Question from the QUORA website:

**WHAT IS THE ORDER OF TRANSFORMATIONS IN GRAPHS?**

I am not absolutely sure that the question is clear enough for me to give a general answer but I think that the following case may be instructive for your requirements.

Consider the graph of ***y = 1 + 3sin2(x – 1800)***

This is a basic Sine Graph after several transformations.

There is a translation upwards, a stretch vertically (up and down), a translation sideways and a compression in the ***x*** direction but not in this order!

***1. To illustrate each transformation I will just consider 2 periods of y = sin(x)***

 ***In this case – 3600 ≤ x ≤ 3600***



***2. Now we need to consider the 1st transformation given by y = sin(x – 180)***

 ***which translates the graph 180 units in the positive x direction.***



***3. Now we consider the 2nd transformation given by y = sin2(x – 180)***

 ***This transformation compresses the graph in the x direction.***

 ***(Points ON the y axis remain in the same places)***



***4. Now we consider y = 3sin2(x – 180) which stretches the***

 ***graph vertically up and down with a scale factor of 3.***

 ***(Points ON the x axis remain in the same places)***



***5. Finally, we consider y = 1 + 3sin2(x – 180) which simply translates the***

 ***graph 1 unit upwards.***



***Normally we would not just consider two periods of a trigonometric function, I only did this to show how each transformation affects a fixed shape.***

***A full version of y = 1 + 3sin(2x – 180) is shown below:***



***So to answer the question generally, we start from the “inside” and work to the “outside”.***

***Start with the basic case y = sin(x)***

***Then y = sin(x – 180) which translates the graph 180 units to the right.***

***Then y = sin2(x – 180) which compresses the graph in the x direction.***

***Then y = 3sin2(x – 180) which stretches the graph vertically.***

***Then y = 1 + 3sin2(x – 180) which translates the graph up 1 unit.***

***There is no actual “rule” for the order in which we do transformations, such as the rule for Order Of Arithmetical Operations commonly known as BIDMAS or something similar.***

***The topic is quite extensive and hard to cover with just one example.***