

**ADVANCED SUBSIDIARY GCE UNIT  
MATHEMATICS (MEI)**

Introduction to Advanced Mathematics (C1)

**THURSDAY 7 JUNE 2007**

**4751/01**

Morning  
Time: 1 hour 30 minutes

Additional materials:  
Answer booklet (8 pages)  
MEI Examination Formulae and Tables (MF2)

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Answer **all** the questions.
- 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.
- The total number of marks for this paper is 72.

**ADVICE TO CANDIDATES**

- Read each question carefully and make sure you know what you have to do before starting your answer.
- 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.



**WARNING**

**You are not allowed to use  
a calculator in this paper**

## Section A (36 marks)

1 Solve the inequality  $1 - 2x < 4 + 3x$ . [3]

2 Make  $t$  the subject of the formula  $s = \frac{1}{2}at^2$ . [3]

3 The converse of the statement ' $P \Rightarrow Q$ ' is ' $Q \Rightarrow P$ '.

Write down the converse of the following statement.

' $n$  is an odd integer  $\Rightarrow 2n$  is an even integer.'

Show that this converse is false. [2]

4 You are given that  $f(x) = x^3 + kx + c$ . The value of  $f(0)$  is 6, and  $x - 2$  is a factor of  $f(x)$ .

Find the values of  $k$  and  $c$ . [3]

5 (i) Find  $a$ , given that  $a^3 = 64x^{12}y^3$ . [2]

(ii) Find the value of  $\left(\frac{1}{2}\right)^{-5}$ . [2]

6 Find the coefficient of  $x^3$  in the expansion of  $(3 - 2x)^5$ . [4]

7 Solve the equation  $\frac{4x + 5}{2x} = -3$ . [3]

8 (i) Simplify  $\sqrt{98} - \sqrt{50}$ . [2]

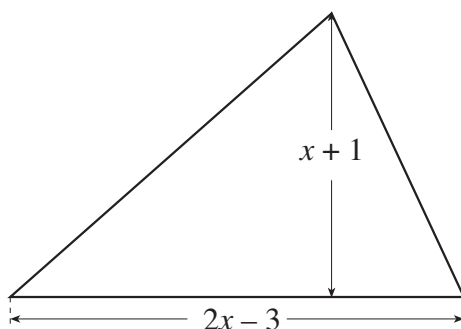
(ii) Express  $\frac{6\sqrt{5}}{2 + \sqrt{5}}$  in the form  $a + b\sqrt{5}$ , where  $a$  and  $b$  are integers. [3]

9 (i) A curve has equation  $y = x^2 - 4$ . Find the  $x$ -coordinates of the points on the curve where  $y = 21$ . [2]

(ii) The curve  $y = x^2 - 4$  is translated by  $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ .

Write down an equation for the translated curve. You need not simplify your answer. [2]

- 10 The triangle shown in Fig. 10 has height  $(x + 1)$  cm and base  $(2x - 3)$  cm. Its area is  $9 \text{ cm}^2$ .



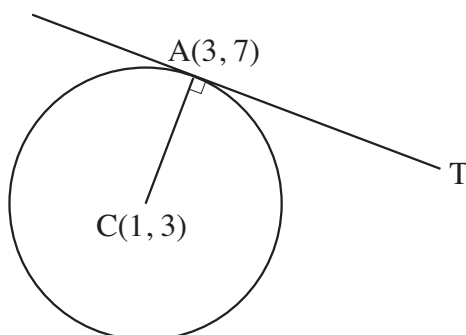
Not to  
scale

Fig. 10

- (i) Show that  $2x^2 - x - 21 = 0$ . [2]
- (ii) By factorising, solve the equation  $2x^2 - x - 21 = 0$ . Hence find the height and base of the triangle. [3]

Section B (36 marks)

11



Not to  
scale

Fig. 11

A circle has centre  $C(1, 3)$  and passes through the point  $A(3, 7)$  as shown in Fig. 11.

- (i) Show that the equation of the tangent at A is  $x + 2y = 17$ . [4]
- (ii) The line with equation  $y = 2x - 9$  intersects this tangent at the point T.  
Find the coordinates of T. [3]
- (iii) The equation of the circle is  $(x - 1)^2 + (y - 3)^2 = 20$ .

Show that the line with equation  $y = 2x - 9$  is a tangent to the circle. Give the coordinates of the point where this tangent touches the circle. [5]

- 12** (i) Write  $4x^2 - 24x + 27$  in the form  $a(x - b)^2 + c$ . [4]
- (ii) State the coordinates of the minimum point on the curve  $y = 4x^2 - 24x + 27$ . [2]
- (iii) Solve the equation  $4x^2 - 24x + 27 = 0$ . [3]
- (iv) Sketch the graph of the curve  $y = 4x^2 - 24x + 27$ . [3]
- 13** A cubic polynomial is given by  $f(x) = 2x^3 - x^2 - 11x - 12$ .
- (i) Show that  $(x - 3)(2x^2 + 5x + 4) = 2x^3 - x^2 - 11x - 12$ . [4]
- Hence show that  $f(x) = 0$  has exactly one real root.
- (ii) Show that  $x = 2$  is a root of the equation  $f(x) = -22$  and find the other roots of this equation. [5]
- (iii) Using the results from the previous parts, sketch the graph of  $y = f(x)$ . [3]