# Trigonometry

Trigonometry is a type of mathematics that is used to find the missing angles and lengths of triangles. It is a concept that started with ancient Greek philosophers. The word trigonometry comes from the Greek word 'trigonon' = three angles and 'metron' = measure.

In this lesson, we are going to look at the right-angled triangle. If we know the value of at least two sides of the triangle, then we can figure out any angle(Θ) within the triangle, using trigonometry.
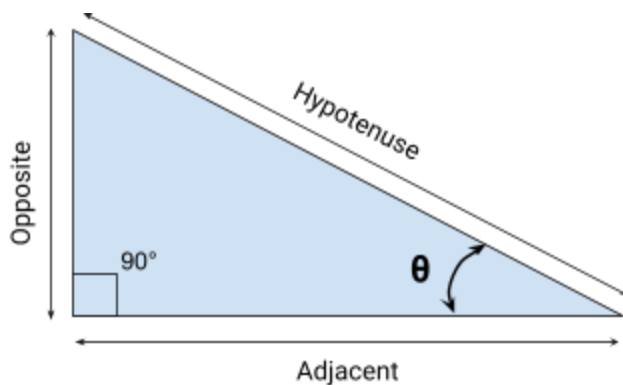

$$\Theta = \sin^{-1} \left(\frac{\text{Opposite}}{\text{Hypotenuse}} \right)$$

$$\Theta = \cos^{-1} \left(\frac{\text{Adjacent}}{\text{Hypotenuse}} \right)$$

$$\Theta = \tan^{-1} \left(\frac{\text{Opposite}}{\text{Adjacent}} \right)$$

To work out the angles within the right-angled triangle, we can use three mathematical functions. These are called: Sine, Cosine and Tangent.

For example, if we need to build a ramp in front of the science building that stretches as far as 4m, to go up as high as 3m, we can figure out how steep the ramp will be by calculating the angle of the ramp using trigonometry.
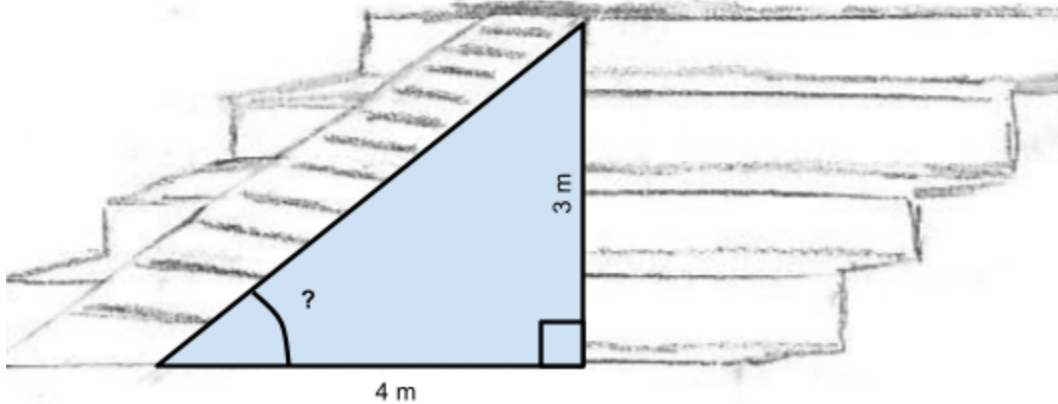
First, we would draw a right-angled triangle in front of the science building. We know we have the distance of adjacent (4m) and opposite (3m).

We now substitute the values into the formula. Now we need to multiply this by $\tan^{-1}$. To find out more about $\tan^{-1}$, have a read through [Appendix A](#)!

Usually, there is a button in the scientific calculator that you could use. In CreateBase, we have calculated $\tan^{-1}$ for you and saved it in the 'arctan' button. So click on the button on the platform to help you calculate the answer.

$$\Theta = \tan^{-1}\left(\frac{\text{Opposite}}{\text{Adjacent}} \right)$$

$$= \tan^{-1}\left(\frac{3m}{4m} \right)$$

In CreateBase Platform, $\tan^{-1}$ = arctan

$$\Theta = \text{arctan}\left(\frac{3m}{4m} \right)$$

$$\Theta = 0.64 \text{ radians or } 36.86°$$

So when we use arctan to calculate the answer, it is 0.64 radians or 36.87 degrees.

Appendix A

A function is a mathematical expression that takes in one or more variables and then outputs a result. Tan is a function that takes an angle within a triangle, Θ, as an input and then returns the ratio of the length of the opposite side to this angle to the length of the adjacent side to this angle. We can represent this mathematically as $\tan(\Theta) = o/a$, where o is the length of the opposite side of the triangle and a is the length of the adjacent side of the triangle.

The tan function is invertible. What this is means is that we can reverse the mathematical expression, aka we can start with the ratio o/a as an input and then perform a calculation to find the angle Θ as an output. We note this function as $\tan^{-1}$ or arctan. Mathematically, the calculation would be $\arctan(o/a) = \Theta$.