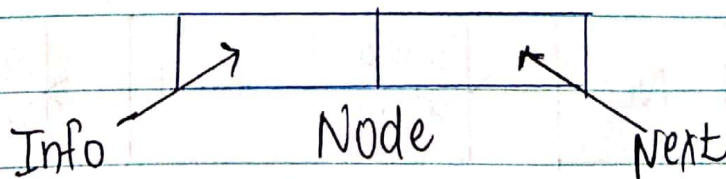


Linked Lists

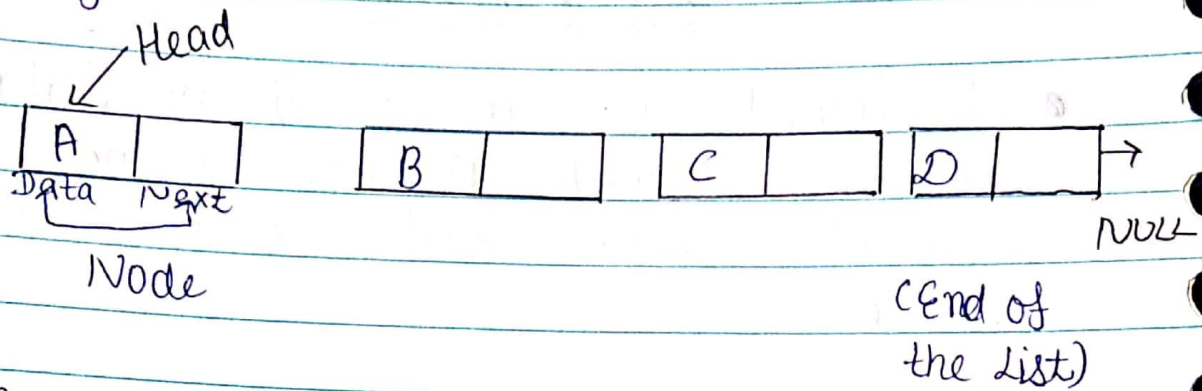
- A linked list is a linear data structure. It can be defined as the linear collection of elements where each element is stored in a node.
 - In this, data are not stored sequentially inside the memory but they are linked with each other by the help of address.
- Elements are not stored at contiguous memory location.
- ⇒ Node has two parts:-
Info (Data)
Next (Pointer)

Structure of node:-



Each node contains two fields :- i.e. data stored at particular address and the which contains

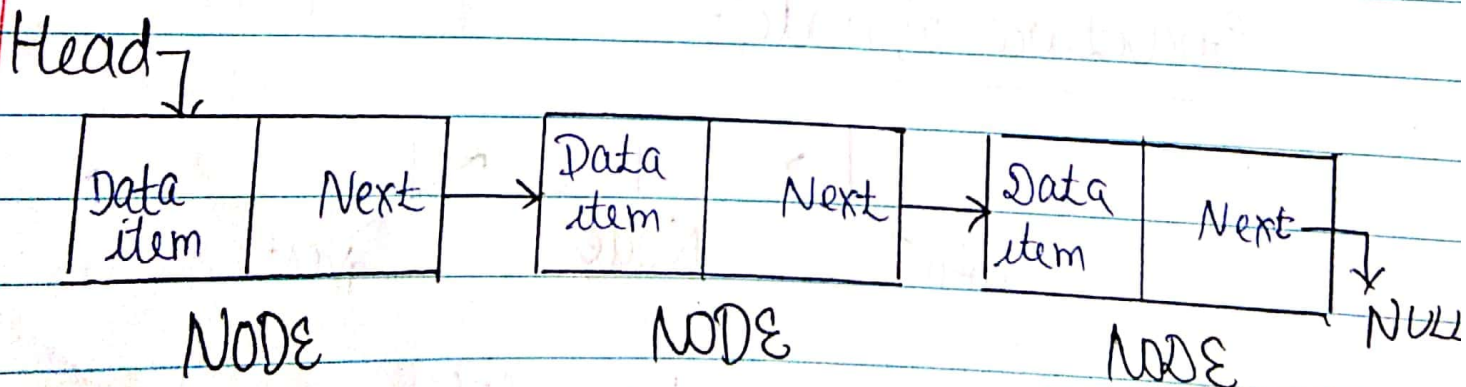
the address of the **next** node in the memory.



→ 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.

Representation of Linked List :-

Linked List can be represented as a chain of nodes, where every node points to next node.



→ Linked List contains a start pointer, holds the address of the first node of the list. It is also called **head** pointer.

→ Each node carries a data field and a link field called next.

→ Each node is linked with its next link using its next link.

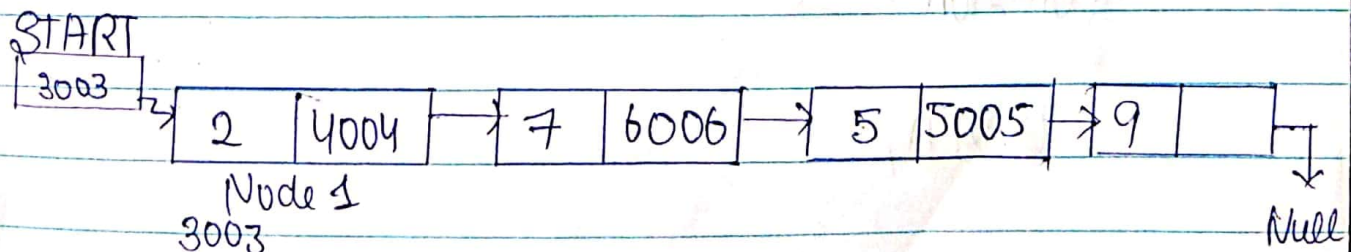
→ Null pointer indicates end of the list i.e. last node of the list.

→ The arrows are used to refer to the next node in the link list.

Example

Node	Data	Address
Node 1	2	3003
Node 2	7	4004
Node 3	5	6006
Node 4	9	5005

Link list will look like:-



* Representation of Linked List in Memory:-

- Representation of linear linked list in memory requires two linear array:-

INFO \rightarrow which store data elements
LINK \rightarrow which store next pointer field.

- It also requires a variable START or HEAD which contains the address of first element.

Example:-

INFO [9] = INDIA	LINK [9] = 6
INFO [5] = UK	LINK [5] = 2
INFO [6] = USA	LINK [6] = 4
INFO [3] = AUS	LINK [3] = 7
INFO [4] = Newzealand	LINK [4] = 5
INFO [2] = CHINA	LINK [2] = 3
INFO [7] = JAPAN	LINK [7] = NULL

Solution:-

INDIA,

Representation of linked list in memory is:-

S.No	INFO	LINK
1	-	-
2	CHINA	3
3	AUS	7
4	New Zealand	5
5	UK	2
6	USA	4
7	JAPAN	NULL
8	-	-
START → 9	INDIA	6

* Operations of Linked List :-

There are various operations that can be performed on linked list :-

1. Creation
2. Traversing
3. Searching
4. Insertion
5. Deletion
6. Sorting

1. Creation :- Creating the linked list.

2. Traversal :- access each element of the linked list.

3. Insertion :- adds a new element to the linked list.

4. Deletion :- removes the existing elements.

5. Search :- find a node in the linked list.

6. Sort :- Sort the nodes of the linked list.

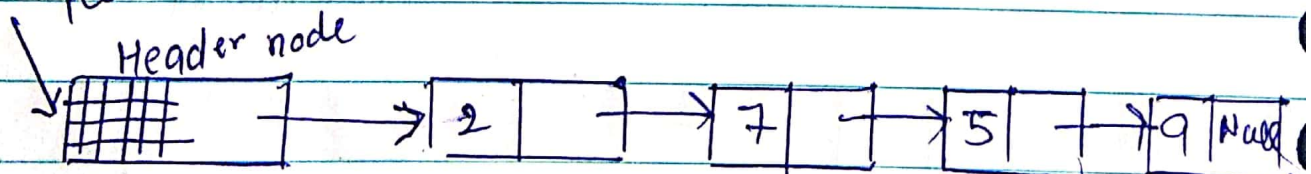
* Types of linked list

- (i) Header linked list (Single)
- (ii) Doubly linked list
- (iii) Circular linked list

(i) Header linked list :-

- It is a linked list with a special node in the beginning of the list.
- This special node is known as header node.
- The pointer variable START/HEAD points to the header node in header link list.
- Next field of header pointer to the first node in the link list.

Start or Head

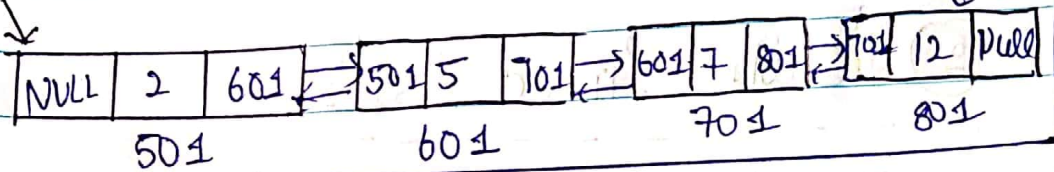


(Header link with four nodes having data 2, 7, 5 and 9)

Example:-

START
↓

END
↓



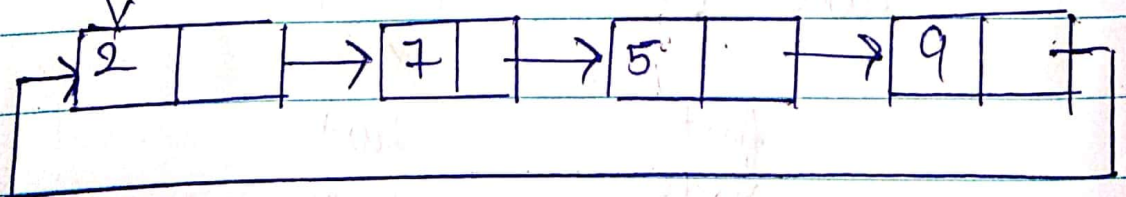
② Circular linked list :-

○ Circular linked list is a list in which last node points to the first node of the list instead of pointing NULL.

○ It means that pointer part of last node contains the address of first node.

Example:-

Start or Head
↓



(Circular linked list)