The Islamic University of Gaza
Faculty of Commerce
Department of Economics and Political Sciences

Business Statistics (ECOE 1302)
Spring Semester 2011
Chapter 3 - Numerical Descriptive Measures
Solutions

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1. Which of the following statistics is not a measure of central tendency?
    a) Arithmetic mean.
    b) Median.
    c) Mode.
    d) Q3.

2. Which of the arithmetic mean, median, and mode are resistant measures of central tendency?
    a) The arithmetic mean and median only.
    b) The median and mode only.
    c) The mode and arithmetic mean only.
    d) All the three are resistant measures.

3. Which of the following statements about the median is not true?
    a) It is more affected by extreme values than the arithmetic mean.
    b) It is a measure of central tendency.
    c) It is equal to Q2.
    d) It is equal to the mode in bell-shaped "normal" distributions.

4. In a perfectly symmetrical distribution
    a) the range equals the interquartile range.
    b) the interquartile range equals the arithmetic mean.
    c) the median equals the arithmetic mean.
    d) the variance equals the standard deviation.

5. In general, which of the following descriptive summary measures cannot be easily approximated from a boxplot?
    a) The variance.
    b) The range.
    c) The interquartile range.
    d) The median.

6. Which descriptive summary measures are considered to be resistant statistics?
    a) The arithmetic mean and standard deviation.
    b) The interquartile range and range.
    c) The mode and variance.
    d) The median and interquartile range.

7. In right-skewed distributions, which of the following is the correct statement?
    a) The distance from Q1 to Q2 is larger than the distance from Q2 to Q3.
    b) The distance from Q1 to Q2 is smaller than the distance from Q2 to Q3.
    c) The arithmetic mean is smaller than the median.
    d) The mode is larger than the arithmetic mean.

8. In left-skewed distributions, which of the following is the correct statement?
    a) The distance from Q1 to Q2 is smaller than the distance from Q2 to Q3.
    b) The distance from the smallest observation to Q1 is larger than the distance from Q3 to the largest observation.
    c) The distance from the smallest observation to Q2 is smaller than the distance from Q2 to the largest observation.
    d) The distance from Q1 to Q3 is twice the distance from the Q1 to Q2.

9. According to the empirical rule, if the data form a "bell-shaped" normal distribution, _____ percent of the observations will be contained within 1 standard deviation around the arithmetic mean.
    a) 68.26
    b) 75.00
    c) 88.89
    d) 93.75

10. Which of the following is NOT a measure of central tendency?
    a) The arithmetic mean.
    b) The median.
    c) The mode.
    d) The interquartile range.

11. Which of the following is sensitive to extreme values?
    a) The median.
    b) The interquartile range.
    c) The arithmetic mean.
    d) The 1st quartile.

12. According to the Chebyshev rule, at least 75% of all observations in any data set are contained within a distance of how many standard deviations around the mean?
    a) 1
    b) 2
    c) 3
    d) 4

13. According to the Chebyshev rule, at least what percentage of the observations in any data set are contained within a distance of 3 standard deviations around the mean?
    a) 67%
    b) 75%
    c) 88.89%
    d) 99.7%

14. According to the Chebyshev rule, at least what percentage of the observations in any data set are contained within a distance of 2 standard deviations around the mean?
   a) 67%
   b) 75%
   c) 88.89%
   d) 95%

TABLE 3-1
Health care issues are receiving much attention in both academic and political arenas. A sociologist recently conducted a survey of citizens over 60 years of age whose net worth is too high to qualify for Medicaid and have no private health insurance. The ages of 25 uninsured senior citizens were as follows:

60	61	62	63	64	65	66	68	68	69	70	73	73
74	75	76	76	81	81	82	86	87	89	90	92	

15. Referring to Table 3-1, calculate the arithmetic mean age of the uninsured senior citizens to the nearest hundredth of a year.
74.04 years

16. Referring to Table 3-1, identify the median age of the uninsured senior citizens.
73 years

17. Referring to Table 3-1, identify the first quartile of the ages of the uninsured senior citizens.
65.5 years

18. Referring to Table 3-1, identify the third quartile of the ages of the uninsured senior citizens.
81.5 years

19. Referring to Table 3-1, identify the interquartile range of the ages of the uninsured senior citizens.
16 years

20. Referring to Table 3-1, identify which of the following is the correct statement.
   a) One fourth of the senior citizens sampled are below 65.5 years of age.
   b) The middle 50% of the senior citizens sampled are between 65.5 and 73.0 years of age.
   c) The average age of senior citizens sampled is 73.5 years of age.
   d) All of the above are correct.

21. Referring to Table 3-1, identify which of the following is the correct statement.
   a) One fourth of the senior citizens sampled are below 64 years of age.
   b) The middle 50% of the senior citizens sampled are between 65.5 and 73.0 years of age.
   c) 25% of the senior citizens sampled are older than 81.5 years of age.
   d) All of the above are correct.

22. Referring to Table 3-1, what type of shape does the distribution of the sample appear to have?
Slightly positive or right-skewed.

23. Referring to Table 3-1, calculate the variance of the ages of the uninsured senior citizens correct to the nearest hundredth of a year squared.

94.96 years^2

24. Referring to Table 3-1, calculate the standard deviation of the ages of the uninsured senior citizens correct to the nearest hundredth of a year.

9.74 years

25. Referring to Table 3-1, calculate the coefficient of variation of the ages of the uninsured senior citizens.

13.16%

26. True or False: The median of the values 3.4, 4.7, 1.9, 7.6, and 6.5 is 1.9.

False

27. True or False: The median of the values 3.4, 4.7, 1.9, 7.6, and 6.5 is 4.05.

False

28. True or False: In a set of numerical data, the value for Q3 can never be smaller than the value for Q1.

True

29. True or False: In a set of numerical data, the value for Q2 is always halfway between Q1 and Q3.

False

30. True or False: If the distribution of a data set were perfectly symmetrical, the distance from Q1 to the median would always equal the distance from Q3 to the median in a boxplot.

True

31. True or False: In right-skewed distributions, the distance from Q3 to the largest observation exceeds the distance from the smallest observation to Q1.

True

32. True or False: In left-skewed distributions, the distance from the smallest observation to Q1 exceeds the distance from Q3 to the largest observation.

True

33. True or False: A boxplot is a graphical representation of a 5-number summary.

True

34. True or False: The 5-number summary consists of the smallest observation, the first quartile, the median, the third quartile, and the largest observation.

True

35. True or False: In a boxplot, the box portion represents the data between the first and third quartile values.

True

36. True or False: The line drawn within the box of the boxplot always represents the arithmetic mean.

False

37. True or False: The line drawn within the box of the boxplot always represents the median.
True

38. True or False: In a sample of size 40, the sample mean is 15. In this case, the sum of all observations in the sample is $\sum X_i = 600$.
True

39. True or False: A population with 200 elements has an arithmetic mean of 10. From this information, it can be shown that the population standard deviation is 15.
False

40. True or False: In exploratory data analysis, a boxplot can be used to illustrate the median, quartiles, and extreme values.
True

41. True or False: An economics professor bases his final grade on homework, two midterm examinations, and a final examination. The homework counts 10% toward the final grade, while each midterm examination counts 25%. The remaining portion consists of the final examination. If a student scored 95% in homework, 70% on the first midterm examination, 96% on the second midterm examination, and 72% on the final, his final average is 79.8%.
True

42. True or False: The median of a data set with 20 items would be the average of the 10th and the 11th items in the ordered array.
True

43. True or False: The coefficient of variation measures variability in a data set relative to the size of the arithmetic mean.
True

44. True or False: The coefficient of variation is expressed as a percentage.

True

45. True or False: The coefficient of variation is a measure of central tendency in the data.
False

46. True or False: The interquartile range is a measure of variation or dispersion in a set of data.
True

47. True or False: The interquartile range is a measure of central tendency in a set of data.
False

48. True or False: If a set of data is perfectly symmetrical, the arithmetic mean must be identical to the median.
True

49. True or False: The coefficient of variation is a measure of relative variation.
True

50. True or False: If the data set is approximately bell-shaped, the empirical rule will more accurately reflect the greater concentration of data close to the mean as compared to the Chebyshev rule.
True

51. If the arithmetic mean of a numerical data set exceeds the median, the data are considered to be _____ skewed.
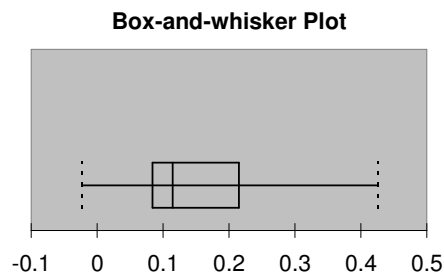positive or right

TABLE 3-6

The rate of return of an Internet Service Provider over a 10 year period are: 10.25%, 12.64%, 8.37%, 9.29%, 6.23%, 42.53%, 29.23%, 15.25%, 21.52%, -2.35%.

52. Referring to Table 3-6, compute the arithmetic mean rate of return.

ANWER:
15.30%

53. Referring to Table 3-6, construct a boxplot for the rate of return

Box-and-whisker Plot

54. Referring to Table 3-6, what is the shape of the distribution for the rate of return?
Right-skewed

55. The Z scores can be used to identify outliers.
True

56. The larger the Z score, the farther is the distance from the observation to the median.
False

57. As a general rule, an observation is considered an extreme value if its Z score is greater than -3.
False

58. As a general rule, an observation is considered an extreme value if its Z score is greater than 3.
True

59. As a general rule, an observation is considered an extreme value if its Z score is less than 3.
False

60. As a general rule, an observation is considered an extreme value if its Z score is less than -3.
True

61. The Z score of an observation can never be negative.
False

62. The Z score of an observation measures how many standard deviations is the value from the mean.
True

TABLE 3-10

The following table represents the assets in billions of dollars of the five largest bond funds.

Bond Fund	Assets (Billions $)
Vanguard GNMA	19.5
Vanguard Total Bond Mkt. Index	16.8
Bond Fund of America A	13.7
Franklin Calif. Tax-Free Inc. A	12.8
Vanguard Short-Term Corp.	10.9

63. Referring to Table 3-10, what is the mean for this population of the five largest bond funds?

$14.74 billions

64. Referring to Table 3-10, what are the variance and standard deviation for this population?

9.2984 squared billion dollars, $3.0493 billions, respectively