

Right Triangle Trigonometry

In a right triangle, how are the sides and angles related?

Trigonometric Functions (Sites 1 & 2)

1. Draw and label the standard notation triangle from Site 1.
2. Apply the definitions of the three trigonometric functions (Site 2) to the triangle you drew for question 1.

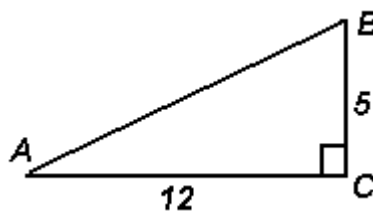
What type of triangle is required for the definitions?

Complete the following table:

$\sin A = \frac{a}{c} = \frac{\text{side opposite } \angle A}{\text{hypotenuse}}$	$\cos A = \frac{b}{c} = \frac{\text{side adjacent to } \angle A}{\text{hypotenuse}}$
$\tan A = \frac{a}{b} = \frac{\text{side opposite } \angle A}{\text{side adjacent to } \angle A}$	$\sin B = \frac{b}{c} = \frac{\text{side opposite } \angle B}{\text{hypotenuse}}$
$\cos B = \frac{a}{c} = \frac{\text{side adjacent to } \angle B}{\text{hypotenuse}}$	$\tan B = \frac{b}{a} = \frac{\text{side opposite } \angle B}{\text{side adjacent to } \angle B}$

3. Complete the following table:

Given the following right triangle, first determine the length of the hypotenuse, AB , using the Pythagorean Theorem. Then, complete the trig ratios. (You do not need to solve for the angle measures.)



Use the Pythagorean Theorem to find AB .

$AB = \underline{\hspace{2cm}}$

$$\sin A = \frac{5}{\hspace{1cm}}$$

$$\cos A = \frac{\hspace{1cm}}{\hspace{1cm}}$$

$$\tan A = \frac{\hspace{1cm}}{12}$$

$$\sin B = \frac{\hspace{1cm}}{\hspace{1cm}}$$

$$\cos B = \frac{\hspace{1cm}}{\hspace{1cm}}$$

$$\tan B = \frac{\hspace{1cm}}{\hspace{1cm}}$$

Comparing Trig Value and Finding the Sides of a Right Triangle (Site 3)

Compare the ratios in your table in problem 2 to those on page 5 of the Read section. Because of similarity, the three functions you have defined now are independent of the lengths of the sides of the right triangle and are based only on the given angle. Thus, even without knowing the lengths of any sides of the triangle, you can find the sine, cosine, and tangent of an angle.

Before finding the length of a side of a right triangle, you must be able to use a calculator to evaluate the sine, cosine, and tangent for various angles. The example in the table at Site 3 provides brief instructions on how to use a scientific or graphing calculator to find the sine, cosine, or tangent of an angle.

4. Use your own calculator or the Windows calculator on your computer (be sure it is in Scientific view) to verify that you get the same value for $\sin 42^\circ$ as calculated at Site 3. Note that the calculator must be set to degree mode. Then, calculate the following values, rounding each answer to the nearest ten-thousandths.

$$\sin 38^\circ = \underline{\hspace{2cm}}$$

$$\cos 38^\circ = \underline{\hspace{2cm}}$$

$$\tan 38^\circ = \underline{\hspace{2cm}}$$

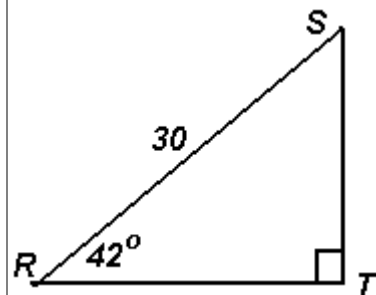
5. Suppose that you are standing 200 feet from a building and the angle of elevation to the top of the building is 37° . What is the building's height? Round your answer to the nearest hundredth.

6.

Consider the right triangle on the right. One side, ST , has been solved for you below.

Find the length of side RT . Use your calculator to get a decimal approximation to the nearest hundredth.

Check your work by using the Pythagorean Theorem to find RT . Explain the slight discrepancy in answers.



Given Work:

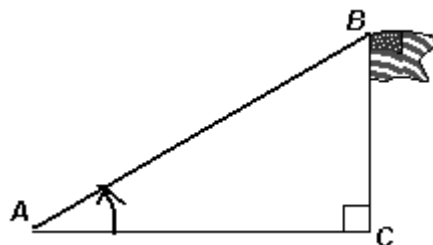
$$\frac{ST}{30} = \sin 42^\circ \Leftrightarrow ST = 30 \sin 42^\circ \approx 20.07$$

Your Work:

Checking with the Pythagorean Theorem:

Homework

You are standing 100 feet from the base of a flagpole, which is perpendicular to the ground. The angle of elevation, $\angle CAB$, equals 23° . How high is the flagpole? Note that the angle of elevation is the angle formed by the ground and the line of sight to the top of the flagpole. Round your answer to the nearest hundredth.



7.

8. A contractor needs to build a ramp from the level ground up to a loading door that is 8 feet higher than the ground. By code, the angle of elevation can be no greater than 6° . How long must the ramp be if a 6° angle of elevation is used? How far along the ground from the base of the door should the contractor begin building the ramp? Round your answers to the nearest hundredth.

9. Recall the original Focus Question: In a right triangle, how are the sides and angles related? You discovered that three trigonometric functions are ratios that relate the sides of a right triangle to its acute angles. As you answer the Focus Question, summarize the relationships and state definitions for each of these trigonometric functions. Indicate how they are applied in right triangles.

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