

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS**

Core Mathematics 1

**4721**

**QUESTION PAPER**

Candidates answer on the printed answer book.

**OCR supplied materials:**

- Printed answer book 4721
- List of Formulae (MF1)

**Other materials required:**

None

**Monday 10 January 2011  
Morning**

**Duration:** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

These instructions are the same on the printed answer book and the question paper.

- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the printed answer book.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- 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.

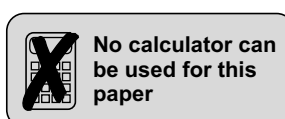
**INFORMATION FOR CANDIDATES**

This information is the same on the printed answer book and the question paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the question paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The printed answer book consists of **12** pages. The question paper consists of **4** pages. Any blank pages are indicated.

**INSTRUCTION TO EXAMS OFFICER / INVIGILATOR**

- Do not send this question paper for marking; it should be retained in the centre or destroyed.



1 The points  $A$  and  $B$  have coordinates  $(6, 1)$  and  $(-2, 7)$  respectively.

(i) Find the length of  $AB$ . [2]

(ii) Find the gradient of the line  $AB$ . [2]

(iii) Determine whether the line  $4x - 3y - 10 = 0$  is perpendicular to  $AB$ . [3]

2 Given that

$$(x - p)(2x^2 + 9x + 10) = (x^2 - 4)(2x + q)$$

for all values of  $x$ , find the constants  $p$  and  $q$ . [3]

3 Express each of the following in the form  $8^p$ :

(i)  $\sqrt{8}$ , [1]

(ii)  $\frac{1}{64}$ , [1]

(iii)  $2^6 \times 2^2$ . [3]

4 By using the substitution  $u = (3x - 2)^2$ , find the roots of the equation

$$(3x - 2)^4 - 5(3x - 2)^2 + 4 = 0. [6]$$

5 (i) Sketch the curve  $y = -x^3$ . [2]

(ii) The curve  $y = -x^3$  is translated by 3 units in the positive  $x$ -direction. Find the equation of the curve after it has been translated. [2]

(iii) Describe a transformation that transforms the curve  $y = -x^3$  to the curve  $y = -5x^3$ . [2]

6 Given that  $y = \frac{5}{x^2} - \frac{1}{4x} + x$ , find

(i)  $\frac{dy}{dx}$ , [4]

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

- 7 (i) Express  $4x^2 + 12x - 3$  in the form  $p(x + q)^2 + r$ . [4]
- (ii) Solve the equation  $4x^2 + 12x - 3 = 0$ , giving your answers in simplified surd form. [4]
- (iii) The quadratic equation  $4x^2 + 12x - k = 0$  has equal roots. Find the value of  $k$ . [3]
- 8 (i) Find the equation of the tangent to the curve  $y = 7 + 6x - x^2$  at the point  $P$  where  $x = 5$ , giving your answer in the form  $ax + by + c = 0$ . [6]
- (ii) This tangent meets the  $x$ -axis at  $Q$ . Find the coordinates of the mid-point of  $PQ$ . [3]
- (iii) Find the equation of the line of symmetry of the curve  $y = 7 + 6x - x^2$ . [2]
- (iv) State the set of values of  $x$  for which  $7 + 6x - x^2$  is an increasing function. [2]
- 9 A circle with centre  $C$  has equation  $x^2 + y^2 - 8x - 2y - 3 = 0$ .
- (i) Find the coordinates of  $C$  and the radius of the circle. [3]
- (ii) Find the values of  $k$  for which the line  $y = k$  is a tangent to the circle, giving your answers in simplified surd form. [3]
- (iii) The points  $S$  and  $T$  lie on the circumference of the circle.  $M$  is the mid-point of the chord  $ST$ . Given that the length of  $CM$  is 2, calculate the length of the chord  $ST$ . [3]
- (iv) Find the coordinates of the point where the circle meets the line  $x - 2y - 12 = 0$ . [6]

**There are no questions printed on this page.**



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