Problem A. Rabbit Lunch

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Snuke wants to feed rabbits. He has the following food for rabbits' lunch:

- M types of carrots. There are m_i carrots of the i-th type.
- N types of kiwis. There are n_i kiwis of the i-th type.

Types are numbered by sequential integers, starting from zero.

Rabbits' lunch must follow the following rules. First, each rabbit must eat a carrot and a kiwi. Second, no two rabbits are allowed to have the exactly same lunch (i.e., same carrot and same kiwi). Compute the maximum number of rabbits who can have lunch.

The input is huge, so use the following recurrence formula to generate m_i and n_i:

- $m_0 = m0$
- $m_{i+1} = (m_i * 58 + md) mod (N + 1)$
- $n_0 = n0$
- $n_{i+1} = (n_i * 58 + nd) mod (M + 1)$

Input

First line of the input consists of 5 integers $M, N, m0, md, n0, nd$.

Constraints:

- $1 \leq M \leq 2,500,000$
- $1 \leq N \leq 2,500,000$
- $0 \leq m0, md \leq N$
- $0 \leq n0, nd \leq M$

Output

Print the maximal number of rabbits who can have lunch.

Examples

standard input	standard output
2 3 1 3 1 0	2
5 8 1 2 3 4	19

Problem B. Snuke

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Snuke likes to remove the character '`s`' from strings. Snuke received a string t as his birthday present. Compute the lexicographically minimal string that can be obtained by removing exactly k occurrences of 's' from the the string t.

Input

First line of input contains one integer k, secont line contains string t.

Constraints:

- $1 \leq k < |t| \leq 10^5$
- Each character in t will be a lowercase letter
- The number of 's' in t is at least k

Output

Print the answer in a single line.

Example

standard input	standard output
1 snuke	nuke
4 srstsrstsrst	rstrstrt

Problem C. Supermarket

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Snuke's supermarket sells n different types of food numbered 1 through n. Some types of food are seasonal: in different months, different types of food may be sold. You are given n strings $s_1, \cdots, s_n$ with length 12. If the j-th character of s_i is 'o', the food i is sold in the j-th month. Otherwise, this character is 'x', and the food i is not sold in the j-th month.

Komaki is a customer of this supermarket. He has a list of his preference of food. The list is a permutation of $1, \cdots, n$, and the fir st number in the list shows his favourite food, and so on. When he comes to this supermarket, he always buy the first food in his preference list among all available food. The preference list never changes, but he may buy different food in different months. Of course, if no food is sold, he can't buy anything during the entire month. You don't know Komaki's preference list. Compute the maximal possible number of different types of food Komaki may buy.

Input

First line of the input contains one integer n. i-th of next n lines contains one string s_i.

Constraints:

- $1 \le n \le 10^4$
- $|s_i| = 12$
- Each character in s_i is either 'o' or 'x'

Output

Output the maximal number of different types of food Komaki may buy.

Examples

standard input	standard output
3 oxooxoxxoxox oooooooooooo xxxoxxxxxxox	3
5 xxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxx	0

Notes

In Sample 1, if Komaki's preference list is 3, 1, 2, he will buy 1 in Januray, 2 in February, and 3 in April, so he will buy all types of food.

In Sample 2, Komaki won't buy anything.

Problem D. Subsequence

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Snuke wants to count the number of pairs of strings (s, t) that satisfy the following conditions:

- s consists of exactly a zeroes and b ones (and no other characters)
- t consists of exactly c zeroes and d ones (and no other characters)
- t is a subsequence of s

Compute the number of such pairs of strings, modulo $10^9 + 7$. Note that a string t is called a subsequence of a string s if you can obtain t by removing zero or more characters from s and concatenate the remaining characters without changing their relative order. For example, "`bcef`" is a subsequence of "`abcdef`".

Input

First line of the input contains four integers a, b, c and d.

Constraints:

- $0 \le a, b, c, d \le 2000$
- $a + b > 0$
- $c + d > 0$
- $c \le a$
- $d \le b$

Output

Print the number of pairs of strings that satisfy the conditions above, modulo $10^9 + 7$.

Examples

standard input	standard output
2 3 1 1	18
87 65 43 21	814209149

Note

In the first sample, for example, $(s, t) =$ ("`01101`", "`10`") satisfies the conditions.

Problem E. Tournament

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

A directed graph is called a tournament with n vertices if:

- The vertices are numbered 1 through n.
- For each $1 \le u < v \le n$ exactly one edge connects the vertices u and v, and the edge is directed either u to v or v to u.

Therefore, there are $2^{n(n-1)/2}$ tournament graphs with n vertices in total. Snuke drew all tournament graphs with n vertices, and for each of them he computed the number of strongly connected components. Compute the sum of all $2^{n(n-1)/2}$ values Snuke computed, modulo 1,000,000,007.

Input

Input contains one integer n.

Constraints:

- $1 \le n \le 10^5$

Output

Print the sum modulo $10^9 + 7$.

Examples

standard input	standard output
3	20
21	736073462

Note

For the first sample, there are 8 tournament graphs in total. Two of them have only one strongly connected component, and the others have three strongly connected components. The answer is $1 \times 2 + 3 \times 6 = 20$.

Problem F. Lake

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	256 mebibytes

There is a lake with perimeter L, and n ports are placed on the boundary of this lake. The ports are numbered 1 through n. If you walk x_i (distance) from the port 1 along the boundary in clockwise direction, you reach the port i. There are two ways to move between two points on the boundary pf the lake:

- Walk along the boundary of the lake (either in clockwise or counterclockwise direction). Your speed is one unit distance per one unit time.
- Move from a port to another port using a boat. Boats are extremely fast, so you can ignore the time required in this method.

Snuke decided to add k new ports on the boundary of the lake. When Snuke chooses the optimal places for new ports, compute the minimal possible value T such that it is possible to travel between any two points on the boundary of the lake in time T.

Input

First line of the input contains three integers L, n and k. Then n lines follow; i-th of them contains one integer x_i.

Constraints:

- $1 \le L \le 10^9$
- $2 \le n \le 10^5$
- $1 \le k \le 10^9$
- $0 = x_1 < x_2 < \cdots < x_n < L$

Output

Output the minimal possible value of T described in the statement. The absolute error or the relative error of your output must be at most 10^{-6}.

Examples

standard input	standard output
10 2 1 0 4	3.500000000000
100 10 1000 0 3 11 18 34 46 55 79 84 90	0.099585062241

Note

For the first sample, in the optimal solution, the location of the new port should be 7 (measured clockwise from the port 1).

Problem G. Medals

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

n people participated in Snuke Olympiad. The contestants were numbered 1 through n. They were ranked 1st through n-th according to the result of the contest, and no two contestants got the same rank. Snuke gave gold, silver, and bronze medals to 1st, 2nd, and 3rd ranked participants of the contest, respectively. For each $1 \le i \le m$, it is known that the contestant a_i performed better (i.e., got smaller rank) than the contestant b_i in the contest. Count the number of different possible results of medal winners. (Two results are considered different if at least one of gold, silver, or bronze medal is given to different contestants.)

Input

First line of the input contains two integers n and m. Then m lines follow, i-th of them containing two integers a_i and b_i.

Constraints:

- $3 \le n \le 10^5$
- $1 \le m \le 10^5$
- $1 \le a_i, b_i \le n$
- The input is consistent: there is at least one way to satisfy all conditions given by a_i, b_i.

Output

Print the number of different possible results of medal winners.

Example

standard input	standard output
3 1 1 2	3
6 8 2 1 6 4 3 4 1 6 3 1 5 4 2 6 2 6	8

Note

In Sample 1, there are three possibilities: $(gold, silver, bronze) = (1, 2, 3), (1, 3, 2), (3, 1, 2)$.

Problem H. Snuke Density

Input file:	*standrd input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

$c!$ Snukes are sleeping in a rectangular room with dimensions $a! \times b!$. Determine whether the Snuke Density of this room, $\frac{c!}{a!b!}$, is an integer or not.

Input

First line of the input contains three integers a, b and c.

Constraints:

- $1 \leq a, b, c \leq 10^{11}$

Output

If $\frac{c!}{a!b!}$ is an integer, print "`YES`". Otherwise print "`NO`".

Examples

standrd input	standard output
2 3 4	YES
100000000000 100000000000 100000000000	NO

Note

In sample 1, $\frac{4!}{2!3!} = 2$ is an integer.

Problem I. Convex Polygon

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Snuke wants to draw a convex n-gon on a grid paper with dimensions $10^6 \times 10^6$.
Output one example of $(x_1, y_1), \cdots, (x_n, y_n)$ that satisfies the following conditions.

- $(x_1, y_1), \cdots, (x_n, y_n)$ are vertices of a convex n-gon in counterclockwise order (In particular, no three points are on the same line)
- $0 \le x_i, y_i \le 10^6$
- x_i, y_i are integers

Input

Input file contains one integer n.

Constraints:

- $3 \le n \le 10^5$

Output

If there is no polygon that satisfies the conditions, print "NO" in a single line. Otherwise, print "YES", then print n lines, i'th of them contains coordinates of i-th vertice of polygon. Vertices must be listed in the counterclockwise order.

Examples

standard input	standard output
4	YES 0 0 1000000 0 1000000 1000000 0 1000000
100000	NO

Problem J. Mixed Drinks

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

There are n types of drinks. The sweetness, the sourness, and the bitterness of the i-th drink is a_i, b_i, c_i, respectively. If you mix k types of drinks with (sweetness, sourness, bitterness) = $(p_1, q_1, r_1), \cdots, (p_k, q_k, r_k)$, the sweetness, the sourness, and the bitterness of the resulting drink will be

$$(\max\{p_1, \cdots, p_k\}, \max\{q_1, \cdots, q_k\}, \max\{r_1, \cdots, r_k\})$$

Snuke decided to choose one or more drinks from the n drinks and mix them, and create a new drink. Count the number of possible combinations of (sweetness, sourness, bitterness) of the drink Snuke will create. It is guaranteed that each of $(a_1, \cdots, a_n), (b_1, \cdots, b_n), (c_1, \cdots, c_n)$ will be a permutation of $(1, \cdots, n)$.

Input

First line of the inut contains one integer n. Then n lines follow, i'th of those lines contains three integers a_i, b_i and c_i.

Constraints:

- $1 \leq n \leq 10^5$
- $(a_1, \cdots, a_n), (b_1, \cdots, b_n), (c_1, \cdots, c_n)$ are permutations of $(1, \cdots, n)$.

Output

Output the number of possible combinations of the sweetness, the sourness, and bitterness.

Examples

standard input	standard output
4 1 2 3 3 1 1 4 4 2 2 3 4	8
10 3 1 3 7 8 2 10 10 5 1 3 9 9 2 4 5 7 6 4 6 10 8 5 1 6 9 7 2 4 8	72

Note

In first sample, for ex, if you mix the second and the fourth drink, the sweetness, the sourness, and the bitterness of the new drink will be $(3, 3, 4)$.

Problem K. Hull Marathon

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Eels like a sport called Hull Marathon. This sport is played by teams. In the beginning of a game, all team members gather at the origin. When the game starts, team members can start running, and one minute later the winning team will be decided by the area of the convex hull of all team members. (Team members are considered as points on a plane). Snuke is the coach of a team with N eels. The i-th eel can run at most r_i in a minute. Compute the maximal possible area of the convex hull when this team plays optimally.

Input

First line of the input contains one integer N. Then N lines follow, i'th iof them contains one integer r_i.

Constraints:

- $3 \leq N \leq 8$
- $1 \leq r_i \leq 1000$
- All numbers in the input are integers.

Output

Print the maximal possible area of the convex hull in a line. You may print arbitrary number of digits, but the absolute error or the relative error must be at most 10^{-6}.

Examples

standard input	standard output
4 5 8 58 85	2970.000000000
6 1 1 1 1 1 1	2.598076211