UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1668603243

ADDITIONAL MATHEMATICS **0606/21**

Paper 2 **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 **14** printed pages and **2** blank 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 $\binom{n}{r} = \frac{n!}{(n-r)!r!}$.

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 Without using a calculator, express $\frac{(5+2\sqrt{3})^2}{2+\sqrt{3}}$ in the form $p + q\sqrt{3}$, where p and q are int

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2 **(i)** Find the coefficient of x^3 in the expansion of $\left(1-\frac{x}{2}\right)^{12}$. [2]

(ii) Find the coefficient of x^3 in the expansion of $(1+4x)\left(1-\frac{x}{2}\right)^{12}$. [3]

3 Relative to an origin O, the position vectors of the points A and B are $\mathbf{i} - 4\mathbf{j}$ and 7[illegible] respectively. The point C lies on AB and is such that $\overrightarrow{AC} = \frac{2}{3}\overrightarrow{AB}$. Find the position vector [illegible] and the magnitude of this vector. [5]

4 Find the set of values of k for which the line $y = 2x - 5$ cuts the curve $y = x^2 + kx + 11$ [illegible]
distinct points.

5 The expression $x^3 + 8x^2 + px - 25$ leaves a remainder of R when divided by $x - 1$
remainder of $-R$ when divided by $x + 2$.

(i) Find the value of p. [4]

(ii) Hence find the remainder when the expression is divided by $x + 3$. [2]

6 **(a)** A shelf contains 8 different travel books, of which 5 are about Europe and 3 are about

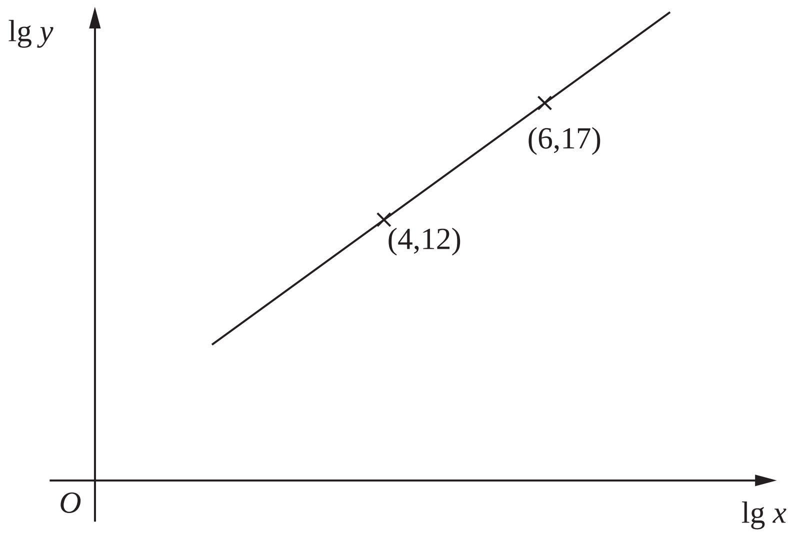
(i) Find the number of different ways the books can be arranged if there are no restrictions. [2]

(ii) Find the number of different ways the books can be arranged if the 5 books about Europe are kept together. [2]

(b) 3 DVDs and 2 videotapes are to be selected from a collection of 7 DVDs and 5 videotapes.

Calculate the number of different selections that could be made. [3]

7 The variables x and y are related so that when $\lg y$ is plotted against $\lg x$ a straight line passing through the points (4, 12) and (6, 17) is obtained.



(i) Express y in terms of x, giving your answer in the form $y = ax^b$. [6]

(ii) Find the value of x when $y = 300$. [2]

8 The temperature, $T°$ Celsius, of an object, t minutes after it is removed from a heat so[urce, is] given by

$$T = 55e^{-0.1t} + 15.$$

(i) Find the temperature of the object at the instant it is removed from the heat source. [1]

(ii) Find the temperature of the object when $t = 8$. [1]

(iii) Find the value of t when $T = 25$. [3]

(iv) Find the rate of change of T when $t = 16$. [3]

9 A coastguard station receives a distress call from a ship which is travelling at 15 km h bearing of 150°. A lifeboat leaves the coastguard station at 15 00 hours; at this time the ship is distance of 30 km on a bearing of 270°. The lifeboat travels in a straight line at constant speed an reaches the ship at 15 40 hours.

(i) Find the speed of the lifeboat. [5]

(ii) Find the bearing on which the lifeboat travelled. [3]

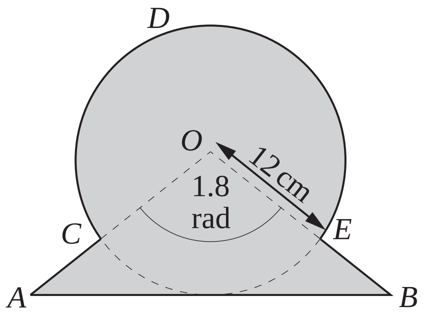
10 **(i)** Solve the equation $3\sin x + 4\cos x = 0$ for $0° < x < 360°$.

(ii) Solve the equation $6\cos y + 6\sec y = 13$ for $0° < y < 360°$. [5]

(iii) Solve the equation $\sin(2z - 3) = 0.7$ for $0 < z < \pi$ radians. [3]

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

EITHER



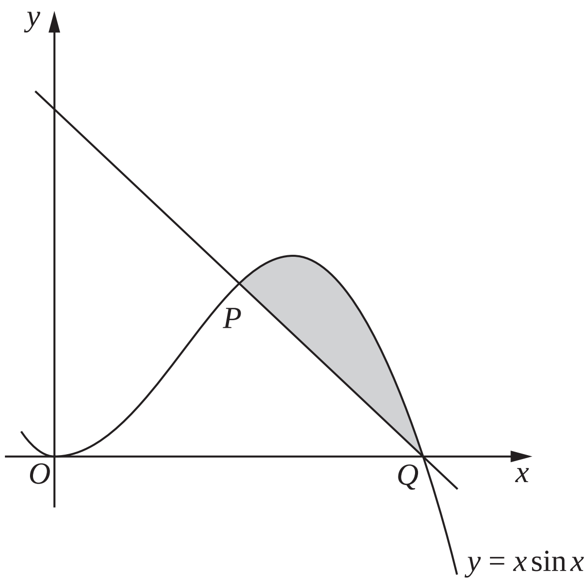
The diagram shows an isosceles triangle AOB and a sector $OCDEO$ of a circle with centre O. The line AB is a tangent to the circle. Angle $AOB = 1.8$ radians and the radius of the circle is 12 cm.

(i) Show that the distance $AC = 7.3$ cm to 1 decimal place. [2]

(ii) Find the perimeter of the shaded region. [6]

(iii) Find the area of the shaded region. [4]

OR



The diagram shows part of the curve $y = x\sin x$ and the normal to the curve at the point $P\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$. The curve passes through the point $Q(\pi, 0)$.

(i) Show that the normal to the curve at P passes through the point Q. [4]

(ii) Given that $\frac{d}{dx}(x\cos x) = \cos x - x\sin x$, find $\int x\sin x\,dx$. [3]

(iii) Find the area of the shaded region. [5]

Start your answer to Question 11 here.

Indicate which question you are answering.

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