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MATHEMATICS**0980/22**

Paper 2 Non-calculator (Extended)

May/June 2025**2 hours**

You must answer on the question paper.

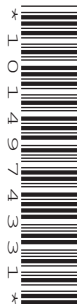
You will need: Geometrical instruments

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. Any blank pages are indicated.

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 .

$$V = \frac{1}{3}\pi r^2 h$$

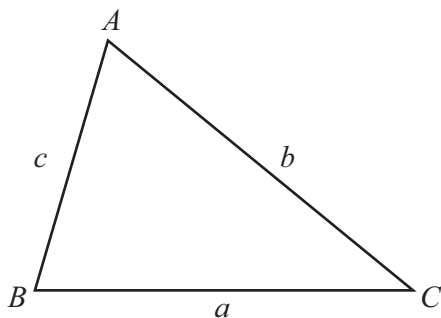
Volume, V , of sphere of radius r .

$$V = \frac{4}{3}\pi r^3$$

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,



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

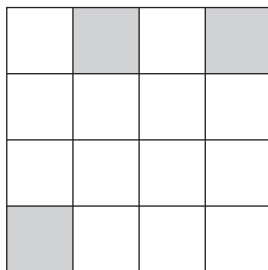
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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



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

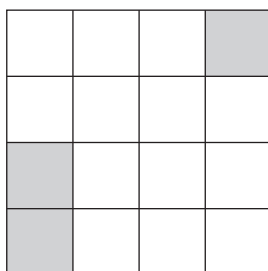
1 (a)



Shade **one** more small square so that the diagram has one line of symmetry.

[1]

(b)

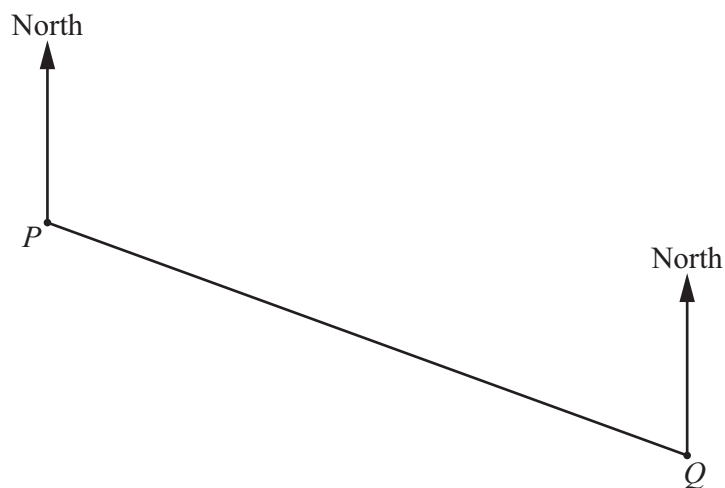


Shade **one** more small square so that the diagram has rotational symmetry of order 2.

[1]

2 The scale drawing shows the positions of two villages, P and Q .

The scale is 1 cm represents 0.5 km.



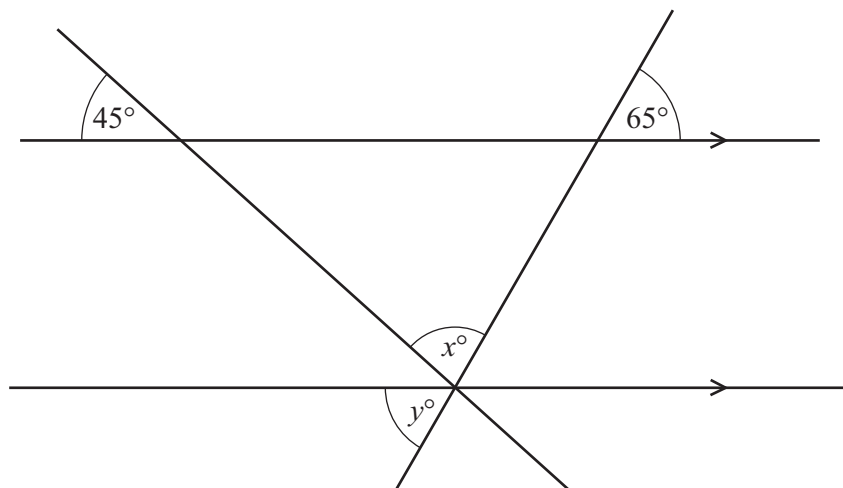
(a) Find the actual distance between village P and village Q .

..... km [2]

(b) Measure the bearing of village Q from village P .

..... [1]





NOT TO
SCALE

The diagram shows two straight lines intersecting two parallel lines.

Find the value of x and the value of y .

$x =$

$y =$

[3]



Samira picks one of these cards at random and replaces it.

(a) Find the probability that she picks an odd number.

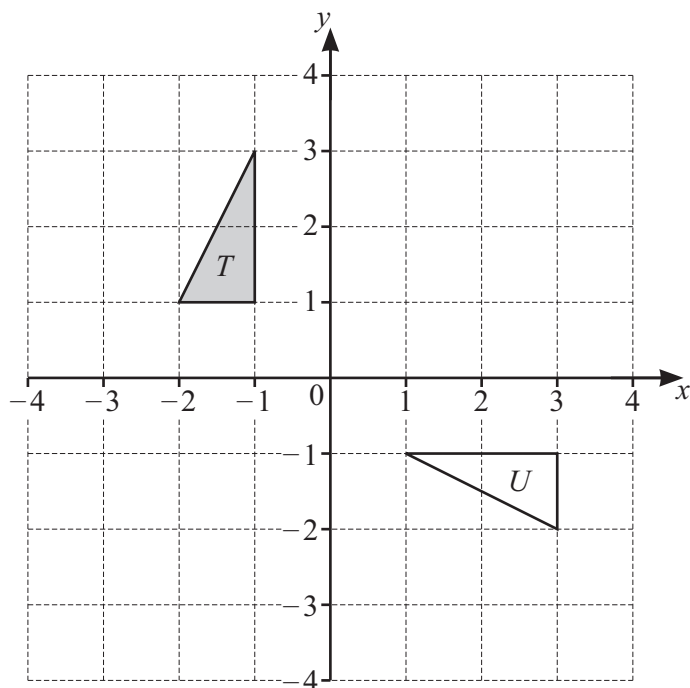
..... [1]

(b) Samira repeats this 35 times.

Calculate the number of times Samira is expected to pick an odd number.

..... [1]





- (a) Translate triangle T by the vector $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$. [1]

- (b) Describe fully the **single** transformation that maps triangle T onto triangle U .

..... [3]

6 Solve.

(a) $8x + 7 = 39$

$x =$ [2]

(b) $2(5y - 1) = 24$

$y =$ [3]





7 These are the first 4 terms of a sequence.

11 8 5 2

(a) Find the next term of this sequence.

..... [1]

(b) Find the n th term of this sequence.

..... [2]

8 Find the highest common factor (HCF) of 36 and 54.

..... [2]



- 9 A is the point $(3, -1)$.

$$\overrightarrow{AB} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$$

(a) $\overrightarrow{AC} = 2\overrightarrow{AB}$

Find the coordinates of the point C .

(..... ,) [2]

- (b) The length of AB is $k\sqrt{5}$.

Find the value of k .

$k =$ [2]

- (c) P is a point on AB .

$$AP : PB = 1 : 3$$

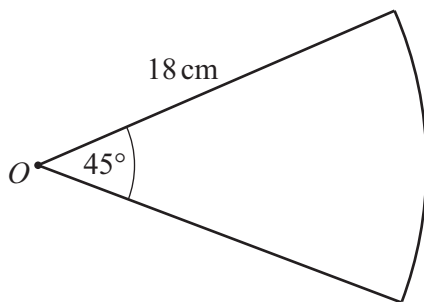
Find the position vector of P .

(.....) [2]





10



NOT TO
SCALE

The diagram shows a sector of a circle, centre O .
The length of the arc is $n\pi$ cm .

Find the value of n .

$n =$ [2]

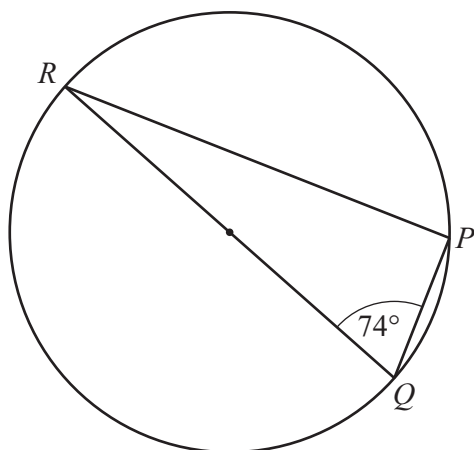
11 (a) Write 0.007 08 in standard form.

..... [1]

(b) Work out $(3.8 \times 10^{22}) + (3.8 \times 10^{23})$.
Give your answer in standard form.

..... [2]





NOT TO
SCALE

P , Q and R lie on a circle.
 QR is a diameter.

Find angle PRQ .
Give geometrical reasons for your answer.

Angle PRQ = because

..... [2]



- 13 (a) 100 students solve a puzzle.

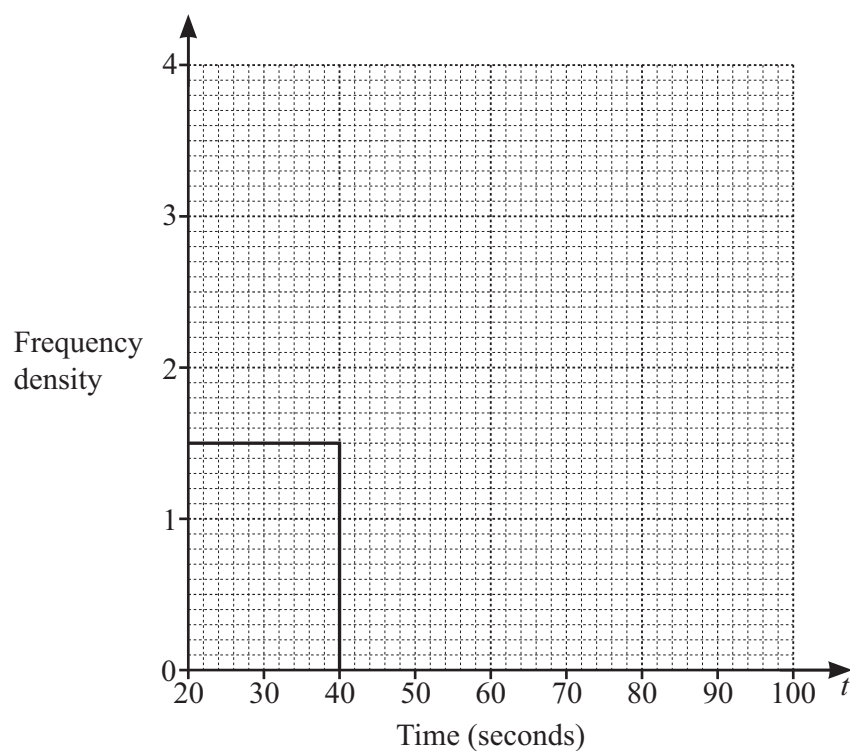
The table shows information about the time taken by each student to solve the puzzle.

Time (t seconds)	$20 < t \leq 40$	$40 < t \leq 60$	$60 < t \leq 100$
Frequency	30	40	30

- (i) Work out an estimate of the mean.

.....s [4]

- (ii) Complete the histogram to show the information in the table.



[2]

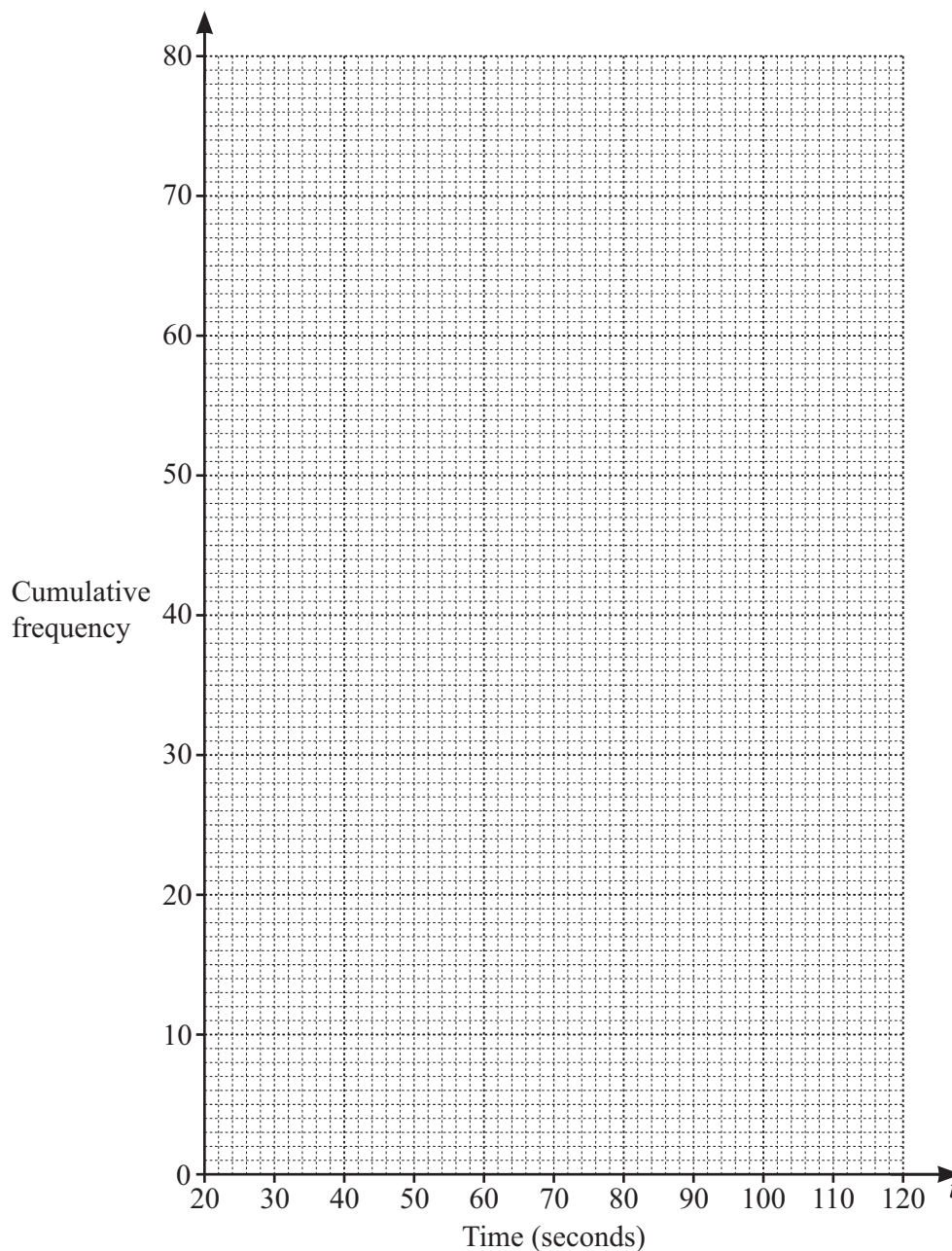


- (b) 80 adults solve the same puzzle as the students.

The cumulative frequency table shows information about the time taken by each adult to solve the puzzle.

Time (t seconds)	$t \leq 20$	$t \leq 40$	$t \leq 60$	$t \leq 80$	$t \leq 100$	$t \leq 120$
Cumulative frequency	0	12	36	60	74	80

- (i) On the grid, draw a cumulative frequency diagram.



[3]

- (ii) Use your cumulative frequency diagram to find an estimate for

- (a) the median

..... s [1]

- (b) the lower quartile.

..... s [1]

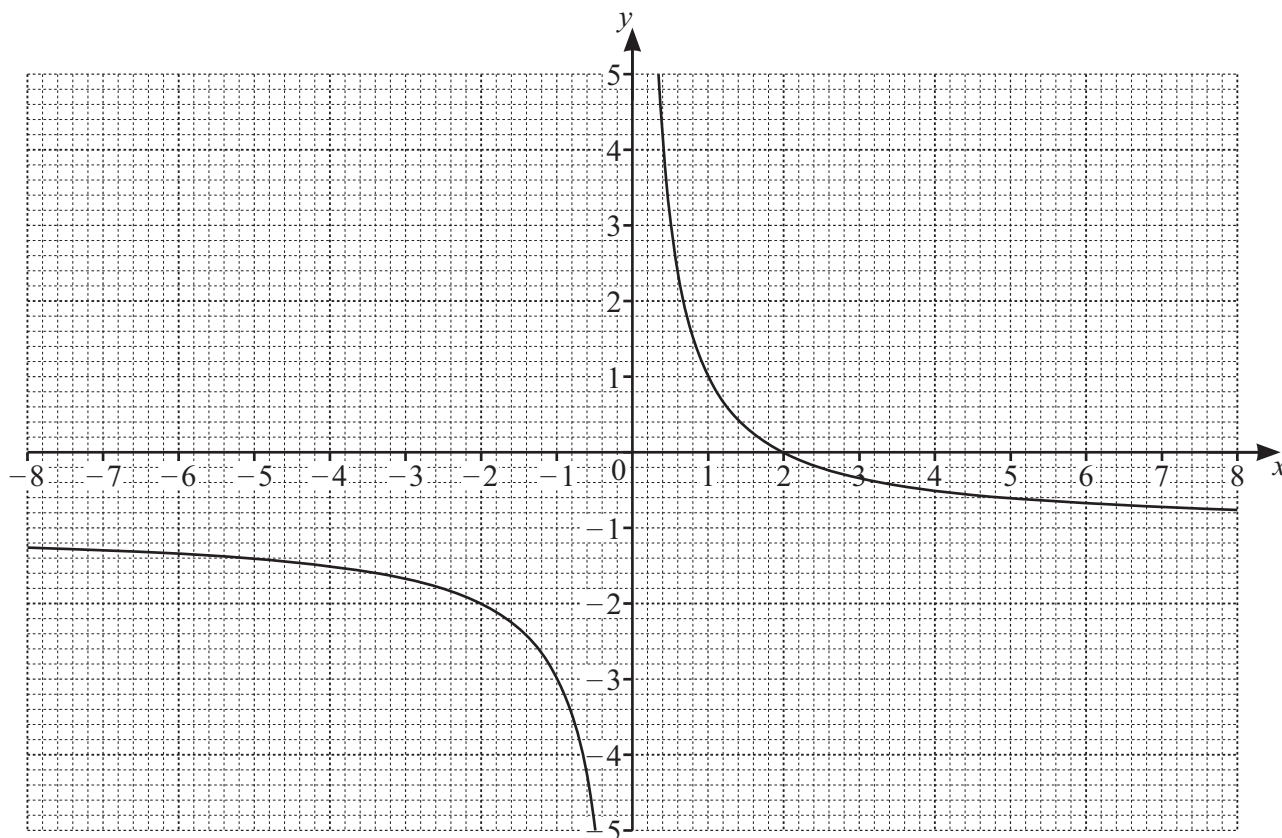




14 Write $0.2\dot{5}$ as a fraction.

..... [2]





The diagram shows the graph of $y = \frac{2}{x} - 1$.

- (a) Write down the coordinates of the point where the graph crosses the x -axis.

(..... ,) [1]

- (b) Write down the equation of each asymptote.

.....

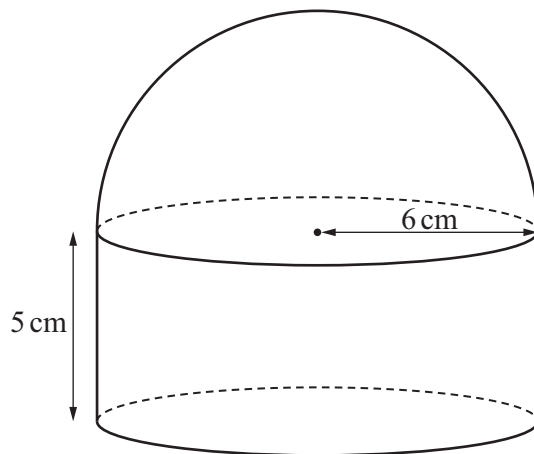
.....

[2]

- (c) By drawing a suitable straight line on the grid, solve $\frac{2}{x} - x - 1 = 0$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]





NOT TO
SCALE

The diagram shows a solid made by joining a hemisphere to a cylinder.
The radius of both the hemisphere and the cylinder is 6 cm.
The height of the cylinder is 5 cm.

Find the **total** surface area of the solid.
Give your answer in terms of π .

..... cm^2 [4]

17 Find the value of

(a) $125^{\frac{2}{3}}$

..... [2]

(b) $4^{-\frac{5}{2}}$

..... [2]



18 (a) $\frac{9}{\sqrt{3}}$

Rationalise the denominator.
Give your answer in its simplest form.

..... [2]

(b) $(5 - \sqrt{2})(1 + 3\sqrt{2}) = c + k\sqrt{2}$

Find the value of c and the value of k .

$c =$

$k =$

[2]

19 Write as a single fraction in its simplest form.

(a) $\frac{5a}{6} \times \frac{3b}{a}$

..... [2]

(b) $\frac{p}{2} + \frac{3t}{4}$

..... [2]

(c) $\frac{2}{x-2} - \frac{3}{x+1}$

..... [3]



20

$$y \propto \frac{1}{\sqrt{x}}$$

- (a) When $x = 9$, $y = 2$.

Find the value of y when $x = 36$.

$$y = \dots\dots\dots [3]$$

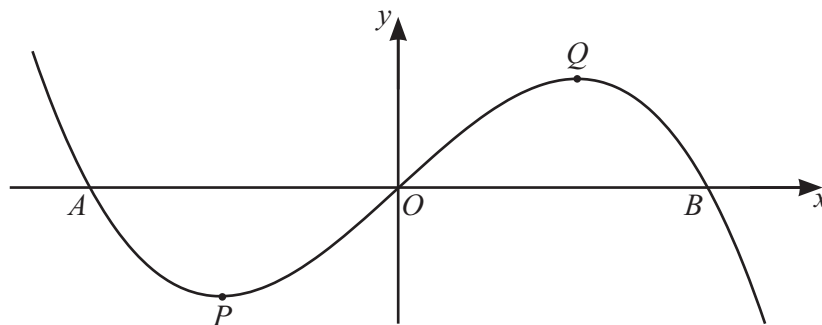
- (b) When x is increased by a factor of 4, the value of y changes by a factor of p .

Find the value of p .

$$p = \dots\dots\dots [1]$$



21



The diagram shows the graph of $y = 3x - x^3$.
 The graph crosses the x -axis at A , at O and at B .
 The turning points of the graph are at P and at Q .

- (a) Find the x -coordinate of A and the x -coordinate of B .
 Give your answers as exact values.

x -coordinate of A

x -coordinate of B [3]

- (b) (i) Differentiate $3x - x^3$.

..... [2]

- (ii) Find the coordinates of P and Q .

P (..... ,)

Q (..... ,) [4]



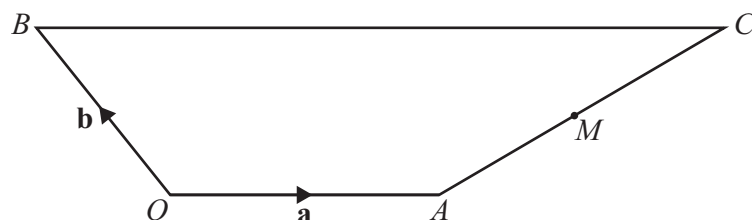
22 (a) Write down the exact value of $\tan 60^\circ$.

..... [1]

(b) Solve $2 \sin x - 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

23



NOT TO
SCALE

In the diagram, OA is parallel to BC .

$BC = 3OA$

M is the midpoint of AC .

The position vector of A is $\mathbf{a}$ and the position vector of B is $\mathbf{b}$.

Find the position vector of M .

Give your answer in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form.

..... [3]



- 24 The line $y = 7x + 3$ intersects the curve $y = x^2 + 5x - 12$ at the points A and B .

Find the coordinates of A and B .

A (..... ,)

B (..... ,)

[5]





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