

**AS GCE  
4721  
MATHEMATICS  
Core Mathematics 1  
QUESTION PAPER**

**MONDAY 14 JANUARY 2013: Morning**

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

**MODIFIED ENLARGED 24pt**

**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  
List of Formulae (MF1)**

**OTHER MATERIALS REQUIRED:**

**None**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**These instructions are the same on the Printed Answer Book and the Question Paper.**

- **The Question Paper will be found in the centre of 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.**

- 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 12 pages. Any blank pages are indicated.

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

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**1 (i) Solve the equation  $x^2 - 6x - 2 = 0$ , giving your answers in simplified surd form. [3]**

**(ii) Find the gradient of the curve  $y = x^2 - 6x - 2$  at the point where  $x = -5$ . [2]**

**2 Solve the equations**

**(i)  $3^n = 1$ , [1]**

**(ii)  $t^{-3} = 64$ , [2]**

**(iii)  $(8p^6)^{\frac{1}{3}} = 8$ . [3]**

**3 (i) Sketch the curve**

**$y = (1 + x)(2 - x)(3 + x)$ , giving  
the coordinates of all points of  
intersection with the axes. [3]**

**(ii) Describe the transformation that  
transforms the curve**

**$y = (1 + x)(2 - x)(3 + x)$  to the curve  
 $y = (1 - x)(2 + x)(3 - x)$ . [2]**

**4 (i) Solve the simultaneous equations**

$$y = 2x^2 - 3x - 5, \quad 10x + 2y + 11 = 0. \quad [5]$$

**(ii) What can you deduce from the answer to  
part (i) about the curve  $y = 2x^2 - 3x - 5$   
and the line  $10x + 2y + 11 = 0$ ? [1]**

**5 (i) Simplify  $(x + 4)(5x - 3) - 3(x - 2)^2$ . [3]**

**(ii) The coefficient of  $x^2$  in the expansion of**

$$(x + 3)(x + k)(2x - 5)$$

**is  $-3$ . Find the value of the constant  $k$ . [3]**

**6 (i) The line joining the points  $(-2, 7)$  and  $(-4, p)$  has gradient 4. Find the value of  $p$ . [3]**

**(ii) The line segment joining the points  $(-2, 7)$  and  $(6, q)$  has mid-point  $(m, 5)$ . Find  $m$  and  $q$ . [3]**

**(iii) The line segment joining the points  $(-2, 7)$  and  $(d, 3)$  has length  $2\sqrt{13}$ . Find the two possible values of  $d$ . [4]**



**7 Find  $\frac{dy}{dx}$  in each of the following cases:**

**(i)  $y = \frac{(3x)^2 \times x^4}{x}$ , [3]**

**(ii)  $y = \sqrt[3]{x}$ , [3]**

**(iii)  $y = \frac{1}{2x^3}$ . [2]**

**8 The quadratic equation  $kx^2 + (3k - 1)x - 4 = 0$  has no real roots. Find the set of possible values of  $k$ . [7]**

**9 A circle with centre  $C$  has equation  $x^2 + y^2 - 2x + 10y - 19 = 0$ .**

- (i) Find the coordinates of  $C$  and the radius of the circle. [3]**
- (ii) Verify that the point  $(7, -2)$  lies on the circumference of the circle. [1]**
- (iii) Find the equation of the tangent to the circle at the point  $(7, -2)$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. [5]**

**10 Find the coordinates of the points on the curve  $y = \frac{1}{3}x^3 + \frac{9}{x}$  at which the tangent is parallel to the line  $y = 8x + 3$ . [10]**

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