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 @ least 10 successes & 10 failures.

2) $\alpha = 1 - (\text{level of confidence})$

3) Look up $z_{\alpha/2}$.

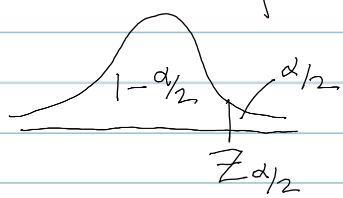

Table A1
hundredths
↑
$z_{\alpha/2} \leftarrow \approx 1 - \alpha/2$

4) $E = z_{\alpha/2} \cdot \sqrt{\dfrac{\hat{p}\hat{q}}{n}}$ ← maximum error in the $\hat{p}$ estimate of p.

5) Confidence Interval: $\hat{p} - E < p < \hat{p} + E$
unknown population proportion

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

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

1) $\hat{p} = \dfrac{x}{n} = \dfrac{360}{750} = .480$, $\hat{q} = 1 - \hat{p} = .520$, $n = 750$, $conf = .96$
We have $360 \geq 10$ successes & $750 - 360 = 390 \geq 10$ failures.

2) $\alpha = 1 - conf = 1 - .96 = 0.04$.

3) Table A1
$2.0 \leftarrow \approx 1 - \overset{.02}{\alpha/2} = .98 \rightarrow z_{\alpha/2} = 2.05$

4) $E = z_{\alpha/2}\sqrt{\dfrac{\hat{p}\hat{q}}{n}} = 2.05\sqrt{\dfrac{.48 \cdot .52}{750}} = .037$

5) $\hat{p} - E < p < \hat{p} + E$
$.480 - .037 < p < .480 + .037 \rightarrow .443 < p < .517$