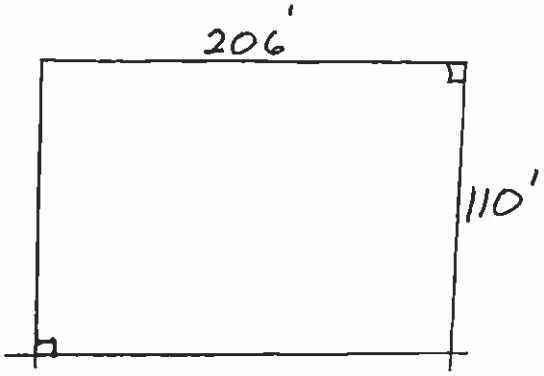
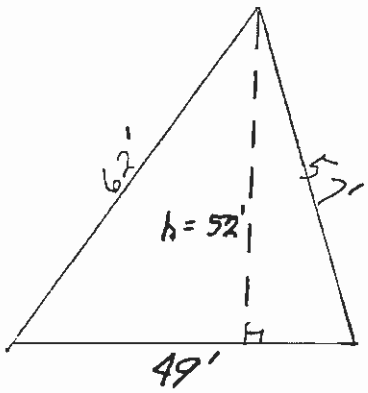
FIND THE AREA



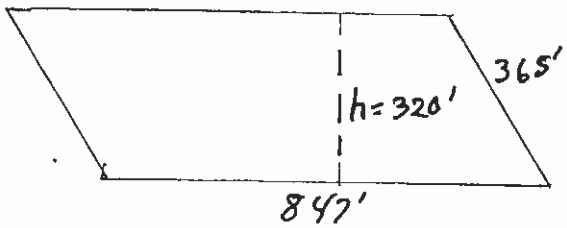
A = _____ SQ FT

A = _____ ACRES.



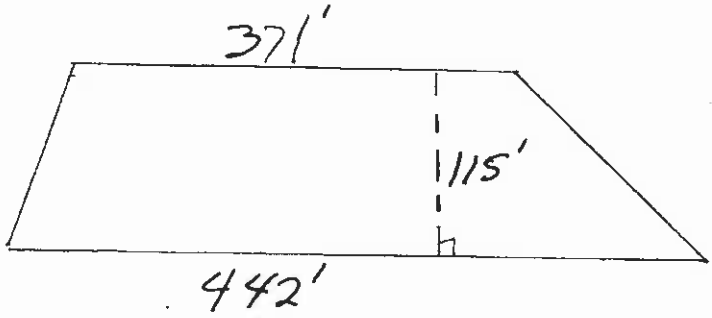
A = _____ SQ FT

A = _____ AC.



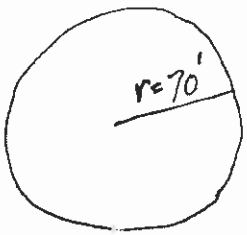
A = _____ SQ FT

A = _____ AC



A = _____ SQ FT

A = _____ AC

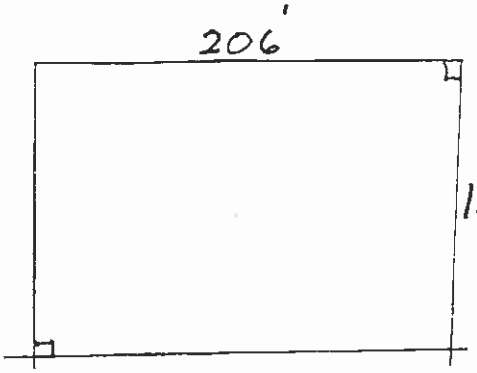


A = _____ SQ FT

A = _____ AC

FIND THE AREA

Answers



$A = B \times H$

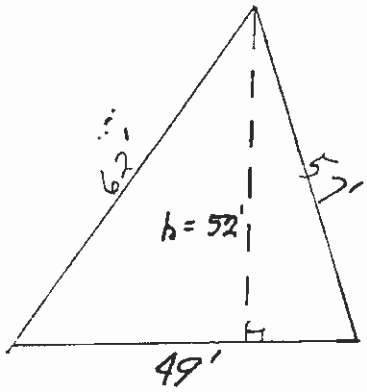
$A = 206' \times 110'$

$A = 22{,}660$ ✓

A = 22,660 SQ FT

A = .520 ACRES.

$A(\text{ACRES}) = \frac{22{,}660}{43{,}560} = 0.52$



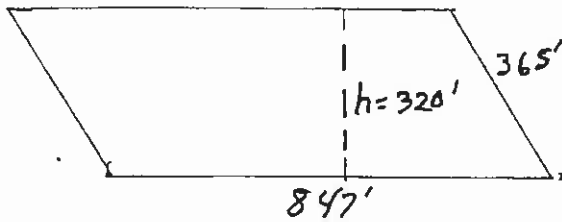
$A = \frac{1}{2} B \times h$

$A = \frac{1}{2}(49')(52')$

$A = 1274$ ✓

A = 1274 SQ FT

$A(\text{ACRES}) = \frac{1274}{43560} =$ A = 0.029 AC.



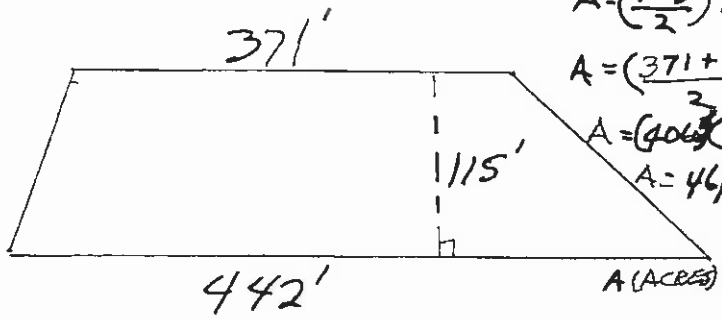
$A = B \times h$

$A = (847)(320)$

$A = 271{,}040$

A = 271,040 SQ FT

$A(\text{ACRES}) = \frac{271040}{43560}$ A = 6.222 AC



$A = \left(\frac{T+B}{2}\right) h$

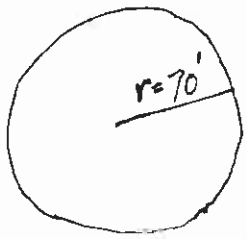
$A = \left(\frac{371+442}{2}\right) 115$

$A = (406.5 \times 115)$

$A = 46{,}747.5$

A = 46,747.5 SQ FT

$A(\text{ACRES}) = \frac{46747.5}{43560}$ A = 1.073 AC



$A = r^2 \pi$

$A = (70)^2 3.1416$

$A = (4900) 3.1416$

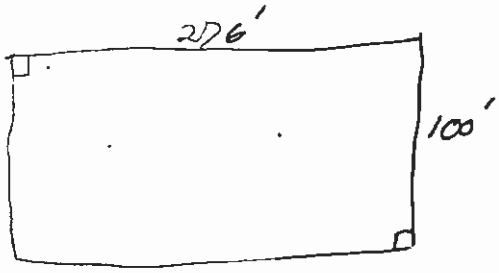
$A = 15{,}393.8$

A = 15,393.8 SQ FT

A = 0.353 AC

FIND THE AREAS OF THE FOLLOWING

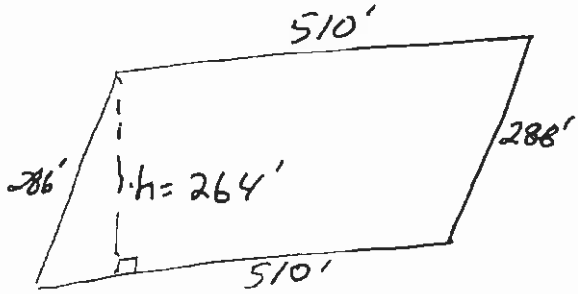
1.



AREA = _____ SQ FT

_____ ACRES

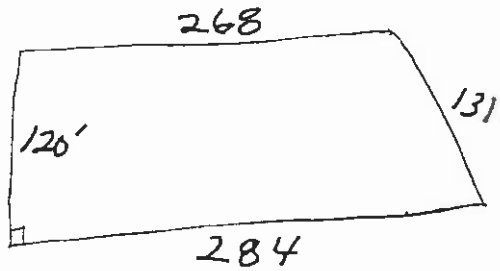
2.



AREA = _____ SQ FT

_____ ACRES

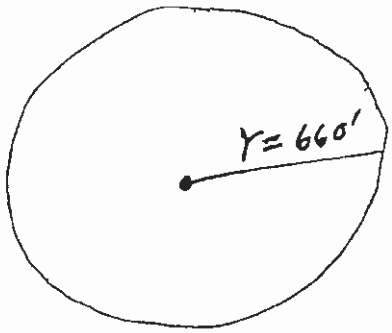
3.



AREA _____ SQ FT

_____ ACRES

4.



AREA = _____ SQ F.

_____ ACRES

5.

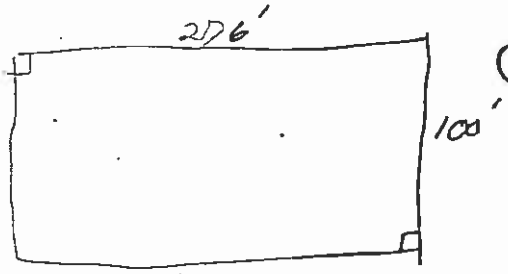
AREA = _____ SQ F

_____ ACR

Answers

FIND THE AREAS OF THE FOLLOWING

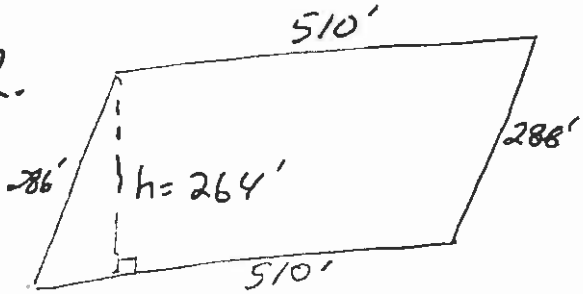
1.



(276)(100) AREA = 27,600 SQ FT

0.63 ACRES

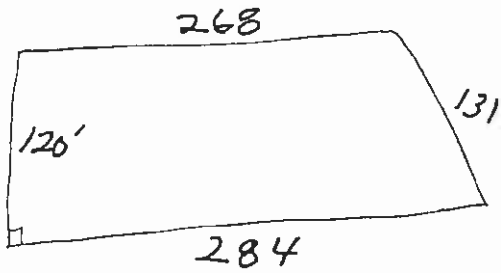
2.



bh = (510)(264) AREA = 134,640 SQ FT

3.09 ACRES

3.

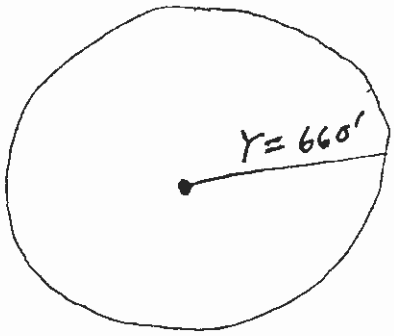


$\left(\frac{a+b}{2}\right)h = \frac{(268+284)}{2}120$ AREA

33,120 SQ FT

0.76 ACRES

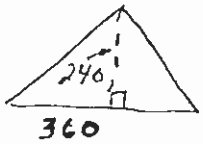
4.



AREA = 1,368,476.60 SQ FT

31.42 ACRES

5.

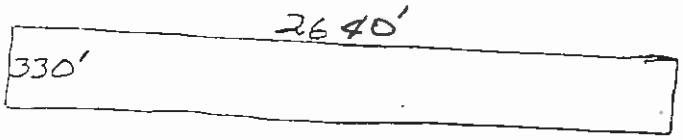


AREA = 43,200 SQ FT

0.99 ACRES

FIND THE AREAS OF THE FOLLOWING

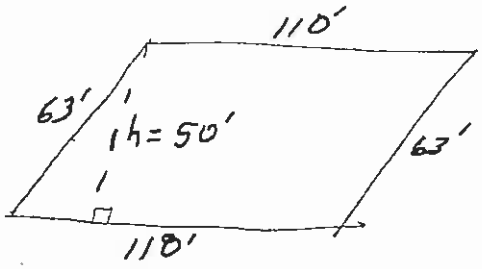
1.



AREA = _____

_____

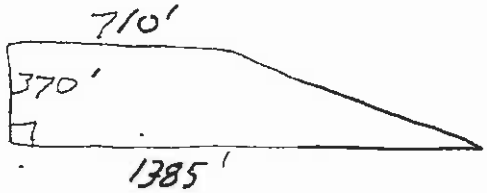
2.



AREA = _____

_____

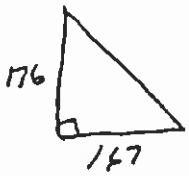
3.



AREA _____ SQ FT

_____ ACRES

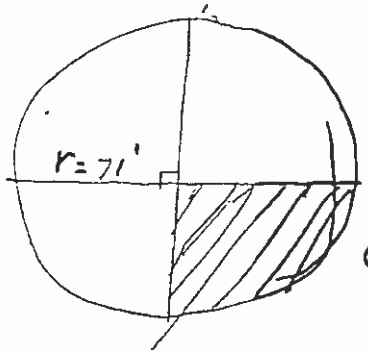
4.



AREA = _____ SQ F

_____ AC

5.



$\frac{1}{4}\pi r^2$

$\frac{1}{4}(3.1416)(71)^2$

$(.25)(3.1416)(5041)$

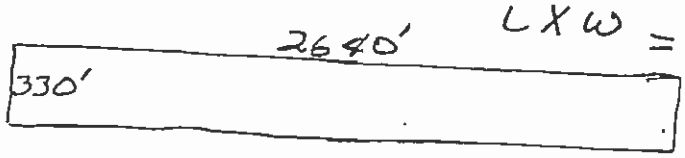
AREA _____ SQ FT

_____ ACRES

FIND THE AREA OF THE SHADED PORTION

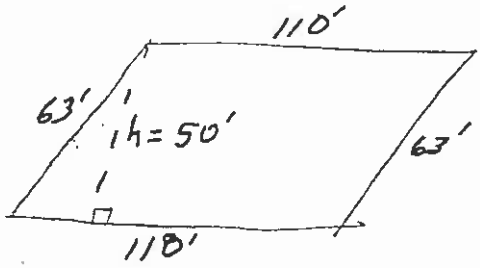
FIND THE AREAS OF THE FOLLOWING

ANSWERS

1. 

$L \times W = 2640 \times 330 =$ AREA = 871,200 SQ

20 ACE

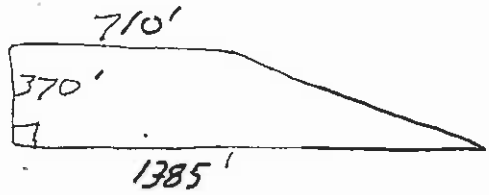
2. 

BASE X HEIGHT =

$110 \times 50 =$

AREA = 5500 SQ FT.

0.13 ACRES

3. 

$\frac{\text{BASE + TOP}}{2} \times \text{HT}$

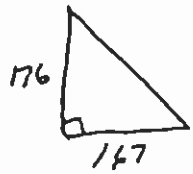
$\frac{1385 + 710}{2} \times 370$

$\frac{2095}{2} \times 370$

$1047.5 \times 370 =$

AREA 387,575 SQ FT

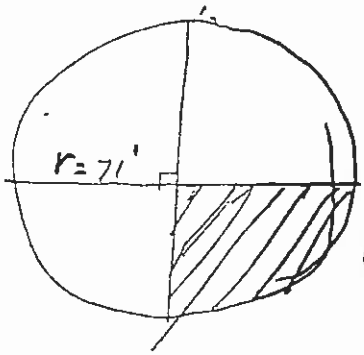
8.90 ACRES

4. 

$\frac{1}{2}bh = \frac{1}{2} \cdot 176 \cdot 167 =$

AREA = 14,696 SQ F

0.34 AC

5. 

$\frac{1}{4}\pi r^2$

$\frac{1}{4}(3.1416)(71)^2$

$(.25)(3.1416)(5041)$

AREA 3959.2 SQ FT

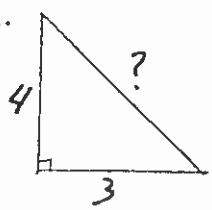
0.09 ACRES

FIND THE AREA OF THE SHADED PORTION

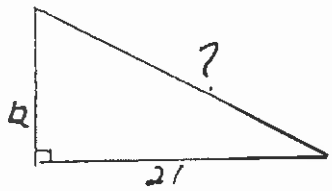
PYTHAGOREAN'S THEOREM

Find the length of the unknown side.

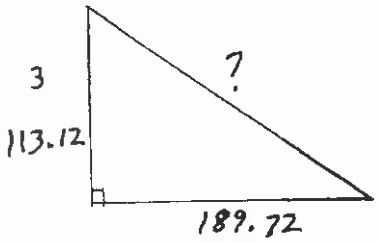
1.



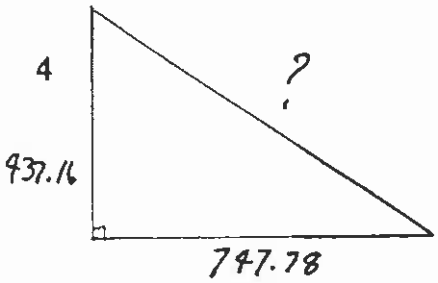
2



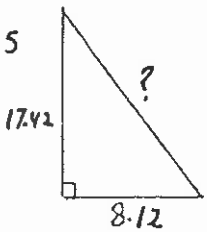
3



4



5

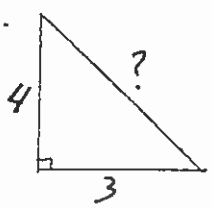


Answers

PYTHAGOREAN'S THEOREM

Find the length of the unknown side.

1.



$H = \sqrt{A^2 + B^2}$

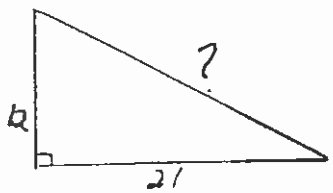
$H = \sqrt{4^2 + 3^2}$

$H = \sqrt{16 + 9}$

$H = \sqrt{25}$

$H = 5$

2



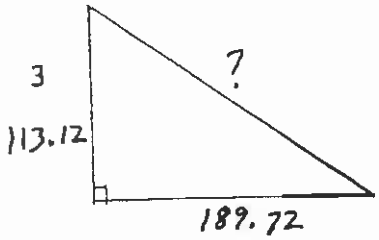
$H = \sqrt{12^2 + 21^2}$

$H = \sqrt{144 + 441}$

$H = \sqrt{585}$

$H = 24.19$

3



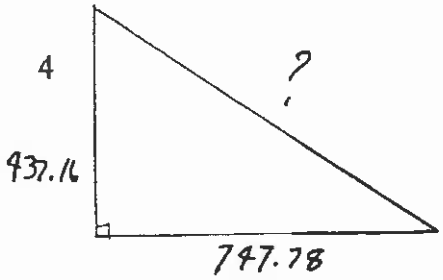
$H = \sqrt{(113.12)^2 + (189.72)^2}$

$H = \sqrt{12{,}796.13 + 35{,}993.68}$

$H = \sqrt{48{,}789.81}$

$H = 220.88$

4



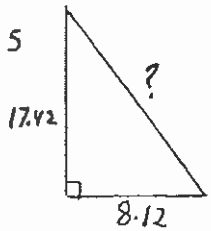
$H = \sqrt{(437.16)^2 + (747.78)^2}$

$H = \sqrt{191{,}108.87 + 559{,}174.93}$

$H = \sqrt{750{,}283.8}$

$H = 866.19$

5



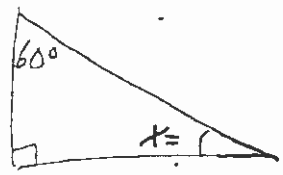
$H = \sqrt{(17.42)^2 + (8.12)^2}$

$H = \sqrt{303.46 + 65.93}$

$H = \sqrt{369.39} = 19.22$

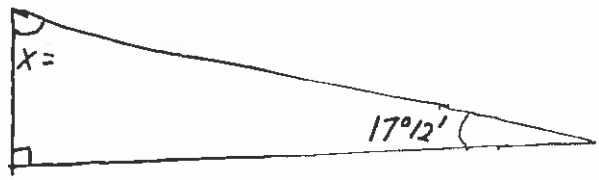
FIND THE COMPLEMENTARY ∠

1.



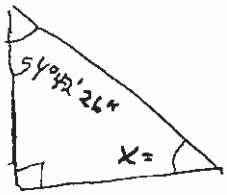
X = _____

2.



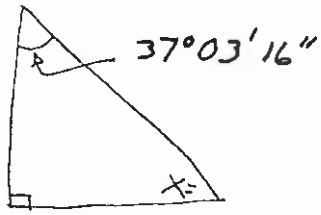
X = _____

3.



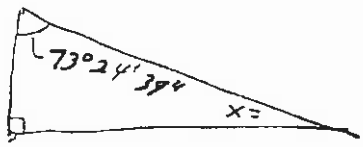
X = _____

4.



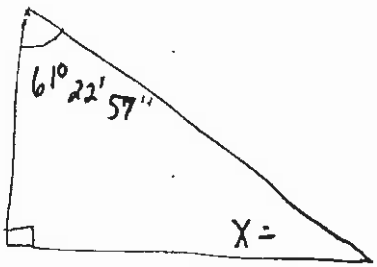
X = _____

5.



X = _____

6.



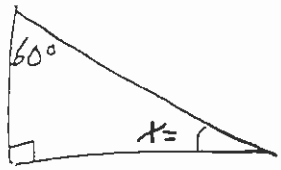
X = _____

Answers

FIND THE COMPLEMENTARY ∠

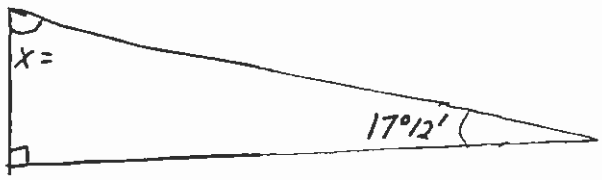
$X = 90 - 60°$

1.



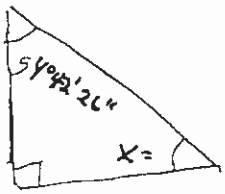
$X =$ 30°

2.



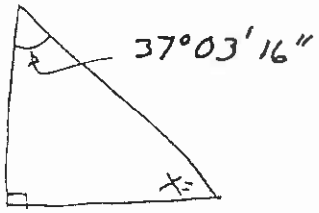
$X = 90° - 17°12'$
$X = 90° - 17.2°$
$X = 72.8°$
$X =$ 72°48'

3.



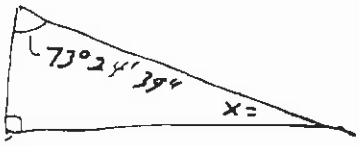
$X = 90° - 54°42'26''$
$X = 90° - 54.707222°$
$X = 35.292778°$
$X =$ 35°17'34"

4.



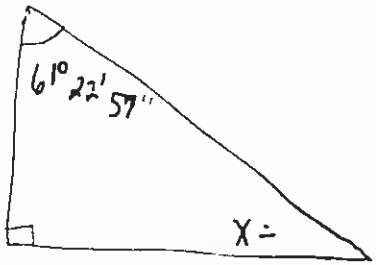
$X = 90° - 37°03'16''$
$X = 90° - 37.054444°$
$X = 52.945556°$
$X =$ 52°56'44"

5.



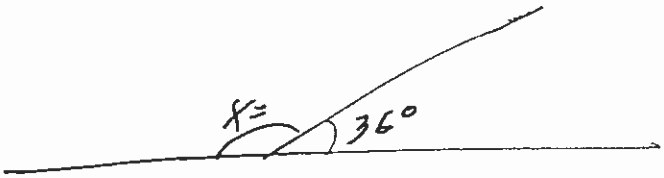
$X = 90° - 73°24'39''$
$X = 90° - 73.410833°$
$X = 16.589167°$
$X =$ 16°35'21"

6.

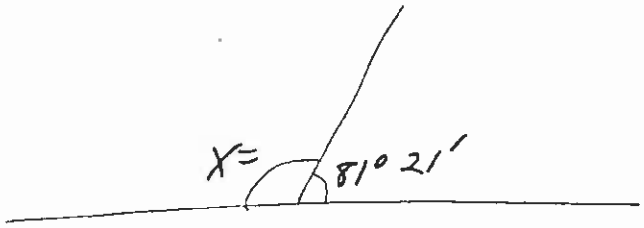


$X = 90° - 61°22'57''$
$X = 90° - 61.3825$
$X = 28.6175$
$X =$ 28°37'03"

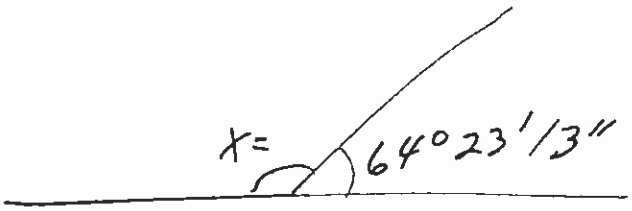
Supplementary $\angle$s

1. 

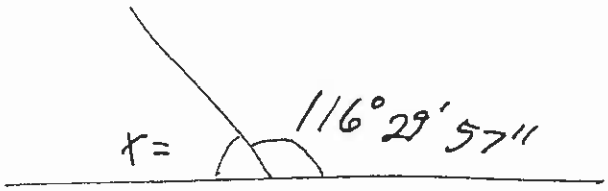
x= _____

2. 

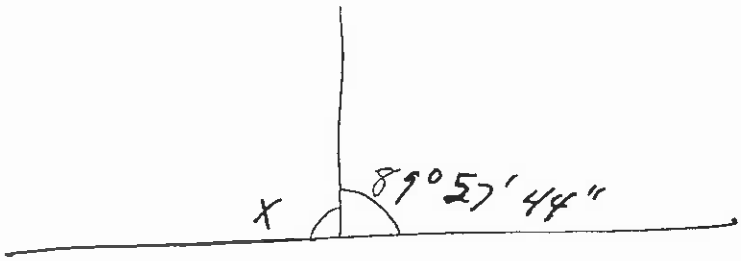
x= _____

3. 

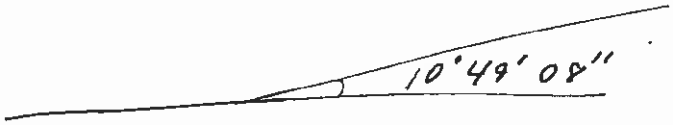
x= _____

4. 

x = _____

5. 

x = _____

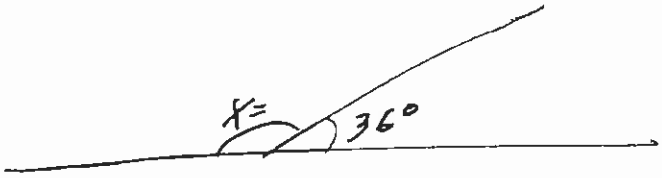
6. 

x = _____

Answers

Supplementary $\angle$s

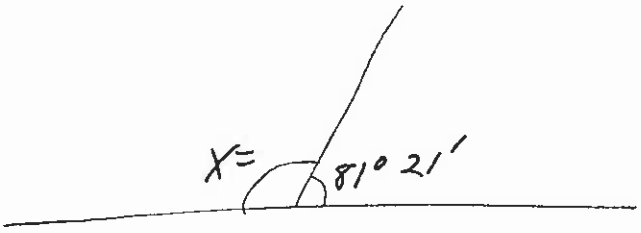
1.



$x = 180° - 36°$

$x = 144°$

2.



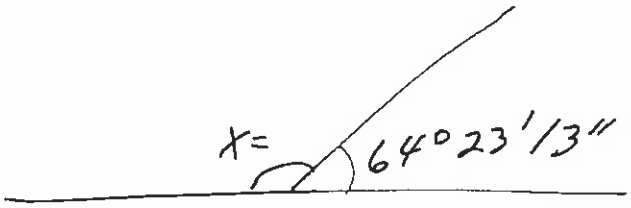
$x = 180° - 81°21'$

$x = 180° - 81.31°$

$x = 98.65°$

$x = 98°39'$

3.



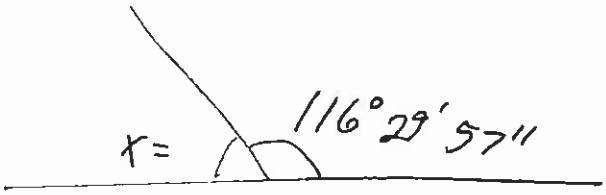
$x = 180° - 64°23'13''$

$x = 180° - 64.386944°$

$x = 115.61306°$

$x = 115°36'47''$

4.



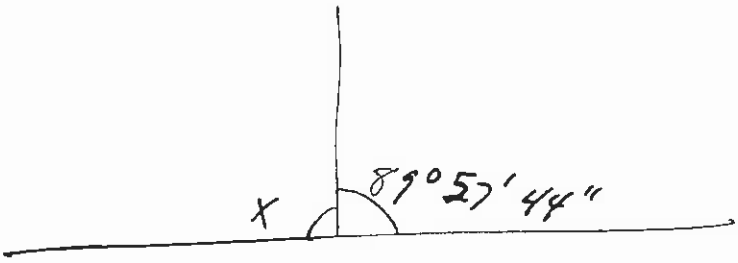
$x = 180° - 116°29'57''$

$x = 180° - 116.49917°$

$x = 63.500833°$

$x = 63°30'03''$

5.



$x = 180° - 89°57'44''$

$x = 180° - 89.96222°$

$x = 90.037778°$

$x = 90°02'16''$

6.

$x = 180° - 10°49'08''$

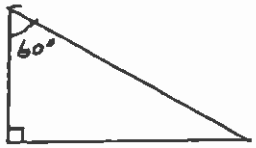
$x = 180° - 10.818889°$

$x = 169.18111$

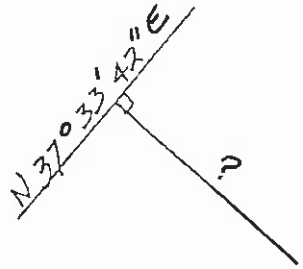
$x = 169°10'52''$

COMPLEMENTARY ANGLE PROBLEMS

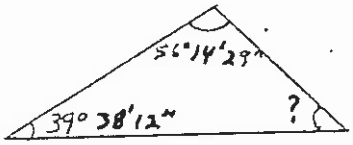
1. Identify the value of the unknown angle.



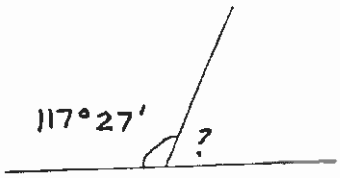
2. What is the bearing of the line perpendicular to N37°33'42"E?



3. What is the value of the unknown angle?



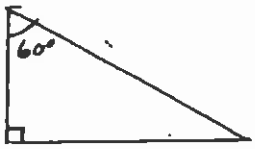
4. What is the angle that supplements 117°27'?



Answers

COMPLEMENTARY ANGLE PROBLEMS

1. Identify the value of the unknown angle.

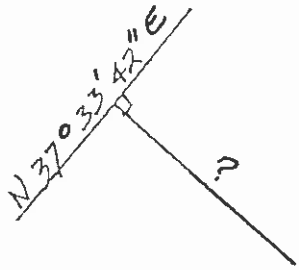


$90° - 60°$

$30°$

2. What is the bearing of the line perpendicular to N~~37°26'18~~"E?

$37°33'42''$



$90° - 37°33'.42''$

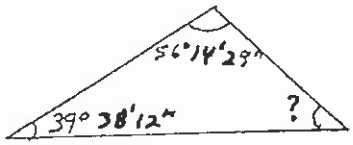
$90° - 37.561667$

52.438333

$52°26'18''$

$S\ 52°26'18''E$

3. What is the value of the unknown angle?



$180° - (56°14'29'' + 39°38'12'')$

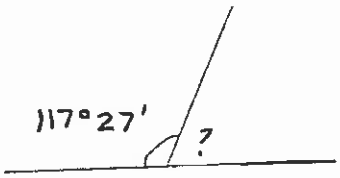
$180° - (56.241389° + 39.636667°)$

$180° - 95.878056°$

$84.121944°$

$84°07'19''$

4. What is the angle that supplements 117°27'?

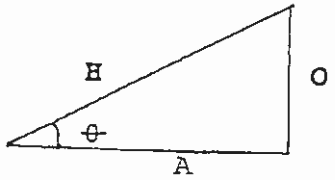


$180° - 117°27'$

$180° - 117.45°$

$62.55°$

$62°33'$



A SOLVE FOR THE UNKNOWNS:

1. θ = 76°35'14"
   H = 493.72'
   O = _____

2. θ = 61°31'36"
   H = 763.21'
   A = _____

3. θ = 27°13'39"
   A = 27.42'
   H = _____

4. θ = 09°13'57"
   H = 1003.74'
   O = _____

5. θ = 44°13'57"
   H = 433.32'
   A = _____

6. θ = 51°27'11"
   H = 27.63'
   O = _____

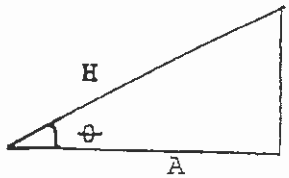
7. θ = 88°02'26"
   H = 397.23'
   A = _____

8. θ = 71°27'28"
   H = 229.83'
   A = _____

9. θ = _____
   A = 293.70'
   O = 270.70'

10. θ = _____
    A = 200.30'
    O = 200.30'

Answers



$\sin\theta = \frac{O}{H}$ $\quad O = H\sin\theta$ $\quad \theta = \sin^{-1}\frac{O}{H}$

$\cos\theta = \frac{A}{H}$ $\quad A = H\cos\theta$ $\quad \theta = \cos^{-1}\frac{A}{H}$

$\tan\theta = \frac{O}{A}$ $\quad O = A\tan\theta$ $\quad A = \frac{O}{\tan\theta}$ $\quad \theta = \tan^{-1}\frac{O}{A}$

A SOLVE FOR THE UNKNOWNS:

1. $\theta = 76°35'14"$
H = 493.72'
O = 480.25

$O = H\sin\theta$
$O = 493.72 \sin 76.58722°$
$O = (493.72)(0.9722242)$
$O = 480.25$

6. $\theta = 51°27'11"$
H = 27.63'
O = 21.61

$O = H\sin\theta$
$O = 27.63 \sin 51.453056°$
$O = (27.63)(0.7820972)$

2. $\theta = 61°31'36"$
H = 763.21'
A = 363.86

$A = H\cos\theta$
$A = 763.21 \cos 61.526667°$
$A = (763.21)(0.4767497)$
$A = 363.86$

7. $\theta = 88°02'26"$
H = 397.23'
A = 13.58

$A = H\cos\theta$
$A = (397.23)(\cos 88.040556°$
$A = (397.23)(0.0341921)$

3. $\theta = 27°13'39"$
A = 27.42'
H = 30.84

$H = \frac{A}{\cos\theta}$
$H = \frac{27.42}{\cos 27.22750°}$
$H = \frac{27.42}{0.8891965}$

8. $\theta = 71°27'28"$
H = 229.83'
A = 73.09

$A = H\cos\theta$
$A = (229.83)\cos 71.457728°$
$A = (229.83)(0.3180034)$

4. $\theta = 09°13'57"$
H = 1003.74'
O = 161.04

$O = H\sin\theta$
$O = (1003.74)\sin 9.2325°$
$O = (1003.74)(0.1604411)$

9. $\theta = 42°39'99"$
A = 293.70'
O = 270.70'

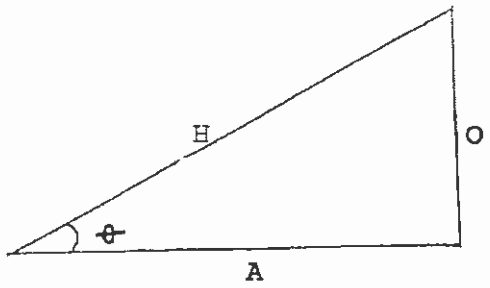
$\theta = \tan^{-1}\frac{O}{A}$
$\theta = \tan^{-1}\frac{270.7}{293.7}$
$\theta = \tan^{-1} 0.9216888$
$\theta = 42.666917°$

5. $\theta = 44°13'57"$
H = 433.32'
A = 310.48

$A = H\cos\theta$
$A = (433.32)\cos 44.2325°$
$A = (433.32)(.716315)$

10. $\theta = 45°$
A = 200.30'
O = 200.30'

$\theta = \tan^{-1}\frac{O}{A}$
$\theta = \tan^{-1}\frac{200.3}{200.3}$
$\theta = \tan^{-1} 1.000$
$\theta = 45°$



B SOLVE FOR THE UNKNOWNS

1. $\theta = 31^{\circ}$
   H=247'
   O=_____

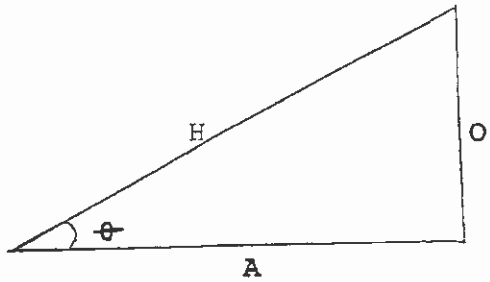
2. $\theta = 47^{\circ}14'34''$
   H=61.47'
   A=_____

3. $\theta = 21^{\circ}22'59''$
   H=603.1'
   O= _____

4. $\theta = 36^{\circ}13'47''$
   A= 52.37'
   H=_____

5. θ=_____
   H=112.7
   O=47.6'

Answers



$\sin\theta = \frac{O}{H}$

$\cos\theta = \frac{A}{H}$

B SOLVE FOR THE UNKNOWNS

1. $\theta = 31°$
   H=247'
   O= 127.21

$\sin\theta = \frac{O}{H}$

$H \sin\theta = O$

$(247)(\sin 31°) = O$

$(247)(0.5150381) = O$

$127.21 = O$

2. $\theta = 47°14'34''$
   H=61.47'
   A= 41.73

$\cos\theta = \frac{A}{H}$

$A = H \cos\theta$

$A = (61.47) \cos 47°14'34''$

$A = (61.47) \cos 47.242778°$

$A = (61.47)(0.6788933)$

$A = 41.73$

3. $\theta = 21°22'59''$
   H=603.1'
   O= 219.89

$\sin\theta = \frac{O}{H}$

$O = H \sin\theta$

$O = (603.1) \sin 21°22'59''$

$O = (603.1)(\sin 21.383056°)$

$O = (603.1)(0.3646014)$

$O = 219.89$

4. $\theta = 36°13'47''$
   A= 52.37'
   H= 64.92

$\cos\theta = \frac{A}{H}$

$H = \frac{A}{\cos\theta}$

$H = \frac{52.37}{\cos 36°13'47''} = \frac{52.37}{\cos 36.229722°} = \frac{52.37}{0.8066538}$

$= 64.92$

5. $\theta =$ _____
   H=112.7
   O=47.6'

$\sin\theta = \frac{O}{H}$

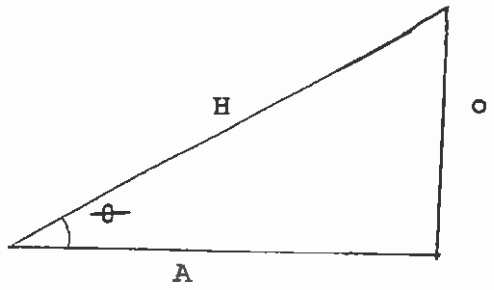
$\theta = \sin^{-1}\frac{O}{H}$

$\theta = \sin^{-1}\frac{47.6}{112.7}$

$\theta = \sin^{-1} 0.4223603$

$\theta = 24.98369°$

$\theta = 24°59'01''$



C SOLVE FOR THE UNKNOWNS:

1. $\theta = 27°31'54''$
H = 137.54'
O = _____

2. $\theta = 10°47'13''$
H = 331.11'
A = _____

3. $\theta = 46°26'20''$
O = 211.47'
A = _____

4. $\theta = 88°22'14''$
H = 98.70'
O = _____

5. $\theta = 39°27'14''$
O = _____
A = 413.57'

6. $\theta = 17°27'37''$
H = 217.43'
A = _____

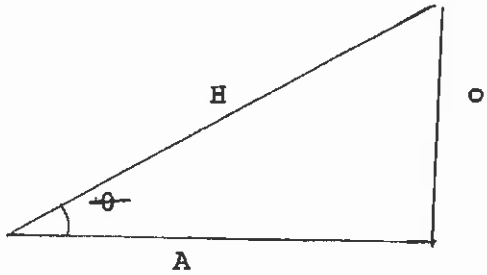
7. θ = _____
H = 413.33'
A = 277.92'

8. θ = _____
H = 277.3'
O = 114.43'

9. θ = _____
O = 243.60'
A = 444.93'

10. θ = _____
O = 372.4'
A = 224.71'
H = _____
Solve for H using 3 formulas

Answers



$\sin\theta = \frac{O}{H}$ $\quad O = H \sin\theta$

$\cos\theta = \frac{A}{H}$ $\quad A = H \cos\theta$

$\tan\theta = \frac{O}{A}$ $\quad O = A \tan\theta$

$A = \frac{O}{\tan\theta}$

C SOLVE FOR THE UNKNOWNS:

1. $\theta = 27°31'54''$
   H = 137.54'
   O = 63.58

$O = H \sin\theta$
$O = 137.54 \sin 27.531676°$
$O = (137.54)(0.4622388)$
$= 63.5763222$

2. $\theta = 10°47'13''$
   H = 331.11'
   A = 325.26

$A = H \cos\theta$
$A = 331.11 \cos 10.78694°$
$A = (331.11)(0.9822298)$
$A = 325.26$

3. $\theta = 46°26'20''$
   O = 211.47'
   A = 201.11

$A = \frac{O}{\tan\theta} = \frac{211.47}{\tan 46.43889}$
$= \frac{211.47}{1.0515317} = 201.11$

4. $\theta = 88°22'14''$
   H = 98.70'
   O = 98.66

$O = H \sin\theta$
$= (98.7) \sin 88.370556$
$= (98.70)(0.9995956)$
$= 98.66$

5. $\theta = 39°27'14''$
   O = 340.36
   A = 413.57'

$O = A \tan\theta$
$O = (413.57) \tan 39.453889$
$= (413.57)(0.8229[illegible])$
$= 340.36$

6. $\theta = 17°27'37''$
   H = 217.43'
   A = 207.41

$A = H \cos\theta$
$A = 217.43(\cos 17.460278°)$
$A = (217.43)(0.9539252)$
$A = 207.41$

7. $\theta = 47°44'53''$
   H = 413.33'
   A = 277.92'

$\theta = \cos^{-1}\frac{A}{H}$
$\theta = \cos^{-1}\frac{277.92}{413.33}$
$\theta = \cos^{-1} 0.6723925$
$\theta = 47.74801°$
$\theta = 47°44'53''$

8. $\theta = 24°22'19''$
   H = 277.3'
   O = 114.43'

$\theta = \sin^{-1}\frac{O}{H}$
$\theta = \sin^{-1}\frac{114.43}{277.3}$
$\theta = \sin^{-1} 0.4126578$
$\theta = 24.371802°$
$\theta = 24°22'19''$

9. $\theta = 28°42'03''$
   O = 243.60'
   A = 444.93'

$\theta = \tan^{-1}\frac{O}{A}$
$\theta = \tan^{-1}\frac{243.60}{444.93}$
$\theta = \tan^{-1} 0.5475079$
$\theta = 28.700787°$
$\theta = 28°42'03''$

10. $\theta = 58°57'42''$
    O = 372.4'
    A = 224.71'

$\theta = \tan^{-1}\frac{O}{A} \left(= \frac{372.4}{224.71}\right)$
$\theta = \tan^{-1} 1.6572491$
$\theta = 58.961637°$
$58°57'42''$

H = _____

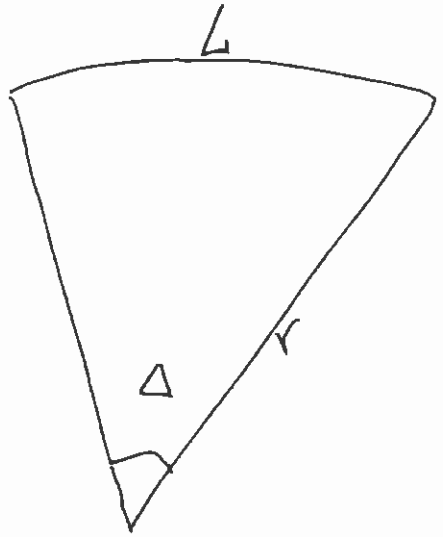
Solve for H using 3 formulas

$= \frac{O}{\sin\theta}$
$= \frac{372.4}{\sin 58.94667}$
$\frac{372.4}{0.8568226}$
$= 434.62$

$H = \frac{A}{\cos\theta}$
$H = \frac{224.71}{\cos 58.94667}$
$H = \frac{224.71}{0.5156494}$
$H = 435.81$

$H = \sqrt{(372.4)^2 + (224.71)^2}$
$H = \sqrt{138,681.76 + 50,494.54}$
$H = \sqrt{189,175.84}$
$H = 434.94$

CURVE PROBLEMS



$$L = \frac{\Delta\, 2\pi r}{360}$$

$$\Delta = \frac{360L}{2\pi r}$$

1) IF $L = 86.73$ & $r = 140'$

FIND Δ

2) IF $\Delta = 88°37'53''$ & $r = 100'$

FIND L

3) IF $L = 207.63$ & $r = 1163.12'$

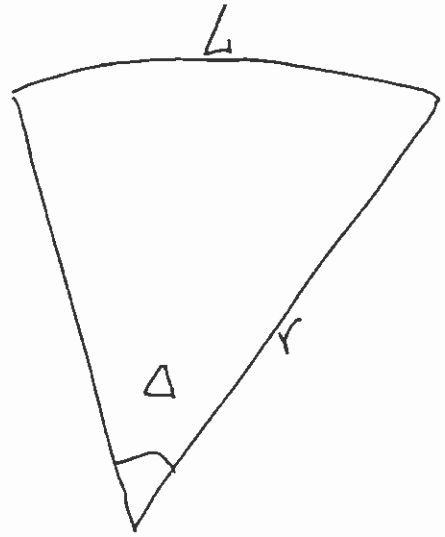
FIND Δ

4) IF $\Delta = 27°31'07''$ & $r = 276$

FIND L

Answers

CURVE PROBLEMS



$$L = \frac{\Delta\, 2\pi r}{360}$$

$$\Delta = \frac{360L}{2\pi r}$$

$$\Delta = \frac{360L}{2\pi r}$$

1) IF $L = 86.73$ & $r = 140'$

FIND Δ

$$\Delta = \frac{(360)(86.73)}{(2)(3.14)(140)} = \frac{31222.8}{879.646}$$

$$\Delta = 35.494735$$

$$\Delta = 35°29'41''$$

2) IF $\Delta = 88°37'53''$ & $r = 100'$

FIND L

$$L = \frac{\Delta\, 2\pi r}{360}$$

$$L = \frac{(88.631389°)(2)(3.14)(100')}{360°}$$

$$L = \frac{55688.744''}{360''}$$

$$L = 154.69'$$

3) IF $L = 207.63$ & $r = 1163.12'$

FIND Δ

$$\Delta = \frac{360L}{2\pi r} = \frac{(360)(207.63)}{(2)(3.14)(1163.12)}$$

$$\Delta = \frac{74,746.8}{7,308.10} = 10.227941°$$

$$\Delta = 10°13'41''$$

4) IF $\Delta = 27°31'07''$ & $r = 276$

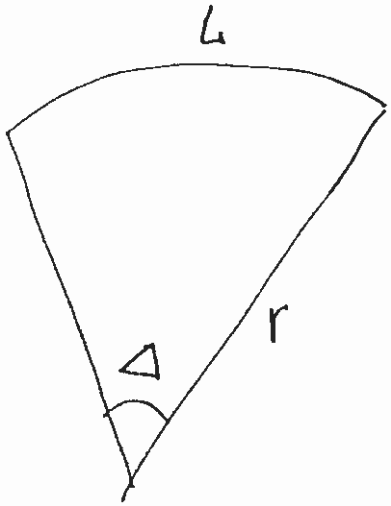
FIND L

$$L = \frac{\Delta 2\pi r}{360} = \frac{(27.51861)(2)(3.14)(276)}{360}$$

$$L = \frac{47721.65}{360}$$

$$L = 132.56'$$

CURVE PROBLEMS



$$L = \frac{\Delta 2\pi r}{360}$$

$$\Delta = \frac{360L}{2\pi r}$$

1) IF $L = 276.34$ AND $r = 500'$
FIND Δ

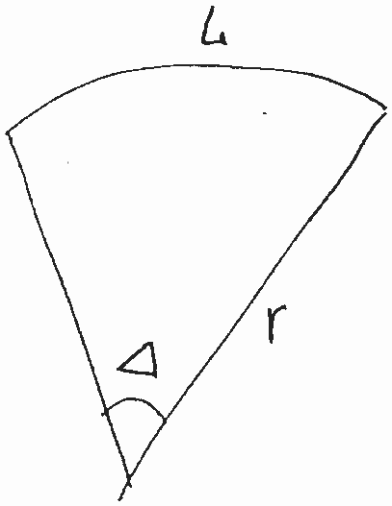
2) IF $\Delta = 37°37'11''$ AND $r = 230'$
FIND L

3) IF $L = 676.24'$ AND $r = 705'$
FIND Δ

4) IF $\Delta = 197°24'37''$ AND $r = 83.14'$
FIND L

Awnsers

CURVE PROBLEMS



$$L = \frac{\Delta 2\pi r}{360}$$

$$\Delta = \frac{360L}{2\pi r}$$

1) IF $L = 276.34$ AND $r = 500'$
FIND Δ

$$\Delta = \frac{360L}{2\pi r} = \frac{(360)(276.34)}{(2)(3.14)(500)}$$

$$\Delta = \frac{99482.4}{3141.59} = 31.66623° = \boxed{31°39'58}$$

2) IF $\Delta = 37°37'11''$ AND $r = 230'$
FIND L

$$L = \frac{\Delta 2\pi r}{360} = \frac{(37°37'11'')(2)(3.14)(230)}{360}$$

$$L = \frac{(37.619722°)(2)(3.14)(230)}{360} = \frac{54,365.4}{360}$$

$$\boxed{L = 151.02'}$$

3) IF $L = 676.24'$ AND $r = 705'$
FIND Δ

$$\Delta = \frac{360L}{2\pi r} = \frac{(360)(676.24)}{(2)(3.14)(705)}$$

$$\frac{243446.4}{4429.6} = 54.959° = \boxed{54°57'32''}$$

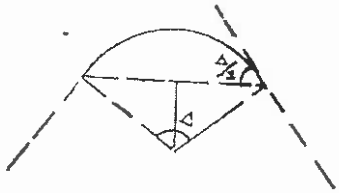
4) IF $\Delta = 197°24'37''$ AND $r = 83.14'$
FIND L

$$L = \frac{\Delta 2\pi r}{360}$$

$$L = \frac{(197°24'37'')(2)(3.14)(83.14)}{360}$$

$$L = \frac{(197.41028°)(2)(3.14)(83.14)}{360} = \frac{103,123.98}{360}$$

$$\boxed{L = 286.46}$$



CURVE PROBLEMS

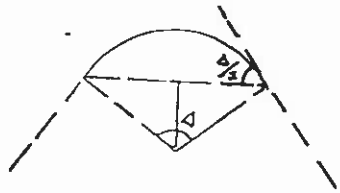
Chord Length=2r Sin$\frac{\Delta}{2}$

Chord Brng. = Tang.line$\pm \frac{\Delta}{2}$

1. If the tangent line to a regular curve to the left bears N66°22'56"W. And Delta Is 36°32'56", and r = 126', what is the chord bearing and distance?

2. If the tangent line to a regular curve to the right bears N22°17'12"E and delta= 44°15'27" and r= 217 ft. What is the chord bearing and distance?

3. Calculate the Chord bearing and distance for the curve in the following description. "....th N72°37'11"E 114.11 feet to the point of tangency of a 417 ft. radius curve to To the left; th.212.73 ft along the arc of said curve . (hint delta= $\frac{360\,L}{2\pi r}$)



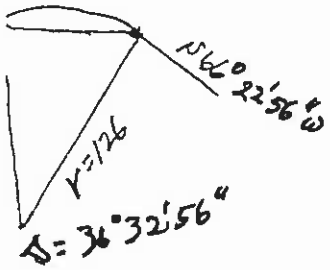
CURVE PROBLEMS

Answers

Chord Length=2r Sin$\frac{\Delta}{2}$

Chord Brng. = Tang.line$\pm\frac{\Delta}{2}$

1. If the tangent line to a regular curve to the left bears N66°22'56"W. And Delta Is 36°32'56", and r = 126', what is the chord bearing and distance?



CHD BRG

Tang. Brg + $\frac{1}{2}\Delta$

66°22'56" + $(\frac{1}{2})$(36°32'56")

66.38222 + $(\frac{1}{2})$(36.54889°)

66.38222 + 18.27445

84.65667

N84°39'24"W

Chd DIST

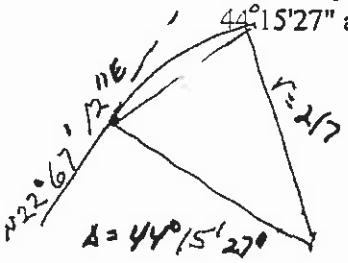
2r Sin $\frac{\Delta}{2}$

(2)(126) Sin 18.27445

(252)(.31357)

79.02 FT

2. If the tangent line to a regular curve to the right bears N22°17'12"E and delta= 44°15'27" and r= 217 ft. What is the chord bearing and distance?



CHD BRG

Tang Brg + $\frac{1}{2}\Delta$

22°17'12" + $(\frac{1}{2})$(44°15'27")

22.28667 + $\frac{1}{2}$(44.25750)

22.28667 + 22.12875

44.41542°

N44°24'56"E

CHD LENGTH

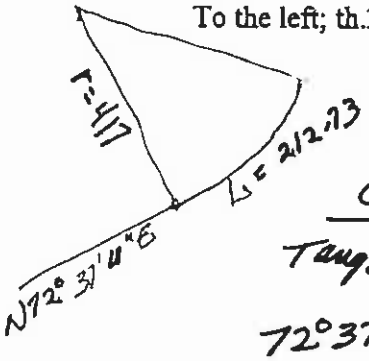
2r Sin $\frac{\Delta}{2}$

(2)(217) Sin 22.12875°

(434)(.37669)

163.48

3. Calculate the Chord bearing and distance for the curve in the following description. "....th N72°37'11"E 114.11 feet to the point of tangency of a 417 ft. radius curve to To the left; th.212.73 ft along the arc of said curve . (hint delta= $\frac{360\,L}{2\pi r}$)



$\Delta = \frac{360L}{2\pi r} = \frac{(360)(212.73)}{(2)(3.1416)(417)} = \frac{76,582.80}{2620.09} = 29.22902° = 29°13'44"$

CHD BRG

Tang.Brg − $\frac{1}{2}\Delta$

72°37'11" − $(\frac{1}{2})$(29.22902)

72.61972 − 14.61451

58.00521°

N58°00'19"E

CHD LENGTH

2r Sin $\frac{\Delta}{2}$

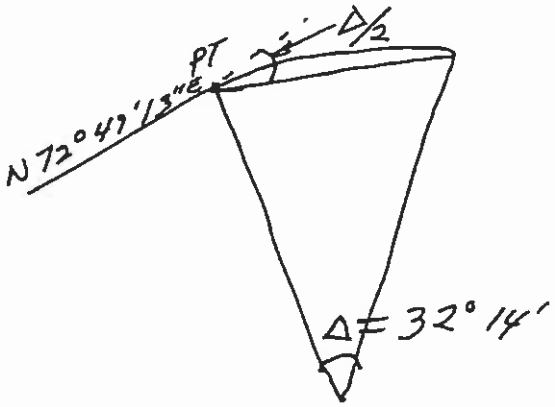
(2)(417) Sin 14.61451°

(834)(.25231)

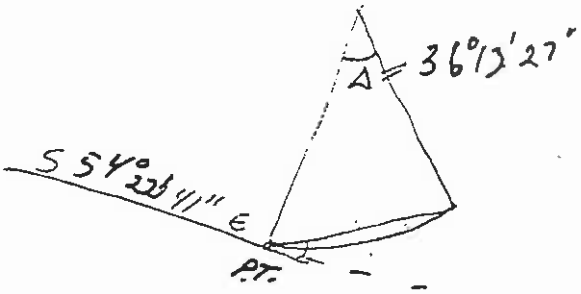
210.43 FT

CALCULATE THE CHORD BEARING

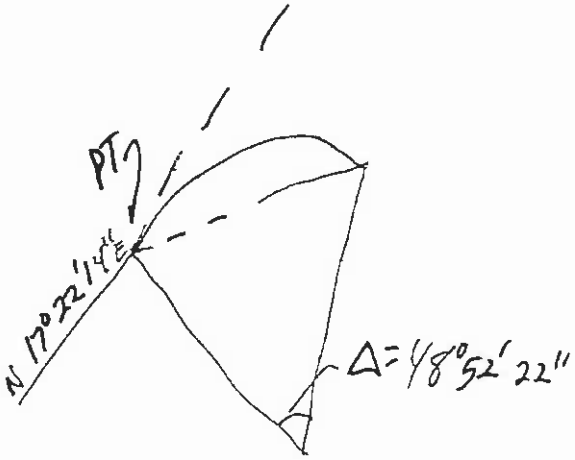
(1)



(2)



(3)



CALCULATE THE CHORD BEARING

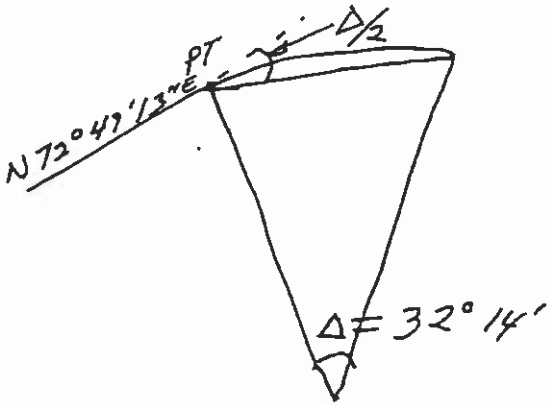
Answers

① $\frac{1}{2}\Delta = 16.1166667$

72.82027778

88.53694444

N 88° 56′ 13″ E

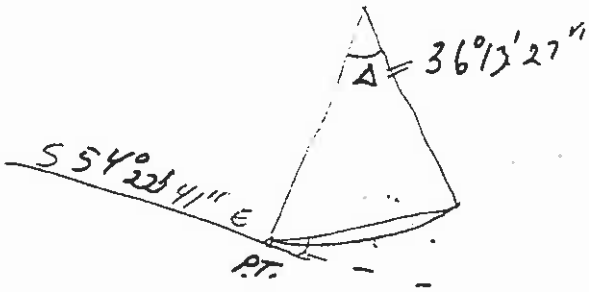


② $\frac{1}{2}\Delta = 18.1120833$

54.37805556

72.49013889

S 72° 29′ 25″ E

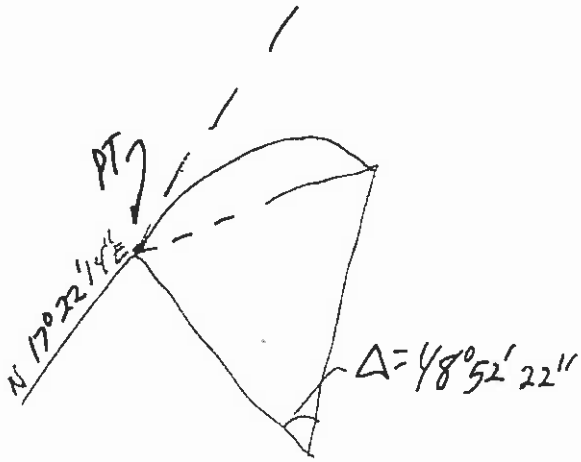


③ $\frac{1}{2}\Delta = 24.43638889$

17.3705556

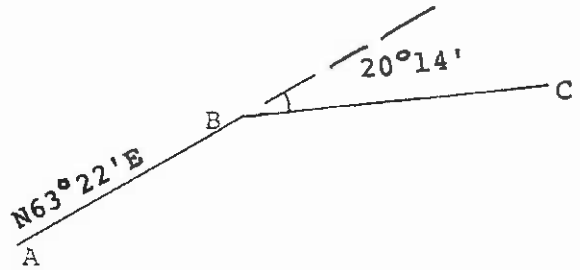
41.80694445

N 41° 48′ 25″ E

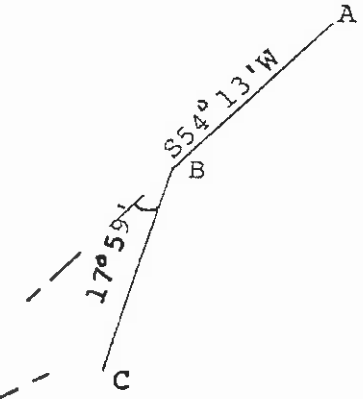


ROTATION PROBLEMS–CALCULATE THE BEARING OF LINE BC

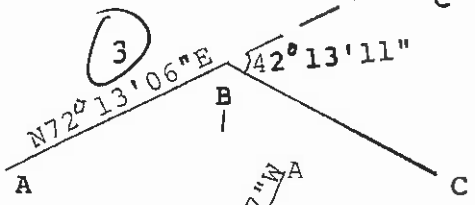
1.



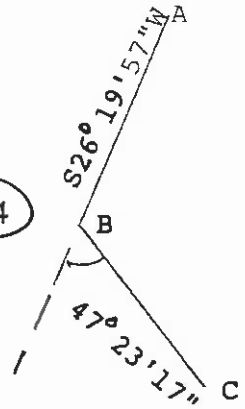
2.



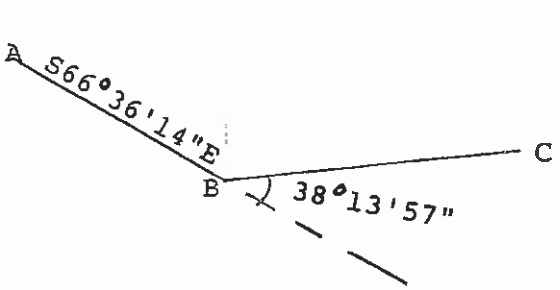
3



4



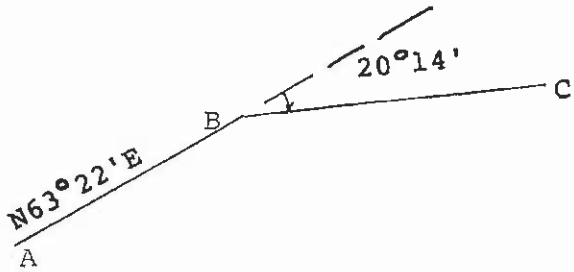
5



Answers

ROTATION PROBLEMS–CALCULATE THE BEARING OF LINE BC

1.



CLOCKWISE ROTATION

63°22' + 20°14'

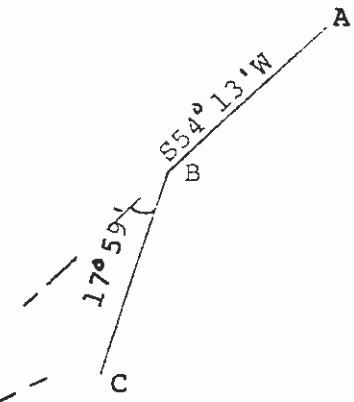
63.366667° + 20.23333°

83.599999°

83°36'

N 83° 36' E

2.



COUNTER CLOCKWISE ROTATION

54°13' – 17°59'

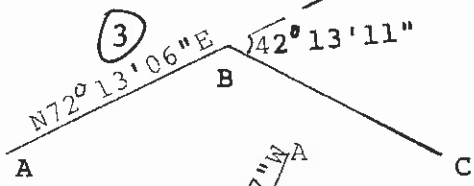
54.216667° – 17.98333°

36.2333°

36°14'

S36°14'W

3



CLOCKWISE ROTATION

72°13'06" + 42°13'11"

72.218333° + 42.219722°

114.43806° (greater than 90° – Subt from 180°)

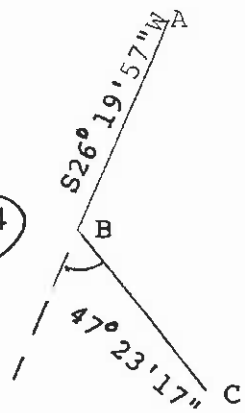
180° – 114.43806°

65.561945°

65°33'43"

S65°33'43"E

4



COUNTER CLOCKWISE ROTATION

26°19'57" – 47°23'17"

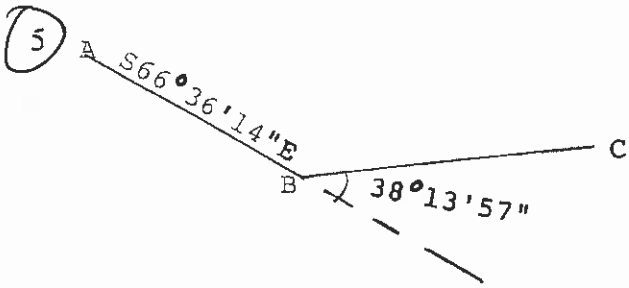
26.3325° – 47.388056°

–21.055556°

–21°03'20"

S21°03'20"E

5



COUNTER CLOCKWISE ROTATION

66°36'14" + 38°13'57"

66.603889° + 38.2325°

104.83639 (greater than 90°)

180° – 104.83639°

75.16361 = 75°09'49"

N 75°09'49"E

CURVE PROBLEMS

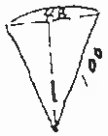
1. Find the central angle (Δ) and the arc length of a curve whose chord is 48 ft long and whose radius is 100 ft.

2. Find the central angle (Δ) and the arc length of a curve whose chord is 297.14 feet Long and whose radius is 213.43 feet.

Answers

CURVE PROBLEMS

1. Find the central angle (Δ) and the arc length of a curve whose chord is 48 ft long and whose radius is 100 ft.



$\Delta = 2 \sin^{-1} \frac{CHD/2}{r}$

$\Delta = 2 \sin^{-1} \frac{48/2}{100}$

$\Delta = 2 \sin^{-1} \frac{24}{100}$

$\Delta = 2 \sin^{-1} 0.24$

$\Delta = 2 (13.88654)$

$\Delta = 27.77308$

$\Delta = 27°46'23''$

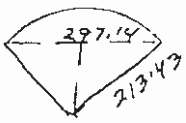
ARC LENGTH $= \frac{\Delta 2\pi r}{360}$

✓ $= \frac{(27.77308)(2)(3.14159)(100)}{360}$

✓ $= \frac{17{,}450.34}{360}$

ARC LENGTH = 48.47'

2. Find the central angle (Δ) and the arc length of a curve whose chord is 297.14 feet Long and whose radius is 213.43 feet.



$\Delta = 2 \sin^{-1} \frac{CHD/2}{r}$

$\Delta = 2 \sin^{-1} \frac{297.14/2}{213.43}$

$\Delta = 2 \sin^{-1} \frac{148.57}{213.43}$

$\Delta = 2 \sin^{-1} 0.6961065$

$\Delta = 2 (44.115453)$

$\Delta = 88.230906$

$\Delta = 88°13'51''$

ARC LENGTH $= \frac{\Delta 2\pi r}{360}$

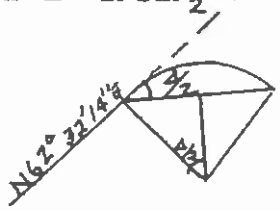
✓ $= \frac{(88.230906)(2)(3.14159)(213)}{360}$

✓ $= \frac{118{,}319.43}{360}$

ARC LENGTH = 328.67

CHORD BEARING AND DISTANCE PROBLEMS

Chd L = 2r Sin$\frac{\Delta}{2}$ Chd bearing = Tangent line bearing $\pm \frac{\Delta}{2}$



1. Tangent Bearing = N62°32'14"E
   Δ = 23°27'14"
   r = 275'

Chd bearing and distance = _____

2. Find the chord bearing and distance for the following curve in the following description. " ...S44°56'11"E 162 ft. to the point of tangency of a 620 ft radius curve to the right whose central angle (Δ) is 36°26'54"....."

Chd bearing and distance = _____

3. Find the chord bearing and distance for the curve in the following partial description.

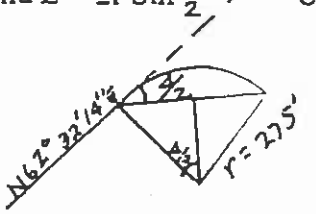
   "...N23°11'51"E 100 ft.to the point of curvature of a 326 ft radius, regular curve to the Left whose central angle is 17°21'16".

Chord bearing and distance is _____

Answers

CHORD BEARING AND DISTANCE PROBLEMS

Chd L = 2r Sin$\frac{\Delta}{2}$, Chd bearing = Tangent line bearing $\pm \frac{\Delta}{2}$



Chd L = (2)(275) Sin $\frac{23.4539°}{2}$ Brng = 62.5372° + $\frac{23.4539}{2}$

Chd = = (550) Sin 11.72694° Brng = 62.5372° + 11.72694°

Chd = (550)(0.20324) Brng = 74.26462°

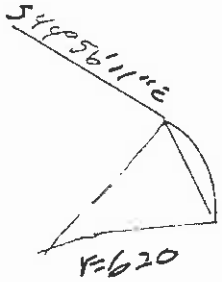
Chd L = 111.79 Brng = N 74°15'51"E

1. Tangent Bearing = N62°32'14"E
   Δ = 23°27'14"
   r = 275'

Chd bearing and distance = _____

2. Find the chord bearing and distance for the following curve in the following description. " ...S44°56'11"E 162 ft. to the point of tangency of a 620 ft radius curve to the right whose central angle (Δ) is 36°26'54"....."

Chd bearing and distance = _____



Chd L = (2)(620) Sin $\frac{36.4483°}{2}$ Brng = 44.936389° − $\frac{36.4483°}{2}$

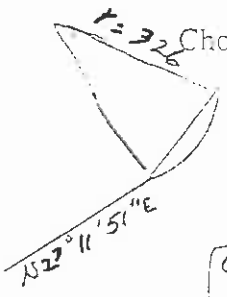
= (2)(620) Sin 18.2242° Brng = 44.936389° − 18.2242°

= (1240)(0.312733) Brng = 26.712189°

Chd = 387.79 Brng = S26°42'44"E

3. Find the chord bearing and distance for the curve in the following partial description.

"...N23°11'51"E 100 ft.to the point of curvature of a 326 ft radius, regular curve to the Left whose central angle is 17°21'16".



Chord bearing and distance is _____

Chd L = (2)(326) Sin $\frac{17.3544°}{2}$ Brng = 22.1975° − $\frac{17.3544°}{2}$

Chd L = 652 Sin 8.67722° Brng = 22.1975° − 8.67722°

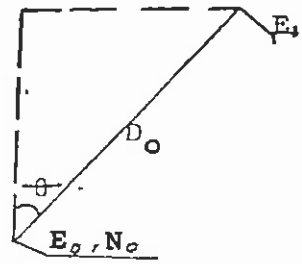
Chd L = (652)(0.1508678) Brng = 14.520278°

Chd L = 98.37 Brng = N14°31'13"E

INVERSE--TRAVERSE PROBLEMS

$$\theta = \tan^{-1} \frac{E_1 - E_o}{N_1 - N_o}$$

$$D_o = \sqrt{(N_1 - N_o)^2 + (E_1 - E_o)^2}$$



Ref. ⊕

Calculate the bearing and distance between points no N , E in the following problems.

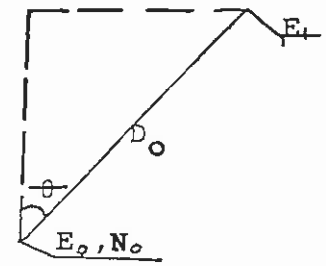
	N_o	E_o	N_1	E_1	Bearing (θ)	Distance (D_o)
1.	27.53′	54.21′	107.12′	313.22′		
2.	0.0′	0.0′	272.11′	304.22′		
3.	1.11′	45.67′	615.23′	27.36′		
4.	27.44′	-31.17′	107.62′	-432.33′		
5.	-22.34′	-10.0′	-462.11′	672.12′		
6.	463.12′	217.31′	23.1′	14.52′		
7.	-22.0′	-10.00′	47.0′	56.0′		

INVERSE--TRAVERSE PROBLEMS

Answers

$$\theta = \tan^{-1} \frac{E_1 - E_0}{N_1 - N_0}$$

$$D_0 = \sqrt{(N_1 - N_0)^2 + (E_1 - E_0)^2}$$

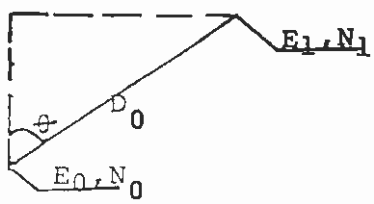


Ref. ⊕

Calculate the bearing and distance between points no N , E in the following problems.

	N_0	E_0	N_1	E_1	Bearing (θ)	Distance (D_0)
1.	27.53′	54.21′	107.12′	313.22′	N 72°55′06″E	270.96
2.	0.0′	0.0′	272.11′	304.22′	N48°11′20″E ~~[illegible]~~	408.09 ~~[illegible]~~
3.	1.11′	45.67′	615.23′	27.36′	N 1°42′27″ W	614.39
4.	27.44′	-31.17′	107.62′	-432.33′	N 78°41′49″W	409.09
5.	-22.34′	-10.0′	-462.11′	672.12′	S 57°11′22″ E	811.59
6.	463.12′	217.31′	23.1′	14.52′	S 24°44′36″ W	484.50
7.	-22.0′	-10.00′	47.0′	56.0′	N 43°43′33″E	95.48

TRAVERSE PROBLEMS



$N_1 = N_0 + D_0 \cos\theta$

$E_1 = E_0 + D_0 \sin\theta$

Sin (-) Cos (+)	Sin (+) Cos (+)
Sin (-) Cos (-)	Sin (+) Cos (-)

1. From the point N_0= 17.12 ft., E_0= 52.76 ft., traverse N 76°13'12"E 276.12 ft. What are the coordinates at the end of the traverse? N_1= _____ E_1= _____

2. From the point N_0= 29.31', E_0= 1.15', traverse N°39 17'22" E 107.12'. What are the Coordinates at the end of the traverse? N_1= _____ E_1= _____

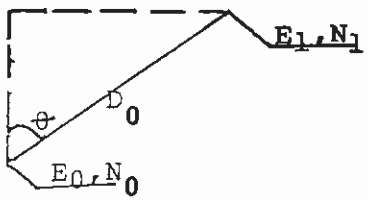
3. From the point N_0= 25.0' and E_0= -54.2' (ie. West), Traverse N23°35'56"W 211.61'. What are the coordinates at the end of the traverse? N_1= _____ E_1= _____

4. From the point N_0= -105.1' and E_0= -23.12', Traverse S41°14'46"W 253.12'. What are The coordinates at the end of the traverse? N_1= _____ E_1= _____

5. From the coordinates N_0= -25', E_0= -25', traverse N 39°27'14"E 107.94'. What are the Coordinates ath the end of the traverse? N_1= _____ E_1= _____

TRAVERSE PROBLEMS

Answers



$N_1 = N_0 + D_0 \cos\theta$

$E_1 = E_0 + D_0 \sin\theta$

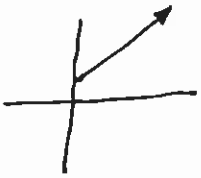
NW	N E
Sin (-) Cos (+)	Sin (+) Cos (+)
Sin (-) Cos (-) SW	Sin (+) Cos (-) SE

1. From the point N_0= 17.12 ft., E_0= 52.76 ft., traverse N 76°13'12"E 276.12 ft. What are the coordinates at the end of the traverse? N_1= 82.89 E_1= 320.93

$N_1 = N_0 + D_0 \cos\theta$
$N_1 = 17.12 + 276.12 \cos 76.22°$
$N_1 = 17.12 + (276.12)(0.2381945)$
$N_1 = 17.12 + 65.77$
$N_1 = 82.89$

$E_1 = E_0 + D_0 \sin\theta$
$E_1 = 52.76 + 276.12 \sin 76.22°$
$E_1 = 52.76 + (276.12)(0.9712175)$
$E_1 = 52.76 + 268.17$
$E_1 = 320.93$

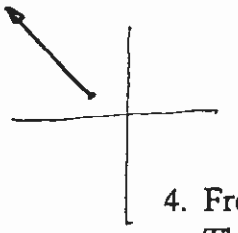
2. From the point N_0= 29.31', E_0= 1.15', traverse N 39 17'22" E 107.12'. What are the Coordinates at the end of the traverse? N_1= 112.22 E_1= 68.98



$N_1 = N_0 + D_0 \cos\theta$
$N_1 = 29.31 + 107.12 \cos 39.289444°$
$N_1 = 29.31 + (107.12)(0.7738569)$
$N_1 = 29.31 + 82.91$
$N_1 = 112.22$

$E_1 = E_0 + D_0 \sin\theta$
$E_1 = 1.15 + (107.12) \sin 39.289444$
$E_1 = 1.15 + (107.12)(0.6332383)$
$E_1 = 1.15 + 67.83$
$E_1 = 68.98$

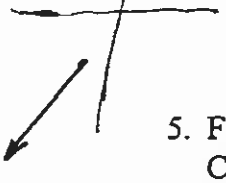
3. From the point N_0= 25.0' and E_0= -54.2' (ie. West), Traverse N23°35'56"W 211.61'. What are the coordinates at the end of the traverse? N_1= 218.91 E_1= -138.91 (ie West)



$N_1 = N_0 + D_0 \cos\theta$
$N_1 = 25.0 + 211.61 \cos 23.598889°$
$N_1 = 25.0 + (211.61)(0.9163705)$
$N_1 = 25.0 + 193.91$
$N_1 = 218.91$

$E_1 = E_0 + D_0 \sin\theta$
$E_1 = -54.2 + 211.61 \sin 23.598889$ (NE)
$E_1 = -54.2 + (211.61)(-.4003313)$
$E_1 = -54.2 + (-84.71)$
$E_1 = -138.91$

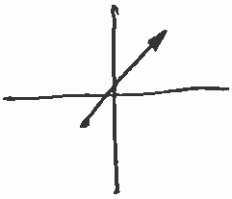
4. From the point N_0= -105.1' and E_0= -23.12', Traverse S41°14'46"W 253.12'. What are The coordinates at the end of the traverse? N_1= -295.41 E_1= -190.00 (WEST)



$N_1 = N_0 + D_0 \cos\theta$
$N_1 = -105.1 + 253.12 \cos 41.246111$
$N_1 = -105.1 + (253.12)(-.7518846)$
$N_1 = -105.1 + (-190.32)$
$N_1 = -295.41$

$E_1 = E_0 + D_0 \sin\theta$
$E_1 = -23.12 + 253.12 \sin 41.246111$
$E_1 = -23.12 + (253.12)(-0.6592948)$
$E_1 = -23.12 + (-166.88)$
$E_1 = -190.00$

5. From the coordinates N_0= -25', E_0= -25', traverse N 39°27'14"E 107.94'. What are the Coordinates ath the end of the traverse? N_1= 58.34 E_1= 43.59



$N_1 = N_0 + D_0 \cos\theta$
$N_1 = -25 + 107.94 \cos 39.453889$
$N_1 = -25 + (107.94)(0.7721362)$
$N_1 = -25 + 83.34$
$N_1 = 58.34$

$E_1 = E_0 + D_0 \sin\theta$
$E_1 = -25 + 107.94 \sin 39.4538$
$E_1 = -25 + (107.94)(0.635452)$
$E_1 = -25 + 68.59$
$E_1 = 43.59$

TRAVERSE AND COORDINATE PROBLEMS

1. Find the coordinates with respect to the <u>SW</u> corner of the point N. 58.94 ft and W. 146.34 ft from the S 1/4 Corner....

(The bearing and distance between the SW cor and the S 1/4 cor is N88°27'15"E 2986.73')

2. Find the coordinates with respect to the S 1/4 cor. Of the point S 215.11 ft and W 121.83 Ft. fm the SE Corner.....

(The bearing and distance between the S 1/4 cor and the SE cor is N89°11'36"E 2652.31')

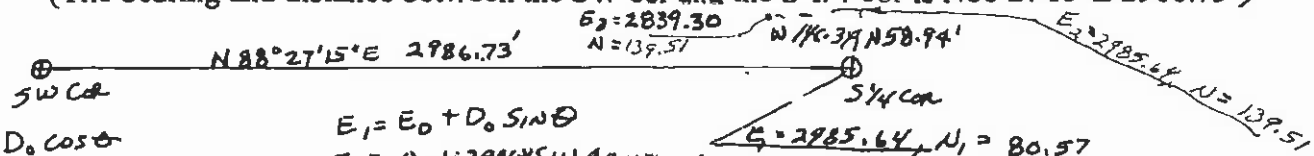
3. Calculate the bearing and distance between the following points. P_1 = E 562.50 ft. and S 2088.13 ft. from the W 1/4 Cor.... P_2= E 311.44 ft. and N 287.23 ft. fm the SW Cor...

(Bearing and distance between the W 1/4 cor and SW cor is S0°52'37"W 2628.96 ft.)

TRAVERSE AND COORDINATE PROBLEMS

1. Find the coordinates with respect to the <u>SW</u> corner of the point N. 58.94 ft and W. 146.34 ft from the S 1/4 Corner....

(The bearing and distance between the SW cor and the S 1/4 cor is N88°27'15"E 2986.73')



$= N_0 + D_0 \cos\theta$
$= 0 + 2986.73 \cos 88.454167°$
$_1 = (2986.73)(0.0269766)$
$_1 = 80.57$

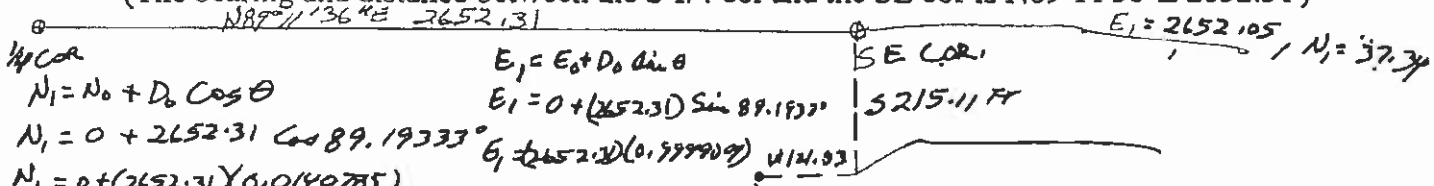
$E_1 = E_0 + D_0 \sin\theta$
$E_1 = 0 + 2986.73 \sin 88.454167°$
$E_1 = (2986.73)(0.999634)$
$E_1 = 2985.64$

N FINAL = 80.57 + 58.94
N = 139.51

E FINAL = 2985.64 − 146.34
E = 2839.30

2. Find the coordinates with respect to the <u>S 1/4</u> cor. Of the point S 215.11 ft and W 121.83 Ft. fm the SE Corner.....

(The bearing and distance between the S 1/4 cor and the SE cor is N89°11'36"E 2652.31')



$N_1 = N_0 + D_0 \cos\theta$
$N_1 = 0 + 2652.31 \cos 89.19333°$
$N_1 = 0 + (2652.31)(0.0140785)$
$N_1 = 37.34$

$E_1 = E_0 + D_0 \sin\theta$
$E_1 = 0 + (2652.31) \sin 89.19333°$
$E_1 = (2652.31)(0.999900)$
$E_1 = 2652.05$

E FINAL = 2652.05 + (−121.83)
E = 2530.22

N FINAL = 37.34 + (−215.
N = −177.77 (SOUTH)

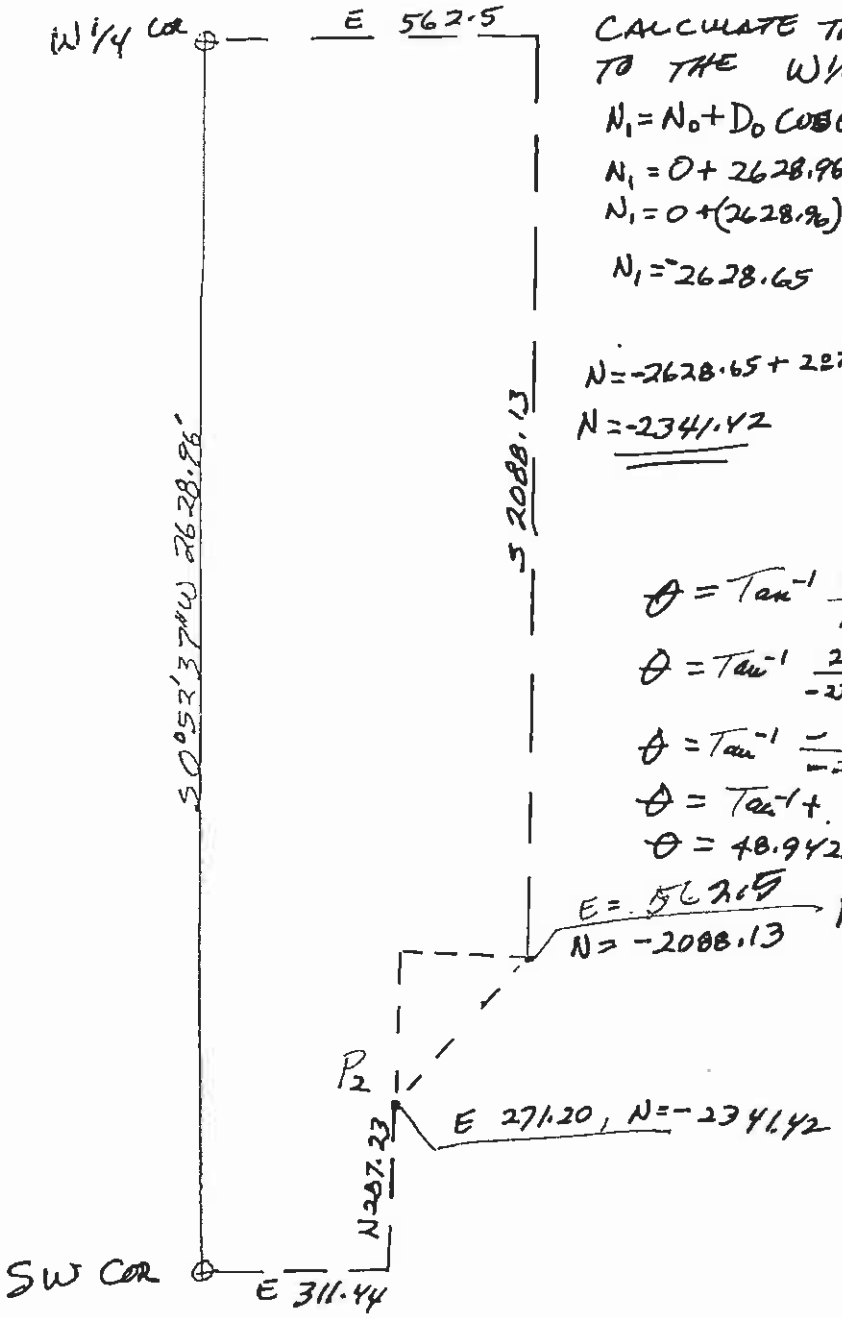
3. Calculate the bearing and distance between the following points. P_1 = E 562.50 ft. and S 2088.13 ft. from the W 1/4 Cor.... P_2 = E 311.44 ft. and N 287.23 ft. fm the SW Cor...

(Bearing and distance between the W 1/4 cor and SW cor is S0°52'37"W 2628.96 ft.)

(SEE ATTACHED)

Attachment Answer #3

FOR THIS EXAMPLE, THE W 1/4 CORNER WILL [illegible] CONSIDERED THE 0,0 POINT. WE NEED TO FIRST CALCULATE THE COORDINATES OF P_2 WITH RESP[illegible] TO THE W 1/4 COR.



$N_1 = N_0 + D_0 \cos\theta$

$N_1 = 0 + 2628.96 \cos 0.876944°$

$N_1 = 0 + (2628.96)(-0.9998829)$

$N_1 = -2628.65$

$N = -2628.65 + 207.23$

$N = -2341.42$

$E_1 = E_0 + D_0 \sin\theta$

$E_1 = 0 + (2628.96) \sin$ [illegible]

$E_1 = (2628.96)(-0.0153$ [illegible]

$E_1 = -40.24$

$E = -40.24 + 311.44$

$E = 271.20$

BEARING BETWEEN P1 & P_2

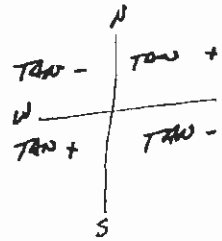
$\theta = \tan^{-1} \frac{E_1 - E_0}{N_1 - N_0}$

$\theta = \tan^{-1} \frac{271.20 - 562.5}{-2341.42 - (-2088.13)}$

$\theta = \tan^{-1} \frac{-291.3}{-253.29}$

$\theta = \tan^{-1} + 1.1500651$

$\theta = 48.9425 = 48°59'33''$



DISTANCE BETWEEN P_1 & P_2

$D_0 = \sqrt{(N_1 - N_0)^2 + (E_1 - E_0)^2}$

$D_0 = \sqrt{(-2341.42 - -2088.13)^2 + (271.2 - 5$ [illegible]

$D_0 = \sqrt{(-253.29)^2 + (-291.3)^2}$

$D_0 = \sqrt{64155.8 + 84855.69}$

$D_0 = \sqrt{149011.49}$

$D_0 = 386.02$

BRNG. & DIST BETWEEN P_1 & P_2 IS S 48°59'33"W 386.02 ft