Problem A. Age

Input file:	`ages.in`
Output file:	`ages.out`
Time limit:	2 seconds
Memory limit:	64 megabytes

Nurzhan asked Askar ages of his two children. He replied that their multiplication is equal to n and older child loves solving mathematical puzzles. Determine age of each child or tell that it is impossible.

Input

Given one positive integer n ($1 \le n \le 10^6$).

Output

Print ages of children starting from younger one, or -1 if it is impossible to determine their ages.

Examples

ages.in	ages.out
1	-1
4	1 4

Problem B. From XOR with love[again 3]

Input file:	`xor.in`
Output file:	`xor.out`
Time limit:	2.5 seconds
Memory limit:	256 megabytes

Again XOR, again query, again tree — романтика (c) Ануар Сериков

Where XOR there is no place for words. So let's move on with problem.

Given a tree with n vertices, all vertices numbered from 1 up to n. Each vertex of the tree has a single number written on it, value of vertex.

In this problem you have to process q queries:

- Given list of vertices a_1, a_2, ..., a_k, lets call them *bad*.

- $X(u, v) ==$ xor sum of all values on path from vertex u to vertex v.

- $f(u, v) = 0$ iff there exist *bad* vertex on path from vertex u to vertex v. Otherwise, $f(u, v) = 1$.

- Calculate $\sum_{i=1}^{n} \sum_{j=i}^{n} X(i, j) * f(i, j)$

- Note that vertex are *bad* only in terms of one query.

Input

In the first line of input given n — number of vertices ($1 \le n \le 10^5$). In the next $n - 1$ lines given description of each edge u and v ($1 \le u, v \le n$). In the next line given n integers ith number — value on ith vertex. Each value is positive integer from 1 to 10^3.

In the next line given integer q — number of queries ($1 \le q \le 2 * 10^5$). Each of next q lines contains description of query k — number of vertices in query followed by k distinct numbers $a_1, a_2, ..., a_k$ ($1 \le k \le 30$, $1 \le a_i \le n$). Sum of all kth is not greater than $2 * 10^5$.

Output

For each query print answer.

Example

xor.in	xor.out
3 1 2 2 3 1 2 3 1 1 2	4

Problem C. Please shift me!

Input file:	`shift.in`
Output file:	`shift.out`
Time limit:	1 second
Memory limit:	256 megabytes

Ali-Amir — first guy from Kazakhstan with medal on ACM-ICPC. Thats all about legendary ACube.

You have a display with one non-negative integer number written on it. User has two buttons. One of them multiplies it by two. Second one divides it by two. Integer division used here, i.e., $5/2 = 2$ and $1/2 = 0$ and $18/2 = 9$. You're given target number, output minimum number clicking required to reach the target.

Input

The first line contains binary number A ($1 \leq |A| \leq 1000$) — initial number written on display. The second line contains binary number B ($1 \leq |B| \leq 1000$) — target number. It's guaranteed that it's possible to get target number from initial number using only those two operations. Numbers are given without leading zeros, i.e., first digit of both line equals to 1.

Output

Output one non-negative integer number — minimum number of operations needed to reach the target.

Example

shift.in	shift.out
11000000 10000	11

Problem D. Ponowne skoordynowanie

Input file:	nur.in
Output file:	nur.out
Time limit:	2 seconds
Memory limit:	64 megabytes

W czasach starożytnych niektóre nazwy kazaw były bardziej popularne niż inne, ale jest to trochę związane z tym problemem. Znalazłeś jakiś tekst, który mógłby zostać w jakiś inny sposób przeorganizowany. Tak więc, tłumaczenie oświadczenia tego problemu nie wystarczy, aby zrozumieć, jak należy rozwiązać reorganizację. Jednak wiesz, że jest to związane z wyrazem "nur".

Input

W pierwszym wierszu podanego łańcucha s ($1 \leq |s| \leq 1000$).

Output

Odpowiedzieć na problem.

Examples

nur.in	nur.out
beknur	nurbek
bakytgul	gulbakyt
runa	nura

Problem E. Abay kara sozderi!

Input file:	abay.in
Output file:	abay.out
Time limit:	2 seconds
Memory limit:	64 megabytes

2439 year... Aliens conquered most of the parts of the Earth and constructed colonies for humans. Kazakh rebels uses "Abay kara sozderi" (45 independent wisdom texts written by kazakh poet, composer and philosopher Abay Kunanbayev in 19th century) as way of communication since aliens didn't learn any language apart from english. In order to confuse aliens kazakh rebels encodes 42 letters of kazakh alphabet "аәбвгғдеёжзийкқлмнңоөпрстуұүфхһцчшщъыіьэюя" into next 42 latin letters "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnop". If text has uppercase letters they transform it into lowercase letter. So word "Ғылым" firstly change into lowercase word "ғылым" and after encodes into "FkPkQ".

In order to test new recruits who wants to join rebel forces they give text which is either one of 45 "Abay kara sozderi" or randomly generated text. Candidate should determine which of two categories this text related. Randomly generated text has random number of words from 200 to 500. Each word has random length from 1 to 12. Each letter randomly generated from set "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnop".

You are currently tested by rebels and have text in front of you. Can you classify the text and join rebels?

Input

In the first line given words separated by spaces. Each word can contain letters from "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnop". It is guaranteed that number of words is at least 200. This problem has no sample.

Output

Print "IA" if given text is encoded version of "Abay kara sozderi", or "ZHOK" if it is randomly generated text.

Note

There is no sample test, intentionally!

Problem F. Rota II

Input file:	`diam.in`
Output file:	`diam.out`
Time limit:	1 second
Memory limit:	64 megabytes

NurlashKO is playing his favorite game Rota II. He has low mmr but he knows that he loses games only because of his low skill teammates and high ping. In the interest of highest ping which could occur in the game, NurlashKO hacked Rota II developer's computer and received detailed network of game servers.

Network represents as n nodes connected by $n - 1$ cables. Packets can get through cables from any node to any another node. NurlashKO knows exact time needed for packets to get through particular cable. Unfortunately, he doesn't know in which node his computer is connected, so he wants to know the longest time needed to transfer packets between any two nodes in the network.

There are millions of people playing Rota II every second. So because of high load some cables getting broken and replaced by another ones. After each such change calculate the longest time needed to transfer packets between any two nodes in the network.

Input

In the first line given n — the number of nodes in the network ($2 \le n \le 10^5$). In the next $n - 1$ line given description of cable u, v and t, where u and v are nodes which cable connects and t is time needed for packets to go through from one end of cable to another ($1 \le u, v \le n, 1 \le t \le 10^4$). Cables have ids from 1 to $n - 1$ in the given order.

In the next line given q — number of queries ($1 \le q \le 5 \times 10^4$). In the next q lines given queries as id and t which means id-s cable time changes to t ($1 \le id \le n - 1, 1 \le t \le 10^4$).

Output

After each change print the longest time needed to transfer packets between any two nodes in the network.

Example

diam.in	diam.out
5 5	8
1 2 3	6
2 3 5	4
2 4 3	2
2 5 3	3
1 1	
2 1	
3 1	
4 1	
2 2	

Problem G. Kinder-surprise

Input file:	`exp.in`
Output file:	`exp.out`
Time limit:	2 seconds
Memory limit:	32 megabytes

Pernekhan, Aidos and Temirulan train as a team for upcoming competitive programming competitions. In order to keep Temirulan's interest in trains, Pernekhan gives one kinder-surprise to him per training contest. Pernekhan gives it at the end of the contest. Kinder-surprise has one of n random parts of Reus's statue — Temirulans's favorite football player. Statue parts enumerated from 1 to n. Two different kinder-surprises can give one part of statue. If Temirulan receives all n unique parts of statue he loses his encourage to participate in training contests. For each given n calculate expected number of training contests before Temirulan loses his encourage.

Input

In the first line of input given one integer q — number of queries ($1 \leq q \leq 10^5$). Next q lines each contains one integer n ($1 \leq n \leq 10^8$).

Output

For each query print expected number of contests before Temirulan loses his encourage with with absolute or relative error no more than $1e - 4$.

Example

exp.in	exp.out
2	3.000000000000000
2	5.500000000000000
3	

Problem H. Study

Input file:	`teachers.in`
Output file:	`teachers.out`
Time limit:	3 seconds
Memory limit:	256 megabytes

Asteroid is coming to Earth and only brave problem solvers can save it by calculating optimal strategy. All students want to learn problem solving as fast as possible to help the process. There are n students and 3 teachers. One teacher can teach at most one student at the same time. You need to calculate the minimum time needed for all students to learn problem solving.

Input

In the first line of input given n ($1 \le n \le 40$) — the number of students. $i + 1$-th line contains three numbers a_i, b_i and c_i ($1 \le a_i, b_i, c_i \le 100$) — time needed for i-th student to learn problem solving at Beisenbek, Pakita and Akbota, respectively.

Output

Answer to the problem.

Example

teachers.in	teachers.out
4 1 2 3 3 2 1 1 10 10 3 4 5	4

Problem I. Two strings

Input file:	strings.in
Output file:	strings.out
Time limit:	1 second
Memory limit:	64 megabytes

Sometimes Aidos likes to sit in silence and think about interesting problems. This time he came up with next problem:

Given two strings s and t. Array a calls good if:

1) $length(a) = |t|$.

2) For each element of array a: $1 \leq a_i \leq |s|$

3) Elements of array are pairwise distinct $a_i \neq a_j$, when $i \neq j$

4) For each element of array a: $s_{a_i} = t_i$

Cost of array is $\sum_{i=2}^{length(a)} |a_i - a_{i-1}|$. Find minimum possible cost of good array.

Input

In the first line given string s ($1 \leq |s| \leq 10^4$). In the second line given string t ($1 \leq |t| \leq 10$).

Output

Print one number —- minimum possible cost of good array. Print «-1» (without quotes) if there is no good array.

Examples

strings.in	strings.out
acbc abc	3
arrrlllaaannns arlans	13

Problem J. Correct priority

Input file:	`team.in`
Output file:	`team.out`
Time limit:	1 second
Memory limit:	256 megabytes

Yerzhan and Nurzhan are twin brothers. One of the many common interests is table tennis. Even they plan To participate in professional tournaments. There is two type tournament, single and double. There is third type - mix, one male and one female, but they will never be interested in this kind of competition. The month left before biggest table tennis tournament in the country called *KiloBytes of Tennis Union*, i.e., *KBTU*. They think that playing in doubles more interesting.

To perform better they hired certified coach Temirulan. He is famous for creating the scoring system of professional table tennis player and with magic training. The main feature of scoring system is defining as a *steepness* of a player. *Steepness* — is an integer number, the more value of *steepness* value the better he is in table tennis. Initially, Temirulan assign to both of them *steepness* as 1. *Disbalance* of team with two person is absolute difference between their *steepness*, i.e. $disbalance(A, B) = |steepness(A) - steepness(B)|$. Team is *perfect* it's team members has positive *steepness* and *disbalance* of team is 0.

After that, Temirulan makes some questionnaire to determine *learning rate* of player, *learning rate* — is an integer number denoting the multiplier to *steepness* after single training session, e.g. if some player has $steepness = 7$ and $learning\_rate = 4$ then after one training session this person will have $steepness = 28$, after second training session *steepness* will become $28 \times 4 = 112$, and so on. *learning_rate* is constant for one person(i.e. never changes) and different persons can have different *learning_rate*.

Performance at competition depends on the *steepness* of the participant. The more of the level of coolness the more likely the victory in the singles tournament, i.e., if participants *steepness*-es differs then performance could be compared unambiguously, otherwise, if participants have equal *steppness* then it's ambiguous. But in doubles better perform team with lower value of *disbalance*, i.e. there is 3 person: A, B, C. $steepness(A) = 5$, $steepness(B) = 7$ and $steepness(C) = 2$, then team A and B will perform better than team A and C (because *disbalance* of first team is 2 and second team is 3), also it's obvious if in tournament participating several *perfect* (at least one) then *disbalance* of champion is 0.

To prevent the number of weak participants at the tournament organizing committee decided that all participants must have a certificate, denoting that he/she visited some certified coach at least once. A team can participate if and only if both team members have a certificate. Moreover, each Temirulans training session costs \$100. Nurzhan loves double table tennis more than single and primary goal of brothers is to become a champion in doubles. Yerzhan hacked all coaches and player information, turned out that this year there is no *perfect* team among other teams. So that means if brothers will schedule training such that they become *perfect* team then they become champion in doubles. Given q pair integer numbers, those are possible variants for *steepness*. For each possible variants of *steepness*-es of Nurzhan and Yerzhan determine it possible to make brothers team *perfect*. If yes output «like a brians» (without quotes) and a minimal number of total training sessions of Nurzhan and Yerzhan sufficient to make them *perfect*. Otherwise output «like a williams» (without quotes).

Input

The first line of input contains one integer number q ($1 \le q \le 10^6$) — the number of possible variants of *steepness*-es of Nurzhan and Yerzhan. Each of the next q lines contains two integer numbers a and b ($0 \le a, b \le 10^{18}$) — *steepness*-es of Nurzhan and Yerzhan respectively.

Output

Output q lines. On ith line print «like a williams» (without quotes) if it's impossible to make *perfect* team, otherwise print «like a brians» (without quotes) and the minimal number of training sessions required, separate with one space.

Example

team.in	team.out
3	like a brians 3
9 3	like a williams
7 5	like a brians 5
4 8	

Problem K. Beautiful raw

Input file:	`raw.in`
Output file:	`raw.out`
Time limit:	2.5 seconds
Memory limit:	64 megabytes

Temirulan is sleeping and having enjoyable dream. In the dream he sees beautiful raw of positive integer numbers of length n. He noticed that each number is some divisor of m and that greatest divisor of two adjacent numbers is greater than 1.

Temirulan suddenly wakes up but he doesn't want dream to stop! Help him calculate all such beautiful raws, so he could be closer to his dreams again.

Input

In the first line given m and q — number from statement and number of queries ($1 \le q \le 150$). In the next q lines given description of query n ($1 \le n \le 10^{18}$).

Output

For each query print number of beautiful raws for given n and initial m.

Example

raw.in	raw.out
12 3	6
1	21
2	91
3	