# **Problem Cheerleader**

Input file:	standard	input
Output file:	standard	output

In preparation for the Fo(1)otball cup, the cheerleaders from Little Square's school are trying to create a new routine. There are  $2^N$  cheerleaders with **distinct** heights between 0 and  $2^N - 1$ . The cheerleaders stand in a row. The height of the cheerleader that is initially at position *i* is h[i] for  $1 \le i \le 2^N$ .

The cheerleaders know two coordinate dance moves:

- The big swap. In this move, the first  $2^{N-1}$  cheerleaders swap places with the last  $2^{N-1}$  cheerleaders.
- The *big split*. In this move, the cheerleaders at odd positions go to the beginning of the row, and the cheerleaders at even positions go to the end of the row.

For instance, a *big swap* on 8 elements has the following effect:



And a *big split* on 8 elements has the following effect:



Now, define the number of inversions of a row of cheerleaders with heights  $h'[1], \ldots, h'[2^N]$  as the number of pairs  $(i, j), 1 \leq i < j \leq 2^N$  where h'[i] > h'[j]. The cheerleaders want to know a sequence of dance moves that minimises the number of inversions in the resulting row.

### Input

On the first line of the input you will find N. On the second line of the input you will find  $2^N$  integers, that represent  $h[1], \ldots, h[2^N]$ .

## Output

On the first line of the output, print the minimum number of inversions that can be achieved. On the second line of the output, write a string that represents a sequence of dance moves that leads to that minimum number of inversions. In this string, a 1 represents a *big swap*, and a 2 represents a *big split*. Any sequence of moves that leads to the minimum number of inversions will be accepted.

## Constraints

- $0 \le N \le 17$ .
- N can be 0.
- If you output the correct minimum number of inversions, but the string of moves is incorrect, you will receive X points. The value of X varies from subtask to subtask.



• The length of the string of moves must be at most 500.000 characters long.

## Subtask 1 (points: 16)

- $\bullet \ N \leq 4$
- X = 8

Subtask 2 (points: 10)

- $N \leq 7$
- X = 5

## Subtask 3 (points: 25)

- $N \leq 11$
- X = 20

# Subtask 4 (points: 21)

- $N \le 16$
- It is guaranteed that the minimum number of inversions that can be achieved is 0.
- X = 0

# Subtask 5 (points: 28)

- No additional restrictions.
- X = 21

### **Examples**

standard input	standard output
2	1
0 3 1 2	2212
3	8
2 3 7 6 1 4 5 0	21221
4	43
1 4 8 5 3 6 12 13 10 11 2 9 14 0 15 7	2222