



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	
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<b>Total</b>	

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  $\Delta ABC$* 

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

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

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

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

[3]

*For  
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- 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]

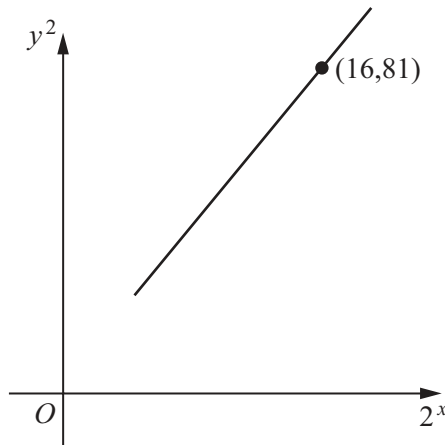
- 4 A curve has equation  $y = (3x^2 + 15)^{\frac{2}{3}}$ . Find the equation of the normal to the curve at the point where  $x = 2$ .

[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  
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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  
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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]





