Cambridge Assessment International Education

# Cambridge IGCSE™

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

*7746514111*

**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 $\pi$, use either your calculator value or 3.142.

**INFORMATION**

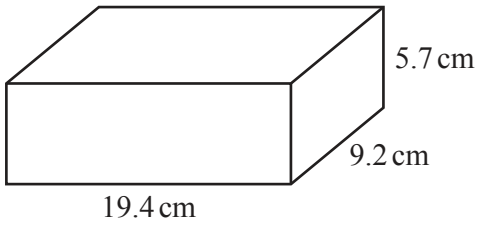
- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

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

DC (CE/SG) 212505/3


**[Turn over**

**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.

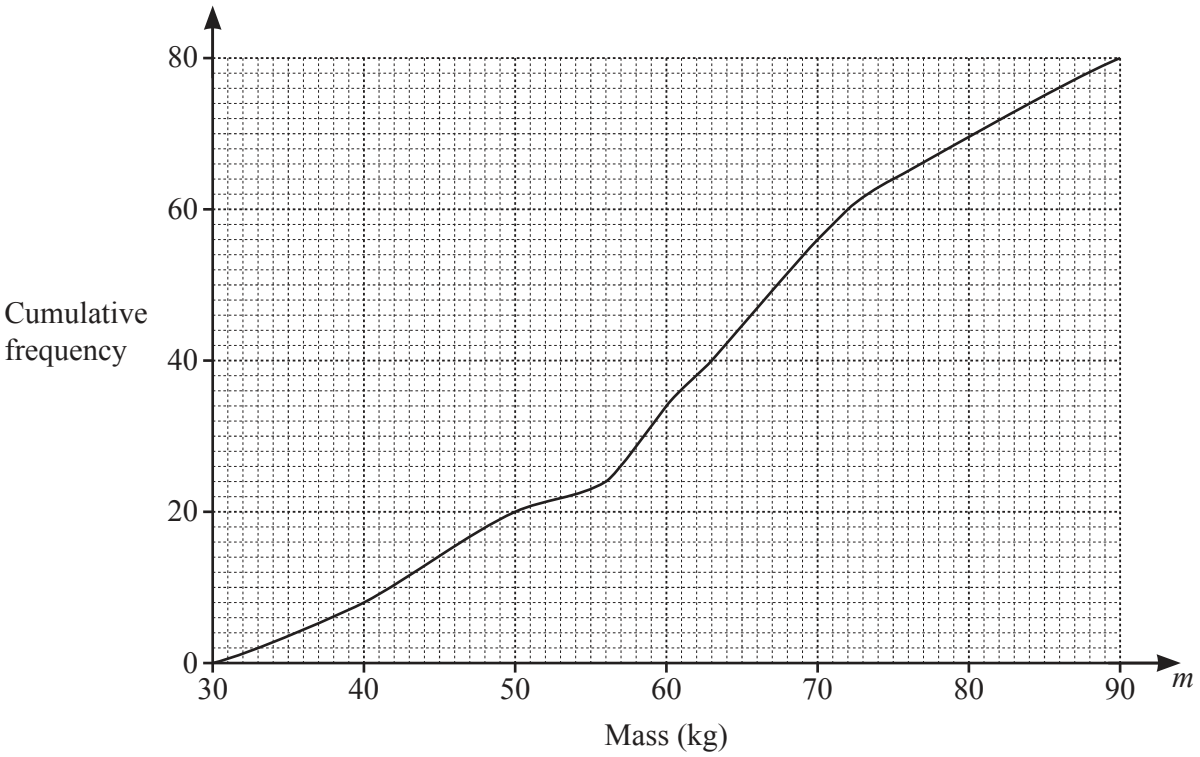
..... [4]

**(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.

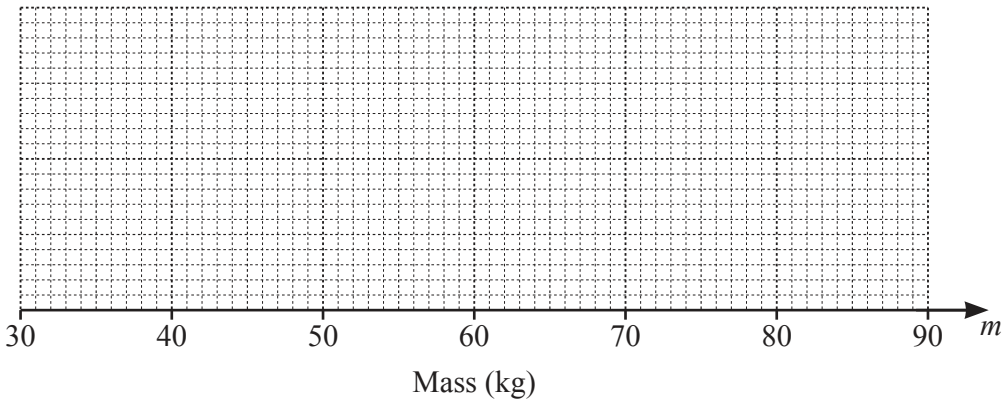
Work out the amount raised by the charity in 2020.

$ ..... million [2]

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




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

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

**(b)** Factorise completely.

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

..... [3]

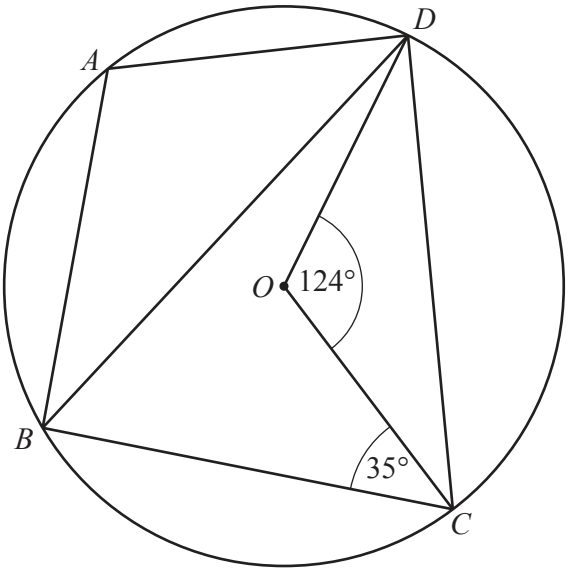
**(ii)** $5x^2 + 17x - 40$

..... [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]

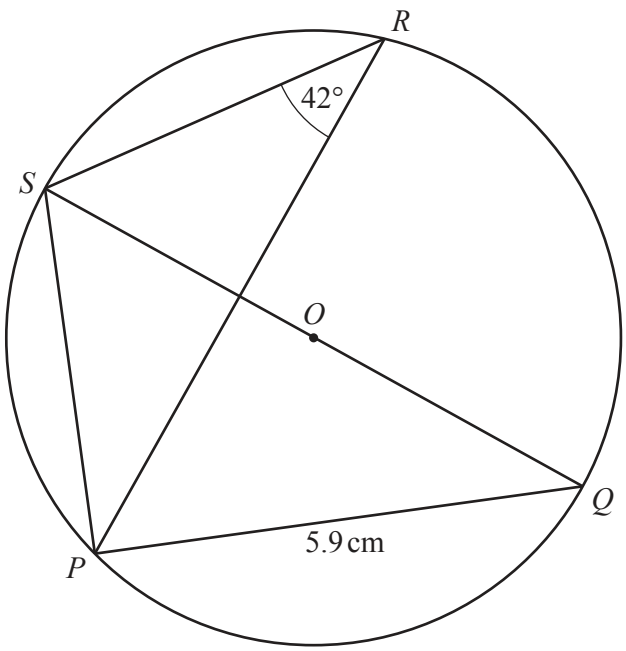
**(ii)** Work out angle $BAD$.
Give a geometrical reason for each step of your working.

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.

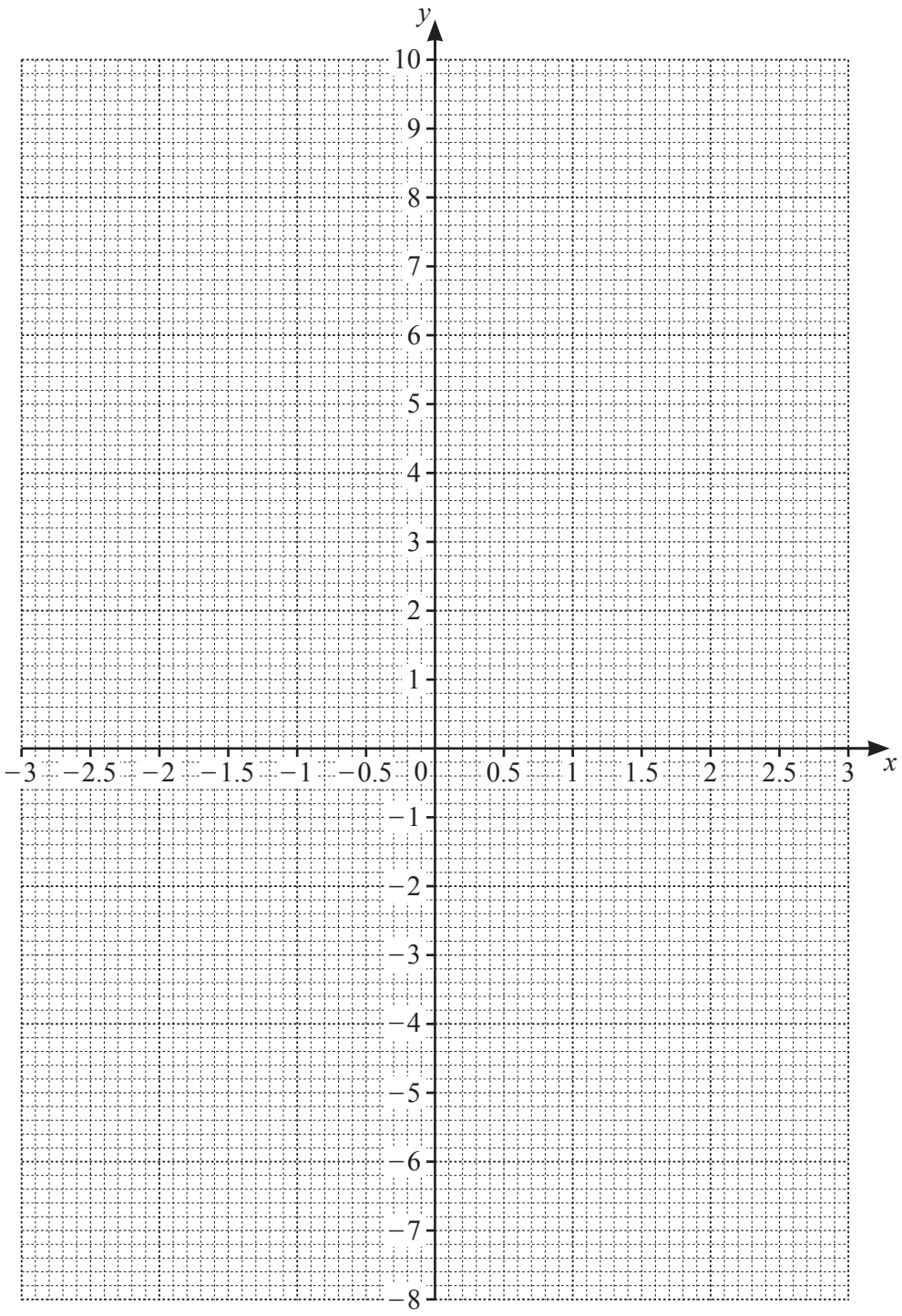
..... cm [5]

**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.

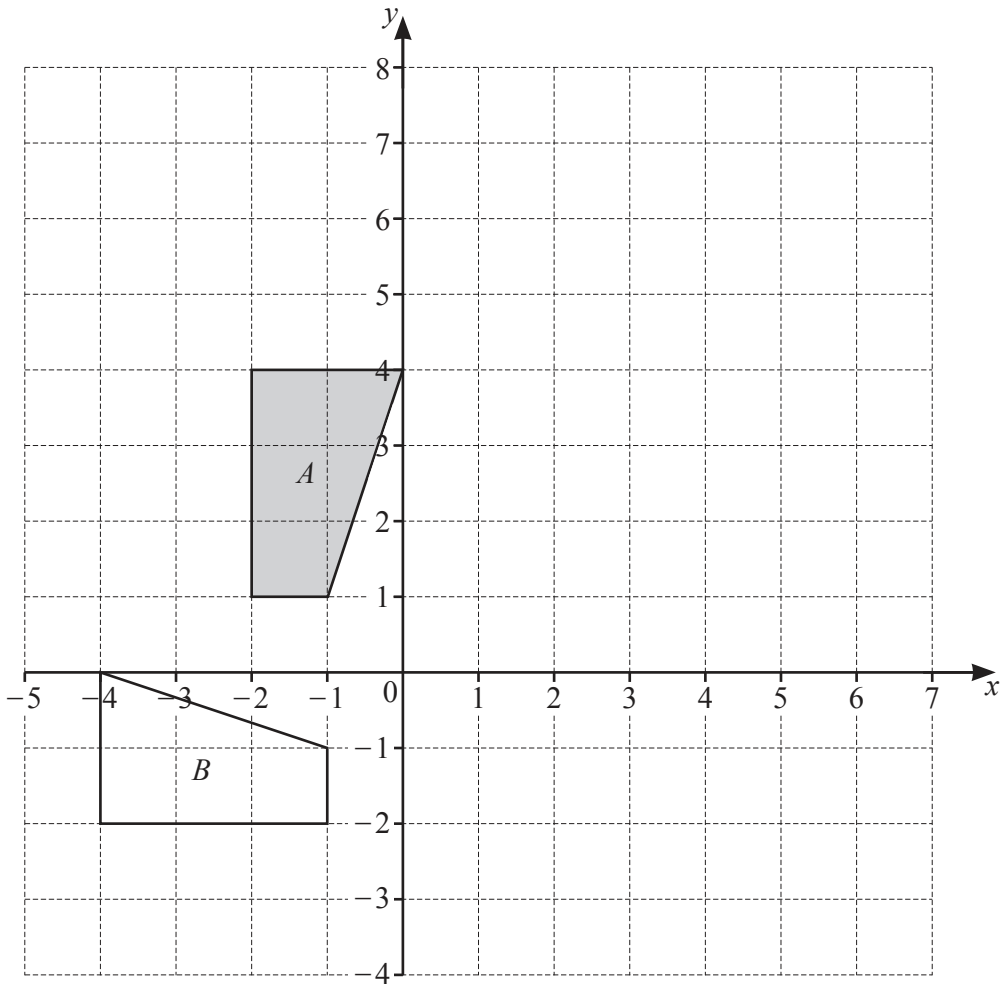
Find the values of $a$, $b$ and $c$.

$a =$ .....

$b =$ .....

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

**7 (a)**




**(i)** On the grid, draw the image of

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

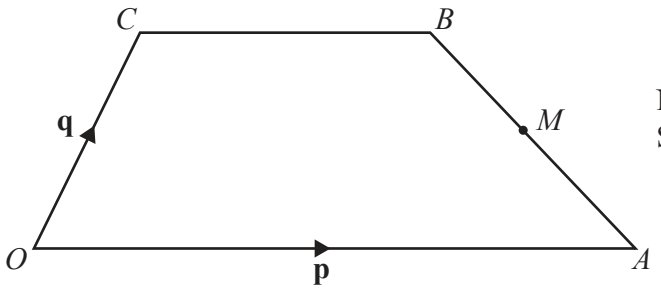
**(b)** shape $A$ after a reflection in the line $y = x - 1$. [3]

**(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 $f^{-1}(x)$.

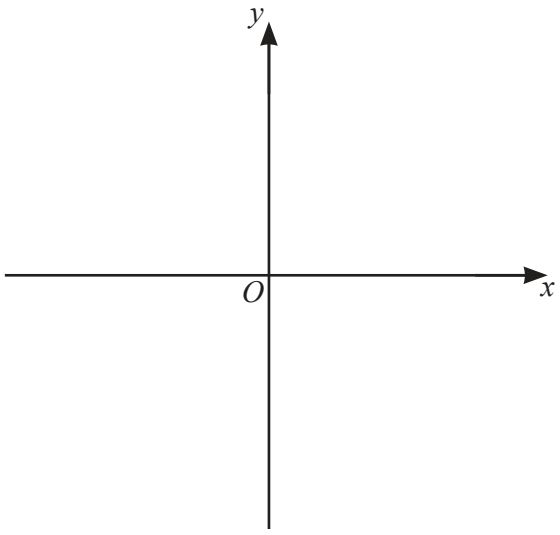
$f^{-1}(x) =$ ..... [2]

**(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.

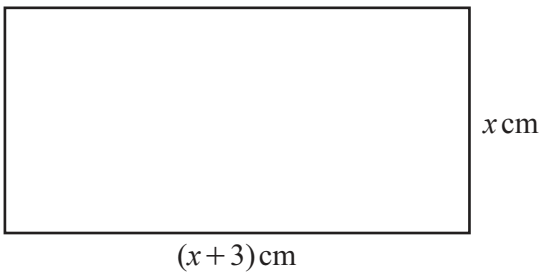



[3]

**(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)**



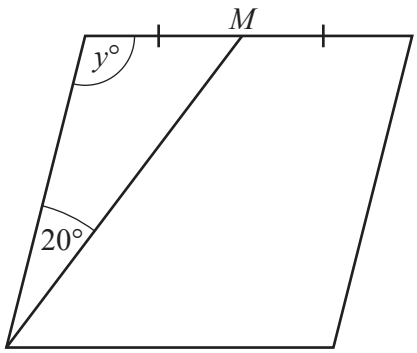

NOT TO SCALE

This rectangle has perimeter 20 cm.

Find the value of $x$.

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

**(b)**



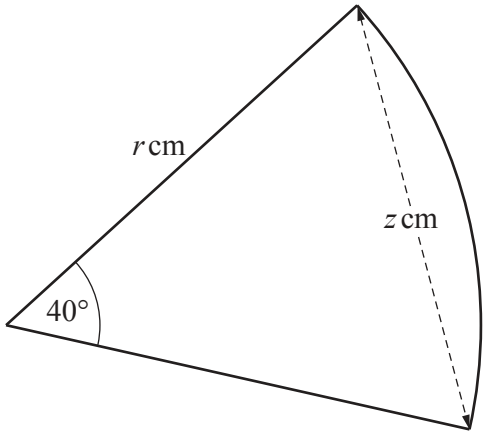

NOT TO SCALE

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]

**BLANK PAGE**