

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

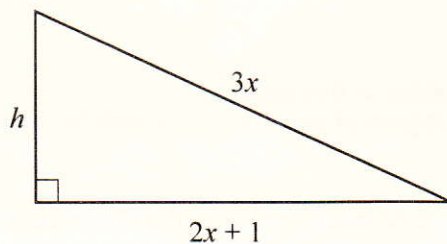
- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.



**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° [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

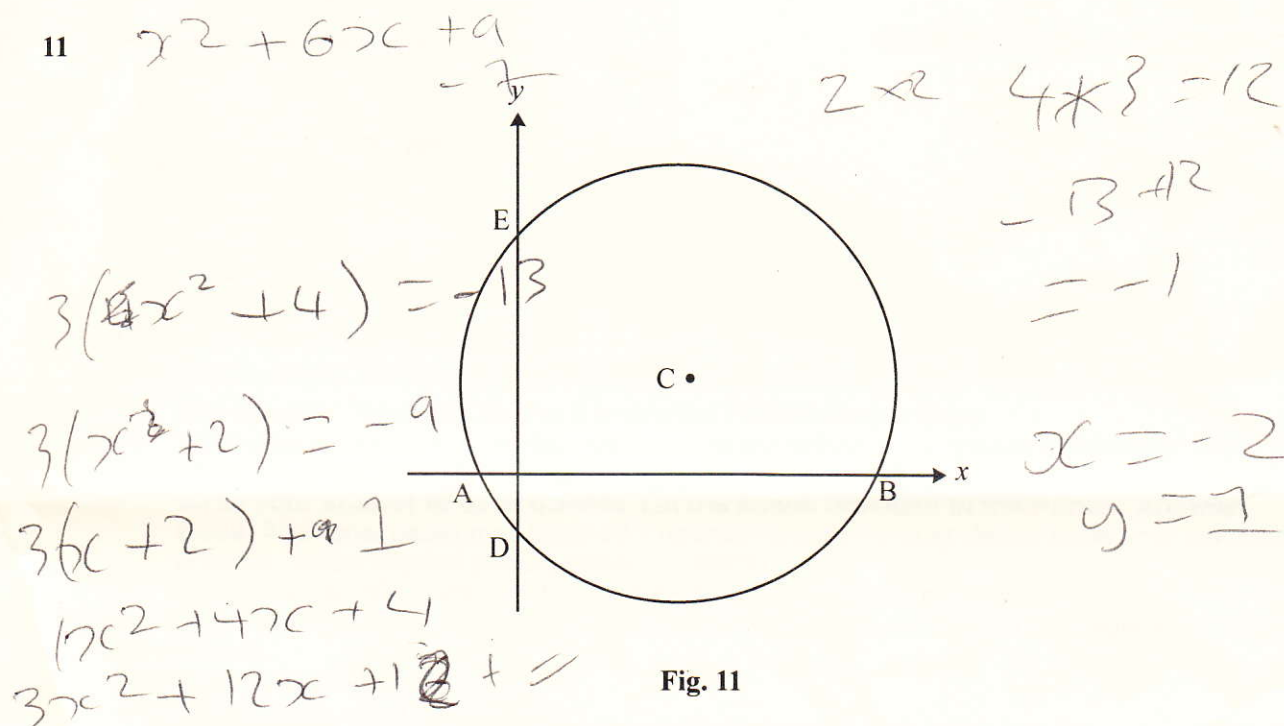


Fig. 11

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