Classroom Activity 7 — Math 113 — Name : ____________________
10 pts — Intro to Applied Stats

Materials Needed:

Bags of popcorn, watch with second hand or microwave with digital timer.

Instructions:

Follow the instructions on the bags of popcorn, do NOT simply hit the popcorn button on the microwave.

Popping Instructions

Brand 1 - ACT II Popcorn

Pop on HIGH at full power until bag expands and popping slows to 1-2 seconds between pops. Normal popping time is 2-5 minutes.

Brand 2 - Orville Redenbacher Popcorn

Pop on HIGH (full power) until rapid popping slows to 2-3 seconds between pops. Normal popping time is between 2 and 5 minutes.

Do the following for each bag.

1. Pop the popcorn.
2. Record the number of seconds before the first kernel pops.
3. Let the popcorn pop until the popping slows to the rate indicated in the instructions.
4. Open the bag. Count and record the number of popped and un-popped kernels.

1. Record your results in the table below. Record times in seconds. The variable names in the boxes are values you'll use for question 2.

	ACT II	Redenbacher	Total
Seconds until first kernel pops			
Total Popping Time (sec)			
Number of popped kernels	x_1	x_2	x_1+x_2
Number of un-popped kernels			
Total number of kernels	n_1	n_2	n_1+n_2
Percentage of popped kernels	$\hat{p}_1$	$\hat{p}_2$	$\overline{p}$

Give your data to the instructor who will make it available to the class. You can go ahead and answer question 2 while waiting on the classroom data. Problems 3 and 4 use the class data.

2. Using *your data only*, test the claim that at the 0.10 level of significance, there is no difference in the proportion of popped kernels (sect 8.4).

   a. We're testing two proportions. Proportions are based on the binomial experiment, so let's verify the conditions of a binomial experiment. For each bag of popcorn, were there a fixed number of independent trials each having only two outcomes? If not, explain why.

   b. All of our parametric hypothesis testing involves normality in some manner. How is that requirement satisfied for this type of test?
      i. The number of kernels popped is normally distributed (use qq-plot to test)
      ii. The sample size is at least 31, so the Central Limit Theorem applies.
      iii. The expected frequency of each category is at least 5.

   c. If you answered that the number of kernels popped is normally distributed (answer a) in the last question, then generate a normal probability plot for the number of kernels popped and see if the data appears normally distributed. The number of kernels popped (does / does not) appear to be normally distributed.

   d. Write the original claim symbolically.

   e. The original claim is the (null / alternative) hypothesis.

   f. Write the null hypothesis and alternative hypotheses:

      H_0:

      H_1:

   g. This is a (left tail / right tail / two tail) test.

   h. The level of significance is α = ___________.

   i. We use the (uniform / binomial / normal / student's t / chi-square / F) distribution to test our hypothesis.

j. The critical value(s) is/are ______________.

k. The test statistic is ______________.

l. The probability value is ______________.

m. The test statistic (does / does not) lie in the critical region.

n. The decision is to (reject / fail to reject) the null hypothesis.

o. There is (sufficient / insufficient) evidence to (reject / support) the claim that there is no difference in the proportion of popped kernels between Act II and Orville Redenbacher.

p. There is (sufficient / insufficient) evidence to (reject / support) the claim that there is a difference in the proportion of popped kernels between Act II and Orville Redenbacher.

3. Use the *combined class data* to test the claim at the 0.10 level of significance that there is no difference in the *first kernel popping time* of the two brands using the dependent case (sect 8.3) by forming a new random variable which is the difference between Act II and Orville Redenbacher's (let d = Act II - Redenbacher).

n	
$\bar{d}$	
s_d	

a. All of our parametric hypothesis testing involves normality in some manner. How is that requirement satisfied for this type of test?
   i. The difference in first kernel popping times are normally distributed (use qq-plot to test).
   ii. The sample size is at least 31, so the Central Limit Theorem applies.
   iii. The expected frequency of each category is at least 5.

b. Write the original claim symbolically.

c. The original claim is the (null / alternative) hypothesis.

d. Write the null and alternative hypotheses:

H_0:

H_1:

e. This is a (left tail / right tail / two tail) test.

f. The level of significance is α = ___________.

g. We will use the (uniform / binomial / normal / student's t / chi-square / F) distribution to test our hypothesis.

h. The critical value(s) is/are ______________.

i. The test statistic is ______________.

j. The probability value is ______________.

k. The test statistic (does / does not) lie in the critical region.

l. The decision is to (reject / fail to reject) the null hypothesis.

m. There is (sufficient / insufficient) evidence to (reject / support) the claim that there is no difference in the first kernel popping time.

n. There is (sufficient / insufficient) evidence to (reject / support) the claim that there is a difference in the first kernel popping time.