Acquisition Lesson Planning Form
Key Standards addressed in this Lesson: MM2A1a
Time allotted for this Lesson: 2 Hours

Essential Question: LESSON 1 – Absolute Value Functions
How do you write absolute value functions as piecewise functions?
Activating Strategies: (Learners Mentally Active)
Session 1: Word splash provided. Give each student a copy of word splash and green, yellow and red colored pencils. Students should circle words they know with green, words that are familiar with yellow, and unknown words with red. Teacher uses this information to guide review of absolute value functions. Session 2: Have students complete the absolute value functions matching page.
Acceleration/Previewing: (Key Vocabulary)
Piecewise Function, Absolute Value Function
Teaching Strategies: (Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)
Session 1: Complete GO #1 with students reminding them of concepts from Math 1. Then, use GO #2 to review the transformations of an absolute value function. Included are vertical shifts, horizontal shifts, reflection over x-axis, stretches and shrinks. Students should use different colored pencils to draw each graph. Session 2: Put 10 absolute value functions on the board. Students should use graph paper and graph an absolute value function of their choice. Then find two points on each side of the vertex. Use these points, find the slope of each side. Do you notice anything in particular? Now, using the slope and one point, write the equation of each side of the absolute value function. Discuss the domain of each side. Use GO #3 to show students the process for writing absolute value functions as piecewise functions. Go through a couple of examples with the students, then have them complete some practice problems or a worksheet.
Distributed Guided Practice/Summarizing Prompts: (Prompts Designed to Initiate Periodic Practice or Summarizing)
How do you write the equation of a line given a graph of the line? Look at several absolute value graphs. What is the relationship of the slopes of the two sides? How is an absolute value function like a piecewise function?

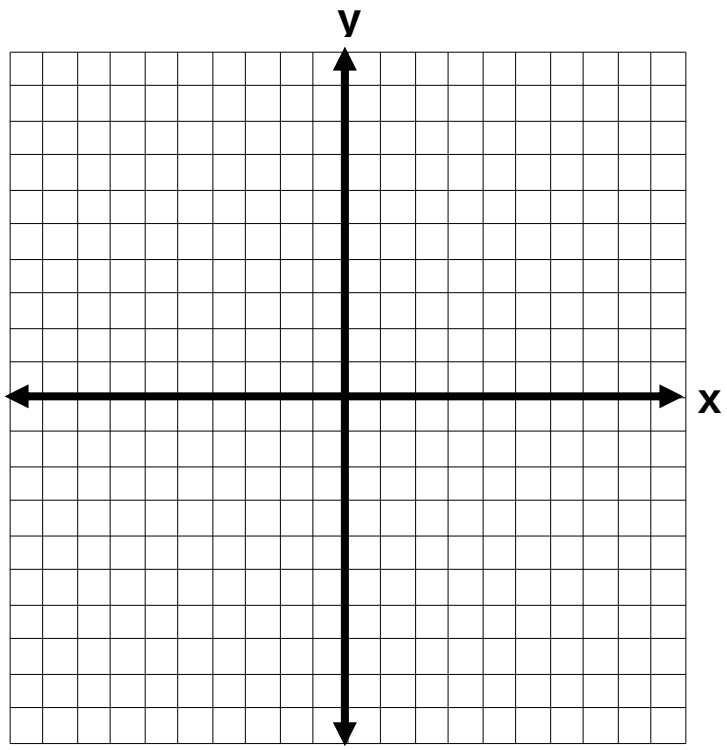
Extending/Refining Strategies:
Summarizing Strategies Learners Summarize & Answer Essential Question
Give one, Get one: Have students write down an absolute value function and trade with another student. Each student will then write the absolute value function as a piecewise function. Use various parts of the task as a summarizer. Complete the worksheet of matching graphs and absolute value functions. Write each function as a piecewise function.

Word Splash


vertex
increasing interval
absolute value
x-intercepts
range
minimum
function notation
decreasing interval
y-intercept
zeros
parent graph
maximum
domain
end behavior

Graphic Organizer #1: ABSOLUTE VALUE FUNCTIONS
Parent Function: f(x) = | x |

f(x) = | x |	
x	f(x)
-6	
-4	
-2	
0	
2	
4	
6	



Describe:

x-intercepts (zeros)

Domain	Range

y-intercept

Intervals of Increase/Decrease

End Behavior

Max or Min

GO #1a: Exploring the Graphs of Absolute Value Functions

Parent Function: $y = |x|$

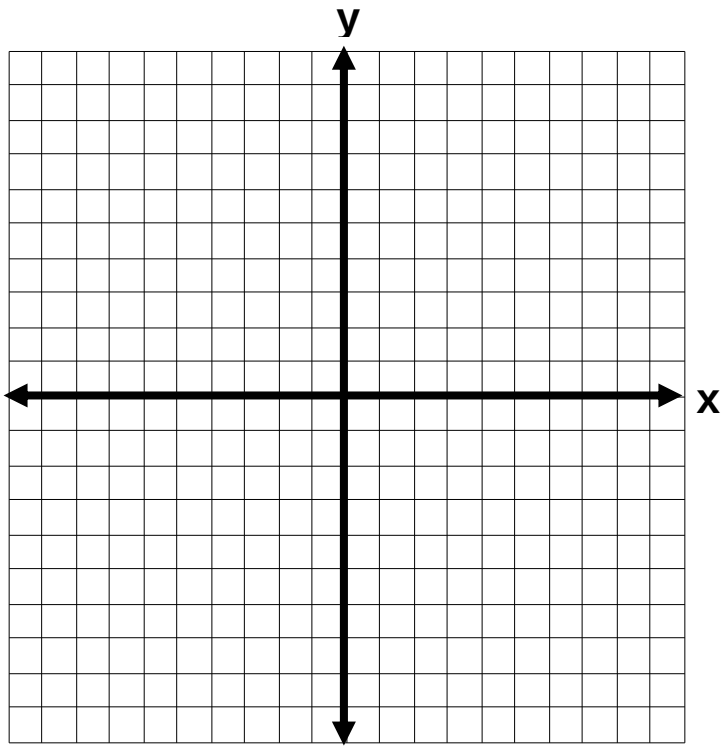
$y = \|x\|+k$	$y = a\|x\|$	$y = a\|x\|+k$

What effect do the variables a and k have on the parent function?

Graphic Organizer #2: ABSOLUTE VALUE FUNCTIONS

TRANSFORMATIONS

Function:	Color:
1. f(x) = | x |	pencil
2. f(x) = | x | + 2	
3. f(x) = | x | - 5	
4. f(x) = - | x |	
5. f(x) = 1/2 | x |	
6. f(x) = 3 | x |	
7. f(x) = | x – 4 |	
8. f(x) = | x + 3 |	



Description of Transformation:

1. Parent graph

2.

3.

4.

5.

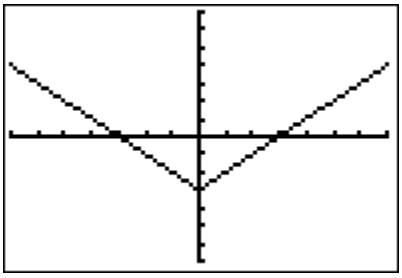
6.

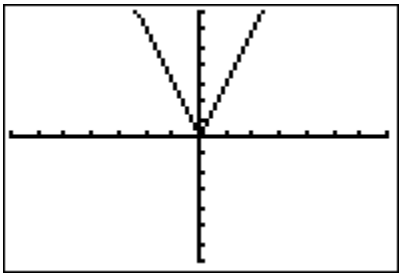
7.

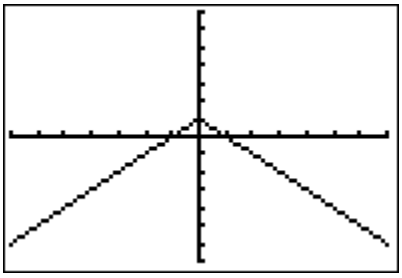
8.

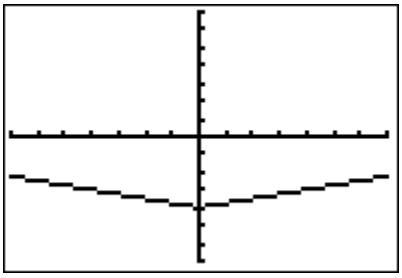
ABSOLUTE VALUE FUNCTIONS

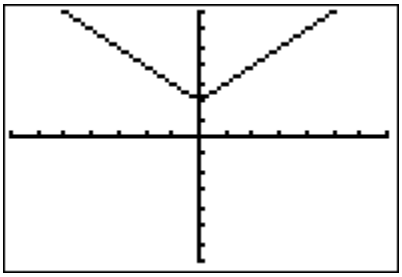
Match the graph of each function (1-6) with the equation of each function (a-f).

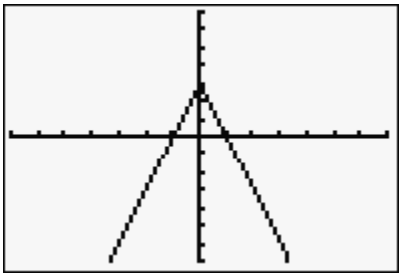
1. 

2. 

3. 

4. 

5. 

6. 

A. $f(x) = -|x| + 1$

B. $f(x) = \frac{1}{4}|x| - 4$

C. $f(x) = |x| - 3$

D. $f(x) = -3|x| + 3$

E. $f(x) = 3|x|$

F. $f(x) = |x| + 2$

GO #3: How do you write an absolute value function as a piecewise function?

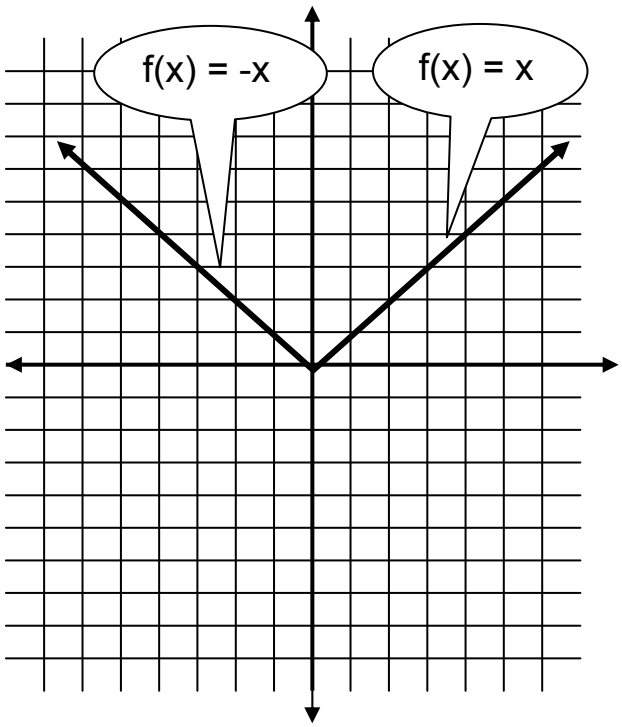
Consider the definition of absolute value,

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

If we use the definition to write a function, we would have the two line piecewise function shown below.

$$f(x) = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

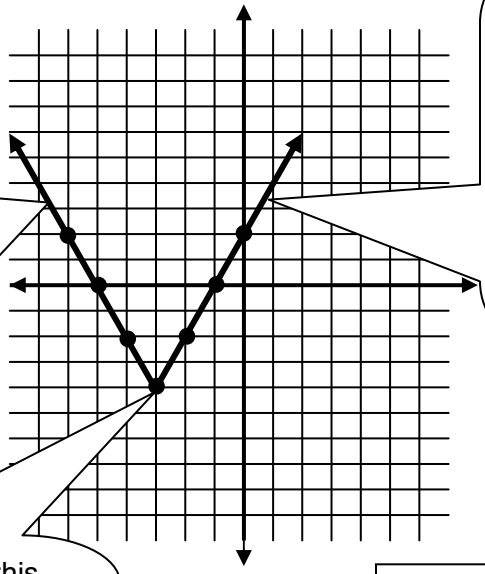
Look at the graph to the right to see each part of the piecewise function.



Here's another example: $f(x) = 2|x + 3| - 4$.

What makes (x + 3) negative? When x < -3, x + 3 < 0 and is negative. This means that when x < -3,
f(x) = 2(-x - 3) - 4
= -2x - 6 - 4
= -2x - 10.
We can write
f(x) = -2x – 10; x < -3

What makes (x + 3) positive? When x ≥ -3, x + 3 ≥ 0 and is positive. This means that when x ≥ -3,
f(x) = 2(x + 3) - 4
= 2x + 6 - 4
= 2x + 2.
We can write
f(x) = 2x + 2; x ≥ -3



To determine the x value where this one turns, look at the value that makes the expression inside the absolute value zero. If x+3=0, then x = -3. Find y by substituting -3 for x in the equation and solving to get f(-3) = -4.. The graph turns at (-3, -4).

As a piecewise function we have

$$f(x) = \begin{cases} -2x - 10; & x < -3 \\ 2x + 2; & x \geq -3 \end{cases}$$