Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Monday 12 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WFM01/01**

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Mathematics

International Advanced Subsidiary/ Advanced Level
Further Pure Mathematics F1

You must have:
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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1. $$f(x) = 3\sqrt{x} - \frac{1}{x} - 5 \qquad x > 0$$

The equation $f(x) = 0$ has a root α in the interval [3, 3.8]

(a) Starting with the end points of this interval, use interval bisection to determine α to one decimal place.

(4)

(b) (i) Determine $f'(x)$

(2)

(ii) Using your answer to part (a) as a first approximation to α, apply the Newton-Raphson process once to calculate a further approximation for α, giving your answer to 4 decimal places.

(2)

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Question 1 continued

(Total for Question 1 is 8 marks)

2. $\mathrm{f}(z) = z^4 + \lambda z^3 + 14z^2 + 9\lambda z + 45 \qquad \lambda \in \mathbb{R}$

(a) Show that $\mathrm{f}(3\mathrm{i}) = 0$

(2)

(b) Hence determine the exact range of values of λ for which the equation $\mathrm{f}(z) = 0$ has no real solutions.

(5)

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Question 2 continued

(Total for Question 2 is 7 marks)

3. Given that **A** and **B** are non-singular matrices and $\mathbf{BAB} = \mathbf{I}$, where **I** is the identity matrix,

(a) show that $\mathbf{A} = \mathbf{B}^{-1}\mathbf{B}^{-1}$

(1)

Given also that $\mathbf{B} = \begin{pmatrix} 3 & k \\ -4 & -2k \end{pmatrix}$ where k is a non-zero constant,

(b) determine **A** in terms of k

(4)

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Question 3 continued

(Total for Question 3 is 5 marks)

4. The parabola C has equation $y^2 = 8x$

The line l

- passes through the focus of C
- has gradient $\frac{8}{15}$
- meets C at the point G where $y > 0$
- meets C at the point H where $y < 0$

(a) Determine the coordinates of G and the coordinates of H

(6)

The midpoint of the line segment GH is M

(b) Determine the shortest distance from M to the directrix of C

(2)

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Question 4 continued

Question 4 continued

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Question 4 continued

(Total for Question 4 is 8 marks)

5.

$$\mathbf{A} = \begin{pmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix}$$

(a) Describe fully the single geometric transformation represented by the matrix **A**

(2)

The matrix **B** represents an enlargement with centre $(0,0)$ and scale factor $2\sqrt{2}$

(b) Write down matrix **B**

(1)

Given that

- **I** is the identity matrix
- the transformation represented by $(\mathbf{A}+\mathbf{I})$ followed by the transformation represented by **B** is represented by the matrix **C**
- the triangle T is transformed by **C** to the triangle T'
- T' has an area of $12\left(1+\sqrt{2}\right)$

(c) determine, in simplest form, the exact area of T

(4)

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Question 5 continued

Question 5 continued

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Question 5 continued

(Total for Question 5 is 7 marks)

6. $f(x) = x^2 + qx + r \qquad q, r \in \mathbb{Z}$

The equation $f(x) = 0$ has roots α and β

(a) Write down, in terms of q or r

(i) $\alpha + \beta$

(ii) $\alpha\beta$

(1)

Given that $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{1}{2}$ and $\alpha^2 + \beta^2 = 5$

(b) without finding α or β, show that

$$r^2 + br + c = 0$$

where b and c are integers to be determined.

(3)

(c) Hence determine the two possible functions $f(x)$

(3)

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Question 6 continued

(Total for Question 6 is 7 marks)

7. $$z = \frac{3 + \left(k\sqrt{3}\right)\mathrm{i}}{2 + \left(\sqrt{3}\right)\mathrm{i}} \qquad k \in \mathbb{Z}$$

(a) Express z in the form $a + b\mathrm{i}$ where a and b are real functions of k.

(3)

Given that $\arg z = \frac{\pi}{6}$

(b) determine the exact value of $|z|$

(5)

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Question 7 continued

(Total for Question 7 is 8 marks)

8. (a) Use the standard results for summations to show that

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

where A and B are integers to be determined.

(5)

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

$$25^2 + 27^2 + 29^2 + \ldots + 95^2$$

You must make your method clear.

(3)

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Question 8 continued

(Total for Question 8 is 8 marks)

9. The rectangular hyperbola H has equation $xy = c^2$ where $c > 0$

The point P lies on H and has coordinates $\left(ct, \frac{c}{t}\right)$ where $t > 0$

The line l_1 is the tangent to H at P

(a) Use calculus to show that an equation for l_1 is

$$x + t^2 y = 2ct$$

(3)

The line l_2 is the normal to H at P

(b) Determine an equation for l_2

(1)

Given that

- l_1 crosses the x-axis at the point X and crosses the y-axis at the point Y
- l_2 crosses the y-axis at the point Z

(c) show that the area of the triangle XYZ is given by

$$c^2\left(1 + t^4\right)$$

(4)

When $t = 3$

- the area of the triangle XYZ is 410
- the line from P through the origin meets H again at the point Q

(d) Determine the exact length of PQ, giving your answer as a simplified surd.

(3)

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Question 9 continued

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Question 9 continued

(Total for Question 9 is 11 marks)



10. A sequence of numbers $u_1, u_2, u_3, \ldots$ is defined by

$$u_1 = 8 \qquad u_2 = 10$$

$$u_{n+2} = u_{n+1} + 2u_n \quad n \in \mathbb{Z}^+$$

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

$$u_n = 3 \times 2^n - 2 \times (-1)^n$$

(6)

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Question 10 continued

Question 10 continued

(Total for Question 10 is 6 marks)

TOTAL FOR PAPER IS 75 MARKS

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