The 43rd ACM International Collegiate Programming Contest
Asia Nanjing Regional Contest

October 14

南京航空航天大学
NANJING UNIVERSITY OF AERONAUTICS AND ASTRONAUTICS

regionals
2018
icpc International Collegiate Programming Contest
icpc.foundation

Problems

Do not open before the contest has started.

Problem A. Adrien and Austin

Input file: `standard input`
Output file: `standard output`

Adrien and Austin are playing a game with rocks.

Initially, there are N rocks, indexed from 1 to N. In one move, the player chooses at least 1 and at most K consecutively indexed rocks (all of them should not have been removed) and removes them from the game.

Adrien always starts the game, and then Adrien and Austin take turns making moves. The player who is unable to make a move (because all rocks are removed) loses.

Given N, K, find who is going to win the game (assuming they are smart and are playing optimally).

Input

The first line contains two integers N, K ($0 \le N \le 10^6, 1 \le K \le 10^6$).

Output

Print a name (`"Adrien"` or `"Austin"`, without the quotes) — the person who is going to win the game.

Examples

standard input	standard output
1 1	Adrien
9 3	Adrien

Problem B. Tournament

Input file: `standard input`
Output file: `standard output`

There are N villagers (including the village chief) living in Number Village. Interestingly, all of their houses lie on a straight line. The house of the i-th villager ($0 \le i < N$) lies exactly a_i kilometers to the east of the village chief's house. (For simplicity, the 0-th villager is the village chief, so $a_0 = 0$.)

Recently, a tournament is going to be held in Number Village, in which everyone in the village will participate.

For the convenience of villagers, the organizer plans to build K stadiums. The stadium can be built anywhere in the village, even at the same place as any villager's house.

However, the organizer wants the traffic cost to be minimized. The traffic cost is defined by $\sum_{i=0}^{N-1} \min_{j=0}^{K-1} D(a_i, s_j)$, where $D(a_i, s_j)$ is the distance between the i-th villager's house and the j-th stadium.

Your task is to calculate the minimal traffic cost (rounded down to the nearest integer), given N, K and a_i.

Input

The first line contains two positive integers N, K ($K \le N \le 3 \times 10^5$).

The second line contains N non-negative integers $a_0, a_1, \cdots, a_{N-1}$ ($0 = a_0 < a_1 < \cdots < a_{N-1} \le 10^9$).

Output

Print a single integer — the minimal traffic cost rounded down to the nearest integer.

Examples

standard input	standard output
5 2 0 4 7 9 10	7
9 3 0 1 10 11 20 21 22 30 32	23

Problem C. Cherry and Chocolate

Input file:	`standard input`
Output file:	`standard output`

Cherry and Chocolate play a game on a tree. First, Cherry picks a node and paints it pink. Then, Chocolate picks another node and paints it brown. Afterwards, Cherry picks yet another node and paints it pink. The game ends here. Chocolate doesn't get the second move.

For each node v, if there is no path from v to the brown node without passing through a pink node, Cherry gets a point.

Cherry wants to maximize her score, and Chocolate wants to minimize it. If both players play optimally, what will Cherry's score be?

Input

The first line contains an integer, n $(3 \le n \le 10^5)$, the number of nodes on the tree.

Each of the next $n-1$ lines contains two integers a_i and b_i, $(1 \le a_i, b_i \le n)$, meaning there is an edge between node a_i and node b_i.

Output

A single integer, Cherry's score if both players play optimally.

Example

standard input	standard output
4 1 2 2 3 2 4	3

Problem D. Country Meow

Input file: `standard input`
Output file: `standard output`

In the 24^{th} century, there is a country somewhere in the universe, namely Country Meow. Due to advanced technology, people can easily travel in the 3-dimensional space.

There are N cities in Country Meow. The i-th city is located at (x_i, y_i, z_i) in Cartesian coordinate.

Due to the increasing threat from Country Woof, the president decided to build a new combatant command, so that troops in different cities can easily communicate. Hence, the Euclidean distance between the combatant command and any city should be minimized.

Your task is to calculate the minimum Euclidean distance between the combatant command and the farthest city.

Input

The first line contains an integer N $(1 \le N \le 100)$.

The following N lines describe the i-th city located.Each line contains three integers x_i, y_i, z_i $(-100000 \le x_i, y_i, z_i \le 100000)$.

Output

Print a real number — the minimum Euclidean distance between the combatant command and the farthest city. Your answer is considered correct if its absolute or relative error does not exceed 10^{-3}. Formally, let your answer be a, and the jury's answer be b. Your answer is considered correct if $\frac{|a-b|}{\max(1,|b|)} \le 10^{-3}$.

Examples

standard input	standard output
3 0 0 0 3 0 0 0 4 0	2.500000590252103
4 0 0 0 1 0 0 0 1 0 0 0 1	0.816496631812619

Problem E. Eva and Euro coins

Input file: `standard input`
Output file: `standard output`

Eva is fond of collecting coins. Whenever she visits a different country, she always picks up as many local coins as she can. As you know, Eva also likes to go trips to Europe; thus she has collected a large amount of Euro coins because so many countries in Europe use them.

Eva has n Euro coins in total. She places all her coins on a desk in a row and plays a game with the coins. In one step Eva can choose exactly k consecutive coins and flips them at the same time, provided that all heads of these coins face up or all heads of these coins face down. She wonders that, in finite steps, what states of the coins can be reached from the original state.

Input

The first line contains two integers, n and k ($1 \le k \le n \le 10^6$) — the number of Euro coins Eva owns and the number of consecutive coins Eva can flip in one step. The next two lines contain two strings, s and t, respectively ($|s| = |t| = n$). s and t only contain the digits `0` and `1`.

s represents the initial state of the n coins: if the head of the i-th coin faces up, then the i-th character of s is `1`; otherwise (i.e. the head of i-th coin faces down), the i-th character of s is `0`. t represents the desired final state of the n coins in the same way as s.

Output

If it is possible for Eva to reach the state represented by t from the state represented by s in finite steps, output `"Yes"`; otherwise, output `"No"` (without the quotes).

Examples

standard input	standard output
6 2 000000 101101	Yes
8 3 10101010 01010101	No

Problem F. Frank

Input file: `standard input`
Output file: `standard output`

Frank likes to travel. However, he doesn't prefer a fully-planned trip. Instead, he enjoys traveling from one city to another randomly.

Frank's favorite country is Country Meow because the roads in the country are complicated.

Country Meow has N cities, indexed with numbers from 0 to $N-1$, and there are M unidirectional roads. The i-th road can be denoted by (a_i, b_i), which means it starts from city a_i and ends in city b_i, and does not pass through any other cities. Interestingly, there may be roads with $a_i = b_i$, or several roads with the same starting and ending cities. The roads are built in a way such that for any two cities A and B, one can travel from A to B through these roads.

Frank is planning Q trips to Country Meow. Each plan is an ordered list of cities $C = (c_0, c_1, \cdots, c_{K-1})$ such that $c_i \neq c_{i+1}$ for all $0 \leq i \leq K-2$.

On a trip with a plan C, Frank will:

1. Go to city c_0.

2. Choose a road uniformly at random from all roads whose starting city is Frank's current city.

3. Follow the chosen road to the next city.

4. If C is a subsequence of the current visited cities sequence, then the trip is finished. Otherwise, go to step 2.

(A sequence A is a subsequence of another sequence B if one can delete some or no elements from B without changing the order and obtain A.)

However, each road requires a toll of 1 dollar. Frank wants to know the expected value of the total amount of fees he spent on each trip. Can you help him?

Input

The first line contains three positive integers N, M, Q ($3 \leq N \leq 400, M \leq 4 \times 10^5, Q \leq 400$).

The following M lines describe the roads in the Country Meow. Each of them contains two integers a_i, b_i ($0 \leq a_i, b_i < N$) — the starting and ending cities of the i-th road.

The following $2Q$ lines describe the plans Frank made. Each two lines describe a plan. The first contains an integer K ($1 \leq K \leq 500$) — the length of the city list; the second contains K integers $c_0, c_1, \cdots, c_{K-1}$ ($0 \leq c_i < N, c_i \neq c_{i+1}$) — the city list in the plan.

Output

For each plan, print a single real number in one line — the expected value of the total amount of fees on the corresponding trip.

Your answer is considered correct if the absolute or relative error between each number in your output and the corresponding one in jury's answer does not exceed 10^{-8}. Formally, let your answer be a, and the jury's answer be b. Your answer is considered correct if $\frac{|a-b|}{\max(1,|b|)} \leq 10^{-8}$.

Example

standard input	standard output
3 4 3 0 1 1 2 2 0 2 1 2 1 0 4 0 2 0 1 3 2 1 2	4.0000000000 6.0000000000 2.5000000000

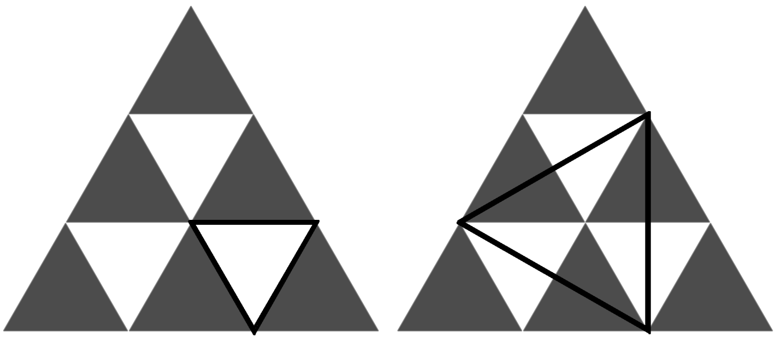
Problem G. Pyramid

Input file: `standard input`
Output file: `standard output`

The use of the triangle in the New Age practices seems to be very important as it represents the unholy trinity (Satan, the Antichrist and the False Prophet bringing mankind to the New World Order with false/distorted beliefs). The triangle is of primary importance in all Illuminati realms, whether in the ritual ceremonies of the Rosicrucians and Masons or the witchcraft, astrological and black magic practices of other Illuminati followers.

One day you found a class of mysterious patterns. The patterns can be classified into different degrees. A pattern of degree n consists of $\frac{n(n+1)}{2}$ small regular triangles with side length 1, all in the same direction, forming a big triangle. The figure below shows the pattern of degree 3. All small regular triangles are highlighted.

Since the pattern contains many regular triangles, which is very evil and unacceptable, you want to calculate the number of regular triangles formed by vertices in the pattern, so that you can estimate the strength of Illuminati. It is not necessary that each side of regular triangles is parallel to one side of the triangles. The figure below shows two regular triangles formed by vertices in a pattern of degree 3.



Since the answer can be very large, you only need to calculate the number modulo $10^9 + 7$.

Input

The first line contains an integer t ($1 \le t \le 10^6$) — the number of test cases.

Each of the next t lines contains an integer n ($1 \le n \le 10^9$) — the degree of the pattern.

Output

For each test case, print an integer in one line — the number of regular triangles modulo $10^9 + 7$.

Example

standard input	standard output
3 1 2 3	1 5 15

Problem H. Huge Discount

Input file: `standard input`
Output file: `standard output`

John heard an urban legend from Dreamoon about convenience stores in Incredible Convenient Purchasing Country (ICPC). The original price of any good there is usually as high as 10^{10^5}. Of course, nobody is going to pay such a high price. Instead, one can remove any two consecutive distinct digits from the original price. One can perform such operation as many times as he wants. Needless to say, each removal must be valid.

For example, if the original price is 123, one could pay 1 dollar by removing 23 or pay 3 dollars by removing 12. However, it's illegal to pay 2 dollars because 1 and 3 are not adjacent. However, if the original price is 111, no removal can be performed as all digits are the same.

There may be leading zeroes on the price tag. Also, leading zeroes may occur after some of such removals. In these cases, the leading zeroes are not removed automatically. Therefore, if the price tag reads 0033, one can get it for free by removing 03 twice.

John found some of such convenience stores. In these particular stores, there are some interesting properties on the prices:

1. Only digits 0, 1 and 2 are used.

2. For every i, if the first digit on the price tag of good i is removed, it becomes the price tag if good $i+1$.

For example, if the price tag of good 1 is 012, the price tag of good 2 is 12 and the price tag of good 3 is 2.

Please tell John how much it costs to buy all goods in one particular store.

Input

The first line contains an integer, n ($1 \le n \le 10^5$), the number of goods in the store.

The second line contains a string, s ($|s| = n$, $s_i \in \{0, 1, 2\}, \forall i \in [1, n]$), the price tag of good 1 in the store.

Output

An integer, the cost to buy all goods, without leading zeroes.

Examples

standard input	standard output
5 11012	3
3 111	123

Problem I. Magic Potion

Input file:	`standard input`
Output file:	`standard output`

There are n heroes and m monsters living in an island. The monsters became very vicious these days, so the heroes decided to diminish the monsters in the island. However, the i-th hero can only kill one monster belonging to the set M_i. Joe, the strategist, has k bottles of magic potion, each of which can buff one hero's power and let him be able to kill one more monster. Since the potion is very powerful, a hero can only take at most one bottle of potion.

Please help Joe find out the maximum number of monsters that can be killed by the heroes if he uses the optimal strategy.

Input

The first line contains three integers n, m, k $(1 \leq n, m, k \leq 500)$ — the number of heroes, the number of monsters and the number of bottles of potion.

Each of the next n lines contains one integer t_i, the size of M_i, and the following t_i integers $M_{i,j}$ $(1 \leq j \leq t_i)$, the indices (1-based) of monsters that can be killed by the i-th hero $(1 \leq t_i \leq m, 1 \leq M_{i,j} \leq m)$.

Output

Print the maximum number of monsters that can be killed by the heroes.

Examples

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

Problem J. Prime Game

Input file: `standard input`
Output file: `standard output`

Given a suqence of n integers a_i.

Let $\text{mul}(l, r) = \prod_{i=l}^{r} a_i$ and $\text{fac}(l, r)$ be the number of distinct prime factors of $\text{mul}(l, r)$.

Please calculate $\sum_{i=1}^{n} \sum_{j=i}^{n} \text{fac}(i, j)$

Input

The first line contains one integer n $(1 \le n \le 10^6)$ — the length of the sequence.

The second line contains n integers a_i $(1 \le i \le n, 1 \le a_i \le 10^6)$ — the sequence.

Output

Print the answer to the equation.

Examples

standard input	standard output
10 99 62 10 47 53 9 83 33 15 24	248
10 6 7 5 5 4 9 9 1 8 12	134

Problem K. Kangaroo Puzzle

Input file: `standard input`
Output file: `standard output`

Your friend has made a computer video game called "Kangaroo Puzzle" and wants you to give it a try for him. As the name of this game indicates, there are some (at least 2) kangaroos stranded in a puzzle and the player's goal is to control them to gather. As long as all the kangaroos in the puzzle get together, they can escape the puzzle by the miraculous power of kangaroos.

The puzzle is a $n \times m$ grid consisting of nm cells. There are walls in some cells and the kangaroos cannot enter these cells. The other cells are empty. The kangaroos can move in the following direction: up, down, left and right. It is guaranteed that one kangaroo can move from an empty cell to any other. It is also guaranteed that there is no cycle in the puzzle — that is, it's impossible that one kangaroo can move from an empty cell, pass by several distinct empty cells, and then back to the original cell.

There is exactly one kangaroo in every empty cell at the beginning. You can control the kangaroos by pressing the button `U`, `D`, `L`, `R` on your keyboard. The kangaroos will move simultaneously according to the button you press. For instance, if you press the button `U`, a kangaroo would move to the upper cell if it exists and is empty; otherwise, the kangaroo will stay still. You can press the buttons for at most 50000 times. If there are still two kangaroos standing in different cells after 50000 steps, you will lose the game.

Input

The first line contains two integers, n and m ($1 \le n, m \le 20$), the height and the width of the puzzle, respectively. Each of the next n lines contains a (`0,1`)-string of length m, representing the puzzle. If the j-th character of the $i+1$-th line is `1`, then the cell at the i-th row and the j-th column is empty; otherwise (i.e. it is `0`), the corresponding cell is blocked and cannot be entered.

Output

Print a string consisting of `U`, `D`, `L`, `R`, such that all kangaroos will get together after pressing the buttons in the order of this string. The length of the string should not exceed 50000. There are many possible valid answers, so just print any of them.

Examples

standard input	standard output
4 4 1111 1001 1001 1110	LLUUURRRDD
2 15 111111111111111 101010101010101	ULLLLLLLLLLLLL

Problem L. Lagrange the Chef

Input file: `standard input`
Output file: `standard output`

Lagrange is a chef. He has developed several theories related to food.

In those theories, the most famous one is called Compatible Theory. Specifically, Lagrange has invented 10^6 different dishes. However, one pair of dishes, namely X and Y, when tasted one after another (regardless of order), would have a negative impact on the dining experience. Lagrange called the pairs of dishes "incompatible".

The concept of "compatible" can also be extended to a full meal. A meal, consisting of several dishes served in a specific order, is compatible if no two dishes served consecutively are incompatible.

One day, a guest requests a meal consists of N dishes $a_0, a_1, \cdots, a_{N-1}$ to be served in order. Since the guest didn't know Compatible Theory, the requested meal can be incompatible.

Lagrange wants to adjust the order of dishes to make the meal compatible while keeping the adjusted list not differ a lot from the original one. Hence, he defines an "adjusting step" as moving a dish in the list to any other position.

Your job is to calculate the minimum number of adjusting step required to make the meal compatible, or determine that this is impossible.

Input

The first line contains three positive integers N, X, Y $(1 \leq N \leq 5000, 1 \leq X, Y \leq 10^6, X \neq Y)$.

The second line cantains N positive integers, $a_0, a_1, \cdots, a_{N-1}$ $(1 \leq a_i \leq 10^6)$.

Output

If it is not possible to make the meal compatible, print `-1`. You should not print the quotation marks.

Otherwise, print an integer — the minimum number of adjusting step required to make the meal compatible.

Examples

standard input	standard output
3 1 2 1 2 3	1
3 1 2 1 2 2	-1

Problem M. Mediocre String Problem

Input file: `standard input`
Output file: `standard output`

Given two strings s and t, count the number of tuples (i, j, k) such that

1. $1 \le i \le j \le |s|$

2. $1 \le k \le |t|$.

3. $j - i + 1 > k$.

4. The i-th character of s to the j-th character of s, concatenated with the first character of t to the k-th character of t, is a palindrome.

A palindrome is a string which reads the same backward as forward, such as "`abcba`" or "`xyzzyx`".

Input

The first line is the string s ($2 \le |s| \le 10^6$). The second line is the string t ($1 \le |t| < |s|$). Both s and t contain only lower case Latin letters.

Output

The number of such tuples.

Examples

standard input	standard output
ababa aba	5
aabbaa aabb	7