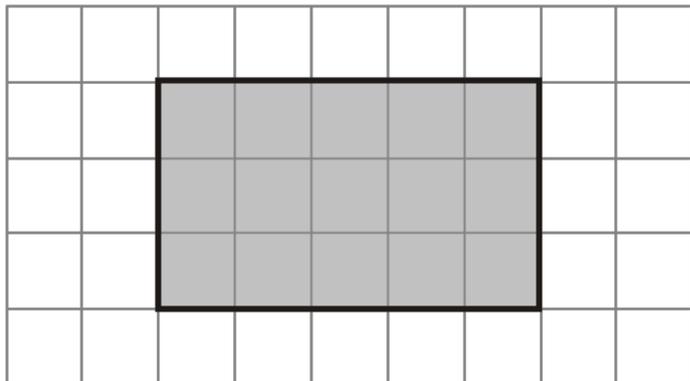


Q1. Here is a shaded shape on a grid of centimetre squares.



(a) Find the perimeter of the shaded shape.

..... cm

(1)

(b) Find the area of the shaded shape.

..... cm²

(1)

(c) Write down the mathematical name of the shaded shape.

.....

(1)

(Total 3 marks)

Q2.

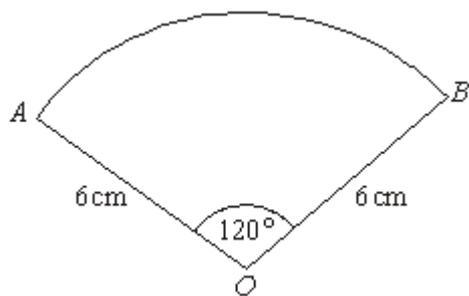


Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre O .

The radius of the circle is 6 cm .

Angle $AOB = 120^\circ$.

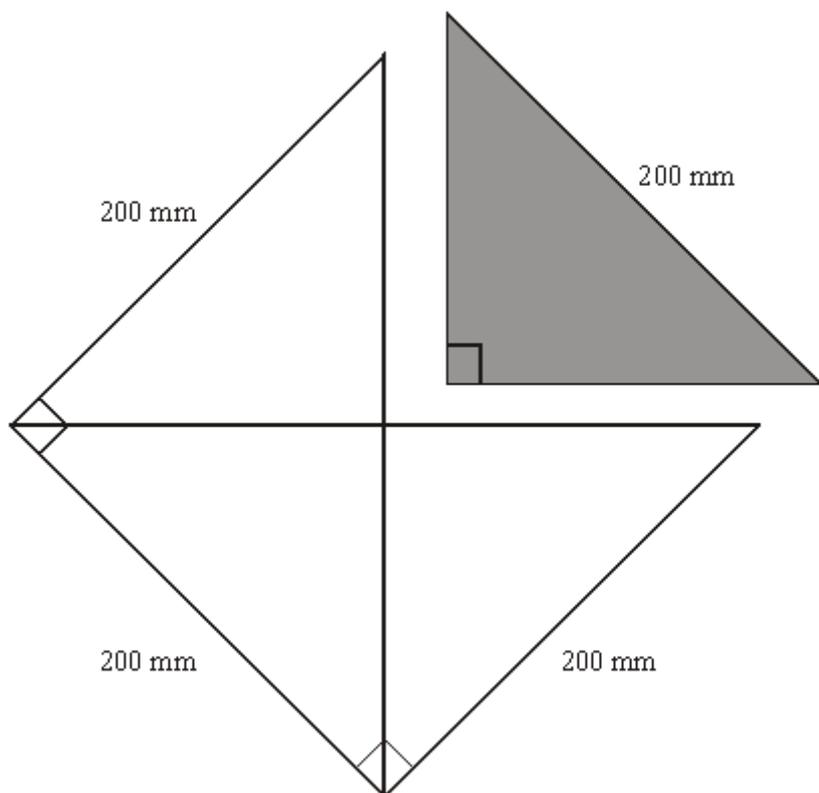
Work out the **perimeter** of the sector.

Give your answer in terms of π in its simplest form.

..... cm

(Total 3 marks)

- Q3.** The shaded isosceles right angled triangle is cut out of a large square of side 200 mm .



The squares are cut out of an A0 sized rectangular piece of paper which has dimensions 1189 mm by 841 mm.

More triangles are cut from the paper that is left after the squares have been cut out.

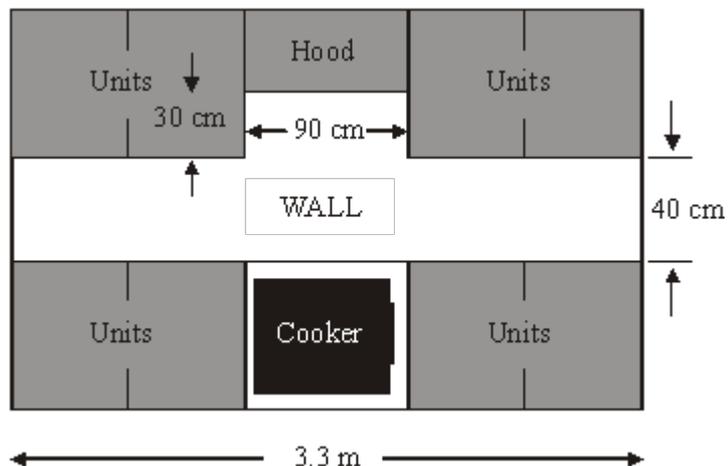
What is the greatest total number of these triangles that can be cut out of the large, rectangular sheet of paper?

..... triangles

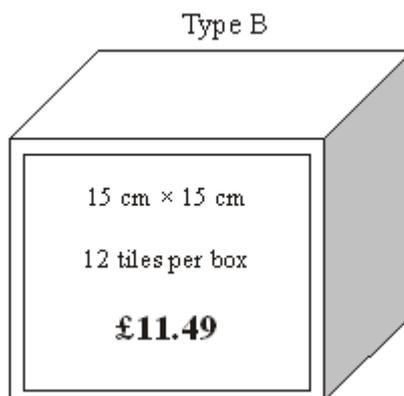
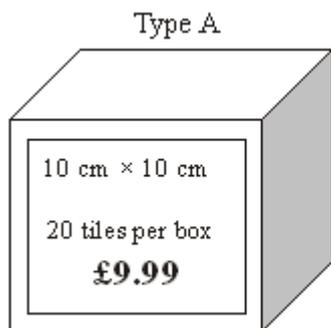
(Total 5 marks)

Q4. The diagram shows a wall in Jenny's kitchen.

Diagram **NOT** accurately drawn



Jenny wishes to tile this wall in her kitchen.
She chooses between the two types of tile shown below.



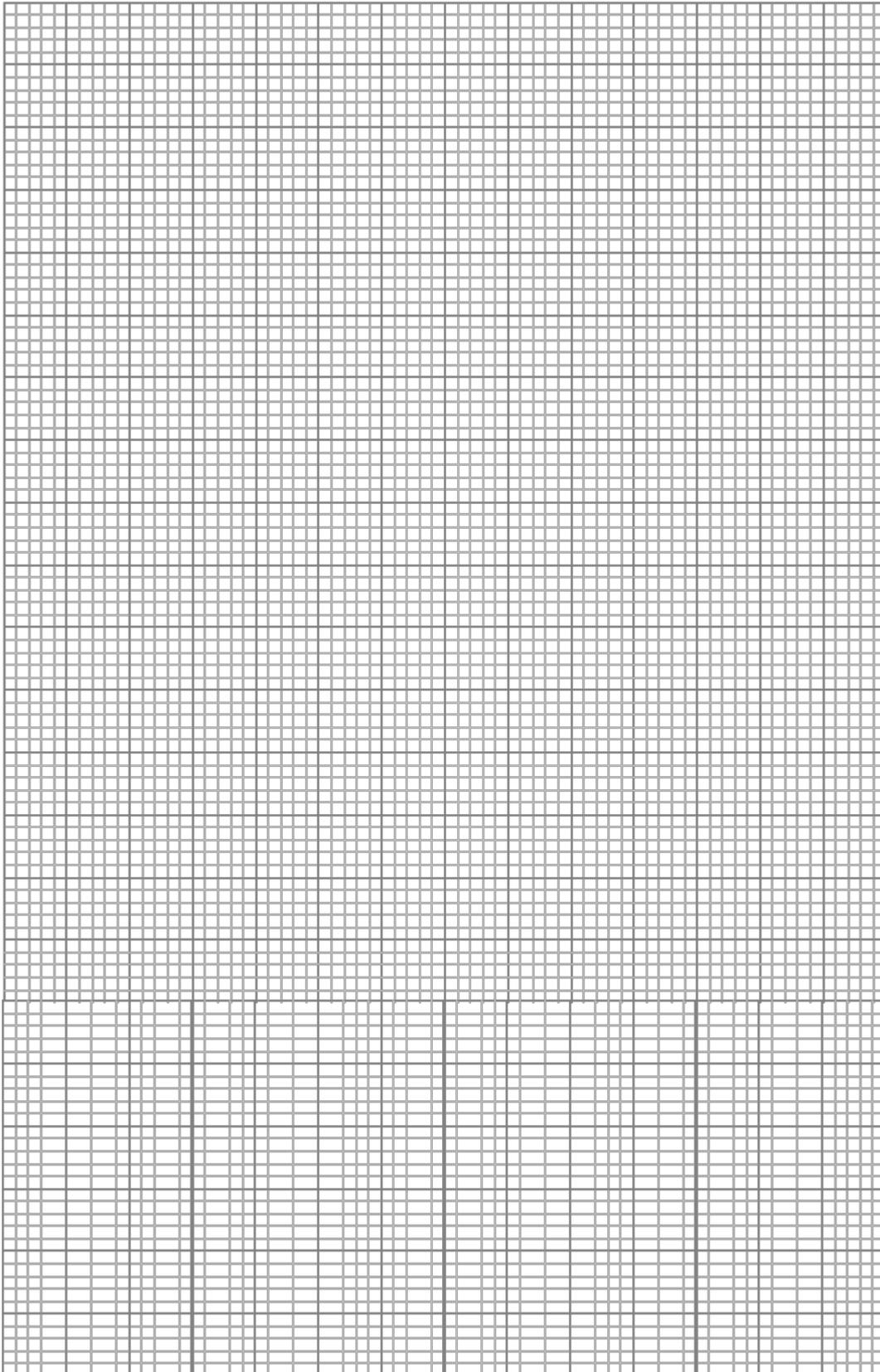
(a) Which tiles should Jenny use to spend the least amount of money on tiling the wall?

You must show all of your working.

(6)

A Box of Type A tiles has dimensions $10.5 \text{ cm} \times 10.5 \text{ cm} \times 21 \text{ cm}$.
Readypac wants to produce cartons which hold 12 boxes of Type A tiles, when full.

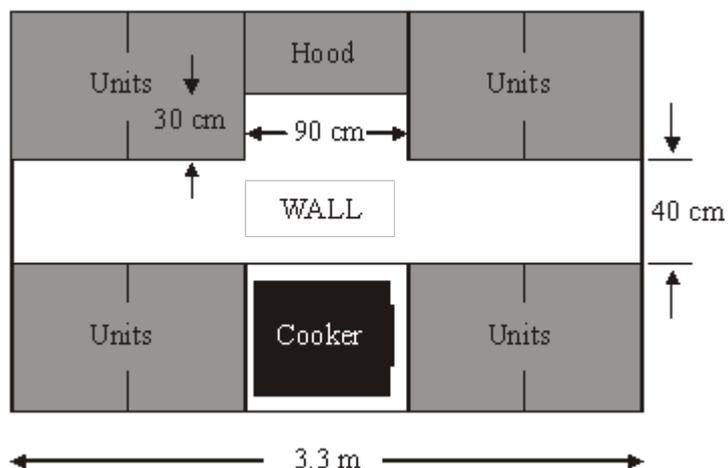
(b) On the grid below, design a net of a carton that Readypac could use.



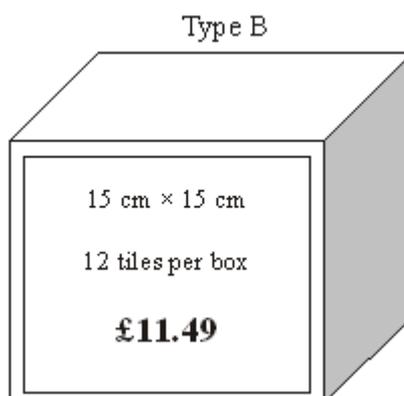
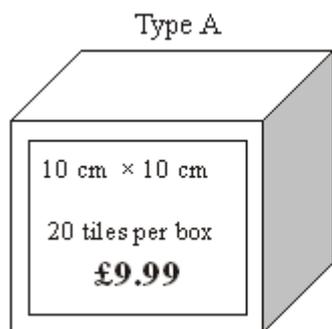
(3)
(Total 9 marks)

Q5. The diagram shows a wall in Jenny's kitchen.

Diagram **NOT** accurately drawn



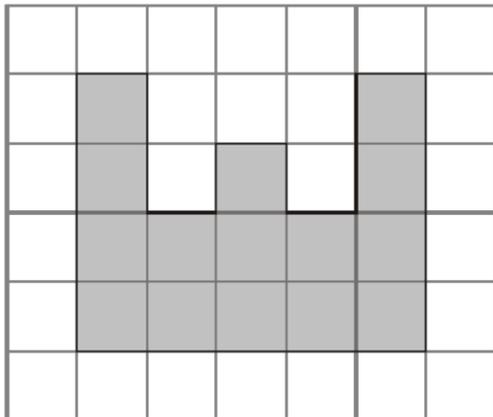
Jenny wishes to tile this wall in her kitchen.
She chooses between the two types of tile shown below.



Which tiles should Jenny use to spend the least amount of money on tiling the wall?
You must show all of your working.

(Total 6 marks)

Q6. 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.

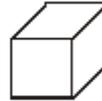
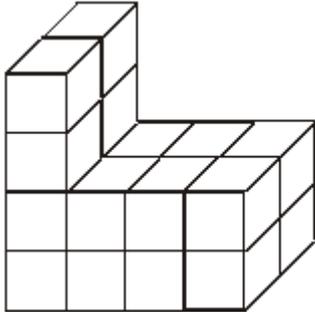
..... cm²

(1)

Here is a solid prism made from centimetre cubes.

(c) Find the volume of this prism.

Diagram **NOT** accurately drawn

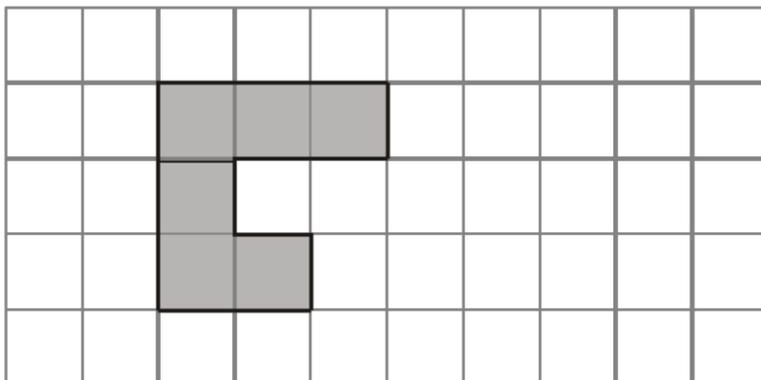


represents 1 cm³

..... cm³

(2)
(Total 4 marks)

Q7.



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

(a) Find the perimeter of the shaded shape.

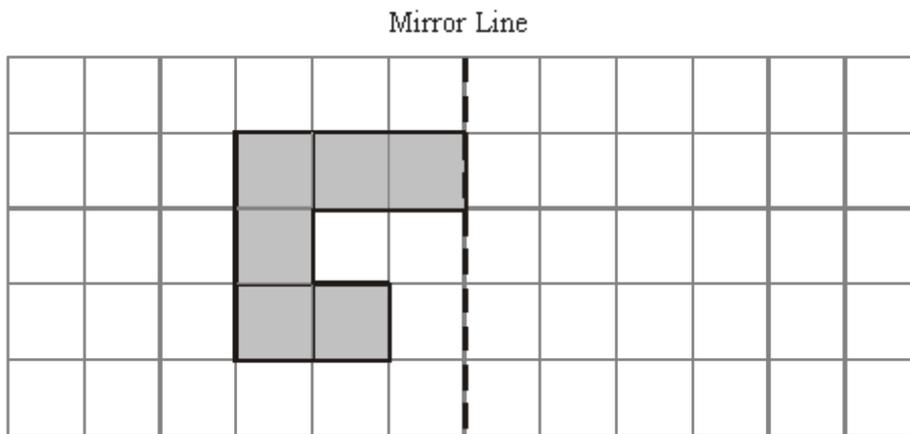
..... cm

(1)

(b) Find the area of the shaded shape.

..... cm²

(1)



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

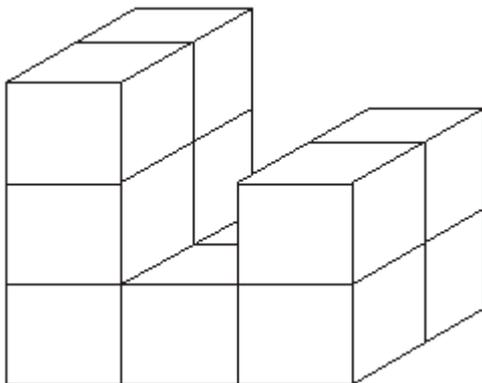


Diagram **NOT** accurately drawn

(1)

Here is a prism made of centimetre cubes.

(d) Find the volume of the prism.

..... cm³

(1)

(Total 4 marks)

Q8. Here is a rectangle.

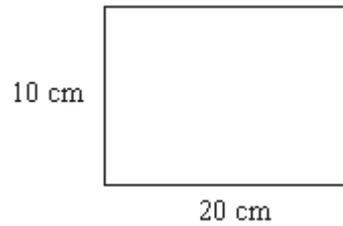


Diagram **NOT** accurately drawn

(a) Work out the perimeter of the rectangle.

..... cm

(2)

(b) Work out the area of the rectangle.

..... cm²

(2)

(Total 4 marks)

Q9. Here is a tile in the shape of a semicircle.

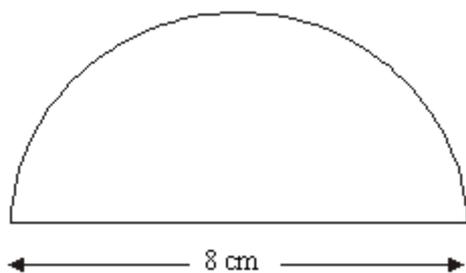


Diagram **NOT** accurately drawn

The diameter of the semicircle is 8 cm.

Work out the perimeter of the tile.
Give your answer correct to 2 decimal places.

..... cm

(Total 3 marks)

Q10.

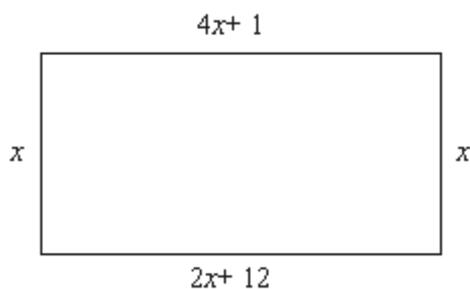


Diagram **NOT** accurately drawn

The diagram shows a rectangle.
All the measurements are in centimetres.

(a) Explain why $4x + 1 = 2x + 12$

.....

(1)

(b) Solve $4x + 1 = 2x + 12$

$x =$

(2)

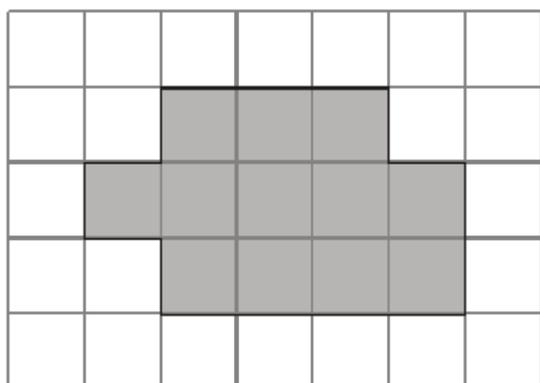
(c) Use your answer to part (b) to work out the perimeter of the rectangle.

..... cm

(2)

(Total 5 marks)

Q11.



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

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

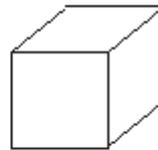
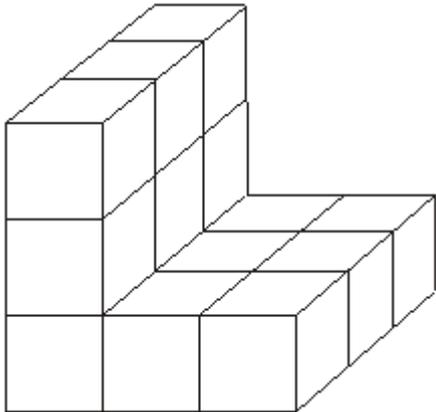
..... cm

(1)

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

.....

(2)



represents
1 cm³

Diagrams **NOT** accurately drawn

Here is a solid prism made of centimetre cubes.

(c) Find the volume of the solid prism.

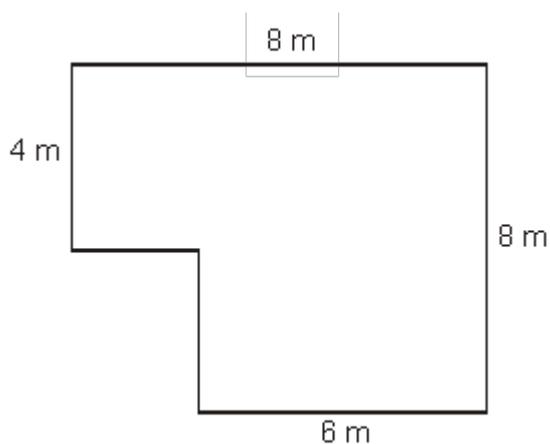
..... cm³

(2)

(Total 5 marks)

Q12.

Diagram **NOT**
accurately drawn



The diagram is a plan of the floor of Nikola's room.
All the angles are right angles.
Nikola is going to lay flooring to cover all the floor.

She can choose either carpet tiles or wood strips.

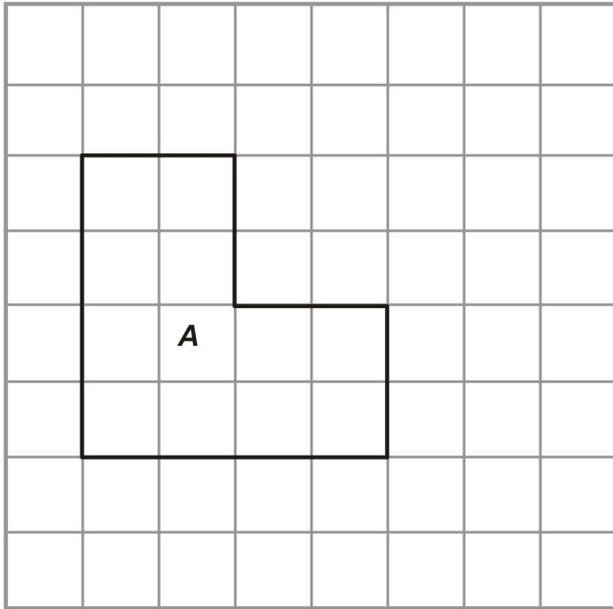
Carpet tiles come in packs of 32 and are square. They measure 50 cm by 50 cm.
Wood strips come in packs of 10 and are rectangular. They measure 2 m by 25 cm.

She only wants to use one type of flooring and buy as few packs as she can.
Which type of flooring should she choose?

.....

(Total 6 marks)

Q13.



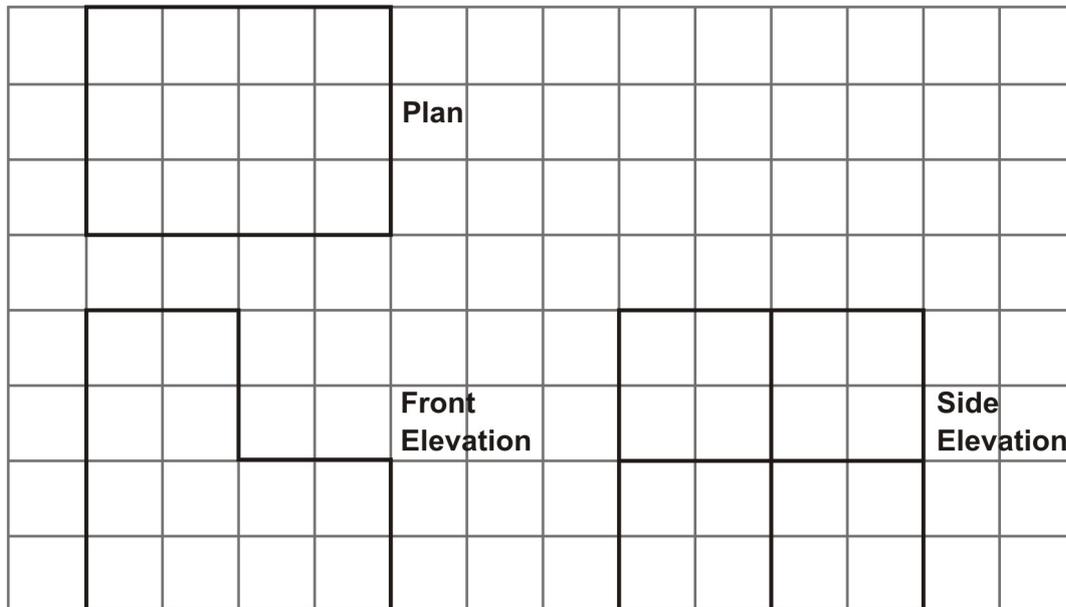
Shape *A* has been drawn on a centimetre grid.

- (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.

	Answer	Mark	Additional Guidance
(a)	16	1	B1 for 16 cao
(b)	15	1	B1 for 15 cao
(c)	rectangle	1	B1 for rectangle, quadrilateral, trapezium, parallelogram or oblong
Total for Question: 3 marks			

M2.

Working	Answer	Mark	Additional Guidance
$\frac{120}{360} \times \pi \times 2 \times 6$	$4\pi + 12$	3	<p>M1 for $\frac{120}{360} \times \pi \times 2 \times 6$ oe allow 3.14, 3.142, $\frac{22}{7}$ for π</p> <p>A1 for 4π or anything in the closed interval [12.56, 12.57], or $12\frac{4}{7}$ oe or $\frac{a\pi}{b}$ where a and b are integers with $a = 4b$</p> <p>A1 $4\pi + 12$ or $\pi 4 + 12$ oe</p> <p>SC (B2 for a fully correct, but unsimplified expression for the perimeter, including $\left(\frac{2\pi r}{3}\right) + 12$ or $\left(\frac{2\pi r}{3}\right) + 2r$)</p> <p>Or for any value in the closed interval [24.56, 24.57])</p>
Total for Question: 3 marks			

M3.

Working	Answer	Mark	Additional Guidance
$1189 \div 200$ or $891 \div 200$ $= 5$ and 4 or 20 squares $200^2 \div 2$ $= \sqrt{(200^2 \div 2)}$ $= 141.4$ Realising that another row of squares of side 141.4 fits or $891 \div 141.4 = 5$ squares	90	5	M1 for attempt to divide $1189 \div 200$ or $891 \div 200$ M1 for $200^2 \div 2$ M1 for $\sqrt{(200^2 \div 2)}$ M1 for realising that another row of squares of side 141.4 fits or $891 \div 141.4$ A1 cao for 90 triangles
			Total for Question: 5 marks

M4.

		Working	Answer	Mark	Additional Guidance
QWC (i, ii, iii) FE	(a)	Wall area = $330 \times 40 + 90 \times 30 = 13200 + 2700 = 15900 \text{ cm}^2$ Tile A area = $10 \times 10 = 100 \text{ cm}^2$ No of tiles = $15900 \div 100 = 159$ No of boxes needed = 8 ($20 \times 8 = 160$ tiles) $\text{£}9.99 \times 8 = \text{£}79.92$ Tile B area = $15 \times 15 = 225 \text{ cm}^2$	Tile A is the most economical	6	M1 for either 330×40 or 90×30 or 10×10 or 15×15 A1 for 15900 and (100 or 225) M1 for $15900 \div 100$ or $15900 \div 225$ A1 ft for 10 A boxes needed ($'15900' \div '100'$) $\div 20$ rounded up to nearest whole number) or 7 B boxes needed ($'15900' \div '225'$) $\div 12$ rounded up to nearest whole

	<p>No of tiles = $15900 \div 225 = 70(225 \times 70 = 15700) + 1$</p> <p>No of boxes needed = 6 ($12 \times 6 = 72$ tiles) but some tiles will need to be cut, so 7 boxes needed $\pounds 11.49 \times 7 = \pounds 80.43$</p> <p>OR</p> <p>$330 \div 10 = 33$ A tiles per long row</p> <p>$40 \div 10 = 4$ long rows</p> <p>$33 \times 4 = 132$ tiles</p> <p>$90 \div 10 = 9$ tiles per short row</p> <p>$30 \div 10 = 3$ short rows</p> <p>$9 \times 3 = 27$ tiles</p> <p>$132 + 27 = 159$ tiles</p> <p>No of boxes needed = 8 ($20 \times 8 = 160$ tiles)</p> <p>$\pounds 9.99 \times 8 = \pounds 79.92$</p> <p>$330 \div 15 = 22$ B tiles per long row</p> <p>$40 \div 15 = 3$ long rows (1 row of tiles will be cut)</p> <p>$22 \times 3 = 66$ A tiles</p> <p>$90 \div 15 = 6$ tiles per short row</p> <p>$30 \div 15 = 2$ short rows</p> <p>$6 \times 2 = 12$ tiles</p> <p>$66 + 12 = 78$ tiles</p> <p>No of boxes needed = 7 ($12 \times 7 = 84$ tiles)</p> <p>$\pounds 11.49 \times 7 = \pounds 80.43$</p>			<p>number)</p> <p>B1 for answers or $\pounds 79.92$ and $\pounds 80.43$ to justify the choice</p> <p>C1 for comment on the need to cut some Type B tiles QWC: Decision must be stated, with all calculations attributable</p> <p>OR</p> <p>M1 for $330 \div 10$ or $90 \div 10$ or $330 \div 15$ or $90 \div 15$</p> <p>A1 for (33 and 9) or (22 and 6)</p> <p>M1 for $33 \times 4 + 9 \times 3$ or $22 \times 3 + 6 \times 2$</p> <p>A1 ft for 10 A boxes needed ($'33 \times 4' \div '9 \times 3'$) $\div 20$ rounded up to nearest whole number) or for 7A boxes needed ($'22 \times 3' \div '6 \times 2'$) $\div 12$ rounded up to nearest whole number)</p> <p>B1 for answers or $\pounds 79.92$ and $\pounds 80.43$ to justify the choice</p> <p>C1 for comment on the need to cut some Type B tiles QWC: Decision must be stated, with all calculations attributable</p>
	(b) The carton can have dimensions	Net	3	<p>B1 for quoting a correct set of dimensions (could be simply on the diagram)</p> <p>M1 for a net showing 6 rectangles that could form a cuboid</p>
	42 cm \times 31.5 cm \times 21 cm or			
	63 cm \times 21 cm \times 21 cm or			

	84 cm × 31.5 cm × 10.5 cm or 63 cm × 42 cm × 10.5 cm or 126 cm × 21 cm × 10.5 cm		A1 for an accurate scale drawing or lengths labeled accurately
Total for Question: 9 marks			

M5.

	Working	Answer	Mark	Additional Guidance
QWC (ii, iii)	$330 \div 10 = 33$ A tiles per long row $40 \div 10 = 4$ long rows $33 \times 4 = 132$ tiles FE $90 \div 10 = 9$ tiles per short row $30 \div 10 = 3$ short rows $9 \times 3 = 27$ tiles $132 + 27 = 159$ tiles No of boxes needed $= 8$ ($20 \times 8 = 160$ tiles) $\pounds 9.99 \times 8 = \pounds 79.92$ $330 \div 15 = 22$ B tiles per long row $40 \div 15 = 3$ long rows (1 row of tiles will be cut) $22 \times 3 = 66$ A tiles $90 \div 15 = 6$ tiles per short row $30 \div 15 = 2$ short rows $6 \times 2 = 12$ tiles $66 + 12 = 78$ tiles No of boxes needed $= 7$ ($12 \times 7 = 84$ tiles) $\pounds 11.49 \times 7 = \pounds 80.43$ OR Wall area = $330 \times 40 + 90 \times 30 = 13200 + 2700 = 15900 \text{ cm}^2$ Tile A area = $10 \times 10 = 100 \text{ cm}^2$ No of tiles = $15900 \div 100 = 159$ No of boxes needed $= 8$ ($20 \times 8 = 160$ tiles) $\pounds 9.99 \times 8 = \pounds 79.92$ Tile B area = $15 \times 15 = 225 \text{ cm}^2$	Tile A is the most economical	6	M1 for $330 \div 10$ or $90 \div 10$ or $330 \div 15$ or $90 \div 15$ A1 for (33 and 9) or (22 and 6) M1 for $33 \times 4 + 9 \times 3$ or $22 \times 3 + 6 \times 2$ A1 ft for 10 A boxes needed (' $33 \times 4 + 9 \times 3$ ') $\div 20$ rounded up to nearest whole number) or for 7A boxes needed (' $22 \times 3 + 6 \times 2$ ') $\div 12$ rounded up to nearest whole number) B1 for answers or $\pounds 79.92$ and $\pounds 80.43$ to justify the choice C1 for comment on the need to cut some Type B tiles QWC: Decision must be stated, with all calculations attributable OR M1 for either 330×40 or 90×30 or 10×10 or 15×15 A1 for 15900 and (100 or 225) M1 for $15900 \div 100$

<p>No of tiles = $15900 \div 225 = 70(225 \times 70 = 15700) + 1$ No of boxes needed = 6 ($12 \times 6 = 72$ tiles) but some tiles will need to be cut, so 7 boxes needed $\pounds 11.49 \times 7 = \pounds 80.43$</p>	<p>or $15900 \div 225$</p> <p>A1 ft for 10 A boxes needed ('15900' \div '100') \div 20 rounded up to nearest whole number) or 7 B boxes needed ('15900' \div '225') \div 12 rounded up to nearest whole number)</p> <p>B1 for answers or $\pounds 79.92$ and $\pounds 80.43$ to justify the choice</p> <p>C1 for comment on the need to cut some Type B tiles QWC: Decision must be stated, with all calculations attributable</p>	
Total for Question: 6 marks		

M6.

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

M7.

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

M8.

	Working	Answer	Mark	Additional Guidance
(a)	$10 + 20 + 10 + 20$	60	2	M1 for $10 + 20 + 10 + 20$ A1 cao
(b)	10×20	200	2	M1 for 10×20 A1 cao
Total for Question: 4 marks				

M9.

Working	Answer	Mark	Additional Guidance
$(0.5 \times 3.14... \times 8) + 8$	20.56 – 20.58	3	M2 for $(0.5 \times \pi \times 8)$ or $\pi \times 4$ or $(\pi \times 8 + 8)$ or $(0.5 \times \pi \times 8 + 8)$ oe (M1 for $\pi \times 8$ or $2\pi \times 4$; for a value 25.1-25.2 inclusive unless seen with incorrect working eg πr^2)

			A1 for 20.56 – 20.58 (SC: B2 if M0 scored for 12.56 – 12.58)
Total for Question: 3 marks			

M10.

	Working	Answer	Mark	Additional Guidance
(a)		opp sides are equal	1	B1 for a correct explanation
(b)	$4x - 2x = 12 - 1$	5.5	2	M1 for $4x + 1 - 1 - 2x = 2x + 12 - 1 - 2x$ oe A1 for 5.5 or 11/2 or 5½
(c)	'5.5' × 2 + 4 × '5.5' + 1 + 2'5.5' + 12	57	2	M1 for correct substitution of $x = '5.5'$ into the four expressions to find the sum of FOUR sides or $8x + 13$ seen A1 ft
Total for Question: 5 marks				

M11.

	Answer	Mark	Additional Guidance
(a)	16	1	B1 cao
(b)	12 cm ²	2	B1 for 12 cao, B1 (indep) for cm ²
(c)	15	2	M1 for 5×3 A1 cao [SC: B1 for 10, 13 or 14]

Total for Question: 5 marks

M12.

	Working	Answer	Mark	Additional Guidance
FE	Area of the room $= 4 \times 8 + 4 \times 6 = 56$ Area of a tile $= 0.5 \times 0.5 = 0.25$ Number of tiles $= 56 \div 0.25 = 224$ Cost = 4×224 OR No of tiles around room $= 2 \times \text{lengths of room} =$ $8, 16, 16, 12$ Total number of tiles $= 8 \times 16 + 8 \times 12 = 224$ Cost = 4×224	£ 896	6	M1 for full method for finding the area of the room A1 at least one area correct B1 for area of tile = 0.25m^2 or 2500 cm^2 or 4 tiles = 1m^2 M1 for area of room \div area of a tile M1 for $4 \times$ number of tiles A1 cao OR M1 for doubling each length to show number of tiles for each side B1 for 8, 16, 16 and 12 M1 for a full method of finding the number of tiles ($12 \times 16 + 8 \times 4$) A1 for at least one 'section' correct M1 for $4 \times$ '224' A1 cao
				Total for Question: 6 marks

M13.

	Working	Answer	Mark	Additional Guidance
(a)		16 cm	1	B1 cao (units included)
(b)		48 cm ³	4	M1 3-D drawing or sketch M1 $4 \times 4 \times 2$ and $2 \times 2 \times 4$ / $4 \times 4 \times 4$ and $2 \times 2 \times 4$ M1 adding or subtracting A1 cao (units included)
				Total for Question: 5 marks

- E1.** A well understood question by most candidates; however a significant minority mixed up area and perimeter and some candidates found the area and perimeter of the grid on which the shaded shape was drawn. Almost all candidates wrote rectangle for the shape though some candidates did write quadrilateral, square or even kite.
- E2.** The sector is, of course, in this case one third of its circle so the fraction demand was reasonable for a higher tier paper, although some candidates assumed it was a quarter of a circle.. Many candidates used the area formula and thus scored no marks. Of those that used the correct formula many could not simplify completely the expression for the arc length. Those that did get the arc length, did, however often go on to add 12 to get an expression for the perimeter although a few spoiled things at the end by writing $12 + 4\pi = 16\pi$.
- E6.** 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.
- E7.** 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 ($3 \times$

3×2) or even $8 (2 \times 2 \times 2)$.

E8. Although some was seen, there seemed less confusion between perimeter and area than in the past. Part (a) was successfully answered by over 80% of candidates. Some candidates only added the two sides given and gave 30 as their answer. Examiners rarely saw any working in part (b). Over 60% of candidates gained both marks in this part of the question.

E9. Specification A

Foundation

Very few correct answers were seen. The errors made by candidates were many and common, including incorrect choice of formula to use (πr^2 quoted and used incorrectly) use of 8 as a radius, incorrect values of π used (though given on the front of the paper), failure to divide by 2, and leaving the answer as the arc, without adding on the straight edge to give the total perimeter.

Higher

A significant number of candidates were unable to gain any marks in this question, this was frequently due to the formula for the area of a circle being used. Common errors were forgetting to halve the circumference, confusing the radius with the diameter or most commonly forgetting to add on the diameter. Many candidates just found the length of the arc rather than the perimeter of the shape.

Specification B

Foundation

The penultimate question on the paper proved to be a challenge for most of the students with nearly 80% of the students failing to make a valid start on this question. Finding half

the circumference of a circle was recognised as in $\pi \times 8$ and then dividing this result by 2. It was the next stage that seemed to lie outside the experience of the student as they failed to grasp that they needed to add on the diameter in order to find the perimeter of the tile. There were a number of candidates who used πr^2 to find the perimeter, scoring no marks. Others showed $\pi \times 4$ but then proceeded to divide this by 2, clearly showing they did not know which formula to use.

Higher

Successful candidates saw that they had to find half the circumference and then add on the diameter to get the base. The others unusually fell into 3 categories and gained 2, 1 or 0 marks as appropriate. Firstly, there were those who found the arc length correctly, but did not add on the base (2marks). Secondly, there were those who found the circumference of the full circle, but then did nothing else (1 mark). Thirdly, were the candidates who either confused perimeter with area or confused the formula for the circumference of a circle with the formula for its area. (0 marks).

E10. Foundation

In part (a), candidates often failed to gain the mark when their explanation was unclear. For example, comments like “because the are the same” are ambiguous. To gain the mark, explanations needed to refer to the sides of the rectangle and not the equation.

As in question 24, algebraic methods were few and far between, many attempts leading to an answer of 6.5 ($2x = 12 + 1$). Some candidates correctly found x to be 5.5 and then tried to use this result to answer part (a). Again, in this question, trial and improvement methods were common.

Having found a value for x in part (b), many failed to use it in an attempt to find the perimeter in part (c). Often just the lengths of two sides were calculated leading to incorrect answers of 11 ($5.5 + 5.5$) or 46, the sum of the two longer sides.

Higher

In part (a) the majority of candidates were able to give a correct explanation although some gave parallel sides rather than equal sides as the reason. Another common error was for candidates to substitute $x = 5.5$ into both expressions instead of using the properties of a rectangle. Only the weakest candidates failed to gain any marks in part (b). The most common errors resulted from incorrect manipulation and often led to $2x = 13$ (instead of $2x = 11$). Some candidates failed to divide 11 by 2 correctly. Those who

resorted to trial and improvement were rarely successful. Although there were many fully correct answers in part (c) some candidates struggled to substitute correctly into each of the four expressions. Many made calculation errors. Only a small number of candidates stated that the total perimeter was $8x + 13$ and then made just the one substitution.

- E11.** 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 5×3 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.