The 12th Open International Student Olympiad in Programming named after S.A. Lebedev and V.M. Glushkov KPI-OPEN 2017
Kyiv, 2017

Problem A. FUNNY CHESSBOARDS

Input file:	standard input
Output file:	standard output
Time limit:	2s.
Memory limit:	128M.

The word "chess" comes from the Persian words "check mate", which means "the king is dead."

The chessboard consists of fields of two colors which alternate. For the sake of convenience, we denote the white color by 0, and black by 1. We will assume that chessboards are rectangular, but of arbitrary size (including 1 × 1), the main thing is that the colors of the fields alternate on them. The task is for a board the size of M × N, on which fields are painted in white and black colors randomly, to determine the number of different funny chessboards.

Input

The first line contains numbers M and N ($0 \le M, N \le 1000$). The next M lines contain N numbers, each of them is either 0 or 1.

Output

Print a single number which is the number of funny chessboards for the given input.

Examples

Input	Output
1 2 0 1	3
2 2 0 1 1 0	9
3 3 1 0 1 0 1 1 1 0 1	25

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Problem B. AN ELECTION OF MAYORS

Input file:	standard input
Output file:	standard output
Time limit:	1s.
Memory limit:	128M.

Near the Carpathians there is a beautiful country of Carpathia, and the mayor in it is Mrs. Sonia. In the Carpathians there are N large cities, which are located at the points with coordinates (x_i, y_i). Obviously, every city should have its own mayor. To elect mayors, Mrs. Sonia called for help from Mr. Antony. They both had a great choice among women and men who could become successful mayors in the cities of Carpathia. Of course, Mrs. Sonya wanted to have as many women as possible among the mayors, while Mr. Anton wanted men. So they decided to create on each vertical and horizontal line the value of inequality - the difference between the number of women and men who will lead the cities on this line. Please help Mr. Antony and Mrs. Sonia to place women and men in the posts of mayors in each city so that the total sum of the values of inequalities on all the lines is minimal.

Input

The first line contains the number N ($1 \le N \le 2*10^4$). The following N lines contain two numbers - the coordinates of the cities. All coordinates do not exceed 10^9 in absolute value.

Output

Print N digits, one in each line. The i-th digit is 0, if in this city a man should be appointed to the post of mayor and 1 - if a woman.

Examples

Input	Output
4 0 0 1 0 1 1 0 1	0 1 0 1

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Problem C. VINNITSA FOUNTAINS

Input file:	standard input
Output file:	standard output
Time limit:	2s.
Memory limit:	128M.

Stepan at last decided to get out from behind the computer and enjoy the beauty of the Vinnitsa fountains. It is known that every street in Vinnitsa is famous for its special fountain. Vinnitsa consists of N - 1 streets and N intersections.

Unfortunately, not everything is so simple - Stepan does not like some fountains. But this does not stop him, and he decides to calculate the average length of a path in which there is at least one fountain that he likes. In other words, the guy wants to know the average length of the path between all pairs of intersections, that have between them at least one fountain he likes.

Today Stepan is not in the mood, so you have to help him to solve this difficult task!

Input

The first line of the input file contains integer n ($1 \le n \le 100000$) which is the number of intersections in Vinnitsa.

The next n - 1 lines of input data contain information about the streets and fountains that are on them. Each line contains four numbers a, b, c, d ($1 \le a, b \le n$, $0 \le c \le 10000$, $0 \le d \le 1$) which are the intersection numbers between which i-th street passes, street length and number describing the fountain on it (1 - the fountain Stepan likes, 0 - the fountain he does not).

Output

In the single output line print the problem solution with an accuracy of 10^{-6}.

Examples

Input	Output
3 1 2 1 1 1 3 2 0	2.0

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Problem D. NAMES OF GOD

Input file:	standard input
Output file:	standard output
Time limit:	2s.
Memory limit:	128M.

Arthur C. Clarke once wrote about a certain Tibetan sect whose monks viewed Universe as merely a complex computational device created to list all the names of God. They devised a suitable encoding for this purpose, but writing all the names by hand would require a substantial time (~15,000 years, to be precise). This sect being eschatological in nature wished to bring the end of the computations (and, subsequently, the world) as fast as possible, so they decided to use modern technologies to do so.

Imagine now that you are the programmer hired to help with the conception of the apocalypse. The encoding created by monks use integers in an occult fashion. For example, integer 1 corresponds to the "name" 1; integer 2 corresponds to the "names" 1+1 and 2; integer 3 — to "names" 1+1+1, 2+1 and 3; integer 4 — to 1+1+1+1, 2+1+1, 2+2, 3+1 and 4 etc.

To list the names monks use the Holy Pthumerian Triangle: each row n of the triangle corresponds to the integer n, and each column m in the given row corresponds to the number of names beginning with m. The name for integer k is then encoded with function R'lyeh(k) that returns a sum of k-th row. This sum can then be simply hash-coded to Pthumerian sacred language.

Your task, therefore, is to find a simple way of computing the R'lyeh(k) for any given k.

Input

The input data is a single number $k < 9*10^9$.

Output

The single line of output must contain the value of *R'lyeh(k)*.

Examples

Input	Output
5	7
23	1255
1234	1569787972237332287878657223549599 30

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Problem E. A RAILWAY STATION

Input file:	standard input
Output file:	standard output
Time limit:	5s.
Memory limit:	256M.

From Enlyandsky railway station trains leave for *k* cities. For each city there is a price to pay to get there. A ticket to each city can be purchased at any of the *m* ticket offices. If two persons buy tickets in the same office to the same city in succession, the second one will get a 20% discount on the purchase of a ticket.

For example, if a ticket to Kiev costs 10 units, and in the ticket office three people buy tickets to Kiev, the first person will pay 10 units, and the second and third will pay 8 units.

n programmers have met at this station. They came to the station one after another. Programmers want to split up into *m* queues and collectively pay as little money as possible. Note that, the person who came to the station earlier can not stand in line behind the person who came after him.

Since programmers have not got their laptops with them to help them solve this problem, they ask you to solve it instead of them.

Input

The first line contains the numbers *n, m, k* ($1 \le n \le 500$, $1 \le m \le 10$ $1 \le k \le 100$) - the number of programmers, ticket offices and cities, respectively.

The following *k* lines describe the cities in which the trains are going. Each line contains the name of the city and c_i ($0 \le ci \le 100$) which is the ticket price to this city. The city name can consist of letters and numbers.

The next *n* lines contain the name of the city the *i*-th programmer needs to reach.

Output

In the first line print one number - the minimum amount to be paid. The answer is considered correct if it differs from the jury's result by less than 0.1. In the next *n* lines print one number - the ticket office number to which the *i*-th person must pay.

Examples

Input	Output
5 2 3 Kyiv 10 Lviv 8 Odesa 12 Odesa Odesa Kyiv Odesa Lviv	49.2 1 1 2 1 1

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Problem F. MAXIMUM SUB-RECTANGLE

Input file:	standard input
Output file:	standard output
Time limit:	2s.
Memory limit:	128M.

Tatiana has a rectangle n by m. Each cell can be either occupied (symbol 'x'), or empty (symbol '.'). She wants to choose a pair of points (x_1, y_1) and (x_2, y_2), inside the rectangle that are opposite vertices of some sub-rectangle ($x_1 < x_2$, $y_1 < y_2$), so that all the cells at the edges of the sub-rectangle are empty.

Now Tatiana is interested to know, from what maximum number of cells may such a sub-rectangle consist?

Input

The first line contains n and m ($1 \le n, m \le 500$) which are the dimensions of the rectangle. The following n lines contain m symbols of type 'x' or '.'.

Output

Print one number - the answer to the task, or "impossible", if it is impossible to make such a rectangle.

Examples

Input	Output
4 6 ..xx.. x....x ..x...	10

Explanation

In the input test, the symbols 'O' denote the maximum sub-rectangle

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..xx..
xOOOOx
.Ox.O.
.OOOO.
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Problem G. A TREE

Input file:	standard input
Output file:	standard output
Time limit:	2s.
Memory limit:	128M.

Today in the Forest School the little creatures learn trees. Hedgehog Colic decided to do some exercises with the trees at home and has drawn one with N vertices. By all rules, his tree contained N - 1 edges and was connected. But not everything had to be so simple. When his mom returned home she offered Hedgehog Colic to solve some problem on tree.

Each node is of black color. There are M operations of two types.

1. Change the color of the vertex to the opposite (from black to white, or vice versa).
2. Find out the minimum distance from given vertex to any white vertex.

It is difficult for Hedgehog Colic to do it, because he has just started to study at the Forest School! Help the little creature!

Input

The first line contains two integers N, M ($1 \le N, M \le 10^5$) which are the number of tree vertices and the number of requests. The next $N - 1$ lines contain a_i, b_i ($1 \le a_i, b_i \le N$, $a_i \ne b_i$) which are the vertex numbers connected to i-th edge. It is guaranteed that the input data corresponds to a tree. The next M lines contain t_i, v_i ($1 \le t_i \le 2$, $1 \le v_i \le N$) which are the request type and the vertex to which the request applied.

Output

For each request of 2-nd type print an answer. If there is a solution for a request, print the minimum distance to white vertex and -1 otherwise.

Examples

Input	Output
5 6 1 2 1 3 4 1 5 1 1 1 2 3 1 1 2 4 1 5 2 2	1 -1 2

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Problem H. A HOLIDAY OF VENICE

Input file:	standard input
Output file:	standard output
Time limit:	1s.
Memory limit:	64M.

To the anniversary of Venice founding the local population have to prepare a huge number of pizzas. Only one pizzeria can do this. More formally: a pizzeria can cook up to c_i pizzas on the i-th day and each pizza will cost f_i euro. It is also known that in order to provide the city with a sufficient number of pizzas, d_i pizzas are needed per day. If there is certain number of pizzas that are left, they will be sent to the warehouse and can be used in the following days. In the warehouse, you can store on night from i-th to $(i + 1)$ -th day no more than g_i pizzas, while keeping each pizza in the warehouse costs e_i euro.

You have to find out what is the minimum amount of euro pizzeria will spend on cooking and storing to provide Venice with pizzas for n days.

Input

The first line contains a positive integer n ($1 \le n \le 10^5$). In the next n lines, the numbers c_i, f_i, d_i are given. Next n -1 lines contains the numbers g_i, e_i ($0 \le c_i, f_i, d_i, g_i, e_i \le 10^9$).

Output

Print the only number - the minimum amount of euro needed by the pizzeria. Since the answer can be too large, count it in modulo $10^{18} + 3$. If it's impossible to satisfy the city's inhabitants, print -1.

Examples

Input	Output
3 5 2 2 3 3 3 7 8 9 7 2 6 5	87