Assignment 10

CS 1083

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Code:

```java
/**
 @Author: Omar Sebri
 */


/**
Defines a class that represents a list of integers
*/
public class IntList {

    /**
    The first node in the list.
    */
    private IntNode front;

    /**
    Constructs an initially list is empty.
    */
    public IntList() {
        front = null;
    }

    /**
    Adds given integer to front of list.
    @param val The integer to be added to the list.
    */
    public void addToFront(int val) {
        front = new IntNode(val, front);
    }

    /**
    Removes the first node from the list.
    If the list is empty, does nothing.
    */
    public void removeFirst() {
        if (front != null) {
            front = front.next;
        }
    }

    /**
```

```
    Prints the list elements from first to last.
    */
    public void print() {
        System.out.println("--------------------");
        System.out.print("List elements: ");
        IntNode temp = front;
        while (temp != null) {
            System.out.print(temp.val + " ");
            temp = temp.next;
        }
        System.out.println("\n-----------------------\n");
    }
    /**
     Returns the length of the list
     */
    public int length(){
        int len = 0;
        IntNode temp=front ;
        while(temp!=null){
            len+=1;
            temp=temp.next ;
        }
        return len ;
    }
    /** add an element at the end of the list */
    public void addToend(int val){
        IntNode end = new IntNode(val, null);
        IntNode temp = front ;
        while(temp.next!=null){
            temp=temp.next;
        }
        temp.next=end;
    }
    /** removes the last element of the list */
    public void removeLast(){
        if(front !=null){
            IntNode temp = front ;
            while(temp.next.next!=null){
                temp=temp.next;
            }
            temp.next = null;
        }
    }
    /** replaces a value with a new one */
    public void replace(int oldVal, int newVal){
        IntNode temp = front;
        while(temp!=null){
            if(temp.val==oldVal)
                temp.val=newVal;
```

```
            temp=temp.next;
        }
    }
    /** prints the list recursively */
    public void printRec(){
        if(front!=null){
            printer(front);
        }
    }
    /** helper method for printRec() */
    public void printer(IntNode el){
        if (el!=null){
        System.out.print(el.val+" ");
        printer(el.next);
        }
    }
    /** prints list recursively backwards */
    public void printRecBackwards(){
        if(front!=null){
            printerBackwards(front);
        }
    }
    /** helper method for printRecBackwards() */
    public void printerBackwards(IntNode el){
        if (el!=null){
        printerBackwards(el.next);
        System.out.print(el.val+" ");
        }
    }

    /**
    An inner class that represents a node in the integer list.
    The public variables are accessed by the IntList class.
    */
    private class IntNode {

        /**
        The value stored in the node.
        */
        public int val;

        /**
        The link to the next node in the list.
        */
        public IntNode next;

        /**
        Constructs the node given a value and reference to the next node.
        @param val The value to be stored in the node.
```

```
        @param next The reference to the next node in the list.
        */
        public IntNode(int val, IntNode next) {
            this.val = val;
            this.next = next;
        }
    }
}
/**
 @Author: Omar Sebri
 */

import java.util.Scanner;

/**
Driver to test IntList methods.
*/
public class IntListDriver{


    /**
    Creates a list, then repeatedly prints the menu and does what
    the user asks until they quit.
    */
    public static void main(String[] args) {
        IntList list = new IntList();
        Scanner scan = new Scanner(System.in);

        printMenu();
        int choice = scan.nextInt();

        while (choice != 0) {
            int newVal;
            int oldVal;
            switch (choice) {
                case 1: //add to front
                     System.out.println("Enter integer to add to front");
                     newVal = scan.nextInt();
                     list.addToFront(newVal);
                     break;
                case 2: //remove first element
                     list.removeFirst();
                     break;
                case 3: //print
                     list.print();
                     break;
                case 4: // print length
                     System.out.println("The length of the list is:
"+list.length());
```

```
                    break;
               case 5: // adds int to the end
                    System.out.println("Enter an Integr you add to end");
                    newVal=scan.nextInt();
                    list.addToend(newVal);
                    break;
               case 6: // removes the last element
                    list.removeLast();
                    break;
               case 7: // replace value with a new one
                    System.out.println("Enter the Value you want to
replace");
                    oldVal=scan.nextInt();
                    String temp= scan.nextLine();
                    System.out.println("Enter the new Value");
                    newVal=scan.nextInt();
                    list.replace(oldVal, newVal);
                    break;
               case 8: // prints list in a recursive fashion
                    System.out.println("--------------------");
                    System.out.print("List elements recursively: ");
                    list.printRec();
                    System.out.println("\n-----------------------\n");
                    break;
               case 9:  // prints list backwards in a recursive fashion
                    System.out.println("--------------------");
                    System.out.print("List elements recursively Backwards:
");
                    list.printRecBackwards();
                    System.out.println("\n-----------------------\n");
                    break;

               default:
                   System.out.println("Sorry, invalid choice");
           }

           printMenu();
           choice = scan.nextInt();
       }

   }

   /**
   Prints the user's choices.
   */
   public static void printMenu() {
       System.out.println("\n Menu ");
       System.out.println(" ====");
       System.out.println("0: Quit");
```

```
        System.out.println("1: Add an integer to the front of the list");
        System.out.println("2: Remove an integer from the front of the list");
        System.out.println("3: Print the list");
        System.out.println("4: Print the length of the list");
        System.out.println("5: Add an Integer to the end of the list");
        System.out.println("6: Remove an Integer from the end of the list");
        System.out.println("7: Replace an old value with a new value");
        System.out.println("8: Print The list recursively");
        System.out.println("9: Print The list recursively backwards");
        System.out.print("\nEnter your choice: ");
    }
}
```

Testing:

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

0

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

5

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

5

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

7

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

2

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 1

Enter integer to add to front

5

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 3

List elements: 5 2 7 5 5 0 1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 2

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 3

List elements: 2 7 5 5 0 1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 4

The length of the list is: 6

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 3

List elements: 2 7 5 5 0 1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 5

Enter an Integr you add to end

5

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 3

List elements: 2 7 5 5 0 1 5

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 6

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 3

List elements: 2 7 5 5 0 1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 7

Enter the Value you want to replace

5

Enter the new Value

1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 3

List elements: 2 7 1 1 0 1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 8

List elements recursively: 2 7 1 1 0 1

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 9

List elements recursively Backwards: 1 0 1 1 7 2

Menu

====

0: Quit

1: Add an integer to the front of the list

2: Remove an integer from the front of the list

3: Print the list

4: Print the length of the list

5: Add an Integer to the end of the list

6: Remove an Integer from the end of the list

7: Replace an old value with a new value

8: Print The list recursively

9: Print The list recursively backwards

Enter your choice: 0