NAME _____ DATE _____ PERIOD _____

# 3-5 Solving Equations with the Variable on Each Side *(Pages 149–154)*

To solve an equation that has the variable on both sides, use the properties of equality to write an equivalent equation that has the variable on only one side. Then solve. When you solve equations that contain grouping symbols, you may need to use the distributive property to remove the grouping symbols. Some equations may have no solution because there is no value of the variable that will result in a true equation. For example, $x + 1 = x + 2$ has no solution; it cannot be true. An equation that is true for every value of the variable is called an **identity**. For example, $x + x = 2x$ is true for every value of $x$.

## Examples

**a. Solve $3(x - 2) = 4x + 5$.**

*First use the distributive property to remove the parentheses.*

$3x - 6 = 4x + 5$

*Next, collect all the terms with x on one side of the equal sign by subtracting 3x from each side.*

$3x - 6 - 3x = 4x + 5 - 3x$

$-6 = x + 5$ *Add like terms.*

$-6 - 5 = x + 5 - 5$ *Subtract 5 from each side.*

$-11 = x$ *Simplify.*

**b. Solve $\frac{1}{2}y = \frac{1}{3}y + 2$.**

*First, multiply each side by 6, the LCD, to clear the fractions from the problem.*

$6 \cdot \frac{1}{2}y = 6\left(\frac{1}{3}y + 2\right)$

$6 \cdot \frac{1}{2}y = 6 \cdot \frac{1}{3}y + 6 \cdot 2$

$3y = 2y + 12$

*Next, collect all the terms with y on one side of the equal sign by subtracting 2y from each side.*

$3y - 2y = 2y - 2y + 12$

$y = 12$

## Try These Together

**1.** Solve $4x + 3 = 5x + 7$.

*HINT: Subtract 4x from each side.*

**2.** Solve $7 + 3t = \frac{6 - t}{2}$.

*HINT: Multiply each side by 2.*

## Practice

**Solve each equation. Then check your solution.**

**3.** $18 + 2n = 4n - 9$

**4.** $10 - 2.7y = y + 9$

**5.** $\frac{2}{3}n + 6 = \frac{1}{4}n - 3$

**6.** $11.1c - 2.4 = -8.3c + 6.4$

**7.** $3 - 4x = 8x + 8$

**8.** $\frac{3}{5}d + 5 = \frac{1}{3}d - 3$

**9.** $3(2x - 1) = 9(x + 3)$

**10.** $2(2x - 5) = 6x + 4$

**11.** $-6(4x + 1) = 5 - 11x$

**12.** $\frac{5}{6}(12p + 4) = -13p + 4$

**13.** $-8\left(\frac{1}{4}n - 3\right) = n + 2$

**14.** $\frac{2 + t}{3} = 4 - \frac{6}{7}t$

**15.** **Standardized Test Practice** Nine less than half $n$ is equal to one plus the product of $-\frac{1}{8}$ and $n$. Find the value of $n$.

**A** 24 **B** $-21$ **C** 8 **D** 16

**Answers:** **1.** $-4$ **2.** $-\frac{8}{7}$ **3.** 13.5 **4.** $\frac{10}{37}$ **5.** $-21\frac{3}{5}$ **6.** $\frac{44}{97}$ **7.** $-\frac{5}{12}$ **8.** $-30$ **9.** $-10$ **10.** $-7$ **11.** $-\frac{11}{13}$ **12.** $\frac{2}{69}$ **13.** $7\frac{1}{3}$ **14.** 2.8 **15.** D