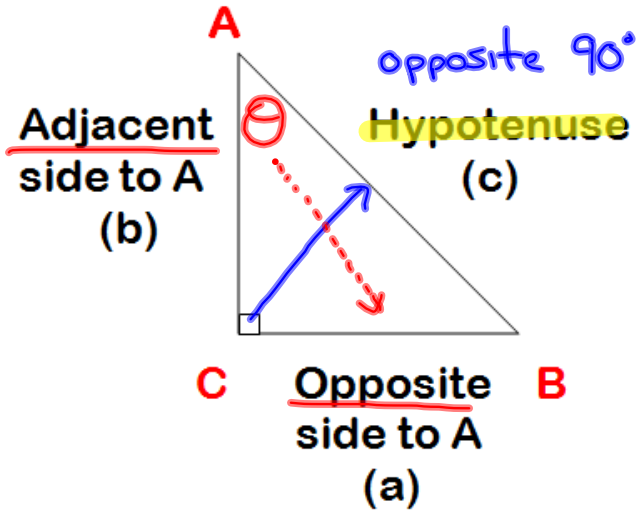
# Unit 1  Applications of Trigonometry

Trigonometry is the study of the relationships of the measures of the sides and angles of triangles.  The roots of trigonometry lie in ancient times; however, trigonometric skills are used to solve practical problems in many situations today.

**These problems could relate the professions such as surveying, construction, or engineering design in planning buildings, bridges, or towers. Often they relate to tasks at home such as finding the area of a room for carpeting or hardwood flooring or finding the area of a surface for painting.**

**All problems that deal with geometric situations where length or angle measure is required can be modeled with diagrams or constructions of the geometric figures.**

**In a right-triangle, the sides have certain relationships.**




The side opposite to the right angle is called the hypotenuse.

It can also be classified as the longest side in a triangle.

If we designate an acute angle A, of the triangle, then we can name the remaining sides of the triangles as in the diagram.

Naming the sides of the right triangle in this manner, we define the primary trigonometric ratios as follows:

They can be abbreviated to:

Sine of A = $\frac{\text{opposite}}{\text{hypotenuse}}$ sin A = $\frac{\text{opp}}{\text{hyp}}$

Cosine of A = $\frac{\text{adjacent}}{\text{hypotenuse}}$ cos A = $\frac{\text{adj}}{\text{hyp}}$

Tangent of A = $\frac{\text{opposite}}{\text{adjacent}}$ tan A = $\frac{\text{opp}}{\text{adj}}$

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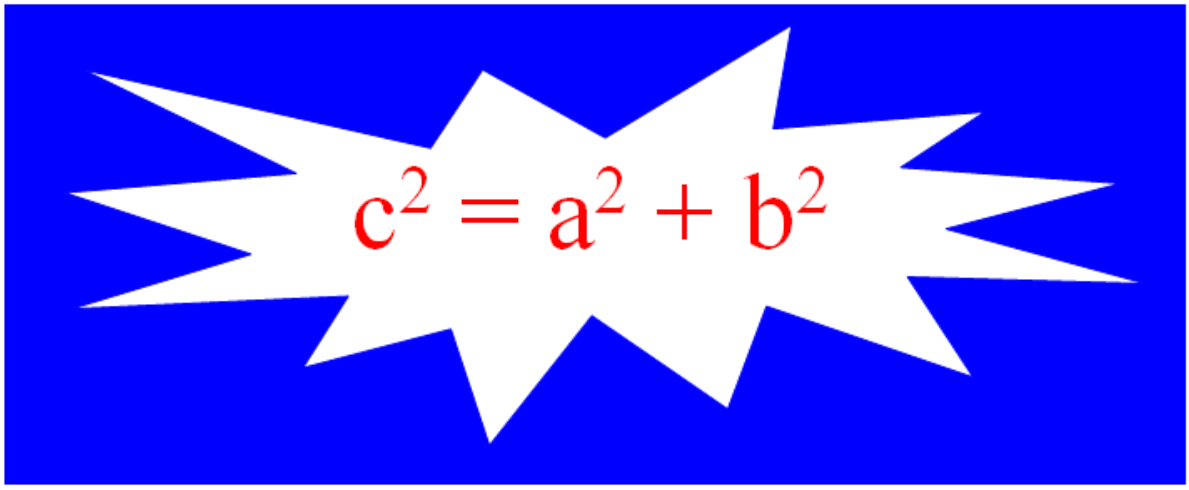
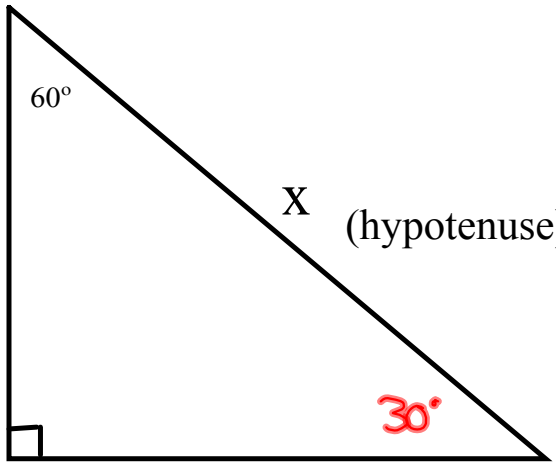
Don't forget that when you are given two sides of a right-triangle, you can solve for the remaining side by using the Pythagorean Theorem.



# Example 1:

Find the missing side x




15.0cm
(opposite to $60^0$)

**HINT**: What trig function uses opposite and hypotenuse?

$\sin 60^o = \frac{\text{opposite}}{\text{hypotenuse}}$

$\sin 60^o = \frac{15.0\text{ cm}}{x}$

$(\sin 60^o)\, x = 15.0\text{cm}$

$x = \frac{15.0\text{cm}}{\sin 60^o}$

$x = \frac{15.0\text{cm}}{0.8660}$

$x = 17.3\text{ cm}$

$\sin 60° = \frac{15}{x}$

$\frac{0.8660}{1} = \frac{15}{x}$

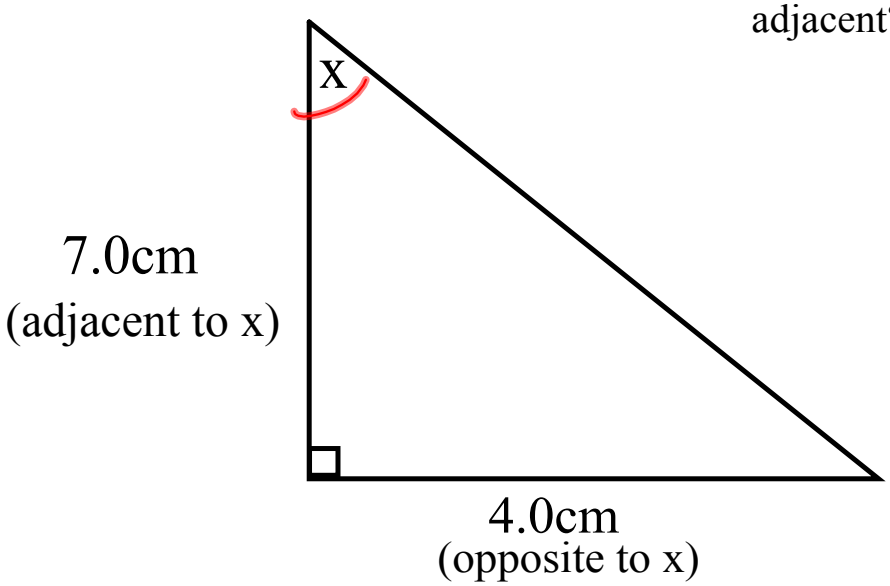
$\frac{0.8660x}{0.8660} = \frac{15}{0.8660}$

$\therefore \quad x = 17.3\text{cm}$

# Example 2:

Find the missing angle x

**HINT:** What trig function uses opposite and adjacent?




$\tan x = \frac{\text{opposite}}{\text{adjacent}}$

$\tan x = \frac{4.0\text{cm}}{7.0\text{cm}}$

$\tan x = 0.5714$

$x = \tan^{-1}(0.5714)$

$x = 30^{o}$