Hamilton-Wenham Regional High School	Trigonometry Semester Exam	Name:_____

GOAL **Use trigonometric relationships to evaluate trigonometric functions of acute angles**

VOCABULARY

Right Triangle Definition of Trigonometric Functions

Let θ be an acute angle of a right triangle. The six trigonometric functions of θ are defined as follows.

$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \qquad \cos\theta = \frac{\text{adj}}{\text{hyp}} \qquad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

$$\csc\theta = \frac{\text{hyp}}{\text{opp}} \qquad \sec\theta = \frac{\text{hyp}}{\text{adj}} \qquad \cot\theta = \frac{\text{adj}}{\text{opp}}$$

The abbreviations *opp, adj,* and *hyp* represent the lengths of the three sides of the right triangle. Note that the ratios in the second row are the reciprocals of the ratios in the first row. That is:

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

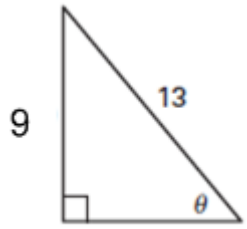
The table below gives values of the six trigonometric functions for the common angles 30°, 45°, and 60°.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$	2	$\frac{2\sqrt{3}}{3}$	$\sqrt{3}$
45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\sqrt{2}$	$\sqrt{2}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2	$\frac{\sqrt{3}}{3}$

Finding all missing side lengths and angle measures is called **solving a right triangle**.

Evaluate the six trigonometric functions of the angle θ

1



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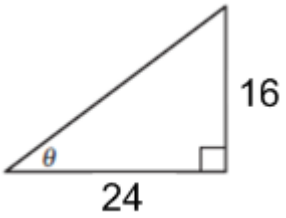

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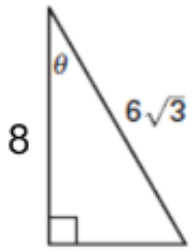

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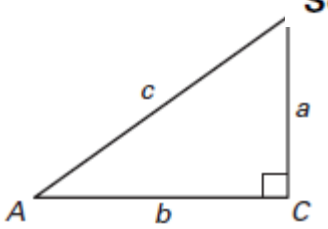
Solve $\triangle ABC$ using the diagram and the given measurements.



1	$A = 19°,\ \ a = 9$	2	$B = 35°,\ \ c = 25.3$	3	$B = 76°,\ \ a = 20$

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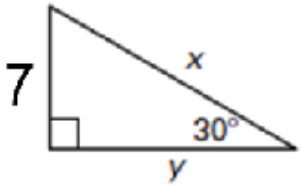
Find the missing side lengths *x* and *y*.

1



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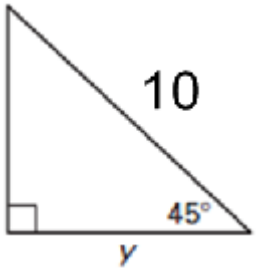

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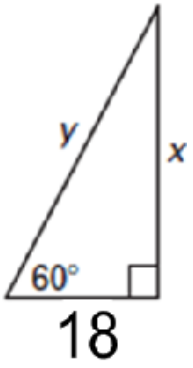

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GOAL **Use the law of sines to find the sides and angles of a triangle**

VOCABULARY

If ABC is a triangle with sides a, b, and c, then according to the **law of sines,**

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \text{or} \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}.$$

Solve $\triangle ABC$.	
1	$A = 81°$, $a = 8$ in., $c = 5$ in.
2	$C = 106°$, b = 9 in., $c = 12$ in.
3	$B = 31°$, $a = 5$ in., b = 7.5 in.

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GOAL **Use the law of cosines to find the sides and angles of a triangle**

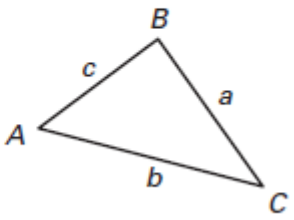
VOCABULARY

If $\triangle ABC$ has sides of length a, b, and c as shown, then:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

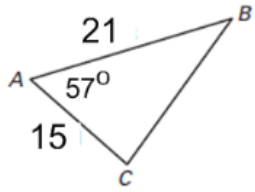
$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$



Solve $\triangle ABC$.

1



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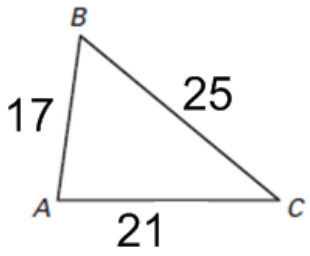

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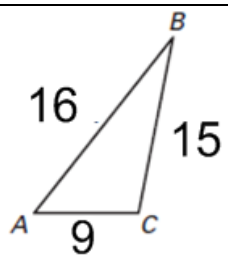

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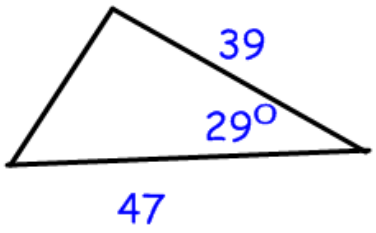
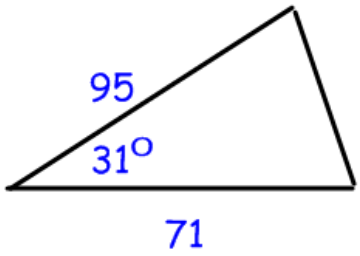
The area of any triangle can be found using any one of the following formulas. What is needed is the length of two sides, and the measure of the angle opposite the third side.

Have: Angle A sides b and c	Have: Angle B sides a and c	Have: Angle C sides a and b
$\frac{1}{2} bc \sin A$	$\frac{1}{2} ac \sin B$	$\frac{1}{2} ab \sin C$

1		2	
Find the area of the triangle to the nearest unit.			
3	$A = 88.4°,\ b = 11.5,\ c = 19.7$	4	$B = 89.4°,\ b = 38.8,\ c = 23.4$

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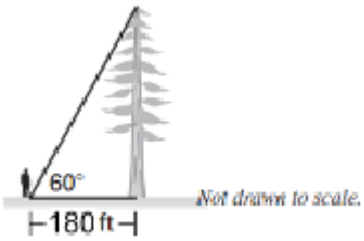
1	***Redwood Trees*** You are standing 180 feet from the base of a redwood tree. You estimate that the angle of elevation to the top of the tree is 60°. What is the approximate height of the tree?	
2	***Flagpole*** You are standing 40 feet from the base of a flagpole. The angle of elevation to the top of the flagpole is 30°. What is the height of the flagpole to the nearest tenth?	