

Sponsored by the National Society of Professional Surveyors

# **SAMPLE PROBLEMS**

**2012-2013**

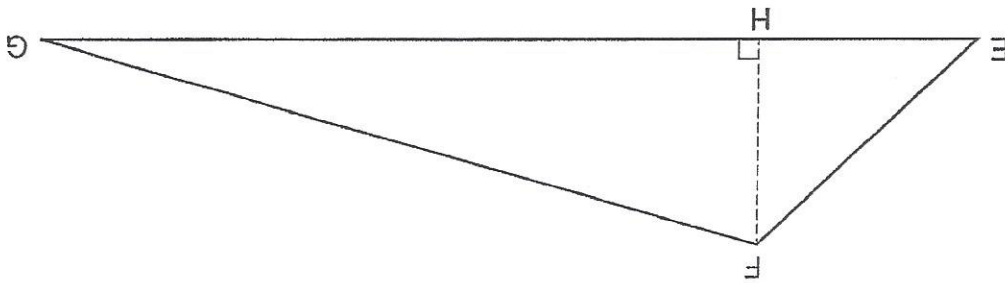


PAGE TOTAL: \_\_\_\_\_ POINTS

REQUIRED ANSWER FORMAT  
 DISTANCES: NEAREST HUNDREDTH  
 ANGLES: DEGREES-MINUTES-SECONDS  
 TO THE NEAREST SECOND

- FIND:  $\angle EGF =$  \_\_\_\_\_ (6 POINTS)  
 DISTANCE  $EH =$  \_\_\_\_\_ (6 POINTS)  
 DISTANCE  $FH =$  \_\_\_\_\_ (6 POINTS)  
 DISTANCE  $FG =$  \_\_\_\_\_ (6 POINTS)  
 DISTANCE  $GH =$  \_\_\_\_\_ (6 POINTS)

KNOWN: DISTANCE  $EF = 190.81$   $\angle EFG = 120.57'18''$   $\angle FEG = 42.24'54''$

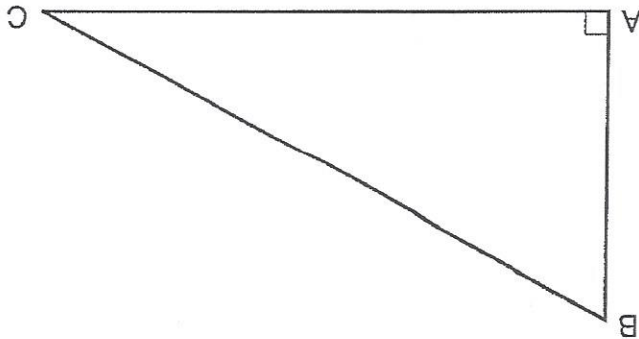


TRIG-STAR PROBLEM LOCAL CONTEST

REQUIRED ANSWER FORMAT  
 DISTANCES: NEAREST HUNDREDTH  
 ANGLES: DEGREES-MINUTES-SECONDS  
 TO THE NEAREST SECOND

- FIND:  $\angle CBA =$  \_\_\_\_\_ (5 POINTS)  
 DISTANCE  $AC =$  \_\_\_\_\_ (5 POINTS)

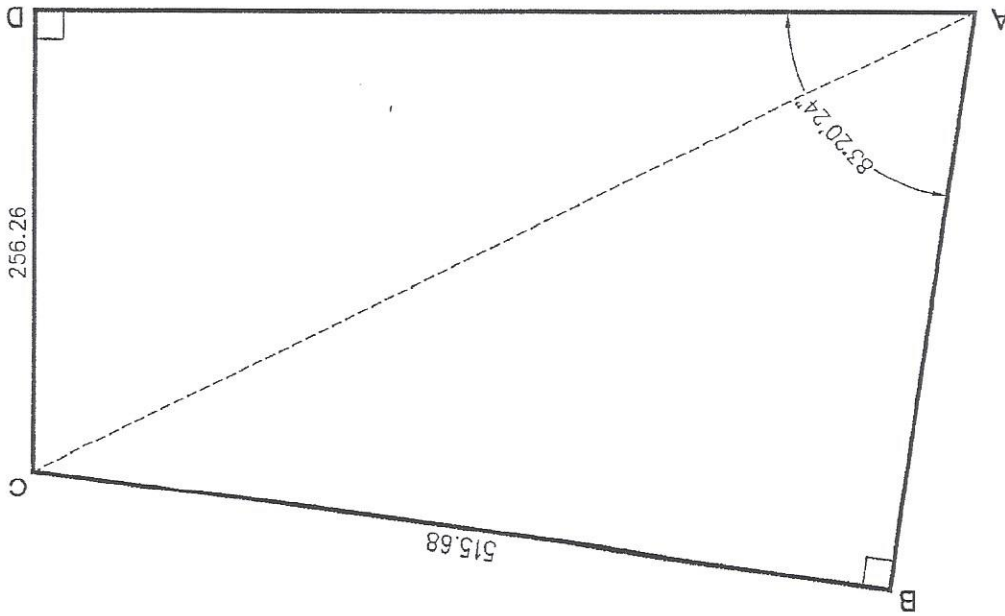
KNOWN: DISTANCE  $AB = 179.12$  DISTANCE  $BC = 375.63$



PRINT NAME: \_\_\_\_\_

TRIG-STAR PROBLEM LOCAL CONTEST

TRIG-STAR PROBLEM LOCAL CONTEST



KNOWN: DISTANCE BC = 515.68     $\angle BAD = 83.2024^\circ$   
 DISTANCE CD = 256.26

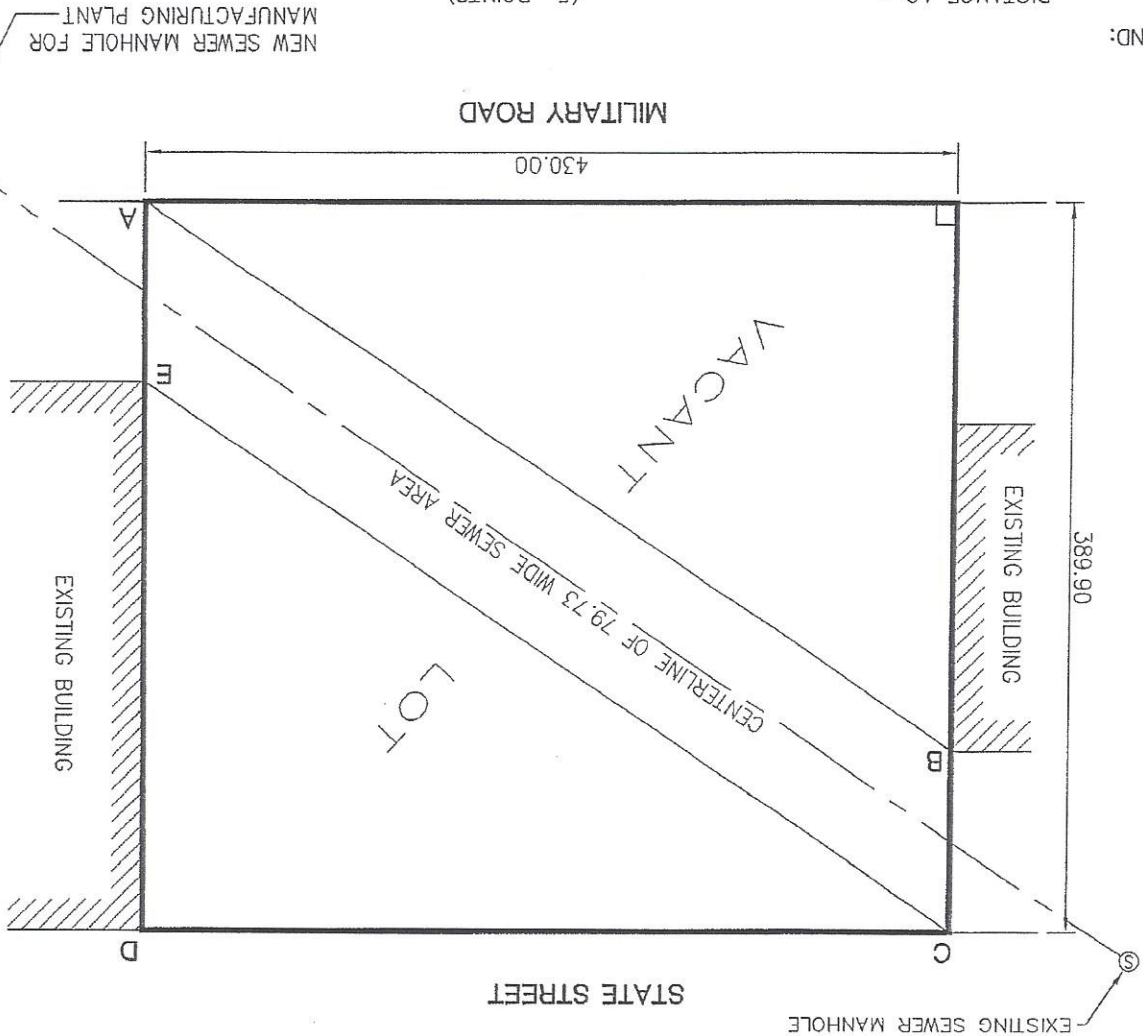
FIND: DISTANCE AB = \_\_\_\_\_ (10 POINTS)  
 DISTANCE AD = \_\_\_\_\_ (10 POINTS)  
 DISTANCE AC = \_\_\_\_\_ (10 POINTS)

REQUIRED ANSWER FORMAT  
 DISTANCES: NEAREST HUNDREDTH

PAGE TOTAL: \_\_\_\_\_ POINTS

# TRIG-STAR PROBLEM LOCAL CONTEST

A MANUFACTURING PLANT WOULD LIKE TO EXPAND BUT NEEDS MORE SEWER CAPACITY. THE CITY HAS AGREED TO HELP BY INSTALLING A NEW SEWER LINE ACROSS A RECTANGULAR SHAPED VACANT LOT TO A NEW MANHOLE FOR THE PLANT'S CONVENIENCE. THE SEWER LINE WILL NEED AN AREA 79.73 IN WIDTH FOR VACANT LOT SUCH THAT THE OPPOSITE SIDES PASS THROUGH THE DIAGONAL CORNERS OF THE LOT. THE OWNER OF THE VACANT LOT WOULD LIKE MORE INFORMATION BEFORE SELLING THE SEWER AREA TO THE CITY.



FIND:

- DISTANCE AC = \_\_\_\_\_ (5 POINTS)
- DISTANCE AE = \_\_\_\_\_ (6 POINTS)
- DISTANCE CE = \_\_\_\_\_ (6 POINTS)
- AREA ABCE = \_\_\_\_\_ (6 POINTS)
- AREA CDE = \_\_\_\_\_ (7 POINTS)

REQUIRED ANSWER FORMAT  
 DISTANCES: NEAREST HUNDREDTH  
 AREA: NEAREST WHOLE UNIT

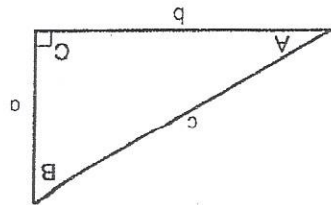
# TRIG-STAR MISCELLANEOUS DATA

## RIGHT TRIANGLE FORMULAS

PYTHAGOREAN THEOREM:  $a^2 + b^2 = c^2$

AREA:  $\frac{1}{2}ab$

TRIGONOMETRIC FUNCTIONS:  $\sin A = \frac{a}{c}$   
 $\cos A = \frac{b}{c}$   
 $\tan A = \frac{a}{b}$

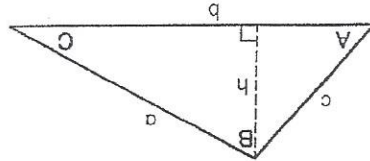


## OBLIQUE TRIANGLE FORMULAS

LAW OF SINES:  $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

LAW OF COSINES:  $a^2 = b^2 + c^2 - 2bc \cos A$

AREA:  $\frac{1}{2}bh$



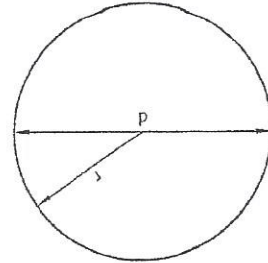
## CIRCLE FORMULAS

DIAMETER =  $d$  RADIUS =  $r$

CIRCUMFERENCE:  $2\pi r$  or  $\pi d$

AREA:  $\pi r^2$

ONE DEGREE (1') OF ARC = 60 MINUTES (60'') OF ARC  
 ONE MINUTE (1'') OF ARC = 60 SECONDS (60''') OF ARC  
 THEREFORE ONE DEGREE OF ARC (1°) = 3600 SECONDS OF ARC.



DISTANCE AC = 580.45  
 DISTANCE AE = 96.52  
 DISTANCE CE = 520.55  
 AREA ABCE = 41503  
 AREA CDE = 63077

PAGE 3

DISTANCE AB = 318.21  
 DISTANCE AD = 549.11  
 DISTANCE AC = 605.96

PAGE 2

∠ EGF = 16°37'48"  
 DISTANCE EH = 140.87  
 DISTANCE FH = 128.70  
 DISTANCE FG = 449.70  
 DISTANCE GH = 430.89

PAGE 1

∠ CBA = 61°31'12"  
 DISTANCE AC = 330.17

PAGE 1

TRIG-STAR ANSWER KEY LOCAL CONTEST



NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS  
Trig-Star Contest Test Cover Sheet - Local Contest

---

**CONTESTANT INFORMATION (PLEASE PRINT)**

Name \_\_\_\_\_ Graduation Year \_\_\_\_\_

High School \_\_\_\_\_ High School Address: \_\_\_\_\_

Street: \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Home Address: \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

Parent / Guardian Names \_\_\_\_\_

Math/Trigonometry Teacher's Full Name \_\_\_\_\_

Phone or Email \_\_\_\_\_

Sponsor's Name or Company \_\_\_\_\_

**I HEREBY STATE THAT THE WORK PERFORMED ON THIS EXAM IS MY OWN WORK DONE WITHOUT THE AID OF COMPUTER / CALCULATOR SOFTWARE PROGRAMS.**

Signature \_\_\_\_\_ Date \_\_\_\_\_

*Check for information about careers in Surveying and Mapping and associated scholarships.*

**CONTEST RULES**

1. One (1) hour maximum for completion of the competition.
2. Place answers in the spaces provided - answers shown elsewhere will not count. Be sure to give answers in the format requested.
3. All competition materials will be collected when you are finished.
4. Raise both hands when you finish - your time will be noted to the nearest second.
5. After your competition paper is collected you may leave the room, unless instructed otherwise.
6. First place is awarded to the highest score. In the event of a tie score, the student that completed the competition first will win.

**PLEASE PLACE YOUR NAME ON THE FIRST PAGE OF THE TEST  
(THIS COVER PAGE WILL NOT BE RETURNED TO YOU)  
DO NOT BEGIN THE TEST UNTIL INSTRUCTED TO DO SO  
GOOD LUCK!**

---

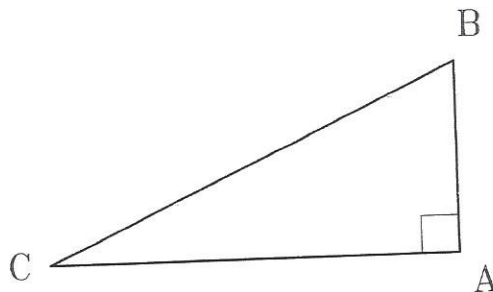
FOR INSTRUCTORS USE

Time \_\_\_\_\_ (nearest second) Point Total \_\_\_\_\_

TRIG-STAR PROBLEM 1A LOCAL CONTEST

REQUIRED ANSWER FORMAT  
 DISTANCES: NEAREST HUNDREDTH  
 ANGLES: DEGREES-MINUTES-SECONDS  
 (TO THE NEAREST SECOND)

PRINT NAME: \_\_\_\_\_

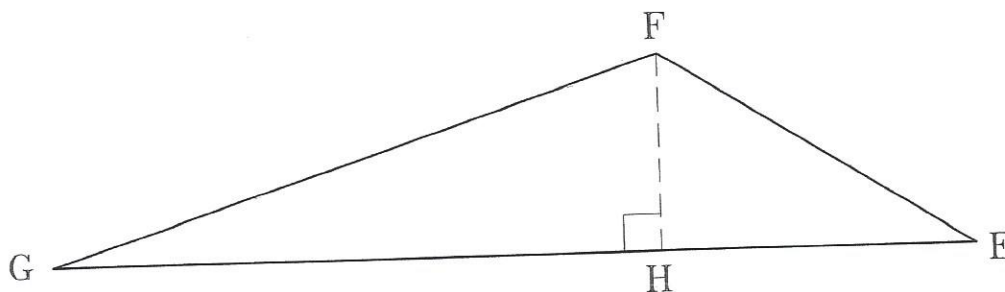


KNOWN:  $AB = 86.27$ ,  $BC = 158.16$

FIND: DISTANCE  $AC =$  \_\_\_\_\_ (5 Points)

$\angle ABC =$  \_\_\_\_\_ (5 Points)

TRIG-STAR PROBLEM 1B LOCAL CONTEST



KNOWN:  $EF = 62.25$ ,  $\angle EFG = 109^\circ-49'-58''$ ,  
 $\angle FEG = 47^\circ-39'-18''$

FIND: DISTANCE  $EH =$  \_\_\_\_\_ (6 Points)

DISTANCE  $FH =$  \_\_\_\_\_ (6 Points)

DISTANCE  $FG =$  \_\_\_\_\_ (6 Points)

DISTANCE  $GH =$  \_\_\_\_\_ (6 Points)

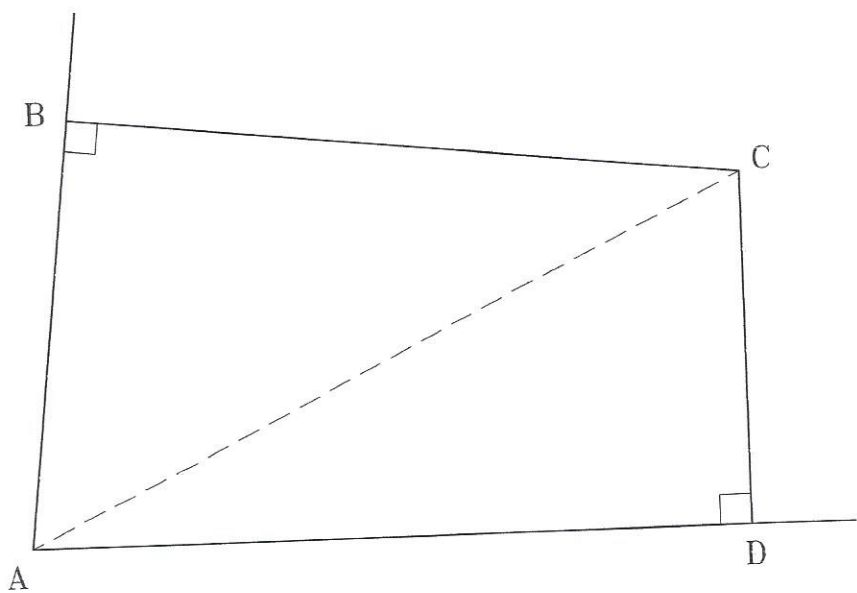
$\angle EGF =$  \_\_\_\_\_ (6 Points)

Page Total: \_\_\_\_\_ Points



TRIG-STAR PROBLEM 2 LOCAL CONTEST

REQUIRED ANSWER FORMAT  
DISTANCES: NEAREST HUNDREDTH  
ANGLES: DEGREES-MINUTES-SECONDS  
(TO THE NEAREST SECOND)



KNOWN:

$BC = 363.56$ ,  $CD = 191.18$ ,  
 $\angle BAD = 76^{\circ}-47'-50''$

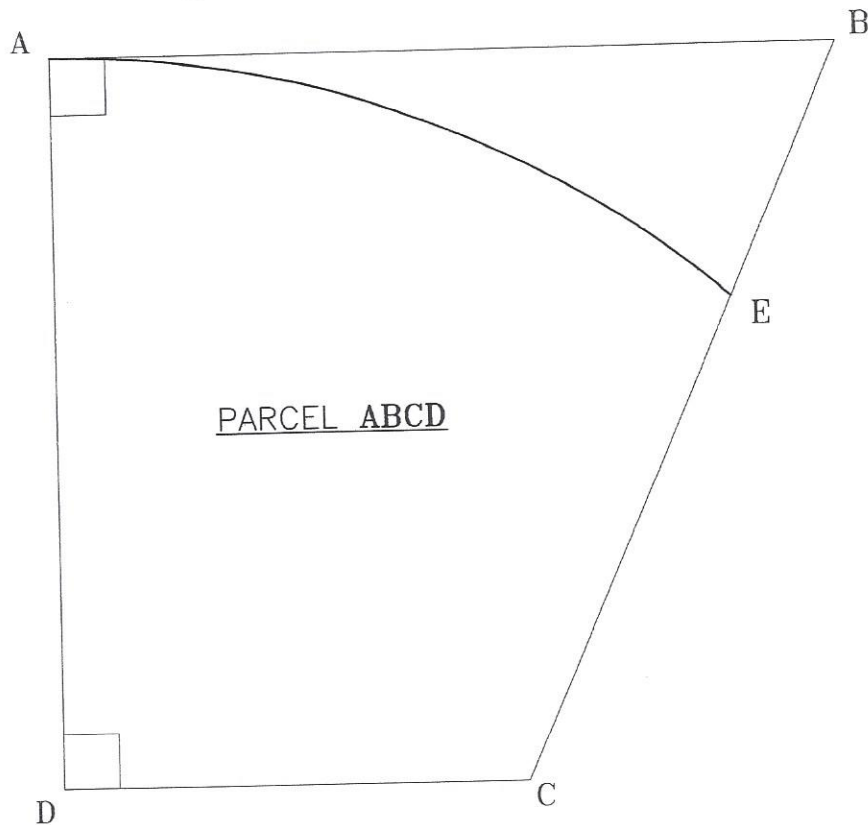
FIND:

- Distance  $AB =$  \_\_\_\_\_ (10 Points)
- Distance  $AD =$  \_\_\_\_\_ (10 Points)
- Distance  $AC =$  \_\_\_\_\_ (10 Points)

TRIG-STAR PROBLEM 3

LOCAL CONTEST

REQUIRED ANSWER FORMAT  
 DISTANCES: NEAREST HUNDREDTH  
 AREAS: NEAREST WHOLE UNIT



**PROBLEM:**

THE NORTH SIDE OF PARCEL **ABCD** IS BOUNDED BY A LOCAL HIGHWAY. DUE TO A NEW HIGHWAY ALIGNMENT, THE NORTH SIDE OF PARCEL **ABCD** IS TO BE ROUNDED OUT WITH A CIRCULAR ARC **AE**. THE RADIUS OF THE ARC IS 500.00 AND IS TANGENT TO LINE **AB** AT POINT **A**. FIND THE NEW BOUNDARY DIMENSIONS OF PARCEL **ABCD**, SUCH AS THE ARC LENGTH OF **AE** AND THE LENGTH OF LINE **CE**.

**KNOWN:**

$AB = 300.00$ ,  $BC = 412.31$ ,  $CD = 200.00$ ,  $DA = 400.00$ ,  
 $\angle BCD = 104^{\circ}-02'-10''$ ,  $\angle CDA$  &  $\angle DAB = 90^{\circ}-00'-00''$ ,  
 & RADIUS OF ARC **AE** = 500.00

**FIND:**

- ARC LENGTH **AE** \_\_\_\_\_ (6 Points)      AREA **ABCD** \_\_\_\_\_ (6 Points)  
 LENGTH **EC** \_\_\_\_\_ (6 Points)      AREA **AECD** \_\_\_\_\_ (6 Points)  
 LENGTH **BE** \_\_\_\_\_ (6 Points)

Page Total: \_\_\_\_\_ Points

PROBLEM 1-A

DISTANCE AC =

ANGLE ABC =

PROBLEM 1-B

DISTANCE EH =

DISTANCE FH =

DISTANCE FG =

DISTANCE GH =

$\angle$  ABC =

PROBLEM 2

DISTANCE AB =

DISTANCE AD =

DISTANCE AC =

PROBLEM 3

LENGTH AE =

LENGTH EC =

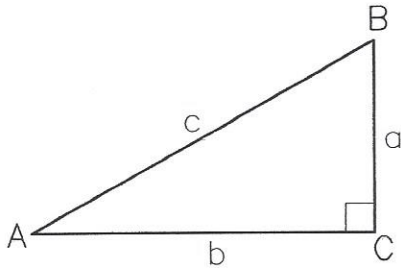
LENGTH BE =

AREA ABCD =

AREA AECD =

# TRIG-STAR MISCELLANEOUS DATA

## RIGHT TRIANGLE FORMULAS



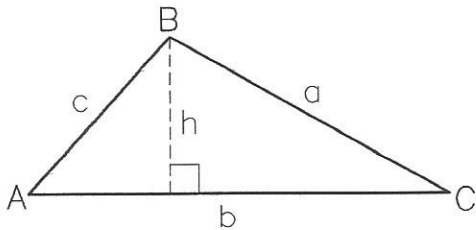
PYTHAGOREAN THEOREM:  $a^2 + b^2 = c^2$

AREA:  $\frac{1}{2}ab$

TRIGONOMETRIC FUNCTIONS:  $\sin A = \frac{a}{c}$ ,  $\cos A = \frac{b}{c}$ ,

$\tan A = \frac{a}{b}$

## OBLIQUE TRIANGLE FORMULAS

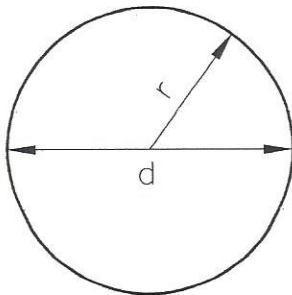


LAW OF SINES:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

LAW OF COSINES:  $d^2 = b^2 + c^2 - 2bc \cos A$

AREA:  $\frac{1}{2}bh$

## CIRCLE FORMULAS



DIAMETER =  $d$       RADIUS =  $r$

CIRCUMFERENCE:  $2\pi r$  or  $\pi d$

AREA:  $\pi r^2$

ONE DEGREE ( $1^\circ$ ) OF ARC = 60 MINUTES ( $60'$ ) OF ARC

ONE MINUTE ( $1'$ ) OF ARC = 60 SECONDS ( $60''$ ) OF ARC

THEREFORE ONE DEGREE OF ARC ( $1^\circ$ ) = 3600 SECONDS OF ARC.