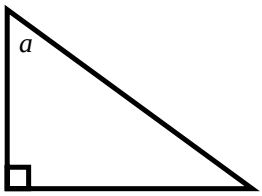
Trigonometry

On the triangle below, identify the:

a) hypotenuse
b) adjacent side
c) opposite side



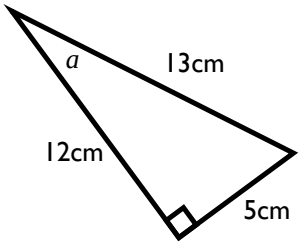
Trigonometry

Explain what is meant by:

SOHCAHTOA

Trigonometry

What are the sin, cos and tan ratios for angle a in the triangle below?



Trigonometry

Sketch the triangle described in this question:

A slide is 7m long. For safety, it cannot make an angle larger than 45° with the ground. What is the maximum height of the slide?

Trigonometry

Sketch the triangle described in this question:

A window is 4m from the ground. A painter needs to reach the window, and his ladder makes a 60° angle with the ground. How long is the ladder?

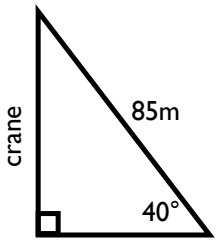
Trigonometry

Sketch the triangle described in this question:

A carpenter leaves a 3.5m plank of wood leaning against the wall. The bottom of the plank is 37cm away from the bottom of the wall. What angles does the plank make with the wall?

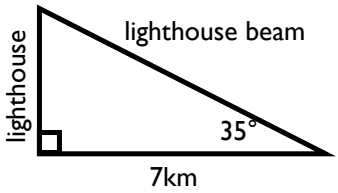
Trigonometry

Show all your workings to find the height of the crane:



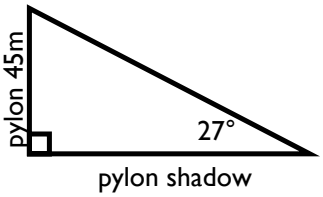
Trigonometry

Show all your workings to find the length of the lighthouse beam:



Trigonometry

Show all your workings to find the length of the shadow:



$$\sin a = \frac{\text{opp}}{\text{hyp}} = \frac{5}{13}$$

$$\cos a = \frac{\text{adj}}{\text{hyp}} = \frac{12}{13}$$

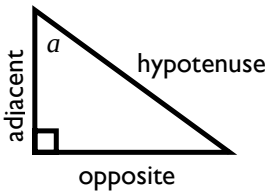
$$\tan a = \frac{\text{opp}}{\text{adj}} = \frac{5}{12}$$

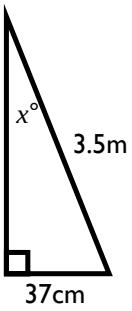
SOHCAHTOA is a way to remember the three ratios in trigonometry:

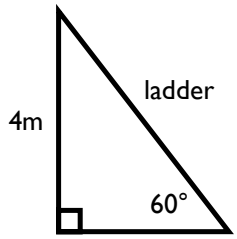
$$\text{sine} = \frac{\text{opposite}}{\text{hypotenuse}}$$

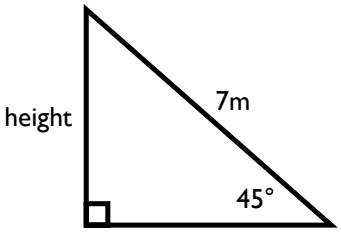
$$\text{cosine} = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{tangent} = \frac{\text{opposite}}{\text{adjacent}}$$









$$\tan 27 = \frac{45}{p}$$

$$p = \frac{45}{\tan 27}$$

$$= 88.3\text{m}(3\text{s.f.})$$

$$\cos 35 = \frac{7}{b}$$

$$b = \frac{7}{\cos 35}$$

$$= 8.55\text{km}(3\text{s.f.})$$

$$\sin 40 = \frac{c}{85}$$

$$c = 85 \sin 40$$

$$= 54.6\text{m}(3\text{s.f.})$$

Trigonometry You know the size of angle x and the length of the hypotenuse but you need to know the length of the opposite side. Which ratio do you use?	Trigonometry You know the lengths of the adjacent and opposite sides but you need to know the size of angle x. Which ratio do you use?	Trigonometry You know the size of angle x and the length of the adjacent side, but you need to know the length of the hypotenuse. Which ratio do you use?
Trigonometry What is an inverse function? E.g. **sin^{-1}**, **cos^{-1}**, **tan^{-1}** When would you use one of these inverse functions in trigonometry?	Trigonometry Explain how you would find the inverse functions **sin^{-1}**, **cos^{-1}** and **tan^{-1}** on your calculator.	Trigonometry Explain what is wrong with these workings: $\tan x = \frac{3}{4} = 0.75$ $x = \frac{0.75}{\tan}$
Trigonometry A tree is 18m tall. 20m away, a mouse is on the ground looking up at the very top of the tree. What is the angle of elevation from the mouse to the top of the tree?	Trigonometry A bird sits on a pylon that is 13m tall. The bird spies a tasty worm 15m away from the base of the pylon. What is the angle of depression from the bird to the worm?	Trigonometry A 40m tall lighthouse shines its beam directly at a ship. The beam has an angle of depression of 22°. How far away is the ship from the bottom of the lighthouse?

You should use cos:

$$\cos x = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{hypotenuse} = \frac{\text{adjacent}}{\cos x}$$

You should use tan:

$$\tan x = \frac{\text{opposite}}{\text{adjacent}}$$

$$x = \tan^{-1}\left(\frac{\text{opposite}}{\text{adjacent}}\right)$$

You should use sin:

$$\sin x = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{opposite} = \text{hypotenuse} \times \sin x$$

The workings are wrong as you cannot remove the tan function from one side by dividing by tan. It is a function, not a number!

You should apply the inverse function to each side:

$$\tan x = \frac{3}{4} = 0.75$$

$$x = \tan^{-1} 0.75$$

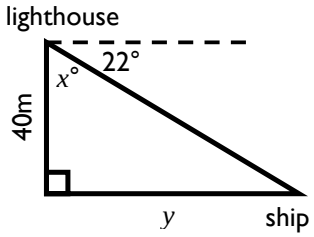
On most calculators …

shift + **sin** gives $\sin^{-1}$
shift + **cos** gives $\cos^{-1}$
shift + **tan** gives $\tan^{-1}$

Make sure you know how your calculator works before your exam!

An inverse function is where you apply the opposite process to the original function.

We use $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$ when you want to find a missing angle.



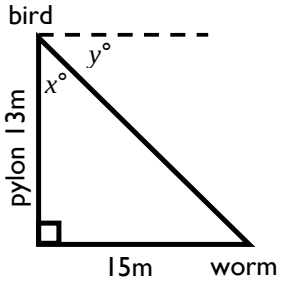
$$x = 90 - 22 = 68^\circ$$

$$\tan x = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan(68) = \frac{y}{40}$$

$$y = 40\tan(68)$$

$$= 99.0\text{m}\,(3\text{s.f.})$$

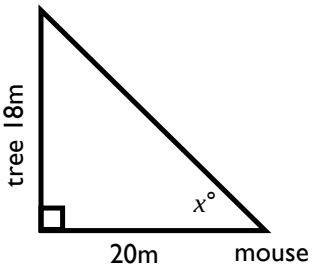


$$\tan x = \frac{\text{opposite}}{\text{adjacent}} = \frac{15}{13}$$

$$x = \tan^{-1}\left(\frac{15}{13}\right)$$

$$y = 90 - \tan^{-1}\left(\frac{15}{13}\right)$$

$$= 40.9^\circ\,(3\text{s.f.})$$



$$\tan x = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan x = \frac{18}{20} = 0.9$$

$$x = \tan^{-1}(0.9)$$

$$= 42.0^\circ\,(3\text{s.f.})$$

Teaching notes

This pack contains 18 flash cards (9 per double sided sheet).

Print or photocopy the sheets back to back, so the questions match up with the answers on the other side. It may be best to print onto thin/scrap paper first to check alignment, before printing onto thicker card or paper.

Collect the cards together into a set with a treasury tag, paper clip, envelope, etc.

Students could be encouraged to take ownership of their cards by colour coding, adding notes, or adding their own cards to the pack.

Cards could be used for independent revision or a 'test' with a friend asking the questions.