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Data Structures

Level 1

Array

Data Structure

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Array Data Structure:

Array: is a variable that can store multiple values of the same type.

Array: An array is a collection of data items stored at contiguous memory locations.

The idea is to store multiple items of the (homogeneous – same type) together.

Array Data Structure:

```
int x[5] = { 22, 18, 2, 55, 520 };
```

Array
Members



x[0]

x[1]

x[2]

x[3]

x[4]

22

18

2

55

520



Array Values

Index starts
from zero



0

1

2

3

4



Array Indexes

1000

1004

1008

1012

1016



Memory addresses

Memory

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Is Array Always Of Fixed Size?

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Is Array Always of Fixed Size?

Depends on the language for example: In C language, the array has a fixed size meaning once the size is given to it, it cannot be changed i.e. you can't shrink it nor can you expand it.

In C++ you can have dynamic arrays.

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Operations on The Array?

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Operations on The Array?

- Arrays allow random access to elements. This makes accessing elements by position faster.
- Hence operation like searching, insertion, and access becomes really efficient.
- Array elements can be accessed using the loops.

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Time Complexity on The Array?

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Time Complexity on The Array?

- **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] = 10;
```

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

Time Complexity on The Array?

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

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

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

Time Complexity on The Array?

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

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

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

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

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Applications of The Array?

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Applications of The Array?

- Array stores data elements of the same data type.
- Arrays are used when the size of the data set is known.
- Used in solving matrix problems.
- Applied as a lookup table in computer.
- Databases records are also implemented by the array.
- Helps in implementing sorting algorithm.
- The different variables of the same type can be saved under one name.
- Arrays can be used for CPU scheduling.
- Used to Implement other data structures like Stacks, Queues, Heaps, Hash tables, etc.



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Thank You

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