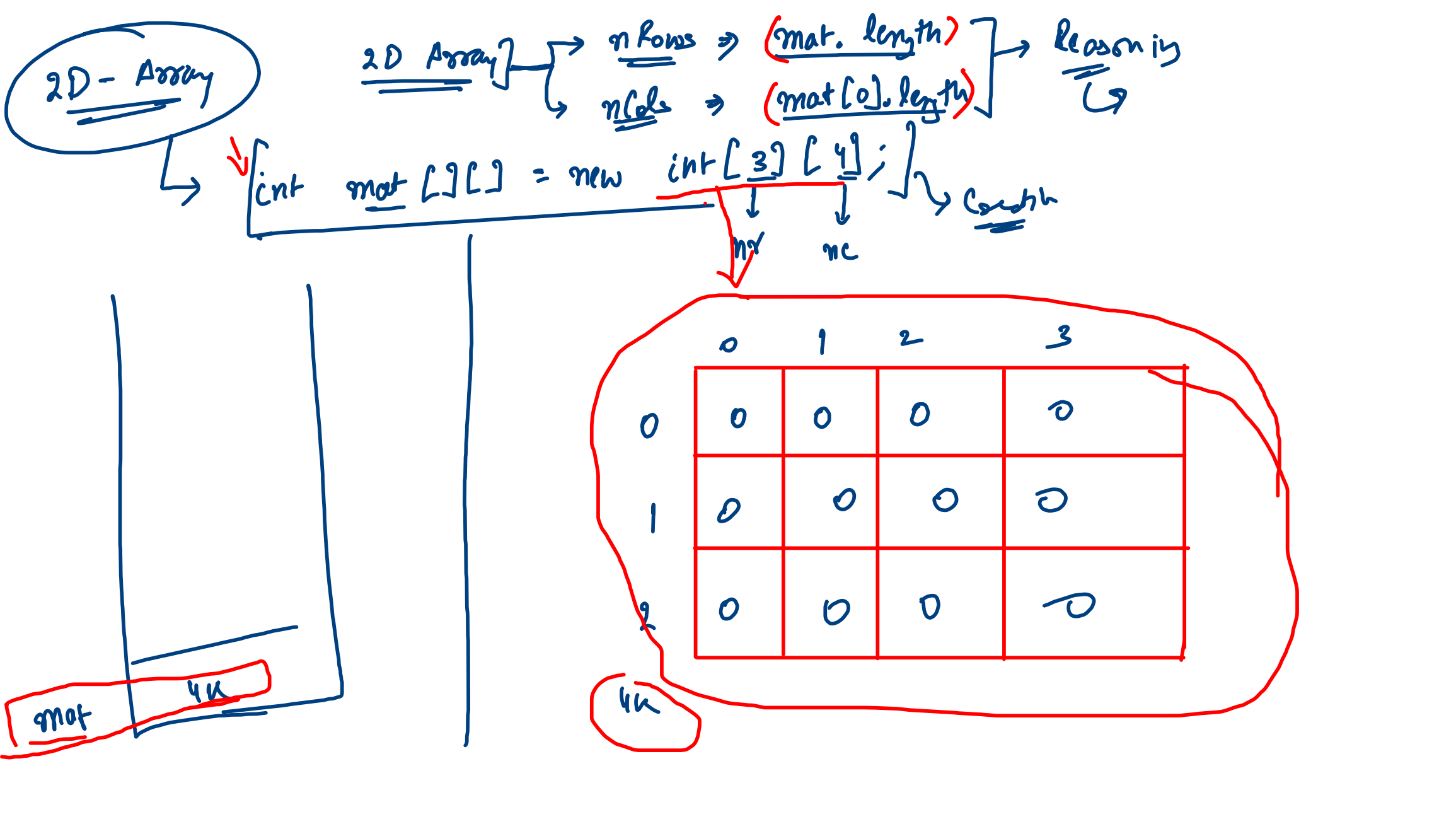
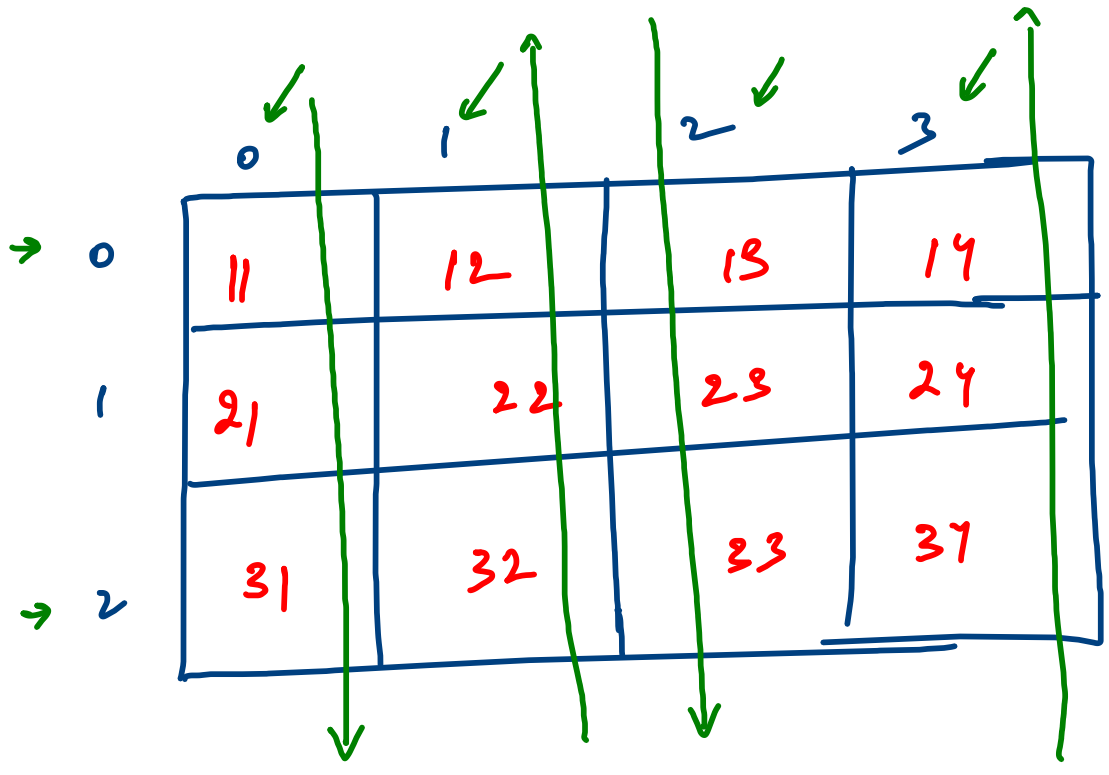
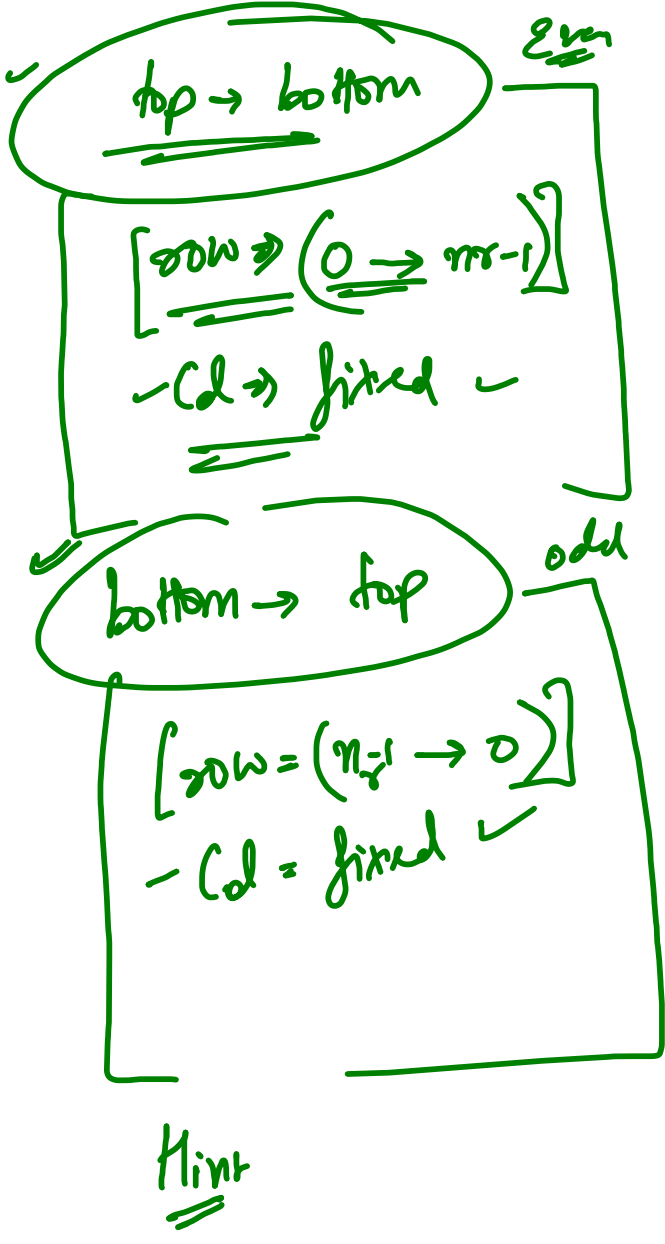
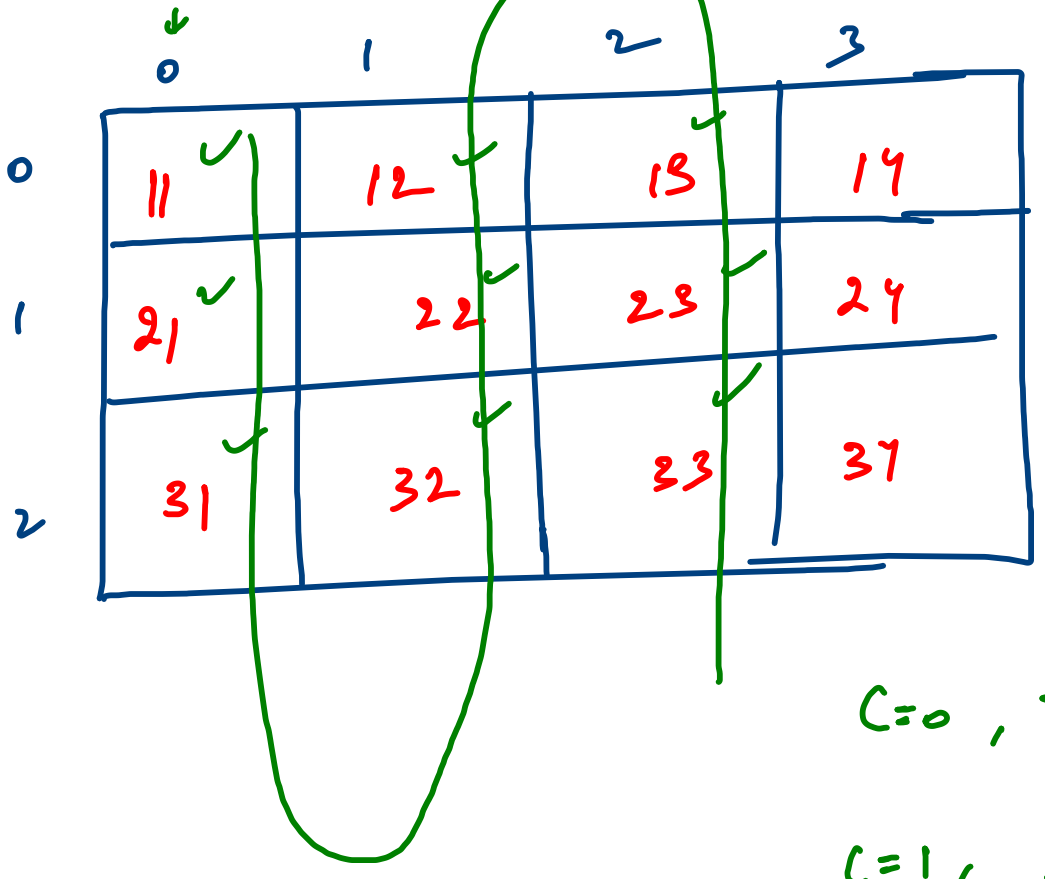

2D - Array
2D Array
nRows ⇒ (mat. length)
nCols ⇒ (mat[0]. length)
Reasoning
int mat [][] = new int [3] [4];
nr
nc
Length
0 1 2 3
0 0 0 0
1 0 0 0
2 0 0 0
mat
4k
4k

3
4
11 12 13 14
21 22 23 24
31 32 33 34





nr : 3




```
for(int c = 0 ; c < nc ; c++){
    if(c % 2 == 0){
        // even : top -> bottom
        for(int r = 0 ; r <= nr-1 ; r++){
            System.out.println(mat[r][c]);
        }
    }else{
        // odd : bottom -> top
        for(int r = nr-1 ; r >= 0 ; r--){
            System.out.println(mat[r][c]);
        }
    }
}
```

c=0 , r=0,1,2

c=1 , r=2,1,0

c=2 , r=0,1,2

[0][0] → 11

[1][0] → 21

[2][0] → 31

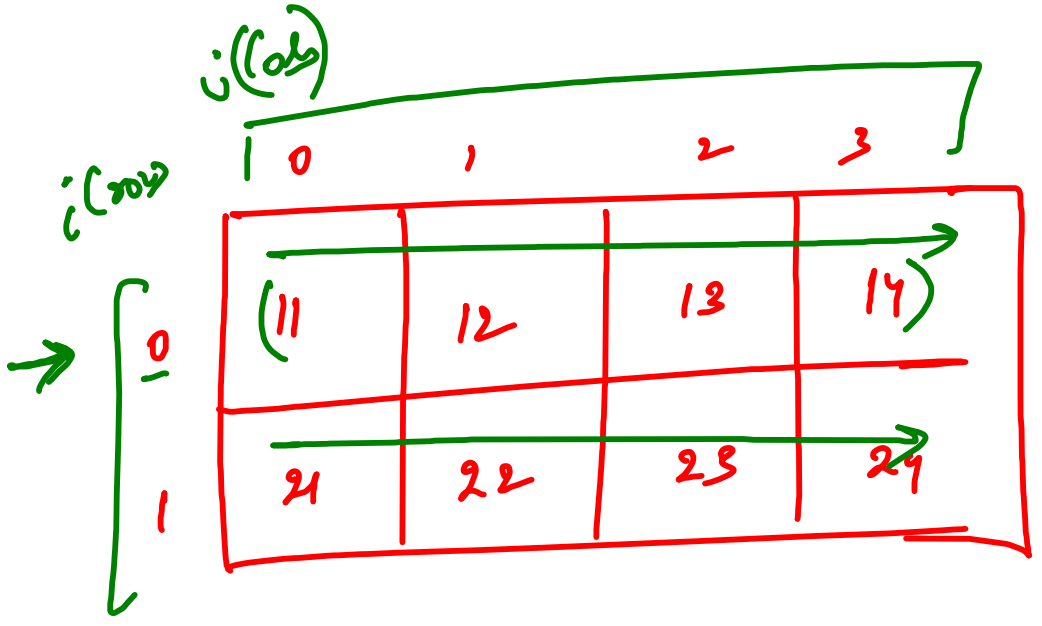
[2][1] → 32

[1][1] → 22

[0][1] → 12

2 → nr
4 → nc

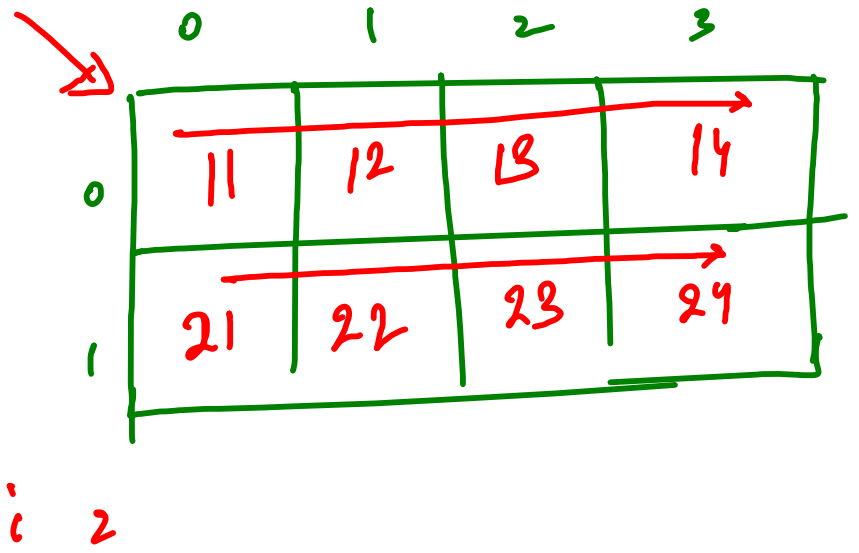
11
12
13
14
21
22
23
24



nr = 2

nc = 4

2
4
11
12
13
14
21
22
23
24



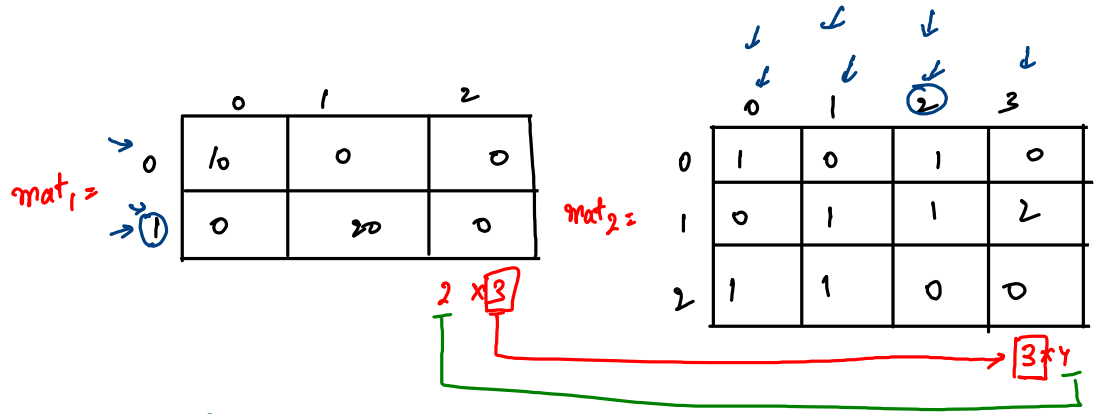
i 2

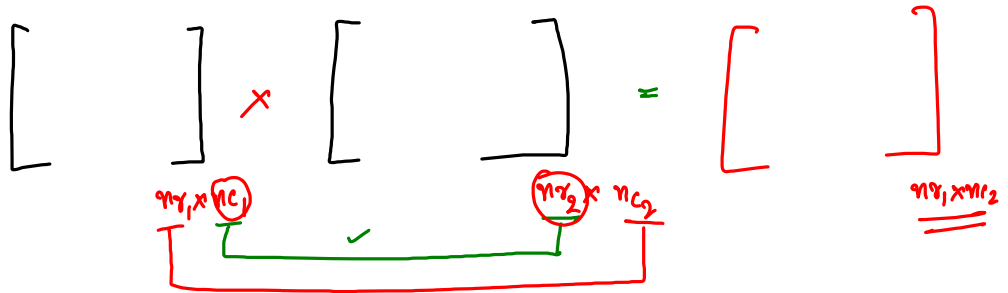
j

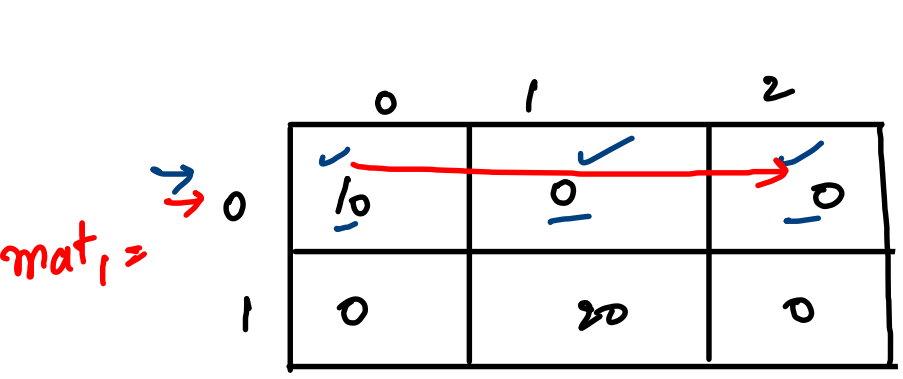
```
int nr = scn.nextInt();
int nc = scn.nextInt();

int mat[][] = new int[nr][nc];

for(int i = 0 ; i < nr ; i++){
    for(int j = 0 ; j < nc ; j++){
        mat[i][j] = scn.nextInt();
    }
}
```

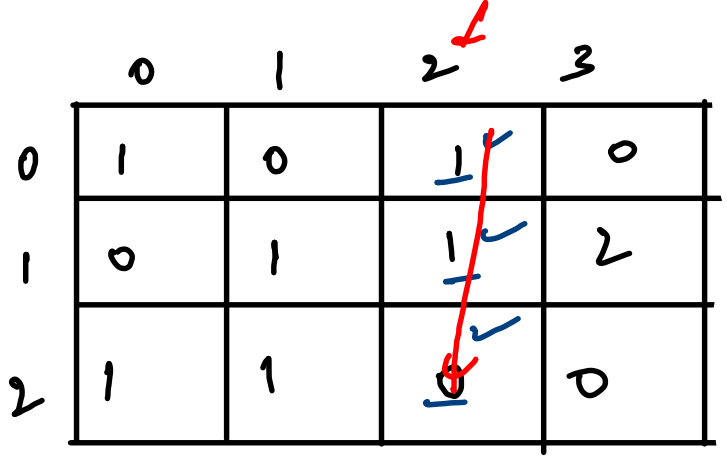
row

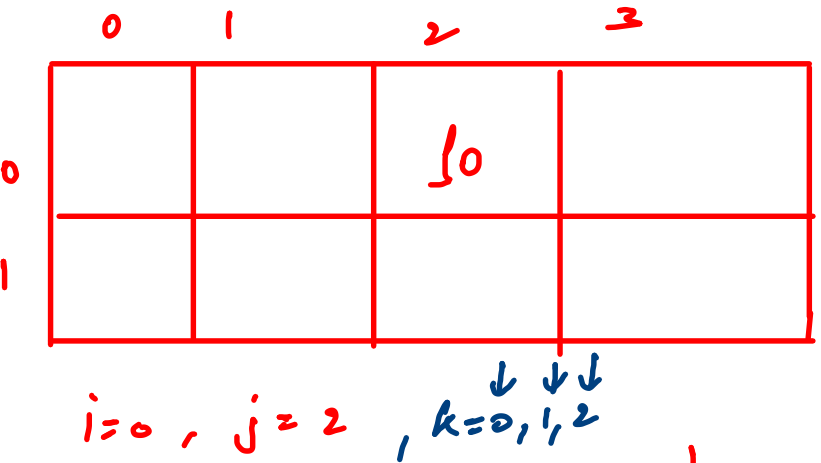
col


mat1 =
mat2 =
2 x 3
3 x 4
res =
res[1][2] = (0.1) + (20.1) + (0.0)
= 20


nr1 x nc1
nr2 x nc2
nr1 x nr2

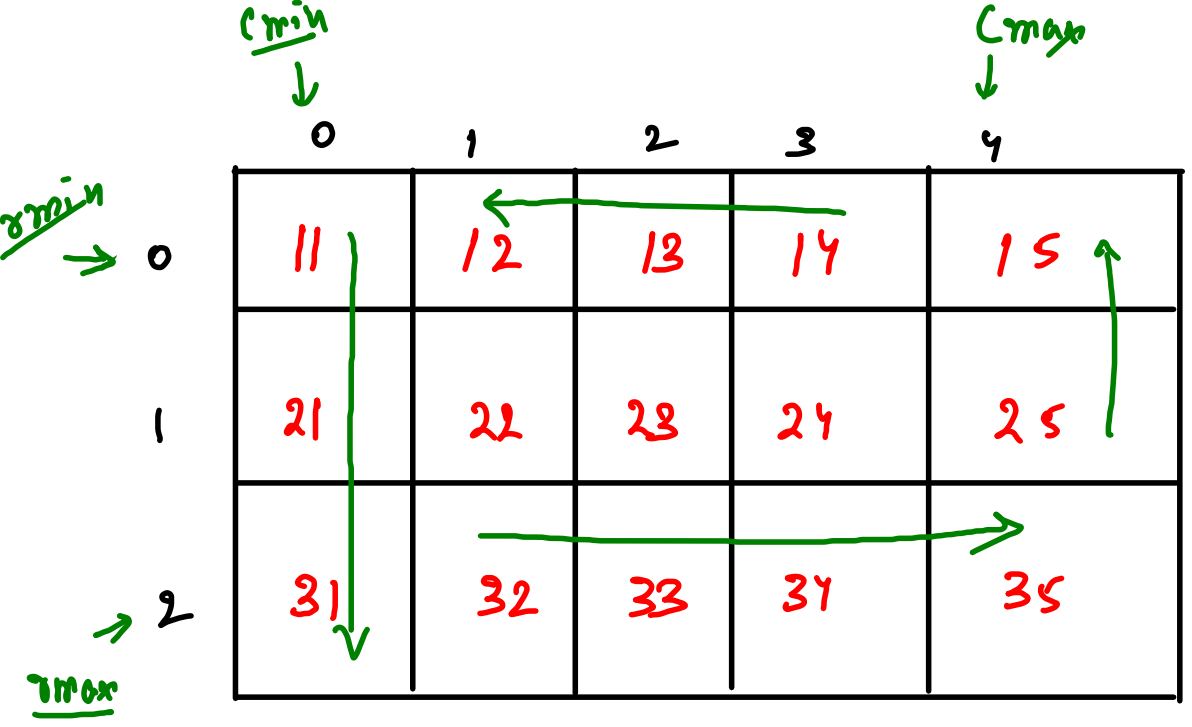


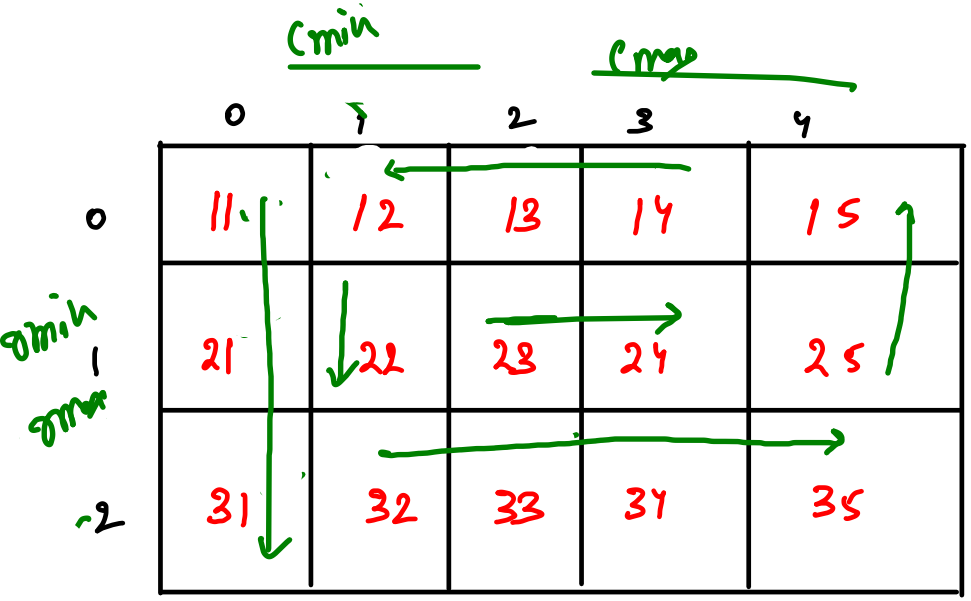


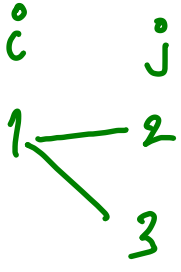



```
int res[][] = new int[nr1][nc2];

// matrix multiplication

for(int i = 0 ; i < res.length ; i++){
    for(int j = 0 ; j < res[0].length ; j++){

        for(int k = 0 ; k < nc1 ; k++){
            res[i][j] = res[i][j] + (mat1[i][k] * mat2[k][j]);
        }
    }
}
```

res[0][2] = (m1[0][0] . m2[0][2]) + (m1[0][1] . m2[1][2]) + (m1[0][2] . m2[2][2])


cmin
cmax
0
1
2
3
4
rmin
0
1
2
rmax
11
12
13
14
15
21
22
23
24
25
31
32
33
34
35





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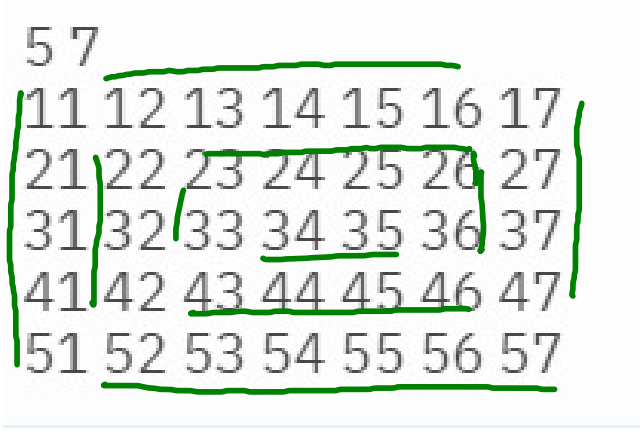
23
24

```java
public static void spiralDisplay(int mat[][]){
    int rmin = 0, cmin = 0, rmax = mat.length-1,cmax = mat[0].length-1;

    while(){
        for(int i = rmin , j = cmin ; i <= rmax ; i++){
            System.out.println(mat[i][j]);
        }

        for(int i = rmax , j = cmin+1 ; j <= cmax ; j++){
            System.out.println(mat[i][j]);
        }

        for(int i = rmax-1 , j = cmax ; i >= rmin; i--){
            System.out.println(mat[i][j]);
        }

        for(int i = rmin , j = cmax-1 ; j >= cmin+1 ; j--){
            System.out.println(mat[i][j]);
        }

        rmin++;
        cmin++;
        rmax--;
        cmax--;
    }
}
```



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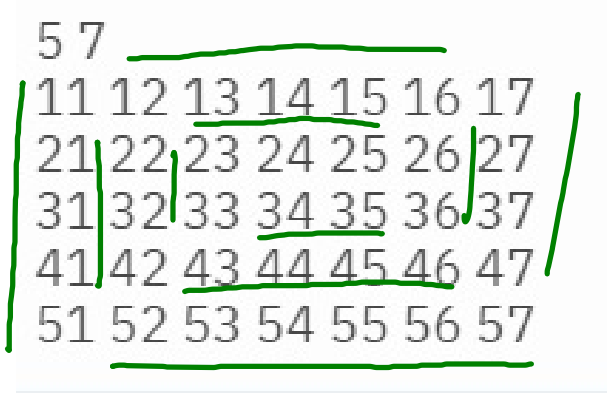
35



11
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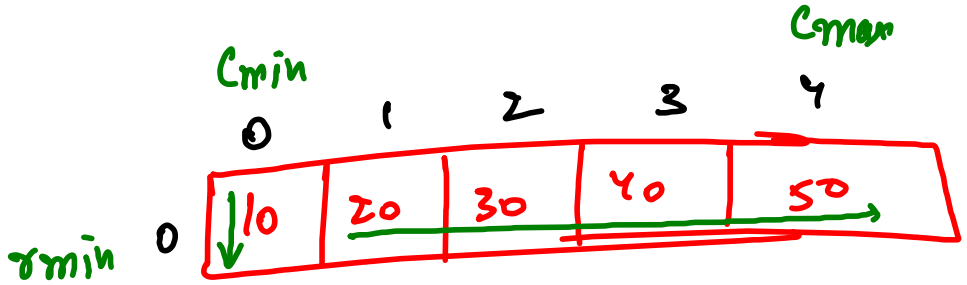
33
34
35 34

Count = 5 x 2 = 10 | total Element = 5



0 0 → 10

0 1 → 20

0 2 → 30

0 3 → 40

0 4 → 50

```java
int rmin = 0, cmin = 0, rmax = mat.length-1,cmax = mat[0].length-1;
int count = 0;
int totalEle = mat.length * mat[0].length;
while(count < totalEle){
    for(int i = rmin , j = cmin ; i <= rmax && count < totalEle ; i++){
        System.out.println(mat[i][j]);
        count++;
    }

    for(int i = rmax , j = cmin+1 ; j <= cmax && count < totalEle ; j++){
        System.out.println(mat[i][j]);
        count++;
    }

    for(int i = rmax-1 , j = cmax ; i >= rmin && count < totalEle ; i--){
        System.out.println(mat[i][j]);
        count++;
    }

    for(int i = rmin , j = cmax-1 ; j >= cmin+1 && count < totalEle; j--){
        System.out.println(mat[i][j]);
        count++;
    }

    rmin++;
    cmin++;
    rmax--;
    cmax--;
}
```