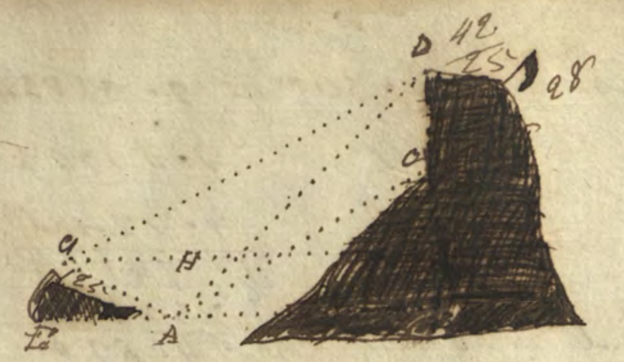
11.46037
9.70332

the length of the tree D.C 57.15 — 1.75705

As radius 90 — 10.00000
Is is to B.D 207.4 — 2.31681
So is the sine of D.B.E 36.30 — 9.77439

2.09120

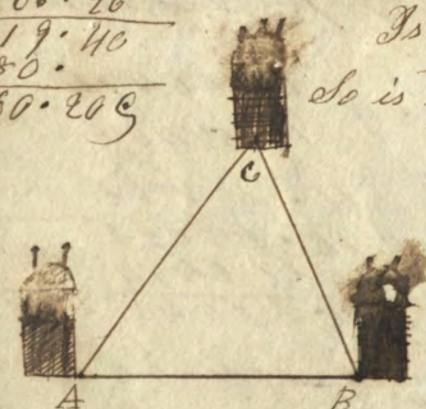
The heigth of the hill 123.4 D.E



Of distances Problem 1st

Let A and B be two houses on one side of a ~~hill~~ river whose distance asunder is 293 perches there is a tower at C on the other side of the river that makes an angle at A with the line A.B of 53·20" and another at B with the line B A of 66·20" required the distance of the tower from each house Viz A.C and B.C &c

53·20"			
66·20			
119·40			
180·			
60·20 C			
	As the sine of	66·20	9·93898
	Is to A.B	293	2·46687
	So is the sine of A	53·20	9·90424
			12·37111
			9·93898
	To B.C	270·5	2·43213



As the sine of C	60·20	9·93898
Is to A.B	293	2·46687
So is the sine of B	66·20	9·96185
		12·42872
		9·93898
To A.C	308·8	2·48974

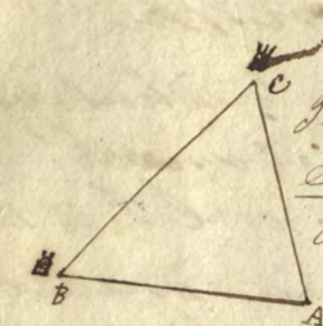
Problem 2

Let B and C be two houses whose direct distance asunder B.C is inaccessible however it is known that a house at A is 252 perches from B and 230 from C and that the angle B.A.C is 70· what is the distance B.C between the two houses

As A B + 252
A.C + 230
482

22

180
70 angle A
110
55 half the unknown



Is to the sum of their difference 22
So is the tangent of half the two unknown angles

As the sum of the two sides A B and of A.C	482	2·68305
Is to their difference	22	1·34242
So is the tangent of half the two unknown ang	55·20·10·	15·477
		11·49719
to the tangent of half their diffe		2·68305
	C + B 3·44"	8·81414

55
3·44
Ang C 58·44 Angle B— 55
3·44
51·16

As the sine of C	58·44	9·93184
Is to A B	252	2·40140
So is the Sine of A	70	9·97299
To B.C	277	2 44255

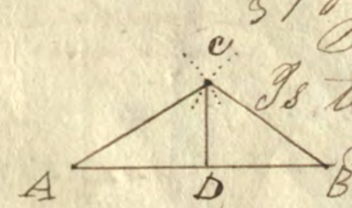
Problem 3d

Suppose A B.C a triangular piece of ground which by an old survey we find ~~ff~~ to be thus A.B 260 A.C 160 B.C 150 perches the Mearing lines A.C and B.C are destroyed or plowed down and the line A B only remaining what angles must be set off at A and B to run new mearings by exactly where the old ones were

A B 260

A.C — B.C
160 · 150
150
310

A C — B C
160 — 150
150
10



As A B	260	2·41497
Is to A C + B C	310	2·49136
So is A.C — B C	10	1·00000
		3·49136
		2·41497
To A B — D B	11·92	1·07639

half of A B 130
5·96
A D 135·96
130
5·96
124·04 D B

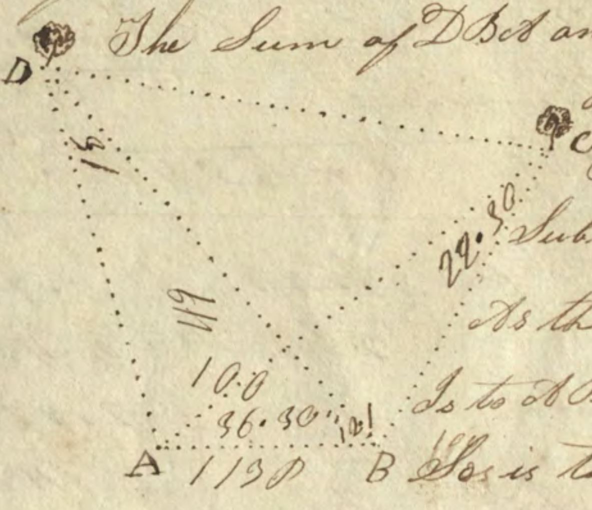
As A D	136	2·13354
Is to Radius	90	10·00000
So is A.C	160	2·20412
		12·20412
		2·13354
To the secant of A 31·47		10·07058

As B.C	150	2·17609
Is to the sine of A	31·47	9·72157
So is A C	160	2·20412
		11·92569
		2·17609
To the sine of B	34·10	9·74960

Ens

Problem 4th

Let D and C be two trees in a bog to which you can have no nearer access than at A and B there is given DAB 100° CAB 36.30" CBA 121 DBA 49° and the line AB 113 perches required the distance of the trees D.C



The Sum of DBA and DAB Subtracted from 180 gives ADB. 31

The sum of CAB and CBA Subtracted from 180 gives ACB 22.30"

As the sine of ADB 31 { 9.71184
Is to AB 113 { 2.05308
So is the Sine of DAB 100 { 9.99335
12.04643
9.71184
To D.B 216 — 2.33459

As the Sine of ACB 22.30" { 9.58284
Is to AB 113 { 2.05308
So is the Sine of CAB 36.30 { 9.77437
11.82747
9.58284
127
49
DBC 72
To B.C 175.6 { 2.24463

In the triangle DBC you have DBC 72 by Subtracting ABD 49 from ABC 121 likewise the sides BD and BC as before found given to find DC

as BD+BC is BD—BC
391.6 40.4
180
DBC 72
108 two unknown angs
54 half the unknown
2CB CDB

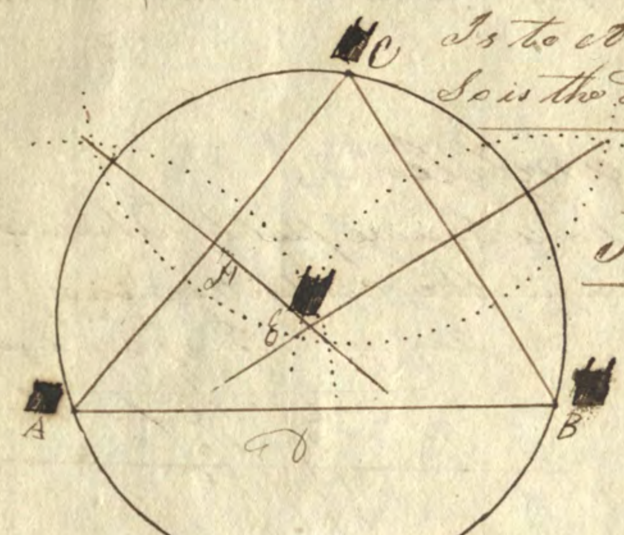
As the Sum of the two sides BD and BC 391.6 { 2.59284
Is to there difference 40.4 { 1.60638
So is half the sum of the two unknown angs 54 { 10.13874
11.74512
2.59284
54 half the unknown angles
8.05
DCB 62.05 To half their difference 8.05 — 9.15228
54
8.05
CDB 45.55 As the Sine of CDB 45.55" { 9.85645
Is to BC 175.6 { 2.24452
So is the Sine of DBC 72° { 9.97821
12.22273
9.85645
To D.C 232.5 — 2.36628

Problem 5th October the 31st

Let three gentlemens Seats A.B.C be situated in a triangular form there is given A.B 2.5 miles A.C 2.3 And BC 2. it is required to build a church at E that shall be equidistant from the seats A.B.C What distance must it be from each seat and by what angle may the place of it be found

As the Sum of the two Sides A and B
Is to there difference A.C

As AB 2.5 { 0.39794
Is to AC + BC 4.3 { 0.63347
So is the difference AC-BC .3 { 0.47712
1.11059
0 39794
To AD — DB .516 { 71265



2)2.5 2)516
1.25 258 { 1.508 ad
128
1.508
1508
12064
75400
1508
2274064
AC 2)2.3
1.15 AH

2.3
2.3
69
46
529
2274064
1|3 01 4984 (1.736 CD
Square root
27) 201
189
343) 1257
1029
3466) 22836
20796

As. C.D — 1.736 { 0.23955
Is to A.C — 2.3 { 0.36173
So is CB 2 { 0.30103
0.66276
0.23955
To the diameter 2.65 { 0.42321

As AH ~~1.15~~ 1.15 { 0.06070
Is to radius ~~90~~ 90 { 10.00000
So is AC Semidiameter 1.325 { 0.12222
10.12222
0 06070
The secant of HAE 27.47 { 10.06152

Problem 1th

To find the content of a Square piece of ground
Multiply the base in perches into the perpendicular in perches or Square the base the product will be the content in perches and because 160 perches Make an acre it Must thence follow that Any area or content in perches be divided by 160 Will give the content in acres the remaining perches if More then 40 being divided by 40 will give the roods and the last remainder if any will be perches

Examples

Let AB, CD be a Square field whose Side is 14C. 29 L I demand the content in acres
By Problem 4th Section 3d 14C 29L are equal

2 . 4
29 . 16 perches
29 . 16
17496
2916
26244
5832
A . R . P
160) 850 . 3056 (5 . 1 . 10 Content
800
40) 50 (1
40
10

Problem 2d

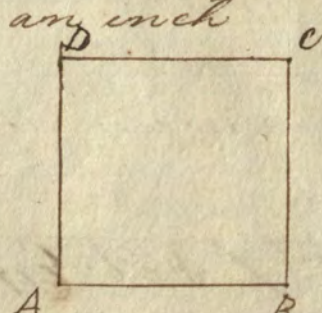
To find the Side of a Square whose content is given
Extract the Square root of the given Content in perches And you have the side in perches and consequently in Chains

Example

It is required to lay out a Square piece of groun which Shal Contain 12A 3R 16P required the number of Chains in each Sid of the Square and to lay down a Map of it by A Scale of 40 perches to an inch

A . R . P
12 . 3 . 16
4
51
40
2056 (45.34
16
85) 456
425
903) 3100
2709
9064) 39100
36256
2844

Ch L
22 . 3 3½
Answer



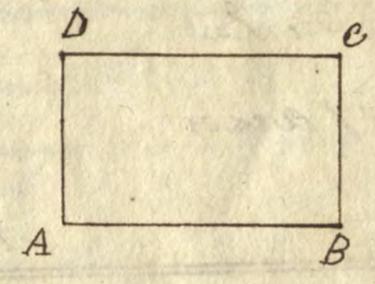
Problem 3d November the 1

To find the content of an oblong piece of ground
Multiply the length by the breadth for the Content

Example

Let AB, CD, be an oblong piece of ground whose length AB 14C and 25L and breadth 8C. 37 L I demand the Content in acres and also to lay down a Map of it by a Scale of 20 perches to an inch

ch L
14 . 25
2 . 4
29 . 00 Perches 29 . 00
C L
8 . 37
2 . 4
17 . 48 Perches 17 . 48
C L Perches
14 . 25 = 29 . 00
8 . 37 = 17 . 48
15732
3496
160) 506 . 92 (3 . 0 . 26
480
26 perches



Problem 4th

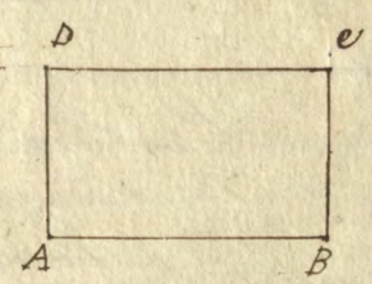
The content of an oblong piece of ground and one Side given to find the other
Divide the content in perches by the given Side in perches the quotient is the required Side in perches and thence it May be easily reduced to Chains

Example

There is a fence 14ch 25L long by the side of which it is required to lay Out an oblong piece of ground which Shal contain 3A 0R 27P what breadth Must be laid off at each end of the fence to enclose the 3A 0R 27P

A . R . P
3 . 0 . 27
4
12
40
29) 507 (17 . 48
29
217
203
14
29) 1400 (48
116
240
232

Ch L
14 . 25
4
29 . 00
C . L
8 . 37
Answer



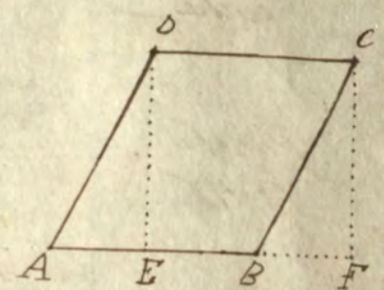
Problem the 5th No 1.

To find the content of a piece of ground in form of a oblique angular parallelogram or of a rhombus or rhomboides; Multiply the base into the perpendicular heighth the reason is plain from theo 3 Section 1st.

Example

Let A B C D be a piece of ground in form of a rhombus Whose base A B is 22 chains and perpendicular D E or F C 20 chains required the content

C
22 — 44 } Perches
20 — 40 }
160) 17 6 0 (11 acres
160
160
160



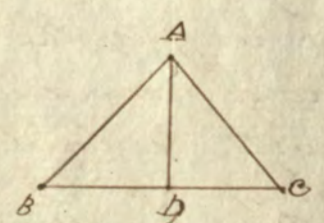
Problem 6th

To find the content of a triangular piece of ground Multiply the base by half the perpendicular or the perpendicular by half the base or take half the product of the base into the perpendicular

Example

Let A B C be a triangular piece of ground whose longest Side or base B C is 24.38 and perpendicular A D let fall from the oposite angle is 13.28 Required the content

1st Base 2) 24 · 38   2) 13 · 28 add 50 to 28 gives 78
12 · 38 }   2) 6 · 39
½ the base 3 · 39 } 4 pole chains   3 · 39 ½ the base
11142
3714
3714
acres 4) 1 1 9 6 8 2
4
Roods) 7 8 7 2 8
40
Perch 31) 4 9 1 2 0
A R P
4 · 0 · 31.



Problem 7th

The content of a triangular piece of ground and the base given to find the perpendicular; divide the content in perches by half the base in perches and the quotient will give you the perpendicular in perches and so in chains

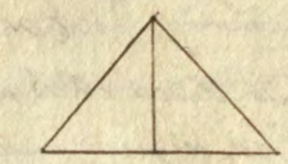
Example

Let B C be a piece whose lengthth is 24 C 40 L by which it is required to lay out a triangular piece of ground whose content sho be 4 A. 1 R. 10 P required the perpendicular

C L
B 24 · 40
4
2) 47 · 60 Perches
24 · 8 half the base

A . R . P
4 · 1 · 10
4
17
40
24.8) 690 (2) 27 · 82 = 13 · 45
496
2940
1736
2040
1984
560
496
64

perch C L
4
(2) 27 · 82 = 13 · 45



Problem the 8th

The three sides of a plane triangle given to find the area

Rule

From half the Sum of the three side subtract each side severally take the logarithms of the half sum and three remainders and half there totle Will be the logarithm of the area or take the square root of the continued product of the half sum and three remainders for the area

Example

1st In the triangle A B C are

Given { AB — 16 · 46, A C — 12 · 28, B C — 9 · 00 } four pole chains required the area

Sum — 31 · 92

Half Sum 15 · 96 log — 1 · 20303

Subtr from the half Sum Remainders { 5 · 32 — 0 · 72591
3 · 68 — 0 56585
6 · 96 — 0 · 84261

2) 3 · 33740

Answer Square Ch 46 · 63 log 1 · 66870

or — 4 · 663 Acres

2d What quantity of land is contained in a triangle the 3 sides of which are 80, 120 and 160 perches respectively Answer 29 - 4

80
120
160
2) 360 Sum
Subtract 180 half Sum
100
60
20

180
100
18000
60
1080000
20
21600000

4) 21600000 (4647
16
86) 560
516
924) 4400
3696
9287) 70400
65009

40) 46.47
116
29 - 0 - 7
Answer

Problem 9th November the 2d. 1826

Two sides of a plane triangle and there includeing angle given to find the area

Rule

To the log Sine of the given angle or of its Supplement to 180° if obtuse add the logarithms of the containing Sides the sum less radius Will be the logarithm of the double area

Example

Suppose two Side A.B and A.C of a triangular lot A.B.C form an angle of 30 degrees and measure one 64 perches and the other 40.5 What Must the content be

Given angle — 30 Sine 9.69897
64 log 1.80618
Containing Sides 40.5 log 1.60746
13.11261
Radius 10.00000
2 / 1296 log 3.11261
160 / 648 (4 A. 8 P. Answer)
640
8

2d. required the area of a triangle two sides of which 49.2 and 40.8 perch and their contained angle 144½ degrees Answer 3 A. 2 R. 22 P

49.2 1.69196
40.8 1.61066
144½ 9.76395
13.06657
Radius 90 10.00000
2 / 1166 — 3.06657
40 / 583
4 / 14.2
3.2.23
A. R. P

180
144.30
35.30

3d. What quantity of ground is inclosed in an equilateral triangle each side of which is 100 perches either angle 60 degrees Ans 27 A 10 P or

100 2.00000
100 2.00000
60 9.93753
13.93753
Radius 10.00000
2 / 8660 log 3.93753
40 / 4330
4 / 108+1
27 A. R. 10 P Ans

Problem 10th Nov. 2d. 1826

To find the area of a trapezoid viz a figure bounded by four right lines two of which are parallel but unequal

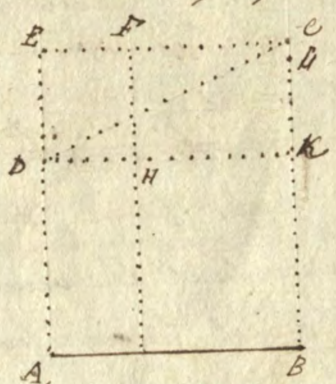
Rule

Multiply the sum of the parallel sides by their perpendicular distance and take half the product for the area

Example

Required the area of a trapezoid of which the parallel Sides are respectively 30 and 49 perches and there perpendicular distance 61.6

30+49 = 79
61.6
5544
4312
2 / 4866.4
40 / 2433.2 area
4 / 60. 33.2 perches
15. 33. 2 P
A. R. P



In the trapezoid A B C D the parallel sides are AD 20 perches BC 32 and their perpendicular distance AB 26 Required the content Ans 4 A 36 P

AD 20
BC 32
52
AB 26
312
104
2 / 1352
40 / 676
4 / 16+36 P
4 A 36 P

Problem 11th

To find the content of a trapezium

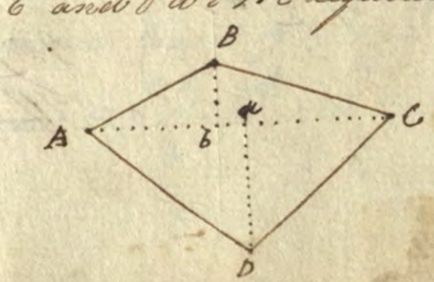
Rule

Multiply the diagonal or line joining the remotest oposite angles by the sum of the two perpendiculars falling from the other angles to that diagonal and half the product will be the area

Example

Let A B C D be a field in form of a trapezium the diagonal A.C 64.4 perches the perpendicular B b 13.6 and D d 27.2 required the content

Diagonal 64.4
13.6+27.2 = 40.8
5152
25760
2 / 26275.2
160 / 13137.6 (8 A 33¾ P
1280
33¾ perches



Problem the 12th

To find the area of an circle or an elipsis
Multiply the square of the circles diameter of the product of the longerst side and shorter diameter of the elipsis by 7854 for the area or subtract 0.10941 from the double logarithm of the circles diameter or from the sum of the logarithms of those eliptic diameters and the remainder will be the logarithm of the area

Example

1st How Many acres are in a circle of amile diameter Answer 502.2.25

1 Mile 320 perches log 2.50515 the log left 9536
the nearest log left 8042.5 — 2.50515 its number 8042
dividend 3000
4) 2010.25 — 5.01030
0.10471 the log found 9536
Answer 502.2.25 Ans 4.90539 the next log 9542
A. R. P.
6) 3.000 6
add that to the number found 5

2d. A gentleman knowing that the area of A circle is greater than that of Any other figure of equal perimeter. Walls in A circular deer-park of 100 perches diameter in Which he Makes an eliptical fish-pond 10 perches long by 5 Wide required the length of his Wall. content of his park and area of his pond

Answer the Wall 314.16 perches inclosing 49 A. 14 P of Which 39¼ perches or ¼ of an acre nearly is appropriated to the pond

100 log 2.00000
2.00000
Subtract 4.00000
0.10471
40) 785.4 log 3.89569
4) 196
49.14
A. P

3.14159
100 P
314159 00

multiply 10
5
50
7854
50
39.2700

3d. What is the area of an eliptical pond Whose diameters are 15 and 28 perches

28
15
140
28
420

7854
420
157080
31416
40) 329.8680
4) 8
2.0.9 Answer

Problem 13

The area of a circle given to find its diameter

Rule

To the logarithm of the area add 0.10491 and half the sum Will be the logarithm of the diameter or divide the area by 7854 and the square root of the quotient. Will be the diameter

Example

A horse in the Midst of a meadow suppose
Made fast to a stake by a line from his nose
how long must this line be that feeding all round
permits him to graze Just an acre of ground

Area in perches 160 log 2.20412
0.10491
2) 14.2727 added 2) 2.30903
7.13645 1.15451 1
Feet a rod 16.5 15442 the log of the first 4 figures
356822 5 9.00 dif
428187 0 15473 the next log in the table
713645 15442
Ft 117751425 31) 900 (29 add 31 dif
12 62
9) 01710 0 } ans 117 Ft 9 280
279

Problem 14th

To make a proper allowance for roads
It is customary to deduct 6 acres out of 106 for roads the land before the deduction is Made may be termed the gross and that remaining after such deductions the neat

Rule

the gross divide } 1.06 { quotes the neat
the neat multiply } { Prod the gross

Example

1st How Much land Must I enclose to have 850 A 2 R 20 P neat

R P
2.20
40
160) 100 0 (.625
960
400
320
800
800

850.625
1.06
5103750
850625
A 901.66250
40
R 2.650000
4
P 26.00000

ans 901 A. 2 R. 26 P

2d How Much neat land is there in a tract of 901 A. 2 R. 26 P

4) 26 6
2.66
40)
106) 901.425 (850 ...625
848 40
534 25.000
530 4
4 2 20.000

ans 850 A. 2 R. 20 P

Field notes of the two foregoing Methods as practised in pennsylvania

N

	Courses	distances
1	N 75.00 E	54.8 P
2	N 20.30 E	41.2
3	East	64.8
4	S 33.30 W	141.2
5	S 76.00 W	64.0
6	north	36.0
7	S 84.00 W	46.4
8	N 53.15 W	46.4
9	N 36.45 E	76.8
10	N 22.30 E	56.0
11	S 76.45 E	48.0
12	S 15.00 W	45.4
13	S 16.45 W	40.5

64 – 32
46
78
32
156
234
2496

(10) 86 – 77
38½
688
25.8
12
3287

(11) 88 – 28
14
35.2
88
1232

(4) 77
29½
693
154
38½
2271½

(8) 84 – 20
10
840

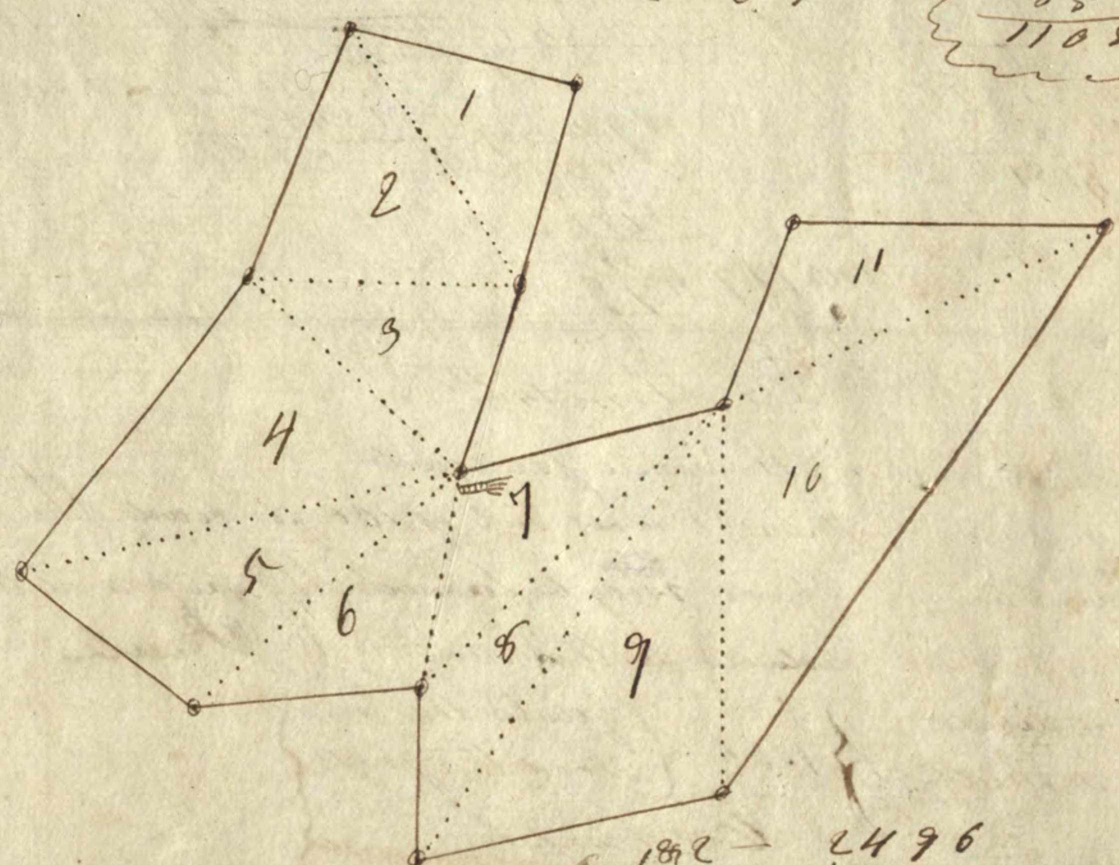
(9) 112 – 144
22 – 22
224
224
2464

276·2 – 35
31
35
105
1085

(3) 73
27½
511
146
36½
2007½

(6) 73 – 127
13½ – 134
219
73
36½
985½

(7) 85 – 121
13 – 13
255
85
1105



1&2	2496
3	1085
4	2271½
5	2007½
6	985½
7	1105
8	840
9	2464
10	3287
11	1232

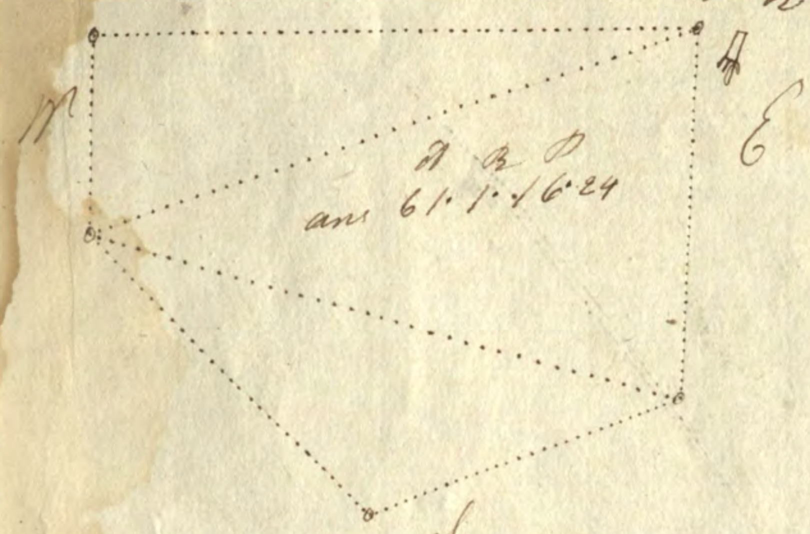
40) 17773½
4) 444 – 13
111·0·13 Answer

	Courses		Distances
1	S 12 W		76 P
2	S 77 W		69 P
3	N 37 W		82 P
4	N 10 E		41 P
5	Thence to the beginning		

(1) 133
19
1197
133
2527

(2) 133.2
35.6
7992
666
3996
4731.92

(3) 126.6
20.2
2532
2532
25573.2
4731.92
2527
40) 98176.24
4) 2454 – 16
61 · 1 · 16 · 24 Answer
A · R · P



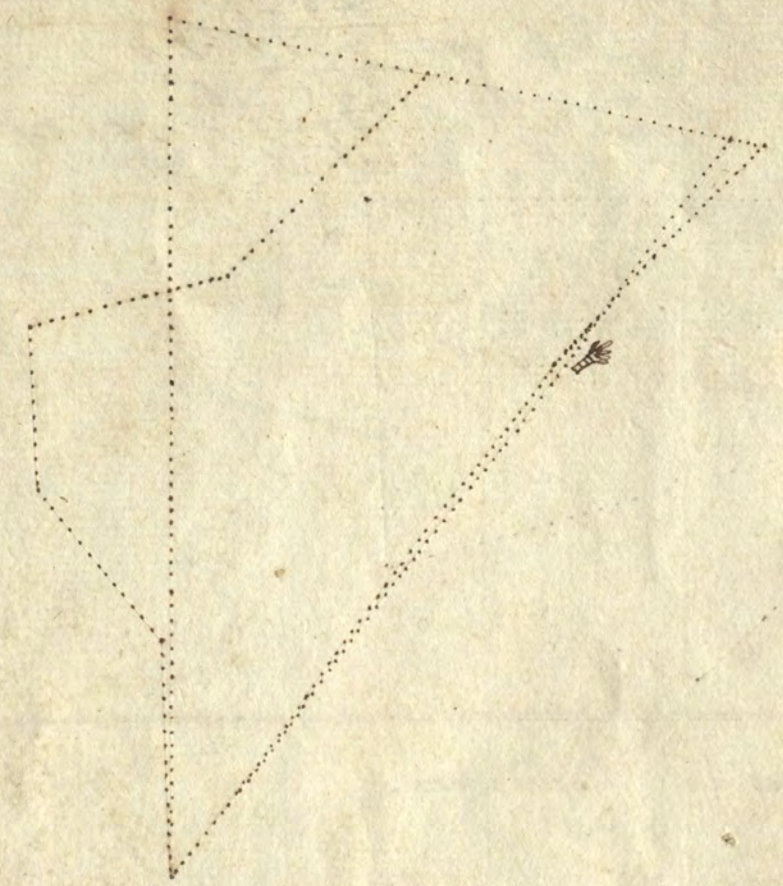
Courses	Distances
S 14.00 E	69 P
S 69.00 E	72
N 2.00 E	48
N 10.00 W	62 P

123.6 – 2) 103
5 1½ – 51½
1236
6180
618
40) 6365.4
4) 159
39 · 3 · 5.4 Answer
A · R · P

	Courses	Distances
1	N.. 47·00 E	64 P
2	N.. 75·00 W ..	.. 71 – P
3	S.. 48·00 W	59 – P
4	S.. 77·00 W	42 P
5	South E	34 P
6	S.. 36·00 E....	41
7	South	49

P
191
54·3
573
764
955
40)1037(1·3
4)259·11
64·3· 11·3 Answer
A· R P

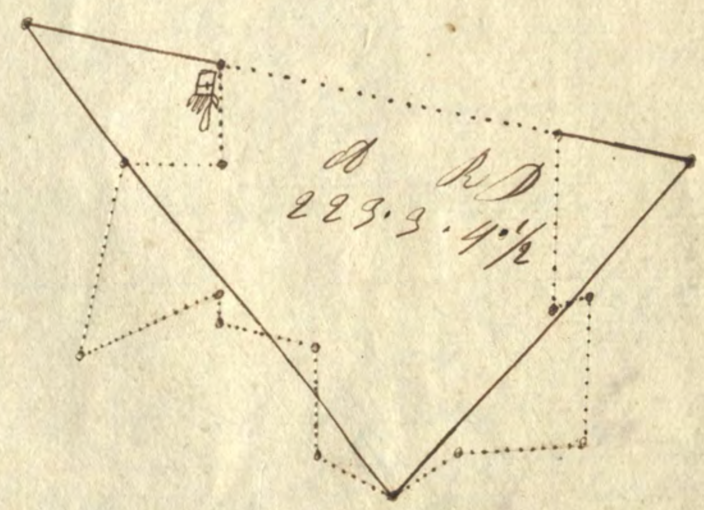
2)108·6
54·3



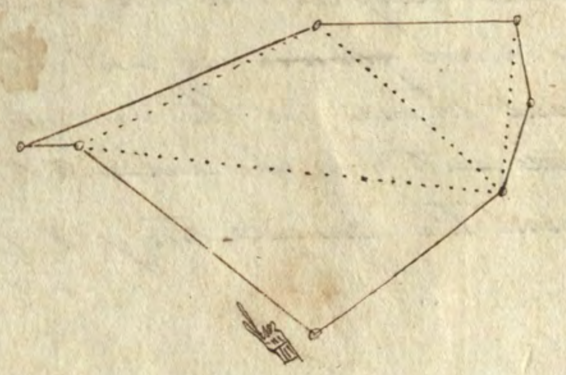
	Courses	Distances
1	South ..	.. 52 P
2	West ..	.. 48 P
3	S 13·00 W ..	.. 104 ..
4	N 65·00 E ..	.. 80 ..
5	South ..	.. 14 ..
6	S 76·00 E ..	.. 52½ ..
7	S 2·00 W ..	.. 55 ..
8	S 65·00 E ..	.. 46 ..
9	N 57·00 E ..	.. 40 ..
10	N 85·00 E ..	.. 66 ..
11	North ..	.. 76 ..
12	S 65·00 W ..	.. 20 ..
13	North	.. 90½ ..
14	N 80·00 W	.. 179 ..

S Base 354·5 Perpend 2)202
101 101
3545
3545
40)3580(4·5
4)895
223·3·4·5 Answer
A· R· P

This map is laid down at 100 perches to an inch
The angles on the outside are laid ~~down~~ in on the line and those in the inside are laid out on the extended lines from the corners. to get the angle



Courses .. Distances
N 52° W .. 160 P
West .. .. 30 P
N 68 30 E .. 168 P
East .. .. 103 P
S 9° E .. 44 ..
S 18° W .. 47 ..
thence to the beginning



The method of calculating in Pennsylvania

	Courses	Dist	N	S	E	W	M.D.	N. area	S area
1	N 75.00 E	54.8	13.9		52.7		233.9 286.0	5251.21	
2	N 20.30 E	41.2	38.4		14.4		300.4 314.8	115.35.36	
3	East	64.8			64.8		379.6 444.4		
4	S 33.30 W	141.2		117.7		77.7	366.7 289.0		45160.59
5	S 76.00 W	64.0		15.4		62.0	227.0 165.0		3495.80
6	North	36.	36.0				165.0 165.6	5940.00	
7	S 84.00 W	46.4		4.7		45.7	119.3 73.6		560.85
8	N 53.15 W	46.4	27.7			36.8	36.8 36.8	1019.36	
9	N 36.45 E	76.8	60.9		45.4		45.4 90.8	2764.56	
10	N 22.30 E	56.	51.7		21.4		112.2 113.6	5800.74	
11	S 76.45 E	48.0		11.0	46.7	11.1	180.3 227.0		1983.30
12	S 15.00 W	43.4		41.5		11.5	215.9 204.8		8959.85
13	S 16.45 W	40.5		38.9			193.3 181.8		7403.39
			228.6	228.6	244.8	244.8		30311.09	65563.76 30311.09

2 | 35252.73
40 | 17626
4 | 440 — 26
110 . 0 . 26.75 Answ
A R P

	Courses	Dist P	N	S	E	W	M.D		
1	N 47° E	64	43.6		46.8		260.4 307.2	11353	
2	N 75° W	71	18.4			68.6	238.6 170.0	4390	
3	S 48° W	59		39.5		43.8	126.2 82.4		4984
4	S 79° W	42		8.0		41.2	41.2 00.0		327
5	South	34		34			000 000		
6	S 36 E	41		33.2	24.1		24.1 48.2		800
7	South	49		49			130.9 213.6		2361
8			101.7		82.7			13512	

the closing line
15.36 E 169.7
70.9 E 62.0
82.7 E 101.7

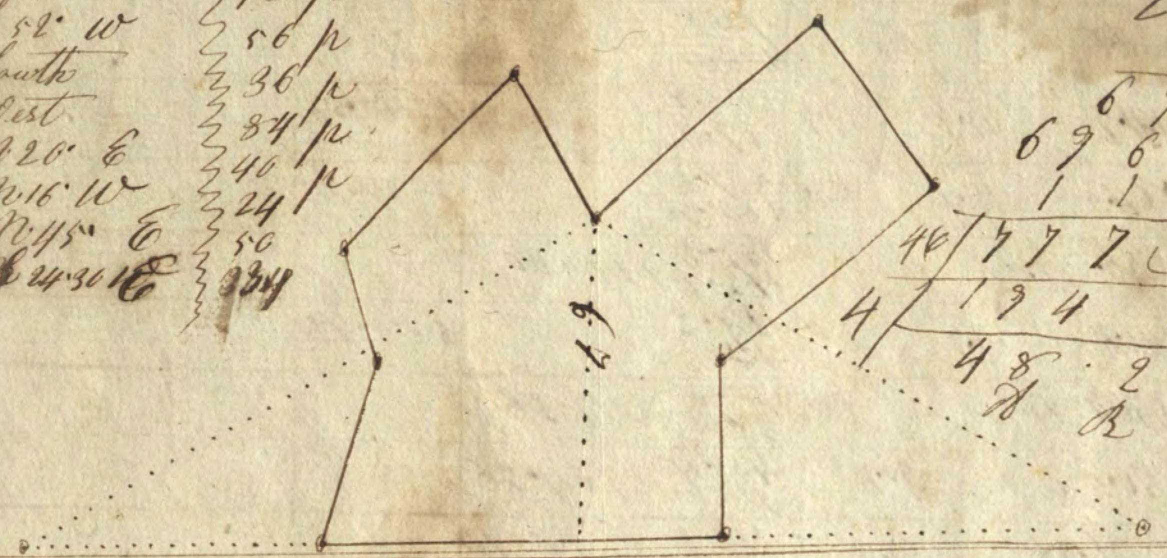
29055
8474
2 | 20581
40 | 10290
4 | 257.10
64.1.10

8474

A R P
64.1.10 Answ

To calculate and divide a tract of land by reducing it to one triangle Let the following field notes be given to be calculated and divided in to two equal parts from the first Station the courses and distances of the dividing line are equal

1 N 50° E } 60 p half the base 116
2 S 36 E } 42 p
3 S 52° W } 56 p
4 South } 36 p
5 West } 84 p
6 N 20° E } 40 p
7 N 16 W } 24
8 N 45° E } 50
9 S 24 30 E } 33 4



69

232
33 ½
696
696
116
40 / 7772
4 / 194 12
48 · 2 · 12 Answer
A R P

The following field notes are proposed to be divided in to three equal by two right lines running from the sixth and seventh stations and prove by calculating the content of the middle part

	Courses	Dist	N	S	E	W	M.D	N area	S area
1	N E 56¼	21·60	12		18		18 36	216	
2	N E 26½	13·44	12		6		42 48	504	
3	S E 71½	18·96		6	18		66 84		396
4	S E 26½	13·44		12	6		90 96		1080
5	S W 71½	18·96		6		18	78 60		468
6	S E 45°	8·47		6	6		66 72		396
7	S E 63½	13·44		6	12		84 96		504
8	N E 45°	8·47	6		6		102 108	612	
9	S E 26½	13·44		12	6		114 120		1368
10	S W 45°	8·47		6		6	114 108		684
11	S W 63½	13·44		6		12	96 84		576
12	N W 76°	24·73	6			24	60 36	360	
13	N W 36¼	30·00	24			18	18 00	432	
			66	66	78	78		2124	5472

5472
2124
2 / 3348
1674
4
A R 160
340
2450

A R P
Answer 167 · 1 · 24

Cask Gaging

(A)

When the head bung and length are given

Rule

To twice the square of the bungs diameter add once the square of the head Multiply by the length and divide by 882 and the quotient will be the content in wine gallons

Example

A cask whose bungs diameter is 24 Inches head 20 length 32 Inches what is the content in wine gallons

24
24
96
48
576 Square
2
1152 twice the Square
400
1552
32
3104
4656
882) 49664 (56 · 3 Answer
4410
5564
5292
2720 (33
2646

20
20
400 Square

A cask whose bung diameter 28 Inches head diameter 22·5 and length 32 inches what is the content in wine gallons

ans 75 3 2

28
28
224
56
784
1568 double Square
506 · 25
2074
32
4148
6222
882) 66336 (75 · 3 · 2
6174
4628
4410
2180 (2
1764

22 · 5
22 · 5
1125
450
450
506 · 25

Rule 2

When the diagonal from the bung to the head is given then cube the length thereof in inches and divide by 370 and the quotient will give the content in wine gallons } Note this rule accurate only when the angle A B C made by the rod in taking the diagonal to each end is an angle of 190 degrees if the angle be either greater or less the content by the rule will be more than the cask realy holds but a differenece of 10 degrees either way will make no meterial differance

Let A B C D E be a cask whose diameter
CA and CB is 27 inches ans. 53.2
required the content

27
27
189
54
729
27
5103
1458
370) 19683 the cube root
1850 53.2 say 2 thous
1183
1110
730 62
740

20

50

By late
Add up the
they are not
are
subtraction
Multi
with
} Ans
to