Math 142: Monday, Nov 25th, Day 26 Notes

Agenda for Monday, Nov 14th 2024

Coming up

- Happy Thanksgiving!

Recall: In general, a hypothesis test will always consist of two contradictory hypotheses or statements, a decision based on sample data, and a conclusion.

Determine where the claim goes (H_o or H_a) and write the null and alternative hypothesis.

a) Sears claims that the average life of their car battery brand lasts more than 5 years.

Claim: $\mu > 5$
H_o:
H_a:

b) An administrator claims that the success rate for MTH 142 is at most 75%.

Claim: $p \leq .75$
H_o:
H_a:

A hypothesis test will involve the following five steps:

Five Step p-value Method for Hypothesis Testing

1. Set up the null hypothesis and the alternative hypothesis
   - Claim: _____
   - H_0: _____
   - H_a: _____

2. Determine test value (Ztest, Ttest, 1-propZtest)

3. Calculate p-value

4. Draw conclusion:
   - Reject H_0 if p-value $\leq \alpha$
   - Fail to reject H_0 if p-value $> \alpha$
5. Interpret

Deciding which test value when testing mean (μ)

Ztest	**Ttest**
Use when: 1. Testing mean 2. σ is given σ is _____	Use when: 1. Testing mean 2. s is given s is _____
Calculator Input (STAT, TESTS, Ztest) μ_0: _____ σ: _____ $\bar{x}$: _____ n: _____ μ: $\begin{cases} \neq \mu_0 \\ < \mu_0 \\ > \mu_0 \end{cases}$ Calculate	Calculator Input (STAT, TESTS, Ttest) μ_0: _____ $\bar{x}$: _____ s_x: _____ n: _____ μ: $\begin{cases} \neq \mu_0 \\ < \mu_0 \\ > \mu_0 \end{cases}$ Calculate
Output to look for: Test Value: _____ p-value: _____	Output to look for: Test Value: _____ p-value: _____

Interpretation Review

Claim is H_0

Reject H_0:

"There is enough evidence at ___% level of significance to reject the claim that ..."

Do Not Reject H_0:

"There is Not enough evidence at ___% level of significance to reject the claim that ..."

Claim is H_a

Reject H_0:

"There is enough evidence at ___% level of significance to support the claim that ..."

Do Not Reject H_0:

"There is Not enough evidence at ___% level of significance to support the claim that ..."

Example 1. A random sample of 50 medical school applicants at a university has a mean raw score of 31 with a population standard deviation of 2.5 on the multiple-choice portions of the Medical College Admission Test (MCAT). A student claims that the mean raw score for the school's applicants is more than 30. Is there enough evidence to support the student's claim at a level of significance of 1%?

Step 1: Claim: _____

- H_0: _____
- H_a: _____

Step 2: Determine test value

Given values:	**Calculator Input:**
_____	_____
_____	_____
_____	_____
_____	_____

Step 3: p-value = _____

Step 4: Conclusion: _____

Step 5: Interpretation: _____

Example 2. A doctor, working at a busy city hospital, is interested in studying the ages of patients who visit the hospital. He claims that the mean age of patients who arrive at the emergency room is greater than 46 years old. A sample of 40 patients had a mean age of 49 years old with a standard deviation of 10 years. Use level of significance of 5%.

Step 1: Claim: _____

- H_0: _____
- H_a: _____

Step 2: Determine test value

Given values:	**Calculator Input:**
_____	_____
_____	_____
_____	_____
_____	_____

Step 3: p-value = _____

Step 4: Conclusion: _____

Step 5: Interpretation: _____

Example 3. Statistics students believe that the mean score on the first statistics test is 65. A statistics instructor thinks the mean score is higher than 65.

To test his claim, he selects a random sample of ten statistics students and obtains the scores: 65, 65, 70, 67, 66, 63, 63, 68, 72, 71.

He uses this data to conduct a hypothesis test using a 5% level of significance. The data are assumed to be from a normal distribution. Does this sample data provide evidence that the mean score for *all* students is more than 65?

Step 1: Claim: _____

- H_0: _____
- H_a: _____

Step 2: Determine test value

Given values:	**Calculator Input:**
_____	_____
_____	_____
_____	_____
_____	_____

Step 3: p-value = _____

Step 4: Conclusion: _____

Step 5: Interpretation: _____

One Proportion Z-Test

Calculator Input (STAT, TESTS, 1propZtest)
p_0 :
x:
prop: $\neq p_0 < p_0 > p_0$
Calculate
Output to look for
Test Value:
p-value:

Example 4. A medical researcher claims that less than 25% of US adults are smokers. In a random sample of 200 US adults, 18.5% say that they are smokers. At $\alpha = .05$, test the researcher's claim.

Step 1: Claim: _____

- H_0: _____
- H_a: _____

Step 2: Determine test value

Given values:	**Calculator Input:**
_____	_____
_____	_____
_____	_____
_____	_____

Step 3: p-value = _____

Step 4: Conclusion: _____

Step 5: Interpretation: _____

Example 5. A medical researcher claims that less than 5% of children under 18 years of age have asthma. In a random sample of 25 children under 18 years of age, 9.6% say they have asthma. Using a level of significance of 5%, is there enough evidence to reject the researcher's claim?

Step 1: Claim: _____

- H_0: _____
- H_a: _____

Step 2: Determine test value

Given values:	**Calculator Input:**
_____	_____
_____	_____
_____	_____
_____	_____

Step 3: p-value = _____

Step 4: Conclusion: _____

Step 5: Interpretation: _____

The Hypothesis Testing Process