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Data Structures
Level 1

Matrix Data Structure

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Matrix Data Structure:

Matrix: A matrix represents a collection of numbers arranged in an order of rows and columns.

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Matrix Data Structure:

	Col 1	Col 2	Col 3	Col 4
Row 1	x[0][0]	x[0][1]	x[0][2]	x[0][3]
Row 2	x[1][0]	x[1][1]	x[1][2]	x[1][3]
Row 3	x[2][0]	x[2][1]	x[2][2]	x[2][3]

	Col 1	Col 2	Col 3	Col 4
Row 1	1	2	3	4
Row 2	5	6	7	8
Row 3	9	10	11	12

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Time Complexity on The Matrix?

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Time Complexity on The Matrix?

- **Insertion:** We try to insert a value to a particular array index position, as the array provides random access it can be done easily using the assignment operator.

```
arr[2][1] = 10;
```

- Time Complexity:
  - O(1) to insert a single element
  - $O(N^2)$ to insert all the matrix elements [where N is the size of the array]

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Time Complexity on The Matrix?

- **Access elements in Matrix:** Accessing Matrix elements become extremely important, in order to perform operations on arrays.

```
return arr[2][1];
```

- Time Complexity:
  - O(1) to insert a single element
  - $O(N^2)$ to access all the matrix elements [where N is the size of the array]

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Time Complexity on The Array?

- **Searching in Array:** We try to find a particular value in the matrix, in order to do that we need to access all the matrix elements and look for the particular value.

```
// searching for value 55 in the matrix;

Loop from i = 0 to 10:
Loop from j = 0 to 10:
    check if  arr[i][j] = 55:
        return true;
```

- Time Complexity:
  $O(N^2)$ [where N is the size of the array]

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