

CHAPTER 2: GRAPHICAL AND TABULAR DESCRIPTIVE TECHNIQUES

TRUE/FALSE

1. Your age group (1-9; 10-19; 20-29; 30-39; etc.) is an interval variable.

ANS: F NAT: Analytic; Descriptive Statistics

2. Your gender is a nominal variable.

ANS: T NAT: Analytic; Descriptive Statistics

3. Your final grade in a course (A, B, C, D, E) is a nominal variable.

ANS: F NAT: Analytic; Descriptive Statistics

4. Your age is an interval variable.

ANS: T NAT: Analytic; Descriptive Statistics

5. Interval data may be treated as ordinal or nominal.

ANS: T NAT: Analytic; Descriptive Statistics

6. Whether or not you are over the age of 21 is a nominal variable.

ANS: T NAT: Analytic; Descriptive Statistics

7. The values of quantitative data are categories.

ANS: F NAT: Analytic; Descriptive Statistics

8. Interval data, such as heights, weights, and incomes, are also referred to as quantitative or numerical data.

ANS: T NAT: Analytic; Descriptive Statistics

9. All calculations are permitted on interval data.

ANS: T NAT: Analytic; Descriptive Statistics

10. Nominal data are also called qualitative or categorical data.

ANS: T NAT: Analytic; Descriptive Statistics

11. A variable is some characteristic of a population or sample.

ANS: T NAT: Analytic; Descriptive Statistics

12. With nominal data, there is one and only one way the possible values can be ordered.
ANS: F NAT: Analytic; Descriptive Statistics
13. You cannot calculate and interpret differences between numbers assigned to nominal data.
ANS: T NAT: Analytic; Descriptive Statistics
14. A bar chart is used to represent interval data.
ANS: F NAT: Analytic; Descriptive Statistics
15. One of the advantages of a pie chart is that it clearly shows that the total percentages of all the categories add to 100%.
ANS: T NAT: Analytic; Descriptive Statistics
16. Bar and pie charts are graphical techniques for nominal data. The former focus the attention on the *frequency* of the occurrences of each category, and the later emphasizes the *proportion* of occurrences of each category.
ANS: T NAT: Analytic; Descriptive Statistics
17. A relative frequency distribution lists the categories and their counts.
ANS: F NAT: Analytic; Descriptive Statistics
18. A frequency distribution lists the categories and the proportion with which each occurs.
ANS: F NAT: Analytic; Descriptive Statistics
19. From a pie chart you are able to find the frequency for each category.
ANS: F NAT: Analytic; Descriptive Statistics
20. The intervals (classes) in a histogram do not overlap.
ANS: T NAT: Analytic; Descriptive Statistics
21. The intervals (classes) in a histogram are equally wide.
ANS: T NAT: Analytic; Descriptive Statistics
22. In a histogram, each observation is assigned to one or more classes.
ANS: F NAT: Analytic; Descriptive Statistics
23. The number of class intervals in a histogram depends on the number of observations in the data set.

ANS: T NAT: Analytic; Descriptive Statistics

24. A relative frequency distribution describes the proportion of data values that fall within each category.

ANS: T NAT: Analytic; Descriptive Statistics

25. A stem-and-leaf display reveals more information about the original data than does a histogram.

ANS: T NAT: Analytic; Descriptive Statistics

26. The number of observations within each class may be found in a frequency distribution.

ANS: T NAT: Analytic; Descriptive Statistics

27. The advantage of a stem-and-leaf display over a histogram is that we can see the actual observations.

ANS: T NAT: Analytic; Descriptive Statistics

28. According to the stem-and-leaf plot below, the median quiz score for this data set is 8.

Stem-and-leaf of Quiz Score; N = 75

Leaf Unit = 1

9	0	000112333
14	0	56899
21	1	0000123
26	1	66699
33	2	3334445
(8)	2	66677888
34	3	0023344
27	3	56669999
19	4	000122233
10	4	5556667799

ANS: F NAT: Analytic; Descriptive Statistics

29. A cumulative relative frequency distribution lists the number of observations that lie below each of the class limits.

ANS: F NAT: Analytic; Descriptive Statistics

30. According to the stem-and-leaf plot below, this data set has a negative median.

Stem-and-leaf of P/E ratio; N = 75

Leaf Unit = 0.01

1	-2	6
2	-2	0
5	-1	555
8	-1	420
22	-0	99999887777665

36	-0	44322111111000
(14)	0	01122233333344
25	0	66678889999
14	1	0022222334
4	1	56
2	2	03

ANS: F NAT: Analytic; Descriptive Statistics

31. A histogram represents interval data.

ANS: T NAT: Analytic; Descriptive Statistics

32. A stem-and-leaf display represents nominal data.

ANS: F NAT: Analytic; Descriptive Statistics

33. According to the stem-and-leaf plot below, this data set is symmetric.

Stem-and-leaf of P/E ratio; N = 10
 Leaf Unit = 0.10

2	-1	53
4	-0	97
(2)	-0	65
4	0	3
3	0	6
2	1	3
1	1	8

ANS: F NAT: Analytic; Descriptive Statistics

34. When a distribution has more values to the left and tails off to the right, it is skewed negatively.

ANS: F NAT: Analytic; Descriptive Statistics

35. A histogram is said to be symmetric if, when we draw a vertical line down the center of the histogram the two sides are nearly identical.

ANS: T NAT: Analytic; Descriptive Statistics

36. A skewed histogram is one with a long tail extending either to the right or left.

ANS: F NAT: Analytic; Descriptive Statistics

37. When a distribution has more values to the right and tails to the left, we say it is skewed negatively.

ANS: T NAT: Analytic; Descriptive Statistics

38. The sum of relative frequencies in a distribution always equals 1.

ANS: T NAT: Analytic; Descriptive Statistics

39. The sum of cumulative relative frequencies always equals 1.

ANS: F NAT: Analytic; Descriptive Statistics

40. The original observations cannot be determined once they are grouped into a frequency distribution.

ANS: T NAT: Analytic; Descriptive Statistics

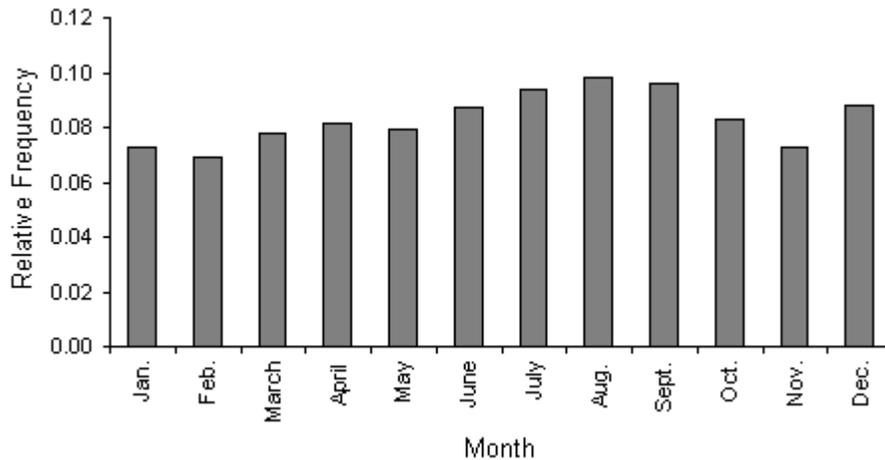
41. A modal class is the class with the largest number of observations.

ANS: T NAT: Analytic; Descriptive Statistics

42. Experience shows that few students hand in their statistics exams early; most prefer to hand them in near the end of the test period. This means the time taken by students to write exams is positively skewed.

ANS: F NAT: Analytic; Descriptive Statistics

43. The graph below is an example of a histogram.



ANS: F NAT: Analytic; Descriptive Statistics

44. The sum of cumulative relative frequencies always equals 1.

ANS: F NAT: Analytic; Descriptive Statistics

45. A line chart is created by plotting the values of the variable on the vertical axis and the time periods on the horizontal axis.

ANS: T NAT: Analytic; Descriptive Statistics

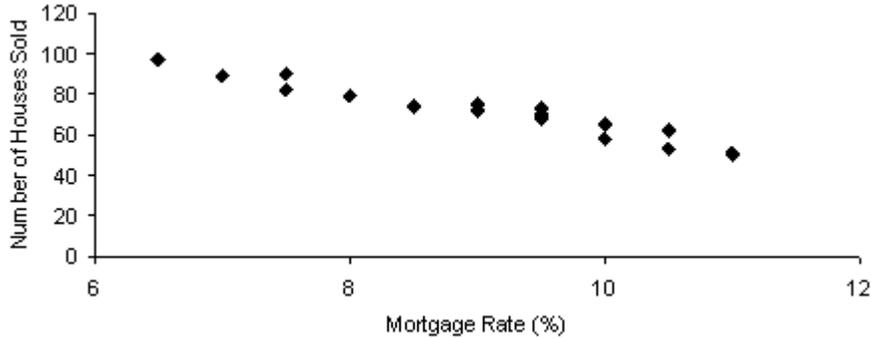
46. Time series data are often graphically depicted on a line chart, which is a plot of the variable of interest over time.

ANS: T NAT: Analytic; Descriptive Statistics

47. A line chart that is flat shows no fluctuation in the variable being presented.

ANS: T NAT: Analytic; Descriptive Statistics

48. The graph below represents a line graph.

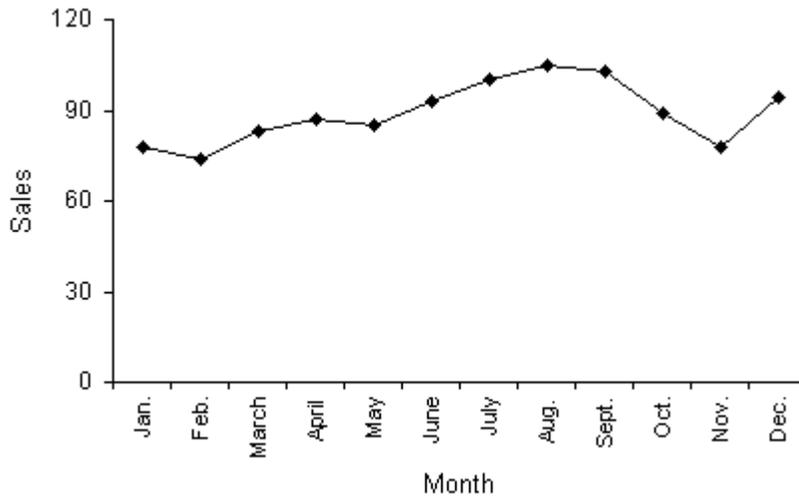


ANS: F NAT: Analytic; Descriptive Statistics

49. A department store's monthly sales (in thousands of dollars) for the last year were as follows. A histogram should be used to present these data.

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

ANS: F



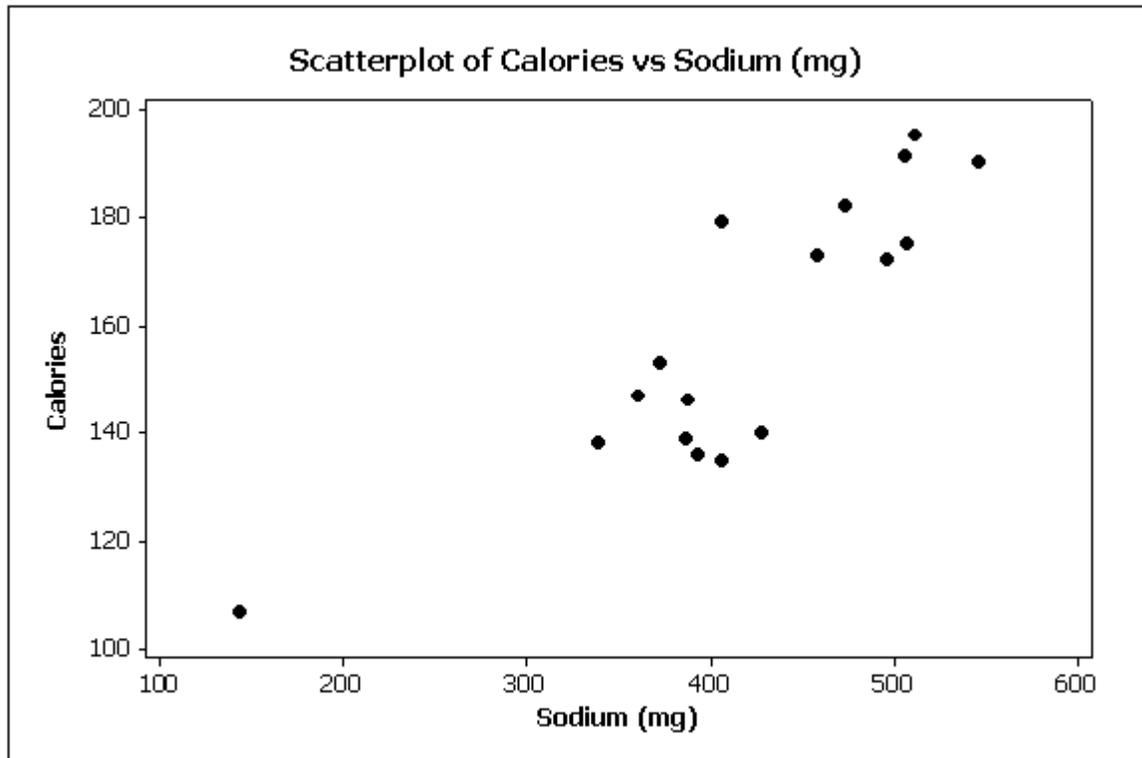
NAT: Analytic; Descriptive Statistics

50. The line chart below shows tomato prices each month from January (month 1) to December last year (\$ per pound). By looking at this chart you can see the lowest tomato prices occurred in July.

53. The two most important characteristics revealed by the scatter diagram are the strength and direction of the linear relationship.

ANS: T NAT: Analytic; Descriptive Statistics

54. Data for calories and salt content (milligrams of sodium) in 17 brands of meat hot dogs are shown in the scatter diagram below. According to this diagram, it appears that hot dogs that are high in sodium are generally low in calories, and hot dogs with low sodium are generally high in calories.



ANS: F NAT: Analytic; Descriptive Statistics

55. If we draw a straight line through the points in a scatter diagram and most of the points fall close to the line, there must be a positive relationship between the two variables.

ANS: F NAT: Analytic; Descriptive Statistics

56. The two most important characteristics to examine in a scatter diagram are the number of possible categories for X and Y and the number of observations in each category.

ANS: F NAT: Analytic; Descriptive Statistics

57. When two variables are linearly related, and tend to move in opposite directions, we describe the nature of their association as a negative linear relationship.

ANS: T NAT: Analytic; Descriptive Statistics

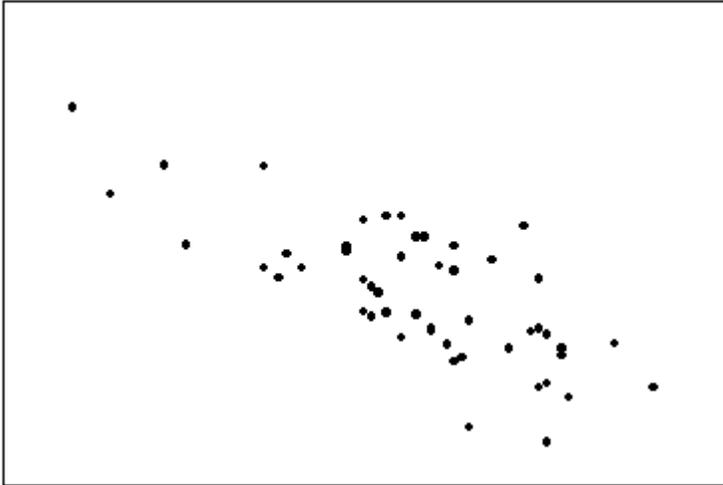
58. Correlation implies causation.

ANS: F NAT: Analytic; Descriptive Statistics

59. If two variables have a strong linear relationship, that means one variable is *causing* the other variable to go up or down.

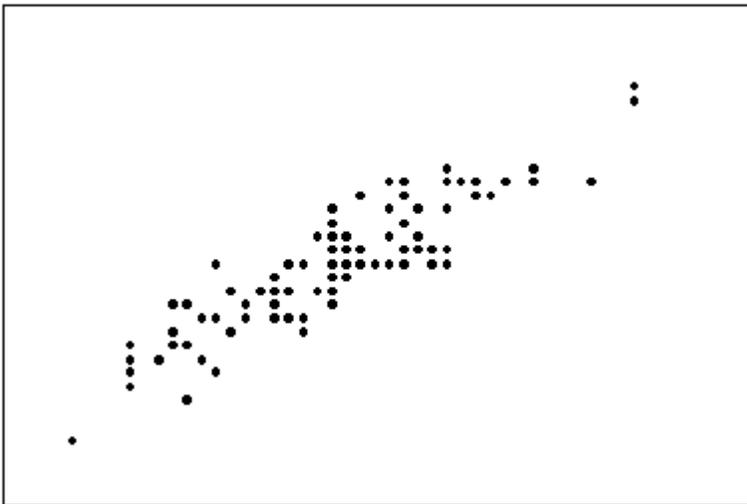
ANS: F NAT: Analytic; Descriptive Statistics

60. The scatter diagram below depicts data with a negative linear relationship.



ANS: T NAT: Analytic; Descriptive Statistics

61. The first scatter diagram below shows a stronger linear relationship than the second scatter diagram. (Assume the scales on both scatter diagrams are the same.)



64. The classification of student class designation (freshman, sophomore, junior, senior) is an example of a(n)
- nominal random variable.
 - interval random variable.
 - ordinal random variable.
 - a parameter.

ANS: C

NAT: Analytic; Descriptive Statistics

65. A researcher wishes to estimate the textbook costs of first-year students at Barry University. To do so, he recorded the textbook cost of 300 first-year students and found that their average textbook cost was \$195 per semester. The variable of interest to the researcher is
- textbook cost.
 - class rank.
 - number of students.
 - name of university.

ANS: A

NAT: Analytic; Descriptive Statistics

66. All calculations are permitted on what type of data?
- Interval data
 - Nominal data
 - Ordinal data
 - All of these choices are true.

ANS: A

NAT: Analytic; Descriptive Statistics

67. Values must represent ordered rankings for what type of data?
- Interval data
 - Nominal data
 - Ordinal data
 - None of these choices.

ANS: C

NAT: Analytic; Descriptive Statistics

68. For what type of data are frequencies the only calculations that can be done?
- Interval data
 - Nominal data
 - Ordinal data
 - None of these choices.

ANS: B

NAT: Analytic; Descriptive Statistics

69. For which type of data are the values arbitrary numbers?
- Interval data
 - Nominal data
 - Ordinal data
 - None of these choices.

ANS: B

NAT: Analytic; Descriptive Statistics

70. Which of the following statements about pie charts is false?

- a. A pie chart is a graphical representation of a relative frequency distribution.
- b. You can always determine frequencies for each category by looking at a pie chart.
- c. The total percentage of all the slices of a pie chart is 100%.
- d. The area of a slice of a pie chart is the proportion of all the individuals that fall into that particular category.

ANS: B NAT: Analytic; Descriptive Statistics

71. Which of the following situations is best suited for a pie chart?
- a. The number of dollars spent this year on each type of legal gambling.
 - b. The percentage of a charitable donation that goes to administrative costs vs. directly to the charity.
 - c. The number of students in your class who received an A, B, C, D, F on their exam.
 - d.** All of these choices are true.

ANS: B NAT: Analytic; Descriptive Statistics

72. Which situation identifies when to use pie charts and/or bar charts?
- a. You want to describe a single set of data.
 - b. Your data is nominal.
 - c. You want to show the number or the percentage of individuals in each category.
 - d.** All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

73. Suppose you measure the number of minutes it takes an employee to complete a task, where the maximum allowed time is 5 minutes, and each time is rounded to the nearest minute. Data from 130 employees is summarized below. How long did it take most employees to complete the task?

Time (minutes)	1	2	3	4	5
Frequency	25	40	50	35	30

- a. 5 minutes
- b. 3 minutes
- c. 30 minutes
- d. 50 minutes

ANS: B NAT: Analytic; Descriptive Statistics

74. Car buyers were asked to indicate the car dealer they believed offered the best overall service. The four choices were Convoy Motors (C), Mako Chrysler (M), Torrent Auto (T), and Unequaled Chevrolet (U). The following data were obtained:

T C C C U C M T C U
 U M C M T C M M C M
 T C C T U M M C C T
 T U C U T M M C U T

What percentage of car buyers identified Convoy Motors as having the best overall service?

- a. $1/4 = 0.25$ or 25%
- b. $14/40 = 0.35$ or 35%
- c. 14%

d. None of these choices.

ANS: B NAT: Analytic; Descriptive Statistics

75. Which of the following represents a graphical presentation of interval data?
- a. A bar chart.
 - b. A histogram.
 - c. A pie chart.
 - d.** All of these choices are true.

ANS: B NAT: Analytic; Descriptive Statistics

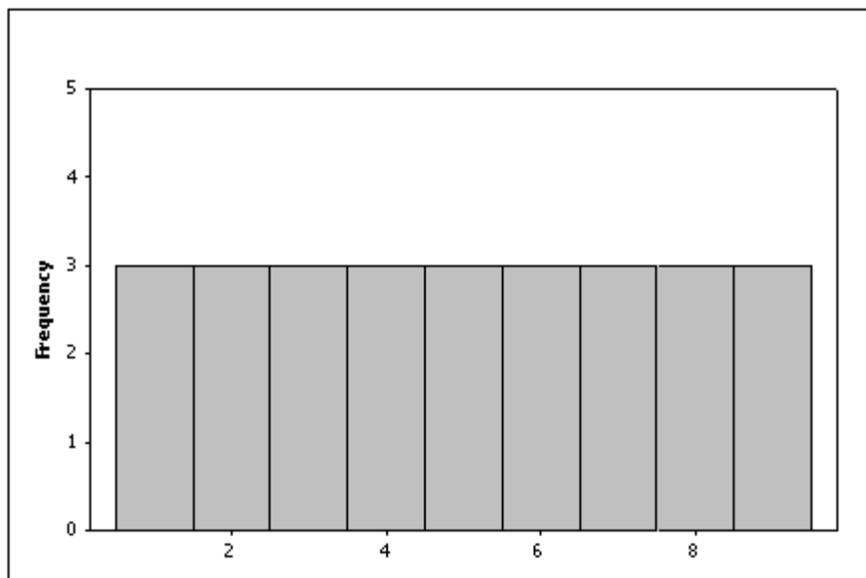
76. Which of the following statements about histograms is false?
- a. A histogram is a summary of interval data.
 - b. A histogram is made of a series of intervals, called classes.
 - c. The classes in a histogram cover the complete range of observations.
 - d.** All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

77. Which of the following statements about histograms is false?
- a. The intervals of a histogram do not overlap.
 - b. Every observation is assigned to one and only one class in a histogram.
 - c. The intervals of a histogram are equally wide.
 - d.** None of these choices.

ANS: D NAT: Analytic; Descriptive Statistics

78. Which of the following describes the shape of the histogram below?



- a. Positively skewed
- b. Negatively skewed
- c. Symmetric
- d.** None of these choices

ANS: C

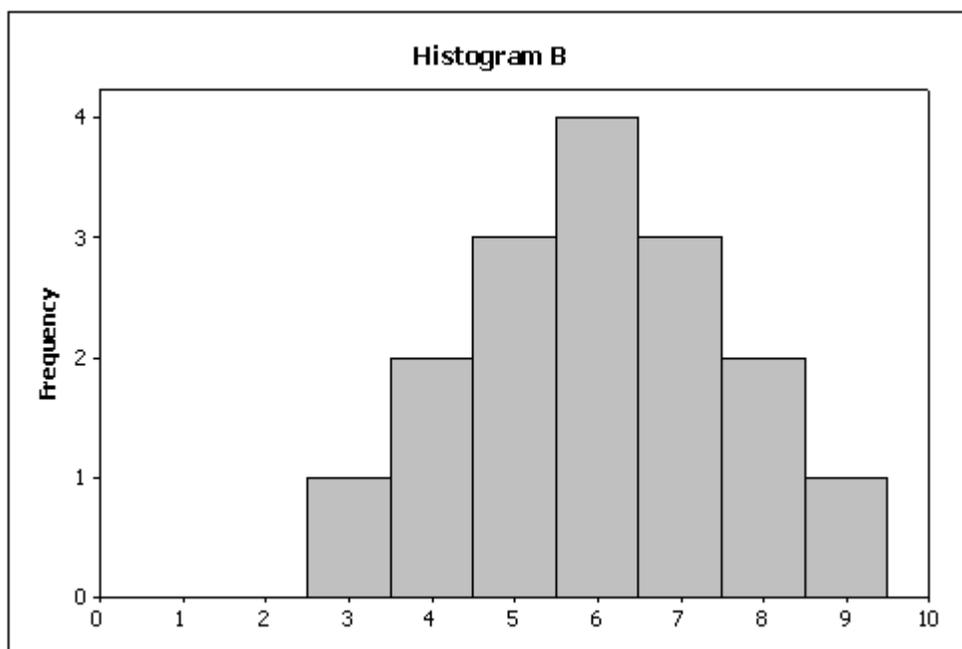
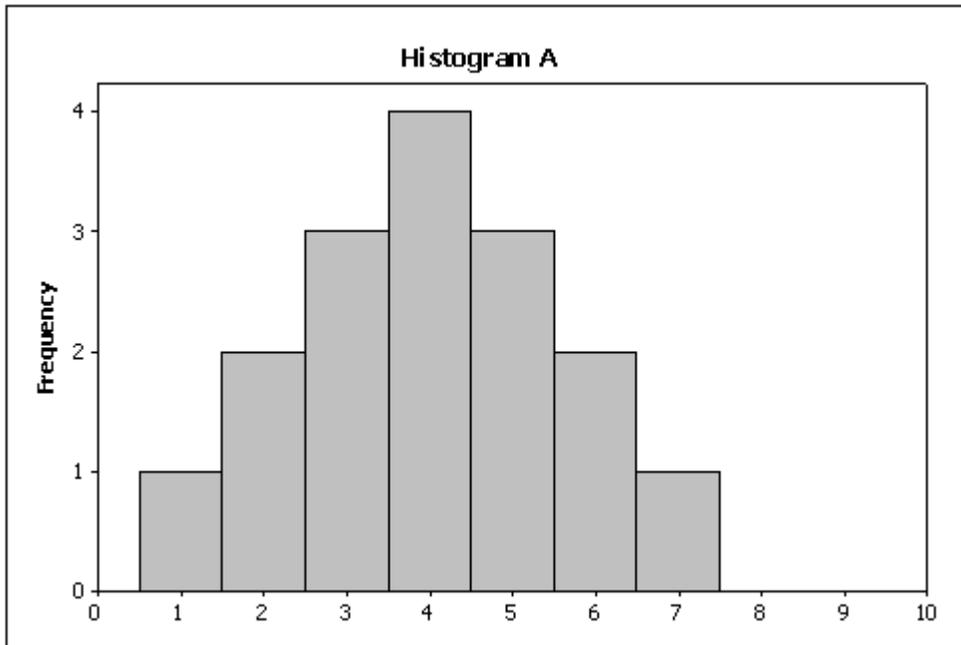
NAT: Analytic; Descriptive Statistics

79. The relative frequency of a class in a histogram is computed by
- dividing the frequency of the class by the number of classes.
 - dividing the frequency of the class by the class width.
 - dividing the frequency of the class by the total of all frequencies.
 - None of these choices.

ANS: C

NAT: Analytic; Descriptive Statistics

80. Compare the two histograms below. Which statement is true?

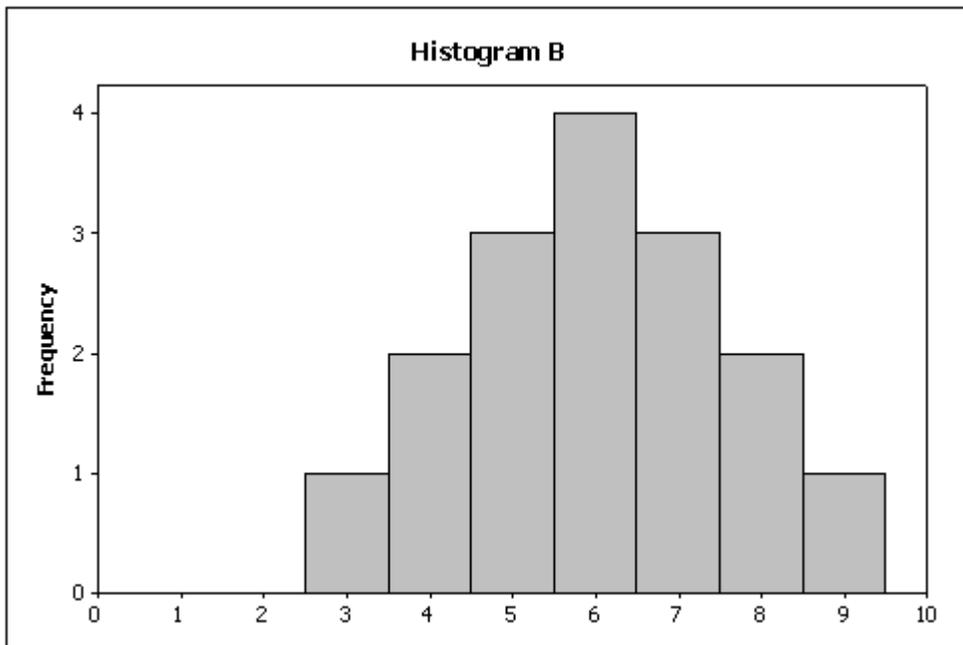
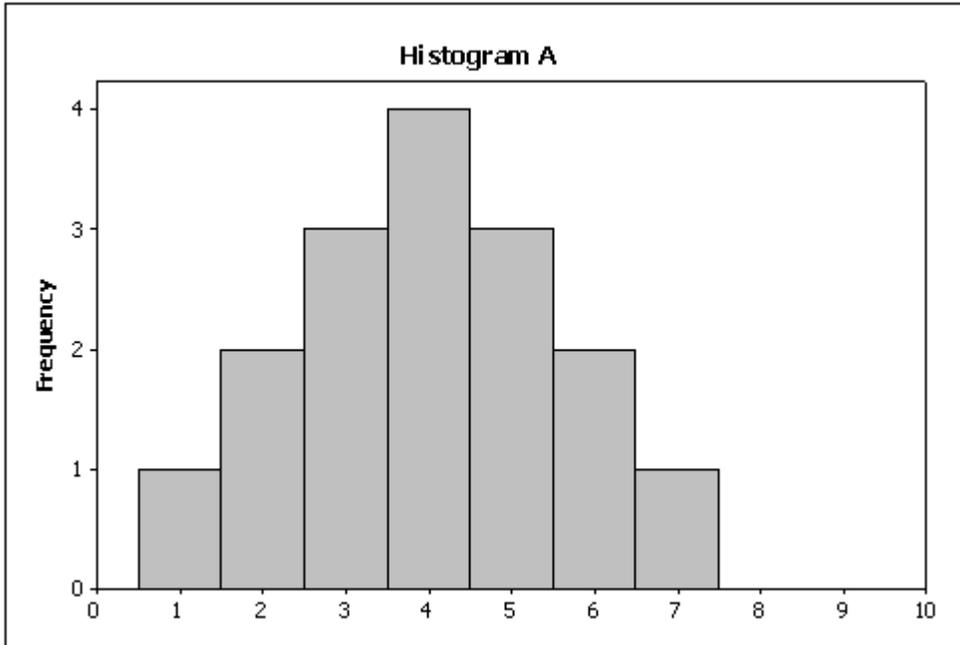


- a. The center of histogram A is lower than the center of histogram B.
- b. The center of histogram A is higher than the center of histogram B.
- c. The center of histogram A is the same as the center of histogram B.
- d. You cannot compare the centers of these two histograms without the original data.

ANS: A

NAT: Analytic; Descriptive Statistics

81. Compare the two histograms below. Which statement is true?



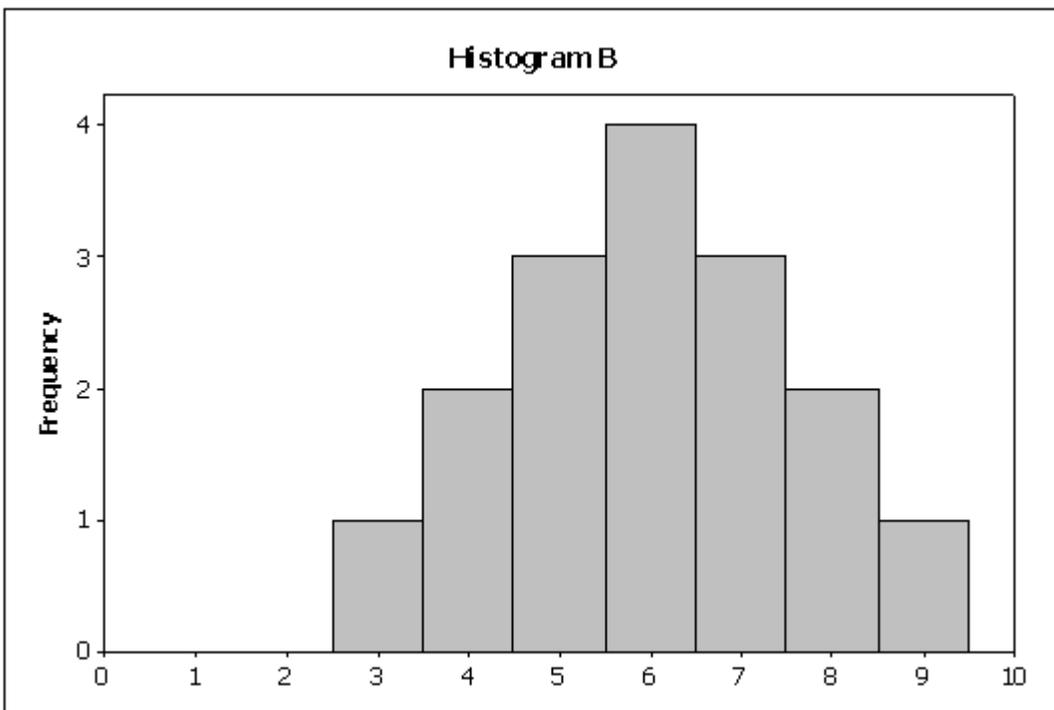
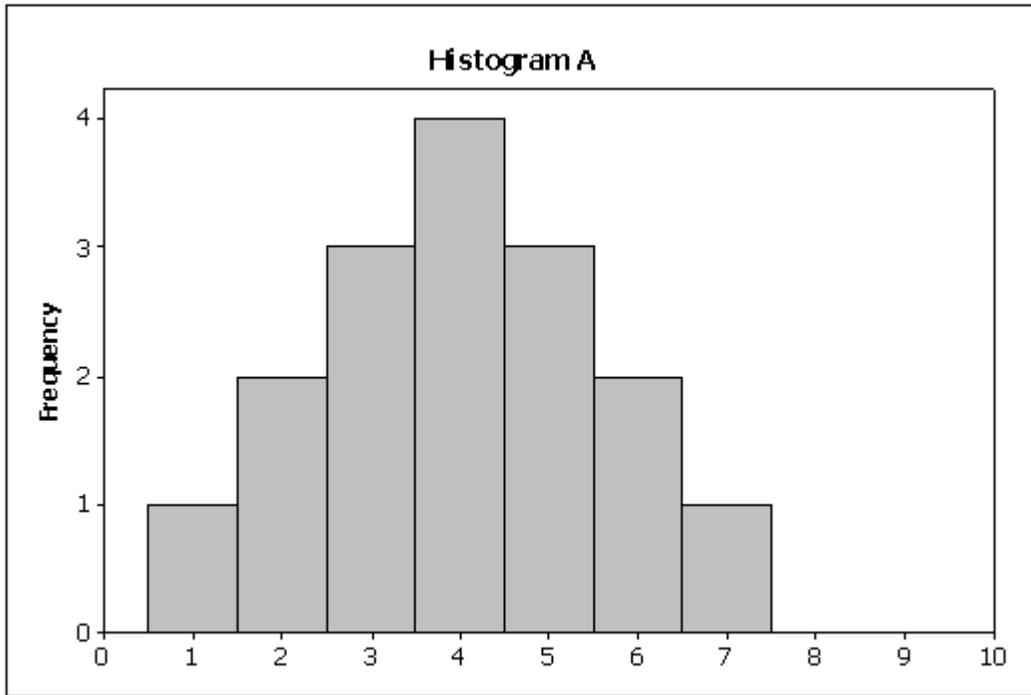
- a. The spread of histogram A is smaller than the spread of histogram B.
- b. The spread of histogram A is larger than the spread of histogram B.
- c. The spread of histogram A is the same as the spread of histogram B.

d. You cannot compare the spreads of these two histograms without the original data.

ANS: C

NAT: Analytic; Descriptive Statistics

82. Compare the two histograms below. Which statement is true?



- a. The shape of histogram A is the same as the shape of histogram B.
- b. The shape of histogram A is positively skewed compared to histogram B.
- c. The shape of histogram A is negatively skewed compared to histogram B.

d. You cannot compare the shapes of these two histograms without the original data.

ANS: A NAT: Analytic; Descriptive Statistics

83. A modal class in a histogram is the class that includes
- a. the largest number of observations.
 - b. the smallest number of observations.
 - c. the largest observation in the data set.
 - d. the smallest observation in the data set.

ANS: A NAT: Analytic; Descriptive Statistics

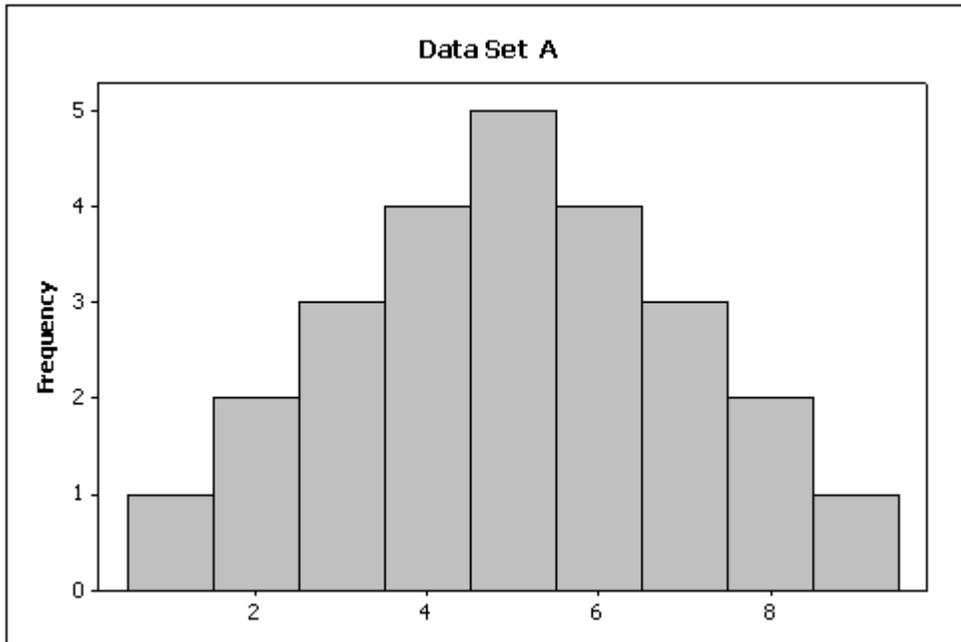
84. The sum of the relative frequencies for all classes in a histogram always equals
- a. the number of classes.
 - b. the class width.
 - c. the total of all the frequencies.
 - d. one.

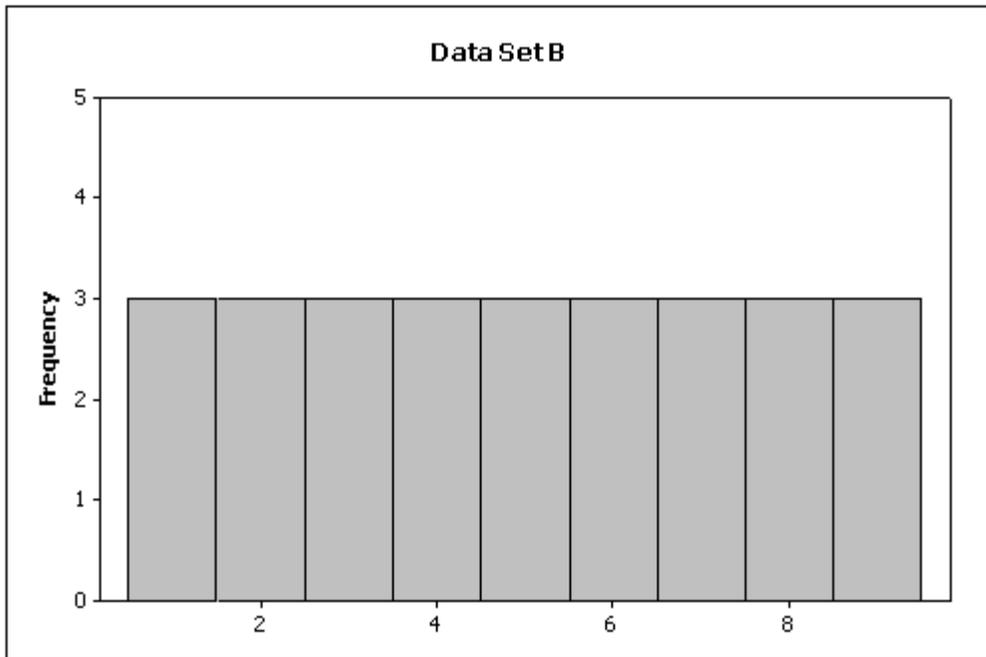
ANS: D NAT: Analytic; Descriptive Statistics

85. Which of the following statements about shapes of histograms is true?
- a. A histogram is said to be symmetric if, when we draw a vertical line down the center of the histogram, the two sides are identical in shape and size.
 - b. A negatively skewed histogram is one with a long tail extending to the left.
 - c. A positively skewed histogram is one with a long tail extending to the right.
 - d.** All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

86. Compare the spread of the two histograms below. Which of the following is true?





- Data Set A has a larger spread than Data Set B.
- Data Set A has a smaller spread than Data Set B.
- Data Set A has the same spread as Data Set B.
- You cannot compare the spreads of these histograms without the original data.

ANS: B NAT: Analytic; Descriptive Statistics

87. Which of the following is true about a stem-and-leaf display?
- You can recreate the original data set from it.
 - Its shape resembles a histogram turned on its side.
 - It provides an organized way to depict interval data.
 - All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

88. What does the length of each line of a stem-and-leaf display represent?
- The percentage of observations in the interval represented by that stem.
 - The number of observations in the interval represented by that stem.
 - The total frequency of observations within or below that stem.
 - The number of digits to the left of the decimal point.

ANS: B NAT: Analytic; Descriptive Statistics

89. What values are displayed on a cumulative relative frequency distribution?
- The number of observations that fall into each class interval.
 - The proportion of observations that fall into each class interval.
 - The number of observations that fall below each class interval.
 - The proportion of observations that fall below each class interval.

ANS: D NAT: Analytic; Descriptive Statistics

90. What type of graph depicts the data below?

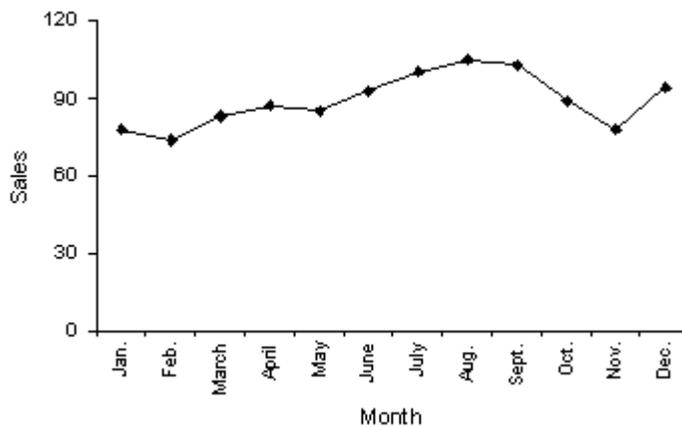
95. Which of the following statements describes a line chart?
- A line chart is a graph of time-series data.
 - A line chart is a plot of a variable over time.
 - The horizontal axis of a line chart contains time periods.
 - All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

96. What kind(s) of data can be depicted by a line chart?
- Frequencies of an interval over time.
 - Frequencies of a nominal variable over time.
 - Relative frequencies of a nominal variable over time.
 - All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

97. Which of the following statements describe(s) the line chart below?



- November experienced the lowest sales throughout the year.
- August experienced the highest sales throughout the year.
- Sales did not fluctuate more than 30 units on either side of 90.
- All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

98. The relationship between two interval variables is graphically displayed by a
- scatter diagram
 - histogram
 - bar chart
 - pie chart

ANS: A NAT: Analytic; Descriptive Statistics

99. In order to draw a scatter diagram, we need interval data for
- one variable
 - two variables
 - three variables

d. four variables

ANS: B NAT: Analytic; Descriptive Statistics

100. Which of the following statements is false?
- a. You can examine the relationship between two nominal variables using a cross-classification table.
 - b. You can only apply statistical techniques to one variable at a time.
 - c. You can examine the relationship between two interval variables using a scatter diagram.
 - d.** None of these choices.

ANS: B NAT: Analytic; Descriptive Statistics

101. How do you determine whether two interval variables have a positive linear relationship?
- a. Most of the points fall close to a straight line with positive slope.
 - b. As the X variable increases, the Y variable increases in a linear way.
 - c. The scatter diagram shows a linear pattern that is going uphill.
 - d.** All of these choices are true.

ANS: D NAT: Analytic; Descriptive Statistics

102. If the data in a scatter diagram is scattered completely at random, what do you conclude?
- a. There is no linear relationship between X and Y .
 - b. There is a strong linear relationship between X and Y .
 - c. There is a strong linear relationship between X and Y that is described by a horizontal (flat) line.
 - d.** None of these choices.

ANS: A NAT: Analytic; Descriptive Statistics

103. Which of the following is the method statisticians use to draw the best fitting straight line through the data on a scatter diagram?
- a. The fit best method.
 - b. The least squares method.
 - c. The point-intercept method.
 - d.** None of these choices.

ANS: B NAT: Analytic; Descriptive Statistics

104. Which of the following describes a positive linear relationship between X and Y ?
- a. As the X values increase, the Y values increase in a linear manner.
 - b. As the X values decrease, the Y values decrease in a linear manner.
 - c. The X and Y values move uphill together in a linear manner.
 - d.** All of these choices are true.

ANS: B NAT: Analytic; Descriptive Statistics

105. When two variables tend to move in opposite directions, yet still form a linear pattern, how do you describe their relationship?
- a. A positive linear relationship.
 - b. A negative linear relationship.
 - c. A proportional inverse relationship.

d. None of these choices.

ANS: B

NAT: Analytic; Descriptive Statistics

COMPLETION

106. The Chief of Police conducted a survey of the officers on his squad. An officer's shooting score at target practice is an example of a(n) _____ variable.

ANS:
interval
quantitative
numerical

NAT: Analytic; Descriptive Statistics

107. The Dean of Students conducted a survey on campus. The gender of each student is an example of a(n) _____ variable.

ANS:
nominal
categorical
qualitative

NAT: Analytic; Descriptive Statistics

108. The Dean of Students conducted a survey on campus. Class rank (Freshman, Sophomore, Junior, and Senior) is an example of a(n) _____ variable.

ANS: ordinal

NAT: Analytic; Descriptive Statistics

109. The final grade received in a Literature course (A, B, C, D, or F) is an example of a(n) _____ variable.

ANS:
nominal
categorical
qualitative

NAT: Analytic; Descriptive Statistics

110. In purchasing a used computer, there are a number of variables to consider. The age of the computer is an example of a(n) _____ variable.

ANS:
interval
quantitative
numerical

NAT: Analytic; Descriptive Statistics

111. In purchasing an automobile, there are a number of variables to consider. The body style of the car (sedan, coupe, wagon, etc.) is an example of a(n) _____ variable.

ANS:
nominal
categorical
qualitative

NAT: Analytic; Descriptive Statistics

112. Two types of graphs that organize nominal data are _____ and _____.

ANS:
pie charts; bar charts
bar charts; pie charts

NAT: Analytic; Descriptive Statistics

113. A bar chart is used to represent _____ data.

ANS:
nominal
categorical
qualitative

NAT: Analytic; Descriptive Statistics

114. A pie chart is used to represent _____ data.

ANS:
nominal
categorical
qualitative

NAT: Analytic; Descriptive Statistics

115. A(n) _____ chart is often used to display frequencies; a(n) _____ chart graphically shows relative frequencies.

ANS: bar; pie

NAT: Analytic; Descriptive Statistics

116. A pie chart shows the _____ of individuals that fall into each category.

ANS:

percentage
relative frequency
proportion

NAT: Analytic; Descriptive Statistics

117. We can summarize nominal data in a table that presents the categories and their counts. This table is called a(n) _____ distribution.

ANS: frequency

NAT: Analytic; Descriptive Statistics

118. A(n) _____ distribution lists the categories of a nominal variable and the proportion with which each occurs.

ANS: relative frequency

NAT: Analytic; Descriptive Statistics

119. A(n) _____ chart is not able to show frequencies. It can only show relative frequencies.

ANS: pie

NAT: Analytic; Descriptive Statistics

120. In a pie chart, each slice is proportional to the _____ of individuals in that category.

ANS:
percentage
proportion
relative frequency

NAT: Analytic; Descriptive Statistics

121. A category in a pie chart that contains 50% of the observations is represented by a slice of the pie that is equal to _____ degrees.

ANS: 180

NAT: Analytic; Descriptive Statistics

122. We create a frequency distribution for interval data by counting the number of observations that fall into each of a series of intervals, called _____.

ANS: classes

NAT: Analytic; Descriptive Statistics

123. The more observations we have, the _____ the number of class intervals we need to use to draw a useful histogram.

ANS:
larger
higher
greater

NAT: Analytic; Descriptive Statistics

124. A graph of the frequency distribution for interval data is called a(n) _____.

ANS: histogram

NAT: Analytic; Descriptive Statistics

125. We determine the approximate width of the classes of a histogram by subtracting the smallest observation from the largest and dividing the answer by the number of _____.

ANS:
classes
intervals

NAT: Analytic; Descriptive Statistics

126. A histogram is said to be _____ if, when we draw a vertical line down the center of the histogram, the two sides are identical in shape and size.

ANS:
symmetric
symmetrical

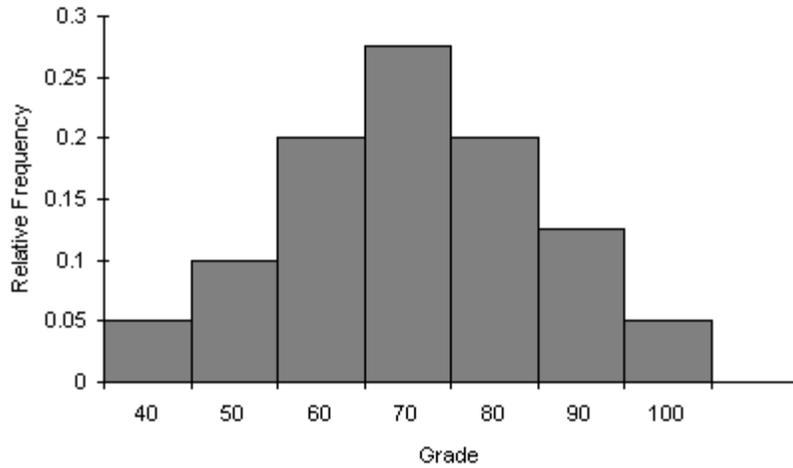
NAT: Analytic; Descriptive Statistics

127. A(n) _____ histogram is one with a long tail extending to either the right or the left.

ANS: skewed

NAT: Analytic; Descriptive Statistics

128. The histogram below has a shape that is _____.



ANS:
 symmetric
 symmetrical
 bell shaped
 bell-shaped

NAT: Analytic; Descriptive Statistics

129. It is typical that when taking an exam, few students hand in their exams early; most prefer to reread their papers and hand them in near the end of the scheduled exam period. Under this scenario, a histogram of exam taking times is _____ skewed.

ANS: negatively

NAT: Analytic; Descriptive Statistics

130. In a histogram a(n) _____ class is the one with the largest number of observations.

ANS: modal

NAT: Analytic; Descriptive Statistics

131. A(n) _____ histogram has two peaks, not necessarily equal in height.

ANS: bimodal

NAT: Analytic; Descriptive Statistics

132. The length of each line in a step-and-leaf display represents the _____ of that class interval defined by the stems.

ANS:
 frequency
 count

NAT: Analytic; Descriptive Statistics

133. The largest value of a cumulative relative frequency is _____.

ANS:

one
1

NAT: Analytic; Descriptive Statistics

134. A(n) _____ display shows the actual observations as well as the number of observations in each class.

ANS:

stem-and-leaf
stem and leaf

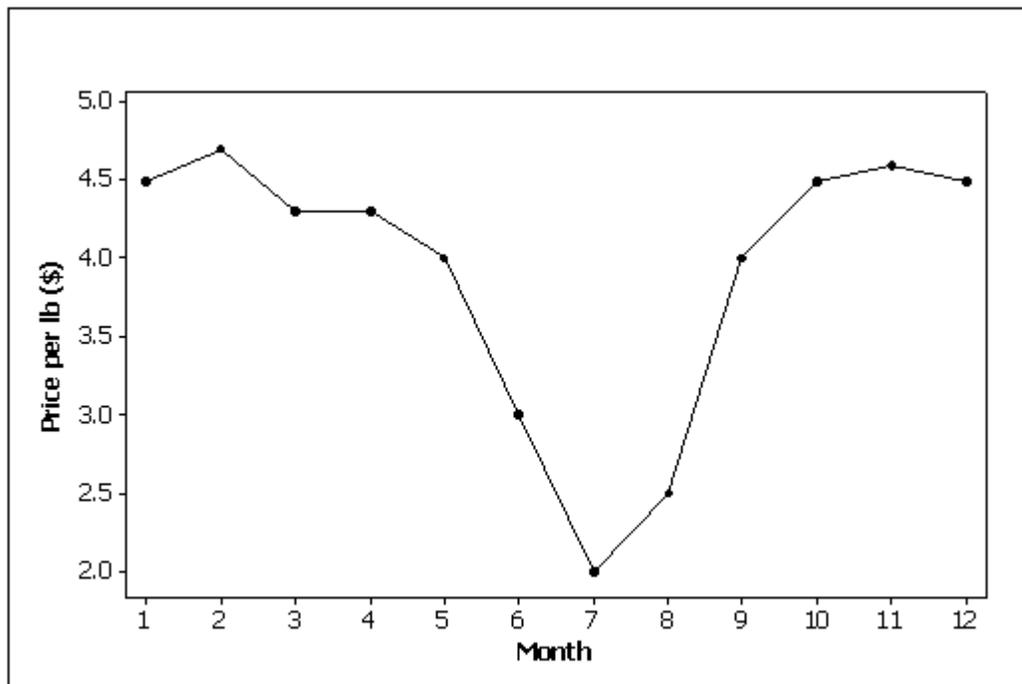
NAT: Analytic; Descriptive Statistics

135. A(n) _____ is a table that sorts data into class intervals (categories) and gives the number of observations in each interval (category).

ANS: frequency distribution

NAT: Analytic; Descriptive Statistics

136. The line chart below shows potato prices per pound for each month from January (month 1) to December last year. By looking at this chart you can see the lowest potato prices occurred in _____.



ANS: July

NAT: Analytic; Descriptive Statistics

137. Observations that are measured at the same time are called _____ data.

ANS:
cross-sectional
cross sectional

NAT: Analytic; Descriptive Statistics

138. Observations that are taken during successive points in time are called _____ data.

ANS:
time-series
time series

NAT: Analytic; Descriptive Statistics

139. Time series data are often graphically depicted on a(n) _____, which is a plot of the variable of interest over time.

ANS: line chart

NAT: Analytic; Descriptive Statistics

140. A(n) _____ is created by plotting the value of the variable on the vertical axis and the time periods on the horizontal axis.

ANS: line chart

NAT: Analytic; Descriptive Statistics

141. A line chart is created by plotting the value of the variable on the _____ axis and the time periods on the _____ axis.

ANS:
vertical; horizontal
Y; X

NAT: Analytic; Descriptive Statistics

142. In applications involving two variables, X and Y , where one variable depends to some degree on the other, we call Y the _____ variable.

ANS: dependent

NAT: Analytic; Descriptive Statistics

143. In applications involving two variables, X and Y , where one variable depends to some degree on the other, we call X the _____ variable.

ANS: independent

NAT: Analytic; Descriptive Statistics

144. A(n) _____ is a graphical display consisting of a set of points, each point representing one variable measured along the horizontal axis, and another variable measured along the vertical axis.

ANS: scatter diagram

NAT: Analytic; Descriptive Statistics

145. If when one variable increases the other one also increases, we say that there is a(n) _____ relationship between these two variables.

ANS:
positive
uphill

NAT: Analytic; Descriptive Statistics

146. When one variable increases and the other decreases, we say that there is a(n) _____ relationship between these two variables.

ANS:
negative
downhill

NAT: Analytic; Descriptive Statistics

147. An individual's income depends somewhat on their number of years of education. Accordingly, we identify income as the _____ variable, and years of education as the _____ variable.

ANS:
dependent; independent
 Y ; X

NAT: Analytic; Descriptive Statistics

148. One of the variables used to help predict unemployment rates is the rate of inflation. Accordingly, we identify rate of inflation as the _____ variable, and unemployment rate as the _____ variable.

ANS:
independent; dependent

X; Y

NAT: Analytic; Descriptive Statistics

149. The two most important characteristics to look for in a scatter diagram are the _____ and _____ of the linear relationship.

ANS:

strength; direction
direction; strength

NAT: Analytic; Descriptive Statistics

SHORT ANSWER

150. At the end of a safari, the tour guide asks the vacationers to respond to the questions listed below. For each question, determine whether the possible responses are interval, nominal, or ordinal.
- How many safaris have you taken prior to this one?
 - Do you feel that your tour safari lasted sufficiently long (yes/no)?
 - Which of the following features of the accommodations did you find most attractive: location, facilities, room size, service, or price?
 - What is the maximum number of hours per day that you would like to spend traveling?
 - Is your overall rating of this safari: excellent, good, fair, or poor?

ANS:

- Interval
- Nominal
- Nominal
- Interval
- Ordinal

NAT: Analytic; Descriptive Statistics

151. Before leaving a particular restaurant, customers are asked to respond to the questions listed below. For each question, determine whether the possible responses are interval, nominal, or ordinal.
- What is the approximate distance (in miles) between this restaurant and your residence?
 - Have you ever eaten at this restaurant before?
 - On how many occasions have you eaten at the restaurant before?
 - Which of the following attributes of this restaurant do you find most attractive: service, prices, quality of the food, or the menu?
 - What is your overall rating of the restaurant: excellent, good, fair, or poor?

ANS:

- Interval
- Nominal
- Interval
- Nominal

e. Ordinal

NAT: Analytic; Descriptive Statistics

152. For each of the following examples, identify the data type as nominal, ordinal, or interval.

- a. The final grade received by a student in a neuro-science class.
- b. The number of students in a Physics course.
- c. The starting salary of a PhD graduate.
- d. The size of an order of fries (small, medium, large, super-size) purchased by a Burger King customer.
- e. The college you are enrolled in (Arts and Sciences, Business, Education, etc.).

ANS:

- a. Ordinal
- b. Interval
- c. Interval
- d. Ordinal
- e. Nominal

NAT: Analytic; Descriptive Statistics

153. For each of the following, indicate whether the variable of interest is nominal or interval.

- a. Your marital status.
- b. Whether you are a U.S. citizen.
- c. Sally's travel time from her dorm to the student union on campus.
- d. The amount of time you spent last week on your homework.
- e. The number of cars parked in a certain parking lot at any given time.
- f. Kate's favorite brand of sneakers.

ANS:

- a. Nominal
- b. Nominal
- c. Interval
- d. Interval
- e. Interval
- f. Nominal

NAT: Analytic; Descriptive Statistics

154. Provide one example of ordinal data; one example of nominal data; and one example of interval data.

ANS:

Ordinal data example: Response to a market research survey question measured on the Likert scale using the code: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree.

Nominal data example: Voters' political party affiliation for using the code: 1 = Democrat, 2 = Republican, and 3 = Independent.

Interval data example: The temperature on a golf course during the U.S. Master's Tournament. (degrees Fahrenheit).

NAT: Analytic; Descriptive Statistics

155. Explain why religious preference is not an ordinal variable.

ANS:

The values of religious preference cannot be ranked in order in any way.

NAT: Analytic; Descriptive Statistics

156. Explain the difference between ordinal data and interval data.

ANS:

The critical difference between them is that the intervals or differences between values of interval data are consistent and meaningful. That is, we can calculate the difference and interpret the results. Because the codes representing ordinal data are arbitrarily assigned except for the order, we cannot calculate and interpret differences.

NAT: Analytic; Descriptive Statistics

157. Give an example of interval data that can also be treated as ordinal data and nominal data.

ANS:

Example: Your actual age is interval data; your age group (1-17; 18-24; 25-30; etc) is ordinal data; and whether or not you are over age 25 is nominal data.

NAT: Analytic; Descriptive Statistics

158. Identify the type of data for which each of the following graphs is appropriate.

- a. Pie chart
- b. Bar chart

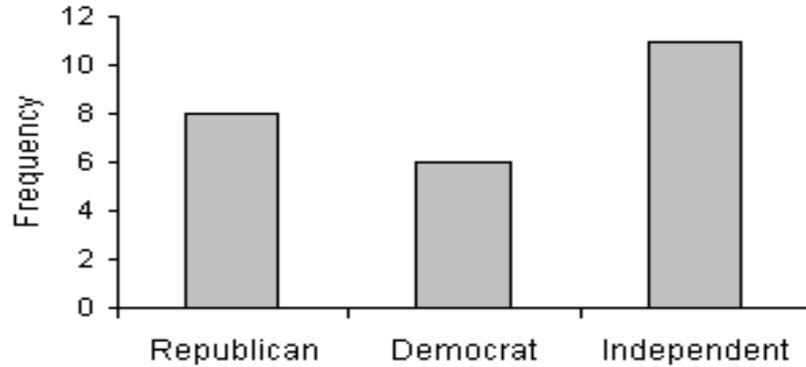
ANS:

- a. Nominal
- b. Nominal

NAT: Analytic; Descriptive Statistics

159. Twenty-five voters participating in a recent election exit poll in Minnesota were asked to state their political party affiliation. Coding the data as R for Republican, D for Democrat, and I for Independent, the data collected were as follows: I, R, D, I, R, I, I, D, R, I, I, D, R, R, I, D, I, R, I, D, I, D, R, R, and I. Construct a frequency bar chart from this data. What does the bar chart tell you about the political affiliations of those in this sample?

ANS:



The bar graph shows most of the people surveyed were Independents (11 out of 25 = 44.0%); Republican followed with $8/25 = 32.0\%$ and Democrats made up 6 of the 25, or 24.0%.

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Car Buyers

Car Buyers

Forty car buyers were asked to indicate which car dealer offered the best overall service. The four choices were Contour Motors (C), Modern Chrysler (M), Tonneau Auto (T), and Uncanny Chevrolet (U). The following data were obtained:

T	C	C	C	U	C	M	T	C	U
U	M	C	M	T	C	M	M	C	M
T	C	C	T	U	M	M	C	C	T
T	U	C	U	T	M	M	C	U	T

NARREND

160. {Car Buyers Narrative} Construct a frequency bar chart of this data. Which car dealer came in last place in terms of overall service?

ANS:

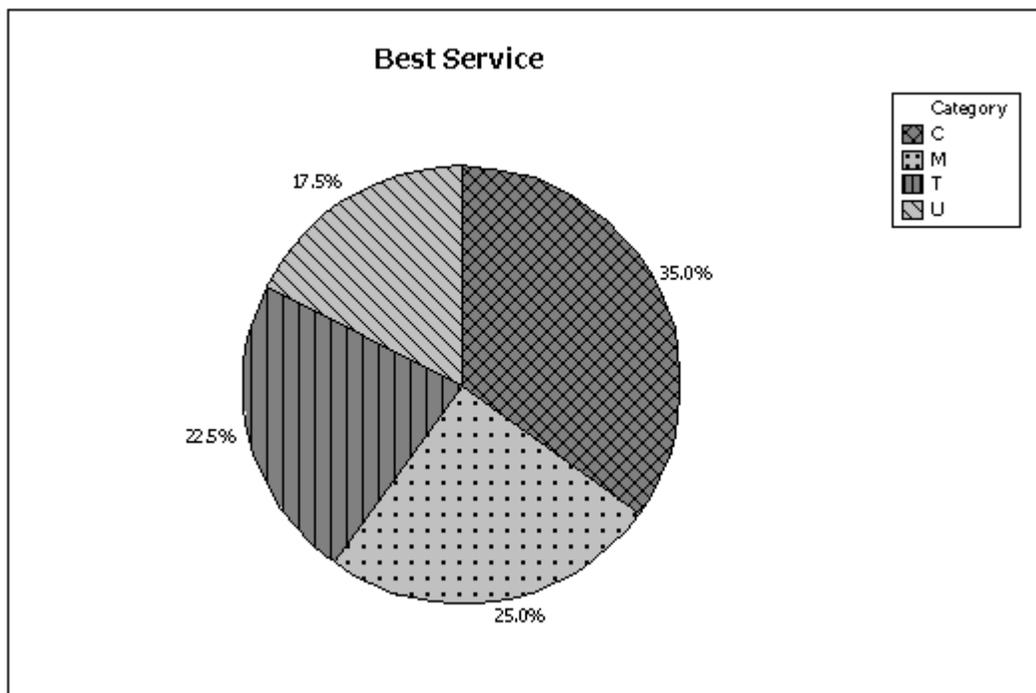


Uncanny Chevrolet (U) received the fewest votes for best overall service (7 out of 40, or 17.5%) and came in last place.

NAT: Analytic; Descriptive Statistics

161. {Car Buyers Narrative} Construct a pie chart of this data. Which car dealer offered the best overall service?

ANS:



Contour Motors (C) received the most votes (35.0%).

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Business School Graduates
Business School Graduates

A sample of business school graduates were asked what their major was. The results are shown in the following frequency distribution.

Major of Graduates	Number of graduates
Accounting	58
Finance	42
Management	38
Marketing	52
Other	10

NARREND

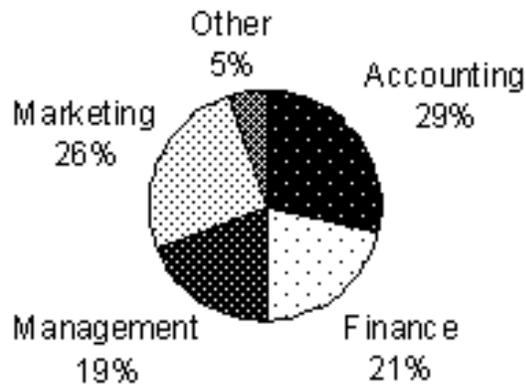
162. {Business School Graduates Narrative} How many graduates were surveyed?

ANS:
200; you get this by totaling the counts for each major.

NAT: Analytic; Descriptive Statistics

163. {Business School Graduates Narrative} Draw a pie chart to summarize this data. Which major was the most popular?

ANS:

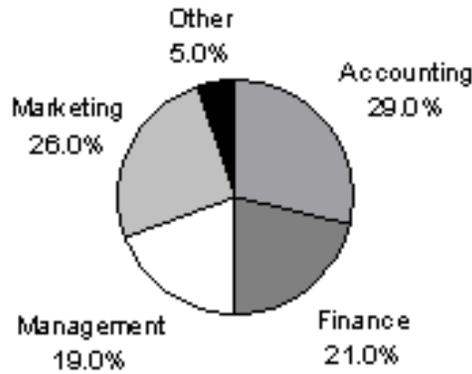


The most popular major was accounting (29%), followed by marketing (26%).

NAT: Analytic; Descriptive Statistics

164. {Business School Graduates Narrative} Draw a pie chart of this data. Are you able to reconstruct the original data from this pie chart alone?

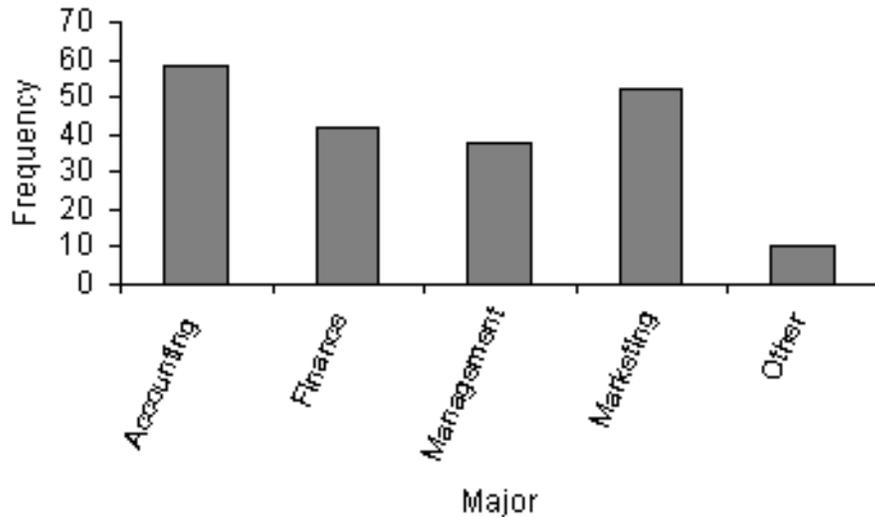
ANS:



No; you cannot reconstruct the original data from this pie chart alone, because you don't know how many observations are in each category.

NAT: Analytic; Descriptive Statistics

165. {Business School Graduates Narrative} If you were only given the frequency bar chart below, would you be able to reconstruct the original observations in the data set?



ANS:

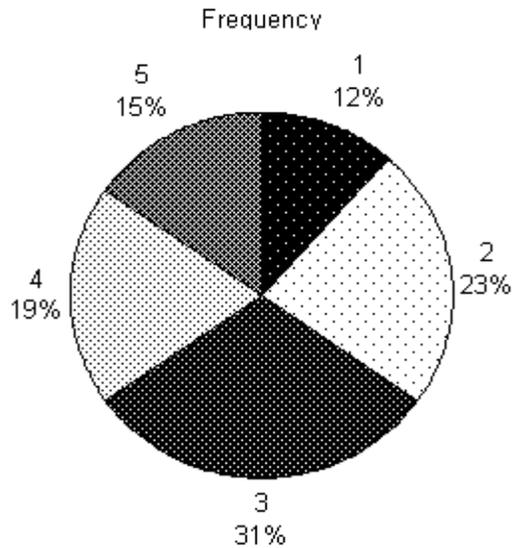
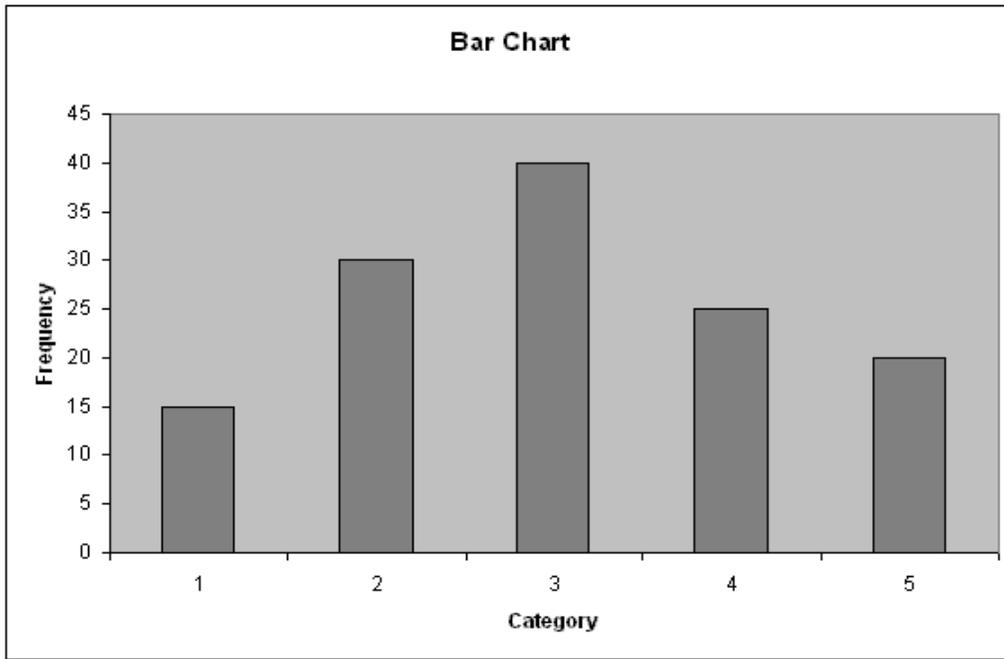
No; you cannot reconstruct the original data from this graph because the scale on the frequency (Y) axis is not precise enough. For example, you can't tell exactly what number of students majored in finance; it appears to be 40 on this bar chart, but the actual value is 42, as seen on the original table.

NAT: Analytic; Descriptive Statistics

166. Suppose you measure the number of minutes it takes an employee to complete a task, where the maximum allowed time is 5 minutes, and each time is rounded to the nearest minute. Data from 130 employees is summarized below. Construct a frequency bar chart and a pie chart from this data. How long did it take most employees to complete the task?

Time (minutes)	1	2	3	4	5
Frequency	15	30	40	25	20

ANS:



The most common time to complete the task was 3 minutes, which was recorded for 40 of the 130 (31%) of the employees.

NAT: Analytic; Descriptive Statistics

167. For what type of data is a histogram appropriate?

ANS:

Interval, numerical, or quantitative data.

NAT: Analytic; Descriptive Statistics

168. Twenty-five voters participating in a recent election exit poll in Alabama 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, 1, 2, 3, 1, 3, 3, 2, 1, 3, 3, 2, 1, 1, 3, 2, 3, 1, 3, 2, 3, 2, 1, 1, 3, 1, 2, 2, 1, and 3. Develop a frequency distribution and a relative frequency distribution for this data. What does the data suggest about the strength of the political parties in Alabama?

ANS:

Party	Frequency	Proportion
Republican	8	0.33
Democrat	6	0.27
Independent	11	0.40

According to the frequency distribution above, the Independents in Alabama outnumber the Republicans and Democrats.

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Teachers Ages
Teachers Ages

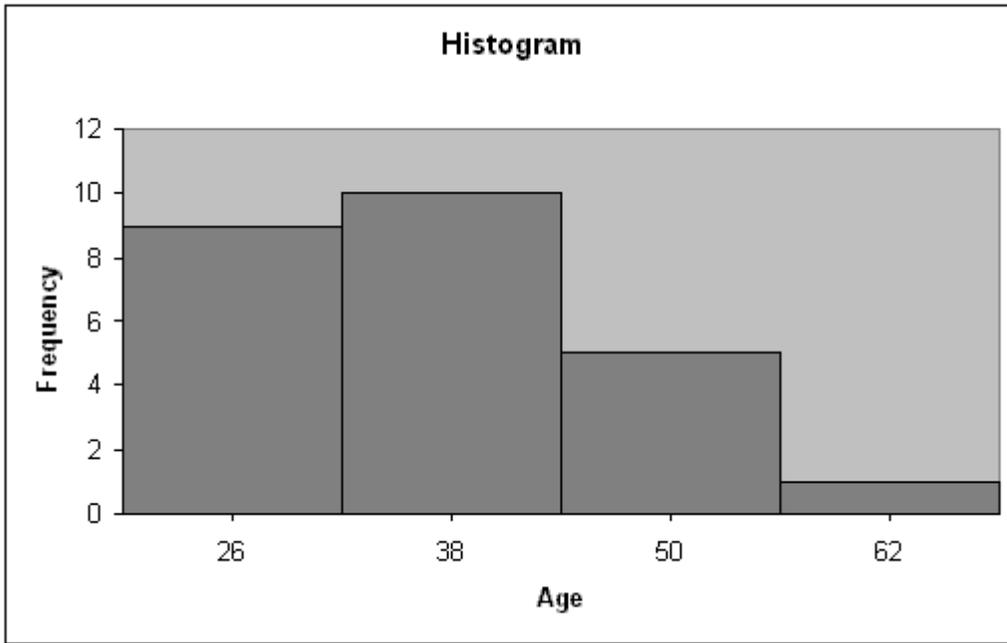
The ages (in years) of a sample of 25 teachers are as follows:

47	21	37	53	28
40	30	32	34	26
34	24	24	35	45
38	35	28	43	45
30	45	31	41	56

NARREND

169. {Teachers Ages Narrative} Draw a frequency histogram of this data which contains four classes. What is the shape of the histogram?

ANS:

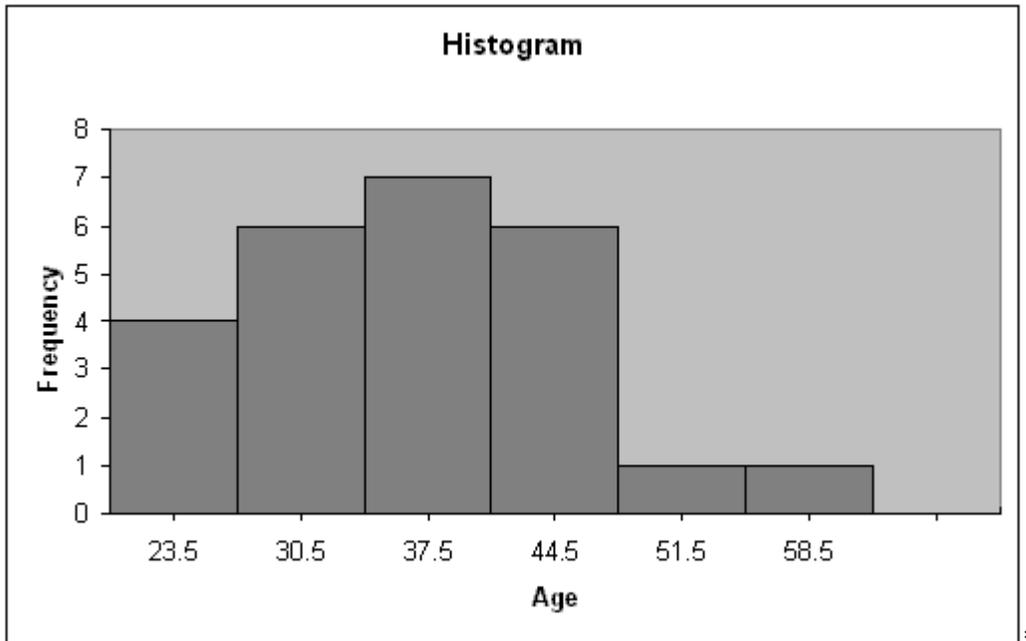


This histogram of ages of teachers is positively skewed.

NAT: Analytic; Descriptive Statistics

170. {Teachers Ages Narrative} Draw a frequency histogram of this data which contains six classes. What is the shape of the histogram?

ANS:



This histogram of ages of teachers is positively skewed.

NAT: Analytic; Descriptive Statistics

171. {Teachers Ages Narrative} Draw a stem-and-leaf display of this data. What is the minimum and maximum age of the teachers in this data set?

ANS:

Stem	Leaf
2	144688
3	0012445578
4	0135557
5	36

The minimum age is 21 and the maximum age is 56.

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Test Grades

Test Grades

The scores on a calculus test for a random 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

NARREND

172. {Test Grades Narrative} Construct a stem-and-leaf display for this data set. Describe the shape of the data.

ANS:

Stem	Leaf
3	68
4	1278
5	14456789
6	12234578889
7	11456799
8	12346
9	14

The data is relatively symmetric and bell shaped.

NAT: Analytic; Descriptive Statistics

173. {Test Grades Narrative} Construct frequency and relative frequency distributions for this data set using seven class intervals. Describe the shape of the data set.

ANS:

Class Limits	Frequency	Relative Frequency
30 to 39	2	0.050

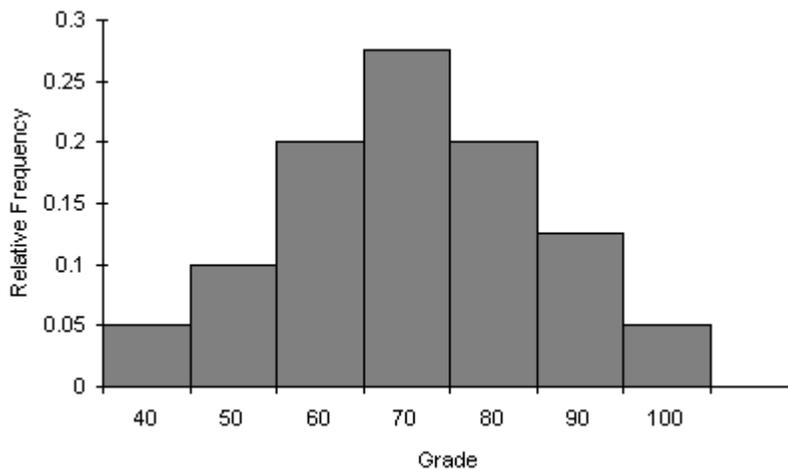
40 to 49	4	0.100
50 to 59	8	0.200
60 to 69	11	0.275
70 to 79	8	0.200
80 to 89	5	0.125
90 to 99	2	0.050
Total	40	1.00

The data is relatively symmetric and bell shaped.

NAT: Analytic; Descriptive Statistics

174. {Test Grade Narrative} Construct a relative frequency histogram for this data set and discuss its shape.

ANS:



The distribution of the data is relatively symmetric and bell shaped.

NAT: Analytic; Descriptive Statistics

175. {Test Grades Narrative} Describe the distribution of exam scores.

ANS:

The distribution of the data is symmetrical and bell-shaped, with 67.5% of the observations between 50 and 80. The center looks to be around 65.

NAT: Analytic; Descriptive Statistics

176. {Test Grades Narrative} Construct a cumulative frequency and a cumulative relative frequency distribution for this data. What proportion of the exam scores are less than 60? What proportion of the exam scores are 70 or more?

ANS:

Classes	Cumulative Frequency	Cumulative Relative Frequency
< 40	2	0.050

< 50	6	0.150
< 60	14	0.350
< 70	25	0.625
< 80	33	0.825
< 90	38	0.950
< 100	40	1.000

$0.35; 1 - 0.625 = 0.375$

NAT: Analytic; Descriptive Statistics

177. Forty truck buyers were asked to indicate the car dealer they believed offered the best overall service. The four choices were A, B, C, and D as shown below:

A C C C D C B A C D A B C
D B C B A C B B C B B A C
A C C A D B B C C A C D B
A D C D A B B C D A B D A

Construct a table showing the frequencies and relative frequencies for this data set. What proportion of car buyers rated dealer D as the best?

ANS:

Dealer	Frequency	Relative frequency
A	12	0.231
B	14	0.269
C	17	0.327
D	9	0.173

0.173 of the truck buyers rated dealer D as the best.

NAT: Analytic; Descriptive Statistics

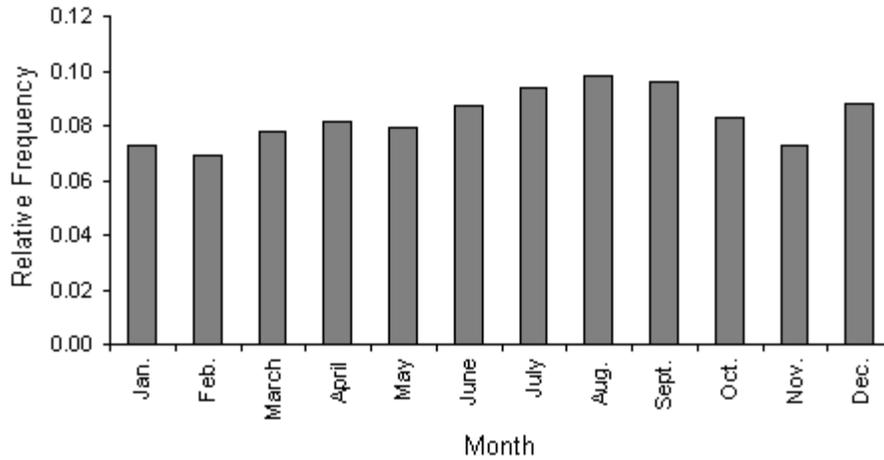
178. A supermarket's monthly sales (in thousands of dollars) for the last year were as follows:

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 relative frequency bar chart for this data set. How many observations are there in this data set?

ANS:

See the graph below. There are 12 observations in this data set; one sales amount is listed for each month.



NAT: Analytic; Descriptive Statistics

179. Consider the following cumulative frequency distribution.

Classes Limits	Cumulative Frequency	Frequency
< 5	11	
< 10	18	
< 15	24	
< 20	33	
< 25	45	

Fill in the frequencies for each class in the above table.

ANS:
11; 7; 6; 9; 12

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Insurance Company
Insurance Company

A representative from a local insurance agency selected a random sample of insured homeowners and recorded the number of claims made in the last three years, with the following results:

Number of claims	0	1	2	3	4	5
Frequency	9	20	14	13	5	3

NARREND

180. {Insurance Company Narrative} How many homeowners are represented in the sample?

ANS:
 $9 + 20 + 14 + 13 + 5 + 3 = 64$

NAT: Analytic; Descriptive Statistics

181. {Insurance Company Narrative} How many total claims are represented in the sample?

ANS:

$$(0 \times 9) + (1 \times 20) + (2 \times 14) + (3 \times 13) + (4 \times 5) + (5 \times 3) = 122$$

NAT: Analytic; Descriptive Statistics

182. {Insurance Company Narrative} What proportion of homeowners had no claims in the last three years?

ANS:

$$9/64 = .14$$

NAT: Analytic; Descriptive Statistics

183. {Insurance Company Narrative} What number of claims was made by the highest proportion of homeowners?

ANS:

20/64 = 31% of the homeowners had one claim in the last three years.

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Electronics Company
Electronics Company

At a meeting of regional offices managers of a national electronics company, a survey was taken to determine the number of employees the regional managers supervise in the operation of their departments. The results of the survey are shown below.

Number of employees supervised	1	2	3	4	5
Frequency	7	11	14	8	10

NARREND

184. {Electronics Company Narrative} How many regional offices are represented in the survey results?

ANS:

$$7 + 11 + 14 + 8 + 10 = 50$$

NAT: Analytic; Descriptive Statistics

185. {Electronics Company Narrative} Across all of the regional offices, how many total employees were supervised by those surveyed?

ANS:

$$(1 \times 7) + (2 \times 11) + (3 \times 14) + (4 \times 8) + (5 \times 10) = 153$$

NAT: Analytic; Descriptive Statistics

186. {Electronics Company Narrative} What proportion of managers supervise 3 employees?

ANS:
 $14/50 = 0.28$

NAT: Analytic; Descriptive Statistics

187. {Electronics Company Narrative} What is the cumulative relative frequency corresponding to 5 employees?

ANS:
This is the total proportion of employees supervising 4 or fewer employees: $40/50 = 0.80$ or 80%.

NAT: Analytic; Descriptive Statistics

NARRBEGIN: Internet Classes

Internet Classes

A survey of 25 students was conducted to determine how they rate the quality of Internet classes. Students 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.

Stem	Leaves
3	15
4	01457889
5	0134677
6	24568
7	29
8	
9	5

NARREND

188. {Internet Classes Narrative} What percentage of the students rated the overall quality of Internet classes as being 70 or above?

ANS:
 $3/25 = 12\%$

NAT: Analytic; Descriptive Statistics

189. {Internet Classes Narrative} What percentage of the students rated the overall quality of Internet classes as being 60 or below?

ANS:
 $17/25 = 68\%$

NAT: Analytic; Descriptive Statistics

190. {Internet Classes Narrative} What percentage of the students rated the overall quality of on-line classes as being between 50 and 75, inclusive?

ANS:
 $13/25 = 52\%$

NAT: Analytic; Descriptive Statistics

191. {Internet Classes Narrative} What percentage of the students rated the overall quality of on-line classes as being below 40?

ANS:
 $2/25 = 8\%$

NAT: Analytic; Descriptive Statistics

192. Explain the difference between a histogram and a line chart.

ANS:
A histogram is a display of cross-sectional data and a line chart is a display of time-series data.

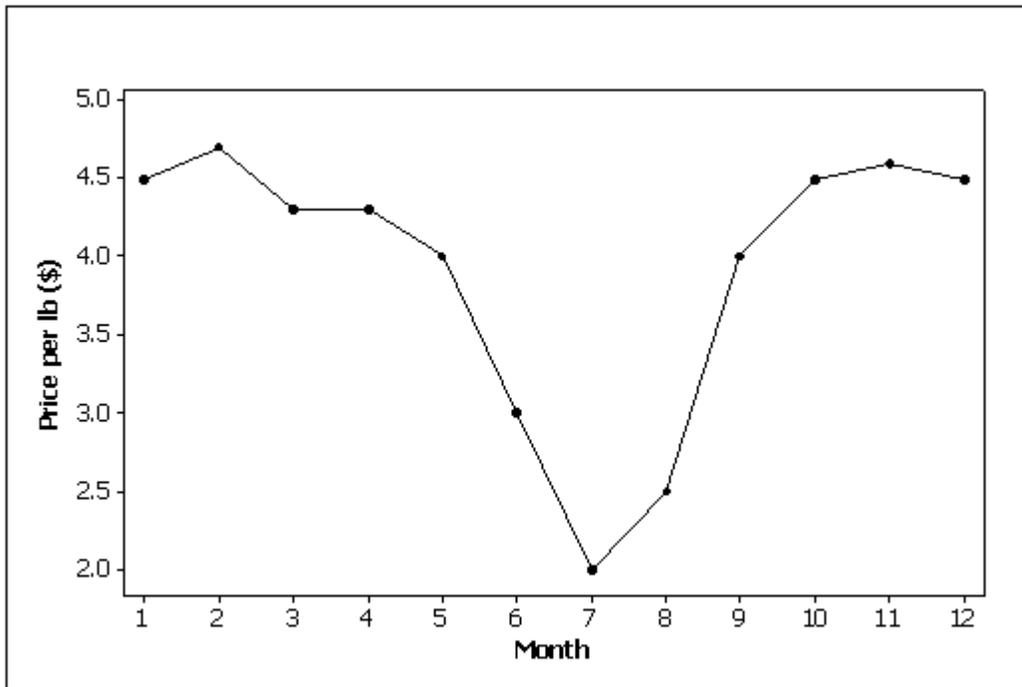
NAT: Analytic; Descriptive Statistics

193. Briefly discuss the difference between cross-sectional data and time-series data.

ANS:
Data can be classified according to whether the observations are measured at the same time or whether they represent measurements at successive points in time. The former are called cross-sectional data and the latter, time-series data.

NAT: Analytic; Descriptive Statistics

194. Beef prices throughout the year (month 1 = January) are shown in the line chart below (per pound). Describe beef prices for this given year using this line chart.



ANS:

Beef prices started at around \$4.50 in January, then lowered consistently through the months of January through July, where they hit their lowest price, \$2.00 per pound. Then prices sharply increased until October, and stayed about the same through December. Prices started the year and ended the year at about the same level (\$4.50 per pound).

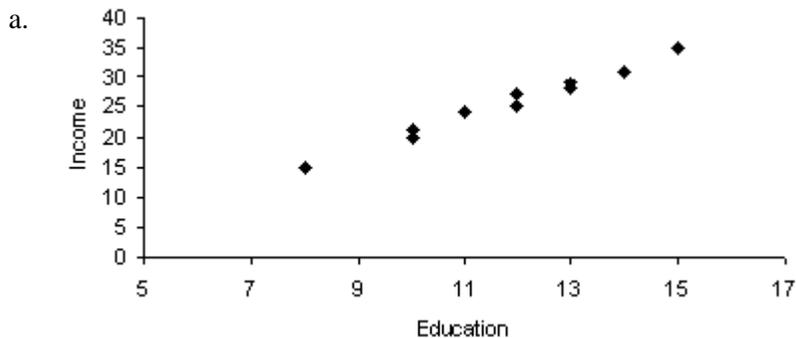
NAT: Analytic; Descriptive Statistics

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

Education	12	14	10	11	13	8	10	15	13	12
Income	25	31	20	24	28	15	21	35	29	27

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

ANS:



- b. There is a very strong positive linear relationship between education and income; as years of education increase, income also increases in a linear manner.

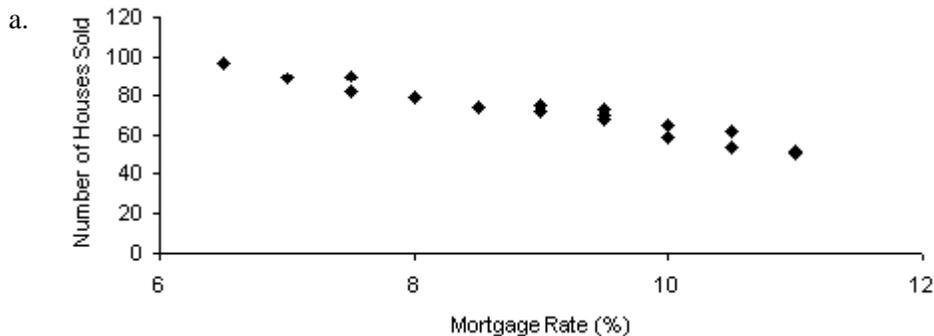
NAT: Analytic; Descriptive Statistics

196. The number of houses sold in Miami Springs and the average monthly mortgage rates for 18 months randomly selected between January 2011 and April 2013 are shown in the following table.

Mortgage rate (%)	Number of houses sold	Mortgage rate (%)	Number of houses sold
7.5	90	9.5	68
9.0	72	6.5	97
7.0	89	8.0	79
10.5	62	9.0	75
10.0	58	10.5	53
9.5	70	9.5	73
8.5	74	11.0	50
10.0	65	7.5	82
11.0	51	8.5	70

- a. Draw a scatter diagram with the number of houses sold on the vertical axis.
 b. Describe the relationship between mortgage rate and number of houses sold.

ANS:



- b. There is a strong negative linear relationship between the mortgage rate and the number of houses sold. As the mortgage rate increases, the number of houses sold decreases, in a linear way.

NAT: Analytic; Descriptive Statistics

197. Briefly explain the difference between correlation and causation in terms of a relationship between X and Y .

ANS:

If two variables are linearly related, it does not mean that one is causing the other to increase or decrease. It means a change in one variable is associated with a change in the other variable, in a linear way. Correlation implies association, not causation.

NAT: Analytic; Descriptive Statistics

198. It is speculated that the number of police officers has a negative linear relationship with number of crimes. Explain why this might be so.

ANS:

As the number of police officers increases, number of crimes goes down. As the number of police officers decreases, the number of crimes goes up.

NAT: Analytic; Descriptive Statistics

199. What are the two most important characteristics to look for in a scatter diagram?

ANS:

The strength and direction of the linear relationship between the two variables.

NAT: Analytic; Descriptive Statistics

200. Can a scatter diagram be used to explore the relationship between two nominal variables? Explain why or why not.

ANS:

No; scatter diagrams plot points of X and Y when both variables are interval variables. You cannot talk about a nominal variable increasing or decreasing.

NAT: Analytic; Descriptive Statistics