MEASURES OF DISPERSION A **measure of dispersion** describes the dispersion, or spread, of data. Two such measures are the *range*, which gives the length of the interval containing the data, and the *mean absolute deviation*, which gives the average variation of the data from the mean.

KEY CONCEPT *For Your Notebook*

Measures of Dispersion

The **range** of a numerical data set is the difference of the greatest value and the least value.

The **mean absolute deviation** of the data set $x_1, x_2, \ldots, x_n$ is given by:

$$\text{Mean absolute deviation} = \frac{|x_1 - \bar{x}| + |x_2 - \bar{x}| + \ldots + |x_n - \bar{x}|}{n}$$

REVIEW ABSOLUTE VALUE
For help with absolute value, see p. 66.

EXAMPLE 2 Compare measures of dispersion

RUNNING The top 10 finishing times (in seconds) for runners in two men's races are given. The times in a 100 meter dash are in set A, and the times in a 200 meter dash are in set B. Compare the spread of the data for the two sets using (**a**) the range and (**b**) the mean absolute deviation.

A: 10.62, 10.94, 10.94, 10.98, 11.05, 11.13, 11.15, 11.28, 11.29, 11.32

B: 21.37, 21.40, 22.23, 22.23, 22.34, 22.34, 22.36, 22.60, 22.66, 22.73

Solution

a. A: $11.32 - 10.62 = 0.7$ B: $22.73 - 21.37 = 1.36$

▶ The range of set B is greater than the range of set A. So, the data in B cover a wider interval than the data in A.

b. The mean of set A is 11.07, so the mean absolute deviation is:

$$\frac{|10.62 - 11.07| + |10.94 - 11.07| + \ldots + |11.32 - 11.07|}{10} = 0.164$$

The mean of set B is 22.226, so the mean absolute deviation is:

$$\frac{|21.37 - 22.226| + |21.40 - 22.226| + \ldots + |22.73 - 22.226|}{10} = 0.3364$$

▶ The mean absolute deviation of set B is greater, so the average variation from the mean is greater for the data in B than for the data in A.

REVIEW NEGATIVE NUMBERS
When using the formula for mean absolute deviation, you will encounter negative numbers. For help with negative numbers, see p. 64.

GUIDED PRACTICE for Example 2

2. RUNNING The top 10 finishing times (in seconds) for runners in a men's 400 meter dash are 46.89, 47.65, 48.15, 49.05, 49.19, 49.50, 49.68, 51.09, 53.31, and 53.68. *Compare* the spread of the data with that of set A in Example 2 using (**a**) the range and (**b**) the mean absolute deviation.