

Name _____

MAT 201 Quiz

November 5, 2010

Problem 1 (5 points each) Circle True or False

- A. Suppose a hypothesis test was conducted to see if the mean pollution released is less for houses that have expensive drip lines. Then the repercussions of a Type I error are that a mandate for drip lines for all houses may be considered when in fact the drip lines are not effective. **True** **False**

True: A Type I Error means to reject H_0 when H_0 is true, so we will say that the drip lines are effective and make everyone have one when they do not help.

- B. A hypothesis test was conducted to see if more than 20% of all LTCC students transfer to the CSUs. The P-Value was found to be 0.34. Then with a level of significance of 0.05, we accept the null hypothesis and conclude that 20% or fewer transfer to the CSUs. **True** **False**

False: Never accept the null hypothesis

- C. In performing a hypothesis test for the mean number of people living in Tahoe households, we have to make sure that np and nq are both larger than 5.

True **False**

False: For means, there is no p or q. We need $n > 30$.

- D. If we survey 45 randomly selected hospital patients to see how long all patients stay at the hospital on average and only know the mean and standard deviation for the 45 surveyed, then we must use the Student's T Distribution to perform the hypothesis test. **True** **False**

True: We do not know the population standard deviation, so we use T.

- E. A hypothesis test with a level of significance of 0.10 was conducted to see if more than 35% of the population takes prescription medication. The result was to reject the null hypothesis. Then there is a 10% chance that it is not true that more than 35% of the population takes prescription medication.

True **False**

False: We can say that if it is true that exactly 35% of the population takes prescription medication, and if many studies with this sample size are done then 10% of them will result in incorrectly concluding that more than 35% of the population takes prescription medication.

- F. A hypothesis test, with a sample size of 60, was conducted to see if the mean water use per person in Tahoe is less than 50 gallons per day. The P-Value was calculated to be 0.02 and the sample mean was 42 gallons. Then if the per capita water use is 50 gallons per day and we conduct a new survey of 60 randomly selected Tahoe residents, there is a 2% chance that the average of these 60

residents is less than 50 gallons per day.

True

False

True: This is the definition of the P-Value

Problem 2 (30 Points) An employment agency averages 3 minutes to read a job application. The standard deviation is 0.8 minutes. A study was done to see if the employment agency spends less time reading applications with Hispanic sounding names. Hidden cameras showed that the 35 applications with Hispanic sounding names were looked at for an average of 2.8 minutes.

A. State the Null and Alternative Hypotheses.

$$H_0: \mu = 3, \quad H_1: \mu < 3$$

B. State the repercussions of a Type I error in the context of this study.

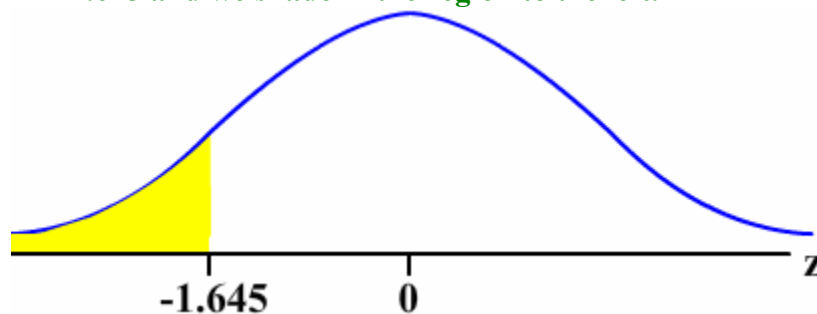
A Type I error means reject the null hypothesis when the null hypothesis is true. In this case we would end up concluding that the agency spends less time on average looking at the Hispanic applications when in fact they are spending 3 minutes on average per application (same as other races). We would end up falsely accusing the agency of discrimination.

C. State the repercussions of a Type II error in the context of this study.

A Type II error means fail to reject the null hypothesis when the null hypothesis is false. In this case we would not have enough evidence to accuse the agency of spending less than three hours on average per Hispanic application when in fact they are spending less than three hours on the applications. The agency would be getting away with discrimination.

D. Sketch the Rejection Region with a level of significance of 0.05.

Since we have a level of significance of 0.05 and a left tailed test we have $z = -1.645$ and we shade in the region to the left.



E. Calculate the test statistic and P-value

Use the ZTest to get $z = -1.479$ and $p = 0.07$

F. Use a complete sentence to state your results using a level of significance of 0.05 in the context of the question.

Since $p > \alpha$, we fail to reject the null hypothesis. With a level of significance of 0.05, there is insufficient evidence to make a conclusion about the agency spending less than 3 minutes per Hispanic application.

- G. The level of significance of 5% represents a probability. State what this represents in the context of the study.

If the mean time to read Hispanic applications is 3 minutes and if many such studies are done each with sample sizes 35, then 5% of these studies would end up falsely concluding that the mean time per Hispanic application is less than 3 minutes.

- H. The P-Value that you obtained represents a probability. State what this represents in the context of the study.

If the mean time to read Hispanic applications is 3 minutes and if a study is done with sample size 35, then there is a 7% chance that the mean number of minutes spent on these new 35 applications is less than 2.8 minutes.

Problem 3 (20 Points) A study was done to see if more than 25% of LTCC students would ride the bus to the college if they were given a free pass. Of the 150 students who were surveyed, 48 said that they would.

A. State the Null and Alternative Hypotheses

$H_0: p = 0.25,$ $H_1: p > .25$

B. Calculate the test statistic and P-Value.

We use a calculator with $n = 150,$ $x = 48,$ $p = .25.$ We use the 1-PropZTest to get

$z = 1.98,$ $p\text{-Value} = 0.02385837$

C. Use a complete sentence to state your results using the level of significance of 0.05 in the context of the question.

Since $p < 0.05,$ we reject the null hypothesis and accept the alternative hypothesis. We have sufficient evidence to conclude that more than 25% of all LTCC students would ride the bus to class if they were given a free pass.

Problem 4 (20 Points) A road sweeping manufacturer claims that their machines will remove on average 17% of the small particulate dirt from the road. You think that the actual percent is different for the one that you purchased. You randomly select 15 roads and come up with the following percent removal:

4, 6, 7, 8, 11, 12, 12, 12, 14, 15, 16, 18, 18, 20, 21

A. State the Null and Alternative Hypotheses

$$H_0: \mu = 17, \quad H_1: \mu \neq 17$$

B. Calculate the test statistic and P-Value.

We enter the data into L1 and notice that since the population standard deviation is unknown, we use a T-test to get

$$t = -3.043 \quad p = 0.00876$$

C. Use a complete sentence to state your results using the level of significance of 0.10 in the context of the question.

Since $p < 0.10$, there is statistically significant evidence to conclude that the actual percent of small particulate dirt that is removed from the road by all of the manufacturer's machines averages less than 17%.

D. Do you need to make any assumptions about the underlying distribution? Explain.

Yes, since the sample size is 15 which is less than 30, we must assume that the underlying distribution is approximately normal.