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MATHEMATICS

0580/43

Paper 4 (Extended)

May/June 2020

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

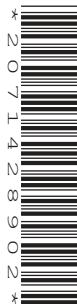
INSTRUCTIONS

- 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 **24** pages. Blank pages are indicated.



2

1 (a)

Campsite fees (per day)	
Tent	\$15.00
Caravan	\$25.00

The sign shows the fees charged at a campsite.
Today there are 54 tents and 18 caravans on the site.

Calculate the fees charged today.

\$ [2]

- (b) In September the total income at the campsite was \$37 054.
This was a decrease of 4.5% on the total income in August.

Calculate the total income in August.

\$ [2]

- (c) The visitors to the campsite today are in the ratio

$$\text{men} : \text{women} = 5 : 4 \quad \text{and} \quad \text{women} : \text{children} = 3 : 7.$$

- (i) Calculate the ratio men : women : children in its simplest form.

..... : : [2]

- (ii) Today there are 224 children at the campsite.

Calculate the total number of men and women.

..... [3]

3

- (d) The space allowed for each tent is a rectangle measuring 8 m by 6 m, each correct to the nearest metre.

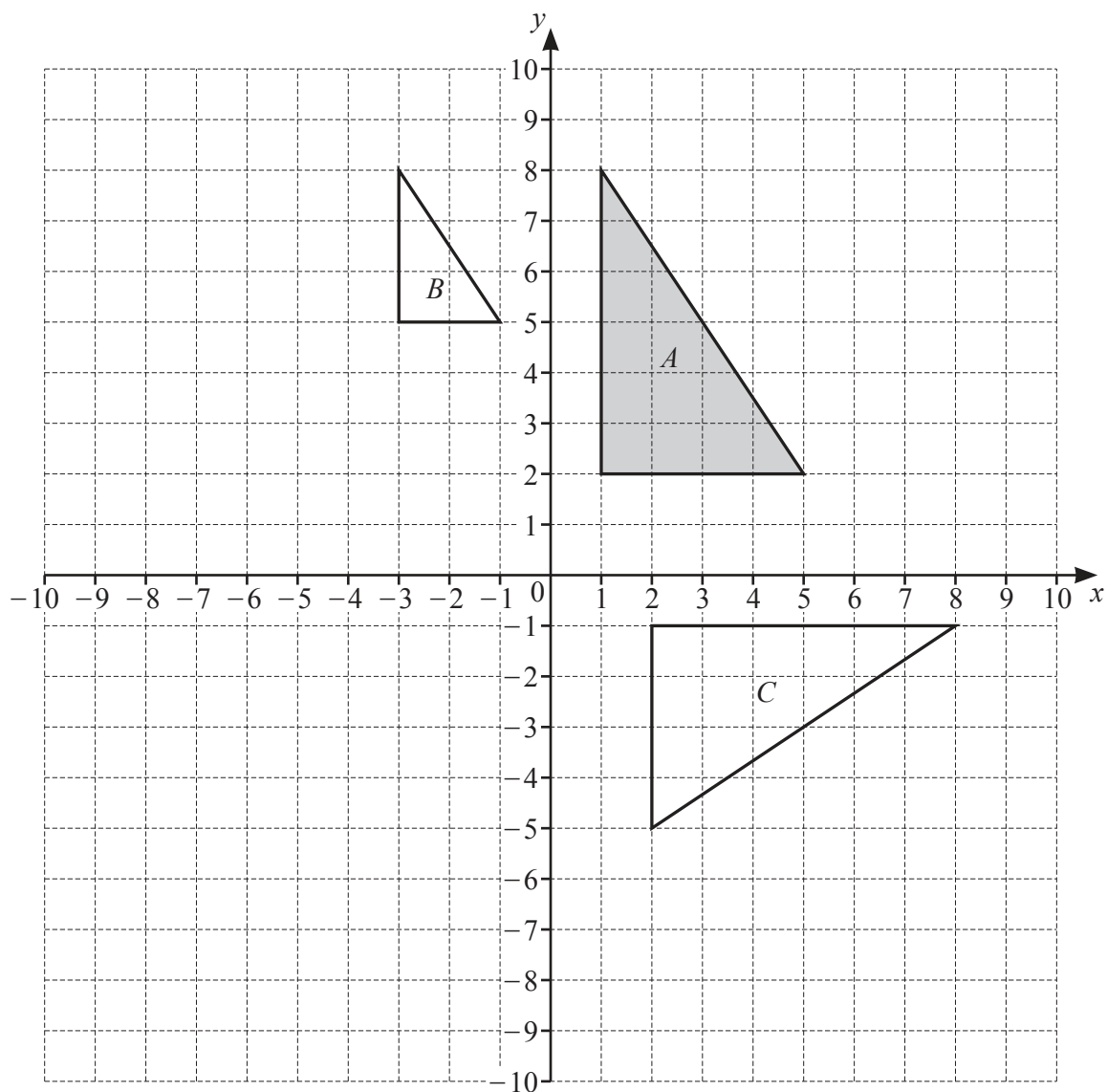
Calculate the upper bound for the area of the space allowed for each tent.

..... m^2 [2]

- (e) The value of the campsite has increased exponentially by 1.5% every year since it opened 30 years ago.

Calculate the value of the campsite now as a percentage of its value 30 years ago.

..... % [2]



(a) (i) Draw the image of triangle A after a reflection in the line $y = -x$. [2]

(ii) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -2 \\ -9 \end{pmatrix}$. [2]

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

(i) triangle A onto triangle B ,

..... [3]

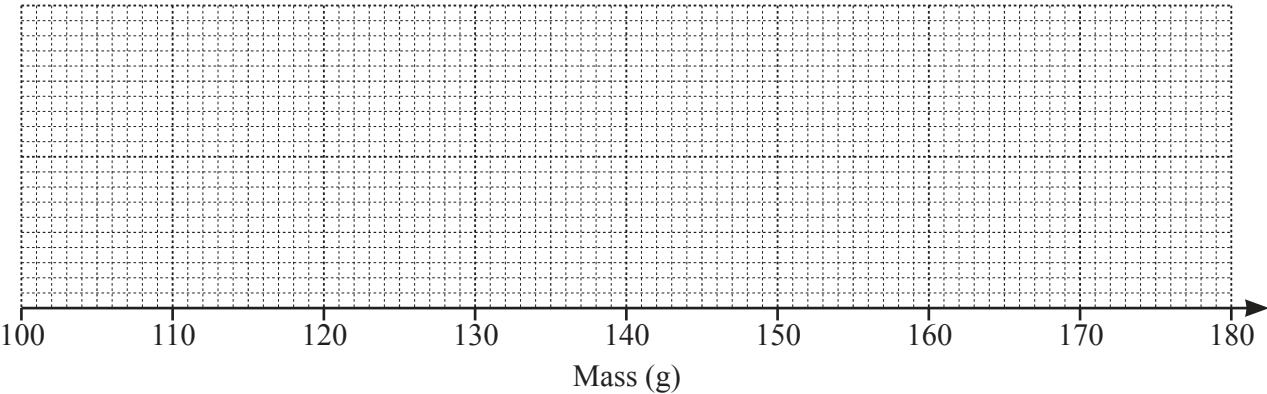
(ii) triangle A onto triangle C .

..... [3]

3 (a) Here is some information about the masses of potatoes in a sack:

- The largest potato has a mass of 174 g.
- The range is 69 g.
- The median is 148 g.
- The lower quartile is 121 g.
- The interquartile range is 38 g.

On the grid below, draw a box-and-whisker plot to show this information.



[4]

(b) The table shows the marks scored by some students in a test.

Mark	5	6	7	8	9	10
Frequency	8	2	12	2	0	1

Calculate the mean mark.

..... [3]

6

- 4 (a)** Solve the inequality.

$$3m + 12 \leq 8m - 5$$

..... [2]

- (b)** Solve the equation.

$$\frac{2x+5}{3-x} = \frac{14}{15}$$

$x =$ [3]

7

- (c) Solve the simultaneous equations.
You must show all your working.

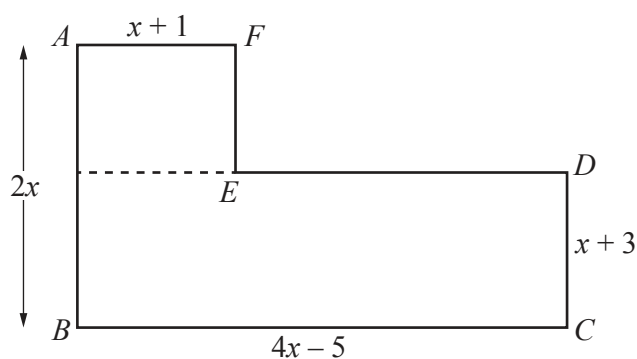
$$\begin{aligned}y &= 4 - x \\x^2 + 2y^2 &= 67\end{aligned}$$

$$x = \dots\dots\dots, y = \dots\dots\dots$$

$$x = \dots\dots\dots, y = \dots\dots\dots [6]$$

8

5 All the lengths in this question are in centimetres.



NOT TO
SCALE

The diagram shows a shape $ABCDEF$ made from two rectangles.
The total area of the shape is 342 cm^2 .

(a) Show that $x^2 + x - 72 = 0$.

[5]

(b) Solve by factorisation.

$$x^2 + x - 72 = 0$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

9

(c) Work out the perimeter of the shape $ABCDEF$.

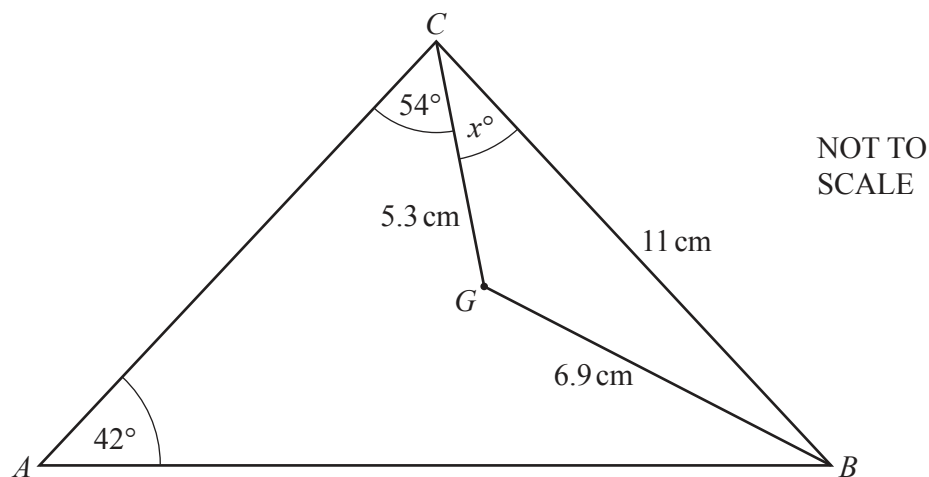
..... cm [2]

(d) Calculate angle DBC .

Angle $DBC =$ [2]

10

6 (a)



The diagram shows triangle ABC with point G inside.
 $CB = 11\text{ cm}$, $CG = 5.3\text{ cm}$ and $BG = 6.9\text{ cm}$.
 Angle $CAB = 42^\circ$ and angle $ACG = 54^\circ$.

(i) Calculate the value of x .

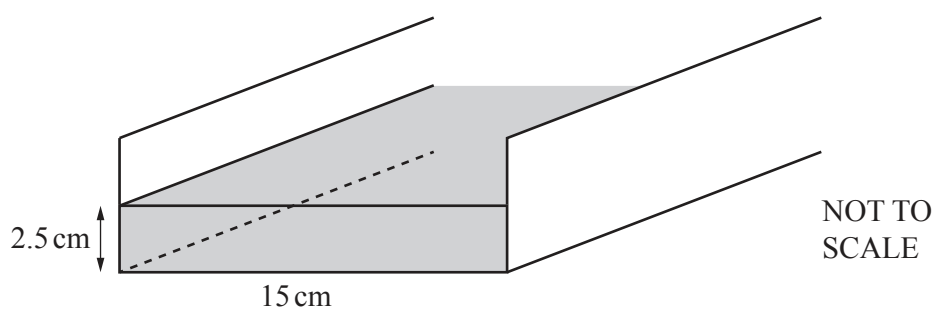
$x = \dots\dots\dots$ [4]

(ii) Calculate AC .

$AC = \dots\dots\dots\text{ cm}$ [4]

11

(b)



Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
The width of the channel is 15 cm.
The depth of the water is 2.5 cm.

Calculate the amount of water that flows from the channel into the lake in 1 hour.
Give your answer in litres.

..... litres [4]

The diagram illustrates an extensive form game tree for a tennis match between Arun and Bob. The game starts with Arun at the root node, who chooses between 'Plays' and 'Does not play'. If Arun chooses 'Plays', the game moves to a node for Bob, who chooses between 'Plays' and 'Does not play'. If Arun chooses 'Does not play', the game moves to another node for Bob, who also chooses between 'Plays' and 'Does not play'. The terminal nodes represent the final outcome of the match. The tree is drawn with solid lines for the main branches and dotted lines for the continuation of the game.

```
graph LR; Arun((Arun)) -- Plays --> Bob1((Bob)); Arun -- Does not play --> Bob2((Bob)); Bob1 -- Plays --> T1[Plays]; Bob1 -- Does not play --> T2[Does not play]; Bob2 -- Plays --> T3[Plays]; Bob2 -- Does not play --> T4[Does not play];
```

(ii) Calculate the probability that, one Saturday, Arun and Bob both play football.

(iii) Calculate the probability that, one Saturday, either Arun plays football or Bob plays football, but not both.

..... [3]

13

- (b)** Calculate the probability that Bob plays football for 2 of the next 3 Saturdays.

..... [3]

- (c)** When Arun plays football, the probability that he scores the winning goal is $\frac{1}{7}$.

Calculate the probability that Arun scores the winning goal one Saturday.

..... [2]

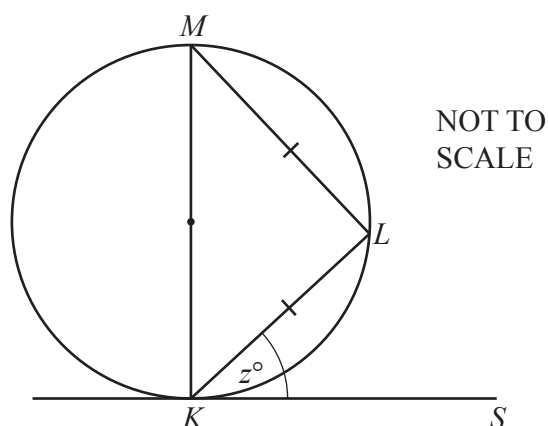
- 8 (a) The interior angle of a regular polygon with n sides is 150° .

Calculate the value of n .

$$n = \dots\dots\dots [2]$$

- (b) (i) K, L and M are points on the circle.
 KS is a tangent to the circle at K .
 KM is a diameter and triangle KLM is isosceles.

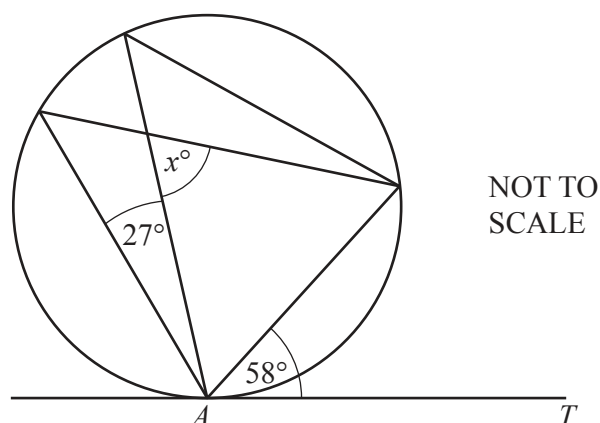
Find the value of z .



$$z = \dots\dots\dots [2]$$

- (ii) AT is a tangent to the circle at A .

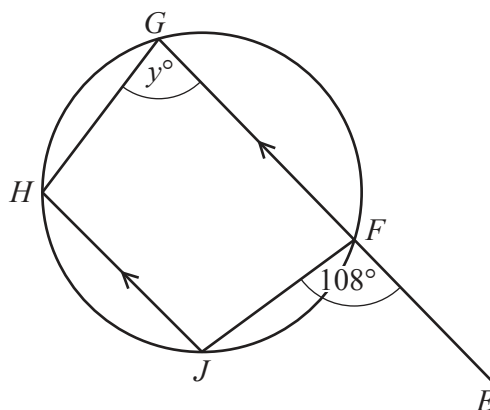
Find the value of x .



$$x = \dots\dots\dots [2]$$

15

(iii)

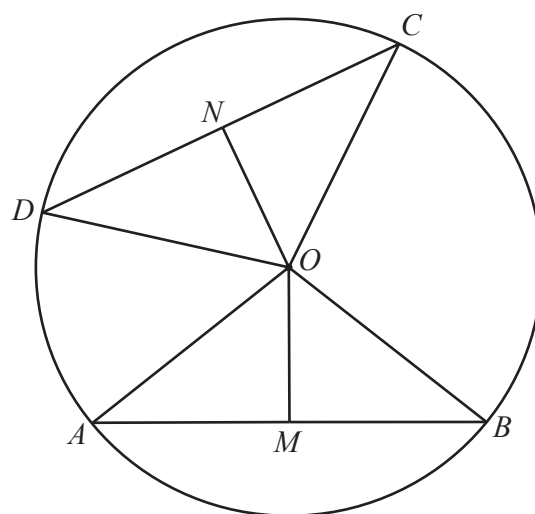
NOT TO
SCALE

F , G , H and J are points on the circle.
 EFG is a straight line parallel to JH .

Find the value of y .

$y = \dots\dots\dots$ [2]

(c)

NOT TO
SCALE

A , B , C and D are points on the circle, centre O .
 M is the midpoint of AB and N is the midpoint of CD .
 $OM = ON$

Explain, giving reasons, why triangle OAB is congruent to triangle OCD .

.....

[3]

16

9 (a) The equation of line L is $3x - 8y + 20 = 0$.

(i) Find the gradient of line L .

..... [2]

(ii) Find the coordinates of the point where line L cuts the y -axis.

(..... ,) [1]

17

(b) The coordinates of P are $(-3, 8)$ and the coordinates of Q are $(9, -2)$.

(i) Calculate the length PQ .

..... [3]

(ii) Find the equation of the line parallel to PQ that passes through the point $(6, -1)$.

..... [3]

(iii) Find the equation of the perpendicular bisector of PQ .

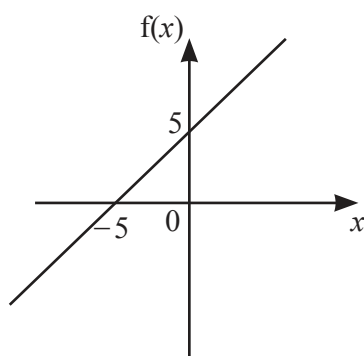
..... [4]

18

10 (a) The diagrams show the graphs of two functions.

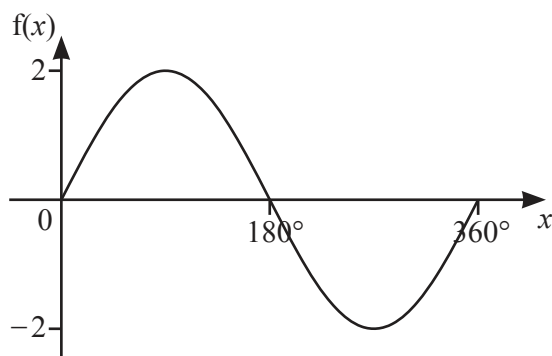
Write down each function.

(i)



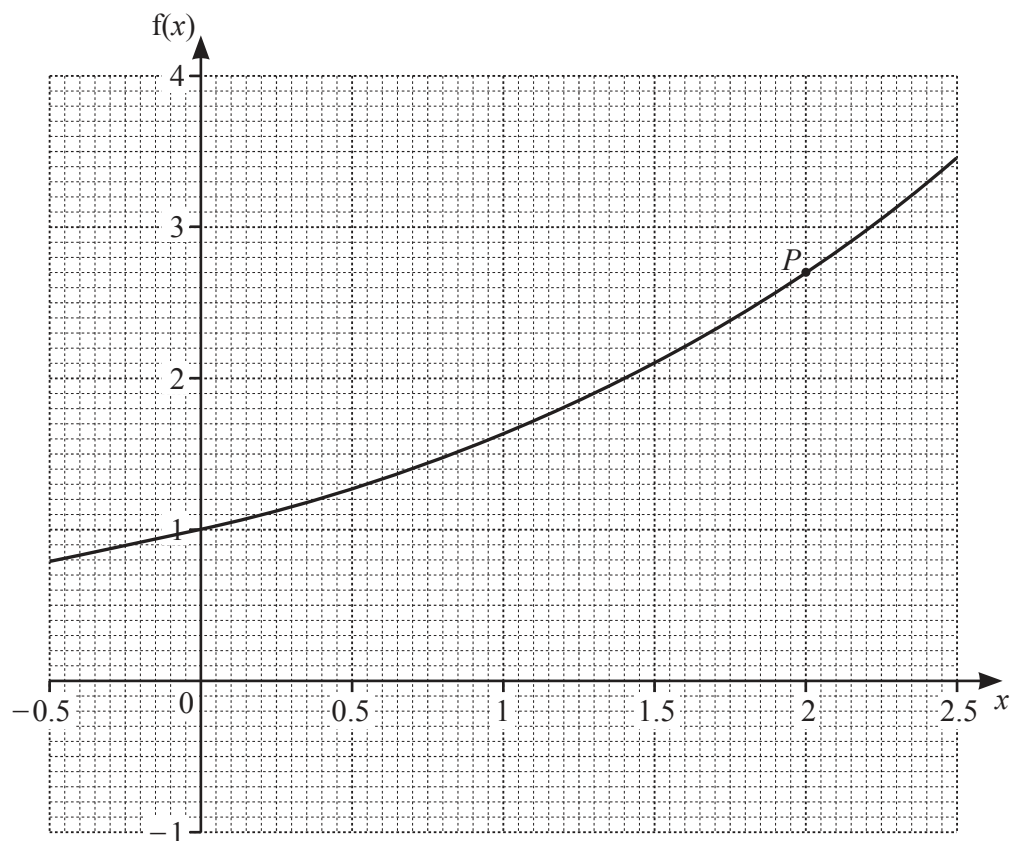
$f(x) = \dots\dots\dots$ [2]

(ii)



$f(x) = \dots\dots\dots$ [2]

(b)



The diagram shows the graph of another function.

By drawing a suitable tangent, find an estimate for the gradient of the function at the point P .

..... [3]

20

11 $f(x) = 7x - 4$

$g(x) = \frac{2x}{x-3}, x \neq 3$

$h(x) = x^2$

(a) Find $g(6)$.

..... [1]

(b) Find $fg(4)$.

..... [2]

(c) Find $fh(x)$.

..... [1]

(d) Find $\frac{f(x)}{2} + g(x)$.Give your answer as a single fraction, in terms of x , in its simplest form.

..... [3]

21

(e) Find the value of x when $f(x+2) = -11$.

$x = \dots\dots\dots$ [2]

(f) Find the values of p that satisfy $h(p) = p$.

$\dots\dots\dots$ [2]

12 (a) A curve has equation $y = 4x^3 - 3x + 3$.

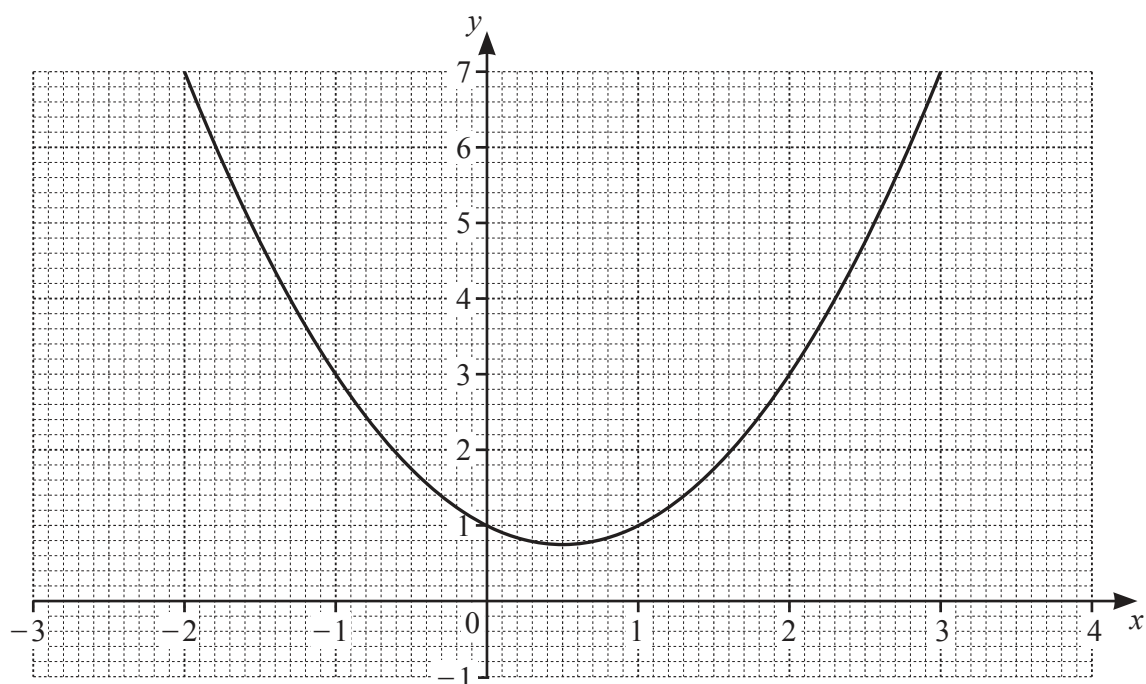
(i) Find the coordinates of the two stationary points.

(..... ,) and (..... ,) [5]

(ii) Determine whether each of the stationary points is a maximum or a minimum.
Give reasons for your answers.

[3]

- (b) The graph of $y = x^2 - x + 1$ is shown on the grid.



By drawing a suitable line on the grid, solve the equation $x^2 - 2x - 2 = 0$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

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