

**HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2018**  
**CARIBBEAN ADVANCED PROFICIENCY EXAMINATION**  
**SCHOOL BASED ASSESSMENT**  
**PURE MATHEMATICS**  
**UNIT 2 – TEST 3**  
**1 hour 20 minutes**

This examination paper consists of 2 pages.  
This paper consists of 5 questions.  
The maximum marks for this examination is 60.

**INSTRUCTIONS TO CANDIDATES**

1. Write in ink.
2. Write your name clearly on each sheet of paper used.
3. Answer **ALL** questions.
4. Do **NOT** do questions beside one another.
5. 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**

1. Mathematical formulae sheet
  2. Scientific Non-programmable calculator (non-graphical)
- 

1. (a) A committee of 4 persons is to be selected from a group of 8 males and 4 females. Determine the number of ways the committee may be formed if it is to have at least one female. [3]
  - (b) (i) Find the number of arrangements of all letters of the word SELECTION. [2]
  - (ii) Find the probability that the two letters, E, are next to each other. [3]
  - (c) Find how many three figure numbers, lying between 100 and 999 inclusive, have two and only two consecutive figures identical. [3]
- Total 11 marks**
- 
2. (a) The probability that it rains on any day in Barbados during March is 0.4. The probability that the daily maximum temperature exceeds  $27^{\circ}\text{C}$  is 0.4 when it rains and 0.7 when it does not rain. Given that the maximum daily temperature exceeded  $27^{\circ}\text{C}$  on a particular day, find the probability that it rained on that day. [6]
  - (b) Events  $A$  and  $B$  are such that  $P(A) = \frac{2}{5}$ ,  $P(B) = \frac{11}{20}$  and  $P(A|B) = \frac{2}{11}$ .
    - (i) Find  $P(A \cap B)$ . [2]
    - (ii) Find  $P(A \cup B)$ . [2]
    - (iii) State with a reason whether  $A$  and  $B$  are independent events. [2]

**Total 12 marks**

**PLEASE TURN OVER**

3. The matrix  $D$  is given by  $D = \begin{pmatrix} 3 & 2 & 0 \\ 3 & 1 & 2 \\ 0 & -1 & 1 \end{pmatrix}$ .

(i) Find  $D^{-1}$ . [7]

(ii) Hence, or otherwise, solve the equations

$$\begin{aligned} 3x + 2y &= 3 \\ 3x + y + 2z &= 4 \\ -y + z &= 1 \end{aligned} \quad [4]$$

**Total 11 marks**

4. A system of equations is given by  $x + y + 2z = -2$

$$3x - y + 14z = 6$$

$$x + 2y = k$$

where  $k$  is a real number.

(i) Write the system in matrix form. [1]

(ii) Write down the augmented matrix. [1]

(iii) Reduce the augmented matrix to echelon form. [3]

(iv) Deduce the value of  $k$  which the system is consistent. [1]

(v) Find ALL solutions corresponding to this value of  $k$ . [3]

**Total 9 marks**

5. (a) Solve the differential equation

$$\frac{dy}{dx} + 5y = e^{8x}$$

given that  $y = \frac{3}{2}$  when  $x = 0$ . [7]

(b) The variables  $x$  and  $y$  satisfy the differential equation

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{3x}$$

(i) Find the complementary function. [3]

(ii) Explain briefly why there is no particular integral either of the form  $y = ke^{3x}$  or  $y = kxe^{3x}$  [1]

(iii) Hence find the general solution of the differential equation. [6]

**Total 17 marks**