



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

Wednesday 14 June 2023

Morning

Time allowed: 1 hour 30 minutes

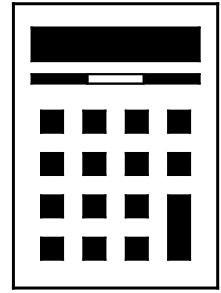
At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]



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 line with equation $y = 2x + 7$ intersects the y -axis at A.**

**Complete the coordinates of A.
[1 mark]**

Answer (0 , _____)

- 2 Write down a fraction equivalent to 1.875 [1 mark]**

Answer _____



3 Solve $5x + 11 = 3x + 19$ [2 marks]

$x =$ _____

[Turn over]



4 A map has a scale of 1 : 5000

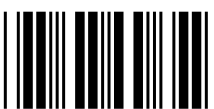
**How many METRES are represented
by a length of 4.5 cm on the map?
[2 marks]**

Answer _____ **m**

**5 The number of hedgehogs in
England is expected to REDUCE by
4% each year.**

**Assume there are now 1 000 000
hedgehogs in England.**

**Work out the expected number of
hedgehogs in England after FIVE
years.**



You MUST show your working.
[3 marks]

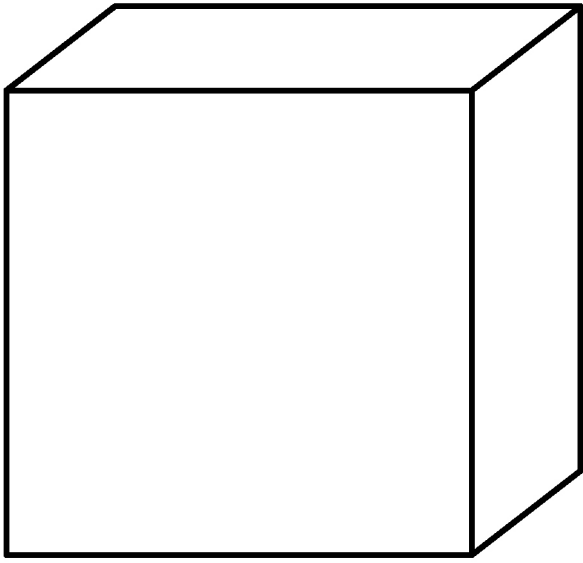
Answer _____

[Turn over]



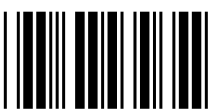
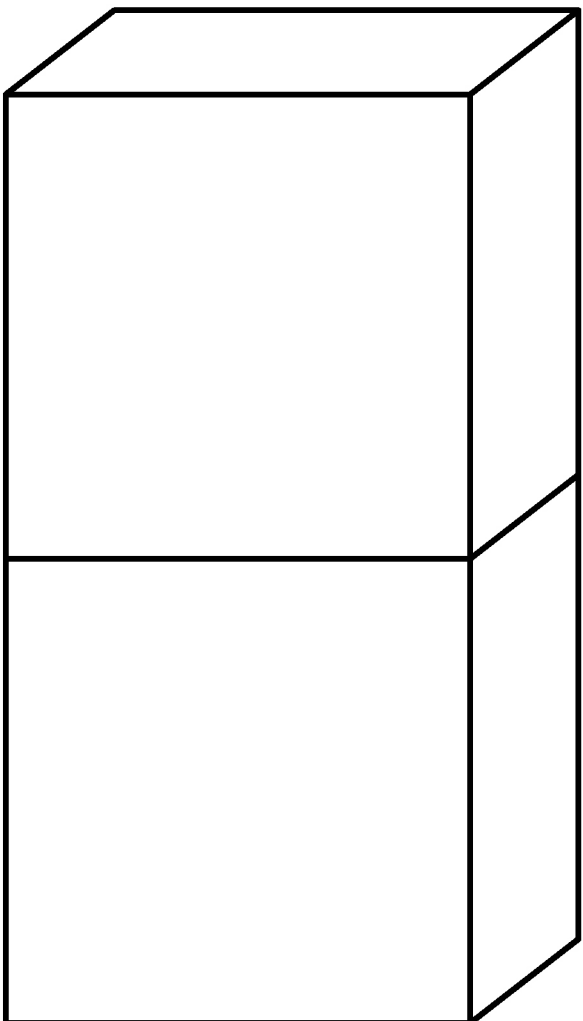
6 Here is cuboid A.

A



Cuboid B is made from TWO of cuboid A.

B



BLANK PAGE

[Turn over]



volume of A : volume of B = 1 : 2

Matthew says,

**“surface area of A : surface area of B
must be 1 : 2 because B is made of
2 of A.”**

Is Matthew correct?

Tick ONE box.

☐

Yes

☐

No

☐

Cannot tell



Give a reason for your answer.
[2 marks]

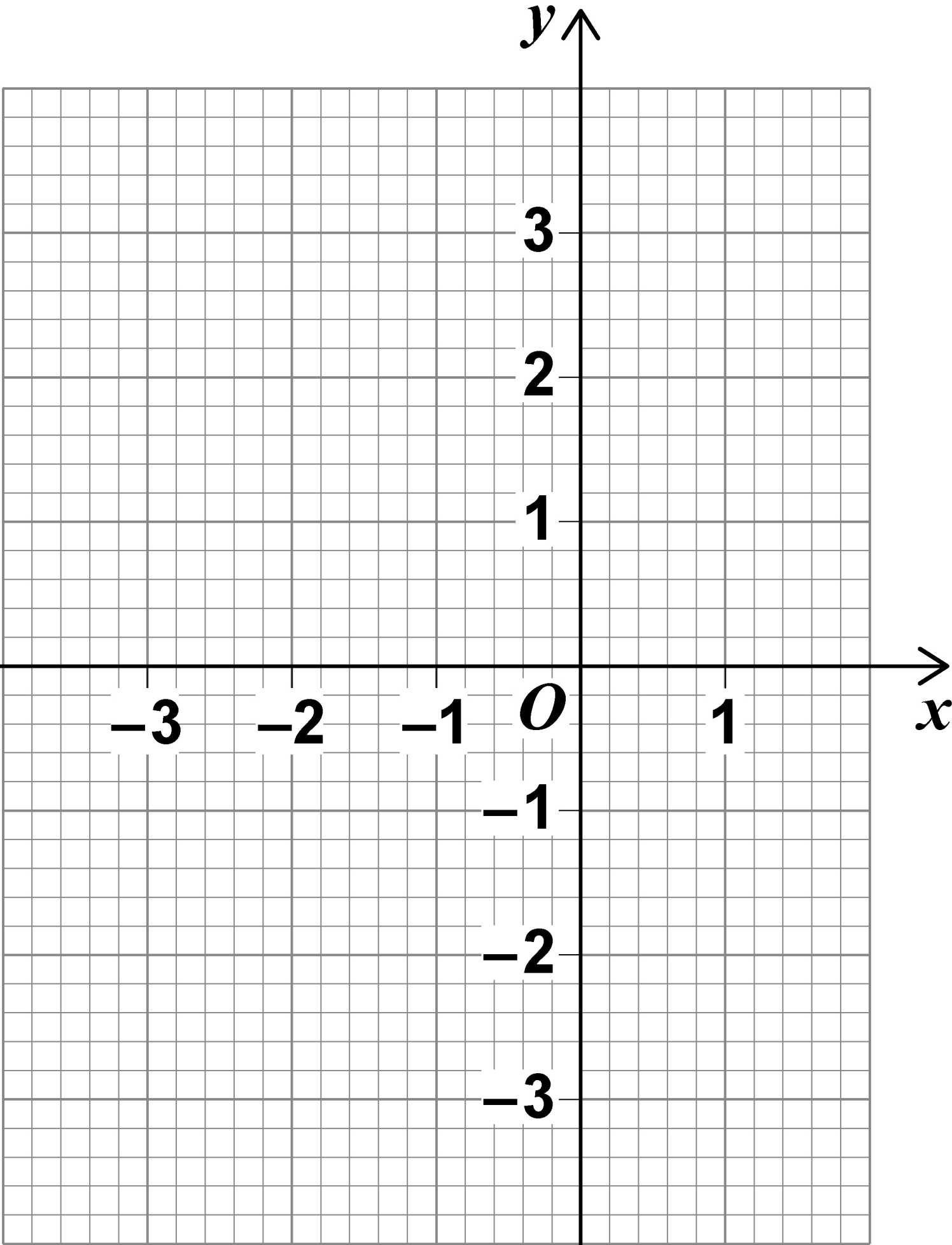
[Turn over]



- 7 (a) Complete the table of values for $y = x^2 + 2x$ [2 marks]**

x	-3	-2	-1	0	1
y	3		-1	0	

- 7 (b) On the opposite page, draw the graph of $y = x^2 + 2x$ for values of x from -3 to 1 [2 marks]**



[Turn over]



8 Jing has £2450

She saves some and gives the rest to her four brothers.

money saved : money given to brothers = 2 : 5

She gives each of her FOUR brothers the SAME amount.

Does each brother receive more than £430 ?

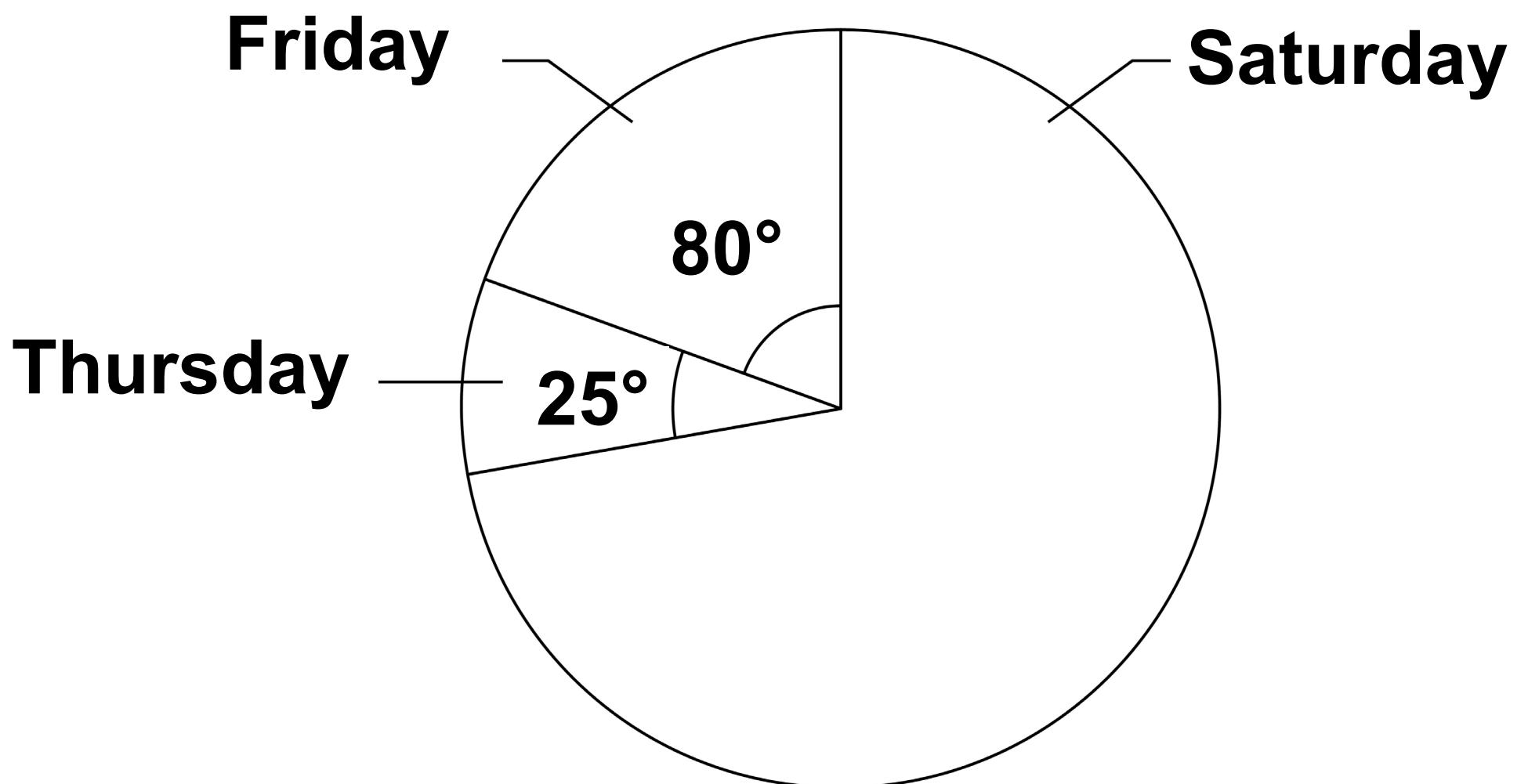
**You MUST show your working.
[4 marks]**

[Turn over]



- 9 The pie chart shows information about people at a fair during three days.**

The diagram is not drawn accurately.



There were 132 MORE people on Friday than on Thursday.

Work out the number of people on Saturday. [3 marks]



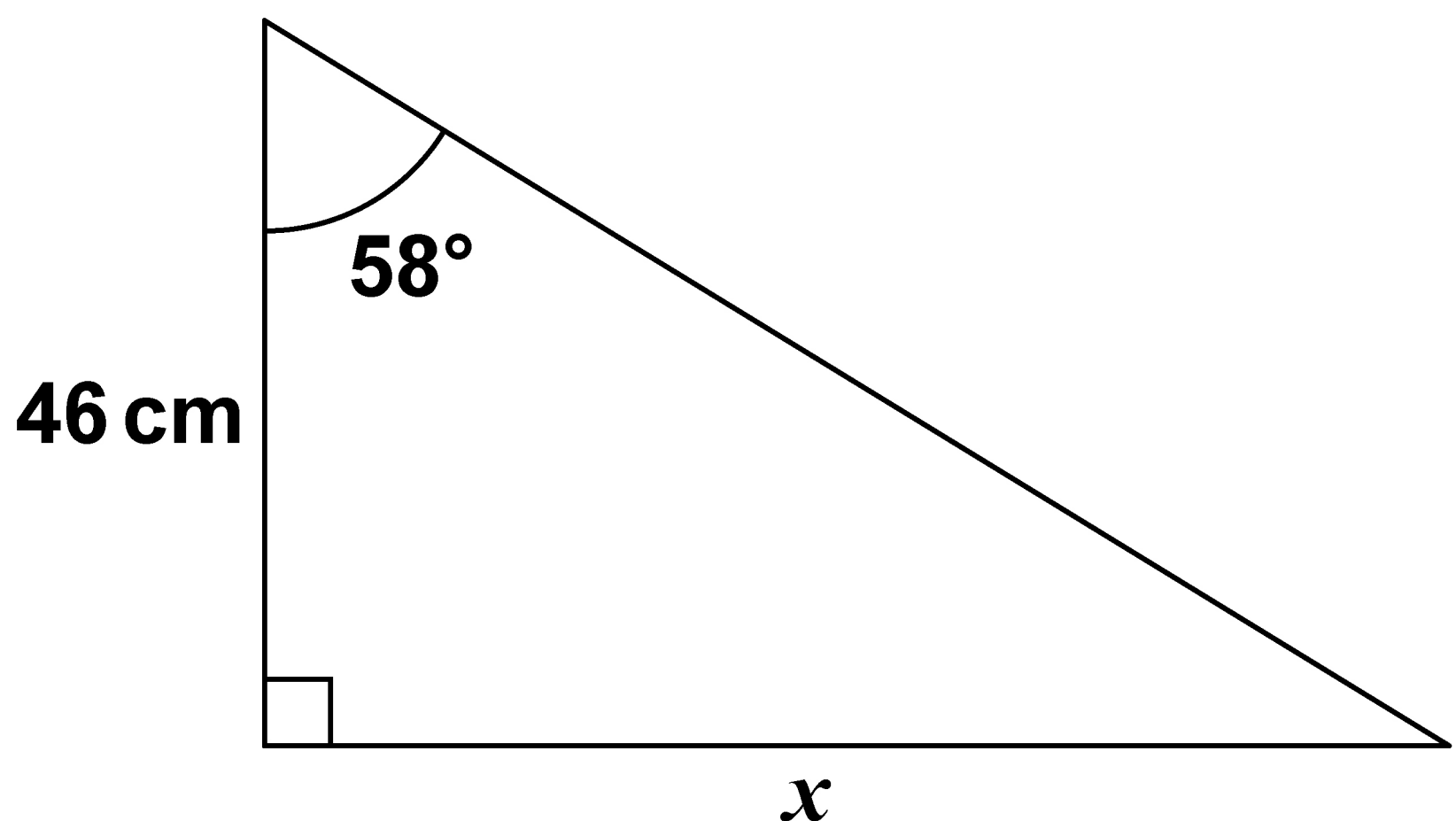
Answer _____

[Turn over]



- 10 Use trigonometry to work out the value of x . [3 marks]**

The diagram is not drawn accurately.





$x =$ _____ **cm**

[Turn over]



11 Millie is estimating the value of

$$\frac{1}{\left(\sqrt[3]{8.34}\right)^2 \times 10.21}$$

She rounds each decimal number to 1 significant figure.

11 (a) Work out Millie's estimate.

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

Answer _____

11 (b) Millie says,

“My estimate must be more than the exact value.”

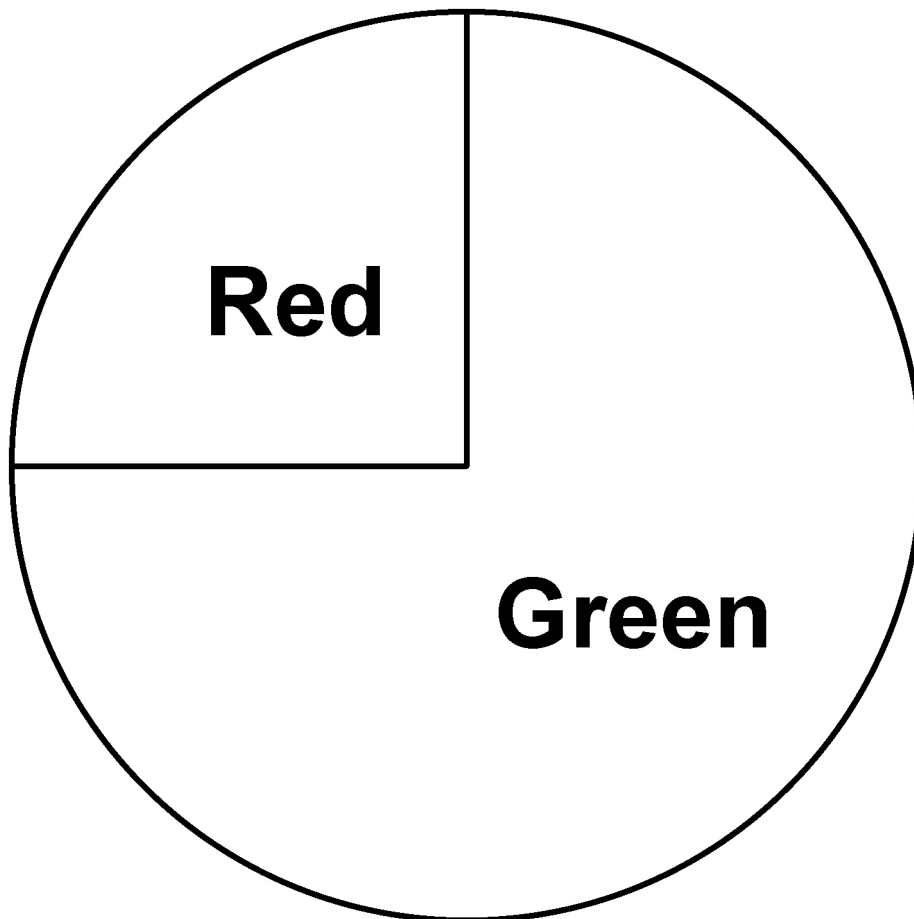
WITHOUT WORKING OUT THE EXACT VALUE, give a reason how she can know this. [1 mark]

[Turn over]



12

Here is a BIASED spinner.



12(a)

Ali, Ben and Cary want to know the probability of spinning red on the biased spinner.

They each spin it and count how many times it lands on red and divide by the total number of spins.

Ali says

I spun red the most times

Ben says

I spun the spinner the most times

Cary says

**My relative frequency of red is
0.25**

**Who had the best estimate for the
probability of spinning red?**

**Give a reason for your answer.
[1 mark]**

[Turn over]



12(b) Dev spins the spinner 80 times.

He says,

“My relative frequency of red is 0.185”

**Give a reason why his relative frequency must be wrong.
[1 mark]**

12(c) Elena spins the spinner 125 times.

The relative frequency of red is 0.32



Work out how many times the spinner landed on GREEN.

[2 marks]

Answer _____

[Turn over]

13 Charlie is driving 293 miles home.

He

- **leaves at 9.00 am**
- **travels the first 176 miles at an average speed of 48 mph**
- **drives the rest of the way at an average speed of 65 mph**

Will he be home by 2.30 pm?

**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]



- 14 Kiran paid Income Tax and National Insurance on her annual salary.**

INCOME TAX

0% of the first £12 570 of her annual salary

20% of the rest of her annual salary

NATIONAL INSURANCE

0% of the first £9880 of her annual salary

13.25% of the rest of her annual salary

**Kiran paid £5186 Income Tax.
How much National Insurance did she pay? [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]



30

Answer £

8



**15 180 runners STARTED a
marathon.**

**Some of the runners did not
complete it.**

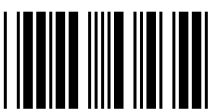
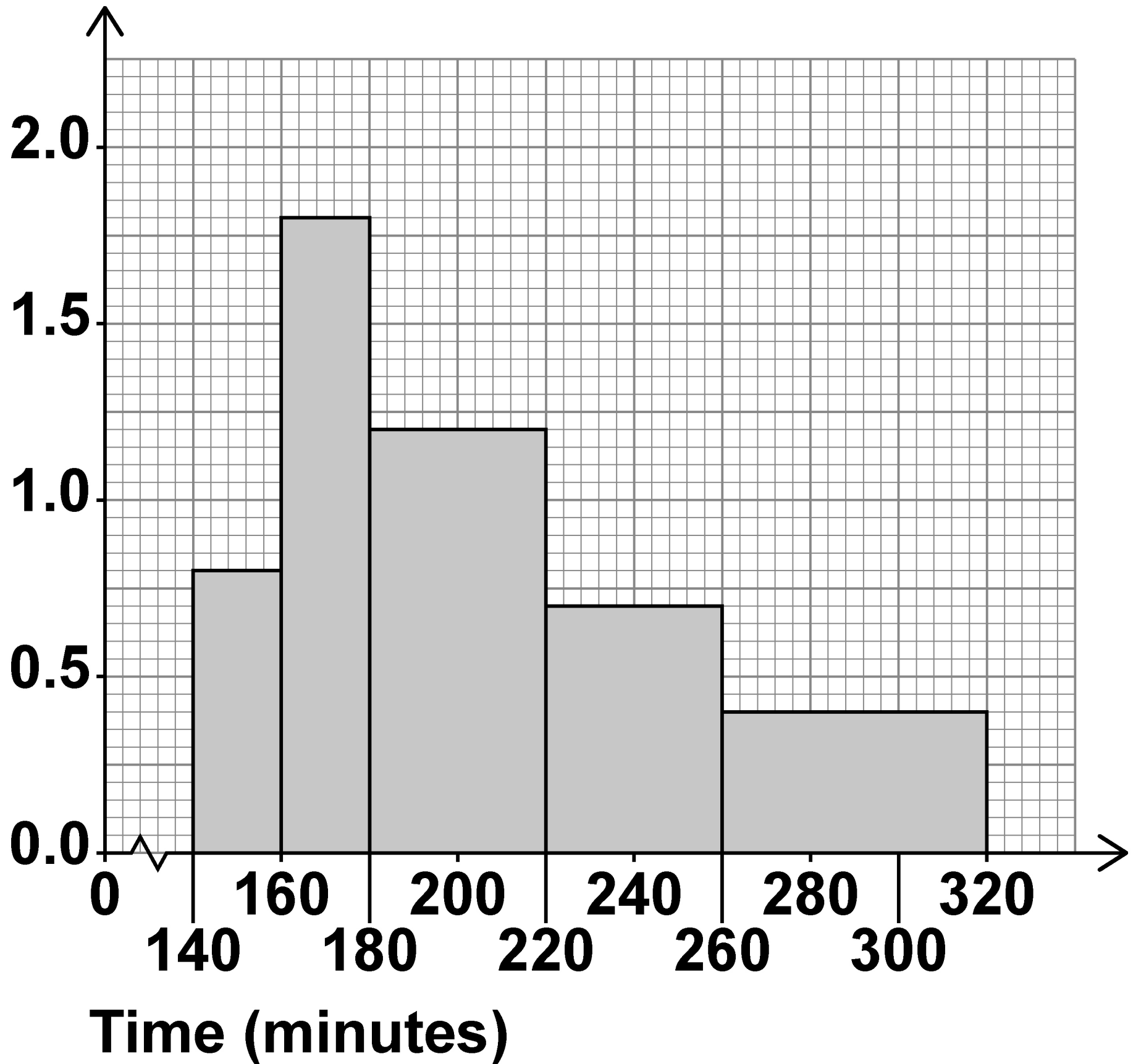
**15(a) The histogram, on page 32,
represents the times of the
runners who did complete the
marathon.**

Question 15 continues on the next page.

[Turn over]



**Frequency
density**



**How many runners did NOT
complete the marathon?
[3 marks]**

Answer _____

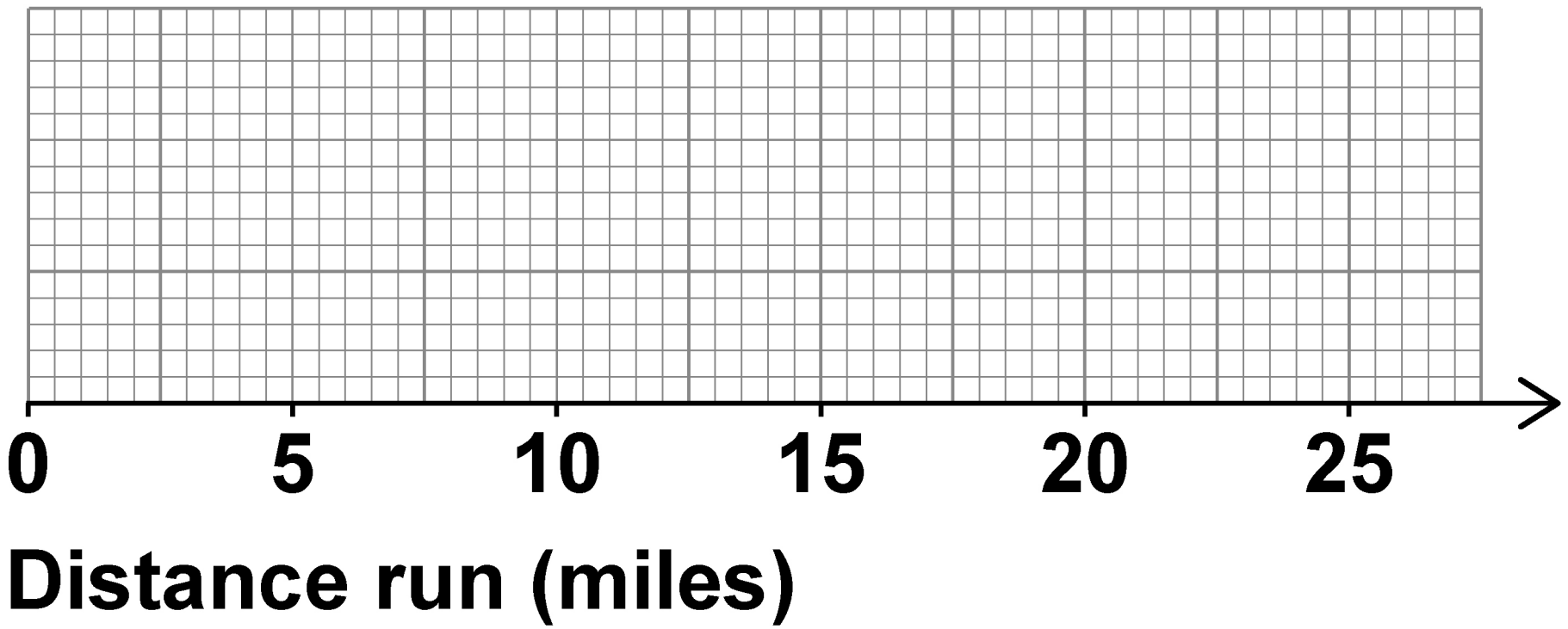
[Turn over]



- 15 (b) The table shows information about the runners who did NOT complete the marathon.**

	DISTANCE RUN (MILES)
Least distance	5
Greatest distance	23
Lower quartile	11
Median	18
Interquartile range	9

**On the opposite page, draw a box plot to represent the information.
[3 marks]**

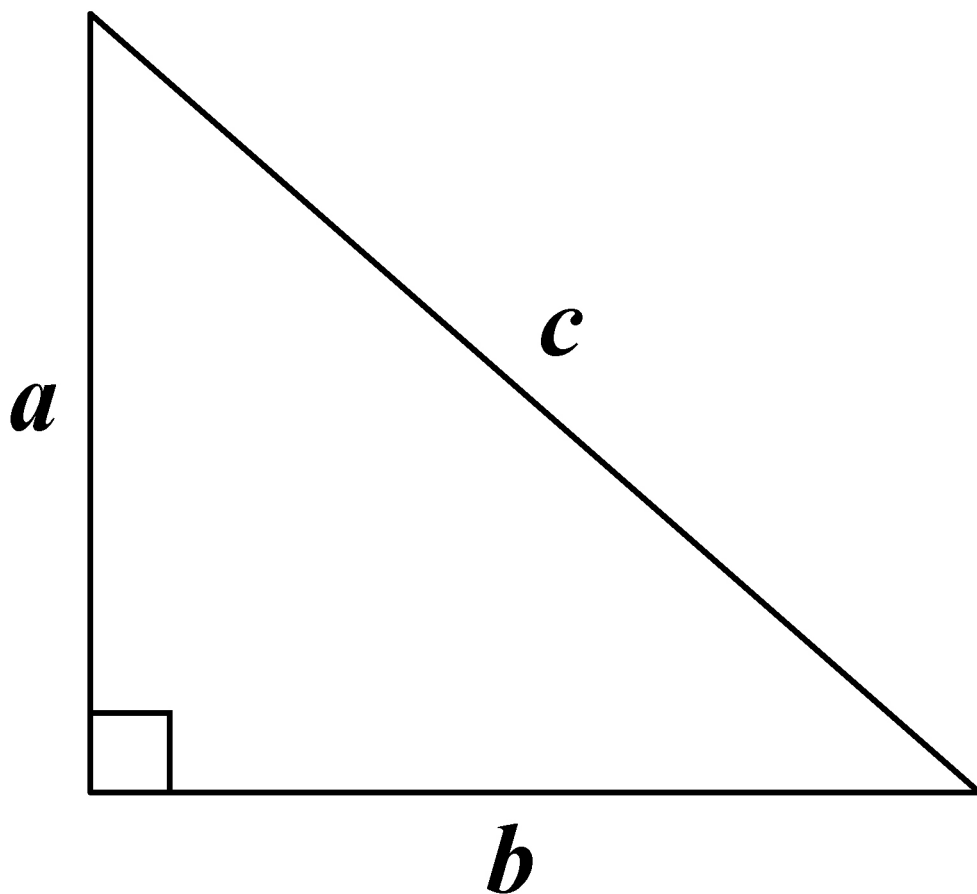


[Turn over]

6



16 The diagram is not drawn accurately.



In this right-angled triangle,

$$a = 16 \text{ cm}$$

$$a : c = 4 : 5$$

**Work out the area of the triangle.
[4 marks]**

37

[illegible]

Answer **cm²**

[Turn over]



3 7

17 Solve $\frac{x+8}{2} + \frac{9-x}{5} = 4$ [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.

$x =$ _____

[Turn over]

8

18 $f(x) = x^2 + 6x$

$$g(x) = 2x + 4$$

18 (a) Show that $fg(x) = 4x^2 + 28x + 40$
[3 marks]

18 (b) Solve $fg(x) = -5$ [3 marks]

Answer _____

[Turn over]



- 19 Two integers have a difference of 6**
- The integers are multiplied together.**
- 9 is then added.**

Prove algebraically that the result is always a square number. [3 marks]



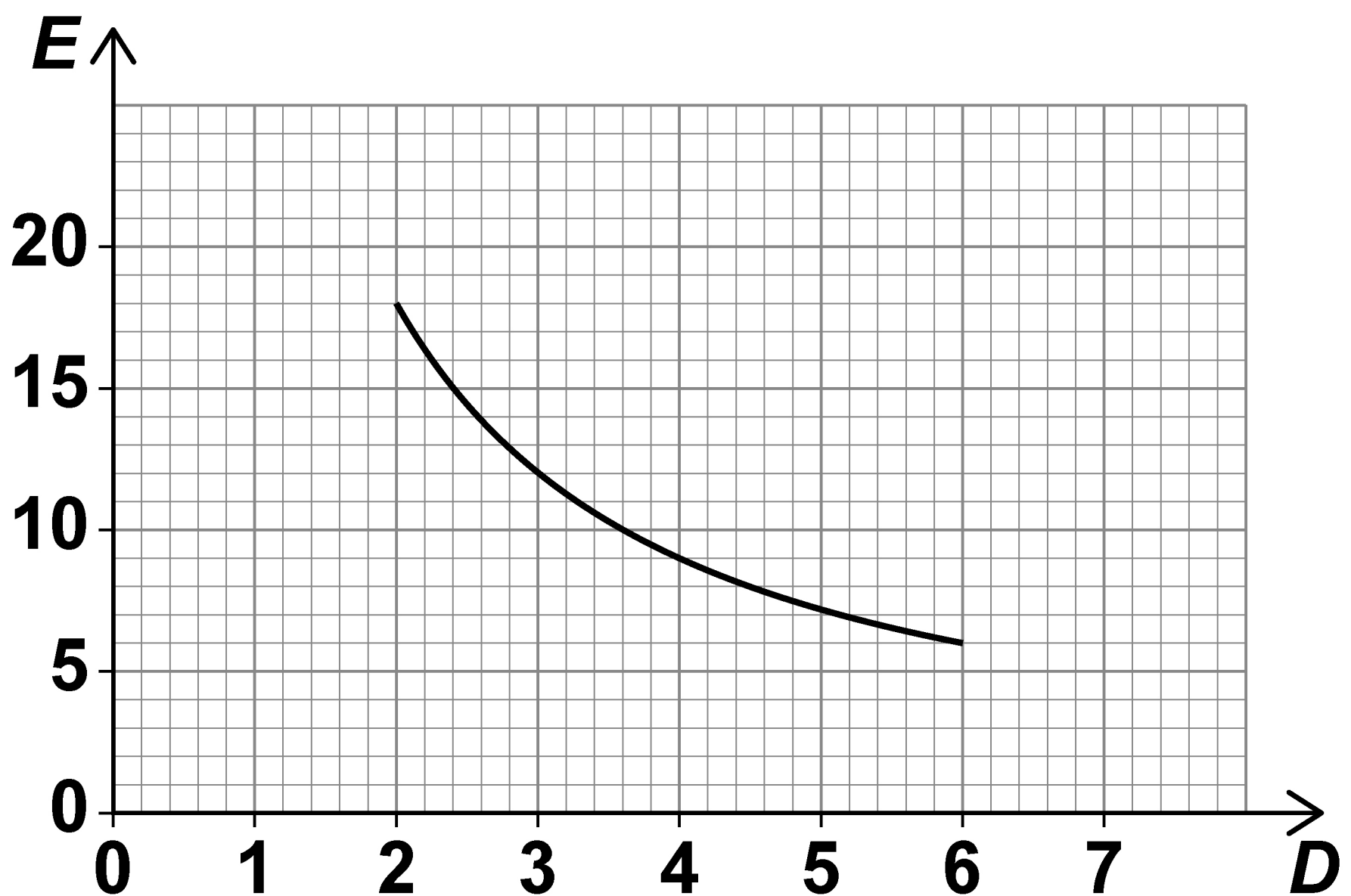
[Turn over]

9



- 20 (a) Sunil thinks that E and D are linked by the equation $E = \frac{36}{D}$

The graph shows the values of D and E for $2 \leq D \leq 6$



Choose ONE point on the graph and state if Sunil's equation is correct for that point. [1 mark]

[Turn over]



20(b) G is directly proportional to the square root of H .

$$G : H = 3 : 2 \quad \text{when} \quad H = 16$$

**Work out $G : H$ when $H = 100$
[4 marks]**

Answer _____ :

[Turn over]

5



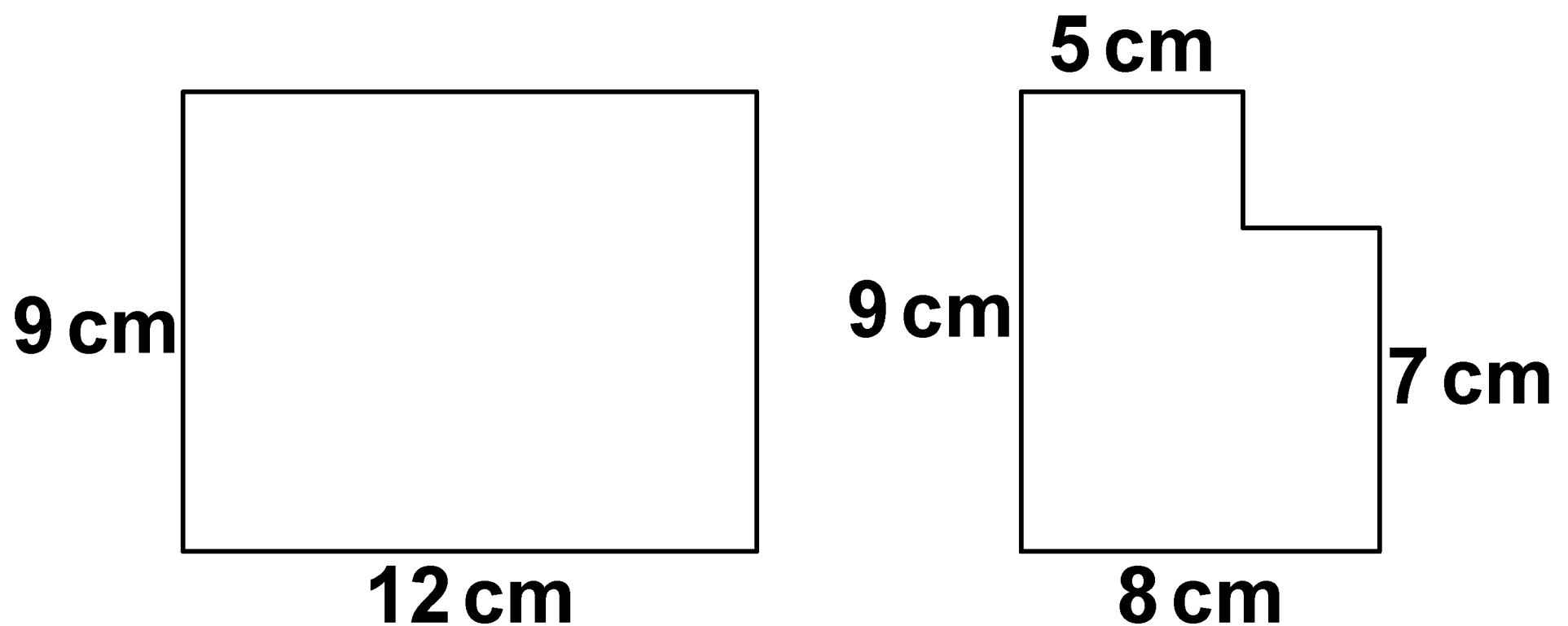
21 A solid shape is made from centimetre cubes.

The front elevation and side elevation of the shape are shown.

The diagram is not drawn accurately.

FRONT ELEVATION

SIDE ELEVATION



Work out

the MAXIMUM possible number of cubes in the shape

and

**the MINIMUM possible number of
cubes in the shape. [3 marks]**

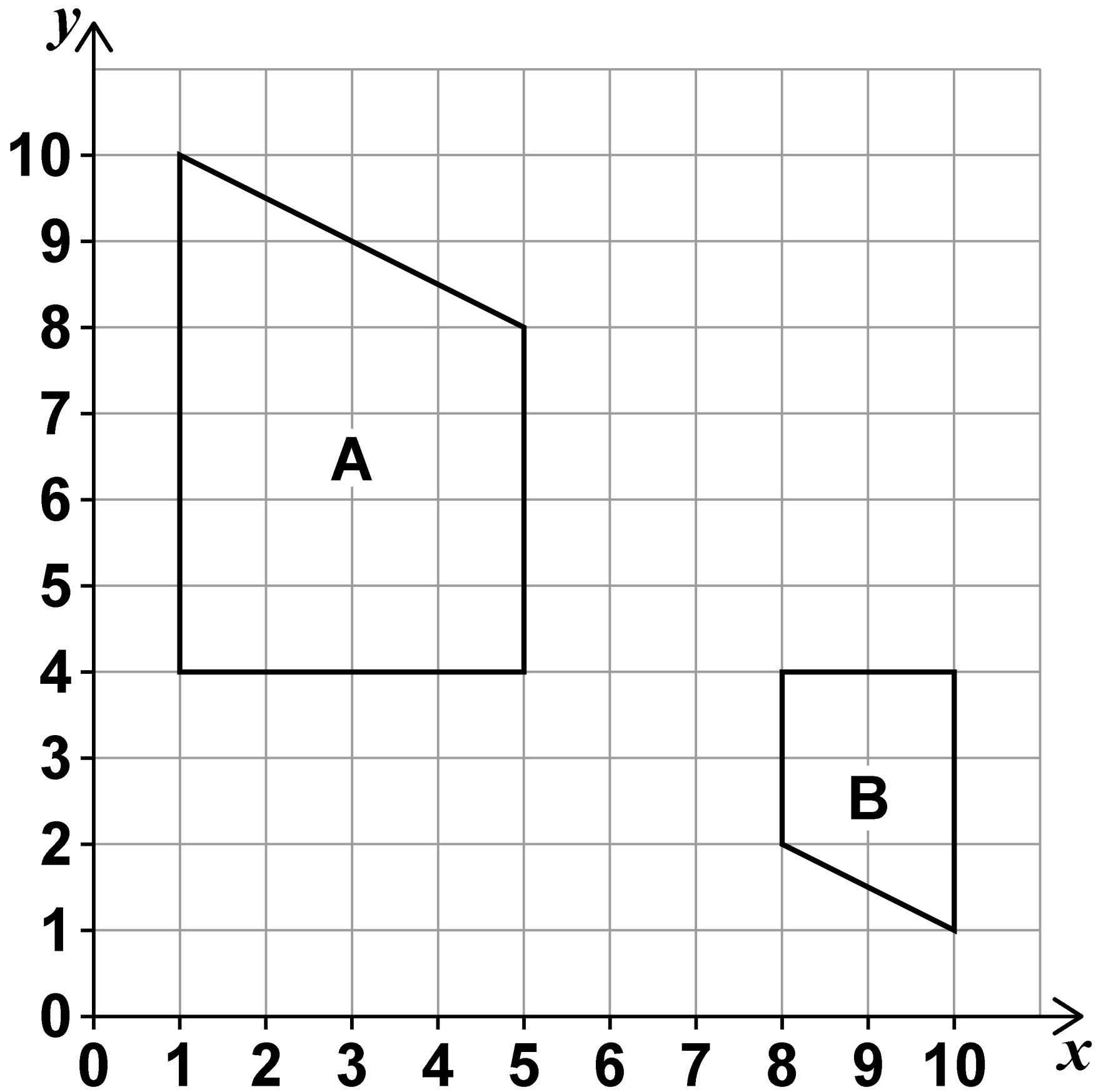
Maximum _____

Minimum _____

[Turn over]



22 Shape A and shape B are shown on the grid.



**Describe the SINGLE transformation
that maps shape A to shape B.
[3 marks]**

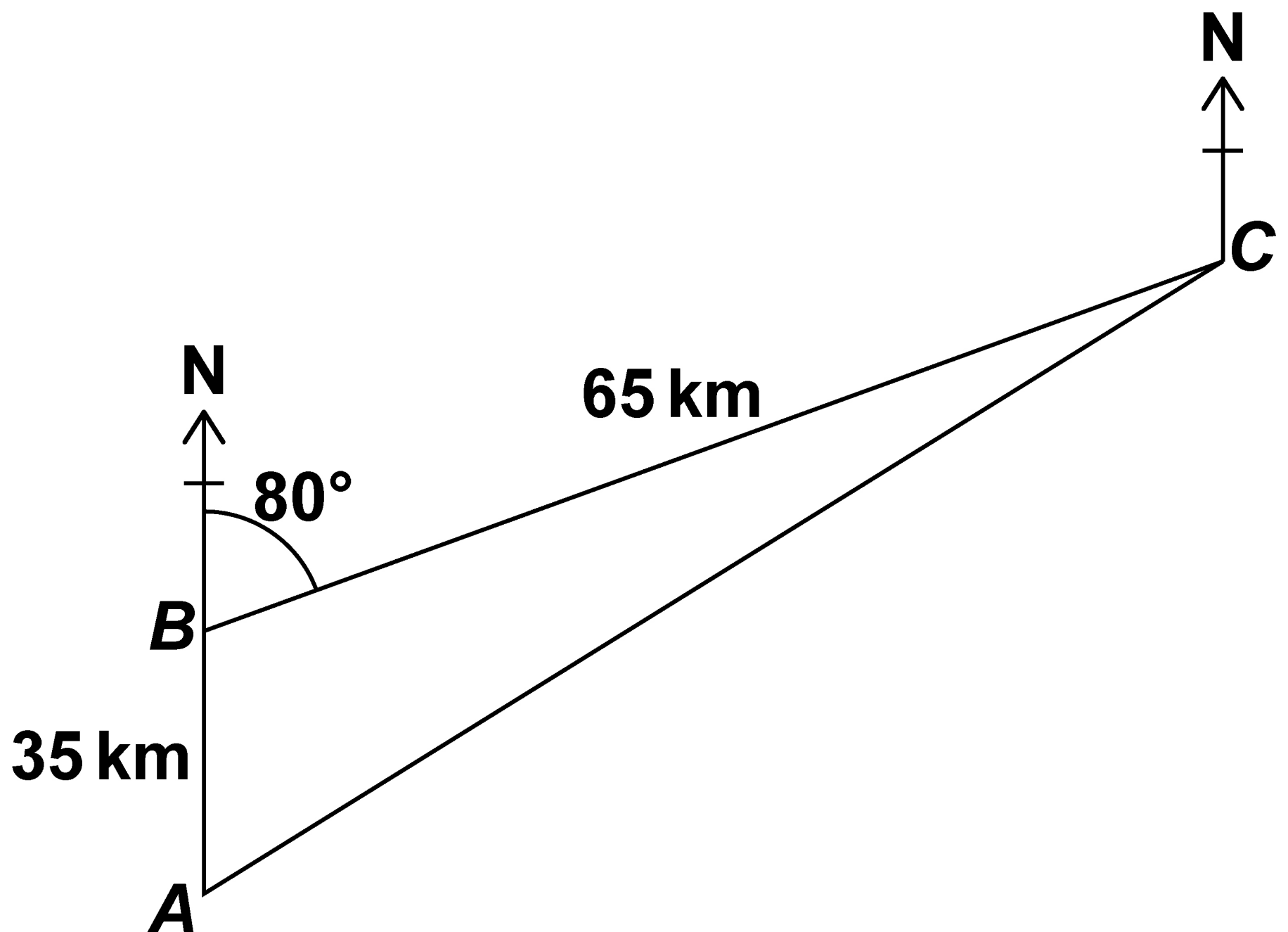
[Turn over]

<hr/>
6



23

The diagram is not drawn accurately.



A boat sails 35 km North from *A* to *B*.

From *B* the boat sails to *C* and then back to *A*.



23 (a) Show that the distance the boat sails from C to A is 79 km to the nearest km

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

[Turn over]



**23 (b) Work out the bearing of A from C.
[4 marks]**

Answer _____ °

END OF QUESTIONS

6



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
4–7	
8–13	
14–17	
18–21	
22–25	
26–30	
31–35	
36–39	
40–43	
44–47	
48–51	
52–55	
TOTAL	

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