Chapter 7: Sampling Distributions

(REQUIRED NOTES) ***Section 7.2: Sample Proportions***

1) What is the difference between "p" and the sample proportion $\hat{p}$?
   - "p" *is population parameter for a proportion and it is a constant value*
   - $\hat{p}$ *is a sample statistic for a proportion (#successes/sample size)*

2) What is the purpose of the sample proportion ("phat") ?
   - *Want $\hat{p}$ to be an unbias estimator for the population proportion*

3) In an SRS of size n, what is true about the sampling distribution of $\hat{p}$ when the sample size n increases?
   - *As the sample size increases, $\hat{p}$ is a more reliable estimator for the population proportion*

4) In an SRS of size n:

   a. What is the mean of the sampling distribution of $\hat{p}$?

   The **mean** of the sampling distribution of $\hat{p}$ is $\mu_{\hat{p}} = p$

   b. What is the standard deviation of the sampling distribution of $\hat{p}$? **What condition must be checked?**

   The **standard deviation** of the sampling distribution of $\hat{p}$ is

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

   as long as the *10% condition* is satisfied : $n \le (1/10)N$.

4) What happens to the standard deviation of $\hat{p}$ as the sample size n increases?
   - As the sample size n increases, the standard deviation of $\hat{p}$ decreases.

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5) When the sample size n is large, the sampling distribution of $\hat{p}$ is approximately Normal. What test can you use to determine if the sample is large enough to assume that the sampling distribution is approximately normal? **What condition must be checked?**

You must check the following 2 conditions have been met

$np \geq 10$ and

$n(1-p) \geq 10$

then the sampling distribution of $\hat{p}$ is approximately Normal

6) **CHECK YOUR UNDERSTANDING** (page 437) complete questions 1-4

Check Your Understanding, page 437:

1. The mean of the sampling distribution is the same thing as the population proportion. In this case $\mu_{\hat{p}} = 0.75$.

2. The standard deviation of the sampling distribution is: $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.75(0.25)}{1000}} = 0.0137$.

There are more than 10,000 young adult internet users, so the 10% condition has been met.

3. The sampling distribution of $\hat{p}$ is approximately Normal. Both $np = 1000(0.75) = 750$ and $n(1-p) = 1000(0.25) = 250$ are greater than 10.

4. If the sample size were 9000 instead of 1000, the sampling distribution would still be approximately Normal with mean 0.75. But the standard deviation of the sampling distribution would be smaller by a factor of 3. In this case $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.75(0.25)}{9000}} = 0.0046$.