

# Geometry Info Sheet #37

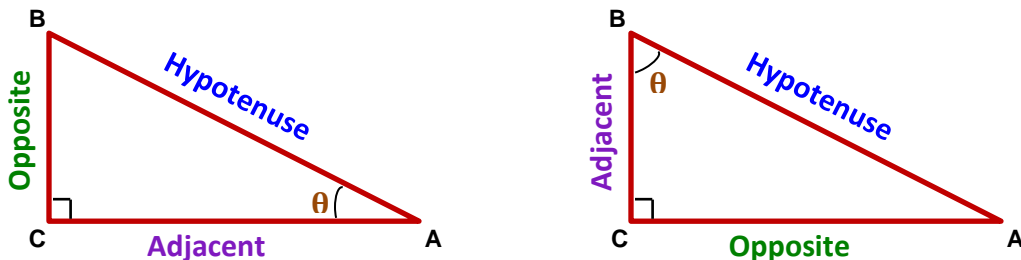
## Trigonometry with Right Triangles

### Definitions

**Trigonometry (Trig):** The study of triangle measurement; it is the branch of mathematics that studies the relationships between triangle angles and side lengths

**Trigonometric Functions:** Functions that relate the angles of a triangle to the lengths of its sides

In trigonometry, angles are often represented by Greek letters, such as theta ( $\theta$ ). The sides (legs) marked "opposite" and "adjacent" in the right triangles below are relative to the angle being referenced.



For right triangles, the three basic trigonometric functions are sine, cosine, and tangent:

$$\text{sine of } \theta = \sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\text{cosine of } \theta = \cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\text{tangent of } \theta = \tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

For a given right  $\triangle ABC$ , if  $\angle A$  and  $\angle B$  are the acute angles, then  $\sin \angle A = \cos \angle B$ . In other words, for an angle  $\theta$  in a right triangle:  $\sin(m\angle \theta) = \cos(90 - m\angle \theta)$  and  $\cos(m\angle \theta) = \sin(90 - m\angle \theta)$ .

As a method of remembering the three trigonometric functions above, some people use "**SOH-CAH-TOA**":

**SOH:** Sine = Opposite / Hypotenuse

**CAH:** Cosine = Adjacent / Hypotenuse

**TOA:** Tangent = Opposite / Adjacent

**Inverse Trigonometric Functions:** The inverse functions of the sine, cosine, and tangent functions; inverse trig functions work in reverse and, for a given triangle, can be used to obtain an angle's measure from any of the angle's trigonometric ratios

Inverse trig functions can be written in many ways. For example, the inverse sine function of a value  $x$  can be written as: "Inverse Sine  $x$ ", "arcsin  $x$ ", or " $\sin^{-1}$   $x$ ". All of these mean "the angle whose sine is  $x$ ".

**Don't confuse the inverse trig superscript "-1" notation with reciprocal functions (multiplicative inverses).**

**Angle of Elevation:** The angle that an upward line of sight makes with a horizontal line

**Angle of Depression:** The angle that a downward line of sight makes with a horizontal line

**Angles of elevation and depression are always measured from the horizontal (never from the vertical).**