

Discovering Trigonometric Ratios

Trigonometry: the study of how sides and angles of a triangle are related

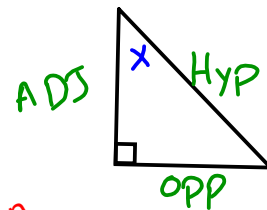
It is used in many professions, including:

- carpentry
- machining
- tool and die
- navigation
- land surveying
- architecture

Naming the sides of a Right Triangle:

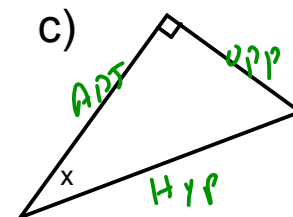
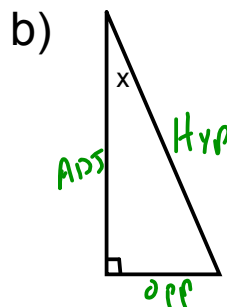
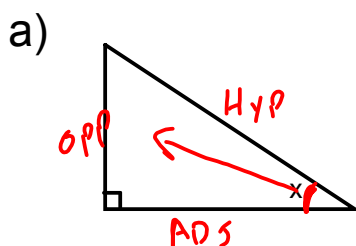
The sides of a right triangle are classified based on their position relative to one of the non-right angles.

The three sides are called:



Side Name	Abbreviation	Location
HYPOTENUSE	HYP	longest side, across from the right angle (always in the same spot, so label this side first!)
OPPOSITE	OPP	the side opposite the chosen acute angle
ADJACENT	ADJ	the side attached to the chosen acute angle (that is not the hypotenuse)

Ex: Label the sides of each right triangle below, in relation to angle x.



Primary Trig Ratios

Recall: a ratio compares two numbers

Ex: 3:4, $\frac{3}{4}$, 0.75

In Trigonometry, there are three very special ratios that compares the sides of a right triangle.

$$\text{sine } x = \frac{\text{opposite}}{\text{hypotenuse}} \longrightarrow \sin x = \frac{O}{H}$$

$$\text{cosine } x = \frac{\text{adjacent}}{\text{hypotenuse}} \longrightarrow \cos x = \frac{A}{H}$$

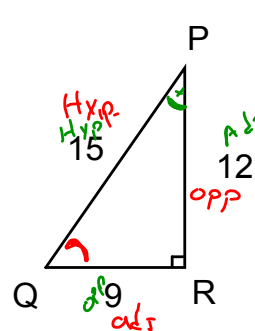
$$\text{tangent } x = \frac{\text{opposite}}{\text{adjacent}} \longrightarrow \tan x = \frac{O}{A}$$

To remember this, use **SOH CAH TOA**.
On your calculator you will see...

sin	cos	tan
SOH	CAH	TOA

IMPORTANT!!! Make sure your calculator is in DEGREE mode (should say DEG, DG, DRG...at the top). If not, you will not get the right answers.

Ex: Find the value of the sine, cosine and tangent ratios for the following triangle. **OPP ADJ HYP**



For angle P:

$$\begin{aligned}\sin P &= \frac{O}{H} \\ \sin P &= \frac{9}{15} \\ \sin P &= 0.6 \\ \cos P &= \frac{A}{H} \\ \cos P &= \frac{12}{15} \\ \cos P &= 0.8 \\ \tan P &= \frac{O}{A} \\ \tan P &= \frac{9}{12} \\ \tan P &= 0.75\end{aligned}$$

For angle Q:

$$\begin{aligned}\sin Q &= \frac{O}{H} \\ \sin Q &= \frac{12}{15} \\ \sin Q &= 0.8 \\ \cos Q &= \frac{A}{H} \\ \cos Q &= \frac{9}{15} \\ \cos Q &= 0.6 \\ \tan Q &= \frac{O}{A} \\ \tan Q &= \frac{12}{9} \\ \tan Q &= 1.3333\end{aligned}$$

Ex. 2. Find the following ratios to ~~three~~ ^{four} decimal places.

a) $\sin 56^\circ$

0.8290

b) $\cos 29^\circ$

0.8746

c) $\tan 80^\circ$

5.6713

Practice Questions:

pg. 59 # 1 - 7