# SOLVING INEQUALITIES

**EXAMPLE 1:** Find the solution set for $k + 5 > 12$

**SOLUTION:**

$$k + 5 > 12 \qquad \text{Original equation}$$
$$k + 5 + (-5) > 12 + (-5) \qquad \text{Adding} -5 \text{ to both sides}$$
$$k > 7 \qquad \text{Simplifying}$$

*Check:*

| | |
|---|---|
| $k + 5 > 12$ | $k + 5 > 12$ |
| $8 + 7 > 12$ | $6 + 5 > 12$ |
| $15 > 12$ True | $11 > 12$ False |

So the solution set for $k + 5 > 12$ consists of all real numbers greater than 7.

**EXAMPLE 2:** Find the solution set for $-3 + x + 5 < 7$

**SOLUTION:**

$$-3 + x + 5 < 7 \qquad \text{Original equation}$$
$$2 + x < 7 \qquad \text{Simplifying the left-hand side}$$
$$2 + x + (-2) < 7 + (-2) \qquad \text{Adding -2 to both sides}$$
$$x < 5 \qquad \text{Simplifying}$$

*Check:*

| | |
|---|---|
| $-3 + x + 5 < 7$ | $-3 + x + 5 < 7$ |
| $-3 + 3 + 5 < 7$ | $-3 + 6 + 5 < 7$ |
| $5 < 7$ True | $8 < 7$ False |

So the solution set for $-3 + \chi + 5 < 7$ contains all real numbers less than 5.

**EXAMPLE 3:** Solve: $2(6x + 3) > 9x - 5$

**SOLUTION**

$$12x + 6 + (-6) > 9x - 5 + (-6) \qquad \text{Addition principle}$$
$$12x > 9x - 11 \qquad \text{Simplifying}$$
$$12x + (-9x) > 9x - 11 + (-9x) \qquad \text{Addition principle}$$
$$3x > -11 \qquad \text{Simplifying}$$
$$\left(\frac{1}{3}\right)(3)x > \left(\frac{1}{3}\right)(-11) \qquad \text{Multiplying both sides by } \frac{1}{3}$$
$$x > -\frac{11}{3} = -3\frac{2}{3} \qquad \text{Simplifying}$$

**EXAMPLE 4:** Solve: $-4(y + 6) \leq 2y - 5 + 4(y - 7)$

**SOLUTION**

$$-4\,(y + 6) \leq 2y - 5 + 4(y - 7)$$ Original Equation
$$-4y - 24 \leq 2y - 5 + 4y - 28$$ Distributive property
$$-4y - 24 \leq 6y - 33$$ Combining like terms
$$-4y - 24 + 24 \leq 6y - 33 + 24$$ Adding 24 to both sides
$$-4y \leq 6y - 9$$ Simplifying
$$-4y + (-6y) \leq 6y - 9 + (-6y)$$ Adding $-6y$ to both sides
$$-10y \leq -9$$ Simplifying
$$y \geq \frac{9}{10}$$ Dividing by a negative value changes the

inequality sign to its opposite

**EXERCISES:**

Solve using the addition principle.

1.  $-24 + x > 9$

2.  $x + 32 < 16$

3.  $-26 \leq y - 18$

4. $-11t < -1144$

5.  $16x \geq -124$

6. $2x - 3 - 9x > 10$

7. $-5(x - 2) \geq 6x - 4 + 3(x + 5)$

8.  $-14r - 3(r + 9) > 7 + 2r$

**SOLUTIONS:**

1.  $x > 33$

2. $x < -16$

3. $y \geq -8$

4.  $t > 104$

5. $x \geq -7\frac{3}{4}$

6. $x < -1\frac{6}{7}$

7. $x \leq \frac{-1}{14}$

8. $r < \frac{-34}{19}$