



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

MATHEMATICS

H

Higher Tier Paper 2 Calculator

8300/2H

Thursday 8 November 2018 Morning

Time allowed: 1 hour 30 minutes

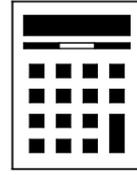
At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



For this paper you must have:

- **a calculator**
- **mathematical instruments.**



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 What does $(A \cap B)$ represent in $P(A \cap B)$?**

Circle your answer. [1 mark]

A or B or both

A but not B

not A and not B

A and B

2 P is $(4, 9)$ and Q is $(-2, 1)$

Circle the midpoint of PQ .
[1 mark]

$(1, 5)$

$(3, 4)$

$(3, 5)$

$(6, 8)$

3 Which of these is a geometric progression?

Circle your answer. [1 mark]

1 3 5 7 9

1 3 6 10 15

1 4 9 16 25

1 3 9 27 81

[Turn over]



4 The bearing of A from B is 310°

Circle the bearing of B from A .
[1 mark]

050°

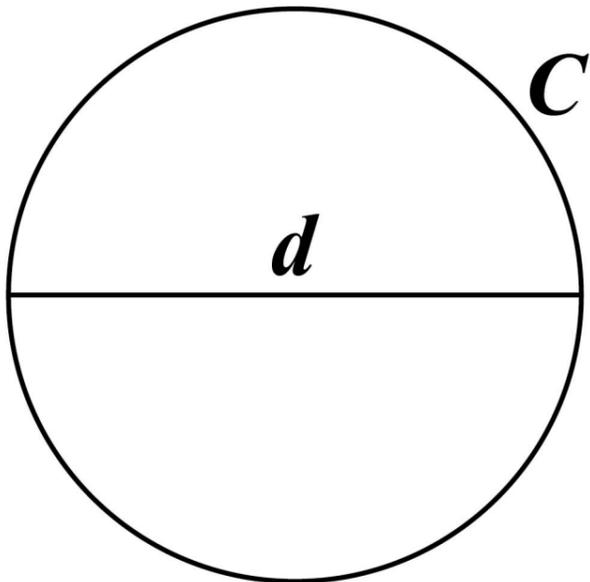
110°

130°

220°



- 5 A circle has circumference C and diameter d .

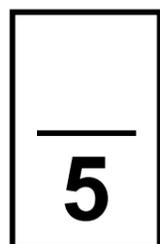


$$C = kd$$

What **VALUE** does the constant k represent? [1 mark]

Answer _____

[Turn over]



6 Here is some information about 20 trains leaving a station.

Number of minutes late, t	Number of trains	Midpoint	
$0 \leq t < 5$	12		
$5 \leq t < 10$	7		
$10 \leq t < 15$	1		
$t \geq 15$	0		

**6 (a) Work out an estimate of the mean number of minutes late.
[3 marks]**

Answer _____ minutes

[Turn over]

6 (b) The station manager looks at the information in more detail.

Number of minutes late, t	Number of trains
$0 \leq t < 2$	12
$2 \leq t < 4$	0
$4 \leq t < 6$	7
$6 \leq t < 8$	0
$8 \leq t < 10$	0
$10 \leq t < 12$	1

He works out an estimate of the mean using this information.

How does his estimate compare with the answer to part (a)?

Tick ONE box. [1 mark]

Higher than part (a)

Same as part (a)

Lower than part (a)

Not possible to tell

[Turn over]

<hr/>
4

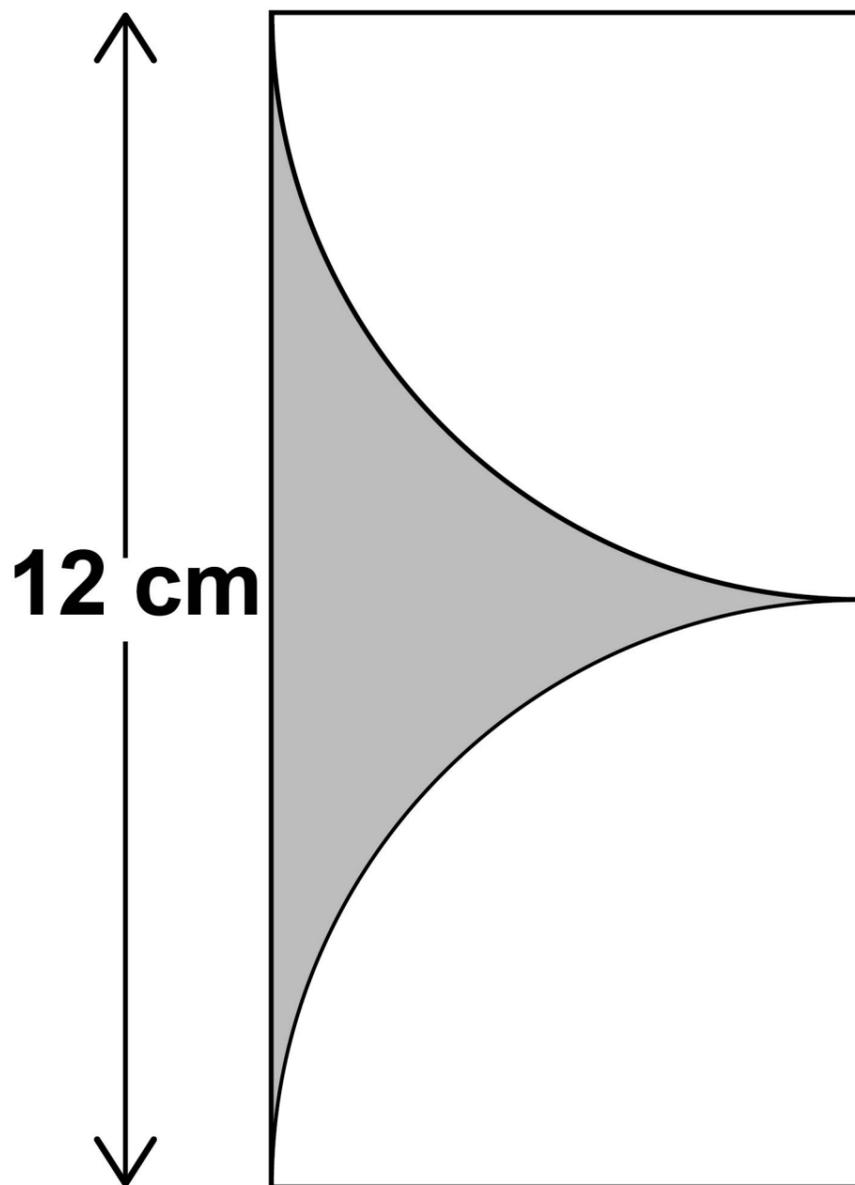


$a =$ _____ $b =$ _____

[Turn over]

8 Two identical quarter circles are cut from a rectangle as shown.

The diagram is not drawn accurately.



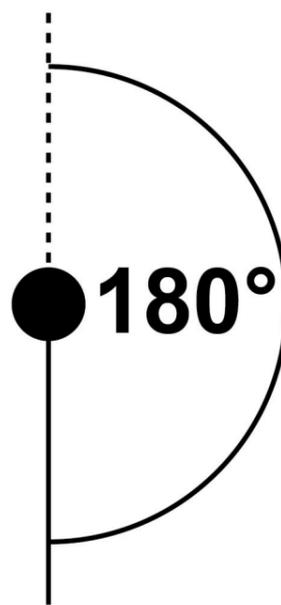
- 9 The diagrams show the position of a tap when off and fully on.

The tap is fully on when the angle of turn is 180°

Off



Fully on



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[Turn over]

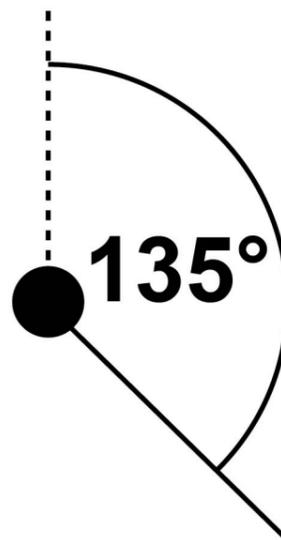


18

When fully on, water flows out of the tap at 14 litres per minute.

The rate at which water flows out is in direct proportion to the angle of turn.

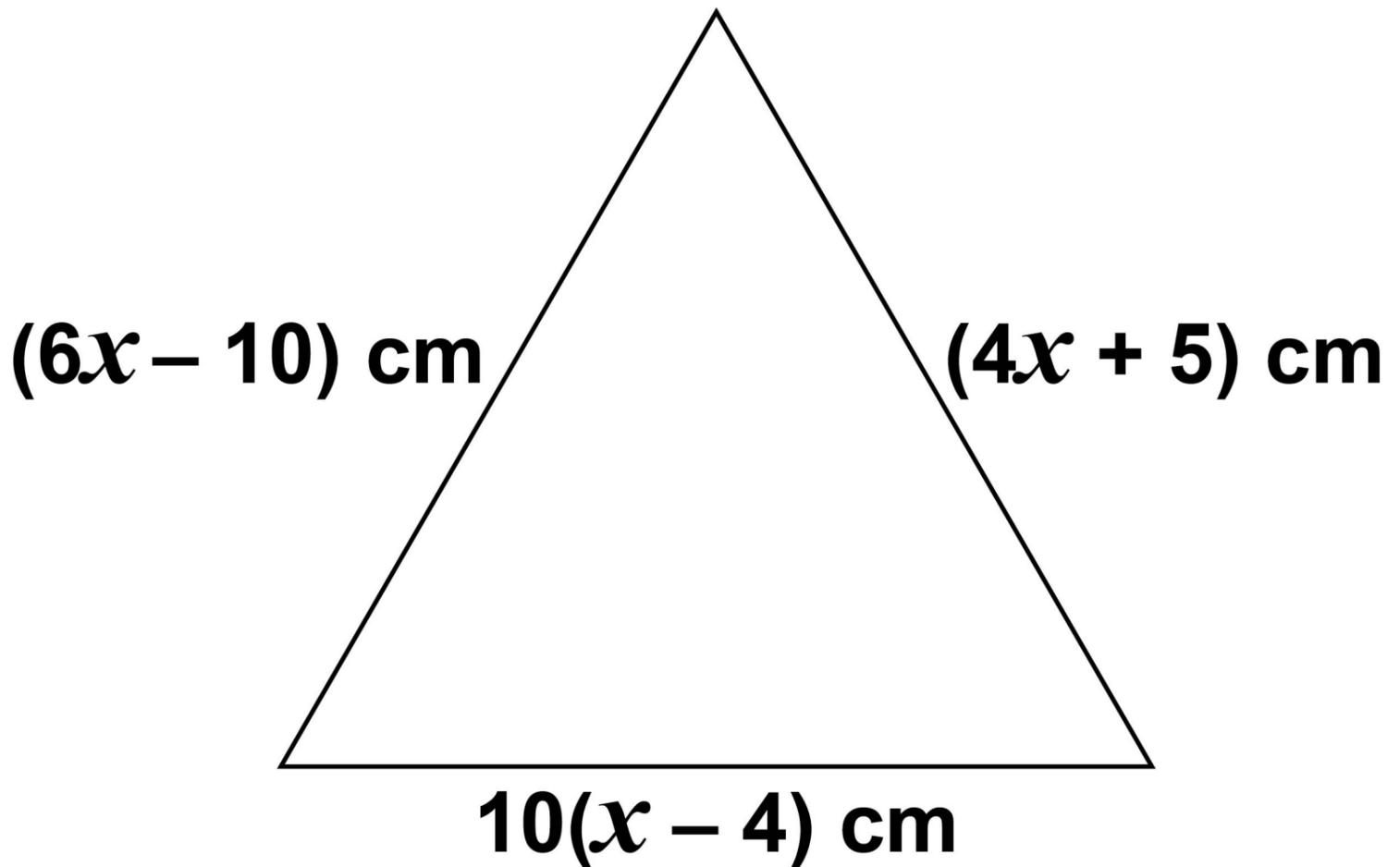
The tap is turned 135°



The water flows into a tank with a capacity of 79.8 litres.

10 This triangle is equilateral.

The diagram is not drawn accurately.



Is the perimeter of the triangle greater than one metre?

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

12 Work out $\frac{9.12 \times 10^{10}}{3.2 \times 10^4}$

Give your answer in standard form.
[2 marks]

Answer _____

[Turn over]

13 Ashraf is going to put boxes into a crate.

The crate is a cuboid measuring 2.5 m by 2 m by 1.2 m

Each box is a cube of length 50 cm

He does these calculations.

$$\begin{aligned}\text{volume of crate} &= 2.5 \times 2 \times 1.2 \\ &= 6 \text{ m}^3\end{aligned}$$

$$\begin{aligned}\text{volume of one box} &= 0.5 \times 0.5 \times 0.5 \\ &= 0.125 \text{ m}^3\end{aligned}$$

$$\begin{aligned}\text{number of boxes} &= 6 \div 0.125 \\ &= 48\end{aligned}$$

He claims,

“I can put 48 boxes in the crate.”

Evaluate Ashraf’s method AND claim. [2 marks]

14 The cross section of a prism has n sides.

Circle the expression for the number of edges of the prism.

[1 mark]

$$2n$$

$$3n$$

$$n + 2$$

$$2n + 3$$

[Turn over]

<hr/> 7



15 The volume of a medal is 45 cm^3

The medal is made from copper and tin.

**volume of copper : volume of tin
= 22 : 3**

The density of copper is 8.96 g/cm^3

The density of tin is 7.31 g/cm^3

**Work out the mass of the medal.
[4 marks]**

Answer _____ **grams**

[Turn over]

16 The cumulative frequency graph, on page 29, shows information about the masses of 50 apples.

16 (a) Use the graph to estimate the median mass of the apples.
[1 mark]

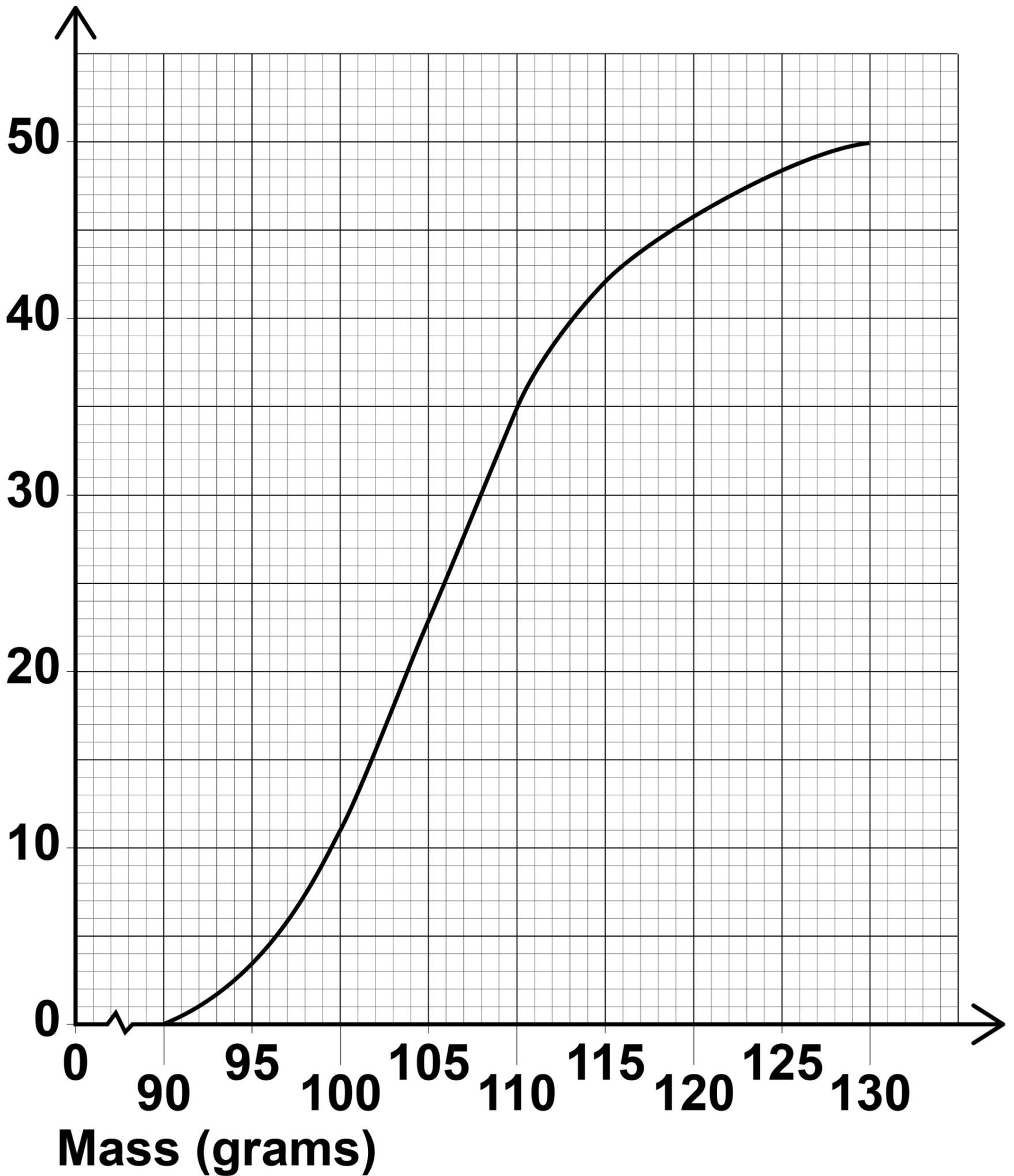
Answer _____ grams

16 (b) Estimate the proportion of the apples that have a mass greater than 115 grams. [2 marks]

Answer _____

7

Cumulative frequency



[Turn over]



17 a is a prime number.

b is an even number.

$$N = a^2 + ab$$

Circle the correct statement about N . [1 mark]

could be even or odd

always even

always prime

always odd

18 A bag contains 20 discs.
10 are red, 7 are blue and 3 are green.

18 (a) Marnie takes a disc at random before putting it back in the bag.

Nick then takes a disc at random before putting it back in the bag.

Olly then takes a disc at random.

Work out the probability that they all take a red disc.
[2 marks]

Answer _____

[Turn over]



A bag contains 20 discs.

10 are red, 7 are blue and 3 are green.

18 (b) All 20 discs are in the bag.

Reggie takes three discs at random, one after the other.

After he takes a disc he does NOT put it back in the bag.

Reggie's first disc is blue.

**Work out the probability that all three discs are different colours.
[3 marks]**

19

LUNCH

Choose one starter and one main course

There are four starters and ten main courses to choose from.

Two of the starters and three of the main courses are suitable for vegans.

What percentage of the possible lunches have BOTH courses suitable for vegans? [3 marks]

Answer _____ %

20 n is a positive integer.

Prove algebraically that

$$2n^2 \left(\frac{3}{n} + n \right) + 6n(n^2 - 1)$$

is a cube number. [3 marks]

[Turn over]



21 y is inversely proportional to \sqrt{x}

$$y = 4 \text{ when } x = 9$$

21 (a) Work out an equation connecting y and x . [3 marks]

Answer _____

21 (b) Work out the value of y when $x = 25$ [2 marks]

Answer _____

[Turn over]

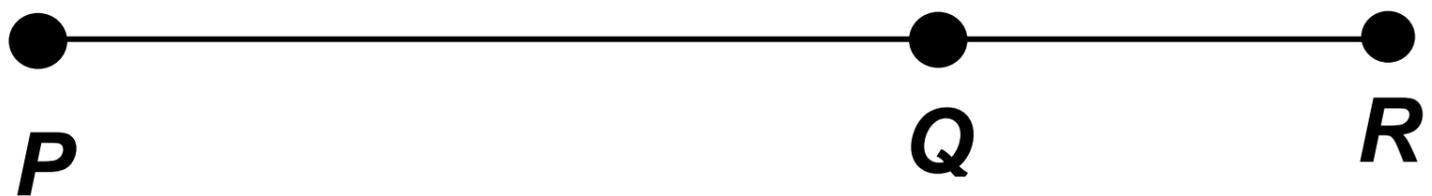
11

23 PQR is a straight line.

$$PQ : QR = 3 : 1$$

$$\vec{PQ} = a$$

The diagram is not drawn accurately.



Circle the vector \vec{RQ}
[1 mark]

$$\frac{1}{3} a$$

$$\frac{1}{4} a$$

$$-\frac{1}{3} a$$

$$-\frac{1}{4} a$$

[Turn over]



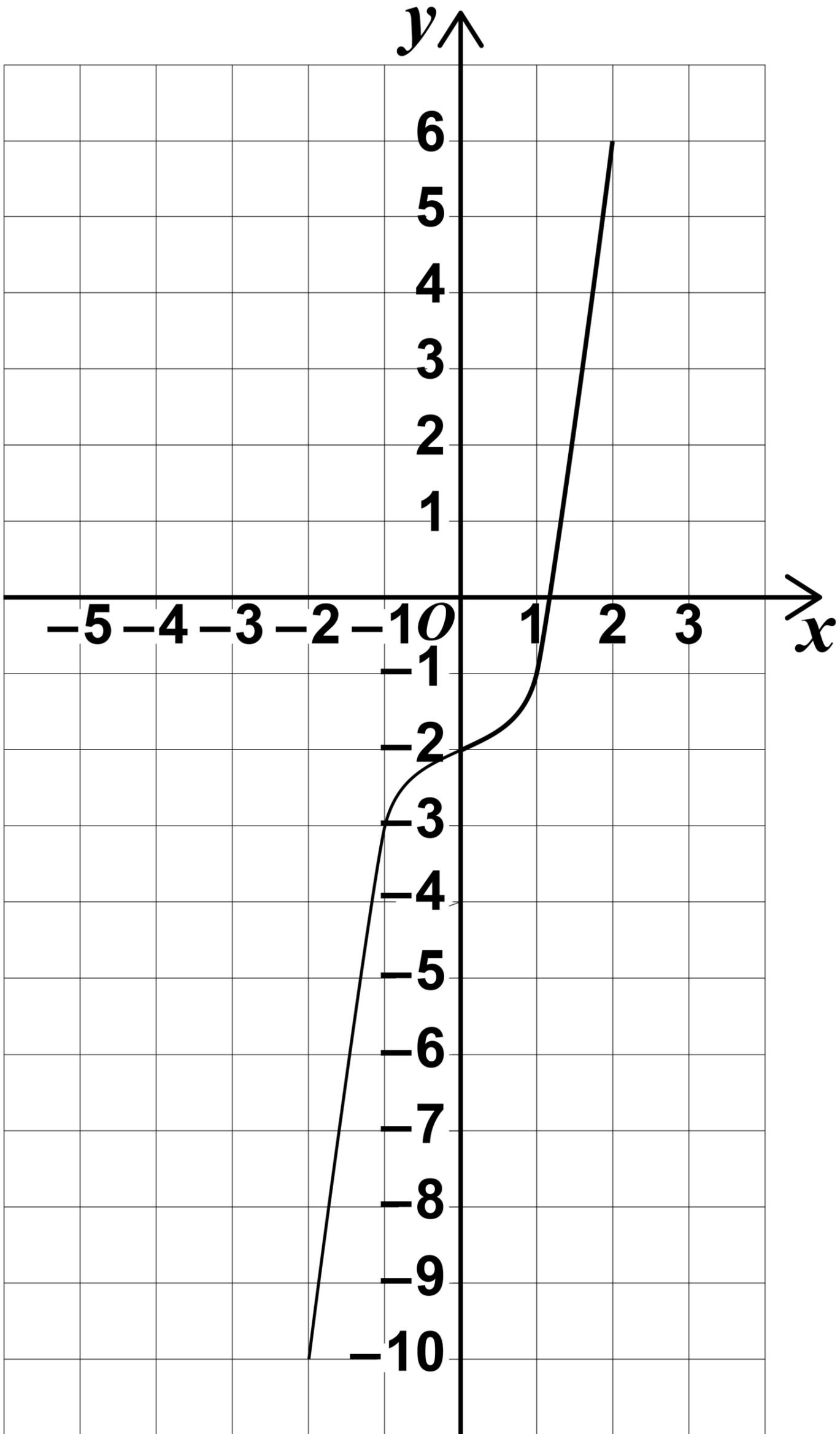
24 Here is a sketch of $y = f(x)$

The curve passes through the points

**$(-2, -10)$ $(-1, -3)$ $(0, -2)$ $(1, -1)$
 $(2, 6)$**

**On the grid, on the opposite page,
sketch the curve $y = f(x + 2)$
[2 marks]**

41



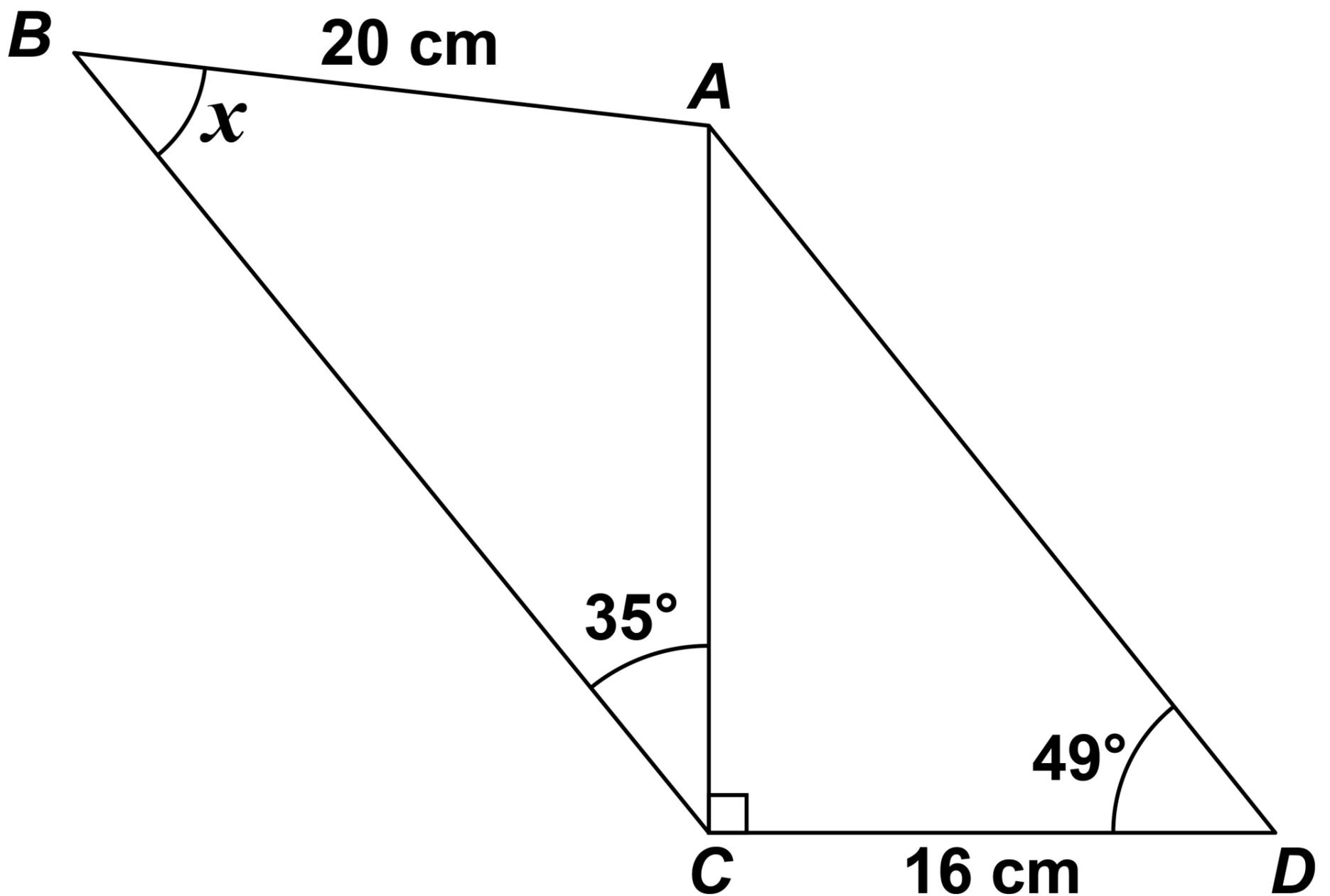
[Turn over]

6



25 *ABC* and *ACD* are triangles.

The diagram is not drawn accurately.



Work out the size of angle x .
[5 marks]

27 The point $\left(3, \frac{1}{64}\right)$ lies on the curve $y = k^x$

where k is a constant.

Show that the point $\left(\frac{1}{2}, \frac{1}{2}\right)$ lies on the curve. [3 marks]

[Turn over]



28 Izzy runs an 80-metre race in 14 seconds.

During the first 6 seconds her speed increases at a constant rate.

During the last 8 seconds her speed increases at a different constant rate.

Her speed at 14 seconds is 2 m/s more than her speed at 6 seconds.

A sketch of her speed-time graph is on page 47.

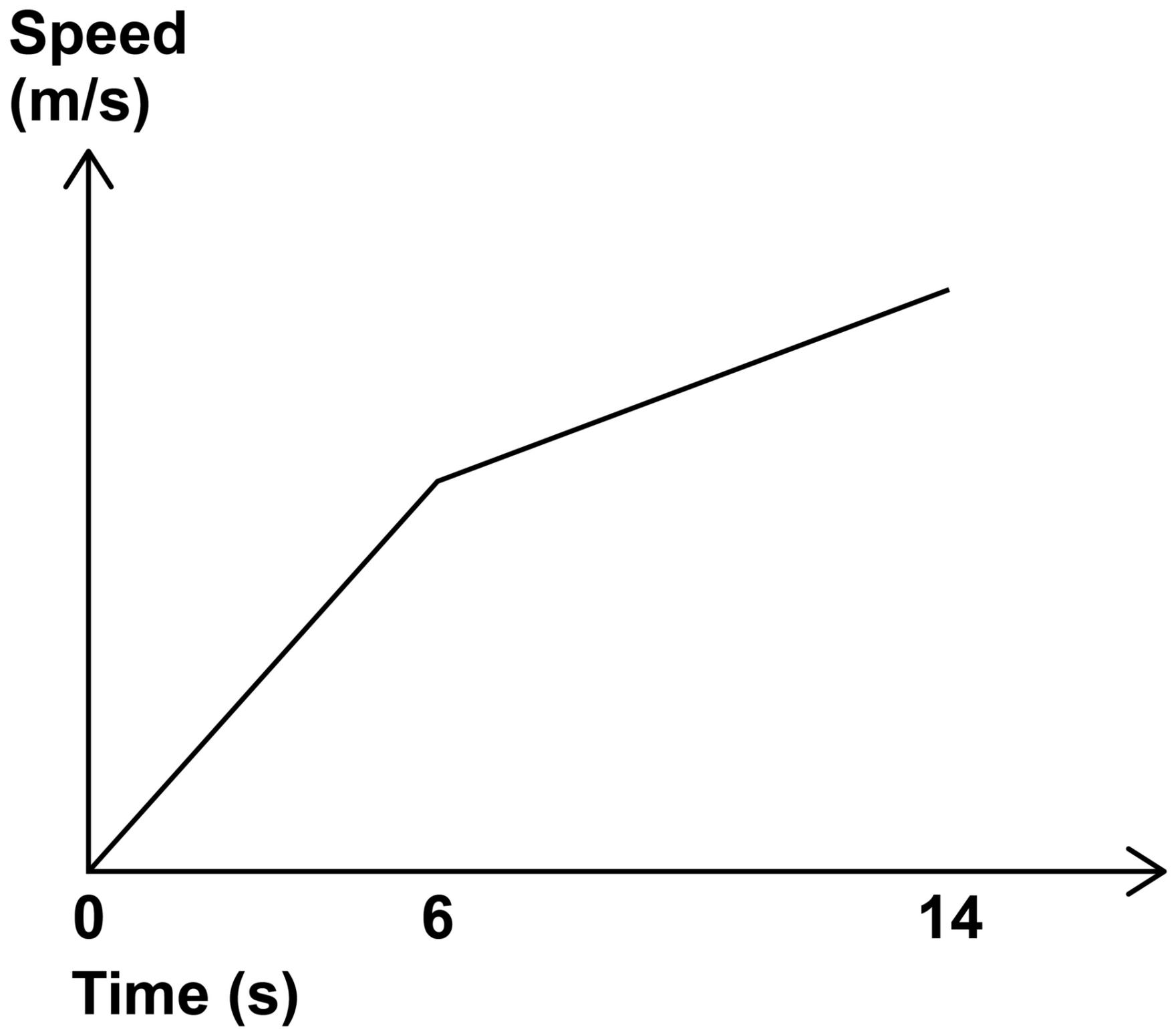
28 (a) Work out her acceleration during the last 8 seconds.

**State the units of your answer.
[2 marks]**

Answer _____



The diagram is not drawn accurately.



[Turn over]



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For Examiner's Use	
Pages	Mark
4–7	
8–11	
12–15	
16–21	
22–25	
26–29	
30–33	
34–37	
38–41	
42–45	
46–49	
TOTAL	

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