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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  $h$ .

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

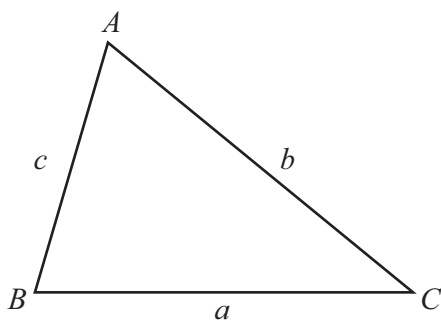
Volume,  $V$ , of sphere of radius  $r$ .

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

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,



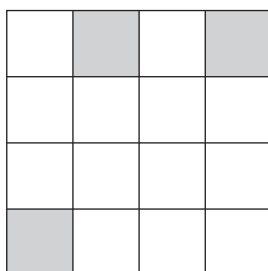
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

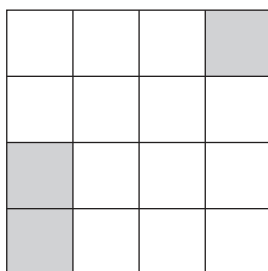
1 (a)



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

[1]

(b)

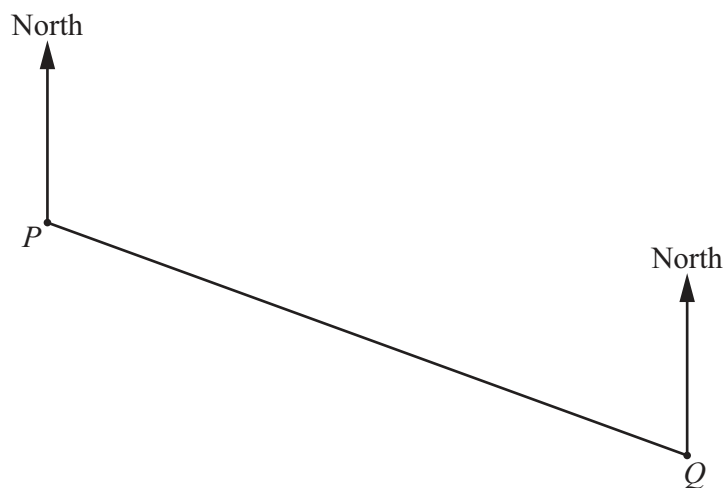


Shade **one** more small square so that the diagram has rotational symmetry of order 2.

[1]

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

The scale is 1 cm represents 0.5 km.



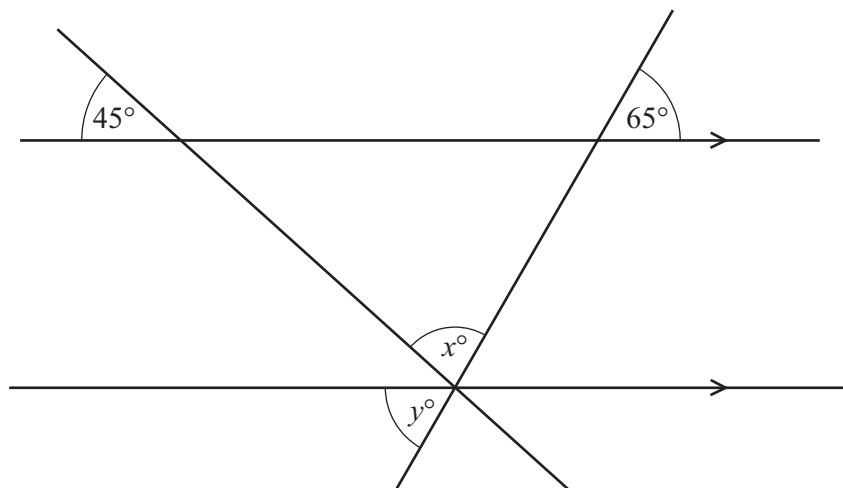
(a) Find the actual distance between village  $P$  and village  $Q$ .

..... 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.

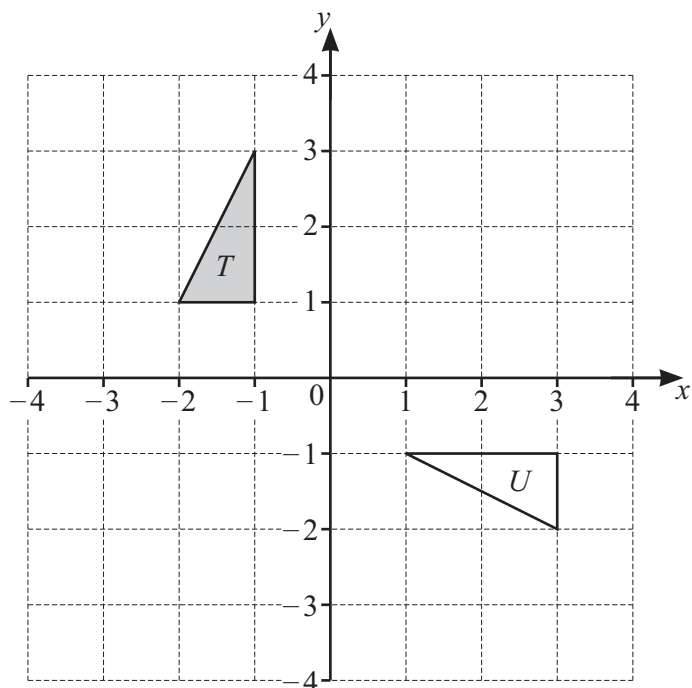
..... [1]

(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  $AB$ .

$$AP : PB = 1 : 3$$

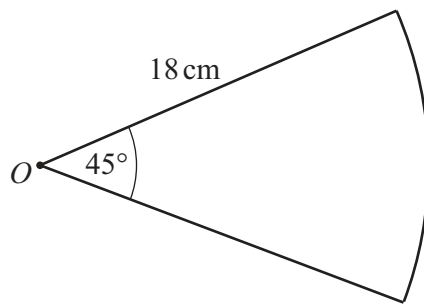
Find the position vector of  $P$ .

( ..... ) [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.

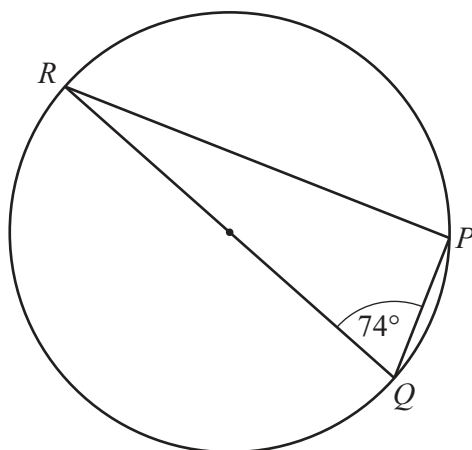
..... [1]

(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.

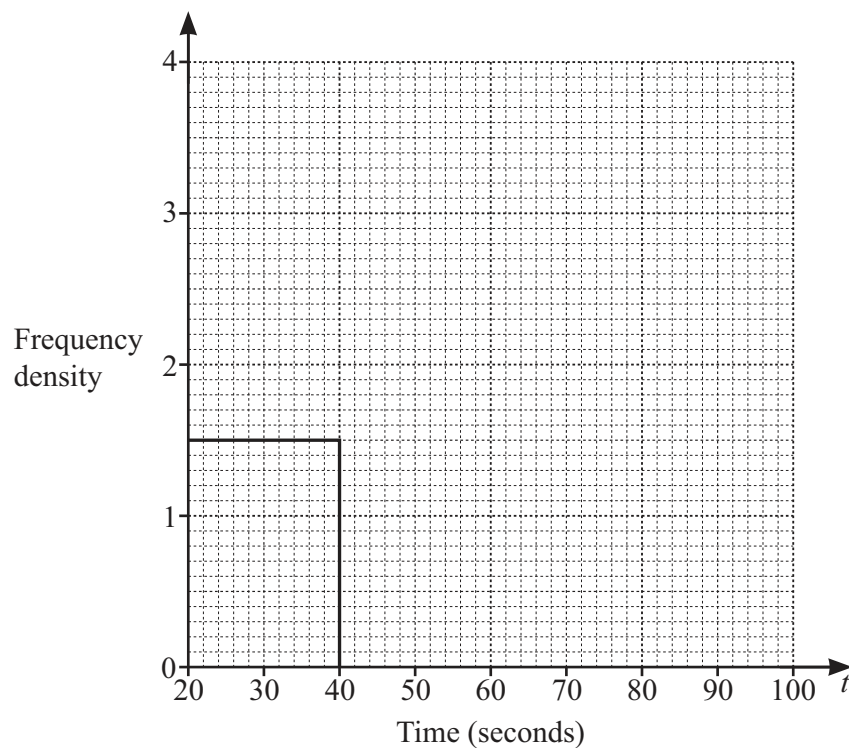
The table shows information about the time taken by each student to solve the puzzle.

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.

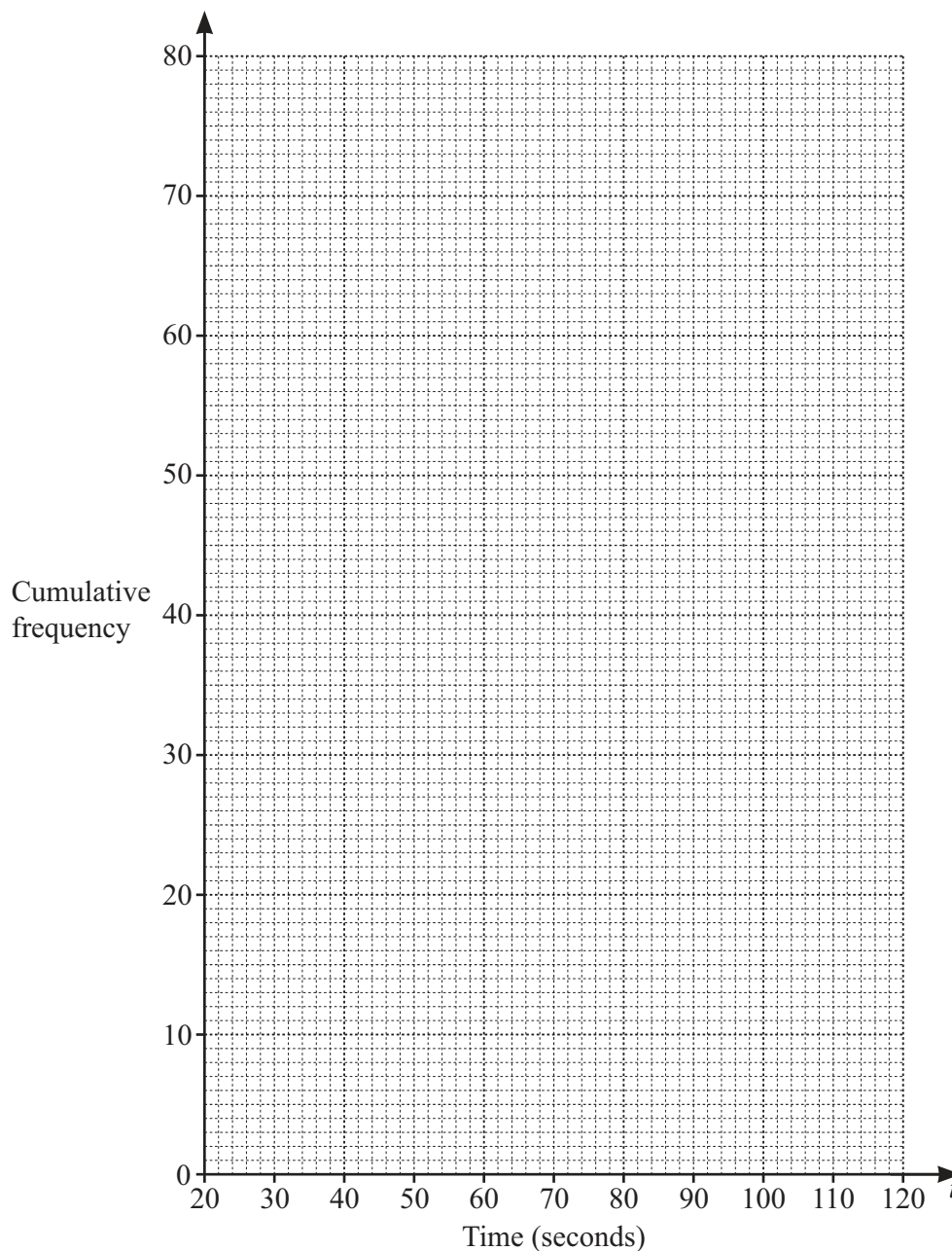


[2]

- (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]

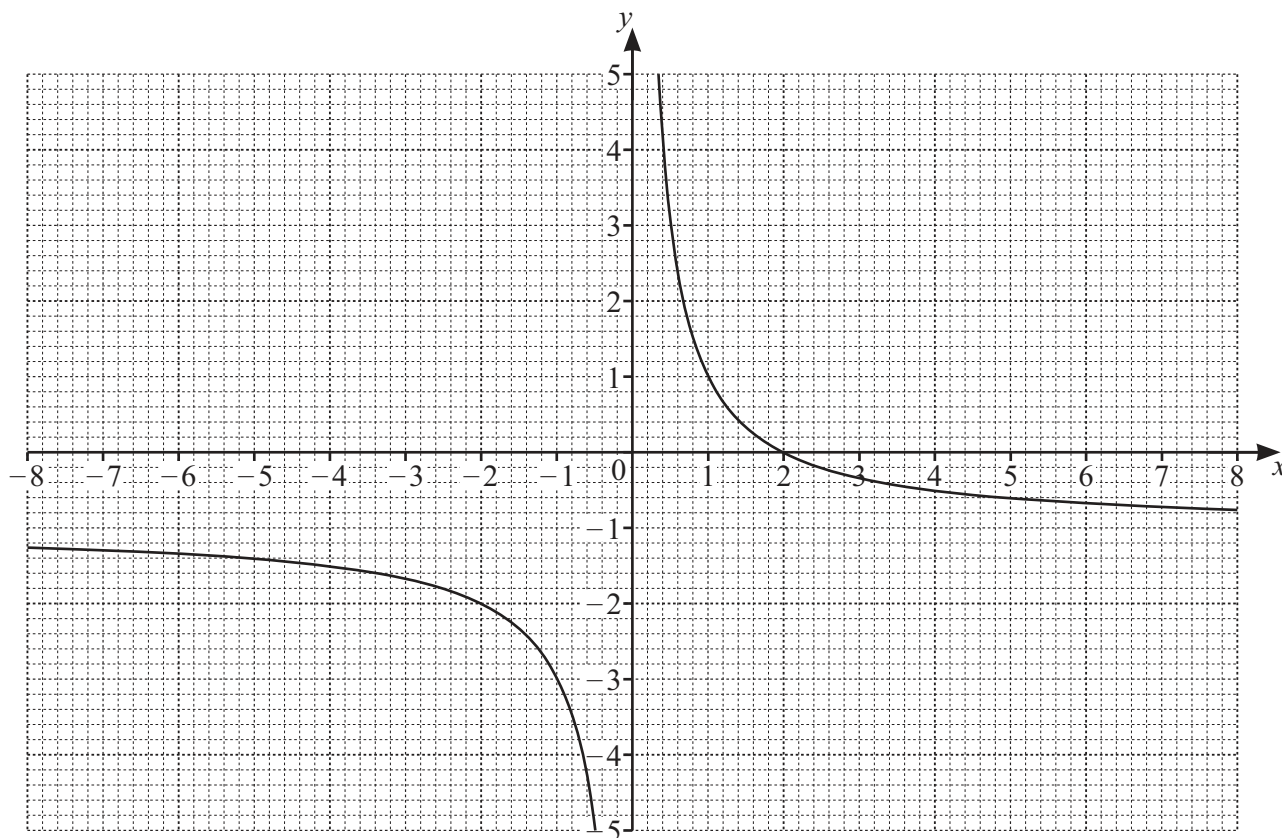




14 Write  $0.\dot{2}\dot{5}$  as a fraction.

..... [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.

.....

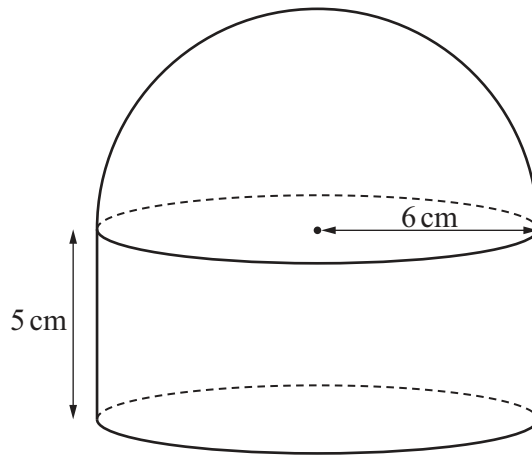
.....

[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  $\pi$ .

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

[Turn over]



20

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

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

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

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

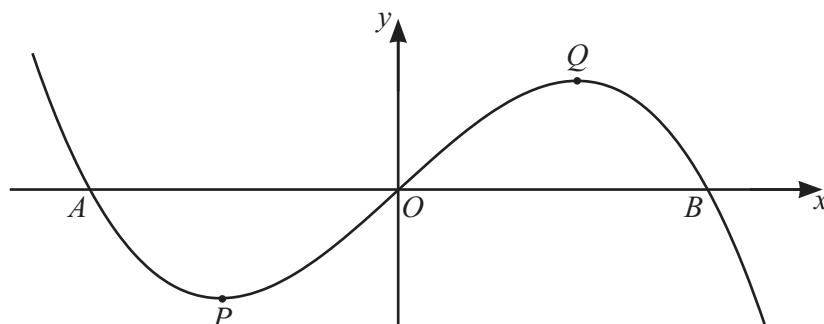
- (b) When  $x$  is increased by a factor of 4, the value of  $y$  changes by a factor of  $p$ .

Find the value of  $p$ .

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







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]



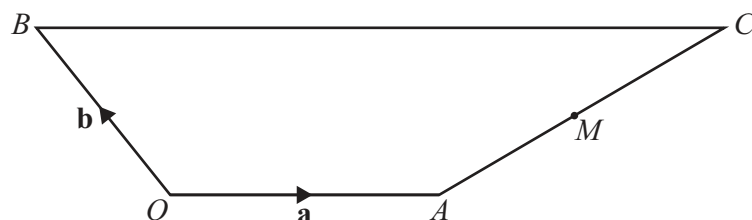
22 (a) Write down the exact value of  $\tan 60^\circ$ .

..... [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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