Solving Absolute Value Inequalities

General procedure for solving 1st degree absolute value inequalities

Mnemonic: 2 & 2 (do 2 things and then if yes, set up 2 equations—original and opposite)

1. **I**solate the absolute value
2. Check to see if it's **R**easonable…the absolute value is always positive so therefore must be compared with a positive. If **yes**, it's reasonable, then write 2 inequalities. If **no**, then there is no solution

   Possible formats depending on the inequality and conditions

   - $|x| < 2$ results in $-2 < x < 2$
   - $|x| > 5$ results in $x < -5$ or $x > 5$
   - $|x| < -1$ results in no solution
   - $|x| > -3$ results in a solution of all real numbers

If reasonable, write the 2 equations based on the above formats

1. Drop the absolute value compare to the original
2. Drop the absolute value compared to the opposite (remember to reverse the inequality sign)

Example:

$3\|x-5\| - 4 < 2$	*addition property of equality*
$3\|x-5\| < 6$	*multiplication property of equality*
$\|x - 5\| < 2$	REASONABLE?
	Can an absolute value of a number be less than a positive number?
	YES…2 equations
$-2 < x - 5 < 2$	solve
$3 < x < 7$	

Alternative approach:

$x - 5 < 2$ $\quad x - 5 > -2$ solve

$x < 7$ $\quad x > 3$

numbers less than 7 and greater than 3 will be a "between" inequality

interval notation : (3, 7)

NOTE: for interval notation remember the <, > get a parenthesis ( ) and $\leq$, $\geq$ will get bracket [ ]

Practice:

$|x + 1| < 5$ $\qquad$ $5|2w-1| - 1 \geq 9$ $\qquad$ $3|x + 3| + 6 < 3$