**IP: Coursework specification - assignment earthquake**

**Outline**

This work is due for electronic submission through duo by 2.00 on Monday 27th January 2014. It contributes 20% to the final mark for this module.

**Objectives**

The objectives for 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
* Devise appropriate test cases

**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.

**Problem Specification**

When a method to find something is required, the value should be returned as a value from the method, not printed to the terminal.   
(25%) Define a Java class Earthquake with appropriate fields, methods and constructors to store and retrieve information about the

* magnitude
* position (latitude and longitude)
* year of the event

(25%) Define a Java class Observatory with appropriate fields and constructors to store and retrieve

* 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)
* a list of Earthquake events that it has recorded.

Include methods to find:

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

(25%) Define a Java class Monitoring which holds information about all observatories. Include methods to find

* the observatory with the largest average earthquake magnitude
* the largest magnitude earthquake ever recorded
* a list of all earthquakes recorded magnitude greater than a given number
* the observatory with the fewest earthquakes per year on average

**Testing**

(25%) Each class chould include a testing method which

* test each method and checks that it executes it correctly
* reports to the user via the console (i.e. System.out) when tests are passed or failed

You do not need a separate test for each method: one test may cover two or more methods.

**Submission**

You need to submit, via duo, the source code (.java files) for your classes.