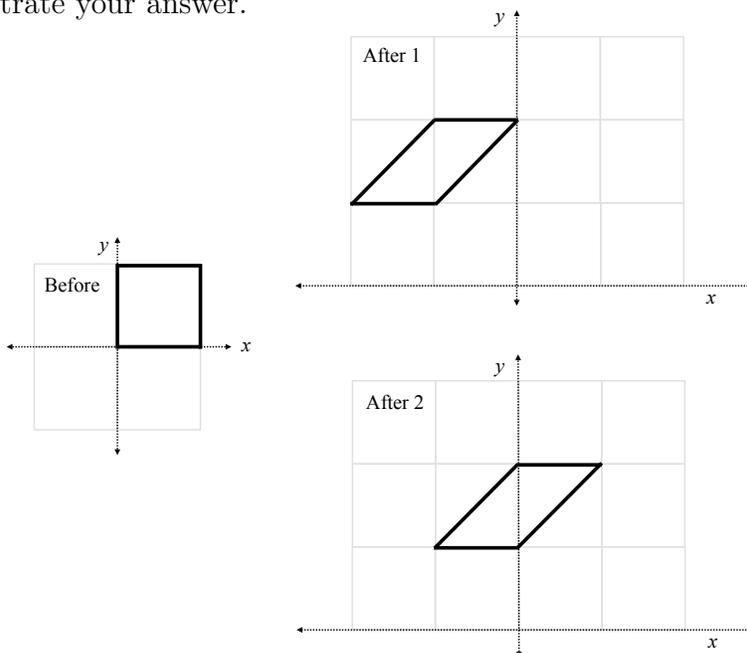


Midterm Practice Problems

1. *Transformations*: the images below show a square before two sets transformations. “After 1” is a composition of two transformations (denote AB in matrix multiplication form). “After 2” is a composition of the same two transformations, but in reverse order (BA in matrix multiplication). Find A and B that satisfy these conditions, and perform matrix multiplication on the “Before” square to demonstrate your answer.



2. *Recursion*: write a recursive function that will return $n!$ for any integer $n \geq 0$. In general, $n! = n \cdot (n - 1) \cdot (n - 2) \cdots 3 \cdot 2 \cdot 1$, so this starts $1! = 1$, $2! = 2$, $3! = 6$, etc, and $0!$ is defined to be 1. In short, implement function `factorial(n) {...}`

3. *Lines*: In HW1 we saw how to implement an algorithm for drawing a line between two points: $p_0 = (x_0, y_0)$ and $p_1 = (x_1, y_1)$, which relied on the slope of the line. For this question, write pseudocode for a line algorithm that would achieve the same goal, but this time using a *parametric Bézier* approach (i.e. implement: `function line(p0,p1) {...}`). Your algorithm should:
- (a) Make the line look “connected” (no gaps). Diagonal pixels are considered connected.
 - (b) No pixel should be colored more than once.

4. *Sweep fill*: as presented in class, what order will the pixels below be filled? Use “A” for the first filled pixel, “B” for the second, etc. The outer loop over the y values will start at y_{\min} and go to y_{\max} . For each y value, the x 's will go loop from x_{\min} to x_{\max} . Assume y increases going down.

