

Name: _____ Hour: _____ Date: _____

Learning Targets

- State appropriate hypotheses for a significance test about a population parameter.
- Interpret a P-value in context.
- Make an appropriate conclusion for a significance test.

Lesson 9.1: Day 1: Is this gender discrimination?

A local engineering firm had to conduct a series of lay offs recently. They will lay off 10 people. The company has 180 employees that could be laid off. All are equally qualified so the company decides to use a lottery system to be carried out by the manager to decide who will be laid off. The manager posts a list of the employees to be laid off. Five employees are women and 5 are men. One of the women claims this is gender discrimination and starts a lawsuit against the company.

1. The manager responds, "How could there be gender discrimination when half of the employees laid off were female and half were male?" What additional information do you need to evaluate this statement?
2. How can you investigate the gender discrimination claim? Detail a process that could be used.
3. Complete your investigation below.
4. What percentage of the dots represent half or more females being laid off?
5. Interpret this percentage in context.
6. Do you have convincing evidence of gender discrimination? Explain.

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Lesson 9.1 Day 1– Significance Tests: The Basics

Significance test

A formal procedure for comparing _____ with a _____ whose truth we want to assess. We express the results of a significance test in terms of a probability that measures how well the data and the claim agree.

Significance tests

- Deal with claims about a _____
- Ask if sample data give good evidence _____ a claim
- “If we took many random samples and the claim were true, we would get a result like this ____% of the time”
- BASIC IDEA: An outcome that would rarely happen if a claim were true is good evidence that the claim is _____!

Important ideas:

L.T. #1 Hypotheses

Null Hypothesis: (What a person claims to be true)

It is the claim about the parameter you are trying to find _____

Alternative Hypothesis: (The claim we suspect is true instead of null hypothesis (H_0)).

One sided:

Two sided:

It is the claim about the parameter you are trying to find _____

L.T. #2 P- Value

The probability that we would get _____

- The smaller the p-value is, _____

- The p- value is a conditional probability: _____

L.T. #3 Conclusions

We _____ have convincing evidence _____

Significant means _____

If $p\text{-value} < \alpha$, then significant (meaning there is evidence against H_0 .)

- $p\text{-value} < \alpha$ _____
- $p\text{-value} > \alpha$ _____

NEVER ACCEPT H_0 as true!!!!

In general, use _____

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Check Your Understanding

Calcium is a vital nutrient for healthy bones and teeth. The National Institutes of Health (NIH) recommends a calcium intake of 1300 milligrams (mg) per day for teenagers. The NIH is concerned that teenagers are not getting enough calcium, on average. Is this true?

1. State appropriate hypotheses for performing a significance test. Be sure to define the parameter of interest. **(YOU MUST ALWAYS DEFINE PARAMETER OF INTEREST!)**

Researchers decide to perform a test using the hypotheses stated in #1. They ask a random sample of 20 teens to record their food and drink consumption for 1 day. The researchers then compute the calcium intake for each student. Data analysis reveals that $\bar{x} = 1198$ mg and $s_x = 411$ mg. Researchers performed a significance test and obtained a P-value of 0.1404.

2. Explain what it would mean for the null hypothesis to be true in this setting.

3. Interpret the P-value.

4. What conclusion would you make at the $\alpha = 0.05$ level?

NOW TRY ON YOUR OWN

- $H_0: \sigma = 15$ yards $H_a: \sigma < 15$ yards where σ = the true standard deviation of the distances Mike hits golf balls using the new 7-iron. Based on 50 shots with the new 7-iron, the standard deviation was $s_x = 10.9$ yards. A significance test using the sample data produced a P-value of 0.002.
5. (a) Interpret the P-value in this context.

- (b) Our significance level is 0.01, what should our conclusion be?