LEARNING AS ONE NATION

Expanded Project

Stat & Prob_13

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: Percentile under a Normal Curve

Learning Target: To compute and interpret percentiles using the standard normal table.

References: *(Author, Title, Pages)*
1) Walpole, R. E. et al. "Probability and Statistics for Engineers & Scientists, 9th Ed", pp. 192-203;
2) L.A. Sajulga, CVIF Learning Activities

Percentile is a measure used to indicate relative standing of a measurement wherein the distribution is divided into one hundred parts.

For example, you got 98 percentile rank (PR) in the Science aptitude test of the National Career Achievement Examination (NCAE). This does not tell you about your actual score. Rather, PR tells you that you scored higher than 98% of all who took the said exam (around 1.8 million in March 2017).

Example 1: The results of a nationwide aptitude test in Logical Reasoning are normally distributed with $\mu = 85$ and $\sigma = 12$. What is the percentile rank of an examinee who scored 94 in the test?

Solution: Convert the normal random variable into a z-score form. Since we need to find the area below $x = 94$, we use the lower limit $x = 93.5$:

$$z = \frac{x-\mu}{\sigma} = \frac{93.5-85}{12} = 0.708 \approx 0.71$$

Then, the value of the area below z is: $P(z < 0.71) = 0.7612$.

Hence, the PR for $x = 94$ is:

$$P_{94} = (0.7612)(100\%) = \boxed{\mathbf{76.12\%}}$$

Example 2: The intelligence quotient (IQ) of 700 applicants to a certain university are normally distributed with $\mu = 115$ and $\sigma = 12$. If the university requires an IQ of *at least 98*, how many of these applicants will be accepted?

Solution: First, we transform $x = 98$ into a z-score value. We use the lower limit $x = 97.5$:

$$z = \frac{x-\mu}{\sigma} = \frac{97.5-115}{12} = \frac{-17.5}{12} = -1.458 \approx -1.46$$

Since they require an IQ of at least 98, so we calculate for $P(x \geq 98)$:

$$P(x \geq 98) = P(z \geq -1.46) = 1 - P(z < -1.46) = 1 - 0.0722 = \mathbf{0.9278}$$

Therefore, the number of applicants that will be accepted is:

$$\Longrightarrow (700\ applicants)(0.9278) = 649.46 \approx \boxed{\mathbf{649\ applicants}}\ .$$

Exercises:

1. In example 1, determine the score of an examinee who got 99 PR.
2. In example 2, solve for the following and show all complete solutions:
   a) Calculate the PR of an applicant with an IQ of 112.
   b) How many applicants are rejected by the university if the required IQ level is changed to 115?