MAT 135, Discussion Questions 4.11

1. What is a point estimate for a parameter? What are the downsides of using point estimates?

a statistic
for instance $\bar{x}$ estimates $\mu$
a single value

it's almost certainly wrong, but by how much? No indication possible for single value

2. Give an example of an unbiased estimator and what parameter it can estimate.

$\bar{x}$, or $\tilde{x}$ for $\mu$

$\hat{p}$ for $p$

3. Why are interval estimates better than point estimates?

Can give a range of values
that indicates quality of estimate
And confidence level in estimate

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

95%

5. What is the margin of error? How is it calculated?

$ME = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$ for means

$1-\alpha$ is confidence level

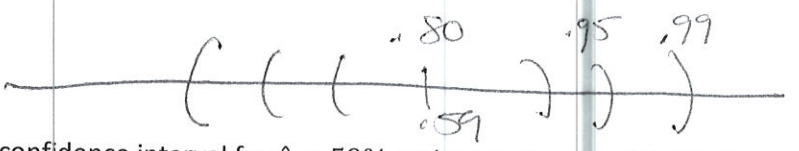
6. Give at least five of the most common z-values for common confidence intervals.

$1-\alpha = 95\% \rightarrow 1.96$
$1-\alpha = 90\% \rightarrow 1.64$
$1-\alpha = 80\% \rightarrow 1.28$
$1-\alpha = 99\% \rightarrow 2.56$

others are likely to vary

7. What conditions need to be satisfied to use the normal approximation for proportions?

$np \geq 5$ & $n(1-p) \geq 5$



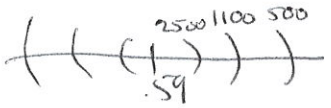

8. Find a 95% confidence interval for $\hat{p} = 59\%$ and a sample size of 1100. Then find an 80% confidence interval and a 99% confidence. Graph the three confidence intervals on a number line along with the center at 0.59. What do you notice about the three intervals as confidence levels change?

higher confidence, wider intervals

1PropZInt $x = .59 * 1100 = 649$
$n = 1100$
C-level: .95 → .80 → .99
(.56094, .61906) (.571, .609) (.5518, .6282)

9. Find a 95% confidence interval for $\hat{p} = 59\%$ and a sample size of 1100. Then find a 95% confidence interval with a sample size of 500, and with a sample size of 2500 for the same statistic. Graph the three confidence intervals on a number line along with the center at 0.59. What do you notice about the three intervals as sample size changes?

bigger sample, smaller intervals




1PropZInt $x = 649$, $n = 1100$, C-level: .95 (.56094, .61906)
$x = 295$, $n = 500$ (.54689, .63311)
$x = 1475$, $n = 2500$ (.57072, .60928)

10. How big a sample size is needed to estimate a true proportion within 1%? (The most conservative estimate for $p$, if it is not known, is to assume a value of 50%.)

assume $1-\alpha = 95\%$

$$n \geq \left(\frac{.5\ 1.96}{.01}\right)^2 = 9604$$

11. The student newspaper at a college asks a simple random sample of 250 undergraduates, "Do you favor eliminating supplemental fees for lab courses?" In all, 150 of the 250 are in favor of eliminating such fees. Find a 95% confidence interval not using the quick method.

1PropZInt $x = 150$
$n = 250$
C-level: .95
(.53927, .66073)

12. A recent Gallup Poll interviewed a random sample of 1523 adults. Of these, 868 bought a lottery ticket in the past year. Construct a 99% confidence interval for these results.

1PropZInt $x = 868$
$n = 1523$
C-level: .99
(.53725, .60261)

13. A poll of 1234 adults found that 62% expect an increase in environmental pollution in the next decade. Take the poll's sample to be a simple random sample of all adults. What is an 98% confidence interval for these results?

1PropZInt $x = .62 * 1234 = 765$ (must be whole #)
$n = 1234$
C-level: .98
(.58779, .65208)