AQA-H | Nov '24 | P3-Calc

Do not write outside the box

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

1 Work out the reciprocal of $\frac{10}{3}$

Give your answer as a decimal.

[2 marks]

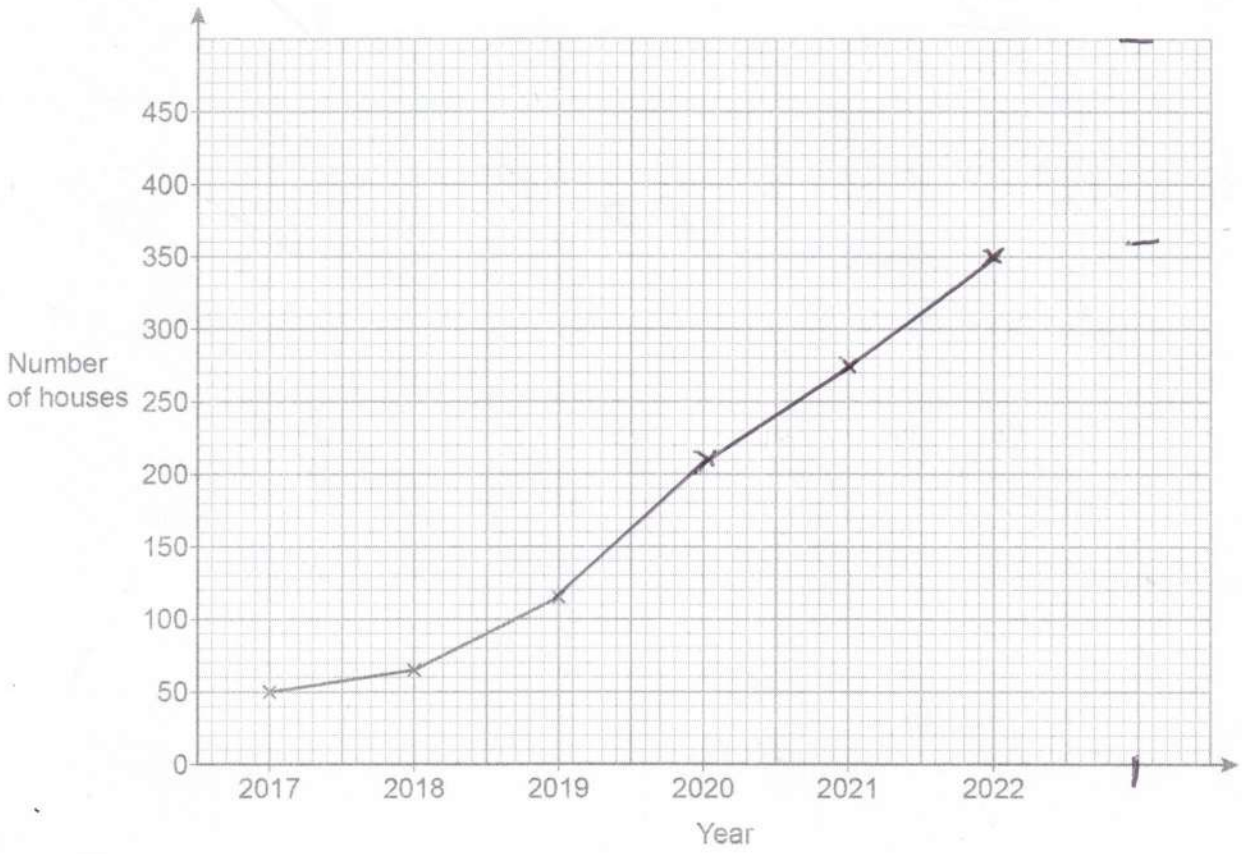
$\frac{3}{10}$ ✓

Answer 0.3 ✓

Do not write outside the box

2 The table shows information about the number of houses with solar panels in a town.

Year	2017	2018	2019	2020	2021	2022
Number of houses	50	65	115	210	275	350



2 (a) Complete the graph.

✓✓

[2 marks]

2 (b) Use the graph to estimate the number of houses with solar panels in 2023

[1 mark]

Answer ms: 360 → 500

5

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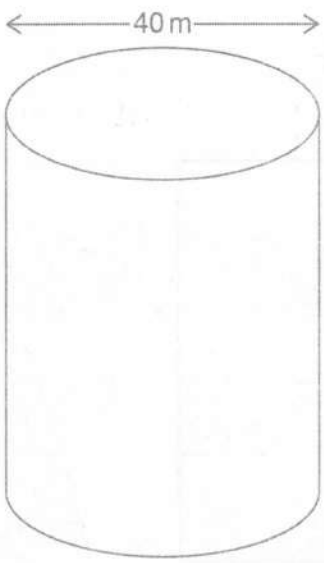
3 A building in the shape of a cylinder has diameter 40 m and height 55 m

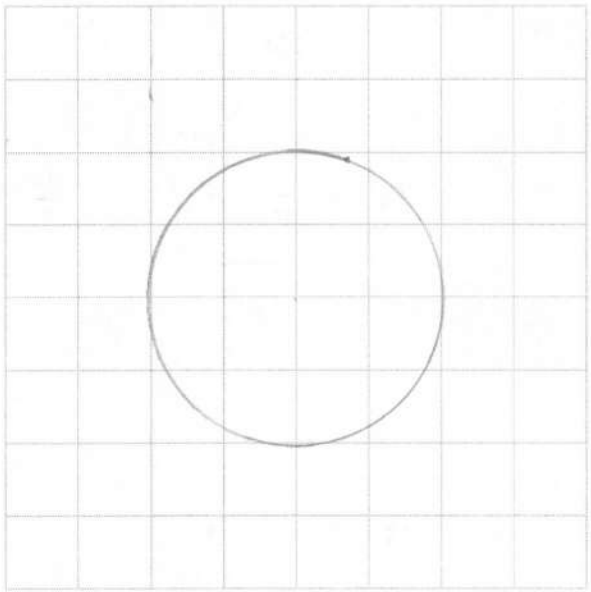


= 4cm

= 5.5cm

3 (a) On the centimetre grid, draw a **plan** of the building.
Use a scale of 1 cm to 10 m

[2 marks]



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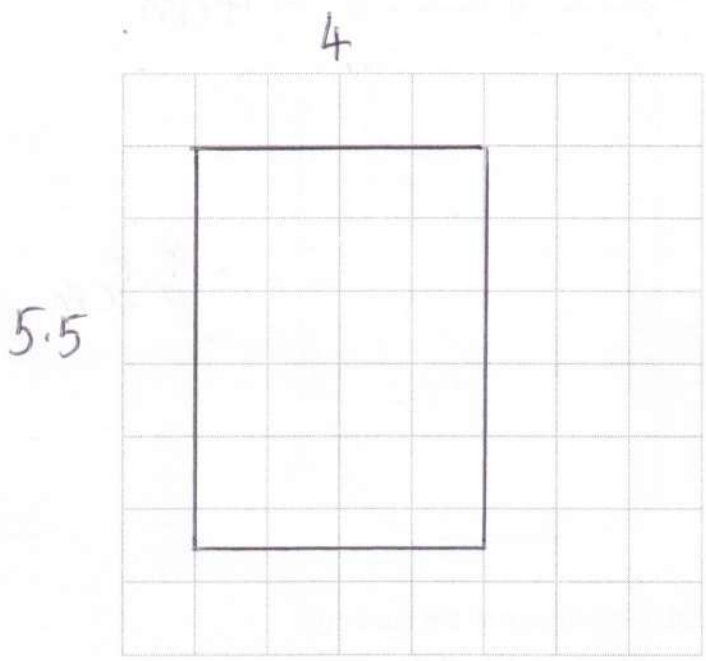
3 (b) On this centimetre grid, draw the **front elevation** of the building.

Use a scale of 1 cm to 10 m

[2 marks]



Turn over for the next question

4

Do not write outside the box

4 To the **nearest pound**, Rosie has £12

She wants to buy 6 drinks.

Each drink costs £1.89

Show that Rosie **definitely** has enough money to buy the 6 drinks.

[3 marks]

Rosie has £11.50 minimum ✓

6 x 1.89 = £11.34 ✓

11.34 < 11.50 ✓

5 The total cost of a taxi ride is calculated by adding

a fixed charge of £4

and

a charge of £2 per mile.

Write a formula to work out the total cost, £C, of a journey of m miles.

[2 marks]

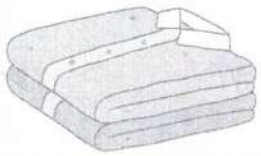
$C =$ 2m +4

✓ ✓

Do not write outside the box

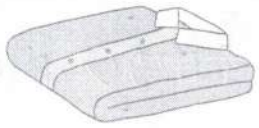
6 Three shops sell shirts.

Shop A



Pack of 2 £19.00

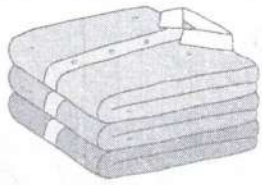
Shop B



Was £12.40

Now 25% off

Shop C



Pack of 3 £37.40

Buy one pack, get another pack half price

At which shop is it cheapest to buy **6 shirts**?

Show working to support your answer.

[5 marks]

(A) $3 \times 19 = £57$ ✓

(B) $6 \times 12.40 \times 0.75 = £55.80$ ✓✓

(C) $37.40 + (\frac{1}{2} \times 37.40) = £56.10$ ✓

All +B ✓

Answer B

10

Turn over ▶

Do not write outside the box

7 (a) At a school

there are 912 students

the ratio of students to teachers is 15.2 : 1

The number of students stays the same.

The number of teachers increases by 2

Work out the new ratio of students to teachers.

Give your answer in the form $n : 1$

[3 marks]

S	T	S	T
15.2	1	912	62
912	60		1

$\times \frac{912}{15.2}$ ÷62

Answer 14.7 : 1

7 (b) On a school trip, one teacher is needed for every group of 10 or fewer students.

72 students want to go on the trip.

Lexi tries to work out how many teachers are needed.

> $72 \div 10 = 7.2$
>
> 7 teachers are needed.

What is wrong with her answer?

[1 mark]

Needed to round up to 8

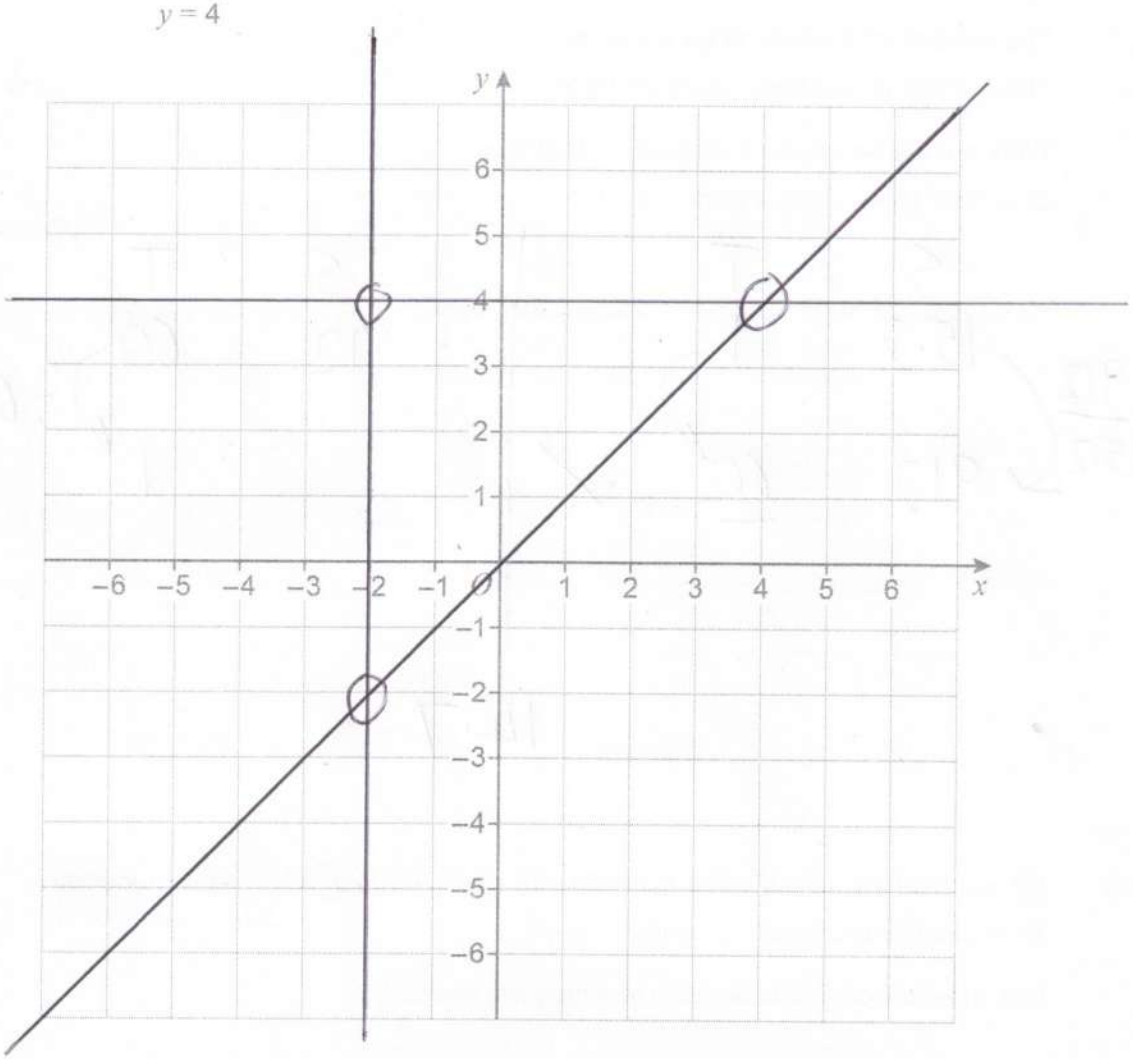
Do not write outside the box.

8 A triangle is drawn using the lines

$y = x$

$x = -2$

$y = 4$



Work out the coordinates of the **three** vertices of the triangle.

[4 marks]

Answer (4 , 4)

(-2 , -2)

(-2 , 4)

8

Do not write outside the box

9 When x is divided by 2 the remainder is 1 → odd

When x is divided by 3 the remainder is 1 → M3 +1

When x is divided by 4 the remainder is 1 → M4 +1

Work out **two** possible values of x.

[2 marks]

M3 and M4 ⇒ M12

$x =$ 13 and $x =$ 25 etc

✓ ✓

Any M12 +1

Do not write outside the box

10 A car will travel 60 miles.

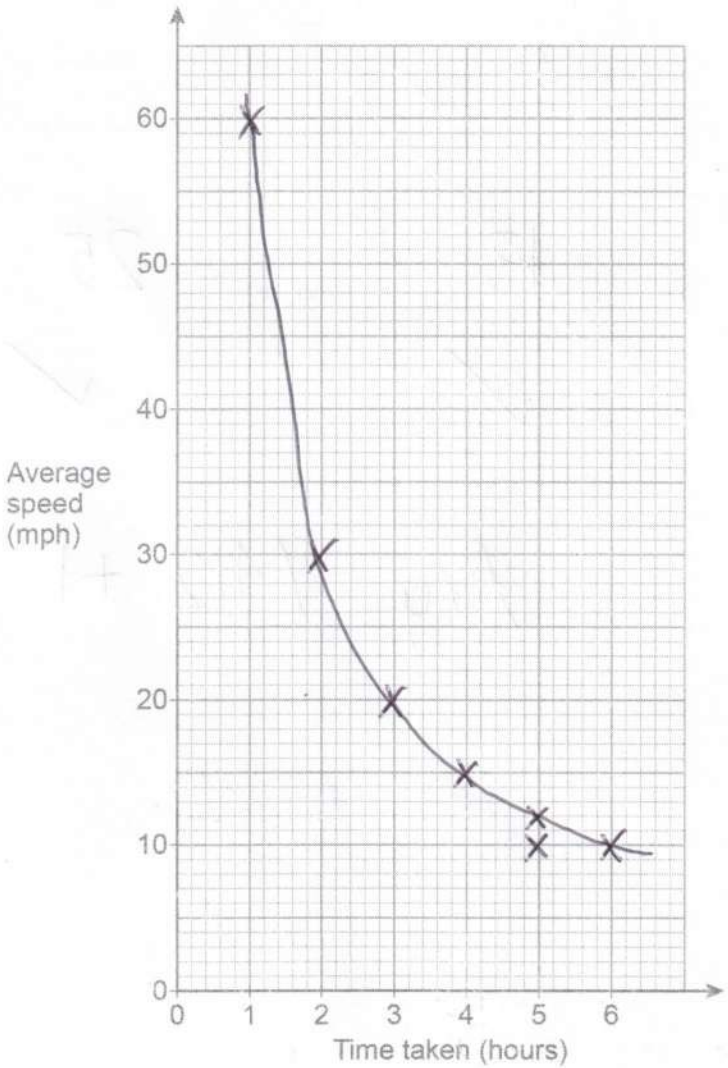
Draw a graph to show the **average speed** of the car for times taken between 1 hour and 6 hours.

You may use the table to help you.

[3 marks]

Time taken (hours)	1	2	3	4	5	6
Average speed (mph)	60	30	20	15	12	10

$S = \frac{D}{T}$



5

Do not write outside the box

11 Factorise fully $12t + 4t^3$

[2 marks]

Answer $4t(3 + t^2)$ ✓✓ -1ee

12 The population of a country is now 67 200 000

The population is predicted to

increase by 1% per year for 6 years

and then

decrease by 1.2% per year for 2 years.

Work out the predicted population of the country 8 years from now.

Give your answer to 3 significant figures.

[4 marks]

$67\,200\,000 \times 1.01^6 \times 0.988^2$ ✓ ✓

$= 69632406.54$ ✓

Answer 69,600,000

Do not write outside the box

13 A bag contains one £5 note, one £10 note, one £20 note and one £50 note.

Amaan picks **two** of the notes at random without replacement.

Work out the probability that he has picked **at least** £30

[2 marks]

12 combinations

50, 20 50, 10
20, 50 10, 50
20, 10 5, 50
10, 20 50, 5

} 8

✓ 8 or 12

Answer $\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$ ✓OE

Turn over for the next question

8

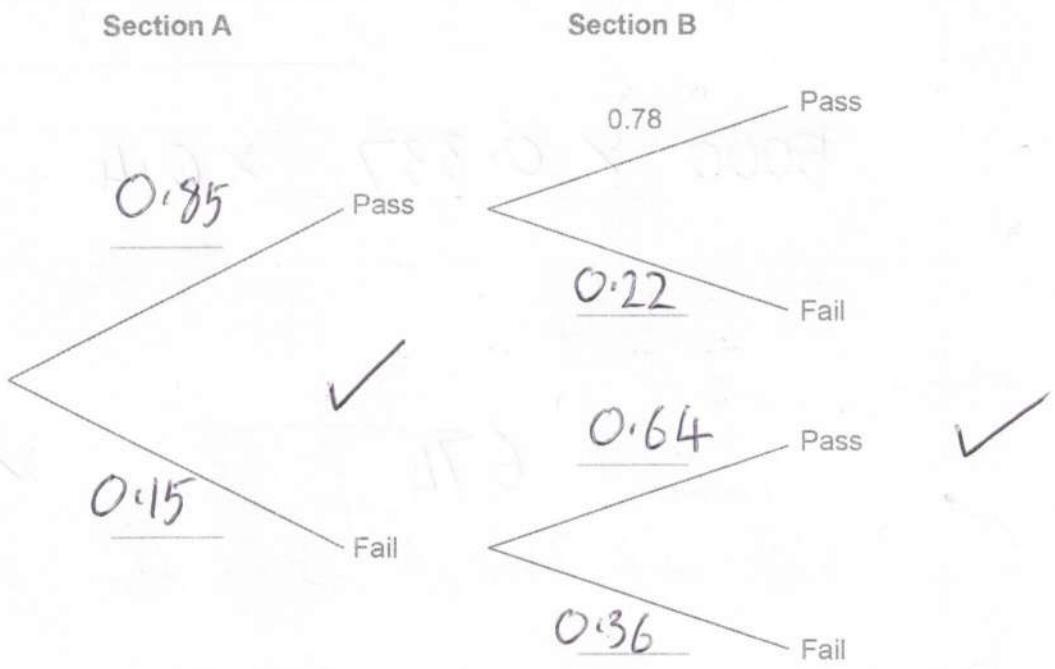
Do not write outside the box

14 A test consists of two sections, A and B.

- 85% of people pass section A.
- 78% of people who **pass** section A also **pass** section B.
- 36% of people who **fail** section A also **fail** section B.

14 (a) Complete the tree diagram.

[2 marks]



Do not write outside the box

14 (b) 40% of people who fail **at least** one section take the test again.

5000 people take the test.

How many of these 5000 people are expected to take the test again?

[4 marks]

$P(\text{Fail} \geq 1) = 1 - \text{Pass both}$

$= 1 - 0.85 \times 0.78$

$= 0.337$ ✓✓

$5000 \times 0.337 \times 0.4$ ✓

Answer 674 ✓

Turn over for the next question

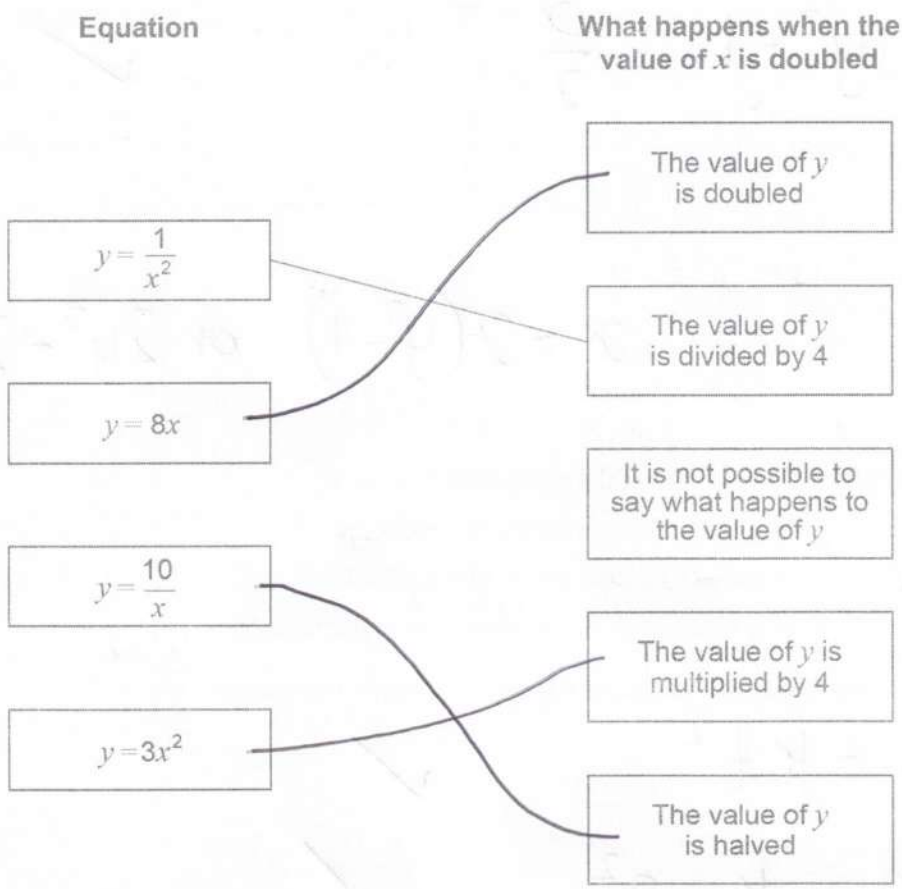
6

Do not write outside the box

15 Match each equation to a statement to show what happens when the value of x is doubled.

One has been done for you.

[3 marks]



Do not write outside the box

16 Rearrange $y = \sqrt{\left(\frac{x}{2} + 1\right)}$ to make x the subject.

[3 marks]

$y^2 = \frac{x}{2} + 1$ ✓

$y^2 - 1 = \frac{x}{2}$ ✓

Answer $x = 2(y^2 - 1)$ or $2y^2 - 2$ ✓

17 A stone falls vertically from 300 metres above ground.

- The stone falls d metres in t seconds.
- d is directly proportional to the square of t.
- The stone falls 20 metres in the first 2 seconds.

Work out the **total** time taken for the stone to reach the ground.

[4 marks]

$d = kt^2$ ✓

$20 = k \times 2^2$

✓ $k = \frac{20}{4} = 5$

$d = 5t^2$

$\frac{300}{5} = t^2$

$t = \sqrt{60}$ ✓

Answer 7.75 seconds ✓

10

[ms 7.7 → 7.75]

Do not write outside the box

18 The table shows information about the height of 40 plants.

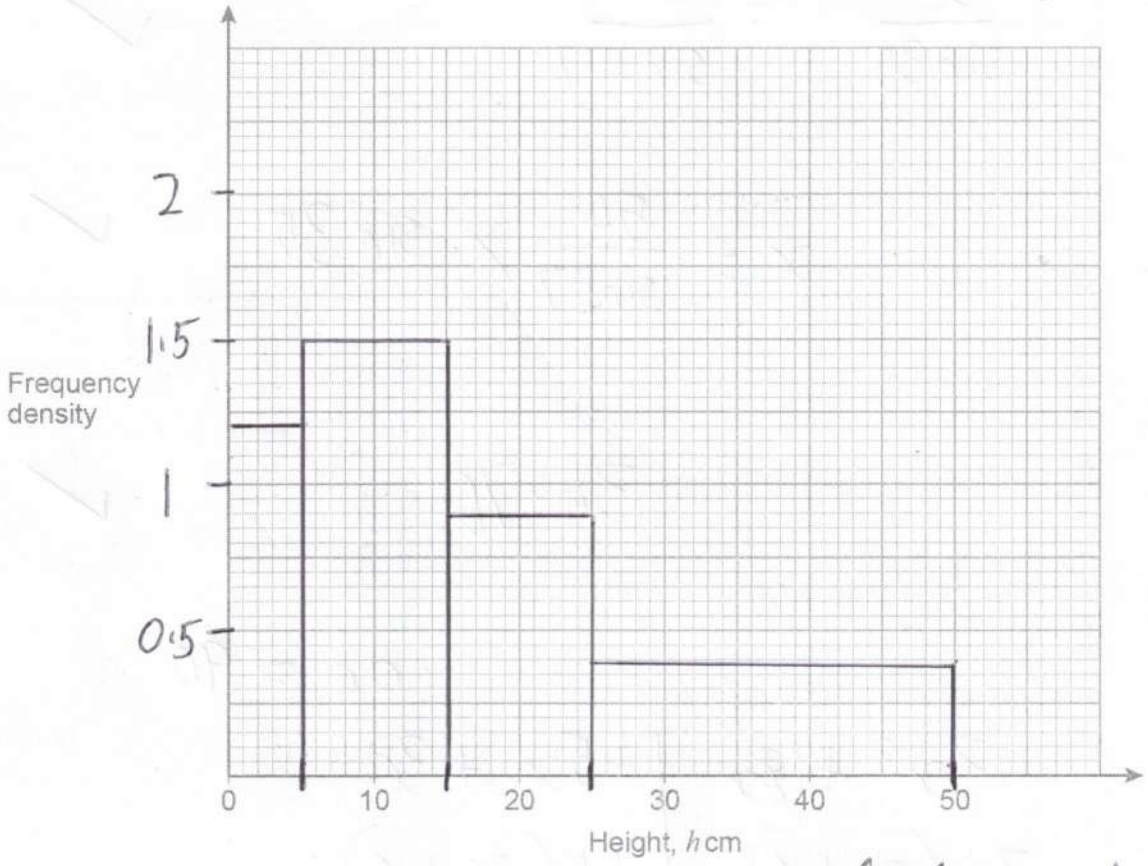
Area Height

Height, h cm	Frequency	Class width	fd
$0 \leqslant h < 5$	6	5	1·2
$5 \leqslant h < 15$	15	10	1·5
$15 \leqslant h < 25$	9	10	0·9
$25 \leqslant h < 50$	10	25	0·4

✓Any
✓✓3

Draw a histogram to represent the heights.

[4 marks]

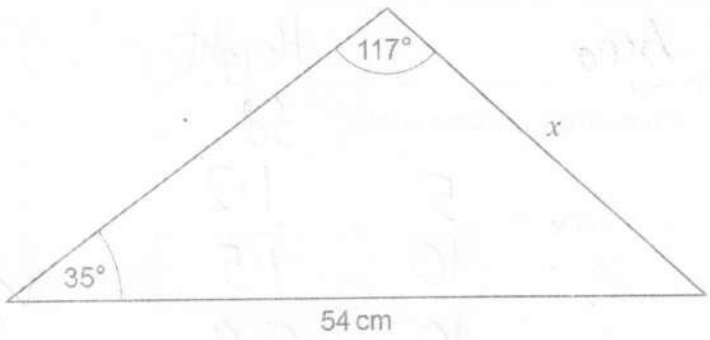


✓✓✓ 3 correct

✓✓✓✓ fully correct

Do not write outside the box

19



Not drawn accurately

Use the sine rule to work out length x.

You **must** show your working.

[3 marks]

$$\frac{x}{\sin 35} = \frac{54}{\sin 117}$$ ✓

$$x = \frac{54}{\sin 117} \times \sin 35$$ ✓

$x =$ 34.76 cm ✓

20 Factorise fully $3x^2 + 23x + 30$

[2 marks]

$ac = 90$

$3x^2 + 18x \mid +5x + 30$

$3x(x+6) \mid +5(x+6)$

Answer $(3x+5)(x+6)$ ✓✓

9

Do not write outside the box

21 A bag contains 25 discs.

11 are red, 9 are blue and 5 are yellow.

Ashley picks three of the discs at random without replacement.

Ashley's first disc is red.

Work out the probability that all three discs are different colours.

[3 marks]

Now 10 9 5
R B Y

$P(B \text{ and } Y) = 2 \times \left(\frac{9}{24} \times \frac{5}{23}\right)$ ✓✓

Answer $\frac{15}{92}$ ✓OE

Do not write outside the box

22 The metal used to make a sphere costs £4320

The metal costs £3.60 per gram.

Each cubic centimetre of metal has a mass of 17.3 grams. = D

Work out the radius, r, of the sphere.

D M (V)

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

[4 marks]

$4320 \div 3.6 = 1200\,g = \text{Mass}$ ✓

$V = \frac{1200}{17.3} = \frac{4}{3}\pi r^3$ ✓

$r = \sqrt[3]{16.559\ldots}$ ✓

$r =$ 2.55 cm ✓

[ms 2.5 → 2.55]

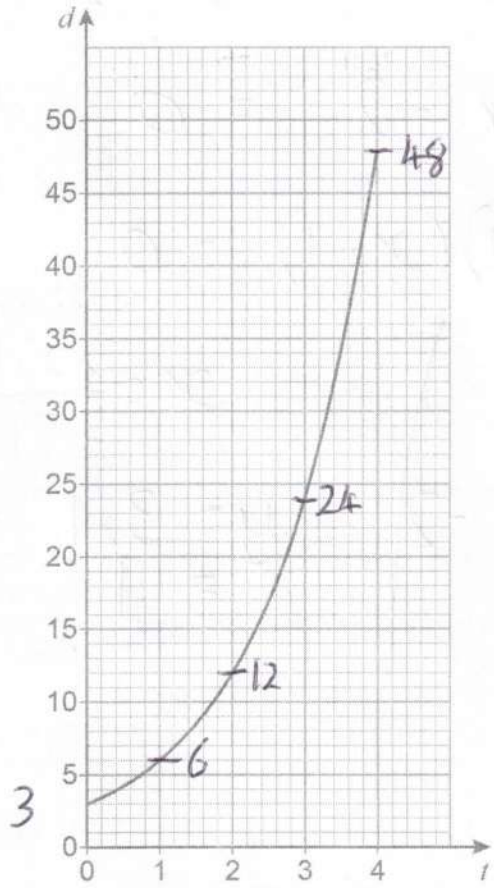
Turn over for the next question

7

Do not write outside the box

23 The distance of a particle from a point is d metres after t seconds.

$d = a \times b^t$ where a and b are constants



Work out the values of a and b.

[3 marks]

At $t = 0$, $d = 3$

$3 = a \times b^0$

$3 = a$

$48 = 3 \times b^4$

$16 = b^4$

$a =$ 3 $b =$ 2

Do not write outside the box

24 A curve has the equation $y = x^2 + 4x - 4$

A straight line has the equation $y = 3x - 2$

Work out the **two** points of intersection of the curve and the straight line.

[5 marks]

$x^2 + 4x - 4 = 3x - 2$

$x^2 + x - 2 = 0$

$(x + 2)(x - 1) = 0$

$x = -2$ | $x = 1$

$y = 3x - 2$ | $y = 3 \times 1 - 2$

$= -8$ | $= 1$

Answer (-2 , -8) and (1 , 1)

END OF QUESTIONS

8