CHAPTER 2: ORGANIZING AND VISUALIZING VARIABLES

SCENARIO 2-1

An insurance company evaluates many numerical variables about a person before deciding on an appropriate rate for automobile insurance. A representative from a local insurance agency selected a random sample of insured drivers and recorded, $X$, the number of claims each made in the last 3 years, with the following results.

<table>
<thead>
<tr>
<th>$X$</th>
<th>$f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

1. Referring to Scenario 2-1, how many drivers are represented in the sample?
   a) 5  
   b) 15 
   c) 18 
   d) 50

ANSWER:  
   d
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: frequency distribution

2. Referring to Scenario 2-1, how many total claims are represented in the sample?
   a) 15  
   b) 50 
   c) 111 
   d) 250

ANSWER:  
   c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: interpretation, frequency distribution

3. A type of vertical bar chart in which the categories are plotted in the descending rank order of the magnitude of their frequencies is called a
   a) contingency table.  
   b) Pareto chart.  
   c) stem-and-leaf display.  
   d) pie chart.

ANSWER:  
   b
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: Pareto chart
SCENARIO 2-2

At a meeting of information systems officers for regional offices of a national company, a survey was taken to determine the number of employees the officers supervise in the operation of their departments, where $X$ is the number of employees overseen by each information systems officer.

<table>
<thead>
<tr>
<th>$X$</th>
<th>$f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>

4. Referring to Scenario 2-2, how many regional offices are represented in the survey results?
   a) 5
   b) 11
   c) 15
   d) 40

ANSWER: 
   d
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: interpretation, frequency distribution

5. Referring to Scenario 2-2, across all of the regional offices, how many total employees were supervised by those surveyed?
   a) 15
   b) 40
   c) 127
   d) 200

ANSWER: 
   c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: interpretation, frequency distribution

6. The width of each bar in a histogram corresponds to the
   a) differences between the boundaries of the class.
   b) number of observations in each class.
   c) midpoint of each class.
   d) percentage of observations in each class.

ANSWER: 
   a
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: histogram
SCENARIO 2-3

Every spring semester, the School of Business coordinates a luncheon with local business leaders for graduating seniors, their families, and friends. Corporate sponsorship pays for the lunches of each of the seniors, but students have to purchase tickets to cover the cost of lunches served to guests they bring with them. The following histogram represents the attendance at the senior luncheon, where \( X \) is the number of guests each graduating senior invited to the luncheon and \( f \) is the number of graduating seniors in each category.

7. Referring to the histogram from Scenario 2-3, how many graduating seniors attended the luncheon?
   a) 4
   b) 152
   c) 275
   d) 388

   ANSWER: c

   TYPE: MC  DIFFICULTY: Difficult
   EXPLANATION: The number of graduating seniors is the sum of all the frequencies, \( f \).
   KEYWORDS: interpretation, histogram

8. Referring to the histogram from Scenario 2-3, if all the tickets purchased were used, how many guests attended the luncheon?
   a) 4
   b) 152
   c) 275
   d) 388

   ANSWER: d

   TYPE: MC  DIFFICULTY: Difficult
   EXPLANATION: The total number of guests is \( \sum_{i=1}^{6} X_i f_i \)
   KEYWORDS: interpretation, histogram
9. A professor of economics at a small Texas university wanted to determine what year in school students were taking his tough economics course. Shown below is a pie chart of the results. What percentage of the class took the course prior to reaching their senior year?

a) 14%
b) 44%
c) 54%
d) 86%

ANSWER: d
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: interpretation, pie chart

10. When polygons or histograms are constructed, which axis must show the true zero or "origin"?
   a) The horizontal axis.
   b) The vertical axis.
   c) Both the horizontal and vertical axes.
   d) Neither the horizontal nor the vertical axis.

ANSWER: b
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: polygon, histogram

11. When constructing charts, the following is plotted at the class midpoints:
   a) frequency histograms.
   b) percentage polygons.
   c) cumulative percentage polygon (ogives).
   d) All of the above.

ANSWER: b
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: percentage polygon
SCENARIO 2-4

A survey was conducted to determine how people rated the quality of programming available on television. Respondents were asked to rate the overall quality from 0 (no quality at all) to 100 (extremely good quality). The stem-and-leaf display of the data is shown below.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>03478999</td>
</tr>
<tr>
<td>5</td>
<td>0112345</td>
</tr>
<tr>
<td>6</td>
<td>12566</td>
</tr>
<tr>
<td>7</td>
<td>01</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

12. Referring to Scenario 2-4, what percentage of the respondents rated overall television quality with a rating of 80 or above?
   a) 0
   b) 4
   c) 96
   d) 100

ANSWER: b

TYPE: MC  DIFFICULTY: Easy
KEYWORDS: stem-and-leaf display, interpretation

13. Referring to Scenario 2-4, what percentage of the respondents rated overall television quality with a rating of 50 or below?
   a) 11
   b) 40
   c) 44
   d) 56

ANSWER: c

TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: stem-and-leaf display, interpretation

14. Referring to Scenario 2-4, what percentage of the respondents rated overall television quality with a rating from 50 through 75?
   a) 11
   b) 40
   c) 44
   d) 56

ANSWER: d

TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: stem-and-leaf display, interpretation
SCENARIO 2-5
The following are the duration in minutes of a sample of long-distance phone calls made within the continental United States reported by one long-distance carrier.

<table>
<thead>
<tr>
<th>Relative Time (in Minutes)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 but less than 5</td>
<td>0.37</td>
</tr>
<tr>
<td>5 but less than 10</td>
<td>0.22</td>
</tr>
<tr>
<td>10 but less than 15</td>
<td>0.15</td>
</tr>
<tr>
<td>15 but less than 20</td>
<td>0.10</td>
</tr>
<tr>
<td>20 but less than 25</td>
<td>0.07</td>
</tr>
<tr>
<td>25 but less than 30</td>
<td>0.07</td>
</tr>
<tr>
<td>30 or more</td>
<td>0.02</td>
</tr>
</tbody>
</table>

15. Referring to Scenario 2-5, what is the width of each class?
   a) 1 minute
   b) 5 minutes
   c) 2%
   d) 100%

   ANSWER:
   b
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: class interval, relative frequency distribution

16. Referring to Scenario 2-5, if 1,000 calls were randomly sampled, how many calls lasted under 10 minutes?
   a. 220
   b. 370
   c. 410
   d. 590

   ANSWER:
   d
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: relative frequency distribution, interpretation

17. Referring to Scenario 2-5, if 100 calls were randomly sampled, how many calls lasted 15 minutes or longer?
   a. 10
   b. 14
   c. 26
   d. 74

   ANSWER:
   c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: relative frequency distribution, interpretation
18. Referring to Scenario 2-5, if 10 calls lasted 30 minutes or more, how many calls lasted less than 5 minutes?
   a) 10
   b) 185
   c) 295
   d) 500

   ANSWER: b
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: relative frequency distribution, interpretation

19. Referring to Scenario 2-5, what is the cumulative relative frequency for the percentage of calls that lasted under 20 minutes?
   a) 0.10
   b) 0.59
   c) 0.76
   d) 0.84

   ANSWER: d
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: cumulative relative frequency

20. Referring to Scenario 2-5, what is the cumulative relative frequency for the percentage of calls that lasted 10 minutes or more?
   a) 0.16
   b) 0.24
   c) 0.41
   d) 0.90

   ANSWER: c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: cumulative relative frequency

21. Referring to Scenario 2-5, if 100 calls were randomly sampled, ______ of them would have lasted at least 15 minutes but less than 20 minutes
   a) 6
   b) 8
   c) 10
   d) 16

   ANSWER: c
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: relative frequency distribution, interpretation
22. Referring to Scenario 2-5, if 100 calls were sampled, _______ of them would have lasted less than 15 minutes.
   a) 26  
   b) 74  
   c) 10  
   d) None of the above.

ANSWER: 
   b 
   TYPE: MC  DIFFICULTY: Moderate  
   KEYWORDS: relative frequency distribution, interpretation

23. Referring to Scenario 2-5, if 100 calls were sampled, _______ of them would have lasted 20 minutes or more.
   a) 26  
   b) 16  
   c) 74  
   d) None of the above.

ANSWER: 
   b 
   TYPE: MC  DIFFICULTY: Moderate  
   KEYWORDS: relative frequency distribution, interpretation

24. Referring to Scenario 2-5, if 100 calls were sampled, _______ of them would have lasted less than 5 minutes or at least 30 minutes or more.
   a) 35  
   b) 37  
   c) 39  
   d) None of the above.

ANSWER: 
   c 
   TYPE: MC  DIFFICULTY: Difficult  
   KEYWORDS: relative frequency distribution, interpretation

25. Which of the following is appropriate for displaying data collected on the different brands of cars students at a major university drive?
   a) A Pareto chart  
   b) A two-way classification table  
   c) A histogram  
   d) A scatter plot

ANSWER: 
   a 
   TYPE: MC  DIFFICULTY: Easy  
   KEYWORDS: choice of chart, Pareto diagram
26. One of the developing countries is experiencing a baby boom, with the number of births rising for the fifth year in a row, according to a BBC News report. Which of the following is best for displaying this data?
   a) A Pareto chart
   b) A two-way classification table
   c) A histogram
   d) A time-series plot

   ANSWER:  
d  
   TYPE: MC  DIFFICULTY: Easy  
   KEYWORDS: choice of chart, time-series plot

27. When studying the simultaneous responses to two categorical questions, you should set up a
   a) contingency table.
   b) frequency distribution table.
   c) cumulative percentage distribution table.
   d) histogram.

   ANSWER:  
a  
   TYPE: MC  DIFFICULTY: Easy  
   KEYWORDS: contingency table

28. Data on 1,500 students’ height were collected at a larger university in the East Coast. Which of the following is the best chart for presenting the information?
   a) A pie chart.
   b) A Pareto chart.
   c) A side-by-side bar chart.
   d) A histogram.

   ANSWER:  
d  
   TYPE: MC  DIFFICULTY: Easy  
   KEYWORDS: choice of chart, histogram

29. Data on the number of part-time hours students at a public university worked in a week were collected. Which of the following is the best chart for presenting the information?
   a) A pie chart.
   b) A Pareto chart.
   c) A percentage table.
   d) A percentage polygon.

   ANSWER:  
d  
   TYPE: MC  DIFFICULTY: Easy  
   KEYWORDS: choice of chart, percentage polygon
30. Data on the number of credit hours of 20,000 students at a public university enrolled in a Spring semester were collected. Which of the following is the best for presenting the information?
   a) A pie chart.
   b) A Pareto chart.
   c) A stem-and-leaf display.
   d) A contingency table.

ANSWER: c
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: choice of chart, stem-and-leaf

31. A survey of 150 executives were asked what they think is the most common mistake candidates make during job interviews. Six different mistakes were given. Which of the following is the best for presenting the information?
   a) A bar chart.
   b) A histogram
   c) A stem-and-leaf display.
   d) A contingency table.

ANSWER: a
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: choice of chart, bar chart

32. You have collected information on the market share of 5 different search engines used by U.S. Internet users in a particular quarter. Which of the following is the best for presenting the information?
   a) A pie chart.
   b) A histogram
   c) A stem-and-leaf display.
   d) A contingency table.

ANSWER: a
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: choice of chart, pie chart
33. You have collected information on the consumption by the 15 largest coffee-consuming nations. Which of the following is the best for presenting the shares of the consumption?
   a) A pie chart.
   b) A Pareto chart
   c) A side-by-side bar chart.
   d) A contingency table.

   ANSWER: b
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: choice of chart, Pareto chart
   NOTE: Even though a pie chart can also be used, the Pareto chart is preferable for separating the “vital few” from the “trivial many”.

34. You have collected data on the approximate retail price (in $) and the energy cost per year (in $) of 15 refrigerators. Which of the following is the best for presenting the data?
   a) A pie chart.
   b) A scatter plot
   c) A side-by-side bar chart.
   d) A contingency table.

   ANSWER: b
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: choice of chart, scatter plot

35. You have collected data on the number of U.S. households actively using online banking and/or online bill payment over a 10-year period. Which of the following is the best for presenting the data?
   a) A pie chart.
   b) A stem-and-leaf display
   c) A side-by-side bar chart.
   d) A time-series plot.

   ANSWER: d
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: choice of chart, time-series plot

36. You have collected data on the monthly seasonally adjusted civilian unemployment rate for the United States over a 10-year period. Which of the following is the best for presenting the data?
   a) A contingency table.
   b) A stem-and-leaf display
   c) A time-series plot.
   d) A side-by-side bar chart.

   ANSWER: c
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: choice of chart, time-series plot
37. You have collected data on the number of complaints for 6 different brands of automobiles sold in the US over a 10-year period. Which of the following is the best for presenting the data?
   a) A contingency table.
   b) A stem-and-leaf display
   c) A time-series plot.
   d) A side-by-side bar chart.

ANSWER: d
TYPE: MC DIFFICULTY: Moderate
KEYWORDS: choice of chart, side-by-side bar chart

38. You have collected data on the responses to two questions asked in a survey of 40 college students majoring in business—What is your gender (Male = M; Female = F) and What is your major (Accountancy = A; Computer Information Systems = C; Marketing = M). Which of the following is the best for presenting the data?
   a) A contingency table.
   b) A stem-and-leaf display
   c) A time-series plot.
   d) A Pareto chart.

ANSWER: a
TYPE: MC DIFFICULTY: Moderate
KEYWORDS: choice of chart, contingency table

39. At the United States Census Bureau’s website, you found a data set on the estimated revenue for employers from 1998 to 2013. Which of the following is the best for presenting the data?
   a) A contingency table.
   b) A stem-and-leaf display
   c) A time-series plot.
   d) A side-by-side bar chart.

ANSWER: c
TYPE: MC DIFFICULTY: Easy
KEYWORDS: choice of chart, time-series plot

40. At the United States Census Bureau’s website, you found a data set on the race and ethnic group of an annual nationwide survey from last year. Which of the following is the best for presenting the data?
   a) A histogram.
   b) A stem-and-leaf display
   c) A bar chart.
   d) A polygon.

ANSWER: c
TYPE: MC DIFFICULTY: Easy
KEYWORDS: choice of chart, bar chart
41. At the United States Census Bureau’s website, you found a data set on the race and ethnic group of an annual nationwide survey from last year. Which of the following is the best for organizing the data?
   a) A summary table.
   b) A contingency table
   c) A frequency distribution.
   d) A cumulative distribution.

   ANSWER: 
a
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: choice of table, summary table

42. At the United States Department of Labor’s website, you found a data set on the amount of time people spent on socializing collected through the American Time Use Survey from last year. Which of the following is the best for presenting the data?
   a) A polygon.
   b) A Pareto diagram.
   c) A bar chart.
   d) A time-series plot.

   ANSWER: 
a
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: choice of chart, polygon

43. At the United States Department of Labor’s website, you found a data set on the amount of time people spent on socializing collected through the American Time Use Survey from last year. Which of the following is the best for organizing the data?
   a) A summary table.
   b) A contingency table.
   c) A percentage distribution.
   d) A cross-classification table.

   ANSWER: 
c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: choice of table, percentage distribution

44. You have downloaded data on crime rate and median income level for 150 communities. You wonder whether there is any association between crime rate and median income level. Which of the following is the best for presenting the data?
   a) A histogram.
   b) A scatter chart
   c) A stem-and-leaf display
   d) A time-series plot.

   ANSWER: 
b
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: choice of chart, scatter chart
SCENARIO 2-6
A sample of 200 students at a Big-Ten university was taken after the midterm to ask them whether they went bar hopping the weekend before the midterm or spent the weekend studying, and whether they did well or poorly on the midterm. The following table contains the result.

<table>
<thead>
<tr>
<th></th>
<th>Did Well in Midterm</th>
<th>Did Poorly in Midterm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studying for Exam</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Went Bar Hopping</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

45. Referring to Scenario 2-6, of those who went bar hopping the weekend before the midterm in the sample, _______ percent of them did well on the midterm.

   a) 15  
   b) 27.27  
   c) 30  
   d) 55

ANSWER: c
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: contingency table, interpretation

46. Referring to Scenario 2-6, of those who did well on the midterm in the sample, _______ percent of them went bar hopping the weekend before the midterm.

   a) 15  
   b) 27.27  
   c) 30  
   d) 50

ANSWER: b
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: contingency table, interpretation

47. Referring to Scenario 2-6, _______ percent of the students in the sample went bar hopping the weekend before the midterm and did well on the midterm.

   a) 15  
   b) 27.27  
   c) 30  
   d) 50

ANSWER: a
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: contingency table, interpretation