

L9

2D arrays

For Discord email - support@learnyard.com

What are 2D Arrays ?

1	2	3
---	---	---

4	5	6
---	---	---

7	8	9
---	---	---

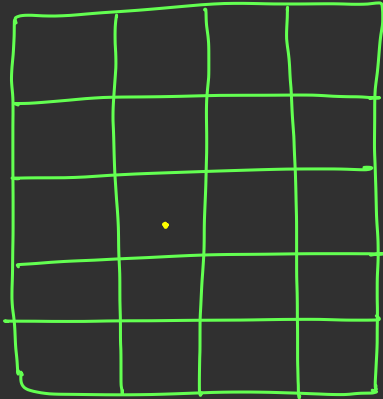


1	2	3
4	5	6
7	8	9

col 2 3

row 2 3

Use-case of 2D Arrays



→ Marks → Student

→ Chessboard

→ Robot / Maze

Declaring different 2D arrays

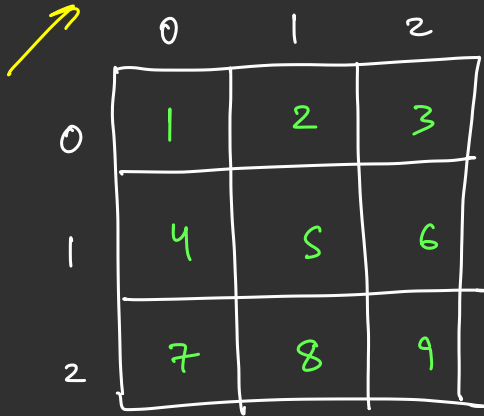
✓ `datatype arrayname[] = new datatype[size];`

✓ `datatype arrayname[][] = new datatype[n][m];`

$n \rightarrow \text{row}$
 $m \rightarrow \text{column}$

arr[rI][cI]

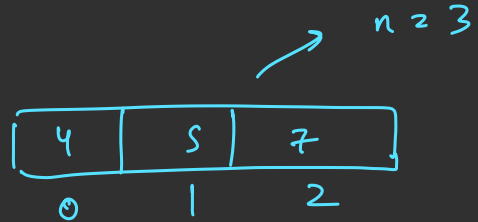
Element Access in 2D array and Indexing in 2D array



A 3x3 grid representing a 2D array. The columns are indexed 0, 1, 2 from left to right. The rows are indexed 0, 1, 2 from top to bottom. The elements in the grid are: Row 0: 1, 2, 3; Row 1: 4, 5, 6; Row 2: 7, 8, 9.

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

→ row index



A 1x3 grid representing a 1D array. The elements are 4, 5, 7. The indices below are 0, 1, 2. An arrow points to the index 2 with the text n=3.

4	5	7
---	---	---

0 1 2

→ n = 3

$e \rightarrow (rI, cI)$

→ column index

	0	1	2
0	1 0,0	2 0,1	3 0,2
1	4 1,0	5 1,1	6 1,2
2	7 2,0	8 2,1	9 2,2

(2,2)

$arr[0][2] \rightarrow 3$

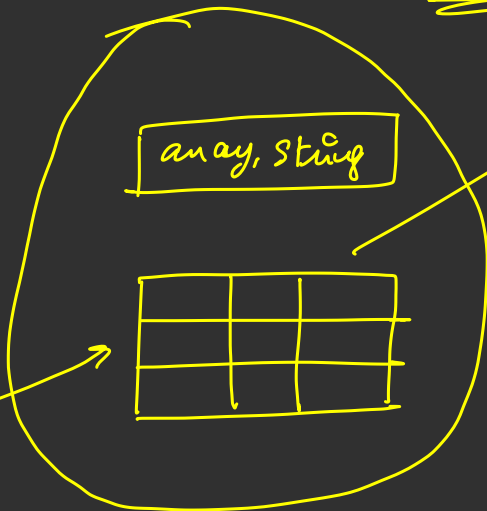
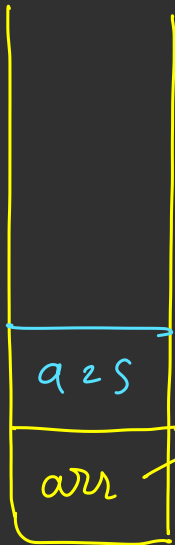
Memory Allocation of 2D Array

Stack

Heap

2D

int arr



Print Row wise traversal of 2D array

	0	1	2
0	1 0,0	2 0,1	3 0,2
1	4 1,0	5 1,1	6 1,2

outer \rightarrow row

inner \rightarrow column

Nested Loop $\begin{cases} \rightarrow \text{outer loop} \\ \rightarrow \text{inner loop} \end{cases}$

Print Column wise traversal of 2D array

	0	1	2
0	1	2	3
1	4	5	6

1	4
2	5
3	6

outer \rightarrow column

inner \rightarrow row

0, (0 - - 1)
1, (0 - - - 1)
2, (0 - - - 1)

Sum of each row and each column in 2D array

	0	1	2
0	1	2	3
1	4	5	6

fixed row
for (int i = 0; i < n; i++)

int sum = 0;

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

sum += arr[i][j];

}

S.O.Dln(sum);

}

Find sum of diagonal elements in 2D array

1
0, 0

2
0, 1

3
0, 2

4
1, 0

5
1, 1

6
1, 2

7

8

9

2, 0

2, 1

2, 2

$$rI = z = cI$$

$$i^0 = z = j^0 \quad \checkmark$$

$$i^0 + j^0 = z = n - 1$$

4+4 ←

1 0,0	2 0,1	3 0,2	4 0,3
5 1,0	6 1,1	7 1,2	8 1,3
1 2,0	2 2,1	3 2,2	4 2,3
5 3,0	6 3,1	7 3,2	8 3,3

$n \rightarrow \text{row}$
 $m \rightarrow \text{column}$

$\left. \begin{array}{l} n \rightarrow \text{row} \\ m \rightarrow \text{column} \end{array} \right\} \begin{array}{c} \text{ } \\ \text{ } \end{array} \left(\begin{array}{cccc} n & 2 & 2 & m \end{array} \right) \rightarrow \text{square}$

$\left(\begin{array}{ccc} m & 1 & 2 & n \end{array} \right) \rightarrow \text{Rectangle matrix}$

Print Only Upper Triangular Elements

$$i >= j$$

1
0, 0

2
0, 1

3
0, 2

4
1, 0

5
1, 1

6
1, 2

7

2, 0

8

2, 1

9

2, 2

1	2	3
—	5	6
—	—	9

Interchange the diagonals in 2D array

Square
Matrix



Original matrix



Matrix diagonal
interchanged

0,0

1

1,0

4

2,0

7

0,1

2

1,1

5

2,1

8

0,2

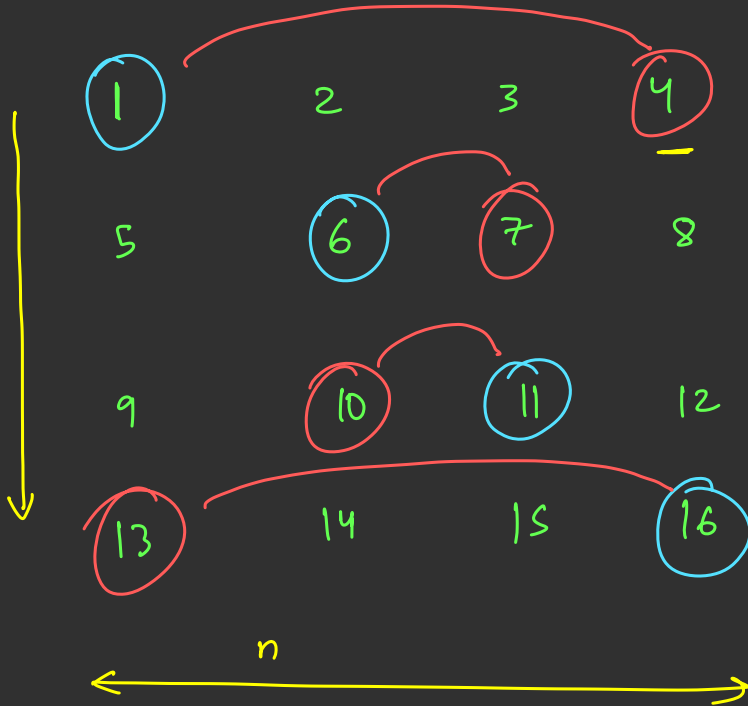
3

1,2

6

2,2

9



$$(i, j)$$

$$(i, n-1-j)$$

- $(0, 0) \rightarrow (0, 3)$
- $(1, 1) \rightarrow (1, 2)$
- $(2, 2) \rightarrow (2, 1)$
- $(3, 3) \rightarrow (3, 0)$

Practice and Homework Questions

Homework questions -

1. <https://codeforwin.org/c-programming/c-program-to-add-two-matrices>
2. <https://codeforwin.org/c-programming/c-program-to-subtract-two-matrices>
3. <https://codeforwin.org/c-programming/c-program-to-find-lower-triangular-matrix>
4. <https://codeforwin.org/c-programming/c-program-to-find-sum-of-upper-triangular-matrix>
5. <https://codeforwin.org/c-programming/c-program-to-find-sum-of-lower-triangular-matrix>

Thank You!

Please practice more questions and examples as above !!