Today's agenda

↳ Intro to 2D Arrays

↳ Print matrix row wise

↳ Print matrix Col wise

↳ Print matrix in wave form

// Intro to 2d array

⎣→ JEE mains →

	Physics 0	Chemistry 1	Maths 2
0th Student	80	85	65
1st Student	80	85	65
2nd Student	80	85	65

⋮

⎣→ Excel sheet → 2d array use

// Syntax

$$int[][] \ arr = new \ int \ [5][4];$$
row ↗   col ↗

arr

Column

	0	1	2	3
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

row

⇒ arr[3][2]

⎣→ 5 * 4 = 20 elements

Q) Print matrix rowwise
  ↳ Print the given mat[N][m] rowwise.

Ex: arr[4][5] =

	0	1	2	3	4
0	10	20	30	40	50
1	60	70	80	90	100
2	110	120	130	140	150
3	160	170	180	190	200

→
```
10   20  30  40  50
60   70  80  90 100
110  120 130 140 150
160  170 180 190 200
```

i j i j

0 0   1 0   2 0   3 0
0 1   1 1   2 1   3 1
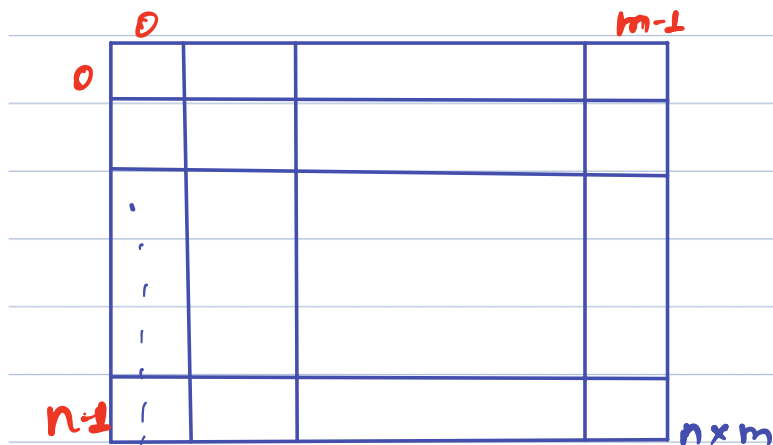0 2   1 2   2 2   3 2
0 3   1 3   2 3   3 3
0 4   1 4   2 4   3 4

```
for (int i=0; i < n; i++){

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

}
```

	0	1	2	3	4
arr[4][5]=0	10	20	30	40	50
1	60	70	80	90	100
2	110	120	130	140	150
3	160	170	180	190	200

4*5

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

i	j
0	0
	1
	2
	3
	4
	5 →false

10   20   30   40   50

60   70   80   90   100

110   120   130   140   150

160   170   180   190   200

1

0
1
2
3
4
5 →false

2

0
1
2
3
4
5 →false

3

0
1
2
3
4
5 → false (exit)

4
↳ false (exit)

Q) Print matrix Colwise

↳ Print the given mat[N][m] col wise.

Ex: arr[4][5] =

	0	1	2	3	4
0	10	20	30	40	50
1	60	70	80	90	100
2	110	120	130	140	150
3	160	170	180	190	200

4x5

```
10   60   110   160
20   70   120   170
30   80   130   180
40   90   140   190
50   100  150   200
```

i j

```
0 0      0 1      0 2      0 3      0 4
1 0      1 1      1 2      1 3      1 4
2 0      2 1      2 2      2 3      2 4
3 0      3 1      3 2      3 3      3 4
```

```
for (int j=0; j < m; j++){

    for (int i=0; i<n; i++){

        System.out.print (arr[i][j] + " ");

    }

    System.out.println();

}
```

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

$$arr[4][5] =$$

	0	1	2	3	4
0	10	20	30	40	50
1	60	70	80	90	100
2	110	120	130	140	150
3	160	170	180	190	200

4×5

j

0

10 — 60 — 110 — 160

20 — 70 — 120 — 170

1

2

i

0
1
2
3
4 → exit

0
1
2
3
4 → exit

Q) Print matrix in wave form

      ↳ Print the given mat[N][m] in wave form.

Ex: arr[4][5] =

	0	1	2	3	4
0	10	20	30	40	50
1	60	70	80	90	100
2	110	120	130	140	150
3	160	170	180	190	200

N×m

L-R → 10 20 30 40 50
R-L → 100 90 80 70 60
L-R → 110 120 130 140 150
R-L → 200 190 180 170 160

L-R → 0, 2, ... (even no.) ⎤ row-wise
R-L → 1, 3, ... (odd no.) ⎦

even → no. that are divisible by 2

```
for(int i=0; i<n; i++){
    if(i%2==0){
        for(int j=0; j<m; j++){
            System.out.print(arr[i][j]+" ");
        }
    }else{
        for(int j=m-1; j>=0; j--){
            System.out.print(arr[i][j]+" ");
        }
    }
}
```

```
for(int i=0; i<n; i++){
    if(i%2==0){
        for(int j=0; j<m; j++){
            System.out.print(arr[i][j]+" ");
        }
    }
    else{
        for(int j=m-1; j>=0; j--){
            System.out.print(arr[i][j]+" ");
        }
    }
    System.out.println();
}
```

$arr[4][5] =$

	0	1	2	3	4
0	10	20	30	40	50
1	60	70	80	90	100
2	110	120	130	140	150
3	160	170	180	190	200

n×m

10_ 20_ 30_ 40_ 50_

100_ 90_ 80_ 70_ 60_

:
0
1
0
1
2
3
4
5 → exit
0
4
3
2
1
0

0 → if

1 → else

2

3

//Psuedo code

```
void main () {
    //input 2d array -> arr[n][m]
        = { 10 20
            30 40
            50 60 }
    S.o.p (arr[0][0]);  → 10
    fun (arr);
  → S.o.p (arr[0][0]);
}

Public Static void fun (int [][] arr) {
    arr[0][0] = 1000;
}
```

→ java is Pass by value only. you Pass the Stock value to the function.