M339G: January 19th, 2024.

Review.

Confidence Intervals.

The Normal Case.

$\boxed{\text{We are in the normal model.}}$

Let $X_1, X_2, \dots, X_n$ be a normal random sample, i.e.,

$\{X_i, i = 1, \dots, n\}$ are all independent, and

$$X_i \sim Normal(mean = \mu, sd = \sigma)$$

?

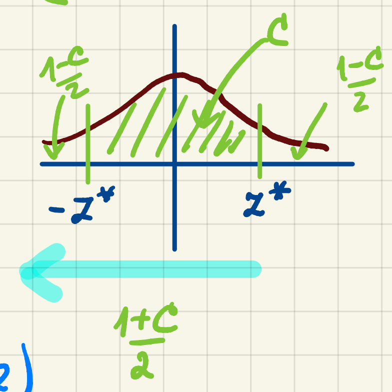
We know exactly the dist'n of the sample mean:

$$\longrightarrow \quad \bar{X}_n \sim Normal\left(mean = \mu, sd = \frac{\sigma}{\sqrt{n}}\right) \quad ✓$$

We know that $\bar{X}_n$ is a "good" estimator for the population mean μ.

$$\mathbb{P}\left[\bar{X}_n - z^* \cdot \frac{\sigma}{\sqrt{n}} < \mu < \bar{X}_n + z^* \cdot \frac{\sigma}{\sqrt{n}}\right] = C$$

Random interval



$$z^* = \Phi^{-1}\left(\frac{1+C}{2}\right) = \texttt{qnorm((1+C)/2)}$$