Problem K. Knapsack Cryptosystem

Time limit: 3 seconds

The Merkle–Hellman Knapsack Cryptosystem was one of the earliest public key cryptosystems invented by Ralph Merkle and Martin Hellman in 1978. Here is its description.

Alice chooses n positive integers $\{a_1, \ldots, a_n\}$ such that each $a_i > \sum_{j=1}^{i-1} a_j$, a positive integer q which is greater than the sum of all a_i, and a positive integer r which is coprime with q. These $n+2$ integers are Alice's private key.

Then Alice calculates $b_i = (a_i \cdot r) \bmod q$. These n integers are Alice's public key.

Knowing her public key, Bob can transmit a message of n bits to Alice. To do that he calculates s, the sum of b_i with indices i such that his message has bit 1 in i-th position. This value s is the encrypted message.

Note that an eavesdropper Eve, who knows the encrypted message and the public key, has to solve a (presumably hard) instance of the knapsack problem to find the original message. Meanwhile, after receiving s, Alice can calculate the original message in linear time; we leave it to you as an exercise.

In this problem you deal with the implementation of the Merkle–Hellman Knapsack Cryptosystem in which Alice chose $q = 2^{64}$, for obvious performance reasons, and published this information. Since everyone knows her q, she asks Bob to send her the calculated value s taken modulo 2^{64} for simplicity of communication.

You are to break this implementation. Given the public key and an encrypted message, restore the original message.

Input

The first line contains one integer n ($1 \le n \le 64$).

Each of the next n lines contains one integer b_i ($1 \le b_i < 2^{64}$).

The last line contains one integer $s \bmod q$ — the encrypted message s taken modulo q ($0 \le s \bmod q < 2^{64}$).

The given sequence b_i is a valid public key in the described implementation, and the given value $s \bmod q$ is a valid encrypted message.

Output

Output exactly n bits (0 or 1 digits) — the original message.

Examples

input	output
5 10 20 50 140 420 440	01001