Cambridge Assessment International Education

# Cambridge IGCSE™

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



**MATHEMATICS** **0580/31**

Paper 3 (Core) **May/June 2021**

**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.
- 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 104.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.



**[Turn over**

**1** **(a)** Strawberries cost \$4.20 per kilogram and cream costs \$8.56 per litre.
Venus buys 1.2 kg of strawberries and 125 ml of cream.

Work out the total cost.

\$ ..... [3]

**(b)** Ravi has \$20.
A pineapple costs \$1.45 .

Work out the largest number of pineapples Ravi can buy and the change he receives.

Number of pineapples .....

Change \$ ..... [3]

**(c)** Abraham has a box of 72 biscuits.
He gives $\frac{2}{9}$ of the biscuits to his grandmother.
He then gives $\frac{3}{7}$ of the biscuits that are left to his cousin.

Work out how many biscuits Abraham has now.

..... [3]

**(d)** Flo makes 84 cakes.
She sells 35 of these cakes.

Calculate the percentage of the cakes that she sells.

..... % [1]

**(e)** A bag contains 132 sweets.
The sweets are shared between Beatrix and Volker in the ratio Beatrix : Volker = 5 : 7.

Work out the number of sweets they each receive.

Beatrix .....

Volker ..... [2]

**(f)** Jed sells desserts for $24 each.
Each dessert costs $12.80 to make.

**(i)** Work out his percentage profit.

..... % [2]

**(ii)** The cost to make each dessert increases to $13.60 .
Jed wants to make the same percentage profit.

Work out the new selling price.

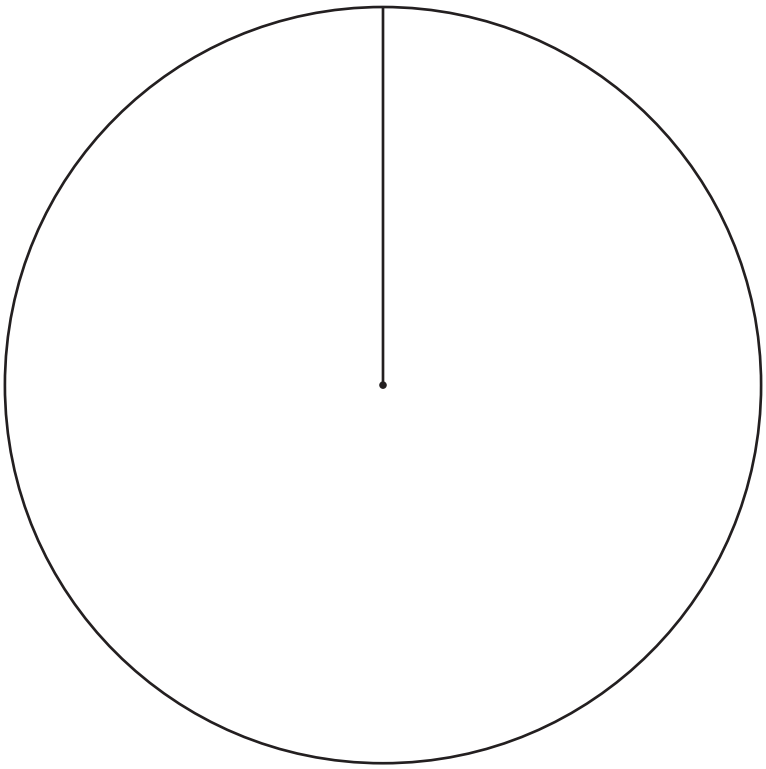
$ ..... [2]

**2** **(a)** Anika asks 15 friends how many marbles they have.
The results are shown in the table.

| Number of marbles | Frequency | Pie chart sector angle |
|---|---|---|
| 0 | 2 | |
| 1 to 10 | 8 | |
| 11 to 50 | 4 | |
| More than 50 | 1 | |

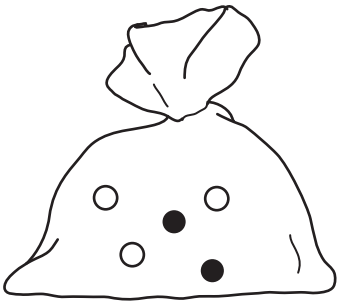
**(i)** Complete the table. [2]

**(ii)** Complete the pie chart.

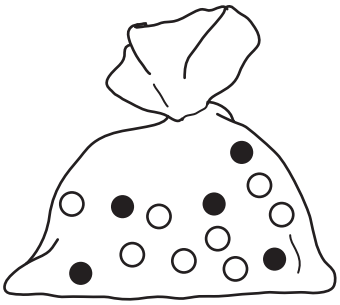


[2]

**(b)**



Bag *A*



Bag *B*

Bag *A* contains 2 black marbles and 3 white marbles.
Bag *B* contains 5 black marbles and 8 white marbles.

**(i)** Write down the probability that a marble picked at random from bag *A* is black.

..... [1]

**(ii)** Toby says,
'You are more likely to pick a black marble at random from bag *B* than from bag *A* because bag *B* has more black marbles.'

Is Toby correct?
Give a reason for your answer.

..... because ..... [2]

**(iii)** Toby adds some marbles to bag *B*.
The probability of picking a black marble at random from either bag is now the same.

Work out the smallest number of black marbles and white marbles he adds to bag *B*.

Black .....

White ..... [2]

**3** The scale drawing shows the position of town *R* on a map.
The scale is 1 centimetre represents 5 kilometres.


Scale : 1 cm to 5 km

**(a)** Town *M* is 36 km from *R* on a bearing of 163°.

Mark the position of *M* on the map.

[2]

**(b)** A railway track, 36 km long, is to be built in a straight line from *R* to *M*.

**(i)** The track costs \$1070 per metre to build.

Work out the cost of building the track.

\$ ..... [2]

**(ii)** 15 people can build 60 metres of track per day.

Work out how many days it will take 45 people to build the whole track.

..... days [3]

**(c)** Trains will travel the 36 km at an average speed of 75 km/h.

Work out the journey time.
Give your answer in minutes.

..... min [2]

**(d)** Town *K* is on a bearing of 312° from *R*.

Work out the bearing of *R* from *K*.

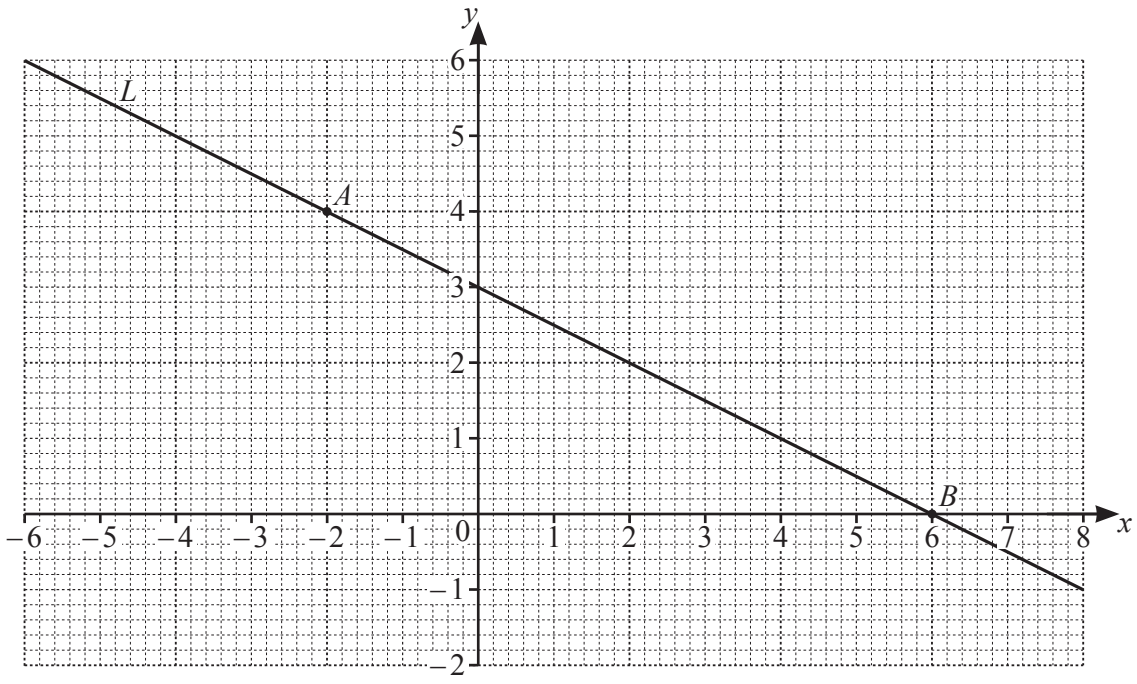
..... [2]





**[Turn over**

**4** The diagram shows a line $L$ and two points, $A$ and $B$, on a grid.




**(a)** Write down the coordinates of point $A$.

( ..... , ..... ) [1]

**(b) (i)** Find the gradient of line $L$.

..... [1]

**(ii)** Write down the equation of line $L$ in the form $y = mx + c$.

$y =$ ..... [2]

**(c) (i)** Draw a line that is perpendicular to line $L$ and passes through the point $A$. [1]

**(ii)** This line crosses the $x$-axis at point $C$.

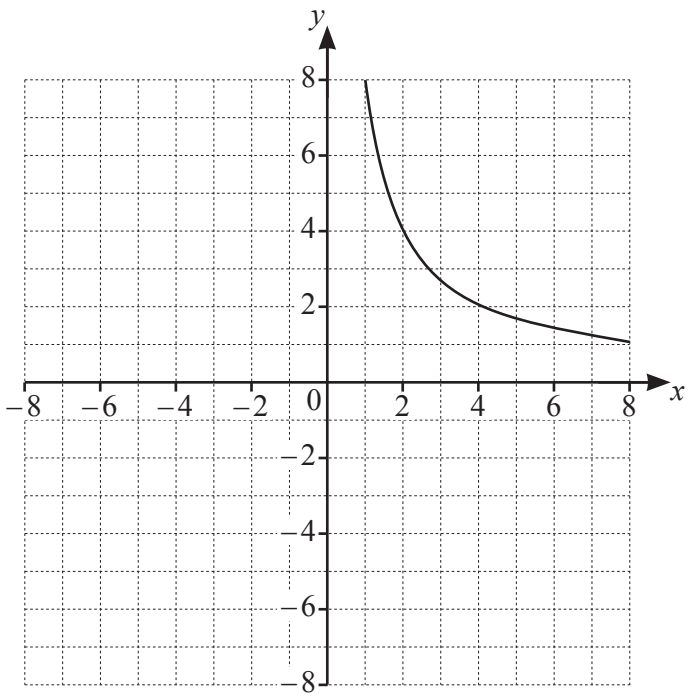
Mark point $C$ on the grid and write down the coordinates of point $C$.

( ..... , ..... ) [1]

**(iii)** Find, by measuring, the perimeter of triangle $ABC$.

..... cm [2]

**5**




The diagram shows the graph of $y = \frac{k}{x}$ for $1 \leqslant x \leqslant 8$.

**(a)** Use the graph to find the value of $x$ when $y = 4$.

$x =$ ..... [1]

**(b) (i)** Show that $k = 8$.

[1]

**(ii)** Calculate the value of $y$ when $x = 250$.

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

**(c) (i)** Complete this table of values for $y = \frac{8}{x}$.

| $x$ | $-8$ | $-4$ | $-2$ | $-1$ |
|---|---|---|---|---|
| $y$ | | | | |

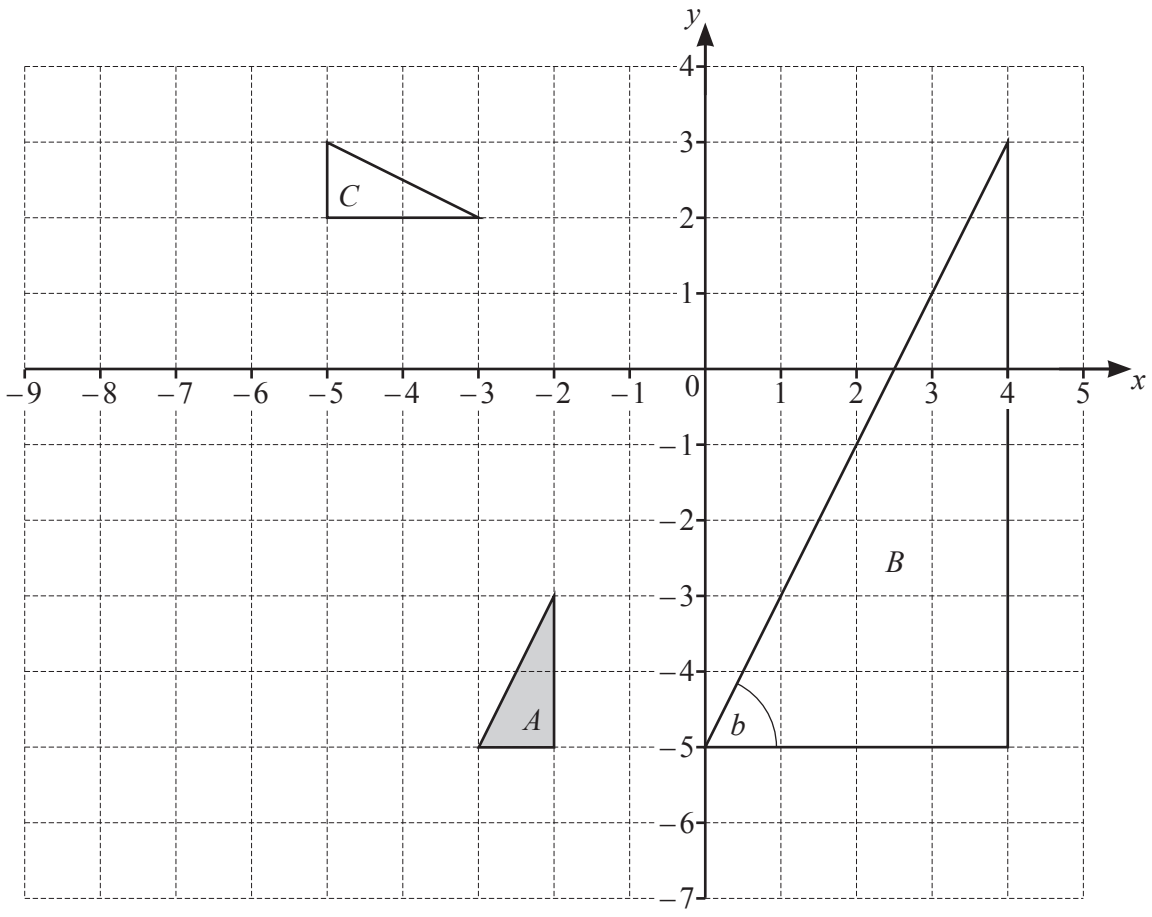
[2]

**(ii)** On the grid, draw the graph of $y = \frac{8}{x}$ for $-8 \leqslant x \leqslant -1$. [3]

**(d)** Write down the equation of each line of symmetry of the graph.

..... and ..... [2]

**6** The diagram shows three triangles, $A$, $B$ and $C$, on a 1 cm$^2$ grid.




**(a)** Describe fully the **single** transformation that maps

**(i)** triangle $A$ onto triangle $B$,

.....

..... [3]

**(ii)** triangle $A$ onto triangle $C$.

.....

..... [3]

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

**(i)** triangle $A$ after a translation by the vector $\begin{pmatrix} -5 \\ 4 \end{pmatrix}$, [2]

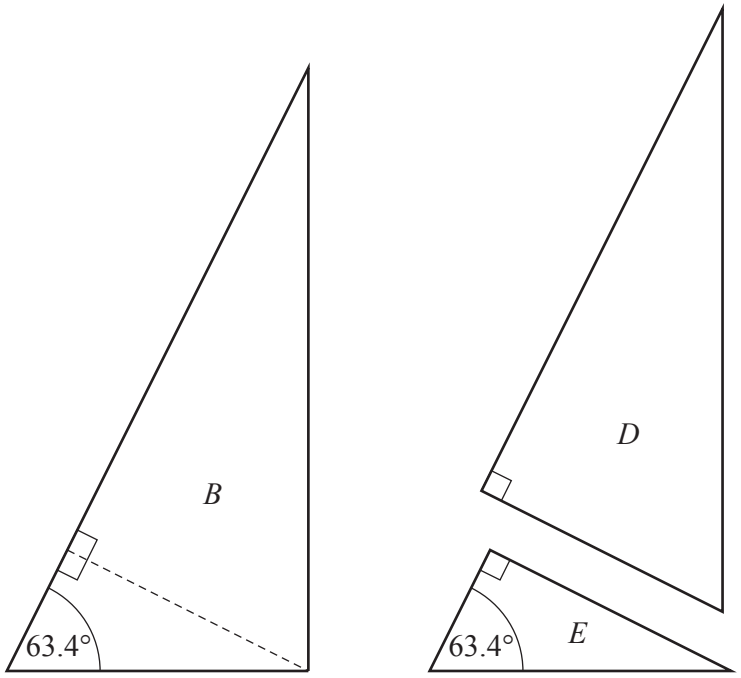
**(ii)** triangle $A$ after a reflection in the line $x = -4.5$. [2]

**(c)** The diagram also shows an angle $b$ in triangle $B$.

Use trigonometry to show that angle $b$ is 63.4°, correct to 1 decimal place.

[2]

**(d)**




Two new triangles, $D$ and $E$, are made from triangle $B$, as shown in the diagram.

Are all three triangles similar?
Give a reason for your answer.

..... because .....

..... [2]

**7** **(a)** Martin, Suki and Pierre make clocks.
In one week

- Martin makes $x$ clocks.
- Suki makes 3 fewer clocks than Martin.
- Pierre makes twice as many clocks as Suki.

**(i)** Write an expression for the total number of clocks they make in one week.
Give your expression in its simplest form.

..... [3]

**(ii)** The total number of clocks they make in one week is 35.

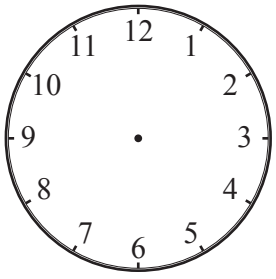
**(a)** Work out the value of $x$.

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

**(b)** Work out how many more clocks Pierre makes than Martin.

..... [2]

**(b)**




**(i)** Complete the clock diagram to show the time 2.30 pm. [1]

**(ii)** Calculate the obtuse angle between the hands of the clock at 2.30 pm.

..... [2]

**(c)** Work out the number of seconds in 10 days.
Give your answer in standard form.

..... seconds [2]

**(d)** A clock is started at 15 00.
The clock is not working correctly and is slow.
The clock loses 8 minutes every hour so after one hour the clock shows 15 52.

What time will the clock show $3\frac{1}{2}$ hours after it is started?

..... [2]

**(e)** The times on two clocks are checked regularly.

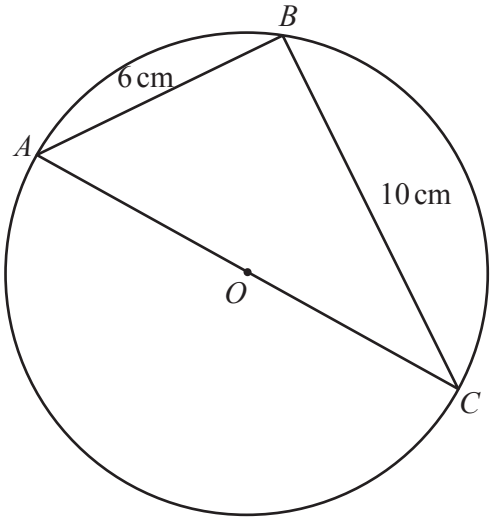
One clock is checked every 6 days.
The other clock is checked every 8 days.

Both clocks are checked on 1st January 2021.

Find the number of days during 2021 when both clocks will be checked on the same day.
[There are 365 days in 2021.]

..... [4]

**8 (a)**




NOT TO SCALE

$A$, $B$ and $C$ lie on a circle, centre $O$, diameter $AC$.

**(i)** Complete this statement.

Angle $ABC$ is 90° because ..... [1]

**(ii)** Work out the area of triangle $ABC$.

..... $cm^2$ [2]

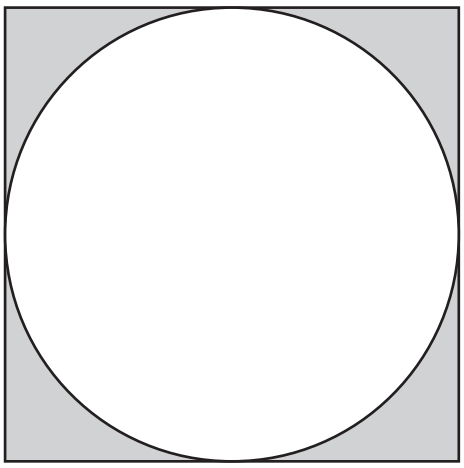
**(iii)** Work out $AC$.

$AC =$ ..... cm [2]

**(b)** Make $r$ the subject of the formula $A = \pi r^2$.

$r =$ ..... [2]

**(c)**



NOT TO SCALE

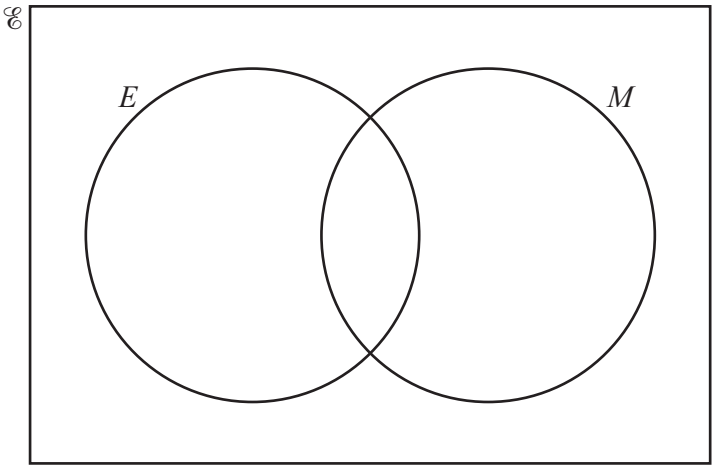
The diagram shows a circle inside a square.
The circle touches the four sides of the square.
The area of the square is 81 $cm^2$.

Calculate the shaded area.

..... $cm^2$ [4]

**Question 9 is printed on the next page.**

**9** **(a)** $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$E = \{x: x \text{ is an even number}\}$
$M = \{x: x \text{ is a multiple of } 3\}$




**(i)** Complete the Venn diagram. [2]

**(ii)** Write down $\text{n}(E \cup M)$.

..... [1]

**(iii)** A number is chosen at random from the universal set $\mathscr{E}$.

Write down the probability that the number is in the set $E \cap M$.

..... [2]

**(b)** Meg says that an even number cannot be a prime number.

Is she correct?
Give a reason for your answer.

..... because ..... [1]