

CISC-365
2009
Lab # 7
Week of October 26

You have been placed in charge of renting billboards to advertisers along the newly constructed Trans-Ontario Tollway, which runs in a perfectly straight line east from Thunder Bay to ... somewhere. The tollway is exactly M kilometers in length. The government has approved a set of n potential billboard locations along the tollway, $L[0..n-1]$. Each location has two pieces of information: its distance from Thunder Bay, and a revenue (the amount you can charge an advertiser for the right to place a billboard there). The revenue values are integers, but the distance values may not be integers.

Example of the information:

Distance	10.5	7.3	9	12.9	4
Revenue	50	49	39	19	17

Note that the information is not necessarily sorted in any particular order when you get it.

Of course you want to maximize the total revenue. However, some pesky environmentalists have managed to get a law passed that requires a distance of at least 5 km between any two billboards.

In the example above, the optimal solution is to place a billboard at 7.3 km and another at 12.9 km, for a total revenue of 68.

Create and implement a Dynamic Programming algorithm to find the optimal solution to this problem. You may want to sort the locations based on their distance information – no problem, because you wrote a sort method in an earlier lab!

You should not have any difficulty working out the recurrence relation for this problem. However if you get totally stuck on this point, see Part 2

Input for this lab consists of a text file containing a number of instances of the problem. The first line of the file contains an integer that specifies the number of instances to be solved. Each instance is defined by three lines of the file. The first line for an instance contains an integer that specifies the number of billboard locations in this instance. The second line for an instance gives the distance information for the locations. The third line for an instance gives the revenue information for the locations.

For example, the input file might look like

```
2
5
19.6    4.2    12    8.5    15.1
30     13     17    20     24
4
17.1   20.2   23    15
1     27     40    3
```