center, but also to interpret those values. Part 1 of this section includes core concepts that should be understood before considering Part 2.

Part 1: Basic Concepts of Measures of Center

In this Part 1, we introduce the mean, median, mode, and midrange as different measures of center.

> **DEFINITION** A **measure of center** is a value at the center or middle of a data set.

There are several different ways to determine the center, so we have different definitions of measures of center, including the mean, median, mode, and midrange. We begin with the mean.

Mean

The mean (or arithmetic mean) is generally the most important of all numerical measurements used to describe data, and it is what most people call an *average*.

> **DEFINITION** The **arithmetic mean,** or the **mean,** of a set of data is the measure of center found by adding the data values and dividing the total by the number of data values.

Important Properties of the Mean

• Sample means drawn from the same population tend to vary less than other measures of center.

• The mean of a data set uses every data value.

• A disadvantage of the mean is that just one extreme value (outlier) can change the value of the mean substantially. (Since the mean cannot resist substantial changes caused by extreme values, we say that the mean is not a *resistant* measure of center.)

Calculation and Notation of the Mean

The definition of the mean can be expressed as Formula 3-1, in which the Greek letter Σ (uppercase sigma) indicates that the data values should be added, so Σx represents the sum of all data values. The symbol n denotes the **sample size,** which is the number of data values.

Formula 3-1

$$\text{mean} = \frac{\Sigma x}{n} \quad \begin{array}{l} \leftarrow \text{sum of all data values} \\ \leftarrow \text{number of data values} \end{array}$$

If the data are a *sample* from a population, the mean is denoted by $\bar{x}$ (pronounced "x-bar"); if the data are the entire population, the mean is denoted by μ (lowercase Greek mu). (Sample statistics are usually represented by English letters, such as $\bar{x}$, and population parameters are usually represented by Greek letters, such as μ.)

Average Bob

According to Kevin O'Keefe, author of *The Average American: The Extraordinary Search for the Nation's Most Ordinary Citizen*, Bob Burns is the most average person in the United States. O'Keefe spent 2 years using 140 criteria to identify the single American who is most average. He identified statistics revealing preferences of the majority and applied them to the many people he encountered. Bob Burns is the only person who satisfied all of the 140 criteria. Bob Burns is 5 ft 8 in. tall, weighs 190 pounds, is 54 years of age, married, has three children, wears glasses, works 40 hours per week, drives an eight-year-old car, has an outdoor grill, mows his own lawn, drinks coffee each day, and walks his dog each evening.