

**Math/STAT 319      Homework 5   Due Feb. 22 (Two pages)**

**Section 8.1**

1. Consider a normal population distribution with the value of  $\sigma$  known.
  - a. What is the confidence level for the interval  $\bar{x} \pm 2.81\sigma/\sqrt{n}$ ?
  - b. What is the confidence level for the interval  $\bar{x} \pm 1.44\sigma/\sqrt{n}$ ?
  
3. Suppose that a random sample of 50 bottles of a particular brand of cough syrup is selected and the alcohol content of each bottle is determined. Let  $\mu$  denote the average alcohol content for the population of all bottles of the brand under study. Suppose that the resulting 95% confidence interval is (7.8, 9.4).
  - a. Would a 90% confidence interval calculated from this same sample have been narrower or wider than the given interval? Explain your reasoning.
  - b. Consider the following statement: There is a 95% chance that  $\mu$  is between 7.8 and 9.4. Is this statement correct? Why or why not?
  - c. Consider the following statement: We can be highly confident that 95% of all bottles of this type of cough syrup have an alcohol content that is between 7.8 and 9.4. Is this statement correct? Why or why not?
  - d. Consider the following statement: If the process of selecting a sample of size 50 and then computing the corresponding 95% interval is repeated 100 times, 95 of the resulting intervals will include  $\mu$ . Is this statement correct? Why or why not?
  
4. A CI is desired for the true average stray-load loss  $\mu$  (watts) for a certain type of induction motor when the line current is held at 10 amps for a speed of 1,500 rpm. Assume that stray-load loss is normally distributed with  $\sigma = 3.0$ .
  - c. Compute a 99% CI for  $\mu$  when  $n = 100$  and  $\bar{x} = 58.3$ .

## Section 8.2

13. The article “Extravizual Damage Detection? Defining the Standard Normal Tree” (*Photogram-metric Engrg. Remote Sensing*, 1981: 515–522) discusses the use of color infrared photography in identification of normal trees in Douglas fir stands. Among data reported were summary statistics for green-filter analytic optical densitometric measurements on samples of both healthy and diseased trees. For a sample of 69 healthy trees, the sample mean dye-layer density was 1.028, and the sample standard deviation was .163.
- Calculate a 95% (two-sided) CI for the true average dye-layer density for all such trees.
  - Suppose the investigators had made a rough guess of .16 for the value of  $s$  before collecting data. What sample size would be necessary to obtain an interval width of .05 for a confidence level of 95%?
15. Determine the confidence level for each of the following large-sample one-sided confidence bounds:
- Upper bound:  $\bar{x} + .84s/\sqrt{n}$
  - Lower bound:  $\bar{x} - 2.05s/\sqrt{n}$
  - Upper bound:  $\bar{x} + .67s/\sqrt{n}$
17. A study was done on 41 first-year medical students to see if their anxiety levels changed during the first semester. One measure used was the level of serum cortisol, which is associated with stress. For each of the 41 students the level was compared during finals at the end of the semester against the level in the first week of classes. The average difference was 2.08 with a standard deviation of 7.88. Find a 95% lower confidence bound for the population mean difference  $\mu$ .