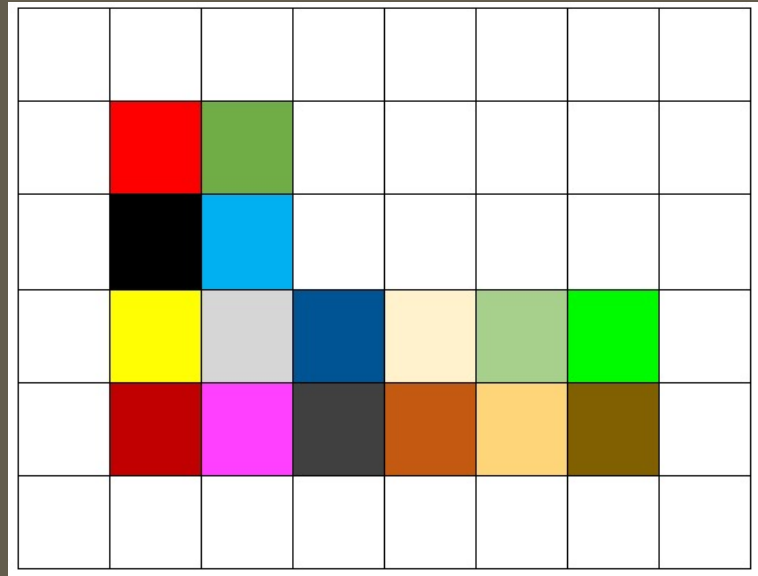


The background of the slide is a dark, semi-transparent image of a car engine, viewed from above. The engine components, including the intake manifold and various hoses, are visible but muted in color. A central, horizontal, olive-green rectangular box with a thin black border contains the text 'IMAGE ROTATION' in white, bold, uppercase letters.

IMAGE ROTATION

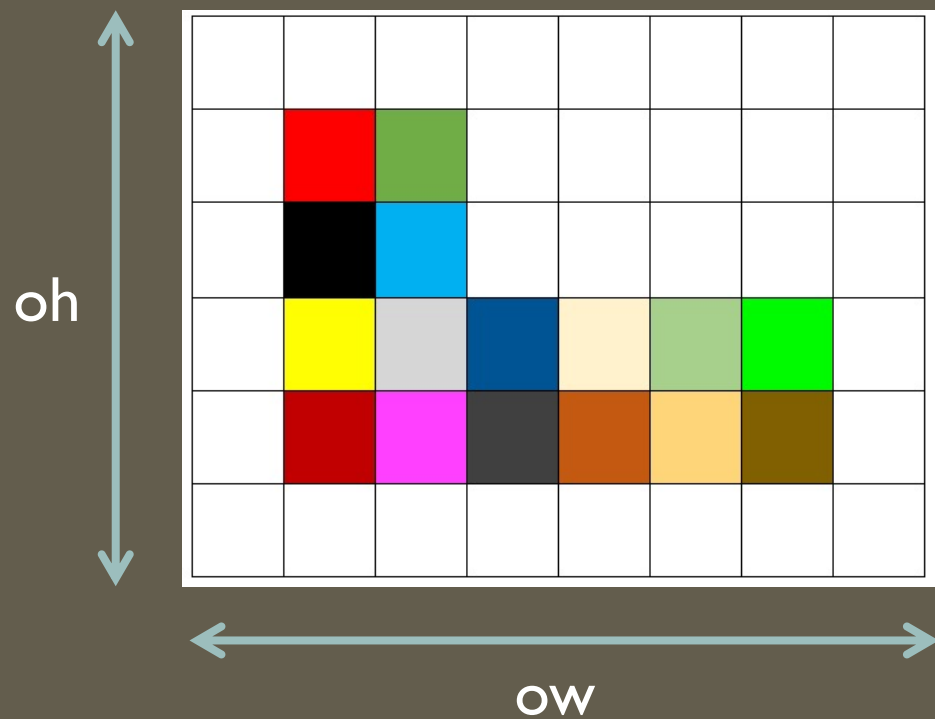
Original



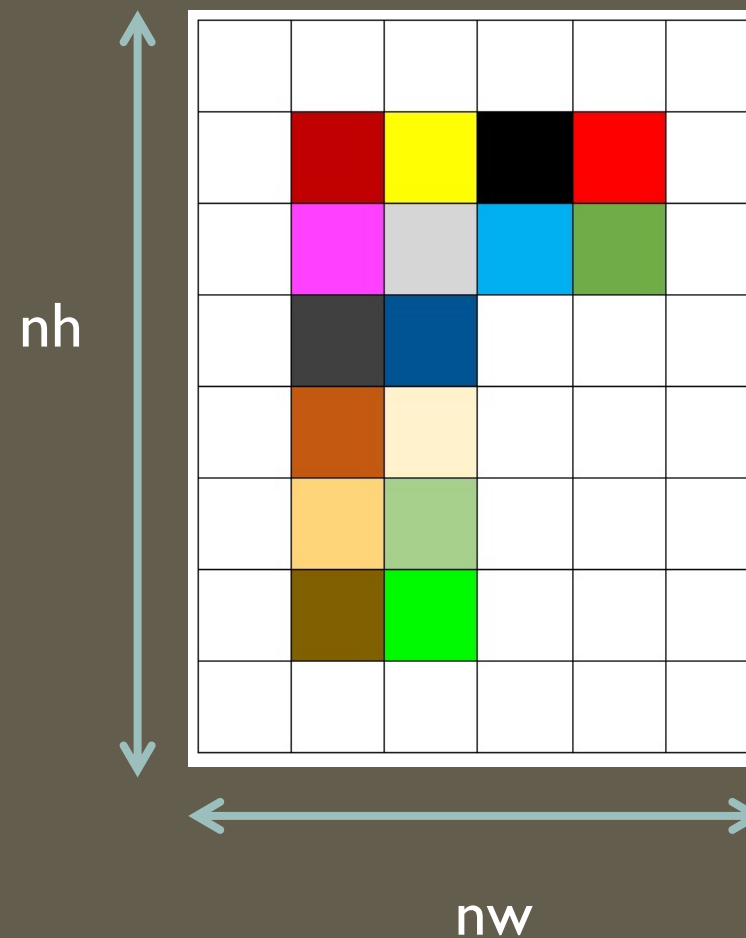
New image – clockwise rotation



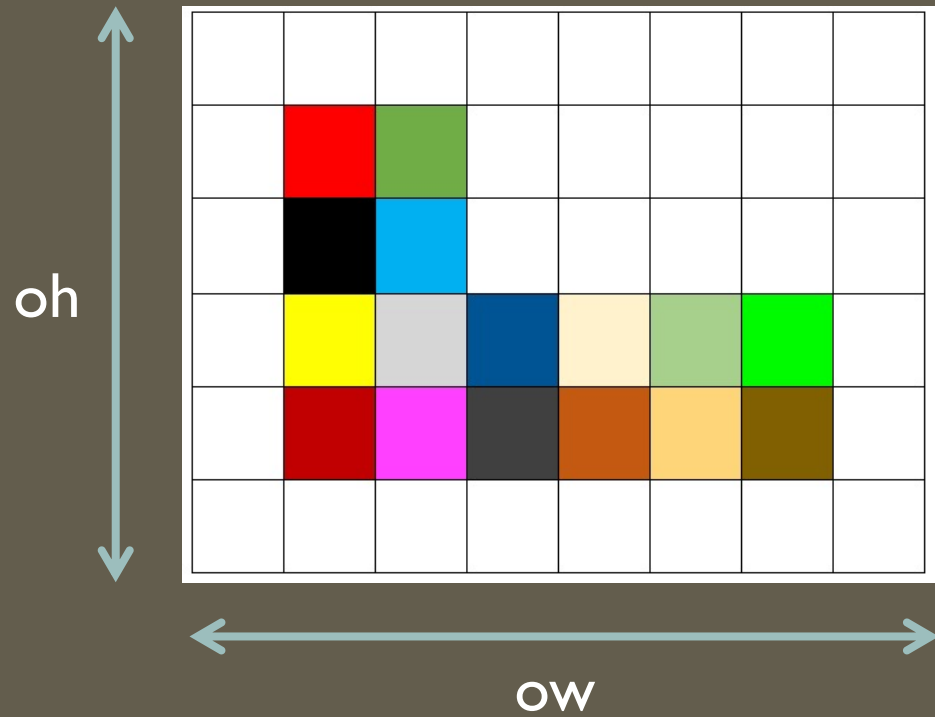
Original



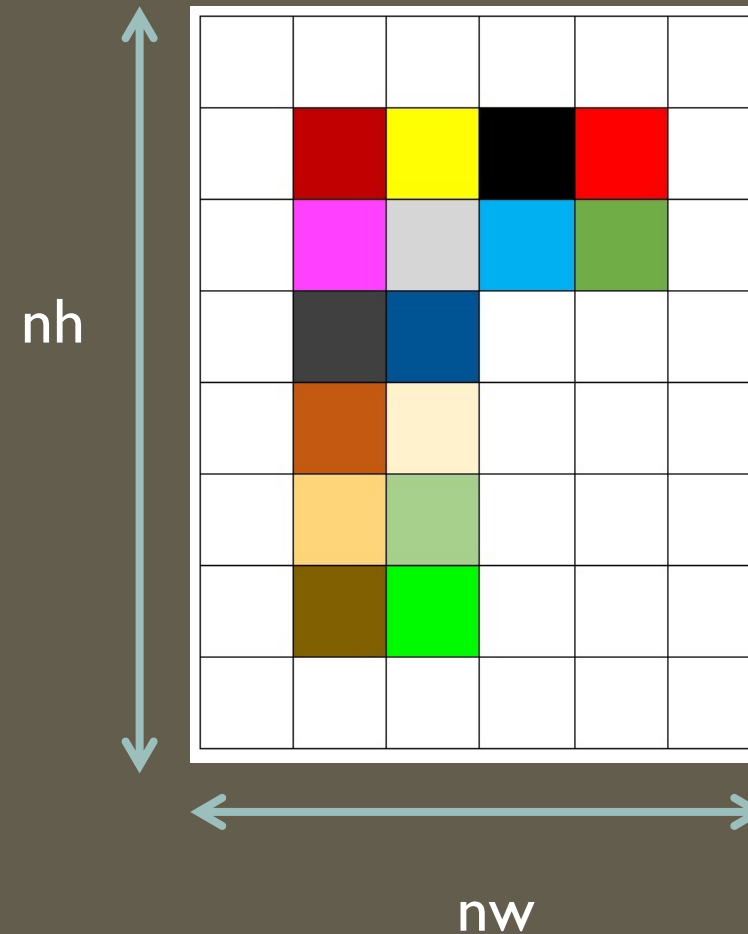
New image – clockwise rotation



Original



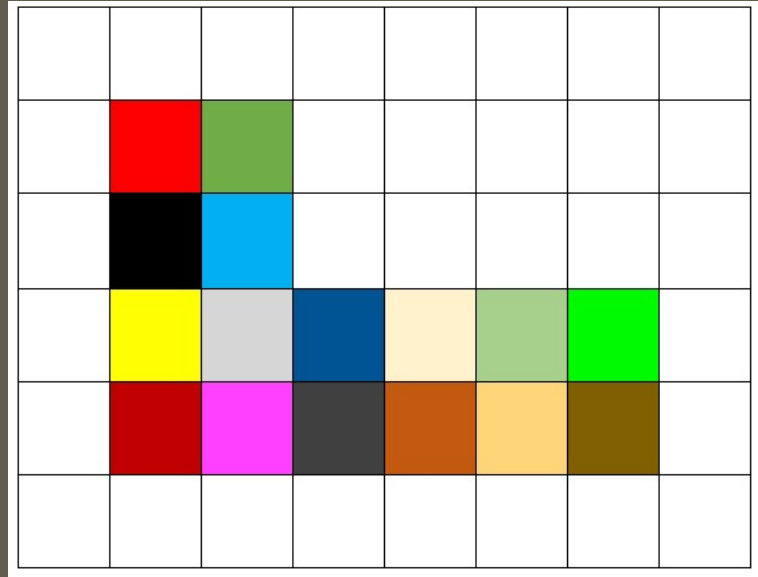
New image – clockwise rotation



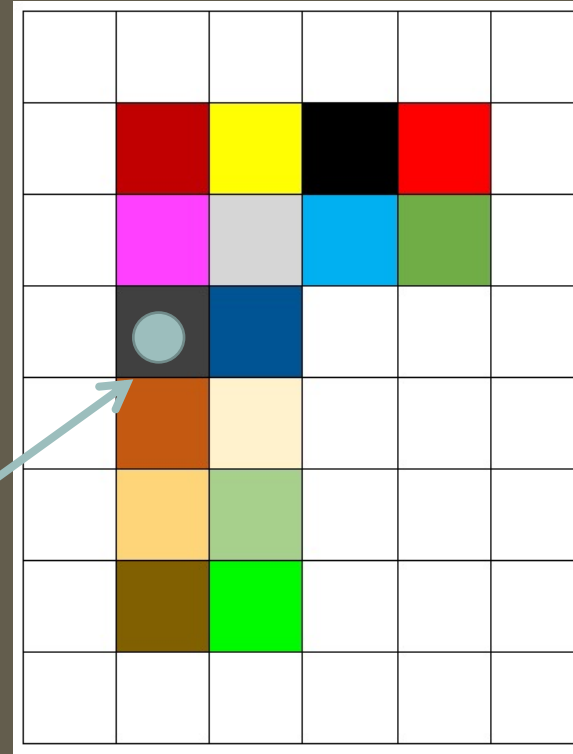
Observation

- nw equals oh
- nh equals ow

Original



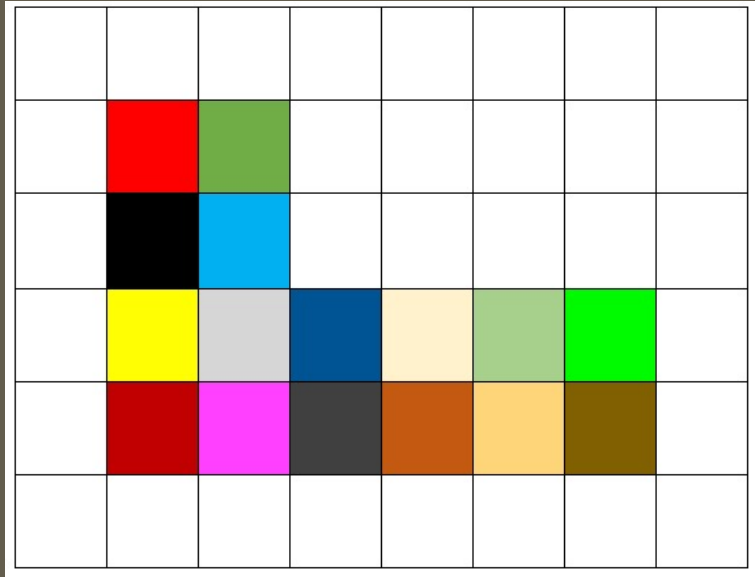
New image – clockwise rotation



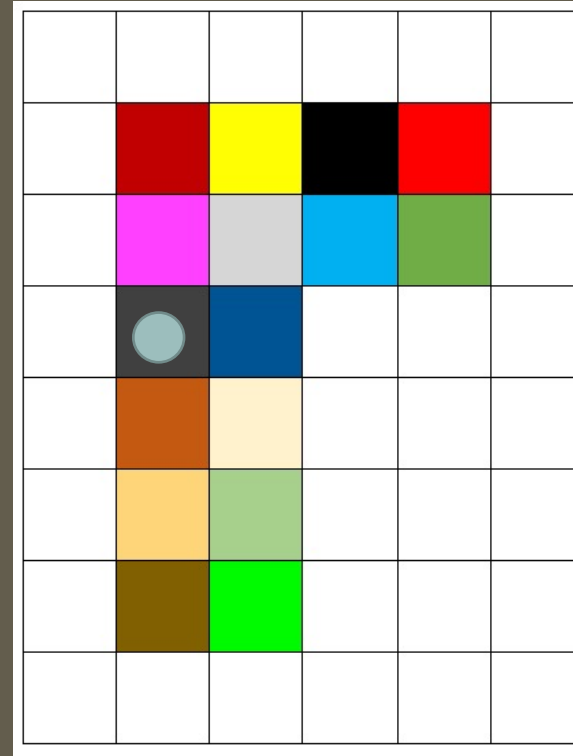
Suppose

- Dotted square is at location (n_x, n_y)

Original



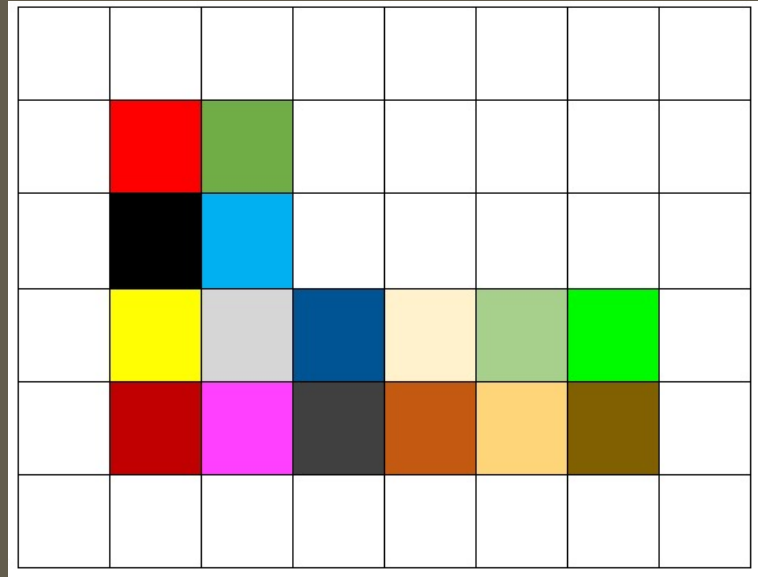
New image – clockwise rotation



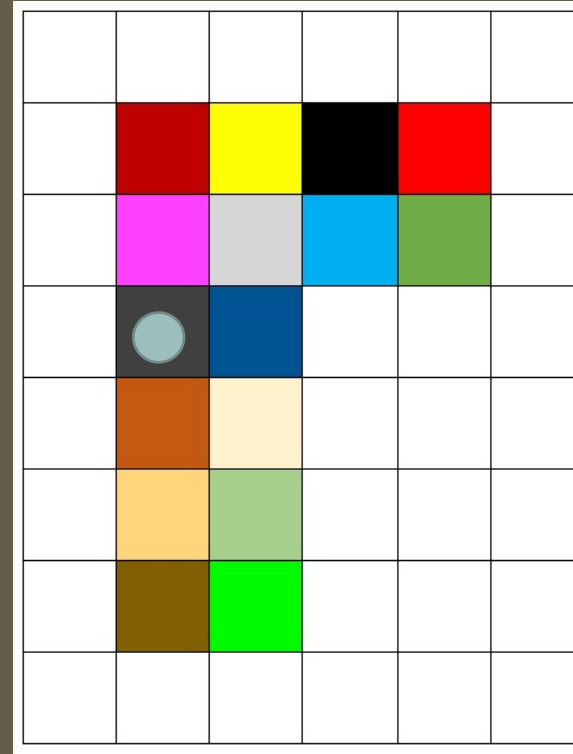
Question

- How did the pixel at (nx, ny) get painted that way?

Original



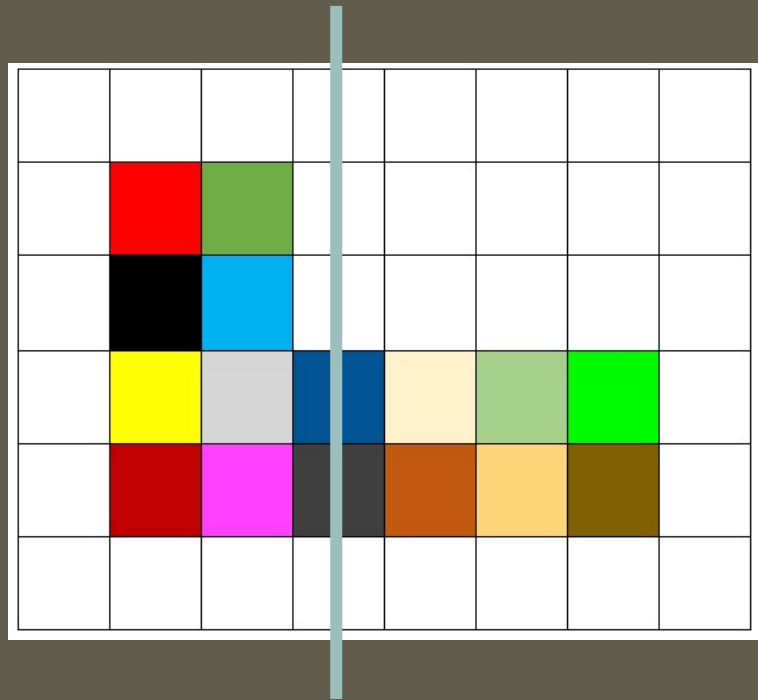
New image – clockwise rotation



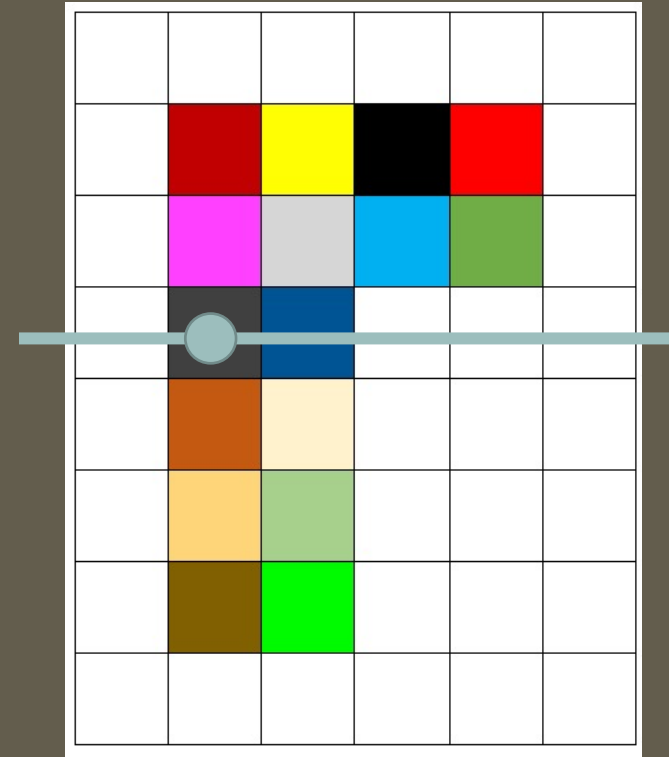
Observation

- Everything in the new image at y-coordinate n_y can be found in the original image at x-coordinate n_y .

Original



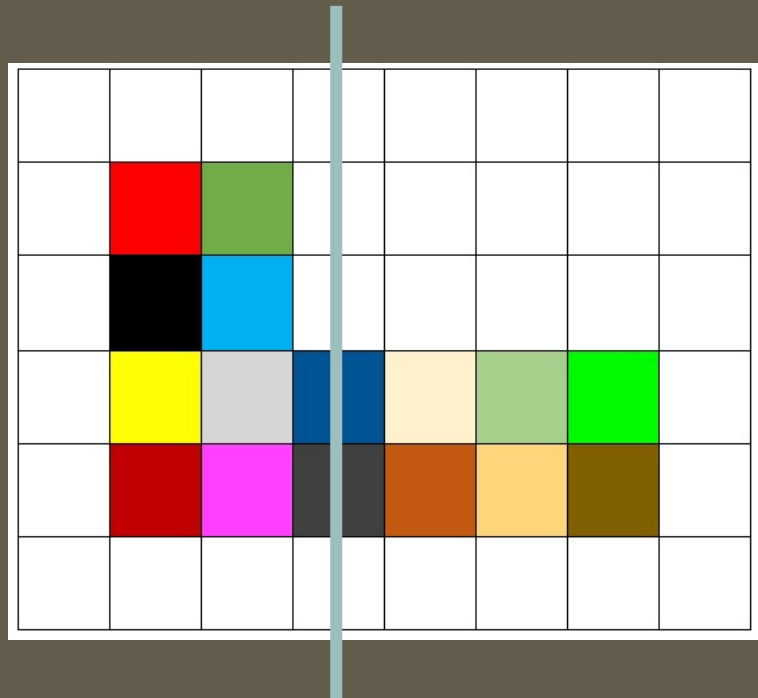
New image – clockwise rotation



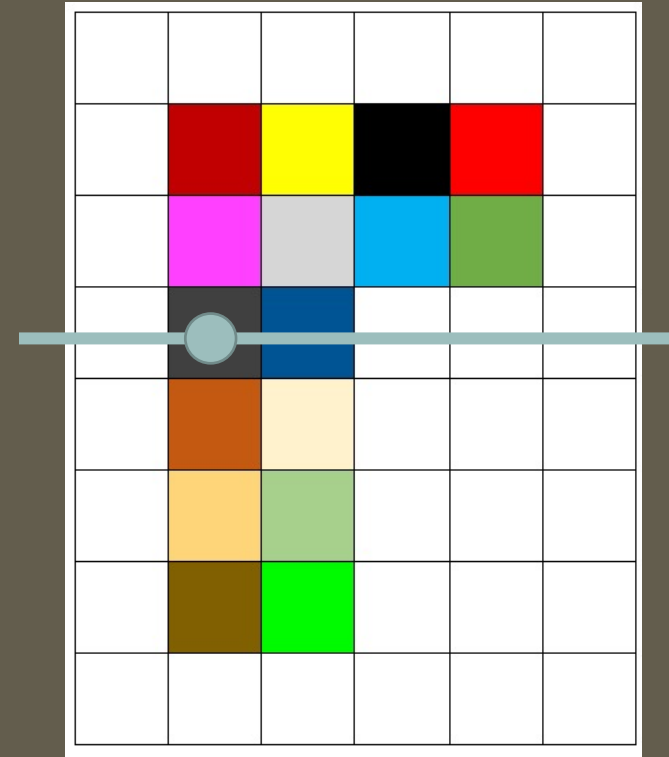
Observation

- Everything in the new image at y-coordinate n_y can be found in the original image at x-coordinate n_y .

Original



New image – clockwise rotation



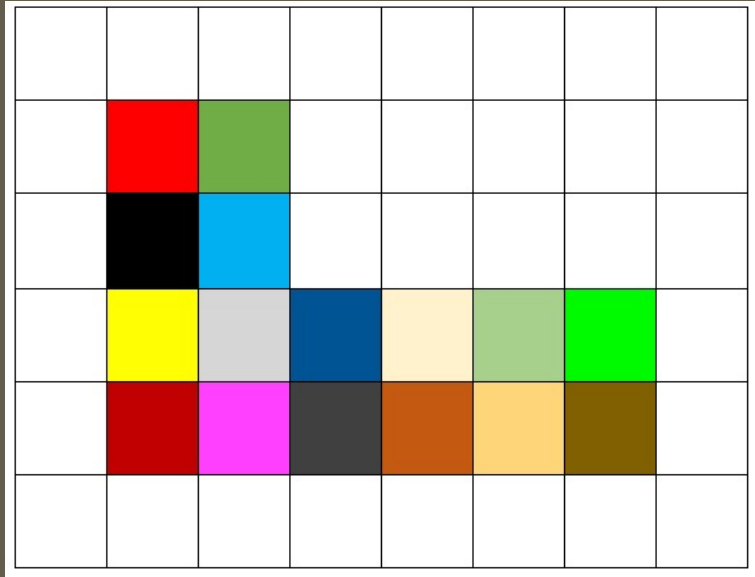
Observation

- Everything in the new image at y -coordinate n_y can be found in the original image at x -coordinate n_y .

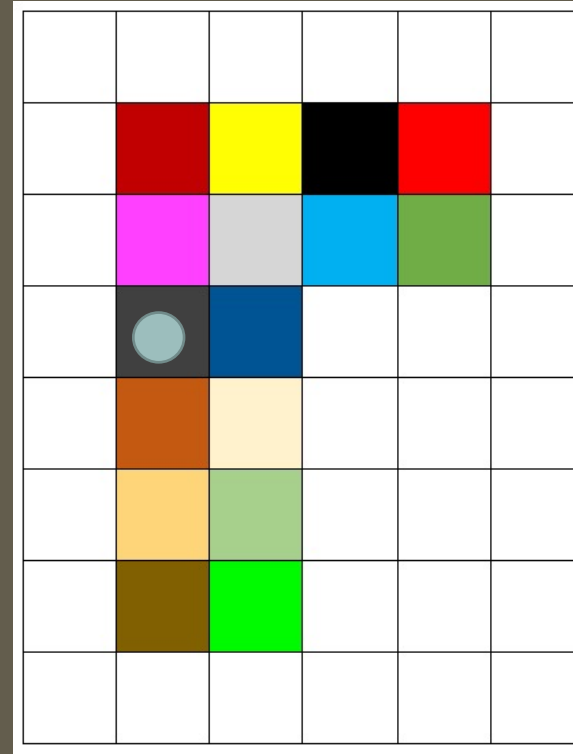
Conclusion

- Knowing the y -coordinate n_y of a pixel in the new image tells you the x -coordinate of the source pixel in the original image – its n_y over from the lefthand side

Original



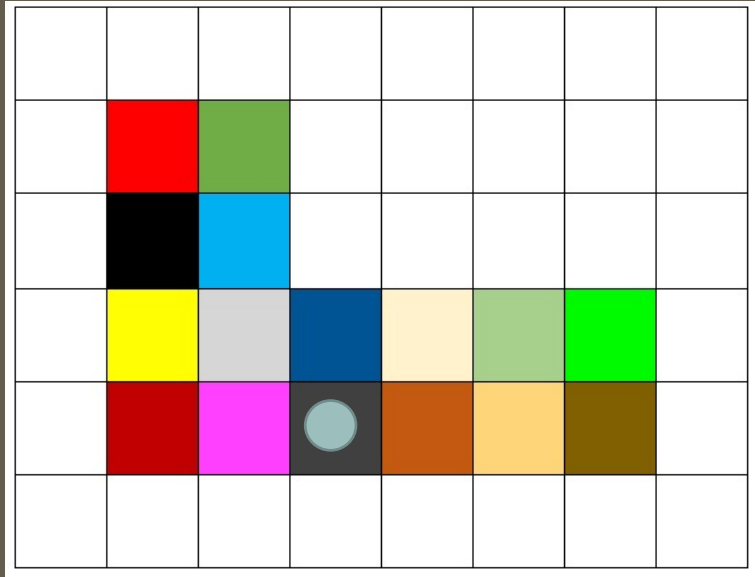
New image – clockwise rotation



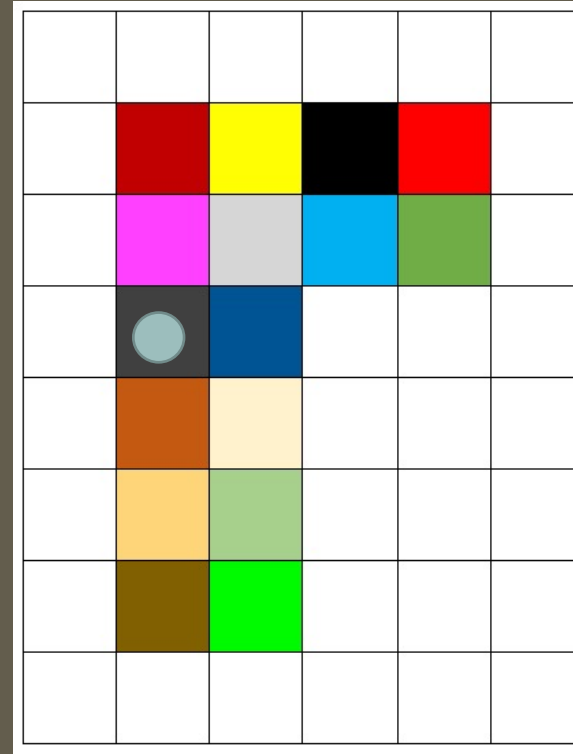
Question

- How can we determine the y-coordinate of the source pixel in the original image?

Original



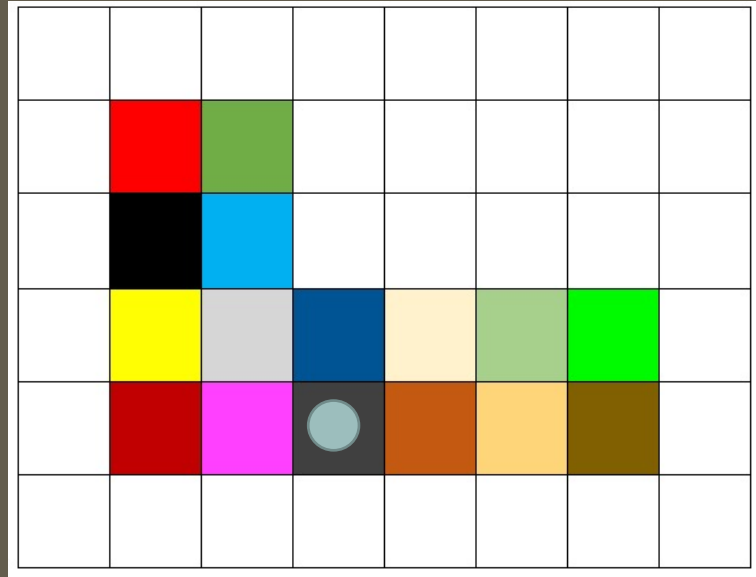
New image – clockwise rotation



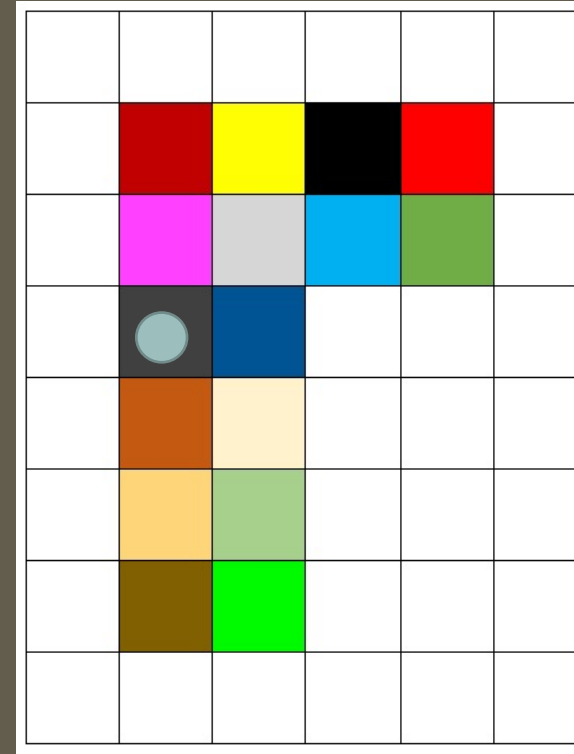
Question

- How can we determine the y-coordinate of the source pixel in the original image?

Original



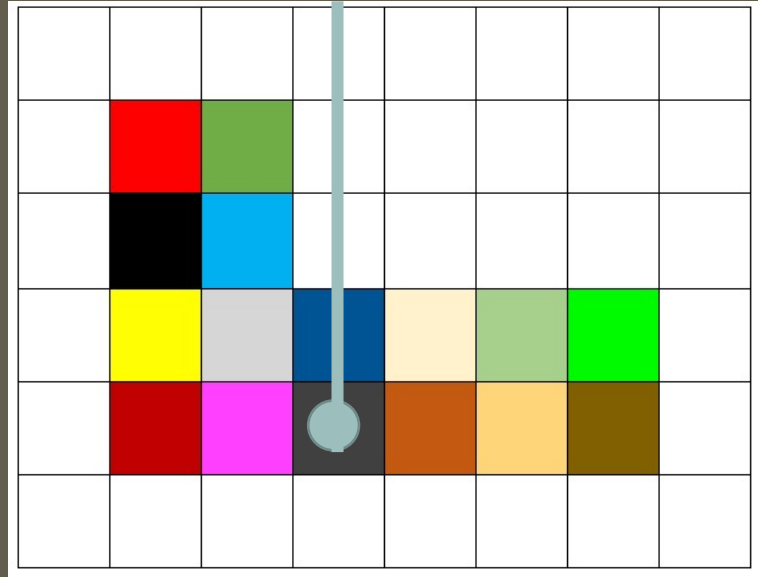
New image – clockwise rotation



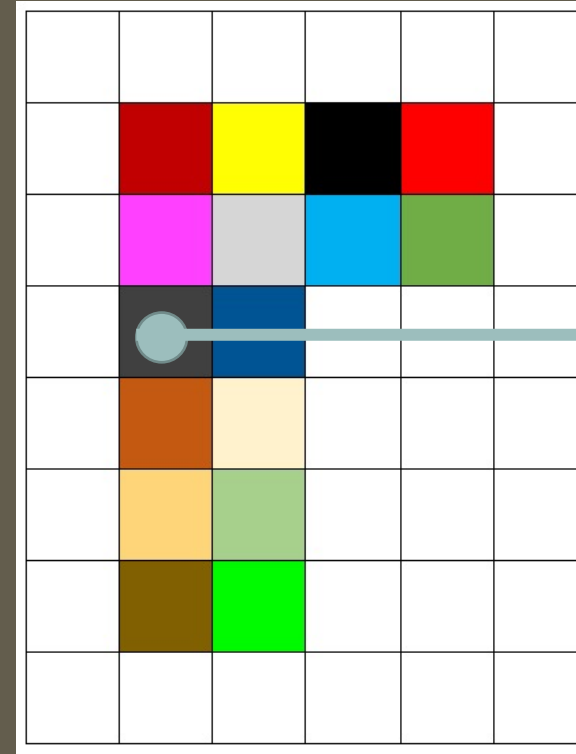
Observation

- The distance of a pixel from the righthand side of the new image is how far the source pixel is from the top in the original image

Original



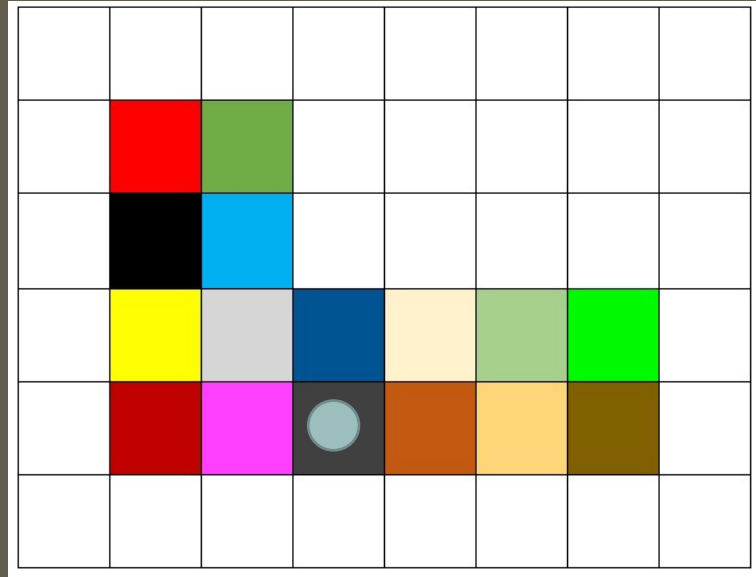
New image – clockwise rotation



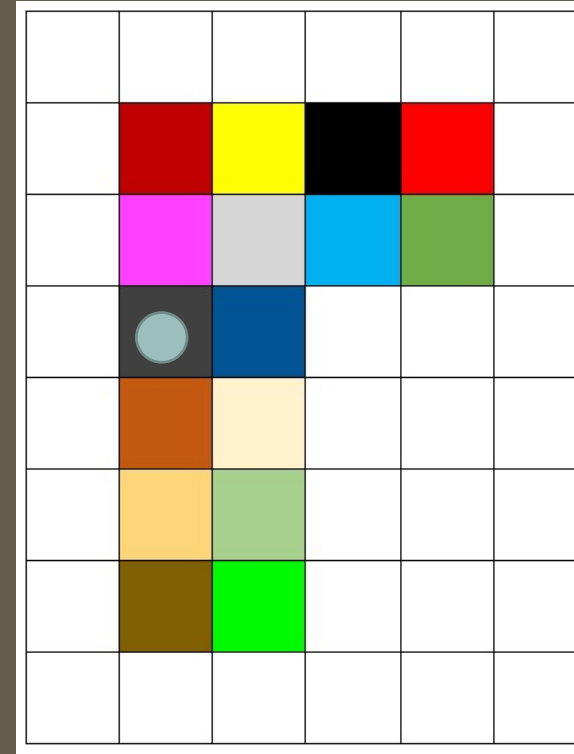
Observation

- The distance of a pixel from the righthand side of the new image is how far the source pixel is from the top in the original image

Original



New image – clockwise rotation



Observation

- The distance of a pixel from the righthand side of the new image is how far the source pixel is from the top in the original image

Conclusion

- Knowing the y-coordinate n_x of a pixel in the new image tells you how to calculate the y-coordinate of the source pixel in the original image