

**Wednesday 13 May 2015 – Morning**

**AS GCE MATHEMATICS**

**4721/01** Core Mathematics 1

**QUESTION PAPER**

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.** 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.
- 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 bar codes.
- 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.

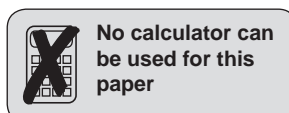
## INFORMATION FOR CANDIDATES

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 **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

- 1 Express  $\frac{8}{\sqrt{3}-1}$  in the form  $a\sqrt{3}+b$ , where  $a$  and  $b$  are integers. [3]
- 2 (i) Sketch the curve  $y = -\frac{1}{x}$ . [2]
- (ii) The curve  $y = -\frac{1}{x}$  is translated by 2 units parallel to the  $x$ -axis in the positive direction. State the equation of the transformed curve. [2]
- (iii) Describe a transformation that transforms the curve  $y = -\frac{1}{x}$  to the curve  $y = -\frac{1}{3x}$ . [2]
- 3 Express each of the following in the form  $5^k$ .
- (i)  $25^4$  [1]
- (ii)  $\frac{1}{\sqrt[4]{5}}$  [2]
- (iii)  $(5\sqrt{5})^3$  [2]
- 4 Solve the equation  $x^{\frac{2}{3}} - x^{\frac{1}{3}} - 6 = 0$ . [5]
- 5 The points  $A$  and  $B$  have coordinates  $(2, 1)$  and  $(5, -3)$  respectively.
- (i) Find the length of  $AB$ . [2]
- (ii) Find an equation of the line through the mid-point of  $AB$  which is perpendicular to  $AB$ , giving your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers. [7]
- 6 Solve the simultaneous equations
- $$2x + y - 5 = 0, \quad x^2 - y^2 = 3. \quad [5]$$
- 7 (a) Given that  $f(x) = (x^2 + 3)(5 - x)$ , find  $f'(x)$ . [4]
- (b) Find the gradient of the curve  $y = x^{-\frac{1}{3}}$  at the point where  $x = -8$ . [4]

- 8 (i) Sketch the curve  $y = 2x^2 - x - 3$ , giving the coordinates of all points of intersection with the axes. [4]
- (ii) Hence, or otherwise, solve the inequality  $2x^2 - x - 3 > 0$ . [2]
- (iii) Given that the equation  $2x^2 - x - 3 = k$  has no real roots, find the set of possible values of the constant  $k$ . [3]
- 9 The curve  $y = 2x^3 - ax^2 + 8x + 2$  passes through the point  $B$  where  $x = 4$ .
- (i) Given that  $B$  is a stationary point of the curve, find the value of the constant  $a$ . [5]
- (ii) Determine whether the stationary point  $B$  is a maximum point or a minimum point. [2]
- (iii) Find the  $x$ -coordinate of the other stationary point of the curve. [3]
- 10 A circle with centre  $C$  has equation  $x^2 + y^2 - 10x + 4y + 4 = 0$ .
- (i) Find the coordinates of  $C$  and the radius of the circle. [3]
- (ii) Show that the tangent to the circle at the point  $P(8, 2)$  has equation  $3x + 4y = 32$ . [5]
- (iii) The circle meets the  $y$ -axis at  $Q$  and the tangent meets the  $y$ -axis at  $R$ . Find the area of triangle  $PQR$ . [4]

**END OF QUESTION PAPER**

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