Section 2.2 and 2.3 Properties of Equality

# Objective 1: The Addition Property of Equality

The **addition property of equality** guarantees that adding the same number to both sides of an equation creates an equation that has the same solution set as the original equation. Since subtraction is defined in terms of addition, this property also applies to subtracting the same number from both sides of an equation.

**Addition Property of Equality:**

If $a$, $b$, and $c$ are real numbers and $a=b$, then $a+c=b+c$.

Solve the equation.

|  |  |
| --- | --- |
| a. $\frac{3}{4}=x+\frac{1}{2}$ | b. $x-1.2=3.5$ |
| c. $7a-5=8a$ | d. $\frac{1}{4}m+\frac{7}{4}m=m+\frac{5}{6}$ |

# Objective 2: The Multiplication Property of Equality

The **multiplication property of equality** guarantees that multiplying both sides of an equation by the same nonzero number creates an equation that has the same solution set as the original equation. Since division is defined in terms of multiplication, this property also applies to dividing both sides of an equation by the same nonzero number.

**Multiplication Property of Equality:**

If $a$, $b$, and $c$ are real numbers, $c\ne 0$, and $a=b$, then $ac=bc$.

Solve the equation.

|  |  |
| --- | --- |
| a. $\frac{2}{3}x=5$ | b. $0.4x=0.88$ |

When solving an equation, it is sometimes necessary to use both the addition and multiplication properties of equality.

Solve the equation.

|  |  |
| --- | --- |
| c. $\frac{7}{8}a=\frac{8}{7}a$ | d. $\frac{6}{5}y-5=-7$ |
| e. $15x-9=5x+19$ |   |

# Objective 3: Defining Linear Equations

The equations we have solved in this section are all examples of **linear equations**.

**Linear Equation in One Variable:**

A linear equation in one variable is an equation that is written in the form

$$ax+b=c$$

where $a, b, $and $c$ are real numbers and $a\ne 0$ or an equation that can be written in that form by using one more properties of arithmetic (commutative, associative, or distributive property) or properties of equality.

To solve a linear equation we use properties of arithmetic or equality to create simpler equations that still have the same solution as the original equation until we are able to determine the solution.