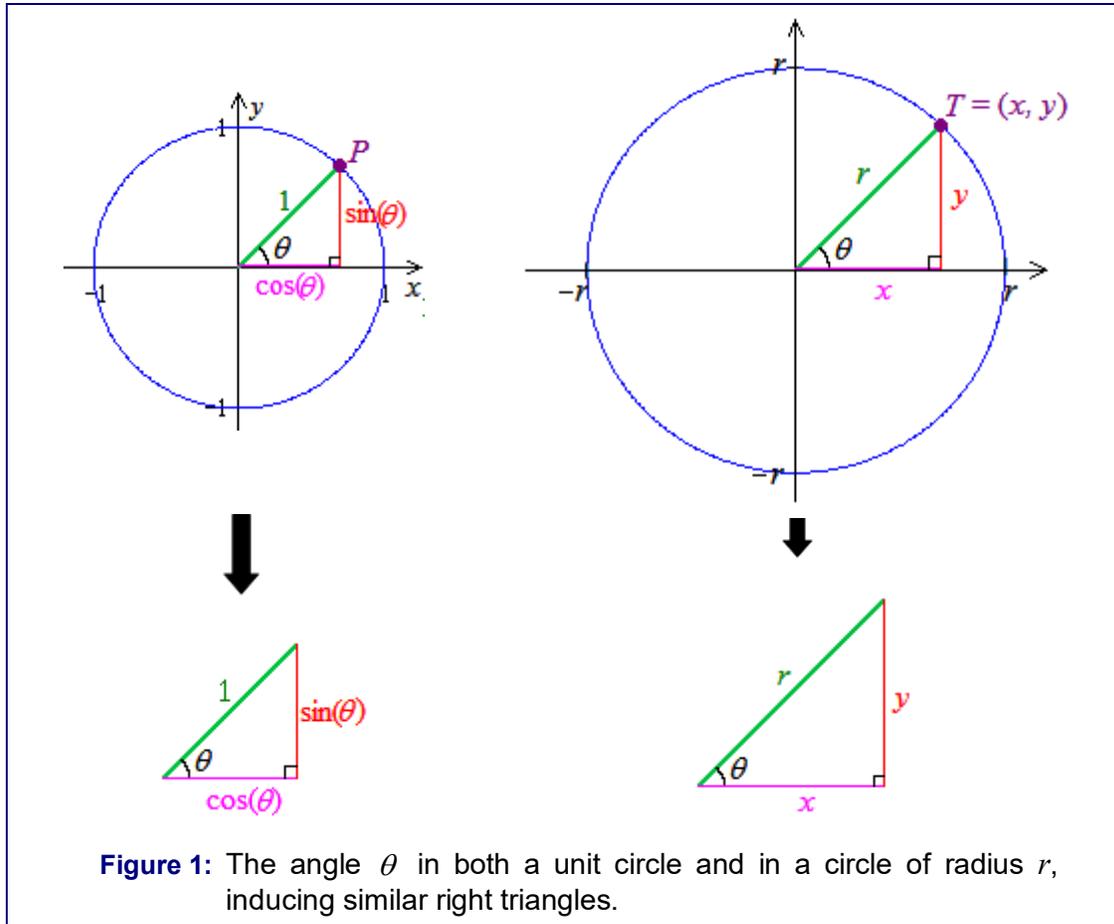


# Right Triangle Trigonometry

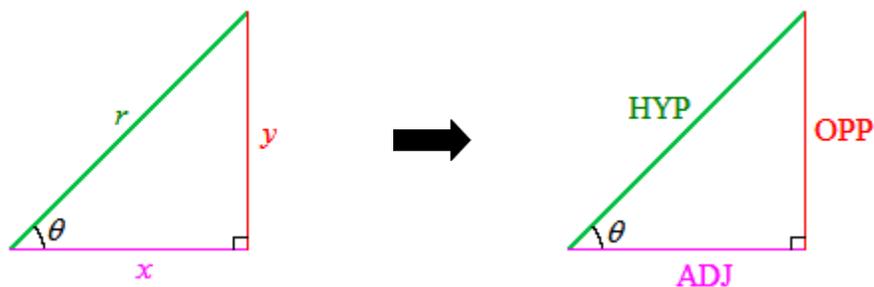
As we studied in “Intro to the Trigonometric Functions: Part 1,” if we put the same angle in the center of two circles of different radii, we can construct two *similar triangles*; see Figure 1.



We can use these similar triangles to obtain the following ratios (which we can use to derive expressions for  $\sin(\theta)$  and  $\cos(\theta)$ ):



To help remember these ratios, it's best to imagine yourself standing at angle  $\theta$  looking into the triangle. Then the side labeled  $y$  is on the **opposite** side of the triangle while the side labeled  $x$  is **adjacent** to you. We use these descriptions (as well as the fact that the side labeled  $r$  is the **hypotenuse** of the triangle) to refer to the sides of the triangles in Figure 1.



**Figure 2:** We use the terms **opposite** (or **OPP**), **adjacent** (or **ADJ**), and **hypotenuse** (or **HYP**) to refer to the sides of a right triangle.

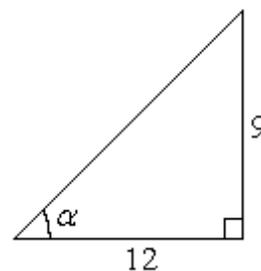
**DEFINITION:** If  $\theta$  is the angle given in the right triangles in Figure 2, then

$$\sin(\theta) = \quad \quad \quad \cos(\theta) = \quad \quad \quad \tan(\theta) =$$

Consequently, the other trigonometric functions can be defined as follows:

$$\cot(\theta) = \quad \quad \quad \sec(\theta) = \quad \quad \quad \csc(\theta) =$$

**EXAMPLE 1:** Find value for all six trigonometric functions of the angle  $\alpha$  given in the right triangle in Figure 3. (The triangle may not be drawn to scale.)



**Figure 3**

We can use the trigonometric functions, along with the Pythagorean Theorem to “**solve a right triangle**,” i.e., find the missing side-lengths and missing angle-measures for a triangle.

**EXAMPLE 2:** Solve the right triangle given in Figure 4 by finding  $A$ ,  $b$ , and  $c$ . (The triangle might not be drawn to scale.)

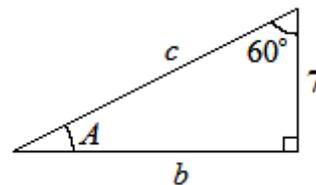


Figure 4

**EXAMPLE 3:** Solve the right triangle given in Figure 5 by finding  $c$ ,  $\alpha$ , and  $\beta$ . (The triangle might not be drawn to scale.)

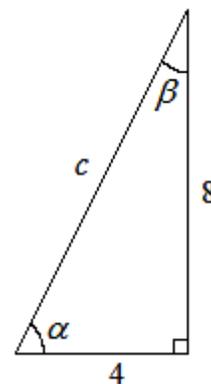


Figure 5