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- A confidence interval gives an estimated range of values which is likely to include an unknown population parameter calculated from a given set of sample data. In statistical inference, one wishes to estimate population parameters using observed sample data.

For population proportion specifically, The parameter, p, is the true proportion. A random sample is taken and the point estimate, $\hat{p} = \frac{\#\ success}{n}$. We determine a confidence interval that is likely to contain the unknown parameter.

The formula used for confidence intervals of a proportion:

$$\left(\hat{p} - z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}, \hat{p} + z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right)$$

For two proportions:

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

We can also determine a Hypothesis test population proportion which will help a candidate determine if his proportion of votes is above .5.

There are two statements:
Null hypothesis- H_o
Alternative hypothesis- H_a

We assume H_o is true and stay with this unless the data suggests otherwise.
To perform a test:
Assume H_o is true
Divide the set of values into fail to reject and reject region
Collect the data
Calculate the test statistic using the formula given
We determine which region our test statistic is in and make that decision.

The formula for population proportion is

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$