

- 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]

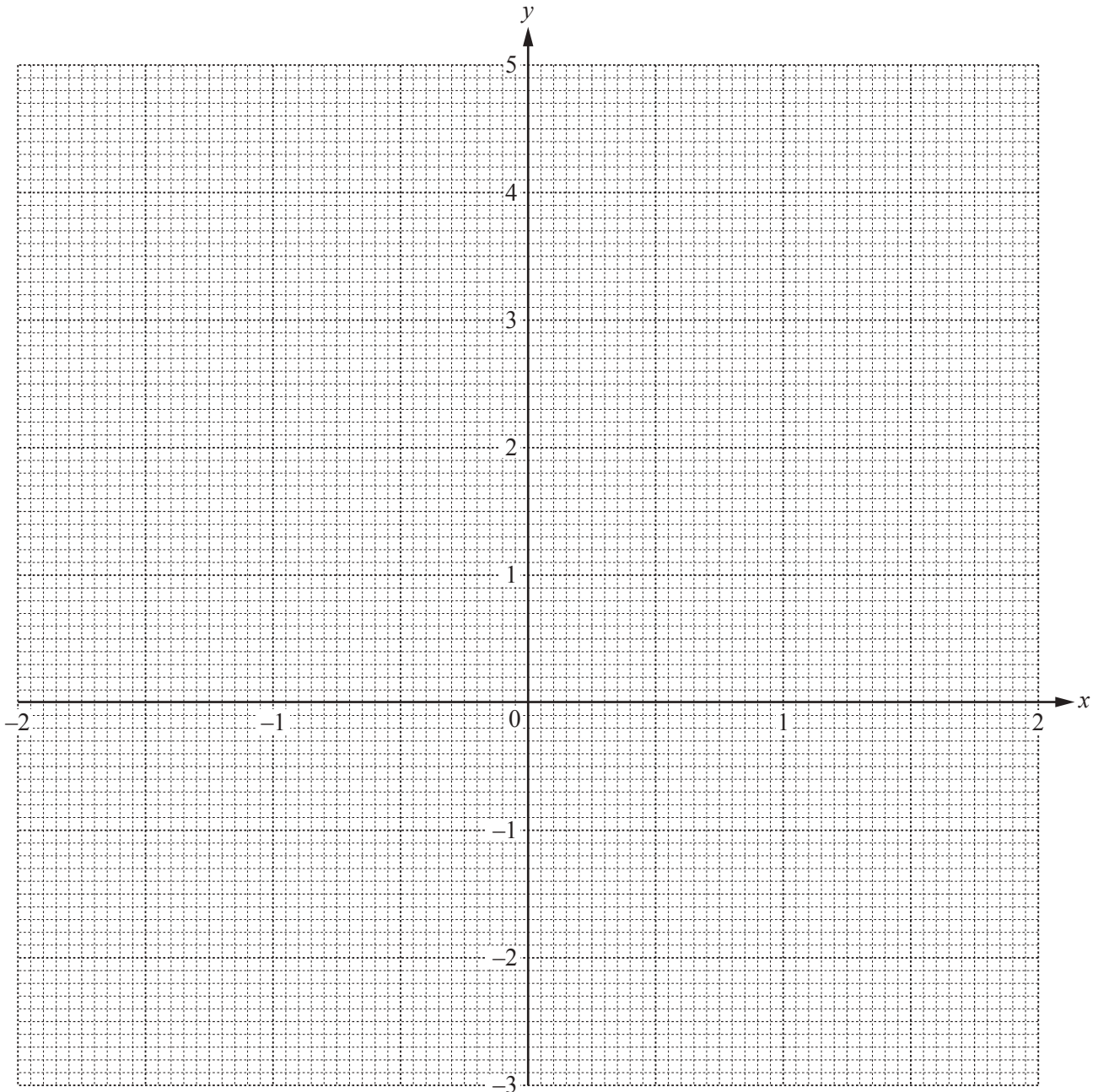
2 The table shows some values for $y = x^2 - \frac{1}{2x}$, $x \neq 0$.

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]

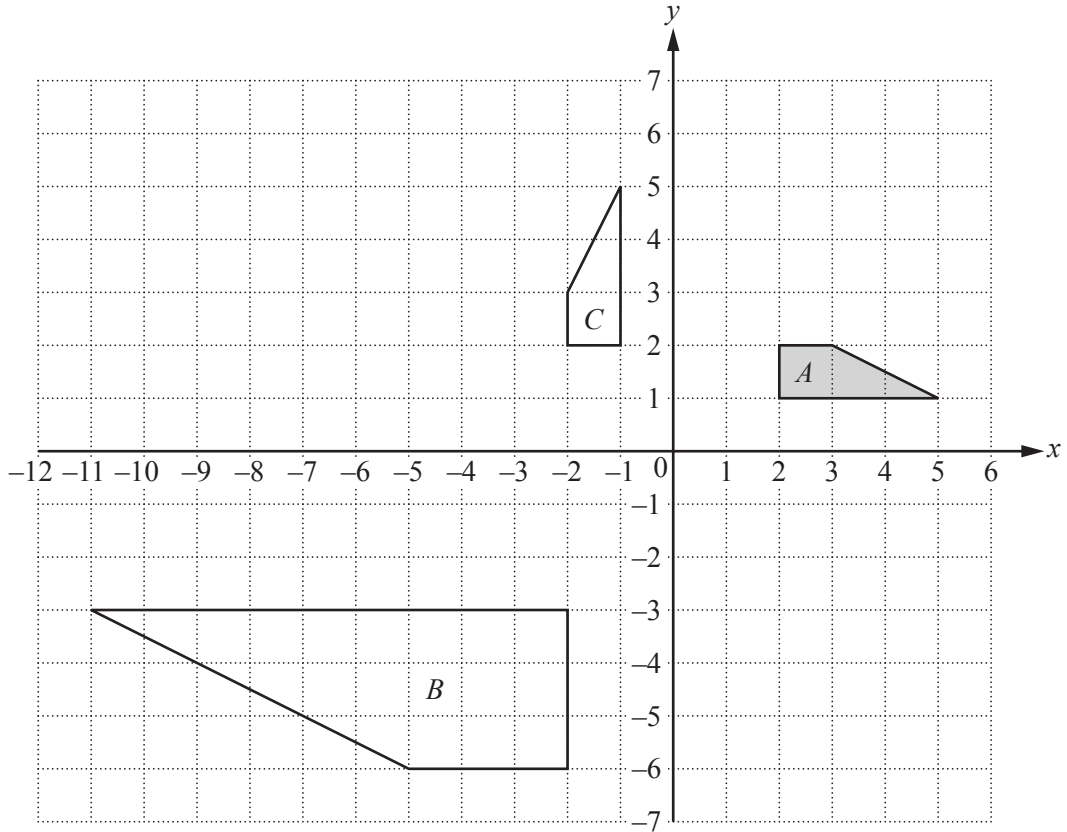
- (d) The equation $x^2 - \frac{1}{2x} = k$ has only one solution.

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]



- (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° 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*.

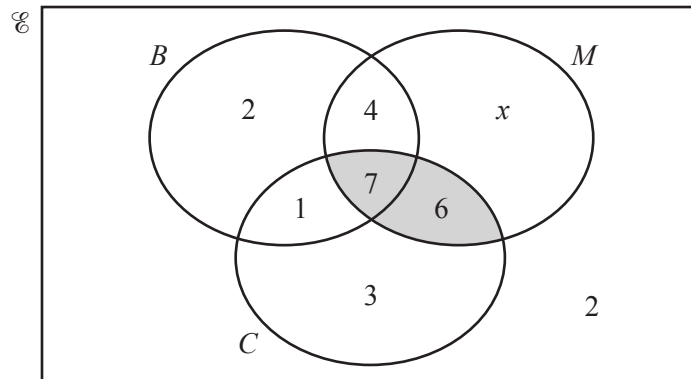
Answer(b)

..... [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.

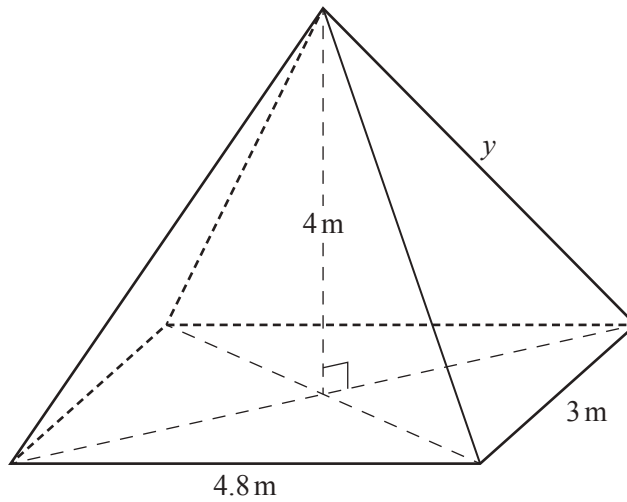
Answer(a)(i) [2]

- (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° .

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.

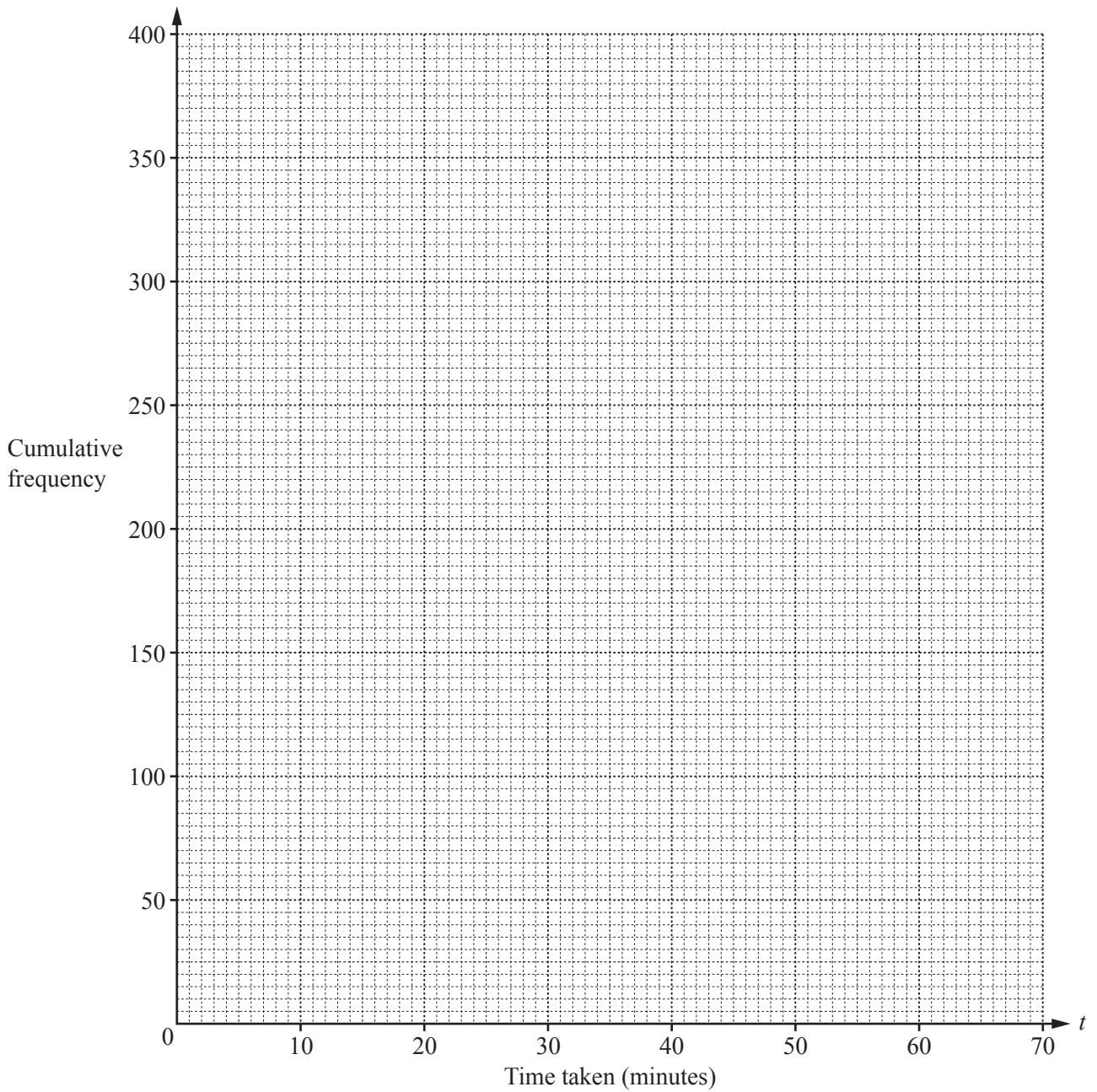
Answer(a)(ii) min [4]

- (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]

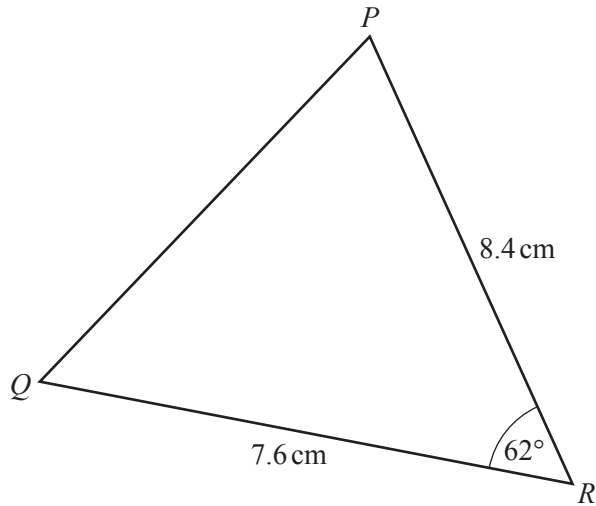
(iii) the 15th percentile,

Answer(c)(iii) min [2]

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

Answer(c)(iv) [2]

7 (a)

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

Calculate

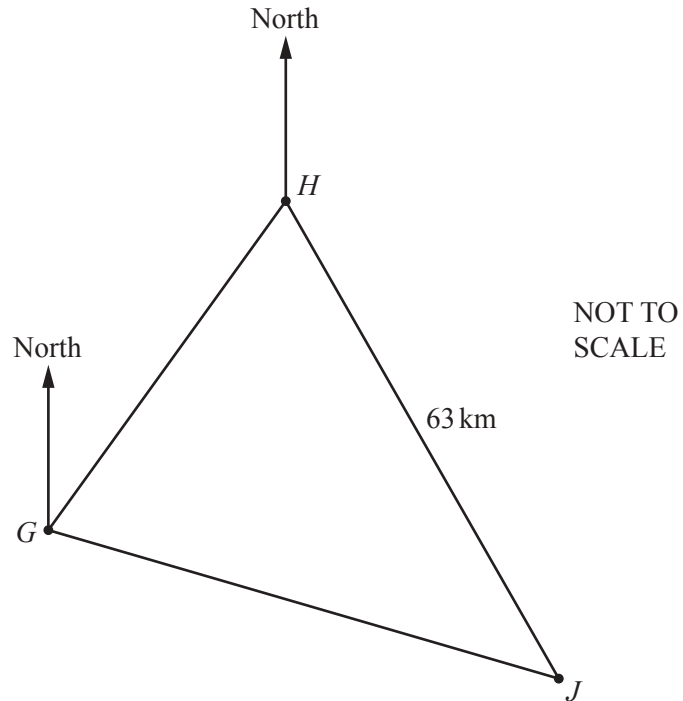
(i) PQ ,

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

(ii) the area of triangle PQR .

Answer(a)(ii) $\dots\dots\dots$ cm² [2]

(b)



The diagram shows the positions of three small islands G , H and J .
 The bearing of H from G is 045° .
 The bearing of J from G is 126° .
 The bearing of J from H is 164° .
 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) $\frac{21-x}{x+3} = 4$

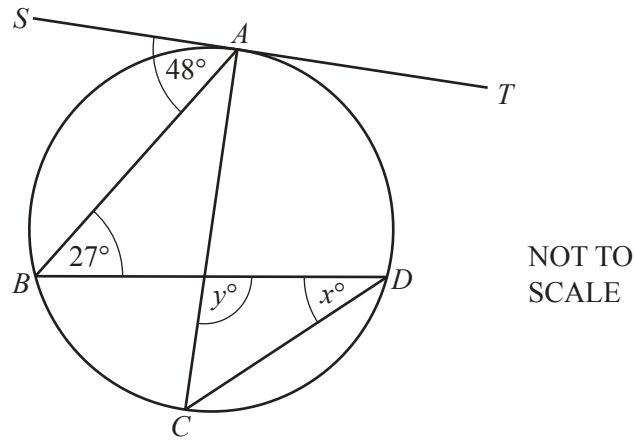
Answer(c)(i) $x = \dots\dots\dots$ [3]

(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]

- 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

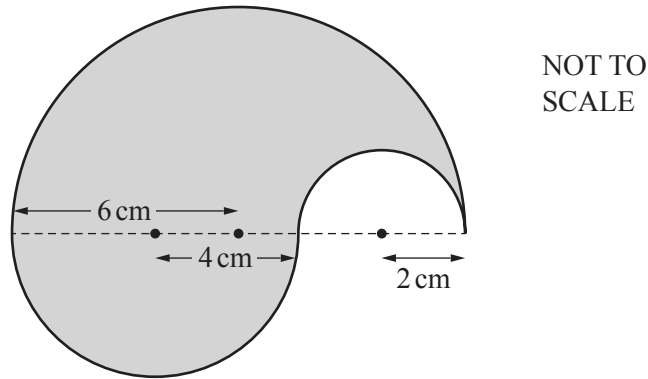
- (i) x ,

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.

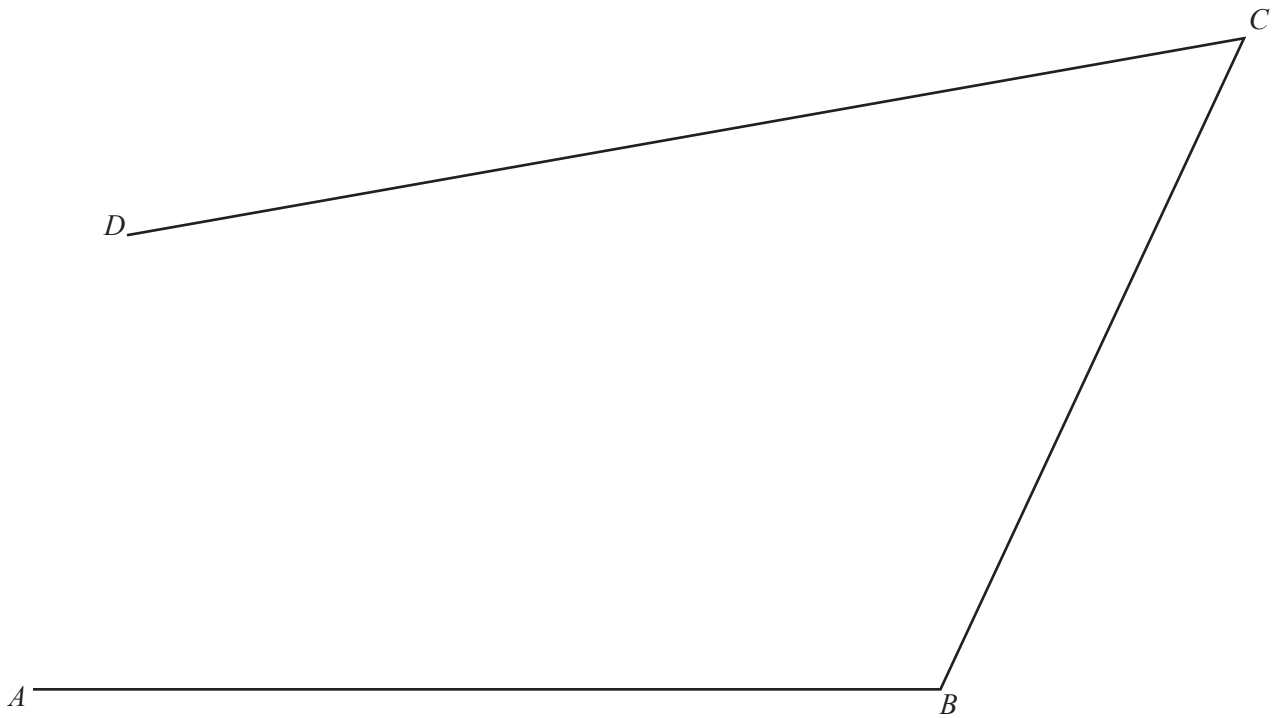
Answer(b)(i) cm [2]

- (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) mm³ [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]

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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