# Cheat Sheet

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

- To get $z^\star$, first get percentile, $\ell$, from confidence level ($\gamma$):

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

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

- Bounds:
  - If $\sigma$ is known:

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

  - If $\sigma$ is unknown, use the sample standard deviation (and $t^\star$). Remember, $df = n - 1$.

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

- Necessary sample size for a given margin of error:

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