

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.

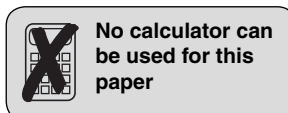
INFORMATION FOR CANDIDATES

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.

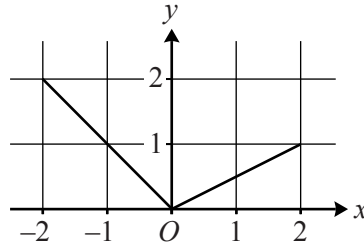
INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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- 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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