Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

MATHEMATICS

H

Higher Tier Paper 3 Calculator

8300/3H

Tuesday 11 June 2019 Morning

Time allowed: 1 hour 30 minutes

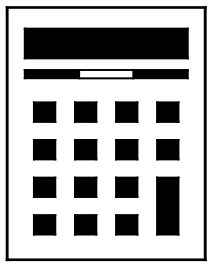
At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

JUN198300 3H 01

For this paper you must have:

- **a calculator**
- **mathematical instruments.**



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.**
- **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

Work out £1.50 as a fraction of 60p

Circle your answer. [1 mark]

$\frac{2}{5}$ $\frac{1}{4}$ $\frac{4}{1}$ $\frac{5}{2}$

2

For a biased dice, P(6) = $\frac{3}{5}$

Circle the probability of two sixes when the dice is rolled twice. [1 mark]

$\frac{6}{25}$ $\frac{6}{10}$ $\frac{9}{25}$ $\frac{9}{5}$

3

Circle the lowest common multiple (LCM) of 5, 15 and 25

[1 mark]

5 45 75 150

4

Circle the TWO roots of $(x - 5)(x + 3) = 0$

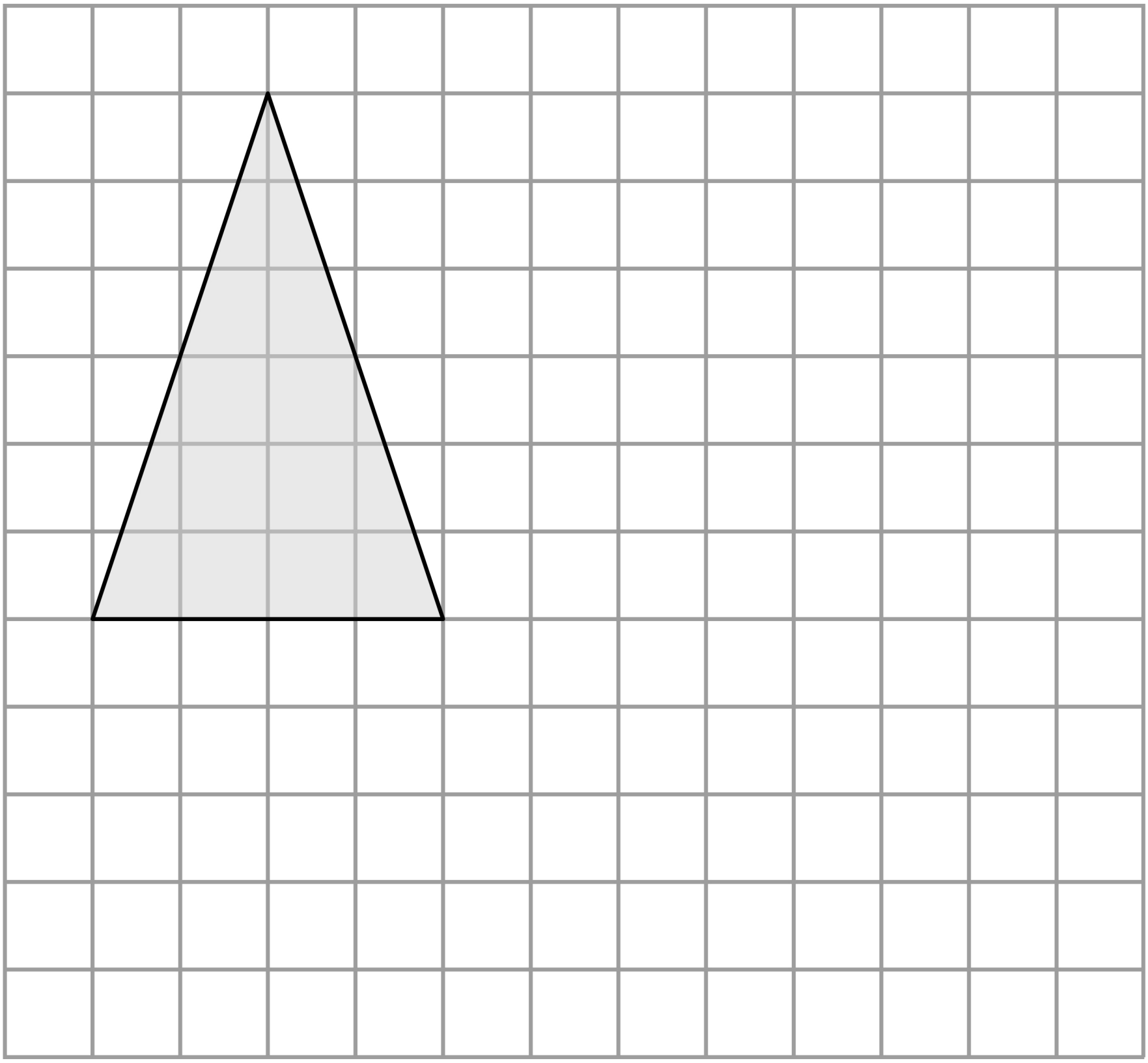
[1 mark]

–5 –3 3 5

5

On the grid, draw an enlargement of the triangle with scale factor $\frac{1}{2}$

[2 marks]



6

6

To the nearest pound, Jon has £9

To the nearest 50p, Ellie has £6.50

Work out the maximum possible total amount of money. [3 marks]

Answer £ _____

7

Two solids, J and K, have the same density.

Complete the table.

Include units in your answers. [3 marks]

	J	K
Mass	**48 g**	**78 g**
Volume	**8 cm^3**	
Density		

8

Rearrange $y = 3x - 2$ to make x the subject.

Circle your answer. [1 mark]

$x = \frac{y}{3} - 2$

$x = \frac{y + 2}{3}$

$x = \frac{y - 2}{3}$

$x = \frac{y}{3} + 2$

7

9

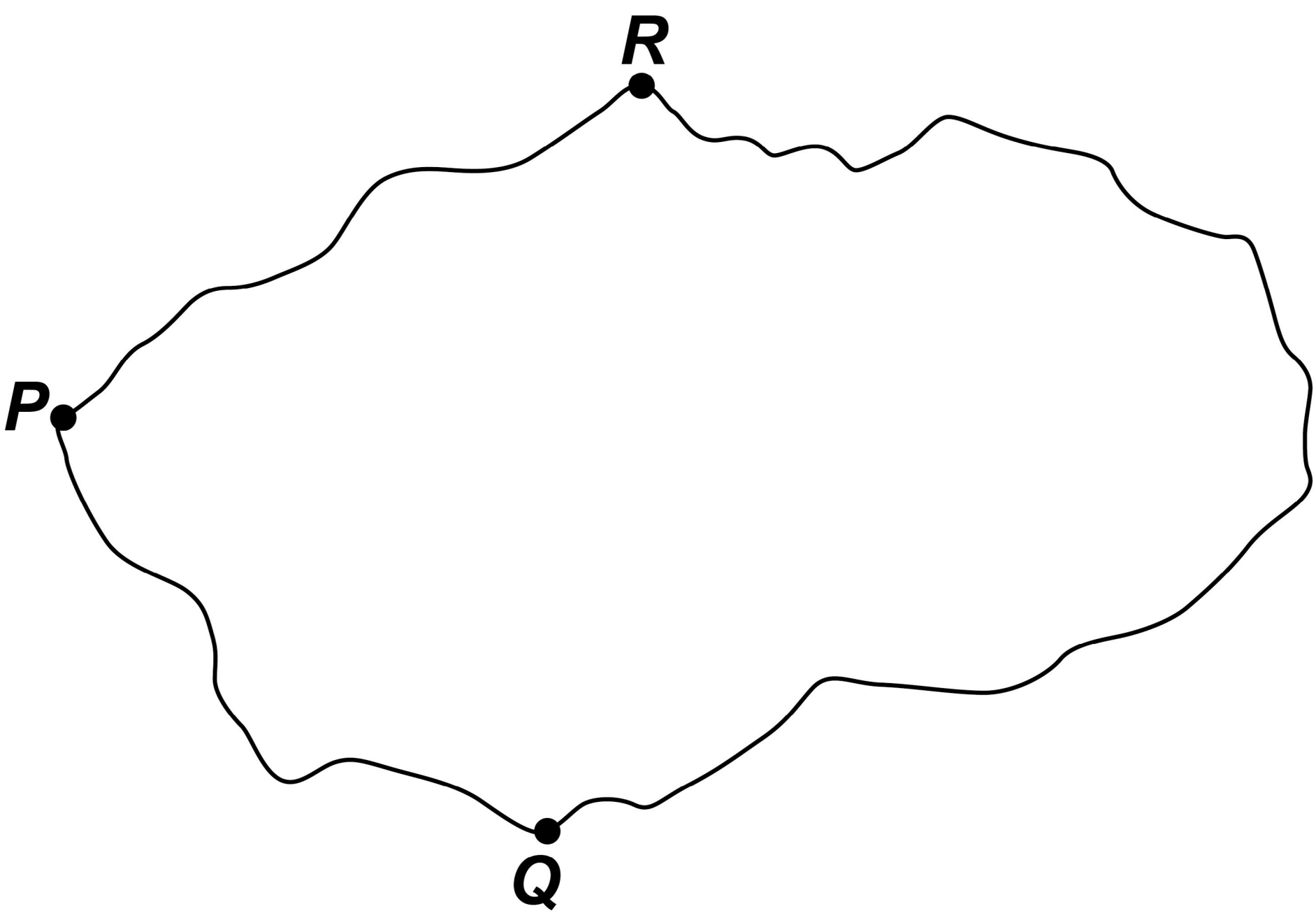
Towns *P*, *Q* and *R* are connected by roads *PQ*, *PR* and *QR*.

***PR* is 10 km longer than *PQ*.**

***QR* is twice as long as *PR*.**

The total length of the three roads is 170 km

The diagram is not drawn accurately.



11

Work out the length of *PQ*. [4 marks]

Answer _____ **km**

[Turn over]

10

Mia wants to borrow £6000 and repay it, with interest, after two years.

She sees two offers for loans.

OFFER 1
Compound interest
3% per year

OFFER 2
Compound interest
First year 1%
Second year 5%

Mia says,
“I will pay back the same amount because the average of 1% and 5% is 3%”

Is she correct?

You MUST show your working. [3 marks]

[Turn over]

7

11

Here are two sets of numbers, A and B.

Set A

200	160
104	100

Set B

270	400	483
	300	x

mean of Set A : mean of Set B = 3 : 8

Work out the value of x. [4 marks]

Answer _____

[Turn over]

12

A straight line
has gradient 4
and
passes through the point (5, 23)

Work out the equation of the line.

Give your answer in the form $y = mx + c$
[3 marks]

Answer

7

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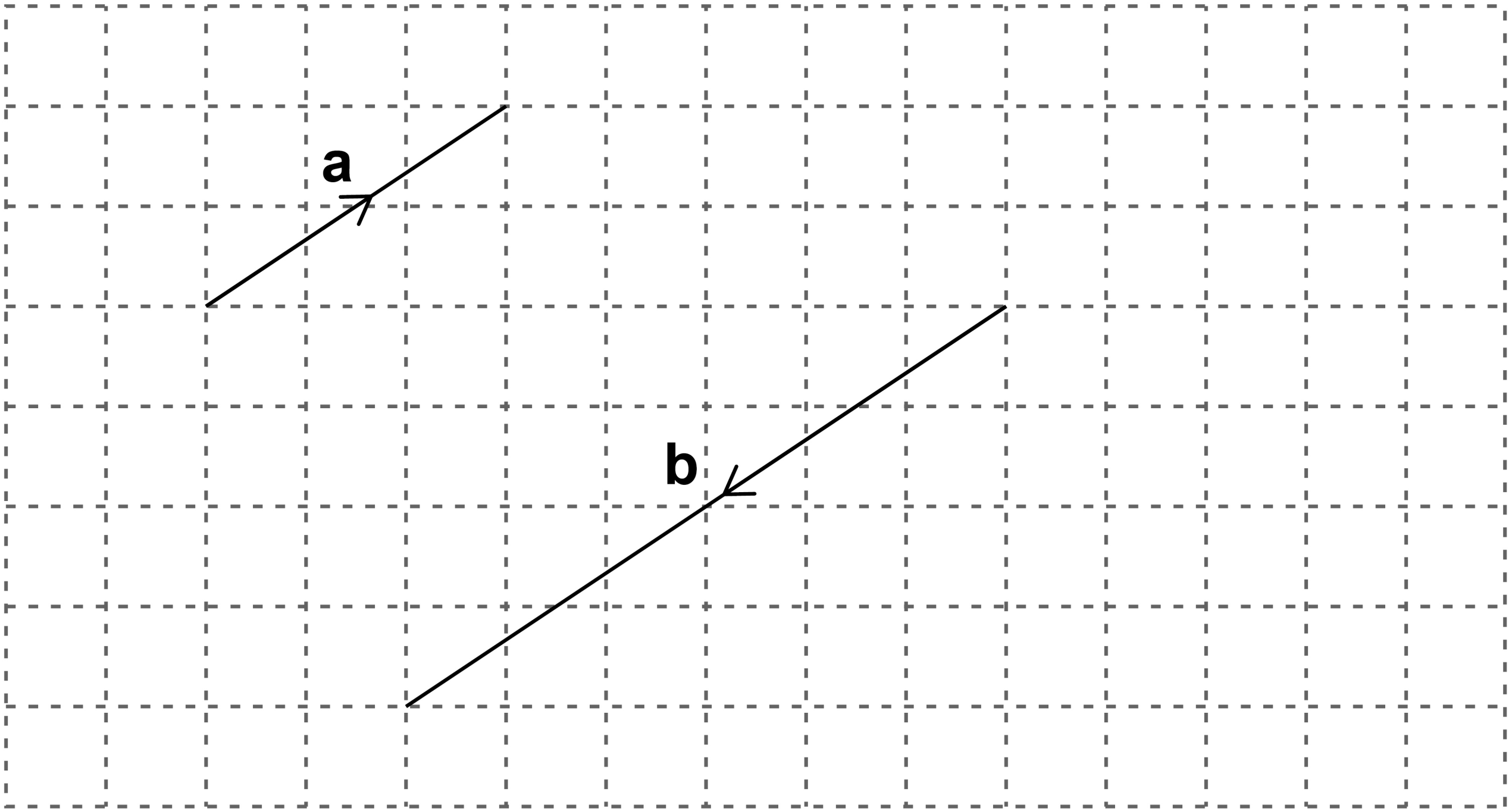
[Turn over]

13 (a)

Vectors a and b are drawn on a grid.



Write b in terms of a. [1 mark]

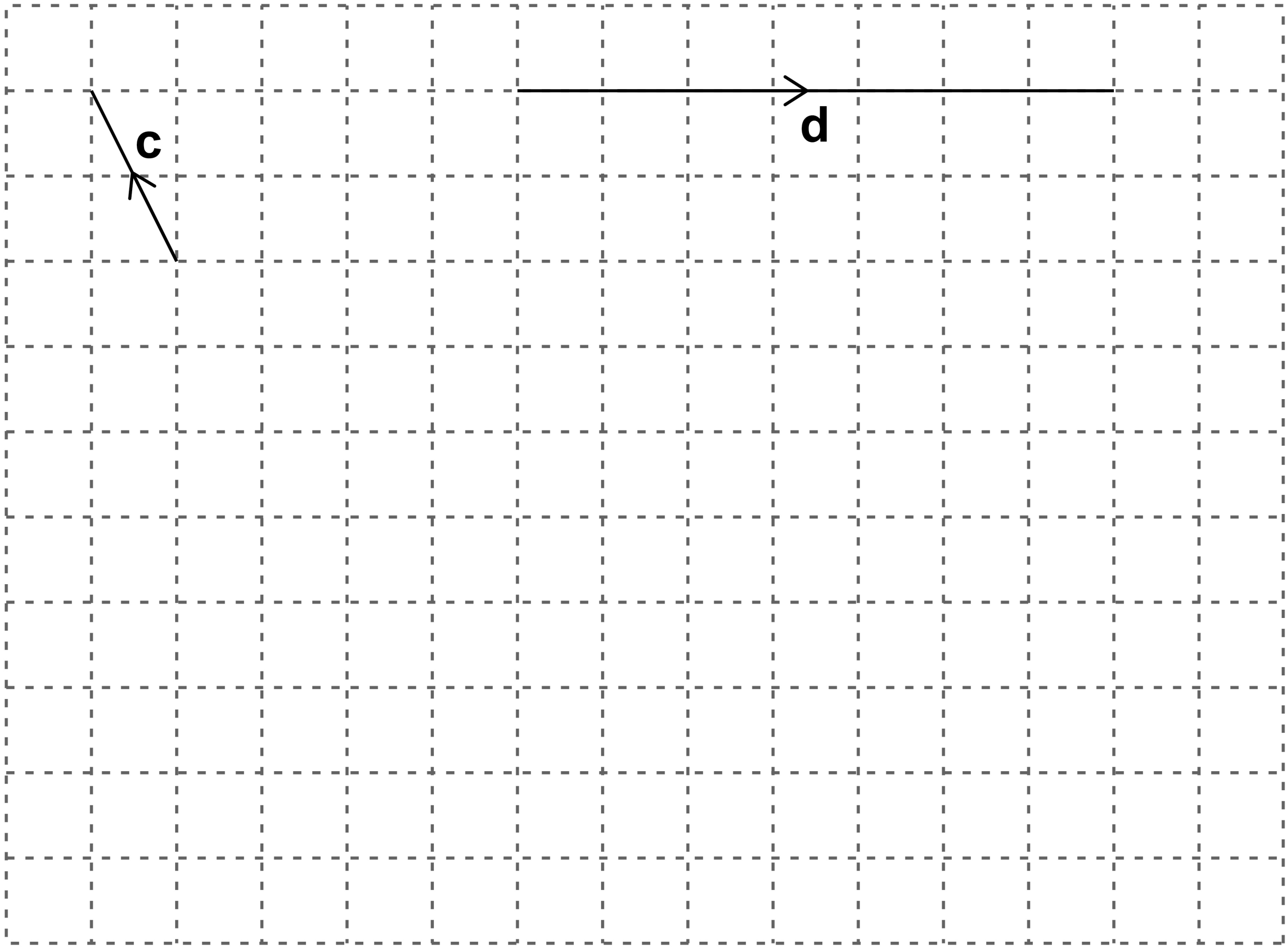
b = _____

[Turn over]

13 (b)

Vectors c and d are drawn on a grid, on page 21.

On the grid, draw a vector representing c – d
[2 marks]


c
d

14

For Class X,
number of boys : number of girls = 7 : 8

For Class Y,
number of boys : number of girls = 3 : 4

Which statement MUST be true?

Tick ONE box. [1 mark]

- ☐ Class X has more boys than class Y
- ☐ Class X has twice as many girls as class Y
- ☐ Class X has a greater proportion of boys than class Y
- ☐ Class X has the same proportion of boys as class Y

15

Simplify fully $\frac{a^3b^2}{cd} \times \frac{c}{ab^5}$

[3 marks]

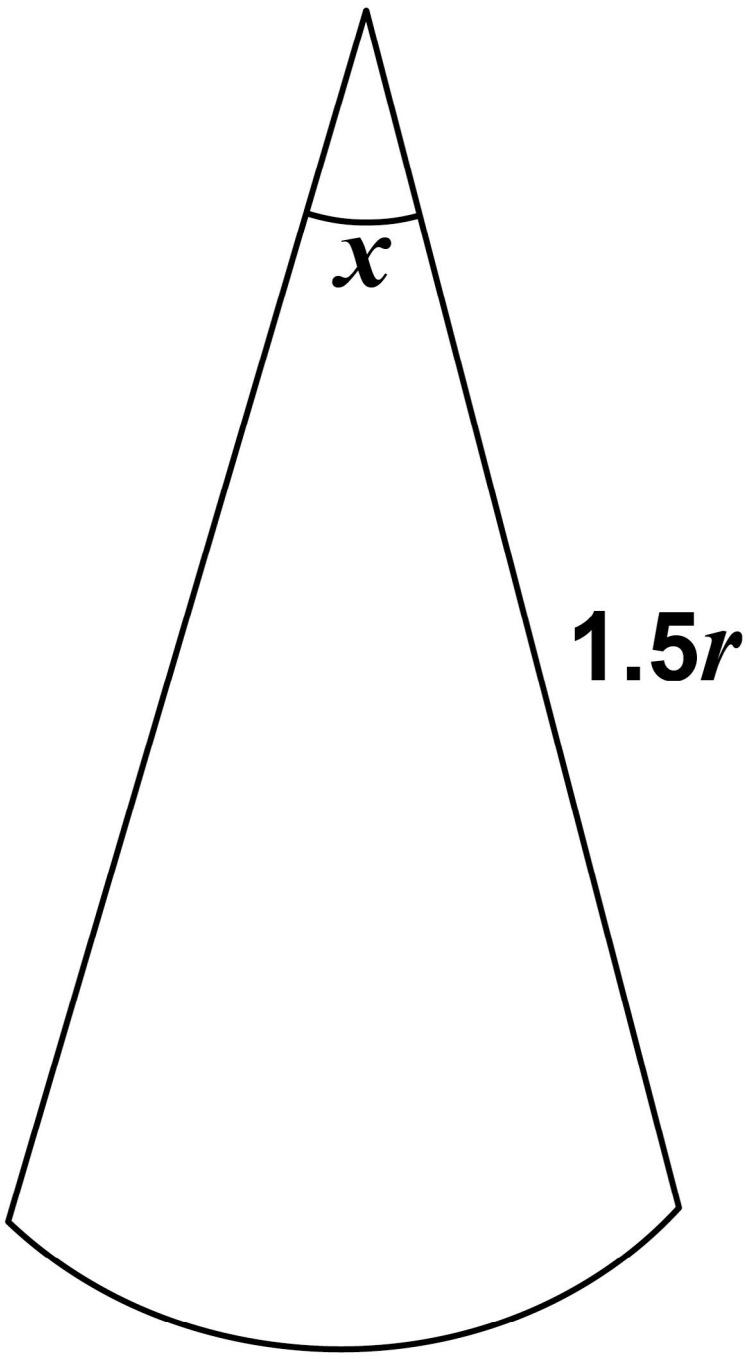
Answer

16

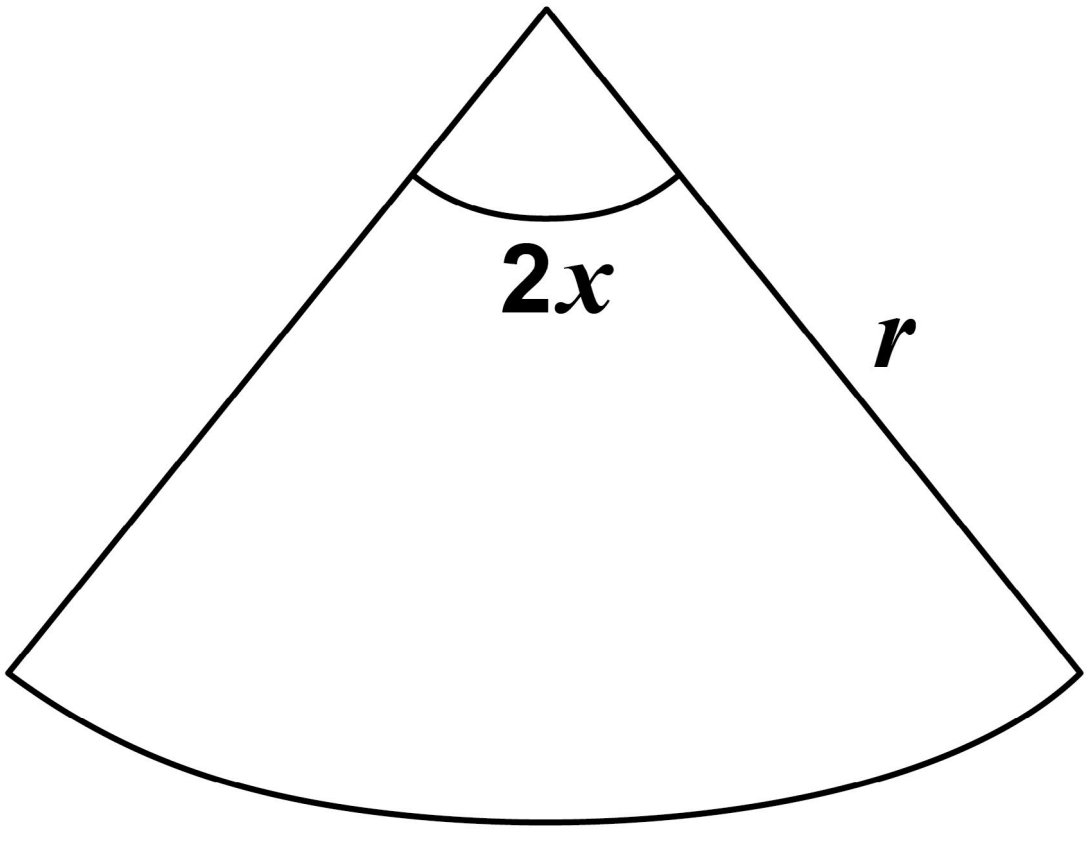
On the opposite page are two sectors from different circles.

The sectors are not drawn accurately.

SECTOR A



SECTOR B



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Which sector, on page 25, has the bigger area?

Tick a box.

☐ **Sector A**

☐ **Sector B**

Show working to support your answer.
[2 marks]

17

A factory makes kettles.

Four samples of kettles are tested for faults.

Each sample has size 200

Here are the relative frequencies of faulty kettles in the samples.

Sample	P	Q	R	S
Relative frequency	0.03	0.035	0.015	0.01

Work out the range of the number of faulty kettles in the four samples. [3 marks]

Answer

[Turn over]

18 (a)

Write $x(3x - 9) = 4$ in the form $ax^2 + bx + c = 0$ where a, b and c are integers. [1 mark]

Answer

18 (b)

Solve $x(3x - 9) = 4$

Give your answers to 2 decimal places.
[2 marks]

Answer

[Turn over]

6

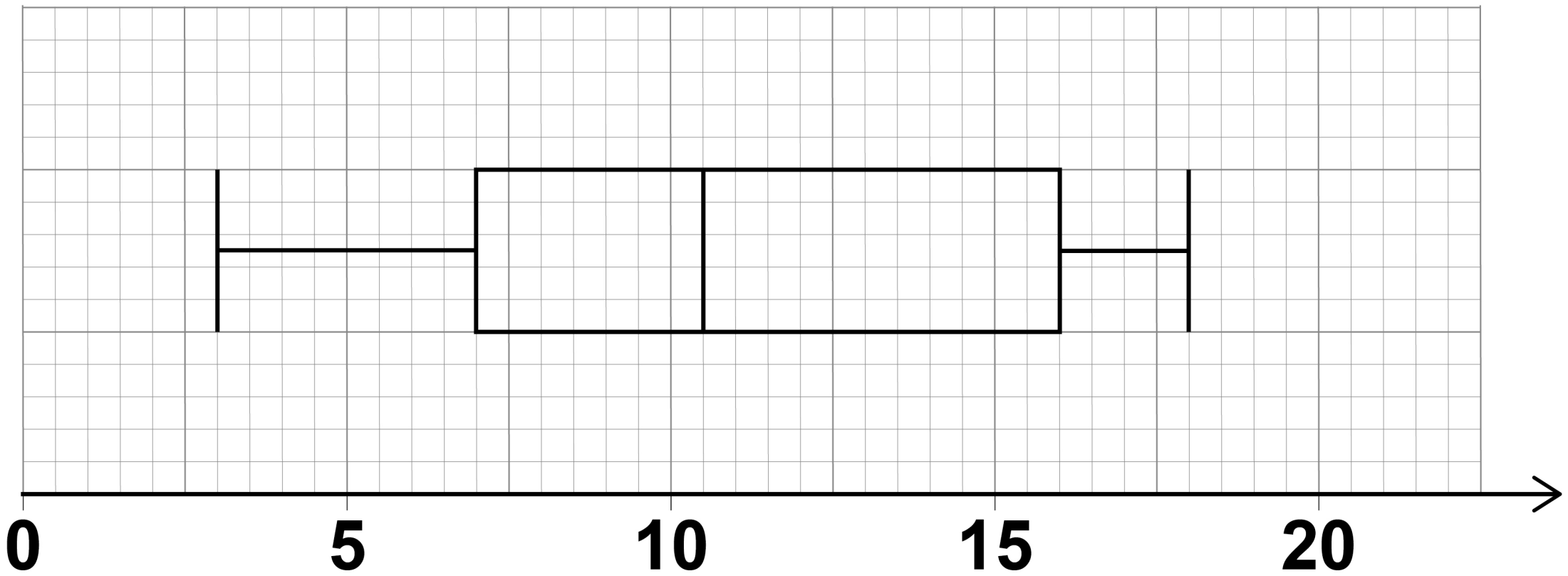
19

Here is some information about the times people took to complete a survey.

Fastest time	**3 minutes**
Slowest time	**18 minutes**
Median	**11 minutes**
Lower quartile	**7 minutes**
Interquartile range	**8 minutes**

Ben draws the box plot on the opposite page to show the information.

Time to complete a survey



[Turn over]

BLANK PAGE

Make TWO criticisms of his box plot. [2 marks]

Criticism 1 _____

_____

_____

_____

_____

Criticism 2 _____

_____

_____

_____

_____

[Turn over]

20

d **is directly proportional to the square of** ***v*****.**

d **= 6 when** ***v*** **= 20**

20 (a)

Work out an equation connecting ***d*** **and** ***v*****. [3 marks]**

Answer

20 (b)

Work out the value of d when $v = 30$

[2 marks]

Answer

7

[Turn over]

21

Hanif makes green paint by mixing blue paint and yellow paint in the ratio

blue : yellow = 7 : 3

He buys blue paint in 50-litre containers, each costing £225

He buys yellow paint in 20-litre containers, each costing £80

He wants to

sell the green paint in 5-litre tins

make 40% profit on each tin.

How much should he sell each tin for?

[5 marks]

Answer £ _____

[Turn over]

22

On the diagram opposite,

ξ = 29 students in a class

C = students who own a cat

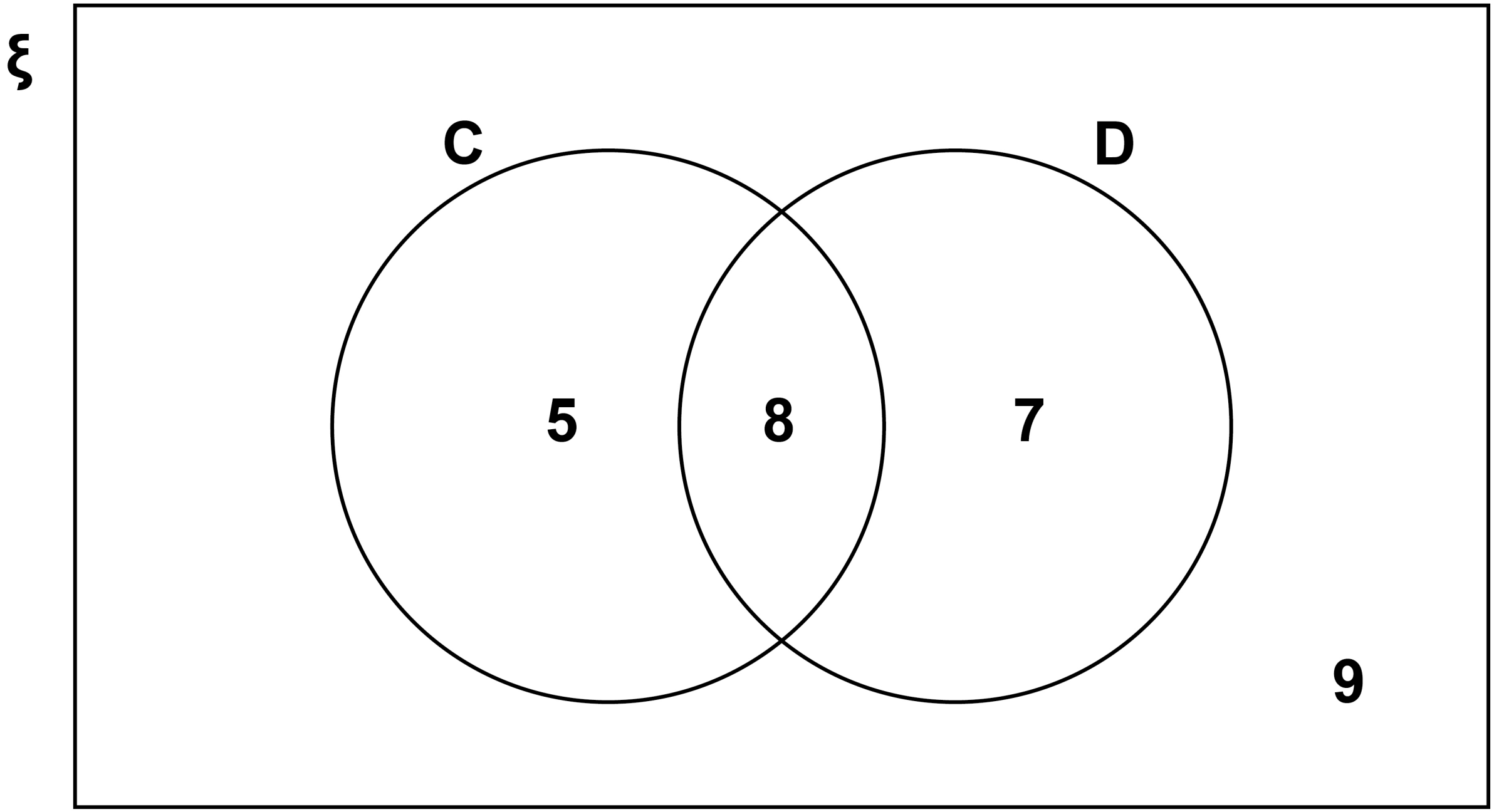
D = students who own a dog

22 (a)

A student is chosen at random.

Circle the probability that the student owns a cat or a dog but not both. [1 mark]

$\frac{12}{29}$ $\frac{13}{29}$ $\frac{15}{29}$ $\frac{20}{29}$



41

[Turn over]

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22 (b)

A student who owns a dog is chosen at random.

Circle the probability that the student also owns a cat.
[1 mark]

$\frac{7}{15}$ $\frac{8}{15}$ $\frac{7}{29}$ $\frac{8}{29}$

4

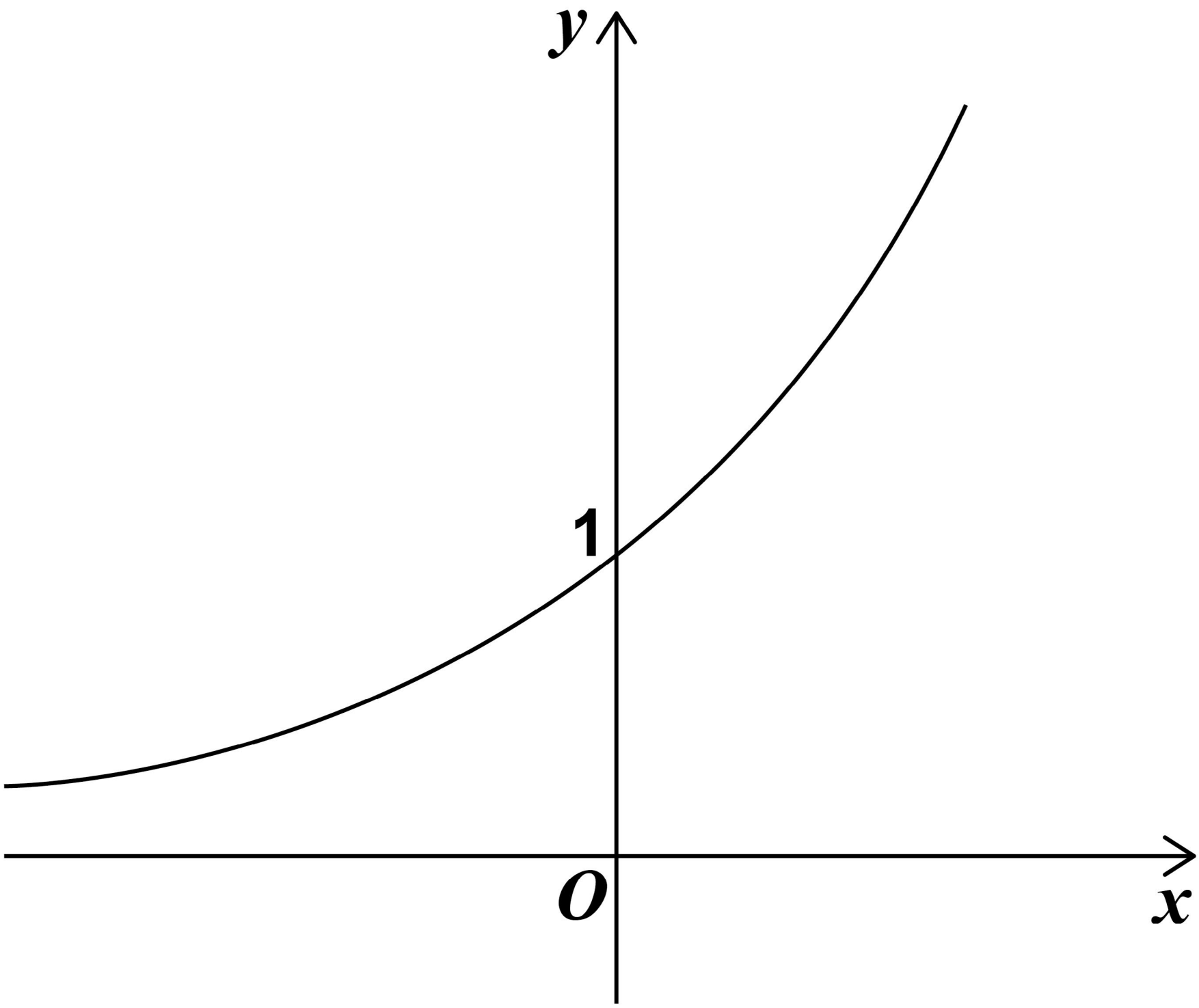
3

$\frac{}{7}$

[Turn over]

23

Here is a sketch of the curve $y = 2^x$



On the axes above, sketch the curve $y = 3^x$

[2 marks]

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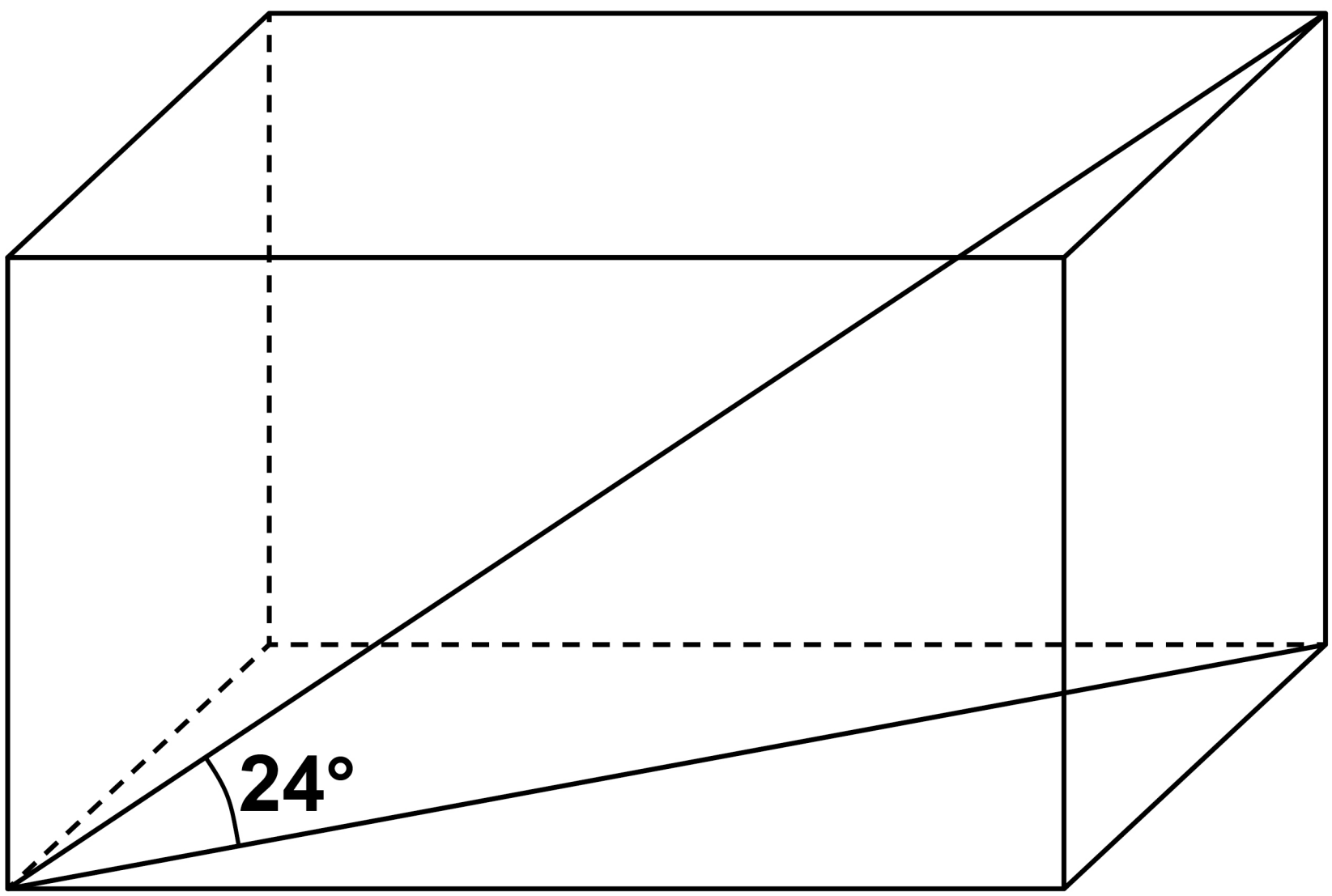
[Turn over]

24

The length of a diagonal of a cuboid is 20 cm

The diagonal makes an angle of 24° with the base.

The area of the base is 150 cm^2



Work out the volume of the cuboid.
[3 marks]

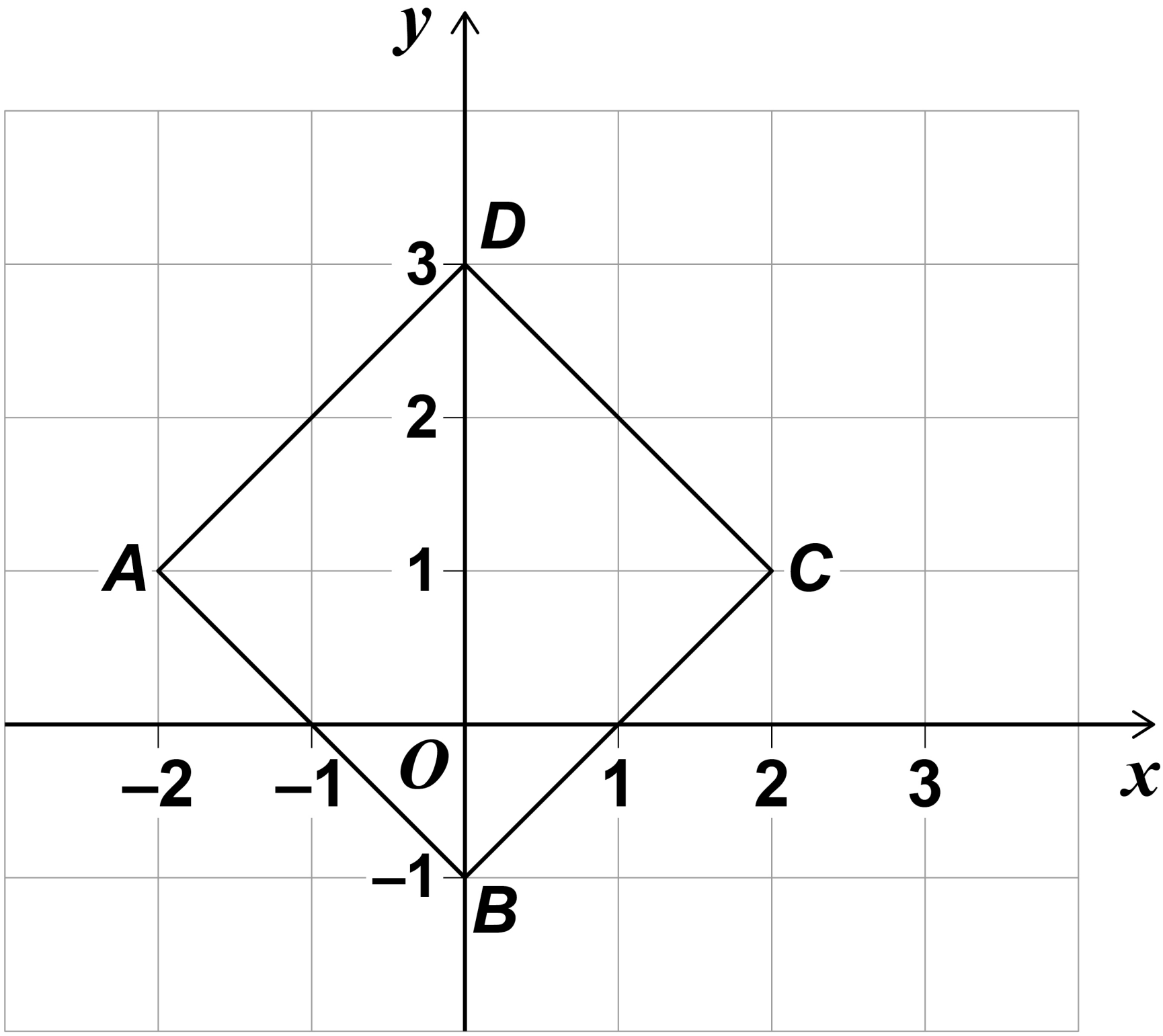
Answer _____ cm^3

5

25

***ABCD* is a square.**

***A* is (–2, 1) *B* is (0, –1) *C* is (2, 1)**
***D* is (0, 3)**



25 (a)

A SINGLE transformation of *ABCD* is such that

B* is mapped to *D

D* is mapped to *B

***A* and *C* are invariant points.**

Describe fully the transformation.
[2 marks]

25 (b)

A different SINGLE transformation of *ABCD* is such that

B* is mapped to *D

D* is mapped to *B

the only invariant point is (0, 1)

Describe fully the transformation.
[3 marks]

26

g(x) = 16 – x h(x) = x^3

Solve gh(x) = 24

[3 marks]

x =

8

27

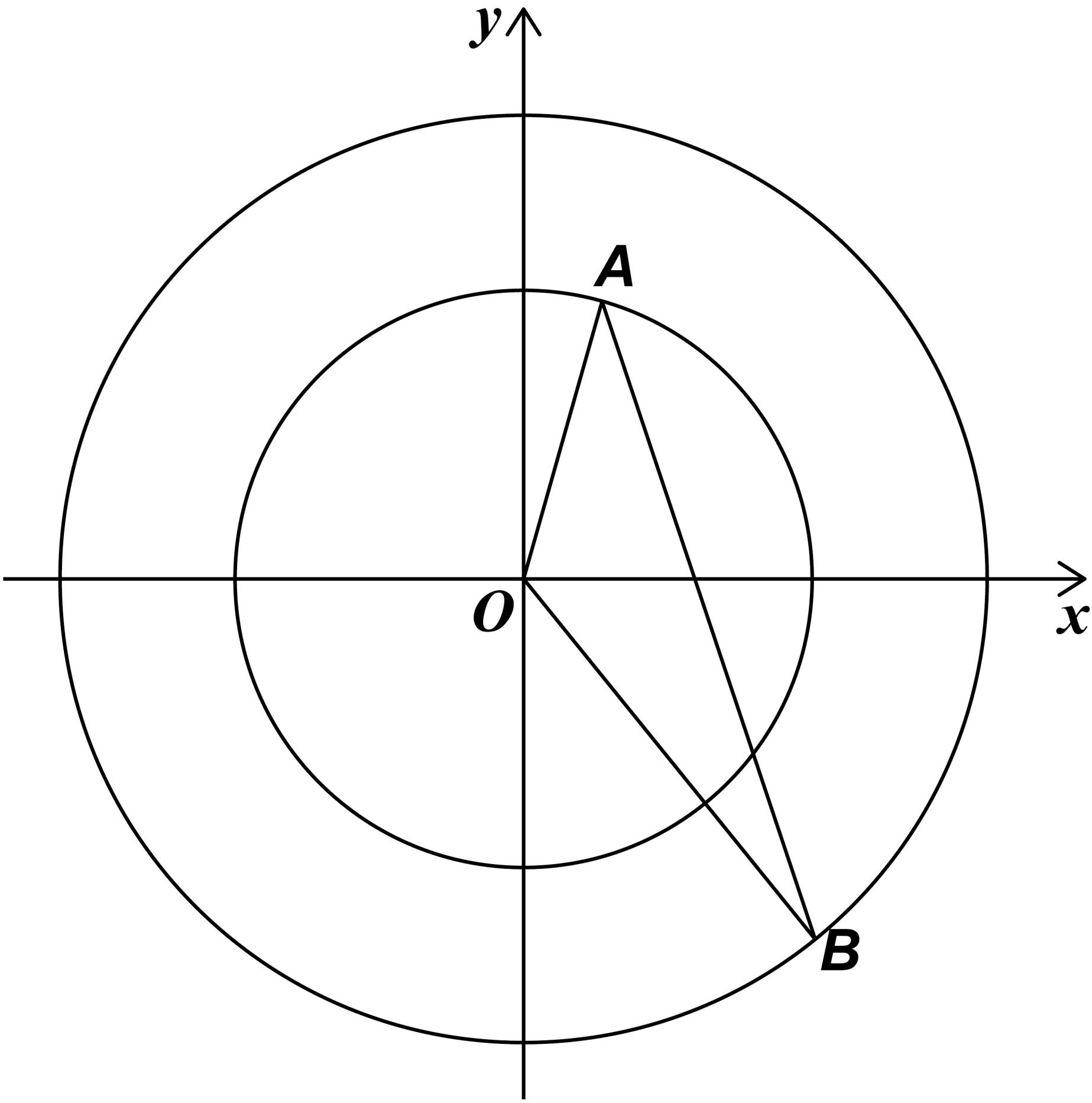
In this question, all lengths are in centimetres.

A **is a point on a circle, centre** O**.**

B **is a point on a different circle, centre** O**.**

$AB = 20$

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



[Turn over]

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The equation of the larger circle is
$x^2 + y^2 = 144$

radius of smaller circle : radius of larger circle = 4 : 5

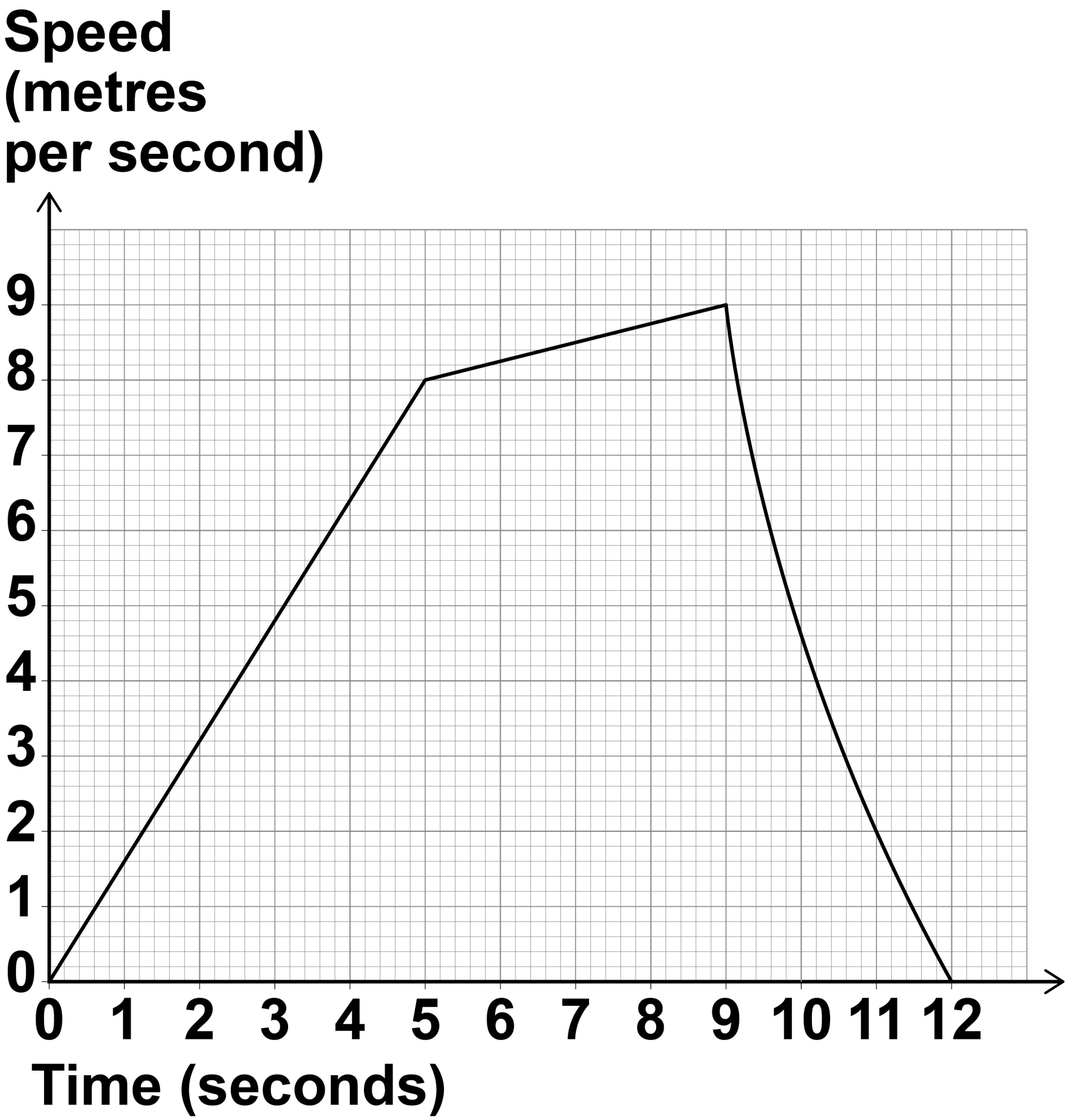
Work out the size of angle AOB. [5 marks]

Answer _____ degrees

28

Leo runs for 12 seconds.

The graph shows his speed.



28 (a)

Show that the distance he runs is less than 67.5 metres. [4 marks]

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28 (b)

Work out his average acceleration for the first 9 seconds.

State the units of your answer. [2 marks]

Answer _____

6

END OF QUESTIONS

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For Examiner's Use	
Pages	Mark
4–6	
7–9	
10–13	
14–16	
18–21	
22–27	
28–31	
32–37	
38–43	
44–47	
48–51	
52–55	
56–59	
TOTAL	