Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/21**

Paper 2 Pure Mathematics 2 **(P2)** **May/June 2014**

1 hour 15 minutes

Additional Materials: Answer Booklet/Paper
Graph Paper
List of Formulae (MF9)

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READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
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 50.
Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.

This document consists of **3** printed pages and **1** blank page.

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1 Solve the inequality $|3x - 2| \geqslant |x + 4|$. [4]

2 Find the gradient of each of the following curves at the point for which $x = 0$.

(i) $y = 3\sin x + \tan 2x$ [3]

(ii) $y = \dfrac{6}{1 + e^{2x}}$ [3]

3 **(i)** Find the quotient when $6x^4 - x^3 - 26x^2 + 4x + 15$ is divided by $(x^2 - 4)$, and confirm that the remainder is 7. [3]

(ii) Hence solve the equation $6x^4 - x^3 - 26x^2 + 4x + 8 = 0$. [3]

4 **(i)** By sketching a suitable pair of graphs, show that the equation

$$3\ln x = 15 - x^3$$

has exactly one real root. [3]

(ii) Show by calculation that the root lies between 2.0 and 2.5. [2]

(iii) Use the iterative formula $x_{n+1} = \sqrt[3]{(15 - 3\ln x_n)}$ to find the root correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

5 **(i)** Prove that $\tan\theta + \cot\theta \equiv \dfrac{2}{\sin 2\theta}$. [3]

(ii) Hence

(a) find the exact value of $\tan\frac{1}{8}\pi + \cot\frac{1}{8}\pi$, [2]

(b) evaluate $\displaystyle\int_0^{\frac{1}{2}\pi} \frac{6}{\tan\theta + \cot\theta}\,d\theta$. [3]

6 **(a)** Show that $\displaystyle\int_6^{16} \frac{6}{2x - 7}\,dx = \ln 125$. [5]

(b) Use the trapezium rule with four intervals to find an approximation to

$$\int_1^{17} \log_{10} x\,dx,$$

giving your answer correct to 3 significant figures. [3]

7 The equation of a curve is

$$2x^2 + 3xy + y^2 = 3.$$

(i) Find the equation of the tangent to the curve at the point $(2, -1)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

(ii) Show that the curve has no stationary points. [4]

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