Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **May/June 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

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

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

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 80.

This document consists of **20** printed pages.

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ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 **(a)** Evaluate $\frac{4}{11} - \frac{2}{7}$.

Answer ..... [1]

(b) Evaluate 0.9×0.011 .

Answer ..... [1]

2 **(a)** Cecil bought a camera for \$120.
After two years he sold it for \$90.

Calculate the percentage loss.

Answer .....% [1]

(b) Some money is shared between Miriam and Nina in the ratio 2 : 3.

What percentage of the total money shared does Miriam receive?

Answer .....% [1]

(c) Given that $a : b = 5 : 6$ and $b : c = 3 : 8$ find $a : b : c$.

Answer ..... : ..... : ..... [1]

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3 0.05 –0.3 1.3 –1.2 0.2

(a) Arrange the five numbers in order, starting with the smallest.

Answer ..... , ... , ... , ... , ... [1]
smallest

(b) For the five numbers, find

(i) the mean,

Answer ..... [1]

(ii) the range.

Answer ..... [1]

4 y is inversely proportional to the square of x.

Given that $y = 10$ when $x = 3$, find y when $x = \frac{1}{2}$.

Answer $y =$ ..... [2]

5 **(a)** Factorise $25t^2 - 4$.

Answer ..... [1]

(b) Factorise $x^2 - 6x - 3xy + 18y$.

Answer ..... [2]

6 A rectangle has length 64 mm and width 37 mm each correct to the nearest millimetre.

(a) Write down the lower bound for the length.

Answer ..... mm [1]

(b) Calculate the lower bound for the perimeter of the rectangle.

Answer ..... mm [1]

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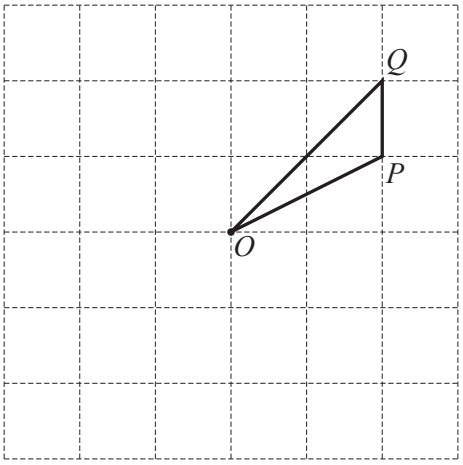
7 **(a)** Triangle *OPQ* is **part** of a figure that has rotational symmetry of order 2 about the point *O*.

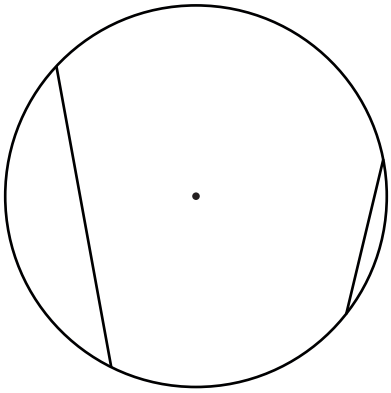
Complete the figure.



[1]

(b) The diagram shows a circle, its centre, and two chords.

Add **one** chord, to give a diagram that has one line of symmetry.



[1]

8 Solve $\dfrac{4}{x-11} = \dfrac{1}{3x}$.

Answer $x =$ ..... [2]

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9 Express each of the following as a single fraction in its simplest form.

(a) $\frac{2}{3a} + \frac{5}{2a}$

Answer ..... [1]

(b) $\frac{5}{2b^2} \div \frac{15}{4b^3}$

Answer ..... [2]

10 By writing each number correct to 2 significant figures, calculate an estimate of

$$\frac{596 \times \sqrt{16.12}}{0.2984}.$$

Answer ..... [2]

11 $$f(x) = \frac{1}{3x + 2}$$

(a) Find f(–2).

Answer ..... [1]

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

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

12 A dice is thrown 400 times.
The results are shown in the table.

Number thrown	1	2	3	4	5	6
Frequency	65	80	70	75	50	60

(a) Find the relative frequency of throwing the number 2.

Answer ..... [1]

(b) Imran throws the dice 1000 times.

How many times would you expect the number 2 to be thrown?

Answer ..... [1]

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13 In a school of 270 children, the distance each child can swim was recorded.
The distances are summarised in the table.

Distance (d metres)	$0 \leqslant d < 100$	$100 \leqslant d < 200$	$200 \leqslant d < 500$	$500 \leqslant d < 1000$
Number of children	110	50	60	50
Frequency density				

(a) Complete the table to show the frequency densities. [2]

(b) Calculate an estimate for the number of children who could swim more than 400 metres.

Answer ..... [1]

14 An irregular polygon has 22 sides.

(a) Calculate the sum of all its interior angles.

Answer ..... [2]

(b) Two of the angles in the polygon are each 170°.
The remaining 20 angles are equal to each other.

Calculate the size of **one** of the 20 equal angles.

Answer ..... [2]

15 During two weeks, a shopkeeper records the number of packets of two different types of tea he sells and the profit he makes from them.

Week 1
- Type A tea, 30 packets sold, profit of \$1.20 on each packet
- Type B tea, 20 packets sold, profit of \$2 on each packet

Week 2
- Type A tea, 40 packets sold, loss of \$0.50 on each packet
- Type B tea, 30 packets sold, profit of \$3 on each packet

This information can be represented by these matrices.

$$\begin{pmatrix} 30 & 20 \end{pmatrix} \qquad \begin{pmatrix} 40 & 30 \end{pmatrix} \qquad \begin{pmatrix} 1.2 \\ 2 \end{pmatrix} \qquad \begin{pmatrix} -0.5 \\ 3 \end{pmatrix}$$

(a) Work out $\begin{pmatrix} 30 & 20 \end{pmatrix} \begin{pmatrix} 1.2 \\ 2 \end{pmatrix} - \begin{pmatrix} 40 & 30 \end{pmatrix} \begin{pmatrix} -0.5 \\ 3 \end{pmatrix}$.

Answer [2]

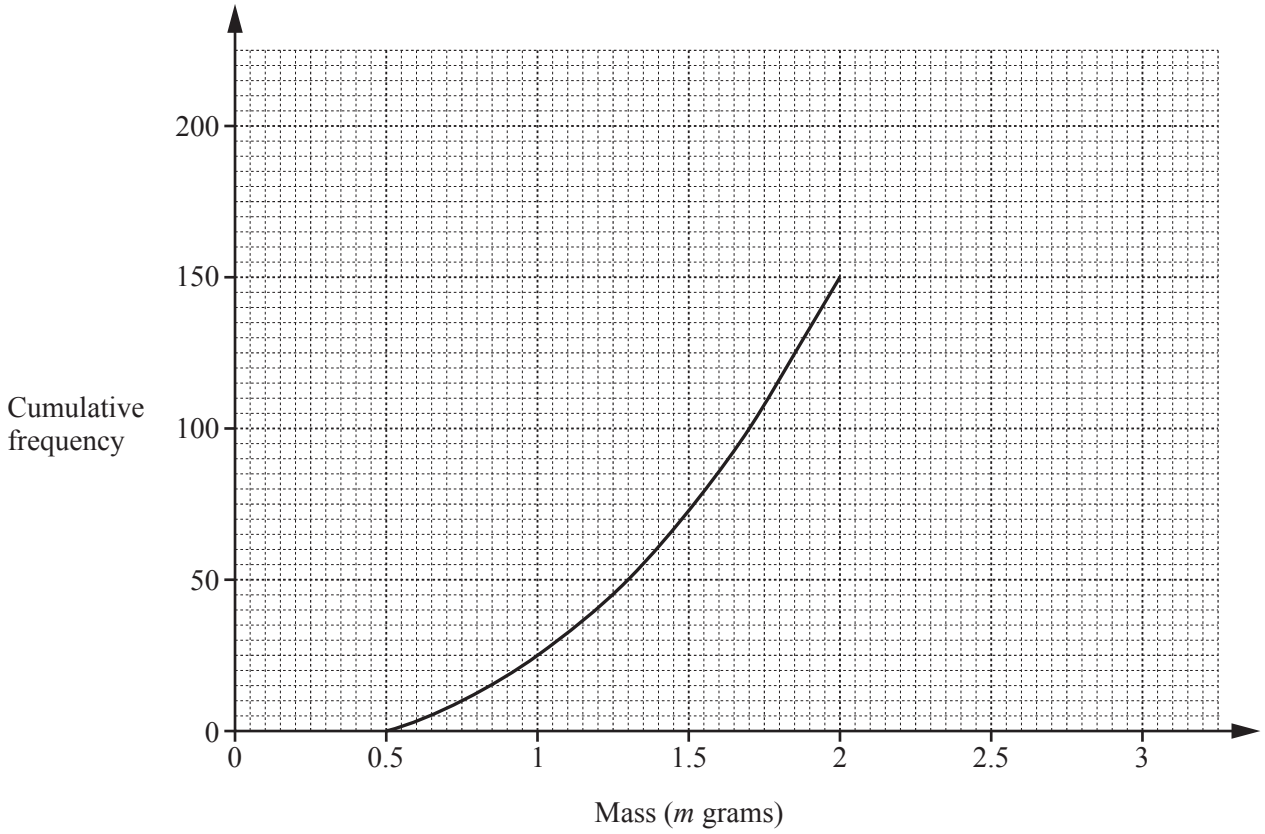
(b) Explain the meaning of your answer to part **(a)**.

.....

..... [1]

16 The masses of 200 beetles were measured.
The results are summarised in the cumulative frequency table and part of the cumulative frequency curve is drawn.

Mass (m grams)	$m \leqslant 0.5$	$m \leqslant 1$	$m \leqslant 1.5$	$m \leqslant 2$	$m \leqslant 2.25$	$m \leqslant 2.5$	$m \leqslant 3$
Cumulative frequency	0	25	75	150	170	185	200



(a) Complete the cumulative frequency curve. [1]

(b) Use the curve to find an estimate for

(i) the median,

Answer ..... g [1]

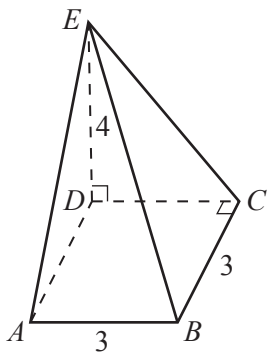
(ii) the lower quartile,

Answer ..... g [1]

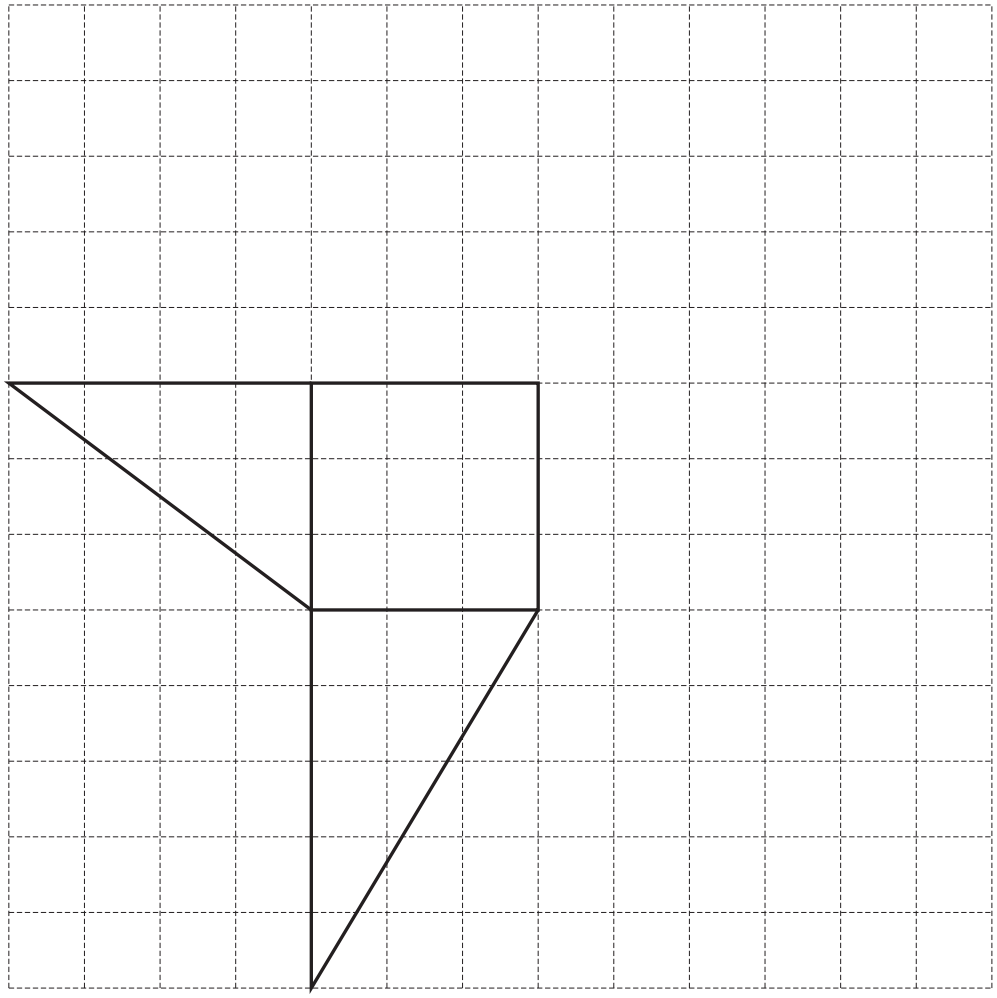
(iii) the number of beetles that have a mass greater than 1.85 grams.

Answer ..... [2]

17 The diagram shows a pyramid.
The square base, $ABCD$, has an edge of 3 cm.
The base is horizontal, and vertex E is vertically above D, where $ED = 4$ cm.



(a) On the grid below, complete the accurate drawing of a net of the pyramid.
Do **not** draw outside the grid.



[2]

(b) Calculate the **total** surface area of the pyramid.

Answer ..... cm^2 [2]

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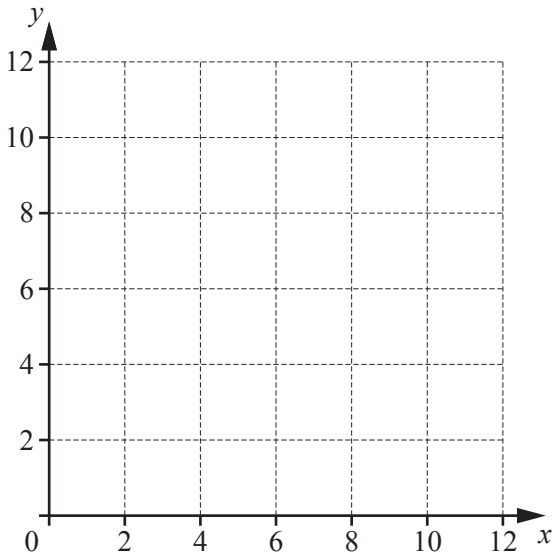
18



The region R is defined by the inequalities

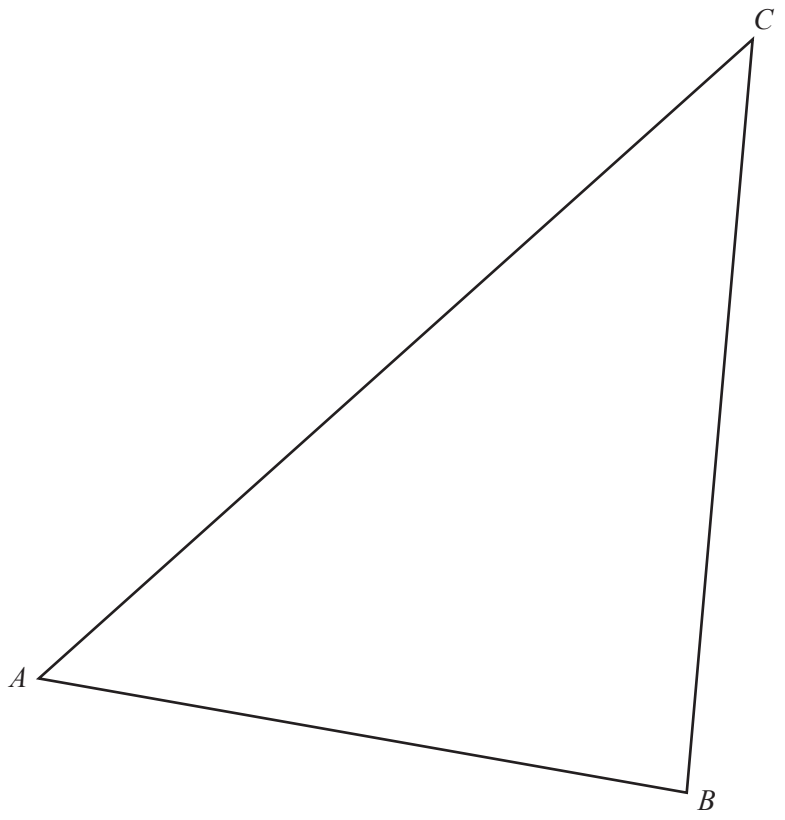
$$2 \leqslant x \leqslant 8$$

$$5 \leqslant y \leqslant 10$$

$$x + y \geqslant 10.$$

On the diagram, shade and label the region R. [3]

19



(a) On the diagram, construct the perpendicular bisector of AB. [1]

(b) On the diagram, construct the locus of points inside triangle ABC, that are

(i) 7 cm from C, [1]

(ii) equidistant from AB and AC. [1]

(c) P is any point which is

equidistant from A and B
and more than 7 cm from C
and nearer to AC than AB.

Find the extremes of the possible positions of P and label them P_1 and P_2. [1]

20 $N = 2 \times 10^8$

(a) Giving your answers in standard form, find the value of

(i) $N \times 700$,

Answer ..... [1]

(ii) $\frac{1}{N}$.

Answer ..... [2]

(b) Find the smallest positive integer M, given that MN is a cube number.

Answer $M =$ ..... [1]

21 The first four terms, u_1, u_2, u_3 and u_4, in a sequence of numbers are given below.

$$u_1 = 1 \times 3 + 2^2 = 7$$

$$u_2 = 2 \times 4 + 3^2 = 17$$

$$u_3 = 3 \times 5 + 4^2 = 31$$

$$u_4 = 4 \times 6 + 5^2 = 49$$

(a) Evaluate u_5 .

Answer ..... [1]

(b) The nth term of the sequence, u_n, is of the form $n(n + p) + (n + q)^2$.

Write down the value of p and the value of q.

Answer $p =$ .....

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

(c) u_n can also be written in the form $An^2 + Bn + C$.

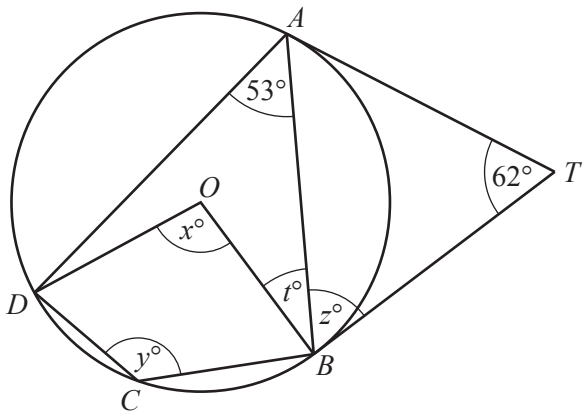
Find the values of A, B and C.

Answer $A =$ .....

$B =$ .....

$C =$ ..... [2]

22



The diagram shows a circle, centre O, that passes through A, B, C and D.
The tangents at A and B meet at T.
$A\hat{T}B = 62°$ and $D\hat{A}B = 53°$.

(a) Find x.

Answer $x =$ ..... [1]

(b) Find y.

Answer $y =$ ..... [1]

(c) Find z.

Answer $z =$ ..... [1]

(d) Find t.

Answer $t =$ ..... [1]

23 $\mathbf{A} = \begin{pmatrix} 4 & -1 \\ 2 & 0 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 6 & -3 \\ 0 & -2 \end{pmatrix}$

(a) Find the matrix $\mathbf{X}$, such that $2\mathbf{A} + \mathbf{X} = \mathbf{B}$.

Answer $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Find the matrix $\mathbf{Y}$, such that $\mathbf{AY} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

Answer [3]

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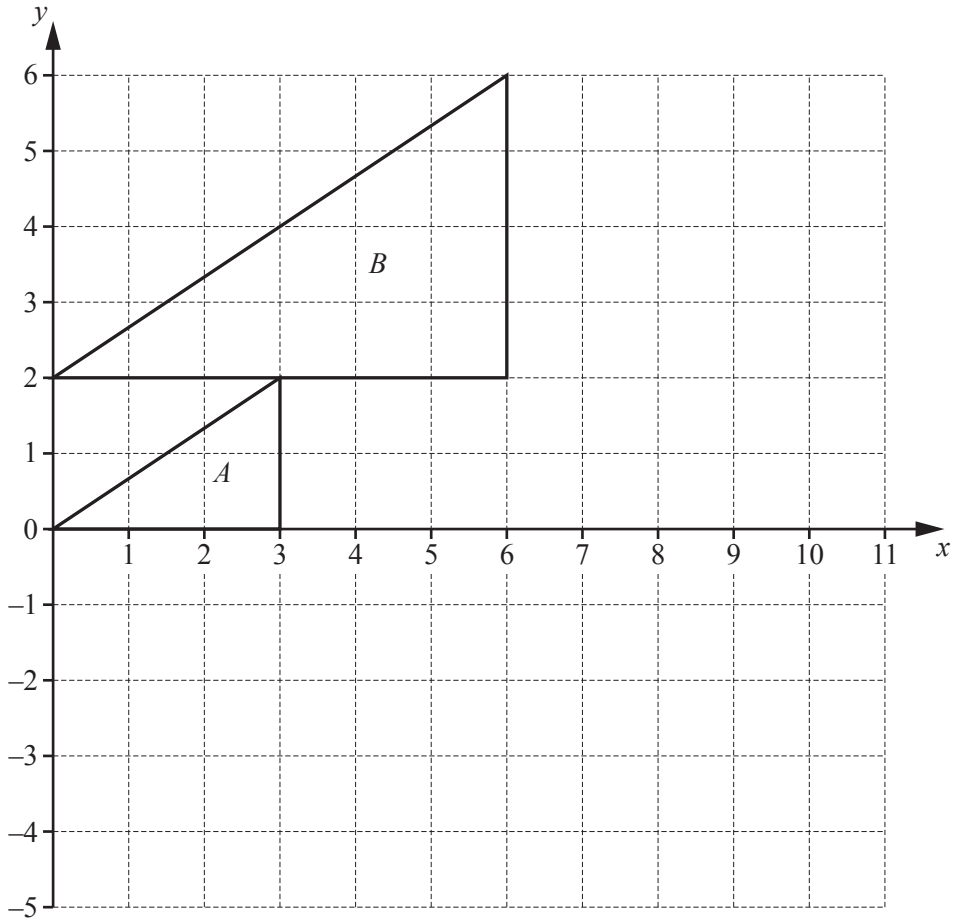


Triangle A is mapped onto triangle B by a translation, **followed by** an enlargement with centre (10, –4).
The translation maps triangle A onto triangle C.
The enlargement maps triangle C onto triangle B.

(a) Write down the scale factor of the enlargement.

Answer ..... [1]

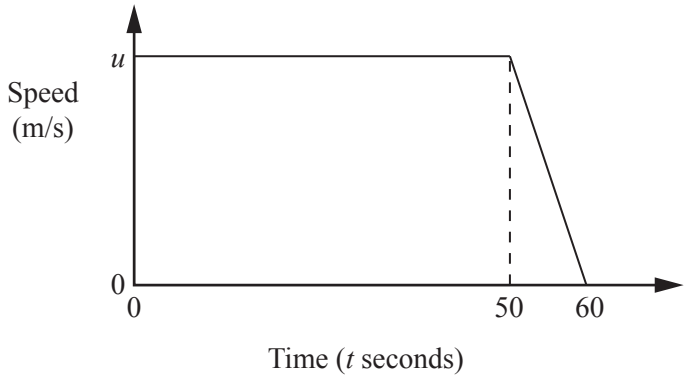
(b) Draw triangle C on the grid. [2]

(c) Find the column vector that represents the translation that maps triangle A onto triangle C.

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

Question 25 is printed on the next page

25 The diagram is the speed–time graph for 60 seconds of a train's journey.
At the beginning of this part of the journey the train is travelling at u m/s.



Giving each answer in its simplest form, find expressions in terms of u, for

(a) the deceleration for the last 10 seconds,

Answer ..... m/s^2 [1]

(b) the speed when $t = 55$,

Answer ..... m/s [1]

(c) the distance travelled during these 60 seconds.

Answer ..... m [2]

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