QMS 101 Introductory Statistics

Topic I: Introduction

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Summary

By the end of this topic, you should be able to:

- Define statistics
- Explain population & sample
- Identify variables
- Classify data types
- Apply statistics in real life

Meaning of Statistics

1. Statistics as Numbers

Examples:

- Inflation $= 4\%$
- Profit $=$ TZS 2 million
- Salary $=$ TZS 800,000

These describe real-world situations

2. Statistics as a Subject

It involves:

- Collecting data
- Organizing data
- Analyzing data
- Interpreting results

Scenario:

A company surveys customers $\rightarrow$ analyzes responses $\rightarrow$ improves product

Real-Life Importance

Banking (Loan Decision)

A bank receives many loan applications.

It checks:

- Income
- Repayment history
- Expenses

Using this data, the bank decides **who should get a loan**

Business (Stock Decision)

A shop owner records daily sales.

He notices:

- High sales on weekends
- Low sales during weekdays

He uses this to decide **how much stock to order**

Government (Planning)

The government collects data on:

- Population
- Employment
- Income levels

Uses statistics to:

- Plan schools
- Build hospitals
- Create jobs

Education (Student Performance)

A lecturer analyzes students' marks.

Finds:

- Average performance
- Number of students failing

Uses this to **improve teaching methods**

Health (Disease Tracking)

Health officials record number of patients daily.

If cases increase:

- They issue warnings
- Provide treatment

Statistics helps **control disease spread**

One Simple Summary for Students

"Statistics helps us make better decisions using data in real life."

Statistics is used in:

- Banking $\rightarrow$ deciding loan eligibility
- Business $\rightarrow$ tracking profit and sales
- Government $\rightarrow$ planning budgets & policies
- Education $\rightarrow$ evaluating student performance
- Health $\rightarrow$ tracking diseases

Key Idea

Raw Data $\rightarrow$ Information $\rightarrow$ Decision Making

Example:

Daily shop sales:
120,000; 150,000; 130,000

Average sales = better decision on stock

Branches of Statistics

1. Descriptive Statistics

Summarizes data

Uses:

- Tables
- Graphs
- Averages

Example:

A shop shows monthly sales using a bar chart

2. Inferential Statistics

Uses **sample data** to make conclusions about a population

Example:

Survey 100 students $\rightarrow$ estimate opinions of 5,000 students

Quick Check

Is it descriptive or inferential?

- Table of employee ages
- Predicting national inflation
- Class average marks
- Survey of customers

Discuss with your neighbor

Importance of Statistics

Statistics helps in:

- Forecasting future trends
- Market research
- Quality control
- Performance evaluation
- Decision making

Real-Life Scenarios

BAF (Finance)

$\rightarrow$ Predict future profits using past data

BBAM (Management)

$\rightarrow$ Decide how many workers are needed

BAEC (Economics)

$\rightarrow$ Analyze inflation trends

BLIM (Library)

$\rightarrow$ Track number of books borrowed

Limitations of Statistics

- Works with groups, not individuals
- Depends on data quality
- Can be misused
- Does not explain causes
- Human behavior is hard to measure

Scenario (Misleading Statistics)

A company surveys only 5 customers

- Concludes: “All customers are unhappy”
- Wrong conclusion
- Sample too small $\rightarrow$ unreliable

Population

Entire group of interest

Examples:

- All students in a university
- All bank customers
- All households in a city

Sample

A subset of the population

Example:

- 100 students selected from 5,000

Census

Data collected from **everyone**

Example:

- National population census

Relationship

- Population $\rightarrow$ Whole group
- Sample $\rightarrow$ Part of group
- Census $\rightarrow$ Entire population studied

Scenario

University wants student feedback

Option 1 $\rightarrow$ Ask all students (Census)

Option 2 $\rightarrow$ Ask 200 students (Sample)

Which is cheaper? Faster?

Variables

A variable is anything we measure or observe

Examples (Real-Life)

- Age of students
- Monthly income
- Number of customers
- Daily sales
- Number of books borrowed

Types of Variables

Qualitative (Categorical)

- Describe categories
- Cannot calculate

Examples:

- Gender
- Religion
- Program (BAF, BAEC, BBAM)

Quantitative (Numerical)

- Represent numbers
- Can calculate

Examples:

- Income
- Age
- Sales

Quantitative Variables

Discrete Variables

- Countable
- Whole numbers only

Examples:

- Number of students
- Number of cars
- Number of books

Scenario

A shop sells 10, 12, 15 items

- You cannot sell 10.5 items
- Discrete variable

Continuous Variables

- Measurable
- Can take decimals

Examples:

- Height
- Weight
- Temperature
- Sales revenue

Scenario

A student weighs 60.5 kg

- Value can be 60.55, 60.555
- Continuous variable