

2.6-2.7 Quiz  
Friday (9/28)

# Solving Absolute Value Equations & Inequalities

**Absolute Value:** Taking the **POSITIVE** value of a number.

ex)  $|x| = 5$       $x$  can be 5 or -5

1<sup>st</sup> Equation: Same as original w/o | |.  
2<sup>nd</sup> Equation: Change the # after the = to opposite.

ex)  $|x - 4| = 6$      means:

Equation #1)  $\frac{x - 4 = 6}{+4 \quad +4}$   
 $x = 10$

OR Equation #2)  $\frac{x - 4 = -6}{+4 \quad +4}$   
OR  $x = -2$

**\*EQUAL sign uses "or"**

**\*\*you need 2 equations... Always !!**

The first equation as is, the second equation put the opposite after the =.

**\*\* For every type of absolute value equation, once you make the 2 equations, you must get rid of the absolute value bars.**

Ex)  $|3 + 2x| < 11$      means...

Always the same as inside the | |.

$\frac{3 + 2x < 11}{-3 \quad -3}$   
 $2x < 8$   
 $x < 4$

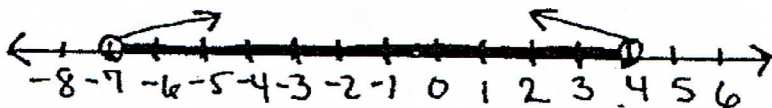
AND  
↓  
AND

1) Same as the original w/o | |.  
2) Flip the sign & change # to opposite.

$\frac{3 + 2x > -11}{-3 \quad -3}$   
 $2x > -14$   
 $x > -7$

**\*Flip the sign & take the opposite**

**\* Less Than "AND"**



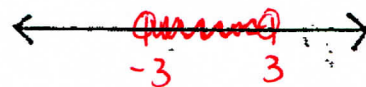
Set Notation:  $\{x \mid -7 < x < 4\}$

Ex)  $|3x + 4| \leq 8$      1) Same as original w/o | |     Ex)  $|x| < 3$

1)  $3x + 4 \leq 8$      And     2)  $3x + 4 \geq -8$      Flip the sign & change # to opposite.

$\frac{3x \leq 4}{-4 \quad -4}$      And      $\frac{3x \geq -12}{-4 \quad -4}$   
 $x \leq \frac{4}{3}$      And      $x \geq -4$

1)  $x < 3$      and     2)  $x > -3$



Set Notation:  $\{x \mid -4 \leq x \leq \frac{4}{3}\}$

Set Notation:  $\{x \mid -3 < x < 3\}$

- 1) Same as Original w/o 1. 1.  
 2) Flip the sign & change # to opposite.

Ex)  $|6y - 12| \geq 36$  means...

$$1) 6y - 12 \geq 36 \quad \text{OR} \quad 6y - 12 \leq -36$$

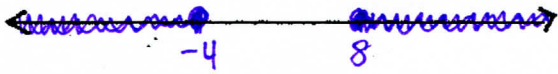
$$+12 \quad +12 \qquad +12 \quad +12$$

$$\frac{6y}{6} \geq \frac{48}{6}$$

$$y \geq 8$$

$$\frac{6y}{6} \leq \frac{-24}{6}$$

$$y \leq -4$$



set Notation:  
 $\{x | y \leq -4 \text{ or } y \geq 8\}$

**\*Flip the sign & take the opposite**

**\*Greater "OR"**

ex)  $|5 + 2x| > 3$

$$5 + 2x > 3 \quad \text{OR} \quad 5 + 2x < -3$$

$$-5 \quad -5 \qquad -5 \quad -5$$

$$\frac{2x}{2} > \frac{-2}{2}$$

$$x > -1$$

$$\frac{2x}{2} < \frac{-8}{2}$$

$$x < -4$$



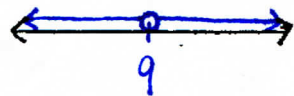
set Notation:  $\{x | x < -4 \text{ or } x > -1\}$

ex)  $|x - 9| \neq 0$

$$x - 9 > 0 \quad \text{OR} \quad x - 9 < 0$$

$$x > 9$$

$$x < 9$$



$\{x | x \neq 9\}$

set Notation

ex)  $|x + 3| + 1 > 10$

$$\frac{-1 \quad -1}{|x + 3| > 9}$$

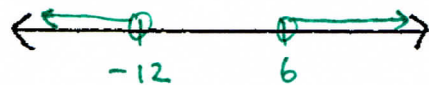
$$|x + 3| > 9$$

\*you must get rid of the 1 first. Then you have your 2 equations

$$x + 3 > 9 \quad \text{OR} \quad x + 3 < -9$$

$$-3 \quad -3 \qquad -3 \quad -3$$

$$x > 6 \quad \text{OR} \quad x < -12$$



set Notation:  $\{x | x < -12 \text{ or } x > 6\}$

ex)  $|5x - 3| \leq 12$

$$5x - 3 \leq 12 \quad \text{And} \quad 5x - 3 \geq -12$$

$$5x \leq 15$$

$$x \leq 3$$

$$5x \geq -9$$

$$x \geq -9/5$$



$\{x | -9/5 \leq x \leq 3\}$

ex)  $|3x - 7| \geq 2$

$$3x - 7 \geq 2 \quad \text{OR} \quad 3x - 7 \leq -2$$

$$+7 \quad +7 \qquad +7 \quad +7$$

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

$$x \geq 3$$

$$\frac{3x}{3} \leq \frac{5}{3}$$

$$x \leq 5/3$$

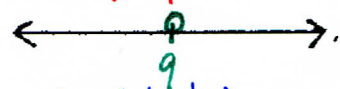


set Notation:  $\{x | x \leq 5/3 \text{ or } x \geq 3\}$

ex)  $|x - 9| \odot 0$

$$x - 9 < 0 \quad \text{And} \quad x - 9 > 0$$

$$x < 9 \quad \text{and} \quad x > 9$$



No Solution.  $\{\emptyset\}$

ex)  $2/4x + 1/-3 \leq 7$  Empty Set.

$$\frac{2}{2} |4x + 1| \leq \frac{10}{2} \Rightarrow |4x + 1| \leq 5$$

$$4x + 1 \leq 5 \quad \text{And} \quad 4x + 1 \geq -5$$

$$-1 \quad -1 \qquad -1 \quad -1$$

$$4x \leq 4$$

$$x \leq 1$$

$$4x \geq -6$$

$$x \geq -6/4$$



set Notation:  $\{x | -3/2 \leq x \leq 1\}$

ex)  $|3x + 3| \geq +6$

$$3x + 3 \geq 6 \quad \text{OR} \quad 3x + 3 \leq -6$$

$$3x \geq 3$$

$$x \geq 1$$

$$3x \leq -9$$

$$x \leq -3$$



$\{x | x \leq -3 \text{ or } x \geq 1\}$