SHS LEARNING ACTIVITY
Expanded Project

Name: _____ **Score/Mark:** _____
Grade and Section: _____ **Date:** _____
Strand: ☐STEM ☐ABM ☐HUMSS ☐ICT (*TVL Track*)
Subject: *Statistics and Probability*
Type of Activity ☐ Concept Notes ☐ Skills: Exercise / Drill ☐ Illustration ☐ Laboratory Report ☐ Essay/Task Report ☐ Others: _____

Activity Title:	Random Variables
Learning Target:	To define and give examples of a random variable.
	To explain and identify the sample space and space of a random variable.
References: *(Author, Title, Pages)*	1) Sahoo, P. "Probability and Mathematical Statistics", pp.45-50;
	2) L.A. Sajulga, CVIF Learning Activities

A **random variable** is qualitatively defined as the outcome of an experiment or a natural process that cannot be predicted with certainty.

Examples of uncertain outcomes are:

- the maximum temperature next Friday
- the individual scores in a Statistics test to be given next week
- the result of flipping a fair two-sided coin
- the number of customers of a popular restaurant tomorrow

Important terms:

- **Sample space** (denoted by Ω, read as 'omega') – the set of all possible outcomes of a random experiment.
- **Space of a random variable** ($\mathbb{R}_x$) – describes the range of the function taking values of any real number.

A random variable X is mathematically defined as: a *function* denoted by X: $\Omega \rightarrow \mathbb{R}_x$ that associates any real number with each element in the sample space. The random variable is usually represented by capital Roman letters such as X and $\mathbf{Y}$.

Example: Suppose Clara is asked to get, without looking, a pen from her bag which has a black pen and a red pen. Construct a random variable for the possible outcome of the color of the pen that she will get. Identify the *sample space* and the *space* of the random variable.

Solution:

→ The sample space of the random experiment is: Ω = {black, red}.

→ Next, we define the space of the random variable as: R_x = {0, 1}.

Note that for convenience, we just arbitrarily chose 0 and 1. However, you can also choose other real numbers to represent your *space*.

→ Now, let us define a random variable $\mathbf{X}$ which is a mapping from Ω into the set of real numbers $\mathbb{R}_x$: X (black) = 0 , X (red) = 1.

Therefore, our random variable is defined as:

$$X = \begin{cases} 0, & \textit{if the pen is black} \\ 1, & \textit{if the pen is red} \end{cases}.$$

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Activity Title:	Exercises on Random Variables
Learning Target:	To identify the sample space and space of different random variables.
References: *(Author, Title, Pages)*	1) Sahoo, P. "Probability and Mathematical Statistics", pp.45-50; 2) L.A. Sajulga, CVIF Learning Activities

Exercises:

Consider the following random experiments:

1) Tossing a fair two-sided coin
2) Throwing a fair die with six sides

A. Explain briefly what 'fair' means.
B. Construct a random variable that will characterize the possible outcome for each given random experiment. Define its *sample space* and variable *space* accordingly.