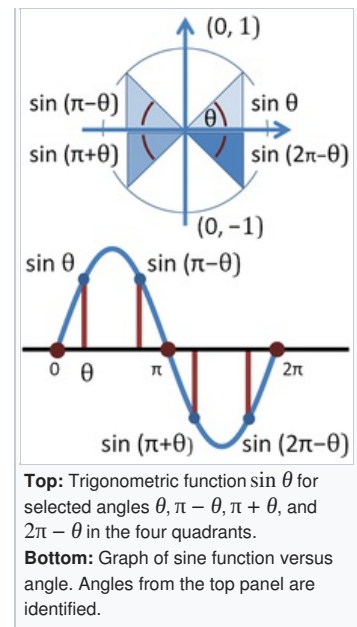


the accompanying diagram.

Function	Abbreviation	Description	Identities (using radians)
<b>sine</b>	sin	$\frac{\text{opposite}}{\text{hypotenuse}}$	
<b>cosine</b>	cos	$\frac{\text{adjacent}}{\text{hypotenuse}}$	
<b>tangent</b>	tan (or tg)	$\frac{\text{opposite}}{\text{adjacent}}$	$\tan \theta = \frac{\sin \theta}{\cos \theta} = \cot \left( \frac{\pi}{2} - \theta \right) = \frac{1}{\cot \theta}$
<b>cotangent</b>	cot (or cotan or cotg or ctg or ctn)	$\frac{\text{adjacent}}{\text{opposite}}$	$\cot \theta = \frac{\cos \theta}{\sin \theta} = \tan \left( \frac{\pi}{2} - \theta \right) = \frac{1}{\tan \theta}$
<b>secant</b>	sec	$\frac{\text{hypotenuse}}{\text{adjacent}}$	$\sec \theta = \csc \left( \frac{\pi}{2} - \theta \right) = \frac{1}{\cos \theta}$
<b>cosecant</b>	csc (or cosec)	$\frac{\text{hypotenuse}}{\text{opposite}}$	$\csc \theta = \sec \left( \frac{\pi}{2} - \theta \right) = \frac{1}{\sin \theta}$



## Sine, cosine, and tangent

The **sine** of an angle is the ratio of the length of the opposite **side** to the length of the hypotenuse. The word comes from the Latin *sinus* for gulf or bay,<sup>[1]</sup> since, given a unit circle, it is the side of the triangle on which the angle *opens*. In our case:

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

The **cosine** of an angle is the ratio of the length of the adjacent side to the length of the hypotenuse, so called because it is the **sine** of the complementary or co-angle, the other non-right angle.<sup>[2]</sup> Because the **angle sum of a triangle** is  $\pi$  radians, the co-angle B is equal to  $\frac{\pi}{2} - A$ ; so  $\cos A = \sin B = \sin(\frac{\pi}{2} - A)$ . In our case:

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

The **tangent** of an angle is the ratio of the length of the opposite side to the length of the adjacent side: so called because it can be represented as a line segment **tangent** to the circle, that is the line that touches the circle, from Latin *linea tangens* or touching line (cf. *tangere*, to touch).<sup>[3]</sup> In our case:

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

Tangent may also be represented in terms of sine and cosine, that is:

$$\tan A = \frac{\sin A}{\cos A} = \frac{\frac{\text{opposite}}{\text{hypotenuse}}}{\frac{\text{adjacent}}{\text{hypotenuse}}} = \frac{\text{opposite}}{\text{adjacent}}$$

These ratios do not depend on the size of the particular right triangle chosen, as long as the focus angle is equal, since all such triangles are **similar**.

The acronyms "SOH-CAH-TOA" ("soak-a-toe", "sock-a-toa", "so-kah-toa") and "OHSAHCOAT" are commonly used **trigonometric mnemonics for these ratios**.

## Cosecant, secant, and cotangent

The remaining three functions are best defined using the above three functions, and can be considered their **reciprocals**.

The **cosecant**  $\csc(A)$  or  $\text{cosec}(A)$ , is the **reciprocal** of  $\sin(A)$ ; i.e. the ratio of the length of the hypotenuse to the length of the opposite side; so called because it is the secant of the complementary or co-angle:

$$\csc A = \frac{1}{\sin A} = \frac{\text{hypotenuse}}{\text{opposite}} = \frac{h}{a}$$

The **secant**  $\sec(A)$  is the **reciprocal** of  $\cos(A)$ ; i.e. the ratio of the length of the hypotenuse to the length of the adjacent side:

