Day 8 - In - Class
16 - Nov - 2009

1 a. Longer - we need bigger interval for more confidence

b. Yes ⇒ definition of confidence interval - see p 83

c. No ⇒ not the defn of confidence interval

2. 25 samples, 24 degrees of freedom

$t_{0.05}(24) = +1.711$

$\mu_{.05} = 4.05 + 1.711 \cdot \frac{s}{\sqrt{n}}$

$= 4.05 + 1.711 \cdot \frac{.08}{\sqrt{25}}$

$= 4.0774$

confidence bound:

$[-\infty, 4.0774]$

3 Because we know $\sigma = 2$ MPA, we know the population standard deviation so we should use z distribution

In the twenty samples,

$\bar{x} = 9.723$

~~$z_{0.975} = 1.96$~~ $z_{0.975} = 1.96$

$\mu \in \left[\bar{x} - 1.96 \cdot \frac{\sigma}{\sqrt{n}}, \bar{x} + 1.96 \cdot \frac{\sigma}{\sqrt{n}}\right]$ 91

$$= \left[9.723 - 1.96 \cdot \frac{2}{\sqrt{20}} \;,\; 9.723 + 1.96 \cdot \frac{2}{\sqrt{20}}\right]$$

$$= [\,8.85 \;,\; 10.6\,]$$

4. Binomial distribution:

$p = 0.52$

$\sigma = \frac{p \cdot (1-p)}{\sqrt{n}} = .025$

$\hat{p} = p \pm 2 \cdot 0.025$

$\hat{p} = [0.47 \;,\; 0.57]$

Right now, the confidence interval is ± 0.05. We want to reduce it by a factor of 2 so we must increase sample size by 4. Thus, we need 400 samples

$\sigma = \frac{.52 \cdot .48}{\sqrt{400}} = 0.025$

$\hat{p} = p \pm 2 \cdot 0.025$

$= [0.495 \;\; 0.545]$

5. $n = 5$

4 degrees of freedom

$\alpha = .9$ [2]

confidence interval for σ^2 [2]

$\hat{\sigma}^2 = \left[\frac{\sigma^2}{\chi^2_{.05}(n-1)} \quad \frac{\sigma^2}{\chi^2_{.95}(n-1)} \right]$ [2]

$= \left[\frac{1}{0.711} \quad \frac{1}{9.488} \right]$

$\hat{\sigma}^2 = [.1054 \quad 1.41]$ [2]

The sample mean is 3 and sample variance is 0.81. The sample variance is within the confidence interval so there isn't sufficient evidence to disprove the manufacturer's claim. Sorry about all the edits. Everything is in terms of variance, not standard deviation.

6. $\bar{X}_1 - \bar{X}_2 = 64 - 64 = -5$

$\hat{S} = \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}} = \sqrt{\frac{52}{11} + \frac{71}{14}} = 3.13$

99% confidence for $\bar{X}_1 - \bar{X}_2 = \bar{X}_1 - \bar{X}_2 \pm t_{23} \cdot \hat{S}$

$= -5 \pm 2.807 \cdot 3.13$

$= [-13.8, \ 3.79]$

Insufficient evidence because 99% confidence interval does not