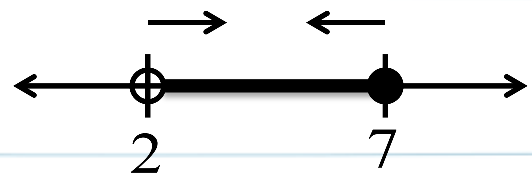
Let's consider two examples of compound inequalities.

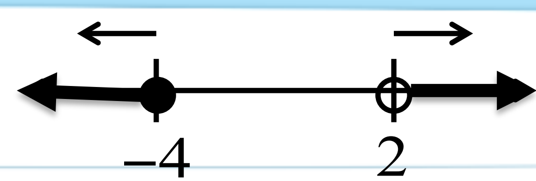
Let's Graph These!

$x > 2$ and $x \le 7$



This inequality is read as "all numbers greater than 2 and less than or equal to 7." This inequality can also be written in the compact form of $2 < x \le 7$.

$x \le -4$ or $x > 2$



This inequality is read as "all numbers less than or equal to −4 *or* greater than 2."

Only compound inequalities containing "and" can be written in compact form.

8. Write the compound inequalities from Question 6 using the compact form.

   a. \$6.50 shipping fees: $\$0.01 \leq x \leq \$20$

   b. \$9.00 shipping fees: $\$20 < x \leq \$50$

   c. \$11.00 shipping fees: $\$50 < x < \$75$

   d. \$12.25 shipping fees: $\$75 \leq x < \$100$

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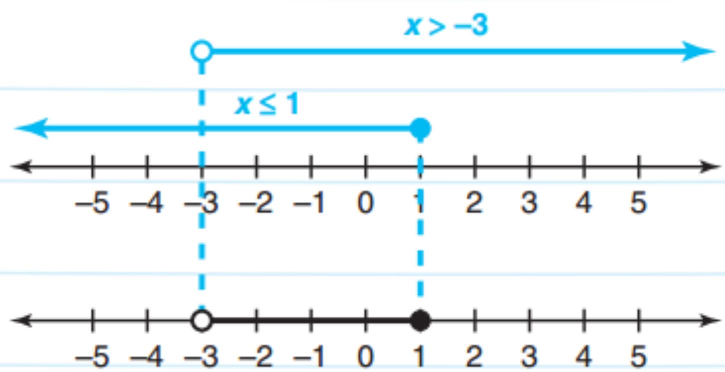
The compound inequality shown involves "and" and is a conjunction.

$$x \le 1 \text{ and } x > -3$$

Represent each part above the number line.



$x \le 1$ and $x > -3$

$-3 < x \le 1$

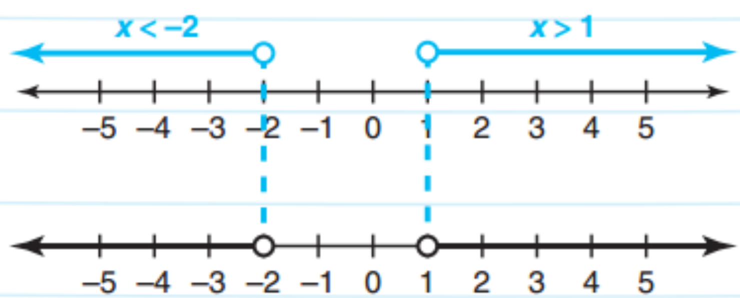
Does this make sense?? ☺

The solution is the region that satisfies both inequalities. Graphically, the solution is the overlapping, or the intersection, of the separate inequalities.

The compound inequality shown involves "or" and is a disjunction.

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

Represent each part above the number line.



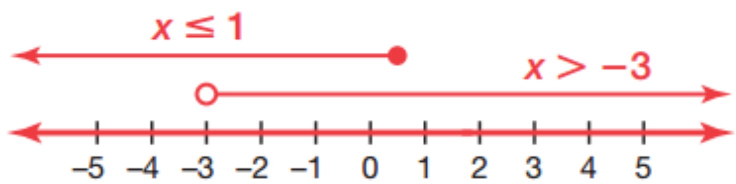
$x < -2$ or $x > 1$

Does this make sense?? ☺

The solution is the region that satisfies either inequality. Graphically, the solution is the union, or all the regions, of the separate inequalities.

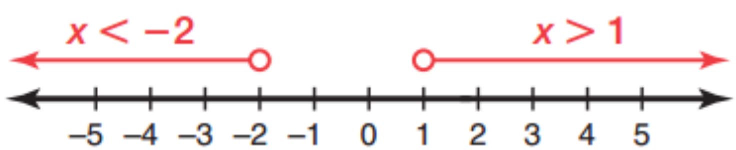
2. Consider the two worked examples in a different way.

   a. If the compound inequality in the first worked example was changed to the disjunction, $x \leq 1$ or $x > -3$, how would the solution set change? Explain your reasoning.



The solution set is “all real numbers” since the inequalities overlap going in both directions.

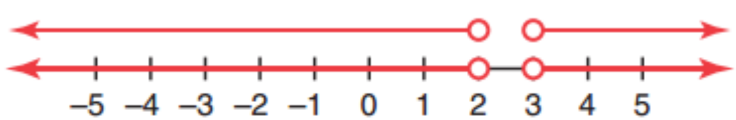
   b. If the compound inequality in the second worked example was changed to the conjunction, $x < -2$ and $x > 1$, how would the solution set change? Explain your reasoning.



There is “no solution” because *x* can’t be less than -2 AND greater than 1 at the same time.

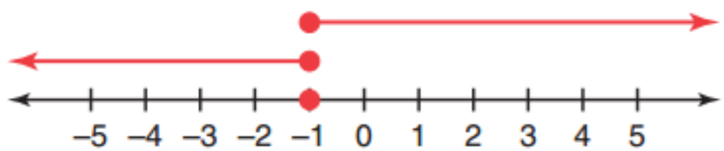
3. Represent the solution to each compound inequality on the number line shown. Then, write the final solution that represents the graph.

   a. $x < 2$ or $x > 3$



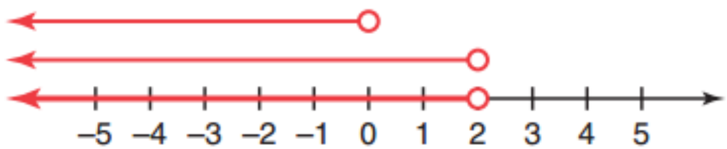
$x < 2$ or $x > 3$ is your solution.

b. $-1 \geq x \geq -1$



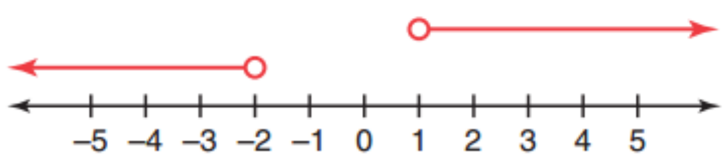
$x = -1$

c. $x < 0$ or $x < 2$



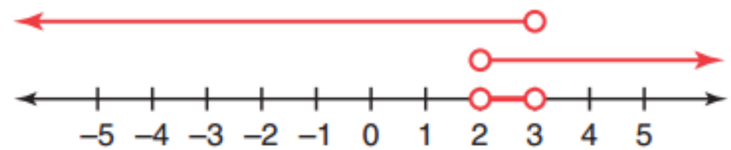
$x < 2$

d. $x > 1$ and $x < -2$



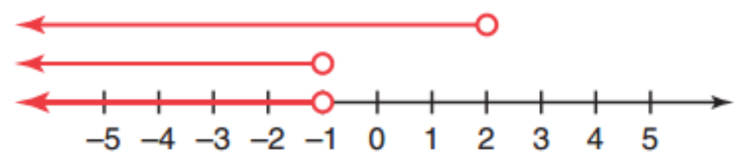
There is no solution.

e. $x < 3$ and $x > 2$



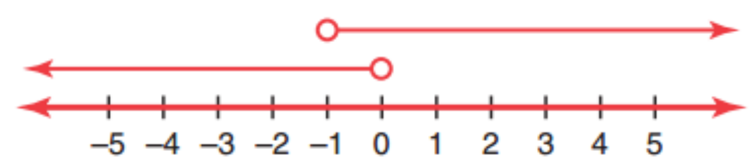
$2 < x < 3$

f. $x < 2$ and $x < -1$



$x < -1$

g. $x > -1$ or $x < 0$



All real numbers

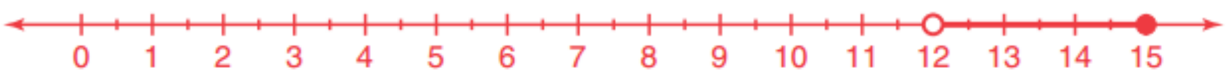
To solve a compound inequality written in compact form, isolate the variable between the two inequality signs, and then graph the resulting statement. To solve an inequality involving "or," simply solve each inequality separately, keeping the word "or" between them, and then graph the resulting statements.

4. Solve and graph each compound inequality showing the steps you performed. Then, write the final solution that represents the graph.

a. $6 < x - 6 \leq 9$

$+6 \quad +6 \quad +6$

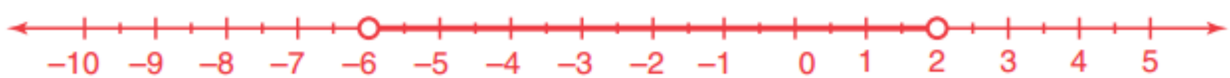
$12 < x \leq 15$



b. $-2 < -x < 6$

$\overline{-1} \quad \overline{-1} \quad \overline{-1}$

$2 > x > -6 \rightarrow -6 < x < 2$



~~**c.** $-4 \leq -3x + 1 \leq 12$~~

Skip to f.

f. $1 + 6x > 11$ or $x - 4 < -5$

$1 + 6x > 11$ *or* $x - 4 < -5$

$\underline{-1} \quad \underline{-1}$ $\quad\quad$ $\underline{+4} \quad \underline{+4}$

$6x > 10$ $\quad\quad$ $x < -1$

$$x > \frac{10}{6}$$

$$x > \frac{5}{3}$$