

ADVANCED SUBSIDIARY GCE
MATHEMATICS
Core Mathematics 1

4721

Candidates answer on the Answer Booklet

OCR Supplied Materials:

- 8 page Answer Booklet
- List of Formulae (MF1)

Other Materials Required:

None

Wednesday 20 May 2009
Afternoon

Duration: 1 hour 30 minutes

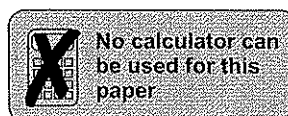


INSTRUCTIONS TO CANDIDATES

- 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 not permitted to use a 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 Given that $y = x^5 + \frac{1}{x^2}$, find

(i) $\frac{dy}{dx}$, [3]

(ii) $\frac{d^2y}{dx^2}$. [2]

2 Express $\frac{8 + \sqrt{7}}{2 + \sqrt{7}}$ in the form $a + b\sqrt{7}$, where a and b are integers. [4]

3 Express each of the following in the form 3^n :

(i) $\frac{1}{9}$, [1]

(ii) $\sqrt[3]{3}$, [1]

(iii) $3^{10} \times 9^{15}$. [2]

4 Solve the simultaneous equations

$$4x^2 + y^2 = 10, \quad 2x - y = 4. \quad [6]$$

5 (i) Expand and simplify $(2x + 1)(x - 3)(x + 4)$. [3]

(ii) Find the coefficient of x^4 in the expansion of

$$x(x^2 + 2x + 3)(x^2 + 7x - 2). \quad [2]$$

6 (i) Sketch the curve $y = -\sqrt{x}$. [2]

(ii) Describe fully a transformation that transforms the curve $y = -\sqrt{x}$ to the curve $y = 5 - \sqrt{x}$. [2]

(iii) The curve $y = -\sqrt{x}$ is stretched by a scale factor of 2 parallel to the x -axis. State the equation of the curve after it has been stretched. [2]

7 (i) Express $x^2 - 5x + \frac{1}{4}$ in the form $(x - a)^2 - b$. [3]

(ii) Find the centre and radius of the circle with equation $x^2 + y^2 - 5x + \frac{1}{4} = 0$. [3]

8 Solve the inequalities

(i) $-35 < 6x + 7 < 1$, [3]

(ii) $3x^2 > 48$. [3]

- 9 A is the point $(4, -3)$ and B is the point $(-1, 9)$.
- (i) Calculate the length of AB . [2]
 - (ii) Find the coordinates of the mid-point of AB . [2]
 - (iii) Find the equation of the line through $(1, 3)$ which is parallel to AB , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. [4]
- 10
- (i) Solve the equation $9x^2 + 18x - 7 = 0$. [3]
 - (ii) Find the coordinates of the stationary point on the curve $y = 9x^2 + 18x - 7$. [4]
 - (iii) Sketch the curve $y = 9x^2 + 18x - 7$, giving the coordinates of all intercepts with the axes. [3]
 - (iv) For what values of x does $9x^2 + 18x - 7$ increase as x increases? [1]
- 11 The point P on the curve $y = k\sqrt{x}$ has x -coordinate 4. The normal to the curve at P is parallel to the line $2x + 3y = 0$.
- (i) Find the value of k . [6]
 - (ii) This normal meets the x -axis at the point Q . Calculate the area of the triangle OPQ , where O is the point $(0, 0)$. [5]

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