Cambridge IGCSE

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6133606886

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **October/November 2015**

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.

DC (LEG/CGW) 98539/3

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

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

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

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

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 range of values of k for which the equation $kx^2 + k = 8x - 2xk$ has 2 real distinct roots. [4]

2 A curve, showing the relationship between two variables x and y, passes through the point $P(-1, 3)$. The curve has a gradient of 2 at P. Given that $\frac{d^2y}{dx^2} = -5$, find the equation of the curve. [4]

3 Show that $\sqrt{\sec^2\theta - 1} + \sqrt{\operatorname{cosec}^2\theta - 1} = \sec\theta\operatorname{cosec}\theta$. [5]

4 **(a)** 6 books are to be chosen from 8 different books.

(i) Find the number of different selections of 6 books that could be made. [1]

A clock is to be displayed on a shelf with 3 of the 8 different books on each side of it. Find the number of ways this can be done if

(ii) there are no restrictions on the choice of books, [1]

(iii) 3 of the 8 books are music books which have to be kept together. [2]

(b) A team of 6 tennis players is to be chosen from 10 tennis players consisting of 7 men and 3 women. Find the number of different teams that could be chosen if the team must include at least 1 woman. [3]

5 Variables x and y are such that $y = (x-3)\ln(2x^2+1)$.

(i) Find the value of $\frac{dy}{dx}$ when $x = 2$. [4]

(ii) Hence find the approximate change in y when x changes from 2 to 2.03. [2]

6 It is given that $\mathscr{E} = \{x : 1 \leqslant x \leqslant 12, \text{where } x \text{ is an integer}\}$ and that sets A, B, C and D are such that

$A = \{\text{multiples of } 3\}$,
$B = \{\text{prime numbers}\}$,
$C = \{\text{odd integers}\}$,
$D = \{\text{even integers}\}$.

Write down the following sets in terms of their elements.

(i) $A \cap B$ [1]

(ii) $A \cup C$ [1]

(iii) $A' \cap C$ [1]

(iv) $(D \cup B)'$ [1]

(v) Write down a set E such that $E \subset D$. [1]

7 Two variables, x and y, are such that $y = Ax^b$, where A and b are constants. When $\ln y$ is plotted against $\ln x$, a straight line graph is obtained which passes through the points $(1.4, 5.8)$ and $(2.2, 6.0)$.

(i) Find the value of A and of b. [4]

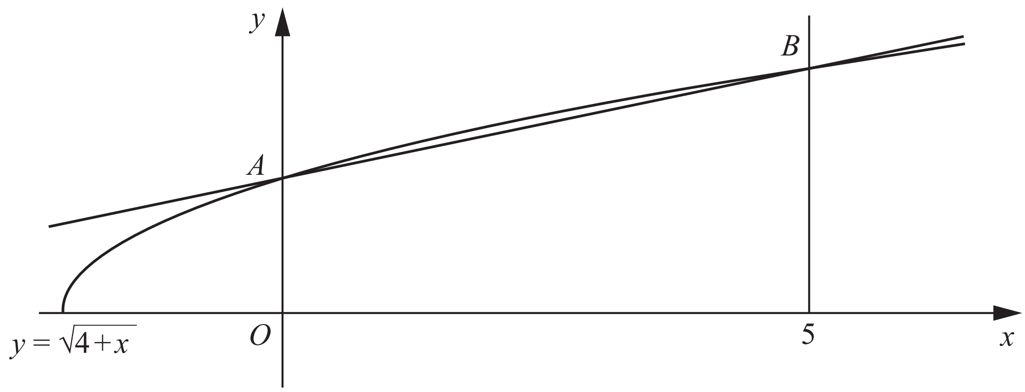
(ii) Calculate the value of y when $x = 5$. [2]

8 Find the equation of the tangent to the curve $y = \dfrac{2x - 1}{\sqrt{x^2 + 5}}$ at the point where $x = 2$. [7]

9 You are not allowed to use a calculator in this question.

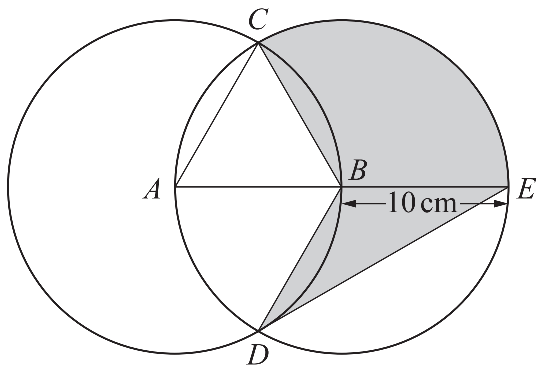
(i) Find $\int \sqrt{4+x}\,\mathrm{d}x$. [2]

(ii)



The diagram shows the graph of $y = \sqrt{4+x}$, which meets the y-axis at the point A and the line $x = 5$ at the point B. Using your answer to part **(i)**, find the area of the region enclosed by the curve and the straight line AB. [5]

10



The diagram shows two circles, centres A and B, each of radius 10 cm. The point B lies on the circumference of the circle with centre A. The two circles intersect at the points C and D. The point E lies on the circumference of the circle centre B such that ABE is a diameter.

(i) Explain why triangle ABC is equilateral. [1]

(ii) Write down, in terms of π, angle CBE. [1]

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

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

11 **(a)** A function f is such that $\mathrm{f}(x) = x^2 + 6x + 4$ for $x \geqslant 0$.

(i) Show that $x^2 + 6x + 4$ can be written in the form $(x + a)^2 + b$, where a and b are integers. [2]

(ii) Write down the range of f. [1]

(iii) Find f^{-1} and state its domain. [3]

(b) Functions g and h are such that, for $x \in \mathbb{R}$,

$$g(x) = e^x \qquad \text{and} \qquad h(x) = 5x + 2.$$

Solve $h^2g(x) = 37$. [4]

Question 12 is printed on the next page.

12 The line $2x - y + 1 = 0$ meets the curve $x^2 + 3y = 19$ at the points A and B. The perpendicular bisector of the line AB meets the x-axis at the point C. Find the area of the triangle ABC. [9]