

CSE 331 - Summer 2015
PROGRAMMING ASSIGNMENT 2
Due Tuesday, June 30, 2015 @ 2:10pm

IMPORTANT: The stated deadline on assignments will be strictly enforced. I will go over solutions at the deadline and will not accept submissions after the solutions have been presented.

Relevant code can be found at <https://bitbucket.org/hartloff/cse331-summer2015/> in the `assignments.assignment2` package. It is recommended that you clone the entire repository and pull regularly as all the code for this course will be placed there.

1 Speedrun Competition (100 points)

For this assignment, you will be taking the role of a manager for a team of video game speed runners. There is an upcoming speed running competition where your team will be competing in Super Mario Bros. on NES (no ROM's for this competition) and Doom 2 on PC. By the nature of the competition, each team will be given as many PC's as they need to run Doom 2, but only one NES to run Mario. Furthermore, each contestant must play through Mario in its entirety before they can start playing Doom 2. This means that your team member must play Mario one at a time before they can start playing Doom 2, however they can all play Doom 2 at the same time if they need to. For example, while the first player is playing Mario the rest of the team is standing by without playing anything. Once the first player finishes Mario and moves on to Doom 2, the next player can start Mario. The next player can finish Mario and start playing Doom 2 even if the first player is still playing Doom 2 since there as many PC's as needed for the entire team to play Doom 2 in parallel.

Your goal is implement an algorithm that produces a schedule for your team that minimizes the completion time of all team members. The completion time for the team is the time taken for all team member to finish both portions of the competition. Specifically, the completion time is the time from when your first player starts Mario until your last player finishes Doom 2. Keep in mind that the last player to finish Doom 2 might not be the last player in your schedule. Each speed runner has a known time for the Mario portion and the Doom 2 portions of the competition and you can assume that each player will exactly match this given time.

This schedule will be computed by implementing Method 1.

Method 1. `public static List<SpeedRunner> generateSchedule(SpeedRunnerProblem problem);`

`SpeedRunnerProblem` will contain a set of `SpeedRunner`'s of size n , each with a Mario time and a Doom 2 time (see the codebase for specific functions and syntax).

You goal for this problem is to implement Method 1 that computes the optimal schedule and runs in $O(n \cdot \log n)$ time. The players will start playing Mario in the order given in this schedule. No formal proof of runtime or correctness is required, though both will be verified during grading. There are no unit tests provided for this assignment, though it is recommended that you verify the correctness of your algorithm by any means you see fit.

Grading rubric:

- (30 points) The implementation of Method 1 outputs a valid schedule.
- (20 points) The implementation of Method 1 runs in $O(n \cdot \log n)$ time.
- (50 points) The implementation of Method 1 outputs a schedule that minimizes the total completion time of the team of speed runners.

2 Submission

Submit the file `Assignment2.java` which contains your implementation of Method 1. You may add additional methods or classes as long as they are all contained in the `Assignment2.java` file. All other files and classes in the package will be used as is for grading.

The preferred method for submission is the `submit_cse331` command. Emailed submissions will also be accepted.