

Centre No.						Paper Reference							Surname	Initial(s)	
Candidate No.						6	6	6	7	/	0	1	R	Signature	

Paper Reference(s)

6667/01R

Edexcel GCE

Further Pure Mathematics FP1

Advanced/Advanced Subsidiary

Tuesday 10 June 2014 – Morning

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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Materials required for examination

Mathematical Formulae (Pink)

Items included with question papers

Nil

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 or symbolic differentiation/integration, or have retrievable mathematical formulae stored in them.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper.

Answer ALL the questions.

You must write your answer to each question in the space following the question.

When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.

Full marks may be obtained for answers to ALL questions.

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 9 questions in this question paper. The total mark for this paper is 75.

There are 28 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.

You should show sufficient working to make your methods clear to the Examiner.

Answers without working may not gain full credit.

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(Total 5 marks)

Q1



2.

$$f(x) = 3 \cos 2x + x - 2, \quad -\pi \leq x < \pi$$

- (a) Show that the equation $f(x) = 0$ has a root α in the interval $[2, 3]$. (2)
- (b) Use linear interpolation once on the interval $[2, 3]$ to find an approximation to α .
Give your answer to 3 decimal places. (3)
- (c) The equation $f(x) = 0$ has another root β in the interval $[-1, 0]$. Starting with this interval, use interval bisection to find an interval of width 0.25 which contains β . (4)



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(Total 9 marks)

Q2



3. (i)

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

(a) Describe fully the single transformation represented by the matrix \mathbf{A} .

(2)

The matrix \mathbf{B} represents an enlargement, scale factor -2 , with centre the origin.

(b) Write down the matrix \mathbf{B} .

(1)

(ii)

$$\mathbf{M} = \begin{pmatrix} 3 & k \\ -2 & 3 \end{pmatrix}, \quad \text{where } k \text{ is a positive constant.}$$

Triangle T has an area of 16 square units.

Triangle T is transformed onto the triangle T' by the transformation represented by the matrix \mathbf{M} .

Given that the area of the triangle T' is 224 square units, find the value of k .

(3)



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(Total 6 marks)

Q3



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- $$z = \frac{p + 2i}{3 + pi}$$

(a) Express z in the form $a + bi$ where a and b are real. Give your answer in its simplest form in terms of p .

(4)

- (b) Given that $\arg(z) = \theta$, where $\tan \theta = 1$ find the possible values of p .

(5)



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(Total 9 marks)

Q4



5. (a) Use the standard results for $\sum_{r=1}^n r$ and $\sum_{r=1}^n r^3$ to show that

$$\sum_{r=1}^n r(r^2 - 3) = \frac{1}{4}n(n+1)(n+3)(n-2) \quad (5)$$

(b) Calculate the value of $\sum_{r=10}^{50} r(r^2 - 3)$ (3)

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(Total 8 marks)

Q5



6.



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Q6

7. The parabola C has cartesian equation $y^2 = 4ax$, $a > 0$

The points $P(ap^2, 2ap)$ and $P'(ap^2, -2ap)$ lie on C .

(a) Show that an equation of the normal to C at the point P is

$$y + px = 2ap + ap^3 \quad (5)$$

(b) Write down an equation of the normal to C at the point P' . (1)

The normal to C at P meets the normal to C at P' at the point Q .

(c) Find, in terms of a and p , the coordinates of Q . (2)

Given that S is the focus of the parabola,

(d) find the area of the quadrilateral $SPQP'$. (3)

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Q7



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(Total 5 marks)

Q8



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- $$\sum_{r=1}^n (r+1)2^{r-1} = n2^n$$

(5)

- $$u_1 = 0, \quad u_2 = 32,$$

$$u_{n+2} = 6u_{n+1} - 8u_n \quad n \geq 1$$

$$u_n = 4^{n+1} - 2^{n+3}$$

(7)



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Q9

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