

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel Level 3 GCE

Wednesday 22 May 2024

Afternoon (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 8 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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2. The roots of the equation

$$2x^3 - 3x^2 + 12x + 7 = 0$$

are α , β and γ

Without solving the equation,

(a) write down the value of each of

$$\alpha + \beta + \gamma \quad \alpha\beta + \alpha\gamma + \beta\gamma \quad \alpha\beta\gamma \quad (1)$$

(b) Use the answers to part (a) to determine the value of

(i) $\frac{2}{\alpha} + \frac{2}{\beta} + \frac{2}{\gamma}$

(ii) $(\alpha - 1)(\beta - 1)(\gamma - 1)$

(iii) $\alpha^2 + \beta^2 + \gamma^2$ (7)



3.

In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

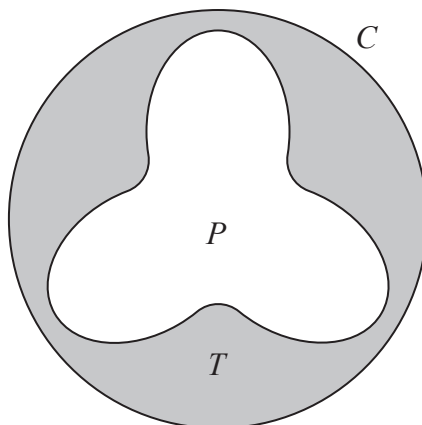


Figure 1

Figure 1 shows the design for a bathing pool.

The pool, P , shown unshaded in Figure 1, is surrounded by a tiled area, T , shown shaded in Figure 1.

The tiled area is bounded by the edge of the pool and by a circle, C , with radius 6 m.

The centre of the pool and the centre of the circle are the same point.

The edge of the pool is modelled by the curve with polar equation

$$r = 4 - a \sin 3\theta \quad 0 \leq \theta \leq 2\pi$$

where a is a positive constant.

Given that the shortest distance between the edge of the pool and the circle C is 0.5 m,

(a) determine the value of a . (2)

(b) Hence, using algebraic integration, determine, according to the model, the exact area of T . (6)

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6. Prove by induction that, for all positive integers n ,

$$\sum_{r=1}^n (2r-1)^2 = \frac{1}{3}n(4n^2-1) \quad (6)$$

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