A
AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

MATHEMATICS

H

Higher Tier

Paper 1 Non-Calculator

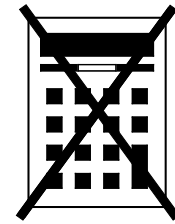# 8300/1H

Thursday 24 May 2018   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]

2

For this paper you must have:
- mathematical instruments

You must NOT use a calculator.

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.**

3

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

0 3

4

Answer ALL questions in the spaces provided

1   **Work out** $\sqrt[3]{64 \times 1000}$

Circle your answer.   [1 mark]

40   **80**   **400**   **4000**

2   **The vector** $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ **translates A to B.**

Circle the vector that translates B to A.   [1 mark]

$\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

5

3   **Circle the expression that is equivalent to**

$3a - a \times 4a + 2a$

[1 mark]

$8a^2 + 2a$ $12a^2$

$5a - 4a^2$ $3a - 6a^2$

4   **Circle the number that is closest in value to**

$\dfrac{9.8}{0.0195}$

[1 mark]

5   50   500   5000

[Turn over]

0 5

5   **Solve $5(x + 3) < 60$**
[2 marks]

_____

_____

_____

_____

_____

_____

Answer _____

6

6 **The height of Zak is 1.86 metres.**

The height of Fred is 1.6 metres.

Write the height of Zak as a fraction of the height of Fred.

Give your answer in its simplest form. [3 marks]

_____

_____

_____

_____

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_____

Answer _____

[Turn over]

0 7

7   *A* (0, 2) and *B* (6, 5) are points on the straight line *ABCD*.

The diagram is not drawn accurately.
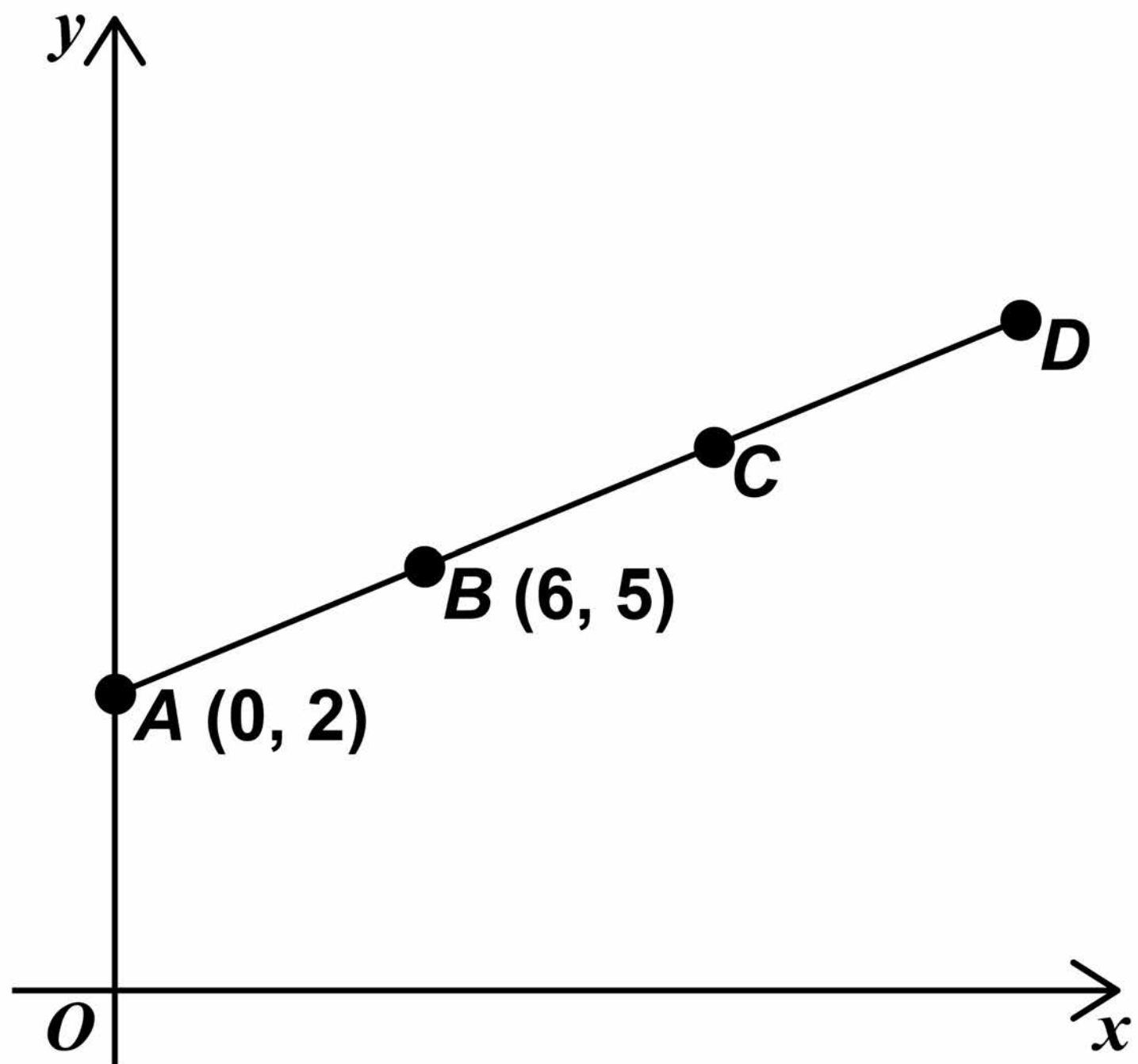
9

AB = *BC* = *CD*

**Work out the coordinates of *D*.
[3 marks]**

_____

_____

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_____

Answer (_____ , _____)

6

[Turn over]

8   **A coin is thrown 50 times.**

It lands on heads 31 times.

8 (a)   Write down the relative frequency it lands on heads.
[1 mark]

Answer _____

**8 (b) Raj says,
"The coin is biased towards heads."**

**Use the data to give a reason why he might be correct.
[1 mark]**

_____

_____

_____

_____

[Turn over]

9 **The range of a set of numbers is** $15\frac{1}{4}$

The smallest number is $-2\frac{7}{8}$

Work out the largest number.
[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____

10 y is inversely proportional to x.

Complete the table.   [2 marks]

x	12	6	
y		4	8

[Turn over]

$$\overline{7}$$

11 **A large rectangle is made by joining three identical small rectangles as shown.**

The diagram is not drawn accurately.

15

The perimeter of one small rectangle is 15 cm

Work out the perimeter of the large rectangle. [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ **cm**

[Turn over]

12 **Put these numbers in order from smallest to largest.**
[2 marks]

8×10^{-4} 4×10^{-2}

6×10^{-4} 0.07

_____

_____

_____

_____

_____

Smallest _____

_____

_____

Largest _____

13   **Circle the volume that is the same as 15 cm^3**
[1 mark]

$15\ 000 \text{ mm}^3$ **1.5 mm^3**

0.0015 mm^3   **150 mm^3**

$\overline{7}$
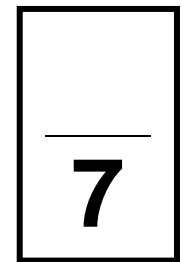
[Turn over]

18

14 **Patterns are made using straight lines and arcs.**

14 (a) **PATTERN A (one row)**

PATTERN B (two rows)
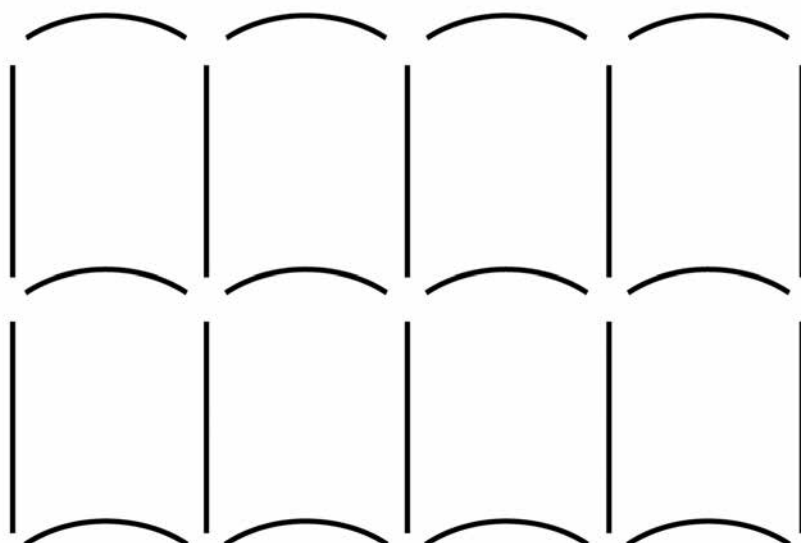
19

More rows are added to PATTERN B so that

number of straight lines : number of arcs = 10 : 9

How many rows are added?
[2 marks]

Answer _____

14 (b) **A different pattern is made using 20 straight lines and 16 arcs.**

The straight lines and arcs are made from metal.

20 straight lines cost £12

cost of one straight line : cost of one arc = 2 : 3

Work out the TOTAL cost of the metal in the pattern. [3 marks]

_____

_____

_____

_____

_____

_____

_____

Answer £ _____

5

15 **A biased dice is thrown. Here are the probabilities of each score.**

Score	1	2	3	4	5	6
Probability	0.25	0.05	0.15	0.05	0.3	0.2

The dice is thrown 200 times.

Work out the expected number of times the score will be odd. [3 marks]

_____

_____

_____

_____

Answer _____

[Turn over]

2 1

22

16 **The value of y is 20% more than the value of x.**

Circle the ratio $x : y$
[1 mark]

5 : 6   6 : 5   4 : 5   5 : 4

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[Turn over]

17　**Here is a triangle.**

The diagram is not drawn accurately.

15 cm
42°
104°
34°
x cm
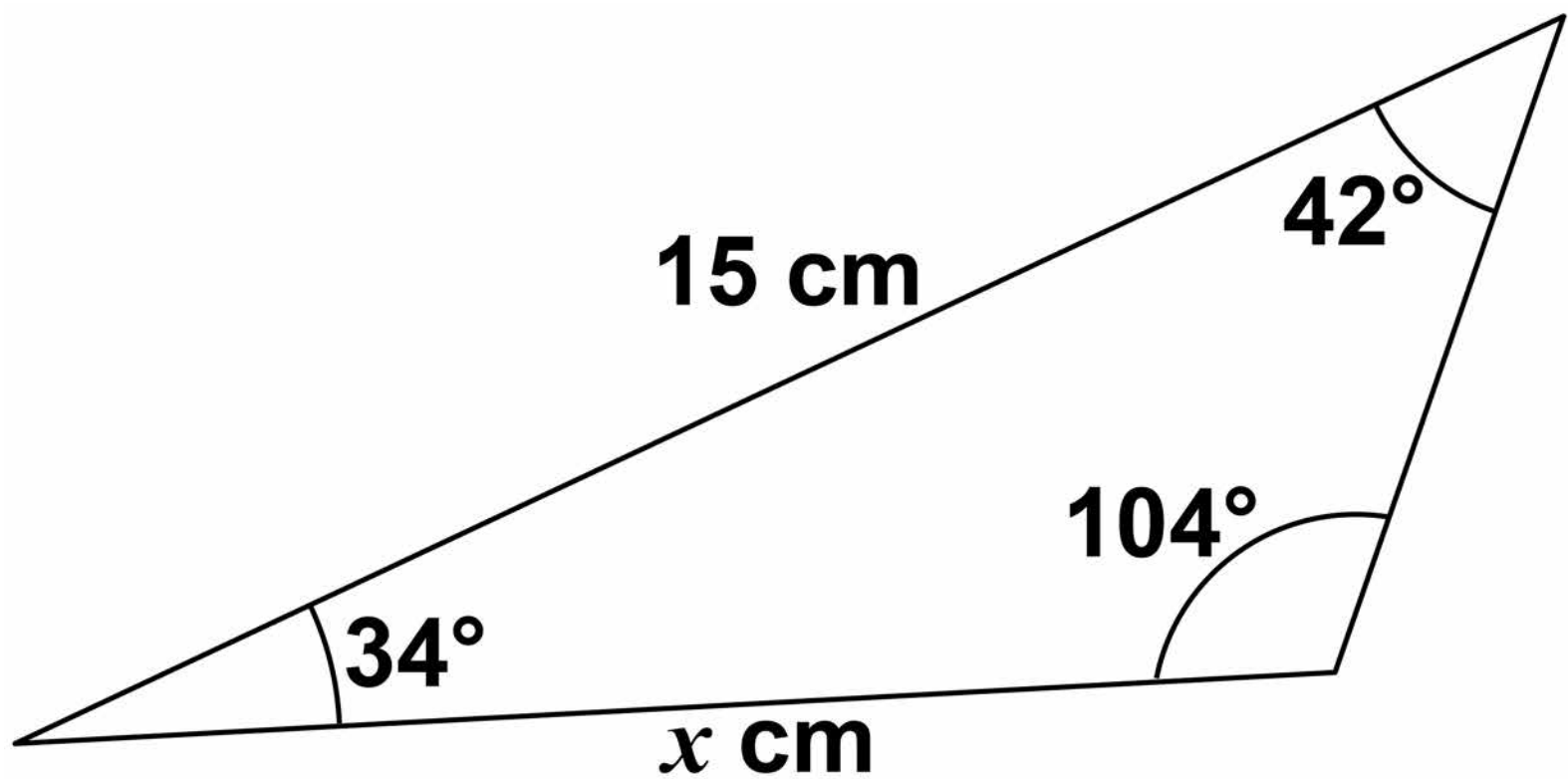
25

Circle the correct equation.
[1 mark]

$$\frac{\sin x}{42} = \frac{\sin 15°}{104}$$

$$\frac{x}{\sin 42°} = \frac{15}{\sin 104°}$$

$$\frac{\sin x}{34} = \frac{\sin 15°}{104}$$

$$\frac{x}{\sin 42°} = \frac{15}{\sin 34°}$$

5

[Turn over]

18 **Here is a tunnel for a toy train.**

The diagram is not drawn accurately.
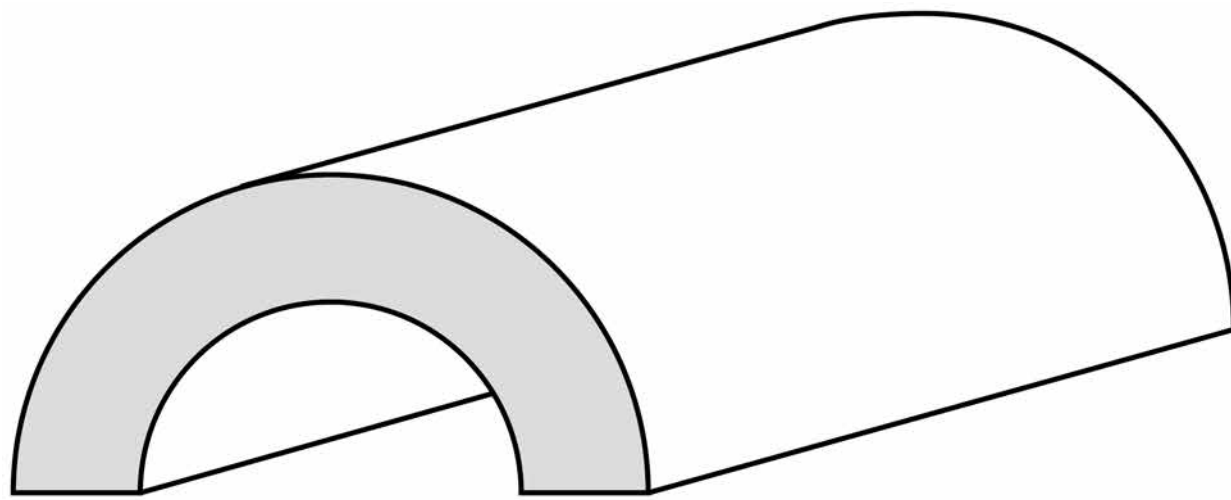
The diagram below shows the cross section of the tunnel.

The diagram is not drawn accurately.

7 cm

A   3 cm   B   C   3 cm   D
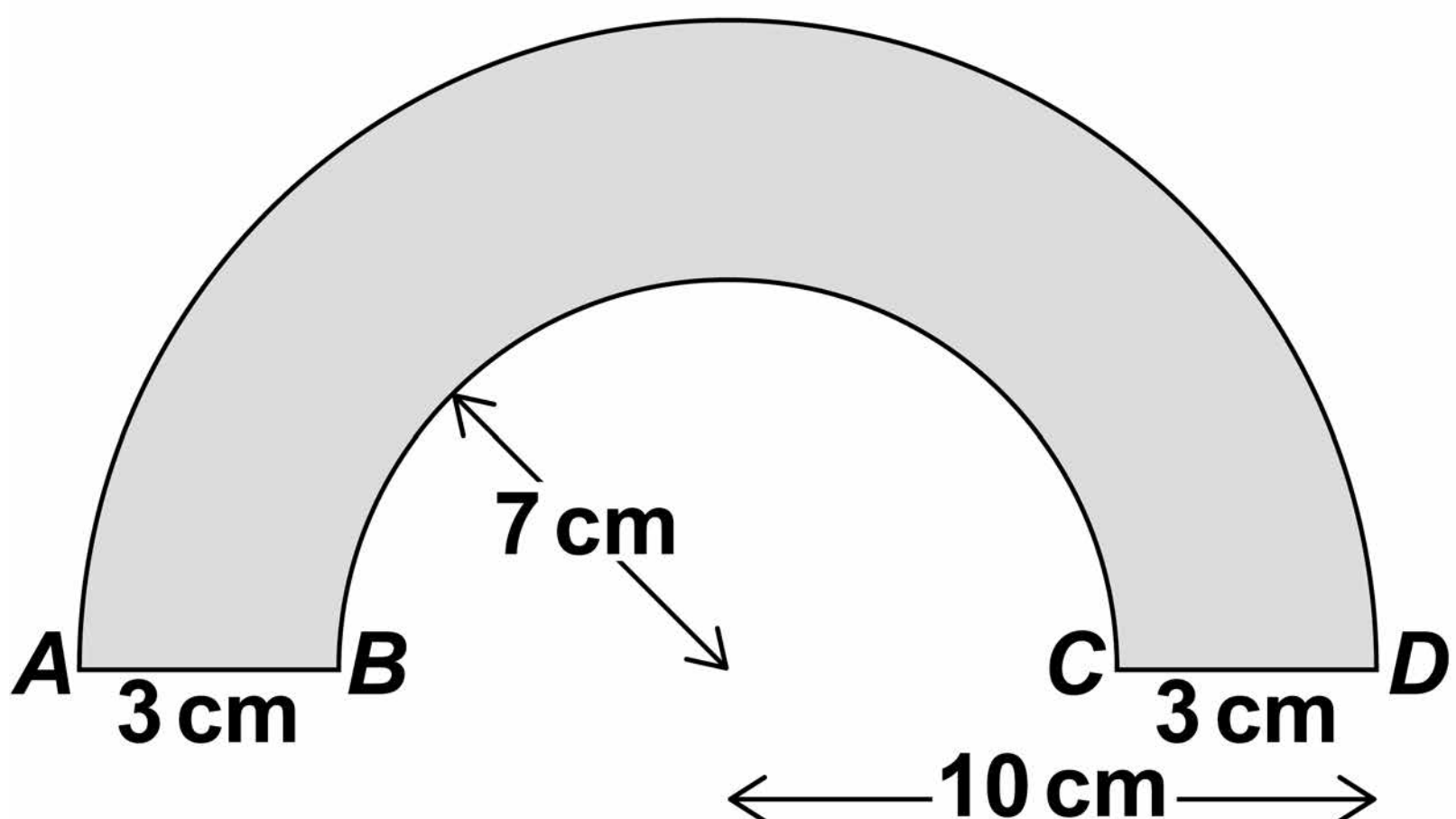
←—10 cm—→

27

AD is a semicircular arc of radius 10 cm

BC is a semicircular arc of radius 7 cm

The length of the tunnel is 30 cm

Work out the total area of all SIX faces of the tunnel.

Give your answer in terms of π.
[5 marks]

_____

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[Turn over]

28

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Answer _____ **cm** ^{2}

5
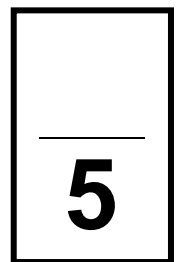
[Turn over]

19 Type A batteries and type B batteries were tested.
The cumulative frequency diagram shows information about the battery life of type A.
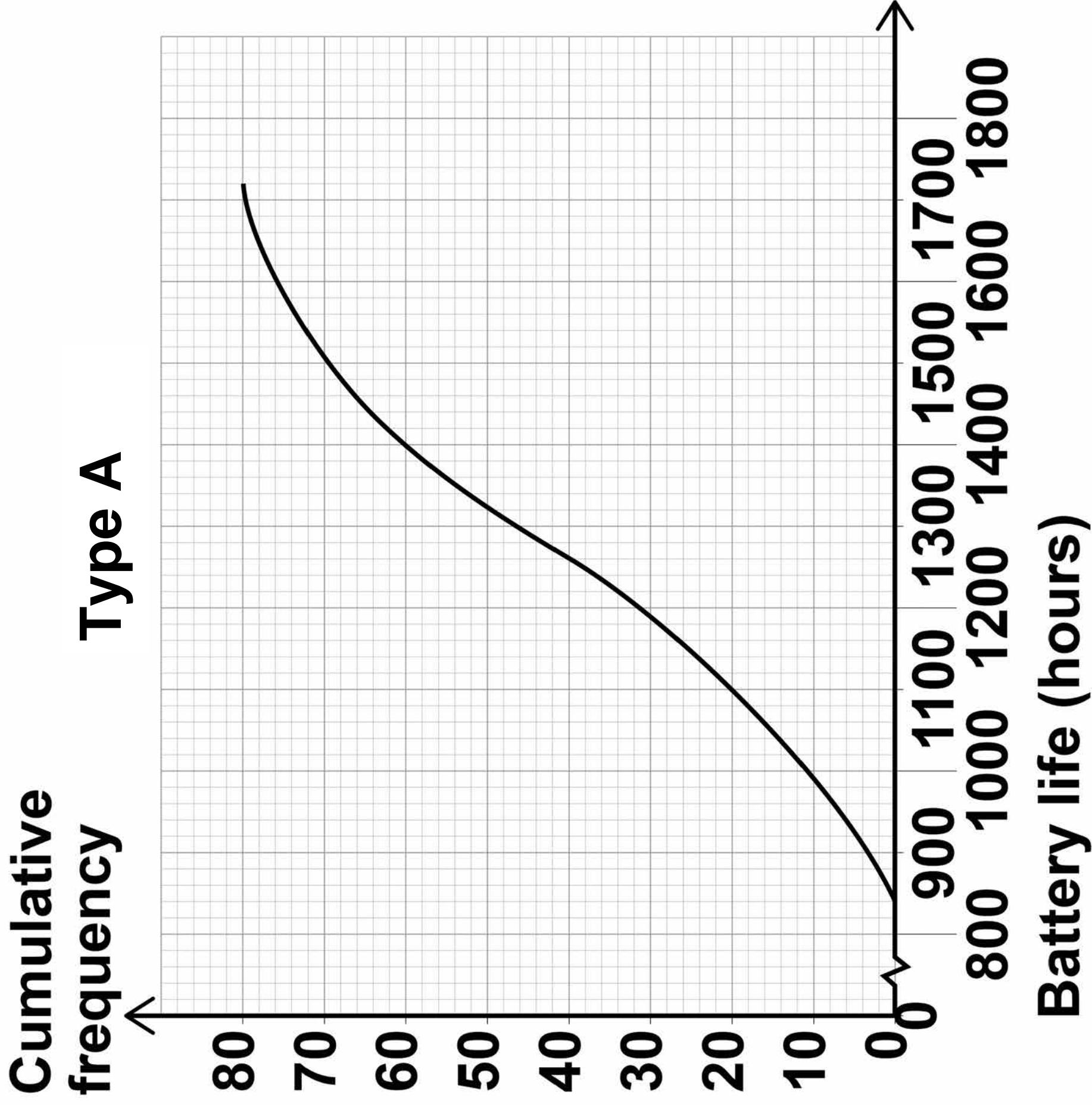
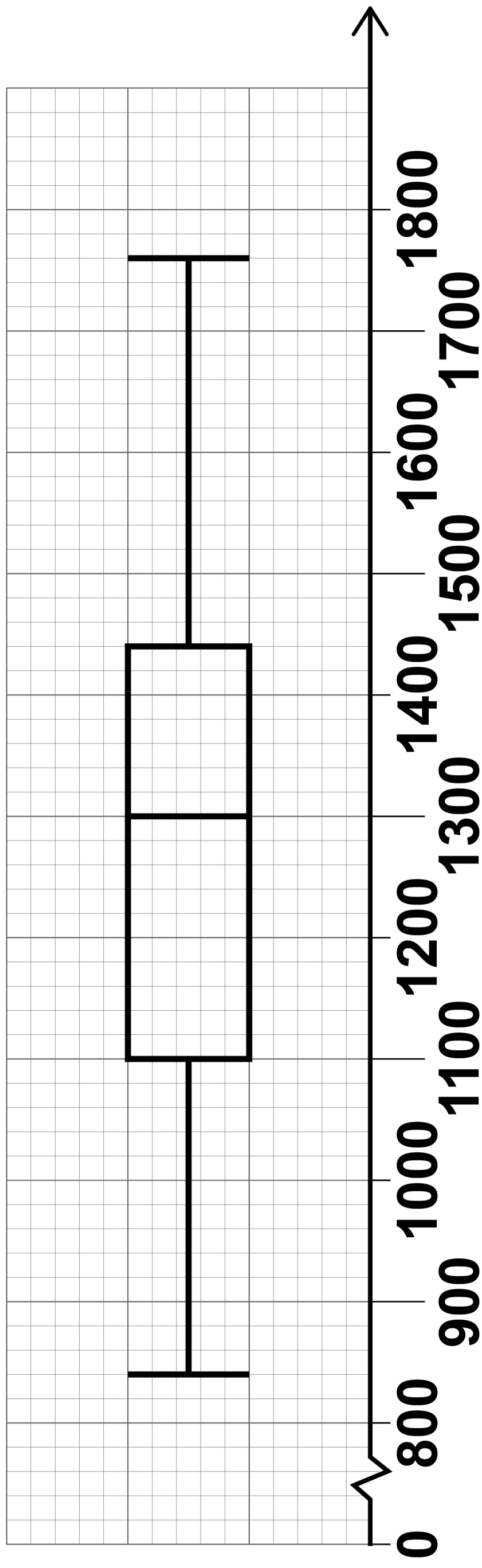**19 (a)** Estimate the interquartile range for type A. [2 marks]

Answer _____ hours

19 (b) Estimate the number of type A batteries that had a battery life of more than 1600 hours. [1 mark]

Answer _____

Cumulative frequency

Type A

Battery life (hours)

80
70
60
50
40
30
20
10
0

0 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

19 (c) The box plot shows information about the battery life of type B.

Type B

Battery life (hours)

On average, which type had the greater battery life?

Tick a box.

| type A

| type B

Using data from BOTH diagrams, state how you chose your answer. [2 marks]

_____

_____

_____

_____

$\boxed{\dfrac{\quad}{5}}$

34

20   **A linear sequence starts**

$a + 2b$ $a + 6b$ $a + 10b$ _____   _____

The 2nd term has value 8

The 5th term has value 44

Work out the values of a and b.
[4 marks]

_____

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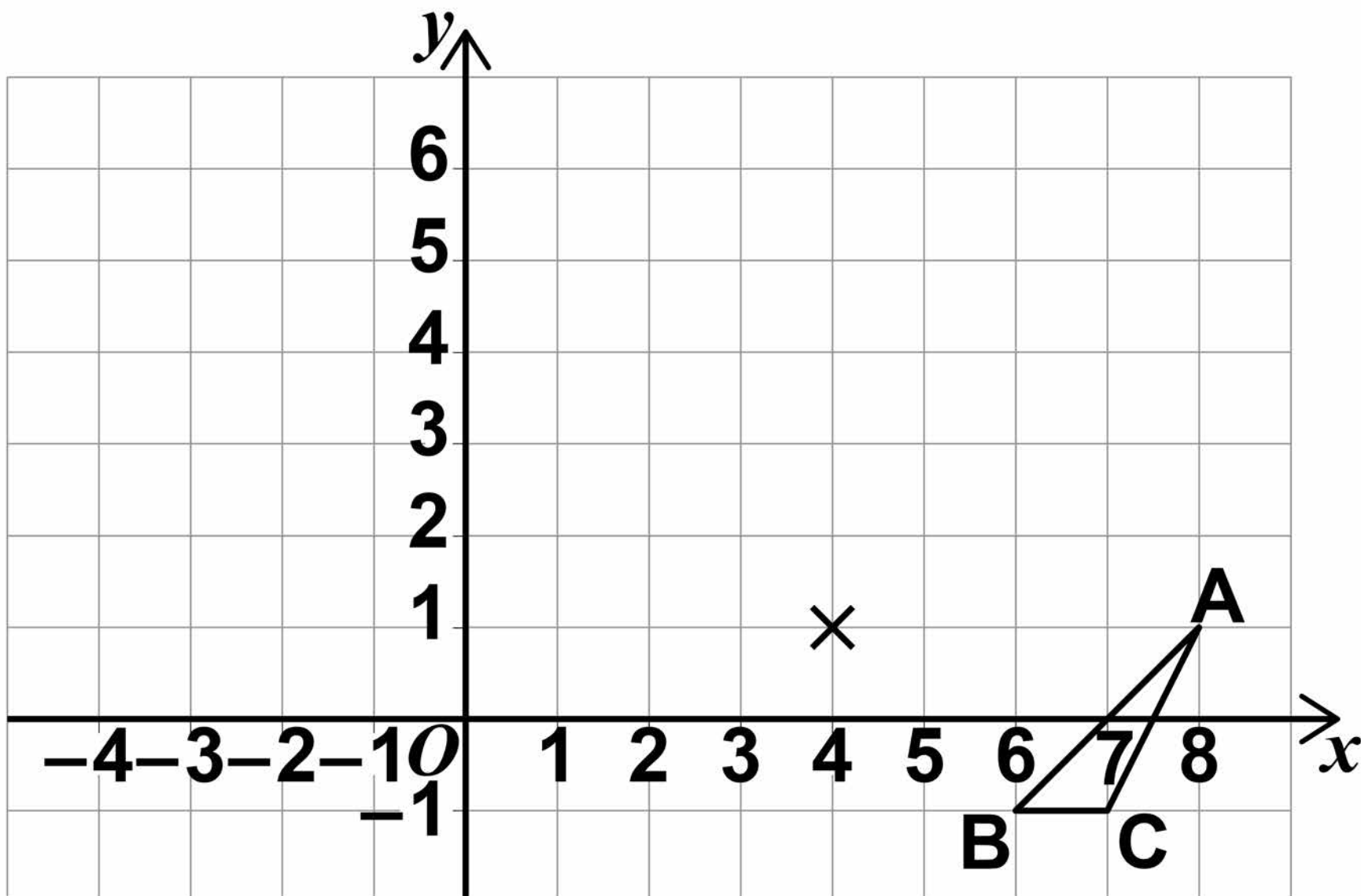
_____

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3 4

35

$a =$
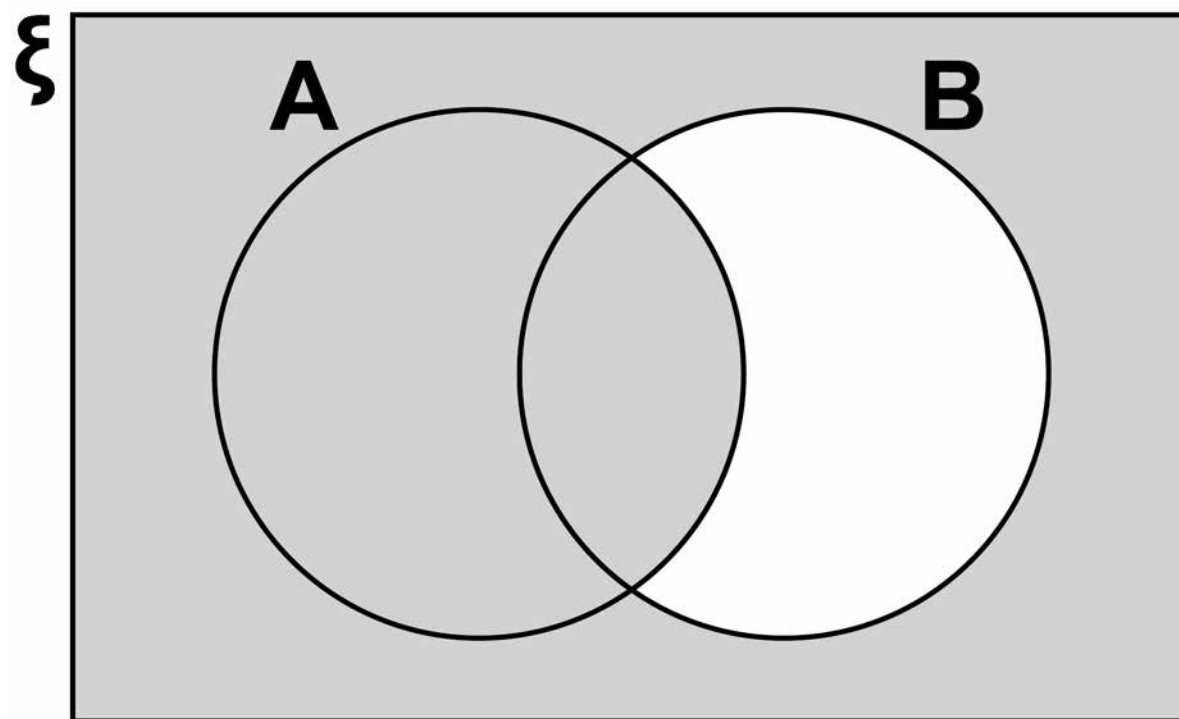
$b =$

[Turn over]

21   **Enlarge triangle *ABC* by scale factor –2, centre (4, 1)**
[2 marks]

22

Which of these represents the shaded region?
Circle your answer. [1 mark]

A ∩ B$'$ B$'$ A U B$'$ A$'$ U B$'$

7

[Turn over]

23 **A shopkeeper compares the income from sales of a laptop in March and April.**

April

Price	$\dfrac{1}{5}$ more than March
Number sold	$\dfrac{1}{4}$ less than March

By what fraction does the income from these sales decrease in April? [3 marks]

_____

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39

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Answer _____

[Turn over]

24 (a) **Work out the value of**

$$2^{14} \div \left(2^{9}\right)^{2}$$

Give your answer as a fraction in its simplest form. **[3 marks]**

_____

_____

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Answer _____

24 (b) **Work out the value of 25 $^{\frac{3}{2}}$**

[2 marks]

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Answer _____

$\boxed{\overline{8}}$

[Turn over]

25 **Here is a sketch of the graph of $y = \cos x$ for values of x from 0° to 360°**
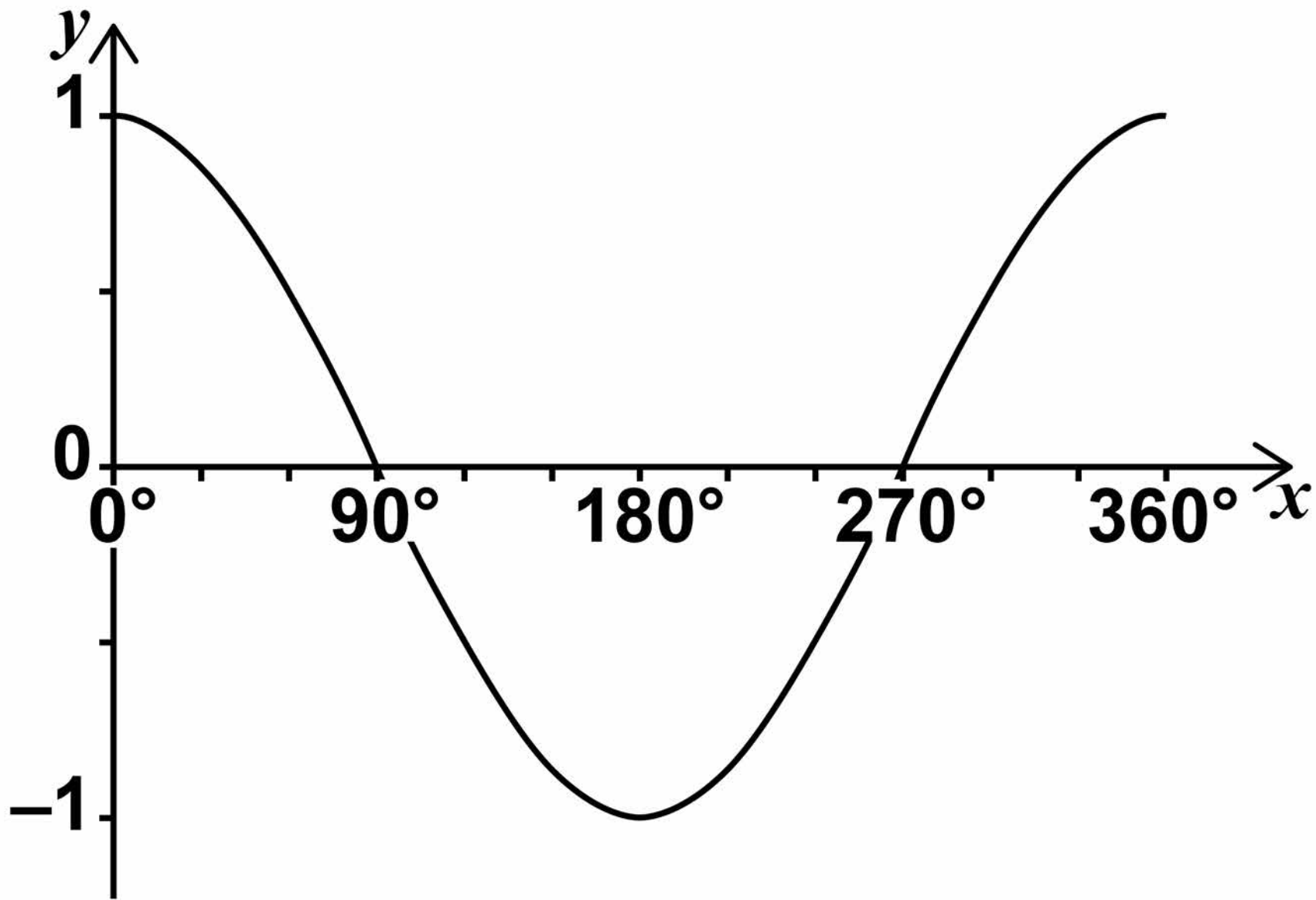
25 (a) $\cos x = \cos 60°$

Work out the value of x when
$90° \leqslant x \leqslant 360°$
[1 mark]

Answer _____ degrees

25 (b) $\cos x = -\cos 60°$

Work out the value of x when
$180° \leqslant x \leqslant 360°$
[1 mark]

Answer _____ degrees

[Turn over]

26 b is two thirds of c.

$5a = 4c$

Work out the ratio $a : b : c$
Give your answer in its
simplest form where a, b and c
are integers. **[3 marks]**

_____

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_____

Answer _____ : _____ : _____

5

45

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[Turn over]

27 (a) Jo wants to work out the solutions of

$$x^2 + 3x - 5 = 0$$

She says,
''The solutions CANNOT be worked out because
$x^2 + 3x - 5$ does NOT factorise to $(x + a)(x + b)$ where a and b are integers.''

Is Jo correct?
Tick a box.

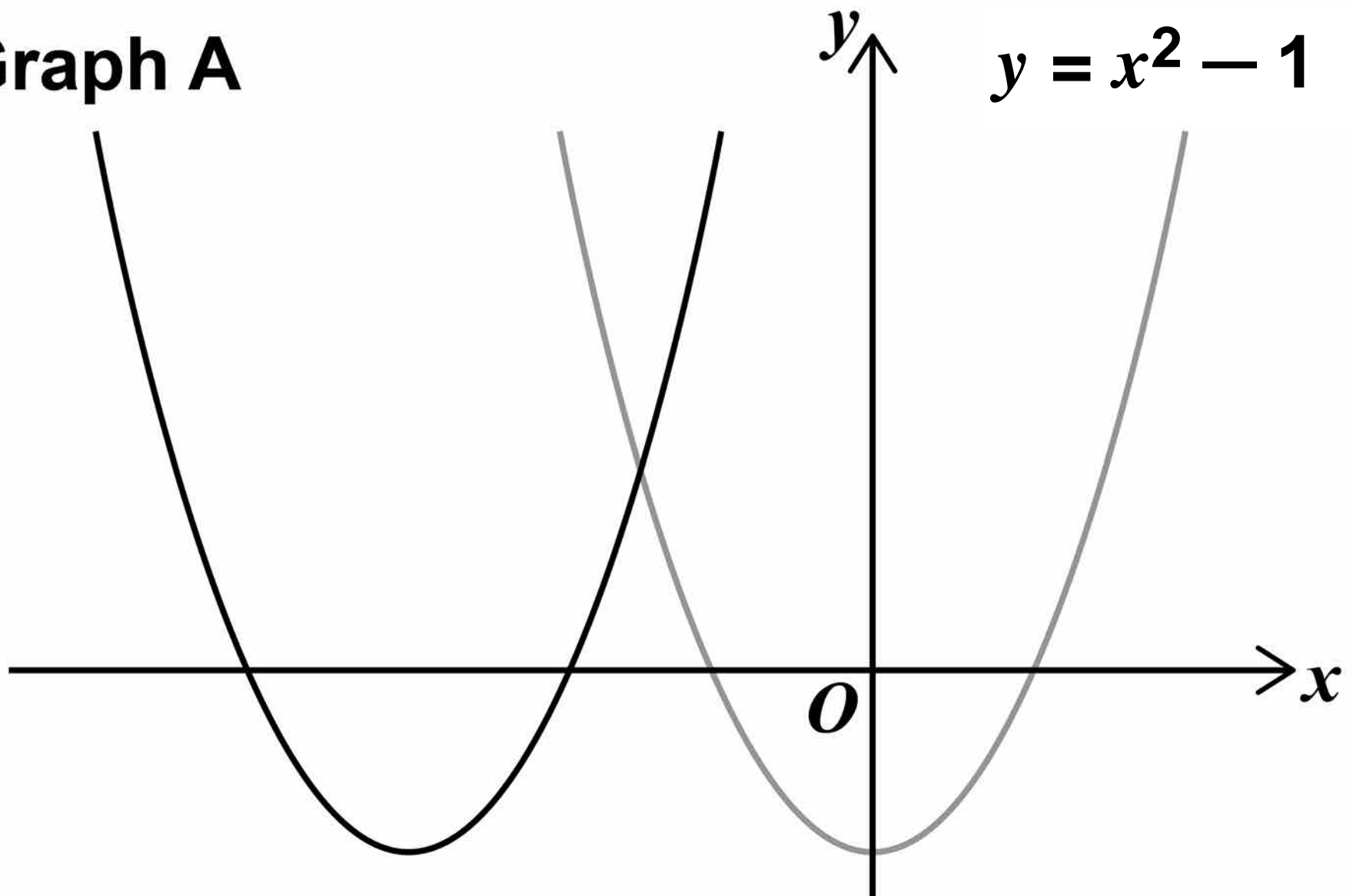☐ Yes   ☐ No

Give a reason for your answer.
[1 mark]

_____

_____

_____

_____

27 (b) **WITHOUT expanding any brackets, show how to work out the EXACT solutions of**

$$9(x + 3)^2 = 4$$

Give the solutions. [3 marks]

_____

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[Turn over]

28 **Simplify** $\sqrt{80} + \sqrt{2\frac{2}{9}}$

Give your answer in the form $\dfrac{a\sqrt{5}}{b}$ **where** a **and** b **are integers.** **[3 marks]**

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Answer _____

7

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[Turn over]

29 **Here are sketches of two graphs.**

Graph A

$y = x^2 - 1$

The graph of $y = x^2 - 1$ is translated 3 units to the left to give graph A.

29 (a) The equation of graph A can be written in the form

$y = x^2 + bx + c$

Work out the values of b and c.
[3 marks]

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_____

$b =$ _____

$c =$ _____

[Turn over]

52

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29 (b) **The graph of $y = x^2 - 1$ is reflected in the x-axis to give graph B.**

Work out the equation of graph B. [1 mark]

_____

_____

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Answer _____

[Turn over]

30 **Show that the value of cos 30° × tan 60° + sin 30° is an integer.** **[3 marks]**

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END OF QUESTIONS

7

55

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56

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For Examiner's Use	
Pages	Mark
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50–54	
TOTAL	

5 6