Chapter 3
Describing Data: Numerical Measures

True/False

1. The arithmetic mean is the sum of the observations divided by the total number of observations.

2. For a set of data arranged or sorted in numerical order, the value of the observation in the center is called the weighted mean.

3. If a variable is measured at the interval or ratio level, all the values are included when computing the mean.

4. A variable measured at the interval or ratio level can have more than one arithmetic mean.

5. The mode is the value of the observation that appears most frequently.

6. A distribution that has the same shape on either side of the center is said to be symmetrical.

7. A negatively skewed distribution is not symmetrical. The long tail is to the left or in the negative direction.

8. A parameter is a measurable characteristic of a sample.

9. The median can be determined for any set of interval-level data.

10. Extremely high or low scores affect the value of the median.

11. The sum of the deviations from the mean for the set of numbers 4, 9 and 5 will equal zero.

12. For salaries of $102,000, $98,000, $45,000, $106,000 and $101,000, the arithmetic mean would be an appropriate average.

13. For any distribution, there are an equal number of values above the mean and below it.

14. For a data set with an even number of ungrouped values, the median is the arithmetic mean of the two middle values.

15. For a data set with an even number of ungrouped values, half of the values will be less than the median.

16. In a negatively skewed distribution, the mean is always greater than the median.

17. Dispersion is the degree of variation in the data.

18. The mean deviation is the mean of the actual values of the deviations from the arithmetic mean.

19. The variance is the mean of the sum of the squared deviations between each observation and the median.

20. The standard deviation is the positive square root of the variance.

21. Chebyshev's Theorem gives the minimum proportion of observations in any data set that occurs within k standard deviations of the mean, where k is greater than 1.0.

22. In a company, the standard deviation of the ages of female employees is six years and the standard deviation of the ages of male employees is ten years. These statistics indicate that there is more spread in the ages of the female employees.

<u>Multiple Choice</u>

23. For which measure of central location will the sum of the deviations of each value from the data's average will always be zero?
A) Mode
B) Mean
C) Median
D) Geometric mean
E) None of the above

24. For a set of grouped or ungrouped data, which measures of central location always have only one value?
A) Mode and median
B) Mode and mean
C) Mode and geometric mean
D) Mean and median

25. Which measures of central location are not affected by extremely small or extremely large values?
A) Mean and median
B) Mean and mode
C) Mode and median
D) Geometric mean and mean
E) None of the above

26. What is the relationship among the mean, median and mode in a symmetric distribution?
A) They are all equal
B) The mean is always the smallest value
C) The mean is always the largest value
D) The mode is the largest value

27. For a data set, half of the observations are always greater than the _____ .
A) Median
B) Mode
C) Mean
D) Geometric mean

28. For an ungrouped data set with an odd number of observations that have been sorted or arrayed from smallest to largest values, where is the median located?
A) n
B) n/2
C) (n + 1)/2
D) n + 1/2

29. Which one of the following is referred to as the population mean?
A) Statistic
B) μ
C) Sample
D) None of the above

30. In the calculation of the arithmetic mean for grouped data, which value is used to represent all the values in a particular class?
A) The upper limit of the class
B) The lower limit of the class
C) The frequency of the class
D) The cumulative frequency preceding the class
E) The class midpoint.

40. What is the median of 26, 30, 24, 32, 32, 31, 27 and 29?
A) 32
B) 29
C) 30
D) 29.5

41. The net incomes (in $ millions) of a sample of steel fabricators are: $86, $67, $86 and $85. What is the modal net income?
A) $67
B) $85
C) $85.5
D) $86

42. A sample of light trucks using diesel fuel revealed the following distribution based on fuel efficiency, i.e., miles per gallon (mpg).

mpg	Number of Trucks
10 up to 13	2
13 up to 16	5
16 up to 19	10
19 up to 22	8
22 up to 25	3
25 up to 28	2

What is the arithmetic mean miles per gallon?
A) 16.9
B) 18.6
C) 17.0
D) 17.9
E) None of the above

43. The ages of newly hired, unskilled employees were grouped into the following distribution:

Ages	Number
18 up to 21	4
21 up to 24	8
24 up to 27	11
27 up to 30	20
30 up to 33	7

What is the mean age?
A) 25.51
B) 24.01
C) 26.99
D) 26.58
E) 20.00

44. A sample of the daily production of transceivers was organized into the following distribution.

Daily Production	Frequencies
80 up to 90	5
90 up to 100	9
100 up to 110	20
110 up to 120	8
120 up to 130	6
130 up to 140	2

What is the mean daily production?
A) 106.4
B) 101.4
C) 111.4
D) 105.0
E) 20.0

45. The net annual sales of a sample of small retail clothing stores were organized into the following relative frequency distribution.

Net Sales (in $ millions)	Percent of Total
1 up to 4	13
4 up to 7	14
7 up to 10	40
10 up to 13	23
13 or more	10

What is the mean net sales (in $ millions)?
A) $7.09
B) $10.09
C) $8.59
D) $8.325
E) Mean cannot be computed

46. A sample of single persons receiving social security payments revealed these monthly benefits: $826, $699, $1,087, $880, $839 and $965. How many observations are below the median?
A) 0
B) 1
C) 2
D) 3
E) 3.5

47. A sample of the paramedical fees charged by clinics revealed these amounts: $55, $49, $50, $45, $52 and $55. What is the median charge?
A) $47.50
B) $51.00
C) $52.00
D) $55.00

48. The lengths of time (in minutes) several underwriters took to review applications for similar insurance coverage are: 50, 230, 52 and 57. What is the median length of time required to review an application?
A) 54.5
B) 141.0
C) 97.25
D) 109.0

49. The U.S. Department of Education reported that for the past seven years 4,033, 5,652, 6,407, 7,201, 8,719, 11,154, and 15,121 people received bachelor's degrees in computer and information sciences. What is the annual arithmetic mean number of degrees awarded?
A) About 12,240
B) About 8,327
C) About 6,217
D) About 15,962

50. Which measure of central location is found by arranging the data from smallest to largest and selecting the middle value?
A) Arithmetic mean
B) Median
C) Mode
D) Geometric mean
E) Standard deviation

51. What is a disadvantage of the range as a measure of dispersion?
A) Based on only two observations
B) Can be distorted by a large mean
C) Not in the same units as the original data
D) Has no disadvantage

52. The sum of the differences between sample observations and the sample mean is
A) Zero
B) The mean deviation
C) The range
D) The standard deviation

53. Which of the following measures of dispersion are based on deviations from the mean?
A) Variance
B) Standard deviation
C) Mean deviation
D) All of the above

54. What is the relationship between the variance and the standard deviation?
A) Variance is the square root of the standard deviation
B) Variance is the square of the standard deviation
C) Variance is twice the standard deviation
D) No constant relationship between the variance and the standard deviation

55. According to Chebyshev's Theorem, what percent of the observations lie within plus and minus 1.75 standard deviations of the mean?
A) 56%
B) 95%
C) 67%
D) Cannot compute because it depends on the shape of the distribution

56. What is the range for a sample of March electric bills amounts for all-electric homes of similar sizes (to the nearest dollar): $212, $191, $176, $129, $106, $92, $108, $109, $103, $121, $175 and $194.
A) $100
B) $130
C) $120
D) $112

57. A survey of passengers on domestic flights revealed these miles:

Miles Flown	Number of Passengers
100 up to 500	16
500 up to 900	41
900 up to 1300	81
1300 up to 1700	11
1700 up to 2100	9
2100 up to 2500	6

What is the range (in miles)?
A) 2,499
B) 1,100
C) 2,400
D) 1,999

58. Which measure of dispersion disregards the algebraic signs (plus and minus) of each difference between X and the mean?
A) Standard deviation
B) Mean deviation
C) Arithmetic mean
D) Variance

59. The following are the weekly amounts of welfare payments made by the federal government to a sample of six families: $139, $136, $130, $136, $147 and $136. What is the range?
A) $0
B) $14
C) $52
D) $17

60. Measures of dispersion calculated from grouped data are
A) Estimates
B) Biased
C) Means
D) Skewed

61. The ages of all the patients in the isolation ward of the hospital are 38, 26, 13, 41 and 22. What is the population variance?
A) 106.8
B) 91.4
C) 240.3
D) 42.4

62. A sample of assistant professors on the business faculty at state supported institutions in Ohio revealed the mean income to be $32,000 for 9 months with a standard deviation of $3,000. Using Chebyshev's Theorem, what proportion of the faculty earns more than $26,000 but less than $38,000?
A) At least 50%
B) At least 25%
C) At least 75%
D) At least 100%

63. The weights (in grams) of the contents of several small bottles are 4, 2, 5, 4, 5, 2 and 6. What is the sample variance?
A) 6.92
B) 4.80
C) 1.96
D) 2.33

64. A sample of the daily number of passengers per bus riding the Bee Line commuter route yielded the following information:

Number of Passengers	Frequency
0 up to 5	4
5 up to 10	9
10 up to 15	15
15 up to 20	10
20 up to 25	2

What is the standard deviation?
A) About 5.2
B) About 20.0
C) About 12.9
D) About 2.3

65. If the sample variance for a frequency distribution consisting of hourly wages was computed to be 10, what is the sample standard deviation?
A) $1.96
B) $4.67
C) $3.16
D) $10.00

66. Samples of the wires coming off the production line were tested for tensile strength. The statistical results (in PSI) were:

Arithmetic mean	500	Median	500
Mode	500	Standard deviation	40
Quartile deviation	25	Mean deviation	32
Range	240	Sample size	100

According to the Empirical Rule, the middle 95 percent of the wires tested between approximately what two values?
A) 450 and 550
B) 460 and 540
C) 420 and 580
D) 380 and 620

Answers

1.True   2.False   3.True   4.False   5.True   6.True   7.True   8.False   9.True
10.False   11.True   12.False   13.False   14.True   15.True   16.False   17.True
18.False   19.False   20.True   21.True   22.False
23. B   24. D   25. C   26. A   27. A   28. C   29. B   30. E   40. D   41. D
42. B   43. D   44. A   45. E   46. D   47. B   48. A   49. B   50. B   51. A
52. A   53. D   54. B   55. C   56. C   57. C   58. B   59. D   60. A   61. A
62. C   63. D   64. A   65. C   66. C