Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number | | | | | |

Candidate Number | | | | |

Further Pure Mathematics FP2

Advanced/Advanced Subsidiary

Wednesday 7 June 2017 – Morning
Time: 1 hour 30 minutes

Paper Reference
6668/01

You must have:
Mathematical Formulae and Statistical Tables (Pink)

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.

Turn over ▶

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Pearson

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1. (a) Show that, for $r > 0$

$$\frac{1}{r^2} - \frac{1}{(r+1)^2} \equiv \frac{2r+1}{r^2(r+1)^2}$$

(1)

(b) Hence prove that, for $n \in \mathbb{N}$

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

(3)

(c) Show that, for $n \in \mathbb{N}$, $n > 1$

$$\sum_{r=n}^{3n} \frac{6r+3}{r^2(r+1)^2} = \frac{an^2 + bn + c}{n^2(3n+1)^2}$$

where a, b and c are constants to be found.

(3)

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Question 1 continued

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Question 1 continued

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Question 1 continued

Q1

(Total 7 marks)

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2. Use algebra to find the set of values of x for which

$$\frac{x-2}{2(x+2)} \leqslant \frac{12}{x(x+2)}$$

(9)

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Question 2 continued

Q2

(Total 9 marks)

Leave blank

3. Solve the equation

$$z^3 + 32 + 32i\sqrt{3} = 0$$

giving your answers in the form $re^{i\theta}$ where $r > 0$ and $-\pi < \theta \leqslant \pi$

(6)

Leave blank

Question 3 continued

Q3

(Total 6 marks)

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4.

$$y = \ln\left(\frac{1}{1-2x}\right), \quad |x| < \frac{1}{2}$$

(a) Find $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ and $\frac{d^3y}{dx^3}$

(4)

(b) Hence, or otherwise, find the series expansion of $\ln\left(\frac{1}{1-2x}\right)$ about $x = 0$, in ascending powers of x, up to and including the term in x^3. Give each coefficient in its simplest form.

(3)

(c) Use your expansion to find an approximate value for $\ln\left(\frac{3}{2}\right)$, giving your answer to 3 decimal places.

(3)

Leave blank

Question 4 continued

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Question 4 continued

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Question 4 continued

Q4

(Total 10 marks)

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5. (a) Find the general solution of the differential equation

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = 26\sin 3x$$

(8)

(b) Find the particular solution of this differential equation for which $y = 0$ and $\frac{dy}{dx} = 0$ when $x = 0$

(5)

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Question 5 continued

Leave blank

Question 5 continued

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Question 5 continued

Q5

(Total 13 marks)

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6.

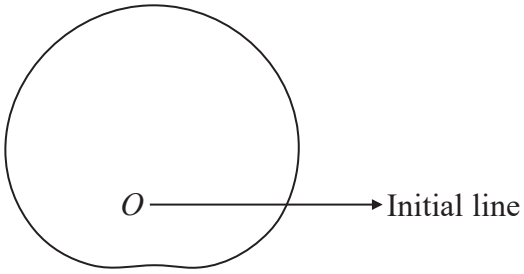

Figure 1

Figure 1 shows a sketch of a curve with polar equation

$$r = 6 + a\sin\theta$$

where $0 < a < 6$ and $0 \leqslant \theta < 2\pi$

The area enclosed by the curve is $\frac{97\pi}{2}$

Find the value of the constant a.

(8)

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Question 6 continued

Q6

(Total 8 marks)

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7. (a) Find, in the form $y = f(x)$, the general solution of the equation

$$\cos x \frac{dy}{dx} + y \sin x = 2\cos^3 x \sin x + 1, \quad 0 < x < \frac{\pi}{2}$$

(8)

Given that $y = 5\sqrt{2}$ when $x = \frac{\pi}{4}$

(b) find the value of y when $x = \frac{\pi}{6}$, giving your answer in the form $a + b\sqrt{3}$, where a and b are rational numbers to be found.

(3)

Leave blank

Question 7 continued

Leave blank

Question 7 continued

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Question 7 continued

Q7

(Total 11 marks)

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8. The transformation T from the z-plane to the w-plane is given by

$$w = \frac{z + 3\mathrm{i}}{1 + \mathrm{i}z}, \quad z \neq \mathrm{i}$$

The transformation T maps the circle $|z| = 1$ in the z-plane onto the line l in the w-plane.

(a) Find a cartesian equation of the line l.

(5)

The circle $|z - a - b\mathrm{i}| = c$ in the z-plane is mapped by T onto the circle $|w| = 5$ in the w-plane.

(b) Find the exact values of the real constants a, b and c.

(6)

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Question 8 continued

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Question 8 continued

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Question 8 continued

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Question 8 continued

Q8

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

END