STAT371 DISCUSSION 5 October 6, 2002

1. The sampling distribution of $\bar{Y}$

   - Mean. The mean of the sampling distribution of $\bar{Y}$ is equal to the population mean. In symbols,

   $$\mu_{\bar{Y}} = \mu$$

   - Standard deviation. The standard deviation of the sampling distribution of $\bar{Y}$ is equal to the population standard deviation divided by the square root of the sample size. In symbols,

   $$\sigma_{\bar{Y}} = \frac{\sigma}{\sqrt{n}}$$

     Comparing: the sample standard deviation is

   $$s = \sqrt{\frac{\sum (y_i - \bar{y})^2}{n-1}}$$

   - Shape. (a) If the population distribution of Y is normal, then the sampling distribution of $\bar{Y}$ is normal, regardless of the sample size n.
     (b) *Central Limit Theorem* If n is large, then the sampling distribution of $\bar{Y}$ is approximately normal, even if the population distribution of Y is not normal.

2. Normal approximation of binomial distribution

   - If n is large, then the binomial distribution can be approximated by a normal distribution with

   $$\text{Mean} = np \qquad \text{Standard deviation} = \sqrt{np(1-p)}$$

   - If n is large, then the sampling distribution of $\hat{p}$ can be approximated by a normal distribution with

   $$\text{Mean} = p \qquad \text{Standard deviation} = \sqrt{\frac{p(1-p)}{n}}$$

   - The normal approximation to the binomial distribution is fairly good if both np and $n(1-p)$ are at least equal to 5.