Tutorial 9: Queues and stacks

Aim:

- Get familiar with queues and stacks.
- Consolidate learning from week 9.
- Get feedback.

Note: Use the material from the lecture if you need. If you find any problem or have a question, ask your tutor. If you do not have enough time during the session, it is recommended that you finish the exercises at home. Challenges are optional, although recommended.

Section 01: Main Questions

Q1: FIFO queue. Work with FIFO queues.

1. Use the FIFO implementation given during the lecture to implement the class FIFO (in a new file) and create an object of type FIFO with a capacity of 10.
2. Then, use the queue to perform the following operations:

    1. Add "Alex" to the queue (enqueue).
    2. Add "Tony" to the queue (enqueue).
    3. Add "Charlie" to the queue (enqueue).

3. Use the method print() from the FIFO class to print the items in the queue.
4. Get one item from the queue (dequeue) and print the returned item.
5. What happens if you empty the queue and then you try to get and print an item?

Q2: FIFO with objects.

In this task, you will have to modify the implementation of a FIFO queue to store objects of type Person instead of Strings.

1.- Create a new Class called Person (Person.java) that has two attributes: name and surname. Add getters and setters, and a print method.

2.- Modify the FIFO queue class to handle objects from the class Person (instead of Strings).

3.- Create some objects of type Person in your main, add them to the queue, get an item from the queue and print the person's details.

Q3: LIFO with objects.

Simulate a simple browser history functionality using a LIFO stack.

1. Use the LIFO implementation given during the lecture to implement the class LIFO (in a new file)
2. Add a method in the LIFO class called getCurrent that returns the current element but does not remove the element from the stack.
3. Create an object of type LIFO with a capacity of 10 in your main.
4. Then, use the stack to perform the following operations:

    4. Add the website "www.google.com" to the stack (enqueue).
    5. Add the website "www.github.com" to the stack (enqueue).
    6. Add the website www.w3schools.com" to the stack (enqueue).
    7. Add the website www.hacherrank.com" to the stack (enqueue).
    8. Get the current website using the new method getCurrent.
    9. Simulate to print the browser history using the print method.
    10. Simulate to go back twice in the browser history and print the websites.

Section 02: Challenging Questions

Q4: Inventory

You are tasked with developing an Inventory Management System for a company that sells boxes of tomatoes and carrots.

The system should accurately track the inventory using the 'best of use date'.

1.- Implement a menu that allows you to add a box of tomatoes or a box of carrots into the inventory. When adding a new box, you should ask for the expiration date.

2.- Add in the menu the functionality of selling a box of tomatoes or a box or carrots.

3.- Add an option in the menu to print the inventory. And an option to exit.

Section 3:HackerRank Interview questions.

You can solve the following tasks in HackerRank:

1.   Queues using Two Stacks
2.   Balanced Brackets
3.   Equal Stacks
4.   Truck Tour
5.   Game of Two Stacks