

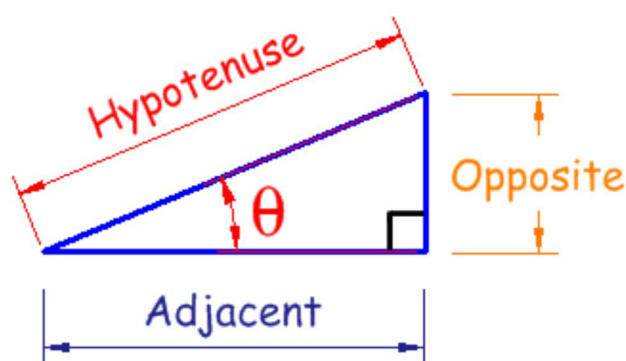
Sine, Cosine and Tangent

Three Functions, but same idea.

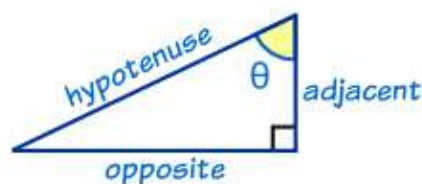
Right Triangle

Sine, Cosine and Tangent are all based on a [Right-Angled Triangle](#)

Before getting stuck into the functions, it helps to give a **name** to each side of a right triangle:



- "Opposite" is opposite to the angle θ
- "Adjacent" is adjacent (next to) to the angle θ
- "Hypotenuse" is the long one



Adjacent is always next to the angle

And **Opposite** is opposite the angle

Sine, Cosine and Tangent

Sine, **Cosine** and **Tangent** are the three main functions in trigonometry.

They are often shortened to **sin**, **cos** and **tan**.

To calculate them:

Divide the length of one side by another side
... but which sides?

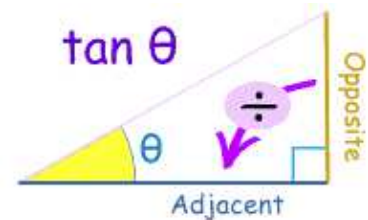
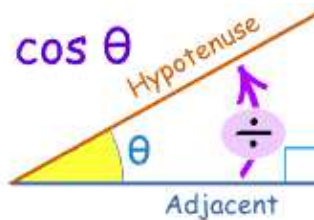
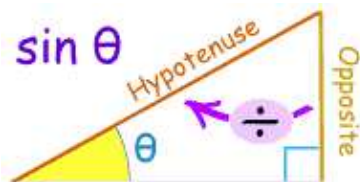
For a triangle with an angle θ , they are calculated this way:

Sine Function: **$\sin(\theta) = \text{Opposite} / \text{Hypotenuse}$**

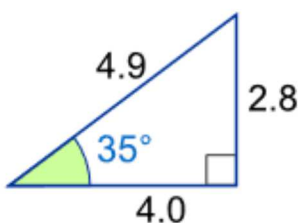
Cosine Function: **$\cos(\theta) = \text{Adjacent} / \text{Hypotenuse}$**

Tangent Function: **$\tan(\theta) = \text{Opposite} / \text{Adjacent}$**

In picture form:



Example: What is the sine of 35° ?



Using this triangle (lengths are only to one decimal place):

$$\begin{aligned}\sin(35^\circ) &= \text{Opposite} / \text{Hypotenuse} \\ &= 2.8 / 4.9 \\ &= \mathbf{0.57\dots}\end{aligned}$$

How to remember? Think "**Sohcahtoa**"! It works like this:

Soh... Sine = **O**pposite / **H**ypotenuse
...cah... Cosine = **A**djacent / **H**ypotenuse
...toa Tangent = **O**pposite / **A**djacent

You can read more about [sohcahtoa](#) ... please remember it, it may help in an exam

Why use trig functions

Why?

Why are these functions important?

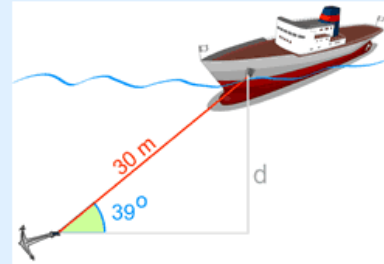
- Because they let us work out angles when we know sides
- And they let us work out sides when we know angles

Example: Use the sine function to find "d"

We know:

- The cable makes a **39° angle** with the seabed
- The cable has a **30 meter length**.

And we want to know "d" (the distance down).



Start with: $\sin 39^\circ = \text{opposite/hypotenuse}$

$$\sin 39^\circ = d/30$$

Swap Sides: $d/30 = \sin 39^\circ$

Use a calculator to find $\sin 39^\circ$: $d/30 = 0.6293\dots$

Multiply both sides by 30: $d = 0.6293\dots \times 30$

$$d = \mathbf{18.88} \text{ to 2 decimal places.}$$

The depth "d" is **18.88 m**