WOBURN CHALLENGE

2017-18 Online Round 1

Friday, January 26th, 2018

Intermediate Division Problems

Automated grading is available for these problems at:
wcipeg.com

For more problems from past contests, visit:
woburnchallenge.com

Problem I1: Stanley

14 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc171j3*

This is it – the exciting finals of the Stanley Cup playoffs are about to begin! The format is a best-of-7 series, in which the first team to win 4 games will claim the Cup!

In each game, the team which scores more points than the other team wins (there are no ties). The series ends as soon as one team has won 4 games, and no further games are played after that point. This means that the series may last between 4 and 7 games, inclusive.

By collecting data on all hockey games which have ever been played, and performing some sophisticated data analysis, you've managed to predict all of the upcoming games' scores with absolute certainty. You know that, in the i-th game, Team A will score A_i points and Team B will scores B_i points ($0 \le A_i, B_i \le 10, A_i \ne B_i$). In fact, you have these values for all 7 potential games in the series, even though the 5th, 6th, and/or 7th games may not actually get played, in which case their scores should be ignored.

All that's left is to place your bets on the winning team. You can rake in even more cash if you bet on the exact final game counts. As such, given your predicted scores, determine the number of games won by each of the teams when the series ends.

Input Format

The input consists of seven lines, the i-th of which consists of two space-separated integers, A_i and B_i (for i = 1..7).

Output Format

Output two space-separated integers, the number of games won by Teams A and B respectively when the series ends.

Sample Input

```
5 3
4 1
1 5
1 4
0 6
0 2
3 1
```

Sample Output

```
2 4
```

Sample Explanation

After the 6th game, Team A has won 2 games (games 1 and 2), while Team B has won the remaining 4 (games 3, 4, 5, and 6). Because Team B has just reached a total of 4 games won, the series ends. Note that the potential scores for game 7 are included in the input, but aren't considered because that game doesn't end up getting played.

Problem I2: Canuck Detection

16 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc171j4*

Nice, you've just landed your first software engineering internship at a popular blog site! Your first task is to collect data about which countries all of the site's bloggers live in, for further analysis.

Now, you don't exactly have the most experience with such things, but it's important that you get it done somehow. Asking for help would make you look weak! As a first step, it shouldn't be too hard to figure out whether or not a given user is Canadian, right?

You've already gotten a script together to load the text from a single blog post and strip it down into a more convenient format – a non-empty string *S* consisting of at most 50,000 lowercase letters.

Unfortunately, from there, your algorithm is questionable at best. You know that a characteristic of words written by Canadians is that they sometimes end in "`our`" rather an "`or`". However, due to faulty programming, your script will decide that the blogger is Canadian if their text contains at least one instance of the *subsequence* "`our`".

A string subsequence is an ordered but possibly non-consecutive set of characters in it. For example, the string "`abac`" contains subsequences "`ab`", "`ac`", "`bc`", and "`abc`", among others. However, it does not contain the subsequence "`ca`", as an "`a`" never appears anywhere after a "`c`".

Things aren't looking great for your internship, but might as well at least test out your approach. Given a string *S*, output "`Y`" if your script would determine that the blogger is Canadian, or "`N`" otherwise.

Subtasks

In test cases worth 13/16 of the points, *S* contains at most 50 letters.

Input Format

The first and only line of input consists of a single string, *S*.

Output Format

Output a single character, either "`Y`" if the blogger is identified as a Canadian, or "`N`" otherwise

Sample Input 1

```
colorusedtobemyfavoriteword
```

Sample Output 1

```
Y
```

Sample Input 2

```
torontousedtobemytowneh
```

Sample Output 2

```
N
```

Sample Explanation

In the first case, though the blogger doesn't seem very Canadian, the subsequence "`our`" is present at least once in S. One instance of it is indicated below:

```
col[o]r[u]sedtobemyfavoritewo[r]d
```

In the second case, though the blogger is clearly Canadian and S does contain the subsequence "`rou`", it does not contain the subsequence "`our`".

Problem I3: On the Rocks

26 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc171s1*

Two teams have just finished playing a riveting round of Canada's national sport, curling, and it's time to tally up their scores! Team A has N ($0 \le N \le 8$) stones in play, with the i-th of them at a distance of A_i ($0 \le A_i \le 370$) cm away from the "button" (the centre of the scoring ring). Meanwhile, Team B has M ($0 \le M \le 8$) stones, with the i-th of them at a distance of B_i ($0 \le B_i \le 370$) cm away from the button. No two stones are equidistant from the button.

If there are no stones in play at all, neither team will score any points. Otherwise, only the single team which owns the closest stone to the button will score points. That team will score 1 point for each of their stones which is closer to the button than all of the other team's stones are. If the other team doesn't even have any stones in play, then each of the scoring team's stones counts for a point.

Please help tally up the two teams' final scores! Note that at least one of these two scores must be equal to 0.

Subtasks

In test cases worth 6/26 of the points, $N = 1$ and $M = 1$.

Input Format

The first line of input consists of two space-separated integers, N and M.

The next line consists of integers, $A_{1..N}$.

The next line consists of integers, $B_{1..M}$.

Output Format

Output two space-separated integers, the number of points scored by Teams A and B respectively.

Sample Input

```
2 4
205 44
33 146 14 45
```

Sample Output

```
0 2
```

Sample Explanation

Team B owns the closest stone to the button (their 3rd one), so they'll be the team scoring some points. In particular, their 1st and 3rd stones will count for 1 point each. On the other hand, Team B's 2nd and 4th stones won't count for any points, as they're further from the button than Team A's 2nd stone is.

Problem I4: Ride the Rocket

44 Points / Time Limit: 2.00s / Memory Limit: 64M *Submit online: http://wcipeg.com/problem/wc171s2*

A certain TTC bus route involves a sequence of N ($2 \le N \le 10^9$) bus stops, numbered from 1 to N.

Every P ($1 \le P \le 100$) minutes, starting at time 0, a new bus will arrive at stop 1. It will wait a brief moment to allow new passengers to board and/or existing passengers to disembark, and then proceed onwards to stop 2, reaching it after another B ($1 \le B \le 100$) minutes. There, it will similarly give passengers an opportunity to board/disembark, before continuing onwards and reaching stop 3 after another B minutes, and so on. In this manner, $B \times (N - 1)$ minutes after any given bus starts its route, it will arrive at stop N, drop off any remaining passengers, and then go out of service. Note that a new bus drives along the route described above every P minutes, meaning that there may be multiple buses on the road at any time.

Each bus has a maximum capacity of C ($1 \le C \le 10^5$) passengers. If some passengers want to get off a bus while others simultaneously want to get on it, the former can happen first to make room for the new passengers. Note that buses take no extra time to pick up or drop off any number of passengers at a stop.

At time 0, your entire class of M ($1 \le M \le 10^5$) students is waiting at stop 1, the i-th of whom wants to get to stop D_i ($2 \le D_i \le N$) as quickly as possible. At any moment, each student not currently on a bus may either wait at their current stop, walk to the next stop along the route in W ($1 \le W \le 100$) minutes, or board a bus (if there's a below-capacity bus at their current stop at that moment). Meanwhile, each student currently on a bus may get off the bus if it's currently at a stop.

Each student's "travel time" is the amount of time which goes by (after time 0) before they arrive at their destination stop. You're thinking it would be nice if the sum of all M students' travel times could be as small as possible. As such, you'd like to determine the minimum possible value this sum could have, assuming that all of the students work together to minimize it. Though, on second thought, getting everyone in your class to cooperate might be the more difficult part…

Please note that the answer may not fit into a 32-bit signed integer.

Subtasks

In test cases worth 8/44 of the points, $N \le 10$ and $M \le 10$.

In test cases worth another 22/44 of the points, $N \le 10^5$ and $M \le 1000$.

Input Format

The first line of input consists of four space-separated integers, N, P, B, and C.
The next line consists of two space-separated integers, M and W.

M lines follow, the i-th of which consists of a single integer, D_i, for $i = 1..M$.

Output Format

Output a single integer, the minimum possible sum of travel times for all *M* students to reach their desired stops.

Sample Input 1

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

Sample Output 1

```
11
```

Sample Input 2

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

Sample Output 2

```
17
```

Sample Explanation 2

In the first case, one optimal strategy is as follows:

Student 1: Board the first bus immediately, and disembark at stop 2 (2 minutes)
Student 2: Wait for 2 minutes, board the second bus at time 2, and disembark at stop 2 (4 minutes)
Student 3: Walk to stop 2 (5 minutes)

In the second case, one optimal strategy is as follows:

Student 1: Board the first bus immediately, and disembark at stop 4 (3 minutes)
Student 2: Walk all the way to stop 3 (4 minutes)
Student 3: Board the first bus immediately, and disembark at stop 5 (4 minutes)
Student 4: Walk to stop 2, wait for 2 minutes, board the second bus at time 4, and disembark at stop 4 (6 minutes)