Problem A. Manhattan

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

In Manhattan, there are streets $x = i$ and $y = i$ for each integer i. It is known that both Snuke's house and Smeke's house are on streets, and the Euclidean distance between them is exactly d. Compute the maximal possible distance between their houses when they travel along streets.

Input

The input contains one number d.

- $0 < d \leq 10$
- d contains exactly three digits after the decimal point.

Output

Print the answer. The answer is considered to be correct if its absolute or relative error is at most 10^{-9}.

Examples

standard input	standard output
1.000	2.000000000000
2.345	3.316330803765

Problem B. Dictionary

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

Snuke's dictionary contains n distinct words $s_1, \ldots, s_n$. Each word consists of English lowercase letters. The words are sorted lexicographically, i.e., $s_1 < \cdots < s_n$. Unfortunately, you can't read some characters in his dictionary. You replaced those characters with '?'. Compute the number of ways to replace each '?' with an English lowercase letter and make a valid dictionary, modulo 1,000,000,007.

Input

First line of the input contains one integer n ($1 \le n \le 50$). Then n lines follow, i'th of then contains word s_i ($1 \le |s_i| \le 20$, each character in s_i is an English lowercase letter or a '?').

Output

Print the answer.

Examples

standard input	standard output
2 ?sum??mer c??a??mp	703286064
3 snuje ????e snule	1

Problem C. Clique Coloring

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

There is a complete graph with m vertices. Initially, the edges of the graph are not colored. Snuke performed the following operation for each $i (1 \le i \le n)$: Choose a_i vertices from the graph and paint all edges that connect two of the chosen points with color i. It turned out that no edges were painted more than once. Compute the minimal possible value of m.

Input

First line of the input contains one integer n ($1 \le n \le 5$). Then n lines follow, i-th of these lines contains one integer a_i ($2 \le a_i \le 10^9$).

Output

Print the minimal possible value of m.

Examples

standard input	standard output
2 3 3	5
5 2 3 4 5 6	12

Note

Number the vertices of the graph: 1, 2, 3, 4, 5. For example, you can color the graph in the following way:

- Choose three vertices 1, 2, 3 and color edges between them with color 1.
- Choose three vertices 1, 4, 5 and color edges between them with color 2.

Problem D. Dense Amidakuji

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

Amidakuji is a famous Japanese game. The game contains w (here w is even) long vertical segments and Snuke can add some short horizontal segments between them. Each horizontal segment connects two adjacent vertical segments. There are h layers and each horizontal segment lies on one of the layers. Thus, there are $h(w-1)$ candidate positions for horizontal segments in total. Let (a, b) be the candidate position that is a-th from the top and b-th from the left (1-based). Check the figure in the next page to see how it looks like.

First, Snuke adds horizontal segments to all positions (a, b) that satisfy $a \equiv b \pmod 2$. Then, he removed n horizontal segments at $(a_1, b_1), \ldots, (a_n, b_n)$.

The game is played as follows. First, Snuke chooses one of the vertical segments. Then, he stands on the top end of the chosen vertical segment and starts moving downward. When he reaches an endpoint of a horizontal segment, he moves to the other end of the horizontal segment, and starts moving downward again. The game finishes when he reaches the bottom end. For each i (1-based), compute the final position of Snuke when he chooses the i-th vertical segment.

Input

First line of the input contains three integers h, w and n ($1 \le h, w, n \le 2 \cdot 10^5$, w is an even number). Then n lines follow; i-th of them contains two integers a_i and b_i ($1 \le a_i \le h$, $1 \le b_i \le w-1$, $a_i \equiv b_i \pmod 2$, (a_i, b_i) are pairwise distinct).

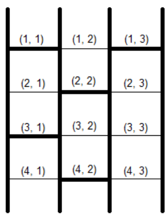
Output

Print w lines. In the i-th line, print the final position of Snuke when he chooses the i-th segment.

Examples

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

Note



For example, if he initially chooses the leftmost segment in sample 1, he crosses $(1, 1), (2, 2), (4, 2)$ and reach the bottom end of the segment that is second from the left.

Problem G. Snake

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Snake is a polyline with n vertices (without self-intersections). Initially, the coordinates of the i-th vertex of Snake is (x_i, y_i). Snake can move continuously by translation and rotation, but it can't change its shape (the lengths of the segments in the polyline and the angles between segments can't be changed). The line $y = 0$ is a wall, and there is a small hole at $(0, 0)$. Determine whether Snake can pass though the hole. (Initially, all points on Snake satisfy $y > 0$. After the movement, all points on Snake should satisfy $y < 0$.)

Input

First line of the input contains one integer n ($2 \le n \le 1000$). Then n lines follow, i'th of them contains pair of integers x_i and y_i ($0 \le x_i \le 10^9$, $1 \le y_i \le 10^9$, $(x_i, y_i) \ne (x_{i+1}, y_{i+1})$). The polyline doesn't have self-intersections. No three points are on the same line.

Output

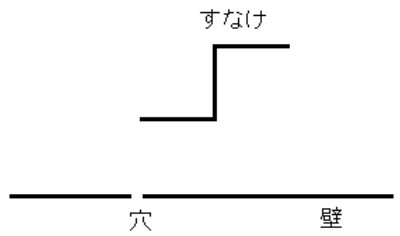
If Snake can pass though the hole, print "`Possible`". Otherwise print "`Impossible`".

Examples

standard input	standard output
4 0 1 1 1 1 2 2 2	Possible
11 63 106 87 143 102 132 115 169 74 145 41 177 56 130 28 141 19 124 0 156 22 183	Impossible

Note

For the first example, solution may look in the next way:



- Move 1 to the $-y$ direction.
- Rotate 90 degrees coounter-clockwise around the point $(0, 0)$.
- Move 1 to the $-y$ direction.
- Rotate 90 degrees clockwise around the point $(0, 0)$.
- Move 1 to the $-y$ direction.
- Rotate 90 degrees counter-clockwise around the point $(0, 0)$.
- Move 2 to the $-y$ direction.

Problem J. Hyperrectangle

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

Snuke received a d-dimensional hyperrectangle of size $l_1 \times \cdots \times l_d$ as a birthday present. Snuke placed it such that its i-th coordinate becomes between 0 and l_i, and ate the part of the hyperrectangle that satisfies $x_1 + \cdots + x_d \leq s$. (Here x_i denotes the i-th coordinate). Let V be the volume of the part eaten by Snuke. We can prove that $d!V$ (V times the factorial of d) is always an integer. Compute $d!V$ modulo $10^9 + 7$.

Input

First line of the input file contains one integer d ($2 \leq d \leq 300$). Then d lines follow; i-th of these lines contain one integer l_i ($1 \leq l_i \leq 300$). Last line contains one integer s ($0 \leq s \leq \sum l_i$).

Output

Print $d!V$ modulo $10^9 + 7$.

Examples

standard input	standard output
2 6 3 4	15
5 12 34 56 78 90 123	433127538

Note

Illustration to Sample 1:

Problem K. Beads (Division 2 Only!)

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

There are N beads in the necklace numbered from 1 to N, clockwisely. Each bead is marked with an uppercase letter. Therefore, when you continuously read these letters on the beads in clockwise order, you get a string of length N. Note that since the necklace is circular, you may obtain different strings by starting from different beads. Naturally, there are at most N different strings that you may obtain.

Find the lexicographically smallest string among all possible candidates.

Input

The first line of the input contains an integer N ($1 \leq N \leq 2 \cdot 10^6$), the length of the necklace. The second line contains a string consisting of N uppercase letters, where the k-th letter is the one marked on the k-th bead in clockwise order.

Output

Print the position of the bead such that you will get the lexicographically smallest string if she starts reading from that gem. If there are multiple smallest strings, select the one with smallest starting position.

Example

standard input	standard output
6 CABCAB	2

Problem L. The Maximum Sum (Division 2 Only!)

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

Given N positive integers, find two whose sum is the largest but not exceeding M.

Input

The first line of the input contains two positive integers N ($3 \le N \le 100$) and M ($1 \le M \le 100$). The second line contains a series S of N positive integers.

Output

The required sum.

Examples

standard input	standard output
5 8 5 3 4 6 5	8
4 116 31 52 73 84	115

Problem M. Spellcheck (Division 2 Only!)

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

New spellchecker must detect and fix next sequences of words:

- "`u`", or "`ur`" instead or "`you`" and "`your`".
- "`would of`", "`should of`" instead of "`would have`", "`should have`".
- "`lol`". In fact spellchecker must react even when a word contains "`lol`" as a substring. (Even if a word contains multiple occurrences of "`lol`", such as the word "`ololololo`", it will only count it as one error).

Write a computer program that reads sentences one by one, and for each sentence calculates how many errors new spellchecker will find in it.

Input

The first line of the input consists of a single integer T , the number of test cases ($1 \leq T \leq 50$). The following T lines each contain one sentence; that is, one or more words separated by space. A sentence consists of at most 100 characters, including lowercase English letters and spaces. Word consists only of lowercase English letters. Words are separeted by exactly one space, leading or trailing spaces are not allowed.

Output

For each test case, output how many errors new spellchecker will find after reading the sentence.

Examples

standard input	standard output
5 r u haz trololo my name is vasya i got the lollipop u should of lollollol i should off line	2 0 1 3 0

Problem N. Bluetooth (Division 2 Only)

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

You are trying to send a message via Bluetooth to a friend from your smartphone. A smartphone can connect to another one nearby via Bluetooth if the distance between them is not greater than D.

Determine whether a communication path between phones can be formed via zero or more intermediate smartphones so that your message can be successfully transmitted or not.

Input

The first line consists of two positive integers N ($1 \le N \le 10$) and D ($1 \le D \le 10$); N is the number of smartphones around, and D the transmission threshold. The next N lines are the X and Y coordinates of the locations of the N smartphones, of which the first one is your phone's, and the last one your friend's. All X and Y are non-negative integers does not exceeding 100.

Output

The (lower-case) character '`y`' if there is a connected path from your phone to your friend's, or '`n`' if there is not.

Example

standard input	standard output
4 7 1 4 6 2 9 7 14 4	y
5 6 7 1 5 5 1 6 8 7 20 15	n