Solve Absolute Value Inequalities

Notes U1A L10 Absolute Value Inequalities. Name: _____ Hr: _____

Target Skills: Interpret absolute value inequalities as distances, write AND or OR statements, solve, and graph the solution sets.

Review Solve or describe the solutions

1. $\|x\| = 5$	2. $\|x - 4\| = 3$	3. $-2x < 8$
$x = 5, -5$	$x - 4 = 3$ $\quad x - 4 = -3$ $x = 7$ $\quad x = 1$	$\frac{-2x}{-2} < \frac{8}{-2}$ ← ÷ by a negative $x > -4$

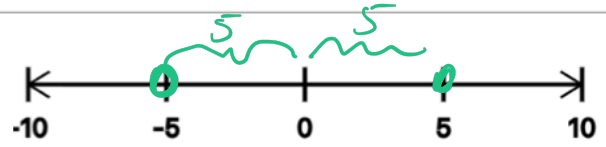
Part 1 Distance from zero

Mark the solutions on each number line. Compare exactly 5 units, more than 5 units, and at most 5 units.

Mark two points that are Exactly 5 units from zero

$|x| = 5$

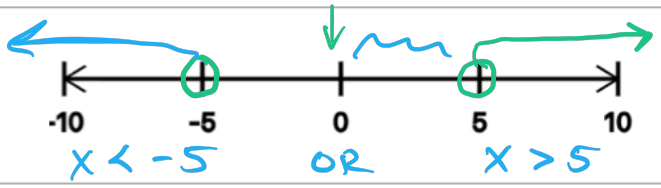
Solutions: $5, -5$



Mark all the points that are More than 5 units from zero

$|x| > 5$

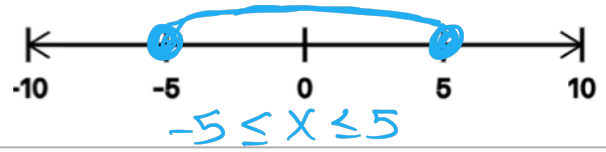
Solutions: Distance from zero > 5



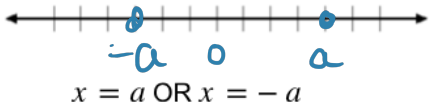
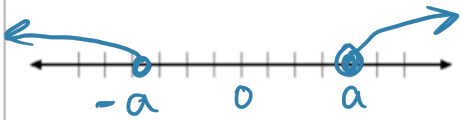
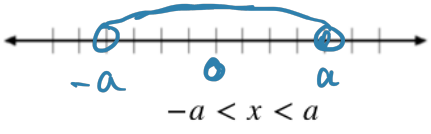
Mark all the points that are At most 5 units from zero

$|x| \leq 5$

Solutions: Dist from zero ≤ 5 units



Part 2 Patterns Assume a > 0 (why?)

EQUAL	GREATER outside	LESS THAN inside
$\|x\| = a$	OR " > " $\|x\| > a$	THAND and $\|x\| < a$
		
$x = a$ OR $x = -a$	$x < -a$ OR $x > a$	$-a < x < a$
Two points.	Two exterior rays, OR.	One interval AND.

Solving Absolute Value Inequalities

1. **ISOLATE the ABSOLUTE VALUE**
2. **CHECK for NO SOLUTIONS or All Real Numbers**
3. Write two cases:

Case 1:	AND or OR	Case 2:
Write the equation without The absolute value bars (| |)		Write the equation without The absolute value bars (| |), FLIP inequality and OPPOSITE of the other side. (FLIP - CHANGE)

4. Solve the two inequalities and interpret solution

Example: $2|x| - 4 < 6$

① $+4 \quad +4$

$\frac{2|x|}{2} < \frac{2}{2}$ Less Than And

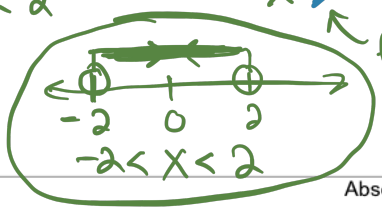
$|x| < 2$

Case 1

$x < 2$

Case 2 change

$x > -2$ flip



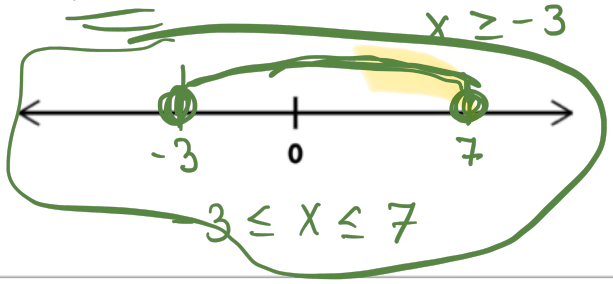
Solve and graph each inequality: First isolate the bars. Then choose AND for an inside interval or OR for outside rays.

1. $|x-2| \leq 5$

① Isolate || And Less Than

Case 1: $x-2 \leq 5$, $+2 \quad +2$, $x \leq 7$

Case 2: $x-2 \geq -5$, $+2 \quad +2$, $x \geq -3$

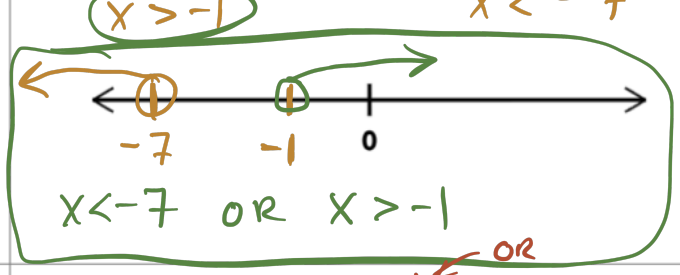


$-3 \leq x \leq 7$

2. $|x+4| > 3$

Case 1: $x+4 > 3$, $-4 \quad -4$, $x > -1$

Case 2: $x+4 < -3$, $-4 \quad -4$, $x < -7$



$x < -7$ OR $x > -1$

3. $2|x-3|+4 \leq 10$

$-4 \quad -4$

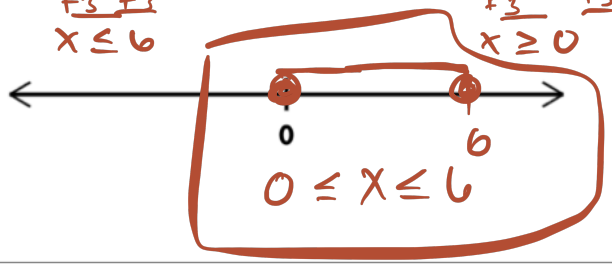
① Isolate ||

$\frac{2|x-3|}{2} \leq \frac{6}{2}$ Less Than

$|x-3| \leq 3$

C1: $x-3 \leq 3$, $+3 \quad +3$, $x \leq 6$

C2: $x-3 \geq -3$, $+3 \quad +3$, $x \geq 0$



$0 \leq x \leq 6$

4. $-3|2x+1| > -12$

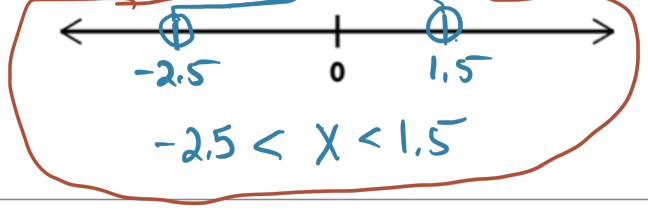
$\frac{-3}{} \quad \frac{-3}{}$ OR

$|2x+1| < 4$ and

Flip, change

$2x+1 < 4$, $-1 \quad -1$, $\frac{2x}{2} < \frac{3}{2}$, $x < \frac{3}{2} = 1.5$

$2x+1 > -4$, $-1 \quad -1$, $2x > -5$, $x > -\frac{5}{2} = -2.5$

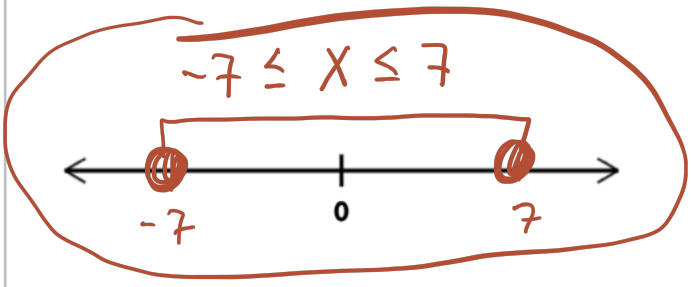


$-2.5 < x < 1.5$

Ready for practice? Solve and graph independently

5. $|x| \leq 7$

C1: $x \leq 7$ C2: $x \geq -7$

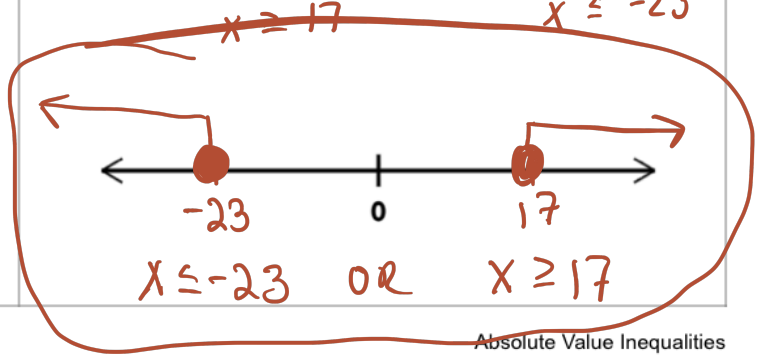


$-7 \leq x \leq 7$

6. $|2x+6| \geq 40$

C1: $2x+6 \geq 40$, $-6 \quad -6$, $\frac{2x}{2} \geq \frac{34}{2}$, $x \geq 17$

C2: $2x+6 \leq -40$, $-6 \quad -6$, $\frac{2x}{2} \leq \frac{-46}{2}$, $x \leq -23$



$x \leq -23$ OR $x \geq 17$