

Compound Inequalities

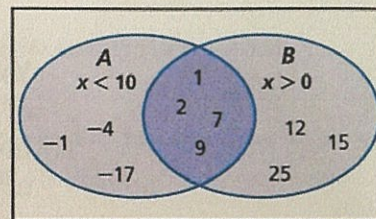
I. When two simple inequalities are combined into one statement by the words AND or OR, the result is called a **compound inequality**.

WORDS	ALGEBRA	GRAPH
All real numbers less than 2 OR greater than 6	$x < 2$ OR $x > 6$ $x < 2 \cup x > 6$	
All real numbers less than or equal to 2 OR greater than or equal to 6	$x \leq 2$ OR $x \geq 6$ $x \leq 2 \cup x \geq 6$	
All real numbers greater than 2 AND less than 6	$x > 2$ AND $x < 6$ $x > 2 \cap x < 6$ $2 < x < 6$	
All real numbers greater than or equal to 2 AND less than or equal to 6	$x \geq 2$ AND $x \leq 6$ $x \geq 2 \cap x \leq 6$ $2 \leq x \leq 6$	

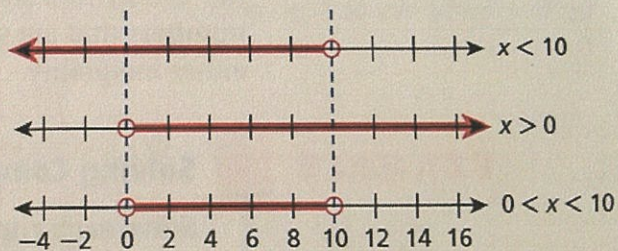
I. Solving Inequalities Containing AND

A) When considered together, two inequalities such as $x < 10$ and $x > 0$ form a **compound inequality**. A compound inequality containing *and* is only true if both inequalities are true.

In this diagram, oval A represents some integer solutions of $x < 10$, and oval B represents some integer solutions of $x > 0$. The overlapping region represents numbers that belong in both ovals. Those numbers are solutions of *both* $x < 10$ *and* $x > 0$.



You can graph the solutions of a compound inequality involving AND by using the idea of an overlapping region. The overlapping region is called the **intersection** and shows the numbers that are solutions of both inequalities.



The statement $0 < x < 10$ can be read as *x is greater than 0 and less than 10* or *x is between 0 and 10*

B) Examples: Solve and graph the intersection. Write your answer in set builder & interval notation.

1) $-2 \leq x - 3 < 4$

2) $-5 < 2x + 3 \leq 9$

*3) $y - 3 \geq -11$ and $y - 3 \leq -8$

II. Solving Compound Inequalities Containing OR

A) Another type of compound inequality contains the word *or*. A compound inequality containing *or* is true if at least one of the inequalities is true.

In this diagram, circle A represents some integer solutions of $x < 0$, and circle B represents some integer solutions of $x > 10$. The combined shaded regions represent numbers that are solutions of *either* $x < 0$ *or* $x > 10$.

A		
$x < 0$		
-4		
-78	-1	
-17		

B		
$x > 10$		
12		
15	400	
25		

You can graph the solutions of a compound inequality involving OR by using the idea of combining regions. The combined regions are called the **union** and show the numbers that are solutions of either inequality.

$x < 0$
 $x > 10$
 $x < 0$ OR $x > 10$

**When solving problems involving inequalities, *within* is meant to be inclusive, so use \leq or \geq . *Between* is meant to be exclusive, so use $<$ or $>$.

B) Examples: Solve and graph the union. Write your answer in set builder & interval notation.

1) $2x \leq 6$ or $3x > 12$

2) $a + 1 < 4 \cup a - 1 \geq 3$

3) $-2m + 7 \leq 13$ or $5m + 12 > 37$

***What is the solution set of the inequality $-7 < x + 2 < 4$

a) $\{x \mid -5 < x < 6\}$

b) $\{x \mid -5 < x < 2\}$

c) $\{x \mid -9 < x < 2\}$

d) $\{x \mid -9 < x < 6\}$