Self-reflection on the learning goals

Unit 6 - Chapter 8 - Confidence Intervals

#	Learning Target	Got it	Almost There	Needs Some work
1	I can interpret a confidence level in context.			
2	I can interpret a confidence interval in context.			
3	I can explain that a confidence interval gives a range of plausible values for the parameter.			
4	I can explain why each of the three inference conditions - random, Normal, and independent - is important.			
5	I can explain how issues like nonresponse, undercoverage, and response bias can influence the interpretation of a confidence interval.			
6	I can can construct and interpret a confidence interval for a population proportion.			
7	I can determine critical values for calculating a confidence interval.			
8	I can determine the sample size necessary to obtain a level C confidence interval for a population proportion with a specified margin of error.			
9	I can explain how sample size and level of confidence C affect the margin of error of confidence interval.			
10	I can construct and interpret a confidence interval for a population mean.			
11	I can determine the sample size required to obtain a level C confidence interval for a population mean with a specified margin of error.			
12	I can determine sample size statistics from a confidence interval.			

*Identify where you are **(Got it, almost, needs work)** with each learning goal.*

We're playing Mathketball!

1. Ms. Congress has done over 50 track days at Sonoma Raceway. She keeps track of each lap time (in seconds) and has found that they follow an approximately normal distribution. A random sample of 9 laps shows a mean laptime of = 102.4 seconds with a standard deviation of = 3.2 seconds. Create a 90% confidence interval for Ms. Congress's career average lap time.

A) Name the type of interval

One Sample t interval for Mu (1pt)

B) Are the conditions Met

Random, 10%, Normal (1 pt)

C) Find the 90% CI

[100.416, 104.384] (2pts)

D) Write the Conclusion

We are 90% confident that the interval from 100.416 to 104.384 seconds captured the true mean career lap time. (2 pts)

1. Edgar Martinez and Ingrid Gustafson are the candidates for mayor in a large city. We want to estimate the proportion p of all registered voters in the city who plan to vote for Gustafson with 95% confidence and a margin of error no greater than 0.03. How large a random sample do we need?

$.03 = 1.96\sqrt{\frac{.5 \times .5}{n}}$ $\quad \hat{p} = 0.5$

$\left(\frac{.03}{1.96}\right)^2 = \sqrt{\frac{.5 \times .5}{n}}^2$

$n \times (.0153)^2 = \frac{.25}{n} \times n$ $\quad \rightarrow \quad n = \frac{.25}{.0153^2}$

$= 1067.96$

$= 1068$

A confidence interval estimate is determined from the summer earnings of an SRS of n students. All other things being equal, which of the following will result in a larger margin of error?

I. A greater confidence level
II. A larger sample standard deviation
III. A larger sample size

(A) I and II (B) I and III (C) II and III (D) I, II, and III

(E) None of the above gives the complete set of true responses.

Answer: (A) The margin of error varies directly with the critical z-value and directly with the standard deviation of the sample, but inversely with the square root of the sample size.

The acceptance rate at a particular college is 58 percent. If one takes an SRS of applicants to this college and constructs a confidence interval estimate of the acceptance rate, which of the following would be true?

I. The center of the interval would be 58 percent.
II. The interval would contain 58 percent.
III. A 99 percent confidence interval estimate would contain 58 percent.

(A) I and II (B) I and III (C) II and III (D) I, II, and III

(E) None of the above gives the complete set of true responses.

Answer: (E) There is no guarantee that 58 percent is anywhere near the interval, so none of the statements are true.

2. Mr. Jamison was an all-star basketball player in high school… for JV. To prove that he still has skills, he took 50 free throws and made 31 of them. Think of these 50 shots as being a random sample of all the free throws he has ever taken. Find a 99% confidence interval for the true proportion of free throws Mr. Jamison would make.

A) Name the type of interval

One Sample z interval for p (1pt)

B) Are the conditions Met

Random, 10%, Normal np & nq> 10 (1 pt)

C) Find the 99% CI

[.443,.797] (2pts)

D) Write the Conclusion

We are 99% confident that the true proportion of made free throws is captured by the interval from .443 to .797. (2 pts)

2. High school students who take the SAT Math exam a second time generally score higher than on their first try. Past data suggest that the score increase has a standard deviation of about 50 points. How large a sample of high school students would be needed to estimate the mean change in SAT score to within 2 points with 95% confidence?

M.O.E. $= t^* \frac{S_x}{\sqrt{n}}$

Use z^* instead

$2 = 1.96 \times \frac{50}{\sqrt{n}}$

$\sqrt{n} \cdot 1.02 = \frac{50}{\sqrt{n}} \times \sqrt{n}$

$\sqrt{n}^2 = \frac{50^2}{1.02}$

$n = 2401$

Under what conditions would it be meaningful to construct a confidence interval estimate when the data consist of the entire population?

(A) If the population size is small ($n < 30$)

(B) If the population size is large ($n \geq 30$)

(C) If a higher level of confidence is desired

(D) If the population is truly random

(E) Never

Answer: (E) In determining confidence intervals, one uses sample statistics to estimate population parameters. If the data are actually the whole population, making an estimate has no meaning.

Two 95 percent confidence interval estimates are obtained: I (78.5, 84.5) and II (80.3, 88.2).

a. If the sample sizes are the same, which has the larger standard deviation?

b. If the sample standard deviations are the same, which has the larger size?

(A) *a*. I *b*. I

(B) *a*. I *b*. II

(C) *a*. II *b*. I

(D) *a*. II *b*. II

(E) More information is needed to answer these questions.

Answer: (C) Narrower intervals result from smaller standard deviations and from larger sample sizes.

3. A college student organization wants to start a ~~nightclub~~ for students under the age of 21. To assess support for the idea, the organization will select an SRS of students and ask each if he or she would patronize this type of establishment. What sample size is required to obtain a 90% confidence interval with a margin of error of at most 0.04 if they suspect $\hat{p} = .75$?

$$\frac{.04}{1.645} = \frac{1.645}{1.645}\sqrt{\frac{.75 \times .25}{n}}$$

$$.0243^2 = \sqrt{\frac{.75 \times .25}{n}}$$

$$n \times .0243^2 = \frac{.1875}{n} \times n$$

$$n = \frac{.1875}{.0243^2}$$

$$= 317.5$$

$$= 318$$