HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2019
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT I – PREVIEW TEST 1
1 hour 20 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 identically as they appear on the question paper 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 <u>exact</u>, **MUST** be
      written correct to <u>three</u> (3) significant figures

EXAMINATION MATERIALS ALLOWED
(a) Mathematical formulae
(b) Scientific calculator (non-programmable, non-graphical)

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1) Given that p and q are propositions, use the <u>algebra of propositions</u> to prove

$\sim (p \lor q) \lor (\sim p \land q) \equiv \sim p$ [4]

2) Prove that for all $x \in \mathbf{R}$, $y \in \mathbf{R}$; $x^2 + y^2 \geq -2xy$ [4]

3) Without the use of a calculator, find the <u>EXACT</u> value of $\dfrac{\sqrt{7} - \sqrt{2}}{\sqrt{7} + \sqrt{2}} - \dfrac{\sqrt{7} + \sqrt{2}}{\sqrt{7} - \sqrt{2}}$ **Ans.** $-\dfrac{4\sqrt{14}}{5}$ [5]

4) Prove by mathematical induction that $\sum_{r=1}^{n} 4(3)^{1-r} = 6(1 - 3^{-n}) \ \forall \, n \in N$ [7]

5) Determine ALL the linear factors of the function $f(x) = x^3 - 7x + 6$. **Ans.** $(x-1)(x-2)(x+3)$ [7]

6) (a) Solve for x, $3log_8 x - 5 = 2log_x 8$. **Ans.** $\dfrac{1}{2}, 64$ [6]

   (b) Solve for x the following equation $e^{2x} + 2e^{-2x} = 3$. **Ans.** $\dfrac{1}{2}\ln 2, 0$ [4]

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7) The number of mosquito larvae, N, found in a pond initially was 3 200.

The number of larvae after t days was found to be directly proportional to $\left(\frac{3}{2}\right)^t$.

Calculate estimates of

    (i) the number of larvae after 3 days   **Ans.** 10 800   [3]
    (ii) the number of days for which the population is expected to reach 30 000. **Ans.** 5.52 [5]

8) Find the range of values of x for which $\left|\frac{x+8}{x-4}\right| \leq 5$, $x \neq 4$. **Ans.** $x \leq 2$, $x \geq 7$ [6]

9) If α, β and γ are the roots of the equation $3x^3 - 4x^2 - 5x + 2 = 0$, find the equation with roots $\alpha - 1, \beta - 1$ and $\gamma - 1$. **Ans.** $3x^3 + 5x^2 - 4x - 4 = 0$ [9]

END OF TEST