

MOD-1

LECTURE-1

1. Definition:

Data structures are a specific way of organizing data in a specialized format on a computer so that the information can be organized, processed, stored, and retrieved quickly and effectively. They are a means of handling information, rendering the data for easy use.

Every application, piece of software, or programs foundation consists of two components: algorithms and data. Data is information, and algorithms are rules and instructions that turn the data into something useful to programming.

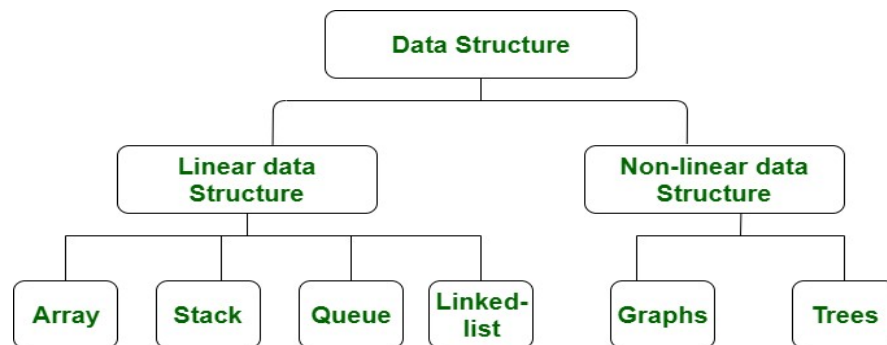
Put another way, remember these two simple equations:

Related data + Permissible operations on the data = Data Structures

Data structures + Algorithms = Programs

2. Classification of Data Structures:

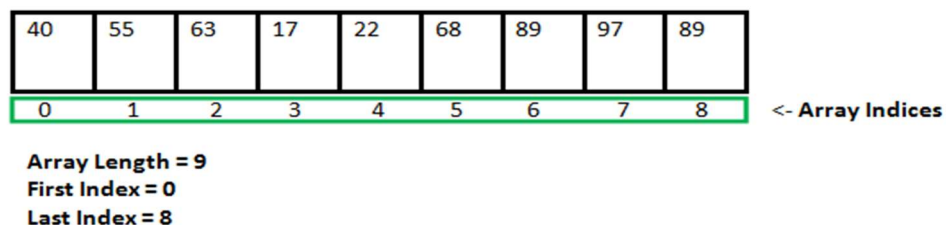
2.1.Linear Vs Non-Linear



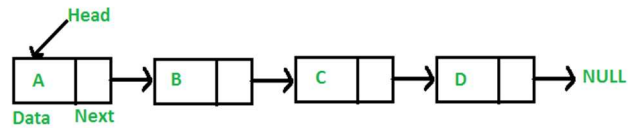
Data structure where data elements are arranged sequentially or linearly where each and every element is attached to its previous and next adjacent is called a linear data structure. In linear data structure, single level is involved. Therefore, we can traverse all the elements in single run only. Linear data structures are easy to implement because computer memory is arranged in a linear way. Its examples are array, stack, queue, linked list, etc.

Data structures where data elements are not arranged sequentially or linearly are called non-linear data structures. In a non-linear data structure, single level is not involved. Therefore, we can't traverse all the elements in single run only. Non-linear data structures are not easy to implement in comparison to linear data structure. It utilizes computer memory efficiently in comparison to a linear data structure. Its examples are trees and graphs.

2.2.Static Vs Dynamic



Static



Dynamic

In Static data structure the size of the structure is fixed. The content of the data structure can be modified but without changing the memory space allocated to it. Eg. Array

In Dynamic data structure the size of the structure is not fixed and can be modified during the operations performed on it. Dynamic data structures are designed to facilitate change of data structures in the run time. Eg. Linked List

Static Data structure has fixed memory size whereas in Dynamic Data Structure, the size can be randomly updated during run time which may be considered efficient with respect to memory complexity of the code. Static Data Structure provides easier access to elements with respect to dynamic data structure. Unlike static data structures, dynamic data structures are flexible.

2.3. Homogenous Vs Non-Homogenous

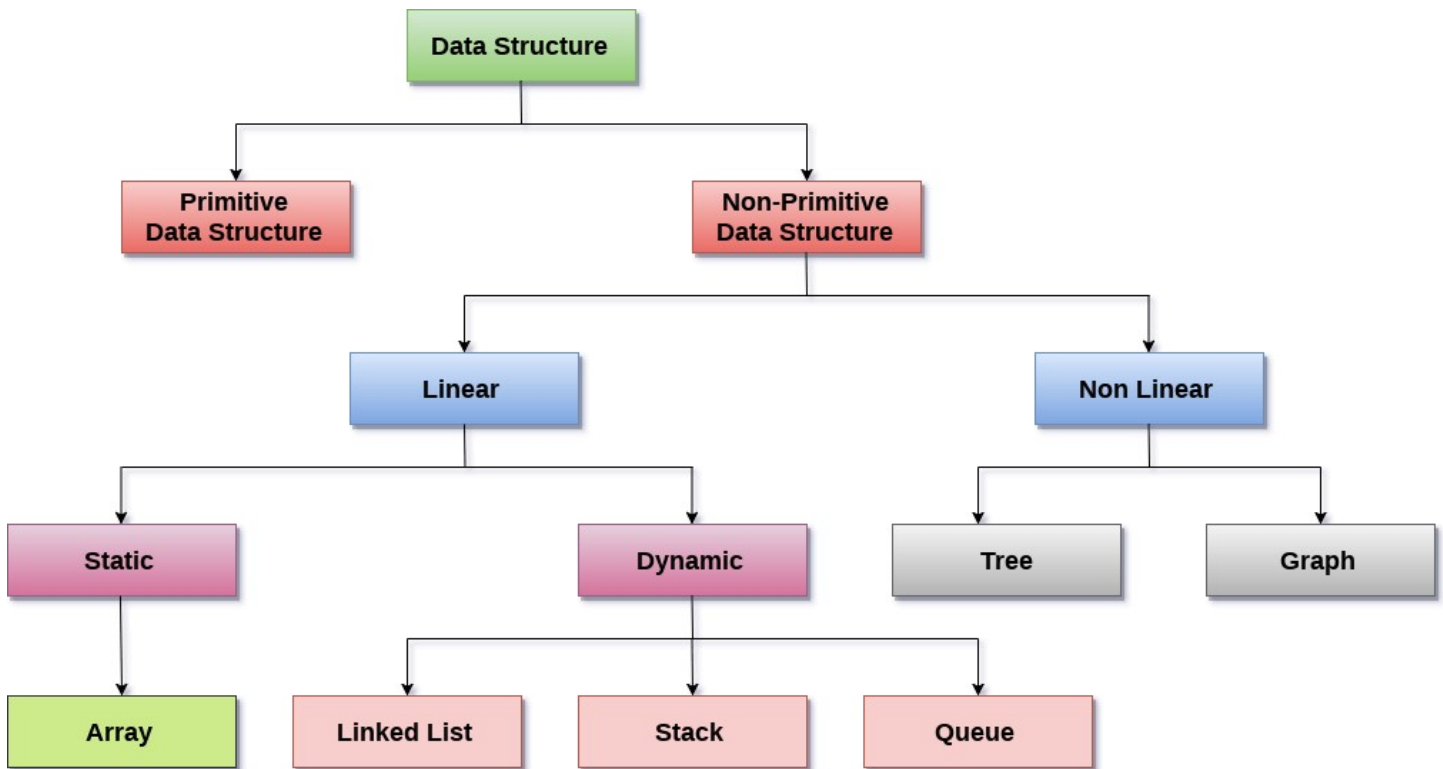
Homogeneous data structure are those structures that contain only similar type of data.

EXAMPLE: like a data structure containing only float and integer values. Simplest example is an array.

Heterogeneous data structure are those structures that contains a variety or dissimilar type of data.

EXAMPLE: a data structure that can contain various data of different types like integer, float and character.

3. Elementary Data Organization



Data are simply values or sets of values. A single unit of value is called a Data item. Data items are divided into subgroups called Group items.

An Entity is something that has certain attributes which may be assigned values. An entity with similar attributes is called an Entity set.

E.g.: -

Entity: Employee

Attribute: Name, Age phone

Values: "ABC", 42, 9847092568

Entity set: All employees in an organization.

Meaningful or processed data is called information. The collection of data is organized into the hierarchy of fields, records and files. A single elementary unit of information representing an attribute of an entity is called a Field.

Records are the collection of field values of a given entity. Collection of records of the entities in a given entity set is called a file. Each record may contain a certain field that uniquely represents that record. Such a field K is called a primary key.

Based on their length, records may be classified into two. They are,

Fixed-length record: All record contains the same data items with the same amount of space assigned to each items.

Variance length record: Records may contain different length data items.