HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2021
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS PREVIEW
UNIT I – TEST 1
1 hour 20 minutes

NAME OF STUDENT: _____
SCHOOL CODE: 030014
DATE: _____

This examination paper consists of **8** printed pages and 2 blank pages for extra working.
This paper consists of **9** questions.
The maximum mark for this examination is **60**.

INSTRUCTIONS TO CANDIDATES

(i) Write your NAME and FORM clearly in the spaces provided above
(ii) Answer **ALL** questions in the SPACES PROVIDED
(iii) **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

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

---

1) Given that $\boldsymbol{p}$ and $\boldsymbol{q}$ are propositions, use the algebra of propositions to simplify fully
$\sim(\boldsymbol{p} \vee \boldsymbol{q}) \vee (\sim \boldsymbol{p} \wedge \boldsymbol{q})$ **Ans.** $\sim \boldsymbol{p}$ [4]

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

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

4) Prove by mathematical induction that $\mathbf{9^{2n} - 1}$ is a multiple of 8. [7]

5) The expression $f(x) \equiv x^3 - bx + 6$ is exactly divisible by $(x - 2)$

(i) Calculate the value of b. **Ans.** 7 [3]

(ii) Solve $f(x) = 0$. **Ans.** 1, 2, -3 [4]

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

(b) Solve for x the following equation $9^x - 7(3^x) = 6$. **Ans.** $\frac{ln\left(\frac{7+\sqrt{73}}{2}\right)}{ln3}$ [4]

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 exceed 16 000. **Ans.** 4 [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 $\boldsymbol{\alpha, \beta}$ **and** $\boldsymbol{\gamma}$ are the roots of the equation $3x^3 - 4x^2 - 5x + 2 = 0$, find the equation with roots $\boldsymbol{\alpha - 1, \beta - 1}$ **and** $\boldsymbol{\gamma - 1}$. **Ans.** $3x^3 + 5x^2 - 4x - 4 = 0$ [9]

End of Test