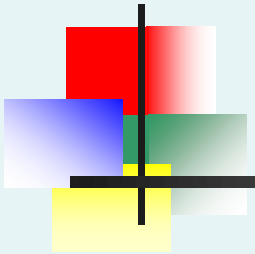
Basic Business Statistics
11th Edition



Chapter 1

Introduction and Data Collection

Learning Objectives

In this chapter you learn:

- How Statistics is used in business
- The sources of data used in business
- The types of data used in business
- The basics of Microsoft Excel
- The basics of Minitab

Why Learn Statistics?

So you are able to make better sense of the ubiquitous use of numbers:

- Business memos
- Business research
- Technical reports
- Technical journals
- Newspaper articles
- Magazine articles

What is statistics?

- A branch of mathematics taking and transforming numbers into useful information for decision makers
- Methods for processing & analyzing numbers
- Methods for helping reduce the uncertainty inherent in decision making

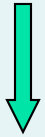
Why Study Statistics?

Decision Makers Use Statistics To:

- Present and describe business data and information properly
- Draw conclusions about large groups of individuals or items, using information collected from subsets of the individuals or items.
- Make reliable forecasts about a business activity
- Improve business processes

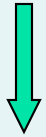
Types of Statistics

- **Statistics**
  - The branch of mathematics that transforms data into useful information for decision makers.



Descriptive Statistics

Collecting, summarizing, and describing data



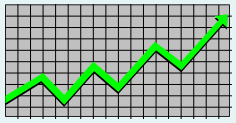
Inferential Statistics

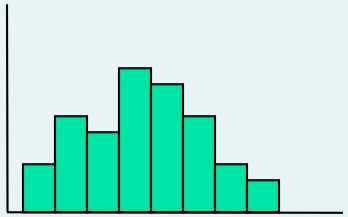
Drawing conclusions and/or making decisions concerning a population based only on sample data

Descriptive Statistics

- Collect data
  - e.g., Survey

- Present data
  - e.g., Tables and graphs





- Characterize data
  - e.g., Sample mean = $\frac{\sum X_i}{n}$

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

Drawing conclusions about a large group of individuals based on a subset of the large group.

Basic Vocabulary of Statistics

VARIABLE

A **variable** is a characteristic of an item or individual.

DATA

Data are the different values associated with a variable.

OPERATIONAL DEFINITIONS

Data values are meaningless unless their variables have **operational definitions,** universally accepted meanings that are clear to all associated with an analysis.

Basic Vocabulary of Statistics

POPULATION

A **population** consists of all the items or individuals about which you want to draw a conclusion.

SAMPLE

A **sample** is the portion of a population selected for analysis.

PARAMETER

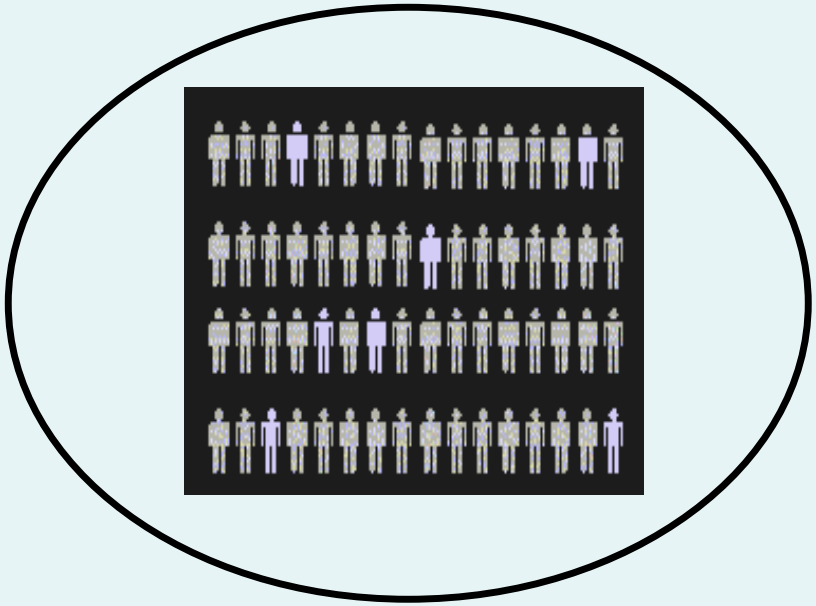
A **parameter** is a numerical measure that describes a characteristic of a population.

STATISTIC

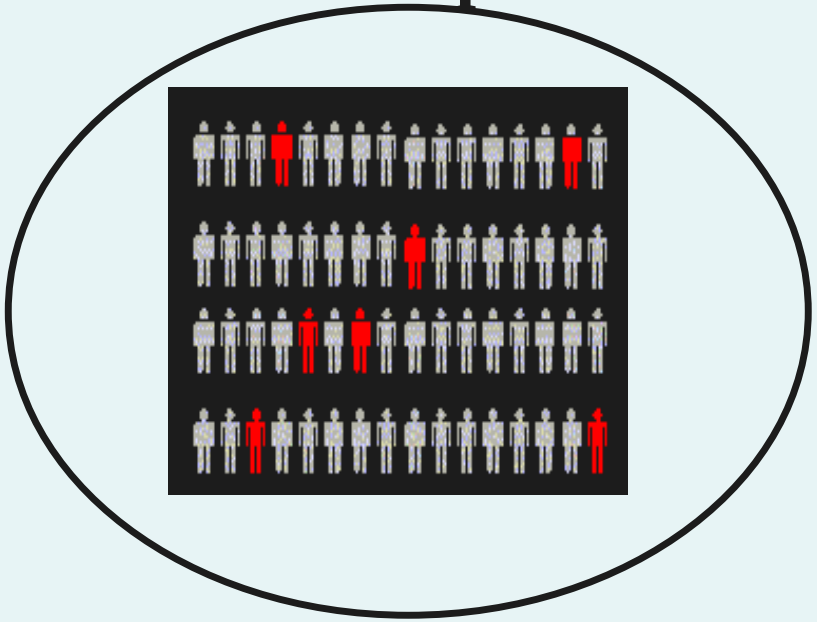
A **statistic** is a numerical measure that describes a characteristic of a sample.

Population vs. Sample

Population



Sample



Measures used to describe the population are called **parameters**

Measures computed from sample data are called **statistics**

Why Collect Data?

- A marketing research analyst needs to assess the effectiveness of a new television advertisement.
- A pharmaceutical manufacturer needs to determine whether a new drug is more effective than those currently in use.
- An operations manager wants to monitor a manufacturing process to find out whether the quality of the product being manufactured is conforming to company standards.
- An auditor wants to review the financial transactions of a company in order to determine whether the company is in compliance with generally accepted accounting principles.

Sources of Data

- Primary Sources: The data collector is the one using the data for analysis
  - Data from a political survey
  - Data collected from an experiment
  - Observed data
- Secondary Sources: The person performing data analysis is not the data collector
  - Analyzing census data
  - Examining data from print journals or data published on the internet.

Sources of data fall into four categories

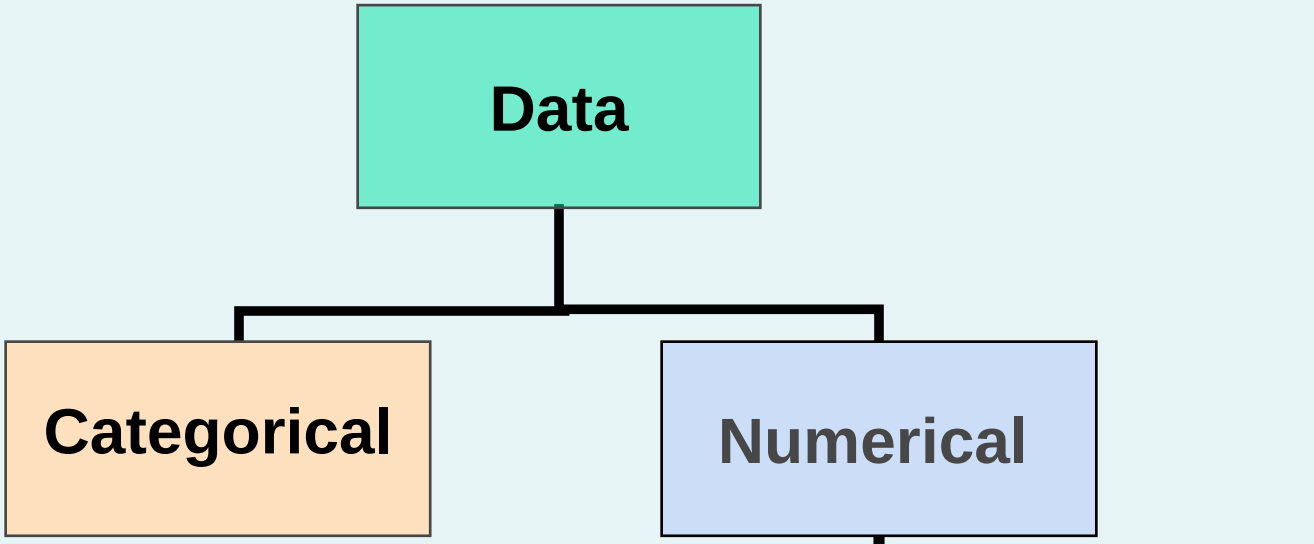
- Data distributed by an organization or an individual
- A designed experiment
- A survey
- An observational study

Types of Variables

- **Categorical** (qualitative) variables have values that can only be placed into categories, such as “yes” and “no.”

- **Numerical** (quantitative) variables have values that represent quantities.

Types of Data



Examples:

- Marital Status
- Political Party
- Eye Color

(Defined categories)

Examples:

- Number of Children
- Defects per hour

(Counted items)

Examples:

- Weight
- Voltage

(Measured characteristics)

Levels of Measurement

- A **nominal scale** classifies data into distinct categories in which no ranking is implied.

Categorical Variables	*Categories*
Personal Computer Ownership	Yes / No
Type of Stocks Owned	Growth Value Other
Internet Provider	Microsoft Network / AOL/ Other

Levels of Measurement

- An **ordinal scale** classifies data into distinct categories in which ranking is implied

Categorical Variable	*Ordered Categories*
Student class designation	Freshman, Sophomore, Junior, Senior
Product satisfaction	Satisfied, Neutral, Unsatisfied
Faculty rank	Professor, Associate Professor, Assistant Professor, Instructor
Standard & Poor's bond ratings	AAA, AA, A, BBB, BB, B, CCC, CC, C, DDD, DD, D
Student Grades	A, B, C, D, F

Levels of Measurement

- An **interval scale** is an ordered scale in which the difference between measurements is a meaningful quantity but the measurements do not have a true zero point.

- A **ratio scale** is an ordered scale in which the difference between the measurements is a meaningful quantity and the measurements have a true zero point.

Interval and Ratio Scales

Numerical Variable	*Level of Measurement*
Temperature (in degrees Celsius or Fahrenheit)	Interval
Standardized exam score (e.g., ACT or SAT)	Interval
Height (in inches or centimeters)	Ratio
Weight (in pounds or kilograms)	Ratio
Age (in years or days)	Ratio
Salary (in American dollars or Japanese yen)	Ratio

Personal Computer Programs Used For Statistics

- Minitab
  - A statistical package to perform statistical analysis
  - Designed to perform analysis as accurately as possible
- Microsoft Excel
  - A multi-functional data analysis tool
  - Can perform many functions but none as well as programs that are dedicated to a single function.
- Both Minitab and Excel use worksheets to store data

Minitab & Microsoft Excel Terms

- When you use Minitab or Microsoft Excel, you place the data you have collected in **worksheets.**
- The intersections of the columns and rows of worksheets form boxes called **cells.**
- If you want to refer to a group of cells that forms a contiguous rectangular area, you can use a **cell range.**
- Worksheets exist inside a **workbook in Excel and inside a Project in Minitab.**
- Both worksheets and projects can contain both data, summaries, and charts.

You are using programs properly if you can

- Understand how to operate the program
- Understand the underlying statistical concepts
- Understand how to organize and present information
- Know how to review results for errors
- Make secure and clearly named backups of your work

Chapter Summary

In this chapter, we have

- Reviewed why a manager needs to know statistics
- Introduced key definitions:
  - Population vs. Sample
  - Primary vs. Secondary data types
  - Categorical vs. Numerical data
- Examined descriptive vs. inferential statistics
- Reviewed data types and measurement levels
- Discussed Minitab and Microsoft Excel terms