UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6732187560

ADDITIONAL MATHEMATICS **0606/12**

Paper 1 **May/June 2011**

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

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

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

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

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

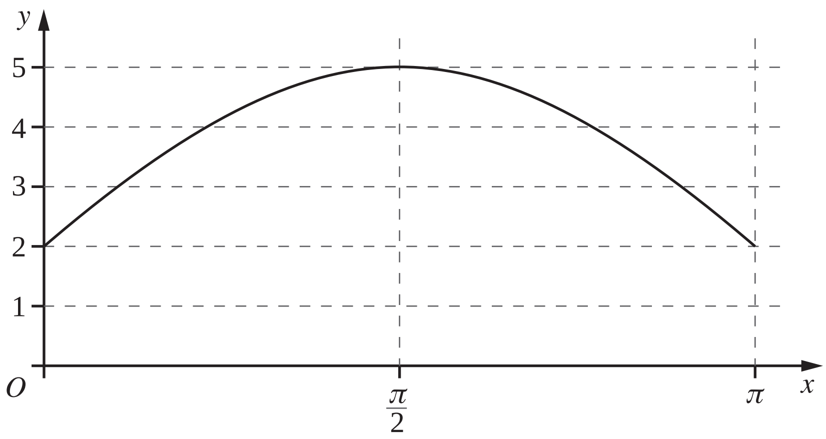
1 Find the value of k for which the x-axis is a tangent to the curve

$$y = x^2 + (2k + 10)x + k^2 + 5.$$

[

2 The coefficient of x^3 in the expansion of $(2 + ax)^5$ is 10 times the coefficient of x
expansion of $\left(1 + \frac{ax}{3}\right)^4$. Find the value of a.

3 **(a)**



The figure shows the graph of $y = k + m\sin px$ for $0 \leqslant x \leqslant \pi$, where k, m and p are positive constants. Complete the following statements.

k = ... m = ... p = ... [3]

(b) The function g is such that $\mathrm{g}(x) = 1 + 5\cos 3x$. Write down

(i) the amplitude of g, [1]

(ii) the period of g in terms of π. [1]

4 **You must not use a calculator in Question 4.**

In the triangle ABC, angle $B = 90°$, $AB = 4 + 2\sqrt{2}$ and $BC = 1 + \sqrt{2}$.

(i) Find $\tan C$, giving your answer in the form $k\sqrt{2}$. [2]

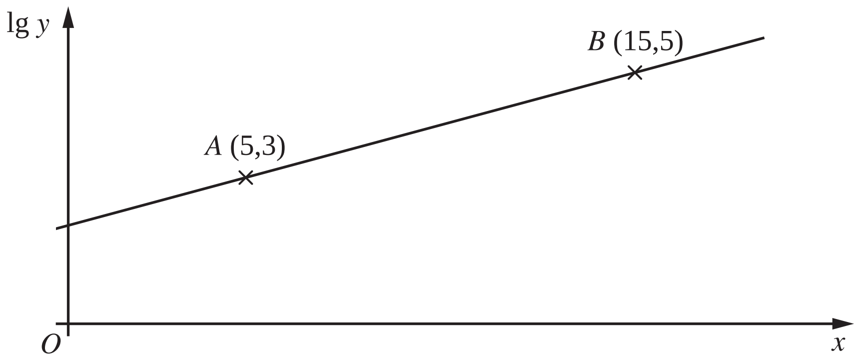
(ii) Find the area of the triangle ABC, giving your answer in the form $p + q\sqrt{2}$, where p and q are integers. [2]

(iii) Find the area of the square whose side is of length AC, giving your answer in the form $s + t\sqrt{2}$, where s and t are integers. [2]

5 **(i)** Show that $2x - 1$ is a factor of $2x^3 - 5x^2 + 10x - 4$.

(ii) Hence show that $2x^3 - 5x^2 + 10x - 4 = 0$ has only one real root and state the value of this root. [4]

6 The figure shows the graph of a straight line with $\lg y$ plotted against x. The straight line through the points $A(5,3)$ and $B(15,5)$.



(i) Express $\lg y$ in terms of x. [3]

(ii) Show that $y = a(10^{bx})$ where a and b are to be found. [3]

7 A team of 6 members is to be selected from 6 women and 8 men.

(i) Find the number of different teams that can be selected. [1]

(ii) Find the number of different teams that consist of 2 women and 4 men. [3]

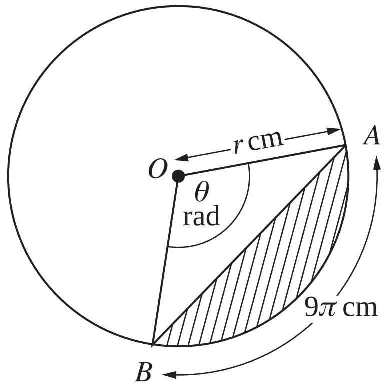
(iii) Find the number of different teams that contain no more than 1 woman. [3]

8 **(i)** Sketch the curve $y = (2x - 5)(2x + 1)$ for $-1 \leqslant x \leqslant 3$, stating the coordinates of the where the curve meets the coordinate axes.

(ii) State the coordinates of the stationary point on the curve. [1]

(iii) Using your answers to parts **(i)** and **(ii)**, sketch the curve $y = |(2x - 5)(2x + 1)|$ for $-1 \leqslant x \leqslant 3$. [2]

9 The figure shows a circle, centre O, radius r cm. The length of the arc AB of the circle is
Angle AOB is θ radians and is 3 times angle OBA.



(i) Show that $\theta = \frac{3\pi}{5}$. [2]

(ii) Find the value of r. [2]

(iii) Find the area of the shaded region. [3]

10 Relative to an origin O, points A and B have position vectors $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$ and $\begin{pmatrix} 29 \\ -13 \end{pmatrix}$ respective

(i) Find a unit vector parallel to $\overrightarrow{AB}$. [3]

The points A, B and C lie on a straight line such that $2\overrightarrow{AC} = 3\overrightarrow{AB}$.

(ii) Find the position vector of the point C. [4]

11 Solve

(i) $2\cot^2 x - 5\operatorname{cosec} x - 1 = 0$ for $0° < x < 180°$, [

(ii) $5\cos 2y - 4\sin 2y = 0$ for $0° < y < 180°$, [4]

(iii) $\cos\left(z + \frac{\pi}{6}\right) = -\frac{1}{2}$ for $0 < z < 2\pi$ radians. [3]

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

EITHER

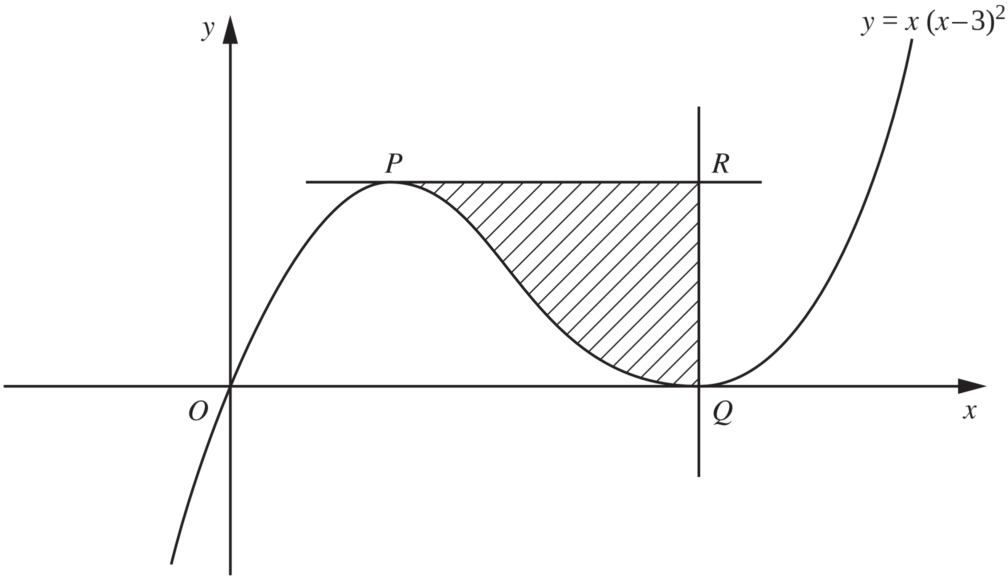
The tangent to the curve $y = 3x^3 + 2x^2 - 5x + 1$ at the point where $x = -1$ meets the y-axis at the point A.

(i) Find the coordinates of the point A. [3]

The curve meets the y-axis at the point B. The normal to the curve at B meets the x-axis at the point C. The tangent to the curve at the point where $x = -1$ and the normal to the curve at B meet at the point D.

(ii) Find the area of the triangle ACD. [7]

OR



The diagram shows the curve $y = x(x - 3)^2$. The curve has a maximum at the point P and touches the x-axis at the point Q. The tangent at P and the normal at Q meet at the point R. Find the area of the shaded region PQR. [10]

Start your answer to Question 12 here.

Indicate which question you are answering.

EITHER	
OR	

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Continue your answer here if necessary.