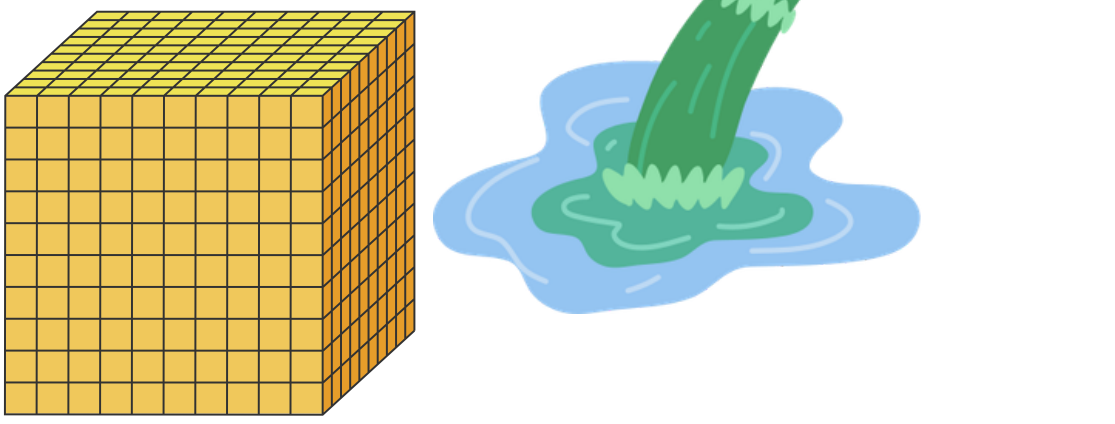
EDEXCEL IGCSE MATHEMATICS

PAPER 1H & 1HR (LINEAR)

GEOMETRY – PRESSURE, DENSITY, & RATE OF FLOW

QP & MS (2018 – 2025)

$$\rho = \frac{m}{V}$$



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by Sir Muhammad Abdullah Shah

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1. June 2024 1H/Q8

A cylinder is placed on a table.

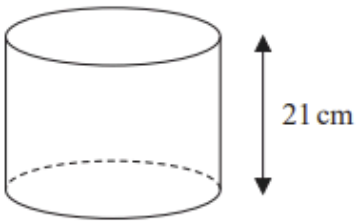


Diagram **NOT** accurately drawn

The volume of the cylinder is $1575\,cm^3$
The force exerted by the cylinder on the table is 84 newtons.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the pressure on the table due to the cylinder.

..... newtons/cm^2

(Total for Question 8 is 3 marks)

..... km/h

(Total for Question 7 is 4 marks)

2. June 2024 1HR/Q6

The diagram shows a solid wooden cylinder.

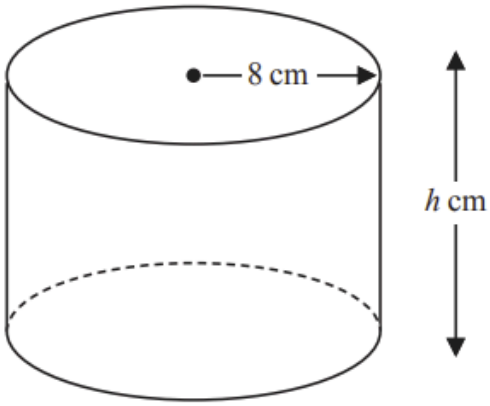


Diagram **NOT** accurately drawn

The cylinder has radius 8 cm and height h cm.
The volume of the cylinder is 1208 cm^3

(a) Work out the value of h
Give your answer correct to the nearest whole number.

$h =$ .....

(2)

The density of the wood is 1.25 g/cm^3

(b) Work out the mass of the cylinder.
Give your answer in kilograms.

..... kilograms

(2)

(Total for Question 6 is 4 marks)

3. June 2023 1HR/Q11

The diagram shows a block of iron in the shape of a cuboid.

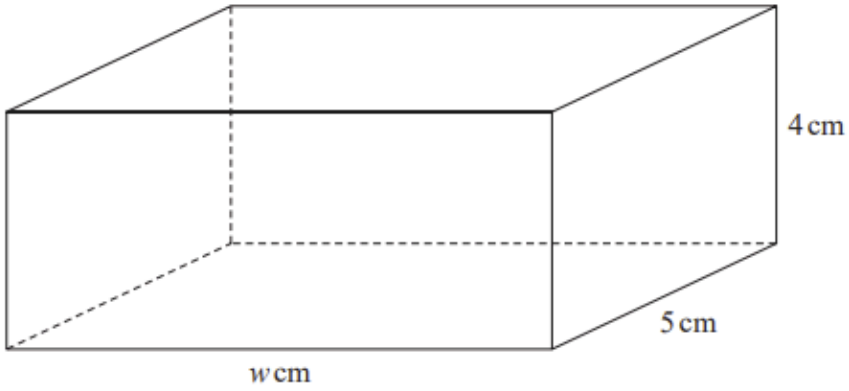


Diagram **NOT** accurately drawn

The block has length w cm, width 5 cm and height 4 cm

The density of iron is 7.8 g/cm^3
The mass of the block is 1950 g

Work out the value of w

$w =$ .....

(Total for Question 11 is 3 marks)

4. June 2022 1H/Q7

A cylinder is placed on the ground.

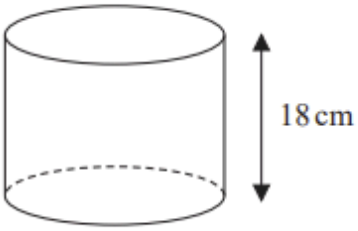


Diagram **NOT** accurately drawn

The height of the cylinder is 18 cm.

The force exerted by the cylinder on the ground is 72 newtons.
The pressure on the ground due to the cylinder is 1.4 newtons / cm^2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

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

..... cm^3

(Total for Question 7 is 4 marks)

5. June 2022 1HR/Q7

The diagram shows a solid cylinder made from iron.

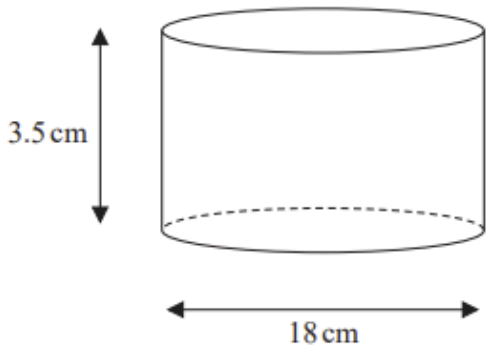


Diagram **NOT** accurately drawn

The cylinder has diameter 18 cm and height 3.5 cm
The mass of the cylinder is 7.04 kg

Work out the density of the iron.
Give your answer in g/cm^3 correct to 2 significant figures.

..... g/cm^3

(Total for Question 7 is 3 marks)

6. Nov 2021 1H/Q10

A solid aluminium cylinder has radius 10 cm and height h cm.

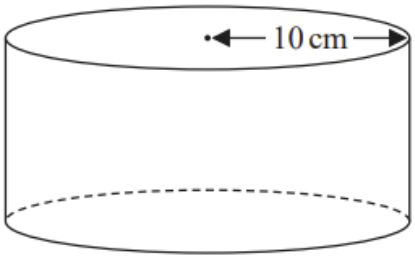


Diagram **NOT** accurately drawn

The mass of the cylinder is 5.4 kg.
The density of aluminium is 0.0027 kg/cm^3

Calculate the value of h.
Give your answer correct to one decimal place.

h = ...

(Total for Question 10 is 5 marks)

7. Jan 2021 1H/Q3

The diagram shows a container for water in the shape of a prism.

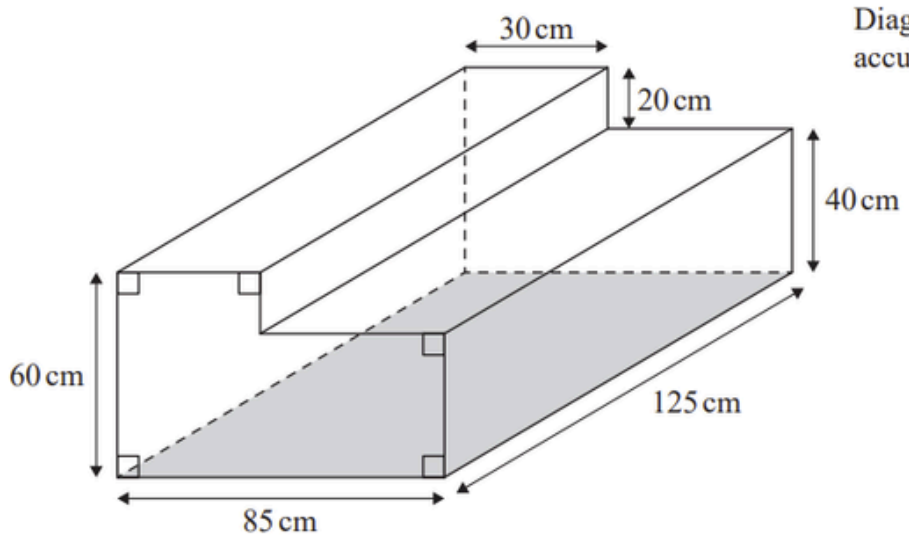


Diagram **NOT** accurately drawn

The rectangular base of the prism, shown shaded in the diagram, is horizontal.
The container is completely full of water.

Tuah is going to use a pump to empty the water from the container so that the volume of water in the container decreases at a constant rate.

The pump starts to empty water from the container at 1030 and at 1200 the water level in the container has dropped by 20 cm.

Find the time at which all the water has been pumped out of the container.

.....

(Total for Question 3 is 4 marks)

8. Nov 2020 1HR/Q9

A box is put on a horizontal table.

The face of the box in contact with the table is a square of side 1.5 metres.
The pressure on the table due to the box is 34.8 newtons/m^2

Work out the force exerted by the box on the table.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

..... newtons

(Total for Question 9 is 3 marks)

9. Jan 2020 1H/Q13

The diagram shows a solid cube.
The cube is placed on a table so that the whole of one face of the cube is in contact with the table.

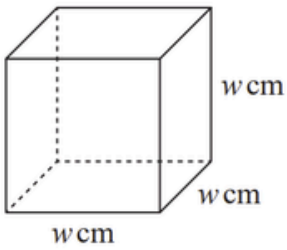


Diagram **NOT** accurately drawn

The cube exerts a force of 56 newtons on the table.
The pressure on the table due to the cube is 0.14 newtons/cm^2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the volume of the cube.

..... cm^3

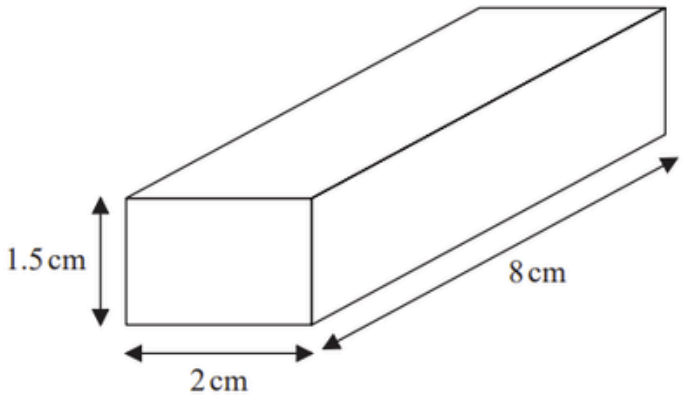
(Total for Question 13 is 4 marks)

10. Jan 2020 1HR/Q9

Pablo made a solid gold statue.

He melted down some gold blocks and used the gold to make the statue.
Each block of gold was a cuboid, as shown below.

Diagram **NOT** accurately drawn



The mass of the statue is 5.73 kg.
The density of gold is 19.32 g/cm^3

Work out the least number of gold blocks Pablo melted down in order to make the statue.
Show your working clearly.

(Total for Question 9 is 5 marks)

11. June 2019 1H/Q6

The diagram shows a solid cuboid made from wood.

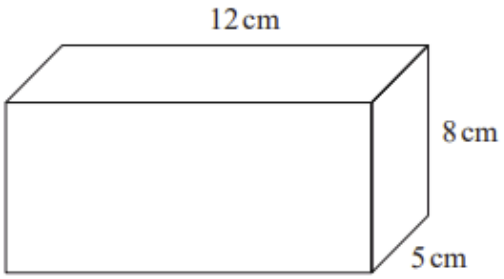


Diagram **NOT** accurately drawn

The wood has density 0.7 g/cm^3

Work out the mass of the cuboid.

..... grams

(Total for Question 6 is 3 marks)

.....

(Total for Question 9 is 5 marks)

12. June 2019 1HR/Q12

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

A box, in the shape of a cuboid, is going to be put on a table.

The whole of one face of the box will be in contact with the table.
The force exerted by the box on the table is always 105 newtons.

The box is 5 m by 4 m by 3 m.

The greatest pressure exerted by the box on the table is P newtons/m^2
The least pressure exerted by the box on the table is Q newtons/m^2

Work out the value of $P - Q$

.....

(Total for Question 9 is 5 marks)

13. June 2018 1HR/Q9

Here is an empty pool in the shape of a cuboid.

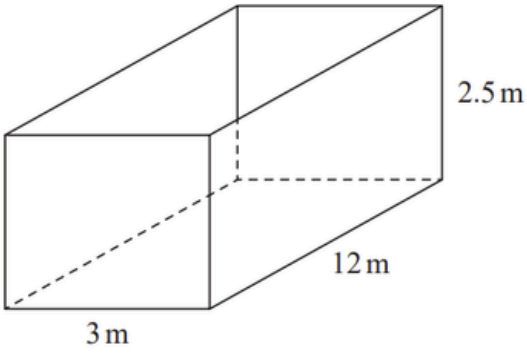


Diagram **NOT** accurately drawn

The width of the pool is 3 m.
The length of the pool is 12 m.
The top of the pool is 2.5 m above the base of the pool.

Jeb is going to put water in the pool.
The level of the surface of the water will be 60 cm below the top of the pool.

Water flows into the pool at 400 litres per minute.
$1\,m^3 = 1000$ litres

How long will it take to fill the pool to 60 cm below the top of the pool?
Give your answer in hours and minutes.

..... hours ..... minutes

(Total for Question 9 is 4 marks)

14. June 2018 1HR/Q22

A 3-D shape consists of a hollow sphere made of metal.

The diagram shows a cross section drawn through the centre, O, of the sphere.

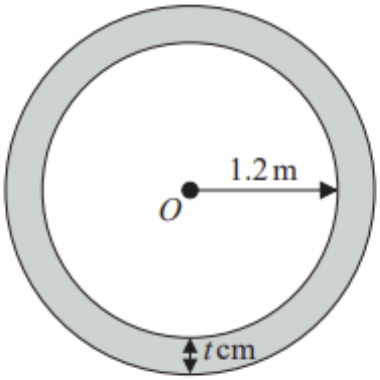


Diagram **NOT** accurately drawn

The internal radius of the sphere is 1.2 m.
The thickness of the metal is t cm.

The density of the metal is 2700 kg per m^3

The mass of the 3-D shape is 1980 kg.

Work out the value of t.
Give your answer correct to 2 significant figures.

$t =$ .....

(Total for Question 22 is 5 marks)

15. Specimen 2018 1H/Q2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Find the pressure exerted by a force of 810 newtons on an area of 120 cm^2
Give your answer in newtons/m^2

..... newtons/m^2

(Total for Question 2 is 3 marks)

$t =$ .....

(Total for Question 22 is 5 marks)

MARKING SCHEME

1. June 2024 1H/Q8

8	$1575 = (\text{area}) \times 21$ oe **or** $(\text{area} =)\ 75$ **or** $1575 = \pi \times r^2 \times 21$ oe **or** $r^2 = \frac{1575}{21\pi} \left(= 23.8(732...)\right)$ oe **or** $r = \sqrt{\frac{1575}{21\pi}} \left(= 4.88(602...)\right)$ oe		3	M1 for finding the area using Vol = cross sectional area × height **or** finding r or r^2 using vol = $\pi r^2 h$ NB r^2 and r can be rounded or truncated
	$\frac{84}{"75"}$ oe or $\frac{84}{\pi"4.88"^2}$ oe or $\frac{84}{\pi"23.8"}$ oe			M1 for $\frac{84}{\text{area of circle}}$
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	1.12		A1 accept 1.06 – 1.121
				Total 3 marks

2. June 2024 1HR/Q6

6 (a)	$\pi \times 8^2 \times h = 1208$ oe **or** $\frac{1208}{\pi \times 8^2}$ oe		2	M1	for setting up an equation in h using the volume of the cylinder **or** a correct calculation for h (may be seen in stages)
	Correct answer scores full marks (unless from obvious incorrect working)	6		A1	accept 6 – 6.02
(b)	$\frac{m}{1208} = 1.25$ oe **or** $(m =)\ 1208 \times 1.25\ (= 1510)$		2	M1	for setting up an equation using $D = M / V$ **or** for a calculation to find the mass (may convert mass to kg first)
	Correct answer scores full marks (unless from obvious incorrect working)	1.51		A1	
					Total 4 marks

3. June 2023 1HR/Q11

11	$(V =) \frac{1950}{7.8} (= 250)$ **or** $7.8 = \frac{1950}{w \times 5 \times 4}$ or $7.8 = \frac{1950}{w \times 20}$		3	M1	for correct method to find volume using mass ÷ density **or** a correct equation with correct expression for volume (may be embedded in another calculation)
	eg $w = \frac{1950}{7.8 \times 5 \times 4}$ **or** $20w = \frac{1950}{7.8}$ **or** $20w =$ "250" **or** $4 \times 5 \times w =$ "250" **OR** eg $\frac{1950}{5 \times 4 \times 7.8}$ **or** $1950 \div (20 \times 7.8)$ **or** $1950 \div 156$ **or** "250" ÷ 20			M1	for a fully correct equation in w **or** a fully correct calculation to find the value of w (may be labelled eg x or L)
	Correct answer scores full marks (unless from obvious incorrect working)	12.5		A1	
					Total 3 marks

4. June 2022 1H/Q7

7	$1.4 = \frac{72}{(\text{area})}$ oe		4	M1
	(area =) $\frac{72}{1.4}$ (= $\frac{360}{7}$ = 51.4…) oe			M1 (51.4 or better)
	"51.4…" × 18 **or** $r = \sqrt{\frac{"51.4..."}{\pi}}$ (= 4.046…) **and** $\pi \times "4.046"^2 \times 18$			M1 allow use of πr^2 to find the radius and then using $\pi r^2 h$ to find the volume
		926		A1 Allow 925 – 928
				Total 4 marks

5. June 2022 1HR/Q7

7	eg (V=) $\pi \times \left(\frac{18}{2}\right)^2 \times 3.5$ (= 890.(64…) or $\frac{567}{2}\pi$)		3	M1 correct method to calculate volume
	eg (7.04 × 1000) ÷ "890.64"			M1 correct method to calculate density (if volume is incorrect, their value can be used if clearly labelled) accept use of 7.04 or an incorrect conversion from kg to g for mass
		7.9		A1 accept 7.9 – 7.92
				Total 3 marks

6. Nov 2021 1H/Q10

10	$0.0027 = \frac{5.4}{(V)}$ oe		5	M1 for correctly using density = $\frac{\text{mass}}{\text{volume}}$
	$(V =) \frac{5.4}{0.0027} = 2000$			M1 for correctly rearranging for V
	$\pi \times 10^2 \times h = 2000$ oe			M1ft their 2000 for $\pi \times 10^2 \times h$ = their V
	$(h =) \frac{2000}{\pi \times 10^2}$ oe (= 6.3661…)			M1ft their 2000 dep on previous M1 for correctly rearranging for h
	Correct answer scores full marks (unless from obvious incorrect working)	6.4		A1 awrt 6.4
				Total 5 marks

7. Jan 2021 1H/Q3

3	e.g. 30 × 20 × 125 (= 75 000) **or** 85 × 40 × 125 (= 425 000) **or** (60×30+(85−30)×40)×125(= 500 000) oe		4	M1	for a method to find the volume of water already pumped out **or** the volume of water left **or** the total volume of the container
	"75 000" ÷ 1.5 (= 50 000) **or** "75 000" ÷ 90 (= 833.3... or $\frac{2500}{3}$) **or** "425000"÷"75000"(= 5.66... or $\frac{17}{3}$) **or** "500000"÷"75000"(= 6.66... or $\frac{20}{3}$)			M1	M2 for $\frac{"425000"}{"75000"} \times 1.5$ oe (= 8.5) **or** $\frac{"500000"}{"75000"} \times 1.5$ oe (= 10)
	"425 000" ÷ "50 000" (= 8.5) **or** "425 000" ÷ ("833.3..." × 60) oe (= 8.5) **or** "5.66…" × 1.5 (= 8.5) **or** "6.66…" × 1.5 (= 10)			M1	
		20 30		A1	Allow 8 30 (pm)
					Total 4 marks

8. Nov 2020 1HR/Q9

9	e.g. 1.5 × 1.5 (= 2.25 oe)		3	M1	for calculating the area of the square, may be seen embedded within a calculation
	e.g. 34.8 × "2.25"			M1	for a complete method to find the force
		78.3		A1	oe
					Total 3 marks

9. Jan 2020 1H/Q13

13		$0.14 = \frac{56}{w^2}$ oe **or** $56 \div 0.14\ (=400)$		4	M1 for using the given formula correctly
		$\sqrt{\frac{56}{0.14}}$ **or** $\sqrt{\text{'400'}}$ (=20)			M1 for a method to find w
		'20' × '20' × '20' oe			M1 (dep on M2) for a method to find the volume of the cube
			8000		A1
					Total 4 marks

10. Jan 2020 1HR/Q9

9	$1.5 \times 2 \times 8\ (= 24\ (\text{cm}^3))$			M1	for finding the volume of the cuboid
	e.g. $(V =)\ \frac{5.73 \times 1000}{19.32}\ (= 296.58...)$ **or** $(M =)\ 19.32 \times \text{"24"}\ (= 463.68)$			M2	complete method to find the volume of statue **or** the mass of one block, could work in g or kg (if not M2 then award M1 for correct use of density formula e.g. $19.32 = \frac{5.73 \times 1000}{V}$ **or** $19.32 = \frac{M}{\text{"24"}}$)
	e.g. "296.58" ÷ "24" (= 12.3576...) **or** "5730" ÷ "463.68" (= 12.3576...)			M1	could work in g or kg
		13	5	A1	cao
					Total 5 marks

11. June 2019 1H/Q6

6		$12 \times 8 \times 5\ (= 480)$		3	M1
		"480" × 0.7			M1 Dep on M1
			336		A1
					Total 3 marks

12. June 2019 1HR/Q12

12	105 ÷ (5 × 4) (=5.25) oe **or** 105 ÷ (4 × 3) (=8.75) oe **or** 105 ÷ (3 × 5) (=7)		3	M1
	"8.75" – "5.25"			M1 dep on previous M1. If M1 gained and they have worked out 3 pressures, award M1 for their highest minus their lowest.
		3.5		A1 oe
				Total 3 marks

13. June 2018 1HR/Q9

9	$2.5 - 0.6 = 1.9$	2 hours 51 minutes	4	M1
	$3 \times 12 \times$ "1.9" (= 68.4)			M1 for using length × width × height to find a volume
	"68.4" × 1000 ÷ 400 (= 171 minutes)			M1 for their volume × 1000 ÷ 400
				A1
				Total 4 marks
	Alternative scheme			
	$250 - 60 = 190$	2 hours 51 minutes	4	M1
	$300 \times 1200 \times$ "190" (= 6.84×10^7)			M1 for using length × width × height to find a volume
	"6.84×10^7" ÷ $10^6 \times 1000 \div 400$ (= 171 minutes)			M1 for their volume ÷ $10^6 \times 1000 \div 400$
				A1
				Total 4 marks

14. June 2018 1HR/Q22

22	$\frac{4}{3}\times\pi\times R^3-\frac{4}{3}\times\pi\times1.2^3$ or $\frac{4}{3}\times\pi\times(1.2+t)^3-\frac{4}{3}\times\pi\times1.2^3$	3.9	5	M1	for an expression for the volume of the inner sphere
	$\left(\frac{4\pi}{3}R^3-\frac{4}{3}\times\pi\times1.2^3\right)\times2700=1980$			M1	
	$\frac{4\pi}{3}R^3=\frac{4}{3}\times\pi\times1.2^3+\frac{1980}{2700}$ $=7.238229474+0.7333333$ $=7.97(1562807)$			M1	for a correct expression **or** sight of 7.23(8229474) + 0.73(33333) **or** sight of 7.97(1562807)
	$R=\sqrt[3]{\left(\frac{3}{4\pi}\times(\frac{4}{3}\times\pi\times1.2^3+\frac{1980}{2700})\right)}$ =1.2392… $1.2392-1.2=0.0392$			M1	for a correct expression **or** sight of $\sqrt[3]{1.90(3070437)}$ **or** sight of 1.23(9229151) **or** sight of 0.0392(29151)
				A1	for 3.9 – 3.92
					Total 5 marks

15. Specimen 2018 1H/Q2

2	$120\div100^2$ (=0.012) **or** $810\div120$ (=6.75)			M1
	$810\div$"0.012" **or** "6.75" $\times100^2$			M1
		67 500	3	A1
				Total 3 marks