Chapter 4 section 2
Notes – Blitzer 7th

A compound Inequality is formed by joining two inequalities with the word, AND, or the word, OR.

Example of compound Inequalities

a) $x - 3 < 5$ and $2x + 4 < 14$
b) $3x - 5 \geq 13$ or $5x + 2 < -3$

Compound Inequalities involving AND
Page 267:

Definition of the Intersection of Sets

The **intersection** of sets A and B, written $A \cap B$, is the set of elements common to both set A **and** set B. This definition can be expressed in set-builder notation as follows:

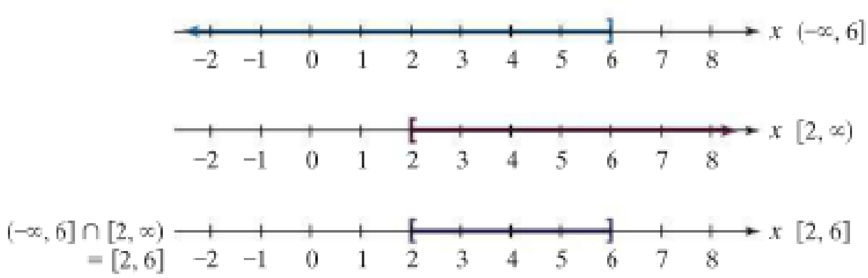
$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}.$$

Example 1: page 267
Find the intersection: $\{7, 8, 9, 10, 11\} \cap \{6, 8, 10, 12\}$

Solution: What are the numbers that belong to both sets (intersection)?
$\{8, 10\}$

Graph the solution to the compound inequality: $x \leq 6$ and $x \geq 2$

Solution: Find the set of values of x that satisfy both the sets.
Graph each set and find the intersection.



After graphing each set, find the intersection. That will be the solution.

Example 2: page 268:
Solve: x – 3 < 5 and 2x + 4 < 14

Solution:
1) Solve each inequality separately
2) Find the intersection of the two inequalities.

Solve a compound inequality
Example 4: page 269
Solve and graph the solution set: -3 < 2x + 1 ≤ 3

Solution:
Isolate x in the middle.

Compound Inequalities Involving OR.
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Definition of the Union of Sets

The **union** of sets A and B, written $A \cup B$, is the set of elements that are members of set A **or** of set B or of both sets. This definition can be expressed in set-builder notation as follows:

$$A \cup B = \{x | x \in A \text{ or } x \in B\}.$$

The symbol, ∪, indicates union, elements in both sets.
Notice union start with ∪.

Example 5: page 270
Find the union: {7, 8, 9, 10, 11} ∪ (6, 8, 10, 12)

Solution: Find the elements that belong to the first set and second set.
List the elements from the first set, then list the elements in the second set that are not duplicates.

First set: 7, 8, 9, 10, 11
Elements in second set that are not duplicates: 6, 12
The union will be these elements: 6, 7, 8, 9, 10, 11, 12

So, the solution will be: {6, 7, 8, 9, 10, 11, 12}

Solving Compound Inequalities Involving *OR*

1. Solve each inequality separately.
2. Graph the solution set to each inequality on a number line and take the union of these solution sets. This union appears as the portion of the number line representing the total collection of numbers in the two graphs.

Example 6: page 271

Solve: $2x - 3 < 7$ or $35 - 4x \leq 3$

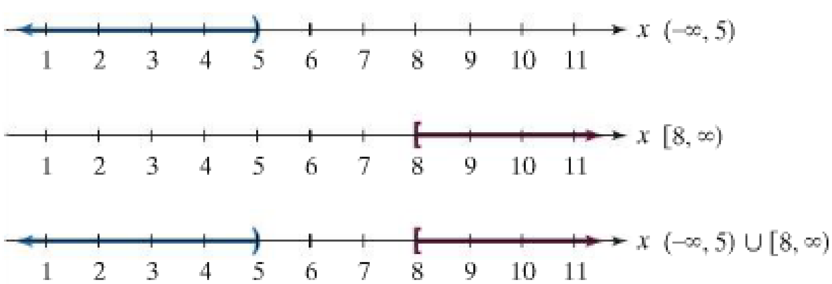
Solution:

1) Solve each inequality and graph the solution set.
2) Graph the union by placing both graphs on one number line.

Step 1. Solve each inequality separately.

$$2x - 3 < 7 \quad \text{or} \quad 35 - 4x \leq 3$$
$$2x < 10 \qquad\qquad -4x \leq -32$$
$$x < 5 \qquad\qquad x \geq 8$$

Step 2. Take the union of the solution sets of the two inequalities. We graph the solution sets of $x < 5$ and $x \geq 8$. We use these graphs to find their union.



How can one describe the solution set?

All number less than 5 or greater than or equal to 8

On can write the solution by using interval notation.

$(-\infty, 5) \cup (8, \infty)$

How can one determine if it is an intersection or union?

Alphabetize:

And, Intersection, $\cap$

Or, Union starts with $\cup$