Pearson Edexcel International Advanced Level

Monday 12 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WFM01/01A**

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Mathematics

International Advanced Subsidiary/ Advanced Level
Further Pure Mathematics F1
Question paper

You must have:
Answer book (sent separately).
Do not return this question paper with the answer book.

Turn over ▶

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1. Use the standard results for $\sum_{r=1}^{n} r$ and for $\sum_{r=1}^{n} r^2$ to show that, for all positive integers n,

$$\sum_{r=1}^{n} r(r+3) = \frac{n}{a}(n+1)(n+b)$$

where a and b are integers to be found.

(4)

(Total for Question 1 is 4 marks)

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2. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

$$f(z) = z^4 - 6z^3 + 38z^2 - 94z + 221$$

(a) Given that $z = 2 + 3i$ is a root of the equation $f(z) = 0$, use algebra to find the three other roots of $f(z) = 0$

(7)

(b) Show the four roots of $f(z) = 0$ on a single Argand diagram.

(2)

(Total for Question 2 is 9 marks)

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3. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

The rectangular hyperbola H has parametric equations

$$x = 4t \quad y = \frac{4}{t}$$

The straight line with equation $3y - 2x = 10$ intersects H at the points A and B.

Given that the point A is above the x-axis,

(a) find the coordinates of the point A and the coordinates of the point B.

(5)

(b) Find the coordinates of the midpoint of AB.

(2)

(Total for Question 3 is 7 marks)

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4. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

Given that $z = x + iy$, where x and y are real numbers, solve the equation

$$(z - 2i)(z^* - 2i) = 21 - 12i$$

where z^* is the complex conjugate of z.

(6)

(Total for Question 4 is 6 marks)

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5. The quadratic equation

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

has roots α and β.

Without solving the equation,

(a) (i) write down the value of $(\alpha + \beta)$ and the value of $\alpha\beta$

(ii) show that $\alpha^2 + \beta^2 = -2$

(iii) find the value of $\alpha^3 + \beta^3$

(5)

(b) (i) show that $\alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2(\alpha\beta)^2$

(ii) find a quadratic equation which has roots

$$(\alpha^3 - \beta) \text{ and } (\beta^3 - \alpha)$$

giving your answer in the form $px^2 + qx + r = 0$ where p, q and r are integers.

(6)

(Total for Question 5 is 11 marks)

6.

$$\mathbf{A} = \begin{pmatrix} 2p & 3q \\ 3p & 5q \end{pmatrix}$$

where p and q are non-zero real constants.

(a) Find $\mathbf{A}^{-1}$ in terms of p and q.

(3)

Given $\mathbf{XA} = \mathbf{B}$, where

$$\mathbf{B} = \begin{pmatrix} p & q \\ 6p & 11q \\ 5p & 8q \end{pmatrix}$$

(b) find the matrix $\mathbf{X}$, giving your answer in its simplest form.

(4)

(Total for Question 6 is 7 marks)

7.

$$\mathrm{f}(x) = 30 + \frac{7}{\sqrt{x}} - x^5 \qquad x > 0$$

The only real root, α, of the equation $\mathrm{f}(x) = 0$ lies in the interval $[2, 2.1]$.

(a) Starting with the interval $[2, 2.1]$, use interval bisection twice to find an interval of width 0.025 that contains α.

(4)

(b) Find $\mathrm{f}'(x)$.

(2)

(c) Taking 2 as a first approximation to α, apply the Newton–Raphson process once to $\mathrm{f}(x)$ to find a second approximation to α, giving your answer to 2 decimal places.

(2)

(Total for Question 7 is 8 marks)

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8. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

The parabola C has equation $y^2 = 4ax$, where a is a positive constant.

The point $P(ap^2, 2ap)$ lies on the parabola C.

(a) Use calculus to show that an equation of the tangent to C at P is

$$py = x + ap^2$$

(4)

The tangent to C at the point P intersects the directrix of C at the point B and intersects the x-axis at the point D.

Given that the y-coordinate of B is $\frac{5}{6}a$ and $p > 0$

(b) find, in terms of a, the x-coordinate of D.

(6)

Given that O is the origin,

(c) find, in terms of a, the area of the triangle OPD, giving your answer in its simplest form.

(2)

(Total for Question 8 is 12 marks)

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9. $$\mathbf{A} = \begin{pmatrix} 6 & 4 \\ 1 & 1 \end{pmatrix}$$

(a) Show that **A** is non-singular.

(2)

The triangle R is transformed to the triangle S by the matrix **A**.

Given that the area of the triangle R is 10 square units,

(b) find the area of triangle S.

(2)

Given that

$$\mathbf{B} = \mathbf{A}^4$$

and that the triangle R is transformed to the triangle T by the matrix **B**,

(c) find, without evaluating **B**, the area of triangle T.

(2)

(Total for Question 9 is 6 marks)

10. Prove by induction that, for $n \in \mathbb{Z}^+$

$$\sum_{r=1}^{n} r^2(2r-1) = \frac{1}{6}n(n+1)\left(3n^2+n-1\right)$$

(5)

(Total for Question 10 is 5 marks)

TOTAL FOR PAPER IS 75 MARKS

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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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Mathematics

International Advanced Subsidiary/Advanced Level
Further Pure Mathematics F1
Answer Book

You must have:
Question paper (sent separately)
Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

Candidates may use any calculator permitted 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 10 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ▶

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Question 1

Write the answer to Question 1 on these 2 pages

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Question 1 continued

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(Total for Question 1 is 4 marks)

Question 2

Write the answer to Question 2 on these 4 pages

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Question 2 continued

Question 2 continued

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Question 2 continued

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(Total for Question 2 is 9 marks)

Question 3

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Question 3 continued

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(Total for Question 3 is 7 marks)

Question 4

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Question 4 continued

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(Total for Question 4 is 6 marks)

Question 5

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Question 5 continued

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Question 5 continued

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(Total for Question 5 is 11 marks)

Question 6

Write the answer to Question 6 on these 2 pages

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Question 6 continued

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(Total for Question 6 is 7 marks)

Question 7

Write the answer to Question 7 on these 2 pages

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Question 7 continued

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(Total for Question 7 is 8 marks)

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Question 8

Write the answer to Question 8 on these 4 pages

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Question 8 continued

Question 8 continued

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Question 8 continued

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(Total for Question 8 is 12 marks)

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Question 9

Write the answer to Question 9 on these 2 pages

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Question 9 continued

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(Total for Question 9 is 6 marks)

Question 10

Write the answer to Question 10 on these 3 pages

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Question 10 continued

Question 10 continued

(Total for Question 10 is 5 marks)

TOTAL FOR PAPER IS 75 MARKS

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