Section 10.3: Hypothesis Tests for a Population Mean

Performing a Hypothesis Test Regarding μ

***Step 1*:** State the null and alternative hypotheses.

	Two-Tailed	Left-Tailed	Right-Tailed
	$H_0: \mu = \mu_0$	$H_0: \mu = \mu_0$	$H_0: \mu = \mu_0$
	$H_1: \mu \neq \mu_0$	$H_1: \mu < \mu_0$	$H_1: \mu > \mu_0$

***Step 2*:** Decide on a level of significance, α, depending on the seriousness of making a Type I error. (α will often be given as part of a test or homework question, but this will not be the case in the outside world.)

***Step 3*:** Compute the test statistic, $t_0 = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$.

***Step 4*:** Determine the *P*-value (see below).

***Step 5*:** Reject the null hypothesis if the *P*-value is less than the level of significance, α.

***Step 6*:** State the conclusion. (You should also include a measure of the *strength* of the results, based on the *P*-value.)

Finding *P*-values using the *t*-distribution

Example

Problem: In Example 1, in Section 10.2, we considered a survey about student work habits. The students who performed the survey found that ECC transfer students work, on average, about 17 hours per week.

In that example, we theorized that Mth120 online students chose the online format because they tend to work full-time, or at least more than the average student. We also assumed that the standard deviation for the hours worked per week was 5 hours.

Suppose instead that we don't have any prior information, and we simply use the sample data. If we collect a random sample of 30 Mth120 online students, and find a sample mean of 19.3 hours per week with a standard deviation of 6.2 hours, is there enough evidence at the 5% level of significance to support our claim that Mth120 online students tend to work more than the average ECC transfer student? (Note: Assume that the sample data are approximately normally distributed with no outliers.)

Solution:

***Step 1*:**
$H_0: \mu = 17$
$H_1: \mu > 17$

***Step 2*:** $\alpha = 0.05$ (given)

***Step 3*:** $t_0 = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} = \dfrac{19.3 - 17}{6.2/\sqrt{30}} \approx 2.03.$

***Step 4*:** *P*-value = P(t > 2.03, df=29) ≈ 0.0258.

***Step 5*:** Since the *P*-value < α, we reject the null hypothesis.

***Step 6*:** Yes, there is enough evidence at the 5% level of signficance to support our claim that the average hours worked for Mth120 online students is more than 17 hours per week.

Hypothesis Testing Using StatCrunch

1. Enter the data.
2. Go to **Stat** > **t-Statistics** > **One Sample**
3. Select **with data** if you have the data, or **with summary** if you only have the summary statistics.
4. If you chose **with data**, click on the variable that you want for the confidence interval and enter the population standard deviation. Otherwise, enter the sample statistics.
5. Click on **Next**.
6. Enter μ_0 and the alternative hypothesis.
7. Click on **Calculate**.