a. Enter the observed frequencies in the table above.

b. Assuming a normal distribution with mean and standard deviation given by the sample mean and standard deviation, use the methods of Chapter 6 to find the probability of a randomly selected height belonging to each class.

c. Using the probabilities found in part (b), find the expected frequency for each category.

d. Use a 0.01 significance level to test the claim that the heights were randomly selected from a normally distributed population. Does the goodness-of-fit test suggest that the data are from a normally distributed population?

11-3 Contingency Tables

Key Concept This section presents methods for analyzing *contingency tables* (or two-way frequency tables), which include frequency counts for categorical data arranged in a table with at least two rows and at least two columns. In Part 1 of this section, we present a method for conducting a hypothesis test of the null hypothesis that the row and column variables are independent of each other. This test of independence is used in real applications quite often. In Part 2, we will consider three variations of the basic method presented in Part 1: (1) test of homogeneity, (2) Fisher exact test, and (3) McNemar's test for matched pairs.

Part 1: Basic Concepts of Testing for Independence

In this section we use standard statistical methods to analyze frequency counts in a contingency table (or two-way frequency table). We begin with the definition of a contingency table.

> **DEFINITION** A **contingency table** (or **two-way frequency table**) is a table consisting of frequency counts of categorical data corresponding to two different variables. (One variable is used to categorize rows, and a second variable is used to categorize columns.)

Example 1   Contingency Table for Different Treatments

Table 11-6 is a contingency table with four rows and two columns. The cells of the table contain frequency counts. The row variable identifies the treatment used for a stress fracture in a foot bone, and the column variable identifies the outcome as a success or failure (based on data from "Surgery Unfounded for Tarsal Navicular Stress Fracture," by Bruce Jancin, *Internal Medicine News*, Vol. 42, No. 14).

Table 11-6 Study of Success with Different Treatments for Stress Fracture

	Success	Failure
Surgery	54	12
Weight-Bearing Cast	41	51
Non-Weight-Bearing Cast for 6 Weeks	70	3
Non-Weight-Bearing Cast Less Than 6 Weeks	17	5