LEARNING AS ONE NATION

Expanded Project

Stat & Prob_5a

SHS LEARNING ACTIVITY

Name: _____ **Score/Mark:** _____

Grade and Section: _____ **Date:** _____

Strand: ☐ STEM ☐ ABM ☐ HUMSS ☐ ICT (*TVL Track*)

Subject: ***Statistics & Probability***

Type of Activity: ☐ Concept Notes ☐ Skills: Exercise/Drill ☐ Illustration ☐ Performance Task ☐ Essay/Report ☐ Others: _____

Activity Title: Probability Mass Function

Learning Target: To construct a probability mass function for discrete random variables.
To construct a probability histogram based on a probability distribution.

References: *(Author, Title, Pages)*
1) Walpole, R. E. et al. "Probability and Statistics for Engineers & Scientists, 8th Ed", pp. 83-96;
2) L.A. Sajulga, CVIF Learning Activities

We can also define a **probability mass function (pmf)** in a similar way as probability distribution. However, to distinguish between the two, the pmf is defined as the function $f(x)$ that gives the probability that a discrete random variable X takes on a particular value. The pmf is often useful for illustrating the probability distribution. To understand what the pmf is all about, we look at an example.

Example: Let's go back to the example from the previous activity wherein a school purchases from a retail store selling computers with units that can either be defective or non-defective. The probability distribution can be represented by the probability mass function as:

$$f(x) = \frac{\binom{4}{x}}{16}, \qquad for\ x = 0, 1, 2, 3, 4\ .$$

The notation $\binom{4}{x}$ refers to the number of occurrences of a particular event. The value $\mathbf{4}$ corresponds to the number of units of laptop bought (that can be either defective or non-defective) and $\boldsymbol{x}$ denotes the individual values in the variable space (the possible number of obtained defective units). The cardinality of our sample space is $\mathbf{16}$ which is the value of $n(\Omega)$. Thus,

$$f(0) = \frac{\binom{4}{0}}{16} = \frac{\mathbf{1}}{\mathbf{16}} \qquad f(2) = \frac{\binom{4}{2}}{16} = \frac{\mathbf{6}}{\mathbf{16}} \qquad f(4) = \frac{\binom{4}{4}}{16} = \frac{\mathbf{1}}{\mathbf{16}}$$

$$f(1) = \frac{\binom{4}{1}}{16} = \frac{\mathbf{4}}{\mathbf{16}} \qquad f(3) = \frac{\binom{4}{3}}{16} = \frac{\mathbf{4}}{\mathbf{16}}$$

Note: The established **pmf** above can only be used in some specific random experiments wherein the involved random process can only have two possible outcomes, i.e., tossing a coin (heads or tails), buying a technical device (defective or non-defective), etc.

Exercise: Consider the probability distribution that you have generated from the last activity where you solved for the probability that Ingrid gets on the yellow bus from her house in going to school for three consecutive days. Formulate a probability mass function that will best represent your distribution.