Matrix Multiplication :-

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

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

- Col of A == row of B
- $C[A[i]][B[j]]$

3×2

2×3

$C = \begin{vmatrix} 5 & 13 & 9 \\ - & - & - \\ - & - & - \end{vmatrix}$

3×3

$(3\times1 + 1\times2) = 5$
$(3\times3) + (1\times4) = 13$
$(3\times2) + (1\times1) = 9$

$|3\times2| \times |2\times3| = |3\times3|$

$|2\times3| \times |3\times2| = |2\times2|$

$|1\times3| \times |3\times2|$

$[1,2,3]$
$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 4 & 6 \end{bmatrix} = 1\times2$

$A = [(3,1),(1,2),(2,4)]$ $r = 3$, $C = 2$

$B = [(1,3,2),(2,4,3)]$ $r = 2$, $C = 3$

$A \begin{vmatrix} 3,1 \\ 1,2 \\ 2,4 \end{vmatrix} \times B \begin{vmatrix} 1,3,2 \\ 2,4,3 \end{vmatrix} = C \begin{vmatrix} 5 & 13 & 9 \\ 5 & 11 & 8 \\ 10 & 22 & 16 \end{vmatrix}$

3×2 2×3 3×3

$A \times B$

$(3\times1) + (1\times2) = \underline{5}$ $(1\times1) + (2\times2) = 5$ $(2\times1) + (4\times2) = 10$
$(3\times3) + (1\times4) = 13$ $(1\times3) + (2\times4) = 11$ $(2\times3) + (4\times4) = 22$
$(3\times2) + (1\times3) = 9$ $(1\times2) + (2\times3) = 8$ $(2\times2) + (4\times3) = 16$

```
void matrixMul( A, B ){
    if( A[0].length != B.length ) return;
    C = new int [A.length][B[0].length]
    for( i=0 ; i < C.length ; i++ ){
        for( j=0 ; j < C[0].length ; j++ ){
            K = 0 , res = 0
            while( K < B.length ){
                res += A[i][K] x B[K][j]
                K++
            }
            C[i][j] = res
        }
    }
}
```

$A \begin{vmatrix} 3,1 \\ 1,2 \\ 2,4 \end{vmatrix} \times B \begin{vmatrix} 1,3,2 \\ 2,4,3 \end{vmatrix} =$

3×2 2×3

$\to n = n+1$
$\to n += 1$

$n = n - 1$
$n -= 1$

Spiral Display :-
https://leetcode.com/problems/spiral-matrix/

0   1   2   3   4

count=0

Spiral Display spiral-matrix/

	0	1	2	3	4
0	1	2	3	4	5
1	6	7	8	9	10
2	11	12	13	14	15
3	16	17	18	19	20

count=0

count = 20

$SR = \cancel{X}\ 2$

$SC = 1$

$eR = \cancel{Z}\ 1$

$eC = \cancel{3}\ 2$

$SR = 0 \qquad eR = arr.length - 1$
$SC = 0 \qquad eC = arr[0].length - 1$

$while\ (count < arr.length \times arr[0].length\ )\ \{$

→ $\bullet\ TL \to TR$
$(arr[SR][SC] \to arr[SR][eC],\ count++)$ / $SR++$

$\bullet\ TR \to BR$
$(arr[SR][eC] \to arr[eR][eC],\ count++)$ / $eC--$

$\bullet\ BR \to BL$
$(arr[eR][eC] \to arr[eR][SC],\ count++)$ / $eR-$

$\bullet\ BL \to TL$
$(arr[eR][SC] \to arr[SR][SC],\ count++)$ / SC

$\}$

$$\begin{array}{cccc} & 0 & 1 & 2 & 3 \\ 0 & [& 1,2,3,4 &] \end{array}$$

$$s_{r} = \cancel{\varnothing} \, 1 \rightarrow$$

$$sc = 0$$

$$er = 0$$

$$ec = \cancel{3} \, 2$$

$$count = \cancel{\varnothing} \, 4$$

$$\begin{array}{l} (0,0) \quad \cancel{\rightarrow} (0,3) \\ (0,2) \rightarrow (0,0) \end{array}$$