

**HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2015**  
**CARIBBEAN ADVANCED PROFICIENCY EXAMINATION**  
**SCHOOL BASED ASSESSMENT**  
**PURE MATHEMATICS**  
**PREVIEW UNIT 1 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 **46**.

INSTRUCTIONS TO CANDIDATES

- (i) Write **in ink**
- (ii) Write your name clearly on each sheet of paper used
- (iii) Answer **ALL** questions
- (iv) Number your questions identically as they appear on the question paper and do **NOT** **write your solutions to different questions** beside each other
- (v) 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  $p$  and  $q$  are propositions, use the algebra of propositions to simplify fully  $(p \wedge q) \vee (\sim p \wedge q)$  [3]

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

3) Evaluate  $\sum_{r=10}^{500} (3r + 2)$ . [4]

4) Prove by mathematical induction that  $4^n + 5$  is divisible by 3 for all  $n \in \mathbf{Z}^+$ . [6]

5) Given the polynomial  $f(x) = x^3 - 2x^2 - x + 2$ , solve  $f(x) = 0$  for  $x \in \mathbf{R}$ . [6]

6) The population of a town at the beginning of the year 2000 was 2400. The population increased so that, after a period of  $n$  years, the new population was  $2400(1.06)^n$ . Calculate estimates of

- (i) the population at the beginning of 2010. [2]
- (ii) the year in which the population is expected to first reached 7000. [4]

7) The function  $f$  is defined by  $f: x \rightarrow 2\ln x: x \in \mathbf{R}, x > -1$ .

(i) Determine an expression for the inverse function,  $f^{-1}(x)$ . [3]

(ii) State the domain, and the range of  $f(x)$ . [2]

(iii) State the domain, and the range of  $f^{-1}(x)$ . [2]

The function  $g$  is defined by  $g: x \rightarrow e^x$

(iv) Determine  $gf(x)$ . [2]

8) Find the range of values of  $x \in \mathbf{R}$  for which  $\frac{x-2}{x-3} \leq 0, x \neq 3$ . [3]

9) Solve for  $x \in \mathbf{R}, x = |3x| - 2$ . [4]

### ANSWERS

2)  $-26 + 17\sqrt{3}$

3) 376 597

5)  $x = 1, 2, -1$

6) 4298 persons; 2018

7)  $e^{\frac{x}{2}}; \mathbf{R}; y > 0; x^2$

8)  $2 \leq x < 3$

9)  $x = -\frac{1}{2}, x = 1$