MSU CSC 325
Spring 2016 Assn. 3. Scheduling Problem
Due 11:59pm, Mon. Feb. 22
(No code is provided)

(Adapted from Dr. Weixiong Zhang, http://www.cs.wustl.edu/~zhang/teaching/cs441/Fall2012/notes/greedy.pdf)

Suppose you manage a large space telescope. Many astronomers want to use it to make observations, but only one project can use the telescope at a time. Each astronomer's project p_i requires use of the telescope starting at a fixed start time s_i and running for d_i days. Your goal is to justify your outrageous budget to NASA by scheduling as many projects as possible!

More formally: given a set P of projects p_i, each occupying the half-open interval $[s_i, s_i + d_i)$, choose a subset $\Pi \subseteq P$ of projects such that:

No two projects' intervals overlap
and
The number of projects in subset Π is maximized.

Use the strategy:

For each project p_i, compute finishing time $f_i = s_i + d_i$.
Repeatedly choose a non-conflicting, unscheduled project with earliest finishing time.

The pseudocode from the original problem: WARNING! THIS PSEUDOCODE HAS A BUG

```
SCHEDULE(P)
  sort P in increasing order {p_1 ... p_n} of finishing time f_i
  Π ← {p_1}
  j ← 1
  for i = 2 ... n {
      if s_i ≥ f_j {
        Π ← Π ∪ {p_i}
        j ← i } }
  return Π
```

Pseudocode rewritten for MSU CSC 325 – **it's still got the bug!**

```
Schedule(P)   // P is a set of projects p_i
   Sort P in increasing order of project finishing time
   Π ← { p_0 }    // Π is a subset of P, initialized to one element p_0
   j ← 0    // j is an index into Π
   for i = 1...n − 1   // i is a valid index to each element p_i of P
      if s_i ≥ f_j
         Π ← Π ∪ { p_i }
         j ← i   // This line is provided -- BUT IT'S GOT A BUG!

   // The output of your program is:
   Display the size of Π
   Display the start and finish time of each element of Π
```

Name your program **Assn3_MyMSUID.cpp** and put it in your eccentric folder.

The command-line input to your program is a file of integers containing:

One value that is the number of astronomy projects

A series of two-integer pairs for each of the astronomy projects. The pair of integers is the begin time of a project and the project's length.

Test your program with the provided **Small_N_Telescope.txt** and **Med_N_Telescope.txt**. The expected outcomes of those two tests are similar to:

4 astronomy projects can be scheduled.
Start and finish time: 25 75
Start and finish time: 75 100
Start and finish time: 100 125
Start and finish time: 125 175

4 astronomy projects can be scheduled.
Start and finish time: 10 19
Start and finish time: 23 36
Start and finish time: 36 79
Start and finish time: 84 101