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Long Jump Take-Home Exam

METU CENG316 Spring 2021-2022
Practice of Algorithms

Start Date: April 8th, 2022
Start Time: 10:40
Due Date: April 8th, 2022
Due Time: 23:59

1 Problem

Traditionally, a long jump competition is held every year in a village and the total score of the participants is hung on the village wall for years. After the competition, the villagers organize a celebration, in appreciation of the hard work. The content of the celebration, however, depends how well the village performed compared to the previous years. For this reason, the villagers calculate their rank each year compared to the previous years. Can you help the villagers?

2 Input

2.1 Template

```
N
S^1  S^2  S^3  S^4  ...  S^N
```

N = Number of years

$\texttt{S}^i$ = Score of the ith year. The years are labeled in temporal order (i.e., increasing time order).

2.2 Limitations

$1 \leq \texttt{N} \leq 500000$
$1 \leq \texttt{S}^i \leq 2000000000$

3 Clarifications

- If equal scores are found in the previous years, those scores will be considered higher in the ranking because they were gotten earlier.
- Time limit: 1 seconds
  Memory limit: 512 MB
- A solution with $O(N \log N)$ time is expected to get full points in this assignment. However, you can get partial points for a suboptimal solution. If you are unable to code the expected solution, please code a suboptimal one.
- Your solution is expected as a C++ program source named `longjump.cpp` that reads from the standard input and writes to the standard output.
- It is OK to copy code from the sample codes we shared in our course website in ODTUClass for this THE.
- The grade from the auto-grader is not final. We can later do further evaluations of your code and adjust your grade. Solutions that do not attempt to a "reasonable solution" to the given task may lose points.
- We will compile your code on g++ with options: `-std=c++17 -O2 -lm -Wall -Wextra -Wpedantic`

4 Output

A list of ranks.

4.1 Template

$\mathtt{R}^1$ $\mathtt{R}^2$ $\mathtt{R}^3$ $\mathtt{R}^4$ $\ldots$ $\mathtt{R}^N$

$\mathtt{R}^i$ = The rank of that ith year's score with respect to the previous years' scores.

4.2 Limitations

$1 \leq \mathtt{R}^i \leq \mathtt{N}$

5 Samples

5.1 Sample1.in

```
5
3 2 5 1 4
```

5.2 Sample1.out

```
1 2 1 4 2
# 3 -> First Score so the rank is 1
# 2 -> Worse score than 3 the rank is 2
# 5 -> Best score respect to the previous years, the rank is 1
# 1 -> Worst score respect to the previous years, the rank is 4
# 4 -> Second best score respect to the previous years, just 5 is better than this score. The rank is 2
```

5.3 Sample2.in

```
8
3 4 2 5 4 1 6 4
```

5.4 Sample2.out

```
1 1 3 1 3 6 1 5
```