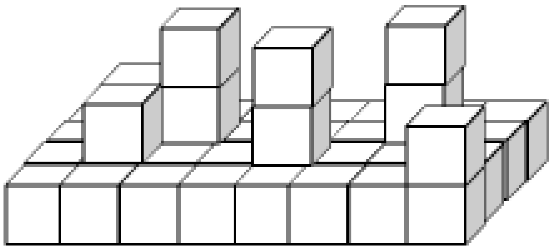
Problem D. UFO

Input file:	`ufo.in`
Output file:	`ufo.out`
Time limit:	2 seconds
Memory limit:	256 megabytes
Feedback	`full`
Grading system	`each test is graded separately`

Earth security agency needs to destroy enemy alien spaceship. They already damaged it and forced it to land in a desert. Spaceship is built of cubic unit blocks and the bottom layer has the form of a $N \times M$ rectangle. Top view of the $N = 4$, $M = 8$ spaceship shown in the figure.



				N					
W	1	1	1	1	1	1	1	1	E
	1	2	3	1	1	1	3	1	
	1	2	1	1	3	1	1	1	
	1	1	1	1	1	1	1	2	
				S					

Spaceship blocks are built from extra-strong metal, that's why lasers are used for destroying the ship. Laser guns were established by four sides of the spaceship, and they periodically shot laser rays into some blocks of the ship (rays are always perpendicular to the spaceship sides). Each ray destroys R first blocks on its way. If there is one or more blocks atop the destroyed block, they move down.

After K shots it was decided to make an airstrike. For the airstrike it makes sense to choose such area of the ship of size $P \times P$ which contains maximal possible number of whole undestroyed blocks. The airstrike will destroy all blocks in this area.

Write a program, which calculates the maximal number of whole undestroyed blocks in the area of size $P \times P$ which can be destroyed by airstrike.

Input

The first line of the input file contains 5 integers: N, M $(1 \le N \cdot M \le 1\,000\,000)$, R $(0 < R \le 10)$, K $(0 < K \le 300\,000)$ and P $(0 < P \le min(N, M, 10))$. Each of the next N lines contain M numbers. Number in i-th row and j-th column is the number of blocks in the corresponding part of the ship (see a figure). Each number is in range $1..10^6$.

Next K lines contain description of laser shots. Each of these lines contain one symbol and two integers (all separated by spaces). Symbol defines the side of the shot: "W" — west, "E" — east, "S" — south, "N" — north. First integer is the number of row (in case of west or east), or the number of column (in case of north and south), and second number is the height of the shot. Rows and columns numbers correspond to numeration of input data, layers are numbered from one. Each number is in range $1..10^6$.

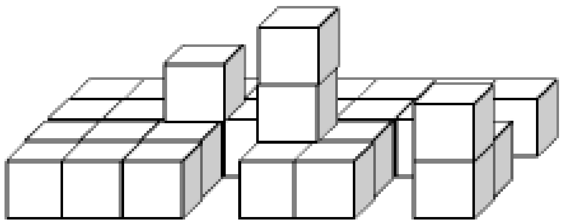
Output

Output maximal number of undestroyed blocks after K laser shots in the area of size $P \times P$.

Examples

ufo.in	ufo.out
4 8 2 6 2 1 1 1 1 1 1 1 1 1 2 3 1 1 1 3 1 1 2 1 1 3 1 1 1 1 1 1 1 1 1 1 2 N 2 2 W 2 2 W 2 3 E 2 1 S 4 1 S 7 1	6

Note



	N								
W	1	1	1	1	1	1	1	1	E
	1	1	2	1	1	1	1	0	
	1	1	1	0	3	1	0	1	
	1	1	1	0	1	1	0	2	
	S								

In the figure 2 it's shown spaceship from the figure 1 after laser shots from example.

For 30% points all shots are on the height one $1 \le N \cdot M \le 50\,000$, $0 < K \le 5000$.

For another 30% points, $1 \le N \cdot M \le 1\,000\,000$, $0 < K \le 300\,000$.

Problem E. K blocks

Input file:	`blocks.in`
Output file:	`blocks.out`
Time limit:	1 second
Memory limit:	256 megabytes
Feedback	`subtask points only`
Grading system	`only full solution for subtask receives points`

You are given a sequence A of N positive integers. Let's define "value of a splitting" the sequence to K blocks as a sum of maximums in each of K blocks. For given K find the minimal possible value of splittings.

Input

First line of the input file contains two integers N and K. Next line contains N integers $A_1, A_2, \ldots, A_N$ ($1 \leq A_i \leq 10^6$) — the sequence elements.

Output

Output one number — minimal possible value of a splittings.

Examples

blocks.in	blocks.out
5 1 1 2 3 4 5	5
5 2 1 2 3 4 5	6

Note

Subtask 1 — $1 \leq N \leq 100$, $1 \leq K \leq min(N, 5)$, 14 points.

Subtask 2 — $1 \leq N \leq 20$, $1 \leq K \leq min(N, 20)$, 18 points.

Subtask 3 — $1 \leq N \leq 100$, $1 \leq K \leq min(N, 100)$, 21 points.

Subtask 4 — $1 \leq N \leq 100000$, $1 \leq K \leq min(N, 100)$, 47 points.

Problem F. Marriage questions

Input file:	`marriage.in`
Output file:	`marriage.out`
Time limit:	1 second
Memory limit:	256 megabytes
Feedback	`full`
Grading system	`each test is graded separately`

Once upon a time in a country far, far away, the wise king had M beautiful daughters. At last, the time for them to get married has come. King sent a message in N neighboring kingdoms, so each of them sent a prince to marry one of the princesses.

As a loving father the king considered his daughters' opinions. First of all he arranged young men in a line, enumerated them with numbers from 1 to N, and asked each of his daughters, with which of those candidates she was agree to get married.

King had an excellent mathematical background, so it was easy for him to check whether it is possible to find a husband for each of his daughters in such way, that requests of each daughter were satisfied. But suddenly the king thought about more interesting question: how many pairs (L, R) $(1 \le L \le R \le N)$ are there, such that it is possible to assign a husband for each daughter, using only candidates with numbers of range from L to R inclusive?

Help king to find an answer to his question!

Input

First line contains three integers N, M and K $(1 \le N \le 30\,000,\ 1 \le M \le 2\,000,\ 1 \le K \le \min(N \cdot M, 100\,000))$ — number of candidates, number of girls and number of lines, describing girls' requests respectively.

In next K lines there are integers A_i, B_i $(1 \le A_i \le N,\ 1 \le B_i \le M)$, it means that girl B_i likes candidate A_i. All pairs are different.

Output

Output the number of ways king can choose a pair (L, R) to satisfy the problem statement.

Examples

marriage.in	marriage.out
5 3 7 1 1 1 2 1 3 2 3 3 2 4 2 5 1	4

Note

In the sample test pairs $(1, 3), (1, 4), (1, 5)$ and $(2, 5)$ satisfy the required conditions.

For 24% points $N \le 10$, $M \le 4$.

For 48% points $N \le 100$, $M \le 50$.

For 72% points $N \le 1\,000$, $M \le 500$.