Hadamard Matrix

Time limit: 1 sec

A Hadamard matrix, named after the French mathematician Jacques Hadamard, is a square matrix containing only 1 or -1. There are several Hadamard matrices, each is identified by an integer **n**. The Hadamard matrix of the order n is denoted by H_n and has the size of n row and n column. The Hadamard matrix of rank 2n can be constructed from the Hadamard matrix of rank n. The construction of the Hadamard matrix of rank n can be defined recursively as follow.

$$H_1 = [1]$$

$$H_2 = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$H_n = \begin{bmatrix} H_{n/2} & H_{n/2} \\ H_{n/2} & -H_{n/2} \end{bmatrix}$$

Given a column vector of size n $v = \begin{pmatrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{pmatrix}$, your task is to calculate $H_n v$ which is the production of the metrix H_n and the vector v

Input

- The first line of input contains an integers **n**. **It is guaranteed that n = 2^k where 0 <= k <= 18**.
- The second line contains **n** integers representing v_1, v_2, …, v_n where -1,000 < v_n < 1000.

Output

The output must has exactly 1 line that contains n integers that described the vector $H_n v$.

Example

Input	Output
1 10	10
2 10 20	30 -10
4 1 2 4 8	15 -5 -9 3