

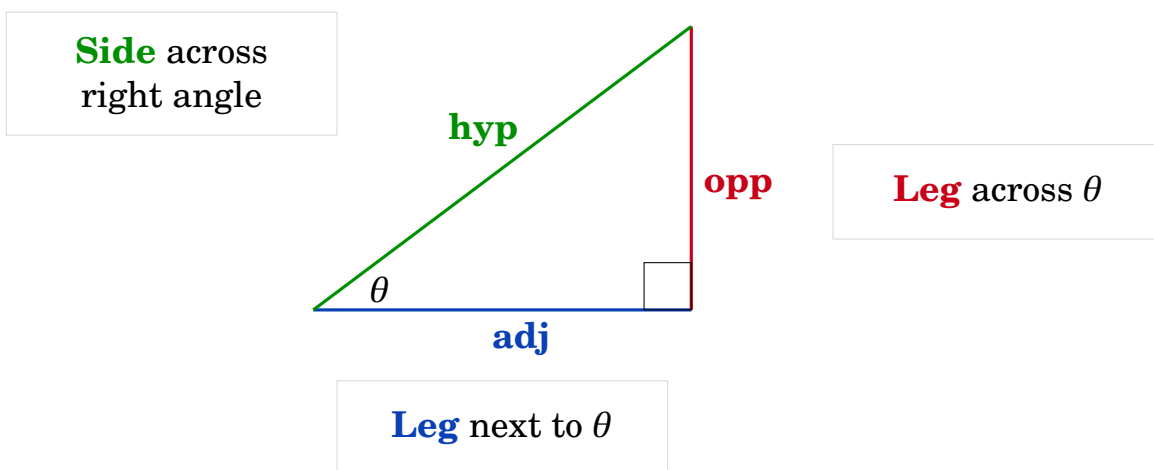
💡 Trigonometric Ratios

There are consistent ratios between the sides of right triangles with the same angle measurements.

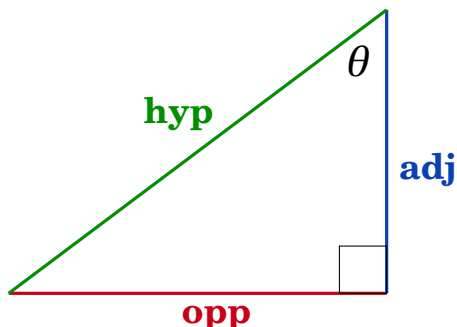
These values are known as **trigonometric ratios**. The three principal ratios are **sine**, **cosine**, and **tangent**.

🔧 Labeling the sides of the right triangle

We take the **sine**, **cosine**, and **tangent** of an **acute angle** inside a right triangle. The sides are labeled relative to a reference angle we will name θ .



⚠️ Pay careful attention to which angle is labeled because it affects which sides are *opposite* and *adjacent*.



Defining Sine, Cosine, and Tangent

Trigonometric ratios relate specific sides of a right triangle with respect to a specific angle.

Sine

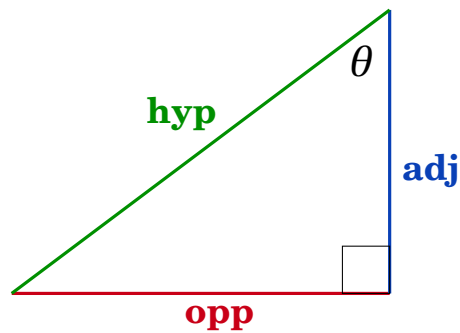
$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

Cosine

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

Tangent

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

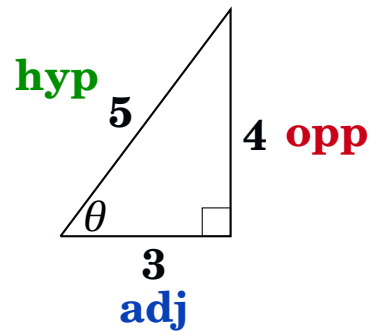
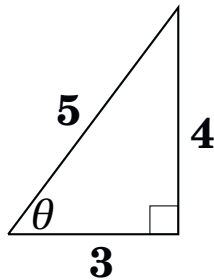


Evaluating Trigonometric Functions

- 1 Label the sides of the triangle relative to the angle.
- 2 Plug in the appropriate side lengths for the specific ratio.
- 3 Evaluate or simplify the ratio.

 **Example 1:** Find the sine, cosine, and tangent of θ .

- ❶ Label the sides of the triangle relative to the reference angle, θ .



- ❷ Plug in the appropriate side lengths for the specific ratio.

Sine

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{4}{5}$$

Cosine

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{3}{5}$$

Tangent

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{4}{3}$$

- ❸ Evaluate or simplify the ratio.

$$\sin \theta = \frac{4}{5} = 0.8$$

$$\cos \theta = \frac{3}{5} = 0.6$$

$$\tan \theta = \frac{4}{3} \approx 1.33$$

 **Example 2:** Find the sine, cosine, and tangent of θ .

- ❶ Label the sides of the triangle relative to the reference angle, θ .



- ❷ Plug in the appropriate side lengths for the specific ratio.

Sine

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{6}{6.5}$$

Cosine

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{2.5}{6.5}$$

Tangent

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{6}{2.5}$$

- ❸ Evaluate or simplify the ratio.

$$\sin \theta = \frac{6}{6.5} \approx 0.923$$

$$\cos \theta = \frac{2.5}{6.5} \approx 0.385$$

$$\tan \theta = \frac{6}{2.5} = 2.4$$

i **S O H - C A H - T O A**

This acronym can help you remember the definition of the ratios.

$$S = \frac{O}{H}$$

$$C = \frac{A}{H}$$

$$T = \frac{O}{A}$$