2020 Luogu Multi-University Spring Training Contest Day 2

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You may enable O2 optimization when submitting solutions.

Problem A. Misaka Network

Input file:	`stdin`
Output file:	`stdout`
Time limit:	1 seconds
Memory limit:	256 megabytes

A Misaka Network is formed by Misakas and by edges connecting pairs of Misakas, each edge has an orientation, from one Misaka to another Misaka. There is no weight on the edge, and from every Misaka you can't go back to the Misaka you start, which means Misaka Network is a directed acyclic unweighted graph. One day, Misakamisaka (the master of Misaka Network) wants to select some of Misakas in the network to be the controller of the Misaka Network so that every other Misaka is controlled by at least one controller Misaka, which means that there is a edge from some controller to it.

To have more time play with Accelerator, Misakamisaka wants to choose as few Misakas as possible. Can you help her?

Input

The first line contains two integers n, m separated by spaces ($1 \leq n \leq 10^5, 1 \leq m \leq 10^6$) — the number of Misakas and the number of edges.

The following m lines describe the directional edges in the graph. The i-th lines contains two integers u_i and v_i ($1 \leq u_i, v_i \leq n$), representing that the i-th edge is from u_i to v_i.

Output

Print the minimum number of controllers Misakamisaka need to choose.

Examples

stdin	stdout
6 5 1 2 2 3 3 4 4 5 5 6	3
10 15 7 6 3 2 4 1 10 5 4 7 8 9 8 2 8 3 1 10 7 6 8 9 7 8 10 3 7 10 2 6	4

Problem B. Mana Eel's Problem

Input file:	`stdin`
Output file:	`stdout`
Time limit:	2 second
Memory limit:	512 megabytes

Given a sequence $a_1, a_2, ..., a_n$of length n and a integer x, you have to answer q queries.

Each query contains two integers l, r, and you have to calculate

$$\prod_{i=l}^{r} (\mu(a_i) + a_i + x) \mod 998244353$$

where $\mu(n)$ is mobius function:

$$\mu(n) = \begin{cases} 1 & , \text{if } n = 1 \\ (-1)^k & , \text{if } n = \prod_{i=1}^{k} p_i (p_1, p_2, \ldots, p_k \text{ are distinct prime numbers}) \\ 0 & , \text{others} \end{cases}$$

It's guaranteed that $1 \le n, q \le 3 * 10^5$, $0 \le x < 998244353$,$1 \le a_i \le 10^{15}$, $LCM(a_1, a_2, ..., a_n) \le 10^{15}$, $1 \le l \le r \le n$.

Input

The first line contains three numbers n, q, x.

The second line contains n numbers $a_1, a_2, ..., a_n$.

The next q lines represent queries, each contains two numbers l, r, .

Output

q lines, the i-th line represents the answer of i-th query.

Examples

stdin	stdout
5 3 0 1 2 3 4 5 2 3 1 2 1 5	2 2 64

Problem C. Schedule

Input file:	`stdin`
Output file:	`stdout`
Time limit:	2 seconds
Memory limit:	512 megabytes

At the beginning of the semester, you received the schedule of each course. You found that you have lots of classes to attend everyday and it's hard for you to read the schedule.

The format of schedule is described below..

```

 The first line contains the name of course and ends with a single comma. The name only
    contains letters and space, and the maximum length of it is 80.

 The several lines follow describes the time of classes. Each of them is formatted as '<
    start week>-<end week> <weekday> <start lesson>-<end lesson>'.

 For example, '1-16 Mon 3-4' means you will have the class on the 3rd and 4th lesson, from
    week 1 to week 16 (inclusive).

So, you decided to make a daily schedule for specific week and weekday.
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The format of daily schedule is described below.

```

The daily schedule includes several lines, describes the time of classes. Each of line is
    formatted as '<start lesson>-<end lesson> <course name>'.

 For example '3-4 Calculus' means you will have Calculus on the 3rd and 4th lesson on that
    day.

The schedule should be arranged in lesson number ascending order, and it's guaranteed that
    you won't have two classes at same time. There may be several classes of same course in
    one day, and you should print them separately.

Lessons are numbered from 1 to 12, weeks are numbered from 1 to 10000, and you'll only have
    classes on weekday Mon, Tue, Wed, Thu, Fri.
```

For given week and weekday, please output the daily schedule.

Input

The first line contains an integer n, ($1 \le n \le 10^4$), representing the number of courses. Then n courses follow, formatted as described above.

Then next line contains an integer q, ($1 \le q \le 10^4$), followed by q lines representing queries. Each query contains the number of week and the name of weekday, seperated by a space. It's guaranteed that there will be at least one class on that day.

The input contains no more than 10^5 lines.

Output

Print the daily schedule for each query. Seperate them with a single blank line.

Examples

stdin	stdout
10 Calculus: 1-16 Mon 3-4 1-15 Wed 5-6 1-15 Fri 1-2 Discrete Mathematics: 1-10 Mon 1-2 1-10 Wed 7-8 Linear Algebra: 1-10 Mon 7-8 1-10 Wed 1-2 Physics: 1-16 Mon 5-6 1-16 Wed 3-4 1-1 Thu 9-12 Physics Experiment: 2-8 Fri 5-8 English: 2-15 Tue 3-4 2-15 Thu 1-2 History: 1-16 Tue 1-2 Physical Education: 1-16 Tue 5-6 Social Practice: 17-18 Wed 3-4 Trash: 3-5 Thu 5-6 3 5 Mon 15 Mon 6 Thu	1-2 Discrete Mathematics 3-4 Calculus 5-6 Physics 7-8 Linear Algebra 3-4 Calculus 5-6 Physics 1-2 English

Problem D. Voluntary Hotel

Input file:	stdin
Output file:	stdout
Time limit:	3 seconds
Memory limit:	512 megabytes

The map of Wuhan can be represented as a connected simple graph with n vertices , numbered from 1 to n and connected by m two-way roads. There are p hospitals on some vertices and r doctors. Because the public transport has been shut down, each doctor has to walk from their home to some hospital every morning.

To help doctors, q hotels offer rooms to them. If a doctor choose to stay in a hotel, then in the morning they will go from the hotel instead. However, i-th hotel can hold at most h_i doctors.

Every doctor will choose the shortest path when they go to work. Let d be the longest distance that a doctor walks. You need to find a plan to minimize d.

Input

The first line contains 5 integers n, m, p, q, r $1 \leq n \leq m \leq 10^4, 1 \leq p, q \leq 100, 1 \leq r \leq 10^6$.

The following m lines represents edges.

Each line contains three integers $u, v, w (1 \leq u, v \leq n, 1 \leq w \leq 10^9)$, denoting a edge between u and v with distance w.

The following line contains p integers $x_1, x_2, ..., x_p$. $1 \leq x_i \leq n$ denotes the vertex where i-th hospital is.

The following q lines describe hotels, each of them contains two integers $y_i, h_i, (1 \leq y_i \leq n, 1 \leq h_i \leq 10^6)$, representing that i-th hotel is in vertex y_i and can hold h_i doctors at most.

The following r lines describe doctors, each of them contains two integers $s_i, k_i, (1 \leq s_i \leq n, 1 \leq k_i \leq p)$, representing that i-th doctor lives in vertex s_i and works in hospital k_i.

Output

Print one integer, the minimum d.

Examples

stdin	stdout
6 6 1 1 3 1 2 20 2 3 2 3 1 5 1 4 2 2 5 10 3 6 10 1 4 2 5 1 6 1 5 1	15

Problem E. Anan and Minecraft

Input file:	stdin
Output file:	stdout
Time limit:	1 second
Memory limit:	128 megabytes

During the long long long long winter holiday, Anan spent lots of time playing an amazing game called Minecraft with his friends.

Today, Anan wants to build transportation system in his world. His world has $n(1 \leq n \leq 10^5)$ landscapes. Anan wants to build railway system and iceway system between these landscapes.Totally, he wants to build $m(1 \leq m \leq 2 \times 10^5)$ edges between these landscapes,and he will never build parallel edges and self-loops.

When Anan is building edges, he has two options:

- 1 u v:build a railway road between the landscape u and v.

- 2 u v:build a iceway road between the landscape u and v.

All the road he builds are bidirectional. When he builds roads, he became curious about if his railway system and iceway system are **equal connected**. We call the system equal connected when $\forall u, v$,if u, v are connected by railway, they must be connected by iceway,which means u can reach v by both iceway and railway, and v can also reach u by both iceway and railway.

You should answer him after he builds every edge.

Input

The first line contains two integers u, v .

the following m lines, each line has three integers, the meaning just as below.

Output

m lines, for each line, a sigle upper-case letter A if the system is equal-connected after building this edge, otherwise a single upper-case letter B.

Examples

stdin	stdout
3 3 1 1 3 2 1 3 2 2 1	B A B

Problem F. Rebuild Teldrassil

Input file:	stdin
Output file:	stdout
Time limit:	2 second
Memory limit:	128 megabytes

Teldrassil, the World Tree was once the home of night elfs until the Sylvanas Windrunner burned it and the war between the Alliance and the Horde broke out again.

After the war, night elfs want to rebuild the World Tree in order to have a new hometown. The new World Tree has $n(1 \leq n \leq 300000)$ nodes and $n-1$ roads connecting them.Because the short of resources, there is only one path between every pair of nodes.The node i has a popularity $a_i(1 \leq a_i \leq 10^9)$. For every simple path of the World Tree, if the median popularity (If the number of nodes is even then the median is greater of two middle values) of all the nodes of the path is at least $x(1 \leq x \leq 10^9)$, we call the path a **important path**. Obviously, there are $\frac{n\times(n-1)}{2}$ paths in the tree.

Now the leader of night elfs, Malfurion Stormrage, wants to choose a node to be the capital node of night elfs. There is only one capital node and he can increase its popularity to any number he likes. To build a better home for night elfs, Malfurion Stormrage wants to maximize the number of new important paths. Help him to do that.

Input

he first line of the input contains two integers n and x .

Next n $-$ 1 lines describe the roads of Teldrassil. Each of them contains two integers — nodes connected by a road. Nodes are numbered 1 through n.

The last line of the input contains n integers ,represents a

Output

One single number, represents the maximum number of new important paths after choosing capital.

Examples

stdin	stdout
3 3 1 2 2 3 1 2 3	2

Problem G. Mana Eel's Graph

Input file:	stdin
Output file:	stdout
Time limit:	1 second
Memory limit:	128 megabytes

Given a undirected graph with n nodes and m edges, each node has its value a_i and weight b_i.

We define a subgraph G 's value $A(G) = \prod_{u \in G} a_u$, and its weight is $B(G) = \prod_{u \in G} b_u$

Now we want to choose all non-empty subgraph G' which is a clique (a clique is a complete graph). Let X be the sum of $A(G')$ of all cliques, Y be the sum of $B(G')$ of all cliques. You should tell us the value $X \times Y \mod 998244353$.

It't guaranteed that $1 \leq n \leq 40$, $1 \leq m \leq \frac{n \times (n-1)}{2}$, $1 \leq a_i, b_i \leq 10^9$.

The given graph doesn't have loop or multiedge.

Input

The first line contains two integers n, m.

The next m lines describe the graph: Each line contains two integers u, v, representing an edge between u and v.

The next line contains n numbers $a_1, a_2, ..., a_n$.

The next line contains n numbers $b_1, b_2, ..., b_n$.

Output

An integer representing the answer in a single line.

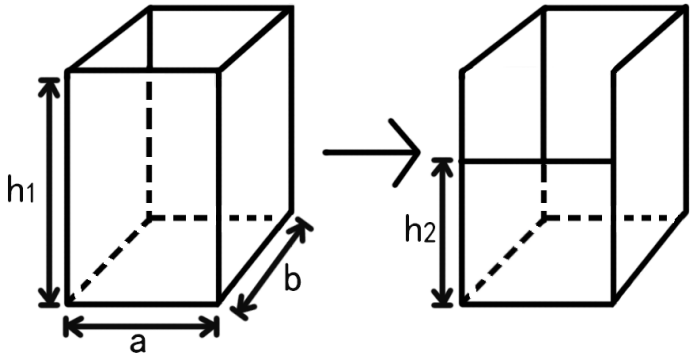
Examples

stdin	stdout
3 2 1 2 1 3 1 2 3 1 2 3	121
5 6 1 2 1 3 1 4 1 5 2 3 2 4 1 2 3 4 5 5 4 3 2 1	10545

Problem H. Fetch spring water

Input file:	`stdin`
Output file:	`stdout`
Time limit:	1 seconds
Memory limit:	128 megabytes

Umiki is playing FFXIV, as a warrior of light, Umiki needs to run errands for others. One day she needs to collect pure spring water at the sacred peak in the Far East. She usually holds water in a open-top cubic container ($a$cm $\times$ $b$cm $\times$ $h_1$cm). But she accidentally broke the upper part of it's front face, causing which became a smaller rectangle as the picture shown below.



Now, she wants to know, after broken, how much water she can fetch pre time at most. She can rotate the container to hold more water, and no water will spill out during transportation.

The answer is guaranteed to be an integer.

Input

The only line of the input contains four integers a, b, h_1, h_2 separated by spaces($1 \leq a, b, h_1, h_2 \leq 2.5 \times 10^6, h_2 \leq h_1$)

Output

Print the maximum volume of water (in cm^3) she can fetch each time.

Examples

stdin	stdout
8 8 8 8	512
8 7 6 5	308