Math 113: Classroom Activity 7   Name : _____
10 pts

Materials Needed:
   Bags of popcorn.

Instructions:
   Use the same microwave for both bags of popcorn. You may follow the
   instructions on the bags of popcorn or use the popcorn button on the microwave if
   there is one.

               Pop Secret is sample 1 and Act II is sample 2.

   Flip a coin. If it is heads, pop Pop Secret first and if it is tails, pop Act II first.

   Use the same microwave and do the following for each bag.
   1.   Pop the popcorn.
   2.   Open the bag. Count and record the number of popped and un-popped
         kernels.

1.   Record your results in the table below.

	Pop Secret	Act II	Total
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
Proportion of popped kernels	$\hat{p}_1$	$\hat{p}_2$	$\overline{p}$

**Use a 0.05 level of significance to test the claim that there is no difference in the
proportion of popped kernels.**

2.   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.

3.	All of our parametric hypothesis testing involves normality in some manner. How is that requirement satisfied for this type of test?
	a.	The number of kernels popped is normally distributed.
	b.	The sample size is large enough that the Central Limit Theorem applies.
	c.	The expected frequency of each category is at least 5 or the observed frequency of each category is at least 10.

4.	Write the original claim symbolically (circle one)

$$p_1 < p_2 \qquad p_1 = p_2 \qquad p_1 > p_2$$
$$p_1 \le p_2 \qquad p_1 \ne p_2 \qquad p_1 \ge p_2$$

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

6.	Write the null hypothesis and alternative hypotheses:

	H_0:

	H_1:

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

8.	The level of significance is $\alpha =$ _____.

9.	The critical value(s) is/are _____.

10.	The test statistic is _____.

11.	The probability value is _____.

12.	Complete the following table to demonstrate an understanding of the relationship between the values in questions 8-11. Label those four values appropriately.

z-score	area to left	area to right	twice smaller area

13. The 95% confidence interval for the difference is
     _____ $< p_1 - p_2 <$ _____.

14. Illustrate the figure as follows.
     a. Draw and label vertical line(s) at the critical value(s)
     b. Shade and label the critical region
     c. Label the non-critical region
     d. Label the area in the critical and non-critical regions. Use α notation
         (example, $\alpha = 0.05$ or $\alpha/2 = 0.025$, or $1 - \alpha = 0.95$)
     e. Identify the regions with "Reject H_0" or "Retain H_0"
     f. Draw and label a vertical line at the test statistic
     g. Label the area beyond the test statistic with the p-value.
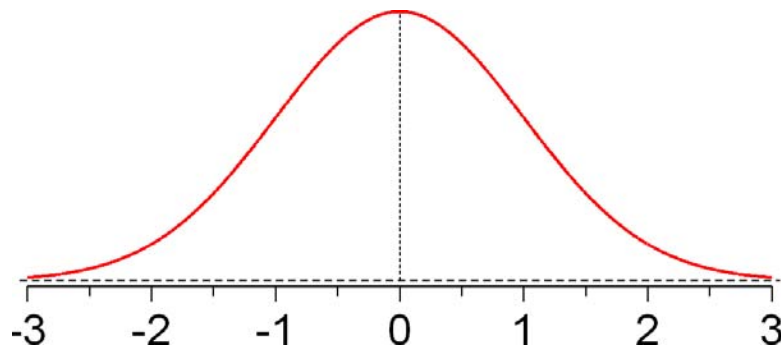
15. The test statistic (does / does not) lie in the critical region, so we (reject / retain)
     the null hypothesis.

16. The p-value is (less / greater) than the significance level, so we (reject / retain)
     the null hypothesis.

17. The claimed difference of 0 (does / does not) fall in the confidence interval, so we
     (reject / retain) the null hypothesis.

18. The decision is to (reject / retain) the null hypothesis

19. There (is / is not) enough evidence to (reject / support) the claim that there is no
     difference in the proportion of popped kernels between Pop Secret and Act II.

20. There (is / is not) enough evidence to (reject / support) the claim that there is a
     difference in the proportion of popped kernels between Pop Secret and Act II.