Lesson #56 · Topic 4B · Practice

Name ______________________

1. The inference procedure for estimating a mean is called a “one-sample t -interval for μ ”.

   a. Why does the name of the procedure include “one-sample”?

   b. Why does the name of the procedure include “ t ”?

   c. Why does the name of the procedure include “interval”?

   d. Why does the name of the procedure include “for μ ”?

2. A plant biologist is studying the effect of a new fertilizer on plant growth. The biologist randomly selects 15 plants from a large greenhouse and calculates the height increase, in centimeters, after being treated with this new fertilizer. The results are provided in the table.

4.0	4.1	3.8	3.5	4.2	3.9	3.4	4.2	3.7	4.1	3.6	3.8	3.9	3.9	3.7

Mean = 3.853 cm, Standard Deviation = 0.245 cm

The biologist wants to construct a 95 percent confidence interval for the true mean height increase of the plants after using the new fertilizer.

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

b. Identify the appropriate procedure and define the parameter of interest.

c. Check the appropriate conditions.

d. Calculate the 95% confidence interval.

e. Interpret the 95% confidence interval.

f. The fertilizer company claims that the new fertilizer increases plant height by 4 centimeters, on average. Does the interval support this claim? Explain.

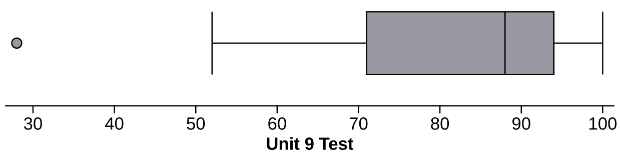
3. A teacher in North Carolina wants to estimate the mean salary of all teachers in the state, so she asks a random sample of 45 North Carolina teachers to report their yearly salary. From the sample, she calculates a mean of $52,509 and a standard deviation of $7,191.

a. Construct and interpret a 98% confidence interval for the true mean salary for all teachers in North Carolina.

b. Suppose the teacher had sampled 100 teachers instead of 45. If everything else remained the same, how would the new sample size affect the margin of error? Explain.

4. An AP Statistics student wants to use a 95% confidence interval to estimate the true mean score on the Unit 9 Test for all 364 AP Statistics students at her large high school. She selects a random sample of test scores from 34 AP Statistics students at her school and calculates the mean and standard deviation. The results are shown in the summary statistics and boxplot.

n	Mean	SD	Min	Q_1	Med	Q_3	Max
34	82.853	15.947	28	71	88	94	100



She uses the 5C method to construct and interpret a 95% confidence interval. Unfortunately, she made one mistake in each part. Identify and correct each mistake.

a. CLASSIFY:

Type of study: Observational study

Variable: Unit 9 Test score (categorical)

b. CHOOSE:

one-sample t -interval for $\bar{x}$ at a 95% confidence level. $\bar{x}$ = true mean Unit 9 Test score for all 34 students in the sample of test scores.

c. CHECK:

$\underline{\text{Random:}}$ Random sample of 34 AP Statistics students ✓

$\underline{\text{10\%:}}$ 34 $\leq$ 0.10 (all 364 AP Statistics students at this large high school) ✓

$\underline{\text{Normal/Large Sample:}}$ The sample data has one low outlier, so we should proceed with caution.

d. CALCULATE:

$$\bar{x} \pm z^* \left(\frac{s}{\sqrt{n}}\right)$$

$$82.853 \pm 1.645 \left(\frac{15.947}{\sqrt{34}}\right)$$

(78.33, 86.32)

e. CONCLUDE:

95% of all random samples of 34 AP Statistics students at this large high school will produce an interval from 78.33 to 87.32 that captures the true mean Unit 9 Test score.

5. A quality control manager at a light bulb factory wants to estimate the mean lifespan of the light bulbs produced at the factory. The manager selects a random sample of 25 light bulbs and finds a mean lifetime of 1,024 hours and a standard deviation of 105 hours. Assuming all conditions for inference are met, which of the following is a 99 percent confidence interval for the true mean lifetime of all light bulbs produced at this factory?

A) $1,024 \pm 2.797\left(\frac{105}{5}\right)$

B) $1,024 \pm 2.576\left(\frac{105}{5}\right)$

C) $1,024 \pm 2.797\left(\frac{\sqrt{105}}{25}\right)$

D) $1,204 \pm 2.797\left(\frac{105}{25}\right)$

6. A student on the football team constructed a 90 percent confidence interval for the true mean weight a player can bench press. The student used a list of bench press weights for all 52 football players and used technology to construct a one-sample t -interval. This procedure is not appropriate in this context because

A) The data likely had outliers, so the normal condition is not met.

B) The sample size is not large enough.

C) Most players bench press the same amount, so it is not appropriate to estimate the average.

D) The bench press weights were known for all players in the population, so the true mean could be calculated.