

3D Shapes

Volumes & Surface Areas

Question Paper 1

Level	IGCSE
Subject	Maths (0580)
Exam Board	Cambridge International Examinations (CIE)
Paper Type	Extended
Topic	Mensuration (Perimeters, Areas & Volumes)
Sub-Topic	3D Shapes: Volumes & Surface Areas
Booklet	Question Paper 1

Time Allowed: 64 minutes

Score: /53

Percentage: /100

Grade Boundaries:

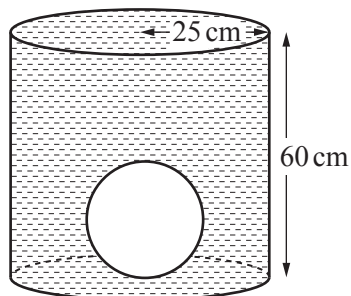
A*	A	B	C	D	E	U
>85%	75%	60%	45%	35%	25%	<25%

- 1 (a) Calculate the volume of a metal sphere of radius 15 cm and show that it rounds to $14\,140\text{ cm}^3$, correct to 4 significant figures.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[2]

- (b) (i) The sphere is placed inside an empty cylindrical tank of radius 25 cm and height 60 cm. The tank is filled with water.

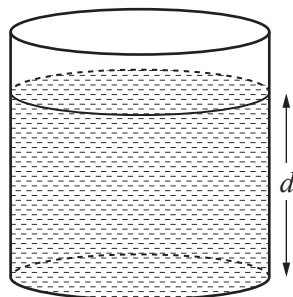


NOT TO SCALE

Calculate the volume of water required to fill the tank.

..... cm^3 [3]

- (ii) The sphere is removed from the tank.



NOT TO SCALE

Calculate the depth, d , of water in the tank.

$d =$ cm [2]

(c) The sphere is melted down and the metal is made into a solid cone of height 54 cm.

(i) Calculate the radius of the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

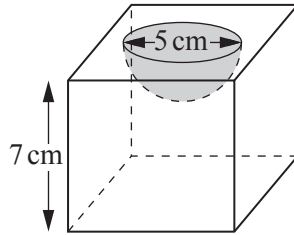
..... cm [3]

(ii) Calculate the **total** surface area of the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm² [4]

- 2 A solid consists of a metal cube with a hemisphere cut out of it.



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The length of a side of the cube is 7 cm.
The diameter of the hemisphere is 5 cm.

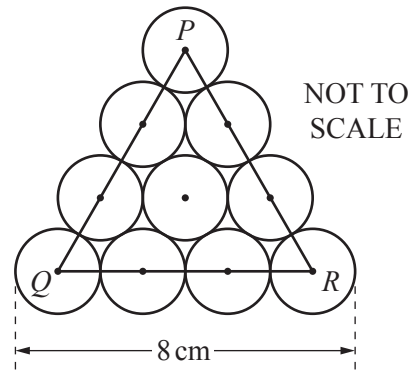
Calculate the volume of this solid.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.....cm³ [3]

- 3 (a) The ten circles in the diagram each have radius 1 cm.
The centre of each circle is marked with a dot.

Calculate the height of triangle PQR .

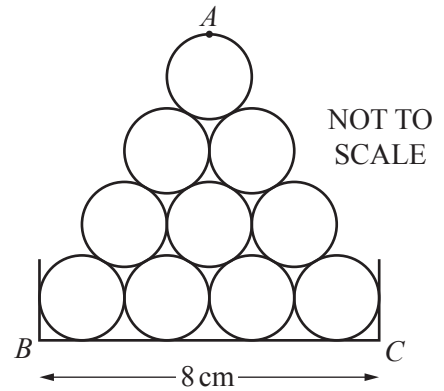


..... cm [3]

- (b) Mr Patel uses whiteboard pens that are cylinders of radius 1 cm.

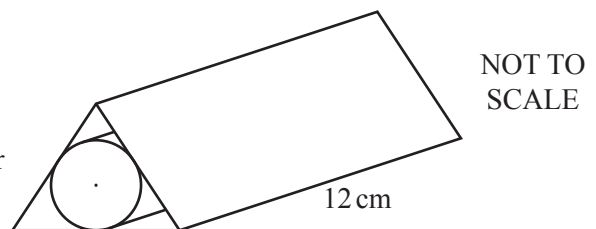
- (i) The diagram shows 10 pens stacked in a tray.
The tray is 8 cm wide.
The point A is the highest point in the stack.

Find the height of A above the base, BC , of the tray.



..... cm [1]

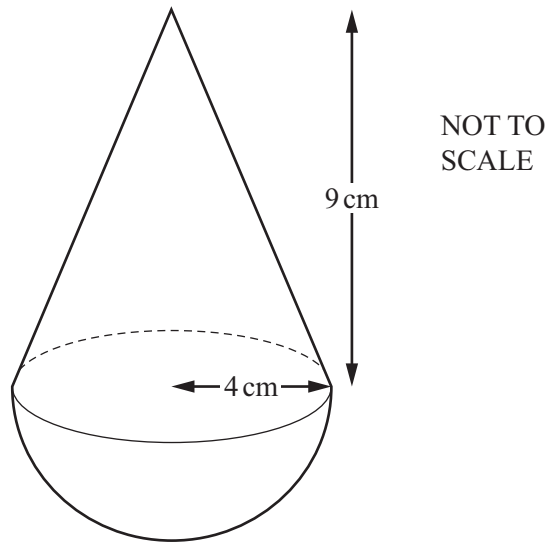
- (ii) The diagram shows a box that holds one pen.
The box is a prism of length 12 cm.
The cross section of the prism is an equilateral triangle.
The pen touches each of the three rectangular faces of the box.



Calculate the volume of this box.

..... cm³ [5]

4



The diagram shows a toy.

The shape of the toy is a cone, with radius 4 cm and height 9 cm, on top of a hemisphere with radius 4 cm.

Calculate the volume of the toy.

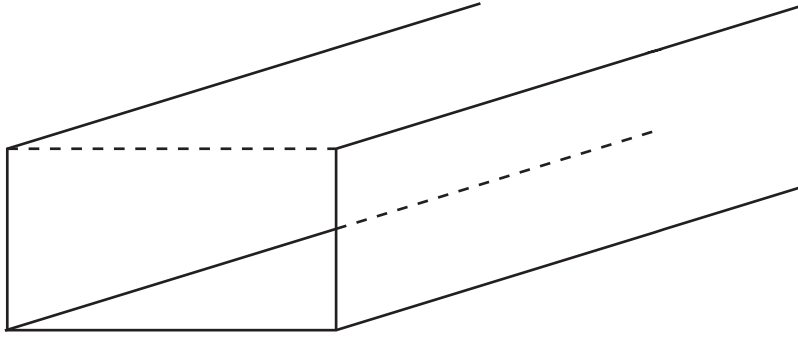
Give your answer correct to the nearest cubic centimetre.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer cm³ [4]

5

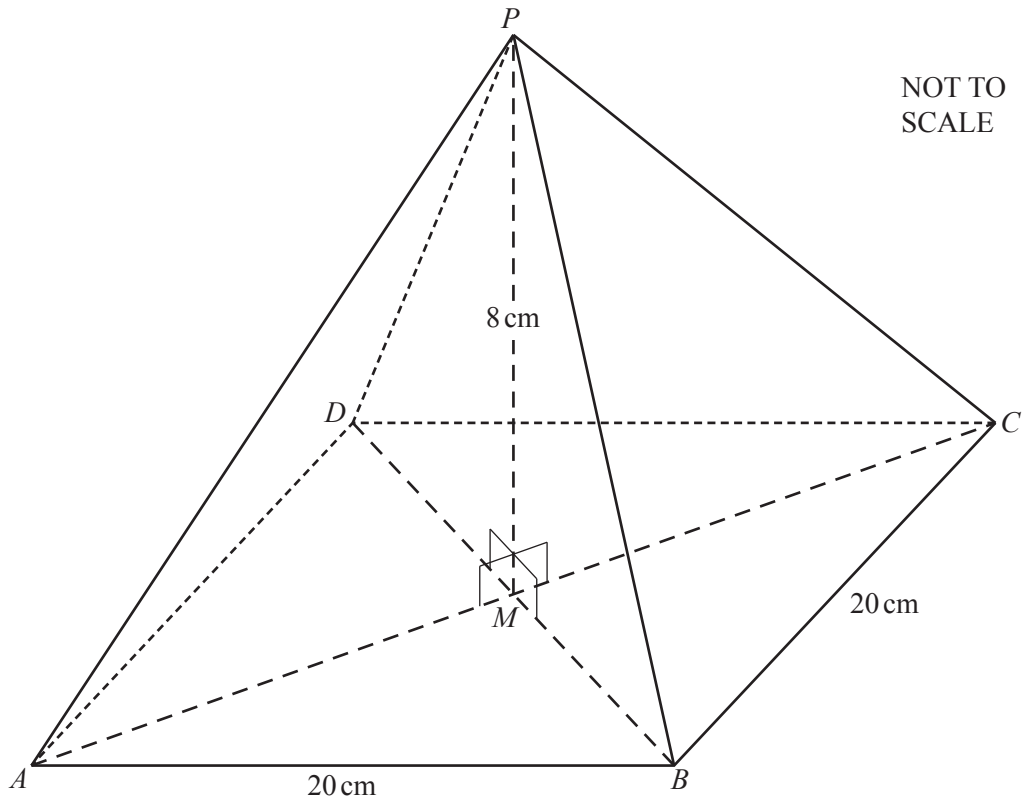


The diagram shows a channel for water.
The channel lies on horizontal ground.
This channel has a constant rectangular cross section with area 0.95 m^2 .
The channel is full and the water flows through the channel at a rate of 4 metres/**minute**.

Calculate the number of cubic metres of water that flow along the channel in 3 **hours**.

Answer m^3 [3]

6



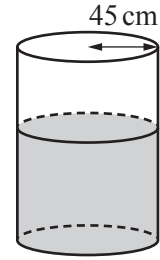
The diagram shows a solid pyramid on a square horizontal base $ABCD$.
 The diagonals AC and BD intersect at M .
 P is vertically above M .
 $AB = 20$ cm and $PM = 8$ cm.

Calculate the total surface area of the pyramid.

Answer cm² [5]

- 7 (a) A cylindrical tank contains $180\,000\text{ cm}^3$ of water.
The radius of the tank is 45 cm.

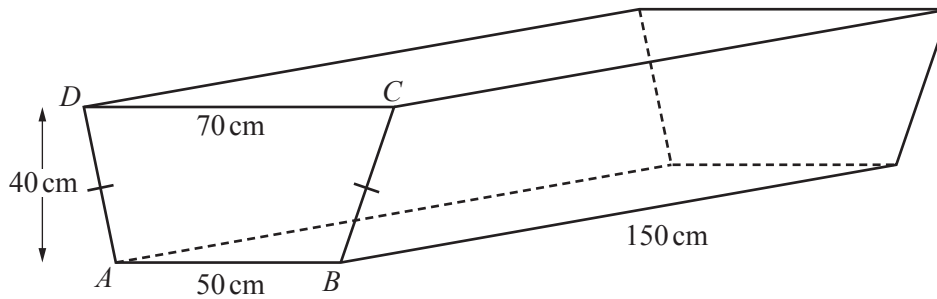
Calculate the height of water in the tank.



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Answer(a) cm [2]

- (b)



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The diagram shows an empty tank in the shape of a horizontal prism of length 150 cm.
The cross section of the prism is an isosceles trapezium $ABCD$.
 $AB = 50\text{ cm}$, $CD = 70\text{ cm}$ and the vertical height of the trapezium is 40 cm.

- (i) Calculate the volume of the tank.

Answer(b)(i) cm^3 [3]

- (ii) Write your answer to **part (b)(i)** in litres.

Answer(b)(ii) litres [1]

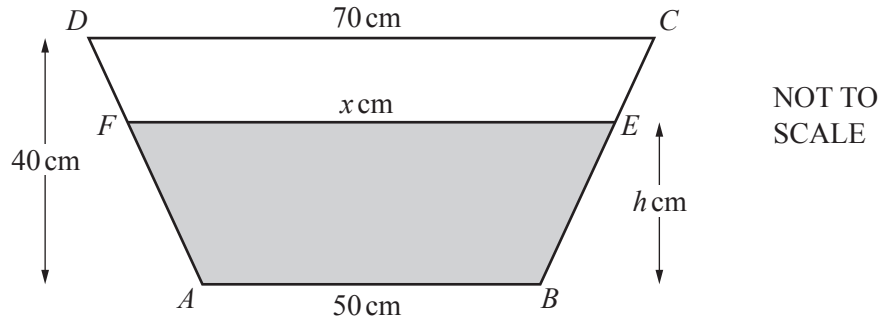
- (c) The $180\,000\text{ cm}^3$ of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of $15\text{ cm}^3/\text{s}$.

Calculate the time this takes.

Give your answer in hours and minutes.

Answer(c) h min [3]

(d)



The $180\,000\text{ cm}^3$ of water reaches the level EF as shown above.
 $EF = x\text{ cm}$ and the height of the water is $h\text{ cm}$.

(i) Using the properties of similar triangles, show that $h = 2(x - 50)$.

Answer(d)(i)

[2]

(ii) Using $h = 2(x - 50)$, show that the shaded area, in cm^2 , is $x^2 - 2500$.

Answer(d)(ii)

[1]

(iii) Find the value of x .

Answer(d)(iii) $x = \dots\dots\dots$ [2]

(iv) Find the value of h .

Answer(d)(iv) $h = \dots\dots\dots$ [1]