Chapter 2. Visual Description of Data

Test Bank

TRUE/FALSE

1. True or False
Raw data are converted to frequency distributions and visual displays that provide us with a "big picture" of the information collected.

ANS: T PTS: 1 OBJ: Section 2.1

2. True or False
The appropriate methods for representing the data do not depend on whether the variable of interest is quantitative or qualitative.

ANS: F PTS: 1 OBJ: Section 2.1

3. True or False
Contingency tables are used primarily for counts involving qualitative data.

ANS: T PTS: 1 OBJ: Section 2.1

4. True or False
In a raw data listing, data are listed in increasing or decreasing numerical order.

ANS: F PTS: 1 OBJ: Section 2.2

5. True or False
Compared to the frequency distribution, the stem-and-leaf display provides more detail since it can describe the individual data values as well as show how many are in each group, or stem.

ANS: T PTS: 1 OBJ: Section 2.3

6. True or False
The following stem-and-leaf output has been generated by Minitab. This data has a negative mode.

ANS: T PTS: 1 OBJ: Section 2.3

7. True or False
When some of the variables represent categories, we can apply a useful summarization method called

tabulation, where we simply count how many people or items are in each category or combination of categories.

ANS: T PTS: 1 OBJ: Section 2.6

8. True or False
To more concisely communicate the information contained, raw data can be visually represented and expressed in terms of statistical summary measures.

ANS: T PTS: 1 OBJ: Section 2.7

9. True or False
A histogram describes a frequency distribution by using a series of adjacent rectangles, each of which has a length that is proportional to the frequency of observations within the range of values it represents.

ANS: T PTS: 1 OBJ: Section 2.1

10. True or False
A frequency distribution may be converted to show either relative or cumulative frequencies for the data.

ANS: T PTS: 1 OBJ: Section 2.2

11. True or False
The set of classes in the frequency distribution should be selected so that any given value falls into at least one category.

ANS: F PTS: 1 OBJ: Section 2.2

12. True or False
The simple tabulation and cross-tabulation are tabular methods that can be extended to include the mean or other measures of a selected quantitative variable for persons or items within a category or combination of categories.

ANS: T PTS: 1 OBJ: Section 2.7

13. True or False
The width (class interval) of a frequency distribution class is the difference between the smallest and largest values in a data set.

ANS: F PTS: 1 OBJ: Section 2.2

MULTIPLE CHOICE

1. Which of the following techniques are applicable to quantitative data?

a. The data array

b. Frequency distributions

c. Stem-and-leaf display

d. Scatter diagram and Dotplot

e. All of these

ANS: E PTS: 1 OBJ: Section 2.1

2. The midway point between the upper and lower class limits for a frequency distribution is known as the:

a. class interval.

b. class width.

c. class mark.

d. class frequency.

e. class average.

ANS: C PTS: 1 OBJ: Section 2.2

3. The _____ consists of line segments connecting the points formed by the intersections of the class marks with the class frequencies.

a. frequency polygon

b. histogram

c. stem-and-leaf diagram

d. scatter plot

e. bar graph

ANS: A PTS: 1 OBJ: Section 2.2

4. The class interval is the:

a. number of categories of the frequency distribution.

b. number of data values falling within each class.

c. lower and upper limits of each class.

d. width of each class.

e. mid-point of each class.

ANS: D PTS: 1 OBJ: Section 2.2

5. The _____ is a graphical display providing cumulative values for frequencies, relative frequencies, or percentages.

a. stem-and-leaf display

b. dotplot

c. line graph

d. pie chart

e. ogive

ANS: E PTS: 1 OBJ: Section 2.2

6. Class limits are the:

a. number of categories of the frequency distribution.

b. number of data values falling within each class.

c. lower and upper boundaries of each class.

d. width of each class.

e. mid-point of each class.

ANS: C PTS: 1 OBJ: Section 2.2

7. The largest value in a set of data is 160, and the smallest value is 70. If the resulting frequency distribution is to have six classes of equal width, what will be the class interval?

a. 15

b. 6

c. 12

d. 5

ANS: A PTS: 1 OBJ: Section 2.2

8. A requirement for a frequency distribution is that the set of classes must be mutually exclusive. This means that

a. the set of classes must include all possible data values.

b. a given data value can fall into only one class.

c. the classes must have equal widths.

d. classes must have an upper limit.

e. classes must have a lower limit.

ANS: B PTS: 1 OBJ: Section 2.2

9. A frequency distribution is a(n):

a. table of the individual observations collected from a sample.

b. individual listing of the random values found in a data set.

c. listing of the individual observations arranged in ascending or descending order.

d. table, which classifies the number of data values into classes.

ANS: D PTS: 1 OBJ: Section 2.2

10. The relative frequency distribution describes the

a. number of observations that fall within each class.

b. proportion of observations that fall within each class.

c. number of observations that are within or below each of the classes.

d. proportion of observations that are within or below each of the classes.

e. None of these is correct.

ANS: B PTS: 1 OBJ: Section 2.2

11. The cumulative frequency distribution describes the

a. number of observations that fall within each class.

b. proportion of observations that fall within each class.

c. number of observations that are within or below each of the classes.

d. proportion of observations that are within or below each of the classes.

e. None of these is correct.

ANS: C PTS: 1 OBJ: Section 2.2

12. Which of the following is not a guideline for constructing a frequency distribution?

a. If possible, open-end classes should be avoided.

b. The set of classes must be mutually exclusive and exhaustive.

c. Whenever possible, the classes should have equal width.

d. Whenever possible, class widths should be round numbers.

e. All of these are guidelines for constructing a frequency distribution.

ANS: E PTS: 1 OBJ: Section 2.2

13. In a scatter diagram, data are represented as:

a. dots which allow us to readily see the shape of the distribution as well as the high and low values.

b. frequencies according to the relative length of a set of rectangles.

c. a subset of the original digits as class descriptors.

d. a circular display divided into sections based on the number of observations within the segments.

e. pairs of known values of two variables, one being referred to as independent and the other, dependent.

ANS: E PTS: 1 OBJ: Section 2.5

14. In the stem-and-leaf display, data are represented as:

a. dots which allow us to readily see the shape of the distribution as well as the high and low values.

b. frequencies according to the relative length of a set of rectangles.

c. a subset of the original digits as class descriptors.

d. a circular display divided into sections based on the number of observations within the segments.

e. pairs of known values of two variables, one being referred to as independent and the other, dependent.

ANS: C PTS: 1 OBJ: Section 2.3

15. A stem-and-leaf display describes two-digit integers between 20 and 80. For one of the classes displayed, the row appears as 5|246. What numerical values are being described?

a. 25, 45, and 65

b. 60, 50, 40, and 20

c. 52, 54, and 56

d. 46 and 52

ANS: C PTS: 1 OBJ: Section 2.3

16. The following stem-and-leaf output has been generated by Minitab.

Which of the following statements are correct?

a. This data set has a mean that is negative.

b. This data set has a median less than -0.5

c. There is no modal class

d. This data set has six negative values

e. All of these are correct

ANS: E PTS: 1 OBJ: Section 2.3

17. The difference between a histogram and a bar chart is that:

a. the histogram reflects qualitative data while the bar chart represents quantitative data.

b. the adjacent rectangles in a histogram have a gap while those for a bar chart do not.

c. the histogram reflects quantitative data while the bar chart represents qualitative data.

d. the adjacent rectangles in a bar chart have a gap while those for a histogram usually do not.

e. Both answers C and D are correct.

ANS: E PTS: 1 OBJ: Section 2.4

18. In cross-tabulation:

a. data are represented in a table showing how many people or items are in combinations of categories.

b. we can identify possible relationships between the variables.

c. data are represented as a circular display divided into sections based on the number of observations within the segments.

d. data are represented as a pair of known values of two variables, one being referred to as independent and the other, dependent.

e. Both A and B are correct.

ANS: E PTS: 1 OBJ: Section 2.6

19. In a _____, we can generate a display that describes how a selected qualitative variable tends to differ from one category to another.

a. histogram

b. crosstab

c. relative frequency distribution

d. pie chart

e. line graph

ANS: B PTS: 1 OBJ: Section 2.6

NUMERIC RESPONSE

1. The following stem-and-leaf output has been generated by Minitab.

How many values are positive?

ANS: 4

PTS: 1 OBJ: Section 2.3

2. The grades on a chemistry exam for a sample of 40 students are as follows:

Estimate the percentage of grades that are between 80 and 90.

ANS: 12.5%

PTS: 1 OBJ: Section 2.2

COMPLETION

1. A cumulative frequency distribution lists the number of observations that are within or _____ each of the classes.

ANS: below

PTS: 1 OBJ: Section 2.2

2. A relative frequency distribution describes the_____ or _____ of data values that fall within each category.

ANS: proportion; percentage

PTS: 1 OBJ: Section 2.2

3. The _____ describes a frequency distribution by using a series of adjacent rectangles with no gaps in-between, each of which has the length that is proportional to the frequency of the observations within the range of values it represents.

ANS: histogram

PTS: 1 OBJ: Section 2.2

4. _____ is also known as marginal or one-way tabulation.

ANS: Simple tabulation

PTS: 1 OBJ: Section 2.6

5. The _____ is also known as the contingency table.

ANS: cross-tabulation

PTS: 1 OBJ: Section 2.6

6. The _____ is a diagram in which each point represents a pair of known or observed values of two variables.

ANS: scatter diagram

PTS: 1 OBJ: Section 2.5

7. The _____ a variant of the frequency distribution, uses a subset of the original digits in the raw data as class descriptors and class members.

ANS: stem-and-leaf display

PTS: 1 OBJ: Section 2.3

SHORT ANSWER

1. A physician takes the following sample of blood cholesterol levels form a group of volunteers (one reading per volunteer): 221, 202, 216, 227, 232, 218, 225, 234, 203, 247.
a. In what form, if any are these data organized?
b. Construct a frequency distribution, with class intervals of 10 points for these results.

ANS:
a. Raw data
b.

Cholesterol	Number of Readings
200-209	2
210-219	2
220-229	3
230-239	2
240-249	1

PTS: 1 OBJ: Section 2.2

2.

Price of a Home	Number of Homes Sold
Under $100,000	35
$100,000 – under $120,000	45
$120,000 – under $140,000	60
$140,000 – under $160,000	75

$160,000 – under $180,000 55

$180,000 – under $200,000 30

a. What is the frequency of the $120,000 – under $140,000 class?

b. What is the width of each class?

c. What is the class mark for the $140,000 – under $160,000 class?

d. If we were to convert thee data to a relative frequency distribution, what value would be associated with the $180,000 – under $200,000 class?

e. For a cumulative frequency distribution (less than or within), what value would be associated with the $160,000 – under $180,000 class?

f. For a cumulative relative frequency distribution (less than or within), what value would be associated with the $100,000 – under $120,000 class?

ANS:

a. 60

b. $20,000

c. $150,000

d. 0.10

e. 270

f..2667

PTS: 1 OBJ: Section 2.2

3. Voters participating in a recent election exit poll in Michigan were asked to state their political party affiliation. Coding the data 1 for Democrat, 2 for Republican and 3 for Independent, the data collected were as follows: 1, 1, 2, 3, 1, 2, 3, 2, 1, 2, 3, 2, 1, 1, 3, 2, 1, 1, 1, 2, 3, 2, 1, 1, 3

Develop a frequency distribution and proportion distribution for the data. What does the data suggest about the strength of the political parties in Michigan?

ANS:

Party Frequency Proportion
Democrat 11 0.44
Republican 8 0.32
Independent 6 0.24
The Democratic Party in Michigan is stronger than the Republican and Independent parties.

4. Consider the following cumulative frequency distribution.

Class Limits Cumulative Frequency

0 – under 5 10

5 – under 10 15

10 – under 15 21

15 – under 20 29

20 – under 25 36

Find the frequencies for each of the following classes:

a. 0 – under 5

b. 5 – under 10

c. 10 – under 15

d. 15 – under 20

e. 20 – under 25

ANS:

a. 10

b. 5

c. 6

d. 8

e. 7

PTS: 1 OBJ: Section 2.2

5. The grades on a statistics exam for a sample of 40 students are as follows:

63 74 42 65 51 54 36 56 68 57

62 64 76 67 79 61 81 77 59 38

84 68 71 94 71 86 69 75 91 55

48 82 83 54 79 62 68 58 41 47

Construct frequency and relative frequency distributions for the data using seven class intervals.

ANS:

Class Limits Frequency Relative Frequency

30 up to 40 2 .050

40 up to 50 4 .100

50 up to 60 8 .200

60 up to 70 11 .275

70 up to 80 8 .200

80 up to 90 5 .125

90 up to 100 2 .050

TOTAL 40 1.000

PTS: 1 OBJ: Section 2.2

6. The following table represents exam grades from 36 students in a statistics class. Construct a stem-and-leaf display.

60 79 75 84 85 74

81 95 89 58 66 98

99 99 62 86 85 99

79 82 98 72 72 72

75 88 86 81 96 86

78 91 83 85 92 68

ANS:

5 | 8

6 | 0 2 6 8

7 | 2 2 2 4 5 5 8 9 9

8 | 1 1 2 3 4 5 5 5 6 6 6 8 9

9 | 1 2 5 6 8 8 9 9 9

PTS: 1 OBJ: Section 2.3

7. The following table represents exam grades from 36 students in a statistics class. Construct a pie chart using classes with grades 51-60, 61-70, 71-80, 81-90, and 91-100.

60 79 75 84 85 74

81 95 89 58 66 98

99 99 62 86 85 99

79 82 98 72 72 72

75 88 86 81 96 86

78 91 83 85 92 68

ANS:

PTS: 1 OBJ: Section 2.4

8. A medical statistician wanted to examine the relationship between the amount of sunshine (x) and incidence of skin cancer (y). As an experiment he found the number of skin cancers detected per 100,000 of population and the average daily sunshine in eight counties around the country. These data are shown below.

Draw a scatter plot and find the least squares regression line.

_____

ANS:

$= -1.115 + 1.846x$

PTS: 1 OBJ: Section 2.5

9. The general manager of a chain of furniture stores believes that experience is the most important factor in determining the level of success of a salesperson. To examine this belief she records last month's sales (in $1,000s) and the years of experience of 10 randomly selected salespeople. These data are listed below.
Draw a scatter diagram of the data and determine the least squares regression line.

ANS:

$= 8.63 + 1.0817x$

PTS: 1 OBJ: Section 2.5

10. The ages for a sample of 25 car dealers are as follows:

30 40 31 41 53 37 54 28 45 30

45 21 32 34 26 34 24 24 35 47

38 45 28 43 35

Use Minitab to draw each of the following graphs.

a. A stem and leaf plot

b. a dot plot

ANS:

a)

Stem-and-leaf of Age N = 25

Leaf Unit = 1.0

3 2 144

6 2 688

12 3 001244

(4) 3 5578

9 4 013

6 4 5557

2 5 34

b)

PTS: 1 OBJ: Section 2.3

11. Voters participating in a recent election exit poll in Michigan were asked to state their political party affiliation. Coding the data 1 for Republican, 2 for Democrat and 3 for Independent, the data collected were as follows: 3, 2, 3, 2, 1, 1, 3, 2, 1, 3, 1, 2, 3, 1, 3, 3, 3, 3, 2, 1, 1, 3, 2, 3, 1

Construct a frequency bar chart.

ANS:

PTS: 1 OBJ: Section 2.4

12. A grocery store's monthly sales (in thousands of dollars) for the last year was as follows:

Month 1 2 3 4 5 6 7 8 9 10 11 12
Sales 78 74 83 87 85 93 100 105 103 89 78 94

Construct a line graph for these data.

ANS:

PTS: 1 OBJ: Section 2.4

13. The ages of a sample of 25 salespersons are as follows:

47 21 37 53 28 40 30 32 34
34 24 24 35 45 38 35 28 43
30 45 31 41 54 26 45

Use Excel or Minitab to draw a histogram with five classes.

ANS:

PTS: 1 OBJ: Section 2.2

ESSAY

1. A friend has constructed the following frequency distribution of test scores in his business
statistics class:
Score Number of Students
40 and below 2
40 – 50 6
50 – 60 8
60 – 70 13
70 – 80 11
80 – 90 5
90 and above 4

He asks for your feedback. What advice would you give him?

ANS:
Your friend needs to revise the distribution. The classes are not mutually exclusive (they overlap).
Also, some classes are open-ended ("40 and below," "90 and above") and not of equal width.

PTS: 1 OBJ: Section 2.2

2. What is the relationship between a frequency distribution and a histogram?

ANS:
The frequency distribution is a table that divides the data values into classes and shows the number of
observed values that fall into each class. The histogram describes the frequency distribution by using

a series of adjacent rectangles, each of which has a length proportional to the frequency of the observations within the range of values or class it represents.

PTS: 1 OBJ: Section 2.2

3. Discuss the importance of choosing a symbol for a pictogram.

ANS:
Choosing a symbol in a pictogram is an important consideration because the right or wrong symbol can lend nonverbal or emotional content to the display which can have an impact on how the data is interpreted.

PTS: 1 OBJ: Section 2.4

4. Discuss the guidelines that are recommended for constructing a frequency distribution.

ANS:
The guidelines for constructing a frequency distribution are: a. The set of classes must be mutually exclusive, with no overlaps. b. Set of classes must be exhaustive. c. If possible the classes should have equal widths. d. In general, about 5 to 15 classes will be suitable. e. When possible, class widths should be round numbers. f. Avoid using open-end classes.

PTS: 1 OBJ: Section 2.2

5. A recent Wall Street Journal poll asked a sample of professional, white collar, and blue-collar workers whether they felt legal immigration had a positive effect on the United States. The responses were graphed as follows:

Identify the type of chart shown, and describe the information it gives.

ANS:
This is a pie chart. It shows that 39% of professionals, 35% of white-collar workers, and 26% of blue-collar workers think legal immigration is positive for the U.S.

PTS: 1 OBJ: Section 2.4

6. What is the difference between a histogram and a bar chart? For what type of data would each be appropriate?

ANS:

A histogram graphically displays class intervals as well as class frequencies. A bar chart displays the frequencies for a set of categories or classes. Histograms are appropriate for quantitative data, while bar charts are better for qualitative data. Adjacent rectangles in the histogram share a common side while those in the bar chart have a gap between them.

PTS: 1 OBJ: Section 2.4

7. What is a scatter diagram, and for what kind of data is it a useful descriptive device?

ANS:

A scatter diagram is a plot in which each point represents a pair of known or observed values of x and y. The variables are represented on the horizontal (x) and vertical (y) axes. The scatter diagram is useful in examining whether the variables might be related to each other in some way.

PTS: 1 OBJ: Section 2.5

8. Differentiate between a positive linear relationship and a negative linear relationship between variables.

ANS:

In a positive linear relationship, y tends to increase linearly with increases in x. In a negative linear relationship, y tends to decrease linearly as x increases.

PTS: 1 OBJ: Section 2.5

9. A professor of economics wants to study the relationship between income and education. A sample of 10 individuals is selected at random, and their income (in thousand of dollars) and education (in years) are shown below:

Draw a scatter diagram for these data with the income on the vertical axis. Describe the relationship between income and education.

ANS:

There is a very strong positive relationship between education and income; as years of education increase, there is a definite tendency for income to linearly increase.

PTS: 1 OBJ: Section 2.5

10. The general manager of a chain of furniture stores believes that experience is the most important factor in determining the level of success of a salesperson. To examine this belief she records last month's sales (in $1,000s) and the years of experience of 10 randomly selected salespeople. These data are listed below.

Interpret the value of the slope of the regression line.

ANS:
For each additional year of experience, monthly sales of a salesperson increase on average by $1,081.70.

PTS: 1 OBJ: Section 2.5

11. When variables are used as the basis for a cross-tabulation, what scale of measurement must they represent?

ANS:
The classificatory variables that represent the rows and columns in cross-tabulation (contingency tables) will be in the nominal scale of measurement. The variables described within the table can be nominal (categories) when counts are being expressed. They can be interval or ratio when measures such as the mean or median are being expressed.

PTS: 1 OBJ: Section 2.6

12. Define and give a real or hypothetical example of simple tabulation.

ANS:
Simple tabulation involves just one variable. Example: we may express a count of how many students in a class are males and how many are females.

PTS: 1 OBJ: Section 2.6

13. Define and give a real or hypothetical example of cross-tabulation.

ANS:
In cross-tabulation, we express a count of how many people or items are in combinations of categories. Example: we may express a count of how many students in a class are males majoring in accounting and how many are females majoring in finance.

PTS: 1 OBJ: Section 2.6

14. A recent Wall Street Journal survey found that 523 Democrats and 765 Republicans and believe legal immigration has a positive effect on the Untied States. Display this data in a bar chart.

ANS:

PTS: 1 OBJ: Section 2.4