OCR
Oxford Cambridge and RSA

Wednesday 17 May 2017 – Morning

AS GCE MATHEMATICS

4721/01 Core Mathematics 1

QUESTION PAPER

5200862324

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4721/01
- List of Formulae (MF1)

Other materials required:
None

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

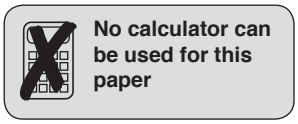
These instructions are the same on the Printed Answer Book and the Question Paper.
- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **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 the Printed Answer Book. The question number(s) must be clearly shown.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Do **not** write in the barcodes.
- You are **not** permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

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 reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **16** 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.



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Answer **all** the questions.

1 Express $\dfrac{2+\sqrt{7}}{\sqrt{7}-2}$ in the form $a+b\sqrt{7}$, where a and b are rational numbers. **[3]**

2 Solve the simultaneous equations

$$y = x^2 - 6x, \qquad 2y + x - 6 = 0.$$ **[5]**

3 It is given that $\mathrm{f}(x) = (3+x^2)(\sqrt{x}-7x)$. Find $\mathrm{f}'(x)$. **[5]**

4 Sketch the curve $y = -\frac{1}{2}(x+1)^2 + 2$, giving the coordinates of the turning point and indicating all points of intersection with the axes. **[5]**

5 Find the roots of the equation $4t^{\frac{2}{3}} = 15 - 17t^{\frac{1}{3}}$. **[5]**

6 **(i)** Express $3x^2 - 5x + 1$ in the form $a(x+b)^2 + c$. **[4]**

(ii) Work out the value of the discriminant of $3x^2 - 5x + 1$ and hence state the number of real roots of the equation $3x^2 - 5x + 1 = 0$. **[2]**

7 **(i)** Find the x values of the stationary points of the curve $y = 2x^4 - x^2$. **[3]**

(ii) Determine, in each case, whether the stationary point is a maximum point or a minimum point. **[2]**

(iii) Hence state the set of values of x for which curve $2x^4 - x^2$ is a decreasing function. **[2]**

8 **(i)** Sketch the curve $y = -2\sqrt{x}$. **[2]**

(ii) The curve $y = -2\sqrt{x}$ is translated by three units in the negative x direction. State the equation of the curve after it has been translated. **[2]**

(iii) Describe fully a single transformation that transforms the curve $y = -2\sqrt{x}$ to $y = -3\sqrt{5x}$. **[2]**

9 A curve has equation $y = 2x^2 + x - 10$.

(i) Determine the set of values of x for which the graph of the curve lies above the x-axis. **[4]**

(ii) The line $3x + y = c$ is a tangent to the curve. Find the value of c. **[5]**

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10 The circle $x^2 + y^2 - 8x + 2y = 0$ passes through the origin O. Line OA is a diameter to this circle.

(i) Find the equation of the line OA, giving your answer in the form $ax + by = 0$, where a and b are integers. **[5]**

(ii) The tangent to the circle at point A meets the x-axis at the point B. Find the area of triangle OAB. **[6]**

11 The normal to the curve $y = \frac{k}{x^2}$ at the point where $x = -3$ is parallel to the line $\frac{1}{2}y = 2 + 3x$.

(i) Determine the value of the constant k. **[6]**

(ii) Find the equation of the normal where $x = -3$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **[4]**

END OF QUESTION PAPER

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