Codeforces Round #259 (Div. 1)

A. Little Pony and Expected Maximum

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Twilight Sparkle was playing Ludo with her friends Rainbow Dash, Apple Jack and Flutter Shy. But she kept losing. Having returned to the castle, Twilight Sparkle became interested in the dice that were used in the game.

The dice has m faces: the first face of the dice contains a dot, the second one contains two dots, and so on, the m-th face contains m dots. Twilight Sparkle is sure that when the dice is tossed, each face appears with probability $\frac{1}{m}$. Also she knows that each toss is independent from others. Help her to calculate the expected maximum number of dots she could get after tossing the dice n times.

Input

A single line contains two integers m and n ($1 \leq m, n \leq 10^5$).

Output

Output a single real number corresponding to the expected maximum. The answer will be considered correct if its relative or absolute error doesn't exceed 10^{-4}.

Sample test(s)

input
6 1
output
3.500000000000

input
6 3
output
4.958333333333

input
2 2
output
1.750000000000

Note

Consider the third test example. If you've made two tosses:

1. You can get 1 in the first toss, and 2 in the second. Maximum equals to 2.
2. You can get 1 in the first toss, and 1 in the second. Maximum equals to 1.
3. You can get 2 in the first toss, and 1 in the second. Maximum equals to 2.
4. You can get 2 in the first toss, and 2 in the second. Maximum equals to 2.

The probability of each outcome is 0.25, that is expectation equals to:

$$(2 + 1 + 2 + 2) \cdot 0.25 = \frac{7}{4}.$$

You can read about expectation using the following link: http://en.wikipedia.org/wiki/Expected_value

B. Little Pony and Harmony Chest

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Princess Twilight went to Celestia and Luna's old castle to research the chest from the Elements of Harmony.

A sequence of positive integers b_i is harmony if and only if for every two elements of the sequence their greatest common divisor equals 1. According to an ancient book, the key of the chest is a harmony sequence b_i which minimizes the following expression:

$$\sum_{i=1}^{n} |a_i - b_i|.$$

You are given sequence a_i, help Princess Twilight to find the key.

Input

The first line contains an integer n $(1 \le n \le 100)$ — the number of elements of the sequences a and b. The next line contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 30)$.

Output

Output the key — sequence b_i that minimizes the sum described above. If there are multiple optimal sequences, you can output any of them.

Sample test(s)

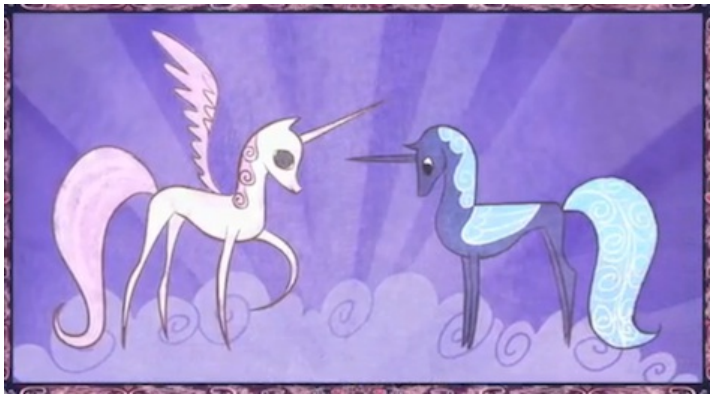
input
5 1 1 1 1 1
output
1 1 1 1 1

input
5 1 6 4 2 8
output
1 5 3 1 8

C. Little Pony and Summer Sun Celebration

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Twilight Sparkle learnt that the evil Nightmare Moon would return during the upcoming Summer Sun Celebration after one thousand years of imprisonment on the moon. She tried to warn her mentor Princess Celestia, but the princess ignored her and sent her to Ponyville to check on the preparations for the celebration.



Twilight Sparkle wanted to track the path of Nightmare Moon. Unfortunately, she didn't know the exact path. What she knew is the parity of the number of times that each place Nightmare Moon visited. Can you help Twilight Sparkle to restore any path that is consistent with this information?

Ponyville can be represented as an undirected graph (vertices are places, edges are roads between places) without self-loops and multi-edges. The path can start and end at any place (also it can be empty). Each place can be visited multiple times. The path must not visit more than $4n$ places.

Input

The first line contains two integers n and m ($2 \le n \le 10^5$; $0 \le m \le 10^5$) — the number of places and the number of roads in Ponyville. Each of the following m lines contains two integers u_i, v_i ($1 \le u_i, v_i \le n$; $u_i \neq v_i$), these integers describe a road between places u_i and v_i.

The next line contains n integers: $x_1, x_2, ..., x_n$ ($0 \le x_i \le 1$) — the parity of the number of times that each place must be visited. If $x_i = 0$, then the i-th place must be visited even number of times, else it must be visited odd number of times.

Output

Output the number of visited places k in the first line ($0 \le k \le 4n$). Then output k integers — the numbers of places in the order of path. If $x_i = 0$, then the i-th place must appear in the path even number of times, else i-th place must appear in the path odd number of times. Note, that given road system has no self-loops, therefore any two neighbouring places in the path must be distinct.

If there is no required path, output `-1`. If there multiple possible paths, you can output any of them.

Sample test(s)

input

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

output

```
3
1 2 3
```

input

```
5 7
1 2
1 3
1 4
1 5
3 4
3 5
4 5
0 1 0 1 0
```

output

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

input

```
2 0
0 0
```

output

```
0
```

D. Little Pony and Elements of Harmony

time limit per test: 6 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

The Elements of Harmony are six supernatural artifacts representing subjective aspects of harmony. They are arguably the most powerful force in Equestria. The inside of Elements of Harmony can be seen as a complete graph with n vertices labeled from 0 to $n - 1$, where n is a power of two, equal to 2^m.

The energy in Elements of Harmony is in constant movement. According to the ancient book, the energy of vertex u in time i ($e_i[u]$) equals to:

$$e_i[u] = \sum_v e_{i-1}[v] \cdot b[f(u, v)].$$

Here $b[]$ is the transformation coefficient — an array of $m + 1$ integers and $f(u, v)$ is the number of ones in the binary representation of number $(u \ xor \ v)$.

Given the transformation coefficient and the energy distribution at time 0 ($e_0[]$). Help Twilight Sparkle predict the energy distribution at time t ($e_t[]$). The answer can be quite large, so output it modulo p.

Input

The first line contains three integers m, t and p ($1 \le m \le 20$; $0 \le t \le 10^{18}$; $2 \le p \le 10^9$). The following line contains n ($n = 2^m$) integers $e_0[i]$ ($1 \le e_0[i] \le 10^9$; $0 \le i < n$). The next line contains $m + 1$ integers $b[i]$ ($0 \le b[i] \le 10^9$; $0 \le i \le m$).

Output

Output n lines, the i-th line must contain a single integer $e_t[i]$ modulo p.

Sample test(s)

input
2 2 10000 4 1 2 3 0 1 0
output
14 6 6 14

E. Little Pony and Lord Tirek

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Lord Tirek is a centaur and the main antagonist in the season four finale episodes in the series "My Little Pony: Friendship Is Magic". In "Twilight's Kingdom" (Part 1), Tirek escapes from Tartarus and drains magic from ponies to grow stronger.

The core skill of Tirek is called Absorb Mana. It takes all mana from a magic creature and gives them to the caster.

Now to simplify the problem, assume you have n ponies (numbered from 1 to n). Each pony has three attributes:

- s_i : amount of mana that the pony has at time 0;
- m_i : maximum mana that the pony can have;
- r_i : mana regeneration per unit time.

Lord Tirek will do m instructions, each of them can be described with three integers: t_i, l_i, r_i. The instruction means that at time t_i, Tirek will use Absorb Mana on ponies with numbers from l_i to r_i (both borders inclusive). We'll give you all the m instructions in order, count how much mana Tirek absorbs for each instruction.

Input

The first line contains an integer n $(1 \le n \le 10^5)$ — the number of ponies. Each of the next n lines contains three integers s_i, m_i, r_i $(0 \le s_i \le m_i \le 10^5; 0 \le r_i \le 10^5)$, describing a pony.

The next line contains an integer m $(1 \le m \le 10^5)$ — the number of instructions. Each of the next m lines contains three integers t_i, l_i, r_i $(0 \le t_i \le 10^9; 1 \le l_i \le r_i \le n)$, describing an instruction of Lord Tirek. The instructions are given in strictly increasing order of t_i (all t_i are distinct).

Output

For each instruction, output a single line which contains a single integer, the total mana absorbed in this instruction.

Sample test(s)

input
5 0 10 1 0 12 1 0 20 1 0 12 1 0 10 1 2 5 1 5 19 1 5
output
25 58

Note

Every pony starts with zero mana. For the first instruction, each pony has 5 mana, so you get 25 mana in total and each pony has 0 mana after the first instruction.

For the second instruction, pony 3 has 14 mana and other ponies have mana equal to their m_i.