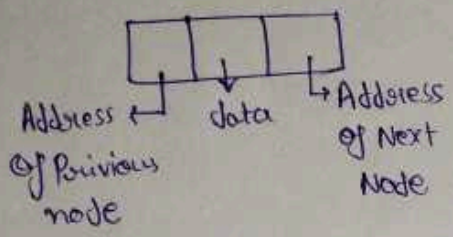
Doubly linked List :-

Doubly link list allow us for traversing in both the directions That is foroword & backword. The node stowctuw of doubly link list will be —




```
Stowct node
{
 Stowct node * pwe ;
 int data;
 Stowct node * next;
 };
```


Implimentation of Doubly link list :-

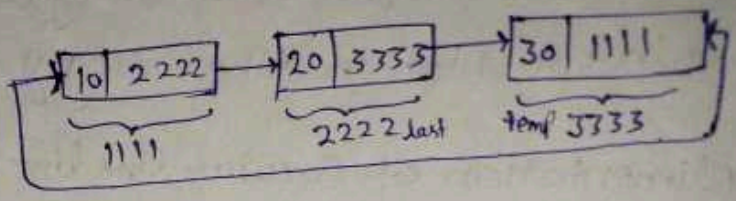
Before Implimenting the Doubly link list we must make some assumption like a following:-

```
Stowct node
{
 Stowct node * pwe;
 Int data;
 Stowct node* next;
} *head = NULL, *newnode, *temp;
```

Note:- We can perform all the operations with the Doubly link list whatever we perform with the Singly link list.

Traverse operation in circular link list:-

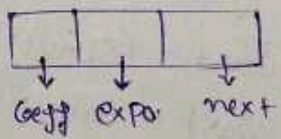
```
void traverse()
{
 temp = last -> link;
 while (temp != last)
 {
  printf("%d\t", temp -> data);
   temp = temp -> link;
 }
 printf("%d", temp -> data);
}
```

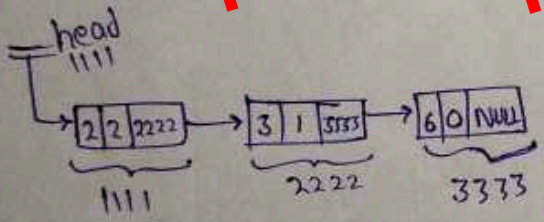


Polynomial representation using link list:-

$2x^2 + 3x + 6$

```
struct node
{
 int coeff;
 int exp;
 struct node *next;
};
```





Program:-

```
#include<stdio.h>
#include<conio.h>
struct poly
 {
    int coeff, expo;
     struct poly *next;
 }*newnode, *temp;
```

```
Void traverse (struct (Poly *P)
{
 Printf("\n");
 temp = P;
 while(temp != NULL)
 {
   Printf("%dX^%d", temp->coeff, temp->expo);
   if (temp -> next != NULL)
        Printf("+");
        temp = temp -> next;
   }
}
```

Sparse Matrix :- If most of the elements of the matrix have 0 Value then it is called a sparse matrix.

Example :-

$$\begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$$

Processing of the sparse matrix :- There are Two mechanism of processing the sparse matrix these are —

(i) Array representation

(ii) Linked list representation.

① Array representation :-

2D array is used to represent a sparse matrix in which there are three rows named as

Row, Column, Value.

$$\begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix} \Rightarrow$$

Row	0	0	1	1	3	3
Column	2	4	2	3	1	2
Value	3	4	5	7	2	6

② Linked list representation :-

In linked list, each node has four fields, These four fields are defined as :-

Row	Column	Value	Add of Next node