

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
2-3	
4-5	
6-7	
8-9	
10-11	
12-13	
14-15	
16-17	
18-19	
20-21	
22	
TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2013

Mathematics (Linear)

43651H

Paper 1

Tuesday 11 June 2013 9.00 am to 10.30 am

H

<p>For this paper you must have:</p> <ul style="list-style-type: none"> mathematical instruments. <p>You must not use a calculator.</p>	
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Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- The quality of your written communication is specifically assessed in Questions 14 and 16. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

Advice

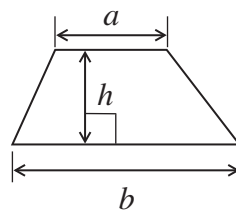
- In all calculations, show clearly how you work out your answer.



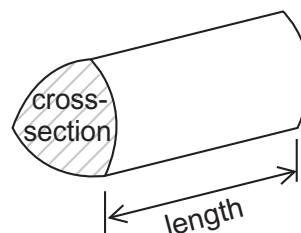
J U N 1 3 4 3 6 5 1 H 0 1

Formulae Sheet: Higher Tier

$$\text{Area of trapezium} = \frac{1}{2}(a+b)h$$

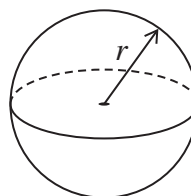


$$\text{Volume of prism} = \text{area of cross-section} \times \text{length}$$



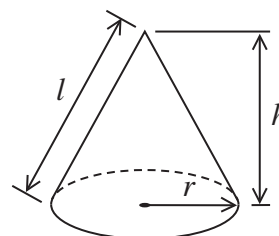
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$\text{Surface area of sphere} = 4\pi r^2$$



$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$

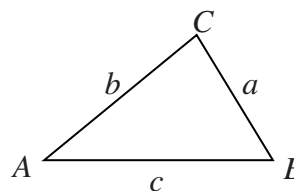


In any triangle ABC

$$\text{Area of triangle} = \frac{1}{2}ab \sin C$$

$$\text{Sine rule} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$



The Quadratic Equation

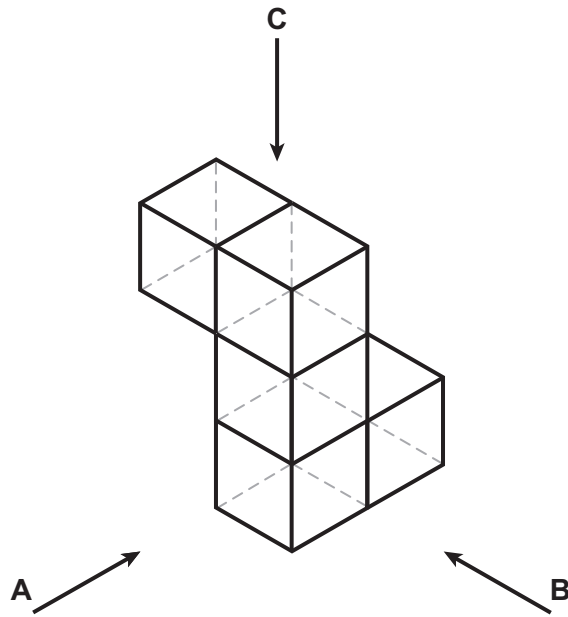
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$



Answer **all** questions in the spaces provided.

1 This shape is made from **five** cubes.



Draw what the shape looks like when seen from A, B and C.

From A

From B

From C

(3 marks)

3

Turn over ►



2 Work out an approximate value of $\frac{41 \times 198}{77}$

.....
.....
.....

Answer (2 marks)

3 Which of the following expressions will give the median value when $n = 10$?

$\frac{1}{n}$ $n - 1$ $n + 1$ n^2 \sqrt{n}

You **must** show your working.

.....
.....
.....

Answer (3 marks)



- 4 p is an even number.
 q is an odd number.

Tick the correct box for each part.

- 4 (a) Is pq an odd number, an even number or could it be either?

odd

even

could be either

(1 mark)

- 4 (b) Is $3(p + q)$ an odd number, an even number or could it be either?

odd

even

could be either

(1 mark)

- 4 (c) Is $p \div q$ an integer, not an integer or could it be either?

integer

not an integer

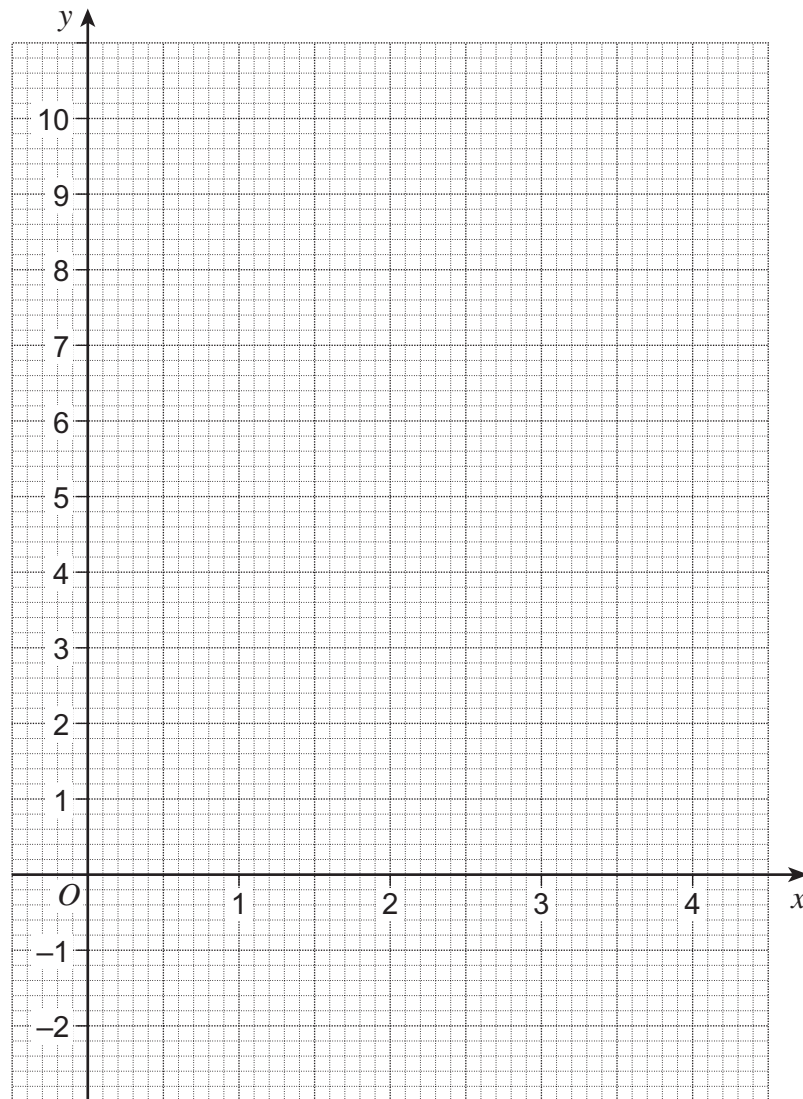
could be either

(1 mark)

Turn over for the next question



5 (a) Draw the graph of $y = 2x - 1$ for values of x from 0 to 4.



(3 marks)



5 (b) Solve $2x - 1 = 2$

.....
.....

$x =$ (1 mark)

Turn over for the next question

4

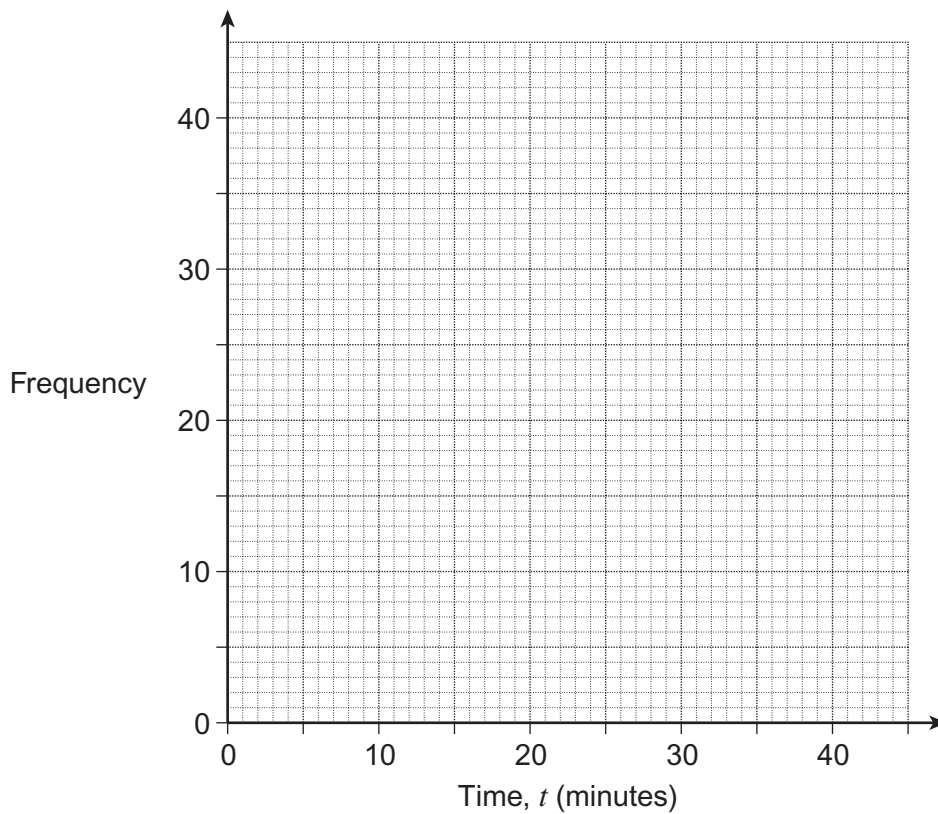
Turn over ►



- 6** The times taken by 100 students to travel to school are shown.

Time, t (minutes)	Frequency
$0 < t \leq 10$	36
$10 < t \leq 20$	34
$20 < t \leq 30$	18
$30 < t \leq 40$	12

- 6 (a)** Draw a frequency diagram for the data.



(2 marks)

- 6 (b)** The school has 600 students.

Estimate how many students take more than 20 minutes to travel to school.

.....

Answer

(2 marks)



- 7 The total number of people living in a street is 30.
The table shows the number of people living in each house.

Number of people living in each house	Number of houses
2	4
3	3
4	a
5	1

Work out the value of a .
You **must** show your working.

.....

.....

.....

$a =$ (3 marks)



8 (a) Factorise $3x - 15$

Answer (1 mark)

8 (b) Multiply out $5(y + 4t - 2)$

.....

Answer (2 marks)

8 (c) Solve $3(w + 2) = 2w - 1$

.....

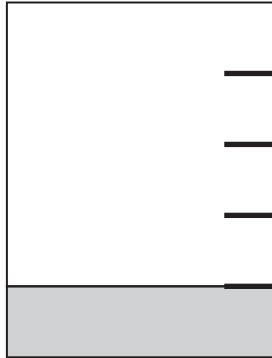
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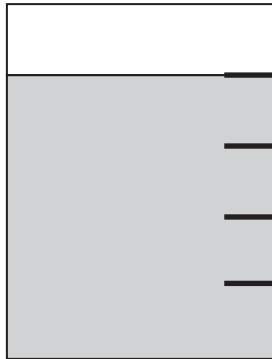
$w =$ (3 marks)



9 When a jug is $\frac{1}{5}$ full of water it weighs 250 grams.



When the same jug is $\frac{4}{5}$ full of water it weighs 550 grams.



How much does the jug weigh when it is empty?

.....

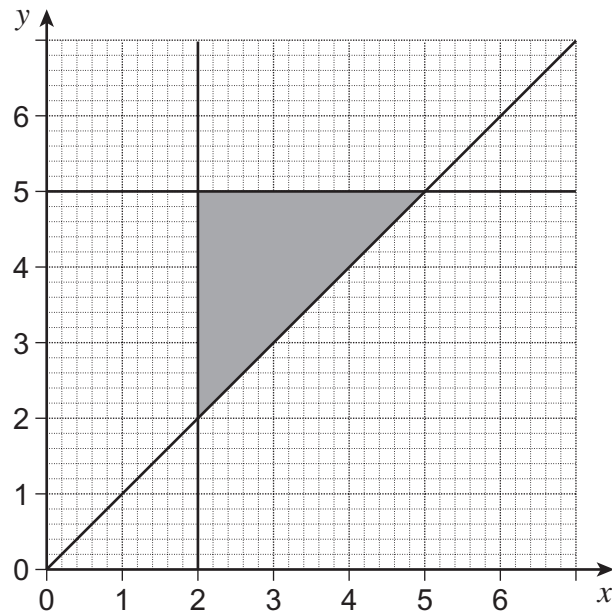
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Answer grams (4 marks)



10 Work out the three inequalities that describe the shaded region.



Answer

.....

.....

(3 marks)



11 A triangle, square and pentagon have a **total** area of 48 cm^2 .
The areas of the shapes are in the ratio of their number of sides.

Work out the area of the **pentagon**.

.....
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.....

Answer cm^2 (3 marks)

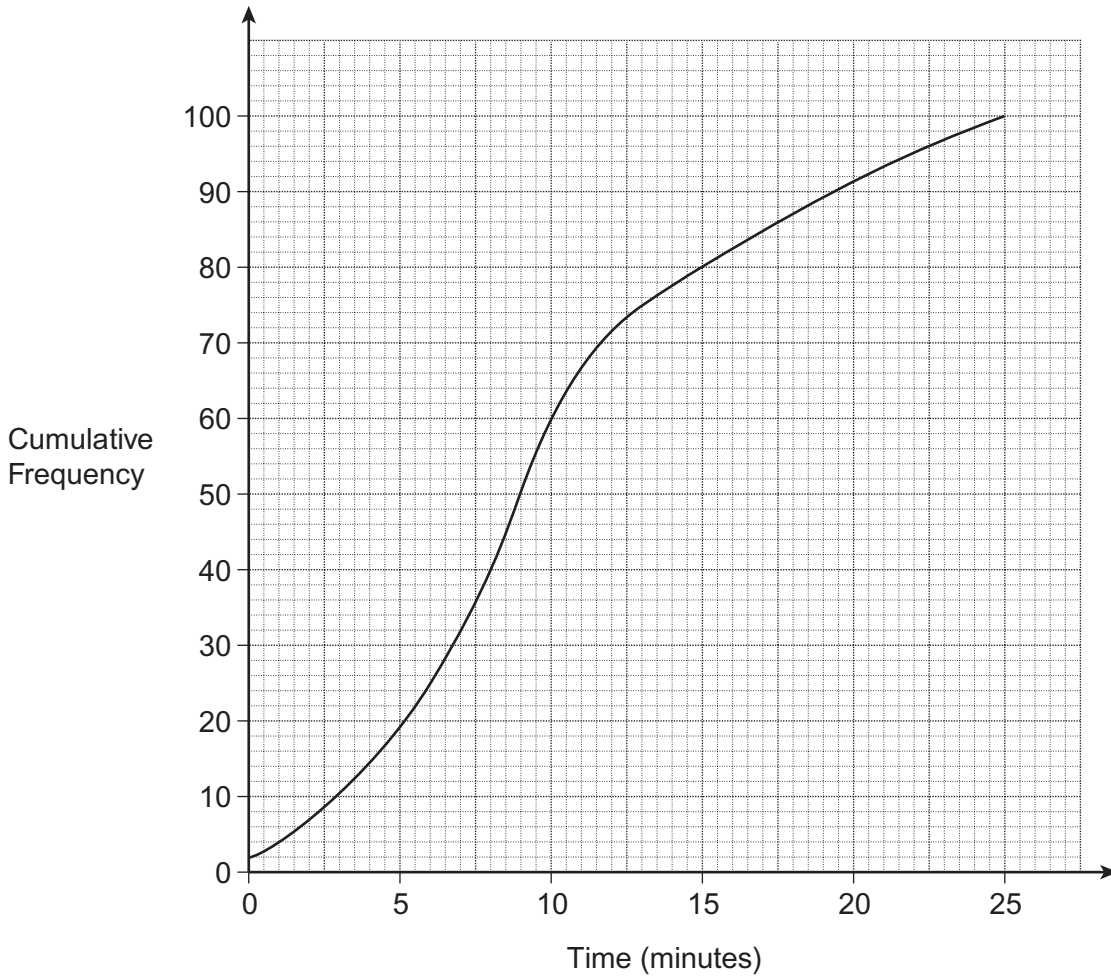
12 Rearrange $2(a + c) = 5(a - b)$ to make c the subject.

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Answer (3 marks)



13 The times that 100 customers spent queuing in a post office were recorded. The cumulative frequency diagram shows the results.



13 (a) How many customers queued for more than 15 minutes?

.....

Answer (1 mark)

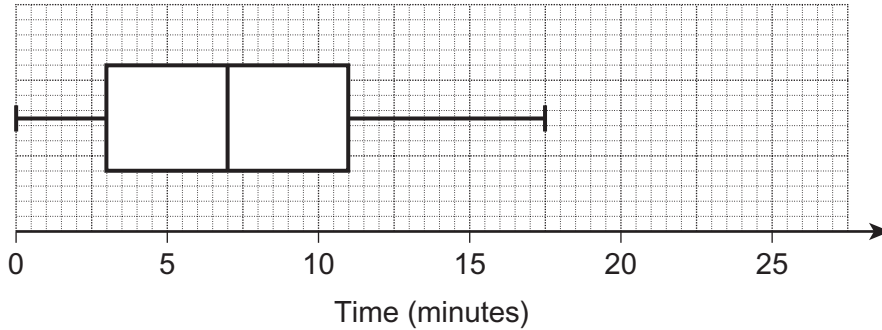
13 (b) Work out the median queuing time.

.....

Answer minutes (1 mark)



- 13 (c)** A new serving window was opened in the post office.
The times that 100 customers spent queuing were then recorded.
The box plot shows the results.



Work out the inter-quartile range of these times.

.....

Answer minutes (2 marks)

- 13 (d)** Compare the queuing times before and after the new serving window was opened.
Give **two** comparisons.

Comparison 1

.....

.....

Comparison 2

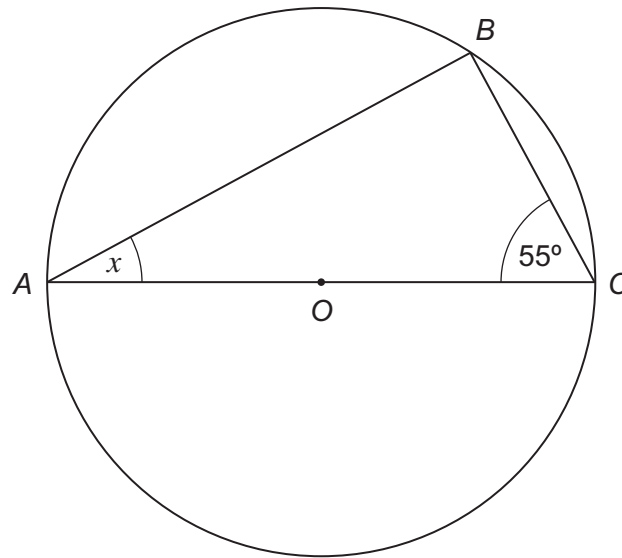
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(2 marks)



- 14 (a) A , B and C are points on the circumference of a circle with centre O .



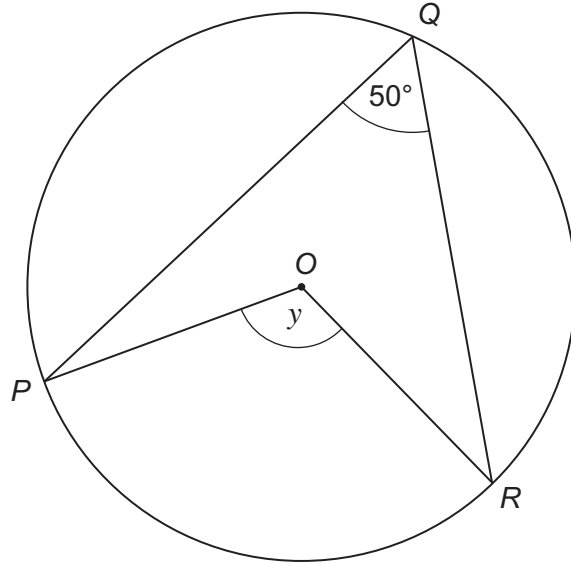
Not drawn
accurately

Work out the size of angle x .

Answer degrees (1 mark)



***14 (b)** P , Q and R are points on the circumference of a circle with centre O .



Not drawn
accurately

Work out the size of angle y .
Give a reason for your answer.

Answer degrees

Reason

.....
(2 marks)

Turn over for the next question



15 (a) Expand and simplify $(3x + 2)(2x + 5)$

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Answer (2 marks)

15 (b) Simplify fully $(3x^2y^4)^2$

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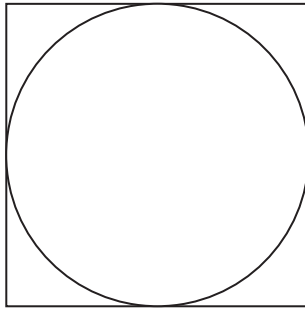
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Answer (2 marks)



***16** A circle is drawn inside a square as shown.



Show that the area of the circle is more than 75% of the area of the square.

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(4 marks)

Turn over for the next question



17 n is an integer.

Show that $\frac{n(n-1)}{2} + \frac{n(n+1)}{2}$ is a square number.

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(3 marks)

18 The graph of $y = x^2 + 2x - 3$ is drawn on the opposite page.

Draw an appropriate **straight** line on the graph to work out the approximate solutions of

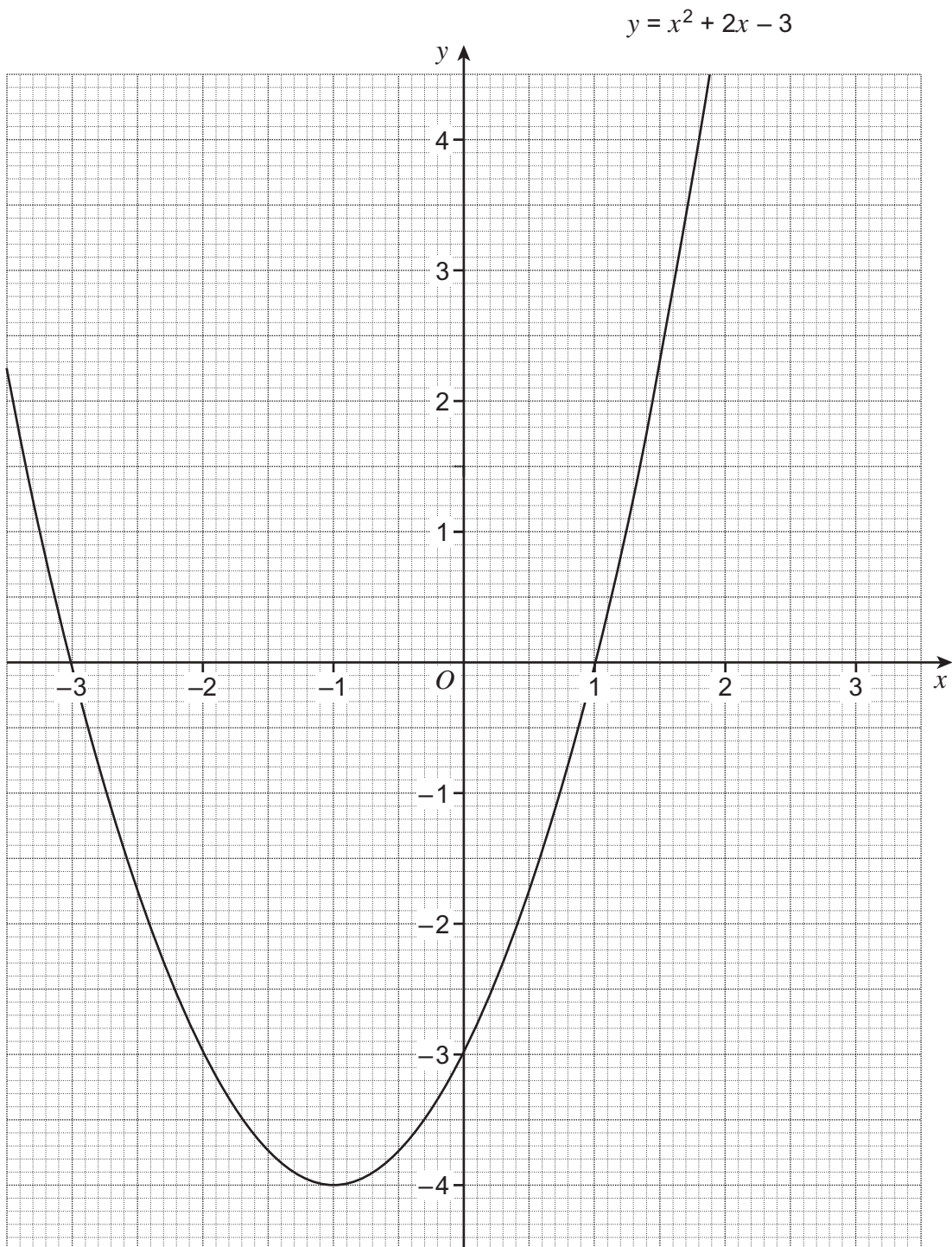
$$x^2 + x - 3 = 0$$

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Answer (3 marks)





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