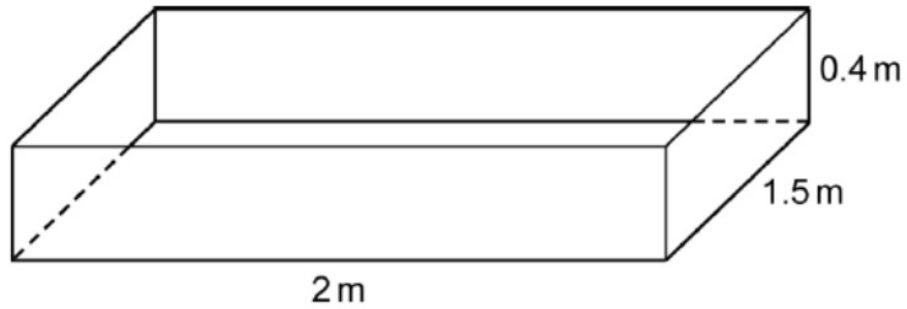


G31 Volume of Cuboids

OCR

13 Lily has an empty pool that is a cuboid with a height of 0.4 m.

Created by W Neill



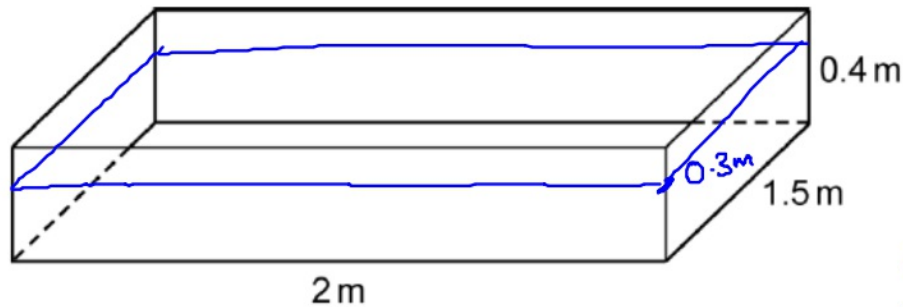
She fills the pool at a rate of 20 litres per minute.

How long does it take to fill the pool to a depth of 0.3 m?
[1000 litres = 1 m³]

..... minutes [5]

13 Lily has an empty pool that is a cuboid with a height of 0.4 m.

Created by W Neill



She fills the pool at a rate of 20 litres per minute.

How long does it take to fill the pool to a depth of 0.3 m?
[1000 litres = 1 m³]

$$1\text{m}^3 = 1000 \text{ Litres}$$

$$0.9\text{m}^3 = 900 \text{ Litres}$$

$$2\text{m} \times 1.5\text{m} \times 0.3\text{m}$$

$$2 \times 15 \times 3 = 90$$

$$= 0.9\text{m}^3$$

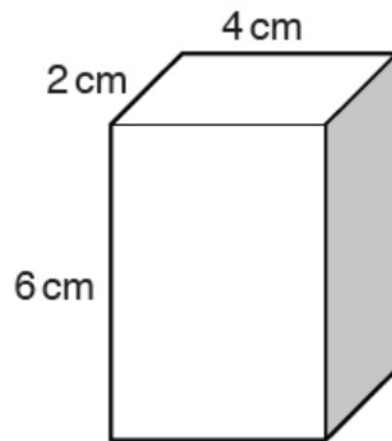
$$\frac{900 \text{ Litres}}{20} = \text{min}$$

$$90 \div 2 = 45 \checkmark$$

45

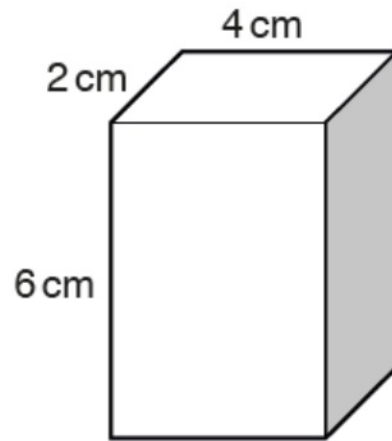
..... minutes [5]

3 (a) Calculate the volume of this cuboid.



(a) cm³ [2]

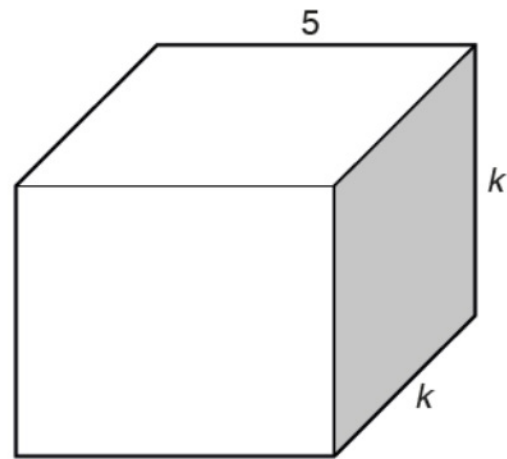
3 (a) Calculate the volume of this cuboid.



$L \times W \times H$

(a) 48 cm^3 cm^3 [2]

(b) In this cuboid all lengths are in centimetres.

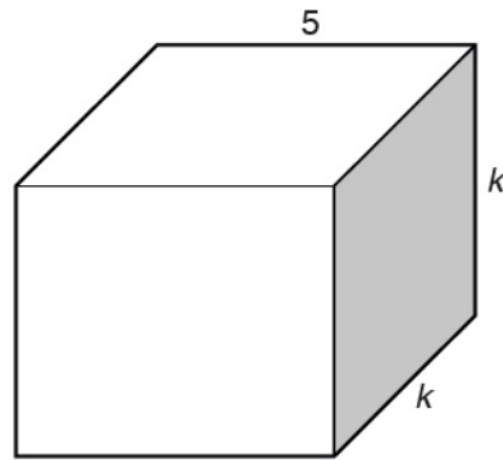


The cuboid has a volume of 320 cm^3 .

Find the value of k .

(b) $k = \dots\dots\dots$ [3]

(b) In this cuboid all lengths are in centimetres.



$$k^2 = 64$$

$$\text{or } k \times k = 64$$

$$k = \sqrt{64}$$

The cuboid has a volume of 320 cm^3 .

Find the value of k .

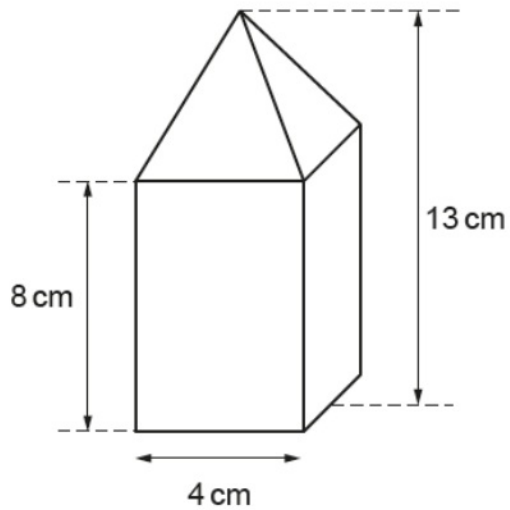
$$5 \times k \times k = 320$$

$$k^2 \dots$$

$$k \times k = \frac{320}{5} = 64$$

(b) $k = \dots 8 \checkmark \dots$ [3]

8 The object below is made from a square-based pyramid joined to a cuboid.



The base of the cuboid and the base of the pyramid are both squares of side 4 cm. The height of the cuboid is 8 cm and the total height of the object is 13 cm. The total mass of the object is 158 g.

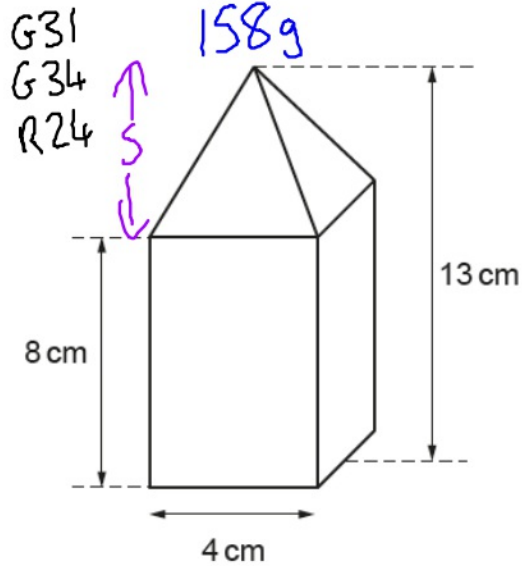
The cuboid is made from wood with density 0.67 g/cm^3 . The pyramid is made from granite.

Calculate the density of the granite.

[The volume of a pyramid is $\frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$.]

..... g/cm^3 [5]

8 The object below is made from a square-based pyramid joined to a cuboid.



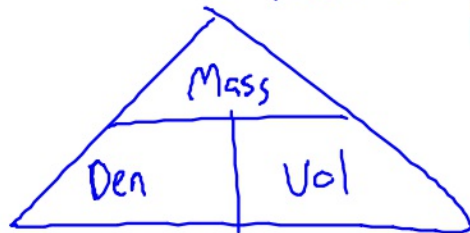
The base of the cuboid and the base of the pyramid are both squares of side 4 cm. The height of the cuboid is 8 cm and the total height of the object is 13 cm. The total mass of the object is 158 g.

The cuboid is made from wood with density 0.67 g/cm^3 . The pyramid is made from granite.

Calculate the density of the granite.

[The volume of a pyramid is $\frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$.]

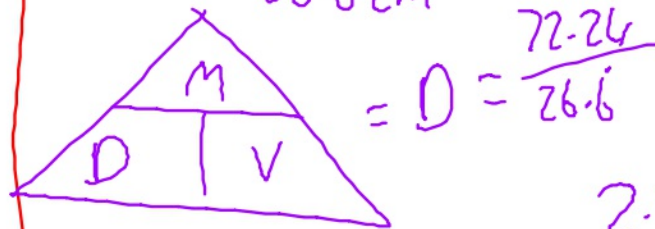
Wood $\rightarrow 4 \times 4 \times 8$
 $= 128 \text{ cm}^3$



Mass = 0.67×128
 85.76 g

granite = mass = 72.24 g

Volume = $\frac{1}{3} \times 4 \times 4 \times 5$
 $= 26.6 \text{ cm}^3$

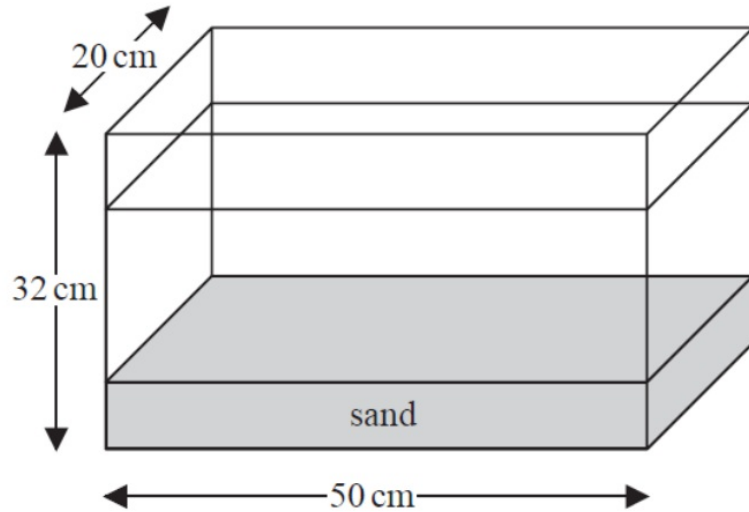


$= D = \frac{72.24}{26.6}$

$2.709 \dots \text{ g/cm}^3$ [5]

Edexcel

21 The diagram shows a fish tank in the shape of a cuboid.



The dimensions of the tank are 50 cm by 32 cm by 20 cm.

The tank is $\frac{3}{4}$ full of water and sand.

The ratio of the volume of water to the volume of sand is 5 : 1

Work out the number of litres of water in the tank.

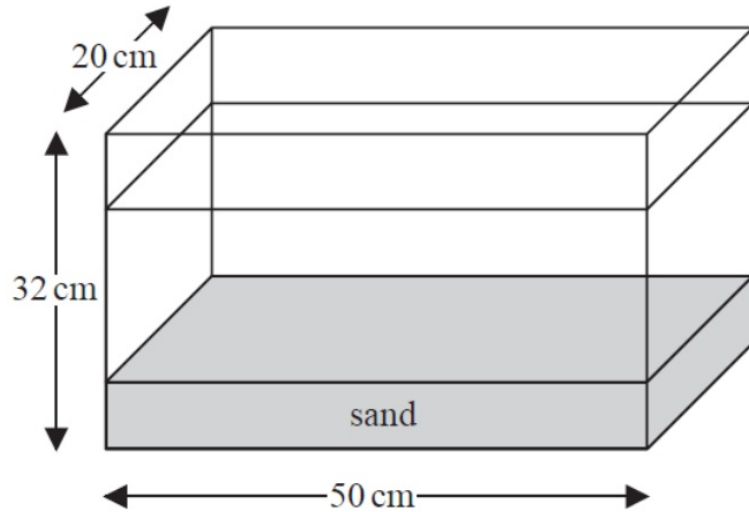
You must show all your working.

.....litres

(Total for Question 21 is 5 marks)

21 The diagram shows a fish tank in the shape of a cuboid.

Created by



Volume of cuboid

$$50 \times 20 \times 32 = 1000 \times 32 = 32000 \text{ cm}^3$$

$$\frac{3}{4} \text{ of } 32000 \text{ cm}^3 = 24000 \text{ cm}^3$$

$\div 4 \times 3$

Water : Sand
5 : 1

$$24000 \div 6$$

$$= 4000 \times 5 \dots 20000 \text{ cm}^3$$

$$4000 \times 1 = 4000 \text{ cm}^3$$

\rightarrow water

The dimensions of the tank are 50 cm by 32 cm by 20 cm.

The tank is $\frac{3}{4}$ full of water and sand.

The ratio of the volume of water to the volume of sand is 5 : 1

Work out the number of litres of water in the tank.

You must show all your working.

$$1000 \text{ cm}^3 = 1 \text{ Litre}$$

$$20,000 \text{ cm}^3 =$$

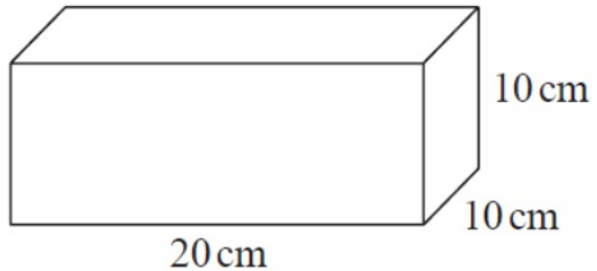
20

litres

(Total for Question 21 is 5 marks)

29 The diagram shows a block of silver in the shape of a cuboid.

29
29



The density of silver is 10.5 g/cm^3

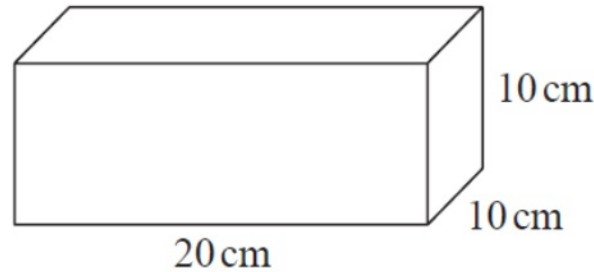
Work out the mass, in grams, of the block of silver.

..... grams

(Total for Question 29 is 3 marks)

29 The diagram shows a block of silver in the shape of a cuboid.

G31
R24



$$\begin{aligned} \text{Volume} &= 10 \times 10 \times 20 \\ &= 2000 \text{ cm}^3 \end{aligned}$$

The density of silver is 10.5 g/cm^3

Work out the mass, in grams, of the block of silver.

$$\begin{aligned} &\times 2000 \text{ g} \quad 10.5 \text{ g} = 1 \text{ cm}^3 \\ &= 2000 \text{ cm}^3 \end{aligned}$$

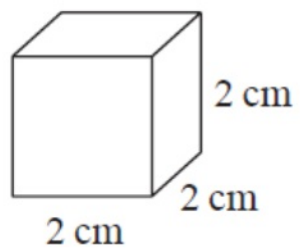
$$\begin{array}{r} \underline{10.5 \times 2000} \\ 21000 \end{array}$$

$$\underline{\hspace{1cm}} 21000 \text{ grams}$$

(Total for Question 29 is 3 marks)

12 The diagram shows a cube of side length 2 cm.

Video created by W Neill



Vera says,

“The volume of any solid made with 6 of these cubes is 48 cm^3 ”

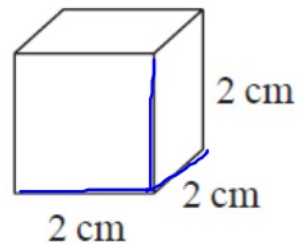
(a) Is Vera correct?

You must show your working.

(2)

12 The diagram shows a cube of side length 2 cm.

Video created by W Neill



$$2 \times 2 \times 2 = 8$$

Vera says,

“The volume of any solid made with 6 of these cubes is 48 cm^3 ”

(a) Is Vera correct?

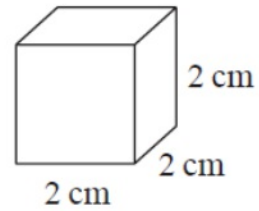
You must show your working.

$$1 \text{ cube} = 8 \text{ cm}^3$$

$$6 \text{ cubes} = 48 \text{ cm}^3$$

Vera is correct ✓

Video created by W Neill



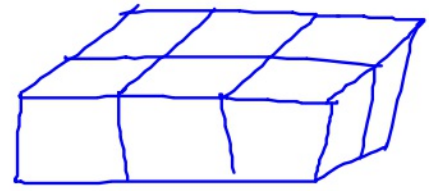
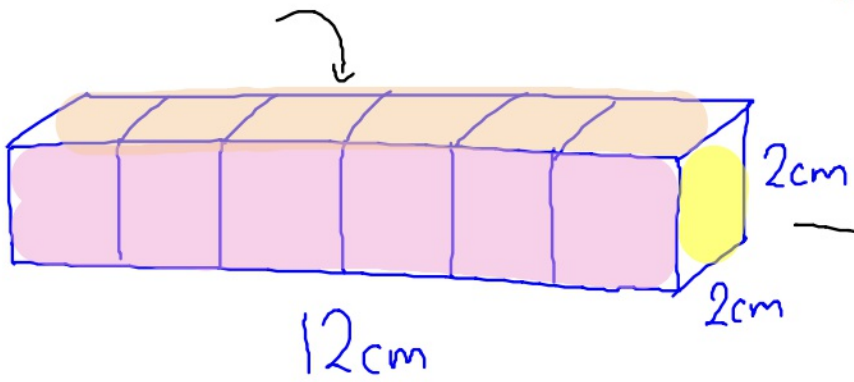
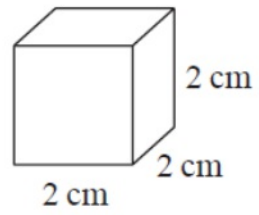
- (b) (i) Draw a cuboid that can be made with 6 of these cubes.
Write the dimensions of the cuboid on your diagram.

(1)

- (ii) Work out the surface area of your cuboid.

Video created by W Neill

(b) (i) Draw a cuboid that can be made with 6 of these cubes.
Write the dimensions of the cuboid on your diagram.



(i) $\underline{\underline{\text{Total} = 104\text{cm}^2}}$ ✓

(ii) Work out the surface area of your cuboid.

● $12 \times 2 = 24\text{cm}^2$
 24cm^2

 48cm^2

● $2 \times 2 = 4\text{cm}^2$
 4cm^2

 8cm^2

● $12 \times 2 = 24\text{cm}^2$
 24cm^2

 48cm^2

13 The total surface area of a cube is 294 cm^2 .

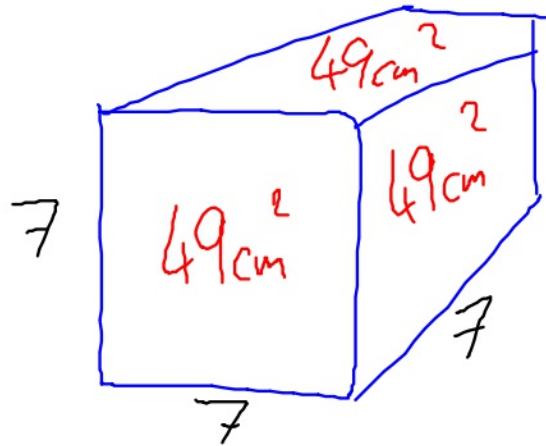
Work out the volume of the cube.

..... cm^3

(Total for Question 13 is 4 marks)

13 The total surface area of a cube is 294 cm^2 .

Work out the volume of the cube.



$$\text{Total Surface Area} = 294 \text{ cm}^2$$

$$1 \text{ face} = 294 \div 6 =$$

$$\begin{array}{r} 49 \\ \times 67 \\ \hline 343 \end{array}$$

Volume =

$$L \times W \times H$$

$$\frac{7 \times 7 \times 7}{49 \times 7}$$

$$49 \times 7$$

$$\dots\dots\dots 343 \text{ cm}^3$$

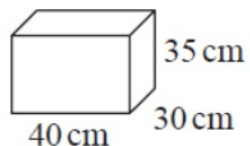
(Total for Question 13 is 4 marks)

$$\begin{array}{r} 49 \\ \hline 6 \overline{) 294} \end{array}$$

16 Chloe has a van.

Created by

She is going to use the van to deliver boxes.
Each box is a cuboid, 40 cm by 30 cm by 35 cm.



The space for boxes in the van has

maximum length	2.4 m
maximum width	1.5 m
maximum height	1.4 m

The space for boxes is empty.

Chloe wants to put as many boxes as possible into the van.

She can put 3 boxes into the van in one minute.

Assume that the space for boxes is in the shape of a cuboid.

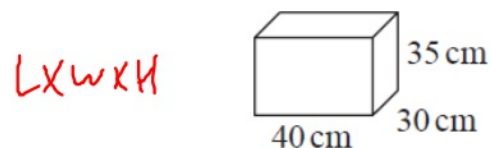
- (a) Work out how many minutes it should take Chloe to put as many boxes as possible into the van.

..... minutes

(4)

16 Chloe has a van.

She is going to use the van to deliver boxes.
Each box is a cuboid, 40 cm by 30 cm by 35 cm.



The space for boxes in the van has

maximum length 2.4 m
maximum width 1.5 m
maximum height 1.4 m

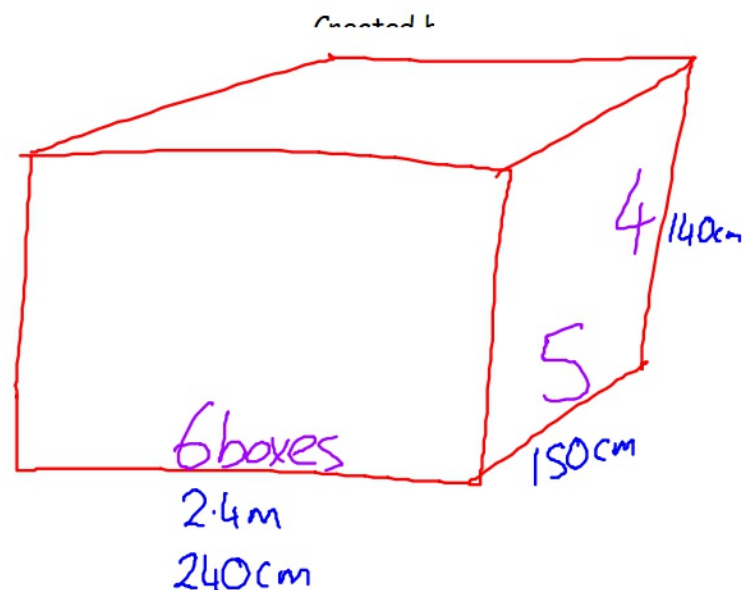
The space for boxes is empty.

Chloe wants to put as many boxes as possible into the van.

She can put 3 boxes into the van in one minute. ✓

Assume that the space for boxes is in the shape of a cuboid.

(a) Work out how many minutes it should take Chloe to put as many boxes as possible into the van.



$$\begin{aligned} \text{Total boxes} &= 6 \times 5 \times 4 \\ &= 120 \text{ boxes} \checkmark \end{aligned}$$

$$\begin{aligned} & \left. \begin{array}{l} 3 \text{ boxes} = 1 \text{ min} \\ 120 \text{ boxes} = 40 \end{array} \right\} \times 40 \\ & \text{40 min} \dots \text{minutes} \end{aligned}$$

(4)

The space for boxes might **not** be in the shape of a cuboid.

- (b) Explain how this could affect the time it would take Chloe to put as many boxes as possible into the van.

(1)

The space for boxes might **not** be in the shape of a cuboid.

- (b) Explain how this could affect the time it would take Chloe to put as many boxes as possible into the van.

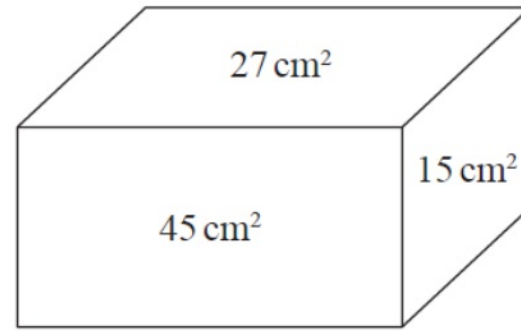
It could take more time as she may have to spend time planning on where they go. ✓

(1)

8 The diagram shows a solid metal cuboid.

The areas of three of the faces are marked on the diagram.

The lengths, in cm, of the edges of the cuboid are whole numbers.



The metal cuboid is melted and made into cubes.

Each of the cubes has sides of length 2.5 cm.

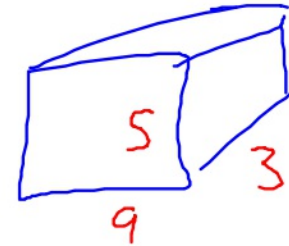
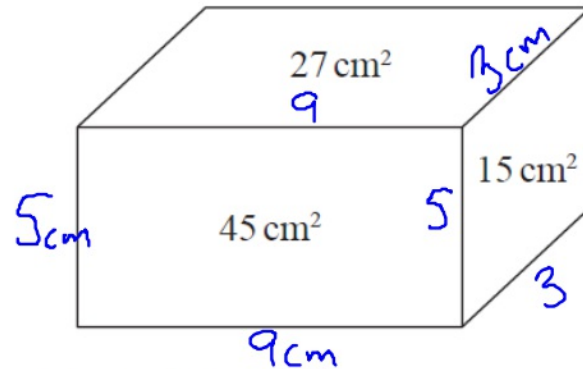
Work out the greatest number of these cubes that can be made.

.....
(Total for Question 8 is 5 marks)

8 The diagram shows a solid metal cuboid.

The areas of three of the faces are marked on the diagram.

The lengths, in cm, of the edges of the cuboid are whole numbers.



$$\begin{aligned} \text{Volume} &= 9 \times 3 \times 5 \\ &= 135 \text{ cm}^3 \end{aligned}$$

The metal cuboid is melted and made into cubes.

Each of the cubes has sides of length 2.5 cm.

Work out the greatest number of these cubes that can be made.

$$\begin{aligned} \text{How many} &= \frac{135}{15.625} \\ &= 8.64 \end{aligned}$$



$$\begin{aligned} &= 2.5 \times 2.5 \times 2.5 \\ &= 15.625 \text{ cm}^3 \end{aligned}$$

8 ✓

(Total for Question 8 is 5 marks)

AQA

21 Eva thinks she can save water by having a shower instead of a bath.

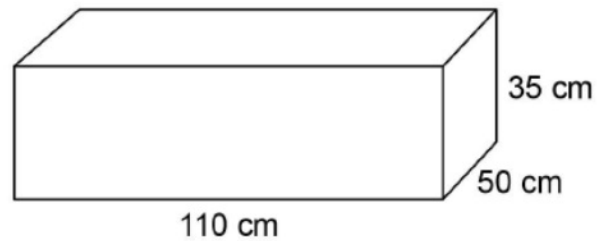
Video assets

Eva's shower

uses 10.8 litres per minute

lasts for 8 minutes.

Eva assumes that the water in her bath is in the shape of this cuboid.



$$1000 \text{ cm}^3 = 1 \text{ litre}$$

21 (a) Using Eva's assumption, work out how many litres of water she saves by having a shower instead of a bath.

[5 marks]

21 Eva thinks she can save water by having a shower instead of a bath.

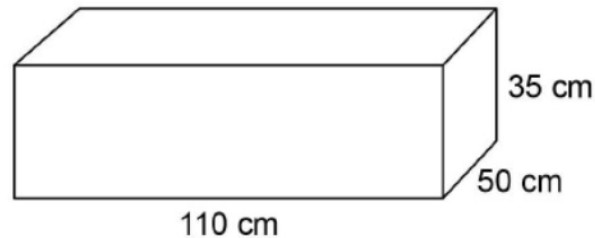
Video credits

Eva's shower

G31 uses 10.8 litres per minute

G37 lasts for 8 minutes.

Eva assumes that the water in her bath is in the shape of this cuboid.



$1000 \text{ cm}^3 = 1 \text{ litre}$

shower

$$10.8 \text{ L} \times 8 \text{ min} = 86.4 \text{ Litres}$$

Bath ... Volume

$$110 \times 50 \times 35 \\ = 192,500 \text{ cm}^3$$

192.5 Litres

21 (a) Using Eva's assumption, work out how many litres of water she saves by having a shower instead of a bath.

[5 marks]

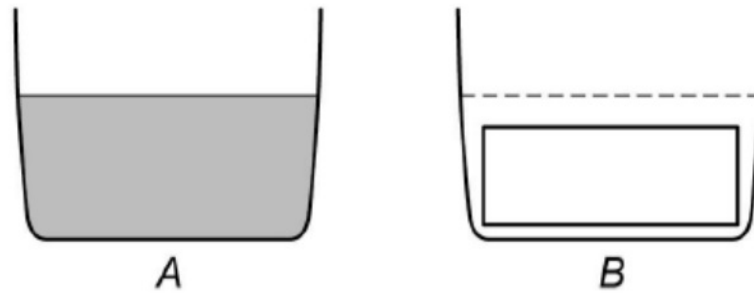
$$192.5 \text{ L} - 86.4 \text{ L}$$

$$= 106.1 \text{ Litres}$$

- 21 (b)** *A* shows the water level before Eva gets into the bath.
B shows the cuboid in the empty bath.

Video assets

Not drawn
accurately

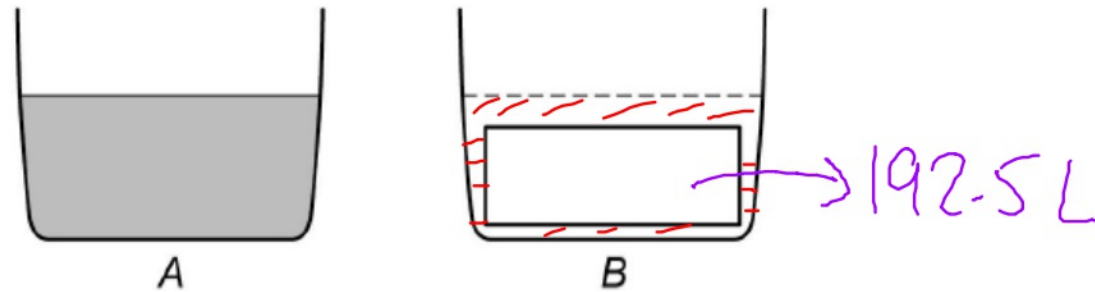


What does this tell you about the amount of water saved?

[1 mark]

- 21 (b) A shows the water level before Eva gets into the bath.
B shows the cuboid in the empty bath.

Not drawn accurately



What does this tell you about the amount of water saved?

[1 mark]

Her bath is bigger than 192.5 L so she
will actually save more water

23

A solid shape is made from centimetre cubes.

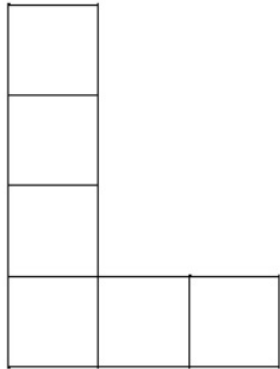
Video created by W Neill

G28

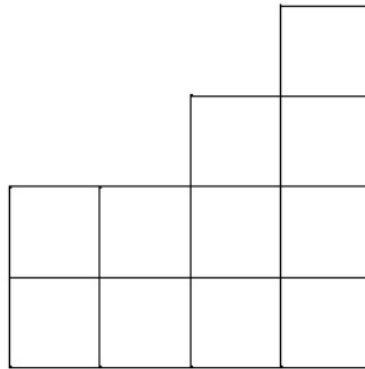
Here are the plan, side elevation and front elevation of the shape.

G31

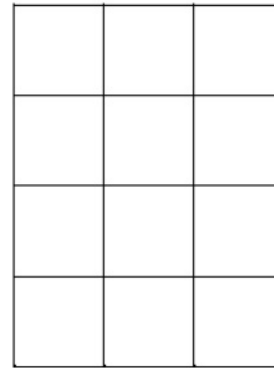
Plan



Side elevation

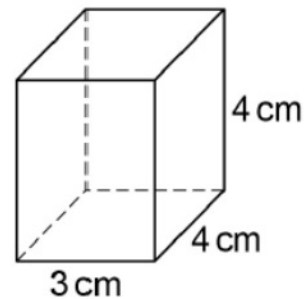


Front elevation



Centimetre cubes are added to make this cuboid.

How many cubes are added? **[3 marks]**



Answer _____

23

A solid shape is made from centimetre cubes.

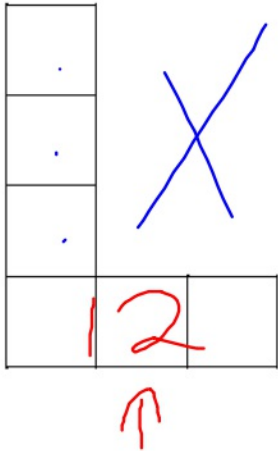
Video created by W Neill

G28

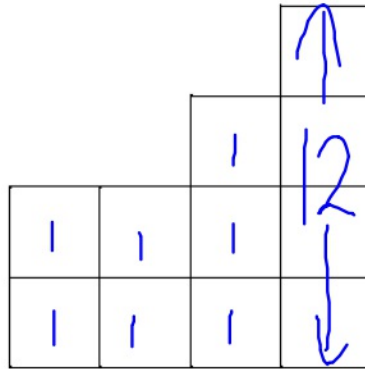
Here are the plan, side elevation and front elevation of the shape.

G31

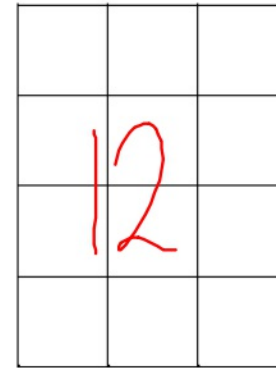
Plan



Side elevation



Front elevation



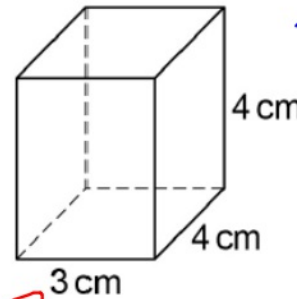
how many we have

$$\begin{array}{r} 12 \\ + 7 \\ \hline 19 \end{array}$$

Centimetre cubes are added to make this cuboid.

How many cubes are added? [3 marks]

$$48 - 19 = 29$$



$$\begin{aligned} \text{Total} &= 4 \times 4 \times 3 \\ &= 48 \text{ cm}^3 \end{aligned}$$

FF

Answer

29 cubes

24

A tank is a cuboid measuring 50 cm by 35 cm by 20 cm

All lengths are to the **nearest centimetre**.

N57

G31

A container has a capacity of **exactly** 34 litres.

1 litre = 1000 cm^3

Which has the greater capacity?

Tick **one** box.

Tank

Container

Cannot tell

Show working to support your answer.

Video created by W Neill

[4 marks]

24

A tank is a cuboid measuring 50 cm by 35 cm by 20 cm

All lengths are to the **nearest centimetre**.

N57

G31

A container has a capacity of **exactly** 34 litres.

1 litre = 1000 cm^3

$$\longrightarrow 34000 \text{ cm}^3$$

Which has the greater capacity?

Tick **one** box.

Tank

Container

Cannot tell

Show working to support your answer.

Volume

Max $50.5 \times 35.5 \times 20.5 = 36751 \text{ cm}^3$

Min $49.5 \times 34.5 \times 19.5 = 33301 \text{ cm}^3$

34000 is in between

13

Ashraf is going to put boxes into a crate.

Video created by W Neill

G31

The crate is a cuboid measuring 2.5 m by 2 m by 1.2 m

Each box is a cube of length 50 cm

He does these calculations.

$$\begin{aligned}\text{volume of crate} &= 2.5 \times 2 \times 1.2 \\ &= 6 \text{ m}^3 \\ \text{volume of one box} &= 0.5 \times 0.5 \times 0.5 \\ &= 0.125 \text{ m}^3 \\ \text{number of boxes} &= 6 \div 0.125 \\ &= 48\end{aligned}$$

He claims,

“I can put 48 boxes in the crate.”

Evaluate Ashraf's method **and** claim.

[2 marks]

13

Ashraf is going to put boxes into a crate.

Video created by W Neill

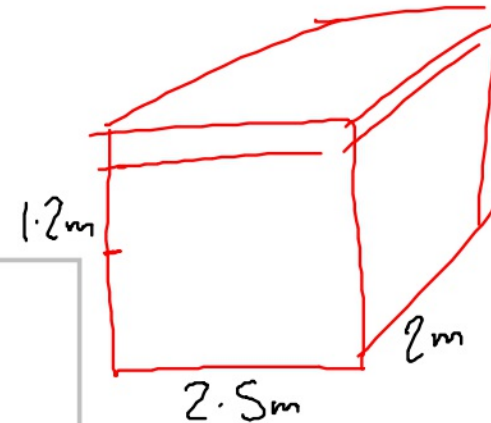
G31

The crate is a cuboid measuring 2.5 m by 2 m by 1.2 m

Each box is a cube of length 50 cm

He does these calculations.

volume of crate	=	$2.5 \times 2 \times 1.2$
	=	6 m^3 ✓
volume of one box	=	$0.5 \times 0.5 \times 0.5$
	=	0.125 m^3 ✓
number of boxes	=	$6 \div 0.125$
	=	48 ✓



50cm fits into

2.5m ✓

2m ✓

50cm does not
fit into 1.2m

So you could not fit 48 boxes.

He claims,

“I can put 48 boxes in the crate.”

Evaluate Ashraf's method **and** claim.

[2 marks]