Combined Translations

You have seen how individual transformations can cause the vertex of the graph of a function to be translated up or down, left or right, while still maintaining the original shape of the function. Now, let's combine horizontal and vertical translations.

When you change the values of "*p*" to 2 and "*q*" to -5, you can see that the new equation is

$y = (x - 2)^2 - 5$.

The -5 shifts the vertex down 5 units (-5),

while the -2 shifts the vertex right 2 units (+2).

The new vertex of the function has been translated from (0,0)

to its new location at (2,-5).

When you change the equation to $y = (x + 3)^2 - 1$.

What does the +3 do to the function?

The +3 shifts the vertex left 3 units.

Now what do you think the -1 does to the function?

The -1 shifts the vertex down 1 unit.

The new vertex of the function has been translated from (0,0)

to its new location at (-3,-1).

Notice how the equation compares to the new vertex. When an equation is written in this form, it is often called the Vertex Form of a function.

The "*p*" value tells you how far to translate the function horizontally right or left from (0,0),

Remember to translate in the opposite direction to the sign in front of "*p*"

So p = +3 means translate the function left 3 units

The "*q*" value tells you how far to translate the function vertically up or down from (0,0).

So "*q*" = -1 tells you to translate the function down one unit.

Activity

Drag the slider *p* to the value -3, and the *q* slider to +2. How does the equation for your new function compare to that of the basic function $y = x^2$? How does the graph compare to $y = x^2$? Where is the new vertex?