Statistics for Business and Economics
6th Edition

Chapter 1

Why Study Statistics?

Chapter Goals

After completing this chapter, you should be able to:

- Explain how decisions are often based on incomplete information

- Explain key definitions:
  - ♦ Population vs. Sample
  - ♦ Parameter vs. Statistic
  - ♦ Descriptive vs. Inferential Statistics

- Describe random sampling

- Explain the difference between Descriptive and Inferential statistics

Dealing with Uncertainty

Everyday decisions are based on incomplete information

Consider:

- The price of IBM stock *will* be higher in six months than it is now.

- If the federal budget deficit is as high as predicted, interest rates *will* remain high for the rest of the year.

Dealing with Uncertainty

Because of uncertainty, the statements should be modified:

- The price of IBM stock is *likely* to be higher in six months than it is now.

- If the federal budget deficit is as high as predicted, it is *probable* that interest rates will remain high for the rest of the year.

Key Definitions

- A population is the collection of all items of interest or under investigation

    - N represents the population size

- A sample is an observed subset of the population

    - n represents the sample size

- A parameter is a specific characteristic of a population
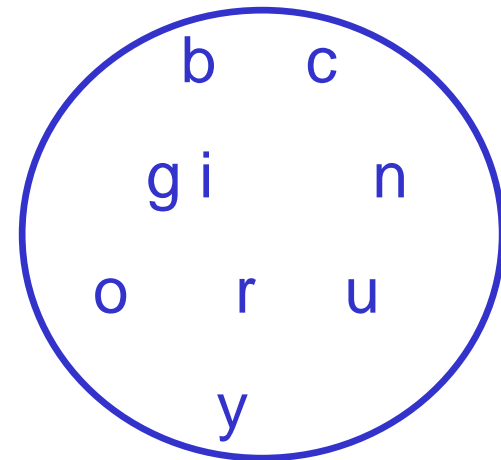
- A statistic is a specific characteristic of a sample

Population vs. Sample

Population   **Sample**

a b   c d

ef gh i jk l m n

o p q rs t u v w

x y   z

b   c

g i   n

o   r   u

y
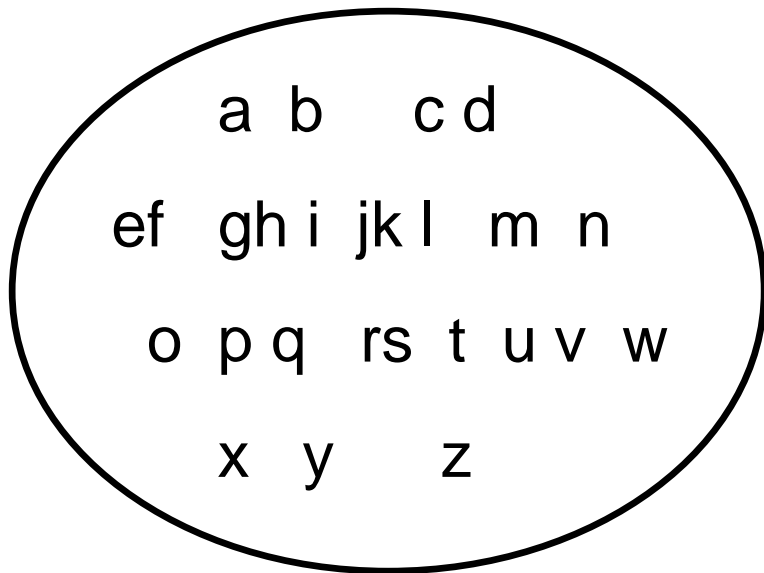
Values calculated using population data are called parameters

Values computed from sample data are called statistics

Examples of Populations

- Names of all registered voters in the United States

- Incomes of all families living in Daytona Beach

- Annual returns of all stocks traded on the New York Stock Exchange

- Grade point averages of all the students in your university

Random Sampling

Simple random sampling is a procedure in which

- each member of the population is chosen strictly by chance,
- each member of the population is equally likely to be chosen,

and

- every possible sample of n objects is equally likely to be chosen

The resulting sample is called a **random sample**

Descriptive and Inferential Statistics

Two branches of statistics:

- ## Descriptive statistics

  - Collecting, summarizing, and processing data to transform data into information

- ## Inferential statistics

  - provide the bases for predictions, forecasts, and estimates that are used to transform information into knowledge
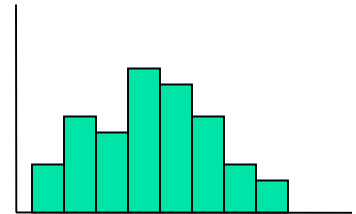
Descriptive Statistics

- ## Collect data

  - e.g., Survey

- ## Present data

  - e.g., Tables and graphs
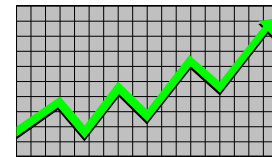
- ## Summarize data

  - e.g., Sample mean $= \dfrac{\sum X_i}{n}$

Inferential Statistics

- Estimation

  - e.g., Estimate the population mean weight using the sample mean weight

- Hypothesis testing

  - e.g., Test the claim that the population mean weight is 120 pounds

Inference is the process of drawing conclusions or making decisions about a population based on sample results

The Decision Making Process

```
                    ┌─────────────────┐
                    │    Decision     │
                    └─────────────────┘
                             ⬆
                    ┌─────────────────┐        ╭──────────────────────╮
                    │    Knowledge    │ ◀──────│ Experience, Theory,  │
                    └─────────────────┘        │ Literature, Inferential│
                             ⬆                 │ Statistics, Computers │
                    ┌─────────────────┐        ╰──────────────────────╯
                    │   Information   │ ───────▶
                    └─────────────────┘
                             ⬆                 ╭──────────────────────╮
┌─────────────┐                               │ Descriptive Statistics,│
│ Begin Here: │ ⟹  ┌─────────────────┐ ◀──────│ Probability, Computers │
│             │     │      Data       │ ───────▶╰──────────────────────╯
│ Identify the│     └─────────────────┘
│  Problem    │
└─────────────┘
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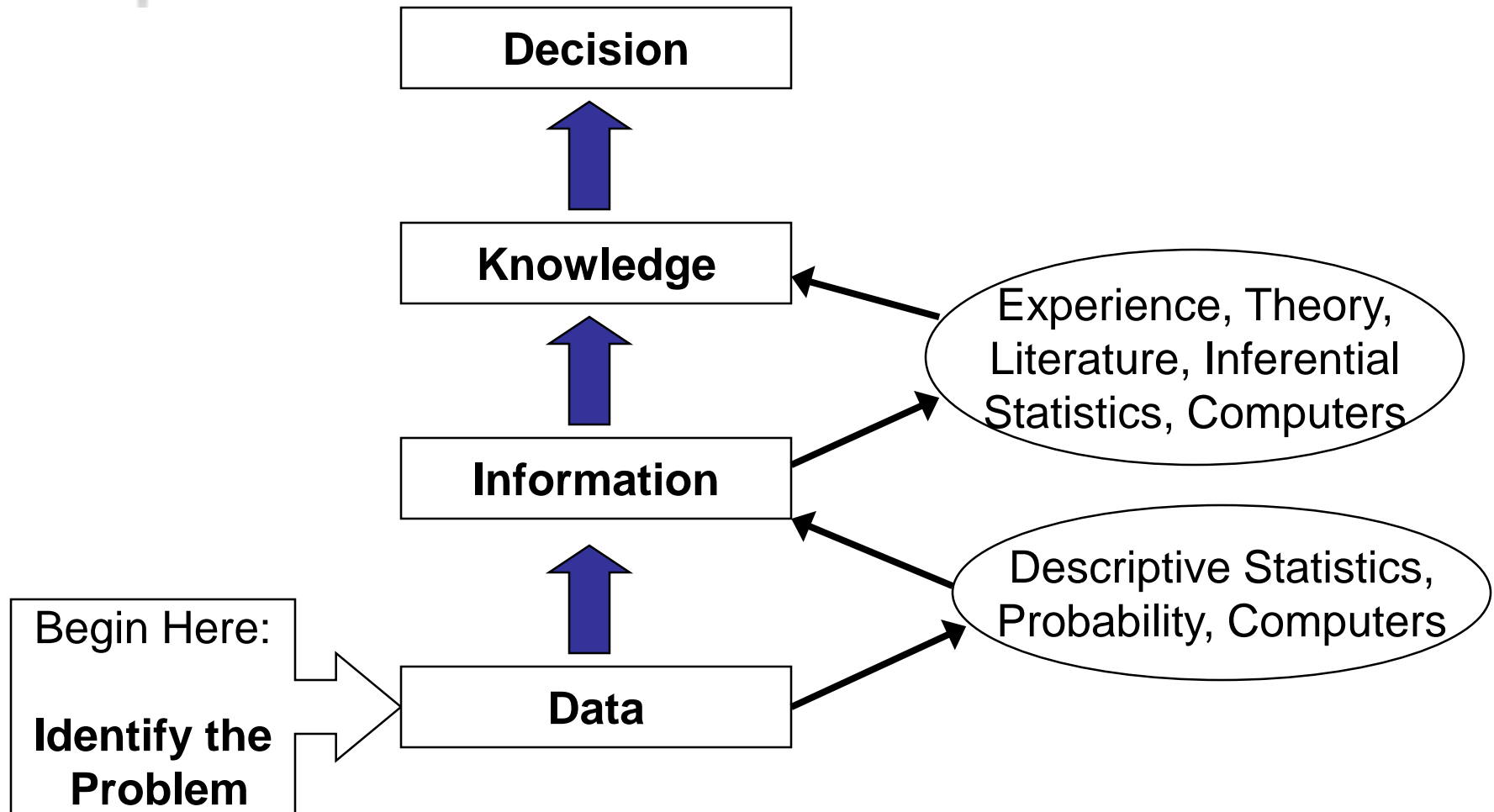
Chapter Summary

- **Reviewed incomplete information in decision making**

- **Introduced key definitions:**
  - Population vs. Sample
  - Parameter vs. Statistic
  - Descriptive vs. Inferential statistics

- **Described random sampling**

- **Examined the decision making process**