Chapter 1.5 Solving Absolute Value Inequalities

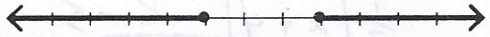
Solving an absolute value inequality is very similar to solving an absolute value equation.

Start by isolating the absolute value on one side of the inequality symbol, then follow the rules below:

If the symbol is > (or ≥) : Then use the word (or) . Called a disjunction

If $a > 0$, then the solutions to $|ax+b| > c$ are $ax + b > c$ **or** $ax + b < -c$.

Graph:



If $c < 0$, all real numbers will satisfy $|ax+b| > c$.

Think about it: absolute value is always positive (or zero), so, of course, it is greater than any negative number.

Solve and graph the absolute value inequality:

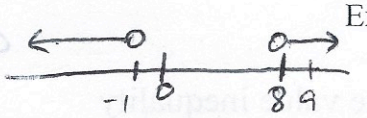
Ex 1: $|2x-7|-3>6$

$|2x-7| > 9$

$2x-7>9$ or $2x-7<-9$

$2x>16$ $\quad 2x<-2$

$x>8$ $\quad x<-1$



Ex2 : $3|2x-5|+6 \geq -9$

$3|2x-5| \geq -15$

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

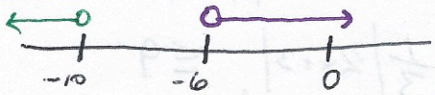
all real #s

Assignment: Solve and graph the absolute value inequality

1. $|k+8| > 2$

$k+8>2$ $\quad k+8<-2$

$k>-6$ $\quad k<-10$



2. $|3w-8| \geq -2$

all real #s

Absolute value greater than a negative #

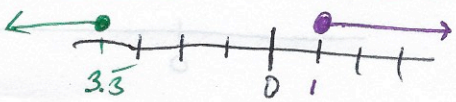
3. $|3c+4| \geq 7$

$3c+4 \geq 7$ $\quad 3c+4 \leq -7$

$3c \geq 3$ $\quad 3c \leq -11$

$c \geq 1$ $\quad c \leq -\frac{11}{3}$

$c \leq -3\frac{2}{3}$



4. $|5y-2|+5>2$

$|5y-2| > -3$

all real #s

If the symbol is < (or ≤) : Then use the word **(and). Called a conjunction**

If $a > 0$, then the solutions to $|ax+b| < c$ are $ax + b < c$ **and** $ax + b > -c$.
Also written: $-c < ax+b < c$.

Graph:

If $c < 0$, there is **no solution** to $|ax+b| < c$.

Think about it: absolute value is always positive (or zero), so, of course, it cannot be less than a negative number.

Ex3: $|7x-11| \leq 3$

$7x - 11 \leq 3$ $\quad +11 \quad +11$

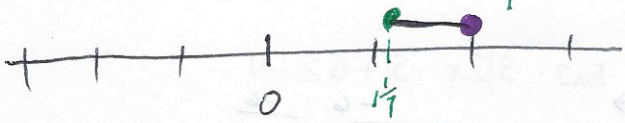
$7x \leq 14$

$x \leq 2$

$7x - 11 \geq -3$ $\quad +11 \quad +11$

$7x \geq 8$

$x \geq \frac{8}{7}$



Ex4: $\frac{1}{2}|x+4| + 7 < 2$ $\quad -7 \quad -7$

$\frac{1}{2}|x+4| < -5$

$|x+4| < -10$

No solution

Assignment: Solve and graph the absolute value inequality

5. $|2x - 9| < -8$

No solution

Absolute value less than a negative #

6. $|3d - 5| \leq 10$

$3d - 5 \leq 10$

$3d \leq 15$

$d \leq 5$

$3d - 5 \geq -10$

$3d \geq -5$

$d \geq -\frac{5}{3}$

$d \geq -1\frac{2}{3}$

7. $2|1 - 3h| - 10 < 12$ $\quad +10 \quad +10$

$2|1-3h| < 22$

$|1-3h| < 11$

$1 - 3h < 11$ $\quad -1 \quad -1$

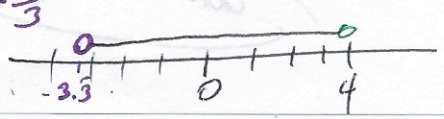
$-3h < 10$

$h > -\frac{10}{3}$

$1 - 3h > -11$

$-3h > -12$

$h < 4$



8. $\frac{1}{3}|2x + 3| - 1 \leq 8$ $\quad +1 \quad +1$

$\frac{1}{3}|2x+3| \leq 9$

$|2x+3| \leq 27$

$2x + 3 \leq 27$ $\quad -3 \quad -3$

$2x \leq 24$

$x \leq 12$

$2x + 3 \geq -27$ $\quad -3 \quad -3$

$2x \geq -30$

$x \geq -15$