***Business Analytics, 2e, GE* (Evans)**

**Chapter 6 Sampling and Estimation**

1) A \_\_\_\_\_\_\_\_ is a description of the approach that is used to obtain samples from a population prior to any data collection activity.

A) population frame

B) sampling weight

C) sampling plan

D) probability interval

Answer: C

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO1: Describe the elements of a sampling plan.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

2) Which of the following is true of judgment sampling?

A) It selects samples based on expert opinion.

B) It selects samples based on ease of data collection.

C) It selects samples based on random procedures.

D) It selects samples based on full representation of all subsets in a population.

Answer: A

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

3) Which of the following types of sampling involves using random procedures to select a sample?

A) judgment sampling

B) probabilistic sampling

C) subjective sampling

D) convenience sampling

Answer: B

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

4) \_\_\_\_\_\_\_\_ involves selecting items from a population so that every subset of a given size has an equal chance of being selected.

A) Convenience sampling

B) Subjective sampling

C) Judgment sampling

D) Simple random sampling

Answer: D

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

5) Which of the following sampling methods bases its selection of samples on the ease of data collection?

A) probabilistic sampling

B) judgment sampling

C) simple random sampling

D) convenience sampling

Answer: D

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

6) Which of the following describes periodic sampling?

A) It is a sampling method based solely on expert opinion.

B) It is a sampling method based on selecting a time and then sampling the products after that time.

C) It is a sampling method based on selecting every *n*th item from a population.

D) It is a sampling method exclusively used for population that is divided into subsets.

Answer: C

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

7) \_\_\_\_\_\_\_\_ sampling applies to populations that are divided into natural subsets and allocates the appropriate proportion of samples to each subset.

A) Systematic

B) Stratified

C) Cluster

D) Continuous process

Answer: B

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

8) \_\_\_\_\_\_\_\_ is based on dividing a population into subgroups, sampling a set of subgroups, and conducting a complete census within the subgroups sampled.

A) Cluster sampling

B) Continuous process sampling

C) Judgment sampling

D) Systematic sampling

Answer: A

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

9) In sampling, \_\_\_\_\_\_\_\_ involves assessing the value of an unknown population parameter–such as a population mean, population proportion, or population variance–using sample data.

A) distribution

B) randomization

C) estimation

D) substitution

Answer: C

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

10) From the standard deviation formula,, identify the estimator.

A) *s2*

B) *σ2*

C)

D) *s*

Answer: A

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

11) A(n) \_\_\_\_\_\_\_\_ is a single number derived from sample data that is used to estimate the value of a population parameter.

A) confidence interval

B) frequentist interference

C) interval estimate

D) point estimate

Answer: D

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

12) For which of the following is the value of the estimator said to be biased?

A) if the expected value of the estimator does not equal the population parameter

B) if the expected value of the estimator equals the population parameter

C) only if the expected value of the estimator is zero

D) only if the expected value of the estimator goes below zero

Answer: A

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

13) Which of the following is true of an unbiased estimator value?

A) The expected value will align perfectly with the population mean.

B) The expected value will not equal the population's parameters.

C) The expected value will not be greater than zero.

D) The expected value will equal the population's parameter.

Answer: D

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO1: Explain the importance of unbiased estimators.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

14) Which of the following accurately describes a sampling distribution of the mean?

A) It is the mean of any one sample from a group of related populations of different sizes.

B) It is the mean distribution of any one sample from a group of samples of varying sizes from a population.

C) It is the mean of half the samples from a related group of populations.

D) It is the distribution of the means of all possible samples of fixed size *n* from a population.

Answer: D

Diff: 1

Blooms: Remember

Topic: Sampling Distributions

LO1: Define the sampling distribution of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

15) Which of the following is the inherent reason why sampling errors occur?

A) because samples represent the whole population

B) because samples are only a subset of the population

C) because samples never provide enough data to estimate standard deviation

D) because the means cannot be accurately estimated using samples

Answer: B

Diff: 1

Blooms: Understand

Topic: Sampling Error

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

16) \_\_\_\_\_\_\_\_ are statistical errors that are due to the sample not representing the target population adequately.

A) Parallax errors

B) Sampling errors

C) Nonsampling errors

D) Quantization errors

Answer: C

Diff: 1

Blooms: Understand

Topic: Sampling Error

LO1: Describe the difference between sampling error and nonsampling error.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

17) The means of all possible samples of a fixed size *n* from some population will form a distribution which is known as the \_\_\_\_\_\_\_\_.

A) corollary of the mean

B) sampling distribution of the mean

C) standard error of the mean

D) point estimate

Answer: B

Diff: 1

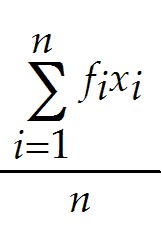
Blooms: Remember

Topic: Sampling Error

LO1: Define the sampling distribution of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

18) Which of the following is the equation for calculating the standard error of the mean?

A) 

B)

C)

D)

Answer: D

Diff: 1

Blooms: Remember

Topic: Sampling Error

LO1: Calculate the standard error of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

19) Which of the following is implied from the standard error of the mean formula?

A) that true means of populations can be found easier than those of samples

B) that standard deviation increases with increase in sample size

C) that larger sample sizes provide greater accuracy in estimating the true population mean

D) that the true mean of the population can only be calculated using smaller sample sizes

Answer: C

Diff: 1

Blooms: Remember

Topic: Sampling Error

LO1: Calculate the standard error of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

20) The Ransin Sports Company has noted that the size of individual customer orders is normally distributed with a mean of $112 and a standard deviation of $9. Which of the following is the answer for the probability that the next individual who buys a product will make a purchase of more than $116?

A) 71%

B) 48%

C) 33%

D) 42%

Answer: C

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Sampling Distributions

LO1: Define the sampling distribution of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

21) The Ransin Sports Company has noted that the size of individual customer orders is normally distributed with a mean of $112 and a standard deviation of $9. If a soccer team of 11 players were to make the next batch of orders, what would be the standard error of the mean?

A) 1.64

B) 2.71

C) 3.67

D) 0.82

Answer: B

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Sampling Distributions

LO1: Define the sampling distribution of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

22) The Ransin Sports Company has noted that the size of individual customer orders is normally distributed with a mean of $112 and a standard deviation of $9. If a soccer team of 11 players were to make the next batch of orders, what is the probability that the mean purchase would exceed $116?

A) 11%

B) 3%

C) 33%

D) 7%

Answer: D

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Sampling Distributions

LO1: Define the sampling distribution of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

23) \_\_\_\_\_\_\_\_ states that if the sample size is large enough, the sampling distribution of the mean is approximately normally distributed, regardless of the distribution of the population and that the mean of the sampling distribution will be the same as that of the population.

A) Chebyshev's theorem

B) Central limit theorem

C) Prime number theorem

D) Oppermann's conjecture

Answer: B

Diff: 1

Blooms: Remember

Topic: Sampling Distributions

LO1: Explain the practical importance of the central limit theorem.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

24) The central limit theorem states that if the population is normally distributed, then the \_\_\_\_\_\_\_\_.

A) mean of the population can be calculated without using samples

B) standard error of the mean will not vary from the population mean

C) sampling distribution of the mean will vary from sample to sample

D) sampling distribution of the mean will also be normal for any sample size

Answer: D

Diff: 1

Blooms: Understand

Topic: Sampling Distributions

LO1: Explain the practical importance of the central limit theorem.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

25) Which of the following is a difference between interval estimates and point estimates?

A) Point estimates cannot be used to calculate statistical error, while interval estimate is used to calculate statistical error.

B) Point estimates provide only a single value for a sample, while interval estimates provide a range of values.

C) Point estimates indicate the magnitude of potential error in the estimate, while interval estimates don't.

D) Point estimates on an average provide more information than interval estimates.

Answer: B

Diff: 2

Blooms: Understand

Topic: Interval Estimates

LO1: Explain how an interval estimate differs from a point estimate.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

26) A \_\_\_\_\_\_\_\_ is a range of values between which the value of the population parameter is believed to be, along with a probability that the interval correctly estimates the true population parameter.

A) point estimate

B) frequentist interference

C) confidence interval

D) fiducial inference

Answer: C

Diff: 1

Blooms: Remember

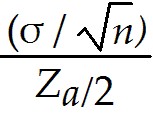
Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

27) A *100(1-α)%* confidence interval for the population mean *μ* based on a sample of size *n* with a sample meanand a known population standard deviation σ is given by \_\_\_\_\_\_\_\_.

A)  ± *za/*2(*n-*1)(*)*

B) 

C) *x*1 - / (σ / )

D) ± *za/*2(σ / )

Answer: D

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

28) For the formula for calculating the confidence level with known standard deviation, the value \_\_\_\_\_\_\_\_ represents the value of a standard normal random variable with a cumulative probability of1 - *α* / 2.

A) σ /

B) *za*/2

C) 

D) *xi* - 

Answer: B

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

29) The \_\_\_\_\_\_\_\_ is a family of probability distributions with a shape similar to the standard normal distribution.

A) log-normal distribution

B) Gaussian *q*-distribution

C) frequentist interference

D) *t*-distribution

Answer: D

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

30) Which of the following is a difference between the *t*-distribution and the standard normal distribution?

A) The *t*-distribution cannot be calculated without a known standard deviation, while the standard normal distributions can be.

B) The standard normal distribution's confidence levels are wider than those of the *t*-distribution.

C) The *t*-distribution has a larger variance than the standard normal distribution.

D) The standard normal distribution is dependent on parameters like degrees of freedom, while *t*-distribution is not.

Answer: C

Diff: 2

Blooms: Understand

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

31) Which of the following is true of the *t*-distribution?

A) It has narrower confidence intervals than the standard normal distribution.

B) It is only used to calculate confidence intervals where there is no known population standard deviation.

C) It converges to the standard normal distribution as degrees of freedom increase.

D) It does not require parameters such as degrees of freedom.

Answer: C

Diff: 2

Blooms: Understand

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

32) Which of the following is true of calculating confidence intervals for larger samples?

A) For larger samples, the *t*-distribution is indistinguishable from the standard normal distribution.

B) For larger samples, both the *t*-distribution and the standard normal distribution require standard deviation values to be calculated.

C) For larger samples, the degrees of freedom cannot be calculated accurately.

D) For larger samples, only *z*-values provide a true sampling distribution of the mean.

Answer: A

Diff: 2

Blooms: Understand

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

33) Which of the following types of distributions use *z*-values to establish confidence intervals?

A) Gaussian *q*-distribution

B) *t*-distribution

C) log-normal distribution

D) standard normal distribution

Answer: D

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

Use the table below to answer the following question(s).

The historical data of Velvetta Inc., a healthcare products manufacturer, have shown that in a production process for filling bottles of shampoo, variance in the volume is constant; however, clogs in the filling machine often affect the meanvolume. The historical standard deviation is 5 milliliters. In filling 250-milliliter bottles, a sample of 20 found ameanvolume of 242 milliliters.

|  |  |
| --- | --- |
| **Velvetta Inc. Shampoo**  **Production** |  |
| **Alpha Value** | 0.05 |
| **Standard Deviation** | 5 |
| **Sample Size** | 20 |
| **Sample Mean** | 242 |

34) Based on the data in the table above, calculate the margin of error at 95% confidence interval.

A) 1.84

B) 2.19

C) 2.51

D) 1.96

Answer: B

Diff: 1

Blooms: Apply

AACSB: Analytic Skills

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

35) From the table above, calculate the value at a 95% confidence interval.

A) 1.64

B) 1.84

C) 1.96

D) 2.19

Answer: C

Diff: 1

Blooms: Apply

AACSB: Analytic Skills

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

36) From the table above, determine the cumulative probability for *z* at a 95% confidence level.

A) 0.975

B) 0.950

C) 1

D) 0.987

Answer: A

Diff: 1

Blooms: Apply

AACSB: Analytic Skills

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

37) From the table above, calculate the lower confidence interval estimate at a confidence level of 95%

A) 239.49

B) 240.16

C) 239.81

D) 240.04

Answer: C

Diff: 1

Blooms: Apply

AACSB: Analytic Skills

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

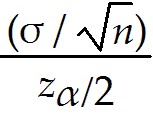
LO2: Discuss the applications of confidence interval estimation

38) The formula for a *100(1 - α)%* confidence interval for the mean μ when the population standard deviation is unknown is \_\_\_\_\_\_\_\_.

A) *xi* - /(σ / )

B) ±*tα*/2*n-*1(*s /* )

C) ±*zα*/2(*σ/* )

D) 

Answer: B

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Calculate confidence intervals for population means and proportions using the formulas in the chapter and the appropriate Excel functions.

LO2: Discuss the applications of confidence interval estimation

39) In which of the following cases is a proportion of the observations of a sample used in estimating the confidence interval?

A) when the degrees of freedom are too large

B) when a true sampling distribution cannot be estimated

C) when the population standard deviation is known

D) when variables have only two possible outcomes

Answer: D

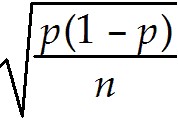
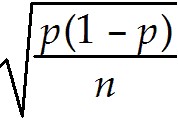
Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Use confidence intervals to draw conclusions about population parameters.

LO2: Discuss the applications of confidence interval estimation

40) In the equation for calculating a confidence interval for a proportion, *p±za*/*2*, what does represent?

A) the mean for the sampling distribution of the proportion

B) the degree of freedom for the sampling distribution of the proportion

C) the standard error for the sampling distribution of the proportion

D) the estimator for sampling distribution of the proportion

Answer: C

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Use confidence intervals to draw conclusions about population parameters.

LO2: Discuss the applications of confidence interval estimation

41) A \_\_\_\_\_\_\_\_ is one that provides a range for anticipating the value of a new observation from the same population.

A) prediction interval

B) confidence interval

C) *t*-distribution

D) standard normal distribution

Answer: A

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Compute a prediction interval and explain how it differs from a confidence interval.

LO2: Discuss the applications of confidence interval estimation

42) Which of the following is true of prediction intervals?

A) It provides estimates for variables that can have only two possible outcomes.

B) It is associated with the distribution of a random variable.

C) It provides an interval estimate of a population parameter.

D) It is associated with the sampling distribution of a statistic.

Answer: B

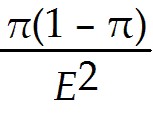
Diff: 2

Blooms: Understand

Topic: Prediction Intervals

LO1: Compute a prediction interval and explain how it differs from a confidence interval.

LO2: Discuss the applications of confidence interval estimation

43) Which of the following is true of the equation [*n ≥*(*zα*/2)2] for computing the sample size required to achieve a desired confidence interval half-width for a proportion?

A) The sample size calculated will only be an approximation.

B) The standard deviation need not be calculated first in order to compute the sample size.

C) The value for π is always set at 1.

D) The most conservative estimate for π is 0.5.

Answer: D

Diff: 1

Blooms: Understand

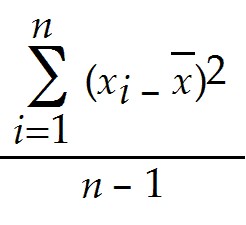
Topic: Prediction Intervals

LO1: Compute sample sizes needed to ensure a confidence interval for means and proportions with a specified margin of error.

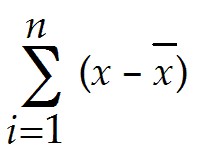
LO2: Discuss the applications of confidence interval estimation

44) The table below shows the weights of female individuals in Catherine's family. Calculate the sample variance in the weights, and the standard deviation.

|  |
| --- |
| **Weights of female individuals in Catherine's family (in lbs)** |
| 163 |
| 160 |
| 155 |
| 161 |
| 158 |
| 155 |
| 149 |
| 151 |
| 158 |
| 171 |

Answer: Sample variance is calculated by the formula, *s*2 = … (1)

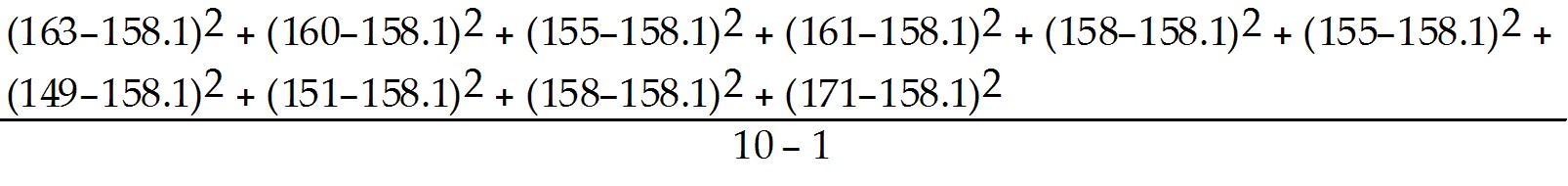
Where, *n* = number of samples

is the sum of individual samples minus the sample mean.

N= 10,

= (163+160+155+161+158+155+149+151+158+171) / 10 = 158.1

Therefore substituting the values in equation (1), and by simplifying the values, we get,



=24.01+3.61+9.61+8.41+.01+9.61+82.81+50.41+.01+166.41 / 9

=354.9 / 9

=39.43.

Therefore, total variance is 39.43.

Standard deviation is the positive square root of variance.

Therefore, standard deviation =  = 6.28.

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

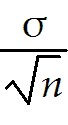
Topic: Estimating Population Parameters

LO1: Explain how the average, standard deviation, and distribution of means of samples changes as the sample size increases.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

45) The table below shows the number of goals scored by the Huntington Soccer Club in their league for the past 12 years. Calculate the standard error of the mean of the data given that the variance of the data is 50.45

|  |  |
| --- | --- |
| **Goals Scored by the Huntington Soccer Club for the past 12 years** |  |
| **Year 1** | 45 |
| **Year 2** | 51 |
| **Year 3** | 33 |
| **Year 4** | 40 |
| **Year 5** | 30 |
| **Year 6** | 38 |
| **Year 7** | 49 |
| **Year 8** | 52 |
| **Year 9** | 46 |
| **Year 10** | 43 |
| **Year 11** | 40 |
| **Year 12** | 50 |

Answer: Standard error of the mean is calculated by the formula …(1), where is the standard deviation of the data, and *n* is the number of samples.

Standard deviation is the positive square root of variance, and since we have the variance value as 50.45, the standard deviation is =7.10

n = 12…(2)

σ =7.10…(3)

Substituting (2) and (3) in (1), we get 7.10 /  = 2.05

Therefore the standard error of the mean = 2.05

Diff: 2

Blooms: Apply

AACSB: Analytic Skills

Topic: Sampling Distributions

LO1: Calculate the standard error of the mean.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

46) Convenience sampling is an example of a probabilistic sampling method.

Answer: FALSE

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO2: Explain systematic, stratified, and cluster sampling, and sampling from a continuous process.

47) Estimators are the measures used to estimate population parameters.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Estimating Population Parameters

LO2: Explain systematic, stratified, and cluster sampling, and sampling from a continuous process.

48) Point estimates do not provide any indication of the magnitude of the potential error in the estimate.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Estimating Population Parameters

LO2: Explain systematic, stratified, and cluster sampling, and sampling from a continuous process.

49) The simple random sampling method is the only statistical sampling method that does not include sampling errors.

Answer: FALSE

Diff: 1

Blooms: Remember

Topic: Sampling Error

LO1: Describe the difference between sampling error and nonsampling error.

LO2: Explain systematic, stratified, and cluster sampling, and sampling from a continuous process.

50) A confidence interval is a range of values between which the value of the population parameter is believed to be.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

51) As the number of degrees of freedom increases, the *t*-distribution converges to the standard normal distribution.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

52) For any sample of fixed size n, the true standard deviation of the sampling distribution of the mean is the standard deviation of the population.

Answer: FALSE

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

53) A confidence interval is associated with the sampling distribution of a statistic.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Prediction Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

54) As the sample size increases, the width of the confidence interval decreases.

Answer: TRUE

Diff: 1

Blooms: Remember

Topic: Confidence Intervals and Sample Size

LO1: Explain how confidence intervals change as the level of confidence increases or decreases.

LO2: Discuss the applications of confidence interval estimation

55) Explain selecting a sample using the continuous process sampling methods.

Answer: Selecting a sample from a continuous manufacturing process can be accomplished in two main ways. First, select a time at random; then select the next *n* items produced after that time. Second, select *n* times at random; then select the next item produced after each of these times. The first approach generally ensures that the observations will come from a homogeneous population; however, the second approach might include items from different populations if the characteristics of the process should change over time.

Diff: 1

Blooms: Remember

Topic: Statistical Sampling

LO1: Explain systematic, stratified, and cluster sampling, and sampling from a continuous process.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

56) Give an account of biased and unbiased estimators in sampling methods.

Answer: Statisticians develop many types of estimators, and from a theoretical as well as a practical perspective, it is important that they "truly estimate" the population parameters they are supposed to estimate. Suppose that we perform an experiment in which we repeatedly sampled from a population and computed a point estimate for a population parameter. Each individual point estimate will vary from the population parameter; however, we would hope that the long-term average (expected value) of all possible point estimates would equal the population parameter. If the expected value of an estimator equals the population parameter it is intended to estimate, the estimator is said to be unbiased. If this is not true, the estimator is called biased and will not provide correct results.

Diff: 1

Blooms: Remember

Topic: Estimating Population Parameters

LO1: Explain the importance of unbiased estimators.

LO2: Explain the fundamentals of sampling methods, experiment designs, and sampling distributions

57) What is a confidence interval in sampling?

Answer: Confidence interval estimates provide a way of assessing the accuracy of a point estimate. A confidence interval is a range of values between which the value of the population parameter is believed to be, along with a probability that the interval correctly estimates the true (unknown) population parameter. This probability is called the level of confidence, denoted by1 -α, where α is a number between 0 and 1. The level of confidence is usually expressed as a percent; common values are 90%, 95%, or 99%.

Diff: 1

Blooms: Remember

Topic: Confidence Intervals

LO1: Define and give examples of confidence intervals.

LO2: Discuss the applications of confidence interval estimation

58) Compare between the *t*-distribution and the standard normal distribution.

Answer: The *t*-distribution is actually a family of probability distributions with a shape similar to the standard normal distribution. Different *t*-distributions are distinguished by an additional parameter, degrees of freedom (*df*). The *t*-distribution has a larger variance than the standard normal, thus making confidence intervals wider than those obtained from the standard normal distribution, in essence correcting for the uncertainty about the true standard deviation, which is not known. As the number of degrees of freedom increases, the *t*-distribution converges to the standard normal distribution. When sample sizes get to be as large as 120, the distributions are virtually identical; even for sample sizes as low as 30 to 35, it becomes difficult to distinguish between the two. Thus, for large sample sizes, many people use *z*-values to establish confidence intervals even when the standard deviation is unknown.

Diff: 2

Blooms: Remember

Topic: Confidence Intervals

LO1: Describe the difference between the t-distribution and the normal distribution.

LO2: Discuss the applications of confidence interval estimation

59) Compare between a prediction interval and a confidence interval.

Answer: A prediction interval is one that provides a range for predicting the value of a new observation from the same population. This is different from a confidence interval, which provides an interval estimate of a population parameter, such as the mean or proportion. A confidence interval is associated with the sampling distribution of a statistic, but a prediction interval is associated with the distribution of the random variable itself.

Diff: 2

Blooms: Remember

Topic: Prediction Intervals

LO1: Compute a prediction interval and explain how it differs from a confidence interval.

LO2: Discuss the applications of confidence interval estimation