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[[bob, golf'] [bob, pizza]].

Problem A
Common Interests

Everybody has various topics that they are interested in. For example, I may be interested in math, while you may be interested in golf.

Given the interests of various people, your goal is to answer queries of the form: Does person X and Y share a common interest?

Input

The first line of the input contains an integer N ($1 \leq N \leq 100\,000$), the number of interest pairs.

Each of the next N lines contain the name of a person and one of their interests, separated by a space. Names and interests consist of 1 to 5 lowercase letters. No (person, interest) pair will be repeated. A given string will never be both a person and an interest.

The next line of the input is an integer Q ($1 \leq Q \leq 100\,000$), the number of queries.

Each of the next Q lines contain the name of two different persons separated by a space. It is guaranteed that a person here will have at least one interest given before.

Output

For each query, output a line with "Yes" if the two persons share at least one common interest, and "No" otherwise.

Sample Input	Sample Output
6 bob golf bob pizza suzy magic andy bugs suzy golf andy math 3 bob suzy bob andy suzy andy	Yes No No

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Problem B
Grenade

Zhan Wok is trapped in a catatomb he was escaping from. Enemies are everywhere and even though Zhan Wok has god like dexterity, he can't hope to outrun them all.

Out of bullets, Zhan Wok has resorted to using grenades. Zhan Wok is so good at throwing grenades he can make sure the grenade lands and explodes exactly where he wants. He also has super human surrounding awareness he knows exactly where every enemy is, namely a coordinate (x, y).

Zhan Wok's grenade has an explosion radius of R. Zhan Wok's enemies have a volume, and interestingly enough, they're also perfectly circular, have radius R, and can overlap.

When a grenade explodes, anyone that comes in contact with the grenade, even if they're barely within range of the explosion, gets game ended instantly.

Zhan Wok wants to know if there is a place he can throw his grenade such that it game ends every enemy. If this is not possible, he will have to do Jiu-Jitsu.

Input

The first line of the input contains two integers N, the number of enemies, and R, the grenade's blast radius as well as enemy's radius. It is guaranteed that $1 \leq N \leq 500$ and $1 \leq R \leq 10^6$.

The next N lines each contains two integers, x, y, where x, y indicate the coordinate position of the enemy. It is guaranteed that $-10^6 \leq x, y \leq 10^6$, and that all enemies are at distinct locations.

Output

Output "possible" if it's possible to game end every enemy with a single grenade, or "impossible" otherwise. Note that the judge's answer is guaranteed to be the same for $R \pm 10^{-6}$.

Sample Input	Sample Output
2 2 0 0 0 5	possible

Sample Input	Sample Output
2 1 0 0 5 5	impossible

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Problem C
Voting

The High Table is electing their new leaders. The current leaders decided that the standard voting procedure is not bureaucratic enough, so they came up with a great new idea: only the High Table leaders are allowed to vote!

Each leader on the High Table will write down the name of M distinct candidates who are not currently on the High Table on their secret ballot. The candidates whose names appear on all the ballots will become the new leaders. Otherwise, the current leaders remain in power.

Rowhn Jick suspects the current leaders are just trying to remain in power forever. He wants to know the number of distinct ballot configurations such that the current leaders remain in power. Ballot configuration A is different from B if at least one of the High Table member's ballot from A contains a name which doesn't exist in their ballot from B.

Input

The only line of the input contains three integers, M, the number of candidates names members must write on their ballot, K, the number of High Table members, and N, the number of candidates. It is guaranteed that $1 \leq K, M \leq 5\,000$, and $max(K, M) \leq N \leq 100\,000$

Output

Output a single integer representing the number of distinct ballot configurations in which the current leaders remains leaders. Since this number may be very large, print the number modulo $10^9 + 7$.

Sample Input	Sample Output
2 2 3	0

M. names

Sample Input	Sample Output
2 2 4	6

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d20 20.

Problem D
Zion's Grocery Store

A few months ago Lohn Lick and his best friend Lomas Landerson moved to Zion. After eating out for the past month they decided to go to the nearest grocery store to pick up some ingredients so they could meal prep for the next week. After arriving at the grocery store they started to go through their list, picking up ingredients one at a time.

After a few minutes Lomas realized something, each product had an alphanumeric SKU (Stock Keeping Unit) S associated with it and if the sum of the last 3 digits of the SKU could be evenly divided by 5 it meant that the product was 50% off! Unfortunately, each product on sale can only be purchased 1 time.

After Lomas revealed this information to Lohn, Lohn had a stroke of genius! If they ignored their original list and instead bought each item in the grocery store that was 50% off they could save a ton of money in the future!

Given a list of SKU numbers S and ***original*** prices P for each product in the store find the total cost of items they brought.

Input

The first line of the input contains one integer N ($1 \leq N \leq 100$), indicating the number of products in the store The following N lines each contains an alphanumeric SKU S which is at most 32 characters long, and an even non-negative integer price P ($0 \leq P \leq 2^{16}$). The last 3 characters of the SKU will always be non-negative integers.

65536.

Output

Output a single integer O, the total cost of all the items they bought.

Sample Input

```
4
a4bc23a456 200
3r4iw9e222 4
z223 90000
yyy442 2
```

Sample Output

```
101
```

Sample Input

```
2
acpc820 4000
1sgr3at320 38
```

Sample Output

```
2019
```

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Problem E
Androids' Frontline

You are the newly appointed commander of the K&G private military contractor group and your first missions is to lead a team to infiltrate the enemy headquarters!

Luckily, you will have some help from allies already positioned in the field, and bases to increase your supplies. The area is split into nodes labelled 0 to $N-1$. The team you're to lead starts at node 0 and must make their way to node $N-1$.

Unfortunately, you remember that the team isn't full of robots that can keep on going forever, so you'll need to find the path that uses the least number of movement points so they'll still have the energy to fight once they've arrived. Movement from one node to a connected node costs exactly one movement point. Your team will start with 2 movement points, and for each base on the map, you'll get an additional point.

There's also one more thing to keep in mind: if the team and an ally are on adjacent nodes, they can swap positions without expending any movement points! Knowing this, what is the fewest number of movement points that the team will need to use to reach the enemy base?

Input

The first line contains four integers $1 \leq N \leq 100$, the number of nodes of the map, $0 \leq M \leq \frac{N(N-1)}{2}$, the number of paths of the map, and $0 \leq B < N$, the number of bases on the map, and $0 \leq A < N$, the number of allies on the map.

The next line contains A space separated integers $(1 \leq a_i \leq B)$ where each a_i denotes an ally is currently positioned at node a_i. Nodes 0 and $N-1$ are guaranteed to never have allies on them.

Each of the next M lines contains two integers $0 \leq u, v < N$, indicating that there is a path from node u to node v.

It is guaranteed that any node will be reachable from any other node, given infinite movement points.

Output

Output a single integer indicating the minimal number of moves required to travel from node 0 to node $N-1$. If it is impossible to reach the $N-1$-th node with your current number of movement points, output -1.

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Sample Input	Sample Output
7 7 0 3 1 2 3 0 1 1 2 2 3 0 4 4 5 3 6 5 6	1

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Problem F
Hans Vick

Hans Vick is a legendary assassin that is out for vengeance after the son of a certain gang leader raided his home. The plan is simple: infiltrate the enemy's hideout, knocking out every goon he runs across with his sleep dart gun.

After breaking into the top floor of the hideout where the gang's leader resides, Hans Vick realizes that he's been swapping magazines even if he hasn't used up every dart in a magazine. While some magazines might be totally empty, others might still have quite a bit left in them.

Being the god-like assassin that he his, he only ever needs one shot to knockout an enemy, and the only time Hans Vick can take any damage to his h health points is when he reloads. In fact, he is so good that for every reload he does, he will always only ever take a fixed d amount of damage to his health points.

Given the number of remaining darts in each of his m magazines, how many enemies will Hans Vick be able to take out before having to retreat, assuming there will always be an infinite number of enemies to knockout? Hans Vick's gun will always start with the magazine that will ensure the optimal number of downed enemies.

Hans Vick must retreat the moment he runs out of ammo or his health points are ever reduced to or below 0.

Input

The first line contains three integers $1 \le h \le 10^6, 0 \le d \le 10^6$, and $0 \le m \le 10^6$.

The next line contains m integers where the i-th integer is the number of remaining darts in the m_i-th magazine where $0 \le m_i \le 30$.

Output

Output the maximum number of enemies Hans Vick can knockout before having to retreat.

Sample Input	Sample Output
health 20 5 5 Damage 30 0 15 3 22	70

Sample Input	Sample Output
13 15 3 7 24 18	24

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Problem G
High Table

The High Table is a shadowy international organization of assassins. Their influence and power reach far and wide.

Various entities serve the High Table, e.g. a hired assassin serves the High Table, the Continental hotel chain serves the High Table, and Sushi Gang serves the High Table.

Entities don't have to directly serve the High Table, they can serve other entities instead. E.g. a hotel staff serves the Continental hotel, which in turn serves the Table. In this case, the hotel staff still serves the Table, just indirectly.

Every entity serves exactly one other entity, e.g. a hotel staff can not serve both the Continental hotel and Sushi Gang at the same time. But one entity can have many entities serving it, e.g. the Continental hotel has many staff members.

These is one entity that does not serve anyone - the High Table itself.

The High Table wants to kill John Wick, but John Wick has friends, e.g. the Continental hotel is willing to defect from the High Table and help John Wick instead. When an entity X decides to defect, all entities that serve X, directly or indirectly, also defect from the High Table.

Given a set of serving relations, and a set of entities that are going to defect, the High Table wants to know whether there will be more entities on their side or more entities will end up helping John Wick. And you have been hired by the High Table to find out!

Input

The first line of the input contains 2 integers N ($1 \leq N \leq 100\,000$), the number of entities in total, and M ($0 \leq M \leq N$), the number of entities that initially defects.

Each entity is coded with an integer between 0 and $N-1$, inclusive. The High Table is coded 0.

$N-1$ lines follow, in these lines, the i-th line contain 1 integer X_i, ($0 \leq X_i \leq i$), this denotes that entity $i+1$ serves entity X_i.

The next M lines contain 1 integer X, denoting the entity coded X initially defects.

Output

Output a line with "We are High Table." if more entities serve the High Table, "We are NYC." if more entities defects, and "I'd say the odds are about even." if the number of entities serving is equal to the number of entities defecting.

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Sample Input

```
11 4
0
0
1
1
2
2
2
3
3
6
1
3
5
6
```

Sample Output

```
We are NYC.
```

Sample Input

```
3 0
0
1
```

Sample Output

```
We are High Table.
```

Sample Input

```
2 1
0
1
```

Sample Output

```
I'd say the odds are about even.
```

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Problem H
Zencrypted Zessage

Zohn Zick is in a load of trouble! He was spotted during a reconnaissance mission in enemy territory and has run out of ammo. Luckily he receives a message from his friend about a secret escape tunnel used for exfiltration. Since his friend wasn't sure that the message was guaranteed to reach Zohn Zick he decided to encrypt it so that only Zohn would be able to find the passage.

The encrypted letter contains two things: the message itself and a list of Pairabellums. In Zohn's line of work, the Pairabellum is a pair of numbers marking a position and an associated priority for it. In order to decrypt the message, he'll need to split up the original at these positions to form new substrings. By reordering these substrings in increasing priority, he can find the true message and make his getaway.

The letter contains the string "lopeflapenve". Following it are three Pairabellums: $(4, 20)$, $(0, 3)$, and $(8, 0)$. From these positions Zohn splits the message into the substrings "lope", "flap", and "enve", with priorities 3, 20, and 0 respectively. A quick reordering reveals the real message: "envelopeflap". Flipping the flap back, he finds hidden behind it another encrypted messsage.

Given this encrypted message and it's Pairabellums, find the decoded message so that Zohn can finally get out!

Input

The first line contains two integers $1 \leq m \leq n \leq 100\,000$, the length of the secret message and the number of characters which have a priority.

The next line contains a string of length n, consisting of only lower case alphabets.

m lines follow. Each line contains two integers x_i, j_i, $0 \leq i < m$, indicating character x_i has a priority y_i, $0 \leq x_i < n$, $0 \leq y_i < m$. x_i's are unique and y_i's are unique for all $0 \leq i < n$. It's guaranteed one $x_i = 0$.

Output

Output the decrypted message.

Sample Input	Sample Output
8 2 sidewest 0 1 4 0	westside

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Sample Input	Sample Output
3 3 abc 0 100 2 1 1 10	cba