UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTER NUMBER

CANDIDATE NUMBER

MATHEMATICS (US) **0444/43**

Paper 4 (Extended) **October/November 2012**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Center number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant digits.
Give answers in degrees to one decimal place.
For π use either your calculator value or 3.142.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 130.

Write your calculator model in the box below.

This document consists of **21** printed pages and **3** blank pages.

UNIVERSITY of CAMBRIDGE International Examinations

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

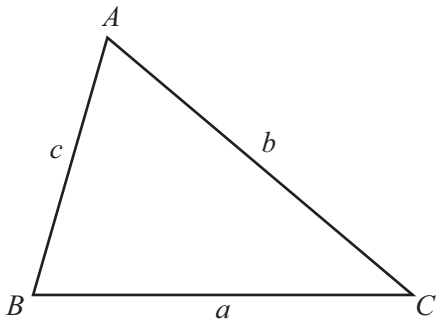
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \dfrac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \dfrac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \dfrac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

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

(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.

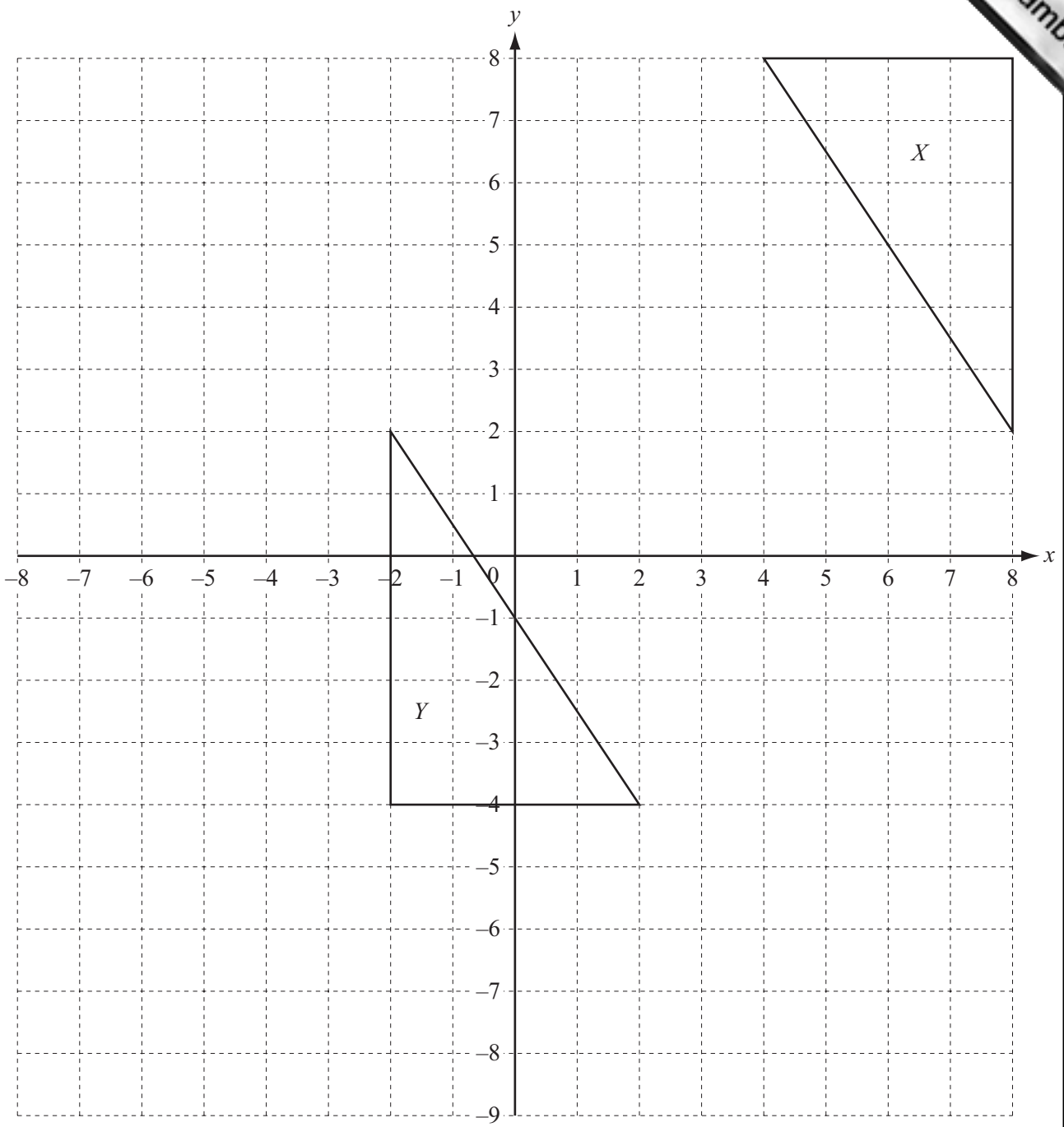
Find the ratio

cost of first gift : cost of second gift.

Give your answer in its simplest form.

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

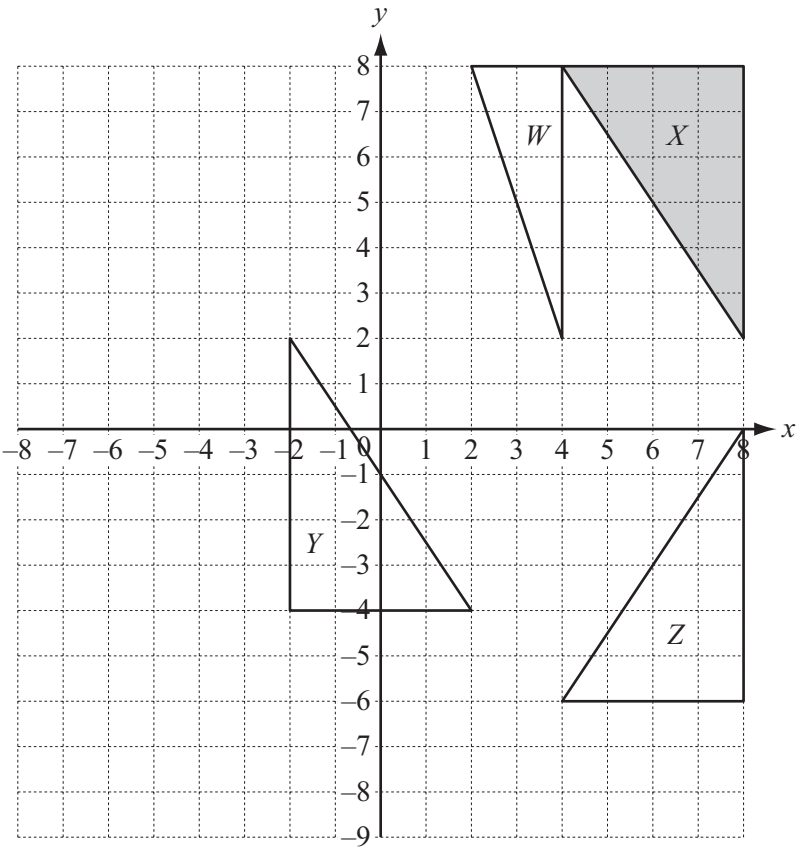
2 (a)



(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 center (–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]

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

(a) Calculate the mass of one cubic centimeter 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.

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

(ii) Calculate the surface area of the sphere.

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

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

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

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

(b) Find the probability that the numbers on the **two** discs have a sum of 5.

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

(c) Find the probability that the numbers on the two discs do **not** have a sum of 5.

Answer(c) ..... [1]

---

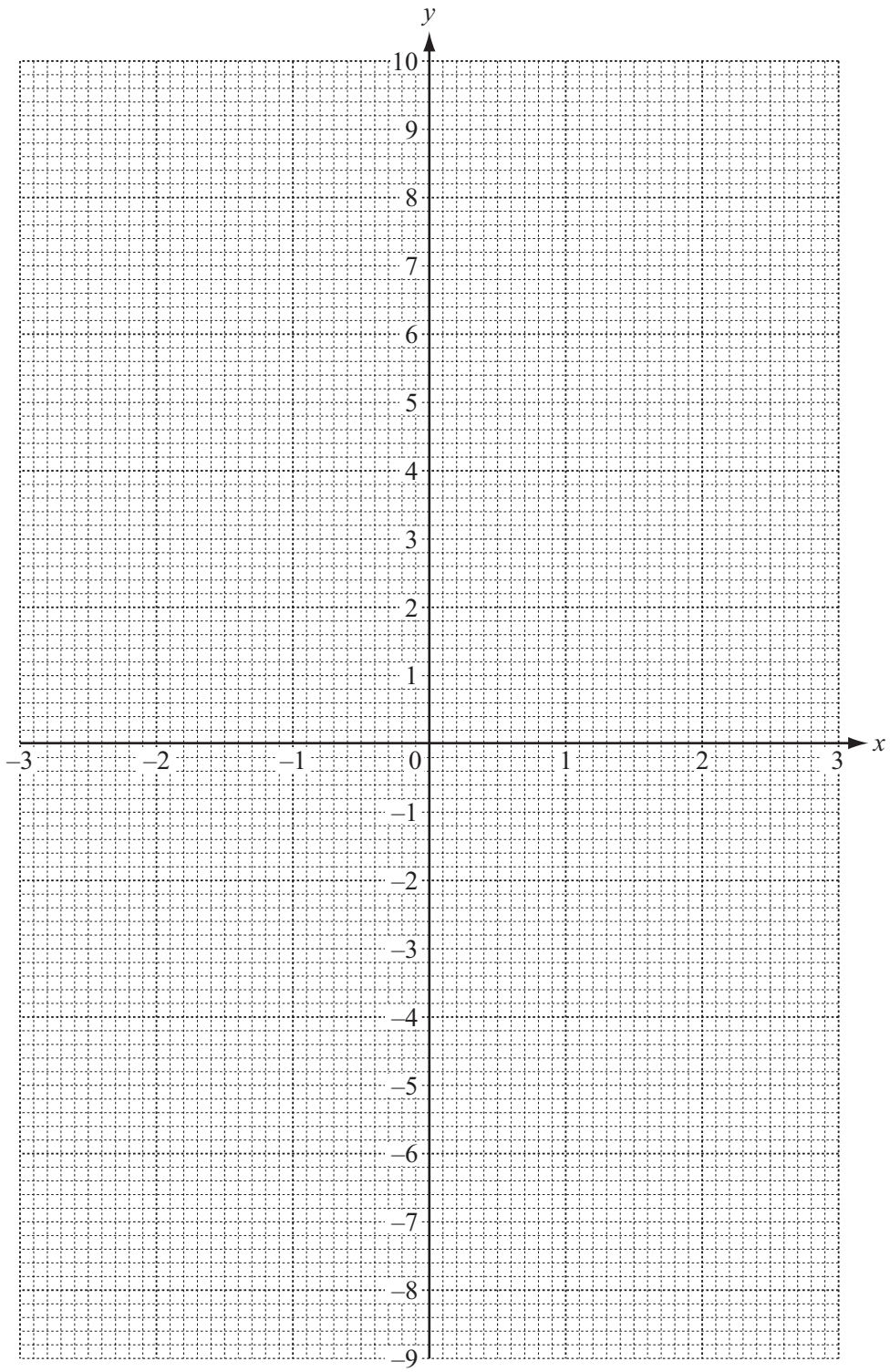
5 $f(x) = \dfrac{2}{x^2} - 3x, \ x \neq 0$

(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 $-3 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 3$.



[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]

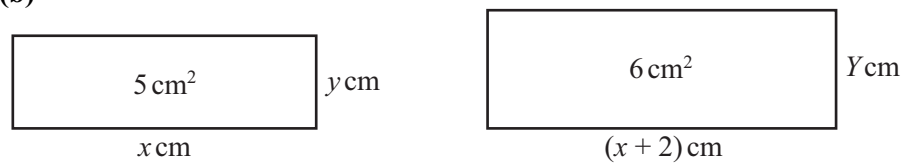
(iii) Complete the statement.

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

6 **(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.

Answer(a) \$ ..... [4]

(b)



The diagram shows two rectangles.
The first rectangle measures x cm by y cm and has an area of 5 cm^2.
The second rectangle measures $(x + 2)$ cm by Y 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]

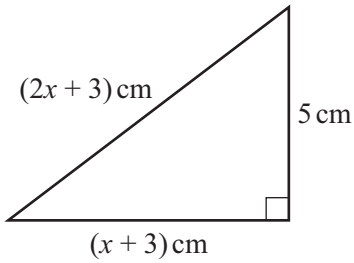
(ii) Factorise $x^2 - 9x - 10$.

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

(iii) Calculate the perimeter of the first rectangle.

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

(c)



NOT TO SCALE

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]

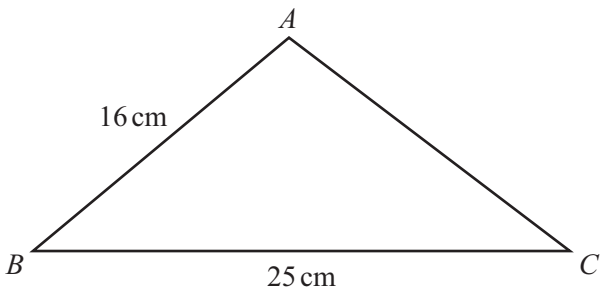
(ii) Solve the equation $3x^2 + 6x - 25 = 0$.
Show all your work and give your answers correct to 2 decimal places.

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

(iii) Calculate the area of the triangle.

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

7



NOT TO SCALE

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

(a) Show clearly that angle $ABC = 40.5°$, correct to one decimal place.

Answer (a)

[3]

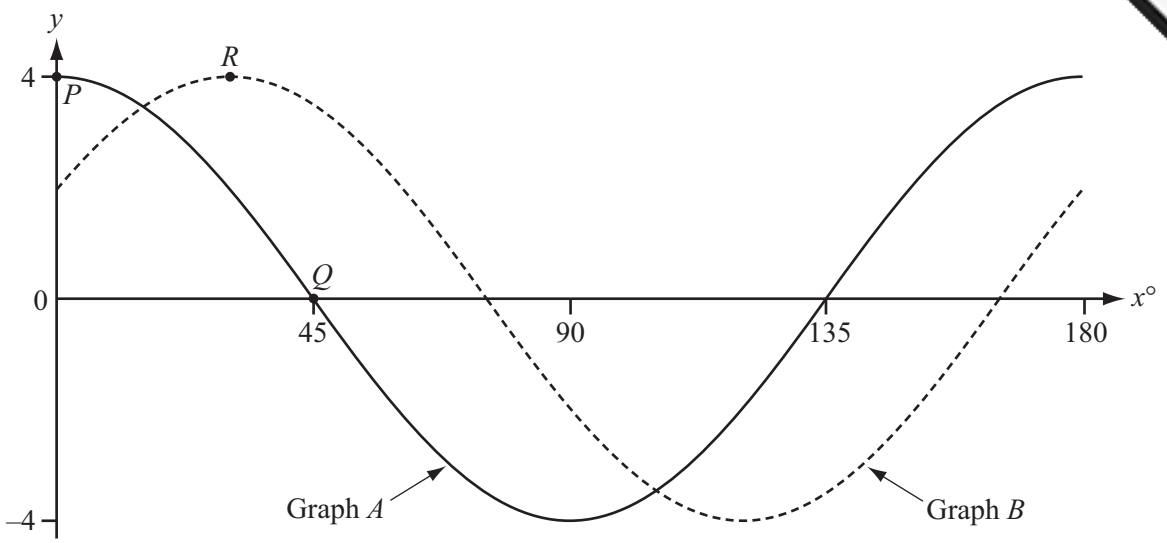
(b) Calculate the length of AC.

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

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

Answer(c) ..... cm [2]

8 **(a)**



Graph A shows the function $f(x) = a\cos(bx°)$.
P is the point (0, 4) and Q is the point (45, 0).

(i) Find the values of a and b.

Answer(a)(i) $a =$ .....

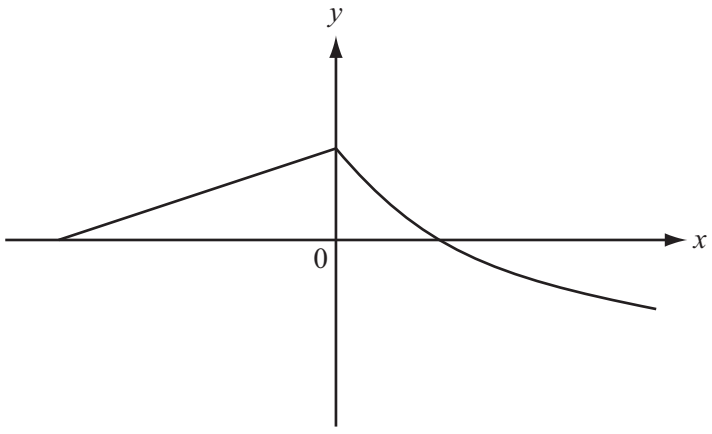
$b =$ ..... [2]

(ii) R is the point (30, 4).

Find the function shown by graph B.

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

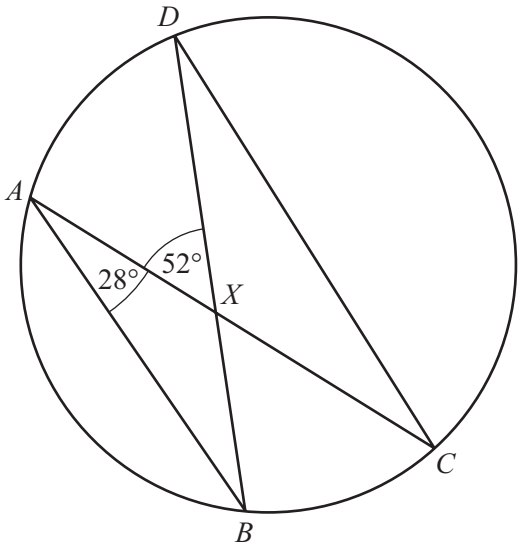
(b)



The diagram shows the graph of $y = g(x)$.

On the same diagram, sketch the graph of $y = 2g(x)$. [2]

9 (a)

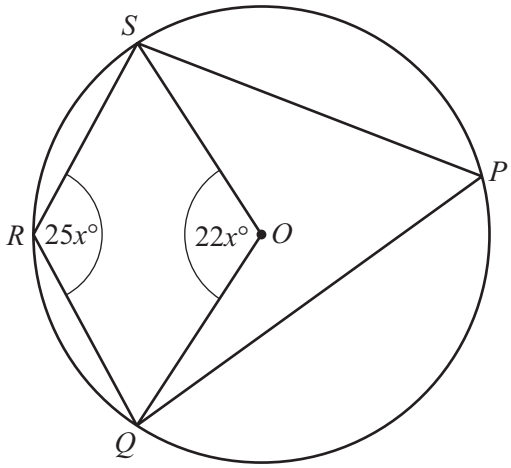


NOT TO SCALE

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

Answer(a) Angle *XCD* = ... [3]

(b)

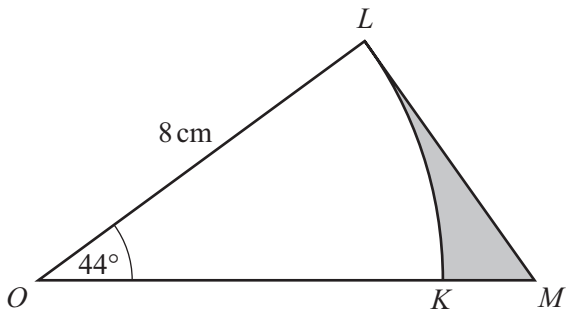


NOT TO SCALE

PQRS is a cyclic quadrilateral in the circle, center *O*.
Angle *QOS* = 22*x*° and angle *QRS* = 25*x*°.
Find the value of *x*.

Answer(b) *x* = ... [3]

(c)



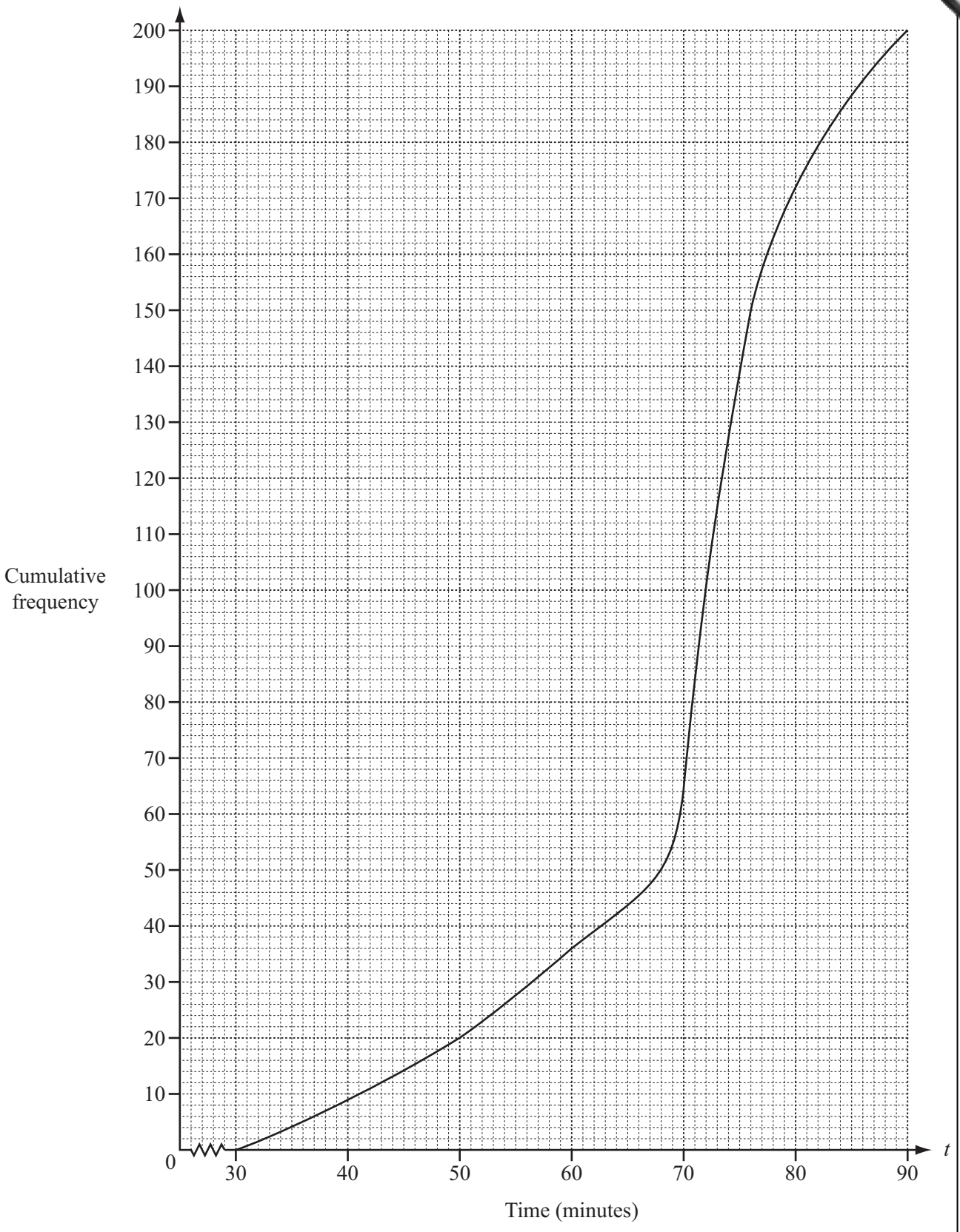
NOT TO SCALE

In the diagram *OKL* is a sector of a circle, center *O* and radius 8 cm.
OKM is a straight line and *ML* is a tangent to the circle at *L*.
Angle *LOK* = 44°.

Calculate the area shaded in the diagram.

Answer(c) ..... cm^2 [5]

10 200 students take a Mathematics examination.
The cumulative frequency diagram shows information about the times taken, t minutes, to com
the examination.



(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	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 90$
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]

11 **(a)** Complete the table for the 6th term and the nth term in each sequence.

	Sequence	6th term		nth 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]

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

Answer(c) $n =$ ..... [1]

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

Answer(d) ..... [1]

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