2007 Paper 1 Question 9

Programming in Java

(*a*) Explain how to set up a 2-dimensional array in Java. [2 marks]

(*b*) A simple spreadsheet is a grid of *cells*. Each cell can contain one of four possible things:

1. Nothing – the cell might be empty;

2. A fixed string, used as a label;

3. A fixed numerical value, represented as a *double*;

4. A formula, as discussed below, which will evaluate to a number.

The sorts of formulae to be supported to start with are very limited, but it is expected that later developments will add more options. For now a formula can indicate that the value in a cell is the sum of two other values whose coordinates are specified relative to the cell being considered. If one of the cells so addressed is empty, contains a string or is off the edge of the grid then it will be treated as if it contains zero.

Somewhere in the spreadsheet program there will need to be methods that make it possible to set the type of content of a cell, and to process the formulae until all values are up to date. They may of course need a number of additional fields and methods not explicitly noted in this specification.

(*i*) Design a set of Java classes that you can use to represent this set-up. Explain what fields and methods each will have, and what needs to be public and what can be kept private. At this stage you do not need to implement any elaborate methods, but you should explain what your methods must achieve. [9 marks]

(*ii*) Sketch an implementation of the methods involved in causing the spreadsheet to bring all its values up to date after the user alters the value in one cell. [9 marks]