Problem A. Adjacent Button Characters

You are given a standard `QWERTY` keyboard and two letters. Find out if they are located on the same row.

Just in case if you don't have a standard keyboard, we give you a picture of it.

If you have doubts about certain cases of the placement of the keys, refer to the sample to clarify.

Input

The first line of the input contains one integer t ($1 \le t \le 1000$) — the number of the test cases.

Then t test cases follow. Each test case is placed on the new line and consists of two lowercase English letters separated by a space. These characters are lowercase English letters.

Output

For each test case print in the new line "`Yes`" if they are on the same row. Otherwise, print "`No`".

Example

standard input	standard output
7	No
s y	Yes
q w	Yes
w e	No
q a	No
s q	No
w a	Yes
g g	

Problem B. Bad Checker Detected

On a well known Contest Management System the following task was found:

“Consider a six-digit integer *lucky* if the sum of three leftmost digits in it is equal to the sum of three rightmost digits. Given a six-digit integer X such as $L \leq X \leq R$, find the lucky integer nearest to X (if X is lucky, you shall consider the X itself). Note that answer may be outside $[L, R]$ interval”

The checker accepted the answer from a participant only when it is equal to the answer generated by the model solution. Given L and R determine if this checker works correctly (assuming that the model solution is correct), or if there exists some X where two or more correct answers are possible, print least such X.

Input

The first line contains two integers L and R ($100\,000 \leq L \leq R \leq 999\,999$) — left and right limits for X in the problem.

Output

If the checker works correctly for all $L \leq X \leq R$, print -1. Otherwise, print the minimal possible X such as there is more than one correct answer for the given X.

Examples

standard input	standard output
108008 108036	-1
100000 100050	-1

Problem C. Conjuring Dark Energy

A mage from Slytherin decided to obtain extra power by conjuring dark energies.

Consider the *cell* with integer coordinates (X, Y) as the set of the points (x, y) such as $X \le x \le X + 1$ and $Y \le y \le Y + 1$, (i.e 1×1 square).

There are three cells with sources of power on the plane, painted in red. To perform the ritual, the mage shall paint some other cells in red to create the connected set of the red cells, containing all three power sources.

The set of cells is considered *connected*, if for any two cells in the set exists the sequence of the cells, starting at one of those cells, ending in another, such as any two neighboring cells in the sequence share an edge.

Because painting each cell costs a lot of power to the mage, he asks you to find the minimal number of cells to be painted to perform his ritual.

Input

First line of the input contains six integers x_1 , y_1, x_2, y_2, x_3, y_3 — coordinates of the given cells $(0 \le x_1, y_1, x_2, y_2, x_3, y_3 \le 100)$. You may assume that the given cells are pairwise distinct.

Output

Print one integer — the minimum number of cells to be painted to create a connected set of cells containing all three power sources.

Example

standard input	standard output
`1 1 2 2 3 3`	`2`

Problem D. Digital Evolution Foundation

The Digital Evolution Foundation finally decided to give each person in the Galaxy an identification number.

Each number is a 15-digit integer. The first digit is not a zero. However, there is at least one zero, but there are no two consecutive zeros.

All possible numbers are written down in increasing order and are given to people in the order they sent a request. But some people from the galaxy far far away were too late to register and now they are worrying that the Foundation is out of the numbers.

Can you find out the number assigned to the n-th person who asked about it or tell that all correct numbers are already given out?

Input

The first line contains the only integer n ($1 \le n \le 10^{16}$).

Output

Print a 15-digit identification number given to the n-th person. If there is no such number, print -1.

Example

standard input	standard output
2	101010101010102

Problem E. Experiments For Generalization

Byteazar is exploring some generalization of the famous Goldbach problem. He takes two integers A and B and counts the number of $A \leq X \leq B$ such as X can be represented as the sum of two primes (**not necessarily different**). Note that 1 cannot be considered as prime.

Given A and B, help him to do that calculation.

Input

Input data contains two integers A and B ($2 \leq A \leq B \leq 10^{12}$), $B - A \leq 4 \cdot 10^4$.

Output

Print one integer — the number of $A \leq X \leq B$ such as X can be represented as the sum of two primes.

Examples

standard input	standard output
10799999 10836006	20223
1302 2021	455

Problem F. Funny Gnomish Hockey

The Gnomes, living in dark and cold caves, invented their own game on ice. They called it a gnomish hockey.

However, it is really different from the hockey we know. The game is played with multiple pucks on the ice $H \times W$ with the outer walls around it. And there is only one team trying to hit one goal.

Some of the cells are empty, some contain pucks. The puck perfectly fits the cell. The gnome may pull any puck in any of four directions parallel to the coordinate axis.

When the puck hits something (either the outer wall or another puck) it stops immediately. When the puck is hit by another puck, it starts movement in the same direction. This is including the cases when puck hits several pucks staying one after another in the direction of the movement: for example, let puck X hit two pucks Y and Z staying in a row: then X stops, Y starts movement and immediately stops at the same cell, but it "passes" movement to Z which starts the movement. Note that a puck will not replace another puck; instead, it will stop right before it.

Exactly one cell is labeled as goal. If the team managed to stop any of the pucks at the goal cell, it wins the round. Otherwise, the round is lost. Note that if the puck is sliding over the goal, it cannot be counted as the victory.

You are given the size of the playfield, initial placement of pucks and the goal cell. Check if gnomes can win the game starting with this placement if they are playing optimally.

Input

First line of the input contains two integers H and W ($1 \le H, W \le 16$). Each of following H lines contains exactly W characters. Character '`p`' denotes the puck, character '`g`' — the goal, character '`.`' — other cells on the ice. You may assume that there is exactly one goal and at least one puck in the input.

Output

Print "`yes`" if gnomes can stop a puck at the goal, or "`no`" otherwise.

Examples

standard input	standard output
1 10 g........p	yes
3 6 ...... .p..g.	no
6 4 .... .pp. .pp. .... .g..	yes

Problem G. General Highway Inspection

There are only three big cities in the Intland — Doublein, Longdon and Longlongdon.

There are a bidirectional highways built between Doublein and Longdon, b roads between Doublein and Longlongdon, and c roads between Longdon and Longlongdon.

The Ministry of Transport of Intland is planning the General Highway Inspection. The inspectors are planning to start from Doublein, where the Ministry is placed, travel along each road exactly once, and return back to Doublein.

It is clear that the Ministry has many plans to choose from. They would like to find out the number of different plans, modulo $(10^9 + 7)$.

Note that two plans A and B are considered different only if there exists an i where the i-th traveled road in plan A is different from the i-th road in plan B.

Input

The first line of the input contains 3 integers a, b, c $(1 \le a, b, c \le 10^5)$.

Output

Print an integer that denotes the number of different ways modulo $(10^9 + 7)$.

Examples

standard input	standard output
1 1 3	12
1 3 1	24

Problem H. Hunter In Jury

ICPC Judge Anton got the hunter bow and the arrows as a birthday gift.

After the last onsite ICPC event, there are N spare balloons in the room. The balloons are lined up such that i-th balloon is placed in the point with coordinates $(i, 0, h_i)$, where h_i is a positive integer.

Anton decided to use those balloons to train his hunting skills.

Anton is located at $(0, 0, 0)$, and he may shoot at the any integer height, i.e. from point $(0, 0, h_j)$. When he shoots an arrow, it starts to move from $(0, 0, h_j)$ horizontally by the direction of increasing the first coordinate. That is, it will be in $(1, 0, h_j)$ first, $(2, 0, h_j)$ later, and so on.

When an arrow touches a balloon, the balloon bursts, and the height of the arrow decreases by one. That is, if the coordinates were $(d, 0, h_j)$ then they would be $(d, 0, h_j - 1)$. Then arrow continues moving horizontally at the new height. If the height decreases to zero, the arrow lands on the floor.

Note that the second coordinate will always be 0. It is given in order to make it easier to understand the statement.

Find out the minimum number of arrows needed to burst all the balloons.

Input

The first line contains the only integer N $(1 \le N \le 10^6)$.

The second line contains N integers h_i $(1 \le h_i \le 10^6)$ — the height of the i-th balloon.

Output

Print out the minimum number of arrows needed to burst all the balloons.

Example

standard input	standard output
5 3 2 9 8 7	2

Problem I. Input Jumbled Key

The digital lock used to access the university datacenter consists of five wheels with hexadecimal digits written on each wheel.

The digits are written in the order "`0123456789ABCDEF`", if rotate wheel after '`F`' digit then '`0`' will appear again and so on.

The new system administrator found that information about the key opening the door is jumbled. He managed to get the list of possible passwords where exactly one is correct. Additionally he was told that:

- The password contained four odd digits and one even digit (the digits 1,3,5,7,9,B,D,F are considered odd, others are considered even).
- Previous system administrator was so odd person that he hacked the lock so it accepted the nearest odd digits instead of even one (so if the key was `30997`, then any of keys `3F997`, `30997` and `31997` is accepted; for the key `FFFFE` any of keys `FFFFD`, `FFFFE` and `FFFFF` is accepted).

The system administrator wants to find the sequence of keys to enter it in the lock one by one that:

1. May contain keys from the list as well as keys not listed in there.
2. Ensures that lock will be opened at the end of the sequence or earlier.
3. Contains the minimum possible number of keys.
4. Is lexicographically minimal among all sequences, conforming 1-3.

Help him to find such a sequence.

Input

First line of the input contains one integer N ($1 \le N \le 6000$). Each of the following N lines contains one key — the five-digit string consisting of the hexadecimal digits ('`0`' - '`9`' and '`A`' - '`F`'). You may assume that exactly one digit in any of the keys is even.

Output

In first line of the input print one integer K — minimum number of keys in the sysadmin's list. Then following K lines shall contain the keys in order they shall be entered to the lock. Note that you shall select lexicographically minimal list of keys among all possible shortest lists.

Examples

standard input	standard output
1 FFFFE	1 FFFFD
3 30997 3E997 0D351	2 0D351 3F997

Problem J. Jungle Kingdom Laws

The Jungle Kingdom can be represented as a convex polygon with N vertices. King Lion decided to divide the kingdom into two districts and give those districts under the control of his two friends.

The laws of the Kingdom allow such a division only if the country is divided by some diagonal (a segment that connects two vertices). King wants to make the difference of the areas two districts as small as possible. Given the coordinates of the vertices of the Jingle Kingdom help him to find that difference.

Input

The first line of the input contains one integer N ($1 \le N \le 60\,000$) — the number of the vertices in a polygon, representing the Jungle Kingdom. Each of the following N lines contain two integers x_i and y_i ($0 \le x_i, y_i \le 10^9$) — coordinates of the next vertex of the polygon. The vertices are given in counterclockwise order. You may assume that the given polygon is strictly convex without three collinear vertices.

Output

Print one non-negative real number — the minimal non-negative absolute value of the difference of the areas of two district with absolute or relative error 10^{-9} or better.

Examples

standard input	standard output
4 0 0 1 0 1 1 0 1	0.0000000000
4 0 0 1 0 1 2 0 1	0.5000000000

Problem K. Kinky Letters Movement

You are given two strings s_1 and s_2.

In one step you can choose any substring from s_1 and reverse it. For example, from the string "abcdef", you can get "aedcbf".

Can you get s_1 to be equal s_2 in four such operations on string s_1 only?

A string a is a substring of a string b if a can be obtained from b by deletion of several (possibly, zero or all) characters from the beginning and several (possibly, zero or all) characters from the end.

Input

The first line contains a string s_1 ($1 \le |s_1| \le 50$).

The second line contains a string s_2 ($|s_1| = |s_2|$).

The strings contain only lowercase English letters.

Output

Print "Yes" if it is possible to transform s_1 to s_2 or "No" otherwise.

Examples

standard input	standard output
abcd dcba	Yes
15 pushoakisaheavy youspeakviahash	No

Problem L. Live Mercurian Navigation

In 2121, in Mercury, there are n mercurian cities and m **directed** roads between cities. The i-th road goes from the a_i-th city to the b_i-th city. For each pair of cities u and v, there is at most one road from u to v.

As traffic on Mercury is becoming heavier, the toll of the roads also varies. At time t, one should pay $(c_i \cdot t + d_i)$ dollars to travel along the i-th road.

Bytica is living in the 1-st city and would like to go to the n-th city, so she uses her oo-car for that. She wants to know the average money she must spend to get from city 1 to city n at $t \in [0, T]$.

Note that since mercurian oo-cars are soo fast, traveling on the roads is instant, i.e. it takes no time for Bytica.

Formally, if $f(t)$ is the minimum money she should pay to get from city 1 to city n at time t, Bytica would like to find

$$\frac{\int_0^T f(t)\mathrm{d}t}{T}.$$

Input

The first line contains 3 integers n, m, T $(2 \le n \le 10, 1 \le m \le n(n-1), 1 \le T \le 10^4)$.

The i-th of the following m lines contains 4 integers a_i, b_i, c_i, d_i $(1 \le a_i, b_i \le n, a_i \ne b_i, 0 \le c_i, d_i \le 10^3)$.

It is guaranteed that Bytica is able to drive from city 1 to city n.

Output

Print a real number that denotes the answer. It will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Examples

standard input	standard output
3 3 2 1 2 1 0 2 3 1 0 1 3 1 1	1.75000000
3 3 2 1 2 1 0 2 3 1 0 1 3 0 5	2.00000000

Problem M. Make Necklace Optimal

Bytica has n gems arranged **in a cycle**, whose values are $a_1, a_2, \ldots, a_n$. She would like to remove some gems to make them into a *optimal necklace* without changing their relative order.

Note that an *optimal necklace* can be divided into 3 consecutive parts X, y, Z, where

- X consists of gems with non-decreasing values,
- y is **the only** diamond. (A diamond is a gem whose value equals to 10000)
- Z consists of gems with non-increasing values.

Find out the maximum total value of the gems in the optimal necklace.

Input

The first line of the input contains one integer n ($1 \leq n \leq 10^5$).

The second line contains n integers $a_1, a_2, \ldots, a_n$ — values of gems ($0 \leq a_i \leq 10^4$, $1 \leq$ number of diamonds ≤ 10).

Output

Print an integer which denotes the maximum total value of the gems in the optimal necklace.

Examples

standard input	standard output
6 10000 3 2 4 2 3	10010
2 10000 10000	10000