UNIT 2 • REASONING WITH LINEAR EQUATIONS AND INEQUALITIES
Lesson 1: Creating Linear Equations and Inequalities in One Variable

Instruction

Prerequisite Skills

This lesson requires the use of the following skills:

- solving simple linear equations (8.EE.7b)

- comparing rational numbers (6.NS.7a)

Introduction

Inequalities are similar to equations in that they are mathematical sentences. They are different in that they are not equal all the time. An inequality has infinite solutions, instead of only having one solution like a linear equation. Setting up the inequalities will follow the same process as setting up the equations did. Solving them will be similar, with two exceptions, which will be described later.

Key Concepts

- The prefix *in-* in the word *inequality* means "not." Inequalities are sentences stating that two things may not be equal. For example, $12 > 2$ and $1 < 7$.

- Remember that the symbols $>$, $<$, $\geq$, $\leq$, and $\neq$ are used with inequalities.

- Use the table that follows to review the meanings of the inequality symbols and the provided examples with their **solution sets**, or the value or values that make a sentence or statement true.

| Symbol	Description	Example	Solution set
>	greater than, more than	$x > 3$	all numbers greater than 3; does not include 3
≥	greater than or equal to, at least	$x \geq 3$	all numbers greater than or equal to 3; includes 3
<	less than	$x < 3$	all numbers less than 3; does not include 3
≤	less than or equal to, no more than	$x \leq 3$	all numbers less than or equal to 3; includes 3
≠	not equal to	$x \neq 3$	includes all numbers except 3

- Solving a linear inequality is similar to solving a linear equation. The processes used to solve inequalities are the same processes that are used to solve equations.

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- Multiplying or dividing both sides of an inequality by a negative number requires reversing the inequality symbol. Here is a number line to show the process.

  - First, look at the example of the inequality $2 < 4$.

$$2 < 4$$
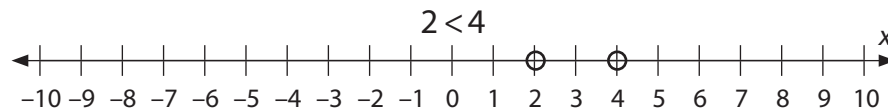
  - Multiply both sides by -2 and the inequality becomes $2(-2) < 4(-2)$ or $-4 < -8$.
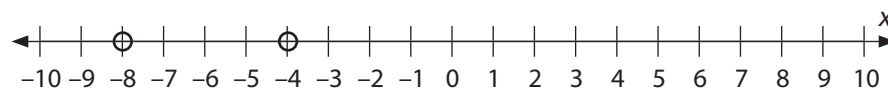
- Is -4 really less than -8?

- To make the statement true, you must reverse the inequality symbol: $-4 > -8$

$$-4 > -8$$
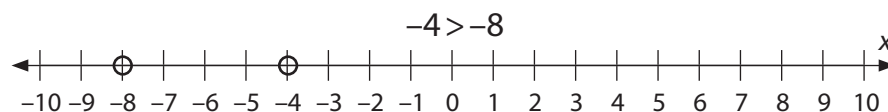
Creating Inequalities from Context

1. Read the problem statement carefully.
2. Reread the scenario and make a list of the known quantities.
3. Read the statement again, identifying the unknown quantity or variable.
4. Create expressions and inequalities from the known quantities and variable(s).
5. Solve the resulting inequality.
6. Interpret the solution of the inequality in terms of the context of the problem.

Common Errors/Misconceptions

- not translating the words into the correct symbols, especially with the phrases *no fewer than*, *no more than*, *at least as many*, and so on

- forgetting to switch the inequality symbol when multiplying or dividing by a negative

- not interpreting the solution in terms of the context of the problem—students can often mechanically solve the problem but don't know what the solution means