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Grade Level/Subject: Algebra

Topic: Absolute Value

Objectives (P.A.S.S.): 1.2.a

Introduction: This lesson graphically illustrates the definition of absolute value as a value's distance from zero on the number line. Here, the number line is represented by the famous highway Route 66, driven by Driving Dan. Locations along the highway are designated with coordinates in relationship to Dan's house. Coordinates may have positive or negative values to designate direction (east being positive and west being negative), but all distances are given as absolute values (magnitude only).

Instructional process: After distributing the student handout and reading the background story and instructions, begin with the given information by having the students properly place G on the number line. As the directions dictate, if $|G| = 10$, then $G = 10$ or $G = -10$. In other words, the gas station can be ten miles east or ten miles west of Dan's House. It is critical here to emphasize to the students that while the equations $G = 10$ and $G = -10$ represent locations, the equation $|G| = 10$ represents a distance! Once the students understand that $|x|$ has two solutions, you then want them to understand that $|x + a|$ also has two solutions. In this problem, the first problem gives the equation $|T + 5| = 20$. Based on the explanation you have given them about absolute value, they should know that $|T + 5|$ represents a distance of 20 in either direction. So there are two possible solutions ... $T + 5 = 20$ (east) or $T + 5 = -20$ (west). The students should solve and plot both of these equations, marking them as T (for truck stop) on the number line. Have the students check the answers in the problem ... If Dan were five miles east of the Truck stop at their solutions (15 or -25), would Dan be 20 miles from home? (Home is at the origin (0).) For the next two problems, the students must generate the equations themselves based on the information in the problem. They need to check their equations before they attempt to solve them. Be sure to push for the understanding of each step within each problem. The rest of the problems are very similar to the original problems except that they deal with inequalities. Be sure they understand that "less than" means all the possible distances from a given point towards Dan's home (zero), and that "greater than" means all of the distances from a given point away from Roy's home (zero).

Closure: Closure could begin by discussing the various answers given for the last problem and discussing the appropriateness of the answers.

Assessment: Assessment could be a short quiz over absolute value or having students write their own story and situations using a given number line with the different locations marked.

Modifications/Accommodations: Modifications for special needs students could include working in groups or using manipulatives to model the examples on an actual number line. Modifications for gifted students could include more written problems rather than question and answer problems.

Reflection: Reflecting on this problem, I would include more problem situations. I would also add more problems where they had to write their own situations to graph. But overall, this lesson seemed to cement the idea of absolute value and solving the equations to the students.

Get your kicks on ROUTE 66

Algebra problem for solving Absolute Value Student Handout

Driving Dan lives along Route 66 (the famous highway). Every day, Dan drives this very straight highway that runs east and west. Locations along the highway are designated with coordinates in relationship to Dan's house. Negative coordinates represent places that are west of Dan's house; positive coordinates represent places that are to the east. All distances are given as absolute values.

For example, there is a gas station 10 miles away from Dan's house. If G represents the coordinate of the gas station, then the distance from Dan's house can be represented by the equation: $|G| = 10$. Solving the equation for G , yields a solution of $\{-10, 10\}$, meaning that the gas station is either ten miles to the west (-10) or ten miles to the east (+10). Graph the possible coordinates of G .



1. Dan drives along Route 66 and stops 5 miles east of a truck stop, and realizes that he is 20 miles away from home. Let T be the coordinate of the truck stop. Dan's distance from home can be represented by the equation below. Find and graph the possible coordinates of T .

$$|T + 5| = 20$$

2. Dan drives 30 miles away from home. He notices that he is also 3 miles west of the mall. Let M be the coordinate of the mall; write an equation representing the scenario above. Then solve the equation to find the possible coordinates of the mall. Graph M .

Equation: _____

3. Dan is 30 miles away from home. He notices that he is also 8 miles east of twice the distance to his buddy's house. Let B be the coordinate of his buddy's house: write an equation representing the scenario above. Then solve the equation to find the possible coordinates of Dan's buddy's house. Graph B .

Equation: _____

4. Driving Dan can drive 300 miles on a full tank of gas. Let F be possible coordinates of places Dan can drive to without stopping for gas; the inequality representing the distance that he can drive is shown below. Solve and graph for F .

$$|F| \leq 300$$



5. The furthest that Driving Dan has ever driven is 100 miles west of his sister's house. He doesn't know how far exactly that total distance is, but he knows that it is less than 450 miles. Let S be the coordinate of Sister's house; write an inequality representing the scenario above. Then solve the inequality to find the possible coordinates of Sister's house, and graph those possible solutions.

Inequality: _____



6. Dan knows that his latest trip took him twice as far as his aunt's house, which he knows was more than 100 miles from home. Let A be the coordinates of Aunt's house; write an inequality representing the scenario above. Then solve the inequality to find the possible coordinates of Aunt's house, and graph those possible solutions.

Inequality: _____



7. Write a Driving Dan scenario for the following inequality, letting J be the coordinate of Dan's job. Then solve the inequality to find the possible coordinates of Dan's job, and graph those possible solutions.

$$|2J + 15| > 65$$

