

Part 6

Questions on Topic Thirteen: Confidence Intervals

Multiple-Choice Questions

Directions: The questions or incomplete statements that follow are each followed by five suggested answers or completions. Choose the response that best answers the question or completes the statement.

1. Changing from a 95% confidence interval estimate for a population proportion to a 99% confidence interval estimate, with all other things being equal,
 - (A) increases the interval size by 4%.
 - (B) decreases the interval size by 4%.
 - (C) increases the interval size by 31%.
 - (D) decreases the interval size by 31%.
 - (E) This question cannot be answered without knowing the sample size.
2. In general, how does doubling the sample size change the confidence interval size?
 - (A) Doubles the interval size
 - (B) Halves the interval size
 - (C) Multiplies the interval size by 1.414
 - (D) Divides the interval size by 1.414
 - (E) This question cannot be answered without knowing the sample size.
3. A confidence interval estimate is determined from the GPAs of a simple random sample of n students. All other things being equal, which of the following will result in a smaller margin of error?
 - (A) A smaller confidence level
 - (B) A larger sample standard deviation
 - (C) A smaller sample size
 - (D) A larger population size
 - (E) A smaller sample mean

5. Most recent tests and calculations estimate at the 95% confidence level that the maternal ancestor to all living humans called mitochondrial Eve lived 273,000 \pm 177,000 years ago. What is meant by “95% confidence” in this context?
- (A) A confidence interval of the true age of mitochondrial Eve has been calculated using z -scores of ± 1.96 .
 - (B) A confidence interval of the true age of mitochondrial Eve has been calculated using t -scores consistent with $df = n - 1$ and tail probabilities of ± 0.025 .
 - (C) There is a .95 probability that mitochondrial Eve lived between 96,000 and 450,000 years ago.
 - (D) If 20 random samples of data are obtained by this method, and a 95% confidence interval is calculated from each, then the true age of mitochondrial Eve will be in 19 of these intervals.
 - (E) 95% of all random samples of data obtained by this method will yield intervals that capture the true age of mitochondrial Eve.

8. The margin of error in a confidence interval estimate using z -scores covers which of the following?
- (A) Sampling variability
 - (B) Errors due to undercoverage and nonresponse in obtaining sample surveys
 - (C) Errors due to using sample standard deviations as estimates for population standard deviations
 - (D) Type I errors
 - (E) Type II errors

14. In an SRS of 80 teenagers, the average number of texts handled in a day was 50 with a standard deviation of 15. What is the 96% confidence interval for the average number of texts handled by teens daily?
- (A) $50 \pm 2.054(15)$
(B) $50 \pm 2.054 \frac{15}{\sqrt{79}}$
(C) $50 \pm 2.054 \frac{15}{\sqrt{80}}$
(D) $50 \pm 2.088 \frac{15}{\sqrt{79}}$
(E) $50 \pm 2.088 \frac{15}{\sqrt{80}}$
15. One gallon of gasoline is put in each of 30 test autos, and the resulting mileage figures are tabulated with $\bar{x} = 28.5$ and $s = 1.2$. Determine a 95% confidence interval estimate of the mean mileage.
- (A) (28.46, 28.54)
(B) (28.42, 28.58)
(C) (28.1, 28.9)
(D) (27.36, 29.64)
(E) (27.3, 29.7)
16. The number of accidents per day at a large factory is noted for each of 64 days with $\bar{x} = 3.58$ and $s = 1.52$. With what degree of confidence can we assert that the mean number of accidents per day at the factory is between 3.20 and 3.96?
- (A) 48%
(B) 63%
(C) 90%
(D) 95%
(E) 99%
17. A company owns 335 trucks. For an SRS of 30 of these trucks, the average yearly road tax paid is \$9540 with a standard deviation of \$1205. What is a 99% confidence interval estimate for the total yearly road taxes paid for the 335 trucks?
- (A) $\$9540 \pm \103
(B) $\$9540 \pm \567
(C) $\$3,196,000 \pm \606
(D) $\$3,196,000 \pm \$35,000$
(E) $\$3,196,000 \pm \$203,000$

18. What sample size should be chosen to find the mean number of absences per month for school children to within ± 2 at a 95% confidence level if it is known that the standard deviation is 1.1?
- (A) 11
 - (B) 29
 - (C) 82
 - (D) 96
 - (E) 117
19. Hospital administrators wish to learn the average length of stay of all surgical patients. A statistician determines that, for a 95% confidence level estimate of the average length of stay to within ± 0.5 days, 50 surgical patients' records will have to be examined. How many records should be looked at to obtain a 95% confidence level estimate to within ± 0.25 days?
- (A) 25
 - (B) 50
 - (C) 100
 - (D) 150
 - (E) 200

25. An engineer wishes to determine the difference in life expectancies of two brands of batteries. Suppose the standard deviation of each brand is 4.5 hours. How large a sample (same number) of each type of battery should be taken if the engineer wishes to be 90% certain of knowing the difference in life expectancies to within 1 hour?
- (A) 10
(B) 55
(C) 110
(D) 156
(E) 202
26. Two confidence interval estimates from the same sample are (16.4, 29.8) and (14.3, 31.9). What is the sample mean, and if one estimate is at the 95% level while the other is at the 99% level, which is which?
- (A) $\bar{x} = 23.1$; (16.4, 29.8) is the 95% level.
(B) $\bar{x} = 23.1$; (16.4, 29.8) is the 99% level.
(C) It is impossible to completely answer this question without knowing the sample size.
(D) It is impossible to completely answer this question without knowing the sample standard deviation.
(E) It is impossible to completely answer this question without knowing both the sample size and standard deviation.
27. Two 90% confidence interval estimates are obtained: I (28.5, 34.5) and II (30.3, 38.2).
- a. If the sample sizes are the same, which has the larger standard deviation?
b. If the sample standard deviations are the same, which has the larger size?
- (A) a. I b. I
(B) a. I b. II
(C) a. II b. I
(D) a. II b. II
(E) More information is needed to answer these questions.
28. Suppose (25, 30) is a 90% confidence interval estimate for a population mean μ . Which of the following are true statements?
- (A) There is a .90 probability that \bar{x} is between 25 and 30.
(B) 90% of the sample values are between 25 and 30.
(C) There is a .90 probability that μ is between 25 and 30.
(D) If 100 random samples of the given size are picked and a 90% confidence interval estimate is calculated from each, then μ will be in 90 of the resulting intervals.
(E) If 90% confidence intervals are calculated from all possible samples of the given size, μ will be in 90% of these intervals.

29. Under what conditions would it be meaningful to construct a confidence interval estimate when the data consist of the entire population?
- (A) If the population size is small ($n < 30$)
 - (B) If the population size is large ($n \geq 30$)
 - (C) If a higher level of confidence is desired
 - (D) If the population is truly random
 - (E) Never
31. What is the critical t -value for finding a 90% confidence interval estimate from a sample of 15 observations?
- (A) 1.341
 - (B) 1.345
 - (C) 1.350
 - (D) 1.753
 - (E) 1.761
32. Acute renal graft rejection can occur years after the graft. In one study (*The Lancet*, December 24, 1994, page 1737), 21 patients showed such late acute rejection when the ages of their grafts (in years) were 9, 2, 7, 1, 4, 7, 9, 6, 2, 3, 7, 6, 2, 3, 1, 2, 3, 1, 1, 2, and 7, respectively. Establish a 90% confidence interval estimate for the ages of renal grafts that undergo late acute rejection.
- (A) 2.024 ± 0.799
 - (B) 2.024 ± 1.725
 - (C) 4.048 ± 0.799
 - (D) 4.048 ± 1.041
 - (E) 4.048 ± 1.725

34. A catch of five fish of a certain species yielded the following ounces of protein per pound of fish: 3.1, 3.5, 3.2, 2.8, and 3.4. What is a 90% confidence interval estimate for ounces of protein per pound of this species of fish?
- (A) 3.2 ± 0.202
 - (B) 3.2 ± 0.247
 - (C) 3.2 ± 0.261
 - (D) 4.0 ± 0.202
 - (E) 4.0 ± 0.247