MY DATA EX0218 **2.18 Utility Bills in Southern California** The monthly utility bills for a household in Riverside, California, were recorded for 12 consecutive months starting in January 2006:

Month	Amount ($)	Month	Amount ($)
January	$266.63	July	$306.55
February	163.41	August	335.48
March	219.41	September	343.50
April	162.64	October	226.80
May	187.16	November	208.99
June	289.17	December	230.46

a. Calculate the range of the utility bills for the year 2006.

b. Calculate the average monthly utility bill for the year 2006.

c. Calculate the standard deviation for the 2006 utility bills.

2.4 ON THE PRACTICAL SIGNIFICANCE OF THE STANDARD DEVIATION

We now introduce a useful theorem developed by the Russian mathematician Tchebysheff. Proof of the theorem is not difficult, but we are more interested in its application than its proof.

Tchebysheff's Theorem

Given a number k greater than or equal to 1 and a set of n measurements, at least $[1 - (1/k^2)]$ of the measurements will lie within k standard deviations of their mean.

Tchebysheff's Theorem applies to *any set of measurements* and can be used to describe either a sample or a population. We will use the notation appropriate for populations, but you should realize that we could just as easily use the mean and the standard deviation for the sample.

The idea involved in Tchebysheff's Theorem is illustrated in Figure 2.10. An interval is constructed by measuring a distance $k\sigma$ on either side of the mean μ. The number k can be any number as long as it is greater than or equal to 1. Then Tchebysheff's Theorem states that at least $1 - (1/k^2)$ of the total number n measurements lies in the constructed interval.

FIGURE 2.10
Illustrating Tchebysheff's Theorem