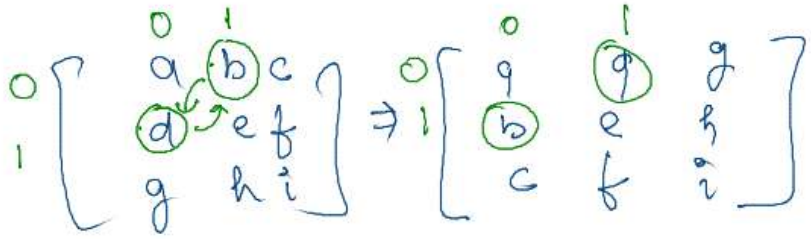
Question

Transpose / rotate by 90°

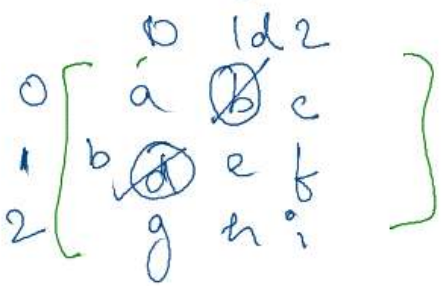
⇓

Extra space



arr[i][j] = arr[j][i];

without using ~~extra~~ space.




```
for(i=0 to n){
    for(j=0 to n){          (b)
        int temp = arr[i][j];
        arr[i][j] = arr[j][i]// d
    }
    arr[j][i] = temp°
}
```

i = 0

j = 1

temp = b;

Rotate 90°

Rotate 90°

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \rightarrow \begin{bmatrix} 7 & 4 & 1 \\ 8 & 5 & 2 \\ 9 & 6 & 3 \end{bmatrix}$$

extra space

transpose

$$\begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix} \Rightarrow$$

swap by col

$$\begin{bmatrix} 7 & 4 & 1 \\ 8 & 5 & 2 \\ 9 & 6 & 3 \end{bmatrix}$$

equal

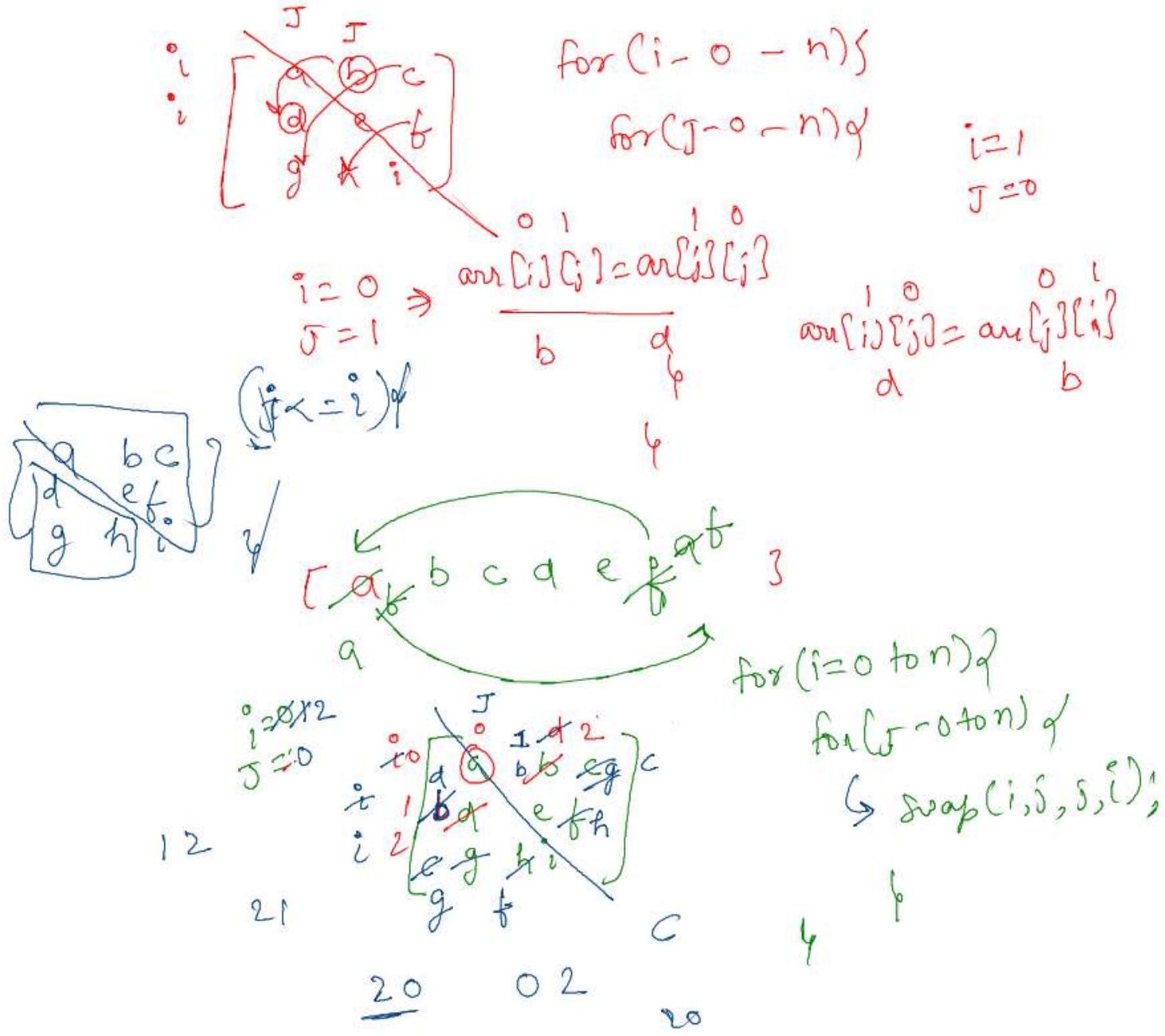
extra space not allowed

90° rotate

180° rotate

rotate (arr);
rotate (arr);

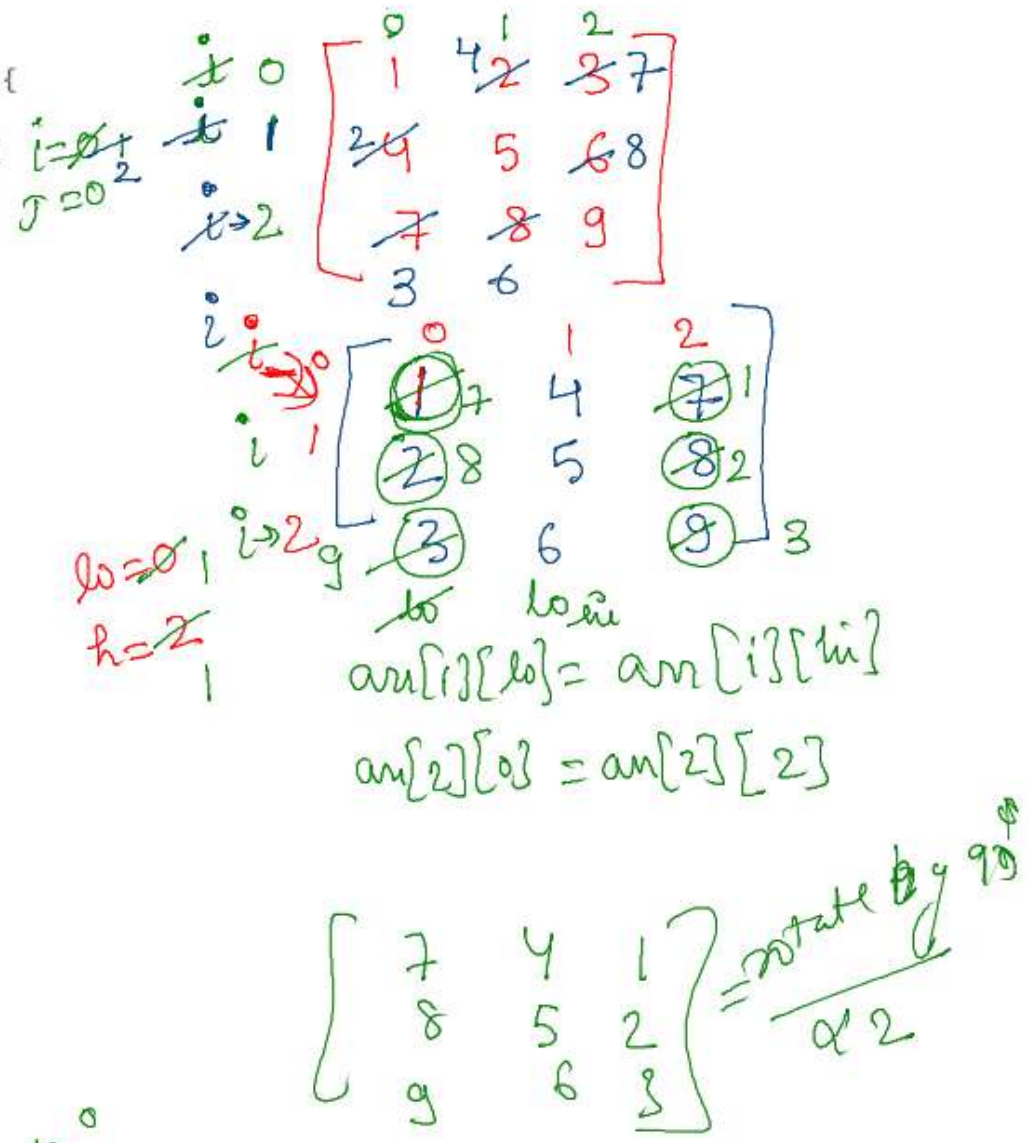
$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix} \Rightarrow \begin{bmatrix} 4 & 3 & 2 & 1 \\ 8 & 7 & 6 & 5 \\ 12 & 11 & 10 & 9 \\ 16 & 15 & 14 & 13 \end{bmatrix}$$


for(i-0-n){
for(J-0-n){
i=1
J=0
arr[i][j]=arr[j][i]
i=0
J=1
b
d
arr[i][j]=arr[j][i]
d
b
(J<=i)
for(i=0 to n){
for(J-0 to n){
swap(i,J,J,i);
}
}
12
21
20
02
20

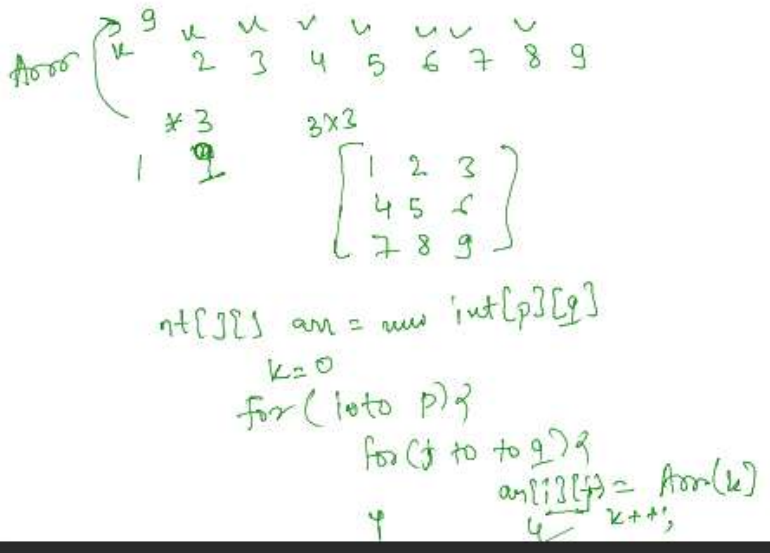
```java
public static void transpose(int[][] arr){
    for(int i=0;i<arr.length;i++){
        for(int j=0;j<arr[0].length;j++){
            if(j<=i){
                int temp = arr[i][j];
                arr[i][j]= arr[j][i];
                arr[j][i]= temp;
            }

        }
    }
}

public static void reverse(int[][] arr){
    int lo =0;
    int hi=arr[0].length-1;
    while(lo<hi){
        for(int i=0;i<arr.length;i++){
            int temp= arr[i][lo];
            arr[i][lo]= arr[i][hi];
            arr[i][hi]= temp;
        }
        lo++;
        hi--;
    }
```



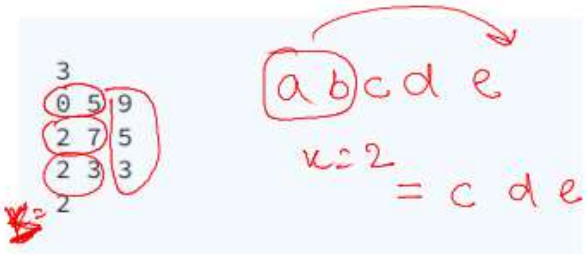
Q= 1D array → 2D array




```java
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int[] arr = new int[n];
    for(int i =0;i<n;i++){
        arr[i]= scn.nextInt();
    }
    int p = scn.nextInt();
    int q = scn.nextInt();
    if(p*q != arr.length){
        System.out.println("conversion to 2d array is not possible");
        return;
    }
    int[][] ans = new int[p][q];
    int k =0;
    for(int i=0;i<p;i++){
        for(int j=0;j<q;j++){
            ans[i][j]=  arr[k];
            k++;
        }
    }
```

Qm

(rotate by k)



k=2

Sample Output 0

arr[i] = matrix

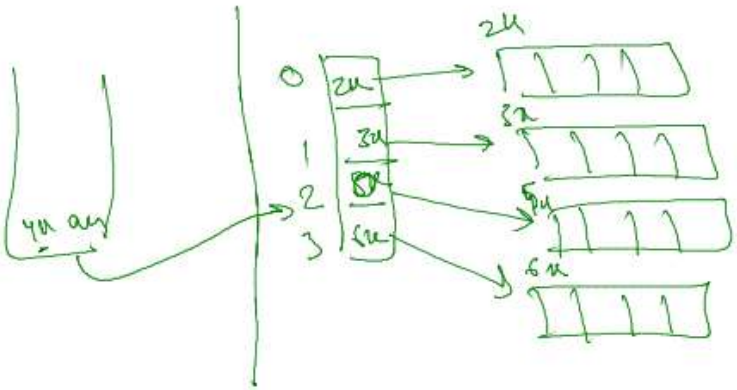
rever(0, k-1)
rev(k, arr.len-1)
rev(0, arr.len-1);

(b a e d c)

(c q e) (a b)

Explanation 0

int[] matrix = arr[2]



arr[1] = 3m

int[] matrix = arr[1]

```
        int k = scn.nextInt();

        for(int i=0;i<n;i++){
            // int[] matrix = arr[i];
            reverse(arr[i],0,k-1);
            reverse(arr[i],k,n-1);
            reverse(arr[i],0,n-1);
        }

        for(int i=0;i<n;i++){
            for(int j=0;j<n;j++){
                System.out.print(arr[i][j]+" ");
            }
            System.out.println();
        }

        /* Enter your code here. Read input from STDIN. Print output to STDOUT. Your c
    }

    public static void reverse(int[] arr, int lo, int hi){
        while(lo<hi){
            int temp = arr[lo];
            arr[lo]= arr[hi];
            arr[hi]=temp;
            lo++;
            hi--;
        }
    }
```