Section 7.3 → **Confidence Intervals (Large Sample)** for a Population Proportion

**Process**

1) Gather \( \hat{p}, \hat{q} = 1 - \hat{p}, n \), level of confidence. Random sample must contain at least 10 successes \( \frac{n}{2} \) and 10 failures.
2) \( \alpha = 1 - \text{(level of confidence)} \)
3) Look up \( Z_{\alpha/2} \).

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<th>( Z_{\alpha/2} )</th>
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4) \( E = Z_{\alpha/2} \sqrt{\frac{\hat{p} \hat{q}}{n}} \leftarrow \text{maximum error in the } \hat{p} \text{ estimate of } p. \)

5) **Confidence Interval**: \( \hat{p} - E < p < \hat{p} + E \)

**Interpretation**: The level of confidence is the proportion of such confidence intervals that actually contain the parameter, \( p \).

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**Example**

You randomly survey 750 voters, 360 voted for Prop 30. Construct a 96% confidence interval for the population proportion.

1) \( \hat{p} = \frac{x}{n} = \frac{360}{750} = .480 \quad \hat{q} = 1 - \hat{p} = .520 \quad n = 750 \quad \text{Conf} = .96 \)
   
   We have 360 successes \( \frac{n}{2} \) and 390 failures.

2) \( \alpha = 1 - \text{Conf} = 1 - .96 = .04 \)

3) \( Z_{\alpha/2} = 1.96 \rightarrow Z_{.02} = 2.05 \)

4) \( E = Z_{\alpha/2} \sqrt{\frac{\hat{p} \hat{q}}{n}} = 2.05 \sqrt{\frac{.480 \times .52}{750}} = .037 \)

5) \( \hat{p} - E < p < \hat{p} + E \)

\( .480 - .037 < p < .480 + .037 \rightarrow .443 < p < .517 \)