



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 13 November 2023

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]

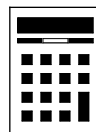


N 0 V 2 3 8 3 0 0 3 H 0 1

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 The first four terms of a linear sequence are

6 13 20 27

**Write down the expression for the n th term.
[1 mark]**

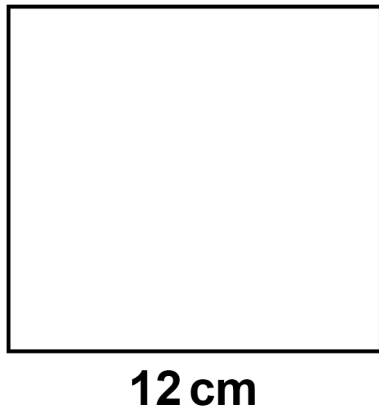
Answer _____



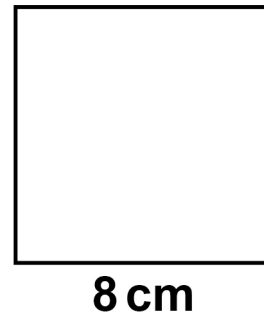
- 2 Square A is enlarged to square B.

The diagrams are not drawn accurately.

A



B



Write down the scale factor of the enlargement as a fraction. [1 mark]

Answer

[Turn over]

- 3 The length of a line is 8 cm to the nearest centimetre.

Complete the error interval. [2 marks]

Answer _____ cm $\leq$ length < _____ cm

- 4 At what point does the graph $y = x^3 - 1$ cross the y axis? [1 mark]

Answer (_____ , _____)

5



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[Turn over]



5 Carly's total annual pay = salary + bonus

	SALARY	BONUS
LAST YEAR	£26 000	£4000
THIS YEAR	6% increase	9% decrease

Work out the percentage change in her total annual pay.

**State whether it is an increase or a decrease.
[4 marks]**

[illegible]

Answer

[Turn over]



- 6 An exhibition
was open for 240 hours
and
had 29 760 visitors.**

**For $\frac{2}{5}$ of the time the exhibition was open, there
were 172 visitors per hour.**

**For the remaining time, how many visitors per
hour were there? [4 marks]**



Answer _____

7 The first two cube numbers are 1 and 8

Show that

the 3rd cube number can be written as the sum of three different prime numbers.

[3 marks]

$$\boxed{} = \boxed{} + \boxed{} + \boxed{}$$

11

[Turn over]



- 8 Circle the largest number. [1 mark]

 $5.30\dot{4}$

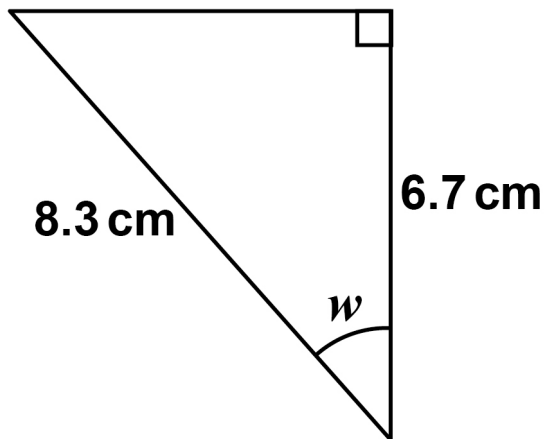
5.344

5.34

 $5.3\dot{4}$

- 9 Use trigonometry to work out the size of angle w .
[3 marks]

The diagram is not drawn accurately.



$$w = \underline{\hspace{10em}} \circ$$

[Turn over]



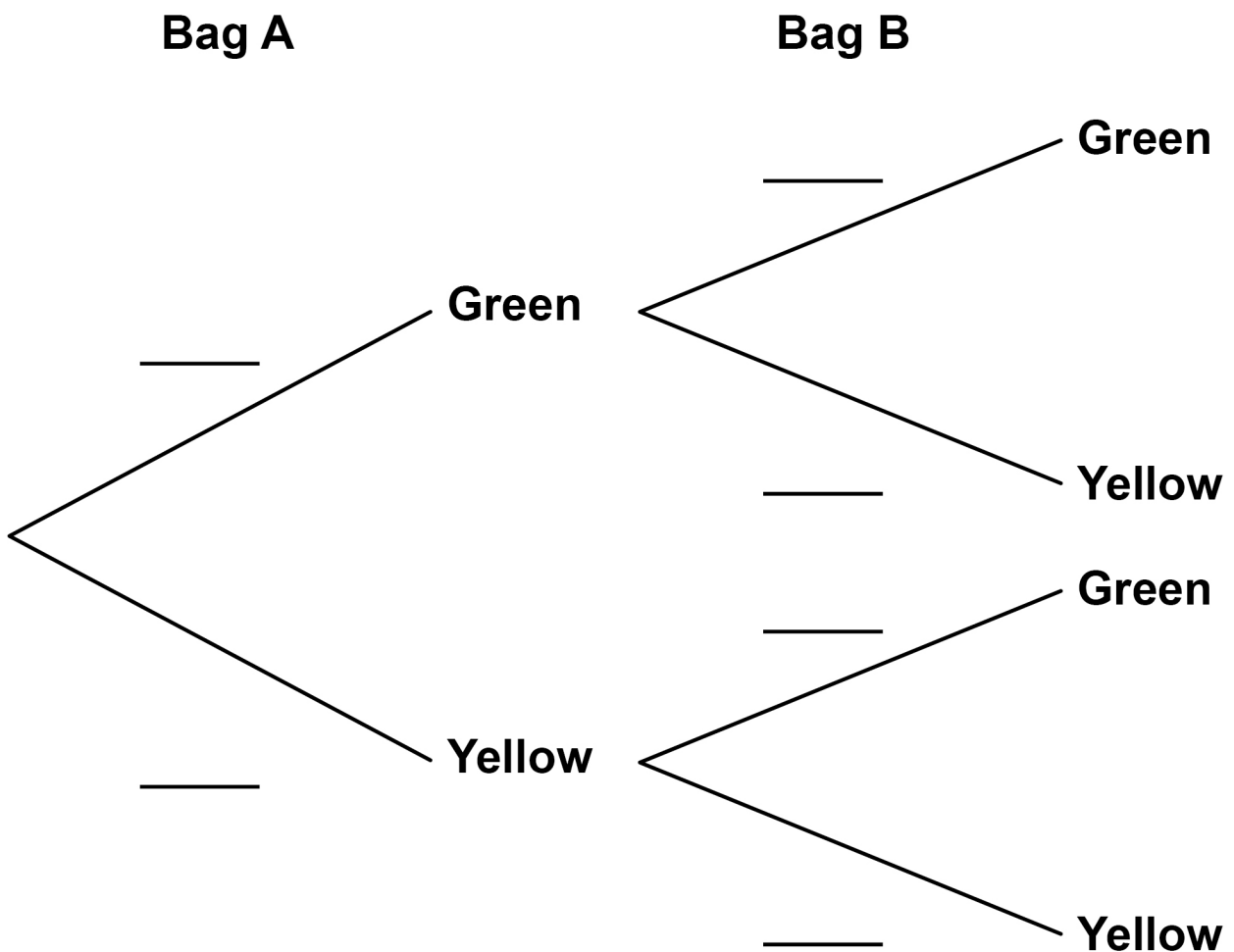
- 10 Two bags contain only green discs and yellow discs.

Bag A contains 1 green disc and 4 yellow discs.

Bag B contains 3 green discs and 7 yellow discs.

One disc is picked at random from each bag.

- 10 (a) Complete the tree diagram with the correct probabilities. [2 marks]



10 (b) Work out the probability that BOTH discs are green. [2 marks]

Answer _____

[Turn over]

—
8



11 Solve these simultaneous equations.

$$7x + 2y = 100$$

$$3x + 2y = 48$$

[3 marks]

[illegible]

$x =$ _____ $y =$ _____

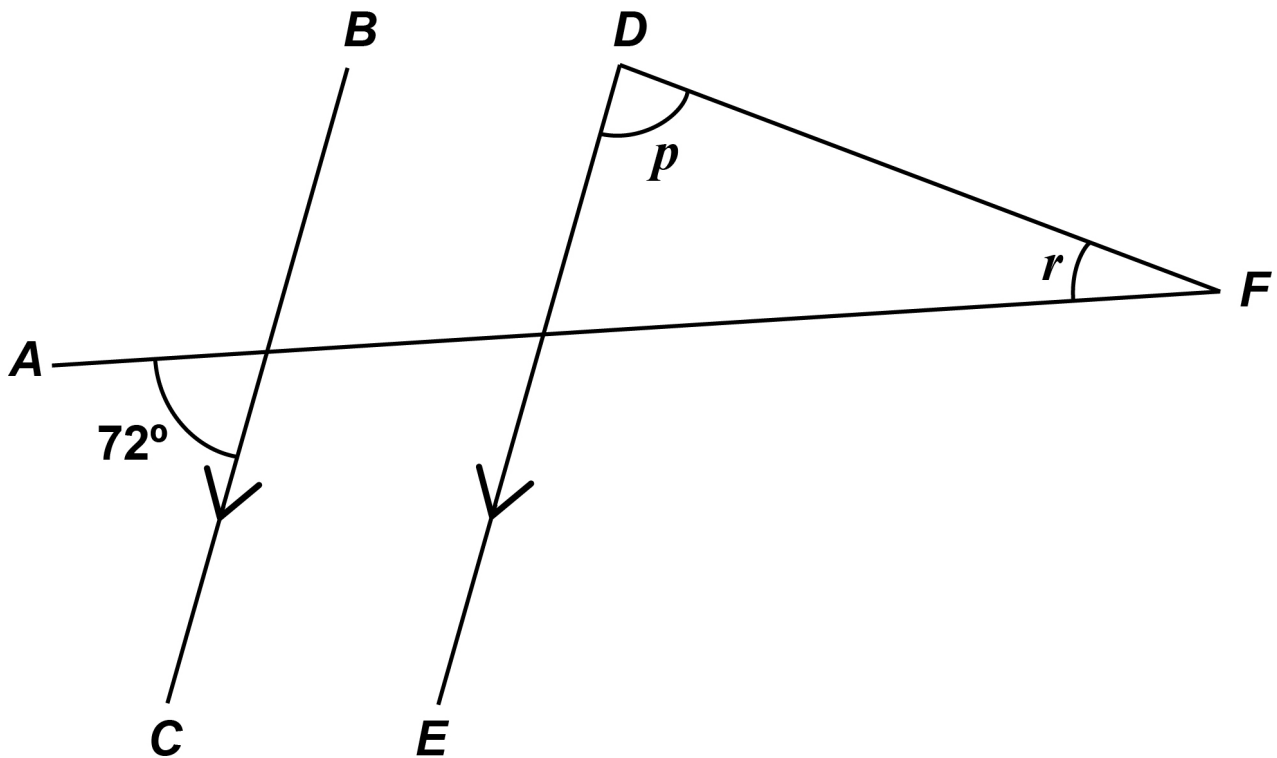
[Turn over]



12 *AF*, *BC*, *DE* and *DF* are straight lines.

BC and *DE* are parallel.

The diagram is not drawn accurately.



p is three times r .

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

6

- 13 100 people were asked about the distance they travel from home to work.

The table shows information about the results.

DISTANCE, d (miles)	FREQUENCY
$0 \leq d < 5$	21
$5 \leq d < 10$	24
$10 \leq d < 20$	37
$20 \leq d < 40$	18

- 13 (a) Write down the **GREATEST** possible number of people who work from home. [1 mark]

Answer _____

- 13 (b) One person is chosen at random.

Work out the probability that the person travels **AT LEAST** 10 miles. [1 mark]

Answer _____



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[Turn over]



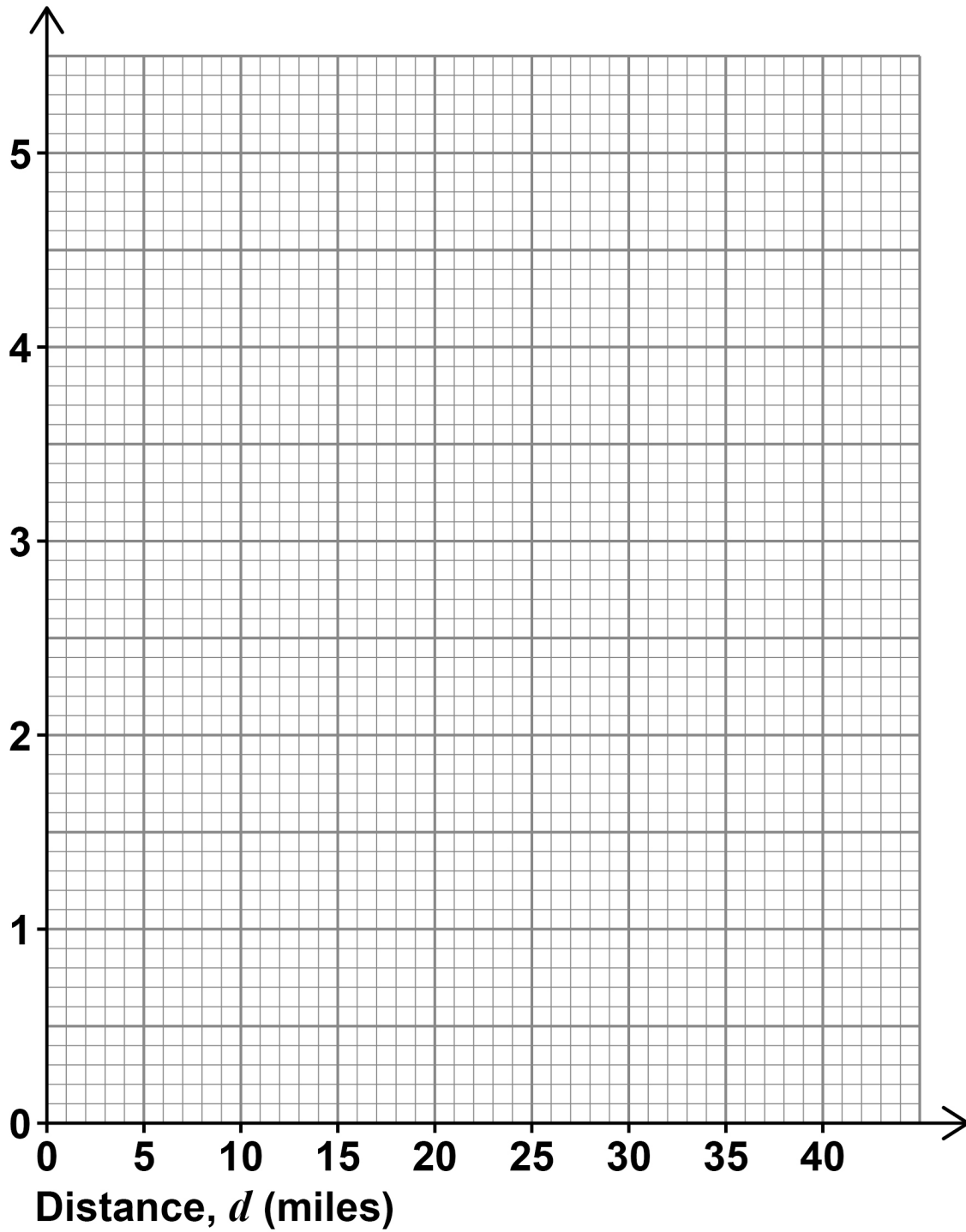
13 (c) The table is repeated.

DISTANCE, d (miles)	FREQUENCY
$0 \leq d < 5$	21
$5 \leq d < 10$	24
$10 \leq d < 20$	37
$20 \leq d < 40$	18

Draw a histogram, on the opposite page, to represent the results. [3 marks]



Frequency
density



[Turn over]

5



- 14 A solid trophy consists of a stand and a player.



Trophy

The stand is made by removing a small pyramid from a large pyramid.

LARGE PYRAMID

Square base, edge 8 cm

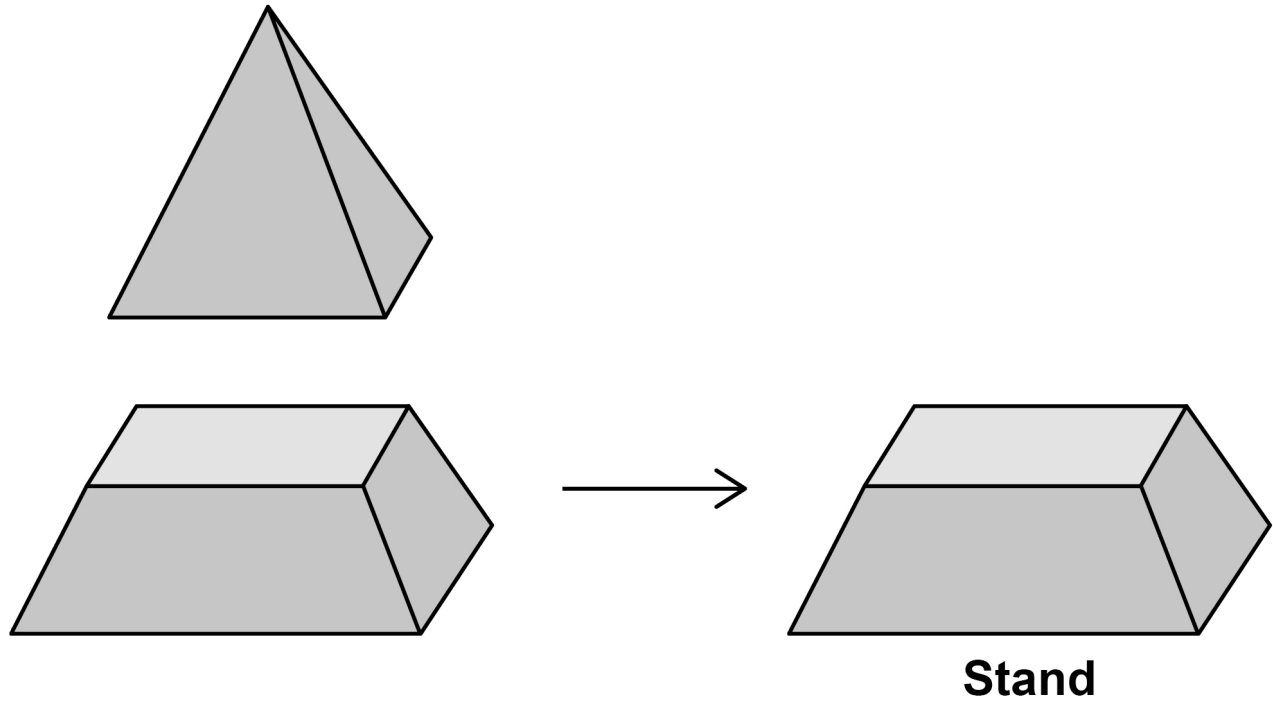
Perpendicular height 16 cm

SMALL PYRAMID

Square base, edge 5 cm

Perpendicular height 10 cm





Volume of a pyramid =

$$\frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$$

[Turn over]



- 14 (a) Show that the volume of the STAND is 258 cm^3
[2 marks]

- 14 (b) The trophy is made from a metal of density
 $7.5 \text{ grams per cm}^3$

The TOTAL mass of the trophy is 2340 grams.

Work out the volume of the PLAYER. [2 marks]

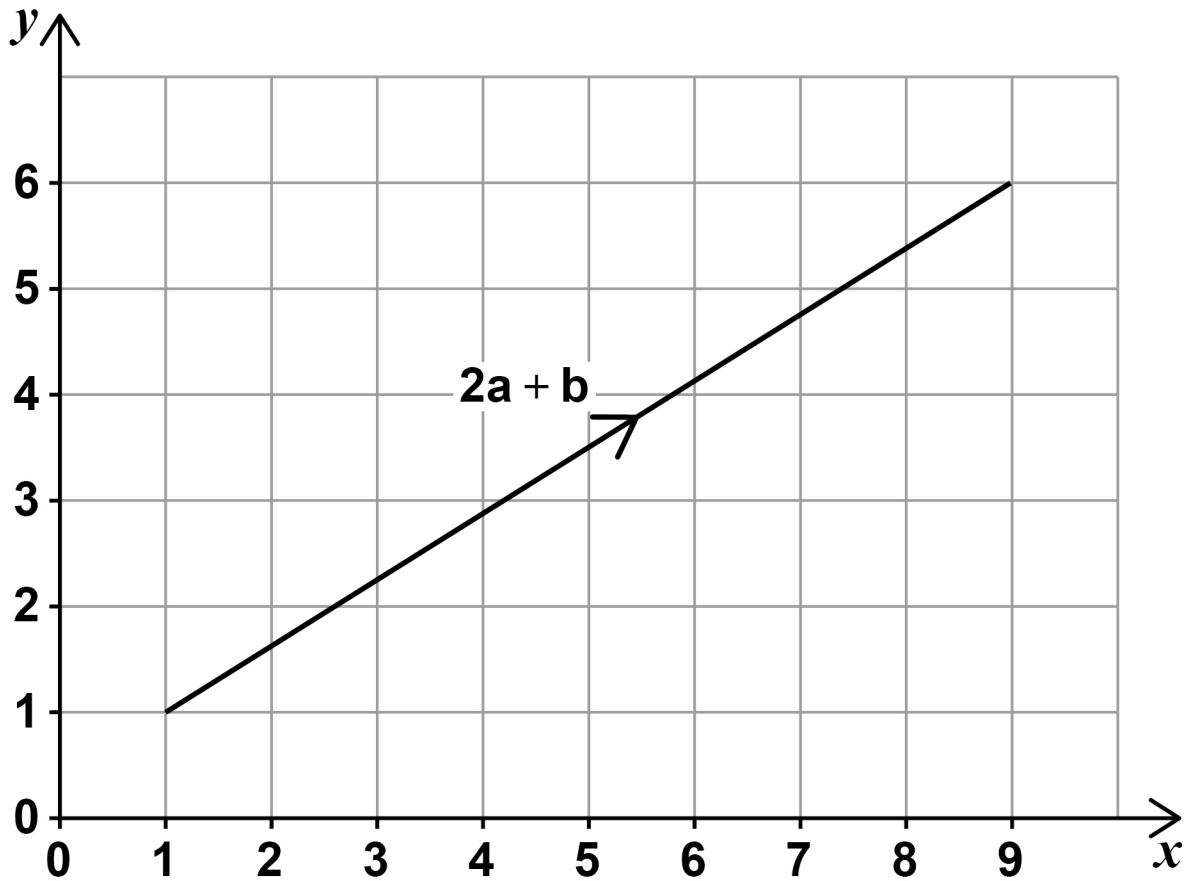


4



15 $\mathbf{a} = \begin{pmatrix} m \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -4 \\ p \end{pmatrix}$

The diagram shows the vector $2\mathbf{a} + \mathbf{b}$



Work out the values of m and p . [4 marks]



$m =$ _____ $p =$ _____

[Turn over]



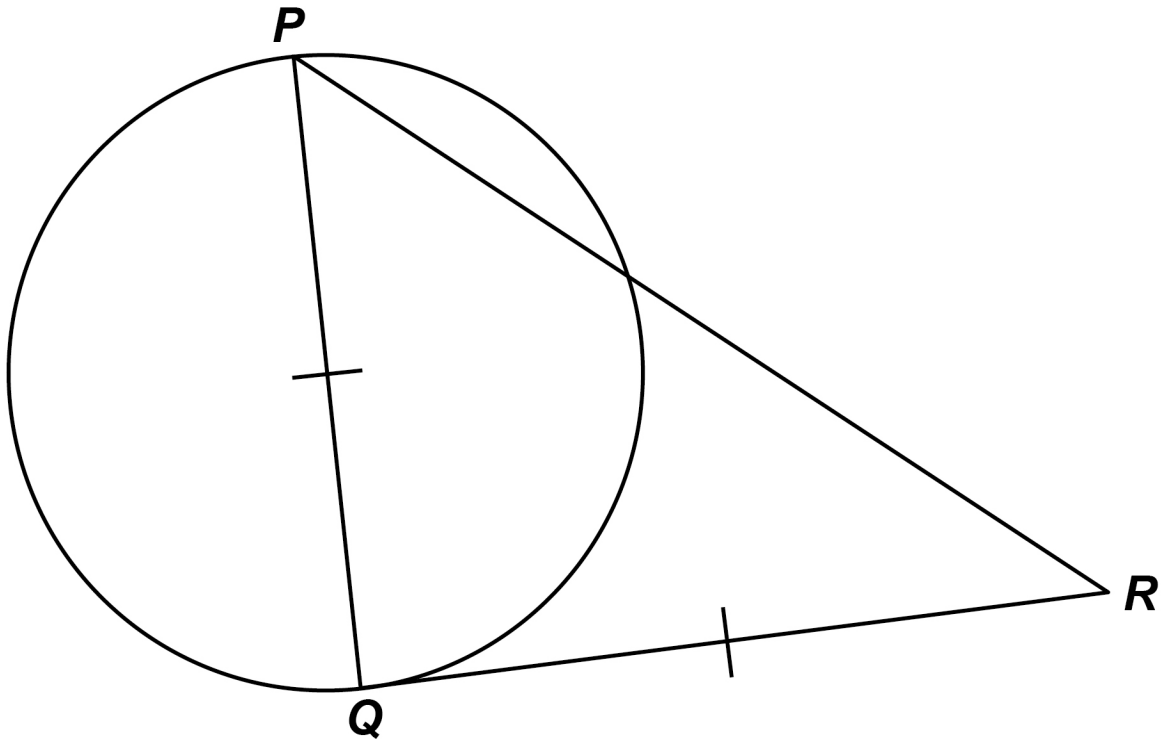
16 ***PQ*** is a diameter of a circle.

QR is a tangent to the circle.

$$PQ = QR$$

$$PR = 10 \text{ cm}$$

The diagram is not drawn accurately.

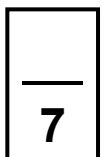


Work out the RADIUS of the circle.

Give your answer as a decimal. [3 marks]

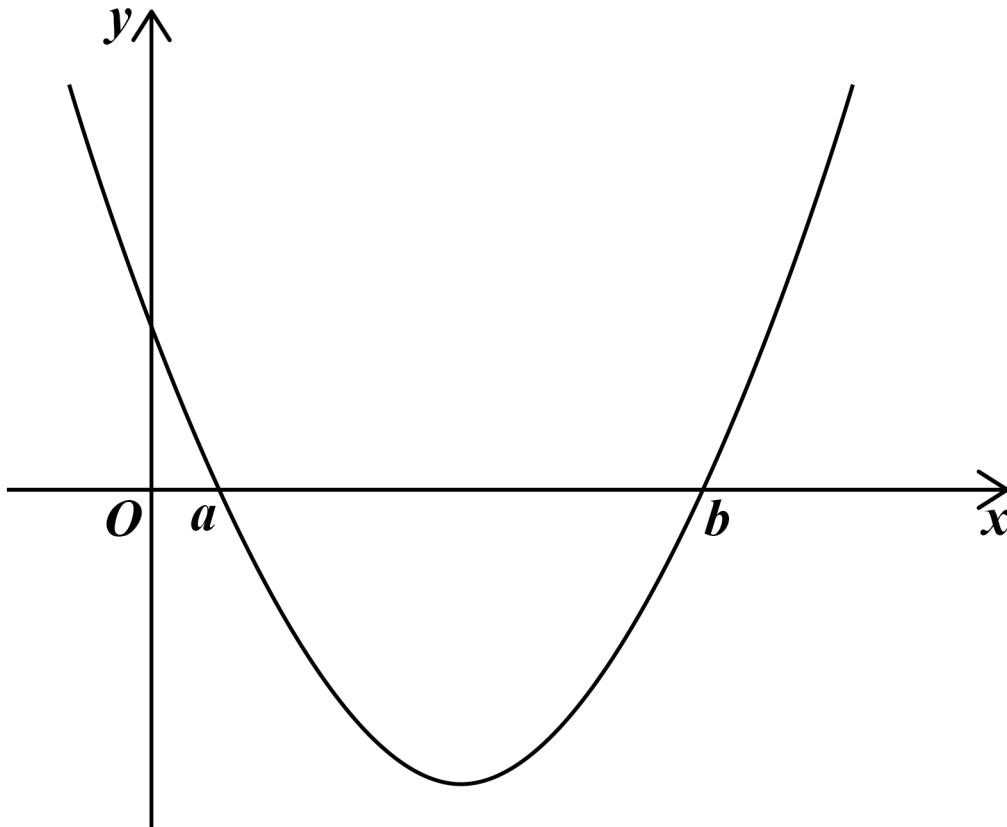
Answer _____ **cm**

[Turn over]



17 Here is a sketch of the quadratic graph $y = f(x)$

The graph crosses the x -axis at $x = a$ and $x = b$



Write an expression for the x -coordinate of the turning point. [1 mark]

Answer _____



18 Simplify $\frac{2(x+4)^5}{(x+4)^3}$

Give your answer in the form $ax^2 + bx + c$
where a , b and c are integers. [3 marks]

Answer _____

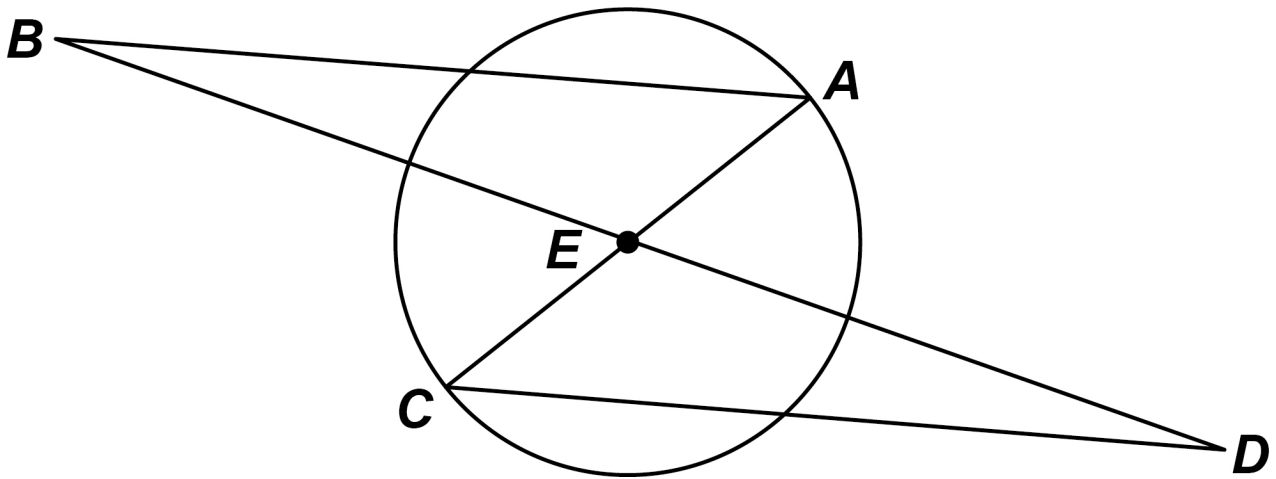
[Turn over]



19 AC is a diameter of a circle, centre E .

E is the midpoint of BD .

The diagram is not drawn accurately.



Prove that triangle ABE is congruent to triangle CDE . [4 marks]

[Turn over]



20 Solve $2x(x + 10) = 5x - 18$ [4 marks]

[illegible]

Answer _____

8



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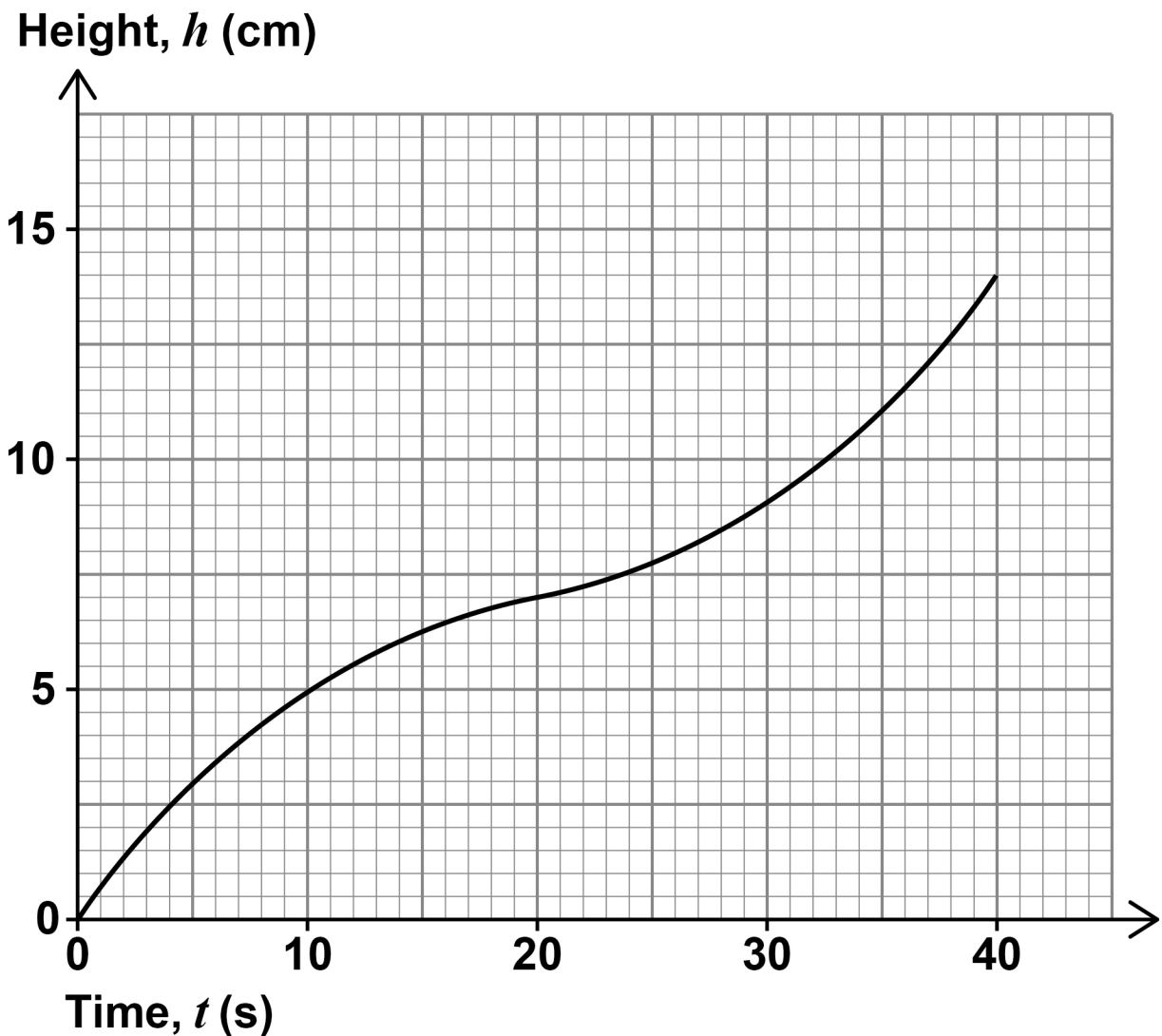
[Turn over]



21 Water flows from a tap at a constant rate.

A container is filled with water from the tap in 40 seconds.

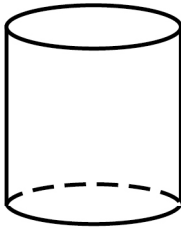
The graph shows the height, h centimetres, of the water after time, t seconds.



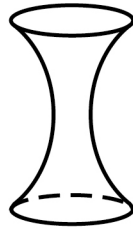
21 (a) The container is one of these shapes.

Circle the letter of the correct shape. [1 mark]

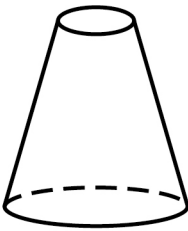
A



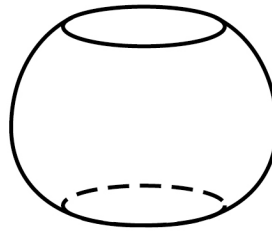
B



C

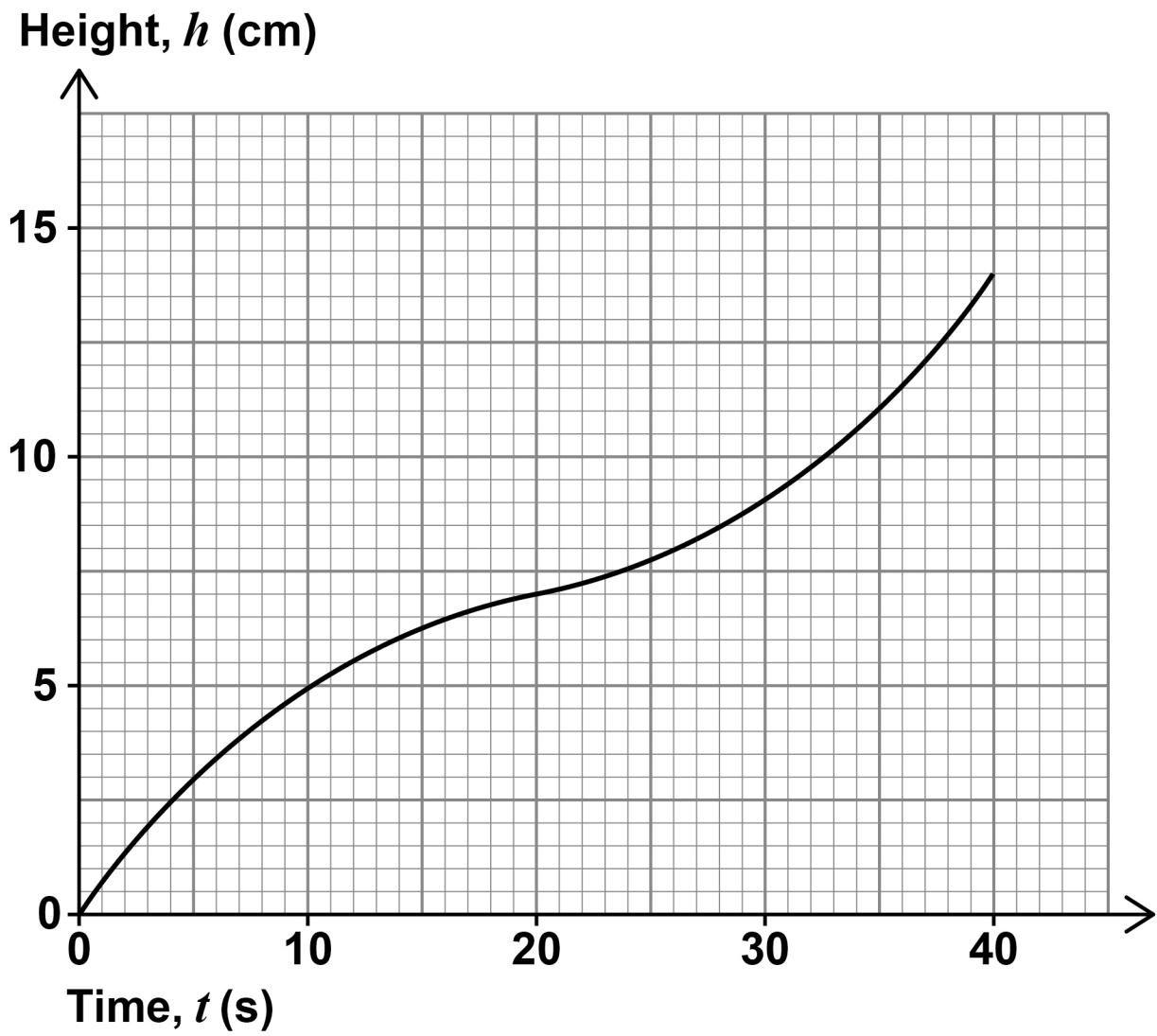


D



[Turn over]

REPEAT OF GRAPH



21 (b) By drawing a tangent on the graph,
estimate the rate at which the height is
increasing when $t = 10$ [2 marks]

Answer _____ cm/s

[Turn over]



- 22 Write $\frac{7}{2a^2} - \frac{3}{5a}$ as a single fraction in its simplest form. [2 marks]

Answer _____

5



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[Turn over]

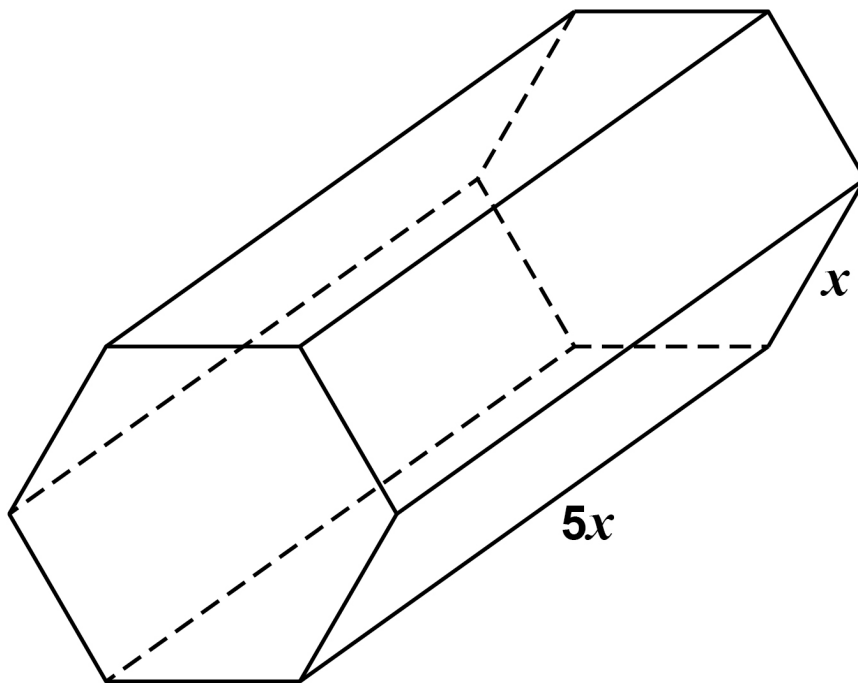


- 23 A chocolate box in the shape of a prism is being designed.

All lengths are in centimetres.

The cross section is a regular hexagon with side x

The length is $5x$



An expression for the area of the cross section,

in cm^2 , is $\frac{3\sqrt{3}}{2} x^2$

The TOTAL surface area of the box must be less than 650 cm^2



Work out the largest possible INTEGER value of x .

You MUST show your working. [4 marks]

[illegible]

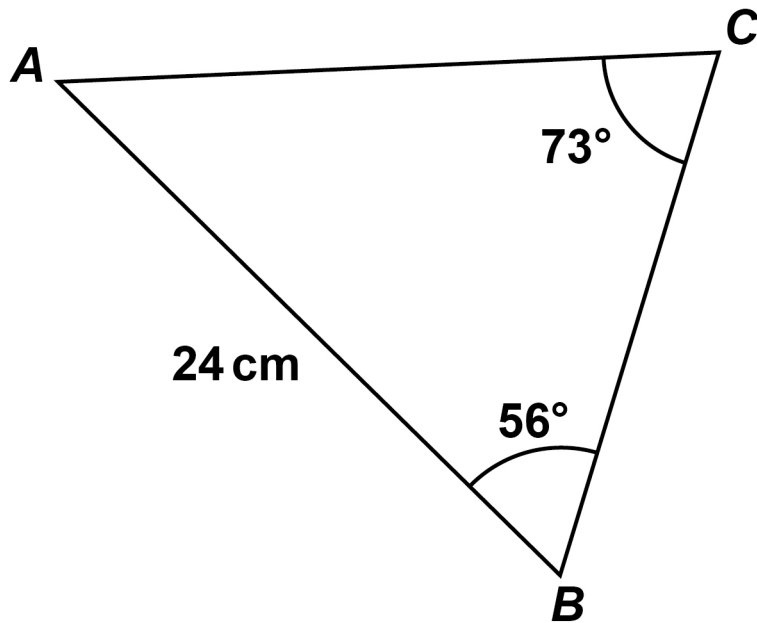
Answer

[Turn over]



24 Work out the area of triangle ABC . [4 marks]

The diagram is not drawn accurately.



Answer _____ cm²

[Turn over]

8



25 a is three quarters of c

$$6b = 5c$$

Work out the ratio $a : b : c$

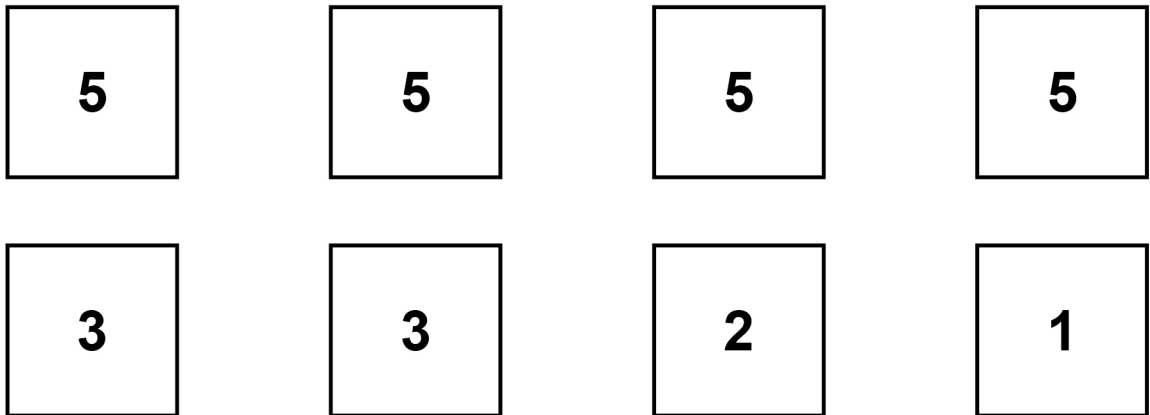
**Give your answer in its simplest form, where
 a , b and c are integers. [3 marks]**

Answer _____ : _____ : _____

[Turn over]



- 26 In a game, these numbered tiles are in a bag.



TO PLAY THE GAME

Choose tiles at random one at a time and do not replace the tiles.

You win if at any stage the total of the numbers on your tiles is 10

Amber plays the game once.

Work out the probability that she wins. [4 marks]

7



- 27 (a) The graph of $y = x^3$ is translated to the graph of $y = (x - 2)^3$

Write down the translation vector. [1 mark]

Answer $\left(\quad \quad \right)$

- 27 (b) The graph of $y = 5x + 4$ is reflected in the y -axis.

Write down the equation of the reflected graph.
[1 mark]

Answer _____

END OF QUESTIONS

2



Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Pages	Mark
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8–11	
12–15	
16–19	
20–23	
24–27	
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32–33	
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44–47	
48–51	
52	
TOTAL	

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