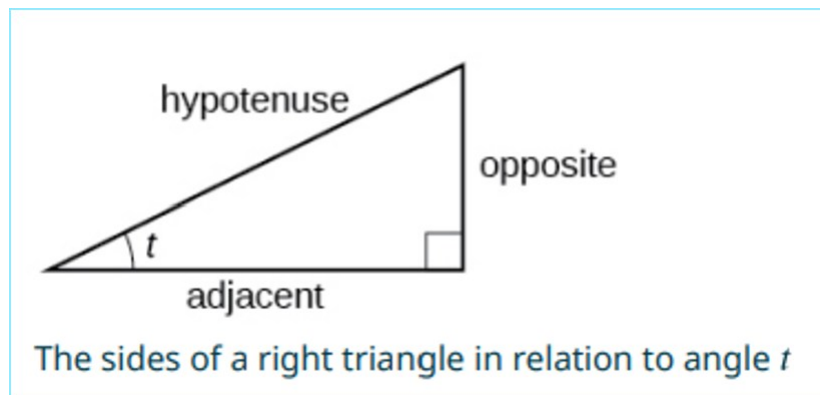


# Right Triangle Trigonometry

## Key Points:

- We can define trigonometric functions as ratios of the side lengths of a right triangle.
- Given a right triangle with an acute angle of  $t$ , the first three trigonometric functions are listed as follows:



$$\text{Sine} \quad \sin t = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{Cosine} \quad \cos t = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{Tangent} \quad \tan t = \frac{\text{opposite}}{\text{adjacent}}$$

- A common mnemonic for remembering these relationships is SohCahToa, formed from the first letters of “Sine is opposite over hypotenuse, Cosine is adjacent over hypotenuse, Tangent is opposite over adjacent.”
- Trigonometric Function Values for Special Angles in a Right Triangle

$t$	$\sin t$	$\cos t$	$\tan t$
$\frac{\pi}{6}$ or $30^\circ$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$
$\frac{\pi}{4}$ or $45^\circ$	$\frac{1}{\sqrt{2}}$ or $\frac{\sqrt{2}}{2}$	$\frac{1}{\sqrt{2}}$ or $\frac{\sqrt{2}}{2}$	1
$\frac{\pi}{3}$ or $60^\circ$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$

## Right Triangle Trigonometry Videos:

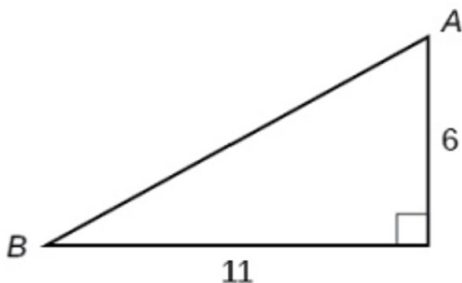
- [Evaluating Trigonometric Functions of a Right Triangle: Examples 1-2](#)
- [Evaluating Trigonometric Functions of Special Angles Using Side Lengths: Example 3](#)
- [Finding missing lengths using Trigonometric Ratios: Example 4](#)
- [Measuring a Distance Indirectly: Example 5](#)

## Practice Exercises

Follow the directions for each exercise below:

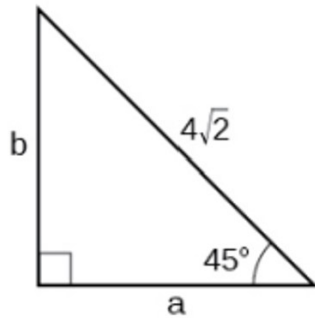
1. Use side lengths to evaluate  $\cos \frac{\pi}{4}$ .
2. Use side lengths to evaluate  $\cot \frac{\pi}{3}$ .
3. Use side lengths to evaluate  $\tan \frac{\pi}{6}$ .
4. Find the lengths of the other two sides of the right triangle using the given information:  
 $\cos(B) = \frac{3}{5}, a = 6$
5. Find the lengths of the other two sides of the right triangle using the given information:  
 $\tan(A) = \frac{5}{9}, b = 6$

For 6-7, use Figure to evaluate the trigonometric function:

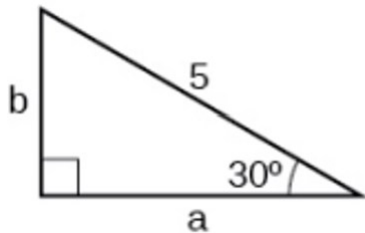


6.  $\sin(A)$
7.  $\tan(B)$

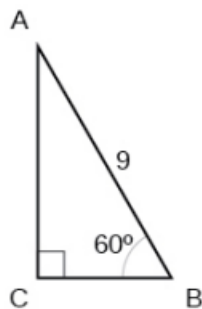
8. Solve for the unknown sides of the given triangle:



9. Solve for the unknown sides of the given triangle:



10. A 15-ft ladder leans against a building so that the angle between the ground and the ladder is  $70^\circ$ . How high does the ladder reach up the side of the building? Find the answer to four decimal places.
11. The angle of elevation to the top of a building in Baltimore is found to be 4 degrees from the ground at a distance of 1 mile from the base of the building. Using this information, find the height of the building. Find the answer to four decimal places.
12. Find the missing sides of the triangle  $ABC$ :  $\sin(B) = \frac{3}{4}$ ,  $c = 12$ .
13. Find the missing sides of the triangle:



14. The angle of elevation to the top of a building in Chicago is found to be 9 degrees from the ground at a distance of 2000 feet from the base of the building. Using this information, find the height of the building.

## Answers:

1.  $\frac{\sqrt{2}}{2}$

2.  $\frac{1}{\sqrt{3}}$

3.  $\frac{\sqrt{3}}{3}$

4.  $b=3, c=5$

5.  $a = \frac{10}{3}, c = \frac{2\sqrt{106}}{3}$

6.  $\frac{11}{6}$

7.  $\frac{6}{11}$

8.  $a=4, b=4$

9.  $a = \frac{5\sqrt{3}}{2}, b = \frac{5}{2}$

10. 14.0954 ft

11. 369.2136 ft

12.  $b=9, a=7.9373$

13.  $a = \frac{9}{2}, b = \frac{9\sqrt{3}}{2}$

14. 316.7689 ft