

Chapter 02

Tabular and Graphical Methods

True / False Questions

1. A frequency distribution for qualitative data groups this data into classes called intervals and records the total number of observations in each class.

True False

2. The relative frequency of a category is calculated by dividing the category's frequency by the total number of observations.

True False

3. The percent frequency of a category equals the frequency of the category multiplied by 100%.

True False

4. A pie chart is a segmented circle that portrays the categories and relative sizes of some quantitative variable.

True False

5. A bar chart depicts the frequency or relative frequency of each category of qualitative data as a bar rising vertically from the horizontal axis. It is also acceptable for the bar to extend horizontally from the vertical axis.

True False

6. To approximate the width of a class in the creation of a bar chart, we may use this formula:

$$\frac{\text{Maximum value} - \text{Minimum value}}{\text{Number of classes}}$$

True False

7. For quantitative data, a cumulative frequency distribution records the number of observations that fall below the upper limit of each class.

True False

8. For quantitative data, a cumulative relative frequency distribution records the proportion (fraction) of values that fall below the upper limit of each class.

True False

9. A histogram is a series of rectangles where the width and height of each rectangle represent the frequency (or relative frequency) and the width of the class, respectively.

True False

10. A polygon connects a series of neighboring points where each point represents the midpoint of a particular class and its associated frequency or relative frequency.

True False

11. An ogive is a graph that plots the cumulative frequency (or the cumulative relative frequency) of each class above the lower limit of the corresponding class.

True False

12. A stem-and-leaf diagram is useful in that it gives an overall picture of where quantitative data are centered and how the data are dispersed from the center.

True False

13. A scatterplot is a graphical tool that helps determine whether or not two quantitative variables are related.

True False

14. When constructing a scatterplot for two quantitative variables, we usually refer to one variable as x and another one as y . Typically, we graph x on the vertical axis and y on the horizontal axis.

True False

Multiple Choice Questions

15. Frequency distributions may be used to describe which of the following types of data?

- A. Nominal and ordinal data only
- B. Nominal and interval data only
- C. Nominal, ordinal, and interval data only
- D. Nominal, ordinal, interval, and ratio data

16. In order to summarize qualitative data, a useful tool is a _____.
- A. Histogram
 - B. Frequency distribution
 - C. Stem-and-leaf diagram
 - D. All of the above
17. For both qualitative and quantitative data, what is the difference between the relative frequency and the percent frequency?
- A. The relative frequency equals the percent frequency multiplied by 100.
 - B. The percent frequency equals the relative frequency multiplied by 100.
 - C. As opposed to the relative frequency, the percent frequency is divided by the number of observations in the data set.
 - D. As opposed to the percent frequency, the relative frequency is divided by the number of observations in the data set.
18. For which of the following data sets will a pie chart be *most* useful?
- A. Heights of high school freshmen
 - B. Ambient temperatures in the U.S. Capitol Building
 - C. Percentage of net sales by product for Lenovo in 2011
 - D. Growth rates of firms in a particular industry
19. **Exhibit 2-1.** An auto parts chain asked customers to complete a survey rating the chain's customer service as average, above average, or below average. The following shows the results from the survey:

Average	Below Average	Average
Above Average	Above Average	Above Average
Below Average	Average	Average
Below Average	Average	Below Average
Below Average	Below Average	Below Average

Refer to Exhibit 2-1. The proportion of customers that felt the customer service was average is *closest* to _____.

- A. 0.20
- B. 0.33
- C. 0.46
- D. 0.53

20. **Exhibit 2-1.** An auto parts chain asked customers to complete a survey rating the chain's customer service as average, above average, or below average. The following shows the results from the survey:

Average	Below Average	Average
Above Average	Above Average	Above Average
Below Average	Average	Average
Below Average	Average	Below Average
Below Average	Below Average	Below Average

Refer to Exhibit 2-1. A rating of Average or Above Average accounted for what number of responses to the survey?

- A. 3
 - B. 7
 - C. 8
 - D. 10
21. **Exhibit 2-2.** The following is a list of five of the world's busiest airports by passenger traffic for 2010.

Name	Location	# of Passengers (in millions)
Hartsfield-Jackson	Atlanta, Georgia, United States	89
Capital International	Beijing, China	74
London Heathrow	London, United Kingdom	67
O'Hare	Chicago, Illinois, United States	66
Tokyo	Tokyo, Japan	64

Refer to Exhibit 2-2. The percentage of passenger traffic in the five busiest airports that occurred in Asia is *closest* to _____.

- A. 18%
- B. 21%
- C. 25%
- D. 38%

22. **Exhibit 2-2.** The following is a list of five of the world's busiest airports by passenger traffic for 2010.

Name	Location	# of Passengers (in millions)
Hartsfield-Jackson	Atlanta, Georgia, United States	89
Capital International	Beijing, China	74
London Heathrow	London, United Kingdom	67
O'Hare	Chicago, Illinois, United States	66
Tokyo	Tokyo, Japan	64

Refer to Exhibit 2-2. How many more millions of passengers flew out of Atlanta than flew out of Chicago?

- A. 13
 - B. 21
 - C. 23
 - D. 25
23. **Exhibit 2-3.** A city in California spent six million dollars repairing damage to its public buildings in 2010. The following table shows the categories where the money was directed.

Cause	Percent
Termites	22%
Water Damage	6%
Mold	12%
Earthquake	27%
Other	33%

Refer to Exhibit 2-3. How much did the city spend to fix damage caused by mold?

- A. \$360,000
- B. \$720,000
- C. \$1,440,000
- D. \$1,800,000

24. **Exhibit 2-3.** A city in California spent six million dollars repairing damage to its public buildings in 2010. The following table shows the categories where the money was directed.

Cause	Percent
Termites	22%
Water Damage	6%
Mold	12%
Earthquake	27%
Other	33%

Refer to Exhibit 2-3. How much more did the city spend to fix damage caused by termites compared to the damage caused by water?

- A. \$360,000
B. \$720,000
C. \$960,000
D. \$1,320,000
25. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What is the most common score given in the evaluations?

- A. 2
B. 3
C. 4
D. 5

26. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What percentage of students gave Professor Smith an evaluation higher than 3?

- A. 20%
- B. 30%
- C. 50%
- D. 80%
27. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What percentage of students gave Professor Smith an evaluation of 2 or less?

- A. 6.7%
- B. 13.3%
- C. 20%
- D. 80%

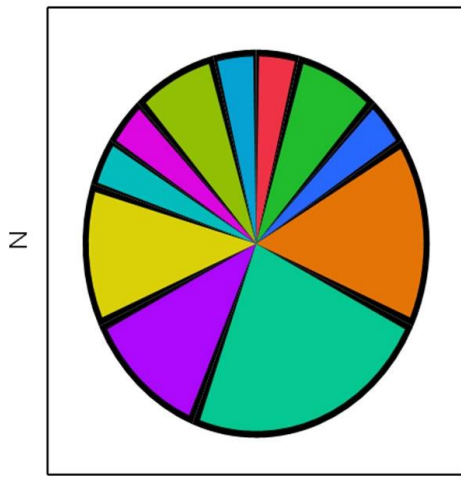
28. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What is the relative frequency of the students who gave Professor Smith an evaluation of 3?

- A. 0.3
- B. 0.5
- C. 9
- D. 15

29. In the following pie chart representing a collection of cookbooks, which author has more titles?

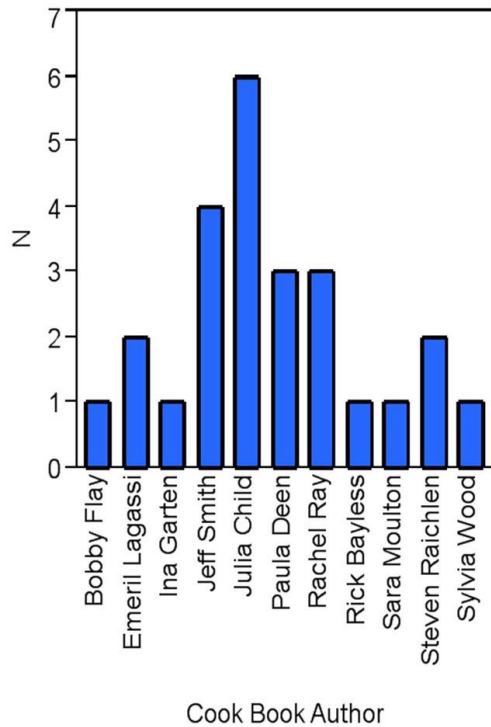


Cook Book Author

Cook Book Author	 Bobby Flay	 Emeril Lagassi
	 Ina Garten	 Jeff Smith
	 Julia Child	 Paula Deen
	 Rachel Ray	 Rick Bayless
	 Sara Moulton	 Steven Raichlen
	 Sylvia Wood	

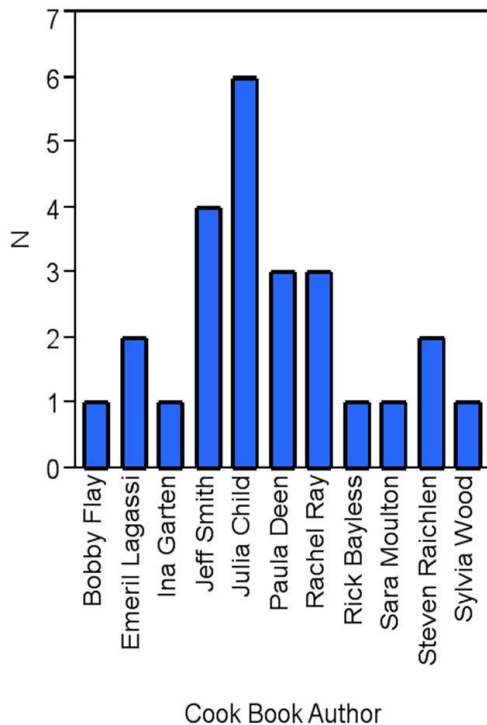
- A. Jeff Smith
- B. Julia Child
- C. Rachel Ray
- D. Paula Deen

30. The accompanying chart shows the numbers of books written by each author in a collection of cookbooks. What type of chart is this?



- A. Bar chart for qualitative data
- B. Bar chart for quantitative data
- C. Frequency histogram for qualitative data
- D. Frequency histogram for quantitative data

31. The accompanying chart shows the number of books written by each author in a collection of cookbooks. What type of data is being represented?



- A. Quantitative, ordinal
B. Quantitative, ratio
C. Qualitative, nominal
D. Qualitative, ordinal
32. When constructing a frequency distribution for quantitative data, it is important to remember that _____.

- A. Classes are mutually exclusive
B. Classes are collectively exhaustive
C. The total number of classes usually ranges from 5 to 20
D. All of the above

33. Which of the following best describes a frequency distribution for qualitative data?
- A. It groups data into histograms and records the proportion (fraction) of observations in each histogram.
 - B. It groups data into categories and records the number of observations in each category.
 - C. It groups data into intervals called classes and records the proportion (fraction) of observations in each class.
 - D. It groups data into intervals called classes and records the number of observations in each class.

34. What graphical tool is *best* used to display the relative frequency of grouped quantitative data?
- A. Ogive
 - B. Pie chart
 - C. Bar chart
 - D. Histogram

35. **Exhibit 2-5.** The following data represent scores on a pop quiz in a statistics section:

45	66	74	72
62	44	55	70
33	82	56	56
84	16	16	47
32	32	17	37

Refer to Exhibit 2-5. Suppose the data on quiz scores will be grouped into five classes. The width of the classes for a frequency distribution or histogram is *closest* to _____.

- A. 10
- B. 12
- C. 14
- D. 16

36. **Exhibit 2-5.** The following data represent scores on a pop quiz in a statistics section:

45	66	74	72
62	44	55	70
33	82	56	56
84	16	16	47
32	32	17	37

Refer to Exhibit 2-5. Suppose the data is grouped into 5 classes, and one of them will be "30 up to 44"—that is, $\{x; 30 \leq x < 44\}$. The frequency of this class is ____.

- A. 0.20
- B. 0.25
- C. 4
- D. 5

37. **Exhibit 2-5.** The following data represent scores on a pop quiz in a statistics section:

45	66	74	72
62	44	55	70
33	82	56	56
84	16	16	47
32	32	17	37

Refer to Exhibit 2-5. Suppose the data is grouped into five classes, and one of them will be "30 up to 44"—that is, $\{x; 30 \leq x < 44\}$. The relative frequency of this class is ____.

- A. 0.20
- B. 0.25
- C. 4
- D. 5

38. **Exhibit 2-6.** The following data represent the recent sales price (in \$1,000s) of 24 homes in a Midwestern city.

187	125	165	170
230	139	195	229
239	135	188	210
228	172	127	139
122	181	196	237
115	199	170	239

Refer to Exhibit 2-6. Suppose the data on house prices will be grouped into five classes. The width of the classes for a frequency distribution or histogram is *closest* to _____.

- A. 15
- B. 20
- C. 25
- D. 30

39. **Exhibit 2-6.** The following data represent the recent sales price (in \$1,000s) of 24 homes in a Midwestern city.

187	125	165	170
230	139	195	229
239	135	188	210
228	172	127	139
122	181	196	237
115	199	170	239

Refer to Exhibit 2-6. Suppose the data is grouped into five classes, and one of them will be "115 up to 140"—that is, $\{x; 115 \leq x < 140\}$. The relative frequency of this class is _____.

- A. 6/24
- B. 7/24
- C. 6
- D. 7

40. **Exhibit 2-6.** The following data represent the recent sales price (in \$1,000s) of 24 homes in a Midwestern city.

187	125	165	170
230	139	195	229
239	135	188	210
228	172	127	139
122	181	196	237
115	199	170	239

Refer to Exhibit 2-6. Suppose the data is grouped into five classes, and one of them will be "165 up to 190"—that is, $\{x; 165 \leq x < 190\}$. The frequency of this class is ____.

- A. 6/24
B. 7/24
C. 6
D. 7
41. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. How many students scored at least 1800 but less than 2000?

- A. 3
B. 7
C. 12
D. 18

42. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. What percent of students scored less than 2200?

- A. 10%
B. 20%
C. 80%
D. 90%
43. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. What is the approximate relative frequency of students who scored more than 1600 but less than 1800?

- A. 0.17
B. 0.23
C. 0.40
D. 0.77

44. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. What graphical tool would you use to display the cumulative relative frequency of the grouped data?

- A. Ogive
- B. Polygon
- C. Pie Chart
- D. Bar Chart

45. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. The total number of observations in the frequency distribution is _____.

- A. 5
- B. 6
- C. 20
- D. 24

46. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. How many observations are at least 15 but less than 18?

- A. 3
- B. 4
- C. 5
- D. 6

47. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. How many observations are less than 21?

- A. 6
- B. 12
- C. 18
- D. 24

48. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. What proportion of the observations are at least 15 but less than 18?

- A. 0.20
- B. 0.25
- C. 0.30
- D. 0.35

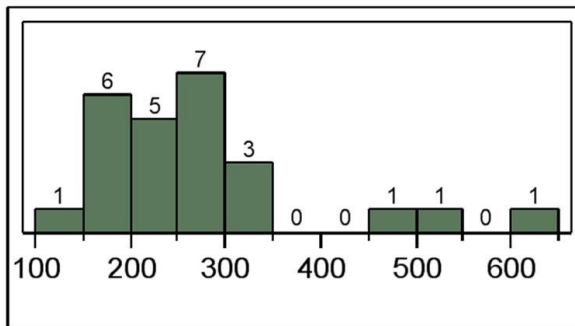
49. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

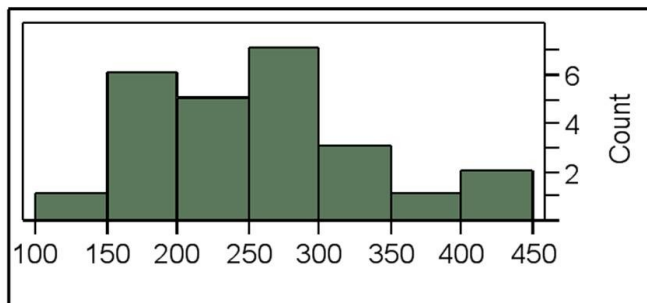
Refer to Exhibit 2-8. What proportion of the observations are less than 21?

- A. 0.30
- B. 0.60
- C. 0.90
- D. 1

50. The following histogram represents the number of pages in each book within a collection. What is the frequency of books containing at least 250 but less than 300 pages?

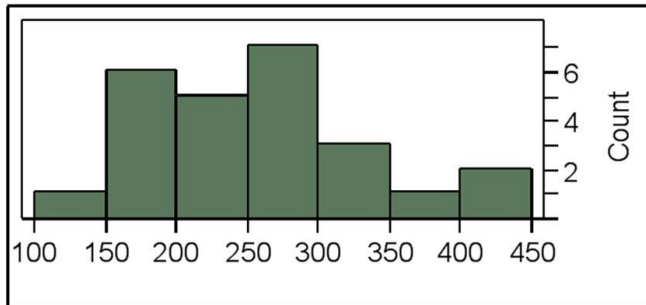


- A. 5
B. 6
C. 7
D. 12
51. The following histogram represents the number of pages in each book within a collection. What is the frequency of books containing at least 200 but less than 250 pages?



- A. 4
B. 5
C. 6
D. 7

52. The following histogram represents the number of pages in each book within a collection. What is the frequency of books containing at least 250 but less than 400 pages?



- A. 7
B. 10
C. 11
D. 12
53. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The number of stocks with returns of 0% up to 10% is _____.

- A. 2
B. 8
C. 15
D. 25

54. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The number of stocks with returns of less than 10% is _____.

- A. 8
 - B. 25
 - C. 33
 - D. 48
55. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The proportion of stocks with returns of 0% up to 10% is _____.

- A. 0.30
- B. 0.50
- C. 0.66
- D. 0.80

56. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The proportion of stocks with returns of less than 10% is ____.

- A. 0.30
B. 0.50
C. 0.66
D. 0.80
57. **Exhibit 2-10.** Automobiles traveling on a road with a posted speed limit of 65 miles per hour are checked for speed by a state police radar system. The following table is a frequency distribution of speeds.

Speed (miles per hour)	Frequency
45 up to 55	50
55 up to 65	325
65 up to 75	275
75 up to 85	25

Refer to Exhibit 2-10. How many of the cars traveled less than 75 miles per hour?

- A. 275
B. 325
C. 650
D. 675

58. **Exhibit 2-10.** Automobiles traveling on a road with a posted speed limit of 65 miles per hour are checked for speed by a state police radar system. The following table is a frequency distribution of speeds.

Speed (miles per hour)	Frequency
45 up to 55	50
55 up to 65	325
65 up to 75	275
75 up to 85	25

Refer to Exhibit 2-10. What proportion of the cars traveled at least 55 but less than 65 miles per hour?

- A. 0.33
- B. 0.48
- C. 0.56
- D. 0.80

59. **Exhibit 2-10.** Automobiles traveling on a road with a posted speed limit of 65 miles per hour are checked for speed by a state police radar system. The following table is a frequency distribution of speeds.

Speed (miles per hour)	Frequency
45 up to 55	50
55 up to 65	325
65 up to 75	275
75 up to 85	25

Refer to Exhibit 2-10. When using a polygon to graph quantitative data, what does each point represent?

- A. The lower limit of a particular class and its width
 - B. The midpoint of a particular class and its associated frequency or relative frequency
 - C. The midpoint of a particular class and its associated cumulative frequency or cumulative relative frequency
 - D. The upper limit of a particular class and its associated cumulative frequency or cumulative relative frequency
60. The accompanying table shows students' scores from the final exam in a history course.

Scores	Cumulative Frequency
50 up to 60	12
60 up to 70	33
70 up to 80	64
80 up to 90	88
90 up to 100	100

How many of the students scored at least 70 but less than 90?

- A. 24
- B. 31
- C. 55
- D. 88

61. The following table shows the number of payroll jobs the government added during the years its added jobs (since 1973). The jobs are in thousands.

Gov Jobs Added	Frequency
100 up to 200	5
200 up to 300	8
300 up to 400	7
400 up to 500	5
500 up to 600	1

Approximately what percent of the time did the government add 200,000 or more jobs?

- A. 19%
 - B. 50%
 - C. 77%
 - D. 81%
62. **Exhibit 2-11.** The accompanying relative frequency distribution represents the last year car sales for the sales force at Kelly's Mega Used Car Center.

Car Sales	Relative Frequency
35 up to 45	0.07
45 up to 55	0.15
55 up to 65	0.31
65 up to 75	0.22
75 up to 85	0.25

Refer to Exhibit 2-11. If Kelly's employs 100 salespeople, how many of these salespeople have sold at least 35 but less than 45 cars in the last year?

- A. 5
- B. 7
- C. 10
- D. 15

63. **Exhibit 2-11.** The accompanying relative frequency distribution represents the last year car sales for the sales force at Kelly's Mega Used Car Center.

Car Sales	Relative Frequency
35 up to 45	0.07
45 up to 55	0.15
55 up to 65	0.31
65 up to 75	0.22
75 up to 85	0.25

Refer to Exhibit 2-11. If Kelly's employs 100 salespeople, how many of these salespeople have sold at least 45 but less than 65 cars in the last year?

- A. 15
- B. 31
- C. 40
- D. 46

64. **Exhibit 2-11.** The accompanying relative frequency distribution represents the last year car sales for the sales force at Kelly's Mega Used Car Center.

Car Sales	Relative Frequency
35 up to 45	0.07
45 up to 55	0.15
55 up to 65	0.31
65 up to 75	0.22
75 up to 85	0.25

Refer to Exhibit 2-11. If Kelly's employs 100 salespeople, how many of these salespeople have sold at least 65 cars in the last year?

- A. 22
- B. 25
- C. 31
- D. 47

65. When displaying quantitative data, what is an ogive used to plot?

- A. Frequency or relative frequency of each class against the midpoint of the corresponding class
- B. Cumulative frequency or cumulative relative frequency of each class against the upper limit of the corresponding class
- C. A and B
- D. None of the above

66. How does an ogive differ from a polygon?

- A. An ogive is used for qualitative data, while a polygon is used for quantitative data.
- B. An ogive is used for quantitative data, while a polygon is used for qualitative data.
- C. An ogive is a graphical depiction of a frequency or relative distribution, while a polygon is a graphical depiction of a cumulative frequency or cumulative relative frequency distribution.
- D. An ogive is a graphical depiction of a cumulative frequency or cumulative relative frequency distribution, while a polygon is a graphical depiction of a frequency or relative frequency distribution.

67. **Exhibit 2-12.** Recent home sales in a suburb of Washington, D.C. are shown in the accompanying ogive.



Refer to Exhibit 2-12. Approximate the percentage of houses that sold for less than \$600,000.

- A. 60%
- B. 70%
- C. 80%
- D. 90%

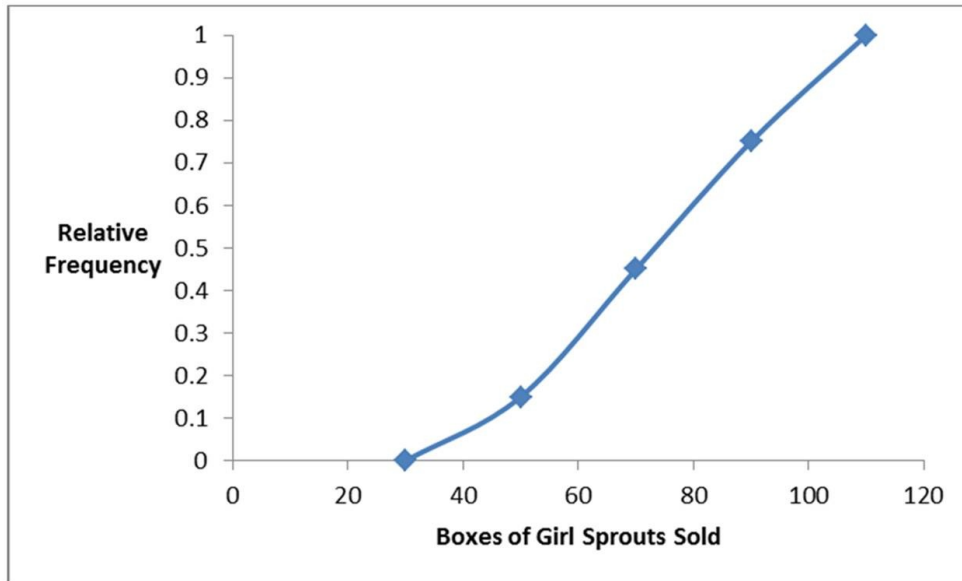
68. **Exhibit 2-12.** Recent home sales in a suburb of Washington, D.C. are shown in the accompanying ogive.



Refer to Exhibit 2-12. Approximate the percentage of houses that sold for more than \$500,000.

- A. 40%
- B. 50%
- C. 60%
- D. 70%

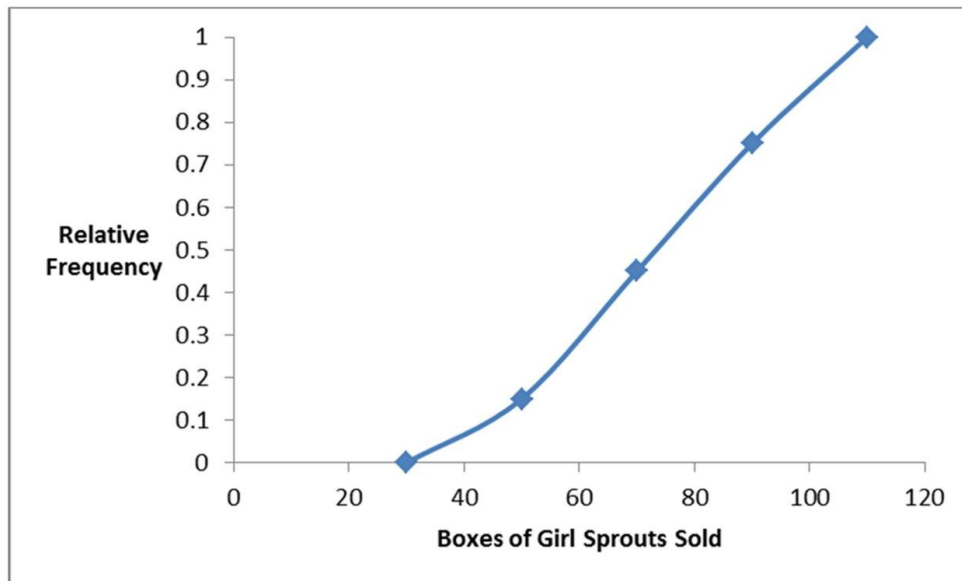
69. **Exhibit 2-13.** The organization of the Girl Sprouts has completed its annual cookie drive. The sales are reported in the accompanying ogive.



Refer to Exhibit 2-13. Approximate the percentage of girls who sold less than 90 boxes of cookies.

- A. 45%
- B. 55%
- C. 65%
- D. 75%

70. **Exhibit 2-13.** The organization of the Girl Sprouts has completed its annual cookie drive. The sales are reported in the accompanying ogive.



Refer to Exhibit 2-13. Approximate the percentage of girls who sold more than 70 boxes of cookies.

- A. 45%
 - B. 55%
 - C. 65%
 - D. 75%
71. A stem-and-leaf diagram is constructed by separating each value of a data set into two parts. What are these parts?
- A. Stem consisting of the last digit and leaf consisting of the leftmost digits.
 - B. Stem consisting of the leftmost digits and leaf consisting of the second digit.
 - C. Stem consisting of the second digit and leaf consisting of the last digit.
 - D. Stem consisting of the leftmost digits and leaf consisting of the last digit.

72. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. Which of the following numbers appears in the stem-and-leaf diagram?

- A. 3800
 - B. 380
 - C. 38
 - D. 3.8
73. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. What would be the frequency of the class 35 up to 45, that is $\{x; 35 \leq x < 45\}$?

- A. 0
- B. 1
- C. 2
- D. 3

74. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. How many values are at least 25 but less than 35?

- A. 10
 - B. 11
 - C. 12
 - D. 13
75. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. Find the frequency associated with data values that are more than 28.

- A. 8
- B. 9
- C. 10
- D. 11

76. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. The stem-and-leaf diagram shows that the distribution is _____.

- A. Symmetric
 - B. Positively skewed
 - C. Negatively skewed
 - D. None of the above
77. The following stem-and-leaf diagram shows the speeds in miles per hour (mph) of 14 cars approaching a toll booth on a bridge in Oakland, California.

Stem	Leaf
2	5 6 6 7 9
3	4 7 7 8 9
4	0 0 2 3

How many of the cars were traveling faster than 25 mph but slower than 40 mph?

- A. 8
- B. 9
- C. 10
- D. 12

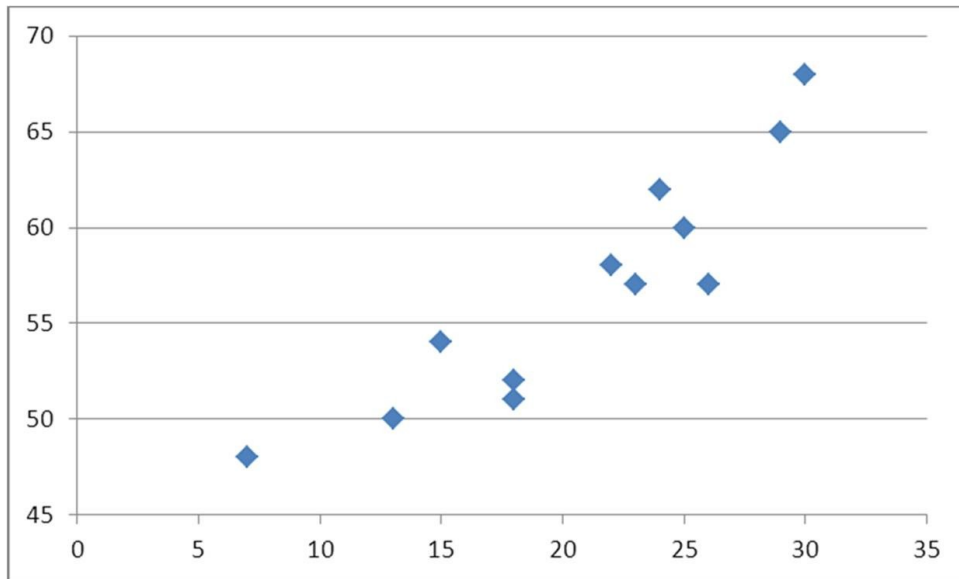
78. The following stem-and-leaf diagram shows the last 20 dividend payments (in cents) paid by Proctor and Gamble.

Stem	Leaf
3	1 5 5 5 5
4	0 0 0 0 4 4 4 4 4 8 8 8
5	3 3 3

The most common dividend payment is _____.

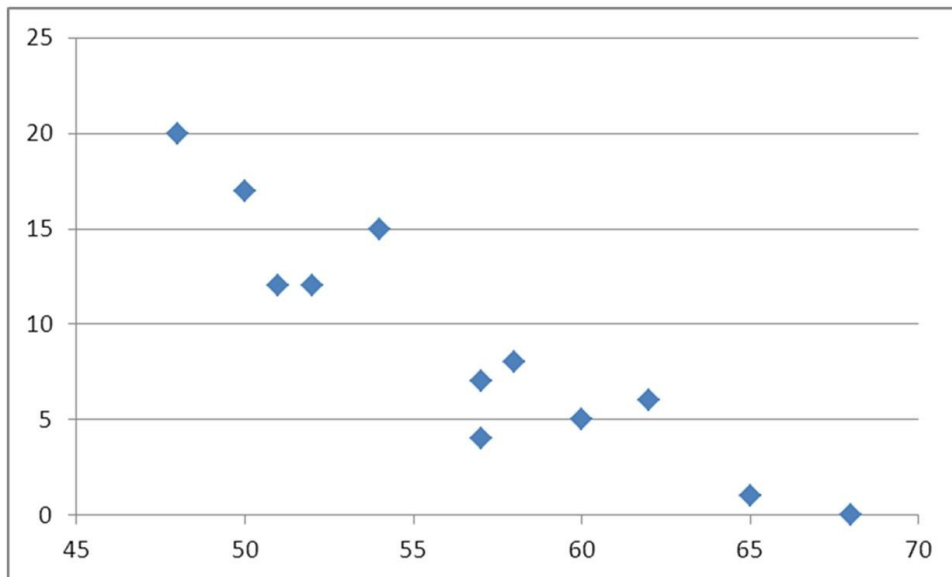
- A. 0.35
 - B. 0.40
 - C. 0.44
 - D. 0.48
79. What may be revealed from a scatterplot?
- A. No relationship between two variables
 - B. A linear relationship between two variables
 - C. A curvilinear relationship between two variables
 - D. All of the above

80. What type of relationship is indicated in the scatterplot?



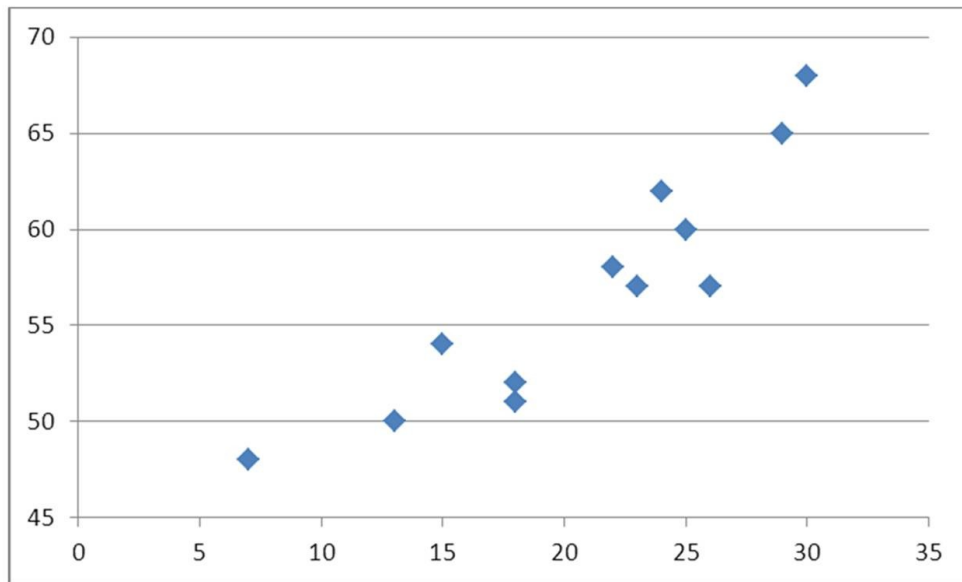
- A. No relationship
- B. A negative linear relationship
- C. A negative curvilinear relationship
- D. A positive linear or curvilinear relationship

81. What type of relationship is indicated in the scatterplot?



- A. No relationship
- B. A negative linear relationship
- C. A positive linear relationship
- D. A positive curvilinear relationship

82. What type of relationship is indicated in the scatterplot?



- A. No relationship
- B. A negative linear relationship
- C. A negative curvilinear relationship
- D. A positive linear or curvilinear relationship

83. Use the following data to construct a scatterplot. What type of relationship is implied?

x	3	6	10	14	18	23
y	34	28	20	12	5	0

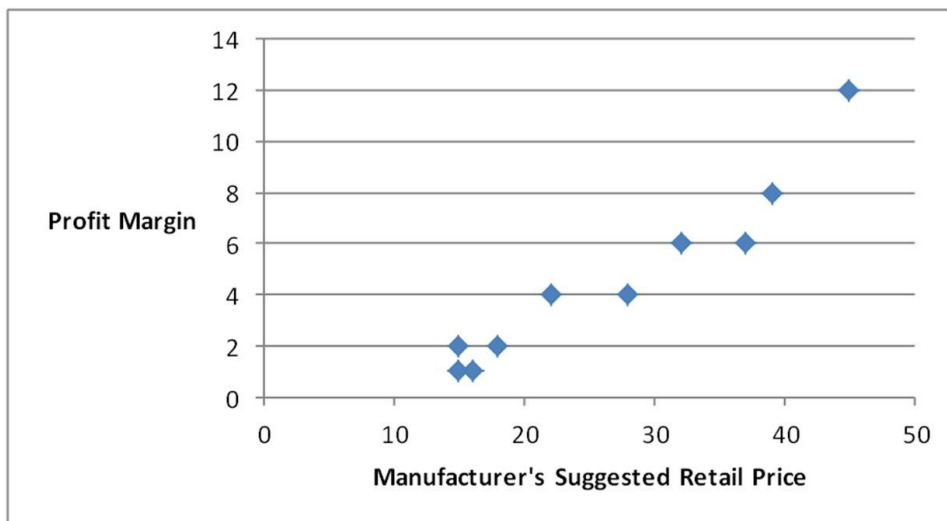
- A. No relationship
- B. A positive relationship
- C. A negative relationship
- D. Not enough information to answer

84. Use the following data to construct a scatterplot. What type of relationship is implied?

x	1	5	9	14	18	23
y	2	4	7	12	15	20

- A. No relationship
- B. A positive relationship
- C. A negative relationship
- D. Not enough information to answer

85. A car dealership created a scatterplot showing the manufacturer's retail price and profit margin for the cars they have on their lot.



As the manufacturer's suggested retail price increases, the profit margin tends to...

- A. Increase
- B. Decrease
- C. Stay the same
- D. None of the above

Essay Questions

86. A survey of 400 unemployed people was completed at a job fair. Each person was asked to categorize their job interests. The accompanying relative frequency distribution was constructed.

Field	Relative Frequency
Management	0.15
Business and financial operations	0.20
Computer and mathematical	0.10
Life, physical, and social science	0.30
Community and social service	0.25

- Construct the corresponding frequency distribution. How many of these people designated that the computer and mathematical industry was their job interest?
- Construct a pie chart.

87. A hair stylist records the hair color of her 25 most recent appointments, classifying the color as blonde, brown, black, or red. Her data set is displayed next.

Red	Blonde	Black	Red	Blonde
Blonde	Black	Blonde	Red	Blonde
Brown	Black	Red	Blonde	Brown
Brown	Red	Black	Black	Red
Brown	Black	Brown	Blonde	Blonde

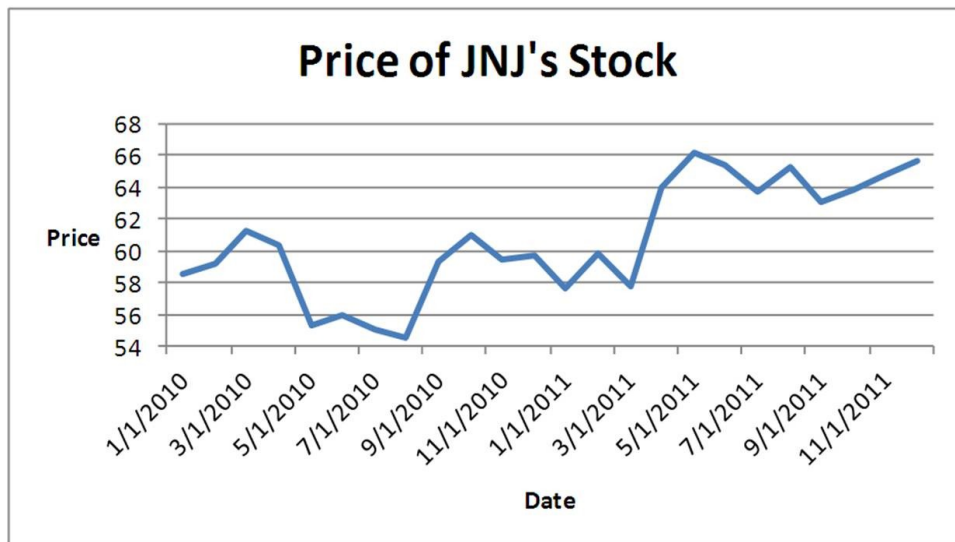
- Construct a frequency and relative frequency distribution of the hair color of the stylist's customers.
- Construct a pie chart. Which hair color is the most common among the stylist's customers?
- Create a bar chart to display the frequency distribution. How many customers had black hair?

88. The following table lists some of the busiest ports in the world based on the number of containers in 2010.

Location of Port	Number of Containers (in millions)
Shanghai	29
Singapore	28
Hong Kong	24
Rotterdam	11
Los Angeles	7
New York	5

Construct a pie chart to summarize the data. Approximately what percent of the total number of containers go through Hong Kong?

89. Johnson and Johnson (JNJ) is a consumer staples company. Consumer staples are products people need and buy even during times of financial hardship. Do you think JNJ will have a volatile stock price? Does the accompanying graph accurately depict the volatility of JNJ stock? Explain.



90. Each month the Bureau of Labor Statistics reports the number of people (in thousands) employed in the United States by age. The accompanying frequency distribution shows the results for August 2011 (Source: <http://data.bls.gov/pdq/SurveyOutputServlet>).

Age	Frequency
16 to 19	4794
20 to 24	13273
25 to 34	30789
35 to 44	30021
45 to 54	32798
55 and over	28660

- Construct a relative frequency distribution. What proportion of workers is between 20 and 24 years old?
- Construct a cumulative relative frequency distribution. What proportion of workers is younger than 35 years old?
- Construct a relative frequency histogram.

91. The following table displays the top 40 American League batting averages of the 2011 season.

Player	Batting Average	Player	Batting Average
Miguel Cabrera	0.344	Yunel Escobar	0.290
Adrian Gonzalez	0.338	Vladimir Guerrero	0.290
Michael Young	0.338	Alberto Callaspo	0.288
Victor Martinez	0.33	Howard Kendrick	0.285
Jacoby Ellsbury	0.321	Jeff Francoeur	0.285
David Ortiz	0.309	Nick Markakis	0.284
Dustin Pedroia	0.307	Michael Cuddyer	0.284
Casey Kotchman	0.306	Adam Jones	0.280
Melky Cabrera	0.305	Elvis Andrus	0.279
Alex Gordon	0.303	Erick Aybar	0.279
Jose Bautista	0.302	Juan Pierre	0.279
Robinson Cano	0.302	Matt Joyce	0.277
Paul Konerko	0.300	Asdrubal Cabrera	0.273
Jhonny Peralta	0.299	Edwin Encarnacion	0.272
Josh Hamilton	0.298	Ichiro Suzuki	0.272
Derek Jeter	0.297	Peter Bourjos	0.271
Adrian Beltre	0.296	J.J. Hardy	0.269
Alex Avila	0.295	Alexei Ramirez	0.269
Eric Hosmer	0.293	Ben Zobrist	0.269
Billy Butler	0.291	Delmon Young	0.268

Source: <http://www.espn.com>

- Construct frequency, relative frequency, and cumulative relative frequency distributions that group the data in classes of 0.265 up to 0.280, 0.280 up to 0.295, 0.295 up to 0.310, and so on.
- How many of these players have a batting average above 0.340? What proportion of these players has a batting average of at least 0.280, but below 0.295? What percentage of these players has a batting average below 0.325?
- Construct a relative frequency histogram. Is the distribution symmetric? If not, is it positively or negatively skewed?
- Construct an ogive.
- Using the ogive, approximately what proportion of the players in this group has a batting average above 0.290?

92. The following table shows analyst sentiment ratings for the 30 stocks listed in the Dow Jones Industrial Average.

7	4	6	8	4	9
4	2	2	4	6	4
5	6	5	3	8	4
9	6	2	9	7	8
4	3	9	4	6	7

- Construct a frequency distribution, relative frequency distribution, cumulative frequency distribution and relative cumulative frequency distribution using classes of 2 up to 4, 4 up to 6, 6 up to 8, and 8 up to 10.
- Construct a histogram that summarizes the data.
- What percentage of the stocks in the Dow Jones Industrial Average received a sentiment rating less than 8?
- What percentage of the stocks in the Dow Jones Industrial Average received a sentiment rating of 6 or more?

93. The accompanying cumulative relative frequency distribution shows a summary of the scores from an Algebra II exam at a local high school. Twenty students took the exam.

Class	Cumulative Relative Frequency
51–60	0.05
61–70	0.20
71–80	0.45
81–90	0.80
91–100	1.00

- Construct the relative frequency distribution. What proportion of students scored between 81 and 90?
- Construct the frequency distribution. How many students scored between 71 and 80?
- Construct an ogive. What is the approximate percentage of students that scored less than 85?

94. The dividend yields of the stocks in an investor's portfolio are shown in the following cumulative relative frequency distribution.

Dividend Yield	Cumulative Relative Frequency
0% up to 2%	0.55
2% up to 4%	0.85
4% up to 6%	0.90
6% up to 8%	0.96
8% up to 10%	1

- a. Construct an ogive.
b. Approximately what percent of the stocks had a dividend yield of 3% or larger?

95. Construct a stem-and-leaf diagram with the following data set:

3.2	1.3	2.1	2.4	4.3	3.1	3.2	1.1	1.4	2.5
2.4	2.9	3.8	1.7	2.3	1.2	3.2	1.4	1.5	2.6

Is the distribution symmetric?

96. Construct a stem-and-leaf diagram for the following data set:

74	75	63	62	56	79	58	79	53	49
78	69	74	72	53	72	64	65	67	77

Is the distribution symmetric?

97. The following table shows average wind speeds (in miles per hour) during 15 major fires in California.

44	55	22
32	29	24
47	33	32
27	58	39
38	51	41

Construct a stem-and-leaf diagram. Were most of these storms fueled by 45+ mile-per-hour winds? Explain.

98. The following table shows the prices (in \$1,000s) of the last 15 trucks sold at a Toyota dealership.

32	21	26
33	23	24
31	22	17
25	18	23
22	19	35

Construct a stem-and-leaf diagram. Given this diagram, estimate the price that a potential buyer would likely pay for a Toyota truck.

99. The following data represent the ages of patients in the cardiac section of the local hospital.
Construct a stem-and-leaf diagram. Comment on whether or not the distribution is symmetric.

48, 53, 60, 61, 62, 63, 70, 70, 72, 77, 78, 79, 80, 82, 87, 88, 90

100 A high school football league recorded the average points scored per game, as well as the winning percentage for the 10 teams in the league.

Points Per Game	Winning Percentage
24	88%
21	66%
27	78%
13	28%
16	32%
18	52%
15	30%
17	44%
19	32%
22	50%

Construct a scatterplot. Does scoring more points appear to be associated with a higher winning percentage?

- 101 A statistics instructor computes the grade and percentage of classes that each of his students attends. Construct a scatterplot from the data displayed next. Does a relationship exist between attendance and grade?

Attendance	47	60	75	86	95	98	100
Grade	58	72	85	84	90	97	92

Chapter 02 Tabular and Graphical Methods **Answer Key**

True / False Questions

1. A frequency distribution for qualitative data groups this data into classes called intervals and records the total number of observations in each class.

FALSE

A frequency distribution for qualitative data groups this data into categories and records the number of observations that fall into each category.

AACSB: Analytic

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

Topic: Summarizing Qualitative Data

2. The relative frequency of a category is calculated by dividing the category's frequency by the total number of observations.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

Topic: Summarizing Qualitative Data

3. The percent frequency of a category equals the frequency of the category multiplied by 100%.

FALSE

The percent frequency of a category equals the relative frequency of the category multiplied by 100%.

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

Topic: Summarizing Qualitative Data

4. A pie chart is a segmented circle that portrays the categories and relative sizes of some quantitative variable.

FALSE

A pie chart is a segmented circle whose segments portray the relative (or percent) frequencies of the categories of some qualitative variable.

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-02 Construct and interpret pie charts and bar charts.

Topic: Summarizing Qualitative Data

5. A bar chart depicts the frequency or relative frequency of each category of qualitative data as a bar rising vertically from the horizontal axis. It is also acceptable for the bar to extend horizontally from the vertical axis.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02-02 Construct and interpret pie charts and bar charts.

Topic: Summarizing Qualitative Data

6. To approximate the width of a class in the creation of a bar chart, we may use this formula:

$$\frac{\text{Maximum value} - \text{Minimum value}}{\text{Number of classes}} .$$

FALSE

This formula is used when we construct a frequency distribution or a histogram for quantitative data.

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.

Topic: Summarizing Quantitative Data

7. For quantitative data, a cumulative frequency distribution records the number of observations that fall below the upper limit of each class.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.

Topic: Summarizing Quantitative Data

8. For quantitative data, a cumulative relative frequency distribution records the proportion (fraction) of values that fall below the upper limit of each class.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.

Topic: Summarizing Quantitative Data

9. A histogram is a series of rectangles where the width and height of each rectangle represent the frequency (or relative frequency) and the width of the class, respectively.

FALSE

A histogram is a series of rectangles where the width and height of each rectangle represent the class width and frequency (or relative frequency) of the class, respectively.

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.

Topic: Summarizing Quantitative Data

10. A polygon connects a series of neighboring points where each point represents the midpoint of a particular class and its associated frequency or relative frequency.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.

Topic: Summarizing Quantitative Data

11. An ogive is a graph that plots the cumulative frequency (or the cumulative relative frequency) of each class above the lower limit of the corresponding class.

FALSE

An ogive is a graph that plots the cumulative frequency (or the cumulative relative frequency) of each class against the upper limit of the corresponding class.

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.

Topic: Summarizing Quantitative Data

12. A stem-and-leaf diagram is useful in that it gives an overall picture of where quantitative data are centered and how the data are dispersed from the center.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.

Topic: Stem-and-Leaf Diagrams

13. A scatterplot is a graphical tool that helps determine whether or not two quantitative variables are related.

TRUE

AACSB: Analytic

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02-06 Construct and interpret a scatterplot.

Topic: Scatterplots

14. When constructing a scatterplot for two quantitative variables, we usually refer to one variable as x and another one as y . Typically, we graph x on the vertical axis and y on the horizontal axis.

FALSE

When constructing a scatterplot for two quantitative variables, we usually refer to one variable as x and another one as y . Typically, we graph x on the horizontal axis and y on the vertical axis.

AACSB: Analytic

Blooms: Remember

Difficulty: 2 Medium

Learning Objective: 02-06 Construct and interpret a scatterplot.

Topic: Scatterplots

Multiple Choice Questions

15. Frequency distributions may be used to describe which of the following types of data?

- A. Nominal and ordinal data only
- B. Nominal and interval data only
- C. Nominal, ordinal, and interval data only
- D.** Nominal, ordinal, interval, and ratio data

AACSB: Analytic

Blooms: Understand

Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

16. In order to summarize qualitative data, a useful tool is a _____.

- A. Histogram
- B. Frequency distribution**
- C. Stem-and-leaf diagram
- D. All of the above

Histograms and stem-and-leaf diagrams describe quantitative data.

AACSB: Analytic
Blooms: Understand
Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

17. For both qualitative and quantitative data, what is the difference between the relative frequency and the percent frequency?

- A. The relative frequency equals the percent frequency multiplied by 100.
- B. The percent frequency equals the relative frequency multiplied by 100.**
- C. As opposed to the relative frequency, the percent frequency is divided by the number of observations in the data set.
- D. As opposed to the percent frequency, the relative frequency is divided by the number of observations in the data set.

AACSB: Analytic
Blooms: Understand
Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

18. For which of the following data sets will a pie chart be *most* useful?

- A. Heights of high school freshmen
- B. Ambient temperatures in the U.S. Capitol Building
- C. Percentage of net sales by product for Lenovo in 2011**
- D. Growth rates of firms in a particular industry

Only answer C looks at multiple categories of a single qualitative variable, in which the percentage of net sales by product may be meaningfully displayed.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

19. **Exhibit 2-1.** An auto parts chain asked customers to complete a survey rating the chain's customer service as average, above average, or below average. The following shows the results from the survey:

Average	Below Average	Average
Above Average	Above Average	Above Average
Below Average	Average	Average
Below Average	Average	Below Average
Below Average	Below Average	Below Average

Refer to Exhibit 2-1. The proportion of customers that felt the customer service was average is *closest* to _____.

- A. 0.20
- B. 0.33**
- C. 0.46
- D. 0.53

Five of the 15 customers responded with a rating of Average. Thus, $5/15 = 0.33$.

Distractors: Wrong answers include the frequencies in the preceding class and the frequency in the relevant class.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

20. **Exhibit 2-1.** An auto parts chain asked customers to complete a survey rating the chain's customer service as average, above average, or below average. The following shows the results from the survey:

Average	Below Average	Average
Above Average	Above Average	Above Average
Below Average	Average	Average
Below Average	Average	Below Average
Below Average	Below Average	Below Average

Refer to Exhibit 2-1. A rating of Average or Above Average accounted for what number of responses to the survey?

- A. 3
- B. 7
- C. 8**
- D. 10

Five of the customers responded with a rating of Average, while 3 responded with a rating of Above Average. Thus, $5 + 3 = 8$.

Distractors: Wrong answers include the frequencies in the preceding category and the frequency in relevant category.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

21. **Exhibit 2-2.** The following is a list of five of the world's busiest airports by passenger traffic for 2010.

Name	Location	# of Passengers (in millions)
Hartsfield-Jackson	Atlanta, Georgia, United States	89
Capital International	Beijing, China	74
London Heathrow	London, United Kingdom	67
O'Hare	Chicago, Illinois, United States	66
Tokyo	Tokyo, Japan	64

Refer to Exhibit 2-2. The percentage of passenger traffic in the five busiest airports that occurred in Asia is *closest* to _____.

- A. 18%
- B. 21%
- C. 25%
- D. 38%**

74 million passengers flew out of Beijing, 64 million passengers flew out of Tokyo, and there were a total of 360 million passengers: $(74 + 64)/360 = 38.33\%$.

Distractors: Wrong answers include the percent frequencies for Tokyo, China, and Atlanta.

AACSB: Analytic
Blooms: Apply

Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

Topic: Summarizing Qualitative Data

22. **Exhibit 2-2.** The following is a list of five of the world's busiest airports by passenger traffic for 2010.

Name	Location	# of Passengers (in millions)
Hartsfield-Jackson	Atlanta, Georgia, United States	89
Capital International	Beijing, China	74
London Heathrow	London, United Kingdom	67
O'Hare	Chicago, Illinois, United States	66
Tokyo	Tokyo, Japan	64

Refer to Exhibit 2-2. How many more millions of passengers flew out of Atlanta than flew out of Chicago?

- A. 13
- B. 21
- C. 23**
- D. 25

89 million passengers flew out of Atlanta and 66 million passengers flew out of Chicago: $89 - 66 = 23$ million.

Distractors: Wrong answers include the differences between Atlanta and other cities.

AACSB: Analytic
Blooms: Apply

Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

Topic: Summarizing Qualitative Data

23. **Exhibit 2-3.** A city in California spent six million dollars repairing damage to its public buildings in 2010. The following table shows the categories where the money was directed.

Cause	Percent
Termites	22%
Water Damage	6%
Mold	12%
Earthquake	27%
Other	33%

Refer to Exhibit 2-3. How much did the city spend to fix damage caused by mold?

- A. \$360,000
- B. \$720,000**
- C. \$1,440,000
- D. \$1,800,000

Six million dollars was spent in total and 12% of the six million was spent on mold: $\$6,000,000 \times 0.12 = \$720,000$.

Distractors: Wrong answers include the costs for the other categories.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

24. **Exhibit 2-3.** A city in California spent six million dollars repairing damage to its public buildings in 2010. The following table shows the categories where the money was directed.

Cause	Percent
Termites	22%
Water Damage	6%
Mold	12%
Earthquake	27%
Other	33%

Refer to Exhibit 2-3. How much more did the city spend to fix damage caused by termites compared to the damage caused by water?

- A. \$360,000
- B. \$720,000
- C. \$960,000**
- D. \$1,320,000

The city spent 22% on termite damage and 6% on water damage. The difference is 16%. The total dollar value spent on the difference is 16% of six million—that is, $6,000,000 \times 0.16 = 960,000$.

Distractors: Wrong answers include the costs for the difference between other categories.

AACSB: Analytic

Blooms: Apply

Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.

Topic: Summarizing Qualitative Data

25. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What is the most common score given in the evaluations?

- A. 2
- B. 3**
- C. 4
- D. 5

Three occurred nine times and the second most frequent number was five with eight occurrences.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

26. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What percentage of students gave Professor Smith an evaluation higher than 3?

- A. 20%
- B. 30%
- C. 50%**
- D. 80%

Fifteen of the 30 students, or 50%, gave an evaluation of 4 or 5.

Distractors: Wrong answers include the proportion of students who gave an evaluation of less than 3, exactly 3, and 3 or greater.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

27. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What percentage of students gave Professor Smith an evaluation of 2 or less?

- A. 6.7%
- B. 13.3%
- C. 20%**
- D. 80%

6 of the 30 students, or 20%, gave an evaluation of 1 or 2.

Distractors: Wrong answers include the proportion who gave exactly 2, less than 2, and more than 2.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

28. **Exhibit 2-4.** Students in Professor Smith's Business Statistics course have evaluated the overall effectiveness of the professor's instruction on a five-point scale, where a score of 1 indicates very poor performance and a score of 5 indicates outstanding performance. The raw scores are displayed in the accompanying table:

1	4	4	5	5	3	4	3	4	1
5	5	4	4	2	3	3	2	3	3
4	5	5	5	5	3	2	3	3	2

Refer to Exhibit 2-4. What is the relative frequency of the students who gave Professor Smith an evaluation of 3?

- A.** 0.3
- B. 0.5
- C. 9
- D. 15

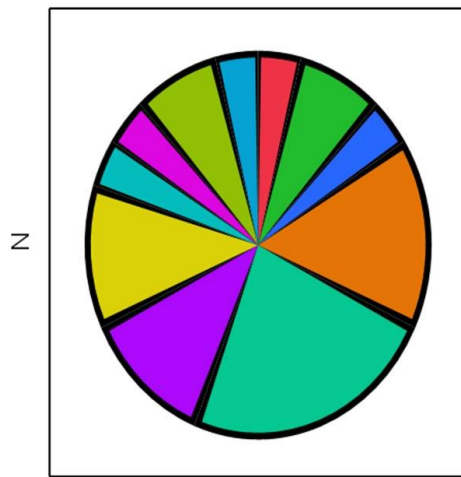
9 of the 30 students gave Professor Smith a 3. The relative frequency is thus $9/30 = 0.3$.

Distractors: Wrong answers include the cumulative frequency, the cumulative relative frequency, and the frequency of students who evaluated Professor Smith as a 3.

AACSB: Analytic
Blooms: Remember
Difficulty: 2 Medium

Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Topic: Summarizing Qualitative Data

29. In the following pie chart representing a collection of cookbooks, which author has more titles?



Cook Book Author

Cook Book Author	 Bobby Flay	 Emeril Lagassi
	 Ina Garten	 Jeff Smith
	 Julia Child	 Paula Deen
	 Rachel Ray	 Rick Bayless
	 Sara Moulton	 Steven Raichlen
	 Sylvia Wood	

- A. Jeff Smith
- B. Julia Child**
- C. Rachel Ray
- D. Paula Deen

The color corresponding to Julia Child has the largest segment in the pie chart.

AACSB: Analytic

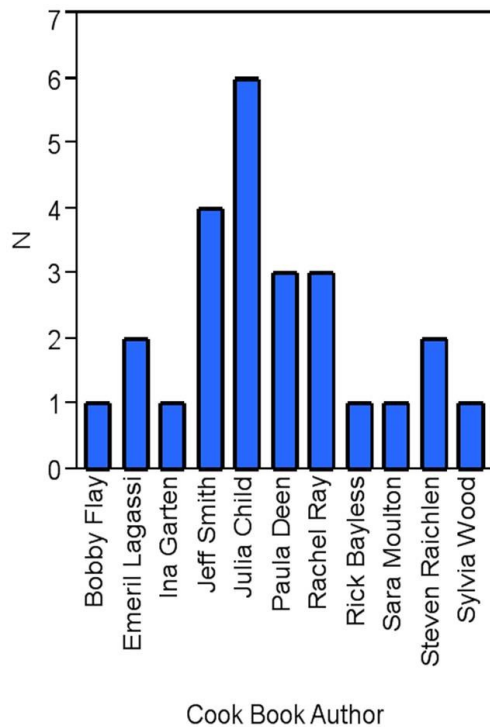
Blooms: Apply

Difficulty: 1 Easy

Learning Objective: 02-02 Construct and interpret pie charts and bar charts.

Topic: Summarizing Qualitative Data

30. The accompanying chart shows the numbers of books written by each author in a collection of cookbooks. What type of chart is this?

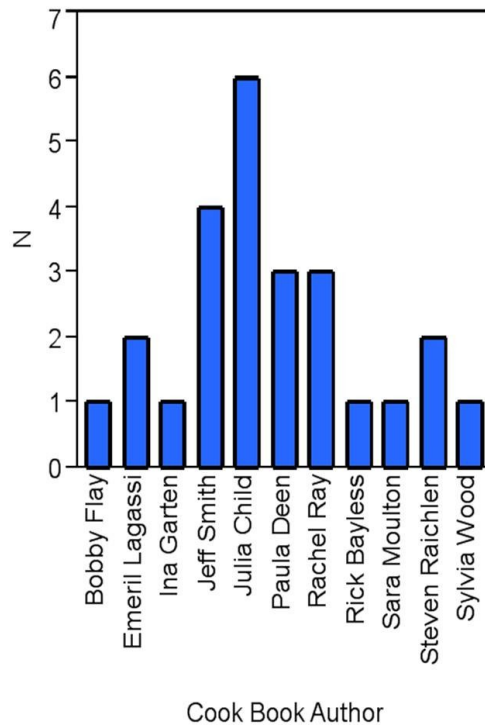


- A.** Bar chart for qualitative data
- B. Bar chart for quantitative data
- C. Frequency histogram for qualitative data
- D. Frequency histogram for quantitative data

The data is qualitative and the chart is a bar chart.

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy
Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

31. The accompanying chart shows the number of books written by each author in a collection of cookbooks. What type of data is being represented?



- A. Quantitative, ordinal
- B. Quantitative, ratio
- C. Qualitative, nominal**
- D. Qualitative, ordinal

The data is qualitative and nominal (no ordering is present in the categories).

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

32. When constructing a frequency distribution for quantitative data, it is important to remember that _____.

- A. Classes are mutually exclusive
- B. Classes are collectively exhaustive
- C. The total number of classes usually ranges from 5 to 20
- D. All of the above**

AACSB: Analytic
Blooms: Remember

33. Which of the following best describes a frequency distribution for qualitative data?
- A. It groups data into histograms and records the proportion (fraction) of observations in each histogram.
 - B.** It groups data into categories and records the number of observations in each category.
 - C. It groups data into intervals called classes and records the proportion (fraction) of observations in each class.
 - D. It groups data into intervals called classes and records the number of observations in each class.

AACSB: Analytic
Blooms: Remember
Difficulty: 2 Medium
Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

34. What graphical tool is *best* used to display the relative frequency of grouped quantitative data?
- A. Ogive
 - B. Pie chart
 - C. Bar chart
 - D.** Histogram

Histograms are used to display the relative frequency of quantitative data. An ogive is used to display the cumulative frequency, while the bar chart and pie chart display qualitative data.

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy
Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

35. **Exhibit 2-5.** The following data represent scores on a pop quiz in a statistics section:

45	66	74	72
62	44	55	70
33	82	56	56
84	16	16	47
32	32	17	37

Refer to Exhibit 2-5. Suppose the data on quiz scores will be grouped into five classes. The width of the classes for a frequency distribution or histogram is *closest* to _____.

- A. 10
- B. 12
- C. 14**
- D. 16

Class width = (Max - Min)/(# of classes) = (84 - 16)/5 = 13.6 $\approx$ 14 (We always round up.)

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

36. **Exhibit 2-5.** The following data represent scores on a pop quiz in a statistics section:

45	66	74	72
62	44	55	70
33	82	56	56
84	16	16	47
32	32	17	37

Refer to Exhibit 2-5. Suppose the data is grouped into 5 classes, and one of them will be "30 up to 44"—that is, $\{x; 30 \leq x < 44\}$. The frequency of this class is _____.

- A. 0.20
- B. 0.25
- C. 4**
- D. 5

There are four data values, which are at least 30 but less than 44. They are 32, 32, 33, and 37.

AACSB: Analytic

37. **Exhibit 2-5.** The following data represent scores on a pop quiz in a statistics section:

45	66	74	72
62	44	55	70
33	82	56	56
84	16	16	47
32	32	17	37

Refer to Exhibit 2-5. Suppose the data is grouped into five classes, and one of them will be "30 up to 44"—that is, $\{x; 30 \leq x < 44\}$. The relative frequency of this class is _____.

- A.** 0.20
- B. 0.25
- C. 4
- D. 5

There are four data values, which are at least 30 but less than 44. They are 32, 32, 33, and 37. So the relative frequency is $4/20 = 0.20$.

38. **Exhibit 2-6.** The following data represent the recent sales price (in \$1,000s) of 24 homes in a Midwestern city.

187	125	165	170
230	139	195	229
239	135	188	210
228	172	127	139
122	181	196	237
115	199	170	239

Refer to Exhibit 2-6. Suppose the data on house prices will be grouped into five classes. The width of the classes for a frequency distribution or histogram is *closest* to _____.

- A. 15
- B. 20
- C. 25**
- D. 30

width of class = (max value - min value)/(# of classes)
Width = $(239 - 115)/5 = 24.8$; so round up to 25.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

39. **Exhibit 2-6.** The following data represent the recent sales price (in \$1,000s) of 24 homes in a Midwestern city.

187	125	165	170
230	139	195	229
239	135	188	210
228	172	127	139
122	181	196	237
115	199	170	239

Refer to Exhibit 2-6. Suppose the data is grouped into five classes, and one of them will be "115 up to 140"—that is, $\{x; 115 \leq x < 140\}$. The relative frequency of this class is _____.

- A. 6/24
- B. 7/24**
- C. 6
- D. 7

There are seven data values, which are at least 115 but less than 140. They are 115, 122, 125, 127, 135, 139, and 139. So the relative frequency of this class is 7/24.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

40. **Exhibit 2-6.** The following data represent the recent sales price (in \$1,000s) of 24 homes in a Midwestern city.

187	125	165	170
230	139	195	229
239	135	188	210
228	172	127	139
122	181	196	237
115	199	170	239

Refer to Exhibit 2-6. Suppose the data is grouped into five classes, and one of them will be "165 up to 190"—that is, $\{x; 165 \leq x < 190\}$. The frequency of this class is ____.

- A. 6/24
- B. 7/24
- C. 6
- D. 7**

There are seven data values, which are at least 165 but less than 190. They are 165, 170, 170, 172, 181, 187, and 188.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

41. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. How many students scored at least 1800 but less than 2000?

- A. 3
- B. 7
- C. 12**
- D. 18

12 students are in the 1800 up to 2000 class.

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

42. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. What percent of students scored less than 2200?

- A. 10%
- B. 20%
- C. 80%
- D.** 90%

27 of the 30 students, or 90%, scored less than 2200.

Distractors: Wrong answers include the percentage of students that scored less than 2000, and the percentage of students that scored more than 2200.

AACSB: Analytic
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

43. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. What is the approximate relative frequency of students who scored more than 1600 but less than 1800?

- A. 0.17
- B. 0.23**
- C. 0.40
- D. 0.77

Seven of the 30 students, or about 0.23, scored between 1600 and 1800.

Distractors: Wrong answers include the proportion of students who scored less than 1600, less than 1800, and more than 1600.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

44. **Exhibit 2-7.** Thirty students at Eastside High School took the SAT on the same Saturday. Their raw scores are given next.

1450	1620	1800	1740	1650	1710	1900	1910	1950	1820
1800	2010	1780	1840	1490	1590	2350	2260	1870	1530
1620	1480	2390	1640	1830	1950	2000	1830	1980	2190

Refer to Exhibit 2-7. Consider a frequency distribution of the data that groups the data in classes of 1400 up to 1600, 1600 up to 1800, 1800 up to 2000, and so on. What graphical tool would you use to display the cumulative relative frequency of the grouped data?

- A.** Ogive
- B. Polygon
- C. Pie Chart
- D. Bar Chart

Ogives are used to display cumulative measures of quantitative data. Polygons are used to display the frequency and relative frequency of quantitative data, while pie charts and bar charts are used to display qualitative data.

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

45. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. The total number of observations in the frequency distribution is _____.

- A. 5
- B. 6
- C. 20**
- D. 24

Sum the frequency column to obtain the total number of observations in the frequency distribution, or 20.

Distractors: Wrong answers include the number of classes and the frequency in one of the classes.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

46. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. How many observations are at least 15 but less than 18?

- A. 3
- B. 4
- C. 5
- D. 6**

There are six observations in the class 15 up to 18.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

47. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. How many observations are less than 21?

- A. 6
- B. 12**
- C. 18
- D. 24

We sum the frequencies in the first three columns: $3 + 6 + 3 = 12$.

AACSB: Analytic

48. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. What proportion of the observations are at least 15 but less than 18?

- A. 0.20
- B. 0.25
- C. 0.30**
- D. 0.35

Six observations of the 20 total observations fall in the class of 15 up to 18: $6/20 = 0.30$.

49. **Exhibit 2-8.** Consider the following frequency distribution.

Class	Frequency
12 up to 15	3
15 up to 18	6
18 up to 21	3
21 up to 24	4
24 up to 27	4

Refer to Exhibit 2-8. What proportion of the observations are less than 21?

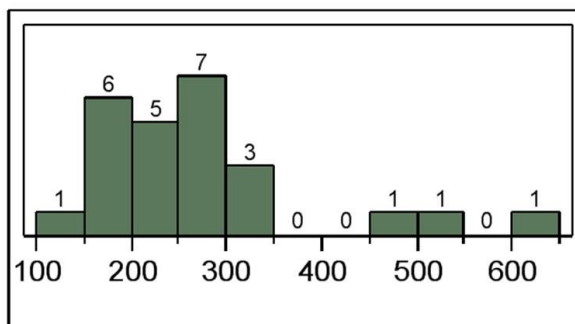
- A. 0.30
B. 0.60
C. 0.90
D. 1

We sum the frequencies in the first three columns and then divide by 20: $(3 + 6 + 3)/20$.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

50. The following histogram represents the number of pages in each book within a collection. What is the frequency of books containing at least 250 but less than 300 pages?

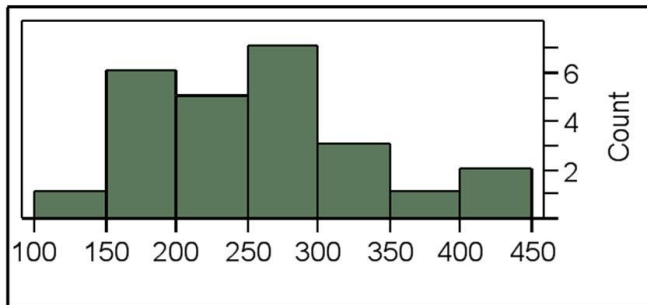


- A. 5
B. 6
C. 7
D. 12

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

51. The following histogram represents the number of pages in each book within a collection. What is the frequency of books containing at least 200 but less than 250 pages?



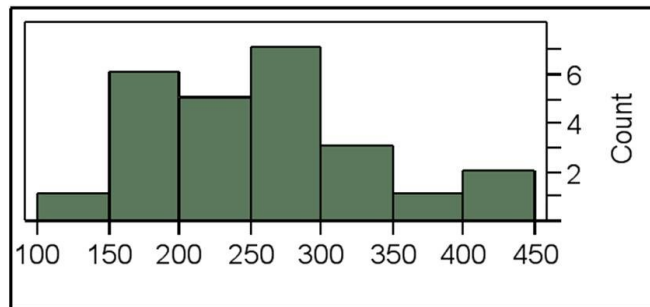
- A. 4
- B. 5**
- C. 6
- D. 7

Distractors: Wrong answers include frequencies in other classes.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

52. The following histogram represents the number of pages in each book within a collection. What is the frequency of books containing at least 250 but less than 400 pages?



- A. 7
- B. 10
- C. 11**
- D. 12

Add the frequencies, 7, 3, and 1, for the classes 250 up to 300, 300 up to 350, and 350 up to 400.

Distractors: Wrong answers include frequency of a class and sum of frequencies in two classes.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

53. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The number of stocks with returns of 0% up to 10% is _____.

- A. 2
- B. 8
- C. 15
- D. 25**

Distractors: Wrong answers include the frequencies in the other classes.

AACSB: Analytic

Blooms: Apply

Difficulty: 1 Easy

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.

Topic: Summarizing Quantitative Data

54. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The number of stocks with returns of less than 10% is _____.

- A. 8
- B. 25
- C. 33**
- D. 48

$$8 + 25 = 33$$

Distractors: Wrong answers include the frequencies in preceding class and frequency in relevant class.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

55. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The proportion of stocks with returns of 0% up to 10% is _____.

- A. 0.30
- B. 0.50**
- C. 0.66
- D. 0.80

$$25/50 = 0.50$$

Distractors: Wrong answers include the relative frequency in the preceding class and the cumulative relative frequency of the respective class.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

56. **Exhibit 2-9.** An analyst constructed the following frequency distribution on the monthly returns for 50 selected stocks:

Class (in percent)	Frequency
-10 up to 0	8
0 up to 10	25
10 up to 20	15
20 up to 30	2

Refer to Exhibit 2-9. The proportion of stocks with returns of less than 10% is ____.

- A. 0.30
- B. 0.50
- C. 0.66**
- D. 0.80

$$(8 + 25)/50 = 0.66$$

Distractors: Wrong answers include the relative frequencies in the preceding class and the respective class.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

57. **Exhibit 2-10.** Automobiles traveling on a road with a posted speed limit of 65 miles per hour are checked for speed by a state police radar system. The following table is a frequency distribution of speeds.

Speed (miles per hour)	Frequency
45 up to 55	50
55 up to 65	325
65 up to 75	275
75 up to 85	25

Refer to Exhibit 2-10. How many of the cars traveled less than 75 miles per hour?

- A. 275
- B. 325
- C. 650**
- D. 675

$$275 + 325 + 50 = 650$$

Distractors: Wrong answers include the frequency in the respective class, the frequency in the preceding class, and the total number of observations.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

58. **Exhibit 2-10.** Automobiles traveling on a road with a posted speed limit of 65 miles per hour are checked for speed by a state police radar system. The following table is a frequency distribution of speeds.

Speed (miles per hour)	Frequency
45 up to 55	50
55 up to 65	325
65 up to 75	275
75 up to 85	25

Refer to Exhibit 2-10. What proportion of the cars traveled at least 55 but less than 65 miles per hour?

- A. 0.33
- B. 0.48**
- C. 0.56
- D. 0.80

$$325/675 = 0.48$$

Distractors: Wrong answers include the relative frequency in the preceding class and the cumulative relative frequency of the relevant class.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

59. **Exhibit 2-10.** Automobiles traveling on a road with a posted speed limit of 65 miles per hour are checked for speed by a state police radar system. The following table is a frequency distribution of speeds.

Speed (miles per hour)	Frequency
45 up to 55	50
55 up to 65	325
65 up to 75	275
75 up to 85	25

Refer to Exhibit 2-10. When using a polygon to graph quantitative data, what does each point represent?

- A. The lower limit of a particular class and its width
- B. The midpoint of a particular class and its associated frequency or relative frequency**
- C. The midpoint of a particular class and its associated cumulative frequency or cumulative relative frequency
- D. The upper limit of a particular class and its associated cumulative frequency or cumulative relative frequency

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

60. The accompanying table shows students' scores from the final exam in a history course.

Scores	Cumulative Frequency
50 up to 60	12
60 up to 70	33
70 up to 80	64
80 up to 90	88
90 up to 100	100

How many of the students scored at least 70 but less than 90?

- A. 24
- B. 31
- C. 55**
- D. 88

Eighty-eight students scored less than 90, and 33 students scored less than 70. The total that scored at least 70 but less than 90 equals the number that scored less than 90 minus the number that scored less than 70: $88 - 33 = 55$.

Distractors: Wrong answers include totals for the other categories.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

61. The following table shows the number of payroll jobs the government added during the years its added jobs (since 1973). The jobs are in thousands.

Gov Jobs Added	Frequency
100 up to 200	5
200 up to 300	8
300 up to 400	7
400 up to 500	5
500 up to 600	1

Approximately what percent of the time did the government add 200,000 or more jobs?

- A. 19%
- B. 50%
- C. 77%
- D.** 81%

Sum the frequency of the intervals 200 up to 300, 300 up to 400, and so on, and divide by the total of 26: $(8 + 7 + 5 + 1)/26 = 21/26 \approx 0.81$ or 81%.

Distractors: Wrong answers include jobs added for other categories.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Topic: Summarizing Quantitative Data

62. **Exhibit 2-11.** The accompanying relative frequency distribution represents the last year car sales for the sales force at Kelly's Mega Used Car Center.

Car Sales	Relative Frequency
35 up to 45	0.07
45 up to 55	0.15
55 up to 65	0.31
65 up to 75	0.22
75 up to 85	0.25

Refer to Exhibit 2-11. If Kelly's employs 100 salespeople, how many of these salespeople have sold at least 35 but less than 45 cars in the last year?

- A. 5
- B. 7**
- C. 10
- D. 15

$$0.07(100) = 7 \text{ employees}$$

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

63. **Exhibit 2-11.** The accompanying relative frequency distribution represents the last year car sales for the sales force at Kelly's Mega Used Car Center.

Car Sales	Relative Frequency
35 up to 45	0.07
45 up to 55	0.15
55 up to 65	0.31
65 up to 75	0.22
75 up to 85	0.25

Refer to Exhibit 2-11. If Kelly's employs 100 salespeople, how many of these salespeople have sold at least 45 but less than 65 cars in the last year?

- A. 15
- B. 31
- C. 40
- D.** 46

$(0.15 + 0.31)100 = 46$ employees.

Distractors: Wrong answers include relative frequencies of two classes times 100.

AACSB: Analytic
Blooms: Apply

Difficulty: 2 Medium

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

64. **Exhibit 2-11.** The accompanying relative frequency distribution represents the last year car sales for the sales force at Kelly's Mega Used Car Center.

Car Sales	Relative Frequency
35 up to 45	0.07
45 up to 55	0.15
55 up to 65	0.31
65 up to 75	0.22
75 up to 85	0.25

Refer to Exhibit 2-11. If Kelly's employs 100 salespeople, how many of these salespeople have sold at least 65 cars in the last year?

- A. 22
- B. 25
- C. 31
- D. 47**

$(0.22 + 0.25)100 = 47$ employees.

Distractors: Wrong answers include relative frequencies of two classes times 100.

AACSB: Analytic
Blooms: Remember
Difficulty: 2 Medium

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

65. When displaying quantitative data, what is an ogive used to plot?

- A. Frequency or relative frequency of each class against the midpoint of the corresponding class
- B. Cumulative frequency or cumulative relative frequency of each class against the upper limit of the corresponding class**
- C. A and B
- D. None of the above

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

66. How does an ogive differ from a polygon?

- A. An ogive is used for qualitative data, while a polygon is used for quantitative data.
- B. An ogive is used for quantitative data, while a polygon is used for qualitative data.
- C. An ogive is a graphical depiction of a frequency or relative distribution, while a polygon is a graphical depiction of a cumulative frequency or cumulative relative frequency distribution.
- D.** An ogive is a graphical depiction of a cumulative frequency or cumulative relative frequency distribution, while a polygon is a graphical depiction of a frequency or relative frequency distribution.

AACSB: Analytic

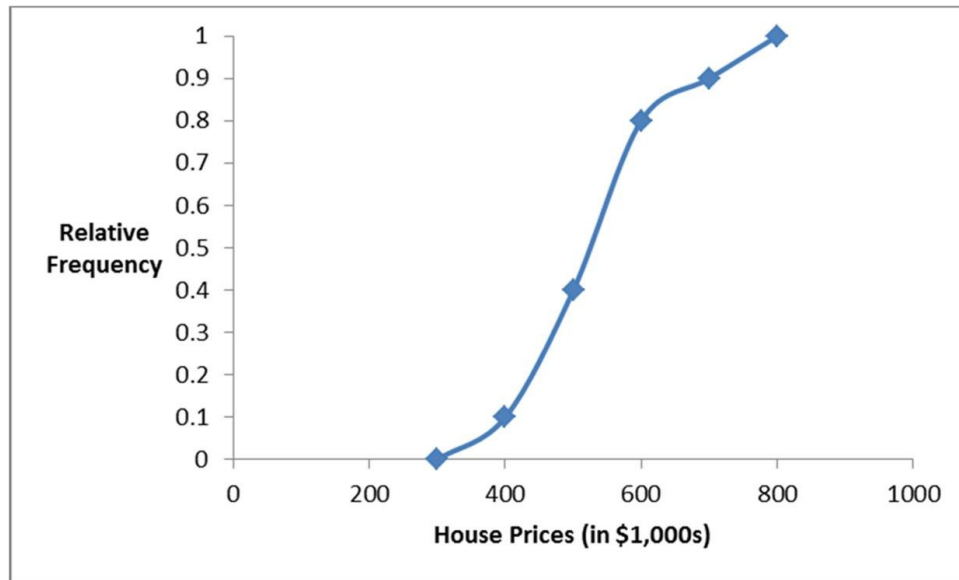
Blooms: Understand

Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.

Topic: Summarizing Qualitative Data

67. **Exhibit 2-12.** Recent home sales in a suburb of Washington, D.C. are shown in the accompanying ogive.



Refer to Exhibit 2-12. Approximate the percentage of houses that sold for less than \$600,000.

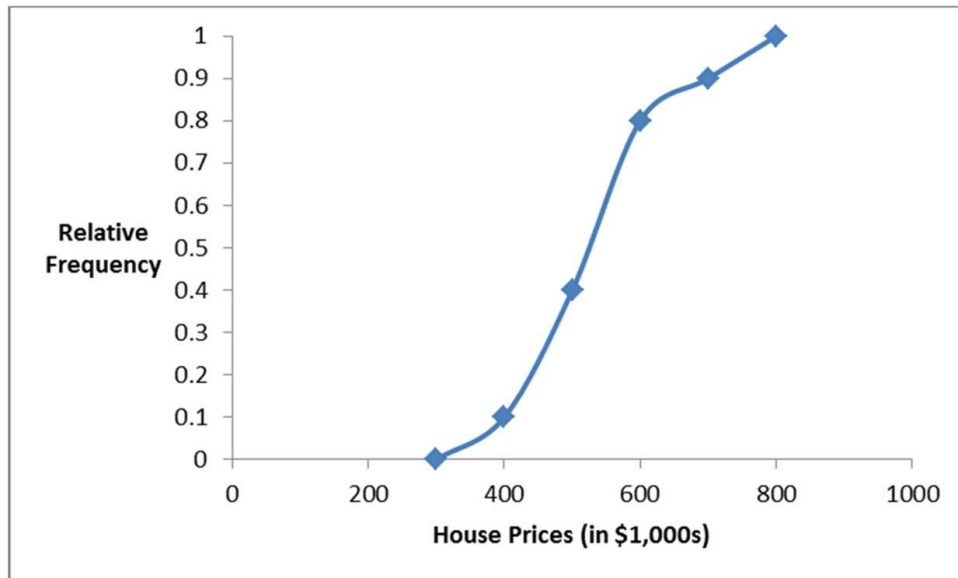
- A. 60%
- B. 70%
- C. 80%**
- D. 90%

Draw a vertical line from the tick mark for 600 on the x axis, this crosses the ogive at approximately 0.8.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

68. **Exhibit 2-12.** Recent home sales in a suburb of Washington, D.C. are shown in the accompanying ogive.



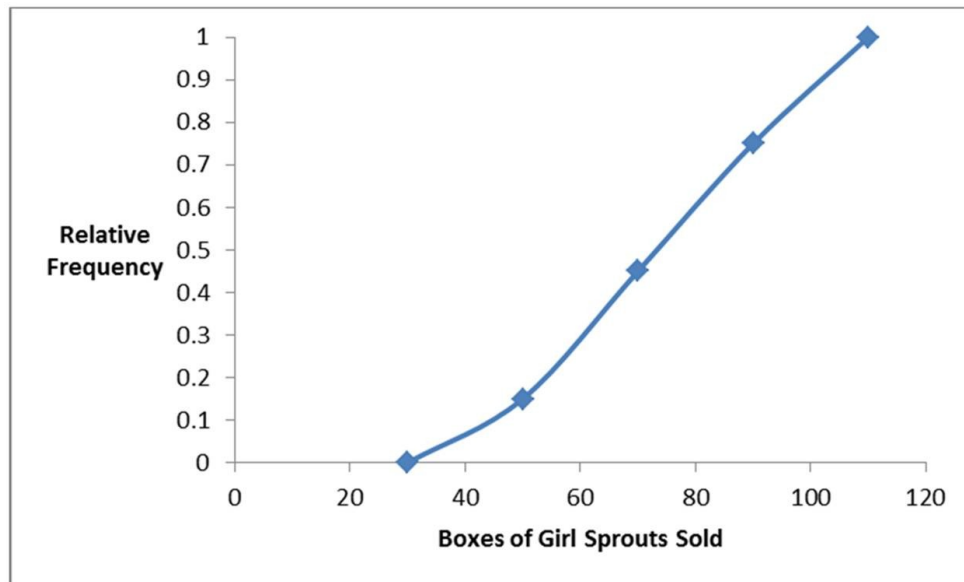
Refer to Exhibit 2-12. Approximate the percentage of houses that sold for more than \$500,000.

- A. 40%
- B. 50%
- C. 60%**
- D. 70%

Draw a vertical line from about 500 on the x axis, this crosses the ogive at approximately 0.4. So about 40% of the houses sold for less than \$500,000, which implies that about 60% sold for more than \$500,000.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

69. **Exhibit 2-13.** The organization of the Girl Sprouts has completed its annual cookie drive. The sales are reported in the accompanying ogive.



Refer to Exhibit 2-13. Approximate the percentage of girls who sold less than 90 boxes of cookies.

- A. 45%
- B. 55%
- C. 65%
- D. 75%**

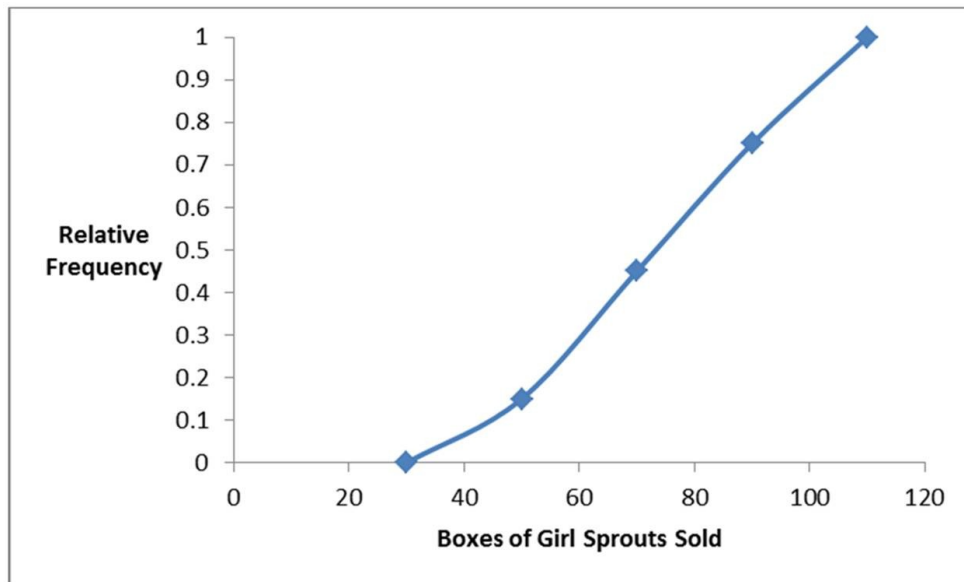
Draw a vertical line from the approximate location for 90 on the x axis, this crosses the ogive at approximately 0.75.

AACSB: Analytic
Blooms: Apply

Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

70. **Exhibit 2-13.** The organization of the Girl Sprouts has completed its annual cookie drive. The sales are reported in the accompanying ogive.



Refer to Exhibit 2-13. Approximate the percentage of girls who sold more than 70 boxes of cookies.

- A. 45%
- B. 55%**
- C. 65%
- D. 75%

Draw a vertical line from the approximate location for 70 on the x axis, this crosses the ogive at approximately 0.45; so about 45% of the Girl Sprouts sold less than 70 boxes, which implies that about 55% of the Girl Sprouts sold more than 70 boxes.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

71. A stem-and-leaf diagram is constructed by separating each value of a data set into two parts. What are these parts?

- A. Stem consisting of the last digit and leaf consisting of the leftmost digits.
- B. Stem consisting of the leftmost digits and leaf consisting of the second digit.
- C. Stem consisting of the second digit and leaf consisting of the last digit.
- D. Stem consisting of the leftmost digits and leaf consisting of the last digit.**

AACSB: Analytic
Blooms: Remember
Difficulty: 1 Easy

Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

72. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. Which of the following numbers appears in the stem-and-leaf diagram?

- A. 3800
- B. 380
- C. 38**
- D. 3.8

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

73. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. What would be the frequency of the class 35 up to 45, that is $\{x; 35 \leq x < 45\}$?

- A. 0
- B. 1
- C. 2
- D.** 3

The observations in this class would be 38, 42, and 42.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

74. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. How many values are at least 25 but less than 35?

- A. 10
- B. 11**
- C. 12
- D. 13

These values are 25, 26, 26, 28, 28, 28, 29, 30, 31, 32, and 32.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

75. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. Find the frequency associated with data values that are more than 28.

- A. 8**
- B. 9
- C. 10
- D. 11

These values are 29, 30, 31, 32, 32, 38, 42, and 42.

AACSB: Analytic

76. **Exhibit 2-14.** In the accompanying stem-and-leaf diagram, the values in the stem and leaf portions represent 10s and 1s digits, respectively.

Stem	Leaf
1	3 5 6 8 8 9
2	0 1 2 2 3 5 6 6 8 8 8 9
3	0 1 2 2 8
4	2 2

Refer to Exhibit 2-14. The stem-and-leaf diagram shows that the distribution is _____.

- A. Symmetric
- B. Positively skewed**
- C. Negatively skewed
- D. None of the above

A stem-and-leaf diagram is basically a histogram on its side. When turned, it reveals a distribution with a few extreme values to the right. Thus, it is positively skewed.

77. The following stem-and-leaf diagram shows the speeds in miles per hour (mph) of 14 cars approaching a toll booth on a bridge in Oakland, California.

Stem	Leaf
2	5 6 6 7 9
3	4 7 7 8 9
4	0 0 2 3

How many of the cars were traveling faster than 25 mph but slower than 40 mph?

- A. 8
- B. 9**
- C. 10
- D. 12

26, 26, 27, 29, 34, 37, 37, 38, 39

Distractors: Wrong answers include one more, one less, and the total, including 25 and 40.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

78. The following stem-and-leaf diagram shows the last 20 dividend payments (in cents) paid by Proctor and Gamble.

Stem	Leaf
3	1 5 5 5 5
4	0 0 0 0 4 4 4 4 8 8 8
5	3 3 3

The most common dividend payment is ____.

- A. 0.35
- B. 0.40
- C. 0.44**
- D. 0.48

Proctor and Gamble paid dividend payments of 0.44 five times.

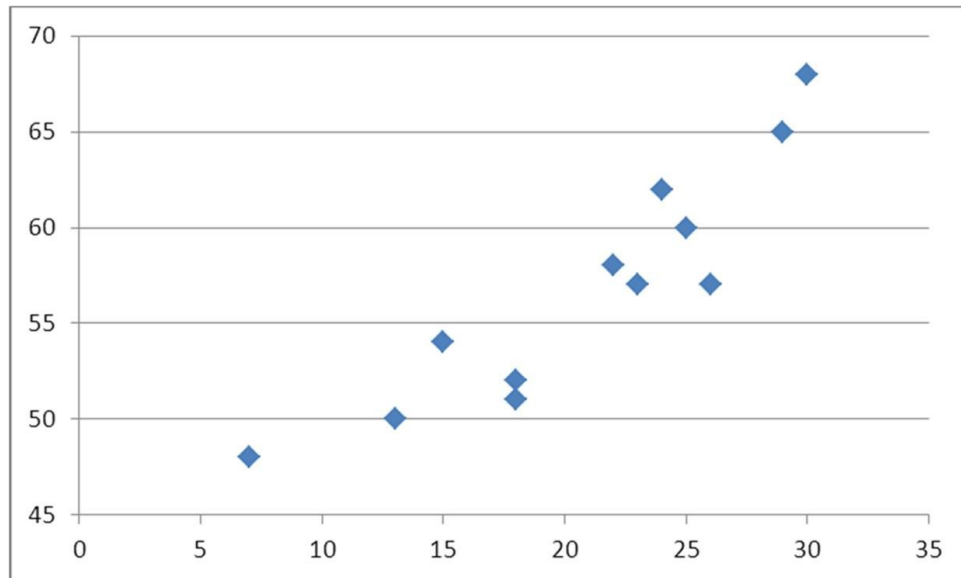
Distractors: Other wrong answers include other dividend payments.

AACSB: Analytic
Blooms: Apply

79. What may be revealed from a scatterplot?
- A. No relationship between two variables
 - B. A linear relationship between two variables
 - C. A curvilinear relationship between two variables
 - D.** All of the above

All of the relationships mentioned may be seen in a scatterplot. The relationships may also be categorized as positive or negative.

80. What type of relationship is indicated in the scatterplot?

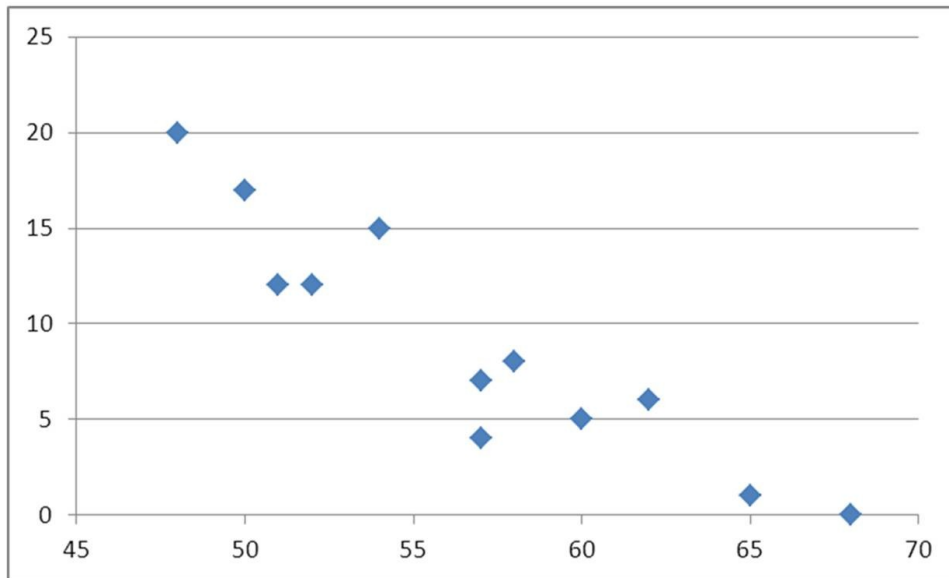


- A. No relationship
- B. A negative linear relationship
- C. A negative curvilinear relationship
- D.** A positive linear or curvilinear relationship

When looking at the plotted points, the variables have a positive relationship (y tends to increase as x increases), and the relationship appears linear or slightly curvilinear.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy
Learning Objective: 02-06 Construct and interpret a scatterplot.
Topic: Scatterplots

81. What type of relationship is indicated in the scatterplot?

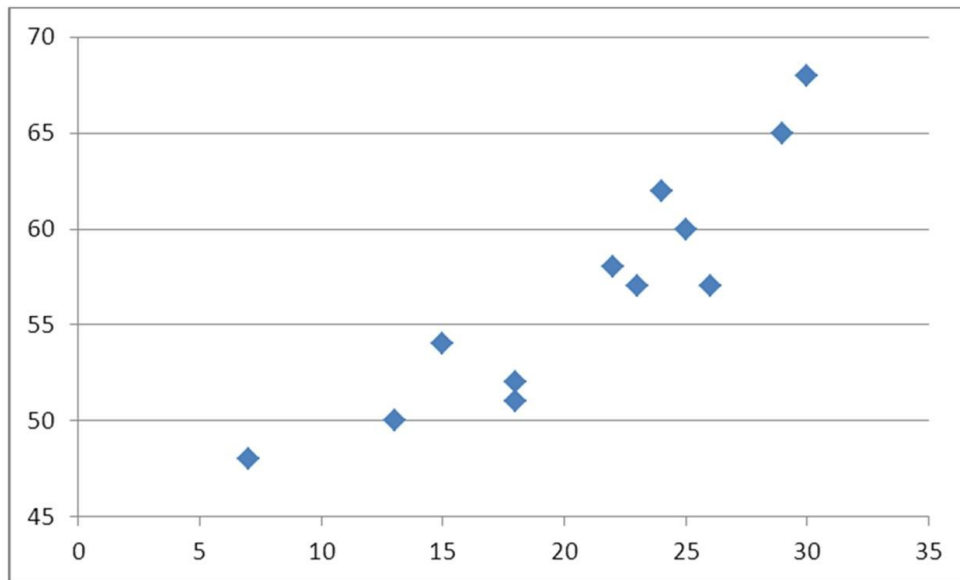


- A. No relationship
- B. A negative linear relationship**
- C. A positive linear relationship
- D. A positive curvilinear relationship

When looking at the plotted points, the variables have a negative relationship (y tends to decrease as x increases), and the relationship looks linear.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy
Learning Objective: 02-06 Construct and interpret a scatterplot.
Topic: Scatterplots

82. What type of relationship is indicated in the scatterplot?



- A. No relationship
- B. A negative linear relationship
- C. A negative curvilinear relationship
- D.** A positive linear or curvilinear relationship

When looking at the plotted points, the variables have a positive relationship (y tends to increase as x increases), and the relationship looks linear or curvilinear.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy
Learning Objective: 02-06 Construct and interpret a scatterplot.
Topic: Scatterplots

83. Use the following data to construct a scatterplot. What type of relationship is implied?

x	3	6	10	14	18	23
y	34	28	20	12	5	0

- A. No relationship
- B. A positive relationship
- C. A negative relationship**
- D. Not enough information to answer

As x increases, y decreases. Therefore, the data have a negative relationship.

AACSB: Analytic
Blooms: Analyze
Difficulty: 2 Medium
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Scatterplots

84. Use the following data to construct a scatterplot. What type of relationship is implied?

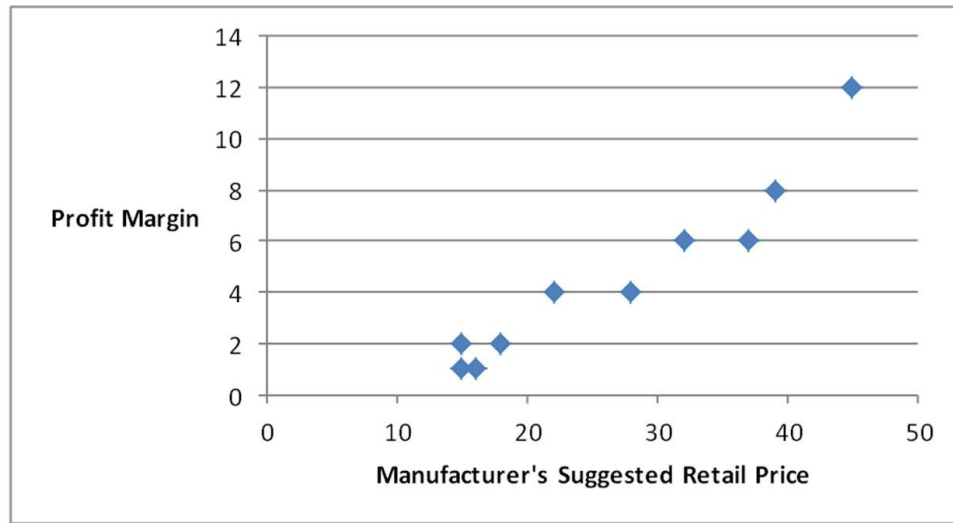
x	1	5	9	14	18	23
y	2	4	7	12	15	20

- A. No relationship
- B. A positive relationship**
- C. A negative relationship
- D. Not enough information to answer

As x increases, y increases. Therefore, the data have a positive relationship.

AACSB: Analytic
Blooms: Remember
Difficulty: 2 Medium
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Scatterplots

85. A car dealership created a scatterplot showing the manufacturer's retail price and profit margin for the cars they have on their lot.



As the manufacturer's suggested retail price increases, the profit margin tends to...

- A.** Increase
- B. Decrease
- C. Stay the same
- D. None of the above

The graph shows that the higher the MSRP, the higher the Profit Margin.

Distractors: All plausible answers.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Scatterplots

Essay Questions

86. A survey of 400 unemployed people was completed at a job fair. Each person was asked to categorize their job interests. The accompanying relative frequency distribution was constructed.

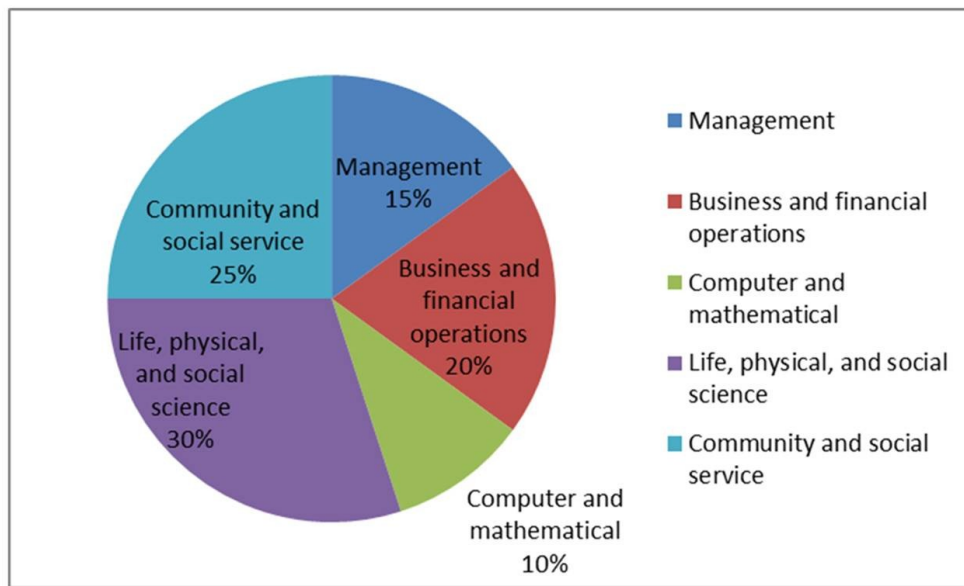
Field	Relative Frequency
Management	0.15
Business and financial operations	0.20
Computer and mathematical	0.10
Life, physical, and social science	0.30
Community and social service	0.25

- a. Construct the corresponding frequency distribution. How many of these people designated that the computer and mathematical industry was their job interest?
b. Construct a pie chart.

- a. See the table below for frequency distribution. Forty people designated that the computer and mathematical field was their job interest.

Field	Relative Frequency	Frequency
Management	0.15	60
Business and financial operations	0.20	80
Computer and mathematical	0.10	40
Life, physical, and social science	0.30	120
Community and social service	0.25	100

- b.



Feedback: In order to construct the frequency distribution, multiply each relative frequency by 400, the sample size. For the pie chart, each segment corresponds to the relative frequency for each job category.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy
Learning Objective: 02-01 Summarize qualitative data by forming frequency distributions.
Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

87. A hair stylist records the hair color of her 25 most recent appointments, classifying the color as blonde, brown, black, or red. Her data set is displayed next.

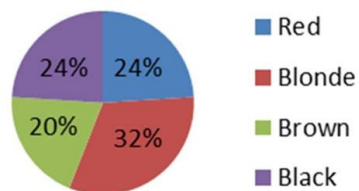
Red	Blonde	Black	Red	Blonde
Blonde	Black	Blonde	Red	Blonde
Brown	Black	Red	Blonde	Brown
Brown	Red	Black	Black	Red
Brown	Black	Brown	Blonde	Blonde

- Construct a frequency and relative frequency distribution of the hair color of the stylist's customers.
- Construct a pie chart. Which hair color is the most common among the stylist's customers?
- Create a bar chart to display the frequency distribution. How many customers had black hair?

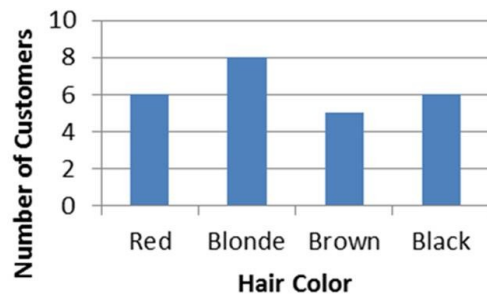
a.

Hair Color	Frequency	Relative Frequency
Black	6	0.24
Blonde	8	0.32
Brown	5	0.20
Red	6	0.24

- b. The most common hair color is blonde.



- c. Six customers have black hair.



Feedback: In order to construct a pie chart in Excel, select both columns of data, and then select **Insert > Pie > 2-D Pie**. Choose the option at the top left. In order to construct a bar chart in Excel, select both columns of data, and then select **Insert > Column > 2-D Column**. Choose the option at the top left. See instructions in text for other formatting options.

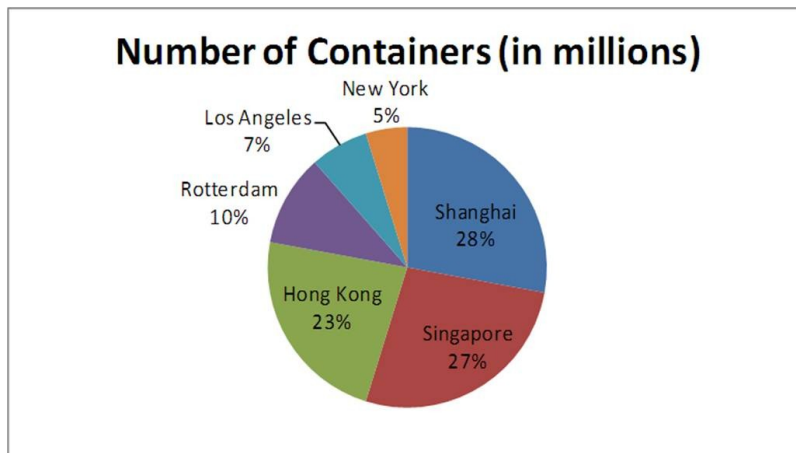
AACSB: Analytic
Blooms: Create
Difficulty: 2 Medium
Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

88. The following table lists some of the busiest ports in the world based on the number of containers in 2010.

Location of Port	Number of Containers (in millions)
Shanghai	29
Singapore	28
Hong Kong	24
Rotterdam	11
Los Angeles	7
New York	5

Construct a pie chart to summarize the data. Approximately what percent of the total number of containers go through Hong Kong?

23% of the containers traveled through Hong Kong.

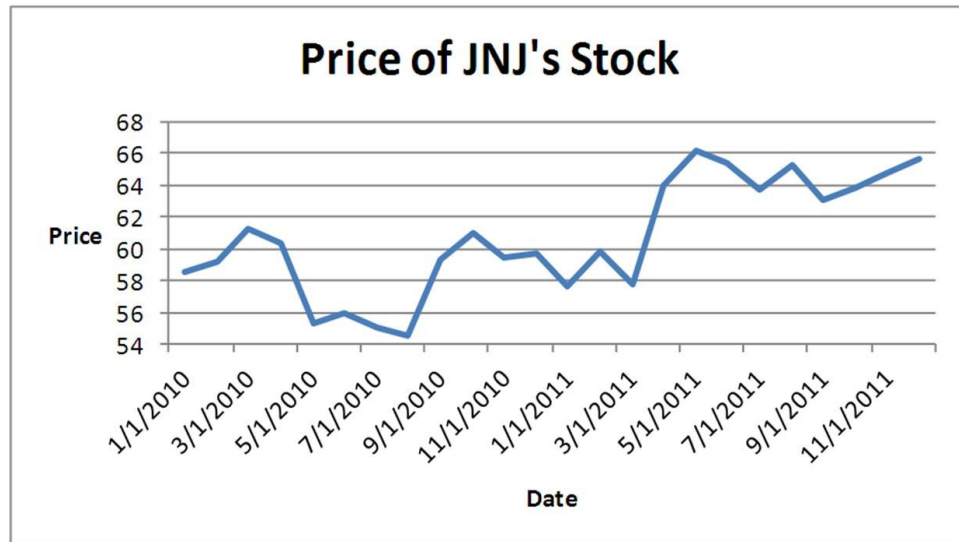


Feedback: In order to construct a pie chart in Excel, select both columns of data, and then select **Insert > Pie > 2-D Pie**. Choose the option at the top left. See instructions in the text for other formatting options. Twenty-four million out of 104 million containers went through Hong Kong. $24/104 = 23\%$.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

89. Johnson and Johnson (JNJ) is a consumer staples company. Consumer staples are products people need and buy even during times of financial hardship. Do you think JNJ will have a volatile stock price? Does the accompanying graph accurately depict the volatility of JNJ stock? Explain.



Consumer staples companies tend to have stable stocks. No the graph does not accurately depict the volatility of JNJ stock. The vertical axis starts at 54 and should start at zero.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-02 Construct and interpret pie charts and bar charts.
Topic: Summarizing Qualitative Data

90. Each month the Bureau of Labor Statistics reports the number of people (in thousands) employed in the United States by age. The accompanying frequency distribution shows the results for August 2011 (Source: <http://data.bls.gov/pdq/SurveyOutputServlet>).

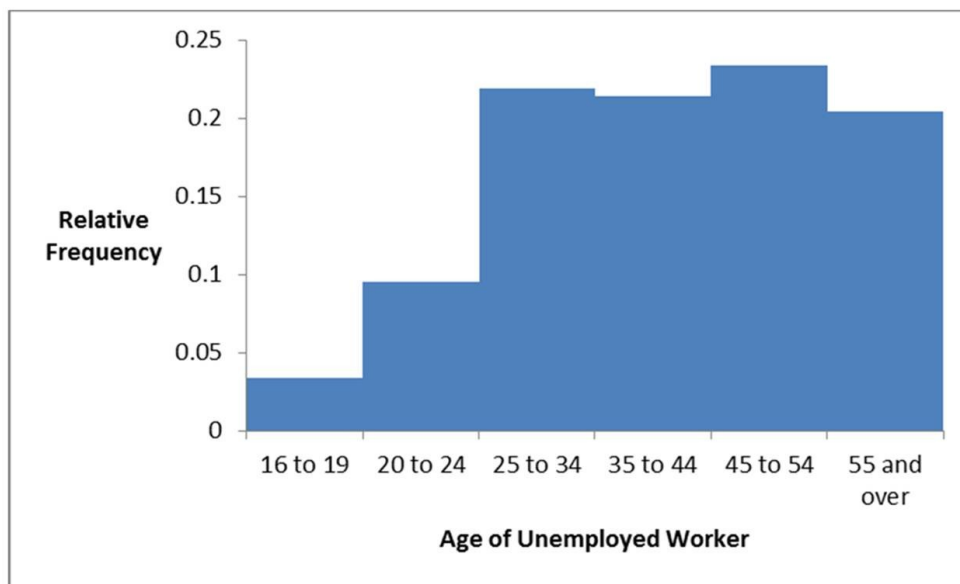
Age	Frequency
16 to 19	4794
20 to 24	13273
25 to 34	30789
35 to 44	30021
45 to 54	32798
55 and over	28660

- Construct a relative frequency distribution. What proportion of workers is between 20 and 24 years old?
- Construct a cumulative relative frequency distribution. What proportion of workers is younger than 35 years old?
- Construct a relative frequency histogram.

- See the accompanying table; 0.095.
- See the accompanying table; 0.348.

Age	Frequency	Relative Frequency	Cumulative Relative Frequency
16 to 19	4794	0.034	0.034
20 to 24	13273	0.095	0.129
25 to 34	30789	0.219	0.348
35 to 44	30021	0.214	0.562
45 to 54	32798	0.234	0.796
55 and over	28660	0.204	1

c.



Feedback: First find the total number of people surveyed by summing the frequency column ($n = 140,335$).

- In order to find the relative frequency for each class, divide each class's frequency by n ; so the proportion of workers that are between 20 to 24 years old is $13,273/140,335 = 0.095$.
- In order to find the cumulative relative frequency for each class, take each class's relative frequency and add it to the preceding relative frequencies. So the proportion of workers that are younger than 35 years old is $0.034 + 0.095 + 0.219 = 0.348$.
- In order to construct a relative frequency histogram by hand, let the width of each rectangle equal the width of the class, and its height equal the corresponding relative frequency. In order to construct a relative frequency histogram in Excel, put the class column and the relative frequency column next to one another in the spreadsheet. Select both columns simultaneously and then choose **Insert > Column > 2-D Column**. Choose the option at the top left. See instructions in the text for other formatting options.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

91. The following table displays the top 40 American League batting averages of the 2011 season.

Player	Batting Average	Player	Batting Average
Miguel Cabrera	0.344	Yunel Escobar	0.290
Adrian Gonzalez	0.338	Vladimir Guerrero	0.290
Michael Young	0.338	Alberto Callaspo	0.288
Victor Martinez	0.33	Howard Kendrick	0.285
Jacoby Ellsbury	0.321	Jeff Francoeur	0.285
David Ortiz	0.309	Nick Markakis	0.284
Dustin Pedroia	0.307	Michael Cuddyer	0.284
Casey Kotchman	0.306	Adam Jones	0.280
Melky Cabrera	0.305	Elvis Andrus	0.279
Alex Gordon	0.303	Erick Aybar	0.279
Jose Bautista	0.302	Juan Pierre	0.279
Robinson Cano	0.302	Matt Joyce	0.277
Paul Konerko	0.300	Asdrubal Cabrera	0.273
Jhonny Peralta	0.299	Edwin Encarnacion	0.272
Josh Hamilton	0.298	Ichiro Suzuki	0.272
Derek Jeter	0.297	Peter Bourjos	0.271
Adrian Beltre	0.296	J.J. Hardy	0.269
Alex Avila	0.295	Alexei Ramirez	0.269
Eric Hosmer	0.293	Ben Zobrist	0.269
Billy Butler	0.291	Delmon Young	0.268

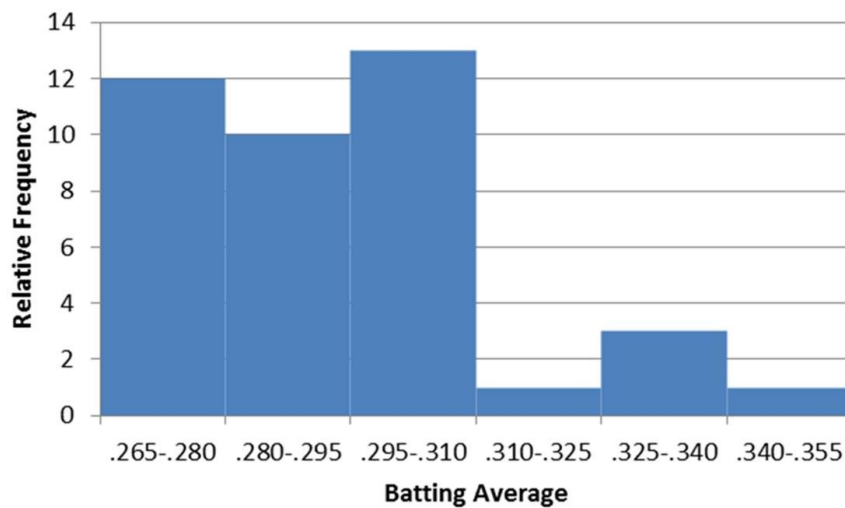
Source: <http://www.espn.com>

- Construct frequency, relative frequency, and cumulative relative frequency distributions that group the data in classes of 0.265 up to 0.280, 0.280 up to 0.295, 0.295 up to 0.310, and so on.
- How many of these players have a batting average above 0.340? What proportion of these players has a batting average of at least 0.280, but below 0.295? What percentage of these players has a batting average below 0.325?
- Construct a relative frequency histogram. Is the distribution symmetric? If not, is it positively or negatively skewed?
- Construct an ogive.
- Using the ogive, approximately what proportion of the players in this group has a batting average above 0.290?

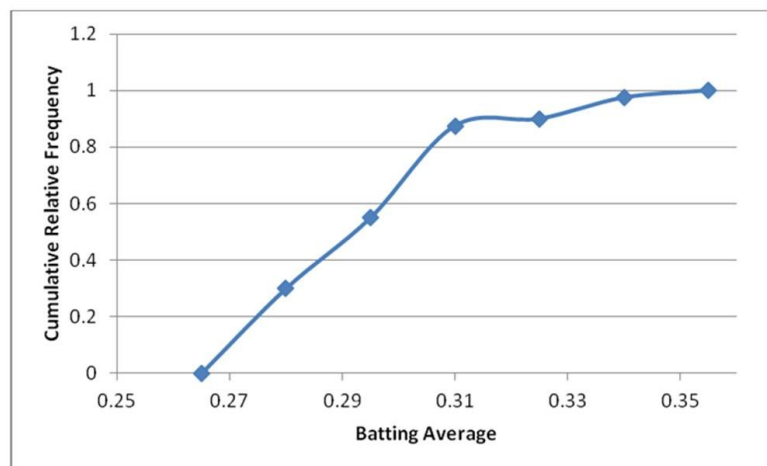
a.

Batting Average	Frequency	Relative Frequency	Cumulative Relative Frequency
0.265–0.280	12	0.30	0.3
0.280–0.295	10	0.25	0.55
0.295–0.310	13	0.325	0.875
0.310–0.325	1	0.025	0.9
0.325–0.340	3	0.075	0.975
0.340–0.355	1	0.025	1

- b. One player has a batting average above 0.340; 0.25 of the players have a batting average of at least 0.280 but less than 0.295; 90% of the players have batting averages below 0.325.
c. The distribution is not symmetric; it is positively skewed.



d.



e. Approximately 0.55

Feedback: a. To construct the frequency distribution, count the number of players whose batting average falls in each class. To construct a relative frequency distribution, divide the frequency of each class by the total number of observations (in this case, 40). To construct the cumulative relative frequency distribution, take the relative distribution and add it to the preceding class's cumulative relative frequency. For the lowest class, the cumulative relative frequency is simply the relative frequency of that class.

b. Use the distributions computed in part a. to answer these questions.

c. Since the distribution has a tail toward the right, we are able to say that it is positively skewed. In order to construct a relative frequency histogram by hand, let the width of each rectangle equal the width of the class, and its height equal the corresponding relative frequency. In order to construct a relative frequency histogram in Excel, put the class column and the relative frequency column next to one another in the spreadsheet. Select both columns simultaneously and then choose **Insert > Column > 2-D Column**. Choose the option at the top left. See instructions in the text for other formatting options.

d. To construct an ogive in Excel, create a table with two columns. In the left column, put the upper limit of each class, and in the right column put the cumulative relative frequency or cumulative percent frequency. In the first row of this table, insert the lower bound of the first class in the left column and a 0 in the right column. Select both columns simultaneously and then choose **Insert > Scatter** and pick the option given at the top right (a scatterplot with a smooth line connecting the points).

e. Draw a vertical line up from .290 on the horizontal axis of the ogive. This intersects the ogive at about 0.45, so about 45% of this group of players has a batting average less than .290. Therefore, about 55% has a batting average greater than .290.

AACSB: Analytic

Blooms: Apply

Difficulty: 3 Hard

Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.

Topic: Summarizing Quantitative Data

92. The following table shows analyst sentiment ratings for the 30 stocks listed in the Dow Jones Industrial Average.

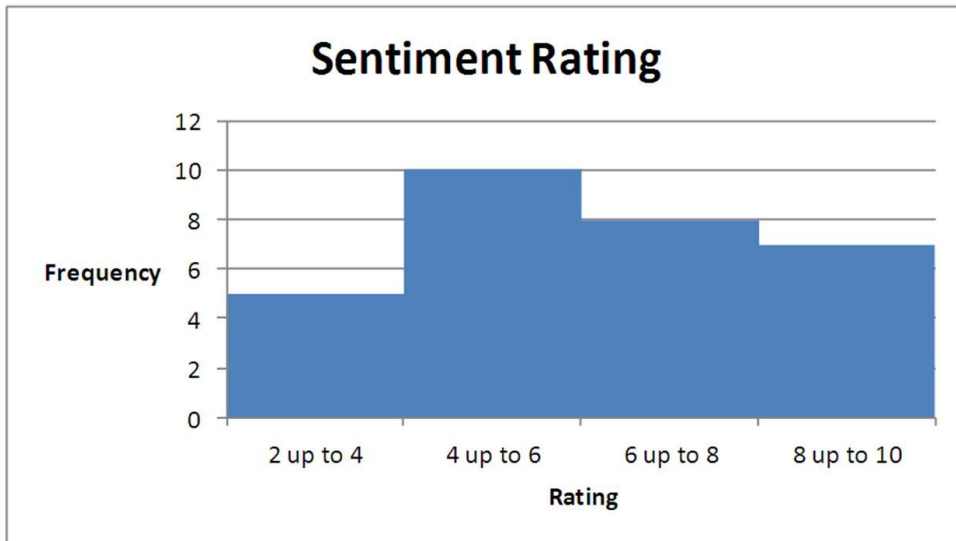
7	4	6	8	4	9
4	2	2	4	6	4
5	6	5	3	8	4
9	6	2	9	7	8
4	3	9	4	6	7

- Construct a frequency distribution, relative frequency distribution, cumulative frequency distribution and relative cumulative frequency distribution using classes of 2 up to 4, 4 up to 6, 6 up to 8, and 8 up to 10.
- Construct a histogram that summarizes the data.
- What percentage of the stocks in the Dow Jones Industrial Average received a sentiment rating less than 8?
- What percentage of the stocks in the Dow Jones Industrial Average received a sentiment rating of 6 or more?

a.

Sentiment Rating	Frequency	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
2 up to 4	5	$5/30 = 0.1667$	5	$5/30 = 0.1667$
4 up to 6	10	$10/30 = 0.3333$	$5 + 10 = 15$	$15/30 = 0.5000$
6 up to 8	8	$8/30 = 0.2667$	$15 + 8 = 23$	$23/30 = 0.7667$
8 up to 10	7	$7/30 = 0.2334$	$23 + 7 = 30$	$30/30 = 1$
Total	30	1		

b.



- c. About 77%
- d. 50%

Feedback: c. $23/30 \approx 0.77$ or about 77%. See cumulative relative frequency distribution in part a. d. $15/30 = 0.5$ or 50%. See cumulative relative frequency distribution in part a.

AACSB: Analytic
Blooms: Apply
Difficulty: 2 Medium
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

93. The accompanying cumulative relative frequency distribution shows a summary of the scores from an Algebra II exam at a local high school. Twenty students took the exam.

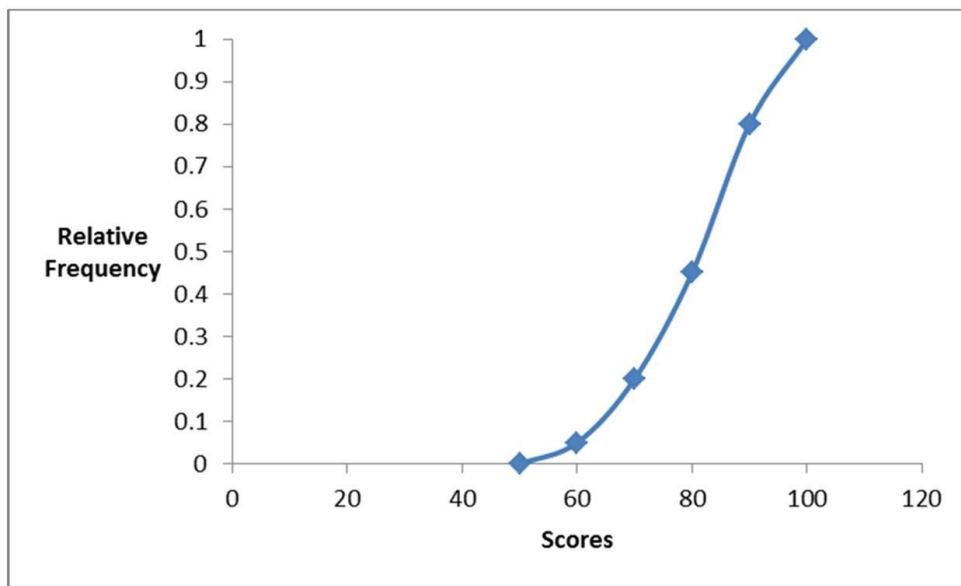
Class	Cumulative Relative Frequency
51–60	0.05
61–70	0.20
71–80	0.45
81–90	0.80
91–100	1.00

- Construct the relative frequency distribution. What proportion of students scored between 81 and 90?
- Construct the frequency distribution. How many students scored between 71 and 80?
- Construct an ogive. What is the approximate percentage of students that scored less than 85?

- See accompanying table; 0.35
- See accompanying table; 5

Class	Cumulative Relative Frequency	Relative Frequency	Frequency
51–60	0.05	0.05	1
61–70	0.20	0.15	3
71–80	0.45	0.25	5
81–90	0.80	0.35	7
91–100	1.00	0.20	4

- Approximately 60% of students scored less than 85.



Feedback:

- In order to find the relative frequency for each class, subtract each class's cumulative relative frequency from the preceding cumulative relative frequency; so the proportion of students that scored between 81 and 90 is $0.80 - 0.45 = 0.35$.
- In order to find the frequency for each class, multiply each class's relative frequency by N ($N = 20$); so the number of students that scored between 71 and 80 is $0.25 \times 20 = 5$.
- In order to construct an ogive, we plot the five points corresponding to the upper class limits and their cumulative relative frequencies. In addition, we add one point being the first class lower limit with a zero value. See instructions in the text for plotting an ogive in Excel. We then draw a vertical line at the score 85 (not shown) until it intersects curve. At the intersection, draw a horizontal line to the y axis—it intersects at approximately 0.60 or 60%.

AACSB: Analytic
 Blooms: Apply
 Difficulty: 2 Medium

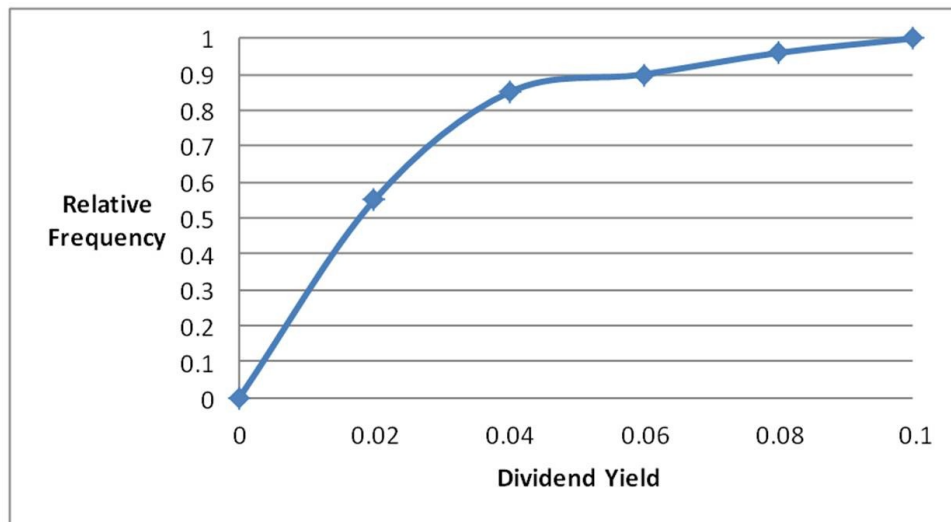
Learning Objective: 02-03 Summarize quantitative data by forming frequency distributions.
 Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
 Topic: Summarizing Quantitative Data

94. The dividend yields of the stocks in an investor's portfolio are shown in the following cumulative relative frequency distribution.

Dividend Yield	Cumulative Relative Frequency
0% up to 2%	0.55
2% up to 4%	0.85
4% up to 6%	0.90
6% up to 8%	0.96
8% up to 10%	1

- a. Construct an ogive.
b. Approximately what percent of the stocks had a dividend yield of 3% or larger?

a.



- b. Approximately 30% of the stocks had a dividend yield of 3% or greater.

Feedback: In order to construct an ogive, we plot the five points corresponding to the upper class limits and their cumulative relative frequencies. In addition, we add one point being the first class lower limit with a zero value. See instructions in the text for plotting an ogive in Excel. We then draw a vertical line at the score .03 (not shown) until it intersects the curve. At the intersection, draw a horizontal line to the y axis—it intersects at approximately 0.70. One minus 0.7 equals 0.3, which is the approximate proportion with dividend yields of 3% or more.

AACSB: Analytic
Blooms: Apply
Difficulty: 1 Easy

Learning Objective: 02-04 Plot and interpret histograms; polygons; and ogives.
Topic: Summarizing Quantitative Data

95. Construct a stem-and-leaf diagram with the following data set:

3.2	1.3	2.1	2.4	4.3	3.1	3.2	1.1	1.4	2.5
2.4	2.9	3.8	1.7	2.3	1.2	3.2	1.4	1.5	2.6

Is the distribution symmetric?

<u>Stem</u>	<u>Leaf</u>
1	1 2 3 4 4 5 7
2	1 3 4 4 5 6 9
3	1 2 2 2 8
4	3

No, the distribution is positively skewed.

Feedback: Sort the data from lowest value to highest value, grouping by the left-most digit. Write the left-most digit in the left-hand column. In the right column, write the right-most digit of each data point, separated by a space in ascending order. By turning the stem-and-leaf diagram on its side, we notice that the distribution has a tail toward the right. The distribution is therefore positively skewed.

AACSB: Analytic
Blooms: Create
Difficulty: 2 Medium
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

96. Construct a stem-and-leaf diagram for the following data set:

74	75	63	62	56	79	58	79	53	49
78	69	74	72	53	72	64	65	67	77

Is the distribution symmetric?

<u>Stem</u>	<u>Leaf</u>
4	9
5	3 3 6 8
6	2 3 4 5 7 9
7	2 2 4 4 5 7 8 9 9

No, the distribution is negatively skewed.

Feedback: Sort the data from lowest value to highest value, grouping by the left-most digit. Write the left-most digit in the left-hand column. In the right column, write the right-most digit of each data point, separated by a space in ascending order. By turning the stem-and-leaf diagram on its side, we notice that the distribution has a tail toward the left. The distribution is therefore negatively skewed.

AACSB: Analytic
Blooms: Create
Difficulty: 2 Medium
Learning Objective: 02-05 Construct and interpret a stem-and-leaf diagram.
Topic: Stem-and-Leaf Diagrams

97. The following table shows average wind speeds (in miles per hour) during 15 major fires in California.

44	55	22
32	29	24
47	33	32
27	58	39
38	51	41

Construct a stem-and-leaf diagram. Were most of these storms fueled by 45+ mile-per-hour winds? Explain.

No, most of the time the average wind speed was below 45 mph; only 4 out of the 15 storms had average wind speeds exceeding 45 mph.

<u>Stem</u>	<u>Leaf</u>
2	2 4 7 9
3	2 2 3 8 9
4	1 4 7
5	1 5 8

Feedback:

- Sort data, then grouping according to the 10s digit

20s 22, 24, 27, 29

30s 32, 32, 33, 38, 39

40s 41, 44, 47

50s 51, 55, 58

- Write the 10s digits in the left-hand column.
- Draw a line next to the 10s digit.
- On the right-hand side of the line, write the 1s digit for each number.

<u>Stem</u>	<u>Leaf</u>
2	2 4 7 9
3	2 2 3 8 9
4	1 4 7
5	1 5 8

98. The following table shows the prices (in \$1,000s) of the last 15 trucks sold at a Toyota dealership.

32	21	26
33	23	24
31	22	17
25	18	23
22	19	35

Construct a stem-and-leaf diagram. Given this diagram, estimate the price that a potential buyer would likely pay for a Toyota truck.

A potential buyer of a Toyota truck is likely to pay in the low to mid \$20s (in thousands).

<u>Stem</u>	<u>Leaf</u>
1	7 8 9
2	1 2 2 3 3 4 5 6
3	1 2 3 5

Feedback:

- Sort data, then group according to the 10s digit

10s 17, 18, 19

20s 21, 22, 22, 23, 23, 24, 25, 26

30s 31, 32, 33, 35

- Write the 10s digits in the left-hand column
- Draw a line next to the 10s digit
- On the right-hand side of the line, write the 1s digit for each number.

<u>Stem</u>	<u>Leaf</u>
1	7 8 9
2	1 2 2 3 3 4 5 6
3	1 2 3 5

99. The following data represent the ages of patients in the cardiac section of the local hospital. Construct a stem-and-leaf diagram. Comment on whether or not the distribution is symmetric.

48, 53, 60, 61, 62, 63, 70, 70, 72, 77, 78, 79, 80, 82, 87, 88, 90

<u>Stem</u>	<u>Leaf</u>
4	8
5	3
6	0123
7	002789
8	0278
9	0

The distribution is not symmetric; it is slightly negatively skewed.

Feedback:

- Since the numbers are already sorted, begin by grouping according to the 10s digit

40s 48
 50s 53
 60s 60, 61, 62, 63
 70s 70, 70, 72, 77, 78, 79
 80s 80, 82, 87, 88
 90s 90

- Write the 10s digits in the left-hand column.
- Draw a line next to the 10s digit.
- On the right-hand side of the line, write the 1s digit for each number.

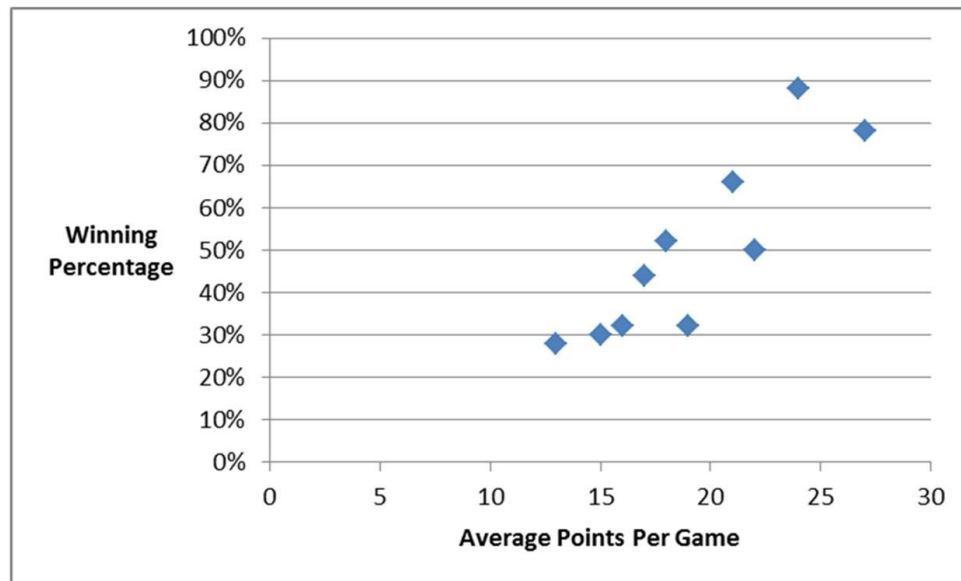
4 | 8
 5 | 3
 6 | 0123
 7 | 002789
 8 | 0278
 9 | 0

100. A high school football league recorded the average points scored per game, as well as the winning percentage for the 10 teams in the league.

Points Per Game	Winning Percentage
24	88%
21	66%
27	78%
13	28%
16	32%
18	52%
15	30%
17	44%
19	32%
22	50%

Construct a scatterplot. Does scoring more points appear to be associated with a higher winning percentage?

Teams with higher points per game tend to have a higher winning percentage.



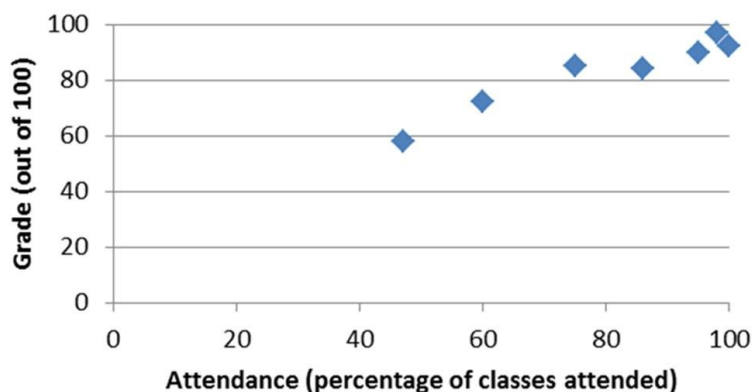
Feedback: To construct the scatterplot, plot each team's points per game-winning percentage combination, where, in our answer key, the points per game correspond to the value on the horizontal axis, and the winning percentage corresponds to the value on the vertical axis. Since the relationship is clearly positive (as one variable gets larger, the other tends to get

larger as well), teams that score more points tend to have a higher winning percentage.

AACSB: Analytic
 Blooms: Apply
 Difficulty: 2 Medium
 Learning Objective: 02-06 Construct and interpret a scatterplot.
 Topic: Scatterplots

101. A statistics instructor computes the grade and percentage of classes that each of his students attends. Construct a scatterplot from the data displayed next. Does a relationship exist between attendance and grade?

Attendance	47	60	75	86	95	98	100
Grade	58	72	85	84	90	97	92



Yes, there appears to be a positive relationship.

Feedback: To construct the scatterplot, plot each attendance-grade combination, where, in our answer key, the attendance corresponds to the value on the horizontal axis and the grade corresponds to the value on the vertical axis. Since a clear positive relationship exists, we are able to say that the two variables are related.

AACSB: Analytic
 Blooms: Create
 Difficulty: 2 Medium
 Learning Objective: 02-06 Construct and interpret a scatterplot.
 Topic: Scatterplots