Graphing Methods are helpful for estimating solutions of inequalities. If you want exact results, you can use symbolic reasoning.

You already know how to use properties of equality to solve linear equations. To solve linear inequalities, you will learn to use the properties of operations on inequalities.

Problem 3.2

A. Suppose that two numbers, q and r, are related by the inequality \( q < r \). Draw a number line such as the one below.

Locate points to represent the numbers q and r when

1. both q and r are positive numbers

2. both q and r are negative numbers

3. one number is negative and the other is positive
B. Suppose $q < r$

- Complete each statement below with an inequality symbol (< or >) so that the result is true for all values of $q$ and $r$.

- Use the number-line graphs from Question A and ideas about geometric transformations to explain each answer.

- If it’s not possible to write an inequality statement that is true for all values of $q$ and $r$, give examples to show why that is the case.

1. $q + 23$ $r + 23$

2. $q - 35$ $r - 23$

3. $14q$ $14r$

4. $-6q$ $-6r$

5. $q$ $r$
   $\frac{5}{5}$ $\frac{5}{5}$

6. $q$ $r$
   $\frac{-3}{-3}$ $\frac{-3}{-3}$
C. What do your results from Question B suggest about how working with inequalities is similar to and different from working with equations?

D. Use symbolic reasoning to solve each inequality. Then, make a number-line graph to show solutions.

1. \( 3x + 17 < 47 \)  
2. \( 43 < 8x - 9 \)

3. \( -6x + 9 < 25 \)  
4. \( 14x - 23 < 5x + 13 \)

5. \( 18 < -4x + 2 \)  
6. \( 3,975 + 6x < 995 + 17.95x \)