

Write your name here

Surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

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Candidate Number

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# Further Pure Mathematics F1

**Advanced/Advanced Subsidiary**

Wednesday 29 January 2014 – Morning  
**Time: 1 hour 30 minutes**

Paper Reference

**WFM01/01**

**You must have:**

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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). Coloured pencils and highlighter pens must not be used.
- **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.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

## Information

- 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.

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**PEARSON**

1.  $f(x) = 6\sqrt{x} - x^2 - \frac{1}{2x}, \quad x > 0$

- (a) Show that the equation  $f(x) = 0$  has a root  $\alpha$  in the interval  $[3, 4]$ . (2)
- (b) Taking 3 as a first approximation to  $\alpha$ , apply the Newton-Raphson process once to  $f(x)$  to obtain a second approximation to  $\alpha$ . Give your answer to 3 decimal places. (5)
- (c) Use linear interpolation once on the interval  $[3, 4]$  to find another approximation to  $\alpha$ . Give your answer to 3 decimal places. (3)

[illegible]

**Q1**



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[illegible]

Q2



**3.**

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

- (a) Show that  $\mathbf{A}$  is non-singular.

(2)

The triangle  $R$  is transformed to the triangle  $S$  by the matrix  $\mathbf{A}$ .

Given that the area of 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  $\mathbf{B}$ ,

- (c) find, without evaluating  $\mathbf{B}$ , the area of triangle  $T$ .

(2)

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### Q3

4.

$$f(x) = x^4 + 3x^3 - 5x^2 - 19x - 60$$

- (a) Given that  $x = -4$  and  $x = 3$  are roots of the equation  $f(x) = 0$ , use algebra to solve  $f(x) = 0$  completely.

(7)

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

(2)







Q4

**(Total 9 marks)**



$$\sum_{r=1}^n (9r^2 - 4r) = \frac{1}{2}n(n+1)(6n-1)$$

(4)

$$\sum_{r=1}^{12} (9r^2 - 4r + k(2^r)) = 6630$$

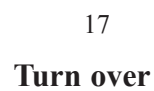
(4)







**(Total 8 marks)**



**6.**

(i)  $\mathbf{B} = \begin{pmatrix} -1 & 2 \\ 3 & -4 \end{pmatrix}, \quad \mathbf{Y} = \begin{pmatrix} 4 & -2 \\ 1 & 0 \end{pmatrix}$

(a) Find  $\mathbf{B}^{-1}$ .

(2)

The transformation represented by  $\mathbf{Y}$  is equivalent to the transformation represented by  $\mathbf{B}$  followed by the transformation represented by the matrix  $\mathbf{A}$ .

(b) Find  $\mathbf{A}$ .

(2)

$$(ii) \quad \mathbf{M} = \begin{pmatrix} -\sqrt{3} & -1 \\ 1 & -\sqrt{3} \end{pmatrix}$$

The matrix  $\mathbf{M}$  represents an enlargement scale factor  $k$ , centre  $(0, 0)$ , where  $k > 0$ , followed by a rotation anti-clockwise through an angle  $\theta$  about  $(0, 0)$ .

(a) Find the value of  $k$ .

(2)

(b) Find the value of  $\theta$ .

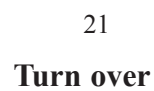
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**(Total 8 marks)**





This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue or grey lines spaced evenly apart, typical of standard notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings present.

[illegible]



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**Q7**





This image shows a full page of blank, lined paper. It features approximately 28 horizontal grey lines spaced evenly across the page, typical of standard notebook paper. The lines are thin and light grey, set against a plain white background. There are no margins, text, or other markings on the page.

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### Question 8 continued

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**(Total 12 marks)**



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[illegible]

**Q9**

END