

Write your name here

Surname

Other names

**Pearson Edexcel**  
**Level 3 GCE**

Centre Number

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Candidate Number

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# Further Mathematics

**Advanced**

**Paper 2: Core Pure Mathematics 2**

Sample Assessment Material for first teaching September 2017

**Time: 1 hour 30 minutes**

Paper Reference

**9FM0/02**

**You must have:**

Mathematical Formulae and Statistical Tables, calculator

Total Marks

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**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.
- Answers should be given to three significant figures unless otherwise stated.

## Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 7 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.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

1. The roots of the equation

$$x^3 - 8x^2 + 28x - 32 = 0$$

are  $\alpha$ ,  $\beta$  and  $\gamma$

Without solving the equation, find the value of

(i)  $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}$

(ii)  $(\alpha + 2)(\beta + 2)(\gamma + 2)$

(iii)  $\alpha^2 + \beta^2 + \gamma^2$

(8)

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3. (i)

$$\mathbf{M} = \begin{pmatrix} 2 & a & 4 \\ 1 & -1 & -1 \\ -1 & 2 & -1 \end{pmatrix}$$

where  $a$  is a constant.

(a) For which values of  $a$  does the matrix  $\mathbf{M}$  have an inverse?

(2)

Given that  $\mathbf{M}$  is non-singular,

(b) find  $\mathbf{M}^{-1}$  in terms of  $a$

(4)

(ii) Prove by induction that for all positive integers  $n$ ,

$$\begin{pmatrix} 3 & 0 \\ 6 & 1 \end{pmatrix}^n = \begin{pmatrix} 3^n & 0 \\ 3(3^n - 1) & 1 \end{pmatrix}$$

(6)











6. (a) (i) Show on an Argand diagram the locus of points given by the values of  $z$  satisfying

$$|z - 4 - 3\mathbf{i}| = 5$$

Taking the initial line as the positive real axis with the pole at the origin and given that

$$\theta \in [\alpha, \alpha + \pi], \text{ where } \alpha = -\arctan\left(\frac{4}{3}\right),$$

- (ii) show that this locus of points can be represented by the polar curve with equation

$$r = 8 \cos \theta + 6 \sin \theta \quad (6)$$

The set of points  $A$  is defined by

$$A = \left\{ z : 0 \leq \arg z \leq \frac{\pi}{3} \right\} \cap \left\{ z : |z - 4 - 3\mathbf{i}| \leq 5 \right\}$$

- (b) (i) Show, by shading on your Argand diagram, the set of points  $A$ .

- (ii) Find the **exact** area of the region defined by  $A$ , giving your answer in simplest form. (7)









