

Volume and surface area

Exam questions

Foundation and Higher tiers

Please write clearly in block capitals.

Name

Class

Teacher

Time allowed: 95 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 10): you must not use a calculator.
- **Section B** (questions 11 to 25): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 86.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

Q	Mark	Q	Mark
1		14	
2		15	
3		16	
4		17	
5		18	
6		19	
7		20	
8		21	
9		22	
10		23	
11		24	
12		25	
13			
TOTAL			

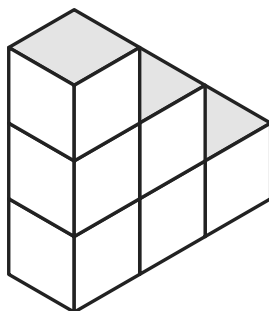
Section A



You must not use a calculator

Do not
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outside
the box

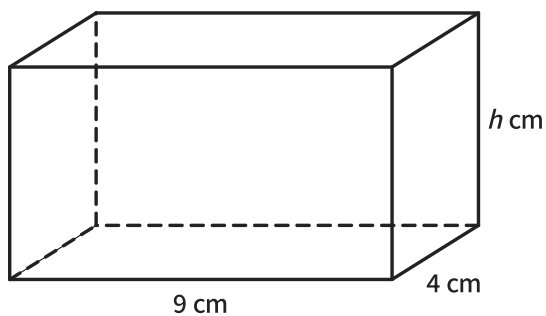
- 1 This solid is made from centimetre cubes.



Work out the volume of the solid.

Answer _____ cm^3
[1 mark]

- 2 The volume of this cuboid is 180 cm^3



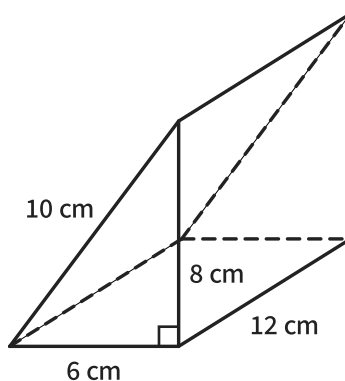
Not drawn accurately

Work out the value of h .

Answer _____
[2 marks]

- 3** The diagram shows a triangular prism.

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outside
the box



Not drawn accurately

- (a)** Write down the number of faces of the prism.

Answer _____

[1 mark]

- (b)** Work out the total surface area of the prism.

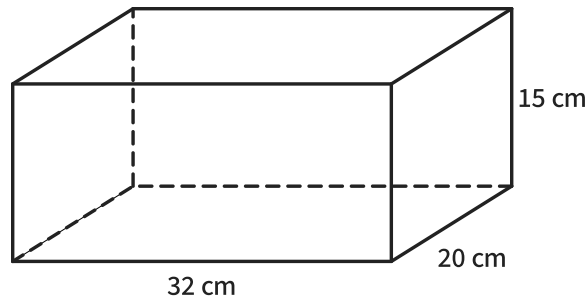
Answer _____ cm^2

[3 marks]

4

A box is a cuboid 32 cm by 20 cm by 15 cm
Kim wants to fill the box with cubes of side 5 cm
She says,

*“The volume of the box is 9600 cm^3 and the volume of one cube is 125 cm^3
 $9600 \div 125 = 76.8$ so 76 cubes will fit in the box.”*



Not drawn accurately

Is Kim correct?
You must show your working.

[3 marks]

5

The total surface area of a cube is 150 cm^2

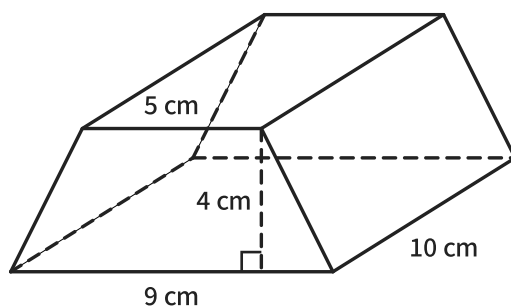
Work out the volume of the cube.

Answer _____ cm^3

[3 marks]

- 6 The diagram shows a prism.
The cross-section of the prism is a trapezium.

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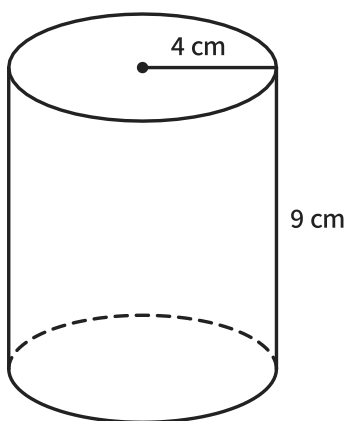


Not drawn accurately

Work out the volume of the prism.

Answer _____ cm^3
[3 marks]

- 7 A closed cylinder has radius 4 cm and height 9 cm



Not drawn accurately

Show that the total surface area of the cylinder is $104\pi \text{ cm}^2$

[3 marks]

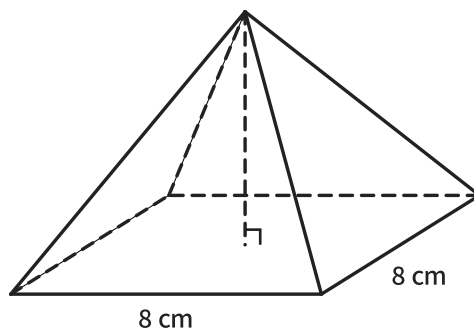
8

A square-based pyramid has a base of side 8 cm

The perpendicular height of the pyramid is 6 cm

A cube has the same volume as the pyramid.

$$\text{Volume of a pyramid} = \frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$$



Not drawn accurately

Show that the length of a side of the cube is between 5 cm and 5.1 cm

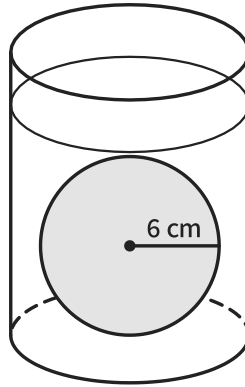
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[3 marks]

9

A cylinder has radius 8 cm. It contains some water.
A solid metal sphere of radius 6 cm is put into the cylinder.
The sphere sinks and is completely covered by the water.

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3 \text{ where } r \text{ is the radius}$$



Not drawn accurately

Work out how much the water level rises.

Answer _____ cm

[3 marks]

Do not
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outside
the box

10

A solid sphere has radius $3x$ cm

A solid cone has base radius $4x$ cm and perpendicular height h cm

The volume of the sphere is equal to the volume of the cone.

Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius
Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the perpendicular height

Work out an expression for h in terms of x .

Give your answer in its simplest form.

$h =$ _____

[3 marks]

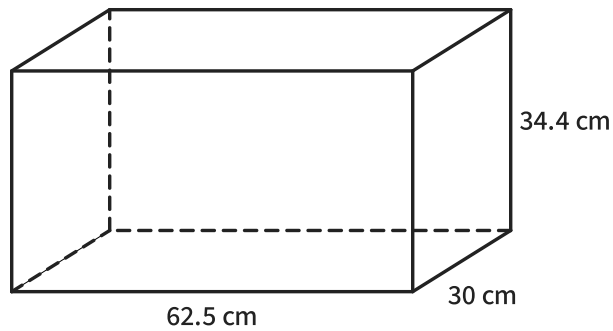
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Section B

You may use a calculator

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- 11** A fish tank is a cuboid.



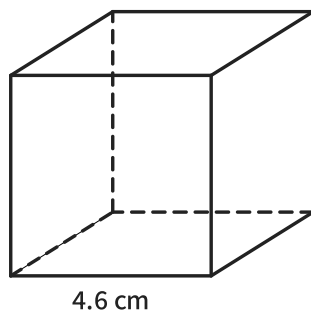
Not drawn accurately

Work out the volume of the fish tank.

Answer _____ cm^3

[2 marks]

- 12** A wooden toy block is a cube with edges of length 4.6 cm



Not drawn accurately

- (a)** Work out the area of one face of the block.

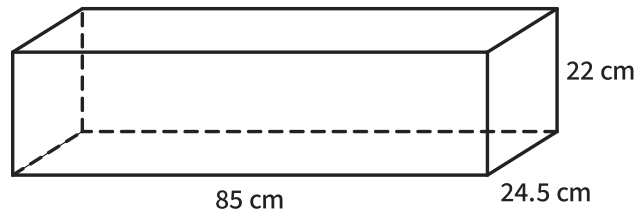
Answer _____ cm^2
[1 mark]

- (b)** Work out the volume of the block.

Answer _____ cm^3
[2 marks]

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the box

- 13** A planter is a cuboid 85 cm long, 24.5 cm wide and 22 cm high.
Compost is sold in 50 litre bags.
1 litre = 1000 cm³

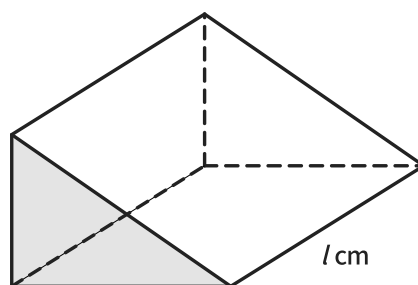


Not drawn accurately

Will one bag of compost be enough to fill the planter?
You must show your working.

[3 marks]

- 14** The diagram shows a prism.
The area of the shaded cross-section is 18.4 cm²
The volume of the prism is 469.2 cm³



Not drawn accurately

Work out the length, l , of the prism.

Answer _____ cm

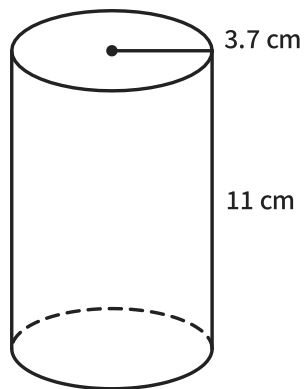
[2 marks]

15

A tin is a cylinder with radius 3.7 cm and height 11 cm

Ellie has 500 ml of soup.

$$1 \text{ ml} = 1 \text{ cm}^3$$



Not drawn accurately

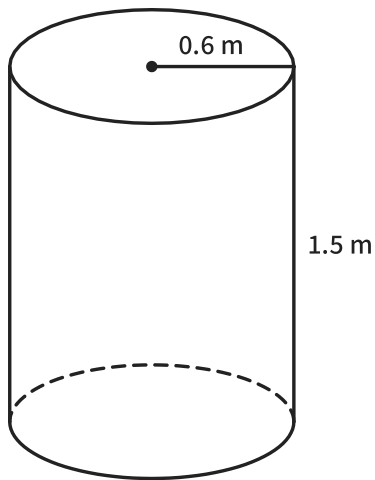
Will all of the soup fit in the tin?

You must show your working.

Do not
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outside
the box

[3 marks]

- 16** A water tank is a cylinder with radius 0.6 m and height 1.5 m
The tank is empty.
Water flows into the tank at 12 litres per minute
 $1 \text{ m}^3 = 1000 \text{ litres}$



Not drawn accurately

How long does it take to fill the tank?
Give your answer in hours and minutes, to the nearest minute.

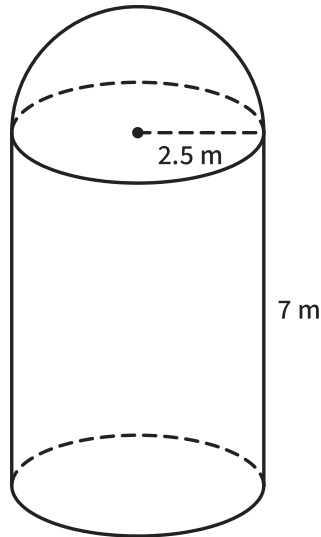
Answer _____

[4 marks]

17

A grain silo is made from a cylinder and a hemisphere.
 The cylinder and the hemisphere both have radius 2.5 m
 The height of the cylinder is 7 m

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3 \text{ where } r \text{ is the radius}$$



Not drawn accurately

Work out the volume of the silo.
 Give your answer to 3 significant figures.

Answer _____ m³

[4 marks]

Do not
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outside
the box

18

A solid metal cube has sides of length 6 cm

The cube is melted down.

The metal is used to make solid spheres, each of radius 1.2 cm

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3 \text{ where } r \text{ is the radius}$$

Work out the greatest number of spheres that can be made.

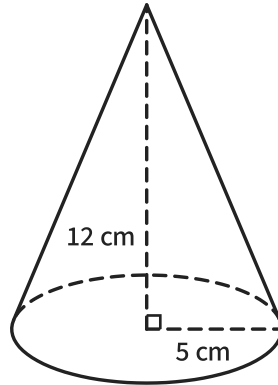
Answer _____

[4 marks]

19

A solid cone has base radius 5 cm and perpendicular height 12 cm

$$\text{Curved surface area of a cone} = \pi r l \text{ where } r \text{ is the radius and } l \text{ is the slant height}$$



Not drawn accurately

Work out the total surface area of the cone.

Give your answer to 1 decimal place.

Answer _____ cm²

[4 marks]

20

A solid metal ball is a sphere with a volume of 1000 cm^3

Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius

Surface area of a sphere = $4\pi r^2$ where r is the radius

Work out the surface area of the ball.

Give your answer to 3 significant figures.

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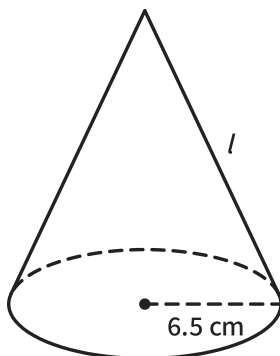
Answer _____ cm^2

[4 marks]

21

A solid cone has a volume of 500 cm^3
The radius of the base of the cone is 6.5 cm

Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the perpendicular height



Not drawn accurately

Work out the slant height, l , of the cone.
Give your answer to 1 decimal place.

Answer _____ cm

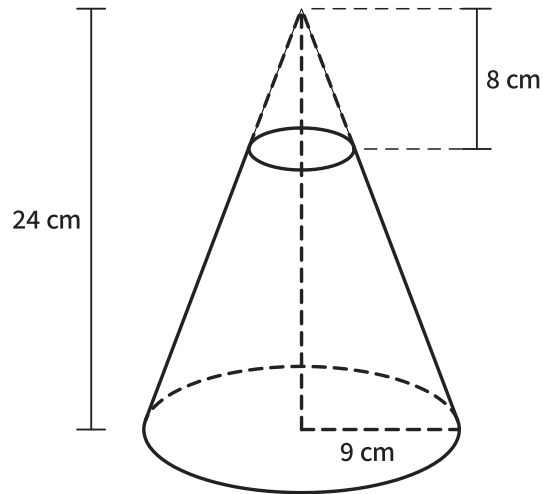
[4 marks]

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22

A small cone is cut from the top of a large solid cone to leave a frustum.
 The large cone has base radius 9 cm and perpendicular height 24 cm
 The small cone has perpendicular height 8 cm

Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the perpendicular height



Not drawn accurately

Work out the volume of the frustum.
 Give your answer to 3 significant figures.

Answer _____ cm^3

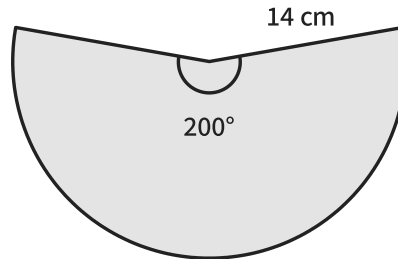
[5 marks]

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23

The diagram shows a sector of a circle with radius 14 cm and angle 200° .
The two straight edges of the sector are joined to make the curved surface of a cone.
There is no overlap.

Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the perpendicular height



Not drawn accurately

Work out the volume of the cone.
Give your answer to 3 significant figures.

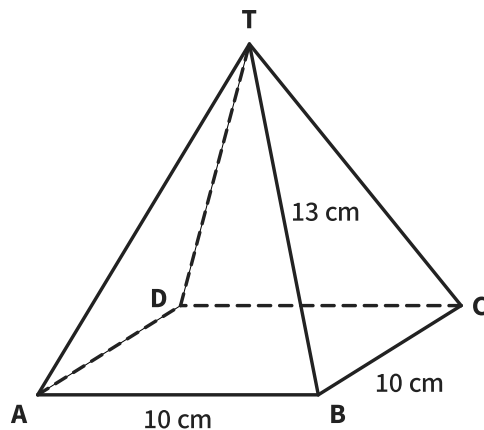
Answer _____ cm^3

[5 marks]

24

The diagram shows a pyramid with a square base ABCD and apex T.
 The sides of the base are 10 cm
 Each of the sloping edges TA, TB, TC and TD is 13 cm

$$\text{Volume of a pyramid} = \frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$$



Not drawn accurately

Work out the volume of the pyramid.
 Give your answer to 3 significant figures.

Answer _____ cm^3

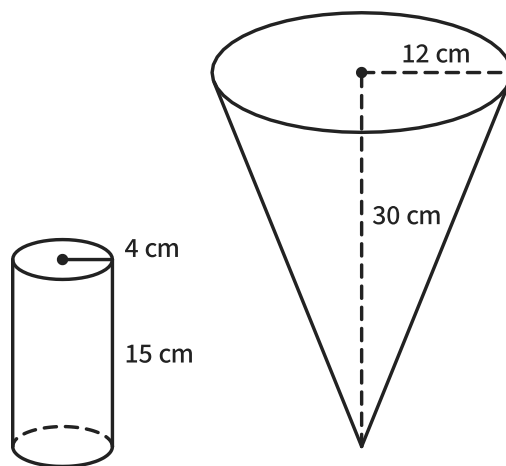
[5 marks]

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the box

25

A cylinder of radius 4 cm and height 15 cm is full of water.
 A container is a cone with base radius 12 cm and depth 30 cm
 The container is held with its point at the bottom and its circular top horizontal.
 All of the water from the cylinder is poured into the container.

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h \text{ where } r \text{ is the radius and } h \text{ is the perpendicular height}$$



Not drawn accurately

Work out the depth of the water in the container.
 Give your answer to 1 decimal place.

Answer _____ cm

[6 marks]

END OF QUESTIONS