

YELLOW QUIZ Chapter 8 12:30 class: solutions appear on following pages.

****** Note about Interpreting confidence intervals******

For the question #1, the interpretation I was hoping for (and that most people gave) is

We estimate with 90% confidence that the true population average hourly salary for all nurses in this city is between \$51.87 and \$60.13 per hour.

If you instead said the following, I also accepted that:

With repeated sampling we expect that 90% of the intervals constructed would contain the true population average salary for all nurses in this city.

I preferred the first interpretation but accepted the second because of the way the textbook and Webassign ask the questions, it might be ambiguous which I am looking for. (An exam will not be ambiguous.)

But several students combined these interpretations and ended up implying that 90% of all samples would produce the same interval of (51.87, 60.13) – that is not correct. Different samples generally do not produce the same confidence interval. I deducted depending on how “off” your interpretation is, but you need to work this out so that on a multiple choice question on the exam or the final exam you do not get mixed up and select an incorrect choice.

So the following (or some variations on this) is not correct.

With repeated sampling we expect that 90% of the intervals constructed would contain the true population average salary for all nurses in this city, which is between \$51.87 and \$60.13 per hour.

For the question #3, the interpretation I was hoping for (and that most people gave) is

We estimate with 92% confidence that between 56.1% and 61.9% of all Gen Z people age 18-20 are enrolled in college.

Also acceptable (but not as nicely worded in English is):

We estimate with 92% confidence that the true population proportion of all Gen Z people age 18-20 who are enrolled in college is between 0.561 and 0.619.

As in question 1, I accepted the interpretation of the confidence level for repeated sampling

With repeated sampling we expect that 92% of the intervals constructed would contain the true population proportion of all Gen Z people age 18-20 who are enrolled in college.

But if your interpretation implied that 92% of intervals were from 0.561 and 0.619, that is not correct and lost 1 to 2 points, depending on how “off” your interpretation is.

So the following is not correct.

With repeated sampling we expect that 92% of the intervals constructed would contain the true population proportion of all Gen Z people age 18-20 who are enrolled in college, which is between 0.561 and 0.619.

You must show work using the appropriate calculations for error bound and constructing the interval (calculating the critical value and standard error to find the error bound),.

No correct work = no credit, even if your answer is correct.

A "magic answer" using the confidence interval function on the calculator without showing the appropriate work required to calculate that answer using the error bound formulas will get no or minimal credit.

1. [9 points] An employment agency is estimating the average salary for registered nurses in a city. It is assumed that the distribution for the salaries for individual nurses is approximately normally distributed. Hourly salary data was collected for a random sample of 8 registered nurses.

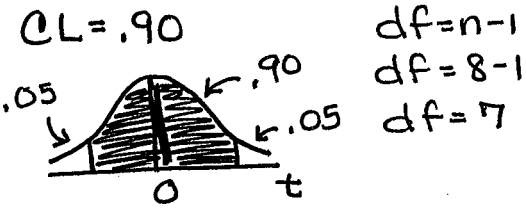
\$51 \$60 \$46 \$62 \$56 \$65 \$53 \$55

put data in list
Do 1 var stats
 $\bar{x} = 56$ $S = 6.19$

Construct and interpret a 90% confidence interval for the true population average hourly salary for all registered nurses in this city.

Show work below.

Round all values to 2 decimal places in your work. Rounding to fewer decimal places may result in lost credit.



Interval $\bar{x} \pm EB$
 56 ± 4.13
 $(51.87, 60.13)$

$invT(.05, 7) = -1.89$
 $invT(.95, 7) = 1.89$
 $EB = t \frac{s}{\sqrt{n}} = 1.89 \left(\frac{6.19}{\sqrt{8}} \right) = 4.13$

Answer: Error Bound = 4.13 Confidence Interval is (51.87, 60.13)

Interpretation in context of the situation in this question:

We estimate with 90% confidence that the true average hourly salary for all nurses in this city is between \$51.87 and \$60.13 per hour.

2. [2 points] In question #1, if we **increased the sample size**, but the values of \bar{x} , s , and the confidence level did not change, , what would we expect to happen to the confidence interval?

- A. would not change B. would get wider C. would get narrower D not able to predict

ANSWER: C

You must show work using the appropriate calculations for error bound and constructing the interval (calculating the critical value and standard error to find the error bound),.

No correct work = no credit, even if your answer is correct.

A "magic answer" using the confidence interval function on the calculator without showing the appropriate work required to calculate that answer using the error bound formulas will get no or minimal credit.

3. [9 points] Based on data from: <http://www.pewsocialtrends.org/2018/11/15/early-benchmarks-show-post-millennials-on-track-to-be-most-diverse-best-educated-generation-yet/>

A November 2018 study by Pew Research presented data about the "Post Millennial" generation (also called Generation Z, consisting of people born 1996 and later).

Suppose that a sample of Gen Z people age 18-20 who were no longer in high school were surveyed, and that in a sample of 900 people, 531 of them were enrolled in college.

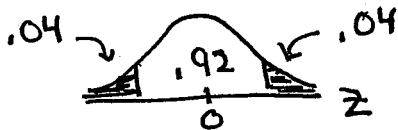
Construct and interpret a 92% confidence interval estimate for the true population proportion of all Gen Z people age 18-20 who are enrolled in college.

Show work below.

Round all values to 3 decimal places in your work. Rounding to fewer decimal places may result in lost credit.

$$p' = \frac{531}{900} = .59$$

$$q' = 1 - p' = .41$$



$$\text{invnorm}(.04, 0, 1) = -1.75$$

$$\text{invnorm}(.96, 0, 1) = 1.75$$

$$EBP = z \sqrt{\frac{p'q'}{n}} = 1.75 \sqrt{\frac{.59 * .41}{900}}$$

$$EBP = .02869 \approx .029$$

$$p' \pm EBP$$

$$.59 \pm .029$$

$$(.561, .619)$$

Answer: Error Bound = .029 Confidence Interval is (.561, .619)

Interpretation in context of the situation in this question:

We estimate with 92% confidence that between 56.1% and 61.9% of all "Gen Z" people age 18-20 are enrolled in college.