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

For this paper you must have:
- **mathematical instruments**

You must NOT use a calculator.

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

[Turn over]

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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

BLANK PAGE

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

The diagram is not drawn accurately.
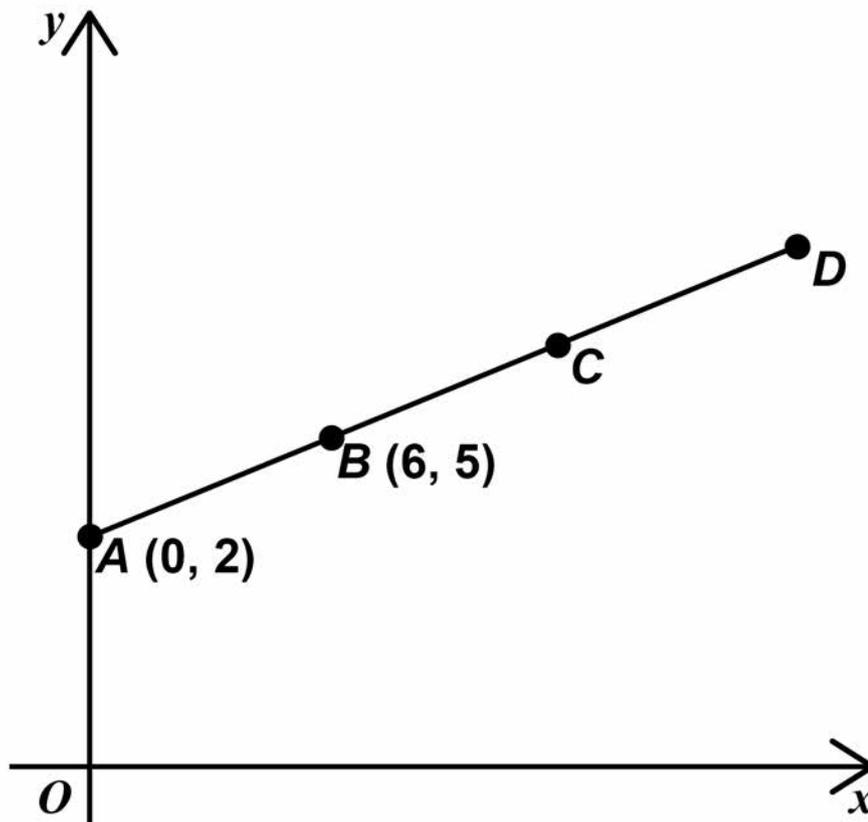
AB = BC = CD

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** $15\dfrac{1}{4}$

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

Work out the largest number. **[3 marks]**

_____

_____

_____

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_____

Answer _____

[Turn over]

10 y is inversely proportional to x.

Complete the table. [2 marks]

x	12	6	
y		4	8

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**
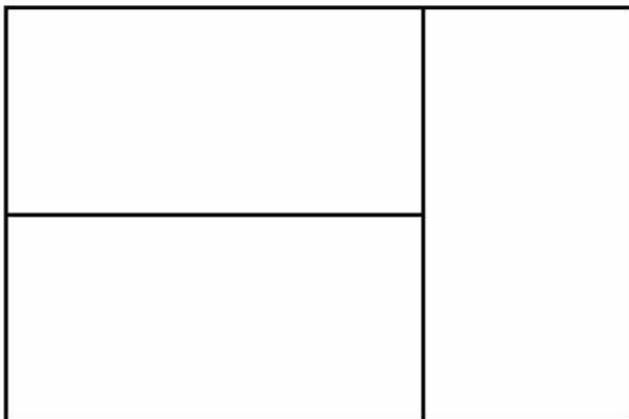
[Turn over]

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 mm^3   **1.5 mm^3**

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

[Turn over]   7

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

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

PATTERN B (two rows)
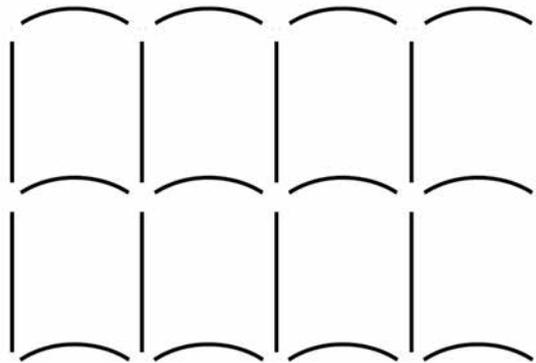
More rows are added to PATTERN B so that

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

How many rows are added? [2 marks]

Answer _____

BLANK PAGE

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]

_____

_____

_____

_____

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_____

_____

_____

Answer £ _____

[Turn over]

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

17 **Here is a triangle.**

The diagram is not drawn accurately.
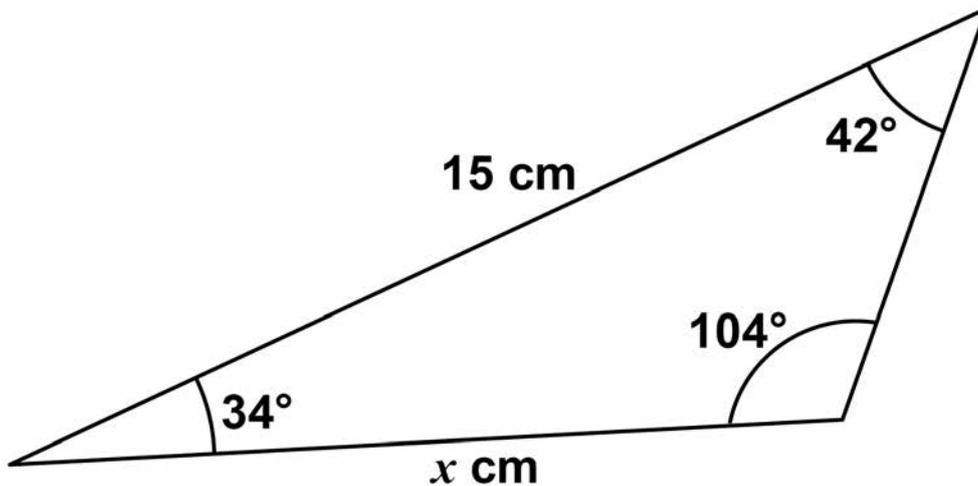
Circle the correct equation. [1 mark]

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

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

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

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

[Turn over]

5

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

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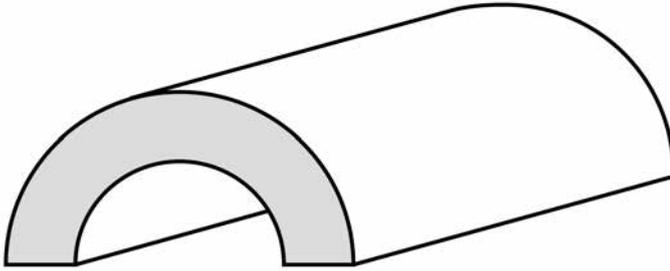
The diagram below shows the cross section of the tunnel.

The diagram is not drawn accurately.
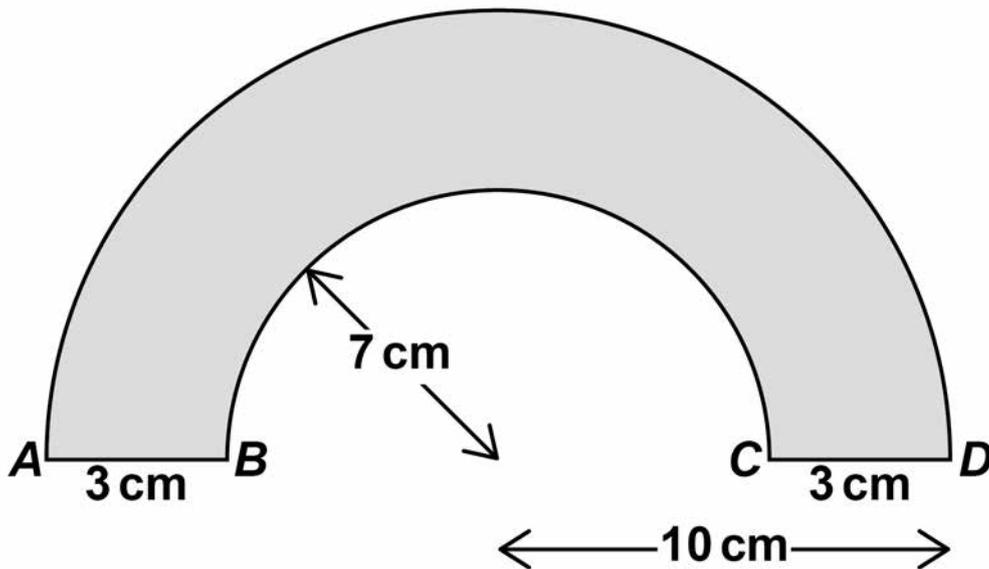
AD **is a semicircular arc of radius 10 cm**
BC **is a semicircular arc of radius 7 cm**
The length of the tunnel is 30 cm

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

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

_____

_____

_____

_____

_____

_____

Answer _____ cm^2

[Turn over]

5

19   **Type A batteries and type B batteries were tested.**

The cumulative frequency diagram shows information about the battery life of type A, on page 27.

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
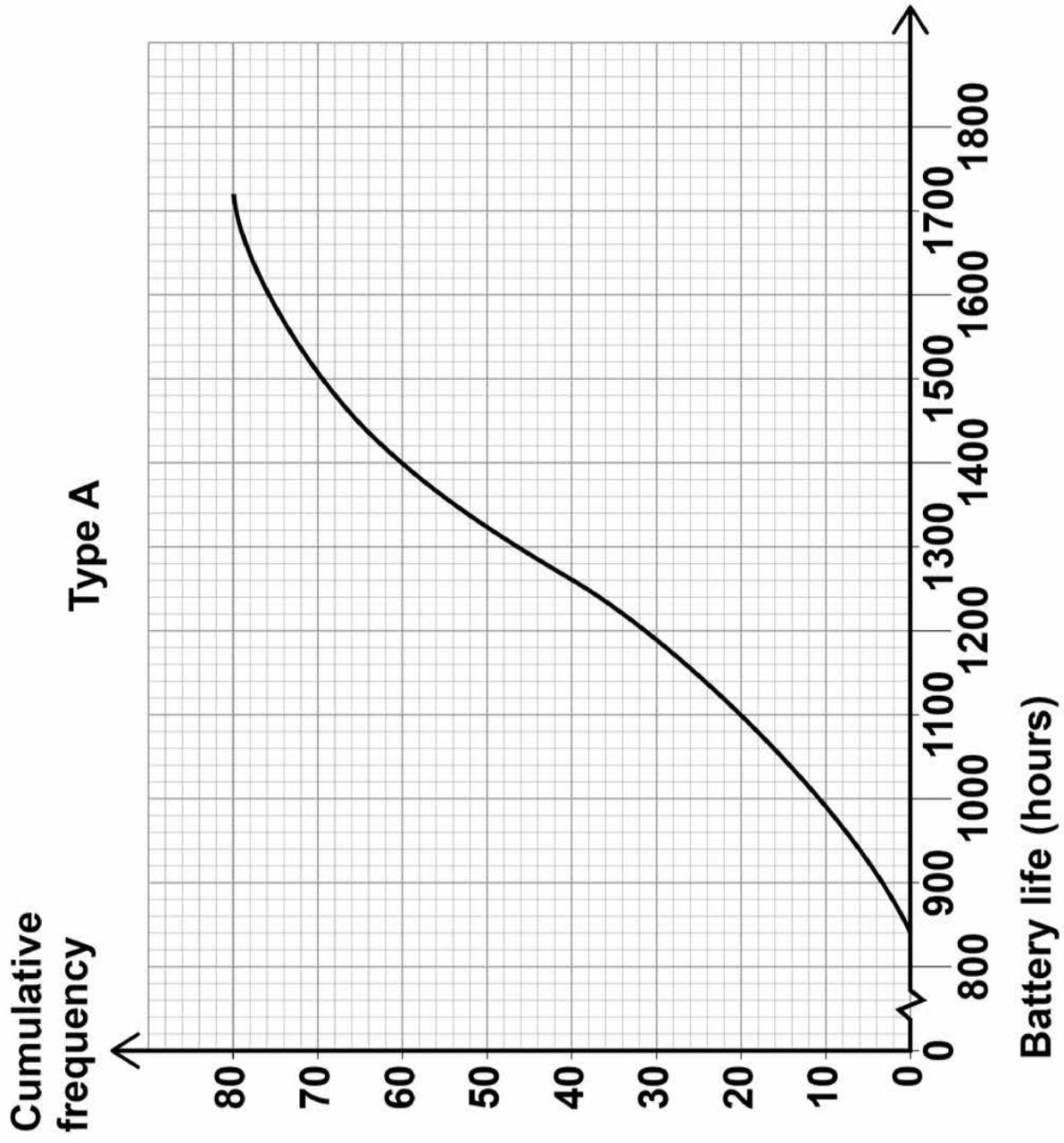
Type A
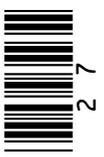
Battery life (hours)

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

Type B
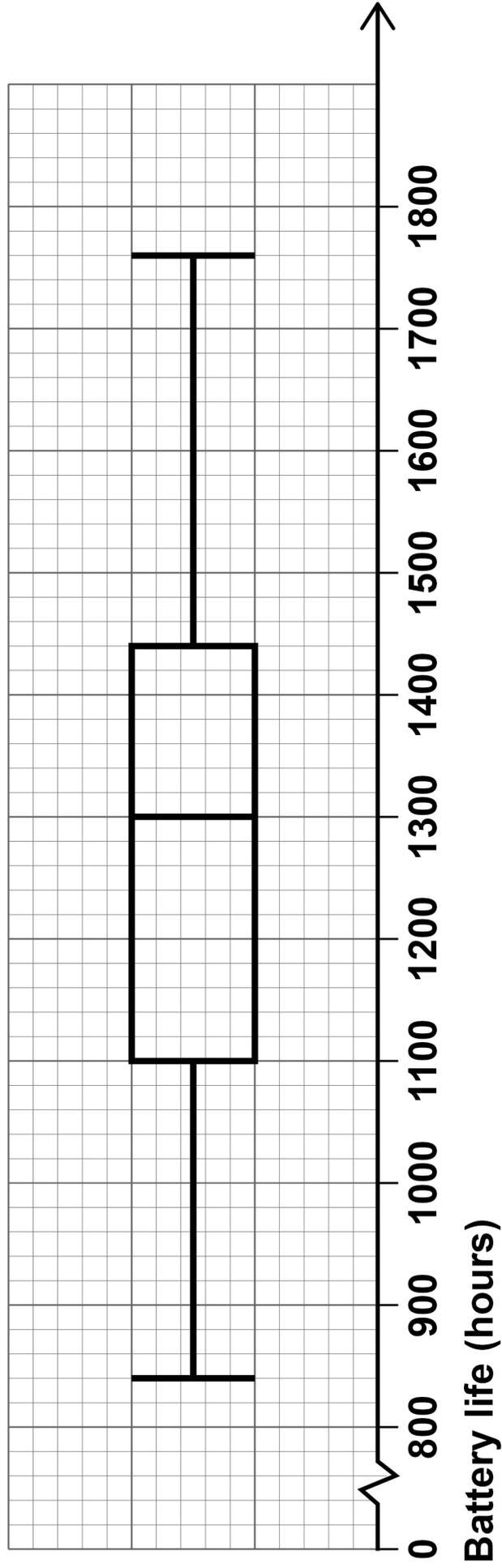
Battery life (hours)

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]
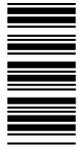
_a_ = _____

_b_ = _____

[Turn over]

21 **Enlarge triangle *ABC* by scale factor –2,
centre (4, 1)
[2 marks]**
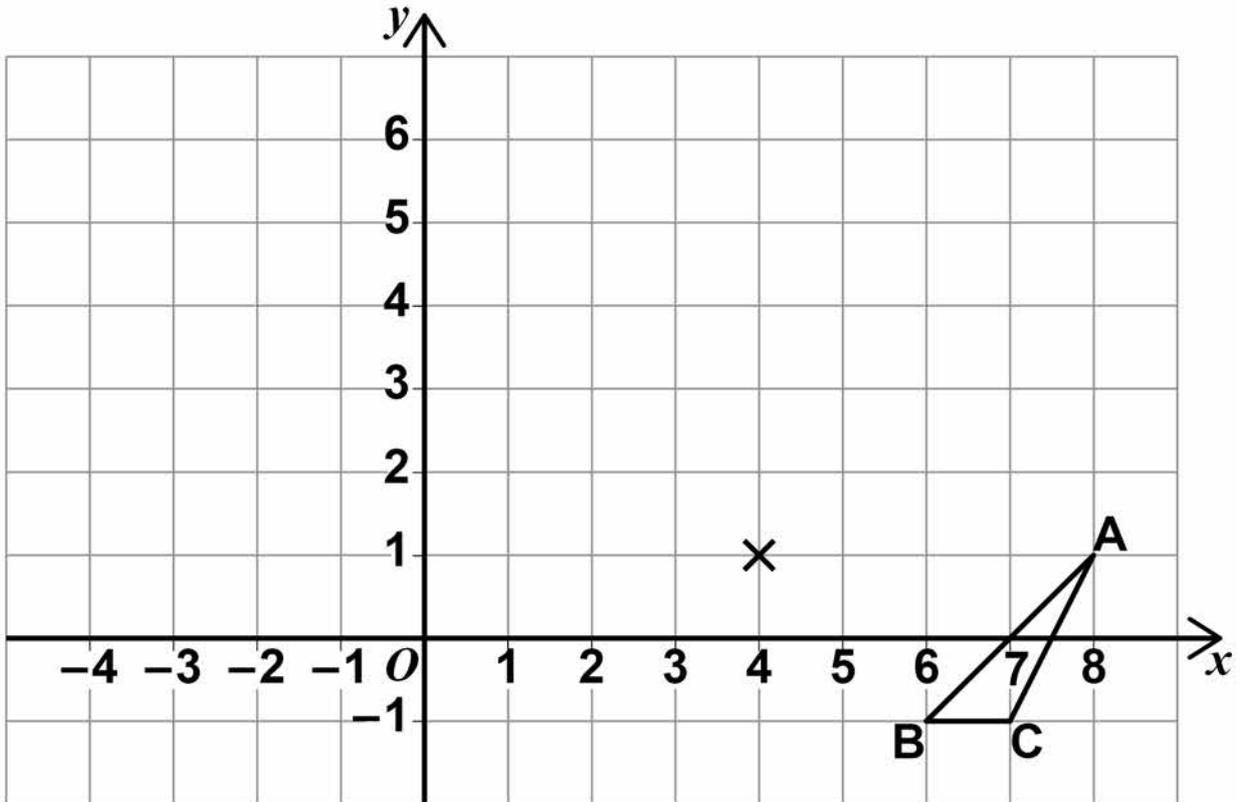
22
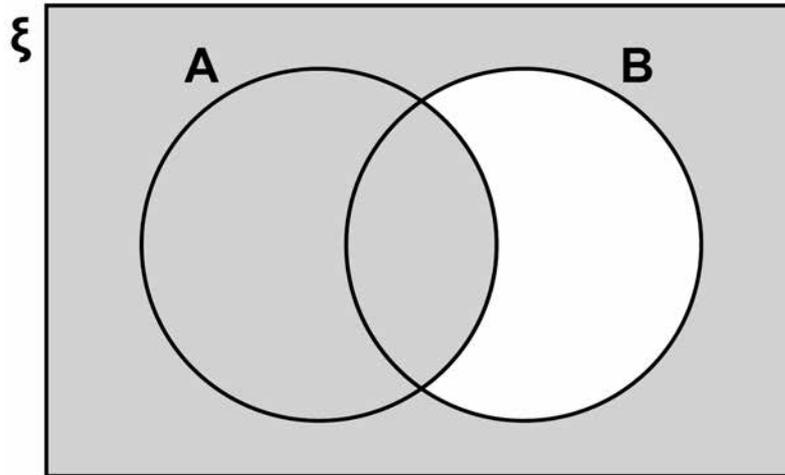
Which of these represents the shaded region?
Circle your answer. [1 mark]

A ∩ B$^{\prime}$ B$^{\prime}$ A U B$^{\prime}$ A$^{\prime}$ U B$^{\prime}$

[Turn over]

7

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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Answer

[Turn over]

24 (a) **Work out the value of** $\quad 2^{14} \div \left(2^9\right)^2$

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 _____

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[Turn over]

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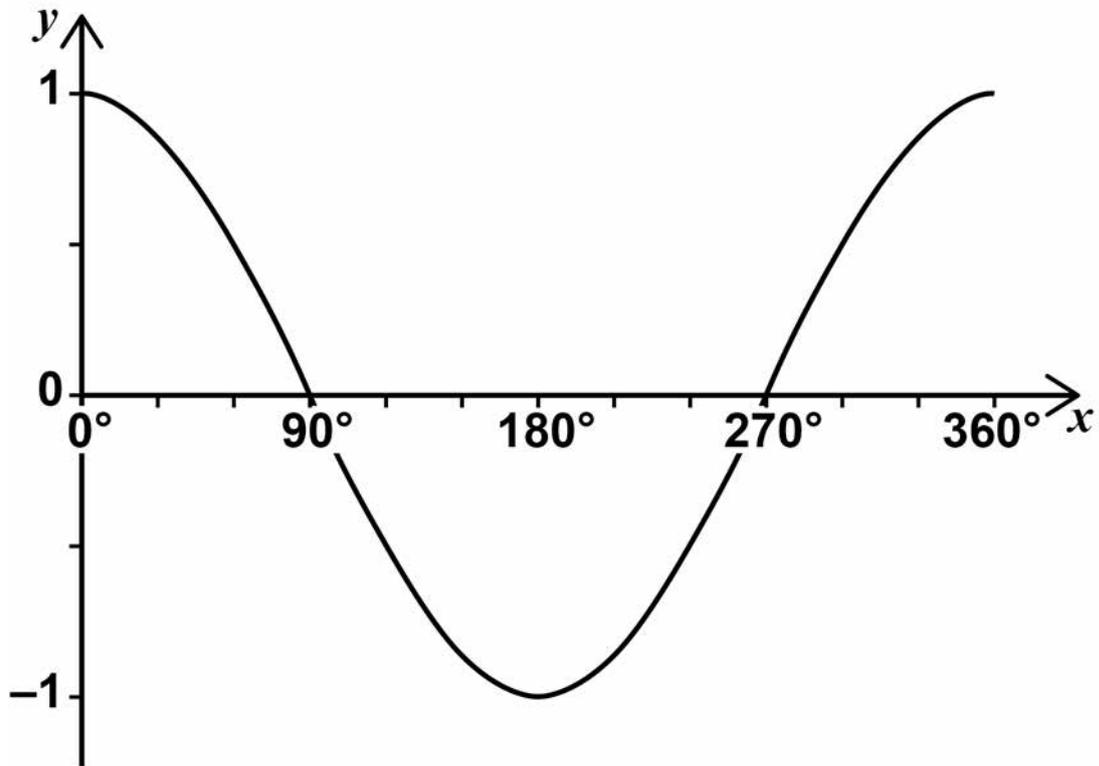
25 (a) $\cos x = \cos 60°$

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 _____ : _____ : _____

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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** $\sqrt{80} + \sqrt{2\dfrac{2}{9}}$

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.**
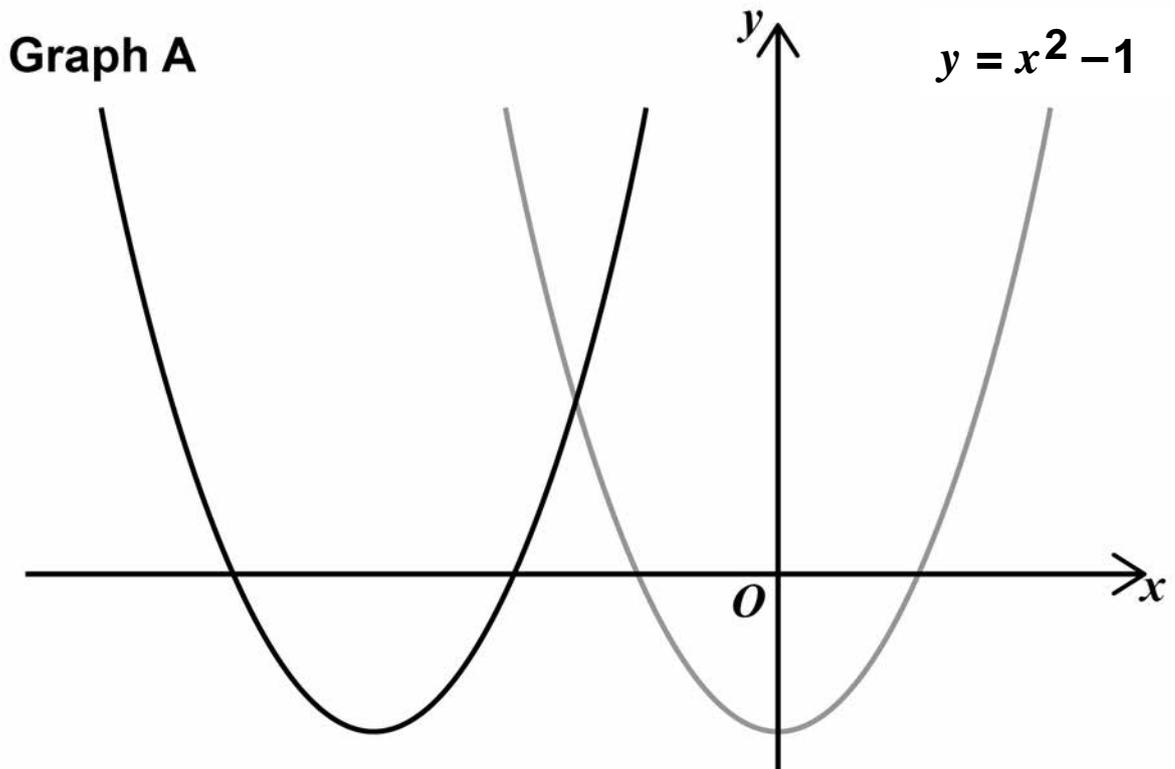
Graph A

$y = x^2 - 1$

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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_____

$b =$ _____

$c =$ _____

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]

4 7

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

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IB/M/Jun18/IK/8300/1H/E6