CAMBRIDGE
International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **9709/32**

Paper 3 Pure Mathematics 3 **February/March 2026**

1 hour 50 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

DC (CE/CB) 358744/3

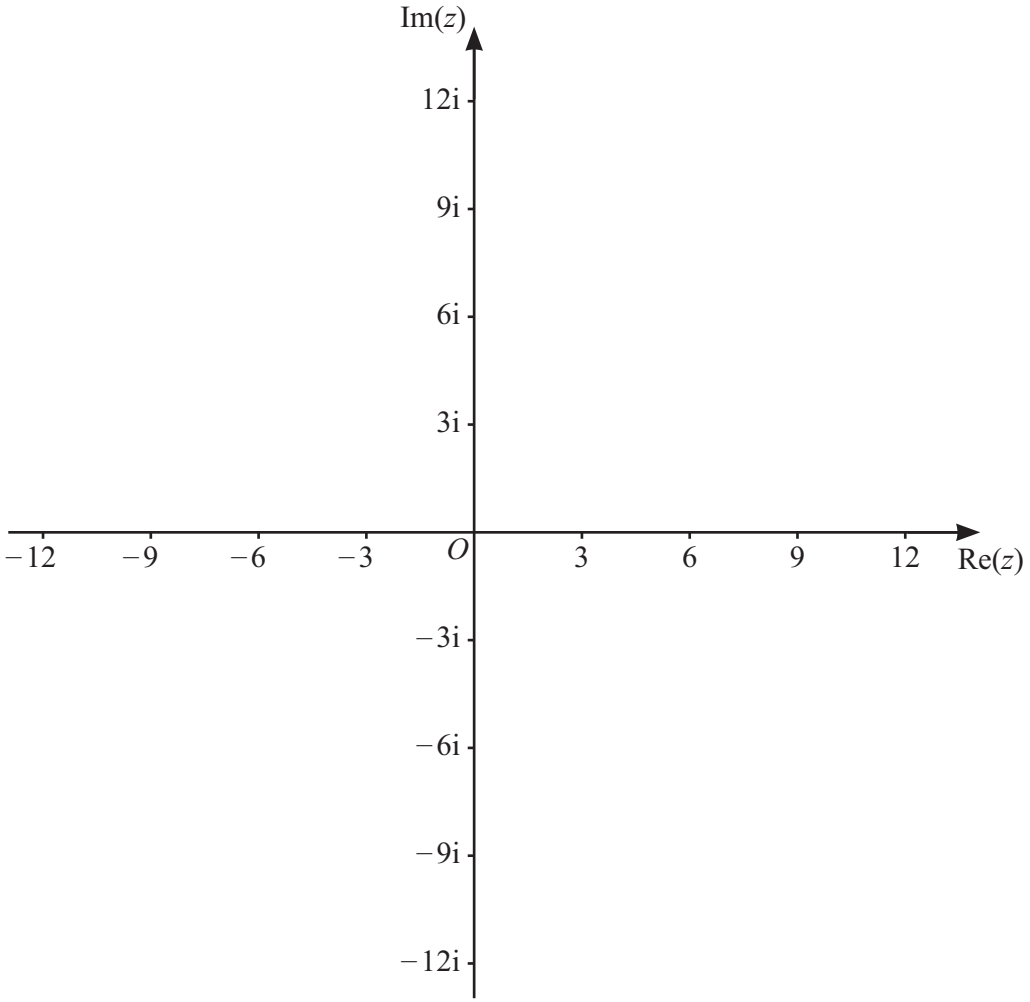
[Turn over

1 Solve the equation $4\times 2^{x+2} - 5\times 2^{2-x} = 3$. Give your answer correct to 3 significant figures. [4]

2 The complex number z satisfies $|z| = 9$ and $\frac{1}{2}\pi \leqslant \arg z \leqslant \pi$.

(a) On the Argand diagram, sketch the locus of the points representing z. [2]

(b) On the **same diagram**, sketch the locus of the points representing $z^* + 3$. [2]



3 Find the exact value of $\int_{\frac{1}{4}\pi}^{\frac{1}{3}\pi} 3\sin x \sin 2x \, \mathrm{d}x$.

Give your answer in the form $p\sqrt{3} + q\sqrt{2}$, where p and q are rational. [4]

4 The coefficient of x^3 in the expansion of $(1-ax)^{\frac{2}{5}}$ is 1.

(a) Find the value of a. [2]

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(b) Hence, find the coefficient of x^4 in the expansion of $(2x+1)(1-ax)^{\frac{2}{5}}$. [3]

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(c) State the set of values of x for which the expansion in **4(b)** is valid. [1]

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5 It is given that $z = \dfrac{3+\lambda \mathrm{i}}{\lambda+2\mathrm{i}}$, where λ is a real constant.

(a) Find the value of λ for which $\arg z = \frac{1}{4}\pi$. [4]

(b) When λ has the value found in **5(a)**, find the exact value of $|z|$, making your method clear. [2]

6 The polynomial $2x^4 + ax^3 + 4x^2 + bx - 3$ is denoted by p(x).

It is given that $\left(x^2 + x + 1\right)$ is a factor of p(x).

(a) Find the values of a and b. [4]

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(b) Hence, show that $(x + 3)$ is a factor of p(x). [2]

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7 **(a)** By sketching a suitable pair of graphs, show that the equation $\ln x = \operatorname{cosec} \frac{1}{2}x$ has exactly one root in the interval $0 < x < \pi$. [2]

(b) Verify by calculation that this root lies between 2.6 and 2.9. [2]

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(c) Use the iterative formula $x_{n+1} = \exp\left(\operatorname{cosec} \frac{1}{2} x_n\right)$ to determine the root correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

[$\exp(x)$ is an alternative notation for e^x.]

8 The variables x and y satisfy the differential equation

$$y\mathrm{e}^{3x}\frac{\mathrm{d}y}{\mathrm{d}x} = x(y+5).$$

It is given that $y = 0$ when $x = 0$.

Solve the differential equation to obtain an equation in x and y. [8]

9 Let $I = \int_1^3 \frac{x^3}{3+x^2}\,\mathrm{d}x$.

(a) Using the substitution $x = \sqrt{3}\tan u$, show that $I = \int_{\frac{1}{6}\pi}^{\frac{1}{3}\pi} 3\tan^3 u\,\mathrm{d}u$. [4]

(b) Hence, or otherwise, find the exact value of I. Give your answer in the form $p + q \ln r$, where p, q and r are rational. [5]

10 The variables x and y satisfy the equation $y^2 = k\dfrac{x-2}{x+2}$, where k is a constant.

(a) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{2y}{x^2-4}$. [5]

(b) Given that $k = 5$, find the angle between the tangents to the curve when $x = 3$.

Give your answer in the form $a\tan^{-1}\left(\frac{b}{c}\right)$, where a, b and c are integers. [4]

11 The points A and B have position vectors $\overrightarrow{OA} = 2\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\overrightarrow{OB} = 4\mathbf{i} + 2\mathbf{j} + 4\mathbf{k}$ relative to the origin, O.

(a) Show that the perpendicular distance from A to the line through O and B is $\frac{1}{3}\sqrt{65}$. [5]

(b) The point C has position vector $\overrightarrow{OC} = 3\mathbf{i} + p\mathbf{j} + q\mathbf{k}$, where p and q are constants.

Given that

- $\overrightarrow{OC}$ is perpendicular to $\overrightarrow{AB}$ and
- angle AOC = angle COB,

find the values of p and q. [7]

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

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