

Solving Two-Step Equations

Objective Teach students to solve linear equations that involve more than one operation by using the Addition, Subtraction, Multiplication, and Division Properties of Equality.

Note to the Teacher *This material is crucial in algebra. Thus, it is beneficial that students be able to use these skills fluently. Provide ample opportunity for students to practice this skill.*

Solving Two-Step Equations

Use the following examples to review with students the techniques they learned in Lesson 3–6 for solving one-step equations.

Example 1 Solve $x + 7 = 15$.

Solution $x + 7 = 15$

$$x + 7 - 7 = 15 - 7 \quad \text{Subtract 7 from each side.}$$

$$x = 8 \quad \text{The solution is 8.}$$

In this example, we used subtraction to undo the addition of 7. Thus, we used the Subtraction Property of Equality.

Example 2 Solve $3x = 27$.

Solution $3x = 27$

$$\frac{3x}{3} = \frac{27}{3} \quad \text{Divide each side by 3.}$$

$$x = 9 \quad \text{The solution is 9.}$$

In this example, we used division to undo the multiplication of 3. Thus, we used the Division Property of Equality.

Sometimes, we encounter problems where there is both addition and multiplication in the equation. We must use both of these methods to solve these kinds of problems.

Example 3 Morgan bought a book for \$10 and some CDs. The cost of each CD was \$12. If Morgan spent a total of \$46, how many CDs did she buy?

Solution First, set up an equation. Let c represent the number of CDs Morgan bought. Since the cost of each CD is \$12, the amount Morgan spent on CDs is given by

$$12c \text{ dollars.}$$

Morgan also spent \$10 on a book. So, the total amount Morgan spent is

$$12c + 10 \text{ dollars.}$$

We know that Morgan spent \$46. So, we can write

$$12c + 10 = 46.$$

To solve this equation, we need to isolate c on the left side of the equation. This means we must undo the addition of 10 and the multiplication of 12. First, undo the addition of 10. Then undo the multiplication of 12.

$$12c + 10 = 46$$

$$12c + 10 - 10 = 46 - 10 \quad \textit{Subtract 10 from each side.}$$

$$12c = 36$$

$$\frac{12c}{12} = \frac{36}{12} \quad \textit{Divide each side by 12.}$$

$$c = 3$$

So, Morgan bought 3 CDs.

Note to the Teacher *As a class, discuss the steps in solving two-step equations.*

(1) *Undo any addition or subtraction. This leaves an equation with only multiplication or division.*

(2) *Undo any multiplication or division.*

Work through Exercises 1–3 with students. Point out how the two steps are applied. Then have students complete Exercises 4–6 on their own.

Exercises

Solve each equation.

1. $3x - 7 = 14$ **7** 2. $-7x + 5 = -16$ **3** 3. $\frac{y}{4} + 8 = 12$ **16**
4. $-5x + 12 = -3$ **3** 5. $\frac{3t}{5} - 6 = 6$ **20** 6. $10 + \frac{w}{4} = -14$ **-96**

Note to the Teacher *Have students write and solve various two-step equations. Be sure they include problems with negative coefficients and constants, and some fractions.*

