Classroom Voting Questions: Statistics

Estimating with Confidence

1. The fundamental concept underlying statistical inference is that

   (a) through the use of sample data we are able to draw conclusions about a sample from which the data were drawn.

   (b) through the examination of sample data we can derive appropriate conclusions about a population from which the data were drawn.

   (c) when generalizing results to a sample we must make sure that the correct statistical procedure has been applied.

   (d) Two of the above are true.

   (e) All of the above are true.

   Answer: (b). (A) With statistical inference, we use samples to draw conclusions about the population, not the sample.

   (B)* correct This statement is the definition of statistical inference.

   (C) We do not generalize results to a sample but a population. Furthermore, using the correct procedure (to generalize to a population) is not the fundamental concept of inferential statistics.

   (D), (E) Only (B) is correct.

   by Murphy, McKnight, Richman, and Terry

   STT.06.01.010

   CC HZ MA207 F09: 0/**29**/0/29/41 time 1:45
   AS DH MA3321 Su12: 0/**33**/8/42/17 time 1:40
   AS DH MA1333 010 F12: 7/**0**/0/40/53 time 2:00
   AS DH MA1333 020 F12: 0/**15**/8/54/23 time 2:00
   AS DH 1333 010 S13: 0/**0**/0/35/65 time 2:40
   AS DH 1333 010 F14: 0/**23**/4/58/15 time 2:30 ,
   AS DH 1333 020 S15: 0/**0**/0/32/68 time 2:30 ,
   AS DH 1333 020 F15: 0/**0**/0/57/43 time 2:30 ,
   CC KC MA315 F15: 0/**33**/0/11/56 time 1:30
   CC KC MA207 F16: 7/**7**/0/40/46
   AS DH 1342 010 F17: 11/**29**/29/29/4 time 1:50
   CC KC MA207 F18: 25/**10**/5/25/35
   CC KC MA315 F18: 0/**42**/5/42/11
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CC KC MA207 S19: 3/**28**/0/41/28
AS DH 1342 040 S19: 0/**14**/0/64/21 time 2:00
CC KC MA315 S20: 0/**11**/0/39/50

2. A 95% confidence interval is an interval calculated from

   (a) sample data that will capture the true population parameter for at least 95% of all samples randomly drawn from the same population.

   (b) population data that will capture the true population parameter for at least 95% of all samples randomly drawn from the same population.

   (c) sample data that will capture the true sample statistic for at least 95% of all samples randomly drawn from the same population.

   (d) population data that will capture the true sample statistic for at least 95% of all samples randomly drawn from the same population.

   Answer: (a). Note: One point of this question is that inferential statistics is about estimating population parameters from sample data.

   (A)* correct This statement refers to the ideas behind sampling and the Central Limit Theorem.

   (B) A calculation from population data would capture the true population parameter with 100% confidence.

   (C) Sample statistics have a sampling distribution so there is no one true sample statistic.

   (D) See the explanations for (B) and (C).

   by Murphy, McKnight, Richman, and Terry

   STT.06.01.020

   CC KC MA207 F09: **65**/5/15/15 time 2:30
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   AS DH 1342 020 F18: **65**/18/9/9 time 2:20
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   AS DH 1342 040 S19: **67**/33/0/0 time 2:10

AS DH 1342 030 F19: **35**/4/61/0 time 2:30
CC KC MA315 S20: **97**/0/3/0
AS DH 1342 030 S20: **0**/0/100/0 time 2:00

3. A 95% confidence interval has been constructed around a sample mean of 28. The interval is (21, 35). Which of the following statement(s) is true?

   (a) The margin of error in the interval is 7.

   (b) 95 out of 100 confidence intervals constructed around sample means will contain the true population mean.

   (c) The interval (21,35) contains the true population mean.

   (d) Both (a) and (b) are true.

   (e) (a), (b), and (c) are true.

   Answer: (a).

   by Jack Oberweiser

   STT.06.01.050

   CC HZ MA207 F09: **0**/18/0/47/35 time 1:30
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   AS DH 1333 020 S15: **46**/0/15/15/23 time 2:30 ,
   AS DH 1333 020 F15: **16**/11/0/32/42 time 2:50 ,
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   CC KC MA207 F16: **13**/7/0/20/60
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   CC KC MA207 F18: **0**/20/0/10/70
   AS DH 1342 020 F18: **32**/0/5/55/9 time 2:50
   CC KC MA207 S19: **45**/7/3/21/24
   AS DH 1342 040 S19: **0**/0/0/0/100 time 3:00
   AS DH 1342 030 F19: **28**/0/4/64/4 time 3:30
   CC KC MA315 S20: **29**/0/4/57/11
   AS DH 1342 030 S20: **0**/0/0/63/38 time 2:50

4. A 95% confidence interval for the mean of a population is given as (6.85, 7.61). Is it correct to say that there is a 95% chance that μ is between 6.85 and 7.61?

   (a) Yes

(b) No

Answer: (b). Technically, no. We're not saying that there's a 95% chance that the interval $(6.85, 7.61)$ contains μ. What we're saying is that there's a 95% chance that the interval

$$\left(\overline{X} - 1.96\frac{\sigma}{\sqrt{n}}, \overline{X} + 1.96\frac{\sigma}{\sqrt{n}}\right)$$

contains μ. We will get different intervals for different values of the random variable $\overline{X}$. In the long run, we would expect 95% of these intervals to contain the constant μ. One such interval is $(6.85, 7.61)$, but we don't know if it lies in the 95% that contain μ or the 5% that don't contain μ–and we have no way of determining how likely it is that it's in either category.

by Derek Bruff

STT.06.01.060

CC HZ MA207 F09: 59/**42** time 1:00
AS DH MA3321 Su12: 85/**15** time 1:00

5. Is it correct to say the following? If the process of selecting a sample of size 30 and then computing the corresponding 95% confidence interval is repeated 100 times, 95 of the resulting intervals will include μ.

   (a) Yes

   (b) No

   Answer: (b). No. In the long run, 95% of such intervals can be expected to include μ. As the number of times we repeat the experiment grows, the proportion of intervals containing μ will approach 95%. One hundred experiments is not enough to guarantee that we will hit 95% exactly.

   by Derek Bruff

   STT.06.01.070

   CC HZ MA207 F09: 6/**94** time 0:30
   AS DH MA3321 Su12: 23/**77** time 1:00
   CC KC MA207 F18: 68/**23**

6. A 95% confidence intervals for birthweights is found to be (6.85, 7.61). Is it correct to say that 95% of all birth weights will be between 6.85 and 7.61 pounds?

   (a) Yes

   (b) No

(c) About 95% of all birth weights will be in this range.

Answer: (b) No. This confidence interval gives us a sense of where the population mean lies, not which individual observations are likely to occur.

by Derek Bruff

STT.06.01.080

CC KC MA207 F09: 56/**44** time 1:30
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AS DH 1333 010 S13: 40/**60** time 2:10
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CC KC MA207 F16: 27/**73**
CC KC MA207 F18: 5/**95**
CC KC MA207 S19: 41/**59**
CC KC MA315 S20: 23/**77**

7. Suppose that a random sample of size 60 resulted in a 90% confidence interval for the proportion of students who carry more than 2 credit cards of (0.52, 0.76). Which of the following is a correct interpretation of the 90% confidence level?

   (a) 90% of the time the population proportion will be between 0.52 and 0.76

   (b) The method used to construct the interval will produce an interval that includes the value of the population proportion about 90% of the time in repeated sampling.

   (c) If 100 different random samples of size 60 from this population were each used to construct a 90% confidence interval, 90 of them will contain the value population proportion.

   (d) The probability that the population proportion is between 0.52 and 0.76 is 0.90.

   Answer: (b).

   by Roxy Peck for the textbooks: Roxy Peck and Jay Devore, Statistics: The Exploration and Analysis of Data, 6th Edition, Brooks/Cole Cengage Learning 2008 and Roxy Peck, Chris Olsen and Jay Devore, Introduction to Statistics and Data Analysis, 3rd Edition, Brooks/Cole Cengage Learning 2008.

   STT.06.01.090

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   CC KC MA207 F18: 19/**57**/5/19

8. Suppose you construct a 95% confidence interval from a random sample of size $n = 20$ with sample mean 100 taken from a population with unknown mean μ and known standard deviation $\sigma = 10$, and the interval is fairly wide. Which of the following conditions would NOT lead to a narrower confidence interval?

   (a) If you decreased your confidence level

   (b) If you increased your sample size

   (c) If the sample mean were smaller

   (d) If the population standard deviation were smaller

   Answer: (c).

   by Derek Bruff

   STT.06.01.100 DH 100

   AS DH MA1333 010 F12: 13/88/**0**/0 time 3:10
   AS DH MA1333 020 F12: 7/36/**36**/21 time 2:50
   AS DH 1333 010 S13: 0/50/**50**/0 time 3:30
   CC KC MA315 F15: 0/5/**95**/0 time 1:30
   CC KC MA207 F16: 27/7/**59**/7
   CC KC MA207 F18: 29/14/**57**/0
   AS DH 1342 030 F19: 5/0/**70**/25 time 4:20

9. Which is wider, an 80% confidence interval, or a 90% confidence interval with both of them made from the same set of numerical data?

   (a) An 80% confidence interval is wider than a 90% confidence interval.

   (b) A 90% confidence interval is wider than an 80% confidence interval.

   (c) This depends on the data.

   Answer: (b). A 90% confidence interval based on the same sample must be wider, so that we are more certain our interval contains the population parameter.

   by Kelly Cline

   STT.06.01.105

10. Each individual in a random sample of 40 cell phone users was asked how many minutes of airtime he or she used in a typical month. The data was then used to construct a 99% confidence interval for the mean monthly number of minutes of air time used. The confidence interval was $(207, 293)$. Which of the following could be the 95% confidence interval constructed using this same sample?

    (a) $(200, 300)$

(b) $(218, 282)$

(c) $(227, 313)$

Answer: (b). A 95% confidence interval based on the same sample will have the same center $\bar{x}$, but will be narrower, with a smaller margin of error.

by Roxy Peck

STT.06.01.110 DH 120

AS DH MA1333 010 F12: 75/**25**/0 time 1:30
AS DH MA1333 020 F12: 7/**79**/14 time 2:30
AS DH 1333 010 S13: 46/**54**/0 time 2:30
AS DH 1333 010 F14: 19/**77**/4 time 3:20 ,
CC KC MA315 F15: 11/**84**/5 time 1:25
CC KC MA207 F18: 27/**73**/0

11. Suppose that for babies born in the United States, birth weight is normally distributed about some unknown mean μ with standard deviation $\sigma = 1.06$ pounds. What is the minimum sample size necessary to ensure that the resulting 99% confidence interval has a width of at most 0.5?

    (a) 70

    (b) 119

    (c) 120

    (d) 140

    Answer: (c). If we use $z_{.005} = 2.575$, then we find that $n \geq 119.2$, thus $n = 120$ is the minimize sample size to ensure a 99% CI of width at most 0.5. Of course, any $n \geq 120$ will do, so choice (d) would work as well, it's just not the minimum sample size.

    by Derek Bruff

    STT.06.01.120

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    AS DH MA1333 010 F12: 56/0/**44**/0 time 3:20
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    AS DH 1333 010 S13: 0/55/**36**/9 time 4:20
    AS DH 1333 020 S14: 20/27/**40**/13 time 4:30 ,
    AS DH 1333 010 F14: 28/44/**28**/0 time 4:30 ,
    AS DH 1333 020 S15: 44/11/**33**/11 time 4:00 ,
    AS DH 1333 020 F15: 4/12/**80**/4 time 4:10 ,
    AS DH 1342 010 F17: 6/0/**81**/13 time 4:20
    AS DH 1342 020 F18: 3/3/**94**/0 time 5:00

AS DH 1342 040 S19: 0/38/**63**/0 time 5:10
AS DH 1342 030 F19: 12/0/**88**/0 time 6:00
AS DH 1342 030 S20: 44/22/**33**/0 time 4:40