

**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	$\hat{p}_1$	$\hat{p}_2$	$\bar{p}$

**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)

$$p_1 < p_2 \quad p_1 = p_2 \quad p_1 > p_2$$

$$p_1 \leq p_2 \quad p_1 \neq p_2 \quad p_1 \geq p_2$$

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 \_\_\_\_\_.

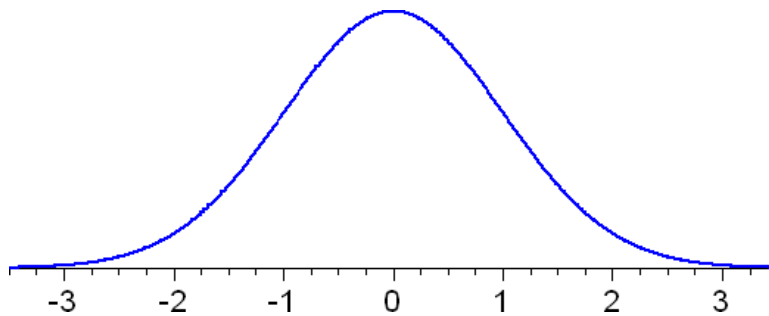
12. Complete the following table to demonstrate an understanding of the relationship between the values in questions 8-11. Label those four values appropriately.

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.

- Draw and label vertical line(s) at the critical value(s)
- Shade and label the critical region
- Label the non-critical region
- Label the area in the critical and non-critical regions. Use  $\alpha$  notation (example,  $\alpha = 0.05$  or  $\alpha/2 = 0.025$ , or  $1 - \alpha = 0.95$ )
- Identify the regions with "Reject  $H_0$ " or "Retain  $H_0$ "
- Draw and label a vertical line at the test statistic
- Label the area beyond the test statistic with the p-value.



- The test statistic ( does / does not ) lie in the critical region, so we ( reject / retain ) the null hypothesis.
- The p-value is ( less / greater ) than the significance level, so we ( reject / retain ) the null hypothesis.
- The claimed difference of 0 falls ( inside / outside ) the confidence interval, so we ( reject / retain ) the null hypothesis.
- The decision is to ( reject / retain) the null hypothesis
- 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.
- 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.