OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS

4721

Core Mathematics 1

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.

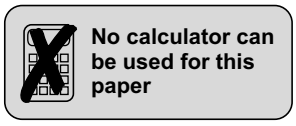
- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the printed 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 $y = \dfrac{5}{x^2} - \dfrac{1}{4x} + x$, find

(i) $\dfrac{\mathrm{d}y}{\mathrm{d}x}$, **[4]**

(ii) $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$. **[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.