PROBLEM SOLVING WORKSHOP
LESSON 3.8

# Using ALTERNATIVE METHODS

TEKS 2A.3.A, 2A.3.B, 2A.3.C

## Another Way to Solve Example 5, page 213

**MULTIPLE REPRESENTATIONS** In Example 5 on page 213, you solved a linear system using an inverse matrix. You can also solve systems using *augmented matrices*. An **augmented matrix** for a system contains the system's coefficient matrix and matrix of constants.

**Linear System**

$$x - 4y = 9$$
$$-6x + 7y = -2$$

**Augmented Matrix**

$$\left[\begin{array}{cc|c} 1 & -4 & 9 \\ -6 & 7 & -2 \end{array}\right]$$

Recall from Lesson 3.2 that an equation in a system can be multiplied by a constant, or a multiple of one equation can be added to another equation. Similar operations can be performed on the rows of an augmented matrix to solve the corresponding system.

**KEY CONCEPT** *For Your Notebook*

### Elementary Row Operations for Augmented Matrices

Two augmented matrices are *row-equivalent* if their corresponding systems have the same solution(s). Any of these row operations performed on an augmented matrix will produce a matrix that is row-equivalent to the original:

- Interchange two rows.
- Multiply a row by a nonzero constant.
- Add a multiple of one row to another row.

**PROBLEM**

**GIFTS** A company sells three types of movie gift baskets. A basic basket with 2 movie passes and 1 package of microwave popcorn costs \$15.50. A medium basket with 2 movie passes, 2 packages of popcorn, and 1 DVD costs \$37. A super basket with 4 movie passes, 3 packages of popcorn, and 2 DVDs costs \$72.50. Find the cost of each item in the gift baskets.

**METHOD**

**Using an Augmented Matrix** You need to write a linear system, write the corresponding augmented matrix, and use row operations to transform the augmented matrix into a matrix with 1's along the main diagonal and 0's below the main diagonal. Such a matrix is in *triangular form* and can be used to solve for the variables in the system.

Let $m$ be the cost of a movie pass, $p$ be the cost of a package of popcorn, and $d$ be the cost of a DVD.