Victoria University

of Bangladesh

Assessment Topic:

Mid Assessment

Course Title: Statistical Decision Making

Course Code: STA-321

Submitted To:

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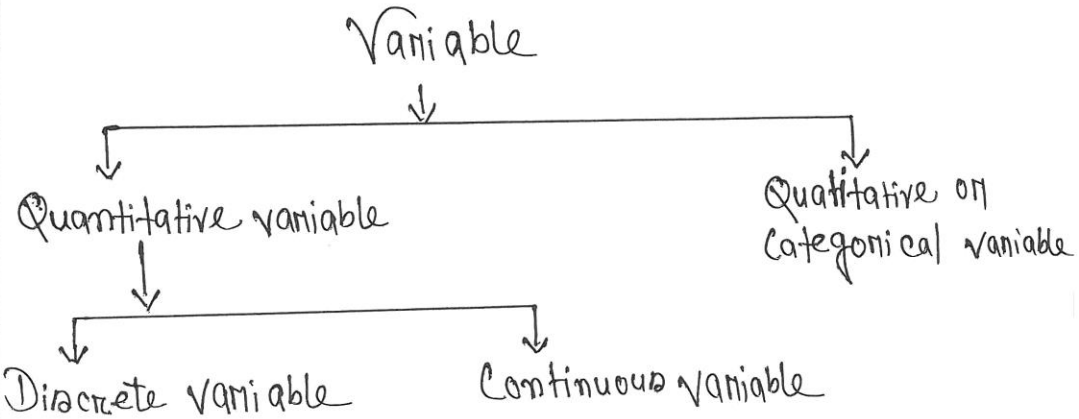
Ans: to the question no-01

* Ans:- Discuss Different Types of variable:- Different types of variable is a characteristic under investigation that assumes different values for different elements. The incomes of families, heights of persons, gross sales of companies, Prices of college textbooks, makes of cars owned by families, number of accidents and status of students enrolled at a university are examples of variables.



* Quantitative variable:- Some variables can be measured numerically, whereas others cannot. The first is an ~~exple~~ examples of a quantitative variable and the second that of a quantitative variable.
A variable that can be measured numerically is called

a quantitative variable. The data collected on a quantitative variable are called quantitative data.
Incomes, heights, gross sales, Prices of homes, number of cars owned, and number of accidents are examples of quantitative variable because each of them can be expressed numerically.

* Discrete variable:- The values that a certain quantitative variable can assume may be countable or noncountable. For example - we can count the number of cars owned by a family, but we cannot count the height of a family member.
A variable whose values are countable is called a discrete variable. In other words, a discrete variable can assume only certain values with no intermediate values.

* Continuous variables:- A variable that can assume any numerical value over a certain interval or intervals is called a continuous variable.

* Qualitative or Categorical variables:- A variable that cannot assume a numerical value but can be classified into two or more nonnumeric categories is called a qualitative or categorical variable. The data collected on such a variable are called qualitative or categorical data.

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Ans: to the question no- 02

* **Ans:- Statistics Study:-**

Statistics is a group of methods used to collect, analyze, present and interpret data and to make decisions.

Every day we make decisions that may be personal, business related or of some other kind. Usually these decisions are made under conditions of uncertainty. Many times the situations or problems we face in the real world have no precise or definite solution. Statistical methods help us make scientific and intelligent decisions in such situations. Decisions made by using statistics methods are called educated guesses. Decisions made without using statistics methods are pure guesses and, hence, may prove to be unreliable.

For Example — opening a large store in an area with or without assessing the need for it may affect its success.

* There are two types of statistics —

(i) Descriptive Statistics.

(ii) Inferential Statistics.

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* Descriptive Statistics:-

Descriptive statistics consists of methods for organizing, displaying and describing data by using tables, graphs and summary measures.

* Inferential Statistics:- Inferential statistics consists of methods that use sample results to help make decisions or predictions about a population.

A major portion of statistics deals with making decisions, inferences, predictions and forecasts about populations based on results obtained from samples.

For Example — we may make some decisions about the political views of all ~~of~~ college and university students based on the political views of 1000 students selected from a few college and universities.

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Ans: to the question no- 03

* Ans:- Sample:- A sample is a smaller set of data that a researcher chooses or selects from a larger population using a predefined selection bias method. These elements are known as sample points, sampling units or observations. Creating sample is an effieient method of conducting research. Researching the whole population is often impossible costly, and time-consuming. Hence examining the sample provides insights the research can apply to the entire population.
A portion of the population selected for study is referred to as a ~~samp~~ sample.

* Different types of Sample:- In statistics there are different sampling techniques available to get relevant results from the population. ~~They are~~ There are two different types of sampling methods are —

① Probability sampling.

② Non-probability sampling.

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* Probability Sampling:- The Probability Sampling method utilizes some form a ~~do~~ random selection. In this method all the eligible individuals have a change of selecting the sampl from the whole sample space. This means that the sample is chosen randomly from the population, using a random number generator or other methods to ensure that each member of the population has an equal chance to being includes in the sample.

Probability Sampling the different ~~type~~ four types of sampling methods —

① Simple Random Sampling.
② Systematic Random Sampling.
③ Stratified Random Sampling.
④ Cluster Sampling.

* Non-Probability Sampling:- Non-Probability sampling is a type in which the sample members are not randomly selected from the population. In non-Probability Sampling, the sample may be selected based on

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convenience, availability, or other factors rather than random selection. Non-Probability sampling is generally considered less reliable and less unbiased than probability sampling because it is not guaranteed to be representative of the population.

Non-Probability sampling are three different type sampling method are—

1. Accidental / Convenience Sampling.
2. Judgemental Sampling.
3. Quota Sampling.

The main difference between probability and non-probability sampling is how the sample is selected from the population. Probability sampling is based on random selection, while non-probability sampling is based on non-random criteria. Probability sampling is considered more reliable and unbiased, while non-probability sampling is deemed less reliable and less fair.

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Ans: to the question no-04

★ **Ans:-** **Mean & Standard Deviation:-** The mean and standard deviation of the sampling distribution of "$\bar{x}$" are called the mean and standard deviation of $\bar{x}$ and are denoted by $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$ respectively.

The mean and standard deviation calculated for the sampling distribution of $\bar{x}$ are called the mean and standard deviation of $\bar{x}$. Actually the mean and standard deviation of $\bar{x}$ are, respectively, the mean and standard deviation of the means of all samples of the same size selected from a population.

The standard deviation of $\bar{x}$ is also called the standard error of $\bar{x}$.

If we calculate the mean and standard deviation of the 10 values of $\bar{x}$ listed in obtain the mean, $\mu_{\bar{x}}$ and the standard deviation, $\sigma_{\bar{x}}$ of $\bar{x}$.

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Alternatively, we can calculate the mean and standard deviation of the sampling distribution of $\bar{x}$ listed in these will also be the values of $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$. From these calculations we will obtain $\mu_{\bar{x}} = 80.60$ and $\sigma_{\bar{x}} = 3.30$.

The mean of the sampling distribution of $\bar{x}$ is always equal to the mean of the population.

* Mean of the Sampling Distribution of $\bar{x}$ — The mean of the sampling distribution of $\bar{x}$ is always equal to the mean of the population. Thus $\mu_{\bar{x}} = \mu$

* Standard Deviation of the Sampling Distribution of $\bar{x}$ — The standard deviation of the sampling distribution of $\bar{x}$ is

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

Where σ is the standard deviation of the population and n is the sample size. This formula is used when $n/N \leq .05$, where N is the population size.

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Ans: to the question no-05

* Ans:- Shape Sampling Distribution:- The shape of the sampling distribution of $\hat{p}$ is inferred from the central limit theorem.

Central limit theorem for sample proportion - According to the central limit theorem, the sampling distribution of $\hat{p}$ is approximately normal for a sufficiently large sample size. In the case of proportion the sample size is considered to be sufficiently large if np and nq are both greater than 5 - that is if

$$np > 5 \text{ and } nq > 5$$

Note that the sampling distribution of $\hat{p}$ will be approximately normal if $np > 5$ and $nq > 5$. This is the same condition that was required for the application of the normal approximation to the binomial probability distribution.

Example- Shown the calculation of the mean and standard deviation of $\hat{p}$ and describes the shape of its sampling distribution.

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