

Write your name here	
Surname	Other names
Edexcel	Centre Number
International GCSE	Candidate Number
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 1</h2>	
Thursday 17 May 2012 – Afternoon	Paper Reference
Time: 2 hours	4PM0/01
Calculators may be used.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.

Turn over ►

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Question 1 continued

Dotted lines for writing.

(Total for Question 1 is 4 marks)



P 4 1 7 7 4 A 0 3 3 2

2 In triangle ABC , $AB = 8$ cm, $BC = 5$ cm and $CA = 7$ cm.

(a) Find, to the nearest 0.1° , the size of angle BAC .

(3)

(b) Find, to 3 significant figures, the area of triangle ABC .

(2)

Area with horizontal dotted lines for writing answers.



Question 2 continued

Ruled area for writing the answer to Question 2.

(Total for Question 2 is 5 marks)



3 (a) Find the full binomial expansion of $(1 + x)^5$, giving each coefficient as an integer. (2)

(b) Hence find the exact value of $(1 - 2\sqrt{3})^5$, giving your answer in the form $a + b\sqrt{3}$, where a and b are integers. (3)

Handwriting practice area consisting of 22 horizontal dotted lines.



Question 3 continued

Dotted lines for writing.

(Total for Question 3 is 5 marks)



P 4 1 7 7 4 A 0 7 3 2

5 The first four terms of an arithmetic series, S , are

$$\log_a 2 + \log_a 4 + \log_a 8 + \log_a 16$$

(a) Write down an expression for the r th term of S . (1)

(b) Find an expression for the common difference of S . (2)

The sum of the first n terms of S is S_n

(c) Show that $S_n = \frac{1}{2}n(n+1)\log_a 2$ (2)

The first four terms of a second arithmetic series, T , are

$$\log_a 6 + \log_a 12 + \log_a 24 + \log_a 48$$

The sum of the first n terms of T is T_n

(d) Find $T_n - S_n$ and simplify your answer. (4)



Question 5 continued

A series of horizontal dotted lines for writing.



Question 5 continued

A series of horizontal dotted lines for writing.



6

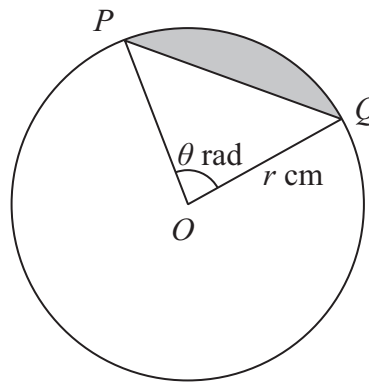


Figure 1

The points P and Q lie on the circumference of a circle with centre O and radius r cm. Angle $POQ = \theta$ radians. The segment shaded in Figure 1 has area A cm².

(a) Show that $A = \frac{1}{2} r^2 (\theta - \sin \theta)$ (3)

When angle POQ is increased to $(\theta + \delta\theta)$ radians, where $\delta\theta$ is small, the area of the shaded segment is increased to $(A + \delta A)$ cm², where δA is small.

(b) Show that $\delta A \approx \frac{1}{2} r^2 (1 - \cos \theta) \delta\theta$ (3)

For a circle of radius 4 cm, the area of the shaded segment is increased by 0.05 cm² when angle POQ increases by 0.02 radians.

(c) Find, to 1 decimal place, an estimate for θ (4)

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Question 6 continued

Area containing horizontal dotted lines for writing.



P 4 1 7 7 4 A 0 1 5 3 2

Question 6 continued

Ruled area for writing the answer to Question 6.

(Total for Question 6 is 10 marks)



7

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

- (a) Express $\cos(2x + 45^\circ)$ in the form $M \cos 2x + N \sin 2x$, where M and N are constants, giving the exact value of M and the exact value of N . (2)
- (b) Solve, for $0^\circ \leq x \leq 180^\circ$, the equation $\cos 2x - \sin 2x = 1$ (5)

The maximum value of $\cos 2x - \sin 2x$ is k .

- (c) Find the exact value of k . (2)
- (d) Find the smallest positive value of x for which a maximum occurs. (3)



Question 7 continued

Ruled area for writing the answer to Question 7 continued.



Question 7 continued

A large rectangular area containing numerous horizontal dotted lines for writing.



Question 7 continued

Ruled area for writing the answer to Question 7.

(Total for Question 7 is 12 marks)



8

$f(x) = ax^3 + bx^2 + cx + d$, where a, b, c and d are integers.

Given that $f(0) = 6$

(a) show that $d = 6$ (1)

When $f(x)$ is divided by $(x - 1)$ the remainder is -6

When $f(x)$ is divided by $(x + 1)$ the remainder is 12

(b) Find the value of b . (4)

Given also that $(x - 3)$ is a factor of $f(x)$,

(c) find the value of a and the value of c , (6)

(d) express $f(x)$ as a product of linear factors. (3)

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Question 8 continued

A series of horizontal dotted lines for writing.



Question 8 continued

A series of horizontal dotted lines for writing the answer to Question 8.

(Total for Question 8 is 14 marks)



P 4 1 7 7 4 A 0 2 5 3 2

9 The point P with coordinates $(4, 4)$ lies on the curve C with equation $y = \frac{1}{4}x^2$

(a) Find an equation of

(i) the tangent to C at P ,

(ii) the normal to C at P .

(6)

The point Q lies on the curve C . The normal to C at Q and the normal to C at P intersect at the point R . The line RQ is perpendicular to the line RP .

(b) Find the coordinates of Q .

(2)

(c) Find the x -coordinate of R .

(4)

The tangent to C at P and the tangent to C at Q intersect at the point S .

(d) Show that the line RS is parallel to the y -axis.

(5)



Question 9 continued

A large rectangular area containing horizontal dotted lines for writing answers.



Question 9 continued

Dotted lines for writing.

(Total for Question 9 is 17 marks)



P 4 1 7 7 4 A 0 2 9 3 2

10 The point A has coordinates $(-3, 4)$ and the point C has coordinates $(5, 2)$. The mid-point of AC is M . The line l is the perpendicular bisector of AC .

(a) Find an equation of l . (4)

(b) Find the exact length of AC . (2)

The point B lies on the line l . The area of triangle ABC is $17\sqrt{2}$

(c) Find the exact length of BM . (2)

(d) Find the exact length of AB . (2)

(e) Find the coordinates of each of the two possible positions of B . (6)

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Question 10 continued

Dotted lines for writing.



P 4 1 7 7 4 A 0 3 1 3 2

Question 10 continued

Handwriting practice area consisting of multiple horizontal dotted lines for writing.

(Total for Question 10 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS

