

**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

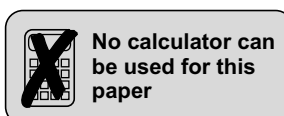


**INSTRUCTIONS TO CANDIDATES**

- 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

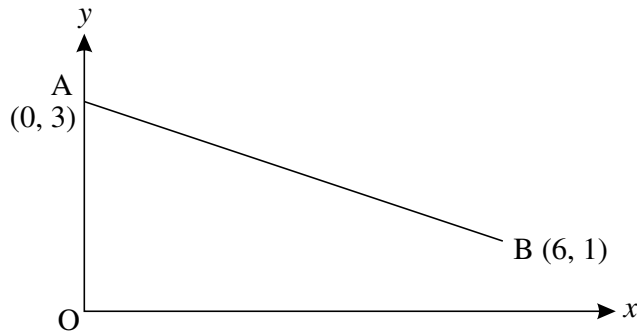


Fig. 11

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]

**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity. For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1PB.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.