

COMPOUND INEQUALITIES

Big Picture

Compound inequalities refer to a group of multiple inequalities joined by either "and" or "or". Venn diagrams are a good visual way to represent the solutions to the compound inequalities. Each circle in a Venn diagram represents the set of solutions for each individual inequality.

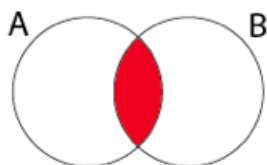
Key Terms

Compound Inequality: Two or more inequalities joined by *and* or *or*.

Types of Compound Inequalities

Inequalities joined by *and*

- The solution must make *both* inequalities true
- If a number makes only one of the inequalities true, that number is not a solution for the compound inequality
- Solutions are like the intersection of two sets. A is the set of solutions for one of the inequalities, and B is the set of solutions for the other inequalities. The solution for the compound inequality is $A \cap B$



Inequalities joined by *or*

- The solution must make *at least one* inequality true
- Solutions are like the union of two sets. A is the set of solutions for one of the inequalities, and B is the set of solutions for the other inequalities. The solution for the compound inequality is $A \cup B$



Compound Inequalities on a Number Line

Inequality Joined by *And*

$x > a$ and $x < b$ (can be rewritten as $a < x < b$)

- a must be less than b

Example: $x \geq -40$ and $x < 60$ (can be rewritten as $-40 \leq x < 60$)



Remember that an open circle means that point is not included and a filled circle means that point is included.

Inequality Joined by *Or*

$x < a$ or $x > b$

- a must be greater than b

Example: $x \leq -1$ or $x \geq 4$



Solving Compound Inequalities

Inequality Joined by *And*

Separate the inequalities and solve them separately.

- Review the *Linear Inequalities* study guide on how to solve inequalities.
- Combine the solutions at the end.

Example: $3x-5 < x+9 \leq 5x+13$

$$\begin{array}{l} 3x-5 < x+9 \quad \text{and} \quad x+9 \leq 5x+13 \\ 2x < 14 \quad \quad \quad -4 \leq 4x \\ x < 7 \quad \quad \quad \quad -1 \leq x \end{array}$$

Answer: $x < 7$ and $x \geq -1$ (rewritten as $-1 \leq x < 7$)



Inequality Joined by *Or*

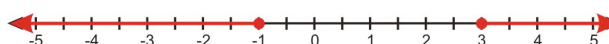
Solve each inequality separately.

- Review the *Linear Inequalities* study guide on how to solve inequalities.

Example: $9-2x \leq 3$ or $3x+10 \leq 6-x$

$$\begin{array}{l} 9-2x \leq 3 \quad \text{or} \quad 3x+10 \leq 6-x \\ -2x \leq -6 \quad \quad \quad 4x \leq -4 \\ x \geq 3 \quad \quad \quad \quad x \leq -1 \end{array}$$

Answer: $x \geq 3$ and $x \leq -1$



Notes
