

Section 1.1 Linear Equations in One Variable

Definition Linear Equation in One Variable

A **linear equation in one variable** is an equation that can be written in the form $ax + b = c$, where a , b , and c are real numbers and $a \neq 0$.

Linear equations are also **first-degree equations** because the exponent on the variable is understood to be 1.

Objective 3: Identify Equations That Are Contradictions and Those That Are Identities

A **conditional equation** is an equation that is true for some values of the variable but not for others. Every linear equation that is a conditional equation has one solution. However, not every linear equation in one variable has a single solution. There are two other cases: no solution and the solution set of all real numbers.

Consider the equation $x = x + 1$. No matter what value is substituted for x , the resulting value on the right side will always be one greater than the value on the left side. Therefore, the equation can never be true. We call such an equation a **contradiction**. It has *no solution*. Its solution set is the *empty* or *null set*, denoted by $\{ \}$ or \emptyset , respectively.

Now consider the equation $x + x = 2x$. The expression on the left side of the equation simplifies to the expression on the right side. No matter what value we substitute for x , the resulting values on both the left and right sides will always be the same. Therefore, the equation is always true. We call such an equation an **identity**. Its solution set is the set of all real numbers, denoted by $(-\infty, \infty)$ or $\{x \mid x \text{ is a real number}\}$.

1.1.13, 19, 22. Solve each equation.

Objective 4: Use Linear Equations to Solve Application Problems

When solving application problems, we use mathematical models. The following strategy can be used for solving application problems involving linear equations.

Problem-Solving Strategy for Applications of Linear Equations

- Step 1: Define the Problem.** Read the problem carefully, or multiple times if necessary. Identify what you are trying to find and determine what information is available to help you find it.
- Step 2: Assign Variables.** Choose a variable to assign to an unknown quantity in the problem. For example, use p for price. If other unknown quantities exist, express them in terms of the selected variable.
- Step 3: Translate into an Equation.** Use the relationships among the known and unknown quantities to form an equation.
- Step 4: Solve the Equation.** Determine the value of the variable and use the result to find any other unknown quantities in the problem.
- Step 5: Check the Reasonableness of Your Answer.** Check to see if your answer makes sense within the context of the problem. If not, check your work for errors and try again.
- Step 6: Answer the Question.** Write a clear statement that answers the question(s) posed.

1.1.33 Sabrina invested _____ in stocks and bonds. Her investment in bonds is _____ more than half her investment in stocks. How much did she invest in each?

1.1.35 It costs _____ to park in a parking garage for the first 2 hours. Then it costs _____ per hour for each hour afterwards. If your parking fee was _____, how long were you parked?