

What is Data Structure?

The data structure name indicates itself that **organizing the data in memory**.

The data structure is not any programming language **like C, C++, java, etc.** It is a **set of algorithms that we can use in any programming language** to structure the data in the memory.

Data structure mainly specifies the following things:

1. **Organization of Data**
2. **Accessing methods**
3. **Degree of associativity**
4. **Processing alternatives for information**

Data Structure can be classified in to two broad categories:

1. Primitive data structure
2. Non primitive data structure

1) Primitive Data Structure

Primitive data structure are basic structures and are **directly operated upon by machine instructions**. Primitive data structure has different representation on the different computers. Primitive data structure is divided in to four categories:

- **Integer**
- **Floating point numbers**
- **Character constants**
- **Pointers**



2) Non primitive data structure

Non-primitive data structure are **more sophisticated data structures**. Non-primitive data structure is **derived from the primitive data structures**. The non-primitive data structures emphasize on **structuring of a group of homogeneous (same type)** or heterogeneous (different type) data items.

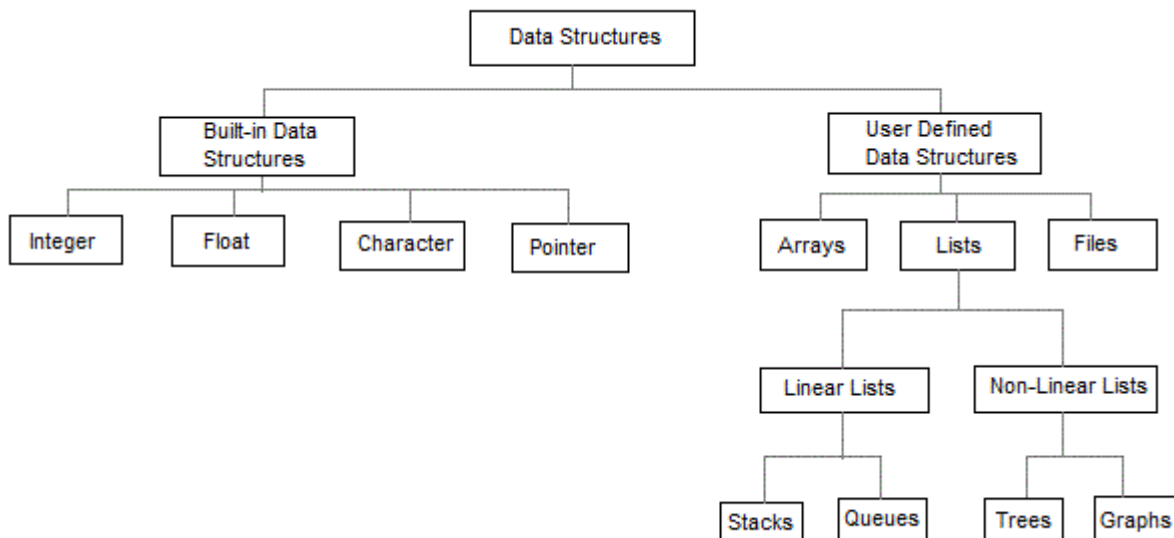
Non-primitive data structure are categorized into following:

- **Array**
- **Linked list**
- **Queue**
- **Tree**
- **Graph**

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Data structure operations

- **Traversing** Accessing each element exactly once, is known as traversing. It is also known as visiting.
- **Insertion** Adding a new element to data structure.
- **Deletion** Removing an element from the data structure.
- **Searching** Finding the location of an item in data structure.
- **Sorting** Arranging the items in ascending or descending order is known as sorting.

What is an Algorithm?

An algorithm is a finite set of instructions or logic, written in order, to accomplish a certain predefined task. Algorithm is not the complete code or program, it is just the core logic(solution) of a problem, which can be expressed either as an informal high level description as pseudocode or using a flowchart.

Characteristics of an Algorithm

The following are the characteristics of an algorithm:

- **Input:** An algorithm has some input values. We can pass 0 or some input value to an algorithm.
- **Output:** We will get 1 or more output at the end of an algorithm.

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- **Unambiguity:** An algorithm should be unambiguous which means that the instructions in an algorithm should be clear and simple.
- **Finiteness:** An algorithm should have finiteness. Here, finiteness means that the algorithm should contain a limited number of instructions, i.e., the instructions should be countable.
- **Effectiveness:** An algorithm should be effective as each instruction in an algorithm affects the overall process.
- **Language independent:** An algorithm must be language-independent so that the instructions in an algorithm can be implemented in any of the languages with the same output.

Importance of Algorithms

1. **Theoretical importance:** When any real-world problem is given to us and we break the problem into small-small modules. To break down the problem, we should know all the theoretical aspects.
2. **Practical importance:** As we know that theory cannot be completed without the practical implementation. So, the importance of algorithm can be considered as both theoretical and practical.

An algorithm is said to be efficient and fast, if it takes less time to execute and consumes less memory space. The performance of an algorithm is measured on the basis of following properties:

1. Time Complexity
2. Space Complexity

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