Lesson 1.6 Warm Up (Clickers)

1. Solve and graph: $-5x - 3 + 2x > 9$

2. Evaluate: $|2x - 5|$ when $x = -1$

3. Solve and graph: $9 < 3x - 5 \leq 13$

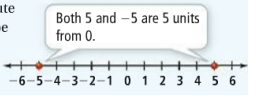
Lesson 1.6 Absolute Value Equations & Inequalities

Essential Understanding: An absolute value quantity is nonnegative. Since opposites have the same absolute value, an absolute value equation can have two solutions.

Key Concept Absolute Value

Definition	Numbers	Symbols
The **absolute value** of a real number x, written $\lvert x \rvert$, is its distance from zero on the number line.	$\lvert 4 \rvert = 4$ $\lvert -4 \rvert = 4$	$\lvert x \rvert = x$, if $x \geq 0$ $\lvert x \rvert = -x$, if $x < 0$

An absolute value equation has a variable within the absolute value sign. For example, $\lvert x \rvert = 5$. Here, the value of x can be 5 or -5 since $\lvert 5 \rvert$ and $\lvert -5 \rvert$ both equal 5.



Ex. What is the solution of $|2x - 1| = 5$?

Graph the solution.

Ex. Solve $|3x + 2| = 4$? Graph the solutions.

1 Solve: $|2x + 5| = 9$

Separate your answers with a comma.

Ex. Solve: $3|x + 2| - 1 = 8$

2 Solve $2|x + 9| + 3 = 7$. Separate your answers with a comma.

Distance from 0 on the number line cannot be negative. Therefore, some absolute value equations, such as $|x| = -5$, have no solution. It is important to check the possible solutions of an absolute value equation. one ore more of the possible solutions may be extraneous.

An extraneous solution is a solution derived from an original equation that is not a solution of the original equation.

Ex. What is the solution of $|3x + 2| = 4x + 5$? Check for extraneous solutions.

3 What is the solution of $|5x - 2| = 7x + 14$? Check for extraneous solutions.

Essential Understanding: You can write an absolute value inequality as a compound inequality without absolute value symbols.

- less than is 'and'
- greater than is 'or'

Ex. What is the solution of $|2x - 1| < 5$? Graph the solution.

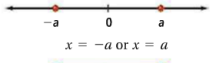
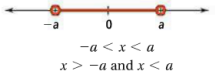
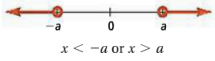
Ex. What is the solution of $|3x - 4| \leq 8$? Graph the solution.

Ex. Solve $|2x + 4| \geq 6$? Graph the solution.

4 Solve: $|5x + 10| > 15$

Then graph.

Concept Summary Solutions of Absolute Value Statements

Symbols	Definition	Graph
$\lvert x\rvert = a$	The distance from x to 0 is a units.	 $x = -a$ or $x = a$
$\lvert x\rvert < a$ $(\lvert x\rvert \leq a)$	The distance from x to 0 is less than a units.	 $-a < x < a$
$\lvert x\rvert > a$ $(\lvert x\rvert \geq a)$	The distance from x to 0 is greater than a units.	$x > -a$ and $x < a$  $x < -a$ or $x > a$

A manufactured item's actual measurements and its target measurements can differ by a certain amount, called tolerance. Tolerance is one half the difference of the maximum and minimum acceptable values. You can use absolute value inequalities to describe tolerance.

Ex. In car racing, a car must meet specific dimensions to enter a race. Officials use a template to ensure these specifications are met. What absolute value inequality describes heights of the model of race car shown within the indicated tolerance?

5 Suppose the least allowable height of the race car in Problem 6 was 52 in. and the desirable height was 52.5 in. What absolute value inequality describes heights of the model of race car shown within the indicated tolerance?