LEARNING AS ONE NATION

Expanded Project

Stat & Prob_Q3_10

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: Standard Normal Distribution

Learning Target: To apply the concept of standard normal distribution.
To convert a normal random variable to a standard normal variable.

References: *(Author, Title, Pages)*
1) Walpole, R. E. et al. "Probability and Statistics for Engineers & Scientists, 8th Ed", pp. 172-185;
2) R.A. Rañoa and L.A. Sajulga, CVIF Learning Activities

From the previous activity, we have learned that the area under the normal curve (or graph) can be determined by performing the integral of the normal density function. However, this approach is a tedious and complicated task to do most of the time. It would, therefore, be convenient to tabulate the possible areas under all normal curves. However, since there are infinite possible values of the parameters μ and σ; statisticians came up with a method of converting every normal curve to a distribution called the *standard normal distribution*.

A "**standard normal distribution**" is also a normal distribution with a constant **mean,** $\boldsymbol{\mu = 0}$ and **variance,** $\boldsymbol{\sigma^2 = 1}$. Usually denoted by Z, any normal random variable X can be transformed into Z using the formula:

$$\boxed{Z = \frac{X - \mu}{\sigma}}\ .$$

The standard normal variable Z is also called the "standard score" or "z-score". It would tell you how far a resulting value deviates away from the mean. If a z-score is negative, the value is below the mean. Otherwise, if it is positive, the value is above the mean.

Example: Suppose a random variable X has a normal distribution with a mean of 52.9 and standard deviation of 7.2. Identify the value of Z if an element x from X is equal to 48.5.

Solution: $Z = \frac{x-\mu}{\sigma} = \frac{48.5-52.9}{7.2} = \boxed{\mathbf{-0.61}}$

Exercises:

1.) The students' scores in a final examination in Probability Theory have a mean (μ) of 32 and a standard deviation (σ) of 5. Convert the following normal random variables into a standard normal variable.

a) $x = 37$
b) $x = 22$
c) $x = 33$
d) $x = 28$

2.) In your own words, state why it is impossible to tabulate the areas under any normal curve given all the possible values of μ and σ.