OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS

Core Mathematics 2

4722

Candidates answer on the Answer Booklet

OCR Supplied Materials:
- 8 page Answer Booklet
- List of Formulae (MF1)

Other Materials Required:
None

Friday 15 January 2010
Afternoon

Duration: 1 hour 30 minutes

4722

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Answer Booklet.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.
- You are permitted to use a graphical calculator in this paper.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- This document consists of **4** pages. Any blank pages are indicated.

1 **(i)** Show that the equation

$$2\sin^2 x = 5\cos x - 1$$

can be expressed in the form

$$2\cos^2 x + 5\cos x - 3 = 0. \quad \textbf{[2]}$$

(ii) Hence solve the equation

$$2\sin^2 x = 5\cos x - 1,$$

giving all values of x between $0°$ and $360°$. **[4]**

2 The gradient of a curve is given by $\frac{\mathrm{d}y}{\mathrm{d}x} = 6x - 4$. The curve passes through the distinct points (2, 5) and $(p, 5)$.

(i) Find the equation of the curve. **[4]**

(ii) Find the value of p. **[3]**

3 **(i)** Find and simplify the first four terms in the expansion of $(2 - x)^7$ in ascending powers of x. **[4]**

(ii) Hence find the coefficient of w^6 in the expansion of $\left(2 - \frac{1}{4}w^2\right)^7$. **[2]**

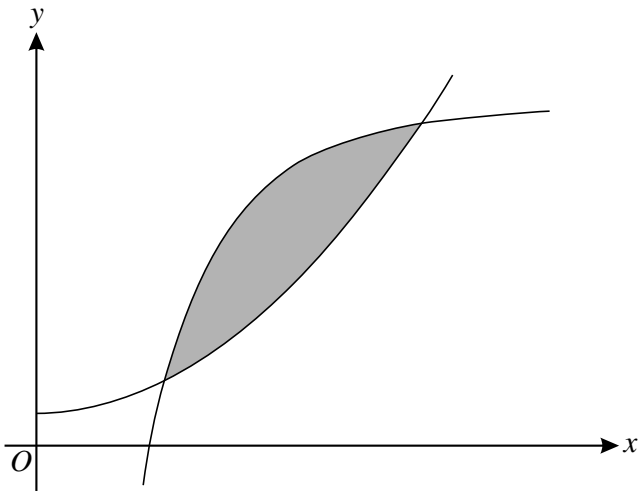
4 **(i)** Use the trapezium rule, with 4 strips each of width 0.5, to find an approximate value for

$$\int_3^5 \log_{10}(2 + x)\,\mathrm{d}x,$$

giving your answer correct to 3 significant figures. **[4]**

(ii) Use your answer to part **(i)** to deduce an approximate value for $\int_3^5 \log_{10}\sqrt{2 + x}\,\mathrm{d}x$, showing your method clearly. **[2]**

5



The diagram shows parts of the curves $y = x^2 + 1$ and $y = 11 - \frac{9}{x^2}$, which intersect at (1, 2) and (3, 10). Use integration to find the exact area of the shaded region enclosed between the two curves. **[7]**

6 The cubic polynomial $\mathrm{f}(x)$ is given by

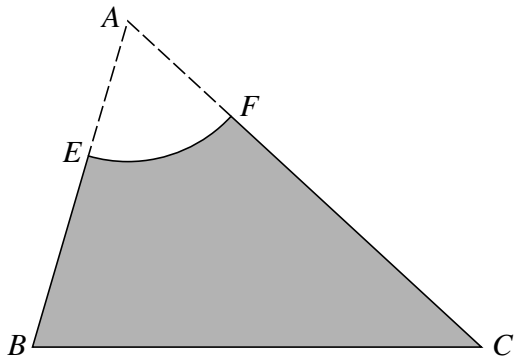
$$\mathrm{f}(x) = 2x^3 + ax^2 + bx + 15,$$

where a and b are constants. It is given that $(x + 3)$ is a factor of $\mathrm{f}(x)$ and that, when $\mathrm{f}(x)$ is divided by $(x - 2)$, the remainder is 35.

(i) Find the values of a and b. **[6]**

(ii) Using these values of a and b, divide $\mathrm{f}(x)$ by $(x + 3)$. **[3]**

7



The diagram shows triangle ABC, with $AB = 10$ cm, $BC = 13$ cm and $CA = 14$ cm. E and F are points on AB and AC respectively such that $AE = AF = 4$ cm. The sector AEF of a circle with centre A is removed to leave the shaded region $EBCF$.

(i) Show that angle CAB is 1.10 radians, correct to 3 significant figures. **[2]**

(ii) Find the perimeter of the shaded region $EBCF$. **[3]**

(iii) Find the area of the shaded region $EBCF$. **[5]**

8 A sequence $u_1, u_2, u_3, \ldots$ is defined by

$$u_1 = 8 \qquad \text{and} \qquad u_{n+1} = u_n + 3.$$

(i) Show that $u_5 = 20$. **[2]**

(ii) The nth term of the sequence can be written in the form $u_n = pn + q$. State the values of p and q. **[2]**

(iii) State what type of sequence it is. **[1]**

(iv) Find the value of N such that $\sum_{n=1}^{2N} u_n - \sum_{n=1}^{N} u_n = 1256$. **[5]**

9 **(i)** Sketch the curve $y = 6 \times 5^x$, stating the coordinates of any points of intersection with the axes. **[3]**

(ii) The point P on the curve $y = 9^x$ has y-coordinate equal to 150. Use logarithms to find the x-coordinate of P, correct to 3 significant figures. **[3]**

(iii) The curves $y = 6 \times 5^x$ and $y = 9^x$ intersect at the point Q. Show that the x-coordinate of Q can be written as $x = \dfrac{1 + \log_3 2}{2 - \log_3 5}$. **[5]**