Congratulations! You passed!

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Go to next item

1. In statistical hypothesis testing, which of the following statements correctly defines Type I and Type II errors?

1 / 1 point

- (●) Type I error occurs when we reject a null hypothesis that is true, while Type II error occurs when we do not reject a null hypothesis that is false.
- ( ) Type I error occurs when we do not reject a null hypothesis that is true, while Type II error occurs when we reject a null hypothesis that is false.
- ( ) Type I error occurs when we reject a null hypothesis that is false, while Type II error occurs when we do not reject a null hypothesis that is true.
- ( ) Type I error occurs when we do not reject a null hypothesis that is false, while Type II error occurs when we reject a null hypothesis that is true.

Correct
Correct! This is the accurate definition of Type I and Type II errors. Type I error refers to rejecting a null hypothesis that is actually true, and Type II error refers to accepting a null hypothesis that is actually false.

2. About the t distribution, select all that apply.

1 / 1 point

- [ ] The t-distribution has a mean of 0 and a standard deviation of 1.
- [x] The t-distribution has thicker tails compared to the standard normal distribution.

Correct
Correct! The "thicker tails" mean that the t-distribution has a higher probability of extreme values or outliers compared to the standard normal distribution. This is because the t-distribution takes into account the added uncertainty introduced by estimating the population standard deviation from a small sample size.

- [x] The t-distribution gets closer to the Standard Normal distribution when the degrees of freedom increase.

Correct
Correct! Since the degrees of freedom are related to the number of samples you are working with, the higher the number of samples, the closer the mean will be with a normal distribution and the closer the sample standard deviation will be from the population standard deviation.

- [x] The t-distribution can be used for testing population means.

Correct
Correct! When working with small sample sizes or when the population standard deviation is unknown, the t-distribution provides a more appropriate probability distribution for testing hypotheses about the population mean. This is done through a statistical test known as the t-test.

3. When conducting a hypothesis test, what are the general steps to decide whether to reject the null hypothesis (H_0) or not? Select the correct sequence of steps. Suppose you have already defined the null hypothesis and the alternative hypothesis.

1 / 1 point

- ( ) Calculate the test statistic, determine the significance level, calculate the p-value, compare the p-value with the significance level, and make a decision.
- ( ) Calculate the p-value, set the significance level, compare the p-value with the significance level, and make a decision.
- (●) Set the significance level, calculate the test statistic, calculate the p-value, compare it with the significance level, and make a decision.

Correct
Correct! The correct sequence of steps in hypothesis testing is to first set the significance level, then calculate the test statistic, compare the test statistic with the critical value, and finally make a decision. This ensures a systematic approach to hypothesis testing and helps

test statistic with the critical value, and finally make a decision. This ensures a systematic approach to hypothesis testing and helps determine whether to reject the null hypothesis or not. Well done!

4. When defining the null hypothesis (H_0) and alternative hypothesis (H_1) in a hypothesis test comparing the average sales before (μ_{before}) and after (μ_{after}) implementing a marketing campaign, which of the following options provides a suitable definition for H_0 and H_1 for testing if the campaign has increased the sales (select all that apply)?

0 / 1 point

- [ ] $H_0 : \mu_{before} \geq \mu_{after}$. $H_1 : \mu_{before} < \mu_{after}$.
- [x] $H_0 : \mu_{before} = \mu_{after}$. $H_1 : \mu_{before} \leq \mu_{after}$.

This should not be selected
Incorrect. Note that H_1 allows for $\mu_{before} = \mu_{after}$ case, which is H_0.

- [x] $H_0 : \mu_{before} = \mu_{after}$. $H_1 : \mu_{before} \geq \mu_{after}$.

This should not be selected
Incorrect. Note that H_1 allows for $\mu_{before} = \mu_{after}$ case, which is H_0.

- [ ] $H_0 : \mu_{before} = \mu_{after}$. $H_1 : \mu_{before} < \mu_{after}$.

5. Suppose you are conducting a hypothesis test to determine whether a new teaching method improves student performance.

1 / 1 point

The null hypothesis (H_0) states that the teaching method has no effect, while the alternative hypothesis (H_1) suggests that the teaching method leads to higher student performance. You collect data from a sample of 50 students and calculate a test statistic of 1.98. The critical value at a significance level of 0.05 is 1.96. Should you reject the null hypothesis?

- ○ No
- ◉ Yes

Correct
Correct! Since the test statistics is **greater than** the critical value, it means that, given our significance level, we should reject H_0.

6. A company claims that their new energy drink decreases reaction times. To investigate this claim, a researcher conducts a hypothesis test using a sample of 40 participants. The average reaction time in the sample is 0.95 seconds, with a standard deviation of 0.12 seconds. The company states that the average reaction time without their energy drink is 1.05 seconds. The researcher wants to determine whether there is sufficient evidence to support the company's claim. Assuming a significance level of 0.05, what is the test statistic for this hypothesis test?

1 / 1 point

- ○ 5.27.
- ◉ -5.27.
- ○ 2.73.
- ○ -2.73.

Correct
Correct! Using the formula $\frac{\bar{x}-\mu}{S/\sqrt{n}}$ you get the result!

7. In the question above, to find *p*-values for different levels of significance, which distribution would you have to work with?

1 / 1 point

- ○ Standard Normal Distribution.
- ○ t-Student Distribution with 40 degrees of freedom.
- ○ Normal Distribution with $\mu = 0.95$ and $\sigma = 0.12$.
- ◉ t-Student Distribution with 39 degrees of freedom.

Correct
Correct! The problem is a hypothesis test for the mean with unknown variance, therefore the test statistic will follow a t-Student Distribution with $n = 40 - 1 = 39$ degrees of freedom!

[redacted]