



Answer **all** questions in the spaces provided.

- 1** Work out the square root of 100 million.  
Circle your answer.

[1 mark]

1000

10 000

100 000

1 000 000

- 2**  $\mathbf{a} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Circle the vector  $\mathbf{a} - \mathbf{b}$

[1 mark]

$\begin{pmatrix} -3 \\ -5 \end{pmatrix}$

$\begin{pmatrix} 7 \\ 1 \end{pmatrix}$

$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$

$\begin{pmatrix} 7 \\ -5 \end{pmatrix}$

- 3** Circle the decimal that is closest in value to  $\frac{2}{3}$

[1 mark]

0.6

0.66

0.667

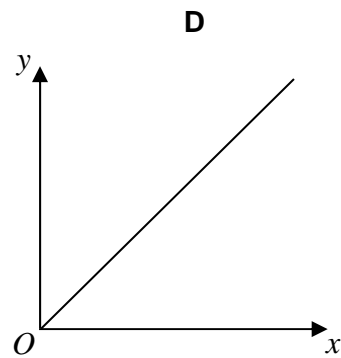
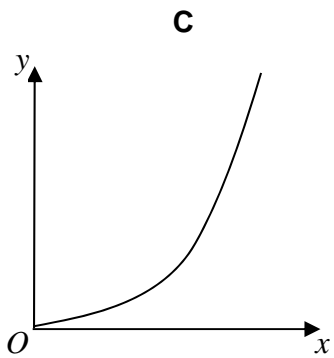
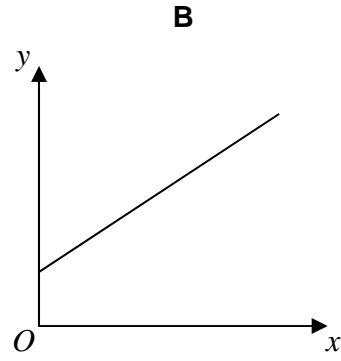
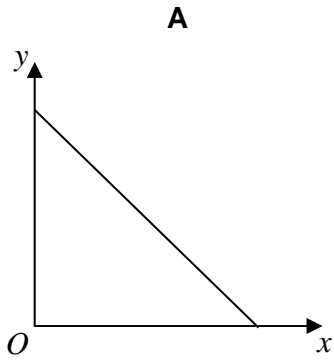
0.67

4  $y$  is directly proportional to  $x$ .

Which graph shows this?

Circle the correct letter.

[1 mark]



Turn over for the next question

- 5 In 1999 the minimum wage for adults was £3.60 per hour.  
In 2013 it was £6.31 per hour.  
Work out the percentage increase in the minimum wage.

[3 marks]

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Answer \_\_\_\_\_ %

- 6 A bag contains counters that are red, blue, green or yellow.

	red	blue	green	yellow
Number of counters	9	$3x$	$x - 5$	$2x$

A counter is chosen at random.

The probability it is **red** is  $\frac{9}{100}$

Work out the probability it is green.

[4 marks]

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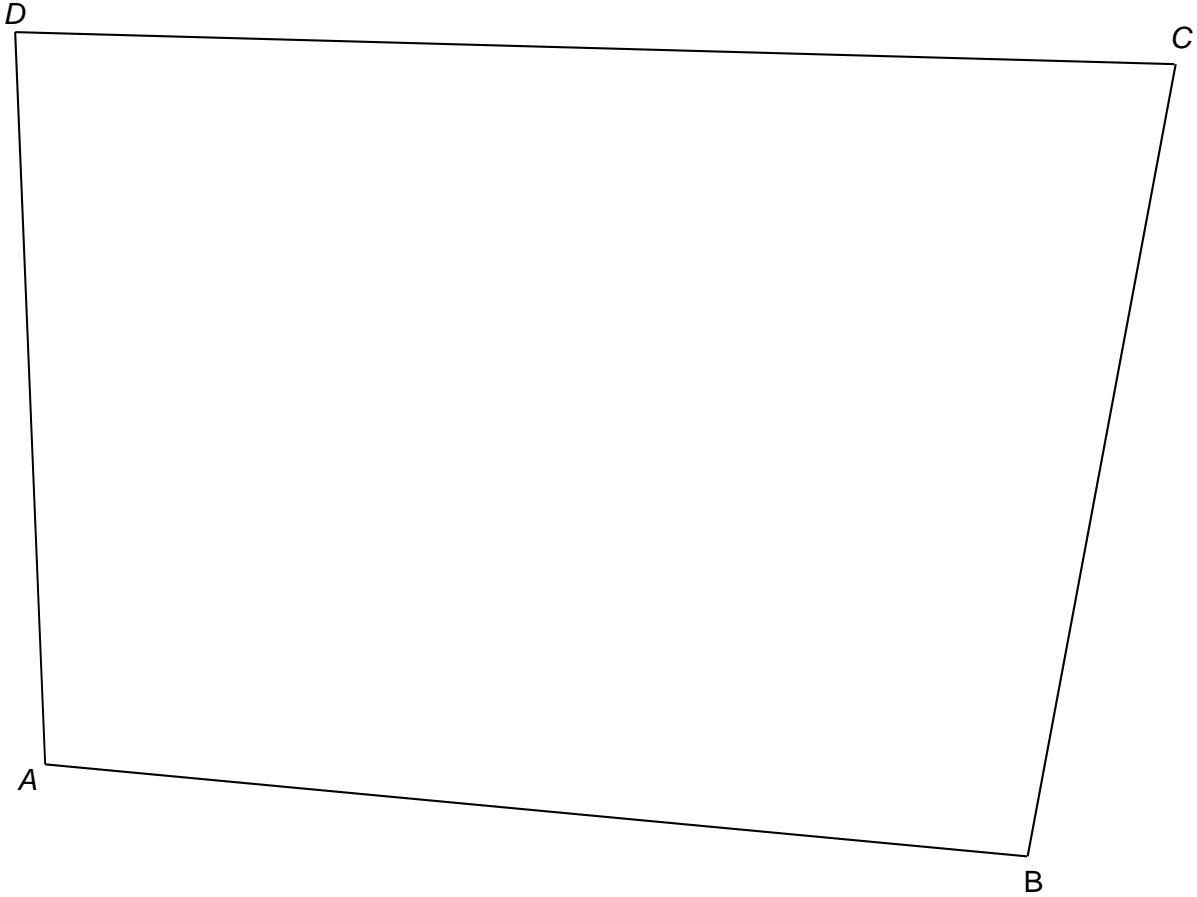
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Answer \_\_\_\_\_

7 Use ruler and compasses to answer this question.

Point  $P$  is

- the same distance from  $AB$  and  $AD$
- 6 cm from  $C$ .



Show the position of  $P$  on the diagram.

[3 marks]

Turn over for the next question

- 8 (a) Use your calculator to work out  $19.42^2 - \sqrt[3]{1006} \div 4.95$

Write down your full calculator display.

[1 mark]

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Answer \_\_\_\_\_

- 8 (b) Use approximations to check that your answer to part (a) is sensible.  
You **must** show your working.

[2 marks]

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- 9 The exterior angle of a regular polygon is  $45^\circ$   
Circle the name of the regular polygon.

[1 mark]

pentagon

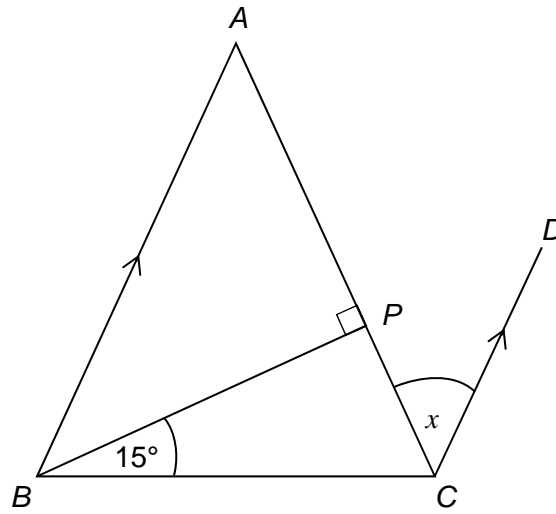
hexagon

octagon

decagon

- 10  $ABC$  is a triangle with  $AB = AC$   
 $BA$  is parallel to  $CD$ .

Not drawn  
accurately



Show that angle  $x = 30^\circ$

[3 marks]

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11 The pressure at sea level is 101 325 Pascals.

Any rise of 1 km above sea level decreases the pressure by 14%

For example,

at 3 km above sea level the pressure is 14% less than at 2 km

Work out the pressure at 4 km above sea level.

Give your answer to 2 significant figures.

**[4 marks]**

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Answer \_\_\_\_\_ Pascals



12 Tick whether each statement is true or false.

Give a reason for your answer.

12 (a) When  $x^2 = 16$  the **only** value that  $x$  can be is 4

[1 mark]

True  False

Reason \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12 (b) When  $n$  is a positive integer, the value of  $2n$  is **always** a factor of the value of  $20n$ .

[1 mark]

True  False

Reason \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12 (c) When  $y$  is positive, the value of  $y^2$  is **always** greater than the value of  $y$ .

[1 mark]

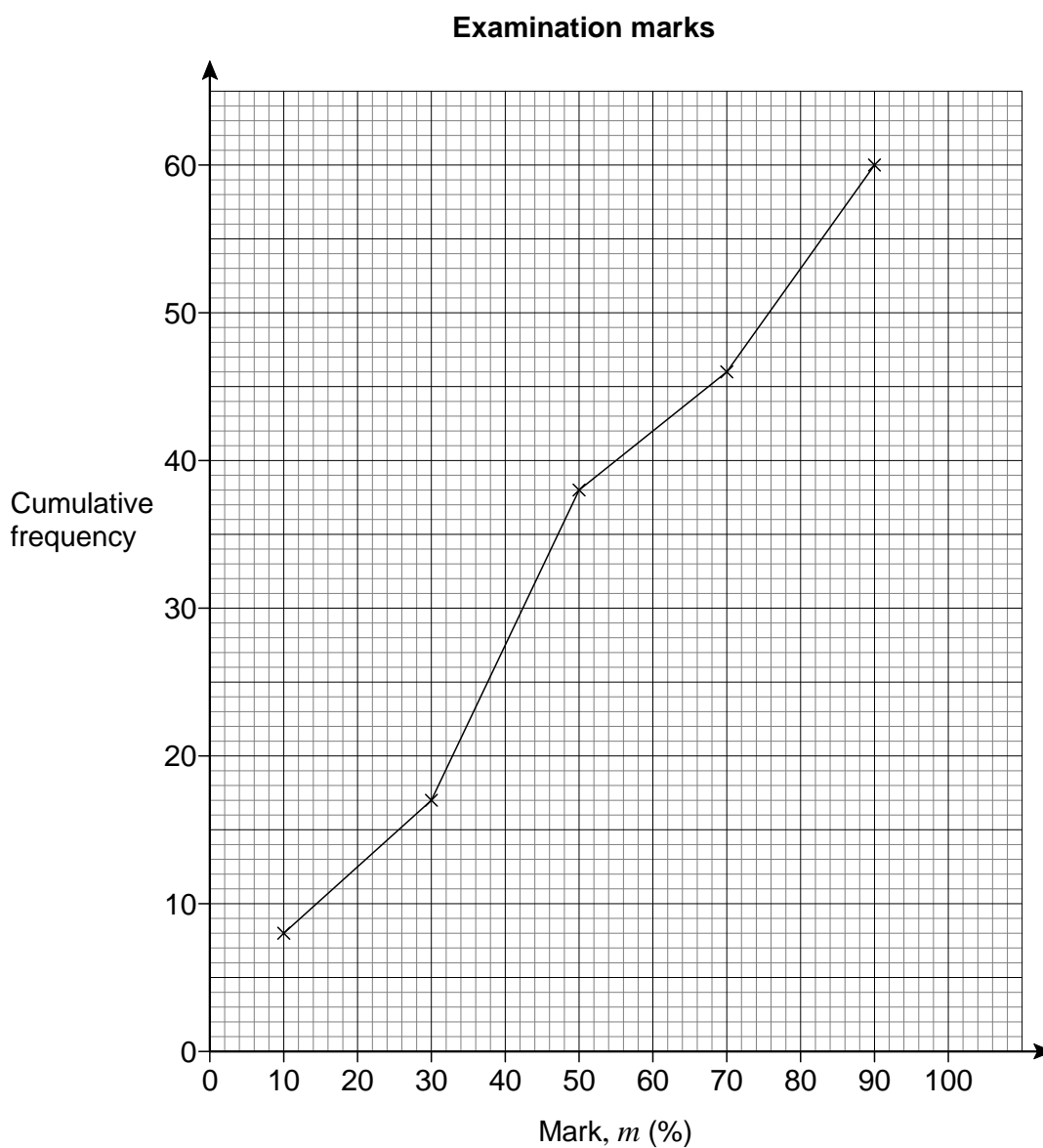
True  False

Reason \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- 13 Here are the examination marks for 60 pupils.

Mark, $m$ (%)	Frequency
$0 \leq m < 20$	8
$20 \leq m < 40$	9
$40 \leq m < 60$	21
$60 \leq m < 80$	10
$80 \leq m < 100$	12

Molly drew this cumulative frequency graph to show the data.



Make **two** criticisms of Molly's graph.

**[2 marks]**

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

**Turn over for the next question**

**14 (a)** The  $n$ th term of a sequence is  $2^n + 2^{n-1}$

Work out the 10th term of the sequence.

[1 mark]

Answer \_\_\_\_\_

**14 (b)** The  $n$ th term of a different sequence is  $4(2^n + 2^{n-1})$

Circle the expression that is equivalent to  $4(2^n + 2^{n-1})$

[1 mark]

$$2^{n+2} + 2^{n+1}$$

$$2^{2n} + 2^{2(n-1)}$$

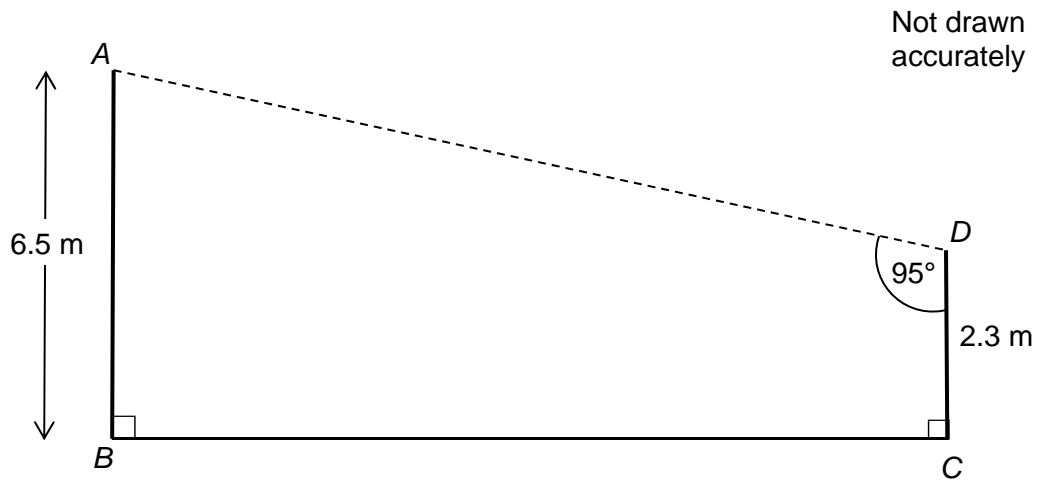
$$8^n + 8^{n-1}$$

$$2^{n+2} + 2^{n-1}$$

15

The diagram shows a design for a zipwire.

The zipwire will run between the top of two vertical posts,  $AB$  and  $CD$ .



Work out the distance  $AD$ .

[4 marks]

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Answer \_\_\_\_\_ m

16 During a game, players can win and lose counters.

At the start of the game

Rob, Tim and Zak share the counters in the ratio 5 : 6 : 7

At the end of the game

Rob, Tim and Zak share the **same number** of counters in the ratio 7 : 9 : 8

Show that Rob ends the game with more counters than he started with.

[3 marks]

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17 Factorise  $3x^2 + 14x + 8$

[2 marks]

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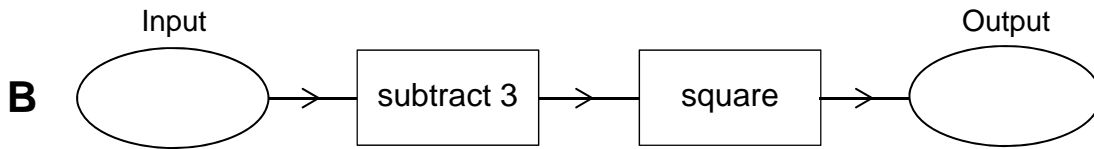
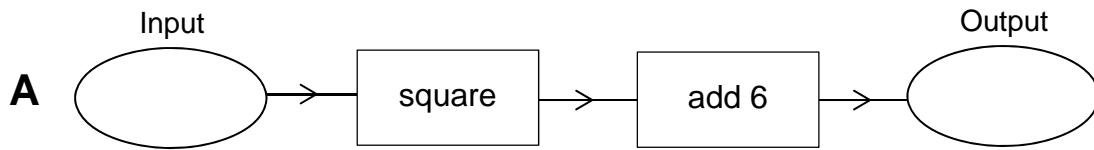
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Answer \_\_\_\_\_



19 Here are two function machines, **A** and **B**.



Both machines have the same input.

Work out the range of input values for which

the output of **A** is **less** than the output of **B**.

**[4 marks]**

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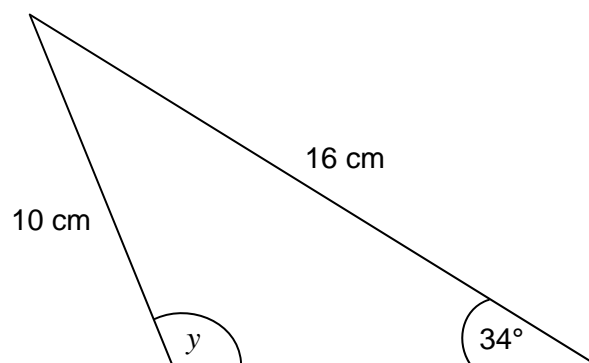
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Answer \_\_\_\_\_



20 In the triangle, angle  $y$  is obtuse.

Not drawn accurately



Work out the size of angle  $y$ .

[3 marks]

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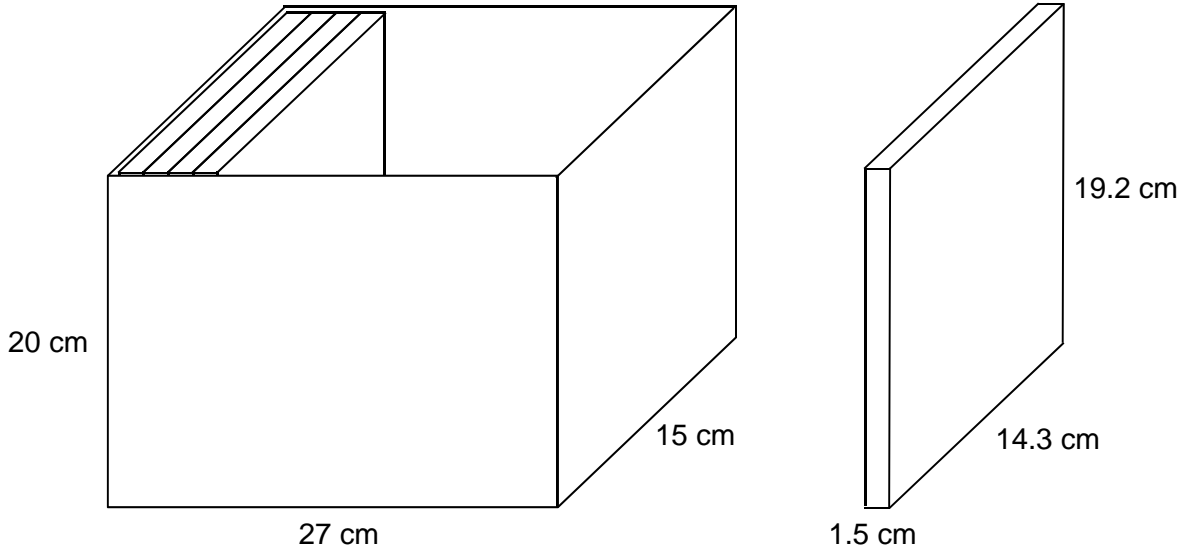
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Answer \_\_\_\_\_ degrees

Turn over for the next question

- 21** A box is a cuboid with dimensions 27 cm by 15 cm by 20 cm  
These dimensions are to the nearest **centimetre**.

DVD cases are cuboids with dimensions 1.5 cm by 14.3 cm by 19.2 cm  
These dimensions are to the nearest **millimetre**.



Show that 17 DVD cases, stacked as shown, will definitely fit in the box.

**[4 marks]**

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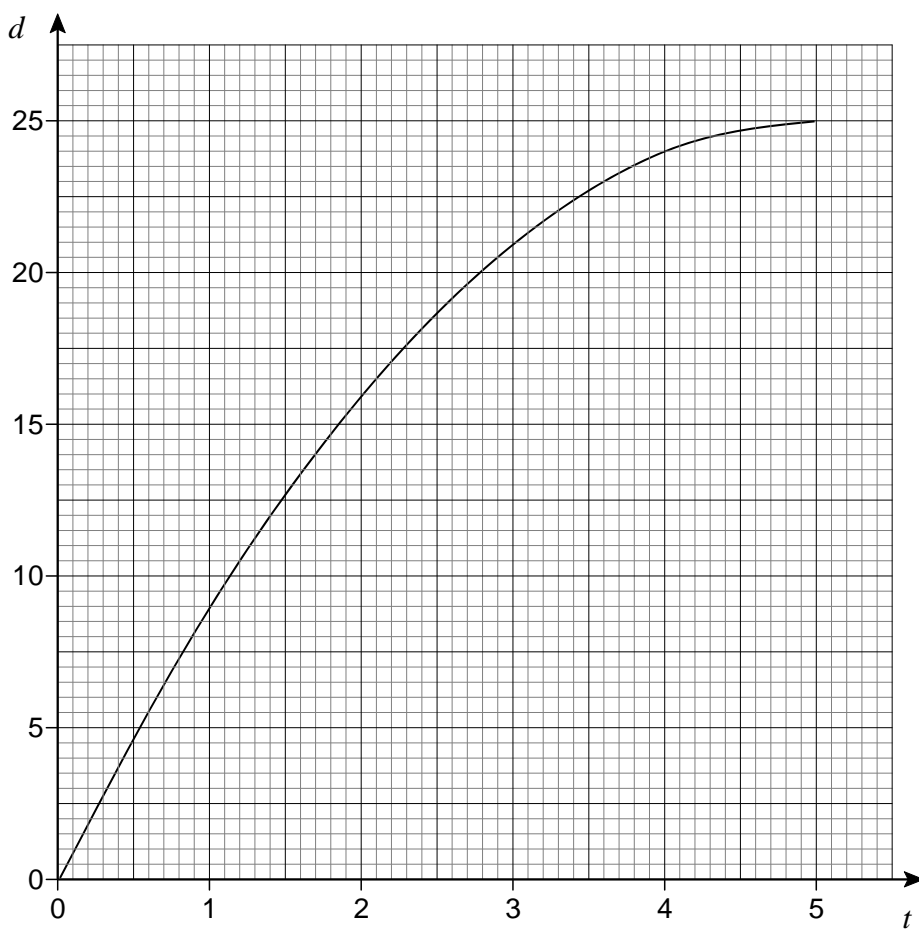
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23

A container is filled with water in 5 seconds.

The graph shows the depth of water,  $d$  cm, at time  $t$  seconds.



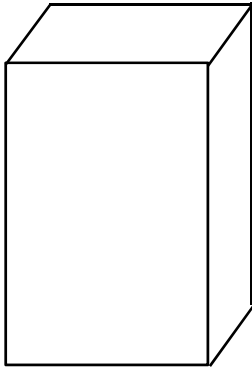
**23 (a)** The water flows into the container at a constant rate.

Which diagram represents the container?

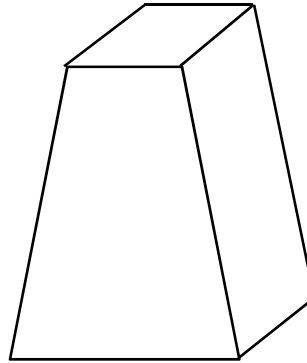
Circle the correct letter.

[1 mark]

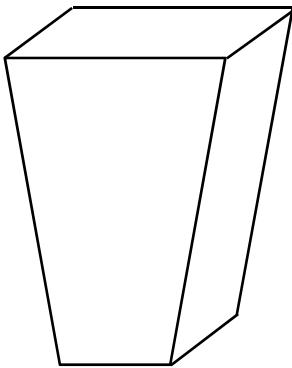
**A**



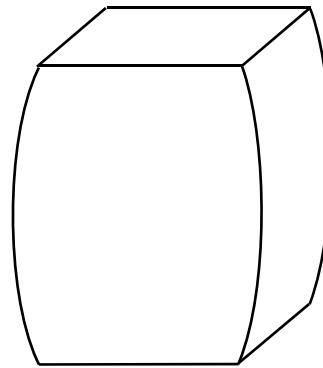
**B**



**C**



**D**



**23 (b)** Use the graph to estimate the rate at which the depth of water is increasing at 3 seconds.

You **must** show your working.

[2 marks]

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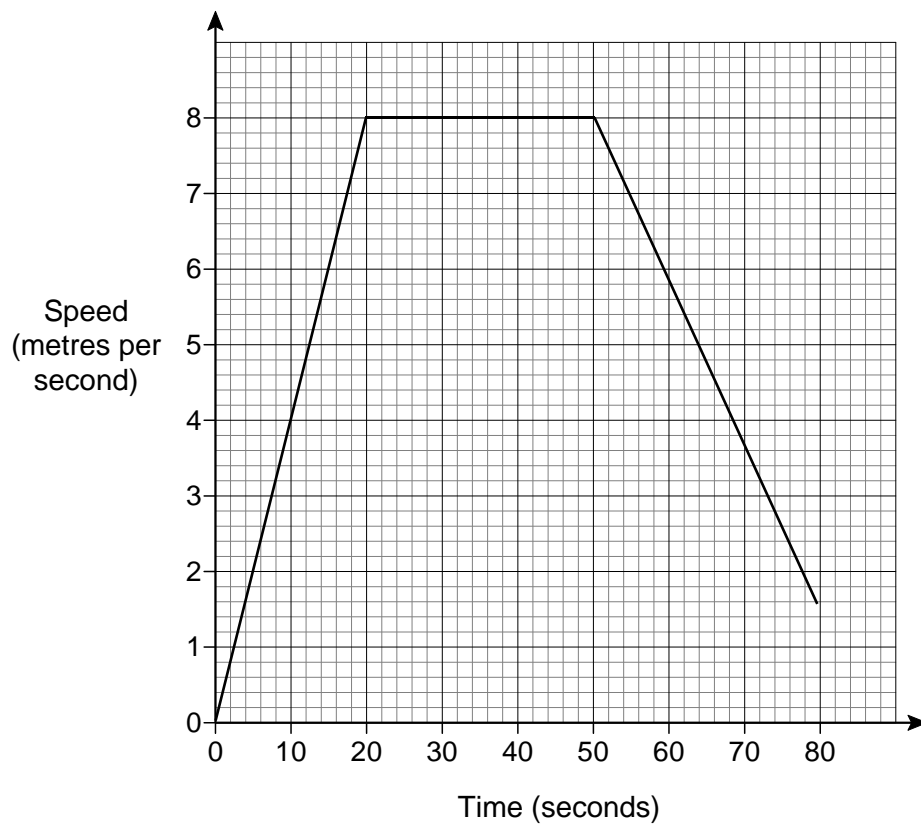


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Answer \_\_\_\_\_ cm/s

**24** Amina and Ben had a cycle race.

Here is Amina's speed-time graph from the start of the race.



- 24** The distance of the race was 400 metres.  
Ben cycled the 400 metres in 64 seconds.  
Who won the race?  
You **must** show your working.

**[4 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**

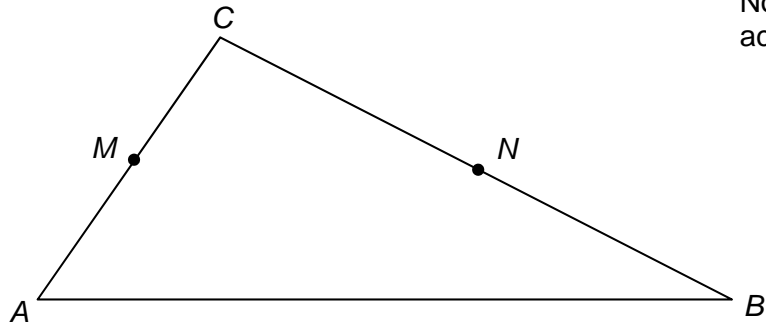
25 In triangle  $ABC$

$M$  is the midpoint of  $AC$

$N$  is the point on  $BC$  where  $BN : NC = 2 : 3$

$$\vec{AC} = 2\mathbf{a}$$

$$\vec{AB} = 3\mathbf{b}$$



Not drawn  
accurately

25 (a) Work out  $\vec{MN}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .  
Give your answer in its simplest form.

[3 marks]

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Answer \_\_\_\_\_

25 (b) Use your answer to part (a) to explain why  $MN$  is **not** parallel to  $AB$ .

[1 mark]

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**26** An approximate solution to an equation is found using this iterative process.

$$x_{n+1} = \frac{(x_n)^3 - 3}{8} \quad \text{and} \quad x_1 = -1$$

**26 (a)** Work out the values of  $x_2$  and  $x_3$

**[2 marks]**

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$$x_2 = \underline{\hspace{10em}}$$

$$x_3 = \underline{\hspace{10em}}$$

**26 (b)** Work out the solution to 6 decimal places.

**[1 mark]**

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$$x = \underline{\hspace{10em}}$$

27 The curve with equation  $y = x^2 - 5x + 2$  is reflected in the  $x$ -axis.

Circle the equation of the reflected curve.

[1 mark]

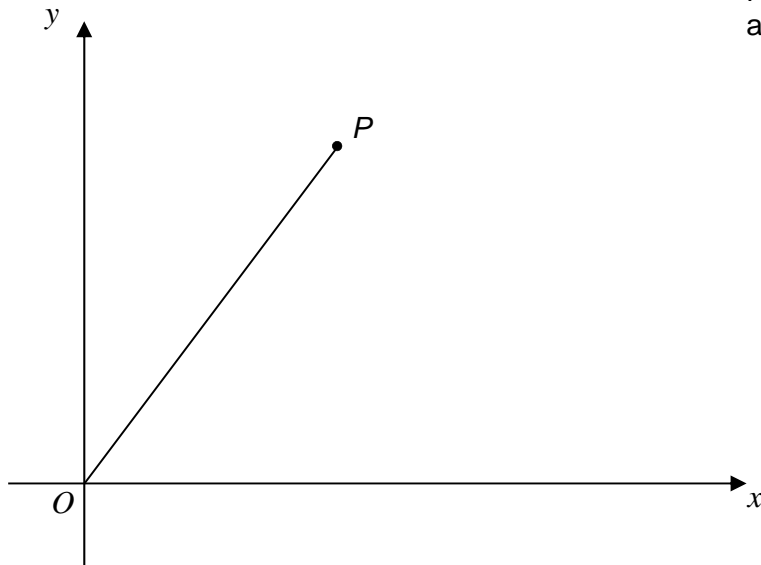
$$y = x^2 - 5x - 2$$

$$y = -x^2 + 5x + 2$$

$$y = -x^2 + 5x - 2$$

$$y = x^2 + 5x + 2$$

- 28 The diagram shows a line joining  $O$  to  $P$ .



Not drawn  
accurately

The gradient of the line is 2

The length of the line is  $\sqrt{2645}$

Work out the coordinates of  $P$ .

**[4 marks]**

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Answer ( \_\_\_\_\_ , \_\_\_\_\_ )

**END OF QUESTIONS**

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