UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

0835058084

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **October/November 2012**

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.

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Total	

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

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Mathematical Formulae

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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 **(i)** Sketch the graph of $y = |3 + 5x|$, showing the coordinates of the points where your graph meets the coordinate axes. [2]

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(ii) Solve the equation $|3 + 5x| = 2$. [2]

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2 Find the values of k for which the line $y = k - 6x$ is a tangent to the curve $y = x(2x + k)$. [4]

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3 Given that $p = \log_q 32$, express, in terms of p,

(i) $\log_q 4$, [2]

(ii) $\log_q 16q$. [2]

4 Using the substitution $u = 5^x$, or otherwise, solve

$$5^{2x+1} = 7(5^x) - 2.$$ [5]

5 Given that $y = \dfrac{x^2}{\cos 4x}$, find

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(i) $\dfrac{dy}{dx}$, [3]

(ii) the approximate change in y when x increases from $\dfrac{\pi}{4}$ to $\dfrac{\pi}{4} + p$, where p is small. [2]

6 **(i)** Find the first 3 terms, in descending powers of x, in the expansion of $\left(x + \frac{2}{x^2}\right)^6$. [3]

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(ii) Hence find the term independent of x in the expansion of $\left(2 - \frac{4}{x^3}\right)\left(x + \frac{2}{x^2}\right)^6$. [2]

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7 Do not use a calculator in any part of this question.

(a) (i) Show that $3\sqrt{5} - 2\sqrt{2}$ is a square root of $53 - 12\sqrt{10}$. [1]

(ii) State the other square root of $53 - 12\sqrt{10}$. [1]

(b) Express $\dfrac{6\sqrt{3} + 7\sqrt{2}}{4\sqrt{3} + 5\sqrt{2}}$ in the form $a + b\sqrt{6}$, where a and b are integers to be found. [4]

8 The points $A(-3, 6)$, $B(5, 2)$ and C lie on a straight line such that B is the mid-point of AC.

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(i) Find the coordinates of C. [2]

The point D lies on the y-axis and the line CD is perpendicular to AC.

(ii) Find the area of the triangle ACD. [5]

9 A function g is such that $g(x) = \dfrac{1}{2x - 1}$ for $1 \leqslant x \leqslant 3$.

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(i) Find the range of g. [1]

(ii) Find $g^{-1}(x)$. [2]

(iii) Write down the domain of $g^{-1}(x)$. [1]

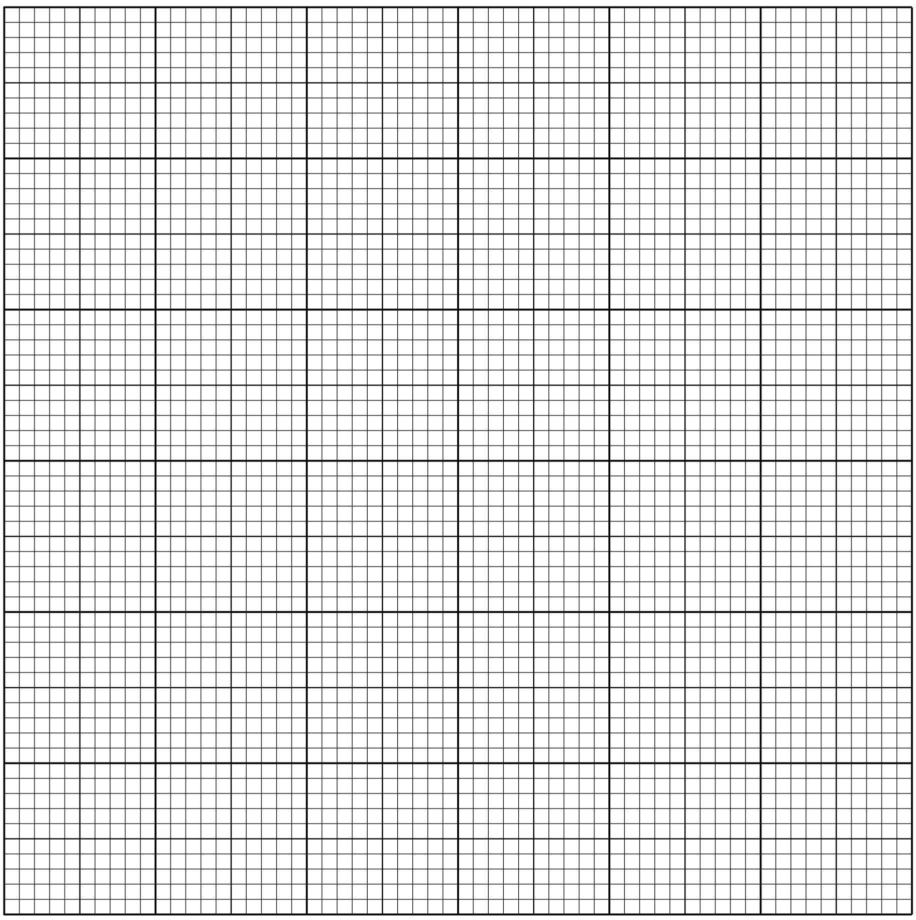
(iv) Solve $g^2(x) = 3$. [3]

10 The table shows values of the variables x and y.

x	10°	30°	45°	60°	80°
y	11.2	16	19.5	22.4	24.7

(i) Using the graph paper below, plot a suitable straight line graph to show that, for $10° \leqslant x \leqslant 80°$,

$$\sqrt{y} = A\sin x + B,$$ where A and B are positive constants. [4]



(ii) Use your graph to find the value of A and of B. [3]

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(iii) Estimate the value of y when $x = 50$. [2]

(iv) Estimate the value of x when $y = 12$. [2]

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11 **(a)** Solve $\operatorname{cosec}\left(2x - \frac{\pi}{3}\right) = \sqrt{2}$ for $0 < x < \pi$ radians. [4]

(b) **(i)** Given that $5(\cos y + \sin y)(2\cos y - \sin y) = 7$, show that $12\tan^2 y - 5\tan y - 3 = 0$. [4]

(ii) Hence solve $5(\cos y + \sin y)(2\cos y - \sin y) = 7$ for $0° < x < 180°$. [3]

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

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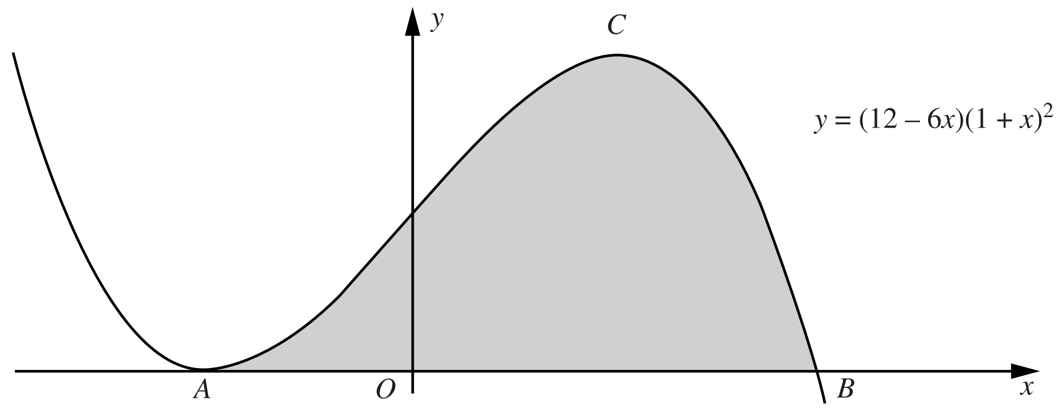
EITHER

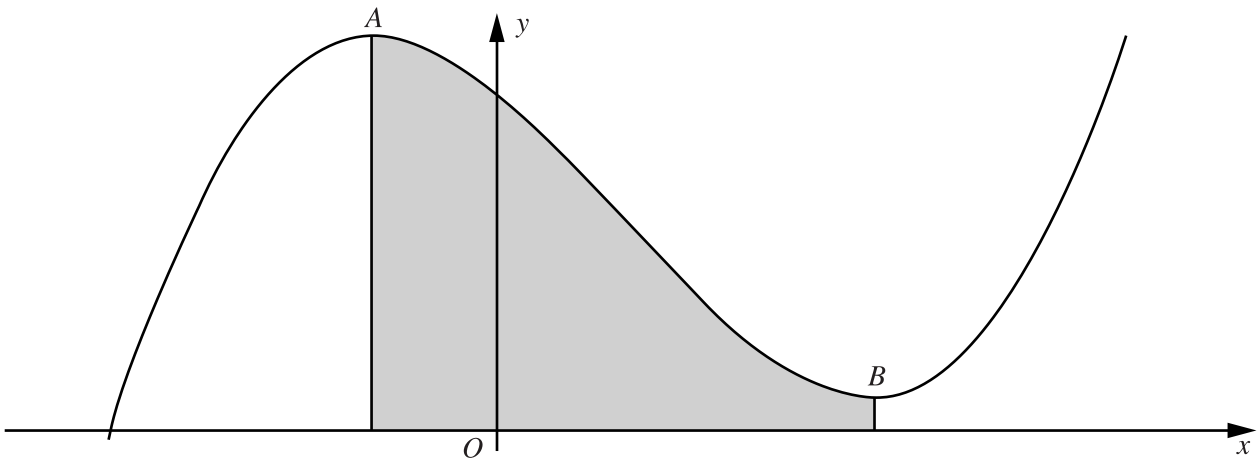


The diagram shows part of the graph of $y = (12 - 6x)(1 + x)^2$, which meets the x-axis at the points A and B. The point C is the maximum point of the curve.

(i) Find the coordinates of each of A, B and C. [6]

(ii) Find the area of the shaded region. [5]

OR



The diagram shows part of a curve such that $\frac{dy}{dx} = 3x^2 - 6x - 9$. Points A and B are stationary points of the curve and lines from A and B are drawn perpendicular to the x-axis. Given that the curve passes through the point (0, 30), find

(i) the equation of the curve, [4]

(ii) the x-coordinate of A and of B, [3]

(iii) the area of the shaded region. [4]

Start your answer to Question 12 here.

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Indicate which question you are answering.

EITHER	
OR	

Continue your answer here if necessary.

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