

Problem G. Berland Post

Input file: *standard input*
Output file: *standard output*
Time limit: 3 seconds
Memory limit: 256 mebibytes

Berland Post is the national postal service of Berland. There is exactly one post office in each of n Berland cities. Cities and their respective offices are numbered by integers from 1 to n .

There are m pairs of cities (a, b) such that there is direct post traffic from a to b . For each such pair of cities, the delivery time is known: formally, you are given m triples (a_j, b_j, d_j) meaning that each day, the post office in a_j has to send correspondence to the post office in b_j , and d_j is the time elapsed between sending the correspondence from a_j and receiving it at b_j .

Each day, all offices must be open for the equal consecutive amount of time, which is denoted as T . But opening times may differ. If the opening time of i -th office is o_i , then the closing time is $o_i + T$.

Some values of o_i are known and fixed, but some of them are up to you. Your goal is to find such values $T \geq 0$ and o_i that each office receives all the correspondence no later than at closing time, and T is the minimum possible. It is allowed for an office to receive the correspondence even before opening. Assume that each office sends the correspondence instantly after opening.

Formally, find the minimum possible non-negative T and values o_i such that $o_{a_j} + d_j \leq o_{b_j} + T$ for each of the m given triples (a_j, b_j, d_j) .

Input

The input contains one or more test cases.

Each test case starts with a line containing two integers: n , the number of cities, and m , the number of direct traffic paths ($1 \leq n \leq 1000, 0 \leq m \leq 2000$).

The second line of each test case contains n tokens o_i , where o_i is either a question mark (“?”) if the opening time of the office i is not given and your task is to define it, or an integer ($-10^5 \leq o_i \leq 10^5$) if the opening time of the office i is known and you can not change it.

The following m lines contain descriptions of direct traffic paths, one per line. Each line contains three integers: a_j, b_j , and d_j , denoting direct post traffic from the city a_j to the city b_j with delivery time d_j ($1 \leq a_j, b_j \leq n, a_j \neq b_j, 1 \leq d_j \leq 100$). It is guaranteed that, for each pair of the cities (a, b) , there is at most one direct traffic path from a to b .

The sum of all values n in a test case does not exceed 1000. The sum of all values m in a test case does not exceed 2000. The test cases just follow one another without any special separators.

Output

For each test case, print exactly two lines.

Print the minimum possible non-negative real value of T on the first line and the values o_1, o_2, \dots, o_n on the second line. The values of o_i must be in the range $[-10^9, 10^9]$. Print T and o_i with absolute error of at most 10^{-4} .

The values $o_i \neq$ “?” in the input must not change. For each of the m given triples (a_j, b_j, d_j) , it must be true that $o_{a_j} + d_j \leq o_{b_j} + T$.

Examples

standard input	standard output
2 1 5 7 1 2 3	1 5 7
2 2 ? ? 1 2 3 2 1 1 3 0 ? ? 3	2 9 10 0 1 -1 3