Cambridge IGCSE

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

ADDITIONAL MATHEMATICS **0606/12**

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.

This document consists of **16** printed pages.

© UCLES 2015

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

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

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

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

© UCLES 2015

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

View solution

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 $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2} = -5$, find the equation of the curve. [4]

View solution

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

View solution

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]

View solution

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]

View solution

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

View solution

(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]

View solution

© UCLES 2015

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]

View solution

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

View solution

© UCLES 2015

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]

View solution

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

View solution

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

View solution

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

View solution

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

View solution

© UCLES 2015

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]

View solution

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

View solution

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]

View solution

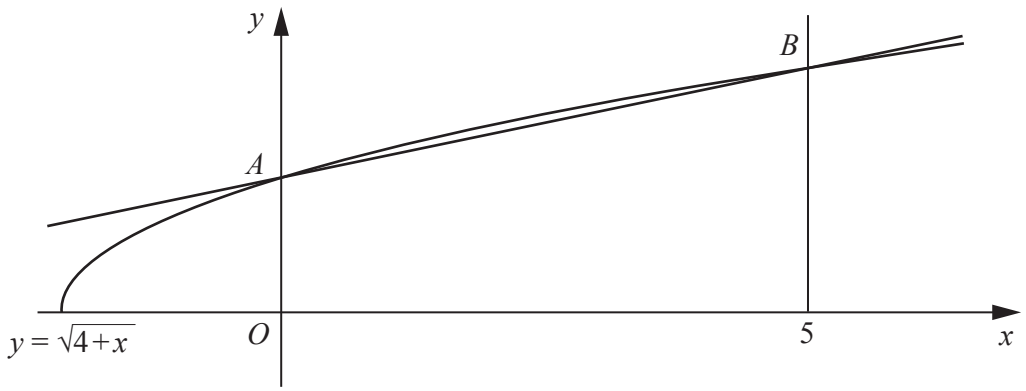
9 You are not allowed to use a calculator in this question.

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

View solution

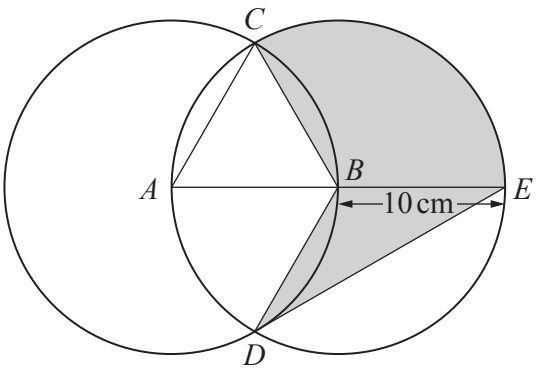
(ii)

View solution



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]

View solution

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

View solution

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

View solution

© UCLES 2015

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

View solution

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]

View solution

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

View solution

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

View solution

© UCLES 2015

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

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

Solve $\mathrm{h}^2\mathrm{g}(x) = 37$. [4]

View solution

Question 12 is printed on the next page.

© UCLES 2015

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]


View solution

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.