

Problem A. Passenger Comfort

Time limit: 1 second
Memory limit: 64 MB

Marketing managers of the company Oceanic Airlines started a new advertising campaign. Its aim was to emphasize the comfort of the passengers on board. However, when the board of directors watched the first commercial shot for the campaign, some questions appeared. The commercial ended with the catchy slogan “Oceanic Airlines. Blocked ears. Choose one of the two.” But the chief executive remembered quite well how his ears had suffered during his last business trip to Bali with Oceanic Airlines...

According to the instructions, the airplane must climb to an altitude of h meters during the first t seconds of the flight and keep that altitude during the whole flight. The climbing rate must not be greater than v meters per second. The plane must not descend before the planned altitude is attained.

The marketing managers wanted to know if their advertising was truthful. They found out that ears were blocked only when a plane was ascending at a rate of more than x meters per second. Help the managers calculate the minimum and maximum amount of time during which passengers may have their ears blocked if the pilot adheres to the instructions. You may assume that the plane can change its speed instantly.

Input

The only line contains the integers h , t , v , and x ($5\,000 \leq h \leq 12\,000$; $50 \leq t \leq 1\,200$; $1 \leq x < v \leq 100$; $h \leq t \cdot v$).

Output

Output two real numbers, which are the minimum and maximum numbers of seconds during which passengers may have their ears blocked. The absolute or relative error of each number should not exceed 10^{-6} .

Example

<i>standard input</i>	<i>standard output</i>
10000 500 50 10	125.0 500.0

Problem B. Trip 2

Time limit: 2 seconds
Memory limit: 64 MB

Denis is sleeping and having a dream in which he has passed the sieve of qualifying rounds, obtained an international passport and an American visa, and left for the overseas city of Vas Legas to take part in a bricklaying competition.

Now he sees himself in an airport. Unfortunately, the organizers agreed to pay his travel expenses only if he will use the services of the Oceanic Airlines company. Though the flights of this company always depart on time, their arrival is often delayed for a considerable time due to meteorological, economic, and geopolitical reasons. Luckily, Denis knows the complete flight schedule and the delay probability for each flight. Instead of buying all the tickets in advance, he will buy a ticket for the first flight only. When he arrives to the first destination, Denis will choose and buy a ticket for the next flight, and so on.

Denis will choose each ticket in such a way as to get to Vas Legas in the end and minimize the expected time of arriving there. Help Denis estimate the time he will spend for the travel.

Input

The first line contains integers n and m , which are the number of airports and the number of Oceanic Airlines flights, respectively ($2 \leq n \leq 100\,000$; $1 \leq m \leq 100\,000$). Denis came to airport 1, and the airport of Vas Legas has number n . The flights are described in the following m lines by six integers each: a , b , t , f , p , and d . These integers are departure and destination airport numbers, departure time, flight duration, probability of the flight delay (as percentage), and delay time, respectively ($1 \leq t, d, f \leq 10^9$; $1 \leq a, b \leq n$; $a \neq b$; $1 \leq p \leq 99$). All the times are given in minutes. Departure times are counted from the moment when Denis came to the first airport. Denis can change flights instantly.

Output

Output the expected time in minutes that Denis will spend for his travel to Vas Legas. Give the answer with an absolute or relative error not exceeding 10^{-6} . If Denis cannot guarantee that he will arrive to Vas Legas, output "Fail".

Examples

<i>standard input</i>	<i>standard output</i>
4 5 1 4 10 10 90 20 1 2 5 5 50 5 2 4 15 10 50 5 2 3 14 1 10 1 3 4 15 1 50 1	27.500
2 1 2 1 10 10 90 20	Fail

Problem C. Frequent Flyer Card

Time limit: 1 second
 Memory limit: 64 MB

The Oceanic Airlines company has presented a new product for its regular customers—a frequent flyer card. If a passenger shows this card at check-in, one tenth of the flown miles will be deposited onto the card. Later the passenger can redeem the accumulated miles for a free Oceanic Airlines flight, thus saving a considerable amount of money. For example, having bought tickets for flights from Yekaterinburg to Frankfurt, from Frankfurt to New York, and from New York to Orlando, the passenger can later get a ticket for a flight from Yekaterinburg to Warsaw for free.

Each frequent flyer card has a unique number consisting of $n + 1$ decimal digits. The first n digits can be arbitrary (let us denote them by x_1, \dots, x_n). The last digit is a check digit; it is calculated by the formula

$$x_{n+1} = \left(\left(\prod_{i=1}^n a_i x_i^2 + b_i x_i + c_i \right) \bmod 11 \right) \bmod 10.$$

Where $(p \bmod q)$ is equal to integer r such that $(0 \leq r < q)$ and q divides $(p - r)$.

The card numbers are produced by the following algorithm: each of the first n digits is chosen uniformly at random from 0 to 9, independently from each other, and then the last digit is calculated according to the above formula. The company management wants the last digits of the first 10 sold cards to be pairwise different. How many card numbers should be generated on average to obtain among them 10 numbers with pairwise different last digits?

Input

The first line contains the integer n ($2 \leq n \leq 25$). The second line contains the integers a_1, \dots, a_n , the third line contains the integers b_1, \dots, b_n , and the fourth line contains the integers c_1, \dots, c_n ($0 \leq a_i, b_i, c_i \leq 9$).

Output

Output a real number, which is the expected number of generations of the first n digits of the card needed for obtaining 10 cards with different last digits. The absolute or relative error of the answer should not exceed 10^{-6} . If there are no 10 card numbers with pairwise different last digits, output “-1”.

Examples

<i>standard input</i>	<i>standard output</i>
13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1	29.2896825397
13 0	-1

Problem D. Pilot Work Experience

Time limit: 1 second
Memory limit: 64 MB

Leonid had n Oceanic Airlines flights during his business trip. He studied the latest issue of the monthly on-board magazine of this company from cover to cover. In particular, he learned about the rules of forming an airplane crew. It turned out that the work experience of the captain (i.e., the number of complete years of work in civil aviation) was always greater by exactly one than the work experience of the second pilot.

The Oceanic Airlines company does not disclose information on the work experience of their pilots. Leonid is interested in the largest possible difference between the work experiences of pilots on the flights he had. He has written the names of the two pilots on each flight but couldn't remember who was the captain and who was the second pilot. Leonid assumes that the work experience of each pilot is in the range from 1 to 50 years and that the work experiences didn't change in the period between his first and last flights with Oceanic Airlines.

Help Leonid use the available information to find out the maximum possible difference in the work experiences of pilots on the flights he had.

Input

The first line contains integers n and p , which are the number of flights Leonid had and the number of pilots flying the planes on these flights ($2 \leq n \leq 1000$; $2 \leq p \leq 50$). The pilots are numbered from 1 to p . In the i th of the following n lines you are given two different integers denoting the pilots of the i th flight.

Output

In the first line output the maximum possible difference in the work experiences of the pilots. In the second line output n integers. The i th integer must be the work experience of the i th pilot. If there are several possible answers, output any of them. If Leonid is wrong in his assumptions or his data are incorrect, output "-1".

Examples

<i>standard input</i>	<i>standard output</i>
4 4 1 2 3 1 2 4 3 4	2 1 2 2 3
3 3 1 2 2 3 1 3	-1

Problem E. Airport Announcements

Time limit: 1 second
Memory limit: 64 MB

Igor was bored of waiting in an airport lounge. Oceanic Airlines, a company he didn't like so much, delayed the departure of his flight, so he was late for the connection flight to Petrozavodsk, where a programming camp was to be held. Now he had to wait for long 300 minutes at the airport. Soon he heard a public announcement. Maybe, his flight had been canceled or, maybe, there were discounts on burgers at a nearby bar—Igor couldn't tell for sure. It seemed that the announcement had been repeated in several languages, but, strangely, there hadn't been Russian among them.

Igor recognized the language of some of the phrases he had heard. He assumed that the number of phrases in the announcement had been the same regardless of the language and that the announcement had been made at most once in each language. Help Igor to find the number of languages in which the announcement was made.

Input

The first line contains the total number n of phrases Igor heard ($2 \leq n \leq 1000$). In the i th of the following n lines you are given the language of the i th phrase or the word “**unknown**” if Igor couldn't recognize the language. It is guaranteed that Igor could recognize the language of at least one of the phrases. The name of a language is a string of a length from four to twenty symbols consisting of lowercase English letters.

Output

Output the number of languages in which the announcement was made. If there are several answers, list them in ascending order. If there is no solution, output the string “**Igor is wrong.**”

Examples

<i>standard input</i>	<i>standard output</i>
6 english unknown unknown unknown german unknown	2 3 6
4 english french unknown english	Igor is wrong.
3 zulu zulu zulu	1

Problem F. Money out of Thin Air

Time limit: 1 second
Memory limit: 64 MB

Each employee of the company Oceanic Airlines, except for the director, has exactly one immediate superior. To encourage the best employees and best departments, the director can issue two kinds of orders:

1. “**employee x y z**” — if the salary of employee x is less than y dollars, increase it by z dollars;
2. “**department x y z**” — if the average salary in the department headed by employee x is less than y dollars, increase the salary of each employee at this department by z dollars (the department includes employee x and all her subordinates, not necessarily immediate).

Given the salaries of all the employees of Oceanic Airlines at the beginning of a year and all the salary increase orders issued by the director during the year, find the salaries of the employees by the end of the year. You may assume that the company didn't hire any new employees and didn't fire anyone during the year.

Input

The first line contains integers n , q , and s_0 , which are the number of employees at Oceanic Airlines, the number of salary increase orders, and the director's salary at the beginning of the year ($1 \leq n, q \leq 50\,000$; $0 \leq s_0 \leq 10^9$). The employees are numbered from 0 to $n-1$; the director's number is zero. In the i th of the following $n-1$ lines you are given integers p_i and s_i , which are the number of the immediate superior and the salary at the beginning of the year of the employee with number i ($0 \leq p_i \leq i-1$; $0 \leq s_i \leq 10^9$). The following q lines are the director's orders given chronologically. Each order has the form “**employee x y z**” or “**department x y z**” (the notation x, y, z is explained above), where $0 \leq x \leq n-1$ and $1 \leq y, z \leq 10^9$.

Output

Output the salaries of all employees at Oceanic Airlines at the end of the year in the ascending order of the employees' numbers.

Example

<i>standard input</i>	<i>standard output</i>
4 3 1	2
0 10	11
0 10	12
1 10	11
employee 2 15 1	
employee 3 5 1	
department 0 10 1	

Problem G. Language Ocean

Time limit: 1 second
Memory limit: 64 MB

Engineers from the Oceanic Airlines company have proposed to write software for airplane equipment using the new, very simple, and efficient programming language Ocean.

This language has only three data types: `int`, `real`, and `string`. Each program starts with a list of function headers in which all the functions used in the program must be mentioned. A function header has the form

- `<function name>(<type of arg 1>, ..., <type of arg k>) : <type of the result>`

A function may have no arguments. The names of different functions may coincide.

The text of the main program is a list of variable declarations together with their initializations. Each line of the program has the form

- `<variable type> <variable name> = <function name>(<arg 1>, ..., <arg k>)`

For a programmer's convenience, the variable type can be replaced with the keyword `auto`, which means that the variable type is defined by the type of the value returned by the function. When a function is called, the names of previously declared variables are specified as its arguments. If there are several functions with the specified name, then a function will be called in which the number of arguments and their types correspond to the function call. The name of a variable may coincide with the name of some function.

Employees of Oceanic Airlines ask you to write an interpreter of the Ocean language. The interpreter must check each line of the main program searching for the following errors (in the following order):

1. "Double declaration" — a variable with this name has already been declared;
2. "Unknown variable" — the name of one of the arguments hasn't been declared in previous lines;
3. "No such function" — there is no function with this name and a suitable list of arguments;
4. "Invalid initialization" — the type of the returned value does not correspond to the type of the variable.

Input

The first line contains the number f of function headers ($1 \leq f \leq 100$). The headers are given in the following f lines. Any two functions differ either by their names or by the lists of their arguments. In the following line you are given the number n of lines in the main program ($1 \leq n \leq 100$). Each of the following n lines contains a variable declaration and its initialization. Each function header and each function call contains at most 10 arguments. The names of variables and functions have lengths from 1 to 20 symbols. Names of the variables consist of lowercase English letters, whereas names of the functions may also contain uppercase English letters. The names of functions differing by letter cases only are considered to be different. The strings "int", "real", "string", and "auto" cannot be names of variables or functions. Spacing is as in the input data examples.

Output

If there are no errors in the program, output the list of all variables declared as "auto" and their types. The variables should be given in the order in which they are declared in the program. If there are errors

in the program, output the number of the line containing the first error and the type of the error. The format of the output should correspond to the examples.

Examples

<i>standard input</i>	<i>standard output</i>
<pre>2 ReadInt() : int IntToReal(int) : real 3 auto a = ReadInt() auto b = IntToReal(a) int c = ReadInt()</pre>	<pre>a : int b : real</pre>
<pre>1 ReadInt() : int 2 int x = ReadInt() int x = ReadInt()</pre>	<pre>Error on line 2: Double declaration</pre>
<pre>3 ReadInt() : int ReadReal() : real SumRealInt(real, int) : real 4 auto x = ReadInt() auto y = ReadReal() real z = SumRealInt(y, x) real q = SumRealInt(x, y)</pre>	<pre>Error on line 4: No such function</pre>

Problem H. Morning in Koltsovo

Time limit: 1 second
Memory limit: 64 MB

Air traffic controllers at Koltsovo airport will long remember the Sunday morning of October 30. At dawn, the planes carrying participants of the ICPC quarter-final back home will start taxiing onto the runway one after another. At the same time, newest airplanes of the Oceanic Airlines company will be landing one after another to take part in the exhibition of the company fleet, which will be held in Koltsovo. The airport has only one operating runway, so managing this flow of airplanes might be a difficult problem for the air traffic controllers.

When all the passengers are aboard a plane, it taxis away from the terminal and queues for takeoff. When a plane is arriving to the airport, it queues for landing. A plane starts takeoff or landing as soon as it receives the corresponding clearance from the air traffic controllers. A plane is not cleared for takeoff as long as there are planes queued for landing regardless of whether they are cleared for landing or not. If a plane queues for landing at the same moment when another plane is ready for takeoff, then the latter plane will not be cleared for takeoff until the former plane lands.

For safety reasons, a certain time must pass between takeoffs and landings. After a plane starts takeoff, at least t_1 seconds must pass before another plane is cleared for takeoff and at least t_2 seconds must pass before another plane is cleared for landing. After a plane starts landing, at least t_3 seconds must pass before another plane is cleared for takeoff and at least t_4 seconds must pass before another plane is cleared for landing.

For each plane you know the exact time when this plane queues for takeoff or landing. Use these data to calculate the times when the planes will be cleared for takeoff or landing, respectively.

Input

The first line contains the integers t_1 , t_2 , t_3 , and t_4 ($30 \leq t_i \leq 500$; $\max(t_1, t_4) \leq \min(t_2, t_3)$). In the second line you are given the number of departing planes n ($1 \leq n \leq 50$). The following n lines contain the times when each plane queues for takeoff. In the next line you are given the number of arriving planes m ($1 \leq m \leq 50$). Then there are the times when each of them queues for landing. All the times are in the format **hh:mm:ss** and are in the range from 6 a.m. to 10 a.m. The times in each list are pairwise different and are given in ascending order.

Output

In the first n lines output the times when the departing planes will be cleared for takeoff. In the following m lines output the times when the arriving planes will be cleared for landing. The times should be output in the format **hh:mm:ss**. The planes should be described in the same order in which they are given in the input.

Example

<i>standard input</i>	<i>standard output</i>
60 60 60 60	07:01:00
2	07:02:00
07:01:00	07:00:00
07:01:30	07:03:00
2	
07:00:00	
07:02:10	

Problem I. A380

Time limit: 1 second
Memory limit: 64 MB

There was no limit to Jack's joy! He managed to buy on the Internet tickets to the ICPC semifinal contest, which was to be held very soon in the mysterious overseas city of Saint Petersburg. Now he was going to have a transoceanic flight in the world largest passenger aircraft Airbus A380.

Jack started studying the aircraft seating chart in Wikipedia, so that he would be able to ask for a nice window seat at check-in. Or maybe he would ask for an aisle seat—he hadn't decided yet.

Airbus A380 has two decks with passenger seats. The upper deck is for premium and business class passengers. The premium class section embraces the first and second rows. Each row contains four seats identified by letters from A to D. The aisles in this section are between the first and second seats and between the third and fourth seats of each row. The rows from the third to the twentieth are for business class passengers. There are six seats in each row, and they are identified by letters from A to F. The aisles are between the second and third and between the fourth and fifth seats of each row.

The lower deck is reserved for economy class passengers. The rows are numbered from 21 to 65. Each row contains ten seats identified by letters from A to K (the letter I is omitted). The aisles are between the third and fourth seats and between the seventh and eighth seats of each row.

Help Jack determine if a seat is next to the window or next to the aisle given the seat designation.

Input

The only line contains a seat designation: the row number and the letter identifying the position of the seat in the row.

Output

If the seat is next to the window, output "window". Otherwise, if the seat is next to the aisle, output "aisle". If neither is true, output "neither".

Examples

<i>standard input</i>	<i>standard output</i>
3C	aisle
64A	window
21F	neither

Problem J. Non-Flying Weather

Time limit: 2 seconds
Memory limit: 64 MB

All departures from the Koltsovo airport are delayed. The chief air traffic controller has declared that he will not let any aircraft get off the ground as long as a suspicious thundercloud hangs over the airport territory. He has also assured passengers that the wind is blowing the cloud away at a speed of one meter per second and the sky over the airport will clear off soon. However, he has said nothing about the wind direction.

One of the passengers has found on the Internet a satellite image of the airport territory taken exactly one minute ago. The location of the cloud at that time can be determined exactly from the image. The exact coordinates of the airport are also easy to find. Is this information sufficient for calculating the minimum time in which the air traffic controller may give the green light to flight departures?

Input

The cloud and the airport territory in the image can be approximately regarded as non-degenerate strictly convex plane polygons. The first line contains the numbers n and m of vertices of the polygons corresponding to the airport territory and to the cloud, respectively ($3 \leq n, m \leq 50\,000$). In each of the following n lines you are given the coordinates of vertices of the polygon describing the airport territory in the counterclockwise order. The following m lines describe the cloud in the same format. All the coordinates are specified in meters and are integers not exceeding 10^8 in absolute value. It is guaranteed that in the image the cloud covers at least one interior point of the airport territory.

Output

Output the minimum number of seconds before there is no cloud over each point of the airport territory. Output the answer with an absolute or relative error not exceeding 10^{-6} . If it is possible that the cloud covers no points of the airport territory right now, output 0.

Example

<i>standard input</i>	<i>standard output</i>
4 4 400 400 600 400 600 600 400 600 0 0 1000 0 1000 1000 0 1000	540.0

Problem K. Steaks on Board

Time limit: 1 second
Memory limit: 64 MB

The Oceanic Airlines company has announced that starting from the new year all passengers of transoceanic flights will be able to taste the famous Ural steaks during the flight. Unlike the standard meals, the steaks will be fresh, hot, and incredibly delicious because they will be cooked right on board.

Each passenger can specify at check-in the exact time when she wants her steak to be served. A steak is cooked by frying each of its sides on a frying pan continuously for one minute. If a steak is cooked too early, it won't be delicious enough, so the cooking must start no earlier than x minutes before the steak is served.

Unfortunately, each Oceanic Airlines plane is equipped with only one electric stove and one frying pan. No more than k steaks can be cooked on the frying pan simultaneously. The stove can be switched off when nothing is cooked. The chef wants to serve the orders of all the passengers on time while minimizing the time during which the stove is switched on. Help the chef.

Input

The first line contains the integers x and k ($2 \leq x \leq 1\,000$; $1 \leq k \leq 50$). In the second line you are given the number n of ordered steaks ($1 \leq n \leq 50$). In the third line there are integers t_1, \dots, t_n , which define the times when the steaks should be served ($2 \leq t_i \leq 1\,000$). The times are given in nondecreasing order and are counted from the moment of departure.

Output

If the chef can cook the ordered steaks on time, output in the first line the minimum number of minutes during which the electric stove will be working. In the i th of the following n lines output two nonnegative integers, which are the times when the i th steak should be put on the frying pan on one side and on the other side, respectively. The steaks must be described in the same order in which they are given in the input. If there are several possible answers, output any of them. If it is impossible to serve all the orders on time, output "-1".

Examples

<i>standard input</i>	<i>standard output</i>
10 2 3 2 16 25	5 0 1 11 15 15 17
10 2 4 7 8 9 10	4 3 6 4 5 3 6 4 5
2 1 2 2 2	-1