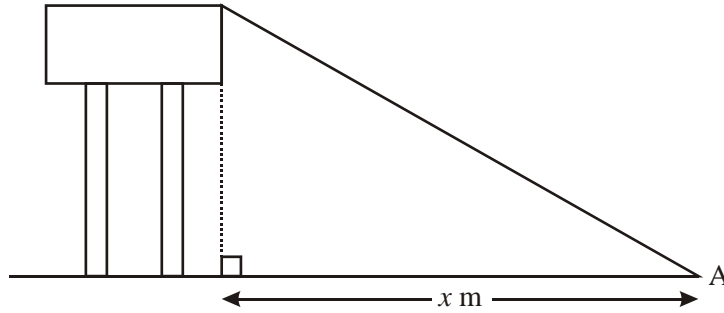
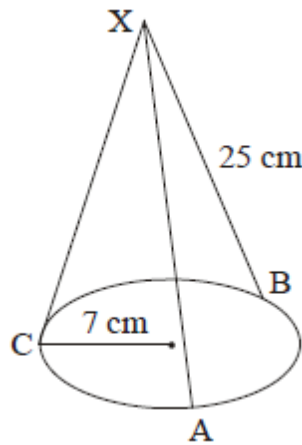


1. The diagram shows a water tower standing on horizontal ground. The height of the tower is 26.5 m.



From a point A on the ground the angle of elevation to the top of the tower is 28° .

- (a) On the diagram, show and label the angle of elevation, 28° .
- (b) Calculate, **correct to the nearest metre**, the distance x m.
- (Total 4 marks)**
2. The diagram below shows a child's toy which is made up of a circular hoop, centre O, radius 7 cm. The hoop is suspended in a horizontal plane by three equal strings XA, XB, and XC. Each string is of length 25 cm. The points A, B and C are equally spaced round the circumference of the hoop and X is vertically above the point O.



- (a) Calculate the length of XO. (2)
- (b) Find the angle, in degrees, between any string and the horizontal plane. (2)
- (c) Write down the size of angle $\hat{A}OB$. (1)
- (d) Calculate the length of AB. (3)
- (e) Find the angle between strings XA and XB. (3)

(Total 11 marks)

3. A room is in the shape of a cuboid. Its floor measures 7.2 m by 9.6 m and its height is 3.5 m.

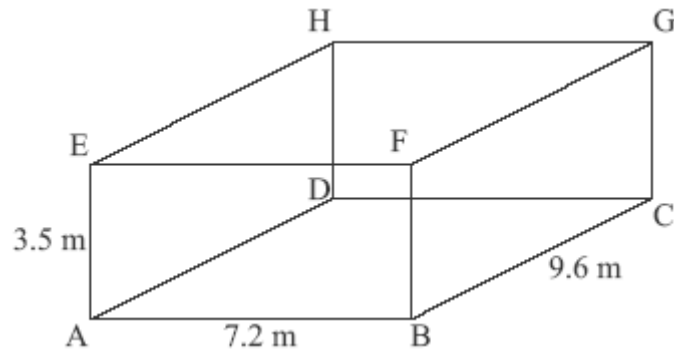
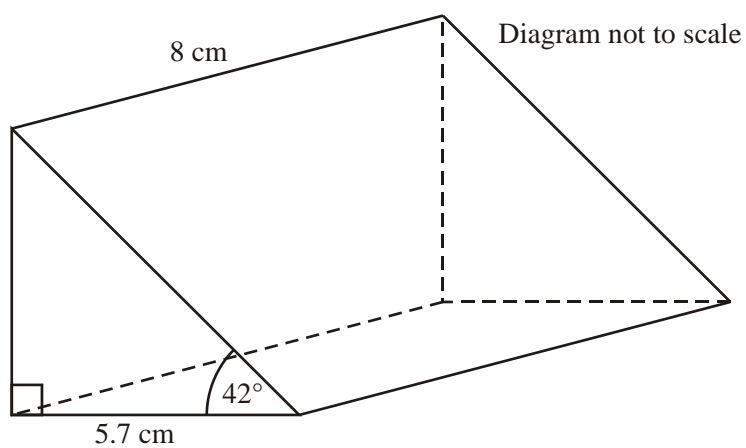


diagram not to scale

- (a) Calculate the length of AC. (2)
- (b) Calculate the length of AG. (2)
- (c) Calculate the angle that AG makes with the floor. (2)

(Total 6 marks)

4. Find the volume of the following prism.



(Total 4 marks)

5. José stands 1.38 kilometres from a vertical cliff.

(a) Express this distance in metres.

(1)

José estimates the angle between the horizontal and the top of the cliff as 28.3° and uses it to find the height of the cliff.

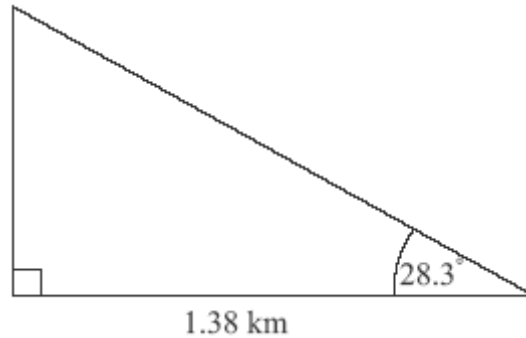


diagram not to scale

(b) Find the height of the cliff according to José's calculation. **Express your answer in metres, to the nearest whole metre.**

(3)

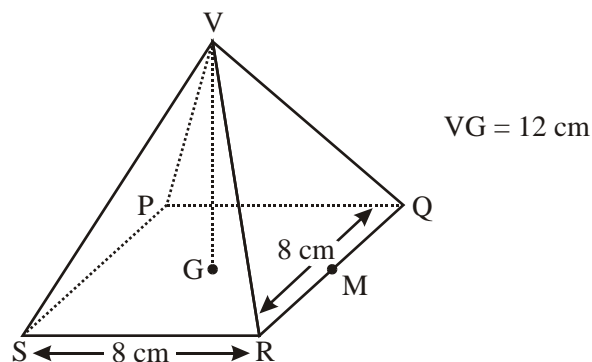
(c) The actual height of the cliff is 718 metres. Calculate the percentage error made by José when calculating the height of the cliff.

(2)

(Total 6 marks)

6. In the diagram below, PQRS is the square base of a solid right pyramid with vertex V. The sides of the square are 8 cm, and the height VG is 12 cm. M is the midpoint of [QR].

Diagram not to scale



(a) (i) Write down the length of [GM].

(ii) Calculate the length of [VM].

(2)

(b) Find

(i) the total surface area of the pyramid;

(ii) the angle between the face VQR and the base of the pyramid.

(4)

(Total 6 marks)

7. A rectangular cuboid has the following dimensions.

Length 0.80 metres (AD)
 Width 0.50 metres (DG)
 Height 1.80 metres (DC)

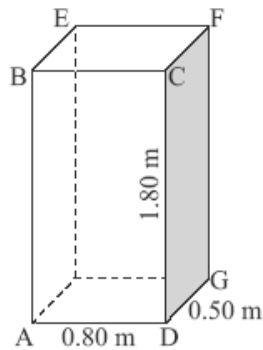


diagram not to scale

- (a) Calculate the length of AG. (2)
- (b) Calculate the length of AF. (2)
- (c) Find the size of the angle between AF and AG. (2)

(Total 6 marks)

8. The diagram below shows a square based right pyramid. ABCD is a square of side 10 cm. VX is the perpendicular height of 8 cm. M is the midpoint of BC.

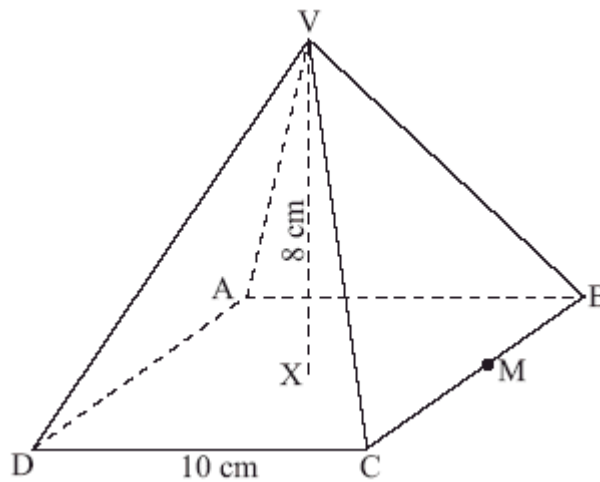


diagram not to scale

- (a) Write down the length of XM. (1)
- (b) Calculate the length of VM. (2)
- (c) Calculate the angle between VM and ABCD. (2)

(Total 5 marks)

9. The right pyramid shown in the diagram has a square base with sides of length 40 cm. The height of the pyramid is also 40 cm.

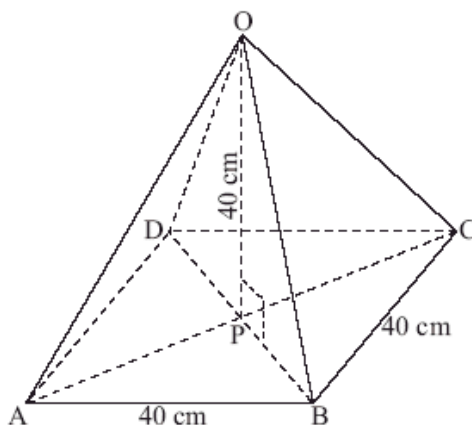


diagram not to scale

- (a) Find the length of OB. (4)
- (b) Find the size of angle $\hat{O}BP$. (2)

(Total 6 marks)

10. Sylvia is making a square-based pyramid. Each triangle has a base of length 12 cm and a height of 10 cm.

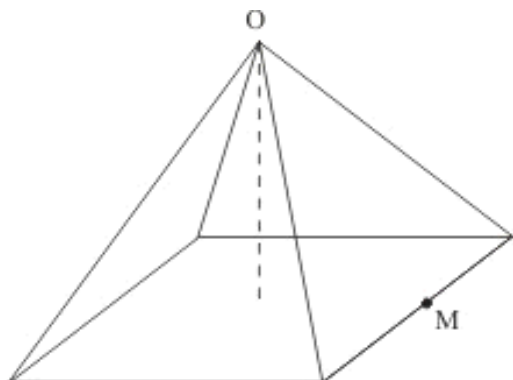


diagram not to scale

- (a) Show that the **height** of the pyramid is 8 cm. (2)

M is the midpoint of the base of one of the triangles and O is the apex of the pyramid.

- (b) Find the angle that the line MO makes with the base of the pyramid. (3)
- (c) Calculate the volume of the pyramid. (2)

- (d) Daniel wants to make a rectangular prism with the same volume as that of Sylvia's pyramid. The base of his prism is to be a square of side 10 cm. Calculate the height of the prism. (2)

(Total 9 marks)

11. The diagram shows a pyramid VABCD which has a square base of length 10 cm and edges of length 13 cm. M is the midpoint of the side BC.

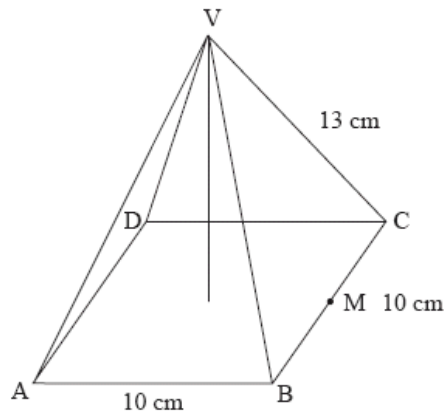
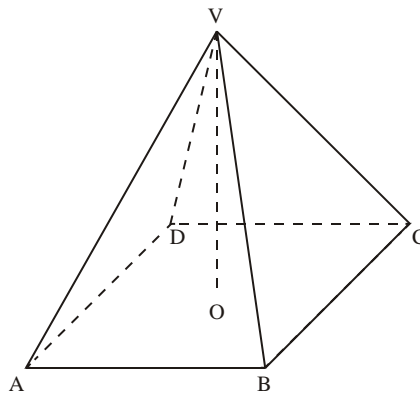


diagram not to scale

- (a) Calculate the length of VM. (2)
- (b) Calculate the vertical height of the pyramid. (2)
- (c) Calculate the angle between a sloping face of the pyramid and its base. (2)
- (Total 6 marks)**

12. ABCDV is a solid glass pyramid. The base of the pyramid is a square of side 3.2 cm. The vertical height is 2.8 cm. The vertex V is directly above the centre O of the base.



- (a) Calculate the volume of the pyramid. (2)
- (b) The glass weighs 9.3 grams per cm^3 . Calculate the weight of the pyramid. (2)
- (c) Show that the length of the sloping edge VC of the pyramid is 3.6 cm. (4)
- (d) Calculate the angle at the vertex, \hat{BVC} . (3)
- (e) Calculate the total surface area of the pyramid. (4)
- (Total 15 marks)**

13. The diagram shows an office tower of total height 126 metres. It consists of a square-based pyramid $VABCD$ on top of a cuboid $ABCDPQRS$.

V is directly above the centre of the base of the office tower.

The length of the sloping edge VC is 22.5 metres and the angle that VC makes with the base $ABCD$ (angle VCA) is 53.1° .

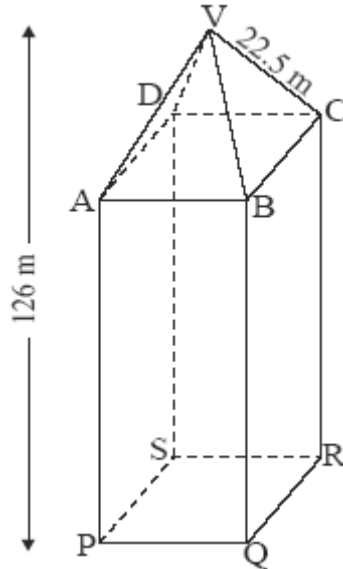


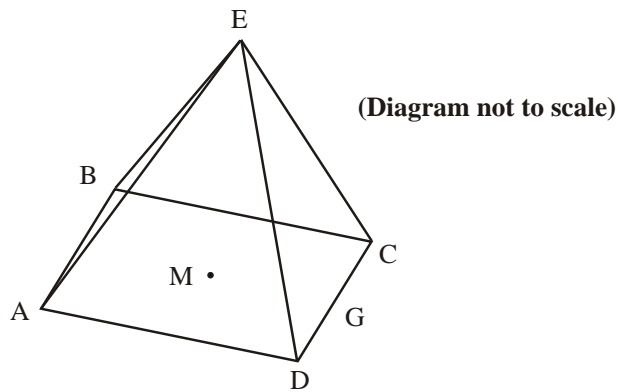
diagram not to scale

- (a) (i) Write down the length of VA in metres. (2)
- (ii) Sketch the triangle VCA showing clearly the length of VC and the size of angle VCA . (2)
- (b) Show that the height of the pyramid is 18.0 metres correct to 3 significant figures. (2)
- (c) Calculate the length of AC in metres. (3)
- (d) Show that the length of BC is 19.1 metres correct to 3 significant figures. (2)
- (e) Calculate the volume of the tower. (4)

To calculate the cost of air conditioning, engineers must estimate the weight of air in the tower. They estimate that 90 % of the volume of the tower is occupied by air and they know that 1 m^3 of air weighs 1.2 kg.

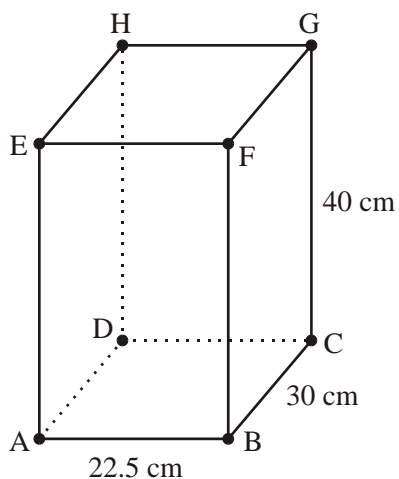
- (f) Calculate the weight of air in the tower. (3)
- (Total 16 marks)

14. The triangular faces of a square based pyramid, ABCDE, are all inclined at 70° to the base. The edges of the base ABCD are all 10 cm and M is the centre. G is the mid-point of CD.



- (a) Using the letters on the diagram draw a triangle showing the position of a 70° angle. (1)
- (b) Show that the height of the pyramid is 13.7 cm, to 3 significant figures. (2)
- (c) Calculate
- (i) the length of EG;
- (ii) the size of angle $\hat{D}E\hat{C}$. (4)
- (d) Find the total surface area of the pyramid. (2)
- (e) Find the volume of the pyramid. (2)
- (Total 11 marks)

15. The diagram shows a cuboid 22.5 cm by 40 cm by 30 cm.



- (a) Calculate the length of [AC].
- (b) Calculate the size of $\hat{G}A\hat{C}$.

(Total 4 marks)