

1-6 notes - Microsoft Word

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1.6. Advanced Algebra

DATE: 9/24

Solving Compound Inequalities

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



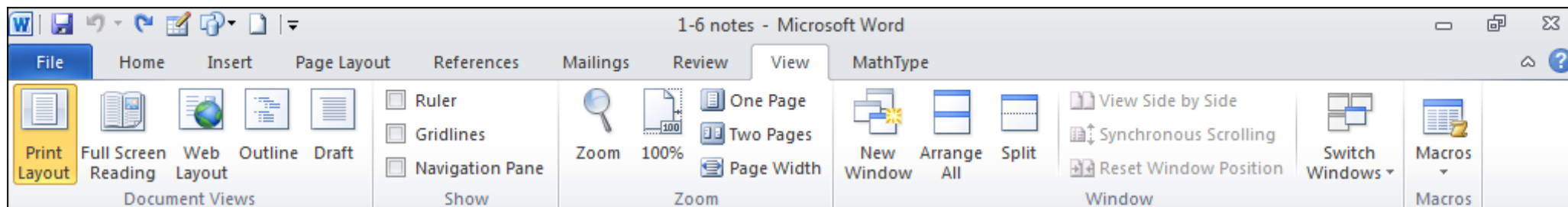
Compound inequality: two inequalities joined by the word **AND** or the word **OR**

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

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AND Compound Inequality

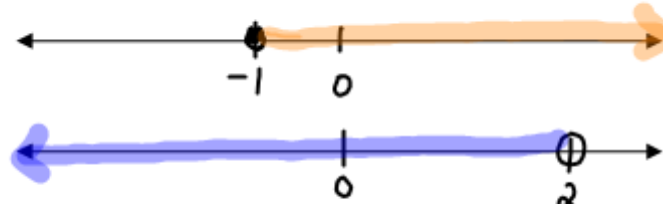
A compound inequality containing the word **AND** is true if and only if both inequalities are true (this means that the solution is where both inequalities intersect, or overlap)

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 $x \geq -1$

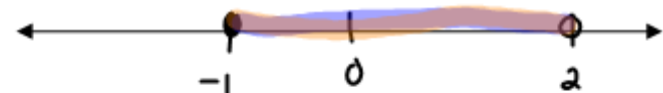
$x < 2$



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

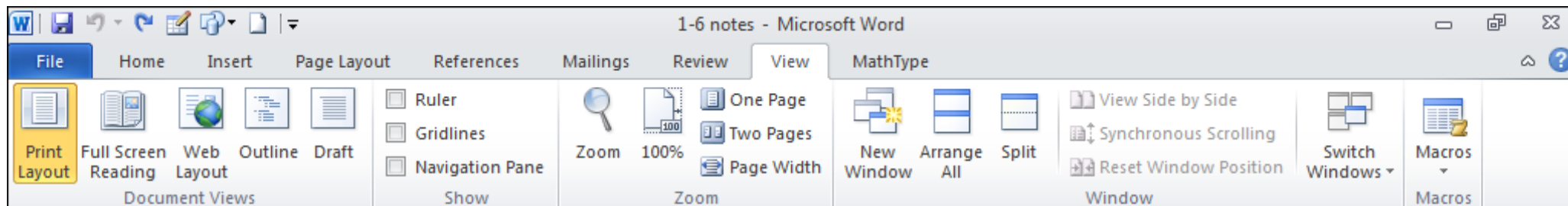
Set builder: $\{x | -1 \leq x < 2\}$

Interval notation: $[-1, 2)$



Remember!
 $<, > \leftrightarrow \circ \leftrightarrow (,)$
 open circle
 $\leq, \geq \leftrightarrow \bullet \leftrightarrow [,]$
 closed circle
 For $-\infty, +\infty$,
 we have $(,)$





Practice

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

$$\begin{array}{r} -7 \quad -7 \quad -7 \\ \hline 6 < 2x \leq 10 \\ \frac{6}{2} < \frac{2x}{2} \leq \frac{10}{2} \\ 3 < x \leq 5 \end{array}$$



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.

$$\begin{array}{r} +2 \quad +2 \quad +2 \\ \hline 12 \leq 3y < 21 \\ \frac{12}{3} \leq \frac{3y}{3} < \frac{21}{3} \\ 4 \leq y < 7 \end{array}$$



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** $x > 4$.

$$x \leq 1$$



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OR Compound Inequality

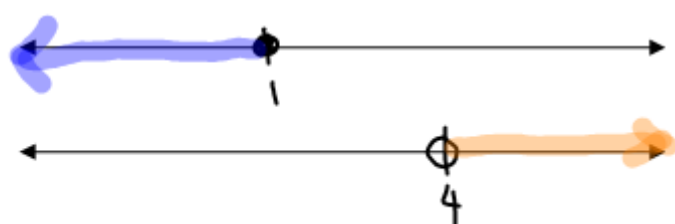
A compound inequality containing the word **OR** is true if one or more of the inequalities is true (this means that the solution is the union or both inequalities together)

$\cup \rightarrow$ 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: $\{x | x \leq 1 \text{ or } x > 4\}$

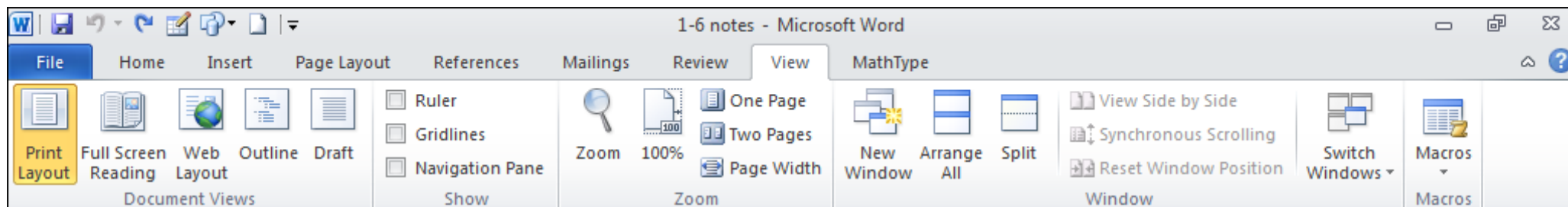


Interval: $(-\infty, 1] \cup (4, +\infty)$

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

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$$x \leq 1$$



$$x > 4$$



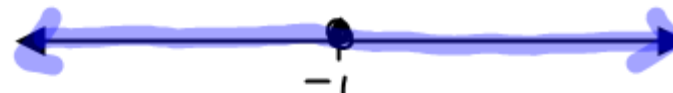
So the graph of $x \leq 1$ **OR** $x > 4$ is both inequalities together.



Practice

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

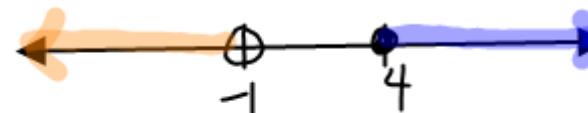
$$\begin{array}{r} +2 \quad +2 \\ y - 2 > -3 \\ \hline y > -1 \end{array} \quad \text{OR} \quad \begin{array}{r} -4 \quad -4 \\ y + 4 \leq 3 \\ \hline y \leq -1 \end{array}$$



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.

$$\begin{array}{r} -3 \quad -3 \\ x + 3 < 2 \\ \hline x < -1 \end{array} \quad \text{OR} \quad \begin{array}{r} -1 \quad -1 \\ -x \leq -4 \\ \hline x \geq 4 \end{array}$$



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

Set builder:

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

↓
"MUST FLIP INEQUALITY" \Rightarrow when \div or \times by a negative #.