Acquisition Lesson Planning Form
Key Standards addressed in this Lesson: MM2A2c
Time allotted for this Lesson: 5 Hours

Essential Question: LESSON 2 – Absolute Value Equations and Inequalities
How do you solve absolute value equations and inequalities algebraically and graphically?
Activating Strategies: (Learners Mentally Active)

Session1:
 3-2-1:
 Give students three multi-step equations to solve, two evaluating absolute value problems, and one absolute value equation to solve.
     1. $5x - 4 = 3x + 6$
     2. $2(3x + 8) + 2 = 3(x - 5)$
     3. $\frac{1}{2}(x - 4) + 3/2(x + 2) = 12$
     4. $\lvert 5 - 7 \rvert$
     5. $\lvert 2(3 - 4) - 6 \rvert$
     6. $\lvert 2x - 1 \rvert = 7$
 	
 Session 2:
 Have students graph the following inequalities. After completing the graphs, have students get with a partner and compare their graphs.
     1. $x > 4$
     2. $x \le -2$
     3. $x \ge 1$ or $x < -3$
     4. $-5 < x < 0$
 	
 Session 3:
 Ask students to solve the following 3 problems:
     1. $\lvert 2x + 3 \rvert = x + 5$
     2. $\lvert 3x - 4 \rvert \le 2x - 3$
     3. $\lvert 1/2x + 1 \rvert - 2 > 2x - 8$

Acceleration/Previewing: (Key Vocabulary)
Absolute value equation;   Absolute value inequality
Teaching Strategies: (Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)
Session 1: (1 Hour)   Discuss the activator and show students how number six produces two answers by discussing absolute value as a piecewise function and looking at the definition of absolute value, the distance from zero on a number line. Be sure to show how to represent this on a number line.   Use Guided Practice worksheet to show students how to solve absolute value equations.

<u>Session 2:</u> (2 Hours)
Before beginning to solve absolute value inequalities, students should be reminded how to solve linear inequalities and compound inequalities. The following problems can be used:

1. $x + 3 > -8$
2. $3x - 4 \leq 5$
3. $-2x - 7 < x - 2$
4. $-1/2(x + 6) \geq 4$
5. $x + 3 > 5$ or $3x - 1 < 2$
6. $-6 \leq 5 - 2x < 3$

Use GO #1 to show students how to solve and graph absolute value inequalities.

Use worksheet to give students more practice on solving and graphing absolute value inequalities.

<u>Session 3:</u> (2 Hours)
At the beginning of this session, the students should be given a quiz over solving absolute value equations and inequalities algebraically.

Ask for three volunteers to work the problems from the activating strategy on the board. Teacher should stress how complex these problems are to solve and pose the question "How might we solve absolute value equations and inequalities graphically?"

Using a graphing calculator, the teacher should demonstrate how to solve the three problems from the activating strategy through graphing. The teacher will stress the following two methods:
1. Put the left side of the equation or inequality in y_1 and the right side of the equation or inequality in y_2. For the equations, the solutions are found by calculating the intersections of those two graphs. For the inequalities, the solutions are found by calculating the intersections and deciding the x-values where the left side is greater than the right or less than the right based on the original problem's inequality sign.
2. For the equations, move everything from the right side of the equation to the left and find the zeros. For the inequalities, move everything from the right to the left. If the original inequality is less than, the solutions are found by looking below the x-axis, and if the original inequality is greater than, the solutions are found by looking above the x-axis.

In pairs, students should be given a set of 5 problems where each person in the pair has a different set. Each student should algebraically solve their set of problems. When they have completed their set, they should switch with their partner and check their partner's answers by solving them graphically.

Distributed Guided Practice/Summarizing Prompts: (Prompts Designed to Initiate Periodic Practice or Summarizing)

Compare the two methods of solving using the graphing calculator. Which is easier and makes the most sense to you? Why?

Extending/Refining Strategies:
Using the calculator, solve $2 \mid 3x - 1 \mid > 4 - \mid 2 - x \mid$

Summarizing Strategies: Learners Summarize & Answer Essential Question

Session 1:
Carousel:
Students will work in groups of four. Give each student a problem and have them do the first step. They then pass it to the left in their group and complete the second step. Pass again and complete the third step. Pass again and complete the fourth step. Finally pass to the original owner and check the answers.

1. $\mid 3x + 1 \mid - 2 = 8$
2. $2 \mid 2x - 4 \mid = 6$
3. $½ \mid 4x + 3 \mid = 4$
4. $\mid 5x - 2 \mid + 3 = 6$

Session 2:
3-2-1:
Have students write 3 absolute value inequalities, solve 2 of the inequalities (one "and" and one "or") they created, and then graph the solutions to 1 of the inequalities they solved.

Session 3:
Using the same pairs from the lesson, 1's write down how you solved a problem algebraically and then tell the 2's. 2's write down how you solved a problem graphically and then tell the 1's. The teacher will randomly pick a few students to share with the class how they solved a problem algebraically and graphically.

Solving Absolute Value Equations
Guided Practice Worksheet

Name_____   Date_____   Per_____

Examples:

$|2x + 4| = 8$	$3|x - 2| = 9$

Your turn:

1. $|x + 3| = 4$

2. $|5x - 2| = 3$

3. $2|x| + 3 = 6$

4. $-4|x - 2| = -32$

5. $1/3 |x| = 2$

6. $-|x + 5| = 40$
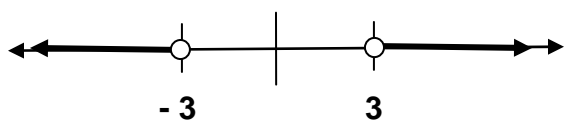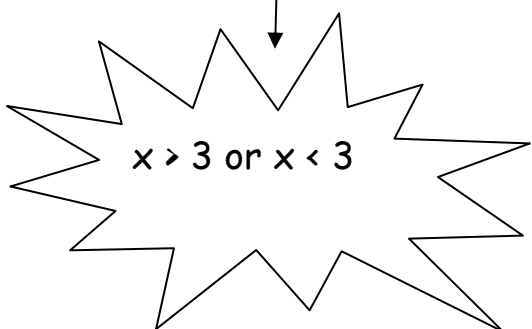
7. $3|6x + 3| = 18$

8. $\frac{1}{4}|x - 7| = 4$

9. $|4x + 10| = x$

10. $15 = |x - 21| + 4$

Absolute Value Inequalities
"GOLA"

Greater than "OR" $|x| > 3$	Less than "AND" $|x| < 3$

$x > 3$ or $x < 3$
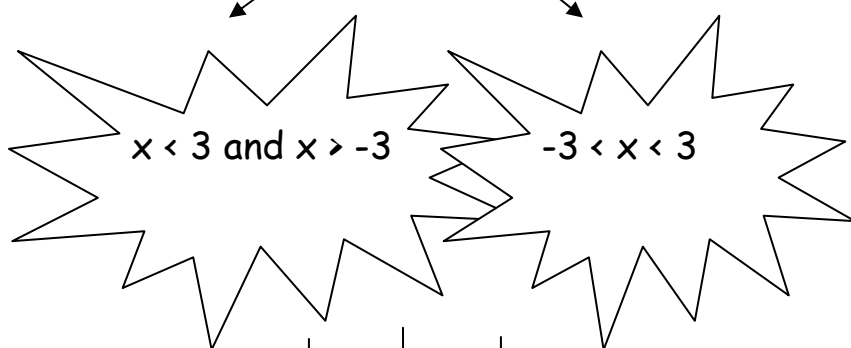
$x < 3$ and $x > -3$

$-3 < x < 3$

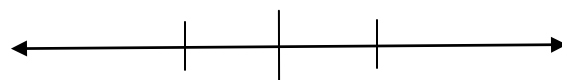-3   3

-3   3
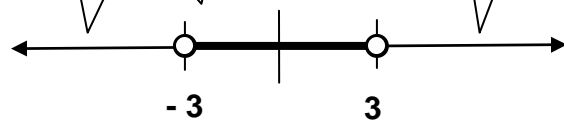
1. $|x + 3| \geq 5$

2. $|2x + 1| < 9$

3. $|x - 4| + 1 > 3$

4. $\frac{1}{2}|3x + 2| \geq 4$

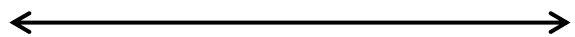5. $3|3x - 4| - 2 \leq 4$

Name _____   Date _____   Per _____

Solving and Graphing Absolute Value Inequalities
Practice Worksheet

Solve and graph each inequality.
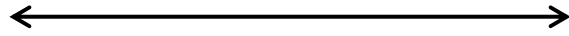
1. $|x - 5| \geq 2$

2. $|2x + 1| < 3$

$\longleftrightarrow$

$\longleftrightarrow$

3. $|4x - 5| + 1 \leq 8$

4. $2|x - 3| > 4$

$\longleftrightarrow$

$\longleftrightarrow$

5. $|5x - 2| \geq 3$

6. $|x + 3| - 5 \leq 1$

$\longleftrightarrow$

$\longleftrightarrow$

7. $\frac{1}{2}|6x + 2| > 4$

8. $3|2x + 1| - 1 \geq 5$

$\longleftrightarrow$

$\longleftrightarrow$

9. $|4x + 1| > 2x$

10. $\frac{1}{3}|4x - 3| < 7$

$\longleftrightarrow$
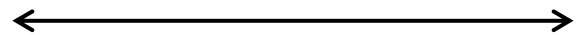
$\longleftrightarrow$

Name: _____   Date: _____   Per: _____

Quiz for Solving Absolute Value Equations and Inequalities

Solve each equation and inequality. Do not forget to graph the solution for your inequalities on the number line provided.

1. $|8x + 7| = 15$

2. $|3x - 4| \geq 5$

3. $2|x - 6| < 4$

4. $|2x + 1| - 7 = 4$

5. ½ $|4x - 2| + 1 > 5$

6. $|6x + 2| \leq 10$

Problems for Session 3 Pairs Activity

Set 1:
1. $|x - 3| < 5x + 1$
2. $|3x + 1| \leq 4x - 5$
3. $|6x + 7| \leq -3x + 16$
4. $|-2x + 3| - 2 > x - 5$
5. $|1/2 \, x - 3| < 6x - 5$

Set 2:
1. $|2x + 6| > 4x - 2$
2. $|4x - 5| \geq 5x - 9$
3. $|-3x + 5| < 2x - 5$
4. $|-2x - 3| \geq -4x + 3$
5. $|3x + 4| - 5 > 2x + 1$

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