Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **May/June 2014**

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, glue or correction fluid.
You may use an HB 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.

This document consists of **22** printed pages and **2** blank pages.

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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. $\quad A = \pi rl$

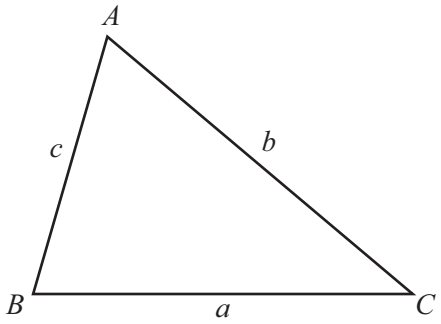
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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



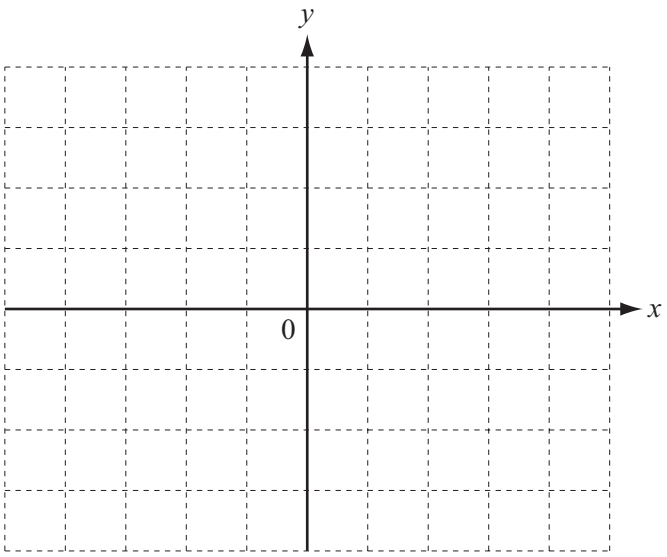
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1 You may use these axes to help you answer this question.



The transformation P is a rotation of 90° clockwise about the origin.
The transformation Q is a reflection in the line $y = -x$.

(a) Find the co-ordinates of the image of the point (4, 1) under the transformation P.

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

(b) Find the co-ordinates of the image of the point (4, 1) under the transformation Q.

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

(c) Find the co-ordinates of the image of the point (x, y) under the transformation P followed by the transformation Q.

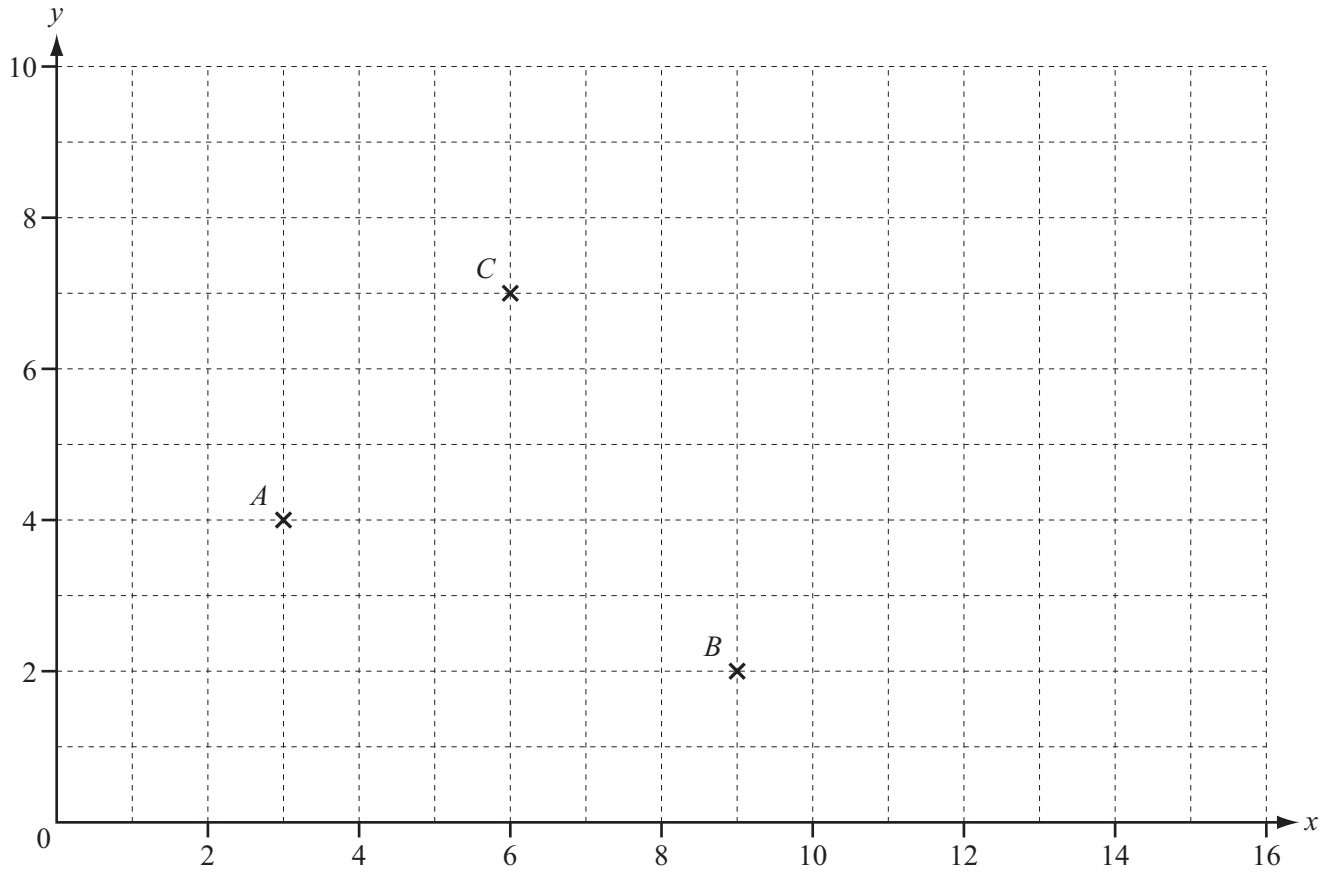
Answer(c) (..... , ...) [2]

(d) Describe fully the **single** transformation equivalent to P followed by Q.

Answer(d) .....

..... [2]

2 The points $A(3, 4)$, $B(9, 2)$ and $C(6, 7)$ are shown on the diagram below.



(a) Write $\overrightarrow{AB}$ as a column vector.

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

(b) Find the gradient of the line AB.

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

(c) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

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

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(d) C is the midpoint of AM.

Find the co-ordinates of M.

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

(e) The point N is such that $ABNM$ is a parallelogram.

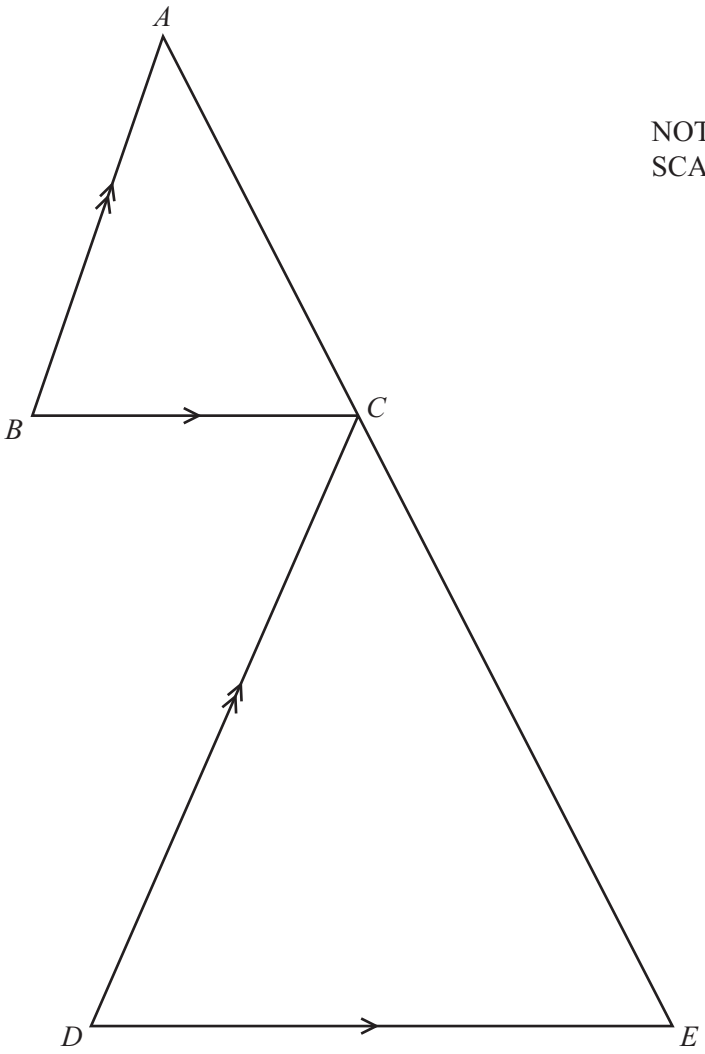
Find the co-ordinates of N.

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

(f) Find the length BM.

Answer(f) ..... [1]

3



NOT TO SCALE

In the diagram, BC is parallel to DE and BA is parallel to DC.
ACE is a straight line.
$BC = 3.5$ cm, $DE = 6.5$ cm and $AE = 12$ cm.

(a) Complete the statement.

Triangle DEC is similar to triangle ..... [1]

(b) Calculate the length AC.

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

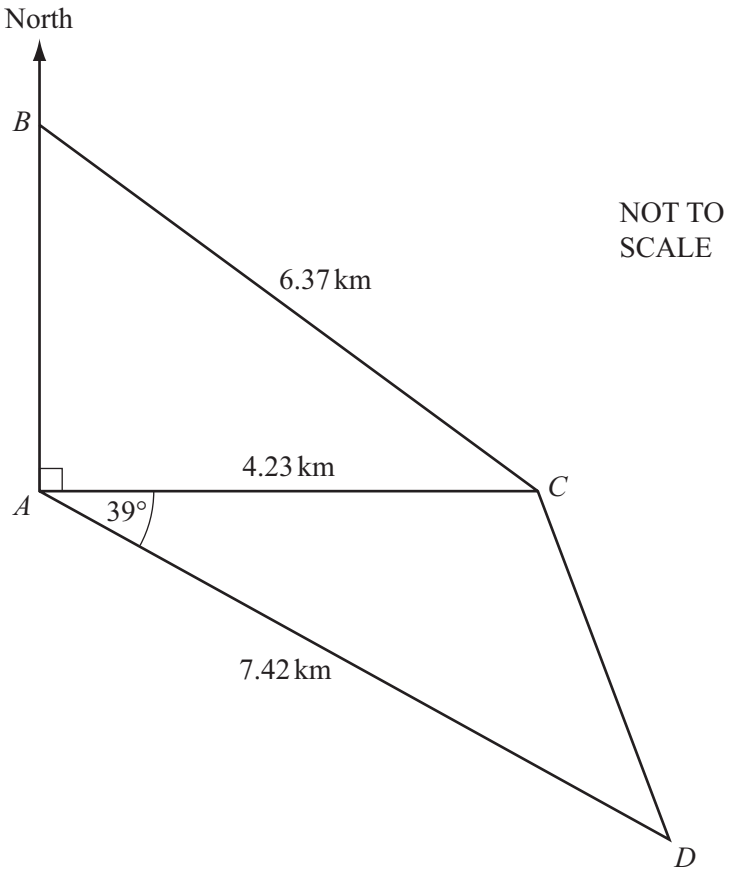
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(c) The area of triangle ABC is $7\,cm^2$.

Calculate the area of triangle CDE.

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

4



The diagram shows four points *A, B, C* and *D*.
B is due North of *A* and *C* is due East of *A*.
AC = 4.23 km, *AD* = 7.42 km, *BC* = 6.37 km and angle *CAD* = 39°.

(a) Find the bearing of

(i) *D* from *A*,

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

(ii) *A* from *D*.

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

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(b) Calculate angle *ABC*.

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

(c) Calculate *CD*.

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

(d) Angle *ACD* is obtuse.

Find the bearing of *D* from *C*.

Answer(d) ..... [4]

5 **(a)** Solve the equation.

$$3\log 2 - 2\log 3 + \log x = 3\log 4$$

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

(b) Solve the simultaneous equations.

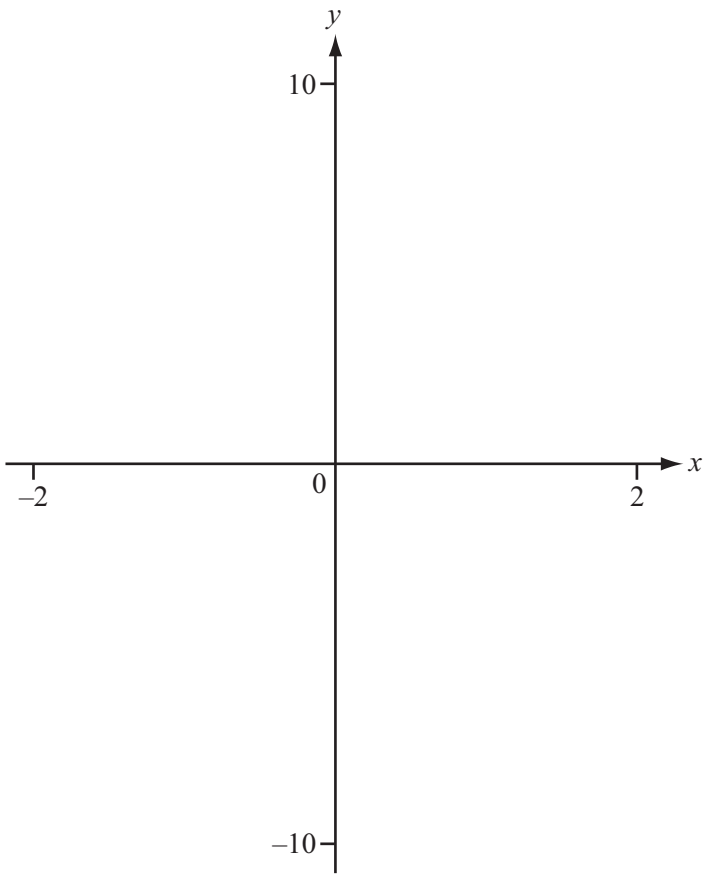
$$5x - 4y = 1$$
$$4x - 5y = 8$$

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

$y =$ ..... [4]

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6



(a) On the diagram, sketch the graph of $y = f(x)$, where

$f(x) = |4x^2 - 9|$ between $x = -2$ and $x = 2$. [2]

(b) Write down the x co-ordinates where the curve meets the x-axis.

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

(c) The line $y = 3x - 2$ intersects the curve $y = |4x^2 - 9|$ twice.

Find the y co-ordinates of the points of intersection.

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

(d) (i) Find the value of k when the line $y = k$ meets the curve $y = |4x^2 - 9|$ three times.

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

(ii) Find the range of values of k when the line $y = k$ meets the curve $y = |4x^2 - 9|$ four times.

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

7 A library allows each member to have up to 10 books on loan.

The table shows the number of books currently on loan to a random sample of 75 members.

Number of books on loan	0	1	2	3	4, 5 or 6	7	8 or 9	10
Number of members	7	4	20	14	10	8	8	4

(a) Write down the mode.

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

(b) Work out the range.

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

(c) Find the median.

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

(d) Find the interquartile range.

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

(e) Calculate an estimate of the mean.

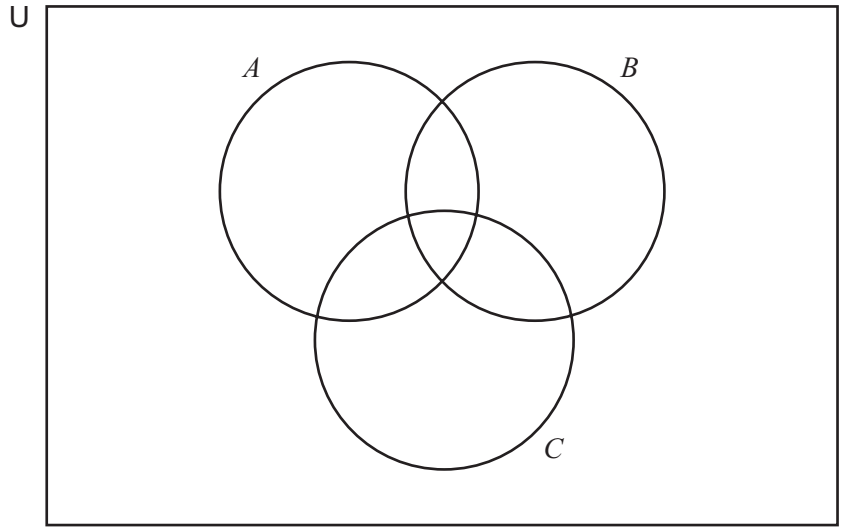
Answer(e) ..... [2]

(f) Two members are chosen at random.
Find the probability that they both have at least seven books on loan.

Answer(f) ..... [2]

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8 The Venn diagram shows the sets A, B and C.



U = {25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36}
A = {prime numbers}
B = {square numbers}
C = {multiples of 4}

(a) List the elements of set A.

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

(b) Write all the elements of U in the correct parts of the Venn diagram above. [3]

(c) List the elements of $(A \cup C)'$.

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

(d) Find $n((A \cup C) \cap B')$.

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

9 **(a)** Find the next term and the nth term in each of the following sequences.

(i) 1, 8, 27, 64, 125, …..

Answer(a)(i) next term = ...

nth term = ... [2]

(ii) 4, 10, 18, 28, 40, …..

Answer(a)(ii) next term = ...

nth term = ... [3]

(b) Use your results to **part (a)**, to find the next term and the nth term in the following sequence.

6, 19, 46, 93, 166, …..

Answer(b) next term = ...

nth term = ... [3]

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10 Paulo bought a car on January 1st 2010.
By January 1st 2011 the value of the car had reduced by 20%.
By January 1st 2012 the value of the car had reduced by a further 15%.
The value of the car on January 1st 2012 was \$18 700.

(a) Find how much Paulo paid for the car.

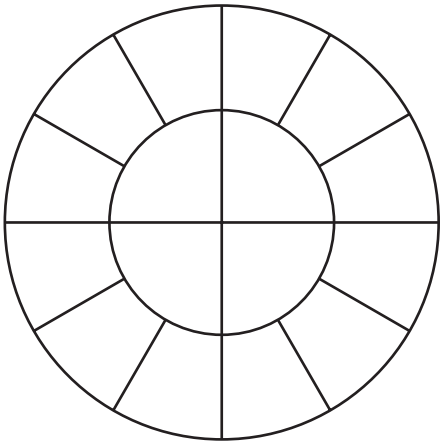
Answer(a) \$ ..... [3]

(b) The value of the car reduces by 15% every year from 2012.

Find the year in which the value of the car will first be below 25% of the price Paulo paid in 2010.

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

11



NOT TO SCALE

The diagram shows the top of a circular cake of **diameter** 30 cm.
The cake is cut into 16 pieces as shown in the diagram.

(a) (i) The top of each of the 16 pieces of cake has the same area.

Find the area of one of the pieces in square centimetres.

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

(ii) Write your answer to **part (a)(i)** in square metres.

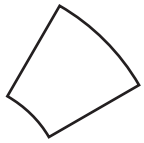
Answer(a)(ii) ..... m^2 [1]

(iii) Show that the radius of the inner circle is 7.5 cm.

[2]

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(b) The diagram shows the top of one of the outer pieces of cake.



NOT TO SCALE

(i) Calculate the perimeter of the top of this piece of cake.

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

(ii) The depth of the cake is 8 cm.

Calculate the **total** surface area of this piece of cake.

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

12 Laura is putting fencing around two flower beds.
She uses 60 m of fencing.
One of the flower beds is a rectangle and the other is a square.





NOT TO SCALE

The length of the rectangle is five times its width, x metres.
The length of a side of the square is y metres.

(a) Find and simplify an expression for y in terms of x.

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

(b) The area of the rectangle is equal to the area of the square.

(i) Write down a quadratic equation, in terms of x, and show that it simplifies to

$$4x^2 - 90x + 225 = 0.$$

[2]

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(ii) Solve the equation $4x^2 - 90x + 225 = 0$.
Give your answers correct to 3 significant figures.

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

(iii) Write down the width of the rectangle, giving a reason for your choice of values of x.

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

..... [1]

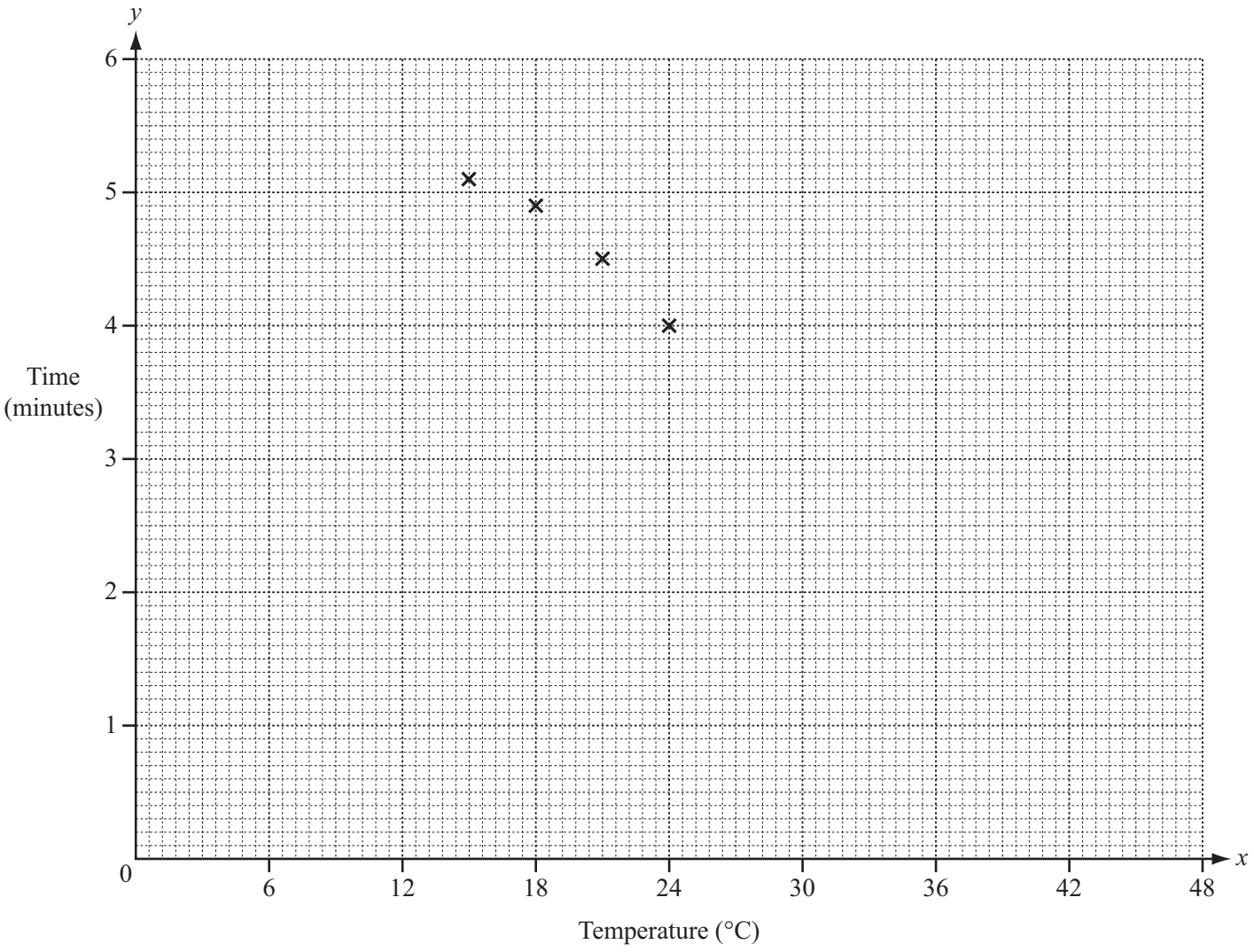
(iv) Calculate the total area of the flower beds.

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

13 Laura sprays insecticide on the flowers in her flower beds.
The insecticide spray is made by dissolving pellets in water.
She measures the time taken, y minutes, to dissolve a pellet in water at different temperatures, x°C.
Her results are shown in the table.

Temperature, x°C	15	18	21	24	27	30	33	36	39	42	45
Time, y minutes	5.1	4.9	4.5	4.0	3.2	2.8	2.4	2.1	1.8	1.6	1.1

(a) (i) Complete the scatter diagram.
The first four points have been plotted for you.



[3]

(ii) Describe the type of correlation shown by the scatter diagram.

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

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(b) Find

(i) the mean temperature,

Answer(b)(i) ..... °C [1]

(ii) the mean time.

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

(c) (i) Find the equation of the regression line in the form $y = mx + c$.

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

(ii) The value for m represents a connection between time and temperature.
Describe this connection.

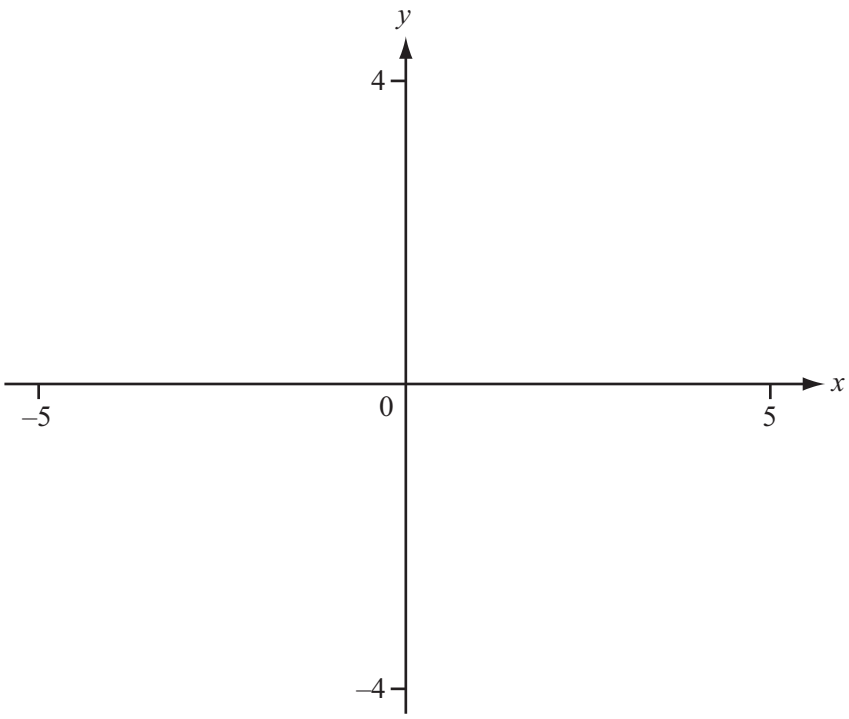
Answer(c)(ii) .....

..... [1]

(iii) Use your answer to **part (c)(i)** to estimate the time taken for a pellet to dissolve when the temperature is 25°C.

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

14



(a) (i) On the diagram, sketch the graph of $y = f(x)$, where

$$f(x) = \frac{x^2}{x^2 - 2x - 3} \quad \text{between } x = -5 \text{ and } x = 5. \qquad [4]$$

(ii) Write down the equations of the three asymptotes of the graph.

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

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

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

(iv) Write down the co-ordinates of the local minimum point of the graph.

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

(b) Solve the inequality $\frac{x^2}{x^2 - 2x - 3} > 3$.

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

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