

**ADVANCED SUBSIDIARY GCE**

**MATHEMATICS (MEI)**

Introduction to Advanced Mathematics (C1)

**4751**

Candidates answer on the Answer Booklet

**OCR Supplied Materials:**

- 8 page Answer Booklet
- MEI Examination Formulae and Tables (MF2)

**Other Materials Required:**

None

**Wednesday 20 May 2009**  
**Afternoon**

**Duration:** 1 hour 30 minutes

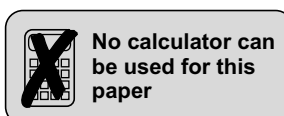


**INSTRUCTIONS TO CANDIDATES**

- 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.
- You are **not** permitted to use a calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **72**.
- This document consists of **4** pages. Any blank pages are indicated.



## Section A (36 marks)

- 1 A line has gradient  $-4$  and passes through the point  $(2, 6)$ . Find the coordinates of its points of intersection with the axes. [4]
- 2 Make  $a$  the subject of the formula  $s = ut + \frac{1}{2}at^2$ . [3]
- 3 When  $x^3 - kx + 4$  is divided by  $x - 3$ , the remainder is 1. Use the remainder theorem to find the value of  $k$ . [3]
- 4 Solve the inequality  $x(x - 6) > 0$ . [2]
- 5 (i) Calculate  ${}^5C_3$ . [2]  
(ii) Find the coefficient of  $x^3$  in the expansion of  $(1 + 2x)^5$ . [2]
- 6 Prove that, when  $n$  is an integer,  $n^3 - n$  is always even. [3]
- 7 Find the value of each of the following.  
(i)  $5^2 \times 5^{-2}$  [2]  
(ii)  $100^{\frac{3}{2}}$  [1]
- 8 (i) Simplify  $\frac{\sqrt{48}}{2\sqrt{27}}$ . [2]  
(ii) Expand and simplify  $(5 - 3\sqrt{2})^2$ . [3]
- 9 (i) Express  $x^2 + 6x + 5$  in the form  $(x + a)^2 + b$ . [3]  
(ii) Write down the coordinates of the minimum point on the graph of  $y = x^2 + 6x + 5$ . [2]
- 10 Find the real roots of the equation  $x^4 - 5x^2 - 36 = 0$  by considering it as a quadratic equation in  $x^2$ . [4]

## Section B (36 marks)

11

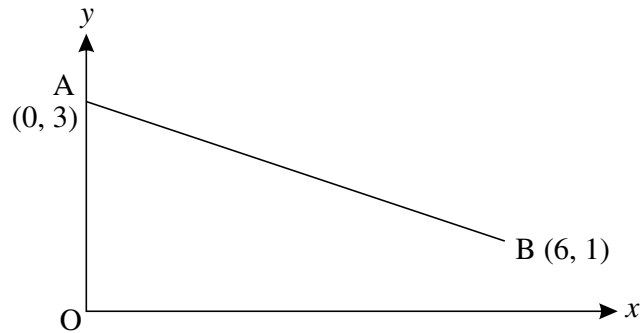


Fig. 11

Fig. 11 shows the line joining the points A (0, 3) and B (6, 1).

(i) Find the equation of the line perpendicular to AB that passes through the origin, O. [2]

(ii) Find the coordinates of the point where this perpendicular meets AB. [4]

(iii) Show that the perpendicular distance of AB from the origin is  $\frac{9\sqrt{10}}{10}$ . [2]

(iv) Find the length of AB, expressing your answer in the form  $a\sqrt{10}$ . [2]

(v) Find the area of triangle OAB. [2]

12 (i) You are given that  $f(x) = (x + 1)(x - 2)(x - 4)$ .

(A) Show that  $f(x) = x^3 - 5x^2 + 2x + 8$ . [2]

(B) Sketch the graph of  $y = f(x)$ . [3]

(C) The graph of  $y = f(x)$  is translated by  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ .

State an equation for the resulting graph. You need not simplify your answer.

Find the coordinates of the point at which the resulting graph crosses the y-axis. [3]

(ii) Show that 3 is a root of  $x^3 - 5x^2 + 2x + 8 = -4$ . Hence solve this equation completely, giving the other roots in surd form. [5]

13 A circle has equation  $(x - 5)^2 + (y - 2)^2 = 20$ .

(i) State the coordinates of the centre and the radius of this circle. [2]

(ii) State, with a reason, whether or not this circle intersects the y-axis. [2]

(iii) Find the equation of the line parallel to the line  $y = 2x$  that passes through the centre of the circle. [2]

(iv) Show that the line  $y = 2x + 2$  is a tangent to the circle. State the coordinates of the point of contact. [5]

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