Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4354645867

ADDITIONAL MATHEMATICS **0606/13**

Paper 1 **May/June 2014**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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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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

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

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

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

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1 **(i)** Show that $y = 3x^2 - 6x + 5$ can be written in the form $y = a(x - b)^2 + c$, where a, b and c are constants to be found. [3]

(ii) Hence, or otherwise, find the coordinates of the stationary point of the curve $y = 3x^2 - 6x + 5$. [1]

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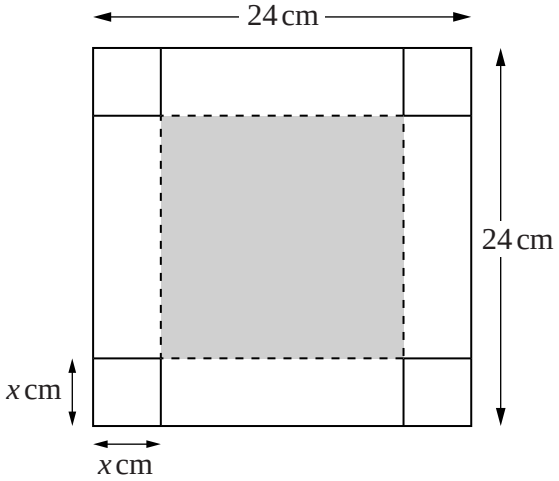
2 Given that $2^{4x} \times 4^y \times 8^{x-y} = 1$ and $3^{x+y} = \frac{1}{3}$, find the value of x and of y. [4]

3 **(i)** Find, in terms of p, the remainder when $x^3 + px^2 + p^2x + 21$ is divided by $x + 3$. [2]

(ii) Hence find the set of values of p for which this remainder is negative. [3]

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4 The diagram shows a thin square sheet of metal measuring 24 cm by 24 cm. A square of side x cm is cut off from each corner. The remainder is then folded to form an open box, x cm deep, whose square base is shown shaded in the diagram.



(i) Show that the volume, $V\text{cm}^3$, of the box is given by $V = 4x^3 - 96x^2 + 576x$. [2]

(ii) Given that x can vary, find the maximum volume of the box. [4]

5 **(i)** The first three terms in the expansion of $(2-5x)^6$, in ascending powers of x, are $p+qx+rx^2$. Find the value of each of the integers p, q and r. [3]

(ii) In the expansion of $(2-5x)^6(a+bx)^3$, the constant term is equal to 512 and the coefficient of x is zero. Find the value of each of the constants a and b. [4]

6 Find the equation of the normal to the curve $y = x(x^2 - 12)^{\frac{1}{3}}$ at the point on the curve where $x = 2$. [6]

7 **(a)** A 5-character password is to be chosen from the letters *A*, *B*, *C*, *D*, *E* and the digits 4, 5, 6, 7. Each letter or digit may be used only once. Find the number of different passwords that can be chosen if

(i) there are no restrictions, [1]

(ii) the password contains 2 letters followed by 3 digits. [2]

(b) A school has 3 concert tickets to give out at random to a class of 18 boys and 15 girls. Find the number of ways in which this can be done if

(i) there are no restrictions, [1]

(ii) 2 of the tickets are given to boys and 1 ticket is given to a girl, [2]

(iii) at least 1 boy gets a ticket. [2]

8 A particle moves in a straight line such that, t s after passing through a fixed point O, its velocity, $v\,\text{ms}^{-1}$, is given by $v = 5 - 4\text{e}^{-2t}$.

(i) Find the velocity of the particle at O. [1]

(ii) Find the value of t when the acceleration of the particle is $6\,\text{ms}^{-2}$. [3]

(iii) Find the distance of the particle from O when $t = 1.5$. [5]

(iv) Explain why the particle does not return to O. [1]

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9 Solve

(i) $3\sin x\cos x = 2\cos x$ for $0° \leqslant x \leqslant 180°$, [4]

(ii) $10\sin^2 y + \cos y = 8$ for $0° \leqslant y \leqslant 360°$. [5]

10 The table shows experimental values of x and y.

x	1.50	1.75	2.00	2.25
y	3.9	8.3	19.5	51.7

(i) Complete the following table.

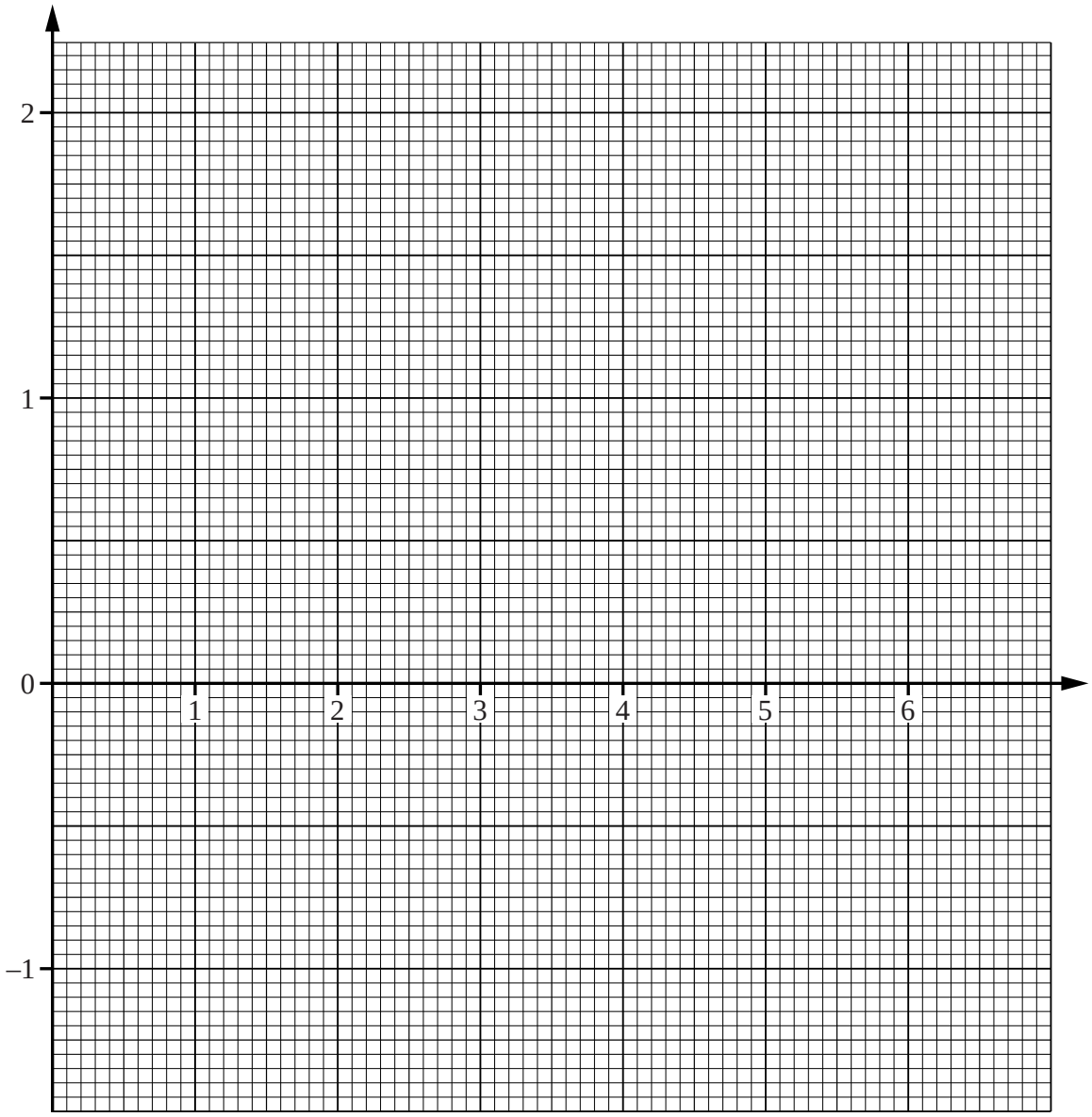
x^2				
1g y				

[1]

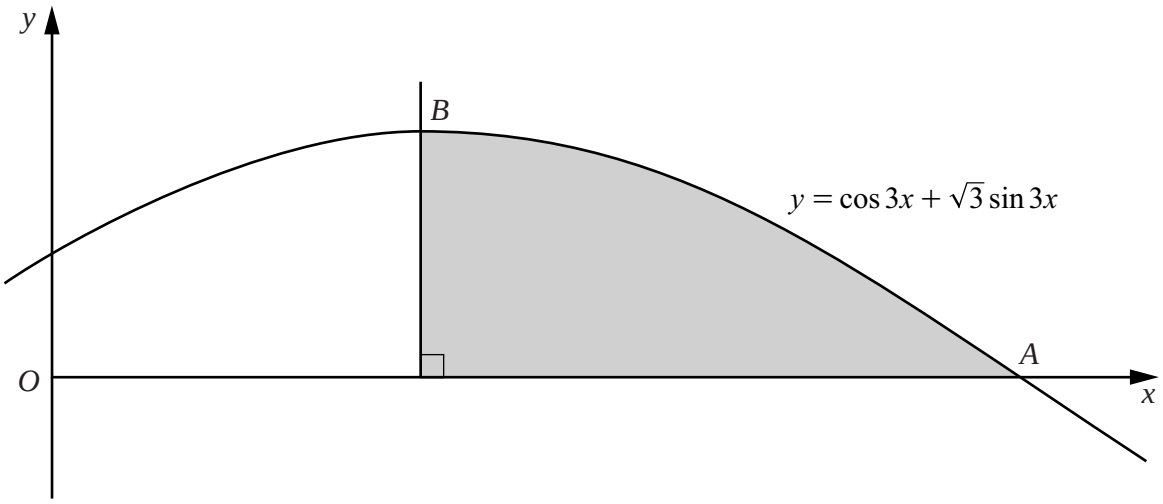
(ii) By plotting a suitable straight line graph on the grid on page 13, show that x and y are related by the equation $y = Ab^{x^2}$, where A and b are constants. [2]

(iii) Use your graph to find the value of A and of b. [4]

(iv) Estimate the value of y when $x = 1.25$. [2]


2
1
0
–1
1
2
3
4
5
6

11 The diagram shows the graph of $y = \cos 3x + \sqrt{3}\sin 3x$, which crosses the x-axis at A and has a maximum point at B.



(i) Find the x-coordinate of A. [3]

(ii) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ and hence find the x-coordinate of B. [4]

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(iii) Showing all your working, find the area of the shaded region bounded by the curve, the x-axis and the line through B parallel to the y-axis. [5]

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