OCR
RECOGNISING ACHIEVEMENT

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

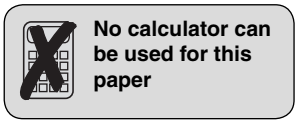
These instructions are the same on the Printed Answer Book and the Question Paper.
- The Question Paper will be found in the centre of the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital 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.



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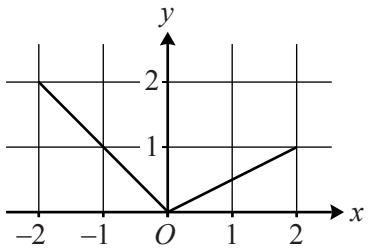
1 Express $\dfrac{15+\sqrt{3}}{3-\sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers. **[4]**

2



The graph of $y = \mathrm{f}(x)$ for $-2 \leqslant x \leqslant 2$ is shown above.

(i) Sketch the graph of $y = \mathrm{f}(-x)$ for $-2 \leqslant x \leqslant 2$. **[2]**

(ii) Sketch the graph of $y = \mathrm{f}(x) + 2$ for $-2 \leqslant x \leqslant 2$. **[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) $\dfrac{\sqrt{200}}{\sqrt{8}}$. **[2]**

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

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

(i) find $\mathrm{f}'(x)$, **[3]**

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