

HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2018
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
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 **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 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 fully simplify
 $\sim p \wedge (\sim q \vee p)$ [3]
Total: 3 marks

2) (a) (i) Express in terms of n , $\sum_{r=1}^n (2r)^3$. [3]
(ii) Given that $\sum_{r=1}^n (2r)^3 = 72$, calculate the value of n . [4]

(b) Determine the values of a , b and c such that $\frac{3\sqrt{5} - 4}{2\sqrt{5} + 1} \equiv a + b\sqrt{c}$ [4]

Total: 11 marks

3) (i) The expression $2x^3 + ax^2 + bx + 6$ is exactly divisible by $(x - 2)$, and gives a remainder of -12 when divided by $(x + 1)$. Find the values of a and b . [4]

(ii) Hence, with these values of a and of b , solve $2x^3 + ax^2 + bx + 6 = 0$. [4]

Total: 8 marks

4) Prove by mathematical induction that $\sum_{r=1}^n \frac{1}{(3r-2)(3r+1)} = \frac{n}{3n+1} \quad \forall n \in \mathbb{N}$. [6]

Total: 6 marks

Please Turn Over

5) (a) Solve for x , $3\log_8 x - 5 = 2\log_x 8$. [4]

(b) Solve for x the following equation $e^{2x} + 2e^{-2x} = 3$. [4]

Total: 8 marks

6) 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 [2]

(ii) the number of days for which the population is expected to reach 30 000. [4]

Total: 6 marks

7) The function f is defined by $f: x \rightarrow \frac{1}{2} \ln x$.

(i) Sketch the graph of f , showing clearly any intersection with the axes. [2]

(ii) Determine an expression for the inverse function, $f^{-1}(x)$. [2]

(iii) The function g is defined by $g: x \rightarrow e^x + 2$.

Determine $gf(x)$, simplifying your answer. [3]

Total: 7 marks

8) Find the range of values of x for which $\frac{x-3}{x-5} - 2 > 0$, $x \neq 5$. [5]

Total: 5 marks

9) Solve for $x \in \mathbf{R}$, $|2x - 5| - 7 \geq -4$.

[6]

Total: 6 marks

End of Test