Chapter 2
Data Collection And Presentation

Chapter Intuition

Once the data have been collected, they need to be organized and summarized so they can be used to make inferences about the population. Descriptive statistics is for that purpose. For example, if there are a lot of students in a class, it will be difficult for the teacher to draw any conclusions about the class's performance by simply looking at the students' scores. However, by organizing the data into descriptive statistics such as tables or graphs, the teacher can easily determine the performance of the class. This chapter discusses how to collect and present data in a systematic way so that it can be easily analyzed.

Chapter Review

1. Data can come from either a ***primary source***, which means it is collected specifically for the study, or from a ***secondary source***, which means that the data was originally collected for some other purpose.
2. Before collecting the data, the researcher must decide whether to collect a ***sample*** or a ***census***. In a census, all members of the population are surveyed. When the population is small, a census is possible. For example, to survey the opinion about a movie, a family of five would find little difficulty in surveying all five members. However, when the population is large, it may be infeasible to survey every member. In this case, it may be more desirable to collect a subset of the population, that is, a sample, from the population. For example, if we are interested in the views of all citizens in the USA concerning a national health care policy, it would be better to examine the views of asubset of citizens and make inferences about the entire population based on this sample.
3. There are two types of errors that are associated with primary and secondary data. ***Random error*** is the difference between the value obtained by taking a

random sample and the value obtained by taking a census. ***Systematic error*** results when there are problems in measurement.

4. One way to organize data is to place them into groups, or classes, and then to present the data using tables.

5. Charts and graphs are another way for presenting data.

   a. A ***pie chart*** shows how the "whole," the pie, is divided into different pieces, the pieces of the pie.

   b. A ***bar chart*** can also be used to display data. A company might use bar graph to see how its advertising dollars are spent on television, radio, and newspapers.

   c. A ***line chart*** can be used to show the relationship between two different variables or how one variable changes over time. For example, a company might be interested in seeing how its advertising expenditures have changed over time.

   d. A ***time series graph*** is a line graph in which the variable on the X-axis represents time, such as the year or month of the data. The line graph is also a time series graph.

Example 1   Presenting Data in Graphs

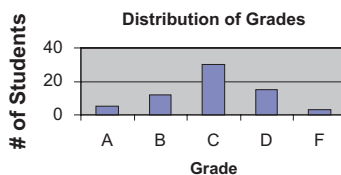An economics professor gives the following grades to her class:

Number of students	Grade
5	A
12	B
30	C
15	D
3	F

a. Use a bar chart to show the distribution of grades.
b. Use a pie chart to show the distribution of grades.
c. Which of these graphs do you think is best for presenting the distribution of grades? Why?
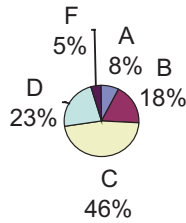

Example Problems

Solution:

a.

b.

Percentage of Grades

c. Both graphs do a good job of presenting the data. However, the two graphs present different aspects of the data. The bar chart gives us information to compare the grades. For example, we can see from the bar chart that most students received a grade C and fewer students received higher and lower grades. On the other hand, the pie chart shows us the allocation of the grades among the 65 students. Pie charts are best used when we are interested in seeing how the whole is divided among smaller subgroups.

Example 2   Primary Versus Secondary Sources of Data

Which of the following are from primary sources and which are from secondary sources?

a. The Dow Jones Industrial Average taken from the *Wall Street Journal*.
b. Responses to a survey on how chief financial officers will respond to a change in the accounting rules.
c. Johnson & Johnson's earnings as given in its annual report.

Solution:

a. Secondary source
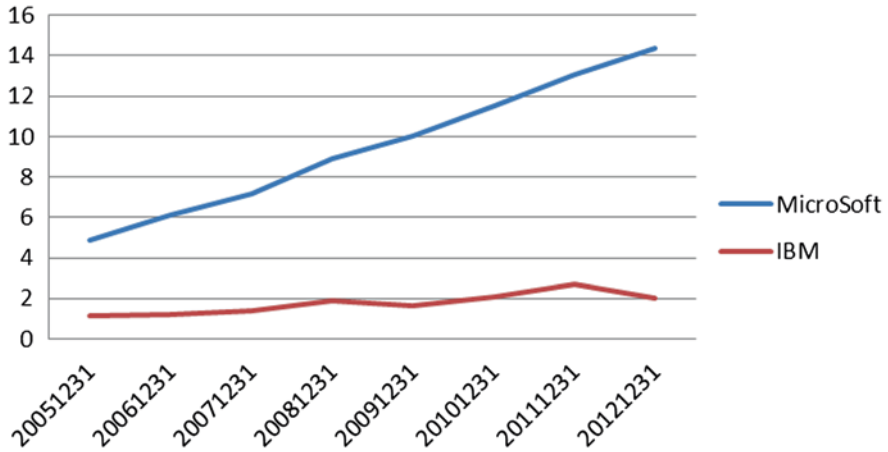b. Primary source
c. Secondary source

Example 3   Charts for Financial Data

Refer to the data below, in which data on EBIT and EPS, during the period 2005–2012 are given. (a) Draw the line chart of EPS for the Microsoft and IBM during the period 2005–2012. (b) Draw the bar chart for the EBIT of Microsoft and IBM during the year 2012.

	MicroSoft		IBM	
	Earnings before interest and taxes	EPS	Earnings before interest and taxes	EPS
20051231	11,714	4.87	16,642	1.12
20061231	12,614	6.11	17,385	1.2
20071231	14,360	7.18	18,524	1.42
20081231	16,750	8.93	23,992	1.87
20091231	17,719	10.01	20,693	1.62
20101231	18,705	11.52	24,157	2.1
20111231	21,578	13.06	27,161	2.69
20121231	21,173	14.37	27,956	2

Solution:

a
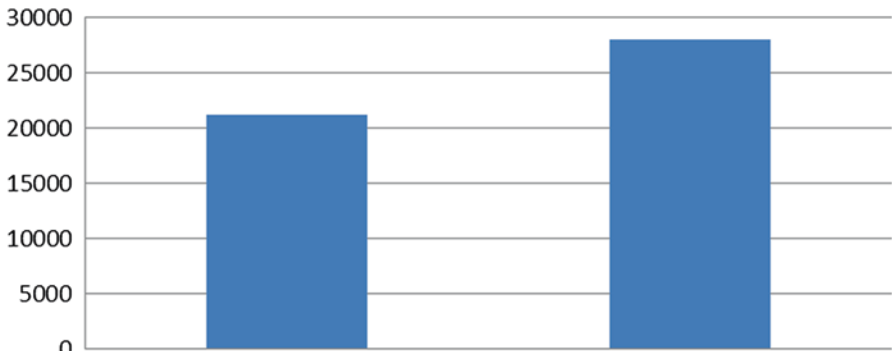
b

Supplementary Exercises

Multiple Choice

1. Data from primary source

   a. are collected for other purposes than the current study.
   b. can be obtained from the newspaper.
   c. are collected specifically for the current study.
   d. are less reliable than data from a secondary source.
   e. indicate correlation.

2. Data from secondary source

   a. are collected for other purposes than the current study.
   b. can be obtained from the newspaper.
   c. are collected specifically for the current study.
   d. are more reliable than data from a primary source.
   e. both a and b.

3. A census

   a. consists of information from all members of the population.
   b. consists of information from a subset of the population.
   c. is a secondary source of data.
   d. is less reliable than a secondary source of data.
   e. is less reliable than a primary source of data.

4. A sample

   a. consists of information from all members of the population.
   b. consists of information from a subset of the population.
   c. is a secondary source of data.
   d. is less reliable than a secondary source of data.
   e. is less reliable than a primary source of data.

5. If you are interested in how a football coach divides the practice session into drills, weight training, scrimmaging and game plans, it would be best to use a

   a. bar graph.
   b. line graph.
   c. pie chart.
   d. times series graph
   e. component-part line chart.

6. If you are interested in how the earnings of a company have fluctuated over time, it would be best to use a

   a. bar graph.
   b. time series graph.
   c. pie chart.

d. component-part line chart.
e. histogram.

7. If you were interested in comparing the average earnings and interest expense for IBM with the average earnings and interest expense for Apple Computers, it would be best to use a

   a. bar graph.
   b. line graph.
   c. pie chart.
   d. time series graph.
   e. histogram.

8. In measuring the height of students, a systematic error could occur if

   a. the ruler used to measure students' height is one inch too long.
   b. we measure the height of the wrong students.
   c. we ask all students to remove their shoes.
   d. both male and female students are measured.
   e. we forget to record one student's height.

9. A random error could occur if

   a. the ruler used to measure students' height is one inch too long.
   b. we measure the height of the wrong students.
   c. we forget to have students remove their shoes.
   d. both male and female students are measured.
   e. we forget to record one student's height.

10. It is best to use a census when conducting a survey if

   a. the population is large.
   b. the population is small.
   c. we have a limited amount of time to conduct the survey.
   d. we would like to keep the costs of the survey low.
   e. the population is spread over a large geographic region.

11. It is best to use a sample when conducting a survey if

   a. the population is large.
   b. the population is small.
   c. we have a limited amount of time to conduct the survey.
   d. we would like to keep the costs of the survey low.
   e. all of the above except b.

12. Graphs can be useful for

   a. summarizing large amounts of data.
   b. showing trends in data.
   c. adding visual appeal to business reports.
   d. making comparisons.
   e. all of the above.

In 13–15, determine if the data is a primary or secondary source.

13. The Educational Testing Service tests 8th graders nationwide to determine average mathematics scores on a standardized test.
14. The captain of a softball team keeps track of batting averages in order to determine batting order.
15. To determine which marketing techniques might be more effective, an insurance executive looks at the composite profile of customers in his region, regularly compiled by his marketing department.

True/False (If False, Explain Why)

1. A golfer interested in knowing the percentage of total shots he hits with each different club should use a line graph.
2. Primary data are data collected specifically for the study.
3. Stock price data collected from the Wall Street Journal are primary data.
4. When the Nielsen television ratings collect data on television viewers to estimate the number of television viewers, they are using secondary data.
5. Random error is the difference between the value taken from a random sample and the value obtained from taking a census.
6. Systematic error results from problems in measurement.
7. Line charts are good for showing how the whole is divided into several parts.
8. Time series graphs show how data fluctuate over time.
9. The Gallup election poll uses primary data.
10. A component-part line chart can be useful for showing how gross national product is divided between consumption, investment, government spending, and net exports.
11. Time series graphs can be useful for examining trends in a company's financial ratios.
12. Financial ratios are often used in accounting and finance because they allow us to compare companies of different sizes.
13. Systematic errors result from the sample differing significantly from the entire population.
14. Random errors can be completely eliminated by appropriate random sampling procedure.
15. Systematic errors can be completely eliminated by appropriate random sampling procedure.
16. A bar chart is used to illustrate the trend of a variable versus time.

Questions and Problems

1. Suppose this month you spend $ 250 on rent, $ 125 on food, and $ 75 on entertainment. Use a pie chart to show how your money was spent.

2. Suppose the average earnings per share for ABC Company is $ 3 and the average earnings per share for XYZ Corporation is $ 6. Use a bar chart to compare the EPS for the two companies.

3. Below is the advertising budget for the Shady Lamp Shade Company from *1995 to 1999*.

Year	TV	Radio	Newspaper	Total
1995	100	25	18	143
1996	105	31	27	163
1997	115	40	33	188
1998	123	42	34	199
1999	151	47	39	237

Use a component-part line chart to show how the advertising budget has been divided between television, radio, and newspaper advertising over this 5-year period.

4. Briefly explain why financial ratios are preferred to absolute numbers in financial analysis.

5. Below is a time series graph of the debt-equity ratios for the Cautious Electronics Company and the High Flying Electric Company. What conclusions can you draw by examining this graph?
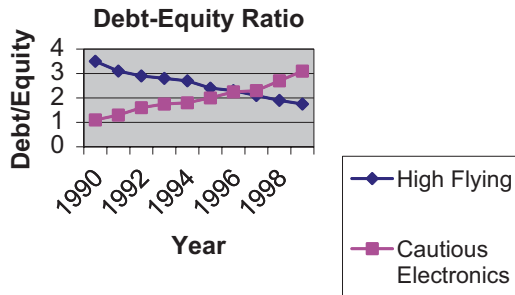
6. Below is a pie graph of the Smyth family's household budget. As their financial planner, what advice might you offer?
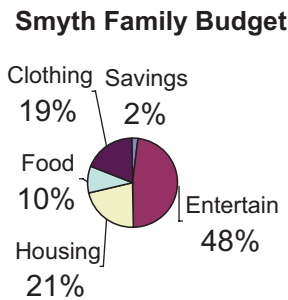
7. Refer to the data in Example 3, in which data on EBIT and EPS, during the period 2005–2012 are given. (a) Draw the line chart of EBIT for the Microsoft and IBM during the period 2005–2012. (b) Draw the bar chart for the EPS of Microsoft and IBM during the year 2012.

Answers to Supplementary Exercises
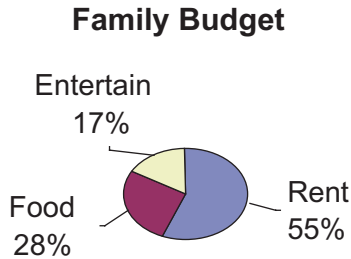
Multiple Choice

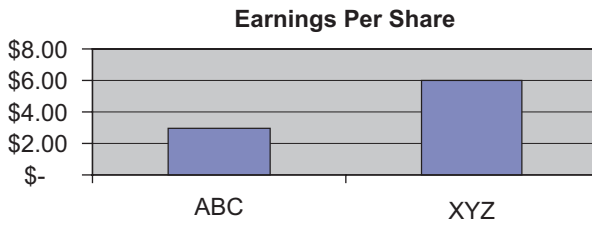|		
1. c	6. b	11. e
2. e	7. a	12. e
3. a	8. a	13. e
4. b	9. b	14. a
5. c	10. b	15. b

True/False

1. False. A pie graph is best for showing how the "whole" is divided into parts.
2. True
3. False. Secondary data.
4. False. Primary data.
5. True
6. True
7. False. Pie chart.
8. True
9. True
10. True
11. True
12. True
13. True
14. False
15. False
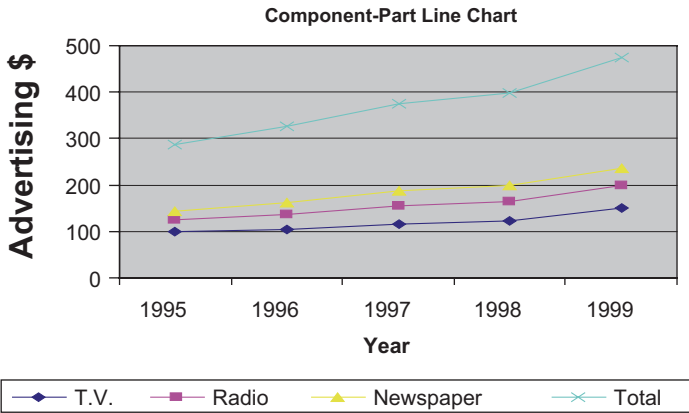16. False

Questions and Problems

1.

Family Budget

Entertain
17%

Food
28%

Rent
55%

2.

Earnings Per Share

$8.00	
$6.00	
$4.00	
$2.00	
$-	

ABC   XYZ

3.

Component-Part Line Chart

Advertising $

500
400
300
200
100
0

1995   1996   1997   1998   1999

Year

━◆━ T.V.   ━■━ Radio   ━▲━ Newspaper   ━✕━ Total

4. Ratios are generally preferred to absolute numbers in financial analysis because they allow us to compare companies of different sizes.
5. From the graph, we can see that the two companies' debt-equity ratios have been moving in different directions over the last few years. High Flying has been