91	80	99	110	95	106	78	121
106	100	97	82	100	83	115	104
114	118	96	101	79	130	94	101

a. Construct an 80% confidence interval for the population mean.
b. Construct a 95% confidence interval for the population mean and compare the width of this interval with that of part a.
c. Carefully interpret each of the confidence intervals, and explain why the 80% confidence interval is narrower.

APPLYING THE CONCEPTS

7.89 Pulse rate is an important measure of the fitness of a person's cardiovascular system. The mean pulse rate for American adult males is approximately 72 heart beats per minute. A random sample of 21 American adult males who jog at least 15 miles per week had a mean pulse rate of 52.6 beats per minute and a standard deviation of 3.22 beats per minute.
a. Find a 95% confidence interval for the mean pulse rate of all American adult males who jog at least 15 miles per week.
b. Interpret the interval found in part a.
c. What assumptions are required for the validity of the confidence interval?

7.90 A consumer protection group is concerned that a catsup manufacturer is filling its 20-ounce family-size containers with less than 20 ounces of catsup. The group purchases ten family-size bottles of this catsup, weighs the contents of each, and finds that the mean weight is equal to 19.86 ounces, and the standard deviation is equal to .22 ounce.
a. Do the data provide sufficient evidence for the consumer group to conclude that the mean fill per family-size bottle is less than 20 ounces? Test using $\alpha = .05$.
b. If the test in part a were conducted on a periodic basis by the company's quality control department, is the consumer group more concerned about making a Type I error or a Type II error? (The probability of making this type of error is called the *consumer's risk*.)
c. The catsup company is also interested in the mean amount of catsup per bottle. It does not wish to overfill them. For the test conducted in part a, which type of error is more serious from the company's point of view—a Type I error or a Type II error? (The probability of making this type of error is called the *producer's risk*.)
d. Find a 90% confidence interval for the mean number of ounces of catsup being dispensed.

7.91 A cigarette manufacturer advertises that its new low-tar cigarette "contains on average no more than 4 milligrams of tar." You have been asked to test the claim using the following sample information: $n = 25$, $\bar{x} = 4.16$ milligrams, $s = .30$ milligram. Does the sample information disagree with the manufacturer's claim? Test using $\alpha = .05$. List any assumptions you make.

7.92 One of the most feared predators in the ocean is the great white shark. Although it is known that the white shark grows to a mean length of 21 feet, a marine biologist believes that the great white sharks off the Bermuda coast grow much longer due to unusual feeding habits. To test this claim, a number of full-grown great white sharks are captured off the Bermuda coast, measured, and then set free. However, because the capture of sharks is difficult, costly, and very dangerous, only three are sampled. Their lengths are 24, 20, and 22 feet.
a. Do the data provide sufficient evidence to support the marine biologist's claim? Use $\alpha = .10$.
b. Give the approximate observed significance level for the test in part a, and interpret its value.
c. What assumptions must be made in order to carry out the test?
d. Do you think these assumptions are likely to be satisfied in this sampling situation?

7.93 A company purchases large quantities of naphtha in 50-gallon drums. Because the purchases are ongoing, small shortages in the drums can represent a sizable loss to the company. The weights of the drums vary slightly from drum to drum, so the weight of the naphtha is determined by removing it from the drums and measuring it. Suppose the company samples the contents of 20 drums, measures the naphtha in each, and calculates $\bar{x} = 49.70$ gallons and $s = .32$ gallon. Do the sample statistics provide sufficient evidence to indicate that the mean fill per 50-gallon drum is less than 50 gallons? Use $\alpha = .10$.

7.94 Refer to Exercise 7.93. Find a 90% confidence interval for the mean number of gallons of naphtha per drum.

7.95 An important problem facing strawberry growers is the control of nematodes. These organisms compete with the plants for nutrients in the soil, thereby reducing yield. For this reason, fumigation is normally a part of field preparation. In the past, the fumigants used yielded an average of 8 pounds of marketable fruit for a certain standard sized plot. Recently, a new fumigant has been developed. It is applied to six standard plots of strawberries, and the yield of marketable fruit (in pounds) for each plot is 9, 9, 13, 9, 10, and 8.
a. Do the data indicate a significant increase in average yield at the .05 level of significance?
b. What assumptions are necessary for the procedure used to be valid?

7.96 A psychologist was interested in knowing whether male heroin addicts' assessments of self-worth differ from those of the general male population. On a test designed to measure assessment of self-worth, the mean score for males from the general population is 48.6. A random sample of 25 scores achieved by heroin addicts yielded a mean of 44.1 and a standard deviation of 6.2.
a. Do the data indicate a difference in assessment of self-worth between male heroin addicts and the general male population? Test using $\alpha = .01$.
b. Give the approximate observed significance level for the test and interpret its value.

7.97 In Exercise 4.46 we reported on research by Frans Van de Werf, M.D., and colleagues (*New England Journal of Medicine*, March 8, 1984) on a new drug, *t*-PA, which may prove to be effective in dissolving blood clots in heart attack patients. One aspect of their research involved measuring the length x of time for a heart attack patient's blood clot to be dissolved after treatment with *t*-PA. These times, recorded for $n = 7$ patients, were 50, 75, 0, 33, 57, 35, and 19 minutes.
a. Assume that the length x of time until a blood clot dissolves is normally distributed. Find a 90% confidence interval for μ, the mean length of time for a blood clot to be dissolved after treatment with *t*-PA.