Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/22**

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

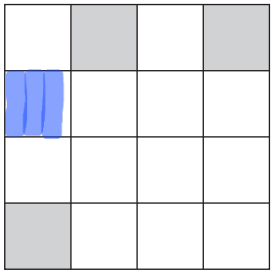
- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

[Turn over

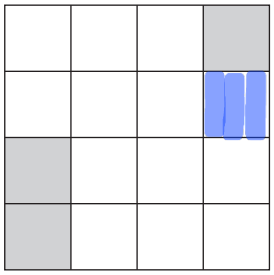
Calculators must **not** be used in this paper.

1 **(a)**



Shade **one** more small square so that the diagram has one line of symmetry. [1]

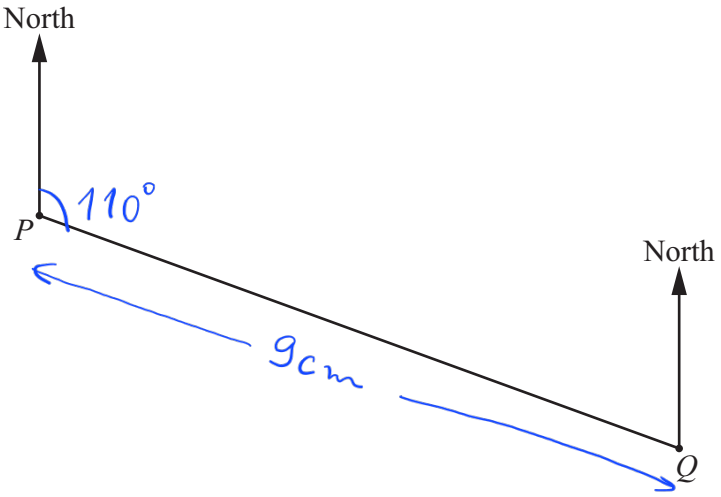
(b)



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*.

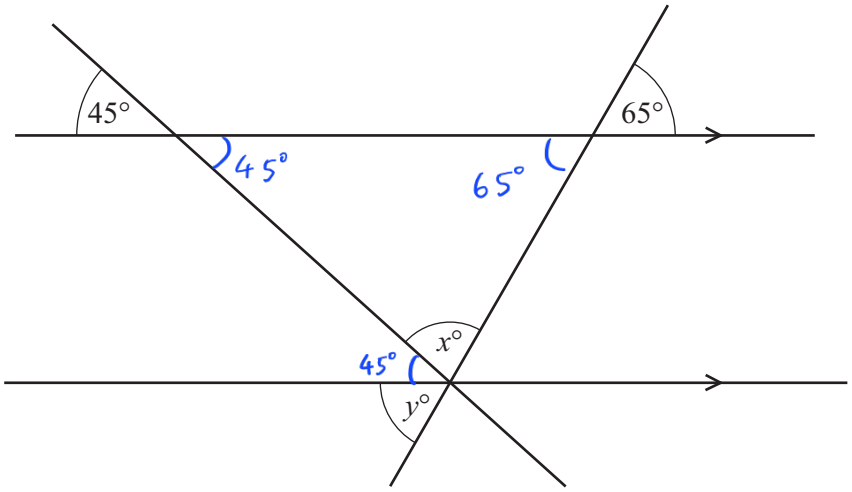
$9 \times 0.5 = 4.5$

4.5 km [2]

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

110° [1]

3



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

Find the value of x and the value of y.

$x = 180° - 45° - 65° = 70°$

$y = 180° - 70° - 45° = 65°$

$x =$ ..... 70° .....

$y =$ ..... 65° .....

[3]

4

1	2	3	4	5	6	7

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

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

..... $\frac{4}{7}$ ..... [1]

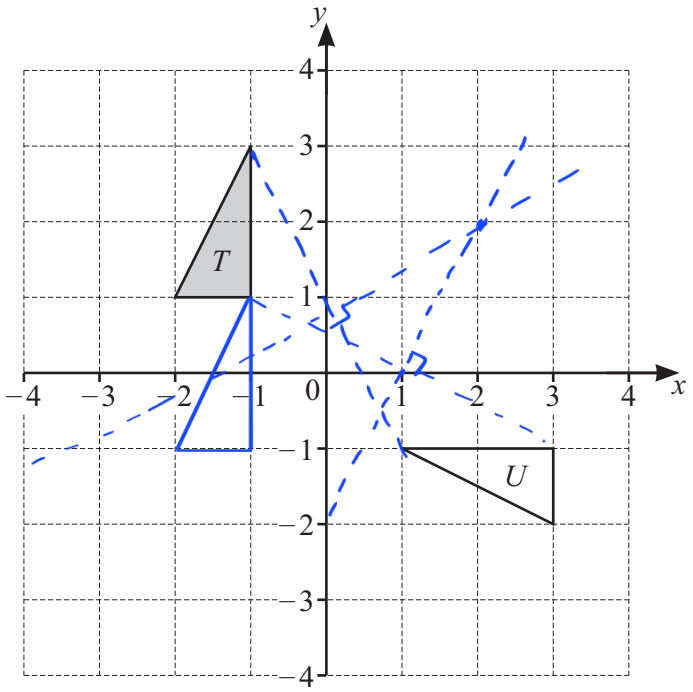
(b) Samira repeats this 35 times.

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

$\frac{4}{7} \times 35 = 20$

..... 20 ..... [1]

5



(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.

Rotation 90° anticlockwise around (2, 2)

..... [3]

6 Solve.

(a) $8x + 7 = 39$

$8x = 39 - 7 = 32$

$x = 32 : 8 = 4$

$x =$ 4 [2]

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

$10y - 2 = 24$

$10y = 24 + 2 = 26$

$y = 2.6$

$y =$ 2.6 [3]

7 These are the first 4 terms of a sequence.

11 8 5 2 -1

-3 -3 -3 -3

(a) Find the next term of this sequence.

-1 [1]

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

-3n + 14 [2]

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

$36 = 2^2 \times 3^2$

4 9

2 2 3 3

$54 = 2 \times 3^3$

6 9

2 3 3 3

HCF(36, 54) = $2 \times 3^2 = 18$

18 [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.

$\begin{pmatrix} x_C - x_A \\ y_C - y_A \end{pmatrix} = 2\begin{pmatrix} 2 \\ -4 \end{pmatrix} = \begin{pmatrix} 4 \\ -8 \end{pmatrix}$

(..... 7 ..... , ... −9 .....) [2]

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

Find the value of k.

$|\overrightarrow{AB}| = \sqrt{2^2 + (-4)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$

$k =$ ..... 2 ..... [2]

(c) P is a point on AB.

$AP : PB = 1 : 3$

Find the position vector of P.

$\frac{AP}{AB} = \frac{1}{4}$

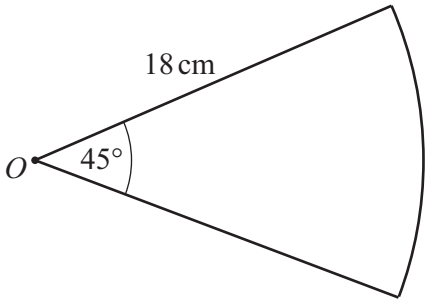
$\Rightarrow \overrightarrow{AP} = \frac{1}{4}\overrightarrow{AB} = \frac{1}{4}\begin{pmatrix} 2 \\ -4 \end{pmatrix} = \begin{pmatrix} 0.5 \\ -1 \end{pmatrix}$

$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$

$= \begin{pmatrix} 3 \\ -1 \end{pmatrix} + \begin{pmatrix} 0.5 \\ -1 \end{pmatrix} = \begin{pmatrix} 3.5 \\ -2 \end{pmatrix}$

$\begin{pmatrix} 3.5 \\ -2 \end{pmatrix}$ [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.

$45° = \frac{\pi}{4}$ rad

Length of arc $= 18 \times \frac{\pi}{4} = 4.5\pi$

$n =$ 4.5 [2]

11 **(a)** Write 0.007 08 in standard form.

7.08×10^{-3} [1]

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

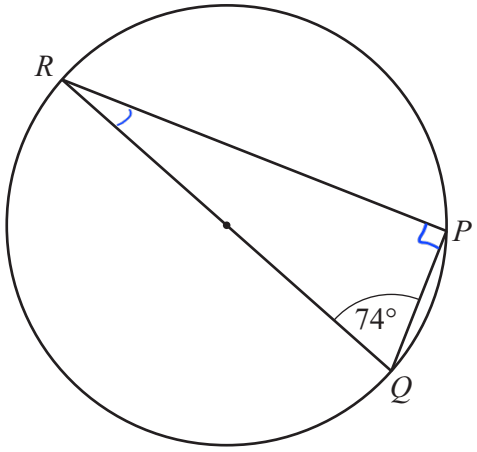
$3.8 \times 10^{22} + 38 \times 10^{22}$

$= 41.8 \times 10^{22}$

$= 4.18 \times 10^{23}$

4.18×10^{23} [2]

12



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 = 16° because angle in a semicircle $\widehat{RPQ} = 90°$ and the sum of 3 angles in a triangle is 180°. [2]

13 **(a)** 100 students solve a puzzle.
The table shows information about the time taken by each student to solve the puzzle.

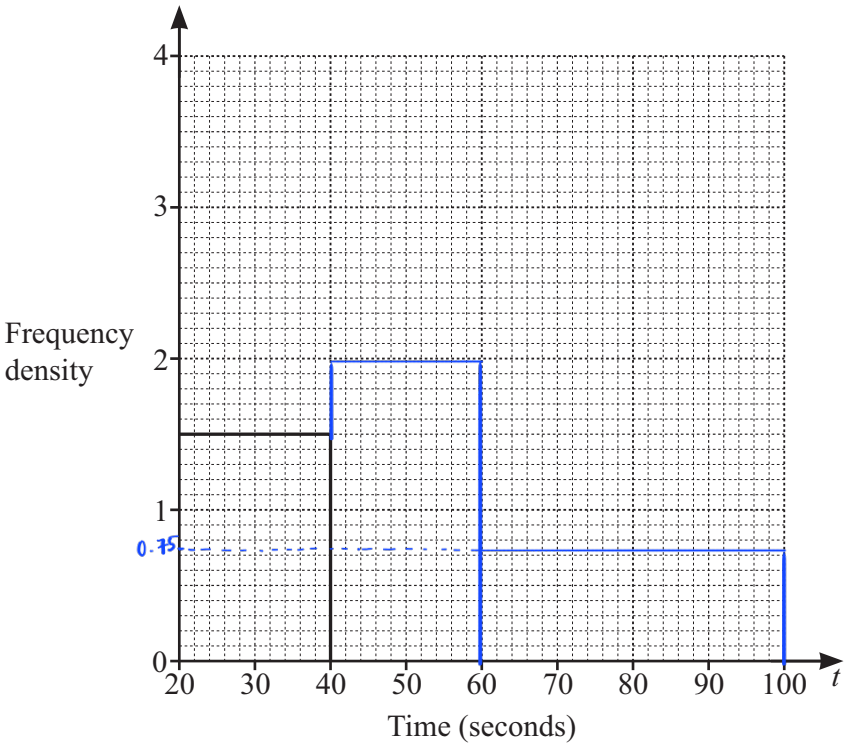
Time (t seconds)	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 100$
Frequency	30	40	30
Mid value	30	50	80
class width	20	20	40
Freq density	1.5	2	0.75

(i) Work out an estimate of the mean.

$$\frac{30 \times 30 + 50 \times 40 + 80 \times 30}{100} = 53$$

.....53.....s [4]

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

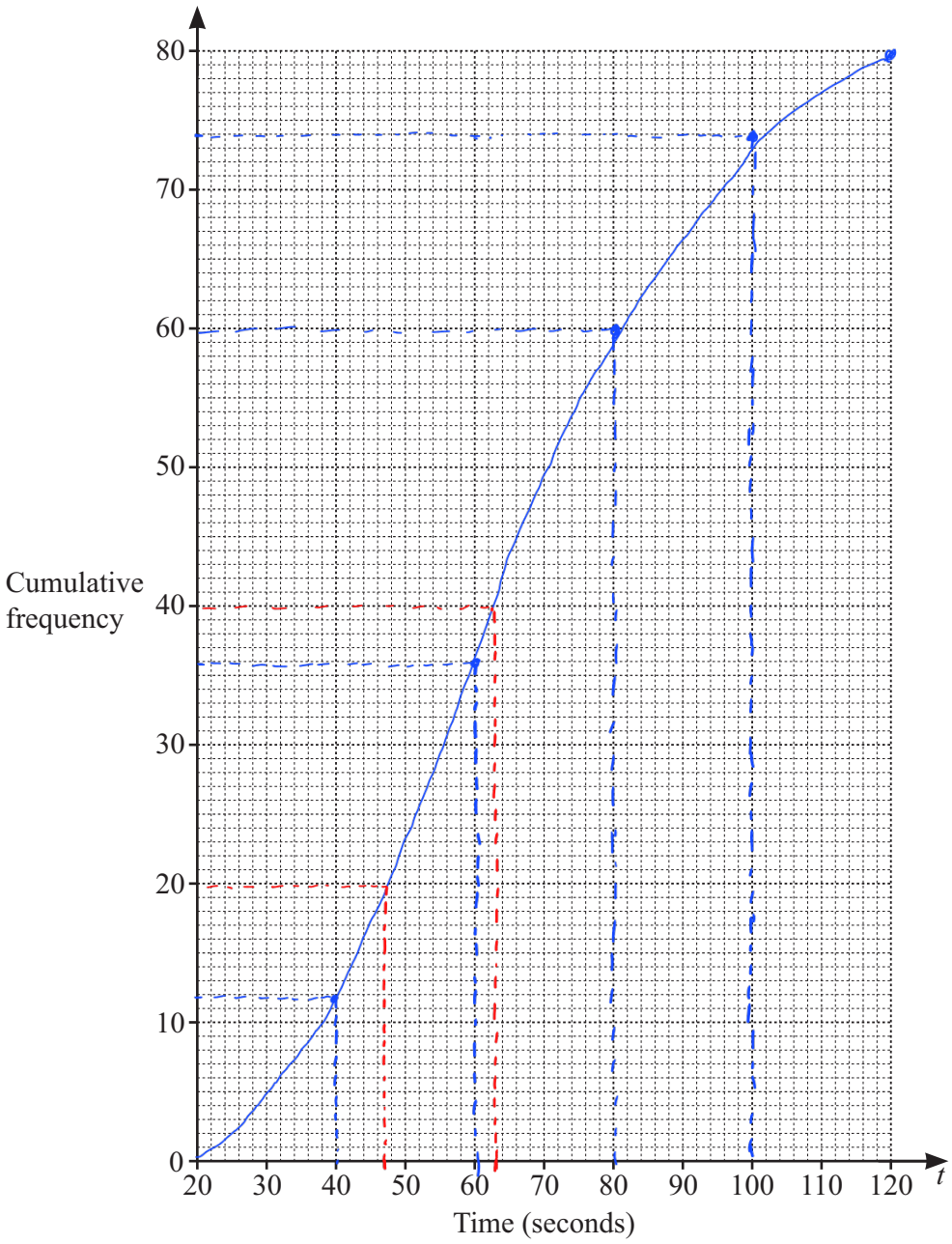


[2]

(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)	$t \leqslant 20$	$t \leqslant 40$	$t \leqslant 60$	$t \leqslant 80$	$t \leqslant 100$	$t \leqslant 120$
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

..... 63 ..... s [1]

(b) the lower quartile.

..... 47 ..... s [1]

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

$x = 0.2555\ldots$

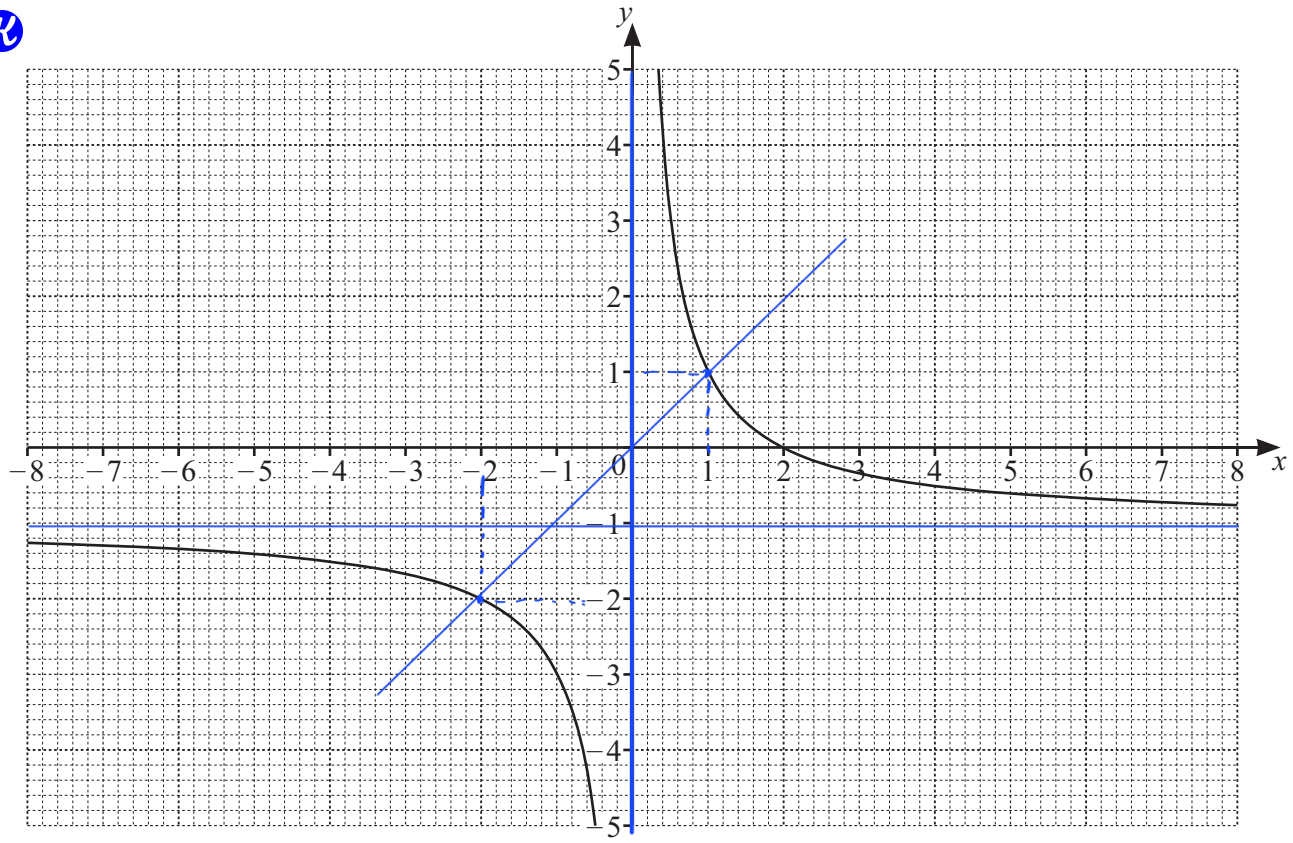
$10x = 2.555\ldots$

$100x = 25.555\ldots$

$90x = 25 - 2 = 23$

$\frac{23}{90}$ [2]

15



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.

(2 , 0) [1]

(b) Write down the equation of each asymptote.

$x = 0$

$y = -1$

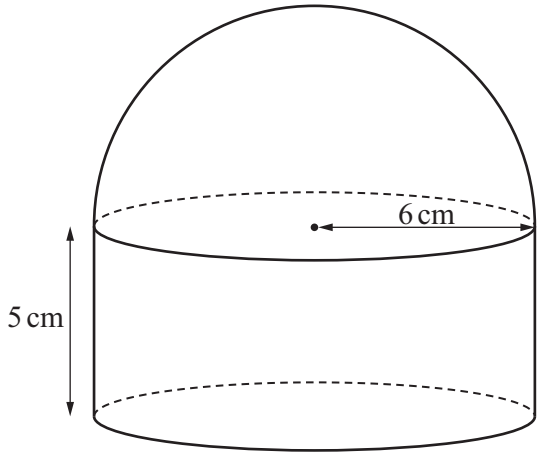
[2]

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

$\frac{2}{x} - 1 = x$

$x =$ −2 or $x =$ 1 [3]

16



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.

$\frac{4\pi \times 6^2}{2} + 2\pi \times 6 \times 5 + \pi \times 6^2$

$= 72\pi + 60\pi + 36\pi$

$= 168\pi$

..... 168π ..... cm^2 [4]

17 Find the value of

(a) $125^{\frac{2}{3}} = \left(\sqrt[3]{125}\right)^2 = 5^2 = 25$

..... 25 ..... [2]

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

$\frac{1}{4^{\frac{5}{2}}} = \frac{1}{\left(\sqrt{4}\right)^5} = \frac{1}{2^5} = \frac{1}{32}$

..... $\frac{1}{32}$ ..... [2]

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

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

$\frac{9}{\sqrt{3}} = \frac{9\sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{9\sqrt{3}}{3} = 3\sqrt{3}$

.....$3\sqrt{3}$..... [2]

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

Find the value of c and the value of k.

$5 - \sqrt{2} + 15\sqrt{2} - 6 = c + k\sqrt{2}$

$-1 + 14\sqrt{2} = c + k\sqrt{2}$

$c =$ .....-1.....

$k =$ .....14.....

[2]

19 Write as a single fraction in its simplest form.

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

$\frac{5a \times 3b}{6a} = \frac{15b}{6} = \frac{5b}{2}$

.....$\frac{5b}{2}$..... [2]

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

$\frac{2p + 3t}{4}$

.....$\frac{2p+3t}{4}$..... [2]

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

$\frac{2(x+1) - 3(x-2)}{(x-2)(x+1)} = \frac{2x + 2 - 3x + 6}{(x-2)(x+1)}$

.....$\frac{-x+8}{(x-2)(x+1)}$..... [3]

20 $y \propto \frac{1}{\sqrt{x}}$

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

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

$y = k \frac{1}{\sqrt{x}}$

$2 = k \frac{1}{\sqrt{9}} \Rightarrow k = 2\sqrt{9} = 6$

When $x = 36$, $y = 6 \frac{1}{\sqrt{36}} = 1$

$y =$ ..... 1 ..... [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.

$y = m \frac{1}{\sqrt{x}}$ $\quad y_{new} = m \frac{1}{\sqrt{x_{new}}}$

$x_{new} = 4x$

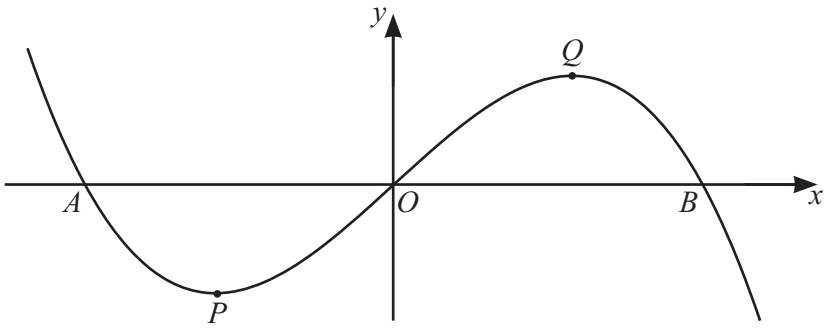
$\Rightarrow \sqrt{x_{new}} = \sqrt{4x} = 2\sqrt{x}$

$\Rightarrow \frac{1}{\sqrt{x_{new}}} = \frac{1}{2}\sqrt{x}$

$\Rightarrow y_{new} = \frac{1}{2} y$

$p =$ ..... $\frac{1}{2}$ ..... [1]

21



NOT TO SCALE

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.

$3x - x^3 = 0$
$x(3 - x^2) = 0$
$x(\sqrt{3} - x)(\sqrt{3} + x) = 0$
$x = 0$ or $x = \sqrt{3}$ or $x = -\sqrt{3}$

x-coordinate of A ..... $-\sqrt{3}$ .....

x-coordinate of B ..... $\sqrt{3}$ .....

[3]

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

..... $3 - 3x^2$ ..... [2]

(ii) Find the coordinates of P and Q.

$3 - 3x^2 = 0$
$3x^2 = 3$
$x^2 = 1$
$x = \pm 1$

When $x = -1$, $y = 3(-1) - (-1)^3 = -2$
When $x = 1$, $y = 3(1) - 1^3 = 2$

P (..... -1 ..... , ... -2 .....)

Q (..... 1 ..... , ... 2 .....)

[4]

22 **(a)** Write down the exact value of $\tan 60°$.

$\sqrt{3}$ [1]

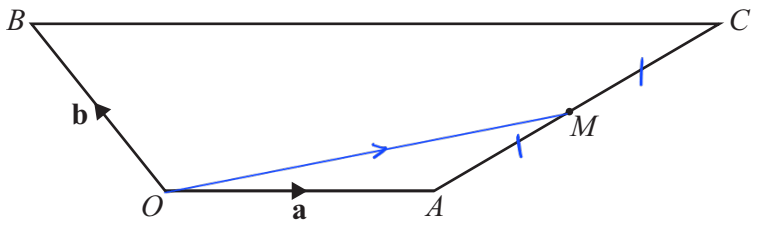
(b) Solve $2\sin x - 1 = 0$ for $0° \leqslant x \leqslant 360°$.

$\sin x = \frac{1}{2}$

$x = 30°$ or $x = 180° - 30° = 150°$

$x =$ 30° or $x =$ 150° [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 **a** and the position vector of B is **b**.

Find the position vector of M.
Give your answer in terms of **a** and **b**, in its simplest form.

$\overrightarrow{BC} = 3\overrightarrow{OA} = 3a$

$\overrightarrow{AC} = \overrightarrow{AO} + \overrightarrow{OB} + \overrightarrow{BC}$

$\overrightarrow{AC} = -a + b + 3a = 2a + b$

$\overrightarrow{AM} = \frac{1}{2}\overrightarrow{AC} = a + \frac{1}{2}b$

$\overrightarrow{OM} = \overrightarrow{OA} + \overrightarrow{AM}$

$= a + a + \frac{1}{2}b = 2a + \frac{1}{2}b$

$2a + \frac{1}{2}b$ [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.

$7x + 3 = x^2 + 5x - 12$

$x^2 - 2x - 15 = 0$

$(x + 3)(x - 5) = 0$

$x = -3$ or $x = 5$

When $x = -3$: $y = 7(-3) + 3 = -18$

When $x = 5$: $y = 7 \times 5 + 3 = 38$

A (..... -3 ..... , ... -18 .....)

B (..... 5 ..... , ... 38 .....)

[5]