Gebze Technical University
Computer Engineering

CSE 222 - 2019 Spring

HOMEWORK 2 REPORT

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1 INTRODUCTION

1.1 Problem Definition

Adding new entries to a data structure can be troublesome to do. In our problem generally we will make new addition to different places of our data structure. Also we'll want to have instant access to target element in specified situations. Therefore we have to implement a special data structure to deal with this inefficiency.

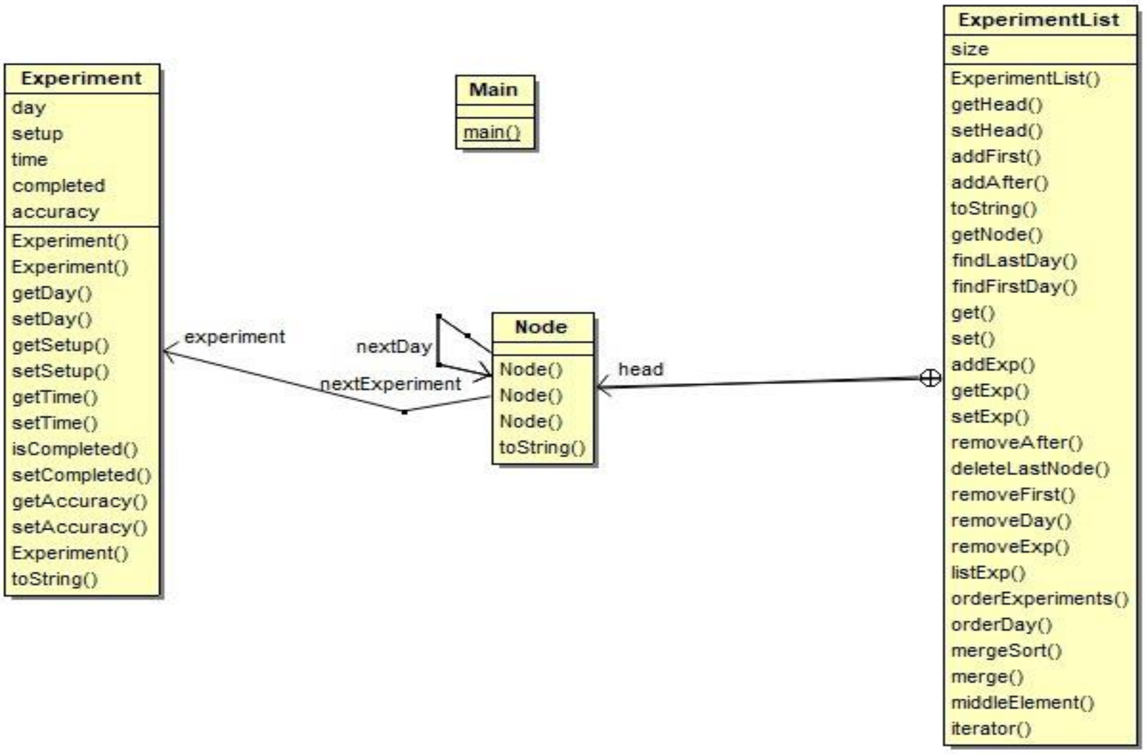
1.2 System Requirements

Experiment instances on main.

Also ExperimentList instances on main.

2 METHOD

2.1 Class Diagrams



2.2 Problem Solution Approach

As shown in PDF I decided to implement my own linkedlist. Since doing it with straight data structure like an array could be painful because mostly we're adding new elements to our list. Therefore Linkedlist usage is logical. What logical means here is efficieny. Instead shifting elements like in regular array we can insert elements instantly with the help of iterators.

Static Inner Node Class:

In this case our linked node structure will point two different Node types. One is next experiment and other one is nextDay. Since we connect these nodes correctly it is easy to traverse list.

As a result Linked Node structure defined and it points two different Nodes. I implemented some helper methods to find first index and last index on given day. These functions gives me extra efficiency to iterate over the list.

Experiment List Class:

Experiment List Class is the root class that has all Node, Iterator classes inside of it. This is the class that used in Main. We can directly access necessary methods through this class.

Iterator Class:

This is the inner class inside of Experiment List class. This class implements Iterable Interface of Java.

Experiment Class:

This is our Experiment type. It is inside of our static Node class. Shortly we keep our data inside of it.

Complexity of Methods inside Experiment List Class:

addExp method:

Inside this method I iterate over the specified day value with one iteration. Then I iterate again to find last index of specified day.
Therefore It's O(2n) which is O(n).

getExp method:

Inside this method same operations like addExp is achieved. Therefore it’s O(n) too.

setExp method:

Since it is only sets an experience in specific location, it is same as getExp. Therefore it’s O(n)

removeExp method:

I find the first day and last day of experience in this method. Therefore it’s O(n).

listExp method:

This method iterates till end of list. Therefore it’s O(n)

removeDay method:

In this method I iterate over the first and last day seperately, therefore this is O(n) too.

orderDay method:

I couldn’t implement this function in proper way. It doesnt effect the original list. It is only doing bubble sort between specified days. Therefore it’s O(n^2).

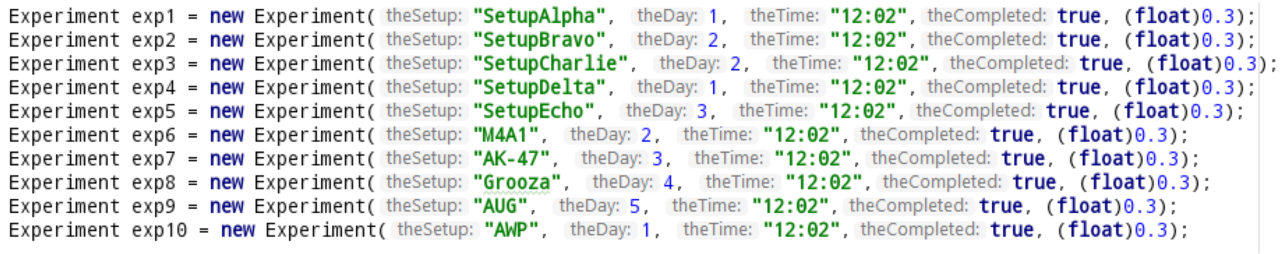
orderExperiment method:

In previous homework we wrote pseudocode of Merge Sort. I’ve made some research and realised that Merge Sort is the most efficient way doing it. Therefore I implemented recursive MergeSort with helper methods. MergeSort has O(nlogn) efficiency.

3 RESULT

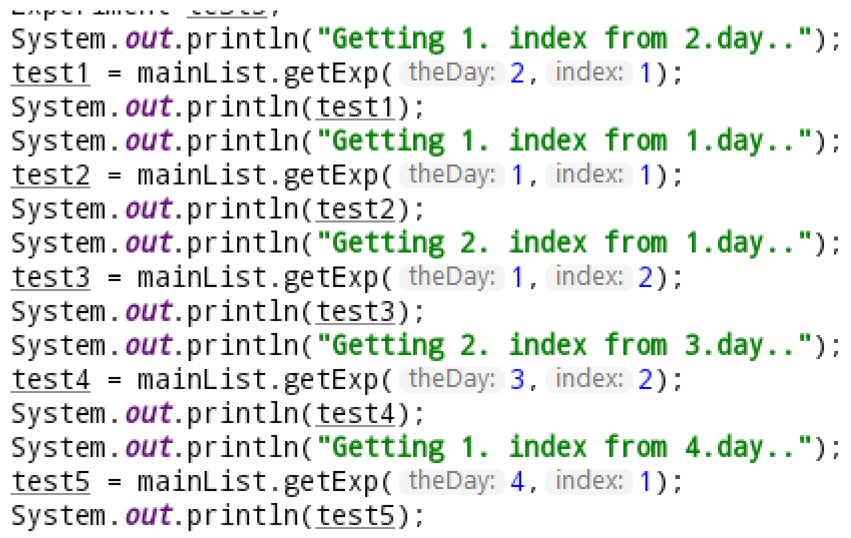
3.1 Test Cases

Test Case 1:



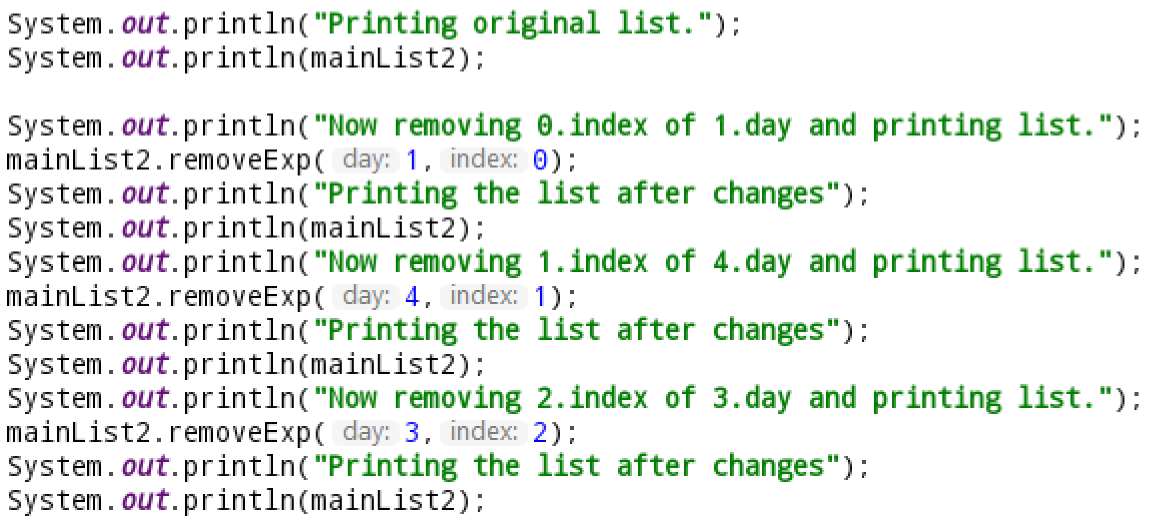
```
Experiment exp1 = new Experiment( theSetup: "SetupAlpha",  theDay: 1,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp2 = new Experiment( theSetup: "SetupBravo",  theDay: 2,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp3 = new Experiment( theSetup: "SetupCharlie",  theDay: 2,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp4 = new Experiment( theSetup: "SetupDelta",  theDay: 1,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp5 = new Experiment( theSetup: "SetupEcho",  theDay: 3,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp6 = new Experiment( theSetup: "M4A1",  theDay: 2,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp7 = new Experiment( theSetup: "AK-47",  theDay: 3,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp8 = new Experiment( theSetup: "Grooza",  theDay: 4,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp9 = new Experiment( theSetup: "AUG",  theDay: 5,  theTime: "12:02", theCompleted: true, (float)0.3);
Experiment exp10 = new Experiment( theSetup: "AWP",  theDay: 1,  theTime: "12:02", theCompleted: true, (float)0.3);
```

Test Case 2:



```
Experiment test5;
System.out.println("Getting 1. index from 2.day..");
test1 = mainList.getExp( theDay: 2, index: 1);
System.out.println(test1);
System.out.println("Getting 1. index from 1.day..");
test2 = mainList.getExp( theDay: 1, index: 1);
System.out.println(test2);
System.out.println("Getting 2. index from 1.day..");
test3 = mainList.getExp( theDay: 1, index: 2);
System.out.println(test3);
System.out.println("Getting 2. index from 3.day..");
test4 = mainList.getExp( theDay: 3, index: 2);
System.out.println(test4);
System.out.println("Getting 1. index from 4.day..");
test5 = mainList.getExp( theDay: 4, index: 1);
System.out.println(test5);
```

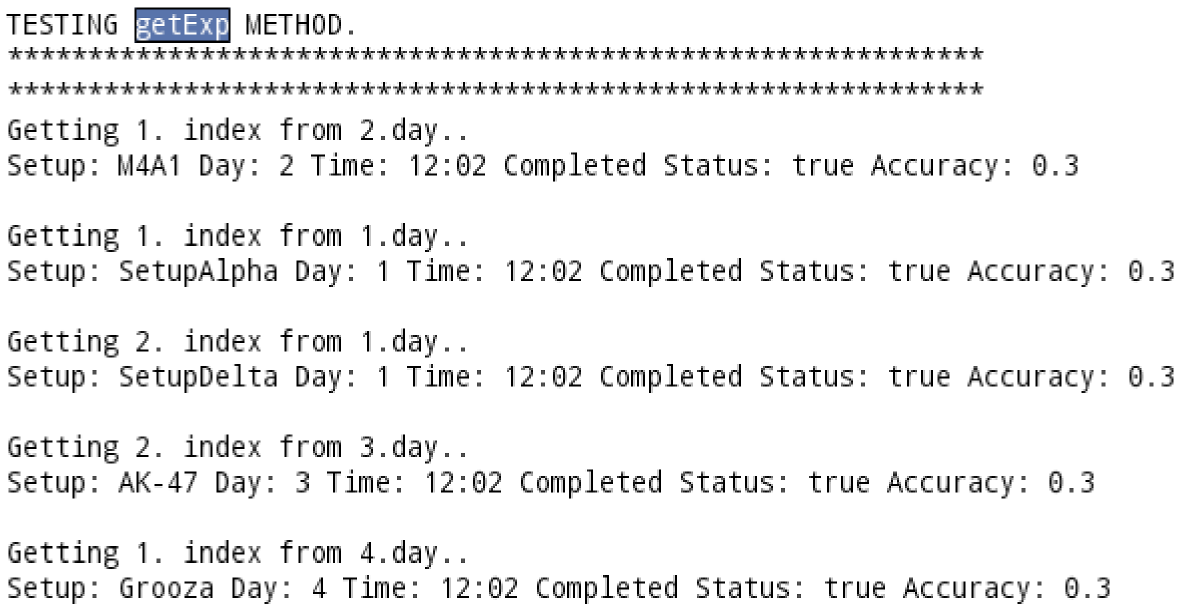
Test Case 3:



```
System.out.println("Printing original list.");
System.out.println(mainList2);

System.out.println("Now removing 0.index of 1.day and printing list.");
mainList2.removeExp( day: 1, index: 0);
System.out.println("Printing the list after changes");
System.out.println(mainList2);
System.out.println("Now removing 1.index of 4.day and printing list.");
mainList2.removeExp( day: 4, index: 1);
System.out.println("Printing the list after changes");
System.out.println(mainList2);
System.out.println("Now removing 2.index of 3.day and printing list.");
mainList2.removeExp( day: 3, index: 2);
System.out.println("Printing the list after changes");
System.out.println(mainList2);
```

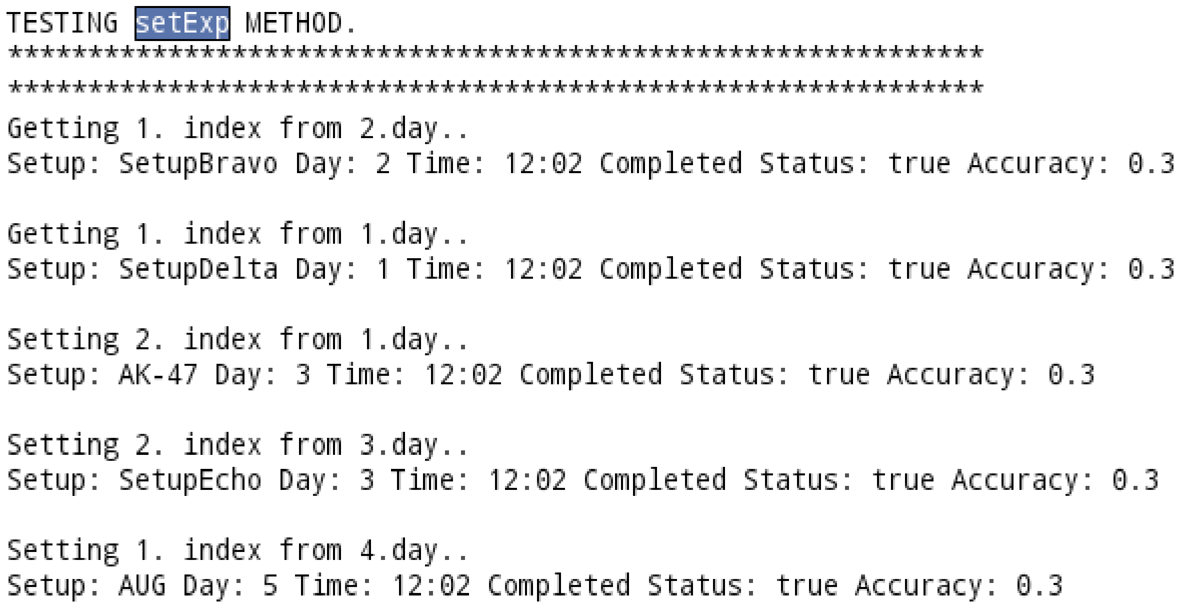
3.2 Running Results

getExp method:



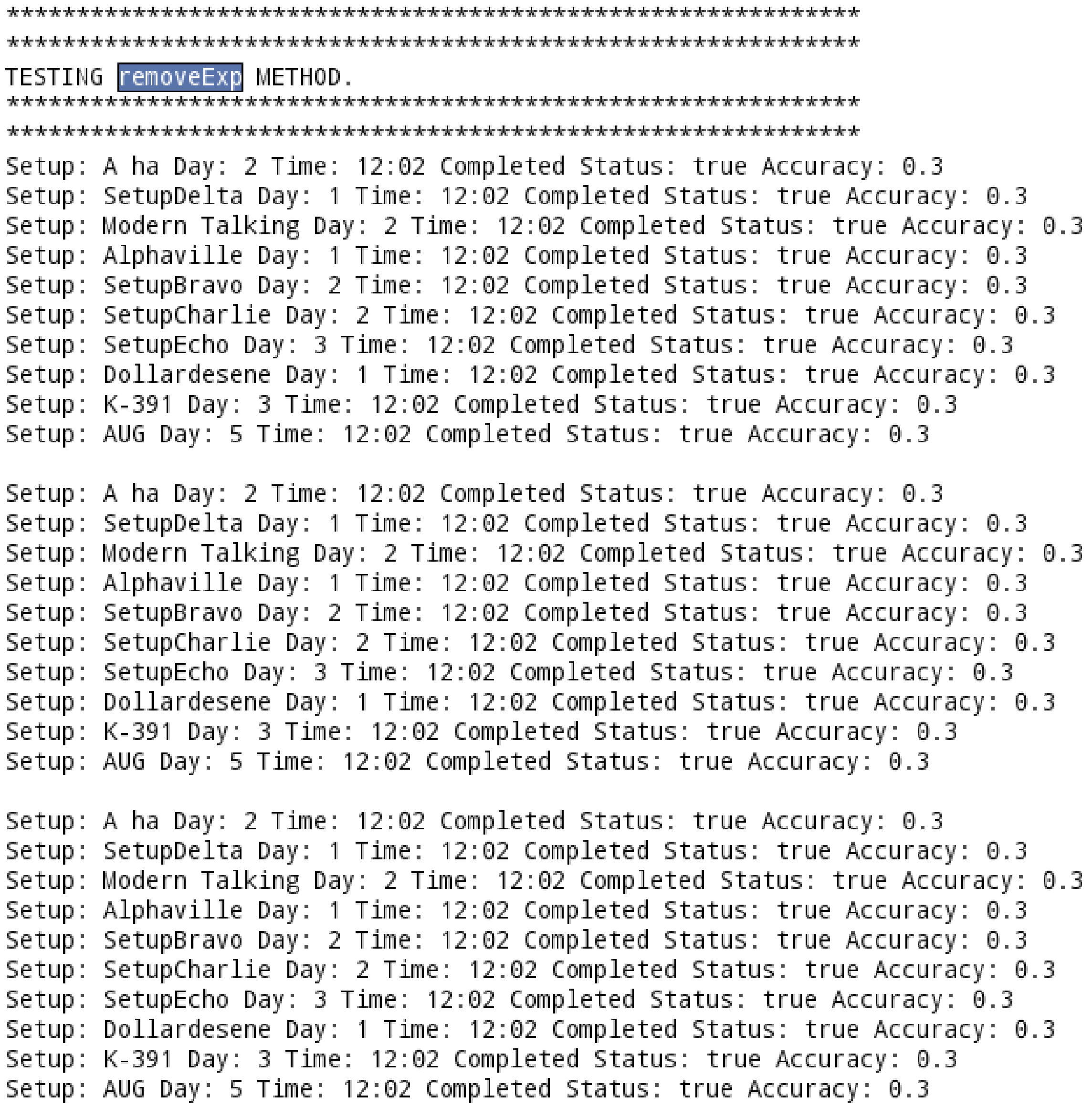
```
TESTING getExp METHOD.
*************************************************************
*************************************************************
Getting 1. index from 2.day..
Setup: M4A1 Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3

Getting 1. index from 1.day..
Setup: SetupAlpha Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3

Getting 2. index from 1.day..
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3

Getting 2. index from 3.day..
Setup: AK-47 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3

Getting 1. index from 4.day..
Setup: Grooza Day: 4 Time: 12:02 Completed Status: true Accuracy: 0.3
```

setExp method:



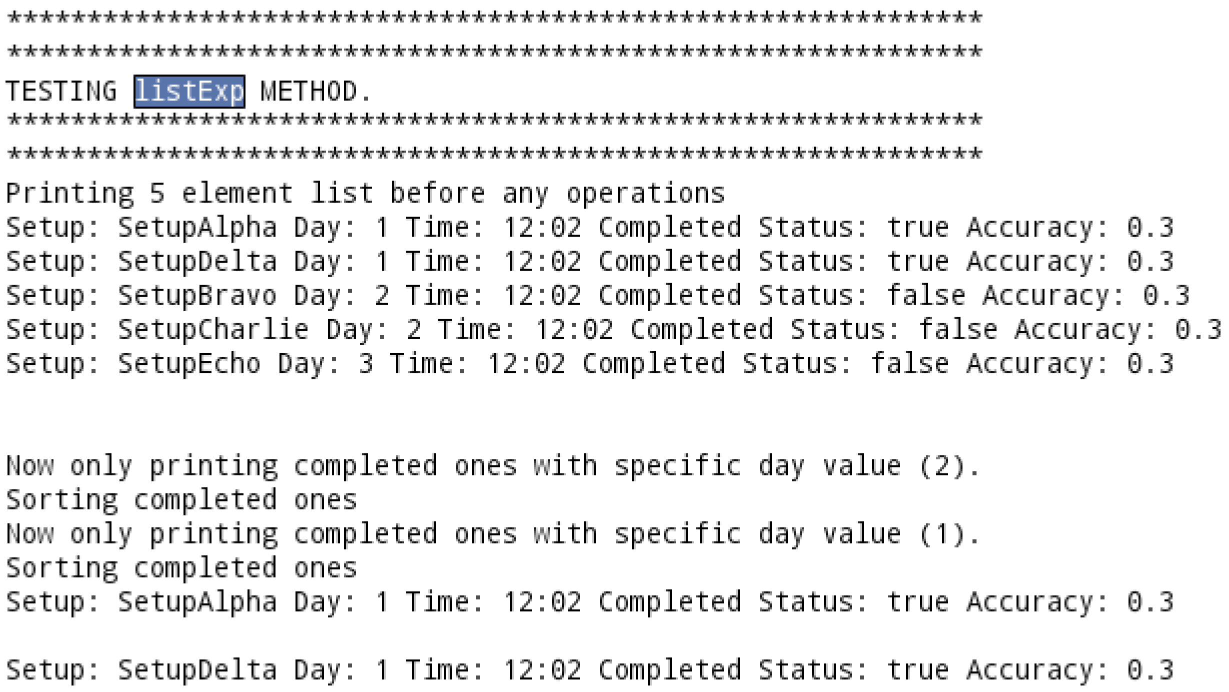
```
TESTING setExp METHOD.
*************************************************************
*************************************************************
Getting 1. index from 2.day..
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3

Getting 1. index from 1.day..
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3

Setting 2. index from 1.day..
Setup: AK-47 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3

Setting 2. index from 3.day..
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3

Setting 1. index from 4.day..
Setup: AUG Day: 5 Time: 12:02 Completed Status: true Accuracy: 0.3
```

removeExp method:



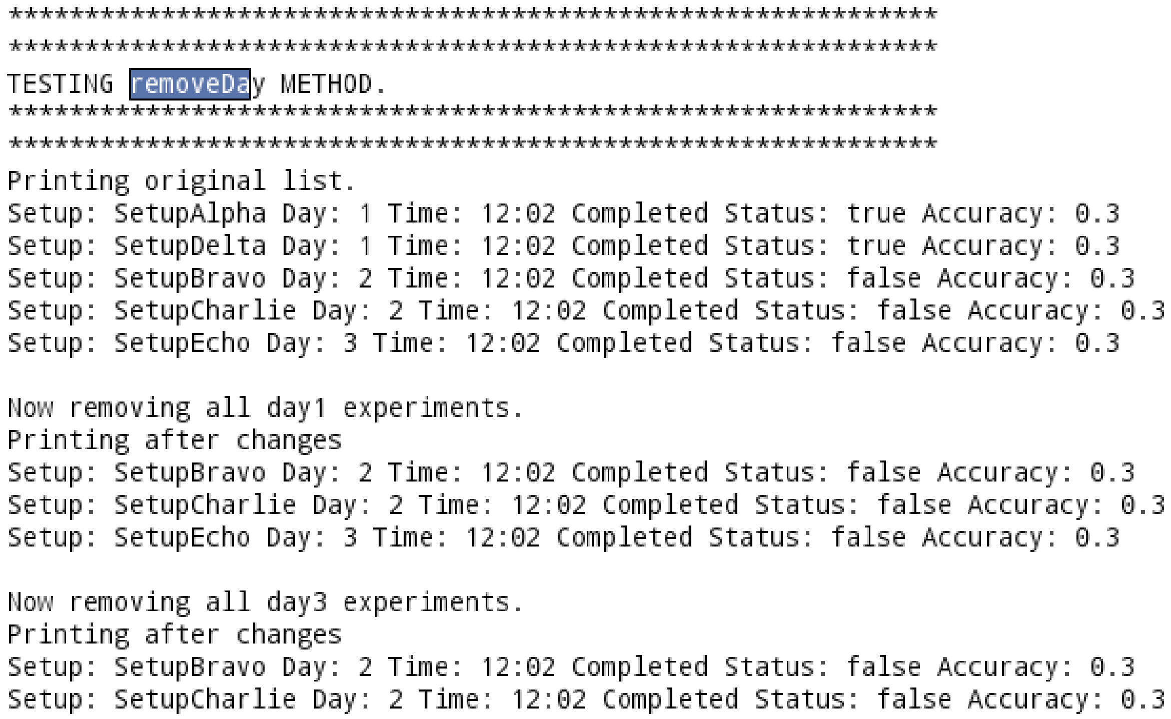
```
*************************************************************
*************************************************************
TESTING removeExp METHOD.
*************************************************************
*************************************************************
Setup: A ha Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Modern Talking Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Alphaville Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Dollardesene Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: K-391 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: AUG Day: 5 Time: 12:02 Completed Status: true Accuracy: 0.3

Setup: A ha Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Modern Talking Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Alphaville Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Dollardesene Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: K-391 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: AUG Day: 5 Time: 12:02 Completed Status: true Accuracy: 0.3

Setup: A ha Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Modern Talking Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Alphaville Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Dollardesene Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: K-391 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: AUG Day: 5 Time: 12:02 Completed Status: true Accuracy: 0.3
```

listExp method:



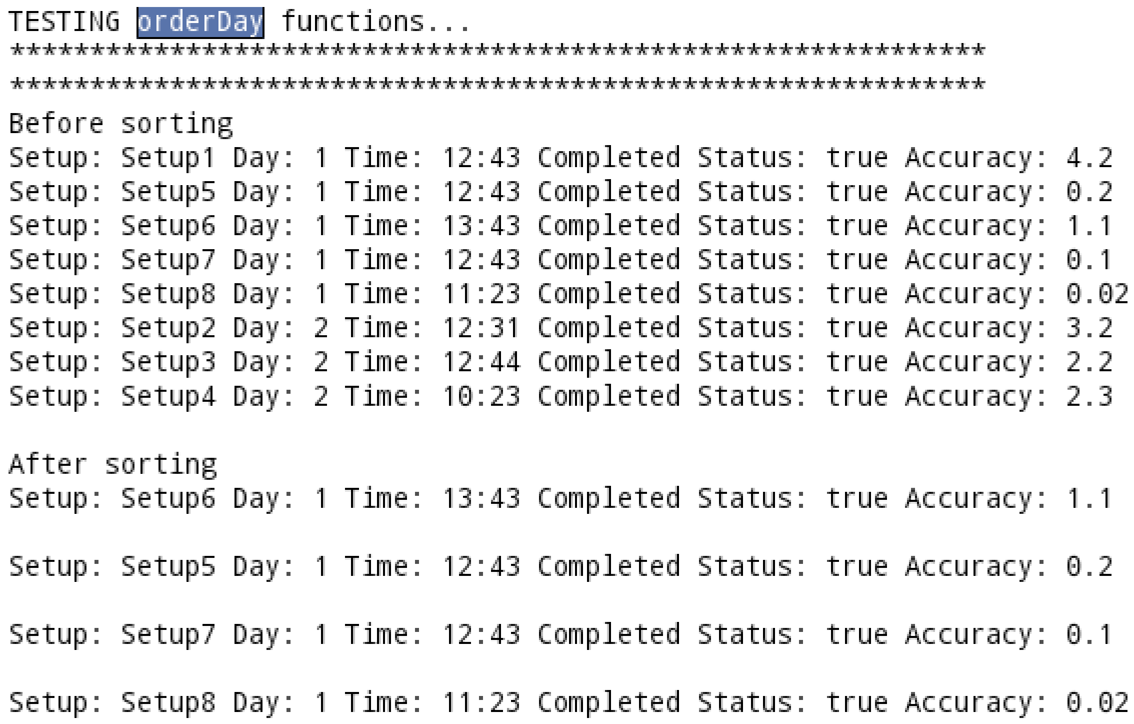
```
*************************************************************
*************************************************************
TESTING listExp METHOD.
*************************************************************
*************************************************************
Printing 5 element list before any operations
Setup: SetupAlpha Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: false Accuracy: 0.3


Now only printing completed ones with specific day value (2).
Sorting completed ones
Now only printing completed ones with specific day value (1).
Sorting completed ones
Setup: SetupAlpha Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3

Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
```

removeDay method:



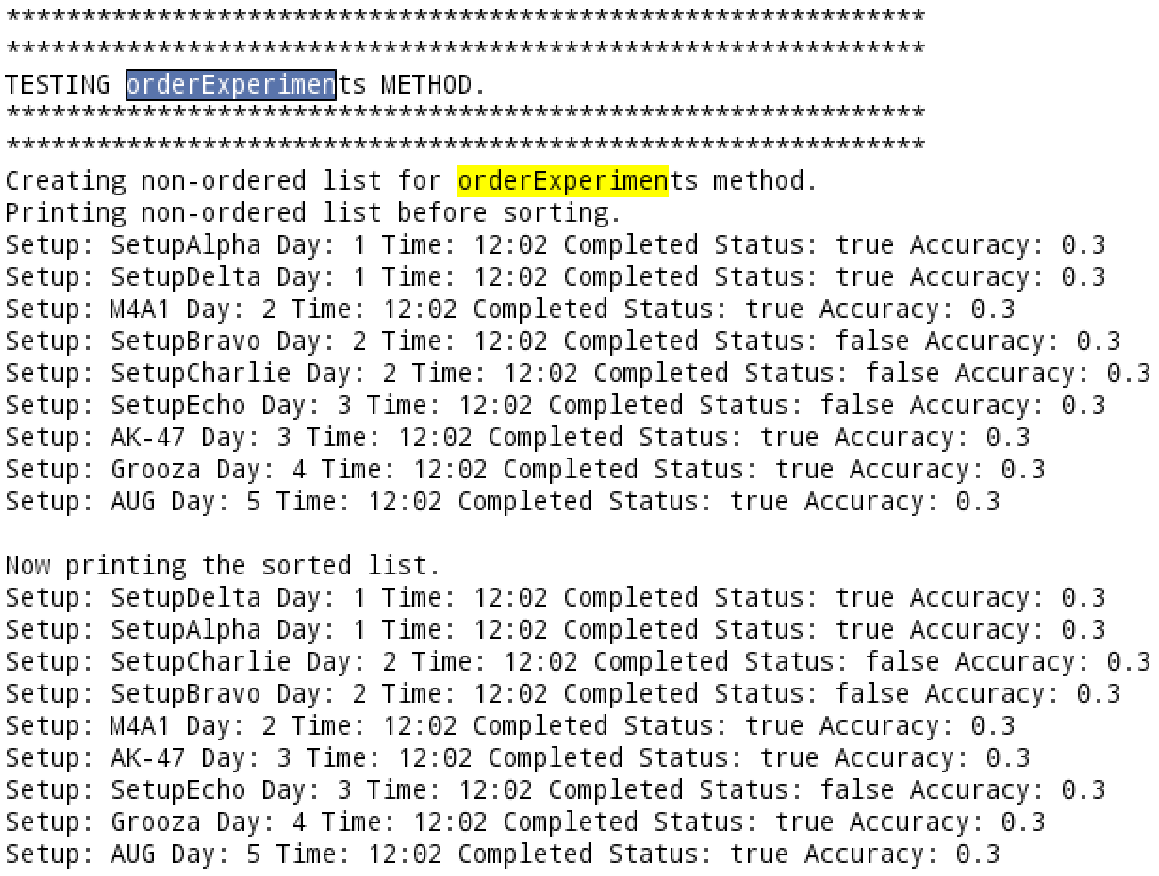
```
*************************************************************
*************************************************************
TESTING removeDay METHOD.
*************************************************************
*************************************************************
Printing original list.
Setup: SetupAlpha Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: false Accuracy: 0.3

Now removing all day1 experiments.
Printing after changes
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: false Accuracy: 0.3

Now removing all day3 experiments.
Printing after changes
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
```

orderDay method:



```
TESTING orderDay functions...
**************************************************************
**************************************************************
Before sorting
Setup: Setup1 Day: 1 Time: 12:43 Completed Status: true Accuracy: 4.2
Setup: Setup5 Day: 1 Time: 12:43 Completed Status: true Accuracy: 0.2
Setup: Setup6 Day: 1 Time: 13:43 Completed Status: true Accuracy: 1.1
Setup: Setup7 Day: 1 Time: 12:43 Completed Status: true Accuracy: 0.1
Setup: Setup8 Day: 1 Time: 11:23 Completed Status: true Accuracy: 0.02
Setup: Setup2 Day: 2 Time: 12:31 Completed Status: true Accuracy: 3.2
Setup: Setup3 Day: 2 Time: 12:44 Completed Status: true Accuracy: 2.2
Setup: Setup4 Day: 2 Time: 10:23 Completed Status: true Accuracy: 2.3

After sorting
Setup: Setup6 Day: 1 Time: 13:43 Completed Status: true Accuracy: 1.1

Setup: Setup5 Day: 1 Time: 12:43 Completed Status: true Accuracy: 0.2

Setup: Setup7 Day: 1 Time: 12:43 Completed Status: true Accuracy: 0.1

Setup: Setup8 Day: 1 Time: 11:23 Completed Status: true Accuracy: 0.02
```

orderExperiment method:



```
*************************************************************
*************************************************************
TESTING orderExperiments METHOD.
*************************************************************
*************************************************************
Creating non-ordered list for orderExperiments method.
Printing non-ordered list before sorting.
Setup: SetupAlpha Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: M4A1 Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: AK-47 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: Grooza Day: 4 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: AUG Day: 5 Time: 12:02 Completed Status: true Accuracy: 0.3

Now printing the sorted list.
Setup: SetupDelta Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupAlpha Day: 1 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupCharlie Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: SetupBravo Day: 2 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: M4A1 Day: 2 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: AK-47 Day: 3 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: SetupEcho Day: 3 Time: 12:02 Completed Status: false Accuracy: 0.3
Setup: Grooza Day: 4 Time: 12:02 Completed Status: true Accuracy: 0.3
Setup: AUG Day: 5 Time: 12:02 Completed Status: true Accuracy: 0.3
```

REFERENCES:

-Data Structures: Abstraction and Design Using Java, 3rd Edition

-https://www.geeksforgeeks.org/merge-sort-for-linked-list/