Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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4015540078

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

Paper 1 Non-calculator **May/June 2025**

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

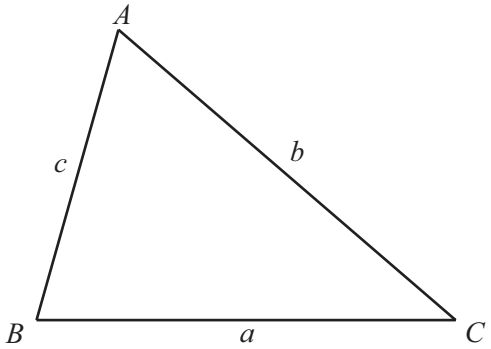
- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



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

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

$$\text{Area} = \frac{1}{2}ab\sin C$$

Calculators must **not** be used in this paper.

1 Work out.

(a) $6 - 2 \times (-4)$

..... [1]

(b) 80×0.2

..... [1]

(c) $\frac{2}{9} \div \frac{5}{6}$

..... [2]

2 A bag contains 11 balls.
There are 5 blue balls and 4 yellow balls.
The rest of the balls are green.
A ball is taken from the bag at random.

Find the probability that the ball is

(a) yellow

..... [1]

(b) **not** blue.

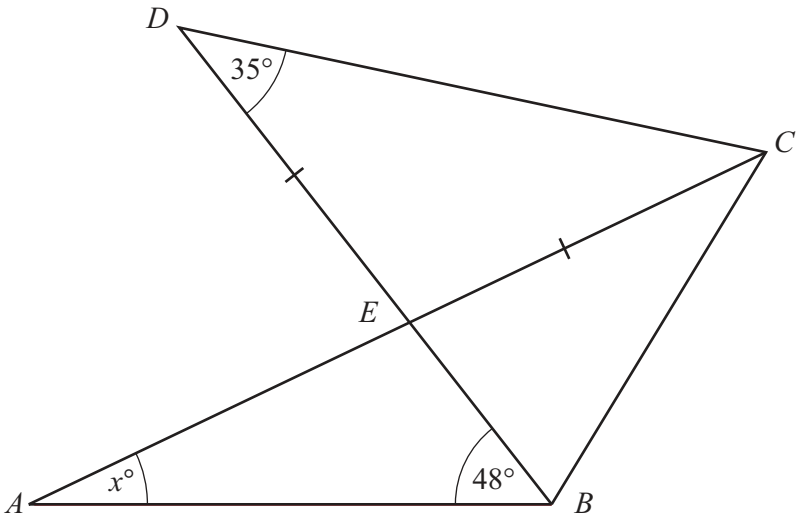
..... [1]

3 The area of one face of a cube is $9\,\text{cm}^2$.

On the 1 cm grid, draw an accurate net of the cube.

[3]

4



NOT TO SCALE

AEC and *BED* are straight lines.
$ED = EC$.

Find the value of x.

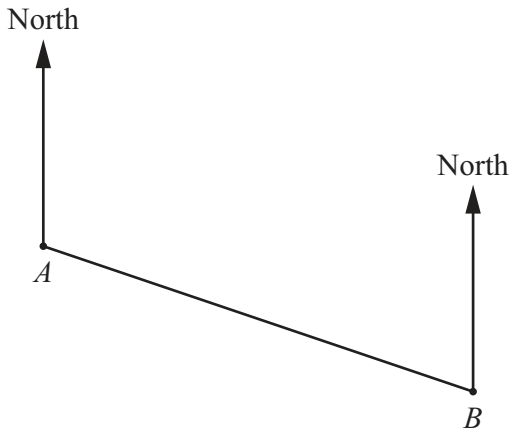
$x =$ ..... [3]

5 Solve.

$5(4-x) = 35$

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

6 The scale drawing shows the positions of two villages, A and B.
The scale is 1 cm to 5 km.



Scale: 1 cm to 5 km

(a) Find the actual distance between village A and village B.

..... km [2]

(b) Village C is on a bearing of 060° from village A.
Village C is on a bearing of 320° from village B.

Find and label the position of village C on the scale drawing. [2]

7 Evaluate.

(a) $\sqrt[3]{125}$

..... [1]

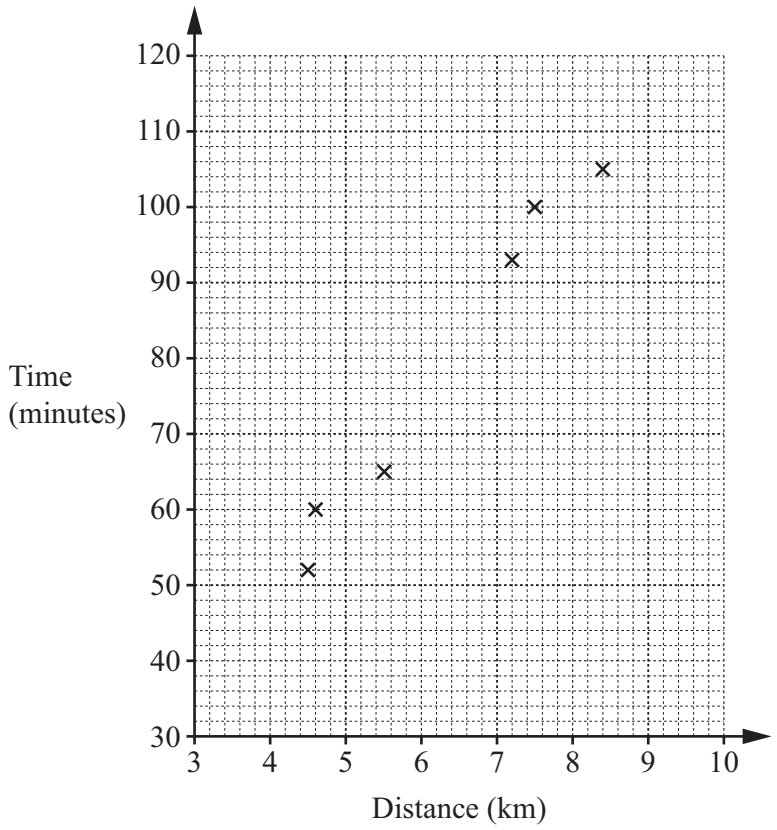
(b) 4^{-2}

..... [2]

8 Asha records the distance she walks and the time she takes for each of 10 walks.
The table shows her results.

Distance (km)	4.5	4.6	7.2	8.4	5.5	7.5	4.2	9.0	3.8	5.6
Time (minutes)	52	60	93	105	65	100	52	116	49	62

(a)



Complete the scatter diagram.
The first 6 points have been plotted for you. [2]

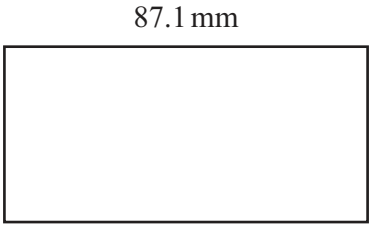
(b) Draw a line of best fit. [1]

(c) Asha goes for another walk.
She walks a distance of 6.8 km.

Use your line of best fit to estimate the time Asha takes for this walk.

..... minutes [1]

9 The diagram shows a rectangle.



NOT TO SCALE

By writing each number correct to 1 significant figure, find an estimate for the area of the rectangle.

..... mm^2 [2]

10 **(a)** Write 228 as a product of its prime factors.

..... [2]

(b) $228^2 = 51984$

Write 51 984 as a product of its prime factors.

..... [1]

11 The mass of a small box is x kg.
The mass of a large box is y kg.

(a) The total mass of 4 small boxes and 6 large boxes is 30 kg.

Show that $2x + 3y = 15$.

[1]

(b) The total mass of 6 small boxes and 1 large box is 13 kg.

Use this information to write down an equation in terms of x and y.

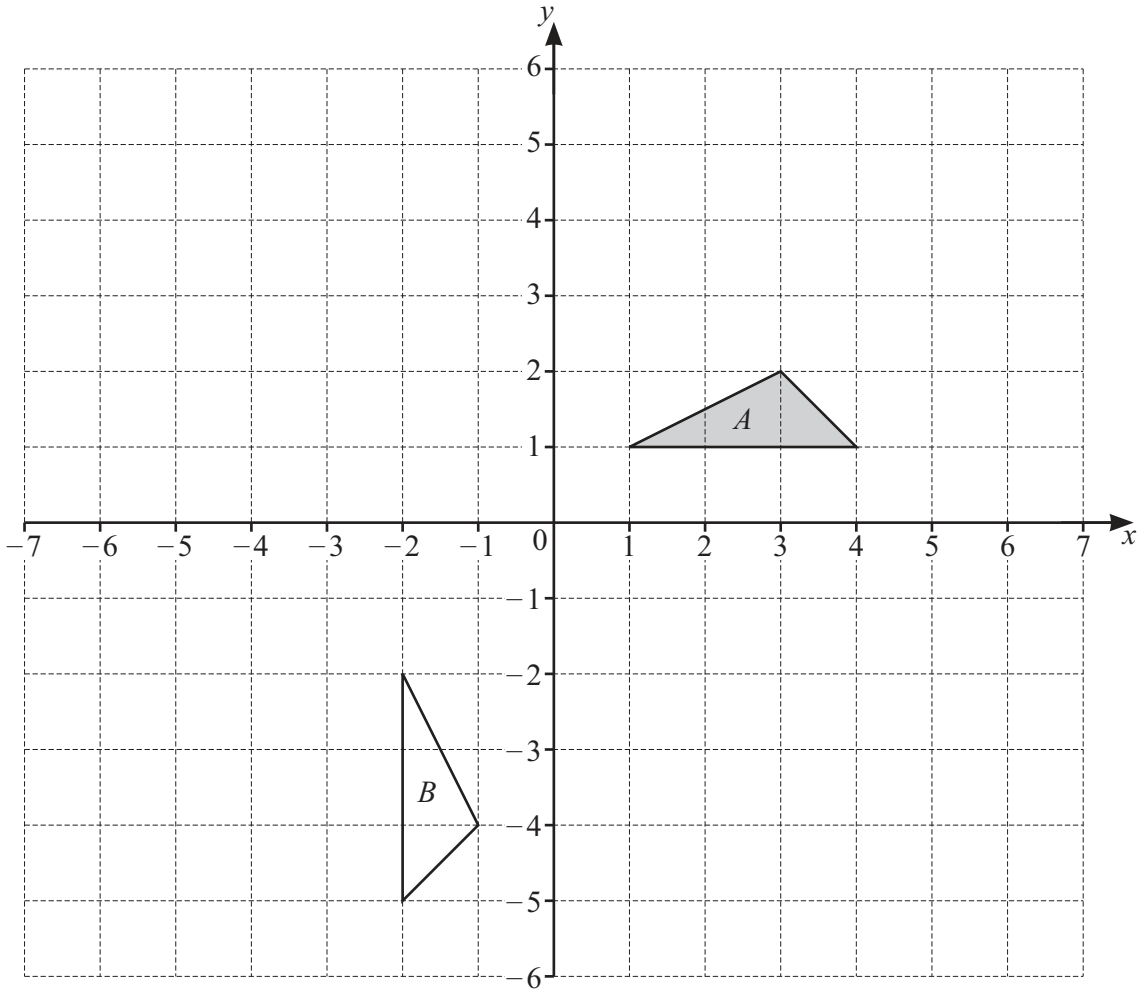
..... [1]

(c) Solve the simultaneous equations to find the mass of a small box and the mass of a large box.
You must show all your working.

Small box = ... kg

Large box = ... kg
[3]

12 Triangle A and triangle B are drawn on the grid.



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(b) Draw the image of triangle A after a reflection in the line $x = -1$. [2]

(c) Triangle A is enlarged with scale factor k and centre (0, 0).
Triangle C is the image of triangle A after the enlargement.
The coordinates of one vertex of triangle C are (12, 3).

(i) Find the value of k.

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

(ii) Find the coordinates of the other two vertices of triangle C.

(..... , ...) and (..... , ...) [2]

13 In a sale, a shop reduces all prices by 20%.

(a) A coat costs \$85 before the sale.

Work out the sale price of the coat.

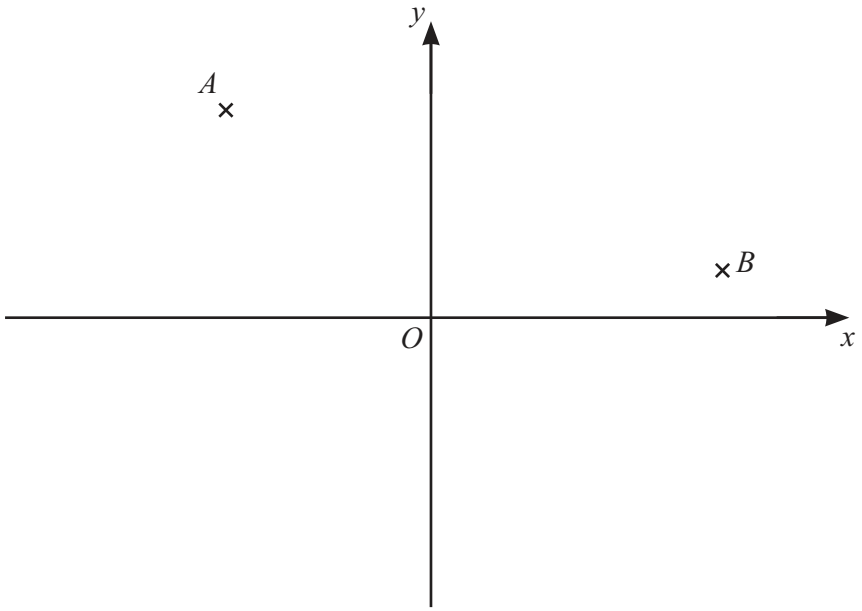
\$ ..... [2]

(b) The sale price of a shirt is \$40.

Work out the cost of the shirt before the sale.

\$ ..... [2]

14



NOT TO SCALE

A is the point (–4, 5) and B is the point (6, 1).

$\overrightarrow{BC} = \begin{pmatrix} -3 \\ -4 \end{pmatrix}$

(a) Find the column vector $\overrightarrow{AB}$.

$\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(b) Find the coordinates of point C.

(..... , ...) [2]

(c) $ABCD$ is a trapezium.
AB is parallel to DC and $AB = 2DC$.

(i) Find the coordinates of point D.

(..... , ...) [2]

(ii) Find the length of line AD.
Give your answer as a surd in its simplest form.

..... [3]

15 **(a)** Simplify.

$\sqrt{175} - \sqrt{28}$

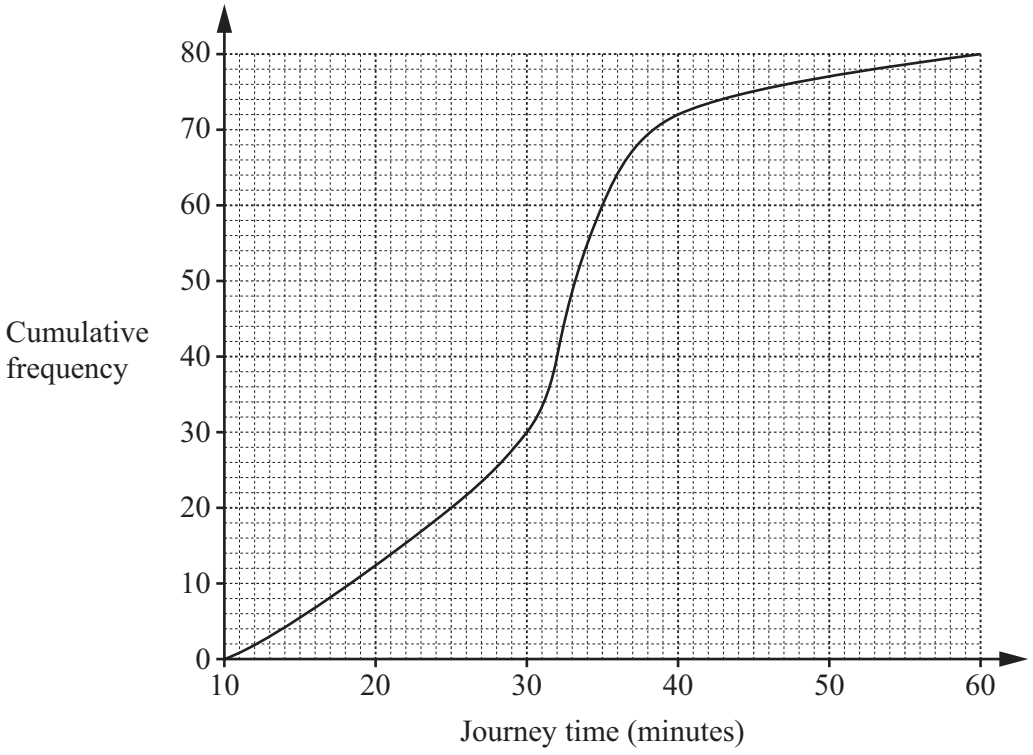
..... [2]

(b) Rationalise the denominator.

$\frac{1}{\sqrt{5}}$

..... [1]

16 A group of 80 people each record their journey time from home to work one day.
The cumulative frequency diagram shows the results.



(a) Use the cumulative frequency diagram to find an estimate of

(i) the median

..... minutes [1]

(ii) the interquartile range

..... minutes [2]

(iii) the number of people who had a journey time of 40 minutes or more.

..... [2]

(b) Each of the 80 people also record their journey time from work to home that day.
The table shows the results.

Median	35 minutes
Interquartile range	15 minutes

Jay says:

"The journey times from home to work are more consistent than the journey times from work to home."

Is Jay correct?
Explain how you decide.

..... because ..... [1]

17 The equation of line L is $5y + 3x = 10$.

(a) Rearrange $5y + 3x = 10$ to make y the subject.

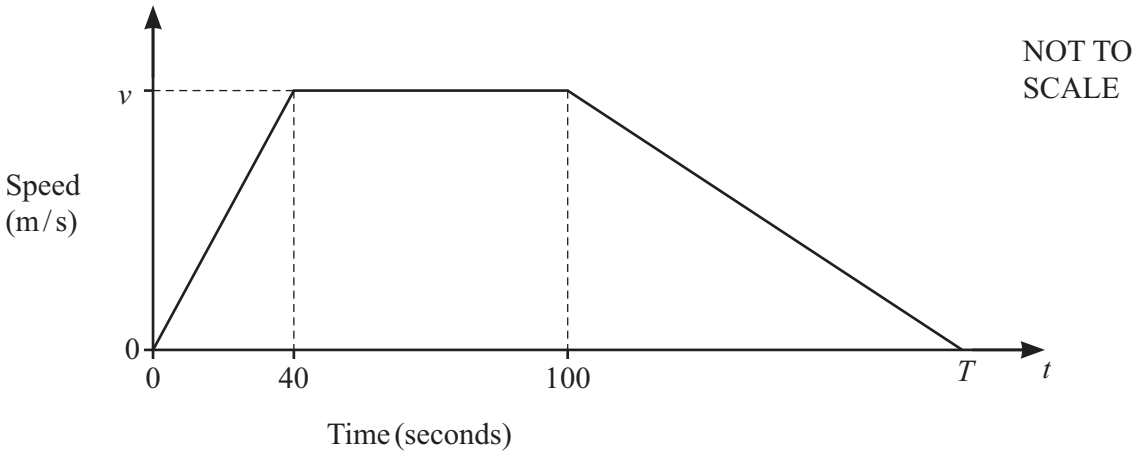
$y =$ ..... [2]

(b) Line P is perpendicular to line L.
Line P passes through the point (6, 7).

Find the equation of line P.

..... [3]

18 The diagram shows the speed–time graph for a cyclist's journey.



(a) Describe the motion of the cyclist between $t = 40$ and $t = 100$.

..... [1]

(b) The acceleration of the cyclist between $t = 0$ and $t = 40$ is $0.25\,\text{m/s}^2$.

Show that $v = 10$.

[1]

(c) The total distance travelled by the cyclist between $t = 0$ and $t = T$ is 1.4 km.

Find the value of T.

$T =$ ..... [3]

19 Simplify.

$$\frac{3x^2 - 12}{2x^2 + 11x + 14}$$

..... [4]

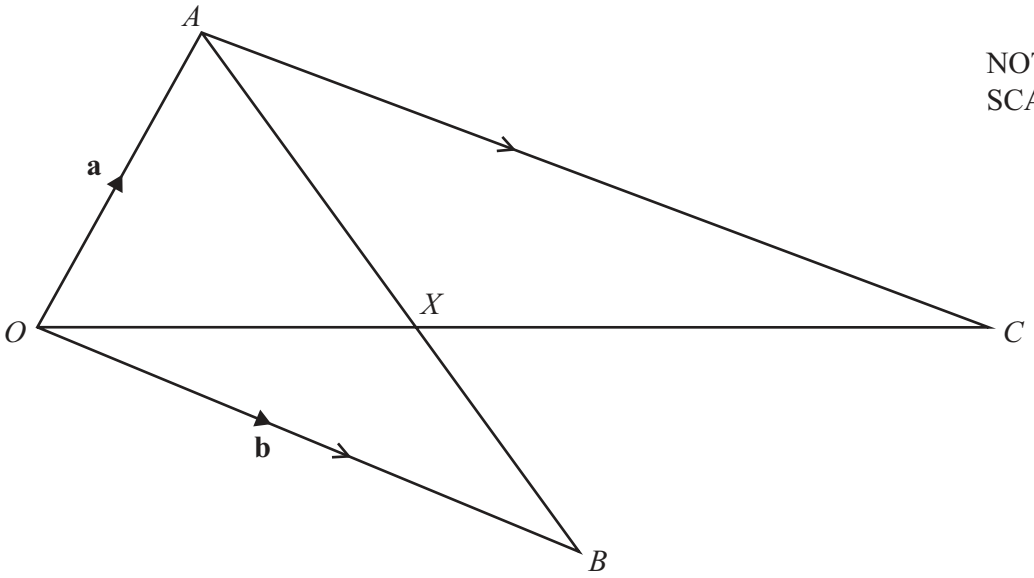
20 Work out.

$$0.\dot{1}\dot{7} + \frac{5}{9}$$

Give your answer as a fraction in its simplest form.

..... [4]

21



NOT TO SCALE

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
X is a point on AB where $AX : XB = 3 : 2$.
OXC is a straight line.
AC is parallel to OB.

(a) Find $\overrightarrow{AX}$.
Give your answer in its simplest form in terms of **a** and **b**.

$\overrightarrow{AX} =$ ..... [2]

(b) Find $\overrightarrow{XC}$.
Give your answer in its simplest form in terms of **a** and **b**.

$\overrightarrow{XC} =$ ..... [3]

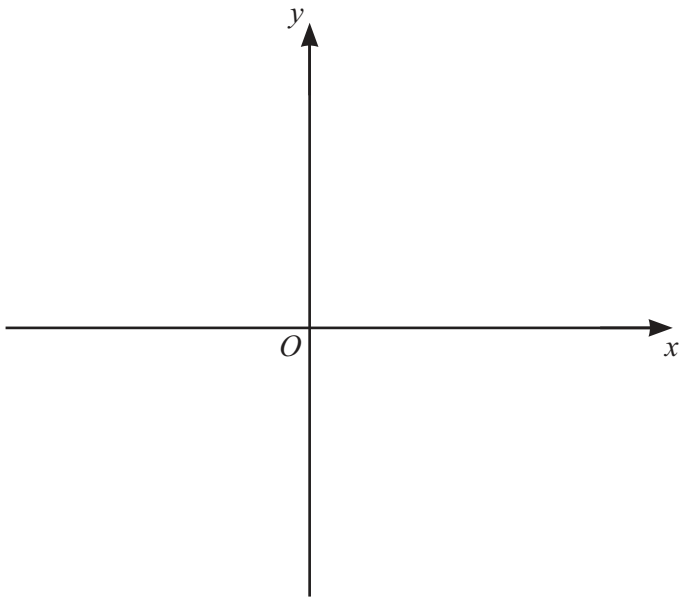
22 **(a)** Write $x^2 + 4x - 12$ in the form $(x + a)^2 + b$.

..... [2]

(b) Use your answer to **part (a)** to find the coordinates of the turning point of the graph of $y = x^2 + 4x - 12$.

(..... , ...) [1]

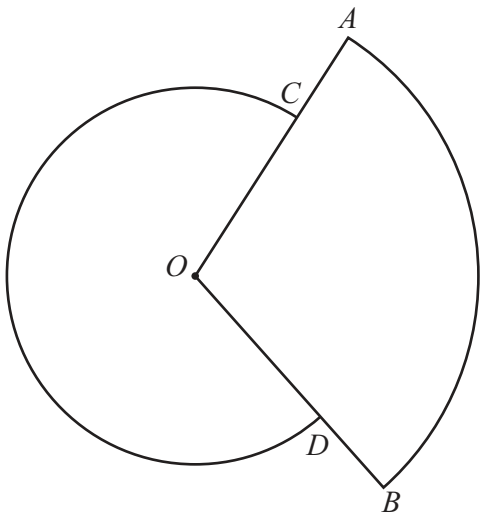
(c) Sketch the graph of $y = x^2 + 4x - 12$ indicating the values where the graph crosses the axes.



[4]

Question 23 is printed on the next page.

23



NOT TO SCALE

OAB is a minor sector of a circle, centre *O*.
OCD is a major sector of a different circle, centre *O*.

OCA and *ODB* are straight lines.
OC = 6 cm and *OA* = 9 cm.
The length of the minor arc *AB* is 5π cm.

Work out the area of the major sector *OCD*.
Give your answer in terms of π.

..... cm^2 [5]