Solving and Graphing Inequalities

Reporting Category	Patterns, Functions, and Algebra
Topic	Solving and graphing inequalities
Primary SOL	8.15b The student will solve two-step linear inequalities and graph the results on a number line.
Related SOL	8.15a

Materials

- Number Line (attached)
- Round hard candies
- Lifesaver candies
- Pieces of licorice

Vocabulary

less than, less than or equal to, greater than, greater than or equal to (earlier grades)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Display the equation $3x - 4 = 8$, and have students work individually to solve it.
2. Discuss the solution to the equation. Then, change the equal sign to a less than sign ($3x - 4 < 8$). Have students discuss with partners how this change affects the solution.
3. Model how to solve the inequality. Have each student select a possible solution and check it. List all of the possible solutions on the board, and lead a discussion about how to represent all of the possible solutions to this inequality.
4. Give each student a copy of the attached Number Line, one round hard candy to represent a closed circle, one lifesaver to represent an open circle, and one piece of licorice to represent the shaded section of the number line. Display various inequalities for students to solve (e.g., $2x < 8$, $6x + 1 > 13$, $3x + 5 \leq 20$). After they have solved the inequalities, have them graph their answers on their number lines, using the two candies and the piece of licorice. Walk around and check their solutions and number line graphs.
5. Give students the inequality $-3x \geq 9$ to solve. Have them check their solutions. Discuss with the class how in order for the solution to work, the sign must be changed. Ask why this is so. Ask when the sign in an inequality must be changed. Repeat with more examples that require changing the sign (e.g., $-4x > -16$, $-x + 8 < 12$).

Assessment

- **Questions**
  - When should you use a closed circle to graph an inequality? When should you use an open circle?
  - When do you have to change the sign in an inequality to solve it? Why?
- **Journal/Writing Prompts**
  - What are the similarities and differences between solving an equation and inequality?

Extensions and Connections (for all students)

- Have students find five different solutions to an inequality. Require that each solution belongs in a different subset of the real number system, if possible.
- Give students the graphs of inequalities on a number line, and have them write the inequalities indicated by the graphs.

Strategies for Differentiation

- Before beginning the lesson, review the symbols for greater than, less than, greater than or equal to, and less than or equal to, including what each represents.
- Have students create a vocabulary card to refer to while solving inequalities.
- Before having students start to solve and graph inequalities, demonstrate how to graph inequalities.
- Progress from solving one-step inequalities to solving two-step inequalities.

Number Line