Today's Learning Goal(s):

By the end of the class, I will be able to:

a) understand the roles of "*a*", "*h*" & "*k*" for vertex form: $y = a(x - h)^2 + k$

MPM 2DI

MPM2DI Name: _____ Date: _____

Worksheet

Quadratics: vertex form

Steps to access today's activity:

1. Go to: http://www.explorelearning.com/
2. Select Login from the top-right corner of the screen.
3. Enter in your User Name and Password.
4. Under the MPM2DI tab, select Quadratics in Vertex Form - Activity B
5. Now click where it says **Gizmo** in the middle-left of the screen.
6. Now complete this entire booklet.

Introduction

Quadratic **relations** can be written in what is known as the "vertex form." The vertex form is: $y = a(x - h)^2 + k$. This worksheet will help you understand how '**a**', '**h**', and '**k**' effect the graph of the quadratic **relation.**

Activity

The meaning of 'a'

Grab the '**a**' slide bar and slide it **slowly to the right, then to the left.**

Question 1a. Which way does the graph open when '**a**' is positive?

Question 1b. Which way does the graph open when '**a**' is negative?

Question 1c. What type of graph is it when '**a**' is zero?

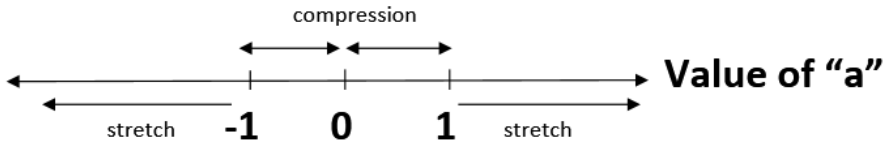
Question 1d. What **predictions** can you make relating the sign of '**a**' to the direction the graphs opens?

Question 1e. What happens to the graph as '**a**' moves away from zero?

Question 1f. What happens to the graph as '**a**' moves close to zero?

Question 1g. What **predictions** can you make relating the vertical scaling of the graph to '**a**'?

Note: If a graph is wide, it is a vertical **compression**.
If the graph is narrow, it is a vertical **stretch**.
The value of "**a**" will decide whether or not it is a compression or a stretch.
Here is a visual aid:



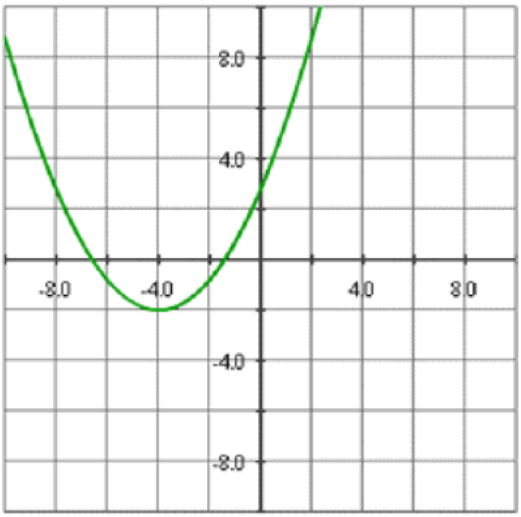
The meaning of 'h'
Select the "show vertex/intercept data" box, then grab the '**h**' slide bar and move it **slowly to the right, then to the left.**

Question 2a. What happens to the vertex of the graph as '**h**' moves to the right?

Question 2b. What happens to the vertex of the graph as '**h**' moves to the left?

Question 2c. **Create the equation** $y = 3(x-2)^2 + 4$ **What is the value of 'h'?** h= 2

Question 2d. In the graph below, what is the approximate value of '**h**'? h= -4
If a=0.3, write the equation of graph.



y= $0.3(x+4)^2 - 2$

Question 2e. What **predictions** can you make relating '**h**' to the graph of a quadratic?

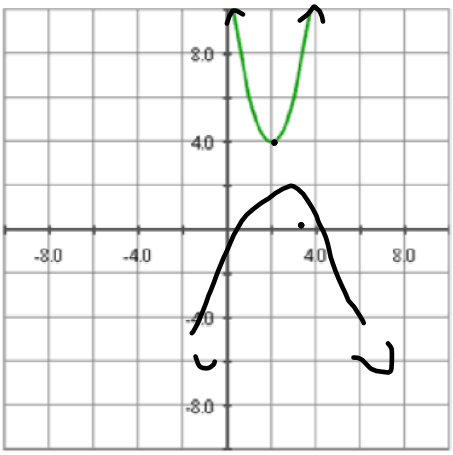
The meaning of 'k'
Grab the 'k' slide bar and move it **slowly to the right, then to the left.**

Question 3a. What happens to the vertex of the graph as 'k' moves to the right?

Question 3b. What happens to the vertex of the graph as 'k' moves to the left?

Question 3c. **Create the equation** $y = -2(x-5)^2 + 6$ **What is the value of 'k'?**
k= 6

Question 3d. In the graph below, what is the approximate value of 'k'?
k= 4



If a=3, write the equation of graph.
y= $3(x-2)^2 + 4$

Question 3e. When does 'k' represent the maximum value that the **relation** attains?
If a is negative

Question 3f. What **predictions** can you make relating 'k' to the graph of a quadratic?

Homework:

1. Write an equation for the quadratic relation that results from each transformation to $y = x^2$.

a) a translation 5 units up $y = x^2 + 5$
b) a translation 2 units right $y = (x-2)^2$
c) a translation 1 unit down $y = x^2 - 1$
d) a translation 4 units left $y = (x+4)^2$
e) stretched vertically by a factor of 3 $y = 3x^2$
f) compressed vertically by a factor of ½ $y = \frac{1}{2}x^2$
g) translated 9 up and 5 left $y = (x+5)^2 + 9$
h) translated 6 up and 3 right $y = (x-3)^2 + 6$
i) translated 2 down and 8 right $y = (x-8)^2 - 2$
j) translated 4 down and 7 left $y = (x+7)^2 - 4$

$h = -4$
$k = 0$
$a = 1$

$y = a(x-h)^2 + k$

$y = a(x-(-4))^2 + k$

$y = (x-(-4))^2$
$= (x+4)^2$

1. (continued) Write an equation for the quadratic relation that results from each transformation to $y = x^2$.

k) reflected in the x-axis $y=-x^2$

l) reflected in the x-axis and stretched vertically by a factor of 5 $y=-5x^2$

m) reflected in the x-axis, stretched vertically by a factor of 4, translated 2 up and 9 left $y=-4(x+9)^2+2$

n) reflected in the x-axis, compressed vertically by a factor of ¼, translated 6 right $y=-\frac{1}{4}(x-6)^2$

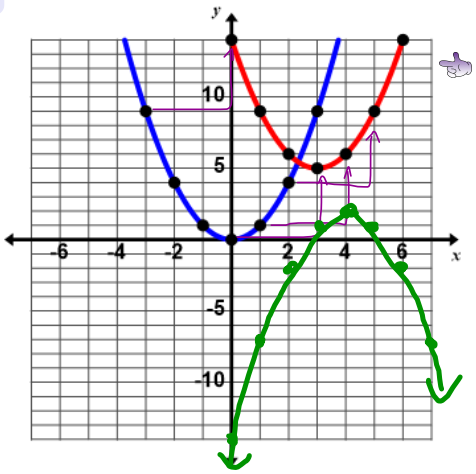
2. For each quadratic relation, state the vertex first, then graph the relation on the grid provided.
For each equation, you **MUST** graph **2** accurate **points** on **each side** of the **vertex**. (You may check using the gizmo).

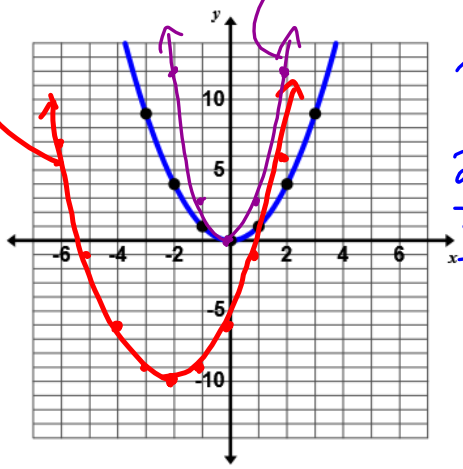
a) $y=(x-3)^2+5$ vertex (3 , 5)

b) $y=-(x-4)^2+2$ vertex (4 , 2)

c) $y=(x+2)^2-10$ vertex (-2 , -10)

d) $y=3x^2$ vertex (0 , 0)





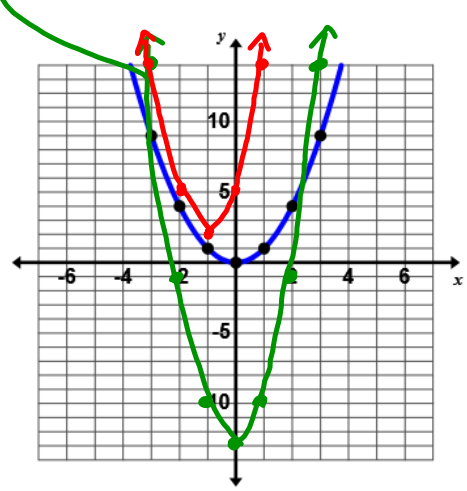
x	$y=3x^2$
0	0
1	3
2	12
3	27

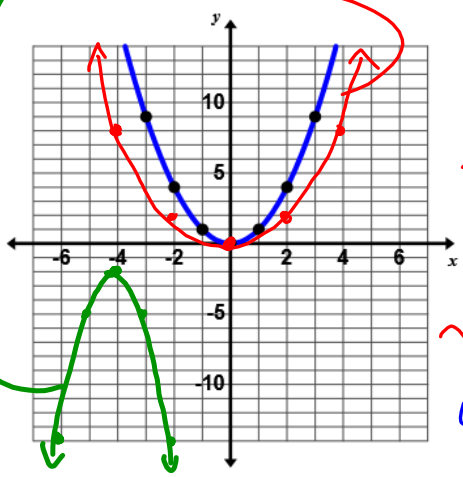
e) $y=3x^2-13$ vertex (0 , -13)

f) $y=3(x+1)^2+2$ vertex (-1 , 2)

g) $y=-3(x+4)^2-2$ vertex (-4 , -2)

h) $y=\frac{1}{2}x^2$ vertex (0 , 0)





x	$y=\frac{1}{2}x^2$
0	0
1	$\frac{1}{2}$
2	2
3	$\frac{9}{2}$
4	8