

**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

**Friday 9 January 2009**  
**Morning**

**Duration:** 1 hour 30 minutes

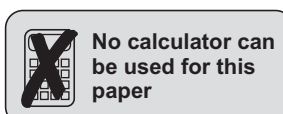


**INSTRUCTIONS TO CANDIDATES**

- 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 Express  $\sqrt{45} + \frac{20}{\sqrt{5}}$  in the form  $k\sqrt{5}$ , where  $k$  is an integer. [3]
- 2 Simplify
- (i)  $(\sqrt[3]{x})^6$ , [1]
- (ii)  $\frac{3y^4 \times (10y)^3}{2y^5}$ . [3]
- 3 Solve the equation  $3x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 = 0$ . [5]
- 4 (i) Sketch the curve  $y = \frac{1}{x^2}$ . [2]
- (ii) The curve  $y = \frac{1}{x^2}$  is translated by 3 units in the negative  $x$ -direction. State the equation of the curve after it has been translated. [2]
- (iii) The curve  $y = \frac{1}{x^2}$  is stretched parallel to the  $y$ -axis with scale factor 4 and, as a result, the point  $P(1, 1)$  is transformed to the point  $Q$ . State the coordinates of  $Q$ . [2]
- 5 Find  $\frac{dy}{dx}$  in each of the following cases:
- (i)  $y = 10x^{-5}$ , [2]
- (ii)  $y = \sqrt[4]{x}$ , [3]
- (iii)  $y = x(x+3)(1-5x)$ . [4]
- 6 (i) Express  $5x^2 + 20x - 8$  in the form  $p(x+q)^2 + r$ . [4]
- (ii) State the equation of the line of symmetry of the curve  $y = 5x^2 + 20x - 8$ . [1]
- (iii) Calculate the discriminant of  $5x^2 + 20x - 8$ . [2]
- (iv) State the number of real roots of the equation  $5x^2 + 20x - 8 = 0$ . [1]

- 7 The line with equation  $3x + 4y - 10 = 0$  passes through point  $A(2, 1)$  and point  $B(10, k)$ .
- (i) Find the value of  $k$ . [2]
  - (ii) Calculate the length of  $AB$ . [2]
- A circle has equation  $(x - 6)^2 + (y + 2)^2 = 25$ .
- (iii) Write down the coordinates of the centre and the radius of the circle. [2]
  - (iv) Verify that  $AB$  is a diameter of the circle. [2]
- 8
- (i) Solve the equation  $5 - 8x - x^2 = 0$ , giving your answers in simplified surd form. [3]
  - (ii) Solve the inequality  $5 - 8x - x^2 \leq 0$ . [2]
  - (iii) Sketch the curve  $y = (5 - 8x - x^2)(x + 4)$ , giving the coordinates of the points where the curve crosses the coordinate axes. [5]
- 9 The curve  $y = x^3 + px^2 + 2$  has a stationary point when  $x = 4$ . Find the value of the constant  $p$  and determine whether the stationary point is a maximum or minimum point. [7]
- 10 A curve has equation  $y = x^2 + x$ .
- (i) Find the gradient of the curve at the point for which  $x = 2$ . [2]
  - (ii) Find the equation of the normal to the curve at the point for which  $x = 2$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. [4]
  - (iii) Find the values of  $k$  for which the line  $y = kx - 4$  is a tangent to the curve. [6]



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