OCR
Oxford Cambridge and RSA

Wednesday 17 May 2017 – Morning

AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

QUESTION PAPER

5203606504

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

- 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 A straight line passes through (0, 1) and has gradient −2. Draw the graph of this line on the grid. **[2]**

2 **(i)** Find the value of $\left(1\frac{7}{9}\right)^{-\frac{1}{2}}$. **[3]**

(ii) Simplify $\dfrac{(6x^5y^2)^3}{18y^{10}}$. **[2]**

3 Solve the inequality $6-x > 5(x-3)$. **[3]**

4 Find the coordinates of the point of intersection of the lines $2x + 5y = 5$ and $x - 2y = 4$. **[4]**

5 The equation of a circle is $(x + 2)^2 + (y - 3)^2 = 5$.

(i) State the radius of this circle and the coordinates of its centre. **[2]**

(ii) Find the equation of the line through the centre of the circle which is parallel to the line $5x + y = 4$. **[2]**

6 Rearrange the formula $r = \sqrt{\dfrac{V}{a+b}}$ to make b the subject. **[4]**

7 **(i)** Simplify $\dfrac{5-2\sqrt{7}}{3+\sqrt{7}}$, giving your answer in the form $\dfrac{a-b\sqrt{7}}{c}$, where a, b and c are integers. **[3]**

(ii) Simplify $\dfrac{12}{\sqrt{2}}+\sqrt{98}$, giving your answer in the form $d\sqrt{2}$, where d is an integer. **[2]**

8 You are given that, in the expansion of $(a + bx)^5$, the constant term is 32 and the coefficient of x^3 is −1080. Find the values of a and b. **[5]**

9 The smallest of three consecutive positive integers is n. Find the difference between the squares of the smallest and largest of these three integers, and hence prove that this difference is four times the middle one of these three integers. **[4]**

Section B (36 marks)

10

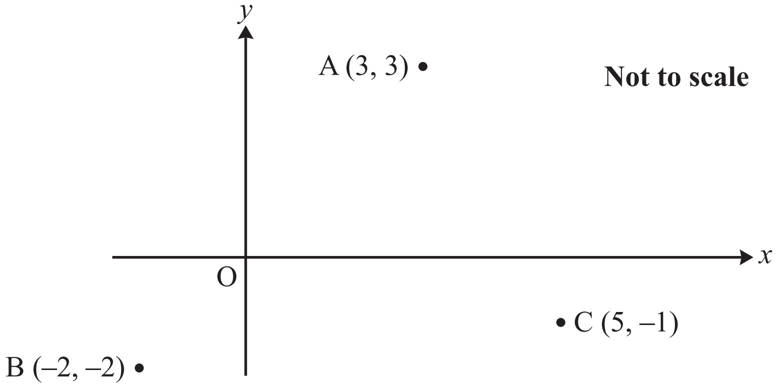

Fig. 10

Fig. 10 shows the points A (3, 3), B (−2, −2) and C (5, −1).

(i) Show that AB = BC. **[2]**

(ii) Find the equation of the line through B which is perpendicular to AC. Give your answer in the form $y = mx + c$. **[4]**

(iii) Find the coordinates of point D such that ABCD is a rhombus. **[2]**

(iv) Determine, showing all your working, whether the point E (8, 3.8) lies inside or outside the rhombus ABCD. **[4]**

11 A cubic function f(x) is given by $f(x) = (x - 2)(2x - 3)(x + 5)$.

(i) Sketch the graph of $y = f(x)$. **[3]**

(ii) The curve $y = f(x)$ is translated by $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$. The equation of the translated curve is $y = g(x)$. Show that

$g(x) = 2x^3 + 21x^2 + 43x + 24$. **[3]**

(iii) Show that $x = -2$ is one root of the equation $g(x) = 6$ and hence find the other two roots of this equation, expressing your answers in exact form. **[6]**

12 **(i)** Express $y = x^2 + x + 3$ in the form $y = (x + m)^2 + p$ and hence explain why the curve $y = x^2 + x + 3$ does not intersect the x-axis. **[4]**

(ii) Find the coordinates of the points of intersection of the curves $y = x^2 + x + 3$ and $y = 2x^2 - 3x - 9$. **[4]**

(iii) Find the set of values of k for which the curves $y = x^2 + x + k$ and $y = 2x^2 - 3x - 9$ do **not** intersect. **[4]**

END OF QUESTION PAPER