

OCR

Oxford Cambridge and RSA

Wednesday 16 May 2018 – Morning

AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

QUESTION PAPER

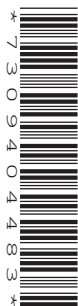
Candidates answer on the Printed Answer Book.

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) $\left(2\frac{1}{4}\right)^{-2}$, [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 $\left(\frac{1}{x} - 3x\right)^6$. [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]

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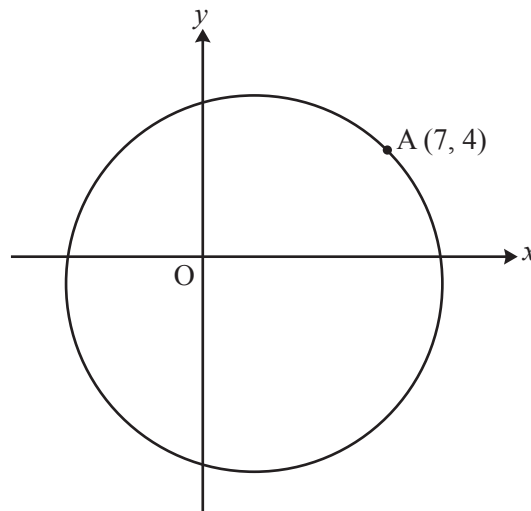
**Fig. 12**

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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