

## Extension

Use after Lesson 13.6

# Calculate Variance and Standard Deviation

TEKS 8.12.A

**GOAL** Find the variance and standard deviation of a data set.

### Key Vocabulary

- variance
- standard deviation

In addition to range and mean absolute deviation, *variance* and *standard deviation* are also measures of dispersion that can be used to describe the spread of a set of data.

### KEY CONCEPT

*For Your Notebook*

#### Variance and Standard Deviation

The **variance** of a numerical data set is denoted by  $\sigma^2$ , which is read as “sigma squared.” For the data set  $x_1, x_2, \dots, x_n$ , the variance is given by:

$$\sigma^2 = \frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \dots + (x_n - \bar{x})^2}{n}$$

The **standard deviation** of a numerical data set is denoted by  $\sigma$ , which is read as “sigma.” For the data set  $x_1, x_2, \dots, x_n$ , the standard deviation is the square root of the variance and is given by:

$$\sigma = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \dots + (x_n - \bar{x})^2}{n}}$$

### EXAMPLE 1 Find variance and standard deviation

**E-MAIL SIZES** The sizes of e-mails (in kilobytes) in your inbox are 1, 2, 2, 7, 4, 1, 10, 3, and 6. Find the variance and standard deviation of the data.

#### Solution

**STEP 1** Find the mean.

$$\bar{x} = \frac{1 + 2 + 2 + 7 + 4 + 1 + 10 + 3 + 6}{9} = \frac{36}{9} = 4$$

**STEP 2** Find the variance.

$$\sigma^2 = \frac{(1 - 4)^2 + (2 - 4)^2 + \dots + (6 - 4)^2}{9} = \frac{76}{9} = 8.444\dots$$

**STEP 3** Find the standard deviation.

$$\sigma = \sqrt{\sigma^2} = \sqrt{8.444\dots} \approx 2.9$$

► The variance is about 8.4, and the standard deviation is about 2.9.

#### IMPROVE ACCURACY

The more accurate the value of  $\sigma^2$  you use to calculate  $\sigma$ , the more accurate the value of  $\sigma$  you obtain. In the final answer, both results are rounded.