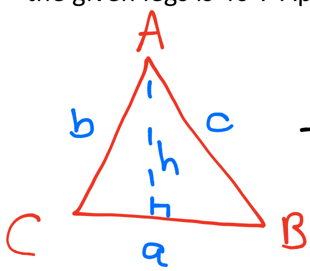
Write your questions and thoughts here!

12.3 Area of Triangles

1

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.



$\sin C = \frac{h}{b}$

$b \sin C = h$

$A_\Delta = \frac{1}{2}\, b\, h$

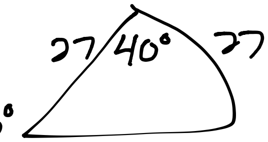
$A_\Delta = \frac{1}{2} a \cdot b \sin C$

$A_\Delta = \frac{1}{2} bc \sin A$

$= \frac{1}{2}(27)(27)\sin 40^\circ$

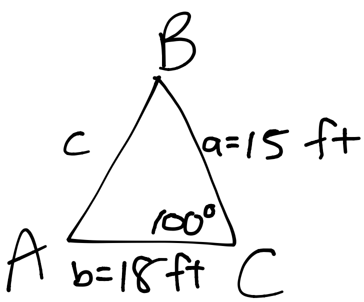
$= 364.5 \sin 40^\circ$

$A_\Delta \approx 234.296\ cm^2$



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 $m\measuredangle C = 100°$.



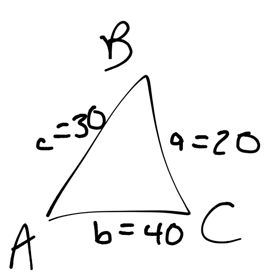
$A_\Delta = \frac{1}{2} ab \sin C$

$= \frac{1}{2}(15)(18)\sin 100^\circ$

$= 135 \sin 100^\circ$

$A_\Delta \approx 132.949\ ft^2$

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



$A = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{45(45-20)(45-40)(45-30)}$

$= \sqrt{45(25)(5)(15)}$

$= \sqrt{84{,}375}$

$A = 290.474$ un

$$\boxed{\begin{aligned} S &= \tfrac{1}{2}(a+b+c) \\ &= \tfrac{1}{2}(20+40+30) \\ &= \tfrac{1}{2}(90) \\ S &= 45 \end{aligned}}$$

Write your questions and thoughts here!

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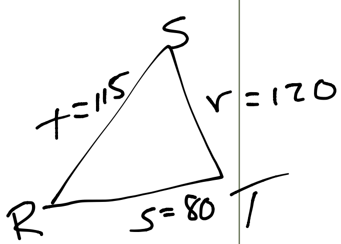
12.3 Area of Triangles

2

You try! Find the following areas:

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



$S = \frac{1}{2}(a+b+c)$

$= \frac{1}{2}(80+115+120)$

$= \frac{1}{2}(315)$

$S = 157.5$

$A = \sqrt{s(s-a)(s-b)(s-c)}$

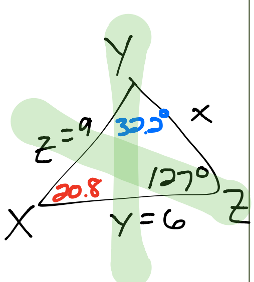
$= \sqrt{157.5(157.5-120)(157.5-80)(157.5-115)}$

$= \sqrt{157.5(37.5)(77.5)(42.5)}$

$= \sqrt{19453710.9375}$

$A \approx 4{,}410.636 \text{ un}^2$

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



$\frac{\sin 127°}{9} = \frac{\sin Y}{6}$

$\frac{6 \sin 127°}{9} = \sin Y$

$\sin^{-1}\left(\frac{6 \sin 127°}{6}\right) = Y$

$32.2° = Y$

$127° + 32.2° + X = 180°$

$159.2° + X = 180°$

$X = 20.8°$

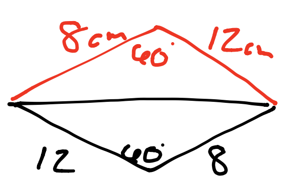
$A = \frac{1}{2} yz \sin X$

$= \frac{1}{2}(6)(9)\sin 20.8°$

$= 27 \sin 20.8°$

$A \approx 9.6 \text{ m}^2$

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.



$A_{\square} = 2A_{\triangle}$

$= 2\left(\frac{1}{2} bc \sin A\right)$

$= (8)(12)\sin 60°$

$= 96 \cdot \frac{\sqrt{3}}{2}$

$A_{\square} = 48\sqrt{3}$

Now summarize what you learned!

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