$\beta_1 = 0$ can tell us whether the corresponding predictor variable should be included in the regression equation. Rejection of $\beta_1 = 0$ suggests that β_1 has a nonzero value and is therefore helpful for predicting the value of the response variable. Procedures for such tests are described in Exercise 17.

Part 2: Dummy Variables and Logistic Regression

So far in this section, all variables have been continuous in nature, but many situations involve a **dichotomous variable,** which is a variable with only *two* possible discrete values (such as male/female or dead/alive or cured/not cured). A common procedure is to represent the two possible discrete values by 0 and 1, where 0 represents a "failure" (such as death) and 1 represents a success. A dichotomous variable with the two possible values of 0 and 1 is called a **dummy variable**.

Procedures of analysis differ dramatically, depending on whether the dummy variable is a predictor (x) variable or the response (y) variable. If we include a dummy variable as another *predictor* (x) variable, we can use the methods of this section, as illustrated in Example 3.

Example 3 Using a Dummy Variable

Use the data in Table 10-6 and, for a predictor variable, use the dummy variable of sex (coded as 0 = female, 1 = male). (The data in Table 10-6 are based on data from the National Health and Nutrition Examination.) Given that a mother is 63 in. tall and a father is 69 in. tall, find the multiple regression equation and use it to predict the height of (a) a daughter and (b) a son.

Table 10-6 Heights (in inches) of Mothers, Fathers, and Their Children

Height of Mother	Height of Father	Sex of Child	Height of Child
66	70	M	62.5
66	64	M	69.1
64	68	M	67.1
66	74	M	71.1
64	62	M	67.4
64	67	M	64.9
62	72	M	66.5
62	72	M	66.5
63	71	M	67.5
65	71	M	71.9
63	64	F	58.6
64	67	F	65.3
65	72	F	65.4
59	67	F	60.9
58	66	F	60.0
63	69	F	62.2
62	69	F	63.4
63	66	F	62.2
63	69	F	59.6
60	66	F	64.0

Making Music with Multiple Regression

Sony manufactures millions of compact discs in Terre Haute, Indiana. At one step in the manufacturing process, a laser exposes a photographic plate so that a musical signal is transferred into a digital signal coded with 0s and 1s. This process was statistically analyzed to identify the effects of different variables, such as the length of exposure and the thickness of the photographic emulsion. Methods of multiple regression showed that among all of the variables considered, four were most significant. The photographic process was adjusted for optimal results based on the four critical variables. As a result, the percentage of defective discs dropped and the tone quality was maintained. The use of multiple regression methods led to lower production costs and better control of the manufacturing process.