EECS1022 -Summer 2023- Lab09

Due Date: Friday, August 11, 2023, before 22:00

Contents

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Instructions:

Important Reminders

- You should attend your lab session (the one you are enrolled in). If you need to change your lab enrollment, you should contact the Undergraduate Office in the department. ***Instructors or TAs cannot change your enrollment***.
- You can submit your lab work in eClass any time before 22:00 on Friday (**August 11, 2023**) of the week the lab is due. Your last submission will overwrite the previous ones, **and only the last submission will be graded**.
- The deadline is strict, with no excuses: **you receive 0 for not making your electronic submission in time**. ***Emailing your solutions to the instructors or TAs will not be acceptable.***
- To submit your work, you need to use the York eClass.
- **Your submission will be graded by JUnit tests given to you and additional JUnit tests covering some other input values. *This is to encourage you to take more responsibility for the correctness of your code by writing more JUnit tests.***
- Developing and submitting a correct solution for this lab without compilation errors is essential. Hence, you must take a reasonable amount of time to test your code in different ways. If you submitted a solution with a small mistake in terms of syntax or do not comply with lab instructions, then you may receive 0 as a grade for the implementation of this lab
- There will be **a 25% penalty** on your lab final grade if your submitted code does not compile due to ***minor compilation errors***, given that TAs can fix these minor compilation errors. **You will receive a zero if your code contains major compilation errors that TAs can not fix**.

Academic Honesty

- Students are expected to read the Senate Policy on Academic Honesty. See also the EECS Department Academic Honesty Guidelines.
- **All labs are to be completed individually: no group work is allowed. Do not discuss solutions with anyone other than the instructor or the TAs. Do not copy or look at specific solutions from the net. *If you are repeating the course, you are not allowed to submit your own solution developed in previous terms or for other purposes. You should start from scratch and follow the instructions.***

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Learning Outcomes and Objectives

The lab aims to familiarize students with creating new data types using a class. Your task is to write the Java code that meets these classe specifications. Also, test your Java code using JUnit testing.

Learning Outcomes

- **CLO1**: *Create new data types using the notion of a class, declared with primitive and/or reference attributes, constructors, and methods (accessors and/or mutators).*
- **CLO2**: *Illustrate the difference between a class and its instances (objects) by writing a program which instantiates objects from classes and calls methods on those objects.*
- **CLO3**: *Document classes (with e.g., UML class diagrams, JavaDoc) and methods (with preconditions and assertions).*
- **CLO4**: *Write unit tests to check correctness of classes and use an IDE debugger to correct errors.*
- **CLO5**: *Use primitive arrays*, linked lists, and library collections (e.g., lists, tables) to implement iterative and recursive algorithms including searching (e.g., linear vs. binary) and sorting (e.g., selection sort, insertion sort, merge sort).
- **CLO6:** Justify (in plain language without formal proofs) the time complexity and correctness of implemented algorithms.
- **CLO7:** Implement in different ways (e.g., arrays, linked lists) simple data structures (e.g., stacks, queues, lists) and explain how these impact on the efficiency of operations.

Lab Learning Objective

- To create a class with some attributes.
- Declaring and manipulating (single-valued vs. multi-valued) reference-typed attributes
- To use Use Java controls structure (selection structures, repetition structures, and nested Loops)
- To use use of the Java Collection (HashSet and ArrayList) library classes.
- To be familiar deep copy and shallow copy
- To use JUnit Tests to verify your work

EECS1022 -Summer 2023- Lab09

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Getting Started

1. Start eclipse.
2. **Download the starter code "Lab9.zip" from the eClass course site**
3. Import the test project by doing the following:
    1. Under the **File** menu, choose **Import...**
    2. Under **General,** choose **Existing Projects into Workspace** and press **Next**
    3. Click the **Select archive file** radio button, and click the **Browse...** button. You may have to wait about 10 seconds before the file browser appears.
    4. In the file browser that appears, navigate to your home directory.
    5. Select the file **Lab8.zip** and click **OK**
    6. Click **Finish**.
4. All files you need for this lab should now appear in eclipse.

EECS1022 -Summer 2023- Lab09

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Lab Structure

After successfully importing the starter code/project "Lab9.zip"

The lab folder/directory structure is as follows:

- **src/lab9**/: directory contains Java file **Lab9Utilities.java.**
- **src/lab9**/: directory contains Java file (JUnit test cases): **JunitTest_ Lab9Utilities.java.** These files contain several JUnit test cases that can help to test your code.
  It should be noted that you need to run the JUnit tester **JunitTest_ Lab9Utilities.java** *after you complete the lab to check your work. Nonetheless, passing all given tests does not guarantee full marks for this lab. Therefore, you are required to write additional tests to ensure the correctness of your implementations.*
- **doc/**: directory contains Java documentations for lab in HTML format.

EECS1022 -Summer 2023- Lab09

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Lab Restrictions:

- You are NOT allowed to add any "import" statement other than the ones already in the starter files. Which is

```
import java.util.LinkedList;
import java.util.Queue;
import java.util.Stack;
```

- For the JUnit test cases class **JunitTest_Lab9Utilities.java** given to you
  - Do not modify the test methods given to you.
  - You are allowed to add new test cases by creating new test methods.
- For each method which you are required to implement, **derived from the JUnit test methods**:
  - No **`System.out.println`** statements should appear in it.
  - No Scanner operations (e.g., **`input.nextInt()`**) should appear in it. Instead, declare the method's input parameters as indicated by the JUnit tests.
- **Hint: You may use any Java collection, such as `ArrayList`, `HashMap`, `TreeMap`, `HashSet`, `TreeSet`, `java.util.Arrays`, `Character` or `String` Classes.**

EECS1022 -Summer 2023- Lab09

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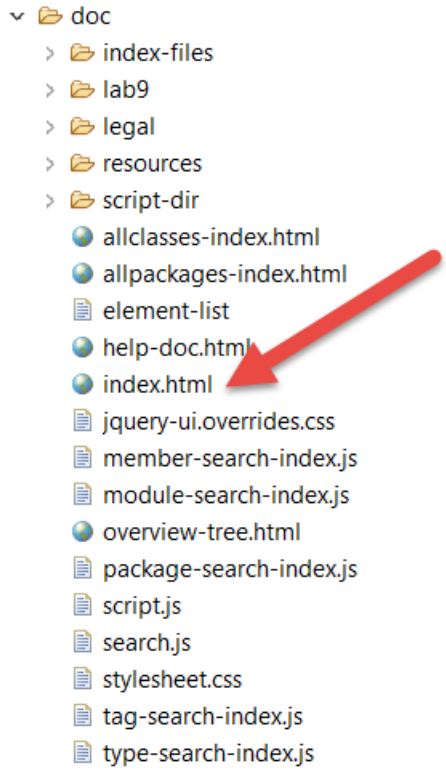
Lab Exercise

In this lab, you need to write Java code to implement the **Lab9Utilities.java** classe described by the given Java API inside the **doc folder** where the documentation for this lab is stored. You'll see there is a file called **index.html**. Clicking on this file shows the lab/project documentation in your browser.

You do not have to include JavaDoc comments.



EECS1022 -Summer 2023- Lab09

Due Date: Friday, August 11, 2023, before 22:00

Submit your work by using the course eClass

Check List:

Before submitting your files for this lab, you need to make sure you completed the following

	There is No compilation error generated from your implementation
	The **Lab9Utilities.java** file contains the implementation for this lab.

Submit The Following File:

1) You need to submit **one** file, **Lab9Utilities.java.**