

**Wednesday 13 May 2015 – Morning**

**AS GCE MATHEMATICS (MEI)**

**4751/01** Introduction to Advanced Mathematics (C1)

**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

**OCR supplied materials:**

- Printed Answer Book 4751/01
- MEI Examination Formulae and Tables (MF2)

**Other materials required:**

None

**Duration:** 1 hour 30 minutes

## INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure 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

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- 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**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

## INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

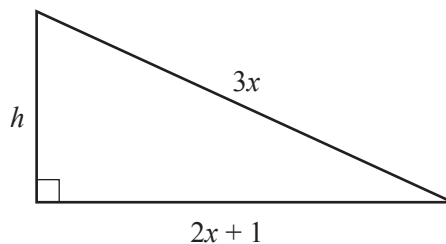
- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.



No calculator can  
be used for this  
paper

## Section A (36 marks)

- 1 Make  $r$  the subject of the formula  $A = \pi r^2(x+y)$ , where  $r > 0$ . [2]
- 2 A line  $L$  is parallel to  $y = 4x + 5$  and passes through the point  $(-1, 6)$ . Find the equation of the line  $L$  in the form  $y = ax + b$ . Find also the coordinates of its intersections with the axes. [5]
- 3 Evaluate the following.
- (i)  $200^0$  [1]
- (ii)  $\left(\frac{25}{9}\right)^{-\frac{1}{2}}$  [3]
- 4 Solve the inequality  $\frac{4x-5}{7} > 2x+1$ . [3]
- 5 Find the coordinates of the point of intersection of the lines  $y = 5x - 2$  and  $x + 3y = 8$ . [4]
- 6 (i) Expand and simplify  $(3 + 4\sqrt{5})(3 - 2\sqrt{5})$ . [3]
- (ii) Express  $\sqrt{72} + \frac{32}{\sqrt{2}}$  in the form  $a\sqrt{b}$ , where  $a$  and  $b$  are integers and  $b$  is as small as possible. [2]
- 7 Find and simplify the binomial expansion of  $(3x - 2)^4$ . [4]
- 8 Fig. 8 shows a right-angled triangle with base  $2x + 1$ , height  $h$  and hypotenuse  $3x$ . [4]



Not to scale

Fig. 8

- (i) Show that  $h^2 = 5x^2 - 4x - 1$ . [2]
- (ii) Given that  $h = \sqrt{7}$ , find the value of  $x$ , giving your answer in surd form. [3]
- 9 Explain why each of the following statements is false. State in each case which of the symbols  $\Rightarrow$ ,  $\Leftarrow$  or  $\Leftrightarrow$  would make the statement true.
- (i)  $ABCD$  is a square  $\Leftrightarrow$  the diagonals of quadrilateral  $ABCD$  intersect at  $90^\circ$  [2]
- (ii)  $x^2$  is an integer  $\Rightarrow x$  is an integer [2]

**Section B (36 marks)**

**10** You are given that  $f(x) = (x+3)(x-2)(x-5)$ .

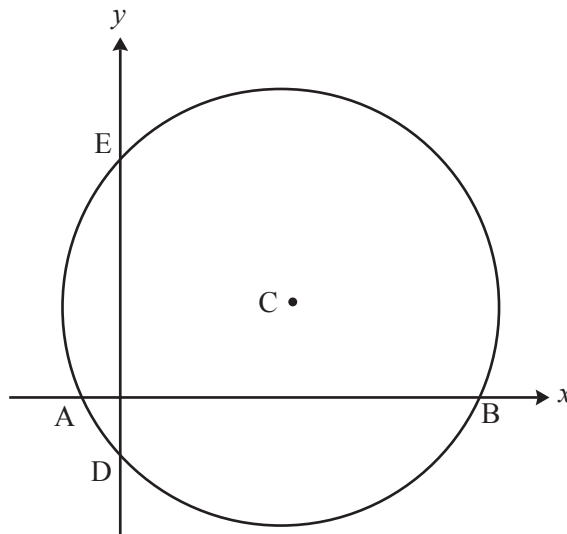
(i) Sketch the curve  $y = f(x)$ . [3]

(ii) Show that  $f(x)$  may be written as  $x^3 - 4x^2 - 11x + 30$ . [2]

(iii) Describe fully the transformation that maps the graph of  $y = f(x)$  onto the graph of  $y = g(x)$ , where  $g(x) = x^3 - 4x^2 - 11x - 6$ . [2]

(iv) Show that  $g(-1) = 0$ . Hence factorise  $g(x)$  completely. [5]

**11**



**Fig. 11**

Fig. 11 shows a sketch of the circle with equation  $(x-10)^2 + (y-2)^2 = 125$  and centre C. The points A, B, D and E are the intersections of the circle with the axes.

(i) Write down the radius of the circle and the coordinates of C. [2]

(ii) Verify that B is the point (21, 0) and find the coordinates of A, D and E. [4]

(iii) Find the equation of the perpendicular bisector of BE and verify that this line passes through C. [6]

**12** (i) Find the set of values of  $k$  for which the line  $y = 2x + k$  intersects the curve  $y = 3x^2 + 12x + 13$  at two distinct points. [5]

(ii) Express  $3x^2 + 12x + 13$  in the form  $a(x+b)^2 + c$ . Hence show that the curve  $y = 3x^2 + 12x + 13$  lies completely above the  $x$ -axis. [5]

(iii) Find the value of  $k$  for which the line  $y = 2x + k$  passes through the minimum point of the curve  $y = 3x^2 + 12x + 13$ . [2]

**END OF QUESTION PAPER**

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