



1 A tennis club has 560 members.

(a) The ratio men : women : children = 5 : 6 : 3.

(i) Show that the club has 240 women members.

*Answer(a)(i)*

[2]

(ii) How many members are children?

*Answer(a)(ii)* ..... [1]

(b)  $\frac{5}{8}$  of the 240 women members play in a tournament.

How many women members do **not** play in the tournament?

*Answer(b)* ..... [2]

(c) The annual membership fee in 2013 is \$198 for each adult and \$75 for each child.

(i) Calculate the total amount the 560 members pay in 2013.

*Answer(c)(i)* \$ ..... [2]

(ii) The adult fee of \$198 in 2013 is 5.6% more than the fee in 2012.

Calculate the adult fee in 2012.

*Answer(c)(ii)* \$ ..... [3]

- (d) The club buys 36 tennis balls for \$9.50 and sells them to members for \$0.75 each.  
Calculate the percentage profit the club makes.

Answer(d) ..... % [3]

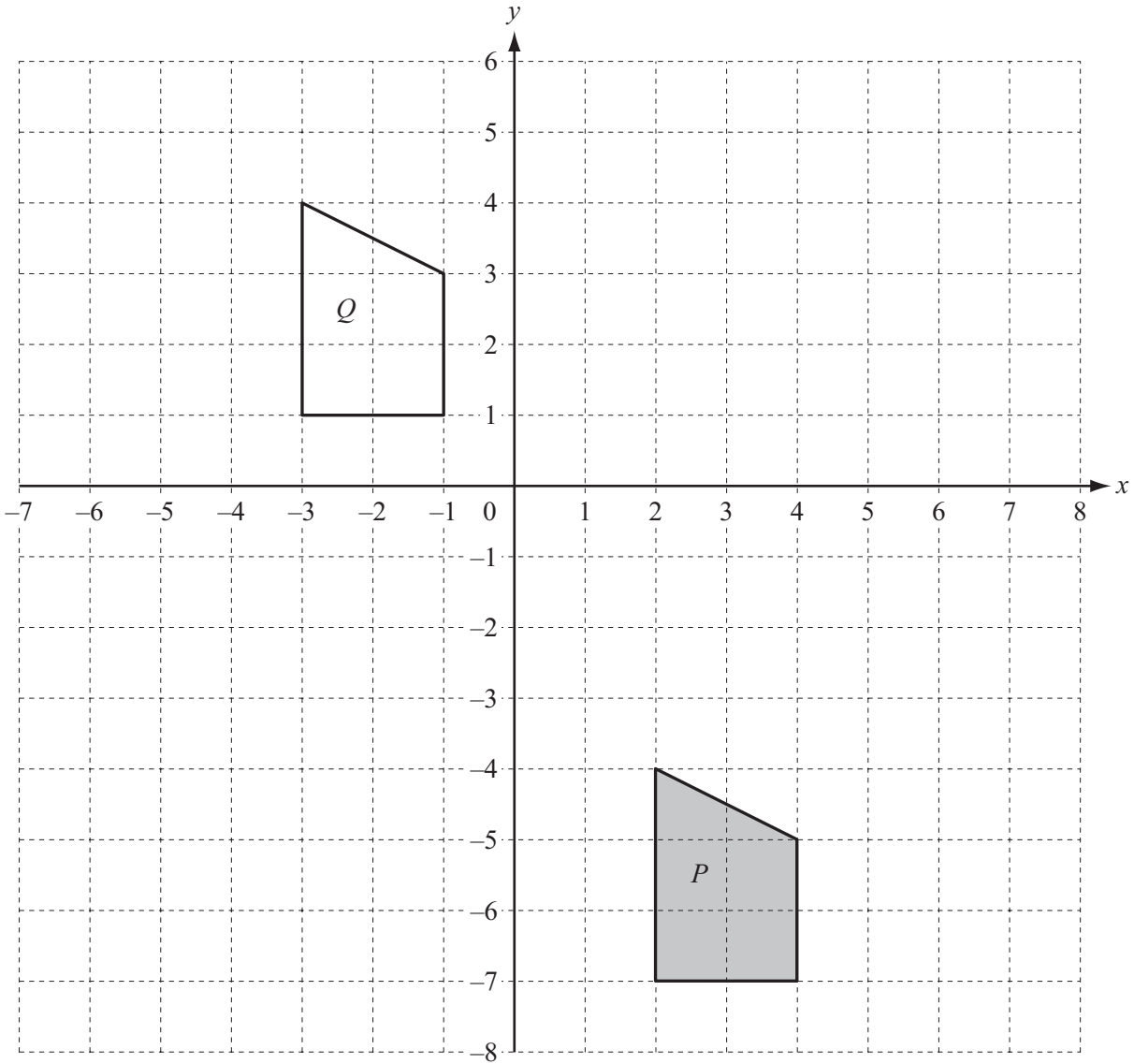
- (e) A tennis court is a rectangle with length 23.7 m and width 10.9 m, each correct to 1 decimal place.  
Calculate the upper and lower bounds of the perimeter of the court.

Answer(e) Upper bound ..... m

Lower bound ..... m [3]

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2 (a)



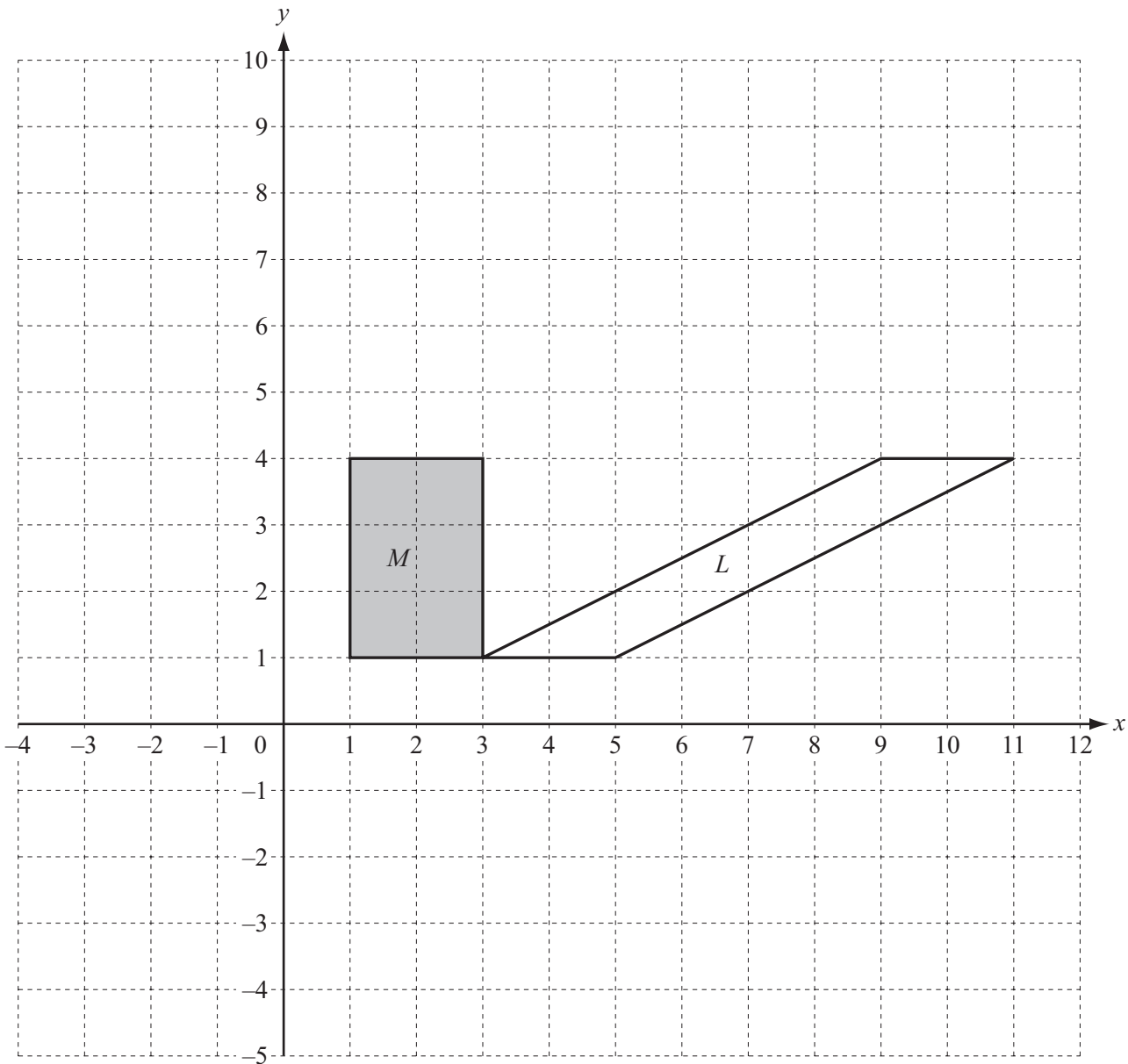
(i) Describe fully the **single** transformation which maps shape *P* onto shape *Q*.

Answer(a)(i) ..... [2]

(ii) On the grid above, draw the image of shape *P* after reflection in the line  $y = -1$ . [2]

(iii) On the grid above, draw the image of shape *P* under the transformation represented by the matrix  $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ . [3]

(b)



(i) Describe fully the **single** transformation which maps shape *M* onto shape *L*.

Answer(b)(i) ..... [3]

(ii) On the grid above, draw the image of shape *M* after enlargement by scale factor 2, centre (5, 0). [2]

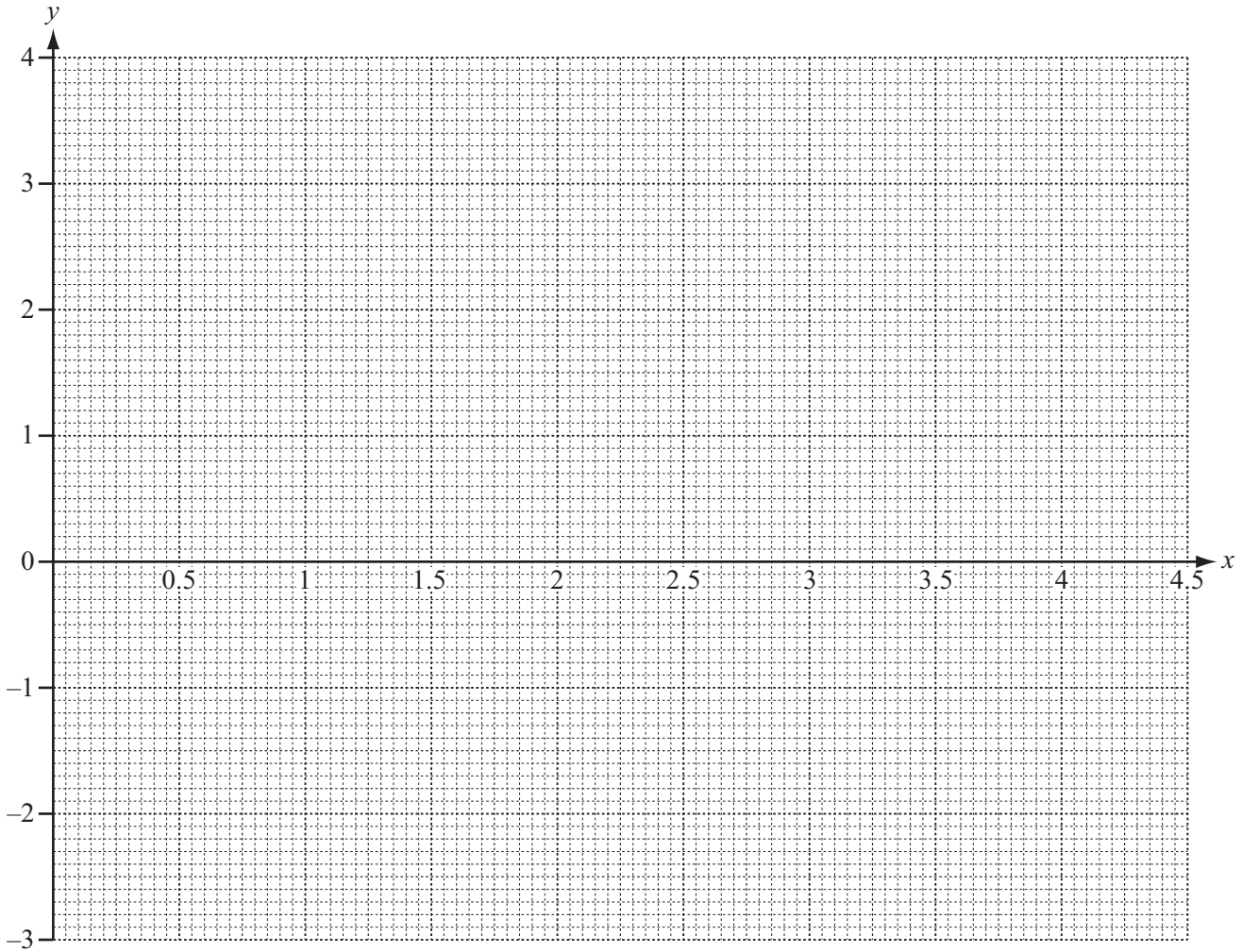
- 3 The table shows some values for the function  $y = 11x - 2x^2 - 12$  for  $1 \leq x \leq 4.5$ .

$x$	1	1.5	2	2.5	3	3.5	4	4.5
$y$	-3		2	3	3			

- (a) Complete the table of values.

[3]

- (b) On the grid below, draw the graph of  $y = 11x - 2x^2 - 12$  for  $1 \leq x \leq 4.5$ .



[4]

- (c) By drawing a suitable line, use your graph to solve the equation  $11x - 2x^2 = 11$ .

*Answer(c)*  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [2]

- (d) The line  $y = mx + 2$  is a tangent to the curve  $y = 11x - 2x^2 - 12$  at the point  $P$ .

By drawing this tangent,

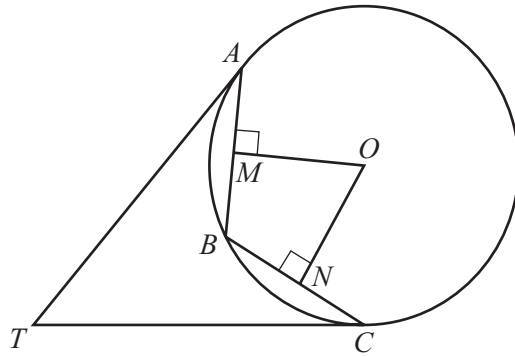
- (i) find the co-ordinates of the point  $P$ ,

*Answer(d)(i)* ( $\dots\dots\dots$ ,  $\dots\dots\dots$ ) [2]

- (ii) work out the value of  $m$ .

*Answer(d)(ii)*  $m = \dots\dots\dots$  [2]

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$A$ ,  $B$  and  $C$  lie on the circle centre  $O$ , radius  $8.5$  cm.  
 $AB = BC = 10.7$  cm.  
 $OM$  is perpendicular to  $AB$  and  $ON$  is perpendicular to  $BC$ .

- (a) Calculate the area of the circle.

Answer(a) ..... cm<sup>2</sup> [2]

- (b) Write down the length of  $MB$ .

Answer(b) ..... cm [1]

- (c) Calculate angle  $MOB$  and show that it rounds to  $39^\circ$  correct to the nearest degree.

Answer(c)

[2]

- (d) Using angle  $MOB = 39^\circ$ , calculate the length of the **major** arc  $AC$ .

Answer(d) ..... cm [3]

- (e) The tangents to the circle at  $A$  and at  $C$  meet at  $T$ .

Explain clearly why triangle  $ATB$  is congruent to triangle  $CTB$ .

Answer(e)

[3]



5 Paul buys a number of large sacks of fertiliser costing  $\$x$  each.

He spends  $\$27$ .

(a) Write down, in terms of  $x$ , an expression for the number of large sacks which Paul buys.

*Answer(a)* ..... [1]

(b) Rula buys a number of small sacks of fertiliser.  
Each small sack costs  $\$2$  less than a large sack.  
Rula spends  $\$25$ .

Write down, in terms of  $x$ , an expression for the number of small sacks which Rula buys.

*Answer(b)* ..... [1]

(c) Rula buys 4 more sacks than Paul.

Write down an equation in  $x$  and show that it simplifies to  $2x^2 - 3x - 27 = 0$ .

*Answer(c)*

[4]

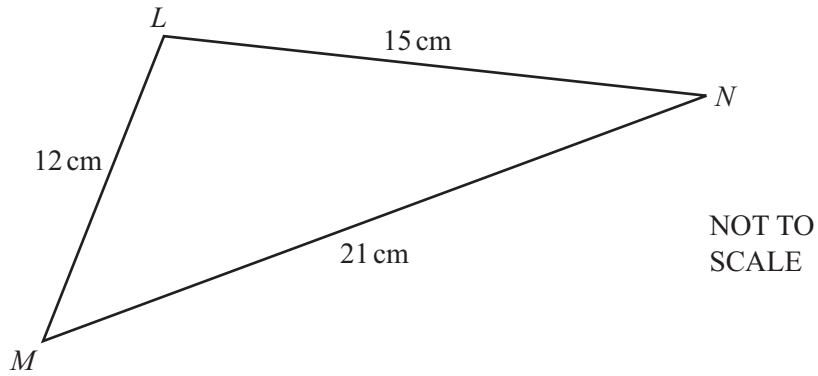
(d) Solve  $2x^2 - 3x - 27 = 0$ .

*Answer(d)*  $x =$  ..... or  $x =$  ..... [3]

(e) Calculate the number of sacks which Paul buys.

*Answer(e)* ..... [1]

6 (a)



The diagram shows triangle  $LMN$  with  $LM = 12$  cm,  $LN = 15$  cm and  $MN = 21$  cm.

- (i) Calculate angle  $LMN$ .  
Show that this rounds to  $44.4^\circ$ , correct to 1 decimal place.

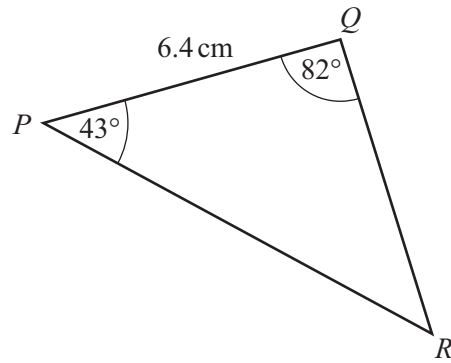
*Answer(a)(i)*

[4]

- (ii) Calculate the area of triangle  $LMN$ .

*Answer(a)(ii)* ..... cm<sup>2</sup> [2]

(b)

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The diagram shows triangle  $PQR$  with  $PQ = 6.4$  cm, angle  $PQR = 82^\circ$  and angle  $QPR = 43^\circ$ .

Calculate the length of  $PR$ .

Answer(b)  $PR = \dots\dots\dots$  cm [4]

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$$7 \quad \mathbf{A} = \begin{pmatrix} 5 \\ 7 \end{pmatrix} \quad \mathbf{B} = (6 \quad -4) \quad \mathbf{C} = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix} \quad \mathbf{D} = \begin{pmatrix} 2 & 9 \\ -1 & -3 \end{pmatrix}$$

(a) Calculate the result of each of the following, if possible.

If a calculation is not possible, write “not possible” in the answer space.

(i)  $3\mathbf{A}$

*Answer(a)(i)* [1]

(ii)  $\mathbf{AC}$

*Answer(a)(ii)* [1]

(iii)  $\mathbf{BA}$

*Answer(a)(iii)* [2]

(iv)  $\mathbf{C} + \mathbf{D}$

*Answer(a)(iv)* [1]

(v)  $\mathbf{D}^2$

*Answer(a)(v)* [2]

(b) Calculate  $\mathbf{C}^{-1}$ , the inverse of  $\mathbf{C}$ .

*Answer(b)* [2]

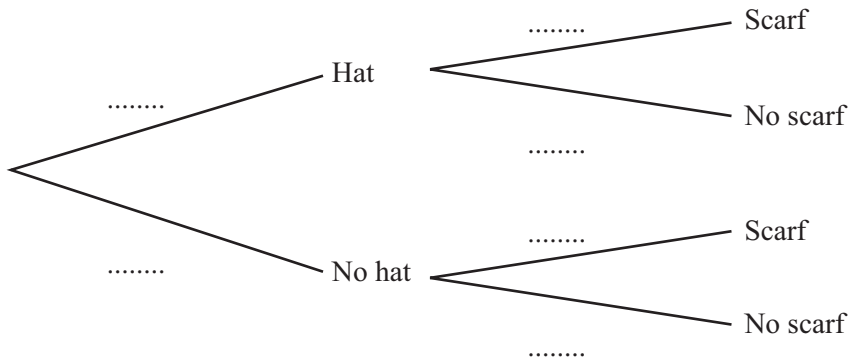
**8 In this question, give all your answers as fractions.**

When Ivan goes to school in winter, the probability that he wears a hat is  $\frac{5}{8}$ .

If he wears a hat, the probability that he wears a scarf is  $\frac{2}{3}$ .

If he does not wear a hat, the probability that he wears a scarf is  $\frac{1}{6}$ .

**(a)** Complete the tree diagram.



[3]

**(b)** Find the probability that Ivan

**(i)** does not wear a hat and does not wear a scarf,

Answer(b)(i) ..... [2]

**(ii)** wears a hat but does not wear a scarf,

Answer(b)(ii) ..... [2]

**(iii)** wears a hat or a scarf but not both.

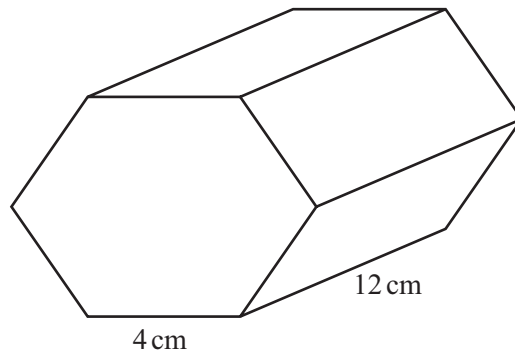
Answer(b)(iii) ..... [2]

**(c)** If Ivan wears a hat and a scarf, the probability that he wears gloves is  $\frac{7}{10}$ .

Calculate the probability that Ivan does **not** wear all three of hat, scarf and gloves.

Answer(c) ..... [3]

9 (a)

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The diagram shows a prism of length 12 cm.  
The cross section is a regular hexagon of side 4 cm.

Calculate the total surface area of the prism.

*Answer(a)* ..... cm<sup>2</sup> [4]

(b) Water flows through a cylindrical pipe of radius 0.74 cm.  
It fills a 12 litre bucket in 4 minutes.

(i) Calculate the speed of the water through the pipe in centimetres per minute.

*Answer(b)(i)* ..... cm/min [4]

- (ii) When the 12 litre bucket is emptied into a circular pool, the water level rises by 5 millimetres.

Calculate the radius of the pool correct to the nearest centimetre.

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*Answer(b)(ii)* ..... cm [5]

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10 (a) Write as a single fraction

(i)  $\frac{5}{4} - \frac{2x}{5}$ ,

Answer(a)(i) ..... [2]

(ii)  $\frac{4}{x+3} + \frac{2x-1}{3}$ .

Answer(a)(ii) ..... [3]

(b) Solve the simultaneous equations.

$$\begin{aligned}9x - 2y &= 12 \\3x + 4y &= -10\end{aligned}$$

Answer(b)  $x =$  .....

$y =$  ..... [3]



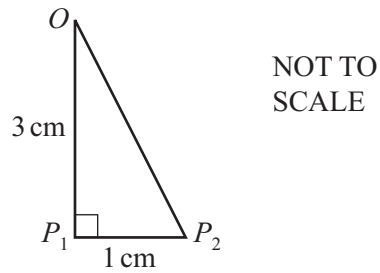
(c) Simplify  $\frac{7x + 21}{2x^2 + 9x + 9}$ .

*For  
Examiner's  
Use*

*Answer(c)* ..... [4]

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- 11 Sidney draws the triangle  $OP_1P_2$ .  
 $OP_1 = 3$  cm and  $P_1P_2 = 1$  cm.  
 Angle  $OP_1P_2 = 90^\circ$ .

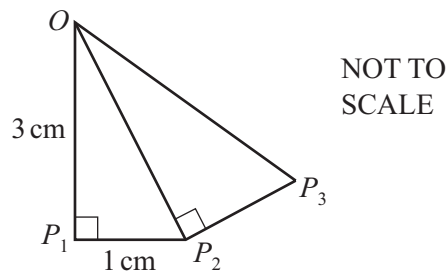


- (a) Show that  $OP_2 = \sqrt{10}$  cm.

Answer(a)

[1]

- (b) Sidney now draws the lines  $P_2P_3$  and  $OP_3$ .  
 Triangle  $OP_2P_3$  is mathematically similar  
 to triangle  $OP_1P_2$ .



- (i) Write down the length of  $P_2P_3$  in the form  $\frac{\sqrt{a}}{b}$  where  $a$  and  $b$  are integers.

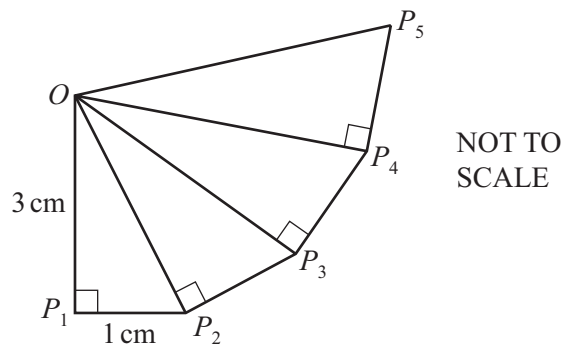
Answer(b)(i)  $P_2P_3 = \dots\dots\dots$  cm [1]

- (ii) Calculate the length of  $OP_3$  giving your answer in the form  $\frac{c}{d}$  where  $c$  and  $d$  are integers.

Answer(b)(ii)  $OP_3 = \dots\dots\dots$  cm [2]

- (c) Sidney continues to add  
 mathematically similar triangles  
 to his drawing.

Find the length of  $OP_5$ .



Answer(c)  $OP_5 = \dots\dots\dots$  cm [2]

- (d) (i) Show that angle  $P_1OP_2 = 18.4^\circ$ , correct to 1 decimal place.

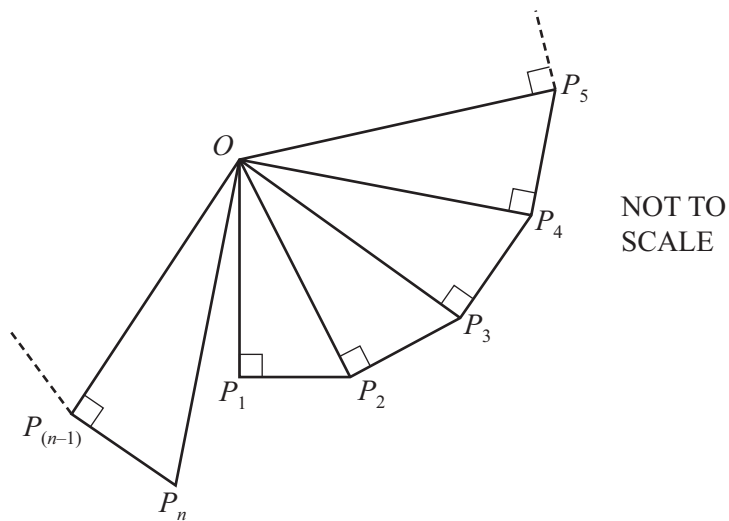
Answer(d)(i)

[2]

- (ii) Write down the size of angle  $P_2OP_3$ .

Answer(d)(ii) Angle  $P_2OP_3 = \dots\dots\dots$  [1]

- (iii) The last triangle Sidney can draw without covering his first triangle is triangle  $OP_{(n-1)}P_n$ .



Calculate the value of  $n$ .

Answer(d)(iii)  $n = \dots\dots\dots$  [3]

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