



Trigonometric Ratios

- Year 9
Mathematics

Year 9 Mathematics
Mainstream

www.maffsguru.com

Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- Know what the three trigonometric ratios are
- Know how to find trigonometric ratios from right angled triangles
- Know how to evaluate trigonometric ratios



RECAP

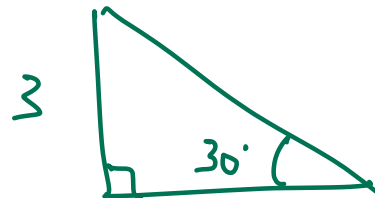
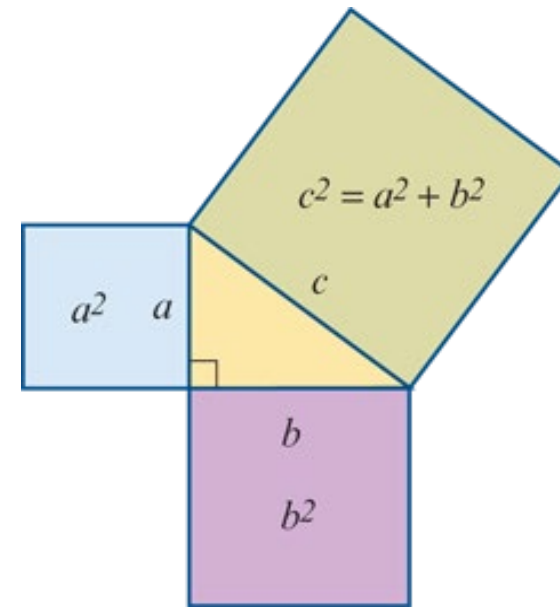
In a previous lesson we looked at how, for right angled triangles, there is a relationship between the sum of the areas of the two shortest sides of a right angled triangle and the area of the hypotenuse.

This is **only true** for right angled triangles.

The relationship is more formally known as:

$$c^2 = a^2 + b^2$$

This allowed us to find missing side lengths when given two other side lengths. But, what happens when we are given an angle and a side length? Is there a way to find the lengths of the other sides of a **right angled triangle**?



SOHCAHTOA

I love this topic as you can pretty much smash it using the word SOHCAHTOA.

Or, as my Maths teacher at school used to make us recite:

Silly
Old
Harry
Caught
A
Herring
Trawling
Off
America



This is a Herring – it's a type of fish!



This is a Trawler – it's a fishing boat!



I'm sure he hate us

I really don't understand why he made us learn the following:

Silly
Old
Harry
Caught
A
Herring
Trawling
Off
America

SOH | CAH | TOA

I really think he hated us ... sigh ... but on with the Maths!



Labelling a right-angled triangle

The first really important thing to note it ... **THIS ONLY WORKS WITH RIGHT-ANGLED TRIANGLES.**

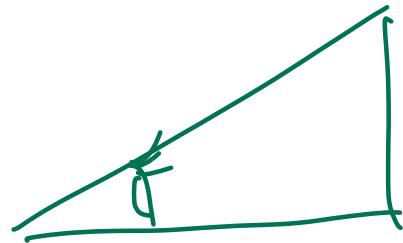
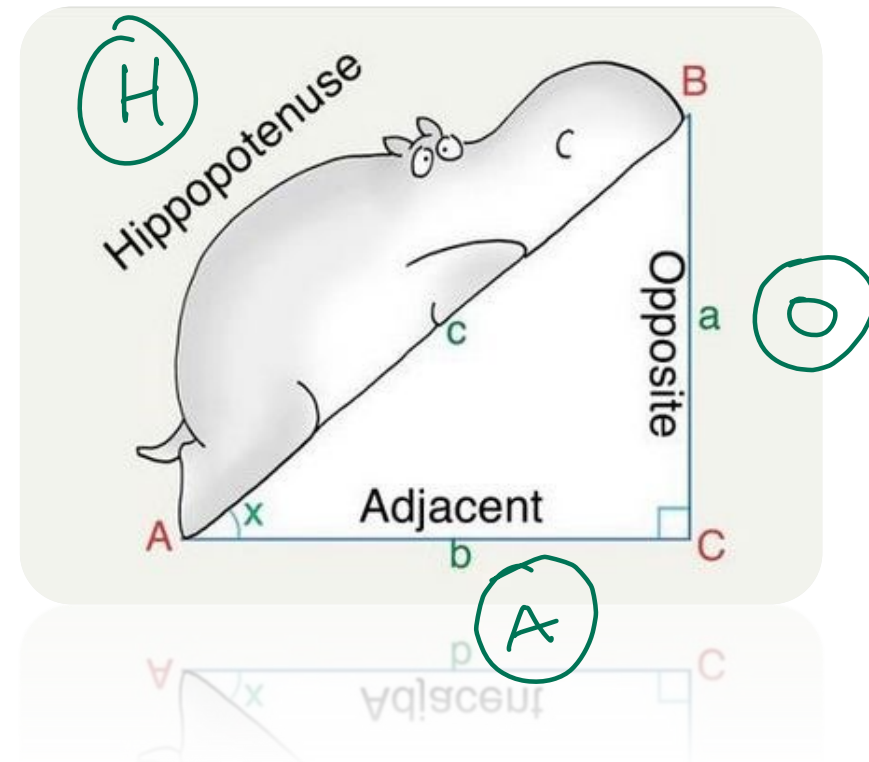
The longest side of a right-angled triangle is called the **Hypotenuse**.

I used to think people were just struggling to say Hippopotamus.

The rest of the sides can only be labelled with reference to an **known** (or unknown by given) **angle**.

The diagram uses 'x' to be the angle.

But we can also use any one of the Greek letters. Generally we use θ .

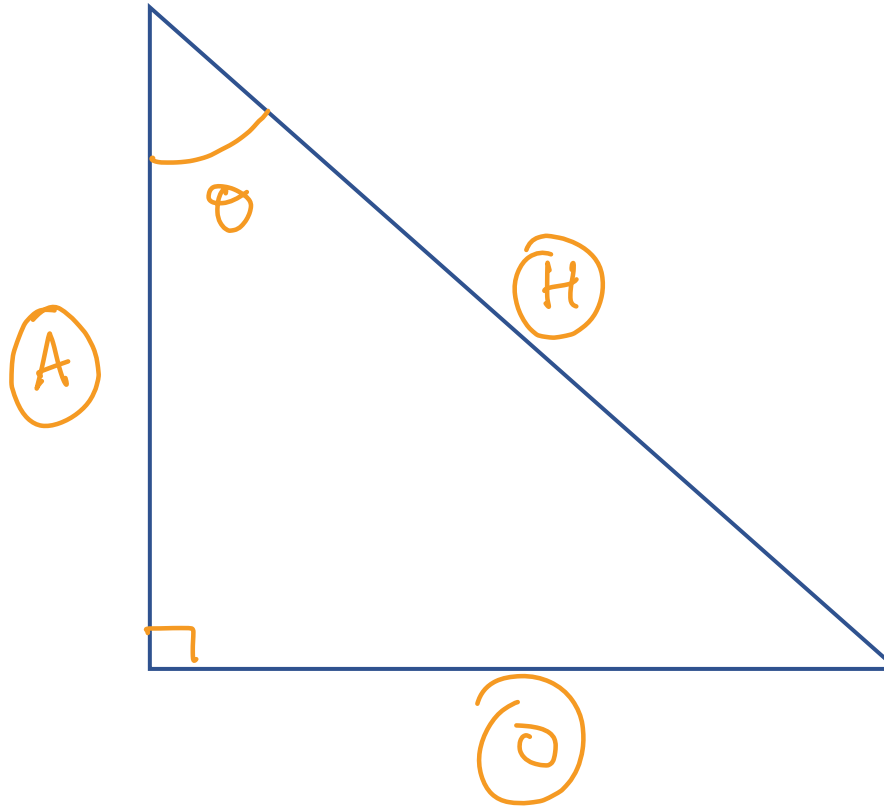


SOH | CAH | TOA



Labelling a right-angled triangle

When the angle is in the other corner, then the adjacent and opposite sides will naturally switch.



Adjacent
Opposite



What is a ratio?

A ratio is a **fraction**.

When you write something as a ratio you leave it as a fraction!

Trigonometric ratios are always written as fractions.

$$\frac{1}{2} \quad \frac{1}{3} \quad \frac{1}{4}$$



Using SOHCAHTOA

I love using SOHCAHTOA. It is an “easy” way to remember the following ...

S^O**H** | **C**^A**H** | **T**^O**A**

sin θ
cos θ
tan θ

Or ...

$$\sin \theta = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

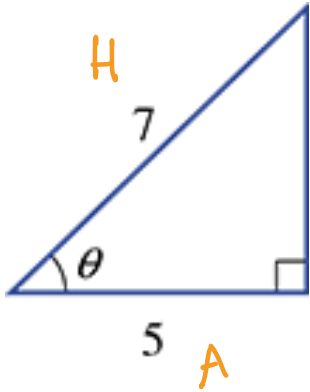
$$\cos \theta = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan \theta = \frac{\textit{opposite}}{\textit{adjacent}}$$



Examples

Using the given sides, write the trigonometric ratio (in fraction form) for each of the following triangles:



S^O **H** | **C**^A **H** | **T**^O **A**

F.

$$\cos \theta = \frac{A}{H}$$

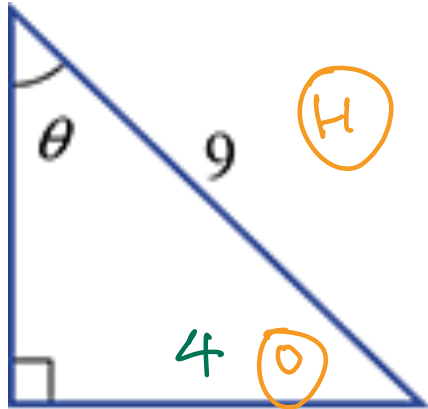
S.

$$\cos \theta = \frac{5}{7}$$



Examples

Using the given sides, write the trigonometric ratio (in fraction form) for each of the following triangles:



4

S^O **H** | **C**^A **H** | **T**^O **A**

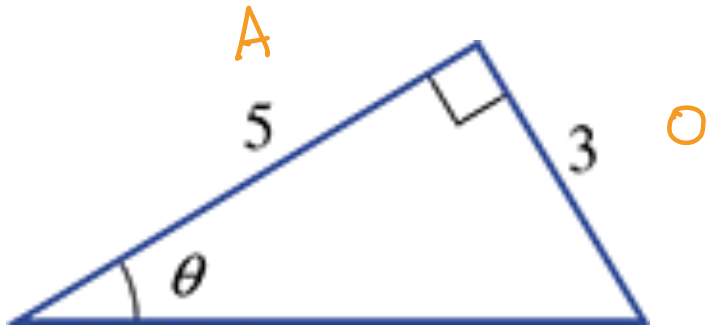
F. $\sin \theta = \frac{4}{9}$

S. $\sin \theta = \frac{4}{9}$



Examples

Using the given sides, write the trigonometric ratio (in fraction form) for each of the following triangles:



^OS ^HC ^AH ^T^OA

F.

$$\tan \theta = \frac{O}{A}$$

S.

$$\tan \theta = \frac{3}{5}$$



Drawing a triangle from a ratio

We can draw a triangle from a ratio by simply using SOHCAHTOA.

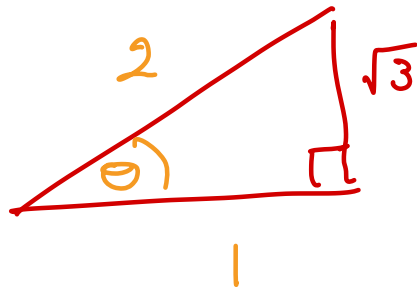
Remember: Any whole number is really a fraction.

E.g. given that $\cos \theta = \frac{1}{2}$, find $\sin \theta$ and $\tan \theta$

Note: This is also going to use the Pythag stuff we did.

S^O **H** **C** **A** **H** **T**^O **A**

$$\cos \theta = \frac{1}{2} = \frac{A}{H}$$



$$\begin{aligned}c^2 &= a^2 + b^2 \\2^2 &= 1^2 + b^2 \\4 &= 1 + b^2 \\b^2 &= 3 \\b &= \sqrt{3}\end{aligned}$$

$$\sin \theta = \frac{O}{H}$$

$$\sin \theta = \frac{\sqrt{3}}{2}$$

$$\tan \theta = \frac{O}{A}$$

$$\tan \theta = \sqrt{3}$$

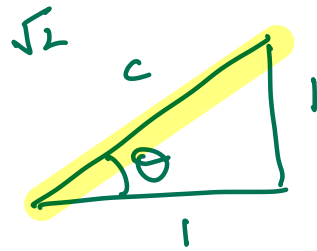


Drawing a triangle from a ratio

We can draw a triangle from a ratio by simply using SOHCAHTOA.

Remember: Any whole number is really a fraction.

E.g. given that $\tan \theta = 1$, find $\sin \theta$ and $\cos \theta$



$$\tan \theta = \frac{1}{1} = \frac{1}{1}$$

S^O **H** **C** **A** **H** **T** **O** **A**

$$c^2 = a^2 + b^2$$

$$c^2 = 1^2 + 1^2$$

$$c^2 = 1 + 1$$

$$c^2 = 2$$

$$c = \sqrt{2}$$

$$\sin \theta = \frac{O}{H}$$

$$\sin \theta = \frac{1}{\sqrt{2}}$$

$$\cos \theta = \frac{A}{H}$$

$$\cos \theta = \frac{1}{\sqrt{2}}$$



Questions to complete:

The questions I would like you to complete for this lesson are:

Exercise 3E: Trigonometric ratios

Questions: 2, 4, 5, 7, 10, 12



Making Maths Easy, Engaging Educational, Entertaining



Navigation: [Home](#)

- Latest uploads
- Years 6 to 10
- VCE Courses
- Exam Solutions
- Buy Merchandise

Why choose MaffsGuru?

I hate talking about myself. So, here are some of the amazing comments I receive about the videos and content I produce followed by reasons to use the resource:

“ I wish I watched your videos before naplan
— Overjoyed Cherry (youtube)



VCAA exam questions

VCE lessons, where possible, include the use of past VCAA exam questions to



Professional Development

This resource isn't just meant for students. I hope it will be useful for teachers both new



Downloadable notes

Every lesson has downloadable notes. Whatever I write on the screen, you can download for



Respected Presenter

I currently present for Cambridge University Press and Nelson - as well as produce my own content for