Problem A. Belarusian State University

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Being a student of Belarusian State University (BSU) is an earnest reason for pride. While studying the Theory of Algorithms course, you are obliged to solve many challenging problems before you are admitted to the final exam. Here is one of these problems.

You are given a positive integer n and $4n$ integers $c(i, j, k)$ which can be equal to 0 or 1 ($0 \le i < n$, $j \in \{0, 1\}$, $k \in \{0, 1\}$).

Consider two integers x and y between 0 and $2^n - 1$, inclusively. Let $x = \sum_{i=0}^{n-1} x_i \cdot 2^i$ and $y = \sum_{i=0}^{n-1} y_i \cdot 2^i$ be their binary representations ($x_i, y_j \in \{0, 1\}$). Define $f(x, y) = \sum_{i=0}^{n-1} c(i, x_i, y_i) \cdot 2^i$. Clearly, $f(x, y)$ is also an integer between 0 and $2^n - 1$.

Given two multisets A and B, find the multiset of values $f(a, b)$ over all pairs (a, b), where $a \in A$, $b \in B$.

Input

The first line contains an integer n ($1 \le n \le 18$).

The second line contains n binary strings of 4 digits. The i-th string consists of the values of $c(i-1, 0, 0)$, $c(i-1, 0, 1)$, $c(i-1, 1, 0)$, $c(i-1, 1, 1)$ in this particular order.

The next two lines describe multisets A and B, respectively. The description of a multiset consists of 2^n integers $q_0, q_1, \ldots, q_{2^n-1}$ denoting the quantities of the numbers $0, 1, \ldots, 2^n - 1$ in the multiset ($q_i \ge 0$, $\sum q_i \le 10^9$). There are no other numbers in the multisets.

Output

Print 2^n integers in a single line, the quantities of the numbers $0, 1, \ldots, 2^n - 1$ in the resulting multiset.

Examples

standard input	standard output
3 0111 0110 0001 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0	0 0 0 0 0 0 0 1
2 1100 1101 2 0 2 1 2 0 2 1	2 4 3 16
1 0000 142857142 857142857 998244353 1755646	999999998000000001 0

Note

In the first example, you are given 5 and 6. For $x_i, y_i \in \{0, 1\}$, we have

$$f(x_0 + 2x_1 + 4x_2,\ y_0 + 2y_1 + 4y_2) = (x_0 \text{ OR } y_0) + 2 \cdot (x_1 \text{ XOR } y_1) + 4 \cdot (x_2 \text{ AND } y_2).$$

Thus, the only number in the resulting multiset is 7.