Lesson 5: Sec. 1-7 Solving Absolute Value Inequalities

Objectives:

~ Solve compound inequalities using AND and OR

~ Solve inequalities involving Absolute Values

~ Graph solutions on a number line

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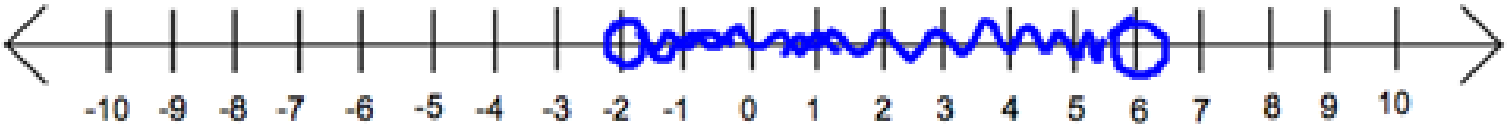
Compound Inequalities are inequalities that have more than one part.

- **The first kind of Compound Inequality is an "Intersection" - also called an "and".** (shading overlaps)

Ex: $-2 < x < 6$ $x > -2$ $x < 6$



- **The second kind of Compound Inequality is a "Union" - also called an "or".** (shade apart)

Ex: $x < -3$ or $x > 5$

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Ex 1: Solve and graph. Solve all three parts at the same time.

$9 < 3x + 6 < 15$

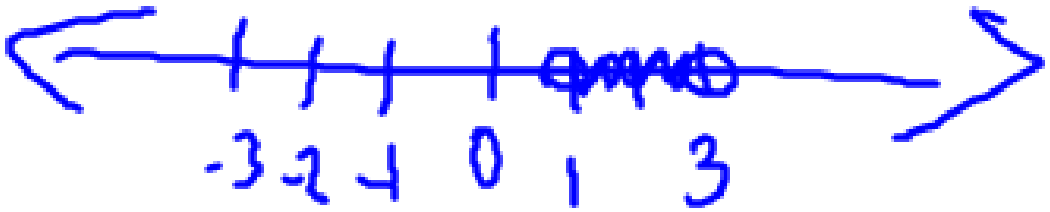
$-6 \quad -6 \quad -6$

$\frac{3}{3} < \frac{3x}{3} < \frac{9}{3}$

$1 < x < 3$

intersection "and"

$x > 1 \qquad x < 3$



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Ex 2: Solve and graph. Solve separately.

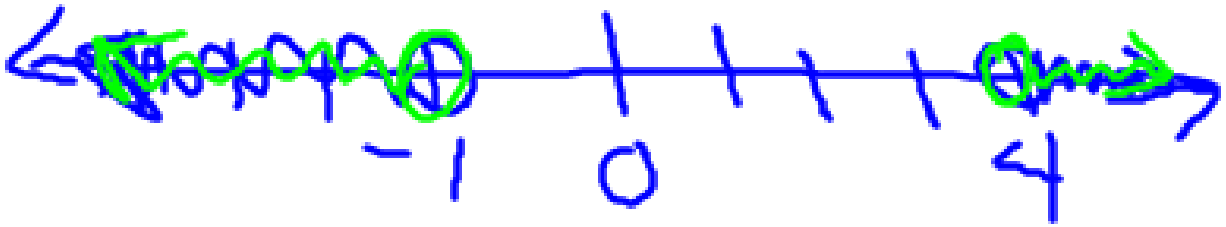
union "or"

$x - 3 > 1$ or $x + 2 < 1$

$+3 \quad +3$ $\qquad$ $-2 \quad -2$

$x > 4$ $\qquad$ $x < -1$

$x < -1$ or $x > 4$



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Ex 3: Solve and graph.

"And" or "Or"?

Hint: "Shade Between" or "Shade Opposite"?

$|y| < 7$

$y < 7$ $\quad$ $y > -7$

$$-7 < y < 7$$

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Solve and graph.

Ex 4: $|2x + 4| \geq 12$ "And" or "Or"?

Hint: "Shade Between" or "Shade Opposite"?

$2x+4 \geq 12$ $\quad$ $2x+4 \leq -12$

$-4 \quad -4$ $\quad$ $-4 \quad -4$

$\frac{2x}{2} \geq \frac{8}{2}$ $\quad$ $\frac{2x}{2} \leq -\frac{16}{2}$

$x \geq 4$ $\quad$ $x \leq -8$

$x \leq -8$ or $x \geq 4$

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Compare and Contrast:

What does the direction of the inequality sign tell us about our final answer and graph?

$|y| < 7$

Intersection "and"

$<$

$\leq$

$|2x + 4| \geq 12$

Union "or"

$>$

$\geq$

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Solve and graph.

Ex 5: $3|2x - 9| - 21 \leq 6$

$+21 \quad +21$

$\frac{3|2x-9|}{3} \leq \frac{27}{3}$

$|2x-9| \leq 9$ ← intersection

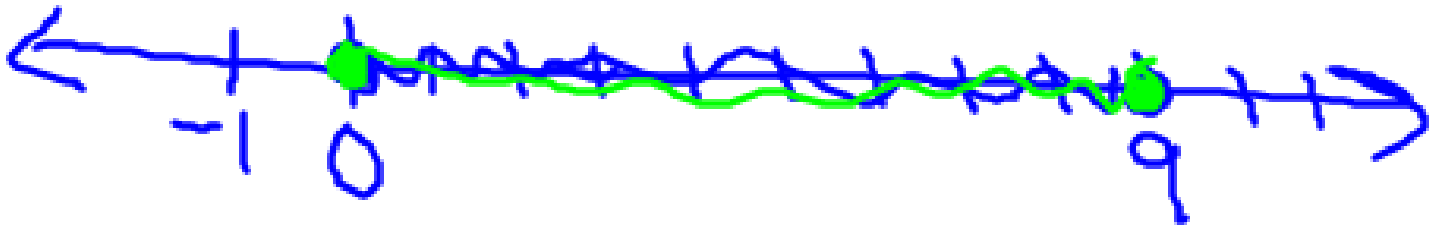
$2x-9 \leq 9$ $\qquad$ $2x-9 \geq -9$

next slide →

$$2x - 9 \leq 9$$
$$+9 \quad +9$$
$$\frac{2x}{2} \leq \frac{18}{2}$$
$$x \leq 9$$

$$2x - 9 \geq -9$$
$$+9 \quad +9$$
$$\frac{2x}{2} \geq \frac{0}{2}$$
$$x \geq 0$$

$$\boxed{0 \leq x \leq 9}$$



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Solve and graph.

Ex 6: $-2|x + 3| + 1 < -17$

$-1 \quad -1$

$-2|x+3| < -18$

$-2 \quad -2$

$|x+3| > 9$ ← union

$x+3 > 9$ | $x+3 < -9$

$-3 \quad -3$ | $-3 \quad -3$

$x > 6$ | $x < -12$

$x < -12$ or $x > 6$

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STOP AND THINK!!

Just like with Absolute values, we have some special cases (remember that absolute values can't equal a negative?).

Special Case #1:

An absolute value that is $<$ or $\leq$ a negative number will never have a solution.

This is because an abs. val. is the distance from zero. Distance can never be less than zero (a negative).

Example: $|2x + 6| < -12$

no Solution

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Solve and graph.

Ex 7: $|x - 4| + 6 \leq 1$

$-6 \quad -6$

$|x-4| \leq -5$

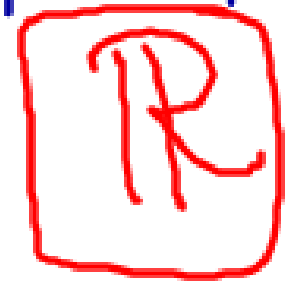
no solution

Special Case #2:

An absolute value that is > or ≥ a negative number will have a solution of all real numbers.

This is because an abs. val. is the distance from zero. Distance will always be greater than zero (a negative).

Example: $|x + 2| > -4$



or all real numbers

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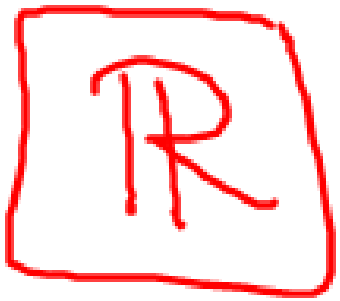
Solve and graph.

Ex 8: $|5x - 2| + 15 \geq 10$

$-15 \quad -15$

$|5x-2| \geq -5$



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Objectives:

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Can you?

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Homework: *Take note of different due dates.

Review for Test 1 worksheet

Due beginning of class next time.

Assignment 5

Due Beginning of class the day AFTER test day.