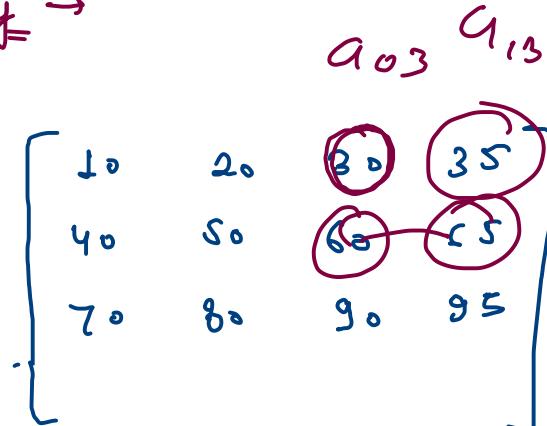


Two D Array →

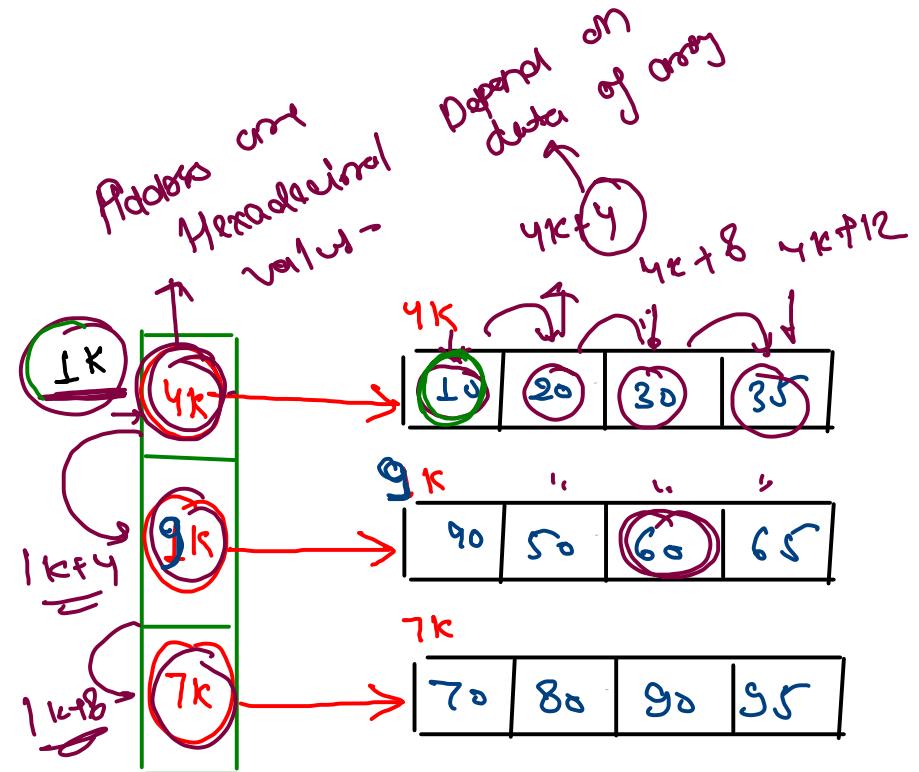


~~int [] [] arr = new int [n] [m]~~

Reference Variable:

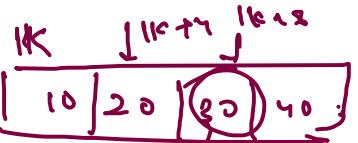
~~arr = 1K~~

1K



41C
51C
71C

$\text{arr} \rightarrow$



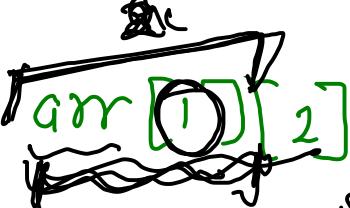
$\text{arr}[2]$

$$\rightarrow \underbrace{1K}_{\sim} + i * (\text{size of data})$$

$$= 1K + 2 \times 4$$

$\cancel{1K} + 8$

$\text{arr} \rightarrow 4K$



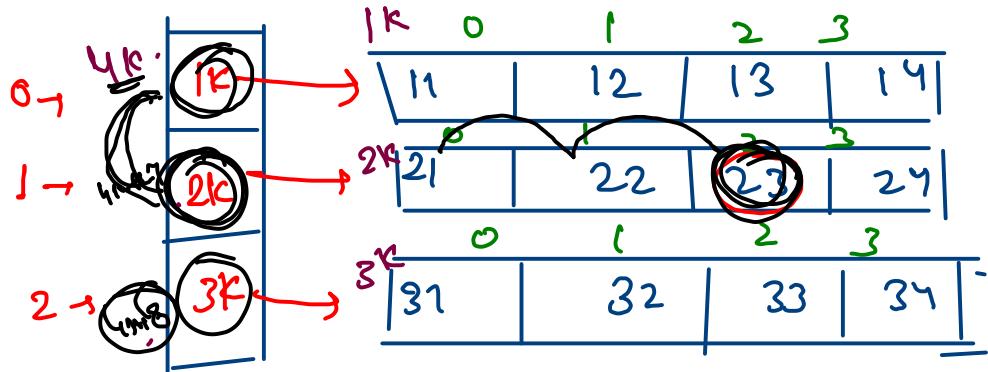
$$4K + (1 \times 4)$$

$\cancel{4K} + 4$

$\cancel{2K}[2]$

$$\cancel{2K} + (2 \times 4)$$

$$= \cancel{2K} + 8 = 23$$



① Create & initialise.

② Input

③ Output

④ Rows and columns.

int arr[] arr = new int[r][c]

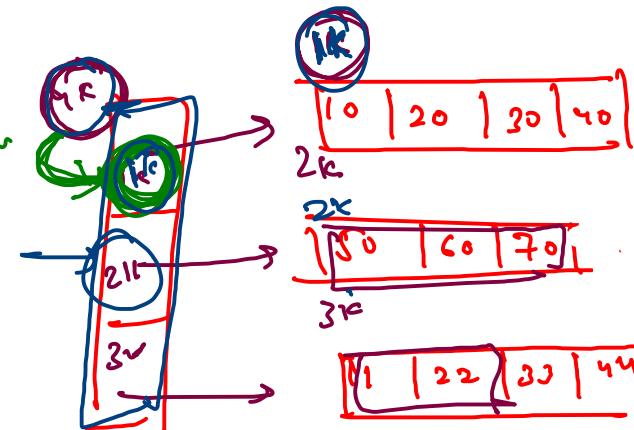
int rows = arr.length; ③

int col = arr[0].length; → ④
15. 1

arr.length
1K.length

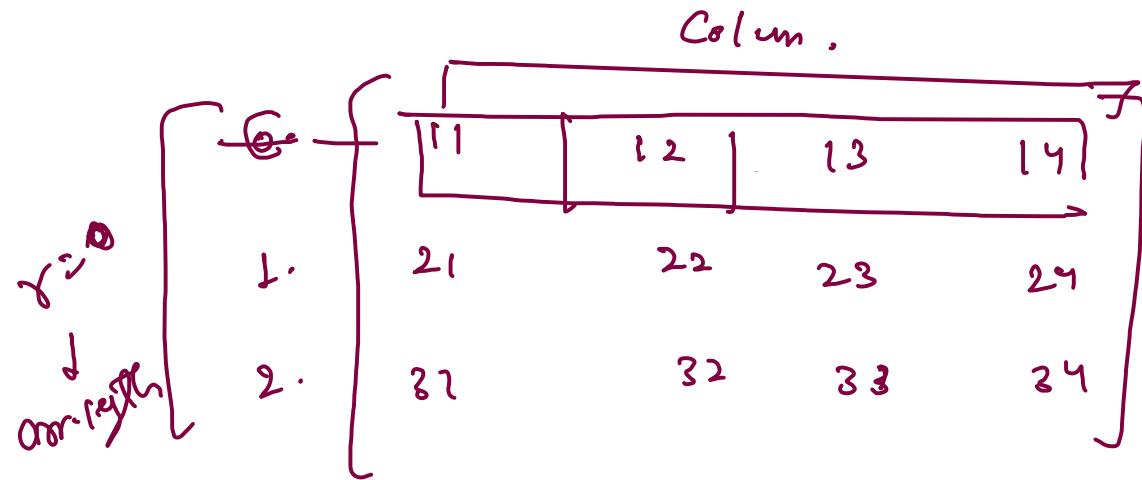
$$\begin{aligned} \text{arr[0]} &= 4K + 0 \times 4 \\ &= 4K \end{aligned}$$

1K.length

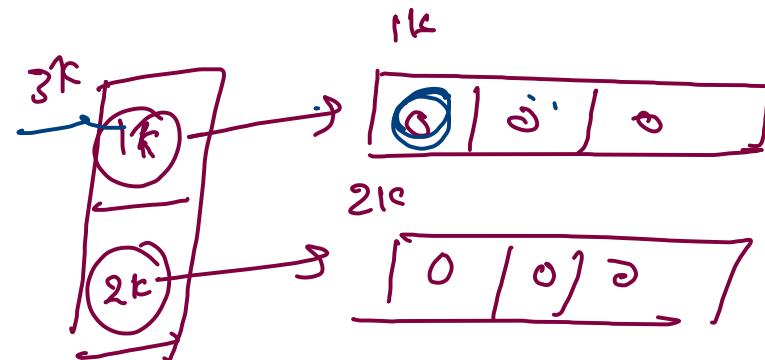


2K.length
3K.length

arr[0].length



`int arr[3][4]` arr = new int[2][3]
 ↓
 ↙
 arr



$$m_1 = \left[\begin{array}{cccc} 1 & 4 & 4 & 5 \\ 3 & 2 & 7 & 9 \\ 8 & 5 & 6 & 4 \end{array} \right]_{3 \times 4} \quad m_2 = \left[\begin{array}{ccc} 1 & 3 & 3 \\ 3 & 2 & 4 \\ 8 & 5 & 9 \\ 6 & 7 & 7 \end{array} \right]_{4 \times 3}$$

$r_1 x G_1$

yes =

$m_1 \times m_2$
 Matrix multiplication is only possible if $(C_1 = r_2) \rightarrow r_2 \times C_2$
 otherwise invalid input

resultant matrix size: $[r, x c_2]$ otherwise

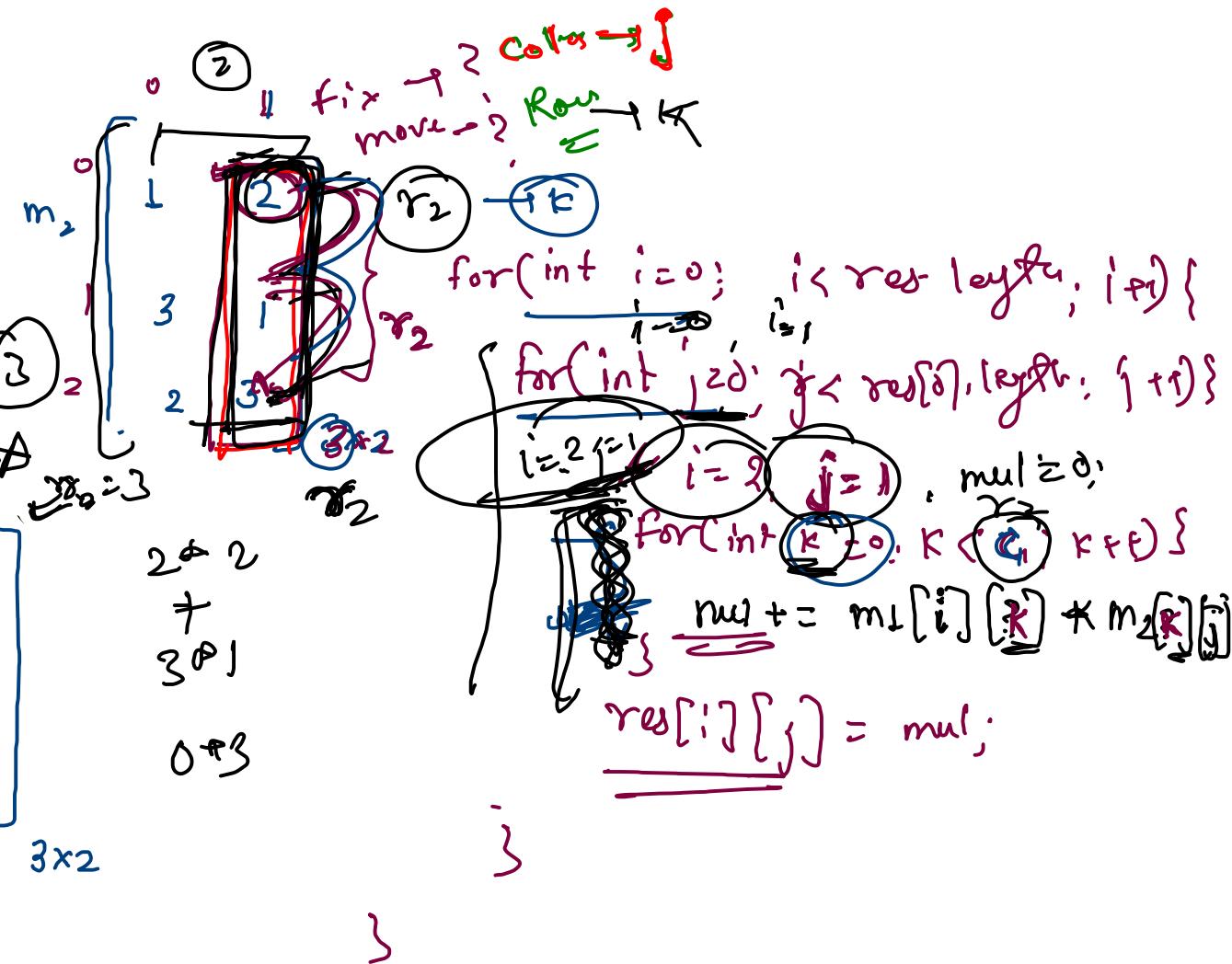
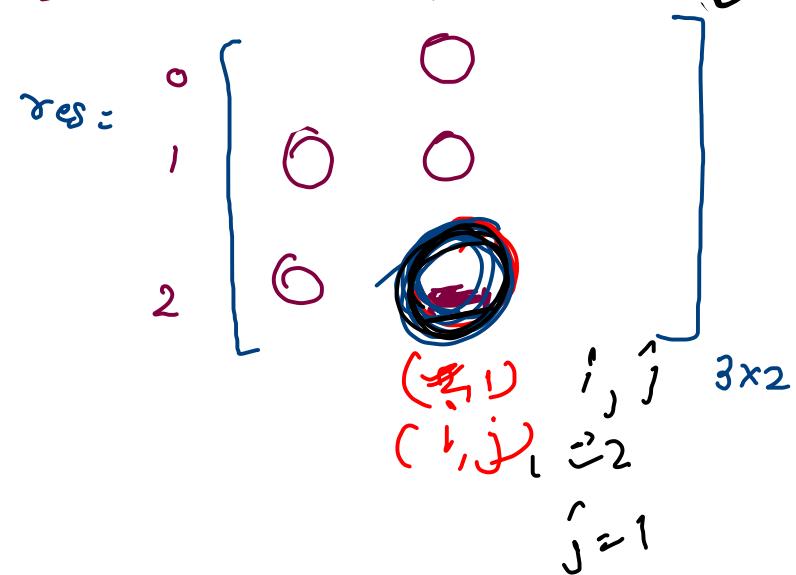
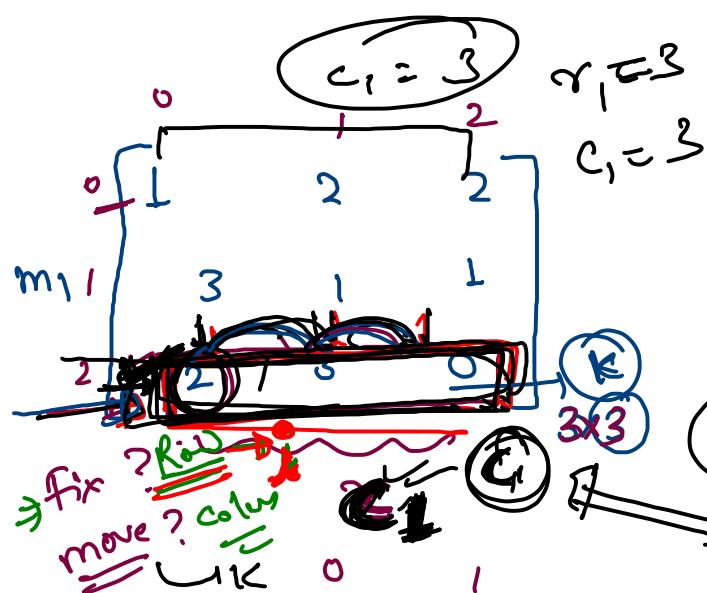
A diagram illustrating a 3x4 matrix with red numbers:

$$\begin{matrix} & \begin{matrix} 0 & 1 & 2 & 3 \end{matrix} \\ \begin{matrix} 0 \\ 1 \\ 2 \end{matrix} & \begin{matrix} 11 & 9 & 4 & 5 \end{matrix} \\ & \begin{matrix} 3 & 2 & 7 & 9 \end{matrix} \\ & \begin{matrix} 8 & 5 & 6 & 4 \end{matrix} \end{matrix}$$

Annotations include:

- Red arrows pointing from the top row labels to the first four columns.
- Red arrows pointing from the left column labels to the first four rows.
- Red circles around the numbers 11, 5, 3, 2, 7, 9, 8, 5, 6, and 4.
- A green bracket under the second row containing the numbers 3, 2, 7, and 9.
- A red bracket on the right side containing the numbers 8, 5, 6, and 4.
- A red circle labeled C_1 at the bottom right corner.
- A label $3 \times 4 -$ at the bottom right.

A hand-drawn diagram showing three vertical columns of numbers. The first column has 4 rows and contains the numbers 0, 1, 2, and 3. The second column has 3 rows and contains the numbers 5, 7, and 9. The third column has 3 rows and contains the numbers 3, 4, and 9. The numbers are written in red ink.



State of Krakonda L

klave traversal →

11	44
21	84
31	24
41	14

42

32

22

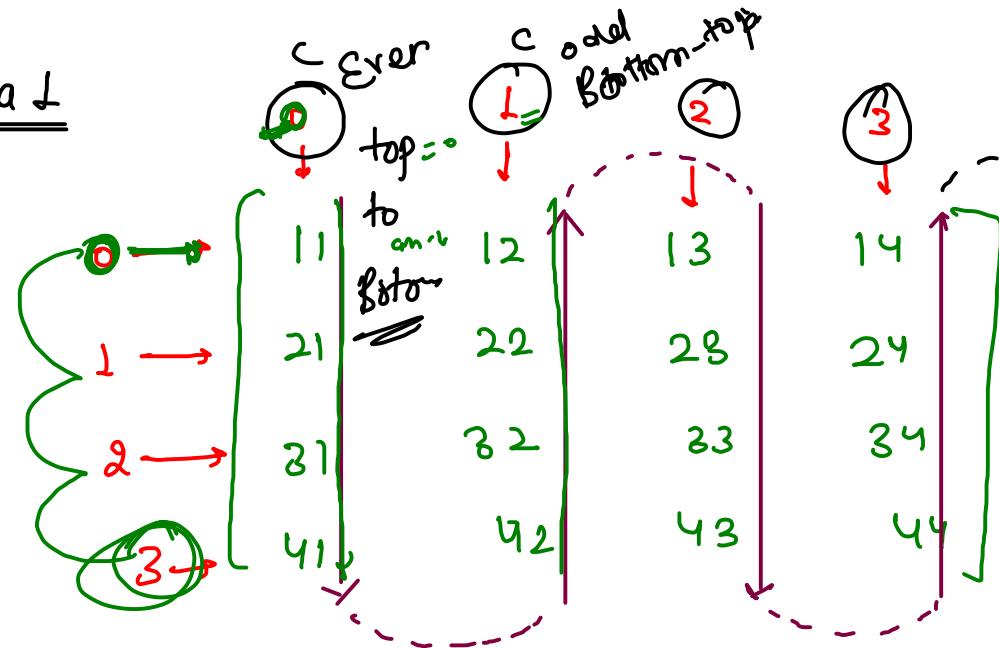
12

13 $c = 0$

23

33

43



$0 \rightarrow$ row = 0 to total row

col

$1 \rightarrow$ row = total col to row

col

$2 \rightarrow$ row = 0 to total row

col

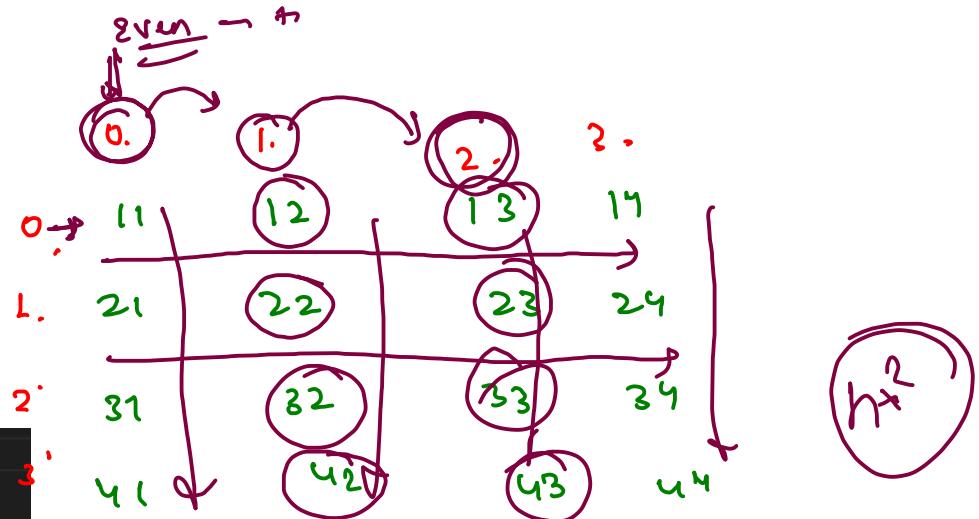
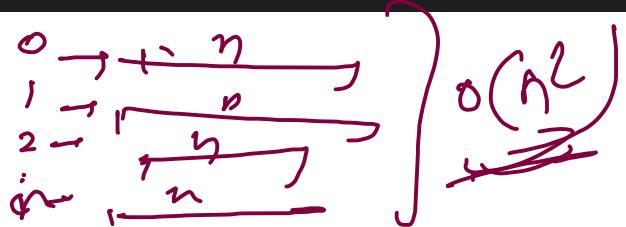
$3 \rightarrow$ row = total col to row

$\text{int}(\text{ff})$ on
 $\text{takeInput}(an)$
 $\text{traversal}(an),$

```

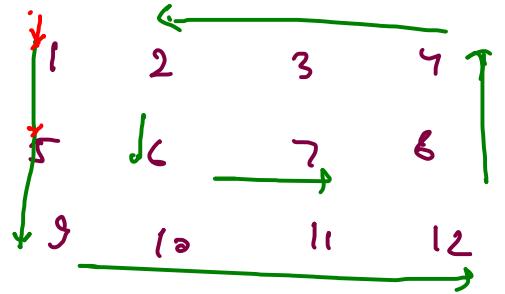
public static void waveDisplay(int[][] arr) {
    for(int c = 0; c < arr[0].length; c++) {
        if(c % 2 == 0) {
            // even column -> display row top -> bottom
            for(int r = 0; r < arr.length; r++) {
                System.out.println(arr[r][c]);
            }
        } else {
            // odd column -> display row bottom -> top
            for(int r = arr.length - 1; r >= 0; r--) {
                System.out.println(arr[r][c]);
            }
        }
    }
}

```



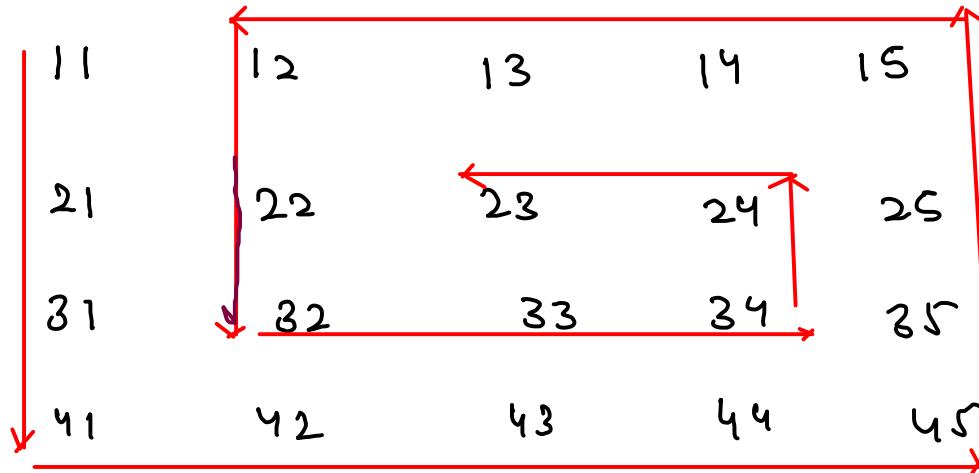
11	13
21	23
31	33
41	43
42	44
32	
22	
12	

Spiral Display -



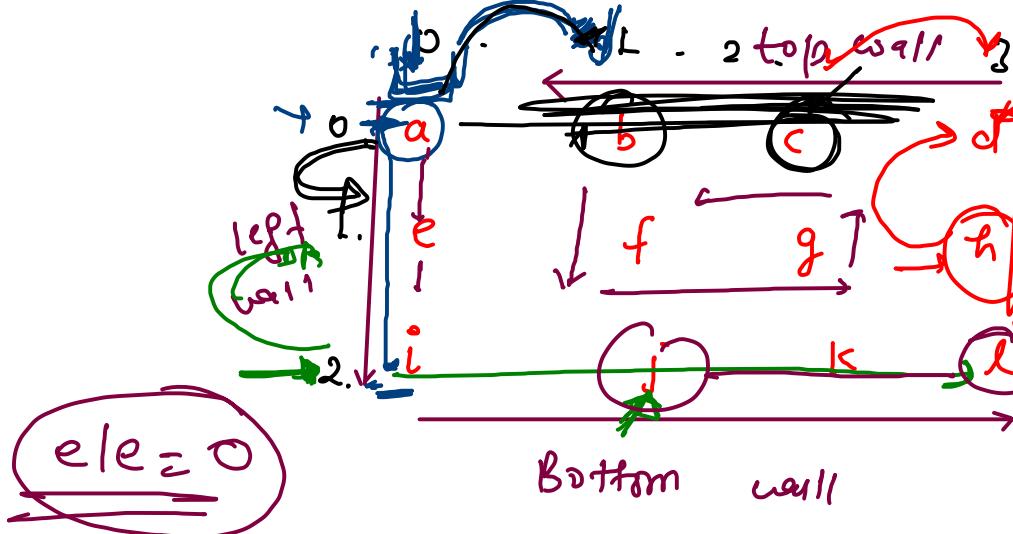
1, 5, 9, 10, 11, 12, 8, 4

3, 2, 6, 7



O/P \rightarrow 11, 21, 31, 41, 42, 43, 44, 45, 35, 25, 15, 14, 13, 12,

22, 32, 33, 34, 24, 23



$$\gamma^{\min} = 0$$

$$\gamma_{\max} = 2$$

$$\text{Canin} = \cancel{0}$$

$$C_{\max} = 3$$

$$\text{tele} = \underline{n \times m}$$

total Element \rightarrow YXC

while(~~fete~~ > 0)

$a \in \vec{i}$

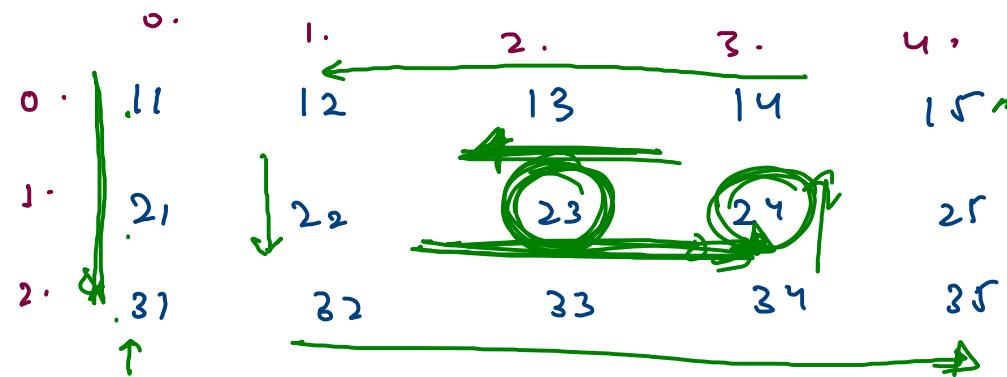
// left wall →
fix → min column.
row + col (minRow) → maxRow
print → tele-
= count++;

// Bottom wall →
 Fix → max Row
 vary → Column (min Col to max Col)
 print → reles -
 rmax --;

// Right wall →
fix → max. column.
vary → Row (rmax to rmin)
print → tele --
cmax --;

top wall →
fix → Row (minRow)
vary → column (cmarr to cmid)
print → tele -
gmin + f.

- | | |
|----|----|
| 1 | 11 |
| 2 | 21 |
| 3 | 31 |
| 4 | 32 |
| 5 | 33 |
| 6 | 34 |
| 7 | 35 |
| 8 | 25 |
| 9 | 15 |
| 10 | 14 |
| 11 | 13 |
| 12 | 12 |
| 13 | 22 |
| 14 | 23 |
| 15 | 24 |
| 16 | 23 |
| 17 | |



$$\text{tele: } 15^{\circ} \cancel{12^{\circ}} \cancel{8^{\circ}}$$
$$r_{\min} = 0 \cancel{1} \cancel{2}$$

$$r_{\text{max}} = \cancel{x} + 0$$

$$c_{\min} = \cancel{0} \times \cancel{2}$$

$$c_{\max} = 4 / 3 \cdot 2^t$$

