



Data Structures – Lesson 1

B.Sc. 3rd Semester, Paper C5

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Algebraic Expressions

An ***algebraic expression*** is a formula constructed with variables and numbers using addition, subtraction, multiplication, division, and taking roots.

Examples of algebraic expressions are

$$3x^2 - 2x + 4, \quad \frac{x^2 + 3}{\sqrt{3}x^3 - 2x - 4}, \quad \frac{(x^{1/2} + y)^{1/3}}{(4y^2 - (x + 4)^{1/2})^{1/4}}$$

Examples of non-algebraic expressions are $\sin(x)$, 2^x , $\log(x + 1)$.

The algebraic expressions $a_n x^n + a_{n-1} x^{n-1} \dots + a_1 x + a_0$ where a_i are numbers, are called ***polynomials*** (in x).

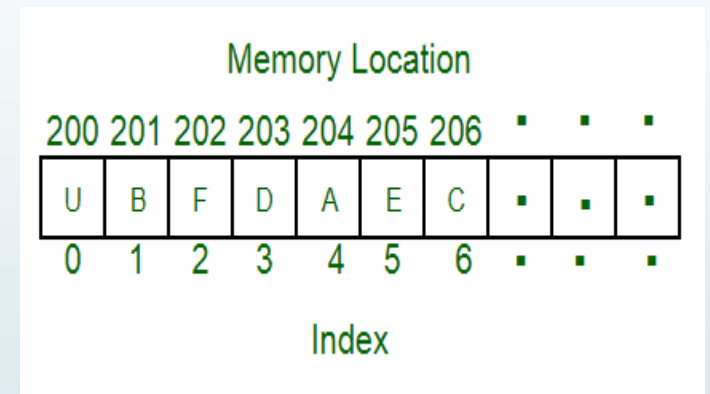
Data Types

A data type, in programming, is a classification that specifies which type of value a variable has and what type of mathematical, relational or logical operations can be applied to it without causing an error. A string, for example, is a data type that is used to classify text and an integer is a data type used to classify whole numbers.

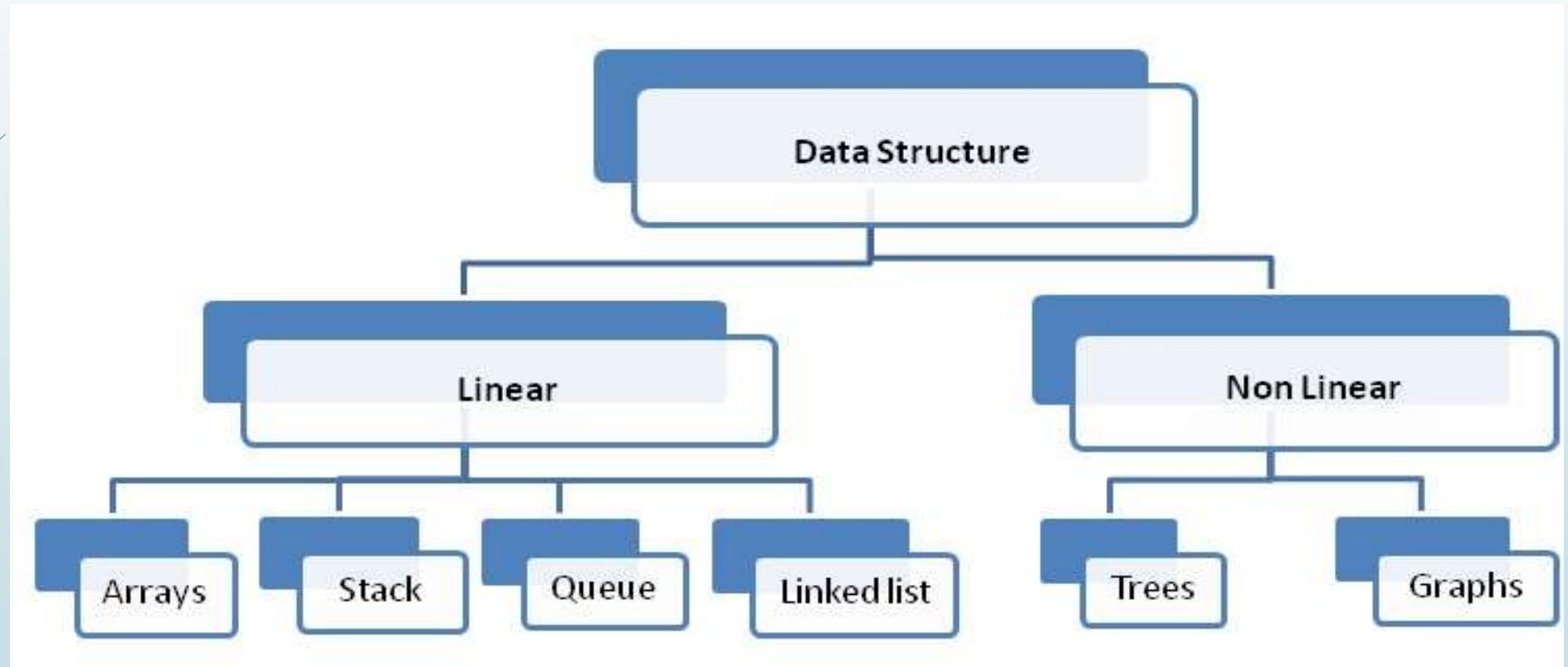
Data Type	Used for	Example
String	Alphanumeric characters	hello world, Alice, Bob123
Integer	Whole numbers	7, 12, 999
Float (floating point)	Number with a decimal point	3.15, 9.06, 00.13
Character	Encoding text numerically	97 (in ASCII, 97 is a lower case 'a')
Boolean	Representing logical values	TRUE, FALSE

Data Structures - Definition

- ▶ A **data structure** is a way of organizing data in a computer so that it can be used effectively.
- ▶ For example, we can store a list of items having the same data-type using the *array* data structure.

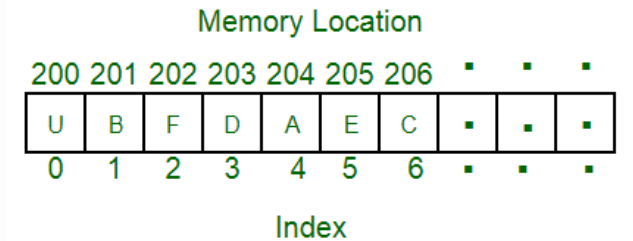


Data Structure Classification



Array Data Structure

- ▶ An array is a collection of items stored at contiguous memory locations. The idea is to store multiple items of the same type together. This makes it easier to calculate the position of each element by simply adding an offset to a base value, i.e., the memory location of the first element of the array (generally denoted by the name of the array).

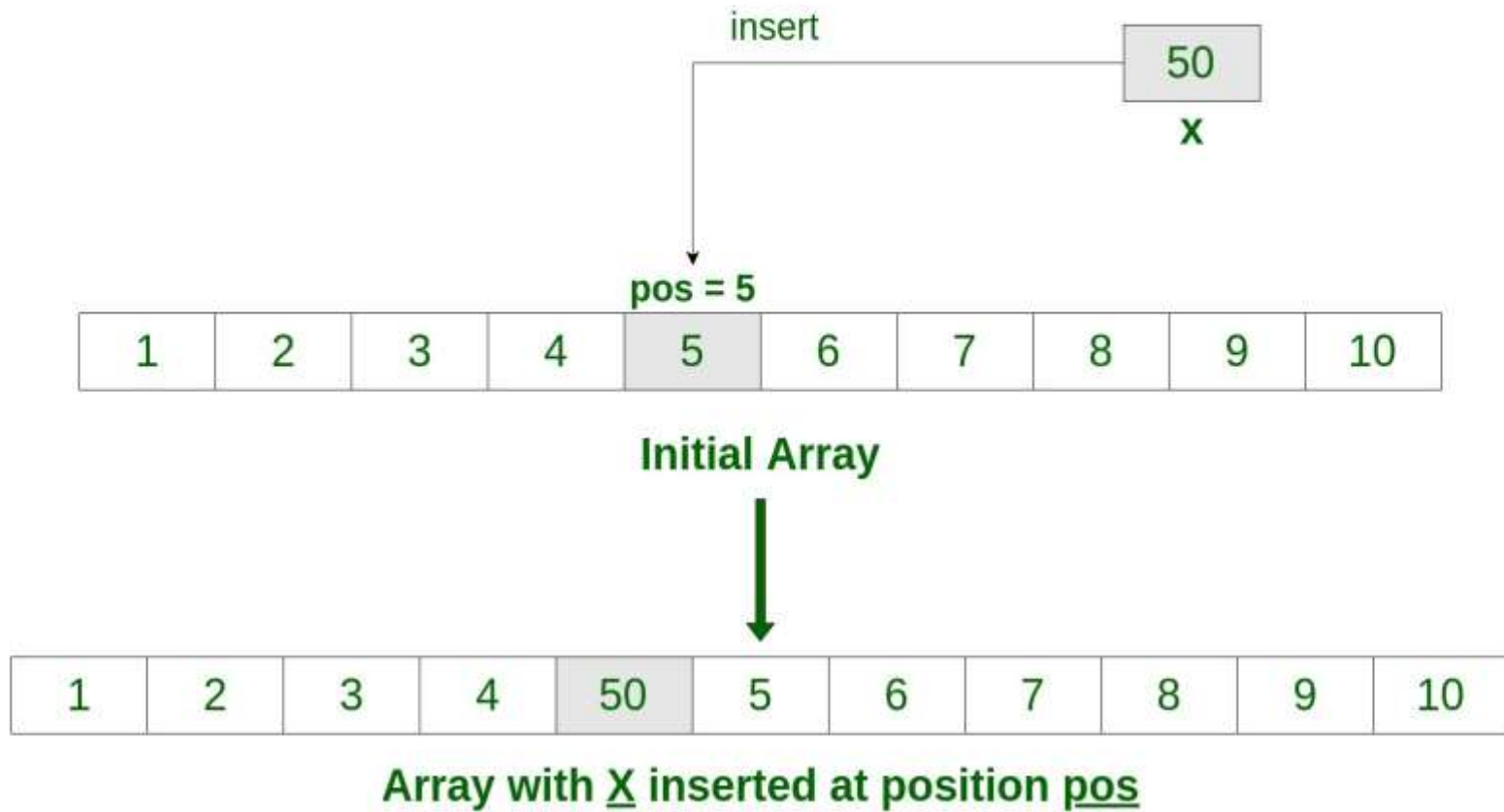




Array Insertions

- Insertion at the beginning of an array
- Insertion at the given index of an array
- Insertion at the end of an array

Insert an element at a specific position in an Array.





Array Deletions

- Deletion at the beginning of an array
- Deletion at the given index of an array
- Deletion at the end of an array

Delete at any position

