Name _____ Date _____ Period ____

Solving Absolute Value Linear Inequalities

TEACHER KEY | Algebra II | Unit 2 | Day 7 | TEK A2.6.F

Objective: I can solve absolute value linear inequalities using the algebraic (compound inequality) method.

Vocabulary

"Or" statement: true if EITHER part is true - used for **>** or **≥**.

"And" statement: true only if BOTH parts are true - used for **<** or **≤**.

KEY IDEA

Step 1 - Isolate: get the absolute value alone.

Step 2 - Split: for > or ≥ use OR. For < or ≤ use AND - as one sandwiched inequality, or as two branches (flip the sign if you divide by a negative).

Step 3 - Solve, then graph the solution on a number line.

Let's Work Through It

Example 1 — Solve $|2x + 3| < 5$ two ways: the sandwich method, and the split method.

Sandwich: $-5 < 2x + 3 < \mathbf{5} \rightarrow \mathbf{-4 < x < 1}$

Split: $2x + 3 < 5$ AND $-(2x + 3) < \mathbf{5}$

Solve each (flip when you divide by the negative): $x < \mathbf{1}$ AND $x > \mathbf{-4}$

Combine: **-4 < x < 1** - same answer either way

-6	-5	-4	-3	-2	-1	0	1	2	3

Example 2 — Solve $|2x - 1| \leq 7$ two ways: the sandwich method, and the split method.

Sandwich: $-7 \leq 2x - 1 \leq \mathbf{7} \rightarrow \mathbf{-3 \leq x \leq 4}$

Split: $2x - 1 \leq 7$ AND $-(2x - 1) \leq \mathbf{7}$

Solve each (flip when you divide by the negative): $x \leq \mathbf{4}$ AND $x \geq \mathbf{-3}$

Combine: **$-3 \le x \le 4$** - same answer either way

-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6

Example 3 — Solve $3|2x - 1| + 4 > 19$.

Isolate: $3|2x - 1| > \mathbf{15} \rightarrow |2x - 1| > \mathbf{5}$

Split: $2x - 1 > 5$ OR $2x - 1 < \mathbf{-5}$

Solve: $x > \mathbf{3}$ or $x < \mathbf{-2}$

Example 4 — Solve $2|3x + 4| - 5 \ge 11$.

Isolate: $2|3x + 4| \ge \mathbf{16} \rightarrow |3x + 4| \ge \mathbf{8}$

Split: $3x + 4 \ge 8$ OR $3x + 4 \le \mathbf{-8}$

Solve: $x \ge \mathbf{4/3}$ or $x \le \mathbf{-4}$

Your Turn

You Try 1 — Solve $|x + 1| \ge 3$.

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

You Try 2 — Is $x = 0$ a solution to $|x - 3| > 5$? Explain.

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