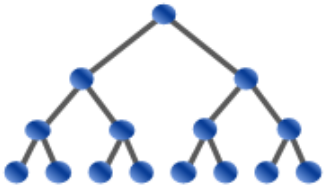

USACO 2020 January Contest, Platinum
Problem 3. Falling Portals

Return to Problem List

Contest has ended.

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English (en)

There are N ($2 \leq N \leq 2 \cdot 10^5$) worlds, each with a portal. Initially, world i (for $1 \leq i \leq N$) is at x-coordinate i, and y-coordinate A_i ($1 \leq A_i \leq 10^9$). There is also a cow on each world. At time 0, all y-coordinates are distinct and the worlds start falling: world i moves continuously in the negative-y direction at a speed of i units per second.

At any time when two worlds are at the same y-coordinate (possibly a fractional time), the portals "align", meaning that a cow on one of the worlds can choose to travel instantaneously to the other world.

For each i, the cow on world i wants to travel to world Q_i ($Q_i \neq i$). Help each cow determine how long her journey will take, if she travels optimally.

Each query output should be a fraction a/b where a and b are positive and relatively prime integers, or -1 if it the journey is impossible.

SCORING:

- Test cases 2-3 satisfy $N \leq 100$.
- Test cases 4-5 satisfy $N \leq 2000$.
- Test cases 6-14 satisfy no additional constraints.

INPUT FORMAT (file falling.in):

The first line of input contains a single integer N.

The next line contains N space-separated integers $A_1, A_2, \ldots, A_N$.

The next line contains N space-separated integers $Q_1, Q_2, \ldots, Q_N$.

OUTPUT FORMAT (file falling.out):

Print N lines, the i-th of which contains the journey length for cow i.

SAMPLE INPUT:

```
4
3 5 10 2
3 3 2 1
```

SAMPLE OUTPUT:

```
7/2
7/2
5/1
-1
```

Consider the answer for the cow originally on world 2. At time 2 worlds 1 and 2 align, so the cow can travel to world 1. At time $\frac{7}{2}$ worlds 1 and 3 align, so the cow can travel to world 3.

Problem credits: Dhruv Rohatgi

Contest has ended. No further submissions allowed.