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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 [].

This document has **16** pages.

- 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]

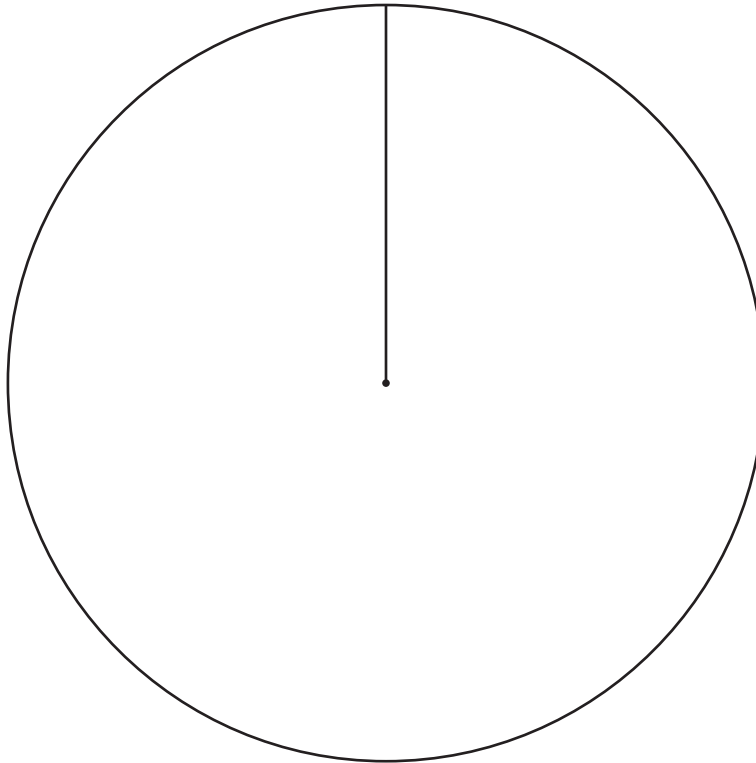
- 2 (a) Anika asks 15 friends how many marbles they have.
The results are shown in the table.

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.

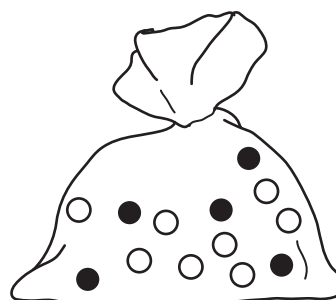
[2]

(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.

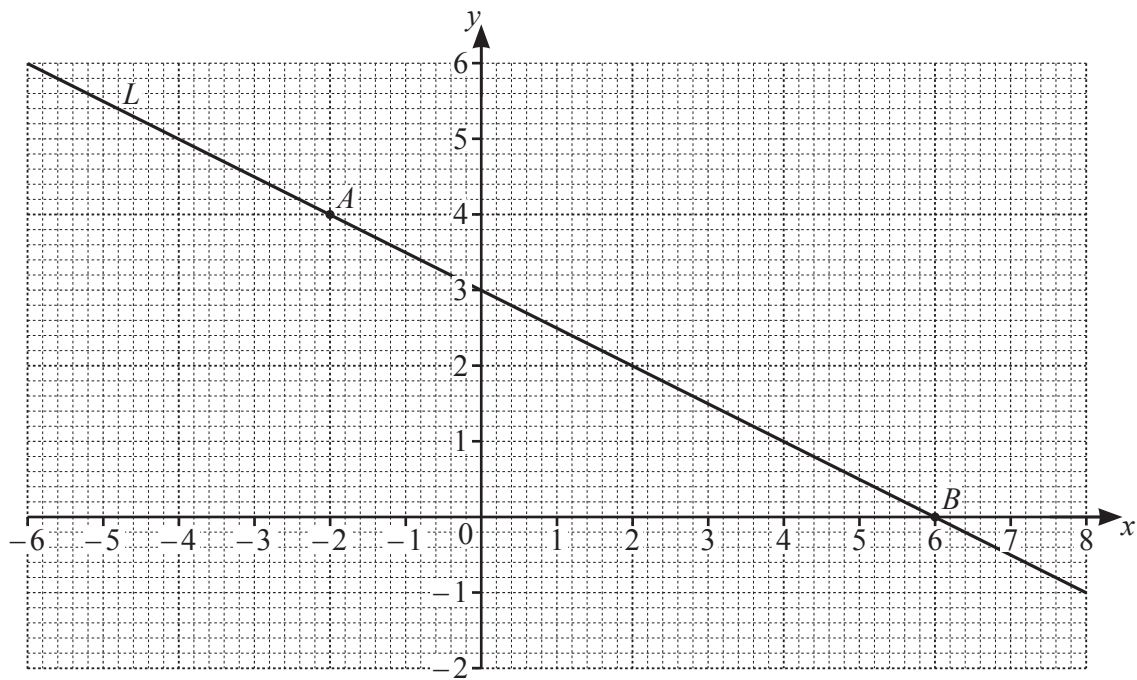
..... min [2]

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

Work out the bearing of R from K .

..... [2]

- 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]

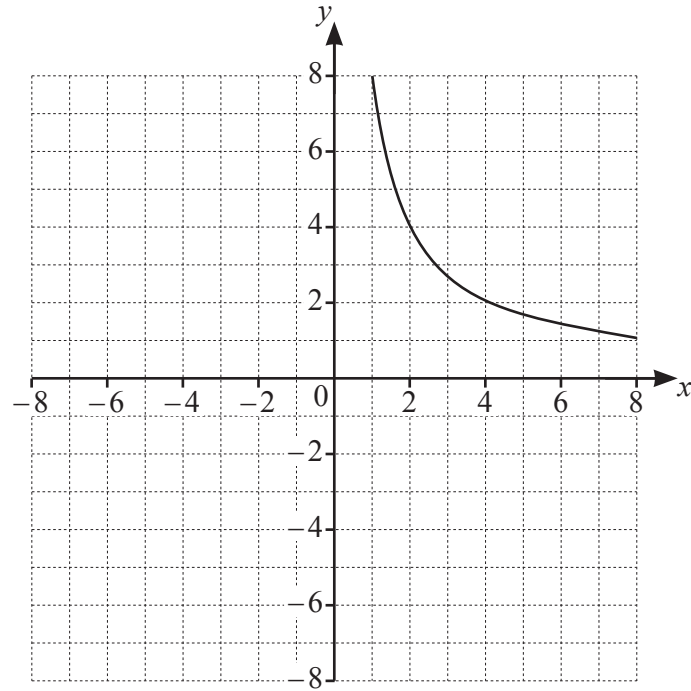
- (ii) This line crosses the x -axis at point C .

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]



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

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

$x = \dots\dots\dots$ [1]

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

[1]

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

$y = \dots\dots\dots$ [1]

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

x	-8	-4	-2	-1
y				

[2]

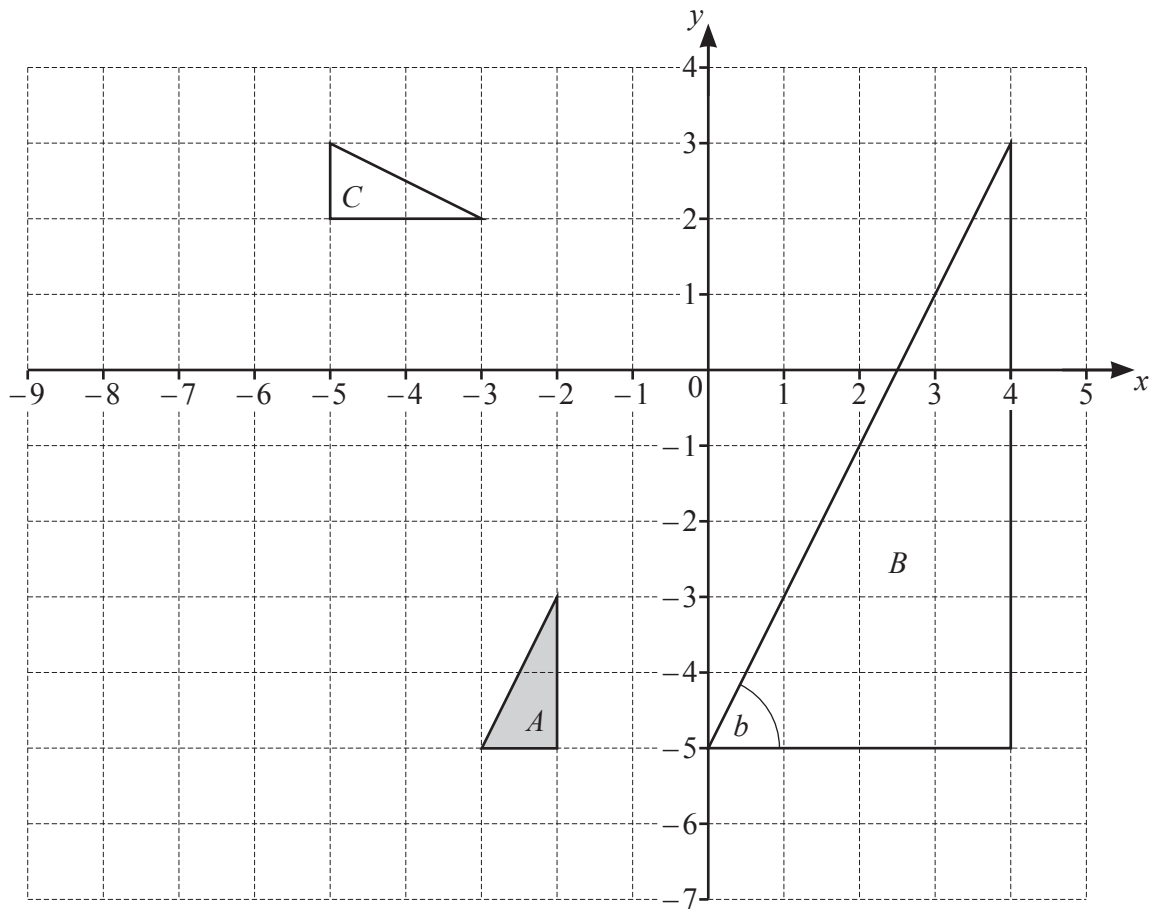
(ii) On the grid, draw the graph of $y = \frac{8}{x}$ for $-8 \leq x \leq -1$.

[3]

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

$\dots\dots\dots$ and $\dots\dots\dots$ [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]

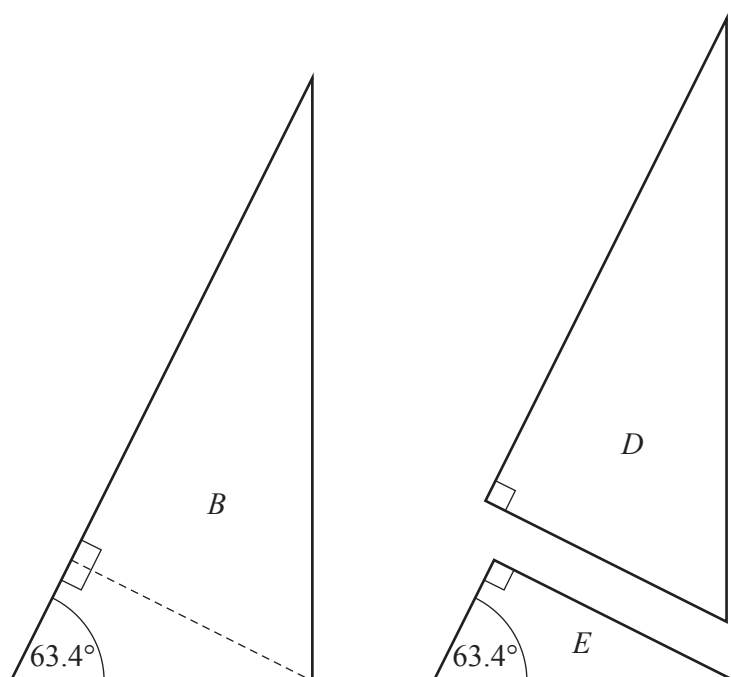
- (ii) triangle A after a reflection in the line $x = -4.5$. [2]

- (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.

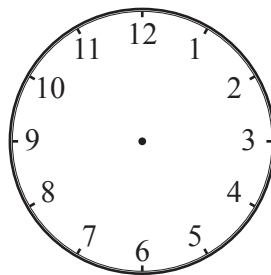
- (a) Work out the value of x .

$x =$ [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.

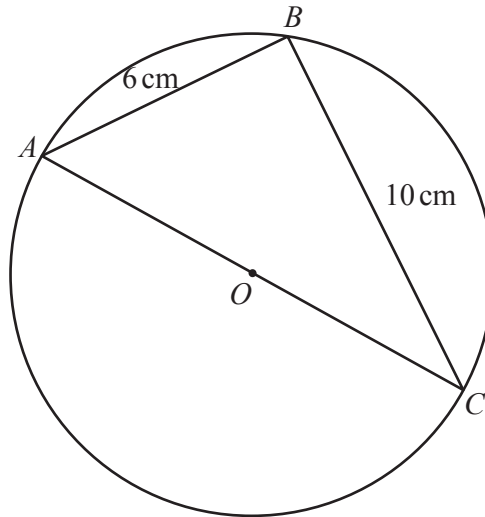
One clock is checked every 6 days.
The other clock is checked every 8 days.

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]

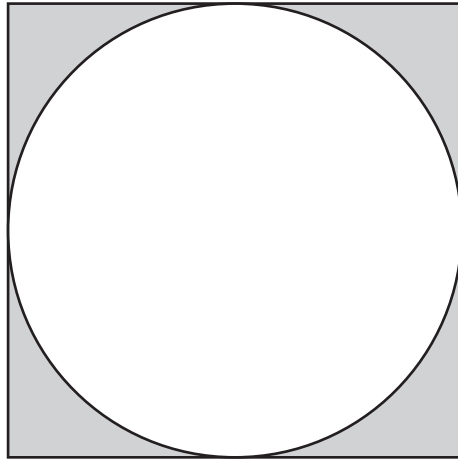
(iii) Work out AC .

$AC =$ cm [2]

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

$r =$ [2]

(c)

NOT TO
SCALE

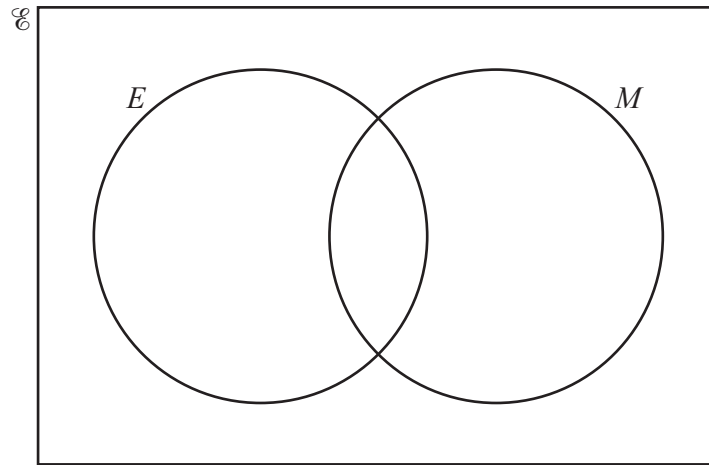
The diagram shows a circle inside a square.
The circle touches the four sides of the square.
The area of the square is 81 cm^2 .

Calculate the shaded area.

..... cm^2 [4]

Question 9 is printed on the next page.

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



(i) Complete the Venn diagram. [2]

(ii) Write down $n(E \cup M)$ [1]

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

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]

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