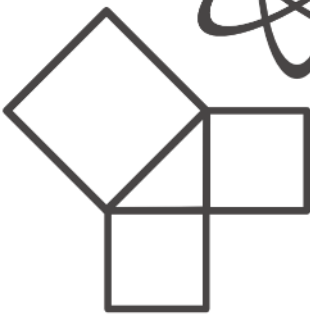
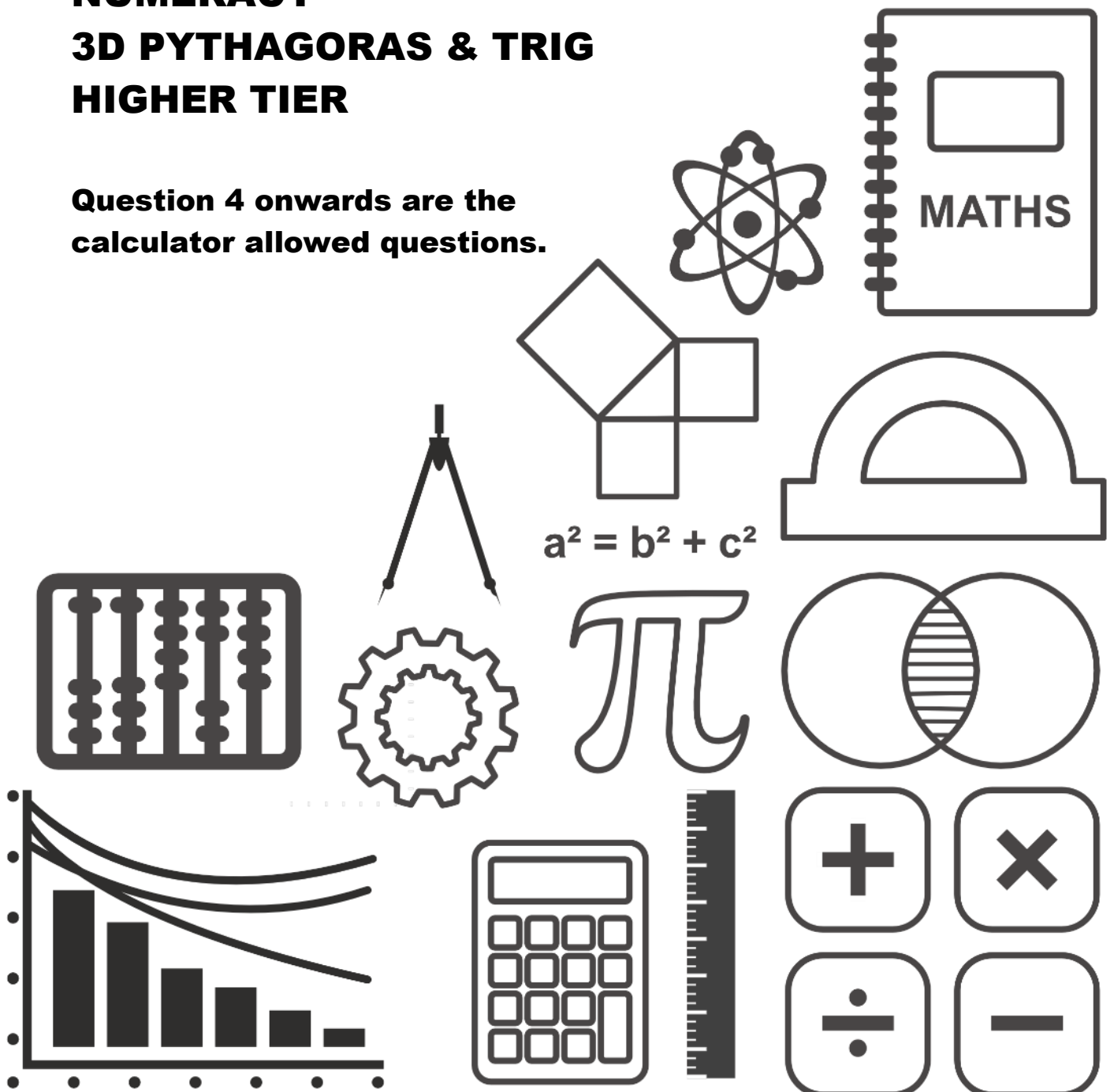


# MATHSDIY

## GCSE TOPIC BOOKLET NUMERACY 3D PYTHAGORAS & TRIG HIGHER TIER

Question 4 onwards are the  
calculator allowed questions.



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

1. The aircraft carries cargo.  
 One customer wants to use the aircraft to transport a new product that is to be packaged in cuboid boxes, as shown below.

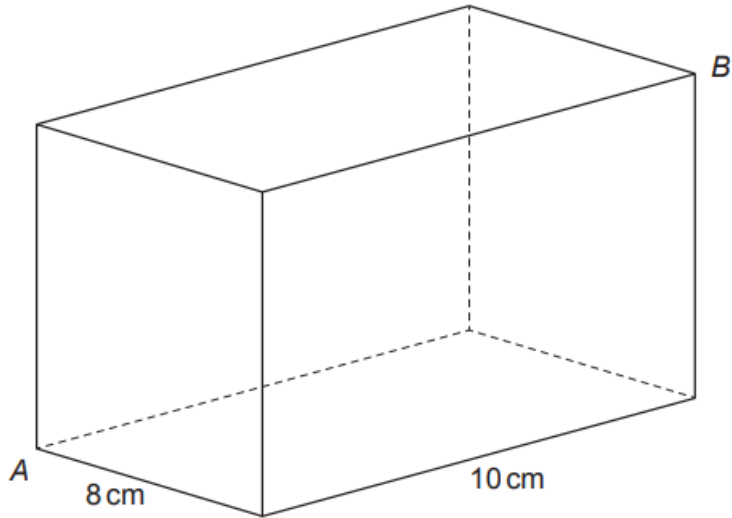


Diagram not drawn to scale

- The boxes will meet the following conditions:
- The boxes will be of width 8 cm and length 10 cm.
  - The length of the diagonal  $AB$  will be 14 cm.

Calculate the height of a box.  
 Give your answer in the form  $a\sqrt{b}$  cm, where  $a$  and  $b$  are integers, and  $b$  is as small as possible. [6]

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2. A tent company is designing a new 2-person tent. The base of the tent is in the shape of a kite, as shown below. The width of the kite is 160 cm, and the two shorter sides are of length 100 cm. The point where the diagonals of the kite intersect has been marked  $O$  on the diagram below.

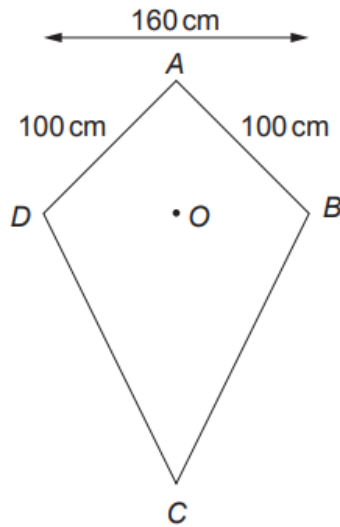


Diagram not drawn to scale

$E$  is the highest point of the tent, and is 110 cm vertically above  $O$ . Part of the frame that supports the tent cover is a straight pole that goes from  $A$  to  $E$ .

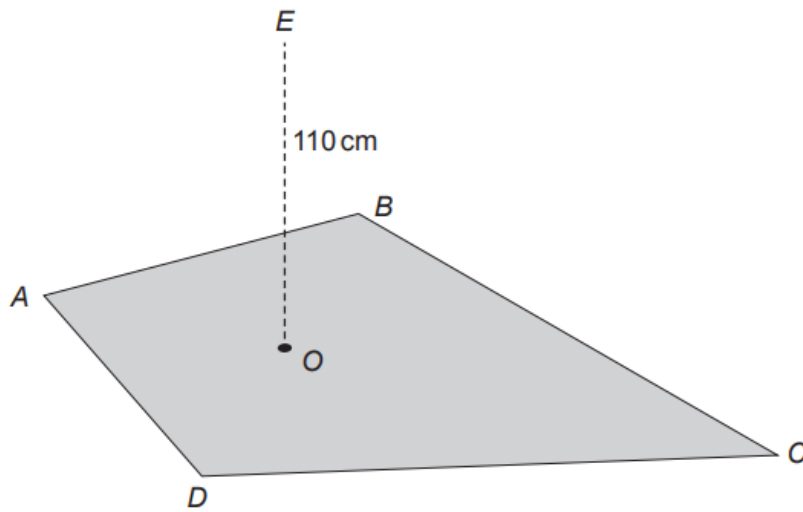


Diagram not drawn to scale

Calculate the length of pole  $AE$ .  
 Give your answer as a surd.  
 You do not need to simplify your answer.

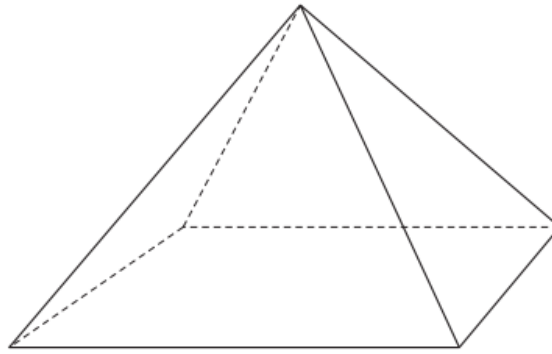
[4]

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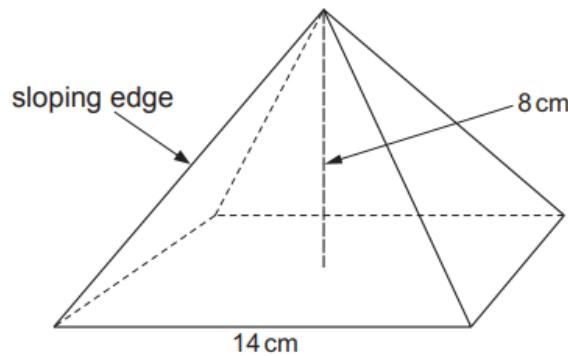
3. An architect has been asked to design a square-based glass pyramid that is to be built in a park. The vertex at the top of the pyramid will be directly above the centre of the square base. The edges of the pyramid will be made from steel. Each sloping face will be made from glass.



*Diagram not drawn to scale*

The architect first plans to make a scale model of the pyramid. The scale model will have base sides of length 14 cm and a vertical height of 8 cm.

The architect has drawn the following diagram of the model.



*Diagram not drawn to scale*

Calculate the length of each sloping edge of the model.

Give your answer in the form  $a\sqrt{b}$ , where  $a$  is an integer and  $b$  is a prime number. [6]

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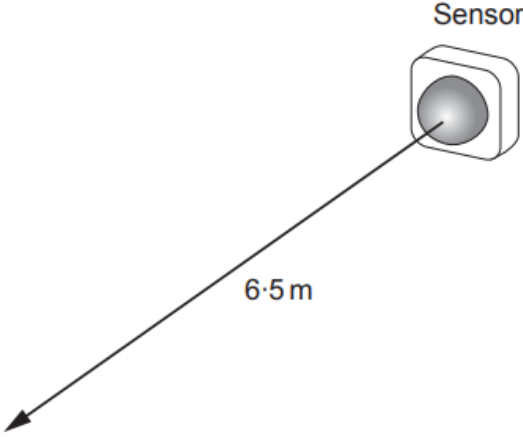
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4. A sensor can detect any movement up to a distance of 6.5 m.



*Diagram not drawn to scale*







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- (b) Show that Ioan's route up this section of road is less steep than Delyth's route. [3]  
You must show all your working.

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6. A confectionary company is designing a new chocolate-covered biscuit in the shape of a square-based pyramid. The centre of the square base is labelled  $O$ . Each biscuit will have base sides of length  $3.4$  cm, and a vertical height of  $2.1$  cm.

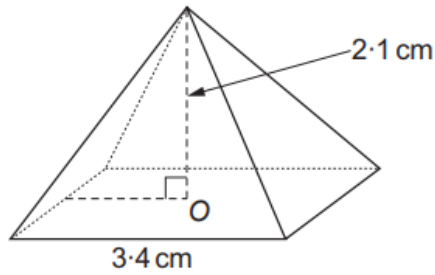


Diagram not drawn to scale

- (a) Calculate the angle that one of the triangular faces makes with the base of the pyramid. [4]

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- (b) The company knows that it costs  $0.08p$  per  $cm^2$  to apply a chocolate covering. Calculate the cost of applying a chocolate covering to all 5 faces of a biscuit. [6]

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