Lesson #41 · Topic 3B · Practice

Answer Key

1. a. $\sqrt{\frac{(0.76)(0.24)}{40}} = 0.068$
   b. $\sqrt{\frac{(0.41)(0.59)}{100}} = 0.049$

2. a. The random sampling condition makes the sample proportion an unbiased estimator of the population proportion and allows us to generalize results to the population of interest.
   b. The 10% condition allows us to consider individual observations independent of each other when sampling without replacement, so we can use the standard error formula for the sampling distribution of $\hat{p}$.
   c. The large counts condition ensures enough successes and failures in the sample for the sampling distribution of $\hat{p}$ to be approximately normal.

3. a. $p =$ true proportion of all U.S. college students who prefer studying alone rather than with others.
   b. Random: Students were randomly selected.
   10%: 1,000 $\leq$ 0.10(all college students in U.S.)
   Large Counts: 1,000(0.84) = 840 $\geq$ 10, 1,000(0.16) = 160 $\geq$ 10
   c. $\hat{p}$ = 0.84, $SE_{\hat{p}} = \sqrt{\frac{(0.84)(0.16)}{1000}} = 0.0116$
   d. z^* = 1.96
   e. 1.96(0.0116) = 0.0227
   f. (0.817, 0.863)
   g. We are 95% confident that the interval from 0.817 to 0.863 captures the true proportion of all U.S. college students who prefer studying alone rather than with others.

4. Only the large counts condition has not been met since $n\hat{p} =$ 3, which is less than 10. The random and 10% conditions have been met because the pages were randomly selected and the sample of 20 pages is less than 10% of the total number of pages in the document (360).

5. (0.659, 0.821); We are 90% confident that the interval from 0.659 to 0.821 captures the true proportion of this podcaster's listeners who prefer the new shorter style of episodes.

6. a. $\hat{p} = 0.04$
   b. $\hat{p} = 0.50$
   c. $\hat{p} = 0.35$ and $\hat{p} = 0.65$ because the numerator for the standard error formula, $\hat{p}(1-\hat{p})$, is the same for both sample proportions: (0.35)(0.65) = (0.65)(0.35) = 0.2275.
   d. The margin of error is largest when $\hat{p} = 0.5$ and gets [illegible] direction.

7. A

8. C