# 14- LL Polynomial

## Aim

Create a polynomial addition using linked list

## Algorithm

I. ~~create~~ struct polynode

```
1. START
2 int coeff
3. int power
4 struct polynode *next
5. STOP
```

II create necessary struct pointers

III struct polynode* insert poly ()

```
1. START
2. struct polynode *start = NULL , *end = NULL;
3. Input the total length of the polynomial
   from user and store it in cap
4 for (int i = 0 to cap )
```

```
            1. Construct a struct ptr p
               and allocate some space
            2. ~~Initialise~~ Input power and cofficient
               from user and store it in
               struct ptr p
            3  p -> next = NULL
            4  If (start == NULL)
                   1. start = p;
                   2. end = p
            5. Else
                   1. end -> next = p
                   2. end = end -> next
            6  End if
        5. End for
        6  return start;
        7. STOP
```

IV void polyadd(struct polynode * t1 , struct polynode * t2)

```
        1. START
        2. int co, ex
        3  while (t1 != NULL && t2 != NULL)
              1 if(t1 -> power < t2 -> power)
                    1. ex = t1 -> power
        2. co = t1->coeff
        3. t1 = t1 -> next
    2. Else if (t1 -> power > t2 -> power)
        1. ex = t2 -> power
        2. co = t2 -> coff
        3 t2 = t2 -> next

    3. Else
        1. ex = t2 -> power
        2. co = t1 -> ~~power~~ coeff + t2 -> ~~power~~ coff
        3 t1 = t1 -> next
        4 t2 = t2 -> next
    4 End If
    5. print ( co + "(x^" + ex+")")
4. while (t1 != NULL)
    1. ex = t1 -> power
    2. co = t1 -> coeff
    3. t1 = t1 -> next
    4. print ( co+ "(x^" + ex+ ")");
5 while (t2 != NULL)
    1. ex = t2 -> power
    2. co = t2 -> coff
    3 t2 -> t2 -> next
    4. print ("%d (x^%d", co, ex);
6. STOP
```

## V void showeach(struct polynode *start)

```
1. START
2. ~~t1 = start~~ Create struct ptr t1
3. t1 = start
4. while (t1 != NULL
      1. printf("%d (X ^ %d) +" t1->coeff, t1->pow);
      2. t1 = t1 -> next
5. End while
6. STOP
```

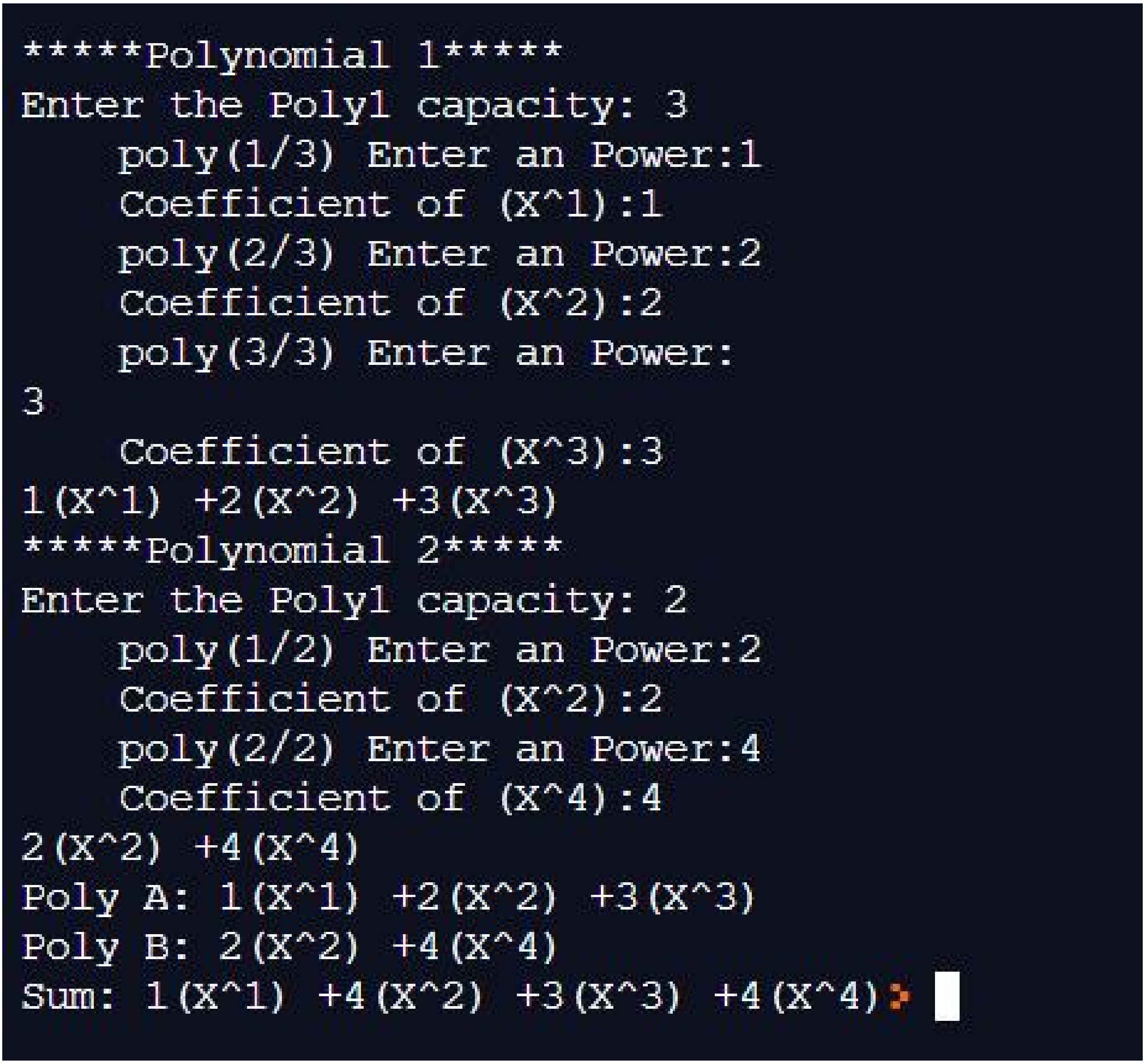
## VI void display() {

```
1. START
2. printf ("\nPoly A: ");
3. showeach(starta)
4. printf (" \n Poly B: ");
5. showeach (startb),
6 printf ("\n Poly C: ");
~~7. showeach (start~~
7. polyadd ();
8. STOP
```

Output

Obtained

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


int size_a=0,size_b=0,size_sum=0;

struct polynode{
        int coeff;
        int power;
        struct polynode *next;
        //struct polynode *prev;
} *starta,*startb,*sumstart,*sumend=NULL,*t1=NULL,*t2=NULL;



struct polynode* insertpoly()
{
    struct polynode *start=NULL,*end=NULL;
        int cap;
        printf("Enter the Poly1 capacity: ");
        scanf("%d",&cap);
    for(int i=0; i<cap; i++){
        int powe,coff;
        struct polynode *p;
                printf("\tpoly(%d/%d) ",i+1,cap);
                p= (struct polynode*)malloc(sizeof(struct polynode));

        printf("Enter an Power:");
        scanf("%d",&powe);
        p->power = powe;

        printf("\tCoefficient of (X^%d):",powe);
        scanf("%d",&coff);
        p->coeff = coff;

        p->next = NULL;

        if(start==NULL){
    //      p->prev = NULL;
                start=p;
                end=p;
        }
        else {
                end->next=p;
    //      end->next->prev=end;
    //          p->next=NULL;
    //          p->prev->next=p;
                end=end->next;
        }
        //      size_a++;
        }
        //printf(":(  ||");
        return start;

}
void polyadd(){
    int c=0,ex,co;
        t1=starta;
        t2=startb;

        while(t1!=NULL && t2!=NULL){
                if(t1->power < t2->power){
                        ex=t1->power;
                        co=t1->coeff;
                        t1=t1->next;
                }
                else if(t1->power > t2->power){
                        ex=t2->power;
                        co=t2->coeff;
                        t2=t2->next;
                }
                else{
                        ex=t2->power;
                        co = t2->coeff + t1->coeff;
                        t1=t1->next;
                        t2=t2->next;
                }
                if(c==0)
                    printf("%d(X^%d) ",co,ex);
                else
                    printf("+%d(X^%d) ",co,ex);
                c++;
        }
        while(t1!=NULL){
                ex=t1->power;
                co=t1->coeff;
                printf("+%d(X^%d) ",co,ex);

                t1=t1->next;
        }
        while(t2!=NULL){
                ex=t2->power;
                co=t2->coeff;
                printf("+%d(X^%d)",co,ex);

                t2=t2->next;
        }
}

void showeach(struct polynode *start){
        int i=0;
        t1=start;
        while(t1->next!=NULL){
                printf("%d(X^%d) +",t1->coeff,t1->power);
                t1=t1->next;
                i++;
        }
        printf("%d(X^%d)",t1->coeff,t1->power);

}

void disp(){
        printf("\nPoly A: ");
        showeach(starta);

        printf("\nPoly B: ");
        showeach(startb);

        printf("\nSum: ");
        polyadd();
}

int main(){
        int cap;
        printf("\n*****Polynomial 1***** \n");
        starta=insertpoly();

        t1=starta;
        while(t1->next!=NULL){
                printf("%d(X^%d) +",t1->coeff,t1->power);
                t1=t1->next;
        }
        printf("%d(X^%d)",t1->coeff,t1->power);

        printf("\n*****Polynomial 2***** \n");
        startb=insertpoly();

        t2=startb;
        while(t2->next!=NULL){
                printf("%d(X^%d) +",t2->coeff,t2->power);
                t2=t2->next;
        }
        printf("%d(X^%d)",t2->coeff,t2->power);

        disp();
    return 0;
}
```



```
*****Polynomial 1*****
Enter the Poly1 capacity: 3
    poly(1/3) Enter an Power:1
    Coefficient of (X^1):1
    poly(2/3) Enter an Power:2
    Coefficient of (X^2):2
    poly(3/3) Enter an Power:
3
    Coefficient of (X^3):3
1(X^1) +2(X^2) +3(X^3)
*****Polynomial 2*****
Enter the Poly1 capacity: 2
    poly(1/2) Enter an Power:2
    Coefficient of (X^2):2
    poly(2/2) Enter an Power:4
    Coefficient of (X^4):4
2(X^2) +4(X^4)
Poly A: 1(X^1) +2(X^2) +3(X^3)
Poly B: 2(X^2) +4(X^4)
Sum: 1(X^1) +4(X^2) +3(X^3) +4(X^4)>
```