MCTC C-Now Intro Stats **Ch. 8 Review** **Name** KEY

LT 8.A – *I can find a probability based on a sampling distribution of sample means or sample proportions.*

1. A random sample of 500 people was selected from the 103,219 people in attendance at a Super Bowl game between the Green Bay Packers and the Pittsburgh Steelers. Within the sample, 290 people (or 58%) supported the Packers.

a) Does this mean that 58% of the entire stadium supported the Packers? Why or why not?

No because it's only from a sample. It's a good estimate, but it would likely be different if we took a different sample of people.

b) Would you be more confident of your estimate if you increased or decreased the sample size?

Increased because the closer our sample size is to the population size, the better our estimate will be.

2. In a survey of children 5 to 17 years old, 1,050 children were randomly selected from the nine states in the Northeast, and the proportion who spoke a language other than English in their home was 0.19 (or 19%). Is that sample proportion a good estimate for the proportion of all children in the United States who speak a language other than English in their home? Why or why not?

No because the sample only came from the nine NE states. The sample should be taken from the entire U.S.

3. Assume that cans of Coke are filled so that the actual amounts have a mean of 12.00 ounces. A random sample of 36 cans has a mean amount of 12.19 ounces. The distribution of amounts in all cans of Coke is normal with a mean of 12.00 ounces and a standard deviation of 0.12 ounce. What is the probability that a random sample of size 36 has a mean of at least 12.19 ounces?

$\mu_{\bar{x}} = \mu = 12$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{0.12}{\sqrt{36}} = .02$

$Z = \frac{12.19 - 12}{.02} = 9.5 \xrightarrow{\text{Table}} 1 - .9999 = \boxed{.0001}$

Calc $\rightarrow \boxed{1.067 \times 10^{-21}}$

4. The College of Portland has 2,444 students and 269 of them are left-handed. You conduct a survey of 50 students and find that 8 of them are left-handed. What is the probability that a random sample of 50 students would have a sample proportion at least as large as the one observed in this sample?

$\hat{p} = \frac{8}{50} = .16$

$\mu_{\hat{p}} = p = \frac{269}{2444} = .11$

$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{.11(1-.11)}{50}} = .044$

$Z = \frac{.16 - .11}{.044} = 1.14 \xrightarrow[\text{Calc}]{\text{Table}} 1 - .8729 = \boxed{.1271}$

LT 8.B – *I can construct and interpret a confidence interval for a population mean or a population proportion.*

5. Find the margin of error corresponding to each 95% confidence interval.

a) $98.0 < \mu < 98.6$

$$E = \frac{98.6 - 98.0}{2} = \boxed{.3}$$

b) $0.440 < p < 0.500$

$$E = \frac{.500 - .440}{2} = \boxed{.03}$$

6. The Gallup Organization conducted a survey of 1,016 randomly selected U.S. adults who were asked:

> *"As you may know, former major league player Pete Rose is ineligible for baseball's Hall of Fame due to charges that he had gambled on baseball games. Do you think he should or should not be eligible for admission to the Hall of Fame?"*

Among those surveyed, 59% believed that Pete Rose should be eligible. Construct and interpret a 95% confidence interval for the population proportion.

$$\hat{p} \pm E \rightarrow \begin{array}{l} \hat{p} = .59 \\ E = 2\sqrt{\frac{(.59)(1-.59)}{1016}} = .03 \end{array} \rightarrow .59 \pm .03 \rightarrow \boxed{.56 < p < .62}$$

We are 95% confident that the true proportion of all U.S. adults who believe Pete Rose should be eligible for the Hall of Fame is somewhere between 56% and 62%.

7. A sample of 40 randomly selected women is obtained and the blood platelet count of each subject is measured. The mean of the sample is 279.5 and the standard deviation is 65.2. Construct and interpret a 95% confidence interval for the population mean.

$$\bar{x} \pm E \rightarrow \begin{array}{l} \bar{x} = 279.5 \\ E = \frac{2(65.2)}{\sqrt{40}} = 20.62 \end{array} \rightarrow 279.5 \pm 20.62 \rightarrow \boxed{258.88 < \mu < 300.12}$$

We are 95% confident that the true mean blood platelet count of all women is between 258.88 and 300.12.

LT 8.C – *I can find the minimum sample size for a desired margin of error.*

8. You have been hired by Intel to determine the proportion of computer owners who plan to upgrade to a new operating system. Assuming that you want to be 95% confident that your sample proportion is within 0.02 (or two percentage points) of the true population proportion, how many people must you survey?

$$n = \frac{1}{E^2} = \frac{1}{.02^2} = \boxed{2500}$$

9. We want to estimate the mean IQ score on the Stanford-Binet test for the population of all college students. We know that for people randomly selected from the general population, the standard deviation of IQ scores on this test is 16. Using that standard deviation, how many college students must we randomly select for IQ tests if we want to have 95% confidence that the sample mean is within 3 IQ points of the population mean?

$$n = \left(\frac{2\sigma}{E}\right)^2 = \left(\frac{2 \cdot 16}{3}\right)^2 = 113.8 \rightarrow \boxed{114}$$

10. In a Pew Research Center poll of 745 randomly selected adults, 589 said that it is morally wrong to not report all income on tax returns. They thought that this sample proportion seemed a bit low for what they expected, so they planned on conducting another poll to determine whether the given sample results were accurate. How many adults would they need to randomly poll in order to be within 3 percentage points of the true population proportion with 95% confidence?

$$n = \frac{1}{E^2} = \frac{1}{.03^2} = 1111.1 \rightarrow \boxed{1112}$$

11. A government survey conducted to estimate the mean price of houses in a large metropolitan area is designed to have a margin of error of $10,000. Studies suggest that the population standard deviation is $65,500. Find the minimum sample size needed to estimate the population mean with the stated accuracy.

$$n = \left(\frac{2\sigma}{E}\right)^2 = \left(\frac{2 \cdot 65{,}500}{10{,}000}\right)^2 = 171.61 \rightarrow \boxed{172}$$