

Combining Transformations – Does Order Matter?

Complete the following transformations in the order given.

Ex 1: Parent function: $y = \sqrt{x}$

- Shift upward 3 units, then left 4 units.
- Shift left 4 units, then left upward 3 units.
- Do you get the same function from a and b?

Ex 2: Parent function: $y = \sqrt{x}$

- Stretch vertically by a factor of 3, then shift upward 2 units.
- Shift upward 2 units, then stretch vertically by a factor of 3.
- Do you get the same function from a and b?

Ex 3: Parent function: $y = \sqrt{x}$

- Reflect across the y-axis, then shift downward 3 units.
- Shift downward 3 units, then reflect across the y-axis.
- Do you get the same function from a and b?

Ex 4: Parent function: $y = \sqrt{x}$

- Reflect across the y-axis, then shift right 3 units.
- Shift right 3 units, then reflect across the y-axis.
- Do you get the same function from a and b?

Ex 5: Parent function: $y = \sqrt{x}$

- Reflect across the x-axis, then shift downward 3 units.
- Shift downward 3 units, then reflect across the x-axis.
- Do you get the same function from a and b?

Ex 6: Parent function: $y = \sqrt{x}$

- Shrink horizontally by a factor of $\frac{1}{5}$, then shift right 3 units.
- Shift right 3 units, then shrink horizontally by a factor of $\frac{1}{5}$.
- Do you get the same function from a and b?

Note that:

Vertical translation (up or down) \longrightarrow Vertical effect (V)

Horizontal translation (left or right) \longrightarrow Horizontal effect (H)

x-axis reflection \longrightarrow Vertical effect (V)

y-axis reflection \longrightarrow Horizontal effect (H)

Vertical stretch or shrink \longrightarrow Vertical effect (V)

Horizontal stretch or shrink \longrightarrow Horizontal effect (H)

Now let's look for a pattern:

Example	Transformations and Effect (V or H) in (a)	Transformations and Effect (V or H) in (b)	(a) and (b) same?
1			
2			
3			
4			
5			
6			

The order of transformations did not matter in examples _____.

The effects in those examples were:

The order of transformations did matter in examples _____.

The effects in those examples were:

Conclusion:

When we perform two or more transformations with the same effect (V or H) the order may affect the final function. But a transformation with a vertical effect (V) and one with a horizontal effect (H) do not affect each other.

So, in which order do we perform the transformations on a given function?

$$(1) y = 5\sqrt{x+3} - 1$$

First, identify each transformation and its effect without regard to correct order.

Which transformation(s) can be done at any point?

Which transformation(s) must be done in a specific order?

$$(2) y = \sqrt{-x+3} - 1$$

First, identify each transformation and its effect without regard to correct order.

Which transformation(s) can be done at any point?

Which transformation(s) must be done in a specific order?