

## Confidence Intervals.

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

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

and  $X_i \sim \text{Normal}(\text{mean}=\mu, \text{sd}=\sigma)$   
? known

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

$$\bar{X}_n \sim \text{Normal}(\text{mean}=\mu, \text{sd}=\frac{\sigma}{\sqrt{n}})$$

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

C... confidence level

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

$$\text{w/ } z^* = \Phi^{-1}\left(\frac{1+C}{2}\right) = q_{\text{norm}}((1+C)/2)$$

