



# Cambridge O Level

CANDIDATE NAME

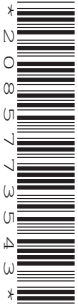


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**MATHEMATICS (SYLLABUS D)**

**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  $-7^{\circ}\text{C}$ .  
At 11 am the next day the temperature is  $12^{\circ}\text{C}$ .

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]

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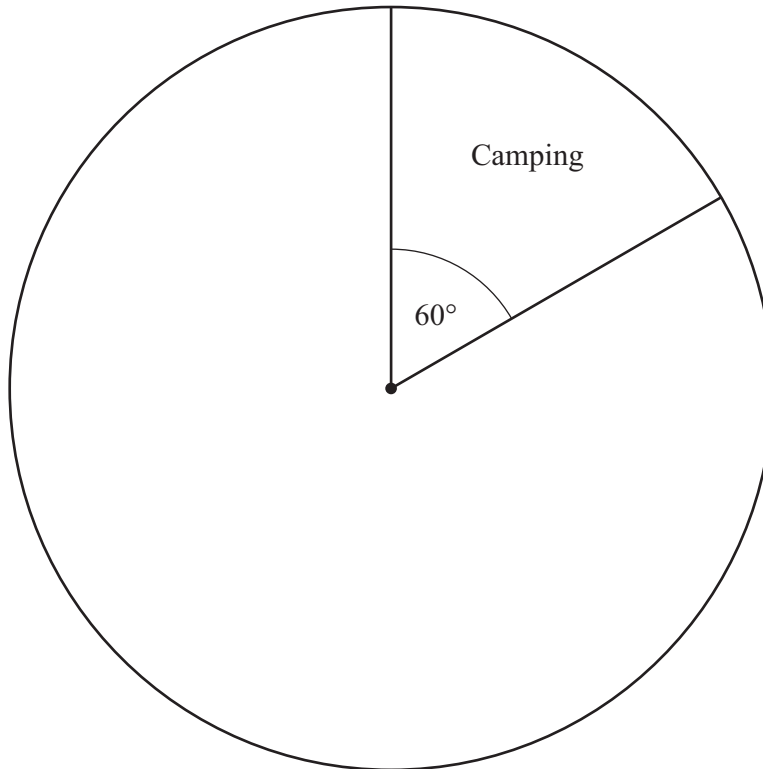
5 A group of people are asked what type of holiday they prefer. The table gives information about the results.

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]



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- 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.

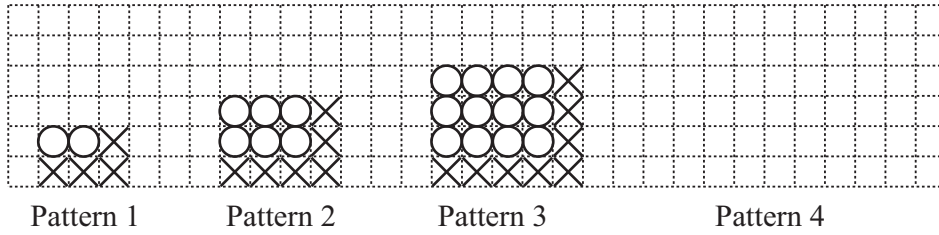
..... hours ..... minutes [2]

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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]

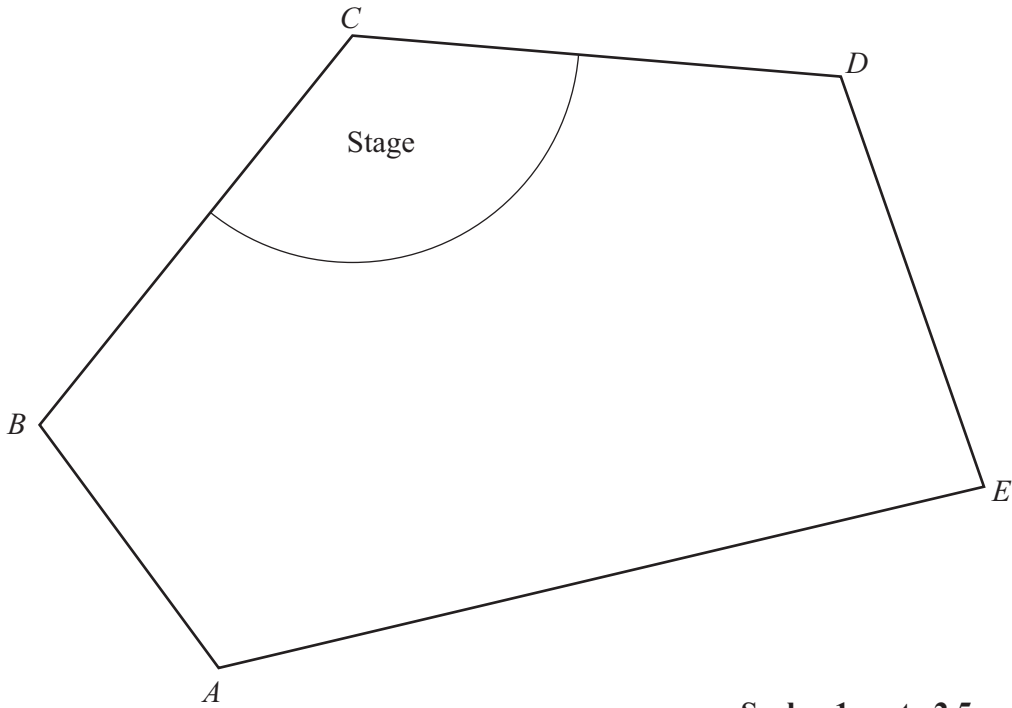


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- 10 The scale drawing shows a field  $ABCDE$ .  
The field contains a stage that is a sector of a circle, centre  $C$ .

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]

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11 Factorise.

$$4m^2 - 14m$$

..... [2]

12 Here is a list of numbers.

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

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]



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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  $160^\circ$ .

Find the number of sides of the polygon.

..... [2]

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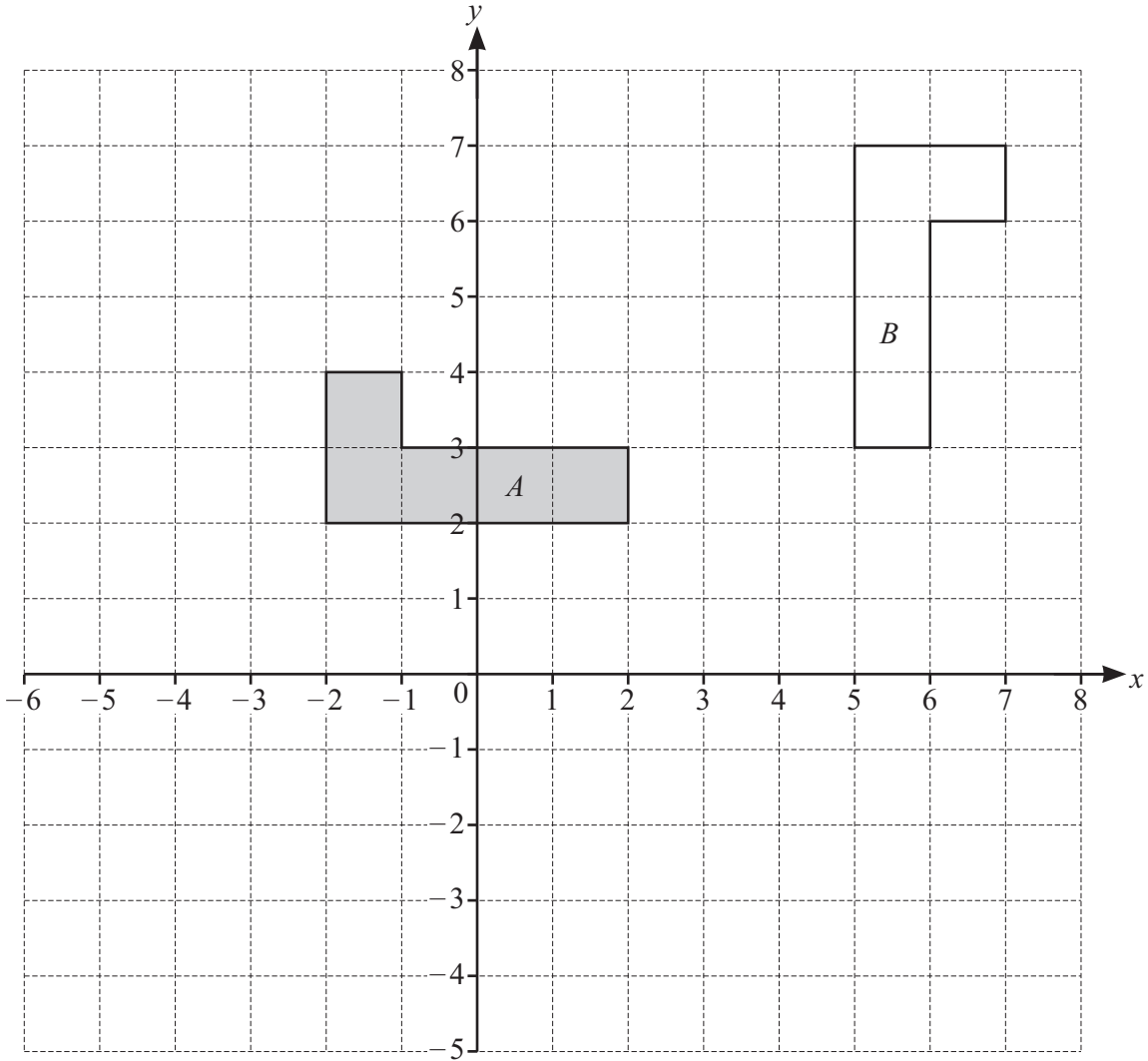
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16



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

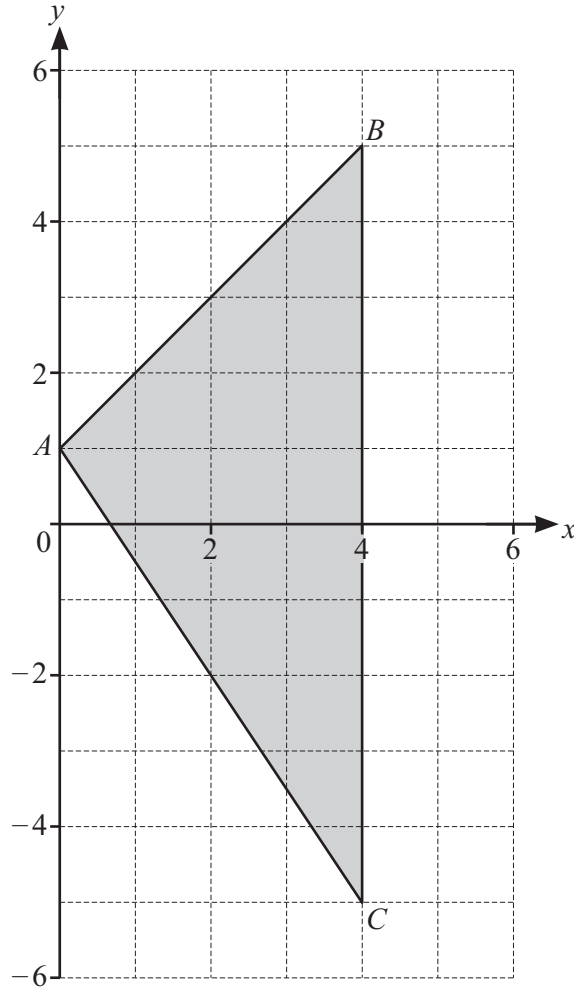
(b) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

.....

..... [3]



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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  $ABC$ .

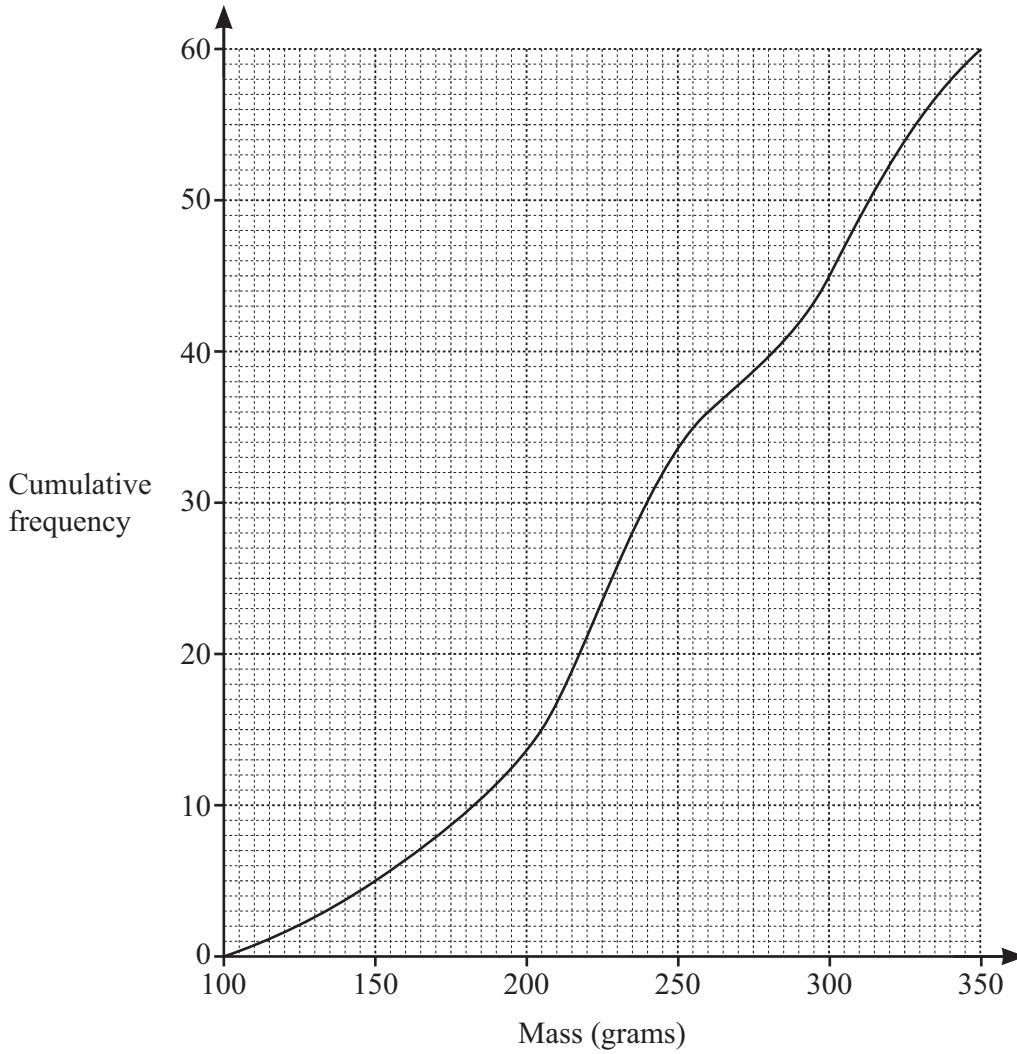
.....  $\text{cm}^2$  [2]

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- 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  $N$ .

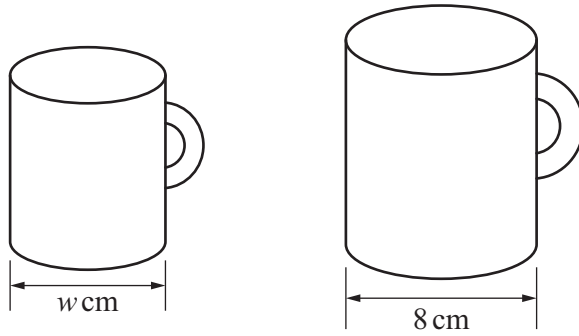
$N =$  ..... [2]



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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 **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**.

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



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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  $x$ .

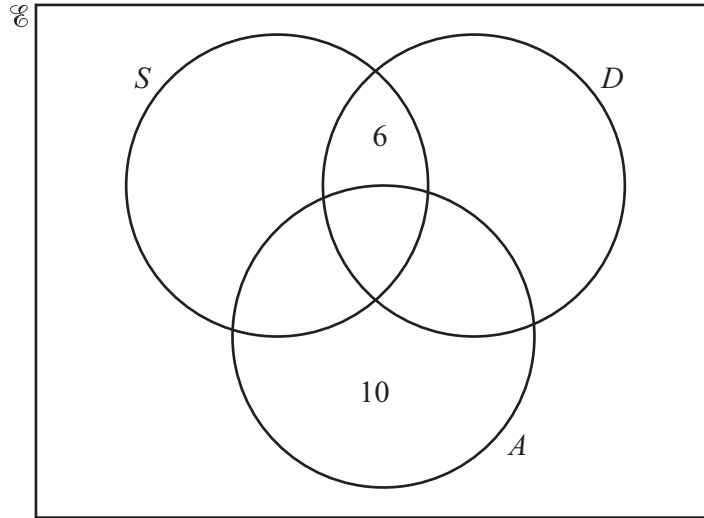
$x =$  ..... [3]

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- 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]



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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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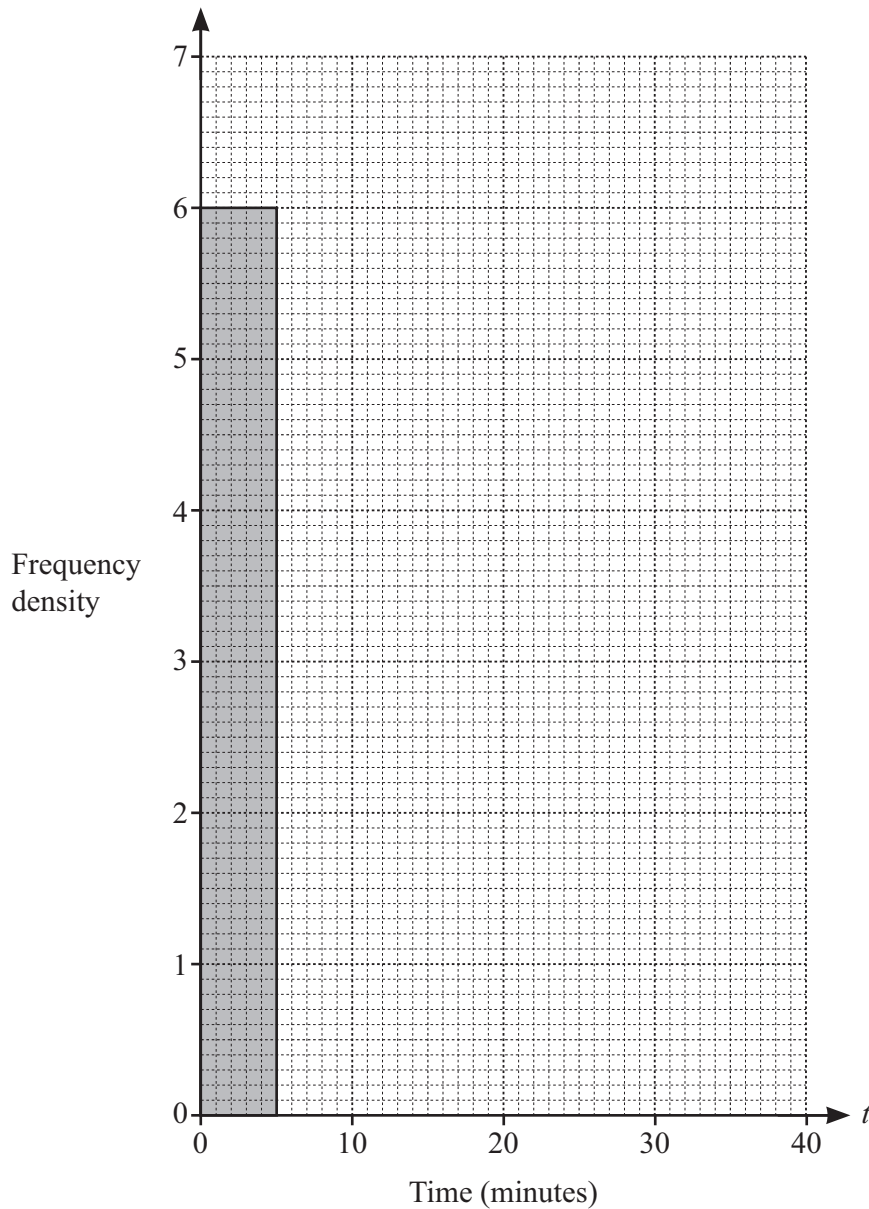




25 The table shows the times each of 110 students take to travel to school one day.

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.



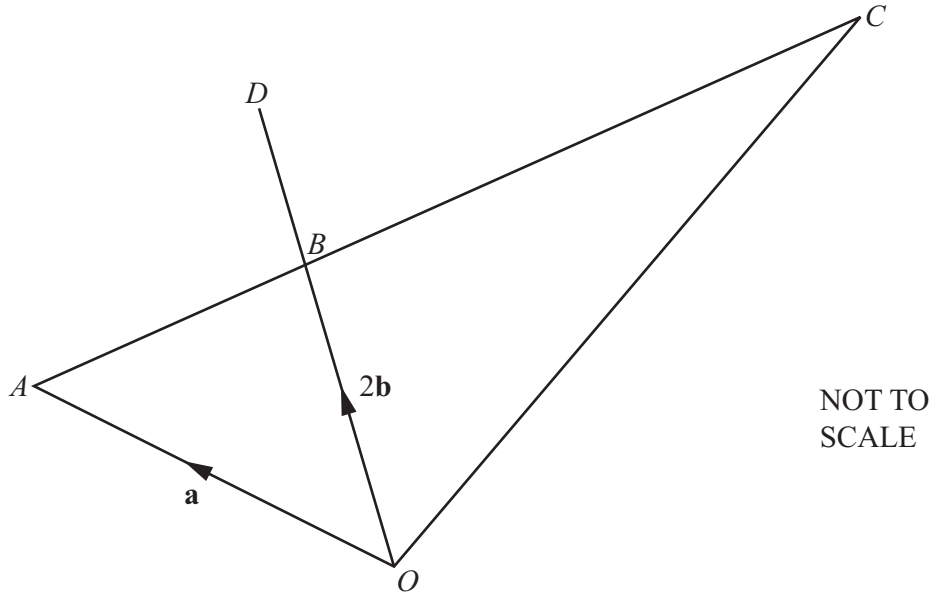
[3]



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26



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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