1.6. Advanced Algebra
Solving Compound Inequalities

DATE: 9/24

Target 2A. Utilize a graph to illustrate the solution set of an absolute value inequality.

Compound inequality: two inequalities joined by the word **AND** or the word **OR**

Anticipation Guide: Please answer the following questions with your shoulder partner.

1) What group of students is less than the seniors **AND** greater than the freshman?

"Soph and Juniors"

2) What letter grade is greater than a D **AND** less than a B?

"C"

3) What group of students is less than the sophomores **OR** greater than the juniors?

"Freshman OR Seniors"

4) What letter grade is greater than a B **OR** less than a D?

"A OR E"

AND Compound Inequality

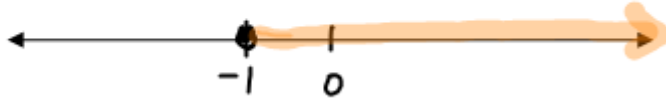
AND Compound Inequality

A compound inequality containing the word **AND** is true if and only if both inequalities are true (this means that the solution is where both inequalities intersect, or overlap)

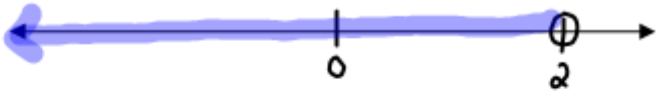
Example

Graph the solution set for $-1 \leq x < 2$. But $-1 \leq x < 2$ is the same as $-1 \leq x$ **AND** $x < 2$.

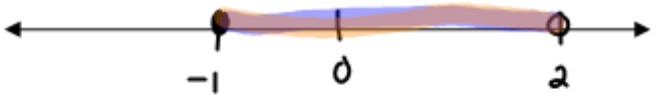
$-1 \leq x$ can be changed to $x \geq -1$



$x < 2$



So the graph of $-1 \leq x < 2$ is where both parts intersect.



Set builder: $\{x \mid -1 \leq x < 2\}$

Interval notation: $[-1, 2)$

Remember!

$<, >$ ↔ ○ ↔ (,) open circle

↔ [,]

$\leq, \geq$ ↔ ● closed circle

For $-\infty, +\infty$, we have (,)

Practice

1. Solve $13 < 2x + 7 \leq 17$. Graph the solution set on a number line.

$-7 \quad -7 \quad -7$

$\frac{6}{2} < \frac{2x}{2} \leq \frac{10}{2}$

$3 < x \leq 5$

Set-builder: $\{x \mid 3 < x \leq 5\}$ Interval: $(3, 5]$

2. Solve $10 \leq 3y - 2 < 19$. Graph the solution set on a number line.

$+2 \quad +2 \quad +2$

$\frac{12}{3} \leq \frac{3y}{3} < \frac{21}{3}$

$4 \leq y < 7$

Set-builder: $\{y \mid 4 \leq y < 7\}$ Interval: $[4, 7)$

OR Compound Inequality

A compound inequality containing the word **OR** is true if one or more of the inequalities is true (this means that the solution is the union, or both inequalities together)

Example

Graph the solution set for $x \leq 1$ **OR** $x > 4$.

$x \leq 1$

OR Compound Inequality

A compound inequality containing the word **OR** is true if one or more of the inequalities is true (this means that the solution is the union, or both inequalities together)

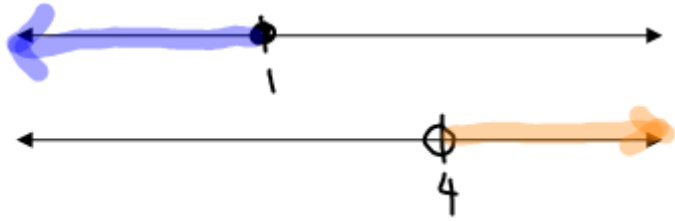
$\cup$ → symbol for union

Example

Graph the solution set for $x \leq 1$ **OR** $x > 4$.

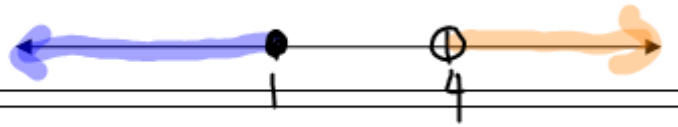
$x \leq 1$

$x > 4$



So the graph of $x \leq 1$ **OR** $x > 4$ is both inequalities together.

Set-builder: $\{x \mid x \leq 1 \text{ or } x > 4\}$



Interval: $(-\infty, 1] \cup (4, +\infty)$

Practice

3. Solve $y - 2 > -3$ **OR** $y + 4 \leq 3$. Graph the solution set on a number line.

$x \leq 1$

$x > 4$

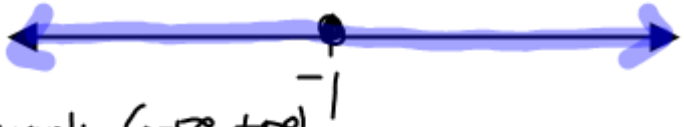
So the graph of $x \leq 1$ **OR** $x > 4$ is both inequalities together.

Practice

3. Solve $y - 2 > -3$ **OR** $y + 4 \leq 3$. Graph the solution set on a number line.

$+2 \quad +2$ $\qquad$ $-4 \quad -4$

$y > -1$ OR $y \leq -1$

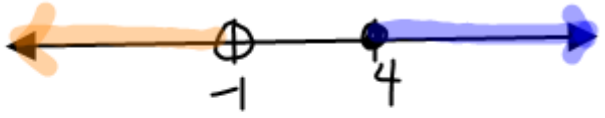


Set builder $\{y \mid y = \mathbb{R}\}$ Interval: $(-\infty, +\infty)$

4. Solve $x + 3 < 2$ **OR** $-x \leq -4$. Graph the solution set on a number line.

$-3 \quad -3$ $\qquad$ $\div -1 \quad \div -1$

$x < -1$ OR $x \geq 4$



Interval: $(-\infty, -1) \cup [4, +\infty)$

Set builder: $\{x \mid x < -1 \text{ OR } x \geq 4\}$

"MUST FLIP INEQUALITY" $\Rightarrow$ when ÷ or × by a negative #.