Cars

Pepe is the manager of a racing club. There are N racers numbered from 1 to N who race every day in the club. The speed of the ith racer's car is $A[i]$ meters per second. Each car starts from 0 meter from the starting line. The speed of a car may change every day due to damages or upgrades. However, for a single race, each car races with a constant speed without any breaks.

Believe it or not, Pepe loves problems solving. Since he is bored watching races everyday, he sometimes comes up with a problem that looks like this: how many cars have been in between X meters and Y $(X \leq Y)$ meters, inclusive, from starting line for at least a moment from L seconds to R seconds inclusive. Pepe have asked you to solve this problem.

You have to handle queries for Q days. Each day, one of the following will happen:

- Query type 1: the speed of the ith car changes to S meters per second.
- Query type 2: for this day's race, Pepe comes up with the problem explained above. Each day he comes up with new X, Y, L, and R.

For each query of type 2, help Pepe solve the problem.

Input

Input will be given in the following format.

- line 1: N
- line 2: $A[1]\ A[2]\ \ldots\ A[N]$
- line 3: Q
- line $3+i$ $(1 \leq i \leq Q)$: One of the following:
  - $1\ i\ S$
  - $2\ X\ Y\ L\ R$

Output

For each query of type 2, print one integer: the answer to Pepe's problem.

Constraints

- $1 \leq N, Q, \leq 10^5$
- $0 \leq A[i], S \leq 10^9$ for $(1 \leq i \leq N)$

- $0 \le X \le Y \le 10^{15}$
- $1 \le L \le R \le 10^9$

Subtasks

Subtask	Score	Additional constraints
1	10	$A[1] = A[2] = \ldots = A[N]$, No type 1 query
2	10	$X = Y$, No type 1 query
3	20	$N \le 10^3$, $Q \le 10^4$, No type 1 query
4	25	No type 1 query
5	35	No additional constraints

Examples

Example 1

```
3
3 2 1
4
2 10 15 3 4
1 2 100
1 3 5
2 10 15 3 4
```

Correct output:

```
1
2
```

Home Decoration

Mr. Pepe bought a colorful tree with N nodes to decorate his home. The nodes are numbered from 1 to N. There is an edge between Nodes $U[i]$ and $V[i]$ for $1 \le i \le N-1$. The color of the ith node is initially $C[i]$.

Mrs. Pepe didn't like the color configuration of the tree, and now she is angry with her husband. She would like the ith node to have color $T[i]$. Now, Mr. Pepe needs to fix the tree. To do so, he can do the following operation: select a node and change its color to any integer in between 1 and N, inclusive. This operation takes 1 second.

However, There is an unspoken rule in the house of Pepes. Two adjacent nodes (nodes sharing an edge) cannot have the same color. Formally, nodes $U[i]$ and $V[i]$ can never have same colors for $1 \le i \le N-1$. It is guaranteed that C and T follows this rule.

To make sure Mrs. Pepe doesn't get more angry, Mr. Pepe needs to fix the tree as quickly as possible. Help Mr. Pepe find the minimum number of operations needed to fix the tree, and one possible sequence of minimum operations or report that it's impossible for him to escape his wife's anger (i.e. it's impossible to fix the tree).

Input

Input will be given in the following format:

- line 1: N
- line 2: $C[1]\ C[2]\ \ldots\ C[N]$
- line 3: $T[1]\ T[2]\ \ldots\ T[N]$
- line $3+i$ $(1 \le i \le N-1)$: $U[i]\ V[i]$

Output

If it's impossible to fix the tree, print output in the following format:

- line 1: -1

If it's possible to fix the tree, and you want to print the sequence, print output in the following format:

- line 1: $M\ 1$

- line $1 + i$ $(1 \leq i \leq M)$: $X[i]$ $Y[i]$

Where M is the minimum number of operations, $X[i]$ is the index of the node you want to change, and $Y[i]$ is it's new color. Both $X[i]$ and $Y[i]$ must be an integer between 1 and N, inclusive. After any operation, there shouldn't be any pair of adjacent nodes with the same color.

You may also decide to not print the operations. In that case, output in the following format:

- line 1: M 0

In this case, if correct, you will 30% of the point. Note that if you decide to print operations, and it's wrong, you will get 0.

If there are multiple possible minimum sequences, print any of them.

Constraints

- $2 \leq N \leq 10^5$
- $1 \leq U[i], V[i] \leq N, U[i] \neq V[i]$ for $(1 \leq i \leq N-1)$
- Given edges form a tree.
- $1 \leq C[i], T[i] \leq N$ for $(1 \leq i \leq N)$

Subtasks

Subtask	Score	Additional constraints
1	2	$N = 2$
2	10	$U[i] = 1$ for $(1 \leq i \leq N-1)$
3	19	$U[i] = i, V[i] = i+1$ for $(1 \leq i \leq N-1)$
4	15	$C[i], T[i] \leq 2$ for $(1 \leq i \leq N)$
5	22	$N \leq 2000$
6	32	No additional constraints

Example

Example 1

Consider the following input:

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

One possible output is:

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

However, You may also print:

```
5 0
```

In this case, you will only get 30% of the score.

Example 2

```
2
1 2
2 1
1 2
```

The correct output is:

```
-1
```

Travel Agency

Byteland has N cities, numbered from 1 to N, and M **one-way** roads, numbered from 1 to M. ith road starts from city $U[i]$ and leads to city $V[i]$. There can be multiple roads between a pair of cities. **Roads don't form a cycle**. That is, once you leave from a city, it's impossible to return to that city only using roads.

Each road has a toll. On day 0, the toll of ith road is $T[i]$ bytecoins. The toll of each road changes each day with a constant rate. The toll of ith road changes at the rate of $r[i]$ $(r[i] \in \{-1, 0, 1\})$ bytecoins per day. Note that the toll of a road can become negative. That means, you will earn money by traveling through that road.

Pepe runs a travel agency in city 1. He has received requests from Q clients. ith client wants to visit city $X[i]$ $(X[i] \neq 1)$ on a day between $L[i]$ and $R[i]$. **Note that the clients want to complete their journey in a single day.** Help Pepe calculate the cheapest journey (maybe in negative) for each client or report that it is impossible to complete that journey.

Input

Input will be given in the following format:

- line 1: N M Q
- line $1 + i$ $(1 \leq i \leq M)$: $U[i]$ $V[i]$ $T[i]$ $r[i]$
- line $1 + M + i$ $(1 \leq i \leq Q)$: $L[i]$ $R[i]$ $X[i]$

Output

Print output in the following format:

- line i $(1 \leq i \leq Q)$: Cost of the cheapest journey, if possible, or `sorry`,if impossible

Constraints

- $2 \leq N \leq 4000$
- $1 \leq M \leq 4000$
- $1 \leq Q \leq 5 \cdot 10^5$
- $1 \leq U[i], V[i] \leq N$ and $U[i] \neq V[i]$ for $(1 \leq i \leq N)$
- Roads don't form a cycle

- $0 \le T[i] \le 10^9$ for $(1 \le i \le M)$
- $r[i] \in \{-1, 0, 1\}$ for $(1 \le i \le M)$
- $1 \le L[i] \le R[i] \le 10^9$ for $(1 \le i \le Q)$
- $2 \le X[i] \le N$ for $(1 \le i \le Q)$

Subtasks

Subtask	Score	Additional constraints
1	6	$N, M, Q \le 20$
2	11	$N = 2, U[i] = 1, V[i] = 2$ for $(1 \le i \le M)$
3	11	$M = N - 1, U[i] = i, V[i] = i + 1$ for $(1 \le i \le N - 1)$
4	20	$N, M, Q \le 200$
5	31	$L[i] = R[i]$ for $(1 \le i \le Q)$
6	21	No additional constraints

Examples

Example 1

```
4 5 4
1 2 10 1
1 3 30 0
2 4 0 1
3 4 1000 -1
2 3 10 1
1 10 3
100 100 3
1 500 4
1 1000000000 4
```

Correct output is:

```
22
30
12
-999998970
```

- For the first client, it's cheapest to travel on day 1 by roads 1 and 5.
- For the second client, it's cheapest to travel by road 2.
- For the third client, it's cheapest to travel on day 1 by roads 1 and 3.

- For the fourth client, it's cheapest to travel on day 1000000000 by roads 2 and 4.

Example 2

```
2 4 4
1 2 100 1
1 2 24 1
1 2 30 -1
1 2 1000 -1
1 1 2
3 3 2
3 4 2
1 30 2
```

Correct output is:

```
25
27
26
0
```

Example 3

```
3 2 2
1 3 15 1
2 1 0 -1
1 10 3
1 10 2
```

Correct output is:

```
16
sorry
```