Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE MATHEMATICS

H

Higher Tier Paper 1 Non-Calculator

Thursday 24 May 2018 Morning Time allowed: 1 hour 30 minutes

Materials

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.
- Fill in the boxes at the top of this page.
- 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
TOTAL	

Do not write outside the box

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]

$8a^2 + 2a$ $12a^2$ $5a - 4a^2$ $3a - 6a^2$

Do not write outside the box

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 _____

Turn over for the next question

6

Do not write outside the box

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.

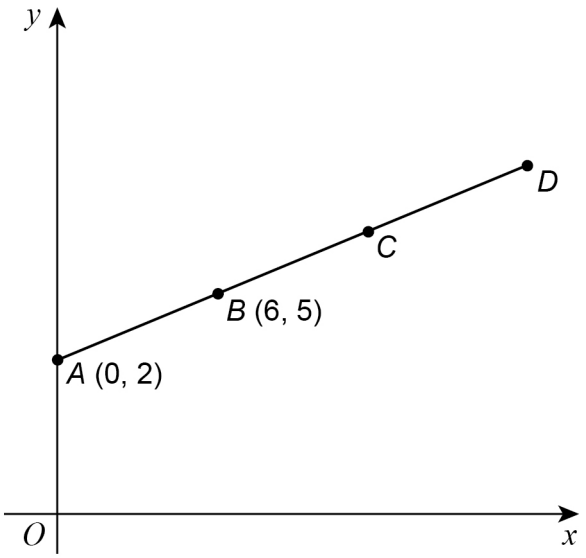
Give your answer in its simplest form.

[3 marks]

Answer _____

Do not write outside the box

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



Not drawn accurately

AB = *BC* = *CD*

Work out the coordinates of *D*.

[3 marks]

Answer (_____ , _____)

Turn over for the next question

6

Do not write outside the box

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]

_____

_____

_____

Do not write outside the box

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 for the next question

7

Do not write outside the box

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

Not drawn accurately

The perimeter of one small rectangle is 15 cm

Work out the perimeter of the large rectangle.

[4 marks]

Answer _____ cm

Do not write outside the box

12 Put these numbers in order from smallest to largest.

8×10^{-4} 4×10^{-2} 6×10^{-4} 0.07

[2 marks]

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 for the next question

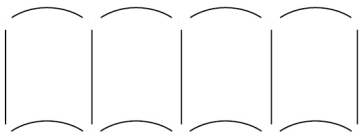
7

Do not write outside the box

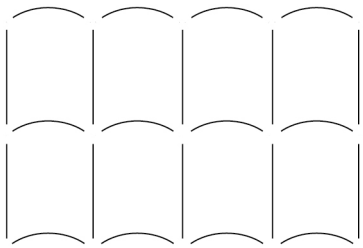
14 Patterns are made using straight lines and arcs.

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 _____

Do not write outside the box

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 £_____

Turn over for the next question

5

Do not write outside the box

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 _____

Do not write outside the box

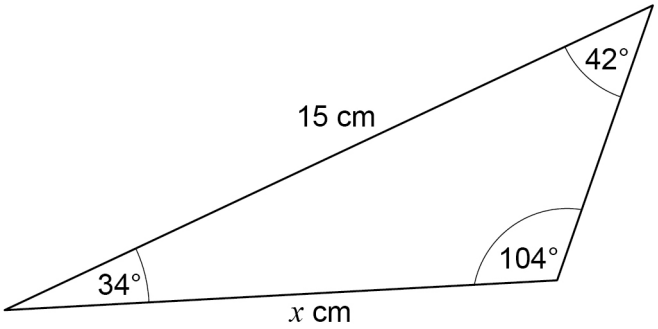
16 The value of y is 20% more than the value of x.

Circle the ratio $x : y$

[1 mark]

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

17 Here is a triangle.



Not drawn accurately

Circle the correct equation.

[1 mark]

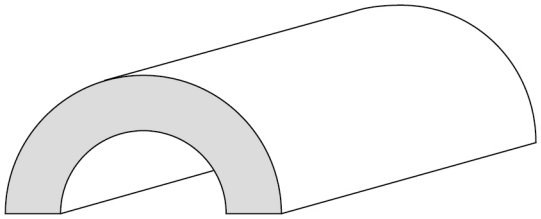
$\frac{\sin x}{42} = \frac{\sin 15^\circ}{104}$ $\frac{x}{\sin 42^\circ} = \frac{15}{\sin 104^\circ}$

$\frac{\sin x}{34} = \frac{\sin 15^\circ}{104}$ $\frac{x}{\sin 42^\circ} = \frac{15}{\sin 34^\circ}$

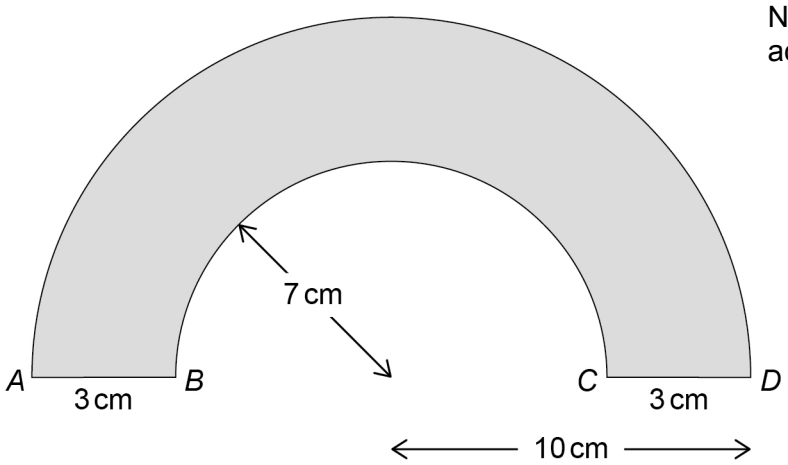
5

Do not write outside the box

18 Here is a tunnel for a toy train.



The diagram below shows the cross section of the tunnel.



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]

Do not write outside the box

Answer _____ cm^2

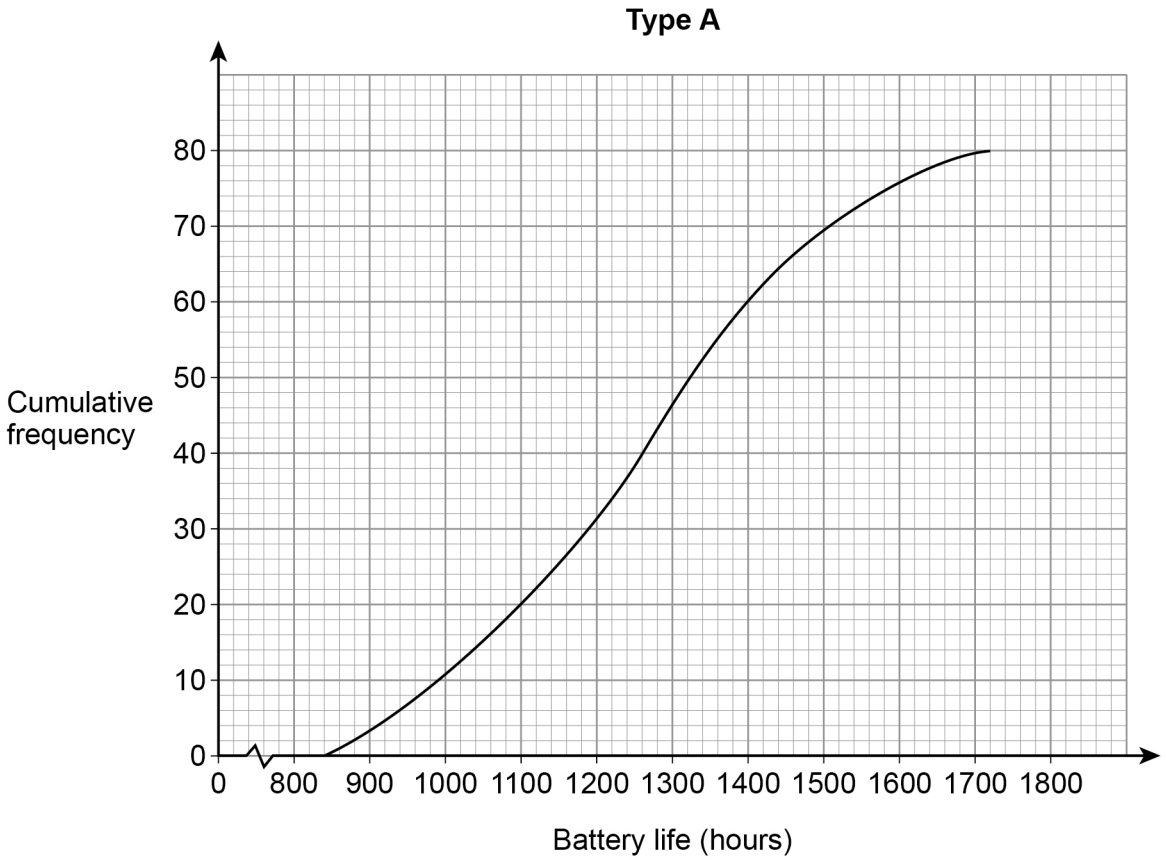
5

Turn over ►

Do not write outside the box

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

Do not write outside the box

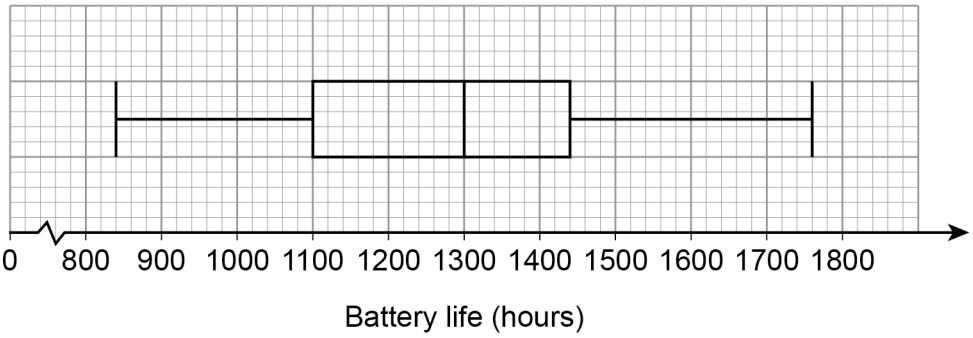
19 (b) Estimate the number of type A batteries that had a battery life of more than 1600 hours.

[1 mark]

Answer _____

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

Type B



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

Turn over ►

Do not write outside the box

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]

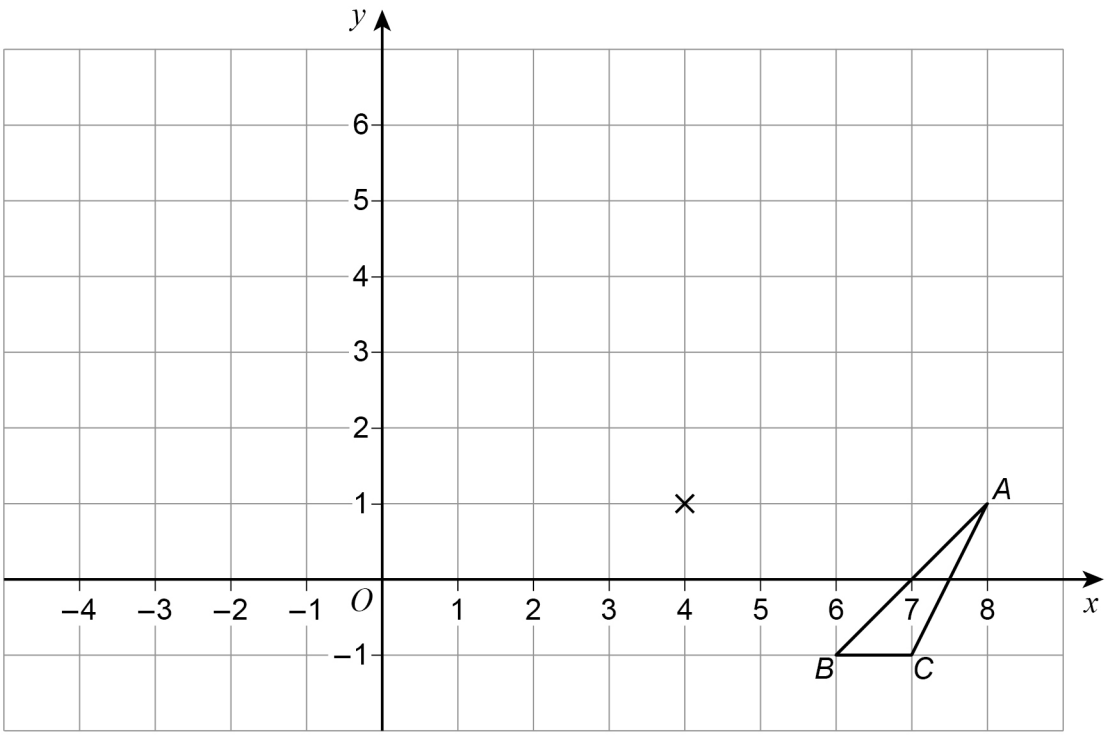
a = _____

b = _____

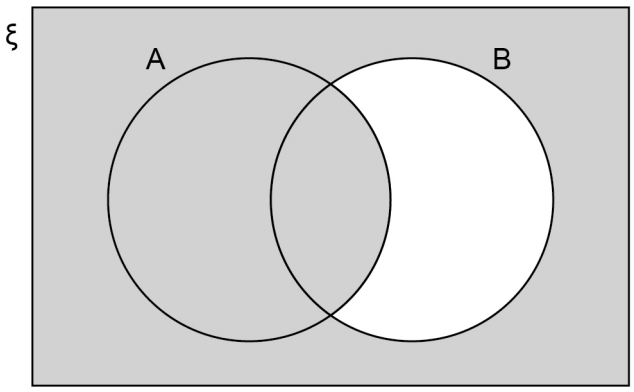
Do not write outside the box

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]

$A \cap B'$ B' $A \cup B'$ $A' \cup B'$

7

Turn over ►

Do not write outside the box

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 _____

Do not write outside the box

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]

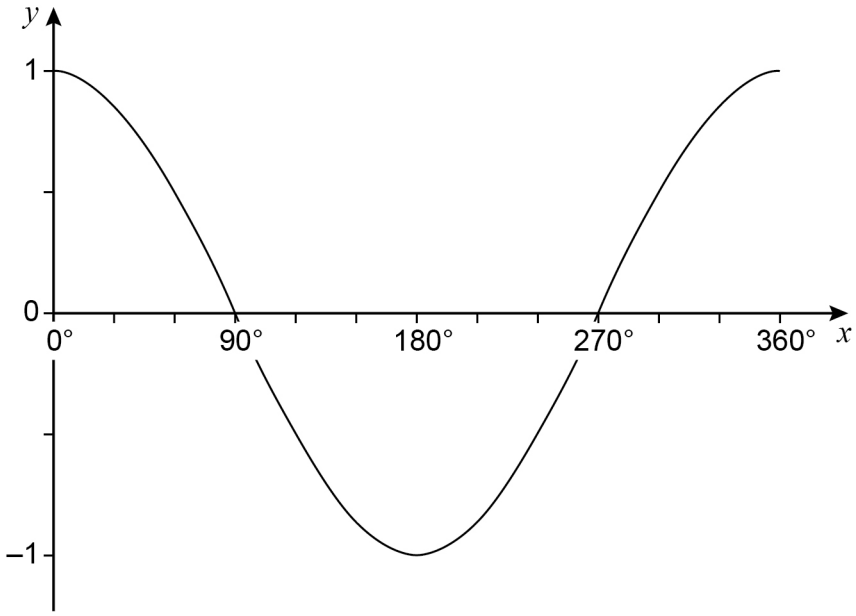
Answer _____

Turn over for the next question

8

Do not write outside the box

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

Do not write outside the box

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 _____ : _____ : _____

Turn over for the next question

5

Do not write outside the box

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]

Do not write outside the box

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 _____

Turn over for the next question

7

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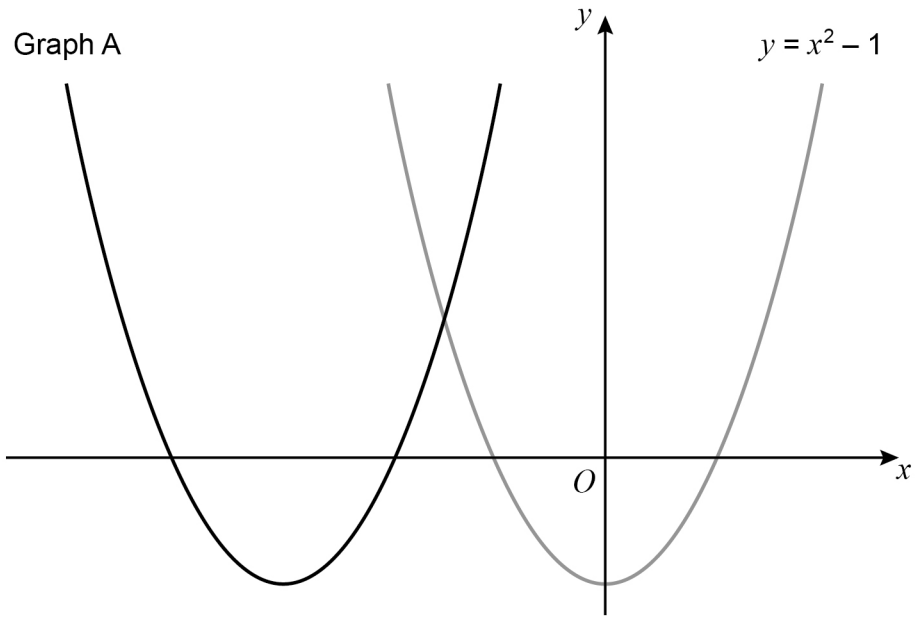
29 Here are sketches of two graphs.



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 = _____

Do not write outside the box

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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There are no questions printed on this page

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