The **population interquartile range** is the difference between the upper and lower population quartiles. If a histogram of the data set under consideration (whether a population or a sample) can be reasonably well approximated by a normal curve, then the relationship between the standard deviation (sd) and the interquartile range is roughly sd = iqr/1.35. A value of the standard deviation much larger than iqr/1.35 suggests a distribution with heavier (or longer) tails than a normal curve. For the degree data of Example 4.9, we had $s = 5.53$, whereas iqr/1.35 = 6/1.35 = 4.44. This suggests that the distribution of data values in Example 4.9 is indeed heavy-tailed compared to a normal curve. This can be seen in the stem-and-leaf display of Figure 4.7.

EXERCISES 4.17 - 4.31

4.17 ● The following data are cost (in cents) per ounce for nine different brands of sliced Swiss cheese (www.consumerreports.org):

29 62 37 41 70 82 47 52 49

a. Compute the variance and standard deviation for this data set.

b. If a very expensive cheese with a cost per slice of 150 cents was added to the data set, how would the values of the mean and standard deviation change?

4.18 ● Cost per serving (in cents) for six high-fiber cereals rated very good and for nine high-fiber cereals rated good by *Consumer Reports* are shown below. Write a few sentences describing how these two data sets differ with respect to center and variability. Use summary statistics to support your statements.

Cereals Rated Very Good

46 49 62 41 19 77

Cereals Rated Good

71 30 53 53 67 43 48 28 54

4.19 ● Combining the cost-per-serving data for high-fiber cereals rated very good and those rated good from the previous exercise gives the following data set:

46 49 62 41 19 77 71 30
53 53 67 43 48 28 54

a. Compute the quartiles and the interquartile range for this combined data set.

b. Compute the interquartile range for just the cereals rated good. Is this value greater than, less than, or about equal to the interquartile range computed in Part (a)?

4.20 ● The paper "Caffeinated Energy Drinks—A Growing Problem" (*Drug and Alcohol Dependence* [2009]: 1–10) gave the accompanying data on caffeine per ounce for eight top-selling energy drinks and for 11 high-caffeine energy drinks:

Top-Selling Energy Drinks

9.6 10.0 10.0 9.0 10.9 8.9 9.5 9.1

High-Caffeine Energy Drinks

21.0 25.0 15.0 21.5 35.7 15.0
33.3 11.9 16.3 31.3 30.0

The mean caffeine per ounce is clearly higher for the high-caffeine energy drinks, but which of the two groups of energy drinks (top-selling or high-caffeine) is the most variable with respect to caffeine per ounce? Justify your choice.

4.21 ● The Insurance Institute for Highway Safety (www.iihs.org, June 11, 2009) published data on repair costs for cars involved in different types of accidents. In one study, seven different 2009 models of mini- and micro-cars were driven at 6 mph straight into a fixed barrier. The following table gives the cost of repairing damage to the bumper for each of the seven models:

Model	Repair Cost
Smart Fortwo	$1,480
Chevrolet Aveo	$1,071
Mini Cooper	$2,291
Toyota Yaris	$1,688
Honda Fit	$1,124
Hyundai Accent	$3,476
Kia Rio	$3,701

a. Compute the values of the variance and standard deviation. The standard deviation is fairly large. What does this tell you about the repair costs?