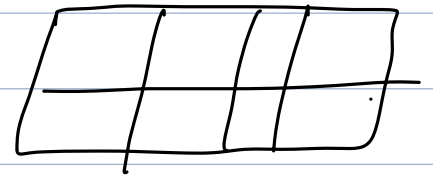


2-D arrays

Has both length & breadth

Eg Chess, Bus seating etc



`int mat[l][l] = new int[row][col]`

	0	1	2	3
0	0,0	0,1	0,2	0,3
1				
2				33
3				

→ 2,3
→ 3,3

`print (arr[row-num][col-num])`

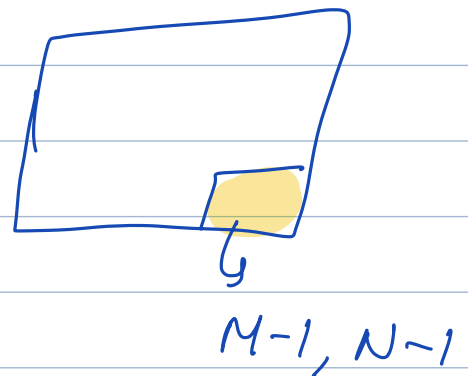
`print (arr[2][3])`

8 x 17

0,0 0,1 - - - -
1,0 1,1 - - - -
⋮
⋮

7,0 7,1 7,16

M x N



Q Print the top row of a matrix

$N \times M$

What is the top row?

	0	1	2	3
0	0,0	0,1	0,2	0,3
1	1,0			
2	2,0			3,3
3	3,0			

i, j

0,0 0,1 0,2 0,3 - - - 0,M-1

```
for (int j=0 ; j<M ; j++) {  
    |  
    print (arr[0][j])  
}
```

Q Print leftmost column

What is leftmost column?

0,0 1,0 2,0 3,0 - - - N-1,0

```
for (i=0 ; i<N ; i++) {  
    |  
    print (arr[i][0])  
}
```

Q Print matrix row by row

$N \times M$

0,0 0,1 - - - - 0,m-1

1,0 1,1 - - - - 1,m-1

```
for (i=0 ; i < N ; i++) {  
    for (j=0 ; j < M ; j++) {  
        print (arr[i][j])  
    }  
    println()  
}
```

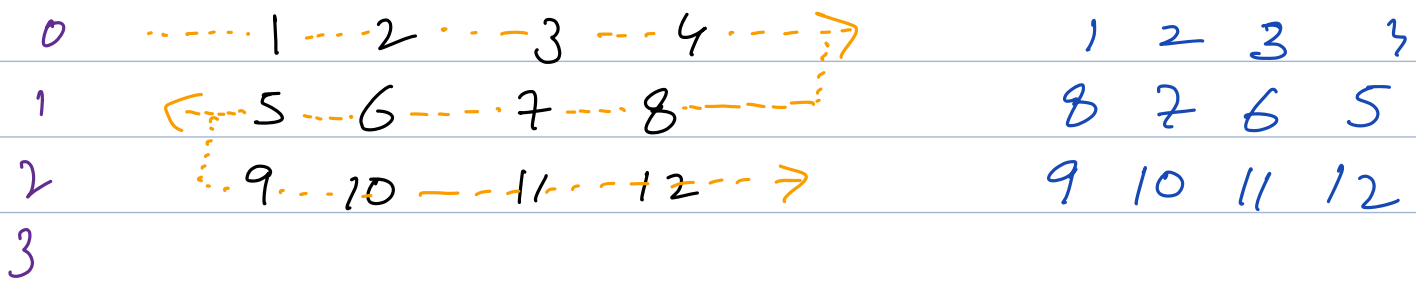
Q Print matrix column by column

```
for (j=0 ; j<M ; j++) {  
    for (i=0 ; i<N ; i++) {  
        print (arr[i][j])  
    }  
    println()  
}
```

Q Find sum of matrix

```
for (i=0 ; i<N ; i++) {  
    for (j=0 ; j<M ; j++) {  
        sum += arr[i][j]  
    }  
}  
print (sum)
```

Q Waveform printing



Idea: What if row number is even?
print Left to Right

What if row number is odd?
print right to left

```
for (i = 0; i < N; i++) {  
    if (i % 2 == 0) {  
        for (j = 0; j < M; j++) {  
            print (arr[i][j])  
        }  
        println()  
    }  
    else {  
        for (j = m - 1; j >= 0; j--) {  
            print (arr[i][j])  
        }  
        println()  
    }  
}
```

Q Row wise sum

1	3	-2	7
9	0	8	-1
5	6	-2	3

ans = [9, 16, 12]

```
for (i=0; i<n; i++) {  
    int sum = 0  
    for (j=0; j<m; j++) {  
        sum += arr[i][j]  
    }  
    print(sum)  
}
```

Q Column wise max

1	3	-2	7
9	0	8	-1
5	6	-2	3

ans = [9, 6, 8, 7]

```
for(j=0; j<M; j++) {
```

```
    ans = arr[0][j]
```

```
    for(i=0; i<N; i++) {
```

```
        if (arr[i][j] > ans)
```

```
            ans = arr[i][j]
```

```
    }
```

```
    println(ans)
```

```
}
```

pos 3 elem = 100

0	1	2	3	4
2	4	6	8	<u>10</u>

arr[6] 2 4 6 100 9 10