

Are four quarters the same as one dollar?

Are four quarters the same as one dollar? There may be a temptation to answer yes and move on to the next chapter. Using our extensive knowledge base of arithmetic and currency, we do know that in terms of pure purchasing power, four quarters are the same as one dollar. But this Chapter Problem deals more with psychology than basic arithmetic. It involves the *denomination effect*, which refers to the tendency of people to spend money more readily when it is in the form of lower denominations (such as four quarters) instead of higher denominations (such as a \$1 bill). This is discussed in "The Denomination Effect" by Priya Raghubir and Joydeep Srivastava, *Journal of Consumer Research*, Vol. 36. In one study of this phenomenon, 43 college students were each given \$1 in the form of four quarters, while 46 other college students were each given \$1 in the form of a dollar bill. All of the students were then given two choices: (1) Keep the money; (2) spend the money on gum. The results are given in Table 11-1.

Table 11-1 Results from a Study of the Denomination Effect

	Purchased Gum	Kept the Money
Students Given Four Quarters	27	16
Students Given a \$1 Bill	12	34

Table 11-1 is called a *two-way table* (because the data are partitioned according to two different variables) or a *contingency table* (because we want to determine whether there is a *dependence* between the row and column categories). Similar tables occur often in real applications, so they are extremely important in the study of statistics.

Analyzing the Results

The purpose of the gum/money study is to determine whether the form of the gift (four quarters or \$1 bill) appears to affect the decision to purchase gum or keep the money. Table 11-1 has two rows corresponding to the variable of the form of the money, and it has two columns corresponding to the variable of how the subjects chose to use the money. We want to determine whether the row variable has an effect on the column variable. If there is an effect, then people behave differently with money in different denominations, so the "denomination effect" appears to be real. Analyzing the data in Table 11-1, we see that there does appear to be an effect, because 63% of those given four quarters chose to spend the money, but only 26% of those given a \$1 bill chose to spend the money. But is that a *significant* difference? That determination can be made using the methods introduced in Section 11-3.

11-1 Review and Preview

11-2 Goodness-of-Fit

11-3 Contingency Tables