UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6890064064

ADDITIONAL MATHEMATICS **0606/12**

Paper 1 **October/November 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

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

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UNIVERSITY *of* CAMBRIDGE
International Examinations

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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

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

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 $\dfrac{1}{\tan\theta + \cot\theta} = \sin\theta\cos\theta$.

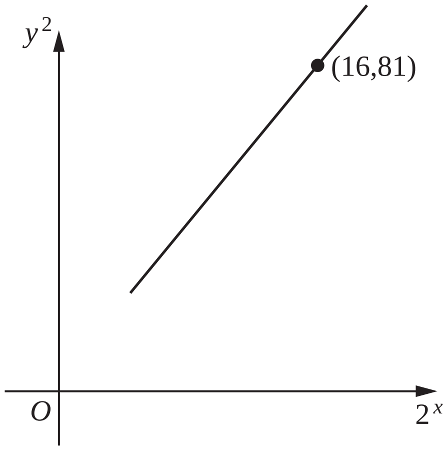
2 Find the coordinates of the points where the line $2y = x - 1$ meets the curve $x^2 + y^2 = 25$

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

(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 po[illegible] where $x = 2$.

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).



(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.

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

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

7 **(i)** Show that $\dfrac{\left(4-\sqrt{x}\right)^2}{\sqrt{x}}$ 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]

(ii) A curve is such that $\dfrac{dy}{dx} = \dfrac{\left(4-\sqrt{x}\right)^2}{\sqrt{x}}$ 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]

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

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

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

(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 $0° < x < 360°$.

(ii) Solve $\sqrt{2}\,\sin\left(\frac{y}{2} + \frac{\pi}{3}\right) = 1$, for $0 < y < 4\pi$ radians. [5]

11 Answer only **one** of the following two alternatives.

EITHER

A curve has equation $y = e^{-x}(A\cos 2x + B\sin 2x)$. At the point (0, 4) on the curve, the gradient of the tangent is 6.

(i) Find the value of A. [1]

(ii) Show that $B = 5$. [5]

(iii) Find the value of x, where $0 < x < \frac{\pi}{2}$ radians, for which y has a stationary value. [5]

OR

A curve has equation $y = \frac{\ln(x^2 - 1)}{x^2 - 1}$, for $x > 1$.

(i) Show that $\frac{dy}{dx} = \frac{kx(1 - \ln(x^2 - 1))}{(x^2 - 1)^2}$, where k is a constant to be found. [4]

(ii) Hence find the approximate change in y when x increases from $\sqrt{5}$ to $\sqrt{5} + p$, where p is small. [2]

(iii) Find, in terms of e, the coordinates of the stationary point on the curve. [5]

Start your answer to Question 11 here.

Indicate which question you are answering.

EITHER	
OR	

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Continue your answer to Question 11 here.

Continue your answer here if necessary.