WOBURN CHALLENGE

2016-17 Online Round 1

Sunday, October 16th, 2016

Junior Division Problems

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

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

Problem J1: A Spooky Season

10 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: wcipeg.com/problem/wc161j1*

Late October can be a rather frightening time of year. Night begins to fall ever earlier, ancient Pagan rituals make demons stir, and at the end of the month, hordes of small creatures can even be seen roaming the streets! It's a spooky sight if there ever was one.

But just how spooky is this demonic festival? Its spookiness level can, in fact, be measured and represented as a single integer S ($2 \le S \le 20$). However, a simple number doesn't truly do the spooky sensation justice. As such, it can also be described with the word "`spoo...oooky`", with exactly S `o`'s.

Given the integer S, can you cast a spooky incantation on your computer to have it produce the corresponding spooky word?

Input Format

The first and only line of input consists of a single integer S.

Output Format

Output a single line consisting of a single string – the spooky word corresponding to the given value of S.

Sample Input

```
5
```

Sample Output

```
spooooky
```

Problem J2: Frankenstein’s Monster

20 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: wcipeg.com/problem/wc161j2*

Frank is upset. "Frankenstein is so big and scary, Frankenstein this, Frankenstein that", he thinks to himself. "Doesn't anyone know that Frankenstein is the name of the scientist, and who they're actually referring to is Frankenstein's monster!?".

He's determined to remedy the situation once and for all. How? It's quite simple. Since everyone derives their knowledge entirely from the internet, Frank will just have to find every occurrence of the word "Frankenstein" on every website, and replace it with "Frankenstein's monster". Problem solved!

For starters, Frank is tackling a Universal Pictures monster fanfiction site. He's downloaded the raw text of one particular story, a string with at most 1000 characters. For convenience, every space has been replaced with a period. As such, the string contains no whitespace, and consists of only lower/uppercase letters, digits, and common punctuation.

A "word" is a maximal consecutive sequence of non-period characters in the string. That is, each word is either preceded by a period or is at the start of the string. Similarly, each word is followed by a period or is at the end of the string. Frank wants to replace each instance of the word "Frankenstein" with the two words "Frankenstein's" "monster" (separated by a period). Frank distinguishes uppercase and lowercase letters, so he doesn't want to replace the word "frankenstein", for example.

Input Format

The first and only line of input consists of a single string representing the content of the story.

Output Format

Output a single line consisting of a single string representing the "corrected" story.

Sample Input

```
Frankenstein.rose.from.his.slab.to.confront.the.evil.Dracula..The.vampire.swung.at.
Frankenstein's.face,.but.at.the.last.moment,.Frankenstein.was.shielded.from.the.blo
w.by.his.ally,.the.mummy.Imhotep.
```

Sample Output

```
Frankenstein's.monster.rose.from.his.slab.to.confront.the.evil.Dracula..The.vampire
.swung.at.Frankenstein's.face,.but.at.the.last.moment,.Frankenstein's.monster.was.s
hielded.from.the.blow.by.his.ally,.the.mummy.Imhotep.
```

Problem J3: Hide and Seek

30 Points / Time Limit: 2.00s / Memory Limit: 16M *Submit online: wcipeg.com/problem/wc161s1*

It's Halloween night in Haddonfield, Illinois. Not exactly in the mood for trick-or-treating, Laurie Strode has instead invited her friend, Michael Myers, to join her for a friendly game of hide and seek.

Laurie's house has a hallway with a number of rooms. The floor plan of this section of the house can be represented as a string with N ($1 \le N \le 200{,}000$) characters, each of which is either a "`.`" (representing empty space) or a "`#`" (representing a wall). A room is a maximal consecutive sequence of empty space in this floor plan. That is, each room is either preceded by a wall or is at the start of the floor plan. Similarly, each room is followed by a wall or is at the end of the floor plan. The floor plan includes at least one room.

No doubt you're familiar with the rules of hide and seek – Laurie is hiding in one of the rooms, and it's Michael's job to find her. When he enters a room, he can immediately determine if Laurie is hiding anywhere in it, so he could simply visit each of the rooms in the hallway and be sure to find her eventually.

However, maybe he can do even better than that. Michael has a superb sense of hearing, so when he enters a room, he can also determine if Laurie is hiding in any of the rooms which are no further than D ($1 \le D \le 10^9$) units away from that room. The distance between two rooms (in units) is equal to the minimum distance between any parts of those rooms in the floor plan (in characters). For example, if the floor plan is "`.#..##..`", then the distance between the left room and the middle room is 2, the distance between the middle room and the right room is 3, and the distance between the left room and the right room is 6.

Michael is certainly looking forward to winning this game of hide and seek, but he values efficiency. He's wondering – what's the minimum number rooms which he must enter in order to guarantee that he'll determine Laurie's location, no matter which room she's hiding in? In particular, to ensure victory, every room in the hallway must be within D units of at least one of Michael's chosen rooms.

In test cases worth 6/30 of the points, $N \le 1000$ and $D = 1$.
In test cases worth another 12/30 of the points, $N \le 1000$.

Input Format

The first line of input consists of two space-separated integers N and D. The second line consists of a single string representing the floor plan.

Output Format

Output one line consisting of a single integer – the minimum number of rooms which Michael must enter to determine Laurie's location.

Sample Input

```
22 4
..#.#...##.#.....###.#
```

Sample Output

```
2
```

Sample Explanation

There are 6 rooms in the house. If Michael enters the 3rd room from the left, he'll be able to hear if Laurie is in any of the 4 leftmost rooms. If he enters the 5th room from the left, he'll be able to hear if she's in any of the 3 rightmost rooms. Therefore, entering the 3rd and 5th rooms from the left will be sufficient. Entering the 3rd and 6th rooms from the left would also do the job.

Problem J4: Alucard's Quest

40 Points / Time Limit: 4.00s / Memory Limit: 64M *Submit online: wcipeg.com/problem/wc161s2*

What a horrible night to have a curse! Alucard has returned to the ancient castle of his evil father, Dracula, determined to wake him from his slumber and then destroy him once and for all. However, something tells him that it won't be easy - though Dracula remains fast asleep in his coffin for now, his monstrous servants are scattered throughout the castle, armed to the teeth and hungry for blood.

The castle consists of N ($1 \le N \le 200{,}000$) chambers, with $N - 1$ passageways running between them. The i-th passageway connects distinct chambers A_i and B_i ($1 \le A_i, B_i \le N$), and has M_i ($1 \le M_i \le 5000$) monsters in it. It's possible to reach any chamber from any other chamber by following a sequence of one or more passageways – in other words, the system of chambers and passageways forms a tree structure when modelled as a graph.

Dracula's resting place is in the 1st chamber, and fortunately for Alucard, he's already infiltrated the castle and also finds himself in the 1st chamber! However, he's realized that he's not quite ready to battle Dracula yet. In order to stand a chance, Alucard will surely need some holy water, stronger weapons (a whip should come in handy), a wider range of magical spells to cast, and of course an oak stake to plunge into his father's heart and finish him off permanently. In particular, Alucard will first need to gather K ($1 \le K < N$) items. Conveniently, all of these items can be found in distinct chambers of Dracula's castle, with the i-th item in chamber C_i ($2 \le C_i \le N$).

Alucard will need to travel around the castle through its passageways, starting from the 1st chamber, visiting all K chambers that contain his required items (in any order), and arriving back in the 1st chamber to finally wake and confront Dracula. If he chooses to travel through a passageway that contains m monsters, he'll first need to destroy them by casting a spell and using up m of his "magic points". That passageway will then be permanently cleared of monsters, so he'll be able to freely travel through it any number of times afterwards.

Conserving magic points for his battle with Dracula is vital, so Alucard will need to carefully plan out a route through the castle which will allow him to collect all K items while requiring him to use as few magic points as possible. Can you help him?

In test cases worth 6/40 of the points, $N \le 1000$ and $K = 1$.
In test cases worth another 14/40 of the points, $N \le 1000$.

Input Format

The first line of input consists of two space-separated integers N and K.
$N - 1$ lines follow, with the i-th of these lines consisting of three space-separated integers A_i, B_i, and M_i (for $i = 1..N - 1$).
K lines follow, with the i-th of these lines consisting of a single integer C_i (for $i = 1..K$).

Output Format

Output one line consisting of a single integer – the minimum number of magic points required for Alucard to collect all K items and return to Dracula's chamber.

Sample Input

```
7 4
1 2 5
1 7 2
2 4 3
2 5 8
5 6 1
7 3 10
4
5
3
7
```

Sample Output

```
28
```

Sample Explanation

One optimal route that Alucard can take, passing through all 4 chambers that contain items and then returning to the 1st chamber, is as follows:

- 1 → 7 (2 magic points)
- 7 → 3 (10 magic points)
- 3 → 7 (already cleared)
- 7 → 1 (already cleared)
- 1 → 2 (5 magic points)
- 2 → 4 (3 magic points)
- 4 → 2 (already cleared)
- 2 → 5 (8 magic points)
- 5 → 2 (already cleared)
- 2 → 1 (already cleared)

The total number of magic points required on this route is 2 + 10 + 5 + 3 + 8 = 28.