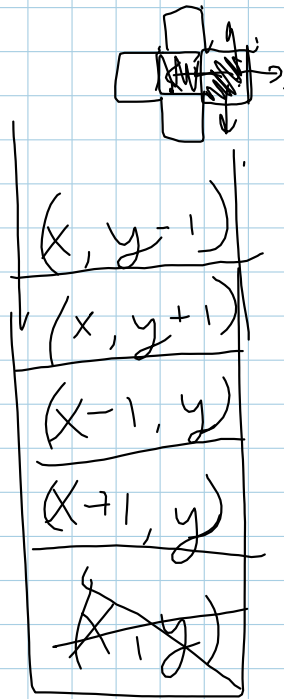


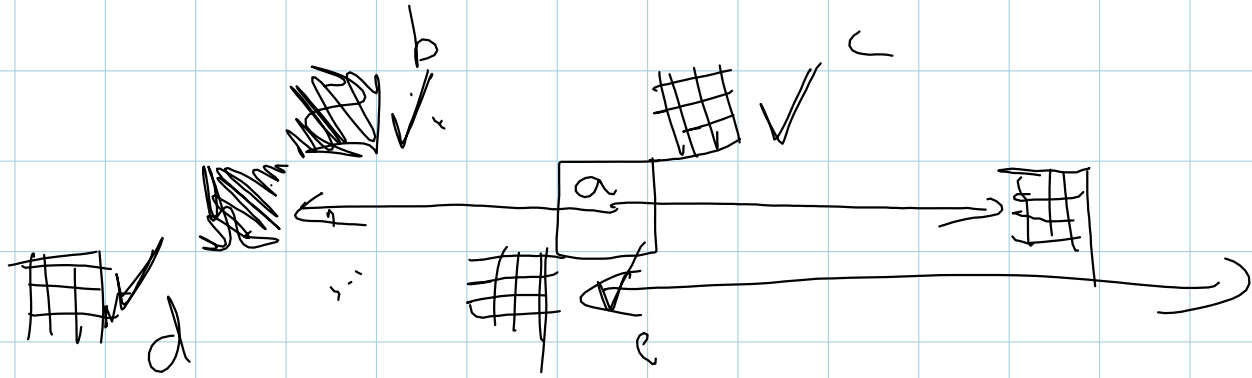
Flood Fill

Stack

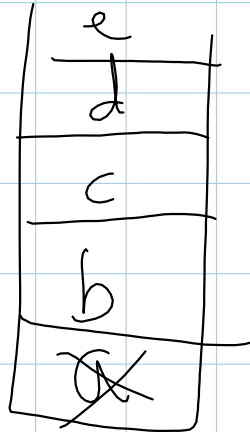


floodfill(x, y)

floodfill(x+1, y)
floodfill(x-1, y)
.

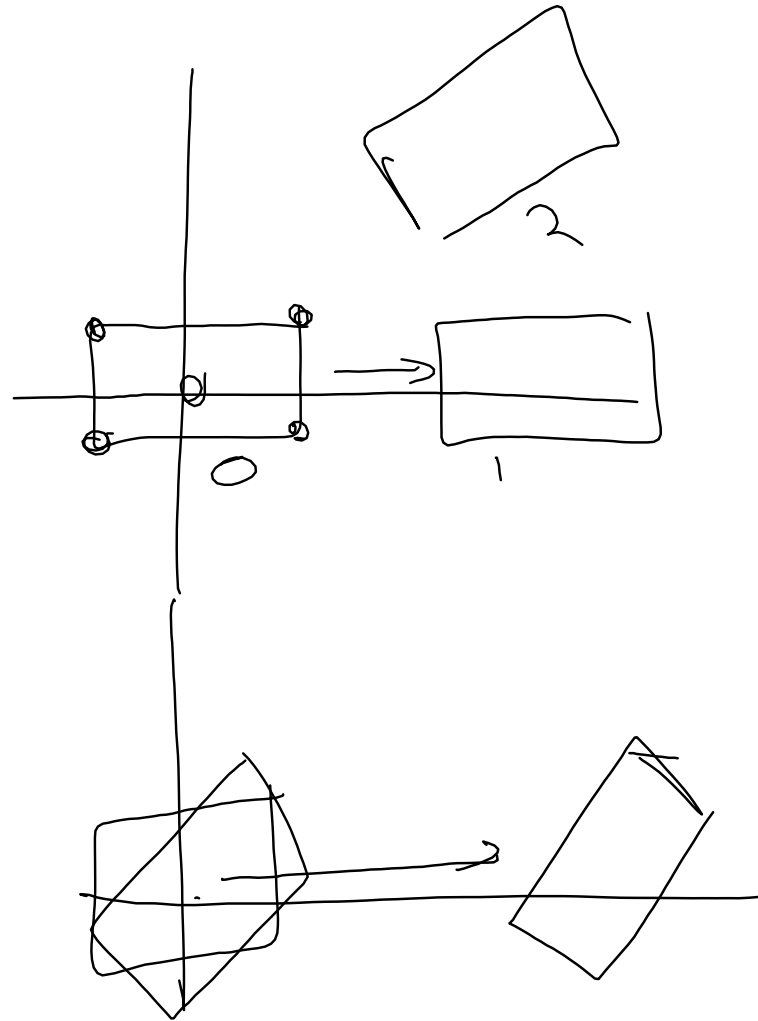


- ① row
- ② row above - put beginning of region on stack
- ③ same for row below



Transform

- translation
- scaling
- rotation



Scaling

$$x' = s_x \cdot x$$

$$y' = s_y \cdot y$$

Translate

$$x' = x + t_x$$

$$y' = y + t_y$$

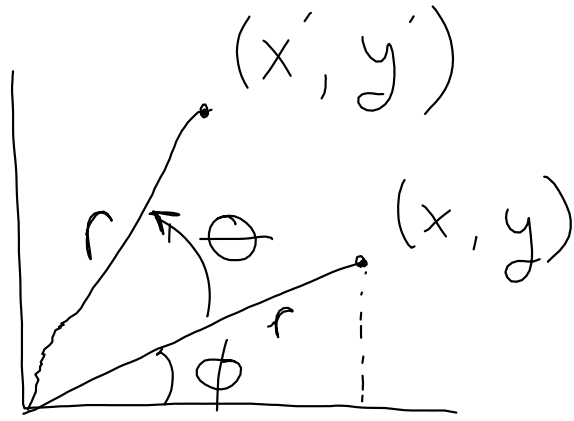
fixed point scaling
 (x_f, y_f) doesn't move

1. translate so (x_f, y_f) is at $(0, 0)$
2. scale by (s_x, s_y)
3. translate $(0, 0)$ back to (x_f, y_f)

$$x' = (x - x_f) \cdot S_x + x_f$$

$$y' = (y - y_f) \cdot S_y + y_f$$

Rotation



$$x = r \cdot \cos \phi$$
$$y = r \cdot \sin \phi$$

$$x' = r \cdot \cos (\theta + \phi)$$

$$= r [\cos \theta \cdot \cos \phi - \sin \theta \cdot \sin \phi]$$

$$= r \cos \theta \cdot \cos \phi - r \sin \theta \cdot \sin \phi$$

$$x' = x \cdot \cos \theta - y \sin \theta$$

$$y' = x \cdot \sin \theta + y \cdot \cos \theta$$

Rotate around (x_r, y_r)

1. move (x_r, y_r) to $(0, 0)$
2. rotate
3. move origin back to (x_r, y_r)

$$x' = (x - x_r) \cdot \cos \theta - (y - y_r) \cdot \sin \theta + x_r$$

$$y' = (x - x_r) \sin \theta + (y - y_r) \cos \theta + y_r$$