STAT 202
Lab #1 – Introduction to Confidence Intervals and Hypothesis Tests
Due: Monday August 3, 2015

Turn in only one answer sheet per group please.

Software such as StatCrunch makes the computation of confidence intervals and hypothesis tests straight forward. For this activity you will be computing and interpreting the results of these statistical analyses.

1. Recently, 73% of first-year college students responding to a national survey identified "being very well-off financially" as an important personal goal. A state university finds that 132 of an SRS of 200 of its first-year students say that this goal is important. Test the hypothesis that the proportion of all first-year students at the state university who identify being well-off as an important goal is different from the national survey proportion. (Take 73% to be the TRUE population proportion of all first-year college students who identify "being very well-off financially" as an important personal goal." Technically this national survey is also based on a sample of students and we'll learn in Chapter 8 how to use two samples to compare proportions.)

   a. State the hypotheses you will test.

   b. Perform a test of these hypotheses in StatCrunch using the following steps.

      1. Got to the STAT menu.
      2. Select PROPORTIONS.
      3. Select ONE SAMPLE.
      4. Select WITH SUMMARY.
      5. Enter the NUMBER OF SUCCESSES = 132
      6. Enter the NUMBER OF OBSERVATIONS (this is the sample size) = 200
      7. Click on NEXT.
      8. Click on HYPOTHESIS TEST.
      9. Enter the appropriate NULL PROPORTION, 0.73 for this example.
      10. Choose the correct ALTERNATIVE hypothesis.
      11. Click on CALCULATE.

      The resulting table contains the estimate, the test statistic (called Z-stat), and the p-value. Identify these values from the table of results.

      $\hat{p}$ =

      z* =

      p-value =

   c. Perform an $\alpha = 0.05$ significance level test. State your conclusions.

d. Give a 95% confidence interval for the proportion of all first-year students at the state university who would identify being well-off as an important personal goal. To do this in StatCrunch, repeat the steps above but select CONFIDENCE INTERVAL in step (8) and enter 0.95 for the CONFIDENCE LEVEL.

e. Interpret your confidence interval.

f. What is the relationship between the results of your hypothesis test in and the confidence interval you found in (d)?

2. The distribution of the amount of medication in a particular pill is known to vary normally with unknown mean μ and standard deviation 10 mg. A pharmaceutical company that manufactures this pill advertises that they contain 500 mg of a particular medication. The plant manager where the medication is produced believes the machinery is incorrectly calibrated and the amount of medication in the pills is actually more than 500 mg. She takes a simple random sample of 15 pills and has them analyzed for the amount of medication they contain. The amount in the 15 pills, in mg, is:

507	503	493	500	488	514	502	520	489	503	511	495	496	498	504

Perform the appropriate hypothesis test by answering the following questions:

a. State the null and alternative hypotheses.

b. Enter the data into the StatCrunch data table.

c. Go to STAT/Z STATISTICS/ONE SAMPLE/WITH DATA. Select the variable. Enter 10 for the standard deviation and select NEXT. Enter the correct NULL: MEAN and ALTERNATIVE hypothesis. Click on CALCULATE.

d. From the StatCrunch output:

i. What is the sample mean?

ii. What is the test statistic?

iii. What is the p-value?

iv. What conclusions can you draw about the machinery?

3. In the previous problem, suppose instead that the plant manager had taken an SRS of size n = 50 pills. Repeat the previous problem using the same sample mean (501.53) and same population standard deviation (10) but assume that the sample mean was found from an SRS of size n = 50.

Go to STAT/Z STATISTICS/ONE SAMPLE/WITH SUMMARY.
Enter 501.53 for the mean, 10 for the standard deviation, and 50 for the sample size.
Select NEXT. Enter the correct NULL: MEAN and ALTERNATIVE hypothesis. Click on CALCULATE.

What conclusions can you draw about the machinery?

4. Repeat the previous problem with n = 200. What conclusions do you now draw about the machinery? How does changing the sample size change the hypothesis test results?

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Software such as StatCrunch makes the computation of confidence intervals and hypothesis tests straight forward. For this activity you will be computing and interpreting the results of these statistical analyses.

1. Recently, 73% of first-year college students responding to a national survey identified "being very well-off financially" as an important personal goal. A state university finds that 132 of an SRS of 200 of its first-year students say that this goal is important. Test the hypothesis that the proportion of all first-year students at the state university who identify being well-off as an important goal is different from the national survey proportion. (Take 73% to be the TRUE population proportion of all first-year college students who identify "being very well-off financially" as an important personal goal." Technically this national survey is also based on a sample of students and we'll learn in Chapter 8 how to use two samples to compare proportions.)

   a. State the hypotheses you will test.

   $H_0: p = .73$
   $H_a: p \neq .73$

   b. Perform a test of these hypotheses in StatCrunch using the following steps.

      1. Got to the STAT menu.
      2. Select PROPORTIONS.
      3. Select ONE SAMPLE.
      4. Select WITH SUMMARY.
      5. Enter the NUMBER OF SUCCESSES = 132
      6. Enter the NUMBER OF OBSERVATIONS (this is the sample size) = 200
      7. Click on NEXT.
      8. Click on HYPOTHESIS TEST.
      9. Enter the appropriate NULL PROPORTION, 0.73 for this example.
      10. Choose the correct ALTERNATIVE hypothesis.
      11. Click on CALCULATE.

      The resulting table contains the estimate, the test statistic (called Z-stat), and the p-value. Identify these values from the table of results.

      $\hat{p}$ = 0.66

      z* = -2.2298

      p-value = 0.0258

   c. Perform an $\alpha = 0.05$ significance level test. State your conclusions.

Because the p-value is less than $0.05 = \alpha$ the test is significant at the 0.05 level. we conclude that there is evidence to reject the hypothesis (null hypothesis) that the proportion of students at the state university that identify as well off is the same as the national average.

c. Go to STAT/Z STATISTICS/ONE SAMPLE/WITH DATA. Select the variable. Enter 10 for the standard deviation and select NEXT. Enter the correct NULL: MEAN and ALTERNATIVE hypothesis. Click on CALCULATE.

d. From the StatCrunch output:

i. What is the sample mean?

501.533

ii. What is the test statistic?

0.593785

iii. What is the p-value?

0.2763

iv. What conclusions can you draw about the machinery?

reject
We do not have evidence to ~~support~~ the ~~Ho~~ hypothesis that the mean is actually 500 in favor of $\mu > 500$

3. In the previous problem, suppose instead that the plant manager had taken an SRS of size n = 50 pills. Repeat the previous problem using the same sample mean (501.53) and same population standard deviation (10) but assume that the sample mean was found from an SRS of size n = 50.

Go to STAT/Z STATISTICS/ONE SAMPLE/WITH SUMMARY.
Enter 501.53 for the mean, 10 for the standard deviation, and 50 for the sample size.
Select NEXT. Enter the correct NULL: MEAN and ALTERNATIVE hypothesis. Click on CALCULATE.

What conclusions can you draw about the machinery?

With ~~the~~ a sample size of 50 the p value is smaller $p = 0.1397$ but we still cannot reject the hypothesis that the dosage is correct

4. Repeat the previous problem with n = 200. What conclusions do you now draw about the machinery? How does changing the sample size change the hypothesis test results?

p value 0.0152
Here we can reject the hypothesis that the mean is correct in favor of the alternative that the mean is too large

d. Give a 95% confidence interval for the proportion of all first-year students at the state university who would identify being well-off as an important personal goal. To do this in StatCrunch, repeat the steps above but select CONFIDENCE INTERVAL in step (8) and enter 0.95 for the CONFIDENCE LEVEL.

(0.594, 0.7256)

e. Interpret your confidence interval.

we are 95% confident that the true proportion of students at the state university lies between 0.594 and 0.7256.

f. What is the relationship between the results of your hypothesis test in and the confidence interval you found in (d)?

Because 0.73 is outside the confidence interval, the test with null hypothesis $p = 0.73$ is significant at the 0.05 level.

2. The distribution of the amount of medication in a particular pill is known to vary normally with unknown mean μ and standard deviation 10 mg. A pharmaceutical company that manufactures this pill advertises that they contain 500 mg of a particular medication. The plant manager where the medication is produced believes the machinery is incorrectly calibrated and the amount of medication in the pills is actually more than 500 mg. She takes a simple random sample of 15 pills and has them analyzed for the amount of medication they contain. The amount in the 15 pills, in mg, is:

507	503	493	500	488	514	502	520	489	503	511	495	496	498	504

Perform the appropriate hypothesis test by answering the following questions:

a. State the null and alternative hypotheses.

$H_0: \mu = 500$

$H_a: \mu > 500$ you can use one sided alternative here because you believed in advance that $\mu > 500$ and you don't care about $\mu < 500$

b. Enter the data into the StatCrunch data table.