

## 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. Between two consecutive points of  $S$ , the function is monotonic.
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