3.2 Solve Linear Systems Algebraically

TEKS a.5, 2A.3.A, 2A.3.B, 2A.3.C

Before You solved linear systems graphically.

Now You will solve linear systems algebraically.

Why? So you can model guitar sales, as in Ex. 55.

Key Vocabulary
- **substitution method**
- **elimination method**

In this lesson, you will study two algebraic methods for solving linear systems. The first method is called the **substitution method**.

KEY CONCEPT *For Your Notebook*

The Substitution Method

STEP 1 **Solve** one of the equations for one of its variables.

STEP 2 **Substitute** the expression from Step 1 into the other equation and solve for the other variable.

STEP 3 **Substitute** the value from Step 2 into the revised equation from Step 1 and solve.

EXAMPLE 1 Use the substitution method

Solve the system using the substitution method.

$2x + 5y = -5$ Equation 1
$x + 3y = 3$ Equation 2

Solution

STEP 1 **Solve** Equation 2 for x.

$x = -3y + 3$ Revised Equation 2

STEP 2 **Substitute** the expression for x into Equation 1 and solve for y.

$2x + 5y = -5$ Write Equation 1.

$2(-3y + 3) + 5y = -5$ Substitute $-3y + 3$ for x.

$y = 11$ Solve for y.

STEP 3 **Substitute** the value of y into revised Equation 2 and solve for x.

$x = -3y + 3$ Write revised Equation 2.

$x = -3(11) + 3$ Substitute 11 for y.

$x = -30$ Simplify.

▶ The solution is $(-30, 11)$.

CHECK Check the solution by substituting into the original equations.

$2(-30) + 5(11) \stackrel{?}{=} -5$ Substitute for x and y. $-30 + 3(11) \stackrel{?}{=} 3$

$-5 = -5$ ✓ Solution checks. $3 = 3$ ✓