The main idea behind Confidence Intervals (CI's) and Tests of Significance

• For large samples, the sampling distribution of $\bar{X}$ and $\hat{p}$ is approximately Normal.

• It is unusual to see a Normal value more than ± 2 standard deviations from the mean.

• 95% of the time, Normal values fall within ± 2 standard deviations of the mean.

Details:

• For inference about the **mean** μ of a numeric variable, the standard deviation is $\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$.

σ_x is the standard deviation of the the values being averaged, and may be estimated by s_x.

• For inference about a probability or population **proportion** p, the sd is $\sigma_{\hat{p}} \; = \leq \frac{0.5}{\sqrt{n}}$.

$\hat{p}$ is the sample proportion of "successes" in n independent trials.

Examples:

• Compare your random averages of 5 coin blobs to the mean value $\mu = 7.15$.

• Test whether or not you have ESP by repeatedly trying to guess at one of five shapes.

• Compare the mean score for older college students on the SSHA test to the overall mean $\mu = 115$.

• Compare the proportion of first-years at your college who "use the internet frequently for research or homework" to the estimated national proportion $p = 0.759$.

• Compare the mean value for a random number generator to the theoretical value $\mu = 0.5$.

• Compare the proportion of girls born to chemists to the state average $p = 0.488$.

• Compare the graduation rate for athletes at a large university to the overall rate $p = 0.71$.