Cambridge Assessment International Education

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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 π, 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 [ ].

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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.

View solution

Work out the total cost.

\$ ..... [3]

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

View solution

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.

View solution

Work out how many biscuits Abraham has now.

..... [3]

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

View solution

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.

View solution

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.

View solution

(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.

View solution

Work out the new selling price.

$ ..... [2]

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

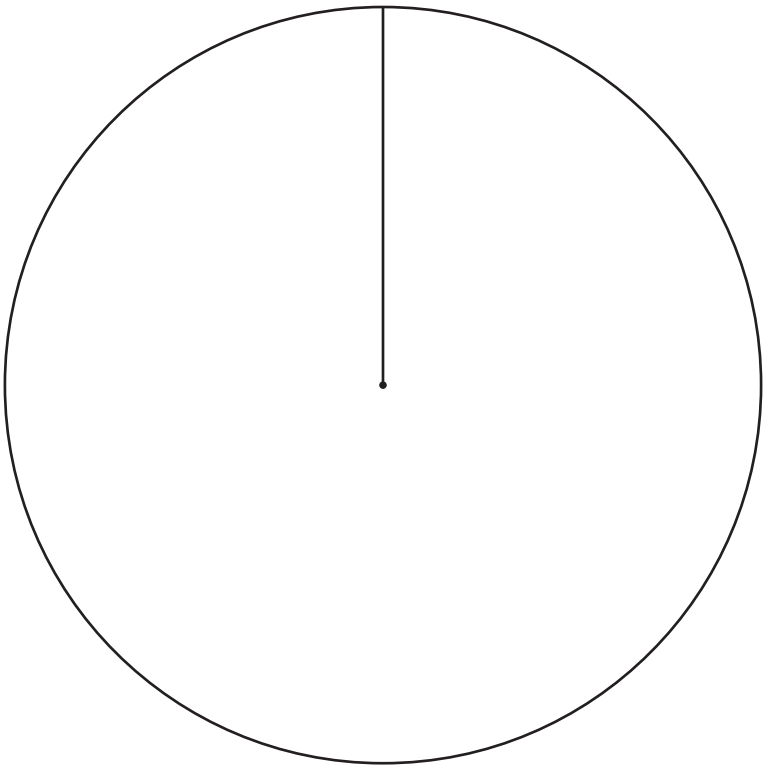
View solution

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.

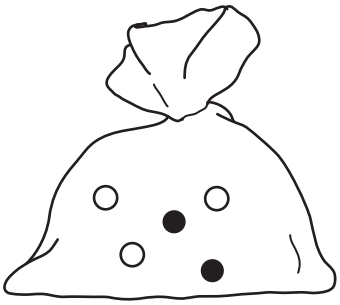
View solution



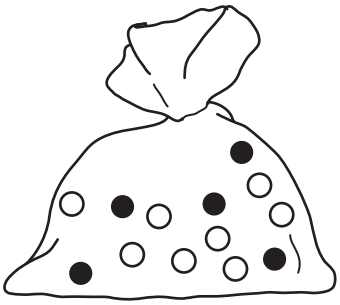
[2]

(b)

View solution



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.'

View solution

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.

View solution

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

Black .....

White ..... [2]

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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.

View solution

[2]

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

View solution

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

Work out the cost of building the track.

\$ ..... [2]

View solution

(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]

View solution

(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]

View solution

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

Work out the bearing of R from K.

..... [2]

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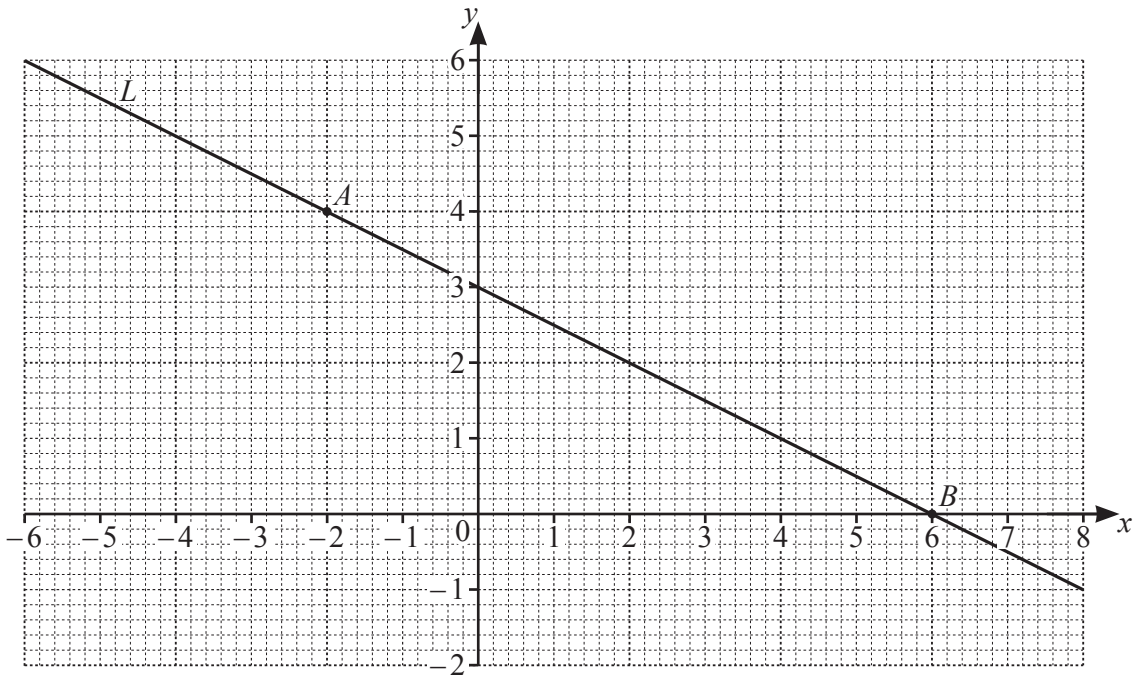
4 The diagram shows a line L and two points, A and B, on a grid.



View solution

(a) Write down the coordinates of point A.

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

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

View solution

..... [1]

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

View solution

$y =$ ..... [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.

View solution

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

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

..... cm [2]

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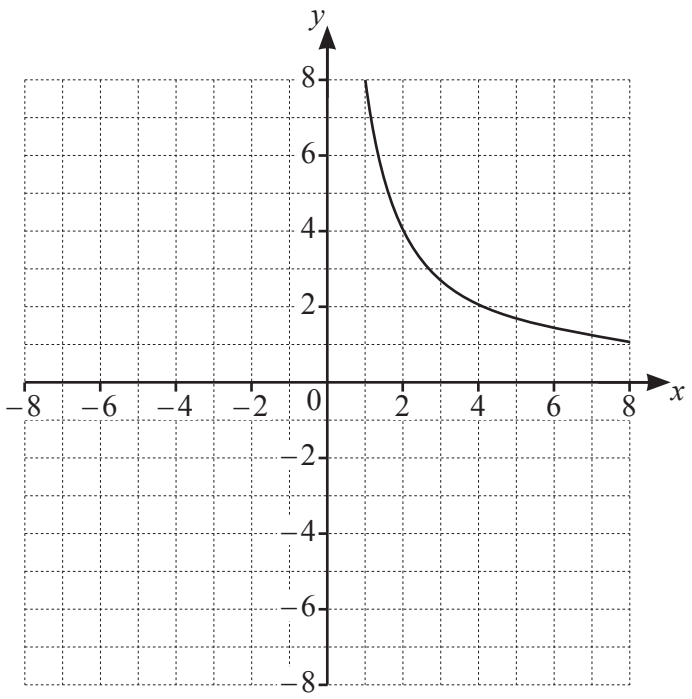
5



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

View solution

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

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

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

View solution

[1]

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

View solution

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

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

View solution

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.

View solution

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

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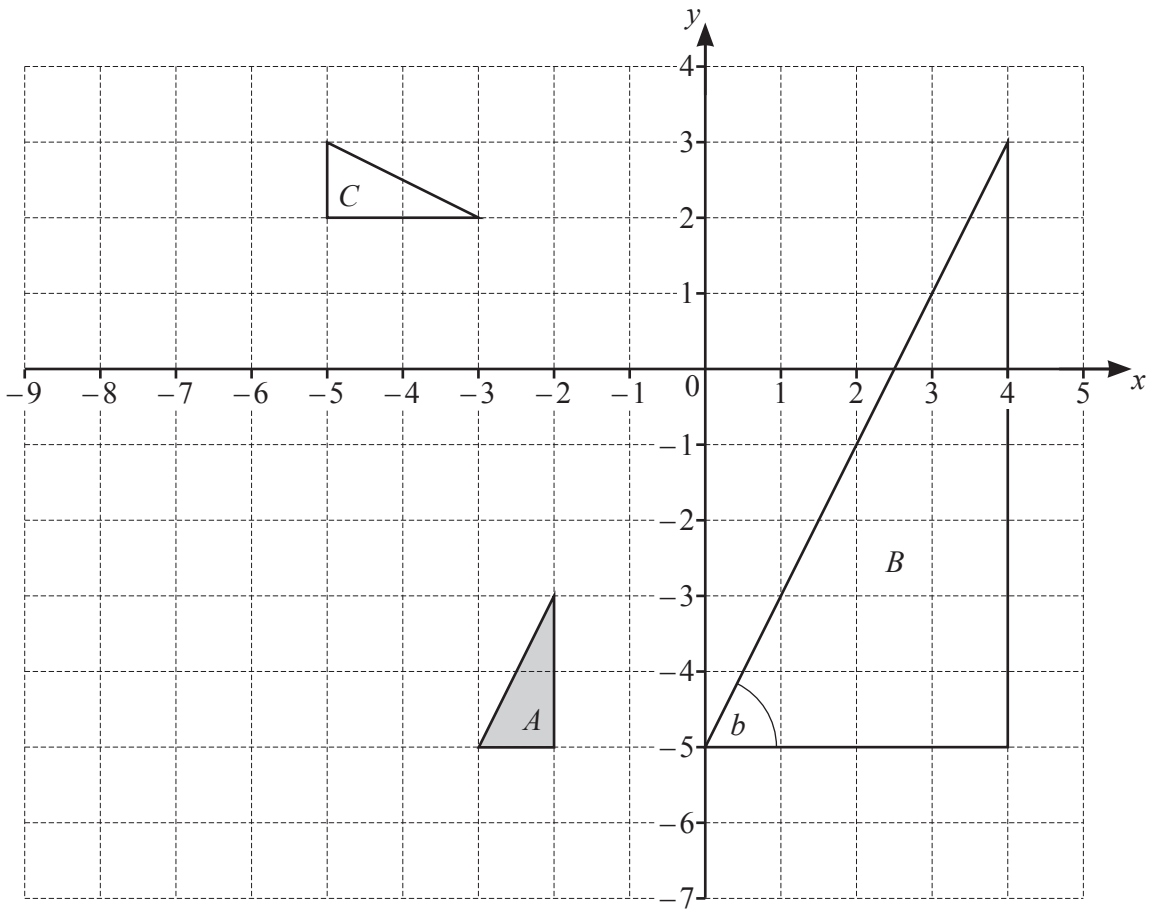
6 The diagram shows three triangles, A, B and C, on a 1 cm^2 grid.



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

(i) triangle A onto triangle B,

.....

..... [3]

View solution

(ii) triangle A onto triangle C.

.....

..... [3]

View solution

(b) On the grid, draw the image of

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

View solution

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

View solution

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

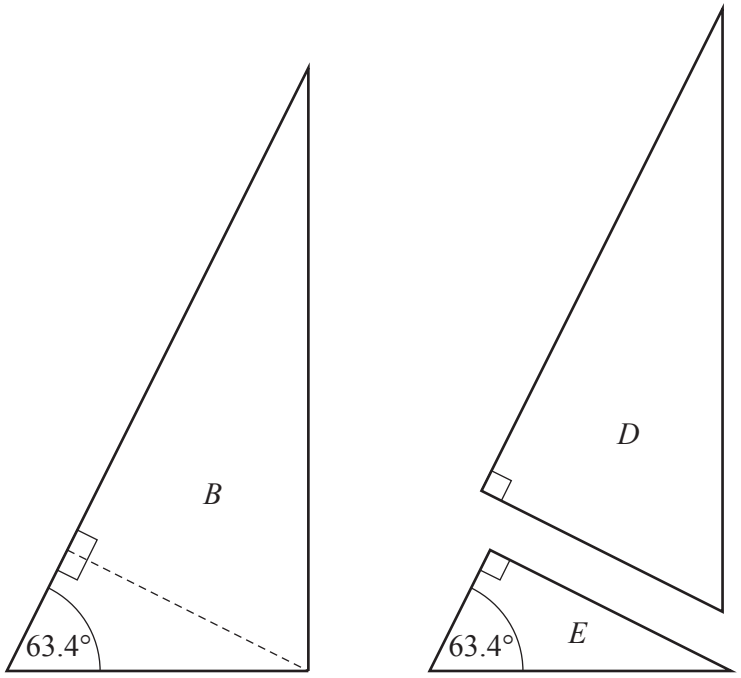
Use trigonometry to show that angle b is 63.4°, correct to 1 decimal place.

View solution

[2]

(d)

View solution



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.

View solution

(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.

View solution

(a) Work out the value of x.

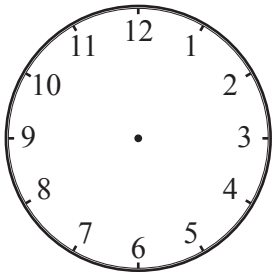
$x =$ ..... [3]

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

..... [2]

(b)

View solution



(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.

View solution

..... [2]

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

View solution

..... 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.

View solution

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.

View solution

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]

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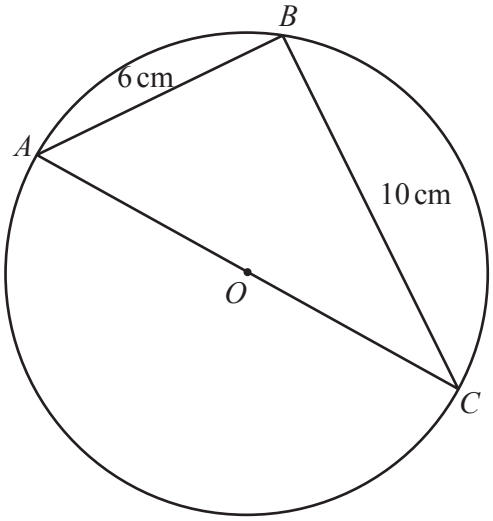
8 (a)



NOT TO SCALE

View solution

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.

View solution

..... cm^2 [2]

(iii) Work out AC.

View solution

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

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

View solution

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

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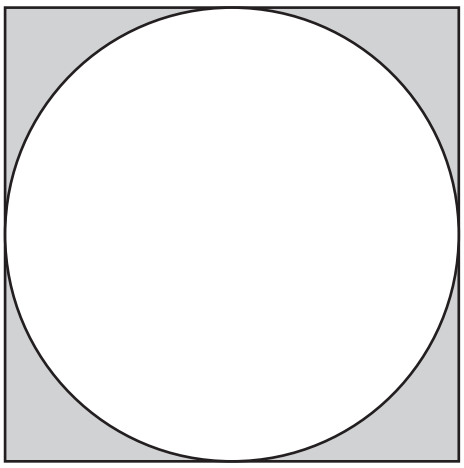
(c)



NOT TO SCALE

View solution

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

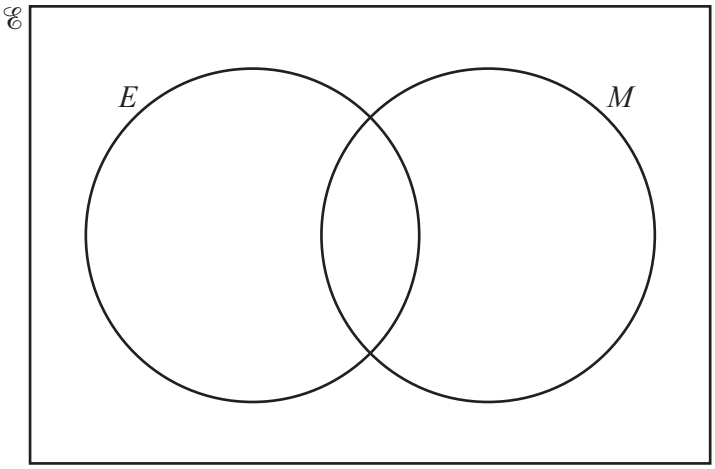
Calculate the shaded area.

..... cm^2 [4]

Question 9 is printed on the next page.

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

View solution



(i) Complete the Venn diagram. [2]

(ii) Write down $n(E \cup M)$.

..... [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.

View solution

Is she correct?
Give a reason for your answer.

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

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