

**STAT 345 - Handout 8**  
**Confidence Intervals for the Population Mean**  
**Normal Probability Plots**  
BASED ON SECTION: 8.3

1. Unusual rocks at “The Seven Islands” located along the lower St. Lawrence River in Canada have attracted geologists to the area for over a century. A major geological survey of “The Seven Islands” was recently completed for the purpose of developing a three-dimensional gravity model of the area. One of the keys to an objective model is obtaining an accurate estimate of the rock densities. Based on samples of several varieties of rock, the following information on the rock density (grams per cubic centimeter) was obtained.

	Type of Rock	Sample Size	Mean Density	Standard Deviation
(a)	Late gabbro	36	3.04	0.13
(b)	Massive gabbro	148	2.83	0.11
(c)	Cumberlandite	135	3.05	0.31

For each rock type, estimate the mean density with a 90% confidence interval.

2. An evaluation of trace metal chemistry and cycling in an acidic Adirondack lake was reported in *Environmental Science & Technology* (1985). Twenty-four water samples were collected from Darts Lake, New York, and analyzed for concentration of both lead and aluminum particulates.
- (a) The lead concentration measurements had a mean of 9.9 nmol/l and a standard deviation of 8.4 nmol/l. Calculate a 99% confidence interval for the true mean lead concentration in water samples collected from Darts Lake.
  - (b) The aluminum concentration measurements had a mean of 6.7 nmol/l and a standard deviation of 10.8 nmol/l. Calculate a 99% confidence interval for the true mean aluminum concentration in water samples collected from Darts Lake.
  - (c) What assumptions are necessary for the intervals of parts (a) and (b) to be valid?

3. Acid rain from the burning of fossil fuels has caused many of the lakes around the world to become acidic. The biology in these lakes often collapses because of the rapid and unfavorable changes in water chemistry. Two researchers measured the pH of high mountain lakes in the Southern Alps. The pH levels obtained for 15 of those lakes is

7.2 7.3 6.1 6.9 6.6  
7.3 6.3 5.5 6.4 6.5  
5.7 6.9 6.7 7.9 5.8

- (a) Make a stem-and-leaf plot. Are there any outliers or strong skewness that might prevent the use of the  $t$  procedures?
- (b) give a 95% confidence interval for the mean pH level of high mountain lakes in the Southern Alps.