

1. A hypothesis test is being performed for a difference of means, $\mu_1 - \mu_2$. The standardized test statistic calculated from the sample data is $t = -1.8$ with 71 degrees of freedom. Determine if each statement is true or false or if there is not enough information. Give a reason for your answer.
- a. $\bar{x}_1 < \bar{x}_2$
- b. $s_1 < s_2$
- c. There is convincing statistical evidence that $\mu_1 \neq \mu_2$, at the significance level of $\alpha = 0.05$.
- d. There is convincing statistical evidence that $\mu_1 < \mu_2$, at the significance level of $\alpha = 0.05$.

2. Two bakeries, Nantucket Bakery and Hall Street Bakery, are known for their artisanal bread. The owner of a local café is considering switching suppliers and wants to determine whether there is a statistically significant difference in the average freshness of bread between the two bakeries at a significance level of $\alpha = 0.05$. To investigate, the cafe owner randomly selects 30 loaves of bread from Nantucket Bakery and 25 loaves of bread from Hall Street Bakery. Each loaf is then assessed for its freshness, with higher scores indicating fresher bread. The mean freshness score for Nantucket Bakery was 9.2, with a standard deviation of 1.5. The mean freshness score for Hall Street Bakery was 8.5, with a standard deviation of 1.2. The distributions of freshness scores for each bakery had no strong skewness or outliers.

- a. Classify the type of variables and type of study.
- b. Choose the appropriate inference procedure and state the hypotheses.
- c. Check the appropriate conditions.
- d. Calculate the standardized test statistic and p -value.
- e. Write a conclusion in the context of the problem.

3. In a Pew Research study, a random sample of 2,007 Americans aged 65+ and a separate random sample of 3,116 Americans aged 30-49 were asked how much of a tip they would leave for a moderate dining experience at a restaurant. The mean tip for Americans aged 65+ was 15.76% with a standard deviation of 3.61%. The mean tip for Americans aged 30-49 was 16.4% with a standard deviation of 4.079%.
- a. Does this result provide convincing statistical evidence that Americans aged 65+ tip less than Americans aged 30-49 for a moderate dining experience at a restaurant, on average? Use $\alpha = 0.05$.
- b. Based on your conclusion from part (a), which of the two errors, Type I or Type II, could have been made? Interpret the error in context.
4. Suppose that for two independent random samples, it was found that $\bar{x}_1 = 12$ and $\bar{x}_2 = 10.5$. Assume that all conditions for inference have been met. Which of the following is more likely to result in a rejection of the null hypothesis?
- A hypothesis test for a difference of means with $H_0 : \mu_1 = \mu_2$ and $H_a : \mu_1 > \mu_2$
 - A hypothesis test for a difference of means with $H_0 : \mu_1 = \mu_2$ and $H_a : \mu_1 \neq \mu_2$

Explain your reasoning.

5. A researcher is interested in comparing the average math test scores of students from two different schools, School X and School Y . The researcher selects random samples of students from each school and administers a standardized math test. The summary statistics for the test scores of the two samples are given below.

	Mean	Standard deviation	Number of students
School X	80	7	35
School Y	75	8	40

Assume that all conditions for inference are met. Is there convincing statistical evidence that students in School X perform better, on average, on the standardized math test than students in School Y ?

- A) Yes, at $\alpha = 0.001$ there is convincing evidence.
- B) Yes, at $\alpha = 0.01$ there is convincing evidence, but not at $\alpha = 0.001$.
- C) Yes, at $\alpha = 0.05$ there is convincing evidence, but not at $\alpha = 0.01$.
- D) No, there is not convincing evidence at $\alpha = 0.05$.
6. A company is interested in assessing customer satisfaction with two different customer service representatives, Ari and Beatrice. The company randomly selects two independent groups of customers who interacted with either Ari or Beatrice and asks them to rate their satisfaction as either "Satisfied" or "Not Satisfied." Of the 150 customers who interacted with Ari, 105 said they were satisfied. Of the 180 customers who interacted with Beatrice, 135 said they were satisfied. Which inference procedure should be used to determine if the proportion of all customers who are satisfied with Ari's customer service is different than the proportion of all customers who are satisfied with Beatrice's customer service?
- A) One-sample z -test for p
- B) Two-sample z -test for $p_1 - p_2$
- C) Two-sample t -test for $\mu_1 - \mu_2$
- D) Two-sample t -interval for $\mu_1 - \mu_2$