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| VP Vidyalankar Polytechnic | DEPARTMENT OF COMPUTER ENGINEERING |

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| **Subject:** - DSU | **Subject Code:** 313301 |
| **Semester:** - III | **Course:** Computer Engineering |
| Laboratory No: L003 | **Name of Subject Teacher:** Prof. Imran S. |
| **Name of Student:** Mohd Saad Khan | **Roll Id: -** 24203A0007 |
| **Experiment No:** | 15 |
| **Title of Experiment** | *Write a C Program to add Two Polynomials using a Linked List. |

**Aim:** *Write a C Program to add Two Polynomials using a Linked List.

**Algorithm:**

Step 1: Start
Step 2: Define a structure Node with data members coeff, power, and next pointer
Step 3: Define functions createnode(), createlinkedlist(), printList(), and add()
Step 4: In main()
- a) Input number of terms n1 for 1st polynomial
- b) Call createlinkedlist(n1) to create the 1st polynomial and store head in poly1
- c) Input number of terms n2 for 2nd polynomial
- d) Call createlinkedlist(n2) to create the 2nd polynomial and store head in poly2
- e) Display both polynomials using printList()
- f) Call add(poly1, poly2) to perform polynomial addition

Step 5: In createlinkedlist(n)
- a) If n <= 0, display error and return NULL
- b) Input coefficient and power for first term
- c) Create first node using createnode() and assign it as head
- d) Repeat for remaining terms and link each node
- e) Return head pointer of polynomial

Step 6: In createnode(coeff, power)
- a) Allocate memory for new node
- b) Store coefficient in coeff, power in power, and set next = NULL
- c) Return new node

Step 7: In printList(head)
- a) Traverse from head till last node
- b) For each node except last, print coeff X^power +
- c) For last node, print only coeff

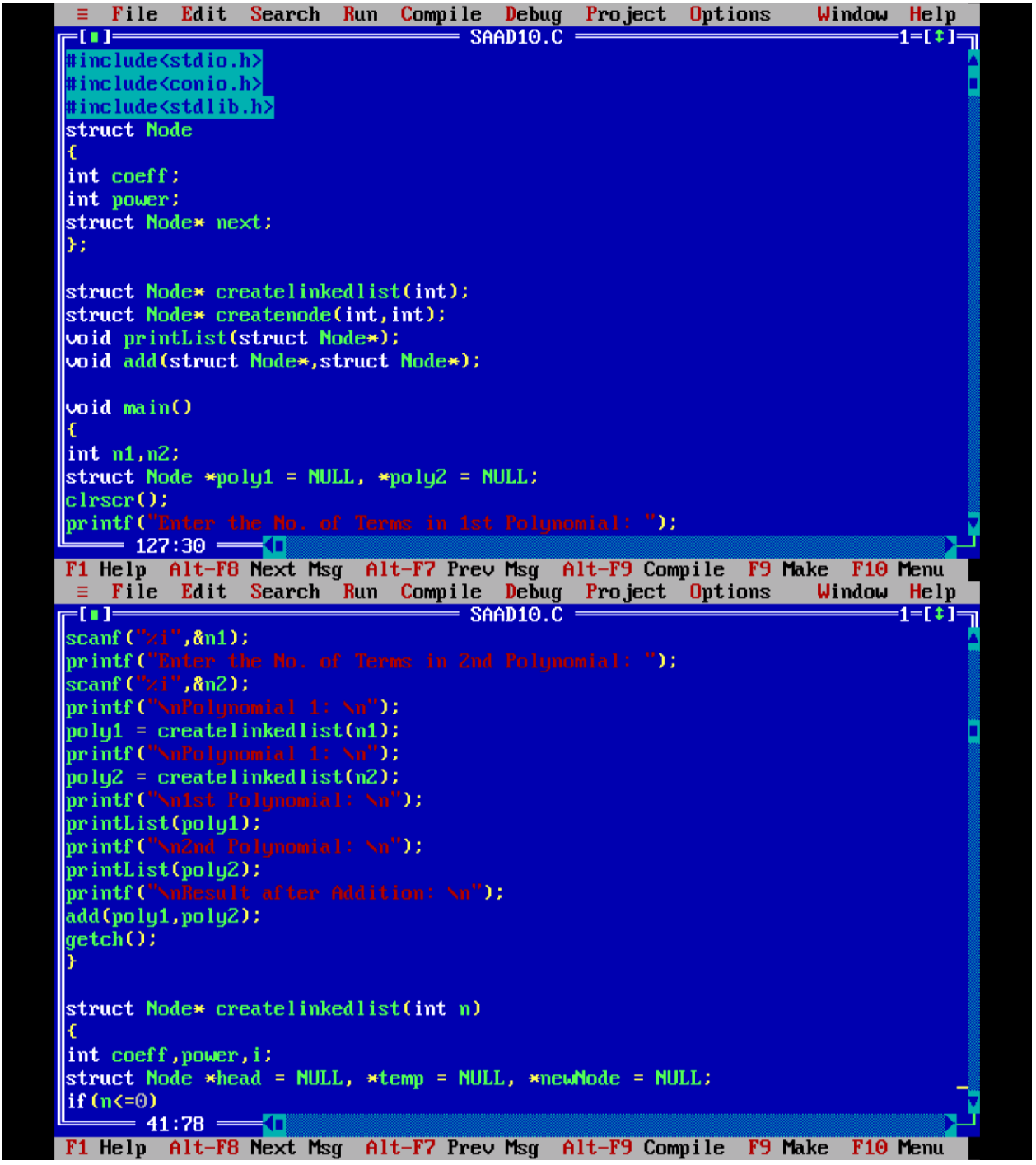
Step 8: In add(poly1, poly2)
- a) Initialize result list with a dummy node
- b) While either poly1 or poly2 is not NULL
  - i) If power of poly1 > power of poly2, copy that term to result and move poly1
  - ii) If power of poly1 < power of poly2, copy that term to result and move poly2

iii) If powers are equal, add coefficients, create node with sum, and move both

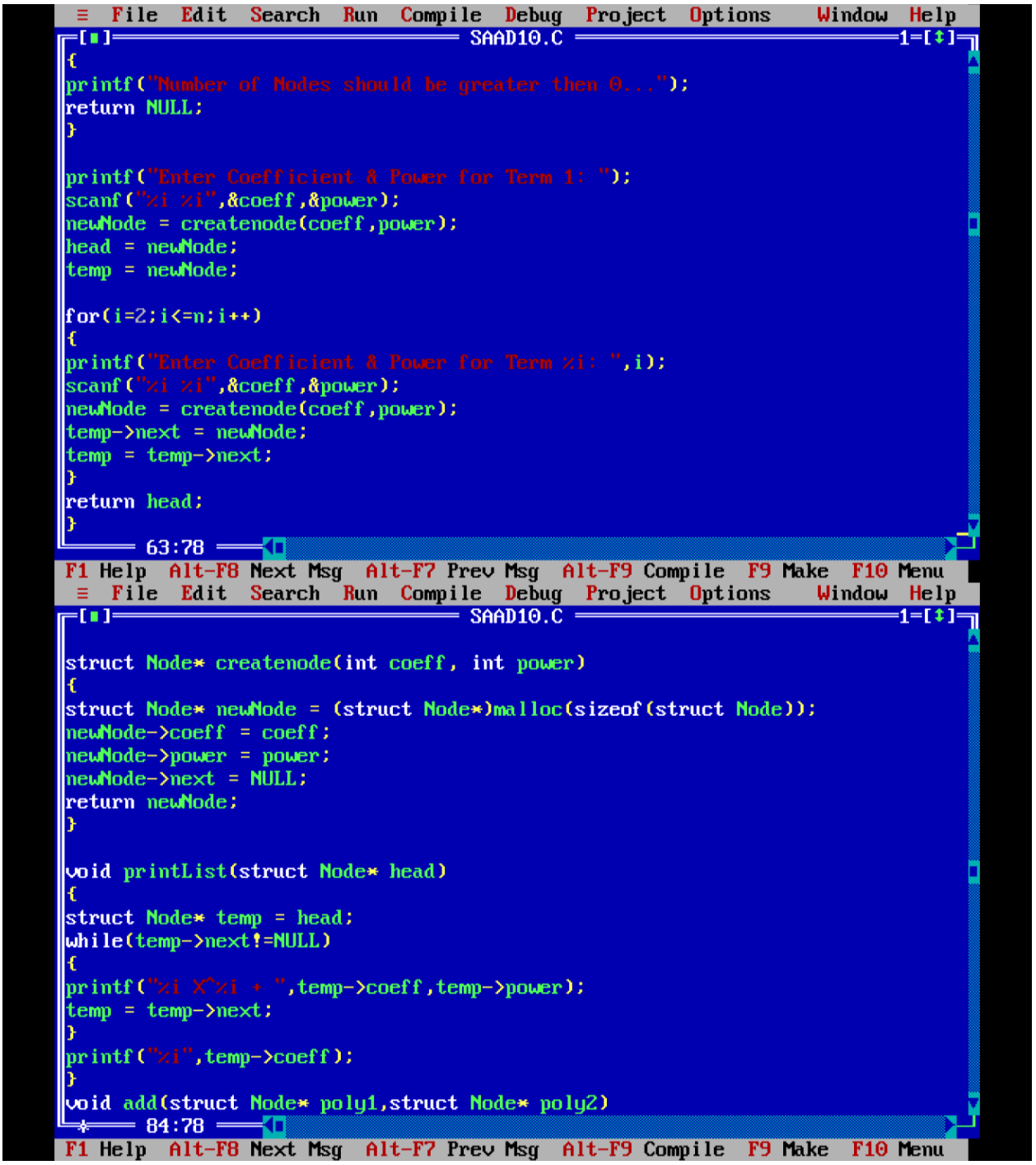
c) When loop ends, print result polynomial using printList()

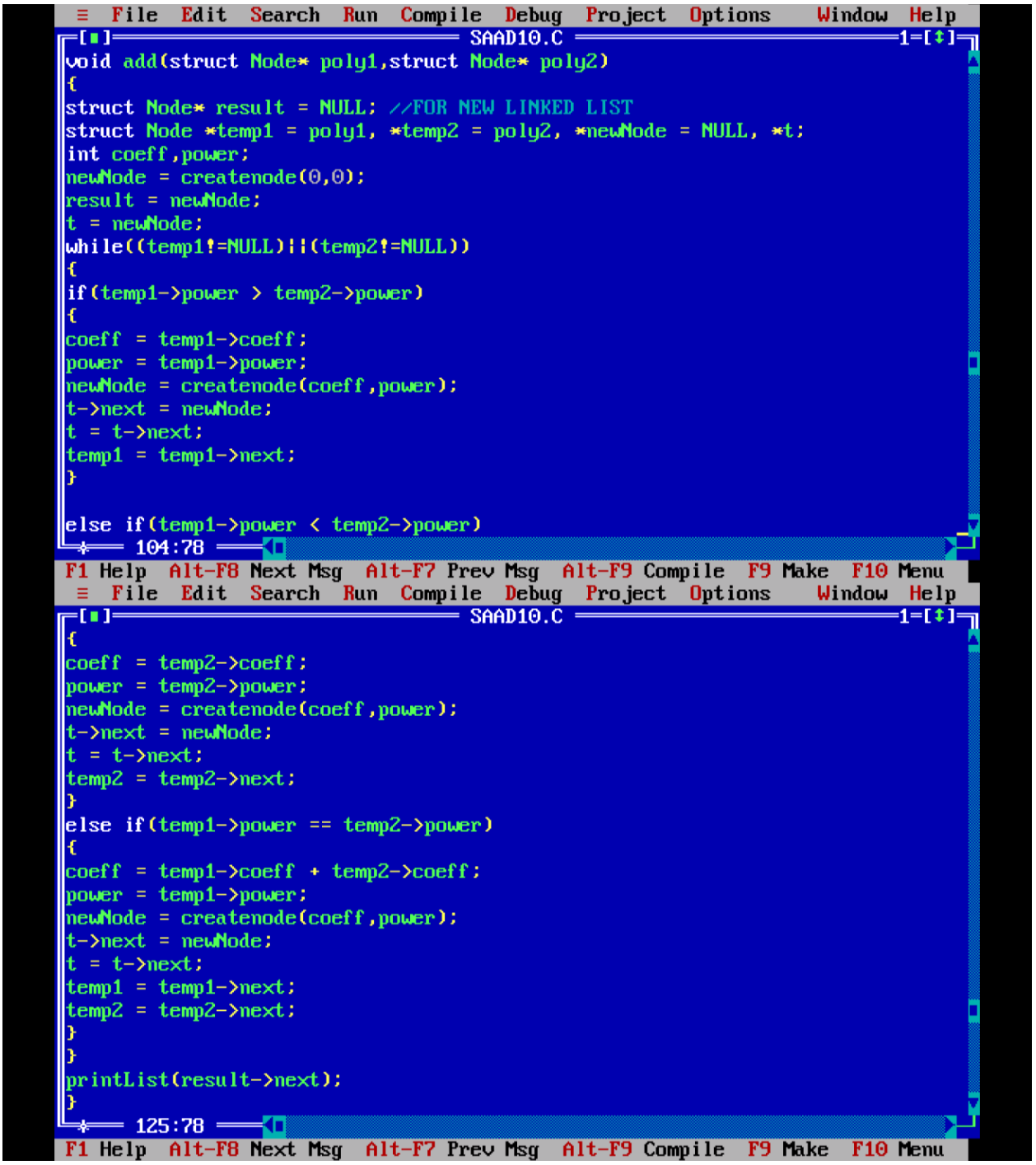
Step 9: End

**Code:**

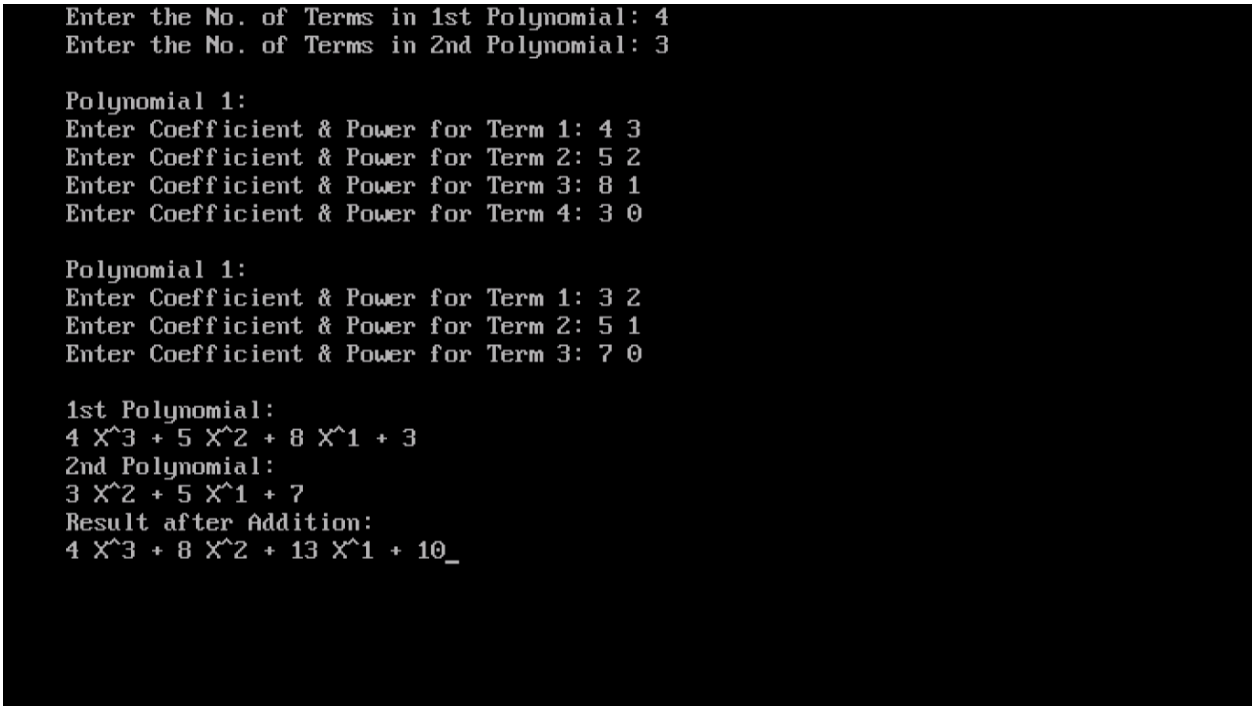


```
File  Edit  Search  Run  Compile  Debug  Project  Options  Window  Help
SAAD10.C
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
struct Node
{
int coeff;
int power;
struct Node* next;
};

struct Node* createlinkedlist(int);
struct Node* createnode(int,int);
void printList(struct Node*);
void add(struct Node*,struct Node*);

void main()
{
int n1,n2;
struct Node *poly1 = NULL, *poly2 = NULL;
clrscr();
printf("Enter the No. of Terms in 1st Polynomial: ");
127:30
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
File  Edit  Search  Run  Compile  Debug  Project  Options  Window  Help
SAAD10.C
scanf("%i",&n1);
printf("Enter the No. of Terms in 2nd Polynomial: ");
scanf("%i",&n2);
printf("\nPolynomial 1: \n");
poly1 = createlinkedlist(n1);
printf("\nPolynomial 1: \n");
poly2 = createlinkedlist(n2);
printf("\n1st Polynomial: \n");
printList(poly1);
printf("\n2nd Polynomial: \n");
printList(poly2);
printf("\nResult after Addition: \n");
add(poly1,poly2);
getch();
}

struct Node* createlinkedlist(int n)
{
int coeff,power,i;
struct Node *head = NULL, *temp = NULL, *newNode = NULL;
if(n<=0)
41:78
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
```


File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
{
printf("Number of Nodes should be greater then 0...");
return NULL;
}
printf("Enter Coefficient & Power for Term 1: ");
scanf("%i %i",&coeff,&power);
newNode = createnode(coeff,power);
head = newNode;
temp = newNode;
for(i=2;i<=n;i++)
{
printf("Enter Coefficient & Power for Term %i: ",i);
scanf("%i %i",&coeff,&power);
newNode = createnode(coeff,power);
temp->next = newNode;
temp = temp->next;
}
return head;
}
63:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu
File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
struct Node* createnode(int coeff, int power)
{
struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
newNode->coeff = coeff;
newNode->power = power;
newNode->next = NULL;
return newNode;
}
void printList(struct Node* head)
{
struct Node* temp = head;
while(temp->next!=NULL)
{
printf("%i X^%i + ",temp->coeff,temp->power);
temp = temp->next;
}
printf("%i",temp->coeff);
}
void add(struct Node* poly1,struct Node* poly2)
84:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu


File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
void add(struct Node* poly1,struct Node* poly2)
{
struct Node* result = NULL; //FOR NEW LINKED LIST
struct Node *temp1 = poly1, *temp2 = poly2, *newNode = NULL, *t;
int coeff,power;
newNode = createnode(0,0);
result = newNode;
t = newNode;
while((temp1!=NULL)||(temp2!=NULL))
{
if(temp1->power > temp2->power)
{
coeff = temp1->coeff;
power = temp1->power;
newNode = createnode(coeff,power);
t->next = newNode;
t = t->next;
temp1 = temp1->next;
}
else if(temp1->power < temp2->power)
104:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu
File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
{
coeff = temp2->coeff;
power = temp2->power;
newNode = createnode(coeff,power);
t->next = newNode;
t = t->next;
temp2 = temp2->next;
}
else if(temp1->power == temp2->power)
{
coeff = temp1->coeff + temp2->coeff;
power = temp1->power;
newNode = createnode(coeff,power);
t->next = newNode;
t = t->next;
temp1 = temp1->next;
temp2 = temp2->next;
}
}
printList(result->next);
}
125:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu

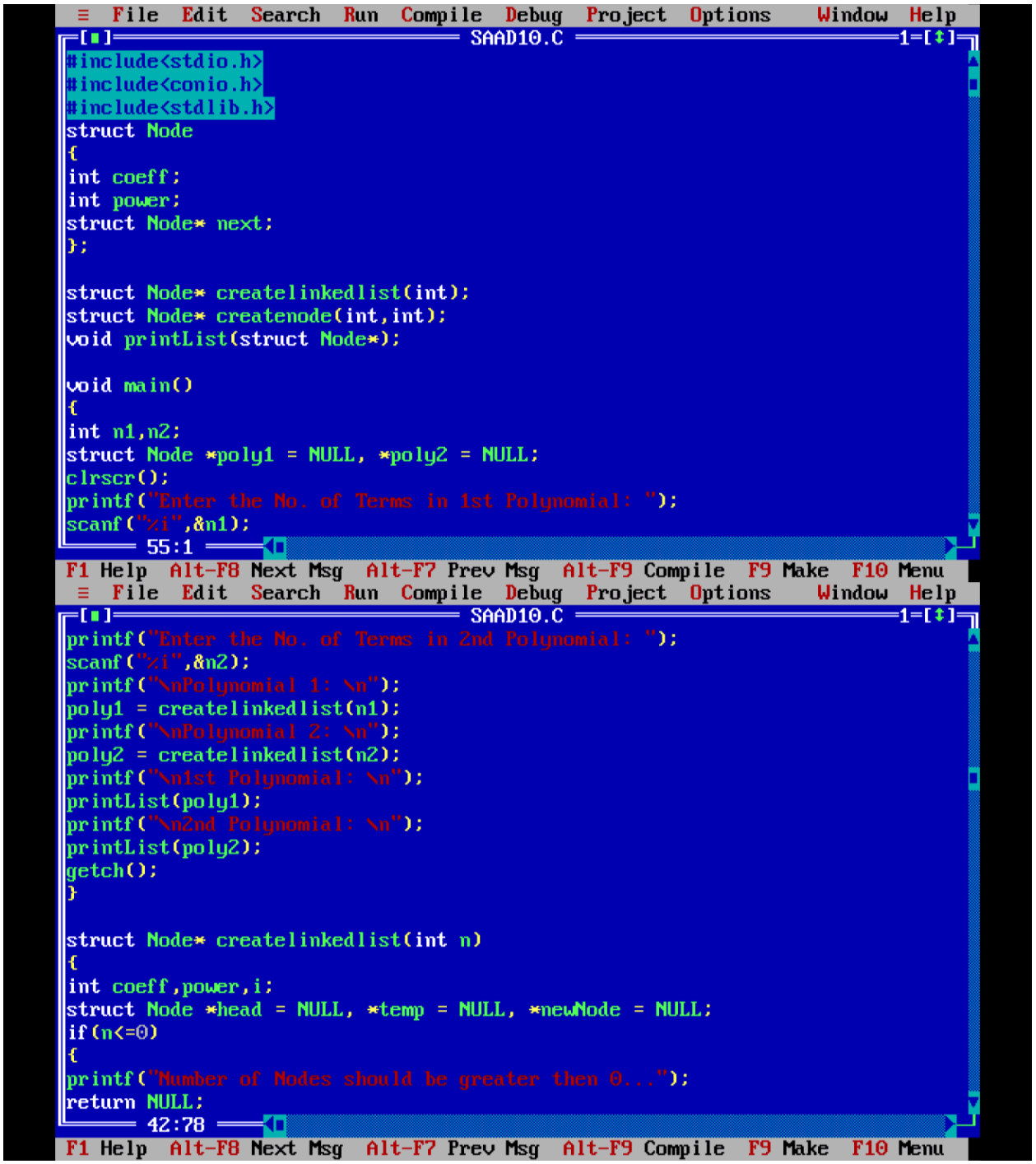
**Output: -**


Enter the No. of Terms in 1st Polynomial: 4
Enter the No. of Terms in 2nd Polynomial: 3
Polynomial 1:
Enter Coefficient & Power for Term 1: 4 3
Enter Coefficient & Power for Term 2: 5 2
Enter Coefficient & Power for Term 3: 8 1
Enter Coefficient & Power for Term 4: 3 0
Polynomial 1:
Enter Coefficient & Power for Term 1: 3 2
Enter Coefficient & Power for Term 2: 5 1
Enter Coefficient & Power for Term 3: 7 0
1st Polynomial:
4 X^3 + 5 X^2 + 8 X^1 + 3
2nd Polynomial:
3 X^2 + 5 X^1 + 7
Result after Addition:
4 X^3 + 8 X^2 + 13 X^1 + 10

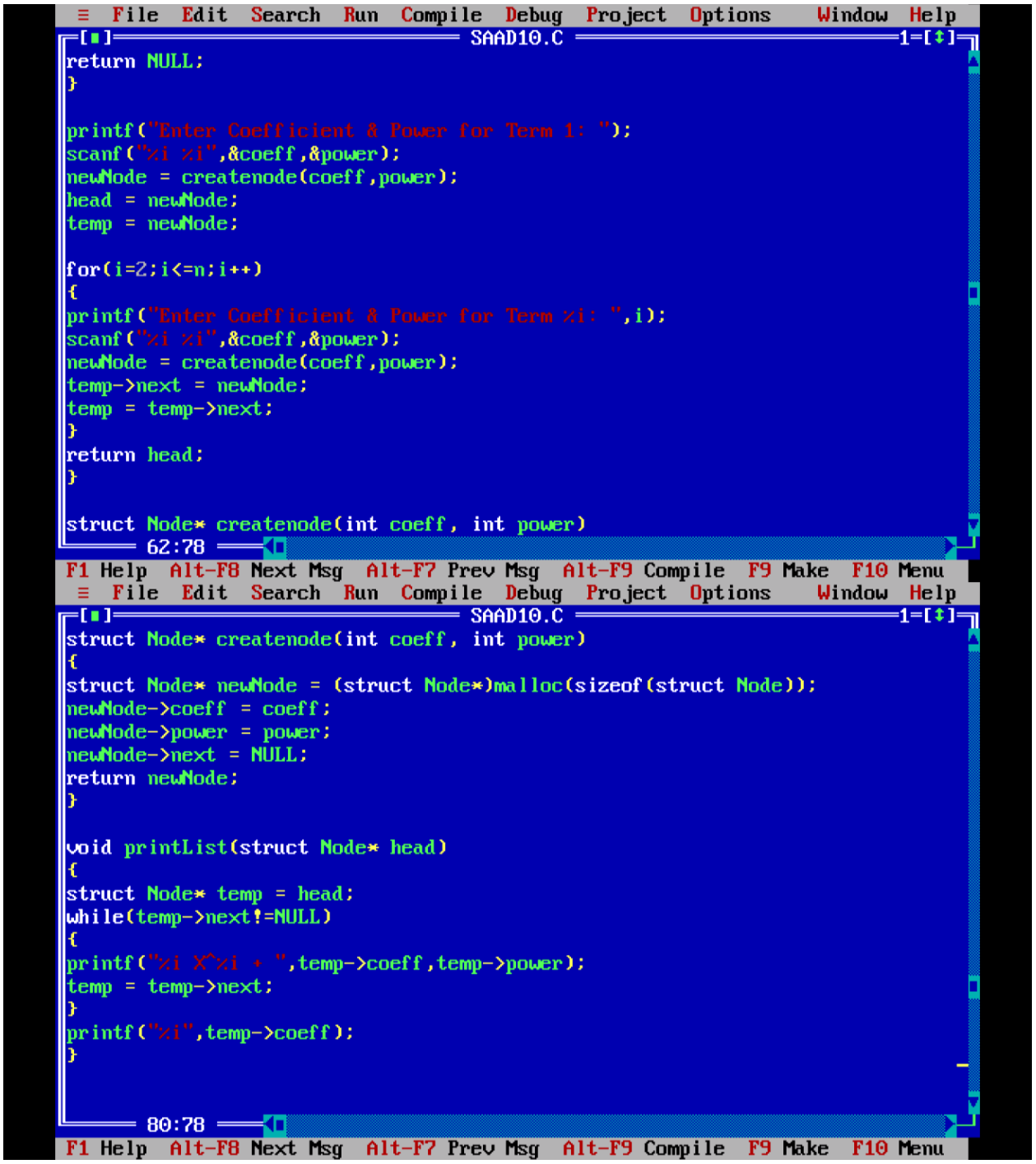
**Practical Related Questions:**

**1. Write a C program to Create two polynomial P(x)=3x4 + 2x3 - 4 x2 + 7 and Q (x) = 5x3 + 4 x2 - 5**

**Ans:**



```
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════════════ SAAD10.C ═══════════════════1=[↕]
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
struct Node
{
int coeff;
int power;
struct Node* next;
};

struct Node* createlinkedlist(int);
struct Node* createnode(int,int);
void printList(struct Node*);

void main()
{
int n1,n2;
struct Node *poly1 = NULL, *poly2 = NULL;
clrscr();
printf("Enter the No. of Terms in 1st Polynomial: ");
scanf("%i",&n1);
═══ 55:1 ═══
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
 ≡  File  Edit  Search  Run  Compile  Debug  Project  Options    Window  Help
[■]═══════════════════ SAAD10.C ═══════════════════1=[↕]
printf("Enter the No. of Terms in 2nd Polynomial: ");
scanf("%i",&n2);
printf("\nPolynomial 1: \n");
poly1 = createlinkedlist(n1);
printf("\nPolynomial 2: \n");
poly2 = createlinkedlist(n2);
printf("\n1st Polynomial: \n");
printList(poly1);
printf("\n2nd Polynomial: \n");
printList(poly2);
getch();
}

struct Node* createlinkedlist(int n)
{
int coeff,power,i;
struct Node *head = NULL, *temp = NULL, *newNode = NULL;
if(n<=0)
{
printf("Number of Nodes should be greater then 0...");
return NULL;
═══ 42:78 ═══
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
```

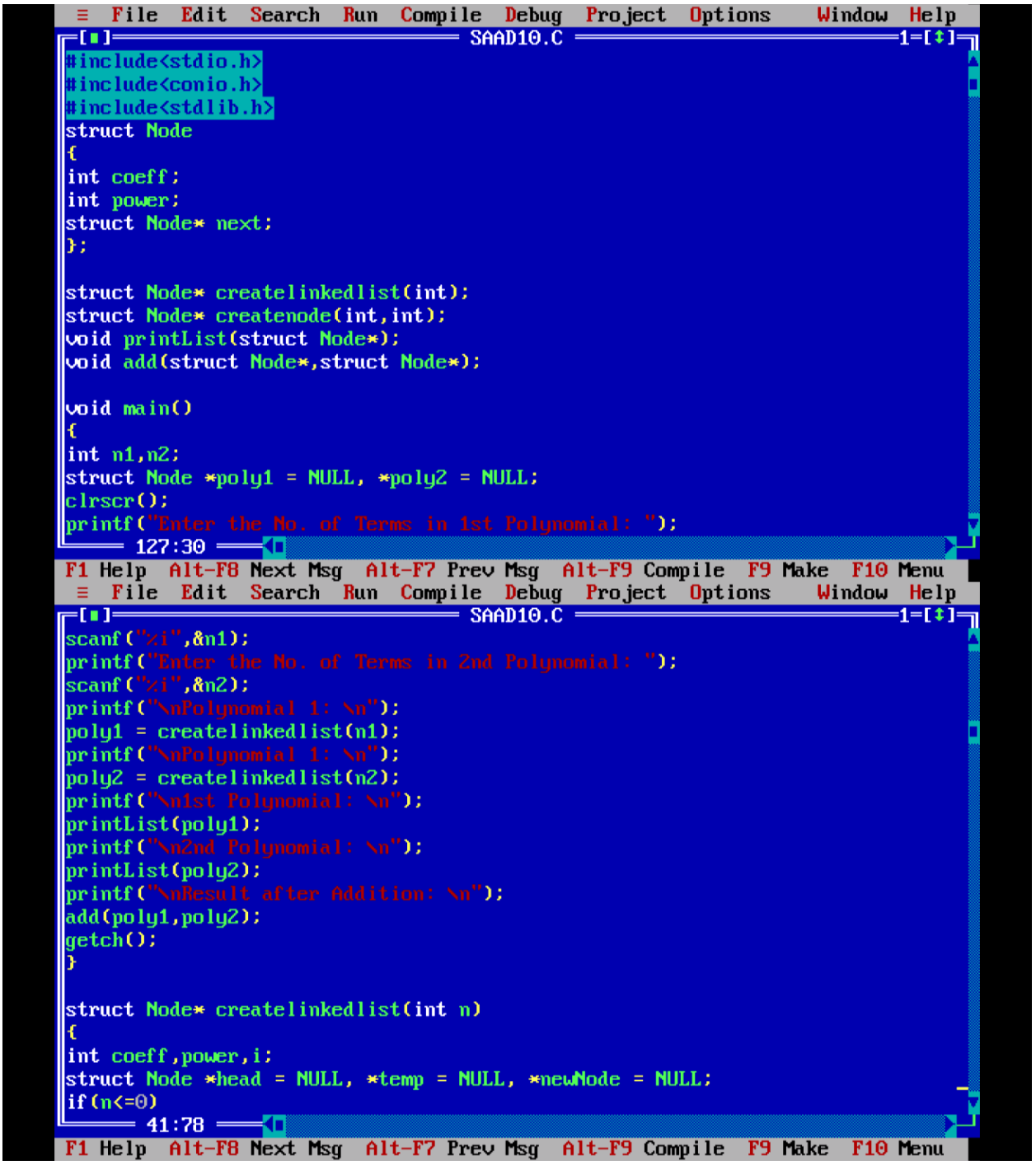

File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
return NULL;
}
printf("Enter Coefficient & Power for Term 1: ");
scanf("%i %i",&coeff,&power);
newNode = createnode(coeff,power);
head = newNode;
temp = newNode;
for(i=2;i<=n;i++)
{
printf("Enter Coefficient & Power for Term %i: ",i);
scanf("%i %i",&coeff,&power);
newNode = createnode(coeff,power);
temp->next = newNode;
temp = temp->next;
}
return head;
}
struct Node* createnode(int coeff, int power)
62:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu
File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
struct Node* createnode(int coeff, int power)
{
struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
newNode->coeff = coeff;
newNode->power = power;
newNode->next = NULL;
return newNode;
}
void printList(struct Node* head)
{
struct Node* temp = head;
while(temp->next!=NULL)
{
printf("%i X^%i + ",temp->coeff,temp->power);
temp = temp->next;
}
printf("%i",temp->coeff);
}
80:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu

**OUTPUT:**

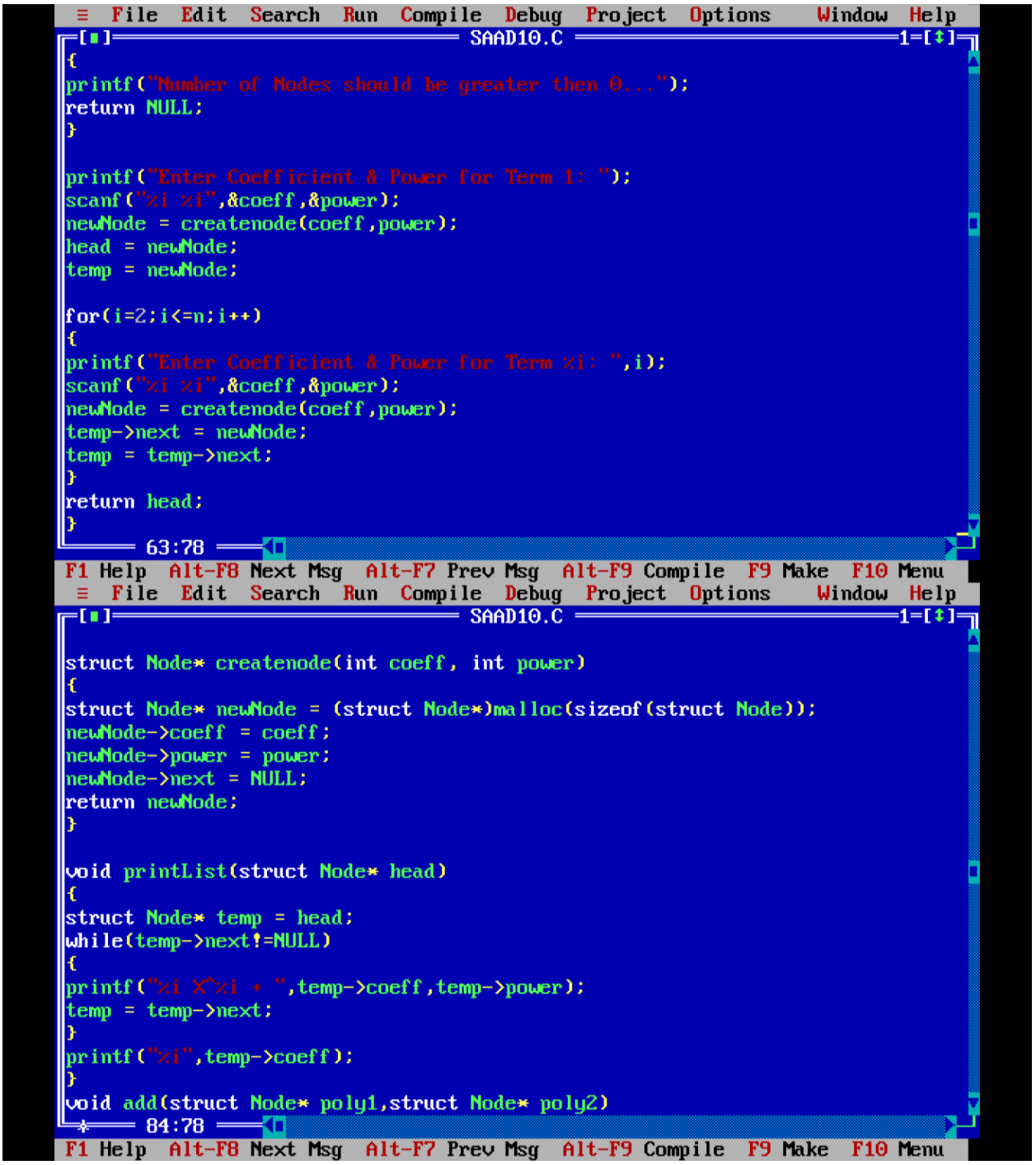
```
Enter the No. of Terms in 1st Polynomial: 4
Enter the No. of Terms in 2nd Polynomial: 3

Polynomial 1:
Enter Coefficient & Power for Term 1: 3 4
Enter Coefficient & Power for Term 2: 2 3
Enter Coefficient & Power for Term 3: -4 2
Enter Coefficient & Power for Term 4: 7 0

Polynomial 2:
Enter Coefficient & Power for Term 1: 5 3
Enter Coefficient & Power for Term 2: 4 2
Enter Coefficient & Power for Term 3: -5 0

1st Polynomial: 3X^4 + 2X^3 + -4X^2 + 7X^0
2nd Polynomial: 5X^3 + 4X^2 + -5X^0
```

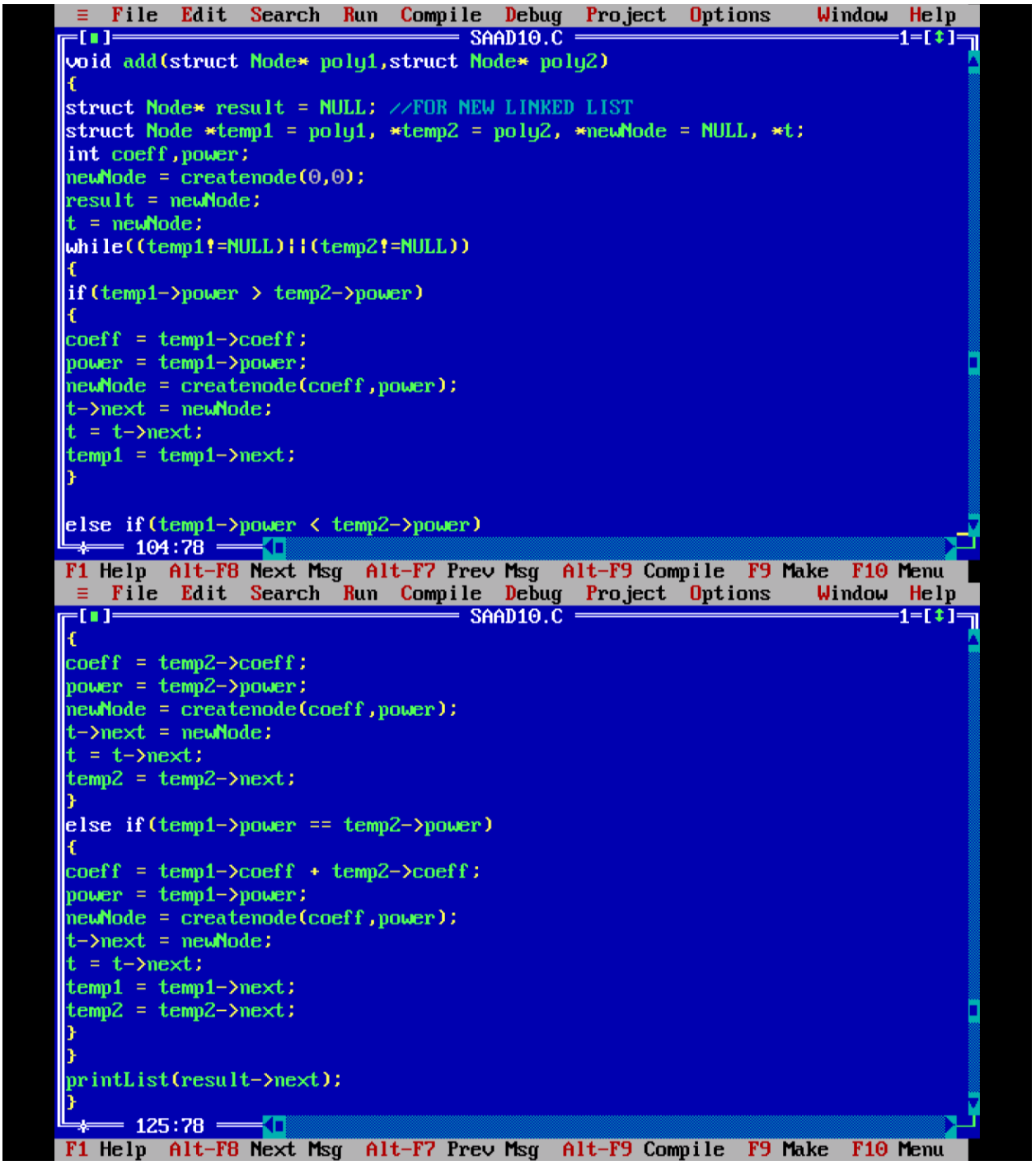
**2. Write a C program to display addition of two created polynomial.**

**Ans:**



```
File  Edit  Search  Run  Compile  Debug  Project  Options  Window  Help
                              SAAD10.C                              1=[↕]
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
struct Node
{
int coeff;
int power;
struct Node* next;
};

struct Node* createlinkedlist(int);
struct Node* createnode(int,int);
void printList(struct Node*);
void add(struct Node*,struct Node*);

void main()
{
int n1,n2;
struct Node *poly1 = NULL, *poly2 = NULL;
clrscr();
printf("Enter the No. of Terms in 1st Polynomial: ");
      127:30
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
File  Edit  Search  Run  Compile  Debug  Project  Options  Window  Help
                              SAAD10.C                              1=[↕]
scanf("%i",&n1);
printf("Enter the No. of Terms in 2nd Polynomial: ");
scanf("%i",&n2);
printf("\nPolynomial 1: \n");
poly1 = createlinkedlist(n1);
printf("\nPolynomial 1: \n");
poly2 = createlinkedlist(n2);
printf("\n1st Polynomial: \n");
printList(poly1);
printf("\n2nd Polynomial: \n");
printList(poly2);
printf("\nResult after Addition: \n");
add(poly1,poly2);
getch();
}

struct Node* createlinkedlist(int n)
{
int coeff,power,i;
struct Node *head = NULL, *temp = NULL, *newNode = NULL;
if(n<=0)
      41:78
F1 Help  Alt-F8 Next Msg  Alt-F7 Prev Msg  Alt-F9 Compile  F9 Make  F10 Menu
```


File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
{
printf("Number of Nodes should be greater then 0...");
return NULL;
}
printf("Enter Coefficient & Power for Term 1: ");
scanf("%i %i",&coeff,&power);
newNode = createnode(coeff,power);
head = newNode;
temp = newNode;
for(i=2;i<=n;i++)
{
printf("Enter Coefficient & Power for Term %i: ",i);
scanf("%i %i",&coeff,&power);
newNode = createnode(coeff,power);
temp->next = newNode;
temp = temp->next;
}
return head;
}
63:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu
File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
struct Node* createnode(int coeff, int power)
{
struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
newNode->coeff = coeff;
newNode->power = power;
newNode->next = NULL;
return newNode;
}
void printList(struct Node* head)
{
struct Node* temp = head;
while(temp->next!=NULL)
{
printf("%i X^%i + ",temp->coeff,temp->power);
temp = temp->next;
}
printf("%i",temp->coeff);
}
void add(struct Node* poly1,struct Node* poly2)
84:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu


File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
void add(struct Node* poly1,struct Node* poly2)
{
struct Node* result = NULL; //FOR NEW LINKED LIST
struct Node *temp1 = poly1, *temp2 = poly2, *newNode = NULL, *t;
int coeff,power;
newNode = createnode(0,0);
result = newNode;
t = newNode;
while((temp1!=NULL)||(temp2!=NULL))
{
if(temp1->power > temp2->power)
{
coeff = temp1->coeff;
power = temp1->power;
newNode = createnode(coeff,power);
t->next = newNode;
t = t->next;
temp1 = temp1->next;
}
else if(temp1->power < temp2->power)
104:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu
File Edit Search Run Compile Debug Project Options Window Help
SAAD10.C
{
coeff = temp2->coeff;
power = temp2->power;
newNode = createnode(coeff,power);
t->next = newNode;
t = t->next;
temp2 = temp2->next;
}
else if(temp1->power == temp2->power)
{
coeff = temp1->coeff + temp2->coeff;
power = temp1->power;
newNode = createnode(coeff,power);
t->next = newNode;
t = t->next;
temp1 = temp1->next;
temp2 = temp2->next;
}
}
printList(result->next);
}
125:78
F1 Help Alt-F8 Next Msg Alt-F7 Prev Msg Alt-F9 Compile F9 Make F10 Menu

**Output: -**

```
Enter the No. of Terms in 1st Polynomial: 4
Enter the No. of Terms in 2nd Polynomial: 3

Polynomial 1:
Enter Coefficient & Power for Term 1: 4 3
Enter Coefficient & Power for Term 2: 5 2
Enter Coefficient & Power for Term 3: 8 1
Enter Coefficient & Power for Term 4: 3 0

Polynomial 1:
Enter Coefficient & Power for Term 1: 3 2
Enter Coefficient & Power for Term 2: 5 1
Enter Coefficient & Power for Term 3: 7 0

1st Polynomial:
4 X^3 + 5 X^2 + 8 X^1 + 3
2nd Polynomial:
3 X^2 + 5 X^1 + 7
Result after Addition:
4 X^3 + 8 X^2 + 13 X^1 + 10_
```

| **Marks Obtained** | | | **Dated signature of Teacher** |
|---|---|---|---|
| **Process Related (35)** | **Product Related (15)** | **Total (50)** | |
| | | | |