Test Bank for Introduction to Probability and Statistics CDN 4th Mendenhall

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TRUE/FALSE

1 : Numerical descriptive measures computed from population measurements are called parameters.
A : true
B : false

Correct Answer : A

2 : Numerical descriptive measures computed from sample measurements are called statistics.
A : true
B : false

Correct Answer : A

3 : Two classes, one with 15 students and the other with 25 students, took the same test and averaged 85 points and 75 points, respectively. If the two classes were combined, the overall average score of the 40 students would be 80 points.
A : true
B : false

Correct Answer : B

4 : If, from a set of data, the sample mean was found to be 15 but the sample median was only 9, then the data set would be said to be skewed to the right.$\overline{x}$

A : true
B : false

Correct Answer : A

5 : When data have been grouped (as in a frequency table, a relative frequency histogram, etc.), the class with the highest frequency is called the modal class, and the midpoint of that class is taken to be the mode.
A : true
B : false

Correct Answer : A

6 : Two classes, with 35 students each, took the same test and averaged 80 points and 60 points, respectively. If the two classes were combined, the overall average score of the 70 students would be 70 points.
A : true
B : false

Correct Answer : A

7 : The mode of a data set or a distribution of measurements, if it exists, is unique.
A : true
B : false

Correct Answer : B

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8 : Jessica has been keeping track of what she spends to eat out. Last week's expenditures for meals eaten out were $15.69, $15.95, $16.19, $20.91, $17.49, $24.53, and $17.66. The mean amount Jessica spends on meals is $18.35.
A : true
B : false

Correct Answer : A

9 : A data sample has a mean of 87 and a median of 117. The distribution of the data is skewed to the right.
A : true
B : false

Correct Answer : B

10 : If the mean and the median of a distribution are not equal, then the distribution is not symmetric.
A : true
B : false

Correct Answer : A

11 : In a mound-shaped distribution, there is no difference in the values of the mean and the median.
A : true
B : false

Correct Answer : A

12 : Measures of centre are values around which observations tend to cluster and which describe the location of what, in some sense, might be called the "centre" of a data set.
A : true
B : false

Correct Answer : A

13 : The median is a measure of centre that divides an ordered list of data into two halves. If the data are arranged in ascending order from smallest to largest, all the observations below the median are smaller than or equal to it, while all the observations above the median are larger than or equal to it.
A : true
B : false

Correct Answer : A

14 : The mode is the sum of a data set's minimum and maximum values, divided by 2.
A : true
B : false

Correct Answer : B

15 : The sample variance could be negative.

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A : true
B : false

Correct Answer : B

16 : When all the numbers in the data set are equal, the standard deviation, s, must be zero.
A : true
B : false

Correct Answer : A

17 : The sum of the deviations of the measurements from their mean is 0.
A : true
B : false

Correct Answer : A

18 : The sample variance is approximately the average of the squared deviations of the measurements from their mean.
A : true
B : false

Correct Answer : A

19 : The sample variance calculated with a divisor of n gives a better estimate of the population variance, ?2, than does the sample variance, s2, with a divisor of n – 1.
A : true
B : false

Correct Answer : B

20 : If the sample variance increases, so does its standard deviation.
A : true
B : false

Correct Answer : A

21 : In order to measure the variability in the same units as the original observations, we compute the sample variance.
A : true
B : false

Correct Answer : B

22 : Distributions with equal ranges must have equal standard deviations.
A : true
B : false

Correct Answer : B

23 : If two data sets have equal means and equal standard deviations, then they are identical.
A : true
B : false

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Correct Answer : B

24 : The range is considered the weakest measure of variability.
A : true
B : false

Correct Answer : A

25 : The value of the standard deviation will always exceed that of the variance.
A : true
B : false

Correct Answer : B

26 : The standard deviation is expressed in terms of the original units of measurement, but the variance is not.
A : true
B : false

Correct Answer : A

27 : The value of the standard deviation may be either positive or negative, while the value of the variance will always be positive or zero.
A : true
B : false

Correct Answer : B

28 : The variance is the positive square root of the standard deviation.
A : true
B : false

Correct Answer : B

29 : A sample of 20 observations has a standard deviation of 4. The sum of the squared deviations from the sample mean is 320.
A : true
B : false

Correct Answer : B

30 : The value of the mean times the number of observations equals the sum of all of the observations.
A : true
B : false

Correct Answer : A

31 : In a histogram, the proportion of the total area that must be to the left of the median is less than 0.50 if the distribution is skewed to the left.
A : true
B : false

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Correct Answer : B

32 : In a histogram, if the distribution is skewed to the right, the proportion of the total area that must be to the left of the median is more than 0.50.
A : true
B : false

Correct Answer : B

33 : If two data sets have the same range, then they either have equal medians or equal means.
A : true
B : false

Correct Answer : B

34 : The variance of a population of 1,000 measurements is 32. The variance of a small sample of 18 measurements must be smaller than 32.
A : true
B : false

Correct Answer : B

35 : Measures of variability are numbers that indicate the spread or scatter of observations; they show the extent to which individual values in a data set differ from one another and, hence, differ from their central location.
A : true
B : false

Correct Answer : A

36 : The variance of a sample is 120. This measure is an example of a parameter.
A : true
B : false

Correct Answer : B

37 : The median is one of the most commonly used measures of variability.
A : true
B : false

Correct Answer : B

38 : For distributions of data that are skewed to the left or right, the median would likely be the best measure of centre.
A : true
B : false

Correct Answer : A

39 : You are given the data values 5, 10, 15, 20, and 25. If these data were considered to be a population, and you calculated its mean, you would get the same value as if these data were considered to be a sample from another larger population.

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A : true
B : false

Correct Answer : A

40 : You are given the data values 1, 3, 4, 8, 12, and 18. If these data were considered to be a population, and you calculated its variance, you would get the same value as if these data were considered to be a sample from another larger population.
A : true
B : false

Correct Answer : B

41 : For any distribution, if the mean is equal to the standard deviation, you can conclude that the distribution is symmetric.
A : true
B : false

Correct Answer : B

42 : A distribution is skewed to the right if the population mean is larger than the sample mean.
A : true
B : false

Correct Answer : B

43 : One advantage of using the median as a measure of centre is that its value is NOT affected by extreme values.
A : true
B : false

Correct Answer : A

44 : If the mean value of a distribution is 45 and the median is 67, the distribution must be skewed to the right.
A : true
B : false

Correct Answer : B

45 : If the mean value of a distribution is 85 and the median is 67, the distribution must be skewed to the right.
A : true
B : false

Correct Answer : A

46 : Suppose the mean for a given sample is 17. If we add 5 to each data value in the sample, the mean will be 22.
A : true
B : false

Correct Answer : A

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47 : The standard deviation is a measure of the variability of the data around the median.
A : true
B : false

Correct Answer : B

48 : Suppose the standard deviation for a given sample is 12. If each data value in the sample is multiplied by 3, the standard deviation will be 36.
A : true
B : false

Correct Answer : A

49 : When the distribution is skewed to the left, then the mean is greater than the median.
A : true
B : false

Correct Answer : B

50 : Suppose the standard deviation for a given sample is 15. If we add 7 to each data value in the sample, the standard deviation will be 22.
A : true
B : false

Correct Answer : B

51 : When the distribution is symmetric and unimodal, the mean is equal to the median.
A : true
B : false

Correct Answer : A

52 : If a distribution is strongly skewed by one or more extreme values, you should use the mean rather than the median as a measure of centre.
A : true
B : false

Correct Answer : B

53 : Half of the observations in a data set are on either side of the mean.
A : true
B : false

Correct Answer : B

54 : The standard deviation of salaries in a large bank is larger than the standard deviation of salaries in a high school.
A : true
B : false

Correct Answer : A

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55 : The sum of the squared deviations from the mean is always zero.
A : true
B : false

Correct Answer : B

56 : If we add 10 to all data values in a sample, its range will increase by 10.
A : true
B : false

Correct Answer : B

57 : Tchebysheff's Theorem states the following: Given a number k greater than or equal to 1, and a set of measurements, at least (/k2) of the measurements in the data set will lie within k standard deviations of their mean.1 – 1

A : true
B : false

Correct Answer : A

58 : The Empirical Rule states the following: Given a distribution of measurements that is approximately bell-shaped (mound-shaped), then the interval μ ± ó contains approximately 68% of the measurements; the interval μ ± 2ó contains approximately 95% of the measurements; and the interval μ ± 3ó contains all or almost all of the measurements.
A : true
B : false

Correct Answer : A

59 : Tchebysheff's Theorem implies that at most one-quarter of the measurements lie farther than two standard deviations from the mean.
A : true
B : false

Correct Answer : A

60 : The Empirical Rule can be applied to any numerical data set.
A : true
B : false

Correct Answer : B

61 : For larger sample sizes, a rough approximation for the sample standard deviation s is that s R/4, where R is the range.≈

A : true
B : false

Correct Answer : A

62 : Since Tchebysheff's Theorem applies to any set of measurements, it provides a very

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conservative estimate of the fraction of measurements that fall into a particular interval.
A : true
B : false

Correct Answer : A

63 : According to Tchebysheff's Theorem, at least 13/16 of all measurements lie within four standard deviations from the mean.
A : true
B : false

Correct Answer : B

64 : Tchebysheff's Theorem applies only to data sets that are normally distributed.
A : true
B : false

Correct Answer : B

65 : While Tchebysheff's Theorem applies to any distribution, regardless of shape, the Empirical Rule applies only to distributions that are mound-shaped (normally distributed).
A : true
B : false

Correct Answer : A

66 : The mean of 40 sales receipts is $69.75 and the standard deviation is $10.25. Using Tchebysheff's Theorem, at least 75% of the sales receipts were between $49.25 and $90.25.
A : true
B : false

Correct Answer : A

67 : According to Tchebysheff's Theorem, at least 96% of observations should fall within five standard deviations of the mean.
A : true
B : false

Correct Answer : A

68 : The mean of 400 sales receipts is $69.75 and the standard deviation is $10.25. Using the Empirical Rule, at least 68% of the sales receipts were between $49.25 and $90.25.
A : true
B : false

Correct Answer : B

69 : The distribution of chequing account balances for customers at a credit union is known to be normally distributed, with a mean of $1,800. The percentage of accounts with balances between $1,500 and $2,100 is approximately 95%. We conclude that the standard deviation is $300.
A : true
B : false

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Correct Answer : B

70 : The daily number of texts sent by a teenager in Canada is bell-shaped, with a mean of 120 and a standard deviation of 15. Using the Empirical Rule, we conclude that approximately 17% of teenagers send more than 135 messages a day.
A : true
B : false

Correct Answer : A

71 : The distribution of credit card balances for customers is highly skewed to the right, with a mean of $1,200 and a standard deviation of $150. Based on this information, we conclude that approximately 68% of the customers will have credit card balances between $1,050 and $1,350.
A : true
B : false

Correct Answer : B

72 : The sample z-score is a measure of relative standing defined by . It measures the distance between an observation and the mean in units of the standard deviation.$z = (x - \overline{x}) / s$

A : true
B : false

Correct Answer : A

73 : z-scores exceeding 3 in absolute value are very likely to occur.
A : true
B : false

Correct Answer : B

74 : Any unusually large observation (as measured by a z-score greater than 3), or any unusually small observation (as measured by a z-score smaller than –3) is considered to be an outlier.
A : true
B : false

Correct Answer : A

75 : The 10th percentile of a set of measurements is the value that exceeds 90% of the measurements and is less than the remaining 10% of the measurements.
A : true
B : false

Correct Answer : B

76 : The difference between the largest and smallest values in an ordered list of measurements is called the interquartile range.
A : true
B : false

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Correct Answer : B

77 : Quartiles divide the values in a data set into four parts of equal size.
A : true
B : false

Correct Answer : A

78 : The interquartile range is the difference between the lower and upper quartiles.
A : true
B : false

Correct Answer : A

79 : Expressed in percentiles, the upper quartile is the 25th percentile.
A : true
B : false

Correct Answer : B

80 : Measures of relative standing indicate the position of one observation relative to other observations in a set of data.
A : true
B : false

Correct Answer : A

81 : The distance from the first quartile to the median is equal to 1/2 of the interquartile range.
A : true
B : false

Correct Answer : A

82 : The standard deviation is a measure of relative standing.
A : true
B : false

Correct Answer : B

83 : If a set of data has 120 values, the value of the 30th percentile will be calculated using the 36th and 37th values in the data, when the data values have been arranged in ascending order.
A : true
B : false

Correct Answer : A

84 : Assume that the mean of a data set is 12, and the standard deviation is 2. The measurement of 15 has the z-score of 3, and hence is an outlier.
A : true
B : false

Correct Answer : B

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85 : If the mean value of a set of data is 83.5 and the median is 72.8, then the third quartile will be at least 83.5.
A : true
B : false

Correct Answer : B

86 : Assume that 75% of the households in Saskatchewan have incomes of $24,375 or below. Given this information, it is certain that the mean household income is less than $24,375.
A : true
B : false

Correct Answer : B

87 : The left and right whiskers of the box in a box plot represent the 25th and 75th percentiles, respectively.
A : true
B : false

Correct Answer : B

88 : The following five-number summary for a sample of size 500 was obtained: Minimum = 250, Q1 = 1,200, Q2 = 3,600, Q3 = 4,800 and Maximum = 4,950. Based on this information, the upper fence is 9,200.
A : true
B : false

Correct Answer : B

89 : The following five-number summary for a sample of size 500 was obtained: Minimum = 250, Q1 = 1,200, Q2 = 3,600, Q3 = 4,800 and Maximum = 4,950. The value 10,000 is considered an outlier.
A : true
B : false

Correct Answer : B

90 : The following five-number summary for a sample of size 500 was obtained: Minimum = 250, Q1 = 1,200, Q2 = 3,600, Q3 = 4,800 and Maximum = 4,950. Based on this information, if you were to construct a box plot, the value corresponding to the right-hand edge of the box would be 4,950.
A : true
B : false

Correct Answer : B

91 : The following five-number summary for a sample of size 500 was obtained: Minimum = 250, Q1 = 1,200, Q2 = 3,600, Q3 = 4,800 and Maximum = 4,950. Based on this information, if you were to construct a box plot, the value corresponding to the lower fence is 4,200.
A : true
B : false

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Correct Answer : A

92 : There exists a data set for which the lower quartile is equal to the upper quartile.
A : true
B : false

Correct Answer : A

SHORT RESPONSE

93 : Motor Skills of ChildrenThe times required for 10 children to learn a particular motor skill were recorded as 9, 15, 23, 20, 16, 15, 24, 18, 10, and 20 minutes.Refer to Motor Skills of Children Narrative. Find the mean time to learn this task.

Correct Answer : minutes

94 : Motor Skills of ChildrenThe times required for 10 children to learn a particular motor skill were recorded as 9, 15, 23, 20, 16, 15, 24, 18, 10, and 20 minutes.Refer to Motor Skills of Children Narrative. Find the median time to learn this task.

Correct Answer : m = 17

95 : Motor Skills of ChildrenThe times required for 10 children to learn a particular motor skill were recorded as 9, 15, 23, 20, 16, 15, 24, 18, 10, and 20 minutes.Refer to Motor Skills of Children Narrative. Based on the values of the mean and median in the previous two questions, are the measurements symmetric or skewed? Give a reason for your answer.

Correct Answer : Since the mean and median values are the same, we conclude that the measurements are symmetric.

96 : Suppose someone told you that each value of a data set of 5 measurements had been multiplied by 100 and the sample mean was calculated to be 17.20. What was the sample mean of the original data?

Correct Answer : = 0.172

97 : Flu Shot Eight doctors were asked how many flu shots they had given to patients this fall. The numbers of flu shots were 6, 3, 5, 24, 2, 6, 0, and 8.Refer to Flu Shot Narrative. Find the sample mean.

Correct Answer :

98 : Flu Shot Eight doctors were asked how many flu shots they had given to patients this fall. The numbers of flu shots were 6, 3, 5, 24, 2, 6, 0, and 8.Refer to Flu Shot Narrative. Find the median number of flu shots given.

Correct Answer : m = 5.5

99 : Flu Shot Eight doctors were asked how many flu shots they had given to patients this fall. The numbers of flu shots were 6, 3, 5, 24, 2, 6, 0, and 8.Refer to Flu Shot Narrative. Based on the values of the mean and median in the previous two questions, are the measurements

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symmetric or skewed? Why?

Correct Answer : Since the mean is larger than the median, we conclude that the measurements are skewed to the right.

100 : In assembling a home appliance, workers generally finish the process within 30 minutes to 1 hour. Occasionally, due to system failures, the assembly process takes a long time, possibly as long as 4 to 5 hours. What is the most appropriate measure of central tendency to use in this case if you want the measure to be representative of most of the observed times? Why is it the most appropriate measure?

Correct Answer : Median is the most appropriate measure because it is not influenced by extreme values.

101 : The following data represent student grades on a statistics test: 8, 10, 15, 12, 14, and 13. Add 5 to every grade and compute the sample mean for both the original data and the new data. How does adding 5 to every grade affect the sample mean?

Correct Answer : , and . The sample mean is shifted to the right (increased) by 5.

102 : Student RatingsThirty-three students were asked to rate themselves on whether they were outgoing or not, using this five-point scale: 1 = extremely extraverted, 2 = extraverted, 3 = neither extraverted nor introverted, 4 = introverted, or 5 = extremely introverted. The results are shown in the table below:$\overline{x}_i$

Rating	1	2	3	4	5
Frequency fi	1	7	20	5	0

Refer to Student Ratings Narrative. Calculate the sample mean.

Correct Answer :

103 : Student RatingsThirty-three students were asked to rate themselves on whether they were outgoing or not, using this five-point scale: 1 = extremely extraverted, 2 = extraverted, 3 = neither extraverted nor introverted, 4 = introverted, or 5 = extremely introverted. The results are shown in the table below:$\overline{x}_i$

Rating	1	2	3	4	5
Frequency fi	1	7	20	5	0

Refer to Student Ratings Narrative. Calculate the median.

Correct Answer : m = 3

104 : Faulty Car PartsThe following data represent the number of faulty car parts produced each hour during an eight-hour shift: 4, 6, 10, 1, 3, 1, 25, and 8.Refer to Faulty Car Parts Narrative. What is the average number of faulty car parts per hour?

Correct Answer :

105 : Faulty Car PartsThe following data represent the number of faulty car parts produced each hour during an eight-hour shift: 4, 6, 10, 1, 3, 1, 25, and 8.Refer to Faulty Car Parts Narrative. Which, if any, of the observations appear to be outliers? Justify your answer.

Correct Answer : The value 25 has a z-score of 2.26 making it a suspect outlier.

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106 : Faulty Car PartsThe following data represent the number of faulty car parts produced each hour during an eight-hour shift: 4, 6, 10, 1, 3, 1, 25, and 8.Refer to Faulty Car Parts Narrative. Find the standard deviation for the number of faulty car parts per hour.

Correct Answer :

107 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. What is the median score?

Correct Answer : m = 84.5

108 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. What is the sample mean for this data set?

Correct Answer : = 80.64

109 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. Should the Empirical Rule be applied to this data set?

Correct Answer : No. The data do not appear to be mound-shaped.

110 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. Use the range approximation to determine an approximate value for the standard deviation. Is this a good approximation?

Correct Answer : s R /4 = 13. This approximation is very close to the actual value of s = 12.85.

111 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. What is the value of the sample standard deviation?

Correct Answer : s = 12.85

112 : Aptitude TestsTwenty-eight applicants interested in working in community services took an

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examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. What is the range of the scores?

Correct Answer : R = 52

113 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. What is the value of the first and third quartiles?

Correct Answer : Position of first quartile = 0.25(29) = 7.25, then Q1 = 70 + 0.25(2) = 70.5Position of third quartile = 0.75(29) = 21.75, then Q3 = 88 + 0.75(3) = 90.25

114 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. What is the interquartile range?

Correct Answer : IQR = Q3 – Q1 = 19.75

115 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. Find the lower and the upper fences. (These fences are also called inner fences.)

Correct Answer : Q1 – 1.5(IQR) = 70.5 – 1.5(19.75) = 40.875, andQ3 + 1.5(IQR) = 90.25 + 1.5(19.75) = 119.875

116 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. Replacing the factor of 1.5 in the calculation of inner fences by 3, we obtain the so-called outer fences. Compute the outer fences.

Correct Answer : Q1 – 3(IQR) = 70.5 – 3(19.75) = 11.25, andQ3 + 3(IQR) = 90.25 + 3(19.75) = 149.50

117 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. Construct a box

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plot for these data.

Correct Answer :

118 : Aptitude TestsTwenty-eight applicants interested in working in community services took an examination designed to measure their aptitude for social work. A stem-and-leaf plot of the 28 scores appears below, in which the first column is the count per “branch,” the second column is the stem value, and the remaining digits are the leaves.Count Stems Leaves1 4 61 5 94 6 36886 7 0267999 8 1456677887 9 1234788Refer to Aptitude Tests Narrative. Does the box plot indicate the presence of any outliers?

Correct Answer : There do not appear to be any outliers present since there are no observations beyond the upper or lower fence (i.e., there are no observations outside the inner fences).

119 : Suppose you are given the following set of sample measurements: –1, 0, 2, 6, 5, and 6.a. Calculate the sample mean.b. Find the median.c. Find the mode.d. Are these data symmetric, skewed to the right or skewed to the left? Justify your answer.

Correct Answer : a. = 3b. m = (2 + 5)/2 = 3.5c. 6d. The data are skewed to the left since the mean is less than the median.

120 : Ice Cream Cone SalesA neighbourhood ice cream vendor reports the following sales of single-scoop ice cream cones (measured in hundreds of cones) for five randomly selected weeks: 5, 4, 6, 5, and 3.Refer to Ice Cream Cone Sales Narrative. Find the average number of weekly sales of single-scoop ice cream cones.

Correct Answer :

121 : Ice Cream Cone SalesA neighbourhood ice cream vendor reports the following sales of single-scoop ice cream cones (measured in hundreds of cones) for five randomly selected weeks: 5, 4, 6, 5, and 3.Refer to Ice Cream Cone Sales Narrative. Find the median number of weekly sales of single-scoop ice cream cones.

Correct Answer : m = 5

122 : Ice Cream Cone SalesA neighbourhood ice cream vendor reports the following sales of single-scoop ice cream cones (measured in hundreds of cones) for five randomly selected weeks: 5, 4, 6, 5, and 3.Refer to Ice Cream Cone Sales Narrative. Find the variance for the weekly sales of single scoop ice cream cones.

Correct Answer : s2 = 1.3

123 : The following data represent the number of unique visitors (in millions) in a week for seven popular websites: 23, 26, 56, 42, 42, 60, and 240. Which measure of centre, the mean or the median, would provide a better measure of the average number of unique visitors? Give a reason for your answer.

Correct Answer : The median would seem to provide a better measure of the average number of unique visitors since it will not be adversely affected by the extreme value of 240. (The mean will be pulled strongly to the right by the extreme value of 240.)

124 : Athletic Training Time The following data represent the numbers of minutes an athlete

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spends training per day: 73, 74, 76, 77, 79, 79, 83, 84, 88, 84, 84, 85, 86, 86, 87, 87, 88, 91, 92, 92, 93, 97, 98, 98, 81, and 82. The mean and standard deviation were computed to be 85.54 and 6.97, respectively.Refer to Athletic Training Time Narrative. Create a stem-and-leaf plot for the distribution of training times.

Correct Answer : Stems Leaves 7 347 67998 1234448 56677889 12239 788

125 : Athletic Training Time The following data represent the numbers of minutes an athlete spends training per day: 73, 74, 76, 77, 79, 79, 83, 84, 88, 84, 84, 85, 86, 86, 87, 87, 88, 91, 92, 92, 93, 97, 98, 98, 81, and 82. The mean and standard deviation were computed to be 85.54 and 6.97, respectively.Refer to Athletic Training Time Narrative. Is the distribution relatively mound-shaped?

Correct Answer : Yes, the distribution of training times appears to be relatively mound-shaped, as can be seen from the answer to the previous question.

126 : Athletic Training Time The following data represent the numbers of minutes an athlete spends training per day: 73, 74, 76, 77, 79, 79, 83, 84, 88, 84, 84, 85, 86, 86, 87, 87, 88, 91, 92, 92, 93, 97, 98, 98, 81, and 82. The mean and standard deviation were computed to be 85.54 and 6.97, respectively.Refer to Athletic Training Time Narrative. What percentage of measurements would you expect to be between 71.60 and 99.48?

Correct Answer : Since the distribution appears to be close to mound-shaped, the Empirical Rule applies. The interval (71.60, 99.48) represents two standard deviations from the mean, so we would expect approximately 95% of the measurements to lie in this interval.

127 : Athletic Training Time The following data represent the numbers of minutes an athlete spends training per day: 73, 74, 76, 77, 79, 79, 83, 84, 88, 84, 84, 85, 86, 86, 87, 87, 88, 91, 92, 92, 93, 97, 98, 98, 81, and 82. The mean and standard deviation were computed to be 85.54 and 6.97, respectively.Refer to Athletic Training Time Narrative. What percentage of the measurements lies in the interval (71.60, 99.48)?

Correct Answer : 26 of the 26 measurements or 100% of the measurements lie in the given interval.

128 : Calories in Soft DrinksThe following data represent the number of calories in 340 mL cans of a sample of 8 popular soft drinks: 124, 144, 147, 146, 148, 154, 150, and 234.Refer to Calories in Soft Drinks Narrative. Find the median and the sample mean.

Correct Answer : m = (147 + 148)/2 = 147.5, =155.875

129 : Calories in Soft DrinksThe following data represent the number of calories in 340 mL cans of a sample of 8 popular soft drinks: 124, 144, 147, 146, 148, 154, 150, and 234.Refer to Calories in Soft Drinks Narrative. Are these measurements of numbers of calories symmetric or skewed? Justify your conclusion.

Correct Answer : Since the mean is larger than the median, we conclude that the measurements are skewed to the right.

130 : Chocolate BarsThe energy values of a sample of ten 25 g chocolate bars were measured to be 189, 197, 207, 272, 192, 257, 240, 197, 232, and 237 calories.Refer to Chocolate Bars Narrative. Find the average energy value of a chocolate bar.

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Correct Answer :

131 : Chocolate BarsThe energy values of a sample of ten 25 g chocolate bars were measured to be 189, 197, 207, 272, 192, 257, 240, 197, 232, and 237 calories.Refer to Chocolate Bars Narrative. Find the median energy value.

Correct Answer : m = (207 + 232)/2 = 219.5

132 : Chocolate BarsThe energy values of a sample of ten 25 g chocolate bars were measured to be 189, 197, 207, 272, 192, 257, 240, 197, 232, and 237 calories.Refer to Chocolate Bars Narrative. If you were writing a report to describe these data, which measure of central tendency would you use? Explain.

Correct Answer : Since there are no unusually large or small observations to affect the value of the mean, we would probably report the mean or average energy value.

133 : You are given a sample of 8 measurements: 13, 11, 15, 16, 14, 14, 13, and 15. Calculate the sample mean.

Correct Answer : = 13.875

134 : A sample of n = 10 measurements consists of the following values: 15, 12, 13, 16, 11, 12, 14, 15, 11, and 13. Calculate the sample mean and the median of this data set. Are the data mound-shaped?

Correct Answer : = 13.2, and m = 13. No; the data is slightly skewed to the right since the mean is slightly larger than the median.

135 : The following data represent the scores for a sample of 10 students on a 20-point chemistry quiz: 16, 14, 2, 8, 12, 12, 9, 10, 15, and 13. Find the median and the sample mean. Later, a marking error was discovered and 2 points were subtracted from each student’s quiz grade. What are the median and the sample mean of the corrected quiz grades?

Correct Answer : Originally, median m = (12 + 12)/2 = 12, and = 11.1. After the correction, both median and mean decreased by 2 points.

136 : Community College RaisesAssume that all employees of a community college received a monthly raise.Refer to Community College Raises Narrative. How would a $150 raise affect the mean of salaries? How would a $150 raise affect the standard deviation of salaries?

Correct Answer : a. The mean of salaries will increase by $150.b. The standard deviation of salaries will remain unchanged.

137 : Community College RaisesAssume that all employees of a community college received a monthly raise.Refer to Community College Raises Narrative. What would happen to the mean of salaries if all salaries were raised by 5%? What would happen to the standard deviation of salaries if all salaries were raised by 4%?

Correct Answer : a. The mean of salaries will increase by 5%.b. The standard deviation of salaries will increase by 4%.

138 : Optometrist Customers The following values denote the number of customers handled by an optometrist during a random sample of four periods of one hour each: 4, 6, 2, and 5.Refer to

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Optometrist Customers Narrative. Find the standard deviation of these values.

Correct Answer : s = 1.708 customers

139 : Optometrist Customers The following values denote the number of customers handled by an optometrist during a random sample of four periods of one hour each: 4, 6, 2, and 5.Refer to Optometrist Customers Narrative. Find the range R.

Correct Answer : R = 6 – 2 = 4

140 : The following data represent scores on a 15-point aptitude test: 8, 10, 15, 12, 14, and 13. Subtract 3 from every observation and compute the sample variance for the original data and the new data. What effect, if any, does subtracting 3 from every observation have on the sample variance?

Correct Answer : = 6.80, and = 6.80. The sample variance remains unchanged.

141 : Student ExtraversionThirty-three students were asked to rate themselves on whether they were outgoing or not using this five-point scale: 1 = extremely extraverted, 2 = extraverted, 3 = neither extraverted nor introverted, 4 = introverted, or 5 = extremely introverted. The results are shown in the table below:$\overline{x}_i$

Rating	1	2	3	4	5
Frequency	1	7	20	5	0

Refer to Student Extraversion Narrative. Calculate the sample standard deviation.

Correct Answer : s = 0.696

142 : Student ExtraversionThirty-three students were asked to rate themselves on whether they were outgoing or not using this five-point scale: 1 = extremely extraverted, 2 = extraverted, 3 = neither extraverted nor introverted, 4 = introverted, or 5 = extremely introverted. The results are shown in the table below:$\overline{x}_i$

Rating	1	2	3	4	5
Frequency	1	7	20	5	0

Refer to Student Extraversion Narrative. Find the percentage of measurements in the intervals and . Compare these results with the Empirical Rule percentages, and comment on the shape of the distribution.

Correct Answer : The mean is 2.878. We see that 20 of the total of 33 observations, i.e., 60.6%, are in the interval = (2.182, 3.574). The Empirical Rule says if the data set is mound-shaped, we should expect to see approximately 68% of the data within one standard deviation of the mean.32 of 33 observations, i.e., 97%, are in the interval = (1.486, 4.270). The Empirical Rule says that if the data set is mound-shaped, we should expect to see approximately 95% of the observations within two standard deviations of the mean.Since both percentages are relatively close to those predicted by the Empirical Rule, the data must be approximately mound-shaped.

143 : Suppose you are given the following set of sample measurements: –1, 0, 2, 6, and 6.a. Calculate the sample variance.b. Calculate the sample standard deviation.c. Calculate the range.

Correct Answer : a. s2 = 10.8b. c. R = 7

144 : You are given a sample of 8 measurements: 13, 11, 15, 16, 14, 14, 13, and 15.a.

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Calculate the range.b. Calculate the sample variance and standard deviation.c. Compare the range and the standard deviation. Approximately how many standard deviations equal the value of the range?

Correct Answer : a. R = 5b. s2 = 2.4107, and s = 1.5526c. The range R = 5, is 5/1.5526 = 3.22 standard deviations.

145 : A sample of n = 10 measurements consists of the following values: 15, 12, 13, 16, 11, 12, 14, 15, 11, and 13. Calculate the value of the sample standard deviation (s) and the range (R), and use R to approximate s. Is this a good approximation?

Correct Answer : s = 1.75, R = 5, s R/4 = 1.25. Yes, this is a good approximation.

146 : The following data represent the scores for a sample of 10 students on a 20-point chemistry quiz: 16, 14, 2, 8, 12, 12, 9, 10, 15, and 13. Calculate the sample variance, the lower and upper quartiles, and the IQR for these data.

Correct Answer : s2 = 16.767, position of lower quartile = 0.25(11) = 2.75; Q1= 8 + 0.75(1) = 8.75; position of upper quartile = 0.75(11) = 8.25; Q3 = 14 + 0.25(1) =14.25, and IQR = Q3 – Q1 = 5.5.

147 : The following data represent the scores for a sample of 10 students on a 20-point chemistry quiz: 16, 14, 2, 8, 12, 12, 9, 10, 15, and 13. Calculate the sample variance, the lower and upper quartiles, and the IQR for these data.

Correct Answer :

148 : Parasites in FoxesA random sample of 100 foxes was examined by a team of veterinarians to determine the prevalence of a particular type of parasite. Counting the number of parasites per fox, the veterinarians found that 65 foxes had no parasites, 20 had one parasite, and so on. A frequency tabulation of the data is given here:$\bar{x}$

Number of Parasites, x	0	1	2	3	4	5	6	7	8
Number of Foxes, f	65	20	7	3	1	2	1	0	1

Refer to Parasites in Foxes Narrative. Calculate the sample mean and the sample standard deviation s for the sample.

Correct Answer : = 0.71, and s = 1.387

149 : Parasites in FoxesA random sample of 100 foxes was examined by a team of veterinarians to determine the prevalence of a particular type of parasite. Counting the number of parasites per fox, the veterinarians found that 65 foxes had no parasites, 20 had one parasite, and so on. A frequency tabulation of the data is given here:

Number of Parasites, x		0
Number of Foxes, f		65

Refer to Parasites in Foxes Narrative. Calculate the sample mean and the sample standard deviation s for the sample.

Correct Answer : The two intervals for k = 2, 3 are calculated in the table below along with the actual proportion of measurements falling in the intervals. Tchebysheff’s Theorem is satisfied and the approximations given by the Empirical Rule are fairly close for k = 2 and k = 3.kIntervalFraction in IntervalTchebysheff’s TheoremEmpirical Rule20.71 2.774–2.064 to 3.48495/100 = 0.95At least 0.75 0.9530.71 4.161–3.451 to 4.87196/100 = 0.96At least 0.89 0.997

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150 : The running speed of a moose is normally distributed with a mean of 42 km/h and a standard deviation of 6 km/h. What percentage of moose run faster than 54 km/h?

Correct Answer : 54 km/h is two standard deviations from the mean. By the empirical rule, about 5% of moose run faster than 54 km/h or slower than 30km/h. The answer is 2.5%.

151 : The running speed of a beagle is skewed right with a mean of 32 km/h and a standard deviation of 8 km/h. How many beagles run faster than 48 km/h?

Correct Answer : Applying Tchebysheff's Theorem, we see that at most 25% of beagles run faster than 48 km/h or slower than 16 km/h. Because the distribution is skewed to the right, we can say that more than half of those 25% of beagles run faster than 48 km/h.

152 : The wingspan of a blue jay is bell-shape distributed with a mean of 38 cm and a standard deviation of 2 cm. How likely is it that we will find a blue jay with a wingspan of at least 44 cm?

Correct Answer : 44 cm is three standard deviations above the mean. Only about 0.3% of all blue jays have a wingspan that is three standard deviations from the mean. So, about half, i.e., 0.15%, have a wingspan of 44 cm or more. So, very unlikely.

153 : The times required to service customers' cars at a repair shop are skewed to the right, with a mean of 2.5 hours and a standard deviation of 0.75 hours. What can be said about the percentage of cars whose service time is either less than 1 hour or more than 4 hours?

Correct Answer : Applying Tchebysheff's Theorem, we can say that at most 25% of the cars take less than one hour or more than four hours to service.

154 : Cola BottlingWhen a machine dispensing cola at a bottling plant is working correctly, it dispenses a mean of 340 mL of cola per bottle, with a standard deviation of 6 mL.Refer to Cola Bottling Narrative. When the machine is working correctly, what percentage of the bottles will be filled with between 328 and 352 mL of cola?

Correct Answer : At least 75% of the bottles will be filled with between 328 and 352 mL of cola.

155 : Cola BottlingWhen a machine dispensing cola at a bottling plant is working correctly, it dispenses a mean of 340 mL of cola per bottle, with a standard deviation of 6 mL.Refer to Cola Bottling Narrative. On a particular day, the bottling plant supervisor randomly selects two bottles from among those filled by the machine. One bottle contains 336 mL of cola, and the other contains 344 mL of cola. Based on the contents of these two bottles, what can the supervisor conclude about the machine's performance?

Correct Answer : 336 mL and 344 mL are within one standard deviation from the mean. Thus, the machine seems to be working correctly.

156 : Job Applicant Test ScoresA new manufacturing plant has 20 job openings. To select the best 20 applicants from among the 1000 job seekers, the plant's personnel office administers a written aptitude test to all applicants. The average score on the aptitude test is 150 points, with a standard deviation of 10 points. Assume the distribution of test scores is approximately mound-shaped.Refer to Job Applicant Test Scores Narrative. What percentage of the test scores will fall between 130 and 160 points?

Correct Answer : Approximately 81.5% of the test scores will fall between 130 and 160 points.

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157 : Job Applicant Test ScoresA new manufacturing plant has 20 job openings. To select the best 20 applicants from among the 1000 job seekers, the plant's personnel office administers a written aptitude test to all applicants. The average score on the aptitude test is 150 points, with a standard deviation of 10 points. Assume the distribution of test scores is approximately mound-shaped.Refer to Job Applicant Test Scores Narrative. How many applicants will score between 130 and 160 points?

Correct Answer : Approximately 815 applicants will score between 130 and 160 points.

158 : Job Applicant Test ScoresA new manufacturing plant has 20 job openings. To select the best 20 applicants from among the 1000 job seekers, the plant's personnel office administers a written aptitude test to all applicants. The average score on the aptitude test is 150 points, with a standard deviation of 10 points. Assume the distribution of test scores is approximately mound-shaped.Refer to Job Applicant Test Scores Narrative. One of the applicants scored 192 points on the test. What might you conclude about this test score?

Correct Answer : The score should be regarded as an outlier; the score should be double-checked to see if it was recorded correctly.

159 : Frequency TableSuppose you are given the following frequency table of ratings from 0 to 8:$\overline{x}_i$

Rating	0	1	2	3	4	5	6	7	8
Frequency	69	17	6	3	1	2	1	0	1

Assume that the sample mean and the sample standard deviation are 0.66 and 1.387, respectively.Refer to Frequency Table Narrative. What fraction of the x-values fall within two standard deviations of the mean? Within three standard deviations of the mean?

Correct Answer : 0.95 of the x values fall within two standard deviations of the mean.0.96 of the x values fall within three standard deviations of the mean.

160 : Frequency TableSuppose you are given the following frequency table of ratings from 0 to 8:$\overline{x}_i$

Rating	0	1	2	3	4	5	6	7	8
Frequency	69	17	6	3	1	2	1	0	1

Assume that the sample mean and the sample standard deviation are 0.66 and 1.387, respectively.Refer to Frequency Table Narrative. Do the results of the previous question agree with Tchebysheff's Theorem?

Correct Answer : Yes. According to Tchebysheff's Theorem, at least 3/4 or 0.75 of the measurements fall within two standard deviations of the mean, and at least 8/9 or 0.89 of the measurements fall within three standard deviations of the mean.

161 : Frequency TableSuppose you are given the following frequency table of ratings from 0 to 8:$\overline{x}_i$

Rating	0	1	2	3	4	5	6	7	8
Frequency	69	17	6	3	1	2	1	0	1

Assume that the sample mean and the sample standard deviation are 0.66 and 1.387, respectively.Refer to Frequency Table Narrative. Do the results of the previous question agree with the Empirical Rule?

Correct Answer : Yes. According to the Empirical Rule, approximately 95% of the

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measurements fall within two standard deviations of the mean, and all or almost all of the measurements fall within three standard deviations of the mean.

162 : Number of Sunny DaysThe number of sunny days in a year in a tropical location is approximately mound-shaped, with a mean of 240 days and a standard deviation of 30 days.Refer to Number of Sunny Days Narrative. What is the chance that a given year will have between 180 and 300 sunny days?

Correct Answer : Two standard deviations from the mean; 95%.

163 : Number of Sunny DaysThe number of sunny days in a year in a tropical location is approximately mound-shaped, with a mean of 240 days and a standard deviation of 30 days.Refer to Number of Sunny Days Narrative. One year, the number of sunny days was at the 84th percentile. How many sunny days were there?

Correct Answer : 84% = 50% + 34%, and 34% = 68%/2. Thus, add the mean to one-half of one standard deviation from the mean: 240 + 30 = 270.

164 : For Labrador Retrievers, the average weight at 12 months of age is 23 kg, with a standard deviation of 1.2 kg. What can be said about the proportion of 12-month-old Labrador Retrievers that will weigh between 21.2 kg and 24.8 kg?

Correct Answer : Since it is not known whether the distribution of weights is mound-shaped, the Empirical Rule doesn't necessarily apply. Using Tchebysheff's Theorem, since the given interval represents 1.5 standard deviations on each side of the mean, at least 1 – 1/(1.5)2 = 0.56 of the weights will lie in the interval.

165 : The mean and variance of a sample of n = 25 measurements are 80 and 100, respectively. Explain in detail how to use Tchebysheff's Theorem to describe the distribution of the measurements.

Correct Answer : You are given = 80, and s2 =100. The standard deviation is s = 10. The distribution of measurements is centred about = 80, and Tchebysheff's Theorem states that§ At least 3/4 of the 25 measurements lie in the interval ; that is, 60 to 100.§ At least 8/9 of the measurements lie in the interval ; that is, 50 to 110.

166 : Manufacturing Operation TimeIn a time study conducted at a manufacturing plant, the length of time to complete a specified operation is measured for each one of n = 40 workers. The mean and standard deviation are found to be 15.2 and 1.40, respectively.Refer to Manufacturing Operation Time Narrative. Describe the sample data using the Empirical Rule.

Correct Answer : To describe the data using the Empirical Rule, calculate these intervals:, or 13.8 to 16.6, or 12.4 to 18.0, or 11.0 to 19.4If the distribution of measurements is mound-shaped, you can apply the Empirical Rule and expect approximately 68% of the measurements to fall into the interval from 13.8 to 16.6, approximately 95% to fall into the interval from 12.4 to 18.0, and all or almost all to fall into the interval from 11.0 to 19.4.

167 : Manufacturing Operation TimeIn a time study conducted at a manufacturing plant, the length of time to complete a specified operation is measured for each one of n = 40 workers. The mean and standard deviation are found to be 15.2 and 1.40, respectively.Refer to Manufacturing Operation Time Narrative. Describe the sample data using Tchebysheff's Theorem.

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Correct Answer : If you doubt that the distribution of measurements is mound-shaped, or if you wish for some other reason to be conservative, you can apply Tchebysheff's Theorem and be absolutely certain of your statements. Tchebysheff's Theorem tells you that at least 3/4 of the measurements fall into the interval from 12.4 to 18.0, and at least 8/9 into the interval from 11.0 to 19.4

168 : A sample of n = 10 measurements consists of the following values: 15, 12, 13, 16, 11, 12, 14, 15, 11, and 13.a. Can you use Tchebysheff's Theorem to describe this data set? Why or why not?b. Can you use the Empirical Rule to describe this data set? Why or why not?

Correct Answer : a. Yes, since it applies to any set of measurements.b. No, since the data set is not mound-shaped.

169 : A distribution of measurements is relatively mound-shaped, with mean 70 and standard deviation 10.a. What percentage of the measurements will fall between 60 and 80?b. What percentage of the measurements will fall between 50 and 90?c. What percentage of the measurements will fall between 50 and 80?d. If a measurement is chosen at random from this distribution, what is the probability that it will be greater than 80?

Correct Answer : a. The interval from 60 to 80 represents . Since the distribution is relatively mound-shaped, the percentage of measurements between 60 and 80 is approximately 68% according to the Empirical Rule.b. Again, using the Empirical Rule, the interval or between 50 and 90 contains approximately 95% of the measurements.c. Since approximately 68% of the measurements are between 60 and 80, the symmetry of the distribution implies that approximately 34% of the measurements are between 70 and 80. Similarly, since approximately 95% of the measurements are between 50 and 90, approximately 47.5% of the measurements are between 50 and 70. Thus, the percentage of measurements between 50 and 80 is 34% + 47.5% = 81.5%.d. Since the proportion of the measurements between 70 and 80 is 0.34, and the proportion of the measurements that is greater than 70 is 0.50, the proportion that is greater than 80 must be 0.50 – 0.34 = 0.16.

170 : A distribution of measurements is roughly mound-shaped, with mean 100 cm and standard deviation of 15 cm. What percentage of the measurements will be smaller than 70 cm?

Correct Answer : Using the Empirical Rule, the interval from 70 cm to 130 cm contains approximately 95% of all measurements. Since the distribution is symmetric, there will be about 2.5% of measurements that are smaller than 70 cm.

171 : Height of Basketball PlayersA sample of basketball players has a mean height of 190 cm, with a standard deviation of 12 cm. You know nothing else about the size of the data set or the shape of the data distribution.Refer to Height of Basketball Players Narrative. Can you use Tchebysheff's Theorem and/or the Empirical Rule to describe the data? Explain.

Correct Answer : Since nothing is known about the shape of the data distribution, we must use Tchebysheff's Theorem to describe the data.

172 : Height of Basketball PlayersA sample of basketball players has a mean height of 190 cm, with a standard deviation of 12 cm. You know nothing else about the size of the data set or the shape of the data distribution.Refer to Height of Basketball Players Narrative. What can you say about the fraction of measurements that fall between 154 and 226 cm?

Correct Answer : The interval from 154 to 226 represents , which will contain at least 8/9 of the measurements.

Access Complete Test Bank for Introduction to Probability and Statistics CDN 4th Mendenhall

173 : Height of Basketball PlayersA sample of basketball players has a mean height of 190 cm, with a standard deviation of 12 cm. You know nothing else about the size of the data set or the shape of the data distribution.Refer to Height of Basketball Players Narrative. What can you say about the fraction of measurements that fall between 166 and 214?

Correct Answer : The interval from 166 to 214 represents 4, which will contain at least 3/4 of the measurements.

174 : Height of Basketball PlayersA sample of basketball players has a mean height of 190 cm, with a standard deviation of 12 cm. You know nothing else about the size of the data set or the shape of the data distribution.Refer to Height of Basketball Players Narrative. What can you say about the fraction of measurements that are less than 166?

Correct Answer : The value x = 166 lies two standard deviations below the mean. Since at least 3/4 of the measurements are within the two standard deviations range, at most 1/4 can lie outside that range, which means that at most 1/4 can be less than 166.

175 : Solution VolumesAn analytical chemist wanted to use electrolysis to determine the number of moles of cupric ions in a given volume of solution. The solution was partitioned into n = 30 portions of 0.2 mL each. Each of the n = 30 portions was tested. The average number of moles of cupric ions for the n = 30 portions was found to be 0.185 mole; the standard deviation was 0.015 mole.$(\overline{x} \pm s)$

Refer to Solution Volumes Narrative. Calculate the intervals , , and .

Correct Answer : or 0.170 to 0.200 or 0.155 to 0.215 or 0.140 to 0.230

176 : Solution VolumesAn analytical chemist wanted to use electrolysis to determine the number of moles of cupric ions in a given volume of solution. The solution was partitioned into n = 30 portions of 0.2 mL each. Each of the n = 30 portions was tested. The average number of moles of cupric ions for the n = 30 portions was found to be 0.185 mole; the standard deviation was 0.015 mole.Refer to Solution Volumes Narrative. Describe the distribution of the measurements for the n = 30 portions of the solution using Tchebysheff's Theorem.

Correct Answer : If we doubt that the distribution of measurements is mound-shaped, or if no prior information as to the shape of the distribution is available, we use Tchebysheff's Theorem. We would expect none or some of the measurements to fall in the interval 0.17 to 0.20, at least 3/4 of the measurements to fall in the interval 0.155 to 0.215, and at least 8/9 of the measurements to fall in the interval from 0.14 to 0.23.

177 : Solution VolumesAn analytical chemist wanted to use electrolysis to determine the number of moles of cupric ions in a given volume of solution. The solution was partitioned into n = 30 portions of 0.2 mL each. Each of the n = 30 portions was tested. The average number of moles of cupric ions for the n = 30 portions was found to be 0.185 mole; the standard deviation was 0.015 mole.Refer to Solution Volumes Narrative. Suppose the chemist had used only n = 5 portions of the solution for the experiment and obtained the readings 0.18, 0.21, 0.20, 0.22, and 0.18. Would the Empirical Rule be suitable for describing the n = 5 measurements? Why?

Correct Answer : If the chemist had used only a sample of size n = 5 for this experiment, the distribution would not be mound-shaped. Therefore, the Empirical Rule cannot be used.

178 : Attendance at London Symphony concerts for the past two years showed an average of

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3000 people per performance, with a standard deviation of 100 people per performance. Attendance at a randomly selected concert was found to be 3290. If attendance data is mound-shaped, does the attendance at the selected concert appear to be unusual? Justify your conclusion.

Correct Answer : The z-score associated with 3290 is 2.90, indicating that 3290 is 2.90 standard deviations above the mean. Although the z-score does not exceed 3, it is close enough for one to suspect that 3290 is an outlier.

179 : Consider the following set of measurements: 5.4, 5.9, 3.5, 4.1, 4.6, 2.5, 4.7, 6.0, 5.4, 4.6, 4.9, 4.6, 4.1, 3.4, and 2.2.a. Find the 25th, 50th, and 75th percentiles.b. What is the value of the interquartile range?

Correct Answer : a. 25th percentile = Q1= 3.5; 50th percentile = Q2= 4.6; 75th percentile = Q3 = 5.4b. IQR = Q3 – Q1 = 5.4 – 3.5 =1.9

180 : Number of Calories in Soft DrinksThe following data represent the number of calories in 340 mL cans of a sample of 8 popular soft drinks: 124, 144, 147, 146, 148, 154, 150, and 234.Refer to Number of Calories in Soft Drinks Narrative. Find the inner fences, i.e., the upper and the lower fences.

Correct Answer : Q1 – 1.5(IQR) = 144.5 – 1.5(8.5) = 131.75, andQ3 + 1.5(IQR) = 153 + 1.5(8.5) = 166.75

181 : Number of Calories in Soft DrinksThe following data represent the number of calories in 340 mL cans of a sample of 8 popular soft drinks: 124, 144, 147, 146, 148, 154, 150, and 234.Refer to Number of Calories in Soft Drinks Narrative. Replacing the factor of 1.5 in the calculation of inner fences by 3, we obtain the so-called outer fences. Find the outer fences.

Correct Answer : Q1 – 3(IQR) = 144.5 – 3(8.5) = 119, andQ3 + 3(IQR) = 153 + 3(8.5) = 178.5

182 : Number of Calories in Soft DrinksThe following data represent the number of calories in 340 mL cans of a sample of 8 popular soft drinks: 124, 144, 147, 146, 148, 154, 150, and 234.Refer to Number of Calories in Soft Drinks Narrative. Construct a box plot for these data. Does the box plot indicate the presence of any outliers?

Correct Answer : Yes, the observation 124 is a suspect outlier since it lies to the left of the lower fence, which is 131.75. Also, the observation 234 is an extreme outlier since it lies to the right of the upper fence, which is 166.75.

183 : The following data represent the scores for a sample of 10 students on a 20-point chemistry quiz: 16, 14, 2, 8, 12, 12, 9, 10, 15, and 13. Calculate the z-score for the smallest and largest observations. Is either of these observations unusually large or unusually small?

Correct Answer : For x = 2, z-score = (2 – 11.1)/4.095 = –2.22. For x = 16, z-score = (16 – 11.1)/4.095 = 1.197. Since the z-score for the smallest observation exceeds 2 in absolute value, the smallest observation is unusually small. However, the largest observation is not unusually large.

184 : Two students are enrolled in different sections of an introductory statistics class at a local university. The first student, enrolled in the morning section, earns a score of 76 on a midterm exam where the class mean was 64 with a standard deviation of 8. The second student, enrolled in the afternoon section, earns a score of 72 on a midterm exam where the class mean

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was 60 with a standard deviation of 7.5. If the scores on the midterm exams are normally distributed, which student scored better relative to his or her classmates?

Correct Answer : z1= (76 – 64)/8 = 1.5; z2 = (72 – 60)/7.5 = 1.6; the student in the afternoon section scored better relative to her classmates since her z-score is larger.

185 : If the 90th and 91st observations in a set of 100 data values are 158 and 167, respectively, what is the 90th percentile value?

Correct Answer : 166.1

186 : If the 18th and 19th observations in a set of 25 data values are 42.6 and 43.8, what is the 70th percentile value?

Correct Answer : 42.84

MULTIPLE CHOICE

187 : Which of the following is a meaningful measure of centre when the data are qualitative?
A : the mean
B : the median
C : the mode
D : the quartile

Correct Answer : C

188 : Which of the following is a property of a symmetric distribution?
A : The mean is greater than the median.
B : The mean and median are equal.
C : The mean is less than the median.
D : The mean is less than the mode.

Correct Answer : B

189 : In a histogram, what may be said of the proportion of the total area that must be to the right of the mean?
A : It is less than 0.50 if the distribution is skewed to the left.
B : It is always exactly 0.50.
C : It is more than 0.50 if the distribution is skewed to the right.
D : It is exactly 0.50 only if the distribution is symmetric.

Correct Answer : D

190 : Which of the following statements applies to this set of data values: 17, 15, 16, 14, 17, 18, and 22?
A : The mean, median, and mode are all equal.
B : Only the mean and median are equal.
C : Only the mean and mode are equal.
D : Only the median and mode are equal.

Correct Answer : A

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191 : Which of the following best describes the relationship between the population mean and the sample mean?
A : The population mean is always larger than the sample mean.
B : The population mean is always smaller than the sample mean.
C : The population mean is always larger than or equal to the sample mean.
D : The population mean can be smaller than, larger than, or equal to the sample mean.

Correct Answer : D

192 : The average score for a class of 35 students was 70. The 20 male students in the class averaged 73. What was the average score for the 15 female students in the class?
A : 60
B : 66
C : 70
D : 73

Correct Answer : B

193 : In a histogram, what may one conclude about the proportion of the total area that must be to the left of the median?
A : It is exactly 0.50.
B : It is less than 0.50 if the distribution is skewed to the left.
C : It is more than 0.50 if the distribution is skewed to the right.
D : It is between 0.25 and 0.75 if the distribution is symmetric.

Correct Answer : A

194 : Which of the following statements about the mean is NOT always correct?
A : The mean is smaller than or equal to the largest observation.
B : Half the observations are on either side of the mean.
C : For a symmetric distribution, the mean is always equal to the median.
D : The value of the mean times the number of observations equals the sum of all of the observations.

Correct Answer : B

195 : Which of the following can be used to summarize data about qualitative variables?
A : measures of centre
B : measures of variability
C : proportions
D : measures of relative standing

Correct Answer : C

196 : Consider this data set: 5, 6, 7, 11, and 15. Which of the following values equals its mean?
A : 7.0
B : 7.1
C : 8.1
D : 8.8

Correct Answer : D

197 : A random sample from an unknown population had a sample standard deviation of zero.

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From this piece of information, which one of the following is a reasonable conclusion?
A : The sample range consists of equal measurements.
B : An error was made in computing the sample standard deviation. It must always be greater than zero.
C : The population standard deviation must be zero.
D : The population standard deviation must be less than zero

Correct Answer : A

198 : The following data represent a sample of 10 scores on a 20-point statistics quiz: 16, 16, 16, 16, 16, 18, 18, 20, 20, and 20. After the mean, median, range, and variance were calculated for the scores, it was discovered that one of the scores of 20 should have been an 18. Which of the following pairs of measures will change when the calculations are redone using the correct scores?
A : mean and range
B : median and range
C : mean and variance
D : median and variance

Correct Answer : C

199 : Which of the following represents a disadvantage of using the sample range to measure dispersion?
A : It produces spreads that are not meaningful for data analysis.
B : The largest or smallest observation (or both) may be an outlier.
C : The sample range is not measured in the same units as the data.
D : The sample range is measured in the same units as the data.

Correct Answer : B

200 : The following 10 scores were obtained on a 20-point quiz: 4, 5, 8, 9, 11, 13, 15, 18, 18, and 20. The teacher computed the usual descriptive measures of centre and variability for these data, and then discovered an error was made. One of the 18s should have been a 16. Which pair of the following measures, calculated on the corrected data, would change from the original computation?
A : mean and standard deviation
B : mean and median
C : range and median
D : mean and range

Correct Answer : A

201 : Which of the following is NOT a measure of variability?
A : the variance
B : the standard deviation
C : the mean
D : the range

Correct Answer : C

202 : If two data sets have the same range, which of the following characteristics do these data sets also share?
A : The distances from the smallest to the largest observations in both sets will be the same.
B : The smallest and largest observations will be the same in both sets.

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C : They will have the same variance.
D : They will have the same interquartile range.

Correct Answer : A

203 : A sample of 26 observations has a standard deviation of 4. What is the sum of the squared deviations from the sample mean?
A : 21
B : 25
C : 100
D : 400

Correct Answer : D

204 : A sample of 100 observations has a mean of 47 and a median of 47. Which statement is always true?
A : The distribution is symmetric.
B : The mode is 47.
C : Exactly 50 observations are greater than or equal to 47.
D : The standard deviation is zero.

Correct Answer : C

205 : Which of the following statements describes the variance of a population?
A : The variance is a mean of absolute deviations.
B : The variance is a mean of positive and negative deviations.
C : The variance is a mean of squared deviations.
D : The variance is a mean of only the positive deviations.

Correct Answer : C

206 : If a store manager selected a sample of customers and computed the mean income for this sample, what has he computed?
A : a parameter
B : a statistic
C : a qualitative value
D : a categorical value

Correct Answer : B

207 : Which of the following is a characteristic of a population mean?
A : It will always be larger than the mean of a sample selected from that population.
B : It will always be larger than the population median.
C : It will usually differ in value from the mean of a sample selected from that population.
D : It will always be smaller than the population median.

Correct Answer : C

208 : A sample of students who have taken a calculus test has a mean score of 78.2, a mode of 67, and a median score of 67. Based on this information, what may one deduce about the distribution of the test scores?
A : It is symmetric.
B : It is right-skewed.

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C : It is left-skewed.
D : It is bimodal.

Correct Answer : B

209 : Which of the following is the most frequently used measure of variation?
A : the mean
B : the range
C : the variance
D : the standard deviation

Correct Answer : D

210 : Which of the following measures is NOT affected by a small number of extreme values in the data?
A : the mean
B : the median
C : the variance
D : the range

Correct Answer : B

211 : A university placement office conducted a survey of 100 engineers who had graduated from a local university. For these engineers, the mean salary was computed to be $72,000 with a standard deviation of $8,000. Which of the following best characterizes the percentage of these engineers who earn either more than $96,000 or less than $48,000?
A : approximately 2.3%
B : at least 5.6% (1/18 of the engineers)
C : at most 5.6% (1/18 of the engineers)
D : at most 11.1% (1/9 of the engineers)

Correct Answer : D

212 : According to Tchebysheff's Theorem, what is the percentage of measurements in a data set that will fall within two standard deviations of the mean?
A : 16%
B : at least 68%
C : at least 75%
D : at least 89%

Correct Answer : C

213 : You are given a distribution of measurements that is approximately mound-shaped. According to the Empirical Rule, what would be the approximate percentage of measurements in a data set that will fall within two standard deviations of their mean?
A : 99%
B : 95%
C : 90%
D : 68%

Correct Answer : B

214 : The expression where , is recognizable as the formula for which of the following

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measures? $\bar{x} = \frac{\sum f_i n_i}{n}$

A : the population mean, computed from ungrouped data
B : the sample mean, computed from ungrouped data
C : the population mean, computed from grouped data
D : the sample mean, computed from grouped data

Correct Answer : D

215 : The grades on a math test are normally distributed, with a mean grade of 72 and a standard deviation of 9. What ratio of students scored more than 90 on the test?
A : 10%
B : 5%
C : 2.5%
D : 1.5%

Correct Answer : C

216 : Suppose that a particular statistical population can be described, at least roughly, by the normal curve. Which of the following can we use to estimate the percentages of all population values that lie within specified numbers of standard deviations from the mean?
A : Tchebysheff's Theorem
B : the Empirical Rule
C : the interquartile range
D : a box plot

Correct Answer : B

217 : The lengths of screws produced by a machine are normally distributed, with a mean of 3 cm and a standard deviation of 0.2 cm. What can we conclude from this?
A : Approximately 68% of all screws have lengths between 2.8 and 3.2 cm.
B : Approximately 95% of all screws have lengths between 2.8 and 3.2 cm.
C : Just about all screws have lengths between 2.8 and 3.2 cm.
D : Just about all screws have lengths between 2.9 and 3.1 cm.

Correct Answer : A

218 : According to Tchebysheff's Theorem, which of the following bounds will delimit the fraction of observations falling within k (where) standard deviations of the mean? $k \geq 1$

A : at most, $1 - (1/k)^2$
B : at least $(1 - 1/k)^2$
C : at most, $1 - (1/k^2)$
D : at least $1 - (1/k^2)$

Correct Answer : D

219 : The distribution of weight of adult beagles (dog species) is thought to be bell-shaped, with a mean of 5.5 kg and a standard deviation equal of 1 kg. Based on this information, between what two values could we expect 95% of adult beagles to weigh?
A : 4.5 and 6.5 kg

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B : 3.5 and 7.5 kg
C : 2.5 and 6.5 kg
D : 3.5 and 7.5 kg

Correct Answer : B

220 : Incomes of workers in an automobile company in Ontario are known to be right-skewed, with a mean equal to $36,200. Applying Tchebysheff's Theorem, at least 8/9 of all incomes are in the range of $29,600 to $42,800. What is the standard deviation of those incomes from that mean?
A : $2,200
B : $4,755
C : $6,500
D : $6,700

Correct Answer : A

221 : Which of the following randomly selected measurements, x, might be considered a potential outlier if it were to be selected from the given population?
A : $x = 0$ from a population with $\mu = 0$ and $\sigma = 2$
B : $x = -5$ from a population with $\mu = 1$ and $\sigma = 4$
C : $x = 7$ from a population with $\mu = 3$ and $\sigma = 2$
D : $x = 4$ from a population with $\mu = 0$ and $\sigma = 1$

Correct Answer : D

222 : Which of these values represents a lower quartile for the data set 23, 24, 21, and 20?
A : 20.25
B : 22.0
C : 22.5
D : 23.5

Correct Answer : A

223 : Which one of these values represents the upper quartile of the data set 10, 12, 16, 7, 9, 7, 41, and 14?
A : 7
B : 8
C : 15.5
D : 24

Correct Answer : C

224 : Expressed in percentiles, how is the interquartile range defined?
A : It is the difference between the 20% and 70% values.
B : It is the difference between the 20% and 80% values.
C : It is the difference between the 25% and 75% values.
D : It is the difference between the 45% and 95% values.

Correct Answer : C

225 : Scores on a chemistry exam were mound-shaped with a mean score of 90 and a standard deviation of 64. Scores on a statistics exam were also mound-shaped, with a mean score of 70

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and a standard deviation of 16. A student who took both exams achieved a grade of 102 on the chemistry exam and a grade of 77 on the statistics exam. Which of these may be inferred from the information given?
A : The student did relatively better on the chemistry exam than on the statistics exam, compared to the other students in each class.
B : The student did relatively better on the statistics exam than on the chemistry exam, compared to the other students in the two classes.
C : The student's scores on both exams are similar when accounting for the scores of the other students in the two classes.
D : Without more information it is impossible to say which of the student's exam scores indicates the better performance.

Correct Answer : B

226 : Which of the following summary measures is most affected by outliers?
A : the first quartile
B : the second quartile
C : the third quartile
D : the variance

Correct Answer : D

227 : What percentage of all observations in a data set lie between the 45th percentile and the third quartile?
A : 30%
B : 45%
C : 75%
D : 79%

Correct Answer : A

228 : Which of the following describes a graphical device that displays the highest and lowest values in a data set, as well as the upper quartile, the middle value, and the lower quartile?
A : a box plot
B : a five-number summary
C : a dotplot
D : a stem-and-leaf plot

Correct Answer : A

229 : Emily's score on her math test placed her at the 85th percentile. What does this mean?
A : Emily's score has a *z*-score of 0.15.
B : Emily was in the bottom 15% of the students who took the test.
C : Emily scored as high as or higher than 85% of the students who took the test.
D : Emily's score has a *z*-score of 0.85.

Correct Answer : C

230 : A sample of 50 values produced the following summary statistics: Q1 = 10, Q2 =14.6, Q3 = 16.7 and = 15.3. Based on this information, what are the left and right ends, respectively, of the box plot?$\overline{x}$

A : 5.3 and 32.0

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B : 10 and 14.6
C : 10 and 16.7
D : 14.6 and 16.7

Correct Answer : C

231 : A sample of 600 values produced the following summary statistics: Q1 = 35.6, Q2 = 54.2, Q3 = 62.4, and $\overline{x}$ = 56.8. Given this information, which of the following values constitutes the lower fence on a box plot?

A : –4.60
B : 26.80
C : 75.80
D : 102.60

Correct Answer : A

232 : A sample of 600 values produced the following summary statistics: Q1 = 35.6, Q2 =54.2, Q3 = 62.4 and $\overline{x}$ = 56.8. Given this information, which of the following values is the upper fence on a box plot of this data set?

A : –4.60
B : 26.80
C : 75.80
D : 102.60

Correct Answer : D

233 : If a data set has 15 values that have been sorted in ascending order, which value in the data set will be at the 25th percentile?
A : the fourth value
B : the third value
C : the second value
D : the first value

Correct Answer : A

234 : If the distribution of sales is thought to be symmetric with very little variation, then what may one conclude about the box plot that represents the data set?
A : The whiskers on a box plot the box should be about half as long as the box is wide.
B : The width of the box will be very wide but the whiskers will be very short.
C : The left and right edges will be approximately at equal distance from the second quartile.
D : The width of the box will be very short, but the whiskers will be very long.

Correct Answer : C

235 : The following summary statistics were computed from a sample of size 250: Q1 = 9, Q2 =13, Q3 = 15, and $\overline{x}$ = 10. Given this information, which of the following statements is correct?

A : A data value of 10 is an outlier.
B : A data value of 22 is an outlier.
C : A data value of 1 is an outlier.

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D : A data value of 25 is an outlier.

Correct Answer : D

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