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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**

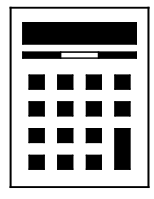
**At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.**

**[Turn over]**

N0V188300 2H01

**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 ∩ B) represent in P(A ∩ 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

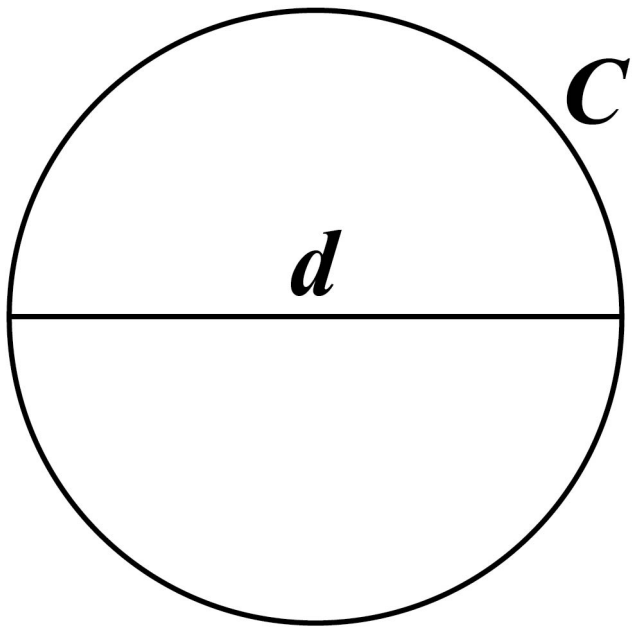
4 The bearing of *A* from *B* is 310º

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

050º 110º

130º 220º

**5** **A circle has circumference $C$ and diameter $d$.**




$C = kd$

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

**Answer**

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

| Number of minutes late, $t$ | Number of trains | Midpoint | |
|---|---|---|---|
| $0 \leqslant t < 5$ | 12 | | |
| $5 \leqslant t < 10$ | 7 | | |
| $10 \leqslant t < 15$ | 1 | | |
| $t \geqslant 15$ | 0 | | |

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

Answer _____ minutes

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

| Number of minutes late, $t$ | Number of trains |
|---|---|
| $0 \leqslant t < 2$ | 12 |
| $2 \leqslant t < 4$ | 0 |
| $4 \leqslant t < 6$ | 7 |
| $6 \leqslant t < 8$ | 0 |
| $8 \leqslant t < 10$ | 0 |
| $10 \leqslant t < 12$ | 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



4

**7** **Work out the values of $a$ and $b$ in the identity**

$$5(7x + 8) + 3(2x + b) \equiv ax + 13$$

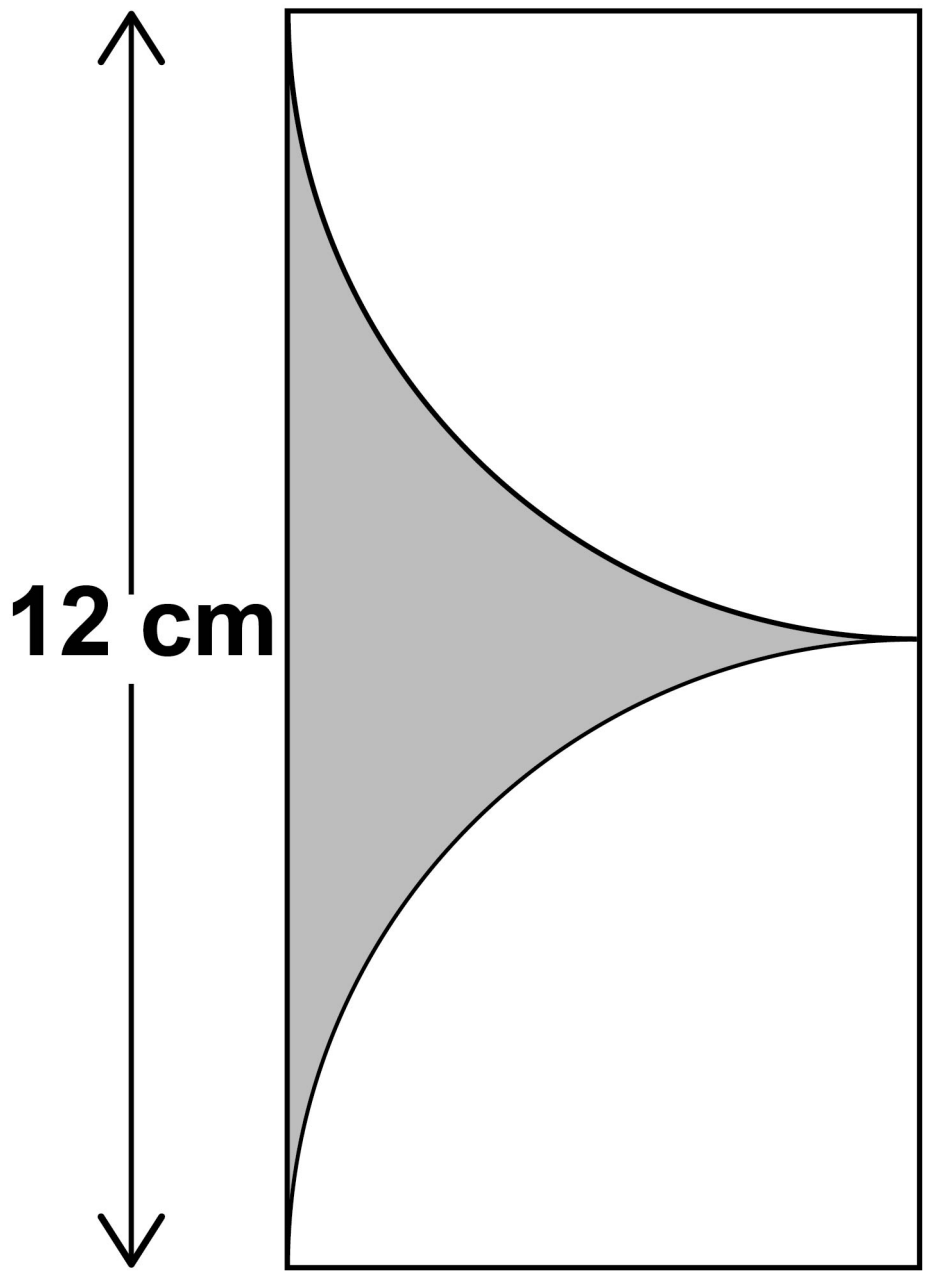
**[4 marks]**

$a$ = _____ $b$ = _____

[Turn over]

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

**The diagram is not drawn accurately.**



**Work out the shaded area.**
**[4 marks]**

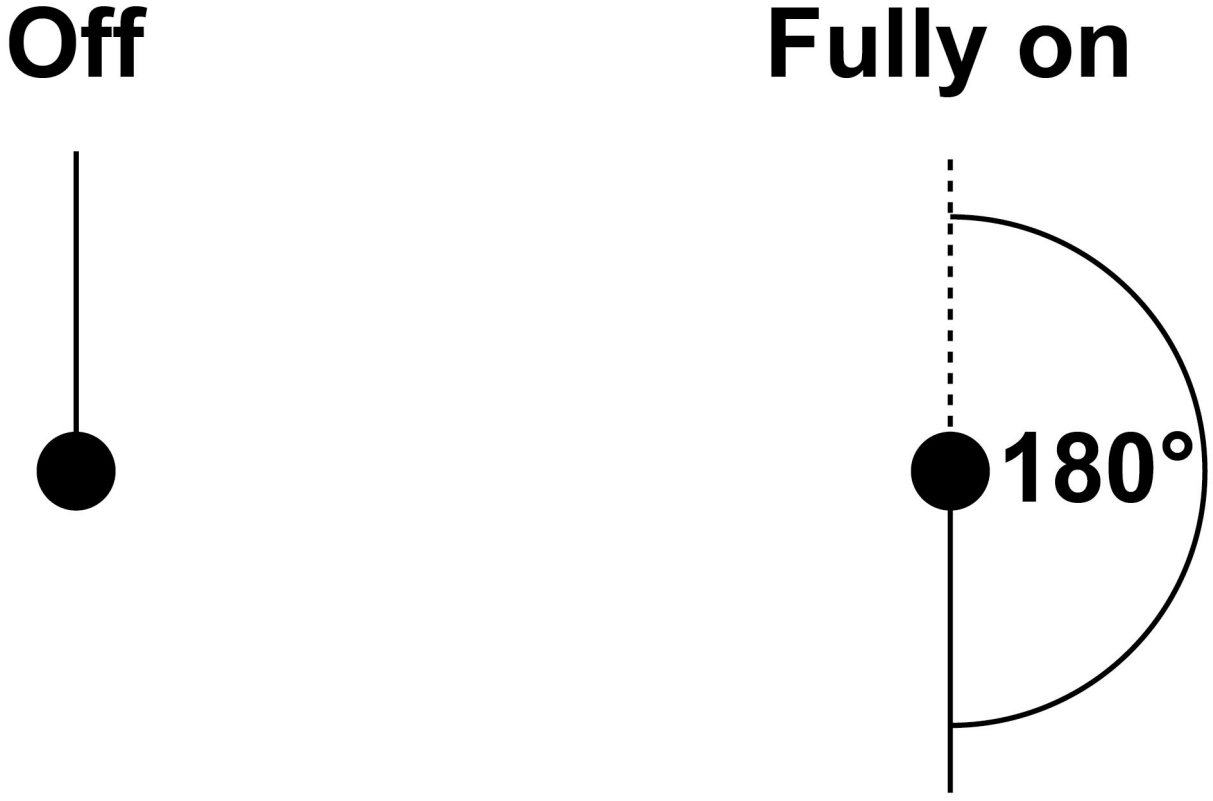
Answer _____ $cm^2$

[Turn over]

8

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 180º



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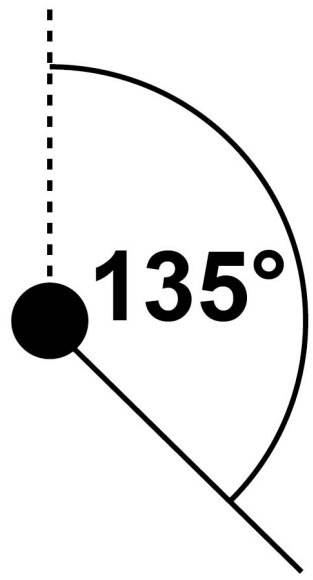
[Turn over]

**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 135º**



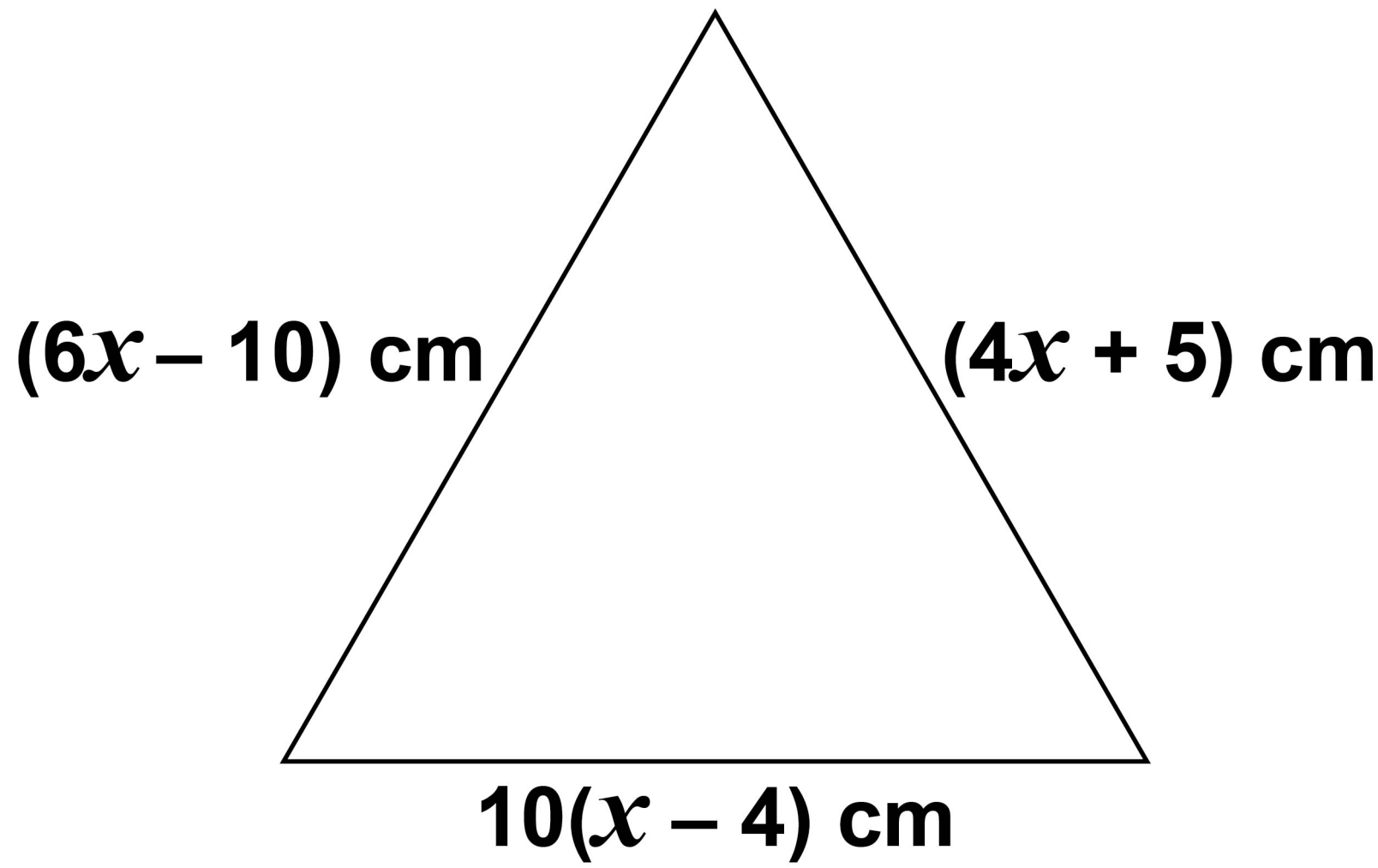

**The water flows into a tank with a capacity of 79.8 litres.**

**Will it take less than $7\frac{1}{2}$ minutes to fill the tank?**

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

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]

[Turn over]

11 An approximation for the value of $\pi$ is given by

$$4\left(1-\frac{22}{57}+\frac{22}{85}-\frac{22}{105}+\frac{22}{117}-\frac{22}{242}\right)$$

Use your calculator to show that this approximation is within 0.1 of 3.14 [2 marks]

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

Give your answer in standard form.
[2 marks]

Answer _____

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.

| | |
|---|---|
| volume of crate | $= 2.5 \times 2 \times 1.2$ |
| | $= 6\ m^3$ |
| volume of one box | $= 0.5 \times 0.5 \times 0.5$ |
| | $= 0.125\ m^3$ |
| number of boxes | $= 6 \div 0.125$ |
| | $= 48$ |

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]

$2n$ $3n$

$n + 2$ $2n + 3$



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.

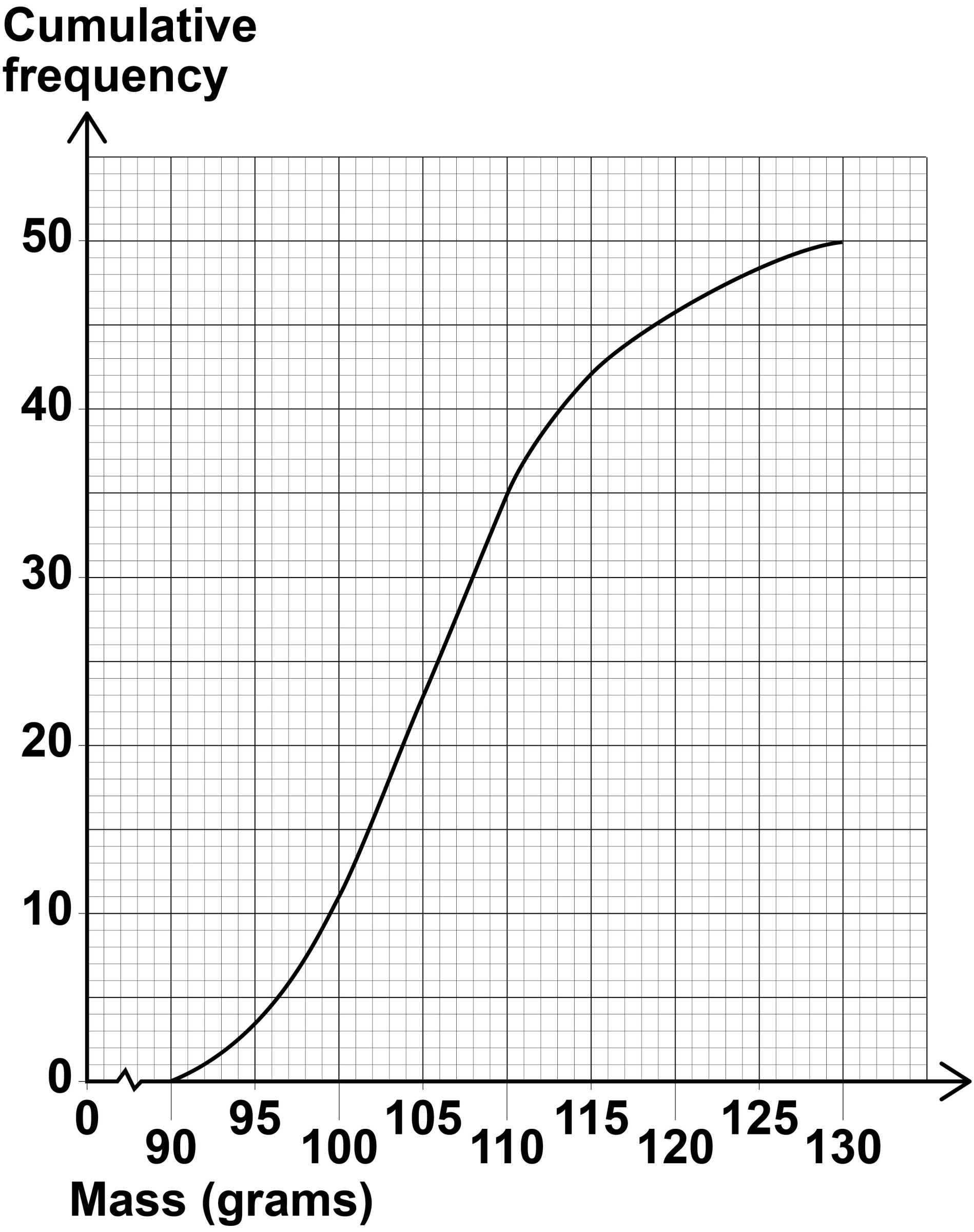
16 (a) Use the graph to estimate the median mass of the apples. [1 mark]

Answer _____ grams

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

Answer

7




[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

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]

**Answer** _____



6

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

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

is a cube number. [3 marks]

21 $y$ is inversely proportional to $\sqrt{x}$

$y = 4$ 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



11

22 Simplify fully $\frac{x^5 - 4x^3}{3x - 6}$ [3 marks]

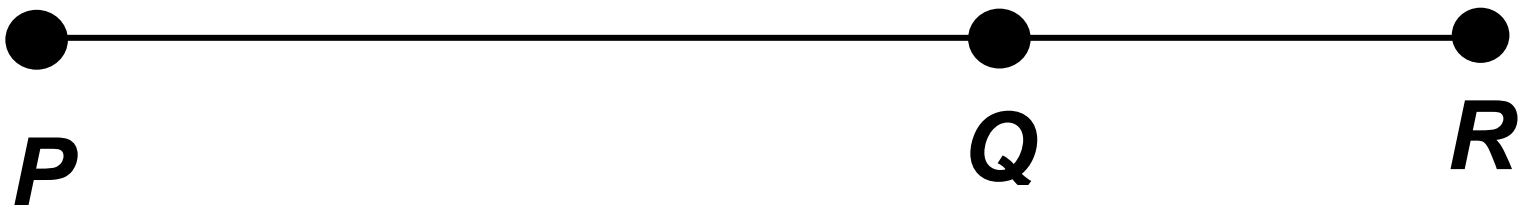
Answer

23 *PQR* is a straight line.

$PQ : QR = 3 : 1$

$\overrightarrow{PQ} = \mathbf{a}$

The diagram is not drawn accurately.




Circle the vector $\overrightarrow{RQ}$

[1 mark]

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

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

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

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

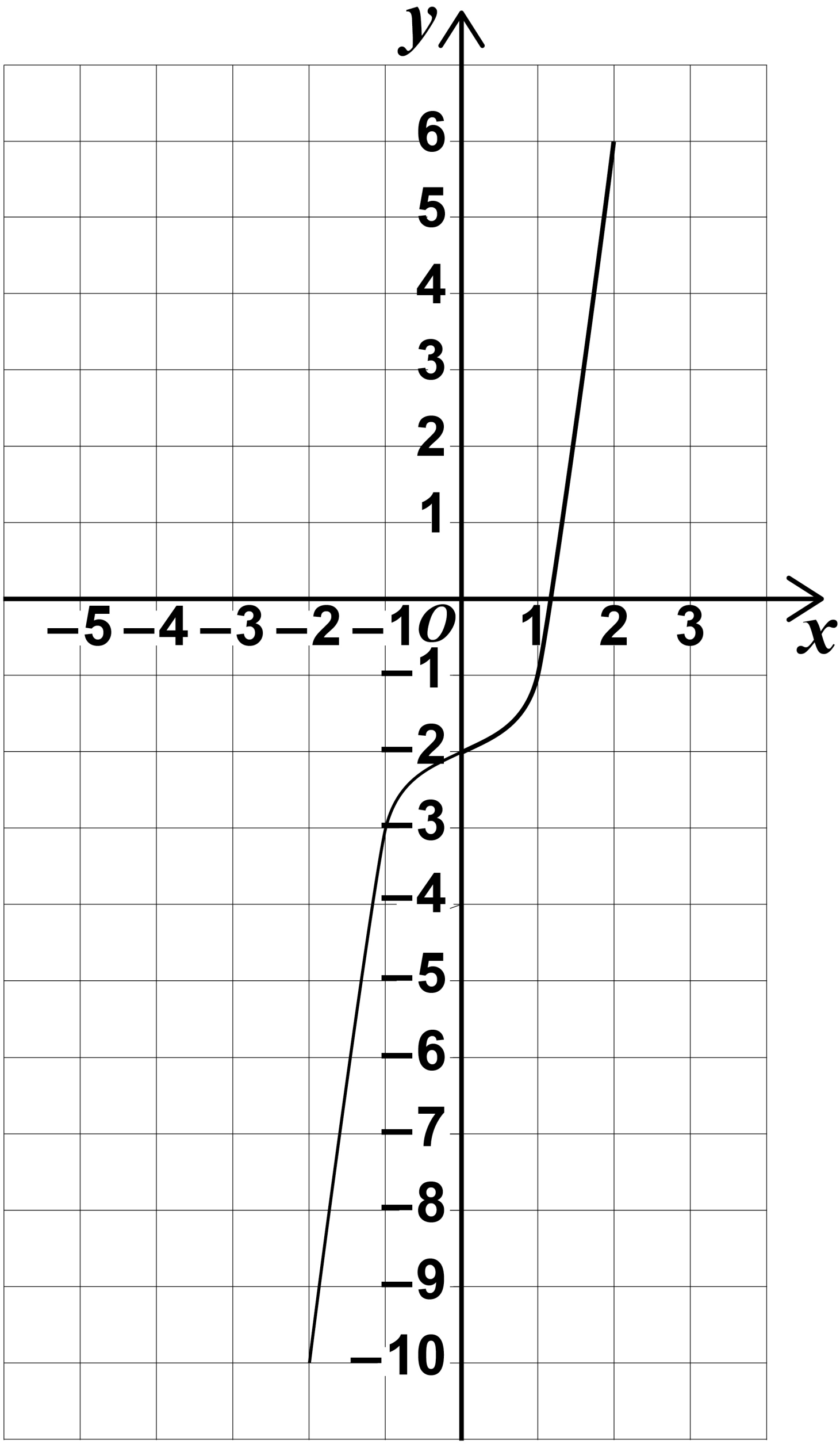
[Turn over]

**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]

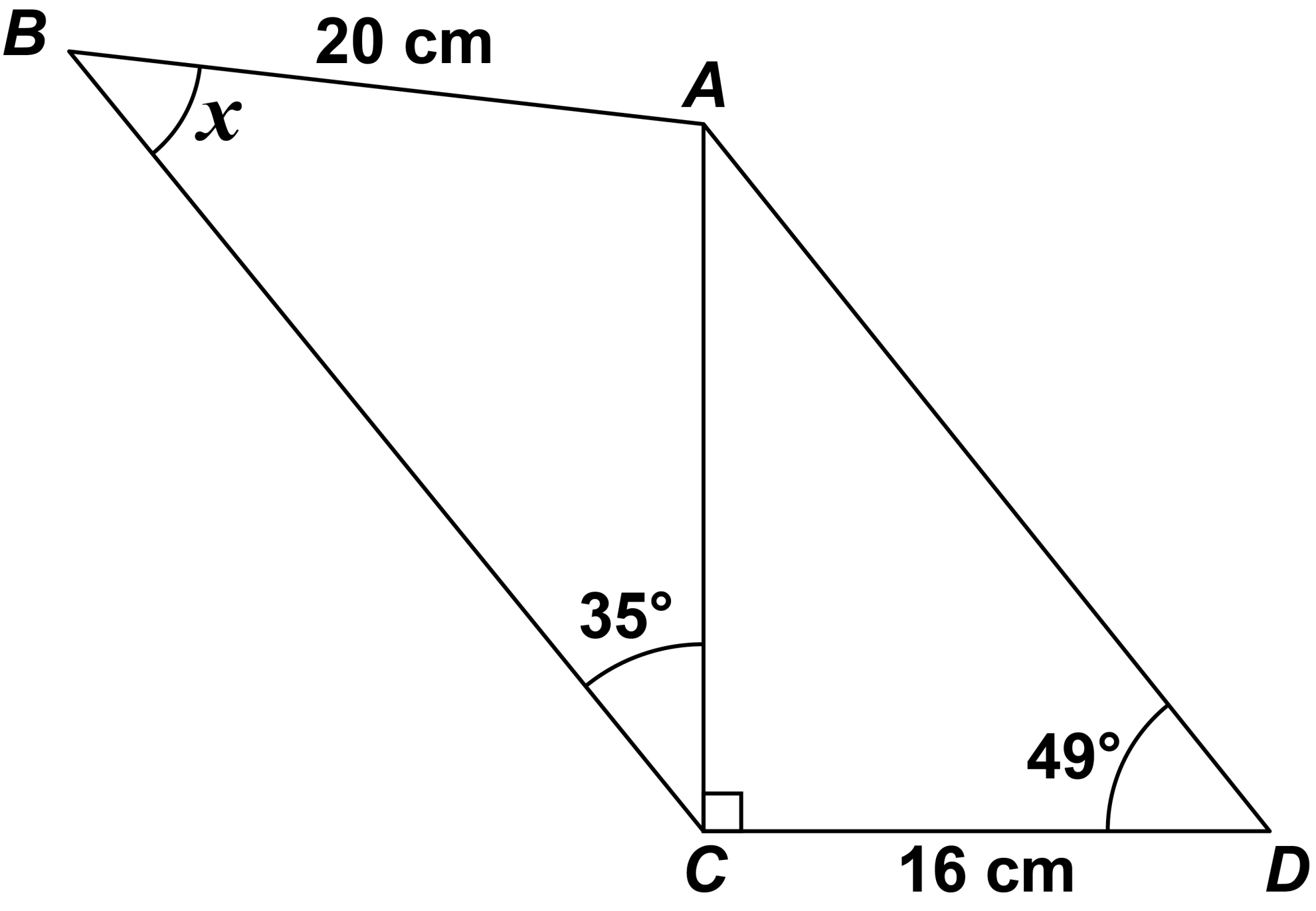





6

25 *ABC* and *ACD* are triangles.

The diagram is not drawn accurately.




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

**Answer** _____ **degrees**

**[Turn over]**

26 $f(x) = \dfrac{x}{x + 2}$ $g(x) = x^2 - 2$

**Work out** $fg(x)$

**Give your answer in the form** $a + bx^n$ **where** $a$, $b$ **and** $n$ **are integers. [3 marks]**

**Answer**

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]

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.

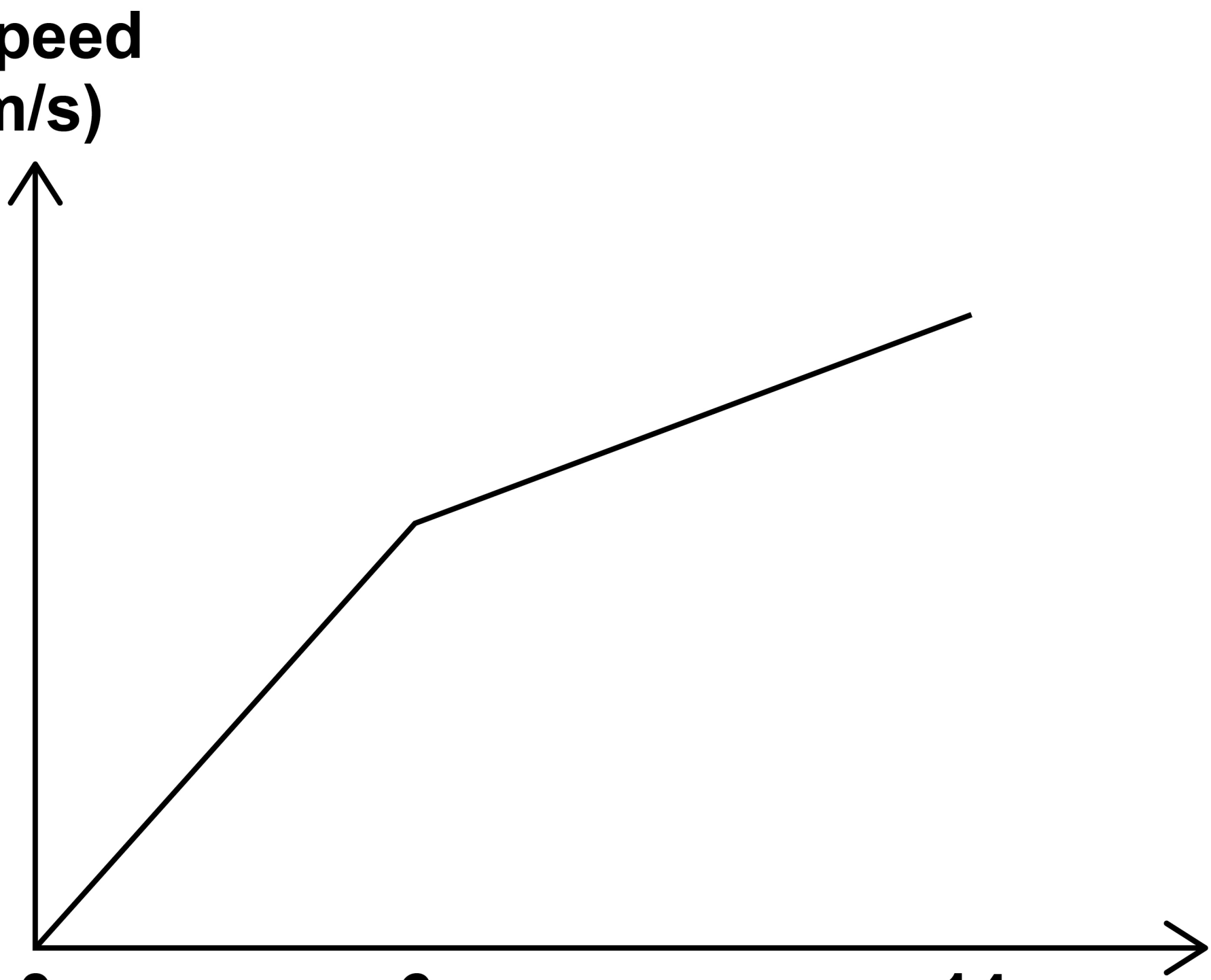
A sketch of her speed-time graph is on page 47.

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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28 (b) When Izzy finishes the 80-metre race, her speed is $v$ m/s

Work out the value of $v$. [4 marks]

Answer _____

END OF QUESTIONS

6

50

# There are no questions printed on this page

| For Examiner's Use | |
|---|---|
| Pages | Mark |
| 4–7 | |
| 8–11 | |
| 12–15 | |
| 16–21 | |
| 22–25 | |
| 26–29 | |
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| 46–49 | |
| **TOTAL** | |