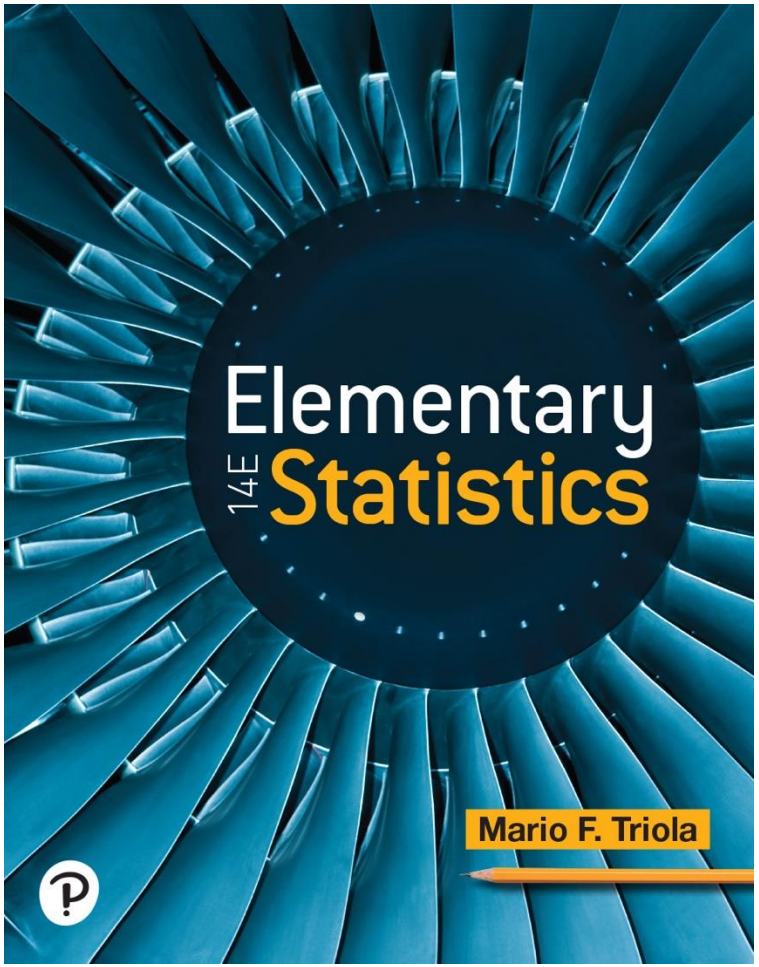
Elementary Statistics

Fourteenth Edition



Chapter 1

Introduction to Statistics

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1-1 Statistical and Critical Thinking

1-2 Types of Data

Key Concept

The process involved in conducting a statistical study consists of “prepare, analyze, and conclude.”

Statistical thinking involves critical thinking and the ability to make sense of results. Statistical thinking demands so much more than the ability to execute complicated calculations.

Data

- Data
  - Collections of observations, such as measurements, or survey responses

Statistics

- Statistics
  - The science of planning studies and experiments; obtaining data; and organizing, summarizing, presenting, analyzing, and interpreting those data and then drawing conclusions based on them.

Population

- Population
  - The complete collection of **all** measurements or data that are being considered. Typically, a population is the complete collection of data that we would like to make inferences about.

Census versus Sample

- Census
  - The collection of data from **every** member of a population
- Sample
  - A **subcollection** of members selected from a population

Example: Watch What You Post Online (1 of 2)

In a survey of 410 human resource professionals, 148 of them said that job candidates were disqualified because of information found on social media postings (based on data from *The Society for Human Resource Management*).

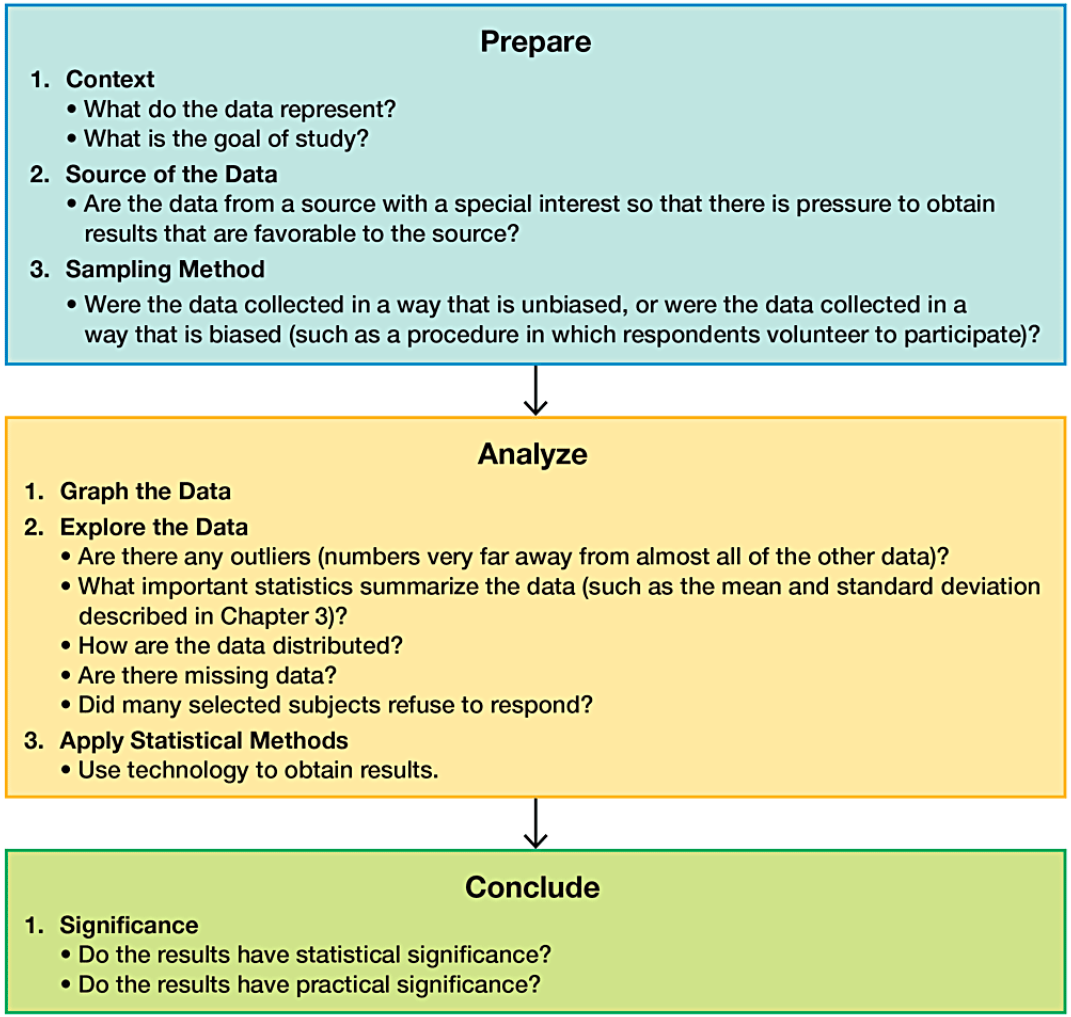
Example: Watch What You Post Online (2 of 2)

In this case, the population and sample are as follows:

- **Population:** All human resource professionals
- **Sample:** The 410 human resource professionals who were surveyed

- The objective is to use the sample as a basis for drawing a conclusion about the population of all human resource professionals, and methods of statistics are helpful in drawing such conclusions.

Statistical and Critical Thinking



Prepare (1 of 2)

Shoe Print Lengths and Heights of Eight Males

Shoe Print (cm)	27.6	29.7	29.7	31.0	31.3	31.4	31.8	34.5
Height (cm)	172.7	175.3	177.8	175.3	180.3	182.3	177.8	193.7

- **Context**
  - The table includes shoe print lengths and heights of eight males. Forensic scientists measure shoe print lengths at burglary scenes and other crime scenes in order to estimate the height of the criminal.
  - The format of the table suggests the following goal: Determine whether there is a *relationship* between shoe print lengths and heights of males. This goal suggests a reasonable hypothesis: Males with larger shoe print lengths tend to be taller. We are using data for males only because 84% of burglaries are committed by males.

Prepare (2 of 2)

Shoe Print Lengths and Heights of Eight Males

Shoe Print (cm)	27.6	29.7	29.7	31.0	31.3	31.4	31.8	34.5
Height (cm)	172.7	175.3	177.8	175.3	180.3	182.3	177.8	193.7

- **Source of the Data**
- The data in the table are from Data Set 9 “Foot and Height” in Appendix B, where the source is identified. The source certainly appears to be reputable.
- **Sampling Method**
  - The individuals were randomly selected, so the sampling method appears to be sound.

Analyze

After completing our preparation by considering the context, source, and sampling method, we begin to **analyze** the data.

- **Graph and Explore**
  - An analysis should begin with appropriate graphs and explorations of the data.
- **Apply Statistical Methods**
  - A good statistical analysis **does not** require strong computational skills. A good statistical analysis **does** require using common sense and paying careful attention to sound statistical methods.

Conclude (1 of 2)

The final step in our statistical process involves conclusions, and we should develop an ability to distinguish between *statistical significance* and *practical significance*.

- **Statistical Significance**
  - **Statistical significance** is achieved in a study if the likelihood of an event occurring by chance is 5% or less.

Conclude (2 of 2)

- **Practical Significance**
  - It is possible that some treatment or finding is effective, but common sense might suggest that the treatment or finding does not make enough of a difference to justify its use or to be practical.

Example: Statistical Significance Versus Practical Significance

- In a trial of weight loss programs, 21 subjects on the Atkins program lost an average (mean) of 2.1 kg (or 4.6 lb) after one year. The results show that this loss is *statistically significant* and is not likely to occur by chance. However, many dieters believe that after following this diet for a year, a loss of only 2.1 kg is not worth the time, cost, and effort so that for these people, this diet does not have *practical significance*.