WOBURN CHALLENGE

2018-19 Online Round 2

Friday, December 14th, 2018

Junior Division Problems

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wcipeg.com

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

Problem J1: Alternate Access

14 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc182j1*

The IMF (Impossible Mission Force) has gotten wind of a vile plot by escaped convict Solomon Lane to poison Toronto's entire supply of maple syrup! They've dispatched their best agent, Ethan Hunt, to put a stop to this.

Ethan has learned that Solomon will be meeting with a poison supplier somewhere in the CN Tower, which has 147 floors, numbered $1 \ldots 147$ from bottom to top. Ethan has already infiltrated the tower by disguising his identity behind a hockey mask, and made his way to floor A ($1 \le A \le 147$). Unfortunately, Solomon is on a different floor B ($1 \le B \le 147$, $A \ne B$). Simply taking the stairs or elevator at this point won't do, as those routes are sure to be heavily guarded. As such, Ethan will need to use creative thinking to gain alternate access to floor B.

Fortunately, he's got the high-tech gadgets for the job. Without a second thought, Ethan has found himself cutting through a window and clinging to the exterior of the tower at floor A using supermagnetic gloves. What remains is painstakingly making his way to floor B, ideally before the gloves run out of energy. Ethan is able to climb upwards by 1 floor (in other words, increase his current floor by 1) by using up U ($1 \le U \le 100$) Joules of energy. Similarly, he's able to climb downwards by 1 floor (decreasing his current floor by 1) by using up D ($1 \le D \le 100$) Joules of energy. Upon arriving at floor B, it'll be a simple matter of cutting through a window, barging inside, and taking out Solomon's guards (there can't be more than a couple dozen of them).

What's the minimum amount of glove energy required for Ethan to gain access to floor B?

Input Format

The first line of input consists of a single integer, A.
The second line consists of a single integer, B.
The third line consists of a single integer, U.
The fourth line consists of a single integer, D.

Output Format

Output a single integer, the minimum amount of energy (in Joules) required for Ethan to climb from floor A to floor B.

Sample Input 1

```
40
39
4
5
```

Sample Output 1

```
5
```

Sample Input 2

```
142
147
9
12
```

Sample Output 2

```
45
```

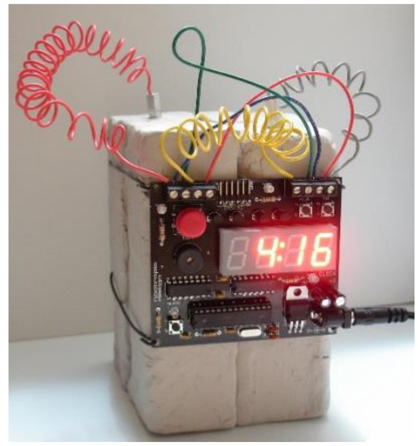
Sample Explanation

In the first case, Ethan must climb downwards by 1 floor (from 40 to 39), which requires 5 Joules of energy.

In the second case, Ethan must climb upwards by 5 floors (from 142 to 147), which requires a total of 45 Joules of energy.

Problem J2: This Message will Self-Destruct

18 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc182j2*



Ethan Hunt has received an audio message recorded by Alan Hunley, the secretary of the IMF, detailing a secret upcoming mission to Newfoundland. Ethan is well aware of a security protocol dictating that the message must self-destruct shortly after being heard, in order to prevent its information from falling into enemy hands. Normally, Alan would end the message by mentioning how quickly it will self-destruct, but it appears that he forgot to do so this time!

Fortunately, the message did come with a digital clock display instead, which is ticking downwards. Ethan assumes that the message will self-destruct when the clock reaches 0:00.

The current clock display may be represented by a string *S* with exactly four characters, in the format "m:ss". The first character ("m") is a digit "0".."9", and indicates the number of minutes remaining. The second character is always ":". The last two characters ("ss") form a number ("00".."59"), indicating the number of seconds additionally remaining. Specifically, the third character is a digit "0".."5", while the fourth character is a digit "0".."9". It's guaranteed that S is not already equal to "0:00".

Based on the clock display, help Ethan determine how many seconds he has left to get the message off his hands before it self-destructs!

Input Format

The first and only line of input consists of a single string, *S* (having exactly 4 characters, in the format "m:ss").

Output Format

Output a single integer, the number of seconds remaining until the message self-destructs.

Sample Input

```
2:07
```

Sample Output

```
127
```

Sample Explanation

The message will self-destruct in 2 minutes and 7 seconds, which is equivalent to 127 seconds.

Problem J3: Seeing Double

28 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc182j3*

While on an undercover mission in Montreal, agents Ethan Hunt and Benji Dunn of the IMF (Impossible Mission Force) will need to attend an exclusive party to listen in on a terrorist scheme. Of course, they'll both need to disguise themselves as members of the party's guest list to gain entry.

Ethan has a set of N ($1 \le N \le 100$) masks, the i-th of which allows him to impersonate a person whose name is a string A_i. Benji agent similarly has M ($1 \le M \le 100$) masks, the i-th of which allows him to impersonate a person whose name is a string B_i. Each of the $N + M$ names is a non-empty string consisting of at most 20 lowercase letters "`a`".."`z`". Neither agent has any duplicate masks in their own set — in other words, the names $A_{1..N}$ are distinct from one another, and the names $B_{1..M}$ are also distinct from one another.

Ethan and Benji will each select one of their masks and wear it to the party. However, they'll run into trouble if they happen to both impersonate the same person! Help them determine how many different people exist who might be impersonated by both agents simultaneously.

Input Format

The first line of input consists of a single integer, N.
N lines follow, the i-th of which consists of a single string, A_i, for $i = 1..N$.
The next line consists of a single integer, M.
M lines follow, the i-th of which consists of a single string, B_i, for $i = 1..M$.

Output Format

Output a single integer, the number of different people who might be impersonated by both agents simultaneously.

Sample Input

```
3
kurt
john
solomon
4
franz
solomon
kurt
james
```

Sample Explanation

It's possible for both Ethan and Benji to impersonate "`kurt`". It's also possible for both of them to impersonate "`solomon`". There are no other people who might be impersonated by both agents.

Sample Output

```
2
```

Problem J4: Ammunition

40 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: http://wcipeg.com/problem/wc182j4*

Ethan Hunt is really in the thick of things now — having infiltrated escaped convict Solomon Lane's hideout in the Rocky Mountains, he's now found himself surrounded by N ($1 \le N \le 1000$) of Solomon's guards, with but a single tranquilizer gun to defend himself!

The tranquilizer gun can hold up to M ($1 \le M \le 1000$) bullets at a time, and Ethan initially has it loaded with S ($0 \le S \le M$) bullets.

Hitting a guard with a single bullet is enough to tranquilize them, and of course, Ethan never misses. The problem is, he might simply not have enough bullets to tranquilize all of the guards. Fortunately, a potential solution has occurred to Ethan — some of the guards appear to be carrying bullets compatible with his gun, which he might be able to grab and use for himself!

The i-th guard is carrying B_i ($0 \le B_i \le 1000$) bullets, which they'll drop upon being tranquilized. This means that, if Ethan chooses to use up a bullet to tranquilize the i-th guard, he can then load up to B_i new bullets into his tranquilizer gun immediately afterwards. However, he may only use a number of new bullets which will not cause his gun's new bullet count to exceed M. He also may not leave excess bullets lying around and load them into his gun later on, as they'll get lost amidst the chaotic firefight.

Ethan may tranquilize 0 or more of the N guards in any order he'd like, as long as he always has at least one bullet available in his gun to tranquilize the next guard. What's the maximum number of guards who he can tranquilize?

Subtasks

In test cases worth 16/40 of the points, $N \le 10$ and $M = 1000$.
In test cases worth another 14/40 of the points, $M = 1000$.

Input Format

The first line of input consists of three space-separated integers, N, M, and S.
N lines follow, the i-th of which consists of a single integer, B_i, for $i = 1..N$.

Output Format

Output a single integer, the maximum number of guards who Ethan can tranquilize.

Sample Input 1

```
3 1000 1
0 1 2
```

Sample Output 1

```
3
```

Sample Input 2

```
6 2 2
1 0 0 3 0 0
```

Sample Output 2

```
5
```

Sample Explanation

In the first case, Ethan could first choose to tranquilize the 2nd guard, using up his only bullet but then picking up another bullet. He could then use that bullet to tranquilize the 3rd guard, picking up two new bullets as a result. Finally, he could use one of those bullets to tranquilize the 1st guard.

In the second case, Ethan could choose to tranquilize guards 1, 2, 4, 3, and 6, in that order. This would leave him with no bullets remaining to tranquilize the 5th guard, but tranquilizing 5 out of the 6 guards is the best he can do.