

**Q1.**

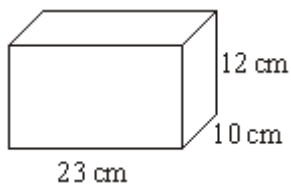


Diagram **NOT** accurately drawn

(a) Work out the volume of this solid cuboid.

..... cm<sup>3</sup>

(2)

The solid cuboid is made of plastic.  
The plastic has a density of 0.8 grams per cm<sup>3</sup>.

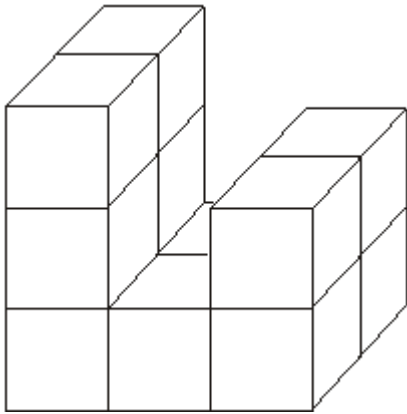
(b) Work out the mass of the cuboid.

..... grams

(2)

(Total 4 marks)

**Q2.** Here is a solid prism made from centimetre cubes.



Work out the volume of the solid prism.

..... cm<sup>3</sup>

(Total 2 marks)

**Q3.**

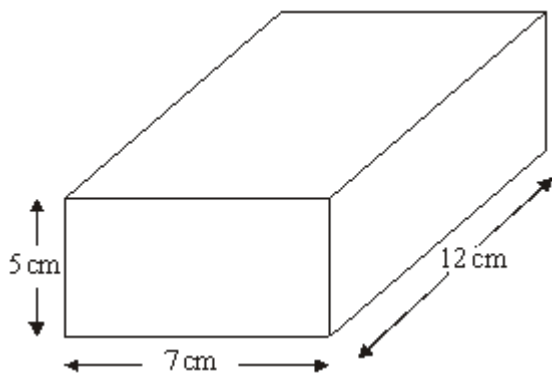


Diagram **NOT** accurately drawn

Work out the volume of the cuboid.

..... cm<sup>3</sup>

(Total 2 marks)

**Q4.**

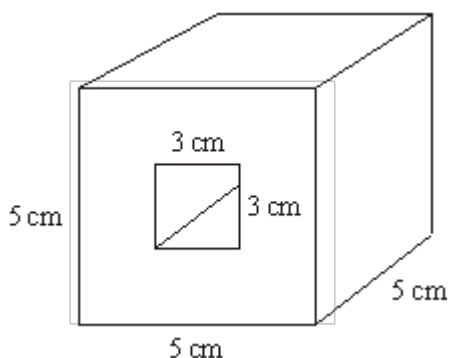


Diagram **NOT** accurately drawn

The solid shape, shown in the diagram, is made by cutting a hole all the way through a wooden cube.

The cube has edges of length 5 cm.

The hole has a square cross section of side 3 cm.

(a) Work out the volume of wood in the solid shape.

..... cm<sup>3</sup>

(2)

The mass of the solid shape is 64 grams.

(b) Work out the density of the wood.

..... grams per  $\text{cm}^3$

(2)  
(Total 4 marks)

**Q5.** The diagram shows a prism.

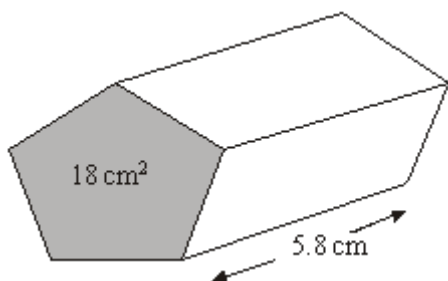


Diagram **NOT** accurately drawn

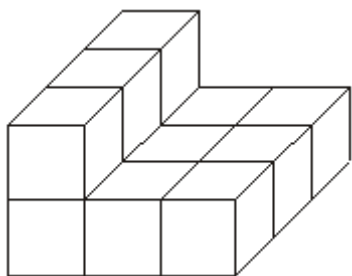
The area of the cross section of the prism is  $18 \text{ cm}^2$ .  
The length of the prism is  $5.8 \text{ cm}$ .

Work out the volume of the prism.

.....  $\text{cm}^3$

(Total 2 marks)

**Q6.** Here is a solid prism made from centimetre cubes.



Find the volume of the prism.

..... cm<sup>3</sup>

(Total 2 marks)

**Q7.** A water trough is in the shape of a prism.

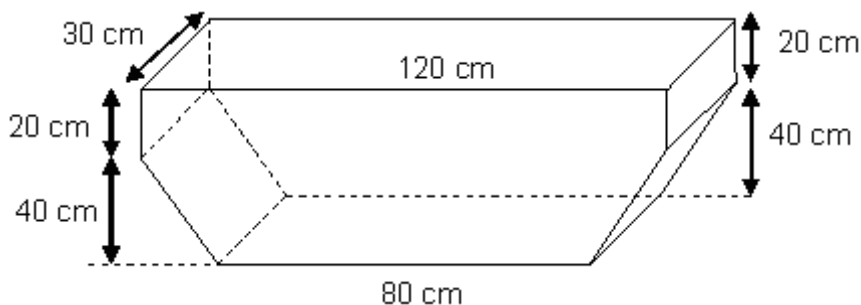


Diagram **NOT** accurately drawn

Hamish fills the trough completely.

Water leaks from the bottom of the trough at a constant rate.  
2 hours later, the level of the water has fallen by 20 cm.

Water continues to leak from the trough at the same rate.

How many more minutes will it take for the trough to empty completely?

..... minutes

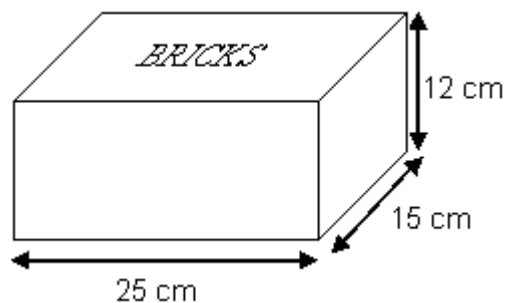
**(Total 6 marks)****Q8.**

A company makes building bricks for children.  
The bricks are all 5 cm cubes.

The bricks are going to be packed in boxes.

John designs a box for the bricks.  
The box is a cuboid.

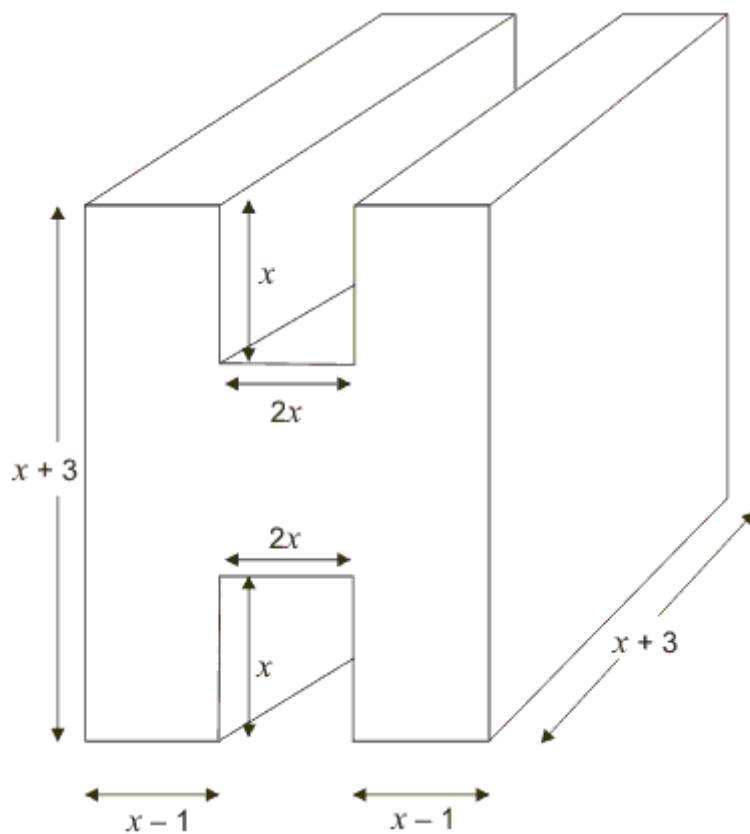
The size of the box is 25 cm by 15 cm by 12 cm.



Will the box be big enough for 36 bricks?  
You must give reasons for your answer.

(Total 4 marks)

Q9.

Diagram **NOT** accurately drawn

The diagram shows a prism.  
 All measurements are in cm.  
 All corners are right angles.  
 The volume of the prism is  $V$  cm<sup>3</sup>.

Find a formula for  $V$ .

$$V = \dots\dots\dots$$

(Total 4 marks)

**Q10.** Here is a diagram of a cuboid.

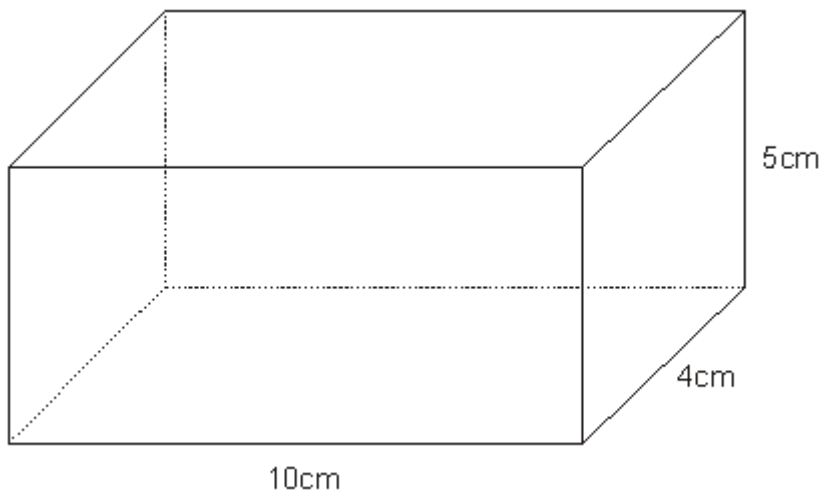


Diagram **NOT** accurately drawn

- (a) Write down the number of edges of the cuboid.



.....

(1)

(b) Calculate the volume of the cuboid.

.....

(3)

(Total 4 marks)

**Q11.** Jemilla goes swimming.

She swims 64 lengths of a swimming pool.

Each length is 25 m long.

(a) Work out how far Jemilla swims.

Give your answer in kilometres.

..... kilometres

(3)

The swimming pool is 25 m long by 10 m wide by 2.5 m deep.

(b) How many litres of water does it contain?

.....  $l$

(3)  
(Total 6 marks)

**Q12.**

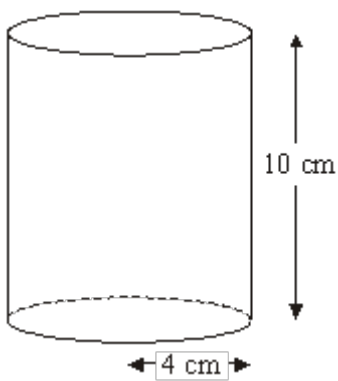


Diagram **NOT** accurately drawn

A solid cylinder has a radius of 4 cm and a height of 10 cm.

- (a) Work out the volume of the cylinder.  
Give your answer correct to 3 significant figures.

.....  $\text{cm}^3$

(2)

The cylinder is made from wood.  
 The density of the wood is 0.6 grams per  $\text{cm}^3$ .

- (b) Work out the mass of the cylinder.  
 Give your answer correct to 3 significant figures.

..... grams

(2)  
 (Total 4 marks)

Q13.

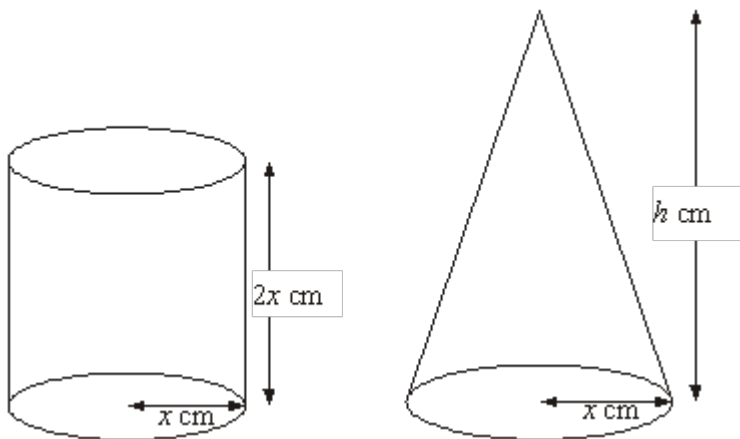


Diagram **NOT** accurately drawn

A cylinder has base radius  $x \text{ cm}$  and height  $2x \text{ cm}$ .

A cone has base radius  $x \text{ cm}$  and height  $h \text{ cm}$ .

The volume of the cylinder and the volume of the cone are equal.

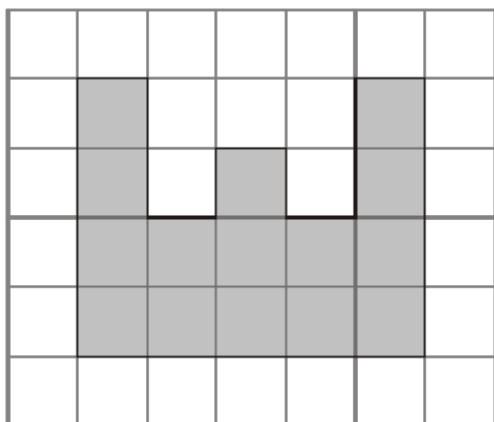
Find  $h$  in terms of  $x$ .

Give your answer in its simplest form.

$h = \dots\dots\dots$

(Total 3 marks)

**Q14.** A shaded shape has been drawn on the centimetre grid.



(a) Find the perimeter of the shaded shape.

..... cm

(1)

(b) Find the area of the shaded shape.

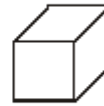
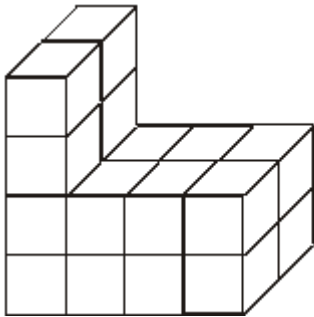
..... cm<sup>2</sup>

(1)

Here is a solid prism made from centimetre cubes.

(c) Find the volume of this prism.

Diagram **NOT** accurately drawn



represents 1 cm<sup>3</sup>

..... cm<sup>3</sup>

(2)

(Total 4 marks)

**Q15.** The diagram shows a storage tank.

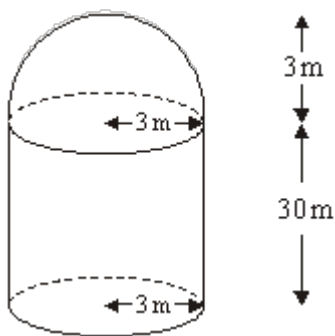


Diagram **NOT** accurately drawn

The storage tank consists of a hemisphere on top of a cylinder.

The height of the cylinder is 30 metres.

The radius of the cylinder is 3 metres.

The radius of the hemisphere is 3 metres.

- (a) Calculate the total volume of the storage tank.  
Give your answer correct to 3 significant figures.

..... m<sup>3</sup>

(3)

A sphere has a volume of 500 m<sup>3</sup>.

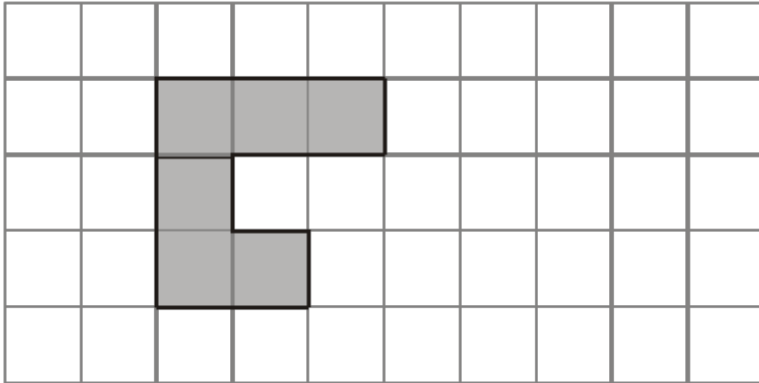
- (b) Calculate the radius of the sphere.  
Give your answer correct to 3 significant figures.

..... m

(3)

(Total 6 marks)

Q16.



The shaded shape is drawn on a grid of centimetre squares.

(a) Find the perimeter of the shaded shape.

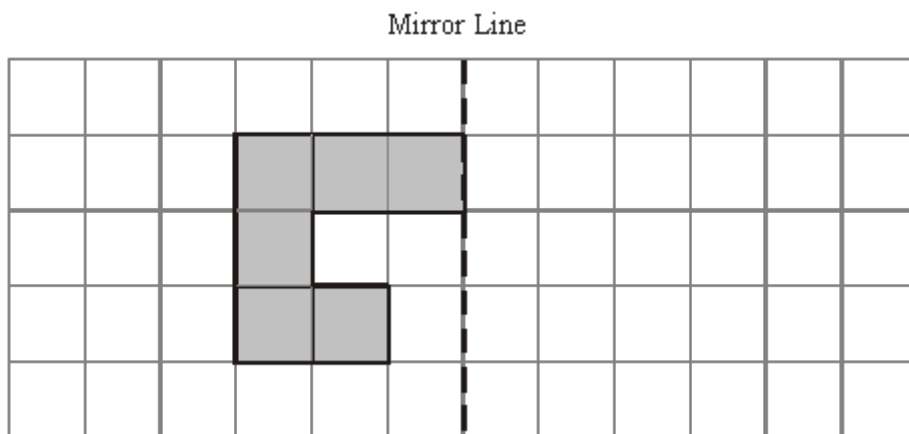
..... cm

(1)

(b) Find the area of the shaded shape.

..... cm<sup>2</sup>

(1)



(c) Reflect the shaded shape in the mirror line.

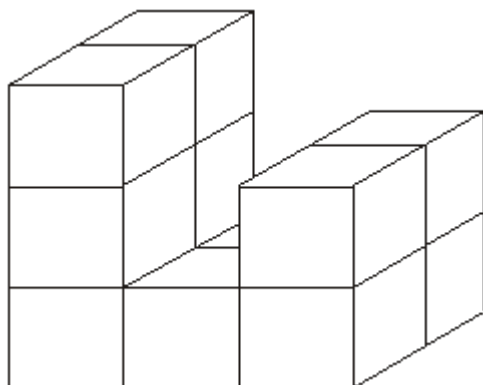


Diagram **NOT** accurately drawn

(1)

Here is a prism made of centimetre cubes.

(d) Find the volume of the prism.

..... cm<sup>3</sup>

(1)

(Total 4 marks)

**Q17.** Here is a cuboid.



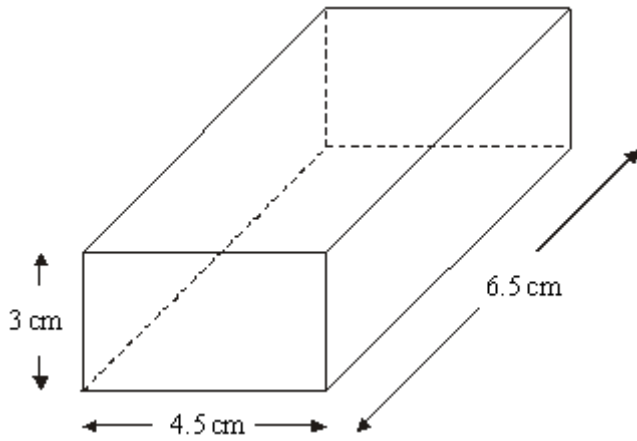


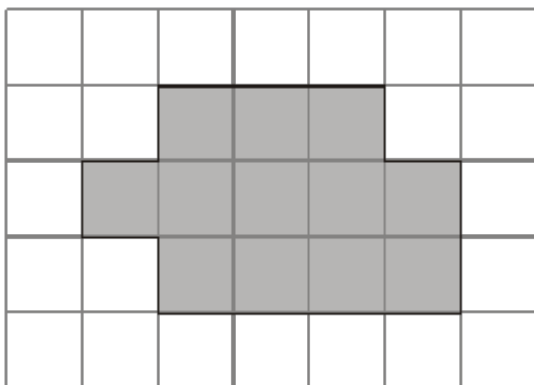
Diagram **NOT** accurately drawn

Calculate the volume of the cuboid.

..... cm<sup>3</sup>

**(Total 2 marks)**

**Q18.**



The diagram shows a shaded shape drawn on a centimetre grid.

(a) Work out the perimeter of the shaded shape.

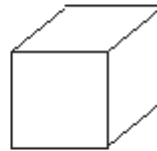
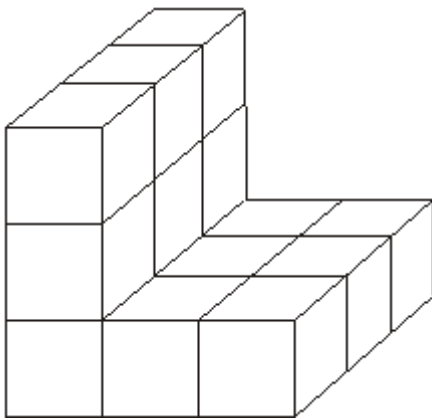
..... cm

(1)

- (b) Work out the area of the shaded shape.  
State the units of your answer.

.....

(2)



represents  
1 cm<sup>3</sup>

Diagrams **NOT** accurately drawn

Here is a solid prism made of centimetre cubes.

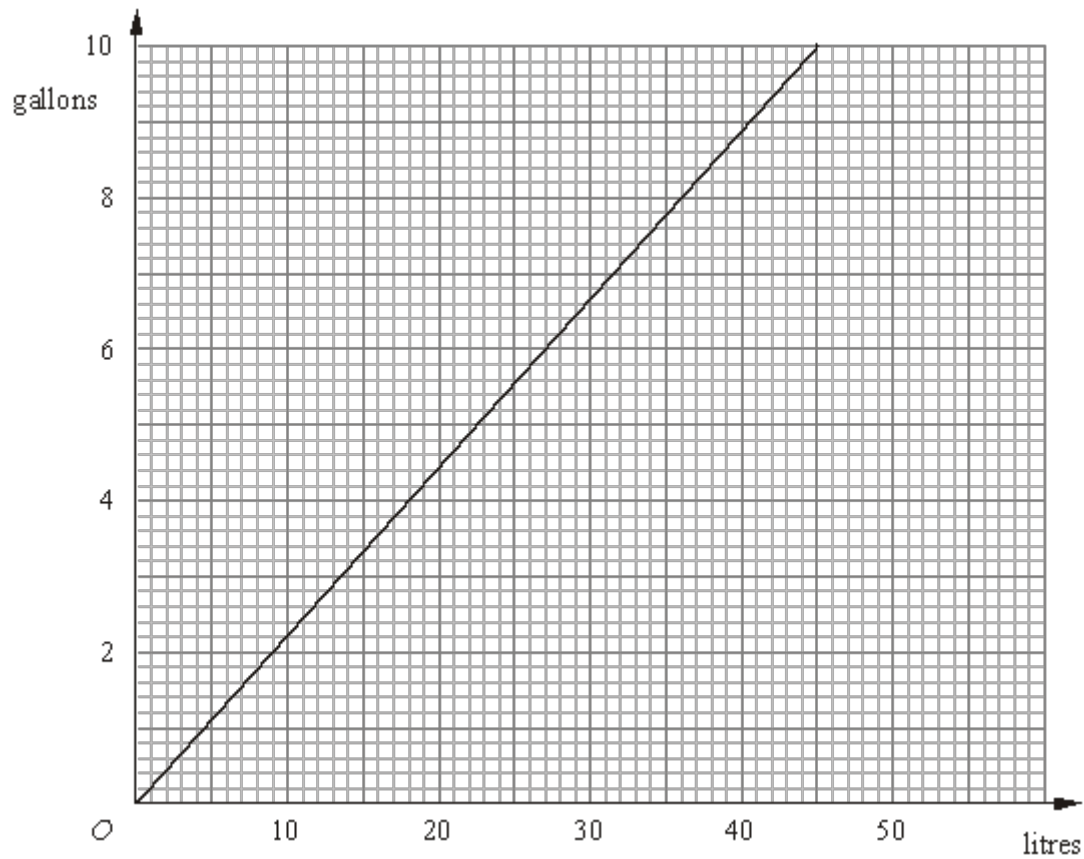
- (c) Find the volume of the solid prism.

..... cm<sup>3</sup>

(2)

(Total 5 marks)

**Q19.** The graph can be used to convert between gallons and litres.



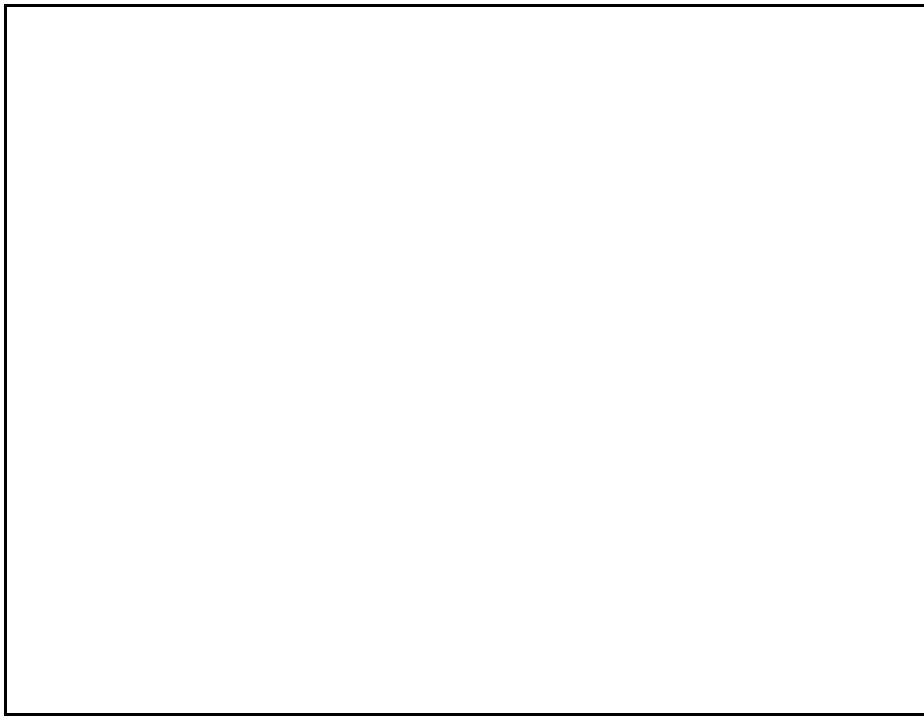
The diagram shows a central heating oil tank.



The oil tank is in the shape of a cylinder of length 180 cm and radius 60 cm.

The oil tank contains 200 gallons of oil.

- (a) Is the oil tank more or less than  $\frac{1}{2}$  full?

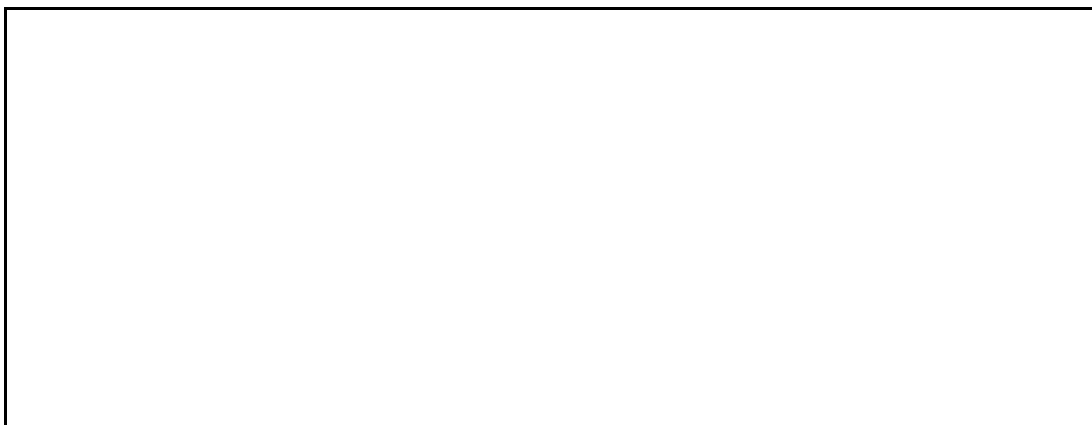


.....

(5)

The oil has a density of  $0.85 \text{ g/cm}^3$ .

(b) Work out, in kg, the mass of the oil in the tank.

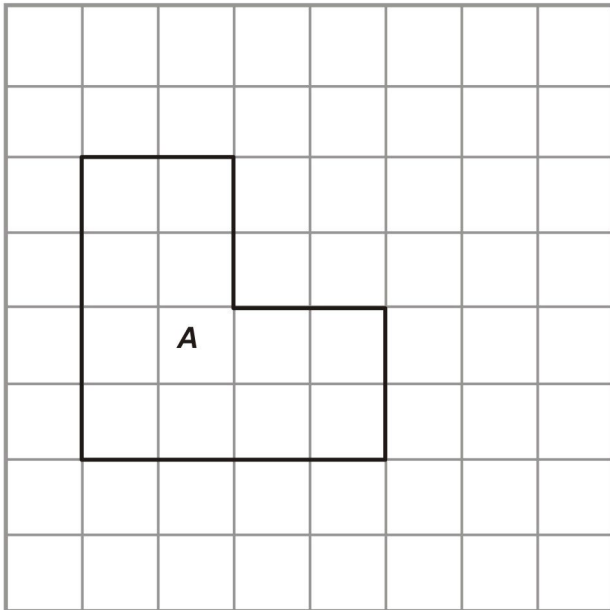


..... kg

(3)

(Total 8 marks)

Q20.



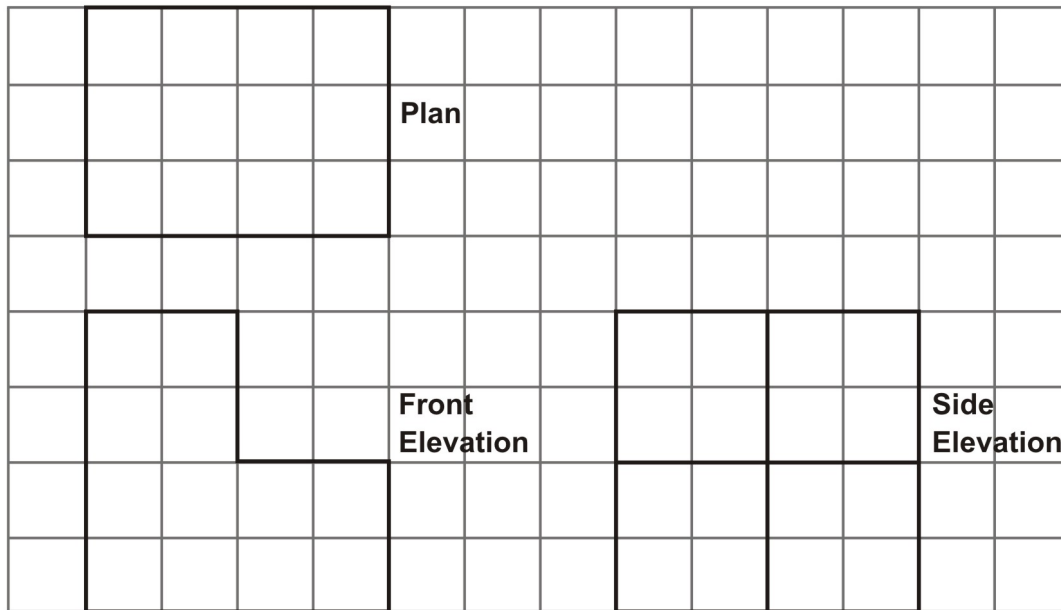
Shape *A* has been drawn on a centimetre grid.

- (a) Find the perimeter of shape *A*.

.....

(1)

The diagram shows the plan, the front elevation and the side elevation of a 3-D solid made from one centimetre cubes drawn full size.



(b) Find the volume of the 3-D shape.

.....

(4)  
(Total 5 marks)

M1.

|                                    | Working                  | Answer | Mark | Additional Guidance                                     |
|------------------------------------|--------------------------|--------|------|---|
| (a)                                | $23 \times 10 \times 12$ | 2760   | 2    | <b>M1</b> for $23 \times 10 \times 12$<br><b>A1</b> cao |
| (b)                                | $2760 \times 0.8$        | 2208   | 2    | <b>M1</b> for ' $2760$ ' $\times 0.8$<br><b>A1</b> f.t. |
| <b>Total for Question: 4 marks</b> |                          |        |      |   |

M2.

| Working                            | Answer | Mark | Additional Guidance   |
|------------------------------------|--------|------|---|
| $6 \times 2$                       | 12     | 2    | <b>M1</b> for $6 \times 2$ or answer of 11 or 13 or 6 seen<br><b>A1</b> cao |
| <b>Total for Question: 2 marks</b> |        |      |   |

M3.

| Working                | Answer | Mark | Additional Guidance  |
|------------------------|--------|------|--|
| $5 \times 7 \times 12$ | 420    | 2    | <b>M1</b> for $5 \times 7 \times 12$ <b>A1</b> for 420 cao |

|                                    |
|------------------------------------|
| <b>Total for Question: 2 marks</b> |
|------------------------------------|

**M4.**

|                                    | Working   | Answer | Mark | Additional Guidance   |
|------------------------------------|---|--------|------|---|
| (a)                                | $5^3 - 5 \times 3 \times 3$<br>$125 - 45$<br><br>$(5 \times 5 - 3 \times 3) \times 5$<br>$(25 - 9) \times 5$<br>$16 \times 5$ | 80     | 2    | <b>M1</b> for attempt to find volume of cube (e.g. $5 \times 5 \times n$ where $n \neq 6$ ) and subtract volume of the hole (e.g. $3 \times 3 \times n$ where $n \neq 6$ ) (needs to be dimensionally correct)<br><b>A1</b> cao<br><b>Alternative method</b><br><b>M1</b> for attempt to find area of the cross section and multiply by the depth of the prism (depth $\neq 6$ )<br><b>A1</b> cao |
| (b)                                | $64 \div 80$  | 0.8    | 2    | <b>M1</b> ft $64 \div "80"$<br><b>A1</b> ft (to 2 sf or better)   |
| <b>Total for Question: 4 marks</b> |   |        |      |   |

**M5.**

| Working                            | Answer | Mark | Additional Guidance                                      |
|------------------------------------|--------|------|--|
| $18 \times 5.8 =$                  | 104.4  | 2    | <b>M1</b> for $18 \times 5.8$<br><b>A1</b> for 104.4 cao |
| <b>Total for Question: 2 marks</b> |        |      |  |



M6.

| Answer                             | Mark | Additional Guidance                               |
|------------------------------------|------|---|
| 12                                 | 2    | <b>B2</b> for 12 cao<br>( <b>B1</b> for 10 or 11) |
| <b>Total for Question: 2 marks</b> |      |   |

M7.

| Working                            | Answer      | Mark | Additional Guidance   |
|------------------------------------|-------------|------|---|
| 45                                 | 200 minutes | 6    | <b>M1</b> for $120 \times 20 \times 30 (= 7200)$<br><b>M1</b> for "72000" $\div$ 120<br><b>A1</b> for 600 cm <sup>3</sup> min oe<br><br><b>M1</b> for $\frac{1}{2} \times (120 + 80) \times 40 \times 30 (= 120000)$<br><b>M1</b> for "120000" $\div$ "600"<br><b>A1</b> for 200 minutes or 3 hours 20 mins oe<br>SC B1 for 4 hours |
| <b>Total for Question: 6 marks</b> |             |      |   |

M8.

| Working  | Answer | Mark | Additional Guidance  |
|--|--------|------|--|
| $25 \div 5$<br>$15 \div 5$<br>$12 \div 5$<br>$5 \times 3 \times 2$ | No     | 4    | <b>M2</b> for 5, 3, 2 (could be on the diagram)<br>(M1 for $25 \div 5$ or $15 \div 5$ or $12 \div 5$ )<br><b>C2</b> QWC: No as only 30 whole bricks will fit oe<br>statement <b>or</b> No and dimensions of a possible box<br>given <b>or</b> No as only 2 layers of 15 will fit oe<br>(C1 for correct conclusion from candidate's working<br>even if incorrect eg vol: $4500 \div 125 = 36$ so yes) |
| <b>Total for Question: 4 marks</b>                                 |        |      |  |

M9.

| Working   | Answer                  | Mark | Additional Guidance   |
|---|-------------------------|------|---|
| Unknown length = $x + 3 - x - x =$<br>$3 - x$<br><b>Cross-sectional area</b><br>$= (x + 3)(x - 1) + (x + 3)(x - 1) +$<br>$(3 - x)(2x)$<br>$= x^2 + 2x - 3 + x^2 + 2x - 3 + 6x - 2x^2$<br>$= 4x - 6 + 6x$<br>$= 10x - 6$<br><b>Volume</b><br>$= (10x - 6)(x + 3)$<br>$= 10x^2 + 24x - 18$<br><b>OR</b><br>Unknown length = $x + 3 - x - x =$<br>$3 - x$<br><b>Volume</b><br>$= (x + 3)(x + 3)(x - 1) +$<br>$(x + 3)(x + 3)(x - 1) +$<br>$(2x)(3 - x)(x + 3)$<br>$= (10x - 6)(x + 3)$<br>$= 10x^2 + 24x - 18$ | $10x^2 + 24x$<br>$- 18$ | 4    | <b>B1</b> for $x + 3 - x - x$ oe or $3 - x$<br>seen<br>or $x - 1 + 2x + x - 1$ oe or $4x - 2$<br>seen<br><b>M1</b> for correct expression for 1 area<br>from cross-section or for 1 volume<br>of cuboid(s)<br>(brackets not needed)<br><b>M1</b> for correct method for total<br>cross-sectional area<br>OR at least 2 volumes added<br>OR volume of surrounding cuboid –<br>at least 1 vol<br>(brackets needed)<br><b>A1</b> for $10x^2 + 24x - 18$ oe |

|  |  |  |
|--|--|--|
| <p><b>OR</b><br/>Unknown length = <math>(2x - 2) + 2x = 4x - 2</math><br/><b>Surrounding area</b><br/><math>= (4x - 2)(x + 3) = 4x^2 + 10x - 6</math><br/>So <math>A = 4x^2 + 10x - 6 - 4x^2 = 10x - 6</math><br/><br/>So <math>V = (10x - 6)(x + 3) = 10x^2 + 24x - 18</math></p> <p><b>OR</b><br/>Unknown length = <math>(2x - 2) + 2x = 4x - 2</math><br/><b>Surrounding volume</b><br/><math>= (4x - 2)(x + 3)(x + 3)</math><br/><math>V = (4x - 2)(x + 3)(x + 3) - 2x(2x)(x + 3)</math></p> |  |  |
| <b>Total for Question: 4 marks</b>   |  |  |

**M10.**

|                                    | Answer              | Mark | Additional Guidance  |
|------------------------------------|---------------------|------|--|
| (a)                                | 12                  | 1    | <b>B1</b> cao  |
| (b)                                | 200 cm <sup>3</sup> | 3    | <b>M1</b> for $10 \times 4 \times 5$<br><b>A1</b> cao<br><b>B1</b> (indep) for cm <sup>3</sup> |
| <b>Total for Question: 4 marks</b> |                     |      |  |

M11.

|                                    | Working   | Answer  | Mark | Additional Guidance  |
|------------------------------------|---|---------|------|--|
| (a)                                | $64 \times 75\text{m} = 4800\text{m}$<br>$4800 \div 1000$                   | 4.8 km  | 3    | <b>M1</b> for $64 \times 75$<br><b>M1</b> for " $64 \times 75$ " $\div$ 1000<br><b>A1</b> cao  |
| (b)                                | $\text{Vol} = 25 \times 10 \times 2.5 = 625\text{m}^3$<br>$625 \times 1000$ | 625 000 | 3    | <b>M1</b> for attempt at finding the volume<br><b>M1</b> for attempt to find the number of l in $1\text{m}^3$ or $1\text{m}^3 = 1000\text{l}$<br><b>A1</b> cao |
| <b>Total for Question: 6 marks</b> |   |         |      |  |

M12.

|                                    | Working   | Answer | Mark | Additional Guidance  |
|------------------------------------|---|--------|------|--|
| (a)                                | $\pi \times 4^2 \times 10$<br>$= 502.65$<br>$(502-503)$ | 503    | 2    | <b>M1</b> $\pi \times 4^2 \times 10 (= 502.65)$<br><b>A1</b> 502-503<br><b>SC B1</b> $\pi \times 8^2 \times 10$  |
| (b)                                | $"502.65" \times 0.6$<br>$= 301.59$                     | 302    | 2    | <b>M1</b> " $502.65$ " $\times$ 0.6<br><b>A1</b> 300 – 302 ft on " $502.65$ " to an answer which would be correct on ft if rounded or truncated to 3SF |
| <b>Total for Question: 4 marks</b> |   |        |      |  |

M13.

| Working                                | Answer | Mark | Additional Guidance   |
|--|--------|------|---|
| $\pi x^2(2x) = \frac{1}{3} \pi(x)^2 h$ | $6x$   | 3    | <p><b>M1</b> for a correct volume formula in terms of <math>x</math>, e.g.<br/> <math>\pi x^2(2x)</math> or <math>\frac{1}{3} \pi x^2 h</math></p> <p><b>A1</b> for <math>\pi(2x) = \frac{1}{3} \pi h</math> or <math>3\pi x^2(2x) = \pi x^2 h</math> or<br/> <math>x^2(2x) = \frac{1}{3} x^2 h</math> (or better)</p> <p><b>A1</b> for <math>6x</math> cao</p> |
|  |        |      | <b>Total for Question: 3 marks</b>  |

M14.

|     | Answer | Mark | Additional Guidance                              |
|-----|--------|------|--|
| (a) | 24     | 1    | <b>B1</b> cao                                    |
| (b) | 15     | 1    | <b>B1</b> cao                                    |
| (c) | 20     | 2    | <b>B2</b> cao<br>( <b>B1</b> for 10 or 16 or 15) |
|     |        |      | <b>Total for Question: 4 marks</b>               |

M15.

|                                    | Working   | Answer | Mark | Additional Guidance   |
|------------------------------------|---|--------|------|---|
| (a)                                | $V_c = \pi \times 3^2 \times 30$<br>$V_k = \frac{2}{3} \times \pi \times 3^3$<br>$V_c + V_k = 288\pi$ | 905    | 3    | <b>M1</b> $V_c = \pi \times 3^2 \times 30$ (= 848.2...)<br><b>or</b> $V_k = \frac{2}{3} \times \pi \times 3^3$ (= 56.54...)<br><b>M1</b> (dep) $V_c + V_k$ (may be implied)<br><b>A1</b> 904 – 905 inclusive  |
| (b)                                | $\frac{4}{3} \times \pi \times R^3 = 500$<br>$R^3 = \frac{500 \times 3}{4 \times \pi}$                | 4.92   | 3    | <b>M1</b> for $\frac{4}{3} \times \pi \times R^3 = 500$<br><b>M1</b> for correct process to reach<br>$R^3 = \frac{500 \times 3}{4 \times \pi}$ oe (= 119.3...) <b>or</b> $\sqrt[3]{\frac{500 \times 3}{4 \times \pi}}$<br>(implies 1 <sup>st</sup> <b>M1</b> )<br><b>A1</b> 4.915-4.925 |
| <b>Total for Question: 6 marks</b> |   |        |      |   |

**M16.**

|                                    | Answer       | Mark | Additional Guidance |
|------------------------------------|--------------|------|---------------------|
| (a)                                | 14           | 1    | <b>B1</b> cao       |
| (b)                                | 6            | 1    | <b>B1</b> cao       |
| (c)                                | (Reflection) | 1    | <b>B1</b> cao       |
| (d)                                | 12           | 1    | <b>B1</b> cao       |
| <b>Total for Question: 4 marks</b> |              |      |                     |

M17.

| Answer                             | Mark | Additional Guidance   |
|------------------------------------|------|---|
| 87.75                              | 2    | <b>M1</b> for $3 \times 4.5 \times 6.5$ seen or implied eg from answer of 87.7 or 87.8 or 88 (with no other working shown)<br><b>A1</b> for 87.75 cao |
| <b>Total for Question: 2 marks</b> |      |   |

M18.

|                                    | Answer             | Mark | Additional Guidance  |
|------------------------------------|--------------------|------|--|
| (a)                                | 16                 | 1    | <b>B1</b> cao  |
| (b)                                | 12 cm <sup>2</sup> | 2    | <b>B1</b> for 12 cao, <b>B1</b> (indep) for cm <sup>2</sup>                  |
| (c)                                | 15                 | 2    | <b>M1</b> for $5 \times 3$<br><b>A1</b> cao [SC: <b>B1</b> for 10, 13 or 14] |
| <b>Total for Question: 5 marks</b> |                    |      |  |

M19.

|  |  | Working | Answer | Mark | Additional Guidance |
|--|--|---------|--------|------|---------------------|
|--|--|---------|--------|------|---------------------|

|                                    |     |  |       |   |   |
|------------------------------------|-----|--|-------|---|---|
| FE                                 | (a) | <p>1 gallon = 4.54 litres,<br/>200 gallons = 908 litres<br/>= 908000 cm<sup>3</sup><br/>Vol of tank<br/><math>60^2 \times \pi \times 180 =</math><br/>2035752.04..cm<sup>3</sup></p> <p>908000 &lt; 1017876.02</p> <p><b>OR</b></p> <p>Vol of tank<br/><math>60^2 \times \pi \times 180 =</math><br/>2035752.04..cm<sup>3</sup><br/>Half vol of tank<br/>= 1017876.02 cm<sup>3</sup><br/>= 1017.876...litres</p> <p><math>1017.876 \div 4.54 = 224</math><br/>gallons</p> <p><math>224 &gt; 200</math></p> | No    | 5 | <p>Response may convert into gallons, litres, or cm<sup>3</sup></p> <p>Calculations may be performed in different orders</p> <p><b>M1</b> Using formulae to find volume of tank</p> <p><b>B1</b> Converts between litres and cubic centimetres</p> <p><b>M1</b> reads off graph for 1l, 2l , 4l, 5l or 10 litres within tolerance (4.4 – 4.6)</p> <p><b>A1</b> Answer in cm<sup>3</sup>, litres or gallons</p> <p><b>C1</b> Decision and reason <b>QWC:</b><br/><b>Decision should be stated, with appropriate supporting statement</b></p> |
|                                    | (b) | <p>"908000" cm<sup>3</sup> × 0.85 g/cm<sup>3</sup><br/>= 771800 g</p>  | 771.8 | 3 | <p><b>M1</b> "908000" × 0.85</p> <p><b>M1(dep)</b> 771800 ÷ 1000</p> <p><b>A1</b> 770 – 772</p>   |
| <b>Total for Question: 8 marks</b> |     |  |       |   |   |

M20.

|     | Working | Answer             | Mark | Additional Guidance  |
|-----|---------|--------------------|------|--|
| (a) |         | 16 cm              | 1    | <b>B1</b> cao (units included)   |
| (b) |         | 48 cm <sup>3</sup> | 4    | <p><b>M1</b> 3-D drawing or sketch</p> <p><b>M1</b> <math>4 \times 4 \times 2</math> and <math>2 \times 2 \times 4</math> / <math>4 \times 4 \times 4</math> and <math>2 \times 2 \times 4</math></p> <p><b>M1</b> adding or subtracting</p> <p><b>A1</b> cao (units included)</p> |



**Total for Question: 5 marks**

**E1.** This question was answered well. Over 85% of candidates gained 1 or more marks for their answers. Most candidates could find the volume of the cuboid though some attempts at finding the total surface area were seen. In part (b) nearly all candidates either multiplied or divided their answer to part (a) by 0.8. Those who multiplied were able to access both marks for this part. Full marks for the question were awarded to over a half of the candidates entered for this examination.

**E2.** This standard question on finding the volume of a prism by counting cubes was not well understood with a success rate of only 45%. In 9% of cases candidates found the volume of the front face, or miscounted the volume by 1 cube.

**E3.** A well understood topic that was well understood though a minority of candidates did try to find the surface area rather than the volume of the cuboid.

**E4.** Fully correct answers to this question were only given by 23% of candidates. In part (a) it was common to see the volume of the 5cm cube being given correctly but then incorrect calculations for the hole were frequently seen. Some candidates thought the hole was a 3 cm cube and not a square prism with length 5cm. Where candidates tried to subtract two sensible volumes they were awarded a mark, however it was quite common to see candidates try to subtract  $9\text{cm}^2$  away from  $125\text{cm}^3$  and therefore achieve no marks.

In part (b) full marks were awarded for dividing the mass of 64 grams by the volume calculated in part (a) and 39% of candidates scored 2 marks usually for doing this. A large number of candidates divided volume by mass or multiplied mass and volume and so gained no credit. It was disappointing to see 39% of candidates gaining no marks at all in this question.

- E5.** Candidates should have found this to be a simple application of the formula for working out the volume of a prism, given on page 2 of the question paper. Two thirds of candidates were awarded both marks.

Unfortunately some candidates who wrote down " $18 \text{ cm}^2 \times 5.8 \text{ cm}$ " in the working space then proceeded to work out " $18^2 \times 5.8$ " revealing an apparent lack of understanding of the notation used for the area of cross section. Some candidates appeared to be trying to work out surface areas.

- E6.** Counting centimetre cubes, including 2 hidden cubes, was the approach expected of candidates in this question. A large proportion of the candidates attempted to do this but accuracy was not a strong point and "9", "10", "11" and "13" were frequently seen. 47% of candidates scored both marks in this question with a further 5% gaining 1 mark. Many candidates attempted to calculate the volume by working out lengths, sometimes more than 3, and multiplying them together.

##

The most successful candidates structured their working clearly, often annotating the diagram to show different sections to match their calculations. Some identified that as the trough was a prism, it was not essential to consider volume but worked with the cross-section areas instead. Large numbers with zeros led to many arithmetical errors and many candidates did not recognise that they had to consider the rate of leakage. These errors along with problems converting between minutes and hours meant that many candidates presented final answers which were far too large. Candidates need to be encouraged to make use of estimation and consider the reasonableness of any answer reached. Perhaps most importantly, candidates need to practice solving unstructured problems and compare the efficiency of a variety of approaches so that they can select appropriate methods to use.

##

This was another QWC question. Candidates who adopted a practical approach to this question did well. Rather than moving straight to a volume calculation, which was the failing of many candidates, the best way was to consider lining up the cubes inside the box to find how many could be laid along each edge. But not only was the calculation needed, candidates then had to communicate a clear conclusion, which is why this question was flagged as being a QWC question. Many did, either by giving the maximum number of bricks that could be put in the box, giving the dimensions of a box that could fit them all, or suggesting that another layer was needed. Overall quite well answered. Centres need to be aware that practical approaches to Mathematics remain appropriate at KS4.

##

This was another question that required organisation as well as basic algebraic skills. There were many instances of addition and multiplication being confused and brackets being omitted leading to incorrect expansions. The majority of candidates attempted this question, with varying degrees of success. Over 38% of candidates were able to score at least 1 mark and often 2 marks. These 1 or 2 marks were generally awarded for finding at least one correct expression for a cross-sectional area or for a volume (brackets could be ignored) and/or for finding a correct expression for the total width of the shape or the height of the middle of the H.

Those who had a correct strategy for calculating the volumes were let down by their algebraic skills. Brackets were often missing when they were essential. It was rare to see a complete method leading to a correct formula. Methods chosen were varied from working out the cross section by dividing it into separate areas or working out the surrounding area and subtracting the "missing bits". Working with the area seemed to be preferred to working out volumes.

##

It was clear that many candidates mis-read the question, since "8" for the number of vertices or "6" for the number of sides were commonly seen. Some only counted the bold (seen) edges. In part (b) there were some attempts at finding the surface area, or the total of the edges ( $5 + 4 + 100$ ). Many stated " $10 \times 4 \times 5$ " but again poor arithmetic then resulted in the wrong answer. There was also a units mark for this question, but many candidates failed to spot that the units were needed, or perhaps were not used to giving them anyway. When the units were stated cm or cm<sup>2</sup> were more commonly seen than cm<sup>3</sup>.

**E12.** For a standard volume question this was poorly answered. Common errors included circumference  $\times$  height,  $k\pi r^2$  where  $k$  was usually 2 (from 2 ends?), 0.5 or 4. Some

candidates evaluated  $\pi \times 4^2$  as  $(\pi \times 4)^2$ .

Part (b) was generally well done with the vast majority of candidates multiplying their answer to part (a) by 0.6.

- E13.** Many candidates were able to score one mark for writing a correct formula for the volume of the cone or the volume of the cylinder in terms of  $x$ , and some were able to equate two correct formulae, but few could rearrange the equation accurately to find  $h$

$$\frac{2x}{\left(\frac{1}{3}\right)} = \frac{2}{3}x$$

in terms of  $x$ . A common error here was  $\left(\frac{1}{3}\right)$ . A small number of candidates were able to compare the two volume formulae and simply write down the answer without working.

- E14.** It is disappointing to have to report that only slightly more than half of all candidates achieved the marks in any part of this question. Errors include confusion between area and perimeter, and errors in simple counting of lines, squares or cubes. Even more able candidates were found to have errors in this question.

- E15.** In part (a), for the volume of the cylinder many used the diameter instead of the radius, others used the surface area. For the volume of the hemisphere – many did not divide by 2, others used  $4 \times \pi \times r^2$  and then divided by 2. Most candidates realised they had to add two answers together. Other errors in accuracy were through premature rounding. Just under 60% of candidates failed to gain any marks, about 16% of candidates gained full marks. In part (b) working was not always clear in this question and premature (or incorrect) rounding of values in responses where the working was sparse often cost candidates method marks that they might otherwise have gained.

Of those who made a reasonable attempt, many used  $\frac{4}{3} \pi r^2$  as their initial formula. Others got as far as  $R^3 = 119.3$  but then took the square root instead of cube root. Those

candidates that started by quoting an equation were the most successful. The correct answer was seen from just over 14% of candidates.

- E16.** There were many correct responses but a significant number of candidates confused perimeter with area and vice versa, scoring no marks. Around two thirds of the candidates got part (a) correct and/or part (b) correct.

In part (c) nearly all candidates got this correct with a few adding an extra square to give 4 squares in the top row.

In part (d) just under 60% got the correct volume. By far the most common error was to attempt to find the volume by multiplying a height by a width by a length, reaching 18 ( $3 \times 3 \times 2$ ) or even 8 ( $2 \times 2 \times 2$ ).

- E17.** It was surprising how many candidates gave an incorrect answer for this question. It was clear that many did not have calculators, and struggled to multiply the three figures together; many answers suggested that a significant number resorted to guessing the answer. Some attempted to add the numbers, suggesting they did not know how to calculate volume, or were trying to find the edge length.

- E18.** In parts (a) and (b), many candidates were confused in distinguishing between perimeter and area. Many gave 12 as their answer to part (a). In part (b), the omission of units was common, even when the area was correct. In part (c), many candidates successfully found the correct volume by working out  $5 \times 3$  or more usually by simply counting the cubes. The most common errors seen were either calculations of  $3 \times 3 \times 3 (= 27)$  or mistakes in counting methods leading to answers of 13 and 14, which gained 1 mark, and sometimes 12 which gained no credit.

