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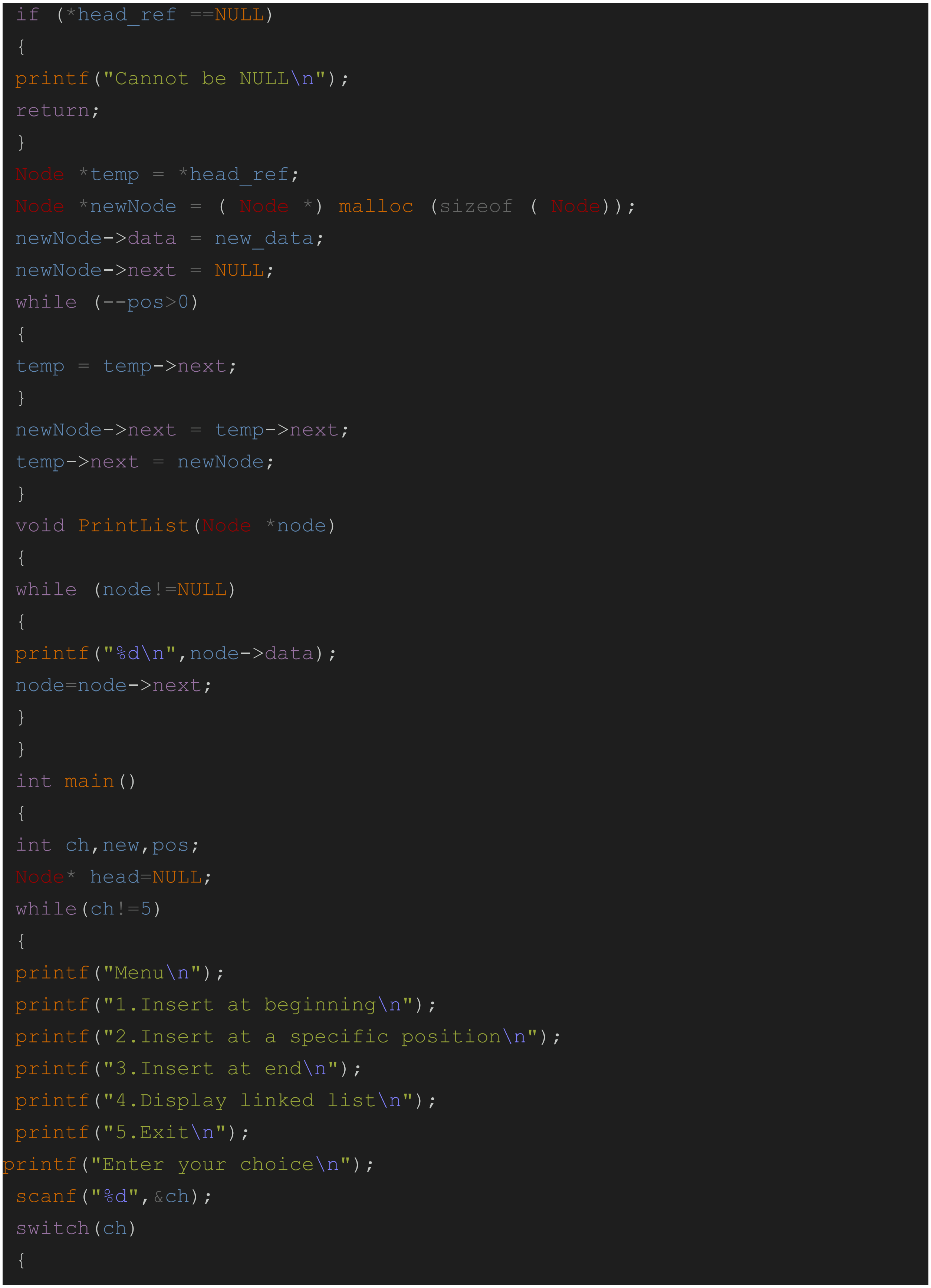
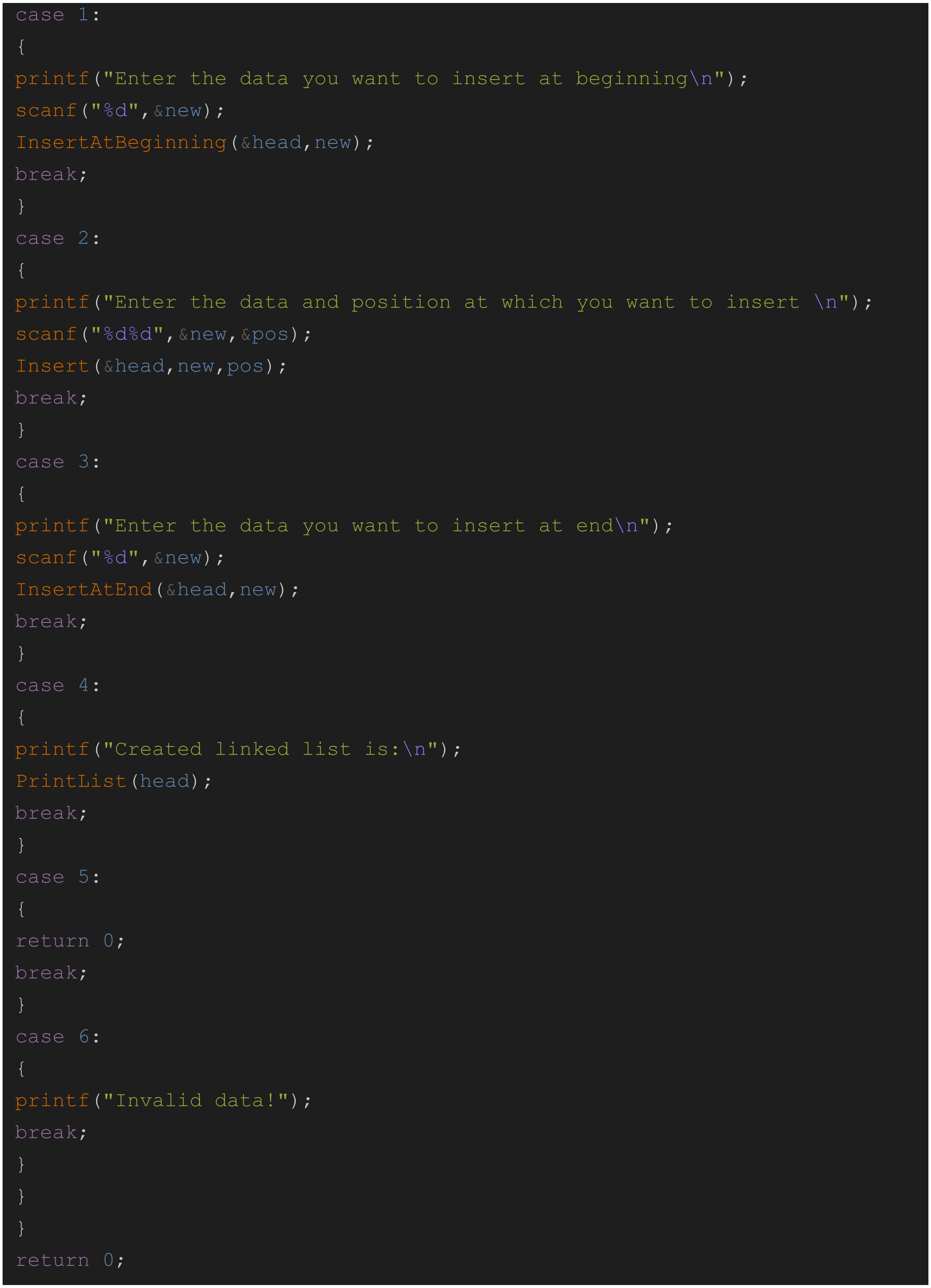
LAB 4

4) WAP to Implement Singly Linked List with following operations
a) Create a linked list.
b) Insertion of a node at first position, at any position and at end of list.
Display the contents of the linked list.

```
 #include <stdio.h>
 #include<stdlib.h>
 typedef struct Node {
 int data;
 struct Node *next;
 }Node;
 void InsertAtBeginning( Node **head_ref,int new_data);
 void InsertAtEnd( Node **head_ref,int new_data);
 void Insert( Node **prev_node,int new_data,int pos);
 void PrintList(Node * next);
 void InsertAtBeginning( Node **head_ref,int new_data)
 {
 Node *new_node=(struct Node*)malloc(sizeof( Node));
 new_node->data=new_data;
 new_node->next=*head_ref;
 *head_ref=new_node;
 }
 void InsertAtEnd(Node **head_ref,int new_data)
 {
 Node *new_node=(struct Node*)malloc(sizeof( Node));
 Node *last=*head_ref;
 new_node->data=new_data;
 new_node->next=NULL;
 if (*head_ref==NULL)
 {
 *head_ref=new_node;
 return ;
 }
 while (last->next!=NULL)
 last=last->next;
 last->next=new_node;
}
 void Insert(Node **head_ref,int new_data,int pos)
 {
```



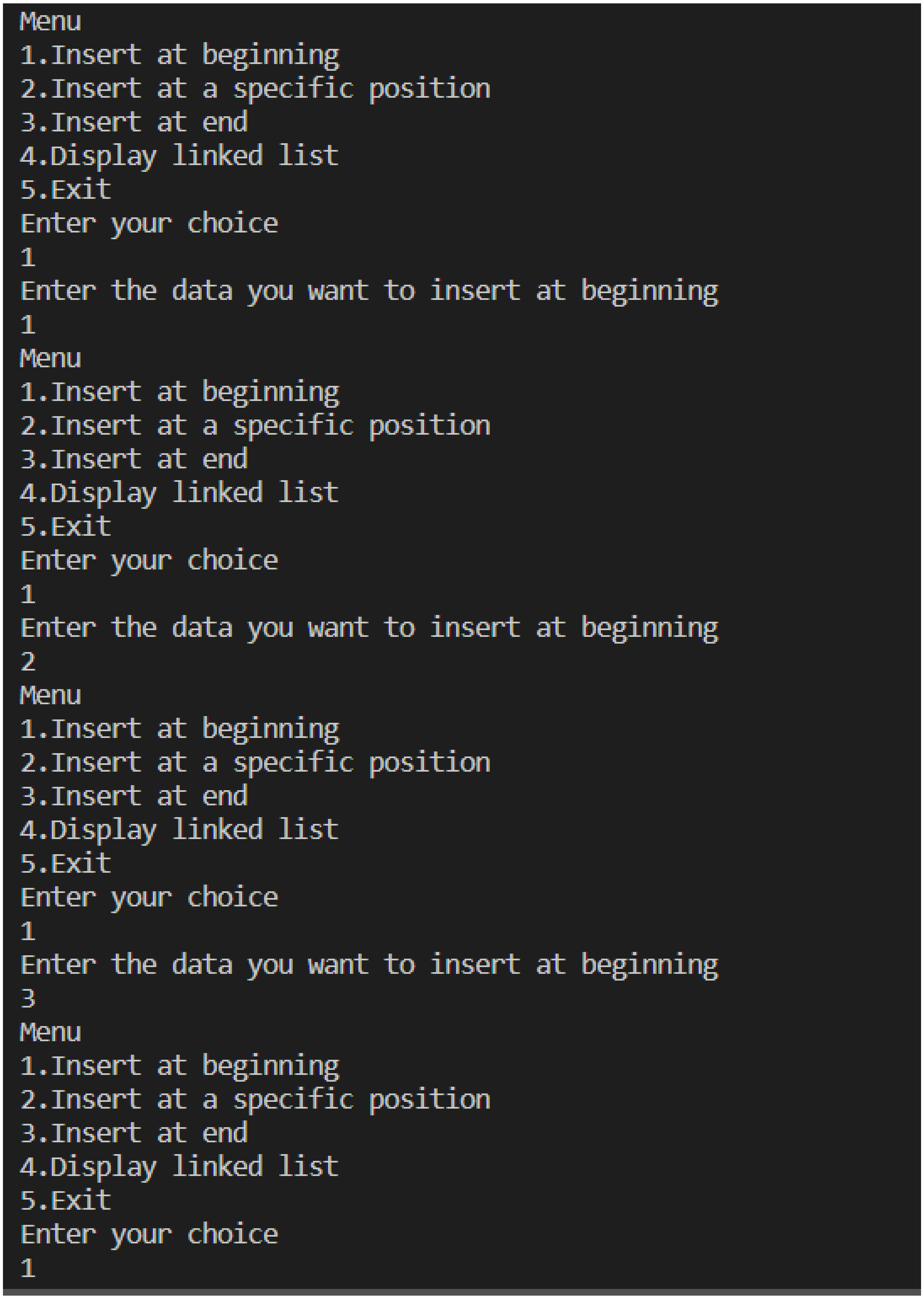
```
 if (*head_ref ==NULL)
 {
 printf("Cannot be NULL\n");
 return;
 }
 Node *temp = *head_ref;
 Node *newNode = ( Node *) malloc (sizeof ( Node));
 newNode->data = new_data;
 newNode->next = NULL;
 while (--pos>0)
 {
 temp = temp->next;
 }
 newNode->next = temp->next;
 temp->next = newNode;
 }
 void PrintList(Node *node)
 {
 while (node!=NULL)
 {
 printf("%d\n",node->data);
 node=node->next;
 }
 }
 int main()
 {
 int ch,new,pos;
 Node* head=NULL;
 while(ch!=5)
 {
 printf("Menu\n");
 printf("1.Insert at beginning\n");
 printf("2.Insert at a specific position\n");
 printf("3.Insert at end\n");
 printf("4.Display linked list\n");
 printf("5.Exit\n");
printf("Enter your choice\n");
 scanf("%d",&ch);
 switch(ch)
 {
```



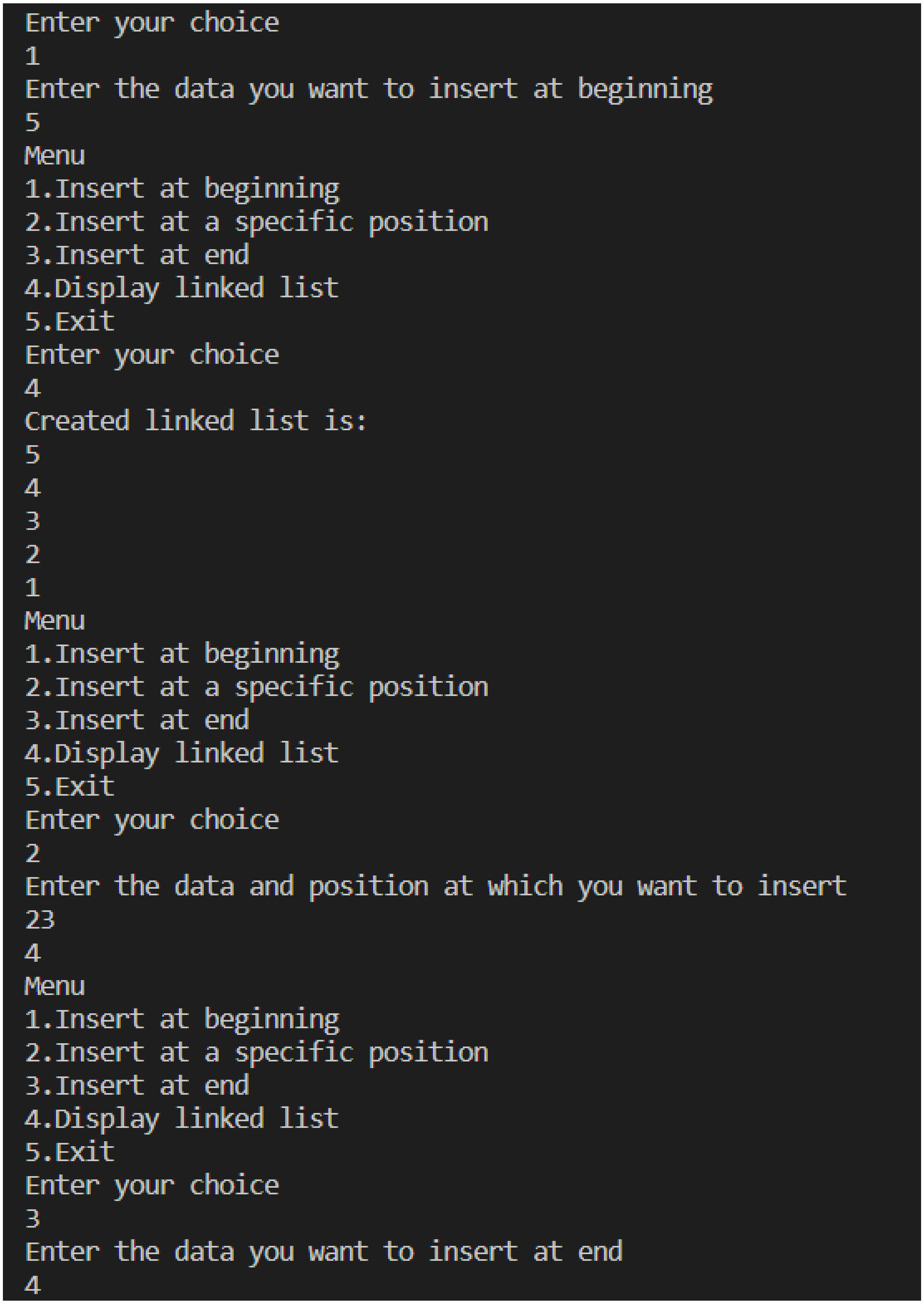
```
case 1:
{
printf("Enter the data you want to insert at beginning\n");
scanf("%d",&new);
InsertAtBeginning(&head,new);
break;
}
case 2:
{
printf("Enter the data and position at which you want to insert \n");
scanf("%d%d",&new,&pos);
Insert(&head,new,pos);
break;
}
case 3:
{
printf("Enter the data you want to insert at end\n");
scanf("%d",&new);
InsertAtEnd(&head,new);
break;
}
case 4:
{
printf("Created linked list is:\n");
PrintList(head);
break;
}
case 5:
{
return 0;
break;
}
case 6:
{
printf("Invalid data!");
break;
}
}
}
return 0;
```

```
}
```

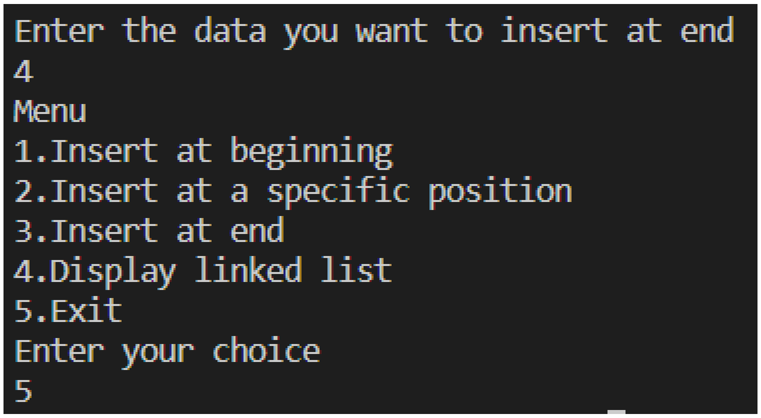
OUTPUT:



```
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
1
Enter the data you want to insert at beginning
1
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
1
Enter the data you want to insert at beginning
2
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
1
Enter the data you want to insert at beginning
3
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
1
```

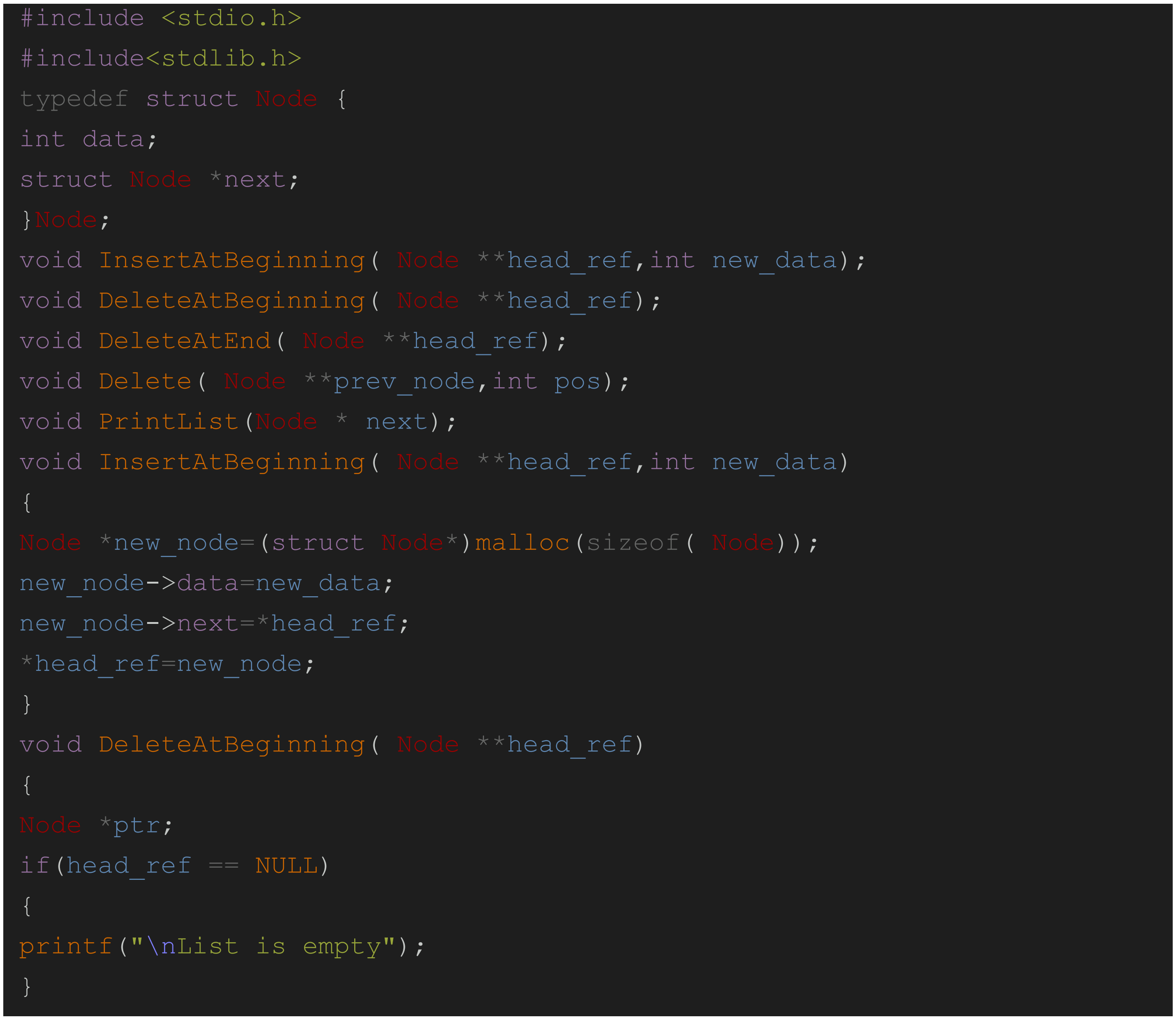


```
Enter your choice
1
Enter the data you want to insert at beginning
5
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
4
Created linked list is:
5
4
3
2
1
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
2
Enter the data and position at which you want to insert
23
4
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
3
Enter the data you want to insert at end
4
```

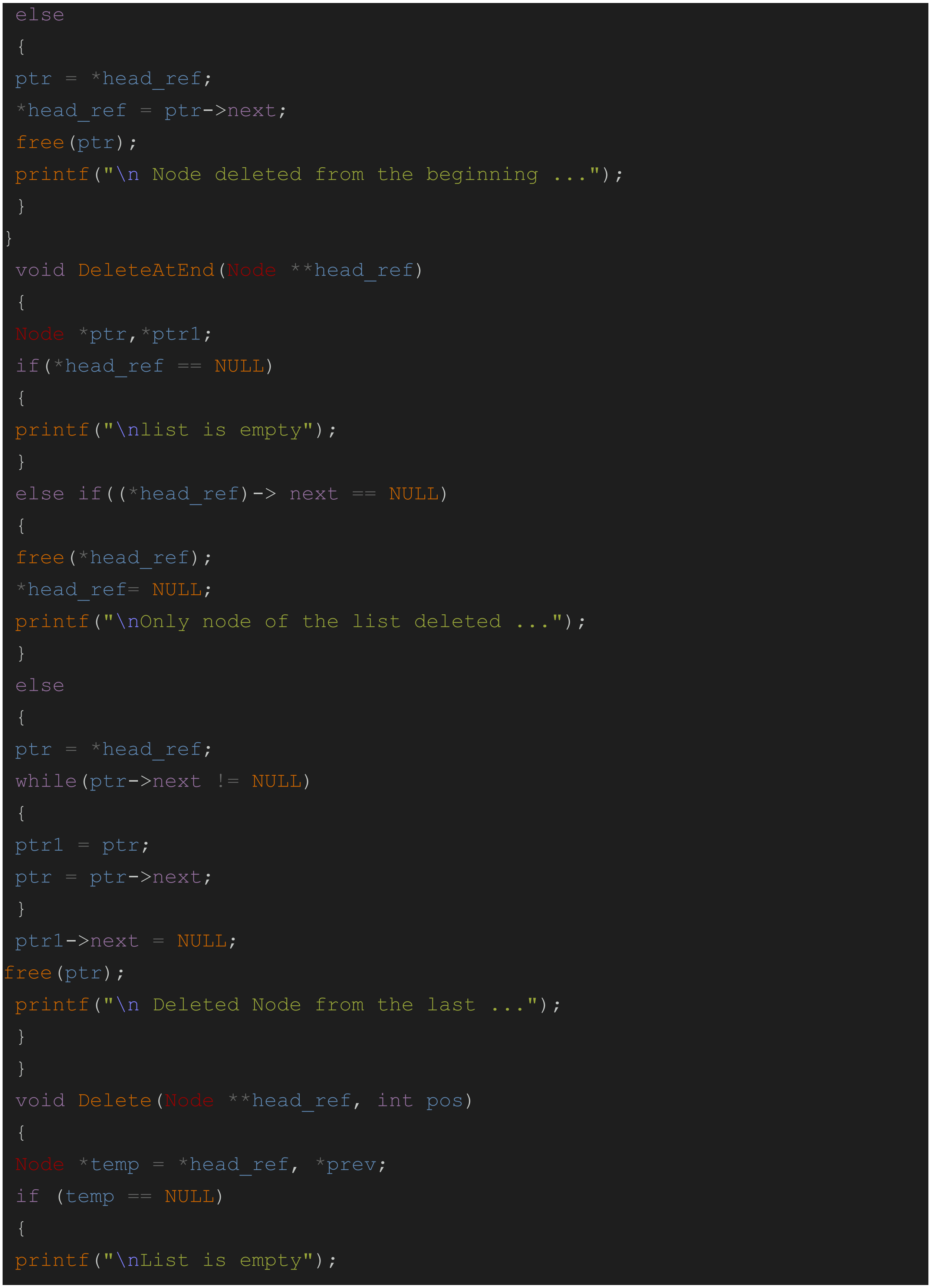


```
Enter the data you want to insert at end
4
Menu
1.Insert at beginning
2.Insert at a specific position
3.Insert at end
4.Display linked list
5.Exit
Enter your choice
5
```

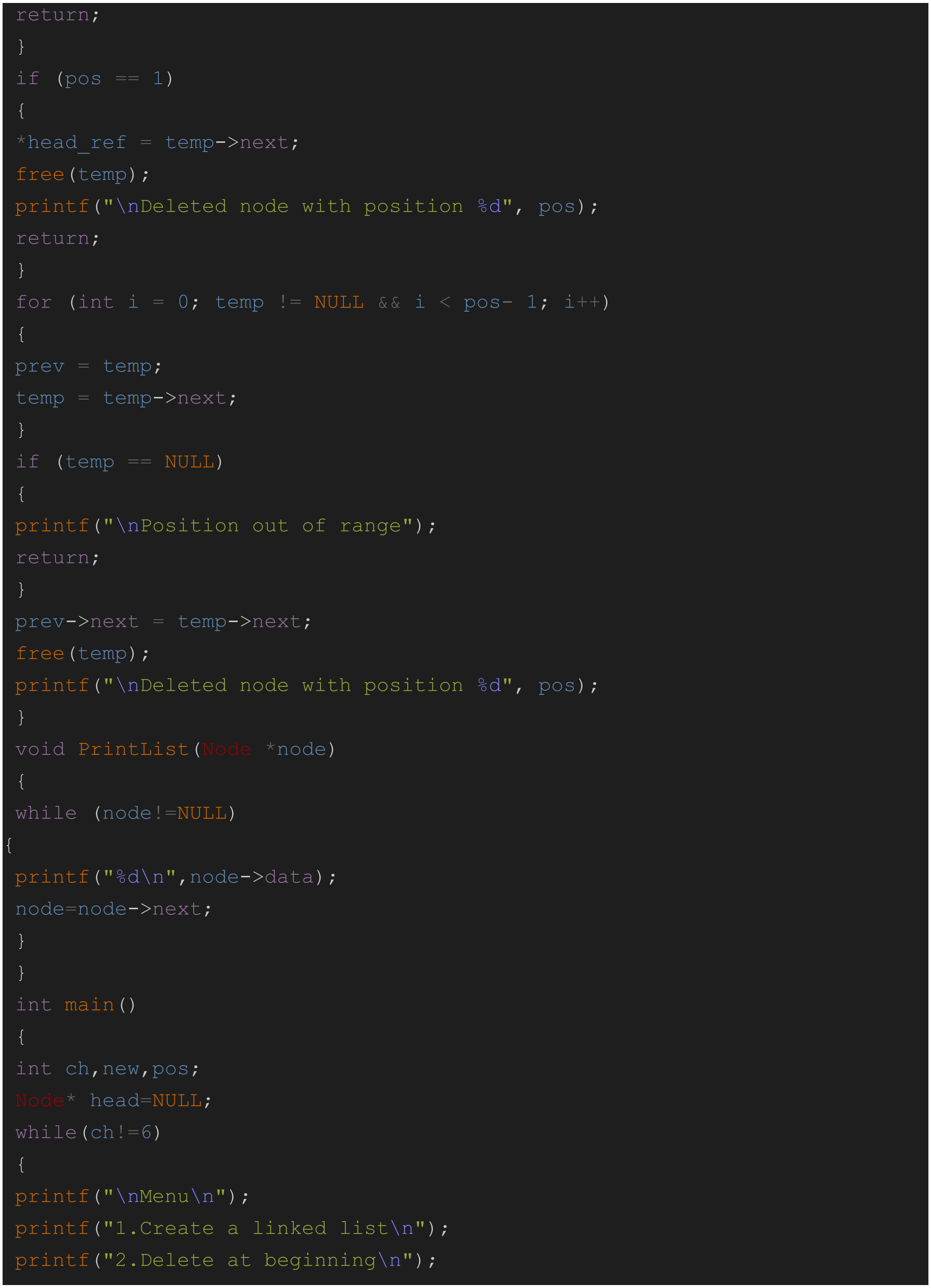
5) WAP to Implement Singly Linked List with following operations
a) Create a linked list.
b) Deletion of first element, specified element and last element in the list.
Display the contents of the linked list.



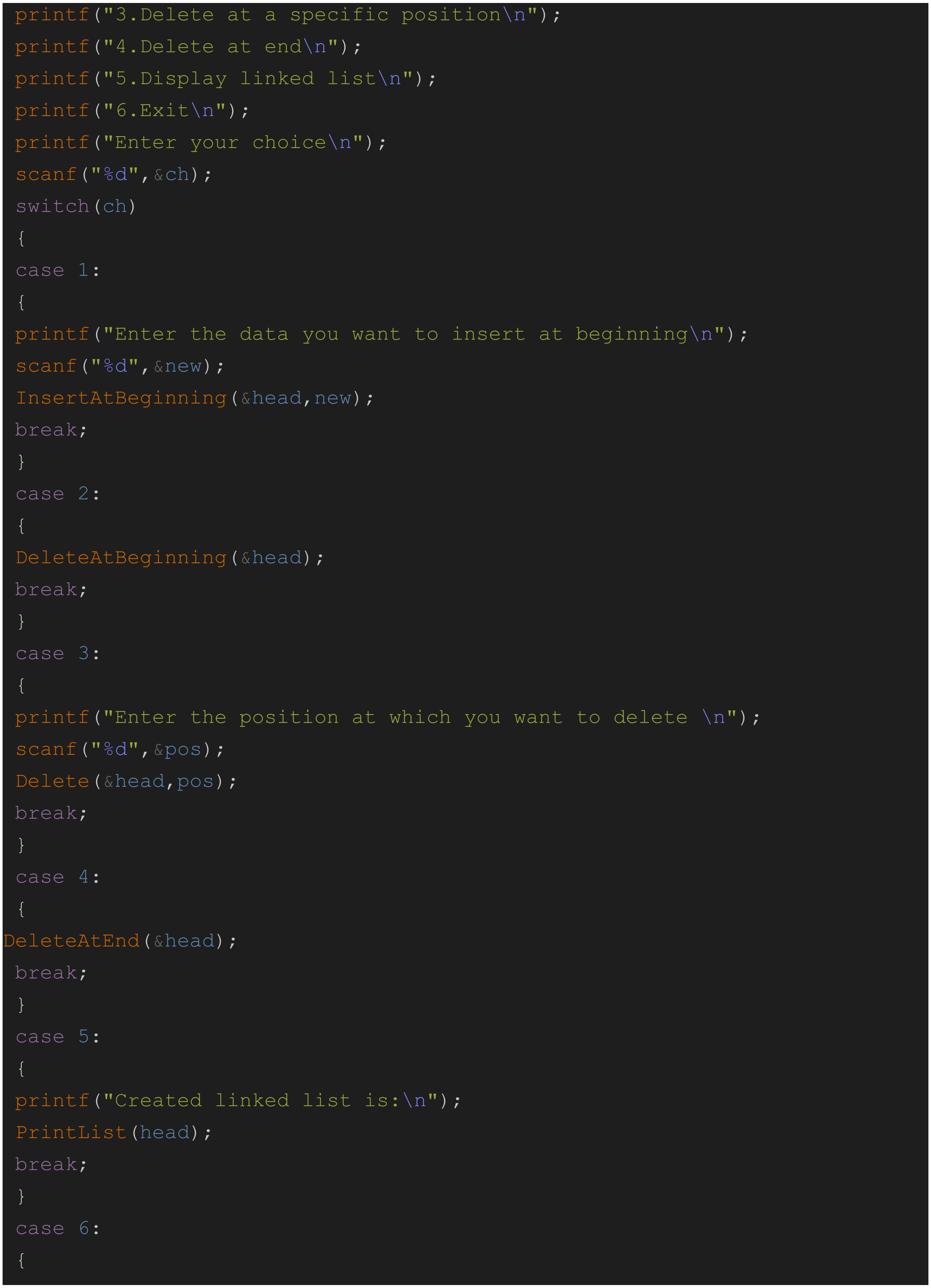
```
#include <stdio.h>
#include<stdlib.h>
typedef struct Node {
int data;
struct Node *next;
}Node;
void InsertAtBeginning( Node **head_ref,int new_data);
void DeleteAtBeginning( Node **head_ref);
void DeleteAtEnd( Node **head_ref);
void Delete( Node **prev_node,int pos);
void PrintList(Node * next);
void InsertAtBeginning( Node **head_ref,int new_data)
{
Node *new_node=(struct Node*)malloc(sizeof( Node));
new_node->data=new_data;
new_node->next=*head_ref;
*head_ref=new_node;
}
void DeleteAtBeginning( Node **head_ref)
{
Node *ptr;
if(head_ref == NULL)
{
printf("\nList is empty");
}
```



```
 else
 {
 ptr = *head_ref;
 *head_ref = ptr->next;
 free(ptr);
 printf("\n Node deleted from the beginning ...");
 }
}
 void DeleteAtEnd(Node **head_ref)
 {
 Node *ptr,*ptr1;
 if(*head_ref == NULL)
 {
 printf("\nlist is empty");
 }
 else if((*head_ref)-> next == NULL)
 {
 free(*head_ref);
 *head_ref= NULL;
 printf("\nOnly node of the list deleted ...");
 }
 else
 {
 ptr = *head_ref;
 while(ptr->next != NULL)
 {
 ptr1 = ptr;
 ptr = ptr->next;
 }
 ptr1->next = NULL;
free(ptr);
 printf("\n Deleted Node from the last ...");
 }
 }
 void Delete(Node **head_ref, int pos)
 {
 Node *temp = *head_ref, *prev;
 if (temp == NULL)
 {
 printf("\nList is empty");
```



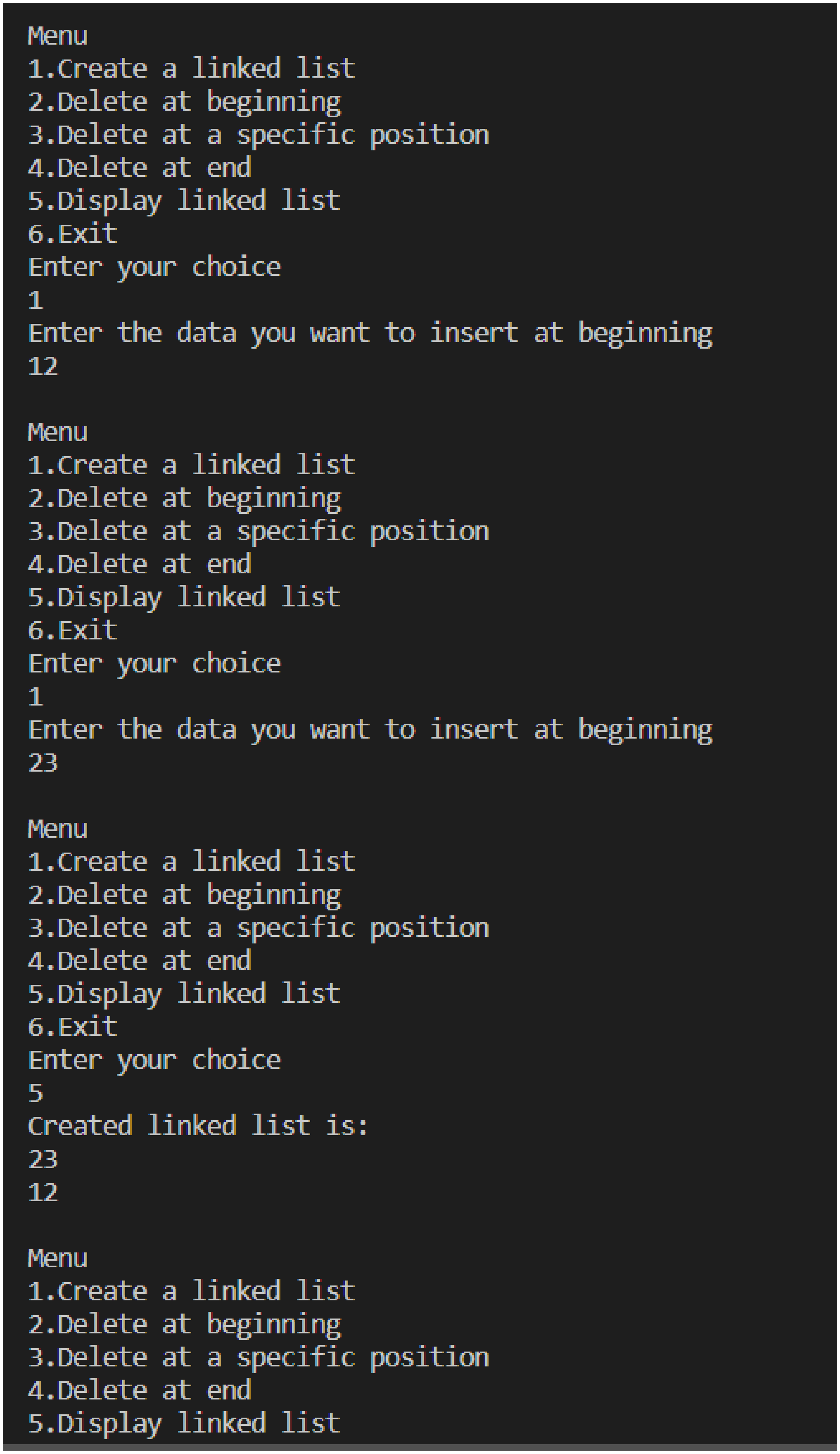
```
return;
}
if (pos == 1)
{
*head_ref = temp->next;
free(temp);
printf("\nDeleted node with position %d", pos);
return;
}
for (int i = 0; temp != NULL && i < pos- 1; i++)
{
prev = temp;
temp = temp->next;
}
if (temp == NULL)
{
printf("\nPosition out of range");
return;
}
prev->next = temp->next;
free(temp);
printf("\nDeleted node with position %d", pos);
}
void PrintList(Node *node)
{
while (node!=NULL)
{
printf("%d\n",node->data);
node=node->next;
}
}
int main()
{
int ch,new,pos;
Node* head=NULL;
while(ch!=6)
{
printf("\nMenu\n");
printf("1.Create a linked list\n");
printf("2.Delete at beginning\n");
```



```
 printf("3.Delete at a specific position\n");
 printf("4.Delete at end\n");
 printf("5.Display linked list\n");
 printf("6.Exit\n");
 printf("Enter your choice\n");
 scanf("%d",&ch);
 switch(ch)
 {
 case 1:
 {
 printf("Enter the data you want to insert at beginning\n");
 scanf("%d",&new);
 InsertAtBeginning(&head,new);
 break;
 }
 case 2:
 {
 DeleteAtBeginning(&head);
 break;
 }
 case 3:
 {
 printf("Enter the position at which you want to delete \n");
 scanf("%d",&pos);
 Delete(&head,pos);
 break;
 }
 case 4:
 {
DeleteAtEnd(&head);
 break;
 }
 case 5:
 {
 printf("Created linked list is:\n");
 PrintList(head);
 break;
 }
 case 6:
 {
```

```
return 0;
break;
}
default:
{
printf("Invalid data!");
break;
}
}
}
return 0;
}
```

OUTPUT:

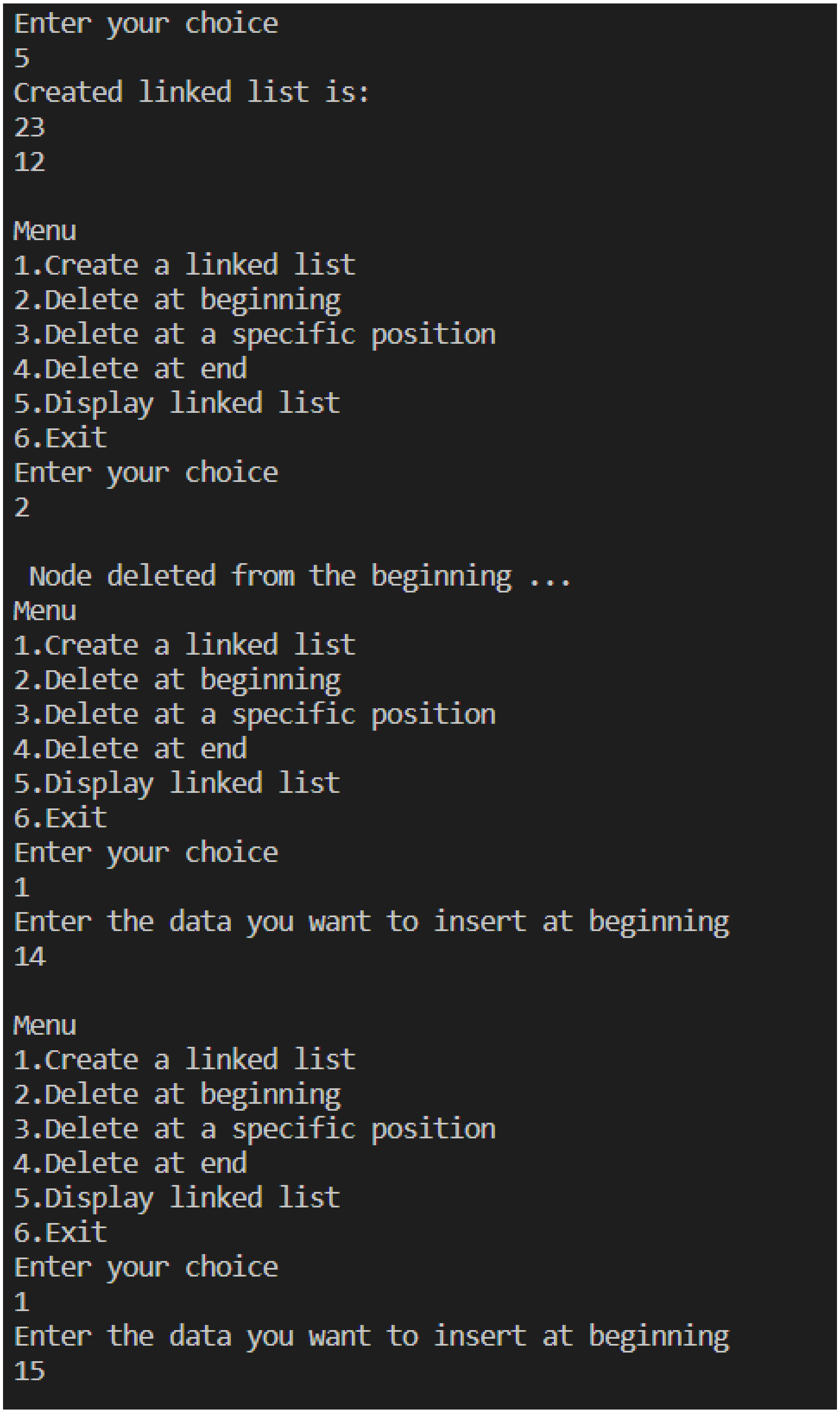


```
Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
1
Enter the data you want to insert at beginning
12

Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
1
Enter the data you want to insert at beginning
23

Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
5
Created linked list is:
23
12

Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
```

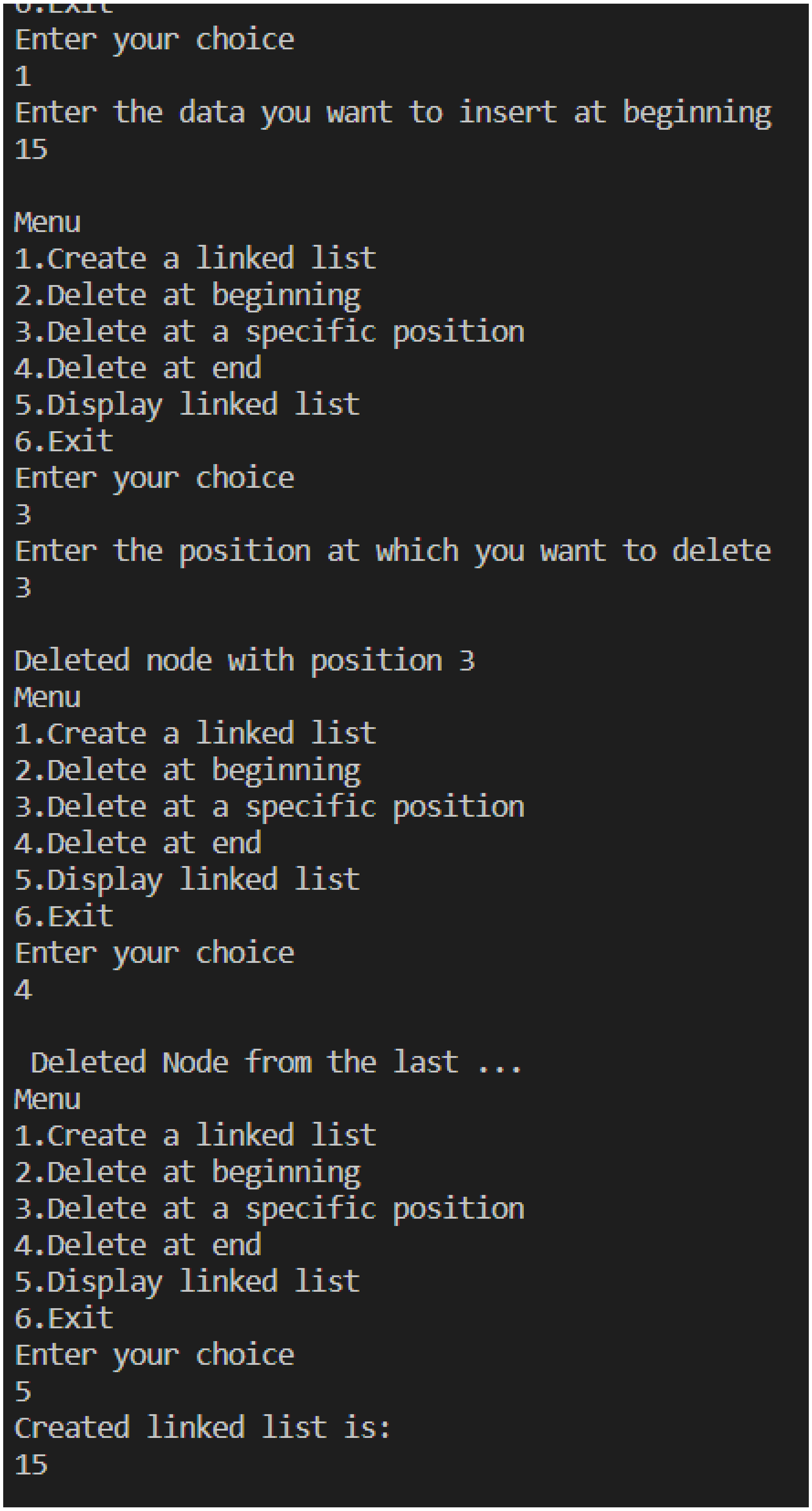


```
Enter your choice
5
Created linked list is:
23
12

Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
2

 Node deleted from the beginning ...
Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
1
Enter the data you want to insert at beginning
14

Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
1
Enter the data you want to insert at beginning
15
```



```
6.Exit
Enter your choice
1
Enter the data you want to insert at beginning
15

Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
3
Enter the position at which you want to delete
3

Deleted node with position 3
Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
4

 Deleted Node from the last ...
Menu
1.Create a linked list
2.Delete at beginning
3.Delete at a specific position
4.Delete at end
5.Display linked list
6.Exit
Enter your choice
5
Created linked list is:
15
```