Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9242819072

ADDITIONAL MATHEMATICS **0606/12**

Paper 1 **February/March 2016**

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.

DC (LEG/FD) 106873/3

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

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

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

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

Formulae for ΔABC

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

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

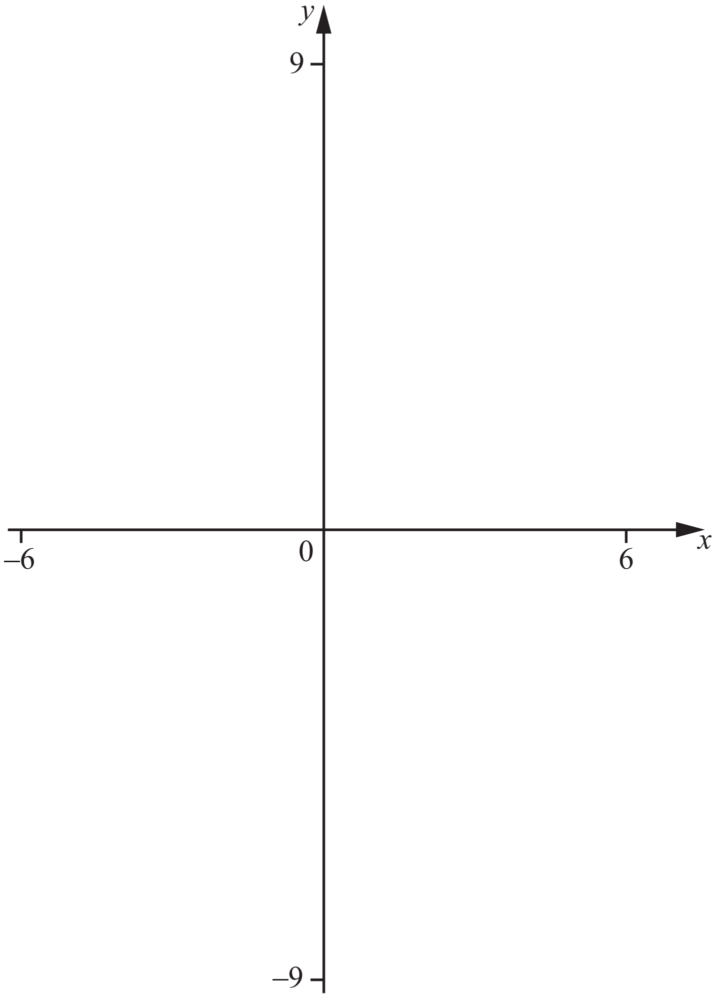
$$\Delta = \frac{1}{2} bc \sin A$$

1 Find the values of a for which the line $y = ax + 9$ intersects the curve $y = -2x^2 + 3x + 1$ at 2 distinct points. [4]

2 Given that $\dfrac{p^{-2}qr^{-\frac{1}{2}}}{\sqrt{p^{\frac{1}{3}}q^2r^{-3}}} = p^a q^b r^c$, find the values of a, b and c. [3]

3 Solve $\log_5 \sqrt{x} + \log_{25} x = 3$. [3]

4 **(i)** On the axes below, sketch the graphs of $y = 2 - x$ and $y = |3 + 2x|$. [4]



(ii) Solve $|3 + 2x| = 2 - x$. [3]

5 **(a)** A 6-character password is to be chosen from the following 9 characters.

letters	A	B	E	F
numbers	5	8	9	
symbols	*	$		

Each character may be used only once in any password.

Find the number of different 6-character passwords that may be chosen if

(i) there are no restrictions, [1]

(ii) the password must consist of 2 letters, 2 numbers and 2 symbols, in that order, [2]

(iii) the password must start and finish with a symbol. [2]

(b) An examination consists of a section A, containing 10 short questions, and a section B, containing 5 long questions. Candidates are required to answer 6 questions from section A and 3 questions from section B. Find the number of different selections of questions that can be made if

(i) there are no further restrictions, [2]

(ii) candidates must answer the first 2 questions in section A and the first question in section B. [2]

6 A function f is such that $f(x) = 6 + e^{4x}$ for $x \in \mathbb{R}$.

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

(ii) Find $f^{-1}(x)$ and state its domain and range. [4]

(iii) Find $f'(x)$. [1]

(iv) Hence find the exact solution of $f(x) = f'(x)$. [2]

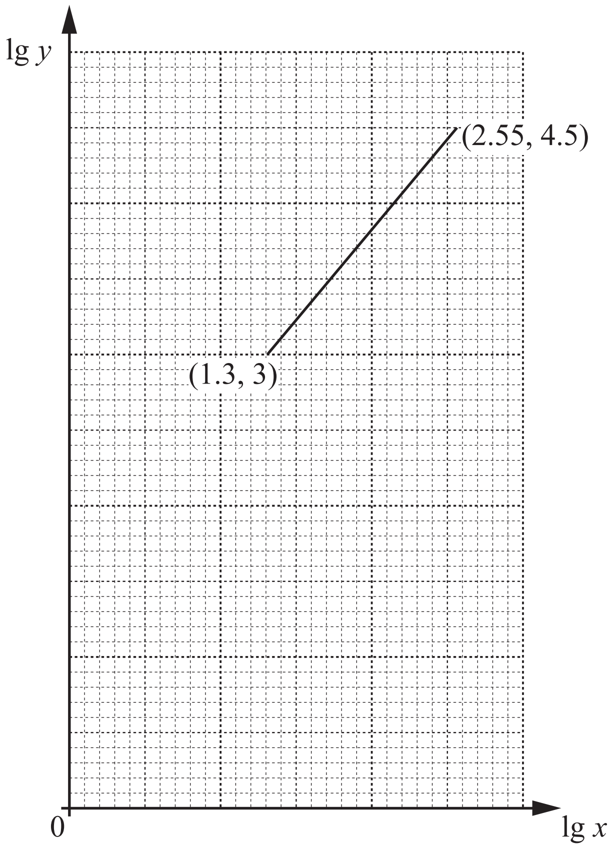
7 The polynomial $f(x) = ax^3 + 7x^2 - 9x + b$ is divisible by $2x - 1$. The remainder when $f(x)$ is divided by $x - 2$ is 5 times the remainder when $f(x)$ is divided by $x + 1$.

(i) Show that $a = 6$ and find the value of b. [4]

(ii) Using the values from part **(i)**, show that $f(x) = (2x - 1)(cx^2 + dx + e)$, where c, d and e are integers to be found. [2]

(iii) Hence factorise $f(x)$ completely. [2]

8



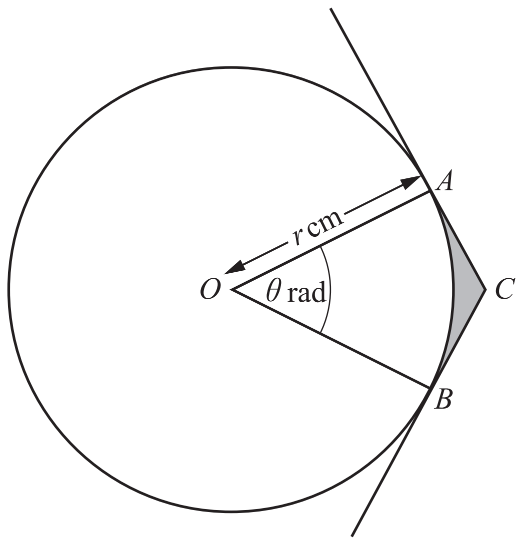
The variables x and y are such that when $\lg y$ is plotted against $\lg x$ the straight line graph shown above is obtained.

(i) Given that $y = Ax^b$, find the value of A and of b. [5]

(ii) Find the value of $\lg y$ when $x = 100$. [2]

(iii) Find the value of x when $y = 8000$. [2]

9



The diagram shows a circle, centre O, radius r cm. Points A, B and C are such that A and B lie on the circle and the tangents at A and B meet at C. Angle $AOB = \theta$ radians.

(i) Given that the area of the major sector AOB is 7 times the area of the minor sector AOB, find the value of θ. [2]

(ii) Given also that the perimeter of the minor sector AOB is 20 cm, show that the value of r, correct to 2 decimal places, is 7.18. [2]

(iii) Using the values of θ and r from parts **(i)** and **(ii)**, find the perimeter of the shaded region ABC. [3]

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

10 **(i)** Find $\frac{\mathrm{d}}{\mathrm{d}x}\left(x(2x-1)^{\frac{3}{2}}\right)$. [3]

(ii) Hence, show that $\int x(2x-1)^{\frac{1}{2}}\,\mathrm{d}x = \frac{(2x-1)^{\frac{3}{2}}}{15}(px+q)+c$, where c is a constant of integration, and p and q are integers to be found. [6]

(iii) Hence find $\int_{0.5}^{1} x(2x-1)^{\frac{1}{2}}\,dx$. [2]

Question 11 is printed on the next page.

11 **(i)** Show that $\dfrac{1}{\operatorname{cosec}\theta - 1} - \dfrac{1}{\operatorname{cosec}\theta + 1} = 2\tan^2\theta$. [4]

(ii) Hence solve $\dfrac{1}{\operatorname{cosec}\theta - 1} - \dfrac{1}{\operatorname{cosec}\theta + 1} = 6 + \tan\theta$ for $0° < \theta < 360°$. [4]

