Chapter 2
Describing Data: Frequency Distributions and Graphic Presentations

True/False

1. A frequency distribution groups data into classes showing the number of observations in each class.

2. A frequency distribution for qualitative data shows the number of observations in each class.

3. A frequency distribution for qualitative data has class limits.

4. A frequency distribution showing the gender of a school’s students groups data into two classes.

5. In frequency distributions, classes are mutually exclusive if each individual, object, or measurement is included in only one category.

6. When a frequency distribution is exhaustive, each individual, object, or measurement from a sample or population must appear in at least one category.

7. The midpoint of a class, which is also called a class mark, is halfway between the lower and upper limits.

8. A class interval, which is the width of a class, can be determined by subtracting the lower limit of a class from the lower limit of the next higher class.

9. A suggested class interval can be determined by the formula:

   \[
   \text{Highest value} - \text{Lowest value} \over \text{Number of classes}
   \]

10. In constructing a frequency distribution, you should try to have open-ended classes such as "Under $100" and "$1,000 and over".

11. When constructing a frequency distribution, try to include overlapping stated class limits, such as 100 up to 201, 200 up to 301, and 300 up to 401.
12. To convert a frequency distribution to a relative frequency distribution, divide each class frequency by the sum of the class frequencies.

13. To construct a histogram, the class frequencies are plotted on the vertical or $Y$-axis and either the stated limits, the true limits or the midpoints are plotted on the horizontal or $X$-axis.

14. A pie chart shows the number of observations in each class.

15. A pie chart is similar to a relative frequency distribution.

16. To construct a pie chart, relative class frequencies are used to graph the “slices” of the pie.

17. A cumulative frequency distribution is used when we want to determine how many observations lie above or below certain values.

18. In general, we should construct a frequency distribution so that there are either 4 or 24 classes.

19. The height of a bar in a histogram represents the number of observations for a class.

20. A relative frequency distribution shows the number of observations in each class.

21. A frequency polygon is a very useful graphic technique when comparing two or more distributions.

**Multiple Choice**

22. Monthly commissions of first-year insurance brokers are $1,270, $1,310, $1,680, $1,380, $1,410, $1,570, $1,180 and $1,420. These figures are referred to as:
   A) histogram.
   B) raw data.
   C) frequency distribution.
   D) frequency polygon.
   E) none of the above.
23. A small sample of computer operators shows monthly incomes of $1,950, $1,775, $2,060, $1,840, $1,795, $1,890, $1,925 and $1,810. What are these ungrouped numbers called?
   A) Histogram  
   B) Class limits  
   C) Class frequencies  
   D) Raw data  
   E) None of the above

24. When data is collected using a quantitative, what is true about a frequency distribution that summarizes the data?
   A) Upper and lower class limits must be calculated.  
   B) A pie chart can be used to summarize the data.  
   C) Number of classes is equal to the number of variable's values.  
   D) The "5 to the k rule" can be applied.

25. When data is collected using a qualitative, nominal variable, what is true about a frequency distribution that summarizes the data?
   A) Upper and lower class limits must be calculated.  
   B) A pie chart can be used to summarize the data.  
   C) Number of classes is equal to the number of variable's values.  
   D) The "5 to the k rule" can be applied.

26. When data is collected using a qualitative, nominal variable, i.e., male or female, what is true about a frequency distribution that summarizes the data?
   A) Upper and lower class limits must be calculated.  
   B) Class midpoints can be computed.  
   C) Number of classes corresponds to number of the variable's values.  
   D) The "2 to the k rule" can be applied.

27. A student was interested in the cigarette smoking habits of college students and collected data from an unbiased random sample of students. The data is summarized in the following table:

<table>
<thead>
<tr>
<th>Male: 50</th>
<th>Female: 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males who smoke: 20</td>
<td>Females who smoke: 25</td>
</tr>
<tr>
<td>Males who do not smoke: 30</td>
<td>Females who do not smoke: 50</td>
</tr>
</tbody>
</table>

Why is the table NOT a frequency distribution?
A) The number of males does not equal the sum of males that smoke and do not smoke.
B) The classes are not mutually exclusive.
C) There are too many classes.
D) Class limits cannot be computed

28. When a class interval is expressed as: 100 up to 200,
A) Observations with values of 100 are excluded from the class frequency.
B) Observations with values of 200 are included in the class frequency.
C) Observations with values of 200 are excluded from the class frequency.
D) The class interval is 99.

29. For qualitative data, the relative frequency for a class is computed as
A) Class width divided by class interval.
B) Class midpoint divided by the class frequency.
C) Class frequency divided by the class interval.
D) Class frequency divided by the total frequency.

30. For quantitative data, the relative frequency for a class is computed as
A) Class width divided by class interval.
B) Class midpoint divided by the class frequency.
C) Class frequency divided by the class interval.
D) Class frequency divided by the total frequency.

31. A group of 100 students were surveyed about their interest in a new International Studies program. Interest was measured in terms of high, medium, or low. 30 students responded high interest; 50 students responded medium interest; 40 students responded low interest. What is the relative frequency of students with high interest?
A) 30%
B) 50%
C) 40%
D) Cannot be determined.

32. A group of 100 students were surveyed about their interest in a new Economics major. Interest was measured in terms of high, medium, or low. 30 students responded high interest; 50 students responded medium interest; 20 students responded low interest. What is the best way to illustrate the results of the study?
A) Cumulative frequency polygon
33. The monthly salaries of a sample of 100 employees were rounded to the nearest ten dollars. They ranged from a low of $1,040 to a high of $1,720. If we want to condense the data into seven classes, what is the most convenient class interval?
A) $ 50  
B) $100  
C) $150  
D) $200  
E) None of the above

34. A student was studying the political party preferences of a university's student population. The survey instrument asked students to identify themselves as a democrat or a republican. This question is flawed because:
A) Students generally don't know their political preferences.  
B) The categories are generally mutually exclusive.  
C) The categories are not exhaustive.  
D) Political preference is a continuous variable.

35. What is the following table called?

<table>
<thead>
<tr>
<th>Ages</th>
<th>Number of Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 up to 30</td>
<td>16</td>
</tr>
<tr>
<td>30 up to 40</td>
<td>25</td>
</tr>
<tr>
<td>40 up to 50</td>
<td>51</td>
</tr>
<tr>
<td>50 up to 60</td>
<td>80</td>
</tr>
<tr>
<td>60 up to 70</td>
<td>20</td>
</tr>
<tr>
<td>70 up to 80</td>
<td>8</td>
</tr>
</tbody>
</table>

A) Histogram  
B) Frequency polygon  
C) Cumulative frequency distribution  
D) Frequency distribution  
E) None of the above

36. For the following distribution of heights, what are the limits for the class with the greatest frequency?
Heights

<table>
<thead>
<tr>
<th>Number</th>
<th>60” up to 65”</th>
<th>65” up to 70”</th>
<th>70” up to 75”</th>
</tr>
</thead>
<tbody>
<tr>
<td>60” up to 75”</td>
<td>10</td>
<td>70</td>
<td>20</td>
</tr>
</tbody>
</table>

A) 64 and up to 70
B) 65 and 69
C) 65 and up to 70
D) 69.5 and 74.5
E) None of the above

37. In a frequency distribution, what is the number of observations in a class called?
A) Class midpoint
B) Class interval
C) Class array
D) Class frequency
E) None of the above

38. Why are unequal class intervals sometimes used in a frequency distribution?
A) To avoid a large number of empty classes
B) For the sake of variety in presenting the data
C) To make the class frequencies smaller
D) To avoid the need for midpoints
E) None of the above

39. The age distribution of a sample of the part-time employees at Lloyd's Fast Food Emporium is:

<table>
<thead>
<tr>
<th>Ages</th>
<th>Cumulative Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 up to 23</td>
<td>6</td>
</tr>
<tr>
<td>23 up to 28</td>
<td>19</td>
</tr>
<tr>
<td>28 up to 33</td>
<td>52</td>
</tr>
<tr>
<td>33 up to 38</td>
<td>61</td>
</tr>
<tr>
<td>38 up to 43</td>
<td>65</td>
</tr>
</tbody>
</table>

What type of chart has the data been organized to draw?
A) Histogram
B) Simple line chart
C) Cumulative Frequency Distribution
D) Pie chart
E) Frequency polygon
40. A sample distribution of hourly earnings in Paul's Cookie Factory is:

<table>
<thead>
<tr>
<th>Hourly Earnings</th>
<th>$6 up to $9</th>
<th>$9 up to $12</th>
<th>$12 up to $15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>16</td>
<td>42</td>
<td>10</td>
</tr>
</tbody>
</table>

The limits of the class with the smallest frequency are:
A) $ 6.00 and $9.00
B) $12.00 and up to $14.00
C) $11.75 and $14.25
D) $12.00 and up to $15.00
E) None of the above

**Fill-in-the-Blank**

41. In constructing a frequency polygon, which axis are the class frequencies scaled on? ______

42. A frequency distribution for nominal data requires that the categories be ______________________ and ________________________.

43. For a frequency distribution of quantitative data, if every individual, object or measurement can be assigned to a class, the frequency distribution is __________.

44. For a frequency distribution of qualitative data, if the observations can be assigned to only one class, the classes are __________________________.

45. What is the number of observations in each class of a frequency distribution called? __________________________.

46. What chart or graph is useful for illustrating relative frequencies of a nominal variable? __________________________.

47. The midpoint of a class interval is also called a ________.

48. What is a table showing the number of observations that have been grouped into each of several classes called? __________________________.

49. In a cumulative frequency distribution, what percent of the total frequencies would fall below the upper limit of the highest class? ______
50. Unorganized data is referred to as _______ _______.

51. What is it called when classes in a frequency table are constructed so that data will fit into only one category? __________________________

52. Calculate the suggested class interval based on number of observations given the data ranges from 100 to 200 with 50 observations. __________________________

53. If the number of observations is 124, calculate the suggested number of classes using the "2 to the k rule".

Multiple Choice

Use the following to answer questions 54-58:
Refer to the following distribution of commissions:

<table>
<thead>
<tr>
<th>Monthly commissions</th>
<th>Class Frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 600 up to $800</td>
<td>3</td>
</tr>
<tr>
<td>800 up to 1,000</td>
<td>7</td>
</tr>
<tr>
<td>1,000 up to 1,200</td>
<td>11</td>
</tr>
<tr>
<td>1,200 up to 1,400</td>
<td>22</td>
</tr>
<tr>
<td>1,400 up to 1,600</td>
<td>40</td>
</tr>
<tr>
<td>1,600 up to 1,800</td>
<td>24</td>
</tr>
<tr>
<td>1,800 up to 2,000</td>
<td>9</td>
</tr>
<tr>
<td>2,000 up to 2,200</td>
<td>4</td>
</tr>
</tbody>
</table>

54. What is the relative frequency for those salespersons that earn between $1,600 and $1,799?
   A) 2%
   B) 2.4%
   C) 20%
   D) 24%
   E) None of the above

55. The first plot for a cumulative frequency distribution would be:
   A) X = 0, Y = 600.
   B) X = 600, Y = 3.
   C) X = 3, Y = 600.
   D) X = 600, Y = 0.
   E) none of the above.
56. What is the relative frequency of those salespersons that earn more than $1,599?
   A) 25.5%
   B) 27.5%
   C) 29.5%
   D) 30.8%
   E) None of the above

57. For the distribution above, what is the midpoint of the class with the greatest frequency?
   A) 1400
   B) 1500
   C) 1700
   D) The midpoint cannot be determined
   E) None of the above

58. What is the class interval?
   A) 200
   B) 300
   C) 3.500
   D) 400
   E) None of the above

**Essay**

Use the following to answer questions 59-61:
Refer to the following ages (rounded to the nearest whole year) of employees at a large company that were grouped into a distribution with class limits:

- 20 up to 30
- 30 up to 40
- 40 up to 50
- 50 up to 60
- 60 up to 70.

59. The class limits for the class 50 up to 60 are _______ and ________.

60. What is the midpoint for the class 40 up to 50? ________
61. What is the class interval? ______
Use the following to answer questions 62-65:
Refer to the following weights of college men recorded to the nearest pound:
The first three class marks are 105, 115, and 125.

62. What is the class interval? ______

63. What is the lower limit for the third class? _______

64. What is the upper limit for the third class? _______

65. What are the class limits for the fourth class? _______ and _______

Multiple Choice

Use the following to answer questions 66-68:
Refer to the following wage breakdown for a garment factory.

<table>
<thead>
<tr>
<th>Hourly Wages</th>
<th>Number of Wage Earners</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 4 up to $7</td>
<td>18</td>
</tr>
<tr>
<td>7 up to 10</td>
<td>36</td>
</tr>
<tr>
<td>10 up to 13</td>
<td>20</td>
</tr>
<tr>
<td>13 up to 16</td>
<td>6</td>
</tr>
</tbody>
</table>

66. What is the class interval for the table of wages above?
A) $2
B) $3
C) $4
D) $5
E) None of the above

67. What is the class midpoint for the class with the greatest frequency?
A) $ 5.50
B) $ 8.50
C) $11.50
D) $14.50
E) None of the above

68. What are the class limits for the class with the smallest number of frequencies?

A) 3.5 and 6.5
B) 4 and up to 7
C) 13 and up to 16
D) 12.5 and 15.5
E) None of the above

Use the following to answer questions 69-71:
Refer to the following distribution of ages:

<table>
<thead>
<tr>
<th>Ages</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 up to 50</td>
<td>10</td>
</tr>
<tr>
<td>50 up to 60</td>
<td>28</td>
</tr>
<tr>
<td>60 up to 70</td>
<td>12</td>
</tr>
</tbody>
</table>

69. For the distribution of ages above, what is the relative class frequency for the lowest class?
A) 50%
B) 18%
C) 20%
D) 10%
E) None of the above

70. What is the class interval?
A) 9
B) 10
C) 10.5
D) 11
E) None of the above

71. What is the class midpoint of the highest class?
A) 54
B) 55
C) 64
D) 65
E) None of the above

Refer To: 02_05

Use the following to answer questions 72-74:
Refer to the following information from a frequency distribution for heights of college women recorded to the nearest inch:
The first two class midpoints are 62.5" and 65.5".
72. What is the class interval?
  A) 1"
  B) 2"
  C) 2.5"
  D) 3"
  E) None of the above

73. What are the class limits for the lowest class?
  A) 61 and up to 64
  B) 62 and up to 64
  C) 62 and 65
  D) 62 and 63
  E) None of the above

74. What are the class limits for the third class?
  A) 64 and up to 67
  B) 67 and 69
  C) 67 and up to 70
  D) 66 and 68
  E) None of the above

Use the following to answer questions 75-77:
Refer to the following distribution:

<table>
<thead>
<tr>
<th>Cost of Textbooks</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25 up to $35</td>
<td>2</td>
</tr>
<tr>
<td>35 up to 45</td>
<td>5</td>
</tr>
<tr>
<td>45 up to 55</td>
<td>7</td>
</tr>
<tr>
<td>55 up to 65</td>
<td>20</td>
</tr>
<tr>
<td>65 up to 75</td>
<td>16</td>
</tr>
</tbody>
</table>

75. What is the relative class frequency for the $25 up to $35 class?
  A) 2%
  B) 4%
  C) 5%
  D) 10%
  E) None of the above.

76. What is the class midpoint for the $45 up to $55 class?
  A) 49
B) 49.5  
C) 50  
D) 50.5  
E) None of the above  

77. What are the class limits for class with the highest frequency?  
A) 55 and 64  
B) 54 and 64  
C) 55 and up to 65  
D) 55 and 64.5  
E) None of the above  

Use the following to answer questions 78-81:  
Refer to the following frequency distribution on days absent during a calendar year by employees of a manufacturing company:  

<table>
<thead>
<tr>
<th>Days Absent</th>
<th>Cumulative Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 up to 3</td>
<td>60</td>
</tr>
<tr>
<td>3 up to 6</td>
<td>31</td>
</tr>
<tr>
<td>6 up to 9</td>
<td>14</td>
</tr>
<tr>
<td>9 up to 12</td>
<td>6</td>
</tr>
<tr>
<td>12 up to 15</td>
<td>2</td>
</tr>
</tbody>
</table>

78. How many employees were absent between 3 up to 6 days?  
A) 31  
B) 29  
C) 14  
D) 2  
E) 17  

79. How many employees were absent fewer than six days?  
A) 60  
B) 31  
C) 91  
D) 46  
E) None of the above  

80. How many employees were absent more than five days?  
A) 8  
B) 4  
C) 22
D) 31
E) None of the above

81. How many employees were absent from 6 up to 12 days?
A) 20
B) 8
C) 12
D) 17
E) None of the above

Use the following to answer questions 82-87:
Refer to the following breakdown of responses to a survey of room cleanliness in a hotel.

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not satisfied</td>
<td>20</td>
</tr>
<tr>
<td>Satisfied</td>
<td>40</td>
</tr>
<tr>
<td>Highly satisfied</td>
<td>20</td>
</tr>
</tbody>
</table>

82. What is the class interval for the frequency table above?
A) 10
B) 20
C) 40
D) None of the above

83. What is the class with the greatest frequency?
A) Not satisfied
B) Satisfied
C) Highly satisfied
D) None of the above

84. What percent of the responses indicated that customers were satisfied?
A) 20
B) 25%
C) 50%
D) 100%
Essay

85. Draw a bar graph that illustrates the frequency table above.

86. Draw a bar graph that illustrates the relative frequencies.

87. Draw a pie chart that illustrates the relative frequencies.