Problem A. Game with chocolates

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

Peter and Vasya have birthdays at the same date. Perhaps, that is a reason why they were given the same boxes of chocolates. But it was too boring for friends just to eat these chocolates, so they decided to make a prize in the game from these chocolates.

The player for a one move is allowed to take from any box a number of chocolates such that there were less chocolates left than in the other box. Let after move in boxes left N and M chocolates ($N > M$). Then the number $N - M$ must be non-negative i-th power of P (in other words $N - M = P^i, i \geq 0$). And the integer part of a division N by the difference $N - M$ should not be a multiple of P, or $[N/(N - M)]$ mod $P \neq 0$.

Parents love their children, so the number of chocolates in each of the boxes can be quite big and game could be delayed. That's why the guys would like to know if the initial configuration of chocolates (X chocolates in the Peter's box and Y in the Vasek's box) is advantageous for the player who will make the first move. Situation is advantageous, if it is possible to bring the game to at least one losing position, and the situation is losing, if it is impossible to bring the game into another losing position.

The player is a loser if he can't make the next move.

Find out the success of the initial situation in the game.

Input

There are three positive integers in the line: P (the difference should be a power of this number), X, Y (numbers of chocolates in the Peter's and Vasek's boxes respectively) ($2 \leq P, X, Y \leq 10^{18}$).

Output

In the first line you should write a message «NO», if the position is losing and «YES», if it is advantageous.

In the case of advantageous position you should write any of the following playing positions such that is losing.

Examples

standard input	standard output
2 3 5	NO
3 3 3	YES 3 0

Problem B. Birches

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	64 megabytes

National Forest state Q recently got a beautiful birch alley, which consists of N trees. Each tree has a height of H_i.

International Classification of national parks is a list of the most beautiful nature reserves in the world. Used to rank parks such a thing as «distinctiveness» which is understood as the number of such pairs (i, j), for which the observed ratio of $H_i \bmod H_j = K$, where K — it special number, which is selected by the Expert Council of the international organization of national parks.

What «distinctiveness» has national park state Q?

Input

The first line has two positive integers N and K — the number of trees in the national park and a special number of advisory council, respectively ($1 \le N \le 10^5, 0 \le K \le 10^6$).

The second line has N numbers H_i — the height of each of the trees in the park ($1 \le H_i \le 10^5$).

Output

In the single line print Q national park «distinctiveness».

Examples

standard input	standard output
5 1 1 2 3 4 5	8

Problem C. Ancient CBS

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

During excavations in one of the caves archaeologists were discovered ancient inscriptions. Each of the records found was a certain number N and correct bracket sequence (CBS).

Recall that the CBS can be defined as follows:

- empty string is the CBS;
- if S is a CBS, then (S) is also a CBS;
- if S_1 and S_2 are CBS, then S_1S_2 is the CBS.

According to some of the records, archaeologists realized that the first number is the number of substrings in the CBS, which are also the CBS. This led archaeologists to believe that if they restore the remaining inscriptions, they will be available for some secret knowledge. Since the walls of the cave mainly found numbers, then they believe that the recovery of the missing CBS possible. The researchers also found that the length of each of the CBS should not exceed 10^5 characters, because it can not fit on the wall in the cave.

Accordingly, now they need to build such a CBS, which contains exactly N substrings, which are also the CBS.

Input

Single line contains a positive integer N — the number of substring in the CBS, which are also CBS ($1 \le N \le 10^9$).

Output

CBS, which contains exactly N substring being CBS. The length of the output string must not exceed 10^5 characters.

Examples

standard input	standard output
`2`	`(())`

Problem D. Interactive lock

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

Interactive combination locks are quite popular nowadays. One of such locks is used in order to test the staff members of an office. They are trying to unlock it but so far there is no success.

Lock consists of T integer-valued sections and you have to guess the divisor (not equal to 1) for each of them in the following way:

- You pick any integer number (candidate divisor);
- if X is divisible by your number, you will receive «YES» message and proceed to guessing the next section;
- if not, you will receive «NO», your number will be subtracted from X and you will now need to guess the divisor of the changed number.

The number being guessed must stay positive after subtraction and your are not allowed to use the same divisor for the same section more than once. In case all the conditions are met and each section is completed the door will be opened.

The staff has been struggling with this task for the whole day. Now people need a hero that will open the door for them. Are you worthy?

Input

First line has number T — the amount of lock sections ($1 \leq T \leq 500$).

Then you will have to read the answers to guess attempts in the form of «YES» or «NO» messages. They will arrive after each guess attempt.

In case of interactor communication protocol violation you program will be closed automatically.

Output

Output candidate divisors. There may be more than one such attempt depending on the success of previous attempts.

Examples

standard input	standard output
3 YES NO YES YES	2 2 3 2

Note

In the sample test given example work correctly for the lock, consisting of three sections with numbers 100, 101 and 102.

Problem E. Interval divisibility

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

Peter has been interested in puzzles since childhood. As such, he attends a fan club of interesting mathematical problems at school. One of the recent classes was dedicated to the divisors of natural numbers. The topics covered there were not enough to Peter; therefore, he decided to invent something more interesting and challenging himself.

Let us call «divisibility» a number of divisors for a given positive integer N and denote this function $D(N)$. For example, for 12 «divisibility» is 6. Now Peter tries to learn how to calculate a sum $\sum_{i=L}^{R} D(i) \cdot i$ for an interval of positive integers from L to R denoted by Peter as «interval divisibility». Finally, Peter would like to develop a program that allows you to calculate «interval divisibility» for a random interval. Help him please.

Input

There are two integers L and R in the line of the input. You need to find the «interval divisibility» for the interval boundaries specified above. ($1 \le L \le R \le 10^{12}$).

Output

Output the only number to the only line. It will be «interval divisibility» for the adjusted interval modulo $10^9 + 7$.

Examples

standard input	standard output
7 16	429

Problem F. A trick

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

«Sad clown», the new season at the circus, decided to entertain the audience with a mathematical trick. Magician George is the most experienced employee of the circus. So he was given the honor to show this trick.

A person chosen at random from the audience by George is asked to call a random number N. After that the magician thinks for exactly 5,674 seconds and says some number M different from N. The feature of the trick is that these two numbers have the same sum of digits.

How does George manage to do this?

Input

There is one non-negative integer N called by spectator($0 \le N \le 10^9$). It is guaranteed that a record of the number N doesn't contain leading zeros.

Output

The only line with a non-negative integer M (the number, called by a magician). If there are a lot of suitable numbers, you can print any of them.

The number M can not contain leading zeros and at the same time should not exceed 10^9.

If the magician can not call the number, you should print -1.

Examples

standard input	standard output
24	42

Problem G. Highest ratings year

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

The mayor of the city Q have recently received a letter from the President about improving ranking cities in the country for the forthcoming «highest ratings» year. The first step is to send the rating of the city, calculated using the new method, to the capital.

The mayor instructed the analytical department to calculate the rating.

There are N monuments situated in city Q, which are numbered from 1 to N and connected by bus routes. It is known that there are exactly $N-1$ routes and they allow tourists to pass the way between any pair of monuments (possibly with changes). Let's call function $F(A, B) = D$ (where D is a number of paid bus routes required to get from A up to B) «attractiveness» of the way from the monument A to the monument B.

To attract more tourists and, thereafter, improve the ranking the mayor issued a decree that every second route on the way from the monument A to the monument B is free.

You need to calculate the ranking of the city, which is defined as the sum of paths «attractiveness» between all pairs of monuments.

Input

The first line contains single integer N — the number of monuments in the city of Q $(1 \leq N \leq 10^5)$. Next each of $N-1$ lines contains two numbers A_i and B_i — numbers of monuments, among which the bus route pass$(1 \leq A_i, B_i \leq N,\ A_i \neq B_i)$.

Output

In the single line print a single number — attractiveness of the city Q.

Examples

standard input	standard output
3 1 2 1 3	3
8 1 3 8 1 4 3 5 2 3 6 7 6 5 6	42

Problem H. Spells

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	64 megabytes

Rinswind the Wizard knows only one spell. And despite his best efforts, he has failed to learn more: new spells weren't staying in his head for long and were vanishing after 3+5 seconds. Because of that he needs to learn how to derive new spells from the one he already knows. Since the spell he knows is a powerful one, he thinks that this might be a good idea.

The spell may be represented as a string S that consists of lowercase latin letters. Rinswind is allowed to swap two adjacent characters while constructing the new spells. There is a condition that needs to be met in order for the spell to preserve its power: you can't swap characters at positions i и $i+1$ if earlier there was a swap of characters at j и $j+1$ and $j > i$. For example, `abc` can be transformed into `abc`, `acb`, `bac` and `bca`, but not into `cab` and `cba`.

The spell can be pretty long and because of that its description consists of blocks. Each block is represented as a string and a number which shows how many times the string must be repeated.

Rinswind is now busy with pronunciation practice, but he is interested in the possible number of spells he can master after perfecting his construction techniques. Lets help him do this. Don't forget about the fact that Rinswind is unable to learn the new spells and he can only construct them from the initial one.

Input

First line has number N — amount of spell blocks ($1 \le N \le 100$).

In the next N lines spell blocks are described in the order they are located within the spell S_i K_i — string and repeat amount ($1 \le |S_i| \le 10^4$, $1 \le K_i \le 10^6$).

Output

The only line must contain the number of potential spells modulo $10^9 + 7$.

Examples

standard input	standard output
3 a 1 ng 2 an 1	42

Problem I. Silver table

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

Few people know that long long ago they used to apply silver tables besides well-known silver bullets to fight with evil spirits (witches, vampires, werewolves, etc.). The use principle of these tables is simple: if You want to protect yourself from the N - creatures, You need to carve on your door a table. The size of a table should be $2^N \times 2^N$, filled with integers from the set $S = \{1, 2, ..., 2^{N+1} - 1\}$.

But, of course, not every table is considered silver. In order to definitely protect You from N units of evil, the table must have a special property: for every integer i from 1 to 2^N the set formed by the i-th row, and the set formed by the i-th column, in the union must give the set S.

Nowadays there is fewer and fewer confidence that vampires and witches don't exist. Therefore, the ability to create a silver table for arbitrary N is in your best interest :)

Input

Single line contains a positive integer N $(1 \leq N \leq 10)$ — the number of creatures, from which the silver table of size $2^N \times 2^N$ will protect you.

Output

Output 2^N lines with 2^N numbers. Each number should belong to the set S and the resulting table should be silver.

Examples

standard input	standard output
`1`	`1 3` `2 1`

Problem J. Soldier's life

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

In one of the units of the republic Q soldiers train every day to stay a single line. After several months of hard training soldiers can perform this exercise well enough. But we need perfectly.

We represent each of N of the soldiers in the form of a material point with coordinates (X_i, Y_i). The challenge is that the soldiers were able to build in straight line so that the maximum Euclidean distance by which on one of the soldiers is moving was the lowest possible.

As you know, in the army, nothing is impossible. However, the soldiers did not manage to find any of its location and the shortest distance and stay along a straight line. Therefore it is required to solve the chief part of the problem.

Input

The first line has a positive integer N — the number of soldiers in the military unit ($2 \le N \le 1000$).

Next N lines has two numbers X_i and Y_i — coordinates of the soldiers ($-1000 \le X_i, Y_i \le 1000$). Initially, all the soldiers are in different locations. Orders are orders, and therefore after rearranging a few soldiers can stand at one point.

Output

Ehe first line must contain the minimum required distance, which is enough to pass the soldier to stand on its position in the line. The answer is considered correct if it is absolute or relative error does not exceed 10^{-6}.

Next N rows must contains two numbers — coordinates of points, in which soldiers move after move.

The distance from each point to the straight line should not exceed 10^{-6}. A straight line will be based on the first and the last soldiers in the ranks.

Examples

standard input	standard output
5 1 1 0 2 -1 -1 1 -2 -1 1	1.00000000 0.00000000 1.00000000 0.00000000 2.00000000 0.00000000 -1.00000000 0.00000000 -2.00000000 0.00000000 1.00000000

Problem K. Casino

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

One of the world famous casino has designed a new card game. Certainly, you would like to take part at the game premiere held soon. However, you are thorough man. Therefore, you have decided to familiarize yourself with the game rules and to design a strategy to win maximum possible amount of money.

Game needs a card deck, which consists of N red and M black cards. The cards of the deck are shuffled randomly before game is started. Every round the player is randomly choosing one face-down card. If the player chooses a red card, then 1 million of Belorussian rubles will be added to his prize, otherwise 1 million of Belorussian rubles will be charged from his prize. Selected card does not return to the deck again. The player may stop the game at any moment and get his prize (probably, he will have to pay, if the prize is negative).

To estimate the benefit of participation in this game you are required to compute the expectation of the prize assuming that player are trying to maximize it.

Input

First line contains two positive integer numbers N and M — the number of red and black cards in the deck respectively ($0 \le N, M \le 100$).

Output

First line should contain the expected value of player's prize. Answer should be given in millions of Belorussian rubles. Answer is considered right if its absolute or relative error is less than 10^{-6}

Examples

standard input	standard output
`1 1`	`0.500000000`
`1 2`	`0.000000000`