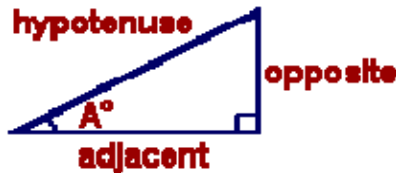


Trigonometry.

RIGHT ANGLED TRIANGLES ONLY

Trigonometry is the study of triangles which connects sides to angles. It uses functions called the sine, cosine and tangent. You can find these on scientific calculators with buttons named sin, cos and tan.

The most common use for these functions is to find sides and angles of a right angled triangle. The rules follow:

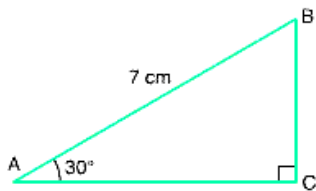


$$\begin{aligned}\sin A^\circ &= \frac{\text{opposite}}{\text{hypotenuse}} \\ \cos A^\circ &= \frac{\text{adjacent}}{\text{hypotenuse}} \\ \tan A^\circ &= \frac{\text{opposite}}{\text{adjacent}}\end{aligned}$$

Often remembered by: **soh cah toa**

The hypotenuse of a right angled triangle is the longest side, which is the one opposite the right angle. The adjacent side is the side which is between the angle in question and the right angle. The opposite side is opposite the angle in question.

Find the length of side BC.



First write down what you know

$$\begin{aligned}\text{Hypotenuse} &= 7\text{ cm} \\ \text{Angle} &= 30^\circ\end{aligned}$$

What do you need to find out? Opposite

Now decide which formula uses all three pieces of information = SINE

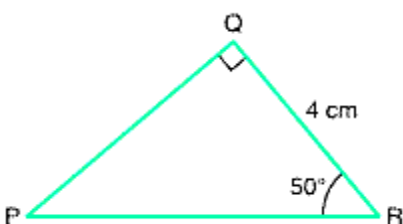
$$\sin \theta = \frac{\text{opp}}{\text{hyp}} \quad \text{formula to use}$$

$$\sin 30^\circ = \frac{\text{opp}}{7} \quad \text{substitute in values}$$

$$0.5 = \frac{\text{opp}}{7} \quad \text{use your calculator to find } \sin 30^\circ$$

$$3.5 \text{ cm} = \text{opp} \quad \text{multiply both sides by 7}$$

Find length of side PR



First write down what you know

$$\begin{aligned}\text{Adjacent} &= 4\text{ cm} \\ \text{Angle} &= 50^\circ\end{aligned}$$

What do you need to find out? hypotenuse

Now decide which formula uses all three pieces of information = cosine

$$\cos\theta = \text{adj}/\text{hyp} \quad \text{formula to use}$$

$$\cos 50^\circ = 4/\text{hyp} \quad \text{substitute in values}$$

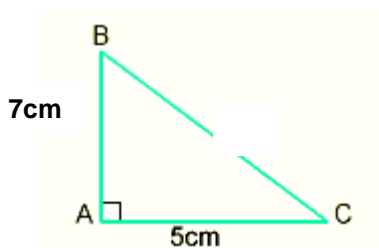
$$0.643 = 4/\text{hyp} \quad \text{use your calculator to find } \cos 50^\circ$$

$$1/0.643 = \text{hyp}/4 \quad \text{invert both sides}$$

$$4/0.643 = \text{hyp} \quad \text{multiply both side by 4}$$

$$\underline{6.22 \text{ cm} = \text{hyp}}$$

Find angle C



First write down what you know

$$\text{Opposite} = 7\text{cm}$$

$$\text{Adjacent} = 5\text{cm}$$

What do you need to find out? angle

Now decide which formula uses all three pieces of information = tangent

$$\tan\theta = \text{opp}/\text{adj} \quad \text{formula to use}$$

$$\tan\theta = 7/5 \quad \text{substitute in values}$$

$$\tan\theta = 1.4 \quad \text{use your calculator to find 7 divided by 5}$$

$$\theta = \tan^{-1} 1.4 \quad \text{use the inverse tan function to find the angle}$$

$$\theta = 54.46^\circ$$

(To use an inverse function press the shift/inverse button before pressing the tangent button.)

I have shown you how each trigonometry function can be used.

Which one you use is totally dependant on the information you have and what you need to find out.

If you have a more information than you need it means you have a choice of which function you can use. Use the information for that function and ignore the rest for now – but don't forget it could be useful later on in the question.

REMEMBER use the correct degree of accuracy.

Work with a maximum of 3dp during all your working out but only use a maximum of 2dp in your final answer. Make sure your round the number correctly. If the question asks for a specific number of dp's or significant figures this applies to your final answer only - you will lose marks if you do not do as asked.

- The Sine Curve

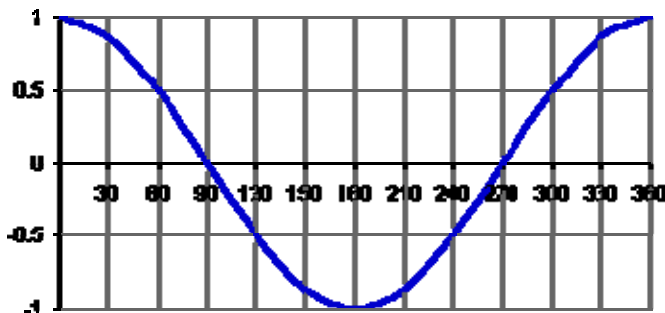
x°	0	30	60	90	120	150	180	210	240	270	300	330	360
$\sin x^\circ$	0.00	0.50	0.86	1.00	0.86	0.50	0.00	-0.50	-0.86	-1.00	-0.86	-0.50	0.00



This is the curve drawn when you put all the figures from the table above. As you can see, this curve is in a wave form. This wave can continue past 360° and go into the negatives.

- The Cosine Curve

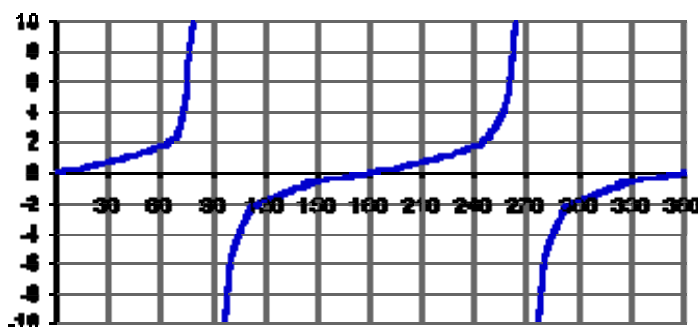
x°	0	30	60	90	120	150	180	210	240	270	300	330	360
$\cos x^\circ$	1.00	0.86	0.50	0.00	-0.50	-0.87	-1.00	-0.87	-0.50	0.00	0.50	0.87	1.00



If you look at this curve you can see it is actually the same as the sine curve except it is a different section (i.e. this peaks at 0° where the sine curve peaks at 90°).

- The Tan Curve

x°	0	30	60	90	120	150	180	210	240	270	300	330	360
$\tan x^\circ$	0.00	0.58	1.73		-1.73	-0.58	0.00	0.58	1.73		-1.73	-0.58	0.00



The tan curve is very different from the others. It is a non-continuous which breaks as the value at the breaking point (when $x=90$ or $x=270$) is infinity. Again this curve can be continued with the section from $x=90$ to $x=270$ repeated.

From the curves we can see there is always more than one possible value for any number you are working out the inverse ($\sin^{-1} 0.5 = 30^\circ$ or 150°). The problem is that your calculator only gives you one of the values (the one below 90°). You must remember the curves to find the position of the second angle.