

**Monday 14 January 2013 – Morning**

**AS GCE MATHEMATICS**

**4721** Core Mathematics 1

**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

**OCR supplied materials:**

- Printed Answer book 4721
- 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 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.
- 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.

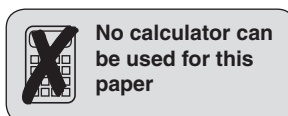
**INFORMATION FOR CANDIDATES**

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 (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]

**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**



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