Lesson 6-3

Example 1 Solve a Real-World Problem

The gravitational force on the moon is 0.17 of the force on Earth. This means, if you weigh 100 pounds on Earth, you would weigh 100 × 0.17 or 17 pounds on the moon. Shawn is an astronaut who will be doing a moon walk. He weighs 165 pounds and will carry a pack. His weight including the pack cannot exceed 34 pounds on the moon. If x represents the weight of the pack, the inequality $0.17(165 + x) \leq 34$ represents this situation. What are the possible weights of Shawn's pack?

$0.17(165 + x) \leq 34$ Original inequality

$28.05 + 0.17x \leq 34$ Distributive Property

$28.05 + 0.17x - 28.05 \leq 34 - 28.05$ Subtract 28.05 from each side.

$0.17x \leq 5.95$ Simplify.

$\frac{0.17x}{0.17} \leq \frac{5.95}{0.17}$ Divide each side by 0.17.

$x \leq 35$ Simplify.

Shawn's pack cannot exceed 35 pounds on Earth.

Example 2 Inequality Involving a Negative Coefficient

Solve $-8 - 2t \geq -6$. Then check your solution.

$-8 - 2t \geq -6$ Original inequality

$-8 - 2t + 8 \geq -6 + 8$ Add 8 to each side.

$-2t \geq 2$ Simplify.

$\frac{-2t}{-2} \leq \frac{2}{-2}$ Divide each side by –2 and change $\geq$ to $\leq$.

$t \leq -1$ Simplify.

Check: To check this solution, substitute –1, a number less than –1, and a number greater than –1.

Let $t = -1$

$-8 - 2t \geq -6$

$-8 - 2(-1) \stackrel{?}{\geq} -6$

$-8 + 2 \stackrel{?}{\geq} -6$

$-6 \geq -6$

Let $t = -2$

$-8 - 2t \geq -6$

$-8 - 2(-2) \stackrel{?}{\geq} -6$

$-8 + 4 \stackrel{?}{\geq} -6$

$-4 \geq -6$

Let $t = 0$

$-8 - 2t \geq -6$

$-8 - 2(0) \stackrel{?}{\geq} -6$

$-8 - 0 \stackrel{?}{\geq} -6$

$-8 \not\geq -6$

The solution set is $\{t \mid t \leq -1\}$.

Example 3 Write and Solve an Inequality

Write an inequality for the sentence below. Then solve the inequality.

Sixteen minus three fifths of a number is at most two fifths of the number minus twelve.

sixteen	minus	three fifths	of	a number	is at most	two fifths	of	the number	minus	twelve
16	-	$\frac{3}{5}$	×	n	≤	$\frac{2}{5}$	×	n	-	12

$16 - \frac{3}{5}n \le \frac{2}{5}n - 12$ Original inequality

$16 - \frac{3}{5}n + \frac{3}{5}n \le \frac{2}{5}n - 12 + \frac{3}{5}n$ Add $\frac{3}{5}n$ to each side.

$16 \le n - 12$ Simplify.

$16 + 12 \le n - 12 + 12$ Add 12 to each side.

$28 \le n$ Simplify.

The solution set is $\{n \mid n \ge 28\}$.

Example 4 Distributive Property

Solve $2(p - 3) - 3(2p + 6) > 4p$.

$2(p - 3) - 3(2p + 6) > 4p$ Original inequality

$2p - 6 - 6p - 18 > 4p$ Distributive Property

$-4p - 24 > 4p$ Combine like terms

$-4p - 24 + 4p > 4p + 4p$ Add $4p$ to each side.

$-24 > 8p$ Simplify

$\frac{-24}{8} > \frac{8p}{8}$ Divide each side by 8

$-3 > p$ Simplify.

Since $-3 > p$ is the same as $p < -3$, the solution set is $\{p \mid p < -3\}$.

Example 5 Empty Set

Solve $2(x + 3) \le \frac{1}{2}(4x + 2) - 1$.

$2(x + 3) \le \frac{1}{2}(4x + 2) - 1$ Original inequality

$2x + 6 \le 2x + 1 - 1$ Distributive Property

$2x + 6 \le 2x$ Combine like terms.

$2x + 6 - 2x \le 2x - 2x$ Subtract $2x$ from each side.

$6 \le 0$ This statement is false.

Since the inequality results in a false statement, the solution set is the empty set Ø.