Lesson #42 · Topic 3B · Practice

Name _____

1. For each scenario, determine if the conditions for constructing a 90% confidence interval for the population proportion, p, are satisfied. If the conditions are met, clearly define the parameter and state the confidence level. If the conditions are not met, explain why not.

   a. A commercial baker selects a random sample of 15 muffins from the hundreds of muffins baked during that day. Of the muffins selected, two exceeded the maximum weight guideline, indicating too much batter was filled into the tin.

   b. The senior class at Paige's school has 530 students. Of the 40 randomly selected students she surveyed, 65% planned to attend a 4-year university after graduation.

2. In a national survey, Grand Canyon University collected responses from 1,000 randomly selected college students from various U.S. post-secondary institutions. The survey found that 63.8% of respondents preferred writing over typing class notes. Suppose you want to construct a 95% confidence interval to estimate the true proportion of all U.S. college students who prefer writing over typing class notes.

a. Classify the type of variables and type of study.

b. Define the parameter of interest and choose the appropriate inference procedure.

c. Check the appropriate conditions.

d. If conditions are met, perform the calculations and give the interval.

e. Interpret the confidence interval in context.

3. A polling organization wants to estimate the proportion of likely voters who plan to vote for a certain candidate in an upcoming election. They will select a random sample of likely voters and construct a 95% confidence interval. The polling organization wants to have a margin of error of less than 0.015.

   a. Using the conservative estimate for $\hat{p}$, how many likely voters should they include in their random sample?

   b. A preliminary poll by a different organization found that 62% of respondents plan to vote for this candidate. Will using 0.62 as an estimate for $\hat{p}$ increase or decrease the required sample size compared to part (a)?

   c. Calculate the required sample size using the results from the preliminary poll in part (b) as the estimate for $\hat{p}$. Was your prediction in part (b) correct?

4. A manufacturing company specialized in steel-based technology routinely samples their products for quality control. A particular type of small steel plate used in electric motors, called a lamella, requires a thickness of less than 0.35 mm. In a random sample of 800 lamellas, 98.3% met the thickness requirement. Over 300,000 lamellas are made every day.

   a. Construct and interpret a 90% confidence interval for the true proportion of all lamellas that meet the thickness requirement.

   b. In order to show an improvement in quality from the previous year, the company must demonstrate that at least 98% of the lamellas meet the thickness requirement. Based on the confidence interval in part (a), is there convincing statistical evidence that this goal has been achieved? Justify your answer.

5. The American Time Use Survey (ATUS) conducted by the U.S. Bureau of Labor Statistics collected data from 8,100 randomly selected adults and found that 85% of women in the sample and 70% of men in the sample spent time every day on household activities, such as cleaning, food preparation, or lawn care.

   a. Suppose you wanted to construct confidence intervals for men and women separately. Explain why this is not possible.

   b. Do you think a 95% confidence interval for the proportion of <u>all men</u> who spent time every day on household activities would be wider or narrower than the 95% confidence interval for the proportion of <u>all adults</u> who spent time every day on household activities? Give a reason for your answer.

6. A random sample of 50 customers at a local diner were asked to choose their favorite pie from four pies offered on the menu. The responses are shown in the table.

Favorite Pie	Number of Responses
Apple	21
Pecan	11
Chocolate	4
Strawberry	14

Based on this sample, a 95% confidence interval for the true proportion of all this diner's customers who prefer fruit pie is

A) 0.28 ± 0.124

B) 0.42 ± 0.137

C) 0.70 ± 0.107

D) 0.70 ± 0.127

7. A hospital wants to estimate the proportion of emergency room patients who are seen by a doctor within 1 hour of arrival. They plan to survey a random sample of patients and then construct a 90% confidence interval. Which of the following is the smallest sample size that will guarantee a margin of error of five percentage points or less?

A) 250

B) 275

C) 390

D) 425