

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
AS GCE**

**4721/01**

**MATHEMATICS  
Core Mathematics 1  
QUESTION PAPER**

**WEDNESDAY 13 MAY 2015: Morning**

**DURATION: 1 hour 30 minutes  
plus your additional time allowance**

**MODIFIED ENLARGED**

**Candidates answer on the Printed Answer Book or any suitable paper provided by the centre. The Printed Answer Book may be enlarged by the centre.**

**OCR SUPPLIED MATERIALS:**

**Printed Answer Book 4721/01  
List of Formulae (MF1)**

**OTHER MATERIALS REQUIRED:**

**None**

<b>NO CALCULATOR CAN BE USED FOR THIS PAPER</b>
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**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book or on the paper provided by the centre. Please write clearly and in capital letters.**

**If you use the Printed Answer Book, WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. 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.**

**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.**

**Any blank pages are indicated.**

## **INSTRUCTION TO EXAMS OFFICER/INVIGILATOR**

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**Answer ALL the questions.**

**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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