



Cambridge International AS & A Level

CANDIDATE
NAME

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CENTRE
NUMBER

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NUMBER

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FURTHER MATHEMATICS

9231/12

Paper 1 Further Pure Mathematics 1

May/June 2021

2 hours

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

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

The matrix \mathbf{N} is such that $\mathbf{MN} = \begin{pmatrix} 1 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$.

(c) Find \mathbf{N} . [3]

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(d) Find the equations of the invariant lines, through the origin, of the transformation in the x - y plane represented by \mathbf{MN} . [5]

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The plane Π_2 has Cartesian equation $5x - 6y + 7z = 0$.

- (c) Find the acute angle between l_2 and Π_2 . [3]

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- (d) Find the acute angle between Π_1 and Π_2 . [3]

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(c) Sketch C , stating the coordinates of any intersections with the axes.

[3]

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(d) Sketch the curve with equation $y = \left| \frac{x^2 + x + 9}{x + 1} \right|$ and find the set of values of x for which $2|x^2 + x + 9| > 13|x + 1|$.

[5]

