

March 7, 2016

Today: Solving Right Triangles  
 Lengths of Sides  
 EQ: How do you use SOHCOHTOA?

mmc9-12.g.srt.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

**MM2G2. Students will define and apply sine, cosine, and tangent ratios to right triangles.**  
 a. Discover the relationship of the trigonometric ratios for similar triangles.  
 b. Explain the relationship between the trigonometric ratios of complementary angles.

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### Trigonometric Ratios

	The <b>sine</b> (sin) of an angle is the ratio of opposite leg to hypotenuse	$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$
	The <b>cosine</b> (cos) of an angle is the ratio of adjacent leg to hypotenuse	$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$
	The <b>tangent</b> (tan) of an angle is the ratio of opposite leg to adjacent leg	$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$ $\tan \theta = \frac{\sin \theta}{\cos \theta}$

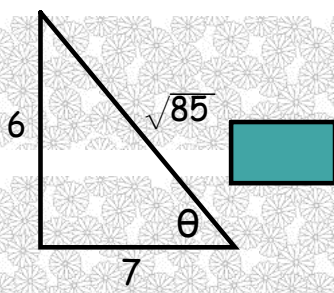
Remembering SOHCAHTOA can help you recall these ratios.

SOH Sine equals Opposite over Hypotenuse  
 CAH Cosine equals Adjacent over Hypotenuse  
 TOA Tangent equals Opposite over Adjacent

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## Let's Apply It

Evaluate each for sin, cos, and tan  $\theta$ .



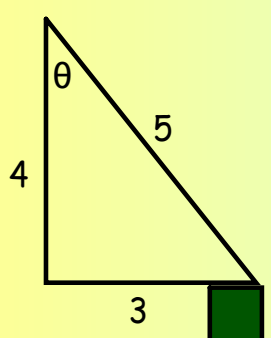
$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{6}{\sqrt{85}} = .65$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{7}{\sqrt{85}} = .76$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{6}{7} = .86$$

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## You Try!



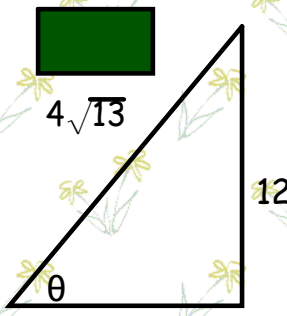
$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{3}{5} = .6$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{4}{5} = .8$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{3}{4} = .75$$

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One more time



$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{12}{4\sqrt{13}} = \frac{3}{\sqrt{13}} = .84$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{8}{4\sqrt{13}} = \frac{2}{\sqrt{13}} = .55$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{12}{8} = \frac{3}{2} = 1.5$$

Oct 14-1:56 AM

In order to move on with trigonometric ratios, we have to learn to use our calculator. Let's make sure we know how. Find the sin, cos, and tan buttons on your calculator. Round to the nearest HUNDREDTHS.

$$\sin 48^\circ$$

**.74**

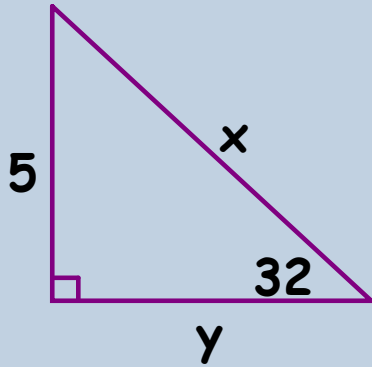
$$\tan 22^\circ$$

**.40**

$$\cos 43^\circ$$

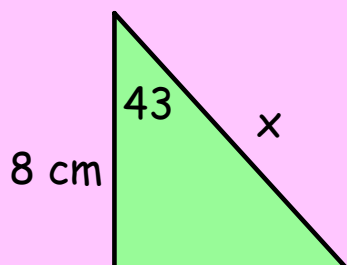
**.73**

Find  $x$  and  $y$  by setting up trigonometric ratios.



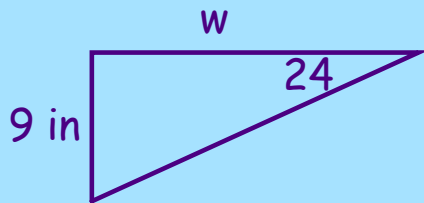
Mar 4-8:00 AM

Find the value of  $x$  in the triangle.



Mar 4-8:01 AM

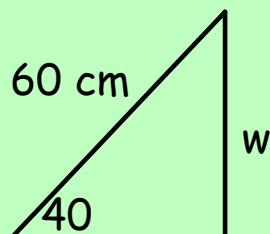
Find the value of  $w$  in the triangle.



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One more try.

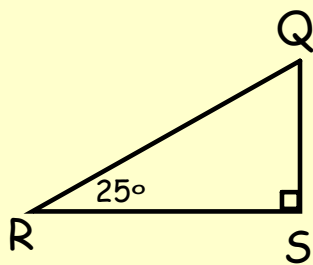
Find the value of  $w$  in the triangle.



$$x \approx 60(\sin 40) \approx 38.57 \text{ cm}$$

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## How are sin and cos related ?



Angles Q and R are examples of complementary angles, so the sum of their measures is  $90^\circ$ .

Angle R measures  $25^\circ$ .

The measure of angle Q is:

$$\underline{90^\circ} - 25 = \underline{65^\circ}$$

Use your calculator to find the following:

$$\sin R = \sin 25 \approx \underline{.4226}$$

$$\cos Q = \cos \underline{65^\circ} \approx \underline{.4226}$$

Are these measures equal? yes

For any pair of complementary angles in a right triangle, the sine of one angle is equal the cosine of the other angle.

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# Homework Worksheet

**On-line and textbook help references:** pp. 438

- <http://www.regentsprep.org/regents/math/algebra/AT2/Ltrig.htm>

- <https://www.khanacademy.org/math/geometry/quadrilaterals-and-polygons/quadrilaterals/v/quadrilateral-properties>

- <http://www.mathsisfun.com/algebra/trig-finding-angle-right-triangle.html>

- <http://www.purplemath.com/modules/basirati.htm>

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