4.5: Solving Absolute Value Inequalities [Algebra 2 (Y)]

ADP Content Standards:

- ***E1: Linear equations and inequalities***
  a. Solve equations and inequalities involving the absolute value of a linear expression.

CCSS for High School Mathematics:

- ***A.CED.1: Create equations that describe numbers or relationships***
  Create equations and inequalities in on variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- ***A.REI.3: Solve equations and inequalities in one variable.***
  Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- ***A.REI.12: Represent and solve equations and inequalities graphically***
  Graph the solutions to linear inequality in two variables as a half-plane (excluding boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Objective: To solve and graph absolute value inequalities.

Absolute Value Inequality

Graphing Inequalities

Inequality	Equivalent Form	Graph
$\lvert ax+b\rvert < c$	$-c < ax+b < c$	
$\lvert ax+b\rvert \le c$	$-c \le ax+b \le c$	
$\lvert ax+b\rvert > c$	$ax+b < -c$ or $ax+b > c$	
$\lvert ax+b\rvert \ge c$	$ax+b \le -c$ or $ax+b \ge c$	

Example 1: Solve an Inequality of Form $|ax+b|<c$

Solve each inequality. Then graph the solution.

a.) $|x+3|<5$.

b.) $|2x+3|<7$.

Example 2: Solve an Inequality of Form $|ax+b|\le c$

Solve each inequality. Then graph the solution.

a.) $|x+4|\le 10$

b.) $|2x-5|\le 9$

Example 3: Solve an Inequality of Form $|ax+b| \geq c$

Solve each inequality. Then graph the solution.

a.) $|3x+2| \geq 4$.

b.) $\left|\frac{1}{2}x-1\right| \geq 3$.

Example 4: Write a Model for Tolerance

A spice scoop should contain 1.8 ounces with a tolerance of 0.01 ounce. Write and solve an absolute value inequality that describes the acceptable capacity for the scoop.