# Problem A. Group Assignments

## Problem Description

There are $n$ students in the class, if the $i^{\text{th}}$ and $j^{\text{th}}$ students are in the same group, there will be a *badness* of $c_{i,j}$.

KCW asks TAs to divide the students into several groups such that each group has at least 2 students, and he wants the sum of badness among each group be the smallest possible.

Please tell TAs the minimum possible sum of badness, and also provide any group assignment.

## Input Format

- line 1: $n$
- line $1 + i$ ( $1 \leq i \leq n$ ): $c_{i,1}$ $c_{i,2}$ $\ldots$ $c_{i,n}$

## Output Format

- line 1: $ans$ : minimum possible sum of badness.
- line 2: $g_1$ $g_2$ $\ldots$ $g_n$ : the group which $i^{\text{th}}$ student belongs to.
  - Your output should satisfy $1 \leq g_i \leq n$ for $i = 1, 2, \ldots, n$.

## Constraints

- $2 \leq n \leq 21$.
- $0 \leq c_{i,j} \leq 99$ for $i = 1, 2, \ldots, n$ and $j = 1, 2, \ldots, n$.
- $c_{i,i} = 0$ for $i = 1, 2, \ldots, n$.
- $c_{i,j} = c_{j,i}$ for $i = 1, 2, \ldots, n$ and $j = 1, 2, \ldots, n$.
- All input values are integers.

## Subtasks

1. (20 points) $n \leq 9$.
2. (20 points) $n \leq 12$.
3. (20 points) $n \leq 15$.
4. (20 points) $n \leq 18$.
5. (20 points) No additional constraints.

- If you output the minimum sum of badness correctly, you can get $50\%$ of a subtask's score;
- furthermore, if you construct a group assignment that yields minimum sum of badness, you can get the other $50\%$ score.
- If you can not construct the grouping, please still print any valid construction.

| No. | Testdata Range | Time Limit (ms) | Memory Limit (KiB) |
|---|---|---|---|
| Samples | 1-4 | 1500 | 262144 |
| 1 | 1-28 | 1500 | 262144 |
| 2 | 1-43 | 1500 | 262144 |
| 3 | 1-58 | 1500 | 262144 |
| 4 | 1-73 | 1500 | 262144 |
| 5 | 1-99 | 1500 | 262144 |

## Samples

### Sample Input 1

```
3
0 1 2
1 0 3
2 3 0
```

This sample input satisfies the constraints of all the subtasks.

### Sample Output 1

```
6
1 1 1
```

Since there must be at least $2$ students in each group, there is only one way to assign the students to groups. The total badness is $c_{1,2} + c_{1,3} + c_{2,3} = 1 + 2 + 3 = 6$.

## Sample Input 2

```
4
0 1 2 4
1 0 3 5
2 3 0 6
4 5 6 0
```

This sample input satisfies the constraints of all the subtasks.

## Sample Output 2

```
7
2 4 4 2
```

The total badness is $(c_{1,4}) + (c_{2,3}) = 4 + 3 = 7$.

Note that both $\{(1,3),(2,4)\}$ and $\{(1,2),(3,4)\}$ has total badness 7, these two group assignments are also considered correct.

## Sample Input 3

```
5
0 2 7 1 8
2 0 2 8 1
7 2 0 8 2
1 8 8 0 8
8 1 2 8 0
```

This sample input satisfies the constraints of all the subtasks.

## Sample Output 3

```
6
1 2 2 1 2
```

Sample Input 4

```
9
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0
```

This sample input satisfies the constraints of all the subtasks.

Sample Output 4

```
0
2 1 4 7 4 7 1 2 1
```

You are not required to minimize the number of groups.