

**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.

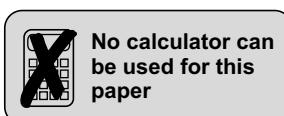
INFORMATION FOR CANDIDATES

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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