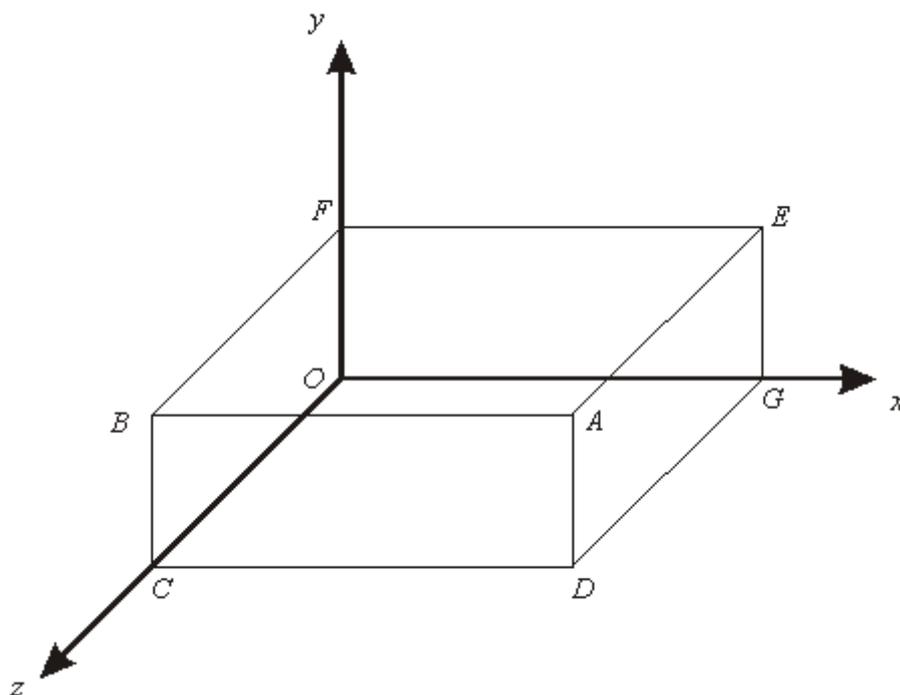


Q1.

Diagram **NOT** accurately drawn

The diagram shows a cuboid drawn on a 3-D grid.

Vertex A has coordinates $(5, 2, 3)$.

(a) Write down the coordinates of vertex E .

(..... , ,)

(1)

B and D are vertices of the cuboid.

(b) Work out the coordinates of the midpoint of BD .

(..... , ,)

(3)
(Total 4 marks)

Q2.

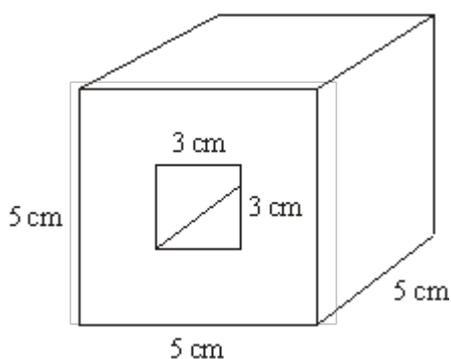


Diagram **NOT** accurately drawn

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.

..... cm³

(2)

The mass of the solid shape is 64 grams.

(b) Work out the density of the wood.

..... grams per cm^3

(2)
(Total 4 marks)

Q3. A water trough is in the shape of a prism.

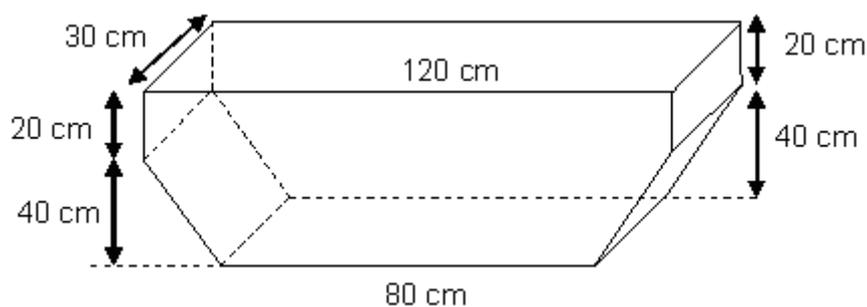


Diagram **NOT** accurately drawn

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.

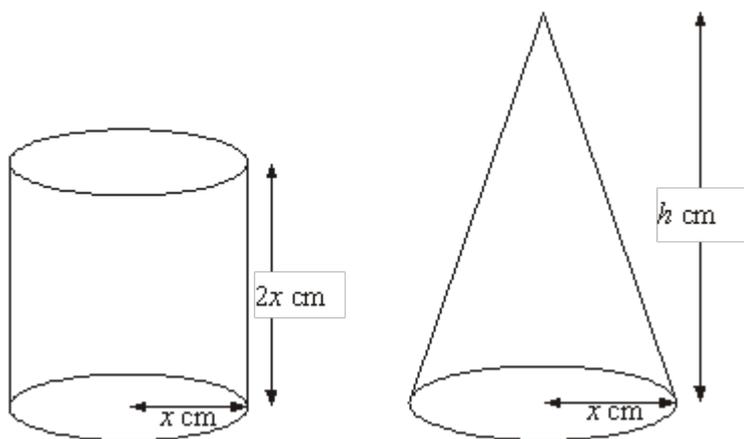
Water continues to leak from the trough at the same rate.

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

.....minutes

(Total 6 marks)

Q4.

Diagram **NOT** accurately drawn

A cylinder has base radius x cm and height $2x$ cm.

A cone has base radius x cm and height h 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)

Q5.

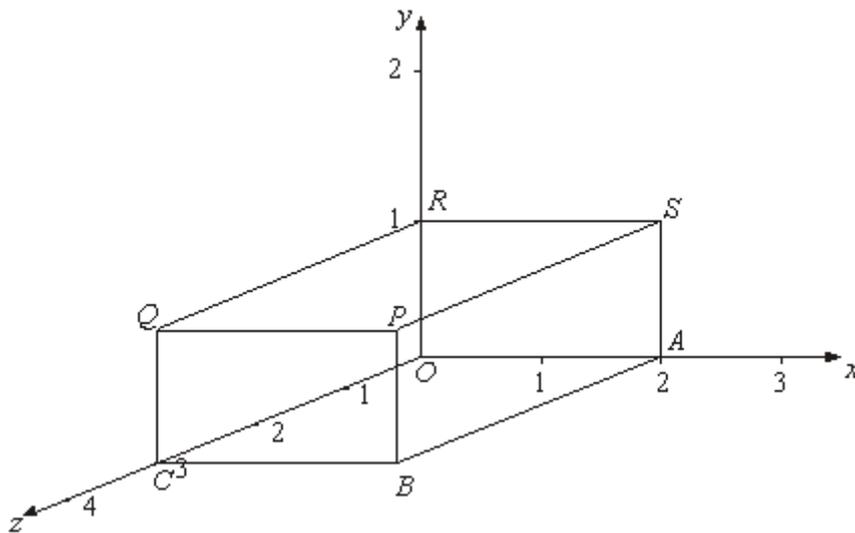


Diagram **NOT** accurately drawn

A cuboid is shown on a 3-dimensional grid.

(a) Write down the letter of the point with coordinates (2, 1, 0).

.....

(1)

(b) Write down the coordinates of the point *P*.

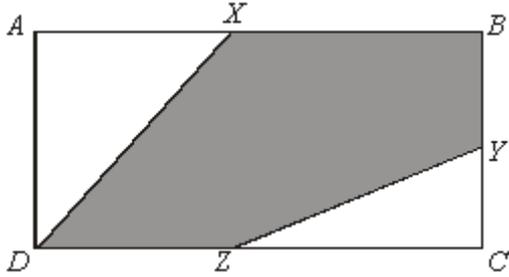
(..... , ,)

(1)

(Total 2 marks)

Q6.

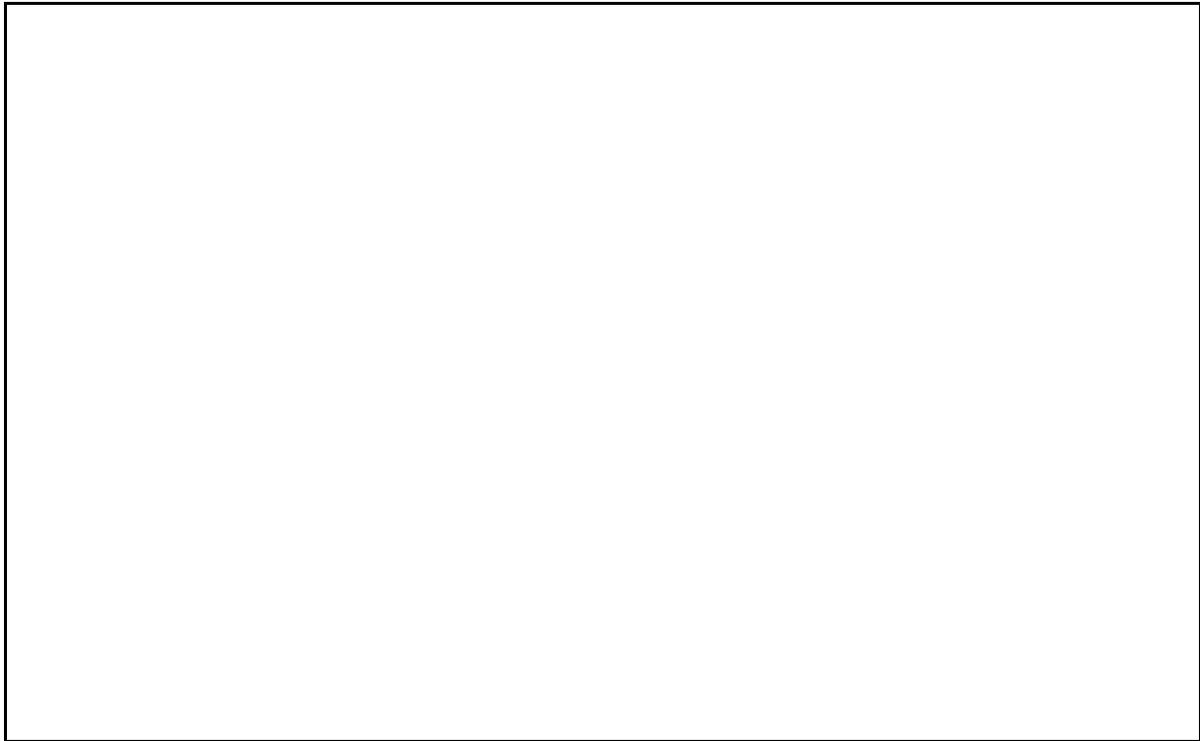
Diagram **NOT**
accurately drawn



$ABCD$ is a rectangle.
 X is the midpoint of AB .
 Y is the midpoint of BC .
 Z is the midpoint of CD .

What fraction of the total area of $ABCD$ is shaded?

Show clearly how you get your answer.



.....

(Total 4 marks)

M1.

	Working	Answer	Mark	Additional Guidance
(a)		(5, 2, 0)	1	B1 for (5, 2, 0) cao
(b)	$\left(\frac{0+5}{2}, \frac{2+0}{2}, \frac{3+3}{2}\right)$	$\left(\frac{5}{2}, 1, 3\right)$	3	<p>B1 for (0, 2, 3) or for (5, 0, 3) or for (0, 0, 3) seen or implied</p> <p>M1 for $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$</p> <p>A1 for $\left(\frac{5}{2}, 1, 3\right)$ oe</p> <p>B1 SC for (x, y, 3)</p> <p>Alternative mark scheme</p> <p>B1 for each coordinate correct.</p>
Total for Question: 4 marks				

M2.

	Working	Answer	Mark	Additional Guidance
(a)	$5^3 - 5 \times 3 \times 3$ $125 - 45$ $(5 \times 5 - 3 \times 3) \times 5$ $(25 - 9) \times 5$ 16×5	80	2	<p>M1 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)</p> <p>A1 cao</p> <p>Alternative method</p> <p>M1 for attempt to find area of the cross section and multiply by the depth of the prism (depth $\neq 6$)</p> <p>A1 cao</p>
(b)	$64 \div 80$	0.8	2	<p>M1 ft 64 \div "80"</p> <p>A1 ft (to 2 sf or better)</p>

Total for Question: 4 marks

M3.

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

M4.

Working	Answer	Mark	Additional Guidance
$\pi x^2(2x) = \frac{1}{3} \pi(x)^2 h$	$6x$	3	M1 for a correct volume formula in terms of x , e.g. $\pi x^2(2x)$ or $\frac{1}{3} \pi x^2 h$ A1 for $\pi(2x) = \frac{1}{3} \pi h$ or $3\pi x^2(2x) = \pi x^2 h$ or

			$x^2(2x) = \frac{1}{3} x^2 h$ (or better) A1 for $6x$ cao
Total for Question: 3 marks			

M5.

	Answer	Mark	Additional Guidance
(a)	S	1	B1 for S cao
(b)	(2, 1, 3)	1	B1 for (2, 1, 3) cao
Total for Question: 2 marks			

M6.

Working	Answer	Mark	Additional Guidance
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Let $AB = x$, $AD = y$

Area of rectangle = xy

4

M1 a full method to find the unshaded area and subtracting from 1

B1 area of $AXD = \text{area of } ABCD \div 4$

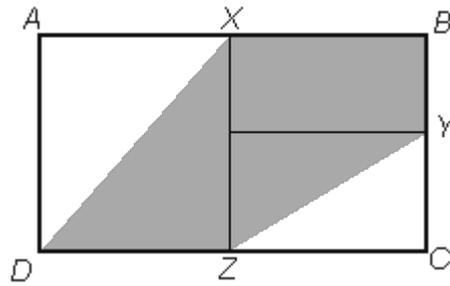
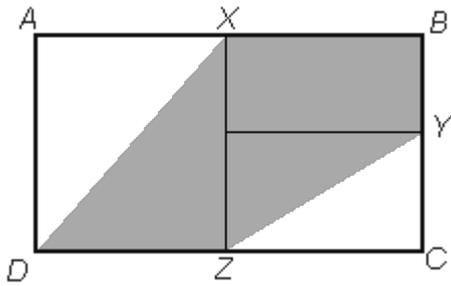
B1 area of $CYZ = \text{area of } ABCD \div 8$

A1 cao

OR

Diagram

M1 for dividing left into 2 congruent triangles
for dividing right into 4 congruent triangles

Total for Question: 4 marks

E1. Candidates realised what was required in this question but could not often carry out the execution of the task. In part (a) it was common to see a repetition of the coordinates of A whilst in (b) some candidates gained credit for realising that the z coordinate was in the same plane as $ABCD$ and so gained a mark for using 3.

E2. 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 9cm^2 away from 125cm^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.

##

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.

- E4.** 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.

- E5.** About three quarters of the candidates were able to gain at least one mark on this question. In part (a), a common incorrect answer for the point with coordinates $(2, 1, 0)$ was R , and in part (b), a common incorrect answer for the coordinates of P was $(2, 3, 1)$.