Algebraic Rules for Transformations

Translations

Right a units Add a to the x-coordinate: $(x, y) \rightarrow (x + a, y)$

Left a units Subtract a from the x-coordinate: $(x, y) \rightarrow (x - a, y)$

Up b units Add b to the y-coordinate: $(x, y) \rightarrow (x, y + b)$

Down b units Subtract b from the y-coordinate: $(x, y) \rightarrow (x, y - b)$

Reflections

Across the x-axis Multiply each y-coordinate by -1: $(x, y) \rightarrow (x, -y)$

Across the y-axis Multiply each x-coordinate by -1: $(x, y) \rightarrow (-x, y)$

Rotations

90° clockwise Multiply each x-coordinate by -1; then switch the x- and y-coordinates: $(x, y) \rightarrow (y, -x)$

90° counterclockwise Multiply each y-coordinate by -1; then switch the x- and y-coordinates: $(x, y) \rightarrow (-y, x)$

180° Multiply both coordinates by -1: $(x, y) \rightarrow (-x, -y)$

Dilations

Enlargement: $(x, y) \rightarrow (kx, ky)$ where $k > 1$ (scale factor greater than 1)

Reduction: $(x, y) \rightarrow (kx, ky)$ where $0 < k < 1$ (scale factor between 0 and 1)