Codeforces Round #428 (Div. 2)

A. Arya and Bran

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Bran and his older sister Arya are from the same house. Bran like candies so much, so Arya is going to give him some Candies.

At first, Arya and Bran have 0 Candies. There are n days, at the i-th day, Arya finds a_i candies in a box, that is given by the Many-Faced God. Every day she can give Bran **at most** 8 of her candies. If she don't give him the candies at the same day, they are saved for her and she can give them to him later.

Your task is to find the minimum number of days Arya needs to give Bran k candies **before** the end of the n-th day. Formally, you need to output the minimum day index to the end of which k candies will be given out (the days are indexed from 1 to n).

Print `-1` if she can't give him k candies during n given days.

Input

The first line contains two integers n and k ($1 \le n \le 100$, $1 \le k \le 10000$).

The second line contains n integers $a_1, a_2, a_3, \ldots, a_n$ ($1 \le a_i \le 100$).

Output

If it is impossible for Arya to give Bran k candies within n days, print `-1`.

Otherwise print a single integer — the minimum number of days Arya needs to give Bran k candies before the end of the n-th day.

Examples

input
2 3 1 2
output
2

input
3 17 10 10 10
output
3

input
1 9 10
output
-1

Note

In the first sample, Arya can give Bran 3 candies in 2 days.

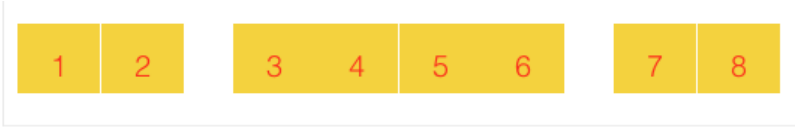
In the second sample, Arya can give Bran 17 candies in 3 days, because she can give him at most 8 candies per day.

In the third sample, Arya can't give Bran 9 candies, because she can give him at most 8 candies per day and she must give him the candies within 1 day.

B. Game of the Rows

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Daenerys Targaryen has an army consisting of k groups of soldiers, the i-th group contains a_i soldiers. She wants to bring her army to the other side of the sea to get the Iron Throne. She has recently bought an airplane to carry her army through the sea. The airplane has n rows, each of them has 8 seats. We call two seats neighbor, if they are in the same row and in seats $\{1, 2\}$, $\{3, 4\}$, $\{4, 5\}$, $\{5, 6\}$ or $\{7, 8\}$.



A row in the airplane

Daenerys Targaryen wants to place her army in the plane so that there are no two soldiers from different groups sitting on neighboring seats.

Your task is to determine if there is a possible arranging of her army in the airplane such that the condition above is satisfied.

Input

The first line contains two integers n and k ($1 \le n \le 10000$, $1 \le k \le 100$) — the number of rows and the number of groups of soldiers, respectively.

The second line contains k integers $a_1, a_2, a_3, \ldots, a_k$ ($1 \le a_i \le 10000$), where a_i denotes the number of soldiers in the i-th group.

It is guaranteed that $a_1 + a_2 + \ldots + a_k \le 8 \cdot n$.

Output

If we can place the soldiers in the airplane print "YES" (without quotes). Otherwise print "NO" (without quotes).

You can choose the case (lower or upper) for each letter arbitrary.

Examples

input
2 2 5 8
output
YES

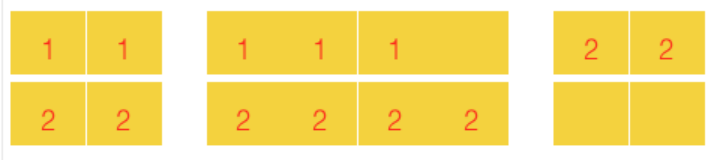
input
1 2 7 1
output
NO

input
1 2 4 4
output
YES

input
1 4 2 2 1 2
output
YES

Note

In the first sample, Daenerys can place the soldiers like in the figure below:



In the second sample, there is no way to place the soldiers in the plane since the second group soldier will always have a seat neighboring to someone from the first group.

In the third example Daenerys can place the first group on seats $(1, 2, 7, 8)$, and the second group an all the remaining seats.

In the fourth example she can place the first two groups on seats $(1, 2)$ and $(7, 8)$, the third group on seats (3), and the fourth group on seats $(5, 6)$.

C. Journey

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

There are n cities and n - 1 roads in the Seven Kingdoms, each road connects two cities and we can reach any city from any other by the roads.

Theon and Yara Greyjoy are on a horse in the first city, they are starting traveling through the roads. But the weather is foggy, so they can't see where the horse brings them. When the horse reaches a city (including the first one), it goes to one of the cities connected to the current city. But it is a strange horse, it only goes to cities in which they weren't before. In each such city, the horse goes with equal probabilities and it stops when there are no such cities.

Let the length of each road be 1. The journey starts in the city 1. What is the expected length (expected value of length) of their journey? You can read about expected (average) value by the link https://en.wikipedia.org/wiki/Expected_value.

Input

The first line contains a single integer n ($1 \le n \le 100000$) — number of cities.

Then n - 1 lines follow. The i-th line of these lines contains two integers u_i and v_i ($1 \le u_i$, $v_i \le n$, $u_i \ne v_i$) — the cities connected by the i-th road.

It is guaranteed that one can reach any city from any other by the roads.

Output

Print a number — the expected length of their journey. The journey starts in the city 1.

Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if $\frac{|a-b|}{max(1,b)} \le 10^{-6}$.

Examples

input
4 1 2 1 3 2 4
output
1.500000000000000

input
5 1 2 1 3 3 4 2 5
output
2.000000000000000

Note

In the first sample, their journey may end in cities 3 or 4 with equal probability. The distance to city 3 is 1 and to city 4 is 2, so the expected length is 1.5.

In the second sample, their journey may end in city 4 or 5. The distance to the both cities is 2, so the expected length is 2.

D. Winter is here

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Winter is here at the North and the White Walkers are close. John Snow has an army consisting of n soldiers. While the rest of the world is fighting for the Iron Throne, he is going to get ready for the attack of the White Walkers.

He has created a method to know how strong his army is. Let the i-th soldier's strength be a_i. For some k he calls $i_1, i_2, ..., i_k$ a clan if $i_1 < i_2 < i_3 < ... < i_k$ and $gcd(a_{i_1}, a_{i_2}, ..., a_{i_k}) > 1$. He calls the strength of that clan $k \cdot gcd(a_{i_1}, a_{i_2}, ..., a_{i_k})$. Then he defines the strength of his army by the sum of strengths of all possible clans.

Your task is to find the strength of his army. As the number may be very large, you have to print it modulo 1000000007 $(10^9 + 7)$.

Greatest common divisor (gcd) of a sequence of integers is the maximum possible integer so that each element of the sequence is divisible by it.

Input

The first line contains integer n $(1 \le n \le 200000)$ — the size of the army.

The second line contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 1000000)$ — denoting the strengths of his soldiers.

Output

Print one integer — the strength of John Snow's army modulo 1000000007 $(10^9 + 7)$.

Examples

input
3 3 3 1

output
12

input
4 2 3 4 6

output
39

Note

In the first sample the clans are $\{1\}, \{2\}, \{1, 2\}$ so the answer will be $1 \cdot 3 + 1 \cdot 3 + 2 \cdot 3 = 12$

E. Mother of Dragons

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

There are n castles in the Lannister's Kingdom and some walls connect two castles, no two castles are connected by more than one wall, no wall connects a castle to itself.

Sir Jaime Lannister has discovered that Daenerys Targaryen is going to attack his kingdom soon. Therefore he wants to defend his kingdom. He has k liters of a strange liquid. He wants to distribute that liquid among the castles, so each castle may contain some liquid (possibly zero or non-integer number of liters). After that the stability of a wall is defined as follows: if the wall connects two castles a and b, and they contain x and y liters of that liquid, respectively, then the strength of that wall is $x \cdot y$.

Your task is to print the maximum possible sum of stabilities of the walls that Sir Jaime Lannister can achieve.

Input

The first line of the input contains two integers n and k ($1 \le n \le 40$, $1 \le k \le 1000$).

Then n lines follows. The i-th of these lines contains n integers $a_{i,1}, a_{i,2}, \ldots, a_{i,n}$ ($a_{i,j} \in \{0, 1\}$). If castles i and j are connected by a wall, then $a_{i,j} = 1$. Otherwise it is equal to 0.

It is guaranteed that $a_{i,j} = a_{j,i}$ and $a_{i,i} = 0$ for all $1 \le i, j \le n$.

Output

Print the maximum possible sum of stabilities of the walls that Sir Jaime Lannister can achieve.

Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Namely: let's assume that your answer is a, and the answer of the jury is b. The checker program will consider your answer correct, if $\frac{|a-b|}{max(1,b)} \le 10^{-6}$.

Examples

input
3 1 0 1 0 1 0 0 0 0 0
output
0.250000000000

input
4 4 0 1 0 1 1 0 1 0 0 1 0 1 1 0 1 0
output
4.000000000000

Note

In the first sample, we can assign $0.5, 0.5, 0$ liters of liquid to castles $1, 2, 3$, respectively, to get the maximum sum (0.25).

In the second sample, we can assign $1.0, 1.0, 1.0, 1.0$ liters of liquid to castles $1, 2, 3, 4$, respectively, to get the maximum sum (4.0)