

# OCR

Oxford Cambridge and RSA

## Wednesday 16 May 2018 – Morning

### AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

#### QUESTION PAPER

Candidates answer on the Printed Answer Book.

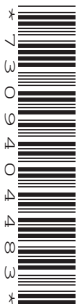
**OCR supplied materials:**

- 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.** If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- 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 barcodes.
- 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.

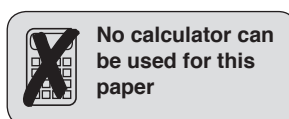
#### INFORMATION FOR CANDIDATES

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

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No calculator can  
be used for this  
paper

## Section A (36 marks)

- 1 Simplify  $(5a^2c)^3 \times 2a^4c^{-5}$ . [2]
- 2 Find the equation of the line joining the points  $(-1, 9)$  and  $(2, -3)$ , giving your answer in the form  $y = mx + c$ . State the coordinates of the points where this line intersects the axes. [5]
- 3 Find the value of
- (i)  $(2\frac{1}{4})^{-2}$ , [2]
- (ii)  $(8000)^{\frac{2}{3}}$ . [2]
- 4 For the following equation, express  $x$  in terms of  $y$ .
- $$\frac{x}{3y} = \frac{2x+1}{y+2}$$
- [4]
- 5 Find the coordinates of the point of intersection of the lines  $y = 4x + 3$  and  $3x + 2y = 9$ . [4]
- 6 Find the term that is independent of  $x$  in the binomial expansion of  $(\frac{1}{x} - 3x)^6$ . [3]
- 7 (i) Express  $\sqrt{28} + 3\sqrt{175}$  in the form  $a\sqrt{b}$ , where  $a$  and  $b$  are integers and  $b$  is as small as possible. [2]
- (ii) Simplify  $\frac{6}{5-\sqrt{2}} - \frac{3\sqrt{2}}{5+\sqrt{2}}$ , giving your answer in the form  $\frac{a+b\sqrt{2}}{c}$ , where  $a$ ,  $b$  and  $c$  are integers. [3]
- 8 For each of the following pairs of sentences A and B, give a reason why the statement  $A \Leftrightarrow B$  is false and write either ' $A \Rightarrow B$ ' or ' $A \Leftarrow B$ ' to show the correct relationship.
- (i) A:  $n$  is positive.  
B:  $n^2 + 6$  is positive. [2]
- (ii) A: The diagonals of a quadrilateral bisect each other but not at right angles.  
B: The quadrilateral is a rectangle but not a square. [2]
- 9 You are given that  $f(x) = ax^3 + cx$  and that  $f(-1) = 3$ . You are also given that when  $f(x)$  is divided by  $(x - 4)$ , the remainder is 108. Find the values of  $a$  and  $c$ . [5]

**Section B** (36 marks)

- 10 (i) Express  $3x^2 - 9x + 5$  in the form  $a(x + b)^2 + c$ . Hence state the equation of the line of symmetry and the  $y$ -coordinate of the minimum point of the curve with equation  $y = 3x^2 - 9x + 5$ . [6]
- (ii) Find the coordinates of the points where the graph of  $y = 3x^2 - 9x + 5$  intersects the axes. Give your answers in an exact form. Hence state the solution of the inequality  $3x^2 - 9x + 5 < 0$ . [4]
- 11 You are given that  $f(x) = (2x + 5)(x^2 - 5x + 4)$ .
- (i) Sketch the graph of  $y = f(x)$ . [4]
- (ii) You are given that  $g(x) = 2x^3 - 5x^2 - 17x + 48$ . Show that  $x = -3$  is a root of  $g(x) = 0$  and that it is the only real root. [6]
- (iii) Show that  $y = g(x)$  is a translation of  $y = f(x)$  by  $\begin{pmatrix} 0 \\ k \end{pmatrix}$ , finding the value of  $k$ . [3]

12

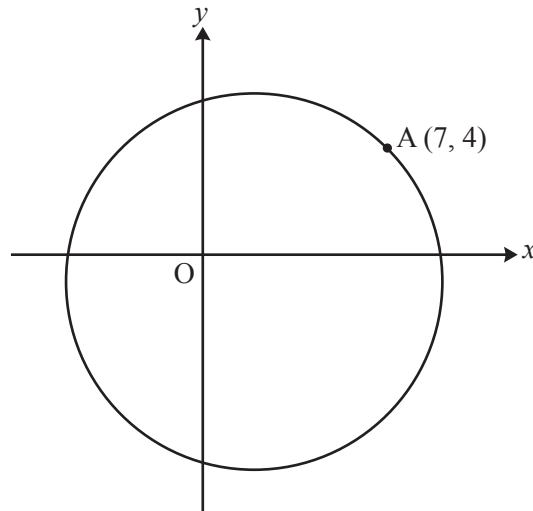
**Fig. 12**

Fig. 12 shows a sketch of the circle with equation  $(x - 2)^2 + (y + 1)^2 = 50$ . You are given that the point A (7, 4) lies on the circle.

- (i) Write down the radius of this circle and the coordinates of its centre. [2]
- (ii) The line  $L$  has equation  $y = 2x - 10$  and passes through the point A (7, 4). Use algebra to find the coordinates of the point B where the line  $L$  meets the circle again. Hence show that the perpendicular distance from the centre of the circle to the line  $L$  is  $\sqrt{5}$ . [6]
- (iii) Show that, when the line  $y = 2x + k$  is a tangent to the circle,  $k$  satisfies the equation

$$k^2 + 10k - 225 = 0. \quad [5]$$

**END OF QUESTION PAPER**

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