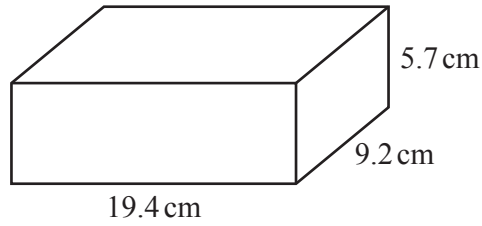


1 (a)



NOT TO SCALE

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

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

..... cm² [3]

(ii) The density of the brick is 1.9 g/cm³.

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]

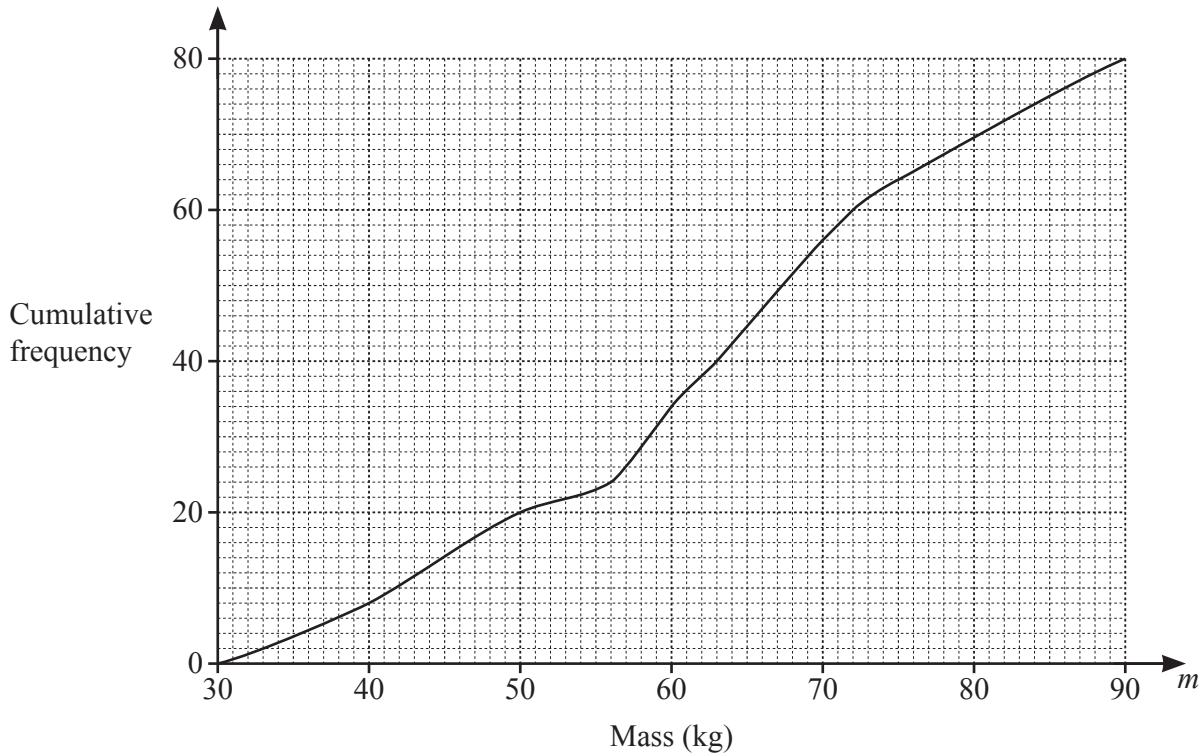
- (d) In 2015, a charity raised a total of \$1.6 million.
After 2015, this amount increased exponentially by 2.4% each year for the next 5 years.

Work out the amount raised by the charity in 2020.

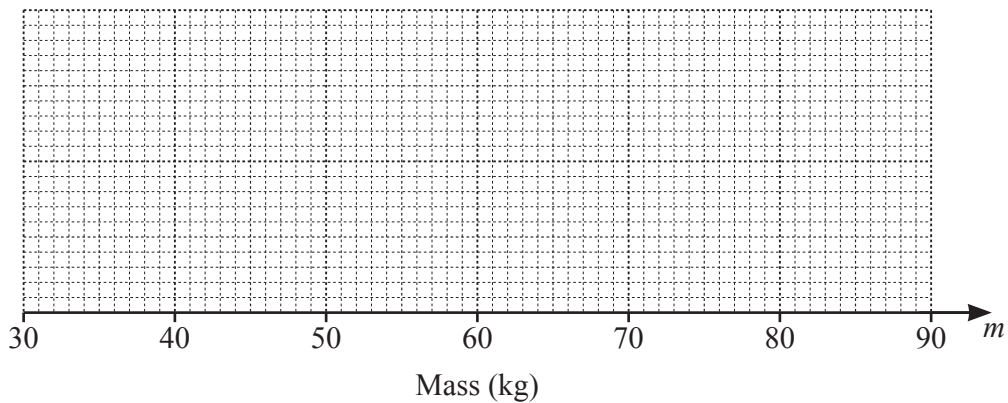
\$ million [2]



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



(a)



On the grid, draw a box-and-whisker plot to show the information in the cumulative frequency diagram. [4]

(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)	$30 < m \leq 40$	$40 < m \leq 50$	$50 < m \leq 60$	$60 < m \leq 70$	$70 < m \leq 80$	$80 < m \leq 90$
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) $6(7 - 2x) = 3x - 8$

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

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

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

(b) Factorise completely.

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

$\dots\dots\dots$ [3]

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

$\dots\dots\dots$ [2]

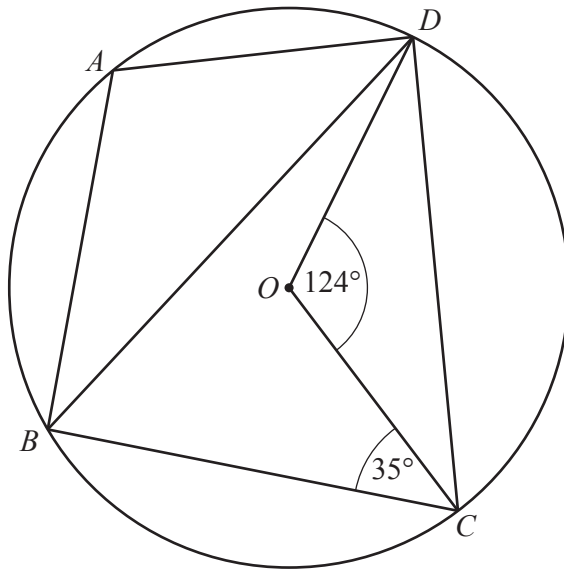


- (c) Solve $x^3 + 4x^2 - 17x = x^3 - 9$.
You must show all your working and give your answers correct to 2 decimal places.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [5]



5 (a)



NOT TO SCALE

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

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

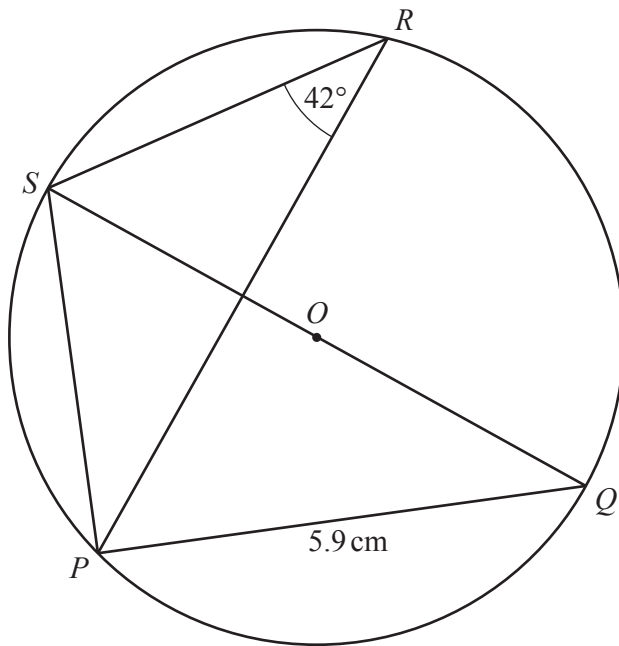
Angle $CBD = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$ [2]

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

Angle $BAD = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$
 $\dots\dots\dots$ [4]



(b)



NOT TO SCALE

P , Q , R and S are points on a circle, centre O .
 QS is a diameter.
Angle $PRS = 42^\circ$ and $PQ = 5.9\text{ cm}$.

Calculate the circumference of the circle.

..... cm [5]



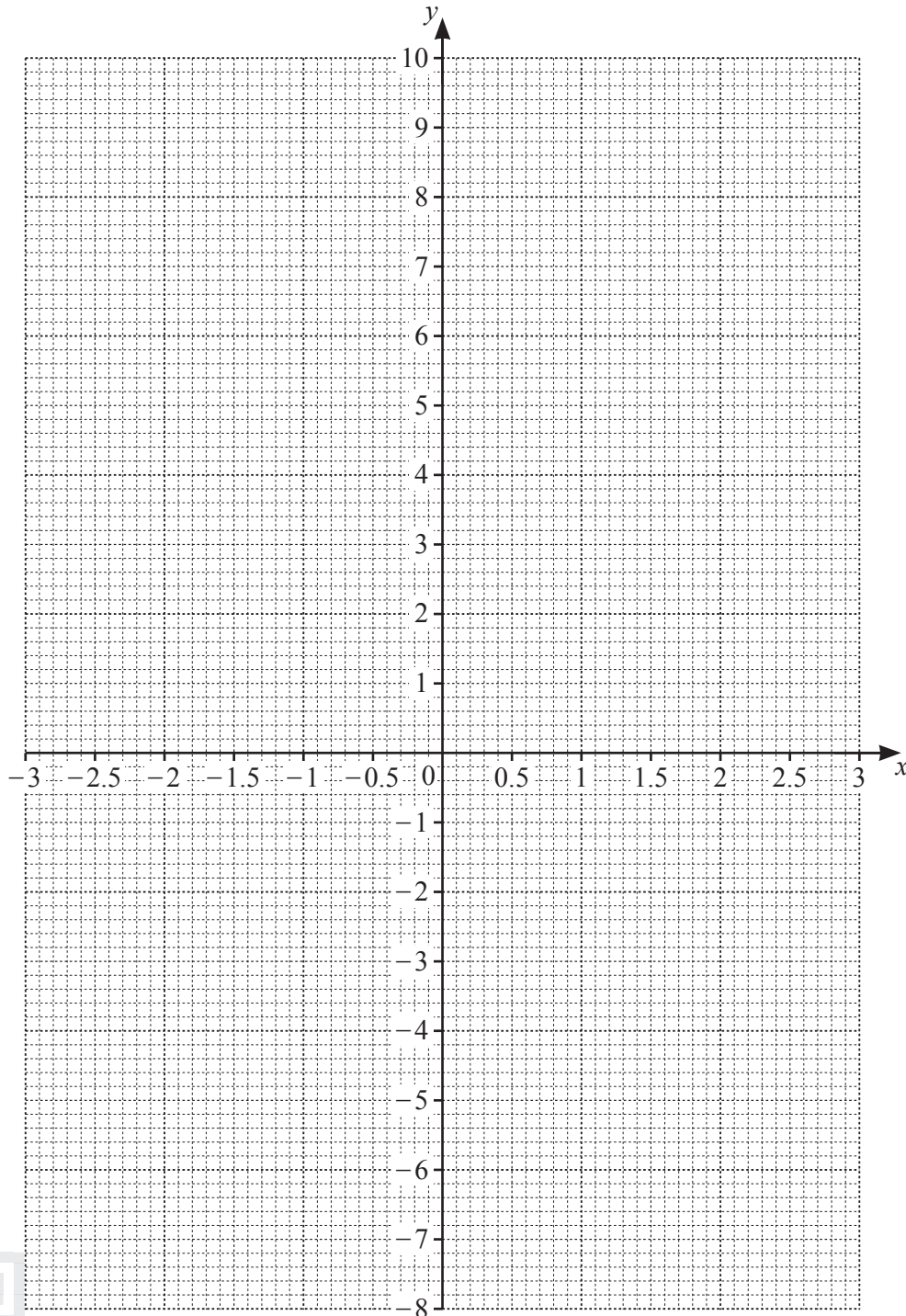
- 6 The table shows some values for $y = x^2 - \frac{3}{2x}$, $x \neq 0$, given correct to 1 decimal place.

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 $-3 \leq x \leq -0.2$ and $0.2 \leq x \leq 3$.



[5]



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

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots [4]$$

- (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 .

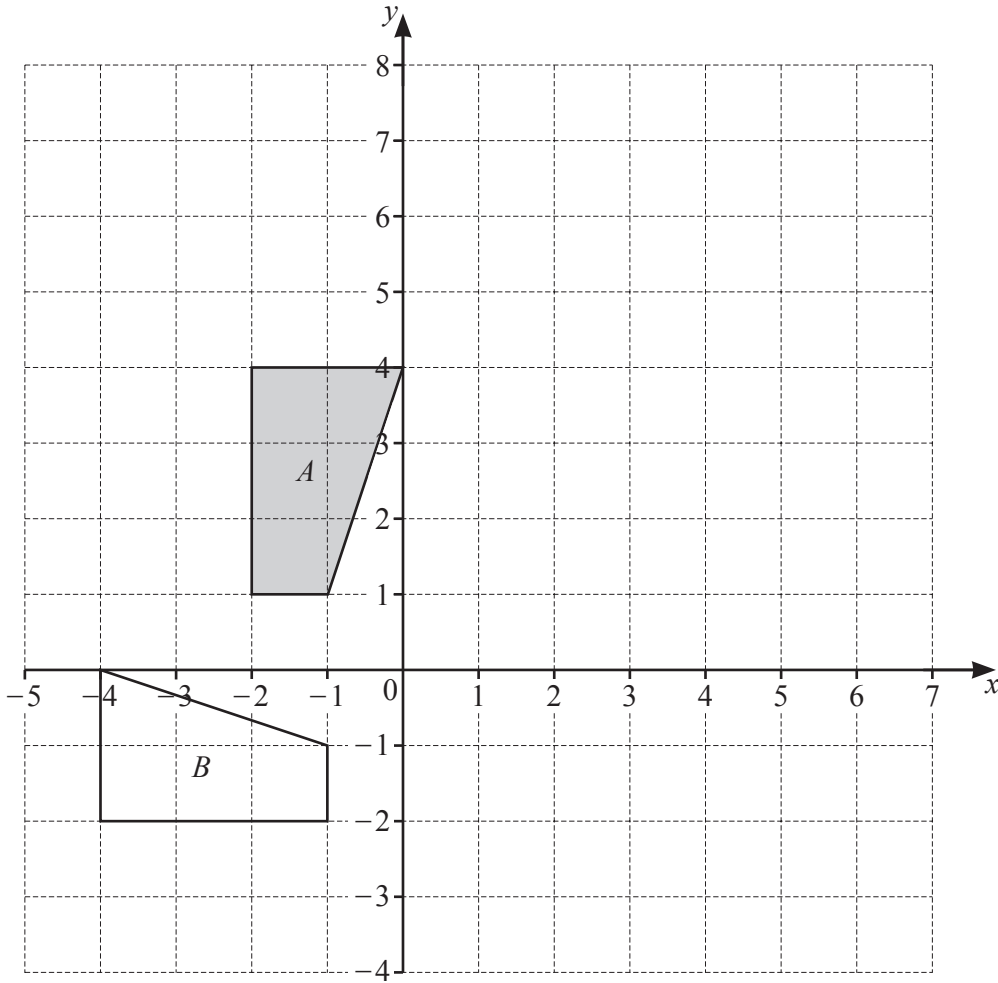
$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

$$c = \dots\dots\dots [4]$$



7 (a)



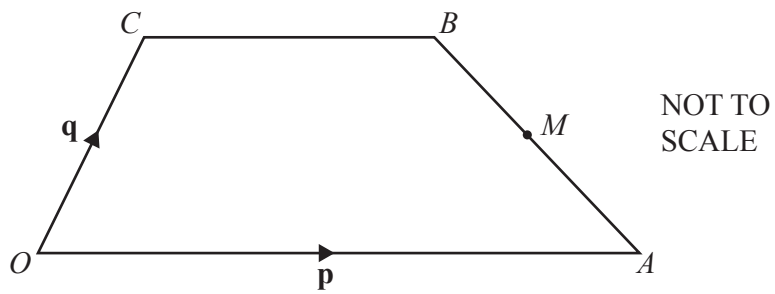
- (i) On the grid, draw the image of
 - (a) shape *A* after an enlargement, scale factor 2, centre (0, 1), [2]
 - (b) shape *A* after a reflection in the line $y = x - 1$. [3]
- (ii) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

..... [3]

.....



(b)



$OABC$ 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 \mathbf{p} and \mathbf{q} , the position vector of M .
Give your answer in its simplest form.

..... [3]



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

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

$x = \dots\dots\dots$ [2]

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

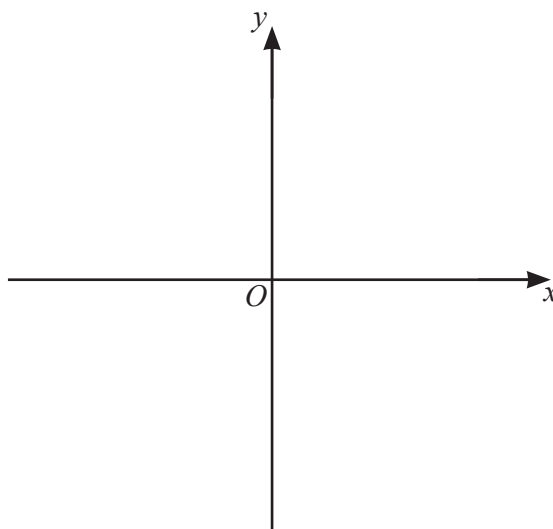
$f^{-1}(x) = \dots\dots\dots$ [2]

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

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

$\dots\dots\dots$ [3]

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



[3]

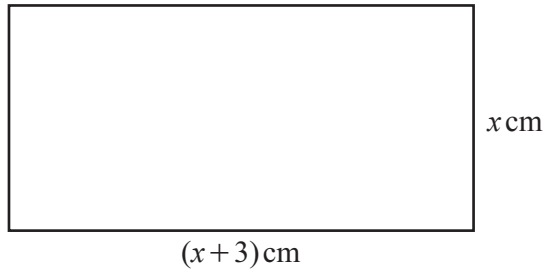


- (iii) Find the equation of the tangent to the graph of $y = 18 - 3x - x^2$ at $x = 4$.
Give your answer in the form $y = mx + c$.

$y = \dots\dots\dots$ [6]



9 (a)



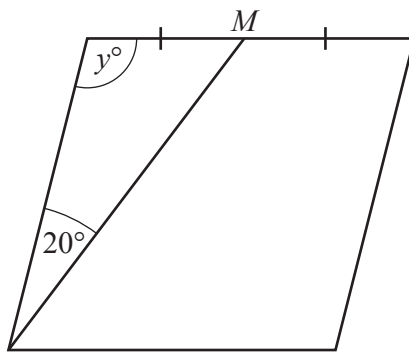
NOT TO SCALE

This rectangle has perimeter 20 cm.

Find the value of x .

$x =$ [3]

(b)



NOT TO SCALE

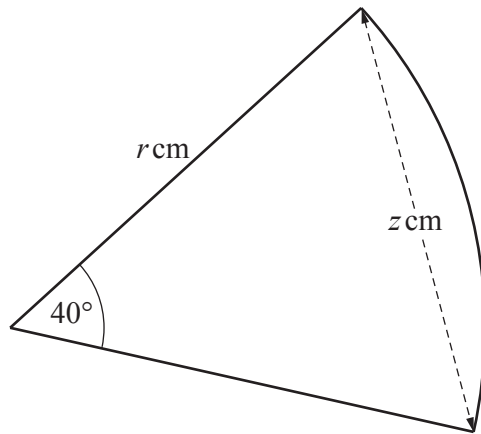
This rhombus has perimeter 20 cm and angle y is obtuse.
 M is the midpoint of one of the sides.

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 .

$z = \dots\dots\dots$ [6]

