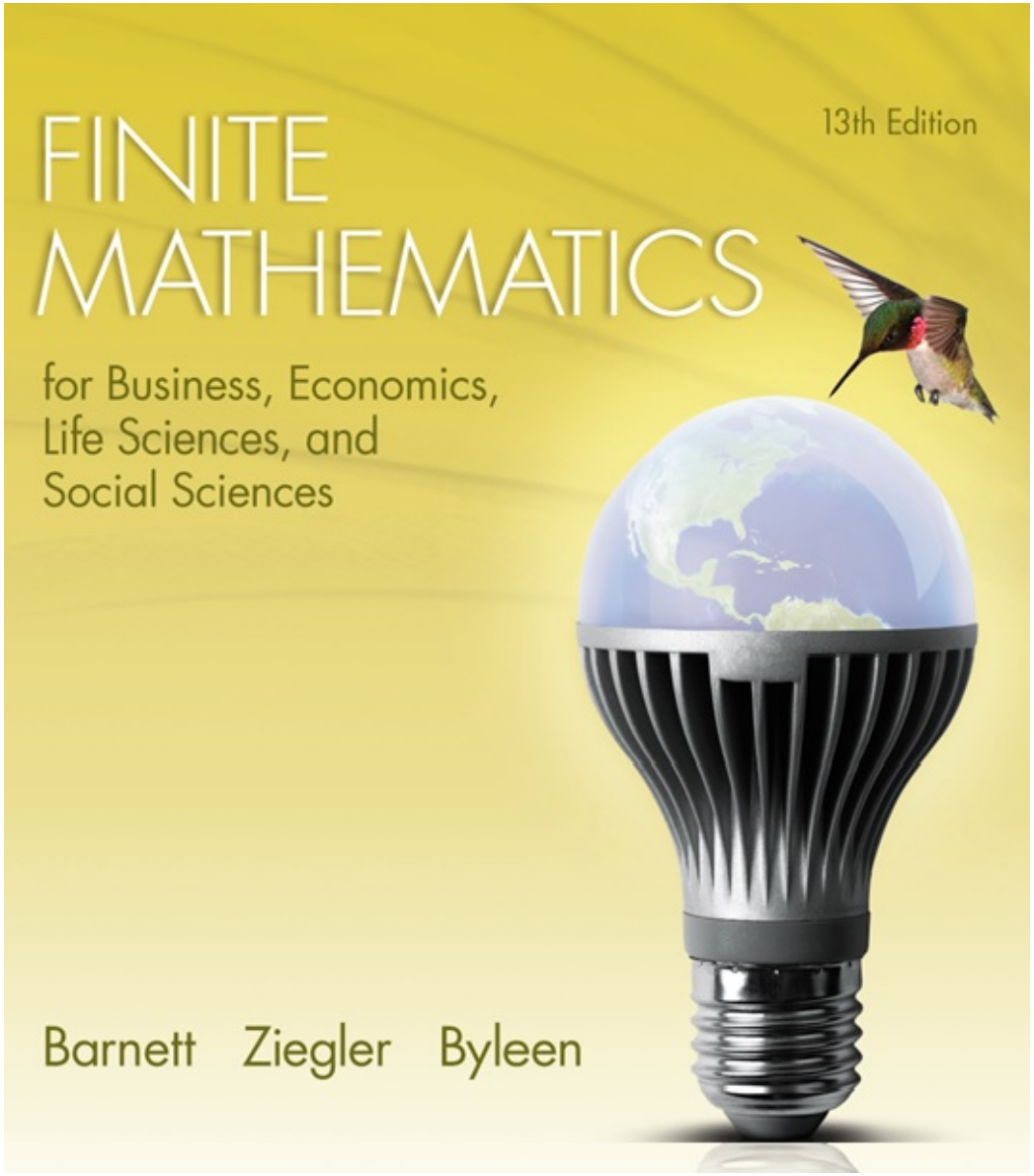


Chapter 11

Data Descriptions and Probability Distributions

Section 1

Graphing Data

Objectives for Section 11.1

Data Description and Probability Distributions

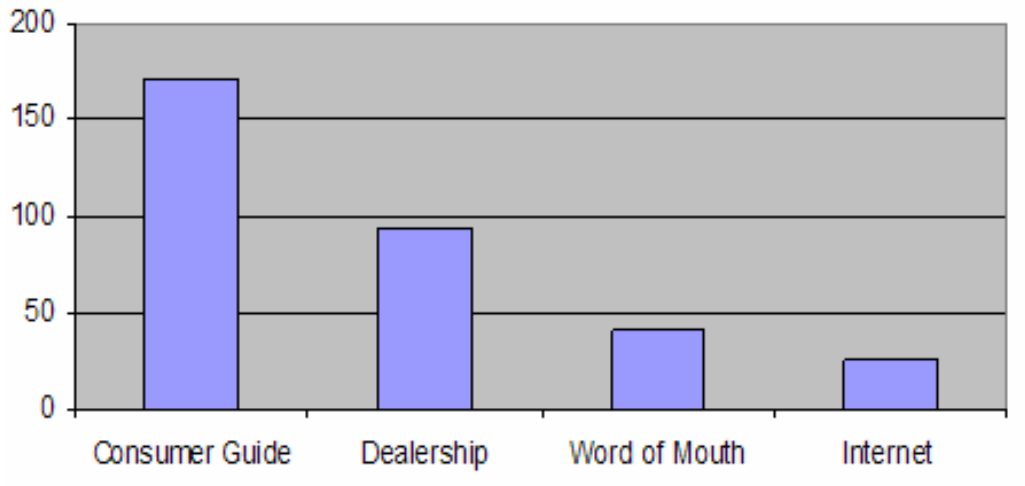
- The student will be able to create bar graphs, broken-line graphs, and pie graphs.
- The student will be able to create frequency distributions and histograms.
- The student will be able to accurately interpret statistics.
- The student will be able to create frequency polygons and cumulative frequency polygons.

11.1 Graphing Data

In this chapter, we will study techniques for graphing data. We will see the importance of visually displaying large sets of data so that meaningful interpretations of the data can be made.

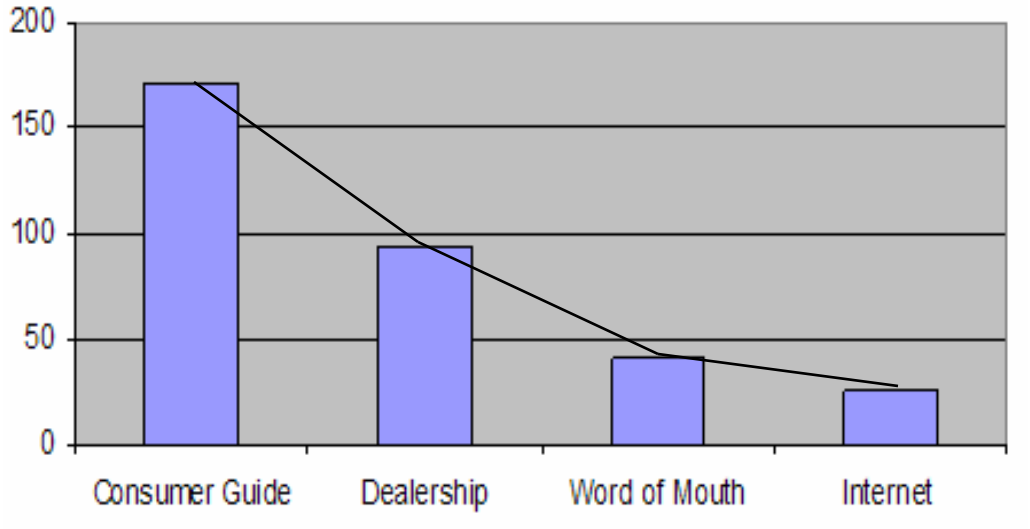
Bar Graphs

Bar graphs are used to represent data that can be classified into categories. The height of the bars represents the frequency of the category. For ease of reading, there is a space between each bar. The bar graph displayed here represents how consumers obtain their information for purchasing a new or used automobile.



There are four categories. The graph illustrates that the category most used by consumers is the Consumer Guide.

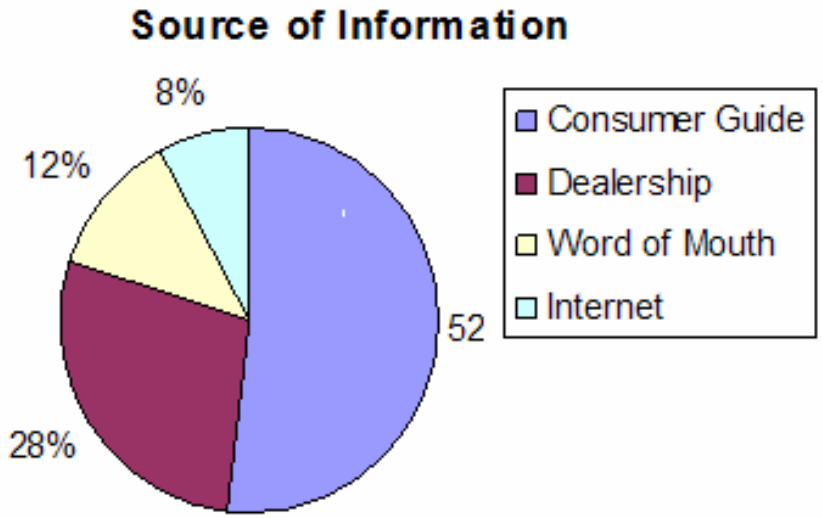
Broken Line Graph



A **broken line graph** is obtained from a bar graph by connecting the midpoints of the tops of consecutive bars with straight lines.

Pie Graphs

A **pie graph** is used to show how a whole is divided among several categories. The amount of each category is expressed as a percentage of the whole. The percentage is multiplied by 360 to determine the number of degrees of the central angle in the pie graph.



Frequency Distributions

A **frequency distribution** is used to organize a large set of numerical data into classes. A **frequency table** consists of 5-20 classes of equal width. An example is on the right.

This distribution has seven classes. The notation [0,7) includes all numbers that are greater than or equal to zero and less than 7. The class with the highest frequency is the class [28, 35) with a class frequency of 23.

Rounds of Golf played by Golfers

Class	Frequency
[0,7)	0
[7,14)	2
[14,21)	10
[21,28)	21
[28,35)	23
[35,42)	14
[42,49)	5

Relative Frequency Distributions

A **relative frequency distribution** is constructed by taking the frequency of each class and dividing that number by the total frequency.

The total number of observations is 75. The third column of percentages is found by dividing the numbers in the second column by 75 and expressing that result as a percentage.

Class	Freq.	Freq. %
[0,7)	0	0.00%
[7,14)	2	2.67%
[14,21)	10	13.33%
[21,28)	21	28.00%
[28,35)	23	30.67%
[35,42)	14	18.67%
[42,49)	5	6.67%
total	75	100%

Determining Probabilities from a Frequency Table

Referring to the probability distribution described on the last slide, determine the probability that

(A) A randomly drawn score is between 14 and 21.

(B) A randomly drawn score is between 14 and 28.

Determining Probabilities from a Frequency Table

Referring to the probability distribution described on the last slide, determine the probability that

(A) A randomly drawn score is between 14 and 21.

(B) A randomly drawn score is between 14 and 28.

Solution:

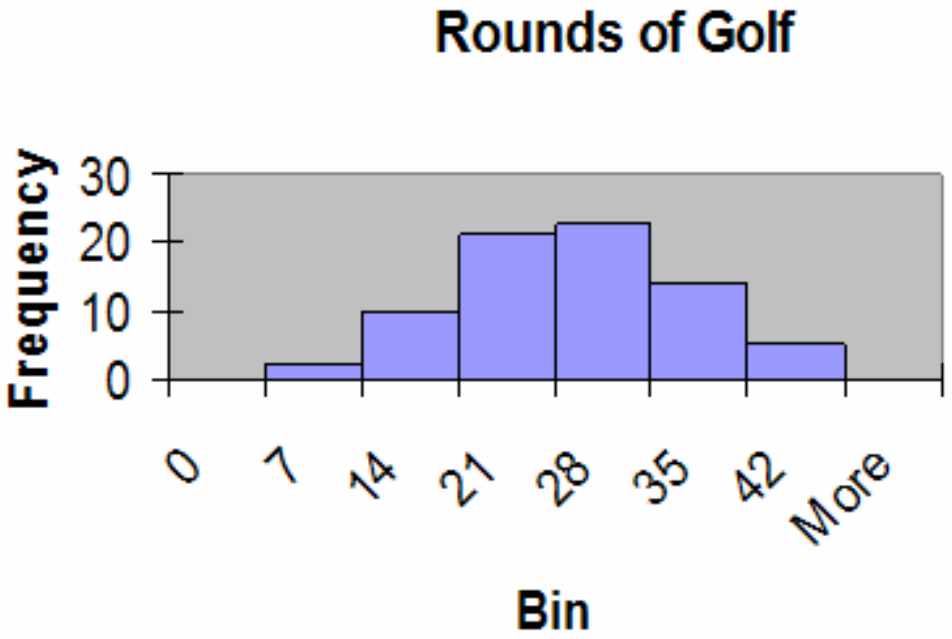
(A) Since the relative frequency associated with the class interval 14-21 is 13.33%, the probability that a randomly drawn score falls in this interval is 13.33%.

(B) Since a score falling in the interval 14-28 is a compound event, we simply add the probabilities for the simple events to get 13.33% + 28% = 41.33%.

Histograms

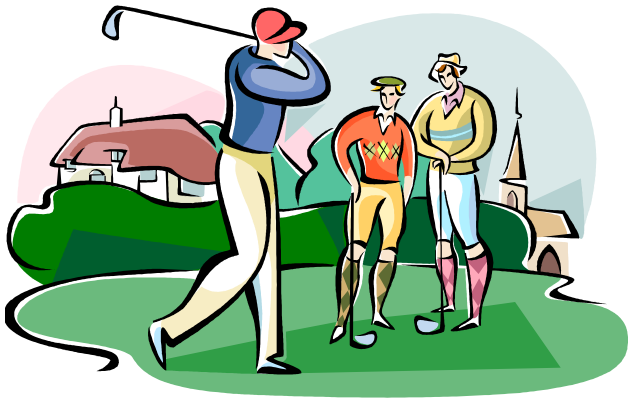
A **histogram** is similar to a vertical bar graph with the exception that there are no spaces between the bars, and the horizontal axis always consists of numerical values. We will represent the frequency distribution of the previous slides with a histogram.

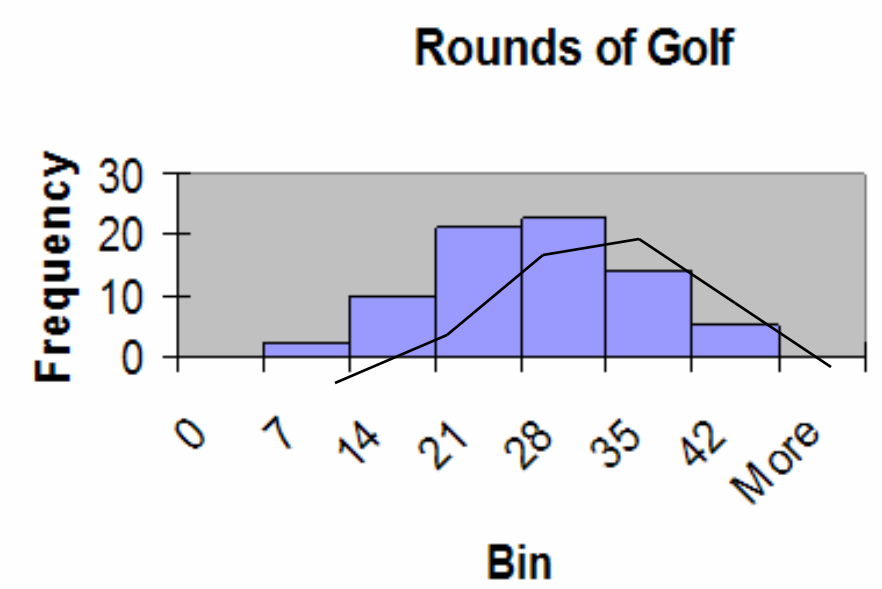
The histogram shows a symmetric distribution with the most frequent classes in the middle between 21 and 35 rounds of golf.



Frequency Polygons

A **frequency polygon** is constructed from a histogram by connecting the midpoints of each vertical bar with a line segment. This is also called a broken-line graph.





Constructing Histograms with a Graphing Utility

Twenty vehicles were chosen at random at a vehicle inspection station, and the time elapsed in minutes from arrival to completion of the emissions test was recorded for each of the vehicles:

5	12	11	4	7	20	14	8	12
	11	18	15	14	9	10	13	12
	20	26	17					

Use a graphing utility to draw a histogram of the data, choosing the five class intervals 2.5 – 7.5, 7.5 – 12.5, and so on.

Constructing a Histogram with a Graphing Utility (continued)

Various kinds of statistical plots can be drawn by most graphing utilities. To draw a histogram we enter the data as a list, specify a histogram from among the various plotting options, set the window variables, and graph. The figures below show the window and the graph for the previous example.

```
WINDOW
  Xmin=2.5
  Xmax=27.5
  Xscl=5
  Ymin=0
  Ymax=8
  Yscl=1
  Xres=1
```