



- 1 12 000 vehicles drive through a road toll on one day.  
The ratio cars : trucks : motorcycles = 13 : 8 : 3.

- (a) (i) Show that 6500 cars drive through the road toll on that day.

*Answer(a)(i)*

[1]

- (ii) Calculate the number of trucks that drive through the road toll on that day.

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

- (b) The toll charges in 2014 are shown in the table.

Vehicle	Charge
Cars	\$2
Trucks	\$5
Motorcycles	\$1

Show that the total amount paid in tolls on that day is \$34 500.

*Answer(b)*

[2]

- (c) This total amount is a decrease of 8% on the total amount paid on the same day in 2013.

Calculate the total amount paid on that day in 2013.

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

- (d) 2750 of the 6500 car drivers pay their toll using a credit card.

Write down, in its simplest terms, the fraction of car drivers who pay using a credit card.

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

- (e) To the nearest thousand, 90 000 cars drive through the road toll in one week.

Write down the lower bound for this number of cars.

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

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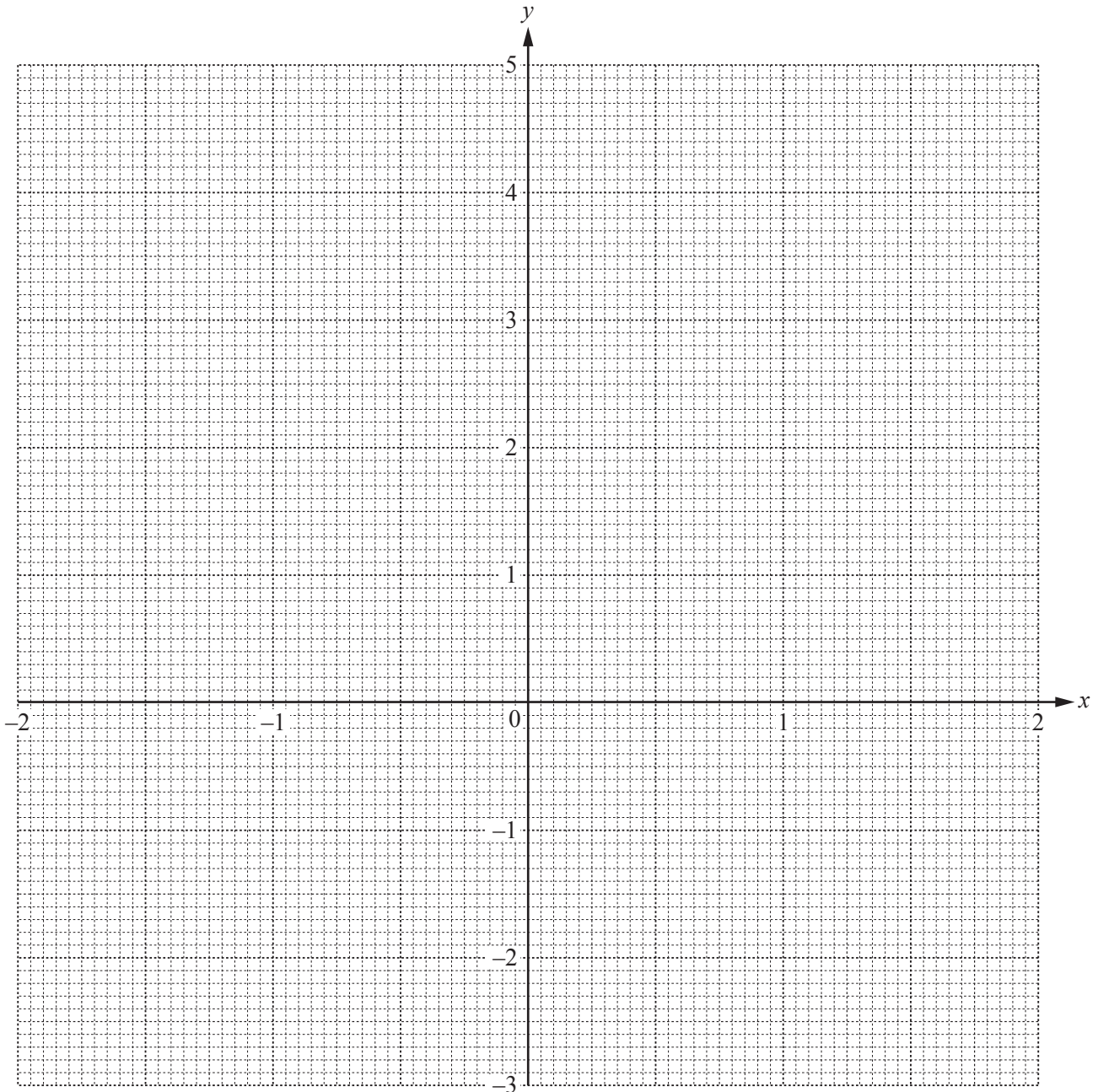
2 The table shows some values for  $y = x^2 - \frac{1}{2x}$ ,  $x \neq 0$ .

$x$	-2	-1.5	-1	-0.5	-0.25	-0.2		0.2	0.25	0.5	1	1.5	2
$y$	4.25	2.58			2.06	2.54		-2.46	-1.94			1.92	3.75

(a) Complete the table of values.

[4]

(b) On the grid, draw the graph of  $y = x^2 - \frac{1}{2x}$  for  $-2 \leq x \leq -0.2$  and  $0.2 \leq x \leq 2$ .



[5]

(c) By drawing a suitable line, use your graph to solve the equation  $x^2 - \frac{1}{2x} = 2$ .

Answer(c)  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [3]

- (d) The equation  $x^2 - \frac{1}{2x} = k$  has only one solution.

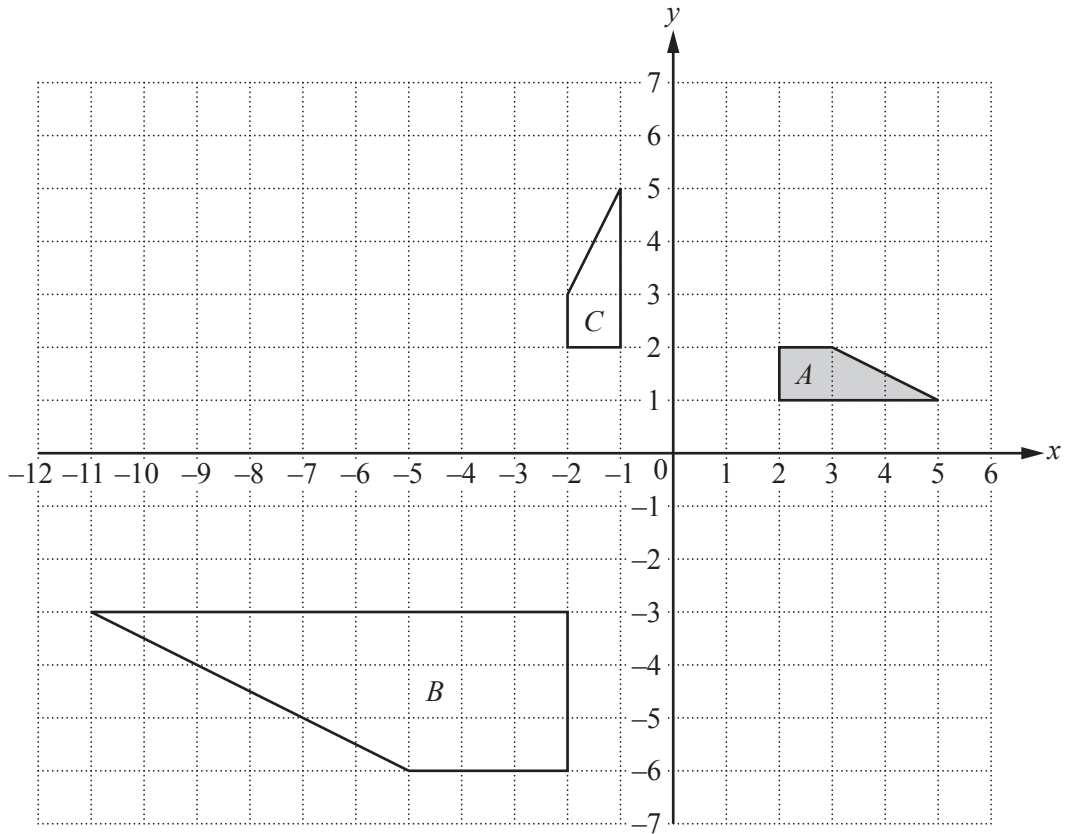
Write down the range of values of  $k$  for which this is possible.

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

- (e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where  $x = -1$ .

*Answer(e)* ..... [3]

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(a) Draw the image of

(i) shape *A* after a translation by  $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ , [2]

(ii) shape *A* after a rotation through  $180^\circ$  about the point  $(0, 0)$ , [2]

(iii) shape *A* after the transformation represented by the matrix  $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ . [3]

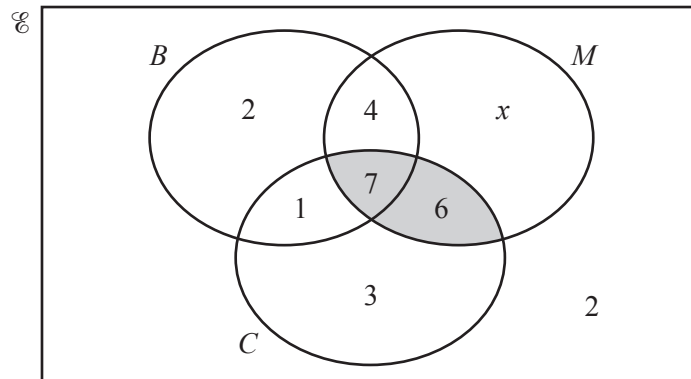
(b) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

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

(c) Find the matrix which represents the transformation that maps shape *A* onto shape *C*.

Answer(c)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

- 4 30 students were asked if they had a bicycle ( $B$ ), a mobile phone ( $M$ ) and a computer ( $C$ ). The results are shown in the Venn diagram.



- (a) Work out the value of  $x$ .

*Answer(a)*  $x = \dots\dots\dots$  [1]

- (b) Use set notation to describe the shaded region in the Venn diagram.

*Answer(b)*  $\dots\dots\dots$  [1]

- (c) Find  $n(C \cap (M \cup B)')$ .

*Answer(c)*  $\dots\dots\dots$  [1]

- (d) A student is chosen at random.

- (i) Write down the probability that the student is a member of the set  $M'$ .

*Answer(d)(i)*  $\dots\dots\dots$  [1]

- (ii) Write down the probability that the student has a bicycle.

*Answer(d)(ii)*  $\dots\dots\dots$  [1]

- (e) Two students are chosen at random from the students who have computers.

Find the probability that each of these students has a mobile phone but no bicycle.

*Answer(e)*  $\dots\dots\dots$  [3]

- 5 (a) Andrei stands on level horizontal ground, 294 m from the foot of a vertical tower which is 55 m high.
- (i) Calculate the angle of elevation of the top of the tower.

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

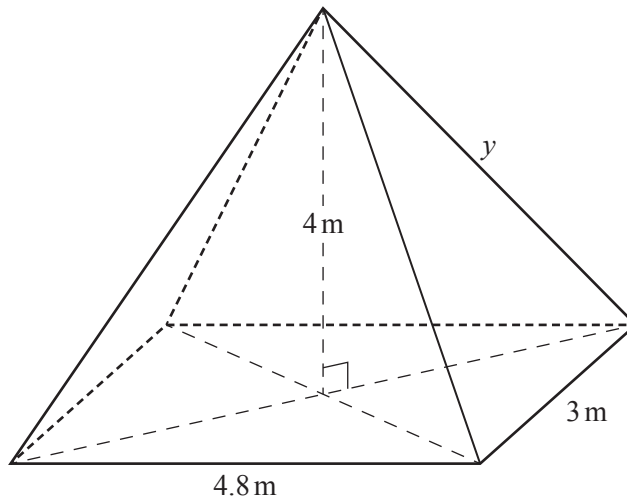
- (ii) Andrei walks a distance  $x$  metres directly towards the tower.  
The angle of elevation of the top of the tower is now  $24.8^\circ$ .

Calculate the value of  $x$ .

*Answer(a)(ii)*  $x =$  ..... [4]



(b) The diagram shows a pyramid with a horizontal rectangular base.



NOT TO SCALE

The rectangular base has length 4.8 m and width 3 m and the height of the pyramid is 4 m.

Calculate

(i)  $y$ , the length of a sloping edge of the pyramid,

*Answer(b)(i)*  $y = \dots\dots\dots$  m [4]

(ii) the angle between a sloping edge and the rectangular base of the pyramid.

*Answer(b)(ii)*  $\dots\dots\dots$  [2]

- 6 The table shows the time,  $t$  minutes, that 400 people take to complete a test.

Time taken ( $t$ mins)	$0 < t \leq 10$	$10 < t \leq 24$	$24 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 60$	$60 < t \leq 70$
Frequency	10	90	135	85	70	10

- (a) (i) Write down the modal time interval.

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

- (ii) Calculate an estimate of the mean time taken to complete the test.

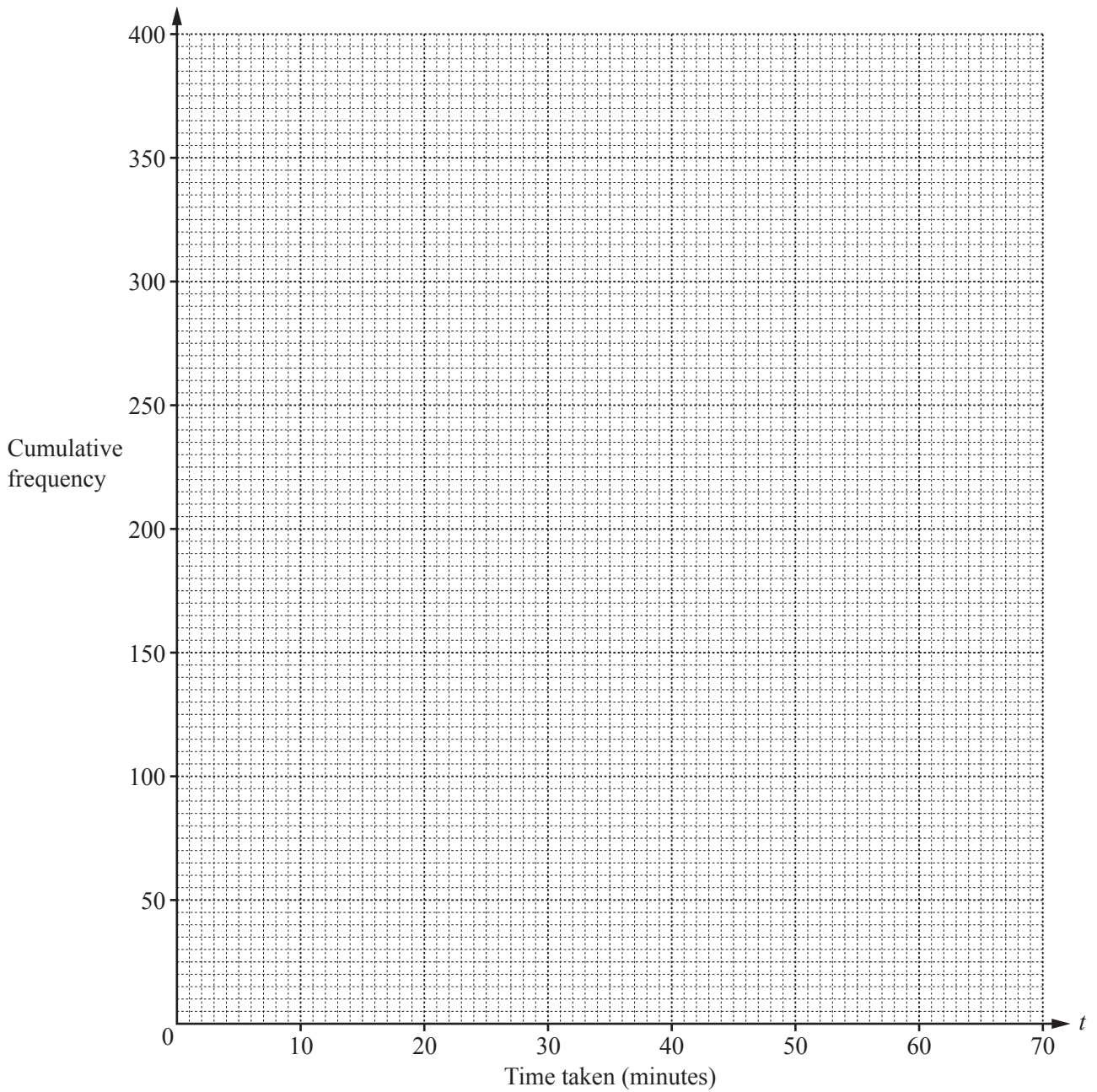
*Answer(a)(ii)* ..... min [4]

- (b) (i) Complete the table of cumulative frequencies.

Time taken ( $t$ mins)	$t \leq 10$	$t \leq 24$	$t \leq 30$	$t \leq 40$	$t \leq 60$	$t \leq 70$
Cumulative frequency	10	100				400

[2]

- (ii) On the grid opposite, draw a cumulative frequency diagram to show this information.



[3]

(c) Use your graph to estimate

(i) the median time,

*Answer(c)(i)* ..... min [1]

(ii) the inter-quartile range,

*Answer(c)(ii)* ..... min [2]

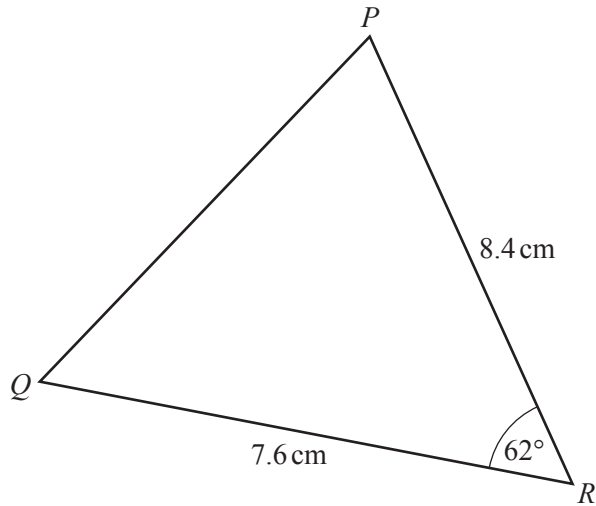
(iii) the 15th percentile,

*Answer(c)(iii)* ..... min [2]

(iv) the number of people who took more than 50 minutes.

*Answer(c)(iv)* ..... [2]

7 (a)

NOT TO  
SCALE

In the triangle  $PQR$ ,  $QR = 7.6$  cm and  $PR = 8.4$  cm.  
Angle  $QRP = 62^\circ$ .

Calculate

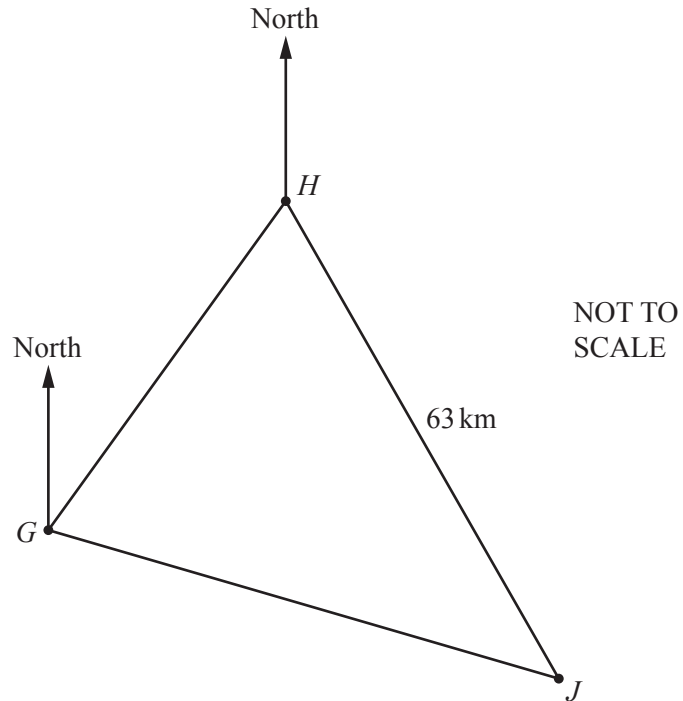
(i)  $PQ$ ,

Answer(a)(i)  $PQ = \dots\dots\dots$  cm [4]

(ii) the area of triangle  $PQR$ .

Answer(a)(ii)  $\dots\dots\dots$  cm<sup>2</sup> [2]

(b)



The diagram shows the positions of three small islands  $G$ ,  $H$  and  $J$ .  
 The bearing of  $H$  from  $G$  is  $045^\circ$ .  
 The bearing of  $J$  from  $G$  is  $126^\circ$ .  
 The bearing of  $J$  from  $H$  is  $164^\circ$ .  
 The distance  $HJ$  is 63 km.

Calculate the distance  $GJ$ .

Answer(b)  $GJ = \dots\dots\dots$  km [5]

- 8 (a) Jamil, Kiera and Luther collect badges.  
Jamil has  $x$  badges.  
Kiera has 12 badges more than Jamil.  
Luther has 3 times as many badges as Kiera.  
Altogether they have 123 badges.

Form an equation and solve it to find the value of  $x$ .

*Answer(a)*  $x = \dots\dots\dots$  [3]

- (b) Find the integer values of  $t$  which satisfy the inequalities.

$$4t + 7 < 39 \leq 7t + 2$$

*Answer(b)*  $\dots\dots\dots$  [3]

- (c) Solve the following equations.

(i)  $\frac{21-x}{x+3} = 4$

*Answer(c)(i)*  $x = \dots\dots\dots$  [3]

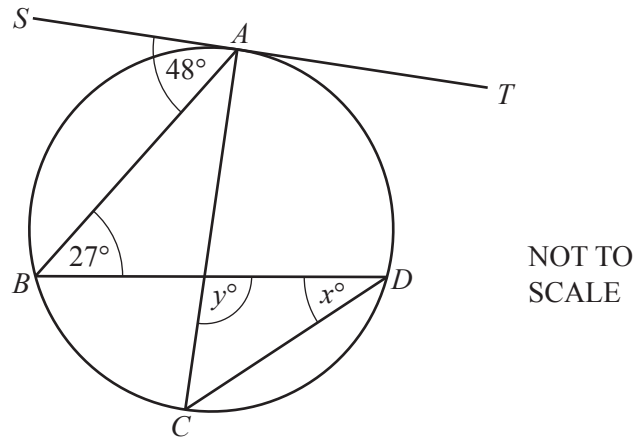
(ii)  $3x^2 + 7x - 5 = 0$

Show all your working and give your answers correct to 2 decimal places.

*Answer(c)(ii)*  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [4]

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- 9 (a) The points  $A, B, C$  and  $D$  lie on a circle.  
 $AC$  is a diameter of the circle.  
 $ST$  is the tangent to the circle at  $A$ .



Find the value of

- (i)  $x$ ,

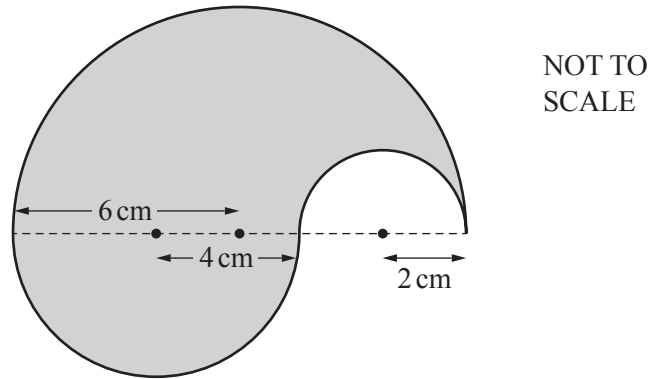
Answer(a)(i)  $x = \dots\dots\dots$  [2]

- (ii)  $y$ .

Answer(a)(ii)  $y = \dots\dots\dots$  [2]



- (b) The diagram shows a shaded shape formed by three semi-circular arcs. The radius of each semi-circle is shown in the diagram.



- (i) Calculate the perimeter of the shaded shape.

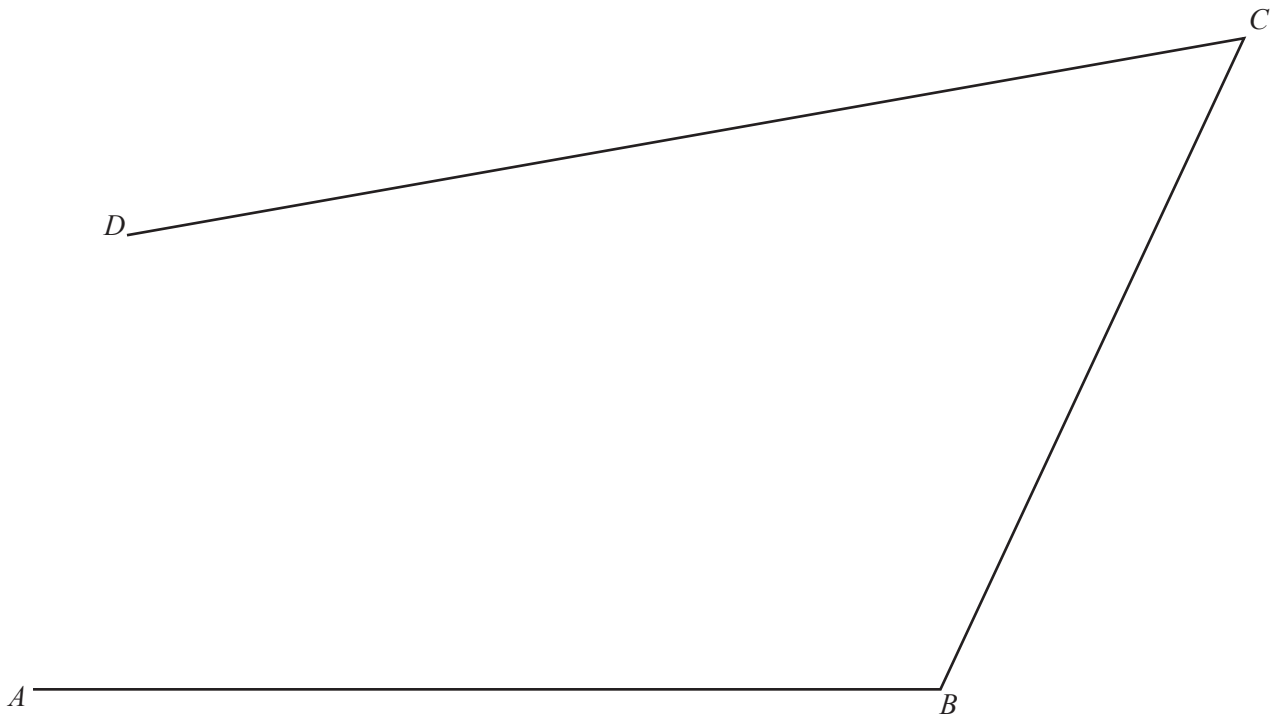
*Answer(b)(i)* ..... cm [2]

- (ii) The shaded shape is made from metal 1.6 mm thick.

Calculate the volume of metal used to make this shape.  
Give your answer in cubic millimetres.

*Answer(b)(ii)* ..... mm<sup>3</sup> [5]

- 10 The diagram is a scale drawing of three straight roads,  $AB$ ,  $BC$  and  $CD$ .  
The scale is 1 : 5000.



Scale 1 : 5000

- (a) Find the actual length of the road  $BC$ .  
Give your answer in metres.

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

- (b) Another straight road starts at  $M$ , the midpoint of  $AB$ .  
This road is perpendicular to  $AB$  and it meets the road  $CD$  at  $X$ .

**Using a straight edge and compasses only**, construct  $MX$ . [2]

- (c) There is a park in the area enclosed by the four roads.

The park is

- less than 290 m from  $B$
- and
- nearer to  $CD$  than to  $CB$ .

**Using a ruler and compasses only**, construct the boundaries of the park.

Leave in all your construction arcs and label the park  $P$ .

[5]

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**Question 11 is printed on the next page.**

- 11 (a) Make  $x$  the subject of the formula.

$$A - x = \frac{xr}{t}$$

*Answer(a)*  $x = \dots\dots\dots$  [4]

- (b) Find the value of  $a$  and the value of  $b$  when  $x^2 - 16x + a = (x + b)^2$ .

*Answer(b)*  $a = \dots\dots\dots$

$b = \dots\dots\dots$  [3]

- (c) Write as a single fraction in its simplest form.

$$\frac{6}{x-4} - \frac{5}{3x-2}$$

*Answer(c)*  $\dots\dots\dots$  [3]

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