7

Mathematics

Quarter 4- Week 1 - Module 1

Introduction to Statistics

AIRs - LM

Mathematics 7
Quarter 4 - Week 1: Module 1 – **Introduction to Statistics**

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Target

This module is an introductory lesson to basic concepts, uses, and importance of Statistics. The first lesson allows you to experience systematic gathering and organizing data. This makes use of your knowledge of arranging numbers according to some considerations, like arranging numbers in descending or ascending order. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course.

After going through this module, you are expected to:

Learning Competencies:

- poses real-life problems that can be solved by Statistics (**M7SP-IVa-2**)
- formulates simple statistical instruments. (**M7SP-IVa-3**)

Subtasks:

- define statistics and identify the role of statistics in real-life
- poses real-life problems that can be solved by Statistics
- define basic terms in statistics and give examples
- formulates simple statistical instruments

Before going on, check how much you know about this topic.

PRE-TEST

Directions: Read and understand the questions below. Select the best answer to each item then write your choice on your answer sheet.

1. Which of these is a mathematical body of science that pertains to the collection, analysis, interpretation or explanation, and presentation of data?
   A. Algebra B. Probability C. Statistics D. Trigonometry
2. Which of the following states all individuals, objects, or measurements whose properties are being studied?
   A. average B. data C. sample D. population
3. Which of the following is a subset of the population studied?
   A. average B. data C. sample D. population

4. Which of the following is a characteristic of interest for each person or object in a population?
   A. data B. sample C. population D. variable

5. Which of the following is categorized by age?
   A. interval B. nominal C. ordinal D. ratio

6. Which of the following is categorized by body temperature?
   A. interval B. nominal C. ordinal D. ratio

7. Which of the following is categorized by class rank?
   A. interval B. nominal C. ordinal D. ratio

8. You are interested in how stress affects heart rate in humans. What is your dependent variable?
   A. interest B. heart rate C. humans D. stress

9. Which of the following statements is true regarding a sample?
   A. It is a part of population
   B. It refers to descriptive statistics
   C. It must contain at least five observations
   D. All of the above are correct

10. Which of the following are examples of continuous variables?
    A. interpreting data B. organizing data
    C. presenting data D. all of these

11. What is a nominal scale variable?
    A. Usually based on counting
    B. Has a meaningful zero-point
    C. Cannot assume negative values
    D. Can't have more than 2 categories

12. What is the use of the ratio scale of measurement?

A. Usually involves ranking
B. Has a meaningful zero-point
C. May assume negative values
D. Usually the result of counting

13. What are the mode and the mean for the following set of numbers?
{4, 9, 8, 2, 16, 4, 4, 8 ,9, 6}

A. Mean = 7, mode =8
B. Mean = 7, mode =4
C. Mean = 6, mode =8
D. Mean = 8, mode =9

14. Which of the following definitions is the definition of the MEDIAN?
A. The greatest value
B. The value that has the highest frequency
C. The value that half of the entries are below and half of the entries are above
D. The average calculated by adding all the values and dividing by no. of entries

15. You are conducting a survey of the people in your barangay to find out how popular the racket sports are. You randomly choose people to call and make 1,000 phone calls to people scattered across. In this study, what is the statistics term for the "People in your barangay" and what is the statistics term for people you called?
A. Both the people in the barangay and the people you called are populations.
B. Both the people in the barangay and the people you called are samples.
C. The people in the barangay are the population, and the people you called are the sample.
D. The people in the barangay are the sample, and the people you called are the population.

Jumpstart

Our life is full of events and phenomena that enhance us to study either natural or artificial phenomena could be studied using different fields one of them is statistics.

Let us begin this lesson with a puzzle. Enjoy this activity!

Directions: Unscramble the words to recognize important terms in Statistics.

Item	Scrambled Word/s	Answer
Ex.	TONUPALIOP	POPULATION
1	SCITSSATIT	_____
2	DAAT	_____
3	PEMLAS	_____
4	BARIAVLE	_____
5	ARAPTEMER	_____
6	QUEFRECYN BELAT	_____
7	CRIPSEDVITE SCITSSATIT	_____
8	LIATRENINFE SCITSSATIT	_____
9	TATLUAQIVE BARIAVLE	_____
10	TITATIVEQUAN BARIAVLE	_____

You did it! Congratulations!

Discover

Statistics

Statistics is a branch of mathematics used to summarize, analyze, and interpret what we observe—to make sense or meaning of our observations. It is an important part of the business and manufacturing industries. Sometimes it is used to understand the measurement system and summarizing data. The best part of Statistics is it keeps us informed about what is happening around us.

Statistics Role in Real Life

There are some of the examples to explain the role of statistic in real life.

1) Medical Study

Statistics are used behind all the medical study. Statistic help doctors keep track of where the baby should be in his/her mental development. Physician's also use statistics to examine the effectiveness of treatments.

2) Weather Forecasts

Statistics are very important for observation, analysis and mathematical prediction models. Weather forecast models are built using statistics that compare prior weather conditions with current weather to forecast future weather conditions.

3) Quality Testing

A company makes thousands of products every day and make sure that they sold the best quality items. For a company it is not possible to test each product. So, the company uses quality test with the help of statistics.

4) Stock Market

The stock market also uses statistical computer models for stock analysis. Stock analysts get the information about economy using statistics concepts.

5) Consumer Goods

Retailers keeps track of everything they sell and to know the stock using statistics. Worldwide leading retailers use statistics to calculate what products ship to each store and when.

Two general type of statistics

A. **Descriptive statistics:** statistics that summarize observations. It deals with methods for collecting, organizing, and describing.

Example:

You've performed a survey to 40 respondents about their favorite car color. And now you want to summarize the data with some graphs and charts that can allow you to come up with some simple conclusions (e.g. 24% of people said that white is their favorite color).

B. **Inferential statistics**: statistics used to interpret the meaning of descriptive statistics.

Example:

Every year, policymakers always estimate economic growth, both quarterly and yearly. By using time series analysis, we can use data from 20 to 30 years to estimate how economic growth will be in the future.

Basic Terms

Population is the set of all elements (observations), items, objects or possible values of a variable.

Example:

In a study of the average number of students in secondary schools in Riyadh city, where there are different stages of the students, such as first, second and third secondary, as well as there are male and female, but they all gathered, including prescription study in high school.

Therefore, we find that **high school students in Riyadh** make up a **population.**

Sample is a subset of the population selected for study
Example:

In a study of the evolving condition of the patients in a hospital, where there are many people of different types of diseases, but they all bind them recipe disease, so patients that in the hospital make up a population. To know the average weight of women that visited diet section, in this case the registered **weights of some women** represent a **sample**.

Variable is a characteristic under study that takes different values for different elements.

Example:

If we collect information about income of households, then **income** is a **variable**. These households are expected to have different incomes; also, some of them may have the same income.

Two types of variables.

Quantitative Variable

It gives us numbers representing counts or measurements. It is divided into two main types, **discrete and continuous.**

- **Discrete variables** assume values that can be counted.

Examples:

- ✓ The no. of children in a family, where we have 1,2,3, … or k children.
- ✓ The no of students in a classroom, where we have 21, 32,18 and so on
- ✓ The no of accidents in a city, where we have 1, 2, 3,… accidents.

- **Continuous variables** assume all values between any two specific values, i.e. they take all values in an interval. They often include fractions and decimals.

Examples:

- ✓ Temperature: The temperature in Baguio City in last summer was between 13 and 19
- ✓ Age: The age of a horse is between 0 (Stillborn) and 62 years the oldest horse was 62 years, but the middle age of a horse is 30 years

- ✓ Height: For example, the height of a student in a Country is between 110 cm (person elf) and 226 cm (person giant)

Qualitative Variable

It gives us names or labels that are not numbers representing the observations.

Examples:

- ✓ The gender of Organisms Male, Female
- ✓ Results tossed a coin twice HH, HT, TH, TT (H=Head, T=Tail)
- ✓ Eye color of people Black, Brown, Blue, Green
- ✓ Religious affiliation Muslim, Christian, Jew
- ✓ The speed of a car going on a main road in Km

Levels of measurement scales

A. Nominal Scale

A scale used to label variables that have no quantitative values. Variables that can be measured on a nominal scale have the following properties:

1. They have no natural order.
2. Categories are mutually exclusive.
3. The only number we can calculate for these variables are *counts*.
4. The only measure of central tendency we can calculate for these variables is *the mode*.

Examples:

- ✓ **Gender:** Male, female
- ✓ **Eye color:** Blue, green, brown
- ✓ **Hair color:** Blonde, black, brown, grey, other
- ✓ **Blood type:** O-, O+, A-, A+, B-, B+, AB-, AB+
- ✓ **Political Preference:** Republican, Democrat, Independent
- ✓ **Place you live:** City, suburbs, rural

B. Ordinal Scale

A scale used to label variables that have a natural *order*, but no quantifiable difference between values.

Examples:

- ✓ **Satisfaction:** Very unsatisfied, unsatisfied, neutral, satisfied, very satisfied
- ✓ **Socioeconomic status:** Low income, medium income, high income
- ✓ **Workplace status:** Entry Analyst, Analyst I, Analyst II, Lead Analyst
- ✓ **Degree of pain:** Small amount of pain, medium amount of pain, high amount of pain

C. Interval Scale

A scale used to label variables that have a natural order and a quantifiable difference between values, *but no "true zero" value*.

Examples:

- ✓ **Temperature:** Measured in Fahrenheit or Celcius
- ✓ **Credit Scores:** Measured from 300 to 850
- ✓ **NAT Scores:** Measured from 400 to 1,600

D. Ratio Scale

A scale used to label variables that have a natural order, a quantifiable difference between values, and a "true zero" value.

Examples

- ✓ **Height:** Can be measured in centimeters, inches, feet, etc. and cannot have a value below zero.
- ✓ **Weight:** Can be measured in kilograms, pounds, etc. and cannot have a value below zero.
- ✓ **Length:** Can be measured in centimeters, inches, feet, etc. and cannot have a value below zero.

The following table provides a summary of the variables in each measurement scale:

Property	Nominal	Ordinal	Interval	Ratio
Has a natural order	Yes	Yes	Yes	Yes
Mode can be calculated	Yes	Yes	Yes	Yes
Median can be calculated		Yes	Yes	Yes
Mean can be calculated			Yes	Yes
Ha exact difference between values			Yes	Yes
Has a "true zero" value				Yes

Explore

Activity 1: Identify Me!

Directions: Identify the given statements whether qualitative or quantitative variable. Write **A** if the statement is qualitative variable and **B** if quantitative variable.

_____1. The gender of new born baby
_____2. The height of Johnny in meters
_____3. The color of hair of Ms. Sanchez
_____4. The weight of 3 sacks of rice
_____5. The daily allowance of Brix
_____6. The scores of Mark in Summative tests in Math 7
_____7. The total number of modular learners

_____8. The number of members of the family
_____9. The weight of Jeston in kilogram
_____10. The daily sales of Jollibee La Union

Work on the following enrichment activities for you to apply your understanding on this lesson.

Deepen

Activity 1: Match Me!

Directions: Match column A to column B. Write the correct answer on the space provided before each number.

Column A	**Column B**
____1. All students who attended the college last year	A. Population
____2. The cumulative GPA of one student who graduated from the college last year	B. Statistic
____3. 3.65, 2.80, 1.50, 3.90	C. Parameter
____4. A group of students who graduated from the college last year, randomly selected	D. Sample
____5. The average cumulative GPA of students who graduated from the college last year	E. Variable
____6. All students who graduated from the college last year	F. Data
____7. The average cumulative GPA of students in the study who graduated from the college last	

Nice work! Now you're up for the final challenge of this module

Gauge

POST-TEST

Directions: Read and understand the questions below. Select the best answer to each item then write your choice on your answer sheet.

1. What branch of science that deals with collecting, organizing, summarizing, analysis, and making decisions from data?
   A. Algebra B. Probability C. Statistics D. Trigonometry

2. Which of the following is role of Statistics in real-life?
   A. consumer goods B. quality testing C. stock market D. all of these

3. Which of the following type of variable categorized by height?
   A. qualitative B. quantitative C. both A & B D. none of these

4. Which of the following are examples of continuous variables?
   A. interpreting data C. organizing data
   B. presenting data D. all of these

5. Which of the following is a part of the population studied?
   A. average B. data C. population D. sample

6. Which area of Statistics that deals with methods for collecting, organizing, and describing data?
   A. descriptive B. inferential C. nominal D. ratio

7. Which of the following is categorized by gender?
   A. interval B. nominal C. ordinal D. ratio

8. Which of the following is the specific subject or object about which the information is collected.
   A. average B. element C. population D. sample

9. Which of the following is a qualitative variable?
   A. color B. gender C. ranking D. both A and B

10. Which of the following is a quantitative variable?
    A. color B. daily allowance
    C. temperature D. both A and C

11. Which of the following is NOT a property of interval scale?
    A. equal distance B. identity C. magnitude D. sample

12. Which of the following is a property of ratio scale?

A. element B. identity C. population D. sample

13. Which of the following statements is an example of a sampling method?

A. face-to-face interview B. paper questionnaires
C. using telephones D. all of these

14.Which is NOT true in discrete variable?

A. cannot be negative B. can assume only whole numbers
C. example of a qualitative variable D. both A and B only

15. You are conducting a study to see whether a new experimental medication will cause bald men to grow hair. You divide your patients into two groups. To one group, you give the medication. To the other group, you give a placebo. Which is the correct terms for the taking of the drug and the growth of hair?

A. Both the medication and the hair growth are dependent variables.
B. Both the medication and the hair growth are independent variables.
C. The medication is the dependent variable, and the hair growth is the independent variable.
D. The medication is the independent variable, and the hair growth is the dependent variable.

References

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- Learner's Module, K-12 Grade 7 Mathematics (Fourth Quarter)

Links:

- https://online.stat.psu.edu/stat500/lesson/1/1.5/1.5.3
- https://statisticsbyjim.com/basics/statistics/areas/measuringscales/
- https://stats.idre.ucla.edu/spss/whatstat/what-statistical-analysis-should-i-usestatistical-analyses-using-spss/