INTRODUCTION
to
Statistics

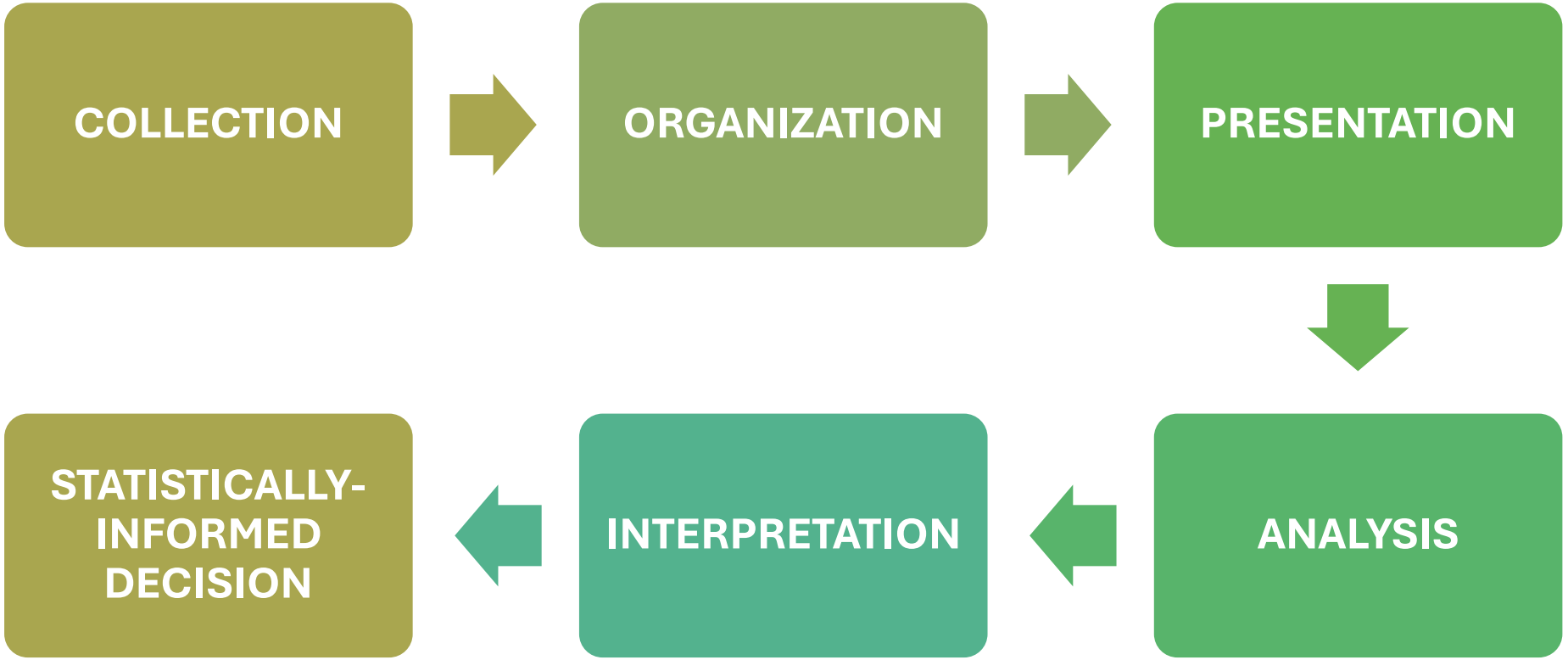
MATH 4B: Experimental Statistics
Second Semester, A.Y. 24-25

INTRODUCTION TO STATISTICS

- Definition of Statistics
- General Uses of Statistics
- Application of Statistics in Various Disciplines
- Branches of Statistics
- Basic Statistical Terms
- Levels of Measurement

Definition of Statistics

Statistics is an art and science that deals with *collection*, *organization*, *presentation*, *analysis*, and *interpretation* of data.



General Uses of Statistics

Generally, statistics is utilized in two ways:

1. Statistics can be used to aid and inform decision-making
2. Statistics can be used to summarize data for public use

Application of Statistics in Various Areas of Discipline

Biological and Medical Sciences

- **Development of Drugs and Vaccines** (formulation, testing, *placebo,* etc.)
- **Risk analysis of various medical practices and operations**
- **Understanding drug potency** (effectiveness and efficiency, dosages, etc.)
- **Environmental and Crop Science** (pollution control, agricultural practices, etc.)
- **Biotechnology** (GMOs, Food Science, Biomedical procedures, etc.)

Application of Statistics in Various Areas of Discipline

Social Sciences

- **Psychology** (Psychological assessment and testing)
- **Education** (Assessment and evaluation of teaching and learning models)
- **Economics** (Analysis of economic activities, economic predictive models)
- **Political Science and Sociology** (analysis of social trends, demographics, etc.)

Business

- **Financial Management** (risk assessment, credit and investment portfolios, etc.)
- **Operations Management** (supply chain, inventory, and warehouse management)
- **Market and Demand Analysis** (consumer preferences, marketing campaigns, etc.)
- **Maximization** (profit maximization, price optimization, etc.)
- **Human Resource Management** (employee performance, turnover, KPIs, etc.)

Application of Statistics in Various Areas of Discipline

Engineering and Information Technology

- **Quality Control** (product consistency, identifying defects, etc.)
- **Reliability Engineering and Predictive Maintenance**
- **Artificial Intelligence and Machine Learning**
- **Analysis of Data from Social Networks**

Other Disciplines

- **Sports Science** (player performances, predictions, strategizing gameplays)
- **Forensic Science** (DNA analysis, fingerprint matching, etc.)
- **Linguistics and Journalism** (trend analysis, *corpus*, natural language processing)
- **Law and Governance** (evidence analysis, damage assessments, policy-making)

Branches of Statistics

1. Descriptive Statistics

This branch of statistics is concerned with the collection, description, and analysis of data **without drawing conclusions or inferences** about a larger set.

2. Inferential Statistics

This branch of statistics is concerned with **making predictions or inferences** about a larger set using the information obtained from a subset (or sample) of the larger set.

Branches of Statistics

DESCRIPTIVE STATISTICS	INFERENTIAL STATISTICS
The coach of a basketball team gathered information about the past games of his team during the current season and was able to determine the average performance of his team across different indicators (shots, steals, rebounds, etc.)	The coach of a basketball team estimates the probability that his team will win by comparing the performance of his team against the performance of the opposing team during the current season.
A market researcher conducted a research and has identified the demographic information of the customers who frequently visit SM Bacoor.	Upon careful examination and analysis, a market researcher has determined which demographic group of customers appear to visit SM Bacoor more significantly.

Written Work # 1

Read and answer each item carefully.

1. What are the five (5) main processes involved in statistics?
2. What are the two (2) general uses of statistics?
3. What are the two (2) branches of statistics
4. Name at least one (1) specific application of statistics in a specialized area of discipline.

Statistical Terms and Definition

Population

a collection of all elements considered in a statistical study

Sample

a part or subset of the population from which information is collected and used for analysis

Statistical Terms and Definition

Variable

a characteristic of interest measured on each and every individual within the population. It is typically denoted by a capital letter in the English Alphabet.

There are two types of variables: **Qualitative** and **Quantitative**

1. Qualitative Variable

consists of categories or attributes which have **non-numerical value** (e.g. name, sex, program, etc.)

Statistical Terms and Definition

2. Quantitative Variable

consists of numbers representing **counts** or **measurements** (e.g. age, monthly income, test score, etc.). There are two classifications of quantitative variable: *discrete* and *continuous*.

A. Discrete Quantitative Variable

numerical values obtained from a counting process (number of students, number of computer units, etc.)

B. Continuous Quantitative Variable

numerical values obtained from a measuring process (volume of a water botte, distance from two locations, etc.)

Try This!

Determine whether the given variable is **QUALITATIVE** or **QUANTITATIVE**. Moreover, if the variable is quantitative, identify if it is **DISCRETE** or **CONTINUOUS**.

1. Number of 5-peso coins in a purse — **QUANTITATIVE - DISCRETE**
2. Name of K-Pop groups who have million albums sold — **QUALITATIVE**
3. Top 10 favorite colors of students at CvSU-Imus — **QUALITATIVE**
4. Employee Number of Teachers — **QUALITATIVE**
5. Amount of gasoline consumed by a vehicle in a day — **QUANTITATIVE - CONTINUOUS**

Statistical Terms and Definition

Data

refers to different values associated with a variable

VARIABLE	SAMPLE DATA
Sex	Male Female
Program	BSE-Math BSCS BSIT
Exam Score	0% - 100%
Student Type	Regular Irregular

Statistical Terms and Definition

Operational Definition

the description of some observable event in terms of specific process or manner by which it was observed or measured

Parameter

numerical measurement describing the characteristic of a population

Statistic

numerical measurement describing the characteristic of a sample

Statistical Terms and Definition

Survey

one of the most widely used tool to gather opinions or feedback about a variety of topics.

Census Survey

a survey conducted by gathering information from the entire population

Sampling Survey

a survey conducted by gathering information from a part of the population

Levels of Measurement

QUALITATIVE (Categorical)	**QUANTITATIVE** (Numerical)
NOMINAL *categorical variables with no ranks/order implied*	**INTERVAL** *An ordered numerical scale with meaningful differences between each quantity but with no "true" zero point*
ORDINAL *Categorical variables with implied ranks/order*	**RATIO** *An ordered numerical scale with meaningful differences in each quantities which involves a "true" zero point*

Written Work # 2

A. Identify the population, variable of interest, and type of variable in the given situation below.

1. The campus administrator of CvSU-Imus wants to know the average weekly allowance (in pesos) of BSCS students.

2. A farmer wants to determine specific names of indigenous plants which are in bloom during the month of March.

B. Determine the level of measurement of each variable given below.

1. Colors of the rainbow

2. Angular velocity of a gear

3. Players' jersey number

4. Level of customer satisfaction using a Likert Scale (1 to 5)