

"Each day is a new beginning, new strength, new hope and new thoughts  
take a deep breath and start over"

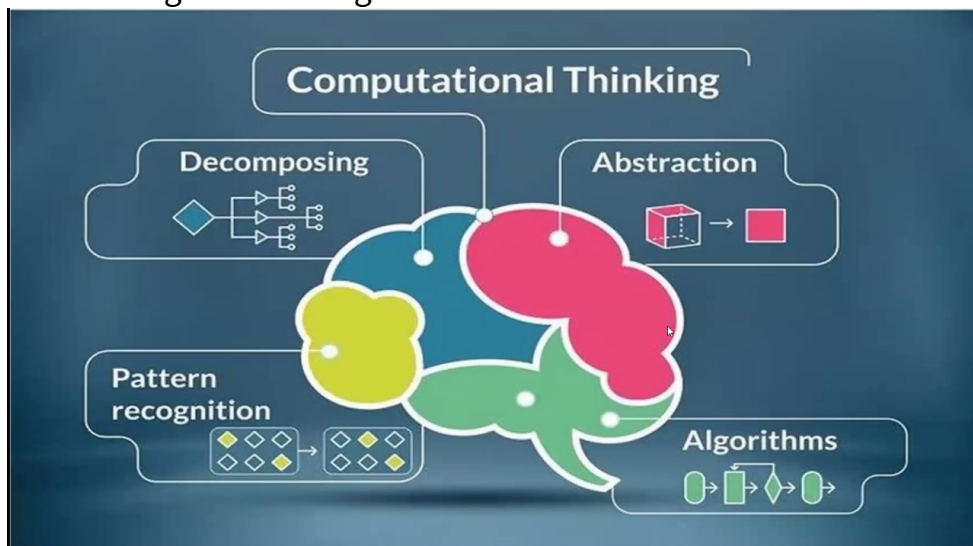
# Algorithms and Data Structure

***\*\*Practice\*\*Practice\*\*Practice\*\****

**Date: 19/10/2023**

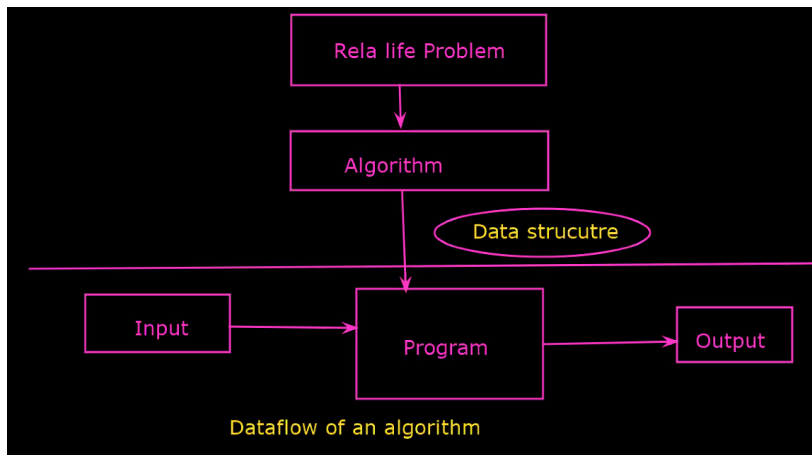
## **1. Problem Solving and Computational Thinking : -**

- **Algorithm + Data Structure = Program**
- **Computational Thinking**
  - Decomposition
  - Pattern Recognition
  - Abstraction
  - Algorithm Design



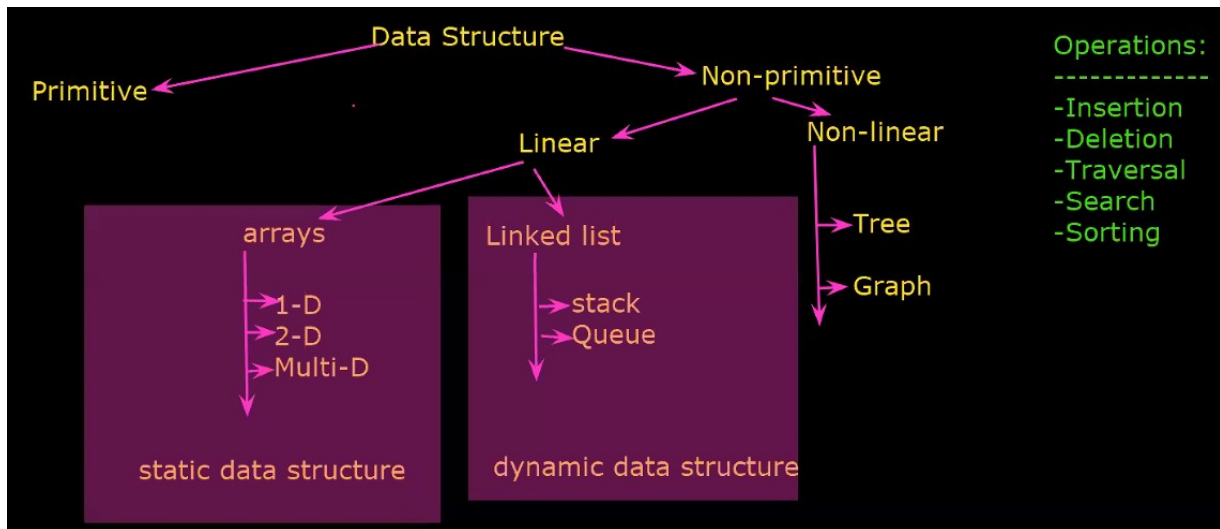
## **2. Data Structure and Algorithms :**

- **Algorithm :**
  - Defination
  - Characteristics
  - Need Of Algorithm
  - Algorithm Strategies

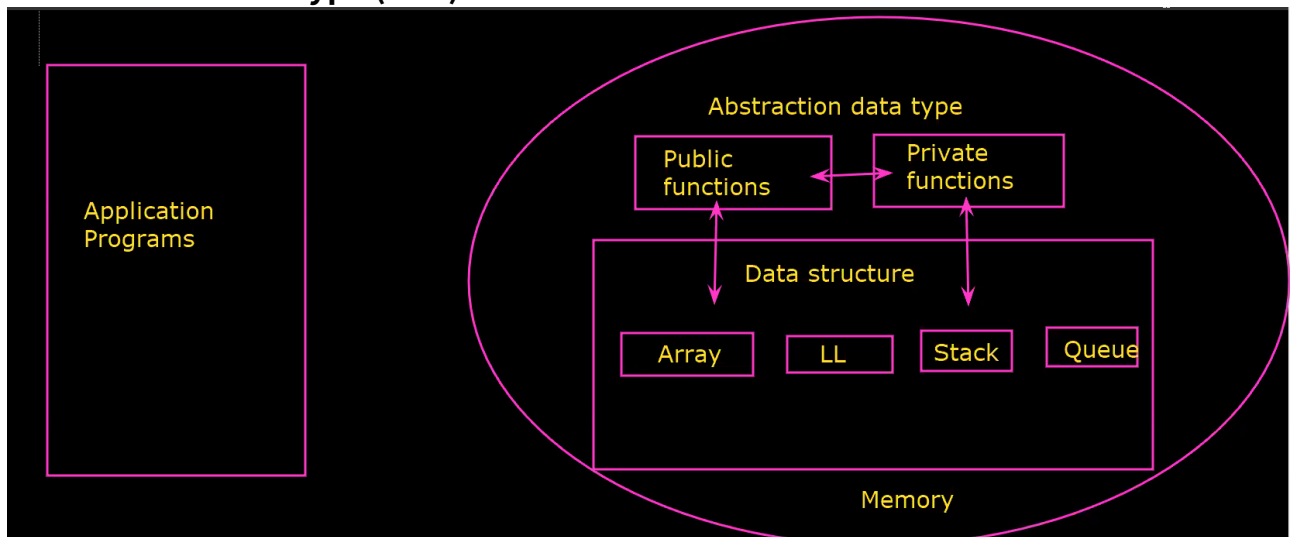


## • Data Structure :

- **Defination**
- **Types of Data Structure**
  - Linear DS
    - Arrays (static DS)
      - 1D array
      - 2D array
      - Multi D array
  - Linked list (dynamic DS)
    - stack
    - Queue
  - Non Linear DS
    - Tree
    - Graph
- **Operations**
  - Insertion
  - Deletion
  - Traversal
  - Search
  - Sorting

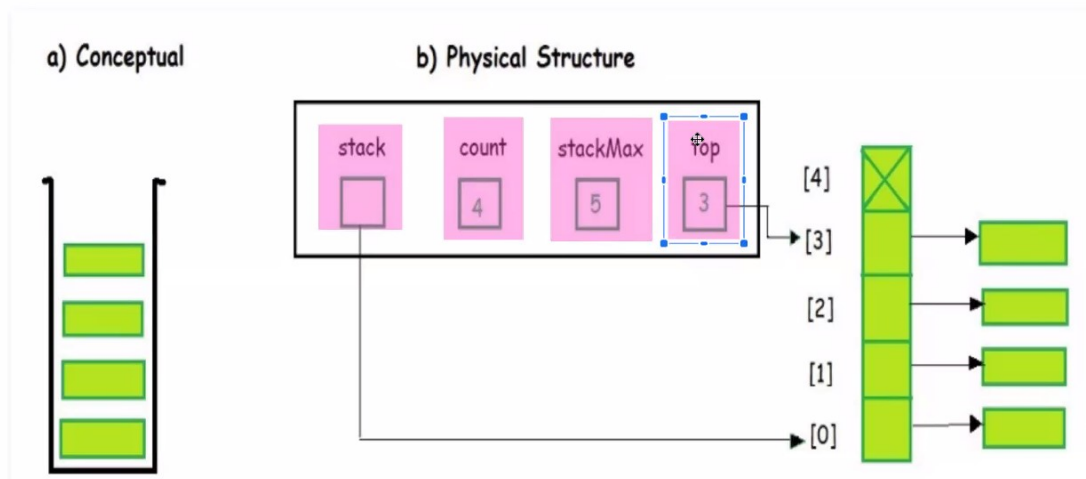


## • Abstract Data Type (ADT)



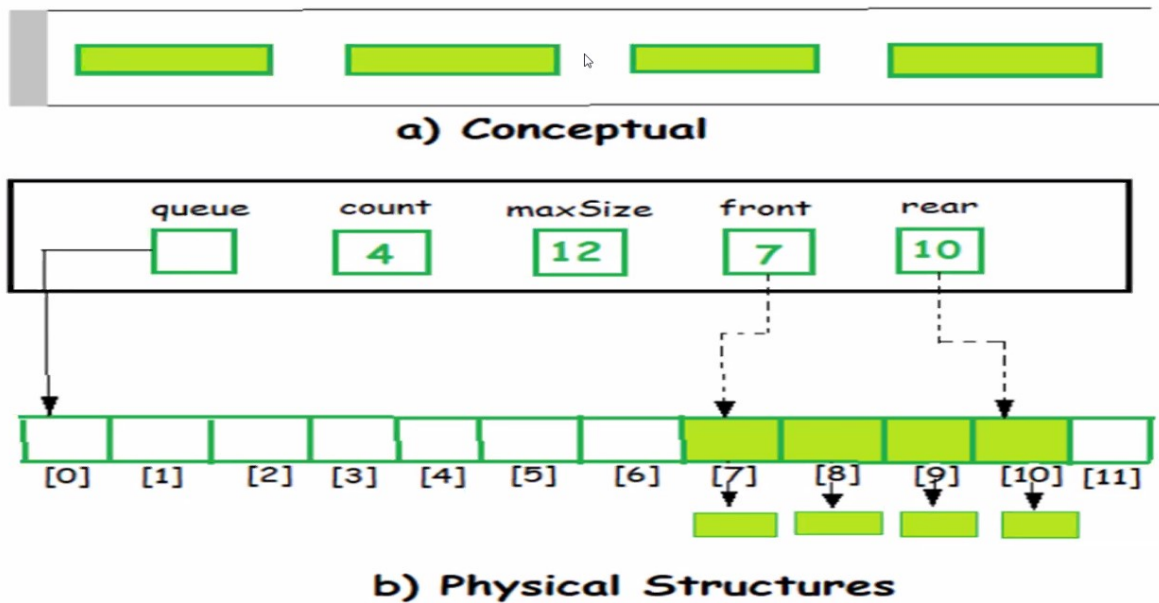
- Stack ADT

## Stack ADT



- Queue ADT

## Queue ADT

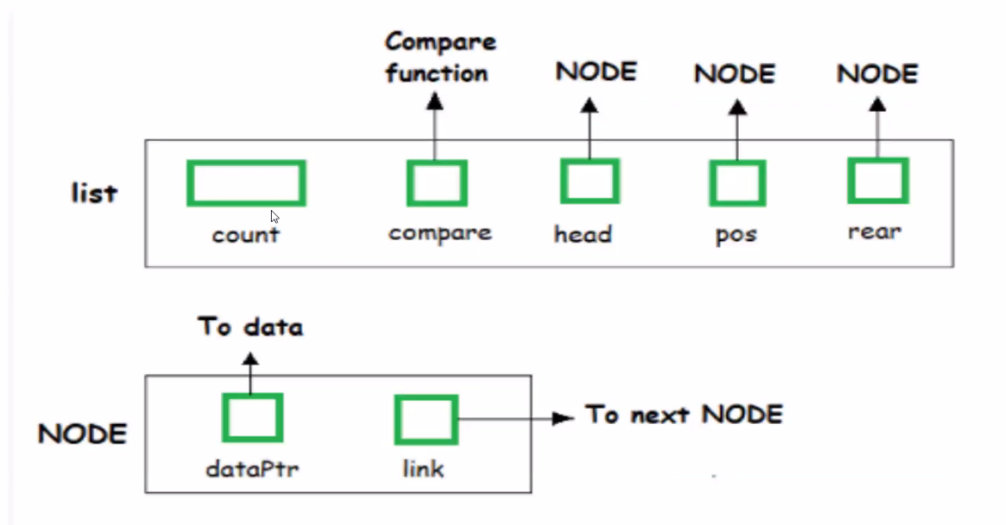


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- List ADT

## List ADT



### • Recursion :

- Direct Recursion

```

class Recursion2{
    static int i=0;
    static void show()//Recursive function
    {
        ++i;
        if(i<5)//termination condition
        {
            System.out.println("Hello Gamechangers.....");
            System.out.println("Game kab change karoge.....");
            show(); //Recursive function ko call kiya hai.
        }
    }

    public static void main(String args[]){
        show();
    }
}

```

C:\Windows\system32\cmd.e. x + v

D:\Test>javac Recursion2.java

D:\Test>java Recursion2

Hello Gamechangers.....  
Game kab change karoge.....  
Hello Gamechangers.....  
Game kab change karoge.....  
Hello Gamechangers.....  
Game kab change karoge.....  
Hello Gamechangers.....  
Game kab change karoge.....  
Hello Gamechangers.....  
Game kab change karoge.....

D:\Test>

### ◦ Indirect Recursion

```

class Recursion3{
    static int show(int n)//Recursive function
    {
        if(n==4)
            return n;
        else
            return 2*show(n+1);
    }

    public static void main(String args[]){
        System.out.println(show(2));
    }
}

```

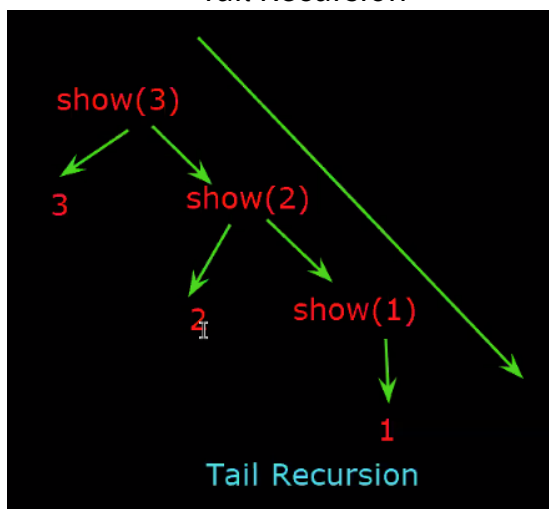
Handwritten notes and calculations:

$fun(n) = 2 * fun(n+1)$   
 $= 2 * 2 * fun(n+2)$   
 $= 2 * 2 * 2 * fun(n+3)$

$show(2) = 2 * show(3)$   
 $= 2 * 2 * show(4)$   
 $= 2 * 2 * (4)$

### ◦ Type of recursion :

- Tail Recursion



- Head Recursion

