Finishing 7.2 \rightarrow \text{Binomial Experiments} \downarrow \text{Estimates of Population Proportions.}

→ Sample Proportion: \( \hat{p} = \frac{x}{n} \) (varies from sample to sample)

The sampling distribution of sample proportions is a collection of all \( \hat{p} \) values from random samples of size \( n \). What we know:

→ The \( \hat{p} \) distribution is approx. normal if \( np \geq 10 \) and \( n(1-p) \geq 10 \).

→ Mean of \( \hat{p} \) values is the population proportion, \( p \)

\[ \mu_{\hat{p}} = E(\hat{p}) = p \leftarrow \text{estimate of } p \]

→ The variance of \( \hat{p} \) values is

\[ \text{Var}(\hat{p}) = \frac{pq}{n} \]

→ The standard error (deviation) of \( \hat{p} \) values is the square root of variance:

\[ \sigma_{\hat{p}} = \sqrt{\frac{pq}{n}} \]

→ The maximum error in an estimate, \( \hat{p} \), of \( p \) is

\[ E = Z_{\frac{a}{2}} \cdot \left( \text{error} \right) = Z_{\frac{a}{2}} \cdot \sqrt{\frac{pq}{n}} \]

→ Confidence Interval

\[ \hat{p} - E < p < \hat{p} + E \]

\[ Z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} \]

\[ p \leftarrow \hat{p} - E < p < \hat{p} + E \]