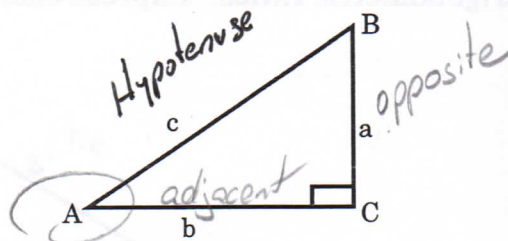


The term "trigonometry" derives from the Greek ("*trigonometria*"), meaning "triangle measuring".

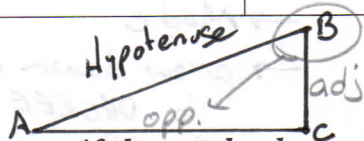
Trigonometry specifically deals with the relationships between the sides and the angles of triangles, that is, the trigonometric functions, and with calculations based on these functions. Trigonometry has important applications in many branches of pure mathematics as well as of applied mathematics and, consequently, much of science. Ancient Egyptians used trigonometry to reset land boundaries after the Nile river flooded each year, and the Babylonians used it to measure distances to nearby stars. Trigonometry is used in engineering, cartography, medical imaging, and many other fields.

In this chapter we study the relationship between the ratios of sides of right triangles. These ratios are called Trigonometric Ratios. All Trigonometric functions are used for right triangles only.

The three ratios we use in Geometry are *SINE*, *COSINE*, & *TANGENT*.



TRIGONOMETRIC RATIO	ABBREVIATION	DEFINITION	RATIO
Sine of A $\angle A$	$\sin A$	$\frac{\text{opposite leg}}{\text{hypotenuse}}$	$\frac{BC}{AB} = \frac{a}{c}$
Cosine of A	$\cos A$	$\frac{\text{adjacent leg}}{\text{hypotenuse}}$	$\frac{AC}{AB} = \frac{b}{c}$
Tangent of A	$\tan A$	$\frac{\text{opposite leg}}{\text{adjacent leg}}$	$\frac{BC}{AC} = \frac{a}{b}$



*** What happens if the angle changes to B? The opp. & adj. sides must be re-labeled.

Can the angle be C? No. Can't use 90° angle.

A mnemonic to help memorize this – SOH CAH TOA.

- S-Sine
- O-Opposite leg
- H-Hypotenuse
- C-Cosine
- A-Adjacent leg
- H-Hypotenuse
- T-Tangent
- O-Opposite leg
- A-Adjacent leg

$$\sin x^\circ = \frac{\text{Opposite leg}}{\text{Hypotenuse}}$$

$$\cos x^\circ = \frac{\text{Adjacent leg}}{\text{Hypotenuse}}$$

$$\tan x^\circ = \frac{\text{Opposite leg}}{\text{Adjacent leg}}$$

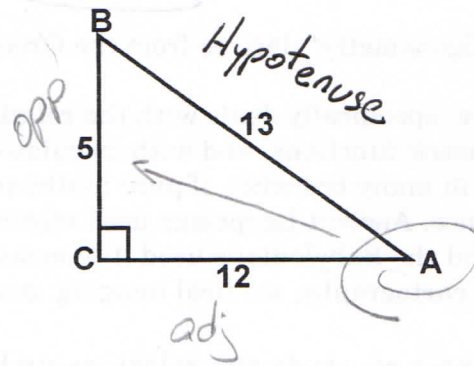
EXAMPLE 1: Determine the trigonometric ratios. Express each ratio as a fraction.

SOH CAH TOA

$$\sin A = \frac{5}{13} \quad \frac{O}{H} \quad \frac{A}{H}$$

$$\cos A = \frac{12}{13} \quad \frac{A}{H}$$

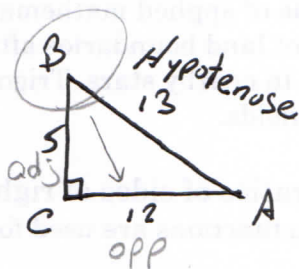
$$\tan A = \frac{5}{12} \quad \frac{O}{A}$$



$$\sin B = \frac{12}{13}$$

$$\cos B = \frac{5}{13}$$

$$\tan B = \frac{12}{5}$$

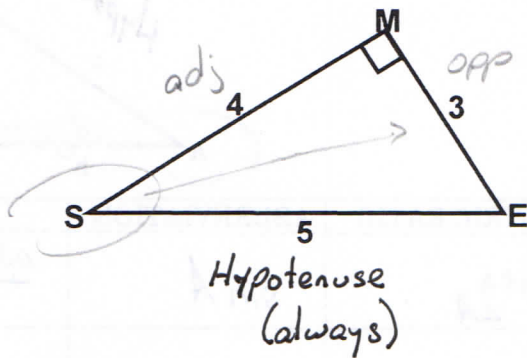


EXAMPLE 2: Determine the trigonometric ratios. Express each ratio as a fraction.

$$\sin S = \frac{3}{5}$$

$$\cos S = \frac{4}{5}$$

$$\tan S = \frac{3}{4}$$



$$\sin E = \underline{\hspace{2cm}}$$

$$\cos E = \underline{\hspace{2cm}}$$

$$\tan E = \underline{\hspace{2cm}}$$

Example 3 - Use your trig table to determine the following ratios:

$$\sin 10^\circ = \underline{.1736}$$

$$\cos 80^\circ = \underline{.1736}$$

$$\tan 40^\circ = \underline{.8391}$$

$$\sin 55^\circ = \underline{.8192}$$

$$\cos 35^\circ = \underline{.8192}$$

Calculator must be in DEGREE mode.

- Mode
- arrow down + right to DEGREE
- ENTER

Example 4 Use your calculator to determine the measures of the angles based on the trig ratios:

$$\sin A = 0.9848 \quad m\angle A = \underline{80^\circ}$$

$$\cos B = 0.7771 \quad m\angle B = \underline{39^\circ}$$

$$\tan C = 2.8 \quad m\angle C = \underline{70^\circ}$$

$$\cos D = 0.88 \quad m\angle D = \underline{28^\circ}$$

$$\tan E = \frac{2}{3} \quad m\angle E = \underline{34^\circ}$$

