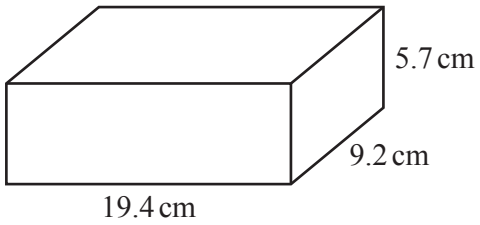
1 **(a)**



NOT TO SCALE

The diagram shows a brick in the shape of a cuboid.

(i) Calculate the total surface area of the brick.

..... cm^2 [3]

(ii) The density of the brick is $1.9\,g/cm^3$.
Work out the mass of the brick.
Give your answer in kilograms.
[Density = mass ÷ volume]

..... kg [3]

(b) 9000 bricks are needed to build a house.
200 bricks cost $175.
Work out the cost of the bricks needed to build 5 houses.

$ ..... [3]

(c) Saskia builds a wall using 1500 bricks.
She can build at the rate of 40 bricks each hour.
She works for 9 hours each day.
Saskia starts work on 6 July and works every day until the wall is completed.
Find the date when she completes the wall.

..... [3]

(d) Rafa has a cylindrical tank.
The cylinder has a height of 105 cm and a diameter of 45 cm.

Calculate the capacity of the tank in litres.

..... litres [3]

2 Bob, Chao and Mei take part in a run for charity.

(a) Their times to complete the run are in the ratio Bob : Chao : Mei = 4 : 5 : 7.

(i) Find Chao's time as a percentage of Mei's time.

..... % [1]

(ii) Bob's time for the run is 55 minutes 40 seconds.

Find Mei's time for the run.
Give your answer in minutes and seconds.

..... min ..... s [3]

(b) Chao collects $47.50 for charity.

(i) Bob collects 28% more than Chao.
Find the amount Bob collects.

$ .....[2]

(ii) Chao collects 60% less than Mei.
Find how much more money Mei collects than Chao.

$ .....[3]

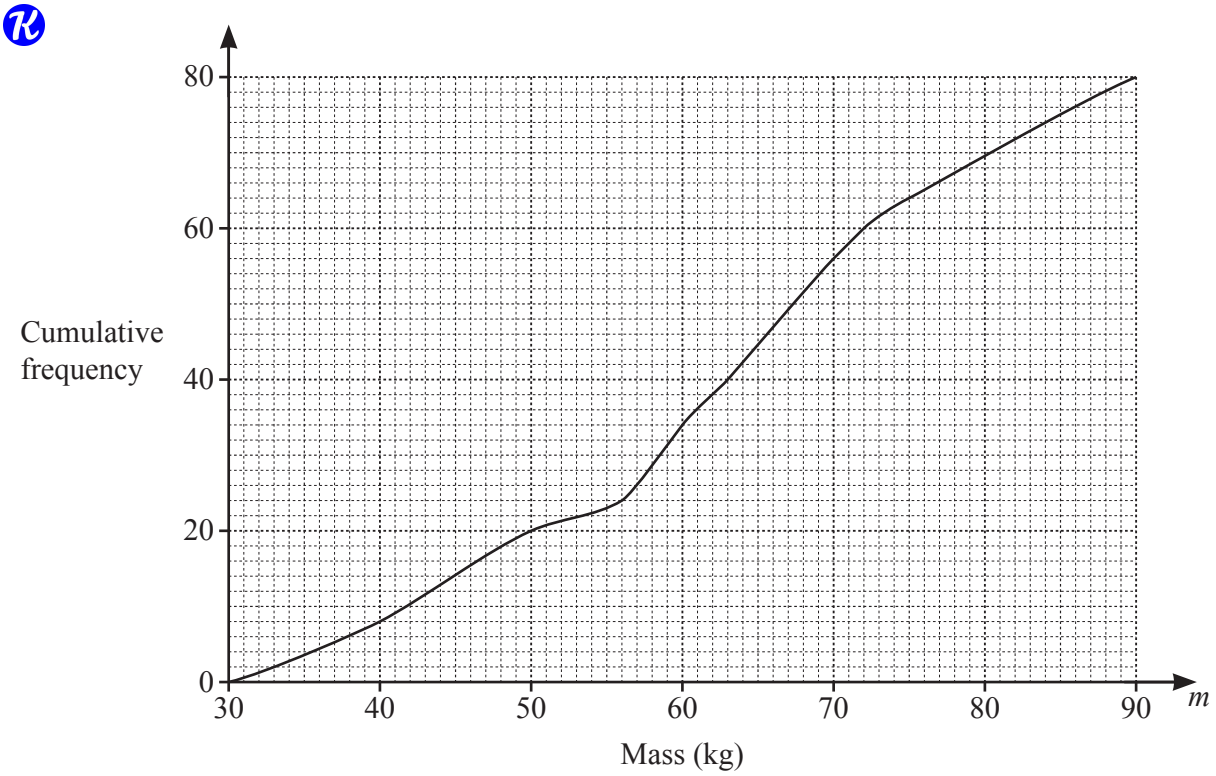
(c) When running, Chao has a stride length of 70 cm, correct to the nearest 5 cm.
Chao runs a distance of 11.2 km, correct to the nearest 0.1 km.
Work out the minimum number of strides that Chao could take to complete this distance.

..... [4]

(d) In 2015, a charity raised a total of $1.6 million.
After 2015, this amount increased exponentially by 2.4% each year for the next 5 years.
Work out the amount raised by the charity in 2020.

$ .....million [2]

3 The cumulative frequency diagram shows information about the mass, m kg, of each of 80 boys.



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

(i) the 30th percentile,

..... kg [2]

(ii) the number of boys with a mass greater than 75 kg.

..... [2]

(c) (i) Use the cumulative frequency diagram to complete this frequency table.

Mass (m kg)	$30 < m \leqslant 40$	$40 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 80$	$80 < m \leqslant 90$
Frequency	8	12			14	10

[1]

(ii) Calculate an estimate of the mean mass of the boys.

..... kg [4]

(iii) Two boys are chosen at random from those with a mass greater than 70 kg.

Find the probability that one of them has a mass greater than 80 kg and the other has a mass of 80 kg or less.

..... [3]

4 **(a)** Solve.

(i) $6(7-2x) = 3x-8$

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

(ii) $\frac{2x}{x-5} = \frac{2}{3}$

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

(b) Factorise completely.

(i) $2x^2 - 288y^2$

..... [3]

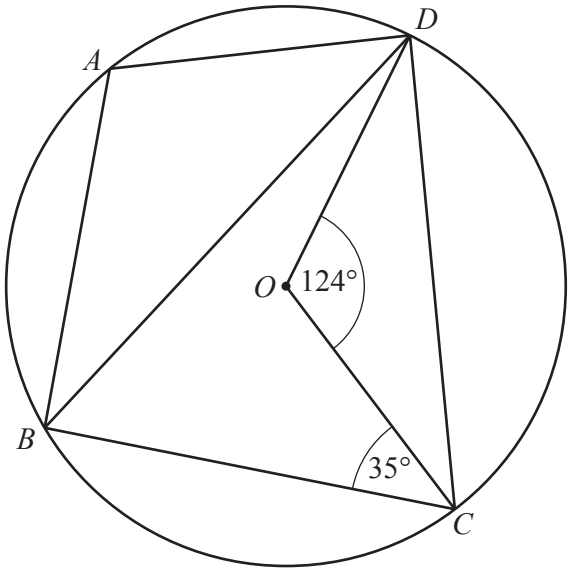
(ii) $5x^2 + 17x - 40$

..... [2]

(c) Solve $x^3 + 4x^2 - 17x = x^3 - 9$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [5]

5 (a)



NOT TO SCALE

A, B, C and D are points on a circle, centre O.
Angle $COD = 124°$ and angle $BCO = 35°$.

(i) Work out angle CBD.
Give a geometrical reason for your answer.

Angle CBD = ... because .....

..... [2]

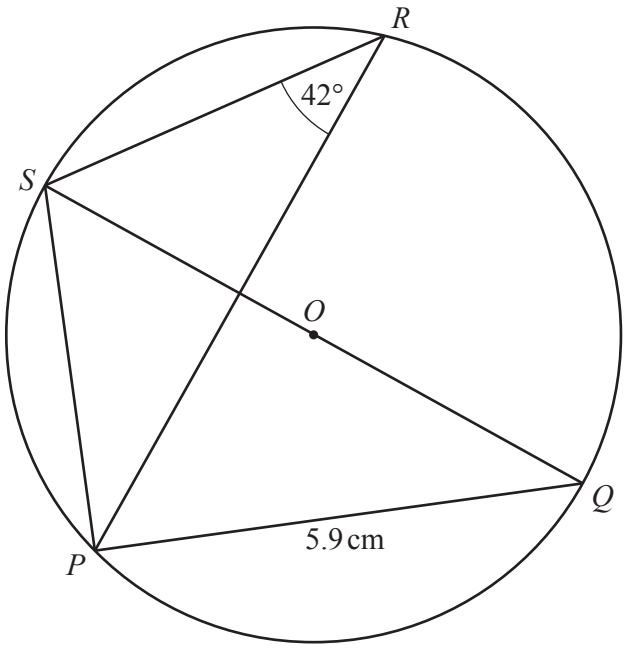
(ii) Work out angle BAD.
Give a geometrical reason for each step of your working.

Angle BAD = ... because .....

.....

..... [4]

(b)



NOT TO SCALE

P, Q, R and S are points on a circle, centre O.
QS is a diameter.
Angle $PRS = 42°$ and $PQ = 5.9$ cm.

Calculate the circumference of the circle.

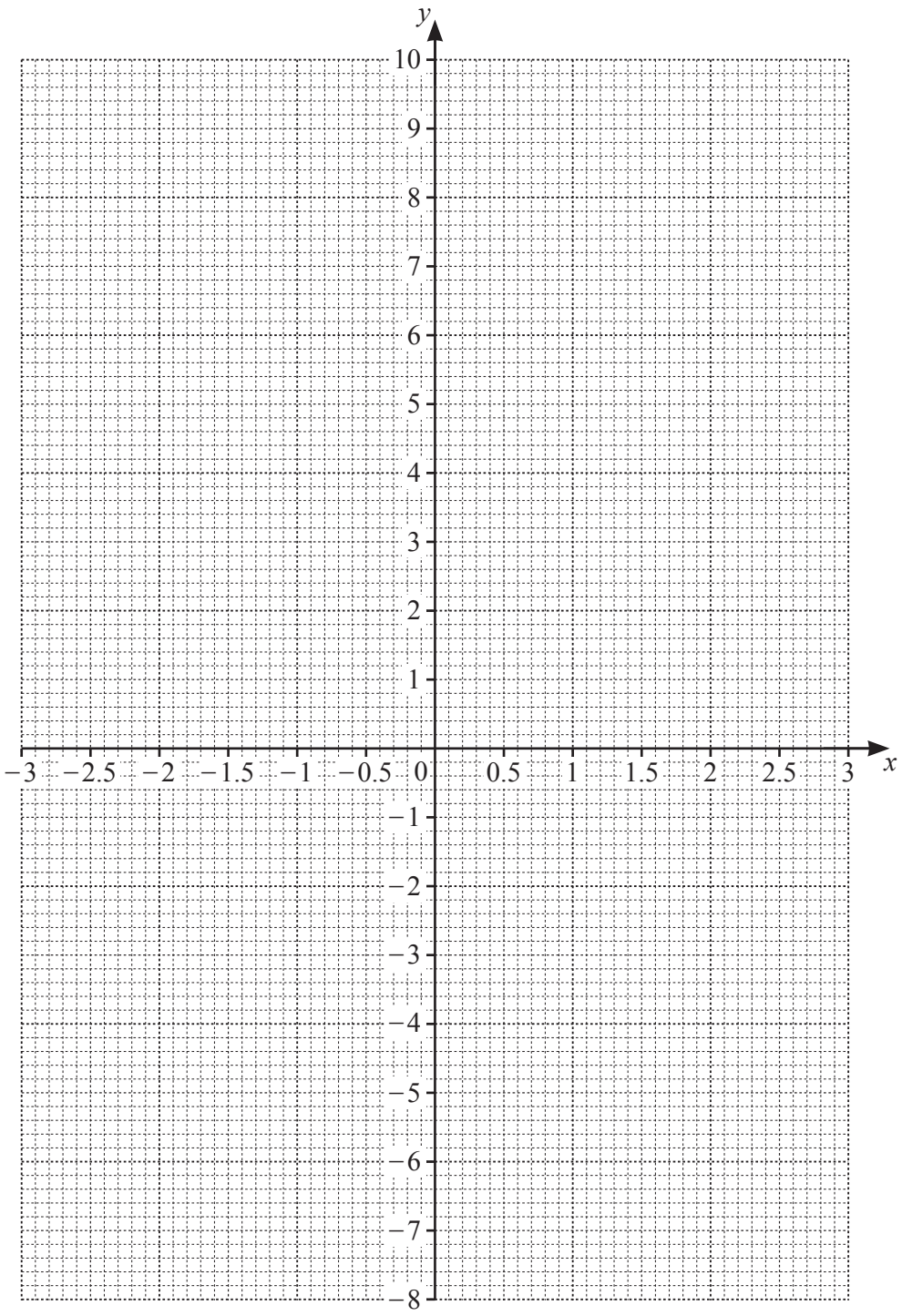
..... cm [5]

6 The table shows some values for $y = x^2 - \frac{3}{2x}$, $x \neq 0$, given correct to 1 decimal place.

x	−3	−2	−1	−0.5	−0.2		0.2	0.5	1	2	3
y			2.5	3.3	7.5		−7.5	−2.8	−0.5	3.3	

(a) (i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = x^2 - \frac{3}{2x}$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.



[5]

(b) By drawing a suitable straight line on the grid, solve the equation $x^2 - \frac{3}{2x} = \frac{24}{5} - 2x$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.

$x =$ ..... or $x =$ ..... [4]

(c) The solutions to the equation $x^2 - \frac{3}{2x} = \frac{24}{5} - 2x$ are also the solutions to an equation of the form $ax^3 + bx^2 + cx - 15 = 0$ where a, b and c are integers.

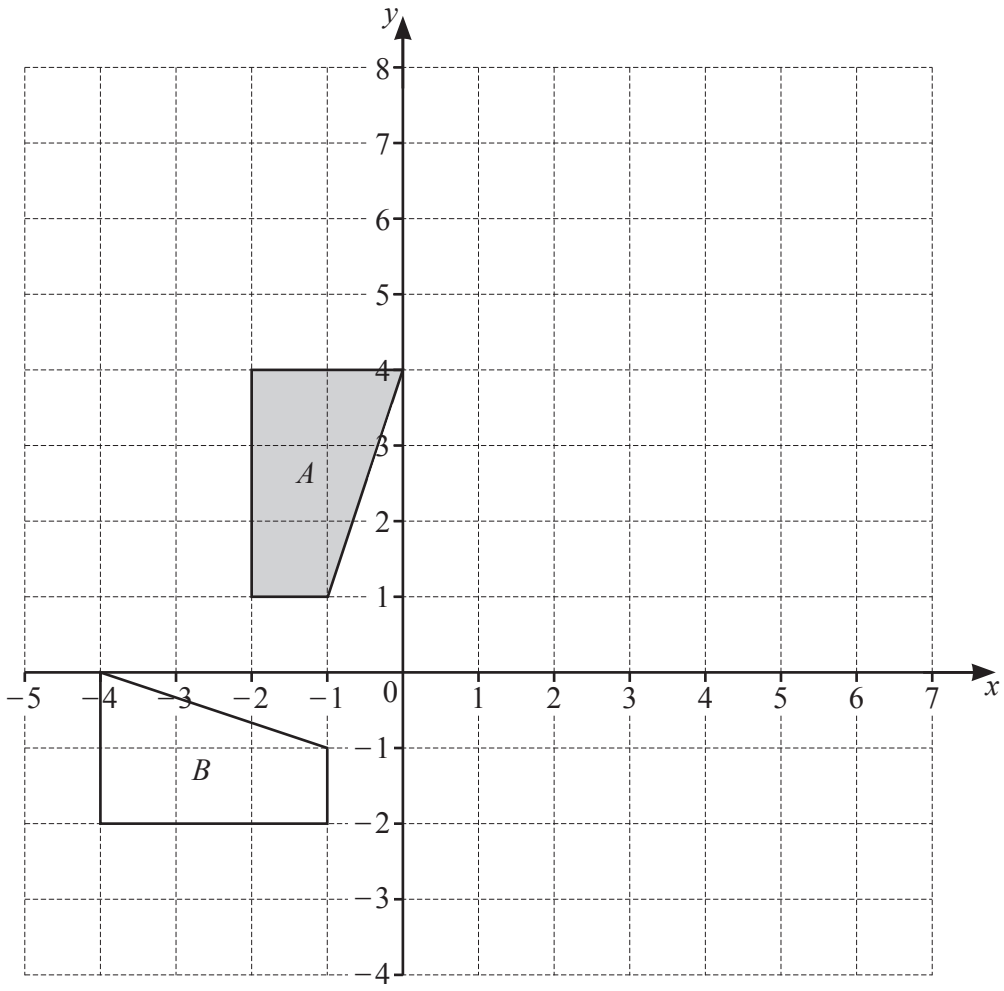
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [4]

7 (a)



(i) On the grid, draw the image of

(a) shape A after an enlargement, scale factor 2, centre (0, 1), [2]

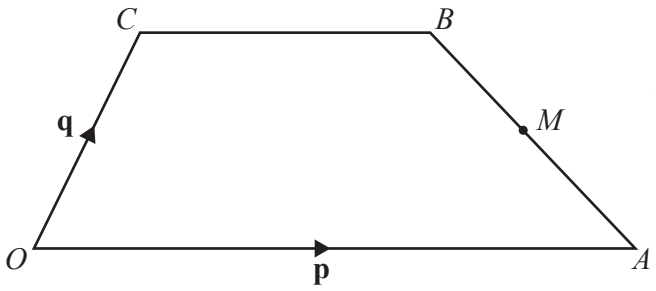
(b) shape A after a reflection in the line $y = x - 1$. [3]

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

.....

..... [3]

(b)



NOT TO SCALE

$OABC$ is a trapezium and O is the origin.
M is the midpoint of AB.
$\overrightarrow{OA} = \mathbf{p}$, $\overrightarrow{OC} = \mathbf{q}$ and $OA = 2CB$.

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

..... [3]

8 **(a)** $f(x) = 3 - 5x$

(i) Find x when $f(x) = -5$.

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

(ii) Find $f^{-1}(x)$.

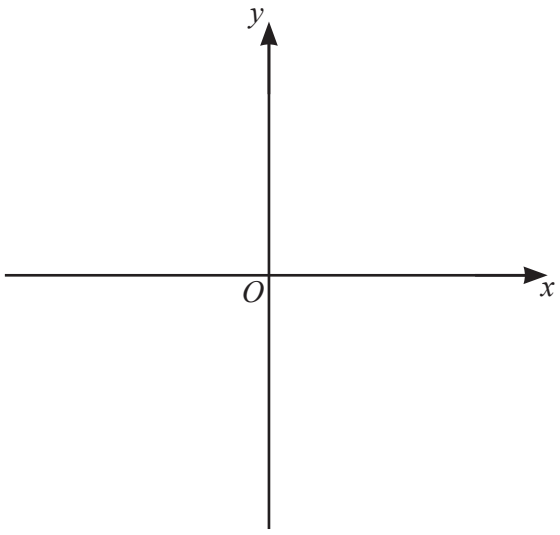
$f^{-1}(x) =$ ..... [2]

(b) $g(x) = 18 - 3x - x^2$

(i) Write $g(x)$ in the form $b - (a + x)^2$.

..... [3]

(ii) Sketch the graph of $y = g(x)$.
On your sketch, show the coordinates of the turning point.

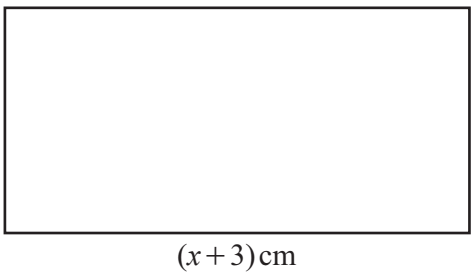


[3]

(iii) Find the equation of the tangent to the graph of $y = 18 - 3x - x^2$ at $x = 4$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [6]

9 (a)



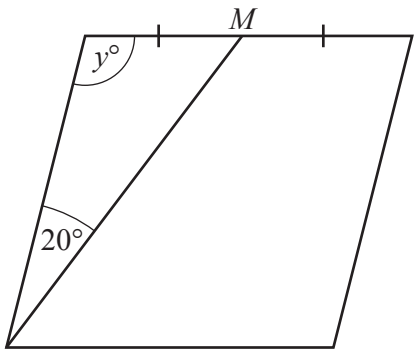
NOT TO SCALE

This rectangle has perimeter 20 cm.

Find the value of x.

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

(b)



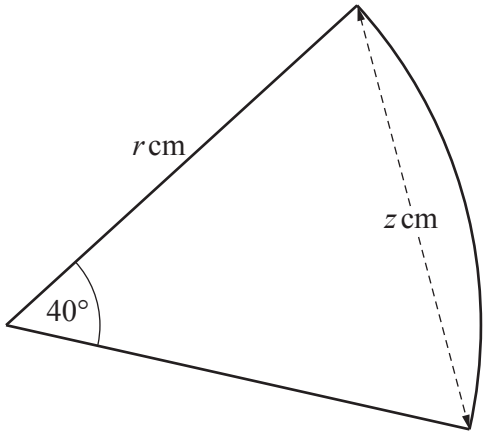
NOT TO SCALE

This rhombus has perimeter 20 cm and angle y is obtuse.
M is the midpoint of one of the sides.

Find the value of y.

$y =$ ..... [5]

(c)



NOT TO SCALE

This sector of a circle has radius r and perimeter 20 cm.

Find the value of z.

$z =$ ..... [6]