Problem A. Bicycle

Input file:	`bicycle.in`
Output file:	`bicycle.out`
Time limit:	1 second
Memory limit:	256 mebibytes

At last the city of New Vasyuki becomes closer to civilization — its authorities built two real cycle paths, each of which can be ridden in both directions! Each of them has the shape of a rectangle sides of which are parallel to the coordinates plotted on the official map of the city. Being allowed to turn from one path to another, cyclists are strictly barred from going beyond path limits (for example, inside a rectangle, which is limited to the path). Paths can cross or touch each other, and even have common sections of nonzero length.

You should ride as quickly as possible from point **A** to the point **B**. It is known that both points are located on one of the cycle paths, and you across the distance unit per time unit.

Input

The first and second lines contain coordinates of northwest and southeast angles of rectangle, corresponding to one of the cycle paths. The third and fourth lines contain the coordinates of the points **A** and **B**, respectively. All the coordinates are integers, not exceeding 10^9 . Rectangles which describe each of the paths, have nonzero height and width.

Output

You must calculate the minimal time to across the distance from the point **A** to the point **B**, following the conditions mentioned above. If such a ride is impossible, output -1.

Examples

bicycle.in	bicycle.out
0 10 10 0 10 20 20 10 0 0 20 15	35
0 10 10 0 2 8 8 2 0 0 2 2	-1

Problem B. Blackjack and... (Division 1 Only!)

Input file:	`blackjack.in`
Output file:	`blackjack.out`
Time limit:	2 seconds
Memory limit:	64 mebibytes

Petya likes to play blackjack for money. But not always wins ... Parents know that he loses a separate game with probability p, and he has no draws. Herewith for every win Petya gets 1 tugrik, for every loss — loses it.

One day he took A tugriks and came to see his friend Vasya. Vasya took his B tugriks, and they decided to play blackjack until one of them runs out of money.

Parents of Petya know everything about it, because Petya hides nothing from them. They do not worry about Petya losing all his money. Then it passes into good hands. If Petya beats Vasya, nothing terrible happens, as they are friends and Petya shares with Vasya if necessary. Parents are interested only in one — what time is the best to cook tasty supper for Petya. But cooking tasty supper takes a lot of time, plus it quickly gets cold. That's why they should define the time Petya comes back home, that is the expected number of games.

Input

The first line contains one integer p ($0 \le p \le 100$) — the probability of loss in percentage terms. The second line contains two integers A and B ($1 \le A, B \le 10^9$), separated by space character.

Output

Output one number — expected number of games with absolute or relative error no more than 10^{-9}.

Examples

blackjack.in	blackjack.out
100 10 20	10.000000000000000
25 1 2	2.153846153846154

Problem C. Circular (Division 1 Only!)

Input file:	`circular.in`
Output file:	`circular.out`
Time limit:	2 seconds
Memory limit:	64 mebibytes

You are given a graph of N vertices and M edges. Kolya wants to arrange vertices on the circle of radius R and center placed in origin, so that edges correspond to segments connecting vertices, and herewith can cross only in vertices. Euclidean distance between any vertices must be less than 1.

Is it possible to arrange vertices in such a way?

Input

First line contains three integers N, M and R ($1 \le N, R \le 1\,000$, $0 \le M \le 5\,000$). Next M lines contain the description of graph edges (one per line): two different integers a_i and b_i ($1 \le a_i, b_i \le N$). There are no multiedges in graph.

Output

In the first line output the only word `Yes`, if such an arrangement is possible, otherwise `No`. If the answer is positive, then in N lines print coordinates of graph vertices x_i, y_i (while checking if a vertex belongs to circle take into account that relative error does not exceed 10^{-8}).

Examples

circular.in	circular.out
3 3 1 1 2 1 3 3 2	Yes 1.0000000000 0.0000000000 -0.5000000000 -0.8660254038 -0.5000000000 0.8660254038
4 6 100 1 2 1 3 1 4 2 3 2 4 3 4	No

Problem D. Guess heavy melody (Division 1 Only!)

Input file:	`entropy.in`
Output file:	`entropy.out`
Time limit:	2 seconds
Memory limit:	64 mebibytes

Popular TV show « Guess heavy melody » gets ready for regular ether. It's hard to believe, but the tune one should guess, in fact is always chosen randomly. But of course, not all the tunes should be equiprobable. Hit of the past summer, the song « Heavy Heavy Metal » of group « Ocean of Metal », should fall more often than slightly forgotten hard rock popular in 70's.

Problem arisen before the organizers, consists in the following: there are N tunes, for every tune m_i there is known minimal and maximal probability of its appearance, denoted as l_i and r_i, respectively. One must choose the probability distribution $p(m_i) = p_i$ ($l_i \leq p_i \leq r_i$), so that every song will appear with probability p_i. To make show more exciting and unpredictable, organizers want to choose distribution with entropy, maximum possible under the given conditions.

Help them to solve the problem.

Input

The first line contains the only integer N ($1 \leq N \leq 10^5$). The second line contains N real numbers $l_i \geq 0$, each of which is given in the form with fixed point with no more than 9 digits after decimal point. The third line contains numbers $r_i \leq 1$, in the same format as second line.

Output

Output N integers p_i, separated by space, where p_i is probability of appearance for i-th song, $l_i \leq p_i \leq r_i$, and under these conditions entropy p is maximal. Your answer will be accepted, if for entropy H of distribution you've given, the following inequality is true: $1 - \frac{H}{H_{max}} \leq 10^{-9}$, where H_{max} is entropy, maximum possible under given conditions.

Examples

entropy.in	entropy.out
3 0.0 0.0 0.0 1.0 1.0 1.0	0.333333333 0.333333333 0.333333333
4 0.5 0.1 0.1 0.1 0.5 0.1 0.2 0.2	0.500000000 0.100000000 0.200000000 0.200000000

Note

The probability distribution for the finite aggregate of events $X = \{x_1, \ldots, x_N\}$ is function $p(x_i) = p_i$, where $0 \leq p_i \leq 1$ and $\sum_{i=1}^{N} p_i = 1$. Entropy of distribution p is defined as $\sum_{i=1}^{N} p_i \log_2 p_i$.

Problem E. Factorial (Division 1 Only!)

Input file:	`factorial.in`
Output file:	`factorial.out`
Time limit:	1 second (2 seconds for Java)
Memory limit:	64 mebibytes

Calculate $N! = 1 \cdot 2 \cdot \ldots \cdot N$.

Input

The only line contains one integer N ($1 \le N \le 40\,000$).

Output

The only line must contain $N!$ without nonsignificant zeros.

Examples

factorial.in	factorial.out
1	1
2	2

Problem F. Be happy!

Input file:	gluck.in
Output file:	gluck.out
Time limit:	2 seconds
Memory limit:	64 mebibytes

Earth's colony on the distant planet New China prospers (unlike overpeopled metropolis), and it needs new people... Colony leaders sent an order for N married couples who would agree to settle in New China for ever. Alas, there were not so many volunteers ... But Earth authorities could select N unmarried women and the same quantity of single men who had agreed to exchange the Earth slums for «paradise» in colony. By the end of interplanetary travel all of them have to make married couples, provided that attached psychologists select future spouses, while the migrants have no right to change this choice.

During the long flight, psychologists looking after the contacts between migrants could determine so called level of mutual sympathy s_{ij} between i-th man and j-th woman. Psychologists believe the greater the mutual sympathy, the more stable and happy marriage.

Help psychologists calculating the option of forming married couples in which the total value of mutual sympathy will be maximal.

Input

The first line contains quantity N ($1 \le N \le 100$). Next there are N lines each of N numbers — matrix of mutual sympathies s_{ij}. Quantities s_{ij} are nonnegative integers, not exceeding 100.

Output

The first line should contain calculated total value of mutual sympathy. Each of the following N lines corresponds to one married couple and contains numbers of a man and a woman, who will make up the pair (numeration is one-based). If a problem has several solutions, print any of them.

Examples

gluck.in	gluck.out
3 3 2 4 2 1 2 2 2 5	9 1 1 2 2 3 3

Problem G. Lanterns 2

Input file:	`lantern2.in`
Output file:	`lantern2.out`
Time limit:	1 second
Memory limit:	256 mebibytes

Straight segment of the road from New Vasyuki to Old Moscow got bad reputation because of large number of accidents on it, especially at night. Finally Road Administration decided to install the street lamps and light up the whole segment. And then officials paid attention that the area near the road, possibly including some segments, was already being illuminated by N street lamps standing at oil stations, roadside cafes and so on, so that money dedicated for it, can be saved …

In particular, a lamp numbered as i ($1 \le i \le N$) lights up a circle with center in point (a_i, b_i) with radius R_i. The road passes from point (x_1, y_1) to point (x_2, y_2), and its width is negligible.

A road segment is considered safe if it is illuminated by at least one street lamp.

Knowing the disposition of illuminated road segments, calculate the total length of safe road segments.

Input

The first line contains one integer: N — number of street lamps ($1 \le N \le 10^5$). The second line contains coordinates x_1, y_1, x_2, y_2 — integers, not exceeding 10^6 by absolute value.

Each of the following N lines gives informaton on one street lamp and contains three integers a_i, b_i and R_i ($-10^6 \le a_i, b_i \le 10^6$, $1 \le R_i \le 10^6$).

Output

Output the only number — the total length of safe road segments with absolute or relative error no more than 10^{-6}.

Examples

lantern2.in	lantern2.out
1 0 0 9 0 3 2 3	4.4721359550
2 -1 -4 5 4 6 -3 5 3 3 3	4.8284271247

Problem H. Palindroming

Input file:	`palindroming.in`
Output file:	`palindroming.out`
Time limit:	2 seconds
Memory limit:	64 mebibytes

According to Guinness World Records, the Finnish word saippuakivikauppias (soapstone vendor), a 19-letter word, is claimed to be the world's longest palindromic word in everyday use.

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You are given a line s consisting of lowercase latin letters. For one turn you can delete a letter or change two letters over.

How many different palindromes can you get for several (possibly zero) turns ?

Input

Input file contains one nonempty line s (under 100 symbols in length).

Output

Output the only number — number of different palindromes one can get. As this number can turn out to be too large, output only the remainder of division this number by $10^9 + 2012$.

Examples

palindroming.in	palindroming.out
acb	3
abracadabra	157

Примечание

Palindrome is nonempty line that can be read the same way in either direction.

Problem I. Runs

Input file:	`runs.in`
Output file:	`runs.out`
Time limit:	2 seconds
Memory limit:	64 mebibytes

For given permutation of π numbers from 1 to N we will denote as *serie* the maximum (by inclusion) the interval of indices $[i; j]$, for which $\pi(k) < \pi(k+1)$ is satisfied for all $i \le k < j$ or $\pi(k) > \pi(k+1)$ for all $i \le k < j$. For example, permutation $\pi = \left(\begin{smallmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 5 & 2 & 3 & 4 \end{smallmatrix}\right)$ contains 3 series: $[1; 2]$, $[2; 3]$, $[3; 5]$, because $\pi(1) < \pi(2)$, $\pi(2) > \pi(3)$ и $\pi(3) < \pi(4) < \pi(5)$.

Let's assume that for given N there is chosen random permutation of N numbers (all possible permutations have equal probabilities). You must calculate probability that chosen permutation will contain R series exactly.

Input

The only line of input file contains two integers N and R ($1 \le N, R \le 500$) — number of elements in permutation and required number of series.

Output

The only line of output must contain required probability with absolute error no more than 10^{-9}.

Examples

runs.in	runs.out
3 1	0.333333333333
4 2	0.500000000000

Problem J. Spiral 2

Input file:	`spiral2.in`
Output file:	`spiral2.out`
Time limit:	0.5 seconds
Memory limit:	64 mebibytes

Matrix, consisting of N lines and N columns, is filled up with natural numbers spirally: the first column upside down, the remaining positions of the last line — from left to right, remaining elements of the last column — downside up, remaining elements of the first line — from right to left etc.

So matrix of 4 lines and 4 columns looks like

1	12	11	10
2	13	16	9
3	14	15	8
4	5	6	7

Find the sum of values of elements of rectangle submatrix between lines r_1 and r_2 and columns c_1 and c_2.

Input

The first line contains one integer N ($1 \le N \le 10^9$). The second line contains four numbers r_1, r_2, c_1, c_2 ($1 \le r_1 \le r_2 \le N$, $1 \le c_1 \le c_2 \le N$).

Output

Print the only number — sum of elements in submatrix modulo $10^9 + 2012$.

Examples

spiral2.in	spiral2.out
4 2 3 1 3	63

Problem K. Lanterns (Division 2 Only!)

Input file:	`lantern.in`
Output file:	`lantern.out`
Time limit:	1 second
Memory limit:	256 mebibytes

Straight segment of the road with length M got bad reputation because of large number of accidents on it, especially at night. Finally Road Administration decided to install the street lamps and light up the whole segment. And then officials paid attention that some road segments were already being illuminated by N street lamps standing at oil stations, roadside cafes and so on, so that money dedicated for it, can be saved . . . In particular, a lamp numbered as i $(1 \le i \le N)$ lights up a road segment $[a_i, b_i]$, где $0 \le a_i < b_i \le M$.

A road segment is considered safe if it is illuminated by at least one street lamp.

Knowing the disposition of illuminated road segments, define the total length of safe road segments and number of unilluminated segments.

Input

The first line contains two integers: M — road length and N — number of street lamps $(1 \le M \le 10^6, 1 \le N \le 10^5)$. Each of the following N lines gives informaton on one street lamp and contains two integers a_i and b_i.

Output

Output two numbers, separated by space character — the total length of safe road segments and number of unilluminated segments.

Examples

lantern.in	lantern.out
8 2 1 5 4 8	7 1
8 2 0 6 6 8	8 0

Problem L. Progression (Division 2 Only!)

Input file:	`progression.in`
Output file:	`progression.out`
Time limit:	1 second
Memory limit:	256 mebibytes

You are given a sequence of N integers. Pick out of it a subsequence of numbers given in succession, of the maximum length that would form arithmetical progression.

It will be recalled that sequence $a_1, a_2, \ldots, a_k$ is arithmetical progression, if difference $a_i - a_{i-1}$ is constant for $i = 2, \ldots, k$.

Input

The first line contains one integer N ($2 \le N \le 10^6$). Each of the following N lines contains one number, not exceeding 10^9 by absolute value — regular element of initial sequence.

Output

Output the only number — length of found progression.

Examples

progression.in	progression.out
7 1 2 3 4 5 4 3	5
5 3 1 8 -4 0	2

Problem M. Spiral (Division 2 Only!)

Input file:	`spiral.in`
Output file:	`spiral.out`
Time limit:	1 second
Memory limit:	256 mebibytes

Matrix, consisting of M lines and N columns, is filled up with natural numbers spirally: the first column upside down, the remaining positions of the last line — from left to right, remaining elements of the last column — downside up, remaining elements of the first line — from right to left, etc.

So, matrix of 4 lines and 4 columns looks like

1	12	11	10
2	13	16	9
3	14	15	8
4	5	6	7

Find the value of matrix element, given in i-th line and j-th column.

Input

The first line of input file contains quantities M and N ($1 \le M, N \le 10^9$).

The second line contains values i and j ($1 \le i \le M$, $1 \le j \le N$).

Output

The only line of input file must contain the required value of matrix element.

Examples

spiral.in	spiral.out
4 5 2 2	15
20 30 1 2	96