Gebze Technical University
Computer Engineering

CSE 222 - 2018 Spring

HOMEWORK 2 REPORT

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1 INTRODUCTION

1.1 Problem Definition

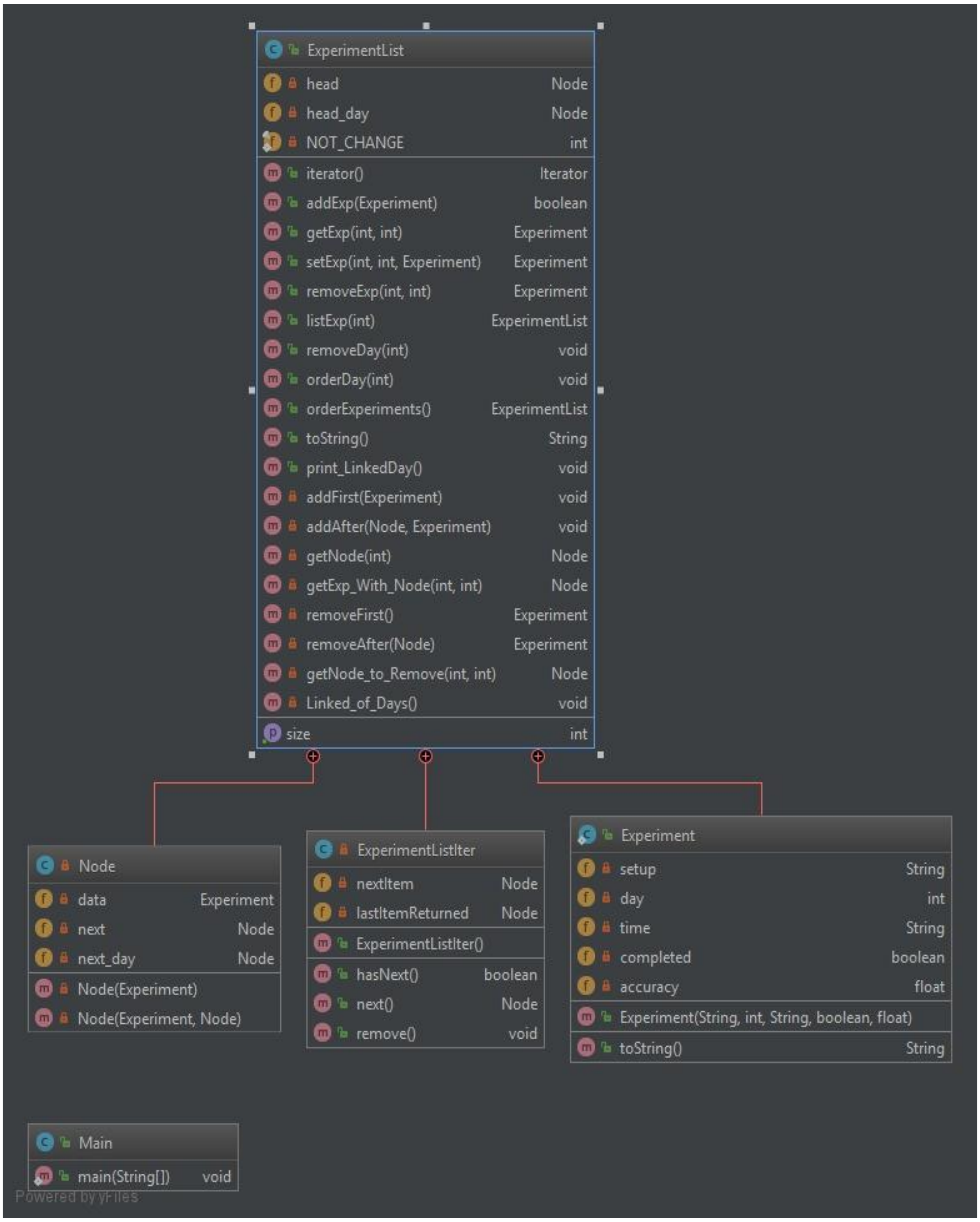
The problem is, there is a single linked list (ExperimentList) which holds data (Experiment). The Experiment holds setup, day, time, completed, accurarcy data fields. The list’s next link shows us a new data and the new data’s next link shows us a new new data and so on. The list also should be define in the level of days. The ExperimentList overcomes add, get, set, remove, and order operations.

1.2 System Requirements

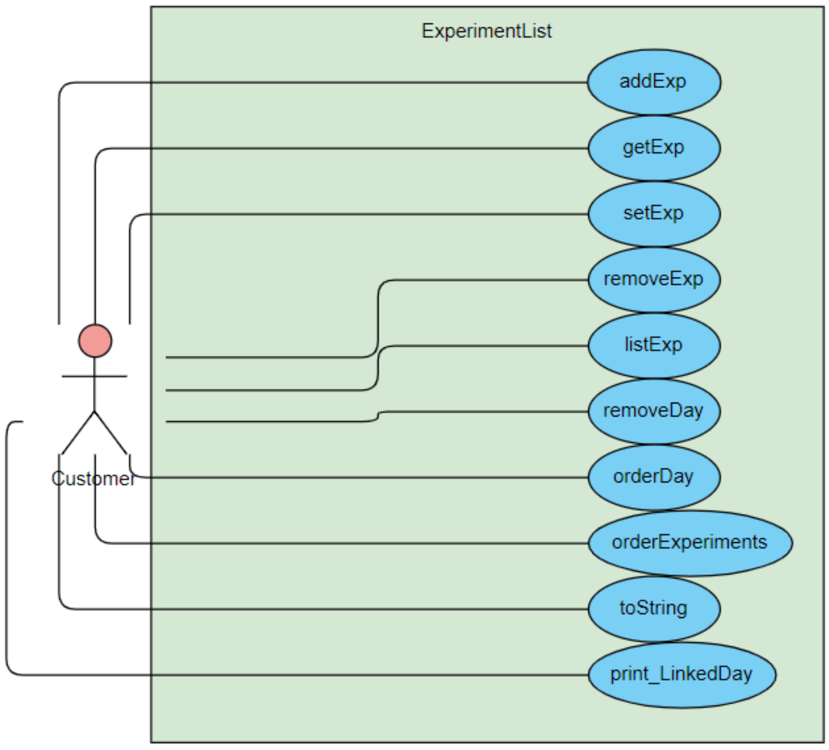
The system has Experiment class to hold setup, day, time, completed, accurarcy. The system has Node class to hold Experiment, next data of the list and also next_day of the list. The system has ExperimentList class to hold all of them and also to hold head of the list and head_day of the list. System has to have some method to solve the problem. addExp method inserts a Experiment end of the day, getExp method get the Experiment given day and index, setExp set a new Experiment given day and and index, removeExp remove Experiment given day and index, listExp list all completed Experiment given day, removeDay remove all Experiments given day, orderDay orders the Experiment according the Experiments accurarcy given day, orderExperiments orders the all ExperimentList according the Experiments accurarcy. All of these system requirement are used to solve this problem.

2 METHOD

2.1 Class Diagrams



2.2 Use Case Diagrams



2.3 Other Diagrams (optional)

There is no other diagrams.

2.4 Problem Solution Approach

First of all I create a ExperimentList class, it holds head type of Node, and head_day type of Node. Then I create a Node class, it holds data type of Experiment, next type of Node and next_day type of Node. In the Node class there are 2 constructor to create new Node reference. head holds the list where it starts, head_day holds the list where is the first day, next holds the next Node reference, next_day holds the next day Node reference. I create Experiment class to hold data fields such as setup, day, … In the Experiment class has 1 contructor to create a new Experiment refenrence. I create ExperimentListIter class to use iterator. Then I create the method to solve problem. The solution is only change the link location.

- addExp method add Experiment to and of the day, If the list is empty or the head days value is bigger than the Experiment’s day value I call helper addFirst method, otherwise I found the where I have to add with helper getNode method and call addAfter method.

- getExp method get the Experiment given index and day. Inside the this method I call getExp_With_Node helper method and find the Node then I return the Node’s Experiment.

- setExp method set a new Experiment to given day and index and returns the old Experiment. So I call getExp_With_Node helper method and find the Node then set the new Experiment the Node which returned by getExp_With_Node method.

- removeExp method remove the Experiment given day and index. If index is 0 and head day is equal to given day I call removeFirst method, otherwise I find the Node where I remove with getNode_to_Remove method then I call removeAfter method.

- listExp method list the given day according to their completed. I create a new ExperimentList. I call helper getExp_With_Node method and find the Node where day stars. Then check if completed or not. If completed addExp method and add the node new ExperimentList. Finally return the new ExperimentList.

- orderDay methods order experiment of given day according to accuracy. I call helper getExp_With_Node method and find the Node where day starts, while day is not change compare the accoracy and swap the Experiment.
- orderExperiments method orders the holl ExperimentList according to accuracy. It cretae a new ExperimentList and add all Experiment to this new list. And order them them returns

- print_LinkedDay method used to print level of days.

- Linked_of_Days is a very important private method, it links the days.

3 RESULT

3.1 Test Cases

addExp method test case :

```
int ELEMENT_SIZE = 8;

ExperimentList myLinkedList = new ExperimentList();

// Create Experiment and store the in an array to use easily
ExperimentList.Experiment[] exp = new ExperimentList.Experiment[ELEMENT_SIZE];
exp[0] = new ExperimentList.Experiment("A",1,time,true,9.1f);
exp[1] = new ExperimentList.Experiment("B",4,time,true,7.2f);
exp[2] = new ExperimentList.Experiment("C",3,time,false,9.3f);
exp[3] = new ExperimentList.Experiment("D",2,time,true,8.4f);
exp[4] = new ExperimentList.Experiment("E",3,time,false,7.5f);
exp[5] = new ExperimentList.Experiment("F",4,time,true,19.6f);
exp[6] = new ExperimentList.Experiment("G",2,time,false,2.7f);
exp[7] = new ExperimentList.Experiment("H",1,time,false,3.8f);


// With a for loop add all exp in to myLinkedList
for(int i = 0; i < ELEMENT_SIZE; ++i)
    myLinkedList.addExp(exp[i]);

System.out.println(myLinkedList.toString());
```

printLinkedDay method test case :

```
myLinkedList.print_LinkedDay();
```

getExp method test case :

```
System.out.println(myLinkedList.getExp(1,1).toString());
System.out.println(myLinkedList.getExp(3,0).toString());
```

setExp method test case :

```
ExperimentList.Experiment set_element1 = new ExperimentList.Experiment("I",
2,time,true, 7.9f);
System.out.println("The Element : " + set_element1.toString());
System.out.println("Old Experiment : " + myLinkedList.setExp(2,1,set_element1));
```

removeExp method test case :

```
System.out.println("The Removed : " + myLinkedList.removeExp(4,1));
System.out.println(myLinkedList.toString());
```

listExp method test case :

```
System.out.println("1st Day's True Completed");
System.out.println(myLinkedList.listExp(1).toString);
```

removeDay method test case :

```
System.out.println("Remove 3rd Days");
myLinkedList.removeDay(3);
System.out.println(myLinkedList.toString());
```

orderDay method test case :

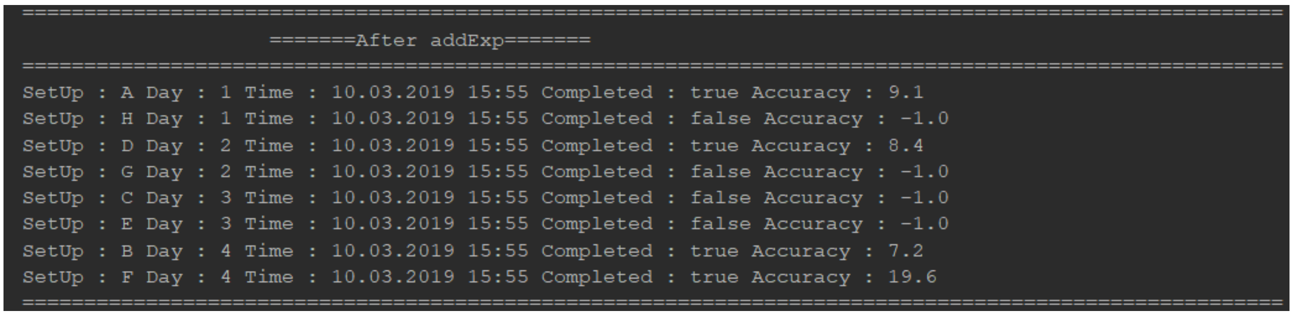
```
System.out.println("Order 2nd Days");
myLinkedList.orderDay(2);
```

orderExperiment method test case :

```
System.out.println(myLinkedList.orderExperiments().toString());
```

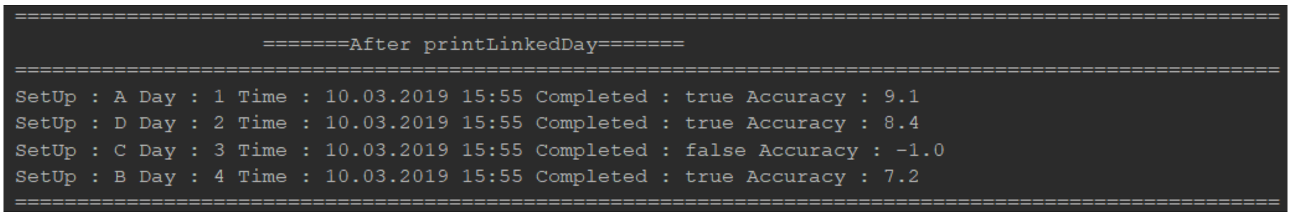
3.2 Running Results

Resutl of addExp method :



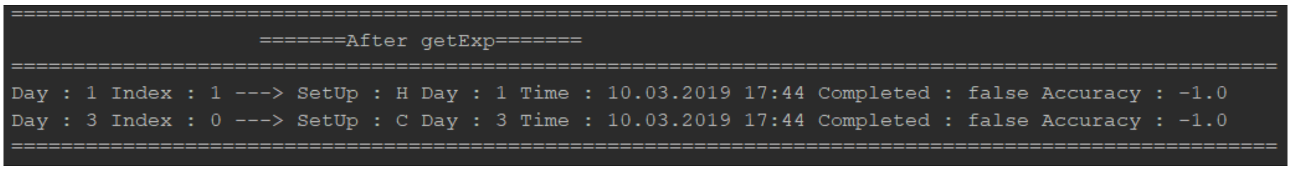
```
=============================================================================================
                    =======After addExp=======
=============================================================================================
SetUp : A Day : 1 Time : 10.03.2019 15:55 Completed : true Accuracy : 9.1
SetUp : H Day : 1 Time : 10.03.2019 15:55 Completed : false Accuracy : -1.0
SetUp : D Day : 2 Time : 10.03.2019 15:55 Completed : true Accuracy : 8.4
SetUp : G Day : 2 Time : 10.03.2019 15:55 Completed : false Accuracy : -1.0
SetUp : C Day : 3 Time : 10.03.2019 15:55 Completed : false Accuracy : -1.0
SetUp : E Day : 3 Time : 10.03.2019 15:55 Completed : false Accuracy : -1.0
SetUp : B Day : 4 Time : 10.03.2019 15:55 Completed : true Accuracy : 7.2
SetUp : F Day : 4 Time : 10.03.2019 15:55 Completed : true Accuracy : 19.6
=============================================================================================
```

Result of printLinkedDay method :



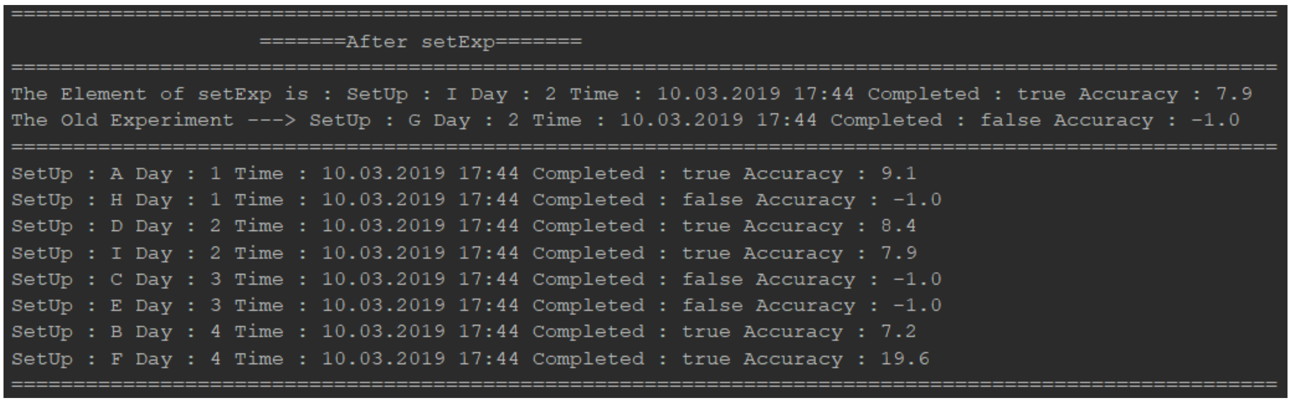
```
=============================================================================================
                    =======After printLinkedDay=======
=============================================================================================
SetUp : A Day : 1 Time : 10.03.2019 15:55 Completed : true Accuracy : 9.1
SetUp : D Day : 2 Time : 10.03.2019 15:55 Completed : true Accuracy : 8.4
SetUp : C Day : 3 Time : 10.03.2019 15:55 Completed : false Accuracy : -1.0
SetUp : B Day : 4 Time : 10.03.2019 15:55 Completed : true Accuracy : 7.2
=============================================================================================
```

Result of getExp method :



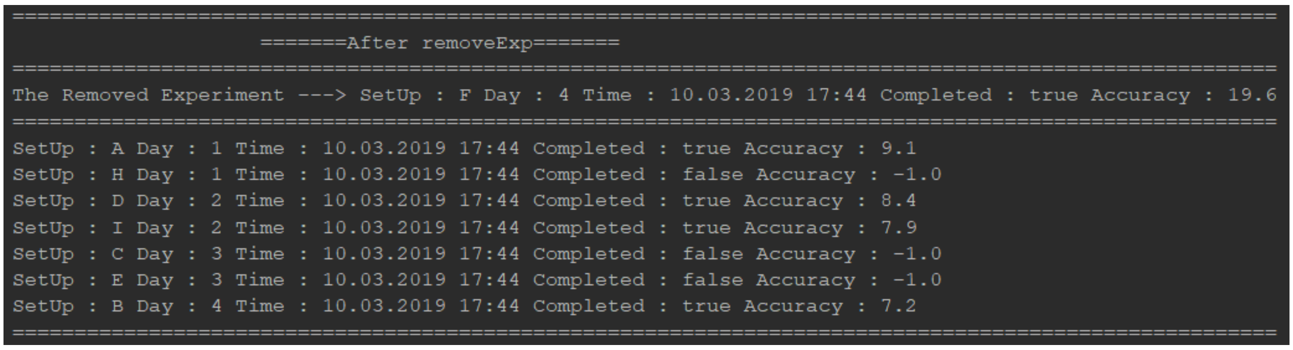
```
=============================================================================================
                    =======After getExp=======
=============================================================================================
Day : 1 Index : 1 ---> SetUp : H Day : 1 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
Day : 3 Index : 0 ---> SetUp : C Day : 3 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
=============================================================================================
```

Result of setExp method :



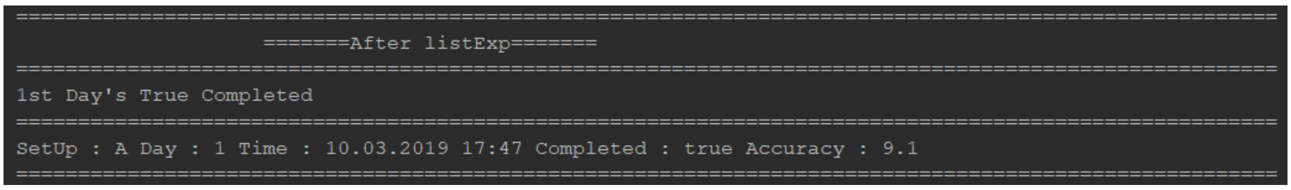
```
====================================================================================================
                   =======After setExp=======
====================================================================================================
The Element of setExp is : SetUp : I Day : 2 Time : 10.03.2019 17:44 Completed : true Accuracy : 7.9
The Old Experiment ---> SetUp : G Day : 2 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
====================================================================================================
SetUp : A Day : 1 Time : 10.03.2019 17:44 Completed : true Accuracy : 9.1
SetUp : H Day : 1 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
SetUp : D Day : 2 Time : 10.03.2019 17:44 Completed : true Accuracy : 8.4
SetUp : I Day : 2 Time : 10.03.2019 17:44 Completed : true Accuracy : 7.9
SetUp : C Day : 3 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
SetUp : E Day : 3 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
SetUp : B Day : 4 Time : 10.03.2019 17:44 Completed : true Accuracy : 7.2
SetUp : F Day : 4 Time : 10.03.2019 17:44 Completed : true Accuracy : 19.6
====================================================================================================
```

Result of removeExp method :



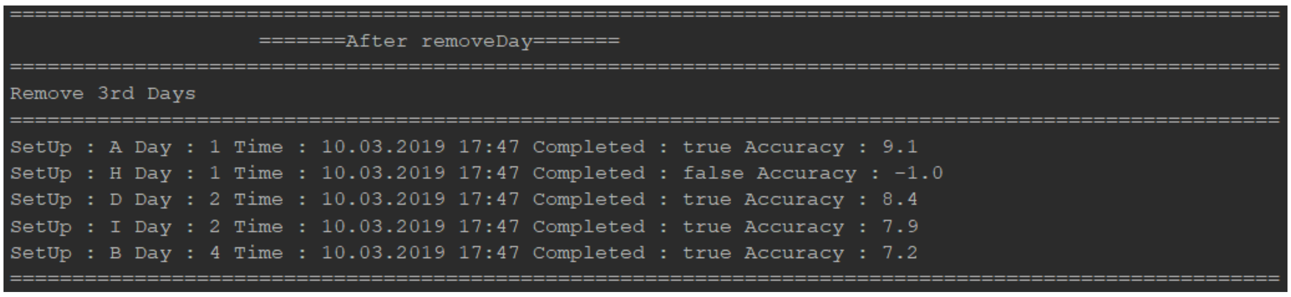
```
====================================================================================================
                   =======After removeExp=======
====================================================================================================
The Removed Experiment ---> SetUp : F Day : 4 Time : 10.03.2019 17:44 Completed : true Accuracy : 19.6
====================================================================================================
SetUp : A Day : 1 Time : 10.03.2019 17:44 Completed : true Accuracy : 9.1
SetUp : H Day : 1 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
SetUp : D Day : 2 Time : 10.03.2019 17:44 Completed : true Accuracy : 8.4
SetUp : I Day : 2 Time : 10.03.2019 17:44 Completed : true Accuracy : 7.9
SetUp : C Day : 3 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
SetUp : E Day : 3 Time : 10.03.2019 17:44 Completed : false Accuracy : -1.0
SetUp : B Day : 4 Time : 10.03.2019 17:44 Completed : true Accuracy : 7.2
====================================================================================================
```

Result of listExp method :



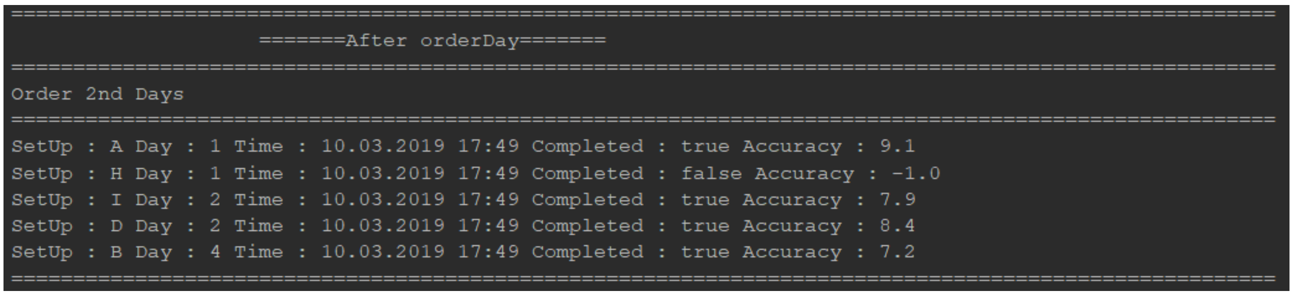
```
====================================================================================================
                   =======After listExp=======
====================================================================================================
1st Day's True Completed
====================================================================================================
SetUp : A Day : 1 Time : 10.03.2019 17:47 Completed : true Accuracy : 9.1
====================================================================================================
```

Result of removeDay method :



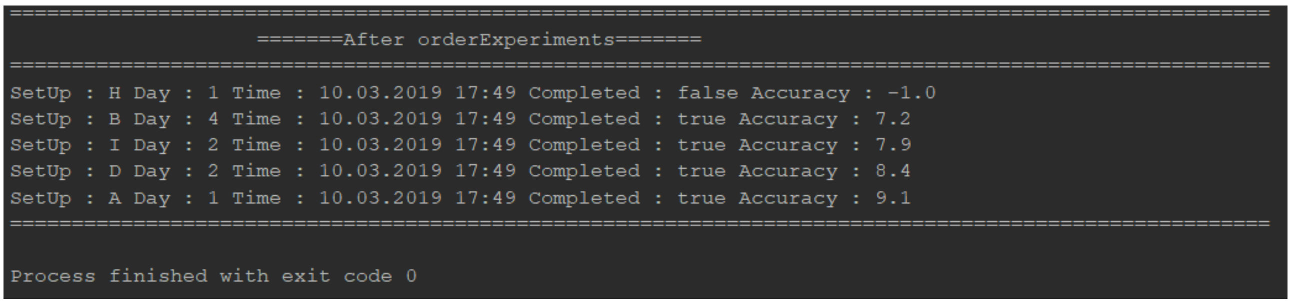
```
====================================================================================================
                   =======After removeDay=======
====================================================================================================
Remove 3rd Days
====================================================================================================
SetUp : A Day : 1 Time : 10.03.2019 17:47 Completed : true Accuracy : 9.1
SetUp : H Day : 1 Time : 10.03.2019 17:47 Completed : false Accuracy : -1.0
SetUp : D Day : 2 Time : 10.03.2019 17:47 Completed : true Accuracy : 8.4
SetUp : I Day : 2 Time : 10.03.2019 17:47 Completed : true Accuracy : 7.9
SetUp : B Day : 4 Time : 10.03.2019 17:47 Completed : true Accuracy : 7.2
====================================================================================================
```

Result of ordeyDay method :



```
==================================================================================
                =======After orderDay=======
==================================================================================
Order 2nd Days
==================================================================================
SetUp : A Day : 1 Time : 10.03.2019 17:49 Completed : true Accuracy : 9.1
SetUp : H Day : 1 Time : 10.03.2019 17:49 Completed : false Accuracy : -1.0
SetUp : I Day : 2 Time : 10.03.2019 17:49 Completed : true Accuracy : 7.9
SetUp : D Day : 2 Time : 10.03.2019 17:49 Completed : true Accuracy : 8.4
SetUp : B Day : 4 Time : 10.03.2019 17:49 Completed : true Accuracy : 7.2
==================================================================================
```

Result of orderExperiments:



```
==================================================================================
                =======After orderExperiments=======
==================================================================================
SetUp : H Day : 1 Time : 10.03.2019 17:49 Completed : false Accuracy : -1.0
SetUp : B Day : 4 Time : 10.03.2019 17:49 Completed : true Accuracy : 7.2
SetUp : I Day : 2 Time : 10.03.2019 17:49 Completed : true Accuracy : 7.9
SetUp : D Day : 2 Time : 10.03.2019 17:49 Completed : true Accuracy : 8.4
SetUp : A Day : 1 Time : 10.03.2019 17:49 Completed : true Accuracy : 9.1
==================================================================================

Process finished with exit code 0
```

4 TIME COMPLEXITY

```
public boolean addExp(Experiment item) → O(n)
```

```
public Experiment getExp(int dayV, int index) → O(n)
```

```
public Experiment setExp(int dayValue ,int index, Experiment newValue) → O(n)
```

```
public Experiment removeExp(int day, int index) → O(n)
```

```
public ExperimentList listExp(int day) → O(n)
```

```
public void removeDay(int day) → O(n)
```

```
public void orderDay(int day) → O(n^2)
```

```
public ExperimentList orderExperiments() → O(n^2)
```

```
public String toString() → O(n)
```

```
public void print_LinkedDay() → O(n)
```

```
private void addFirst(Experiment item) → O(1)
```

```
private void addAfter(Node node, Experiment item) → O(1)
```

```
private Node getNode(int tempday) → O(n)
private Node getExp_With_Node(int dayV, int index) → O(n)
```

```
private Experiment removeFirst() → O(1)
```

```
private Experiment removeAfter(Node node) → O(1)
```

```
private Node getNode_to_Remove(int dayV, int index) → O(n)
```

```
private void Linked_of_Days() → O(n)
```

```
public Iterator iterator() → O(1)
```

```
private Node(Experiment dataItem) → O(1)
```

```
private Node(Experiment dataItem, Node nodeRef) → O(1)
```

```
public Experiment(String setupName, int dayValue, String timeV,
boolean compltedV, float accuracyV) → O(1)
```

```
public String toString() → O(1) It is method of Experiment class
```

```
public ExperimentListIter() → O(1)
```

```
public boolean hasNext() → O(1)
```

```
public Node next() → O(1)
```

O(1) means that no loop or no calling method
O(n) means that one loop or calling method which has one loop
O(n^2) means that nested loop or O(n) method calls method with O(n) complexity.

THE TOTAL COMPLEXITY IS O(n^2)