Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	Intermediate Algebra	Unit 8 Title:	Absolute Value Functions	Grade Level(s):	9
Assessed Trimester:	Trimester B	Pacing:	5-6 Days	Date Created:	6/13/2013	Last Revision Date:	08/27/2014

Course Understandings: *Students will understand that:*

A. Relationships exist between real-world situations, mathematical equations, inequalities and graphs for linear, exponential, absolute value, radical, and polynomial functions.

C. There are a variety of strategies of varying efficiency for simplifying linear, absolute value, exponential, radical, complex and polynomial expressions.

E. The context of a problem is important in recognizing the reasonableness of a solution.

F. There are benefits and limitations in the use of calculators and other technology to solve mathematical situations.

DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

Minnesota State/Local/Technology Standard(s) addressed (2007):

- **Standard (9.2.1.#):** Understand the concept of function, and identify important features of functions and other relations using symbolic and graphical methods where appropriate.
  Benchmark:
  9.2.1.3 Find the domain of a function defined symbolically, graphically or in a real-world context.
  9.2.1.6 Identify intercepts, zeros, maxima, minima and intervals of increase and decrease from the graph of a function.

- **Standard (9.2.2.# - Modified):** Recognize absolute value functions in real-world and mathematical situations; represent these functions with tables, verbal descriptions, symbols and graphs; solve problems involving these functions, and explain results in the original context.
  Benchmark:
  9.2.2.6 Sketch the graphs of common non-linear functions such a $f(x) = \sqrt{x}, f(x) = |x|$, $f(x) = \frac{1}{x}$, $f(x) = x^3$, and translations of these functions, such as $f(x) = \sqrt{x-2} + 4$. Know how to use graphing technology to graph these functions.

- **Standard (9.2.4.# - Modified):** Represent real-world and mathematical situations using equations and inequalities involving absolute value functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.
  Benchmark:
  9.2.4.6 Represent relationships in various contexts using absolute value inequalities in two variables; solve them graphically.

Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

- Analyze a real-world situation using different representations of an absolute value function.

Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: ● Graphs of absolute value functions can be used to model real world situations. ● Absolute value functions can be analyzed by using a table, graph, equation or verbal description.	**Students will keep considering:** ● Where can I find situations involving absolute value functions in the real world? ● When looking at absolute value functions, how do the significant features of the graph, its algebraic equation and real world representation relate to each other? ● How do I decide the best method to solve an absolute value equation or inequality? ● How do the skills and knowledge that we are learning influence the task of understanding situations that can be modeled by absolute value functions?

Acquisition

Knowledge - Students will:

- Demonstrate an understanding of the significant features of an absolute value graph and their relationship to real-world situations.
  - Intercepts, zeros, maxima, minima, intervals of increase and decrease, domain and range

Reasoning - Students will:

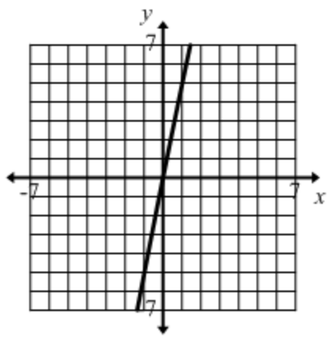
- Understand if their solution is appropriate given a real world situation.

Skills - Students will:

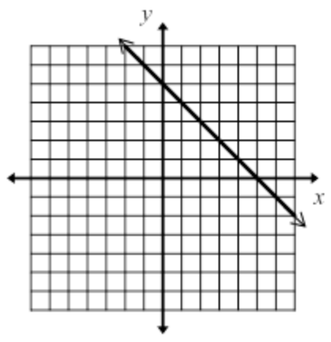
- Graph absolute value equations and inequalities with and without graphing technology.
- Find solutions of absolute value equations and inequalities.
- Represent relationships in various contexts using absolute value inequalities in two variables;solve them graphically.
- *For example*: If a pipe is to be cut to a length of 5 meters accurate to within a tenth of its diameter, the relationship between the length *x* of the pipe and its diameter *y* satisfies the inequality $|x - 5| \leq 0.1y$.

Common Misunderstandings

- Students interchange the x-intercept and the y-intercept
- Students misunderstand the zero of a function to mean when x = 0, rather than when y = 0.
- Students state that x and y-intercepts are values rather than the coordinates of points on a graph. The y-intercept of the line y = 2x + 7 is the coordinate (0,7) not the value 7. The x-intercepts of the function y = 3(*x* + 5)(2 - *x*) are (-5,0) and (2,0) not -5 and 2. This is an important distinction since intercepts highlight important features of the relationship between two variables and not simply the value of one variable.
- Students incorrectly identify the features of a function based on limited information. For example, a student might incorrectly explain that the graph of the function $y = \frac{(50-x)}{10x}$ is a linear function because when the function is entered into a graphing calculator using the default settings the graph looks like a line.



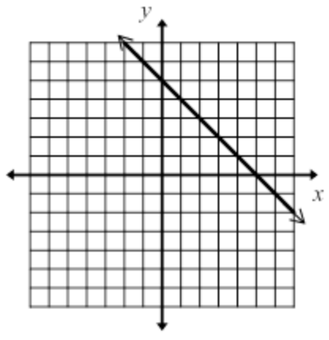
- Students will incorrectly state that the maximum value of the function y = -3|*x* - 11| + 7 is 11. Students confuse which variable, the independent or dependent, is being maximized or minimized and which variable determines where this occurs.
- Students will calculate too small a set of point to graph a function. For example, a student asked to graph y = |*x* - 5| will correctly calculate the ordered pairs (0,5), (1,4), and (2,3) and incorrectly graph a line passing through the points.



Essential new vocabulary

- Absolute value function

- Students do not use the correct syntax when entering a function into a graphing utility. Students who are trying to graph $y = \frac{1}{x-3}$ often enter $1 \div x - 3$, which results in a graph of a different function $y = \frac{1}{x} - 3$.
- Students will graph a linear inequality as a line.
    - Example: Graph: x + y ≤ 5



- Students struggle with writing linear equations and inequalities for a given situation and identifying the independent and dependent variables.
- Students may confuse the symbols for inequalities (< and >), or may not be sure about when to include equivalence (< and >).
- Students struggle with determining how to separate out the objective function and use the graph to find the optimal solution when solving a problem using linear programming.