

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

--	--	--	--	--

--	--	--	--

Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper

reference

WFM01/01

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 9 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 ►

P73334A

©2022 Pearson Education Ltd.

Q:1/1/1/



Pearson

Question 1 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined writing area for the answer.



P 7 3 3 3 4 A 0 3 3 6

2.

$$f(x) = 10 - 2x - \frac{1}{2\sqrt{x}} - \frac{1}{x^3} \quad x > 0$$

- (a) Show that the equation $f(x) = 0$ has a root α in the interval $[0.4, 0.5]$ (2)
- (b) Determine $f'(x)$. (3)
- (c) Using $x_0 = 0.5$ as a first approximation to α , apply the Newton-Raphson procedure once to $f(x)$ to find a second approximation to α , giving your answer to 3 decimal places. (2)

The equation $f(x) = 0$ has another root β in the interval $[4.8, 4.9]$

- (d) Use linear interpolation once on the interval $[4.8, 4.9]$ to find an approximation to β , giving your answer to 3 decimal places. (2)



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined writing area consisting of 30 horizontal lines for student response.



Question 5 continued

Lined writing area for the answer to Question 5.

DO NOT WRITE IN THIS AREA

(Total for Question 5 is 10 marks)



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Multiple horizontal lines for writing.

(Total for Question 6 is 11 marks)



7.

$$\mathbf{A} = \begin{pmatrix} -\frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & -\frac{\sqrt{3}}{2} \end{pmatrix}$$

(a) Determine the matrix \mathbf{A}^2 (1)

(b) Describe fully the single geometrical transformation represented by the matrix \mathbf{A}^2 (2)

(c) Hence determine the smallest positive integer value of n for which $\mathbf{A}^n = \mathbf{I}$ (1)

The matrix \mathbf{B} represents a stretch scale factor 4 parallel to the x -axis.

(d) Write down the matrix \mathbf{B} (1)

The transformation represented by matrix \mathbf{A} followed by the transformation represented by matrix \mathbf{B} is represented by the matrix \mathbf{C}

(e) Determine the matrix \mathbf{C} (2)

The parallelogram P is transformed onto the parallelogram P' by the matrix \mathbf{C}

(f) Given that the area of parallelogram P' is 20 square units, determine the area of parallelogram P (2)



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area consisting of multiple horizontal lines.



P 7 3 3 3 4 A 0 2 5 3 6

Question 7 continued

Lined writing area for the answer.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



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

$$\sum_{r=0}^n (r+1)(r+2) = \frac{1}{3}(n+1)(n+2)(n+3) \quad (5)$$

- (b) Hence determine the value of

$$10 \times 11 + 11 \times 12 + 12 \times 13 + \dots + 100 \times 101 \quad (3)$$



9. (i) A sequence of numbers is defined by

$$u_1 = 3$$

$$u_{n+1} = 2u_n - 2^{n+1} \quad n \geq 1$$

Prove by induction that, for $n \in \mathbb{N}$

$$u_n = 5 \times 2^{n-1} - n \times 2^n \tag{5}$$

(ii) Prove by induction that, for $n \in \mathbb{N}$

$$f(n) = 5^{n+2} - 4n - 9$$

is divisible by 16 (5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



