Rajalakshmi Engineering College

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_week 1_CY

Attempt : 1
Total Mark : 30
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Akila is a tech enthusiast and wants to write a program to add two polynomials. Each polynomial is represented as a linked list, where each node in the list represents a term in the polynomial.

A term in the polynomial is represented in the format ax^b, where a is the coefficient and b is the exponent.

Akila needs your help to implement a program that takes two polynomials as input, adds them, and stores the result in ascending order in a new polynomial-linked list. Write a program to help her.

Input Format

The input consists of lines containing pairs of integers representing the

coefficients and exponents of polynomial terms.

Each line represents a single term, with the coefficient and exponent separated by a space.

The input for each polynomial ends with a line containing "0 0".

Output Format

The output consists of three lines representing the first, second, and resulting polynomial after the addition operation, with terms sorted in ascending order of exponents.

Each line contains terms of the polynomial in the format "coefficientx^exponent", separated by " + ".

If the resulting polynomial is zero, the output is "0".

Refer to the sample output for the formatting specifications.

Sample Test Case

Input: 3 4
2 3
1 2
0 0
1 2
2 3
3 4
0 0

Output: 1x^2 + 2x^3 + 3x^4
1x^2 + 2x^3 + 3x^4
2x^2 + 4x^3 + 6x^4

Answer

```
#include<stdlib.h>
#include<stdio.h>
typedef struct node{
    int coe;
    int expo;
    struct node* next;
```

```
}Node;
Node* createNode(int coe,int expo){
    Node* newNode=(Node*)malloc(sizeof(Node));
    newNode->coe=coe;
    newNode->expo=expo;
    newNode->next=NULL;
    return newNode;
}
 void insertTerm(Node** head,int coe,int expo){
     if(coe==0){
         return;
     }
     Node* newNode=createNode(coe,expo);
     if(*head==NULL || expo < (*head)->expo){
         newNode->next=*head;
         *head=newNode;
         return;
     }
     Node* current=*head;
     while(current->next!=NULL && current->next->expo<expo){
         current=current->next;
     }
     if(current->next!=NULL && current->next->expo==expo){
         current->next->coe+= coe;
         if(current->next->coe==0){
             Node* temp= current->next;
             current->next=current->next->next;
             free(temp);
         }
         free(newNode);
     }else{
         newNode->next=current->next;
         current->next=newNode;
     }
 }
 Node* addPoly(Node* poly1,Node* poly2){
     Node* result=NULL;
     while(poly1!=NULL || poly2!=NULL){
         int coe,expo;
         if(poly1==NULL){
             coe=poly2->coe;
             expo=poly2->expo;
```

```
            poly2=poly2->next;
        }
        else if(poly2==NULL){
            coe=poly1->coe;
            expo=poly1->expo;
            poly1=poly1->next;
        }else if(poly1->expo<poly2->expo){
            coe=poly1->coe;
            expo=poly1->expo;
            poly1=poly1->next;
        }else if(poly1->expo>poly2->expo){
            coe=poly2->coe;
            expo=poly2->expo;
            poly2=poly2->next;
        }else{
            coe= poly1->coe+poly2->coe;
            expo=poly1->expo;
            poly1=poly1->next;
            poly2=poly2->next;
        }
        insertTerm(&result,coe,expo);
    }
    return result;
}
void printPoly(Node* head){
    if(head==NULL){
        printf("0\n");
        return;
    }
    Node* current=head;
    while(current!=NULL){
        printf("%dx^%d ",current->coe,current->expo);
        if(current->next!=NULL){
            printf(" + ");
        }
        current=current->next;
    }
    printf("\n");
}
void freelist(Node* head){
    while(head!=NULL){
        Node* temp=head;
```

```
        head=head->next;
        free(temp);
    }
}
int main(){
    Node* poly1=NULL;
    Node* poly2=NULL;
    int coe,expo;
    while(1){
        scanf("%d %d",&coe,&expo);
        if(coe==0 && expo==0){
            break;
        }
        insertTerm(&poly1,coe,expo);
    }
    while(1){
        scanf("%d %d",&coe,&expo);
        if(coe==0 && expo==0){
            break;
        }
        insertTerm(&poly2,coe,expo);
    }
    printPoly(poly1);
    printPoly(poly2);
    Node* result=addPoly(poly1,poly2);
    printPoly(result);
    freelist(poly1);
    freelist(poly2);
    freelist(result);
    return 0;
}
```

Status : Correct **Marks : 10/10**

2. Problem Statement

Hasini is studying polynomials in her class. Her teacher has introduced a new concept of two polynomials using linked lists.

The teacher provides Hasini with a program that takes two polynomials as

input, represented as linked lists, and then displays them together. The polynomials are simplified and should be displayed in the format ax^b, where a is the coefficient and b is the exponent.

Input Format

The first line of input consists of an integer n, representing the number of terms in the first polynomial.

The following n lines of input consist of two integers each: the coefficient and the exponent of the term in the first polynomial.

The next line of input consists of an integer m, representing the number of terms in the second polynomial.

The following m lines of input consist of two integers each: the coefficient and the exponent of the term in the second polynomial.

Output Format

The first line of output prints the first polynomial.

The second line of output prints the second polynomial.

The polynomials should be displayed in the format ax^b, where a is the coefficient and b is the exponent.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 3
1 2
2 1
3 0
3
2 2
1 1
4 0
Output: 1x^2 + 2x + 3
2x^2 + 1x + 4

Answer

```
#include<stdio.h>
#include<stdlib.h>
typedef struct Node{
    int coeff;
    int expo;
    struct Node*next;
}Node;
Node*createNode(int coeff,int expo){
    Node*newNode=(Node*)malloc(sizeof(Node));
    newNode->coeff=coeff;
    newNode->expo=expo;
    newNode->next=NULL;
    return newNode;
}
void insert(Node**poly,int coeff,int expo){
    Node*newNode=createNode(coeff,expo);
    if(expo<0){
        free(newNode);
        return;
    }
    if(*poly==NULL||expo>(*poly)->expo){
        newNode->next=*poly;
        *poly=newNode;
        return;
    }
    Node*temp=*poly;
    while(temp->next!=NULL&&temp->next->expo>expo){
        temp=temp->next;
    }
    if(temp->next!=NULL&&temp->next->expo==expo){
        temp->next->coeff=coeff;
        free(newNode);
    }
    else{
        newNode->next=temp->next;
        temp->next=newNode;
    }
}
void printPoly(Node*poly){
    if(poly==NULL){
        printf("0\n");
```

```
        return;
    }
    Node*temp=poly;
    int first=1;
    while(temp!=NULL){
        if(temp->coeff!=0){
        if(!first&&temp->coeff>0){
            printf(" + ");
        }
        if(temp->expo==1){
            printf("%dx",temp->coeff);
        }
        else if(temp->expo==0){
            printf("%d",temp->coeff);
        }
        else if(temp->expo<0){
            continue;
        }
        else{
            printf("%dx^%d",temp->coeff,temp->expo);
        }
        first=0;
    }
    temp=temp->next;
  }
  printf("\n");
}
void freePoly(Node*poly){
    while(poly!=NULL){
        Node*temp=poly;
        poly=poly->next;
        free(temp);
    }
}
int main(){
    int n,coeff,expo;
    Node*poly1=NULL;
    Node*poly2=NULL;
    scanf("%d",&n);
    for(int i=0;i<n;i++){
        scanf("%d %d",&coeff,&expo);
        insert(&poly1,coeff,expo);
```

```
    }
    scanf("%d",&n);
    for(int i=0;i<n;i++){
        scanf("%d %d",&coeff,&expo);
        insert(&poly2,coeff,expo);
    }
    printPoly(poly1);
    printPoly(poly2);
    freePoly(poly1);
    freePoly(poly2);
}
```

Status : Correct ***Marks : 10/10***

3. Problem Statement

Rani is studying polynomials in her class. She has learned about polynomial multiplication and is eager to try it out on her own. However, she finds the process of manually multiplying polynomials quite tedious. To make her task easier, she decides to write a program to multiply two polynomials represented as linked lists.

Help Rani by designing a program that takes two polynomials as input and outputs their product polynomial. Each polynomial is represented by a linked list of terms, where each term has a coefficient and an exponent. The terms are entered in descending order of exponents.

Input Format

The first line of input consists of an integer n, representing the number of terms in the first polynomial.

The following n lines of input consist of two integers each: the coefficient and the exponent of the term in the first polynomial.

The next line of input consists of an integer m, representing the number of terms in the second polynomial.

The following m lines of input consist of two integers each: the coefficient and the exponent of the term in the second polynomial.

Output Format

The first line of output prints the first polynomial.

The second line of output prints the second polynomial.

The third line of output prints the resulting polynomial after multiplying the given polynomials.

The polynomials should be displayed in the format, where each term is represented as ax^b, where a is the coefficient and b is the exponent.

Refer to the sample output for the exact format.

Sample Test Case

Input: 2
2 3
3 2
2
3 2
2 1

Output: 2x^3 + 3x^2
3x^2 + 2x
6x^5 + 13x^4 + 6x^3

Answer

-

Status : Skipped ***Marks : 0/10***