Name Key

8A; Algebra 1

Date_____

Period____

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.**

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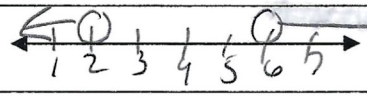
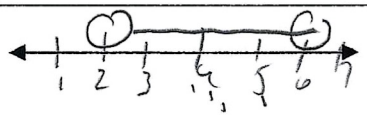
WORDS	ALGEBRA	GRAPH
All real numbers less than 2 OR greater than 6	$x < 2$ OR $x > 6$ $x < 2 \cup x > 6$	
All real numbers less than or equal to 2 OR greater then or equal to 6	$x \leq 2$ OR $x \geq 6$ $x \leq 2 \cup x \geq 6$	
All real numbers greater than 2 AND less than 6	$x > 2$ AND $x < 6$ $x >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

IN: $(-\infty, 2) \cup (6, \infty)$

IN: $(-\infty, 2] \cup [6, \infty)$

IN: $(2, 6)$

IN: $[2, 6]$

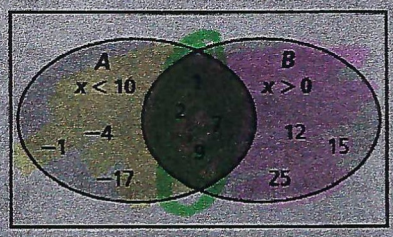
"OR" 2 inequalities are NOT connected

"AND" 2 inequalities are connected

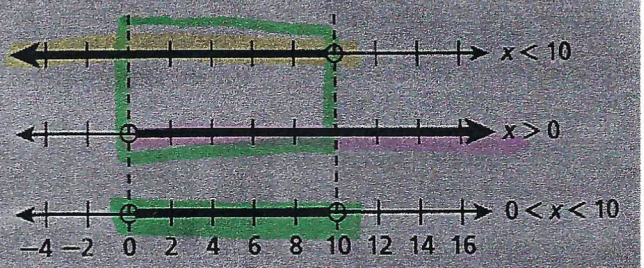
Solving Inequalities Containing *AND*

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. → what they have in common

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.



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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*

not including ( )

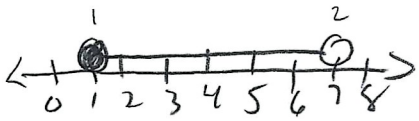
$-2 \le x-3$ and $x-3<4$
$+3 \quad +3$ $+3 \quad +3$

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

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

$+3 \quad +3 \quad +3$

$1 \le x < 7$ AND



SB: $\{x \in R \mid 1 \le x < 7\}$

IN: $[1, 7)$

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

$-3 \quad -3 \quad -3$

$\frac{-8}{2} < \frac{2x}{2} \le \frac{6}{2}$

$-4 < x \le 3$

SB: $\{x \in R \mid -4 < x \le 3\}$

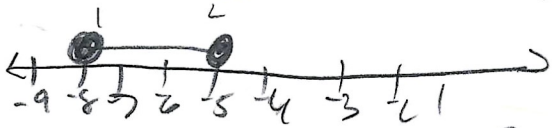
IN: $(-4, 3]$

***3) $y-3 \ge -11$ and $y-3 \le -8$**

$+3 \quad +3$ $+3 \quad +3$

$y \ge -8$ and $y \le -5$

$-8 \le y \le -5$ → must be written as a single compound inequality



SB: $\{y \in R \mid -8 \le y \le -5\}$

IN: $[-8, -5]$

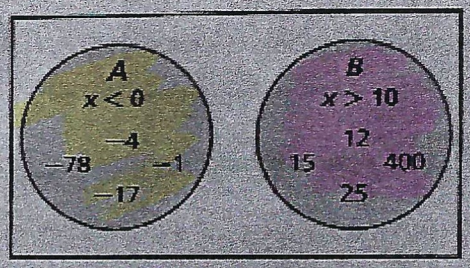
* make sure to use the letter 'y'

* And must be combined into 1 inequality *

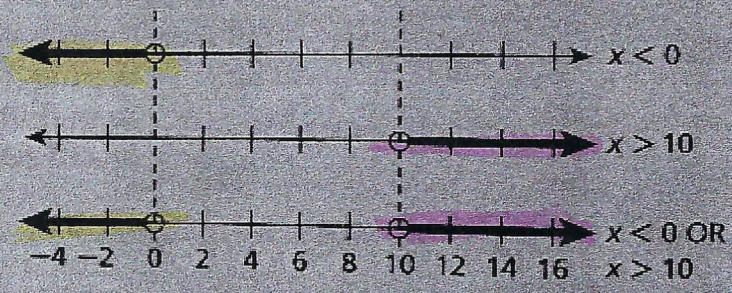
II. Solving Compound Inequalities Containing *OR*

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. * only has to satisfy one

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* $x > 10$.



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.



"all together" ∪

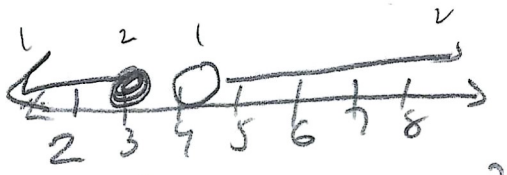
**When solving problems involving inequalities, *within* is meant to be inclusive, so use ≤ or ≥. *Between* is meant to be exclusive, so use < or >.

not including ( ) including [ ]

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

1) $\frac{2x}{2} \le \frac{6}{2}$ or $\frac{3x}{3} > \frac{12}{3}$

$x \le 3$ OR $x > 4$



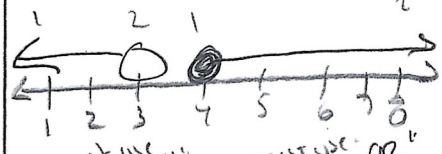
SB: $\{x \in \mathbb{R} \mid x \le 3 \text{ or } x > 4\}$

IN: $(-\infty, 3] \cup (4, \infty)$

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

$-1 \quad -1 \qquad +1 \quad +1$

$a < 3 \cup a \ge 4$



*must use "U" MUST USE "OR"

SB: $\{a \in \mathbb{R} \mid a < 3 \text{ or } a \ge 4\}$

IN: $(-\infty, 3) \cup [4, \infty)$

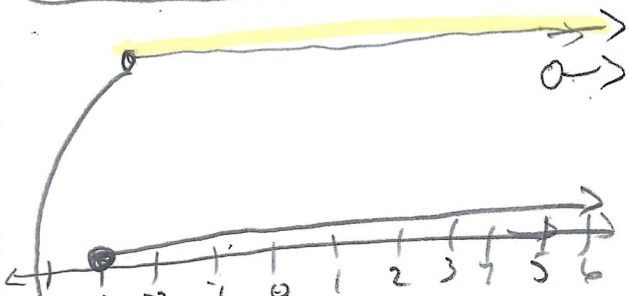
*3) $-2m + 7 \le 13$ or $5m + 12 > 37$

$-7 \quad -7 \qquad -12 \quad -12$

$\frac{-2m}{-2} \le \frac{6}{-2} \qquad \frac{5m}{5} > \frac{25}{5}$

*switch direction of symbol when dividing by a neg #

$m \ge -3$ OR $m > 5$



*pick the one that covers more (bigger)

SB: $\{m \in \mathbb{R} \mid m \ge -3\}$

IN: $[-3, \infty)$

*You do NOT combine "OR" into a single compound inequality

SB & IN MUST reflect graph

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

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

$-2 \quad -2 \quad -2$

$-9 < x < 2$

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

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

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