HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2012
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT 1 – TEST 1
1 hour 30 minutes

This examination paper consists of **2** printed pages.
This paper consists of **9** questions.
The maximum mark for this examination is **60**.

INSTRUCTIONS TO CANDIDATES

(i) Write your name clearly on each sheet of paper used
(ii) Answer **ALL** questions
(iii) Number your questions carefully and do **NOT write your solutions to different questions** beside each other
(iv) Unless otherwise stated in the question, any numerical answer that is not exact, **MUST** be written correct to three (3) significant figures

EXAMINATION MATERIALS ALLOWED

(i) Mathematical formulae
(ii) Scientific calculator (non-programmable, non-graphical)

1. Express $\frac{8\sqrt{3}-1}{2+\sqrt{3}}$ in the form $a+b\sqrt{3}$ where a and b are real numbers. [5]

Total 5 marks

2. Prove by mathematical induction that $\sum_{r=1}^{n}\frac{1}{(2r-1)(2r+1)}=\frac{n}{2n+1}\ \forall n\in Z^{+}$. [8]

Total 8 marks

3. Given that – 1 and 2 are two roots of the equation $x^3+px^2+x+q=0$.
(i) Find the values of p and q [4]
(ii) Hence find the other root of the equation. [3]

Total 7 marks

4. Solve for y, the equations
(a) $16^{y}=2^{2y+3}$ [3]
(b) $\log_5 y^4+\log_y 5=4$ [6]

Total 9 marks

5. A renewable energy supplier finds that when x millions of dollars are spent on research the profit, $P(x)$, in millions of dollars, is given by $P(x)=2+\log_{10}(x+3)$.
Calculate how much should be spent on research to make a profit of 4 million dollars. [4]

Total 4 marks

P.T.O

6. The function f is defined by $f: x \to 1 + 4x - x^2, x \geq 2, x \in \boldsymbol{R}$.

(i) Express f in the form $k + a(x + h)^2$, where a, h and k are constants [4]

(ii) Sketch the graph of f [2]

(iii) State the range of f [1]

(iv) Giving a reason to support your answer, state whether f is

(a) injective [2]

(b) surjective [2]

(c) bijective. [2]

Total 13 marks

7. The equation $2x^2 + 4x - 3 = 0$ has real roots α and β. Without solving the equation, find the equation whose roots are α^2 and β^2. [5]

Total 5 marks

8. Solve for x, $x \neq 1$, $\dfrac{3-2x}{x-1} < 0$ [5]

Total 5 marks

9. Find the range of values of x such that $|4 - 3x| \leq x$, and $x > 0$. [4]

Total 4 marks

END OF TEST