OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS (MEI)

4751

Introduction to Advanced Mathematics (C1)

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

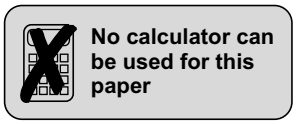
* 4 7 5 1 *

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 $\dfrac{\sqrt{48}}{2\sqrt{27}}$. **[2]**

(ii) Expand and simplify $\left(5 - 3\sqrt{2}\right)^2$. **[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

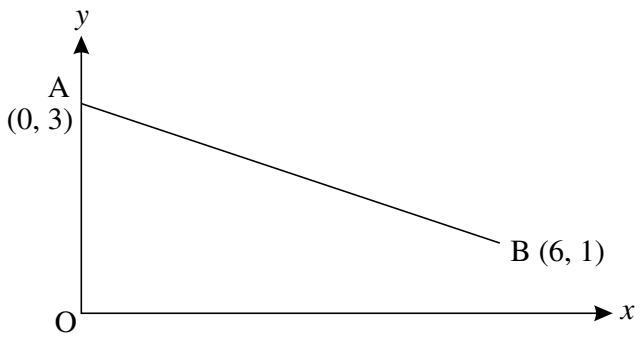


Fig. 11

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]**