

chapter

2

## Trigonometry 1

## Section 2.6 Problems in three dimensions

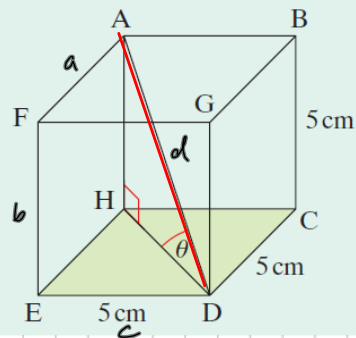
PROJECT MATHS – STRAND 2  
**Text & Tests** 4  
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## Example 1

The given figure shows a cube of side 5 cm.

Find the measure of the angle between the diagonal [AD] and the base of the cube.



Pythagoras in 3D

$$a^2 + b^2 + c^2 = d^2$$

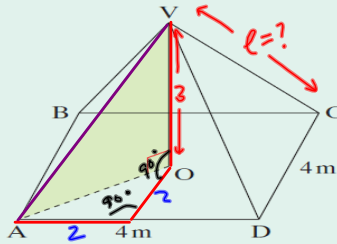
$$(5)^2 + (5)^2 + (5)^2 = d^2$$

$$75 = d^2$$

$$d = \sqrt{75} = 5\sqrt{3}$$

**Example 2**

The pyramid shown has a square base of side 4 m and a vertical height of 3 m.



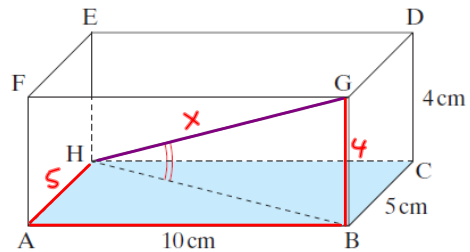
- (i) Calculate the length of the edge [AV].
- (ii) Hence calculate, correct to the nearest whole number, the total area of the four triangular faces.

$$l^2 = 2^2 + 2^2 + 3^2$$

$$l = \sqrt{17}$$

**Exercise 2.6**

- 1. An open rectangular box has dimensions 10 cm by 5 cm by 4 cm, as shown.
  - (i) Find the length of the diagonal [GH].
  - (ii) Find the measure of the angle between GH and the base of the box.



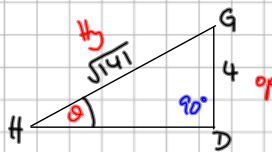
(i) Pythagoras in 3D

$$X^2 = 5^2 + 10^2 + 4^2$$

$$X = \sqrt{141}$$

(ii)

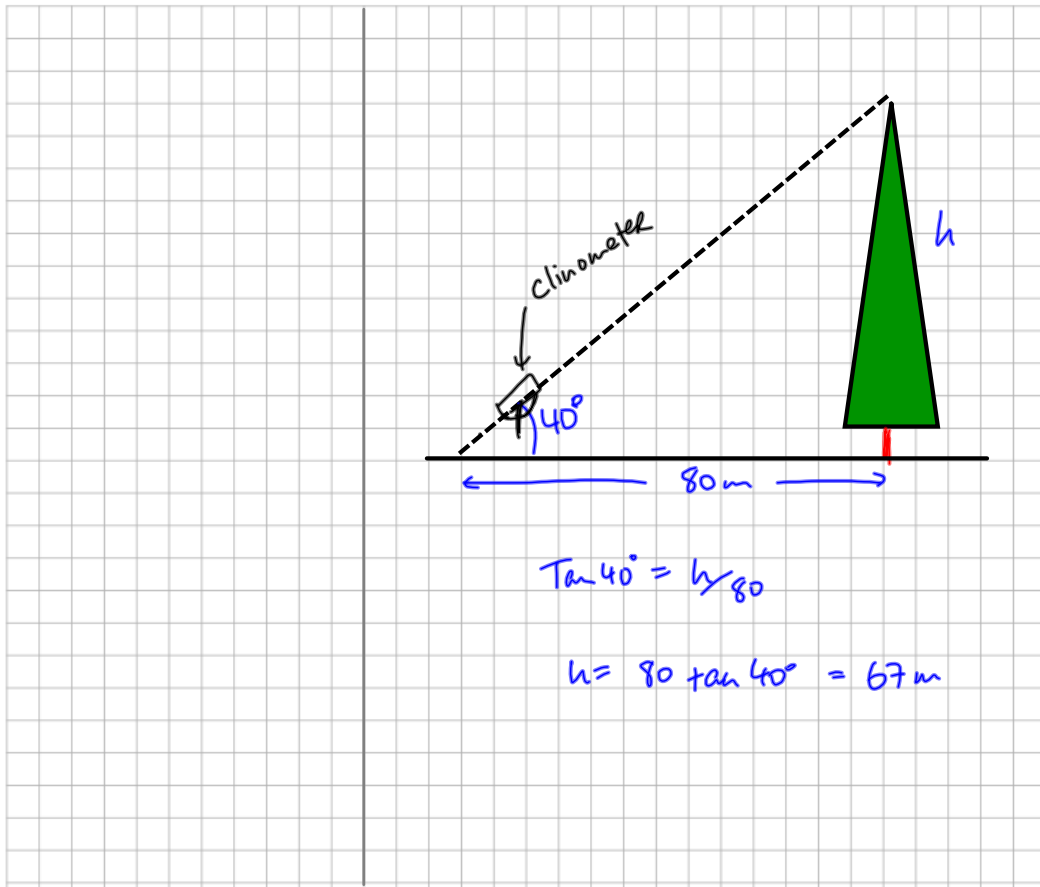
SOH  
CAH  
TOA



$$\sin \theta = \frac{4}{\sqrt{141}}$$

$$\theta = \sin^{-1} \left( \frac{4}{\sqrt{141}} \right)$$

$$\theta \approx 19.7^\circ$$



A tower that is part of a hotel has a square base of side 4 metres and a roof in the form of a pyramid. The owners plan to cover the roof with copper. To find the amount of copper needed, they need to know the total area of the roof.

A surveyor stands 10 metres from the tower, measured horizontally, and makes observations of angles of elevation from the point  $O$  as follows:

- The angle of elevation of the top of the roof is  $46^\circ$ .
- The angle of elevation of the closest point at the bottom of the roof is  $42^\circ$ .
- The angle of depression of the closest point at the bottom of the tower is  $9^\circ$ .

