

Lesson 2: Trigonometry in engineering and manufacturing

Trigonometry worksheet 2 – Questions

Trigonometry

In our previous session, we discussed right-angled triangles and trigonometry, please apply the knowledge you developed during that session to answer the following questions.

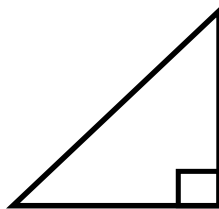
Commented [LS1]: See Answers sheet for changes and comments relating to this sheet

Commented [Ed2]: Suggested wording:

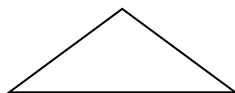
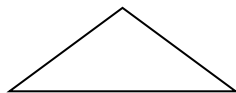
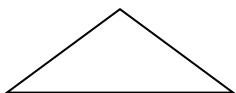
"...trigonometry. Please apply the knowledge you developed during that session to answer the following questions."

Starter activity

- i) What is the difference between an acute angle and a right angle?
- ii) What are the three sides of a right-angled triangle called?
- iii) State the three functions for calculating the ratio of the sides of a right-angled triangle and express them mathematically.



If we can recall we can show the relationships between the lengths of the sides and the angles mathematically using the following formulas:



Commented [Ed3]: It's not clear what learners have to do here. Perhaps the three triangles should be deleted and the wording changed to:

"We can use those functions to calculate a triangle's angles and the lengths of its sides."

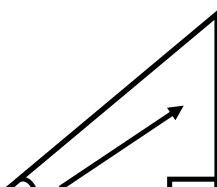
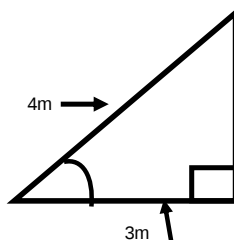
Example

To calculate the angle ϕ

Cosine (cos) = $\frac{\text{Adjacent}}{\text{Hypotenuse}}$

Cosine ϕ = $\frac{3}{4}$

Cosine ϕ = $41^\circ 41'$



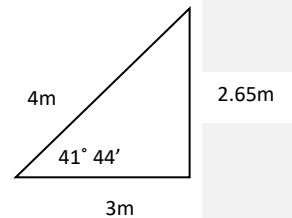
Example

$$\text{Tangent (tan)} = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\text{Tan} \times \text{adjacent} = \text{opposite}$$

$$\text{Tan } 41^\circ 44' = 0.88$$

$$0.88 \times 3 = \mathbf{2.65}$$



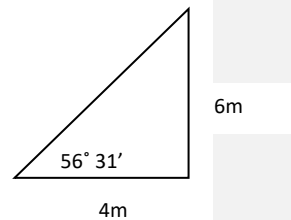
Example

$$\text{Tangent (tan)} = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\text{Tan} = \frac{6}{4}$$

$$\text{Tan} = 1.5$$

$$\text{Inv tan } 1.5 = 56^\circ 31'$$



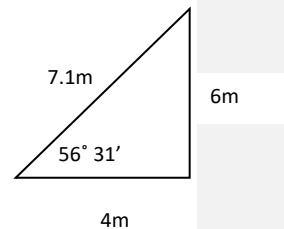
Example

$$\text{Cosine (cos)} = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\text{Hypotenuse} = \frac{\text{Adjacent}}{\text{Cos } 56^\circ 31'}$$

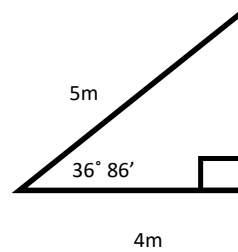
$$\text{Hypotenuse} = \frac{4}{0.56}$$

$$\text{Hypotenuse} = \mathbf{7.1m}$$

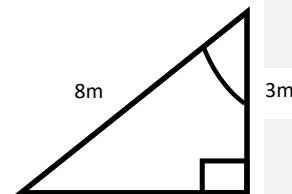


Activity 1

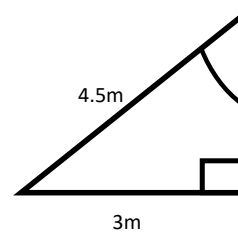
Use trigonometry to calculate the length of the third side.



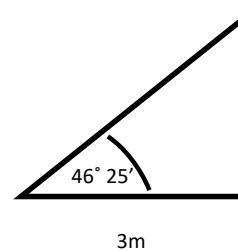
Calculate the length of the third side and the angle.



Calculate the length of the third side and the angle.



Calculate the length of the hypotenuse.



Commented [Ed4]: Calibri font is used on this page.

Activity 2

Download a clinometer app to your phone or find another learner who can.
Pick a spot away from your table and measure the:

- i) distance to the base of the table
- ii) height of the table
- iii) angle using your clinometer.

Then calculate the length of the third side (the hypotenuse).
Do this for three surfaces / items / the ceiling in the room.

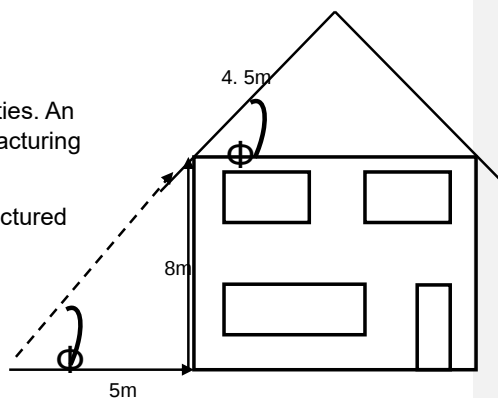


Commented [Ed5]: This doesn't specify which angle is to be measured.

Activity 3

A housebuilder is building several domestic properties. An engineering company has been tasked with manufacturing the rafting brackets for the roof (part A).

Calculate the angle the brackets should be manufactured at for the required pitch of the roof.



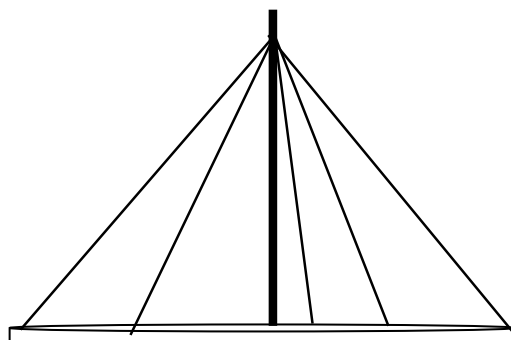
Plenary

Kew Gardens has a design for a Christmas tree light. It stands 11.8m tall on a circular base. The pitch angle for the wires is 20° .

Search on the internet for:

“Maypole Christmas tree lights”.

Now produce a labelled scale diagram.



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