

### 3.2 Solve and Graph Compound Inequalities

The inequalities you have seen so far are simple inequalities. When two simple inequalities are combined into one statement by the words AND or OR, the result is called a compound inequality

Differences in AND and OR:

**AND means intersection**—only elements common to both sets are part of the solution

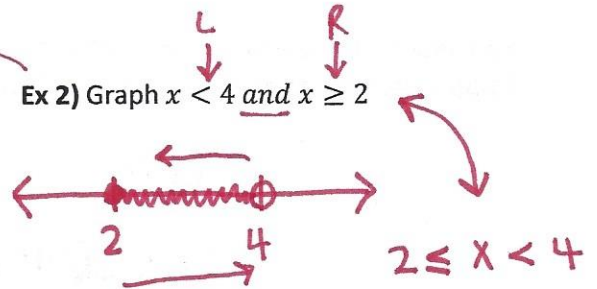
**OR means union**—elements from both sets are part of the solution

Ex 1) Graph  $x < 2$  or  $x \geq 4$



"OR" is always shaded in opposite directions

Ex 2) Graph  $x < 4$  and  $x \geq 2$

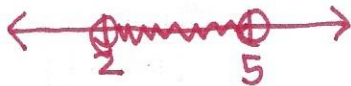


"And" is always shaded in the middle

Ex 3) Solve each compound inequality. Graph the solution on a number line.

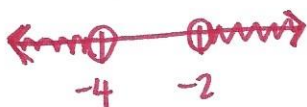
$$\begin{array}{c} 3 < 2m - 1 < 9 \\ +1 \quad +1 \quad +1 \\ \hline 4 < 2m < 10 \\ \hline \frac{4}{2} < \frac{2m}{2} < \frac{10}{2} \end{array}$$

$$2 < m < 5$$



$$\begin{array}{c} 6n + 6 < -18 \text{ or } 9n + 8 > -10 \\ -6 \quad -6 \quad -8 \quad -8 \\ \hline \frac{6n}{6} < \frac{-24}{6} \quad \frac{9n}{9} > \frac{-18}{9} \\ \hline n < -4 \text{ OR } n > -2 \end{array}$$

$$n < -4 \text{ OR } n > -2$$



$$\begin{array}{c} -5 \leq 2x + 3 < 9 \\ -3 \quad -3 \quad -3 \\ \hline -8 \leq 2x < 6 \\ \hline \frac{-8}{2} \leq \frac{2x}{2} < \frac{6}{2} \end{array}$$

$$-4 \leq x < 3$$



$$\begin{array}{c} 8k + 5 \leq 7k + 4 \text{ or } 5k - 4 > 4k + 6 \\ -7k \quad -7k \quad -4k \quad -4k \\ \hline k + 5 \leq 4 \quad k - 4 > 6 \\ \hline -5 \quad -5 \quad +4 \quad +4 \end{array}$$

$$k \leq -1 \text{ OR } k > 10$$



Special types of answers:

$$-\frac{3a}{-3} < \frac{15}{-3} \text{ or } \frac{a}{-3} > -4.7$$

$$a > -5 \text{ OR } a > -28$$

$$a > -28 \text{ OR } a > -5$$

$$\boxed{a > -28}$$



$$\begin{array}{r} -2 < 4x - 10 \leq -50 \\ +10 \quad +10 \quad +10 \\ \hline \frac{8}{4} < \frac{4x}{4} \leq \frac{-40}{4} \end{array}$$

$$2 < x \leq -10$$

$$-10 \geq x > 2$$

**No Solution**

You have \$50 to spend at a county fair. You spend \$20 for admission. You want to play a game that costs \$1.50. Describe the possible numbers of times you can play the game.

~~50/14~~  

$$50 \geq 20 + 1.50g$$

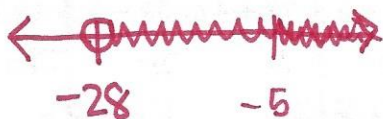
$$\frac{-20}{-20}$$

$$\frac{30}{1.50} \geq \frac{1.50g}{1.50}$$

$$20 \geq g$$

$$g \leq 20$$

**You can play at most 20 times.**



$$\textcircled{6} \quad n - 8 \leq 7 - 4n \leq n + 2$$

$$\begin{array}{r} n - 8 \leq 7 - 4n \text{ and } 7 - 4n \leq n + 2 \\ +n \quad +4n \quad +4n \quad +4n \\ \hline 5n - 8 \leq 7 \quad \quad 7 \leq 5n + 2 \\ +8 \quad +8 \quad \quad -2 \quad \quad -2 \\ \hline 5n \leq 15 \quad \quad 5 \leq 5n \\ \frac{5n}{5} \leq \frac{15}{5} \quad \quad \frac{5}{5} \leq \frac{5n}{5} \\ n \leq 3 \quad \quad 1 \leq n \end{array}$$

$$\boxed{1 \leq n \leq 3}$$