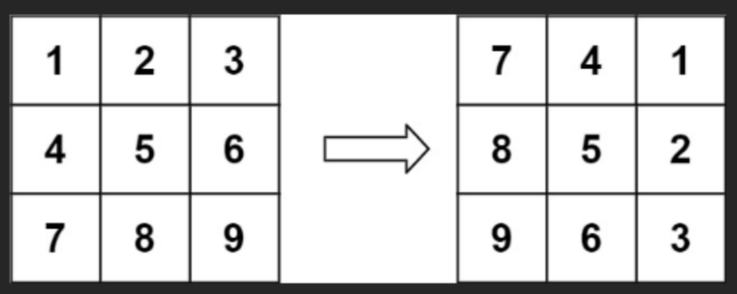
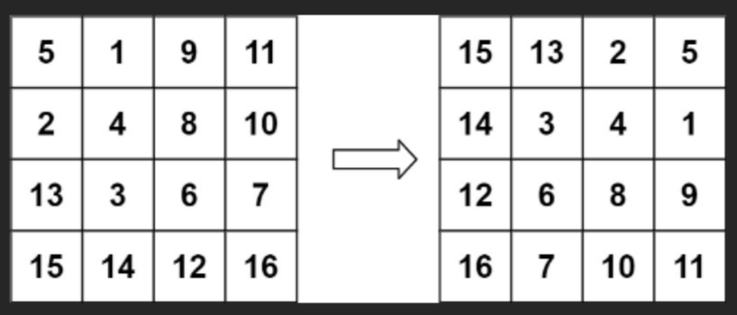
Rotate Matrix By 90° (clockwise)

Example 1:



Input: matrix = [[1,2,3],[4,5,6],[7,8,9]]
Output: [[7,4,1],[8,5,2],[9,6,3]]

Example 2:



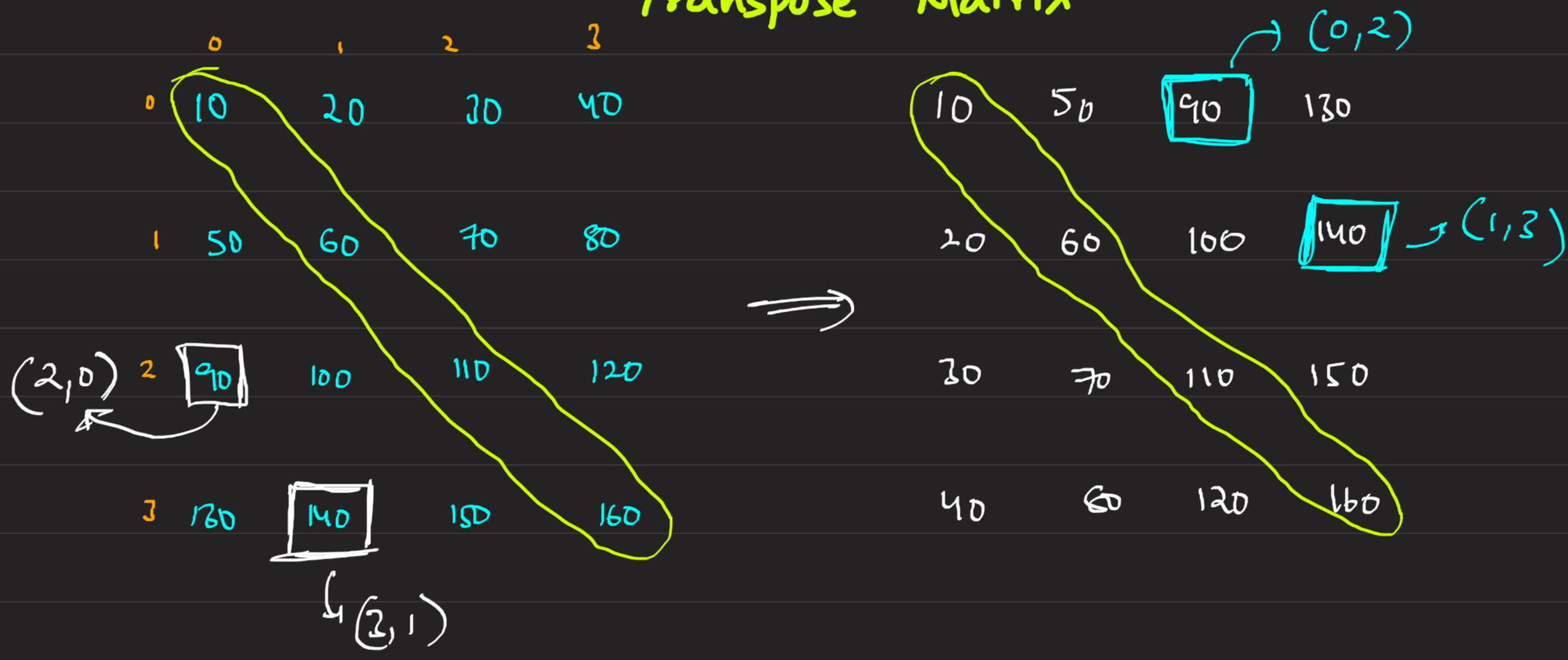
Input: matrix = [[5,1,9,11],[2,4,8,10],[13,3,6,7],[15,14,12,16]]
Output: [[15,13,2,5],[14,3,4,1],[12,6,8,9],[16,7,10,11]]

* Pre-requisites

① Inorder to do this, first learn

→ how to transpose a matrix

Transpose Matrix



Observation

* The value in (2,0) ⟶ changed to (0,2)

* The value in (3,1) ⟶ changed to (1,3)

∴ Transpose is nothing but swapping of $(i, j) \rightarrow (j, i)$

⟹ if (0,0) swap's, again (0,0) only comes
(1,1) (1,1)

→ So no problem for diagonals, they stay intact

* We need to iterate only half triangle (Either lower triangle or Upper triangle)

* if we travel whole matrix

"if you are at some (x,y) → you do transpose and it turns out to be (y,x)

* And again if you are at (y,x) → you swap right, if you travel whole array

this becomes (x,y) again

* So, travel only one half

```
public void transpose(int[][] arr){
    int n = arr.length;
    for(int i = 0;i<n;i++){
        for(int j = 0;j<i;j++){
            int temp = arr[i][j];
            arr[i][j] = arr[j][i];
            arr[j][i] = temp;
        }
    }

}
```

→ one half

Rotate Matrix By 90°

Input

10	20	30	40
50	60	70	80
90	100	110	120
130	140	150	160

Output

130	90	50	10
140	100	60	20
150	110	70	30
160	120	80	40

// Approach

Input

10	20	30	40
50	60	70	80
90	100	110	120
130	140	150	160

Output

130	90	50	10
140	100	60	20
150	110	70	30
160	120	80	40

Both are Same

transpose

10	50	90	130
20	60	100	140
30	70	110	150
40	80	120	160

reverse every row

130	90	50	10
140	100	60	20
150	110	70	30
110	120	80	40

* So, inorder to rotate this matrix by 90° (clockwise)

→ we need to transpose first
→ then reverse (each row)

```java
public void reverse(int[][] arr){
    int n = arr.length;
    for(int i = 0;i<n;i++){
        for(int j = 0;j<n/2;j++){
            int temp = arr[i][j];
            arr[i][j] = arr[i][n-j-1];
            arr[i][n-j-1] = temp;
        }
    }
}
```

if arr[] : (1, 2, 3, 4)

↓

if you want to reverse this

(1, 2, 3, 4) → Swap

j n-j-1

(1, 2, 3, 4) → Swap

j n-j-1

* So, you iterate for half only...