



CARIBBEAN EXAMINATIONS COUNCIL
ADVANCED PROFICIENCY EXAMINATION

PURE MATHEMATICS

UNIT 2 – PAPER 03/B

1½ hours

22 MAY 2006 (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.** The rate of increase of the number of algae with respect to time, t days, is equal to k times $f(t)$, where $f(t)$ is the number of algae at any given time t and $k \in \mathbb{R}$.
- (a) Obtain a differential equation involving $f(t)$ which may be used to model this situation. [1 mark]
- (b) Given that
- the number of algae at the beginning is 10^6
 - the number of algae doubles every 2 days,
- (i) determine the values of $f(0)$ and $f(2)$ [2 marks]
- (ii) show that
- a) $k = \frac{1}{2} \ln 2$ [10 marks]
 - b) $f(t) = 10^6(2^{t/2})$ [5 marks]
- (iii) determine the approximate number of algae present after 7 days. [2 marks]

Total 20 marks

GO ON TO THE NEXT PAGE

Section B (Module 2)

Answer this question.

2. (a) A car was purchased at the beginning of the year, for P dollars. The value of a car at the end of each year is estimated to be the value at the beginning of the year multiplied by $(1 - \frac{1}{q})$, $q \in N$.

- (i) Copy and complete the table below showing the value of the car for the first five years after purchase.

	Year 1	Year 2	Year 3	Year 4	Year 5
Value at the Beginning of Year (\$)	P	$P(1 - \frac{1}{q})$	$P(1 - \frac{1}{q})^2$		
Value at the End of Year (\$)	$P(1 - \frac{1}{q})$	$(1 - \frac{1}{q}) \left[P(1 - \frac{1}{q}) \right]$ $= P(1 - \frac{1}{q})^2$			

[3 marks]

- (ii) Describe FULLY the sequence shown in the table. [2 marks]
- (iii) Determine, in terms of P and q , the value of the car n years after purchase. [1 mark]
- (b) If the original value of the car was \$20 000.00 and the value at the end of the fourth year was \$8 192.00, find
- (i) the value of q [5 marks]
- (ii) the estimated value of the car after five years [2 marks]
- (iii) the LEAST integral value of n , the number of years after purchase, for which the estimated value of the car falls below \$500.00. [7 marks]

Total 20 marks

Section C (Module 3)

Answer this question.

- 3.** (a) A box contains 8 green balls and 6 red balls. Five balls are selected at random. Find the probability that
- (i) ALL 5 balls are green [4 marks]
- (ii) EXACTLY 3 of the five balls are red [4 marks]
- (iii) at LEAST ONE of the five balls is red. [3 marks]
- (b) Use the method of row reduction to echelon form on the augmented matrix for the following system of equations to show that the system is inconsistent. [9 marks]

$$x + 2y + 4z = 6$$

$$y + 2z = 3$$

$$x + y + 2z = 1$$

Total 20 marks

END OF TEST