UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6116049483

ADDITIONAL MATHEMATICS **0606/22**

Paper 2 **October/November 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.

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

[Turn over

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

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\text{cosec}^2 A = 1 + \cot^2 A$$

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 $|7x + 5| = |3x - 13|$.

2 The total surface area, A cm², of a solid cylinder with radius r cm and height 5 cm is given by $A = 2\pi r^2 + 10\pi r$. Given that r is increasing at a rate of $\frac{0.2}{\pi}$ cm s^{-1}, find the rate of increase of A when r is 6. [4]

3 Solve the inequality $4x(4 - x) > 7$.

4 **(i)** Find the coefficient of x^5 in the expansion of $(2 - x)^8$.

(ii) Find the coefficient of x^5 in the expansion of $(1 + 2x)(2 - x)^8$. [3]

5 A 4-digit number is formed by using four of the six digits 2, 3, 4, 5, 6 and 8; no digit may be used more than once in any number. How many different 4-digit numbers can be formed if

(i) there are no restrictions, [2]

(ii) the number is even and more than 6000? [3]

6 **(i)** Given that $\frac{2^{x-3}}{8^{2y-3}} = 16^{x-y}$, show that $3x + 2y = 6$.

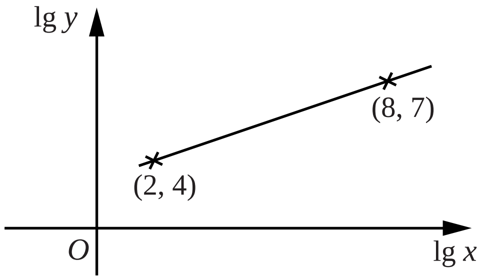
(ii) Given also that $\frac{5^y}{125^{x-2}} = 25$, find the value of x and of y. [4]

7 **(i)** Find $\frac{\mathrm{d}}{\mathrm{d}x}(\tan 4x)$.

(ii) Hence find $\int (1 + \sec^2 4x)\,\mathrm{d}x$. [3]

(iii) Hence show that $\int_{-\frac{\pi}{16}}^{\frac{\pi}{16}} (1 + \sec^2 4x)\,\mathrm{d}x = k(\pi+4)$, where k is a constant to be found. [2]

8



The variables x and y are related in such a way that when lg y is plotted against lg x a straight line graph is obtained as shown in the diagram. The line passes through the points (2, 4) and (8, 7).

(i) Express y in terms of x, giving your answer in the form $y = ax^b$, where a and b are constants. [5]

Another method of drawing a straight line graph for the relationship $y = ax^b$, found in part **(i)**, involves plotting lg x on the horizontal axis and $\lg(y^2)$ on the vertical axis. For this straight line graph what is

(ii) the gradient, [1]

(iii) the intercept on the vertical axis? [1]

9 A plane, whose speed in still air is $420\,\text{km}\,\text{h}^{-1}$, travels directly from A to B, a distance of 1000 km. The bearing of B from A is 230° and there is a wind of $80\,\text{km}\,\text{h}^{-1}$ from the east.

(i) Find the bearing on which the plane was steered. [4]

(ii) Find the time taken for the journey. [4]

10 The acceleration, a m s^{-2}, of a particle, t s after passing through a fixed point O, is given by $a = 4 - 2t$, for $t > 0$. The particle, which moves in a straight line, passes through O with a velocity of 12 m s^{-1}.

(i) Find the value of t when the particle comes to instantaneous rest. [5]

(ii) Find the distance from O of the particle when it comes to instantaneous rest. [3]

11 **(a)** Solve $4\sin x + 9\cos x = 0$ for $0° < x < 360°$.

(b) Solve $\operatorname{cosec} y - 1 = 12\sin y$ for $0° < y < 360°$. [5]

(c) Solve $3\sec\left(\frac{z}{3}\right) = 5$ for $0 < z < 6\pi$ radians.

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

EITHER

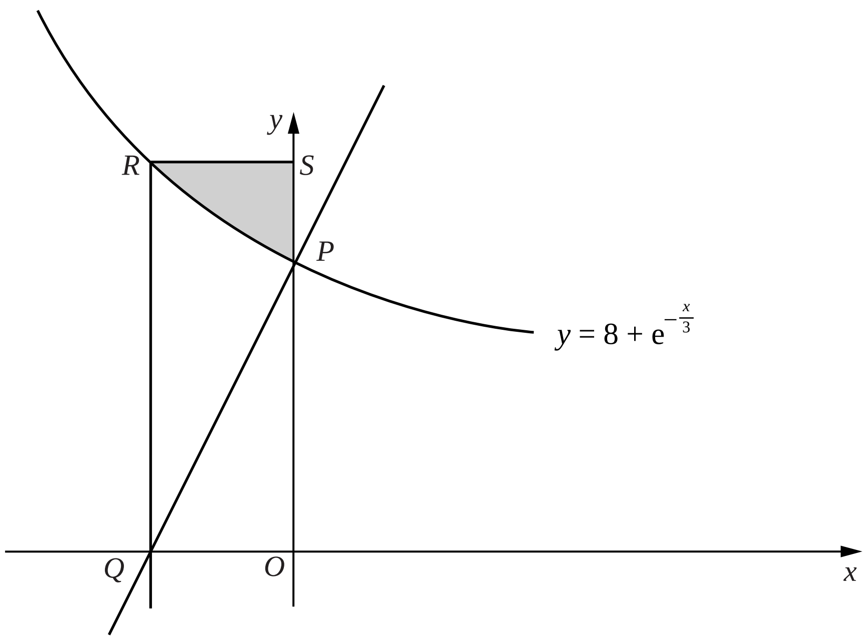
12 The point $A(0, 10)$ lies on the curve for which $\frac{dy}{dx} = e^{-\frac{x}{4}}$. The point B, with x-coordinate –4, also lies on the curve.

(i) Find, in terms of e, the y-coordinate of B. [5]

The tangents to the curve at the points A and B intersect at the point C.

(ii) Find, in terms of e, the x-coordinate of the point C. [5]

OR



The diagram shows part of the curve $y = 8 + e^{-\frac{x}{3}}$ crossing the y-axis at P. The normal to the curve at P meets the x-axis at Q.

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

The line through Q, parallel to the y-axis, meets the curve at R and $OQRS$ is a rectangle.

(ii) Find $\int \left(8 + e^{-\frac{x}{3}}\right) dx$ and hence find the area of the shaded region. [6]

Start your answer to Question 12 here.

Indicate which question you are answering.

EITHER	
OR	

Continue your answer here if necessary.