AQA

GCSE
MATHEMATICS

H

Higher Tier   Paper 3 Calculator

Date of Exam   Morning   Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a calculator
- mathematical instruments.
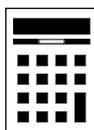
Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- 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.

Advice

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

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

1   Rearrange $A = \dfrac{B}{C}$ to make C the subject.

Circle your answer.

[1 mark]

$$AC = B \qquad C = \frac{A}{B} \qquad C = \frac{B}{A} \qquad C = B - A$$

2   Circle the smallest number from the list below.

[1 mark]

$$5 \times 10^{-1} \qquad 10^{-3} \qquad 4 \times 10^{-3} \qquad 10^{-1}$$

3   Circle the identity.

[1 mark]

$$(x - 3)^2 \qquad\qquad (x - 3)^2 > 5$$

$$(x - 3)^2 = 1 - 6x \qquad\qquad (x - 3)^2 \equiv x^2 - 6x + 9$$

4 One of these is a sketch of $y = x^3 + 2$

Which one?

Circle the correct letter.

[1 mark]

A
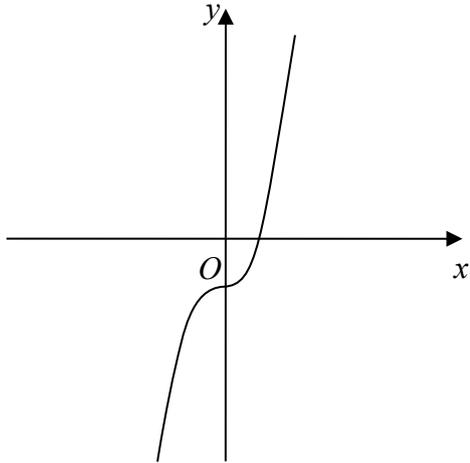
B
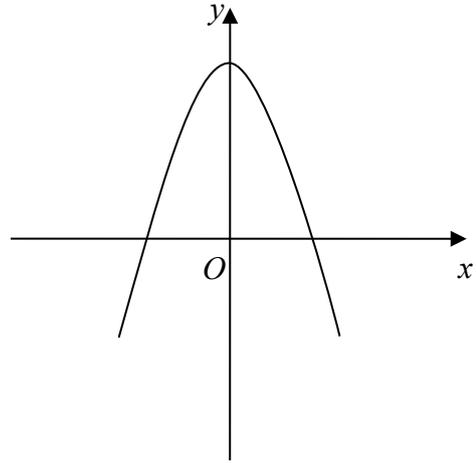
C
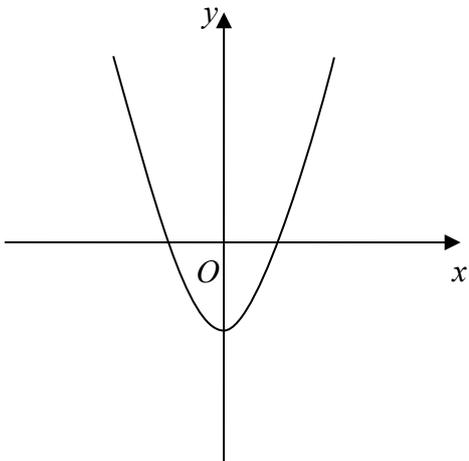
D
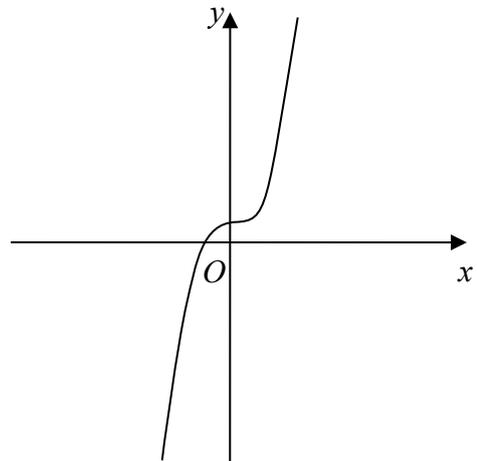
Turn over for the next question

Turn over ►

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5 A spinner lands on red, blue or green.

The relative frequencies after 400 spins are shown.

Colour	red	blue	green
Relative frequency	0.35	0.5	0.15

How many more times did it land on red than green?

[2 marks]

Answer

6   Use ruler and compasses for this question.

A ship is

      closer to port *X* than port *Y*

      less than 11 km from *Y*.

The map below shows the positions of *X* and *Y*.

On the map, show the region where the ship could be.

Label it *R*.

[4 marks]

Scale   1 cm represents 2 km

Land

X

Y

Land

Land
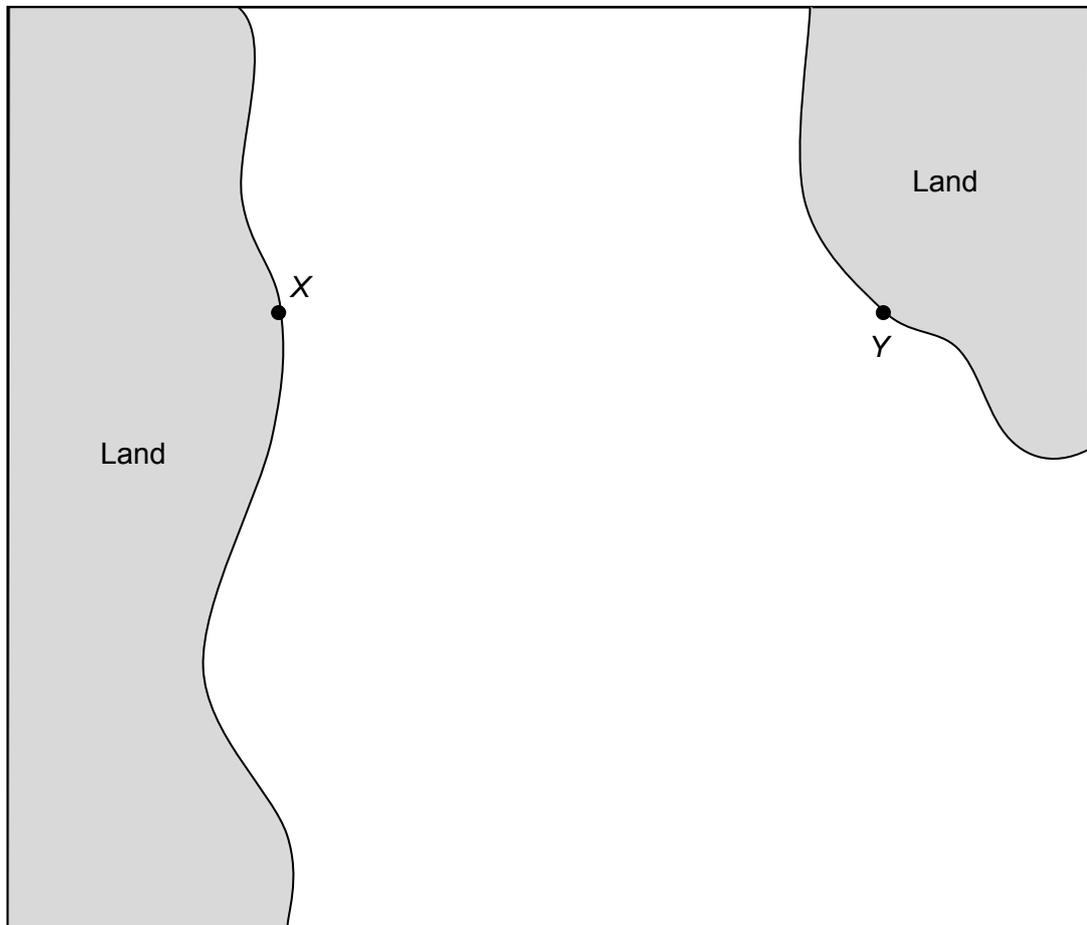
7   A solid shape is made with a cube and a cylinder.

         The cube has edge length 3 cm

         The cylinder has diameter 1 cm and height 3 cm

7 (a)   The cylinder sits symmetrically on the centre of the top of the cube as shown.

1 cm

3 cm

3 cm

3 cm
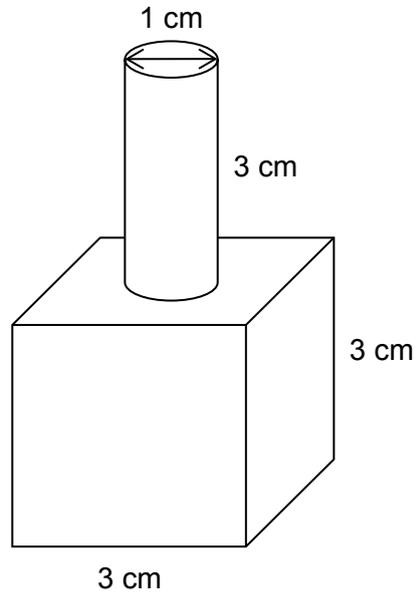
Draw the front elevation on the centimetre grid below.

[1 mark]
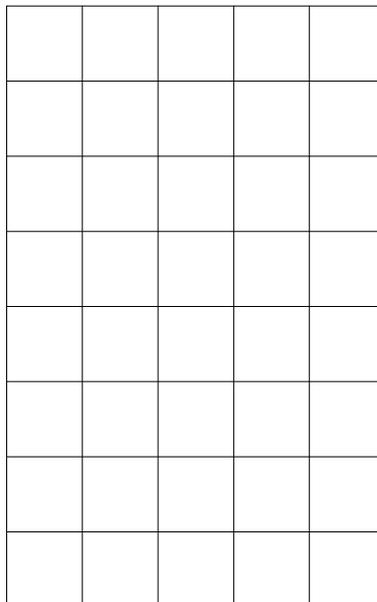
7 (b)   The cylinder now sits symmetrically on the centre of the top of the cube as shown.
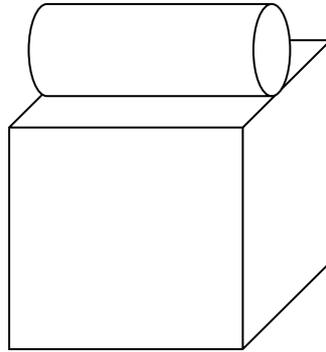
Draw the front elevation and the side elevation on the centimetre grids below.

[2 marks]
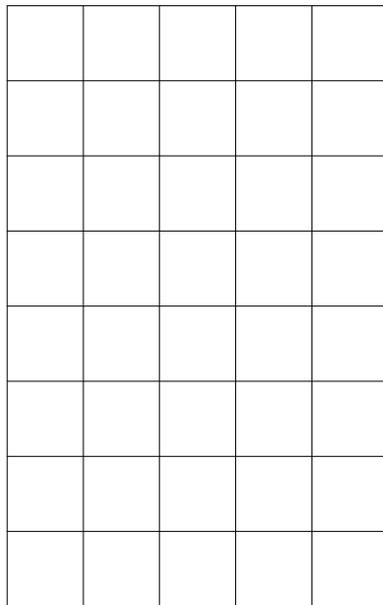
Front   **Side**
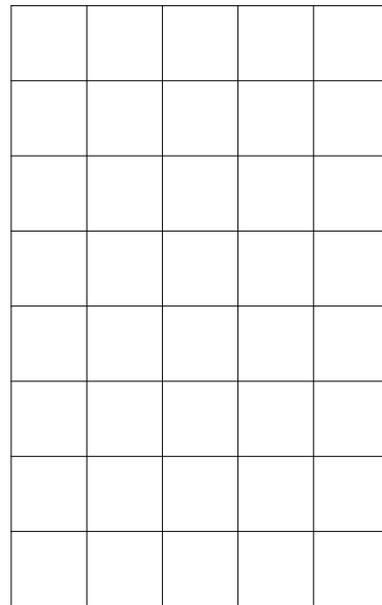
Turn over for the next question

8 The distance-time graph shows the journey of a toy train.

Distance (metres) vs Time (seconds)
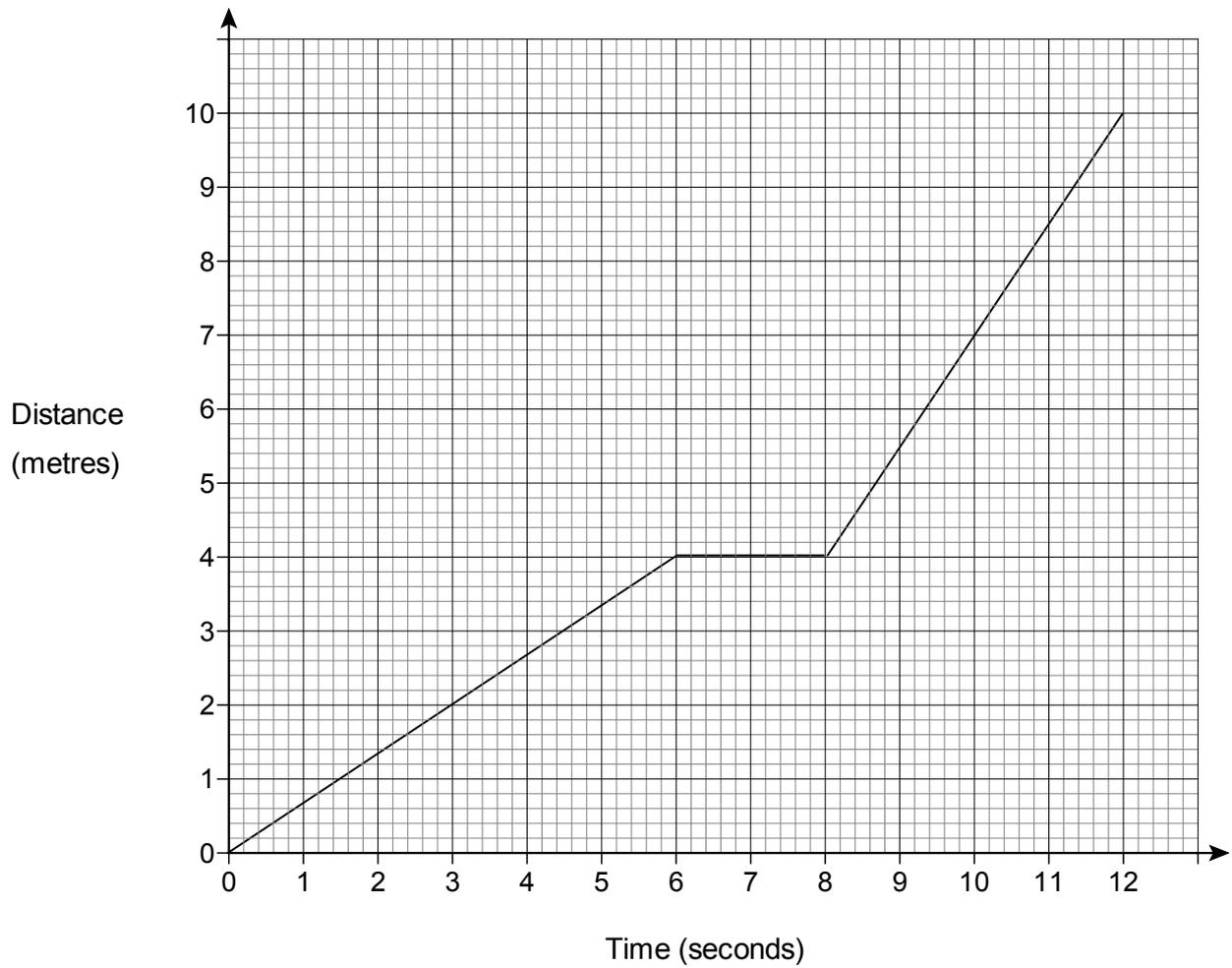
8 (a) Here are some descriptions of the first **two** parts of the journey.

Circle the letter of the correct description.

[1 mark]

A Accelerates then stationary

B Moves at constant speed then stationary

C Accelerates then moves at constant speed

D Stationary then moves at constant speed

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8 (b)   Work out the average speed for the last four seconds of the journey.

[2 marks]

Answer _____ m/s

Turn over for the next question

9 Here is a frequency table for the times taken to solve a puzzle.

Times, t (min)	Frequency
$0 < t \leqslant 1$	38
$1 < t \leqslant 2$	16
$2 < t \leqslant 3$	17
$3 < t \leqslant 4$	15
$4 < t \leqslant 5$	14
	Total = 100

Circle the class interval that contains the median.

[1 mark]

$0 < t \leqslant 1$ $\qquad$ $1 < t \leqslant 2$ $\qquad$ $2 < t \leqslant 3$ $\qquad$ $3 < t \leqslant 4$

10 Here is

a rectangle

and

a T-shape made from two rectangles.

Not drawn accurately

7 cm

$(x + 1)$ cm

$(2x + 5)$ cm

2 cm

3 cm

$(x - 1)$ cm

Show that the rectangle and the T-shape have the same area.

[4 marks]

11 The area of shape A is 36 cm^2

Shape B is similar to shape A with sides 4 times bigger.

Circle the calculation to work out the area of shape B.

[1 mark]

$$36 + 4 \qquad 36 \div 4 \qquad 36 \times 4 \qquad 36 \times 4^2$$

12 I am thinking of two numbers.

If I multiply the first number by 4 and add the second number the answer is 32

If I multiply the first number by 2 and add the second number the answer is 23

Work out the two numbers.

[4 marks]

First number _____

Second number _____

13 Here is a formula.

$$s = 5t^2$$

s is the distance in metres a ball falls when dropped

t is the time taken in seconds

13 (a) A ball is dropped from 2 metres above the floor.

Work out the time taken for the ball to hit the floor.

[3 marks]

Answer _____ seconds

13 (b) Which of these statements is true for the ball?

Tick a box.

☐ It falls 2 metres in **exactly** double the time it falls the first metre.

☐ It falls 2 metres in **less than** double the time it falls the first metre.

☐ It falls 2 metres in **more than** double the time it falls the first metre.

You **must** show working to support your answer.

[3 marks]

Turn over ►

14 These two shapes are similar.

Not drawn
accurately

8 cm

6 cm

12 cm

x cm
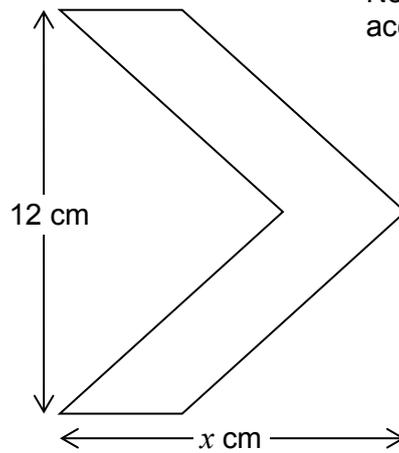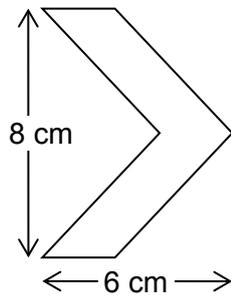
Work out the value of x.

[3 marks]

Answer _____

15 $y = \dfrac{10}{x^2}$

What happens to the value of y as the value of x doubles?

Circle your answer.

[1 mark]

$\times 2$ $\qquad$ $\div 2$ $\qquad$ $\times 4$ $\qquad$ $\div 4$

16 A tank is filled with water at a constant rate.

The tank is a cuboid of height 80 cm
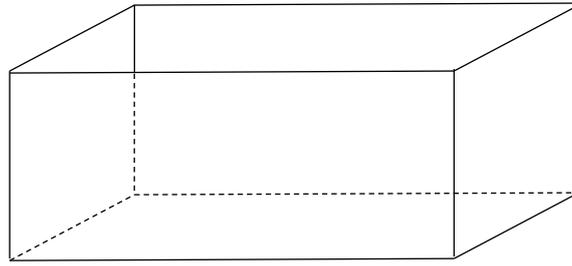
The tank is full after 15 minutes.

Sita draws this graph to show the depth of water during the 15 minutes.
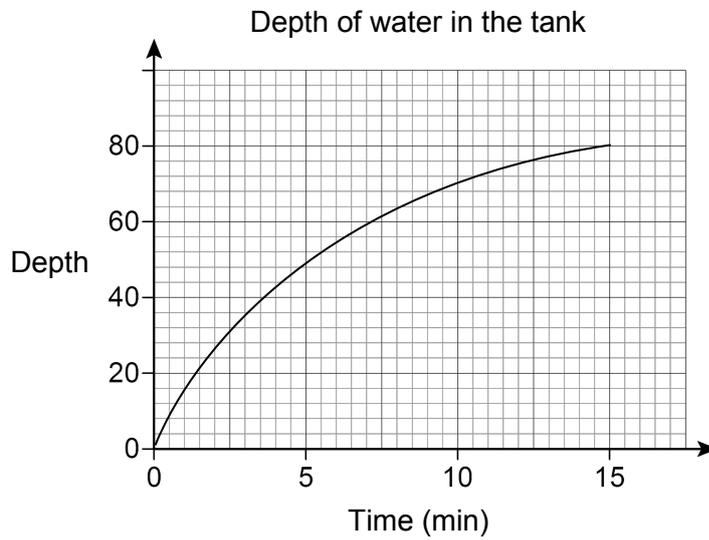
Make **two** criticisms of Sita's graph.

[2 marks]

Criticism 1 _____

_____

_____

Criticism 2 _____

_____

_____

Turn over ►

17 Some girls and boys take an examination.

17 (a) Here is some information about the marks for the girls.

Lowest is 16

Highest is 78

Lower quartile is 24

Upper quartile is 66

Median is 48

Draw a box plot for this information.

[2 marks]
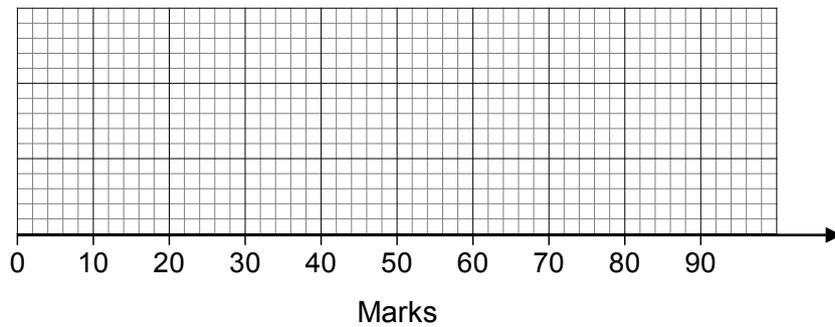
Marks

17 (b) Here is some information about the marks for the boys.

Median is 45

Interquartile range is 39

Whose marks were more consistent?

Tick a box.

girls ☐   boys ☐

You **must** show your working.

[2 marks]

18 a, b and c are positive integers.

$a : b = 5 : 6$ and $b : c = 8 : 11$

Work out the **smallest** possible value of $a + b + c$

[2 marks]

Answer _____

19 Tom picks a three-digit **even** number

The first digit is greater than 6

The second digit is less than 7

How many different numbers could he pick?

[3 marks]

Answer _____

20 Here is a diagram of a pack of cereal.

Lovely Flakes

360 grams

12 servings

79 grams of carbohydrates per 100 grams of flakes
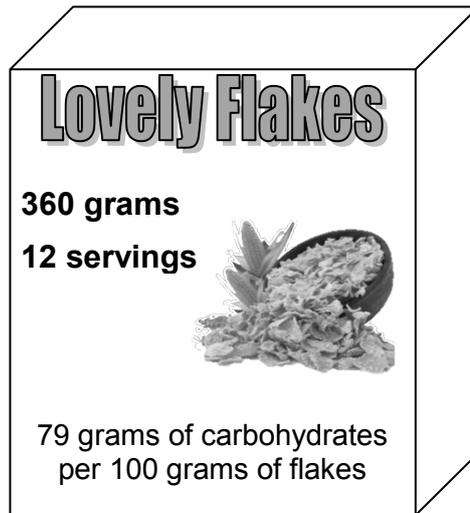
Eve has a daily allowance of 260 grams of carbohydrates.

She says,

"One serving gives **more than** 9% of my daily allowance."

Is she correct?

You **must** show your working

[4 marks]

Answer _____

21 Prove that $5n - (2n + 3)(n + 1)$ is always negative.

[3 marks]

Turn over for the next question

22 (a) Write $x^2 + 6x + 10$ in the form $(x + a)^2 + b$

[2 marks]

Answer _____

22 (b) Hence, write down the coordinates of the turning point of the curve $y = x^2 + 6x + 10$

[1 mark]

Answer (_____ , _____)

23 Use the iteration $x_{n+1} = 4 - \dfrac{2}{x_n^2}$

to work out an approximate solution to $x = 4 - \dfrac{2}{x^2}$

Start with $x_1 = 1$

Give your answer to 2 decimal places.

[3 marks]

Answer _____

Turn over for the next question

24 The diagram shows a vertical tower *CD* of height, h, metres.

ABC is horizontal.

AB = 40 metres.

Not drawn accurately

D

h

26°

32°

A

40 m

B

C

Work out the height, h, of the tower.

[5 marks]

Answer _____ metres

25   An **empty** container has a capacity of 80 000 litres to 1 significant figure.

Mel pours in 7400 litres of water to 2 significant figures.

She says,

"I have filled more than 10% of the container."

Is she correct?

You **must** show your working.

[4 marks]

Answer _____

Turn over for the next question

26   A bag contains 12 discs.

       7 are red

       3 are blue

       2 are yellow.

Two discs are taken from the bag at random, without replacement.

Work out the probability that the two discs are the same colour.

[4 marks]

Answer _____

27 Sam runs for 10 minutes.

The graph shows his pulse, in beats per minute.
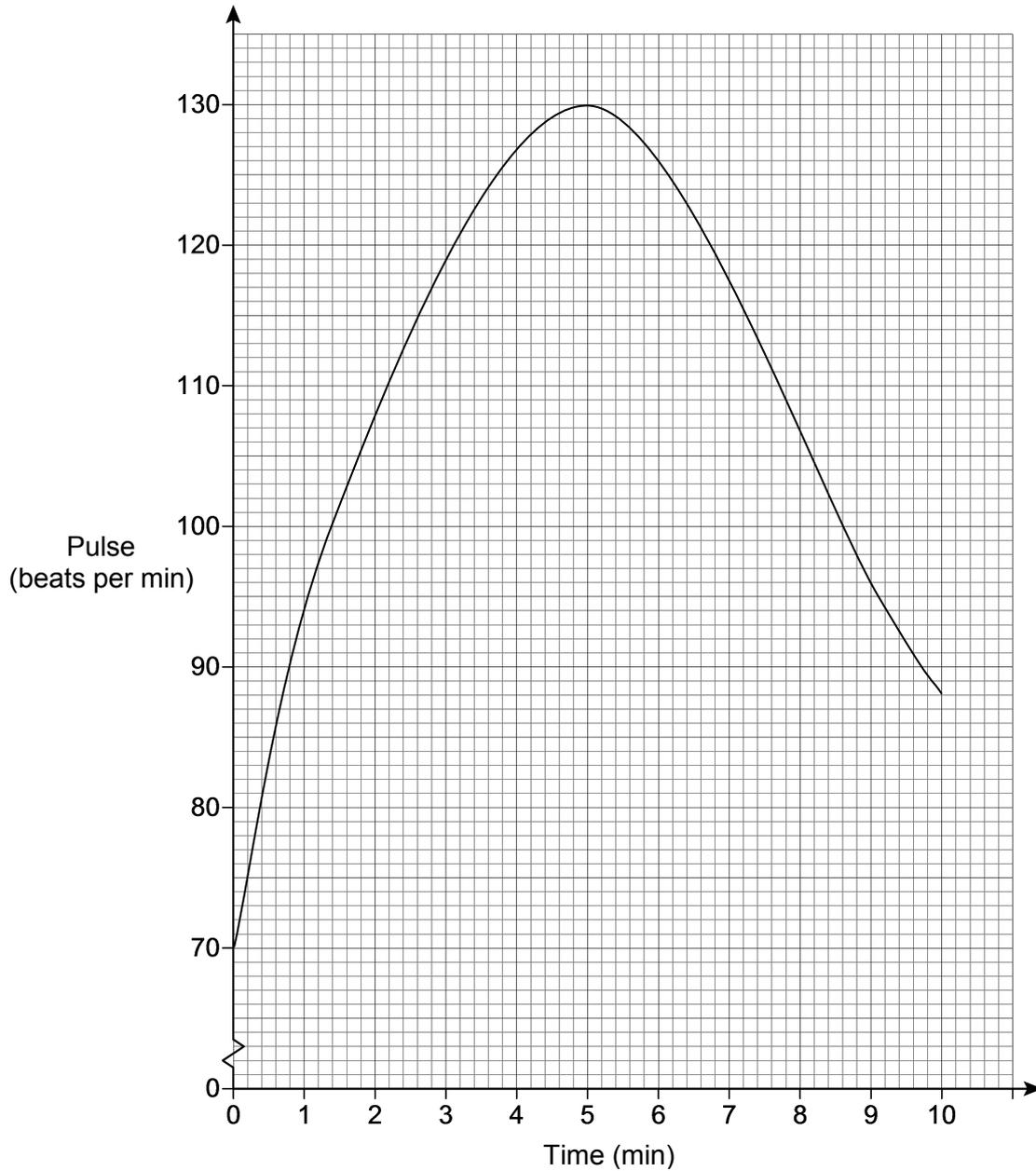
By drawing a tangent, work out the rate at which his pulse is increasing after 3 minutes.

Give the units of your answer.

[4 marks]

Answer _____

28 (a) Here is triangle *ABC*.
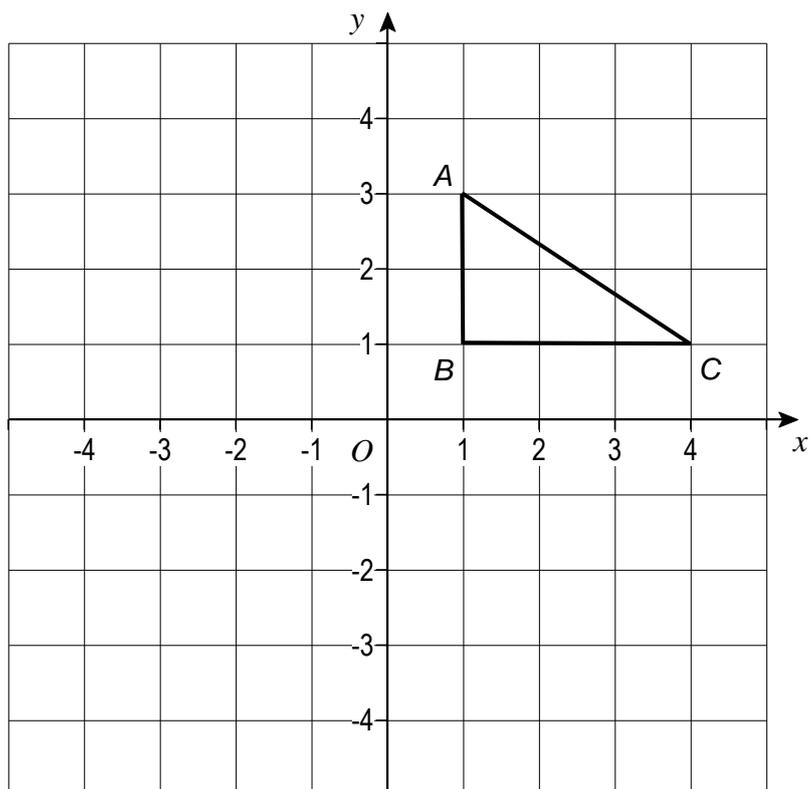
Describe fully a **single** transformation of the triangle for which

- all points on *BC* are invariant
- there are no other invariant points.

[1 mark]

28 (b) Here is an L-shape *PQRSTU*.
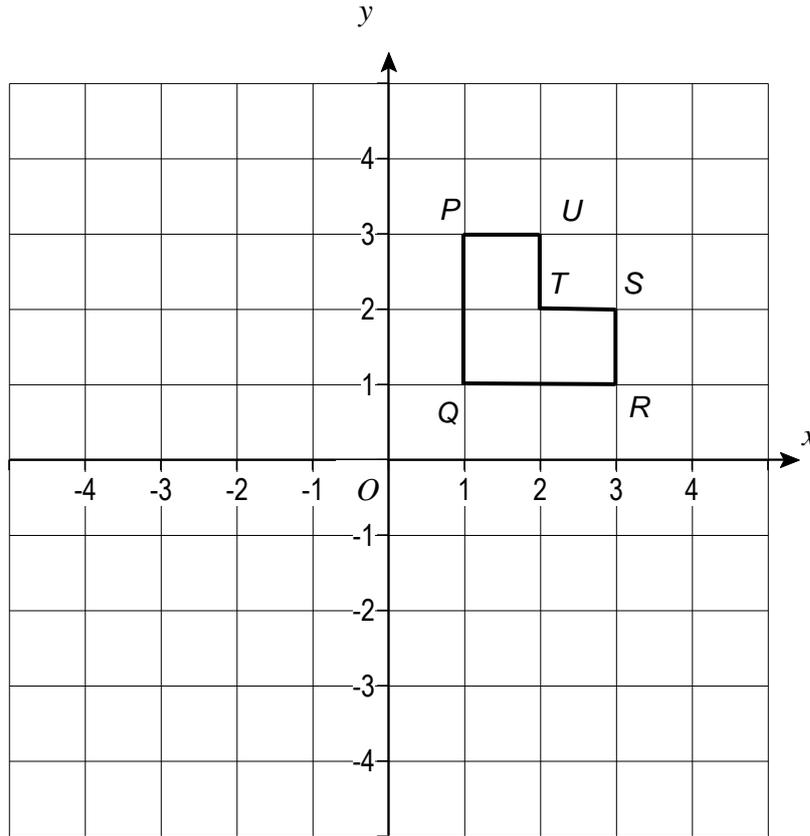
Describe fully a **single** transformation of the L-shape for which

only one vertex is invariant

the line joining *P* and *Q* remains vertical

the area of the L-shape does not change.

[2 marks]

END OF QUESTIONS

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There are no questions printed on this page

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