

Score:

Name:

Solution

Section (circle one): 1 2 3 4 5 6

Team (circle one): a b c d e f

SM316 – Quiz #7 (Section 9.4) – Due Friday

Take home quiz, open book, open notes. You may work with team members to solve problems, but you may not copy another's work. Calculators are allowed, but you must show all work for full credit.

1. (3 pts) A random sample of 75 connector modules has an average size of $\bar{x} = .4$ inches. Assume that $\sigma = .002$ inches. Determine a 98% confidence interval the mean size of all connector modules. Assume a normal distribution.

$$\rightarrow \sigma \text{ known} \rightarrow \text{use } z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \Rightarrow \mu = \bar{x} \pm (z) \frac{\sigma}{\sqrt{n}}$$

$$\rightarrow \text{for 98\% confidence use } z_{.01} \approx -2.329 \text{ and } z_{.99} \approx 2.329$$

$$\Rightarrow \mu = .4 \pm 2.329 \left(\frac{.002}{\sqrt{75}} \right) = .4 \pm .00054$$

$$\Rightarrow \boxed{.3995 \leq \mu \leq .4005}$$

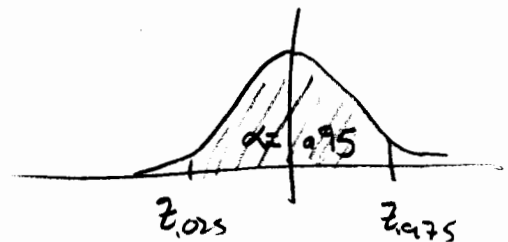
2. (2 pts) In problem #1 how many modules should be sampled if we desire a 95% confidence interval that our sample mean will be within .001 inch of the true mean.

$$\Rightarrow e = (z) \left(\frac{\sigma}{\sqrt{n}} \right) \Rightarrow \text{for 95\% C.I use } z_{.975} = 1.96$$

$$\Rightarrow .001 = (1.96) \left(\frac{.002}{\sqrt{n}} \right)$$

$$\Rightarrow \sqrt{n} = (1.96) \left(\frac{.002}{.001} \right)$$

$$\Rightarrow n = 15.4 \approx \boxed{16}$$



3. (2 pts) A random sample of 10 energy bars has on average, 250 calories with a standard deviation of 10 calories. Construct a 99% confidence interval for the true mean of all bars manufactured. Assume that distribution of calories is normal.

σ not known \Rightarrow use t-distribution w/ 9 degrees of freedom

$$t_{.005} = \frac{\bar{X} - \mu}{S/\sqrt{n}} \Rightarrow \mu = \bar{X} - t_{.005} \frac{S}{\sqrt{n}} = 250 - (-3.25) \left(\frac{10}{\sqrt{10}}\right)$$

$$\Rightarrow \mu \approx 260.3$$

$$\Rightarrow \text{now calculate } \mu \text{ for } t_{.995} \Rightarrow \mu = 250 - (3.25) \left(\frac{10}{\sqrt{10}}\right) = 239.7$$

\therefore $\boxed{239.7 \leq \mu \leq 260.3}$ calories

4. (3 pts) On board the USS RUSTBUCKET the drying times in hours for paint is measured to be:

3.4 2.5 4.8 2.9 3.6

Construct a 95% confidence interval for the mean drying time of the paint. Assume that the distribution of drying times is normal.

$$\bar{X} = 3.44 \quad s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 = 0.763 \Rightarrow s = .873$$

$$\left. \begin{array}{l} t_{.025} = -2.776 \\ t_{.975} = 2.776 \end{array} \right\} \text{ for 4 degrees of freedom}$$

$$\mu = 3.44 \pm 2.776 \left(\frac{.873}{\sqrt{5}}\right)$$

$$= 3.44 \pm 1.08$$

\Rightarrow $\boxed{2.36 \leq \mu \leq 4.52}$ hours