Stat 2470, 3/5 Discussion Questions Name ______________________

Instructions: Attempt to answer these questions by reading the textbook or with online resources before coming to class on the date above.

1. In what way are confidence intervals better than point estimates?

they provide information on accuracy & reliability which point estimates cannot.

2. What is the most common confidence level used for confidence intervals?

95%

3. Describe two ways of interpreting a confidence interval.

① we are 95% sure that the true parameter of the population is captured in this range of values.

② if we repeat this experiment over and over, we expect that 95% of the time, the intervals we get will overlap w/ this one.

4. What is the general formula for a confidence interval, of any level of confidence, when σ is known?

mean: $\left(\bar{x} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}}, \bar{x} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}\right)$

5. Why do we use the standard error of the sampling distribution rather than just the standard deviation of the population distribution?

because we are using/making a prediction on/about a sample and not an individual measurement

6. When we increase the confidence level, what happens to the confidence interval width?

gets wider

7. When we increase the ~~same~~ sample size, what happens to the confidence interval width?

it gets narrower

8. If we have a certain level of accuracy (width of the confidence interval) in mind, what is the formula for calculating the same size needed for that level of accuracy? And how do we round n?

$$n = \left(2 z_{\alpha/2} \cdot \frac{\sigma}{w}\right)^2$$

round n up to the next largest integer

9. Write the equation above in terms of the error rather than the width ($w = 2E$).

$$n = \left(z_{\alpha/2} \cdot \frac{\sigma}{E}\right)^2$$

E = margin of error desired

10. How do large samples confidence intervals with s differ from confidence intervals when σ is known?

for sufficiently large samples ($n>40$) and normality, $s \to \sigma$ as sample size increases, so we can replace σ w/ s in all our formulas.

11. What do we mean when we say "large sample"? How large is large enough?

$n > 40$

12. How do we calculate these z-confidence intervals in our calculator?

ZInterval function (under STAT → TESTS) (on TI-84)

13. The formula for the confidence interval for a proportion is significantly more complicated. What is it?

$$\frac{\hat{p} + z_{\alpha/2}^2/2n}{1 + z_{\alpha/2}^2/n} \pm z_{\alpha/2} \frac{\sqrt{\hat{p}(1-\hat{p})/n + z_{\alpha/2}^2/4n^2}}{1 + z_{\alpha/2}^2/n}$$

14. What is the simplified version when n is very large?

$$\hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

15. How do we calculate this interval in our calculator?

1PropZInt under STAT → TESTS (Scroll down) in TI-84
note: X in the function needs to be a whole #

16. What is the long version of the formula for the sample size using proportions?

$$n = \frac{2z_{\alpha/2}^2 \hat{p}\hat{q} - z^2 w^2 \pm \sqrt{4z_{\alpha/2}^4 \hat{p}\hat{q}(\hat{p}\hat{q} - w^2) + w^2 z^4}}{w^2}$$

17. What is the reduced version of this formula?

$$n \approx \frac{4z^2 \hat{p}\hat{q}}{w^2}$$

18. When $\hat{p}$ is not known in advance of sampling, what is the most conservative estimate to use when calculating the sample size?

$\hat{p} \approx .50$

19. Why might we want to calculate a one-sided confidence interval?

if we are very close to a natural boundary value (like 0, or 100%) we might only want the error to appear on one side.