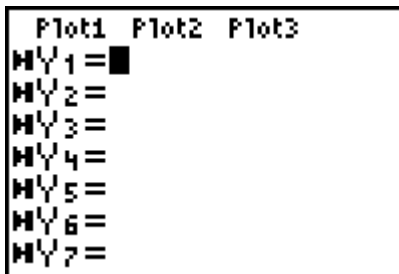Name: _____   Date: _____

Parameter Changes in Quadratic Functions
Student Handout
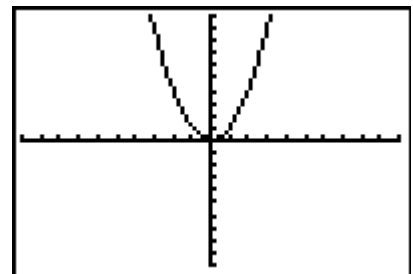
Go to APPS and choose Transfrm and press ENTER.

It may seem like nothing happened, but if you press Y=, there is change to the screen. Can you see what is different?

On **Y1=** enter the quadratic function **y = x²**. This is the parent function for all quadratic functions. Look at your graph and answer the following questions:

What is the vertex of the parabola?

What is the y-intercept of the parabola?

What is (are) the x-intercept(s) of the parabola?

Describe the graph.

All parabolas are variations or transformations of this one graph. There are several parameters that will affect the position and shape of the graph. In the following activity, we will discuss how different parameter changes in the function affect the graph.

Name: _____   Date: _____
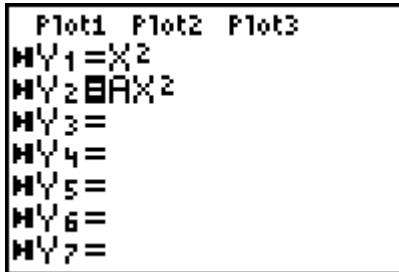
Investigating $y = ax^2$

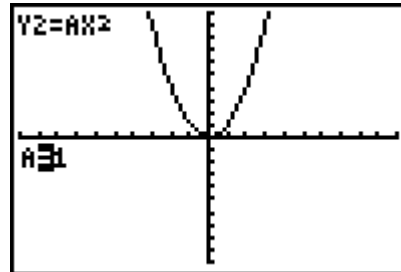Compare the equations $y = ax^2$ and $y = x^2$.
      What is different?
      What is the same?
      Make a prediction on how the value of **a** will affect the graph?

On Y2 enter y = **A**X^2 then press GRAPH

Pressing the left and right arrows will decrease and increase the value of **a**, respectively. The value of **a** can also be changed by typing in a value and pressing ENTER. When **a=1**, the parent function is graphed, since y = **1**X^2 = X^2 .

Change the value of **a**, analyze how the change of **a** affects the graph and complete the sentences below. When describing the changes, describe them as related to the parent function, for example: the graph of $y = 0.5x^2$ is wider than the graph of $y = x^2$.

Complete the following sentences:
1. When **a** is increasing the graph _____

    _____

2. When **a** is decreasing the graph _____

    _____

3. When the value of **a** is between 0 and 1, the graph _____

_____

4. When the value of **a** is negative, the graph _____

_____

5. When the value of **a** is positive, the graph _____

    _____

Name: _____   Date: _____

Investigating $y = x^2 + c$
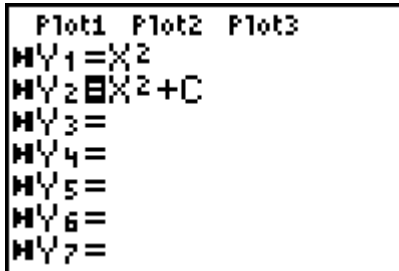
Compare the quadratic equations $y = x^2 + c$ and $y = x^2$.
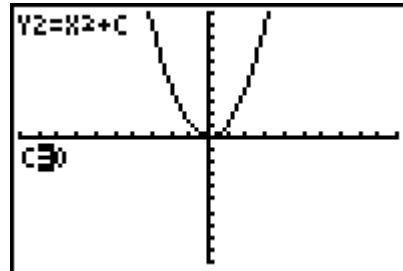   What is different?
     What is the same?
     Make a prediction on how the value of c will affect the graph?

On Y2 enter y = X^2 + **C**   then press GRAPH

```
 Plot1  Plot2  Plot3
\Y1=X2
\Y2=X2+C
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

```
Y2=X2+C
```

Pressing the left and right arrows will decrease and increase the value of c, respectively. The value of c can also be changed by typing in a value and pressing ENTER. When **c=0**, the parent function is graphed, since $y = X^2 + 0 = X^2$.

Change the value of c and analyze how the change of c is affecting the graph, then complete the sentences below. When describing the changes, describe them as related to the parent function, for example: the graph of $y = 0.5x^2$ is wider than the graph of $y = x^2$.

Complete the following sentences:
1. When c is increasing the graph _____

_____

2. When c is decreasing the graph _____

_____

3. When the value of c is positive, the graph _____

_____

4. When the value of c is negative, the graph _____

_____

Name: _____   Date: _____
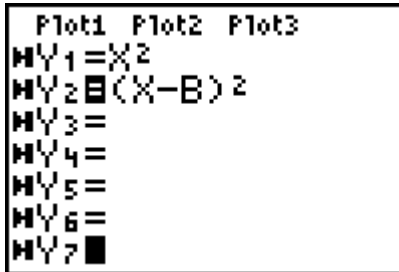
Investigating $y = (x-b)^2$

Compare the quadratic equations $y = (x-b)^2$ and $y = x^2$.
  What is different?
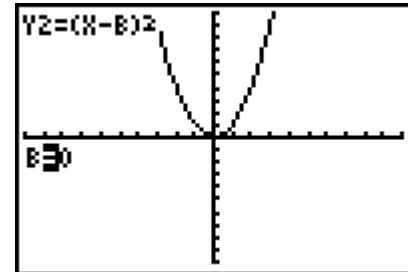 What is the same?
  Make a prediction on how the value of c will affect the graph?

On Y2 enter y = $(X-B)^2$ then press GRAPH

```
 Plot1  Plot2  Plot3
\Y1=X²
\Y2◘(X-B)²
\Y3=
\Y4=
\Y5=
\Y6=
\Y7■
```

```
Y2=(X-B)²
B=0
```

Pressing the left and right arrows will decrease and increase the value of **b,** respectively. The value of **c** can also be changed by typing in a value and pressing ENTER. When **b=0**, the parent function is graphed, since $y = (X-0)^2 = X^2$.

Change the value of **b** and analyze how the change of **b** is affecting the graph, then complete the sentences below. When describing the changes, describe them as related to the parent function, for example: the graph of $y = 0.5x^2$ is wider than the graph of $y = x^2$.

Complete the following sentences:
1. When **b** is increasing the graph _____

   _____

2. When **b** is decreasing the graph _____

_____

3. When the value of **b** is positive, the graph _____

   _____

4. When the value of **b** is negative, the graph _____

   _____

Summarize what you have learned about the parameter changes for each situation presented. Predict the graph of the following quadratic function: $y = -2(x - 3)^2 +5$.