

FORM TP 2005254



TEST CODE **02134032**

MAY/JUNE 2005

CARIBBEAN EXAMINATIONS COUNCIL
ADVANCED PROFICIENCY EXAMINATION

PURE MATHEMATICS

UNIT 1 – PAPER 03/B

1½ hours

20 MAY 2005 (p.m.)

This examination paper consists of **THREE** sections: Module 1, Module 2, and Module 3.

Each section consists of 1 question.

The maximum mark for each section is 20.

The maximum mark for this examination is 60.

This examination paper consists of 4 pages.

INSTRUCTIONS TO CANDIDATES

1. **DO NOT** open this examination paper until instructed to do so.
2. Answer **ALL** questions from the **THREE** sections.
3. Unless otherwise stated in the question, any numerical answer that is not exact **MUST** be written correct to three significant figures.

Examination materials

Mathematical formulae and tables

Electronic calculator

Graph paper

Section A (Module 1)

Answer this question.

1. (a) Given that $2x^2 + 8x + 11 = 2(x + h)^2 + k$ for all values of x , find the value of EACH of the constants h and k . [5 marks]
- (b) (i) If $p, q, r, s \in \mathbf{R}$, use the fact that $(p - q)^2 \geq 0$ to show that $p^2 + q^2 \geq 2pq$. [2 marks]
- (ii) Deduce that if $p^2 + q^2 = 1$, then $pq \leq \frac{1}{2}$. [1 mark]
- (c) A club bakes and sells x cakes, making a profit, in dollars, that is modelled by the function $f(x) = x^2 - 10x$.
- (i) Sketch the graph of the function $f(x) = x^2 - 10x$. [8 marks]
- (ii) From your graph, determine
- a) the LEAST number of cakes sold for which a profit is realised [2 marks]
- b) the GREATEST possible loss in dollars [1 mark]
- c) the number of cakes for which the GREATEST possible loss occurs. [1 mark]

Total 20 marks

Section B (Module 2)

Answer this question.

2. (a) The straight line through the point $P(4, 3)$ is perpendicular to $3x + 2y = 5$ and meets the given line at N .

Find

- (i) the coordinates of N [6 marks]
- (ii) the length of the line-segment PN . [2 marks]
- (b) The table below presents data collected on the movement of the tide at various times after midnight on a particular day.

| Tide Movement | Time After Midnight (t hours) | Height (h metres) |
|---------------|-------------------------------------|-------------------------|
| High | 0 | 12 |
| Low | 6 | 2 |
| High | 12 | 12 |
| Low | 18 | 2 |

The height, h metres, can be modelled by a function of the form $h = p \cos(qt)^\circ + 7$ where t is the time in hours after midnight. Use the data from the table to find the values of p and q . [12 marks]

Total 20 marks

GO ON TO THE NEXT PAGE