

Problem Cheerleader

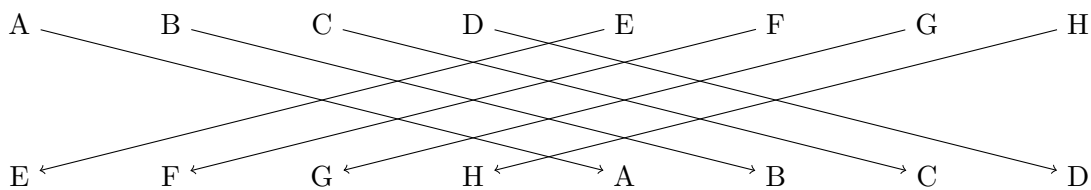
Input file: *standard input*
 Output file: *standard output*

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 $1 \leq i \leq 2^N$.

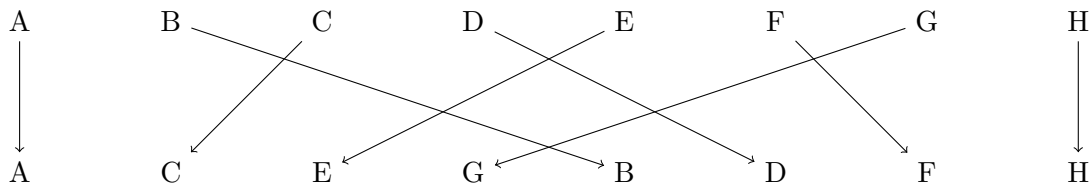
The cheerleaders know two coordinate dance moves:

- 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 $h'[1], \dots, h'[2^N]$ 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 $h[1], \dots, h[2^N]$.

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

- $0 \leq N \leq 17$.
- **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)

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

Subtask 2 (points: 10)

- $N \leq 7$
- $X = 5$

Subtask 3 (points: 25)

- $N \leq 11$
- $X = 20$

Subtask 4 (points: 21)

- $N \leq 16$
- 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 0 3 1 2	1 2212
3 2 3 7 6 1 4 5 0	8 21221
4 1 4 8 5 3 6 12 13 10 11 2 9 14 0 15 7	43 2222