



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

MATHEMATICS

H

Higher Tier Paper 3 Calculator

8300/3H

Time allowed: 1 hour 30 minutes

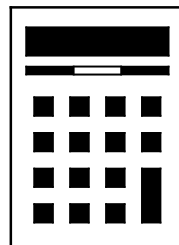
At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



For this paper you must have:

- a calculator
- mathematical instruments
- 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 Circle the smallest number. [1 mark]

4.31

4. $\dot{3}$

4.301

4.33

2 Work out $\begin{pmatrix} -4 \\ 8 \end{pmatrix} - \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

Circle your answer. [1 mark]

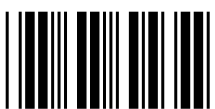
$\begin{pmatrix} -7 \\ 10 \end{pmatrix}$

$\begin{pmatrix} -7 \\ 6 \end{pmatrix}$

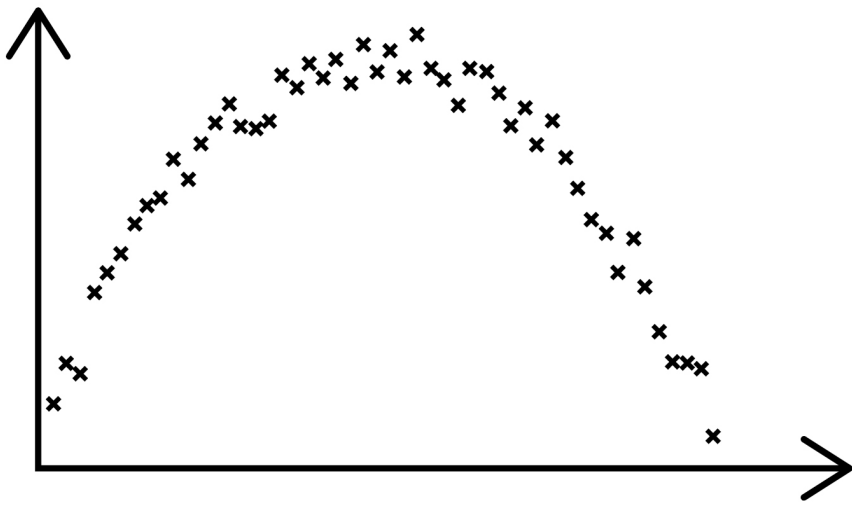
$\begin{pmatrix} -1 \\ 10 \end{pmatrix}$

$\begin{pmatrix} -1 \\ 6 \end{pmatrix}$

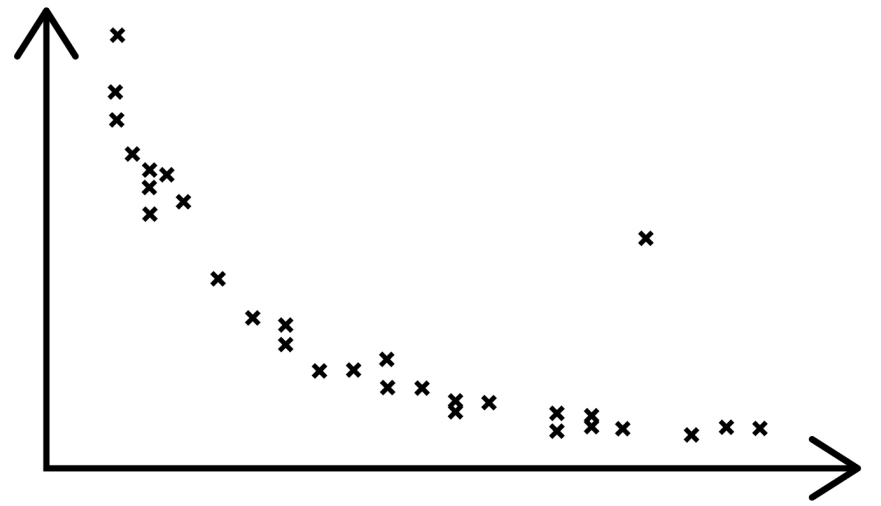
3 Here are four scatter graphs, on the opposite page.



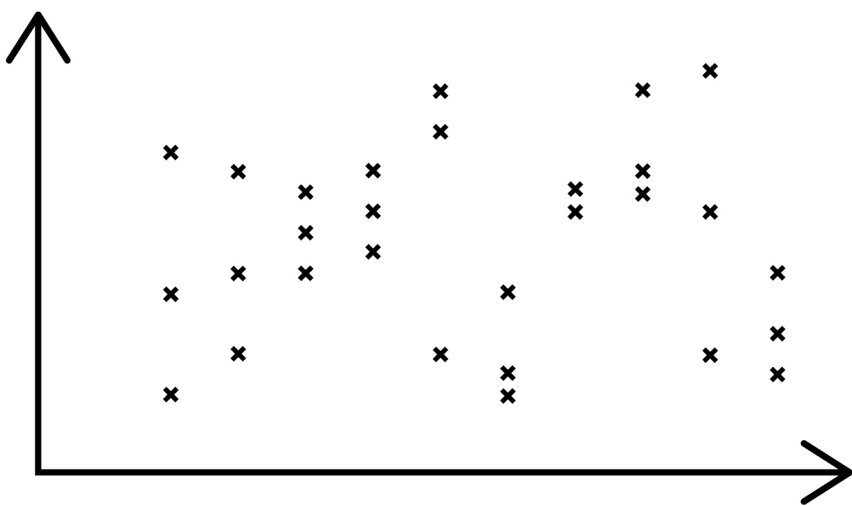
Graph A



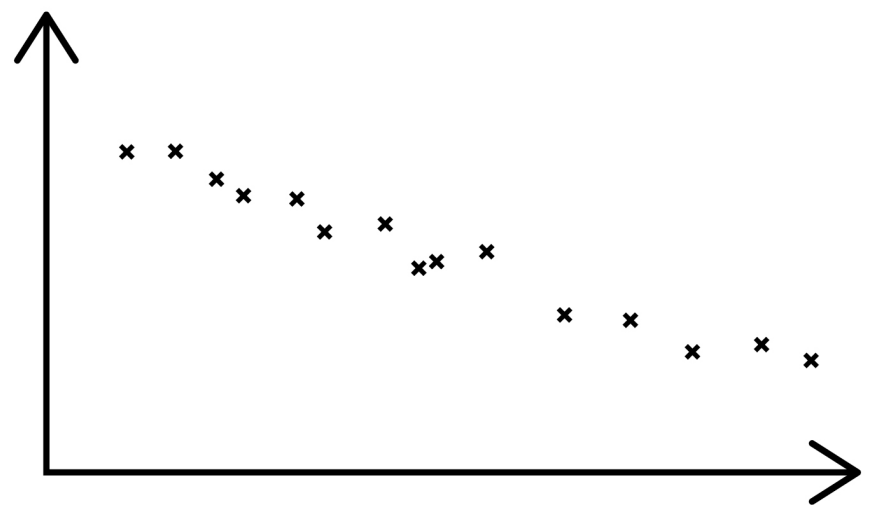
Graph B



Graph C



Graph D



- 3 (a) For which graph is a straight line of best fit appropriate?

Circle your answer. [1 mark]

A

B

C

D

- 3 (b) Which graph has ONE outlier?

Circle your answer. [1 mark]

A

B

C

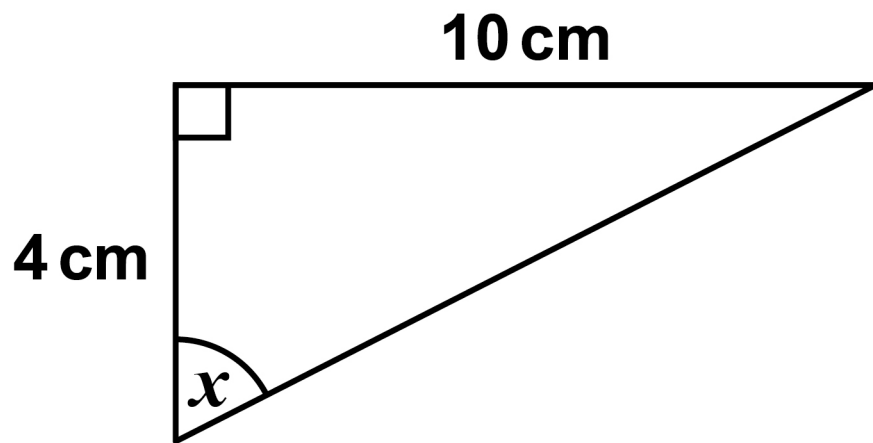
D

[Turn over]



4 Use trigonometry to work out the size of angle x .

The diagram is not drawn accurately.



[3 marks]

$x =$ _____ °

5 Laura works in a shop.

The table shows the number of hours she works on two weekends.

	Saturday	Sunday
Weekend 1	3	2
Weekend 2	$5\frac{1}{2}$	$3\frac{1}{2}$

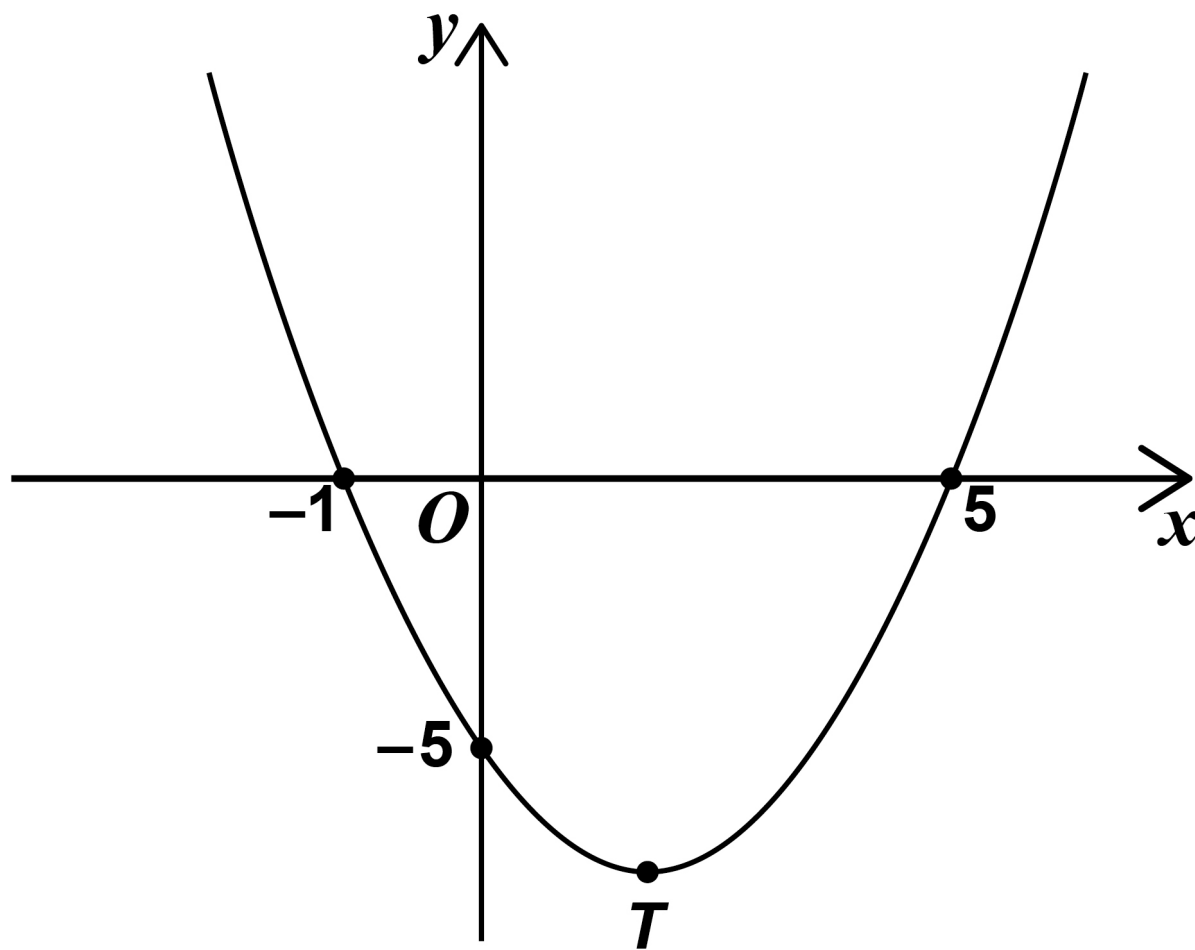
Work out the percentage increase in her TOTAL hours from Weekend 1 to Weekend 2 [3 marks]

Answer _____ %

[Turn over]

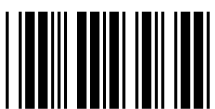


6 Here is a sketch of the curve $y = x^2 - 4x - 5$



6 (a) Write down the TWO roots of $x^2 - 4x - 5 = 0$
[1 mark]

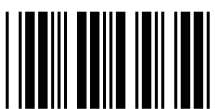
Answer _____ and _____



- 6 (b) Work out the coordinates of T , the turning point of the curve. [2 marks]

Answer (_____ , _____)

[Turn over]



7 A is an ARITHMETIC progression.

Here are the first four terms.

13 16 19 22

G is a GEOMETRIC progression.

Here are the first four terms.

2 4 8 16

n th term of A = 8th term of G

Work out the value of n . [4 marks]



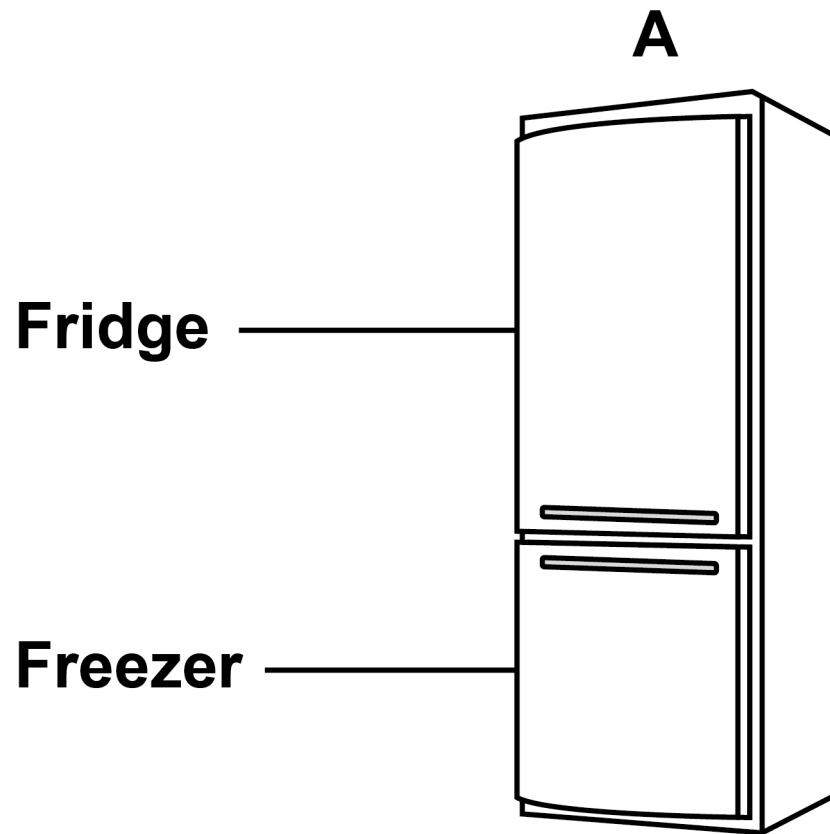
n = _____

[Turn over]

7

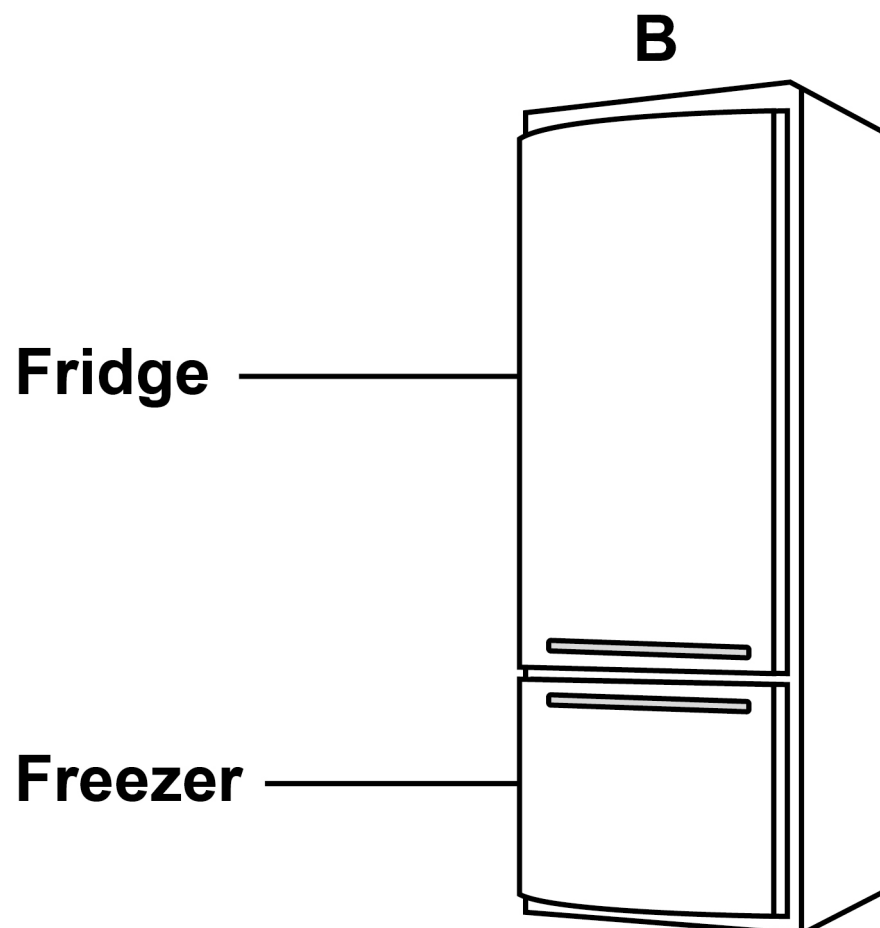


- 8 Information about two fridge-freezers, A and B, is shown.



TOTAL capacity is 330 litres

fridge capacity : freezer capacity = 3 : 2



FRIDGE capacity is 294 litres

fridge capacity : freezer capacity = 7 : 3



Grace buys one of these fridge-freezers.

She buys the one with the greater FREEZER capacity.

Which one does she buy?

You MUST show your working. [4 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[Turn over]



Answer _____

4



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[Turn over]



9 **Tom and Adil are the two runners in a 200-metre race.**

Tom completes the race in 24 seconds.

Adil completes the race at an average speed of 28.8 kilometres per hour.

Who wins the race?

You MUST show your working. [3 marks]

Answer _____

[Turn over]



- 10 The mass of a baby is 3.6 kilograms to 1 decimal place.

What is the error interval for the mass in kilograms?

Tick ONE box. [1 mark]

☐

$$3.5 \leq \text{mass} \leq 3.6$$

☐

$$3.55 \leq \text{mass} \leq 3.65$$

☐

$$3.5 \leq \text{mass} < 3.6$$

☐

$$3.55 \leq \text{mass} < 3.65$$

- 11 A quadrilateral has angles 70° , 110° , 130° and 50°

Circle the possible type of quadrilateral. [1 mark]

kite

parallelogram

rhombus

trapezium

5



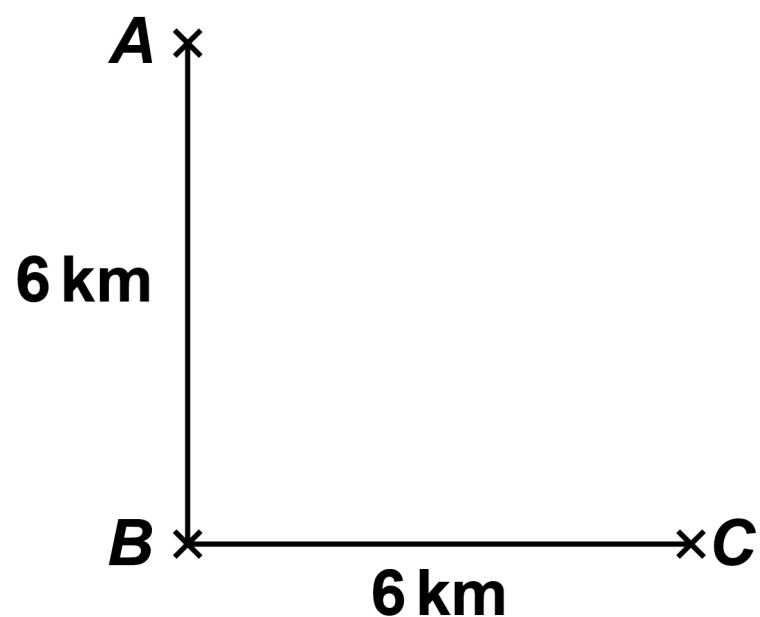
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[Turn over]



- 12 (a) *B* is
6 km due South of *A*
and
6 km due West of *C*.

The diagram is not drawn accurately.

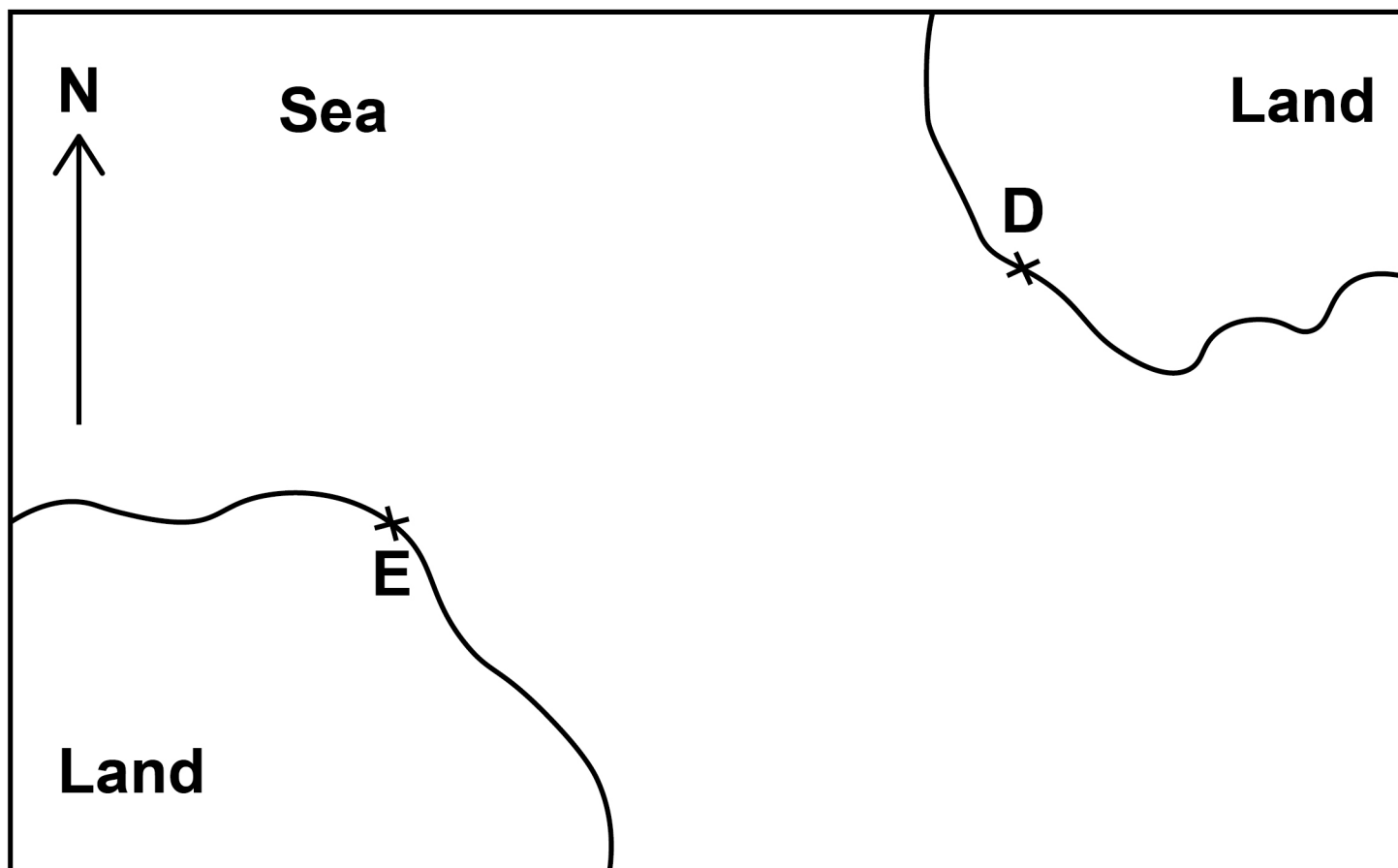


Work out the bearing of *A* from *C*. [2 marks]

Answer _____ °



12 (b) Here is a scale drawing.



A ship is going to sail from *D* to *E*.

Mia works out that the ship needs to sail on a bearing of 068°

Why must Mia be wrong? [1 mark]

[Turn over]



13 Simplify $\sqrt{5}a + \sqrt{5}a$

Circle your answer. [1 mark]

$5a$

$5a^2$

$2\sqrt{5}a$

$\sqrt{10}a$

4



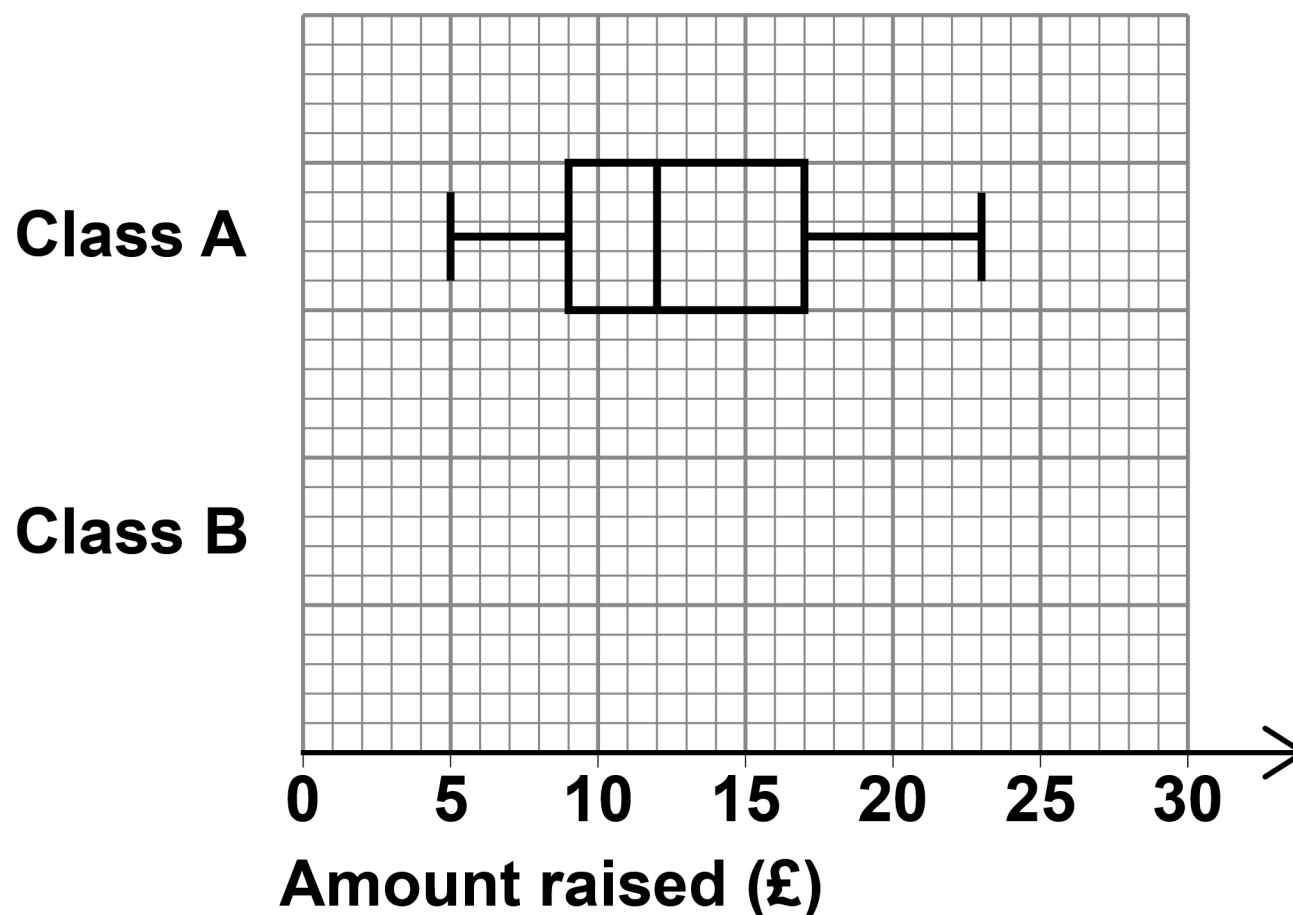
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[Turn over]



- 14 Students in two classes, A and B, raised money for charity.

The box plot for class A is shown on the grid.



For class B,

- the lowest amount was £3 and the highest amount was £26
- the lower quartile was £11
- the median was £2 greater than the class A median
- the interquartile range was $1\frac{1}{2}$ times greater than the class A interquartile range.

Draw the box plot for class B on the grid.
[4 marks]

[Turn over]



15

A town has**a population density of 278 people per km²****and****a population of 158 460**

$$\text{population density} = \frac{\text{population}}{\text{area}}$$

The population increases to 168 720**Work out the population density after the increase.
[3 marks]**



Answer _____ people per km²

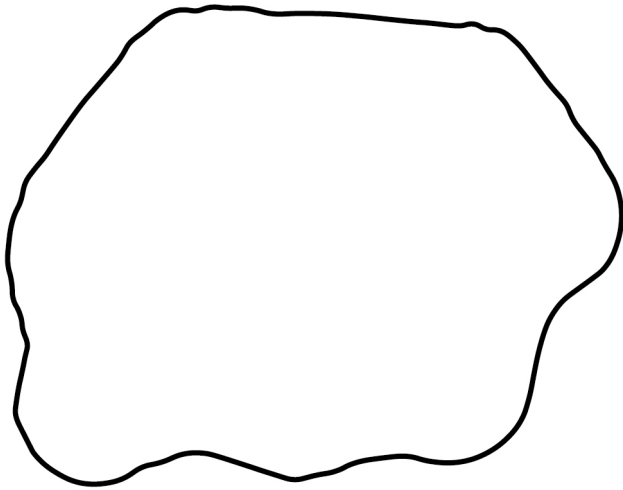
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7



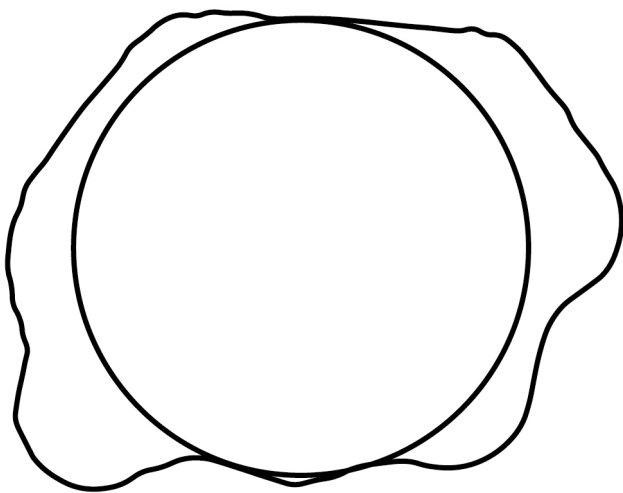
16 Here is a scale drawing of a reservoir.

SCALE: 1 cm represents 500 m



Virat wants to estimate the volume of water in the reservoir.

He draws on the scale drawing a circle with radius 3 cm



16 (a) Virat estimates the volume of the reservoir by assuming that

- the reservoir is a cylinder whose cross section is the circle
- the depth of the reservoir is 17 metres.

**Work out Virat's estimate in cubic metres.
[3 marks]**

Answer _____ **m³**

[Turn over]



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16 (b) In fact,

- the depth of the reservoir is 13.8 metres
- the reservoir is not a cylinder (see diagram).

Which statement about the actual volume of the reservoir is correct?

Tick ONE box.

☐

It is less than Virat's estimate

☐

It is greater than Virat's estimate

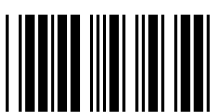
☐

It could be less than or greater than Virat's estimate

Give a reason for your answer. [2 marks]

[Turn over]

5



17 In a video game, players make their own character.

They choose one of each from

8 faces

4 bodies

5 hairstyles.

**17 (a) How many different characters can be made?
[2 marks]**

Answer _____



17 (b) Two characters are made at random.

**What is the probability that they are exactly the same?
[1 mark]**

Answer _____

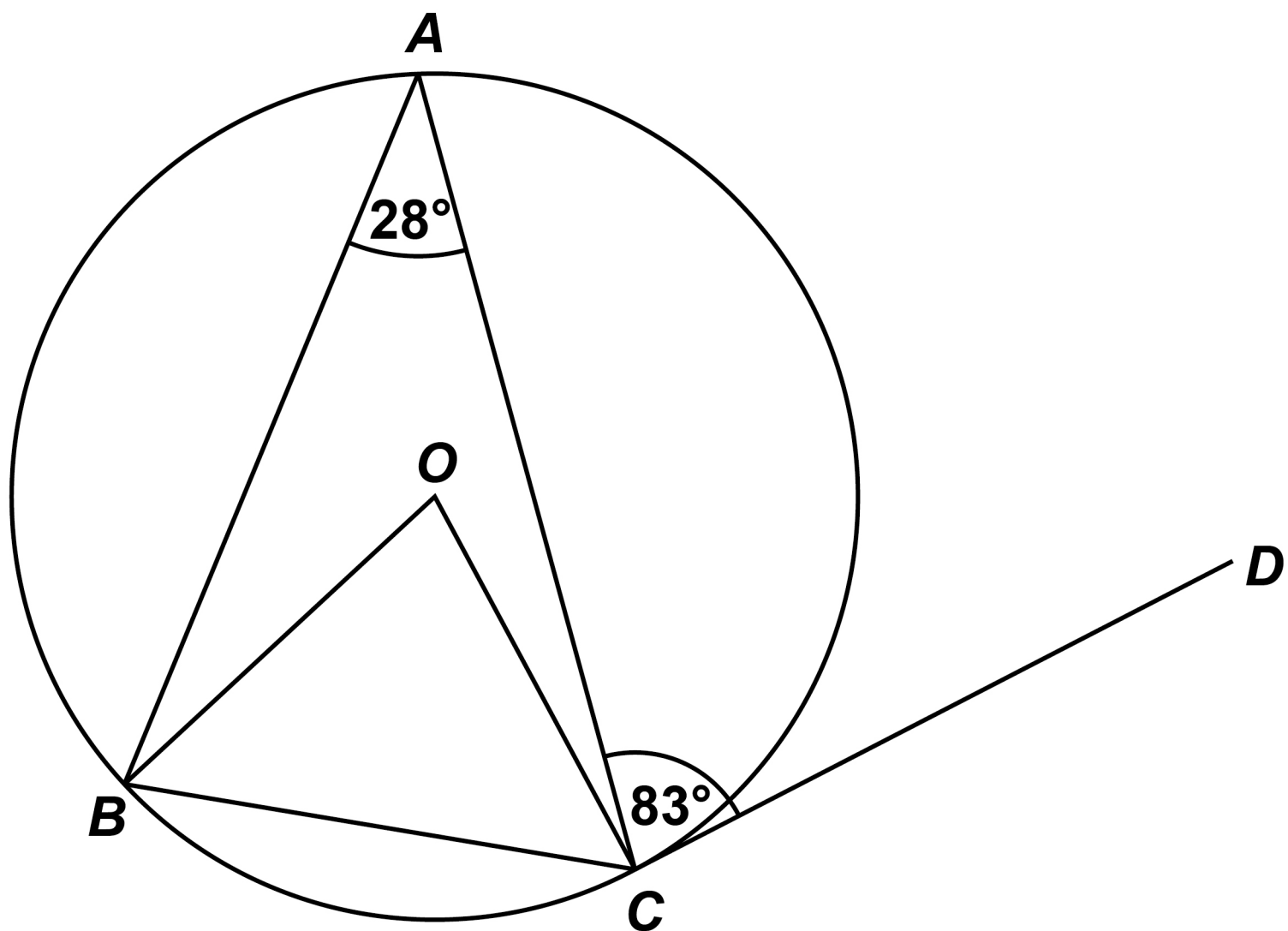
[Turn over]



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

DC is a tangent to the circle.

The diagram is not drawn accurately



Show that $\text{angle } ABO : \text{angle } ACO = 3 : 1$
[5 marks]

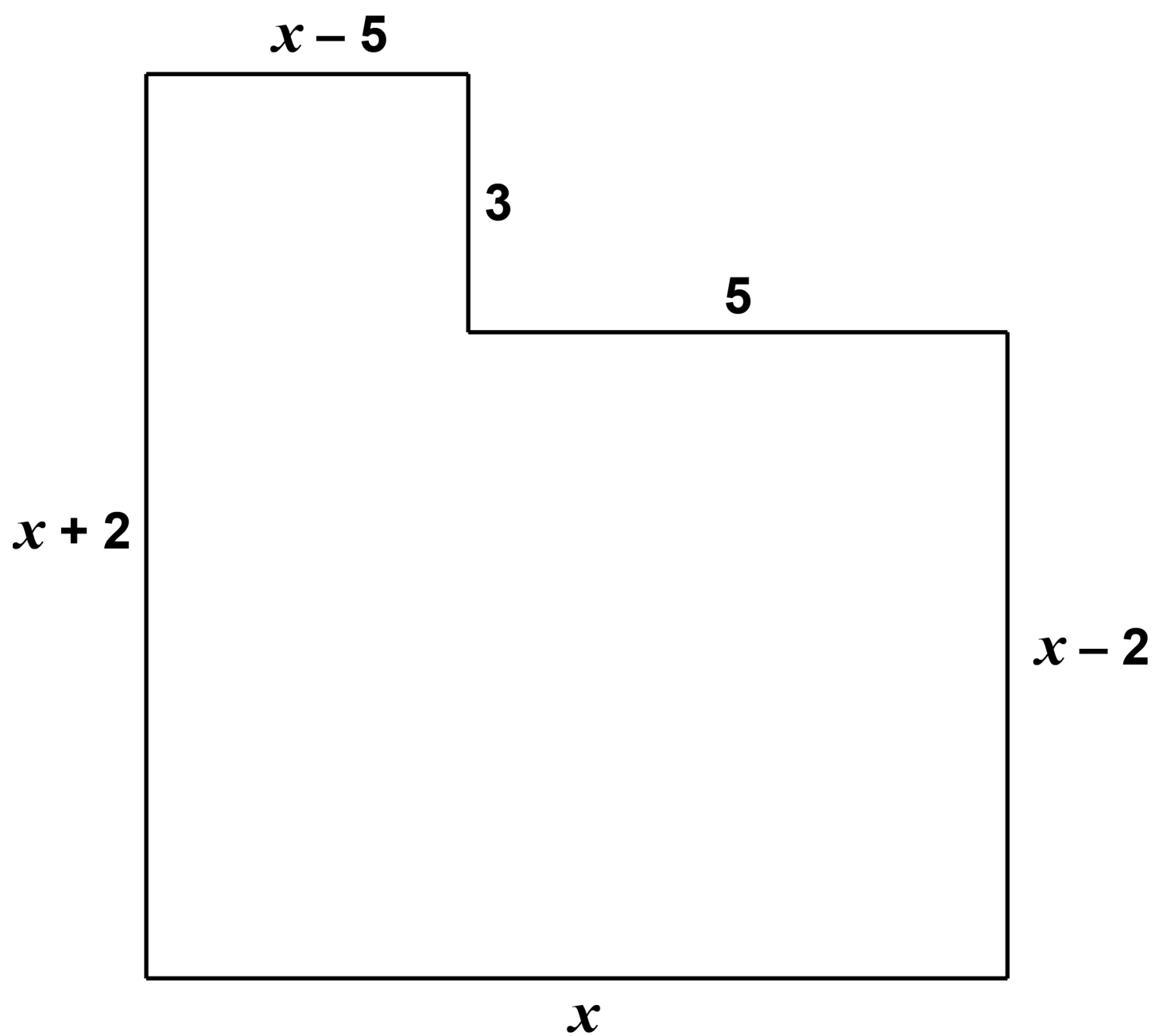
8



19 Here is the plan of the floor of an L-shaped room.

All lengths are in metres.

The diagram is not drawn accurately.



19 (a) The area of the floor is 75 m^2

Show that $x^2 + x - 90 = 0$ [3 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[Turn over]



- 19 (b) By factorising $x^2 + x - 90$ work out the value of x .

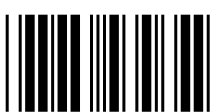
You MUST show your working [2 marks]

$x =$ _____

- 20 £2448 is invested in an account at a rate of compound interest.

One year after the investment there is £2496.96 in the account.

How much is in the account four years after the investment? [3 marks]



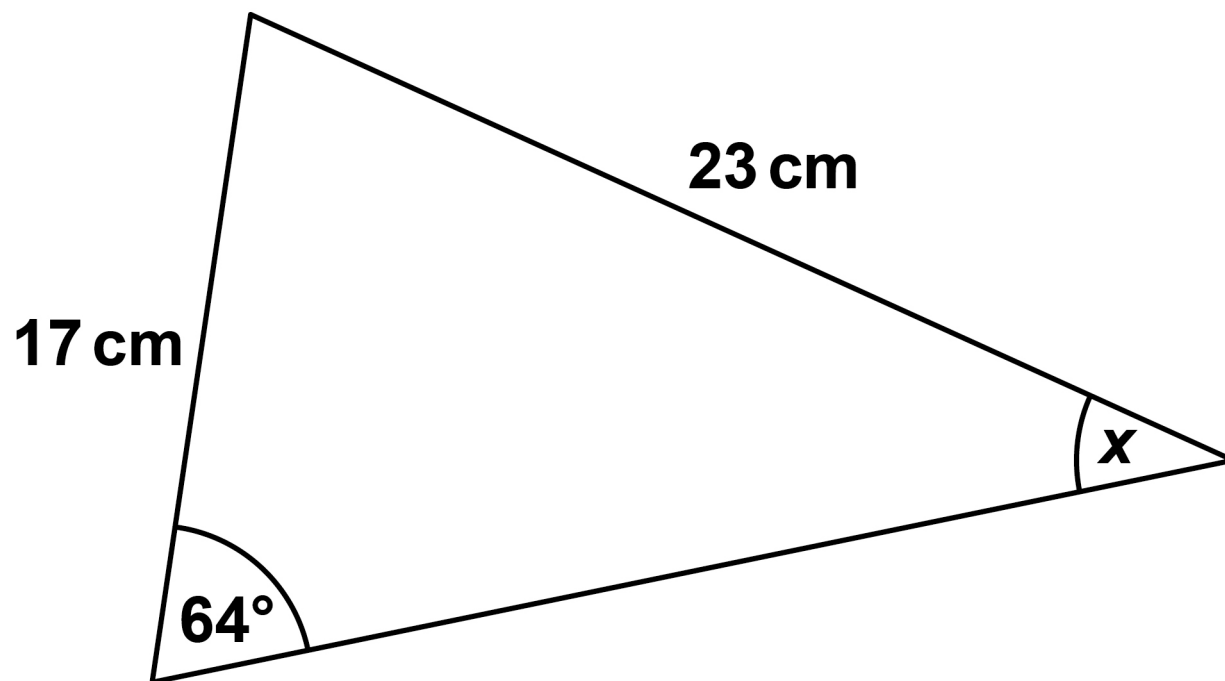
Answer £ _____

[Turn over]

8



- 21 The diagram is not drawn accurately.



Use the sine rule to work out the size of angle x .
[3 marks]

$x =$ _____ °

22 $f(x) = 3x$ and $g(x) = x^2$

Circle the expression for $fg(x)$ [1 mark]

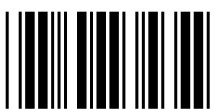
$3x^2$

$9x^2$

$3x^3$

$9x^4$

[Turn over]



23 Here are two simultaneous equations.

$$y = x^2 + 7x - c$$

and

$$y = 3x + d$$

There is a solution when $x = 5$

Work out the value of $c + d$ [3 marks]



Answer

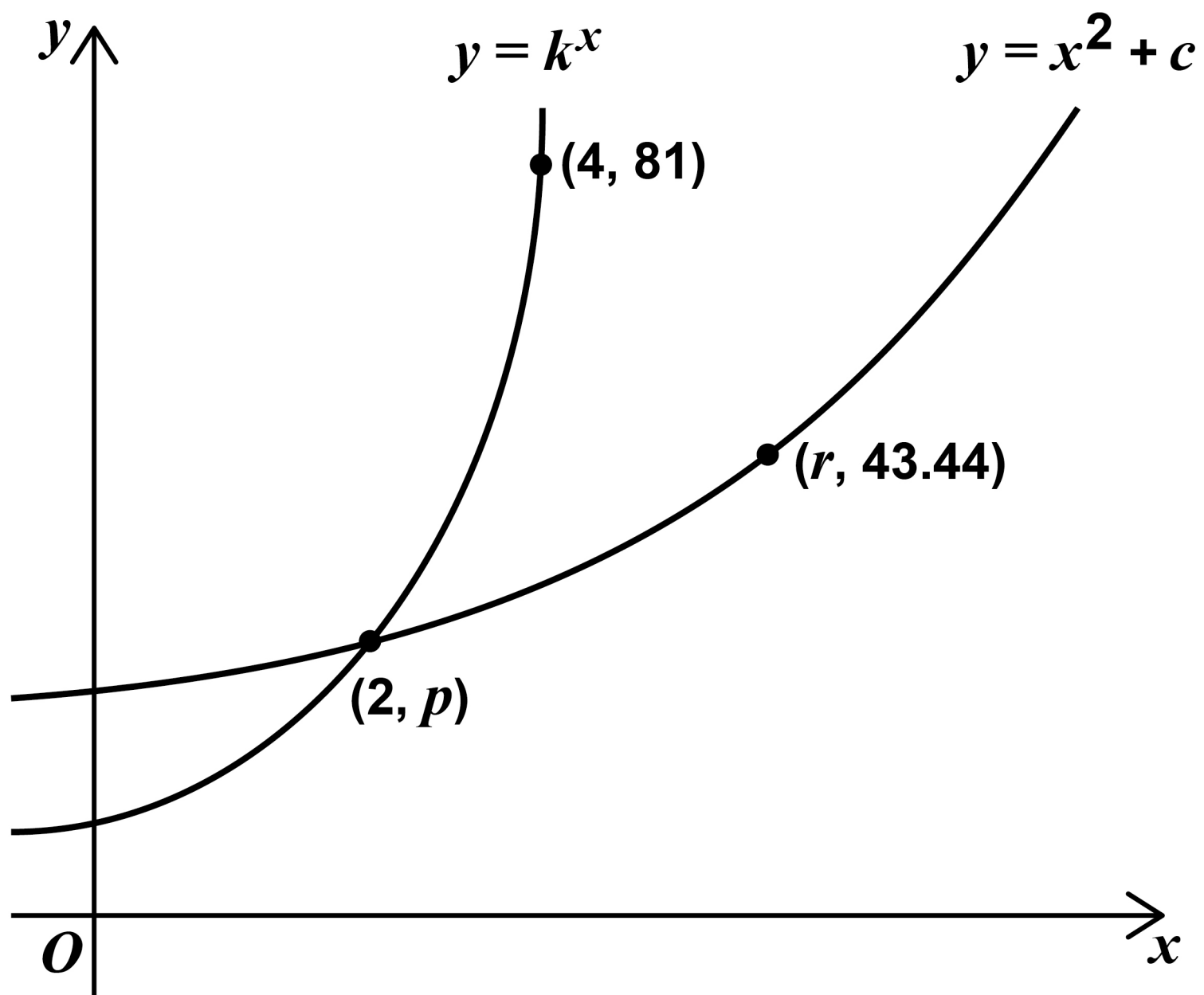
[Turn over]

7



- 24 Here is a sketch of the graphs of $y = k^x$ and $y = x^2 + c$

k and c are positive constants.



Work out the value of r . [4 marks]



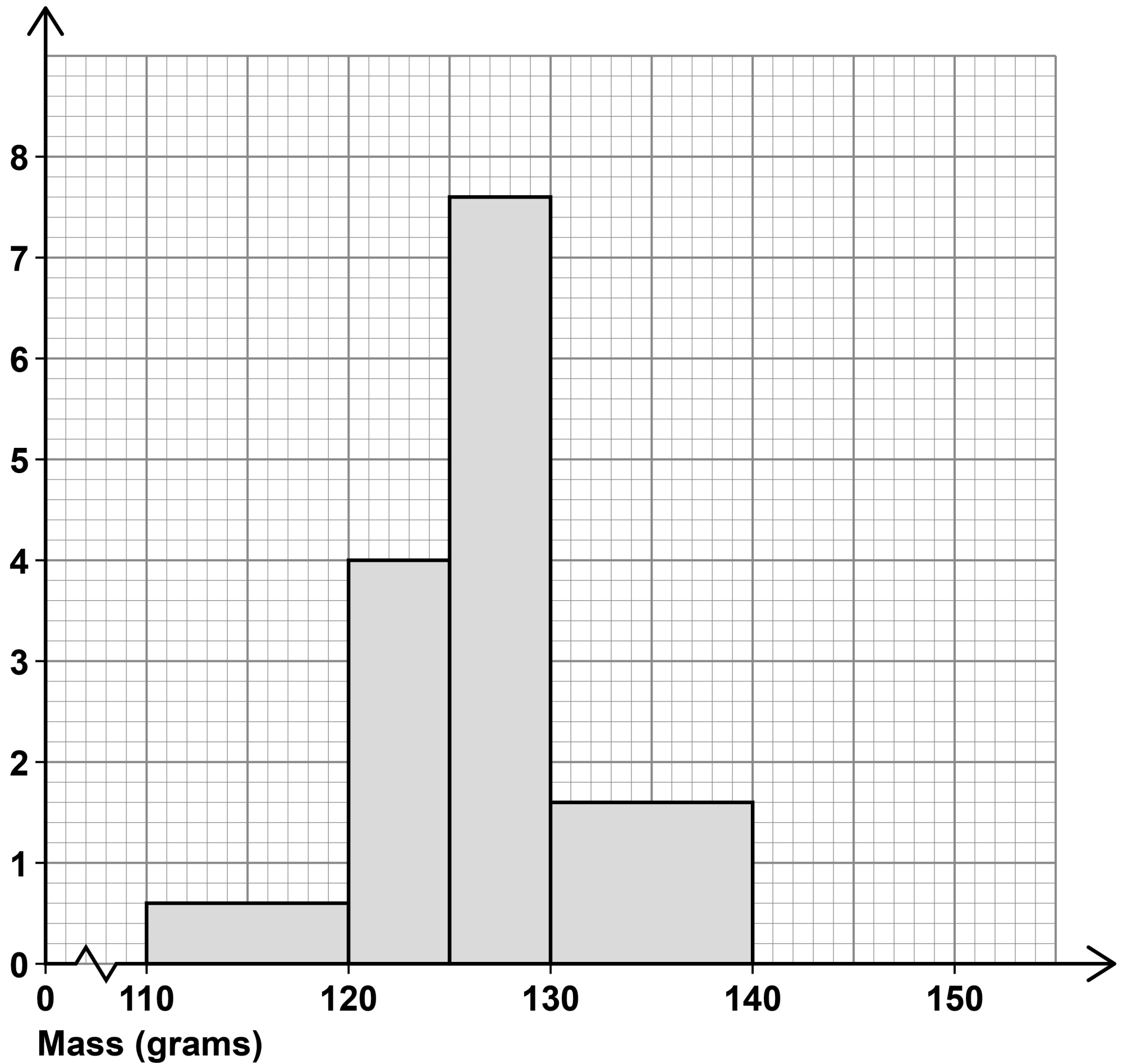
$r =$ _____

[Turn over]



- 25 A company makes tubes of toothpaste.
The masses of 80 tubes are checked.
A histogram is drawn to represent the data.

Frequency density



The company makes 28 000 tubes each day.

Estimate how many tubes each day have a mass LESS THAN 122 grams. [4 marks]

Answer _____

[Turn over]

8



26 Q and R are two numbers.

As a product of prime factors,

$$Q = 2^3 \times 3 \times a^3$$

$$R = 2^4 \times 3^2 \times a^2$$

26 (a) The highest common factor (HCF) of Q and R is 4056

Work out the value of a . [2 marks]

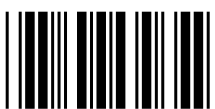
$a =$ _____



26 (b) Work out the lowest common multiple (LCM) of Q and R . [2 marks]

Answer _____

[Turn over]



27

Expand and simplify fully $(x - 3)(x - 4)(x + 8)$
[3 marks]

[illegible]

Answer _____

END OF QUESTIONS

7



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]

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For Examiner's Use	
Pages	Mark
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6–7	
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16–18	
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28–31	
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36–39	
40–43	
44–47	
48–51	
TOTAL	

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