...ntitative variable. Or a variable is called quantitative variable when i... measures ...numerical quantity or amount on each experimental unit.

Examples: **Number of children, Price, Production in kg, Daily rainfall, Sy...tolic BP etc.**

- **Kinds of Variables:** According to whether a variable is countable or measura...le.
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Examples: **Age, Systolic blood pressure, Weight, Height etc.**

❖ Distinguish between variable and constant?

Answer: HW

❖ What do you mean by change of origin and scale? Discuss it with an example?

Answer:

- Change of Origin and Scale:
  - Change of Origin: Shifting all values in a variable by a constant amount.

❖ Example: If temperatures in Celsius are converted to Fahrenheit (adding 32), it's a change of origin.

  - Change of Scale: Multiplying all values in a variable by a constant factor.

❖ Example: Converting lengths from meters to centimeters (multiplying by 100) is a

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❖ Why is it necessary to shift origin and scale?

Answer:

- Simplify analysis or interpretation.
- Standardize units for comparison.

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- Simplify analysis or interpretation.
- Standardize units for comparison.
- Enhance visualization.

❖ What is a measurement of scale?

Answer: The measurement of scale refers to the unit of measurement used for a variable.

Examples: Inches, centimeters, kilograms, degrees Celsius.

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Examples: Inches, centimeters, kilograms, degrees Celsius.

⁘ **Explain different measurement scales with examples?**

Answer:

➢ **Measurement Scales:**

- **Nominal Scale:** The scale of measurement by which we can classify and identify a qualitative variable according to different categories is called nominal scale.

Example: Gender, Religion, Marital status etc.

- **Ordinal Scale:** The scale of measurement by which we can classify, identify and rank a qualitative variable according to different categories is called ordinal scale.

Example: Grading of a student, Size of a worker, Rating of an executive etc.

- **Interval Scale:** The scale of measurement by which we can measure a

- **Interval Scale:** The scale of measurement by which we can measure a qualitative variable numerically on experimental unit with arbitrary zero as origin is called interval scale.

Quantitative data with equal intervals, but no true zero point.
Example: Body temperature, Marks obtained by students, Calendar time etc.

- **Ratio Scale:** The scale of measurement is called ratio scale when a quantitative variable is measured numerically on experimental unit with absolute zero as origin.

Quantitative data with equal intervals and a true zero point.
Example: Age, Weight, Height, Number of children etc.

❖ Identify the types of variables and their scales of measurement on which the following

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❖ **Identify the types of variables and their scales of measurement on which the following**

∴ Identify the types of variables and their scales of measurement on which the following variables are measured:

I. Religion of an employee of a factory (Muslim, Hindu, Buddhist, Christen etc.), Official status of an employee, Monthly salary of an employee, Number of family members of an employee, Age of an employee, IQ score of an employee, Name of the students of BBA and Smoking status of an employee.

Answer:

Characteristics	Variable Type1	Variable Type2	Measurement scale
Religion	Qualitative	Discrete	Nominal
Official status of an employee	Qualitative	Discrete	Ordinal
Monthly salary of an employee	Quantitative	Continuous	Ratio
Number of family members of an employee	Quantitative	Discrete	Ratio
Age of an employee	Quantitative	Continuous	Ratio
IQ score of an employee	Quantitative	Discrete/Continuous	Interval

Practicing Ingredients

II. Classify each of the followings as different measurement of scales: Sex, Marital status, Religious affil
Class room number, Political affiliation, Level of education, Opinion, Satisfaction score, Mental health
Disease risk, Telephone number and shoe size.

III. State whether each of the followings are qualitative or quantitative: Prime interest rate, Bacteria co
drinking water, Percentage of arsenic in tubewell water, Divorce rate, Investment in business, Bank intere
Response to a four-point Likert scale, Car number and Prevalence.

IV. A building contractor has a chance to buy an old lot of 5000 used bricks at an auction. She is intere
determining the proportion of bricks in the lot that are cracked and therefore unusable for her current proje
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Find population, sample, experimental unit, measurable variable and nature of the variable.

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Response to a four-point Likert scale, Car number and Prevalence.

IV. A building contractor has a chance to buy an old lot of 5000 used bricks at an auction. She is interested in determining the proportion of bricks in the lot that are cracked and therefore unusable for her current project, but she does not have enough time to inspect all. Instead, she checks 100 bricks to determine whether each is cracked. Find population, sample, experimental unit, measurable variable and nature of the variable.

V. Suppose a medical researcher wants to find the average systolic blood pressure of the employees of a big firm. For this purpose, a sample of 50 employees has been selected randomly from that firm. Indicate population, sample, experimental unit, measurable variables and nature of the variable.

VI. University authority needs the following information about the students before making decision whether the students are eligible for any financial aid. Classify each of the statement as qualitative or quantitative and corresponding scale of measurements: GPA of HSC, GPA of SSC, Sex of applicant, Parents' monthly income and Age of applicant.

Methods of Data Collection and All

❖ **What do you mean by data and dataset?**

Answer:

Data: Data refers to individual pieces of information such as numbers, text, or symbols. It represents the raw material from which insights and knowledge are derived. Data can take various forms, including quantitative (measurable values like temperature), qualitative (descriptive characteristics like color), and categorical (grouped into specific categories).

Dataset: A dataset is a structured collection of data organized into rows and columns. Each row represents an individual observation, while each column represents a specific variable or attribute. Datasets are formatted for analysis and can vary in size and complexity. They serve as the foundation for tasks such as statistical analysis, machine learning, and research, providing a coherent framework for extracting meaningful insights.

❖ **Describe the necessity of collecting data.**

Answer:

Answer:

Primary Data: Primary data refers to information collected directly from original sources for a specific purpose or research study. This data is firsthand and is not previously gathered or analyzed. Methods of collecting primary data include surveys, interviews, observations, experiments, and direct interactions with individuals or entities relevant to the research. Primary data is often considered more accurate and tailored to the specific research objectives, but it can be more time-consuming and costly to collect compared to secondary data.

Secondary Data: Secondary data, on the other hand, refers to information that has already been collected and analyzed by someone else for a purpose other than the current research. It is pre-existing data that is repurposed for a different study. Sources of secondary data include books, articles, government reports, databases, and other published materials. While secondary data is

∴ Discuss various methods of collecting primary data and secondary data with its relative advantages and disadvantages.

Answer:

Methods of Collecting Primary Data:

- **Surveys:**
  - ✓ *Advantages:* Surveys allow researchers to gather information from a large number of respondents. They can be conducted through various channels, including online surveys, paper surveys, and interviews.
  - ✓ *Disadvantages:* Response bias, inaccuracies due to self-reporting, and the potential for low response rates are common challenges with surveys.
- **Interviews:**
  - ✓ *Advantages:* Interviews provide in-depth, qualitative data, and allow for clarification of responses. Face-to-face interviews can establish rapport and yield richer insights.

low response rates are common challenges with surveys.

Interviews:

- ✓ ***Advantages:*** Interviews provide in-depth, qualitative data, and allow for clarification of responses. Face-to-face interviews can establish rapport and yield richer insights.
- ✓ ***Disadvantages:*** Interviews are time-consuming and can be influenced by interviewer bias. They may also be more expensive, especially if conducted in person.

Observations:

- ✓ ***Advantages:*** Observations involve directly watching and recording behaviors. This method is particularly useful in naturalistic settings and can provide unbiased insights.
- ✓ ***Disadvantages:*** The presence of an observer can alter behavior, and the method may be limited in capturing underlying reasons for observed behaviors.

Experiments:

may limit the manipulation of certain variables.

Methods of Collecting Secondary Data:

- **Literature Review:**
  - ✓ *Advantages:* Literature reviews provide a comprehensive understanding of existing knowledge. They are cost-effective and time-efficient.
  - ✓ *Disadvantages:* There may be gaps in the available literature, and the relevance of existing studies to the current research may vary.
- **Government Reports:**
  - ✓ *Advantages:* Government reports often provide reliable and comprehensive data on various topics. They are easily accessible and can cover large populations.
  - ✓ *Disadvantages:* The data may not be current, and government reports may not address specific research questions.
- **Published Research Papers:**
  - ✓ *Advantages:* Research papers offer insights from previous studies. They are peer-reviewed and provide a basis for understanding methodologies and findings.

∴ Define questionnaire and schedule for data collection.

Answer:

Questionnaire: A questionnaire is a structured set of questions designed to collect information from respondents. It serves as a standardized instrument for gathering data, commonly used in surveys and quantitative research. Questionnaires can be administered through various means, including interviews, mailed forms, or online surveys. They offer efficiency in collecting data from a large sample size, but their reliability can be influenced by the wording of questions and the potential for respondent bias.

Schedule for Data Collection: A schedule for data collection is a plan outlining the timeline and sequence of activities for gathering research data. It includes details such as when, how, and for how long data will be collected. This organized plan ensures systematic and timely data collection, helping researchers coordinate activities and allocate resources effectively. While a schedule provides a roadmap, it needs periodic review and adjustment to accommodate unforeseen

Population: Population consists of all subjects which are being studied.

Sample: In statistics, a sample is a subset of a larger population. The purpose of taking a sample is to make inferences about the population, based on the characteristics of the sample. Sample is the representative part of a population.

Parameter: Parameter is the measure, quantity or numerical value obtained from population.

Statistic: Statistic is the measure, quantity, or numerical value obtained from population.

Population size: Population size refers to the total number of individuals, objects, events, or other units in a particular group or population. Generally, denoted by N.

Sample size: Sample size refers to the number of participants or observations included in a study. Generally, denoted by n.

Define various kinds of variables with examples?

Answer:

- **Kinds of Variables:** According to whether a variable takes numerical or non-numerical values.

  - **Qualitative variable:** A variable that cannot assume a numerical value but can be classified into two or more non-numerical categories is called a qualitative or categorical variable. Or a variable is called qualitative when it measures a qualitative characteristic on each experimental unit.

Examples: **Religion, Gender, Economic status, Teaching performance, Color** etc.

- **Quantitative variable:** A variable that can be measured numerically is called a quantitative variable. Or a variable is called quantitative variable when it measures a numerical quantity or amount on each experimental unit.

***Examples*: Number of children, Price, Production in kg, Daily rainfall, Systolic BP etc.**

➢ **Kinds of Variables:** According to whether a variable is countable or measurable.

- Discrete Variable: A variable, which can take, only isolated or countable finite or infinite number of values is called a discrete variable.

***Examples*: Size of shoes, Size of nails, Coins etc.**

- **Continuous Variable:** A variable that can take infinitely many values over a certain interval or intervals is called a continues variable.

***Examples*: Age, Systolic blood pressure, Weight, Height etc.**

❖ **What is a variable?**

Answer:

Variable is a changeable characteristic of the experimental units under consideration. Actually, it is the characteristic of experiment units which varies from experimental unit to experimental unit.

For example,

1. Age of a worker
2. Religion of a student
3. Wage of a worker
4. Gross profits of a company
5. Height of a student etc.

❖ **Define various kinds of variables with examples?**

Answer: