Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

6699279819

ADDITIONAL MATHEMATICS **4037/23**

Paper 2 **October/November 2018**

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 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.

This document consists of **15** printed pages and **1** blank page.

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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

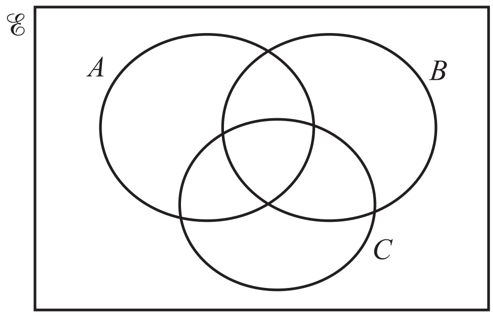
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

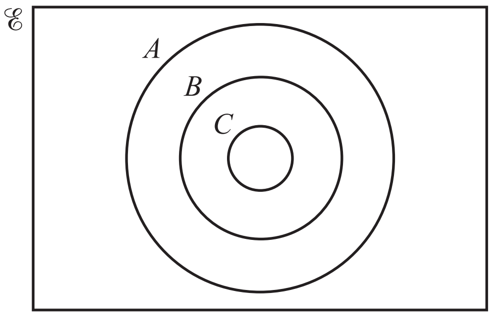
$$\Delta = \frac{1}{2} bc \sin A$$

1 Solve the equation $|5x-3| = -3x + 13$. [3]

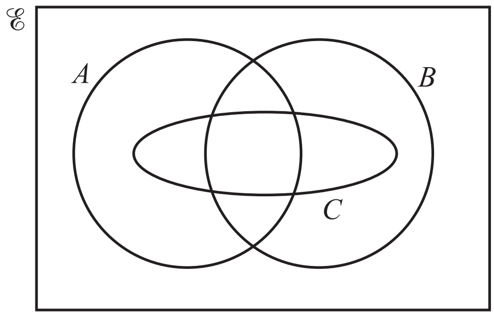
2 On each of the Venn diagrams below, shade the region indicated.



$(A \cup B \cup C)'$



$A \cap B \cap C'$



$(A \cap B) \cup C'$

[3]

3 **(i)** Write $8+7x-x^2$ in the form $a-(x-b)^2$, where a and b are constants. [3]

(ii) Hence state the maximum value of $8+7x-x^2$ and the value of x at which it occurs. [2]

(iii) Using your answer to **part (i)**, or otherwise, solve the equation $8+7z^2-z^4=0$. [3]

4 $$\frac{d^2y}{dx^2} = 2x + \frac{3}{(x+1)^4}$$

(i) Find $\frac{dy}{dx}$, given that $\frac{dy}{dx} = 1$ when $x = 1$. [3]

(ii) Find y in terms of x, given that $y = 3$ when $x = 1$. [3]

5 Given that $\mathbf{A} = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 1 & 4 \\ -2 & 5 \end{pmatrix}$, find

(i) $\mathbf{A}^{-1}$, [2]

(ii) the matrix $\mathbf{C}$ such that $\mathbf{CA} = \mathbf{B}$, [2]

(iii) the matrix $\mathbf{D}$ such that $\mathbf{A}^{-1}\mathbf{D} + \mathbf{B} = \mathbf{I}$. [3]

6 Solve the simultaneous equations

$$\log_2(x+2y) = 3,$$

$$\log_2 3x - \log_2 y = 1.$$

[5]

7 A squad of 20 boys, which includes 2 sets of twins, is available for selection for a cricket team of 11 players. Calculate the number of different teams that can be selected if

(i) there are no restrictions, [1]

(ii) both sets of twins are selected, [2]

(iii) one set of twins is selected but neither twin from the other set is selected, [2]

(iv) exactly one twin from each set of twins is selected. [2]

8 Variables x and y are such that when y^2 is plotted against e^{2x} a straight line is obtained which passes throug[h] the points (1.5, 5.5) and (3.7, 12.1). Find

(i) y in terms of e^{2x}, [3]

(ii) the value of y when $x = 3$, [1]

(iii) the value of x when $y = 50$. [3]

9 **(a)** Solve $2\sin\left(x+\frac{\pi}{4}\right)=\sqrt{3}$ for $0 < x < \pi$ radians. [3]

(b) Solve $3\sec y = 4\operatorname{cosec} y$ for $0° < y < 360°$. [3]

(c) Solve $7\cot z - \tan z = 2\operatorname{cosec} z$ for $0° < z < 360°$. [6]

10 The equation of a curve is $y = x^2\sqrt{3+x}$ for $x \geqslant -3$.

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

(ii) Find the equation of the tangent to the curve $y = x^2\sqrt{3+x}$ at the point where $x = 1$. [3]

(iii) Find the coordinates of the turning points of the curve $y = x^2\sqrt{3+x}$. [4]

11 A line with equation $y = -5x + k + 5$ is a tangent to a curve with equation $y = 7 - kx - x^2$.

(i) Find the two possible values of k. [5]

(ii) Find, for **each** of your values of k,

- the equation of the tangent
- the equation of the curve
- the coordinates of the point of contact of the tangent and the curve. [5]

(iii) Find the distance between the two points of contact. [2]

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