INSTRUCTOR GUIDANCE EXAMPLE: Week Two Discussion

One-Variable Compound Inequalities

- **compound inequality**
- **and**
- **or**
- **intersection**
- **union**

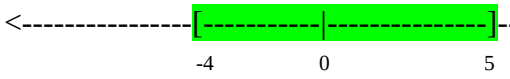
This is my "and" **compound inequality**: $-7 \leq 5 + 3x \leq 20$
What that means is the inequality must fulfill two conditions at the same time. It means 5 + 3x must be equal to or less than 20 **and** also at the same time greater than or equal to -7. I think of these as "between" inequalities because it turns out that the solution set for x will be between two numbers. Now I will find out what those two numbers are.

$-7 \leq 5 + 3x \leq 20$ Subtract 5 from all three parts of the inequality.
$-7 - 5 \leq 5 - 5 + 3x \leq 20 - 5$
$-12 \leq 3x \leq 15$ Divide all three parts by 3

$$\frac{-12}{3} \leq \frac{3x}{3} \leq \frac{15}{3}$$

$-4 \leq x \leq 5$ So any value of x greater than or equal to -4 and less than or equal to 5 will make this inequality true.

This $-4 \leq x \leq 5$ is how this **compound inequality** is written algebraically.
As an **intersection** of sets it would look like $[-4, \infty) \cap (-\infty, 5]$ which equals [-4, 5] in interval notation.



Here is a number line graph of the solution set.

The square brackets mean that the end points are included in the solution set; notice the green highlighting extends through the square brackets as well.

This is my "**o**r" **compound inequality**: $4 - x \geq 1$ **or** $6x - 3 > 27$
What this means is that there are two conditions and one of them must be true with any given x from the solution set but both cannot be true at the same time. Since the solution will turn out to be two disjoint intervals, I am going to solve each part of the inequality separately.

$4 - x \geq 1$ Subtract 4 from both sides.
$4 - 4 - x \geq 1 - 4$
$-x \geq -3$ We must pay close attention to that negative in front of x. To remove it I must divide both sides of the inequality by -1 which also means I must flip the inequality symbol over so it points the other direction.

$$\frac{-x}{-1} \leq \frac{-3}{-1}$$

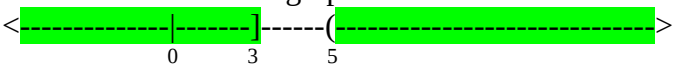
Symbol is flipped.

$x \leq 3$	This is one part of my "**or**" **compound inequality**.
$6x - 3 > 27$	Add 3 to both sides.
$6x - 3 + 3 > 27 + 3$	
$6x > 30$	Divide both sides by 6, but it is positive, so no flipping involved.
$\frac{6x}{6} > \frac{30}{6}$	
$x > 5$	This is the other part of my "**or**" **compound inequality**.

The complete solution set written algebraically is
$x \leq 3$ or $x > 5$

The solution set written in interval notation is the **union** of two intervals
$(-\infty, 3] \cup (5, \infty)$

Here is a number line graph of the solution set:



Notice that the 3 is included in the solution set but 5 is not.