

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



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

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

- (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 $\frac{dy}{dx} = 6x - 4$. 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 $(2 - \frac{1}{4}w^2)^7$. [2]

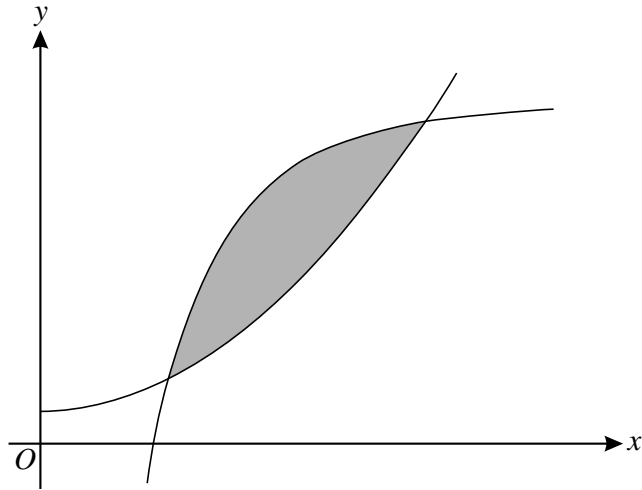
- 4 (i) Use the trapezium rule, with 4 strips each of width 0.5, to find an approximate value for

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

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

(ii) Use your answer to part (i) to deduce an approximate value for $\int_3^5 \log_{10} \sqrt{2 + x} dx$, 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 $f(x)$ is given by

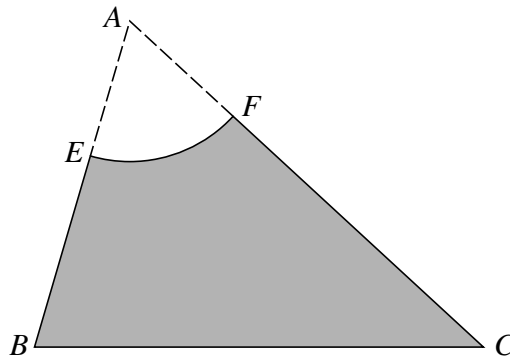
$$f(x) = 2x^3 + ax^2 + bx + 15,$$

where a and b are constants. It is given that $(x + 3)$ is a factor of $f(x)$ and that, when $f(x)$ 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 $f(x)$ 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, \dots is defined by

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

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

(ii) The n th 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 $x = \frac{1 + \log_3 2}{2 - \log_3 5}$. [5]



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