

## Implementing Singly Linked List in C++ Using **struct**

**Example 1:** Declarations to create a node and playing with pointers.

```
#include <iostream>
using namespace std;

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

int main()
{
    Node *head=NULL;
    Node *t;
    Node *n;

    n = new Node;
    n->data = 10;
    n->next = NULL;

    head=n;
    t=n;

    n = new Node;
    n->data = 20;
    n->next = NULL;

    cout<<head->data<<endl;
    cout<<head<<endl;
    cout<<t->data<<endl;
    cout<<t<<endl;

    cout<<n->data<<endl;
    cout<<n<<endl;

    head->next=n;

    cout<<n<<endl;

    t=t->next;
    cout<<t<<endl;
```

}

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### **Example 2:** Adding or Appending a Node to the List

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void appendNode(int value)
{
    Node *n, *curr;

    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;

    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
```

```

else // Otherwise, insert newNode at end
{
    // Initialize curr to head of list
    curr = head;

    // Find the last node in the list
    while (curr->next!= NULL)
    {
        curr = curr->next;
    }

    // Insert newNode as the last node
    curr->next = n;
}

}

int main()
{
    appendNode(2);
    appendNode(14);
    appendNode(26);
    return 0;
}

```

**Example 3:** Adding Nodes to the List and then printing them from the beginning until the end.

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void appendNode(int value)
{
    Node *n, *curr;

    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;

    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
```

```

else // Otherwise, insert newNode at end
{
    // Initialize curr to head of list
    curr = head;

    // Find the last node in the list
    while (curr->next!= NULL)
    {
        curr = curr->next;
    }

    // Insert newNode as the last node
    curr->next = n;
}
}

```

// displaying the list from the beginning

```
void displayList(void)
```

```

{
    Node *curr;
    curr = head;
    while (curr!=NULL)
    {
        cout << curr->data << endl;
        curr = curr->next;
    }
}

```

```
}
```

```
}
```

```
// main function
```

```
int main()
```

```
{
```

```
    appendNode(2);
```

```
    appendNode(14);
```

```
    appendNode(26);
```

```
    displayList();
```

```
    return 0;
```

```
}
```

**Example 4:** Insertion at the end of the list.

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void appendNode(int value)
{
    Node *n, *curr;

    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;

    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
    else // Otherwise, insert newNode at end
```



```

{
    // Initialize curr to head of list
    curr = head;

    // Find the last node in the list
    while (curr->next!= NULL)
    {
        curr = curr->next;
    }

    // Insert newNode as the last node
    curr->next = n;
}
}

```

// displaying the list from the beginning

```
void displayList(void)
```

```

{
    Node *curr;
    curr = head;
    while (curr!=NULL)
    {
        cout << curr->data << endl;
        curr = curr->next;
    }
}

```

```
}
```

```
// main function
```

```
int main()
```

```
{
```

```
    appendNode(2);
```

```
    appendNode(14);
```

```
    appendNode(26);
```

```
    displayList();
```

```
    return 0;
```

```
}
```

**Example 5:** Insertion at the top of the list.

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void InsertNode(int value)
{
    Node *n, *curr;

    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;

    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
    else // Otherwise, insert newNode at end
```

```

{
    // Initialize curr to head of list
    curr = head;

    // Insert n as the first node
    head = n;

    // connect the first node to the rest of the nodes
    head->next = curr;
}
}

```

// displaying the list from the beginning

void displayList(void)

```

{
    Node *curr;
    curr = head;
    while (curr!=NULL)
    {
        cout << curr->data << endl;
        curr = curr->next;
    }
}

```

// main function

```
int main()
{
    InsertNode(2);
    InsertNode(14);
    InsertNode(26);
    displayList();
    return 0;
}
```

### **Example 6:** Insertion at the middle of the list

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void InsertNode(int value)
{
    Node *n, *curr, *previous=NULL;
    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;
    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
```

```

else // Otherwise, insert n at end
{
    curr = head;
    // Skip all nodes whose value member is less than value.
    while (curr != NULL && curr->data < value)
    {
        previous = curr;
        curr = curr->next;
    }

```

// If n is to be the 1st in the list, insert it before all other nodes

```

if (previous == NULL)
{
    head = n;
    n->next = curr;
}
else
{
    previous->next = n;
    n->next = curr;
}

}

```

```
}
```

```
// displaying the list from the beginning
```

```
void displayList(void)
```

```
{
```

```
    Node *curr;
```

```
    curr = head;
```

```
    while (curr!=NULL)
```

```
    {
```

```
        cout << curr->data << endl;
```

```
        curr = curr->next;
```

```
    }
```

```
}
```

```
// main function
```

```
int main()
```

```
{
```

```
    InsertNode(2);
```

```
    InsertNode(14);
```

```
    InsertNode(26);
```



```
    InsertNode(30);  
    InsertNode(18);  
    InsertNode(1);  
    displayList();  
    return 0;  
}
```

**Example 7:** Delete a node with a specific value from the list

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void InsertNode(int value)
{
    Node *n, *curr, *previous=NULL;
    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;
    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
    else // Otherwise, insert n at end
```

```
{  
    curr = head;  
    // Skip all nodes whose value member is less than value.  
    while (curr != NULL && curr->data < value)  
    {  
        previous = curr;  
        curr = curr->next;  
    }
```

// If n is to be the 1st in the list, insert it before all other nodes

```
if (previous == NULL)  
{  
    head = n;  
    n->next = curr;  
}  
else  
{  
  
    previous->next = n;  
    n->next = curr;  
}  
  
}
```

```
}
```

```
// displaying the list from the beginning
```

```
void displayList(void)
```

```
{
```

```
    Node *curr;
```

```
    curr = head;
```

```
    while (curr!=NULL)
```

```
    {
```

```
        cout << curr->data << endl;
```

```
        curr = curr->next;
```

```
    }
```

```
}
```

```
void DeleteNode(int value)
```

```
{
```

```
    Node *curr, *previous = NULL;
```

```
    // If the list is empty, do nothing.
```

```
    if (!head)
```

```
        return;
```

```
    // Determine if the first node is the one.
```

```
if (head->data == value)
```

```
{
```

```
    curr = head->next;
```

```
    delete head;
```

```
    head = curr;
```

```
}
```

```
else
```

```
{
```

```
    // Initialize nodePtr to head of list
```

```
    curr = head;
```

```
    // Skip all nodes whose value member is
```

```
    // not equal to num.
```

```
    while (curr != NULL && curr->data != value)
```

```
    {
```

```
        previous = curr;
```

```
        curr = curr->next;
```

```
    }
```

```
    // Link the previous node to the node after
```

```
    // nodePtr, then delete nodePtr.
```

```
    previous->next = curr->next;
```

```
    delete curr;
```

```
}
```

```
}
```

```
// main function
```

```
int main()
```

```
{
```

```
    InsertNode(2);
```

```
    InsertNode(14);
```

```
    InsertNode(26);
```

```
    InsertNode(30);
```

```
    InsertNode(18);
```

```
    InsertNode(1);
```

```
    cout<<"the list after insertion is:\n";
```

```
    displayList();
```

```
    DeleteNode(18);
```

```
    cout<<"the list after deleting 18 is:\n";
```

```
    displayList();
```

```
    return 0;
```

```
}
```

**Example 8:** Delete the first node from the list

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void InsertNode(int value)
{
    Node *n, *curr, *previous=NULL;
    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;
    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
    else // Otherwise, insert n at end
```

```
{  
    curr = head;  
    // Skip all nodes whose value member is less than value.  
    while (curr != NULL && curr->data < value)  
    {  
        previous = curr;  
        curr = curr->next;  
    }
```

// If n is to be the 1st in the list, insert it before all other nodes

```
    if (previous == NULL)  
    {  
        head = n;  
        n->next = curr;  
    }  
    else  
    {  
  
        previous->next = n;  
        n->next = curr;  
    }  
  
}
```



```
}
```

```
// displaying the list from the beginning
```

```
void displayList(void)
```

```
{
```

```
    Node *curr;
```

```
    curr = head;
```

```
    while (curr!=NULL)
```

```
    {
```

```
        cout << curr->data << endl;
```

```
        curr = curr->next;
```

```
    }
```

```
}
```

```
void DeleteFirstNode()
```

```
{
```

```
    Node *curr;
```

```
    // If the list is empty, do nothing.
```

```
    if (!head)
```

```
        return;
```

```
    else
```

```

        {
            curr = head->next;
            delete head;
            head = curr;
        }
    }
// main function
int main()
{
    InsertNode(2);
    InsertNode(14);
    InsertNode(26);
    InsertNode(30);
    InsertNode(18);
    InsertNode(1);
    cout<<"the list after insertion is:\n";
    displayList();
    DeleteFirstNode();
    cout<<"the list after deleting the first node is:\n";
    displayList();

    return 0;
}

```

**Example 9:** Delete the last node from the list

```
#include <iostream>

using namespace std;

//Declaration to create a node
struct Node
{
    int data;
    Node *next;
};

// define the head pointer and make it points to null
Node *head = NULL;

// Adding or Appending a Node to the List
void InsertNode(int value)
{
    Node *n, *curr, *previous=NULL;
    // Allocate a new node & store data
    n = new Node();
    n->data = value;
    n->next = NULL;
    // If there are no nodes in the list
    // make n the first node
    if (head==NULL)
        head = n;
    else // Otherwise, insert n at end
```

```

{
    curr = head;
    // Skip all nodes whose value member is less than value.
    while (curr != NULL && curr->data < value)
    {
        previous = curr;
        curr = curr->next;
    }
}

```

// If n is to be the 1st in the list, insert it before all other nodes

```

if (previous == NULL)
{
    head = n;
    n->next = curr;
}
else
{
    previous->next = n;
    n->next = curr;
}

}

```

```
}
```

```
// displaying the list from the beginning
```

```
void displayList(void)
```

```
{
```

```
    Node *curr;
```

```
    curr = head;
```

```
    while (curr!=NULL)
```

```
    {
```

```
        cout << curr->data << endl;
```

```
        curr = curr->next;
```

```
    }
```

```
}
```

```
void DeleteLastNode()
```

```
{
```

```
    Node *curr, *previous;
```

```
    // If the list is empty, do nothing.
```

```
    if (!head)
```

```
        return;
```

```
    else
```

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

    delete curr;
    previous->next = NULL;
}
```

// main function

```
int main()
```

```
{
    InsertNode(2);
    InsertNode(14);
    InsertNode(26);
    InsertNode(30);
    InsertNode(18);
    InsertNode(1);
    cout<<"the list after insertion is:\n";
    displayList();
}
```

```
DeleteLastNode();
```

```
cout<<"the list after deleting the last node is:\n";
```

```
displayList();
```

```
return 0;
```

```
}
```