$X_1, X_2 \ldots X_n \sim \text{NORMAL}(\mu, 1)$

HOW DO YOU LEARN ABOUT μ FROM DATA $X_1, \ldots X_n$?

NEED AN ESTIMATOR FOR μ

$\bar{X} = \frac{1}{n}(X_1 + \ldots + X_n)$ ESTIMATES μ

"FIND THE UNCERTAINTY" BY STUDYING THE ESTIMATOR

$\bar{X}$ IS RANDOM VARIABLE

$$E(\bar{X}) = E\left(\frac{1}{n}\sum_{i=1}^{n} X_i\right) = \frac{1}{n}\sum_{i=1}^{n} E(X_i) = \frac{1}{n} \cdot n\mu = \mu$$

$$\text{Var}(\bar{X}) = \text{Var}\left(\frac{1}{n}\sum_{i=1}^{n} X_i\right) = \frac{1}{n^2}\sum_{i=1}^{n} \text{Var}(X_i) = \frac{1}{n^2} n 1 = \frac{1}{n}$$

$\bar{X} \sim \text{NORMAL}\left(\mu, \frac{1}{n}\right)$

WANT: $\mu \sim \text{NORMAL}\left(\bar{X}, \frac{1}{n}\right)$