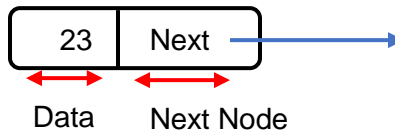


Lab Assignment 03, Data Abstractions and Structures, CSE 274, Fall 2018
Department of Computer Science and Engineering, Miami University

Node and Linked List

In this lab, we will implement the Linked List. More specifically, we will implement our first defined array (linked data). The list will contain a sequence of integers. First, we will design the Node class (Node.java). It will contain an integer **data** and a reference to the next Node. The constructor of the Node class receives an integer and assigns it to the data field. It also has a default constructor.



Next, we will design another class named LinkedList (LinkedList.java). LinkedList class has an instance variable(object) called **head** of type Node. It stores first data of the list and also points to the start of the linked list. The LinkedList class has the following methods:

1. **public LinkedList()**
The head points to null.
2. **public void addToHead(int value)**
Adds the specified value to the start of the linked list.
3. **public void addToTail(int value)**
Adds the specified value to the end of the linked list.
4. **public Node removeFirst()**
Removes and returns the first item from the list. If the list has no nodes, returns null.
5. **public Node removeLast()**
Removes and returns the last item from the list.
6. **public boolean contains(int value)**
Returns true if the list contains the value, and false otherwise.
7. **public Node lastNode()**
Returns the last node in the list
8. **public int countNodes()**
Returns a count of the number of nodes in a list.
9. **public String toString()**
Returns a String representing the sequence of integers.
10. **public void randomNodes(int n)**
Create a linked list of **n** nodes of random integer values.

Implement all the methods in LinkedList class. We will work together to complete the Node class and a couple of methods from the LinkedList class. You have to complete the rest by yourself.

Grading Rubric:

Each method is worth 10 points. Total 100 points.

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Node and Linked List

Before getting started:

- Create a new project named Lab3LinkedList
- Next, we are going to create two classes, Node and LinkedList. Complete the methods from these classes.
- Now download the LinkedListTester class and add it to your project. Run and test your code.

You will have the following output (except for the last list, random integers).

```
=====
Created a linked list:
Content of the list:[ ]
Number of items in the list:0
=====
Add 5 to the head:
Content of the list:[ 5 ]
Number of items in the list:1
=====
Add 9 and 1 to the head:
Content of the list:[ 1 9 5 ]
Number of items in the list:3
=====
Contains the value 9? true
Contains the value 4? false
=====
Add 3 to the tail:
Content of the list:[ 1 9 5 3 ]
Number of items in the list:4
=====
Add 8 and 2 to the tail:
Content of the list:[ 1 9 5 3 8 2 ]
Number of items in the list:6
=====
Contains the value 2? true
Contains the value 7? false
=====
Remove first node from the list:
Content of the list:[ 9 5 3 8 2 ]
Number of items in the list:5
=====
What is the last node? 2
Remove last node from the list:
Content of the list:[ 9 5 3 8 ]
Number of items in the list:4
=====
Generate a list of 10 random integers:
Content of the list:[ 34 8 96 16 91 91 15 64 48 75 ]
Number of items in the list:10
```

What to do when you are done:

- Submit java files (Node.java, LinkedList.java) to the appropriate submission folder on Canvas.