



General Certificate of Secondary Education  
November 2023

Centre Number

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Candidate Number

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# Mathematics

Unit M8 Paper 2  
(With calculator)

Higher Tier

[GMC82]



\*GMC82\*

**THURSDAY 23 NOVEMBER, 10.45 am – 12 NOON**

## TIME

1 hour 15 minutes.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

**You must answer the questions in the spaces provided.**

**Do not write outside the boxed area on each page, on blank pages or tracing paper.**

Complete in black ink only. **Do not write with a gel pen.**

Answer **all thirteen** questions.

All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.

You **may** use a calculator for this paper.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 50.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

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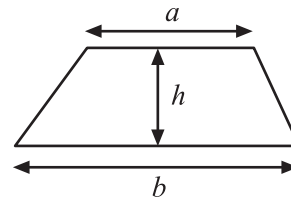
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# Formula Sheet

**Volume of prism** = area of cross section  $\times$  length



**Area of trapezium** =  $\frac{1}{2}(a+b)h$



**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**Surface area of sphere** =  $4\pi r^2$

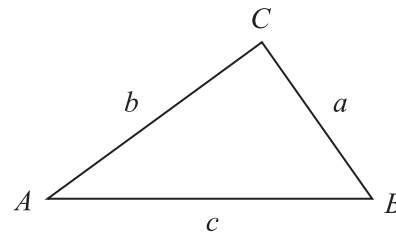


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

**Curved surface area of cone** =  $\pi r l$



**In any triangle ABC**



**Quadratic Equation**

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

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

**Sine Rule:**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule:**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



1 Simplify  $(x^5)^3$

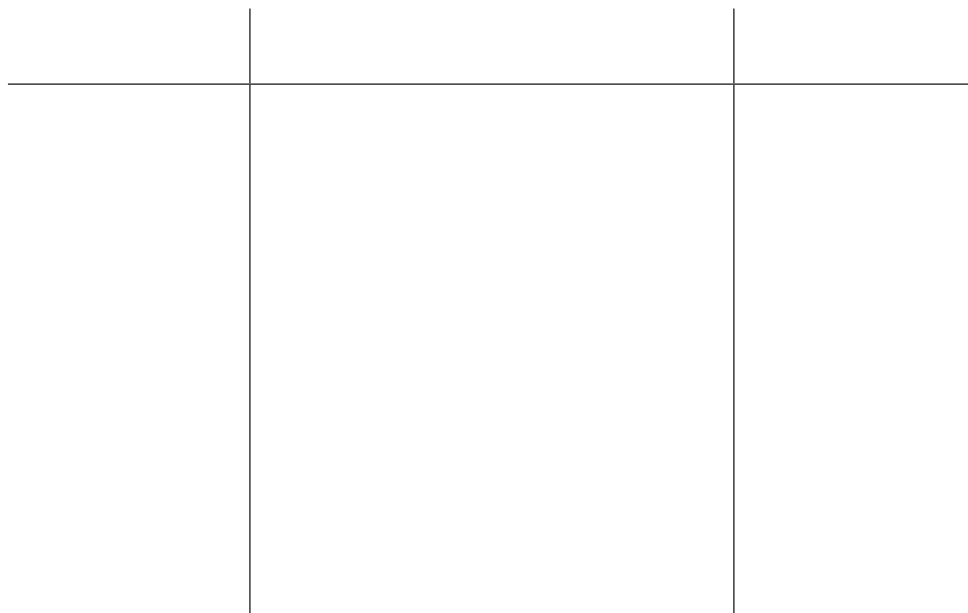
Answer \_\_\_\_\_ [1]

2 Use trial and improvement to find a solution of the equation

$$x^2 + \frac{x}{2} = 15$$

Give your answer correct to 1 decimal place.

**You must show all your working.**



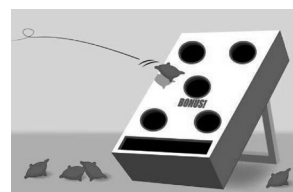
Answer  $x =$  \_\_\_\_\_ [4]

[Turn over



3 Kate plays the game “throw the bean bag”.

She records the number of times she gets the bean bag in the bonus hole.



<b>Total number of throws</b>	10	30	100	200
<b>Total number of times in the bonus hole</b>	2	8	49	104

(a) Write down the best estimate of the probability that Kate gets the bean bag in the bonus hole if she continues throwing.

Give a reason for your answer.

Answer \_\_\_\_\_

because \_\_\_\_\_

\_\_\_\_\_ [2]

(b) Kate continues with her game and throws it a total of 300 times.

Calculate the number of times you would expect her to get the bean bag in the bonus hole.

Answer \_\_\_\_\_ [2]





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**(Questions continue overleaf)**

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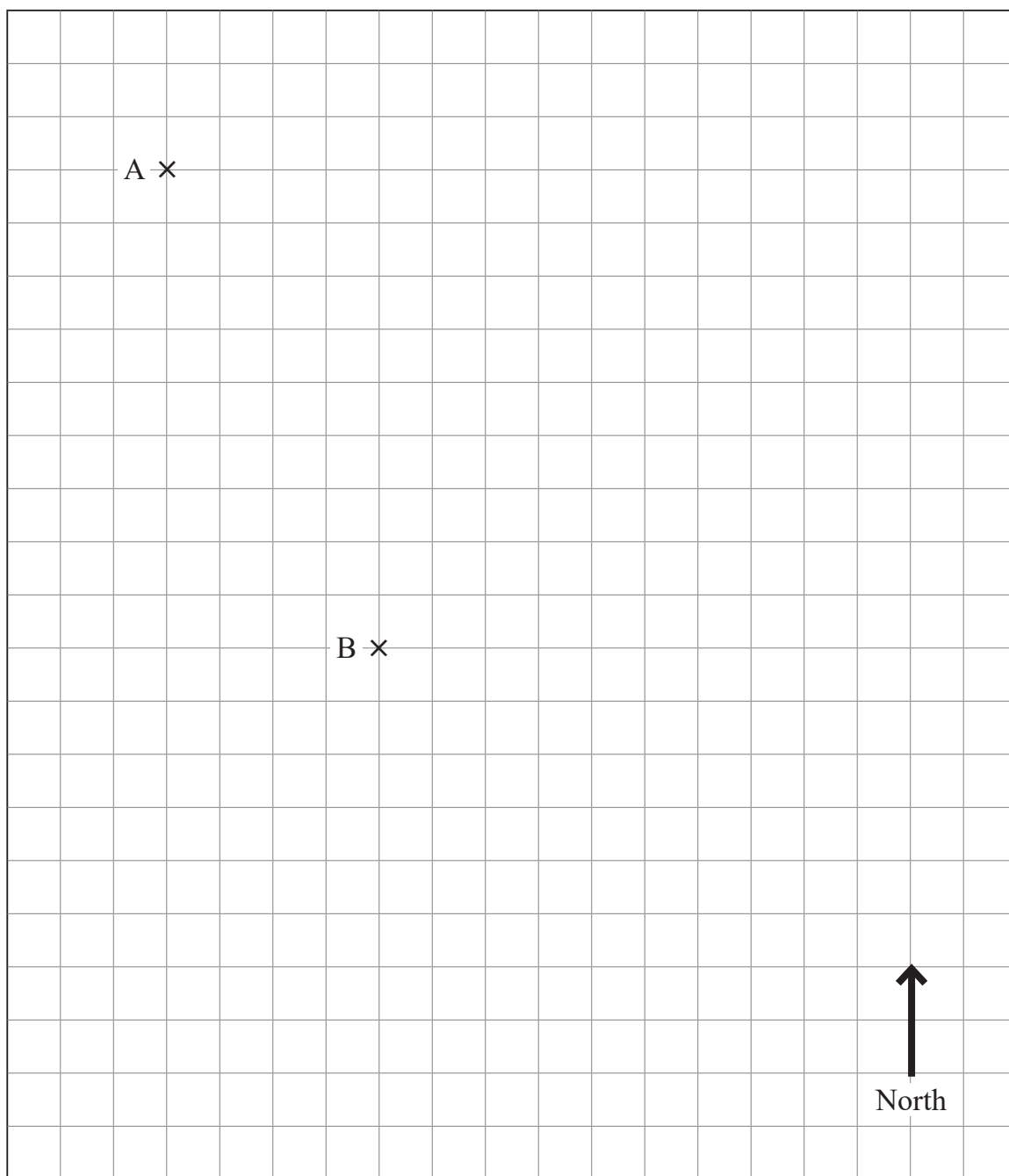


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4 The position of two Airport Control Towers, A and B, are shown.

(a) What is the bearing of B from A?

Answer \_\_\_\_\_ ° [1]



(b) The two towers pick up a distress signal from a plane.

The bearing of the plane from A is  $110^\circ$

The bearing of the plane from B is  $050^\circ$

Find and mark the position of the plane with a P on the diagram.

[2]

[Turn over

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5 Pete orders cold meals and hot meals on Monday, Tuesday and Wednesday.

On Monday he got 16 cold meals and 3 hot meals.

He paid £74

On Tuesday he got 20 cold meals and 7 hot meals.

He paid £112

On Wednesday he got 10 cold meals and 8 hot meals.

Work out what Pete paid for the meals on Wednesday.

A solution by trial and improvement will not be accepted.

Answer £ \_\_\_\_\_ [6]

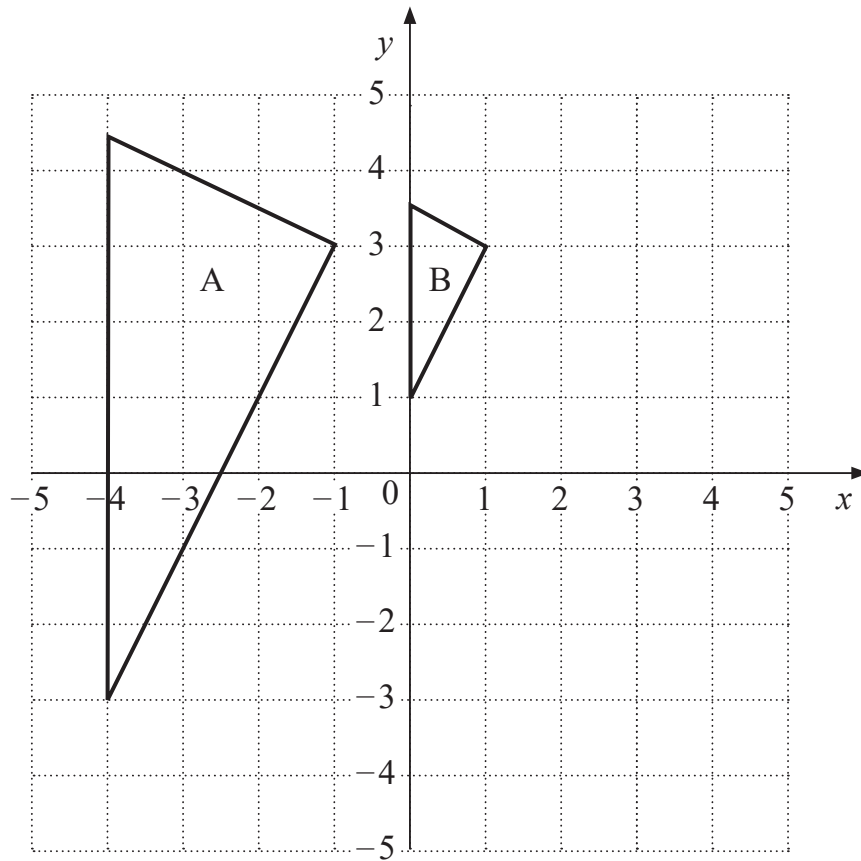


6 Rearrange to make  $z$  the subject of

$$x = \sqrt{yz}$$

Answer \_\_\_\_\_ [2]





- (a) Describe fully the transformation that maps A to B.

Answer \_\_\_\_\_ [3]

- (b) On the grid above, draw the enlargement of triangle B using centre (1, 2) and scale factor  $-2$  [3]



8 (a) £8000 is invested at 3% per annum compound interest.

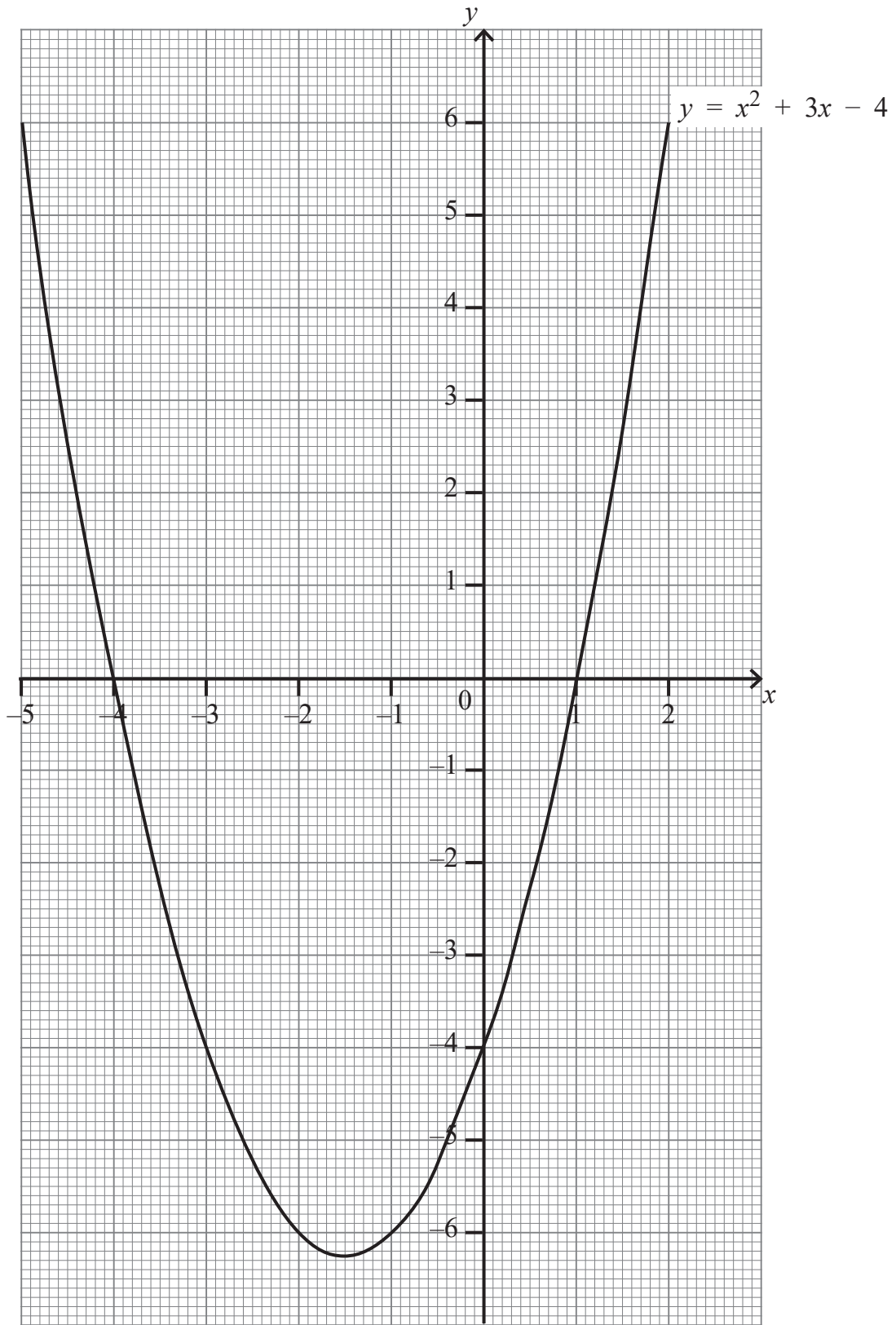
Complete the formula for the amount £A after  $n$  years.

$$A = 8000( \quad )^n \quad [1]$$

(b) Calculate the total **interest** earned after 4 years.

Answer £ \_\_\_\_\_ [2]





The graph of  $y = x^2 + 3x - 4$  is drawn opposite.

(a) (i) Use the graph to solve  $x^2 + 3x - 4 = 2x - 1$

Answer \_\_\_\_\_ [2]

(ii) In its simplest form, what quadratic equation has been solved in (i)?

Answer \_\_\_\_\_ [1]

(b) Use the graph to solve the equation  $x^2 + 3x - 7 = 0$

Answer \_\_\_\_\_ [2]

(c) To solve the equation  $x^2 - x - 5 = 0$ , what line should be drawn?

Answer \_\_\_\_\_ [2]

[Turn over



10 Each week Tom plays a game of chess and a game of backgammon.

The probability that he will win the chess game is  $\frac{3}{5}$

When he wins the chess game, the probability that he will win the backgammon game is  $\frac{3}{7}$

When he does not win the chess game, the probability that he will win the backgammon game is  $\frac{2}{7}$

Draw a tree diagram to represent all the outcomes and use it to find the probability that he wins at least one of the games that he plays.

Answer \_\_\_\_\_ [4]

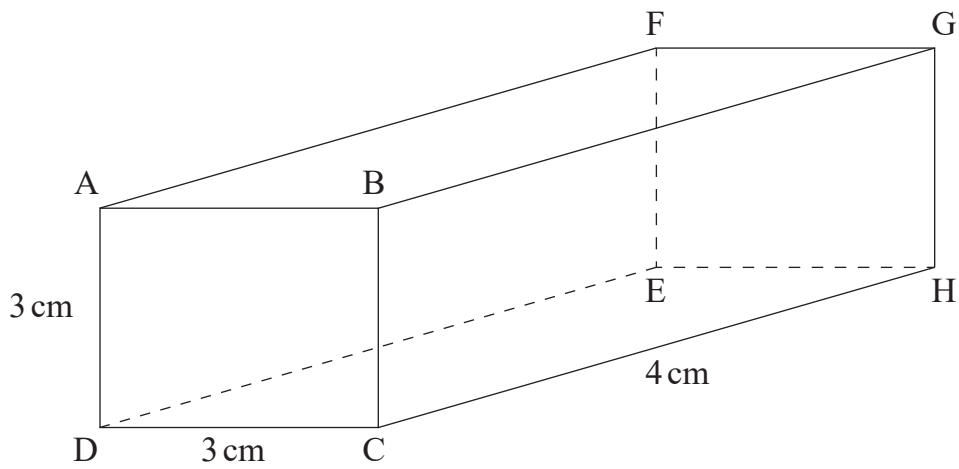


11 Simplify  $(\sqrt{x})^4 \times x^{-\frac{3}{2}}$

Answer \_\_\_\_\_ [2]



12 ABCDEFGH is a cuboid with sides 3 cm, 3 cm and 4 cm as shown.



Calculate the angle between the space diagonal DG and the base DCHE.

Answer \_\_\_\_\_ ° [3]



13

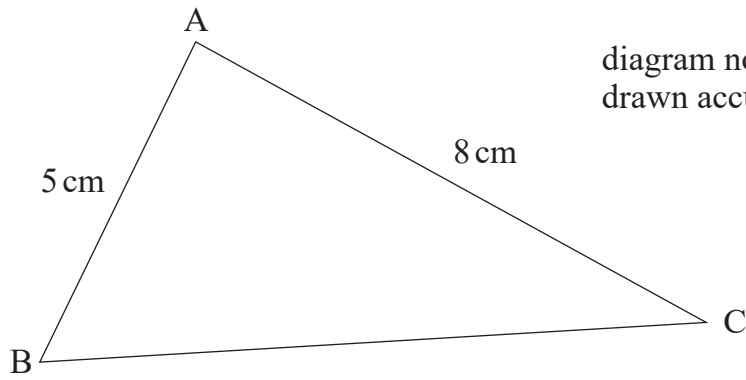


diagram not  
drawn accurately

The area of ABC is  $16 \text{ cm}^2$

Find the length of BC.

Answer \_\_\_\_\_ cm [5]

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Question Number	Marks
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<b>Total Marks</b>	
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Examiner Number

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