

**Friday 13 January 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.

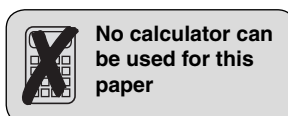
**INFORMATION FOR CANDIDATES**

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**

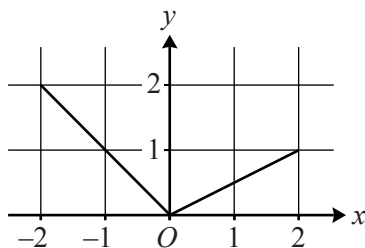
- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.



No calculator can  
be used for this  
paper

- 1 Express  $\frac{15 + \sqrt{3}}{3 - \sqrt{3}}$  in the form  $a + b\sqrt{3}$ , where  $a$  and  $b$  are integers. [4]

2



The graph of  $y = f(x)$  for  $-2 \leq x \leq 2$  is shown above.

- (i) Sketch the graph of  $y = f(-x)$  for  $-2 \leq x \leq 2$ . [2]
- (ii) Sketch the graph of  $y = f(x) + 2$  for  $-2 \leq x \leq 2$ . [2]

3 Given that

$$5x^2 + px - 8 = q(x - 1)^2 + r$$

for all values of  $x$ , find the values of the constants  $p$ ,  $q$  and  $r$ . [4]

4 Evaluate

- (i)  $3^{-2}$ , [1]
- (ii)  $16^{\frac{3}{4}}$ , [2]
- (iii)  $\frac{\sqrt{200}}{\sqrt{8}}$ . [2]

- 5 Find the real roots of the equation  $\frac{3}{y^4} - \frac{10}{y^2} - 8 = 0$ . [5]

6 Given that  $f(x) = \frac{4}{x} - 3x + 2$ ,

(i) find  $f'(x)$ , [3]

(ii) find  $f''\left(\frac{1}{2}\right)$ . [4]

7 A curve has equation  $y = (x + 2)(x^2 - 3x + 5)$ .

(i) Find the coordinates of the minimum point, justifying that it is a minimum. [8]

(ii) Calculate the discriminant of  $x^2 - 3x + 5$ . [2]

(iii) Explain why  $(x + 2)(x^2 - 3x + 5)$  is always positive for  $x > -2$ . [2]

- 8 The line  $l$  has gradient  $-2$  and passes through the point  $A(3, 5)$ .  $B$  is a point on the line  $l$  such that the distance  $AB$  is  $6\sqrt{5}$ . Find the coordinates of each of the possible points  $B$ . [6]
- 9 (i) Sketch the curve  $y = 12 - x - x^2$ , giving the coordinates of all intercepts with the axes. [5]
- (ii) Solve the inequality  $12 - x - x^2 > 0$ . [2]
- (iii) Find the coordinates of the points of intersection of the curve  $y = 12 - x - x^2$  and the line  $3x + y = 4$ . [5]
- 10 A circle has centre  $C(-2, 4)$  and radius 5.
- (i) Find the equation of the circle, giving your answer in the form  $x^2 + y^2 + ax + by + c = 0$ . [3]
- (ii) Show that the tangent to the circle at the point  $P(-5, 8)$  has equation  $3x - 4y + 47 = 0$ . [5]
- (iii) Verify that the point  $T(3, 14)$  lies on this tangent. [1]
- (iv) Find the area of the triangle  $CPT$ . [4]

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



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