

LESSON 83 Coin Problems

When we solve a problem, we read the problem and search for statements about quantities that are equal. Each time we find a statement of equality, we write it as an algebraic equation. When we have the same number of independent equations as we have variables, we solve the equations by using substitution, elimination, or by graphing.

The word problems that we have been working thus far have contained only one statement about quantities that are equal. We have worked these problems by using one equation and one variable. Now we will begin solving word problems that contain two statements about quantities that are equal. We will turn each of the statements into an equation that has two variables. Then we will solve the equations by using either substitution or elimination. The first problems of this kind are called **coin problems**.

In coin problems one statement will be about the number of coins. This statement will be like one of the following:

- (a) The number of nickels plus the number of dimes equals 40.

$$N_N + N_D = 40$$

- (b) There were six more nickels than dimes.

$$N_N = N_D + 6$$

The other statement will be about the value of the coins. Two examples are:

- (c) The value of the nickels plus the value of the dimes equals \$4.65.

$$5N_N + 10N_D = 465$$

- (d) The value of the dimes and quarters equaled \$25.10.

$$10N_D + 25N_Q = 2510$$

To avoid decimal numbers, we will often write all values in cents, as in (c) and (d).

example 83.1 Jack and Betty have 28 coins that are nickels and dimes. If the value of the coins is \$1.95, how many coins of each type do they have?

solution This is a typical problem about coins. It says that the number of nickels plus the number of dimes equals 28 and that the value of the nickels plus the value of the dimes equals 195 cents.

$$(a) N_N + N_D = 28$$

$$(b) 5N_N + 10N_D = 195$$

The values of N_N and N_D that will simultaneously satisfy both equations may be found using either the substitution method or the elimination method.

SUBSTITUTION	ELIMINATION
$5(28 - N_D) + 10N_D = 195$	$-5N_N - 5N_D = -140$
$140 - 5N_D + 10N_D = 195$	$\frac{5N_N + 10N_D = 195}{5N_D = 55}$
$140 + 5N_D = 195$	$N_D = 11$
$5N_D = 55$	And since $N_N + N_D = 28$
$N_D = 11$	$N_N = 17$
And since $N_N + N_D = 28$	
$N_N = 17$	