UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2012**

2 hours 30 minutes

Candidates answer on the Question Paper.

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

READ THESE INSTRUCTIONS FIRST

Write your Centre 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 figures. Give answers in degrees to one decimal place.
For π use either your calculator value or 3.142.

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.

This document consists of **16** printed pages.

For Examiner's Use

1 Anna, Bobby and Carl receive a sum of money.
They share it in the ratio $12 : 7 : 8$.
Anna receives \$504.

(a) Calculate the **total** amount.

Answer(a) \$ ..... [3]

(b) **(i)** Anna uses 7% of her \$504 to pay a bill.
Calculate how much she has left.

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

(ii) She buys a coat in a sale for \$64.68.
This was 23% less than the original price.
Calculate the original price of the coat.

Answer(b)(ii) \$ ..... [3]

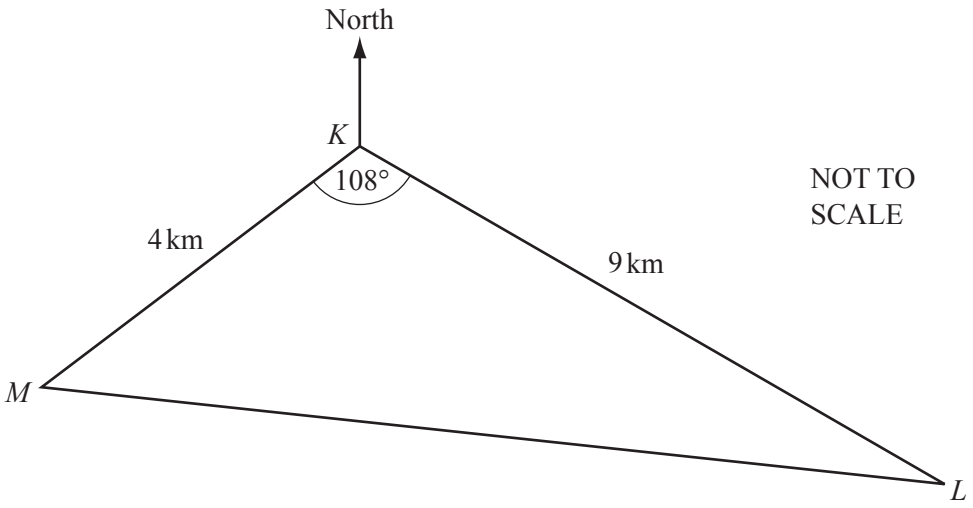
(c) Bobby uses \$250 of his share to open a bank account.
This account pays compound interest at a rate of 1.6% per year.
Calculate the amount in the bank account after 3 years.
Give your answer correct to 2 decimal places.

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

(d) Carl buys a computer for \$288 and sells it for \$324.
Calculate his percentage profit.

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

2



Three buoys *K*, *L* and *M* show the course of a boat race.
MK = 4 km, *KL* = 9 km and angle *MKL* = 108°.

(a) Calculate the distance *ML*.

Answer(a) ML = ... km [4]

(b) The bearing of *L* from *K* is 125°.

(i) Calculate how far *L* is south of *K*.

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

(ii) Find the three figure bearing of *K* from *M*.

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

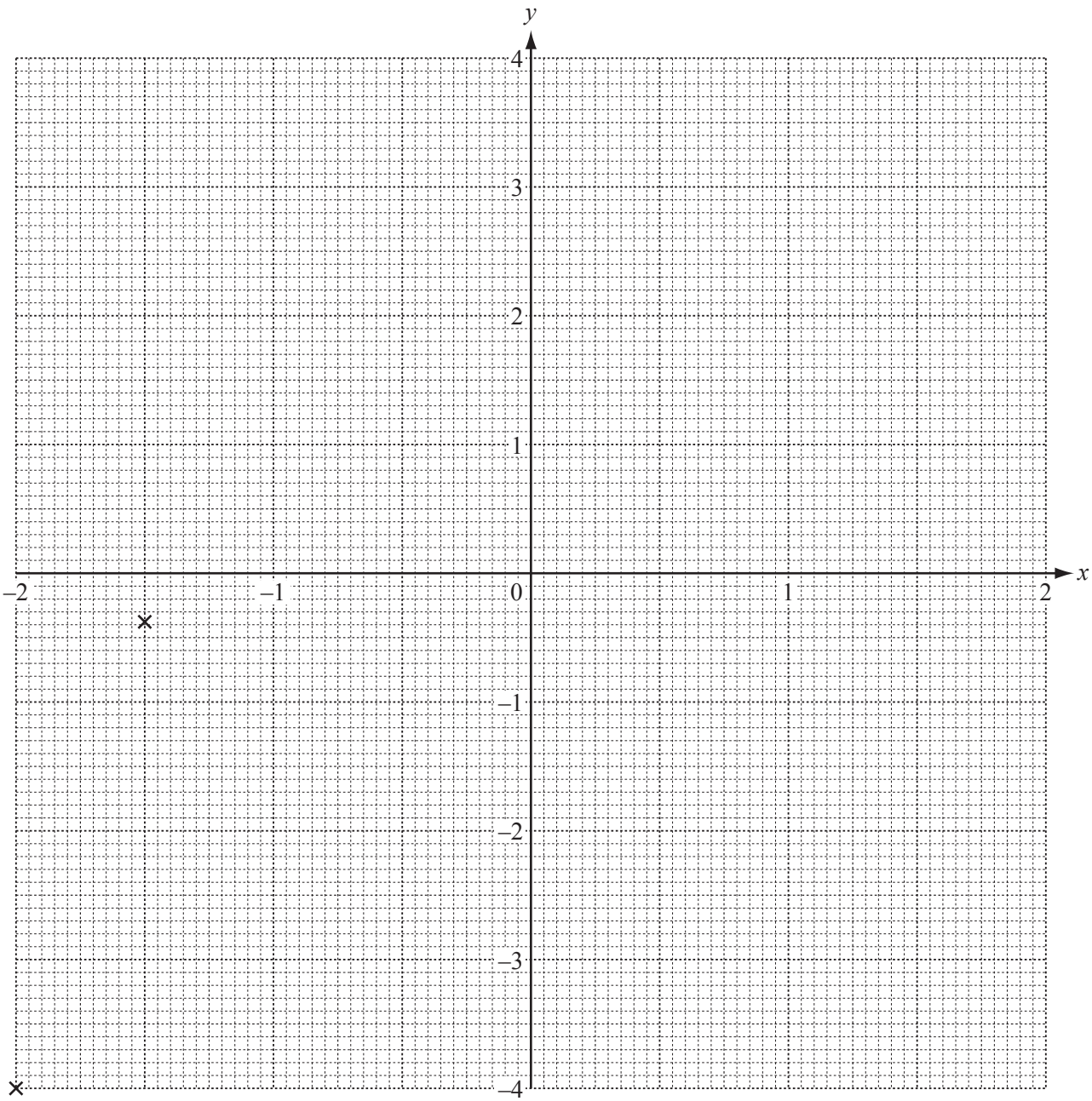
3 The table shows some values for the equation $y = x^3 - 2x$ for $-2 \leqslant x \leqslant 2$.

For Examiner's Use

x	–2	–1.5	–1	–0.6	–0.3	0	0.3	0.6	1	1.5	2
y	–4	–0.38			0.57		–0.57			0.38	4

(a) Complete the table of values. [3]

(b) On the grid below, draw the graph of $y = x^3 - 2x$ for $-2 \leqslant x \leqslant 2$.
The first two points have been plotted for you.



[4]

For Examiner's Use

(c) **(i)** On the grid, draw the line $y = 0.8$ for $-2 \leqslant x \leqslant 2$. [1]

(ii) Use your graph to solve the equation $x^3 - 2x = 0.8$.

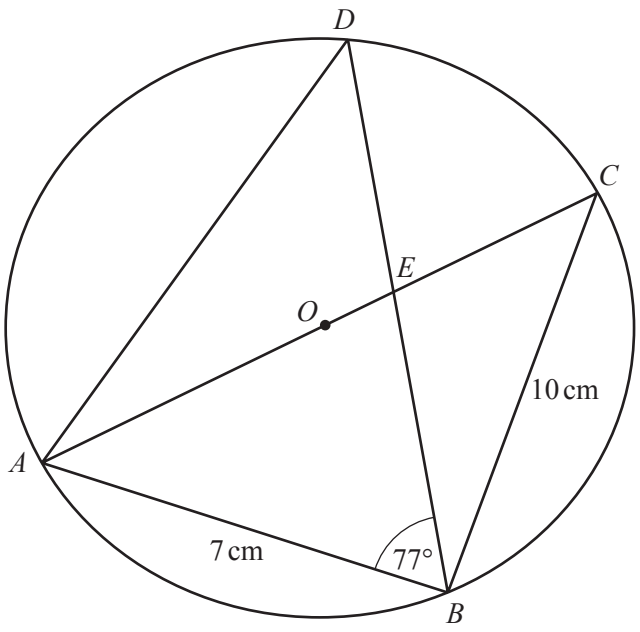
Answer(c)(ii) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) By drawing a suitable tangent, work out an estimate for the gradient of the graph of $y = x^3 - 2x$ where $x = -1.5$.

You must show your working.

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

4



NOT TO SCALE

A, B, C and D lie on a circle, centre O.
$AB = 7$ cm, $BC = 10$ cm and angle $ABD = 77°$.
AOC is a diameter of the circle.

(a) Find angle ABC.

Answer(a) Angle ABC = ... [1]

(b) Calculate angle ACB and show that it rounds to 35° correct to the nearest degree.

Answer(b)

[2]

(c) Explain why angle ADB = angle ACB.

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

For Examiner's Use

(d) (i) Calculate the length of AD.

Answer(d)(i) AD = ... cm [3]

(ii) Calculate the area of triangle ABD.

Answer(d)(ii) ..... cm^2 [2]

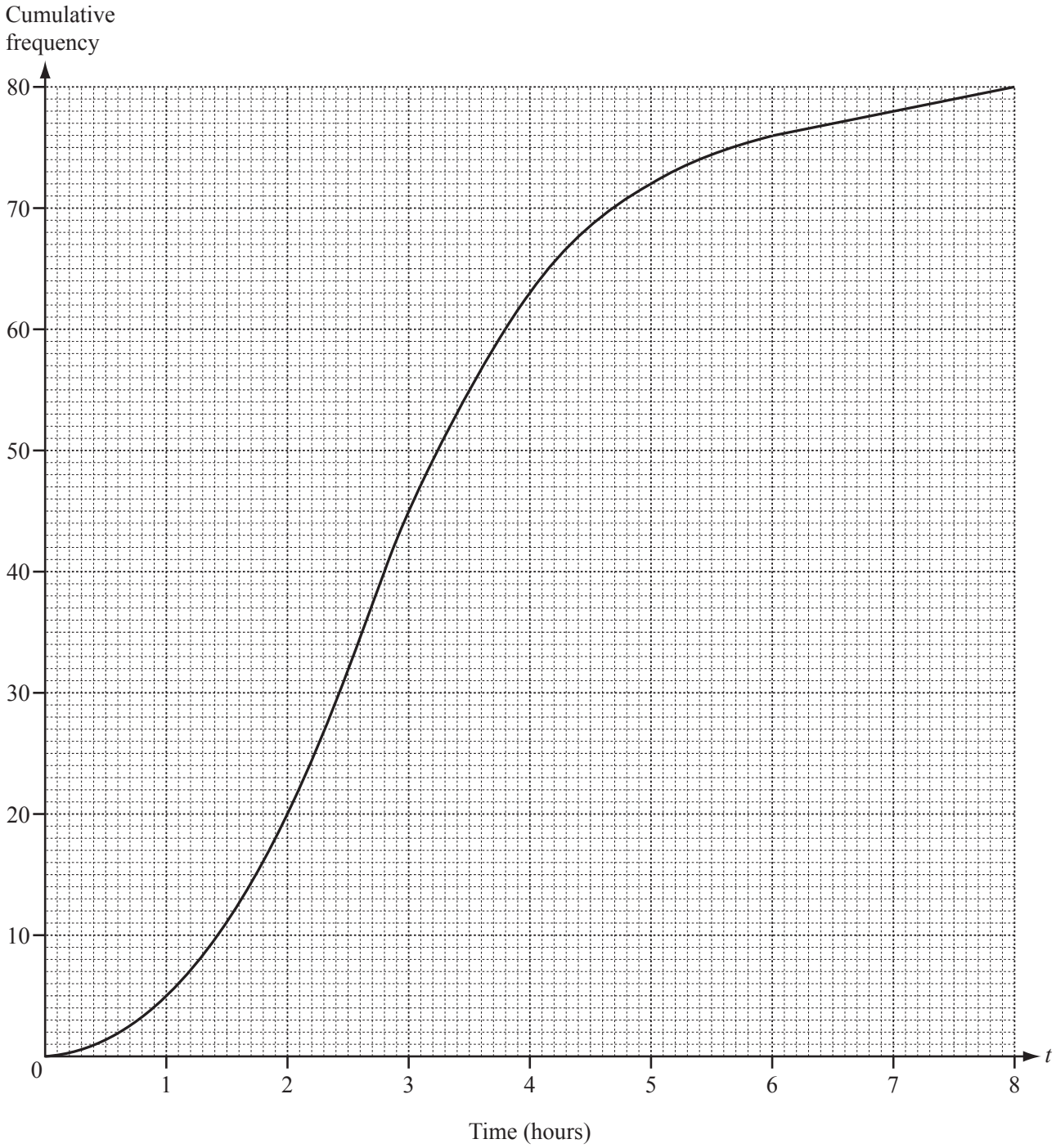
(e) The area of triangle $AED = 12.3\,cm^2$, correct to 3 significant figures.

Use similar triangles to calculate the area of triangle BEC.

Answer(e) ..... cm^2 [3]

5 Felix asked 80 motorists how many hours their journey took that day.
He used the results to draw a cumulative frequency diagram.

For Examiner's Use



(a) Find

(i) the median,

Answer(a)(i) ..... h [1]

(ii) the upper quartile,

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

(iii) the inter-quartile range.

Answer(a)(iii) ..... h [1]

(b) Find the number of motorists whose journey took more than 5 hours but no more than 7 hours.

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

For Examiner's Use

(c) The frequency table shows some of the information about the 80 journeys.

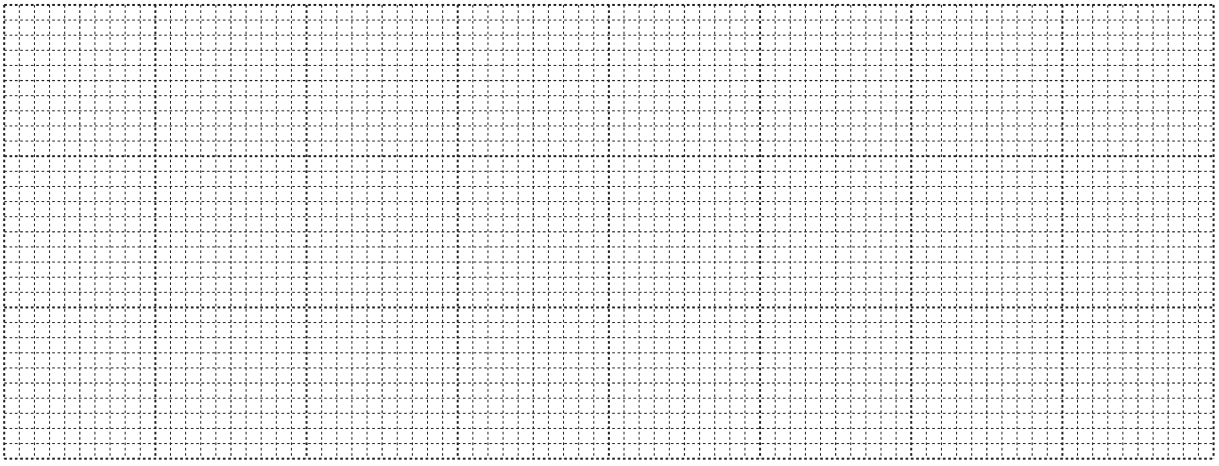
Time in hours (t)	$0 < t \leqslant 2$	$2 < t \leqslant 3$	$3 < t \leqslant 4$	$4 < t \leqslant 5$	$5 < t \leqslant 6$	$6 < t \leqslant 8$
Frequency	20	25	18			

(i) Use the cumulative frequency diagram to complete the table above. [2]

(ii) Calculate an estimate of the mean number of hours the 80 journeys took.

Answer(c)(ii) ..... h [4]

(d) On the grid, draw a histogram to represent the information in your table in **part (c)**.



[5]

For Examiner's Use

6 **(a)** A parallelogram has base $(2x - 1)$ metres and height $(4x - 7)$ metres.
The area of the parallelogram is $1\ m^2$.

(i) Show that $4x^2 - 9x + 3 = 0$.

Answer (a)(i)

[3]

(ii) Solve the equation $4x^2 - 9x + 3 = 0$.

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

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

(iii) Calculate the height of the parallelogram.

Answer(a)(iii) ..... m [1]

(b) (i) Factorise $x^2 - 16$.

For Examiner's Use

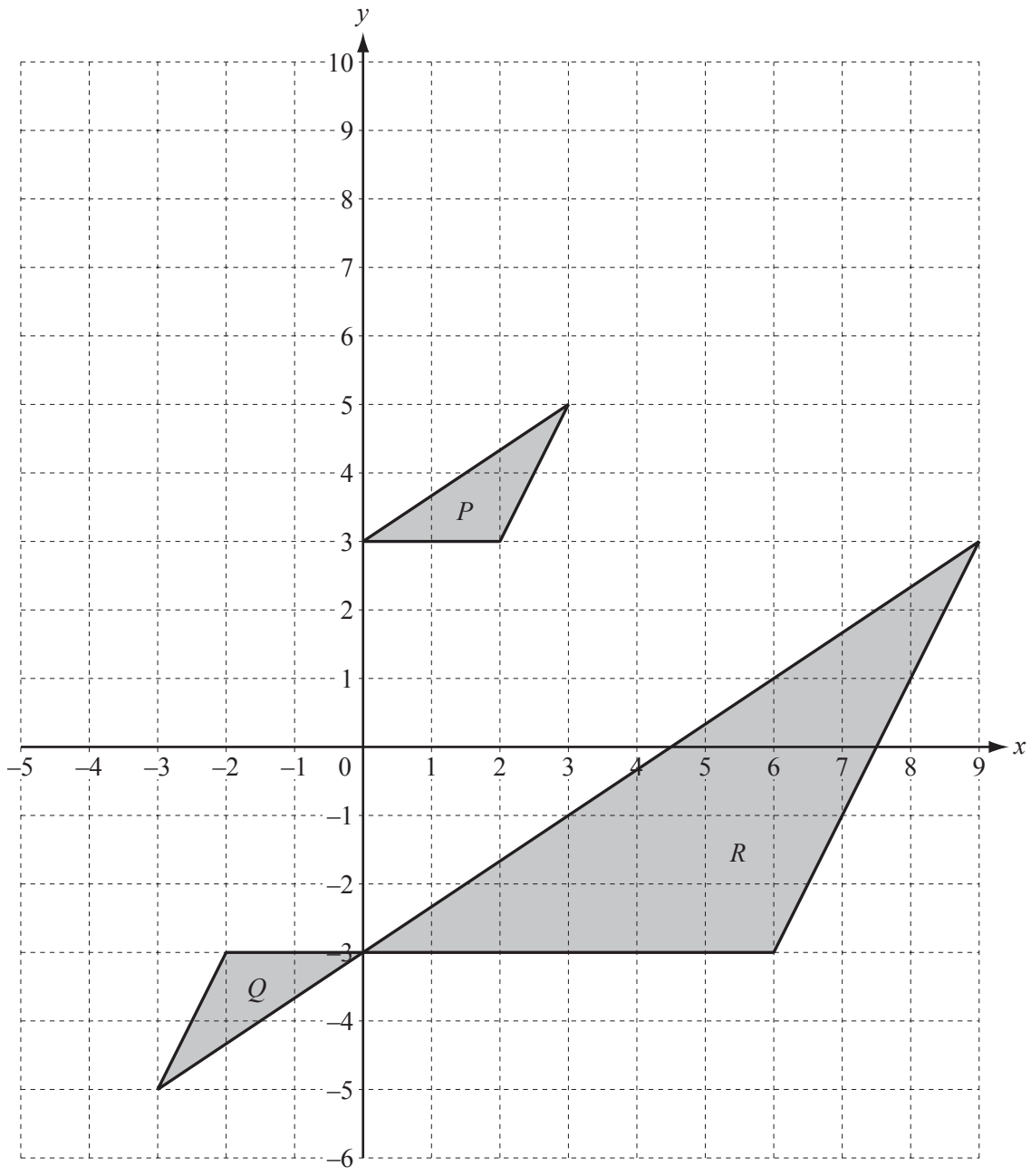
Answer(b)(i) ..... [1]

(ii) Solve the equation $\frac{2x+3}{x-4} + \frac{x+40}{x^2-16} = 2$.

Answer(b)(ii) $x =$ ..... [4]

7

For Examiner's Use



(a) Describe fully

(i) the **single** transformation which maps **triangle *P*** onto triangle *Q*,

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

(ii) the **single** transformation which maps **triangle *Q*** onto triangle *R*,

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

(iii) the **single** transformation which maps **triangle *R*** onto triangle *P*.

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

For Examiner's Use

(b) On the grid, draw the image of

(i) **triangle *P*** after translation by $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$, [2]

(ii) **triangle *P*** after reflection in the line $x = -1$. [2]

(c) **(i)** On the grid, draw the image of **triangle *P*** after a stretch, scale factor 2 and the y-axis as the invariant line. [2]

(ii) Find the matrix which represents this stretch.

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

8 $\mathscr{E} = \{1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8,\ 9\}$

$E = \{x : x \text{ is an even number}\}$

$F = \{2,\ 5,\ 7\}$

$G = \{x : x^2 - 13x + 36 = 0\}$

For Examiner's Use

(a) List the elements of set E.

Answer(a) $E = \{$ $\}$ [1]

(b) Write down $\text{n}(F)$.

Answer(b) $\text{n}(F) =$ ..... [1]

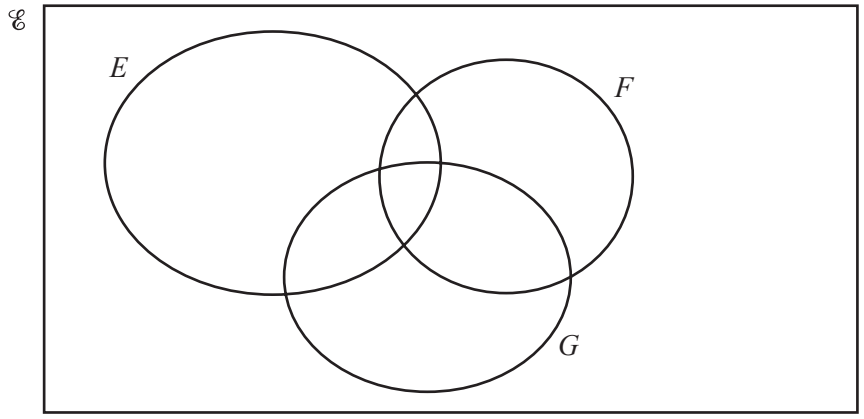
(c) **(i)** Factorise $x^2 - 13x + 36$.

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

(ii) Using your answer to **part (c)(i)**, solve $x^2 - 13x + 36 = 0$ to find the two elements of G.

Answer(c)(ii) $x =$ ..... or $x =$ ..... [1]

(d) Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.



[2]

(e) Use set notation to complete the following statements.

(i) $F \cap G =$ ..... [1]

(ii) 7 .... E [1]

(iii) $\text{n}(E$ ..... $F) = 6$ [1]

9 $f(x) = 3x + 5$ $g(x) = 7 - 2x$ $h(x) = x^2 - 8$

For Examiner's Use

(a) Find

(i) f(3),

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

(ii) $g(x - 3)$ in terms of x in its simplest form,

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

(iii) $h(5x)$ in terms of x in its simplest form.

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

(b) Find the inverse function $g^{-1}(x)$.

Answer(b) $g^{-1}(x) =$ ..... [2]

(c) Find $hf(x)$ in the form $ax^2 + bx + c$.

Answer(c) $hf(x) =$ ..... [3]

(d) Solve the equation $ff(x) = 83$.

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

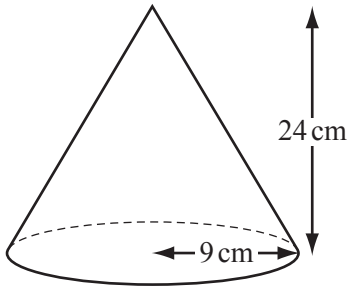
(e) Solve the inequality $2f(x) < g(x)$.

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

Question 10 is printed on the next page.

10

For Examiner's Use



NOT TO SCALE

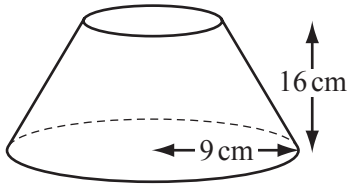
A solid metal cone has base radius 9 cm and vertical height 24 cm.

(a) Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(a) ..... cm^3 [2]

(b)



NOT TO SCALE

A cone of height 8 cm is removed by cutting parallel to the base, leaving the solid shown above. Show that the volume of this solid rounds to 1960 cm^3, correct to 3 significant figures.

Answer (b)

[4]

(c) The 1960 cm^3 of metal in the solid in **part (b)** is melted and made into 5 identical cylinders, each of length 15 cm.
Show that the radius of each cylinder rounds to 2.9 cm, correct to 1 decimal place.

Answer (c)

[4]