Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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.

..... °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]

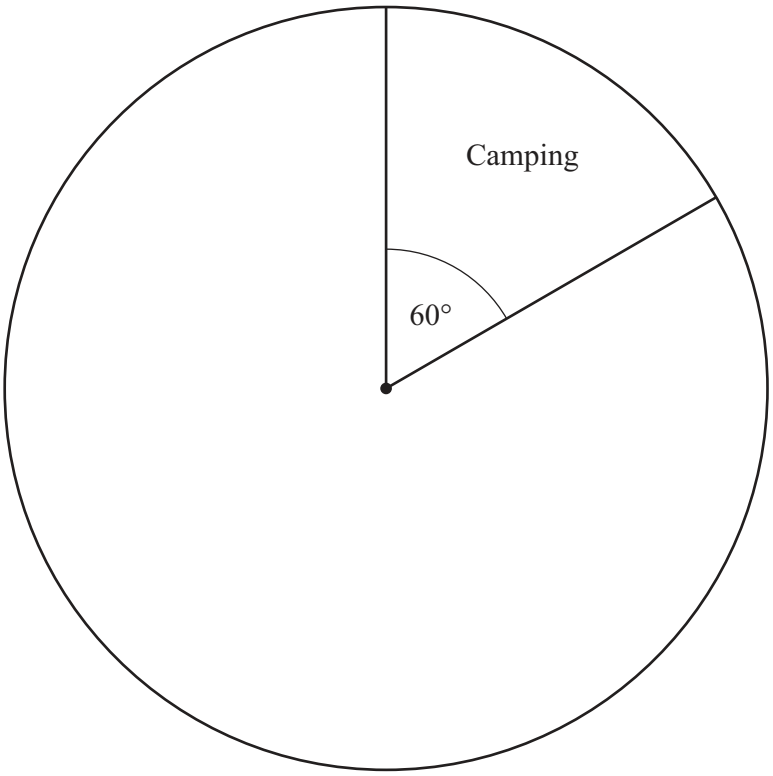
5 A group of people are asked what type of holiday they prefer.
The table gives information about the results.

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.

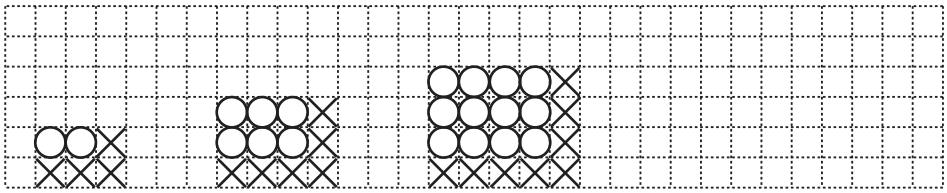
..... [2]

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.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

(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.

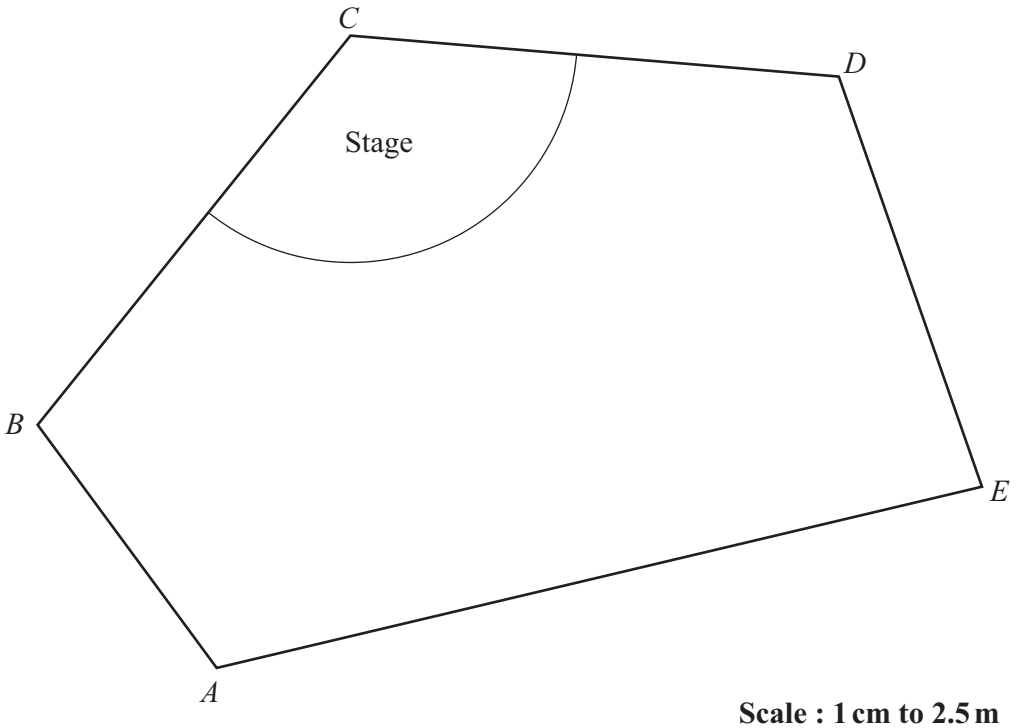
..... [1]

(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.

$$\frac{1}{3} \qquad \sqrt{4} \qquad 2^0 \qquad \sqrt{5} \qquad \frac{10}{8} \qquad 2^{-1}$$

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.

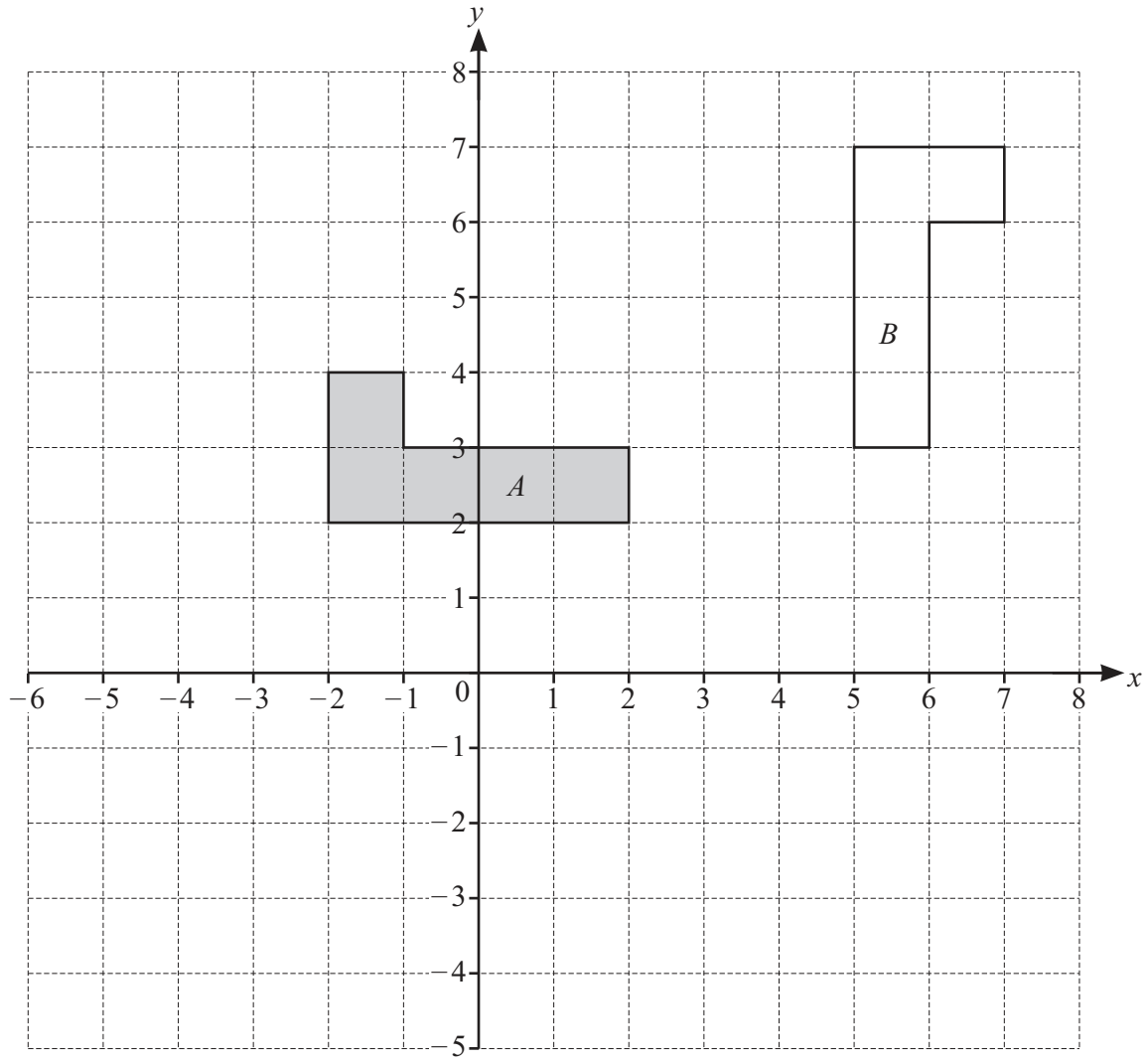
..... [1]

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

Find the number of sides of the polygon.

..... [2]

16



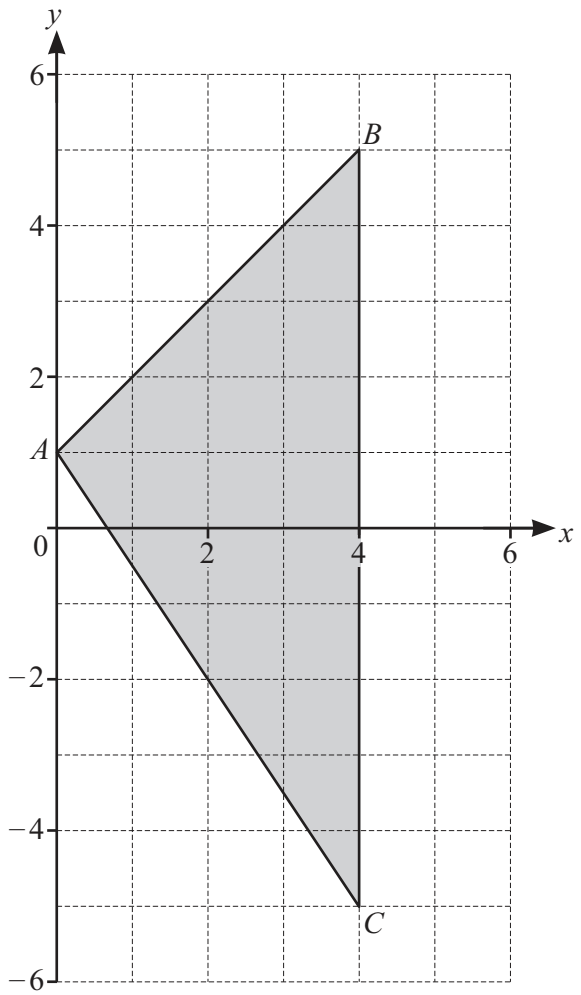
(a) Draw the image of shape A after a translation by vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [3]

17



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 $y \geqslant -\frac{3}{2}x + 1$.

Find the other two inequalities.

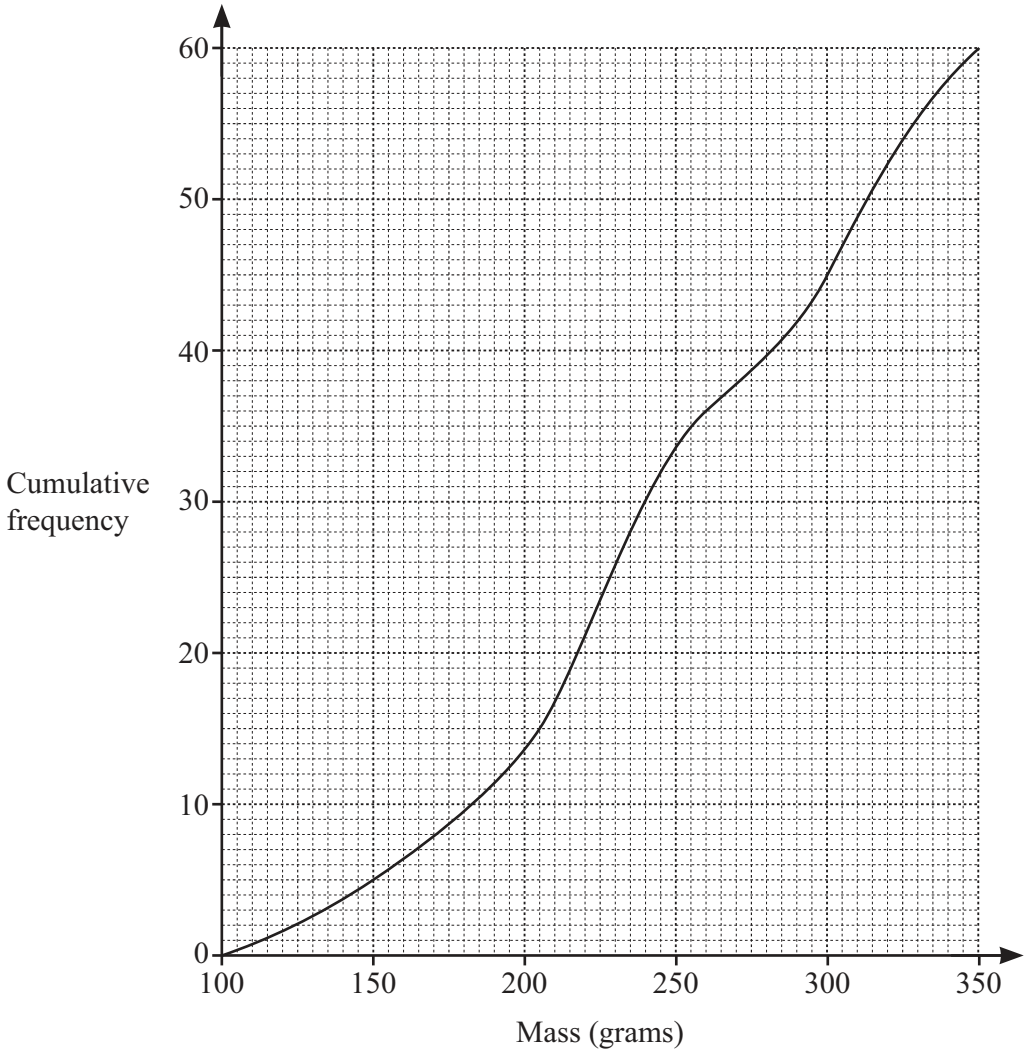
.....

..... [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.

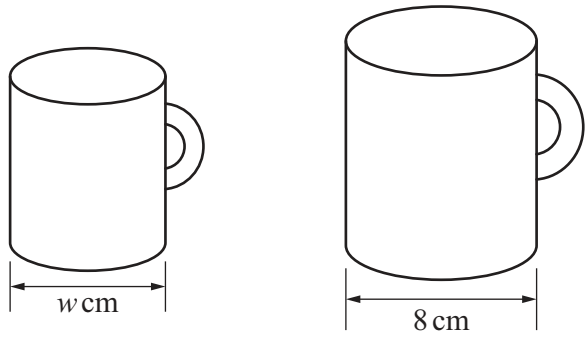
..... g [2]

(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.

$w =$ ..... [2]

20 **(a)** Simplify.

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

..... [2]

(b) Expand and simplify.

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

..... [2]

21 The inverse of a matrix **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 **A** is 20.

Find **A**.

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

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

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

..... [1]

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

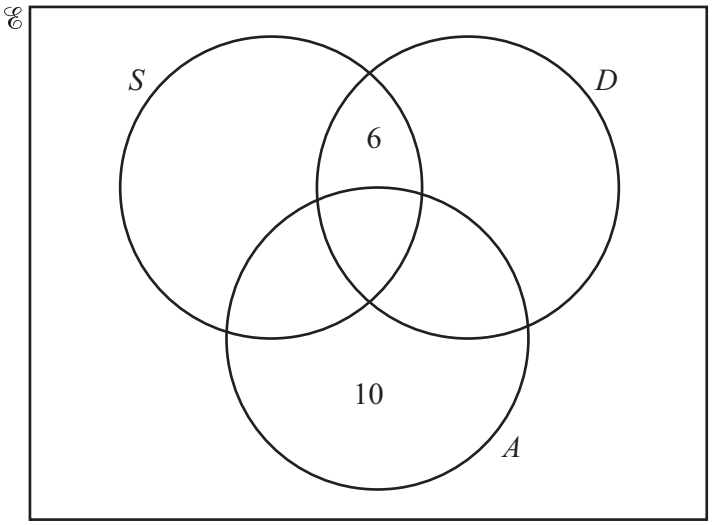
$f^{-1}(x) =$ ..... [2]

(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]

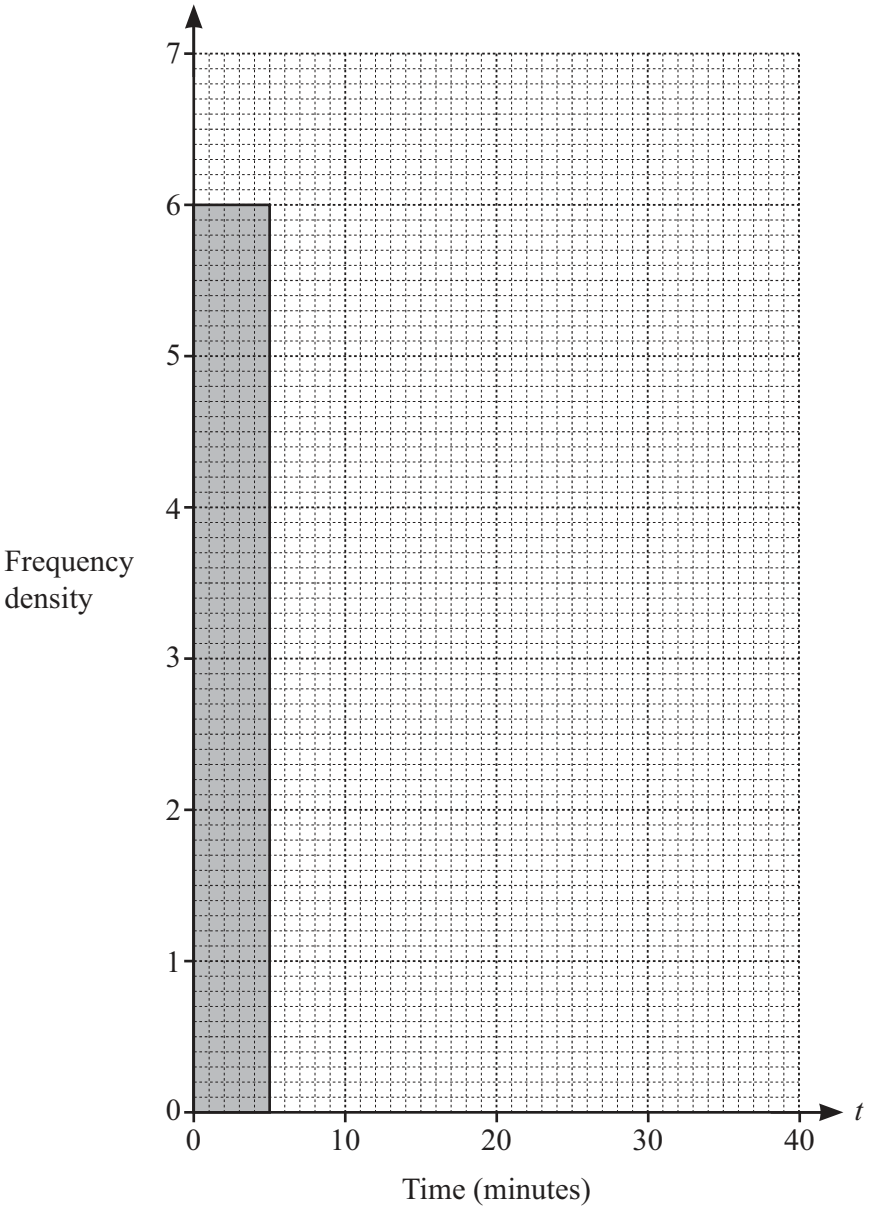
(b) Find the equation of the line perpendicular to PQ which passes through the point P.

..... [4]

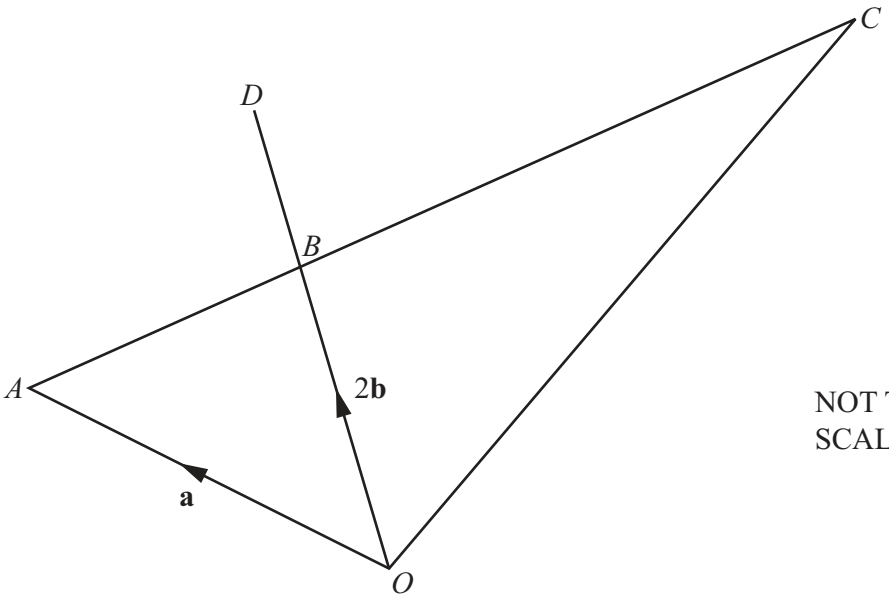
25 The table shows the times each of 110 students take to travel to school one day.

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

Complete the histogram to show this information.



[3]



NOT TO SCALE

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

(a) Express $\overrightarrow{AB}$ in terms of **a** and **b**.

$\overrightarrow{AB} =$ ..... [1]

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

[2]

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

Find the value of k.

$k =$ ..... [1]

BLANK PAGE

BLANK PAGE