CHAPTER 8: CONFIDENCE INTERVAL ESTIMATION

1. True or False: A point estimate consists of a single sample statistic that is used to estimate the true population parameter.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: point estimate

2. True or False: The sample mean is a point estimate of the population mean.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: point estimate, mean

3. The head librarian at the Library of Congress has asked her assistant for an interval estimate of the mean number of books checked out each day. The assistant provides the following interval estimate: from 740 to 920 books per day. What is an efficient, unbiased point estimate of the number of books checked out each day at the Library of Congress?
   a) 740
   b) 830
   c) 920
   d) 1,660

   ANSWER:
   b
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: point estimate, mean

4. Private colleges and universities rely on money contributed by individuals and corporations for their operating expenses. Much of this money is put into a fund called an endowment, and the college spends only the interest earned by the fund. A recent survey of 8 private colleges in the United States revealed the following endowments (in millions of dollars): 60.2, 47.0, 235.1, 490.0, 122.6, 177.5, 95.4, and 220.0. What value will be used as the point estimate for the mean endowment of all private colleges in the United States?
   a) $1,447.8
   b) $180.975
   c) $143.042
   d) $8

   ANSWER:
   b
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: point estimate, mean

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5. True or False: A population parameter is used to estimate a confidence interval.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: point estimate, confidence interval

6. True or False: For a given data set, the confidence interval will be wider for 95% confidence than for 90% confidence.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: width, confidence interval, properties

7. True or False: Holding the sample size fixed, increasing the level of confidence in a confidence interval will necessarily lead to a wider confidence interval.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: trade-off, confidence interval, properties, width

8. True or False: Holding the level of confidence fixed, increasing the sample size will lead to a wider confidence interval.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: trade-off, confidence interval, properties, width

9. True or False: Holding the width of a confidence interval fixed, increasing the level of confidence can be achieved with a lower sample size.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: trade-off, confidence interval, properties, width
10. Suppose a 95% confidence interval for $\mu$ turns out to be (1,000, 2,100). To make more useful inferences from the data, it is desired to reduce the width of the confidence interval. Which of the following will result in a reduced interval width?
   a) Increase the sample size.
   b) Increase the confidence level.
   c) Increase the population mean.
   d) Increase the sample mean.

ANSWER:
   a
TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: width, confidence interval, properties

11. Suppose a 95% confidence interval for $\mu$ has been constructed. If it is decided to take a larger sample and to decrease the confidence level of the interval, then the resulting interval width would ____________. (Assume that the sample statistics gathered would not change very much for the new sample.)
   a) be larger than the current interval width
   b) be narrower than the current interval width
   c) be the same as the current interval width
   d) be unknown until actual sample sizes and reliability levels were determined

ANSWER:
   b
TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: width, confidence interval, properties

12. In the construction of confidence intervals, if all other quantities are unchanged, an increase in the sample size will lead to a ____________ interval.
   a) narrower
   b) wider
   c) less significant
   d) biased

ANSWER:
   a
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: width, confidence interval, properties

13. True or False: Other things being equal, as the confidence level for a confidence interval increases, the width of the interval increases.

ANSWER:
   True
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: trade-off, confidence interval, properties
14. True or False: The confidence interval obtained will always correctly estimate the population parameter.

   ANSWER:
   False
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: confidence interval, interpretation

15. True or False: Other things being equal, the confidence interval for the mean will be wider for 95% confidence than for 90% confidence.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: confidence interval, properties, width

16. True or False: The difference between the upper limit of a confidence interval and the point estimate used in constructing the confidence interval is called the sampling error.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: sampling error

17. True or False: The difference between the lower limit of a confidence interval and the point estimate used in constructing the confidence interval is called the sampling error.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: sampling error

18. True or False: Sampling error equals half the width of a confidence interval.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: sampling error

19. True or False: The width of a confidence interval equals twice the sampling error.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: sampling error
20. True or False: The sampling error can either be positive or negative.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Difficult
   KEYWORDS: sampling error

21. True or False: The difference between the sample mean and the population mean is called the sampling error.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Difficult
   KEYWORDS: sampling error

22. True or False: The difference between the sample proportion and the population proportion is called the sampling error.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Moderate
   KEYWORDS: sampling error

23. True or False: The difference between the sample size and the population size is called the sampling error.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: sampling error

24. True or False: The confidence interval estimate of the population mean is constructed around the sample mean.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean
25. A 99% confidence interval estimate can be interpreted to mean that
   a) if all possible samples of size \( n \) are taken and confidence interval estimates are
devolved, 99% of them would include the true population mean somewhere
within their interval.
   b) we have 99% confidence that we have selected a sample whose interval does
include the population mean.
   c) Both of the above.
   d) None of the above.

   ANSWER: c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: interpretation, confidence interval

26. An economist is interested in studying the incomes of consumers in a particular country. The
population standard deviation is known to be $1,000. A random sample of 50 individuals
resulted in a mean income of $15,000. What is the upper end point in a 99% confidence
interval for the average income?
   a) $15,052
   b) $15,141
   c) $15,330
   d) $15,364

   ANSWER: d
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, standardized normal distribution

27. An economist is interested in studying the incomes of consumers in a particular country. The
population standard deviation is known to be $1,000. A random sample of 50 individuals
resulted in a mean income of $15,000. What is the width of the 90% confidence interval?
   a) $232.60
   b) $364.30
   c) $465.23
   d) $728.60

   ANSWER: c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: width, confidence interval, mean, standardized normal distribution

28. True or False: Given a sample mean of 2.1 and a population standard deviation of 0.7 from a
sample of 10 data points, a 90% confidence interval will have a width of 2.36.

   ANSWER: False
   TYPE: TF  DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, standardized normal distribution
29. True or False: A sample size of 5 provides a sample mean of 9.6. If the population variance is known to be 5 and the population distribution is assumed to be normal, the lower limit for a 90% confidence interval is 7.96.

ANSWER:
True
TYPE: TF  DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean, standardized normal distribution

30. The t distribution approaches the standardized normal distribution when the number of degrees of freedom increases.

ANSWER:
True
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: t distribution, standardized normal distribution, degrees of freedom

31. True or False: The t distribution is used to develop a confidence interval estimate of the population mean when the population standard deviation is unknown.

ANSWER:
True
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, t distribution

32. True or False: For a t distribution with 12 degrees of freedom, the area between – 2.6810 and 2.1788 is 0.980.

ANSWER:
False
TYPE: TF  DIFFICULTY: Moderate
KEYWORDS: t distribution, degrees of freedom

33. If you were constructing a 99% confidence interval of the population mean based on a sample of n=25 where the standard deviation of the sample $S = 0.05$, the critical value of $t$ will be

   a) 2.7969  
   b) 2.7874  
   c) 2.4922  
   d) 2.4851

ANSWER:
a
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: critical value, t distribution
34. Which of the following is not true about the Student’s $t$ distribution?
   a) It has more area in the tails and less in the center than does the normal distribution.
   b) It is used to construct confidence intervals for the population mean when the population standard deviation is known.
   c) It is bell shaped and symmetrical.
   d) As the number of degrees of freedom increases, the $t$ distribution approaches the normal distribution.

   ANSWER: b
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: $t$ distribution, properties

35. True or False: The $t$ distribution is used to construct confidence intervals for the population mean when the population standard deviation is unknown.

   ANSWER: True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, standard deviation unknown

36. The $t$ distribution
   a) assumes the population is normally distributed.
   b) approaches the normal distribution as the sample size increases.
   c) has more area in the tails than does the normal distribution.
   d) All of the above.

   ANSWER: d
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: $t$ distribution, properties

37. It is desired to estimate the mean total compensation of CEOs in the Service industry. Data were randomly collected from 18 CEOs and the 95% confidence interval was calculated to be ($2,181,260, $5,836,180). Which of the following interpretations is correct?
   a) 95% of the sampled total compensation values fell between $2,181,260 and $5,836,180.
   b) We are 95% confident that the mean of the sampled CEOs falls in the interval $2,181,260 to $5,836,180.
   c) In the population of Service industry CEOs, 95% of them will have total compensations that fall in the interval $2,181,260 to $5,836,180.
   d) We are 95% confident that the mean total compensation of all CEOs in the Service industry falls in the interval $2,181,260 to $5,836,180.

   ANSWER: d
   TYPE: MC  DIFFICULTY: Difficult
   KEYWORDS: confidence interval, mean, interpretation
38. It is desired to estimate the mean total compensation of CEOs in the Service industry. Data were randomly collected from 18 CEOs and the 95% confidence interval was calculated to be ($2,181,260, $5,836,180). Based on the interval above, do you believe the mean total compensation of CEOs in the Service industry is more than $3,000,000?
   a) Yes, and I am 95% confident of it.
   b) Yes, and I am 78% confident of it.
   c) I am 95% confident that the mean compensation is $3,000,000.
   d) I cannot conclude that the mean exceeds $3,000,000 at the 95% confidence level.

ANSWER: d
TYPE: MC  DIFFICULTY: Difficult
KEYWORDS: confidence interval, mean, interpretation

39. Suppose a 95% confidence interval for $\mu$ turns out to be (1,000, 2,100). Give a definition of what it means to be “95% confident” as an inference.
   a) In repeated sampling, the population parameter would fall in the given interval 95% of the time.
   b) In repeated sampling, 95% of the intervals constructed would contain the population mean.
   c) 95% of the observations in the entire population fall in the given interval.
   d) 95% of the observations in the sample fall in the given interval.

ANSWER: b
TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean, interpretation

40. A major department store chain is interested in estimating the mean amount its credit card customers spent on their first visit to the chain’s new store in the mall. Fifteen credit card accounts were randomly sampled and analyzed with the following results: $\bar{X} = $50.50 and $S = 20$. Assuming the distribution of the amount spent on their first visit is normal, what is the shape of the sampling distribution of the sample mean that will be used to create the desired confidence interval for $\mu$?
   a) Approximately normal with a mean of $50.50
   b) A standard normal distribution
   c) A $t$ distribution with 15 degrees of freedom
   d) A $t$ distribution with 14 degrees of freedom

ANSWER: d
TYPE: MC  DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, $t$ distribution, degrees of freedom

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41. A major department store chain is interested in estimating the mean amount its credit card customers spent on their first visit to the chain’s new store in the mall. Fifteen credit card accounts were randomly sampled and analyzed with the following results: $X = 50.50$ and $S = 20$. Construct a 95% confidence interval for the mean amount its credit card customers spent on their first visit to the chain’s new store in the mall assuming that the amount spent follows a normal distribution.

- a) $50.50 \pm 9.09$
- b) $50.50 \pm 10.12$
- c) $50.50 \pm 11.00$
- d) $50.50 \pm 11.08$

**ANSWER:**

d
**TYPE:** MC  **DIFFICULTY:** Easy  
**KEYWORDS:** confidence interval, mean, $t$ distribution

42. Private colleges and universities rely on money contributed by individuals and corporations for their operating expenses. Much of this money is put into a fund called an endowment, and the college spends only the interest earned by the fund. A recent survey of 8 private colleges in the United States revealed the following endowments (in millions of dollars): 60.2, 47.0, 235.1, 490.0, 122.6, 177.5, 95.4, and 220.0. Summary statistics yield $X = 180.975$ and $S = 143.042$. Calculate a 95% confidence interval for the mean endowment of all the private colleges in the United States assuming a normal distribution for the endowments.

- a) $180.975 \pm 94.066$
- b) $180.975 \pm 99.123$
- c) $180.975 \pm 116.621$
- d) $180.975 \pm 119.586$

**ANSWER:**

d  
**TYPE:** MC  **DIFFICULTY:** Moderate  
**KEYWORDS:** confidence interval, mean, $t$ distribution

Note: The value of the sample mean is the correct answer for the previous question.

43. As an aid to the establishment of personnel requirements, the director of a hospital wishes to estimate the mean number of people who are admitted to the emergency room during a 24-hour period. The director randomly selects 64 different 24-hour periods and determines the number of admissions for each. For this sample, $X = 396$ and $S = 100$. Which of the following assumptions is necessary in order for a confidence interval to be valid?

- a) The population sampled from has an approximate normal distribution.
- b) The population sampled from has an approximate $t$ distribution.
- c) The mean of the sample equals the mean of the population.
- d) None of these assumptions are necessary.

**ANSWER:**

d  
**TYPE:** MC  **DIFFICULTY:** Moderate  
**KEYWORDS:** confidence interval, mean, $t$ distribution
44. As an aid to the establishment of personnel requirements, the director of a hospital wishes to estimate the mean number of people who are admitted to the emergency room during a 24-hour period. The director randomly selects 64 different 24-hour periods and determines the number of admissions for each. For this sample, $\bar{X} = 396$ and $S = 100$. Estimate the mean number of admissions per 24-hour period with a 95% confidence interval.

**ANSWER:**

$396 \pm 24.9793$ or $371.0207 \leq \mu \leq 420.9793$

**TYPE:** PR  **DIFFICULTY:** Moderate  **KEYWORDS:** confidence interval, mean, $t$ distribution

45. True or False: In estimating the population mean with the population standard deviation unknown, if the sample size is 12, there will be 6 degrees of freedom.

**ANSWER:**

False  
**TYPE:** TF  **DIFFICULTY:** Easy  **KEYWORDS:** confidence interval, mean, $t$ distribution, degrees of freedom

46. True or False: A race car driver tested his car for time from 0 to 60 mph, and for 20 tests obtained a mean of 4.85 seconds with a standard deviation of 1.47 seconds. A 95% confidence interval for the 0 to 60 mean time is 4.52 seconds to 5.18 seconds.

**ANSWER:**

False  
**TYPE:** TF  **DIFFICULTY:** Moderate  **KEYWORDS:** confidence interval, mean, $t$ distribution

47. True or False: Given a sample mean of 2.1 and a sample standard deviation of 0.7 from a sample of 10 data points, a 90% confidence interval will have a width of 2.36.

**ANSWER:**

False  
**TYPE:** TF  **DIFFICULTY:** Moderate  **KEYWORDS:** confidence interval, mean, $t$ distribution

48. True or False: A random sample of 50 provides a sample mean of 31 with a standard deviation of $S = 14$. The upper bound of a 90% confidence interval estimate of the population mean is 34.32.

**ANSWER:**

True  
**TYPE:** TF  **DIFFICULTY:** Moderate  **KEYWORDS:** confidence interval, mean, $t$ distribution
49. True or False: In forming a 90% confidence interval for a population mean from a sample size of 22, the number of degrees of freedom from the \( t \) distribution equals 22.

ANSWER:
False
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, \( t \) distribution, degrees of freedom

50. True or False: The \( t \) distribution allows the calculation of confidence intervals for means when the actual standard deviation is not known.

ANSWER:
True
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, \( t \) distribution

51. True or False: The \( t \) distribution allows the calculation of confidence intervals for means for small samples when the population variance is not known, regardless of the shape of the distribution in the population.

ANSWER:
False
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, \( t \) distribution

52. A university dean is interested in determining the proportion of students who receive some sort of financial aid. Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid. Use a 90% confidence interval to estimate the true proportion of students who receive financial aid.

ANSWER:

\[ 0.59 \pm 0.057 \text{ or } 0.533 \leq \pi \leq 0.647 \]

TYPE: PR  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion
53. A university dean is interested in determining the proportion of students who receive some sort of financial aid. Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid. The 95% confidence interval for $\pi$ is $0.59 \pm 0.07$. Interpret this interval.
   a) We are 95% confident that the true proportion of all students receiving financial aid is between 0.52 and 0.66.
   b) 95% of the students get between 52% and 66% of their tuition paid for by financial aid.
   c) We are 95% confident that between 52% and 66% of the sampled students receive some sort of financial aid.
   d) We are 95% confident that 59% of the students are on some sort of financial aid.

ANSWER:

a

TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation

54. The county clerk wants to estimate the proportion of voters who will need special election facilities. The clerk wants to construct a 95% confidence interval for the population proportion which extends at most 0.07 to either side of the sample proportion. How large a sample must be taken to assure these conditions are met?

ANSWER:

196

TYPE: PR  DIFFICULTY: Easy
KEYWORDS: sample size determination, proportion

55. The county clerk wants to estimate the proportion of voters who will need special election facilities. Suppose a sample of 400 voters was taken. If 150 need special election facilities, calculate an 90% confidence interval for the population proportion.

ANSWER:

0.3352 to 0.4148

TYPE: PR  DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion

56. A quality control engineer is interested in estimating the proportion of defective items coming off a production line. In a sample of 300 items, 27 are defective. A 90% confidence interval for the proportion of defectives from this production line would go from

_______ to ________.

ANSWER:

0.063 to 0.117

TYPE: FI  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion
57. A prison official wants to estimate the proportion of cases of recidivism. Examining the records of 250 convicts, the official determines that there are 65 cases of recidivism. A confidence interval will be obtained for the proportion of cases of recidivism. Part of this calculation includes the estimated standard error of the sample proportion. For this sample, the estimated standard error is __________.

ANSWER: 
0.028
TYPE: FI DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion

58. A prison official wants to estimate the proportion of cases of recidivism. Examining the records of 250 convicts, the official determines that there are 65 cases of recidivism. A 99% confidence interval for the proportion of cases of recidivism would go from __________ to __________.

ANSWER: 
0.189 to 0.331
TYPE: FI DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion

59. True or False: A sample of 100 fuses from a very large shipment is found to have 10 that are defective. The 95% confidence interval would indicate that, for this shipment, the proportion of defective fuses is between 0 and 0.28.

ANSWER: 
False
TYPE: TF DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion

60. True or False: The confidence interval estimate of the population proportion is constructed around the sample proportion.

ANSWER: 
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion

61. True or False: The t distribution is used to develop a confidence interval estimate of the population proportion when the population standard deviation is unknown.

ANSWER: 
False
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, t distribution
62. True or False: The standardized normal distribution is used to develop a confidence interval estimate of the population proportion regardless of whether the population standard deviation is known.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, standardized normal distribution

63. True or False: The standardized normal distribution is used to develop a confidence interval estimate of the population proportion when the sample size is sufficiently large.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, standardized normal distribution

64. True or False: The width of a confidence interval estimate for a proportion will be
   a) narrower for 99% confidence than for 95% confidence.
   b) wider for a sample size of 100 than for a sample size of 50.
   c) narrower for 90% confidence than for 95% confidence.
   d) narrower when the sample proportion is 0.50 than when the sample proportion is 0.20.

ANSWER:
c
TYPE: MC DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, properties, width

65. When determining the sample size for a proportion for a given level of confidence and sampling error, the closer to 0.50 that \( \pi \) is estimated to be, the sample size required
   a) is smaller
   b) is larger
   c) is not affected
   d) can be smaller, larger or unaffected

ANSWER:
b
TYPE: MC DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, properties
66. A confidence interval was used to estimate the proportion of statistics students who are females. A random sample of 72 statistics students generated the following 90% confidence interval: (0.438, 0.642). Based on the interval above, is the population proportion of females equal to 0.60?
   a) No, and we are 90% sure of it.
   b) No. The proportion is 54.17%.
   c) Maybe. 0.60 is a believable value of the population proportion based on the information above.
   d) Yes, and we are 90% sure of it.

   ANSWER: 
c
   TYPE: MC  DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, testing

67. When determining the sample size necessary for estimating the true population mean, which factor is not considered when sampling with replacement?
   a) The population size.
   b) The population standard deviation.
   c) The level of confidence desired in the estimate.
   d) The allowable or tolerable sampling error.

   ANSWER: 
a
   TYPE: MC  DIFFICULTY: Easy
   KEYWORDS: sample size determination, mean

68. The head librarian at the Library of Congress has asked her assistant for an interval estimate of the mean number of books checked out each day. The assistant provides the following interval estimate: from 740 to 920 books per day. If the head librarian knows that the population standard deviation is 150 books checked out per day, approximately how large a sample did her assistant use to determine the interval estimate?
   a) 2
   b) 3
   c) 12
   d) It cannot be determined from the information given.

   ANSWER: 
d
   TYPE: MC  DIFFICULTY: Difficult
   KEYWORDS: sample size determination, mean
69. The head librarian at the Library of Congress has asked her assistant for an interval estimate of the mean number of books checked out each day. The assistant provides the following interval estimate: from 740 to 920 books per day. If the head librarian knows that the population standard deviation is 150 books checked out per day, and she asked her assistant for a 95% confidence interval, approximately how large a sample did her assistant use to determine the interval estimate?
   a) 125  
   b) 13   
   c) 11   
   d) 4

ANSWER: c

TYPE: MC  DIFFICULTY: Difficult
KEYWORDS: sample size determination, mean

70. The head librarian at the Library of Congress has asked her assistant for an interval estimate of the mean number of books checked out each day. The assistant provides the following interval estimate: from 740 to 920 books per day. If the head librarian knows that the population standard deviation is 150 books checked out per day, and she asked her assistant to use 25 days of data to construct the interval estimate, what confidence level can she attach to the interval estimate?
   a) 99.7%  
   b) 99.0%   
   c) 98.0%   
   d) 95.4%

ANSWER: a

TYPE: MC  DIFFICULTY: Difficult
KEYWORDS: sample size determination, mean

71. An economist is interested in studying the incomes of consumers in a particular country. The population standard deviation is known to be $1,000. A random sample of 50 individuals resulted in a mean income of $15,000. What total sample size would the economist need to use for a 95% confidence interval if the width of the interval should not be more than $100?
   a) $n = 1537$  
   b) $n = 385$   
   c) $n = 40$   
   d) $n = 20$

ANSWER: a

TYPE: MC  DIFFICULTY: Easy
KEYWORDS: sample size determination, mean
72. As an aid to the establishment of personnel requirements, the director of a hospital wishes to estimate the mean number of people who are admitted to the emergency room during a 24-hour period. The director randomly selects 64 different 24-hour periods and determines the number of admissions for each. For this sample, $\bar{X} = 396$ and $S = 100$. Using the sample standard deviation as an estimate for the population standard deviation, what size sample should the director choose if she wishes to estimate the mean number of admissions per 24-hour period to within 1 admission with 99% reliability?

ANSWER:

$n = 166$

TYPE: PR DIFFICULTY: Moderate

KEYWORDS: sample size determination, mean

Note: The answer is computed using $Z = 2.575$ from Table E.2 or $Z = 2.5758293$ using PHStat.

73. Suppose a department store wants to estimate the mean age of the customers of its contemporary apparel department, correct to within 2 years, with level of confidence equal to 95%. Management believes that the standard deviation is 8 years. The sample size they should take is ________.

ANSWER:

62

TYPE: FI DIFFICULTY: Easy

KEYWORDS: sample size determination, mean

74. A university dean is interested in determining the proportion of students who receive some sort of financial aid. Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid. If the dean wanted to estimate the proportion of all students receiving financial aid to within 3% with 99% reliability, how many students would need to be sampled?

a) $n = 1,844$

b) $n = 1,784$

c) $n = 1,503$

d) $n = 1,435$

ANSWER:

b

TYPE: MC DIFFICULTY: Moderate

KEYWORDS: sample size determination, proportion

Note: The answer is computed using $Z = 2.575$ from Table E.2 or $Z = 2.5758293$ using PHStat.
75. A confidence interval was used to estimate the proportion of statistics students who are female. A random sample of 72 statistics students generated the following 90% confidence interval: (0.438, 0.642). Using the information above, what total size sample would be necessary if we wanted to estimate the true proportion to within ±0.08 using 95% confidence?

a) 105  
b) 150  
c) 420  
d) 597

ANSWER: b
TYPE: MC  DIFFICULTY: Moderate
KEYWORDS: sample size determination, proportion

76. A university system enrolling hundreds of thousands of students is considering a change in the way students pay for their education. Currently, the students pay $400 per credit hour. The university system administrators are contemplating charging each student a set fee of $7,000 per quarter, regardless of how many credit hours each takes. To see if this proposal would be economically feasible, the administrators would like to know how many credit hours, on the average, each student takes per quarter. A random sample of 250 students yields a mean of 14.1 credit hours per quarter and a standard deviation of 2.3 credit hours per quarter. Suppose the administration wanted to estimate the mean to within 0.1 hours at 95% reliability and assumed that the sample standard deviation provided a good estimate for the population standard deviation. How large a total sample would they need to take?

ANSWER: 

\[ n = 2033 \]

TYPE: PR  DIFFICULTY: Easy
KEYWORDS: sample size determination, mean

SCENARIO 8-1

The managers of a company are worried about the morale of their employees. In order to determine if a problem in this area exists, they decide to evaluate the attitudes of their employees with a standardized test. They select the Fortunato test of job satisfaction, which has a known standard deviation of 24 points.

77. Referring to Scenario 8-1, they should sample ________ employees if they want to estimate the mean score of the employees within 5 points with 90% confidence.

ANSWER: 63
TYPE: FI  DIFFICULTY: Easy
KEYWORDS: sample size determination, mean
78. Referring to Scenario 8-1, due to financial limitations, the managers decide to take a sample of 45 employees. This yields a mean score of 88.0 points. A 90% confidence interval would go from ________ to ________.

ANSWER:
82.12 to 93.88
TYPE: FI DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean, standardized normal distribution

79. True or False: Referring to Scenario 8-1, this confidence interval is only valid if the scores on the Fortunato test are normally distributed.

ANSWER:
False
TYPE: TF DIFFICULTY: Difficult
EXPLANATION: With a sample size of 45, this confidence interval will still be valid if the scores are not normally distributed due to the central limit theorem.
KEYWORDS: confidence interval, mean, standardized normal distribution, central limit theorem

SCENARIO 8-2

A quality control engineer is interested in the mean length of sheet insulation being cut automatically by machine. The desired mean length of the insulation is 12 feet. It is known that the standard deviation in the cutting length is 0.15 feet. A sample of 70 cut sheets yields a mean length of 12.14 feet. This sample will be used to obtain a 99% confidence interval for the mean length cut by machine.

80. Referring to Scenario 8-2, the critical value to use in obtaining the confidence interval is ________.

ANSWER:
2.58
TYPE: FI DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, standardized normal distribution

81. Referring to Scenario 8-2, the confidence interval goes from ________ to ________.

ANSWER:
12.09 to 12.19
TYPE: FI DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean, standardized normal distribution

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82. True or False: Referring to Scenario 8-2, the confidence interval indicates that the machine is not working properly.

**ANSWER:**
True
**TYPE:** TF  **DIFFICULTY:** Moderate
**KEYWORDS:** confidence interval, mean, standardized normal distribution, interpretation

83. True or False: Referring to Scenario 8-2, the confidence interval is valid only if the lengths cut are normally distributed.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Moderate
**EXPLANATION:** With a sample size of 70, this confidence interval will still be valid if the lengths cut are not normally distributed due to the central limit theorem.
**KEYWORDS:** confidence interval, mean, standardized normal distribution, central limit theorem

84. Referring to Scenario 8-2, suppose the engineer had decided to estimate the mean length to within 0.03 with 99% confidence. Then the sample size would be ________.

**ANSWER:**
165.8724 rounds up to 166
**TYPE:** FI  **DIFFICULTY:** Moderate
**KEYWORDS:** sample size determination, mean

**SCENARIO 8-3**

To become an actuary, it is necessary to pass a series of 10 exams, including the most important one, an exam in probability and statistics. An insurance company wants to estimate the mean score on this exam for actuarial students who have enrolled in a special study program. They take a sample of 8 actuarial students in this program and determine that their scores are: 2, 5, 8, 8, 7, 6, 5, and 7. This sample will be used to calculate a 90% confidence interval for the mean score for actuarial students in the special study program.

85. Referring to Scenario 8-3, the mean of the sample is __________, while the standard deviation of the sample is __________.

**ANSWER:**
6.0; 2.0
**TYPE:** FI  **DIFFICULTY:** Moderate
**KEYWORDS:** confidence interval, mean
86. Referring to Scenario 8-3, the confidence interval will be based on ________ degrees of freedom.

   ANSWER:
   7
   TYPE: FI DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, t distribution, degrees of freedom

87. Referring to Scenario 8-3, the critical value used in constructing a 90% confidence interval is __________.

   ANSWER:
   1.8946
   TYPE: FI DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, t distribution

88. Referring to Scenario 8-3, a 90% confidence interval for the mean score of actuarial students in the special program is from __________ to __________.

   ANSWER:
   4.66 to 7.34
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, t distribution

89. True or False: Referring to Scenario 8-3, for the confidence interval to be valid, it is necessary that test scores of students in the special study program on the actuarial exam be normally distributed.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, t distribution

90. True or False: Referring to Scenario 8-3, it is possible that the confidence interval obtained will not contain the mean score for all actuarial students in the special study program.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation

91. True or False: Referring to Scenario 8-3, if we use the same sample information to obtain a 95% confidence interval, the resulting interval would be narrower than the one obtained here with 90% confidence.

   ANSWER:
   False
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: width, confidence interval, mean, properties
SCENARIO 8-4

The actual voltages of power packs labeled as 12 volts are as follows: 11.77, 11.90, 11.64, 11.84, 12.13, 11.99, and 11.77.

92. Referring to Scenario 8-4, a confidence interval for this sample would be based on the \( t \) distribution with \__________\ degrees of freedom.

\textbf{ANSWER:}
6
\textbf{TYPE: FI  DIFFICULTY: Easy}
\textbf{KEYWORDS: confidence interval, mean, \( t \) distribution, degrees of freedom}

93. Referring to Scenario 8-4, the critical value for a 99\% confidence interval for this sample is \__________\.

\textbf{ANSWER:}
3.7074
\textbf{TYPE: FI  DIFFICULTY: Easy}
\textbf{KEYWORDS: confidence interval, mean, \( t \) distribution}

94. Referring to Scenario 8-4, a 99\% confidence interval for the mean voltage of the power packs is from \__________\ to \__________\.

\textbf{ANSWER:}
11.6367 to 12.0891
\textbf{TYPE: FI  DIFFICULTY: Moderate}
\textbf{KEYWORDS: confidence interval, mean, \( t \) distribution}

95. True or False: Referring to Scenario 8-4, a 95\% confidence interval for the mean voltage of the power pack is wider than a 99\% confidence interval.

\textbf{ANSWER:}
False
\textbf{TYPE: TF  DIFFICULTY: Easy}
\textbf{KEYWORDS: confidence interval, mean, properties, width}

96. True or False: Referring to Scenario 8-4, a 99\% confidence interval will contain 99\% of the voltages for all such power packs.

\textbf{ANSWER:}
False
\textbf{TYPE: TF  DIFFICULTY: Moderate}
\textbf{KEYWORDS: confidence interval, mean, interpretation}
97. True or False: Referring to Scenario 8-4, a confidence interval estimate of the population mean would only be valid if the distribution of voltages is normal.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, t distribution

98. True or False: Referring to Scenario 8-4, a 90% confidence interval calculated from the same data would be narrower than a 99% confidence interval.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, properties, width

99. True or False: Referring to Scenario 8-4, it is possible that the 99% confidence interval calculated from the data will not contain the mean voltage for the sample.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, interpretation

100. True or False: Referring to Scenario 8-4, it is possible that the 99% confidence interval calculated from the data will not contain the mean voltage for the entire population.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, interpretation

SCENARIO 8-5

A sample of salary offers (in thousands of dollars) given to management majors is: 48, 51, 46, 52, 47, 48, 47, 50, 51, and 59. Using this data to obtain a 95% confidence interval resulted in an interval from 47.19 to 52.61.

101. True or False: Referring to Scenario 8-5, 95% of the time, the sample mean salary offer to management majors will fall between 47.19 and 52.61.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation
102. True or False: Referring to Scenario 8-5, 95% of the salary offers are between 47.19 and 52.61.

   ANSWER:
   False
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation

103. True or False: Referring to Scenario 8-5, it is possible that the mean of the population is between 47.19 and 52.61.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation

104. True or False: Referring to Scenario 8-5, it is possible that the mean of the population is not between 47.19 and 52.61.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation

105. True or False: Referring to Scenario 8-5, 95% of the sample means will fall between 47.19 and 52.61.

   ANSWER:
   False
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation

106. True or False: Referring to Scenario 8-5, 95% of all confidence intervals constructed similarly to this one with a sample size of 10 will contain the mean of the population.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, mean, interpretation

107. True or False: Referring to Scenario 8-5, a 99% confidence interval for the mean of the population from the same sample would be wider than 47.19 to 52.61.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, properties, width
108. True or False: Referring to Scenario 8-5, the confidence interval obtained is valid only if the distribution of the population of salary offers is normal.

**ANSWER:**
True
**TYPE:** TF  **DIFFICULTY:** Easy
**KEYWORDS:** confidence interval, mean, \( t \) distribution

**SCENARIO 8-6**

After an extensive advertising campaign, the manager of a company wants to estimate the proportion of potential customers that recognize a new product. She samples 120 potential consumers and finds that 54 recognize this product. She uses this sample information to obtain a 95% confidence interval that goes from 0.36 to 0.54.

109. True or False: Referring to Scenario 8-6, the parameter of interest to the manager is the proportion of potential customers in this sample that recognize the new product.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Easy
**KEYWORDS:** confidence interval, proportion, parameter

110. True or False: Referring to Scenario 8-6, the parameter of interest is \( \frac{54}{120} = 0.45 \).

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Easy
**KEYWORDS:** confidence interval, proportion, parameter

111. True or False: Referring to Scenario 8-6, this interval requires the use of the \( t \) distribution to obtain the confidence coefficient.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Easy
**KEYWORDS:** confidence interval, proportion, \( t \) distribution

112. True or False: Referring to Scenario 8-6, this interval requires the assumption that the distribution of the number of people recognizing the product has a normal distribution.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Moderate
**KEYWORDS:** confidence interval, proportion
113. True or False: Referring to Scenario 8-6, 95% of the time, the proportion of people that recognize the product will fall between 0.36 and 0.54.

ANSWER:
False
TYPE: TF  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation

114. True or False: Referring to Scenario 8-6, 95% of the time, the sample proportion of people that recognize the product will fall between 0.36 and 0.54.

ANSWER:
False
TYPE: TF  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation

115. True or False: Referring to Scenario 8-6, 95% of the people will recognize the product between 36% and 54% of the time.

ANSWER:
False
TYPE: TF  DIFFICULTY: Difficult
KEYWORDS: confidence interval, proportion, interpretation

116. True or False: Referring to Scenario 8-6, it is possible that the true proportion of people that recognize the product is between 0.36 and 0.54.

ANSWER:
True
TYPE: TF  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation

117. True or False: Referring to Scenario 8-6, it is possible that the true proportion of people that recognize the product is not between 0.36 and 0.54.

ANSWER:
True
TYPE: TF  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation
118. The head of a computer science department is interested in estimating the proportion of students entering the department who will choose the new computer engineering option. Suppose there is no information about the proportion of students who might choose the option. What size sample should the department head take if she wants to be 95% confident that the estimate is within 0.10 of the true proportion?

ANSWER: 97
TYPE: PR DIFFICULTY: Moderate
KEYWORDS: sample size determination, proportion

119. The head of a computer science department is interested in estimating the proportion of students entering the department who will choose the new computer engineering option. A preliminary sample indicates that the proportion will be around 0.25. Therefore, what size sample should the department head take if she wants to be 95% confident that the estimate is within 0.10 of the true proportion?

ANSWER: 73
TYPE: PR DIFFICULTY: Easy
KEYWORDS: sample size determination, proportion

SCENARIO 8-7

A hotel chain wants to estimate the mean number of rooms rented daily in a given month. The population of rooms rented daily is assumed to be normally distributed for each month with a standard deviation of 240 rooms. During February, a sample of 25 days has a sample mean of 370 rooms.

120. True or False: Referring to Scenario 8-7, the parameter of interest is the mean number of rooms rented daily in a given month.

ANSWER: True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, parameter

121. True or False: Referring to Scenario 8-7, the parameter of interest is the proportion of the rooms rented daily in a given month.

ANSWER: False
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, parameter
122. Referring to Scenario 8-7, the critical value for a 99% confidence interval for this sample is __________.

ANSWER:
2.5758 or 2.58
TYPE: FI DIFFICULTY: Easy
KEYWORDS: confidence interval, mean

123. Referring to Scenario 8-7, a 99% confidence interval for the mean number of rooms rented daily in a given month is from __________ to __________.

ANSWER:
246.3602 to 493.6398 or 246.36 to 493.64
TYPE: FI DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean

124. Referring to Scenario 8-7, the sampling error of a 99% confidence interval for the mean number of rooms rented daily in a given month is __________.

ANSWER:
123.6398 or 123.64
TYPE: FI DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean, sampling error

125. True or False: Referring to Scenario 8-7, a 95% confidence interval for the mean number of rooms rented daily in a given month is narrower than a 99% confidence interval.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, mean, properties, width

126. True or False: Referring to Scenario 8-7, a 99% confidence interval will contain 99% of the sample mean number of rooms rented daily in a given month.

ANSWER:
False
TYPE: TF DIFFICULTY: Moderate
KEYWORDS: confidence interval, mean, interpretation

127. True or False: Referring to Scenario 8-7, a 90% confidence interval calculated from the same data would be narrower than a 99% confidence interval.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: width, confidence interval, mean, properties
128. True or False: Referring to Scenario 8-7, it is possible that the 99% confidence interval calculated from the data will not contain the sample mean number of rooms rented daily in a given month.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, interpretation

129. True or False: Referring to Scenario 8-7, it is possible that the 99% confidence interval calculated from the data will not contain the population mean number of rooms rented daily in a given month.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, interpretation

130. True or False: Referring to Scenario 8-7, we are 99% confident that between 246.36% and 493.64% of the rooms will be rented daily in a given month.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, interpretation

131. True or False: Referring to Scenario 8-7, we are 99% confident that the average number of rooms rented daily in a given month is somewhere between 246.36 and 493.64.

   ANSWER:
   True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, mean, interpretation

SCENARIO 8-8

The president of a university would like to estimate the proportion of the student population that owns a personal computer. In a sample of 500 students, 417 own a personal computer.

132. True or False: Referring to Scenario 8-8, the parameter of interest is the mean number of students in the population who own a personal computer.

   ANSWER:
   False
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, proportion, parameter

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133. True or False: Referring to Scenario 8-8, the parameter of interest is the proportion of the student population who own a personal computer.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: confidence interval, proportion, parameter

134. Referring to Scenario 8-8, the critical value for a 99% confidence interval for this sample is __________.

   ANSWER:
   2.5758
   TYPE: FI DIFFICULTY: Easy
   KEYWORDS: confidence interval, proportion

135. Referring to Scenario 8-8, a 99% confidence interval for the proportion of the student population who own a personal computer is from __________ to __________.

   ANSWER:
   0.7911 to 0.8769
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion

136. Referring to Scenario 8-8, the sampling error of a 99% confidence interval for the proportion of the student population who own a personal computer is __________.

   ANSWER:
   0.04286
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, sampling error

137. True or False: Referring to Scenario 8-8, a 95% confidence interval for the proportion of the student population who own a personal computer is narrower than a 99% confidence interval.

   ANSWER:
   True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: confidence interval, proportion, properties, width

138. True or False: Referring to Scenario 8-8, a 99% confidence interval will contain 99% of the student population who own a personal computer.

   ANSWER:
   False
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, interpretation
139. True or False: Referring to Scenario 8-8, a confidence interval estimate of the population proportion would only be valid if the distribution of the number of students who own a personal computer is normal.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Moderate  
**KEYWORDS:** confidence interval, proportion

140. True or False: Referring to Scenario 8-8, a 90% confidence interval calculated from the same data would be narrower than a 99% confidence interval.

**ANSWER:**
True
**TYPE:** TF  **DIFFICULTY:** Easy  
**KEYWORDS:** width, confidence interval, proportion, properties

141. True or False: Referring to Scenario 8-8, it is possible that the 99% confidence interval calculated from the data will not contain the sample proportion of students who own a personal computer.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Easy  
**KEYWORDS:** confidence interval, proportion, interpretation

142. True or False: Referring to Scenario 8-8, it is possible that the 99% confidence interval calculated from the data will not contain the proportion of the student population who own a personal computer.

**ANSWER:**
True
**TYPE:** TF  **DIFFICULTY:** Easy  
**KEYWORDS:** confidence interval, proportion, interpretation

143. True or False: Referring to Scenario 8-8, we are 99% confident that the mean numbers of student population who own a personal computer is between 0.7911 and 0.8769.

**ANSWER:**
False
**TYPE:** TF  **DIFFICULTY:** Easy  
**KEYWORDS:** confidence interval, proportion, interpretation
144. True or False: Referring to Scenario 8-8, we are 99% confident that between 79.11% and 87.69% of the student population own a personal computer.

ANSWER:
True
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, interpretation

SCENARIO 8-9

A university wanted to find out the percentage of students who felt comfortable reporting cheating by their fellow students. A surveyed of 2,800 students was conducted and the students were asked if they felt comfortable reporting cheating by their fellow students. The results were 1,344 answered “Yes” and 1,456 answered “no”.

145. True or False: Referring to Scenario 8-9, the parameter of interest is the total number of students in the population who feel comfortable reporting cheating by their fellow students.

ANSWER:
False
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, parameter

146. True or False: Referring to Scenario 8-9, the parameter of interest is the proportion of the student population who feel comfortable reporting cheating by their fellow students.

ANSWER:
True
TYPE: TF  DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, parameter

147. Referring to Scenario 8-9, the critical value for a 99% confidence interval for this sample is _________.

ANSWER:
2.5758
TYPE: FI  DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion

148. Referring to Scenario 8-9, a 99% confidence interval for the proportion of the student population who feel comfortable reporting cheating by their fellow students is from ________ to _________.

ANSWER:
0.4557 to 0.5043
TYPE: FI  DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion
149. Referring to Scenario 8-9, the sampling error of a 99% confidence interval for the proportion of student population who feel comfortable reporting cheating by their fellow students is __________.

   ANSWER: 0.0243
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, sampling error

150. True or False: Referring to Scenario 8-9, a 95% confidence interval for the proportion of the student population who feel comfortable reporting cheating by their fellow students is narrower than a 99% confidence interval.

   ANSWER: True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: width, confidence interval, proportion, properties

151. True or False: Referring to Scenario 8-9, a 99% confidence interval will contain 99% of the student population who feel comfortable reporting cheating by their fellow students.

   ANSWER: False
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, interpretation

152. True or False: Referring to Scenario 8-9, a confidence interval estimate of the population proportion would only be valid if the distribution of the number of students who feel comfortable reporting cheating by their fellow students is normal.

   ANSWER: False
   TYPE: TF DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion

153. True or False: Referring to Scenario 8-9, a 90% confidence interval calculated from the same data would be narrower than a 99% confidence interval.

   ANSWER: True
   TYPE: TF DIFFICULTY: Easy
   KEYWORDS: width, confidence interval, proportion, properties
154. True or False: Referring to Scenario 8-9, it is possible that the 99% confidence interval calculated from the data will not contain the sample proportion of students who feel comfortable reporting cheating by their fellow students.

ANSWER:
False
TYPE: TF DIFFICULTY: Moderate
EXPLANATION: The confidence interval always contains the sample proportion.
KEYWORDS: confidence interval, proportion, interpretation

155. True or False: Referring to Scenario 8-9, it is possible that the 99% confidence interval calculated from the data will not contain the proportion of the student population who feel comfortable reporting cheating by their fellow students.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, interpretation

156. True or False: Referring to Scenario 8-9, we are 99% confident that the total number of the student population who feel comfortable reporting cheating by their fellow students is between 0.4557 and 0.5043.

ANSWER:
False
TYPE: TF DIFFICULTY: Difficult
KEYWORDS: confidence interval, proportion, interpretation

157. True or False: Referring to Scenario 8-9, we are 99% confident that between 45.57% and 50.43% of the student population feel comfortable reporting cheating by their fellow students.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, interpretation
SCENARIO 8-10

A sales and marketing management magazine conducted a survey on salespeople cheating on their expense reports and other unethical conduct. In the survey on 200 managers, 58% of the managers have caught salespeople cheating on an expense report, 50% have caught salespeople working a second job on company time, 22% have caught salespeople listing a “strip bar” as a restaurant on an expense report, and 19% have caught salespeople giving a kickback to a customer.

158. Referring to Scenario 8-10, construct a 95% confidence interval estimate of the population proportion of managers who have caught salespeople cheating on an expense report.

ANSWER:
0.5116 to 0.6484
TYPE: PR DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion

159. Referring to Scenario 8-10, the critical value for a 95% confidence interval estimate of the population proportion of managers who have caught salespeople cheating on an expense report is _________.

ANSWER:
±1.96
TYPE: FI DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion

160. Referring to Scenario 8-10, the sampling error of a 95% confidence interval estimate of the population proportion of managers who have caught salespeople cheating on an expense report is _________.

ANSWER:
0.0684
TYPE: FI DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, sampling error

161. True or False: Referring to Scenario 8-10, a 95% confidence interval will contain 95% of the population proportion of managers who have caught salespeople cheating on an expense report.

ANSWER:
False
TYPE: TF DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation
162. True or False: Referring to Scenario 8-10, it is possible that the 95% confidence interval calculated from the data will not contain the sample proportion of managers who have caught salespeople cheating on an expense report.

   ANSWER: False
   TYPE: TF  DIFFICULTY: Moderate
   EXPLANATION: The confidence interval always contains the sample proportion.
   KEYWORDS: confidence interval, proportion, interpretation

163. True or False: Referring to Scenario 8-10, it is possible that the 95% confidence interval calculated from the data will not contain the population proportion of managers who have caught salespeople cheating on an expense report.

   ANSWER: True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, proportion, interpretation

164. True or False: Referring to Scenario 8-10, we are 95% confident that the population mean number of managers who have caught salespeople cheating on an expense report is between 0.5116 to 0.6484.

   ANSWER: False
   TYPE: TF  DIFFICULTY: Difficult
   KEYWORDS: confidence interval, proportion, interpretation

165. True or False: Referring to Scenario 8-10, we are 95% confident that between 51.16% and 64.84% of managers in the population have caught salespeople cheating on an expense report.

   ANSWER: True
   TYPE: TF  DIFFICULTY: Easy
   KEYWORDS: confidence interval, proportion, interpretation

166. Referring to Scenario 8-10, construct a 95% confidence interval estimate of the population proportion of managers who have caught salespeople working a second job on company time.

   ANSWER: 0.4307 to 0.5693
   TYPE: PR  DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion
167. Referring to Scenario 8-10, the sampling error of a 95% confidence interval estimate of the population proportion of managers who have caught salespeople working a second job on company time is __________.

   ANSWER:
   0.0693
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, sampling error

168. Referring to Scenario 8-10, construct a 95% confidence interval estimate of the population proportion of managers who have caught salespeople listing a “strip bar” as a restaurant on an expense report.

   ANSWER:
   0.1626 to 0.2774
   TYPE: PR DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion

169. Referring to Scenario 8-10, the sampling error of a 95% confidence interval estimate of the population proportion of managers who have caught salespeople listing a “strip bar” as a restaurant on an expense report is __________.

   ANSWER:
   0.05741
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, sampling error

170. Referring to Scenario 8-10, construct a 95% confidence interval estimate of the population proportion of managers who have caught salespeople giving a kickback to a customer.

   ANSWER:
   0.1356 to 0.2444
   TYPE: PR DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion

171. Referring to Scenario 8-10, the sampling error of a 95% confidence interval estimate of the population proportion of managers who have caught salespeople giving a kickback to a customer is __________.

   ANSWER:
   0.05437
   TYPE: FI DIFFICULTY: Moderate
   KEYWORDS: confidence interval, proportion, sampling error
172. Referring to Scenario 8-10, determine the sample size needed to estimate the proportion of managers who have caught salespeople working a second job on company time to within ±0.02 with 95% confidence.

**ANSWER:**
2401

**TYPE:** PR  **DIFFICULTY:** Moderate  **KEYWORDS:** sample size determination, confidence interval, proportion

**SCENARIO 8-11**

A poll was conducted by the marketing department of a video game company to determine the popularity of a new game that was targeted to be launched in three months. Telephone interviews with 1,500 young adults were conducted which revealed that 49% said they would purchase the new game. The margin of error was ±3 percentage points.

173. True or False: Referring to Scenario 8-11, the report contains all the essential components for an ethical reporting of poll results.

**ANSWER:**
False

**TYPE:** TF  **DIFFICULTY:** Easy  **KEYWORDS:** confidence interval, ethical issues  
**EXPLANATION:** The level of confidence is missing.

174. True or False: Referring to Scenario 8-11, the size of the population is 1,500.

**ANSWER:**
False

**TYPE:** TF  **DIFFICULTY:** Easy  **KEYWORDS:** confidence interval, proportion

175. Referring to Scenario 8-11, 1,500 is the size of the
   a) population
   b) sample
   c) frame
   d) proportion

**ANSWER:**
b

**TYPE:** MC  **DIFFICULTY:** Easy  **KEYWORDS:** confidence interval, proportion
176. True or False: Referring to Scenario 8-11, you are 99% confidence that the percentage of the targeted young adults who will purchase the new game is somewhere between 46% and 52%.

ANSWER:
False
TYPE: TF DIFFICULTY: Moderate
KEYWORDS: confidence interval, proportion, interpretation

177. True or False: Referring to Scenario 8-11, the standard error is 3%.

ANSWER:
False
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, sampling error

178. True or False: Referring to Scenario 8-11, the sampling error is 3%.

ANSWER:
True
TYPE: TF DIFFICULTY: Easy
KEYWORDS: confidence interval, proportion, sampling error

179. Referring to Scenario 8-11, what is the needed sample size to obtain a 95% confidence interval estimate of the percentage of the targeted young adults who will purchase the new game by allowing the same level of margin of error?

ANSWER:
1067
TYPE: PR DIFFICULTY: Moderate
KEYWORDS: sample size determination, confidence interval, proportion

180. Referring to Scenario 8-11, what is the needed sample size to obtain a 90% confidence interval estimate of the percentage of the targeted young adults who will purchase the new game by allowing the same level of margin of error?

ANSWER:
752
TYPE: PR DIFFICULTY: Moderate
KEYWORDS: sample size determination, confidence interval, proportion

181. Referring to Scenario 8-11, what is the needed sample size to obtain a 95% confidence interval in estimating the percentage of the targeted young adults who will purchase the new game to within ±5%?

ANSWER:
384
TYPE: PR DIFFICULTY: Moderate
KEYWORDS: sample size determination, confidence interval, proportion
182. Referring to Scenario 8-11, what is the needed sample size to obtain a 95% confidence interval in estimating the percentage of the targeted young adults who will purchase the new game to within ±5% if you do not have the information on the 49% in the interviews who said that they would purchase the new game?

**ANSWER:**
385
**TYPE:** PR  **DIFFICULTY:** Moderate
**KEYWORDS:** sample size determination, confidence interval, proportion

183. Referring to Scenario 8-11, what is the needed sample size to obtain a 99% confidence interval in estimating the percentage of the targeted young adults who will purchase the new game to within ±5% if you do not have the information on the 49% in the interviews who said that they would purchase the new game?

**ANSWER:**
664 using $Z = 2.5758$ or 666 using $Z = 2.58$
**TYPE:** PR  **DIFFICULTY:** Moderate
**KEYWORDS:** sample size determination, confidence interval, proportion