

1-1

Elementary Statistics

**A Step by Step Approach
Third Edition**

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1-2

Chapter 1

The Nature of Probability and Statistics

Outline

- **1-1 Introduction**
- **1-2 Descriptive and Inferential Statistics**
- **1-3 Variables and Types of Data**
- **1-4 Data Collection and Sampling Techniques**

1-4

Outline

- **1-5 Computers and Calculators**

1-5

Objectives

- **Demonstrate knowledge of all statistical terms.**
- **Differentiate between the two branches of statistics.**
- **Identify types of data.**

1-6

Objectives

- **Identify the measurement level for each variable.**
- **Identify the four basic sampling techniques.**

1-7

Objectives

- **Explain the importance of computers and calculators in statistics.**

1-1 Introduction

- **Statistics** consists of conducting studies to collect, organize, summarize, analyze, and draw conclusions.

1-2 Descriptive and Inferential Statistics

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

1-2 Descriptive and Inferential Statistics

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

1-2 Descriptive and Inferential Statistics

- **Descriptive statistics** consists of the collection, organization, summation, and presentation of data.

1-2 Descriptive and Inferential Statistics

- A **population** consists of all subjects (human or otherwise) that are being studied.
- A **sample** is a subgroup of the population.

1-2 Descriptive and Inferential Statistics

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

1-3 Variables and Types of Data

- **Qualitative variables** are variables that can be placed into distinct categories, according to some characteristic or attribute. For example, gender (male or female).

1-3 Variables and Types of Data

- **Quantitative variables** are numerical in nature and can be ordered or ranked. Example: age is numerical and the values can be ranked.

1-3 Variables and Types of Data

- **Discrete variables** assume values that can be counted.
- **Continuous variables** can assume all values between any two specific values. They are obtained by measuring.

1-3 Variables and Types of Data

- 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.

1-3 Variables and Types of Data

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

1-3 Variables and Types of Data

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

1-3 Variables and Types of Data

- The **ratio level of measurement** possesses all the characteristics of interval measurement, and there exists a true zero. In addition, true ratios exist for the same variable.

1-4 Data Collection and Sampling Techniques

- **Data can be collected in a variety of ways.**
- **One of the most common methods is through the use of surveys.**
- **Surveys can be done by using a variety of methods -**
- **Examples are telephone, mail questionnaires, personal interviews, surveying records and direct observations.**

1-4 Data Collection and Sampling Techniques

- To obtain samples that are unbiased, statisticians use four methods of sampling.
- **Random samples** are selected by using chance methods or random numbers.

1-4 Data Collection and Sampling Techniques

- **Systematic samples** are obtained by numbering each value in the population and then selecting the k^{th} value.

1-4 Data Collection and Sampling Techniques

- **Stratified samples** are selected by dividing the population into groups (strata) according to some characteristic and then taking samples from each group.

1-4 Data Collection and Sampling Techniques

- **Cluster samples** are selected by dividing the population into groups and then taking samples of the groups.

1-5 Computers and Calculators

- **Computers and calculators make numerical computation easier.**
- **Many statistical packages are available. One example is MINITAB. The TI-83 calculator can also be used to do statistical calculations.**
- **Data must still be understood and interpreted.**