Linkedlist based polynomial addition

Polynomial addition

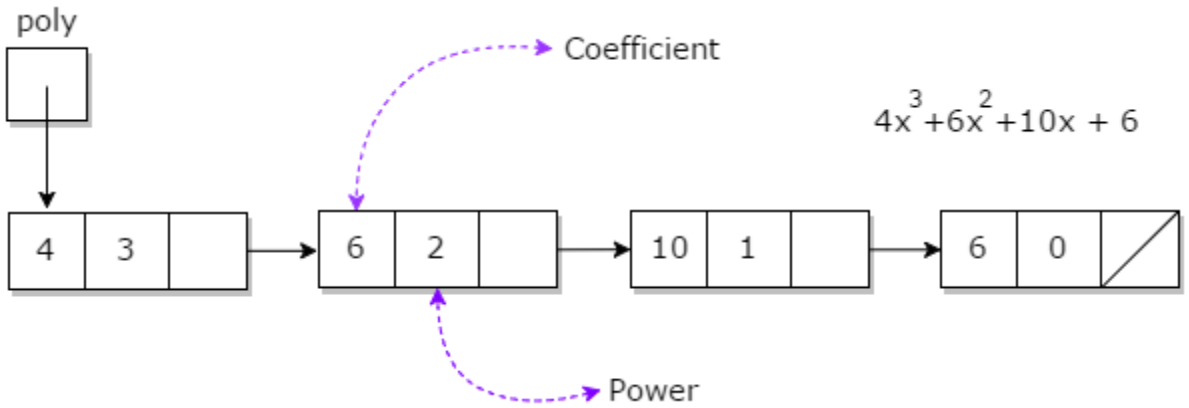
- A polynomial p(x) is the expression in variable x which is in the form ($ax^n + bx^{n-1} + ... + jx + k$)
- where a, b, c …., k are real numbers
- 'n' is non negative integer, which is called the degree of polynomial.
- An essential characteristic of the polynomial is that each term in the polynomial expression consists of two parts:

✓ one is the coefficient

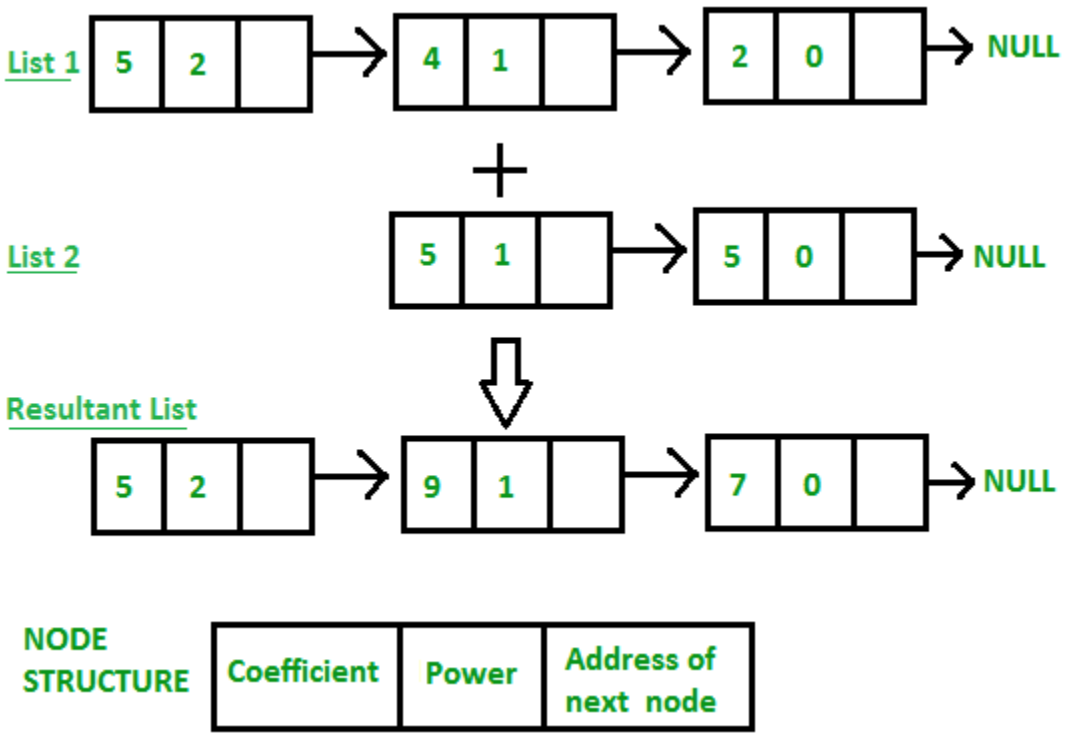
✓ other is the exponent

Example:

- $4x^3 + 6x^2 + 10x + 6$
- here 4,6 ,10 and 6 are coefficients
- 3,2 and 1 is its exponential value.



Addition of two polynomial



Algorithm to add two polynomials using linked list

- Let p and q be the two polynomials represented by linked lists

Step1: while p and q are not null, repeat step 2.

Step2: If powers of the two terms ate equal then if the terms do not cancel then insert the sum of the terms into the sum Polynomial

- Advance p
- Advance q
- Else if the power of the first polynomial> power of second
- Then insert the term from first polynomial into sum polynomial
- Advance p
- Else insert the term from second polynomial into sum polynomial
- Advance q

Step3: copy the remaining terms from the non empty polynomial into the sum polynomial.

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>

typedef struct node
{
    int coef;
    int exp;
    struct node* next;
} node;

void get_input(node** head)
{
    node* temp,*ptr;
    ptr = *head;
    temp = (node*)malloc(sizeof(node));

    printf("\nEnter coef : ");
    scanf("%d",&(temp->coef));
    printf("\nEnter exp : ");
    scanf("%d",&(temp->exp));
```

```
if(NULL == *head)
   {
      *head = temp;
      (*head)->next = NULL;
   }
   else
   {
      while(NULL != ptr->next)
      {
         ptr = ptr->next;
      }
      ptr->next = temp;
      temp->next = NULL;
   }
}
void display(node* head)
{
   while(head->next != NULL)
   {
      printf("(%d.x^%d)+",head->coef,head->exp);
      head = head->next;
   }
   printf("(%d.x^%d)",head->coef,head->exp);
   printf("\n");
}
```

```
void add(node* poly, node* poly1, node* poly2 ) //poly==result
{
   while(poly1->next && poly2->next)
   {
      if(poly1->exp > poly2->exp)
      {
         poly->coef = poly1->coef;
         poly->exp = poly1->exp;
         poly1 = poly1->next;
      }
      else if(poly1->exp < poly2->exp)
      {
         poly->coef = poly2->coef;
         poly->exp = poly2->exp;
         poly2 = poly2->next;
      }
      else
      {
         poly->coef = poly1->coef + poly2->coef;
         poly->exp = poly1->exp;
         poly1 = poly1->next;
         poly2 = poly2->next;
      }
      poly->next = (node*)malloc(sizeof(node));
      poly = poly->next;
      poly->next = NULL;
   }
```

```
int main()
{
   node* head1 = NULL;
   node* head2 = NULL;
   node* head = (node*)malloc(sizeof(node));
   int ch;
      do
   {
      get_input(&head1);
      printf("\nEnter more node in poly1? (1,0) :");
      scanf("%d",&ch);
   }while(ch);
      do
   {
      get_input(&head2);
      printf("\nEnter more node in poly2? (1,0) :");
      scanf("%d",&ch);
   }while(ch);
      add(head,head1,head2);
   display(head1);
   display(head2);
   display(head);
      return 0;
}
```