UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

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

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 **19** printed pages and **1** blank page.

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International Examinations

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Formula List

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

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

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

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

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

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

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

Volume, V, of sphere of radius r. $\qquad V = \dfrac{4}{3}\pi r^3$
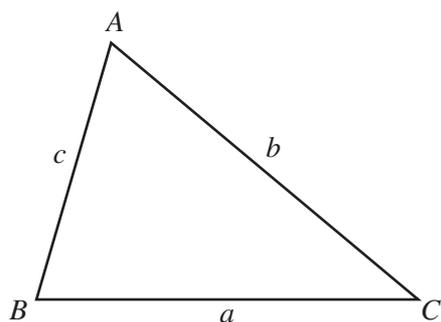
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1 In July 2009, the population of the world was 6.78×10^9.

   (a) The population of Bangladesh was 2.39% of the world population.

      (i) Calculate the population of Bangladesh.
Give your answer correct to 2 significant figures.

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

      (ii) Write your answer to **part(a)(i)** in standard form.

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

   (b) The population of Uganda was 3.27×10^7.

Calculate the population of Uganda as a percentage of the **world population**.

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

   (c) The world population of 6.78×10^9 was an increase of 169% on the population in 1950.

Calculate the population in 1950.
Give your answer correct to the nearest million.

Answer(c) .... [3]

2
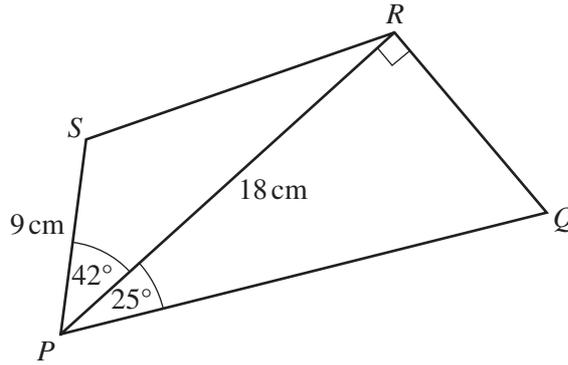
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In the quadrilateral *PQRS*, *PR* = 18 cm and *PS* = 9 cm.
Angle *PRQ* = 90°, angle *RPQ* = 25° and angle *SPR* = 42°.

(a) Calculate *QR*.

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

(b) Calculate the area of the quadrilateral *PQRS*.

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

(c) Calculate *SR*.

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

3
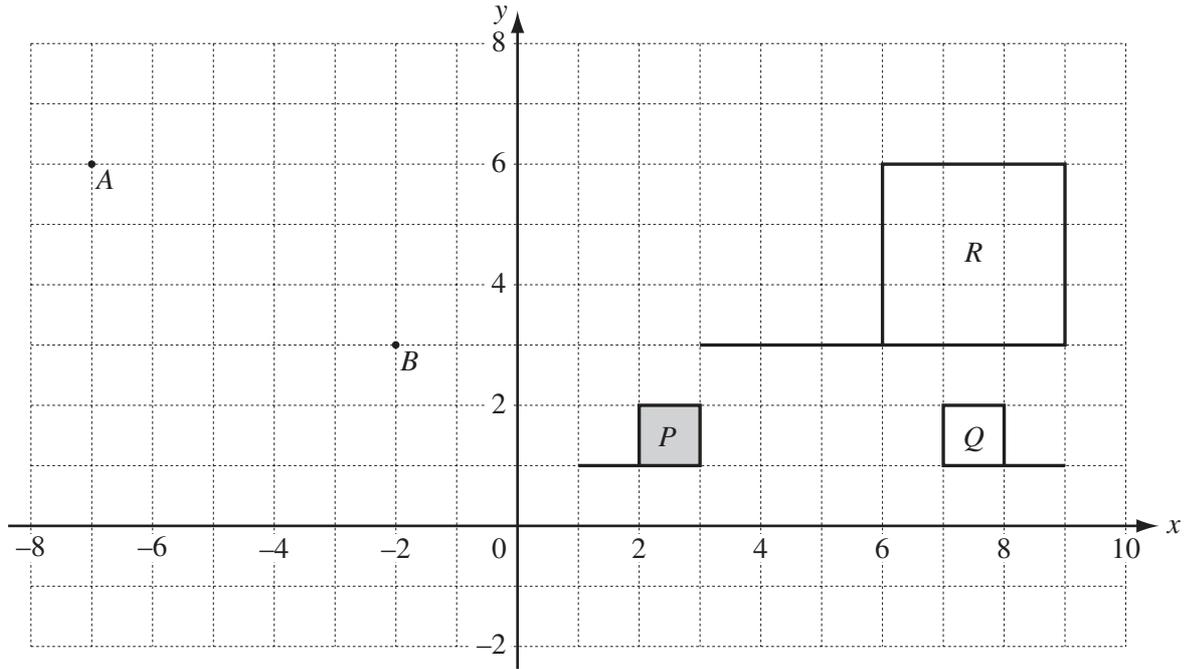
(a) (i) Write down the column vector $\overrightarrow{AB}$.

Answer(a)(i) $\begin{pmatrix} \\ \\ \end{pmatrix}$ [1]

(ii) Calculate $|\overrightarrow{AB}|$.

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

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

(i) *P* onto *Q*,

Answer(b)(i) ....

.... [2]

(ii) *P* onto *R*.

Answer(b)(ii) ....

.... [3]

4   100 students take part in a reaction time test.
    The table shows their results.

Reaction time (t seconds)	$0 \leqslant t < 20$	$20 \leqslant t < 30$	$30 \leqslant t < 40$	$40 \leqslant t < 80$
Number of students	20	36	32	12

(a) Calculate an estimate of the mean reaction time.

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

(b)
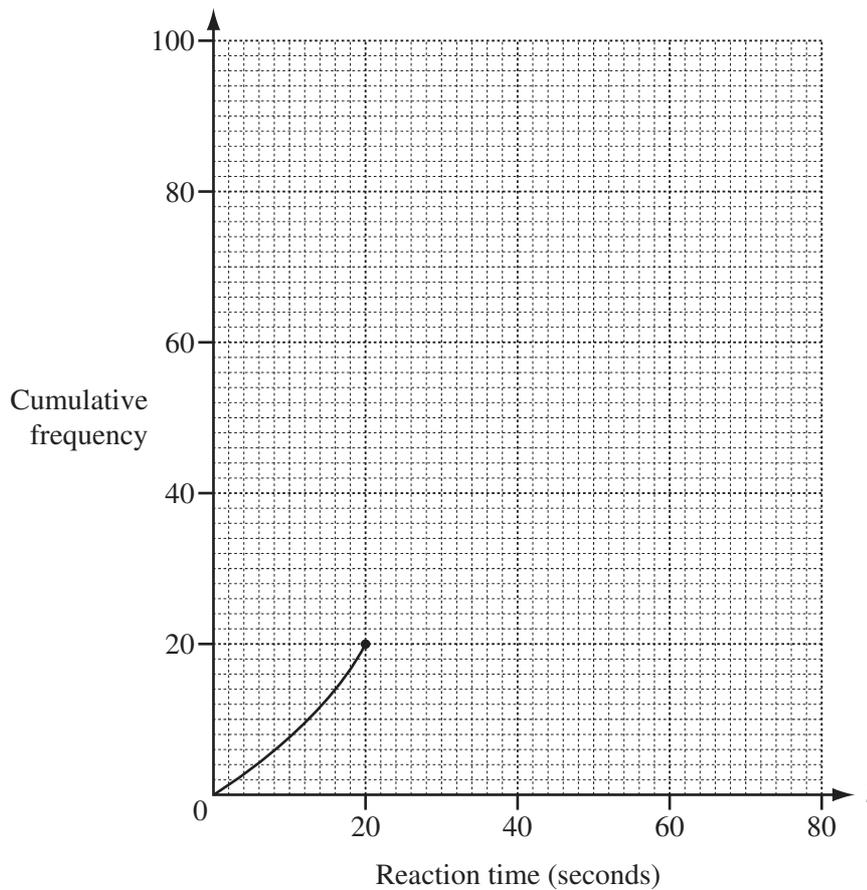
On the grid, complete the **cumulative frequency** curve to show the information in the table.   [3]

0607/41/M/J/12

(c) Use your cumulative frequency curve to find

    (i) the median,

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

    (ii) the inter-quartile range,

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

   (iii) the number of students with a reaction time of at least 25 seconds.

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

   [Turn over

5

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11 cm

8 cm
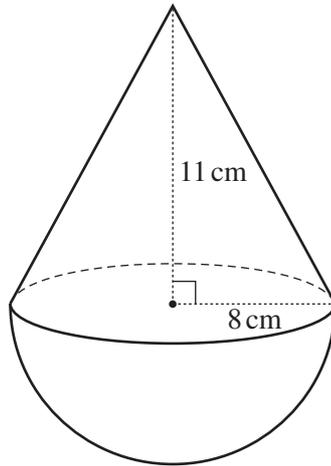
The diagram shows a solid made up of a cone and a hemisphere.
The hemisphere has a radius of 8 cm.
The cone has a base radius of 8 cm and a height of 11 cm.

(a) (i) Calculate the volume of the solid.

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

(ii) The solid is made of plastic and 1 cm^3 of plastic has a mass of 1.15 g.

Calculate the mass of the solid.
Give your answer in kilograms.

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

(b) (i) Calculate the surface area of the solid.

Answer(b)(i) .... cm^2 [4]

(ii) The surface is painted with silver paint.
The cost of all the paint used is $81.50 .

Calculate the cost per square centimetre.
Give your answer correct to 2 decimal places.

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

6

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D

C

94°

A

O

B
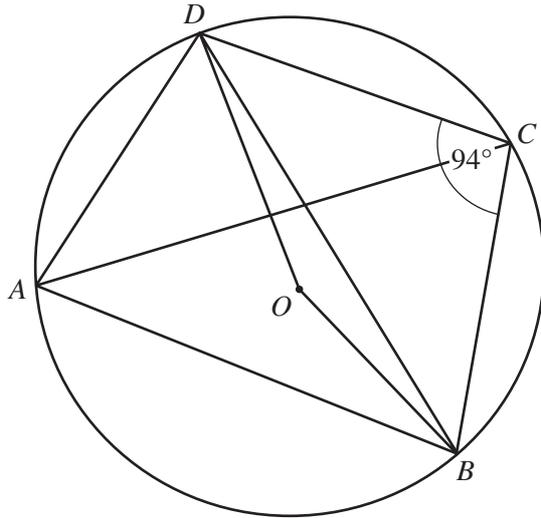
ABCD is a cyclic quadrilateral in the circle, centre *O*.
Angle *DCB* = 94°.

(a) Calculate

   (i) angle *DAB*,

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

   (ii) the reflex angle *DOB*,

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

   (iii) angle *OBD*.

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

(b) Angle *BDC* = 40°.

   Calculate angle *DAC*.

   Answer(b) .... [2]

7

NOT TO
SCALE

A

B

C
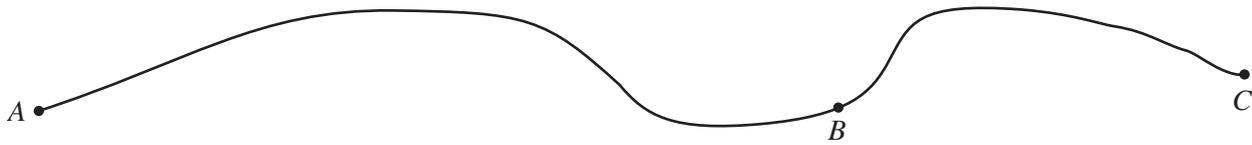
The diagram shows Anne's car journey from *A* to *C*.
The total distance from *A* to *C* is 720 km.
There is a motorway from *A* to *B* and other roads from *B* to *C*.

Anne travels on the motorway for 7.5 hours and on the other roads for 3 hours.

(a) Calculate the average speed of her journey.

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

(b) Anne's average speed from *A* to *B* is *x* km/h.

Her average speed from *B* to *C* is $\frac{x}{2}$ km/h.

(i) Find an expression, in terms of *x*, for the total distance from *A* to *C*.
Give your answer in its simplest form.

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

(ii) Find Anne's average speed on the motorway.

Answer(b)(ii) .... km/h [1]

(c) Find the ratio

Anne's distance travelled on the motorway : Anne's distance travelled on the other roads.

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

8
$$g(x) = x^5 - x^3$$

(a) (i) Sketch the graph of $y = g(x)$ for $-1.1 \leqslant x \leqslant 1.1$.
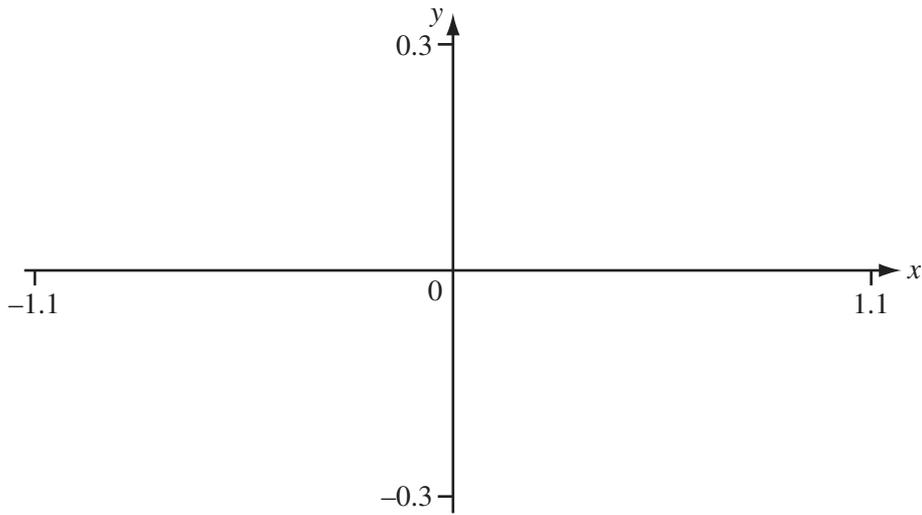
[2]

(ii) Write down the zeros of g(x).

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

(iii) Find the co-ordinates of the local minimum point.

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

(iv) The point $(-0.5, 0.09375)$ is on the graph of $y = g(x)$.

Complete the following statement.

The point (.............. , -0.09375) is also on the graph of $y = g(x)$. [1]

(v) Describe the symmetry of the graph of $y = g(x)$.

....

....[3]

(b) $$x^5 - x^3 + \frac{x}{5} = 0$$

This equation can be solved by drawing a suitable straight line on the diagram opposite.

(i) Write down the equation of this straight line.

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

(ii) On the diagram in **part(a)(i)**, sketch this straight line. [1]

(iii) Two of the solutions to this equation are $x = -0.526$ and $x = 0.526$.

Find the other three solutions.

Answer(b)(iii) $x =$ ....

or $x =$ ....

or $x =$ .... [2]

9

A   B
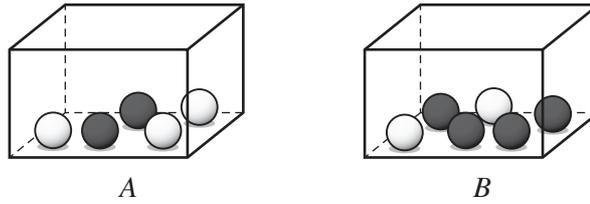
The diagram shows 2 boxes, *A* and *B*.
Box *A* contains 2 black marbles and 3 white marbles.
Box *B* contains 4 black marbles and 2 white marbles.

(a) Carlene takes out one marble at random from each box.

Calculate the probability that she takes out 2 black marbles.

Answer(a) .... [2]

(b) Carlene returns the marbles to the boxes she took them from.
Ricky then chooses a box and takes out 2 marbles at random.

The probability that he chooses box *A* is $\frac{2}{3}$.

Calculate the probability that Ricky takes out 2 black marbles.

Answer(b) .... [3]

(c) Ricky returns the marbles to the box he took them from.
Ali takes marbles out of box *B* at random until she gets a **white** marble.

The probability that this is the *n*th marble taken out is $\frac{1}{5}$.

Find the value of *n*.

Answer(c) .... [3]

         0607/41/M/J/12

10 $f(x) = 2^x - 3$

(a) Sketch the graph of $y = f(x)$, for $-3 \leqslant x \leqslant 3$.
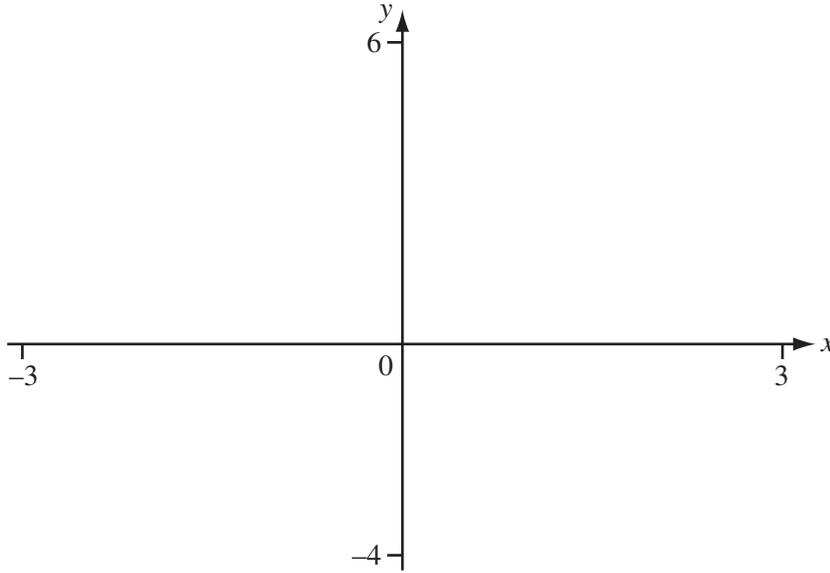
[2]

(b) Write down the equation of the asymptote of the graph of $y = f(x)$.

Answer(b) .... [1]

(c) Write down the range of $f(x)$ for

    (i) $-2 \leqslant x \leqslant 2$,

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

    (ii) $x \in \mathbb{R}$.

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

(d) Find the **exact** solution of the equation $2^x - 3 = 0$.

Answer(d) $x=$ .... [2]

                                       [Turn over

11   f$(x) = 2x + 3$ g$(x) = x - 1$ h$(x) = x^2 + 1$

(a) Find f(g(– 5)).

Answer(a) .... [2]

(b) Find x when f(x) = g(x).

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

(c) Find x when f(x) = h(x).

Give your answers correct to 2 decimal places.

Answer(c) x = ... or *x =* .... [4]

(d) Find f$^{-1}(x)$.

Answer(d) .... [2]

(e) Find $\dfrac{1}{f(x)} + \dfrac{1}{g(x)}$ in terms of x.

Give your answer as a single fraction.

Answer(e) .... [3]

0607/41/M/J/12

12
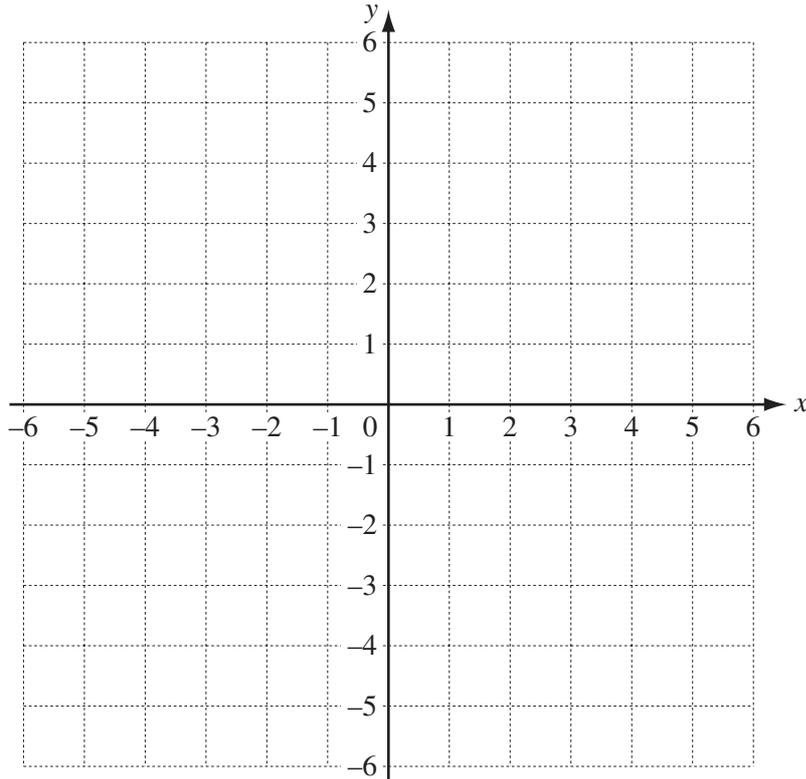
(a) On the grid, draw the lines

   (i) $x = 5$, [1]

   (ii) $y = -x$, [1]

   (iii) $y = 4 - 2x$. [1]

(b) The region R is defined by

    $y \leqslant 0, \ x \leqslant 5, \ y \geqslant -x$ and $y \geqslant 4 - 2x$.

    On the grid, label the region R. [2]

(c) The point (h, k) is in the region R.

    h and k are integers and $h + 3k = 0$.

    Find the value of h and the value of k.

Answer(c) $h =$ ....

$k =$ .... [2]

13 Issa sells newspapers and magazines.

The table shows the number of newspapers (x) and the number of magazines (y) sold during a period of 10 days.

Number of newspapers (x)	50	35	60	55	50	40	30	50	55	45
Number of magazines (y)	10	15	10	8	12	15	18	8	10	13

(a) Complete the scatter diagram.
The first seven points in the table have been plotted for you.

Number of newspapers
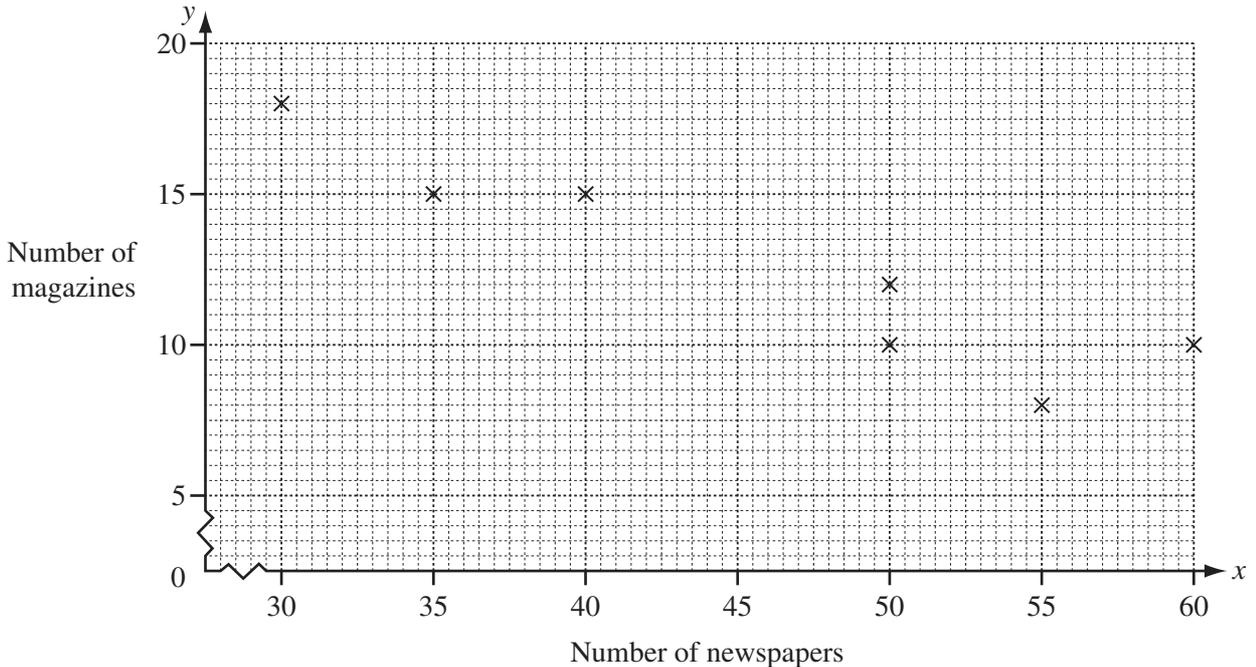
[2]

(b) Complete the sentence to make a correct statement about the information on the scatter diagram.

There is .... between the number of newspapers sold

and the number of magazines sold. [1]

(c) Find the mean number of

  (i) newspapers sold,

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

  (ii) magazines sold.

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

(d) Find the equation of the line of regression for the number of magazines sold (y) and the number of newspapers sold (x).

Write your answer in the form $y = mx + c$.

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

(e) Find the value of y when $x = 32$.

Answer(e) .... [1]

(f) Draw the line of regression accurately on the scatter diagram. [2]

(g) Use your graph to predict the number of magazines sold when 43 newspapers are sold.

Answer(g) .... [1]

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0607/41/M/J/12