# Hypothesis Testing

## Two Sample Proportions

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Much of the material will be the two-sample version of hypothesis testing of a single proportion.

# Test Statistic and $p$-Value

The test statistic for two sample proportions is given by

$$t = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}}$$

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The $p$-value is found in the same manner as other sections.

# Confidence Intervals

The $1 - \alpha$ confidence interval is calculated as

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

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Remember, if our confidence interval contains the claimed difference in population proportions, we do not reject the null hypothesis.

# Example 1

A poll of 450 registered voters is taken and 43% of them would vote for the incumbent candidate. A week later a poll of 300 registered voters is taken and 41% of them would vote for the incumbent candidate.

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$H_0 : \; p_1 = p_2$
$H_A : \; p_1 \neq p_2$