

Problem

Output statistics on data from a triathlon race. The output is to be produced in a text file (`trirace.out`).

Discussion

The race consists of a swimming leg, a biking leg, and a running leg. Competitors are assigned a number between 100 and 900. The results of the race are posted in the input file in four columns. The first column contains the racer number. The next three are times in seconds of the three race legs.

If a racer fails to complete a leg, a zero is entered into the time slot for that leg and any remaining legs. The winner is the racer with the fastest time that completes the entire race.

You are required to print out a labelled list of the all the racers, who finish the race, in the same order as the input file. The times of the racers, who complete all three legs, should be outputted in the format: HH:MM:SS. Racers who do not complete all three legs do not have their total time output. However, their times may affect statistics for the legs which they do complete.

You must also compute the average time for each leg of the race: (total time of all racers in the leg / number of racers to complete the leg), rounded to the nearest hundredth of a second. Furthermore, the number and time of the fastest and slowest competitor in each leg are to be output. The number of people NOT completing each leg is to be counted and output. The average and the standard deviation of the total times for racers completing all three legs is also to be output, rounded to the nearest hundredth of a second. To compute the standard deviation use the following formula:

where:

$$\sigma = \sqrt{\frac{N \sum_{i=1}^N X_i^2 - \left(\sum_{i=1}^N X_i\right)^2}{N^2}}$$

σ standard deviation
 X_i total time for an individual racer
 N number of racers to complete all 3 legs

Finally, the racer number and total time of the winner is to be output.

Input

Assume that there are 20-50 participants in the race. All time units in the input data are in seconds. Each racer occupies one line in the data file, (`trirace.dat`).. The format for a data line is as follows:

| Column | Contents | Data Type |
|---------|--------------|-----------|
| 1 - 3 | Racer Number | int |
| 5 - 9 | Swim Time | int |
| 11 - 15 | Bike Time | int |
| 17 - 21 | Run Time | int |

Output

Your final output should look like the following: (the first 2 lines are only for column numbers)

```
0000000001111111111222222222333333333344444444455555555566666666667
1234567890123456789012345678901234567890123456789012345678901234567890
```

The Ill-Fated Triathlon Results

| Racer | Time |
|-------|----------|
| XXX | XX:XX:XX |
| XXX | XX:XX:XX |
| . | . |
| . | . |
| XXX | XX:XX:XX |
| XXX | XX:XX:XX |

(All following times are given in seconds.)

The average swimming time was XXXXX.XX.

The average biking time was XXXXX.XX.

The average running time was XXXXX.XX.

The fastest swimmer was XXX with a time of XXXXX.

The slowest swimmer was XXX with a time of XXXXX.

The fastest biker was XXX with a time of XXXXX.

The slowest biker was XXX with a time of XXXXX.

The fastest runner was XXX with a time of XXXXX.

The slowest runner was XXX with a time of XXXXX.

Number of swimmers who dropped out : XX.

Number of bikers who dropped out : XX.

Number of runners who dropped out : XX.

The overall average race completion time was : XXXXX.XX.

The standard deviation of completion times was: XXXXX.XX.

The winner of the race was XXX with a time of XXXXX.

Grading

Due Dates: Submit: Monday Sept. 29 Hardcopy: Tues. Sept. 30

Two grades will be given for this assignment. The first will be given by the automatic grading system which will assign a grade based on the output. (See the course Web site: <http://ei.cs.vt.edu/~cs1344/> for more details.)

The second grade will assigned by the GTA. It will be based upon design, documentation and coding style. Turn in hard copies of the source code, output file and a top-down hierarchical design tree of the program. In addition, submit a diskette with files containing: all project workspace files: (project file, source code, etc.), executable image, (.exe), I/O files, and an ASCII, (text), *readme* file with execution instructions. The source code file must be named trirace.cpp and the executable image named trirace.exe. The disk should contain no subdirectories. All materials to be graded must be placed in a sealed folder, neatly labeled with your name, course number and date.

In addition, the GTA may require you to demonstrate your program. To receive partial credit for programs that are non-working, or are not fully functional, a brief one or two paragraph description of the problem(s) must be included in the assignment folder. The location, routine minimum, must also be specified along with possible corrections that need to be made.