



Finding side lengths using Trigonometry

Year 9 Mathematics
Mainstream

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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 how to use the trigonometric ratios to help you find the lengths of missing sides of a right angled triangle.
- Be able to find a trigonometric value on your calculator



RECAP

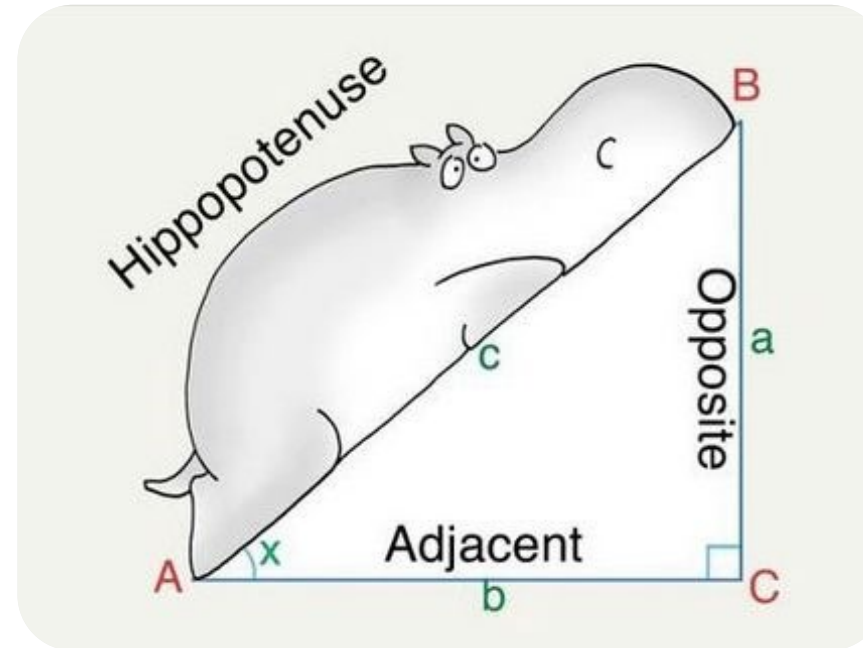
In a previous lesson we looked at how an angle can be related to the ratio of the side lengths of a right angled triangle using trigonometry.

SOHCAHTOA became our friend.

Rather than writing a ratio, we can actually use trigonometry to find missing side lengths (and angles!) when given the correct information.

To find a missing side length you always need an angle and one other side.

This lesson is going to show you how to find the missing side length when given an angle and one other side.



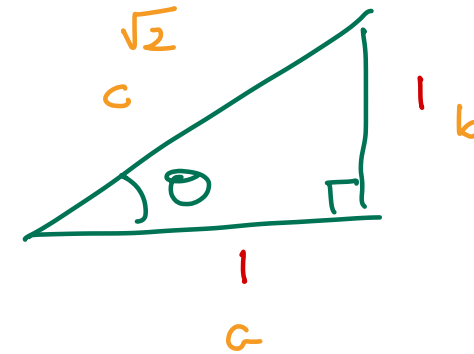
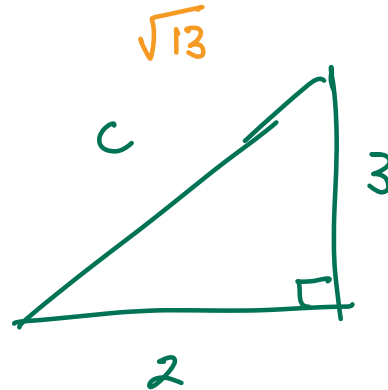
RECAP: Pythagoras' theorem

A reminder that we **may** have to use Pythagoras' Theorem for this topic.

This only works on right angled triangles.

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

This helps us find missing side lengths when **given two other sides of a right angled triangle**.



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



RECAP: SURDS

We will also need to use SURDS in this topic.

When we are asked to write something as an **exact value** this means we are not to write any answers as a decimal.

We may be expected to simplify surds.

We like surds for trigonometry and Pythag. as they make the calculations a lot easier for us and we don't end up with round errors.

$$\sqrt{3} \quad \sqrt{7} \quad \sqrt{11}$$

$$\sqrt{9} = \underline{\underline{3}}$$



Using the calculator to find a trig ratio

We will need to use the calculator for the whole topic. I sadly don't have the emulator for a scientific calculator so you will have to see what a CAS screen looks like.

The most important thing to remember is to have your calculator in the correct mode: DEG.

If you have the calculator in any other mode, it will give you wrong answers.

If we now look at $\sin 30$ and find it on the calculator ...

SOH:

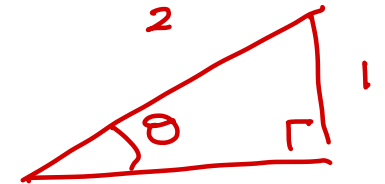
$$\sin \theta = \frac{O}{H}$$



This means that the ratio of the opposite side length divided by the hypotenuse for a triangle with an internal angle of 30 degrees is one half.

My calculator is showing the value as an exact value.

SOH | CAH | TOA



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

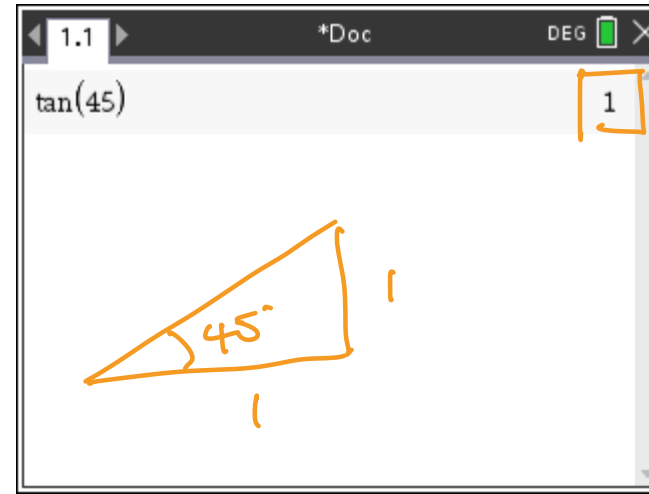
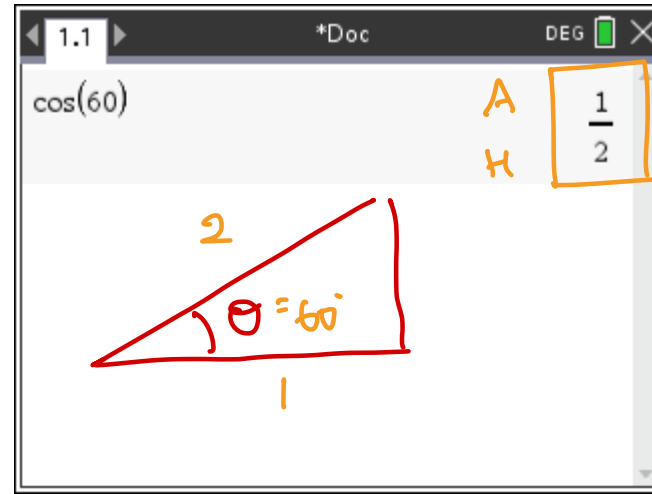
$$\sin 30 = \frac{1}{2}$$



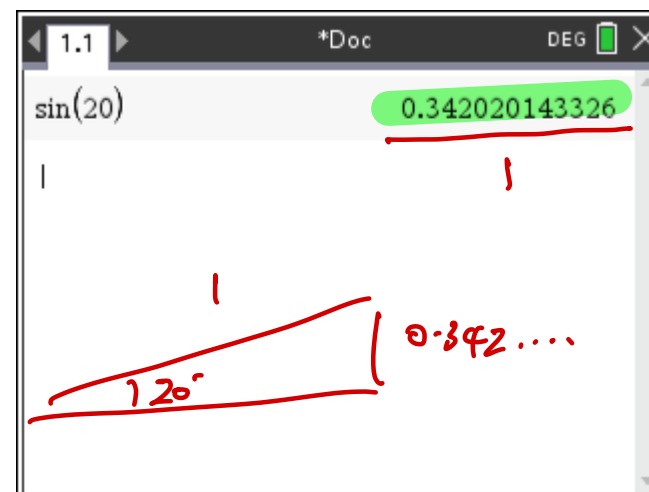
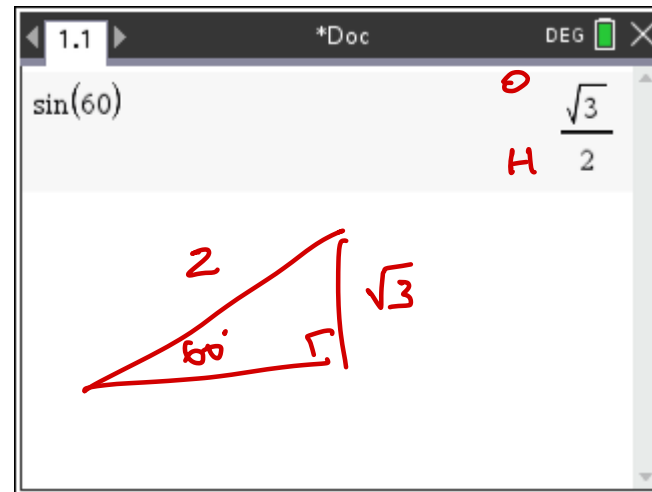
Using the calculator to find a trig ratio

Here are some other examples

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

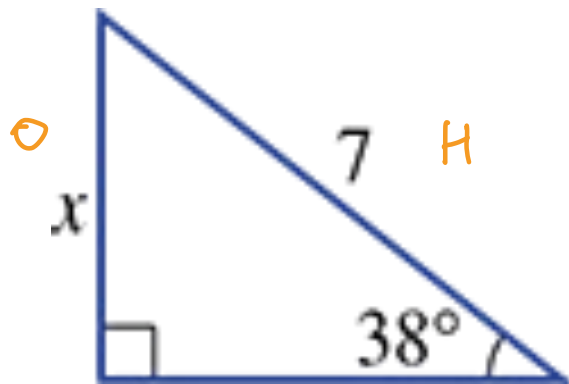


$$\tan \theta = \frac{O}{A}$$



Using this information to find missing side lengths

For each triangle, find the value of x correct to **two decimal places**



$$F. \quad \sin O = \frac{O}{H}$$

$$S. \quad \sin 38 = \frac{x}{7} \quad \times 7$$

$$S. \quad \sin 38 \times 7 = x$$

$$x = \sin 38 \times 7$$

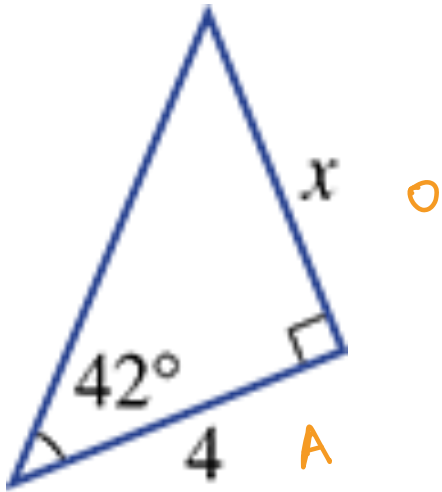
$$x = \underline{\underline{4.31}}$$

1.1	*Doc	DEG
$7 \cdot \sin(38)$	4.30963032728	
$4 \cdot \tan(42)$	3.60161617719	
$10 \cdot \cos(24)$	9.13545457643	



Using this information to find missing side lengths

For each triangle, find the value of x correct to **two decimal places**



$$F. \quad \tan \theta = \frac{O}{A}$$

$$S. \quad \tan 42 = \frac{x}{4}$$

$$S. \quad \tan 42 \times 4 = x$$

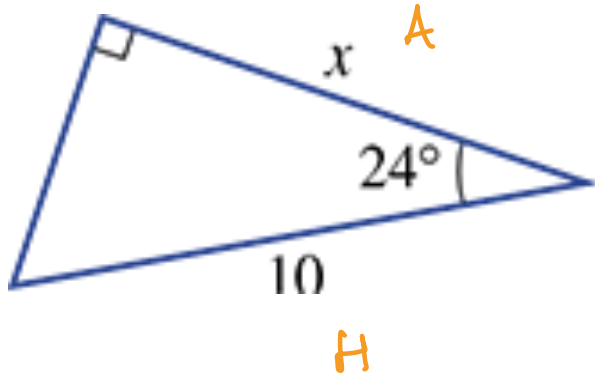
$$x = \tan(42) \times 4$$
$$= \underline{\underline{3.60}}$$

1.1	*Doc	DEG
7 · sin(38)	4.30963032728	
4 · tan(42)	3.60161617719	
10 · cos(24)	9.13545457643	



Using this information to find missing side lengths

For each triangle, find the value of x correct to **two decimal places**



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

$$\cos 24 = \frac{x}{10}$$

$$x = \cos(24) \times 10$$

$$= \underline{\underline{9.14}}$$

1.1	*Doc	DEG
$7 \cdot \sin(38)$	4.30963032728	
$4 \cdot \tan(42)$	3.60161617719	
$10 \cdot \cos(24)$	9.13545457643	



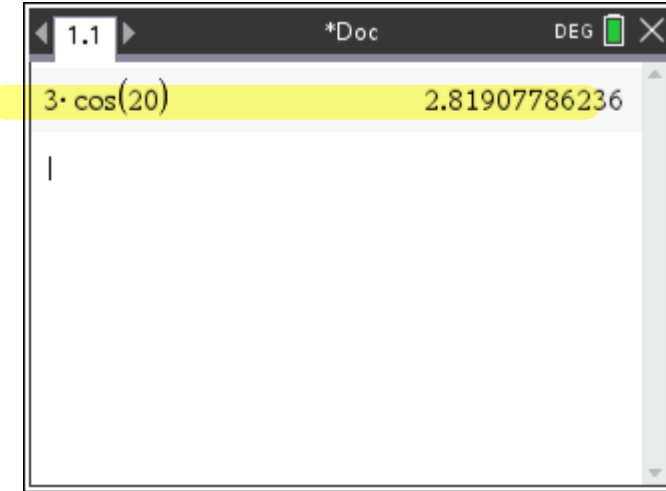
We don't always need a triangle to be able to work out missing side lengths

Find the value of x in the equation given below, correct to two decimal places.

$$\cos(20) = \frac{x}{3}$$

$$\times 3 \quad \cos 20 = \frac{x}{3} \quad \times 3$$

$$\begin{aligned} x &= \cos(20) \times 3 \\ &= \underline{\underline{2.82}} \end{aligned}$$



Questions to complete:

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

Exercise 3F: Finding side lengths using Trigonometry

Questions: 2, 3, 4bdfhj, 5, 7, 8, 10

Extension: 11



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