MATH 3307

Homework 10 (Lessons 29 - 30)

Instructions: Answer all questions through the EMCF tab of casa under the assignment named "Homework 10" before the deadline.

There is no "Submit" button. Your answers will be automatically submitted once the deadline arrives.

Assignments will be graded out of 20 points.

For Questions 1 - 3, indicate Choice A: True, or Choice B: False

1. For a fixed confidence level, when the sample size decreases, the length of the confidence interval for a population mean decreases.

2. The critical value, z*, corresponding to a 90% confidence level is 1.96.

3. The confidence interval for the population mean can always be computed from $\bar{x} \pm z^* \left(\frac{\sigma}{n} \right)$.

For Questions 4 - 6, consider the following: A company claims that the mean weight per apple they ship is 120 grams with a standard deviation of 12 grams. Data generated from a sample of 49 apples randomly selected from a shipment indicated a mean weight of 122.5 grams per apple. Calculate and interpret a 95% confidence interval for the mean weight per apple.

4. Which test should be used here?

   A. One sample z-test for means

   B. One sample t-test for means

5. Calculate the confidence interval indicated.

A. [119.68, 125.32] B. [119.05, 125.95]

C. [119.62, 125.38] D. [113.61, 131.39] E. [119.14, 125.86]

6. Give an interpretation of this interval.

   A. 95% of the population falls within the interval specified.

   B. 95% of the sample was used to calculate the mean.

   C. We are 95% certain that the sample mean falls within the interval.

   D. We are 95% certain that the population mean falls within the interval.

   E. The sample mean will exactly equal the population mean 95% of times

For Questions 7 - 10, refer to the following: The dean of a large community college claims that the average distance that commuting students travel to campus is 32 miles. The commuting students feel otherwise. A sample of 64 students was randomly chosen and yielded a mean of 35 miles and a standard deviation of 5 miles. Find and interpret the 90% confidence interval for the average distance that commuting students travel to the campus.

7. Which test should be used here?

A. One sample z-test for means

B. One sample t-test for means

8. Compute the indicated confidence interval:

A. [32.05, 37.95]

B. [33.96, 36.04]

C. [34.92, 35.08]

D. [34.19, 35.81]

E. [33.61, 36.39]

9. Interpret these results.

A. We are 90% confident that the population mean falls within the interval.

B. We are 95% confident that the population mean falls within the interval.

C. Approximately 90% of the population falls within the interval.

D. Approximately 10% of the population is considered an outlier.

E. Since we assumed a normal distribution, 68% of the population falls within the interval.

10. On a second run of the data, it was determined that the sample mean was actually 37 miles instead of the originally reported 35 miles. How will this affect the width of the confidence interval?

A. The new interval would be wider.

B. The new interval would be narrower.

C. There would be no change in the interval width.

For Questions 11 - 12, refer to the following:

A 95% confidence interval for the mean of a population is to be constructed and must be accurate to within 0.3 unit. A preliminary sample standard deviation is 2.9. Find the smallest sample size, n, that provides the desired accuracy.

11. What test should be used here and why?

A. z* because we are finding a sample size

B. t* because a sample (rather than population) standard deviation is provided.

12. Determine the minimum sample size needed here.

A. n = 358 B. n = 19 C. n = 18 D. n = 359 E. n = 947

For Questions 13 - 14, refer to the following: The height (in inches) of men at UH is assumed to have a normal distribution with a standard deviation of 3.6 inches. The height (in inches) of women at UH is also assumed to have a normal distribution with a standard deviation of 2.9 inches. A random sample of 49 men and 38 women yielded respective means of 68.3 and 64.6 inches. Find the 90% confidence interval for the difference in the heights of men and women at UH.

13. What test should be used?

A. Two sample z-test for means

B. Two sample t-test for means

14. Compute the appropriate confidence interval.

A. [3.06, 4.34]

B. [131.75, 134.05]

C. [-3.26, 2.66]

D. [2.55, 4.85]

E. [2.52, 4.88]

For Questions 15 - 16, refer to: One of your peers claims that males do better in math classes than females. Together you run two independent simple random samples and calculate the given summary of statistics for comparable math classes. In Calculus, 15 males had a mean percentage of 82.3 with a standard deviation of 5.6, while 12 girls had a mean percentage of 81.2 with a standard deviation of 6.7.

15. What assumptions need to be made, and which test should be used?

A. Since the population is not specified as Normally Distributed, the problem cannot be solved.

B. We can assume that the population is normally distributed and solve using a Two Sample z-test for means.

C. We can assume that the population is normally distributed and solve using a Two Sample t-test for means.

16. Calculate the 90% confidence interval for them mean percentage difference between males and females taking Calculus.

A. [-0.633, 2.833]

B. [-3.237, 5.437]

C. [-3.203, 5.404]

D. [0.789, 1.411]

E. [-7.373, 11.573]

17. In interval estimation, the t distribution is applicable only when

A. the population has a mean of less than 30.

B. the sample standard deviation (s) is given instead of the population standard deviation (σ).

C. the variance of the population is known.

D. the standard deviation of the population is known.

E. we will always use the t distribution.

18. To assess the precision of a laboratory scale, we measure a block known to have a mass of 1 gram. We measure the block n times and record the mean $\bar{x}$ of the measurements. Suppose the scale readings are normally distributed with unknown mean μ and standard deviation σ= 0.001 g. How large should n be so that a 95% confidence interval for μ has a margin of error of ± 0.0001?

A. 20

B. 385

C. 10,000

D. 66,358

E. 384

19. A 95% confidence interval for the mean reading achievement score for a population of third grade students is (44.2, 54.2). Suppose you compute a 99% confidence interval using the same information. Which of the following statements is correct?

A. The intervals have the same width.

B. The 99% interval is longer.

C. The 99% interval is shorter.

D. None of the above.

20. The mean caloric intake of an adult male is 2800 with a standard deviation of 115. To verify this information, a sample of 25 men are selected and determined to have a mean caloric intake of 2950. Determine the 98% confidence interval for mean caloric intake of an adult male.

Proposed Solution:

Since n < 30, a t-test must be used.

2950 – qt(1.98/2,24)*115/sqrt(25)

2950 + qt(1.98/2,24)*115/sqrt(25)

[2892.68, 3007.32]

What is wrong with the proposed solution?

A. A normally distributed population was not specified, so the answer cannot be found.

B. There should be 25 degrees of freedom (because the sample size is 25) when calculating t*.

C. A one sample z-test should be used rather than a t-test.

D. Parenthesis are needed around the fraction 115/sqrt(25)

E. There is nothing wrong in the proposed solution.