

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel
Level 3 GCE**

Centre Number

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Candidate Number

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Time 1 hour 30 minutes

Paper
reference

9FM0/01

Further Mathematics

Advanced

PAPER 1: Core Pure Mathematics 1

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for algebraic manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ►

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1. The transformation P is an enlargement, centre the origin, with scale factor k , where $k > 0$
The transformation Q is a rotation through angle θ degrees anticlockwise about the origin.
The transformation P followed by the transformation Q is represented by the matrix

$$\mathbf{M} = \begin{pmatrix} -4 & -4\sqrt{3} \\ 4\sqrt{3} & -4 \end{pmatrix}$$

(a) Determine

- (i) the value of k ,
(ii) the smallest value of θ

(4)

A square S has vertices at the points with coordinates $(0, 0)$, $(a, -a)$, $(2a, 0)$ and (a, a) where a is a constant.

The square S is transformed to the square S' by the transformation represented by \mathbf{M} .

(b) Determine, in terms of a , the area of S'

(2)



Question 1 continued

Lined area for writing the answer to Question 1. The area contains 26 horizontal lines.

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Question 1 continued

Handwriting practice area consisting of multiple horizontal lines for writing.

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2. (a) Use the Maclaurin series expansion for $\cos x$ to determine the series expansion of $\cos^2\left(\frac{x}{3}\right)$ in ascending powers of x , up to and including the term in x^4

Give each term in simplest form.

(2)

- (b) Use the answer to part (a) and calculus to find an approximation, to 5 decimal places, for

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \left(\frac{1}{x} \cos^2 \left(\frac{x}{3} \right) \right) dx$$

(3)

- (c) Use the integration function on your calculator to evaluate

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \left(\frac{1}{x} \cos^2 \left(\frac{x}{3} \right) \right) dx$$

Give your answer to 5 decimal places.

(1)

- (d) Assuming that the calculator answer in part (c) is accurate to 5 decimal places, comment on the accuracy of the approximation found in part (b).

(1)



Question 2 continued

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Question 2 continued

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