Cheat Sheet

Confidence Interval: Inferring about a population parameter from a sample statistic

- The confidence level, γ, represents how confident we are the interval will contain the population parameter (population proportion or population mean).
- To get $z^\star$, find $z^\star$ such that $P(|Z| < z^\star) = \gamma$. To do that, first get percentile, ℓ, from confidence level (γ):

$$\ell = \frac{\gamma + 1}{2}$$

  then, use the z-table to find $z^\star$ such that $P(Z < z^\star) = \ell$.

Proportion

The population proportion, p, is estimated with an interval (to indicate uncertainty) based on a sample proportion, $\hat{p}$.

- Bounds:

$$\hat{p} \pm z^\star \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

- Necessary sample size for a given margin of error:
  - If $\hat{p}$ is known:

$$n = \hat{p}(1-\hat{p})\left(\frac{z^\star}{ME}\right)^2$$

  - If $\hat{p}$ is unknown, assume it is 0.5 to be conservative

$$n = \frac{1}{4}\left(\frac{z^\star}{ME}\right)^2$$

Mean

The population mean, μ, is estimated with an interval (to indicate uncertainty) based on a sample mean, $\bar{x}$.

- Bounds:
  - If σ is known:

$$\bar{x} \pm z^\star \cdot \frac{\sigma}{\sqrt{n}}$$

  - If σ is unknown, use the sample standard deviation (and $t^\star$). Remember, $df = n-1$. To get $t^\star$, find $t^\star$ such that $P(|T| < t^\star) = \gamma$ and $df = n-1$.

$$\bar{x} \pm t^\star \cdot \frac{s}{\sqrt{n}}$$

- Necessary sample size for a given margin of error:

$$n = \left(\frac{z^\star \sigma}{ME}\right)^2$$