Surname

Other Names

Candidate Signature

Methods in Mathematics (Linked Pair Pilot)   **93652H**

Unit 2   Geometry and Algebra

Tuesday 21 June 2011   1.30 pm to 3.00 pm

H

	For Examiner's Use
	Examiner's Initials
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
TOTAL	

Time allowed
- 1 hour 30 minutes

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 space 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 that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Questions 1, 10 and 21. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

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

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$
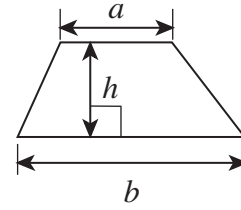
Volume of prism = area of cross-section × length
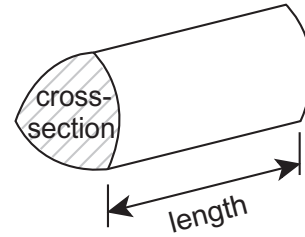
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$
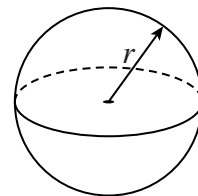
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$
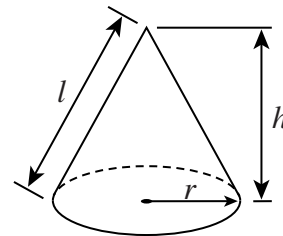
In any triangle ABC

Area of triangle = $\frac{1}{2}ab \sin C$

Sine rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$
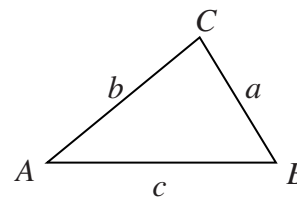
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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

*1 Increase £480 by 3.5%.

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Answer £ .... *(3 marks)*

2 In a class there are 32 students.

23 take History.

15 take French.

6 do **not** take either of these subjects.

2 (a) Use this information to fill in the Venn diagram below.

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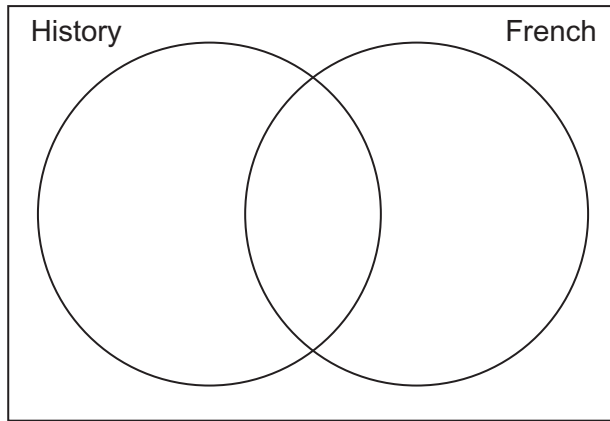
(3 marks)

2 (b) How many students take French but not History?

....

Answer .... *(1 mark)*

7

3 Here is a tile.
The length of the tile is 4 times its width.

Length
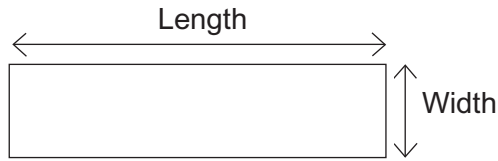
Width

Six tiles are put together as shown.
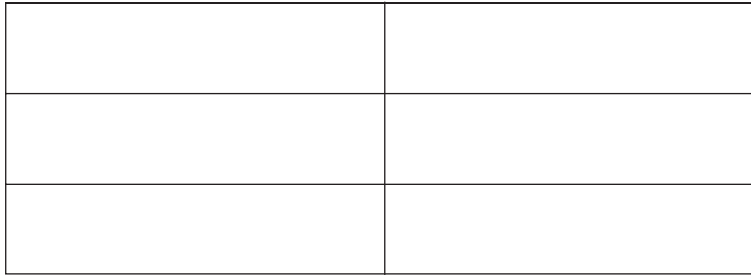
Not drawn accurately

The perimeter of the whole shape is 55 cm.

Work out the width of a tile.

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Answer .... cm   *(3 marks)*

4 (a) Calculate the circumference of a circle with diameter 13 cm.

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Answer .... cm   *(2 marks)*

4 (b) Calculate the area of a circle with radius 9 cm.

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Answer .... cm^2 *(2 marks)*

5 Expand and simplify $(x - 4)(x + 1)$

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Answer ....   *(2 marks)*

Turn over for the next question

9

Turn over ▶

6   Here is a number machine.
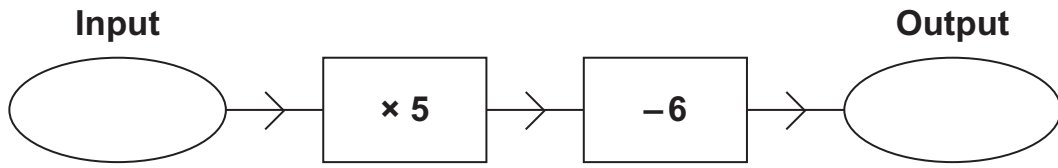
Input   **Output**

6 (a)   What is the output when the input is –3?

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Answer ....   *(1 mark)*

6 (b)   Here is a graph of $y = 5x - 6$
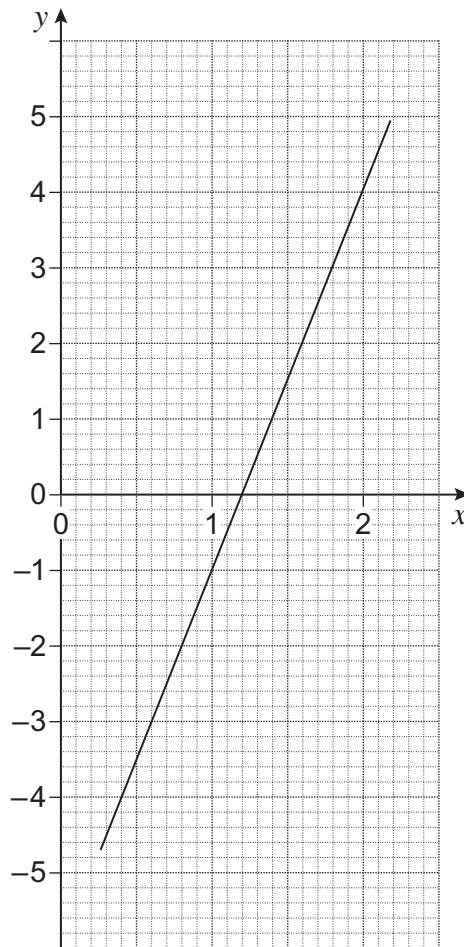
Find the input value for the number machine that gives the same output value.
You **must** show clearly how you obtain your answer.

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Answer ....   *(2 marks)*

7 Shapes A and B are shown on the grid.
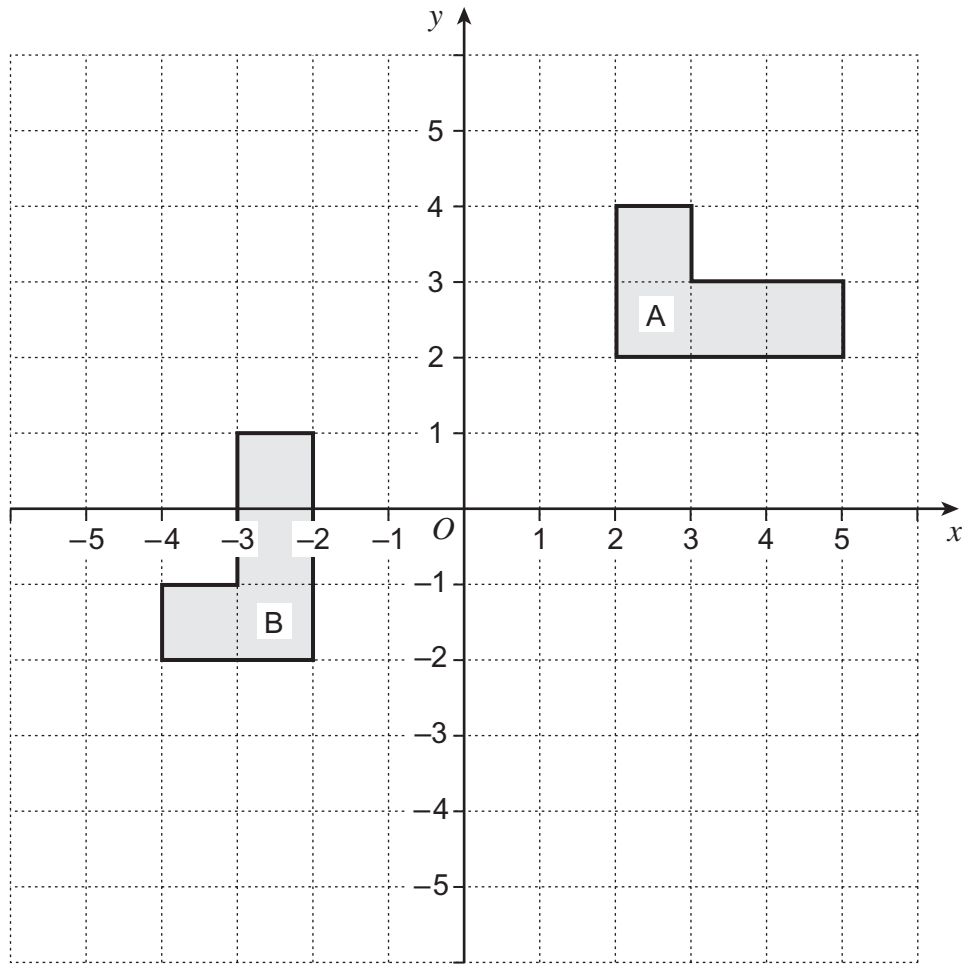
7 (a) Reflect shape A in the line $y = 1$

(2 marks)

7 (b) Describe fully the **single** transformation that maps shape A to shape B.

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Answer .... *(3 marks)*

8

Turn over ▶

8   On this centimetre square grid, *A* and *B* are two vertices of a kite.
The diagonals of the kite meet at (3, 4).
The area of the kite is 10 cm².

Draw the kite on the grid.
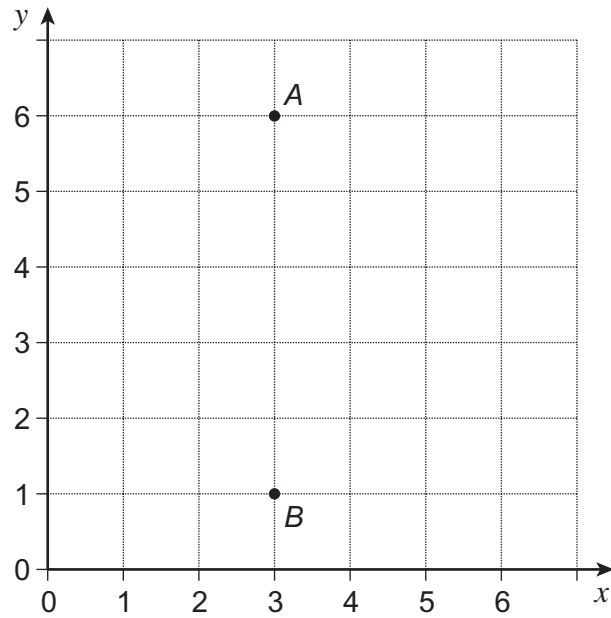
(3 marks)

9 On the grid are two triangles A and B.
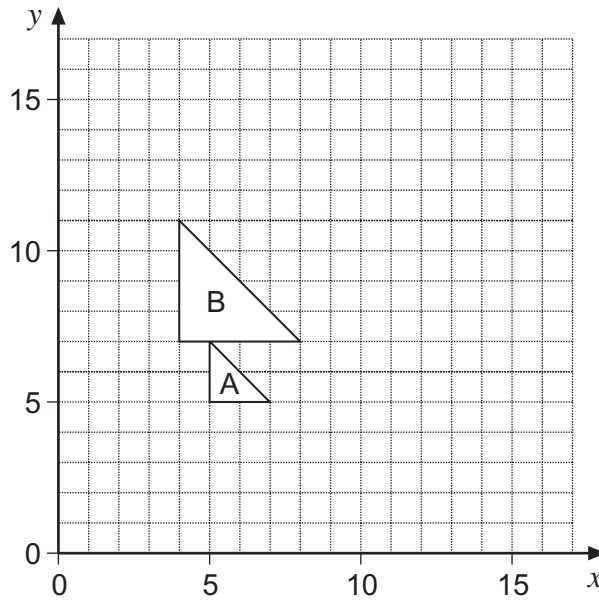
Triangle C, not shown on the diagram, is an enlargement of triangle B with scale factor 2, centre of enlargement (0, 9).

What is the scale factor and centre of enlargement that maps triangle A to triangle C?

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Answer   Scale factor...

Centre   (......................., ...)   *(4 marks)*

Turn over for the next question

7

Turn over ▶

10 (a) Solve the equation $\dfrac{10}{x} = 2$

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Answer x = ... *(1 mark)*

10 (b) Solve the equation $7y - 8 = 4 - 2y$

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Answer y = ... *(3 marks)*

*10(c) Solve the equation $\dfrac{w + 2}{3} - \dfrac{w - 4}{7} = 1$

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Answer w = ... *(5 marks)*

11   Use your calculator to work out   sin(cos^{-1} 0.6372)

11 (a)   Write down your full calculator display.

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Answer ....   *(1 mark)*

11 (b)   Give your answer to part (a) to 3 significant figures.

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Answer ....   *(1 mark)*

12 (a)   The nth term of a sequence is given by $n^2 - n + 4$

Work out the first 5 terms of the sequence.

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Answer .... , ... , ... , ... , ...   *(2 marks)*

12 (b)   Work out the 25th term of the sequence 2, 3, 5, 8, 12, ...

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Answer ....   *(2 marks)*

Turn over for the next question

15

13 (a) Calculate the length x in the triangle.

Not drawn accurately

18 cm

13 cm

x

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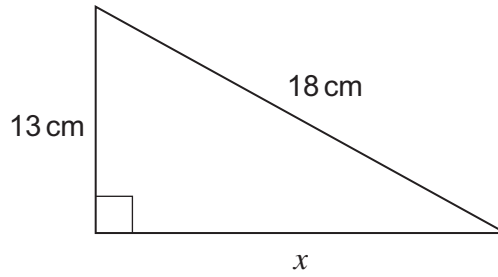
Answer .... cm   *(3 marks)*

13 (b) Calculate the length x in the triangle.

Not drawn accurately

x

12 cm

42°

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Answer .... cm   *(3 marks)*

14 The diagram shows a regular nonagon and a regular hexagon joined at side *XY*.
The straight line *ABD* passes through the vertex *C* of the hexagon.

Not drawn accurately

Calculate the size of angle *ECD*.

You **must** show your working.

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Answer .... degrees   *(5 marks)*

11
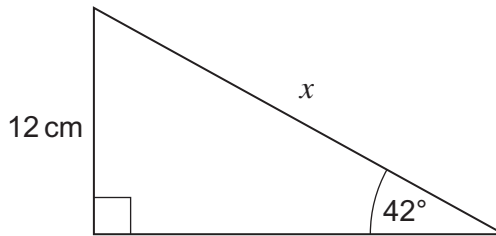
15 Write the quadratic expression $x^2 + 6x - 5$ in the form $(x + a)^2 - b$

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Answer .... *(2 marks)*

16 *AB* and *CD* are two chords of a circle that intersect at *X*.

CX = 9 cm, *DX* = 16 cm.

AX = *BX*
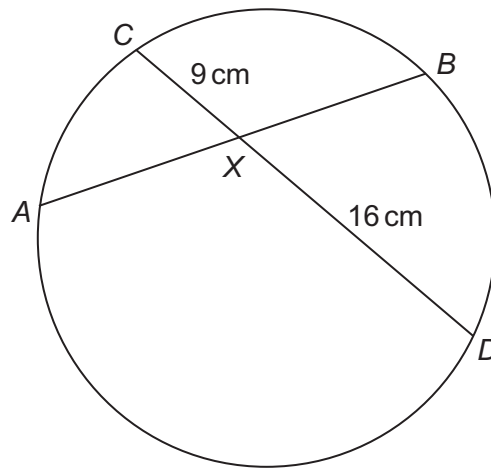
Not drawn accurately

Work out the length of *AX*.

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Answer .... cm *(2 marks)*

17   Work out the size of angle *QRP*.

Not drawn accurately

Q

85°

11 cm

P

18 cm

R

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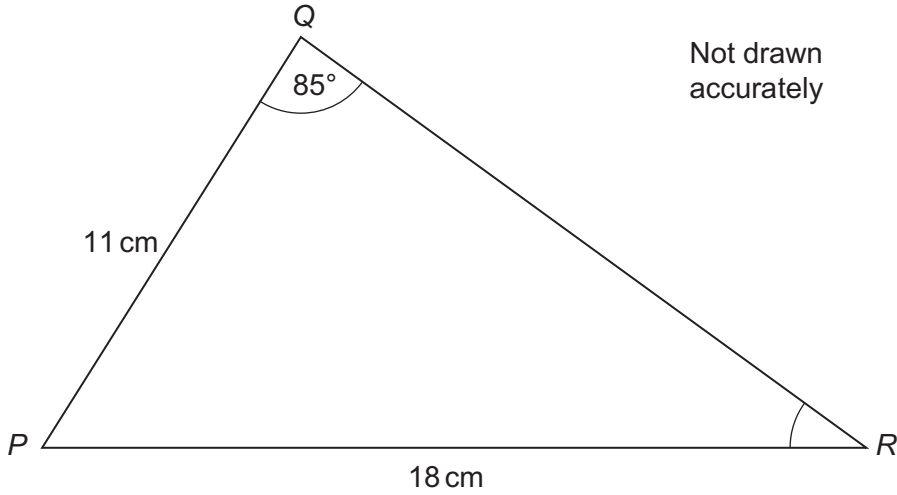
Answer .... degrees   *(3 marks)*

18   Simplify fully $\dfrac{4x^2 - 9}{2x^2 - 7x - 15}$

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Answer ....   *(4 marks)*

11

Turn over ▶

19 The ratio of men to women in a running club is 5 : 3

After a group of 6 women join the club the percentage of women in the club goes up to 40%.

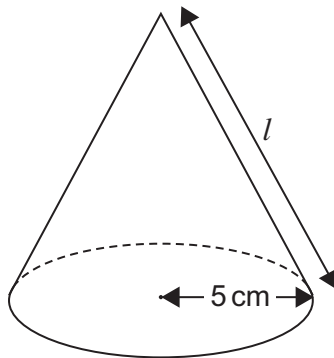How many people were in the club before the women joined?

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Answer .... *(4 marks)*

20 A cone has a base radius of 5 cm and a slant height l.

The **total** surface area is 220 cm^2.

Not drawn accurately

l

5 cm

Calculate the value of l.

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Answer .... cm *(3 marks)*

*21 The diagram shows the points O, P, Q, R, M and N.

$\overrightarrow{OP}$ = **a**, $\overrightarrow{OQ}$ = **b** and $\overrightarrow{QR}$ = 3**b**

$PM : MQ = 2 : 1$

$PN : NR = 1 : 2$

Not drawn accurately
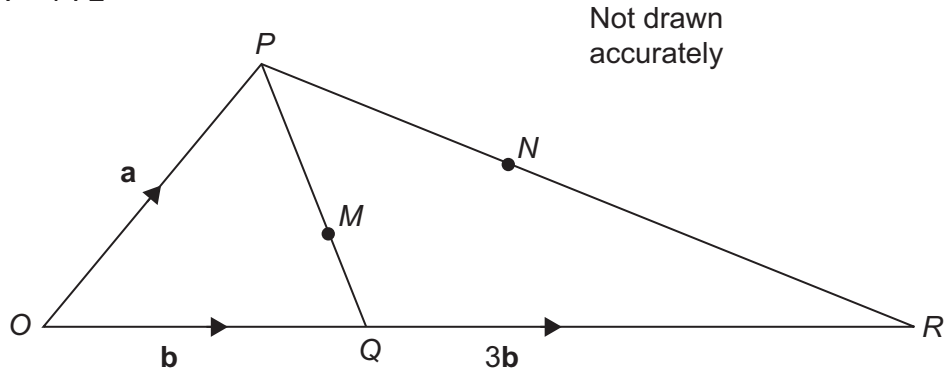
21 (a) $\overrightarrow{PQ}$ = **b** − **a**

Show that $\overrightarrow{OM}$ = $\frac{1}{3}$ **a** + $\frac{2}{3}$ **b**

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(1 mark)

21 (b) Show that OMN is a straight line.

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(4 marks)

END OF QUESTIONS

12

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