Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME		
CENTRE NUMBER		CANDIDATE NUMBER

6941654349

ADDITIONAL MATHEMATICS **0606/12**

Paper 1 **October/November 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.

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

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CAMBRIDGE International Examinations

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

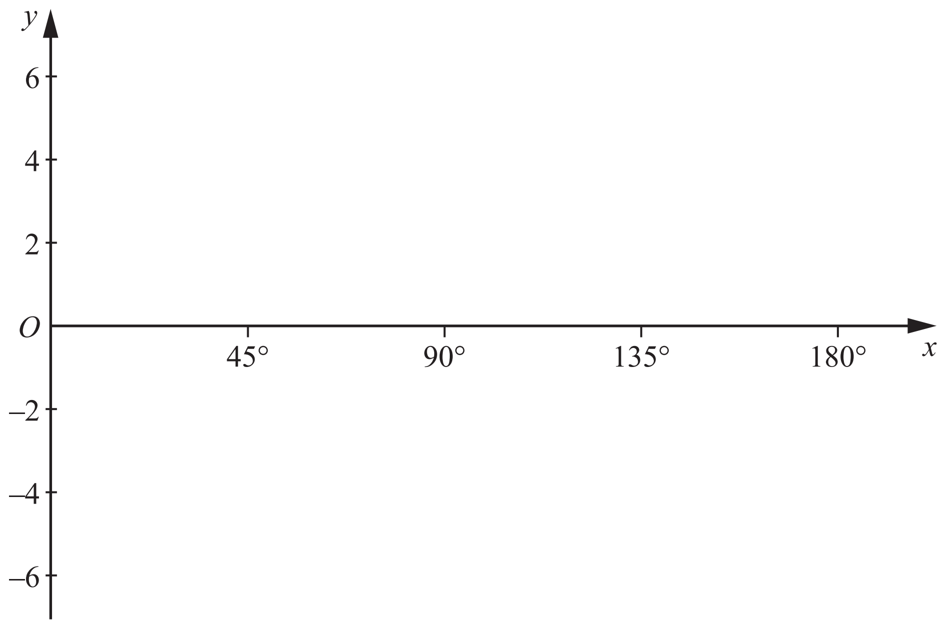
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

1 Find the coordinates of the stationary point on the curve $y = x^2 + \frac{16}{x}$. [4]

2 **(a)** On the axes below, sketch the curve $y = 3\cos 2x - 1$ for $0° \leqslant x \leqslant 180°$. [3]



(b) **(i)** State the amplitude of $1 - 4\sin 2x$. [1]

(ii) State the period of $5\tan 3x + 1$. [1]

3 A curve is such that $\dfrac{dy}{dx} = \dfrac{2}{\sqrt{x+3}}$ for $x > -3$. The curve passes through the point $(6, 10)$.

(i) Find the equation of the curve. [4]

(ii) Find the x-coordinate of the point on the curve where $y = 6$. [1]

4 **(i)** Using the substitution $y = 5^x$, show that the equation $5^{2x+1} - 5^{x+1} + 2 = 2(5^x)$ can be written in the form $ay^2 + by + 2 = 0$, where a and b are constants to be found. [2]

(ii) Hence solve the equation $5^{2x+1} - 5^{x+1} + 2 = 2(5^x)$. [4]

5 **(i)** Find the equation of the tangent to the curve $y = x^3 - \ln x$ at the point on the curve where $x = 1$. [4]

(ii) Show that this tangent bisects the line joining the points $(-2, 16)$ and $(12, 2)$. [2]

6 **(i)** Given that the coefficient of x^2 in the expansion of $(2+px)^6$ is 60, find the value of the positive constant p. [3]

(ii) Using your value of p, find the coefficient of x^2 in the expansion of $(3-x)(2+px)^6$. [3]

7 Matrices **A** and **B** are such that $\mathbf{A} = \begin{pmatrix} 3a & 2b \\ -a & b \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} -a & b \\ 2a & 2b \end{pmatrix}$, where a and b are non-zero constants.

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

(ii) Using your answer to part **(i)**, find the matrix **X** such that $\mathbf{XA} = \mathbf{B}$. [4]

8 The point P lies on the line joining $A(-2, 3)$ and $B(10, 19)$ such that $AP:PB = 1:3$.

(i) Show that the x-coordinate of P is 1 and find the y-coordinate of P. [2]

(ii) Find the equation of the line through P which is perpendicular to AB. [3]

The line through P which is perpendicular to AB meets the y-axis at the point Q.

(iii) Find the area of the triangle AQB. [3]

9 The table shows experimental values of variables x and y.

x	2	2.5	3	3.5	4
y	18.8	29.6	46.9	74.1	117.2

(i) By plotting a suitable straight line graph on the grid below, show that x and y are related by the equation $y = ab^x$, where a and b are constants. [4]

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

10 **(a)** **(i)** Find how many different 4-digit numbers can be formed using the digits 1, 2, 3, 4, 5 and 6 if no digit is repeated. [1]

(ii) How many of the 4-digit numbers found in part **(i)** are greater than 6000? [1]

(iii) How many of the 4-digit numbers found in part **(i)** are greater than 6000 and are odd? [1]

(b) A quiz team of 10 players is to be chosen from a class of 8 boys and 12 girls.

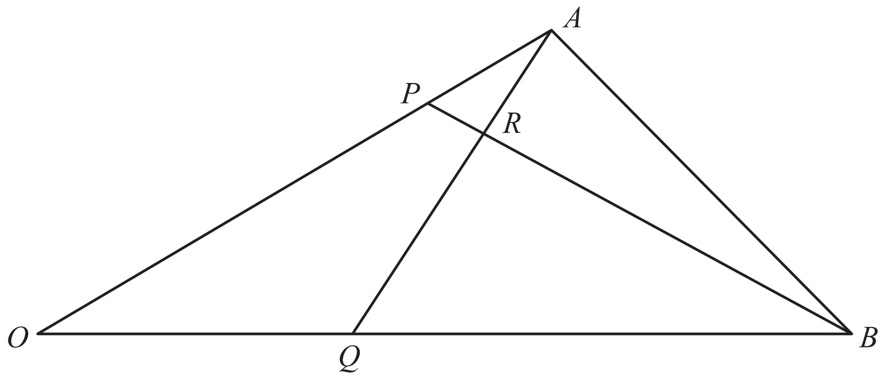
(i) Find the number of different teams that can be chosen if the team has to have equal numbers of girls and boys. [3]

(ii) Find the number of different teams that can be chosen if the team has to include the youngest and oldest boy and the youngest and oldest girl. [2]

11 **(a)** Solve $2\cos 3x = \cot 3x$ for $0° \leqslant x \leqslant 90°$. [5]

(b) Solve $\sec\left(y + \frac{\pi}{2}\right) = -2$ for $0 \leqslant y \leqslant \pi$ radians. [4]

12



The position vectors of points A and B relative to an origin O are **a** and **b** respectively. The point P is such that $\overrightarrow{OP} = \mu\overrightarrow{OA}$. The point Q is such that $\overrightarrow{OQ} = \lambda\overrightarrow{OB}$. The lines AQ and BP intersect at the point R.

(i) Express $\overrightarrow{AQ}$ in terms of λ, **a** and **b**. [1]

(ii) Express $\overrightarrow{BP}$ in terms of μ, **a** and **b**. [1]

It is given that $3\overrightarrow{AR} = \overrightarrow{AQ}$ and $8\overrightarrow{BR} = 7\overrightarrow{BP}$.

(iii) Express $\overrightarrow{OR}$ in terms of λ, **a** and **b**. [2]

(iv) Express $\overrightarrow{OR}$ in terms of μ, **a** and **b**. [2]

(v) Hence find the value of μ and of λ. [3]

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