Problem I

Integral

Arquivo: ***integral.[c|cpp|java]***

Given a positive integer n, denote by $[n]$ the interval $\{x : 0 \leq x \leq n\}$ of real numbers. Consider a function $f : [n] \Rightarrow \mathcal{R}$. Values of f are provided on a subset S of $[n]$, thereby partially specifying f.

The set S satisfies the following properties:

1. The points in S are all integers.
2. The extremes 0 and n of $[n]$ are both in S.

The function f satisfies the following properties:

1. The values of f in the integral points of $[n]$ are integers.
2. For every integral point x in $[n] \setminus S$ (ie, the integral points of $[n]$ are not in S), the function f is monotonic in the interval $[x-1, x+1]$. In other words, at least one of the inequalities $f(x-1) \leq f(x) \leq f(x+1)$ and $f(x-1) \geq f(x) \geq f(x+1)$ is satisfied.
3. For each non-integral point x in $[n]$, the value of $f(x)$ is given by the linear interpolation of $f(\lfloor x \rfloor)$ and $f(\lceil x \rceil)$, ie, $f(x) = (x - \lfloor x \rfloor)f(\lfloor x \rfloor) + (\lceil x \rceil - x)f(\lceil x \rceil)$.

We still have the freedom of specifying the values of f in the integral points of $[n] \setminus S$ (note however that S can contain all the integral points of $[n]$). We would like to use this flexibility to make $\int_0^n f(x)dx = y$, i.e., the area under $f(x)$ between the extremes 0 and n equal to y, a given value.

Your problem then is to decide whether this is possible or not.

Input

The input contains several test cases. The first line of a test case contains three integers, N, M and Y, respectively the amplitude of the interval, the size of S and the value of y. Each of the following M lines describes function f at a point of S, containing two integers X and F, representing $f(X) = F$. The values of X are not necessarily in ascending order.

Output

For each test case, determine whether there is a value assignment to $f(x)$ for each integral point $x \in [n] \setminus S$ such that $\int_0^n f(x)dx = y$, i.e. the area under $f(x)$ between the ends 0 and n is equal to y. If not, your program should print a line containing only the character '`N`'. If the assignments are possible, your program should print a line containing the character '`S`', followed by values of $f(x)$ for the integral points x in $[n] \setminus S$, in increasing order of the values of x. The initial character and following values, if any, should be separated by a blank space. If more than one solution is possible, then print the lexicographically smallest solution.

Restrictions

- $1 \leq N \leq 10^6$
- $0 \leq X \leq N$, X integer, $\forall X \in S$
- $0 \leq F \leq 10^6$, F integer

- $0 \leq Y \leq 10^9$, Y integer
- $\int_0^n f(x)dx \leq 10^9$ for any assignment of values to $f(x)$ for $x \in [n] \setminus S$ satisfying the stated constraints.

Examples

Sample input	**Sample output**
5 6 10 0 2 1 2 5 2 2 2 3 2 4 2 5 2 10 0 0 5 10 2 2 5 0 1 2 2 10 3 18 0 2 6 4 10 0 2 2 1 0 0 2 1	S S 0 0 0 5 N S 2 2 2 2 2 1 1 1 N