

1. What does  $\hat{p}$  represent? *sample proportion*
2. What does  $p$  represent? *population proportion*
3. Define what it means for  $\hat{p}$  to be an unbiased estimator of  $p$ .

the mean of all the  $\hat{p}$  for *all possible* samples of size  $n$  equals  $p$

$$\mu_{\hat{p}} = p$$

4. Define and show the formula for  $\sigma_{\hat{p}}$ :

$\sigma_{\hat{p}}$  is the standard error for the sampling distribution of  $\hat{p}$  for samples of size  $n$

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

As long as what condition is met?

as long as  $n \leq \frac{1}{10} N$  or each sample is independent

5. What conditions must be met in order to use Normal Calculations?

$$np \geq 10 \text{ and } n(1-p) \geq 10$$

at least 10 predicted successes and failures

About 60% of internet users in South Carolina are 18-29. A survey contacts a SRS of 1000 internet users in SC and calculates the proportion,  $\hat{p}$ , that are 18-29. There were 607 internet users in the sample from 18-29 years old.

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

$$\mu_{\hat{p}} = p = 0.60 \text{ b/c } \hat{p} \text{ is an unbiased estimator of } p$$

7. Can we treat the subjects as being independent? Why?

yes since  $n=1000$  is safely less than 10% of the population of internet users in SC

8. What is the value for  $\sigma_{\hat{p}}$ ?

$$\sigma_{\hat{p}} = \sqrt{\frac{(0.6)(0.4)}{1000}} = 0.0155$$

9. What shape is the sampling distribution of  $\hat{p}$ ? How do you know?

$\approx$  Normal since  $\begin{cases} np = 1000(0.6) \geq 10 \\ n(1-p) = 1000(0.4) \geq 10 \end{cases}$

10. What is the z-score for the 607/1000 internet users?

$$Z = \frac{\frac{607}{1000} - 0.6}{0.0155} = 0.4518$$