

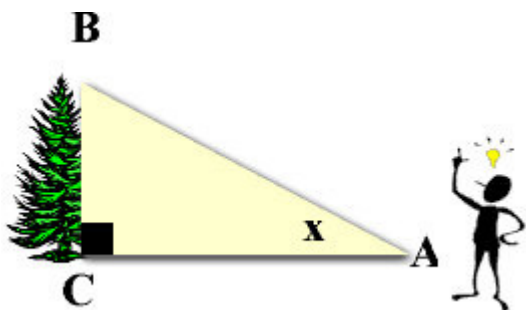
Trigonometry is used on a daily basis in the workplace. Since trigonometry means "triangle measure", any profession that deals with measurement deals with trigonometry as well. Carpenters, construction workers and engineers, for example, must possess a thorough understanding of trigonometry.

In word problems, the formulas remain the same:

$\sin A = \frac{\text{opposite leg}}{\text{hypotenuse}}$	$\cos A = \frac{\text{adjacent leg}}{\text{hypotenuse}}$	$\tan A = \frac{\text{opposite leg}}{\text{adjacent leg}}$
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Word problems introduce two new vocabulary terms:

Angle of Elevation

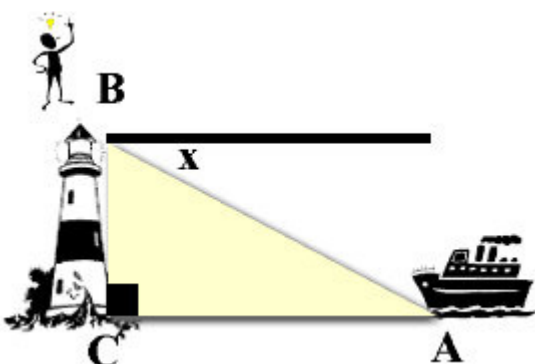


The **angle of elevation** is always measured from the ground up. Think of it like an elevator that only goes up. It is always **INSIDE** the triangle.

In the diagram at the left, x marks the angle of elevation of the top of the tree as seen from a point on the ground.

You can think of the angle of elevation in relation to the movement of your eyes. You are looking straight ahead and you must raise (elevate) your eyes to see the top of the tree.

Angle of Depression



The **angle of depression** is always **OUTSIDE** the triangle. It is never inside the triangle.

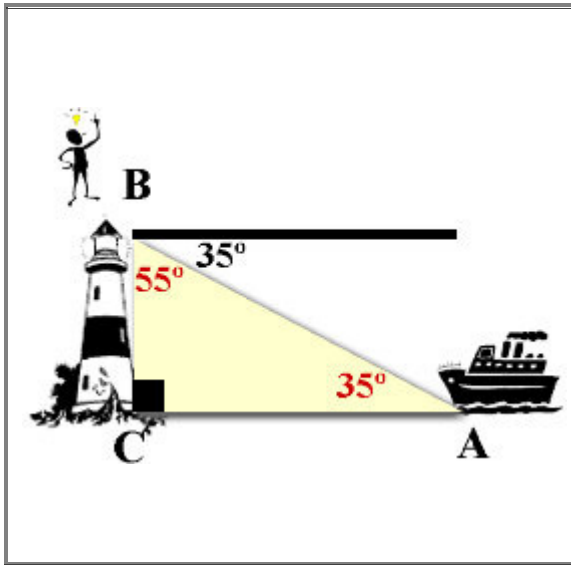
In the diagram at the left, x marks the angle of depression of a boat at sea from the top of a lighthouse.

You can think of the angle of depression in relation to the movement of your eyes. You are standing at the top of the lighthouse and you are looking straight ahead. You must lower (depress) your eyes to see the boat in the water.

As seen in the diagram above, the dark black horizontal line is parallel to side CA of triangle ABC. This forms two alternate interior angles which are equal in measure. This tells us that:

the angle of elevation = the angle of depression.

So what do we do with this angle of depression that is **OUTSIDE** of our triangle?



There are two possible ways to use our **angle of depression** to obtain an angle **INSIDE** the triangle.

1. find the angle adjacent (next door) to our angle. This adjacent angle will always be the complement of our angle. Our angle and the angle next door will add to 90° . In the diagram on the left, the adjacent angle is 55° .
2. utilize the fact that the **angle of depression = the angle of elevation** and simply place 35° in angle A. (the easiest method)

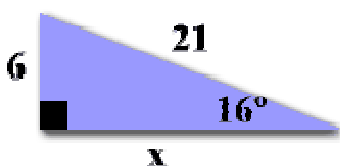
Once you have created your diagram, the word problems are solved in exactly the same manner as the problems we discussed earlier.

Adapted from <http://regentsprep.org/regents/Math/rtritrig/LtrigW.htm> by M. Gerlach on 3/27/06

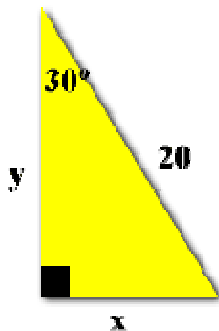
Right Triangle Word Problems

1. A ladder leans against a building. The foot of the ladder is 6 feet from the building. The ladder reaches height of 14 feet on the building.
 - a. Find the length of the ladder to the nearest foot.
 - b. Find to the nearest degree, the angle the ladder makes with the ground.

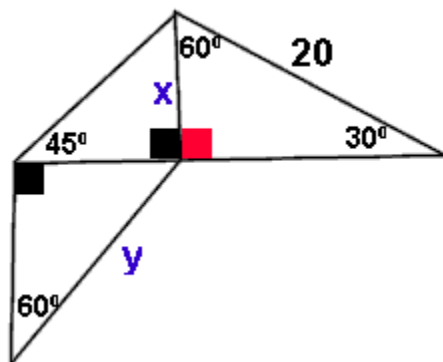
2. Write a statement that can be used to find the length of x .



3. From a point on the ground 25 feet from the foot of a tree, the angle of elevation to the top of the tree is 32° . Find, to the nearest foot, the height of the tree.
4. From the top of a barn 25 feet tall, you see a cat on the ground. The angle of depression of the cat is 40° . How many feet, to the nearest foot, must the cat walk to reach the barn?
5. For the triangle below, find x and find y .



6. Find x and find y in the figure below.



7. At 10am on April 24, 2005, a building 300 feet high cast a shadow 50 feet long. What is the angle of elevation of the sun?
8. A surveyor sets up a transit at a point C at the edge of one bank of a river and takes a sighting of a point A at the edge of the opposite bank. Then the surveyor walks along a line perpendicular to AC to a point B, a distance of 200m from C, and, using the transit, finds that the angle CBA is 20° . What is the width of the river, rounded to the nearest meter?
9. A guy wire 80 feet long is attached to the top of a radio transmission tower, making an angle of 25° with the ground. How tall is the tower?
10. A ramp for wheelchair accessibility is to be constructed with an angle of elevation of 15° and a final height of 5 feet. How long is the ramp?
11. To measure the “length” of Abraham Lincoln’s face on Mount Rushmore, two sightings are taken from a spot 800 feet from the base of the mountain. If the angle of elevation to the bottom of Lincoln’s face is 32° and the angle of elevation to the top of his face is 35° , what is the length of Lincoln’s face?

#1-6 from <http://regentsprep.org/regents/Math/rtritrig/PracTrig.htm> 3/27/06
#7-11 from www.math.lsu.edu/courses/1022/lecture/files/trig_8_1.pdf 3/27/06