

**MEI STRUCTURED MATHEMATICS****INTRODUCTION TO ADVANCED MATHEMATICS, C1****Practice Paper C1-A**

Additional materials: Answer booklet/paper  
Graph paper  
MEI Examination formulae and tables (MF12)

**TIME** 1 hour 30 minutes

**INSTRUCTIONS**

- Write your Name on each sheet of paper used or the front of the booklet used.
- Answer **all** the questions.
- You are **not** permitted to use a graphical calculator in this paper.

**INFORMATION**

- 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.
- Final answers should be given to a degree of accuracy appropriate to the context.
- The total number of marks for this paper is **72**.

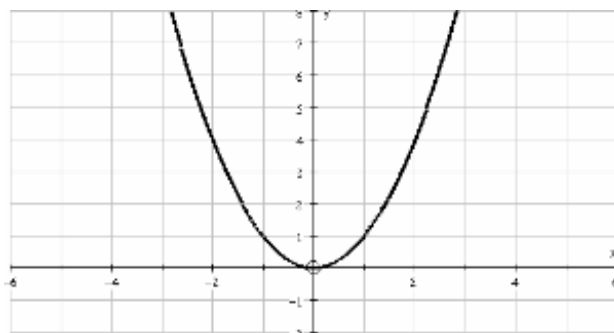
### Section A (36 marks)

1 Find the equation of the line which passes through (1, 3) and (4, 9). [2]

2 Find the range of values of  $x$  for which  $x^2 - 5x + 6 \leq 0$ . [3]

3 Write  $(\sqrt{3} - \sqrt{2})^2$  in the form  $a + b\sqrt{6}$  where  $a$  and  $b$  are integers to be determined. [4]

4



The graph shows a function  $y = f(x)$ .

On separate graphs, sketch the graphs of the following functions:

(i)  $y = f(x) + 1$ ,      (ii)  $y = f(x+1)$ . [4]

5 Make  $u$  the subject of the formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \quad [4]$$

6 The equation of a circle is  $x^2 + y^2 - 2x - 8 = 0$ .  
Find the centre and radius of the circle. [4]

7 Show that  $(x - 2)$  is a factor of  $f(x) = x^3 - x^2 - 4x + 4$ .  
Hence solve the equation  $x^3 - x^2 - 4x + 4 = 0$ . [5]

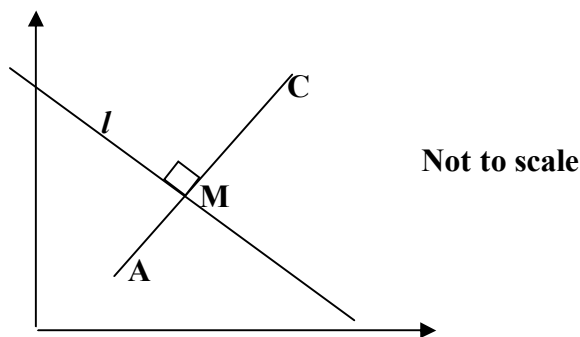
8 Find the points where the line  $y = 2x - 3$  cuts the curve  $y = x^2 - 4x + 5$ . [5]

9 (i) Simplify  $\frac{2^6}{8^{\frac{1}{2}} \times 2^{\frac{1}{2}}}$  [3]

(ii) Solve the equation  $x^{\frac{1}{3}} = 8$ . [2]

**Section B (36 marks)**

10



**Fig. 10**

In Fig.10, A has coordinates (1, 1) and C has coordinates (3, 5). M is the mid-point of AC. The line  $l$  is perpendicular to AC.

(i) Find the coordinates of M.  
Hence find the equation of  $l$ . [5]

(ii) The point B has coordinates ( -2, 5).  
Show that B lies on the line  $l$ .  
Find the coordinates of the point D such that ABCD is a rhombus. [4]

(iii) Find the lengths MC and MB.  
Hence calculate the area of the rhombus ABCD. [3]

- 11** (i) Multiply out  $(x - p)(x - q)$ . [1]
- (ii) You are given that  $p = 2 + \sqrt{3}$  and  $q = 2 - \sqrt{3}$  are the roots of a quadratic equation. Find  $p + q$  and  $pq$  and hence find the quadratic equation with roots  $x = p$  and  $x = q$ . [4]
- (iii) Solve the quadratic equation  $x^2 + 5x - 7 = 0$  giving the roots exactly. [3]
- (iv) Show that  $x = 1$  is the only root of the equation  $x^3 + 2x - 3 = 0$ . [3]
- (v) A quadratic equation  $x^2 + rx + s = 0$ , where  $r$  and  $s$  are integers, has two roots. One root is  $x = 3 + \sqrt{5}$ . Without finding  $r$  or  $s$ , write down the other root. [1]
- 12** (i) Expand  $(1 + 2x)^6$ , simplifying all the terms. [3]
- (ii) Hence find an expression for  $f(x) = (1 + 2x)^6 + (1 - 2x)^6$  in its simplest form. [3]
- (iii) Substituting  $x = 0.01$  into the first two terms of  $f(x)$  gives an approximate value,  $z$  for  $1.02^6 + 0.98^6$ . Find  $z$ .
- By considering the value of the third term, comment on the accuracy of  $z$  as an approximation for  $1.02^6 + 0.98^6$ . [6]