Name Key Period _____

Lesson 5.3 Notes (Solving Multi-Step Inequalities)

Objectives:

- Solve linear inequalities involving more than one operation.
- Solve linear inequalities involving the Distributive Property.

Multi-Step Inequalities – solved by undoing operations in the same way you would solve a multi-step equation

- ***Exception!*** Multiply/divide by a negative → reverse direction of inequality
- Examples:

1. Solve each inequality. Then, graph the solution set on a number line.

a. $-11y - 13 > 42$

$+13 \quad +13$

$\frac{-11y}{-11} > \frac{55}{-11}$

$y < -5$

b. $4(3t - 5) + 7 \geq 8t + 3$

$12t - 20 + 7 \geq 8t + 3$

$12t - 13 \geq 8t + 3$

$12t \geq 8t + 16$

$4t \geq 16$

$t \geq 4$

2. Define a variable, write an inequality, and solve the problem.

a. Write and solve an inequality to find the sales Mrs. Jones needs if she earns a monthly salary of $2000 plus a 10% commission on her sales. Her goal is to make at least $4000 per month. What sales does she need to meet her goal?

$2000 + .10s \geq 4000$

$.10s \geq 2000$

$s \geq 20{,}000$

she must make [at least $20,000] in sales to meet her monthly goal.

b. Five minus 6 times a number is more than 4 times the number plus 45.

$5 - 6n > 4n + 45$

$5 > 10n + 45$

$-40 > 10n$

$-4 > n \Rightarrow$ [$n < -4$]

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Special Cases:

- **Empty Set** (∅) – solving results in a statement that is *never true*
  - the inequality has no solutions
    - Notation: ∅
- **All Real Numbers** – solving results in a statement that is *always true*
  - All real numbers are part of the solution set
    - Notation: **{x | x is a real number}**

- Examples: Solve each inequality.

3. $9t - 5(t - 5) \leq 4(t - 3)$

$9t - 5t + 25 \leq 4t - 12$

$4t + 25 \leq 4t - 12$

$-4t \qquad -4t$

$25 \leq -12$ ← Never true

No solution ⇒ $\{\emptyset\}$

4. $6(5z - 3) \leq 36z$

$30z - 18 \leq 36z$

$-30z \qquad -30z$

$-18 \leq 6z$

$\frac{-18}{6} \leq \frac{6z}{6}$

$-3 \leq z$ ⇒ $z \geq -3$

5. $3(4m + 6) \leq 42 + 6(2m - 4)$

$12m + 18 \leq 42 + 12m - 24$

$12m + 18 \leq 18 + 12m$

$-12m \qquad -12m$

$18 \leq 18$ ← Always True

Solution: $\{m \mid m \text{ is a real number}\}$