c. Interpret the results found in parts (a) and (b). Do the confidence intervals suggest a difference in the variation among waiting times? Which arrangement seems better: the single-line system or the multiple-line system?

Using Large Data Sets from Appendix B. *In Exercises 17 and 18, use the data set from Appendix B. Assume that each sample is a simple random sample obtained from a population with a normal distribution.*

17. Penny Weights Refer to Data Set 21 in Appendix B and use the weights of the post-1983 pennies to construct a 98% confidence interval estimate of the standard deviation of the weights of all post-1983 pennies.

18. Ages of Presidents Refer to Data Set 12 in Appendix B and use the ages (years) of the presidents at the times of their inaugurations. Treating the data as a sample, construct a 98% confidence interval estimate of the standard deviation of the population of all such ages.

Determining Sample Size. *In Exercises 19–22, assume that each sample is a simple random sample obtained from a normally distributed population. Use Table 7-2 to find the indicated sample size.*

19. IQ of Statistics Professors You want to estimate σ for the population of IQ scores of statistics professors. Find the minimum sample size needed to be 99% confident that the sample standard deviation s is within 1% of σ. Is this sample size practical?

20. McDonald's Waiting Times You want to estimate σ for the population of waiting times at McDonald's drive-up windows, and you want to be 95% confident that the sample standard deviation is within 20% of σ. Find the minimum sample size. Is this sample size practical?

21. Flight Delays You want to estimate the standard deviation of arrival delays for American Airlines flights from Chicago to Miami. Find the minimum sample size needed to be 95% confident that the sample standard deviation is within 5% of the population standard deviation. A histogram of a sample of those arrival delays suggests that the distribution is skewed, not normal. How does the distribution affect the sample size?

22. U.S. Incomes You want to estimate the standard deviation of the population of current annual incomes of adults in the United States. Find the minimum sample size needed to be 99% confident that the sample standard deviation is within 5% of the population standard deviation. Does the population of incomes have a normal distribution, and how is the sample size affected by the distribution?

7-4 Beyond the Basics

23. Finding Critical Values In constructing confidence intervals for σ or σ^2, Table A-4 can be used to find the critical values X_L^2 and X_R^2 only for select values of n up to 101, so the number of degrees of freedom is 100 or smaller. For larger numbers of degrees of freedom, we can approximate X_L^2 and X_R^2 by using

$$\chi^2 = \frac{1}{2}[\pm z_{\alpha/2} + \sqrt{2k - 1}]^2$$

where k is the number of degrees of freedom and $z_{\alpha/2}$ is the critical z score described in Section 7-2. Use this approximation to find the critical values X_L^2 and X_R^2 for Exercise 9. How do the results compare to the actual critical values of 82.354 and 129.918?