Computer Science 405
The Vernal Quarter
Third and Final Programming Assignment

In former times, truffle harvesters in France were required to purchase permits to gather truffles on public lands. An area of land was known to have a certain number of truffles per square meter. A gathering permit would allow limited traversals of the truffle field. Staring at any position at the top row they would make their way to the bottom, gather all of the truffles in each square meter they passed through. At each row, truffle hunters can move straight down, one place the down to left (diagonally) or one place down to the right (diagonally). Of course, the truffle gathering class wanted to maximize their yield so, knowing the number of truffles at each square meter, they would plan their route accordingly.

Your purpose in this programming assignment is to find the optimum path through the truffle field.

Input: a file with positive integers denoting the number of truffles at each square meter. Each line represents a row in the truffle field.

Output: The sequence of truffles to gather, in accordance with the constraints on movement through the field.

For example, given this field,

1	5	1	5	1	5
3	3	2	3	3	4
2	3	4	4	3	2
2	2	3	2	2	4
2	2	4	3	4	2
4	4	4	4	2	3

a truffle hunter might choose this highlighted path (though it may not the maximal one):

1	5	1	5	1	5
3	3	2	3	3	4
2	3	4	4	4	2
2	2	3	2	2	3
2	2	4	3	4	2
4	4	4	4	2	3

for a total of 24 truffles. If this path is selected the output of your program would be:

[1,2] – 5

[2,2] – 3

[3,3] – 4

[4,3] – 3

[5,3] – 4

[6,3] – 4

24 truffles

Analysis: With the program should be submitted a document describing the algorithm you have devised. This part of the assignment is intended to simulate the real-world writing experience in which you are assigned the task of designing algorithm, and the resulting document you produce has two audiences, a manager responsible for resource allocation decisions (man-hours, computing equipment, *etc*) and programmers tasked with turning your design into executing software. Please attend carefully to these **two audiences** and the communications they each require.

The prose should be clear, objective and professional. After reading your document, managers should understand the main idea and implementers should be able to proceed without the necessity of additional creative thought. Where appropriate equations that show the main insight should be provided, especially the recurrence that defines the problem in the case of dynamic programming solutions. The anticipated length is a page or so.

Notes:

1. There may be more than one optimal path; any of them is a correct answer.
2. The truffle fields will be of various sizes, and not necessarily square.
3. The positive integers in each row if the input file will be separated by tab characters.
4. A sample test file is posted.

Stipulations:

1. This program should be implemented in Java.
2. Please follow the output specifications given above.
3. Positive integers on each row will be separated by a single tab character.

4. Your code should be properly documented, identifying you, the developer, and proper explanations of the purpose the various code segments.

5. Do not compress the code file.

6. The input file name will be read as a command-line argument.

Grading: There will be approximately four test files, of varying sizes. Correct output will be given credit for each test case, regardless of the quality of your design and implementation. However, ten points will be reserved for proper code documentation and coding practices.