



Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# GCSE MATHEMATICS

# H

Higher Tier

Paper 3 Calculator

Tuesday 11 June 2019

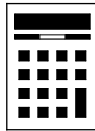
Morning

Time allowed: 1 hour 30 minutes

## Materials

For this paper you must have:

- a calculator
- mathematical instruments.



## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
<b>TOTAL</b>	

## Advice

In all calculations, show clearly how you work out your answer.



JUN1983003H01

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

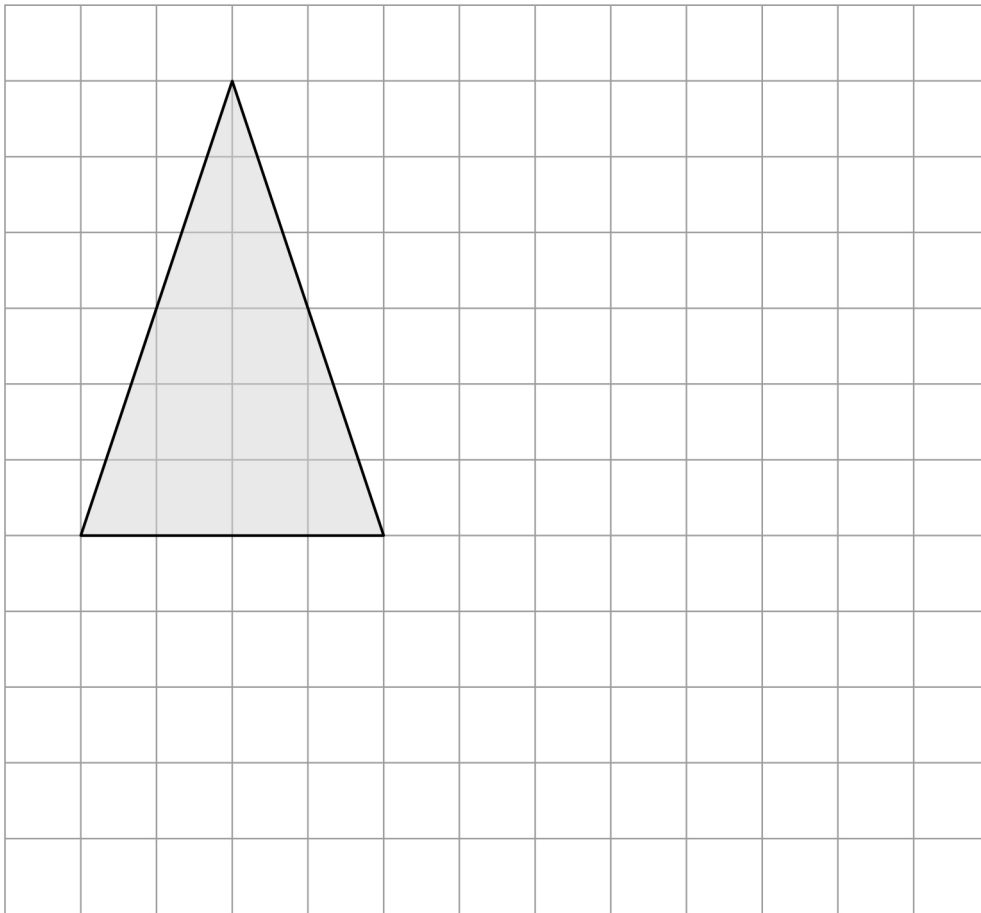
-3

3

5

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

[2 marks]



6

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]

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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 <sup>3</sup>	
Density		

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

Circle your answer.

[1 mark]

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

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

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

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



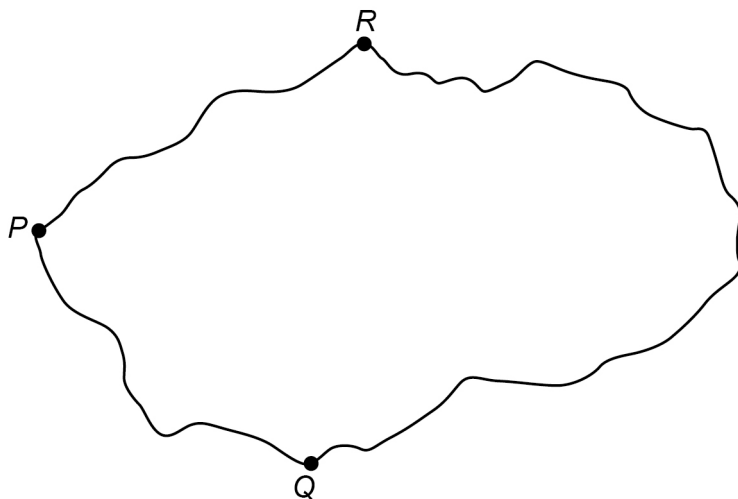
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outside the  
box

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



Not drawn  
accurately

Work out the length of  $PQ$ .

[4 marks]

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Answer \_\_\_\_\_ km



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]

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Turn over for the next question



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]**

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Answer \_\_\_\_\_





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]

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Answer \_\_\_\_\_

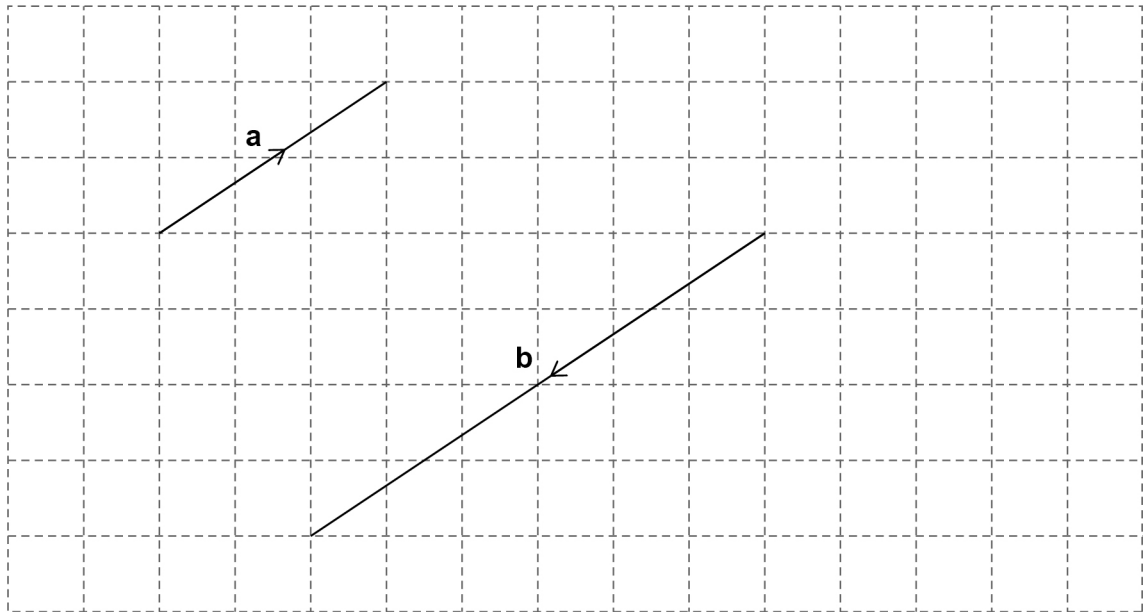
Turn over for the next question

7

Turn over ►



13 (a) Vectors **a** and **b** are drawn on a grid.



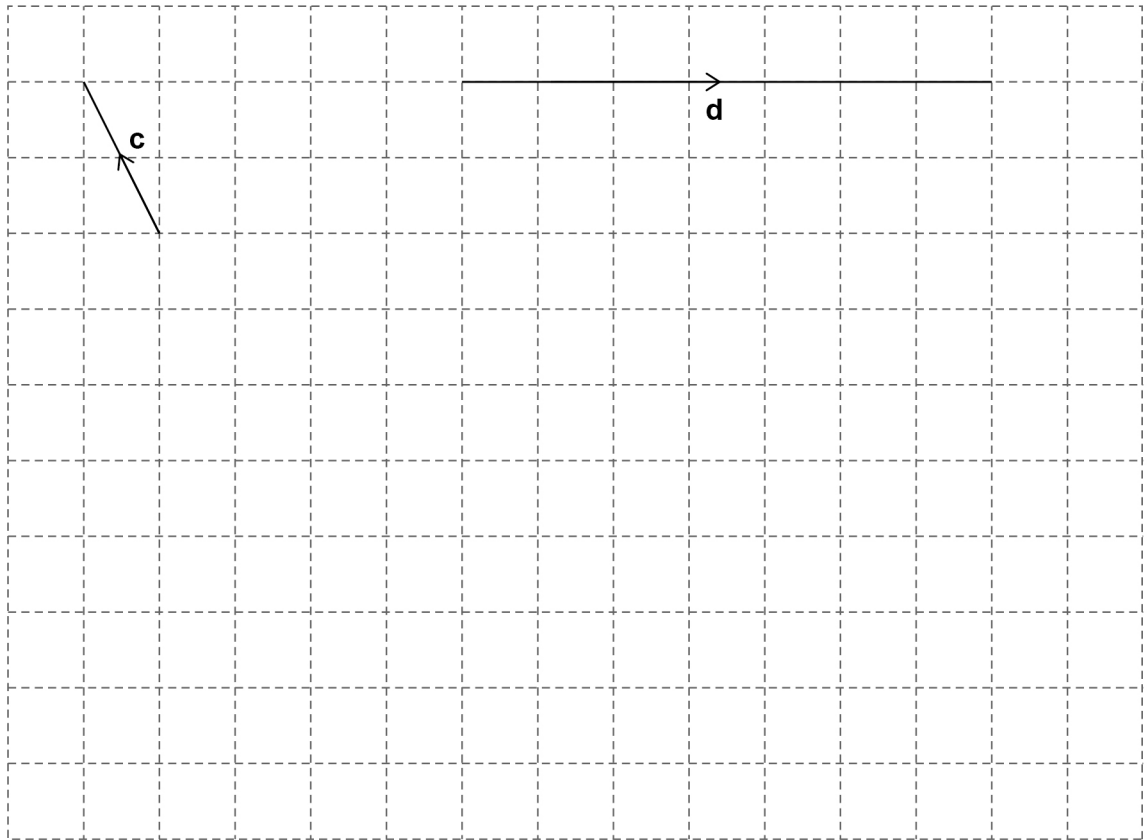
Write **b** in terms of **a**.

[1 mark]

**b** = \_\_\_\_\_



13 (b) Vectors **c** and **d** are drawn on a grid.



On the grid above, draw a vector representing  $\mathbf{c} - \mathbf{d}$

[2 marks]

Turn over for the next question



- 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]

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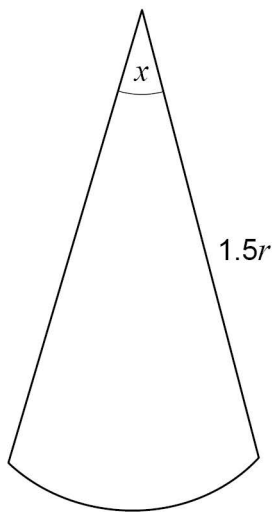
Answer \_\_\_\_\_



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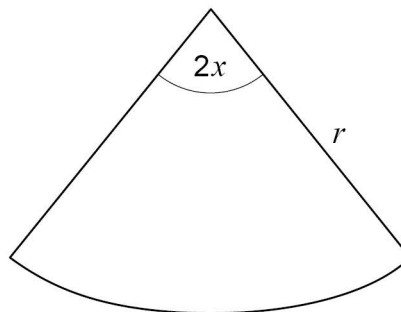
16 Here are two sectors from different circles.

Sector A



Sector B

Not drawn accurately



Which sector has the bigger area?

Tick a box.

Sector A

Sector B

Show working to support your answer.

[2 marks]

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6
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Turn over ►



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]

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Answer \_\_\_\_\_



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

**[1 mark]**

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Answer \_\_\_\_\_

**18 (b)** Solve  $x(3x - 9) = 4$

Give your answers to 2 decimal places.

**[2 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**

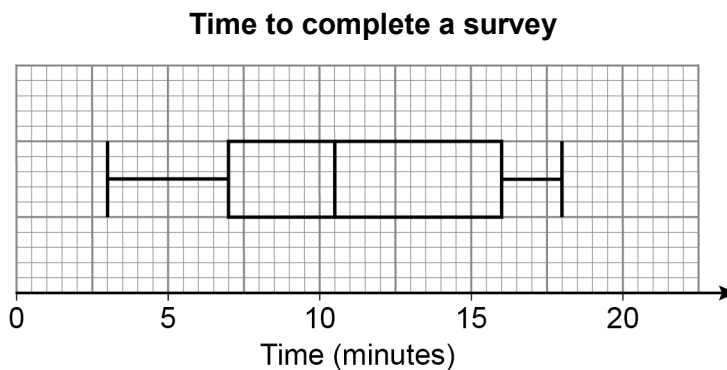
**Turn over ►**



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 this box plot to show the information.



Make **two** criticisms of his box plot.

**[2 marks]**

Criticism 1 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Criticism 2 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_





Do not write  
outside the  
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**20**  $d$  is directly proportional to the square of  $v$ .

$$d = 6 \text{ when } v = 20$$

**20 (a)** Work out an equation connecting  $d$  and  $v$ .

**[3 marks]**

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Answer \_\_\_\_\_

**20 (b)** Work out the value of  $d$  when  $v = 30$

**[2 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**

7

**Turn over ►**



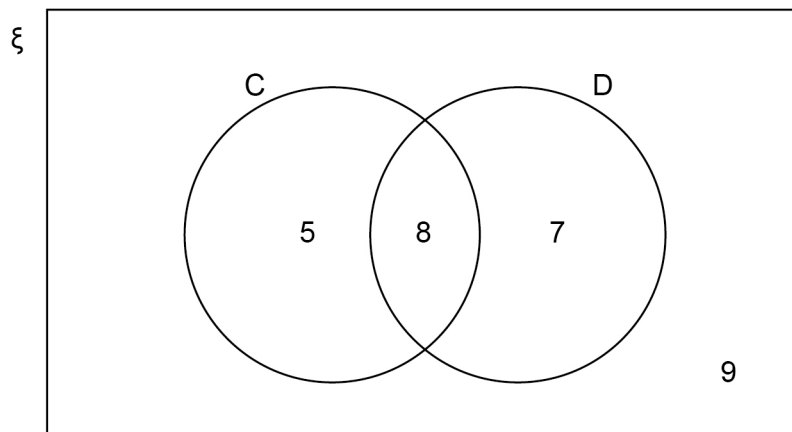


22

 $\xi = 29$  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]

$\frac{12}{29}$

$\frac{13}{29}$

$\frac{15}{29}$

$\frac{20}{29}$

22 (b) A student who owns a dog is chosen at random.

Circle the probability that the student also owns a cat.

[1 mark]

$\frac{7}{15}$

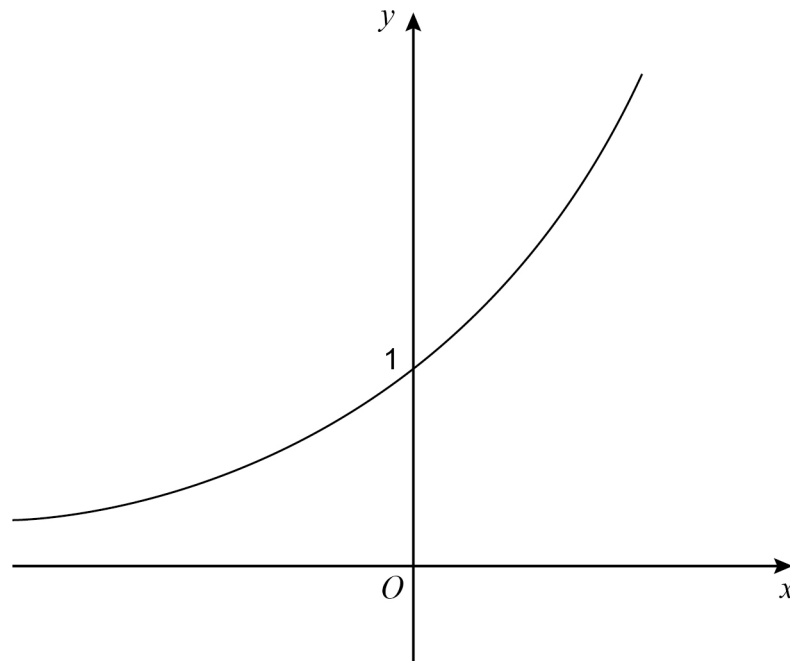
$\frac{8}{15}$

$\frac{7}{29}$

$\frac{8}{29}$

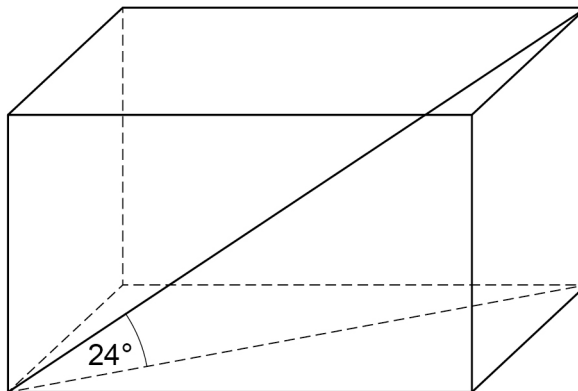


23

Here is a sketch of the curve  $y = 2^x$ On the axes above, sketch the curve  $y = 3^x$ **[2 marks]**

24

The length of a diagonal of a cuboid is 20 cm  
 The diagonal makes an angle of  $24^\circ$  with the base.  
 The area of the base is  $150 \text{ cm}^2$



Work out the volume of the cuboid.

[3 marks]

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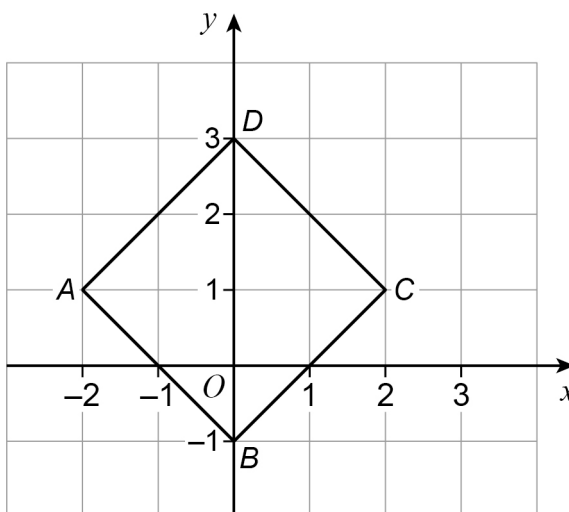
Answer \_\_\_\_\_  $\text{cm}^3$



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]

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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]

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26  $g(x) = 16 - x$      $h(x) = x^3$

Solve  $gh(x) = 24$

[3 marks]

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$x =$  \_\_\_\_\_

Turn over for the next question



27

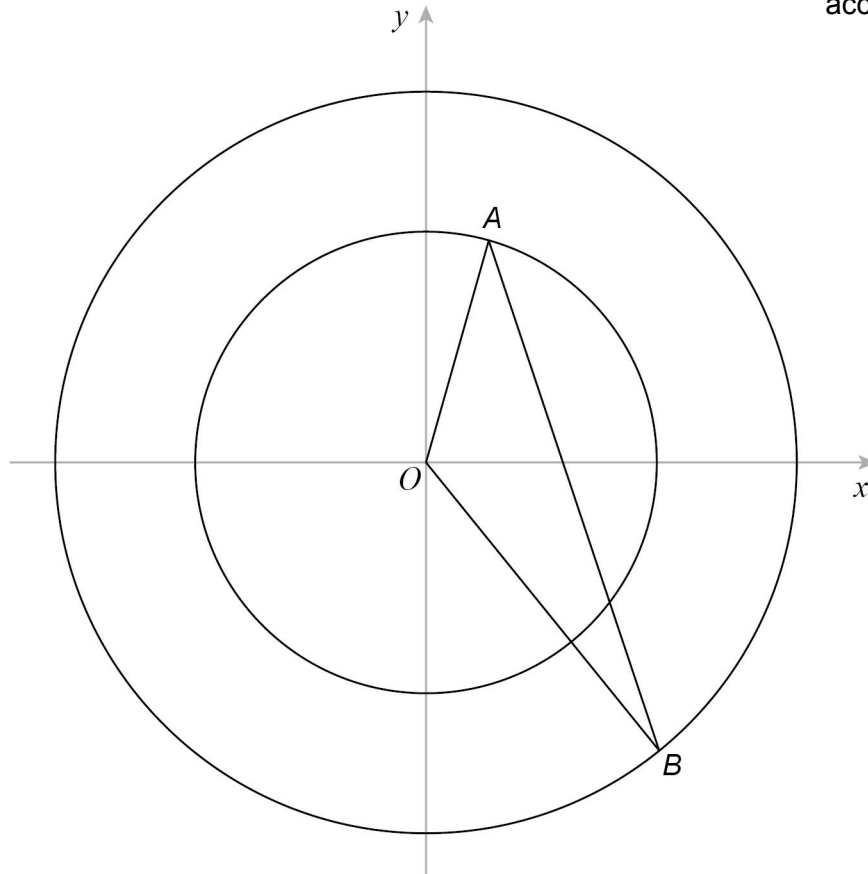
In this question, all lengths are in centimetres.

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

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

$AB = 20$

Not drawn  
accurately



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

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

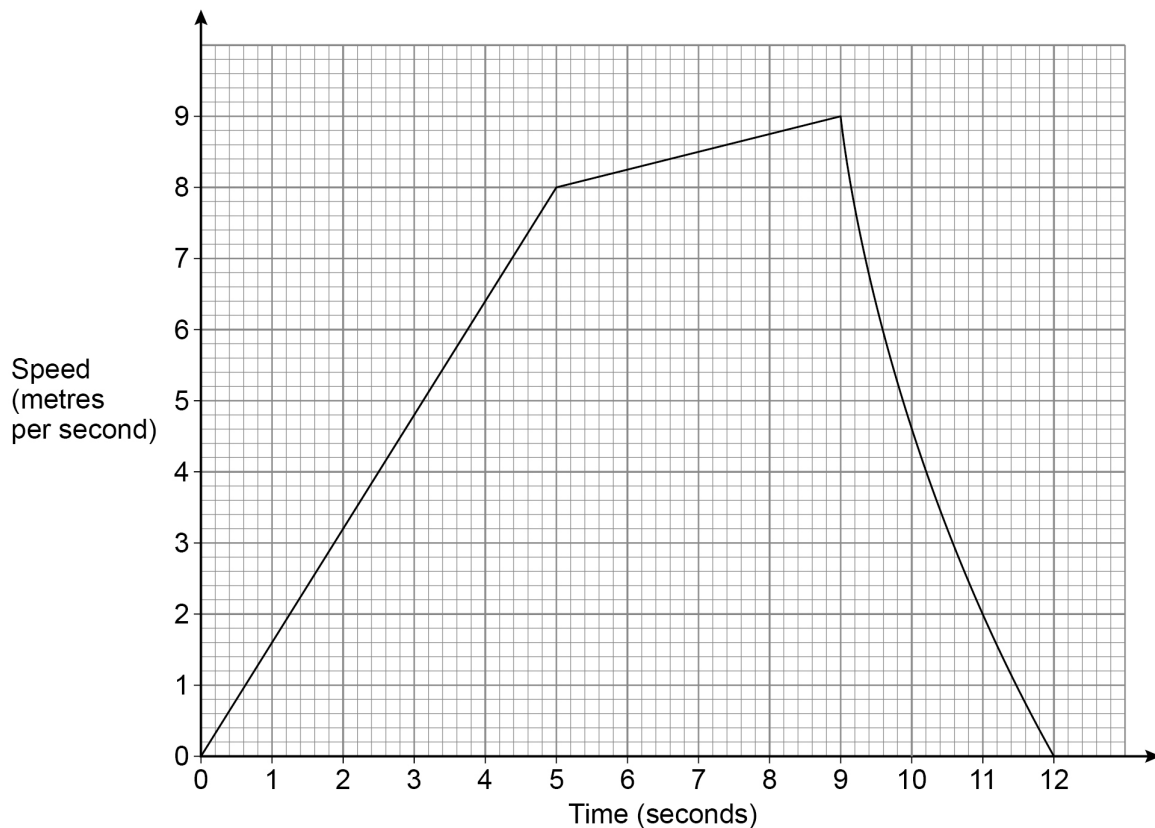






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28 Leo runs for 12 seconds.  
The graph shows his speed.



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]**

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Answer \_\_\_\_\_

**END OF QUESTIONS**

6



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