

CSC8001 “Programming and Data Structures”

Coursework Part 1

This work is due for electronic submission through NESS by **4:30pm on Friday 11th November 2019**. It represents an individual assignment (no group work) and can be carried out during independent study and during weekly practical classes.

This is the first half of the module’s coursework, which constitutes 15% of the final mark (overall coursework contributes 30% of the total assessment).

1. Objectives

The objectives of this coursework are for you to demonstrate that you can:

- Define classes, fields, constructors, and methods in Java
- Use appropriate types, including collections
- Implement basic algorithms using collections
- Write a main method including console I/O
- Devise appropriate test cases
- Document your solution with javadoc

Note that at the time of setting the coursework, you will not have been taught all the material relevant to this exercise (for example, main method, console I/O, testing). You may need to research relevant Java Class libraries in order to get help with certain features.

2. Scenario: Earthquake monitoring

Earthquakes can have devastating effects when they occur, and although it is known that they are more likely to occur in some places than in others they are almost impossible to predict. In order to help scientists understand earthquakes better, an international monitoring system is in place to record where earthquakes occur and how powerful they are. Earthquake strength is measured by the ‘magnitude moment’: earthquakes of magnitude three or lower usually imperceptible but those with magnitude seven and over can cause serious damage over large areas. National seismological observatories record earthquakes that occur, although different observatories were set up at different times, so the period over which historical data is available varies from place to place.

3. Problem specification

Define a Java class **Earthquake** with appropriate fields, methods and constructor to store and retrieve information about the magnitude, position (latitude and longitude) and year of the event.

Define a Java class **Observatory** with appropriate fields, methods and constructor to store and retrieve the name of the observatory, the name of the country in which it is located, the year in which earthquake observations started, the area covered by the observatory (in square kilometres) and a list of Earthquake events that it has recorded. Include methods to return:

- The largest magnitude earthquake recorded by the observatory.
- The average earthquake magnitude recorded at the observatory.
- A list of all earthquakes recorded at the observatory with a magnitude greater than a given number.

Define a Java class **Monitoring**, which holds information about all observatories. Include methods to return:

- The observatory with the largest average earthquake magnitude.
- The largest magnitude earthquake ever recorded.
- A list of all earthquakes recorded with magnitude greater than a given number.

Define a class **MonitoringIO**, with a main method which does the following:

- Presents the user with a menu (printed to the console) of features:
 - enter observatory data;
 - enter earthquake data;
 - provide monitoring statistics on largest average earthquake, largest earthquake ever and all earthquakes with magnitude greater than a given number; or
 - exit
- Takes user input from the console to choose one of the menu features
- Allows the user to input, via the console, the details of observatories and earthquakes
- After executing one of the features, returns the user to the menu to choose another option

All classes should be properly documented with javadoc and include appropriate testing methods.

4. What to submit

You must submit 2 files to Ness, as follows:

- A zip file named 'CSC8001_coursework_pt1_2016_FirstnameLastname.zip', where 'Firstname' is replaced with your first name, and 'Lastname' is replaced with your last name. The zip file must contain:
 - The source code of your Java classes.
 - The generated javadoc for your classes.
- A PDF document named 'CSC8001_coursework_pt1_2016_FirstnameLastname.pdf' following the same conventions as above, containing a reflective commentary on your implementation (approx.. 1,000 words), saying what went well and what you would do to improve or extend your program.

5. Mark Scheme

The coursework is marked out of 40 and accounts for 15% of the module mark.

35 marks are available for the code, testing and Javadoc. 5 marks are available for the reflective report.