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0580/43

October/November 2012

2 hours 30 minutes

Additional Materials:	Electronic calculator	Geometrical instruments
	Mathematical tables (optional)	Tracing paper (optional)

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.
The total of the marks for this paper is 130.



[Turn over

- 1 (a) The Martinez family travels by car to Seatown.
The distance is 92 km and the journey takes 1 hour 25 minutes.

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- (i) The family leaves home at 07 50.
Write down the time they arrive at Seatown.

Answer(a)(i) [1]

- (ii) Calculate the average speed for the journey.

Answer(a)(ii) km/h [2]

- (iii) During the journey, the family stops for 10 minutes.

Calculate 10 minutes as a percentage of 1 hour 25 minutes.

Answer(a)(iii) % [1]

- (iv) 92 km is 15% more than the distance from Seatown to Deecity.

Calculate the distance from Seatown to Deecity.

Answer(a)(iv) km [3]

- (b) The Martinez family spends \$150 in the ratio

fuel : meals : gifts = 11 : 16 : 3 .

- (i) Show that \$15 is spent on gifts.

Answer (b)(i)

[2]

- (ii) The family buys two gifts.
The first gift costs \$8.25.

Find the ratio

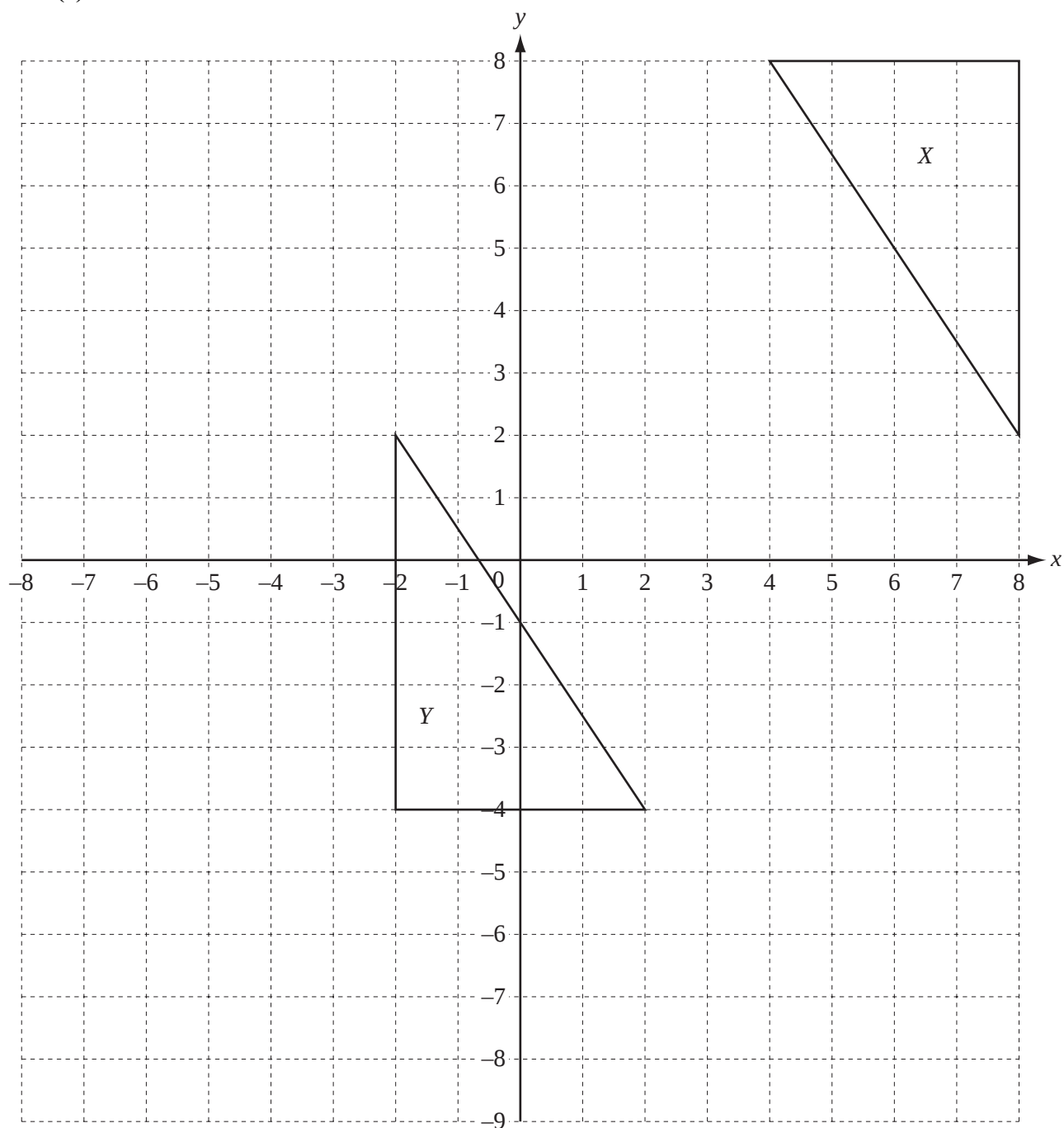
cost of first gift : cost of second gift.

Give your answer in its simplest form.

Answer(b)(ii) : [2]

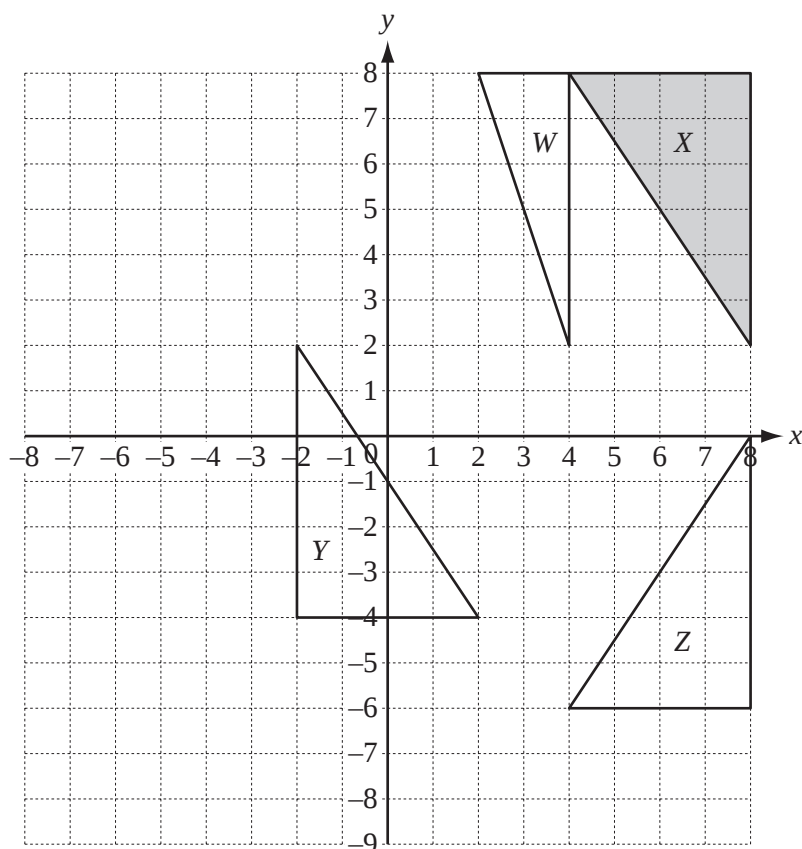
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2 (a)

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- (i) Draw the translation of triangle X by the vector $\begin{pmatrix} -11 \\ -1 \end{pmatrix}$. [2]
- (ii) Draw the enlargement of triangle Y with centre $(-6, -4)$ and scale factor $\frac{1}{2}$. [2]

(b)



Describe fully the **single** transformation that maps

- (i) triangle X onto triangle Z ,

Answer(b)(i) [2]

- (ii) triangle X onto triangle Y ,

Answer(b)(ii) [3]

- (iii) triangle X onto triangle W .

Answer(b)(iii) [3]

- (c) Find the matrix that represents the transformation in **part (b)(iii)**.

Answer(c) $\left(\begin{array}{cc} & \\ & \end{array} \right)$ [2]

- 3 A metal cuboid has a volume of 1080 cm^3 and a mass of 8 kg.

- (a) Calculate the mass of one cubic centimetre of the metal.
Give your answer in grams.

Answer(a) g [1]

- (b) The base of the cuboid measures 12 cm by 10 cm.

Calculate the height of the cuboid.

Answer(b) cm [2]

- (c) The cuboid is melted down and made into a sphere with radius r cm.

- (i) Calculate the value of r .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer(c)(i) $r =$ [3]

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- (ii) Calculate the surface area of the sphere.

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

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Answer(c)(ii) cm^2 [2]

- (d) A larger sphere has a radius R cm.
The surface area of this sphere is double the surface area of the sphere with radius r cm in **part (c)**.

Find the value of $\frac{R}{r}$.

Answer(d) [2]

4

$$f(x) = \frac{2}{x^2} - 3x, \quad x \neq 0$$

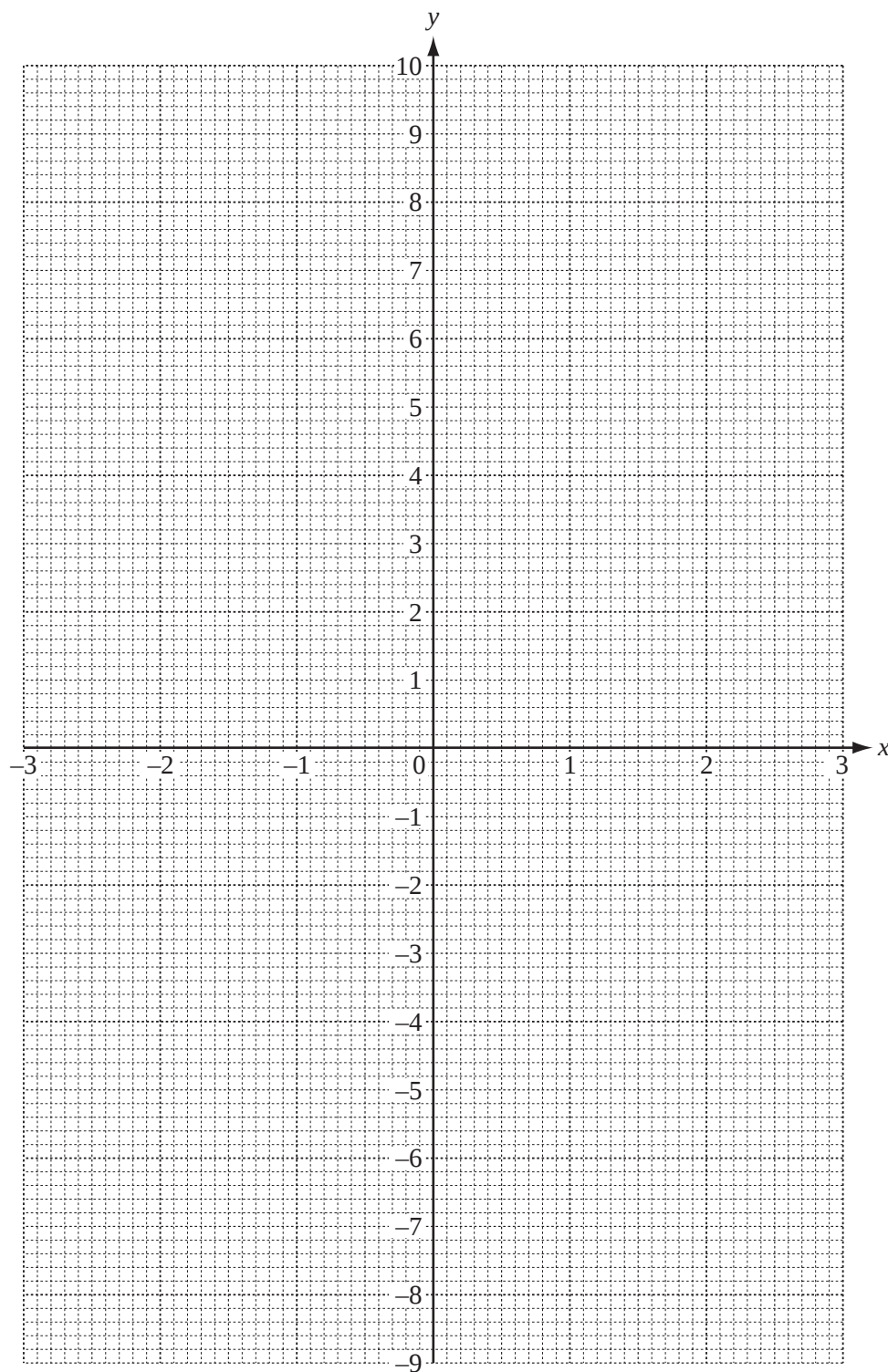
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(a) Complete the table.

x	-3	-2.5	-2	-1.5	-1	-0.5	0.5	1	1.5	2	2.5	3
$f(x)$	9.2	7.8	6.5	5.4		9.5	6.5		-3.6	-5.5	-7.2	-8.8

[2]

(b) On the grid, draw the graph of $y = f(x)$, for $-3 \leq x \leq -0.5$ and $0.5 \leq x \leq 3$.



[5]

(c) Use your graph to solve the equations.

(i) $f(x) = 4$

Answer(c)(i) $x =$ [1]

(ii) $f(x) = 3x$

Answer(c)(ii) $x =$ [2]

(d) The equation $f(x) = 3x$ can be written as $x^3 = k$.

Find the value of k .

Answer(d) $k =$ [2]

(e) (i) Draw the straight line through the points $(-1, 5)$ and $(3, -9)$. [1]

(ii) Find the equation of this line.

Answer(e)(ii) [3]

(iii) Complete the statement.

The straight line in **part (e)(ii)** is a to the graph of $y = f(x)$. [1]

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- 5 (a) Marcos buys 2 bottles of water and 3 bottles of lemonade.

The total cost is \$3.60.

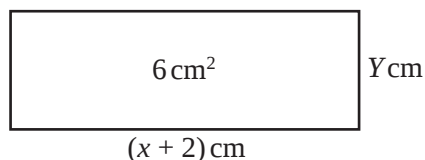
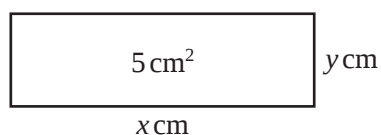
The cost of one bottle of lemonade is \$0.25 more than the cost of one bottle of water.

Find the cost of one bottle of water.

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Answer(a) \$ [4]

(b)



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The diagram shows two rectangles.

The first rectangle measures $x \text{ cm}$ by $y \text{ cm}$ and has an area of 5 cm^2 .

The second rectangle measures $(x + 2) \text{ cm}$ by $Y \text{ cm}$ and has an area of 6 cm^2 .

- (i) When $y + Y = 1$, show that $x^2 - 9x - 10 = 0$.

Answer (b)(i)

[4]

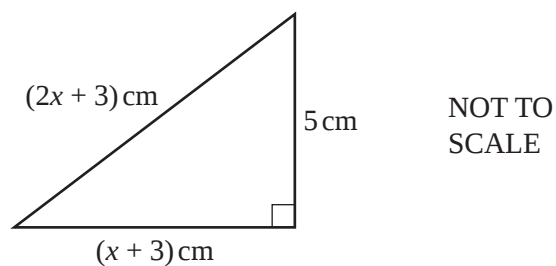
- (ii) Factorise $x^2 - 9x - 10$.

Answer(b)(ii) [2]

- (iii) Calculate the perimeter of the first rectangle.

Answer(b)(iii) cm [2]

(c)



The diagram shows a right-angled triangle with sides of length 5 cm, $(x + 3)$ cm and $(2x + 3)$ cm.

- (i) Show that $3x^2 + 6x - 25 = 0$.

Answer (c)(i)

[4]

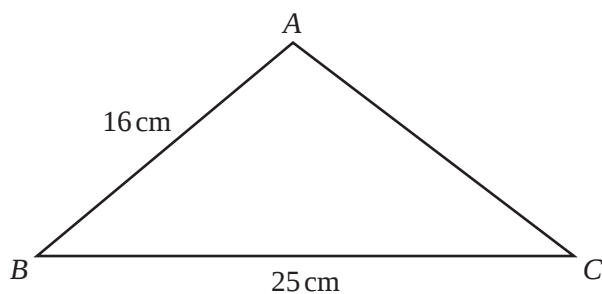
- (ii) Solve the equation $3x^2 + 6x - 25 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

- (iii) Calculate the area of the triangle.

Answer(c)(iii) cm^2 [2]

6

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The area of triangle ABC is 130 cm^2 .
 $AB = 16 \text{ cm}$ and $BC = 25 \text{ cm}$.

- (a) Show clearly that angle $ABC = 40.5^\circ$, correct to one decimal place.

Answer (a)

[3]

- (b) Calculate the length of AC .

Answer(b) $AC =$ cm [4]

- (c) Calculate the shortest distance from A to BC .

Answer(c) cm [2]

7 (a)



Two discs are chosen at random **without** replacement from the five discs shown in the diagram.

- (i) Find the probability that both discs are numbered 2.

Answer(a)(i) [2]

- (ii) Find the probability that the numbers on the **two** discs have a total of 5.

Answer(a)(ii) [3]

- (iii) Find the probability that the numbers on the two discs do **not** have a total of 5.

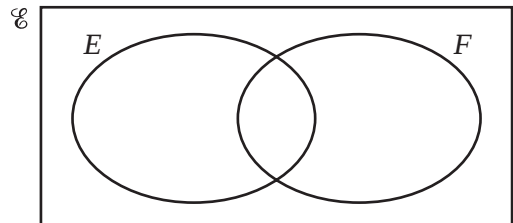
Answer(a)(iii) [1]

- (b) A group of international students take part in a survey on the nationality of their parents.

$E = \{\text{students with an English parent}\}$

$F = \{\text{students with a French parent}\}$

$n(\mathcal{E}) = 50$, $n(E) = 15$, $n(F) = 9$ and $n(E \cup F)' = 33$.



- (i) Find $n(E \cap F)$.

Answer(b)(i) [1]

- (ii) Find $n(E' \cup F)$.

Answer(b)(ii) [1]

- (iii) A student is chosen at random.
Find the probability that this student has an English parent and a French parent.

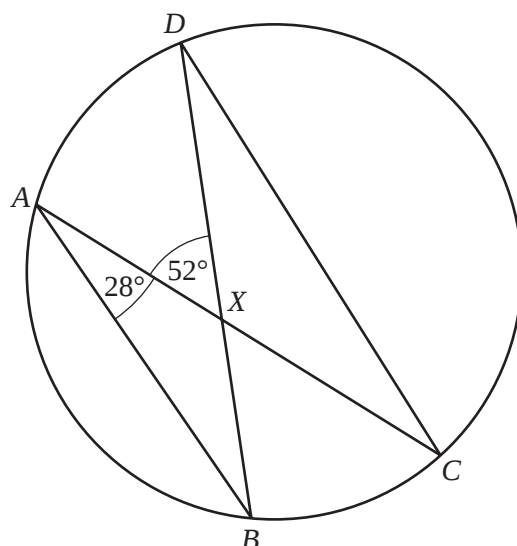
Answer(b)(iii) [1]

- (iv) A student who has a French parent is chosen at random.
Find the probability that this student also has an English parent.

Answer(b)(iv) [1]

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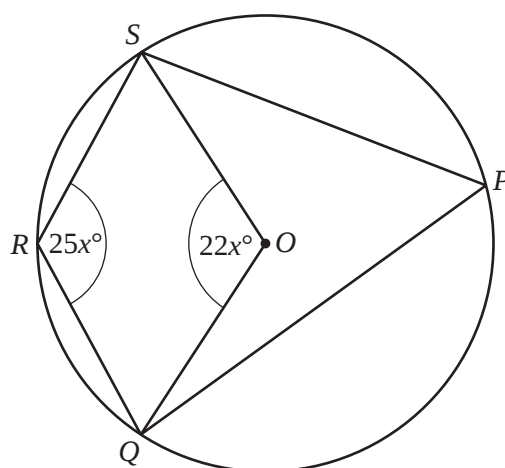
8 (a)

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A, B, C and D lie on a circle.
The chords AC and BD intersect at X .
Angle $BAC = 28^\circ$ and angle $AXD = 52^\circ$.
Calculate angle XCD .

Answer(a) Angle $XCD = \dots\dots\dots$ [3]

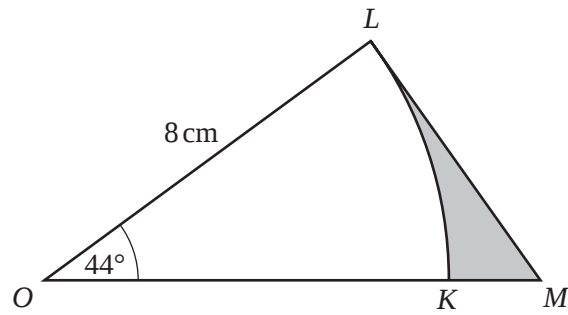
(b)

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$PQRS$ is a cyclic quadrilateral in the circle, centre O .
Angle $QOS = 22x^\circ$ and angle $QRS = 25x^\circ$.
Find the value of x .

Answer(b) $x = \dots\dots\dots$ [3]

(c)

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In the diagram OKL is a sector of a circle, centre O and radius 8 cm.
 OKM is a straight line and ML is a tangent to the circle at L .
 Angle $LOK = 44^\circ$.

Calculate the area shaded in the diagram.

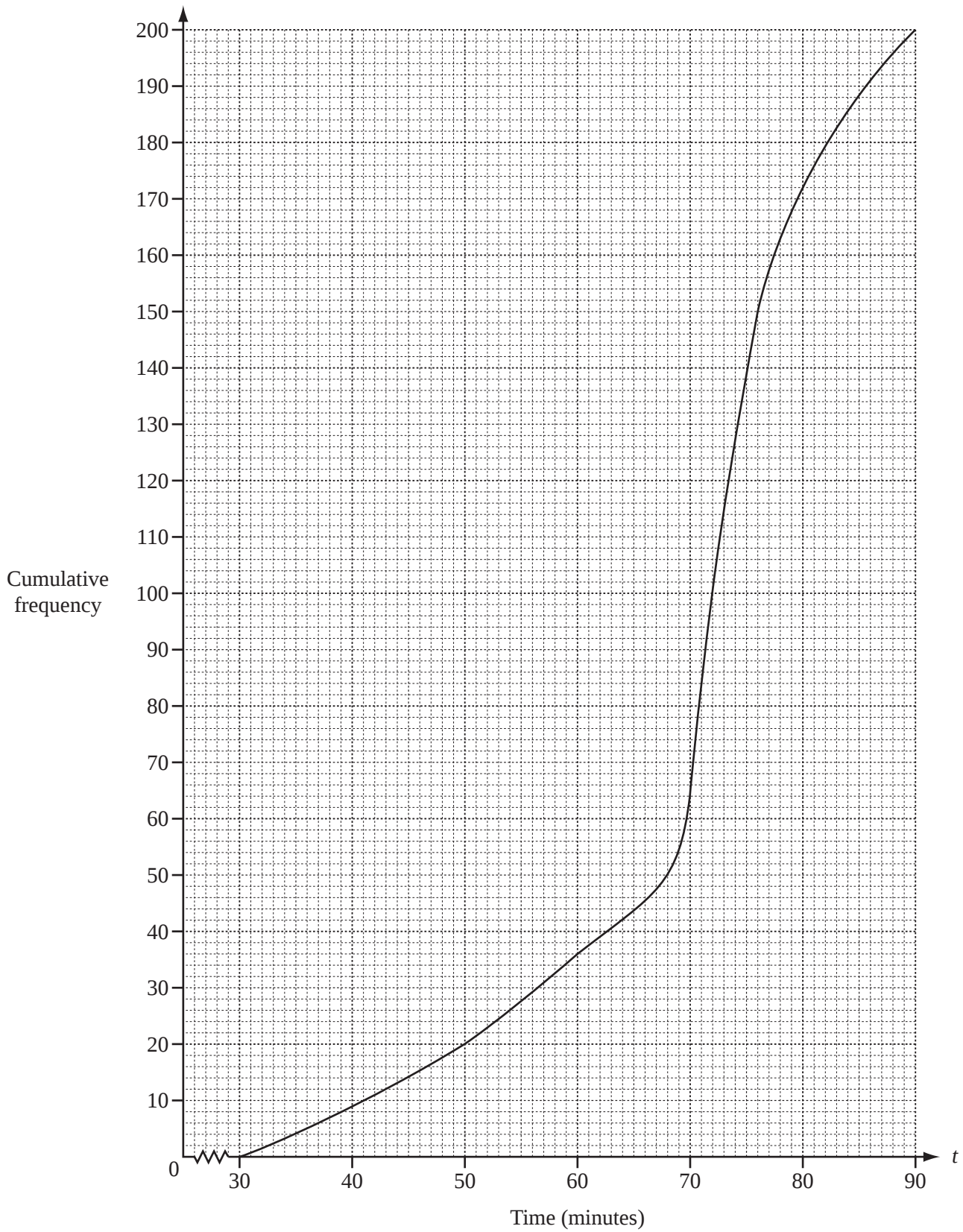
Answer(c) cm^2 [5]

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- 9 200 students take a Mathematics examination.

The cumulative frequency diagram shows information about the times taken, t minutes, to complete the examination.

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(a) Find**(i)** the median,

Answer(a)(i) min [1]

(ii) the lower quartile,

Answer(a)(ii) min [1]

(iii) the inter-quartile range,

Answer(a)(iii) min [1]

(iv) the number of students who took more than 1 hour.

Answer(a)(iv) [2]

(b) (i) Use the cumulative frequency diagram to complete the grouped frequency table.

Time, t minutes	$30 < t \leq 40$	$40 < t \leq 50$	$50 < t \leq 60$	$60 < t \leq 70$	$70 < t \leq 80$	$80 < t \leq 90$
Frequency	9		16	28	108	28

[1]

(ii) Calculate an estimate of the mean time taken by the 200 students to complete the examination.

Show all your working.

Answer(b)(ii) min [4]

- 10 (a) Complete the table for the 6th term and the n th term in each sequence.

	Sequence	6th term		n th term
A	11, 9, 7, 5, 3			
B	1, 4, 9, 16, 25			
C	2, 6, 12, 20, 30			
D	3, 9, 27, 81, 243			
E	1, 3, 15, 61, 213			

[12]

- (b) Find the value of the 100th term in

- (i) Sequence A ,

Answer(b)(i) [1]

- (ii) Sequence C .

Answer(b)(ii) [1]

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- (c) Find the value of n in Sequence D when the n th term is equal to 6561.

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Answer(c) $n =$ [1]

- (d) Find the value of the 10th term in Sequence E .

Answer(d) [1]

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