### 4.5: Solving Absolute Value Inequalities

**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 one 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

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Equivalent Form</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>ax + b</td>
<td>&lt; c$</td>
</tr>
<tr>
<td>$</td>
<td>ax + b</td>
<td>\leq c$</td>
</tr>
<tr>
<td>$</td>
<td>ax + b</td>
<td>&gt; c$</td>
</tr>
<tr>
<td>$</td>
<td>ax + b</td>
<td>\geq c$</td>
</tr>
</tbody>
</table>
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 $|ax + b| \leq c$
Solve each inequality. Then graph the solution.

a.) $|x + 4| \leq 10$.  
b.) $|2x - 5| \leq 9$. 
Example 3: Solve an Inequality of Form $|ax + b| \geq c$

Solve each inequality. Then graph the solution.

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

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

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.