A

Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE MATHEMATICS

H

Higher Tier Paper 3 Calculator

8300/3H

Monday 7 November 2022 Morning

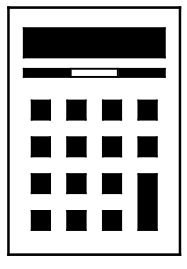
Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]

MATERIALS

For this paper you must have:



- **a calculator**
- **mathematical instruments**
- **the Formulae Sheet (enclosed).**

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.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**

- **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 $2^x = 32$

Circle the value of x. [1 mark]

4 **5** **6** **7**

2 **What is 1.8×10^{-4} as an ordinary number?**

Circle your answer. [1 mark]

–180 000 **–18 000**

0.000 18 **0.000 018**

3 **Expand** $6x^2(x^3 + 2)$

Circle your answer. [1 mark]

$6x^5 + 2$ $6x^6 + 2$

$6x^5 + 12x^2$ $6x^6 + 12x^2$

4 $30 < x < 300$

x **is 200% of** y

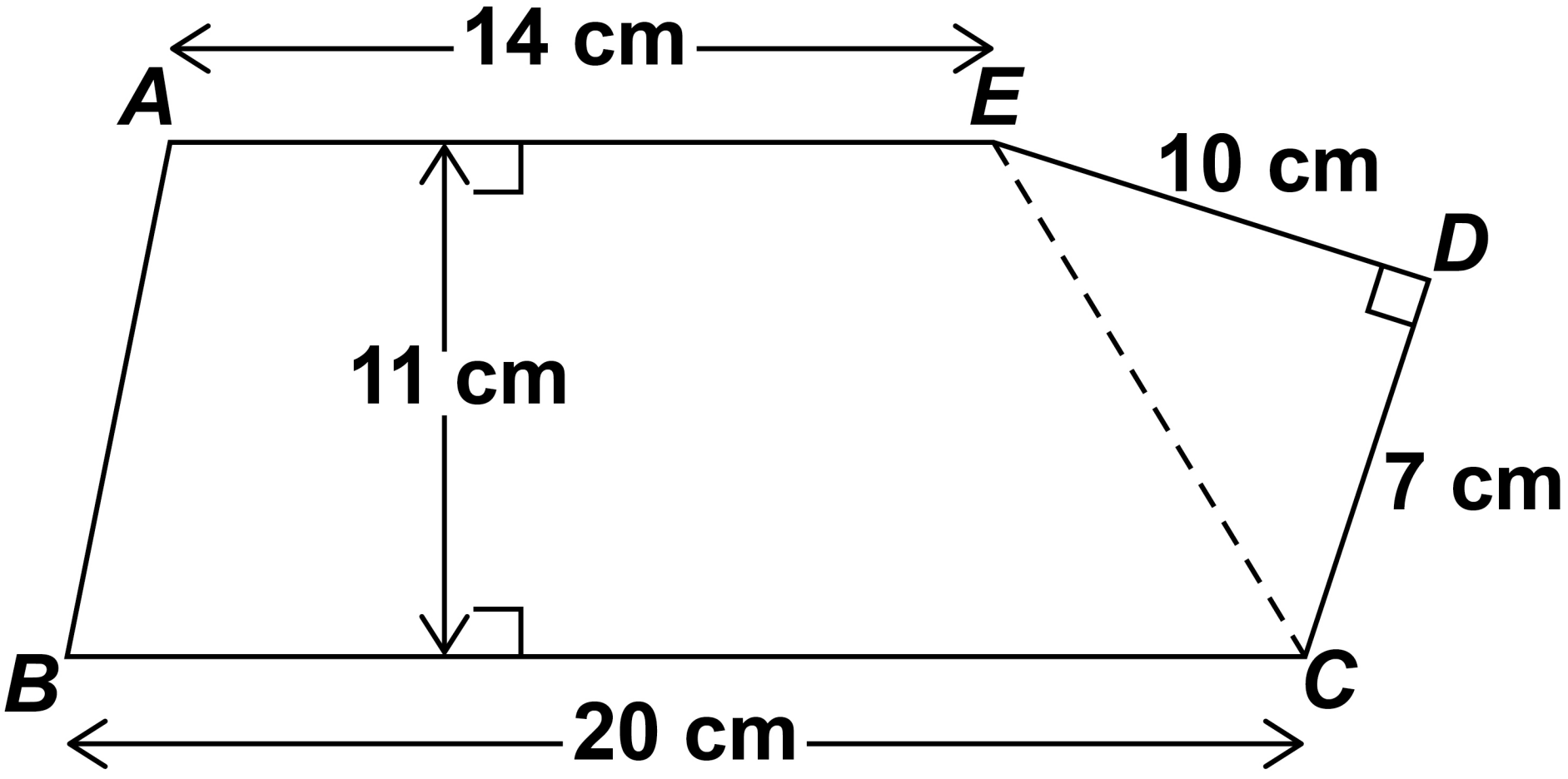
Circle the correct inequality. [1 mark]

$10 < y < 100$ $15 < y < 150$

$60 < y < 600$ $90 < y < 900$

5 ***ABCDE*** **is a pentagon.**

The diagram is not drawn accurately.



Work out the area of the pentagon.

[3 marks]

Answer _____ cm^2

[Turn over]

6 Joe, Kim and Lisa each have an amount of money.

Joe has £72

Joe's amount : Kim's amount = 6 : 5

Lisa's amount is $1\frac{1}{2}$ times Joe's amount.

Show that, in total, they have LESS than £250 [3 marks]

9

[Turn over]

6

0 9

7 (a) Here is the rule for a sequence.

After the first two terms, each term is the sum of the previous two terms

The 1st term is 33

The 2nd term is x

The 4th term is 73

Work out the value of x. [3 marks]

$x =$ _____

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[Turn over]

7 (b) An expression for the nth term of a different sequence is $n - n^2$

Ruth says,
"All the terms will be negative because n^2 is always greater than n."

Is she correct?

Tick a box.

☐ Yes

☐ No

Give a reason for your answer.
[1 mark]

_____

_____

_____

_____

[Turn over]

8 Here is some information about the members of clubs A and B.

	Number of members	Mean height of members
CLUB A	24	1.8 m
CLUB B	20	1.92 m

Work out

$$\frac{\text{total height of the members of club A}}{\text{total height of the members of club B}}$$

Give your answer as a decimal.

[2 marks]

Answer _____

6

9 *P* and *Q* are points.

The x-coordinate of *Q* is 4 MORE than the x-coordinate of *P*.

The y-coordinate of *Q* is 5 LESS than the y-coordinate of *P*.

Work out the gradient of the straight line through *P* and *Q*.
[2 marks]

Answer _____

[Turn over]

10 Here are the results after 250 spins of a coin.

HEADS	128
TAILS	122

The coin is spun an extra 50 times.

After all 300 spins, the relative frequency of Heads is 0.49

For the EXTRA 50 SPINS, work out

number of Heads : number of Tails
[3 marks]

Answer _____ : _____

[Turn over]

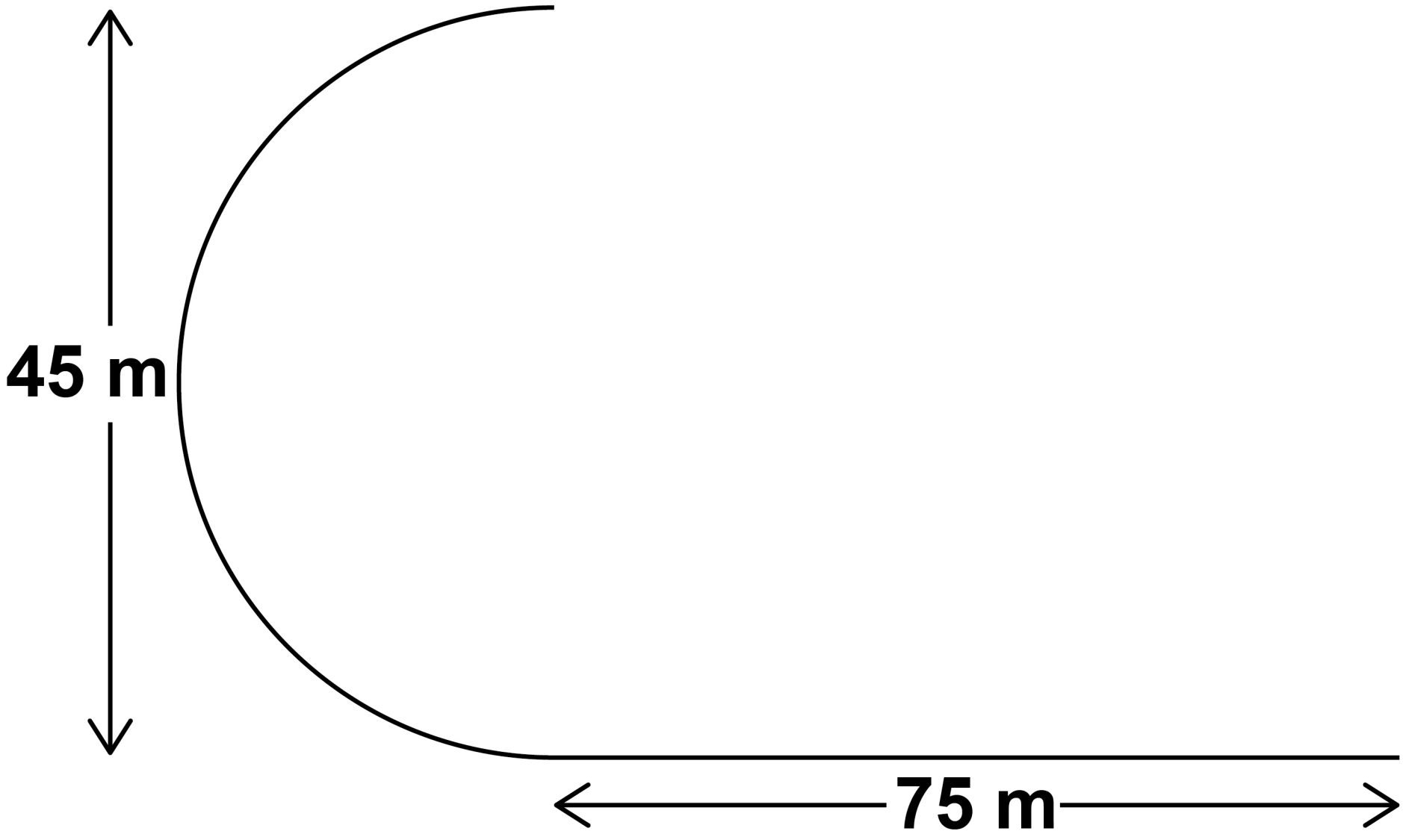
5

11 **Part of a running track is the arc of a semicircle joined to a straight line.**

The semicircle has diameter 45 metres.

The straight line has length 75 metres.

The diagram is not drawn accurately.



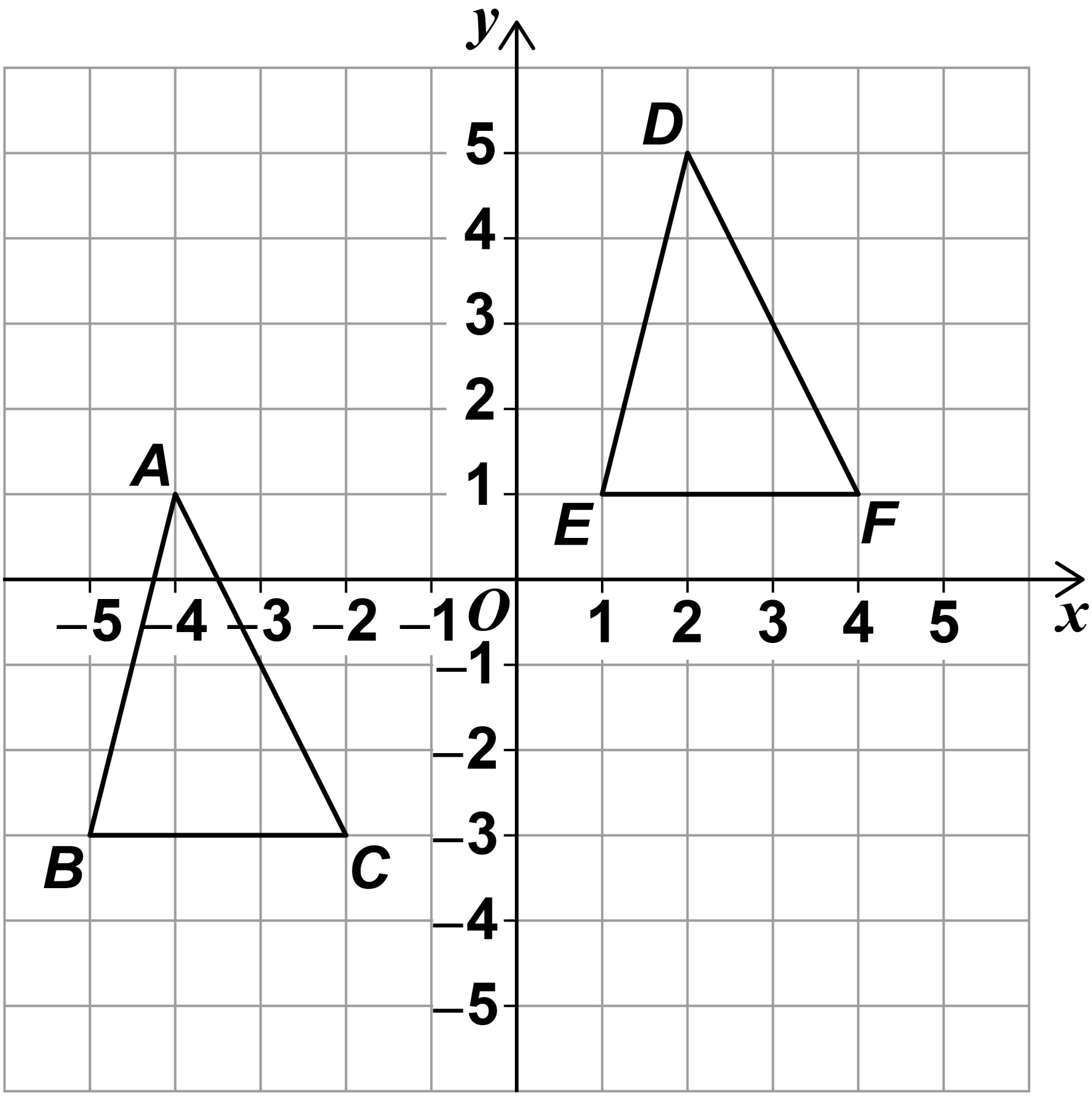
Abby runs once along this part of the track in 18 seconds.

Work out her average speed.

Give your answer to 2 significant figures. [4 marks]

Answer _____ **m/s**

12 Triangles *ABC* and *DEF* are shown on a grid.



Describe a single transformation that shows the triangles are congruent. [2 marks]

6

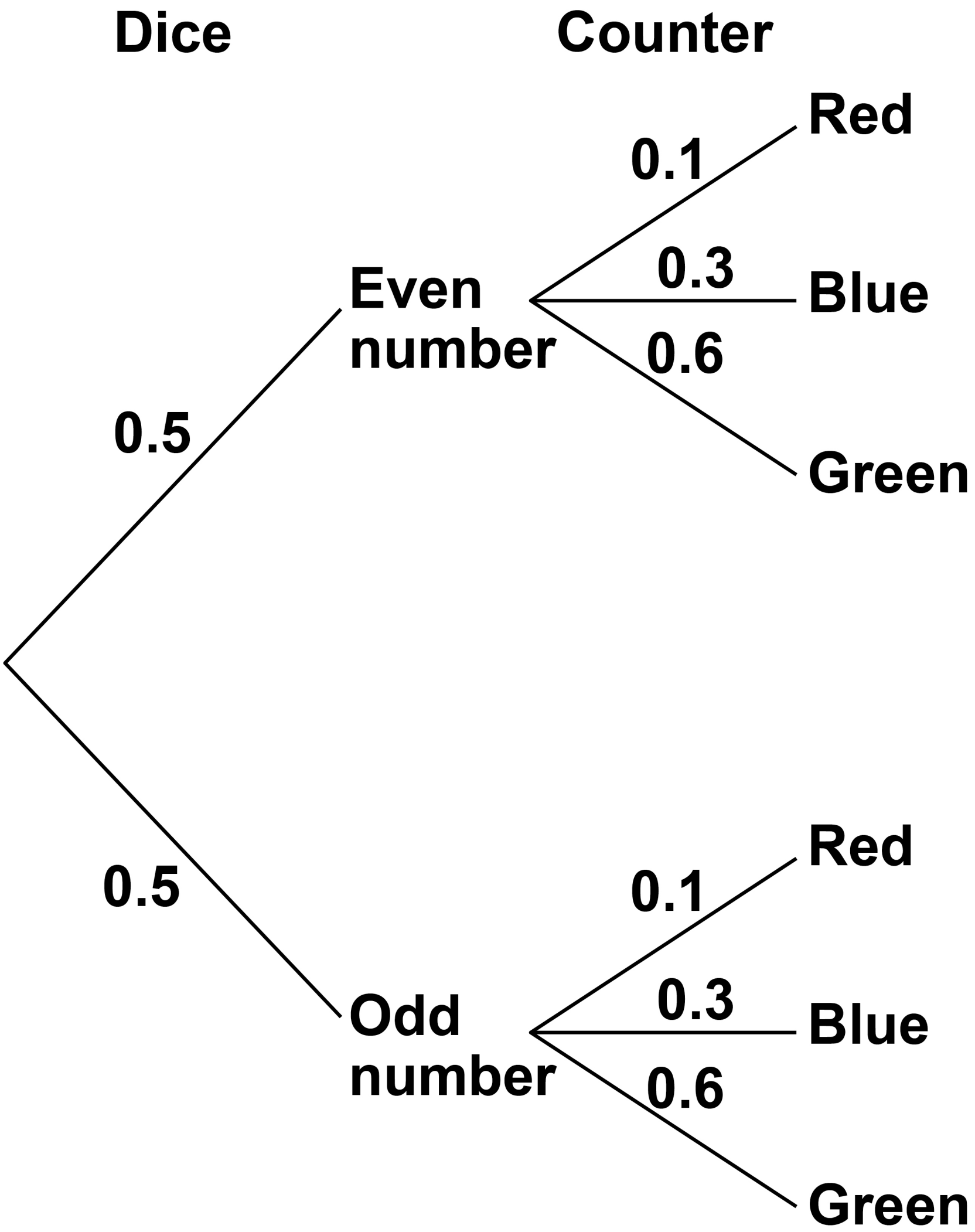
13 A fair, ordinary dice is rolled and a counter is taken at random from a bag.

The tree diagram, on the opposite page, shows the probabilities.

13 (a) How do the probabilities show that ALL the counters in the bag are red, blue or green? [1 mark]

13 (b) Circle the probability that the counter is red OR blue. [1 mark]

0.0009 0.8 0.03 0.4


Dice
Counter
0.5
Even number
0.1
Red
0.3
Blue
0.6
Green
0.5
Odd number
0.1
Red
0.3
Blue
0.6
Green

[Turn over]

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13 (c) Circle the probability that the dice lands on an even number AND the counter is blue. [1 mark]

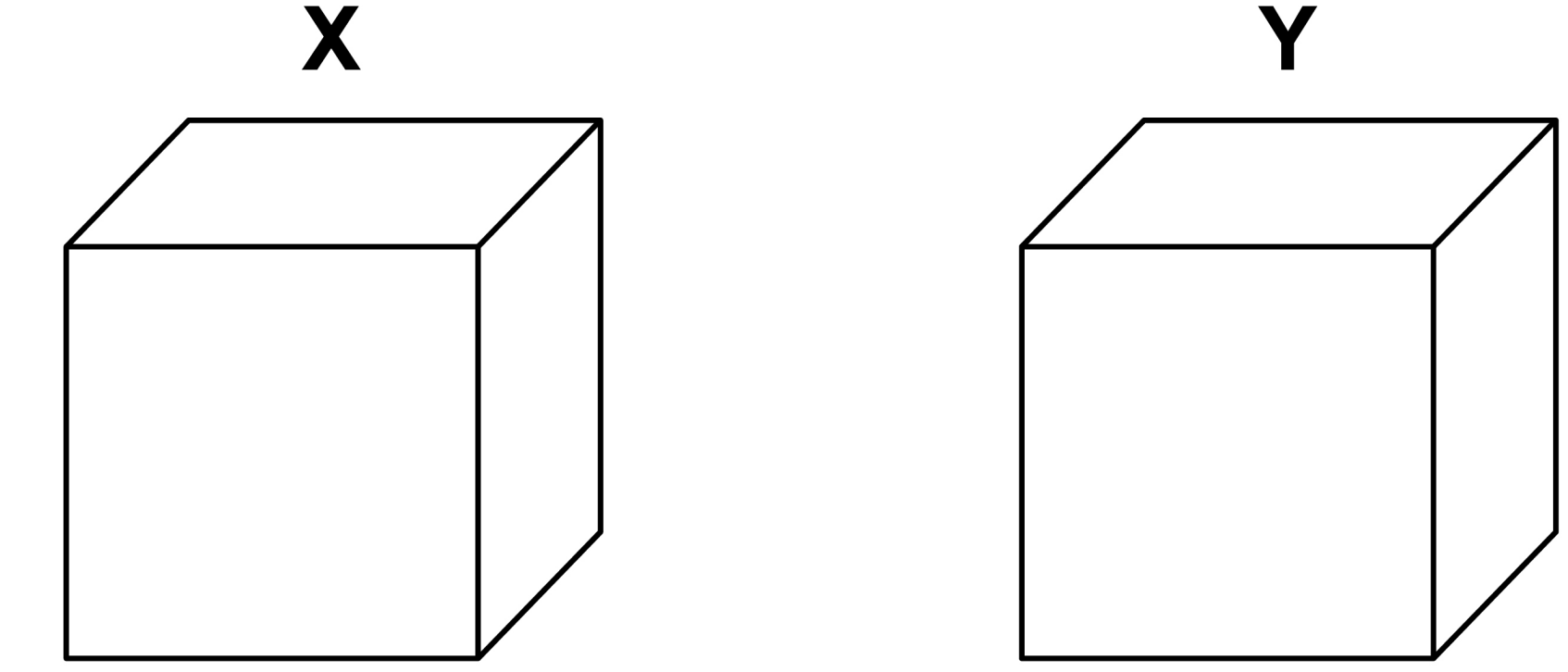
0.15 0.3 0.35 0.8

3

14 Here are two solid cubes, X and Y.

The mass of X is 10.976 kg

The area of EACH FACE of X is 784 cm^2



14 (a) Zayan wants to know the density of Y.

He assumes that Y is identical to X.

What density should he get for Y?

Give your answer in GRAMS PER CUBIC CENTIMETRE.
[4 marks]

Answer _____ g/cm^3

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14 (b) In fact,

the mass of Y is less than the mass of X

the area of each face of Y is greater than the area of each face of X.

What does this mean about the actual density of Y?

Tick ONE box. [1 mark]

☐ It is less than the answer to part (a)

☐ It is equal to the answer to part (a)

☐ It is greater than the answer to part (a)

☐ It is not possible to tell

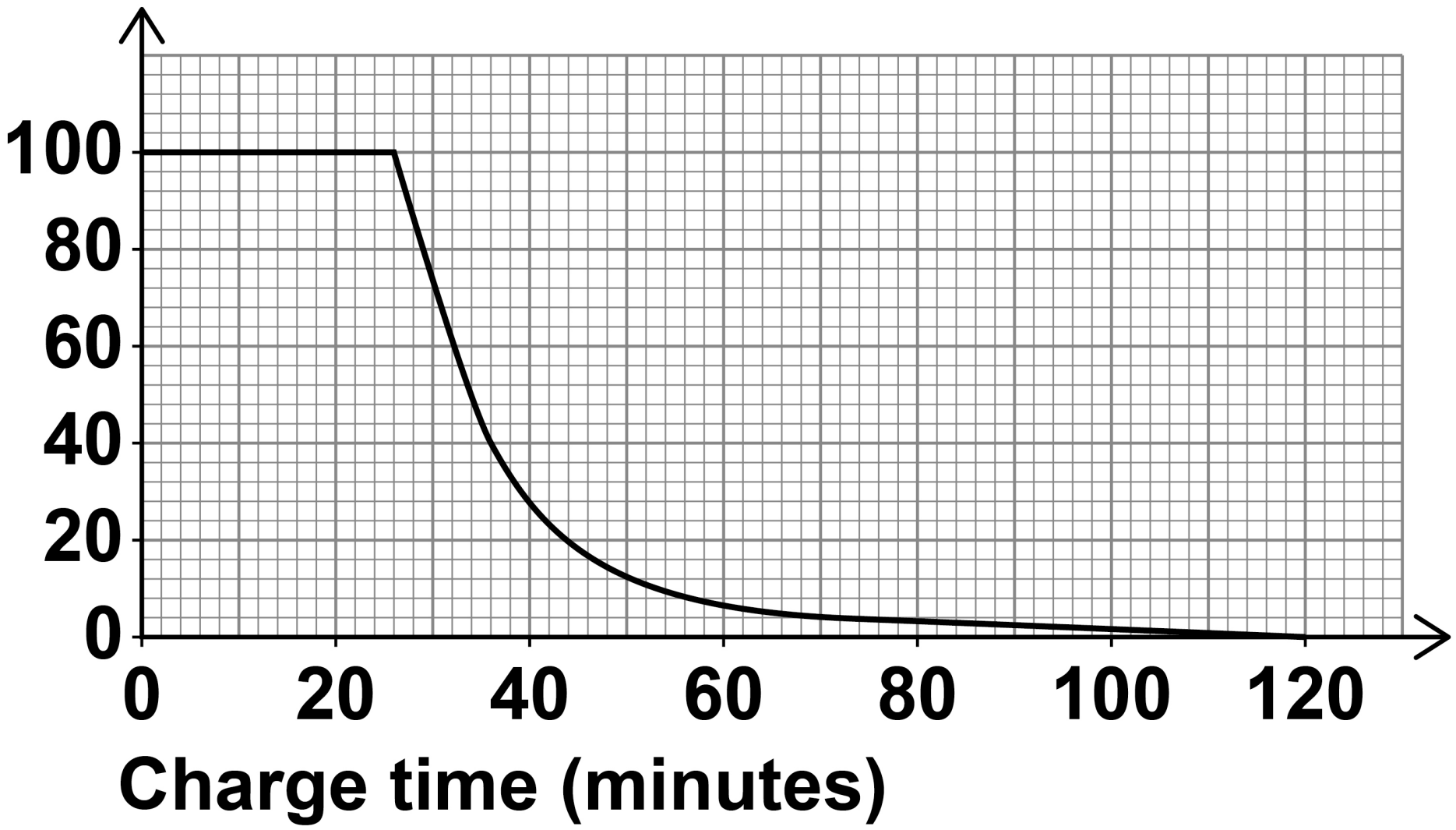
15 A mobile phone takes 2 hours to charge from empty.

When the phone is being charged, the current flow into the phone

- starts at full current flow (100%)
- continues at full current flow for a period of time
- gradually decreases until the phone is fully charged.

This is shown on GRAPH A, on the opposite page.

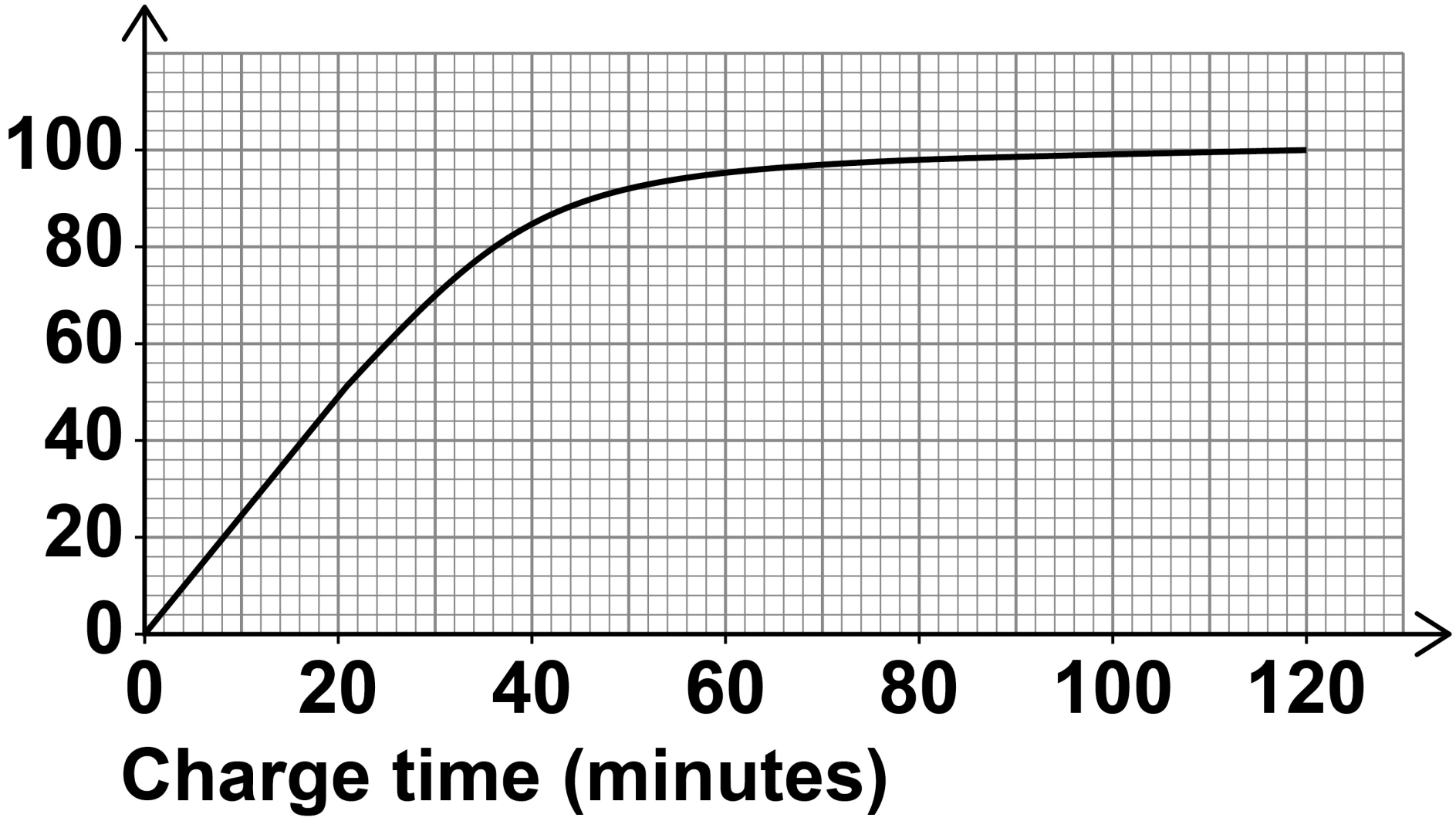
GRAPH A



[Turn over]

GRAPH B shows the percentage charge in the phone when charging from empty.

GRAPH B



Megan's phone is empty of charge.

She starts to charge her phone at 10.00 am

15(a) Using GRAPH A, on page 33, estimate the time when the current flow starts to decrease. [2 marks]

Answer _____ am

15(b) Using GRAPH A, on page 33, and GRAPH B, on page 34, estimate the percentage charge in the phone when the current flow is 40% [1 mark]

Answer _____ %

15 (c) Using GRAPH B, on page 34, estimate the rate of increase in the percentage charge when the phone has 90% charge. [2 marks]

Answer

_____ percent per minute

5

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[Turn over]

16 H is inversely proportional to the cube root of L.
$H = 7$ when $L = 64$

16 (a) Work out an equation connecting H and L. [3 marks]

Answer

16(b) Work out the value of H when $L = 2744$ [2 marks]

$H =$

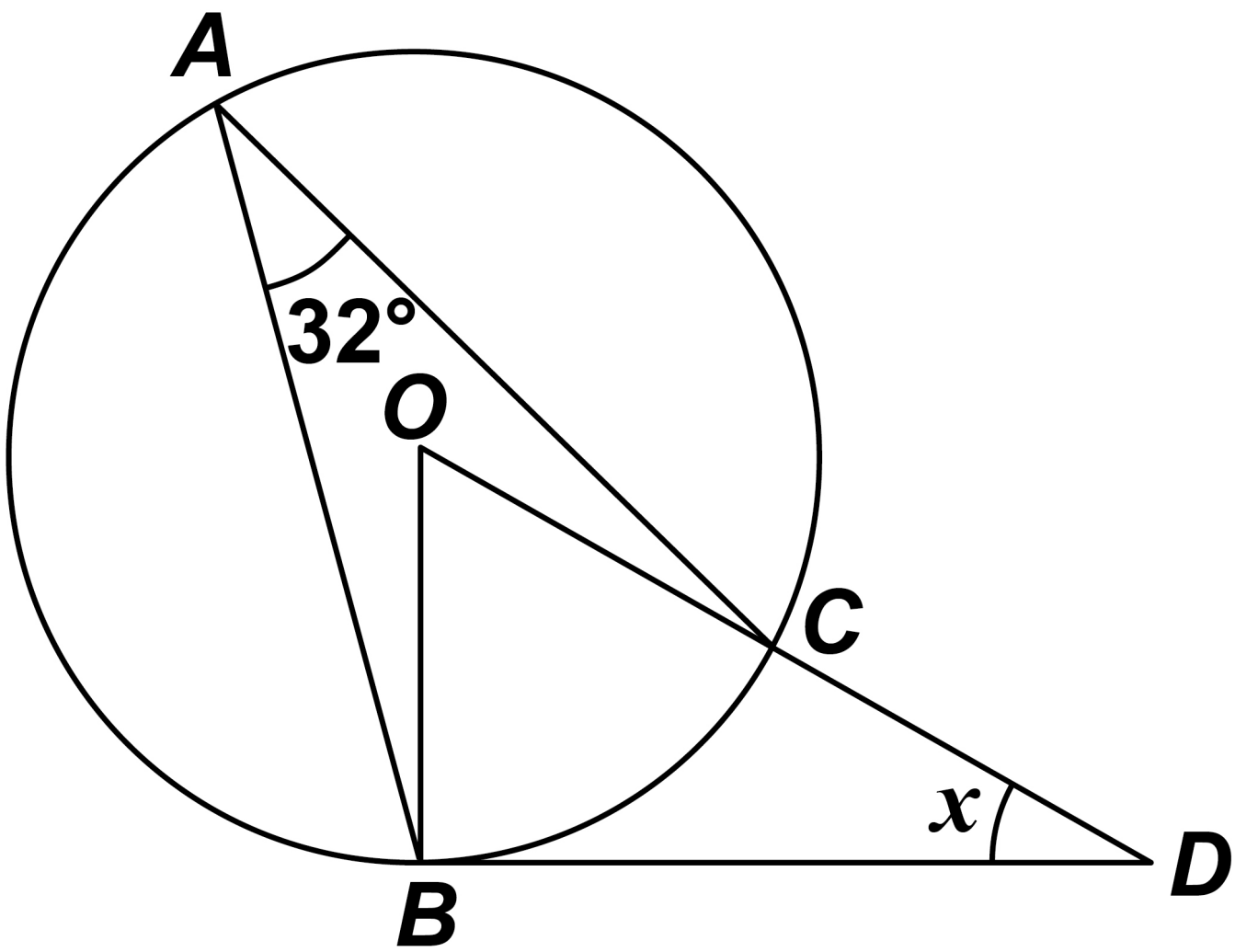
[Turn over]

17 ***A*, *B* and *C* are points on a circle, centre *O*.**

***BD* is a tangent to the circle.**

***OCD* is a straight line.**

The diagram is not drawn accurately.



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

$x =$ _____ **degrees**

8

18 Rearrange $9m + 4(2m - 1) =$
$p^2 + pm$ to make m the subject.
[4 marks]

Answer _____

19 A circle has centre (0, 0) and passes through (0, 11)

Write down the equation of the circle. [1 mark]

Answer _____

20 There should be a train leaving a station every hour from 7 am

No trains leave early.

P(the FIRST TRAIN leaves on time) = 0.9

For all the OTHER TRAINS,

if the previous train did leave on time, P(this train leaves on time) = 0.8

if the previous train did NOT leave on time, P(this train leaves on time) = 0.65

20 (a) Work out P(the first three trains leave on time) [2 marks]

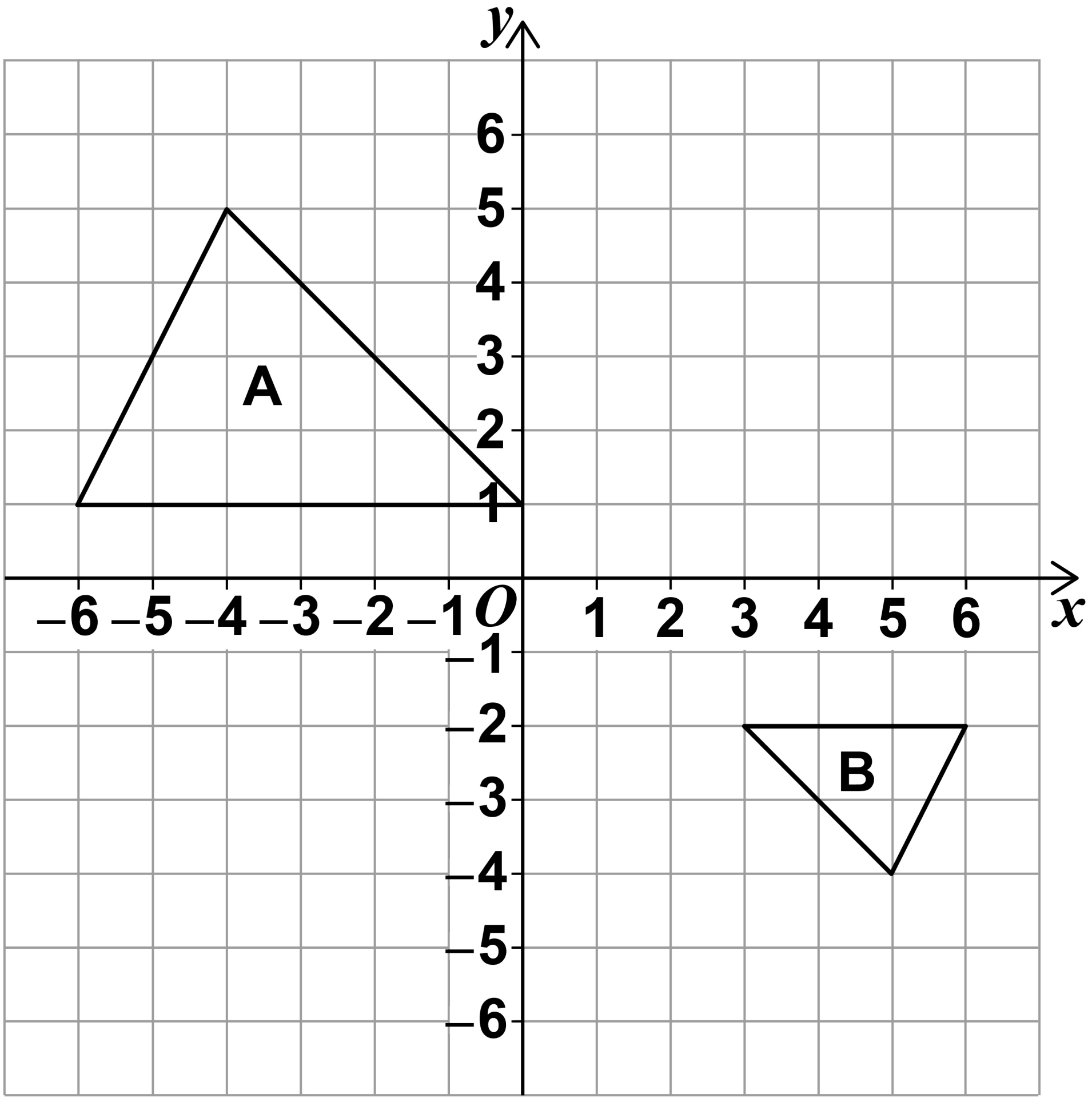
Answer

20(b) The 2 pm train does NOT leave on time.

Work out P(exactly one of the next two trains does NOT leave on time) [3 marks]

Answer

21 Shape A is enlarged to shape B.



21 (a) Circle the scale factor of the enlargement. [1 mark]

$-\frac{1}{2}$ $\quad -2 \quad$ $\frac{1}{2}$ $\quad 2$

21 (b) Write down the coordinates of the centre of enlargement. [1 mark]

Answer (_____ , _____)

22 Simplify fully $\frac{2}{x+1} + \frac{7-5x}{3} + 4x$

Give your answer as a single fraction. [4 marks]

Answer _____

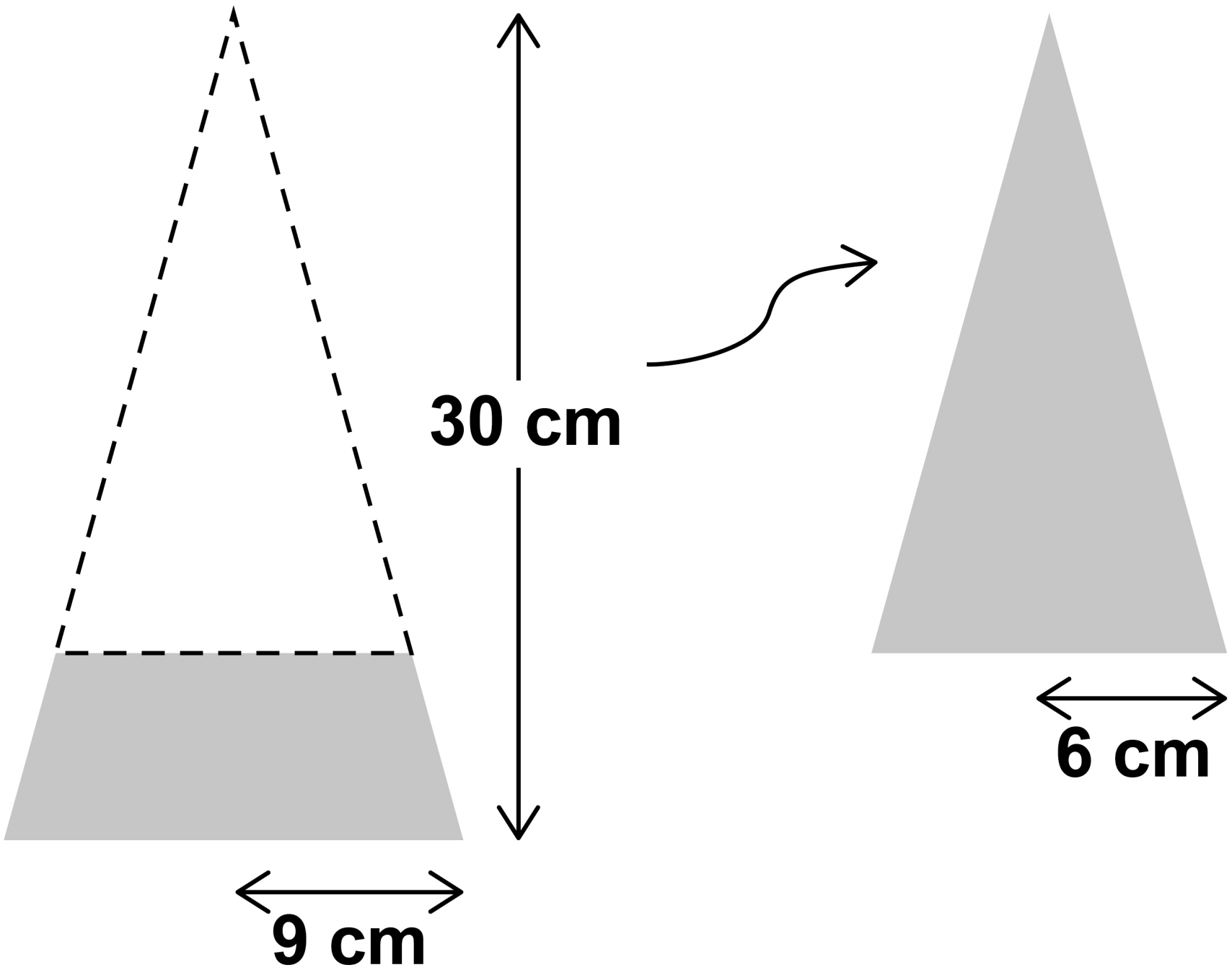
23 Alec makes a bowl for dog food from a solid wooden cone.

The sketches, on the opposite page, show how the bowl is made.

The cone has radius 9 cm and perpendicular height 30 cm

A smaller cone, with radius 6 cm, is removed.

The diagram, on the opposite page, is not drawn accurately.



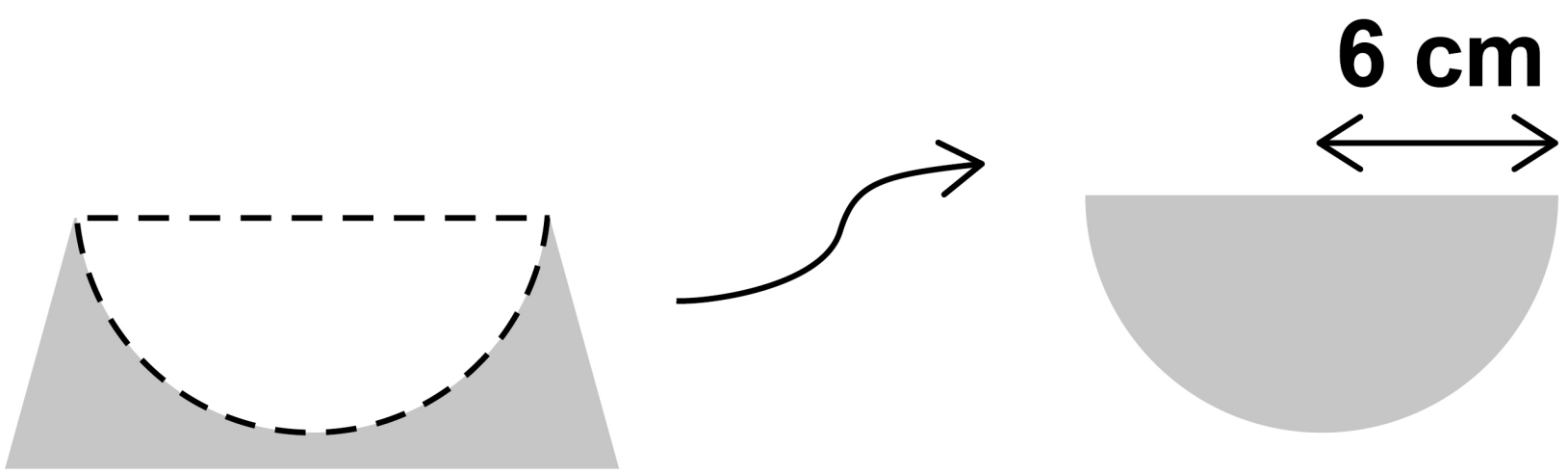
[Turn over]

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

where r is the radius and h is the perpendicular height

A hemisphere with radius 6 cm is then removed.

The diagram is not drawn accurately.



Bowl

Volume of a hemisphere = $\frac{2}{3}\pi r^3$

where r is the radius

Work out the volume of the remaining wood that forms the bowl. [5 marks]

Answer _____ cm^3

5

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[Turn over]

24 On the same day, Kate buys

a car for £14 000

and

a painting for £5000

The value of the car decreases by 35% in the first year, and then by 10% each year.

The value of the painting increases by 4% each year.

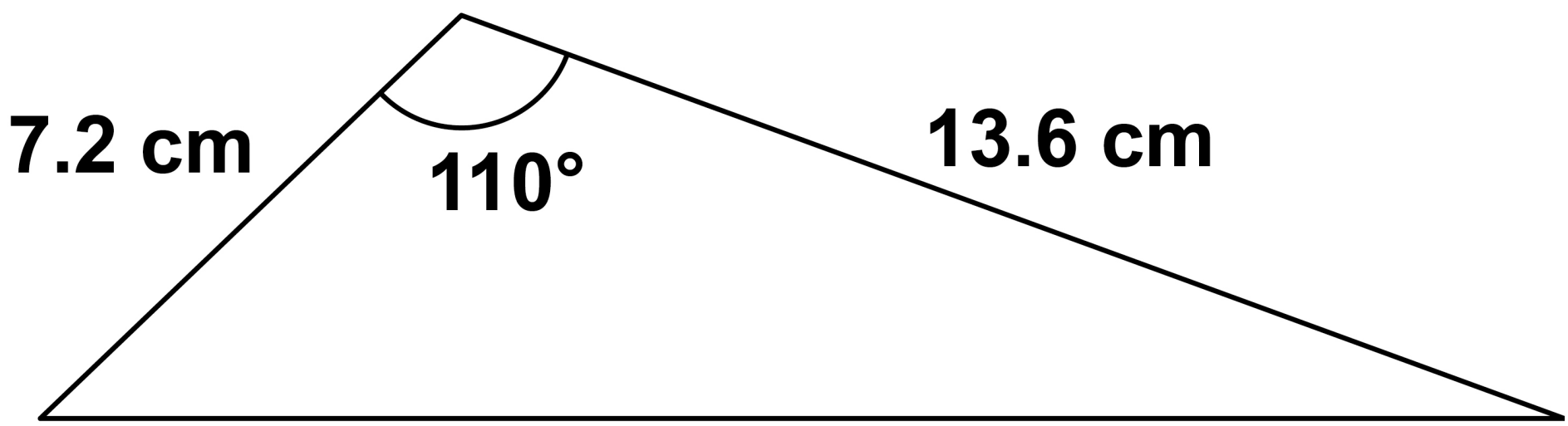
Show that the painting becomes worth more than the car during the fifth year. [5 marks]

[Turn over]

25 Two sides of a triangle are measured to 1 decimal place.

The angle between the sides is measured to the nearest degree.

The diagram is not drawn accurately.



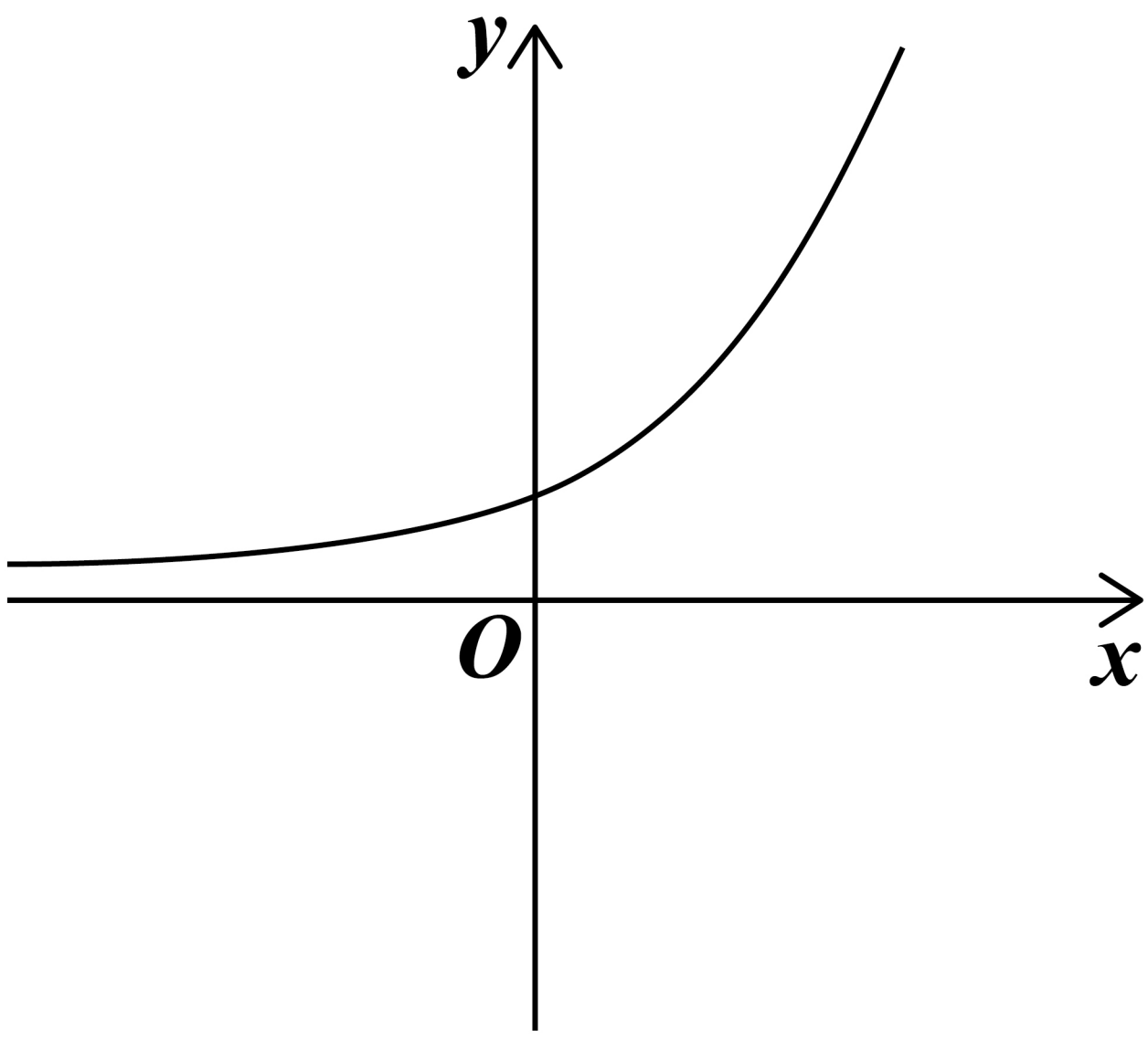
Work out the upper bound for the area of the triangle.

You MUST show your working.
[4 marks]

Answer cm^2

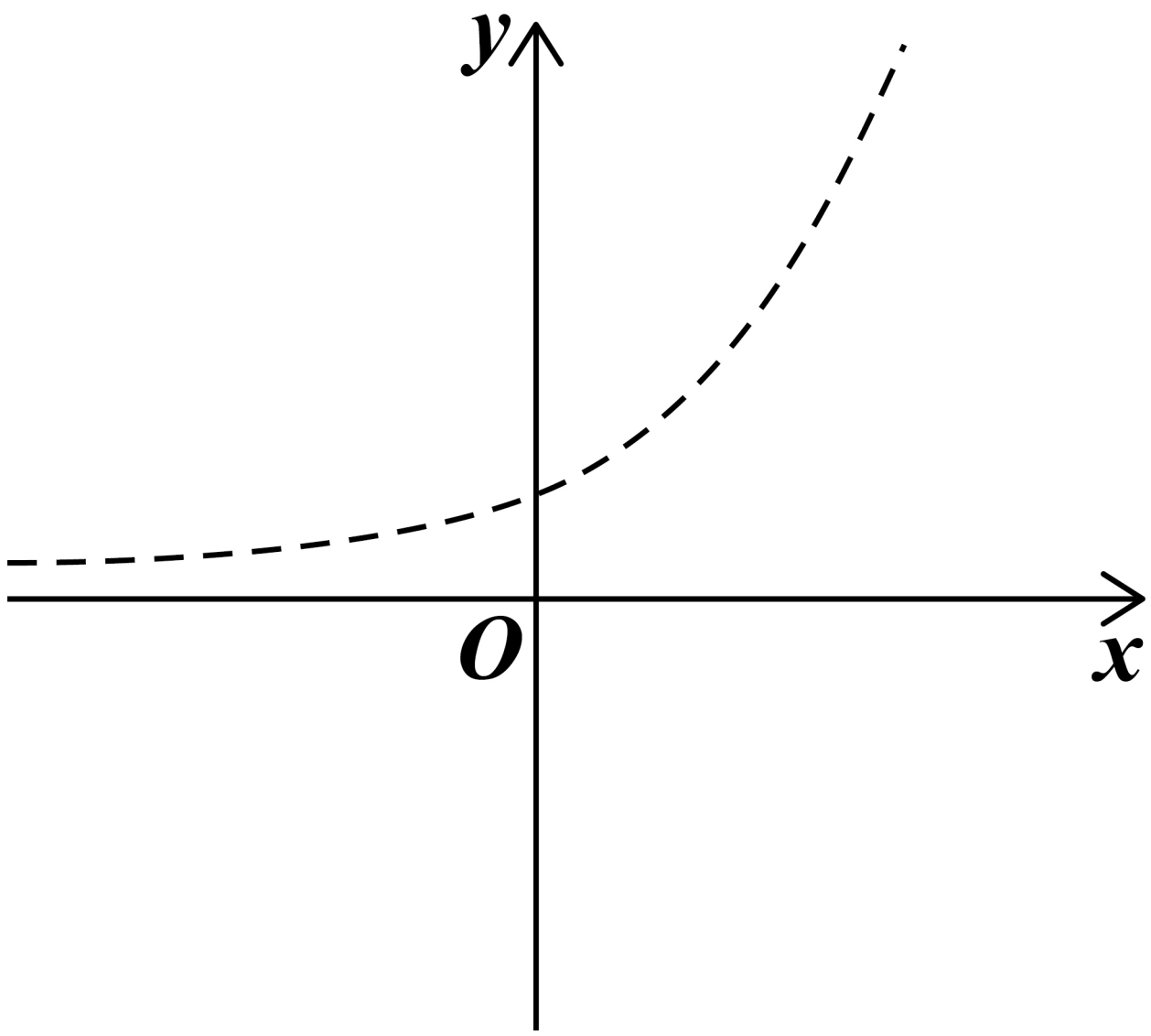
9

26 Here is a sketch of the graph of $y = 5^x$



In parts (a) and (b) the sketch of $y = 5^x$ is shown as a dashed line.

26 (a) On the axes below, sketch the graph of $y = -5^x$ [1 mark]



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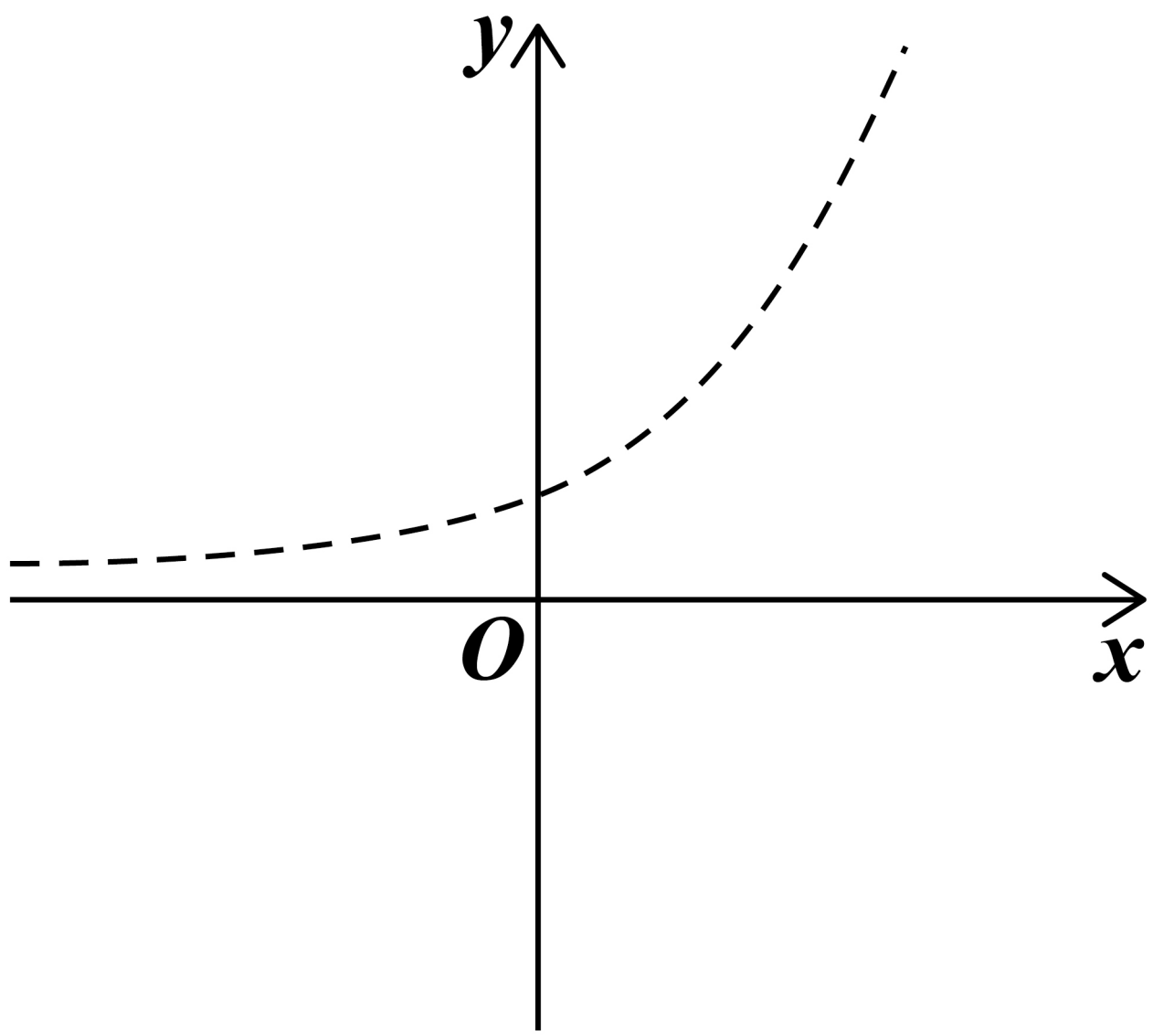
26 (b) On the axes below, sketch the graph of $y = 5^x - 1$ [1 mark]



END OF QUESTIONS

2

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Pages	Mark
4–5	
6–9	
10–15	
16–19	
20–23	
24–27	
28–31	
32–36	
38–41	
42–45	
46–49	
50–54	
56–59	
60–63	
TOTAL	