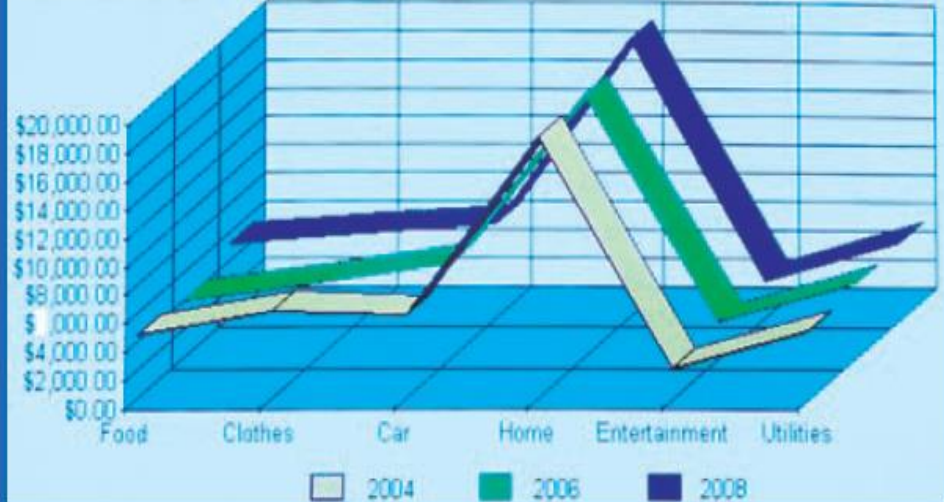




CHAPTER

1

The Nature of Probability and Statistics

Outline

- 1 What is Meant by Statistics?**
- 2 Descriptive and Inferential Statistics.**
- 3 Variables and Types of Data.**
- 4 The Measurement Level for each Variable.**

Introduction

- **Statistics** is the science of conducting studies to
collect,
organize,
summarize,
analyze, and
draw conclusions from data.

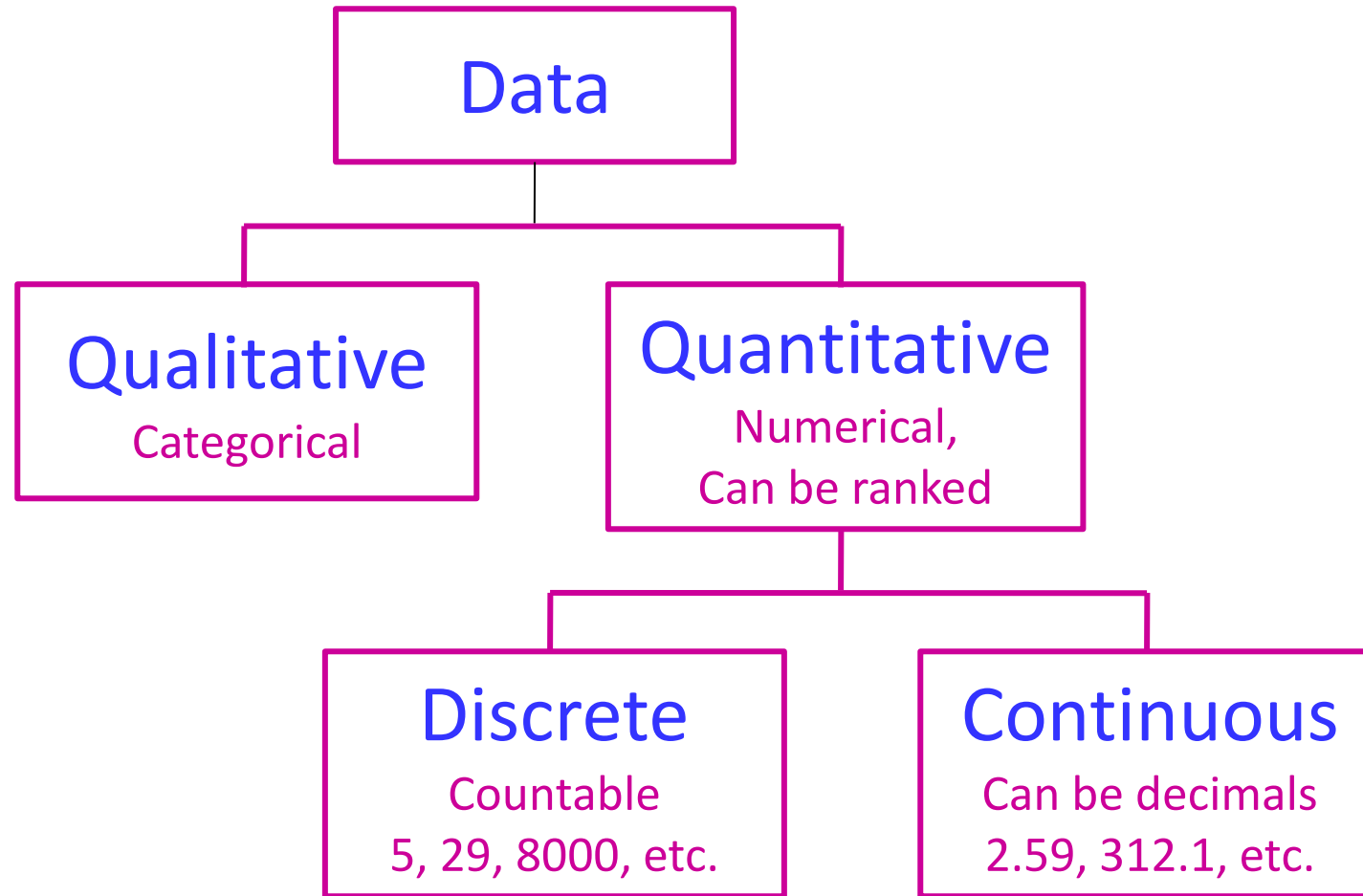
Descriptive and Inferential Statistics

- A **variable** is a characteristic or attribute that can assume different values.
- The values that a variable can assume are called **data**.
- A **population** consists of all subjects (human or otherwise) that are studied.
- A **sample** is a subset of the population.

Descriptive and Inferential Statistics

- **Descriptive statistics** consists of the collection, organization, summarization, and presentation of data.
- **Inferential statistics** consists of generalizing from samples to populations, performing estimations and hypothesis tests, determining relationships among variables, and making predictions.

Variables and Types of Data



Variables and Types of Data

Levels of Measurement

1. The Nominal level of measurement classifies data into mutually exclusive (nonoverlapping), exhausting categories in which no order or ranking can be imposed on the data.
2. The Ordinal level of measurement classifies data into categories that can be ranked, precise differences between the ranks do not exist.
3. The Interval level of measurement ranks data, and precise differences between units of measure do exist, there is no meaningful zero.
4. The Ratio level of measurement possesses all the characteristics of interval measurement, and there exists a true zero.

Nominal-Level Data

Properties:

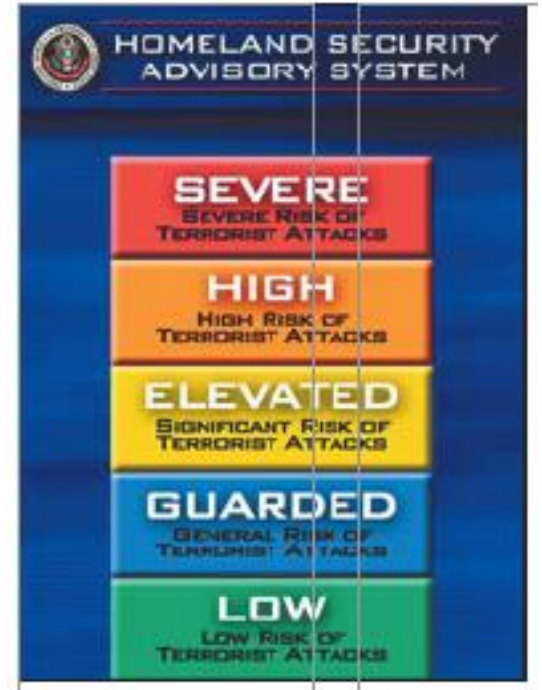
1. Observations of a qualitative variable can only be **classified** and **counted**.
2. There is **no particular order** to the labels.



Ordinal-Level Data

Properties:

1. Data classifications are represented by sets of labels or names (high, medium, low) that have **relative values**.
2. Because of the relative values, the **data classified can be ranked or ordered**.



Interval-Level Data

Properties:

1. Data classifications are ordered according to the amount of the characteristic they possess.
2. Equal differences in the characteristic are represented by equal differences in the measurements.

Example: Women's dress sizes listed on the table.

Size	Bust (in)	Waist (in)	Hips (in)
8	32	24	35
10	34	26	37
12	36	28	39
14	38	30	41
16	40	32	43
18	42	34	45
20	44	36	47
22	46	38	49
24	48	40	51
26	50	42	53
28	52	44	55

Ratio-Level Data

- Practically all quantitative data is recorded on the ratio level of measurement.
- Ratio level is the **“highest” level of measurement.**

Properties:

1. Data classifications are **ordered** according to the amount of the characteristics they possess.
2. Equal differences in the characteristic are represented by equal differences in the numbers assigned to the classifications.
3. The **zero point is the absence of the characteristic** and the ratio between two numbers is meaningful.

Variables and Types of Data

Determine the measurement level.

Variable	Level
Hair Color	Nominal
Zip Code	Nominal
Letter Grade	Ordinal
Height	Ratio
Age	Ratio
Temperature (F)	Interval

Levels of Measurement

More Examples

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			

Summary of the Characteristics for Levels of Measurement

