

PRG-6

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

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

```
struct Node {
```

```
    int data;
```

```
    struct Node *next;
```

```
};
```

```
// Global heads
```

```
struct Node *head1 = NULL;
```

```
struct Node *head2 = NULL;
```

```
// Function prototypes
```

```
struct Node* createList(int n);
```

```
void displayList(struct Node *head);
```

```
void sortLinkedList(struct Node *head);
```

```
struct Node* reverseLinkedList(struct Node *head);
```

```
struct Node* concatenateLinkedList(struct Node *head1, struct Node *head2);
```

```
// Create list
```

```
struct Node* createList(int n) {
```

```
    struct Node *head = NULL, *newNode, *temp;
```

```
    int data;
```

```
    if (n <= 0) {
```

```
        printf("Number of nodes should be greater than 0\n");
```

```
        return NULL;
```

```
    }
```

```

for (int i = 1; i <= n; i++) {
    newNode = (struct Node*)malloc(sizeof(struct Node));
    if (newNode == NULL) {
        printf("Memory allocation failed\n");
        return head;
    }

    printf("Enter data for node %d: ", i);
    scanf("%d", &data);

    newNode->data = data;
    newNode->next = NULL;

    if (head == NULL)
        head = newNode;
    else
        temp->next = newNode;

    temp = newNode;
}

printf("Linked list created successfully\n");
return head;
}

```

// Display

```

void displayList(struct Node *head) {
    struct Node *temp = head;

    if (head == NULL) {

```

```

    printf("List is empty\n");
    return;
}

printf("Linked List: ");
while (temp != NULL) {
    printf("%d -> ", temp->data);
    temp = temp->next;
}
printf("NULL\n");
}

// Sort
void sortLinkedList(struct Node *head) {
    struct Node *i, *j;
    int tempData;

    if (head == NULL) {
        printf("List is empty, cannot sort.\n");
        return;
    }

    for (i = head; i->next != NULL; i = i->next) {
        for (j = i->next; j != NULL; j = j->next) {
            if (i->data > j->data) {
                tempData = i->data;
                i->data = j->data;
                j->data = tempData;
            }
        }
    }
}

```

```
    printf("Linked list sorted successfully\n");  
}
```

// Reverse

```
struct Node* reverseLinkedList(struct Node *head) {  
    struct Node *prev = NULL, *curr = head, *next = NULL;  
  
    while (curr != NULL) {  
        next = curr->next;  
        curr->next = prev;  
        prev = curr;  
        curr = next;  
    }  
  
    printf("Linked list reversed successfully\n");  
    return prev;  
}
```

// Concatenate

```
struct Node* concatenateLinkedList(struct Node *head1, struct Node *head2) {  
    struct Node *temp;  
  
    if (head1 == NULL)  
        return head2;  
  
    temp = head1;  
    while (temp->next != NULL)  
        temp = temp->next;  
  
    temp->next = head2;
```

```
    printf("Linked lists concatenated successfully\n");
    return head1;
}
```

// Menu

```
int main() {
    int choice, n;

    while (1) {
        printf("\n===== \n");
        printf("    LINKED LIST MENU    \n");
        printf("===== \n");
        printf("1. Create List 1\n");
        printf("2. Create List 2\n");
        printf("3. Display List 1\n");
        printf("4. Display List 2\n");
        printf("5. Sort List 1\n");
        printf("6. Reverse List 1\n");
        printf("7. Concatenate List 1 + List 2\n");
        printf("8. Exit\n");
        printf("Enter choice: ");
        scanf("%d", &choice);

        switch (choice) {
        case 1:
            printf("Enter number of nodes for List 1: ");
            scanf("%d", &n);
            head1 = createList(n);
            break;
```

case 2:

```
printf("Enter number of nodes for List 2: ");  
scanf("%d", &n);  
head2 = createList(n);  
break;
```

case 3:

```
displayList(head1);  
break;
```

case 4:

```
displayList(head2);  
break;
```

case 5:

```
sortLinkedList(head1);  
break;
```

case 6:

```
head1 = reverseLinkedList(head1);  
break;
```

case 7:

```
head1 = concatenateLinkedList(head1, head2);  
printf("After concatenation:\n");  
displayList(head1);  
break;
```

case 8:

```
printf("Exiting program...\n");  
exit(0);
```

```

        default:

            printf("Invalid choice. Try again.\n");

        }

    }

return 0;

}

```

OUTPUT:

```

C:\Users\student\Desktop\ch...
=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 1
Enter number of nodes for List 1: 4
Enter data for node 1: 40
Enter data for node 2: 20
Enter data for node 3: 30
Enter data for node 4: 10
Linked list created successfully

=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 2
Enter number of nodes for List 2: 5
Enter data for node 1: 10
Enter data for node 2: 20
Enter data for node 3: 15
Enter data for node 4: 30
Enter data for node 5: 50
Linked list created successfully

```

```
=====
LINKED LIST MENU
=====
```

```
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 3
Linked List: 40 -> 20 -> 30 -> 10 -> NULL
```

```
=====
LINKED LIST MENU
=====
```

```
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 4
Linked List: 10 -> 20 -> 15 -> 30 -> 50 -> NULL
```

```
=====
LINKED LIST MENU
=====
```

```
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 5
Linked list sorted successfully
```

```
C:\Users\student\Desktop\ch... X + v

=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 3
Linked List: 10 -> 20 -> 30 -> 40 -> NULL

=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 6
Linked list reversed successfully

=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 3
Linked List: 40 -> 30 -> 20 -> 10 -> NULL
```

```
C:\Users\student\Desktop\chi X + v

=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 7
Linked lists concatenated successfully
After concatenation:
Linked List: 40 -> 30 -> 20 -> 10 -> 10 -> 20 -> 15 -> 30 -> 50 -> NULL

=====
LINKED LIST MENU
=====
1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit
Enter choice: 8
Exiting program...

Process returned 0 (0x0)   execution time : 60.018 s
Press any key to continue.
|
```

OBSERVATION:

24/11/25

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Prq-6a

- a. NAP to implement Singly linked list with following operations: sort the linked list, Reverse the linked list, Concatenation of two linked list.

Pseudo:

Ans To sort a linked list (Bubble Sort):-

1. Start with the first node as pointer i .
2. Repeat while i is not the last node:
 - Set pointer j to the node after i .
 - Repeat while j is not NULL:
 - If the data in i is greater than the data in j , swap the data using temp.
 - Move j to the next data.
 - Move i to the next node.

To reverse a linked list:-

1. Set $prev$ to NULL.
2. Set $curr$ to the head of the list.
3. Repeat while $curr$ is not NULL:
 - Store the next node of $curr$ in $nextNode$.
 - Change the next pointer of $curr$ to $prev$.
 - Move $prev$ to $curr$.
 - Move $curr$ to $nextNode$.
4. After the loop, set the head of the list to $prev$.

To concatenate two linked list:-

1. If the first list is empty, make the second list as the resulting list.
2. Otherwise, start from head of the first list.
3. Move through the list until the last node is reached.
4. Set the next pointer of the last node of the first list to the head of the second list.

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

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

```
struct Node {
    int data;
    struct Node *next;
};
```

```
struct Node *head1 = NULL;
```

```
struct Node *head2 = NULL;
```

```
struct Node *createList (int n);
```

```
void displayList (struct Node *head);
```

```
void sortLinkedList (struct Node *head);
```

```
struct Node *reverseLinkedList (struct Node *head);
```

```
struct Node *concatenateLinkedList (struct Node *head1,
```

```
struct Node *head2);
```

```
struct Node *createList (int n) {
```

```
    struct Node *head = NULL, *newNode, *temp;
```

```
    int data;
```

Date / /
Page
if ($n <= 0$) {
 printf ("Number of nodes should be greater than 0 \n");
 return NULL;
}

for (int i = 1; i <= n; i++) {
 newNode = (struct Node*) malloc (size of (struct Node));
 if (newNode == NULL) {
 printf ("Memory allocation failed \n");
 return head;
 }

 printf ("Enter data for node %d: ", i);
 scanf ("%d", &data);

 newNode->data = data;
 newNode->next = NULL;

 if (head == NULL)
 head = newNode;
 else

 temp->next = newNode;

 temp = newNode;

}

printf ("Linked List created successfully \n");
return head;

}

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Page: __

```

void displayList (struct Node * head) {
    struct Node * temp = head;
    if (head == NULL) {
        printf ("List is empty \n");
        return;
    }

```

```

    printf ("Linked List: ");
    while (temp != NULL) {
        printf ("%d -> ", temp->data);
        temp = temp->next;
    }
    printf ("NULL \n");
}

```

```

void sortLinkedList (struct Node * head) {
    struct Node * i, * j;
    int tempData;

    if (head == NULL) {
        printf ("List is empty, cannot sort \n");
        return;
    }

```

```

    for (i = head; i->next != NULL; i = i->next)

```

```

    {
        for (j = i->next; j != NULL; j = j->next)

```

```

        {
            if (i->data > j->data) {
                tempData = i->data;
                i->data = j->data;
                j->data = tempData;
            }
        }
    }
}

```

```
    j->data = tempData;  
}  
}  
printf ("Linked List sorted successfully\n");  
}
```

```
struct Node * reverselinkedlist (struct Node *head)  
{
```

```
    struct Node * prev = NULL, * curr = head,  
                * next = NULL;
```

```
    while (curr != NULL) {  
        next = curr->next;  
        curr->next = prev;  
        prev = curr;  
        curr = next;  
    }
```

```
    printf ("Linked List reversed successfully\n");  
    return prev;  
}
```

```
3 struct Node * concatenateLinkedList (struct  
Node *head1, struct Node *head2)  
{
```

```
    struct Node * temp;
```

```
    if (head1 == NULL)  
        return head2;
```

```
    temp = head1;
```

```
    while (temp->next != NULL)  
        temp = temp->next;
```

```
temp->next = head2;
printf("linked list concatenated\n");
return head1;
}
```

```
int main() {
    int choice, n;
```

```
while(1) {
    printf("\n =====\n");
    printf("Linked List Menu\n");
    printf("===== \n");
    printf("1. Create List 1\n");
    printf("2. Create List 2\n");
    printf("3. Display List 1\n");
    printf("4. Display List 2\n");
    printf("5. Sort List 1\n");
    printf("6. Reverse List 1\n");
    printf("7. Concatenate List 1 + List 2\n");
    printf("8. Exit\n");
    printf("Enter choice: ");
    scanf("%d", &choice);
```

```
switch(choice) {
```

```
case 1:
```

```
    printf("Enter no. of nodes for List 1: ");
```

```
    scanf("%d", &n);
```

```
    head1 = createList(n);
    break;
```

case 2:

```
printf("Enter number of nodes for  
list 2: ");  
scanf("%d", &n);  
head2 = createList(n);  
break;
```

case 3:

```
displayList(head1);  
break;
```

case 4:

```
displayList(head2);  
break;
```

case 5:

```
sortLinkedList(head1);  
break;
```

case 6:

```
head1 = reverseLinkedList(head1);  
break;
```

~~case 7:~~

```
head1 = concatenateLinkedList(head1, head2);  
printf("After concatenation: \n");  
displayList(head1);  
break;
```

case 8:

```
printf("Exiting program ... \n");  
exit(0);
```

```

default;
    printf("Invalid choice. Try again\n");
}
}
return 0;
}

```

output:-

----- Linked List Menu -----

1. Create List 1
2. Create List 2
3. Display List 1
4. Display List 2
5. Sort List 1
6. Reverse List 1
7. Concatenate List 1 + List 2
8. Exit.

Enter choice: 1

Enter number of nodes for List 1: 4

Enter data for node 1: 40

Enter data for node 2: 20

Enter data for node 3: 30

Enter data for node 4: 10

Linked List created successfully.

Enter choice: 2

Enter number of nodes for List 2: 5

Enter data for node 1: 10

Enter data for node 2: 20

Enter data for node 3: 35

Enter data for node 4 : 30
Enter data for node 5 : 50
Linked list created successfully.

Enter choice : 3
Linked List : 40 → 20 → 30 → 10 → NULL

Enter choice : 4
Linked List : 10 → 20 → 15 → 30 → 50 → NULL

Enter choice : 5
Linked list sorted successfully.

Enter choice : 3
Linked List : 10 → 20 → 30 → 40 → NULL

Enter choice : 6
Linked list reversed successfully.

Enter choice : 3
Linked List : 40 → 30 → 20 → 10 → NULL

Enter choice : 7
~~Linked list~~ concatenated successfully
After concatenation:
Linked list : 40 → 30 → 20 → 10 → 10 → 20 →
15 → 30 → 50 → NULL

~~Enter choice : 8~~
Exiting program....

