SUMMARY FOR DESCRIPTIVE AND INFERENTIAL STATISTICS VARIABLES AND TYPES OF DATA

MATH205

- Reference Book:
- “ELEMENTARY STATISTICS”_ A Brief Version, Allan G. Bluman, Third edition, McGraw-Hill.

STATISTICAL TERMS

- VARIABLE

A **variable** is a characteristic or attribute that can assume different values.

- DATA

Data are the values (measurements or observations) that the variables can assume. Variables whose values are determined by chance are called **random variables.**

- DATA SET

A collection of data values forms a **data set.** Each value in the data set is called a **data value** or a **datum.**

DESCRIPTIVE AND INFERENTIAL STATISTICS

- DESCRIPTIVE

Descriptive statistics consists of the collection, organization, summarization, and presentation of data.

- INFERENTIAL

The second area of statistics is called *inferential statistics*. Here, the statistician tries to make inferences from *samples* to *populations*. Inferential statistics uses **probability,** i.e., the chance of an event occurring. Many people are familiar with the concepts

Inferential statistics consists of generalizing from samples to populations, performing estimations and hypothesis tests, determining relationships among variables, and making predictions.

POPULATION and SAMPLE

- POPULATION

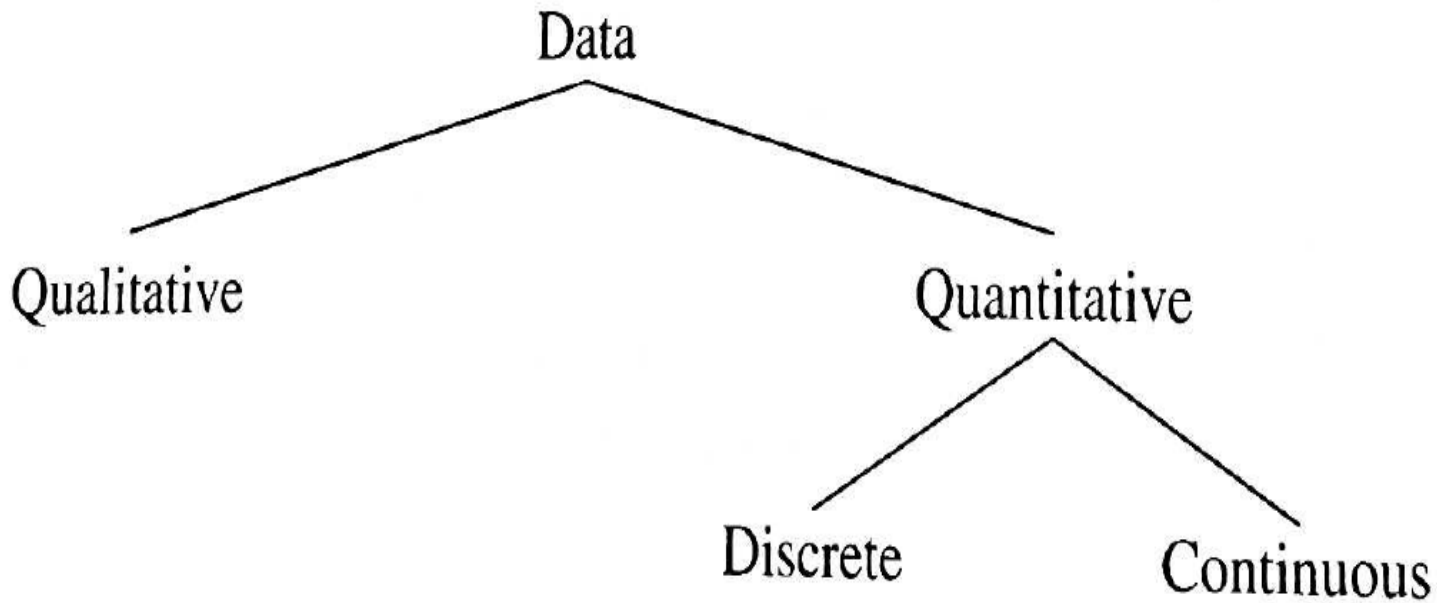
A **population** consists of all subjects (human or otherwise) that are being studied.

- SAMPLE

A **sample** is a group of subjects selected from a population.

VARIABLES and TYPES OF DATA

The classification of variables can be summarized as follows:



QUALITATIVE and QUANTITATIVE

ture of variables and types of data.

Variables can be classified as qualitative or quantitative. **Qualitative variables** are variables that can be placed into distinct categories, according to some characteristic or attribute. For example, if subjects are classified according to gender (male or female), then the variable *gender* is qualitative. Other examples of qualitative variables are religious preference and geographic locations.

Quantitative variables are numerical and can be ordered or ranked. For example, the variable *age* is numerical, and people can be ranked in order according to the value of their ages. Other examples of quantitative variables are heights, weights, and body temperatures.

Quantitative variables can be further classified into two groups: discrete and continuous. *Discrete variables* can be assigned values such as 0, 1, 2, 3 and are said to be countable. Examples of discrete variables are the number of children in a family, the number of students in a classroom, and the number of calls received by a switchboard operator each day for a month.

- DISCRETE

Discrete variables assume values that can be counted.

- CONTINUOUS

Continuous variables, by comparison, can assume all values in an interval between any two specific values. Temperature, for example, is a continuous variable, since the variable can assume all values between any two given temperatures.

Continuous variables can assume all values between any two specific values. They are obtained by measuring.

MEASUREMENT SCALES

- NOMINAL

The **nominal level of measurement** classifies data into mutually exclusive (non-overlapping), exhausting categories in which no order or ranking can be imposed on the data.

Examples:

A sample of college instructors classified according to subject taught (e.g., English, history, psychology, or mathematics) is an example of nominal-level measurement. Classifying survey subjects as male or female is another example of nominal-level measurement. No ranking or order can be placed on the data. Classifying residents according to zip codes is also an example of the nominal level of measurement. Even though numbers are assigned as zip codes, there is no meaningful order or ranking.

- ORDINAL

The **ordinal level of measurement** classifies data into categories that can be ranked; however, precise differences between the ranks do not exist.

- Examples:

Examples of ordinal-measured data are letter grades (A, B, C, D, F), rating scales, and rankings.

Note that precise measurement of differences in the ordinal level of measurement does not *exist.* For instance, when people are classified according to their build (small, medium, or large), a large variation exists among the individuals in each class.

- INTERVAL

The **interval level of measurement** ranks data, and precise differences between units of measure do exist; however, there is no meaningful zero.

- Examples:

The third level of measurement is called the *interval level*. This level differs from the ordinal level in that precise differences do exist between units. For example, many standardized psychological tests yield values measured on an interval scale. IQ is an example of such a variable. There is a meaningful difference of 1 point between an IQ of 109 and an IQ of 110. Temperature is another example of interval measurement, since there is a meaningful difference of 1° between each unit, such as 72° and 73°. *One property is lacking in the interval scale: There is no true zero.* For example, IQ tests do not measure people who have no intelligence. For temperature, 0°F does not mean no heat at all.

- RATIO

The **ratio level of measurement** possesses all the characteristics of interval measurement, and there exists a true zero. In addition, true ratios exist when the same variable is measured on two different members of the population.

- Examples:

The final level of measurement is called the *ratio level.* Examples of ratio scales are those used to measure height, weight, area, and number of phone calls received. Ratio scales have differences between units (1 inch, 1 pound, etc.) and a true zero. In addition, the ratio scale contains a true ratio between values. For example, if one person can lift 200 pounds and another can lift 100 pounds, then the ratio between them is 2 to 1. Put another way, the first person can lift twice as much as the second person.

EXAMPLES OF MEASUREMENT SCALES

able. Table 1–2 gives some examples of each type of data.

Table 1–2 Examples of Measurement Scales

Nominal-level data	Ordinal-level data	Interval-level data	Ratio-level data
Zip code	Grade (A, B, C, D, F)	SAT score	Height
Gender (male, female)	Judging (first place, second place, etc.)	IQ	Weight
Eye color (blue, brown, green, hazel)	Rating scale (poor, good, excellent)	Temperature	Time
Political affiliation	Ranking of tennis players		Salary
Religious affiliation			Age
Major field (mathematics, computers, etc.)			
Nationality			