Computer Science 3A

Practical Assignment 5

23 March 2023

Time: 23 March 2023 13h00 – 17h00 Marks: 40

Practical assignments must be uploaded to `eve.uj.ac.za` **before** 17h00 in the practical session.

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 **before** it will be marked.

1. ArrayLists as a data structure allow you to make use of an array while storing an "infinite" number of elements. The strategy for dealing with the dynamic expansion of the underlying array can be managed in two ways:

   - Using an incremental approach — the array is expanded by a fixed number of elements when it gets full.
   - Using a doubling approach — the array is expanded by doubling the number of elements when it gets full.

   You are required to implement an ArrayList that realises the above strategies. Both strategies should be implemented and in the constructor for your ArrayList you should be able to specify a value of one (1) to indicate an incremental strategy is being followed or two (2) if a doubling strategy is being followed. This should be managed when the array is expanded.

   You must complete the classes and methods marked by:

   ```
   //TODO: COMPLETE CODE HERE
   ```

   A *Main* class has been provided to test your implementation. You should not add any extra functions to the provided classes, only complete the methods that have been indicated.

   Closest Petrol Station Finder

   Whether you are driving around in the city or heading on a road trip, it is helpful to know which petrol station is the closest to you. You are required to implement a program that takes GPS coordinates (in longitude:latitude format) from the command line and finds the closest petrol station to that location. It will be measured according to a database of petrol stations (a binary file of serialized objects) that has been provided. For example the GPS co-ordinates for UJ are: 27.9989:-26.1833, or you could make use of `https://www.latlong.net/convert-address-to-lat-long.html` and use those coordinates to find the closest petrol station to that location.

The results of your test program should look similar to:

```
12 petrol stations loaded
Enter your GPS coordinates in the long:lat format ('q' to quit):
27.9989:-26.1833
The closest petrol station to {27.9989,-26.1833} is:
 Shell Melville: Features: Vida e Cafe ; Nedbank ; Standard Bank; Car Wash
{28.00112,-26.1785}
```

The following files must be submitted to EVE:

1. *studentnumber*_p5.zip

Marksheet

1. ArrayListIterator: hasNext [2]
2. ArrayListIterator: next [3]
3. ArrayList: add [2]
4. ArrayList: remove [2]
5. ArrayList: expandArray [4]
6. ArrayList: iterator [2]
7. Main: readPetrolStationsFromDB [10]
8. Main: calculateClosestPetrolStation [5]
9. Correctness [10]