What is data structure?

Ans: (i) Data structure is a representation of logical relationships between element of data.

(ii) Data structure is a way of organizing data item by considering its relationship to each other.

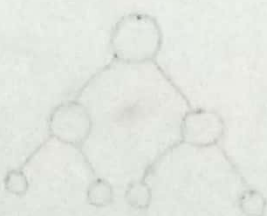
Algorithm + Data structure = Program

(iii) Data structure is the building block of a Program.

Data structure = organized data + operation

Types of data structure:

(i) Linear and nonlinear.
(ii) Homogenous and Non homogenous.
(iii) static and dynamic.



What is algorithm ?

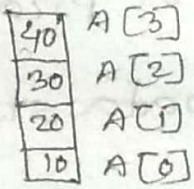
Ans: Algorithm is a step-by-step finite sequence of instruction to solve a well defined computational problem.

complexity:

Two types : (i) Time complexity. → কত সময়
(ii) Space complexity. → কত মেমোরি

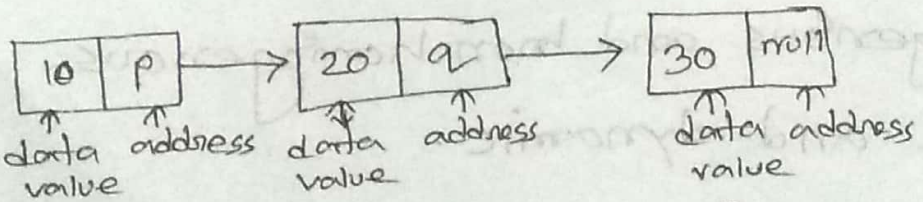
Data type : [structure]

(i) Array type data: A[0], A[1], A[2]

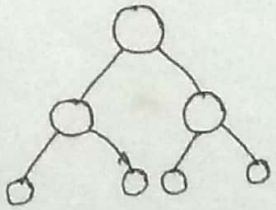


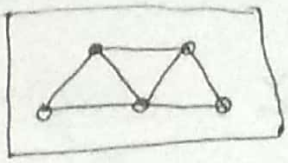
(ii) vector type data: $A = \begin{pmatrix} A_1 \\ A_2 \\ \vdots \\ A_n \end{pmatrix}$

(iii) Linked list type data:

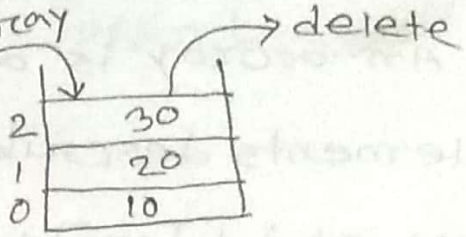


(iv) Tree type data:

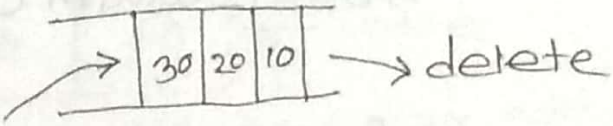


(v) Graph type data: 

(vi) stack type data:



(vii) Queue type data:



Basic operation of data structure:

(i) Traversing.
(ii) searching.
(iii) Inserting.
(iv) Deleting.
(v) sorting.
(vi) merging.

Array

Date: 15-11-15

Array: An array is a collection of homogeneous data elements described by a single name.

Exm: Abdul [100];

Abdul_Rahim [200];

☞ **Types of array:**

(i) one dimentional array.

(ii) multidimentional array.

* (i) **onedimentional array or linear array:**

It is a set of 'n' finite member of homogeneous data elements. such as:

(i) Index is consisting with n consecutive members.

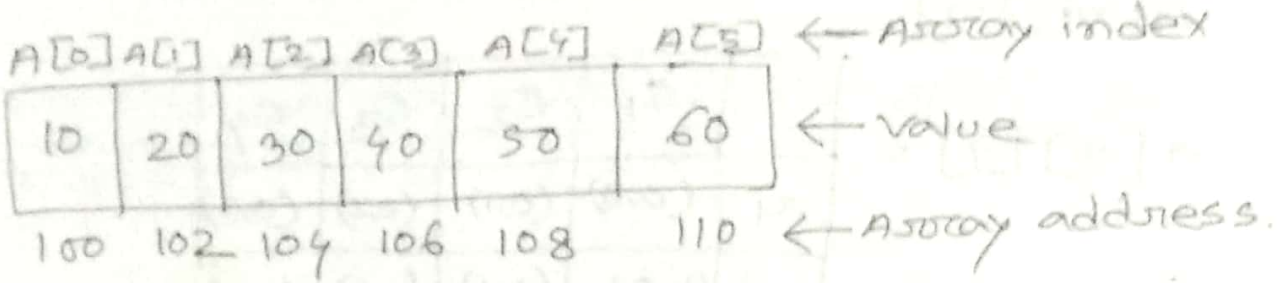
(ii) The elements of the array are stored respectively.

(iii) N is the maximum length or size of array.

A[0], A[1], A[2], ... A[n-1]

↓ Lower bound

↘ upper bound



A[70] ← address কত হবে তার জন্য নিম্নের সূত্রটি use করতে হবে।

Add(A[k]) = Base add(A) + w (k - lower bound)

[w = Datatype of array.
k = input index.]

Exm:

Add(A[4]) = 100 + 2(4 - 0)

= 100 + 8

= 108.

* (ii) Two dimentional array: A two dimentional array is a collection of elements placed in m rows and n columns. It is also called a matrix.

* Types of two dimentional array:

(i) row major order.

(ii) column major order.

A[m] [n]

A[3] [4] =

	c_1	c_2	c_3	c_4
r_1	(0,0)	(0,1)	(0,2)	(0,3)
r_2	(1,0)	(1,1)	(1,2)	(1,3)
r_3	(2,0)	(2,1)	(2,2)	(2,3)

For row major order:

a(0,0)	a(0,1)	a(0,2)	a(0,3)	a(1,0)	a(1,1)	a(1,2)	a(1,3)
10	20	30	40	50	60	70	80
100	102	104	106	108	110	112	114

Row major-এর ক্ষেত্রে নিম্নোক্ত সূত্রটি use করতে হবে।

$$Add(A[i][k]) = Base(A) + w\left[n(i - row\_lowerbound) + (k - column\_lowerbound)\right]$$

$m = 3, n = 4$

$$Add(A[0][3]) = 100 + 2\left[4(0-0) + (3-0)\right]$$
$$= 100 + 2(0+3)$$
$$= 106.$$

For column major order:

a(0,0)	a(1,0)	a(2,0)	a(0,1)	a(1,1)	a(2,1)	a(0,2)	a(1,2)
10	20	30	40	50	60	70	80
100	102	104	106	108	110	112	114

column major এর ক্ষেত্রে নিম্নোক্ত সূত্রটি use করতে হবে।

$$Add(A[i][k]) = Base(A) + w[m(k - column\text{-}lowerbound) + (i - Row.\ Lowerbound)]$$

$m = 3, n = 4$

$$Add(A[1][1]) = 100 + 2[3(1-0) + (1-0)]$$

$$= 100 + 2(3+1)$$

$$= 108.$$