

1. Jimmy John's advertises "Freaky Fast Subs" and claims delivery time is 4 minutes from order to delivery within their 2-mile radius. Irmgard records the delivery times for her next 10 Jimmy John's orders. The mean delivery time is 6.3 minutes, and the distribution of these delivery times shows no strong skewness or outliers. She wants to perform a hypothesis test to determine if the true mean delivery time for all Jimmy John's deliveries exceeds 4 minutes.

Are the conditions for inference met for performing this test? Justify your answer.

2. The average word length in the English language is 5.1 letters. Is the average word length greater in the German language? The average word length from a sample of 85 randomly selected German words was calculated to be 5.874 letters with a standard deviation of 1.402 letters.
 - a. State the appropriate hypotheses for a one-sample t -test with a significance level of $\alpha = 0.05$. Be sure to define the parameter.
 - b. Assume the conditions for inference have been met. Calculate the test statistic and the p -value.
 - c. Write a conclusion for the hypothesis test.

3. According to the Center for Disease Control and Prevention (CDC), the average shower length is eight minutes. Faruk wonders if this is different for teens at his large high school. Faruk selects an SRS of 45 teens at his school and finds that the mean shower length is 10.1 minutes, with a standard deviation of 7.5 minutes.
- a. Does this result provide convincing statistical evidence, at a significance level of $\alpha = 0.05$, that the average shower length is different for teens at Faruk's school than the average given by the CDC?
- b. Would a 95% confidence interval for the true mean shower length of all teens at Faruk's school contain 8? Explain.

4. A car dealer claims that their used cars have a mean mileage of 50,000. To investigate this claim, many random samples of cars will be selected from their lot. For each sample, the mean and standard deviation of the mileages will be calculated. Suppose that the null hypothesis is true: the mean mileage of all used cars on this lot is 50,000.
- Approximately what percentage of hypothesis tests conducted at the $\alpha = 0.05$ significance level from random samples of cars on this lot will reject H_0 ?
 - Approximately what percentage of 95% confidence intervals constructed from random samples of cars on this lot will fail to capture 50,000 in the interval?
 - Use the results from parts (a) and (b) to explain the relationship between the significance level and confidence level.
 - If H_0 is rejected in this scenario which type of error (Type I or Type II) occurs? Explain.
5. One difference between a hypothesis test for a mean and a hypothesis test for a proportion is that a t - distribution is used for means, rather than a normal distribution. Why is this the case?
- When performing a test for a mean, the population mean isn't known, but when performing a test for a proportion, the population proportion is known.
 - When performing a test for a mean, the sampling distribution isn't normal, but when performing a test for a proportion, the sampling distribution is normal.
 - When performing a test for a mean, the sample size can be less than 30, but when performing a test for a proportion, the sample size must be greater than or equal to 30.
 - When performing a test for a mean, the population standard deviation is estimated using the sample standard deviation, but when performing a test for a proportion, the population standard deviation can be calculated based on the null value.

6. A hypothesis test of $H_0 : \mu = 10$ versus $H_a : \mu \neq 10$ yields a p -value of 0.084. Using the same data, what is the smallest confidence level for which the confidence interval for μ will contain the value of 10?
- A) 90% confidence
 - B) 92% confidence
 - C) 95% confidence
 - D) 98% confidence