Problem A. Amazon

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Amazon has grown so much these days, it has decided to build its own subway lines to be able to supply the demand of its products. To maximize efficiency, every line is completely straight. As Jeff Bezos is the richest man on the planet, every subway line is large enough to be considered infinite on a 2D representation since good old Jeff will pay as much as necessary to cover all the planet.

Such long subway lines come with a catch: to be able to move products from one line to the other, the intersections must be strong enough to handle the weight of the cargo which is moved. After thorough research amazon scientists have concluded that an intersection is strong enough only when its subway lines form a right angle.

The engineering team has gathered pairs of locations which typically ship products between each other, for each pair the team wants to build a subway line. The team also wants to build as much strong intersections as possible. Note that is possible that more than one pair of locations may share the same subway line.

How many intersections will be built? The team wants you to help with this problem.

Input

The first line contains the number of test cases T ($1 \le T \le 100$).

Each test case starts with an integer n ($1 \le n \le 10^5$) which denotes the number of location pairs, next there will be n lines with four integers x_1, y_1, x_2, y_2 where (x_1, y_1) and (x_2, y_2) are a location pair ($-2 * 10^4 \le x_1, y_1, x_2, y_2 \le 2 * 10^4$).

Output

For each test case print the number of intersections to build.

Example

standard input	standard output
3 3 -3 2 2 2 3 1 3 -3 -3 -3 -1 -3 3 2 -2 -4 7 0 -2 6 2 4 -2 0 0 2 0 -1 -6 1 2 5 -3 0	2 1 0

Problem B. Boring Non-Palindrome

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Holidays are almost over and our dear friend Mr. Potato Head wants to enjoy his last days of vacations with different fun activities like solving equations, calculating areas of figures, among others.

Currently, he is playing with different strings, although he finds that most of strings are boring non-palindromic strings. That is why Mr. Potato Head will transform any string into a palindrome inserting characters at the end of the corresponding string.

However, Mr. Potato Head does not want to spend his lasts days of holidays only inserting characters in strings, so he will insert the minimum possible of characters to convert the boring non-palindromic string into a fun palindromic one.

Can you guess the fun strings Mr. Potato Head created from boring ones?

Input

Input consists of a single line with a non-empty string without spaces.

The length of the string is at most 5000.

Output

Print one single line with the string after the changes of Mr. Potato Head.

Examples

standard input	standard output
`helloworld`	`helloworldlrowolleh`
`anitalavalatina`	`anitalavalatina`

Note

A palindrome is a string that reads the same backwards as forwards

Problem C. Common Subsequence

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Manuel thinks that Diego is his long lost brother. But Diego thinks Manuel is wrong, and to prove it, he got DNA samples from himself and Manuel. Now Diego has given you the DNA samples and it is your task to say whether they are brothers or not.

The DNA samples of Diego and Manuel are strings A and B, both have length n ($1 \leq n \leq 10^5$) and consist of only the characters 'A', 'T', 'G' and 'C'. If there is a common subsequence of A and B that has length greater than or equal to $0.99 \times n$, then Diego and Manuel are brothers, in other case, they are not.

Input

The input consists of two lines with strings A and B, respectively.

Output

You should output a single line with "Long lost brothers D:" (without quotes) if Diego and Manuel are brothers, and "Not brothers :(" (without quotes) if they are not.

Examples

standard input	standard output
`GAATTGCGTACAATGC` `GAATTGCGTACAATGC`	`Long lost brothers D:`
`CCATAGAGAA` `CGATAGAGAA`	`Not brothers :(`

Note

A subsequence of a string X is any string that you can get by removing any number of characters from X.

A common subsequence of strings X and Y is a string that is a subsequence of both X and Y.

Problem D. Do Not Try This Problem

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Mr. Potato Head has given you a string s of length n and a list of q operations. Each operation is defined by three integers i, a and k, and a character c. To complete an operation on a string s, you must replace s_i, s_{i+a}, $s_{i+2a}, \ldots$ and s_{i+ka} with the character c. In order to impress Mr. Potato Head, you will write a program that will perform all of this operations, in the order they are given, and print the resulting string. If this program runs in under 2 seconds, using less than 256MB of memory, then Mr. Potato Head will be in awe!

Input

The first line contains a single string s. s consists of lowercase English letters and has length n $(1 < n \leq 10^5)$.

The second line contains a single integer q $(1 \leq q \leq 10^5)$.

Each of the next q lines contains i, a, k and c, in this order, and defines an operation. $1 \leq i \leq n$, $1 \leq a < n$, $0 \leq k < n$ and $i + ka \leq n$. c is a lowercase English letter.

Output

Output a single line containing the resulting string after sequentially completing all the operations on the string Mr. Potato Head gave you.

Example

standard input	standard output
xaaaaaaaaaaaaaaaaaaa 3 4 2 8 b 6 3 4 c 10 5 2 d	xaabacabcdacabdbacad

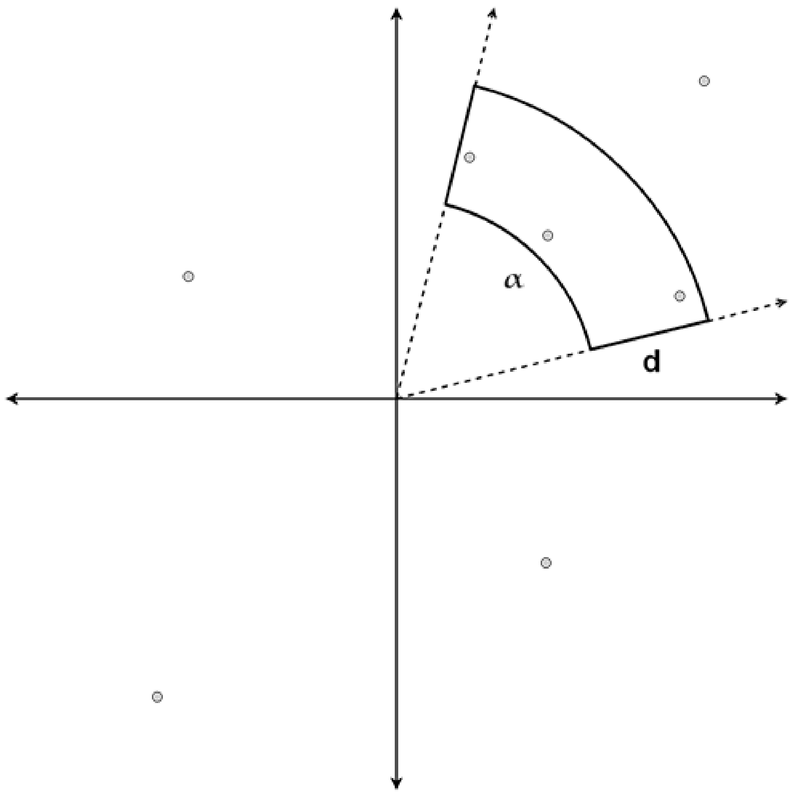
Problem E. Extreme Image

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Mr. Potato Head is working now for the Universal Network of Astronomical Luminous bodies (UNAL). As his first work, he has to capture an image with the closest luminous bodies from earth and present the image to the UNAL.

However, the UNAL observatory cannot get the image for all distances and all angles, in fact, it only captures an image for an angular range of α degrees and a distance range of d millions of kilometers.

Formally, given x (millions of kilometers) and ω (degrees), the observatory can capture all luminous-bodies with a distance in the range $[x, x+d]$ and an angle in the range $[\omega, \omega+\alpha]$. The size of each luminous body is considered negligible.



Mr. Potato Head wants to get the best possible image from the observatory, in order to do so, he needs to get the image with the maximum number of luminous bodies he can.

Can you help him to achieve this goal?

Input

The first line of input contains 3 numbers: integer n ($1 \le n \le 10^5$), integer d ($1 \le d \le 10^5$) and real α ($0.00 \le \alpha < 360.00$) − The number of luminous bodies closest to earth, the distance range of the observatory in millions of kilometers and the angular range of the observatory in degrees, respectively.

Next n lines contains the information of the location of the luminous bodies regarding to the earth. The i-th line consists of 2 numbers: integer r_i ($1 \le r_i \le 10^5$) and real ω_i ($0.00 \le \omega_i < 360.00$) − The distance of the i-th luminous-body to the earth in millions of kilometers and its corresponding angle in degrees, respectively.

All the reals numbers on the input are up to 2 decimals.

Output

Output a single integer − The maximum number of luminous bodies to capture in the observatory.

Example

standard input	standard output
7 80 60.00 220 20.00 360 45.00 180 45.00 200 150.00 200 75.00 180 315.00 360 225.00	3

Problem F. Fraction Formula

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Mr. Potato Head has been promoted and now is a math professor at the UNAL.

For his first course he is willing to teach hard subjects, so at the moment he is teaching how to add and subtract fractions.

To complete his course the students have to do a long series of exercises, each exercise corresponds to a valid formula containing only additions and subtractions of fractions.

Formally a valid formula is one of the following:

- A fraction
- $F_1 + F_2$
- $F_1 - F_2$
- (F_1)

where F_1 and F_2 are also valid formulas.

Mr. Potato Head knows that the exam would be impossible if fractions are too large or if they are negative, so he decides that for every fraction a/b, $0 \leq a \leq 100$ and $0 < b \leq 20$.

Can you pass the course of Mr. Potato Head?

Input

The input consists of several lines, each line contains a valid formula without spaces.

It is guaranteed that all lines contains valid formulas and the total number of characters in all formulas does not exceed $2 * 10^5$

Output

For each formula output a line with an *irreducible* fraction a/b, $b > 0$ − The solution of the corresponding formula

Example

standard input	standard output

`1/2+1/3`
`1/5-2/10`
`1/2+(1/2-2/1)`
	`5/6`
	`0/1`
	`-1/1`

Note

A fraction is *irreducible* if its numerator and denominator do not have common divisors greater than 1

Problem G. Graduation

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

It is time for Mr. Potato Head, the best student in his high school, to enter the university, he has chosen to study in the UNAL. In order for Mr. Potato Head to finish his studies he must take and pass n courses.

In the UNAL every course can be prerequisite of *at most* another course, i.e. if a course A is a prerequisite of course B, Mr. Potato Head must pass the course A before taking the course B, when a course has no prerequisites it can be taken in any semester. Moreover, Mr. Potato Head knows that it is very hard to pass more than k courses in a semester, therefore, no matter how many courses he can take in a semester, he will take at most k.

Given the list of courses that Mr. Potato Head must pass and the information about prerequisites, which is the minimum number of semesters that Mr. Potato Head must take to graduate from UNAL?

Input

The first line of input consist of integers n $(1 \leq n \leq 10^4)$ and k $(1 \leq k \leq 10)$ − The number of courses Mr. Potato Head must pass and the maximum number of courses per semester Mr. Potato Head will take, respectively.

The following line consists of n integers $a_1, a_2, ..., a_n$ separated by spaces, where the i-th course is the prerequiste of the course a_i. If the i-th course is not a prerequisite of any other course $a_i = 0$.

Output

Print a single integer − The minimum number of semesters Mr. Potato Head needs to graduate.

Examples

standard input	standard output
`4 2` `3 3 4 0`	`3`
`3 3` `0 1 2`	`3`

Note

It is guaranteed that Mr. Potato Head can graduate within the conditions above.

Problem H. Hardest Challenge

Input file:	`standard input`
Output file:	`standard output`
Time limit:	10 seconds
Memory limit:	256 megabytes

Today is the final and hardest challenge for the prestigious Unlimited National Algorithmic League (UNAL) contest. In the contest we have a passionate clash between two old rivals the Owls and the Goats.

Each team is composed by 3 participants, the members of the Owls participated in A challenges and for each one, each member received a rating from 'A' to 'Z'. In the same way, the members of the Goats participated in B challenges and for each one, each member received a rating from 'A' to 'Z'.

For today's challenge each participant will have the rating string resulting from previous challenges and the team must use them to build an unique string of length A for Owls and B for Goats. Each position i of this string must contain a character of the position i of some team member's string, i.e., if P, Q and R are the strings of the team members, the resulting string S holds $S[i] = P[i]\ or\ S[i] = Q[i]\ or\ S[i] = R[i]$ for all $i = 1, ..., n$, where $n = A$ for Owls and $n = B$ for Goats.

The string S of size n generated by each team will obtain a score calculated as follows:

$$Score(S) = (\sum_{i=1}^{n} val\langle S[i]\rangle * 127^{\ n-i-1})\%\ MOD$$

Where $val\langle S[i]\rangle$ corresponds to the ASCII code of the i-th character of the string S and $MOD = 10^{15}+37$.

Then the team with the lowest score will be the winner, if both teams have the same score the game ends in a tie.

Given the rating strings of each participant, calculate who will be the winner of the competition if both build the string with the lowest possible score

Input

The first line contains 2 numbers A and B ($1 \leq A, B \leq 28$) the length of the Owls and Goats team strings, respectively.

Following 3 lines contains each a string of length A − The strings of Owls members.

Following 3 lines contains each a string of length B − The strings of Goats members.

Output

Output a line with the winner of the competition "Owls", "Goats" or "Tie" (without quotes)

Examples

standard input	standard output
6 6 ANDRES FELIPE MANUEL VICTOR IVANSS DIEGOS	Owls
1 28 E L I AAAAAAAAAAAAAAAAAAAAAAAAAAAA BBBBBBBBBBBBBBBBBBBBBBBBBBBB CCCCCCCCCCCCCCCCCCCCCCCCCCCC	Goats

Problem I. Integer Prefix

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

The Unique Numerical Association of Language (UNAL) is an association created to conserve only numbers in different texts. In fact, numbers are so important for UNAL, that its lemma is: 'people can communicate only using digits'.

Mr. Potato Head, the head of the UNAL has assigned you a task to help them to achieve the goal of the association.

Given a text T you have to find the longest non-empty prefix of T consisting only of digits, for the UNAL this is enough to understand the whole text.

Input

Input consists of a single line with a text T without spaces.

The length of the text is between 1 and $2 * 10^5$

Output

Print one line with the longest non-empty numeric prefix of T, if there is no such prefix print -1 instead.

Examples

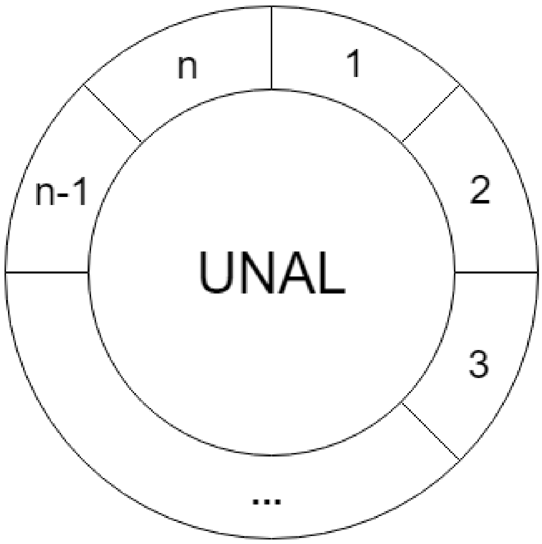
standard input	standard output
23082019UNAL	23082019
_1234567890	-1

Problem J. Jail Destruction

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	256 megabytes

The semester has just begun at Universidad Nacional (UNAL). As usual, a group of vandals enjoys bringing chaos to all students and damaging the university facilities. Those guys have been planning the next attack on the university, their goal is to try to tear down all the walls that enclose the university.

First, they see the university as a set of n walls numbered from 1 to n, each with a height of h_i meters, arranged as shown in the following image.



They plan to carry out q attacks, in each attack, they tear down s meters of all walls from a to b.

The day has come and Mr. Potato Head is sad because this attack will be very costly for the university. He wants to know how many meters of the wall are left after some attacks. Can you help him with this task?

Input

The first line contains two integers n and q ($1 \le n, q \le 10^5$), the number of walls and number of attacks respectively.

The second line contains n numbers $h_1, ..., h_n$ separated by spaces − The height of each wall ($1 \le h_i \le 10^8$).

Each of the next q lines contains one of the following operations:

- 1 a b: Mr. Potato Head ask how many meters of wall in total are left from walls a to b ($1 \le a, b \le n$).
- 2 a b s: The vandals have torn down s ($1 \le s \le 10^8$) meters of all walls from a to b ($1 \le a, b \le n$) (Note that if a wall has a height lower than s then its height after the attack will be zero).

Output

For each operation of type 1 print the number of meters that are left in this interval.

Example

standard input	standard output
2 5 10 10 1 1 2 2 1 2 5 1 1 2 2 2 2 6 1 1 2	20 10 5

Note

It is guaranteed that there is at least one operation of type 1.

Problem K. Kernel Of Love

Input file:	`standard input`
Output file:	`standard output`
Time limit:	10 seconds
Memory limit:	256 megabytes

Mr. Potato Head works on Unified Non-linear Algorithms about Love (UNAL). These algorithms are connected to a traditional machine learning branch called Kernel methods. Mr. Potato Head has discovered a Kernel function which measures the similarity of two persons and hence can predict the likelihood of them being a good couple. He has taken his discoveries one step forward, after running a Kernel algorithm over a vast database of Facebook profiles, he made some interesting (albeit scary) discoveries: every single human can be mapped bijectively to a Fibonacci number, which allowed him to derive a formula that tells if a couple will be happy for ever and ever.

The Fibonacci numbers are the sequence of numbers $\{F_k\}_{k=1}^{\infty}$ defined by the linear recurrence equation

$$F_{k+2} = F_{k+1} + F_k$$

with $F_1 = F_2 = 1$.

A perfect couple is represented by two numbers x and y such that:

1. x and y are Fibonacci numbers.
2. They are attractive to each other but not too much, this holds true when $gcd(x, y) = 1$
3. They are not too different or too similar, this is achieved when $(x + y) \mod 2 = 1$
4. Their eternal combination leads to another human being, this means, another Fibonacci number. This happens when $x + y = z$ where z is a Fibonacci number.

Mr. Potato Head is astonished with his discovery, he now wants to understand how many truly happy couples are there in the world. For a given n he wants to know how many couples exist on the first n human beings (i.e. the first n Fibonacci numbers) such that all conditions above hold true.

Input

The first line of the input represents the number of test cases. Each case consists of a single integer n $(1 \le n \le 10^5)$ per line.

Output

For each case print the number of perfect couples.

Example

standard input	standard output
6 1 4 8 17 20 25	0 3 5 11 13 17

Problem L. Liquid X

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

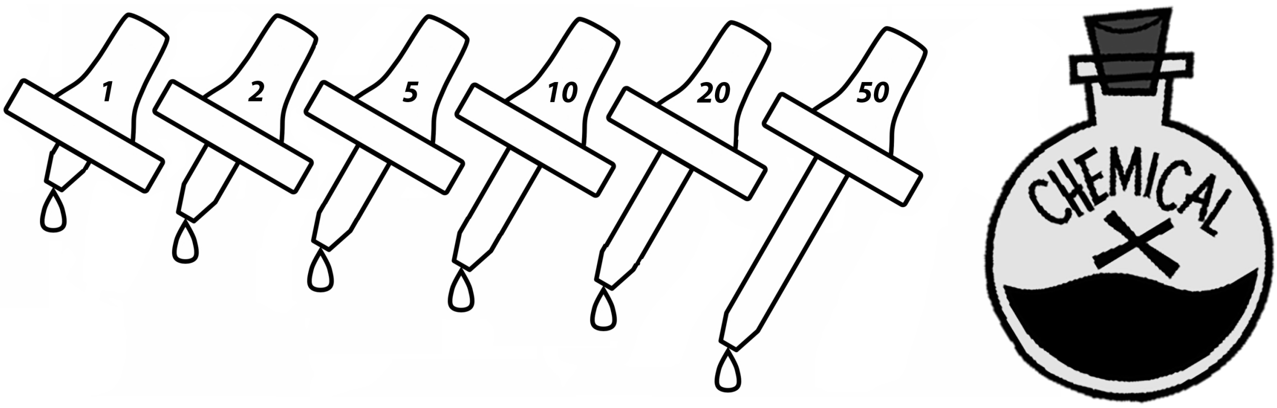
This is an interactive problem

The summer break has just started in the UNAL. Normally at this time students would take a rest, but Mr. Potato Head really wants to learn more things, for this reason he will take a chemistry summer course.

In this course he has a very simple project, in which he has to mix some chemical liquids to get a particular solution. At the beginning of the course Mr. Potato Head knows the quantity of all liquids he needs except for liquid X.

Luckily, he knows the solution becomes *yellow* when the quantity of X is right, when it is too little the solution becomes *green* and if it is too much the solution gets *red*. Unluckily, the solution will show its color only one day after it is mixed and it cannot be modified, i.e. it is not possible to add or remove liquid X from the solution after it showed its color, in other words, the components have to be mixed all over again.

In the chemistry laboratory there is unlimited quantity of liquid X, only one container to mix the components, and n droppers of different capacities.



Mr. Potato Head asked you to help him to pass successfully this course within the *30 days* of the summer break or say if it is impossible to do so.

It is guaranteed that the right quantity of liquid X to get the solution is a positive integer lower or equal than 10^6.

Interaction Protocol

The interaction starts with a line containing an integer n $(1 \le n \le 100)$ − The number of droppers.

The following line contains n integers $a_1, ..., a_n$ $(1 \le a_i \le 10^6)$ − The capacities of the droppers.

Then you can make daily experiments on chemical liquid X.

For each day, print a line with 1 and then another line with n integers $x_1, ..., x_n$, x_i is the number of times the i-th dropper with liquid X was used in the solution. If for some i x_i is not a non-negative integer or if the total quantity of liquid X used in the experiment is greater than 10^6 the system will terminate the program with a *Wrong Answer* veredict.

After each experiment you have to read a single string c, the color of the resulting solution: 'green', 'yellow', or 'red' (without quotes).

When you are done with the experiments print a line with 2 and then another line with the answer, if there is no way of knowing the answer print −1 instead.

Examples

standard input	standard output
6 1 2 5 10 20 50 red green yellow	1 0 1 0 1 0 0 1 2 3 0 0 0 0 1 1 2 1 0 0 0 2 10
2 4 8 green green red	1 1 0 1 2 0 1 3 0 2 -1
2 2 3 red red	1 0 1 1 1 0 2 1

Note

Remember to flush after printing each experiment.

To flush you need to do the following right after printing a query and a line end:

- fflush(stdout) or cout.flush() in C++;
- System.out.flush() in Java;
- stdout.flush() in Python;