Write your questions and thoughts here!

12.3 Area of Triangles

The side lengths of a triangular traffic sign are approximately 27 cm, 27 cm and ???. The angle between the given legs is 40°. Approximate the area of the sign. Round your answer to the nearest whole cm^2.

Area of Triangles	
Let ΔABC be any triangle with *a*, *b*, and *c* representing the measures of the sides opposite the angles with measurements A, B and C respectively. Then the area of the triangle equals:	
	Hero's (Heron's) Formula
$A = \frac{1}{2}ab\ sin\ C$	$A = \sqrt{s(s-a)(s-b)(s-c)}$ where s is the *semiperimeter* of the triangle.

Example 1. Find the area of ΔABC if a = 15 ft., b = 18 ft. and $m\measuredangle C = 100°$.

Example 2. Find the area of ΔABC if a = 20, b = 40 and c = 30.

Write your questions and thoughts here!

12.3 Area of Triangles

You try! Find the following areas:

3. Find the area of ΔRST if r = 120, s = 80 and $t = 115$.

4. Find the area of ΔXYZ if y = 6 *m*, $m\measuredangle Z = 127°$ and $z = 9$ *m*.

5. The adjacent sides of a parallelogram measure 8 cm and 12 cm and one angle between them measures 60°. Find the area of the parallelogram.

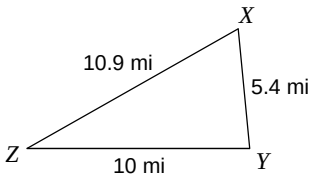
Now summarize what you learned!

Skillz Review Important Note: $(\sin x)(\sin x) = (\sin x)^2 = \sin^2 x$		
$(x+3)(2x-1)$	$(\sin x+3)(2\sin x-1)$	$(\sin x+\cos x)(2\sin x-\cos x)$
$\left(\frac{12}{5}\right)\left(\frac{5}{4}\right) =$	$\left(\frac{12}{\tan x}\right)\left(\frac{\tan x}{4}\right) =$	$\left(\frac{12\sin x}{\tan x}\right)\left(\frac{\tan x}{4\cos x}\right) =$

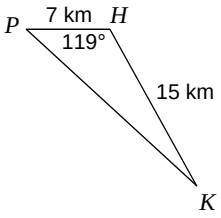
12.3 Area of Triangles

Find the area of each triangle to the nearest tenth.

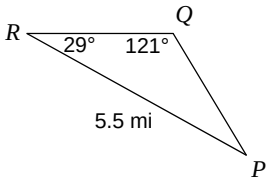
1)



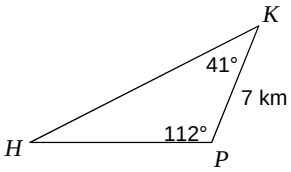
2)



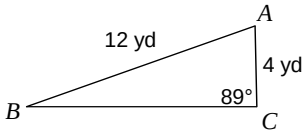
3)



4)



5)



6) In ΔQRP, $q = 5$ m, $m\angle R = 56°$, $m\angle Q = 54°$

7) In ΔRST, $m\angle S = 56°$, $m\angle R = 56°$, $t = 4$ cm

8) In ΔHPK, $p = 13$ m, $k = 18$ m, $h = 16.6$ m

9) In ΔDEF, $f = 8$ ft, $m\angle D = 106°$, $d = 12$ ft

10) In ΔTRS, $r = 16$ cm, $s = 7.2$ cm, $m\angle T = 68°$

12.3 Area of Triangles

APPLICATION 12.3

1. Find the area of **ΔABC** if b = 15, c = 13 and C = 50°

2. A triangular parcel of land has sides of length 680 feet, 320 feet, and 802 feet. What is the area of the parcel of land? If land is valued at $2100 per acre (1 acre is 43560 square feet), what is the value of the parcel of land.

3. Farmer Bean has a triangular field with sides of 240 feet, 300 feet, and 360 feet. Through experimentation based off of past practice with similar compounds, he finds that Mr. Brust's videos work as great fertilizer! He wants to apply fertilizer to the field. If one 40-pound bag of Brust's videos can fertilize 6,000 square feet, how many bags must he buy to cover the field?

4. ***Calculator Programming***. For this Application Problem, you will need a TI83 or Ti84 calculator! When computing several different triangle areas, it may be best to write a small program. This is actually easier than you might think! We will start by naming our program: HERO. Use the following keystrokes:

Step 1 (***Naming the Program***): PRGM ▶ ▶ ENTER ^ SIN × 7 ENTER

This has essentially created a new program with the name "HERO." We know that Hero's formula is :

Area of a triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ where s is the ***semiperimeter*** of the triangle.

12.3 Area of Triangles

The calculator needs to know the lengths of the three sides a, b, and c. We will ask the program in the I/O (input/output) menu to prompt for the side lengths a, b and c:

Step 2 (***Prompting for a, b, c***): [PRGM] [▶] [2] [ALPHA] [MATH] [,] [ALPHA] [APPS] [,] [ALPHA] [PRGM] [ENTER]

We will now have the program calculate the semiperimeter, and store the value into the variable s:

Step 3 (***Calculating the Semiperimeter***):

[(] [1] [÷] [2] [)] [(] [ALPHA] [MATH] [+] [ALPHA] [APPS] [+] [ALPHA] [PRGM] [)] [STO▶] [ALPHA] [LN] [ENTER]

We are almost done! Before we calculate the area, we will ask the program to output some friendly words:

Step 4 (***Customizing the output***): [PRGM] [▶] [3] [2nd] [ALPHA] [+] [4] [^] [SIN] [0] [MATH] [×] [SIN] [MATH] [0] [x^2] [LN] [+] [ENTER]

And finally, we can now calculate the area:

Step 5 (***Calculating the Area***):

[2nd] [x^2] [ALPHA] [LN] [(] [ALPHA] [LN] [−] [ALPHA] [MATH] [)] [(] [ALPHA] [LN] [−] [ALPHA] [APPS] [)] [(] [ALPHA] [LN] [−] [ALPHA] [PRGM] [)] [ENTER]

When finished, your program should look like this →

```
PROGRAM:HERO
:Prompt A,B,C
:(1/2)(A+B+C)→S
:Disp "THE AREA
IS"
:√(S(S-A)(S-B)(S
-C)
:
```

It is now time to run (or execute) our program!

Return to the home screen: [2nd] [MODE]

Now, test your program on a triangle with the following side lengths: a = 10, b = 12 and c = 13.

Step 6 (***Running your program***): [PRGM] [ENTER] [ENTER] [1] [0] [ENTER] [1] [2] [ENTER] [1] [3] [ENTER]

Your program should give you the correct area if you programmed the calculator correctly:

```
A=?10
B=?12
C=?13
THE AREA IS
     56.99506558
```

Congratulations!! You may now use your program to find the areas of the triangles with the following side lengths:

a.	a = 14 b = 12 c = 5	b.	a = 54 b = 67 c = 90	c.	d = .09 e = .04 f = .1	d.	x = 1100 y = 103 z = 1202