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

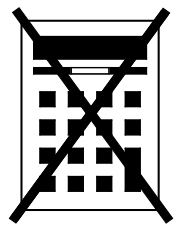
At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

JUN188300 1H 01

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.**

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 $\sqrt[3]{64 \times 1000}$

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]

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

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

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

$$\frac{9.8}{0.0195}$$

[1 mark]

5 50 500 5000

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.

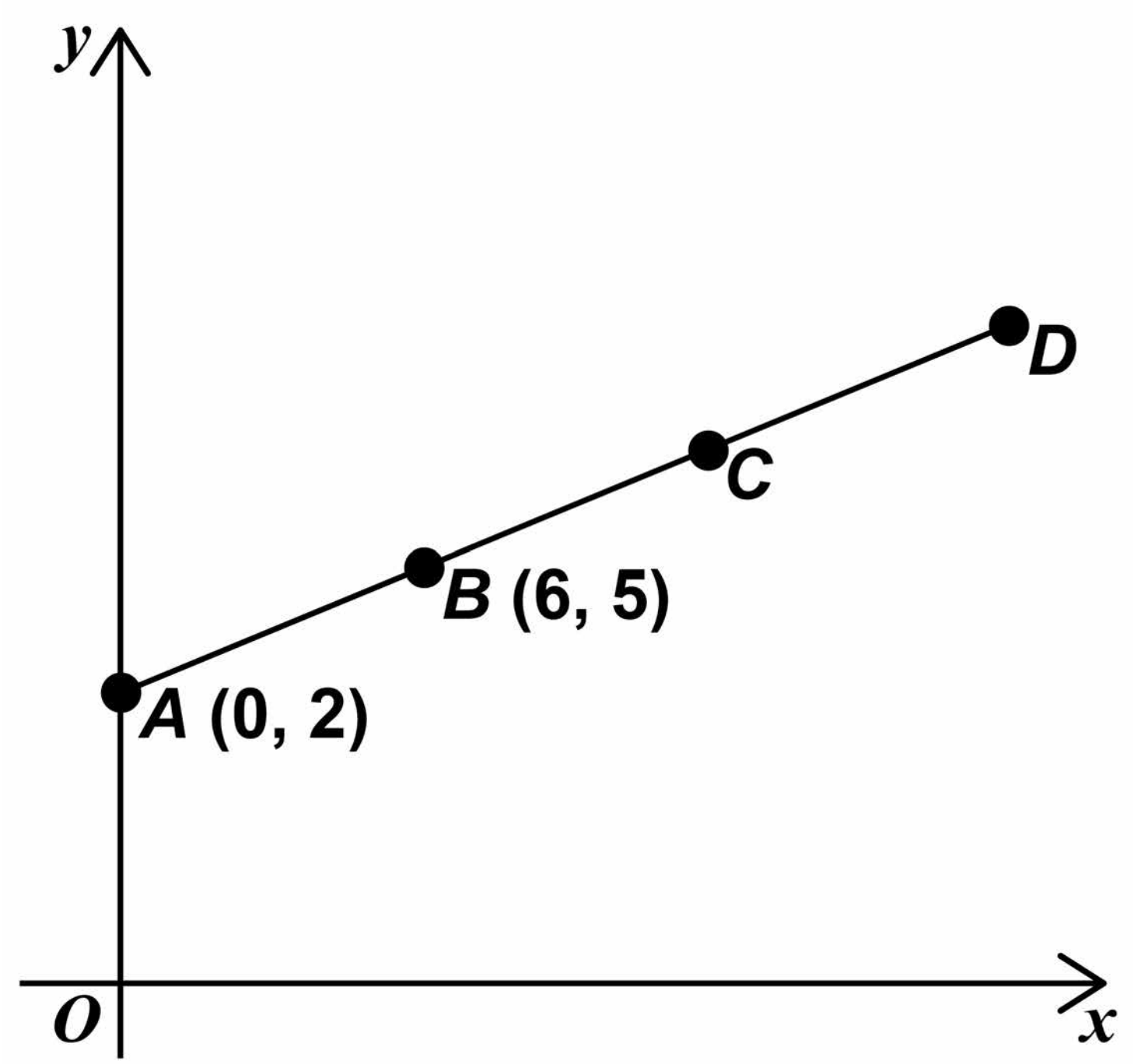
Write the height of Zak as a fraction of the height of Fred.

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

Answer _____

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]

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]

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

7

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

The diagram is not drawn accurately.

The perimeter of one small rectangle is 15 cm

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

Answer _____ cm

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 mm^3 1.5 mm^3

0.0015 mm^3 150 mm^3

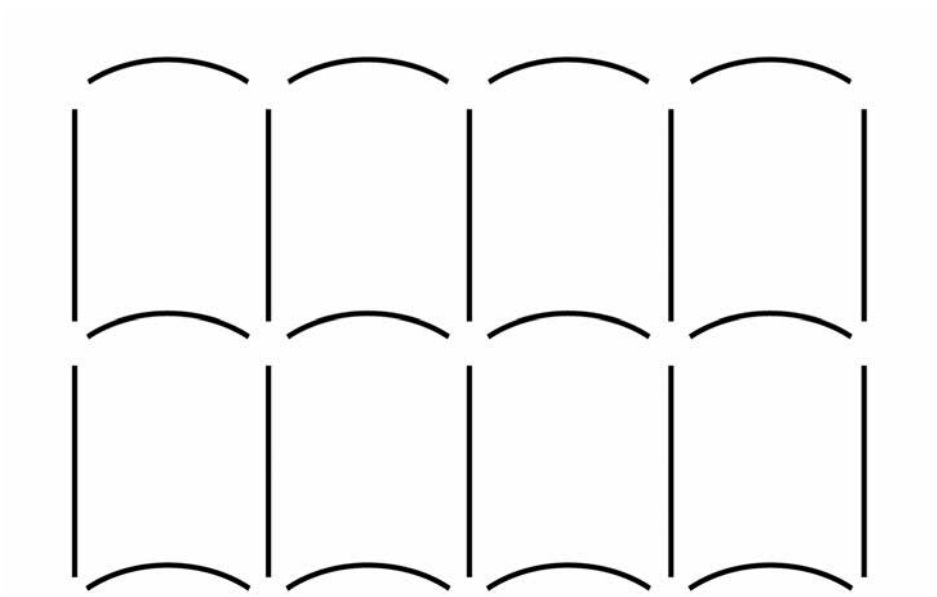
7

[Turn over]

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

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

PATTERN B (two rows)



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 _____

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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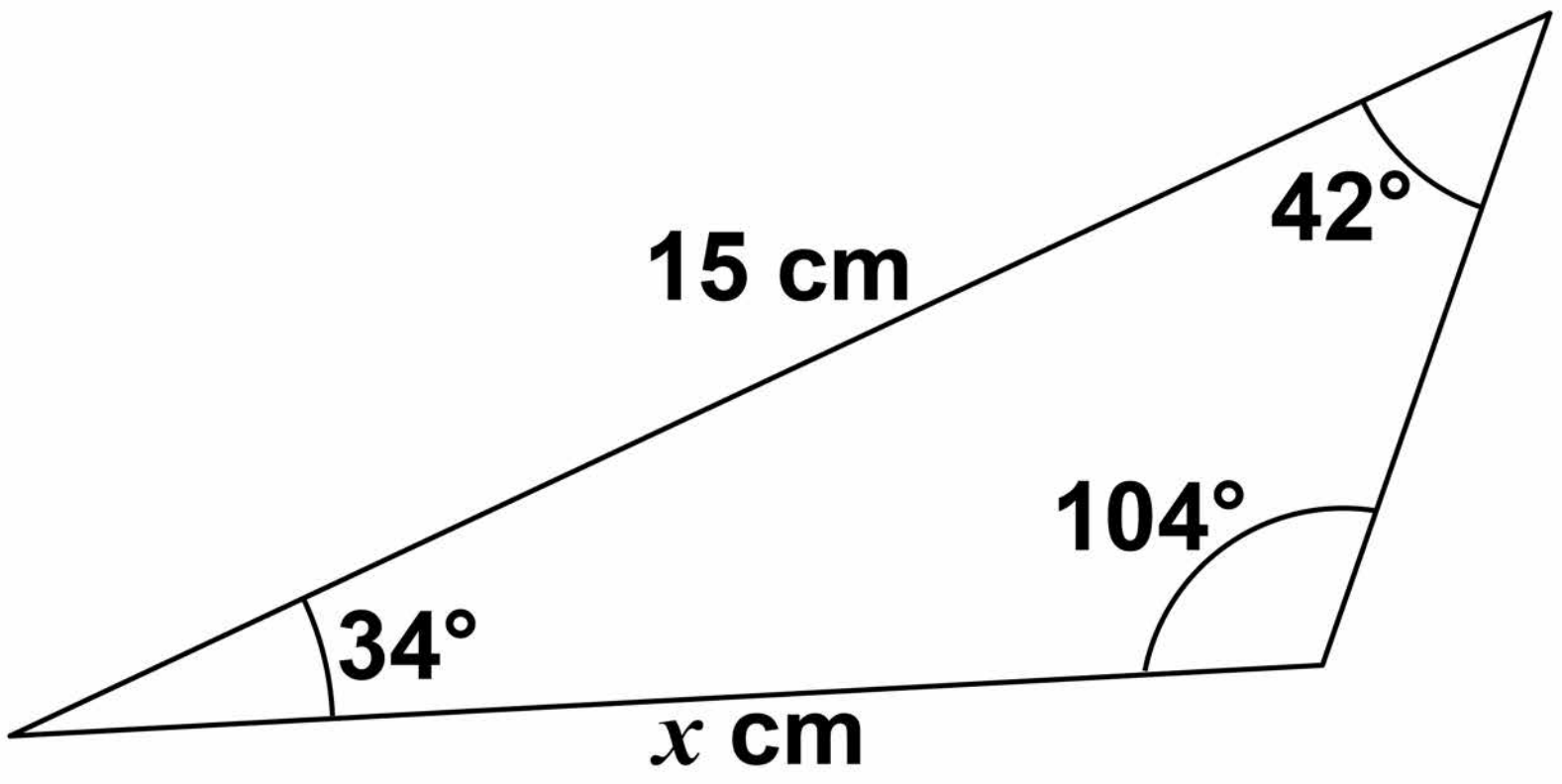
[Turn over]

17 **Here is a triangle.**

The diagram is not drawn accurately.



Circle the correct equation.
[1 mark]

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

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

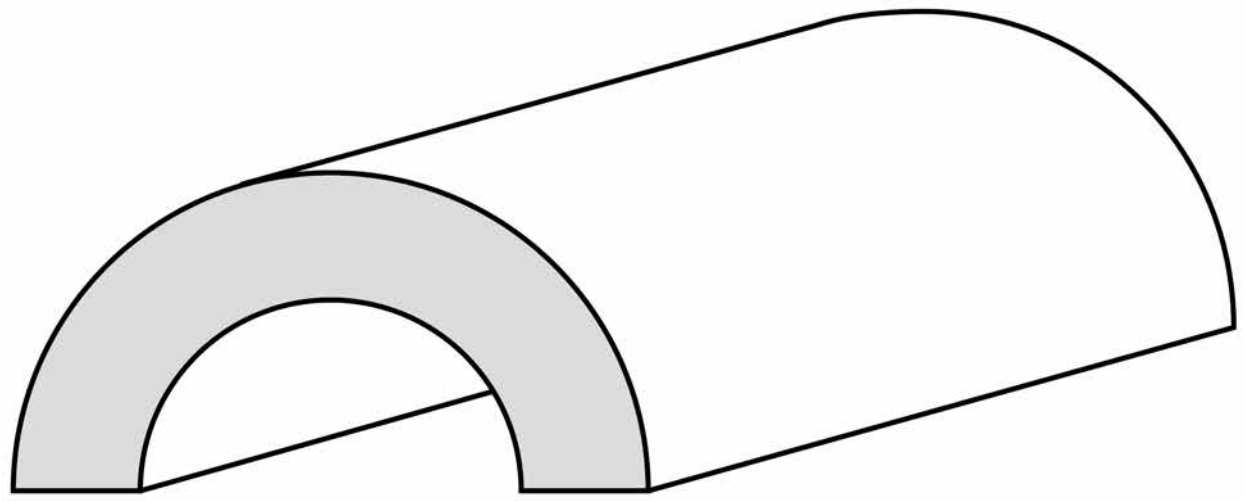
$$\frac{\sin x}{34} = \frac{\sin 15°}{104}$$

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

5

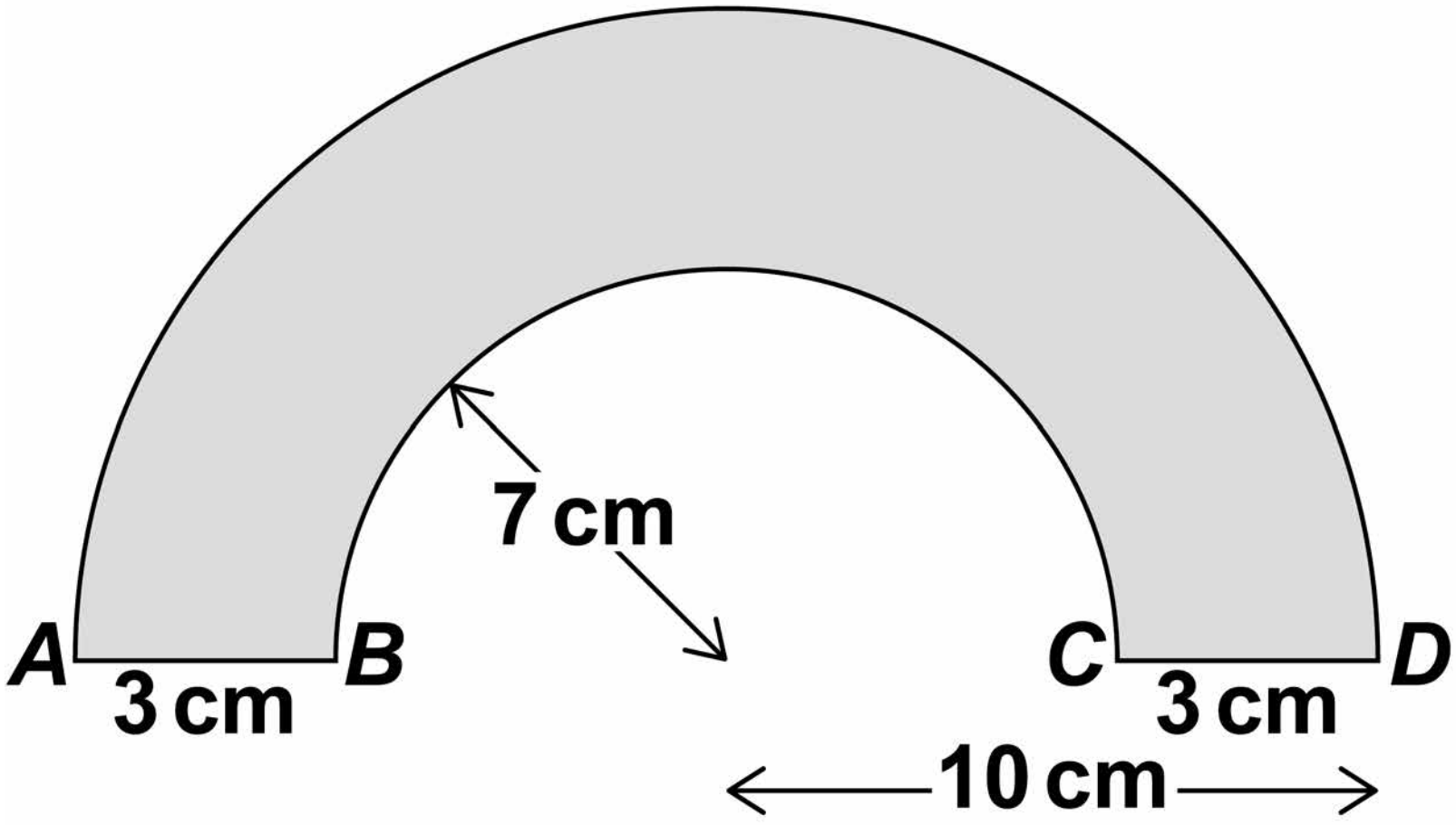
18 **Here is a tunnel for a toy train.**

The diagram is not drawn accurately.



The diagram below shows the cross section of the tunnel.

The diagram is not drawn accurately.



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]

Answer _____ cm ^{2}

5

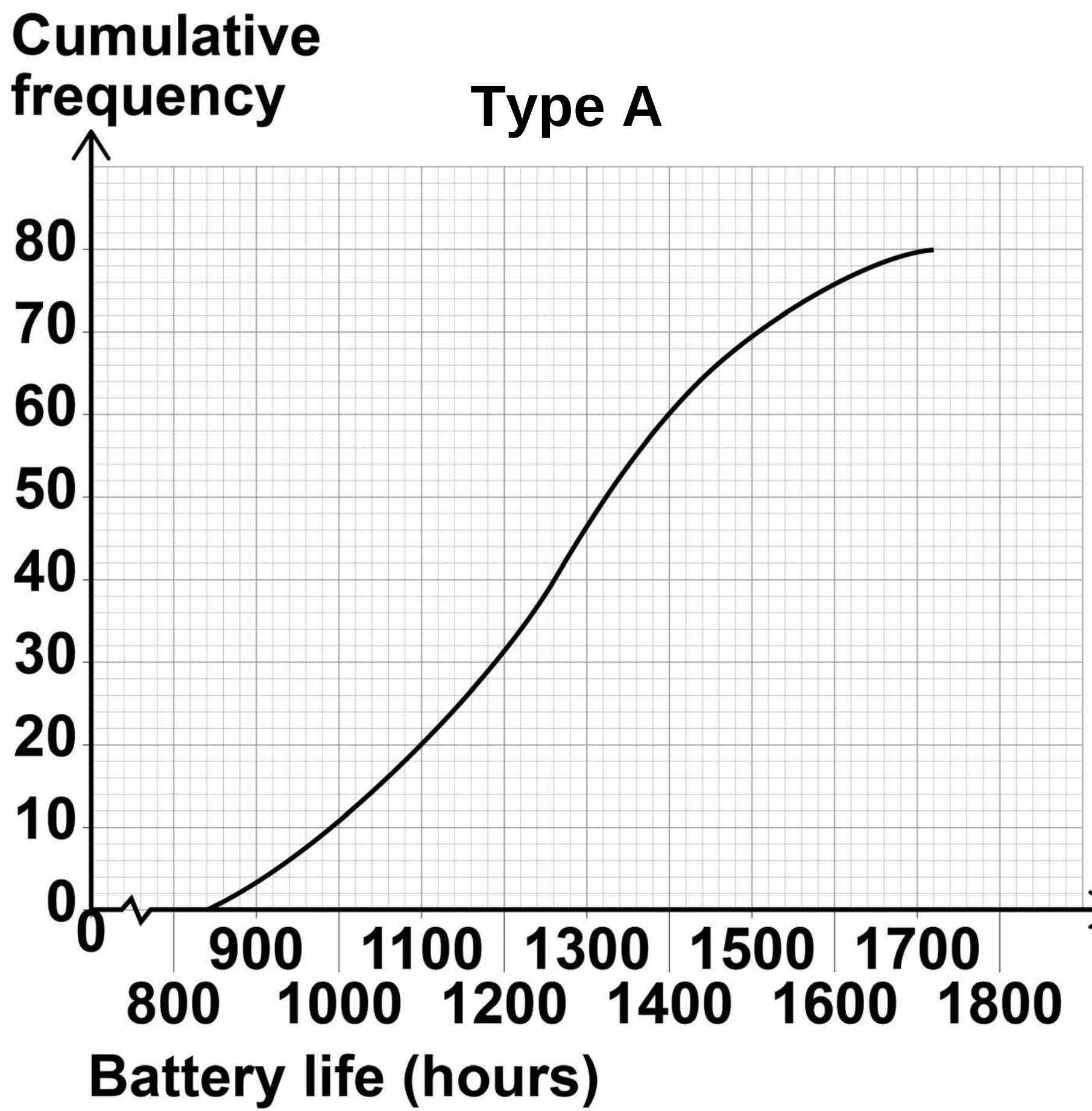
19 Type A batteries and type B batteries were tested. The cumulative frequency diagram shows information about the battery life of type A.

19 (a) Estimate the interquartile range for type A. [2 marks]

Answer _____ hours

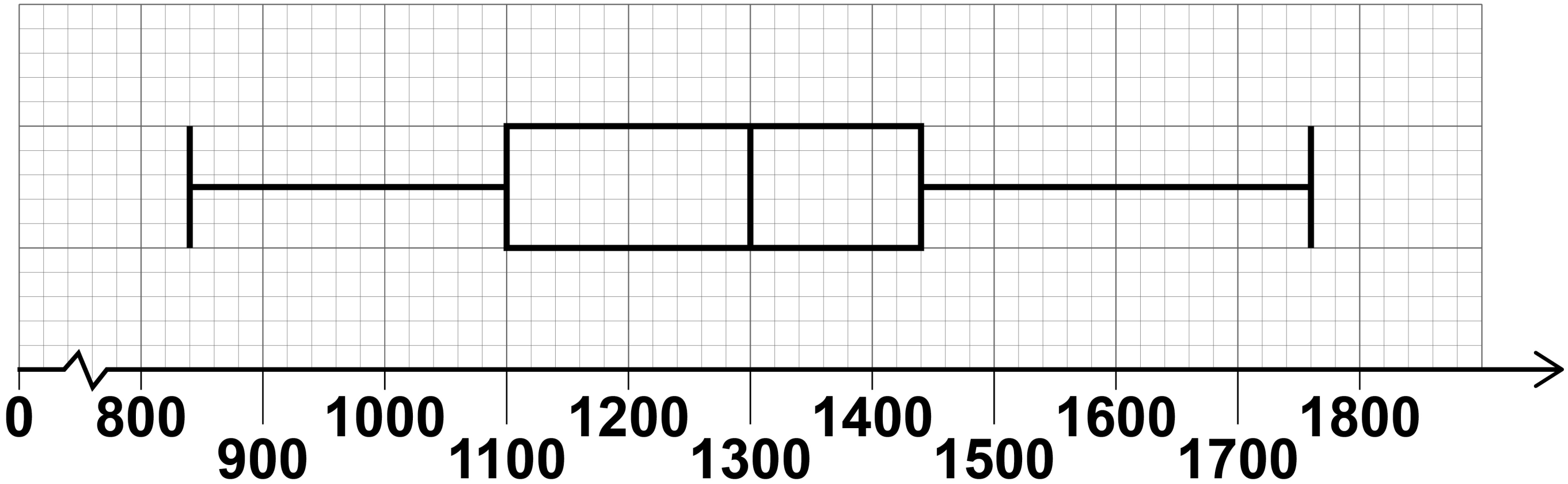
19 (b) Estimate the number of type A batteries that had a battery life of more than 1600 hours. [1 mark]

Answer _____


Cumulative frequency
Type A
80
70
60
50
40
30
20
10
0
0
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
Battery life (hours)

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]

5

20 **A linear sequence starts**

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

The 2nd term has value 8

The 5th term has value 44

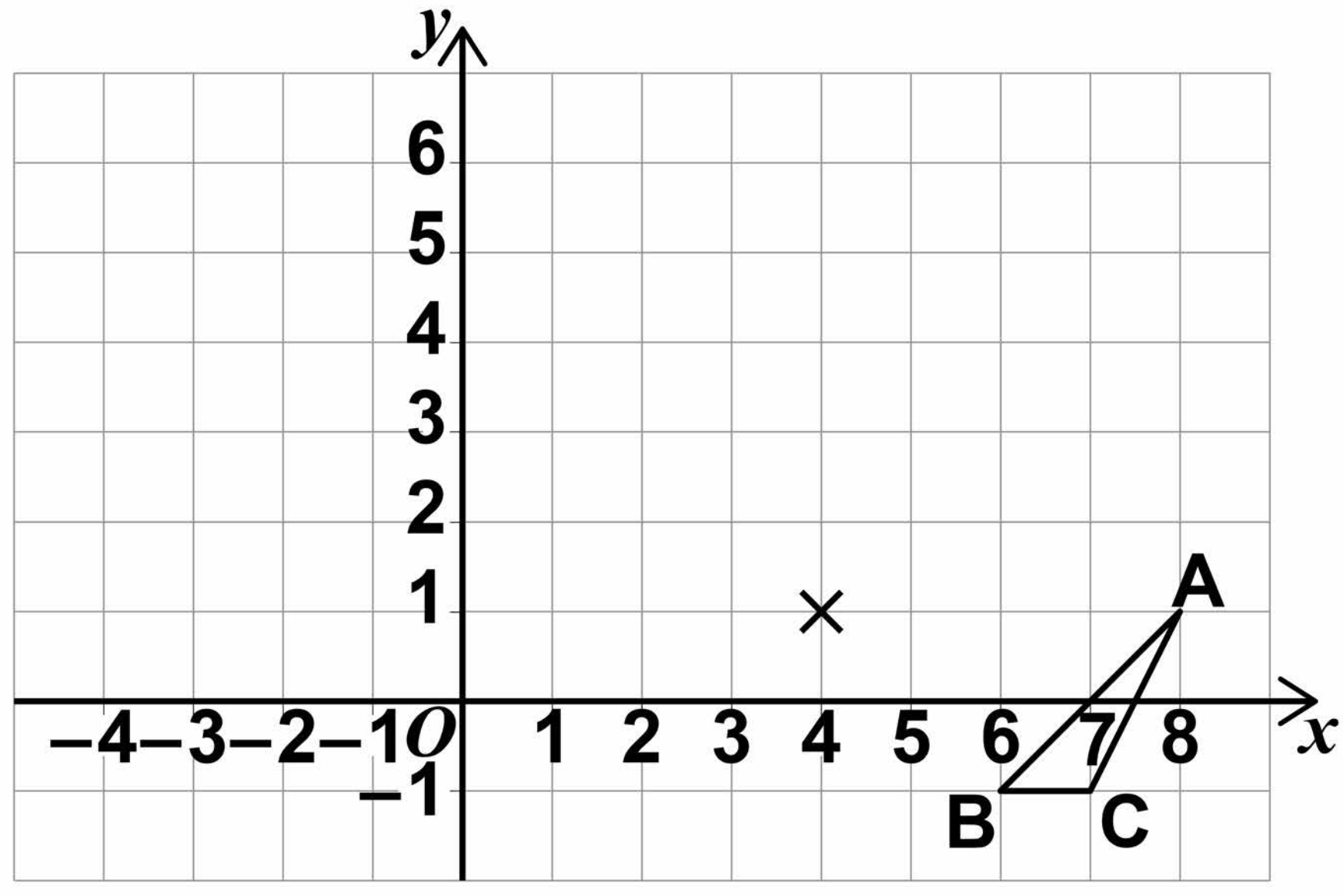
Work out the values of a and b.
[4 marks]

a =

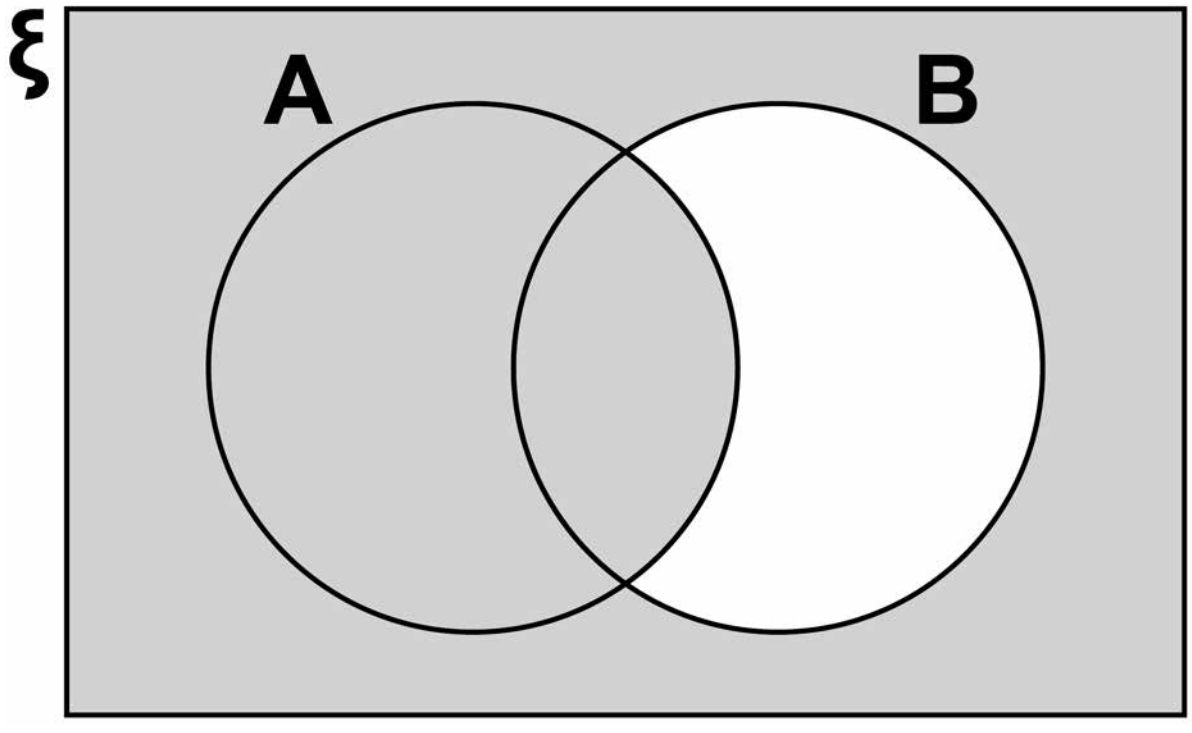
b =

[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

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

April

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

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

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]

Answer

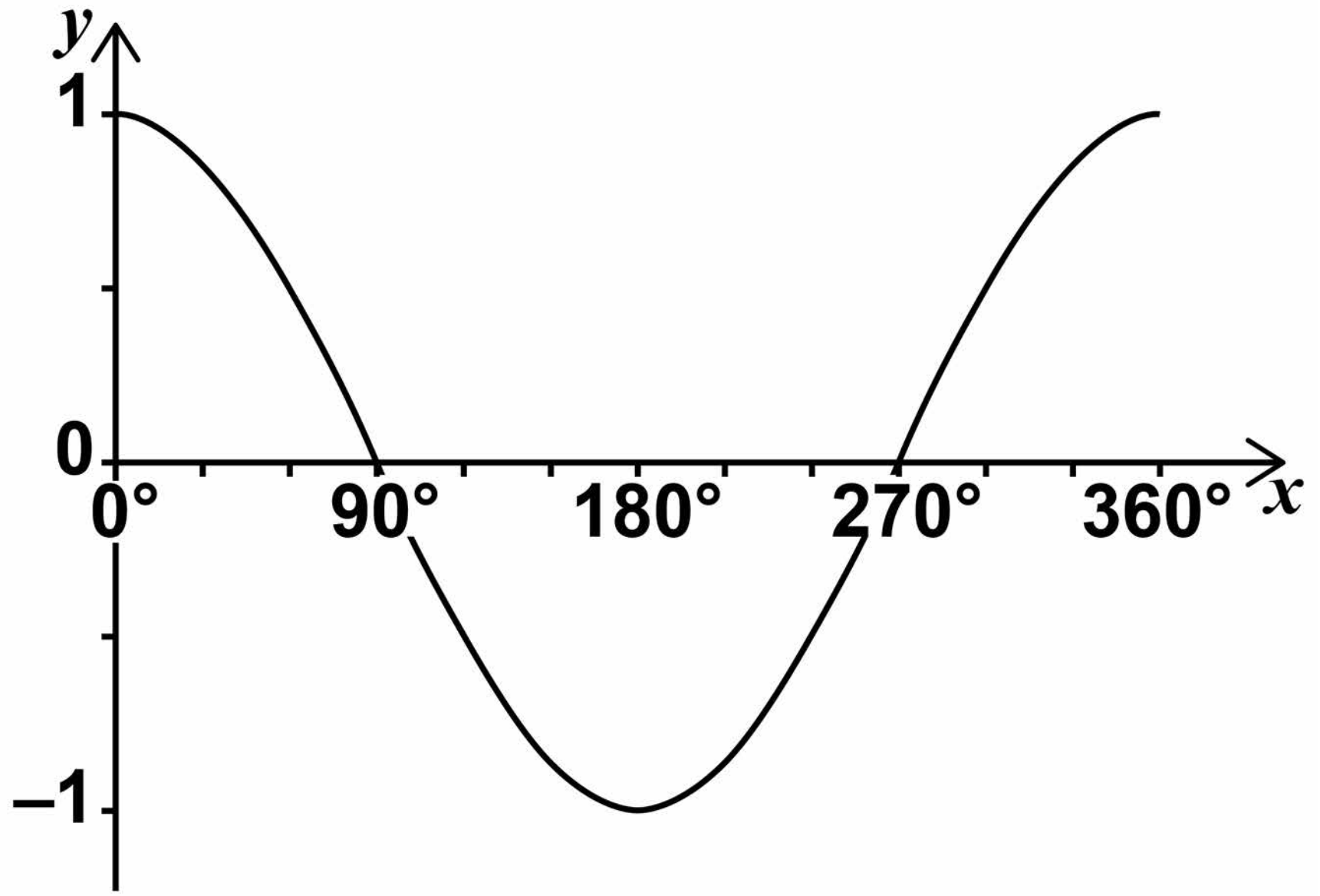
24 (b) Work out the value of $25^{\frac{3}{2}}$

[2 marks]

Answer _____

8

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]

Answer _____ : _____ : _____

5

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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]

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

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

Answer

7

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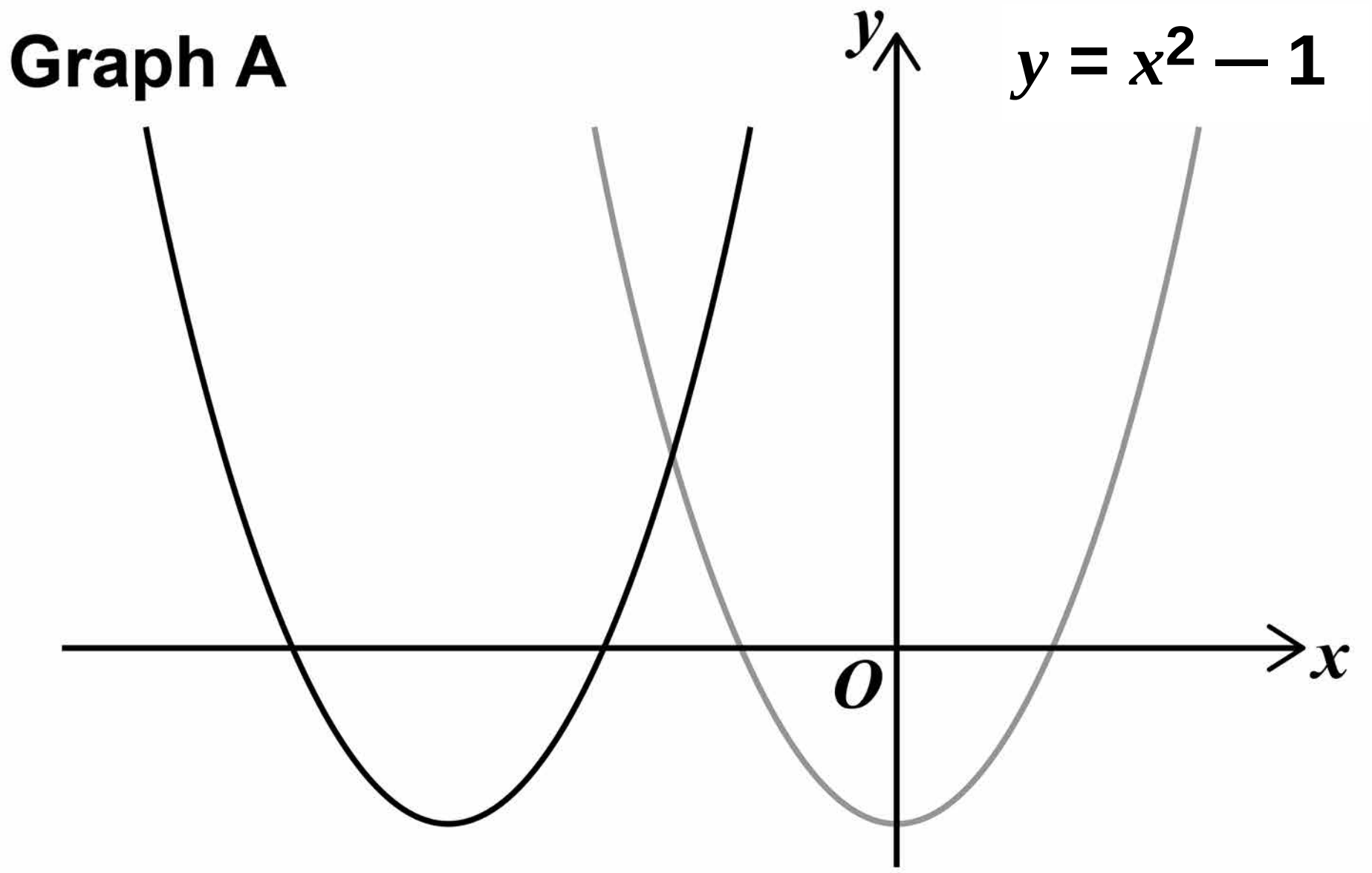
[Turn over]

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



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]

$b =$

$c =$

[Turn over]

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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]

Answer _____

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

END OF QUESTIONS

7

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56

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For Examiner's Use	
Pages	Mark
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10–13	
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30–33	
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46–48	
50–54	
TOTAL	