UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	CANDIDATE NUMBER

0755012000

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/42**

Paper 4 (Extended) **May/June 2011**

2 hours 15 minutes

Candidates answer on the Question Paper

Additional Materials: Geometrical Instruments
Graphics Calculator

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.
Do not use staples, paper clips, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.

Unless instructed otherwise, give your answers exactly or correct to three significant figures as appropriate.
Answers in degrees should be given to one decimal place.
For π, use your calculator value.

You must show all the relevant working to gain full marks and you will be given marks for correct methods, including sketches, even if your answer is incorrect.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 120.

For Examiner's Use

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

Formula List

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

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

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

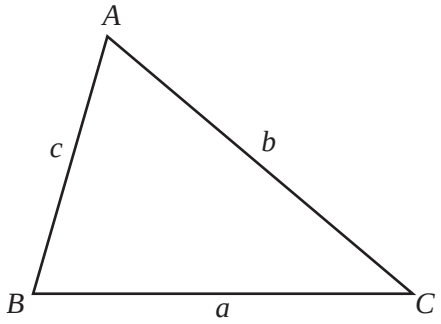
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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

Volume, V, of cylinder of radius r, height h. $\quad V = \pi r^2 h$

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. $\quad V = \dfrac{4}{3}\pi r^3$



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

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

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

For Examiner's Use

Answer **all** the questions.

1 **(a)** **(i)** The population of a village is 4620.
The ratio children : women : men = 5 : 7 : 8.

Show that the number of women in the village is 1617.

[2]

(ii) During the last ten years, the number of women has increased from 1475 to 1617.

Calculate the percentage increase in the number of women.

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

(b) The population of 4620 is expected to decrease by 5%.

Calculate the population following this decrease.

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

(c) The number of children is now 1155.
This is an increase of 65% on the number of children twenty years ago.

Calculate the number of children twenty years ago.

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

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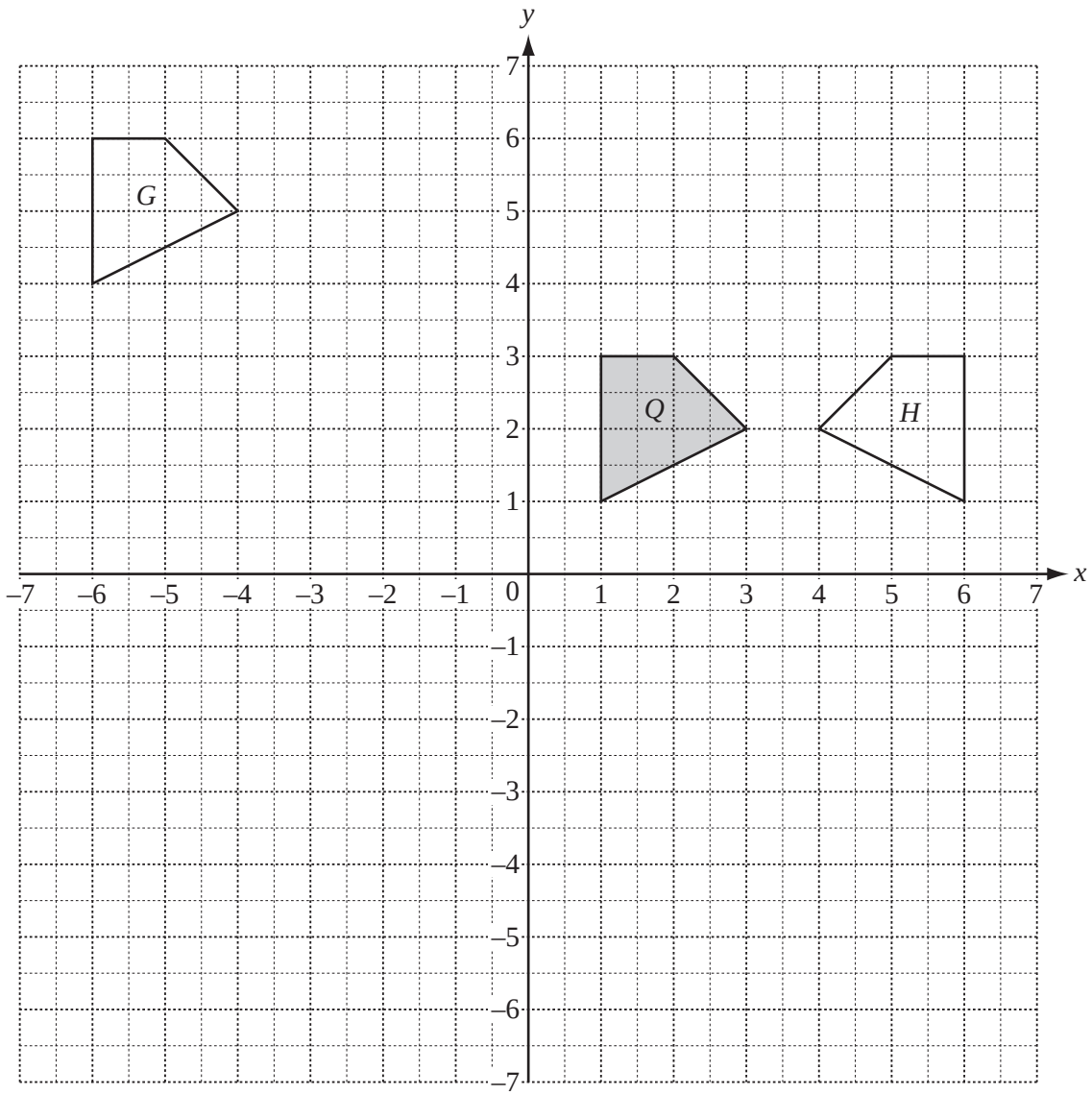

(a) Describe fully the **single** transformation that maps

(i) shape Q onto shape G,

.....

..... [2]

(ii) shape Q onto shape H.

.....

..... [2]

(b) On the grid, draw the enlargement of shape Q, centre (2, 5), scale factor 3. [2]

(c) Use one mathematical word to complete the statement.

The shapes G and H and the image drawn in **part (b)** are all ..... to shape Q. [1]

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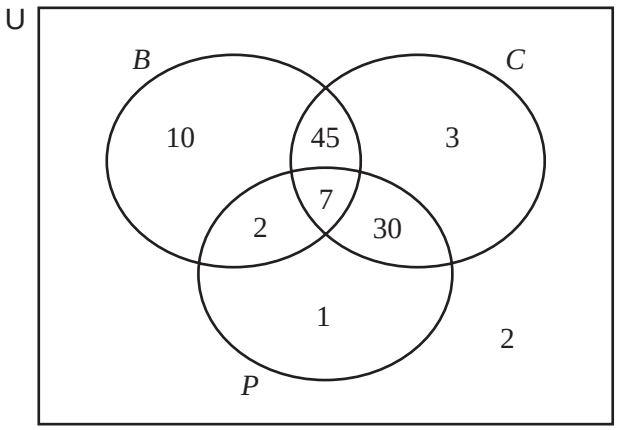
3



100 students are asked which science subjects they study.
The Venn diagram shows how many students study biology (B), chemistry (C) and physics (P).

(a) Write down the number of students that study

(i) all three subjects,

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

(ii) biology and chemistry,

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

(iii) physics but not chemistry,

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

(iv) exactly one of the three subjects.

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

(b) Find

(i) $\mathrm{n}(P \cup C)$,

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

(ii) $\mathrm{n}(C')$.

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

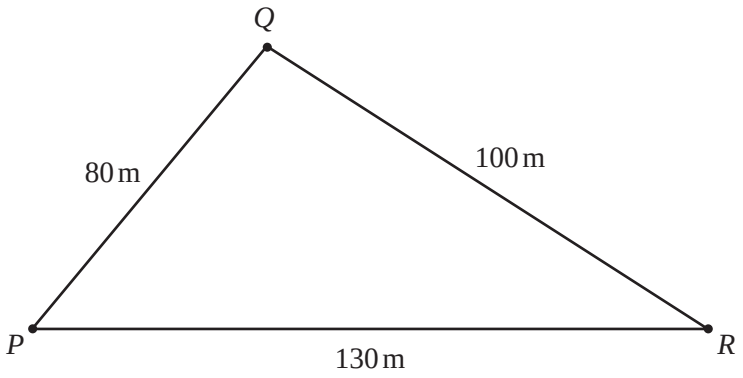
(c) From the 100 students, one student is chosen at random.
Write down the probability that this student studies physics.

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

(d) From the students who study chemistry, one student is chosen at random.
Find the probability that this student also studies physics.

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

4



NOT TO SCALE

Pierre ran around an exercise course.
The three exercise points P, Q and R are shown on the diagram.
$PQ = 80$ m, $QR = 100$ m and $RP = 130$ m.

(a) (i) Pierre ran from P to Q at 2.5 m/s.

Calculate the time taken.

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

(ii) The table shows some of the times Pierre took to complete each part of the course.

	Time taken
Run from P to Q	
Exercise at Q	5 min 20 s
Run from Q to R	50 s
Exercise at R	4 min 28 s
Run from R to P	50 s

Pierre started **from *P*** at 14 55.

At what time did he arrive back at P?

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

For Examiner's Use

(b) Calculate angle *PQR*.
Show all your working and show that your answer rounds to 91.8°, correct to 1 decimal place.

[3]

(c) Calculate the area of triangle *PQR*.
Show all your working.

Answer(c) ..... m^2 [2]

(d) A new exercise point, *S*, is put on the line *QR*, so that angle *QPS* = 20°.

(i) On the diagram, sketch the line *PS* and label the point *S*. [1]

(ii) Find the size of angle *PSQ*.

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

(iii) Calculate the distance *QS*.

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

For Examiner's Use

5 Ten students take part in two quizzes.
The scores in Quiz 1 and Quiz 2 are shown by the values x and y in the table.

Quiz 1 (x)	7	1	1	5	6	4	7	6	5	3
Quiz 2 (y)	6	2	1	5	5	5	6	6	4	4

(a) Which word best describes the correlation between x and y?

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

(b) The line of best fit on a scatter diagram goes through the mean point.

Find the co-ordinates of this point.

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

(c) Find the equation of the line of regression, writing y in terms of x.

Answer(c) $y =$ ..... [2]

(d) (i) How many students scored **more than** 5 in both quizzes?

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

(ii) Two of the ten students are chosen at random.

Calculate the probability that they both scored **more than** 5 in both quizzes.

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

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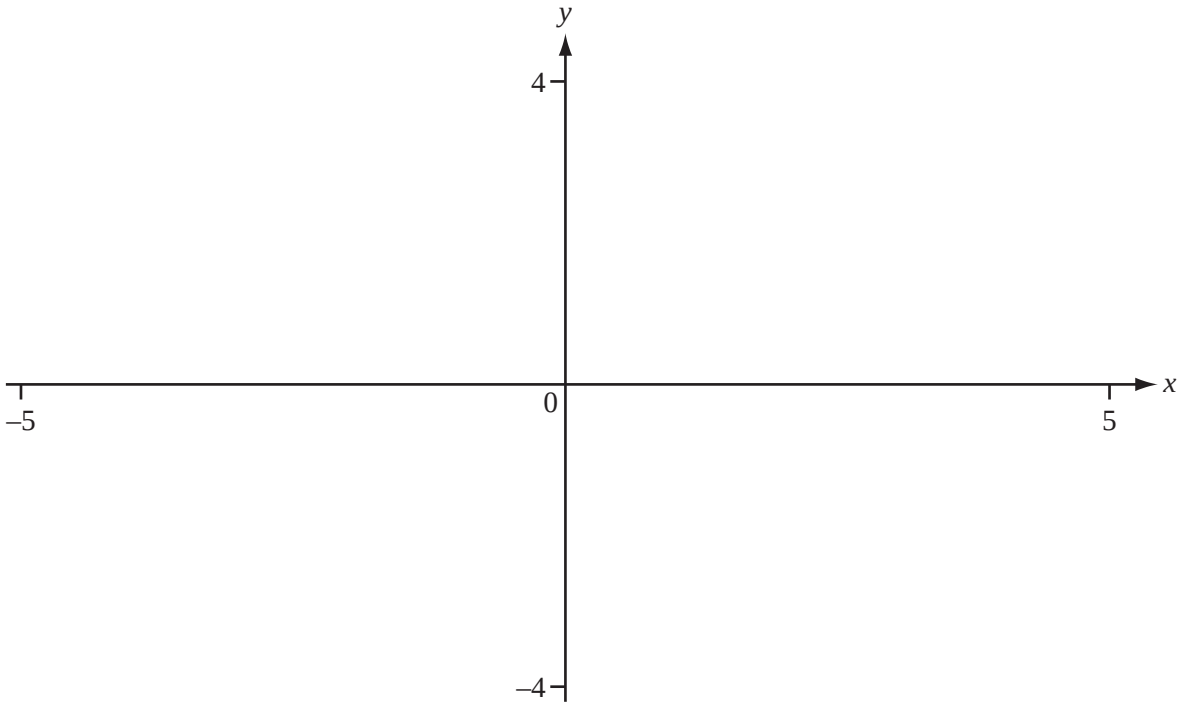

(a) On the axes sketch the graph of $y = f(x)$, where $f(x) = \dfrac{x^2}{x^2 - 4}$, between $x = -5$ and $x = 5$.

(The graph has three separate parts.) [5]

(b) The graph has three asymptotes.

Write down their equations.

Answer(b) .....

.....

..... [3]

(c) Write down the co-ordinates of the local maximum point.

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

(d) (i) Write down the range of $f(x)$ for $x \in \mathbb{R}$.

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

(ii) The equation $f(x) = k$, where $k \in \mathbb{R}$ has no solutions.

Write down a possible value of k.

Answer(d)(ii) $k =$ ..... [1]

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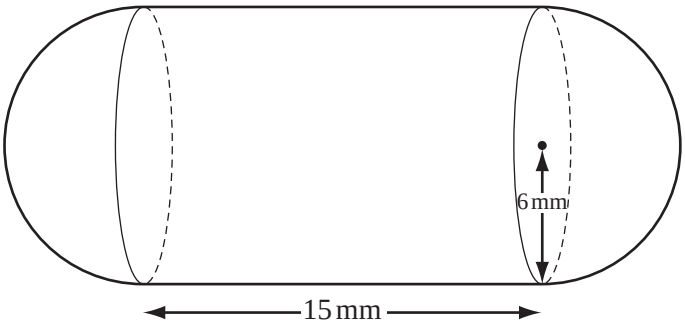

NOT TO SCALE

The diagram shows a solid made from a cylinder of radius 6 mm, length 15 mm and two hemispheres of radius 6 mm.

(a) Calculate the total surface area of the solid

(i) in mm^2,

Answer(a)(i) ..... mm^2 [3]

(ii) in cm^2.

Answer(a)(ii) ..... cm^2 [1]

(b) (i) Calculate the total volume of the solid.
Give your answer in mm^3.

Answer(b)(i) ..... mm^3 [3]

(ii) The solid is made of gold.
1 mm^3 of gold has a mass of 0.0193 g.
One gram of gold has a value of $31.80.

Calculate the value of the solid.

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

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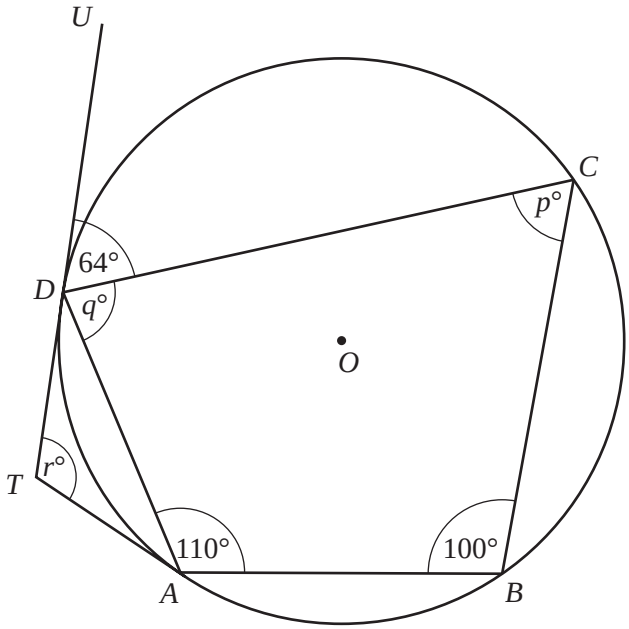

NOT TO SCALE

The diagram shows a cyclic quadrilateral *ABCD*, centre *O*.
Angle *DAB* = 110° and angle *ABC* = 100°.
TA and *TD* are tangents at *A* and *D*.
TD is extended to *U* and angle *UDC* = 64°.

(a) Calculate the values of *p*, *q* and *r*.

Answer(a) $p =$ ..... [1]

$q =$ ..... [1]

$r =$ ..... [2]

(b) Calculate

(i) angle *ODC*,

Answer(b)(i) Angle *ODC* = ... [1]

(ii) angle *DAC*.

Answer(b)(ii) Angle *DAC* = ... [1]

For Examiner's Use

9 Veronica and Tiago walk 9 km.
The first 5 km of the walk is up a hill.

(a) Veronica walks the first 5 km at a speed of 2 km/h.

She then walks the remaining 4 km at a speed of 4 km/h.

Calculate the average speed of Veronica's journey.

Answer(a) ..... km/h [4]

(b) Tiago walks the first 5 km at a speed of x km/h.

He then increases his speed by 2 km/h for the remaining 4 km.

(i) Find, in terms of x, the total time of Tiago's journey.

Answer(b)(i) ..... h [2]

(ii) The average speed for Tiago's journey is 4.5 km/h.

Show that $2x^2 - 5x - 10 = 0$.

[3]

(iii) Solve the equation $2x^2 - 5x - 10 = 0$.
Give your answers correct to 2 decimal places.

Answer(b)(iii) $x =$ ..... or $x =$ ..... [3]

(iv) Work out the time Tiago took to walk the first 5 km.

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

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10 100 students record how far they can run in one minute.
The results are shown in the table.

Distance (d metres)	$0 \leqslant d < 200$	$200 \leqslant d < 250$	$250 \leqslant d < 300$	$300 \leqslant d < 400$
Frequency	5	20	56	19

(a) Write down the interval in which the median lies.

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

(b) Calculate an estimate of the mean.

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

(c) Calculate the frequency density of

(i) the interval $250 \leqslant d < 300$,

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

(ii) the interval $0 \leqslant d < 250$.

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

For Examiner's Use

11 y varies inversely as the square root of x.
When $x = 9$, $y = 2$.

(a) Find y in terms of x.

Answer(a) $y =$ ..... [2]

(b) Find y when $x = 36$.

Answer(b) $y =$ ..... [1]

(c) Write x in terms of y.

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

(d) When y is multiplied by 0.5, x is multiplied by k.
Find the value of k.

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

For Examiner's Use

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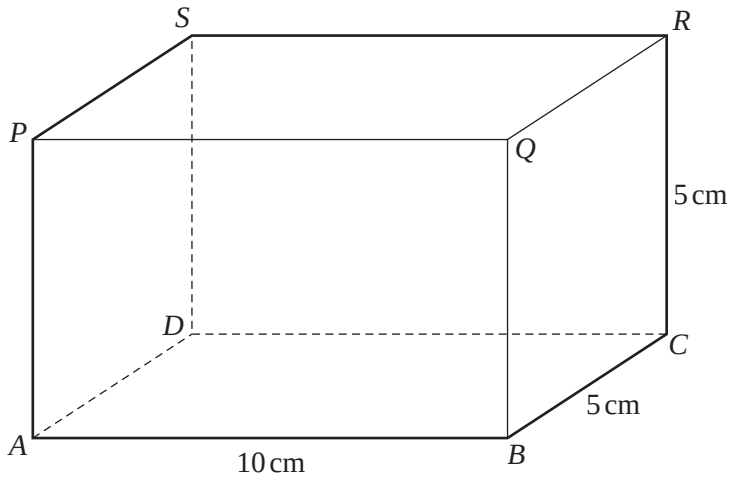


NOT TO SCALE

The diagram shows a cuboid of length 10 cm, with a square cross-section of side 5 cm.

Calculate

(a) the length AR,

Answer(a) $AR =$ ..... cm [3]

(b) angle RAC,

Answer(b) Angle $RAC =$ ..... [2]

(c) the angle between the plane $PBCS$ and the base $ABCD$.

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

For Examiner's Use

13 $f(x) = x^2$

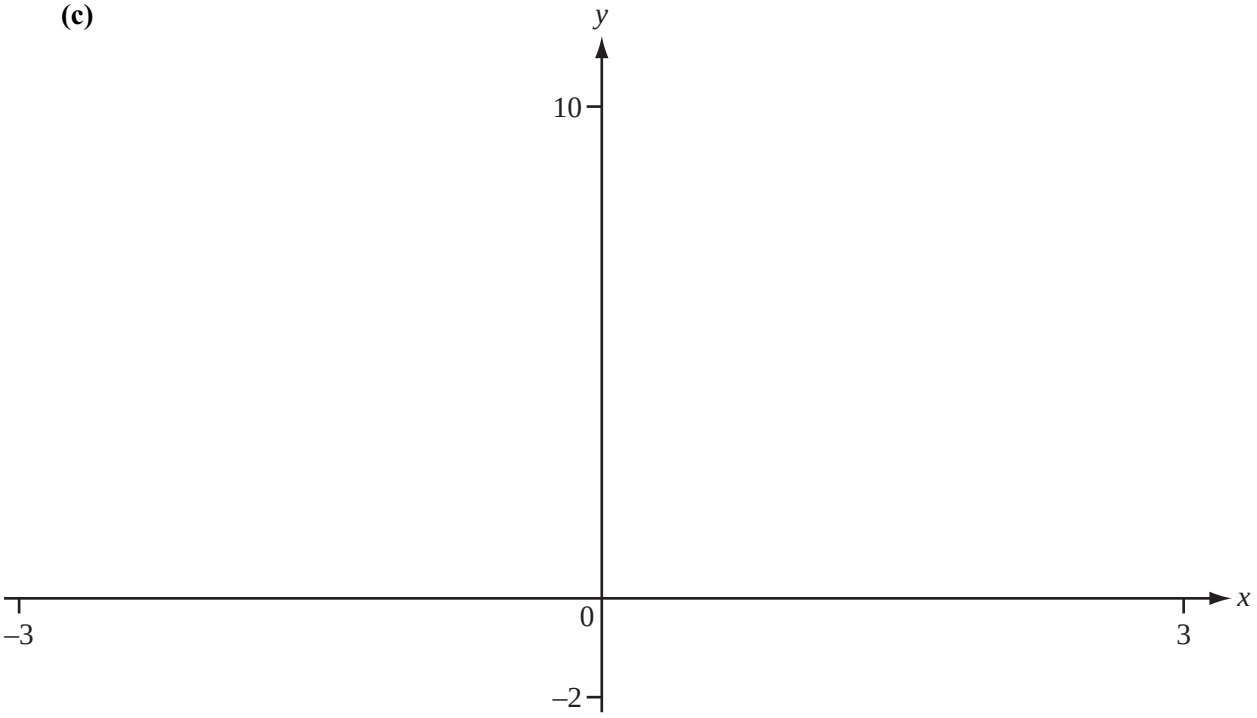
(a) Write down the value of f(–2).

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

(b) Find x when $f(x) = 9$.

Answer(b) $x =$ ..... or $x =$ ..... [1]

(c)



On the axes, sketch and label the graph of

(i) $y = f(x)$, [1]

(ii) $y = f(x – 1)$, [1]

(iii) $y = 2f(x)$. [1]

(d) Describe fully the **single** transformation that maps

(i) the graph of $y = f(x)$ onto the graph of $y = f(x – 1)$,

.....

..... [2]

(ii) the graph of $y = f(x)$ onto the graph of $y = 2f(x)$.

.....

..... [3]