Problem A. Max Weight Independent Set

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

You are given a tree, each vertex has an integer weight.

The set of vertices is called *independent* if no pair of vertices in it is connected by an edge.

Find the largest sum of weights of vertices in an **independent** set.

Input

The tree in this problem is rooted.

The first line of input contains one integer n ($1 \le n \le 100$): the number of vertices in the tree.

Each of the next n lines contains two integers. The i-th of them contains two integers p_i, q_i ($0 \le p_i \le n, -10\,000 \le q_i \le 10\,000$).

If $p_i = 0$, vertex i is a root. Otherwise, p_i is a parent of vertex i.

Output

Print one integer: the largest sum of weights of vertices in an **independent** set.

Examples

standard input	standard output
5 0 1 1 2 1 3 2 4 3 5	10
6 5 8 6 0 5 -1 1 1 0 3 1 2	8

Problem B. Simple Paths in a Tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

You are given a connected undirected graph with n vertices and $n-1$ edges. For each edge, you need to find the sum of lengths of all simple paths, passing through this edge. The length of a path is equal to the number of edges in it.

Input

The first line contains one integer n ($2 \le n \le 300\,000$).

Each of the next $n-1$ lines contains two integers from 1 to n, representing the tree edges.

Output

Print $n-1$ lines, the i-th of them should contain one integer: the answer for the i-th edge.

Example

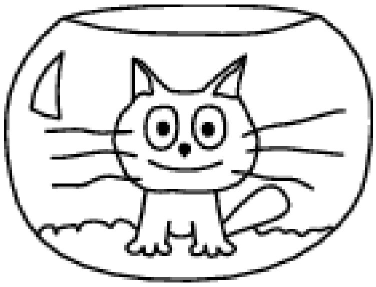
standard input	standard output
5 1 2 2 3 2 4 5 1	13 8 8 9

Problem C. The Salesman Problem

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

The Salesman (The Cat Aquariums Salesman) is going to visit n cities, visiting each city exactly once.

Help him to find the shortest possible path.



Input

The first line of input contains one integer n ($1 \leqslant n \leqslant 13$): the number of cities. Each of the next n lines contains n integers: the lengths of paths between cities.

The j-th integer in the i-th line is $a_{i,j}$: the distance between cities i and j ($0 \leqslant a_{i,j} \leqslant 10^6$; $a_{i,j} = a_{j,i}$; $a_{i,i} = 0$).

Output

In the first line print one integer: the smallest total distance that Salesman needs to travel. In the second line print n integers: the order in which he should visit the cities.

Examples

standard input	standard output
5 0 183 163 173 181 183 0 165 172 171 163 165 0 189 302 173 172 189 0 167 181 171 302 167 0	666 4 5 2 3 1

Problem D. Cows in a Skyscraper

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

A little known fact about Bessie and friends is that they love stair climbing races. A better known fact is that cows really don't like going down stairs. So after the cows finish racing to the top of their favorite skyscraper, they had a problem. Refusing to climb back down using the stairs, the cows are forced to use the elevator in order to get back to the ground floor.

The elevator has a maximum weight capacity of w ($1 \le w \le 10^8$) pounds and cow i weighs c_i ($1 \le c_i \le w$) pounds. Please help Bessie figure out how to get all the n ($1 \le n \le 18$) of the cows to the ground floor using the least number of elevator rides. The sum of the weights of the cows on each elevator ride must be no larger than w.

Input

First line contains two integers n and w ($1 \le n \le 18$; $1 \le w \le 10^8$).

Next n lines describe weights of the cows: i-th line contains integer c_i ($1 \le c_i \le w$).

Output

First line should contain integer r — the minimum number of elevator rides needed.

Each of the next r lines should start with an integer giving the number of cows in the set, followed by the indices of the cows in the set during that ride.

Examples

skyscraper.in	skyscraper.out
4 10 5 6 3 7	3 2 1 3 1 2 1 4

Note

There are four cows weighing 5, 6, 3, and 7 pounds. The elevator has a maximum weight capacity of 10 pounds.

We can put the cow weighing 3 on the same elevator as any other cow but the other three cows are too heavy to be combined. For the solution above, elevator ride 1 involves cow 1 and 3, elevator ride 2 involves cow 2, and elevator ride 3 involves cow 4. Several other solutions are possible for this input.

Problem E. Cute Drawings

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Find the number of colorings of a $n \times m$ grid in two colors without 2×2 squares of the same color.

Input

The first line of input contains two integers n, m ($1 \le n \cdot m \le 30$).

Output

Print one integer: the number of colorings of a $n \times m$ grid in two colors without 2×2 squares of the same color. Colorings that can be made equal by rotations or reflections are considered different.

Examples

standard input	standard output
1 1	2
1 2	4

Problem F. Cute Drawings Strike Back

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Find the number of colorings of a $n \times m$ grid in two colors without 2×2 squares of the same color, modulo $2^{30} + 1$

Input

The first line of input contains two integers n, m ($1 \leq n \cdot m \leq 300$).

Output

Print one integer: the number of colorings of a $n \times m$ grid in two colors without 2×2 squares of the same color, modulo $2^{30} + 1$. Colorings that can be made equal by rotations or reflections are considered different.

Examples

standard input	standard output
2 2	14
3 3	322