



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

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ADDITIONAL MATHEMATICS

4037/12

Paper 1

October/November 2011

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 80.

For Examiner's Use	
1	
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11	
Total	

This document consists of **16** printed pages.



*Mathematical Formulae***1. ALGEBRA***Quadratic Equation*

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} .$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$.

2. TRIGONOMETRY*Identities*

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

1 Show that $\frac{1}{\tan \theta + \cot \theta} = \sin \theta \cos \theta$.

[3]

*For
Examiner's
Use*

- 2 Find the coordinates of the points where the line $2y = x - 1$ meets the curve $x^2 + y^2 = 29$. [5]

*For
Examiner's
Use*

- 3 (i) Express $\log_x 2$ in terms of a logarithm to base 2.

[1]

*For
Examiner's
Use*

- (ii) Using the result of part (i), and the substitution $u = \log_2 x$, find the values of x which satisfy the equation $\log_2 x = 3 - 2 \log_x 2$. [4]

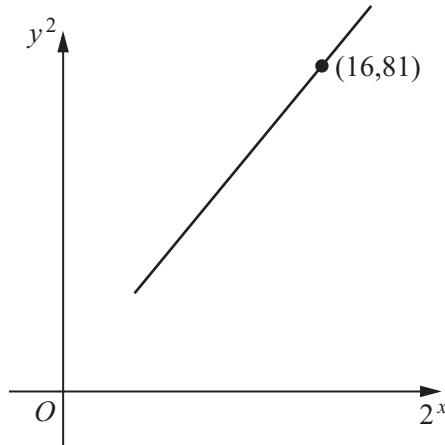
- 4 A curve has equation $y = (3x^2 + 15)^{\frac{2}{3}}$. Find the equation of the normal to the curve at the point where $x = 2$.

[6]

*For
Examiner's
Use*

- 5 Variables x and y are such that, when y^2 is plotted against 2^x , a straight line graph is obtained. This line has a gradient of 5 and passes through the point $(16,81)$.

*For
Examiner's
Use*



- (i) Express y^2 in terms of 2^x . [3]

- (ii) Find the value of x when $y = 6$. [3]

- 6 (i) Given that $(3 + x)^5 + (3 - x)^5 = A + Bx^2 + Cx^4$, find the value of A , of B and of C . [4]

*For
Examiner's
Use*

- (ii) Hence, using the substitution $y = x^2$, solve, for x , the equation

$$(3 + x)^5 + (3 - x)^5 = 1086. \quad [4]$$

- 7 (i) Show that $\frac{(4 - \sqrt{x})^2}{\sqrt{x}}$ can be written in the form $px^{-\frac{1}{2}} + q + rx^{\frac{1}{2}}$, where p , q and r are integers to be found. [3]

For
Examiner's
Use

- (ii) A curve is such that $\frac{dy}{dx} = \frac{(4 - \sqrt{x})^2}{\sqrt{x}}$ for $x > 0$. Given that the curve passes through the point (9, 30), find the equation of the curve. [5]

8 The line CD is the perpendicular bisector of the line joining the point $A (-1, -5)$ and the point $B (5,3)$.

(i) Find the equation of the line CD .

[4]

*For
Examiner's
Use*

- (ii) Given that M is the midpoint of AB , that $2CM = MD$, and that the x -coordinate of C is -2 , find the coordinates of D . [3]

*For
Examiner's
Use*

- (iii) Find the area of the triangle CAD . [2]

9 (i) Given that $y = x \sin 4x$, find $\frac{dy}{dx}$.

[3]

*For
Examiner's
Use*

(ii) Hence find $\int x \cos 4x \, dx$ and evaluate $\int_0^{\frac{\pi}{8}} x \cos 4x \, dx$.

[6]

10 (i) Solve $2 \sec^2 x = 5 \tan x + 5$, for $0^\circ < x < 360^\circ$.

[5]

*For
Examiner's
Use*

(ii) Solve $\sqrt{2} \sin\left(\frac{y}{2} + \frac{\pi}{3}\right) = 1$, for $0 < y < 4\pi$ radians.

[5]

