Calculating a Weighted Mean

When different x data values are assigned different weights w, we can compute a **weighted mean.** Formula 3-3 can be used to compute the weighted mean.

Formula 3-3

$$\text{weighted mean: } \bar{x} = \frac{\Sigma(w \cdot x)}{\Sigma w}$$

Formula 3-3 tells us to first multiply each weight w by the corresponding value x, then to add the products, and then finally to divide that total by the sum of the weights, Σw.

Example 9 **Computing Grade Point Average**

In her first semester of college, a student of the author took five courses. Her final grades along with the number of credits for each course were A (3 credits), A (4 credits), B (3 credits), C (3 credits), and F (1 credit). The grading system assigns quality points to letter grades as follows: A = 4; B = 3; C = 2; D = 1; F = 0. Compute her grade point average.

Solution

Use the numbers of credits as weights: w = 3, 4, 3, 3, 1. Replace the letter grades of A, A, B, C, and F with the corresponding quality points: x = 4, 4, 3, 2, 0. We now use Formula 3-3 as shown below. The result is a first-semester grade point average of 3.07. (Using the preceding round-off rule, the result should be rounded to 3.1, but it is common to round grade point averages to two decimal places.)

$$\bar{x} = \frac{\Sigma(w \cdot x)}{\Sigma w}$$
$$= \frac{(3 \times 4) + (4 \times 4) + (3 \times 3) + (3 \times 2) + (1 \times 0)}{3 + 4 + 3 + 3 + 1}$$
$$= \frac{43}{14} = 3.07$$

using TECHNOLOGY

The calculations of this section are fairly simple, but some of the calculations in the following sections are not so simple. Many computer software programs allow you to enter a data set and use one operation to get several different sample statistics, referred to as *descriptive statistics*. Here are some of the procedures for obtaining such displays. (The accompanying displays are based on the numbers of chocolate chips in Chips Ahoy regular cookies, as listed in Table 3-1.)

STATDISK   Enter the data in the Data Window or open an existing data set. Click on **Data**, select **Descriptive Statistics**, and enter the column number for the desired data set. Now click on **Evaluate** to get the various descriptive statistics, including the mean, median, midrange, and other statistics to be discussed in the following sections. (Click on **Data** and use the **Explore Data** option to display descriptive statistics along with a histogram and other items discussed later.)

STATDISK

```
Descriptive Statistics
Column 1

Sample Size, n: 40
Mean:              23.95
Median:            24
Midrange:          24.5
RMS:               24.08215
Variance, s^2:     6.510256
St Dev, s:         2.55152
Mean Abs Dev:      2.0075
Range:             11
Coeff. Of Var.     10.65%

Minimum:           19
1st Quartile:      22.5
2nd Quartile:      24
3rd Quartile:      26
Maximum:           30

Sum:               958
Sum Sq:            23198
```