*YOUR TA’S NAME*:

*Lecture Worksheet*

*Thursday 10/15/2020*

**MAIN POINTS OF LECTURE**

1. When we conduct hypothesis testing (or significance testing) we use sample data to test particular claims about the value of a population parameter
2. AFTER THE BREAK: Hypothesis tests for means, differences in proportions, and differences in means
3. **We always operate under the assumption that the null hypothesis is true in the population**
4. “Rejecting” and “failing to reject” the null are the only possible outcomes of a hypothesis test
5. Hypothesis testing involves six steps:
6. State the null (H0) and alternative (H1) hypotheses
7. Check that the sample data conform to basic assumptions; if they do not, then do not go any further.
8. Choose an  probability level … that is, a probability associated with incorrectly rejecting the null hypothesis
9. Determine the “critical value” … that is, how large the test statistic must be in order to reject the null hypothesis at the given a level … it can be helpful to re-write the hypotheses in terms of the critical values. (For hypothesis tests about proportions: These will be Z values. For hypothesis tests about means, these will be t values)
10. Calculate the test statistic:

For hypothesis tests about proportions: $Z=\frac{\hat{p}-p\_{0}}{\sqrt{\frac{p\_{0}(1-p\_{0})}{N}}}$

For hypothesis tests about means: $t=\frac{\overline{Y}-μ\_{Y}}{{s\_{Y}}/{\sqrt{N}}}$

For hypothesis tests about differences in proportions: $Z=\frac{\hat{p}\_{1}-\hat{p}\_{2}-0}{\sqrt{\frac{\hat{p}(1-\hat{p})}{N\_{1}}+\frac{\hat{p}(1-\hat{p})}{N\_{2}}}}$

For hypothesis tests about differences in means: $t=\frac{\overline{Y}\_{1}-\overline{Y}\_{2}-0}{\sqrt{\frac{s\_{1}^{2}}{N\_{1}}+\frac{s\_{2}^{2}}{N\_{2}}}}$

1. Compare the test statistic to the critical value
	* If the test statistic is as large or larger than the critical value, then reject H0 (with probability of a of doing so even though H0 should not actually be rejected)
	* If the test statistic is less than the critical value, then do not reject H0 (with probability of b of doing so even though H0 should be rejected)

**QUESTIONS**

1. [From the recorded lecture] Does the average undergraduate student bring more than $40 to class? Using data from a survey conducted on the first day of my undergraduate research methods class, I found that the mean amount of money that the 75 students had on them was $43 with a standard deviation of $78. (Assume for now that students in my class represent a random sample of all undergraduate students.) Test the hypothesis that the average student brings more than $40 to class. Use =0.05.
2. [From the recorded lecture] Did high school age boys’ condom use during last intercourse increase between 2009 and 2014? From the 2009 Youth Risk Behavior Survey, I found that 69% of high school age boys used a condom (n = 2,640). From the 2014 National Survey of Sexual Health and Behavior I found that 79% of high school age boys used a condom (n = 57). Test this hypothesis using =0.05.
3. [From the recorded lecture] Do men and women tend to bring the same amount of money to class? Using data from a survey conducted on the first day of my undergraduate research methods class, which included 21 men and 54 women, I found that men brought an average of $38 with a standard deviation of $59, while women brought an average of $45 with a standard deviation of $85. (Assume for now that students in my class represent a random sample of all undergraduate students.) Use =0.05 to test this hypothesis.
4. [From the synchronous session] Were Minnesota kids more likely to be in families that received food stamps in 2010 than in 2007? Data from the 2007 and 2010 American Community Surveys show: **2007**: 7.1% of 13,511 sampled MN kids in such families. **2010**: 11.7% of 12,832 sampled MN kids in such families.
	1. Construct a 99% confidence interval for the difference in proportions between these two years
	2. Test the hypothesis that there was no difference between the two years in the rate of food stamp receipt. Use an  of 0.01.