Cambridge IGCSE™

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2021**

2 hours 30 minutes

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.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION
- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

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

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[Turn over

1 (a)
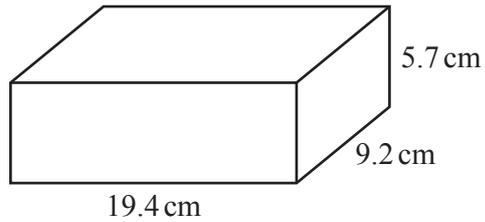
The diagram shows a brick in the shape of a cuboid.

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

.... cm^2 [3]

(ii) The density of the brick is $1.9\,\text{g/cm}^3$.

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.
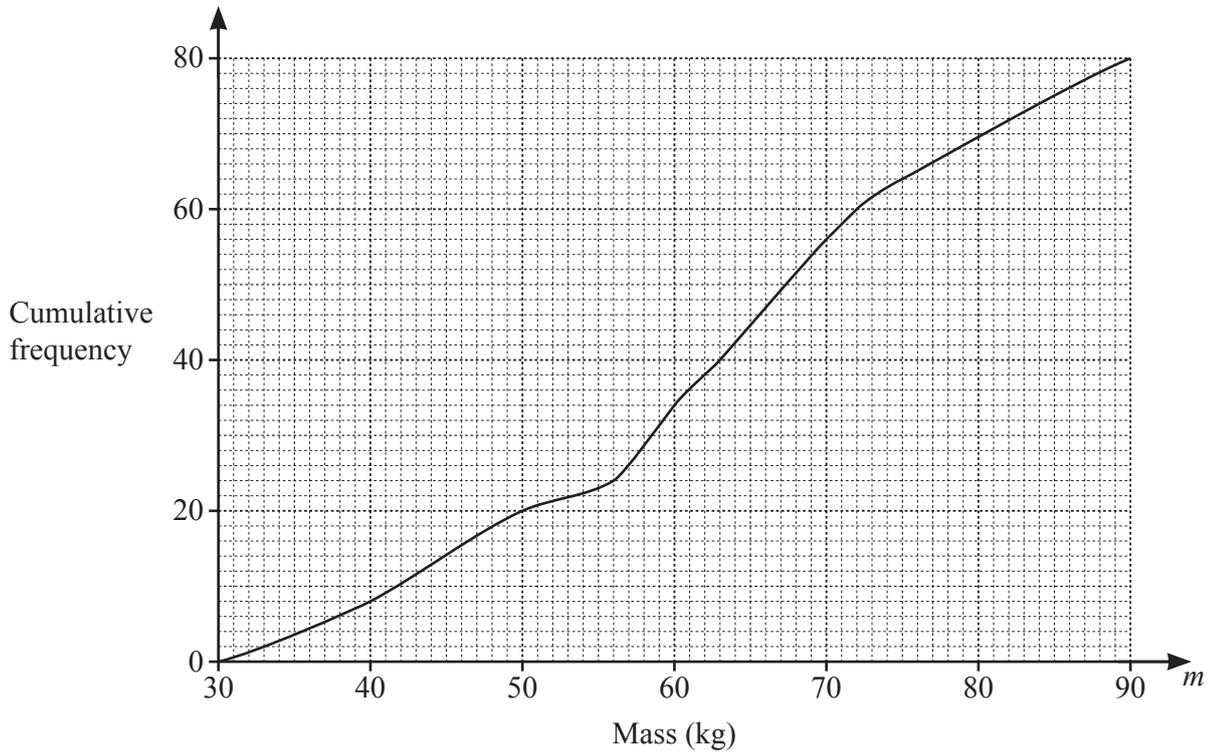
.... [4]

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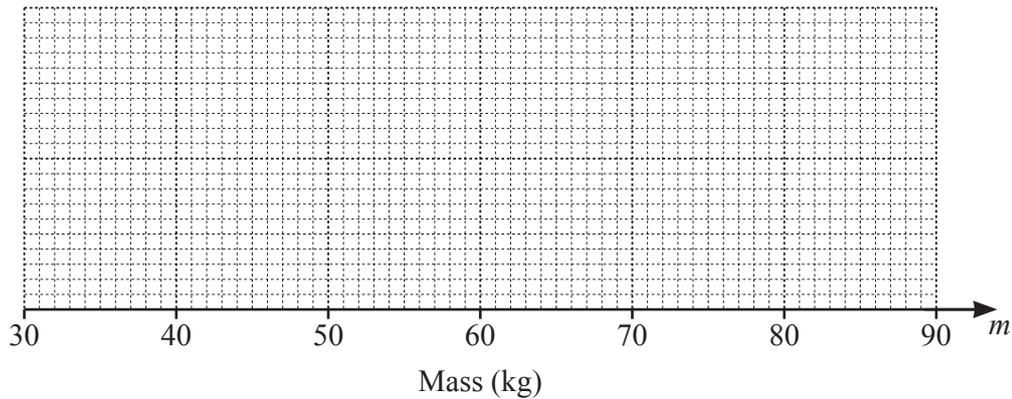After 2015, this amount increased exponentially by 2.4% each year for the next 5 years.

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.

(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)	$30 < m \leqslant 40$	$40 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 80$	$80 < m \leqslant 90$
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) $\dfrac{2x}{x-5} = \dfrac{2}{3}$

$x =$ .... [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)
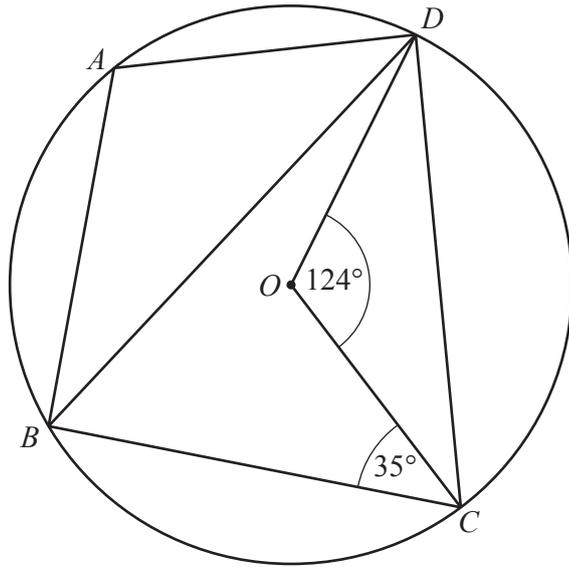
NOT TO
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A, *B*, *C* and *D* are points on a circle, centre *O*.
Angle *COD* = 124° and angle *BCO* = 35°.

(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)
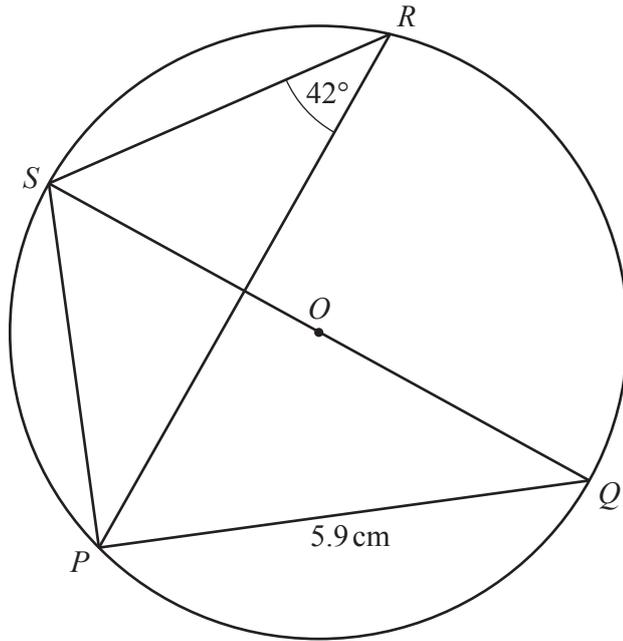
NOT TO
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P, *Q*, *R* and *S* are points on a circle, centre *O*.
QS is a diameter.
Angle *PRS* = 42° and *PQ* = 5.9 cm.

Calculate the circumference of the circle.

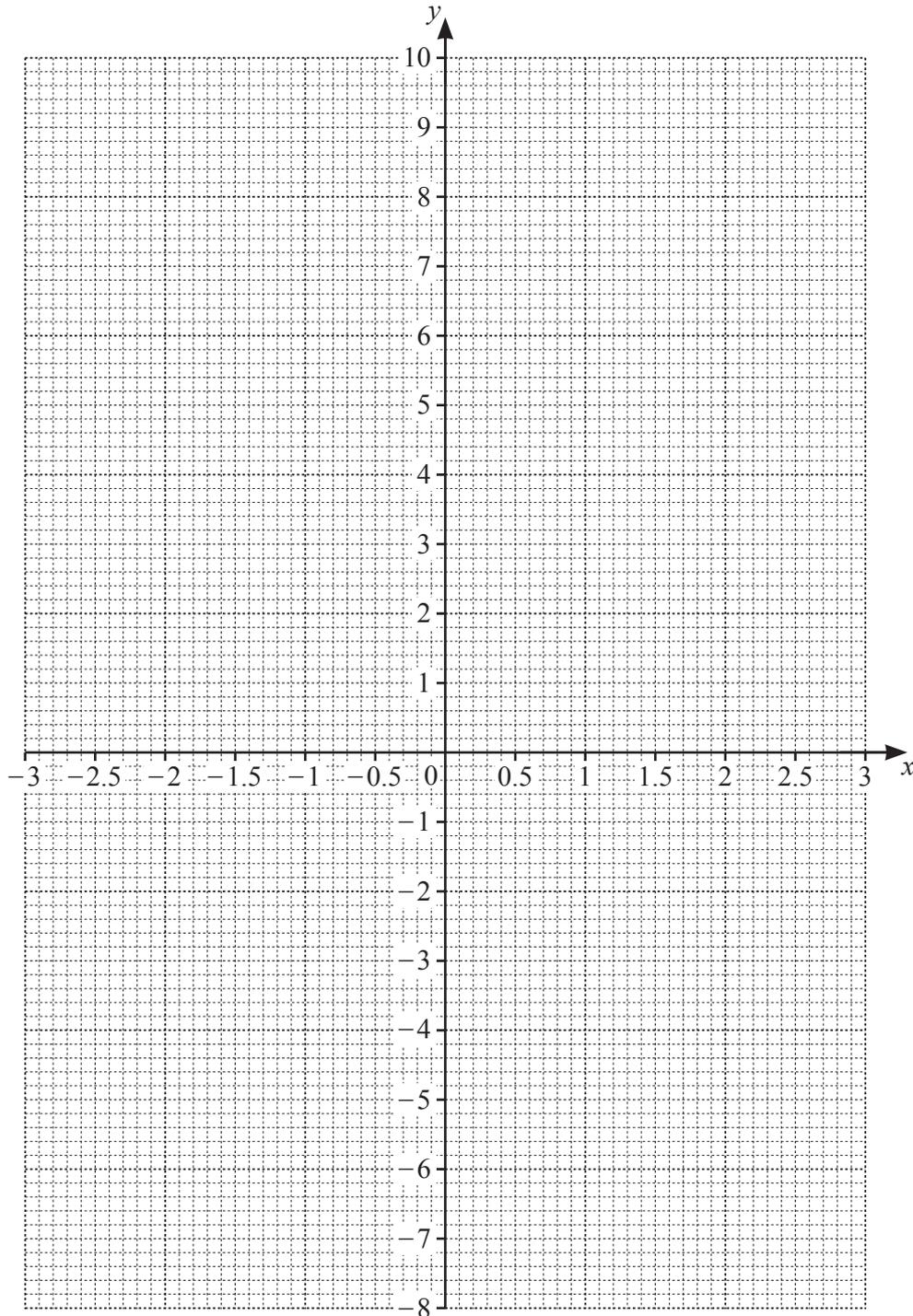.. cm [5]

6 The table shows some values for $y = x^2 - \dfrac{3}{2x}$, $x \neq 0$, 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 $y = x^2 - \dfrac{3}{2x}$ 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 $x^2 - \dfrac{3}{2x} = \dfrac{24}{5} - 2x$
for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.

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

(c) The solutions to the equation $x^2 - \dfrac{3}{2x} = \dfrac{24}{5} - 2x$ 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)**
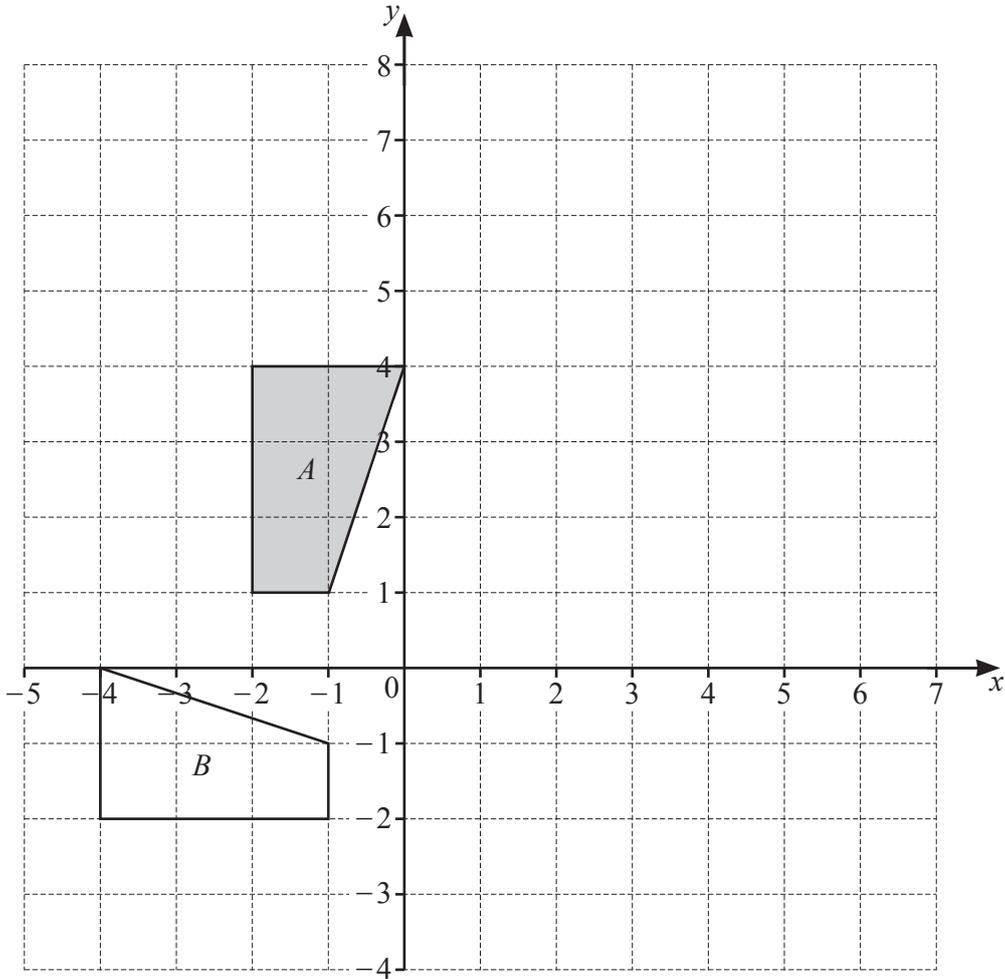
(i) On the grid, draw the image of

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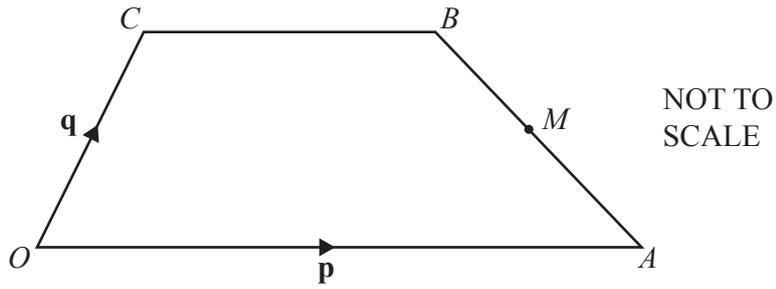
$OABC$ is a trapezium and O is the origin.
M is the midpoint of AB.
$\overrightarrow{OA} = \mathbf{p}$, $\overrightarrow{OC} = \mathbf{q}$ and $OA = 2CB$.

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 $f(x) = -5$.

$$x = \text{...} \quad [2]$$

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

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

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

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

$$\text{...} \quad [3]$$

    (ii) Sketch the graph of $y = g(x)$.
On your sketch, show the coordinates of the turning point.
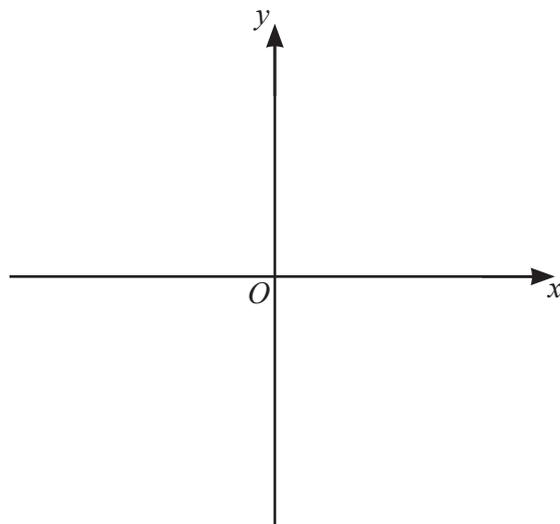
[3]

(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)**

x cm

NOT TO
SCALE

$(x+3)$ cm
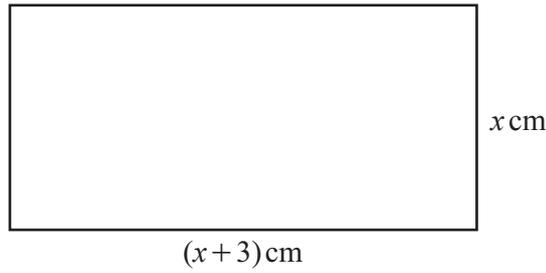
This rectangle has perimeter 20 cm.

Find the value of x.

$x =$ .... [3]

(b)

M

$y°$

$20°$
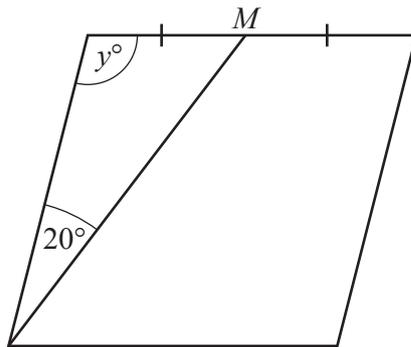
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SCALE

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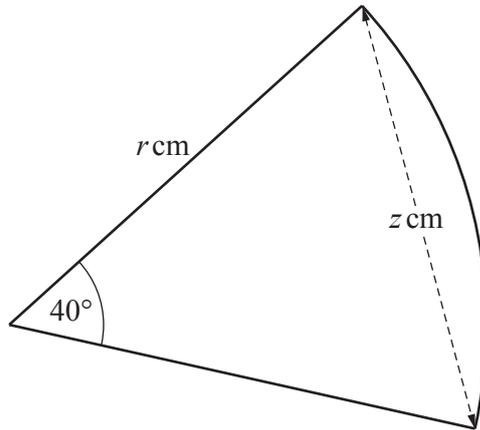
This sector of a circle has radius *r* and perimeter 20 cm.

Find the value of *z*.

z = ... [6]

20

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