Assuming the data in Table 4.5.1 are population data, the mean cash on hand for the 45 companies is calculated as follows.

$$\mu = \frac{\Sigma(f_i M_i)}{N} = \frac{1575}{45} = \$35 \text{ million}$$

The variance of the grouped data is calculated as follows.

$$\sigma^2 = \frac{\Sigma(f_i M_i^2) - \frac{(\Sigma(f_i M_i))^2}{N}}{N}$$

$$= \frac{90125 - \frac{1575^2}{45}}{45} \approx 777.7778$$

If the data are sample data, then the variance is:

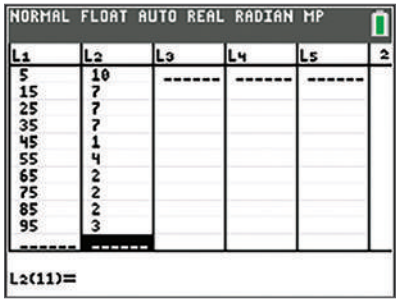
$$s^2 = \frac{\Sigma(f_i M_i^2) - \frac{(\Sigma(f_i M_i))^2}{n}}{n-1}$$

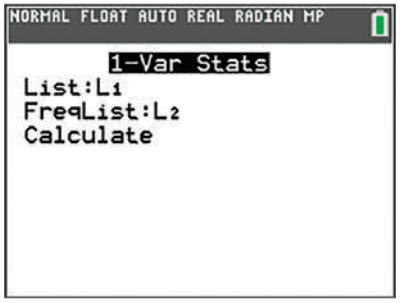
$$= \frac{90125 - \frac{1575^2}{45}}{44} \approx 795.4545.$$

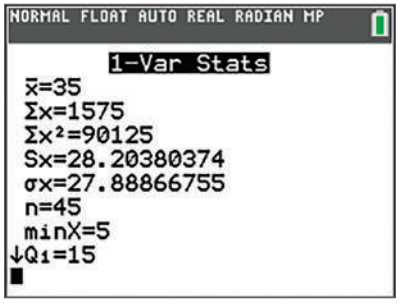
It is important to remember that the calculations of the mean and variance are approximate. That is, if the raw data are available, the actual mean and variance would differ from the measures calculated using the grouped data.

Technology

For technology instructions to calculate the sample statistics for grouped data, like the mean and standard deviation, visit stat.hawkeslearning.com and navigate to **Discovering Business Statistics, Second Edition > Technology Instructions > Descriptive Statistics > Two Variables**.







4.5 Exercises

Basic Concepts

1. When analyzing grouped data, are the measurements exact? Why or why not?
2. What calculations are required in order to analyze grouped data?

Exercises

3. A client of a commercial rose grower has been keeping records on the shelf-life of a rose. The client sent the frequency distribution to the grower. Calculate the mean and variance for the shelf-life given the following frequency distribution.

Rose Shelf-Life	
Days of Shelf-Life	Frequency
1 – 6	2
7 – 12	3
13 – 18	9
19 – 24	6
25 – 30	3
31 – 36	1

4. An article in *Business Week* discussed the large spread between the federal funds rate and the average credit card rate. The table below is a frequency distribution of the credit card rate charged by the top 100 issuers. Note that at the time these figures were published, the average federal funds rate was well below 5%.

Credit Card Rates

Credit Card Rate	Frequency
19% – 24%	36
18% – 18.9%	8
17% – 17.9%	15
16% – 16.9%	12
15% – 15.9%	29

a. Calculate the average credit card rate charged by the top 100 issuers based on the frequency distribution.

b. Calculate the variance of the credit card rate charged by the top 100 issuers based on the frequency distribution.

c. Calculate the standard deviation of the credit card rate charged by the top 100 issuers based on the frequency distribution.

5. A frequency distribution for the Beers and Breweries data set from the companion website is shown below. Use the frequency distribution to perform the following.

Data

stat.hawkeslearning.com
Discovering Business Statistics, Second Edition > Data Sets > Beers and Breweries

ABV Frequencies

ABV	Frequency
0.0010–0.017	1
0.0175–0.033	6
0.0335–0.049	402
0.0495–0.065	1228
0.0655–0.081	565
0.0815–0.097	146
0.0975–0.113	45
0.1135–0.129	3

a. Calculate the average ABV of all beers based on the frequency distribution. Round your answer to three decimal places.

b. Calculate the variance of the ABVs of the different beers based on the frequency distribution. Round your answer to four decimal places.

c. Calculate the standard deviation of the ABVs of the different beers based on the frequency distribution. Round your answer to three decimal places.

4.6 Proportions

Definition

Proportion

A **proportion** measures the fraction of a group that possesses some characteristic.

The **proportion** is one of the more common summary measures.

To calculate a proportion, simply count the number in the group that possess the characteristic and divide the count by the total number in the group. Let

x = number of observations that possess the characteristic,

N = number of observations in the population, and

n = number of observations in the sample, then