



Cambridge O Level

CANDIDATE
NAME



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MATHEMATICS (SYLLABUS D)

4024/12

Paper 1

October/November 2024

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.



ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

- 1 Write 43.07862 correct to 3 decimal places.

..... [1]

- 2 At midnight the temperature is -7°C .
At 11 am the next day the temperature is 12°C .

Find the increase in temperature from midnight to 11 am.

..... $^{\circ}\text{C}$ [1]

- 3 Write these numbers in order of size, starting with the smallest.

$\frac{2}{3}$ 66% 0.6 $\frac{16}{25}$ 0.606

..... , , , , [2]
smallest

- 4 Simplify.

(a) $\frac{t^4 \times t^3}{t^{10}}$

..... [1]

(b) $(\sqrt{6})^2$

..... [1]





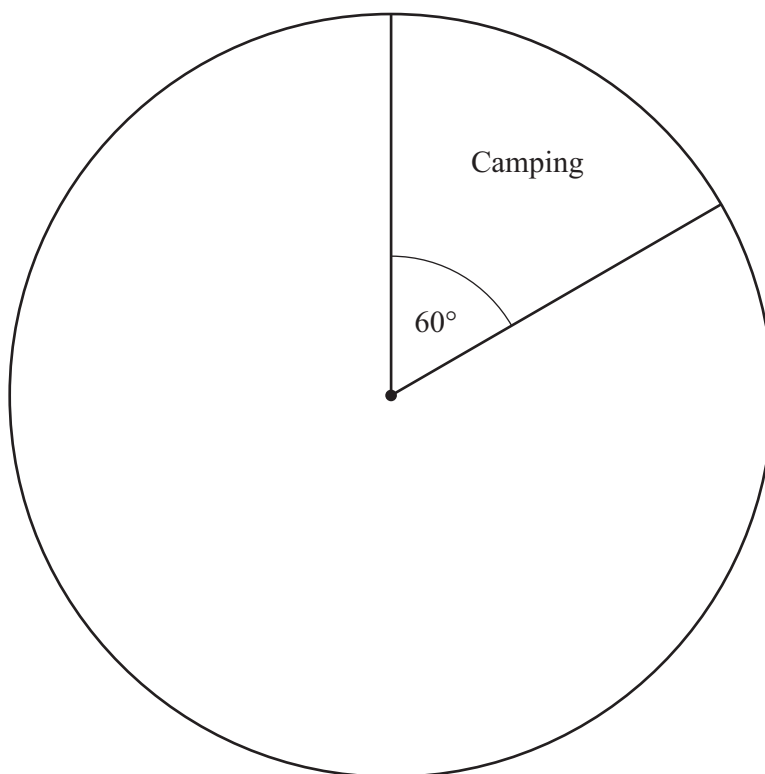
- 5 A group of people are asked what type of holiday they prefer.
The table gives information about the results.

Type of holiday	Number of people	Pie chart angle
Camping	15	60°
Beach	45	
Cruise	20	
Hiking	10	

- (a) Complete the table.

[2]

- (b) Complete the pie chart to show this information.



[2]





- 6 A laptop costs \$800.
In a sale, the cost is reduced by 15%.

Work out the cost of the laptop in the sale.

\$ [2]

- 7 Work out $\frac{3}{4} + \frac{5}{6}$.

Give your answer as a mixed number in its simplest form.

..... [2]

- 8 Sophia walks at an average speed of 4 km/h.

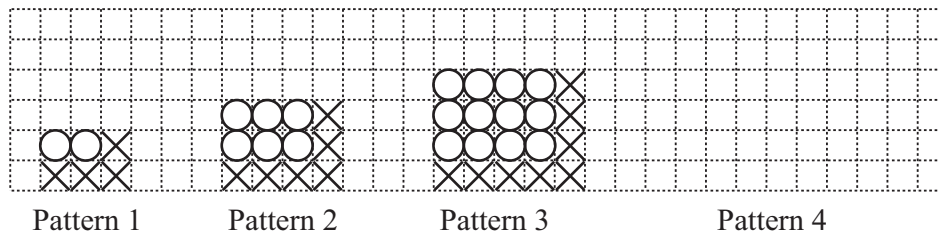
Work out the time Sophia takes to walk 13 km.
Give your answer in hours and minutes.

..... hours minutes [2]





9 A sequence of patterns is made using crosses and circles.



(a) Draw Pattern 4.

[1]

(b) Complete the table for Pattern 4 and Pattern 5.

Pattern number (n)	1	2	3	4	5
Number of crosses	4	6	8		
Number of circles	2	6	12		

[2]

(c) The expression for the number of crosses in Pattern n is $2n + 2$.

Find the number of crosses in Pattern 35.

..... [1]

(d) Find an expression, in terms of n , for the number of circles in Pattern n .

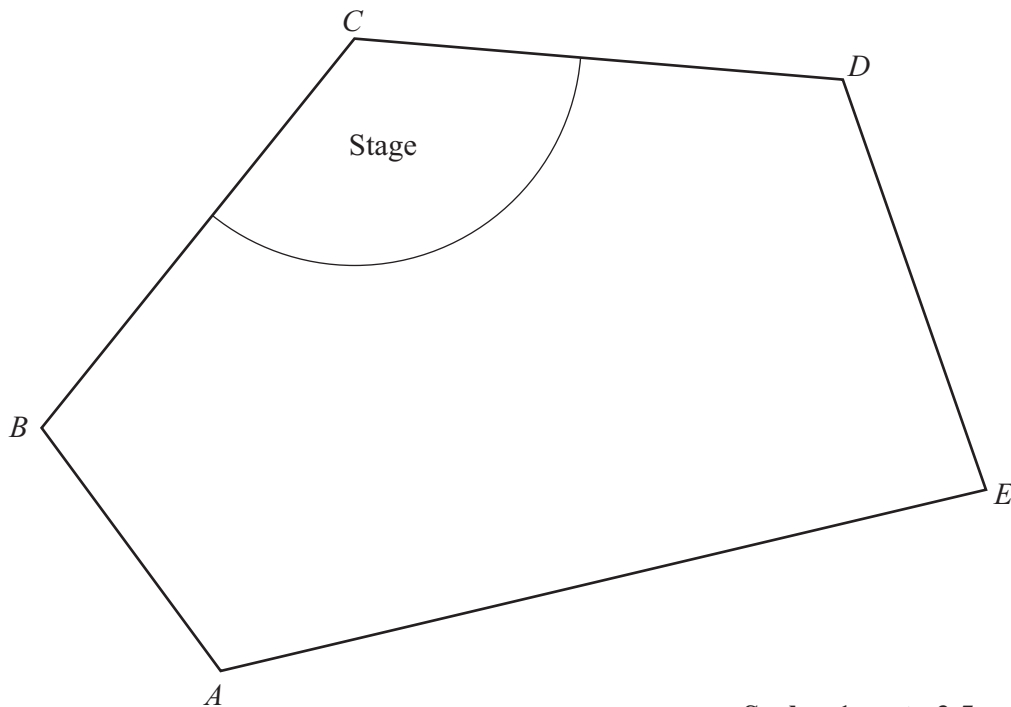
..... [2]





- 10 The scale drawing shows a field $ABCDE$.
The field contains a stage that is a sector of a circle, centre C .

The scale is 1 cm to 2.5 m.



Scale : 1 cm to 2.5 m

- (a) Find the actual radius of the stage.

..... m [2]

- (b) The rest of the field is split into two zones, zone 1 and zone 2.
Zone 1 and zone 2 do **not** include the stage.
Zone 1 is the region that is nearer to EA than to ED .

- (i) Using compasses and a straight edge only, construct the boundary between zone 1 and zone 2. [2]

- (ii) Shade the region that represents zone 1. [1]

- (c) The field is used for a concert.
Tickets for the concert cost \$30.75 each.

Work out the cost of 8 tickets.

\$ [1]





11 Factorise.

$$4m^2 - 14m$$

..... [2]

12 Here is a list of numbers.

$$\frac{1}{3}$$

$$\sqrt{4}$$

$$2^0$$

$$\sqrt{5}$$

$$\frac{10}{8}$$

$$2^{-1}$$

Write down the number in the list that is irrational.

..... [1]

13 Evaluate.

$$5 \times 10^7 - 8 \times 10^6$$

Give your answer in standard form.

..... [2]





14 $120 = 2^3 \times 3 \times 5$ $126 = 2 \times 3^2 \times 7$

The lowest common multiple (LCM) of 120 and 126 is 2520.

Write 2520 as a product of its prime factors.

..... [1]

15 Each interior angle of a regular polygon is 160° .

Find the number of sides of the polygon.

..... [2]

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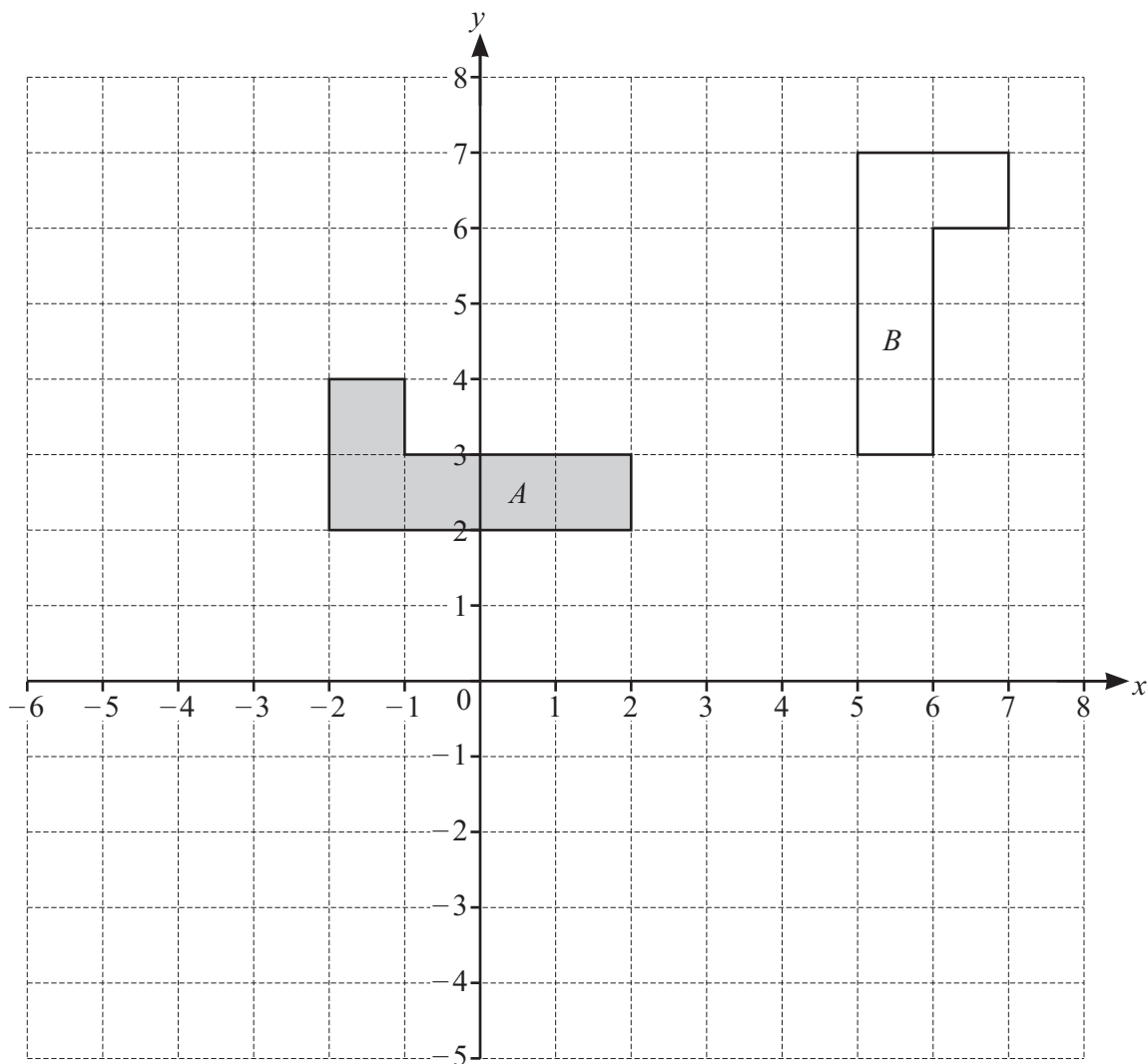
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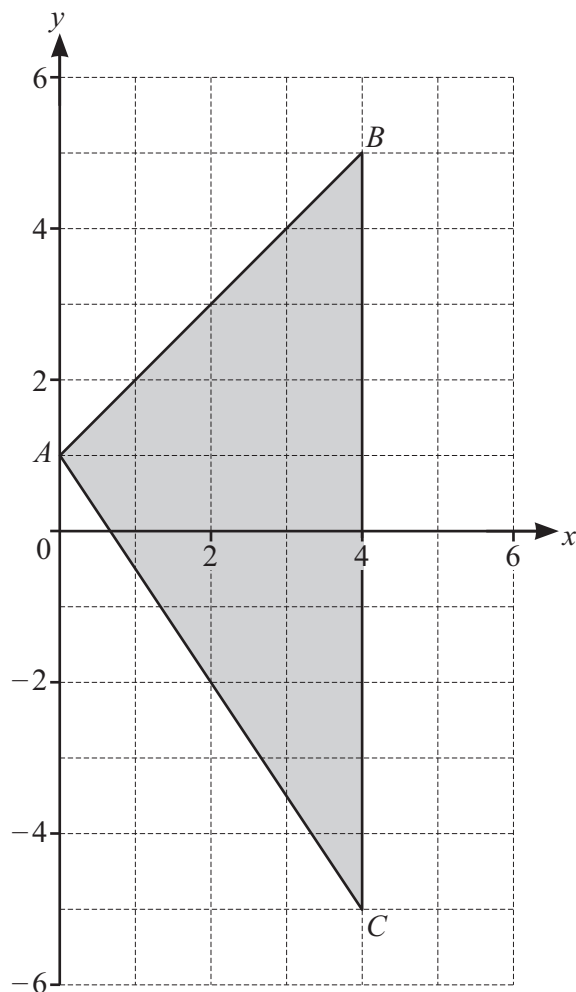


- (a) Draw the image of shape *A* after a translation by vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. [2]
- (b) Describe fully the **single** transformation that maps shape *A* onto shape *B*. [3]

.....

.....





The diagram shows a shaded triangle, ABC , drawn on a 1 cm square grid.

The equation of the line AC is $y = -\frac{3}{2}x + 1$.

- (a) The shaded region inside triangle ABC is defined by three inequalities.

One of these inequalities is $y \geq -\frac{3}{2}x + 1$.

Find the other two inequalities.

.....

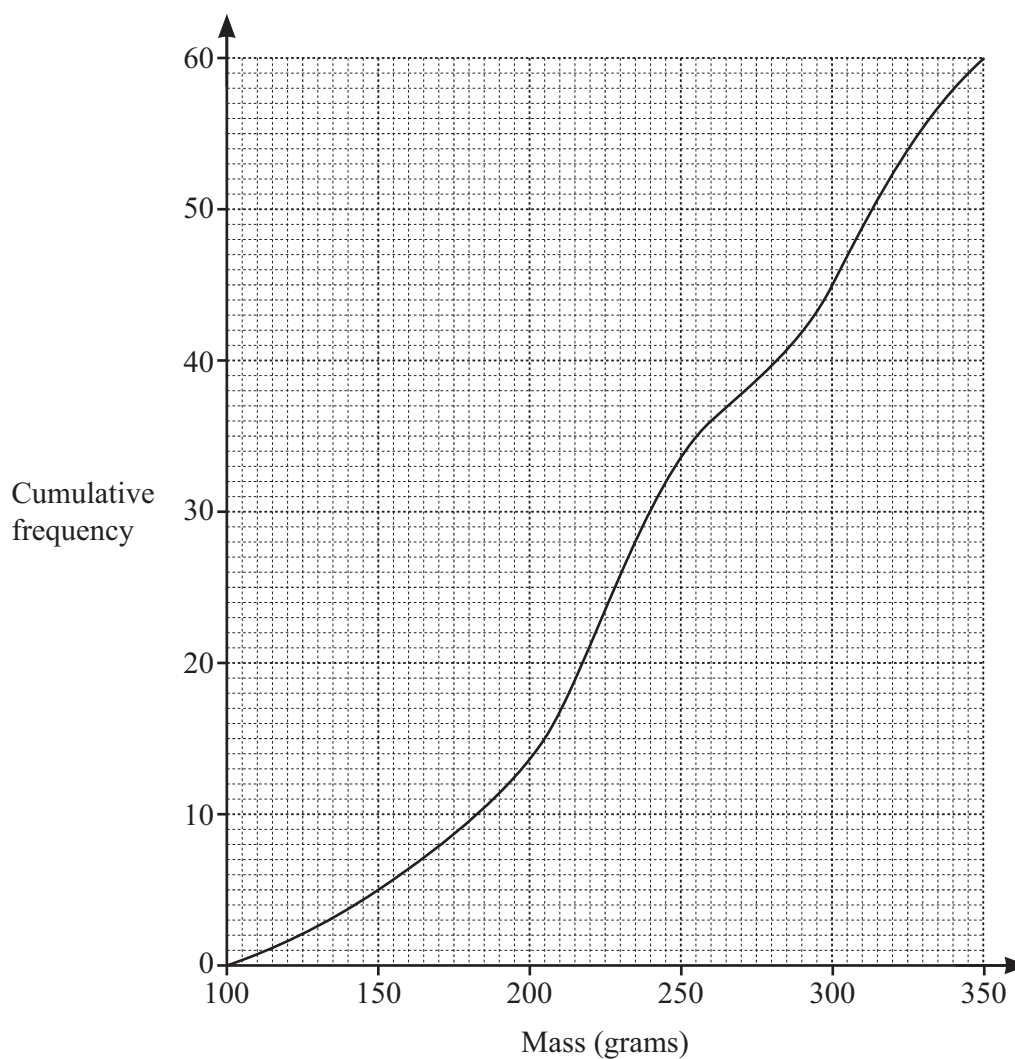
..... [2]

- (b) Work out the area of triangle ABC .

..... cm^2 [2]



- 18 Lin records the masses, in grams, of 60 onions.
The cumulative frequency diagram shows her results.



- (a) Use the diagram to find an estimate for the interquartile range.

..... g [2]

- (b) An onion is large if its mass is at least N grams.
24 of the 60 onions are large.

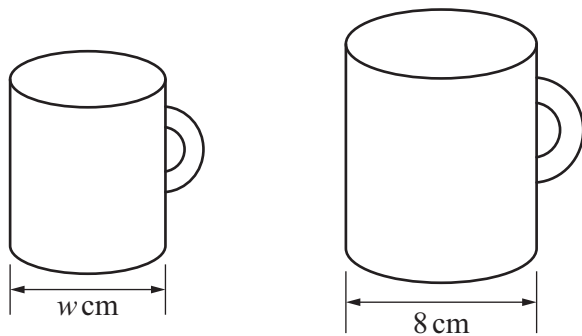
Find the value of N .

$N =$ [2]





19 The diagram shows two mathematically similar mugs.



NOT TO SCALE

The small mug has width w cm and holds 270 ml when full.
The large mug has width 8 cm and holds 640 ml when full.

Find the value of w .

$w = \dots\dots\dots$ [2]

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20 (a) Simplify.

$$(16a^{20})^{\frac{3}{4}}$$

..... [2]

(b) Expand and simplify.

$$(2c + 9d)(4c - 3d)$$

..... [2]

21 The inverse of a matrix $\mathbf{A}$ is given by $\frac{1}{20} \begin{pmatrix} m & 7 \\ -1 & k \end{pmatrix}$.

m and k are positive integers and $m < k$.

The determinant of matrix $\mathbf{A}$ is 20.

Find $\mathbf{A}$.

$$\mathbf{A} = \begin{pmatrix} & \\ & \end{pmatrix} \quad [3]$$





22 $f(x) = \frac{3x-1}{2}$ $g(x) = 5^x$

(a) Find $f(-7)$.

..... [1]

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

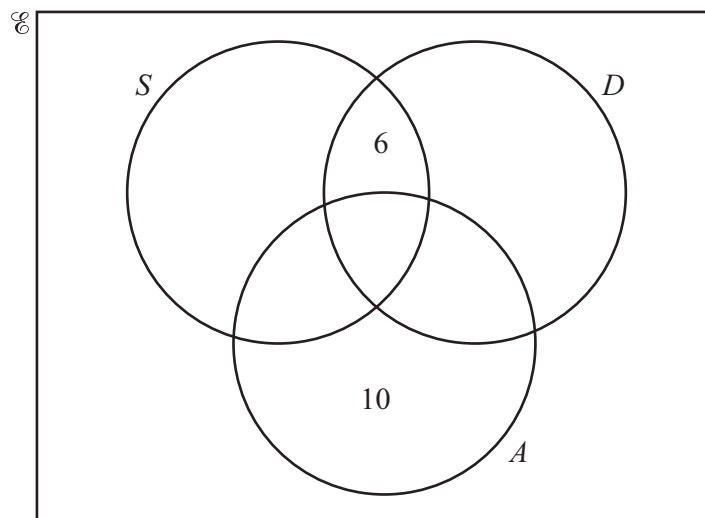
$f^{-1}(x) =$ [2]

(c) $f\left(\frac{9}{25}\right) = g(x)$
Find x .

$x =$ [3]



- 23 A theatre offers a singing lesson (S), a dancing lesson (D) and an acting lesson (A). A group of 40 people are asked which lessons they take part in. Some of the results are shown in the Venn diagram.



- (a) All 40 people take part in at least one lesson.
 3 people take part in a singing lesson and an acting lesson but **not** a dancing lesson.
 7 people take part in a dancing lesson only.
 19 people take part in a singing lesson.
 4 times as many people take part in a singing lesson only as those who take part in all three lessons.

Use this information to complete the Venn diagram.

[3]

- (b) Use set notation to describe the subset with 10 people.

[1]



24 P is the point $(-1, 4)$ and Q is the point $(-3, -2)$.

(a) Find the coordinates of the midpoint of the line PQ .

(..... ,) [1]

(b) Find the equation of the line perpendicular to PQ which passes through the point P .

..... [4]

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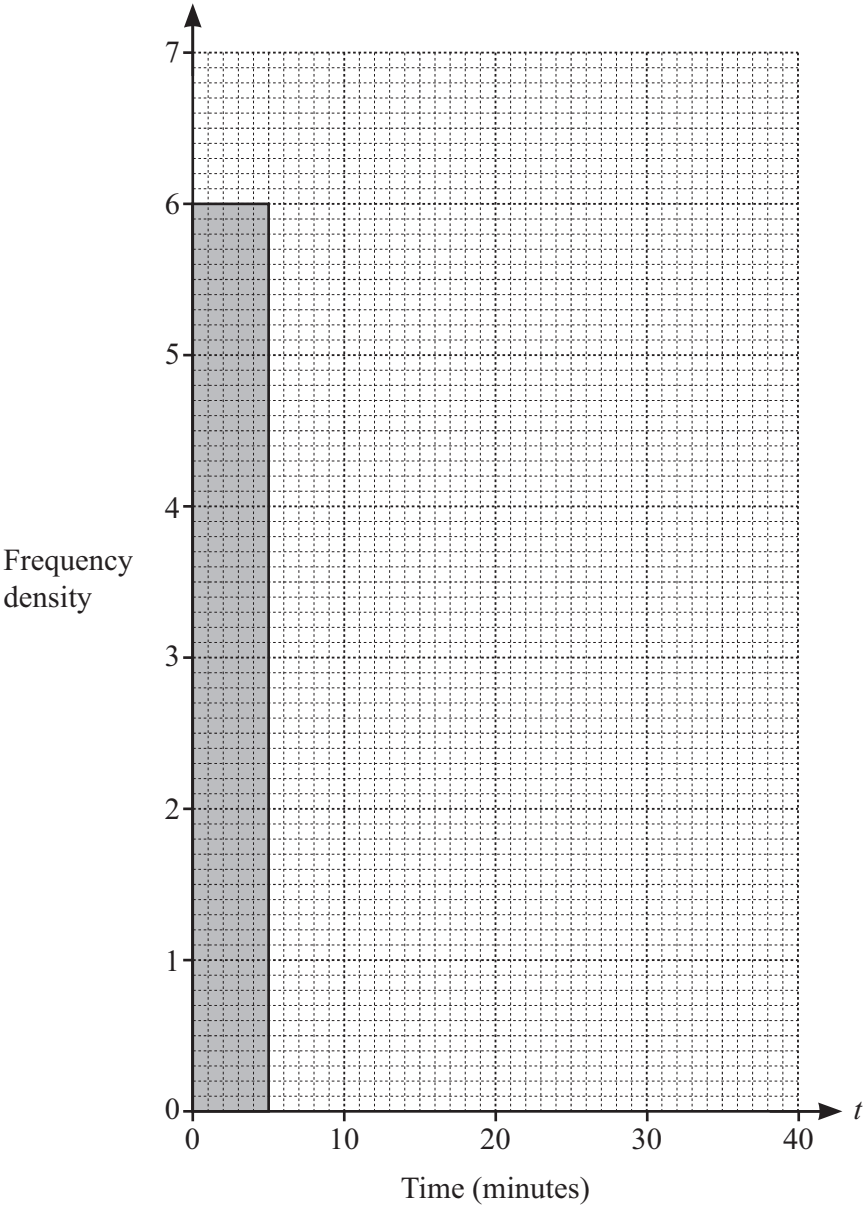




25 The table shows the times each of 110 students take to travel to school one day.

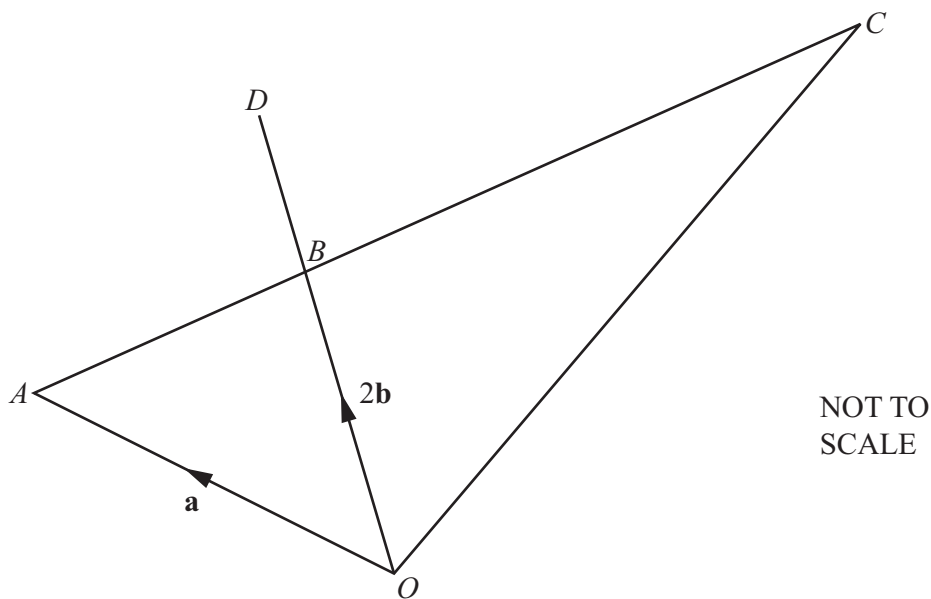
Time (t minutes)	$0 < t \leq 5$	$5 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 40$
Frequency	30	25	35	20

Complete the histogram to show this information.



[3]





In the diagram,
 $\vec{OA} = \mathbf{a}$, $\vec{OB} = 2\mathbf{b}$ and $AB : BC = 1 : 3$.
 OBD is a straight line.

(a) Express $\vec{AB}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

$$\vec{AB} = \dots\dots\dots [1]$$

(b) Show that $\vec{OC} = 8\mathbf{b} - 3\mathbf{a}$.

[2]

(c) $\vec{AD} = k\vec{OC}$.

Find the value of k .

$$k = \dots\dots\dots [1]$$





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