Computer Science 3A

Practical Assignment 4

9 March 2023

Time: 9 March 2021 13:00 – 17h00 Marks: 50

Practical assignments must be uploaded to `eve.uj.ac.za` **before** 20h00.

Late submissions **will not be accepted**, and will therefore not be marked. You are **not allowed to collaborate** with any other student. You **must** upload your assignment to Eve for it to be marked. You **must** include your Javadoc for each question in your submission.

1. For this practical you are required to complete the implementation of a Queue, using the adapter pattern with an underlying singly linked list. This list should conform to the implementation specifications that have been provided to you. There are a number of functions that have been removed that you should complete.

   You must complete the methods marked by:

   ```
   //COMPLETE CODE HERE
   ```

   This week, we will consider the task of buying and selling of shares on a stock market. When a share of common stock of some company is sold, the capital gain (or, sometimes, loss) is the difference between the share's selling price and the price originally paid to buy it. This rule is easy to understand for a single share, but if we sell multiple shares of stock bought over a long period of time, then we must identify the shares actually being sold. A standard accounting principle for identifying which shares of a stock were sold in such a case is to use a FIFO protocol — the shares sold are the ones that have been held the longest (indeed, this is the default method built into several personal finance software packages).

   For example, suppose we buy 100 shares at R20 each on day 1, 20 shares at R24 on day 2, 200 shares at R36 on day 3, and then sell 150 shares on day 4 at R30 each. Then applying the FIFO protocol means that of the 150 shares sold, 100 were bought on day 1, 20 were bought on day 2, and 30 were bought on day 3. The capital gain in this case would therefore be $100 * 10 + 20 * 6 + 30 * (-6)$, or R940.

   Write a program that takes as input a sequence of transactions of the form "BUY X Y" which means "buy x share(s) at Ry each" or "SELL X Y" meaning "sell x share(s) at Ry each", assuming that the transactions occur on consecutive days and the values x and y are integers. Given this input sequence, the output should be the total capital gain (or loss) for the entire sequence, using the FIFO protocol to identify shares.

   You have been provided with a partially completed main class that you can use to test the execution of your solution, the results of your test program should look as follows:

```
Transaction: BUY 100 20
Transaction: BUY 20 24
Transaction: BUY 200 36
Transaction: SELL 150 30
Capital Gain/Loss: R940
```

The following files must be submitted to EVE:

1. *studentnumber*_p4.zip

Marksheet

1. LinkedQueue: size [2]
2. LinkedQueue: isEmpty [2]
3. LinkedQueue: enqueue [2]
4. LinkedQueue: first [2]
5. LinkedQueue: dequeue [2]
6. LinkedQueue: clone [5]
7. Main: processTransactions [15]
8. Main: calculateCapitalGainLoss [10]
9. Compilation and Correct execution [10]