1.3 Solve Linear Equations

TEKS *a.2, a.5, 2A.2.A, A.7.A*

Before	You simplified algebraic expressions.
Now	You will solve linear equations.
Why?	So you can solve problems about earnings, as in Example 2.

Key Vocabulary
• equation
• linear equation
• solution
• equivalent equations

An **equation** is a statement that two expressions are equal. A **linear equation** in one variable is an equation that can be written in the form $ax + b = 0$ where a and b are constants and $a \neq 0$.

A number is a **solution** of an equation in one variable if substituting the number for the variable results in a true statement. Two equations are **equivalent equations** if they have the same solution(s).

KEY CONCEPT   *For Your Notebook*

Transformations That Produce Equivalent Equations

Addition Property of Equality	*Add* the same number to each side.	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	*Subtract* the same number from each side.	If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	*Multiply* each side by the same nonzero number.	If $a = b$ and $c \neq 0$, then $a \cdot c = b \cdot c$.
Division Property of Equality	*Divide* each side by the same nonzero number.	If $a = b$ and $c \neq 0$, then $a \div c = b \div c$.

EXAMPLE 1 **Solve an equation with a variable on one side**

ANOTHER WAY
You can also solve the equation in Example 1 by multiplying each side by 5 first.

$$5\left(\frac{4}{5}x + 8\right) = 5(20)$$
$$4x + 40 = 100$$
$$4x = 60$$
$$x = 15$$

Solve $\frac{4}{5}x + 8 = 20$.

$\frac{4}{5}x + 8 = 20$	**Write original equation.**
$\frac{4}{5}x = 12$	**Subtract 8 from each side.**
$x = \frac{5}{4}(12)$	**Multiply each side by $\frac{5}{4}$, the reciprocal of $\frac{4}{5}$.**
$x = 15$	**Simplify.**

▶ The solution is 15.

CHECK   Check $x = 15$ in the original equation.

$$\frac{4}{5}x + 8 = \frac{4}{5}(15) + 8 = 12 + 8 = 20 \checkmark$$