Absolute Value Equations & Inequalities *(Instructor Version/GCC)*

*This lab will take one 90-minute class period. Students will work in groups in with a suggested group size of 3 to 4.*

**Motivation:** There are several methods to solve solutions absolute value inequalities. By “seeing” the interval(s) containing solutions to inequalities of the form $\left|x\right|\leq a$ and $\left|x\right|\geq a$, translations can be used to easily solve inequalities of the form $\left|x+c\right|\leq a$ and $\left|x-c\right|\geq a$.

**Objectives**: Students will understand the nature of absolute value inequalities and write their solutions in interval notation.

**Materials**:

1. Prepared 40 ft rope labeled with red, black, and green tape.
2. Prepared set of large (8.5” by 11”) poster board with equations and inequalities.
3. One brightly colored vest

**Activity 1: Equations and Inequalities of the form** $\left|x\right|=a$**,** $\left|x\right|\leq a$**, and** $\left|x\right|\geq a$

*This activity will take about 30 minutes. Your students will first need to be arranged in groups of 3 to 4, then you will ask for 11 volunteers, one from each group. If you need more volunteers, select one more from each group until you have 11. These volunteers will create a “human number line” by standing behind the rope facing the class at the front of the classroom and each will hold the rope with their left hand next to “their” number. The student with the vest will stand at position zero.*

1. You will hold up one card one at a time and the students at the number line whose number solves the equation will raise their right hand. Students at their desk will graph the solution and write the solution in interval notation for each example.

*Encourage you student to notice the center of the resulting interval and the distance around the center that contains solutions.*

1. Have all students return to their groups and discuss how to write each of the following without absolute value symbols: $\left|x\right|=a$, $\left|x\right|\leq a$, and $\left|x\right|\geq a$. The groups will record their results on the worksheets.

**Activity 2: Equations and Inequalities of the form** $\left|x-c\right|=a$**,** $\left|x-c\right|\leq a$**, and** $\left|x-c\right|\geq a$

*Again, this activity will take about 30 minutes. Ask for 11 new volunteers to create the “human number line” again. As you hold up each card, have the students “shift” so that the student with the vest is now at position c.*

1. You will hold up one card one at a time and the students at the number line whose number solves the equation will raise their right hand. Students at their desk will graph the solution and write the solution in interval notation for each example.

*Encourage students to notice that the center of the interval is now located at c and the distance around the center that contains solutions is still a.*

1. Have all students return to their groups and discuss how to write each of the following without absolute value symbols: $\left|x-c\right|=a$, $\left|x-c\right|\leq a$, and $\left|x-c\right|\geq a$. The groups will record their results on the worksheets.

**Activity 3: Mixed Practice**

*This activity will take about 20 minutes. The students will record their answers on the worksheet.*

**Activity 3: Follow-up Discussion**

*This activity should take 10 minutes.*

1. What is the difference between “$<$” and “$\leq "$ and between “$>$” and “$\geq $” in rewriting the inequality without absolute value? How do these effect the interval notation?
2. How can you use your results from Activity 2 to solve the inequality $\left|2x-1\right|\leq 3$?