

Key

Quiz 8  
Statistics for Business (22S:008, Bognar)

October 18, 2006

1. (15 pts) It is known that the tensile strength (the amount of weight that can be suspended from a wire without breaking) of a certain type of copper wire follows a normal distribution with mean  $\mu$  and standard deviation  $\sigma$ . Suppose a researcher randomly selected 11 pieces of copper wire and determined that the mean tensile strength was  $\bar{x} = 92$  pounds with standard deviation  $s = 8$  pounds.

- (a) (4 pts) Find a 90% CI for  $\mu$ . Show all of your work using good notation.

$$\bar{x} \pm t_{\alpha/2, n-1} \frac{s}{\sqrt{n}} = 92 \pm 1.812 \left( \frac{8}{\sqrt{11}} \right) = 92 \pm 4.371 = (87.629, 96.371)$$

↓

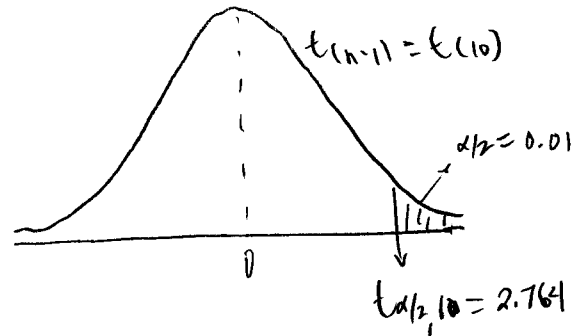
$$\alpha = 0.10 \rightarrow t_{\alpha/2, n-1} = t_{0.05, 10} = 1.812$$

- (b) (4 pts) In reference to question (1a), are you at least 90% confident that the mean tensile strength  $\mu$  is less than 95 pounds? Why?

No, since the 90% CI does not lie entirely below 95.

- (c) (7 pts) Suppose the researcher stated that the CI for  $\mu$  was (85.333, 98.667). What percent CI is this? Show all of your work using good notation.

$$\begin{aligned} \bar{x} \pm t_{\alpha/2, n-1} \frac{s}{\sqrt{n}} &= 98.667 \\ \rightarrow 92 \pm t_{\alpha/2, 10} \frac{8}{\sqrt{11}} &= 98.667 \\ \rightarrow t_{\alpha/2, 10} \frac{8}{\sqrt{11}} &= 6.667 \\ \rightarrow t_{\alpha/2, 10} &= 2.764 \end{aligned}$$



No now

$$\frac{\alpha}{2} = 0.01 \rightarrow \alpha = 0.02 \rightarrow 98\% \text{ CI}$$

2. (5 pts) It is known that the tensile strength of a certain type of steel wire follows a normal distribution with mean  $\mu$  pounds and standard deviation  $\sigma = 42$  pounds. Suppose a 95% CI for  $\mu$  is desired. How large of a sample size  $n$  would be required for the margin of error (at 95% confidence) to equal 5.5? Show all of your work using good notation.

$$\underbrace{\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}}_{\text{ME} = 5.5} \rightarrow z_{\alpha/2} \frac{\sigma}{\sqrt{n}} = 5.5 \rightarrow 1.96 \cdot \frac{42}{\sqrt{n}} = 5.5 \rightarrow n = \left( \frac{1.96 \times 42}{5.5} \right)^2 = 224.02$$

So 224 or 225