Section 2.4 Solving Linear Equations

# Objective 1: Apply a General Strategy for Solving a Linear Equation

# When solving a linear equation, there are multiple solution paths to choose from that all lead to the correct solution. In this section, we will look at some general strategies for how to decide on a solution path. A good strategy is to start by simplifying each side of the equation, if possible, by applying the commutative, associative, and distributive properties as necessary.

Solve the equation. State the operation or property used for each step.

|  |  |
| --- | --- |
| a. $11-5\left(a+2\right)=7+a$ |  |
| b. $-4\left(t-1\right)+6t=5t-5$ |  |

# Objective 2: Solving Equations Containing Fractions

If an equation contains fractions, one option is to clear the equation of fractions by multiplying both sides of the equation by the least common denominator.

Solve the equation. State the operation or property used for each step.

|  |  |
| --- | --- |
| a. $\frac{x}{2}-1=\frac{2x}{3}-3$ |  |
| b. $\frac{4\left(x+5\right)}{9}=\frac{2}{3}x-4$ |  |

# Objective 3: Solving Equations Containing Decimals

If an equation contains decimals, a similar strategy can be used to clear the equation of decimals.

Solve the equation. State the operation or property used for each step.

|  |  |
| --- | --- |
| $0.10\left(y-8\right)+0.04y=0.06y-1.4$  |  |

# Objective 4: Recognizing Identities and Equations with No Solution

So far, each linear equation we have solved has had one solution. However, some linear equations have no solution. For example, consider the equation

$x+5=x+7$.

This equation has no solution since there is no number with which we can replace $x$ that will create a true number sentence. If we subtract $x$ from both sides of the equation, we get a false number sentence, $5=7$, which further confirms that this equation has no solution since $5\ne 7$.

It is also possible for a linear equation to be an **identity** which is an equation that is true for all real numbers. Consider the equation

$2\left(x-2\right)=2x-4$.

This equation is true when $x$ is replaced with any real number. Thus, this equation has a solution set of all real numbers and is an identity. To further confirm that this equation has a solution set of all real numbers, let’s take steps towards solving the equation.

$$2\left(x-2\right)=2x-4$$

$$2x-4=2x-4$$

$$2x-2x-4=2x-2x-4$$

$$-4=-4$$

We are left with a true number sentence which means the equation is an identity.

Solve the equation.

|  |  |
| --- | --- |
| a. $5x+8=5(x+6)$ | b. $\frac{x}{2}-2=\frac{x}{5}+1$ |
| c. $2\left(x+2\right)=x-4$  | d. $0.04\left(2t-4\right)=0.08\left(t+5\right)-0.56$ |