Algebra 1 *Key*

Name _____ Block _____ Date _____

Essential Question: How do I solve absolute value inequalities?

REVIEW: What does absolute value mean? The distance a # is from 0 on a number line

Absolute Value Inequalities

Inequality	What It Means	What It Looks Like
$\lvert x \rvert = 6$	What #'s are 6 spaces from 0 on a number line?	number line: open dots at -6 and 6
$\lvert x \rvert < 6$	What #'s are **LESS THAN** 6 spaces from 0 on a number line?	number line: open circles at -6 and 6 connected
$\lvert x \rvert > 6$	What #'s are **GREATER THAN** 6 spaces from 0 on a number line?	number line: arrows outward from -6 and 6
$\lvert x \rvert < -6$	What #'s are **LESS THAN** −6 spaces from 0 on a number line?	no solution
$\lvert x \rvert > -6$	What #'s are **GREATER THAN** −6 spaces from 0 on a number line?	all reals, arrow across whole line $\mathbb{R}$
$\lvert x \rvert = -6$	What #'s are −6 spaces from 0 on a number line?	no solution

"AND"

"OR"

REMEMBER:

LESS THAN: "_AND_" problem   GREATER THAN: "_OR_" problem

$<$ $\leq$ $>$ $\geq$

Examples:

1. $\lvert x \rvert < 4$ 2. $\lvert x \rvert > 8$ 3. $\lvert x \rvert \geq 2$

number line: open circles at -4 and 4, -4 0 4

number line: open circles at -8 and 8, arrows outward, -8 0 8
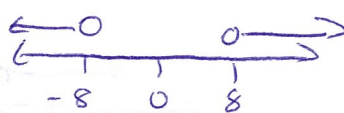
number line: closed circles at -2 and 2, arrows outward, -2 0 2

To Solve Absolute Value Inequalities:

1. Get the absolute value by itself on the left hand side (__Isolate__ it!).

www.clipartkid.com

2. Write two separate __inequalities__.

   The first one stays the same as the original (just remove the vertical bars)

   The second one needs to have the inequality sign "__flipped__" AND use the opposite __sign__ of the original number!

3. Determine if it is an "__AND__" or an "__OR__" problem. Write AND or OR between the inequalities.

4. Check for __extraneous__ solutions. They look like solutions but don't work when you plug them back in

5. Graph your answer.

Examples:

1. $|2x - 7| < 9$

$2x - 7 < 9$ AND $2x - 7 > -9$
$2x < 16$ $2x > -2$
$x < 8$ And $x > -1$
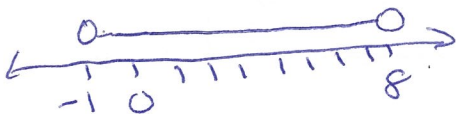
2. $|x + 8| - 4 \geq 2$

$*$ ISOLATE $*$

$|x + 8| \geq 6$

$x + 8 \geq 6$ OR $x + 8 \leq -6$
$x \geq 2$ or $x \leq -14$

3. $3|x - 6| > 9$ $*$ ISOLATE!

$|x - 6| > 3$

$x - 6 > 3$ OR $x - 6 < -3$
$x > 9$ OR $x < 3$

4. $|6x - 11| \leq 7$

$6x - 11 \leq 7$ AND $6x - 11 \geq -7$
$6x \leq 18$ $6x \geq 4$
$x \leq 3$ AND $x \geq \frac{4}{6}$
                    $x \geq \frac{2}{3}$

5. $-2|6x - 1| + 5 < 3$ *** ISOLATE ***

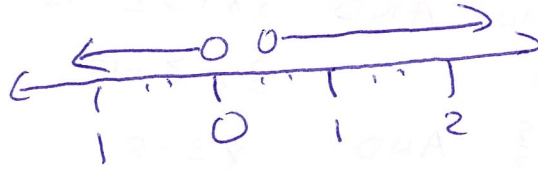$-2|6x-1| < -2$

$|6x-1| > 1$ *** WATCH your sign!**

$6x - 1 > 1$ OR $6x - 1 < -1$

$6x > 2$ $6x < 0$
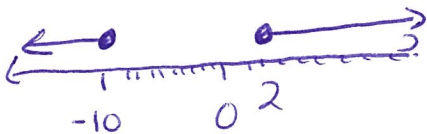
$x > \frac{2}{6}$ $x < 0$

$x > \frac{1}{3}$ or $x < 0$

Now you try.

Solve the inequality. Then graph the solution.

1. $|x + 4| \geq 6$

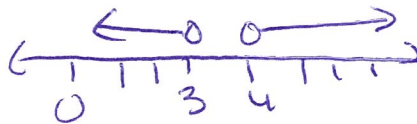$x + 4 \geq 6$ OR $x + 4 \leq -6$

$x \geq 2$ or $x \leq -10$

2. $|2x - 7| > 1$

$2x - 7 > 1$ or $2x - 7 < -1$

$2x > 8$ or $2x < 6$

$x > 4$ OR $x < 3$

3. $|3x + 5| \geq 10$

$3x + 5 \geq 10$ or $3x + 5 \leq -10$

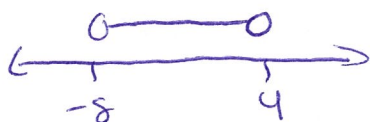$3x \geq 5$ $3x \leq -15$

$x \geq \frac{5}{3} = 1\frac{2}{3}$ or $x \leq -5$
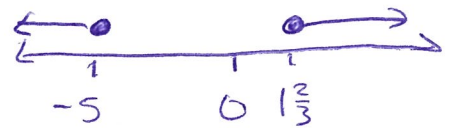
4. $|x + 2| < 6$

$x + 2 < 6$ AND $x + 2 > -6$

$x < 4$ AND $x > -8$
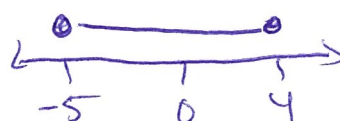

5. $|2x + 1| \leq 9$

$2x + 1 \leq 9$ AND $2x + 1 \geq -9$

$2x \leq 8$ $2x \geq -10$
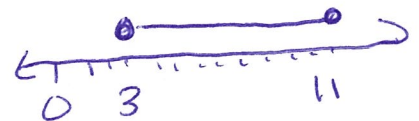
$x \leq 4$ AND $x \geq -5$

6. $|7 - x| \leq 4$

$7 - x \leq 4$ AND $7 - x \geq -4$

$-x \leq -3$ $-x \geq -11$

$x \geq 3$ $x \leq 11$