

| | |
|---------------------|------------------------------------|
| Trạng thái | Đã xong |
| Bắt đầu vào lúc | Thứ Hai, 30 tháng 9 2024, 11:47 AM |
| Kết thúc lúc | Thứ Hai, 30 tháng 9 2024, 12:21 PM |
| Thời gian thực hiện | 34 phút 17 giây |
| Điểm | 8,00/8,00 |
| Điểm | 10,00 trên 10,00 (100%) |



Câu hỏi 1

Đúng

Đạt điểm 1,00 trên 1,00

Implement methods **add**, **size** in template class **SLinkedList (which implements List ADT)** representing the singly linked list with type **T** with the initialized frame. The description of each method is given in the code.

```
template <class T>
class SLinkedList {
public:
    class Node; // Forward declaration
protected:
    Node* head;
    Node* tail;
    int count;
public:
    SLinkedList();
    ~SLinkedList();
    void add(T e);
    void add(int index, T e);
    int size();
public:
    class Node {
    private:
        T data;
        Node* next;
        friend class SLinkedList<T>;
    public:
        Node() {
            next = 0;
        }
        Node(Node* next) {
            this->next = next;
        }
        Node(T data, Node* next) {
            this->data = data;
            this->next = next;
        }
    };
};
```

For example:

| Test | Result |
|---|-----------------------|
| <pre>SLinkedList<int> list; int size = 10; for(int index = 0; index < size; index++){ list.add(index); } cout << list.toString();</pre> | [0,1,2,3,4,5,6,7,8,9] |
| <pre>SLinkedList<int> list; int size = 10; for(int index = 0; index < size; index++){ list.add(0, index); } cout << list.toString();</pre> | [9,8,7,6,5,4,3,2,1,0] |

Answer: (penalty regime: 0, 0, 0, 5, 10, 15, ... %)

Reset answer

```

1  template <class T>
2  void SLinkedList<T>::add(const T& e) {
3      /* Insert an element into the end of the list. */
4      Node *pNew = new Node(e);
5      if(this->count == 0){
6          head = pNew;
7          tail = pNew;
8      } else {
9          tail->next = pNew;
10         tail = pNew;
11     }
12     count += 1;
13 }
14
15 template<class T>
16 void SLinkedList<T>::add(int index, const T& e) {
17     /* Insert an element into the list at given index. */
18     if(index < 0 || index > this->count){
19         throw std::out_of_range("Index is out of range");
20     }
21     Node *pNew = new Node(e);
22     if(index == 0){
23         pNew->next = head;
24         head = pNew;
25         if(this->count == 0){
26             tail = pNew;
27         }
28     } else {
29         Node *pre = head;
30         for(int i = 0; i < index - 1; i++){
31             pre = pre->next;
32         }
33         pNew->next = pre->next;
34         pre->next = pNew;
35         if(pNew->next == nullptr){
36             tail = pNew;
37         }
38     }
39     this->count += 1;
40 }
41
42 template<class T>
43 int SLinkedList<T>::size() {
44     /* Return the length (size) of list */
45     return this->count;
46 }
47

```

| | Test | Expected | Got | |
|---|--|-----------------------|-----------------------|---|
| ✓ | <pre>SLinkedList<int> list; int size = 10; for(int index = 0; index < size; index++){ list.add(index); } cout << list.toString();</pre> | [0,1,2,3,4,5,6,7,8,9] | [0,1,2,3,4,5,6,7,8,9] | ✓ |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.



Câu hỏi 2

Đúng

Đạt điểm 1,00 trên 1,00

Implement methods **get**, **set**, **empty**, **indexOf**, **contains** in template class **SLinkedList** (which implements **List ADT**) representing the singly linked list with type T with the initialized frame. The description of each method is given in the code.

```
template <class T>
class SLinkedList {
public:
    class Node; // Forward declaration
protected:
    Node* head;
    Node* tail;
    int count;
public:
    SLinkedList(): head(NULL), tail(NULL), count(0);
    ~SLinkedList() { };
    void    add(T e);
    void    add(int index, T e);
    int     size();
    bool    empty();
    T       get(int index);
    void    set(int index, T e);
    int     indexOf(T item);
    bool    contains(T item);
public:
    class Node {
    private:
        T data;
        Node* next;
        friend class SLinkedList<T>;
    public:
        Node() {
            next = 0;
        }
        Node(Node* next) {
            this->next = next;
        }
        Node(T data, Node* next = NULL) {
            this->data = data;
            this->next = next;
        }
    };
};
```

For example:



| Test | Result |
|---|----------------------|
| <pre> SLinkedList<int> list; int values[] = {10, 15, 2, 6, 4, 7, 40, 8}; int index[] = {0, 0, 1, 3, 2, 3, 5, 0}; int expvalues[] = {8, 15, 2, 4, 7, 10, 40, 6}; for (int idx = 0; idx < 8; idx++){ list.add(index[idx], values[idx]); } assert(list.size() == 8); for (int idx = 0; idx < 8; idx++){ assert(list.get(idx) == expvalues[idx]); } cout << list.toString(); </pre> | [8,15,2,4,7,10,40,6] |
| <pre> SLinkedList<int> list; assert(list.empty() == true); cout << list.toString(); </pre> | [] |

Answer: (penalty regime: 0, 0, 0, 5, 10, 15, ... %)

Reset answer

```

1  template<class T>
2  T SLinkedList<T>::get(int index) {
3      /* Give the data of the element at given index in the list. */
4      if(index < 0 || index >= this->count){
5          throw std::out_of_range("Index is out of range");
6      }
7      Node *tmp = head;
8      for(int i = 0; i < index; i++){
9          tmp = tmp->next;
10     }
11     return tmp->data;
12 }
13
14 template <class T>
15 void SLinkedList<T>::set(int index, const T& e) {
16     /* Assign new value for element at given index in the list */
17     if(index < 0 || index >= this->count){
18         throw std::out_of_range("Index is out of range");
19     }
20     Node *tmp = head;
21     for(int i = 0; i < index; i++){
22         tmp = tmp->next;
23     }
24     tmp->data = e;
25 }
26
27 template<class T>
28 bool SLinkedList<T>::empty() {
29     /* Check if the list is empty or not. */
30     return this->count == 0;
31 }
32
33 template<class T>
34 int SLinkedList<T>::indexOf(const T& item) {
35     /* Return the first index wheter item appears in list, otherwise return -1 */
36     Node *tmp = head;
37     for(int i = 0; i < this->count; i++){
38         if(tmp->data == item) return i;
39         tmp = tmp->next;
40     }
41     return -1;

```

```

42 | }
43 |
44 | template<class T>
45 | bool SLinkedList<T>::contains(const T& item) {
46 |     /* Check if item appears in the list */
47 |     return this->indexOf(item) != -1;
48 | }

```

| | Test | Expected | Got | |
|---|---|----------------------|----------------------|---|
| ✓ | <pre> SLinkedList<int> list; int values[] = {10, 15, 2, 6, 4, 7, 40, 8}; int index[] = {0, 0, 1, 3, 2, 3, 5, 0}; int expvalues[] = {8, 15, 2, 4, 7, 10, 40, 6}; for (int idx = 0; idx < 8; idx++){ list.add(index[idx], values[idx]); } assert(list.size() == 8); for (int idx = 0; idx < 8; idx++){ assert(list.get(idx) == expvalues[idx]); } cout << list.toString(); </pre> | [8,15,2,4,7,10,40,6] | [8,15,2,4,7,10,40,6] | ✓ |
| ✓ | <pre> SLinkedList<int> list; assert(list.empty() == true); cout << list.toString(); </pre> | [] | [] | ✓ |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.

Câu hỏi 3

Đúng

Đạt điểm 1,00 trên 1,00

Implement methods **removeAt**, **removeItem**, **clear** in template class **SLinkedList** (which implements **List ADT**) representing the singly linked list with type T with the initialized frame. The description of each method is given in the code.

```
template <class T>
class SLinkedList {
public:
    class Node; // Forward declaration
protected:
    Node* head;
    Node* tail;
    int count;
public:
    SLinkedList();
    ~SLinkedList();
    void add(T e);
    void add(int index, T e);
    int size();
    bool empty();
    int size();
    void clear();
    T get(int index);
    void set(int index, T e);
    int indexOf(T item);
    bool contains(T item);
    T removeAt(int index);
    bool removeItem(T item);
public:
    class Node {
    private:
        T data;
        Node* next;
        friend class SLinkedList<T>;
    public:
        Node() {
            next = 0;
        }
        Node(Node* next) {
            this->next = next;
        }
        Node(T data, Node* next = NULL) {
            this->data = data;
            this->next = next;
        }
    };
};
```

For example:



| Test | Result |
|--|---------------------|
| <pre>SLinkedList<int> list; for (int i = 0; i < 10; ++i) { list.add(i); } assert(list.get(0) == list.removeAt(0)); cout << list.toString();</pre> | [1,2,3,4,5,6,7,8,9] |
| <pre>SLinkedList<int> list; for (int i = 0; i < 10; ++i) { list.add(i); } assert(list.get(9) == list.removeAt(9)); cout << list.toString();</pre> | [0,1,2,3,4,5,6,7,8] |
| <pre>SLinkedList<int> list; for (int i = 0; i < 10; ++i) { list.add(i); } assert(list.removeItem(9)); cout << list.toString();</pre> | [0,1,2,3,4,5,6,7,8] |

Answer: (penalty regime: 0 %)

Reset answer

```
1  template <class T>
2  T SLinkedList<T>::removeAt(int index)
3  {
4      /* Remove element at index and return removed value */
5      if(index < 0 || index >= this->count){
6          throw std::out_of_range("Index is out of range");
7      }
8      Node *current = head;
9      T value;
10     if(index == 0){
11         value = current->data;
12         head = current->next;
13         if(head == nullptr) tail = nullptr;
14         delete current;
15     } else {
16         Node *pre = nullptr;
17         for(int i = 0; i < index; i++){
18             pre = current;
19             current = current->next;
20         }
21         value = current->data;
22         pre->next = current->next;
23         if(current == tail) tail = pre;
24         delete current;
25     }
26     this->count -= 1;
27     return value;
28 }
29
30 template <class T>
31 bool SLinkedList<T>::removeItem(const T& item)
32 {
33     /* Remove the first apperance of item in list and return true, otherwise return false */
34     Node *tmp = head;
35     for(int i = 0; i < this->count; i++){
36         if(tmp->data == item){
```

```

37         this->removeAt(i);
38         return true;
39     }
40     tmp = tmp->next;
41 }
42 return false;
43 }
44
45 template<class T>
46 void SLinkedList<T>::clear(){
47     /* Remove all elements in list */
48     Node *tmp = head;
49     while(tmp != nullptr){
50         Node *nextNode = tmp->next;
51         delete tmp;
52         tmp = nextNode;
53     }
54     head = nullptr;
55     tail = nullptr;
56     this->count = 0;
57 }
58
59

```

| | Test | Expected | Got | |
|---|--|---------------------|---------------------|---|
| ✓ | <pre> SLinkedList<int> list; for (int i = 0; i < 10; ++i) { list.add(i); } assert(list.get(0) == list.removeAt(0)); cout << list.toString(); </pre> | [1,2,3,4,5,6,7,8,9] | [1,2,3,4,5,6,7,8,9] | ✓ |
| ✓ | <pre> SLinkedList<int> list; for (int i = 0; i < 10; ++i) { list.add(i); } assert(list.get(9) == list.removeAt(9)); cout << list.toString(); </pre> | [0,1,2,3,4,5,6,7,8] | [0,1,2,3,4,5,6,7,8] | ✓ |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.

Câu hỏi 4

Đúng

Đạt điểm 1,00 trên 1,00

Class **LLNode** representing a node of singly linked lists is declared as below:

```
class LLNode {
public:
    int val;
    LLNode* next;
    LLNode(); // Constructor: val = 0, next = nullptr
    LLNode(int val, LLNode* next); // Constructor with customized data
}
```

Given a singly linked list head node.

Your task is to implement a function with following prototype:

```
LLNode* reverseLinkedList(LLNode* head);
```

The function returns head node of the reversed singly linked list.

Note:

- The **iostream** library has been included and **namespace std** is being used. No other libraries are allowed.
- The constructors and methods of class **LLNode** have been defined fully so you do not need to redefine them.
- You can write helper functions.

For example:

| Test | Result |
|---|--|
| <pre>int arr[] = {13, 88, 60, 7, 192}; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear();</pre> | <pre>[13, 88, 60, 7, 192] [192, 7, 60, 88, 13]</pre> |

Answer: (penalty regime: 0 %)

Reset answer

```
1 LLNode* reverseLinkedList(LLNode* head) {
2     LLNode *pre = nullptr;
3     LLNode *current = head;
4     LLNode *next = nullptr;
5     while(current != nullptr){
6         next = current->next;
7         current->next = pre;
8         pre = current;
9         current = next;
10    }
11    return pre;
12 }
```

| | Test | Expected | Got | |
|---|---|--|--|---|
| ✓ | <pre>int arr[] = {13, 88, 60, 7, 192}; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear();</pre> | <pre>[13, 88, 60, 7, 192] [192, 7, 60, 88, 13]</pre> | <pre>[13, 88, 60, 7, 192] [192, 7, 60, 88, 13]</pre> | ✓ |
| ✓ | <pre>int arr[] = {}; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear();</pre> | <pre>[] []</pre> | <pre>[] []</pre> | ✓ |
| ✓ | <pre>int arr[] = {31, 22, 46, 152, 14, 87, 196, 97, 5, 93}; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear();</pre> | <pre>[31, 22, 46, 152, 14, 87, 196, 97, 5, 93] [93, 5, 97, 196, 87, 14, 152, 46, 22, 31]</pre> | <pre>[31, 22, 46, 152, 14, 87, 196, 97, 5, 93] [93, 5, 97, 196, 87, 14, 152, 46, 22, 31]</pre> | ✓ |
| ✓ | <pre>int arr[] = {115, 59, 178, 39, 109, 18, 154, 106, 94, 174, 51, 33, 132, 195, 161, 37, 61, 107, 120, 190}; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear();</pre> | <pre>[115, 59, 178, 39, 109, 18, 154, 106, 94, 174, 51, 33, 132, 195, 161, 37, 61, 107, 120, 190] [190, 120, 107, 61, 37, 161, 195, 132, 33, 51, 174, 94, 106, 154, 18, 109, 39, 178, 59, 115]</pre> | <pre>[115, 59, 178, 39, 109, 18, 154, 106, 94, 174, 51, 33, 132, 195, 161, 37, 61, 107, 120, 190] [190, 120, 107, 61, 37, 161, 195, 132, 33, 51, 174, 94, 106, 154, 18, 109, 39, 178, 59, 115]</pre> | ✓ |



| | Test | Expected | Got | |
|---|---|--|--|---|
| ✓ | <pre> int arr[] = {104, 50, 154, 40, 15, 171, 56, 114, 67, 90, 46, 179, 152, 177, 139, 45, 18, 55, 38, 158, 8, 157, 143, 37, 16, 83, 173, 82, 156, 51, 124, 25, 68, 51, 194, 105, 44, 17, 97, 0, 150, 66, 71, 81, 11, 180, 148, 160, 127, 93, 108, 13, 122, 172, 39, 88, 62, 38, 61, 156, 45, 131, 69, 191, 123, 42, 103, 56, 69, 138, 185, 162, 192, 147, 71, 80, 12, 36, 191, 121, 194, 86, 92, 183, 164, 97, 185, 130, 29, 174, 112, 194, 185, 132, 27, 197, 158, 151, 51, 174}; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear(); </pre> | <pre> [104, 50, 154, 40, 15, 171, 56, 114, 67, 90, 46, 179, 152, 177, 139, 45, 18, 55, 38, 158, 8, 157, 143, 37, 16, 83, 173, 82, 156, 51, 124, 25, 68, 51, 194, 105, 44, 17, 97, 0, 150, 66, 71, 81, 11, 180, 148, 160, 127, 93, 108, 13, 122, 172, 39, 88, 62, 38, 61, 156, 45, 131, 69, 191, 123, 42, 103, 56, 69, 138, 185, 162, 192, 147, 71, 80, 12, 36, 191, 121, 194, 86, 92, 183, 164, 97, 185, 130, 29, 174, 112, 194, 185, 132, 27, 197, 158, 151, 51, 174] [174, 51, 151, 158, 197, 27, 132, 185, 194, 112, 174, 29, 130, 185, 97, 164, 183, 92, 86, 194, 121, 191, 36, 12, 80, 71, 147, 192, 162, 185, 138, 69, 56, 103, 42, 123, 191, 69, 131, 45, 156, 61, 38, 62, 88, 39, 172, 122, 13, 108, 93, 127, 160, 148, 180, 11, 81, 71, 66, 150, 0, 97, 17, 44, 105, 194, 51, 68, 25, 124, 51, 156, 82, 173, 83, 16, 37, 143, 157, 8, 158, 38, 55, 18, 45, 139, 177, 152, 179, 46, 90, 67, 114, 56, 171, 15, 40, 154, 50, 104] </pre> | <pre> [104, 50, 154, 40, 15, 171, 56, 114, 67, 90, 46, 179, 152, 177, 139, 45, 18, 55, 38, 158, 8, 157, 143, 37, 16, 83, 173, 82, 156, 51, 124, 25, 68, 51, 194, 105, 44, 17, 97, 0, 150, 66, 71, 81, 11, 180, 148, 160, 127, 93, 108, 13, 122, 172, 39, 88, 62, 38, 61, 156, 45, 131, 69, 191, 123, 42, 103, 56, 69, 138, 185, 162, 192, 147, 71, 80, 12, 36, 191, 121, 194, 86, 92, 183, 164, 97, 185, 130, 29, 174, 112, 194, 185, 132, 27, 197, 158, 151, 51, 174] [174, 51, 151, 158, 197, 27, 132, 185, 194, 112, 174, 29, 130, 185, 97, 164, 183, 92, 86, 194, 121, 191, 36, 12, 80, 71, 147, 192, 162, 185, 138, 69, 56, 103, 42, 123, 191, 69, 131, 45, 156, 61, 38, 62, 88, 39, 172, 122, 13, 108, 93, 127, 160, 148, 180, 11, 81, 71, 66, 150, 0, 97, 17, 44, 105, 194, 51, 68, 25, 124, 51, 156, 82, 173, 83, 16, 37, 143, 157, 8, 158, 38, 55, 18, 45, 139, 177, 152, 179, 46, 90, 67, 114, 56, 171, 15, 40, 154, 50, 104] </pre> | ✓ |



| | Test | Expected | Got | |
|---|---|--|--|---|
| ✓ | <pre> int arr[] = {106, 14, 71, 71, 166, 172, 128, 128, 52, 113, 58, 184, 70, 73, 37, 83, 71, 46, 133, 100, 37, 186, 199, 69, 79, 71, 70, 13, 155, 90, 60, 82, 180, 125, 108, 160, 74, 93, 72, 152, 106, 11, 174, 164, 168, 6, 9, 41, 58, 65, 141, 22, 103, 49, 114, 197, 175, 131, 109, 135, 124, 19, 76, 109, 130, 15, 120, 12, 11, 77, 88, 56, 127, 162, 67, 133, 162, 22, 94, 122, 53, 132, 167, 111, 138, 61, 169, 64, 98, 159, 58, 147, 137, 50, 193, 190, 173, 28, 35, 108, 138, 110, 184, 82, 114, 199, 137, 156, 155, 167, 165, 134, 193, 22, 173, 176, 46, 61, 196, 137, 151, 69, 67, 87, 161, 72, 60, 70, 67, 109, 149, 16, 38, 127, 15, 12, 107, 48, 184, 185, 43, 178, 14, 188, 61, 79, 189, 144, 27, 41, 114, 182, 118, 76, 89, 126, 124, 195, 180, 133, 118, 96, 61, 95, 127, 40, 62, 102, 130, 174, 47, 131, 187, 103, 88, 109, 153, 110, 184, 72, 178, 41, 93, 112, 24, 156, 180, 150, 114, 172, 43, 170, 46, 166, 109, 193, 13, 17, 190, 153, 80, 106, 199, 163, 106, 39, 85, 56, 174, 189, 61, 72, 154, 149, 59, 110, 139, 189, 99, 40, 84, 180, 23, 13, 9, 192, 163, 88, 1, 3, 149, 132, 36, 34, 120, 40, 48, 32, 91, 166, 42, 155, 30, 111, 140, 6, 189, 169, 50, 15, 144, 67, 145, 169, 49, 135, 49, 76, 0, 105, 90, 60, 75, 88, 150, 88, 122, 11, 158, 12, 43, 182, 152, 112, 65, 149, 14, 194, 146, 120, 114, 178, 177, 159, 105, 45, 169, 152, 150, 60, 99, 39, 73, 101, 162, 173, 127, 122, 157, 116, 139, 57, 101, 121, 45, 133, 151, 171, 186, 186, 116, 4, 173, 118, 103, 70, 133, 158, 119, 47, 142, 111, 110, 96, 68, 118, 153, 178, 174, 130, 176, 186, 23, 193, 40, 175, 107, 184, 168, 185, 56, 167, 169, 68, 42, 75, 26, 174, 92, 46, 18, 85, 131, 164, 15, 116, 197, 88, 143, 8, 115, 199, 173, 142, 139, 162, 62, 7, 33, 2, 4, 54, 22, 135, 194, 34, 17, 90, 154, 71, 6, 156, 76, 66, 172, 157, 39, 92, 68, 169, 117, 166, 86, 153, 106, 63, 142, 190, 149, 58, 31, 19, 114, 35, 110, 108, 103, 27, 139, 97, 166, 186, 164, 55, 19, 133, 194, 153, 38, 8, 87, 35, 179, 5, 32, 143, 104, 86, 184, 116, 70, 39, 22, 172, 28, 40, 72, 116, 192, 17, 159, 169, 143, 167, 77, 25, 128, 102, 140, 120, 140, 71, 56, 76, 16, 13, 144, 91, 166, 2, 74, 164, 153, 71, 37, 187, 104, 172, 122, 9, 109, 116, 173, 75, 70, 117, 57, 129, 171, 198, 194, 154, 177, 82, 103, 30, 174, 85, 191, 116, 30, 164, 155, 38, 38, 49, 84, 34, 111, 159}; 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122, 71, 134, 43, 40, 18, 168, 171, 196, 101, 103, 94, 155, 20, 183, 151, 126, 130, 31, 10, 16, 142, 163, 193, 36, 93, 2, 110, 105, 144, 43, 169, 175, 143, 187, 21, 36, 174, 123, 110, 139, 86, 144, 134, 37, 87, 122, 0, 90, 30, 113, 188, 1, 114, 77, 141, 70, 35, 45, 127, 164, 44, 66, 69, 12, 24, 85, 66, 84, 115, 126, 142, 107, 99, 127, 75, 164, 191, 168, 57, 146, 166, 20, 111, 107, 43, 124, 178, 175, 16, 122, 83, 186, 153, 17, 164, 136, 170, 59, 83, 57, 179, 195, 11, 38, 155, 196, 7, 162, 27, 169, 72, 20, 44, 39, 41, 29, 140, 104, 33, 165, 116, 185, 112, 195, 118, 38, 142, 4, 30, 117, 32, 138, 13, 144, 93, 89, 30, 47, 40, 159, 99, 69, 38, 3, 23, 138, 131, 167, 154, 81, 64, 144, 144, 170, 167, 190, 35, 179, 162, 31, 146, 187, 25, 80, 10, 159, 67, 15, 196, 88, 103, 91, 55, 45, 115, 5, 64, 101, 21, 67, 119, 87, 103, 178, 3, 94, 152, 179, 41, 79, 121, 26, 193, 45, 62, 83, 73, 183, 150, 22, 22, 79, 12, 101, 24, 7, 31, 26, 86, 128, 134, 174, 10, 51, 88, 152, 22, 123, 163, 107, 118, 82, 147, 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78, 56, 71, 182, 118, 97, 86, 127, 35, 124, 138, 138, 196, 2, 52, 187, 101, 119, 108, 18, 52, 60, 36, 160, 177, 85, 46, 112, 77, 70, 85, 89, 178, 162, 35, 147, 147, 173, 190, 121, 133, 67, 40, 86, 63, 7, 72, 66, 86, 24, 179, 79, 180, 129, 199, 151, 74, 176, 105, 161, 147, 26, 173, 179, 162, 69, 62, 122, 191, 93, 63, 96, 119, 155, 65, 197, 18, 11, 53, 49, 64, 133, 85, 64, 86, 79, 135, 80, 109, 153, 178, 55, 61, 177, 43, 169, 64, 103, 65, 120, 89, 131, 144, 124, 167, 46, 27, 118,</pre> | ✓ |

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175, 85, 188, 14, 133, 89, 79, 164, 101, 112, 51, 80, 186, 187, 80, 168, 70, 0, 100, 18, 75, 45, 62, 60, 17, 171, 48, 189, 19, 38, 76, 164, 93, 162, 13, 48, 121, 80, 97, 0, 26, 177, 102, 68, 56, 66, 3, 3, 174, 40, 65, 70, 24, 94, 178, 125, 161, 5, 32, 41, 148, 164, 49, 145, 145, 152, 1, 17, 130, 53, 16, 192, 46, 198, 30, 136, 110, 177, 181, 180, 111, 126, 110, 37, 71, 194, 102, 53, 59, 143, 90, 40, 128, 14, 144, 55, 177, 0, 176, 7, 161, 73, 36, 162, 57, 14, 76, 109, 188, 192, 28, 105, 112, 82, 122, 45, 192, 112, 122, 196, 176, 120, 45, 75, 161, 181, 154, 150, 110, 41, 91, 156, 198, 43, 3, 96, 90, 18, 46, 65, 81, 153, 10, 20, 83, 19, 85, 40, 147, 88, 111, 10, 112, 193, 49, 179, 165, 192, 78, 55, 64, 36, 57, 79, 144, 140, 175, 145, 83, 65, 174, 197, 174, 9, 31, 164, 62, 9, 176, 45, 151, 139, 12, 144, 171, 177, 151, 102, 181, 120, 61, 24, 31, 32, 50, 143, 192, 51, 55, 28, 138, 132, 20, 114, 131, 155, 41, 40, 194, 118, 34, 67, 173, 153, 186, 116, 193, 145, 190, 78, 169, 109, 125, 146, 74, 174, 175, 134, 119, 169, 124, 195, 96, 19, 6, 38, 72, 21, 138, 122, 23, 127, 59, 100, 165, 25, 199, 175, 153, 192, 38, 121, 177, 78, 40, 142, 122, 190, 95, 179, 155, 158, 5, 61, 5, 117, 150, 43, 5, 111, 161, 145, 69, 183, 147, 15, 135, 28, 101, 138, 164, 39, 160, 129, 69, 188, 54, 194, 112, 103, 34, 62, 84, 161, 170, 42, 8, 75, 132, 152, 121, 74, 31, 77, 147, 84, 187, 132, 43, 170, 52, 83, 42, 62, 147, 149, 164, 70, 21, 24, 145, 26, 16, 143, 76, 59, 68, 18, 27, 100, 158, 100, 102, 30, 75, 86, 115, 54, 66, 91, 136, 137, 154, 60, 107, 164, 55, 108, 71, 101, 47, 14, 64, 94, 154, 102, 89, 139, 89, 133, 180, 121, 62, 9, 10, 106, 37, 4, 131, 78, 129, 76, 48, 156, 89, 11, 15, 169, 132, 184, 46, 192, 12, 14, 180, 68, 127, 99, 165, 130, 139, 67, 124, 58, 75, 46, 166, 38, 37, 0, 92, 60, 183, 23, 129, 57, 121, 82, 21, 95, 123, 72, 169, 168, 106, 71, 36, 67, 40, 110, 166, 103, 170, 197, 187, 158, 190, 163, 42, 68, 172, 0, 94, 63, 164, 116, 156, 81, 16, 184, 190, 11, 100, 12, 40, 125, 3, 0, 153, 164, 91, 95, 109, 67, 5, 65, 64, 85, 190, 192, 61, 145, 185, 5, 40, 7, 136, 188, 185, 43, 128, 157, 186, 152, 29,</pre> | <pre>[12, 55, 161, 35, 13, 74, 88, 155, 173, 132, 83, 198, 116, 53, 124, 177, 35, 77, 129, 127, 44, 27, 124, 25, 49, 153, 167, 61, 192, 95, 92, 83, 102, 159, 12, 11, 105, 89, 94, 91, 146, 48, 50, 176, 163, 53, 95, 146, 173, 67, 122, 118, 110, 178, 72, 150, 168, 24, 197, 43, 29, 12, 70, 78, 42, 29, 52, 131, 10, 19, 146, 87, 13, 84, 137, 171, 168, 74, 82, 65, 199, 179, 76, 95, 136, 121, 182, 51, 113, 146, 127, 125, 189, 27, 52, 155, 59, 41, 106, 104, 47, 24, 85, 110, 53, 24, 112, 71, 68, 132, 62, 94, 31, 101, 128, 107, 2, 183, 64, 191, 43, 97, 53, 116, 110, 67, 136, 81, 142, 123, 190, 21, 17, 33, 23, 57, 139, 68, 95, 131, 77, 108, 51, 8, 127, 97, 102, 10, 28, 187, 28, 26, 14, 68, 191, 192, 82, 100, 120, 113, 173, 115, 0, 72, 94, 4, 103, 80, 110, 136, 198, 88, 189, 80, 0, 48, 199, 119, 174, 3, 183, 31, 91, 6, 43, 99, 140, 40, 136, 85, 109, 34, 31, 178, 24, 25, 104, 194, 79, 154, 94, 156, 44, 45, 140, 129, 199, 5, 22, 0, 103, 55, 42, 2, 69, 1, 40, 182, 126, 189, 49, 120, 175, 85, 188, 14, 133, 89, 79, 164, 101, 112, 51, 80, 186, 187, 80, 168, 70, 0, 100, 18, 75, 45, 62, 60, 17, 171, 48, 189, 19, 38, 76, 164, 93, 162, 13, 48, 121, 80, 97, 0, 26, 177, 102, 68, 56, 66, 3, 3, 174, 40, 65, 70, 24, 94, 178, 125, 161, 5, 32, 41, 148, 164, 49, 145, 145, 152, 1, 17, 130, 53, 16, 192, 46, 198, 30, 136, 110, 177, 181, 180, 111, 126, 110, 37, 71, 194, 102, 53, 59, 143, 90, 40, 128, 14, 144, 55, 177, 0, 176, 7, 161, 73, 36, 162, 57, 14, 76, 109, 188, 192, 28, 105, 112, 82, 122, 45, 192, 112, 122, 196, 176, 120, 45, 75, 161, 181, 154, 150, 110, 41, 91, 156, 198, 43, 3, 96, 90, 18, 46, 65, 81, 153, 10, 20, 83, 19, 85, 40, 147, 88, 111, 10, 112, 193, 49, 179, 165, 192, 78, 55, 64, 36, 57, 79, 144, 140, 175, 145, 83, 65, 174, 197, 174, 9, 31, 164, 62, 9, 176, 45, 151, 139, 12, 144, 171, 177, 151, 102, 181, 120, 61, 24, 31, 32, 50, 143, 192, 51, 55, 28, 138, 132, 20, 114, 131, 155, 41, 40, 194, 118, 34, 67, 173, 153, 186, 116, 193, 145, 190, 78, 169, 109, 125, 146, 74, 174, 175, 134, 119, 169, 124, 195, 96, 19, 6, 38, 72, 21, 138, 122, 23, 127, 59, 100, 165, 25, 199, 175, 153, 192, 38, 121, 177, 78, 40, 142, 122, 190, 95, 179, 155, 158, 5, 61, 5, 117, 150, 43, 5, 111, 161, 145, 69, 183, 147, 15, 135, 28, 101, 138, 164, 39, 160, 129, 69, 188, 54, 194, 112, 103, 34, 62, 84, 161, 170, 42, 8, 75, 132, 152, 121, 74, 31, 77, 147, 84, 187, 132, 43, 170, 52, 83, 42, 62, 147, 149, 164, 70, 21, 24, 145, 26, 16, 143, 76, 59, 68, 18, 27, 100, 158, 100, 102, 30, 75, 86, 115, 54, 66, 91, 136, 137, 154, 60, 107, 164, 55, 108, 71, 101, 47, 14, 64, 94, 154, 102, 89, 139, 89, 133, 180, 121, 62, 9, 10, 106, 37, 4, 131, 78, 129, 76, 48, 156, 89, 11, 15, 169, 132, 184, 46, 192, 12, 14, 180, 68, 127, 99, 165, 130, 139, 67, 124, 58, 75, 46, 166, 38, 37, 0, 92, 60, 183, 23, 129, 57, 121, 82, 21, 95, 123, 72, 169, 168, 106, 71, 36, 67, 40, 110, 166, 103, 170, 197, 187, 158, 190, 163, 42, 68, 172, 0, 94, 63, 164, 116, 156, 81, 16, 184, 190, 11, 100, 12, 40, 125, 3, 0, 153, 164, 91, 95, 109, 67, 5, 65, 64, 85, 190, 192, 61, 145, 185, 5, 40, 7, 136, 188, 185, 43, 128, 157, 186, 152, 29,</pre> | <pre>[12, 55, 161, 35, 13, 74, 88, 155, 173, 132, 83, 198, 116, 53, 124, 177, 35, 77, 129, 127, 44, 27, 124, 25, 49, 153, 167, 61, 192, 95, 92, 83, 102, 159, 12, 11, 105, 89, 94, 91, 146, 48, 50, 176, 163, 53, 95, 146, 173, 67, 122, 118, 110, 178, 72, 150, 168, 24, 197, 43, 29, 12, 70, 78, 42, 29, 52, 131, 10, 19, 146, 87, 13, 84, 137, 171, 168, 74, 82, 65, 199, 179, 76, 95, 136, 121, 182, 51, 113, 146, 127, 125, 189, 27, 52, 155, 59, 41, 106, 104, 47, 24, 85, 110, 53, 24, 112, 71, 68, 132, 62, 94, 31, 101, 128, 107, 2, 183, 64, 191, 43, 97, 53, 116, 110, 67, 136, 81, 142, 123, 190, 21, 17, 33, 23, 57, 139, 68, 95, 131, 77, 108, 51, 8, 127, 97, 102, 10, 28, 187, 28, 26, 14, 68, 191, 192, 82, 100, 120, 113, 173, 115, 0, 72, 94, 4, 103, 80, 110, 136, 198, 88, 189, 80, 0, 48, 199, 119, 174, 3, 183, 31, 91, 6, 43, 99, 140, 40, 136, 85, 109, 34, 31, 178, 24, 25, 104, 194, 79, 154, 94, 156, 44, 45, 140, 129, 199, 5, 22, 0, 103, 55, 42, 2, 69, 1, 40, 182, 126, 189, 49, 120, 175, 85, 188, 14, 133, 89, 79, 164, 101, 112, 51, 80, 186, 187, 80, 168, 70, 0, 100, 18, 75, 45, 62, 60, 17, 171, 48, 189, 19, 38, 76, 164, 93, 162, 13, 48, 121, 80, 97, 0, 26, 177, 102, 68, 56, 66, 3, 3, 174, 40, 65, 70, 24, 94, 178, 125, 161, 5, 32, 41, 148, 164, 49, 145, 145, 152, 1, 17, 130, 53, 16, 192, 46, 198, 30, 136, 110, 177, 181, 180, 111, 126, 110, 37, 71, 194, 102, 53, 59, 143, 90, 40, 128, 14, 144, 55, 177, 0, 176, 7, 161, 73, 36, 162, 57, 14, 76, 109, 188, 192, 28, 105, 112, 82, 122, 45, 192, 112, 122, 196, 176, 120, 45, 75, 161, 181, 154, 150, 110, 41, 91, 156, 198, 43, 3, 96, 90, 18, 46, 65, 81, 153, 10, 20, 83, 19, 85, 40, 147, 88, 111, 10, 112, 193, 49, 179, 165, 192, 78,</pre> | ✓ |

| Test | Expected | Got |
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| 196, 74, 198, 182, 147, 115, 126, 11, 127, 129, 141, 52, 80, 189, 104, 123, 117, 104, 128, 164, 7, 36, 70, 60, 21, 63, 96, 16, 177, 145, 4, 72, 64, 145, 132, 4, 191, 146, 42, 53, 196, 84, 150, 127, 51, 32, 127, 133, 2, 4, 111, 142, 71, 120, 154, 87, 112, 56, 103, 121, 84, 35, 111, 52, 104, 43, 78, 108, 108, 6, 160, 171, 7, 180, 158, 127, 48, 98, 129, 157, 127, 7, 102, 94, 155, 37, 83, 65, 142, 82, 33, 194, 150, 31, 10, 121, 156, 113, 61, 142, 42, 22, 183, 108, 49, 146, 172, 123, 145, 131, 175, 26, 20, 153, 78, 76, 85, 3, 42, 107, 5, 78, 61, 195, 47, 47, 93, 24, 173, 186, 112, 66, 1, 28, 40, 72, 56, 198, 105, 67, 44, 75, 152, 69, 162, 100, 127, 89, 20, 1, 70, 148, 15, 172, 140, 132, 79, 193, 79, 136, 89, 80, 40, 89, 161, 158, 82, 0, 150, 104, 12, 88, 19, 113, 141, 36, 143, 127, 40, 44, 183, 17, 64, 188, 162, 171, 126, 158, 14, 54, 72, 26, 57, 129, 124, 26, 194, 84, 86, 187, 97, 183 ...snip... 171, 71, 144, 180, 126, 156, 53, 196, 145, 138, 5, 173, 77, 23, 69, 148, 99, 86, 80, 70, 162, 197, 182, 197, 9, 65, 77, 64, 79, 85, 125, 105, 121, 3, 152, 144, 84, 178, 74, 105, 132, 113, 45, 1, 180, 27, 8, 143, 63, 155, 17, 40, 126, 65, 136, 51, 171, 126, 102, 183, 125, 108, 175, 121, 5, 122, 84, 138, 120, 127, 35, 129, 14, 116, 90, 61, 75, 47, 66, 198, 68, 13, 73, 180, 28, 112, 59, 128, 47, 185, 162, 50, 31, 136, 115, 106, 21, 82, 186, 107, 66, 98, 113, 92, 7, 131, 109, 73, 170, 116, 66, 130, 65, 133, 128, 75, 108, 33, 150, 187, 86, 93, 134, 41, 132, 24, 145, 124, 74, 3, 140, 137, 74, 123, 163, 155, 158, 133, 133, 165, 160, 105, 80, 84, 112, 74, 127, 187, 198, 69, 153, 86, 8, 184, 68, 76, 150, 197, 73, 135, 36, 54, 186, 37, 184, 147, 185, 140, 156, 122, 155, 89, 126, 31, 157, 170, 95, 189, 37, 133, 177, 195, 157, 16, 164, 154, 35, 163, 59, 158, 124, 67, 50, 3, 155, 64, 19, 18, 124, 104, 89, 156, 62, 173, 36, 182, 24, 165, 79, 85, 59, 10, 182, 100, 64, 97, 148, 156, 36, 190, 20, 148, 193, 80, 30, 33, 79, 120, 60, 23, 171, 136, 149, 48, 134, 130, 178, 85, 185, 46, 160, 131, 183, 160, 101, 7, 53, 153, 86, 134, 133, 61, 80, 150, 129, 134, 22, 193, 46, 159, 3, 195, 126, 91, 0, 105, 115, 54, 160, 44, 193, 188, 137, 15, 99, 49, 142, 53, 81, 104, 75, 87, 152, 161, 9, 21, 51, 117, 147, 82, 8, 83, 136, 69, 38, 120, 137, 21, 46, 90, 141, 68, 7, 30, 116, 184, 191, 115, 1, 46, 182, 103, 115, 71, 13, 24, 157, 56, 127, 189, 93, 93, 182, 78, 26, 158, 194, 9, 34, 148, 190, 63, 170, 109, 67, 14, 103, 110, 33, 56, 125, 97, 171, 132, 78, 72, 58, 35, 101, 128, 69, 102, 84, 177, 40, 175, 34, 181, 98, 45, 57, 31, 43, 115, 111, 158, 158, 75, 75, 122, 67, 143, 147, 199, 72, 112, 68, 192, 1, 195, 65, 181, 134, 81, 183, 175, 52, 125, 137, 195, 31, 108, 151, 38, 94, 104, 20, 80, 175, 85, 144, 108, 60, 0, 155, 79, 54, 124, 196, 127, 10, 182, 97, 134, 25, 44, 119, 119, 116, 194, 165, 136, 151, 149, 60, 192, 94, 100, 169, 115, 94, 148, 126, 108, 5, 34, 125, 42, 132, 150, 7, 198, 115, 30, 197, 180, 86, 8, 197, 128, 159, 93, 134, 43, 197, 82, 63, 110, 155, 129, 117, 174, 131, 32, 108, 56, 61, 199, 81, 199, 66, 72, 85, 116, 110, 50, 148, 118, 110, 30, 183, 82, 134, 86, 182, 164, 14, 122, 114, 31, | 55, 64, 36, 57, 79, 144, 140, 175, 145, 83, 65, 174, 197, 174, 9, 31, 164, 62, 9, 176, 45, 151, 139, 12, 144, 171, 177, 151, 102, 181, 120, 61, 24, 31, 32, 50, 143, 192, 51, 55, 28, 138, 132, 20, 114, 131, 155, 41, 40, 194, 118, 34, 67, 173, 153, 186, 116, 193, 145, 190, 78, 169, 109, 125, 146, 74, 174, 175, 134, 119, 169, 124, 195, 96, 19, 6, 38, 72, 21, 138, 122, 23, 127, 59, 100, 165, 25, 199, 175, 153, 192, 38, 121, 177, 78, 40, 142, 122, 190, 95, 179, 155, 158, 5, 61, 5, 117, 150, 43, 5, 111, 161, 145, 69, 183, 147, 15, 135, 28, 101, 138, 164, 39, 160, 129, 69, 188, 54, 194, 112, 103, 34, 62, 84, 161, 170, 42, 8, 75, 132, 152, 121, 74, 31, 77, 147, 84, 187, 132, 43, 170, 52, 83, 42, 62, 147, 149, 164, 70, 21, 24, 145, 26, 16, 143, 76, 59, 68, 18, 27, 100, 158, 100, 102, 30, 75, 86, 115, 54, 66, 91, 136, 137, 154, 60, 107, 164, 55, 108, 71, 101, 47, 14, 64, 94, 154, 102, 89, 139, 89, 133, 180, 121, 62, 9, 10, 106, 37, 4, 131, 78, 129, 76, 48, 156, 89, 11, 15, 169, 132, 184, 46, 192, 12, 14, 180, 68, 127, 99, 165, 130, 139, 67, 124, 58, 75, 46, 166, 38, 37, 0, 92, 60, 183, 23, 129, 57, 121, 82, 21, 95, 123, 72, 169, 168, 106, 71, 36, 67, 40, 110, 166, 103, 170, 197, 187, 158, 190, 163, 42, 68, 172, 0, 94, 63, 164, 116, 156, 81, 16, 184, 190, 11, 100, 12, 40, 125, 3, 0, 153, 164, 91, 95, 109, 67, 5, 65, 64, 85, 190, 192, 61, 145, 185, 5, 40, 7, 136, 188, 185, 43, 128, 157, 186, 152, 29, 196, 74, 198, 182, 147, 115, 126, 11, 127, 129, 141, 52, 80, 189, 104, 123, 117, 104, 128, 164, 7, 36, 70, 60, 21, 63, 96, 16, 177, 145, 4, 72, 64, 145, 132, 4, 191, 146, 42, 53, 196, 84, 150, 127, 51, 32, 127, 133, 2, 4, 111, 142, 71, 120, 154, 87, 112, 56, 103, 121, 84, 35, 111, 52, 104, 43, 78, 108, 108, 6, 160, 171, 7, 180, 158, 127, 48, 98, 129, 157, 127, 7, 102, 94, 155, 37, 83, 65, 142, 82, 33, 194, 150, 31, 10, 121, 156, 113, 61, 142, 42, 22, 183, 108, 49, 146, 172, 123, 145, 131, 175, 26, 20, 153, 78, 76, 85, 3, 42, 107, 5, 78, 61, 195, 47, 47, 93, 24, 173, 186, 112, 66, 1, 28, 40, 72, 56, 198, 105, 67, 44, 75, 152, 69, 162, 100, 127, 89, 20, 1, 70, 148, 15, 172, 140, 132, 79, 193, 79, 136, 89, 80, 40, 89, 161, 158, 82, 0, 150, 104, 12, 88, 19, 113, 141, 36, 143, 127, 40, 44, 183, 17, 64, 188, 162, 171, 126, 158, 14, 54, 72, 26, 57, 129, 124, 26, 194, 84, 86, 187, 97, 183 ...snip... 171, 71, 144, 180, 126, 156, 53, 196, 145, 138, 5, 173, 77, 23, 69, 148, 99, 86, 80, 70, 162, 197, 182, 197, 9, 65, 77, 64, 79, 85, 125, 105, 121, 3, 152, 144, 84, 178, 74, 105, 132, 113, 45, 1, 180, 27, 8, 143, 63, 155, 17, 40, 126, 65, 136, 51, 171, 126, 102, 183, 125, 108, 175, 121, 5, 122, 84, 138, 120, 127, 35, 129, 14, 116, 90, 61, 75, 47, 66, 198, 68, 13, 73, 180, 28, 112, 59, 128, 47, 185, 162, 50, 31, 136, 115, 106, 21, 82, 186, 107, 66, 98, 113, 92, 7, 131, 109, 73, 170, 116, 66, 130, 65, 133, 128, 75, 108, 33, 150, 187, 86, 93, 134, 41, 132, 24, 145, 124, 74, 3, 140, 137, 74, 123, 163, 155, 158, 133, 133, 165, 160, 105, 80, 84, 112, 74, 127, 187, 198, 69, 153, 86, 8, 184, 68, 76, 150, 197, 73, 135, 36, 54, 186, 37, 184, 147, 185, 140, 156, 122, 155, 89, 126, 31, 157, 170, 95, 189, 37, 133, 177, 195, 157, 16, 164, 154, 35, 163, 59, 158, 124, 67, 50, 3, 155, 64, 19, 18, 124, 104, 89, 156, 62, 173, 36, 182, 24, 165, 79, 85, 59, 10, 182, 100, 64, 97, 148, 156, 36, 190, 20, 148, 193, 80, 30, 33, 79, 120, 60, 23, 171, 136, 149, 48, 134, 130, 178, 85, 185, 46, 160, 131, 183, 160, 101, 7, 53, 153, 86, 134, 133, 61, 80, 150, 129, 134, 22, 193, 46, 159, 3, 195, 126, 91, 0, 105, 115, 54, 160, 44, 193, 188, 137, 15, 99, 49, 142, 53, 81, 104, 75, 87, 152, 161, 9, 21, 51, 117, 147, 82, 8, 83, 136, 69, 38, 120, 137, 21, 46, 90, 141, 68, 7, 30, 116, 184, 191, 115, 1, 46, 182, 103, 115, 71, 13, 24, 157, 56, 127, 189, 93, 93, 182, 78, 26, 158, 194, 9, 34, 148, 190, 63, 170, 109, 67, 14, 103, 110, 33, 56, 125, 97, 171, 132, 78, 72, 58, 35, 101, 128, 69, 102, 84, 177, 40, 175, 34, 181, 98, 45, 57, 31, 43, 115, 111, 158, 158, 75, 75, 122, 67, 143, 147, 199, 72, 112, 68, 192, 1, 195, 65, 181, 134, 81, 183, 175, 52, 125, 137, 195, 31, 108, 151, 38, 94, 104, 20, 80, 175, 85, 144, 108, 60, 0, 155, 79, 54, 124, 196, 127, 10, 182, 97, 134, 25, 44, 119, 119, 116, 194, 165, 136, 151, 149, 60, 192, 94, 100, 169, 115, 94, 148, 126, 108, 5, 34, 125, 42, 132, 150, 7, 198, 115, 30, 197, 180, 86, 8, 197, 128, 159, 93, 134, 43, 197, 82, 63, 110, 155, 129, 117, 174, 131, 32, 108, 56, 61, 199, 81, 199, 66, 72, 85, 116, 110, 50, 148, 118, 110, 30, 183, 82, 134, 86, 182, 164, 14, 122, 114, 31, | 55, 64, 36, 57, 79, 144, 140, 175, 145, 83, 65, 174, 197, 174, 9, 31, 164, 62, 9, 176, 45, 151, 139, 12, 144, 171, 177, 151, 102, 181, 120, 61, 24, 31, 32, 50, 143, 192, 51, 55, 28, 138, 132, 20, 114, 131, 155, 41, 40, 194, 118, 34, 67, 173, 153, 186, 116, 193, 145, 190, 78, 169, 109, 125, 146, 74, 174, 175, 134, 119, 169, 124, 195, 96, 19, 6, 38, 72, 21, 138, 122, 23, 127, 59, 100, 165, 25, 199, 175, 153, 192, 38, 121, 177, 78, 40, 142, 122, 190, 95, 179, 155, 158, 5, 61, 5, 117, 150, 43, 5, 111, 161, 145, 69, 183, 147, 15, 135, 28, 101, 138, 164, 39, 160, 129, 69, 188, 54, 194, 112, 103, 34, 62, 84, 161, 170, 42, 8, 75, 132, 152, 121, 74, 31, 77, 147, 84, 187, 132, 43, 170, 52, 83, 42, 62, 147, 149, 164, 70, 21, 24, 145, 26, 16, 143, 76, 59, 68, 18, 27, 100, 158, 100, 102, 30, 75, 86, 115, 54, 66, 91, 136, 137, 154, 60, 107, 164, 55, 108, 71, 101, 47, 14, 64, 94, 154, 102, 89, 139, 89, 133, 180, 121, 62, 9, 10, 106, 37, 4, 131, 78, 129, 76, 48, 156, 89, 11, 15, 169, 132, 184, 46, 192, 12, 14, 180, 68, 127, 99, 165, 130, 139, 67, 124, 58, 75, 46, 166, 38, 37, 0, 92, 60, 183, 23, 129, 57, 121, 82, 21, 95, 123, 72, 169, 168, 106, 71, 36, 67, 40, 110, 166, 103, 170, 197, 187, 158, 190, 163, 42, 68, 172, 0, 94, 63, 164, 116, 156, 81, 16, 184, 190, 11, 100, 12, 40, 125, 3, 0, 153, 164, 91, 95, 109, 67, 5, 65, 64, 85, 190, 192, 61, 145, 185, 5, 40, 7, 136, 188, 185, 43, 128, 157, 186, 152, 29, 196, 74, 198, 182, 147, 115, 126, 11, 127, 129, 141, 52, 80, 189, 104, 123, 117, 104, 128, 164, 7, 36, 70, 60, 21, 63, 96, 16, 177, 145, 4, 72, 64, 145, 132, 4, 191, 146, 42, 53, 196, 84, 150, 127, 51, 32, 127, 133, 2, 4, 111, 142, 71, 120, 154, 87, 112, 56, |

| Test | Expected | Got |
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170, 176, 177, 5, 159, 98, 91, 29, 51, 22, 199, 125, 192, 61, 70, 10, 29, 85, 23, 4, 61, 52, 135, 9, 182, 14, 135, 32, 199, 123, 30, 9, 102, 189, 24, 99, 136, 96, 15, 126, 82, 162, 41, 147, 128, 21, 179, 1, 180, 147, 109, 33, 97, 114, 5, 11, 128, 112, 128, 106, 75, 128, 70, 158, 184, 21, 117, 25, 33, 79, 33, 77, 137, 164, 147, 163, 57, 88, 199, 111, 85, 48, 163, 50, 32, 124, 133, 7, 159, 19, 52, 67, 109, 35, 42, 127, 34, 185, 55, 15, 113, 190, 49, 160, 74, 155, 60, 6, 173, 198, 109, 195, 129, 125, 35, 111, 20, 74, 95, 124, 83, 176, 115, 121, 4, 86, 114, 170, 138, 145, 31, 86, 89, 174, 48, 89, 115, 88, 116, 154, 58, 63, 130, 79, 167, 42, 28, 56, 171, 134, 180, 58, 76, 79, 150, 157, 89, 30, 63, 144, 185, 124, 196, 164, 97, 55, 21, 70, 189, 2, 147, 40, 82, 1, 32, 186, 57, 150, 46, 173, 110, 77, 187, 33, 17, 183, 52, 48, 108, 189, 112, 74, 135, 139, 134, 130, 57, 160, 8, 81, 160, 66, 146, 9, 99, 175, 158, 4, 93, 57, 50, 199, 20, 122, 61, 177, 19, 65, 13, 144, 93, 195, 197, 79, 116, 125, 53, 80, 145, 193, 26, 64, 28, 104, 168, 187, 149, 183, 133, 86, 4, 100, 31, 52, 135, 123, 57, 178, 138, 28, 18, 151, 28, 183, 198, 78, 127, 115, 162, 23, 152, 195, 2, 93, 96, 27, 61, 152, 130, 65, 91, 118, 158, 167, 142, 69, 173, 176, 175, 197, 94, 65, 114, 84, 185, 66, 4, 57, 2, 125, 156, 85, 159, 54, 176, 7, 173, 75, 106, 63, 121, 39, 115, 117, 59, 41, 29, 99, 111, 122, 95, 184, 79, 159, 109, 110, 187, 196, 119, 135, 115, 34, 131, 75, 102, 57, 133, 109, 100, 10, 37, 96, 89, 158, 194, 3, 178, 195, 102, 140, 173, 137, 106, 164, 188, 183, 172, 47, 179, 164, 189, 160, 171, 75, 112, 50, 165, 173, 136, 73, 58, 117, 25, 138, 123, 153, 98, 57, 61, 157, 129, 10, 175, 172, 111, 122, 151, 137, 102, 158, 25, 138, 40, 116, 17, 39, 146, 17, 156, 106, 57, 66, 162, 175, 131, 31, 63, 93, 74, 29, 18, 14, 76, 171, 13, 124, 22, 112, 70, 108, 91, 91, 109, 159, 175, 82, 167, 142, 81, 95, 98, 135, 16, 192, 99, 182, 77, 30, 69, 125, 82, 65, 66, 142, 169, 137, 142, 56, 64, 184, 50, 9, 27, 142, 135, 107, 11, 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148, 118, 21, 73, 154, 4, 159, 106, 176, 82, 188, 136, 194, 4, 156, 135, 159, 158, 122, 109, 141, 112, 26, 175, 1, 7, 147, 55, 50, 74, 69, 53, 79, 105, 92, 156, 61, 61, 69, 15, 5, 108, 160, 91, 150, 92, 79, 94, 199, 58, 166, 8, 31, 163, 132, 145, 137, 82, 193, 75, 178, 163, 88, 74, 77, 25, 87, 73, 9, 171, 68, 95, 113, 91, 42, 98, 36, 50, 93, 18, 46, 118, 115, 114, 7, 78, 115, 34, 3, 8, 74, 88, 17, 32, 171, 56, 128, 52, 102, 65, 71, 77, 45, 98, 99, 193, 75, 22, 54, 39, 150, 148, 110, 106, 183, 105, 156, 122, 176, 58, 38, 151, 101, 45, 32, 7, 165, 151, 62, 50, 75, 115, 181, 60, 184, 73, 11, 28, 11, 38, 67, 50, 60, 83, 45, 46, 61, 40, 30, 126, 10, 130, 68, 72, 195, 178, 21, 17, 39, 144, 161, 37, 43, 120, 108, 105, 20, 196, 112, 196, 105, 34, 75, 53, 84, 119, 157, 81, 11, 52, 181, 28, 2, 56, 164, 178, 83, 95, 50, 62, 57, 74, 151, 179, 161, 54, 189, 34, 185, 137, 116, 19, 190, 106, 142, 110, 49, 113, 101, 172, 137, 191, 193, 98, 23, 39, 110, 103, 134, 53, 13, 78, 66, 13, 82, 102, 50, 71, 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173, 136, 73, 58, 117, 25, 138, 123, 153, 98, 57, 61, 157, 129, 10, 175, 172, 111, 122, 151, 137, 102, 158, 25, 138, 40, 116, 17, 39, 146, 17, 156, 106, 57, 66, 162, 175, 131, 31, 63, 93, 74, 29, 18, 14, 76, 171, 13, 124, 22, 112, 70, 108, 91, 91, 109, 159, 175, 82, 167, 142, 81, 95, 98, 135, 16, 192, 99, 182, 77, 30, 69, 125, 82, 65, 66, 142, 169, 137, 142, 56, 64, 184, 50, 9, 27, 142, 135, 107, 11, 77, 171, 26, 158, 158, 9, 116, 110, 51, 124, 162, 150, 71, 20, 63, 27, 11, 125, 46, 63, 171, 67, 177, 140, 56, 163, 143, 191, 55, 190, 37, 171, 74, 183, 49, 175, 157, 183, 74, 114, 75, 30, 100, 95, 106, 85, 35, 156, 149, 114, 14, 7, 81, 180, 134, 130, 10, 120, 71, 62, 158, 187, 78, 95, 154, 161, 35, 199, 196, 141, 81, 149, 64, 145, 132, 119, 39, 49, 74, 197, 54, 163, 165, 144, 163, 129, 184, 27, 28, 3, 176, 177, | 196, 164, 97, 55, 21, 70, 189, 2, 147, 40, 82, 1, 32, 186, 57, 150, 46, 173, 110, 77, 187, 33, 17, 183, 52, 48, 108, 189, 112, 74, 135, 139, 134, 130, 57, 160, 8, 81, 160, 66, 146, 9, 99, 175, 158, 4, 93, 57, 50, 199, 20, 122, 61, 177, 19, 65, 13, 144, 93, 195, 197, 79, 116, 125, 53, 80, 145, 193, 26, 64, 28, 104, 168, 187, 149, 183, 133, 86, 4, 100, 31, 52, 135, 123, 57, 178, 138, 28, 18, 151, 28, 183, 198, 78, 127, 115, 162, 23, 152, 195, 2, 93, 96, 27, 61, 152, 130, 65, 91, 118, 158, 167, 142, 69, 173, 176, 175, 197, 94, 65, 114, 84, 185, 66, 4, 57, 2, 125, 156, 85, 159, 54, 176, 7, 173, 75, 106, 63, 121, 39, 115, 117, 59, 41, 29, 99, 111, 122, 95, 184, 79, 159, 109, 110, 187, 196, 119, 135, 115, 34, 131, 75, 102, 57, 133, 109, 100, 10, 37, 96, 89, 158, 194, 3, 178, 195, 102, 140, 173, 137, 106, 164, 188, 183, 172, 47, 179, 164, 189, 160, 171, 75, 112, 50, 165, 173, 136, 73, 58, 117, 25, 138, 123, 153, 98, 57, 61, 157, 129, 10, 175, 172, 111, 122, 151, 137, 102, 158, 25, 138, 40, 116, 17, 39, 146, 17, 156, 106, 57, 66, 162, 175, 131, 31, 63, 93, 74, 29, 18, 14, 76, 171, 13, 124, 22, 112, 70, 108, 91, 91, 109, 159, 175, 82, 167, 142, 81, 95, 98, 135, 16, 192, 99, 182, 77, 30, 69, 125, 82, 65, 66, 142, 169, 137, 142, 56, 64, 184, 50, 9, 27, 142, 135, 107, 11, 77, 171, 26, 158, 158, 9, 116, 110, 51, 124, 162, 150, 71, 20, 63, 27, 11, 125, 46, 63, 171, 67, 177, 140, 56, 163, 143, 191, 55, 190, 37, 171, 74, 183, 49, 175, 157, 183, 74, 114, 75, 30, 100, 95, 106, 85, 35, 156, 149, 114, 14, 7, 81, 180, 134, 130, 10, 120, 71, 62, 158, 187, 78, 95, 154, 161, 35, 199, 196, 141, 81, 149, 64, 145, 132, 119, 39, 49, 74, 197, 54, 163, 165, 144, 163, 129, 184, 27, 28, 3, 176, 177, |

| Test | Expected | Got |
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| <pre> 146, 19, 118, 51, 81, 149, 74, 1, 99, 187, 64, 161, 116, 95, 113, 139, 6, 32, 198, 181, 154, 142, 164, 145, 120, 67, 167, 5, 1, 132, 157, 11, 115, 128, 181, 114, 165, 80, 160, 125, 188, 144, 134, 194, 37, 165, 180, 157, 123, 40, 61, 182, 19, 10, 158, 40, 55, 0, 78, 140, 168, 161, 126, 37, 183, 60, 46, 93, 141, 160, 184, 113, 162, 199, 192, 0, 139, 50, 196, 98, 111, 19, 97, 174, 37, 79, 119, 188, 94, 98, 85, 52, 88, 16, 183, 191, 86, 65, 23, 109, 186, 124, 27, 22, 12, 167, 110, 13, 48, 134, 128, 113, 75, 178, 170, 198, 142, 36, 93, 125, 182, 58, 59, 47, 130, 153, 121, 23, 31, 181, 122, 192, 58, 52, 111, 140, 68, 57, 126, 16, 106, 144, 57, 84, 157, 85, 33, 79, 118, 18, 114, 90, 199, 96, 168, 84, 183, 38, 74, 182, 196, 104, 15, 192, 101, 98, 38, 156, 192, 133, 170, 72, 178, 112, 142, 130, 133, 131, 5, 56, 7, 160, 85, 21, 193, 92, 173, 67, 148, 68, 92, 85, 91, 187, 164, 3, 85, 51, 88, 20, 121, 50, 169, 31, 16, 111, 119, 195, 53, 165, 198, 184, 168, 111, 63, 117, 83, 44, 65, 20, 92, 94, 135, 178, 133, 141, 163, 75, 128, 82, 51, 150, 23, 120, 44, 188, 187, 93, 37, 63, 99, 58, 53, 1, 80, 191, 174, 146, 126, 11, 196, 111, 126, 162, 169, 175, 74, 168, 99, 103, 136, 28, 97, 64, 74, 81, 10, 87, 117, 41, 54, 110, 193, 43, 137, 26, 8, 159, 29, 77, 115, 7, 110, 60, 81, 0, 148, 187, 137, 193, 189, 95, 35, 172, 42, 12, 18, 58, 11, 56, 180, 188, 44, 16, 125, 39, 146, 195, 72, 120, 113, 172, 176, 72, 16, 3, 46, 41, 64, 125, 180, 98, 144, 147, 1, 104, 76, 41, 166, 38, 151, 72, 41, 69, 87, 126, 87, 23, 72, 92, 112, 49, 92, 64, 109, 104, 17, 124, 93, 125, 19, 167, 97, 123}; 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| Test | Expected | Got |
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193, 187, 59, 63, 7, 185, 56, 50, 115, 163, 92, 169, 113, 48, 107, 13, 141, 62, 22, 17, 190, 197, 137, 132, 12, 38, 124, 49, 28, 92, 109, 110, 33, 106, 131, 75, 77, 110, 38, 3, 24, 92, 125, 103, 111, 149, 0, 73, 73, 153, 0, 14, 94, 139, 139, 48, 10, 21, 12, 51, 1, 108, 35, 134, 178, 44, 73, 172, 169, 15, 71, 172, 168, 26, 15, 117, 85, 41, 122, 198, 82, 60, 147, 5, 97, 49, 189, 135, 198, 53, 17, 64, 82, 165, 2, 170, 53, 186, 149, 19, 28, 196, 154, 10, 163, 6, 136, 147, 52, 171, 161, 52, 137, 102, 73, 62, 142, 48, 149, 152, 123, 22, 137, 184, 41, 17, 179, 68, 106, 115, 174, 160, 133, 198, 153, 48, 18, 63, 178, 17, 132, 163, 37, 99, 133, 88, 33, 73, 118, 167, 188, 28, 87, 177, 54, 165, 19, 160, 68, 10, 176, 71, 46, 163, 46, 4, 99, 117, 101, 61, 11, 134, 156, 17, 134, 10, 119, 161, 99, 118, 185, 47,</pre> | <pre>[68, 67, 36, 184, 137, 30, 103, 195, 31, 125, 116, 61, 46, 46, 145, 99, 4, 117, 183, 27, 173, 49, 116, 20, 178, 55, 14, 99, 167, 88, 89, 100, 162, 79, 59, 117, 72, 61, 149, 193, 146, 24, 172, 148, 25, 121, 98, 58, 85, 86, 199, 45, 180, 24, 67, 167, 121, 13, 88, 116, 99, 96, 188, 147, 152, 23, 37, 15, 10, 13, 160, 89, 184, 57, 67, 89, 40, 24, 81, 117, 28, 63, 158, 168, 10, 115, 172, 78, 136, 60, 149, 7, 192, 63, 66, 179, 64, 155, 131, 125, 54, 62, 96, 99, 98, 33, 175, 148, 156, 193, 167, 115, 199, 96, 77, 68, 174, 83, 173, 180, 71, 45, 147, 173, 125, 197, 130, 162, 50, 147, 53, 144, 188, 184, 52, 190, 199, 70, 25, 167, 76, 70, 132, 85, 169, 145, 60, 88, 128, 89, 119, 55, 100, 129, 155, 158, 98, 2, 125, 192, 53, 151, 99, 199, 4, 155, 93, 27, 95, 106, 65, 23, 88, 189, 88, 114, 127, 90, 98, 116, 137, 156, 25, 143, 65, 190, 197, 177, 15, 14, 131, 151, 81, 104, 84, 67, 111, 183, 155, 193, 187, 59, 63, 7, 185, 56, 50, 115, 163, 92, 169, 113, 48, 107, 13, 141, 62, 22, 17, 190, 197, 137, 132, 12, 38, 124, 49, 28, 92, 109, 110, 33, 106, 131, 75, 77, 110, 38, 3, 24, 92, 125, 103, 111, 149, 0, 73, 73, 153, 0, 14, 94, 139, 139, 48, 10, 21, 12, 51, 1, 108, 35, 134, 178, 44, 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165, 31, 76, 152, 65, 151, 157, 94, 133, 40, 45, 30, 183, 167, 44, 13, 61, 79, 41, 25, 44, 190, 74, 44, 176, 40, 116, 136, 31, 138, 173, 21, 86, 137, 24, 18, 65, 84, 66, 49, 125, 119, 83, 133, 16, 138, 70, 40, 83, 138, 20, 160, 126, 142, 125, 129, 53, 156, 41, 170, 138, 109, 127, 145, 19, 6, 156, 151, 46, 153, 94, 100, 90, 155, 105, 90, 47, 111, 170, 29, 49, 163, 154, 78, 185, 138, 53, 12, 149, 98, 163, 84, 33, 78, 47, 50, 45, 118, 22, 25, 48, 93, 123, 167, 158, 84, 73, 93, 127, 190, 159, 69, 128, 68, 59, 116, 77, 137, 160, 99, 95, 16, 90, 120, 162, 125, 156, 130, 59, 185, 176, 102, 176, 58, 183, 179, 40, 138, 41, 53, 69, 95, 103, 16, 103, 163, 126, 98, 83, 21, 39, 38, 75, 192, 134, 102, 104, 74, 31, 113, 61, 55, 40, 70, 190, 119, 195, 104, 152, 118, 138, 146, 147, 194, 120, 37, 166, 194, 181, 7, 146, 149, 2, 118, 81, 9, 6, 182, 96, 37, 136, 135, 171, 169, 143, 106, 16, 92, 94, 117, 63, 86, 131, 101, 64, 39, 51, 4, 190, 136, 150, 116, 74, 193, 49, 170, 50, 146, 123, 102, 172, 6, 119, 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86, 111, 109, 111, 151, 22, 121, 137, 18, 24, 105, 149, 44, 160, 196, 27, 128, 89, 59, 0, 152, 192, 50, 155, 132, 51, 19, 42, 145, 18, 108, 17, 86, 21, 191, 83, 36, 71, 156, 99, 172, 9, 26, 157, 53, 2, 115, 169, 198, 46, 169, 80, 105, 132, 99, 82, 160, 68, 5, 39, 60, 192, 23, 92, 188, 139, 4, 169, 27, 32, 37, 64, 157, 60, 87, 169, 59, 118, 139, 28, 117, 78, 69, 174, 160, 4, 63, 23, 144, 122, 175, 91, 184, 149, 182, 81, 55, 72, 146, 64, 61, 17, 158, 48, 110, 120, 48, 8, 22, 189, 164, 12, 94, 57, 199, 185, 126, 176, 199, 100, 84, 174, 145, 111, 132, 40, 130, 38, 136, 92, 98, 186, 81, 83, 6, 75, 159, 61, 45, 147, 77, 166, 182, 192, 193, 152, 184, 42, 51, 129, 193, 167, 99, 174, 11, 3, 24, 57, 12, 124, 174, 63, 125, 133, 176, 28, 173, 0, 23, 19, 135, 114, 33, 17, 89, 186, 133, 26, 190, 122, 158, 150, 71, 185, 142, 109, 85, 119, 157, 104, 2, 139, 170, 146, 169, 130, 137, 103, 11, 185, 46, 91, 20, 125, 105, 86, 109, 40, 59, 167, 75, 191, 176, 7, 119, 145, 148, 184, 64, 35, 67, 101, 110, 114, 180, 196, 96, 17, 165, 193, 8, 92, 61, 100, 53, 179, 150, 62, 98, 107, 74, 96, 5, 97, 144, 149, 91, 185, 14, 41, 122, 142, 97, 41, 7, 155, 51, 93, 112, 121, 36, 68, 53, 90, 60, 198, 171, 29, 32, 112, 16, 75, 171, 92, 134, 82, 39, 199, 138, 103, 92, 111, 52, 58, 32, 132, 68, 100, 87, 149, 179, 60, |

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LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = reverseLinkedList(head); LLNode::printList(newhead); newhead->clear(); </pre> | <pre> 29, 143, 160, 82, 122, 66, 20, 52, 86, 149, 16, 136, 165, 131, 93, 0, 180, 157, 12, 172, 93, 122, 199, 45, 95, 156, 31, 94, 186, 5, 136, 32, 169, 42, 114, 174, 88, 79, 170, 38, 160, 195, 120, 185, 65, 14, 97, 132, 160, 40, 128, 0, 18, 99, 49, 159, 87, 11, 167, 49, 97, 61, 175, 158, 183, 134, 99, 108, 54, 173, 67, 67, 71, 20, 81, 119, 135, 107, 148, 6, 11, 38, 104, 131, 90, 89, 12, 106, 111, 136, 44, 181, 167, 75, 168, 46, 176, 34, 164, 134, 107, 181, 177, 141, 147, 136, 52, 107, 30, 37, 157, 174, 108, 90, 187, 13, 125, 172, 7, 13, 48, 52, 198, 177, 26, 9, 34, 56, 91, 166, 187, 130, 55, 94, 178, 10, 1 ...snip... , 10, 178, 94, 55, 130, 187, 166, 91, 56, 34, 9, 26, 177, 198, 52, 48, 13, 7, 172, 125, 13, 187, 90, 108, 174, 157, 37, 30, 107, 52, 136, 147, 141, 177, 181, 107, 134, 164, 34, 176, 46, 168, 75, 167, 181, 44, 136, 111, 106, 12, 89, 90, 131, 104, 38, 11, 6, 148, 107, 135, 119, 81, 20, 71, 67, 67, 173, 54, 108, 99, 134, 183, 158, 175, 61, 97, 49, 167, 11, 87, 159, 49, 99, 18, 0, 128, 40, 160, 132, 97, 14, 65, 185, 120, 195, 160, 38, 170, 79, 88, 174, 114, 42, 169, 32, 136, 5, 186, 94, 31, 156, 95, 45, 199, 122, 93, 172, 12, 157, 180, 0, 93, 131, 165, 136, 16, 149, 86, 52, 20, 66, 122, 82, 160, 143, 29, 60, 179, 149, 87, 100, 68, 132, 32, 58, 52, 111, 92, 103, 138, 199, 39, 82, 134, 92, 171, 75, 16, 112, 32, 29, 171, 198, 60, 90, 53, 68, 36, 121, 112, 93, 51, 155, 7, 41, 97, 142, 122, 41, 14, 185, 91, 149, 144, 97, 5, 96, 74, 107, 98, 62, 150, 179, 53, 100, 61, 92, 8, 193, 165, 17, 96, 196, 180, 114, 110, 101, 67, 35, 64, 184, 148, 145, 119, 7, 176, 191, 75, 167, 59, 40, 109, 86, 105, 125, 20, 91, 46, 185, 11, 103, 137, 130, 169, 146, 170, 139, 2, 104, 157, </pre> | <pre> 29, 143, 160, 82, 122, 66, 20, 52, 86, 149, 16, 136, 165, 131, 93, 0, 180, 157, 12, 172, 93, 122, 199, 45, 95, 156, 31, 94, 186, 5, 136, 32, 169, 42, 114, 174, 88, 79, 170, 38, 160, 195, 120, 185, 65, 14, 97, 132, 160, 40, 128, 0, 18, 99, 49, 159, 87, 11, 167, 49, 97, 61, 175, 158, 183, 134, 99, 108, 54, 173, 67, 67, 71, 20, 81, 119, 135, 107, 148, 6, 11, 38, 104, 131, 90, 89, 12, 106, 111, 136, 44, 181, 167, 75, 168, 46, 176, 34, 164, 134, 107, 181, 177, 141, 147, 136, 52, 107, 30, 37, 157, 174, 108, 90, 187, 13, 125, 172, 7, 13, 48, 52, 198, 177, 26, 9, 34, 56, 91, 166, 187, 130, 55, 94, 178, 10, 1 ...snip... , 10, 178, 94, 55, 130, 187, 166, 91, 56, 34, 9, 26, 177, 198, 52, 48, 13, 7, 172, 125, 13, 187, 90, 108, 174, 157, 37, 30, 107, 52, 136, 147, 141, 177, 181, 107, 134, 164, 34, 176, 46, 168, 75, 167, 181, 44, 136, 111, 106, 12, 89, 90, 131, 104, 38, 11, 6, 148, 107, 135, 119, 81, 20, 71, 67, 67, 173, 54, 108, 99, 134, 183, 158, 175, 61, 97, 49, 167, 11, 87, 159, 49, 99, 18, 0, 128, 40, 160, 132, 97, 14, 65, 185, 120, 195, 160, 38, 170, 79, 88, 174, 114, 42, 169, 32, 136, 5, 186, 94, 31, 156, 95, 45, 199, 122, 93, 172, 12, 157, 180, 0, 93, 131, 165, 136, 16, 149, 86, 52, 20, 66, 122, 82, 160, 143, 29, 60, 179, 149, 87, 100, 68, 132, 32, 58, 52, 111, 92, 103, 138, 199, 39, 82, 134, 92, 171, 75, 16, 112, 32, 29, 171, 198, 60, 90, 53, 68, 36, 121, 112, 93, 51, 155, 7, 41, 97, 142, 122, 41, 14, 185, 91, 149, 144, 97, 5, 96, 74, 107, 98, 62, 150, 179, 53, 100, 61, 92, 8, 193, 165, 17, 96, 196, 180, 114, 110, 101, 67, 35, 64, 184, 148, 145, 119, 7, 176, 191, 75, 167, 59, 40, 109, 86, 105, 125, 20, 91, 46, 185, 11, 103, 137, 130, 169, 146, 170, 139, 2, 104, 157, </pre> |

| Test | Expected | Got |
|------|---|---|
| | 119, 85, 109, 142, 185, 71, 150, 158, 122, 190, 26, 133, 186, 89, 17, 33, 114, 135, 19, 23, 0, 173, 28, 176, 133, 125, 63, 174, 124, 12, 57, 24, 3, 11, 174, 99, 167, 193, 129, 51, 42, 184, 152, 193, 192, 182, 166, 77, 147, 45, 61, 159, 75, 6, 83, 81, 186, 98, 92, 136, 38, 130, 40, 132, 111, 145, 174, 84, 100, 199, 176, 126, 185, 199, 57, 94, 12, 164, 189, 22, 8, 48, 120, 110, 48, 158, 17, 61, 64, 146, 72, 55, 81, 182, 149, 184, 91, 175, 122, 144, 23, 63, 4, 160, 174, 69, 78, 117, 28, 139, 118, 59, 169, 87, 60, 157, 64, 37, 32, 27, 169, 4, 139, 188, 92, 23, 192, 60, 39, 5, 68, 160, 82, 99, 132, 105, 80, 169, 46, 198, 169, 115, 2, 53, 157, 26, 9, 172, 99, 156, 71, 36, 83, 191, 21, 86, 17, 108, 18, 145, 42, 19, 51, 132, 155, 50, 192, 152, 0, 59, 89, 128, 27, 196, 160, 44, 149, 105, 24, 18, 137, 121, 22, 151, 111, 109, 111, 86, 30, 159, 59, 135, 6, 185, 40, 147, 27, 188, 33, 165, 14, 82, 95, 28, 97, 87, 65, 79, 146, 52, 152, 80, 130, 173, 54, 5, 77, 109, 128, 51, 148, 63, 185, 93, 153, 55, 33, 189, 50, 88, 174, 153, 58, 64, 49, 105, 117, 122, 91, 110, 130, 108, 74, 69, 197, 120, 110, 78, 124, 23, 153, 70, 91, 4, 150, 28, 163, 125, 89, 163, 16, 24, 15, 28, 115, 44, 94, 24, 85, 71, 0, 35, 5, 95, 125, 18, 99, 35, 47, 185, 118, 99, 161, 119, 10, 134, 17, 156, 134, 11, 61, 101, 117, 99, 4, 46, 163, 46, 71, 176, 10, 68, 160, 19, 165, 54, 177, 87, 28, 188, 167, 118, 73, 33, 88, 133, 99, 37, 163, 132, 17, 178, 63, 18, 48, 153, 198, 133, 160, 174, 115, 106, 68, 179, 17, 41, 184, 137, 22, 123, 152, 149, 48, 142, 62, 73, 102, 137, 52, 161, 171, 52, 147, 136, 6, 163, 10, 154, 196, 28, 19, 149, 186, 53, 170, 2, 165, 82, 64, 17, 53, 198, 135, 189, 49, 97, 5, 147, 60, 82, 198, | 119, 85, 109, 142, 185, 71, 150, 158, 122, 190, 26, 133, 186, 89, 17, 33, 114, 135, 19, 23, 0, 173, 28, 176, 133, 125, 63, 174, 124, 12, 57, 24, 3, 11, 174, 99, 167, 193, 129, 51, 42, 184, 152, 193, 192, 182, 166, 77, 147, 45, 61, 159, 75, 6, 83, 81, 186, 98, 92, 136, 38, 130, 40, 132, 111, 145, 174, 84, 100, 199, 176, 126, 185, 199, 57, 94, 12, 164, 189, 22, 8, 48, 120, 110, 48, 158, 17, 61, 64, 146, 72, 55, 81, 182, 149, 184, 91, 175, 122, 144, 23, 63, 4, 160, 174, 69, 78, 117, 28, 139, 118, 59, 169, 87, 60, 157, 64, 37, 32, 27, 169, 4, 139, 188, 92, 23, 192, 60, 39, 5, 68, 160, 82, 99, 132, 105, 80, 169, 46, 198, 169, 115, 2, 53, 157, 26, 9, 172, 99, 156, 71, 36, 83, 191, 21, 86, 17, 108, 18, 145, 42, 19, 51, 132, 155, 50, 192, 152, 0, 59, 89, 128, 27, 196, 160, 44, 149, 105, 24, 18, 137, 121, 22, 151, 111, 109, 111, 86, 30, 159, 59, 135, 6, 185, 40, 147, 27, 188, 33, 165, 14, 82, 95, 28, 97, 87, 65, 79, 146, 52, 152, 80, 130, 173, 54, 5, 77, 109, 128, 51, 148, 63, 185, 93, 153, 55, 33, 189, 50, 88, 174, 153, 58, 64, 49, 105, 117, 122, 91, 110, 130, 108, 74, 69, 197, 120, 110, 78, 124, 23, 153, 70, 91, 4, 150, 28, 163, 125, 89, 163, 16, 24, 15, 28, 115, 44, 94, 24, 85, 71, 0, 35, 5, 95, 125, 18, 99, 35, 47, 185, 118, 99, 161, 119, 10, 134, 17, 156, 134, 11, 61, 101, 117, 99, 4, 46, 163, 46, 71, 176, 10, 68, 160, 19, 165, 54, 177, 87, 28, 188, 167, 118, 73, 33, 88, 133, 99, 37, 163, 132, 17, 178, 63, 18, 48, 153, 198, 133, 160, 174, 115, 106, 68, 179, 17, 41, 184, 137, 22, 123, 152, 149, 48, 142, 62, 73, 102, 137, 52, 161, 171, 52, 147, 136, 6, 163, 10, 154, 196, 28, 19, 149, 186, 53, 170, 2, 165, 82, 64, 17, 53, 198, 135, 189, 49, 97, 5, 147, 60, 82, 198, |

| | Test | Expected | Got | |
|--|------|---|---|--|
| | | 122, 41, 85, 117, 15, 26, 168, 172, 71, 15, 169, 172, 73, 44, 178, 134, 35, 108, 1, 51, 12, 21, 10, 48, 139, 139, 94, 14, 0, 153, 73, 73, 0, 149, 111, 103, 125, 92, 24, 3, 38, 110, 77, 75, 131, 106, 33, 110, 109, 92, 28, 49, 124, 38, 12, 132, 137, 197, 190, 17, 22, 62, 141, 13, 107, 48, 113, 169, 92, 163, 115, 50, 56, 185, 7, 63, 59, 187, 193, 155, 183, 111, 67, 84, 104, 81, 151, 131, 14, 15, 177, 197, 190, 65, 143, 25, 156, 137, 116, 98, 90, 127, 114, 88, 189, 88, 23, 65, 106, 95, 27, 93, 155, 4, 199, 99, 151, 53, 192, 125, 2, 98, 158, 155, 129, 100, 55, 119, 89, 128, 88, 60, 145, 169, 85, 132, 70, 76, 167, 25, 70, 199, 190, 52, 184, 188, 144, 53, 147, 50, 162, 130, 197, 125, 173, 147, 45, 71, 180, 173, 83, 174, 68, 77, 96, 199, 115, 167, 193, 156, 148, 175, 33, 98, 99, 96, 62, 54, 125, 131, 155, 64, 179, 66, 63, 192, 7, 149, 60, 136, 78, 172, 115, 10, 168, 158, 63, 28, 117, 81, 24, 40, 89, 67, 57, 184, 89, 160, 13, 10, 15, 37, 23, 152, 147, 188, 96, 99, 116, 88, 13, 121, 167, 67, 24, 180, 45, 199, 86, 85, 58, 98, 121, 25, 148, 172, 24, 146, 193, 149, 61, 72, 117, 59, 79, 162, 100, 89, 88, 167, 99, 14, 55, 178, 20, 116, 49, 173, 27, 183, 117, 4, 99, 145, 46, 46, 61, 116, 125, 31, 195, 103, 30, 137, 184, 36, 67, 68] | 122, 41, 85, 117, 15, 26, 168, 172, 71, 15, 169, 172, 73, 44, 178, 134, 35, 108, 1, 51, 12, 21, 10, 48, 139, 139, 94, 14, 0, 153, 73, 73, 0, 149, 111, 103, 125, 92, 24, 3, 38, 110, 77, 75, 131, 106, 33, 110, 109, 92, 28, 49, 124, 38, 12, 132, 137, 197, 190, 17, 22, 62, 141, 13, 107, 48, 113, 169, 92, 163, 115, 50, 56, 185, 7, 63, 59, 187, 193, 155, 183, 111, 67, 84, 104, 81, 151, 131, 14, 15, 177, 197, 190, 65, 143, 25, 156, 137, 116, 98, 90, 127, 114, 88, 189, 88, 23, 65, 106, 95, 27, 93, 155, 4, 199, 99, 151, 53, 192, 125, 2, 98, 158, 155, 129, 100, 55, 119, 89, 128, 88, 60, 145, 169, 85, 132, 70, 76, 167, 25, 70, 199, 190, 52, 184, 188, 144, 53, 147, 50, 162, 130, 197, 125, 173, 147, 45, 71, 180, 173, 83, 174, 68, 77, 96, 199, 115, 167, 193, 156, 148, 175, 33, 98, 99, 96, 62, 54, 125, 131, 155, 64, 179, 66, 63, 192, 7, 149, 60, 136, 78, 172, 115, 10, 168, 158, 63, 28, 117, 81, 24, 40, 89, 67, 57, 184, 89, 160, 13, 10, 15, 37, 23, 152, 147, 188, 96, 99, 116, 88, 13, 121, 167, 67, 24, 180, 45, 199, 86, 85, 58, 98, 121, 25, 148, 172, 24, 146, 193, 149, 61, 72, 117, 59, 79, 162, 100, 89, 88, 167, 99, 14, 55, 178, 20, 116, 49, 173, 27, 183, 117, 4, 99, 145, 46, 46, 61, 116, 125, 31, 195, 103, 30, 137, 184, 36, 67, 68] | |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.



Câu hỏi 5

Đúng

Không chấm điểm

Implement Iterator class in class SLinkedList.

Note: Iterator is a concept of repetitive elements on sequence structures. Iterator is implemented in class vector, list in STL container in C++ (<https://www.geeksforgeeks.org/iterators-c-stl/>). Your task is to implement the simple same class with iterator in C++ STL container.

Please read example and testcase carefully.



```

template <class T>
class SLinkedList
{
public:
    class Iterator; //forward declaration
    class Node;     //forward declaration
protected:
    Node *head;
    Node *tail;
    int count;
public:
    SLinkedList() : head(NULL), tail(NULL), count(0){};
    ~SLinkedList();
    void add(const T &e);
    void add(int index, const T &e);
    T removeAt(int index);
    bool removeItem(const T &removeItem);
    bool empty();
    int size();
    void clear();
    T get(int index);
    void set(int index, const T &e);
    int indexOf(const T &item);
    bool contains(const T &item);
    string toString();
    SLinkedList(const SLinkedList &list)
    {
        this->count = 0;
        this->head = NULL;
        this->tail = NULL;
    }
    Iterator begin()
    {
        return Iterator(this, true);
    }
    Iterator end()
    {
        return Iterator(this, false);
    }
public:
    class Node
    {
    private:
        T data;
        Node *next;
        friend class SLinkedList<T>;
    public:
        Node()
        {
            next = 0;
        }
        Node(Node *next)
        {
            this->next = next;
        }
        Node(T data, Node *next = NULL)
        {
            this->data = data;
            this->next = next;
        }
    };
    class Iterator
    {
    private:
        SLinkedList<T> *pList;
        Node *current;
    };
};

```

```

        int index; // corresponding with current node
public:
    Iterator(SLinkedList<T> *pList, bool begin);
    Iterator &operator=(const Iterator &iterator);
    void set(const T &e);
    T &operator*();
    bool operator!=(const Iterator &iterator);

    // Prefix ++ overload
    Iterator &operator++();

    // Postfix ++ overload
    Iterator operator++(int);
};
};

```

For example:

| Test | Result |
|--|--------|
| <pre> SLinkedList<int> list; int size = 10; for(int idx=0; idx < size; idx++){ list.add(idx); } SLinkedList<int>::Iterator it; int expvalue = 0; for(it = list.begin(); it != list.end(); it++){ assert(*it == expvalue); expvalue += 1; } </pre> | |
| <pre> SLinkedList<int> list; int size = 10; for(int idx=0; idx < size; idx++){ list.add(idx); } SLinkedList<int>::Iterator it; int expvalue = 0; for(it = list.begin(); it != list.end(); ++it){ assert(*it == expvalue); expvalue += 1; } </pre> | |

Answer:

Reset answer

```

1  template <class T>
2  SLinkedList<T>::Iterator::Iterator(SLinkedList<T>* pList, bool begin)
3  {
4      this->pList = pList;
5      if(begin){
6          this->current = (pList != nullptr) ? pList->head : nullptr;
7          this->index = (pList != nullptr) ? 0 : -1;
8      } else {
9          this->current = nullptr;
10         this->index = (pList != nullptr) ? pList->count : 0;
11     }
12 }
13
14 template <class T>
15 typename SLinkedList<T>::Iterator& SLinkedList<T>::operator=(const Iterator& iterator)
16 {

```

```

17     this->pList = iterator.pList;
18     this->current = iterator.current;
19     this->index = iterator.index;
20     return *this;
21 }
22
23 template <class T>
24 void SLinkedList<T>::Iterator::remove()
25 {
26     if(this->current == nullptr){
27         throw std::out_of_range("Segmentation fault!");
28     }
29     if(this->current == this->pList->head){
30         Node *tmp = this->pList->head;
31         this->pList->head = tmp->next;
32         delete tmp;
33         if(this->pList->head == nullptr){
34             this->pList->tail = nullptr;
35         }
36         this->current = nullptr;
37         this->index = -1;
38     } else {
39         Node *pre = this->pList->head;
40         for(int i = 0; i < this->index - 1; i++){
41             pre = pre->next;
42         }
43         pre->next = this->current->next;
44         if(this->current == this->pList->tail){
45             this->pList->tail = pre;
46         }
47         delete this->current;
48         this->current = pre;
49         --this->index;
50     }
51     this->pList->count --;
52 }
53
54 template <class T>
55 void SLinkedList<T>::Iterator::set(const T& e)
56 {
57     if(this->current == nullptr){
58         throw std::out_of_range("Segmentation fault!");
59     }
60     this->current->data = e;
61 }
62

```

| | Test |
|---|--|
| ✓ | <pre> SLinkedList<int> list; int size = 10; for(int idx=0; idx < size; idx++){ list.add(idx); } SLinkedList<int>::Iterator it; int expvalue = 0; for(it = list.begin(); it != list.end(); it++){ assert(*it == expvalue); expvalue += 1; } </pre> |

| | Test |
|---|--|
| ✓ | <pre>SLinkedList<int> list; int size = 10; for(int idx=0; idx < size; idx++){ list.add(idx); } SLinkedList<int>::Iterator it; int expvalue = 0; for(it = list.begin(); it != list.end(); ++it){ assert(*it == expvalue); expvalue += 1; }</pre> |

Passed all tests! ✓



Câu hỏi 6

Đúng

Đạt điểm 1,00 trên 1,00

Class `LLNode` is used to store a node in a singly linked list, described on the following:

```
class LLNode {
public:
    int val;
    LLNode* next;
    LLNode();
    LLNode(int val, LLNode* next);
}
```

Where `val` is the value of node, `next` is the pointer to the next node.

Request: Implement function:

```
LLNode* addLinkedList(LLNode* l0, LLNode* l1);
```

Where `l0`, `l1` are two linked lists represented positive integers, each node is a digit, the head is the least significant digit (the value of each node is between 0 and 9, the length of each linked list is between 0 and 100000). This function returns the linked list representing the sum of the two integers.

Example:

Given `l0 = [2, 3]` (representing 32) and `l1 = [1, 8]` (representing 81). The result would be `l0 = [3, 1, 1]` (representing 32 + 81 = 113).

Note:

In this exercise, the libraries `iostream`, `string`, `cstring`, `climits`, `utility`, `vector`, `list`, `stack`, `queue`, `map`, `unordered_map`, `set`, `unordered_set`, `functional`, `algorithm` has been included and `namespace std` are used. You can write helper functions and classes. Importing other libraries is allowed, but not encouraged, and may result in unexpected errors.

For example:

| Test | Result |
|--|-----------|
| <pre>int arr1[] = {2, 9}; int arr2[] = {0, 5}; LLNode* head1 = LLNode::createWithIterators(arr1, arr1 + sizeof(arr1) / sizeof(int)); LLNode* head2 = LLNode::createWithIterators(arr2, arr2 + sizeof(arr2) / sizeof(int)); LLNode* newhead = addLinkedList(head1, head2); LLNode::printList(newhead); head1->clear(); head2->clear(); newhead->clear();</pre> | [2, 4, 1] |

Answer: (penalty regime: 0, 0, 0, 5, 10, ... %)

Reset answer

```
1 LLNode* addLinkedList(LLNode* l0, LLNode* l1) {
2     LLNode *result = nullptr;
3     LLNode *tail = nullptr;
4     int carry = 0;
5     while(l0 != nullptr || l1 != nullptr){
6         int val0 = (l0 != nullptr) ? l0->val : 0;
7         int val1 = (l1 != nullptr) ? l1->val : 0;
8         int total = val0 + val1 + carry;
9         carry = total / 10;
10        total %= 10;
11
12        LLNode *newNode = new LLNode(total);
13        if(result == nullptr) result = newNode;
14        else tail->next = newNode;
15        tail = newNode;
```

```

16         if(l0 != nullptr) l0 = l0->next;
17         if(l1 != nullptr) l1 = l1->next;
18     }
19     if(carry > 0){
20         LLNode *newNode = new LLNode (carry);
21         tail->next = newNode;
22         tail = newNode;
23     }
24     return result;
25 }

```

| | Test | Expected | Got | |
|---|--|-----------|-----------|---|
| ✓ | <pre> int arr1[] = {2, 9}; int arr2[] = {0, 5}; LLNode* head1 = LLNode::createWithIterators(arr1, arr1 + sizeof(arr1) / sizeof(int)); LLNode* head2 = LLNode::createWithIterators(arr2, arr2 + sizeof(arr2) / sizeof(int)); LLNode* newhead = addLinkedList(head1, head2); LLNode::printList(newhead); head1->clear(); head2->clear(); newhead->clear(); </pre> | [2, 4, 1] | [2, 4, 1] | ✓ |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.

Câu hỏi 7

Đúng

Đạt điểm 1,00 trên 1,00

Class `LLNode` representing a node of singly linked lists is declared as below:

```
class LLNode {
public:
    int val;
    LLNode* next;
    LLNode(); // Constructor: val = 0, next = nullptr
    LLNode(int val, LLNode* next); // Constructor with customized data
}
```

Given a singly linked list head node and a integer `k`.

Your task is to implement a function with following prototype:

```
LLNode* rotateLinkedList(LLNode* head, int k);
```

The function returns head node of the rotated singly linked list obtained after rotate the linked list to the right by `k` places.

Note:

- The `iostream` library has been used and `namespace std` is being used. No other libraries are allowed.
- The constructors and methods of class `LLNode` have been defined fully so you do not need to redefine them.
- You can write helper functions.

For example:

| Test | Result |
|--|--|
| <pre>int arr[] = {2, 4, 6, 6, 3}; int k = 3; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead);</pre> | <pre>[2, 4, 6, 6, 3] [6, 6, 3, 2, 4]</pre> |

Answer: (penalty regime: 0 %)

Reset answer

```
1 LLNode* rotateLinkedList(LLNode* head, int k) {
2     if(!head || head->next == nullptr || k == 0) return head;
3     LLNode *tail = head;
4     int length = 1;
5     while(tail->next){
6         tail = tail->next;
7         length += 1;
8     }
9     k %= length;
10    if(k == 0) return head;
11    LLNode *tmp = head;
12    for(int i = 0; i < length - k - 1; i++){
13        tmp = tmp->next;
14    }
15    LLNode *newHead = tmp->next;
16    tmp->next = nullptr;
17    tail->next = head;
18    tail = tmp;
19    return newHead;
20 }
```

| | Test | Expected | Got | |
|---|---|---|---|---|
| ✓ | <pre>int arr[] = {2, 4, 6, 6, 3}; int k = 3; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead);</pre> | <pre>[2, 4, 6, 6, 3] [6, 6, 3, 2, 4]</pre> | <pre>[2, 4, 6, 6, 3] [6, 6, 3, 2, 4]</pre> | ✓ |
| ✓ | <pre>int arr[] = {}; int k = 2; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead);</pre> | <pre>[] []</pre> | <pre>[] []</pre> | ✓ |
| ✓ | <pre>int arr[] = {0, 4, 2, 5, 1, 0, 6, 4, 8, 6}; int k = 11; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead);</pre> | <pre>[0, 4, 2, 5, 1, 0, 6, 4, 8, 6] [6, 0, 4, 2, 5, 1, 0, 6, 4, 8]</pre> | <pre>[0, 4, 2, 5, 1, 0, 6, 4, 8, 6] [6, 0, 4, 2, 5, 1, 0, 6, 4, 8]</pre> | ✓ |
| ✓ | <pre>int arr[] = {6, 1, 3, 2, 6, 0, 0, 0, 3, 3, 9, 8, 5, 6, 0, 7, 7, 8, 5, 7, 7, 9, 6, 3, 3, 0, 0, 8, 0, 0, 4, 9, 7, 1, 7, 2, 7, 5, 4, 4, 7, 5, 9, 2, 4, 5, 7, 9, 7, 9, 7, 2, 0, 6, 7, 6, 5, 1, 9, 7, 1, 2, 7, 8, 7, 5, 4, 7, 6, 9, 0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9}; int k = 35; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead);</pre> | <pre>[6, 1, 3, 2, 6, 0, 0, 0, 3, 3, 9, 8, 5, 6, 0, 7, 7, 8, 5, 7, 7, 9, 6, 3, 3, 0, 0, 8, 0, 0, 4, 9, 7, 1, 7, 2, 7, 5, 4, 4, 7, 5, 9, 2, 4, 5, 7, 9, 7, 9, 7, 2, 0, 6, 7, 6, 5, 1, 9, 7, 1, 2, 7, 8, 7, 5, 4, 7, 6, 9, 0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9] [0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9, 6, 1, 3, 2, 6, 0, 0, 0, 3, 3, 9, 8, 5, 6, 0, 7, 7, 8, 5, 7, 7, 9, 6, 3, 3, 0, 0, 8, 0, 0, 4, 9, 7, 1, 7, 2, 7, 5, 4, 4, 7, 5, 9, 2, 4, 5, 7, 9, 7, 9, 7, 2, 0, 6, 7, 6, 5, 1, 9, 7, 1, 2, 7, 8, 7, 5, 4, 7, 6, 9, 0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9]</pre> | <pre>[6, 1, 3, 2, 6, 0, 0, 0, 3, 3, 9, 8, 5, 6, 0, 7, 7, 8, 5, 7, 7, 9, 6, 3, 3, 0, 0, 8, 0, 0, 4, 9, 7, 1, 7, 2, 7, 5, 4, 4, 7, 5, 9, 2, 4, 5, 7, 9, 7, 9, 7, 2, 0, 6, 7, 6, 5, 1, 9, 7, 1, 2, 7, 8, 7, 5, 4, 7, 6, 9, 0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9] [0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9, 6, 1, 3, 2, 6, 0, 0, 0, 3, 3, 9, 8, 5, 6, 0, 7, 7, 8, 5, 7, 7, 9, 6, 3, 3, 0, 0, 8, 0, 0, 4, 9, 7, 1, 7, 2, 7, 5, 4, 4, 7, 5, 9, 2, 4, 5, 7, 9, 7, 9, 7, 2, 0, 6, 7, 6, 5, 1, 9, 7, 1, 2, 7, 8, 7, 5, 4, 7, 6, 9, 0, 2, 7, 0, 5, 5, 6, 8, 3, 1, 9, 3, 0, 1, 4, 6, 6, 9, 2, 2, 0, 6, 7, 4, 4, 6, 0, 7, 3, 5, 2, 9, 1, 0, 9]</pre> | ✓ |



| | Test | Expected | Got | |
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| ✓ | <pre> int arr[] = {9, 1, 7, 5, 8, 6, 2, 2, 2, 6, 0, 8, 1, 9, 6, 8, 4, 8, 4, 3, 7, 0, 7, 8, 9, 5, 3, 4, 7, 4, 3, 5, 2, 2, 7, 8, 9, 7, 1, 9, 9, 8, 3, 5, 7, 1, 6, 9, 1, 2, 0, 6, 8, 0, 4, 1, 6, 5, 8, 7, 6, 8, 0, 5, 7, 8, 8, 6, 7, 5, 8, 0, 7, 6, 4, 9, 5, 9, 6, 4, 1, 5, 6, 2, 2, 6, 7, 0, 3, 4, 2, 3, 9, 0, 9, 6, 3, 6, 7, 5, 5, 5, 9, 0, 6, 1, 1, 5, 0, 9, 1, 1, 1, 0, 4, 6, 3, 3, 3, 5, 8, 7, 4, 7, 1, 7, 1, 8, 4, 2, 0, 1, 9, 0, 7, 9, 2, 8, 9, 2, 5, 3, 5, 9, 3, 2, 7, 3, 5, 9, 5, 5, 3, 2, 3, 9, 4, 1, 6, 1, 8, 3, 1, 4, 5, 2, 5, 7, 7, 0, 9, 6, 6, 4, 8, 1, 1, 6, 0, 2, 6, 0, 7, 5, 5, 0, 5, 2, 6, 9, 9, 9, 9, 2, 3, 0, 6, 8, 8, 4, 5, 6, 2, 8, 5, 9, 8, 3, 6, 8, 8, 6, 2, 1, 2, 1, 4, 6, 2, 0, 9, 3, 9, 6, 4, 2, 3, 6, 2, 0, 9, 8, 7, 0, 6, 0, 7, 0, 5, 9, 4, 3, 7, 9, 7, 3, 5, 7, 0, 3, 1, 8, 9, 9, 4, 0, 8, 6, 4, 6, 7, 3, 8, 1, 2, 1, 5, 4, 9, 5, 9, 5, 8, 6, 6, 8, 9, 4, 4, 0, 6, 4, 5, 3, 0, 3, 9, 7, 1, 7, 2, 5, 0, 1, 9, 1, 2, 5, 6, 8, 7, 1, 6, 9, 6, 2, 8, 1, 2, 0, 4, 3, 4, 6, 7, 1, 0, 7, 0, 7, 9, 4, 0, 1, 2, 3, 5, 6, 3, 5, 6, 7, 5, 4, 2, 4, 8, 2, 5, 8, 8, 6, 6, 2, 6, 6, 8, 1, 2, 2, 8, 0, 8, 9, 0, 7, 9, 0, 1, 6, 6, 3, 6, 5, 1, 5, 9, 0, 3, 7, 3, 7, 2, 0, 0, 2, 7, 5, 2, 9, 5, 5, 8, 1, 7, 7, 9, 7, 1, 1, 6, 4, 3, 8, 0, 7, 9, 1, 0, 9, 5, 2, 7, 2, 1, 5, 3, 9, 7, 6, 9, 1, 3, 5, 5, 0, 6, 9, 4, 7, 1, 7, 2, 0, 4, 5, 8, 1, 6, 1, 0, 7, 2, 2, 6, 7, 4, 4, 9, 5, 4, 5, 2, 0, 8, 0, 5, 5, 1, 8, 9, 4, 5, 6, 1, 2, 0, 7, 0, 2, 1, 6, 8, 8, 7, 8, 7, 0, 1, 8, 5, 6, 5, 9, 2, 2, 9, 3, 6, 0, 1, 7, 9, 8, 1, 1, 5, 4, 5, 7, 5, 0, 2, 0, 4, 4, 8, 0, 7, 3}; int k = 196; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead); </pre> | <pre> [9, 1, 7, 5, 8, 6, 2, 2, 2, 6, 0, 8, 1, 9, 6, 8, 4, 8, 4, 3, 7, 0, 7, 8, 9, 5, 3, 4, 7, 4, 3, 5, 2, 2, 7, 8, 9, 7, 1, 9, 9, 8, 3, 5, 7, 1, 6, 9, 1, 2, 0, 6, 8, 0, 4, 1, 6, 5, 8, 7, 6, 8, 0, 5, 7, 8, 8, 6, 7, 5, 8, 0, 7, 6, 4, 9, 5, 9, 6, 4, 1, 5, 6, 2, 2, 6, 7, 0, 3, 4, 2, 3, 9, 0, 9, 6, 3, 6, 7, 5, 5, 5, 9, 0, 6, 1, 1, 5, 0, 9, 1, 1, 1, 0, 4, 6, 3, 3, 3, 5, 8, 7, 4, 7, 1, 7, 1, 8, 4, 2, 0, 1, 9, 0, 7, 9, 2, 8, 9, 2, 5, 3, 5, 9, 3, 2, 7, 3, 5, 9, 5, 5, 3, 2, 3, 9, 4, 1, 6, 1, 8, 3, 1, 4, 5, 2, 5, 7, 7, 0, 9, 6, 6, 4, 8, 1, 1, 6, 0, 2, 6, 0, 7, 5, 5, 0, 5, 2, 6, 9, 9, 9, 9, 2, 3, 0, 6, 8, 8, 4, 5, 6, 2, 8, 5, 9, 8, 3, 6, 8, 8, 6, 2, 1, 2, 1, 4, 6, 2, 0, 9, 3, 9, 6, 4, 2, 3, 6, 2, 0, 9, 8, 7, 0, 6, 0, 7, 0, 5, 9, 4, 3, 7, 9, 7, 3, 5, 7, 0, 3, 1, 8, 9, 9, 4, 0, 8, 6, 4, 6, 7, 3, 8, 1, 2, 1, 5, 4, 9, 5, 9, 5, 8, 6, 6, 8, 9, 4, 4, 0, 6, 4, 5, 3, 0, 3, 9, 7, 1, 7, 2, 5, 0, 1, 9, 1, 2, 5, 6, 8, 7, 1, 6, 9, 6, 2, 8, 1, 2, 0, 4, 3, 4, 6, 7, 1, 0, 7, 0, 7, 9, 4, 0, 1, 2, 3, 5, 6, 3, 5, 6, 7, 5, 4, 2, 4, 8, 2, 5, 8, 8, 6, 6, 2, 6, 6, 8, 1, 2, 2, 8, 0, 8, 9, 0, 7, 9, 0, 1, 6, 6, 3, 6, 5, 1, 5, 9, 0, 3, 7, 3, 7, 2, 0, 0, 2, 7, 5, 2, 9, 5, 5, 8, 1, 7, 7, 9, 7, 1, 1, 6, 4, 3, 8, 0, 7, 9, 1, 0, 9, 5, 2, 7, 2, 1, 5, 3, 9, 7, 6, 9, 1, 3, 5, 5, 0, 6, 9, 4, 7, 1, 7, 2, 0, 4, 5, 8, 1, 6, 1, 0, 7, 2, 2, 6, 7, 4, 4, 9, 5, 4, 5, 2, 0, 8, 0, 5, 5, 1, 8, 9, 4, 5, 6, 1, 2, 0, 7, 0, 2, 1, 6, 8, 8, 7, 8, 7, 0, 1, 8, 5, 6, 5, 9, 2, 2, 9, 3, 6, 0, 1, 7, 9, 8, 1, 1, 5, 4, 5, 7, 5, 0, 2, 0, 4, 4, 8, 0, 7, 3] [6, 2, 8, 1, 2, 0, 4, 3, 4, 6, 7, 1, 0, 7, 0, 7, 9, 4, 0, 1, 2, 3, 5, 6, 3, 5, 6, 7, 5, 4, 2, 4, 8, 2, 5, 8, 8, 6, 6, 2, 6, 6, 8, 1, 2, 2, 8, 0, 8, 9, 0, 7, 9, 0, 1, 6, 6, 3, 6, 5, 1, 5, 9, 0, 3, 7, 3, 7, 2, 0, 0, 2, </pre> | <pre> [9, 1, 7, 5, 8, 6, 2, 2, 2, 6, 0, 8, 1, 9, 6, 8, 4, 8, 6, 0, 8, 1, 9, 6, 8, 4, 8, 4, 3, 7, 0, 7, 8, 9, 5, 3, 4, 3, 7, 0, 7, 8, 9, 5, 3, 4, 7, 4, 3, 5, 2, 2, 7, 8, 4, 7, 4, 3, 5, 2, 2, 7, 8, 9, 7, 1, 9, 9, 8, 3, 5, 7, 1, 6, 9, 1, 2, 0, 6, 8, 0, 4, 1, 6, 5, 8, 7, 6, 8, 0, 5, 7, 8, 8, 6, 7, 5, 8, 0, 7, 6, 4, 9, 5, 9, 6, 4, 1, 5, 6, 2, 2, 6, 7, 0, 3, 4, 2, 3, 9, 0, 9, 6, 3, 6, 7, 5, 5, 5, 9, 0, 6, 1, 1, 5, 0, 9, 1, 1, 1, 0, 4, 6, 3, 3, 3, 5, 8, 7, 4, 7, 1, 7, 1, 8, 4, 2, 0, 1, 9, 0, 7, 9, 2, 8, 9, 2, 5, 3, 5, 9, 3, 2, 7, 3, 5, 9, 5, 5, 3, 2, 3, 9, 4, 1, 6, 1, 8, 3, 1, 4, 5, 2, 5, 7, 7, 0, 9, 6, 6, 4, 8, 1, 1, 6, 0, 2, 6, 0, 7, 5, 5, 0, 5, 2, 6, 9, 9, 9, 9, 2, 3, 0, 6, 8, 8, 4, 5, 6, 2, 8, 5, 9, 8, 3, 6, 8, 8, 6, 2, 1, 2, 1, 4, 6, 2, 0, 9, 3, 9, 6, 4, 2, 3, 6, 2, 0, 9, 8, 7, 0, 6, 0, 7, 0, 5, 9, 4, 3, 7, 9, 7, 3, 5, 7, 0, 3, 1, 8, 9, 9, 4, 0, 8, 6, 4, 6, 7, 3, 8, 1, 2, 1, 5, 4, 9, 5, 9, 5, 8, 6, 6, 8, 9, 4, 4, 0, 6, 4, 5, 3, 0, 3, 9, 7, 1, 7, 2, 5, 0, 1, 9, 1, 2, 5, 6, 8, 7, 1, 6, 9, 6, 2, 8, 1, 2, 0, 4, 3, 4, 6, 7, 1, 0, 7, 0, 7, 9, 4, 0, 1, 2, 3, 5, 6, 3, 5, 6, 7, 5, 4, 2, 4, 8, 2, 5, 8, 8, 6, 6, 2, 6, 6, 8, 1, 2, 6, 2, 6, 6, 8, 1, 2, 2, 8, 0, 8, 9, 0, 7, 9, 0, 1, 6, 6, 3, 6, 5, 1, 5, 9, 0, 3, 7, 3, 7, 2, 0, 0, 2, 7, 5, 2, 9, 5, 5, 8, 1, 7, 7, 9, 7, 1, 1, 6, 4, 3, 8, 0, 7, 9, 1, 0, 9, 5, 2, 7, 2, 1, 5, 3, 9, 7, 6, 9, 1, 3, 5, 5, 0, 6, 9, 4, 7, 1, 7, 2, 0, 4, 5, 8, 1, 6, 1, 0, 7, 2, 2, 6, 7, 4, 4, 9, 5, 4, 5, 2, 0, 8, 0, 5, 5, 1, 8, 9, 4, 5, 6, 1, 2, 0, 7, 0, 2, 1, 6, 8, 8, 7, 8, 7, 0, 1, 8, 5, 6, 5, 9, 2, 2, 9, 3, 6, 0, 1, 7, 9, 8, 1, 1, 5, 4, 5, 7, 5, 0, 2, 0, 4, 4, 8, 0, 7, 3] [6, 2, 8, 1, 2, 0, 4, 3, 4, 6, 7, 1, 0, 7, 0, 7, 9, 4, 0, 1, 2, 3, 5, 6, 3, 5, 6, 7, 5, 4, 2, 4, 8, 2, 5, 8, 8, 6, 6, 2, 6, 6, 8, 1, 2, 2, 8, 0, 8, 9, 0, 7, 9, 0, 1, 6, 6, 3, 6, 5, 1, 5, 9, 0, 3, 7, 3, 7, 2, 0, 0, 2, </pre> | ✓ |

| | Test | Expected | Got | |
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| | | 7, 5, 2, 9, 5, 5, 8, 1, 7, 7, 9, 7, 1, 1, 6, 4, 3, 8, 0, 7, 9, 1, 0, 9, 5, 2, 7, 2, 1, 5, 3, 9, 7, 6, 9, 1, 3, 5, 5, 0, 6, 9, 4, 7, 1, 7, 2, 0, 4, 5, 8, 1, 6, 1, 0, 7, 2, 2, 6, 7, 4, 4, 9, 5, 4, 5, 2, 0, 8, 0, 5, 5, 1, 8, 9, 4, 5, 6, 1, 2, 0, 7, 0, 2, 1, 6, 8, 8, 7, 8, 7, 0, 1, 8, 5, 6, 5, 9, 2, 2, 9, 3, 6, 0, 1, 7, 9, 8, 1, 1, 5, 4, 5, 7, 5, 0, 2, 0, 4, 4, 8, 0, 7, 3, 9, 1, 7, 5, 8, 6, 2, 2, 2, 6, 0, 8, 1, 9, 6, 8, 4, 8, 4, 3, 7, 0, 7, 8, 9, 5, 3, 4, 7, 4, 3, 5, 2, 2, 7, 8, 9, 7, 1, 9, 9, 8, 3, 5, 7, 1, 6, 9, 1, 2, 0, 6, 8, 0, 4, 1, 6, 5, 8, 7, 6, 8, 0, 5, 7, 8, 8, 6, 7, 5, 8, 0, 7, 6, 4, 9, 5, 9, 6, 4, 1, 5, 6, 2, 2, 6, 7, 0, 3, 4, 2, 3, 9, 0, 9, 6, 3, 6, 7, 5, 5, 5, 9, 0, 6, 1, 1, 5, 0, 9, 1, 1, 1, 0, 4, 6, 3, 3, 3, 5, 8, 7, 4, 7, 1, 7, 1, 8, 4, 2, 0, 1, 9, 0, 7, 9, 2, 8, 9, 2, 5, 3, 5, 9, 3, 2, 7, 3, 5, 9, 5, 5, 3, 2, 3, 9, 4, 1, 6, 1, 8, 3, 1, 4, 5, 2, 5, 7, 7, 0, 9, 6, 6, 4, 8, 1, 1, 6, 0, 2, 6, 0, 7, 5, 5, 0, 5, 2, 6, 9, 9, 9, 9, 2, 3, 0, 6, 8, 8, 4, 5, 6, 2, 8, 5, 9, 8, 3, 6, 8, 8, 6, 2, 1, 2, 1, 4, 6, 2, 0, 9, 3, 9, 6, 4, 2, 3, 6, 2, 0, 9, 8, 7, 0, 6, 0, 7, 0, 5, 9, 4, 3, 7, 9, 7, 3, 5, 7, 0, 3, 1, 8, 9, 9, 4, 0, 8, 6, 4, 6, 7, 3, 8, 1, 2, 1, 5, 4, 9, 5, 9, 5, 8, 6, 6, 8, 9, 4, 4, 0, 6, 4, 5, 3, 0, 3, 9, 7, 1, 7, 2, 5, 0, 1, 9, 1, 2, 5, 6, 8, 7, 1, 6, 9] | 7, 5, 2, 9, 5, 5, 8, 1, 7, 7, 9, 7, 1, 1, 6, 4, 3, 8, 0, 7, 9, 1, 0, 9, 5, 2, 7, 2, 1, 5, 3, 9, 7, 6, 9, 1, 3, 5, 5, 0, 6, 9, 4, 7, 1, 7, 2, 0, 4, 5, 8, 1, 6, 1, 0, 7, 2, 2, 6, 7, 4, 4, 9, 5, 4, 5, 2, 0, 8, 0, 5, 5, 1, 8, 9, 4, 5, 6, 1, 2, 0, 7, 0, 2, 1, 6, 8, 8, 7, 8, 7, 0, 1, 8, 5, 6, 5, 9, 2, 2, 9, 3, 6, 0, 1, 7, 9, 8, 1, 1, 5, 4, 5, 7, 5, 0, 2, 0, 4, 4, 8, 0, 7, 3, 9, 1, 7, 5, 8, 6, 2, 2, 2, 6, 0, 8, 1, 9, 6, 8, 4, 8, 4, 3, 7, 0, 7, 8, 9, 5, 3, 4, 7, 4, 3, 5, 2, 2, 7, 8, 9, 7, 1, 9, 9, 8, 3, 5, 7, 1, 6, 9, 1, 2, 0, 6, 8, 0, 4, 1, 6, 5, 8, 7, 6, 8, 0, 5, 7, 8, 8, 6, 7, 5, 8, 0, 7, 6, 4, 9, 5, 9, 6, 4, 1, 5, 6, 2, 2, 6, 7, 0, 3, 4, 2, 3, 9, 0, 9, 6, 3, 6, 7, 5, 5, 5, 9, 0, 6, 1, 1, 5, 0, 9, 1, 1, 1, 0, 4, 6, 3, 3, 3, 5, 8, 7, 4, 7, 1, 7, 1, 8, 4, 2, 0, 1, 9, 0, 7, 9, 2, 8, 9, 2, 5, 3, 5, 9, 3, 2, 7, 3, 5, 9, 5, 5, 3, 2, 3, 9, 4, 1, 6, 1, 8, 3, 1, 4, 5, 2, 5, 7, 7, 0, 9, 6, 6, 4, 8, 1, 1, 6, 0, 2, 6, 0, 7, 5, 5, 0, 5, 2, 6, 9, 9, 9, 9, 2, 3, 0, 6, 8, 8, 4, 5, 6, 2, 8, 5, 9, 8, 3, 6, 8, 8, 6, 2, 1, 2, 1, 4, 6, 2, 0, 9, 3, 9, 6, 4, 2, 3, 6, 2, 0, 9, 8, 7, 0, 6, 0, 7, 0, 5, 9, 4, 3, 7, 9, 7, 3, 5, 7, 0, 3, 1, 8, 9, 9, 4, 0, 8, 6, 4, 6, 7, 3, 8, 1, 2, 1, 5, 4, 9, 5, 9, 5, 8, 6, 6, 8, 9, 4, 4, 0, 6, 4, 5, 3, 0, 3, 9, 7, 1, 7, 2, 5, 0, 1, 9, 1, 2, 5, 6, 8, 7, 1, 6, 9] | |



| | Test | Expected | Got | |
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| ✓ | <pre>int arr[] = {8, 0, 8, 8, 9, 3, 3, 5, 4, 9, 7, 9, 5, 3, 8, 6, 1, 0, 6, 4, 5, 1, 1, 5, 3, 8, 6, 1, 1, 1, 0, 1, 4, 9, 0, 1, 8, 0, 2, 7, 1, 5, 7, 6, 7, 7, 9, 5, 0, 9, 6, 3, 7, 6, 6, 4, 6, 2, 9, 1, 5, 0, 8, 6, 0, 8, 6, 3, 0, 3, 6, 8, 5, 0, 1, 9, 9, 6, 3, 3, 2, 9, 2, 0, 0, 5, 0, 4, 6, 7, 2, 6, 5, 2, 8, 8, 7, 1, 0, 9, 7, 7, 1, 5, 8, 7, 5, 7, 8, 7, 8, 7, 1, 7, 9, 7, 1, 3, 0, 5, 5, 1, 0, 2, 1, 0, 1, 5, 3, 7, 7, 9, 6, 1, 6, 4, 8, 9, 8, 6, 0, 0, 3, 6, 2, 3, 4, 9, 7, 4, 2, 2, 9, 7, 7, 4, 9, 9, 7, 5, 6, 2, 4, 0, 1, 9, 9, 8, 4, 6, 1, 2, 9, 6, 7, 9, 4, 7, 5, 2, 9, 4, 2, 5, 9, 4, 1, 6, 0, 0, 5, 0, 6, 1, 7, 8, 6, 9, 5, 4, 7, 0, 5, 3, 2, 4, 9, 9, 2, 3, 4, 4, 1, 8, 2, 4, 4, 6, 2, 0, 5, 9, 4, 5, 8, 1, 8, 4, 7, 5, 4, 9, 7, 3, 1, 7, 7, 5, 4, 5, 6, 2, 1, 7, 5, 9, 7, 4, 8, 4, 6, 9, 3, 4, 4, 3, 7, 1, 3, 9, 3, 3, 7, 9, 7, 9, 4, 6, 0, 5, 5, 5, 6, 2, 5, 5, 9, 0, 2, 9, 0, 3, 8, 7, 6, 1, 0, 4, 0, 7, 4, 2, 5, 0, 0, 6, 4, 3, 6, 0, 9, 2, 4, 1, 0, 3, 8, 0, 1, 7, 3, 8, 9, 0, 5, 3, 2, 8, 4, 0, 4, 6, 9, 8, 6, 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| <pre>int k = 389; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead);</pre> | <pre>7, 2, 0, 7, 3, 5, 5, 3, 5, 6, 2, 3, 3, 1, 2, 4, 4, 4, 5, 5, 4, 9, 7, 0, 8, 0, 4, 3, 0, 9, 7, 7, 8, 1, 3, 7, 1, 5, 4, 7, 6, 3, 8, 6, 7, 5, 4, 2, 0, 6, 7, 4, 7, 4, 6, 1, 3, 7, 2, 4, 4, 0, 1, 2, 9, 1, 9, 5, 7, 1, 7, 7, 3, 2, 9, 8, 2, 4, 4, 9, 0, 5, 6, 7, 9, 1, 8, 3, 8, 2, 3, 2, 4, 6, 2, 0, 7, 5, 9, 5, 2, 2, 6, 8, 6, 9, 9, 3, 0, 4, 1, 5, 2, 3, 9, 3, 9, 1, 7, 3, 1, 2, 8, 2, 0, 4, 1, 1, 8, 4, 8, 2, 0, 0, 6, 6, 5, 1, 3, 5, 0, 6, 1, 6, 1, 7, 9, 2, 3, 5, 2, 9, 6, 8, 3, 6, 9, 4, 1, 0, 8, 7, 2, 5, 7, 4, 4, 0, 2, 0, 6, 6, 4, 9, 1, 8, 1, 1, 8, 8, 3, 5, 2, 5, 5, 5, 1, 8, 3, 7, 8, 8, 1, 1, 5, 5, 1, 9, 7, 2, 2, 7, 2, 4, 4, 1, 0, 0, 0, 8, 7, 9, 4, 0, 0, 3, 5, 5, 1, 9, 5, 9, 3, 7, 5, 9, 0, 9, 8, 2, 7, 2, 0, 5, 2, 5, 1, 6, 0, 8, 5, 2, 4, 9, 0, 8, 3, 9, 1, 9, 9, 2, 5, 5, 3, 0, 5, 4, 4, 5, 3, 2, 0, 2, 4, 3, 5, 1, 9, 3, 0, 8, 1, 4, 4, 9, 9, 0, 9, 9, 1, 3, 0, 1, 1, 9, 6, 9, 2, 4, 4, 2, 5, 2, 3, 9, 6, 2, 3, 0, 8, 3, 2, 8, 8, 3, 0, 5, 1, 8, 8, 2, 9, 3, 7, 7, 4, 9, 6, 2, 0, 0, 6, 8, 4, 6, 7, 7, 8, 0, 7, 7, 5, 6, 5, 6, 2, 8, 3, 2, 7, 5, 7, 4, 0, 0, 2, 2, 6, 7, 8, 5, 9, 3, 3, 0, 6, 5, 4, 5, 9, 4, 1, 2, 9, 7, 6, 2, 0, 2, 3, 3, 8, 0, 1, 8, 4, 7, 1, 0, 6, 4, 1, 0, 4, 0, 4, 8, 9, 5, 1, 0, 5, 2, 4, 5, 6, 3, 5, 2, 2, 9, 6, 0, 2, 1, 2, 9, 7, 8, 3, 1, 6, 0, 2, 2, 7, 8, 9, 3, 4, 5, 7, 8, 4, 0, 7, 2, 8] [6, 3, 8, 6, 7, 5, 4, 2, 0, 6, 7, 4, 7, 4, 6, 1, 3, 7, 2, 4, 4, 0, 1, 2, 9, 1, 9, 5, 7, 1, 7, 7, 3, 2, 9, 8, 2, 4, 4, 9, 0, 5, 6, 7, 9, 1, 8, 3, 8, 2, 3, 2, 4, 6, 2, 0, 7, 5, 9, 5, 2, 2, 6, 8, 6, 9, 9, 3, 0, 4, 1, 5, 2, 3, 9, 3, 9, 1, 7, 3, 1, 2, 8, 2, 0, 4, 1, 1, 8, 4, 8, 2, 0, 0, 6, 6, 5, 1, 3, 5, 0, 6, 1, 6, 1, 7, 9, 2, 3, 5, 2, 9, 6, 8, 3, 6, 9, 4, 1, 0, 8, 7, 2, 5, 7, 4, 4, 0, 2, 0, 6, 6, 4, 9, 1, 8, 1, 1, 8, 8, 3, 5, 2, 5,</pre> | <pre>7, 2, 0, 7, 3, 5, 5, 3, 5, 6, 2, 3, 3, 1, 2, 4, 4, 4, 5, 5, 4, 9, 7, 0, 8, 0, 4, 3, 0, 9, 7, 7, 8, 1, 3, 7, 1, 5, 4, 7, 6, 3, 8, 6, 7, 5, 4, 2, 0, 6, 7, 4, 7, 4, 6, 1, 3, 7, 2, 4, 4, 0, 1, 2, 9, 1, 9, 5, 7, 1, 7, 7, 3, 2, 9, 8, 2, 4, 4, 9, 0, 5, 6, 7, 9, 1, 8, 3, 8, 2, 3, 2, 4, 6, 2, 0, 7, 5, 9, 5, 2, 2, 6, 8, 6, 9, 9, 3, 0, 4, 1, 5, 2, 3, 9, 3, 9, 1, 7, 3, 1, 2, 8, 2, 0, 4, 1, 1, 8, 4, 8, 2, 0, 0, 6, 6, 5, 1, 3, 5, 0, 6, 1, 6, 1, 7, 9, 2, 3, 5, 2, 9, 6, 8, 3, 6, 9, 4, 1, 0, 8, 7, 2, 5, 7, 4, 4, 0, 2, 0, 6, 6, 4, 9, 1, 8, 1, 1, 8, 8, 3, 5, 2, 5, 5, 5, 1, 8, 3, 7, 8, 8, 1, 1, 5, 5, 1, 9, 7, 2, 2, 7, 2, 4, 4, 1, 0, 0, 0, 8, 7, 9, 4, 0, 0, 3, 5, 5, 1, 9, 5, 9, 3, 7, 5, 9, 0, 9, 8, 2, 7, 2, 0, 5, 2, 5, 1, 6, 0, 8, 5, 2, 4, 9, 0, 8, 3, 9, 1, 9, 9, 2, 5, 5, 3, 0, 5, 4, 4, 5, 3, 2, 0, 2, 4, 3, 5, 1, 9, 3, 0, 8, 1, 4, 4, 9, 9, 0, 9, 9, 1, 3, 0, 1, 1, 9, 6, 9, 2, 4, 4, 2, 5, 2, 3, 9, 6, 2, 3, 0, 8, 3, 2, 8, 8, 3, 0, 5, 1, 8, 8, 2, 9, 3, 7, 7, 4, 9, 6, 2, 0, 0, 6, 8, 4, 6, 7, 7, 8, 0, 7, 7, 5, 6, 5, 6, 2, 8, 3, 2, 7, 5, 7, 4, 0, 0, 2, 2, 6, 7, 8, 5, 9, 3, 3, 0, 6, 5, 4, 5, 9, 4, 1, 2, 9, 7, 6, 2, 0, 2, 3, 3, 8, 0, 1, 8, 4, 7, 1, 0, 6, 4, 1, 0, 4, 0, 4, 8, 9, 5, 1, 0, 5, 2, 4, 5, 6, 3, 5, 2, 2, 9, 6, 0, 2, 1, 2, 9, 7, 8, 3, 1, 6, 0, 2, 2, 7, 8, 9, 3, 4, 5, 7, 8, 4, 0, 7, 2, 8] [6, 3, 8, 6, 7, 5, 4, 2, 0, 6, 7, 4, 7, 4, 6, 1, 3, 7, 2, 4, 4, 0, 1, 2, 9, 1, 9, 5, 7, 1, 7, 7, 3, 2, 9, 8, 2, 4, 4, 9, 0, 5, 6, 7, 9, 1, 8, 3, 8, 2, 3, 2, 4, 6, 2, 0, 7, 5, 9, 5, 2, 2, 6, 8, 6, 9, 9, 3, 0, 4, 1, 5, 2, 3, 9, 3, 9, 1, 7, 3, 1, 2, 8, 2, 0, 4, 1, 1, 8, 4, 8, 2, 0, 0, 6, 6, 5, 1, 3, 5, 0, 6, 1, 6, 1, 7, 9, 2, 3, 5, 2, 9, 6, 8, 3, 6, 9, 4, 1, 0, 8, 7, 2, 5, 7, 4, 4, 0, 2, 0, 6, 6, 4, 9, 1, 8, 1, 1, 8, 8, 3, 5, 2, 5,</pre> |

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| <pre> 8, 7, 5, 5, 4, 6, 4, 3, 4, 4, 4, 8, 7, 3, 4, 1, 3, 8, 1, 4, 4, 7, 8, 6, 9, 6, 8, 2, 4, 6, 7, 5, 0, 6, 1, 0, 9, 7, 7, 8, 0, 0, 3, 4, 9, 4, 6, 6, 8, 7, 2, 4, 4, 4, 9, 3, 2, 1, 3, 6, 1, 1, 6, 1, 9, 2, 5, 7, 7, 3, 5, 8, 5, 4, 9, 1, 1, 5, 6, 2, 0, 4, 2, 3, 6, 3, 9, 8, 5, 4, 8, 5, 9, 6, 5, 8, 2, 0, 8, 8, 3, 2, 0, 9, 8, 9, 7, 5, 9, 9, 0, 8, 8, 4, 2, 0, 2, 6, 4, 6, 2, 2, 1, 7, 4, 5, 2, 9, 7, 4, 7, 5, 8, 6, 5, 1, 6, 8, 5, 1, 4, 7, 5, 2, 7, 8, 2, 5, 5, 3, 5, 2, 5, 4, 6, 8, 3, 8, 4, 0, 5, 6, 4, 6, 9, 8, 5, 5, 5, 9, 1, 7, 8, 3, 3, 0, 8, 9, 6, 6, 2, 8, 1, 6, 1, 2, 5, 4, 7, 9, 5, 0, 6, 2, 3, 7, 7, 3, 4, 7, 6, 8, 9, 9, 0, 5, 7, 5, 0, 6, 2, 4, 4, 3, 7, 4, 1, 7, 4, 6, 8, 1, 2, 9, 9, 3, 7, 7, 6, 7, 2, 8, 5, 2, 8, 4, 2, 9, 6, 5, 4, 1, 3, 7, 8, 4, 4, 7, 0, 2, 2, 2, 0, 2, 4, 9, 5, 3, 1, 1, 1, 3, 6, 2, 3, 2, 4, 0, 3, 0, 0, 0, 9, 6, 7, 5, 6, 7, 8, 1, 9, 1, 2, 4, 2, 4, 3, 3, 1, 0, 5, 8, 6, 7, 6, 1, 4, 7, 5, 4, 4, 0, 6, 7, 1, 8, 9, 9, 9, 8, 8, 6, 4, 6, 8, 1, 2, 2, 7, 9, 6, 8, 6, 4, 9, 2, 3, 0, 5, 7, 2, 3, 1, 9, 7, 1, 7, 0, 3, 9, 5, 7, 2, 1, 5, 6, 1, 5, 3, 8, 0, 1, 1, 0, 6, 1, 5, 1, 5, 5, 9, 8, 9, 0, 5, 5, 8, 8, 2, 6, 6, 7, 7, 9, 5, 6, 4, 2, 3, 3, 0, 5, 8, 4, 7, 1, 5, 2, 3, 4, 3, 8, 6, 4, 0, 9, 8, 3, 8, 4, 3, 7, 9, 4, 3, 1, 7, 8, 6, 5, 8, 5, 6, 4, 0, 6, 6, 2, 9, 3, 9, 8, 5, 4, 7, 3, 7, 8, 9, 7, 9, 5, 3, 2, 4, 1, 2, 2, 9, 1, 9, 0, 4, 3, 6, 1, 6, 1, 1, 5, 2, 8, 6, 0, 9, 0, 6, 9, 0, 3, 0, 9, 8, 7, 3, 3, 1, 0, 7, 2, 1, 3, 3, 7, 7, 6, 9, 1, 3, 8, 5, 6, 2, 8, 8, 3, 7, 3, 4, 7, 6, 6, 8, 5, 1, 7, 8, 1, 5, 3, 7, 9, 6, 3, 8, 4, 8, 0, 4, 7, 7, 2, 9, 2, 6, 2, 8, 7, 7, 5, 9, 4, 4, 3, 0, 6, 2, 2, 6, 5, 4, 4, 7, 8, 0, 7, 5, 8, 5, 6, 7, 2, 5, 3, 4, 6, 4, 4}; int k = 1000; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead); </pre> | <pre> 3, 6, 8, 7, 1, 7, 6, 7, 9, 5, 7, 2, 8, 1, 1, 8, 7, 4, 6, 5, 7, 7, 0, 3, 8, 0, 5, 3, 6, 1, 0, 0, 5, 5, 9, 8, 9, 2, 2, 0, 5, 0, 9, 4, 4, 6, 8, 5, 9, 7, 1, 4, 6, 4, 5, 1, 5, 2, 2, 7, 3, 6, 4, 9, 2, 9, 7, 8, 1, 5, 5, 8, 5, 5, 6, 4, 1, 1, 8, 0, 6, 8, 9, 4, 8, 4, 2, 4, 0, 1, 3, 7, 6, 5, 7, 8, 3, 6, 8, 7, 8, 3, 3, 8, 9, 9, 9, 1, 0, 3, 0, 2, 0, 3, 7, 1, 2, 1, 1, 6, 5, 0, 2, 6, 8, 7, 5, 0, 7, 1, 7, 7, 0, 5, 2, 2, 2, 8, 6, 9, 4, 7, 7, 7, 0, 0, 4, 9, 7, 5, 8, 5, 5, 4, 5, 2, 2, 4, 2, 0, 2, 5, 3, 1, 2, 3, 6, 8, 0, 0, 3, 4, 5, 2, 8, 6, 8, 9, 2, ...snip... 7, 8, 2, 8, 6, 3, 4, 1, 0, 2, 4, 7, 0, 2, 4, 8, 2, 6, 2, 1, 0, 5, 1, 5, 0, 6, 1, 0, 9, 8, 6, 9, 5, 7, 5, 3, 6, 0, 5, 9, 0, 9, 9, 0, 3, 0, 9, 3, 9, 6, 5, 3, 2, 8, 9, 0, 0, 7, 5, 1, 1, 2, 1, 4, 0, 2, 0, 7, 1, 4, 5, 5, 6, 2, 6, 1, 0, 4, 0, 7, 1, 3, 3, 4, 5, 0, 7, 1, 0, 9, 8, 7, 0, 0, 8, 2, 5, 3, 2, 7, 4, 9, 0, 6, 0, 7, 4, 7, 2, 8, 6, 3, 9, 7, 0, 6, 3, 9, 6, 7, 7, 4, 6, 9, 7, 5, 9, 9, 4, 8, 3, 3, 6, 6, 6, 7, 5, 4, 7, 0, 6, 2, 9, 7, 4, 2, 3, 9, 3, 9, 6, 0, 7, 8, 0, 0, 7, 9, 1, 6, 0, 7, 1, 6, 1, 0, 9, 1, 0, 9, 1, 8, 3, 6, 8, 1, 2, 8, 5, 9, 7, 1, 1, 5, 4, 5, 7, 5, 9, 4, 9, 5, 4, 2, 4, 4, 1, 1, 3, 1, 9, 8, 6, 4, 1, 2, 2, 4, 2, 9, 8, 2, 4, 9, 0, 3, 6, 1, 1, 8, 4, 2, 0, 7, 6, 7, 3, 9, 7, 0, 9, 8, 6, 0, 5, 1, 8, 0, 2, 9, 5, 5, 8, 5, 3, 9, 8, 7, 0, 4, 8, 2, 2, 6, 8, 4, 1, 4, 7, 2, 2, 1, 0, 6, 4, 8, 9, 5, 1, 0, 2, 6, 3, 9, 1, 2, 0, 1, 3, 6, 4, 7, 0, 0, 5, 6, 7, 3, 2, 6, 8, 8, 5, 4, 8, 4, 5, 0, 2, 8, 1, 2, 9, 9, 5, 1, 4, 8, 8, 1, 3, 9, 2, 8, 6, 1, 0, 8, 7, 3, 7, 3, 6, 9, 7, 1, 7, 9, 3, 3, 8, 7, 9, 1, 9, 1, 9, 4, 1, 1, 0, 3, 6, 7, 5, 3, 7, 8, 8, 1, 4, 9, 0, 3, 9, 9, 6, 4, 8, 2, 6, 7, 9, 0, 3, 9, 0, 6, 8, 9, 2, 1, 2, 5, 0, 8, 8, 4, 5, 6, 3, 7, 5, 2, 0, 0, 2, 1, 2, 4, 7, 8, </pre> | <pre> 3, 6, 8, 7, 1, 7, 6, 7, 9, 5, 7, 2, 8, 1, 1, 8, 7, 4, 6, 5, 7, 7, 0, 3, 8, 0, 5, 3, 6, 1, 0, 0, 5, 5, 9, 8, 9, 2, 2, 0, 5, 0, 9, 4, 4, 6, 8, 5, 9, 7, 1, 4, 6, 4, 5, 1, 5, 2, 2, 7, 3, 6, 4, 9, 2, 9, 7, 8, 1, 5, 5, 8, 4, 5, 6, 4, 1, 1, 8, 0, 6, 8, 9, 4, 8, 4, 2, 4, 0, 1, 3, 7, 6, 5, 7, 8, 3, 6, 8, 7, 8, 3, 3, 8, 9, 9, 9, 1, 0, 3, 0, 2, 0, 3, 7, 1, 2, 1, 1, 6, 5, 0, 2, 6, 8, 7, 5, 0, 7, 1, 7, 7, 0, 5, 2, 2, 2, 8, 6, 9, 4, 7, 7, 7, 0, 0, 4, 9, 7, 5, 8, 5, 5, 4, 5, 2, 2, 4, 2, 0, 2, 5, 3, 1, 2, 3, 6, 8, 0, 0, 3, 4, 5, 2, 8, 6, 8, 9, 2, ...snip... 7, 8, 2, 8, 6, 3, 4, 1, 0, 2, 4, 7, 0, 2, 4, 8, 2, 6, 2, 1, 0, 5, 1, 5, 0, 6, 1, 0, 9, 8, 6, 9, 5, 7, 5, 3, 6, 0, 5, 9, 0, 9, 9, 0, 3, 0, 9, 3, 9, 6, 5, 3, 2, 8, 9, 0, 0, 7, 5, 1, 1, 2, 1, 4, 0, 2, 0, 7, 1, 4, 5, 5, 6, 2, 6, 1, 0, 4, 0, 7, 1, 3, 3, 4, 5, 0, 7, 1, 0, 9, 8, 7, 0, 0, 8, 2, 5, 3, 2, 7, 4, 9, 0, 6, 0, 7, 4, 7, 2, 8, 6, 3, 9, 7, 0, 6, 3, 9, 6, 7, 7, 4, 6, 9, 7, 5, 9, 9, 4, 8, 3, 3, 6, 6, 6, 7, 5, 4, 7, 0, 6, 2, 9, 7, 4, 2, 3, 9, 3, 9, 6, 0, 7, 8, 0, 0, 7, 9, 1, 6, 0, 7, 1, 6, 1, 0, 9, 1, 0, 9, 1, 8, 3, 6, 8, 1, 2, 8, 5, 9, 7, 1, 1, 5, 4, 5, 7, 5, 9, 4, 9, 5, 4, 2, 4, 4, 1, 1, 3, 1, 9, 8, 6, 4, 1, 2, 2, 4, 2, 9, 8, 2, 4, 9, 0, 3, 6, 1, 1, 8, 4, 2, 0, 7, 6, 7, 3, 9, 7, 0, 9, 8, 6, 0, 5, 1, 8, 0, 2, 9, 5, 5, 8, 5, 3, 9, 8, 7, 0, 4, 8, 2, 2, 6, 8, 4, 1, 4, 7, 2, 2, 1, 0, 6, 4, 8, 9, 5, 1, 0, 2, 6, 3, 9, 1, 2, 0, 1, 3, 6, 4, 7, 0, 0, 5, 6, 7, 3, 2, 6, 8, 8, 5, 4, 8, 4, 5, 0, 2, 8, 1, 2, 9, 9, 5, 1, 4, 8, 8, 1, 3, 9, 2, 8, 6, 1, 0, 8, 7, 3, 7, 3, 6, 9, 7, 1, 7, 9, 3, 3, 8, 7, 9, 1, 9, 1, 9, 4, 1, 1, 0, 3, 6, 7, 5, 3, 7, 8, 8, 1, 4, 9, 0, 3, 9, 9, 6, 4, 8, 2, 6, 7, 9, 0, 3, 9, 0, 6, 8, 9, 2, 1, 2, 5, 0, 8, 8, 4, 5, 6, 3, 7, 5, 2, 0, 0, 2, 1, 2, 4, 7, 8, </pre> |

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| <pre> 6, 5, 1, 0, 8, 5, 5, 6, 6, 8, 5, 0, 4, 5, 4, 0, 5, 6, 4, 0, 5, 5, 0, 1, 1, 6, 2, 9, 6, 1, 4, 0, 9, 8, 6, 7, 3, 0, 3, 7, 2, 8, 5, 6, 0, 8, 4, 2, 9, 9, 4, 8, 7, 8, 4, 7, 1, 3, 7, 0, 8, 3, 9, 3, 1, 0, 8, 7, 8, 4, 5, 2, 7, 4, 9, 9, 6, 0, 0, 9, 2, 3, 2, 2, 3, 3, 5, 7, 6, 8, 7, 6, 0, 1, 3, 6, 1, 3, 6, 5, 1, 7, 1, 7, 6, 3, 6, 8, 0, 5, 4, 2, 2, 2, 8, 3, 9, 8, 7, 8, 5, 2, 6, 5, 3, 2, 1, 0, 8, 7, 4, 4, 8, 9, 7, 9, 4, 1, 4, 6, 5, 3, 2, 8, 6, 8, 8, 2, 0, 1, 5, 3, 8, 5, 9, 8, 0, 3, 5, 8, 4, 6, 5, 0, 4, 0, 6, 6, 0, 1, 5, 0, 2, 4, 6, 8, 9, 7, 9, 4, 3, 9, 3, 6, 9, 3, 7, 2, 3, 2, 5, 8, 8, 0, 5, 2, 4, 2, 9, 2, 6, 4, 4, 1, 2, 1, 6, 7, 3, 7, 1, 7, 8, 9, 7, 6, 2, 8, 7, 8, 3, 2, 6, 3, 7, 0, 2, 5, 5, 1, 4, 1, 6, 2, 9, 5, 9, 4, 3, 2, 8, 7, 4, 8, 5, 1, 2, 9, 5, 0, 7, 3, 1, 7, 0, 8, 3, 6, 5, 8, 5, 2, 7, 5, 0, 3, 0, 7, 3, 0, 6, 1, 5, 5, 5, 1, 5, 8, 2, 3, 2, 3, 6, 0, 1, 5, 1, 2, 2, 3, 6, 0, 4, 1, 9, 1, 4, 1, 7, 6, 4, 6, 6, 5, 7, 5, 4, 1, 1, 0, 4, 7, 6, 1, 6, 8, 9, 6, 3, 2, 1, 5, 1, 0, 2, 8, 6, 6, 6, 2, 3, 5, 2, 6, 7, 1, 9, 9, 2, 2, 6, 5, 8, 0, 4, 3, 1, 9, 6, 8, 7, 4, 0, 3, 3, 7, 1, 3, 0, 2, 9, 1, 5, 7, 7, 6, 7, 8, 4, 5, 7, 5, 5, 5, 4, 9, 7, 2, 6, 6, 5, 3, 2, 1, 1, 9, 8, 9, 1, 6, 7, 8, 4, 6, 1, 7, 5, 1, 9, 3, 0, 5, 1, 1, 4, 2, 5, 1, 5, 2, 7, 4, 7, 9, 8, 9, 2, 0, 2, 9, 9, 6, 8, 4, 0, 9, 5, 6, 0, 8, 7, 1, 3, 1, 3, 1, 7, 3, 5, 2, 7, 2, 4, 2, 4, 4, 3, 7, 0, 8, 2, 1, 2, 0, 5, 6, 3, 6, 9, 6, 4, 7, 1, 7, 2, 1, 7, 6, 7, 0, 1, 6, 8, 6, 5, 1, 6, 0, 8, 5, 7, 4, 9, 5, 9, 2, 6, 4, 9, 3, 4, 4, 6, 7, 6, 6, 6, 5, 0, 4, 9, 4, 3, 9, 2, 6, 3, 0, 7, 6, 5, 6, 8, 8, 7, 6, 4, 5, 1, 8, 1, 4, 4, 3, 5, 6, 2, 2, 8, 8, 8, 0, 5, 8, 9, 0, 9, 0, 7, 0, 2, 6, 2, 3, 8, 1, 6, 5}; int k = 11111; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead); </pre> | <pre> 5, 7, 0, 4, 2, 3, 0, 9, 1, 9, 3, 7, 8, 4, 7, 0, 9, 8, 7, 3, 7, 5, 1, 7, 7, 4, 4, 1, 7, 8, 4, 0, 6, 4, 9, 5, 4, 5, 3, 7, 3, 3, 7, 2, 1, 6, 3, 4, 6, 3, 1, 5, 9, 7, 3, 6, 2, 0, 9, 7, 0, 0, 3, 1, 5, 6, 3, 8, 2, 1, 6, 3, 4, 8, 9, 2, 3, 5, 9, 1, 4, 6, 9, 5, 8, 6, 6, 3, 4, 7, 2, 3, 7, 0, 2, 2, 7, 6, 8, 9, 9, 7, 2, 0, 9, 0, 3, 9, 6, 5, 9, 4, 3, 6, 8, 4, 3, 1, 0, 7, 2, 7, 3, 9, 3, 2, 0, 1, 9, 2, 3, 9, 1, 3, 3, 6, 5, 6, 5, 5, 5, 9, 1, 4, 6, 5, 4, 3, 2, 8, 7, 0, 1, 4, 4, 8, 9, 7, 4, 1, 1, 9, 4, 1, 0, 9, 5, 8, 6, 6, 9, 1, 5, 6, 0, 8, 0, 3, 3, ...snip... 3, 0, 7, 6, 6, 4, 1, 7, 5, 1, 2, 9, 2, 6, 3, 8, 7, 6, 7, 2, 9, 1, 3, 0, 2, 5, 8, 1, 1, 8, 9, 9, 7, 5, 9, 9, 4, 7, 5, 1, 5, 2, 0, 0, 5, 9, 8, 0, 4, 1, 1, 1, 6, 7, 5, 6, 3, 4, 0, 5, 9, 8, 4, 0, 9, 8, 8, 8, 2, 3, 7, 5, 5, 5, 5, 7, 2, 6, 1, 0, 2, 3, 1, 1, 9, 5, 1, 4, 5, 9, 1, 9, 6, 5, 1, 7, 4, 1, 3, 0, 7, 6, 6, 3, 8, 8, 9, 3, 8, 6, 5, 4, 1, 7, 3, 5, 8, 0, 9, 8, 5, 3, 2, 6, 4, 4, 1, 6, 3, 1, 5, 9, 9, 7, 9, 4, 4, 2, 8, 3, 6, 0, 9, 8, 5, 1, 2, 3, 3, 7, 5, 7, 0, 1, 2, 8, 3, 4, 4, 9, 3, 0, 2, 7, 3, 2, 6, 4, 5, 3, 4, 9, 7, 1, 5, 8, 7, 9, 9, 1, 7, 3, 1, 3, 5, 4, 4, 5, 4, 4, 8, 2, 1, 0, 5, 2, 3, 8, 2, 9, 2, 4, 3, 3, 7, 8, 1, 5, 5, 0, 4, 5, 2, 7, 7, 0, 8, 0, 4, 1, 9, 2, 0, 1, 6, 3, 9, 8, 3, 8, 3, 7, 1, 2, 5, 9, 1, 2, 9, 7, 4, 2, 4, 5, 5, 7, 9, 6, 9, 0, 6, 8, 0, 5, 3, 9, 1, 9, 9, 5, 6, 1, 0, 6, 2, 0, 8, 1, 1, 2, 3, 5, 6, 8, 6, 6, 4, 8, 7, 5, 4, 2, 7, 6, 8, 0, 9, 2, 9, 5, 3, 3, 0, 6, 4, 8, 8, 1, 6, 0, 5, 8, 6, 6, 1, 1, 0, 3, 7, 4, 3, 0, 0, 3, 4, 0, 7, 0, 7, 1, 3, 7, 5, 7, 5, 8, 9, 3, 5, 8, 8, 8, 4, 5, 1, 2, 8, 6, 9, 6, 9, 2, 7, 6, 9, 9, 4, 0, 8, 0, 4, 3, 5, 2, 0, 3, 2, 6, 5, 8, 5, 2, 9, 8, 6, 9, 8, 1, 7, 4, 9, 0, 2, 6, 8, 1, 9, 9, 1, 3, 4, 5, 4, 1, 1, 7, 5, 2, 0, 4, 3, 5, </pre> | <pre> 5, 7, 0, 4, 2, 3, 0, 9, 1, 9, 3, 7, 8, 4, 7, 0, 9, 8, 7, 3, 7, 5, 1, 7, 7, 4, 4, 1, 7, 8, 4, 0, 6, 4, 9, 5, 4, 5, 3, 7, 3, 3, 7, 2, 1, 6, 3, 4, 6, 3, 1, 5, 9, 7, 3, 6, 2, 0, 9, 7, 0, 0, 3, 1, 5, 6, 3, 8, 2, 1, 6, 3, 4, 8, 9, 2, 3, 5, 9, 1, 4, 6, 9, 5, 8, 6, 6, 3, 4, 7, 2, 3, 7, 0, 2, 2, 7, 6, 8, 9, 9, 7, 2, 0, 9, 0, 3, 9, 6, 5, 9, 4, 3, 6, 8, 4, 3, 1, 0, 7, 2, 7, 3, 9, 3, 2, 0, 1, 9, 2, 3, 9, 1, 3, 3, 6, 5, 6, 5, 5, 5, 9, 1, 4, 6, 5, 4, 3, 2, 8, 7, 0, 1, 4, 4, 8, 9, 7, 4, 1, 1, 9, 4, 1, 0, 9, 5, 8, 6, 6, 9, 1, 5, 6, 0, 8, 0, 3, 3, ...snip... 3, 0, 7, 6, 6, 4, 1, 7, 5, 1, 2, 9, 2, 6, 3, 8, 7, 6, 7, 2, 9, 1, 3, 0, 2, 5, 8, 1, 1, 8, 9, 9, 7, 5, 9, 9, 4, 7, 5, 1, 5, 2, 0, 0, 5, 9, 8, 0, 4, 1, 1, 1, 6, 7, 5, 6, 3, 4, 0, 5, 9, 8, 4, 0, 9, 8, 8, 8, 2, 3, 7, 5, 5, 5, 5, 7, 2, 6, 1, 0, 2, 3, 1, 1, 9, 5, 1, 4, 5, 9, 1, 9, 6, 5, 1, 7, 4, 1, 3, 0, 7, 6, 6, 3, 8, 8, 9, 3, 8, 6, 5, 4, 1, 7, 3, 5, 8, 0, 9, 8, 5, 3, 2, 6, 4, 4, 1, 6, 3, 1, 5, 9, 9, 7, 9, 4, 4, 2, 8, 3, 6, 0, 9, 8, 5, 1, 2, 3, 3, 7, 5, 7, 0, 1, 2, 8, 3, 4, 4, 9, 3, 0, 2, 7, 3, 2, 6, 4, 5, 3, 4, 9, 7, 1, 5, 8, 7, 9, 9, 1, 7, 3, 1, 3, 5, 4, 4, 5, 4, 4, 8, 2, 1, 0, 5, 2, 3, 8, 2, 9, 2, 4, 3, 3, 7, 8, 1, 5, 5, 0, 4, 5, 2, 7, 7, 0, 8, 0, 4, 1, 9, 2, 0, 1, 6, 3, 9, 8, 3, 8, 3, 7, 1, 2, 5, 9, 1, 2, 9, 7, 4, 2, 4, 5, 5, 7, 9, 6, 9, 0, 6, 8, 0, 5, 3, 9, 1, 9, 9, 5, 6, 1, 0, 6, 2, 0, 8, 1, 1, 2, 3, 5, 6, 8, 6, 6, 4, 8, 7, 5, 4, 2, 7, 6, 8, 0, 9, 2, 9, 5, 3, 3, 0, 6, 4, 8, 8, 1, 6, 0, 5, 8, 6, 6, 1, 1, 0, 3, 7, 4, 3, 0, 0, 3, 4, 0, 7, 0, 7, 1, 3, 7, 5, 7, 5, 8, 9, 3, 5, 8, 8, 8, 4, 5, 1, 2, 8, 6, 9, 6, 9, 2, 7, 6, 9, 9, 4, 0, 8, 0, 4, 3, 5, 2, 0, 3, 2, 6, 5, 8, 5, 2, 9, 8, 6, 9, 8, 1, 7, 4, 9, 0, 2, 6, 8, 1, 9, 9, 1, 3, 4, 5, 4, 1, 1, 7, 5, 2, 0, 4, 3, 5, </pre> |

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int k = 5555; LLNode* head = LLNode::createWithIterators(arr, arr + sizeof(arr) / sizeof(int)); LLNode::printList(head); cout << "\n"; LLNode* newhead = rotateLinkedList(head, k); LLNode::printList(newhead); </pre> | <pre> 8, 9, 0, 2, 7, 9, 5, 6, 2, 0, 4, 0, 4, 2, 7, 1, 4, 3, 0, 7, 0, 2, 0, 9, 3, 9, 5, 2, 2, 8, 4, 2, 0, 0, 5, 8, 7, 5, 3, 6, 7, 7, 1, 5, 3, 3, 9, 4, 9, 1, 3, 8, 5, 8, 1, 1, 9, 8, 1, 0, 4, 9, 4, 6, 5, 4, 8, 4, 4, 4, 3, 1, 6, 5, 7, 5, 3, 4, 2, 4, 9, 1, 1, 8, 4, 7, 4, 0, 6, 2, 2, 0, 0, 2, 8, 6, 7, 5, 6, 0, 4, 6, 1, 2, 1, 3, 7, 4, 5, 3, 8, 3, 0, 3, 0, 5, 2, 0, 9, 7, 3, 0, 5, 1, 8, 5, 2, 9, 7, 4, 0, 9, 8, 5, 1, 0, 8, 1, 8, 1, 3, 9, 1, 8, 7, 2, 6, 0, 9, 0, 5, 2, 3, 6, 0, 6, 0, 6, 6, 8, 7, 3, 6, 3, 8, 3, 0, 4, 6, 5, 6, 4, 3, 4, 7, 8, 7, 8, 4, ...snip... 1, 9, 1, 5, 1, 5, 0, 2, 9, 5, 1, 7, 0, 2, 5, 3, 7, 9, 9, 6, 9, 5, 9, 3, 7, 3, 0, 4, 5, 7, 7, 0, 9, 4, 2, 2, 3, 5, 3, 5, 7, 1, 0, 1, 1, 2, 6, 9, 5, 2, 0, 6, 3, 5, 4, 3, 0, 6, 1, 4, 8, 7, 5, 3, 6, 1, 0, 4, 8, 7, 5, 1, 4, 6, 1, 0, 0, 2, 1, 9, 2, 3, 3, 5, 6, 8, 0, 3, 1, 1, 0, 6, 8, 9, 4, 8, 0, 5, 1, 0, 4, 0, 5, 6, 3, 6, 6, 1, 3, 5, 0, 0, 7, 9, 1, 7, 9, 1, 7, 3, 3, 4, 0, 2, 5, 0, 8, 7, 3, 9, 4, 9, 7, 7, 9, 0, 2, 1, 6, 8, 2, 0, 7, 9, 9, 4, 2, 2, 8, 8, 1, 7, 9, 7, 8, 7, 7, 6, 7, 2, 9, 4, 6, 2, 5, 1, 7, 3, 3, 1, 7, 5, 4, 9, 9, 4, 0, 4, 7, 4, 3, 5, 2, 9, 7, 5, 6, 9, 2, 0, 1, 9, 7, 2, 5, 0, 6, 2, 6, 4, 1, 5, 1, 7, 9, 0, 5, 2, 4, 1, 3, 9, 7, 2, 4, 0, 9, 2, 6, 6, 2, 9, 1, 1, 3, 4, 4, 9, 0, 5, 1, 7, 7, 4, 5, 0, 5, 4, 7, 1, 9, 1, 0, 5, 6, 3, 4, 2, 0, 1, 6, 6, 5, 4, 0, 0, 7, 8, 3, 4, 3, 7, 1, 3, 1, 9, 0, 4, 3, 5, 0, 9, 7, 9, 3, 0, 2, 9, 3, 0, 8, 0, 0, 5, 2, 8, 5, 8, 0, 6, 3, 8, 7, 3, 6, 2, 3, 7, 8, 5, 5, 4, 9, 5, 5, 3, 7, 7, 0, 0, 0, 0, 5, 4, 6, 1, 2, 3, 2, 2, 9, 1, 1, 5, 9, 8, 8, 9, 9, 4, 4, 1, 8, 2, 9, 9, 0, 8, 0, 2, 2, 3, 9, 3, 3, 0, 1, 4, 7, 6, 6, 0, 6, 4, 1, 2, 8, 7, 9, 2, 7, 0, 7, 9, 8, 0, 8, 7, 4, 4, 2, 3, 5, 0, 2, 7, 9, 5, 8, 5, 9, 9, 1, 1, 7, 7, 6, 3, 6, 3, 1, 3, </pre> | <pre> 8, 9, 0, 2, 7, 9, 5, 6, 2, 0, 4, 0, 4, 2, 7, 1, 4, 3, 0, 7, 0, 2, 0, 9, 3, 9, 5, 2, 2, 8, 4, 2, 0, 0, 5, 8, 7, 5, 3, 6, 7, 7, 1, 5, 3, 3, 9, 4, 9, 1, 3, 8, 5, 8, 1, 1, 9, 8, 1, 0, 4, 9, 4, 6, 5, 4, 8, 4, 4, 4, 3, 1, 6, 5, 7, 5, 3, 4, 2, 4, 9, 1, 1, 8, 4, 7, 4, 0, 6, 2, 2, 0, 0, 2, 8, 6, 7, 5, 6, 0, 4, 6, 1, 2, 1, 3, 7, 4, 5, 3, 8, 3, 0, 3, 0, 5, 2, 0, 9, 7, 3, 0, 5, 1, 8, 5, 2, 9, 7, 4, 0, 9, 8, 5, 1, 0, 8, 1, 8, 1, 3, 9, 1, 8, 7, 2, 6, 0, 9, 0, 5, 2, 3, 6, 0, 6, 0, 6, 6, 8, 7, 3, 6, 3, 8, 3, 0, 4, 6, 5, 6, 4, 3, 4, 7, 8, 7, 8, 4, ...snip... 1, 9, 1, 5, 1, 5, 0, 2, 9, 5, 1, 7, 0, 2, 5, 3, 7, 9, 9, 6, 9, 5, 9, 3, 7, 3, 0, 4, 5, 7, 7, 0, 9, 4, 2, 2, 3, 5, 3, 5, 7, 1, 0, 1, 1, 2, 6, 9, 5, 2, 0, 6, 3, 5, 4, 3, 0, 6, 1, 4, 8, 7, 5, 3, 6, 1, 0, 4, 8, 7, 5, 1, 4, 6, 1, 0, 0, 2, 1, 9, 2, 3, 3, 5, 6, 8, 0, 3, 1, 1, 0, 6, 8, 9, 4, 8, 0, 5, 1, 0, 4, 0, 5, 6, 3, 6, 6, 1, 3, 5, 0, 0, 7, 9, 1, 7, 9, 1, 7, 3, 3, 4, 0, 2, 5, 0, 8, 7, 3, 9, 4, 9, 7, 7, 9, 0, 2, 1, 6, 8, 2, 0, 7, 9, 9, 4, 2, 2, 8, 8, 1, 7, 9, 7, 8, 7, 7, 6, 7, 2, 9, 4, 6, 2, 5, 1, 7, 3, 3, 1, 7, 5, 4, 9, 9, 4, 0, 4, 7, 4, 3, 5, 2, 9, 7, 5, 6, 9, 2, 0, 1, 9, 7, 2, 5, 0, 6, 2, 6, 4, 1, 5, 1, 7, 9, 0, 5, 2, 4, 1, 3, 9, 7, 2, 4, 0, 9, 2, 6, 6, 2, 9, 1, 1, 3, 4, 4, 9, 0, 5, 1, 7, 7, 4, 5, 0, 5, 4, 7, 1, 9, 1, 0, 5, 6, 3, 4, 2, 0, 1, 6, 6, 5, 4, 0, 0, 7, 8, 3, 4, 3, 7, 1, 3, 1, 9, 0, 4, 3, 5, 0, 9, 7, 9, 3, 0, 2, 9, 3, 0, 8, 0, 0, 5, 2, 8, 5, 8, 0, 6, 3, 8, 7, 3, 6, 2, 3, 7, 8, 5, 5, 4, 9, 5, 5, 3, 7, 7, 0, 0, 0, 0, 5, 4, 6, 1, 2, 3, 2, 2, 9, 1, 1, 5, 9, 8, 8, 9, 9, 4, 4, 1, 8, 2, 9, 9, 0, 8, 0, 2, 2, 3, 9, 3, 3, 0, 1, 4, 7, 6, 6, 0, 6, 4, 1, 2, 8, 7, 9, 2, 7, 0, 7, 9, 8, 0, 8, 7, 4, 4, 2, 3, 5, 0, 2, 7, 9, 5, 8, 5, 9, 9, 1, 1, 7, 7, 6, 3, 6, 3, 1, 3, </pre> |

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| Test | Expected | Got |
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| | 9, 7, 6, 7, 5, 8, 3, 2, 3, 2, 7, 3, 8, 3, 6, 2, 3, 3, 1, 4, 3, 4, 1, 5, 5, 8, 0, 2, 1, 5, 7, 0, 7, 1, 9, 2, 6, 6, 7, 6, 9, 0, 6, 3, 0, 0, 8, 1, 2, 5, 4, 2, 6, 5, 3, 8, 5, 8, 3, 0, 9, 8, 0, 1, 4, 4, 7, 9, 4, 2, 9, 6, 2, 3, 4, 4, 4, 5, 0, 1, 7, 9, 2, 6, 0, 4, 2, 5, 1, 3, 6, 9, 6, 8, 9, 0, 2, 5, 5, 8, 3, 2, 4, 9, 2, 4, 6, 8, 1, 9, 4, 9, 5, 5, 7, 4, 3, 2, 4, 1, 8, 0, 2, 3, 8, 0, 1, 6, 3, 6, 2, 5, 6, 0, 3, 1, 7, 7, 4, 6, 5, 6, 3, 7, 1, 4, 0, 9, 3, 2, 7, 3, 1, 2, 3, 7, 9, 5, 4, 1, 6, 6, 5, 6, 7, 7, 2, 4, 6, 9, 8, 1, 6, 3, 8, 5, 2, 9, 8, 5, 8, 5, 7, 1, 5, 0, 0, 8, 2, 1, 9, 7, 2, 9, 3, 7, 6, 2, 5, 2, 7, 3, 4, 3, 7, 5, 3, 9, 9, 9, 3, 7, 6, 5, 6, 9, 9, 2, 0, 8, 1, 9, 1, 8, 8, 8, 6, 9, 2, 3, 3, 5, 2, 8, 0, 0, 3, 5, 5, 1, 3, 3, 2, 1, 7, 7, 2, 2, 0, 5, 9, 5, 6, 7, 8, 5, 9, 5, 8, 6, 7, 0, 9, 9, 6, 3, 8, 1, 4, 8, 7, 2, 1, 1, 2, 0, 3, 6, 7, 3, 5, 9, 2, 2, 2, 2, 7, 8, 2, 5, 8, 8, 7, 0, 0, 3, 4, 1, 5, 9, 6, 3, 7, 6, 6, 8, 1, 8, 0, 3, 1, 2, 9, 6, 0, 2, 2, 2, 4, 0, 0, 5, 1, 1, 3, 3, 8, 3, 4, 7, 6, 0, 3, 3, 4, 8, 4, 0, 8, 1, 1, 3, 4, 8, 4, 3, 1, 5, 2, 2, 4, 0, 2, 9, 5, 7, 7, 2, 1, 0, 6, 9, 6] | 9, 7, 6, 7, 5, 8, 3, 2, 3, 2, 7, 3, 8, 3, 6, 2, 3, 3, 1, 4, 3, 4, 1, 5, 5, 8, 0, 2, 1, 5, 7, 0, 7, 1, 9, 2, 6, 6, 7, 6, 9, 0, 6, 3, 0, 0, 8, 1, 2, 5, 4, 2, 6, 5, 3, 8, 5, 8, 3, 0, 9, 8, 0, 1, 4, 4, 7, 9, 4, 2, 9, 6, 2, 3, 4, 4, 4, 5, 0, 1, 7, 9, 2, 6, 0, 4, 2, 5, 1, 3, 6, 9, 6, 8, 9, 0, 2, 5, 5, 8, 3, 2, 4, 9, 2, 4, 6, 8, 1, 9, 4, 9, 5, 5, 7, 4, 3, 2, 4, 1, 8, 0, 2, 3, 8, 0, 1, 6, 3, 6, 2, 5, 6, 0, 3, 1, 7, 7, 4, 6, 5, 6, 3, 7, 1, 4, 0, 9, 3, 2, 7, 3, 1, 2, 3, 7, 9, 5, 4, 1, 6, 6, 5, 6, 7, 7, 2, 4, 6, 9, 8, 1, 6, 3, 8, 5, 2, 9, 8, 5, 8, 5, 7, 1, 5, 0, 0, 8, 2, 1, 9, 7, 2, 9, 3, 7, 6, 2, 5, 2, 7, 3, 4, 3, 7, 5, 3, 9, 9, 9, 3, 7, 6, 5, 6, 9, 9, 2, 0, 8, 1, 9, 1, 8, 8, 8, 6, 9, 2, 3, 3, 5, 2, 8, 0, 0, 3, 5, 5, 1, 3, 3, 2, 1, 7, 7, 2, 2, 0, 5, 9, 5, 6, 7, 8, 5, 9, 5, 8, 6, 7, 0, 9, 9, 6, 3, 8, 1, 4, 8, 7, 2, 1, 1, 2, 0, 3, 6, 7, 3, 5, 9, 2, 2, 2, 2, 7, 8, 2, 5, 8, 8, 7, 0, 0, 3, 4, 1, 5, 9, 6, 3, 7, 6, 6, 8, 1, 8, 0, 3, 1, 2, 9, 6, 0, 2, 2, 2, 4, 0, 0, 5, 1, 1, 3, 3, 8, 3, 4, 7, 6, 0, 3, 3, 4, 8, 4, 0, 8, 1, 1, 3, 4, 8, 4, 3, 1, 5, 2, 2, 4, 0, 2, 9, 5, 7, 7, 2, 1, 0, 6, 9, 6] |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.



Câu hỏi 8

Đúng

Đạt điểm 1,00 trên 1,00

Class **LinkedList** is used to represent single linked list, described as the following:

```
class LinkedList {
public:
    class Node;
private:
    Node* head;
    Node* tail;
    int size;
public:
    class Node {
    private:
        int value;
        Node* next;
        friend class LinkedList;
    public:
        Node() {
            this->next = NULL;
        }
        Node(Node* node) {
            this->value = node->value;
            this->next = node->next;
        }
        Node(int value, Node* next = NULL) {
            this->value = value;
            this->next = next;
        }
    };
    LinkedList(): head(NULL), tail(NULL), size(0) {};
    void partition(int k);
};
```

In this class; **head**, **tail** and **size** are the pointers of the first element, the last element and size of linked list.

Request: Implement function

```
void LinkedList::partition(int k);
```

To rearrange elements in this linked list by this way: split all elements of this linked list to 3 groups include: group I (the value of each element is smaller than k), group II (the value of each element is equal to k) and group III (the value of each element is larger than k); after that, move group I to the head of linked list, group II is after group I and group III is after group II. Note that the orders of the elements of each group are unchanged.

Example:

- The given linked list: 10->55->45->42->50
- k=45



In this case, group I includes elements with value 10 and 42, group II includes elements with 45 and group III includes elements with value 55 and 50. Rearrange by above way, this linked list will become 10->42->45->55->50 (the orders of the elements in each group is unchanged: 10 before 42 and 55 before 50).

Note: In this exercise, libraries `iostream`, `sstream` and `using namespace std`; have been used. You can add other functions for your answer, but you are not allowed to add other libraries.

For example:

| Test | Result |
|--|------------------------|
| <pre>LinkedList* l1 = new LinkedList(); l1->add(20); l1->add(30); l1->add(10); l1->add(60); l1->add(40); l1->add(45); l1->add(55); l1->partition(45); cout << l1->toString() << "\n";</pre> | [20,30,10,40,45,60,55] |

Answer: (penalty regime: 0 %)

Reset answer

```

1 void LinkedList::partition(int k) {
2     Node *lessHead = nullptr, *lessTail = nullptr;
3     Node *equalHead = nullptr, *equalTail = nullptr;
4     Node *greaterHead = nullptr, *greaterTail = nullptr;
5     Node *current = head;
6
7     while(current != nullptr){
8         if(current->value < k){
9             if(lessHead == nullptr){
10                lessHead = current;
11                lessTail = current;
12            } else {
13                lessTail->next = current;
14                lessTail = current;
15            }
16        } else if(current->value == k){
17            if(equalHead == nullptr){
18                equalHead = current;
19                equalTail = current;
20            } else {
21                equalTail->next = current;
22                equalTail = current;
23            }
24        } else {
25            if(greaterHead == nullptr){
26                greaterHead = current;
27                greaterTail = current;
28            } else {
29                greaterTail->next = current;
30                greaterTail = current;
31            }
32        }
33        current = current->next;
34    }
35    if(lessHead != nullptr){
36        head = lessHead;
37    }
38    if(equalHead != nullptr){
39        lessTail->next = equalHead;
40        if(greaterHead != nullptr){
41            equalTail->next = greaterHead;
42            tail = greaterTail;
43        } else tail = equalTail;
44    } else {
45        if(greaterHead != nullptr){
46            lessTail->next = greaterHead;
47            tail = greaterTail;
48        } else tail = lessTail;
49    }
50    if(equalHead != nullptr){
51        greaterTail->next = equalHead;
52        tail = equalTail;
53    }
54}
```

```

50         head = equalHead;
51         if(greaterHead != nullptr){
52             equalTail->next = greaterHead;
53             tail = greaterTail;
54         } else tail = equalTail;
55     } else if(greaterHead != nullptr){
56         head = greaterHead;
57         tail = greaterTail;
58     }
59     if(tail != nullptr){
60         tail->next = nullptr;
61     }
62 }

```

| | Test | Expected | Got | |
|---|---|------------------------|------------------------|---|
| ✓ | LinkedList* l1 = new LinkedList(); l1->add(20); l1->add(30); l1->add(10); l1->add(60); l1->add(40); l1->add(45); l1->add(55); l1->partition(45); cout << l1->toString() << "\n"; | [20,30,10,40,45,60,55] | [20,30,10,40,45,60,55] | ✓ |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.



Câu hỏi 9

Đúng

Đạt điểm 1,00 trên 1,00

Polynomials is an important application of arrays and linked lists. A polynomial is composed of different terms where each of them holds a coefficient and an exponent. A polynomial $p(x)$ is the expression in variable x which is in the form $(a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0)$, where a_n, a_{n-1}, \dots, a_0 fall in the category of real numbers and 'n' is the non-negative integer, which is called the degree of polynomial.

Example: $10x^2 + 26x$, here 10 and 26 are coefficients and 2, 1 is its exponential value.

Points to keep in Mind while working with Polynomials:

- The sign of each coefficient and exponent is stored within the coefficient and the exponent itself.
- The storage allocation for each term in the polynomial must be done in descending order of their exponent.

In this question, complete SLinkedList class is included. You should use this class to complete your Polynomial class with initialized frame as following. This task is implement insertTerm to insert a term into a polynomial.

```
class Polynomial;
class Term {
private:
    double coeff;
    int exp;
    friend class Polynomial;
public:
    Term(double coeff = 0.0, int exp = 0) {
        this->coeff = coeff;
        this->exp = exp;
    }
    bool operator==(const Term& rhs) const {
        return this->coeff == rhs.coeff && this->exp == rhs.exp;
    }
    friend ostream & operator<<(ostream &os, const Term& term) {
        cout << endl;
        cout << "Term: " << "(" << term.coeff << " " << term.exp << ")";
        return os;
    }
};

class Polynomial {
private:
    SLinkedList<Term>* terms;
public:
    Polynomial() {
        this->terms = new SLinkedList<Term>();
    }
    ~Polynomial() {
        this->terms->clear();
    }
    void insertTerm(const Term& term);
    void insertTerm(double coeff, int exp);
    void print() {
        SLinkedList<Term>::Iterator it;
        cout << "[";
        for (it = this->terms->begin(); it != this->terms->end(); it++) {
            cout << (*it);
        }
        cout << endl << "]";
    }
};
```

For example:

| Test | Result |
|--|--|
| <pre>Polynomial *poly = new Polynomial(); poly->insertTerm(6.0, 2); poly->insertTerm(4.0, 5); poly->insertTerm(4.0, 3); poly->insertTerm(6.0, 5); poly->insertTerm(-1.0, 0); poly->insertTerm(-6.0, 6); poly->insertTerm(6.0, 6); poly->print();</pre> | <pre>[Term: (10 5) Term: (4 3) Term: (6 2) Term: (-1 0)]</pre> |
| <pre>int n = 5; int coeff[] = { 1, 2, 3, 4, 5 }; int exp[] = { 1, 2, 3, 4, 5 }; Polynomial p1; for (int i = 0; i < n; ++i) p1.insertTerm(coeff[i], exp[i]); p1.print();</pre> | <pre>[Term: (5 5) Term: (4 4) Term: (3 3) Term: (2 2) Term: (1 1)]</pre> |

Answer: (penalty regime: 0, 0, 0, 5, 10 %)

Reset answer

```

1 void Polynomial::insertTerm(const Term& term) {
2     if(term.coeff == 0) return;
3     SLinkedList<Term>::Iterator it = this->terms->begin();
4     SLinkedList<Term>::Iterator pre = this->terms->begin();
5     int index = 0;
6     while(it != this->terms->end()){
7         Term current = *it;
8         if(current.exp == term.exp){
9             current.coeff += term.coeff;
10            if(current.coeff == 0){
11                this->terms->removeAt(index);
12            } else {
13                *it = current;
14            }
15            return;
16        }
17        if(current.exp < term.exp){
18            this->terms->add(index, term);
19            return;
20        }
21        index += 1;
22        pre = it;
23        ++it;
24    }
25    this->terms->add(term);
26 }
27
28 void Polynomial::insertTerm(double coeff, int exp) {
29     Term newTerm(coeff, exp);
30     insertTerm(newTerm);
31 }
```

| | Test | Expected | Got | |
|---|--|--|--|---|
| ✓ | <pre>Polynomial *poly = new Polynomial(); poly->insertTerm(6.0, 2); poly->insertTerm(4.0, 5); poly->insertTerm(4.0, 3); poly->insertTerm(6.0, 5); poly->insertTerm(-1.0, 0); poly->insertTerm(-6.0, 6); poly->insertTerm(6.0, 6); poly->print();</pre> | <pre>[Term: (10 5) Term: (4 3) Term: (6 2) Term: (-1 0)]</pre> | <pre>[Term: (10 5) Term: (4 3) Term: (6 2) Term: (-1 0)]</pre> | ✓ |
| ✓ | <pre>int n = 5; int coeff[] = { 1, 2, 3, 4, 5 }; int exp[] = { 1, 2, 3, 4, 5 }; Polynomial p1; for (int i = 0; i < n; ++i) p1.insertTerm(coeff[i], exp[i]); p1.print();</pre> | <pre>[Term: (5 5) Term: (4 4) Term: (3 3) Term: (2 2) Term: (1 1)]</pre> | <pre>[Term: (5 5) Term: (4 4) Term: (3 3) Term: (2 2) Term: (1 1)]</pre> | ✓ |

Passed all tests! ✓

Đúng

Marks for this submission: 1,00/1,00.