



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

MATHEMATICS

H

Higher Tier Paper 3 Calculator

8300/3H

Tuesday 13 June 2017 Morning

Time allowed: 1 hour 30 minutes

For this paper you must have:

- a calculator
- mathematical instruments.

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



JUN178300/3H01

INSTRUCTIONS

- **Use black ink or black ball-point pen. Draw diagrams in pencil.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do NOT write on blank pages.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**



INFORMATION

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 80.**
- **You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.**

ADVICE

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

**DO NOT TURN OVER UNTIL TOLD
TO DO SO**



Answer ALL questions in the spaces provided

1 $\mathbf{a} = \begin{pmatrix} -4 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$

**Circle the vector $2\mathbf{a} + \mathbf{b}$
[1 mark]**

$$\begin{pmatrix} -5 \\ -3 \end{pmatrix}$$

$$\begin{pmatrix} -11 \\ -3 \end{pmatrix}$$

$$\begin{pmatrix} -5 \\ -1 \end{pmatrix}$$

$$\begin{pmatrix} -11 \\ -1 \end{pmatrix}$$

2 **Which of these values of n
makes $2 \cdot 7 \times 10^n$ a cube number?**

Circle your answer. [1 mark]

0

1

2

3



- 3 Rearrange $2x = \frac{y}{w}$ to make w the subject.

Circle your answer. [1 mark]

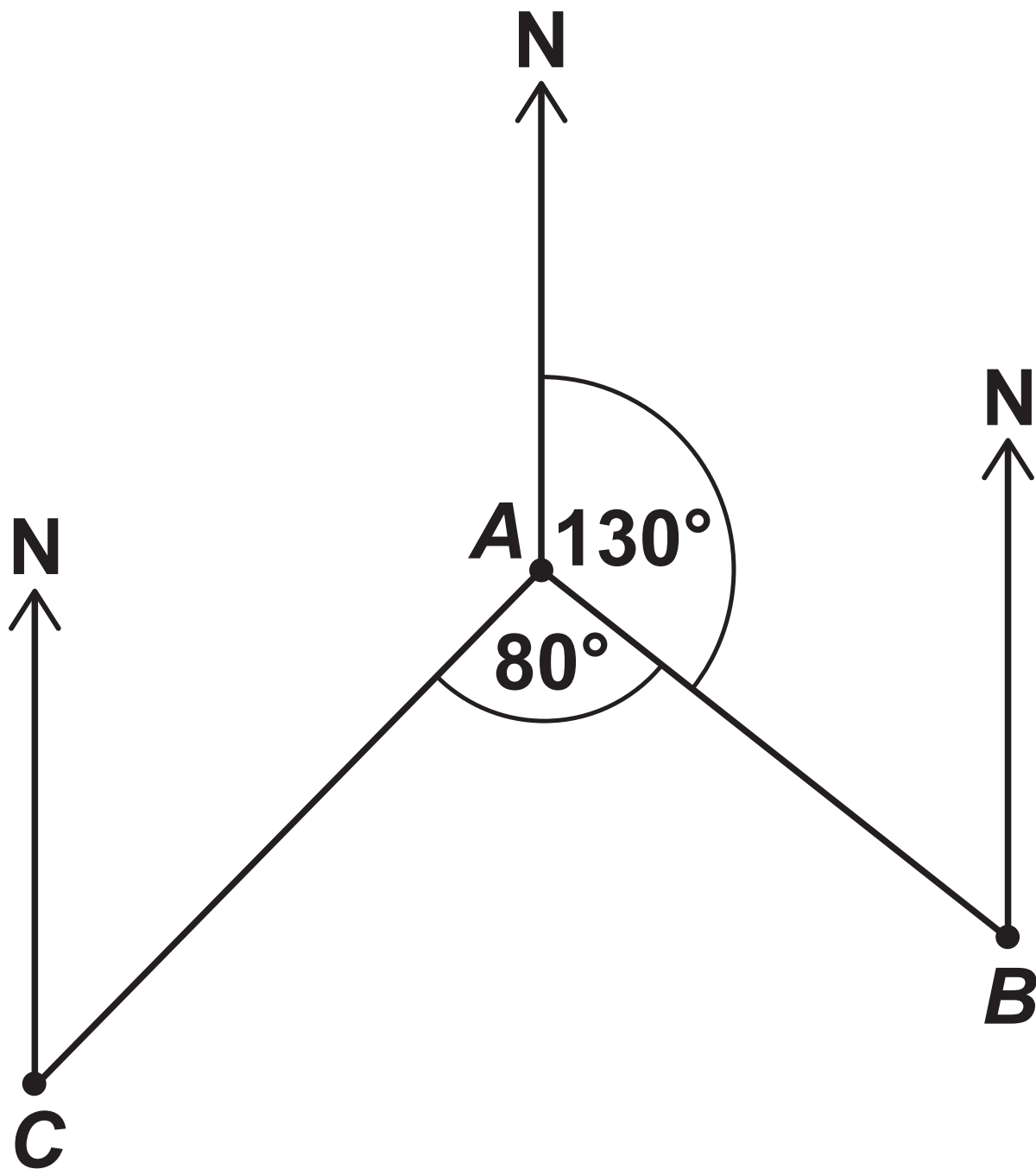
$$w = \frac{2y}{x} \quad w = \frac{2x}{y} \quad w = \frac{y}{2x} \quad w = \frac{x}{2y}$$

[Turn over]



4

Not drawn accurately



Work out the bearing of C from A.

Circle your answer. [1 mark]

030°

130°

150°

210°



5 A coin lands on Tails 200 times.

The relative frequency of Tails is 0.4

Work out the number of times the coin was thrown. [2 marks]

Answer _____

[Turn over]

6 How are the whole number solutions to A and B different?

A Solve $3 \leq 3x < 18$

B Solve $3 < 3x \leq 18$

[2 marks]



- 7 (a) The length of a pipe is 6 metres to the nearest metre.

Complete the error interval for the length of the pipe. [2 marks]

Answer _____ m \leq length $<$ _____ m

[Turn over]



7 (b) The length of a different pipe is 4 metres to the nearest metre.

Olly says,

“The total length of the two pipes is 11 metres to the nearest metre.”

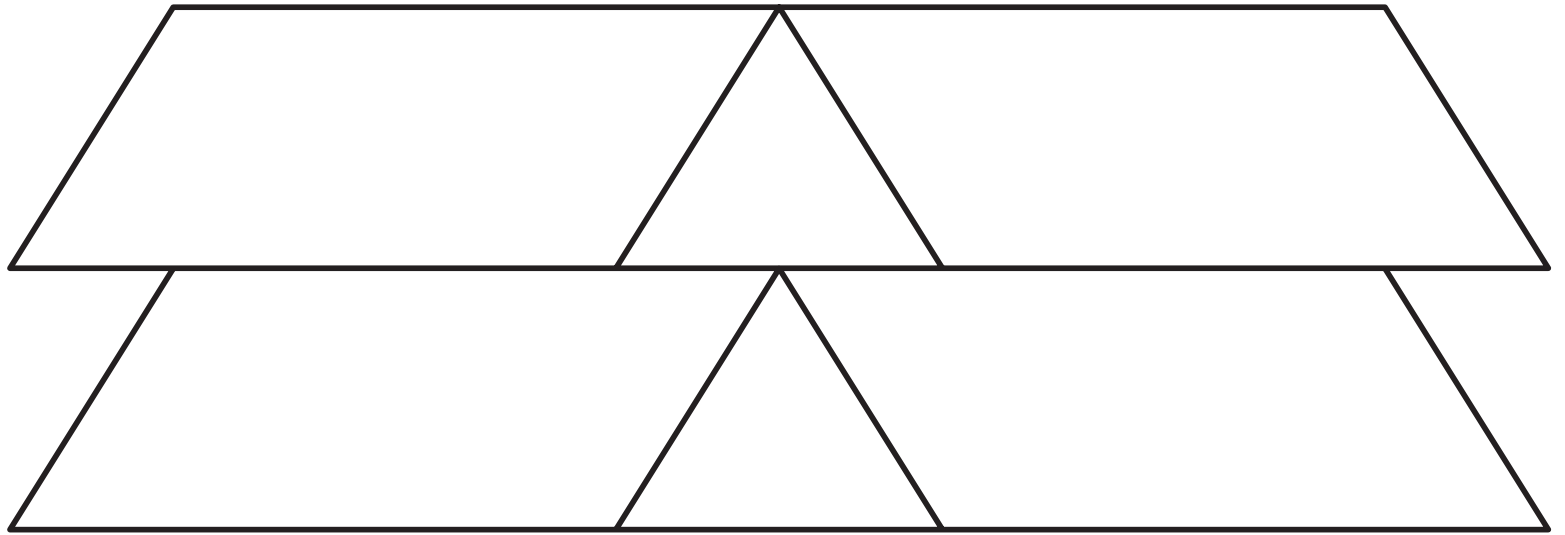
Give an example to show that he could be correct. [2 marks]

8



- 8 This shape is made from two triangles and four congruent parallelograms.

Not drawn accurately



For each statement, tick the correct box.

- 8 (a) The triangles are equilateral.
[1 mark]

Must be true

Could be true

Must be false

[Turn over]



**8 (b) The triangles are congruent.
[1 mark]**

Must be true

Could be true

Must be false

**9 There are 720 boys and 700 girls
in a school.**

**The probability that a boy chosen
at random studies French is $\frac{2}{3}$**

**The probability that a girl chosen
at random studies French is $\frac{3}{5}$**



9 (a) Work out the number of students in the school who study French. [3 marks]

Answer _____

[Turn over]



9 (b) Work out the probability that a student chosen at random from the whole school does NOT study French. [2 marks]

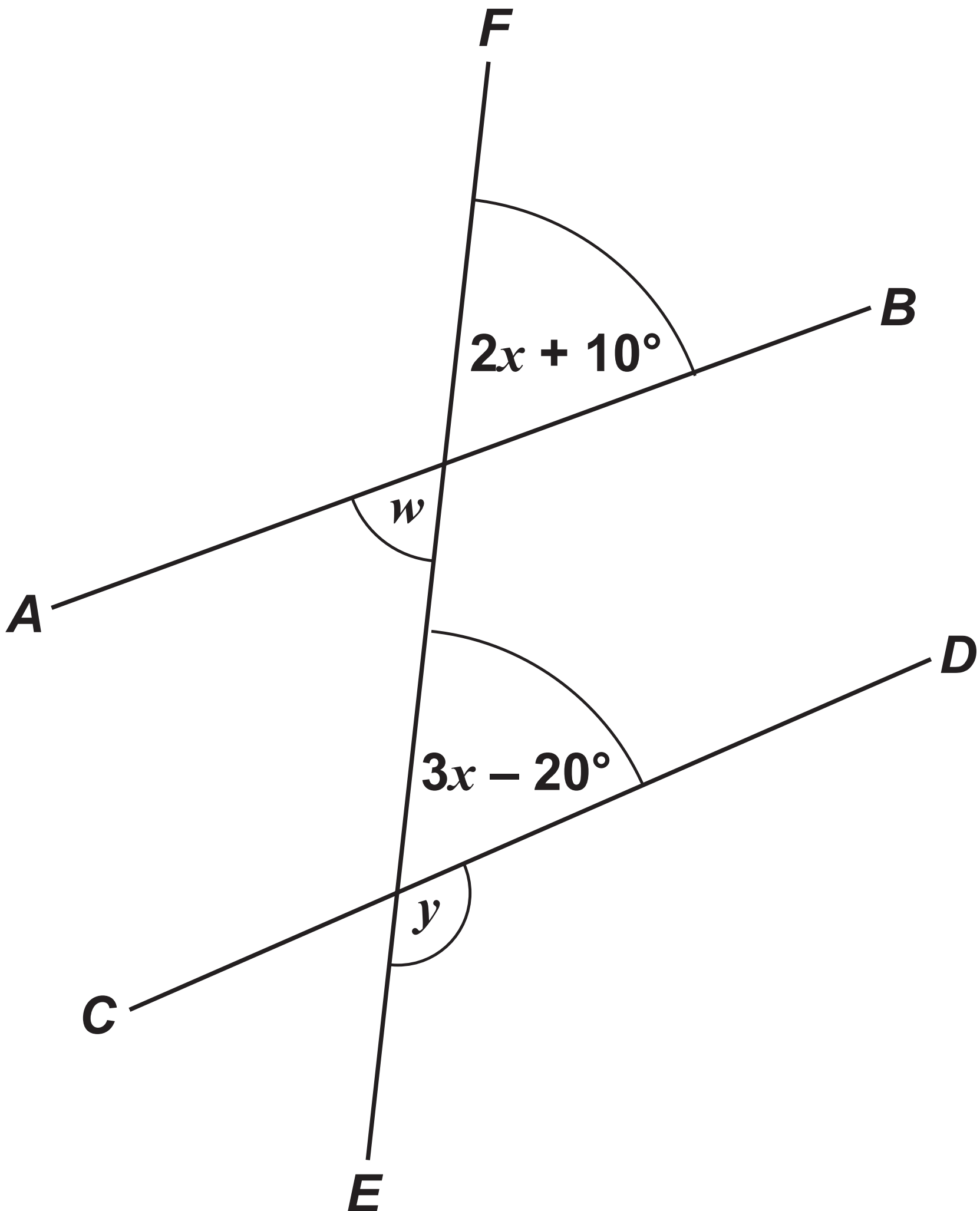
Answer _____

7



10 AB , CD and EF are straight lines.

Not drawn accurately



[Turn over]



10 (a) Ava assumes that AB and CD are parallel.

What answer should she get for the size of angle y ? [4 marks]

Answer _____ degrees



10 (b) In fact,

***AB* and *CD* are NOT parallel
angle w is 60°**

**What effect does this have on
the size of angle y ?**

Tick a box.

y is bigger

y is the same

y is smaller

**Show working to support your
answer. [3 marks]**

[Turn over]



7

11 Purple paint is made by mixing red paint and blue paint in the ratio 5 : 2

Yan has 30 litres of red paint and 9 litres of blue paint.

**What is the MAXIMUM amount of purple paint he can make?
[3 marks]**



Answer _____ **litres**

[Turn over]



12 $(ar^b)^4 = 16r^{20}$ where a and b are positive integers.

Work out a and b [2 marks]

$a =$ _____ $b =$ _____



13

In a class of 28 students
the mean height of the 12 boys is
1.58 metres
the mean height of all 28 students
is 1.52 metres.

Work out the mean height of the
girls. [4 marks]

Answer _____ metres

[Turn over]



14 $xy = c$ where c is a constant.

Circle the correct statement.
[1 mark]

y is directly proportional to x

y is directly proportional to $\frac{1}{x}$

y is inversely proportional to $\frac{1}{x}$

x is directly proportional to y

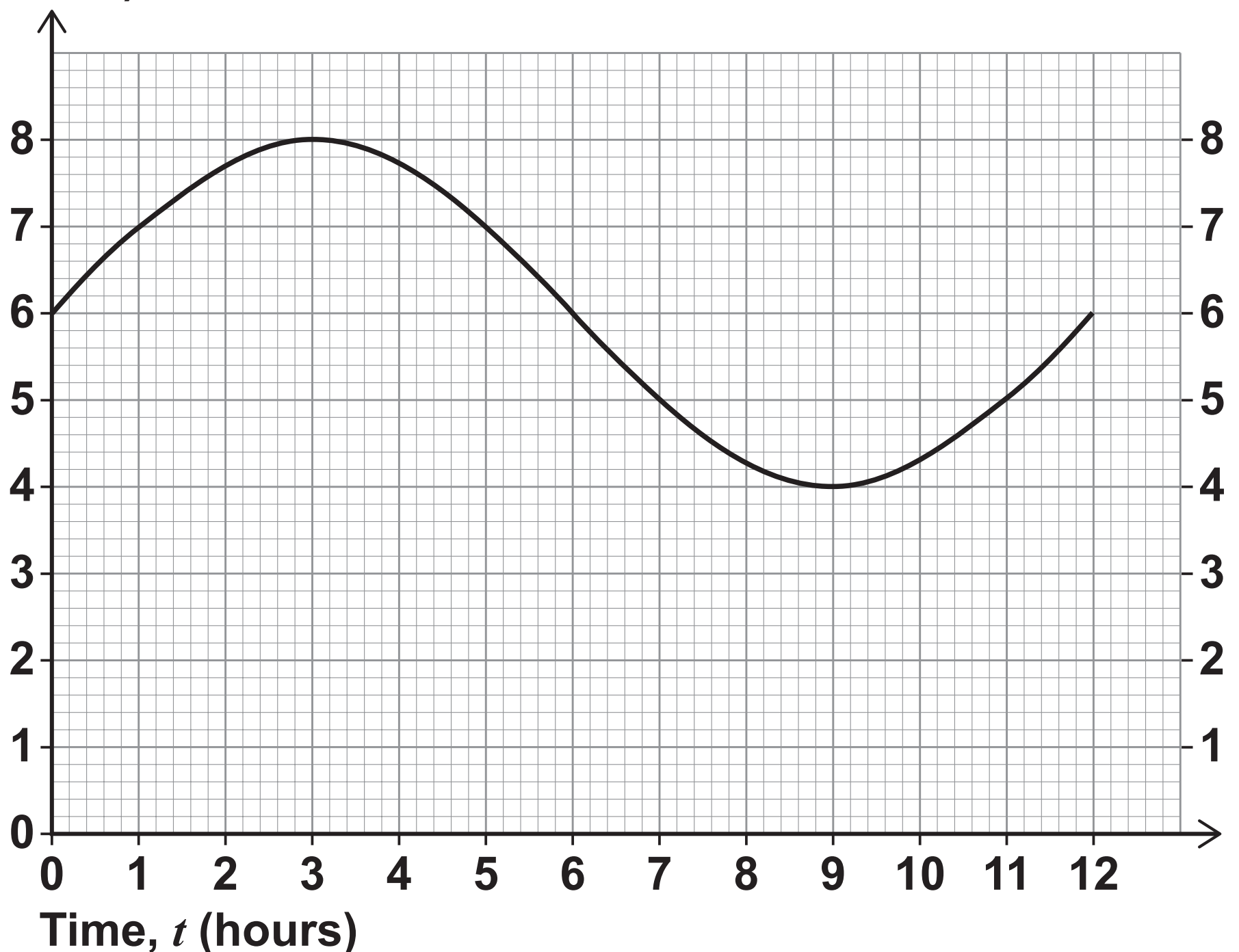


15 The graph shows the depth of water in a harbour for 12 hours.

d is the depth of water in a harbour in metres

t is the number of hours after 9 am

Depth, d
(metres)



[Turn over]



**15 (a) For how many of the 12 hours is the depth more than 5 metres?
[1 mark]**

Answer _____

15 (b) By how much does the depth change between 12 noon and 4 pm? [1 mark]

Answer _____ metres

**16 The value of a new car is £18 000
The value of the car decreases by 25% in the first year
12% in each of the next 4 years.
Work out the value of the car after 5 years. [3 marks]**



17 Liam drives his car.

He drives the first 9 miles in 9 minutes.

He then drives at an average speed of 70 miles per hour for 1 hour 36 minutes.

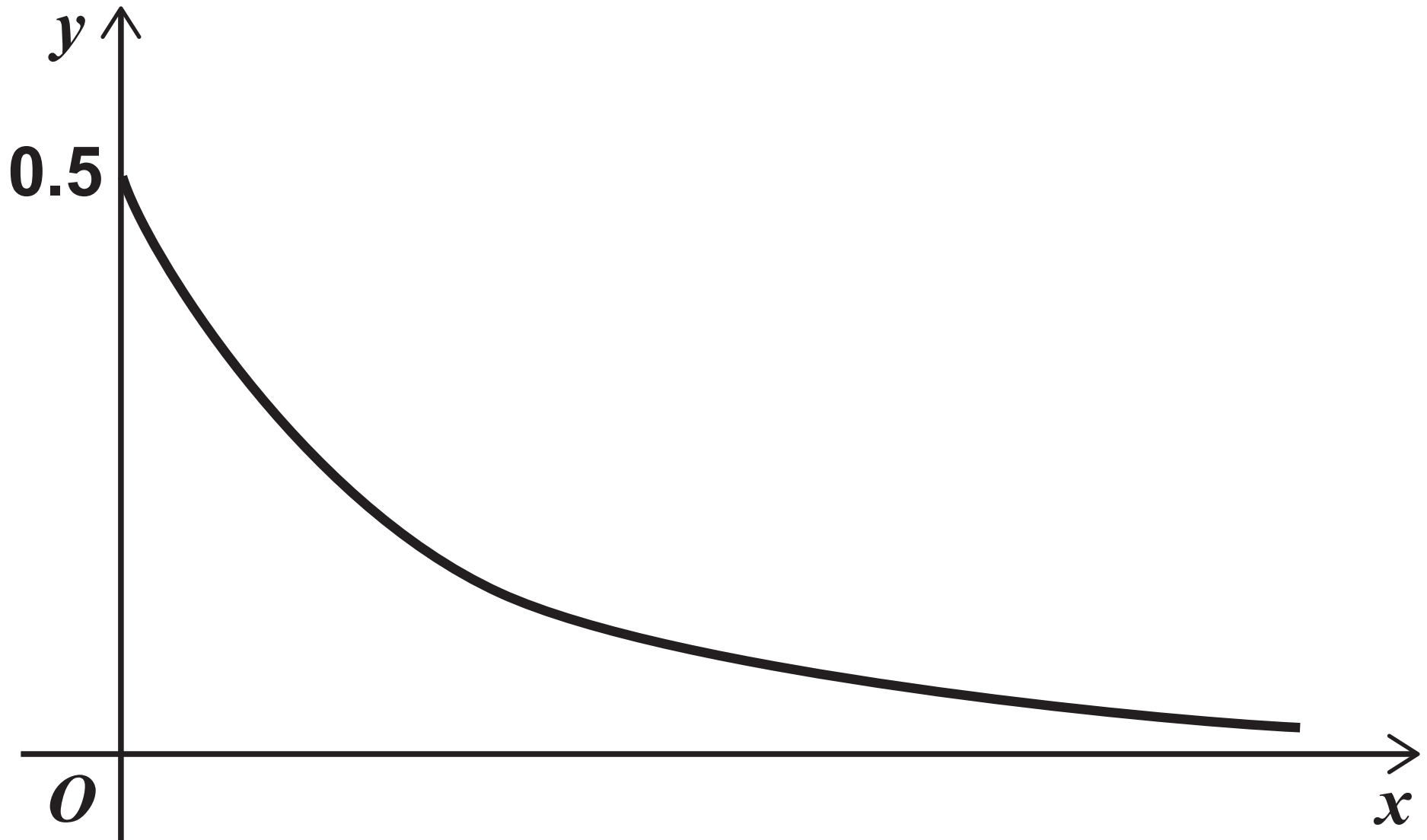
He finds this information about his car.

Average speed	Miles travelled per gallon
65 miles per hour or less	50
More than 65 miles per hour	40

Use the information to show that his car uses less than 3 gallons of petrol for the drive. [5 marks]



18 Nick sketches the graph of $y = 0.5^x$ for $x \geq 0$



Make ONE criticism of his sketch. [1 mark]



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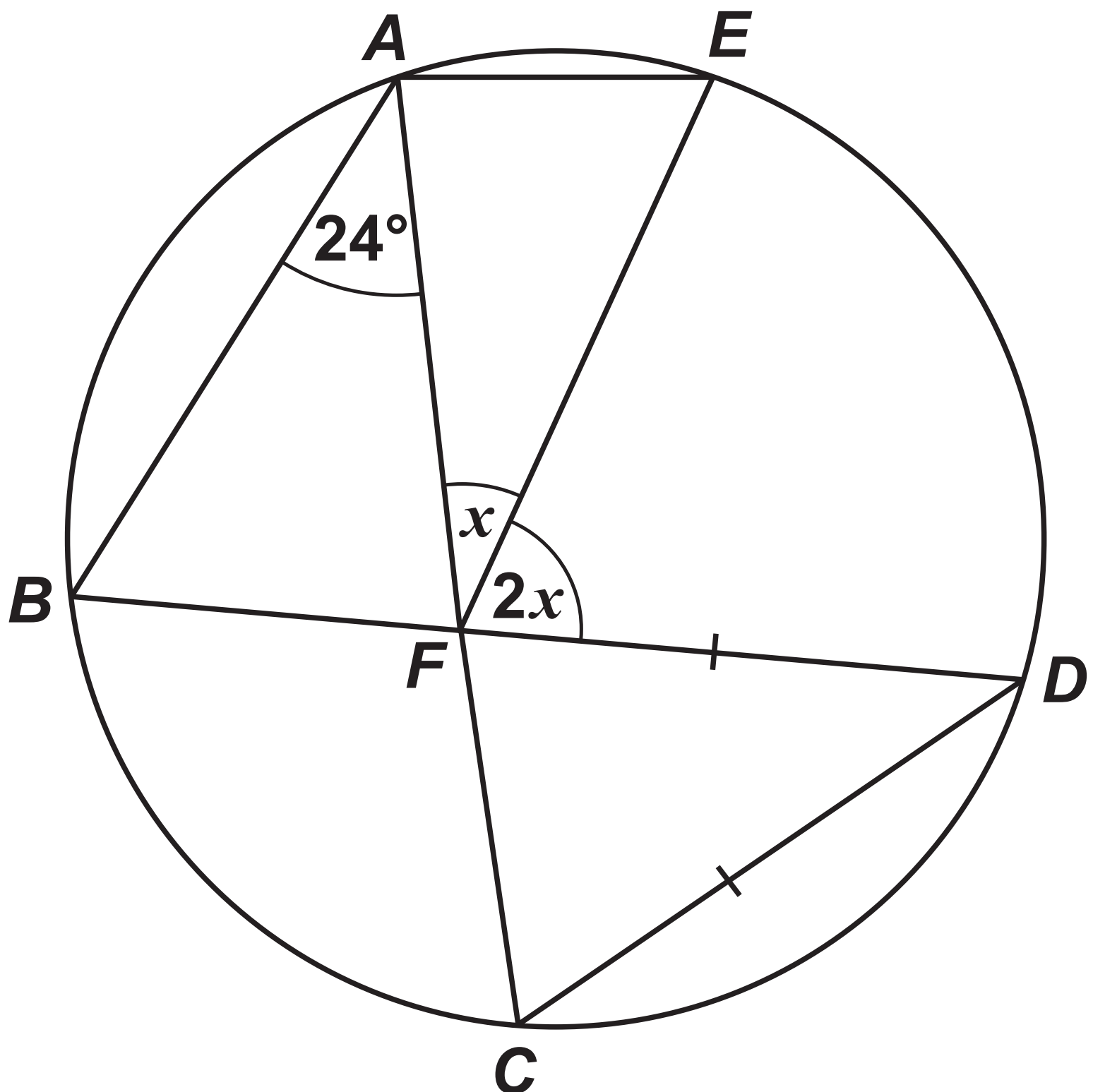
19

A, B, C, D and E are points on a circle.

BFD and AFC are straight lines.

$DC = DF$

Not drawn accurately



Work out the size of angle x .



31

**You MUST show your working
which may be on the diagram.
[4 marks]**

Answer _____ degrees

[Turn over]



20

This sign shows when a lift is safe to use.

‘Total mass of people must be 450 kg or less’

Ben and some other people are in the lift.

Their total mass is 525 kg to the nearest 5 kg

Ben gets out.

He has a mass of 78 kg to the nearest kg

Is the lift now safe to use?

**You MUST show your working.
[4 marks]**



Answer _____

8

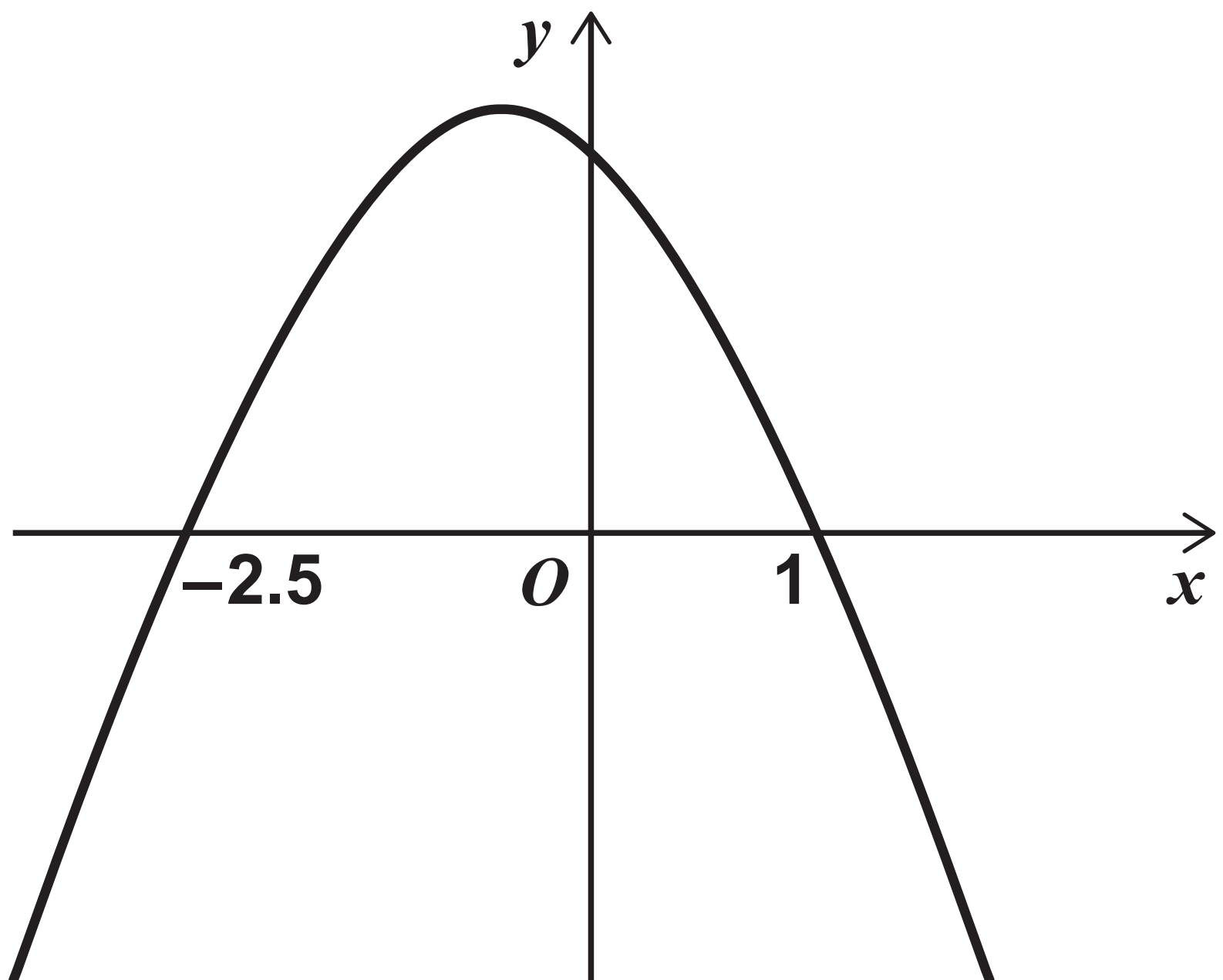
[Turn over]



21 Here is a sketch of $y = f(x)$ where $f(x)$ is a quadratic function.

The graph intersects the x -axis where $x = -2.5$ and $x = 1$

Not drawn accurately



**Circle the solution of $f(x) > 0$
[1 mark]**

$$x < -2.5 \text{ or } x > 1$$

$$x > -2.5 \text{ or } x > 1$$

$$-2.5 < x < 1$$

$$x > -2.5 \text{ or } x < 1$$

[Turn over]



Answer

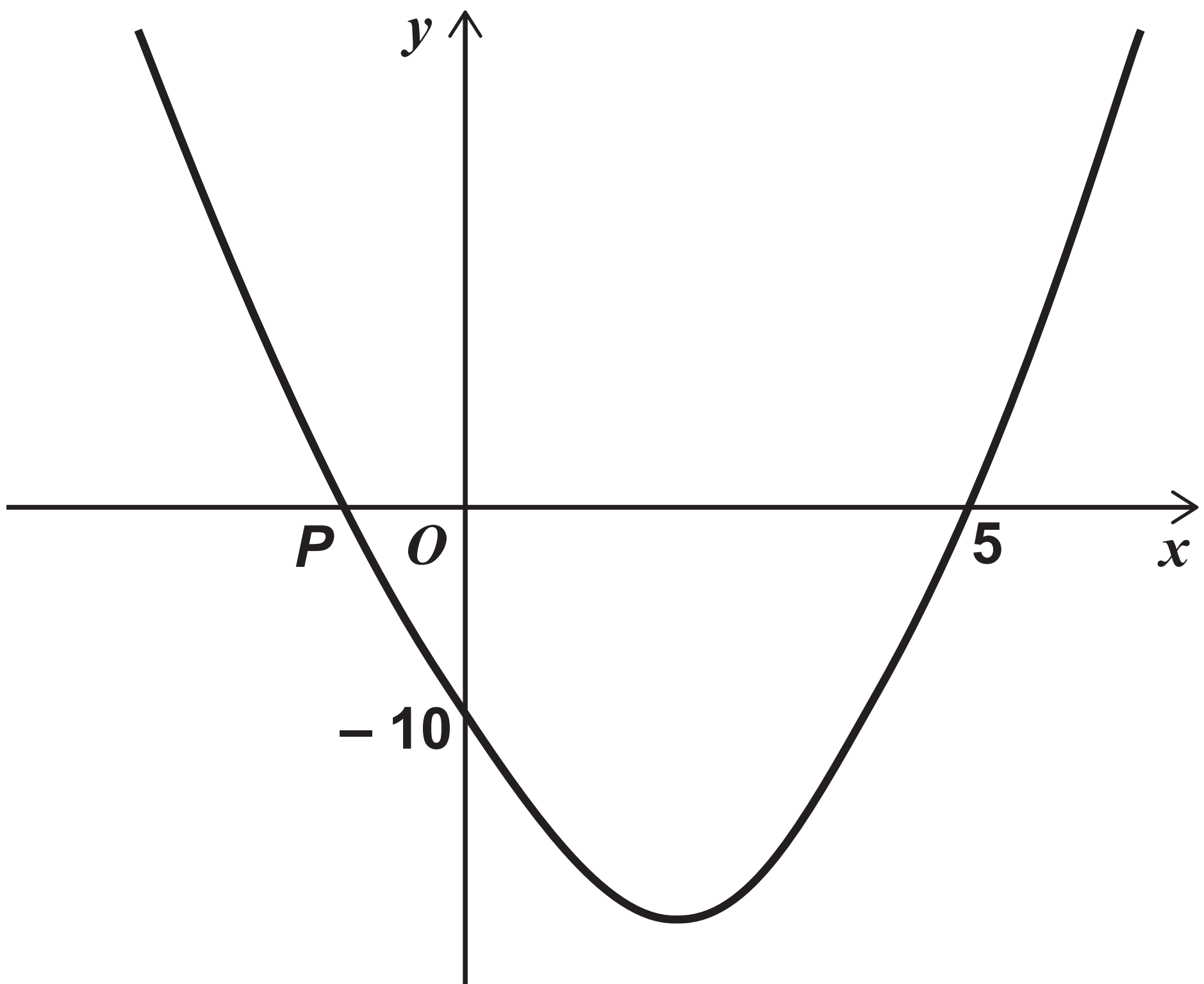
4

[Turn over]



- 23 Here is a sketch of $y = x^2 + bx + c$
The curve intersects
the x -axis at $(5, 0)$ and point P
the y -axis at $(0, -10)$

Not drawn accurately

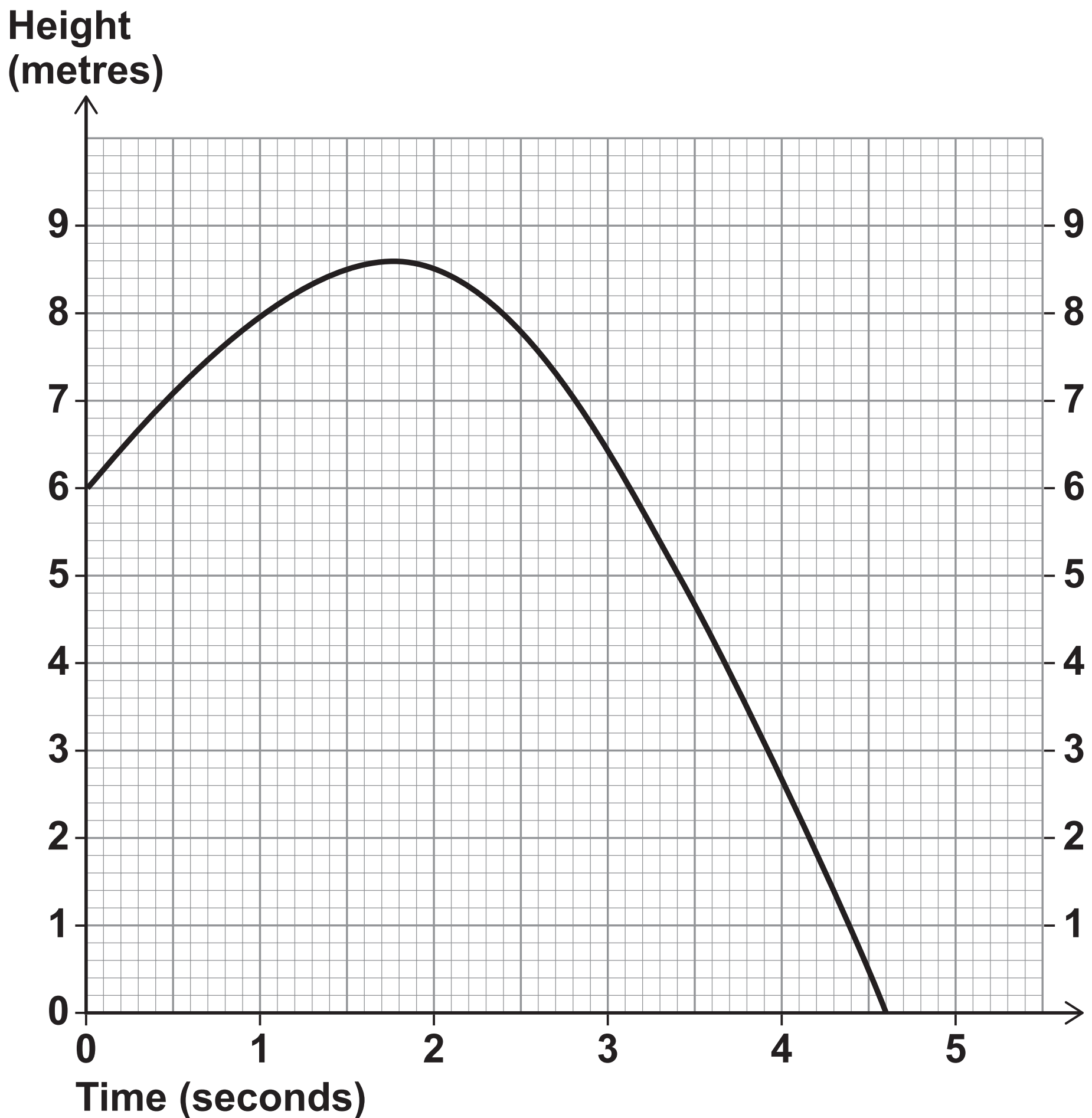


Work out the x -coordinate of
the turning point of the graph.
[4 marks]



24 A ball is thrown from a point 6 metres above the ground.

The graph shows the height of the ball above the ground, in metres.



41

**Estimate the speed of the ball,
in m/s, after 1 second.**

**You MUST show your working.
[2 marks]**

Answer _____ m/s

6

[Turn over]



25

Rectangle $ABCD$ is the horizontal base of a triangular prism $ABCDEF$.

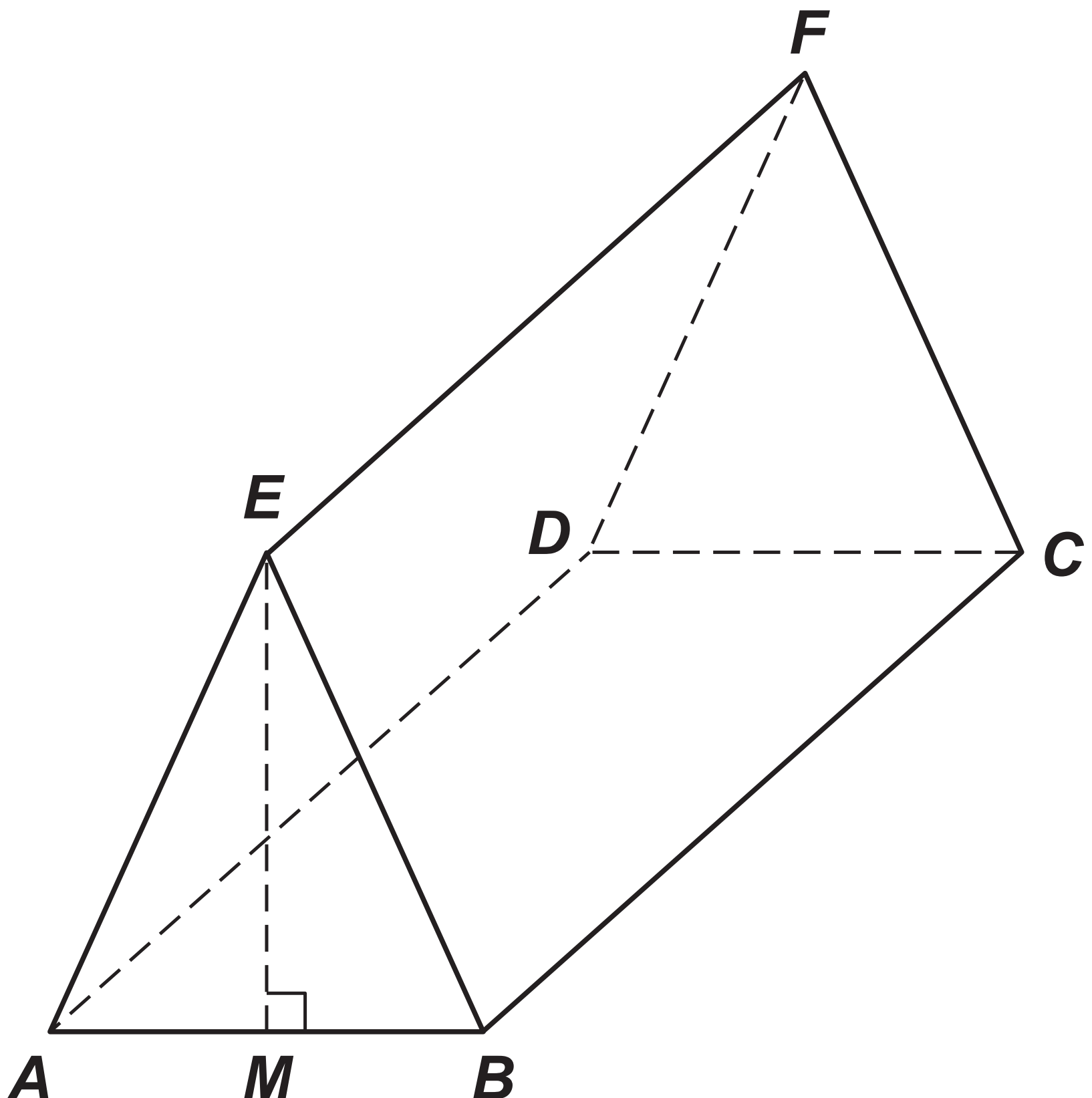
$$AE = BE$$

E is vertically above M , the midpoint of AB .

$$AB = 16 \text{ cm}$$

$$AE = 17 \text{ cm}$$

$$BC = 30 \text{ cm}$$



25 (a) Show that $EM = 15$ cm [2 marks]

[Turn over]



45

Answer _____ degrees

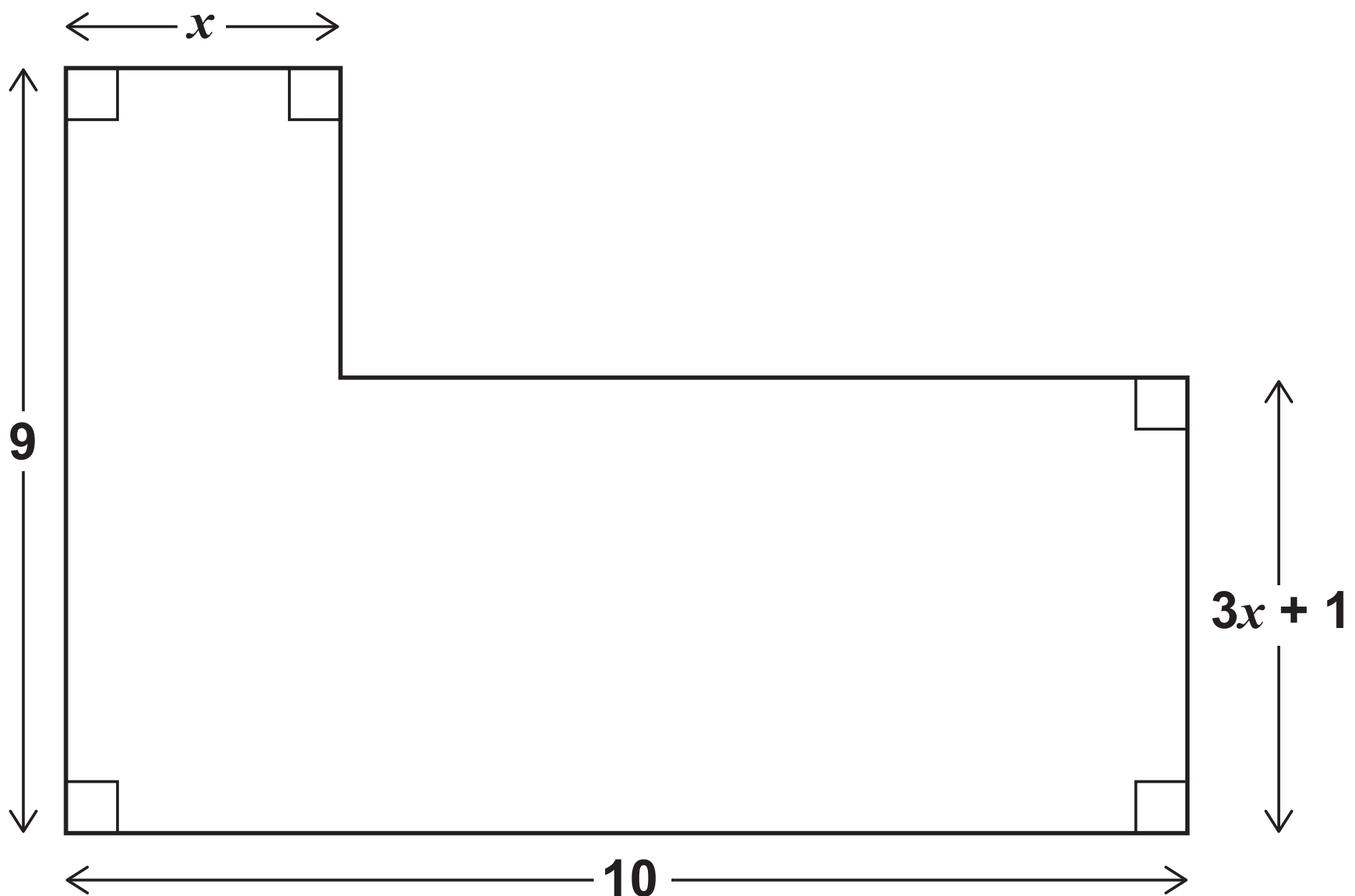
6

[Turn over]



- 26 Here is an L-shape.
All dimensions are in centimetres.

Not drawn accurately



The area of the L-shape is 65 cm^2
Work out the value of x . [6 marks]



27 Prove that $x^2 + x + 1$ is always positive. [3 marks]

END OF QUESTIONS



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For Examiner's Use	
Pages	Mark
4 – 6	
7 – 10	
11 – 14	
15 – 18	
18 – 22	
23 – 25	
26 – 28	
30 – 33	
34 – 37	
38 – 41	
42 – 45	
46 – 48	
49	
TOTAL	

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