OCR
RECOGNISING ACHIEVEMENT

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 24 May 2010
Afternoon

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES
These instructions are the same on the Printed Answer Book and the Question Paper.

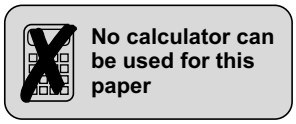
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **Write your answer to each question in the space provided in the Printed Answer Book.** Additional paper 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 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.
- 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 **(i)** Evaluate 9^0. **[1]**

(ii) Express $9^{-\frac{1}{2}}$ as a fraction. **[2]**

2 **(i)** Sketch the curve $y = -\frac{1}{x^2}$. **[2]**

(ii) Sketch the curve $y = 3 - \frac{1}{x^2}$. **[2]**

(iii) The curve $y = -\frac{1}{x^2}$ is stretched parallel to the y-axis with scale factor 2. State the equation of the transformed curve. **[1]**

3 **(i)** Express $\frac{12}{3+\sqrt{5}}$ in the form $a - b\sqrt{5}$, where a and b are positive integers. **[3]**

(ii) Express $\sqrt{18} - \sqrt{2}$ in simplified surd form. **[2]**

4 **(i)** Expand $(x-2)^2(x+1)$, simplifying your answer. **[3]**

(ii) Sketch the curve $y = (x-2)^2(x+1)$, indicating the coordinates of all intercepts with the axes. **[3]**

5 Find the real roots of the equation $4x^4 + 3x^2 - 1 = 0$. **[5]**

6 Find the gradient of the curve $y = 2x + \frac{6}{\sqrt{x}}$ at the point where $x = 4$. **[5]**

7 Solve the simultaneous equations

$$x + 2y - 6 = 0, \qquad 2x^2 + y^2 = 57.$$ **[6]**

8 **(i)** Express $2x^2 + 5x$ in the form $2(x+p)^2 + q$. **[3]**

(ii) State the coordinates of the minimum point of the curve $y = 2x^2 + 5x$. **[2]**

(iii) State the equation of the normal to the curve at its minimum point. **[1]**

(iv) Solve the inequality $2x^2 + 5x > 0$. **[4]**

9 **(i)** The line joining the points $A\,(4,\ 5)$ and $B\,(p,\ q)$ has mid-point $M\,(-1,\ 3)$. Find p and q. **[3]**

AB is the diameter of a circle.

(ii) Find the radius of the circle. **[2]**

(iii) Find the equation of the circle, giving your answer in the form $x^2 + y^2 + ax + by + c = 0$. **[3]**

(iv) Find an equation of the tangent to the circle at the point $(4,\ 5)$. **[5]**

10 **(i)** Find the coordinates of the stationary points of the curve $y = 2x^3 + 5x^2 - 4x$. **[6]**

(ii) State the set of values for x for which $2x^3 + 5x^2 - 4x$ is a decreasing function. **[2]**

(iii) Show that the equation of the tangent to the curve at the point where $x = \frac{1}{2}$ is $10x - 4y - 7 = 0$. **[4]**

(iv) Hence, with the aid of a sketch, show that the equation $2x^3 + 5x^2 - 4x = \frac{5}{2}x - \frac{7}{4}$ has two distinct real roots. **[2]**