Algebra I *1-6 Solving Compound Inequalities* Name:_____Date:_____

Objectives: Solve compound inequalities with one variable.
Graph solution sets of compound inequalities with one variable.

***The inequalities you have seen so far are simple inequalities. When two simple inequalities are combined into one statement by the words AND or OR, the result is called a compound inequality.

Compound Inequalities:

1. x > 2 **AND** x < 6 can be joined together $2 < x < 6$

   In words: "x is between 2 and 6, non-inclusive"

   Graph:

2. x ≥ 2 **AND** x ≤ 6 can be joined together $2 \leq x \leq 6$

   In words: "x is between 2 and 6, inclusive"

   Graph:

3. x < 2 **OR** x > 6

   In words: "x is less than 2 or greater than 6"

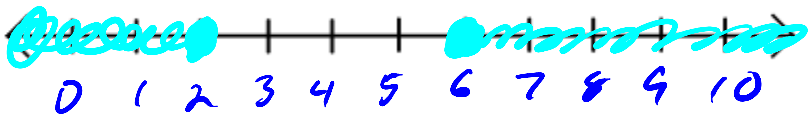
   non inclusive

   Graph:

4. x ≤ 2 **OR** x ≥ 6

   In words: "x is less than 2 or greater than 6, inclusive"

   Graph:



Example 1: The pH level of a popular shampoo is between 6.0 and 6.5 inclusive. Write a compound inequality to show the pH levels of this shampoo.

$6 \leq pH \leq 6.5$

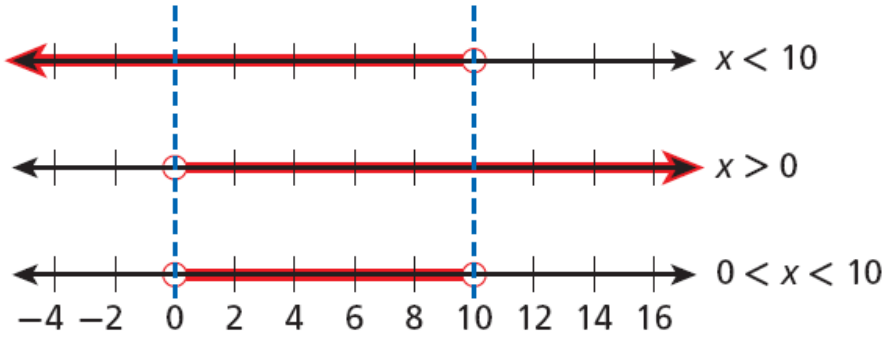
Graphing Compound Inequaulities

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 solution set and shows the numbers that are solutions of BOTH inequalities.

For example: x < 10 **and** x > 0

0 < x < 10

*Notice the graphs are combined to represent the solutions between 0 and 10.

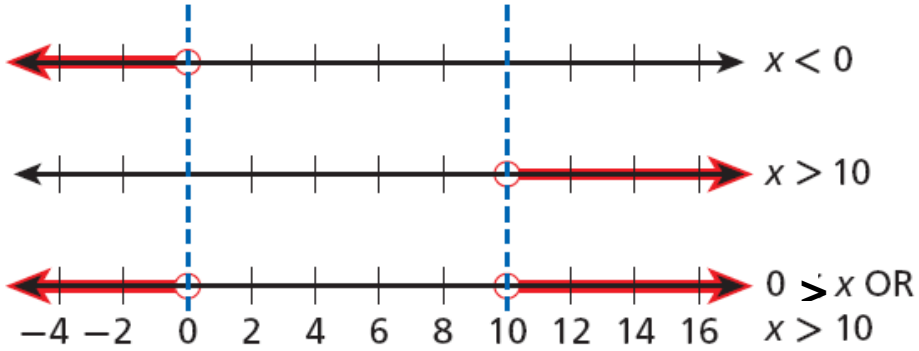


You can graph the solutions of a compound inequality involving **OR** by using the idea of combining regions.

The combine regions are called the solution set and show the numbers that are solutions of either inequality.

For example: **x < 0 or x > 10**

*Notice the graphs are in opposite directions to represent solutions less than 0 and greater than 10.



Solving Compound Inequalities Involving AND

Solve each inequality and graph the solutions.

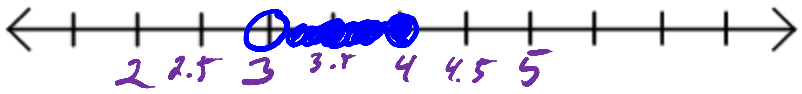
Example 2: $8 \leq 3x - 1 \leq 11$

+1 +1 +1

$9 \leq 3x \leq 12$

$\frac{9}{3} \leq \frac{3x}{3} \leq \frac{12}{3}$

$3 < x \leq 4$

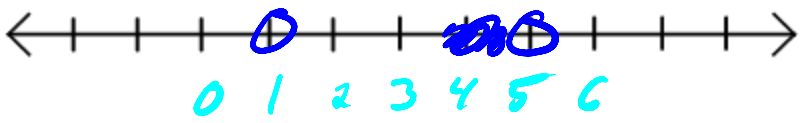


$x > 3$ AND $x \leq 4$

You Try! $-9 < x - 10 < -5$

+10 +10 +10

$1 < x < 5$



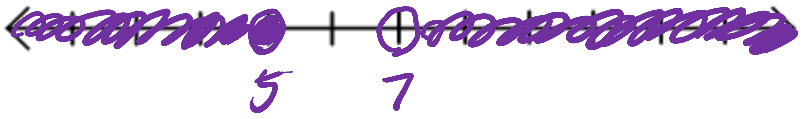
Solving Compound Inequalities Involving OR

Solve each inequality and graph the solutions.

Example 3: $4x \le 20$ OR $3x > 21$

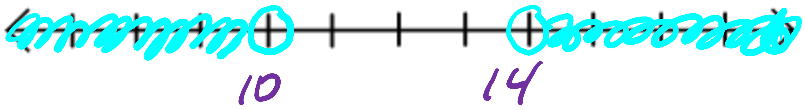
$\frac{4x}{4} \le \frac{20}{4}$ $\quad$ $\frac{3x}{3} > \frac{21}{3}$

$x \le 5$ or $x > 7$



You Try! $2 + r < 12$ OR $r + 5 > 19$

$r < 10$ or $r > 14$



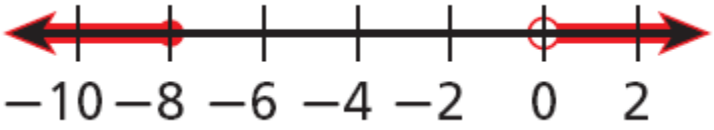
Writing a Compound Inequality from a Graph

When writing an inequality from a graph, you must decide:

1) AND or OR

2) open or closed circle(s)

3) what numerical values



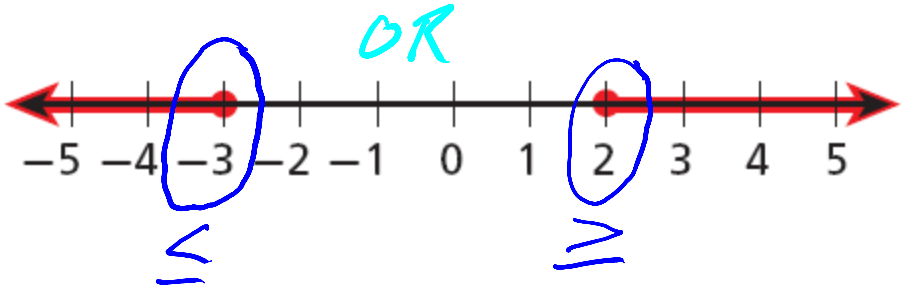
Since the arrows are going in opposite directions…OR

Closed circle at (-8) and open circle at (0)

So, $x \le -8$ or $x > 0$

Example 4: Write the compound inequality shown by the graph.

$x \le -3$ or $x \ge 2$



$x > -9$ AND $x < -2$

$-9 < x < -2$