



Cambridge International AS & A Level

CANDIDATE
NAME

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MATHEMATICS

9709/22

Paper 2 Pure Mathematics 2

February/March 2024

1 hour 15 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 or correction fluid.
- 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 50.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.

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- 1 Use logarithms to solve the equation $3^{4x+3} = 5^{2x+7}$. Give your answer correct to 3 significant figures. [4]

[illegible]

- 2 (a) Sketch the graph of $y = |3x - 7|$, stating the coordinates of the points where the graph meets the axes. [2]

- (b) Hence find the set of values of the constant k for which the equation $|3x - 7| = k(x - 4)$ has exactly two real roots. [2]

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3 The polynomial $p(x)$ is defined by

$$p(x) = 6x^3 + ax^2 + 3x - 10,$$

where a is a constant. It is given that $(2x - 1)$ is a factor of $p(x)$.

(a) Find the value of a and hence factorise $p(x)$ completely. [5]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(b) Solve the equation $p(\operatorname{cosec} \theta) = 0$ for $-90^\circ < \theta < 90^\circ$. [2]

- (b)** The shaded region is rotated completely about the x -axis.

Find the exact volume of the solid produced.

[4]

This image shows a full page of primary-ruled paper. It features approximately 20 horizontal dashed lines spaced evenly down the page, providing a guide for handwriting practice. The background is white, and there are no margins or other markings present.

- (b) Show by calculation that the x -coordinate of P lies between 3.8 and 4.0 . [2]

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- (c) Use an iterative formula, based on the equation in part (a), to find the x -coordinate of P correct to 3 significant figures. Show the result of each iteration to 5 significant figures. [3]

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- (b) Find the exact gradient of the curve at B . [2]

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- (c) Find the exact coordinates of M . [3]

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(b) Find the exact value of $\int_{\frac{1}{12}\pi}^{\frac{1}{6}\pi} \sin 2\theta(5 \cot \theta + 3 \tan \theta) d\theta$. [3]

[illegible]

(c) Solve the equation $\sin \frac{2}{3}\alpha (2 \cot \frac{1}{3}\alpha + 7 \tan \frac{1}{3}\alpha) = 11$ for $-\pi < \alpha < \pi$. [3]

[illegible]

Additional page

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

[illegible]

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