Problem A. «Metro»

Input:	stdin
Output:	stdout
Time limit:	0.7 sec.
Memory limit:	256 Mb

Bunny McRabbit, mayor of Rabbitville, has decided that the city needs an underground metro system. The system will consist of a single line and the line will go straight from one side of Rabbitville to the opposite side of the city. There will not be bends of any kind, mayor insists. Furthermore, there will be underground stations at a few precisely specified locations on the line. Each station will have a single street-level entrance located along the metro line (above the tunnel or beyond it, but on the same line with the tunnel anyway). Entrance to the station cannot be too far from the station itself. In fact, distance along the line between a station and its entrance can be at most d (but can be less than that or even equal 0). Please help Mr. McRabbit to choose locations for the entrances in such a way that distances between any two consecutive stations' entrances will be the same.

Input

We consider both metro stations and their entrances to be points on the line containing the tunnel. In the first line of the input there are two integers: n, the total number of metro stations ($2 \le n \le 1000$), and d, the maximum distance allowed between a station and its entrance ($0 \le d \le 10\,000$). The second line of the input contains n distinct integers, in ascending order, with absolute values not exceeding 10^9. These are the coordinates of the first, second, …, last stations on the line.

Output

Output n integers which are coordinates of entrances to the first, second, …, last metro stations respectively. No two entrances can be located at the same point. If there are multiple solutions, you can output any one of them. If there are no integral solutions, output 0.

Sample

stdin	stdout
3 2 -4 2 3	-3 0 3
3 2 -4 2 999	0

Problem B. «Supernatural»

Input:	Stdin
Output:	Stdout
Time limit:	0.2 sec.
Memory limit:	256 Mb

We call a natural number supernatural if it does not contain any ones in its decimal representation and the product of its digits is equal to *n*. For given *n*, find how many supernatural numbers exist.

Input

The input contains a single integer *n* not exceeding 2×10^9.

Output

Output the total number of supernatural numbers modulo 101.

Sample

stdin	stdout
6	3

Problem C. «Pieces of Paper»

Input:	stdin
Output:	stdout
Time limit:	0.2 sec.
Memory limit:	256 Mb

Edgy the Rabbit's got a sheet of checked paper. The grid is aligned with the edges of the sheet. In particular, all four vertices of the sheet contain grid nodes in them. Edgy cuts the sheet along the grid with his scissors. Each cut is a straight line joining two grid nodes while parallel to the grid. Determine how many connected pieces of paper Edgy will have after each cut.

Input

The first line of the input contains three positive integers: width of the sheet w (in grid units), height of the sheet h (in grid units) and the number of cuts n ($w \le 200$, $h \le 200$, $n \le 2wh - w - h$). Each of the following n lines consists of four integers x_1, y_1, x_2, y_2 where (x_1, y_1) and (x_2, y_2) are the endpoints of the cut. Here $0 \le x_1 \le x_2 \le w$, $0 \le y_1 \le y_2 \le h$ and either $0 < x_1 = x_2 < w$, $y_1 < y_2$ or $0 < y_1 = y_2 < h$, $x_1 < x_2$. No segment of the grid with non-zero length will be cut through more than once.

Output

For each cut output the number of connected pieces of paper after that cut. Each number's to be put in a separate line.

Sample

stdin	stdout
4 2 3 2 1 3 1 2 0 2 2 3 0 3 2	1 2 4

Problem D. «Nested rectangles»

Input:	stdin
Output:	stdout
Time limit:	0.5 sec.
Memory limit:	64 Mb

Let's consider a sequence of rectangles $a_1 \times b_1$, $a_2 \times b_2$, …, $a_N \times b_N$. For each j, $a_j \le b_j$. Rectangles cannot be rotated. Rectangle $a_i \times b_i$ can be put inside rectangle $a_k \times b_k$ iff ($a_i < a_k$) and ($b_i < b_k$). We call sequence of rectangles nesting sequence, iff each rectangle can be put inside following one.

Your task is to write a program that finds the longest nesting subsequence, i. e. the longest nesting sequence among all subsequences of the given sequence.

Input

The 1st line of input data contains the number of rectangles N ($1 \le N \le 100{,}000$). Each of the following N lines contains two integers a_i b_i ($1 \le a_i \le b_i \le 10^9$) — size of i-th rectangle.

Output

Output exactly one integer number — the length of the longest nesting subsequence.

Sample

stdin	stdout
5 10 10 3 7 5 5 4 9 12 12	3

Choosing 3 rectangles 3×7, 4×9 and 12×12, one can put 3×7 inside 4×9 and put 4×9 inside 12×12. Note that 4×9 can be put inside 10×10 and 10×10 can be put inside 12×12, but it's not a subsequence.

Problem E. «Turns minimization»

Input:	stdin
Output:	stdout
Time limit:	0.5 sec.
Memory limit:	64 Mb

Consider a map of maze in the form of rectangular table filled with zeroes and ones, where "0" means a free cell and "1" means a wall.

Robot initially is in the cell with coordinates (i_0, j_0). It should be moved outside the maze (via any free cell in any outer side). Robot can move to any free of four neighboring cells (left, right, up, down). Robot's significant feature is that it can pass many free cells in the same direction very quickly, but each turn (direction changing) requires a lot of time.

Your task is to write a program finding the way to move outside the maze with minimal number of turns.

Input

The 1st line of input contains two integers N, M ($5 \le N, M \le 555$) which are the size of the maze. Each of following N lines contains exactly M ones and/or zeroes (without any delimiters), denoting walls and free cells. The next and the last line contains two integers i_0, j_0 ($2 \le i_0 \le N-1$, $2 \le j_0 \le M-1$) which are initial coordinates. It's guaranteed that initial coordinates correspond to free cell, but it's unknown whether any way out exists.

Output

Output exactly one integer — the minimal number of same-directed fragments of way outside. If no way out exists, program should output "–1" (without quotes).

Sample

stdin	Stdout
5 6 110111 000001 101101 100001 111111 4 5	2

The way is: (1) 2 cells up; (2) 4 cells left.

Problem F. «Same quantity, sum and product»

Input:	stdin
Output:	stdout
Time limit:	1 sec.
Memory limit:	64 Mb

Your task is to write a program, which will count how many different multisets has N elements with sum S and product P ($1 \le N \le 2^5 = 32$, $1 \le S \le 2^{15} = 32768$ and $1 \le P \le 2^{40} = 1099511627776$).

Two multisets are considered different when they differ by elements or by quantities of some elements. If two sequences differ by elements' order only, they are the same multiset.

Input

Input contains three space-separated integers N, S and P in the same line. $1 \le N \le 2^5 = 32$, $1 \le S \le 2^{15} = 32768$ and $1 \le P \le 2^{40} = 1099511627776$.

Output

Output exactly one integer number — the quantity of different multisets.

Sample

stdin	stdout
9 45 362880	12
7 7 7	0

The 12 multisets for 1st test case are:

1 2 3 4 5 6 7 8 9
1 2 3 4 6 6 6 7 10
1 2 4 4 4 5 7 9 9
1 3 3 3 4 6 7 8 10
1 3 3 4 4 4 7 9 10
1 3 3 4 4 5 6 7 12
2 2 2 3 4 6 7 9 10
2 2 2 3 5 6 6 7 12
2 2 3 3 3 5 7 8 12
2 2 3 3 4 5 6 6 14
2 3 3 3 3 4 5 8 14
2 3 3 3 4 4 4 7 15

Problem G. «A Cycle of Points»

Input:	stdin
Output:	stdout
Time limit:	3 sec.
Memory limit:	64 Mb

There are n points on a plane, numbered from 1 to n. They form a directed cycle 1→2→...→n→1. You need to perform the following operation several times: given the numbers of two points a and b, remove the part of the cycle starting with the point a and ending with the point b, and return it back in reversed order, so that part will start from b and end with a. Find the length of the final cycle.

Input

The first line of the input contains two numbers n and m ($3 \le n,m \le 100000$). Next n lines contain two numbers x_i and y_i — coordinates of i-th point. Next m lines contain two numbers a_i and b_i — point numbers in i-th operation.

Output

Output the length of the final cycle with two digits after the decimal point.

Sample

stdin	stdout
5 3 0 0 1 0 2 0 2 2 0 2 5 2 5 2 4 5	10.89

Explanation:

1. Initial cycle: 1→2→3→4→5→1
2. After the first operation: 1→5→3→4→2→1 (part 5→1→2 is replaced with 2→1→5)
3. After the second operation: 1→2→4→3→5→1 (part 5→3→4→2 is replaced with 2→4→3→5)
4. After the third operation: 1→2→5→3→4→1

Problem H. «Sum»

Input:	stdin
Output:	stdout
Time limit:	0.1 sec.
Memory limit:	256 Mb

It is well known that Mark likes creating mathematical tasks very much. Recently he has invented the following one: for given S find all positive integers A and B, that $A \leq B$ and $A + (A + 1) + (A + 2) + \ldots + (B - 1) + B = S$.

Input

Input contains one integer S ($1 \leq S \leq 10^{12}$).

Output

First line at output should contain one integer K – number of pairs that have been found. Each of following K lines should contain 2 integers, first not greater than second – corresponding pair. Pairs should be printed sorted ascending by first number.

Sample

stdin	stdout
25	3 3 7 12 13 25 25

Problem I. «Desoxyribonucleic Acid»

Input:	stdin
Output:	stdout
Time limit:	0.2 sec.
Memory limit:	64 Mb

Science marches on and biology is not an exception. DNA decoding became one of turning points in history of biology. One of last year students of biology faculty, George, decided to make own contribution to this fascinating science. George plans to develop a database to store genetic codes of DNAs. You are assigned to implement a program, which adds codes to the database and returns number of codes for which give code is a prefix.

Code *A* of length *N* is a prefix of code *B* of length *M* if $N<M$ and first *N* symbols of code *B* equal code *A*. For convenience DNA code is presented by non-empty string of characters ‘a’, ‘b’, ‘c’, ‘d’. George’s database should correctly process duplicated DNA codes.

Input

The first input line contains integer *T* – number of database operations. Following T lines contain one operation each. Insert operation consists of symbol «+» followed by DNA code to be added to the database, query operation consists of symbol «?» followed by DNA code for which number of codes from the database having this code as prefix needs to be found.

Output

For each line at input, which starts from symbol «?» you need to print result into separate line at output.

Constraints

Total length of codes in George’s database does not exceed 1000000.

Sample

stdin	stdout
4 +abcd ?abc +abc ?ab	1 2
7 +abab +abab ?aba ?abab ?c +cba ?cb	2 0 0 1

Problem J. «Easy Recurrence»

Input:	stdin
Output:	stdout
Time limit:	2 sec.
Memory limit:	64 Mb

You are given four positive integers *a*, *b*, *c*, and *d*, which define the following recurrence:
$x_n=1$ for $n\le 0$,
$x_n=cx_{n-a}+dx_{n-b}$ for $n>0$.

For a given *n* find x_n mod 1000000007.

Input

The only line of the input contains five integers *a*, *b*, *c*, *d*, and *n* ($1\le a<b\le 2000$, $1\le c,d\le 100$, $1\le n\le 10^9$).

Output

Output x_n mod 1000000007.

Sample

stdin	stdout
1 2 1 1 5	13