Problem A. K-based numbers

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

Let's consider K-based numbers, containing exactly N digits. We define a number to be valid if its K-based notation doesn't contain two successive zeros. For example:

- 1010230 is a valid 7-digit number;
- 1000198 is not a valid number;
- 0001235 is not a 7-digit number, it is a 4-digit number.

Given two numbers N and K, you are to calculate an amount of valid K based numbers, containing N digits.

Input

The numbers N and K in decimal notation separated by the line break. ($2 \leq K \leq 10$, $2 \leq N$, $N+K \leq 18$)

Output

Output one integer — the result in decimal notation.

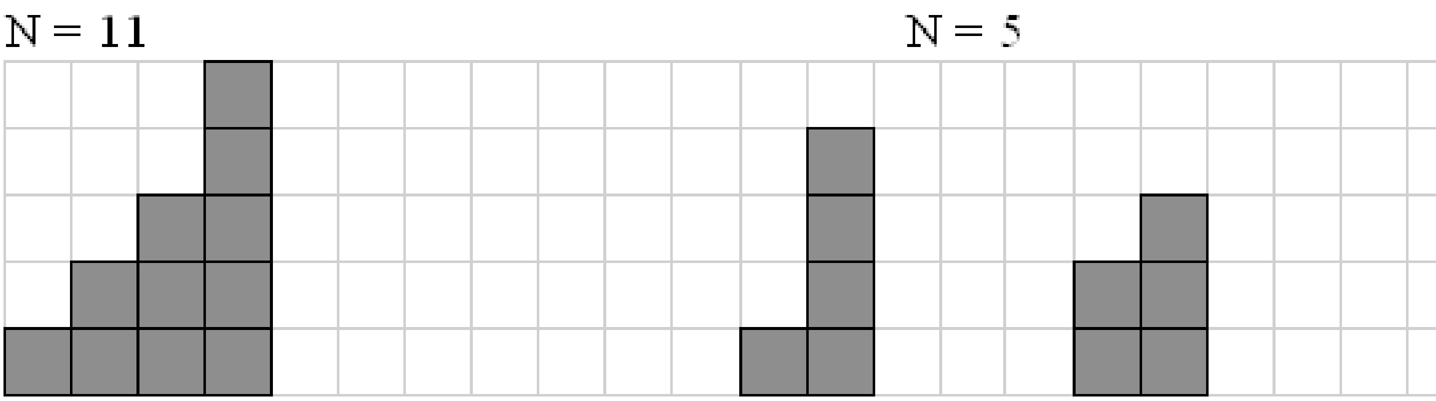
Examples

standard input	standard output
2 10	90

Problem B. Staircases

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

One curious child has a set of N little bricks. From these bricks he builds different staircases. Staircase consists of steps of different sizes in a strictly descending order. It is not allowed for staircase to have steps equal sizes. Every staircase consists of at least one step and each step contains at least one brick. Picture gives examples of staircase for N=11 and N=5:



Your task is to write a program that reads the number N and writes the only number Q — amount of different staircases that can be built from exactly N bricks.

Input

The only integer N $(1 \leq N \leq 100)$ — the amount of bricks.

Output

Print one integer Q — the answer to the problem.

Examples

standard input	standard output
1	1
7	5
100	444793

Problem C. Brackets Sequence

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

Let us define a regular brackets sequence in the following way:

- Empty sequence is a regular sequence.
- If `S` is a regular sequence, then `(S)` and `[S]` are both regular sequences.
- If `A` and `B` are regular sequences, then `AB` is a regular sequence.

For example, all of the following sequences of characters are regular brackets sequences: `()`, `[]`, `(())`, `([])`, `()[]`, `()[()]`

And all of the following character sequences are not: `(`, `[`, `)`, `)(`, `([)]`, `([(]`

Some sequence of characters `'('`, `')'`, `'['`, and `']'` is given. You are to find the shortest possible regular brackets sequence, that contains the given character sequence as a subsequence. Here, a string $a_1 a_2 ... a_n$ is called a subsequence of the string $b_1 b_2 ... b_m$, if there exist such indices $1 \le i_1 < i_2 < ... < i_n \le m$, that $a_j = b_{i_j}$ for all $1 \le j \le n$.

Input

The input contains at least 1 and at most 100 brackets (characters `'('`, `')'`, `'['`, and `']'`) that are situated on a single line without any other characters among them.

Output

Write a single line that contains some regular brackets sequence that has the minimal possible length and contains the given sequence as a subsequence.

Examples

standard input	standard output
`([(]`	`()[()]`

Problem D. Gentlemen

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

Let's remember one old joke:

Once a gentleman said to another gentleman:

— What if we play cards?

— You know, I haven't played cards for ten years...

— And I haven't played for fifteen years...

So, little by little, they decided to resurrect their youth. The first gentleman asked a servant to bring a pack of cards, and before starting playing out weighed in his hand the pack.

— It seems to me, one card is missing from the pack... — he said and gave the pack to the other gentleman.

— Yes, the nine of spades, — the man agreed.

An incomplete pack of cards is given. The program should determine which cards are missing.

Input

The first line contains a positive integer, which is the weight in milligrams of the given incomplete pack. The second line contains an integer N, $2 \leq N \leq 100$ — the number of cards in the complete pack. In the next N lines there are integers from 1 to 1000, which are the weights of the cards in milligrams. It's guaranteed that the total weight of all cards in the complete pack is strictly greater than the weight of the incomplete pack.

Output

If there is no solution, then output the single number 0. If there are more than one solutions, then you should write -1. Finally, if it is possible to determine unambiguously which cards are missing in the incomplete pack as compared to the complete one, then output the numbers of the missing cards separated with a space in ascending order.

Examples

standard input	standard output
270 4 100 110 170 200	2 4
270 4 100 110 160 170	-1
270 4 100 120 160 180	0

Problem E. False Mirrors

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

We wandered in the labyrinth for twenty minutes before finally entering the large hall. The walls were covered by mirrors here as well. Under the ceiling hung small balconies where monsters stood. I had never seen this kind before. They had big bulging eyes, long hands firmly holding riffles and scaly, human-like bodies. The guards fired at me from the balconies, I shot back using my BFG-9000. The shot shattered three mirrors filling the room with silvery smoke. Bullets drummed against my body-armor knocking me down to the floor. Falling down I let go a shot, and got up as fast as I fell down by rotating on my back, like I did in my youth while break dancing, all this while shooting three more times. Three mirrors, three mirrors, three mirrors...

Sergey Lukjanenko, «The Labyrinth of Reflections»

BFG-9000 destroys three adjacent balconies per one shoot (N-th balcony is adjacent to the first one). After the shoot the survival monsters inflict damage to Leonid (main hero of the novel) — one unit per monster. Further follows new shoot and so on until all monsters will perish. It is required to define the minimum amount of damage, which can take Leonid.

Input

The first line contains integer N, amount of balconies, on which monsters have taken a circular defense. $3 \le N \le 20$. The second line contains N integers, amount of monsters on each balcony (not less than 1 and no more than 100 on each).

Output

Output minimum amount of damage.

Examples

standard input	standard output
7 3 4 2 2 1 4 1	9

Problem F. Anniversary Firework

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

Denis has to prepare the Ural State University 90th anniversary firework. He bought n rockets and started to think of the way he should launch them. After a pair of sleepless nights he invented the following algorithm:

All n rockets are placed on the surface in a single line. The interval between two consecutive salvos is ten seconds. The leftmost and the rightmost rocket are launched in the first salvo. After i salvos are fired, all non-empty segments between two neighboring launched rockets are considered. One rocket is chosen randomly and uniformly at each of these segments. All chosen rockets are launched in the $(i+1)$-st salvo. Algorithm runs until all rockets are launched.

Calculate the average duration in seconds of such a firework.

Input

The only input line contains an integer n ($3 \le n \le 400$), which is the number of rockets bought by Denis.

Output

Output the expected duration of the firework in seconds, with absolute or relative error not exceeding 10^{-6}.

Examples

standard input	standard output
5	26.6666666667

Problem G. Martian Army

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

Many centuries ago Martians switched to using huge robots for military operations. During the current Moon conquest campaign, all of the Martian army is located at the headquarters on Mars, and each person is controlling the actions of his robot. There is a strict hierarchy in the Martian army: each person excepting the general (there is only one general in the army) has a direct commander. According to the army regulations, communication is allowed only between a commander and his direct subordinate. The communication is carried out via the headquarters local network. At the headquarters, each military person has his own computer, and computers are numbered from 1 to N, where N is the size of the Martian army. It is a tradition that a subordinate's computer has number that is greater than the number of his commander's computer. Each military person, in addition to the number of his computer, is characterized by his reliability. This is a real number; the owner of the computer i has reliability A_i. The general has reliability 1, and soldiers (soldiers and only they have no subordinates) have reliability 0.

The traffic in the headquarters network is not free for the military. For every megabyte of traffic between the i-th computer and the computer of the commander of the i-th computer's owner, the central Martian provider demands C_i Martian dollars in payment. The complication is that the volume of traffic between any two headquarters computers is a state secret, and is unknown even to the provider. Every month the provider sends a bill, and the military write there the traffic (a whole number of megabytes) themselves. Let a commander and his subordinate have computers with numbers i and k respectively. According to the contract with the provider, the traffic between the computers i and k must be not less than A_i˘A_k. In the beginning of every month, the provider's representatives know the hierarchy in the Martian army and costs of a megabyte of traffic, but they don't know the numbers A_i except for the general and soldiers, and of course they don't know beforehand the amounts of traffic that the military will write in the bill. It is interesting to know the guaranteed amount of money that the provider will receive from the military.

Input

The first line contains the size of the army $2 \le N \le 100000$. Each of the next N˘1 lines contains integers K_i and C_i, which are the number of the computer of the commander of the i-th computer's owner and the cost of a megabyte of traffic between the computers i and K_i ($1 \le K_i < i \le N, 0 \le Ci \le 1000$).

Output

Output the minimal guaranteed amount of payment to the provider in Martian dollars. This amount must be a real number given with exactly two decimal digits.

Examples

standard input	standard output
7 1 10 2 5 2 3 3 1 3 2 3 3	8.00

Problem H. One-two, One-two

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

A year ago the famous gangster Vito Maretti woke up in the morning and realized that he was bored of robbing banks of round sums. And for the last year he has been taking from banks sums that have only digits 1 and 2 in their decimal notation. After each robbery, Vito divides the money between N members of his gang. Your task is to determine the minimal stolen sum which is a multiple of N.

Input

The input contains the number N ($1 \le N \le 10^6$).

Output

Output the minimal number which is a multiple of N and whose decimal notation contains only digits 1 and 2. If it contains more than 30 digits or if there are no such numbers, then output "Impossible".

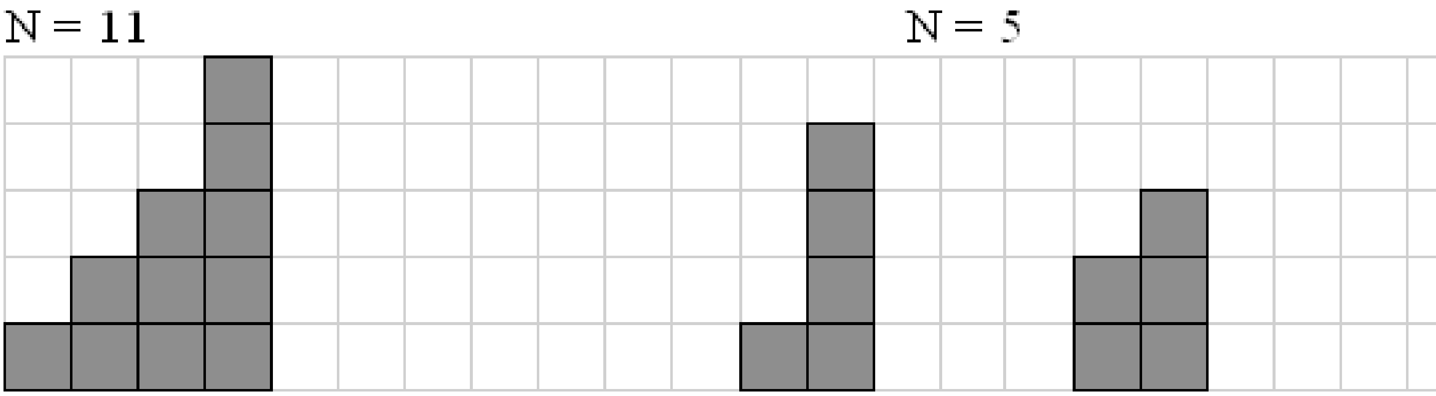
Examples

standard input	standard output
5	Impossible
8	112

Problem I. Staircases. Version 2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	32 megabytes

One curious child has a set of N little bricks. From these bricks he builds different staircases. Staircase consists of steps of different sizes in a strictly descending order. It is not allowed for staircase to have steps equal sizes. Every staircase consists of at least one step and each step contains at least one brick. Picture gives examples of staircase for N=11 and N=5:



Your task is to write a program that reads the number N and writes the only number Q — amount of different staircases that can be built from exactly N bricks. The answer is quite big, so print it modulo $10^9 + 7$.

Input

The only integer N $(1 \le N \le 10^5)$ — the amount of bricks.

Output

Print one integer — the answer to the problem modulo $10^9 + 7$.

Examples

standard input	standard output
1	1
7	5
100	444793

Problem J. K-based Numbers. Version 2

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

Let's consider K-based numbers, containing exactly N digits. We define a number to be valid if its K-based notation doesn't contain two successive zeros. For example:

- 1010230 is a valid 7-digit number;
- 1000198 is not a valid number;
- 0001235 is not a 7-digit number, it is a 4-digit number.

Given three numbers N, K and M, you are to calculate an amount of valid K based numbers, containing N digits modulo M. You may assume that $2 \le N, K, M \le 10^{18}$.

Input

The numbers N, K and M in decimal notation separated by the line break.

Output

The result in decimal notation.

Examples

standard input	standard output
2 10 100	90

Problem K. Classmates

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

Tanya almost left for school when the telephone rang. It was the director of studies. She said the first three lessons that day had been cancelled because of an electricity failure. Tanya was the head girl of the class and the director of studies asked her to pass this news to her classmates.

— What shall I do? — thought Tanya, — there is almost no time! OK, now I'm going to call Lena, then Katya, then Masha. Lena will meantime call Vitya, she knows his telephone number, Vitya will call Masha. No, I'll call Masha myself: let him better call Misha. Katya will call Natasha... No, it won't work. They quarreled yesterday. Thus there is no time to think. I must immediately call Lena. Hit-or-miss everyone will know the news.

Tanya managed to send this message to all her classmates. But someone knew it very late and someone heard this news from several people. In the evening, Tanya decided to work out a plan of calls and not to let it ride the next time. After all, she is the head girl of the class!.. But the problem turned out to be not so easy.

Help Tanya to work out a plan of calls such that a news might be delivered to all the pupils as soon as possible. All the pupils of the class must receive the message but not more than once. It takes exactly one minute to pass the news over the telephone. At the beginning only the head girl knows the news.

To solve the problem, Tanya wrote down the list of her classmates and for each classmate the list of those whom he or she might call. You may assume that if Masha can call Katya, then Katya can call Masha, too (even if only one connection is mentioned in the list). It is known that a message can be delivered to everyone in the class through a sequence of calls.

Input

The first line contains the number of pupils N in Tanya's class ($1 \le N \le 10$). The second line contains the integer number M ($0 \le M \le 45$). Each of the following M lines contains a pair of pupil's names who can call each other separated by space. The last line contains the name of the head girl. All the names in the class differ and consist of no more than 20 capital and small Latin letters.

Output

The first line of the output should contain the time in minutes necessary to spread the news to all the class according to the suggested plan. Then there is a description of the plan. The calls that should be made simultaneously must be arranged in groups. Groups should be ordered according to the time. Each group should start with a line containing the amount of calls in the group. Each call must be described in a separate line. The description of call consists of a pair of names (who calls and whom) separated by a space.

Examples

standard input	standard output
6 7 Tanya Lena Tanya Katya Tanya Masha Lena Natasha Lena Vitya Natasha Vitya Masha Vitya Tanya	3 1 Tanya Lena 2 Tanya Katya Lena Natasha 2 Tanya Masha Lena Vitya