AP Statistics

Chapter 7:
Sampling Distributions

Day 3

HW: p. 454-456, #53, 55, 59, 65-68

Sample Means

Sample proportions arise most often when we are interested in categorical variables.

When we are interested in quantitative variables, we use <u>sample means</u> .

Sample Means

- The mean of the sampling distribution of is $\bar{x}$

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

- The standard deviation of the sampling distribution of $\bar{x}$ is

$\sigma_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

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

Conditions

$n \le \frac{1}{10}N$

The 10% condition must be satisfied.

The Central Limit Theorem:

- If you are not told that the sampling distribution is approximately normal.
- If the population distribution is not normal, the central limit theorem tells us that the sampling distribution of $\bar{x}$ will be approximately normal in most cases if n $\geq$ 30.

Example

Suppose that tomatoes weigh an average of 10 ounces with a standard deviation of 3 ounces and a store sells boxes containing 12 tomatoes each. If customers determine the average weight of the tomatoes for each box they buy, what will be the mean and standard deviation of these averages?

$n = 12$ $\mu_{\bar{x}} = 10$

$\sigma_{\bar{x}} = \frac{3}{\sqrt{12}} = .866$

Suppose that the distribution for total amounts spent by students vacationing for a week in Florida is normally distributed with a mean of \$650 and a standard deviation of \$120. What is the probability that an SRS of 10 students will spend an average of between \$600 and \$700?

$P(-1.32 < z < 1.32) = .9066 - .0934 = \boxed{.8132}$

$\mu_{\bar{x}} = 650$

$\sigma_{\bar{x}} = \frac{120}{\sqrt{10}} = 37.95$

Normal Condition

Stated to be normally distributed.

$P(600 < x < 700)$

$z = \frac{600-650}{37.95} = -1.32$

$z = \frac{700-650}{37.95} = 1.32$

10% condition

$10 \le \frac{1}{10}N$

$100 \le N$

we can assume that there are at least 100 students

Example

Suppose that the average outstanding credit card balance for young couples is \$650 with a standard deviation of \$420. In an SRS of 100 couples, what is the probability that the mean outstanding credit card balance <u>exceeds \$700</u>?

$\mu_{\bar{x}} = 650$

$\sigma_{\bar{x}} = \frac{420}{\sqrt{100}} = 42$

<u>10% condition</u>

$100 \leq \frac{1}{10} N$

$1000 \leq N$

we can assume that there are at least 1000 young couples

<u>Normal Condition</u>

According to the CLT, since there are at least 30 couples in our SRS, we can assume our distribution is appox. normal.

$P(\bar{x} > 700)$

$z = \frac{700-650}{42} = 1.19$

$P(z > 1.19) = 1 - .8830 = .117$