

Wednesday 16 May 2012 – 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.

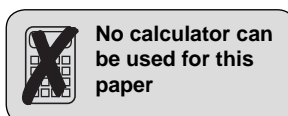
- The Question Paper will be found in the centre of the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed 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.

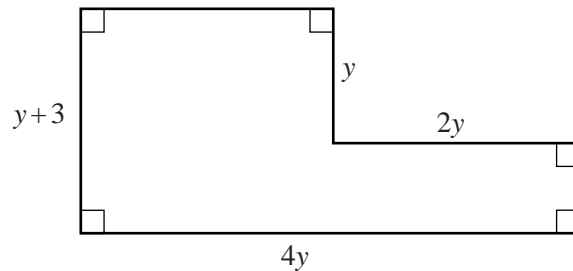
**INSTRUCTION TO EXAMS OFFICER/INVIGILATOR**

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- 1 Simplify  $(x - 5)(x^2 + 3) - (x + 4)(x - 1)$ . [3]
- 2 Express each of the following in the form  $7^k$ :
- (i)  $\sqrt[4]{7}$ , [1]
- (ii)  $\frac{1}{7\sqrt{7}}$ , [2]
- (iii)  $7^4 \times 49^{10}$ . [2]
- 3 (i) Find the gradient of the line  $l$  which has equation  $3x - 5y - 20 = 0$ . [1]
- (ii) The line  $l$  crosses the  $x$ -axis at  $P$  and the  $y$ -axis at  $Q$ . Find the coordinates of the mid-point of  $PQ$ . [4]
- 4 (i) Express  $2x^2 - 20x + 49$  in the form  $p(x - q)^2 + r$ . [4]
- (ii) State the coordinates of the vertex of the curve  $y = 2x^2 - 20x + 49$ . [2]
- 5 (i) Sketch the curve  $y = \sqrt{x}$ . [2]
- (ii) Describe the transformation that transforms the curve  $y = \sqrt{x}$  to the curve  $y = \sqrt{x - 4}$ . [2]
- (iii) The curve  $y = \sqrt{x}$  is stretched by a scale factor of 5 parallel to the  $x$ -axis. State the equation of the transformed curve. [2]
- 6 Find the equation of the normal to the curve  $y = \frac{6}{x^2} - 5$  at the point on the curve where  $x = 2$ . Give your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. [7]
- 7 Solve the equation  $x - 6x^{\frac{1}{2}} + 2 = 0$ , giving your answers in the form  $p \pm q\sqrt{r}$ , where  $p$ ,  $q$  and  $r$  are integers. [6]
- 8 (i) Find the coordinates of the stationary point on the curve  $y = x^4 + 32x$ . [5]
- (ii) Determine whether this stationary point is a maximum or a minimum. [2]
- (iii) For what values of  $x$  does  $x^4 + 32x$  increase as  $x$  increases? [1]

- 9 (i) A rectangular tile has length  $4x$  cm and width  $(x + 3)$  cm. The area of the rectangle is less than  $112 \text{ cm}^2$ . By writing down and solving an inequality, determine the set of possible values of  $x$ . [6]
- (ii) A second rectangular tile of length  $4y$  cm and width  $(y + 3)$  cm has a rectangle of length  $2y$  cm and width  $y$  cm removed from one corner as shown in the diagram.



Given that the perimeter of this tile is between 20 cm and 54 cm, determine the set of possible values of  $y$ . [5]

- 10 A circle has equation  $(x - 5)^2 + (y + 2)^2 = 25$ .
- (i) Find the coordinates of the centre  $C$  and the length of the diameter. [3]
- (ii) Find the equation of the line which passes through  $C$  and the point  $P (7, 2)$ . [4]
- (iii) Calculate the length of  $CP$  and hence determine whether  $P$  lies inside or outside the circle. [3]
- (iv) Determine algebraically whether the line with equation  $y = 2x$  meets the circle. [5]

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



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