Programming Assignment 3 due 11/20/2019

Write a Java program to compute the total completion time for Part a, and Part b descriptions given below. Your output must be only two lines such as: "Cost for part a = ----" and "Cost for part b = ---- ." The input data is provided in the text file 'jobs.txt'. Your program must read the input and compute the total weighted completion time for the rule described below. Name your program file as 'Scheduling.java'. Your program can only import java.util.Scanner, java.io.File and java.io.IOException packages. Your program must use the same file name for input and cannot assume the user to input a file name or other inputs to the program.

Part a

In this part, you'll code up a greedy algorithm to minimize the weighted sum of completion times. The input file jobs.txt describing a set of jobs with positive integral weights and lengths has the format:

[number_of_jobs]

[job_1_weight] [job_1_length]

[job_2_weight] [job_2_length]

...

For example, the third line of the file is "74 59", indicating that the second job has weight 74 and length 59. You should not assume that the weights or lengths are distinct. Your task in this problem is to run a greedy algorithm that schedules the jobs (optimally) in decreasing order of the difference (weight - length). If two jobs have equal difference (weight - length), then you should schedule the job with higher weight first. The difference could be negative, positive, or zero. You should report the sum of the weighted completion times of the scheduling.

Part b

Use the same dataset and run a greedy algorithm's java code that schedules jobs (optimally) in decreasing order of the ratio (weight/length as a real number). In this part your will not have ties because the ratios are different. You should report the sum of the weighted completion times of the scheduling. Use long type variable for the sum.

The following is a sample to illustrate the sum of the weighted time computation. Here the first number is the number of job scheduled.

4

1 2

4 2

5 1

6 2

For part 2a,

After arranging the jobs in the decreasing order of the difference, the sum of weighted completion time is = (6*2) + (5*(1+2)) + (4*(2+1+2)) + (1*(2+2+1+2)) = 54.

For part 2b,

After arranging the jobs in the decreasing of the ratios, the sum of weighted completion time is = (5*1) + (6*(1+2)) + (4*(2+1+2)) + (1*(2+2+1+2)) = 50.

For the given dataset your output must be

Cost for part a = 69,119,377,652

Cost for part b = 67,311,454,237

Since the answers are provided, your instructor may choose other input such as the sample illustration dataset. That is, your program must compute for any input dataset with the given format, assuming that the number of jobs is less than or equal to 10,000 and the input file name is jobs.txt. This will be an important rubric consideration while grading the assignment.

Steps to turn in your assignment:

Copy your java source code file and save it as text file in a folder labeled Lab 3. Archive the folder and label it as 'your_last_name_03.zip.' Make sure that you can unzip your submitted work and the Java program is the solution program. Then

(1) Log on to WTCLASS
(2) Click on '2019FA_CS_3307_01_Algorithm Analysis and Design'
(3) Click on the left side item 'Lessons'. (The remaining steps are to upload your archived work into the drop box.)
(4) On the right side item under 'Lessons,' click on 'Programming Assignment 3.'
(5) Click on 'Browse' and point to your saved text file 'your_lastname_03.zip' and click 'Open.' Next click 'Upload File' and wait for the remote server to upload your work. Then click 'Finished.'
(6) Click 'Submit.' Now you will get the message on the screen "Your submission has been received successfully." Click on 'Log Off' button on the left to exit from the submission site.