



James Madison
HIGH SCHOOL

Solving Compound Inequalities

Goal:

I can Write, Solve and Graph compound inequalities.

What do you think a compound inequality is?



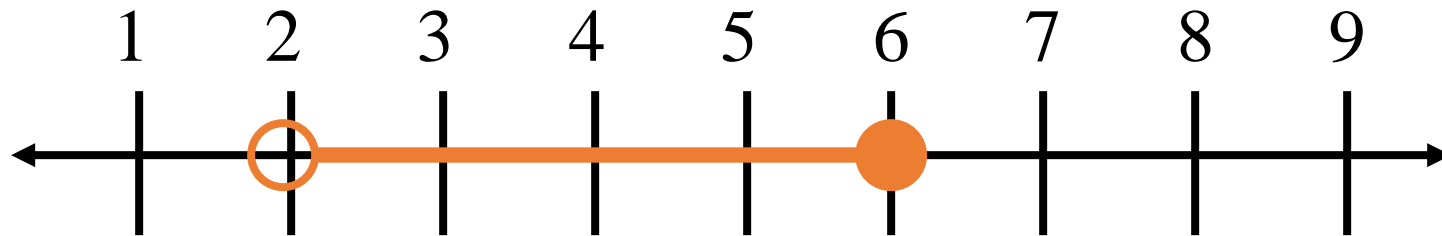
Recall and Vocabulary

So far, we studied simple inequalities, but now we will study *compound inequalities*.

A **compound inequality** consists of two inequalities connected by the words *and* or *or*. For example:

$2 < x \leq 6$ is a compound inequality, read as

“2 is less than x , *and* x is less than or equal to 6.”

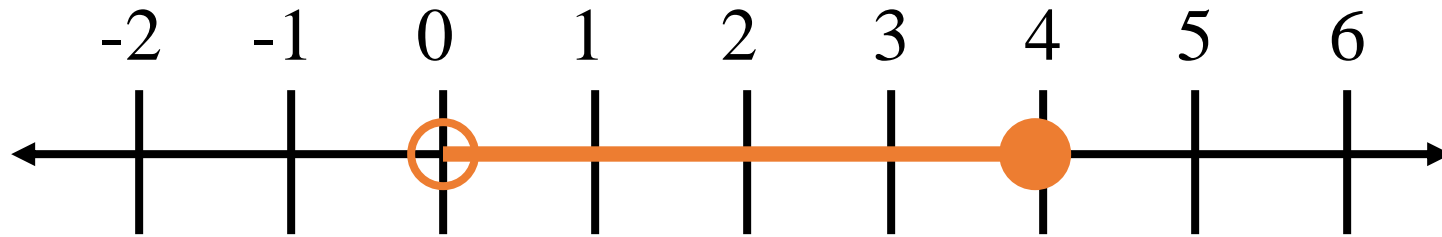




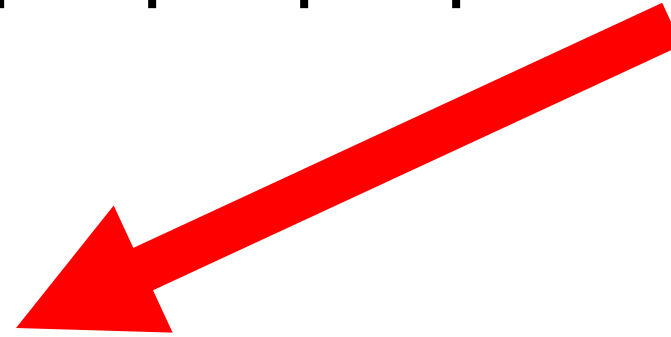
Compound Inequalities - two possible cases:

1) And 2) Or

Graph all real numbers that are greater than zero *and* less than or equal to 4.



$$0 < x \leq 4$$



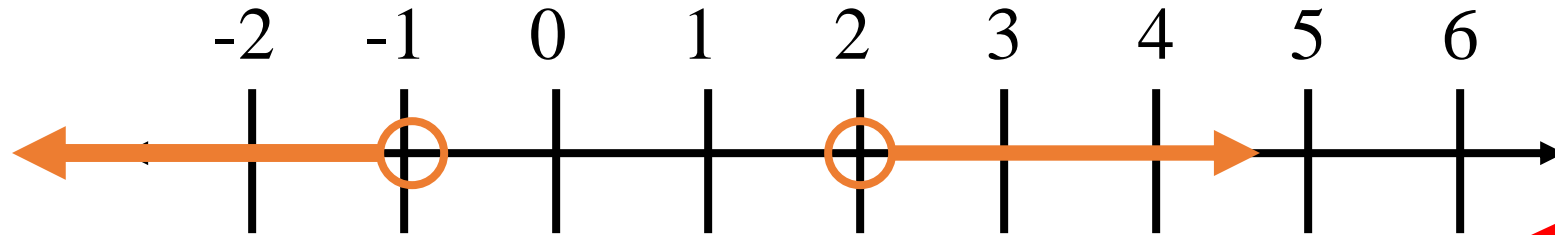
AND cases have the **variable in-between** two numbers. The graph is therefore **in-between** two numbers. This is the INTERSECTION of the Individual Solutions.



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Compound Inequalities - two cases: And/Or

Graph all real numbers that are less than -1 *or* greater than 2 .



$$x < -1 \text{ or } x > 2$$

OR cases have **TWO separate answers** and are solved (and graphed) separately (but on the same number line). The graph of this case goes in opposite directions. (This is the Union of the solutions to either inequality)



Solving a Compound Inequality - AND

When solving for variables in the “and” case, you isolate the variable **in-between** the inequality symbols.

IMPORTANT – inverse operations apply to the **WHOLE THING** (that means both sides!).

$$-2 \leq 3x - 8 \leq 10$$

Original Problem

$$-2 + 8 \leq 3x - 8 + 8 \leq 10 + 8$$

Add 8

$$6 \leq 3x \leq 18$$

Simplify

$$\frac{6}{3} \leq \frac{3x}{3} \leq \frac{18}{3}$$

Divide 3

$$2 \leq x \leq 6$$

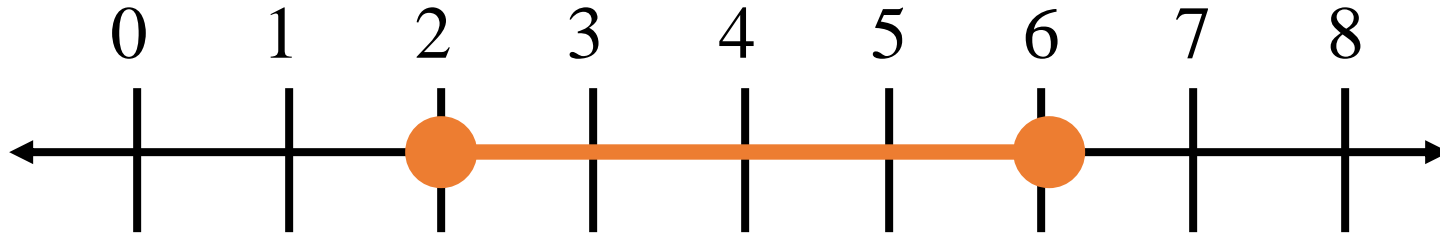
Simplify



Example

Solve $-2 \leq 3x - 8 \leq 10$. Graph the solution.

$$2 \leq x \leq 6$$





Solving Compound Inequalities - Or

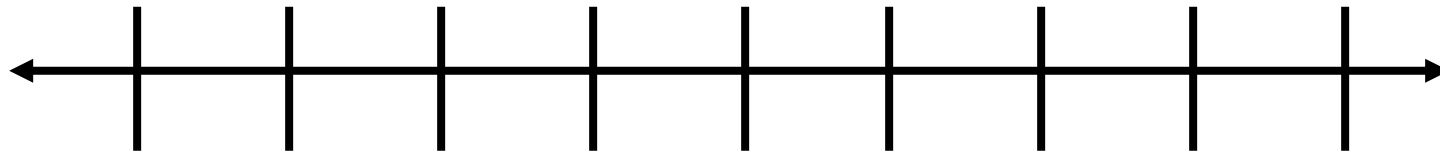
When solving for variables in the “or” case, you **MUST** solve **AND** graph each inequality separately (but on the same number line). **Your solution is the union of both the simple parts.**

Solve:

$$3x + 1 < 4 \text{ OR } 2x - 5 > 7$$

$$3x + 1 < 4$$

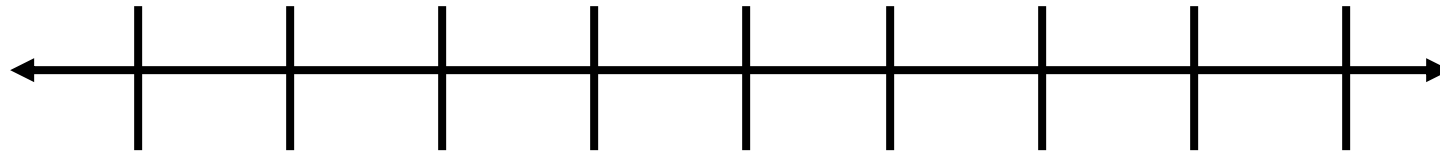
$$2x - 5 > 7$$



Example - OR Case

Solve Separately, Graph together

Solve $3x + 1 < 4$ OR $2x - 5 > 7$. Graph the solution.

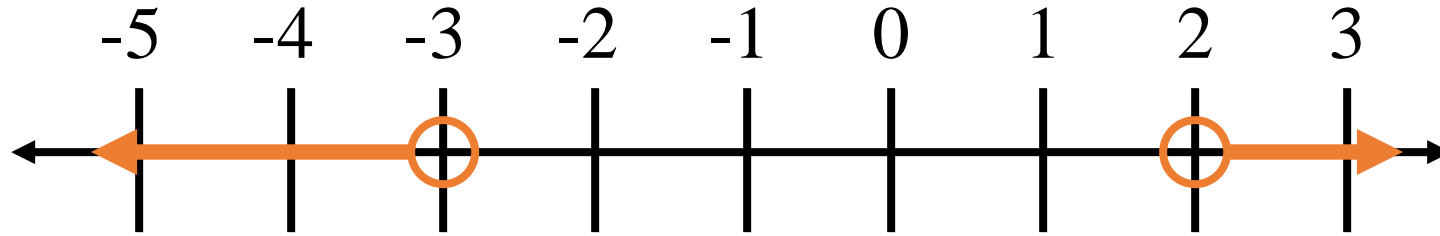




Compound Inequalities

When graphing compound inequalities, be sure that the graph satisfies **BOTH** if it is AND or **ONE** if it is OR.....inequality.

$$-3 > x \text{ OR } x > 2$$





Compound Inequalities - Multiplying or Dividing by negative numbers

When you divide or multiply by a negative number, you must reverse BOTH signs if an “and” Case. In the “or” inequalities, only reverse it if it applies to the individual inequality.

$$-2 < -x < 5 \longrightarrow 2 > x > -5$$



Quick Review

Solve inequalities just as you would equations using inverse operations, **KNOW WHEN AND WHEN NOT TO FLIP INEQUALITY SIGNS!!!**

Make sure your graph agrees with the inequalities involved.

What does the graph of a compound inequality (AND) case look like? OR Case?