Please start working on this assignment as early as possible!

CS2400 Project 2

Total points: 100

Purpose:

1. Master the interface and implementations of Stacks.
2. Use Stacks to solve some computer science problems.

Task Descriptions:

Chapter 5 of the textbook (5th Edition) presents a couple of algebraic expression-related problems that could be solved by Stacks. In this assignment, you will **read and study** the textbook from page 164 to page 170 to learn

- the process of using stack in *Transforming an Infix Expression to a Postfix Expression*, and
- the process of using stack in *Evaluating Postfix Expressions*

and **implement** them in Java. Specifically,

(10 pts) **Task 1: Read and Study** the textbook from page 164 to page 168, "A Problem Solved: Transforming an Infix Expression to a Postfix Expression". **Use** a stack to manually convert the following infix expression to postfix expression:

$$a * b \ / (c - a) + d * e$$

Note: **Your answer sheet must show** the conversion process step by step, presenting the status of the stack after each step using a table with three columns (like Figure 5-9 on page 168 of the textbook).

(20 pts) **Task 2:** Use a **LinkedStack** class instance to **implement** the algorithm ***convertToPostfix***, given in Segment 5.16 of the textbook. Note: the class **LinkedStack** presents an implementation of the ADT stack using a linked chain.

(20 pts) **Task 3:** Write a main method to **test** your implementation (Task 2) using the infix expression given in Task 1.

(10 pts) **Task 4: Read and Study** the textbook from page 168 to page 170, "A Problem Solved: Evaluating Postfix Expressions". **Use** a stack to manually evaluate the postfix expression obtained from Task 1, assuming that $a = 2, b = 3, c = 4, d = 5$, and $e = 6$.

Note: **Your answer sheet must show** the evaluation process step by step, presenting the status of the stack after each step (like Figure 5-11 on page 169 of the textbook).

(20 pts) **Task 5:** Use a **ResizeableArrayStack** class instance to **implement** the algorithm ***evaluatePostfix***, given in Segment 5.18 of the textbook. Note: the class **ResizeableArrayStack** presents an implementation of the ADT stack using a resizable array.

(20 pts) **Task 6:** Write a main method to test your implementation (Task 5) using the postfix expression and the variable values given in Task 4.

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What to Submit?

1. An excel file showing the answers for Task 1 and Task 4 and include a link to your GitHub repo.
2. Your GitHub repo (add GitHub user "2404s21" as a contributor) should include:
    1. Source codes in your group repo for Tasks 2-3 and Tasks 5-6, which are *"StackInterface.java", "ResizeableArrayStack.java", "LinkedStack.java", "ArrayStackTest.java", and "LinkedStackTest.java"*.
    2. A README.md file containing:
        a. Your full names
        b. Each member's contribution
        c. A link to the Javadoc's start page (index.html).
        d. A link to your screencast on some video streaming website. The screen cast should introduce your names and demo run your code, and each person should talk about their code briefly. Please make it <3 minutes. (Hint: you can edit the video – concatenate/delete video sections.)

Note:

- The *class Node* could be used as a member inner class of the class *LinkedStack*. Alternatively, it is also fine to make *class Node<T>* an independent class and place in an additional java file "Node.java".
- Please do unit testing on your added methods using some unit test framework.
- You will be graded based on the quality of your program.

Textbook used:

- Data Structures and Abstractions with Java, 5th Edition, by Frank M. Carrano and Timothy M. Henry, Prentice Hall, 2018.