

## LAB #13 SEARCHING AND SORTING WITH LINKED LISTS

1. Write the implementation for a linked list of integers (modify/adapt for `int` the generic implementation discussed in class). Have the following:

```
//Interface: LinkedListADT
public interface LinkedListADT<T> {
    public boolean isEmptyList();
    public void initializeList();
    public void print();
    public int length();
    public T front();
    public T back();
    public boolean search(T searchItem);
    public void insertFirst(T newItem);
    public void insertLast(T newItem);
    public void deleteNode(T deleteItem);
}

//Class: LinkedListClass implements
//Interface: LinkedListADT
import java.util.*;
public abstract class LinkedListClass<T> implements
LinkedListADT<T> {
    ...
}

//Class: UnorderedLinkedList extends
//Class: LinkedListClass
public class UnorderedLinkedList<T> extends LinkedListClass<T> {
    ...
}
```

2. Add the class `UnorderedLinkedListInt` the following methods: ***linearSearch()***, ***bubbleSort()*** and ***selectionSort()***. How would you implement ***binarySearch()*** method in this linked-list data structure?

3. Test the new methods using the client below. Handle input validation.

```
//Class: ClientUnorderedLinkedListInt
//Input: 37 10 88 59 27 20 14 32 89 100 12 999
import java.util.*;
public class ClientUnorderedLinkedList {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        UnorderedLinkedList<Integer> intList = new
            UnorderedLinkedList<Integer>();
    }
}
```

```

UnorderedLinkedList<Integer> tempList;
int num;
System.out.println("Enter integers (999 to stop)");
num = input.nextInt();//valid??
while (num != 999) {
    intList.insertLast((Integer) num);
    num = input.nextInt();//valid??
}
System.out.print("Testing linearSearch. Enter the number to
                  search for/list: ");
num = input.nextInt(); //valid??
if (intList.linearSearch(num))
    System.out.println(num + " found in this list by
                        linearSearch.");
else
    System.out.println(num + " is not in this list by
                        linearSearch.");
tempList = inList.clone();
System.out.println("Testing bubbleSort. Sorted list is:");
inList.bubbleSort();
inList.print();
System.out.println("Testing selectionSort. Sorted list is:");
tempList.selectionSort();
tempList.print();
if (intList.binarySearch(num))
    System.out.println(num + " found in this list by
                        binarySearch.");
else
    System.out.println(num + " is not in this list by
                        binarySearch.");
//Optional: add more testing here

} // add methods for input validation
}

```

### OUTPUT:

```

Enter integers (999 to stop)
37 10 88 59 27 20 14 32 89 100 12 999
The original list is: 37 10 88 59 27 20 14 32 89 100 12
Testing linearSearch. Enter the number to search for/list: 20
20 found in this list by linearSearch.
Testing bubbleSort. Sorted list is: 10 12 14 20 27 32 37 59 88
89 100.
Testing bubbleSort. Sorted list is: 10 12 14 20 27 32 37 59 88
89 100.
20 found in this list by binarySearch

```