

1. A bottling company selects a random sample of 6 water bottles and measures the amount of water in each. The standard deviation of the amount of water for all of the bottles produced by this bottling company is unknown. A 95% confidence interval is constructed for the population mean amount of water in all water bottles produced by the bottling company.
 - a. Write a correct interpretation of what “95% confident” means in this context.
 - b. Explain why we must use the t -distribution to calculate this confidence interval.

2. **In order** to estimate a population mean, suppose that two 90% confidence intervals are constructed from the same small sample. Interval 1 uses a z^* value while Interval 2 uses a t^* value. Which interval will be wider? Why?

3. An engineer tests the battery life (in hours) of 10 randomly selected rechargeable batteries. The sample mean battery life is 9.4 hours with a standard deviation of 2.1 hours. She plans to construct a 90% confidence interval for the true mean battery life for all rechargeable batteries of this type.
- Calculate the standard error.
 - The critical value used for calculating the interval is 1.833. Is this a t^* or z^* ? Explain.
 - Calculate the margin of error.
 - Calculate and interpret the 90% confidence interval in context.
4. A café owner records the wait time (in minutes) for a random sample of customers during the morning rush. Using the same sample data and the t -distribution, two confidence intervals are constructed to estimate the true mean wait time:
- Interval A: (4.6, 5.4)
Interval B: (4.1, 5.9)
- Which interval was constructed with a higher level of confidence? Explain your reasoning.
 - Calculate the sample mean wait time.

5. A confidence interval for a population mean is constructed using a sample size of 18 and the t -distribution. What is the number of degrees of freedom associated with the appropriate t -test?
- A) 17
 - B) 18
 - C) 19
 - D) It depends on the confidence level.
6. When constructing a confidence interval for a population mean, a student keeps the confidence level the same and increases the sample size from $n = 9$ to $n = 12$. Which of the following must be true?
- A) The standard error decreases.
 - B) The t^* critical value decreases.
 - C) The sample mean is closer to the population mean.
 - D) The confidence interval contains the true population mean.