UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0104471722

ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **May/June 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.
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.

For Examiner's Use	
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This document consists of **16** printed pages.

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UNIVERSITY *of* CAMBRIDGE
International Examinations

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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 $\binom{n}{r} = \dfrac{n!}{(n-r)!r!}$

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 It is given that P is the set of prime numbers, S is the set of square numbers and N is th
numbers between 10 and 90. Write each of the following statements using set notation.

(i) 7 is a prime number. [1]

(ii) 8 is not a square number. [1]

(iii) There are 6 square numbers between 10 and 90. [1]

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2 **(i)** Given that $y = \sqrt{(4x+1)^3}$, find $\frac{dy}{dx}$. [2]

(ii) Hence find the approximate increase in y as x increases from 6 to $6 + p$, where p is small. [2]

3 Find the values of m for which the line $y = mx - 5$ is a tangent to the curve $y = x^2 + 3x + 4$.

4 In a competition the contestants search for hidden targets which are classed as difficult, medium or easy. In the first round, finding a difficult target scores 5 points, a medium target 3 points and an easy target 1 point. The number of targets found by the two contestants, Claire and Denise, are shown in the table.

Contestant \ Target	Difficult	Medium	Easy
Claire	4	1	7
Denise	2	5	1

In the second round, finding a difficult target scores 8 points, a medium target 4 points and an easy target 2 points. In the second round Claire finds 2 difficult, 5 medium and 2 easy targets whilst Denise finds 4 difficult, 3 medium and 6 easy targets.

(i) Write down the sum of two matrix products which, on evaluation, would give the total score for each contestant. [3]

(ii) Use matrix multiplication and addition to calculate the total score for each contestant. [2]

5 It is given that $x - 2$ is a factor of $f(x) = x^3 + kx^2 - 8x - 8$.

(i) Find the value of the integer k. [2]

(ii) Using your value of k, find the non-integer roots of the equation $f(x) = 0$ in the form $a \pm \sqrt{b}$, where a and b are integers. [5]

6 **(a)** Find the coefficient of x^3 in the expansion of

(i) $(1 - 2x)^7$, [2]

(ii) $(3 + 4x)(1 - 2x)^7$. [3]

(b) Find the term independent of x in the expansion of $\left(x + \dfrac{3}{x^2}\right)^6$. [3]

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

x	5	30	150	400
y	8.9	21.9	48.9	80.6

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

(ii) Use your graph to estimate the value of a and of b.

(iii) Estimate the value of y when $x = 100$. [2]

8 An open rectangular cardboard box with a square base is to have a volume of $256\,\text{cm}^3$. [illegible] dimensions of the box if the area of cardboard used is as small as possible.

9 **(a)** Solve the equation

(i) $3\sin x - 5\cos x = 0$ for $0° < x < 360°$, [3]

(ii) $5\sin^2 y + 9\cos y - 3 = 0$ for $0° < y < 360°$. [5]

(b) Solve $\sin(3 - z) = 0.8$ for $0 < z < \pi$ radians.

10 **(a)** A team of 7 people is to be chosen from 5 women and 7 men. Calculate the number of different ways in which this can be done if

(i) there are no restrictions, [1]

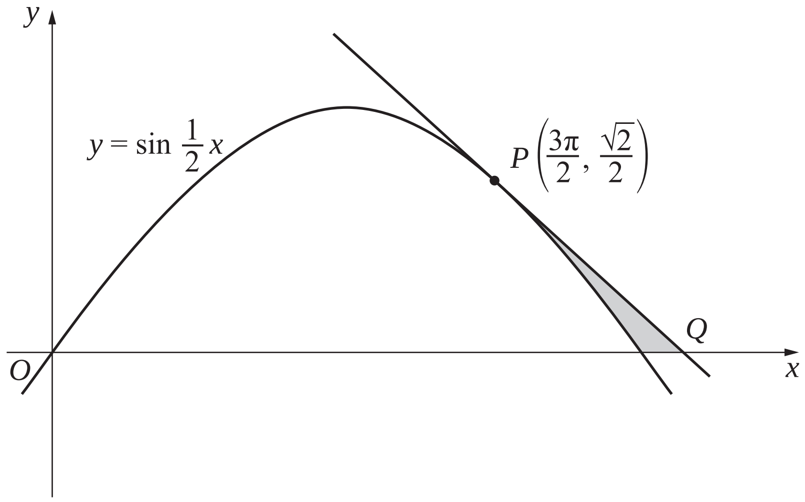
(ii) the team is to contain more women than men. [3]

(b) **(i)** How many different 4-digit numbers, less than 5000, can be formed using 4 o[illegible] digits 1, 2, 3, 4, 5 and 6 if no digit can be used more than once?

(ii) How many of these 4-digit numbers are divisible by 5? [2]

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

EITHER



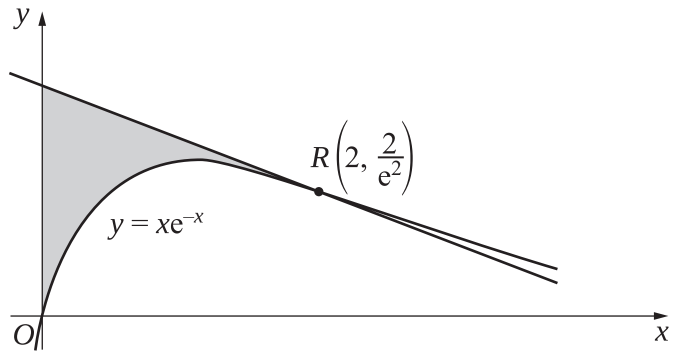
The diagram shows part of the curve $y = \sin \frac{1}{2}x$. The tangent to the curve at the point $P\left(\frac{3\pi}{2}, \frac{\sqrt{2}}{2}\right)$ cuts the x-axis at the point Q.

(i) Find the coordinates of Q. [4]

(ii) Find the area of the shaded region bounded by the curve, the tangent and the x-axis. [7]

OR

(i) Given that $y = xe^{-x}$, find $\frac{dy}{dx}$ and hence show that $\int xe^{-x}\,dx = -xe^{-x} - e^{-x} + c$. [4]



The diagram shows part of the curve $y = xe^{-x}$ and the tangent to the curve at the point $R\left(2, \frac{2}{e^2}\right)$.

(ii) Find the area of the shaded region bounded by the curve, the tangent and the y-axis. [7]

Start your answer to Question 11 here.

Indicate which question you are answering.

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Continue your answer here if necessary.