

$\leftarrow$  0 5 9 1  
 1 2 3 8  
 6 8 2 5

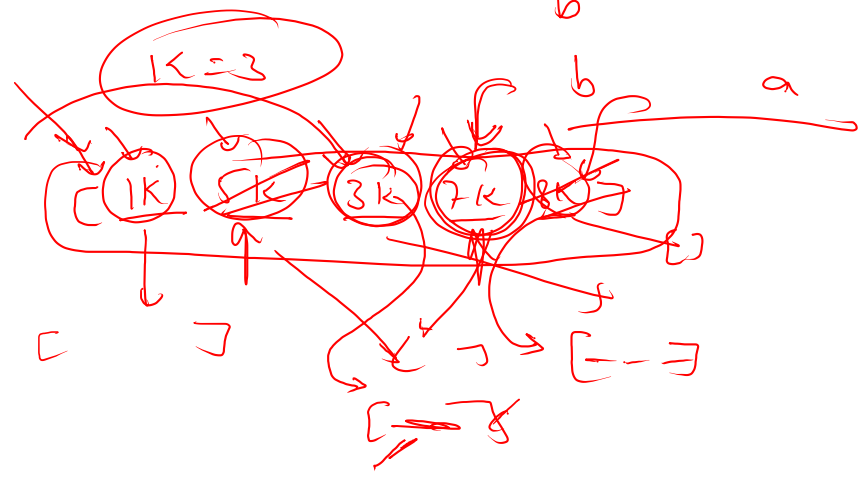
$K=2$

$\overleftarrow{\hspace{1cm}}$   
 $\overrightarrow{\hspace{1cm}}$   
 $a \rightarrow b$   
 $a' \quad b'$   
 $b'' \quad a''$

0 5 9 6  
 $\underbrace{\hspace{1cm}}$   
 $K$   
 (3) (1)

a 5 0 6

6 0 5 9



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

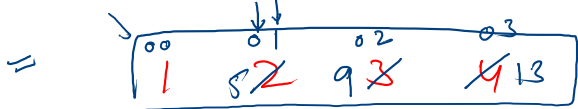
$\boxed{m \times n}$

1 gauss | 0 0 1

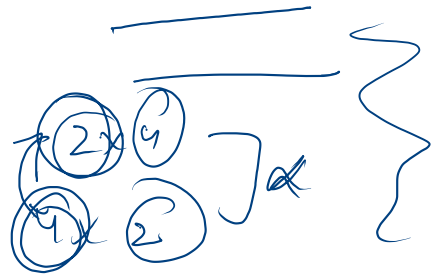
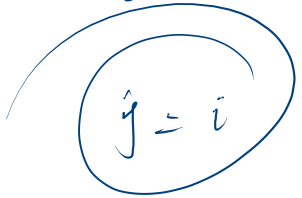
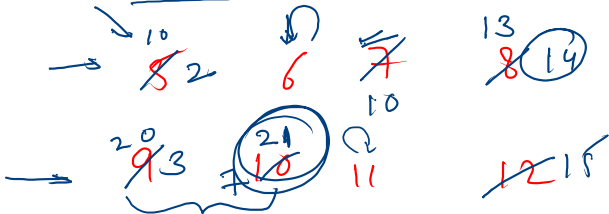
Break for  $\rightarrow$

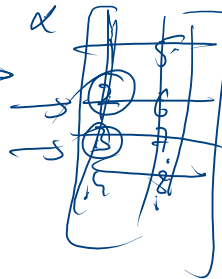
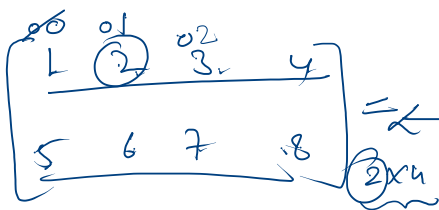
$$\begin{bmatrix} z \\ \vdots \\ z \end{bmatrix}$$

$\rightarrow z$



1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16





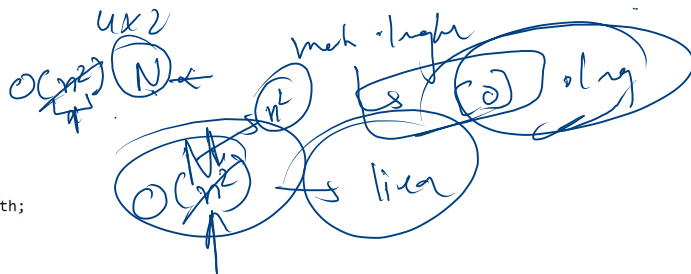
rows  $\rightarrow$  high  $\rightarrow$  2D  
cols  $\rightarrow$  low of 1D

10  $\downarrow$   
20 10.

transpose

tr=2

tc=4



```
class Solution {
    public int[][] transpose(int[][] matrix) {
        int tr = matrix.length, tc = matrix[0].length;
        int[][] transpose = new int[tc][tr];
        for(int i = 0; i < tr; i++) {
            for(int j = 0; j < tc; j++) {
                transpose[j][i] = matrix[i][j];
            }
        }
        return transpose;
    }
}
```

1 2 3

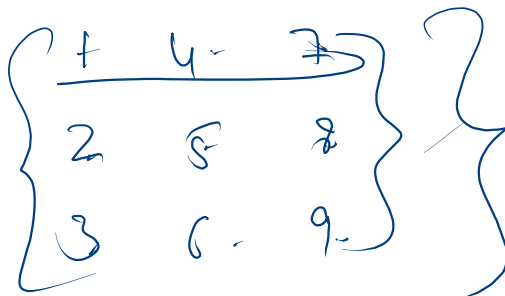
4 5 6

7 8 9

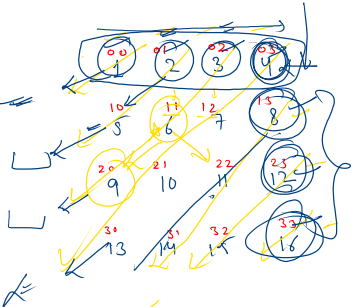


```
public static void transpose(int[][] arr) {
    int n = arr.length;
    for(int i = 0; i < n; i++) {
        for(int j = i; j < n; j++) {
            int temp = arr[i][j];
            arr[i][j] = arr[j][i];
            arr[j][i] = temp;
        }
    }
}
```

```
public void reverse(int[] arr) {
    int s = 0, e = arr.length - 1;
    while(s < e) {
        int temp = arr[e];
        arr[e] = arr[s];
        arr[s] = temp;
        s++;
        e--;
    }
}
```



Araspaes grows



$\leftarrow 1$   
 $\downarrow$   
 $\rightarrow 2 = 5$   
 $\rightarrow 3 \rightarrow 6 = 9$   
 $\rightarrow 4 \rightarrow 7 \rightarrow 10 \rightarrow 13$   
 $\rightarrow 8 \rightarrow 11 \rightarrow 14$   
 $\rightarrow 12 \rightarrow 15$   
 $\rightarrow 16$

$m+n-1$   
 $c++$   
 $r++$   
 $c--$   
 $r--$

$n+m-1$

SW  $\leftarrow$   $r, c$   
 $r++$   $c--$   
 $r++$   $c++$

$\left\{ \begin{matrix} n-1-r \\ n-1-c \end{matrix} \right\}$

$3, 2$   
 $0, 1$

$1, 2$   $4-1-1=2$   
 $4-1-2=1$

$n/2$



$4 \ 3 \ 2 \ 1$   
 $8 \ 7 \ 6 \ 5$   
 $12 \ 11 \ 10 \ 9$   
 $16 \ 15 \ 14 \ 13$

$16 \ 15 \ 14 \ 13$   
 $12 \ 11 \ 10 \ 9$   
 $8 \ 7 \ 6 \ 5$   
 $4 \ 3 \ 2 \ 1$

$r, c$   
 $00 \rightarrow n-1, n-1$   $i, j$   
 $01 \rightarrow n-1, n-2$   $(n-1-i)$   
 $02 \rightarrow n-1, n-3$   $(n-1-j)$   
 $03 \rightarrow n-1, n-4$

1 2 3 4

5 6 7 8

9 10 11 12

13 14 15 16