



Ljubo is planning to build a big wall in just two days.

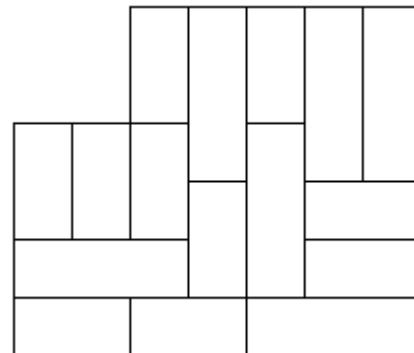
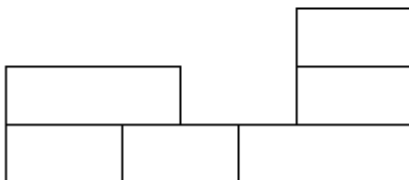
A store offers  $N$  distinct types of bricks in unlimited supply. Each brick type has specific price  $C_i$  and dimensions  $1 \times 1 \times D_i$ .

One day Ljubo will place bricks in the wall horizontally, while the other day he will place bricks vertically. He can choose if he will place bricks horizontally the first day or the second day and he will, of course, choose the cheaper variant.

The wall lies on the flat ground and is  $L$  meters long, and can be described by *silhouette*, a sequence of points  $(x_1, y_1), (x_2, y_2), \dots, (x_M, y_M)$  that follows the upper border of the wall. Silhouette begins with upper left corner of the wall and ends with upper right corner of the wall. Specifically:

- $M$  is an even number
- $x_1 = 0, x_M = L$
- $x_{2k-1} < x_{2k}, x_{2k} = x_{2k+1}$ , for each  $k$
- $y_{2k-1} = y_{2k}$ , for each  $k$

For example, a wall of length 7 in the left illustration is described by silhouette  $(0, 2), (3, 2), (3, 1), (5, 1), (5, 3), (7, 3)$ , while the wall on the right illustration is described by silhouette  $(0, 4), (2, 4), (2, 6), (7, 6)$ .



Given the data for available brick types as well as the wall silhouette after the first day and the final wall silhouette, write a program that will calculate the cost of the cheapest possible total price to build a wall in two days as described.

### INPUT

The first line contains one integer  $L$  ( $2 \leq L \leq 10^9$ ), wall length.

The second line contains one integer  $N$  ( $1 \leq N \leq 100$ ), the number of brick types.

The next  $N$  lines contain two natural numbers each  $D$  and  $C$  ( $2 \leq D \leq 1000, 1 \leq C \leq 1\,000\,000$ ), the brick length and price for each brick type.

The next line contains one even integer  $M_1$  ( $2 \leq M_1 \leq 100\,000$ ), the number of points on a wall silhouette after the first day.

The next  $M_1$  lines contain points coordinates, two non-negative integers each.

The next line contains one even integer  $M_2$  ( $2 \leq M_2 \leq 100\,000$ ), the number of points on a wall silhouette after the second day.

The next  $M_2$  lines contain points coordinates, two non-negative integers each.

Wall height will not exceed  $10^9$ .



For each  $x$  coordinate, the height of first wall silhouette will be less than or equal to the height of the second wall silhouette.

## OUTPUT

Output one integer, the minimum cost to build the wall.

**Note:** The input data will be such that it will be possible to build the wall in the way described, and the minimum cost will not exceed  $10^{18}$ .

## SCORING

Possible additional constraints:

- $M_1$  and  $M_2$  are both equal to 2 (i.e. walls are rectangles).
- The length and the height of the wall is less than 100000.

Test data are divided in four sets worth 25 points each:

Test data in the first set has both additional constraint a) and additional constraint b).

Test data in the second set has additional constraint a).

Test data in the third set has additional constraint b).

Test data in the fourth set has no additional constraints.

## SAMPLE TEST CASES

input	input
7	10
2	2
2 5	3 1
3 7	4 10
6	6
0 2	0 0
3 2	4 0
3 1	4 6
5 1	6 6
5 3	6 0
7 3	10 0
4	6
0 4	0 10
2 4	4 10
2 6	4 6
7 6	6 6
	6 10
	10 10
<b>output</b>	<b>output</b>
92	204



Mirko is a proud founder of a big software company. Initially he was the only worker in the company, but as the business grew, company hired  $N$  additional workers, one by one. We will denote Mirko with integer 0, and each of the remaining worker with integers 1 to  $N$  in order they were hired.

On the first day of work every worker was assigned as a subordinate to another worker. Also, every worker was assigned with initial salary. However, if the salary of the new worker was greater than the salary of his boss, then his boss also got a raise to equal their salaries. If the boss of the new worker now has a greater salary than his boss, the procedure is repeated until every worker has a salary that is less than or equal to the salary of his boss.

Write a program that will determine the number of workers that got a raise during the process of hiring each new worker.

### INPUT

The first line contains one integer  $N$  ( $1 \leq N \leq 300000$ ), the number of workers.

The second line contains one integer  $M$ , Mirko's initial salary.

The next  $N$  lines contain two integers each  $I$  and  $B$ , initial salary of the new worker and the index of his boss. Workers are given in the order they were hired, i.e. in ascending order of their indices.

All salaries are integers between 1 and  $10^9$  and boss indices always denote a worker that was already hired at that moment.

### OUTPUT

Output  $N$  integers, one per line, the total number of workers that got a raise during the process of hiring each new worker in order they were hired.

### SCORING

Test data worth 20 points has ( $1 \leq N \leq 10000$ ).

### SAMPLE TEST CASES

input	output
7	0
5000	1
4500 0	0
6000 0	2
4000 1	4
5500 3	1
7000 4	0
6300 2	
6300 2	