

Lesson 1: Trigonometry in engineering and manufacturing

QA worksheet – Questions

Trigonometry

In the area of engineering, at times we will be required to apply different mathematical principles to real-life applications. One subject area that crops up frequently in real life is trigonometry.

In engineering and manufacturing, trigonometry has a variety of uses.

A classic example would be calculating the amount of light falling on a surface. Here trigonometry is needed to find missing sides and angles.

Starter activity

Give **two** examples of where trigonometry is used in engineering or manufacturing.

i)

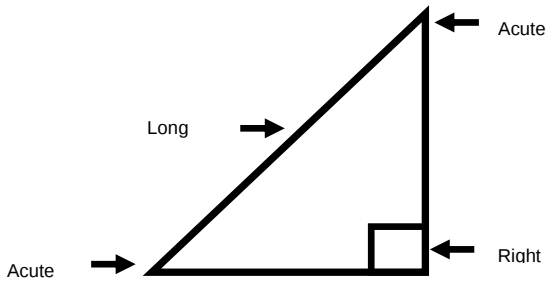
ii)

Activity 1

Trigonometry facts

A right-angled triangle is one that has _____ and _____.

A right-angled triangle has _____ ($< 90^\circ$) and _____ ($= 90^\circ$).



Trigonometry facts

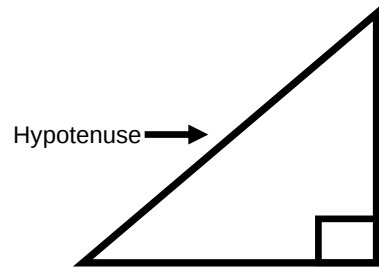
The sides of a right-angled triangle are called the following:

Opposite – this is the side that is opposite the angle in question.

Adjacent - this is the side that is next to the angle in question.

* Note the sides can swap over depending on which angle is in question.

Hypotenuse – just for fun, this comes from two Greek words meaning to stretch, hence the hypotenuse is the longest side.



Activity 2

Name the sides of a right-angled triangle.

What are the angles called?

Which angles are less than 90° ?

Which angles are 90° ?

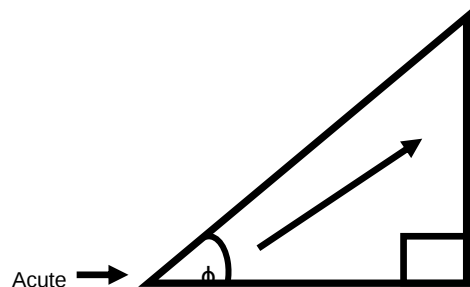
Trigonometry facts

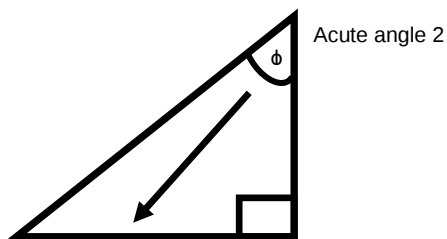
Working with our acute angle 1

There are two short sides:

one which is _____ the angle and

one which is _____ (next to) the angle.





Trigonometry facts

Working with our acute angle 2

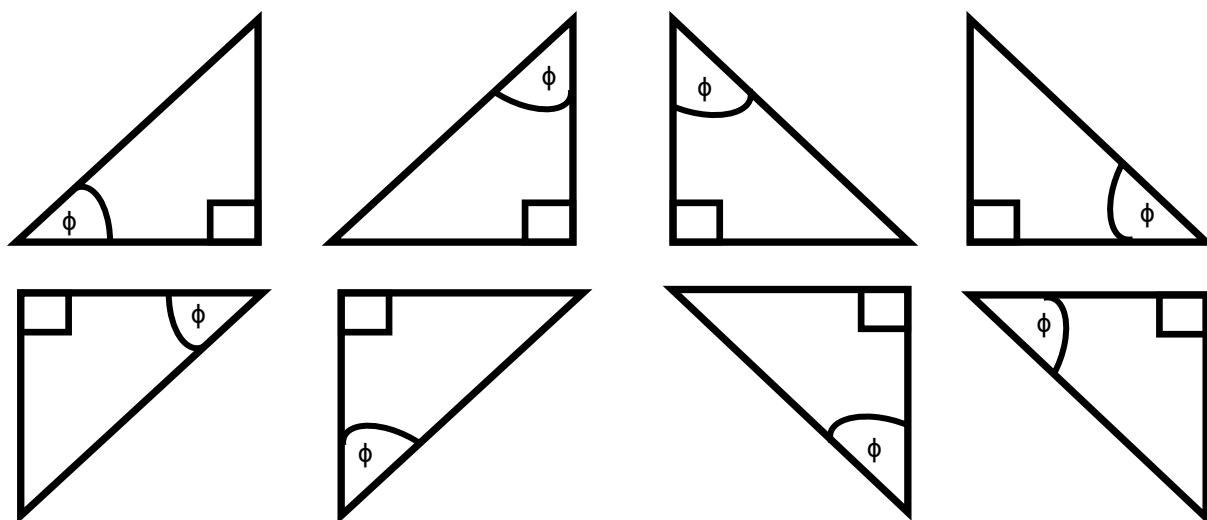
There are two short sides, one which is opposite our angle and one which is adjacent (next to) our angle.

I have shown this on the diagram.

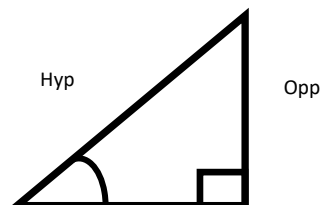
The amazing thing is that the hypotenuse is still the longest side.

Activity 3

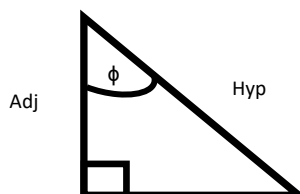
For the triangles shown, identify the sides in relation to the acute angle given.



Example



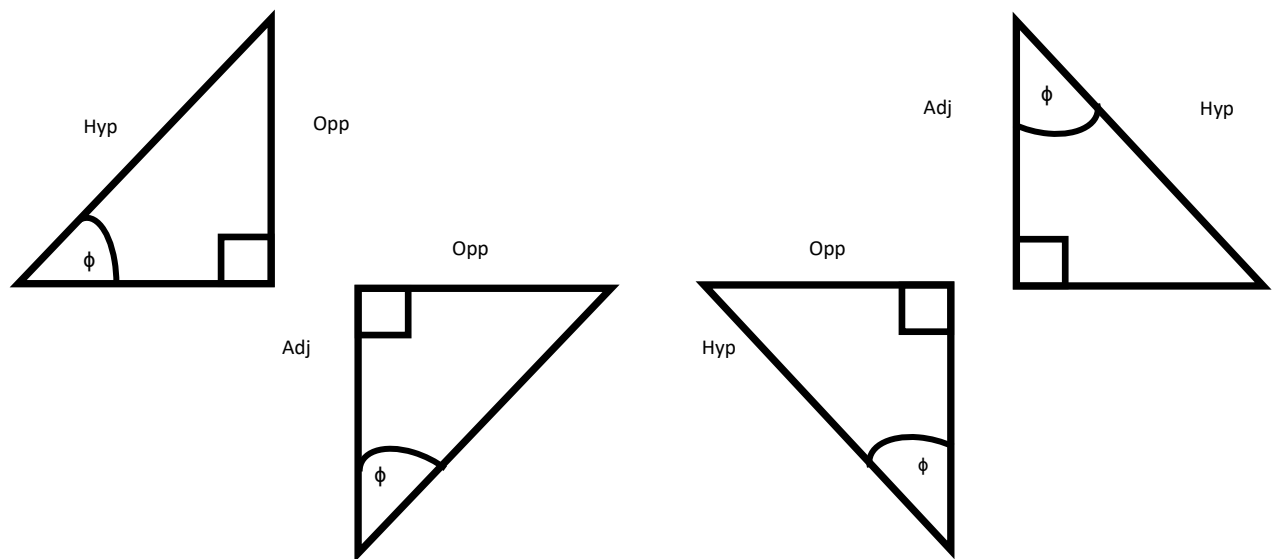
$$\sin = \frac{\text{Opp}}{\text{Hyp}}$$



$$\cos = \frac{\text{Adj}}{\text{Hyp}}$$

Activity 4

Show the correct formula (ratio) for the following:



Activity 5

Convert the following given decimals into angles and angles into decimal numbers.

- 0.75
- 0.45
- 0.25
- 0.19
- 0.90
- 45°
- 90°
- 0°
- 75°
- 19°

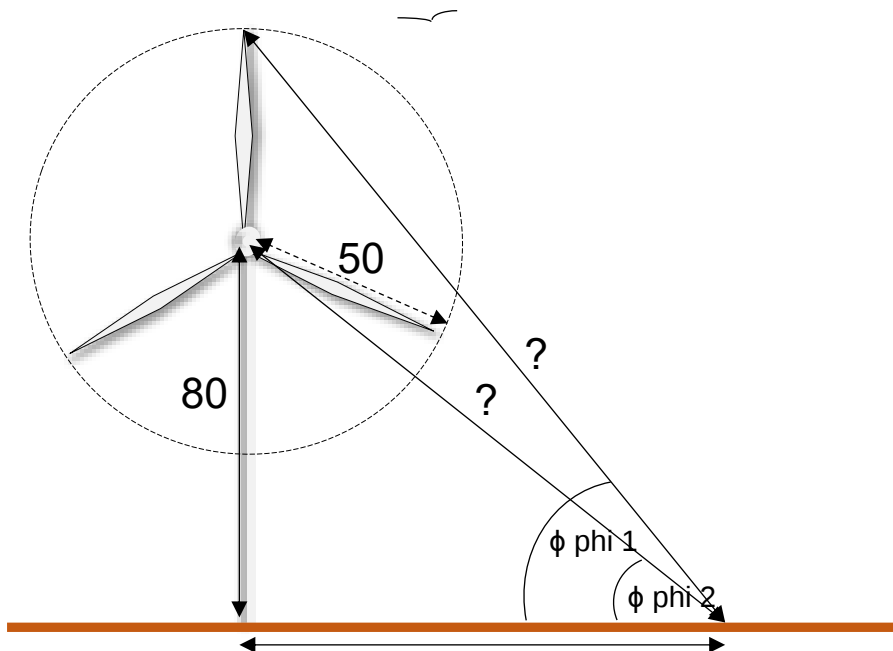
Activity: plenary

An engineer has been asked to carry out a service and to check the efficiency of a wind turbine. You have been asked to assist with some calculations.

The wind turbine stands 80m tall. The length of the blades is 50m.

From a position 100m from the base of the turbine:

- determine the angles to the top of the turbine and to the top of a blade when vertical
- calculate the length of the hypotenuse to the top of the turbine and to the top of a blade when vertical.



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