

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Similarity: Trigonometric Ratios

We already know that any right triangle with a given acute angle is similar to every other right triangle with that same acute angle measure (AA Postulate).

We can use the AA Postulate to discover properties of the angles in the triangle:

**Example:** CD intersects right triangle,  $\triangle ABC$ . Identify whether  $\triangle ABC \sim \triangle CBD \sim \triangle ACD$

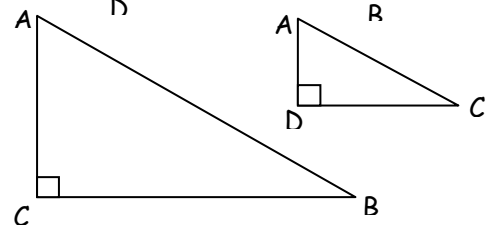
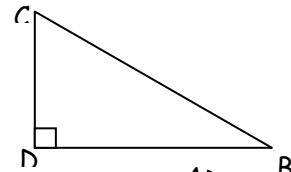
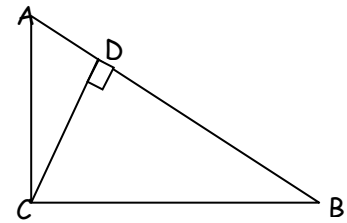
Notice that  $\triangle CBD$  and  $\triangle ACD$  are also right triangles

$\triangle ABC \sim \triangle ACD$  because of AA:  $m\angle A = m\angle A$ ;  $m\angle C = m\angle D$ .

$\triangle ABC \sim \triangle CBD$  because of AA:  $m\angle B = m\angle B$ ;  $m\angle D = m\angle C$

$\triangle CBD \sim \triangle ACD$  because of AA:  $m\angle C = m\angle C$ ;  $m\angle D = m\angle D$

Therefore,  $\triangle ABC \sim \triangle CBD \sim \triangle ACD$



**Trigonometric ratios** are established ratios used to find the acute angle measures in right triangles. For example, to find the  $m\angle A$  in  $\triangle ABC$  above, apply the trigonometric ratio, **sine**, to compare the values of opposite leg  $a$  to hypotenuse  $c$ .

$$\sin A = \frac{CB}{AB}$$

If the measurement of  $a$  is unknown, use **cosine** to compare the values of the adjacent leg to the hypotenuse:

$$\cos A = \frac{AC}{CB}$$

A summary of these ratios, their shortenings (how they appear on your calculator), and the values they compare are listed below. Note that theta ( $\theta$ ) is a Greek symbol used to represent the unknown angle.

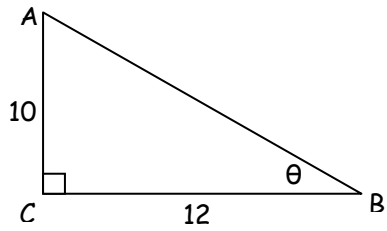
Trigonometric Ratio	Shortening	Values Compared
Sine	$\sin \theta$	<u>Opposite leg</u> Hypotenuse
Cosine	$\cos \theta$	<u>Adjacent Leg</u> Hypotenuse

Name: \_\_\_\_\_

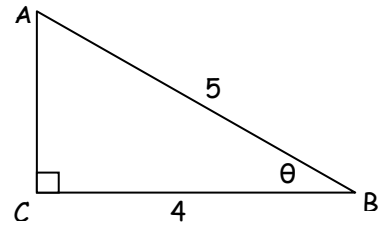
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Practice. Identify the sine or cosine.

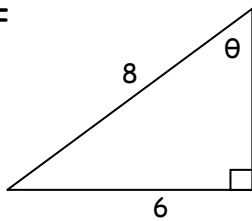
1.  $\sin \theta =$



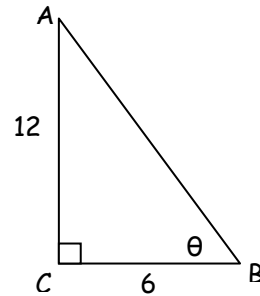
2.  $\cos \theta =$



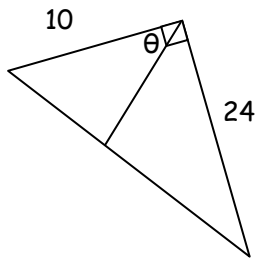
3.  $\sin \theta =$



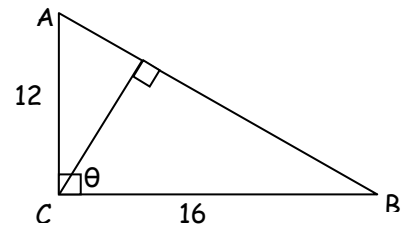
4.  $\sin \theta =$



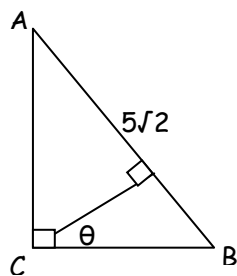
5.  $\cos \theta =$



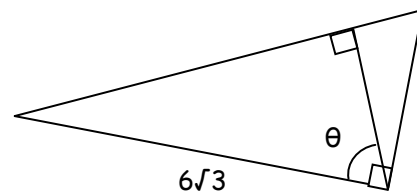
6.  $\sin \theta =$



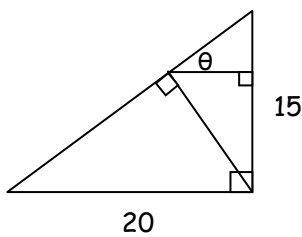
7.  $\sin \theta =$



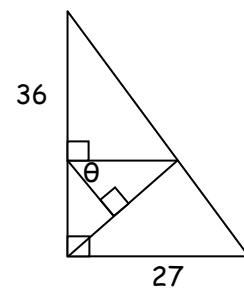
8.  $\cos \theta =$



9.  $\cos \theta =$



10.  $\sin \theta =$



Name: \_\_\_\_\_

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## Answer Key

### Similarity: Trigonometric Ratios

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1.  $\sin \theta = 10/2\sqrt{61} = \sqrt{61}/61$

2.  $\cos \theta = 4/5$

3.  $\sin \theta = \frac{3}{4}$

4.  $\sin \theta = 12/12\sqrt{5} = \sqrt{5}/5$

5.  $\cos \theta = 24/26 = 12/13$

6.  $\sin \theta = 12/20 = 6/10 = 3/5$

7.  $\sin \theta = \sqrt{2}/2$

8.  $\cos \theta = 3\sqrt{3}/6 \cdot 3 = \sqrt{3}/6$

9.  $\cos \theta = 20/25 = 4/5$

10.  $\sin \theta = 36/45 = 4/5$