Section 6-5
The Central Limit Theorem

Central Limit Theorem
Given:
1. The random variable $x$ has a distribution (which may or may not be normal) with mean $\mu$ and standard deviation $\sigma$.
2. Samples of size $n$ are randomly selected from the population of $x$ values.

Conclusions:
1. The distribution of sample $\bar{x}$ will, as the sample size increases, approach a normal distribution.
2. The mean of the sample means will be the population mean $\mu$.
3. The standard deviation of the sample means will approach $\sigma/\sqrt{n}$.
Practical Rules Commonly Used:

1. For samples of size \( n \) larger than 30, the distribution of the sample means can be approximated reasonably well by a normal distribution. The approximation gets better as the sample size \( n \) becomes larger.

2. If the original population is itself normally distributed, then the sample means will be normally distributed for any sample size \( n \) (not just the values of \( n \) larger than 30).

Notation

the mean of the sample means

\[ \mu_{\bar{x}} = \mu \]

the standard deviation of sample mean

\[ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \]

(often called standard error of the mean)