

**HARRISON COLLEGE INTERNAL EXAMINATION 2012
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION**

SCHOOL BASED ASSESSMENT

**PURE MATHEMATICS
UNIT 2 - TEST 3[PREVIEW]**

TIME: 1 Hour & 30 minutes

This examination paper consists of 2 printed pages.

The paper consists of 8 questions.

The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

1. Write your name clearly on each sheet of paper used.
2. Answer **ALL** questions.
3. Number your questions carefully and do **NOT** write your solutions to different questions beside one another.
4. 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
 2. Electronic calculator (non-programmable, non-graphical)
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1. A committee of 7 people is to be chosen at random from 18 volunteers.
 - (a) In how many different ways can the committee be chosen? [2]

The 18 volunteers consist of 5 people from St.Michael, 6 from St. Lucy and 7 from St. John. The committee is to be chosen randomly. Find the probability that the committee will
 - (b) consist of 2 people from St.Michael, 2 from St.Lucy and 3 from St.John. [3]
 - (c) exactly 3 people from St.John . [3]

2. Each of the 8 letters of the word AARDVARK is printed on a separate card. The cards are arranged in a row.
 - (i) How many different arrangements of the letters are possible? [3]
 - (ii) In how many of these arrangements are the Rs together? [2]

The 8 cards are now shuffled and 2 cards are selected at random, without replacement.
 - (iii) Find the probability that at least one of these 2 cards has R printed on it. [3]

3. The independent events A and B are such that $P(A) = 0.5$ and $P(A \cup B) = 0.9$. Find
 - (a) $P(B)$. [4]
 - (b) the probability that either A occurs or B occurs, but not both. [2]

4. (a) Express the complex number $\frac{(1+2i)^2}{7-i}$ in the form $a+ib$ where a and b are real numbers. [4]

(b) Given that $1-i$ is the root of the equation $z^3 + z^2 - 4z + 6 = 0$, find the remaining roots. [4]

5. (i) Express $-\frac{1}{2} + i\frac{\sqrt{3}}{2}$ in modulus argument form. [3]

(ii) Hence, by using de Moivre's theorem, find $(-\frac{1}{2} + i\frac{\sqrt{3}}{2})^3$ in the form $a+ib$. [3]

6. Sketch and describe the following loci in separate Argand diagrams

(i) $|z+4| = |z-8i|$ [3]

(ii) $|z-5+2i| = 5$ [3]

7. A system of equations is given by

$$\begin{aligned}x + y + z &= 0 \\2x + y - z &= -1 \\x + 2y + 4z &= k\end{aligned}$$

where k is constant.

(i) Write the augmented matrix of the system. [2]

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

(iii) Find the value of k for which the equations are consistent. [2]

(iv) For this value of k , find the general solution of these equations. [4]

8. The matrix A is given by

$$\mathbf{A} = \begin{pmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ -1 & k & 6 \end{pmatrix}$$

Find the value of k for which A is singular. [5]