WHS College Statistics
Dr. Hartman
Confidence Interval Quiz

Name: ________________________

Per: __________ Date: ____________

1. For a distribution, the mean is 5, the median is 15, and the mode is 20. Based on this information, the distribution is:

A. Positively Skewed
B. Symmetric
C. Negatively Skewed
D. It cannot be determined

2. Heights of men on a basketball team have a bell-shaped distribution with a mean of 174 cm and standard deviation of 8 cm. Using the empirical rule, what is the approximate percentage of the men between 166 cm and 182 cm.

86 − 174 → 8
1 STDEV

A. 34% B. 50% C. 68% D. 95% E. 99.7%

3. We wish to estimate the population proportion. We want to be 95 percent confident of our results and we want the estimate to be within .01 of the population parameter. No estimate of the population proportion is available. What value should we use for p?

best we can assume is 50/50

A. 1.96 B. 0.01 C. 0.50 D. We cannot complete the problem; we need more information

4. We wish to develop a confidence interval for the population mean. The population follows the normal distribution, the sample standard deviation is 3, and we have a sample of 10 observations. We decide to use the 95 percent level of confidence. The margin of error for the confidence interval is?

ok

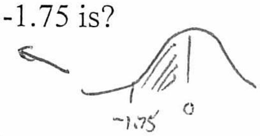
$S = 3$ $n = 10$

if ≥ 30, then z^* ok b/c of CLT

A. ± 1.561 B. ± 1.859 C. ± 2.114 D. We cannot complete the problem yet; we need the t-score

5. The area under a standard normal curve between $z = 0$ and $z = -1.75$ is?

A) 0.0401 B) ~~0.9599~~ C) 0.4599 D) ~~1.4599~~

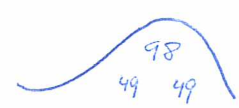


less than 50%

6. Assume a population that is normally distributed. Given a confidence level of 98%, number sampled at 19, and $\sigma = 21.5$, find the critical value:

Can use z

A. $\cancel{t} = 2.214$ B. $z = 2.33$ C. $z = 2.055$ D. $\cancel{t} = 2.552$



.4900
$z = 2.33$

7. We have calculated a 95% confidence interval and would prefer for our next confidence interval to have a smaller margin of error without losing any confidence. In order to do this, we

I. change the z value to a smaller number. ← Cant
II. take a larger sample.
III. take a smaller sample.

A. I only B. II only C. III only D. I & II E. I & III

narrows b/c $\frac{\sigma}{\sqrt{n}}$ as n increases, $\sqrt{n}$ increases, $\frac{\sigma}{\sqrt{n}}$ decreases

$\hat{p} = .63 \quad \hat{q} = .37$

8. *Pew Research* reports that 63% of the U.S. adult cell phone owners use their phone as their only calendar. An app company wants to target 16- to 24-year olds for advertisting via a calendar app and they wonder if that age group has a similar percentage of calendar phone use.

A. The company wants to estimate the true percentage of 16- to 24-year old cell phone owners who use their phone at their only calendar within ±7.5%, with 95% confidence. How many cell phone owners in this age group should they sample? (show work) 1.96

$$ME = z^* \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$.075 = 1.96 \cdot \sqrt{\frac{.63 \cdot .37}{n}} \longrightarrow n = 160$$

B. They ignore your advice in part A and just select a random sample of 300 cell phone users aged 16 to 24, and find that 206 of those surveyed do use their phone as their only calendar. Create the confidence interval.

Assumptions/Conditions

Random Sample ... we are told ✓

assume independence

300 → 3000 I can assume there are 3000 cell phone 16-24 yr olds

S/F is met → 206 "S" and 94 "F"

I can use Normal

$N\left(\hat{p}, \sqrt{\frac{\hat{p}\hat{q}}{n}}\right)$

$\hat{p} = \frac{206}{300} \approx .6867$

$\hat{q} \approx .3133$

$$.6867 \pm 1.96\sqrt{\frac{.6867 \cdot .3133}{300}}$$

$$.6867 \pm .0525$$

63.42% to 73.92%

C. Interpret what the confidence interval means in this context.

The Company is 95% Confident the true value of the proportion wanting to use "only calendar on phone" is

D. Should the company conclude that the percentage of cell phone owners in this age group who use their phone as their only calendar is different from 63%? Explain.

Yes, 63% is outside the 95% Confidence interval.

9. A point estimate is: $\bar{x}$ or $\hat{p}$ μ or p

A. ~~A range of possible values~~ for a population parameter.
B. A statistic that estimates a population parameter.
C. ~~Always~~ equal to a population value.
D. ~~The population mean.~~

10. Which is true about a 95% confidence interval based on a given sample? true value of "parameter" not stat

~~I.~~ The probability that the interval contains the true value of the statistic is 95%.
~~II.~~ Results from 95% of all samples will lie in the interval.
III. The interval is narrower than a 98% confidence interval would be.

A. None B. I only C. II only D. III only E. II and III only

we expect 95% of sample means "$\bar{x}$" would lie in interval

11. From a random sample of 50 middle school students, 27 of them said they plan on going trick-or-treating. Which of the following shows the correct calculation for a 90% confidence interval that could be used to estimate the proportion of all middle school students who will trick-or-treat?

$\frac{27}{50} = .54$

A. $\cancel{27 \pm 1.645\sqrt{\frac{27(23)}{50}}}$

B. $.54 \pm 1.645\sqrt{\frac{.54(.46)}{50}}$

C. $.54 \pm 1.96\sqrt{\frac{.54(.46)}{50}}$

90% Confiden is 1.645

D. $\cancel{.54 \pm 1.645\sqrt{50(.54)(.56)}}$

E. $\cancel{27 \pm 1.645\sqrt{\frac{.5(.5)}{50}}}$

12. For $n = 121$ and $\bar{x} = 96$, and a known population standard deviation of $\sigma = 14$, construct a 90% confidence interval for the population mean.

A. 93.53 to 98.48

B. 93.51 to 98.49

C. 93.02 to 98.98

D. 93.06 to 98.94

E. 93.00 to 98.95

None

$96 \pm 1.645 \cdot \frac{14}{\sqrt{121}}$

96 ± 2.09

F. 93.91 to 98.09

13. The Bun-and-Run is a franchise fast-food restaurant located in the Northeast specializing in half-pound fish sandwiches. The planning department for B&R Inc. reports that the random sample daily sales for restaurants' daily sales has a mean of $20,000 with standard deviation of $3000.

a. What is the population mean? we don't know this . . .

b. What is the best *estimate* of the population mean? What is this value called?

$20,000 , called the point estimate

c. Develop an 86% confidence interval for the population mean.

Assumptions / Conditions

We don't if the population is normal

we don't know the "n" Sample size

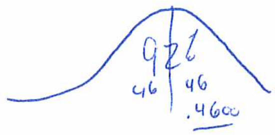
we only know "s" Sample STDEV

we can't find this Conf. Int.

14. We wish to develop a confidence interval for the population mean. The population standard deviation is known. We have a sample of 40 observations. We decide to use the 92 percent level of confidence. The appropriate value of z is: → $n = 40$

→ σ

ok to use z^*



$Z = 1.75$

15. In a large school district, a tech grant is available to teachers in order to install heat into their classrooms. From the 6250 teachers in the district, 250 were randomly selected and asked if they felt that heat was an essential tool for their classroom. Of those selected, 142 teachers said yes.

2.58

$n = 250$

a. Create a 99% confidence interval for the proportion of teachers who felt that heat is an essential for the classroom.

S/F 142 vs 108
ok

250 is < 10% of 6250
ok

Random selection
(assume indep)
ok

$\hat{p} = \frac{142}{250} = .568 \qquad \hat{q} = .432$

$.568 \pm 2.58 \cdot \sqrt{\frac{.568 \cdot .432}{250}}$

$.568 \pm .081$

b. How could the survey be changed to narrow the confidence interval but to maintain the 99% confidence level?

Select more than 250 teachers (but no more than 624)

624 is still less than 10% of 6250

16. The American Management Association wishes to have information on the mean income of store managers in the retail industry. A random sample of 256 managers reveals a sample mean of $45,420. The standard deviation of the population is $2050. → n is large enough for CLT to kick in

→ σ is given

a. What is the population mean? We don't know!

b. What is a reasonable range of values for the population mean at 90% confidence?

random sample

< 10% should be ok

$45420 \pm 1.645 \cdot \frac{2050}{\sqrt{256}}$

45420 ± 210.77

45239.23 to 45660.77

45239 to 45661