Table 3.1.6 – Frequency Distribution of Responses

"I am aware that I can reduce exposure to system compromise by restricting who uses my personal computer."	
Strongly Agree	520
Slightly Agree	435
Neutral	310
Slightly Disagree	115
Strongly Disagree	90

Definition

Relative Frequency Distribution

A **relative frequency distribution** summarizes data into classes and provides in tabular form a list of the classes along with the proportion (or percentage) of observations in each class.

In Table 3.1.7 and Table 3.1.8, **relative frequency distributions** are calculated. In these tables, the frequencies are converted into percentages. These are defined as **relative frequencies**, i.e., the proportion relative to the total. They are valuable in assessing the data quickly in terms we use frequently. (See Section 3.3 for an additional discussion of relative frequency distributions.)

Table 3.1.7 – Relative Frequency Distribution of Responses

"I am aware that there are measures that I can take to help protect my personal information on my personal computer."	
Strongly Agree	35%
Slightly Agree	27%
Neutral	21%
Slightly Disagree	10%
Strongly Disagree	7%

Table 3.1.8 – Relative Frequency Distribution of Responses

"I am aware that I can reduce exposure to system compromise by restricting who uses my personal computer."	
Strongly Agree	35%
Slightly Agree	30%
Neutral	21%
Slightly Disagree	8%
Strongly Disagree	6%

As one can see in Tables 3.1.5 through 3.1.8, the majority of students are aware that there are measures that they can take to protect the information on their personal computers. Summarizing the qualitative data (via a frequency distribution table or relative frequency distribution table) allows the researcher to make conclusions about the data without having to view each observation.

3.1 Exercises

Basic Concepts

1. From a comprehension standpoint, what are the advantages of visual images over the written word?
2. Describe two situations in which graphical displays are used in business.
3. Describe the purpose of a frequency distribution.
4. What are the basic questions to ask when examining the structure of a data set?
5. What are the two steps to constructing a frequency distribution?
6. In the construction of a frequency distribution, what are the two requirements that the classification categories must meet?

Exercises

7. In order to help him decide when and where to advertise, a local repairman decided to pull his invoices for the month of June and tally what types of machines he had worked on. There were forty-eight items repaired that month.

Office copier	Washing machine	Air conditioner
Air conditioner	Fan	Lawn mower
Lawn mower	Air conditioner	Fan
DVD Player	Fan	Air conditioner
Air conditioner	Lawn mower	Washing machine
Lawn mower	Air conditioner	Stereo
Exercise bike	DVD Player	Air conditioner
Air conditioner	Lawn mower	Lawn mower
Lawn mower	Air conditioner	Fan
Radio	Washing machine	Air conditioner
Air conditioner	Radio	Stereo
Fan	Air conditioner	Lawn mower
Washing machine	Lawn mower	Air conditioner
Air conditioner	Fan	Fan
Lawn mower	Air conditioner	DVD player
Washing machine	Washing machine	Air conditioner

a. What level of measurement do the data possess?

b. Are the data qualitative or quantitative?

c. Construct a frequency distribution for the data. Any machine types worked on three or fewer times are classified as miscellaneous.

8. Parkinsonism is an affliction of the aged and is frequently caused by Parkinson's disease, Alzheimer's disease, or other illnesses. The results from a recent study on Parkinsonism were reported in "Prevalence of Parkinsonian Signs and Associated Mortality in a Community Population of Older People," *New England Journal of Medicine*. A sample of 467 people, all 65 years of age or older, was selected from East Boston, Massachusetts. Each person was clinically evaluated and various signs of Parkinsonism, if any, were noted. The following table is a frequency distribution for some of the signs of Parkinsonism.

Signs of Parkinsonism	
Sign	**Frequency**
Reduced arm swing	210
Prolonged turning	153
Right leg rigidity	141
Left leg rigidity	154
Slow finger taps	197
Shuffling gait	83

a. What level of measurement do the data possess?

b. What percent of the sample suffered from left leg rigidity? Round your answer to two decimal places.

c. Add up the frequencies. Why does the sum of the frequencies exceed the total sample size of 467?

d. Suppose 30 people suffer from both left leg rigidity and right leg rigidity. How many people in the sample suffer from rigidity in at least one of their legs?

9. A small commuter airline in the West keeps records of complaints received from its customers. Complaints for March and July are listed in the following table.

Customer Complaints

Type of Complaint	March	July
Tickets cost too much	11	15
Stewardess did not provide blankets	8	3
Schedules not convenient	12	17
Plane often late	17	16
Seats too stiff	3	3
Airplane too hot	6	20
Airplane too cold	8	5
Poor reservation system	5	5
Plane interior looks shabby	5	6

a. Classify the items by the following categories: comfort, price, service, and schedule, and develop a qualitative frequency distribution.

b. Classify the items by the following categories: plane, personnel, building/equipment, and other, and develop a qualitative frequency distribution.

c. Would another person necessarily assign the same items to the same categories as you have? Discuss the implications of this when reviewing data collected and distributed by someone else for open answer questions.

d. Do the categories chosen in parts **a.** and **b.** meet the requirement that categories be mutually exclusive and exhaustive? Discuss.

3.2 Displaying Qualitative Data

Graphical analysis is a trade-off. We lose sight of the individual observations (the raw data). In return, we are able to see a representation of the totality of observations. The trade is almost always beneficial since a well-designed graph gives our visual processing system the kind of image it processes best, a picture.

Because a set of data can be graphically represented in many different ways, selecting and creating graphical displays requires a certain amount of artistic judgment. Fortunately, the development of graphics software has made the creation of sophisticated graphs quite easy.

Several types of graphs and tabular displays will be discussed in this chapter. Bar charts, stacked bar charts, 3-D bar charts, and pie charts are effective, visually appealing methods of graphically displaying qualitative data. An examination of publications such as *Time*, *USA Today*, *The Wall Street Journal*, *Scientific American*, or *Forbes* provides convincing evidence of the frequent and beneficial usage of these graphical display techniques.

Definition

Bar Chart

The **bar chart** is a simple graphical display in which the length of each bar corresponds to the number of observations in a category.

Bar Charts

Bar charts are often used to illustrate a frequency distribution for qualitative data.

Bar charts are valuable as presentation tools and are especially effective at reinforcing differences in magnitudes, since they permit the visual comparison of data by displaying the magnitude of each category by a vertical or horizontal bar. Figure 3.2.1 is a bar chart constructed from majors of the students in a business statistics course.