Finding an angle in a right-angled triangle

Year 11 General Maths
Units 1 and 2

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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 Unit 1 and 2 General Mathematics course.

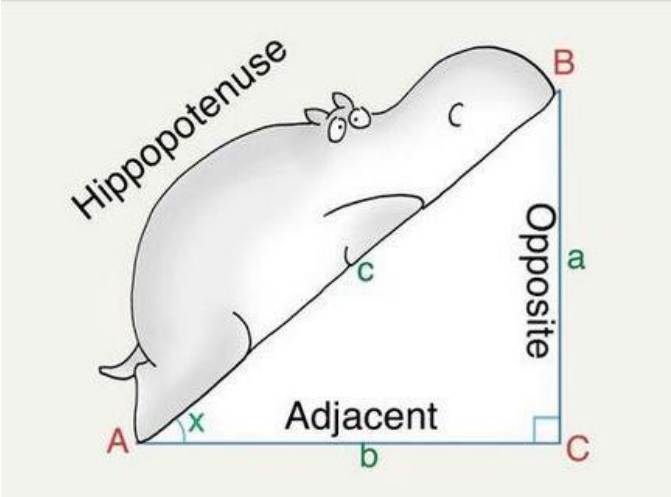
- Know how to find the missing angle(s) in a right angled triangle
- Use the CAS to be able to find angles

Recap of past learning

We are now going to continue to use SOHCAHTOA and the work we have done in the previous lessons to be able to find missing angles of right angled triangles.

We remember that we can use SOHCAHTOA to help us remember the following trigonometric ratios:

$$\sin\theta = \frac{opposite}{hypotenuse} \qquad cos\,\theta = \frac{adjacent}{hypotenuse} \qquad \tan\theta = \frac{opposite}{adjacent}$$



The ratio and SOHCAHTOA will only work if we have labelled the right-angled triangle correctly!

GET OUT OF THE WAY!!!

In the olden days, when dinosaurs roamed the earth, we had a very interesting button on our calculators. It was called the SHIFT button. Much the same as on the modern day keyboard.

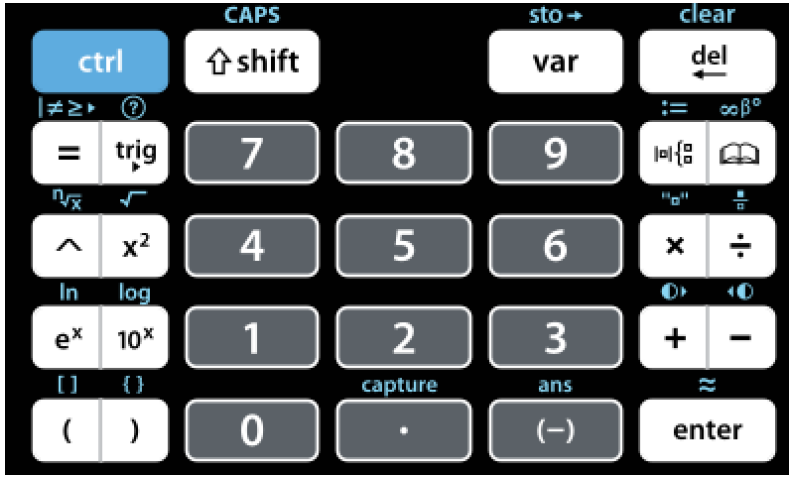
I loved the SHIFT button.

It reminded me of my favourite WORD … SHIFT.

Many a time I would walk down the corridors of the schools I worked in and yelled SHIFT to any students who got in my way. It was a sure-fire way to get people to MOVE.

Sadly, the SHIFT button has been relegated to something … less important.

Now we need to take CONTROL …



$$\sin\theta = 0.5$$

$$\theta = \sin^{-1}(0.5)$$

Shifting the SIN, COS and TAN out of the way

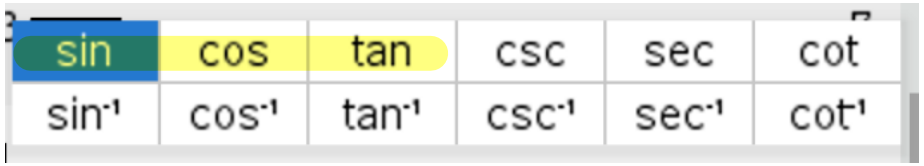
If I was given the following:

$$\sin\theta = 0.4$$

It is clear that I want to get the θ alone and SHIFT the sin out of the way.

Sorry … take control and MOVE THE SIN AWAY.

Well … when you press the TRIG button you can see the following …



solve(sin x = 0.4 , x)

sin x = 0.4

$x = \sin^{-1}(0.4)$

The functions below the sin, cos and tan are the ones which help us get the angle.

When we SHIFT the sin out of the way, the only place it can go is the other side of the equals.

Because it's moved place, we have to make sure we write it in a way which tells us it's moved … this is where the **floaty minus one comes from.**

So, if we go back to the example:

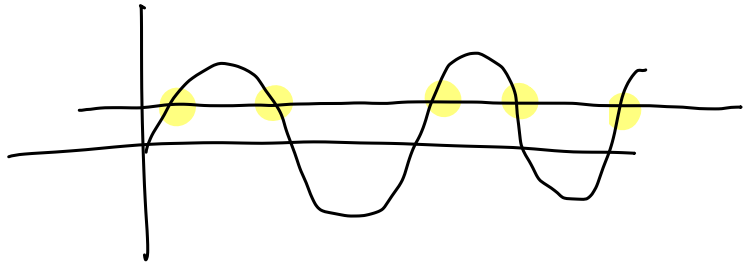
$$\boldsymbol{\theta = sin^{-1}(0.4)}$$

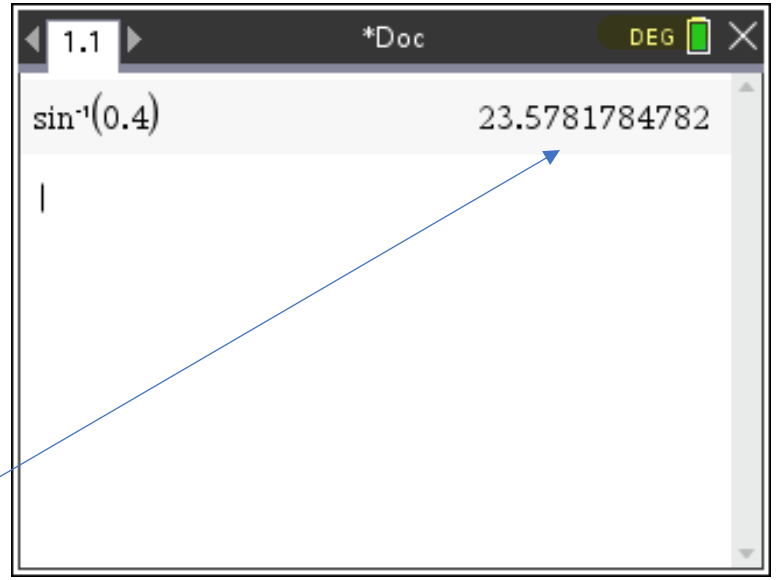
Tells us the sin has moved to the other side of the equals and hence we use the CAS to help us find the angle.

Shifting the SIN, COS and TAN out of the way

Putting this into the CAS is relatively simple:

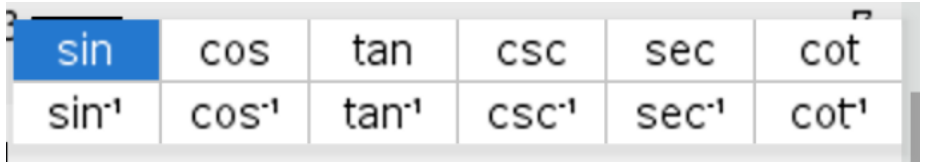
$$\theta = sin^{-1}(0.4)$$





This answer is the size of the angle.
Always make sure you check the accuracy and round to the correct number of decimal places.

Remember that there are "inverse" buttons for sine, cosine and tangent.



Examples of finding angles

Find the angle θ, correct to one decimal place, given:

- $\sin\theta = 0.8480$ $\approx 58°$
- $\cos\theta = 0.5$
- $\tan\theta = 1.67$

$\sin\theta = 0.8480$

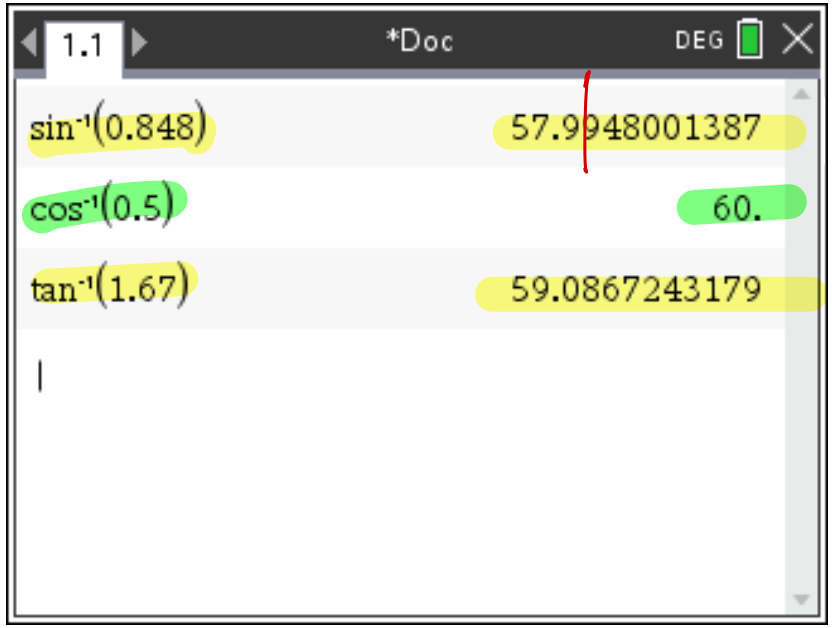
$\theta = \sin^{-1}(0.8480)$

$\cos\theta = 0.5$

$\theta = \cos^{-1}(0.5)$

$\tan\theta = 1.67$

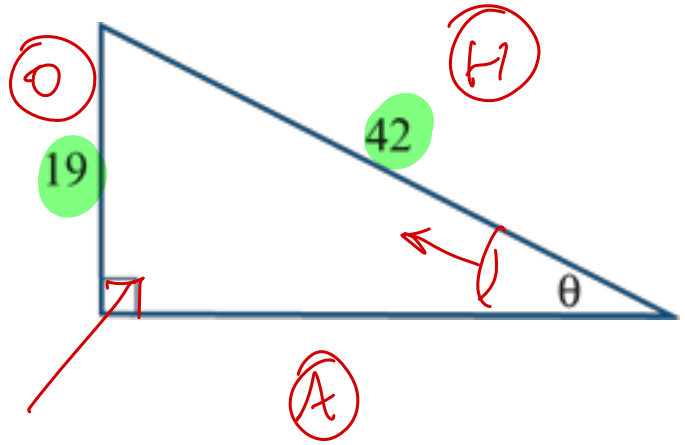
$\theta = \tan^{-1}(1.67)$



Make sure your CAS is in the correct mode
This will only give the correct answers if your CAS is in the correct mode … DEG.

Example: Finding an angle from two sides

Find the angle θ, in the right-angled triangle shown, correct to one decimal place.



1. label side
2. Highlight
3. SOHCAHTOA

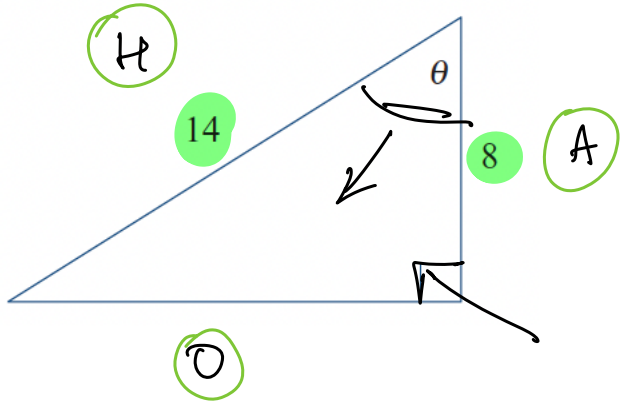
$$\therefore \quad \sin\theta = \frac{O}{H} \qquad F$$

$$\sin x = \frac{19}{42}$$

$$x = \sin^{-1}\left(\frac{19}{42}\right) = 26.9$$

Example: Finding an angle from two sides

Find the angle, θ, in the triangle shown to two decimal places.



SOHCAHTOA

$$\therefore \cos x = \frac{A}{H}$$

$$x = \cos^{-1}\left(\frac{8}{14}\right) = 55.15$$

Learning Objectives: Revisited

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