

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

Monday 11 May 2026

Afternoon (Time: 1 hour 40 minutes)

Paper
reference

8FM0/01

Further Mathematics

Advanced Subsidiary

PAPER 1: Core Pure Mathematics

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator allowed by Pearson regulations. Calculators must not have the facility for symbolic algebra 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 80. 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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Pearson

1. The cubic equation

$$2x^3 - 3x^2 + 5x + 7 = 0$$

has roots α , β and γ .

Without solving the equation, determine the exact value of

(i) $\alpha^2 + \beta^2 + \gamma^2$ (3)

(ii) $\frac{3}{\alpha} + \frac{3}{\beta} + \frac{3}{\gamma}$ (3)

(iii) $(1 - \alpha)(1 - \beta)(1 - \gamma)$ (3)

Question

1

continued

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(Total for Question 1 is 9 marks)

2. (a) Use the standard results for summations to show that, for all positive integers n ,

$$\sum_{r=1}^n 2r = \sum_{r=1}^n (a + br)$$

where a and b are integers to be determined.

(5)

(b) Hence show that there are no values of k for which

$$\sum_{r=1}^k r^2 = 3k^2$$

(3)

Question

2

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(Total for Question 2 is 8 marks)

Question

3

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(Total for Question 3 is 8 marks)

Question

4

continued

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(Total for Question 4 is 7 marks)

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

$$r_1^{n-1} + r_2^{n-1} + \dots + r_n^{n-1} = \frac{r_1^n + r_2^n + \dots + r_n^n}{n}$$

(6)

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6.

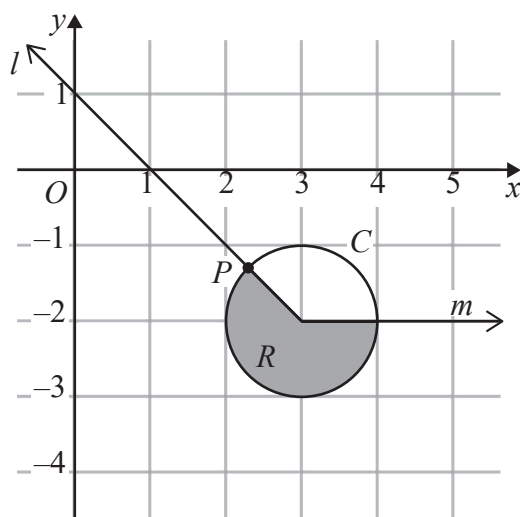


Figure 1

Figure 1 shows an Argand diagram with the circle C , the half-line l and the half-line m .

The set of points that lie on the perimeter of C , is defined by

$$z \in C : |z - a - bi| = 1$$

where a and b are integers.

(a) Write down the value of a and the value of b .

(2)

(b) Write down an equation for the locus represented by the half-line l .

(2)

Given that l and C intersect at the point P , as shown in Figure 1,

(c) determine, in exact form, the complex number represented by P .

(2)

The region R , including its boundaries, shown shaded in Figure 1, is bounded by l , C and m .

(d) Use inequalities to define R .

(3)

Question

6

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(Total for Question 6 is 9 marks)

7.

$$\mathbf{M} \begin{pmatrix} 6 & 5 & 3 \\ k_1 & 1 & 1 \\ 3 & 3 & 2 \end{pmatrix}$$

where k is a constant.

- (a) Determine the value of k for which \mathbf{M} is singular. (2)

Given that k does not have the value found in part (a),

- (b) determine \mathbf{M}^{-1} in terms of k . (4)

- (c) Determine, in terms of the constant p , the solution of the simultaneous equations

$$\begin{aligned} 6x - 5y + 3z &= p \\ 5x + y - z &= -5 \\ x - 3y + 2z &= -7 \end{aligned}$$

(2)

- (d) Determine the value of p for which the following simultaneous equations can be solved.

$$\begin{aligned} 6x - 5y + 3z &= p \\ 4x + y - z &= -5 \\ x - 3y + 2z &= -7 \end{aligned}$$

(2)

Given that p does **not** have the value found in part (d),

- (e) interpret geometrically the failure of the solution of the simultaneous equations in part (d).
Give a reason for your answer. (2)

Question

7

continued

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(Total for Question 7 is 12 marks)

Question

8

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(Total for Question 8 is 10 marks)

9.

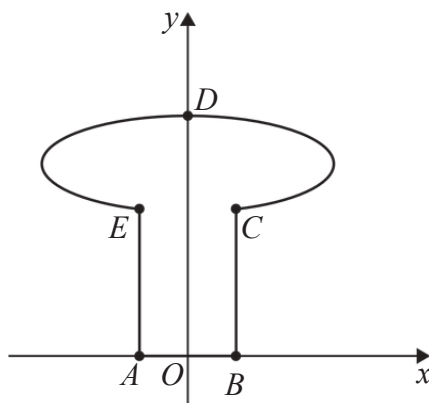


Figure 2

Figure 2 shows the central vertical cross-section, $AOBCEA$, of a plastic door handle.

In a model, the handle is formed by rotating the region bounded by the y -axis, the line OB , the line BC , and the curve CD through 360° about the y -axis.

The point B has coordinates $(1, 0)$

The units are in centimetres.

The curve CD is represented by the equation

$$x^2 + 9(y - 4)^2 = 9 \quad k \quad y \quad 5$$

where k is a constant.

Given that the point C has coordinates $(1, k)$,

(a) determine the exact value of k according to this model.

(2)

(b) Using algebraic integration determine the volume of plastic that would be required to make the handle, according to the model. Give your answer to the nearest cm^3 .

(Solutions relying on calculator technology are not acceptable.)

(6)

(c) State a limitation of the model.

(1)

When the handle was manufactured, 48 cm^3 of plastic were required.

(d) Use this information and your answer to part (b) to evaluate the model, explaining your reasoning.

(1)

Given that, for a different handle, CDE is part of a cross-section of a sphere,

(e) explain how the model could be refined to take this into account.

(1)

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Lined writing area for the answer to Question 9.

