Codeforces Round #599 (Div. 1)

A. Tile Painting

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

Ujan has been lazy lately, but now has decided to bring his yard to good shape. First, he decided to paint the path from his house to the gate.

The path consists of n consecutive tiles, numbered from 1 to n. Ujan will paint each tile in some color. He will consider the path *aesthetic* if for any two **different** tiles with numbers i and j, such that $|j-i|$ is a divisor of n greater than 1, they have the same color. Formally, the colors of two tiles with numbers i and j should be the same if $|i-j|>1$ and $n \bmod |i-j|=0$ (where $x \bmod y$ is the remainder when dividing x by y).

Ujan wants to brighten up space. What is the maximum number of different colors that Ujan can use, so that the path is aesthetic?

Input

The first line of input contains a single integer n ($1 \leq n \leq 10^{12}$), the length of the path.

Output

Output a single integer, the maximum possible number of colors that the path can be painted in.

Examples

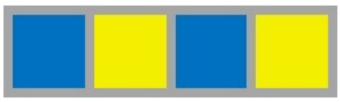
input
4
output
2

input
5
output
5

Note

In the first sample, two colors is the maximum number. Tiles 1 and 3 should have the same color since $4 \bmod |3-1|=0$. Also, tiles 2 and 4 should have the same color since $4 \bmod |4-2|=0$.

In the second sample, all five colors can be used.



B. 0-1 MST

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

Ujan has a lot of useless stuff in his drawers, a considerable part of which are his math notebooks: it is time to sort them out. This time he found an old dusty graph theory notebook with a description of a graph.

It is an undirected weighted graph on n vertices. It is a complete graph: each pair of vertices is connected by an edge. The weight of each edge is either 0 or 1; exactly m edges have weight 1, and all others have weight 0.

Since Ujan doesn't really want to organize his notes, he decided to find the weight of the minimum spanning tree of the graph. (The weight of a spanning tree is the sum of all its edges.) Can you find the answer for Ujan so he stops procrastinating?

Input

The first line of the input contains two integers n and m ($1 \leq n \leq 10^5$, $0 \leq m \leq \min(\frac{n(n-1)}{2}, 10^5)$), the number of vertices and the number of edges of weight 1 in the graph.

The i-th of the next m lines contains two integers a_i and b_i ($1 \leq a_i, b_i \leq n$, $a_i \neq b_i$), the endpoints of the i-th edge of weight 1.

It is guaranteed that no edge appears twice in the input.

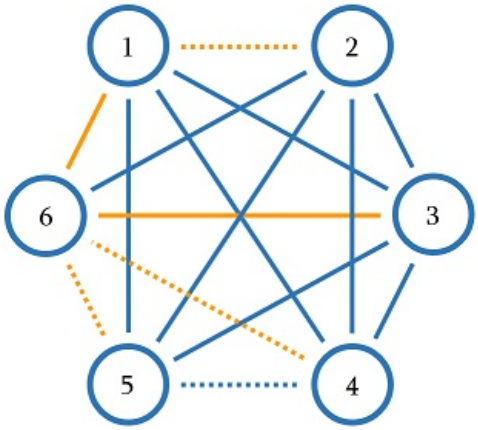
Output
Output a single integer, the weight of the minimum spanning tree of the graph.

Examples

input
6 11 1 3 1 4 1 5 1 6 2 3 2 4 2 5 2 6 3 4 3 5 3 6
output
2

input
3 0
output
0

Note
The graph from the first sample is shown below. Dashed edges have weight 0, other edges have weight 1. One of the minimum spanning trees is highlighted in orange and has total weight 2.



In the second sample, all edges have weight 0 so any spanning tree has total weight 0.

C. Sum Balance

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

Ujan has a lot of numbers in his boxes. He likes order and balance, so he decided to reorder the numbers.

There are k boxes numbered from 1 to k. The i-th box contains n_i integer numbers. The integers can be negative. **All of the integers are distinct.**

Ujan is lazy, so he will do the following reordering of the numbers **exactly once**. He will pick a single integer from each of the boxes, k integers in total. Then he will insert the chosen numbers — one integer in each of the boxes, so that the number of integers in each box is the same as in the beginning. Note that he may also insert an integer he picked from a box back into the same box.

Ujan will be happy if the sum of the integers in each box is the same. Can he achieve this and make the boxes perfectly balanced, like all things should be?

Input
The first line contains a single integer k ($1 \leq k \leq 15$), the number of boxes.

The i-th of the next k lines first contains a single integer n_i ($1 \leq n_i \leq 5\,000$), the number of integers in box i. Then the same line contains n_i integers $a_{i,1}, \ldots, a_{i,n_i}$ ($|a_{i,j}| \leq 10^9$), the integers in the i-th box.

It is guaranteed that all $a_{i,j}$ are distinct.

Output

If Ujan cannot achieve his goal, output "No" in a single line. Otherwise in the first line output "Yes", and then output k lines. The i-th of these lines should contain two integers c_i and p_i. This means that Ujan should pick the integer c_i from the i-th box and place it in the p_i-th box afterwards.

If there are multiple solutions, output any of those.

You can print each letter in any case (upper or lower).

Examples

input
4 3 1 7 4 2 3 2 2 8 5 1 10
output
Yes 7 2 2 3 5 1 10 4

input
2 2 3 -2 2 -1 5
output
No

input
2 2 -10 10 2 0 -20
output
Yes -10 2 -20 1

Note

In the first sample, Ujan can put the number 7 in the 2nd box, the number 2 in the 3rd box, the number 5 in the 1st box and keep the number 10 in the same 4th box. Then the boxes will contain numbers $\{1,5,4\}$, $\{3,7\}$, $\{8,2\}$ and $\{10\}$. The sum in each box then is equal to 10.

In the second sample, it is not possible to pick and redistribute the numbers in the required way.

In the third sample, one can swap the numbers -20 and -10, making the sum in each box equal to -10.

D. Number Discovery

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

Ujan needs some rest from cleaning, so he started playing with infinite sequences. He has two integers n and k. He creates an infinite sequence s by repeating the following steps.

1. Find k smallest distinct positive integers that are not in s. Let's call them $u_1, u_2, \ldots, u_k$ from the smallest to the largest.
2. Append $u_1, u_2, \ldots, u_k$ and $\sum_{i=1}^{k} u_i$ to s in this order.
3. Go back to the first step.

Ujan will stop procrastinating when he writes the number n in the sequence s. Help him find the index of n in s. In other words, find the integer x such that $s_x = n$. It's possible to prove that all positive integers are included in s only once.

Input

The first line contains a single integer t ($1 \leq t \leq 10^5$), the number of test cases.

Each of the following t lines contains two integers n and k ($1 \leq n \leq 10^{18}$, $2 \leq k \leq 10^6$), the number to be found in the sequence s and the parameter used to create the sequence s.

Output

In each of the t lines, output the answer for the corresponding test case.

Example

input
2 10 2 40 5

output
11 12

Note
In the first sample, $s = (1, 2, 3, 4, 5, 9, 6, 7, 13, 8, 10, 18, \ldots)$. 10 is the 11-th number here, so the answer is 11.

In the second sample, $s = (1, 2, 3, 4, 5, 15, 6, 7, 8, 9, 10, 40, \ldots)$.

E. Planar Perimeter

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

Ujan has finally cleaned up his house and now wants to decorate the interior. He decided to place a beautiful carpet that would really tie the guest room together.

He is interested in carpets that are made up of polygonal patches such that each side of a patch is either a side of another (different) patch, or is an exterior side of the whole carpet. In other words, the carpet can be represented as a planar graph, where each patch corresponds to a face of the graph, each face is a simple polygon. The perimeter of the carpet is the number of the exterior sides.

Ujan considers a carpet beautiful if it consists of f patches, where the i-th patch has exactly a_i sides, and the perimeter is the smallest possible. Find an example of such a carpet, so that Ujan can order it!

Input
The first line of input contains a single integer f ($1 \leq f \leq 10^5$), the number of patches in the carpet.

The next line contains f integers $a_1, \ldots, a_f$ ($3 \leq a_i \leq 3 \cdot 10^5$), the number of sides of the patches. The total number of the sides of the patches $a_1 + \ldots + a_f$ does not exceed $3 \cdot 10^5$.

Output
Output the description of the carpet as a graph.

First, output a single integer n ($3 \leq n \leq 3 \cdot 10^5$), the total number of vertices in your graph (the vertices must be numbered from 1 to n).

Then output f lines containing the description of the faces. The i-th line should describe the i-th face and contain a_i distinct integers $v_{i,1}, \ldots, v_{i,a_i}$ ($1 \leq v_{i,j} \leq n$), which means that the vertices $v_{i,j}$ and $v_{i,(j \bmod a_i)+1}$ are connected by an edge for any $1 \leq j \leq a_i$.

The graph should be planar and satisfy the restrictions described in the problem statement. Its perimeter should be the smallest possible. **There should be no double edges or self-loops in the graph.** The graph should be connected. Note that a solution always exists; if there are multiple solutions, output any of them.

Examples

input
2 3 3

output
4 2 1 4 1 2 3

input
3 5 3 5

output
6 1 2 3 4 5 4 5 6 1 3 4 6 5

Note
In the first sample, the two triangular faces are connected by a single edge, which results in the minimum perimeter 4.

The figure shows one possible configuration for the second sample. The minimum perimeter in this case is 3.