

Lesson 53: Significance Tests on a Mean

Reminders:

Define the null hypothesis and alternate hypothesis

Conditions:

Randomly selected sample – Look for the term SRS. Without random selection, we lose the ability to make inferences about the population.

Normal Distribution – We will be using Normal Curves to find probabilities, so we need the distribution to be Normal.

For Means: either the population has to be normal, or the sample size n must be at least 30 CLT.

Independent Observations – In order to use our standard deviation formula, we need the sample size to be less than 10% of the population size, so $10n < N$. This is especially true when sampling without replacement.

	Z-Test	T-Test
Standard Deviation	The population SD is known $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$	The population SD is NOT known $\sigma_{\bar{x}} = \frac{s_x}{\sqrt{n}}$
Find the P-Value	Find the Z-value One sided test: Probability in the tail outside the z-value on the normal curve is the p-value Two sided test: Probability in the tail outside the z-value on the normal curve will be doubled to find the p-value.	Find the T-Value with $n-1$ Deg. of Freedom One sided test: Probability in the tail outside the T-value on the T-distribution curve is the p-value Two sided test: Probability in the tail outside the T-value on the T-distribution curve will be doubled to find the p-value.
Compare the p-value to the α -level and make the conclusion about the hypotheses.		

Example

A classic rock radio station claims to play an average of 50 minutes of music every hour. However, it seems that every time you turn to this station, there is a commercial playing. To investigate their claim, you randomly select 12 different hours during the next week and record what the radio station plays in each of the 12 hours. Here are the number of minutes of music in each of these hours:

44 49 45 51 49 53 49 44 47 50 46 48

Describe the hypotheses, compute the test statistic and P-value.

What is the conclusion.

Example

For a job satisfaction survey, workers job satisfaction for two types of tasks are recorded. The matched pair analysis scores (self-paced – machine-paced) in the population of 18 assembly-line workers at the company found $\bar{x} = 17$ and $S_x = 60$.

Hypotheses: $H_0: \mu = 0$ $H_a: \mu \neq 0$

Find T and P

What is the proper conclusion?

Example

Construction zones have a lowered speed limit. The police chief claims people follow the speed limit in construction zones. The following are speeds recorded in a 25mph construction zone

27 33 32 21 30 30 29 25 27 34

Run a test to test the chief's claim.

Example

A college professor suspects that students at his school are getting less than 8 hours of sleep a night, on average. To test his belief, the professor asks a random sample of 28 students, "How much sleep did you get last night?"

Here are the data (in hours):

9 6 8 6 8 8 6 6.5 6 7 9 4 3 4
5 6 11 6 3 6 6 10 7 8 4.5 9 7 7

Run a test of the professor's claim.