Practice Assignment: Confidence Intervals for Proportions (Continued)

1) True or false: A confidence level associated with a calculated confidence interval tells us the likelihood that the population proportion is contained within that individual interval.

Answer: False

2) True or false: A confidence level associated with a calculated confidence interval refers to the method used to construct confidence intervals. That is, if we repeatedly took samples of a given size and constructed a confidence interval for each sample, in the long run, we'd expect that the percentage of confidence intervals that contain the population proportion would be equal to our chosen confidence level.

Answer: True

A Harris poll of a random sample of 2,113 adults in the United States in October 2010 reported that 72% (i.e., 1,521) of those polled said they believe stem cell research has merit.

3) Before constructing a confidence interval to estimate the population proportion of adults in 2010 who said they believe stem cell research has merit, determine whether the following conditions have been met:
   - Random sampling is used.
   - The sample is less than 10% of the population.
   - The sample is large enough that $n\hat{p} \geq 10$ and $n\left(1 - \hat{p}\right) \geq 10$.

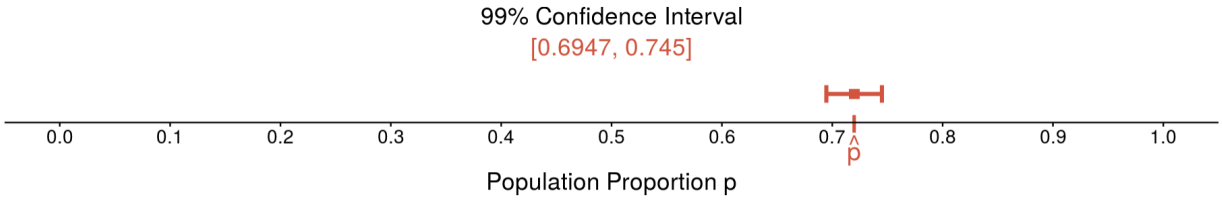
Answer: Yes, the conditions have been met. We are told it is a random sample. We can assume that 2,113 adults is less than 10% of the population of adults in the United States. 2,113(0.72) and 2,113(0.28) are both greater than 10.

4) The following picture shows a confidence interval constructed from the 2010 Harris survey result described previously. Which of the following is the correct interpretation of the confidence interval presented?

[Continued on the next page.]

Confidence Interval:

Population Parameter	Lower Bound	Upper Bound	Confidence Level
Proportion p	0.6947	0.7450	99%



a) There is a 95% chance that the population proportion of adults in 2010 who said they believe stem cell research has merit is between 0.6947 and 0.745, or 69.47% and 74.5%.

b) We can be 95% confident that the population proportion of adults in 2010 who said they believe stem cell research has merit is between 0.6947 and 0.745, or 69.47% and 74.5%.

c) There is a 99% chance that the population proportion of adults in 2010 who said they believe stem cell research has merit is between 0.6947 and 0.745, or 69.47% and 74.5%.

d) We can be 99% confident that the population proportion of adults in 2010 who said they believe stem cell research has merit is between 0.6947 and 0.745, or 69.47% and 74.5%.

Answer: d

5) Based on the previous confidence interval, is there evidence to support the claim that a majority (i.e., greater than 50%) of adults in the United States in 2010 said they believe stem cell research has merit? Explain.

Answer: Yes, our interval supports this claim. We can be 99% confident that the population proportion of 2010 is between 0.6947 and 0.745, or 69.47% and 74.5%. The entire interval is greater than 50%, which suggests that more than a majority said they believe stem cell research has merit.

A March 2021 *Morning Consult/Politico* poll of a random sample of U.S. adults asked participants about their preferred alcoholic beverages. Participants could select beer, wine, hard liquor, other, or “I do not drink alcoholic beverages.”

Out of the 1,922 participants, 450 said that they prefer beer.[1]

6) Calculate the point-estimate, $\hat{p}$, for the proportion of adults who said they prefer beer over other alcoholic beverages.

Point Estimate, $\hat{p}$	0.2341

Answer: Noted above in red.

7) Before constructing a confidence interval to estimate the population proportion of adults who said they prefer beer over other alcoholic beverages, determine whether the necessary assumptions have been met.

Answer: Yes. We are told it is a random sample. We can assume that 1,922 adults is less than 10% of the population of adults in the United States, and 1,922(0.2341) and 1,922(0.7659) are both greater than 10.

8) Use the appropriate data analysis tool to calculate a 95% confidence interval to estimate the proportion of adults who said they prefer beer over other alcoholic beverages.

Lower Bound	0.2152
Upper Bound	0.2531

Answer: Noted above in red.

9) Interpret the confidence interval using full sentences.

Answer: We can be 95% confident that the population proportion of adults in the United States who said they prefer beer over alcoholic beverages is between 0.2152 and 0.2531, or 21.52% and 25.31%.

10) In an online commercial, a beer manufacturer claims that 30% of adults identified beer as their favorite alcoholic beverage. Is this claim consistent with the previous confidence interval? Explain.

[1] Morning Consult + Politico. (2021). *National tracking poll #2102136, February 26 - March 1, 2021 [Survey report]*. https://assets.morningconsult.com/wp-uploads/2021/03/03081114/2102136_crosstabs_POLITICO_RVs_v2.pdf

Answer: We can be 95% confident that the population proportion of adults in the United States who said they prefer beer as their favorite alcoholic beverage is between 0.2152 and 0.2531, or 21.52% and 25.31%. The manufacturer's claim of 30% is outside of this interval, so the claim is not consistent with the calculated confidence interval.

Adults are encouraged to visit the dentist at least once a year. In the 2019 National College Health Assessment, 28,021 out of a random sample of 38,433 college students said they had a dental exam in the last 12 months.[2]

11) Calculate the point-estimate for the population proportion of college students who said they had a dental exam in the last 12 months.

Point Estimate, $\hat{p}$	0.7291

Answer: Noted above in red.

12) Before constructing a confidence interval to estimate the population proportion of college students who said they had a dental exam in the last 12 months, determine whether the necessary assumptions have been met. You can assume that the sample is less than 10% of the population.

Answer: Yes, the necessary assumptions have been met. We are told it is a random sample, and 38,433(0.7291) and 38,433(0.2709) are both greater than 10.

13) Use the appropriate data analysis tool to construct a 99% confidence interval to estimate the population proportion of college students who said they had a dental exam in the last 12 months.

Lower Bound	0.7232
Upper Bound	0.7349

Answer: Noted above in red.

14) Interpret your confidence interval using complete sentences.

[2] American College Health Association-National College Health Assessment. (2020). *Undergraduate student reference group data report, Fall 2019*. https://www.acha.org/NCHA/ACHA-NCHA_Data/Publications_and_Reports/NCHA/Data/Reports_ACHA-NCHAIII.aspx

Answer: We can be 99% confident that the population proportion of college students who said they had a dental exam in the last 12 months is between 0.7232 and 0.7349, or 72.32% and 73.49%.

15) True or false: If a confidence level of 95% is used instead of 99%, then the resulting confidence interval would be *wider* than the one calculated in Question 13.

Answer: False; lowering the confidence interval would result in a narrower interval.