

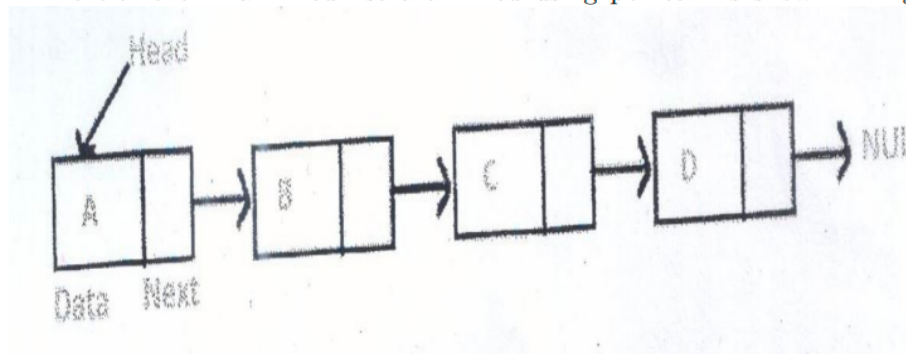
# DATA STRUCTURE = Linked List

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## 1 Introduction

- \* A linked list is a linear data structure, in which the element are not stored at contiguous memory location.
  - \* It consists of group of nodes in a sequence.
- In simple words, a linked list consists of nodes where each node contains a data field and a reference (link) to the next node in the list.
- \* Linked lists are used to create Trees and Graph.
  - \* The element in a linked list are linked using pointer As shown in Figure.



## 2 Advantages of Linked Lists

- \* They are dynamic in nature which allocates the memory when required.
- \* Insertion and deletion operation can be easily implemented.
- \* Linked List reduces the access time.

## 3 Disadvantages of Linked Lists

- \* The memory is wasted as pointer require extra memory for storage.
- \* No element can be accessed randomly; it has to access each node sequentially.
- \* Reverse Traversing is difficult in linked list.

## 4 Applications of Linked Lists

- \* Linked lists are used to implement stacks, queues, graphs, etc.
- \* Linked lists let you insert elements at the beginning and end of the list.
- \* In Linked Lists we don't need to know the size in advance.

## 5 The Operations on the Linked Lists

- \* Search: This operation involves the searching of an element in the linked list.
- \* Insertion: To add new node to data structure.
- \* Deletion: To delete a node from data structure.
- \* Merge: To merge two structures or more to constituting one structure.

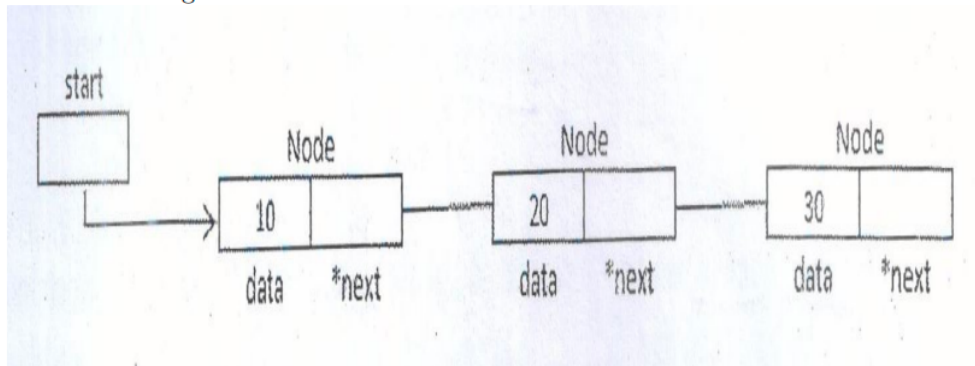
## 6 Types Of Linked Lists

There are four different implementations of linked list available, they are as follows.

- 6.1. Singly Linked List.
- 6.2. Doubly Linked List.
- 6.3. Circular Singly Linked List.
- 6.4. Circular Doubly Linked List.

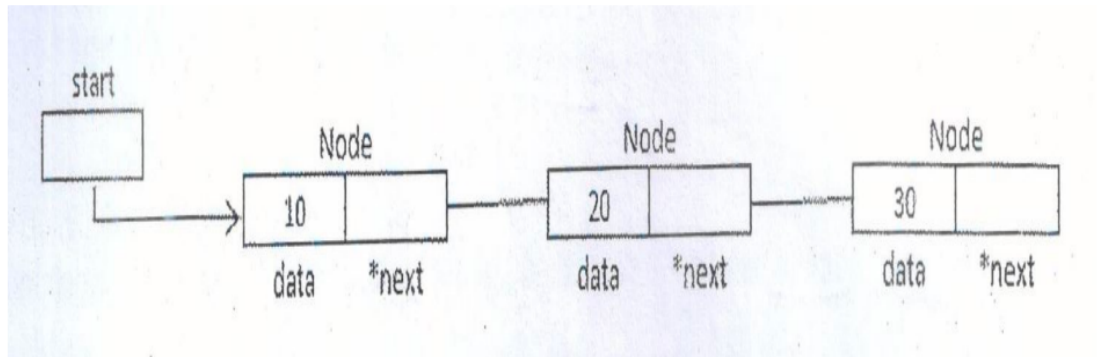
### 6.1 Singly Linked List

- \* Singly linked list contain nodes which have a data part as well as an address part i.e, next: which points to the next node in sequence of nodes.
- \* The operation we can perform on singly linked list are insertion, and deletion, As shown in Figure.



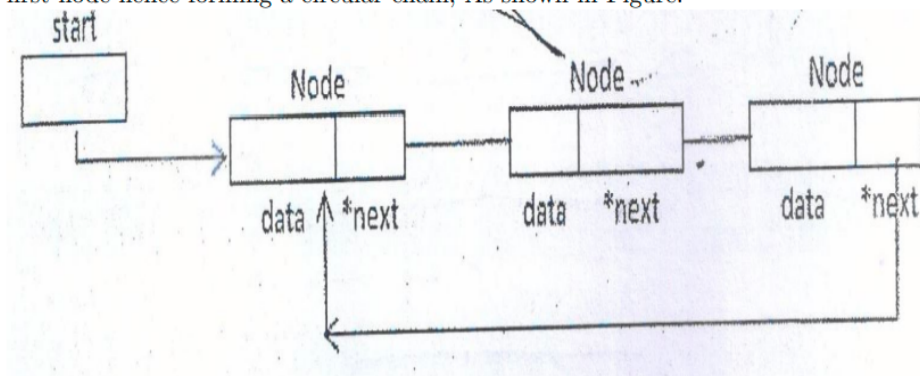
### 6.2 Doubly Linked List

- \* In a doubly linked list, each node contains a data part and two addresses, one for the previous node and other one for the next node, As shown in Figure.



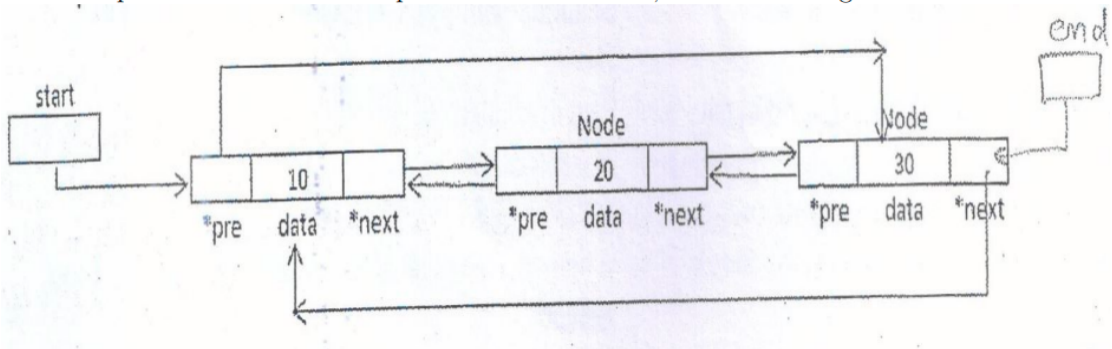
### 6.3 Circular Singly Linked List

\* In circular singly linked list the last node of the list holds the address of the first node hence forming a circular chain, As shown in Figure.



### 6.4 Circular Doubly Linked List

\* In circular doubly linked list the forward node points to the first node and backward pointer of the first node points to the last node, As shown in Figure.



## 7 Euation

A genearal mathical equation

$$\begin{aligned}(x+y)^3 &= (x+y)^2(x+y) \\&= (x^2 + 2xy + y^2)(x+y) \\&= (x^3 + 2x^2y + xy^2) + (x^2y + 2xy^2 + y^3) \\&= x^3 + 3x^2y + 3xy^2 + y^3\end{aligned}$$

## 8 Table

Create a simple table

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

## 9 Reference

<https://www.programiz.com/dsa/linked-list>