Computer Science 320SC – (2019)

Programming Assignment 3

Due: Saturday, September 14th (11:57pm)

Requirements

This assignment requires you to write three efficient algorithms that processes intervals. At least two of them should be implemented via some type of greedy algorithm. It is worth 5% of your total course marks.

All three programs have the same input and output format. The input will begin with an integer $n \leq 1000$ denoting how many test cases. This is followed by n lines of an even number $2m$ of whitespace separated integers:

$$a_1\ b_2\ a_2\ b_2\ a_3\ b_3\ \ldots\ a_m\ b_m$$

Each pairs $[a_i, b_i]$ denotes a closed interval where it is guaranteed that $a_i \leq b_i$ for $1 \leq i \leq m$. The output will be a single integer per line denoting the answer to the following questions.

Problem 1:

Determine the maximum number of non-overlapping intervals.

Problem 2:

Find the maximum number of intervals that overlap at a single point (on x-axis).

Problem 3:

Compute the largest contiguous interval obtained by taking a union of some of the input intervals.

Sample Input:	**Output 1**	**Output 2**	**Output 3**
4	2	2	4
1 3 0 2 3 4	2	3	3
0 3 1 2 1 3 4 4	3	3	6
0 2 3 4 5 6 3 6 2 4	1	5	4
1 1 1 2 1 3 1 4 1 5			

Submission

These problem requirements will be worth 2, 2 and 1 marks, respectively, on the computer science automarker `https://www.automarker.cs.auckland.ac.nz/`. For this assignment you can use any language supported on the automarker and can submit up to 8 times for each problem before occuring a 20% penalty.