



Task Korupcija

... Corruption for all, not just for some. I offer corruption, a corrupt order, work, and growth. Whatever these other bosses offer you, I offer double. I even propose an eighth case: To whom? How much? ...

Little Mirko was fascinated by the speech of the man on television. He was convinced he understood the message: he had to corrupt the bits of his binary numbers.

Mirko considers the numbers $0, 1, \dots, 2^N - 1$ (viewed as binary numbers with N binary digits). Driven by his desire for corruption, Mirko will choose two numbers X and Y ($0 \leq X, Y < 2^N$) that differ in exactly one bit. He will then overwrite that bit with a “?” symbol in both numbers X and Y , thus achieving corruption: the numbers X and Y can no longer be distinguished. Mirko will repeat this process with the remaining numbers until he obtains exactly 2^{N-1} pairs of numbers that cannot be distinguished. In other words, each number between 0 and $2^N - 1$ belongs to exactly one pair, and two numbers can form a pair if and only if they differ in exactly one bit.

For an extra challenge, Mirko decides he wants exactly a_i pairs where the overwritten “?” symbol is at the i -th bit position, for each $i = 0, 1, \dots, N - 1$. Here, bits are numbered from least significant to most significant, so the i -th bit corresponds to the value 2^i . Help Mirko by choosing the pairs to satisfy the desired conditions, or determine that it is impossible to do so.

Input

The first line contains a positive integer N as described above.

The second line contains N non-negative integers a_i , for $i = 0, \dots, N - 1$, where a_i represents the required number of pairs that differ at the i -th bit position. The sum of all a_i is exactly 2^{N-1} .

Output

If it is impossible to form pairs satisfying the required conditions, output a single line containing -1 .

Otherwise, output 2^{N-1} lines. Each line should contain two space-separated integers X and Y , representing a selected pair. You may output the pairs in any order.

If multiple solutions exist, output any.

Scoring

In all subtasks, it holds that $1 \leq N \leq 20$.

In every subtask, 20% of the points are awarded for simply determining whether it is possible to satisfy the conditions. For these points, if you output anything other than -1 , you may print any pairing (even if it does not fully satisfy the required condition).

Subtask	Points	Constraints
1	15	$N \leq 4$
2	15	$N \geq 2$ and $a_i = 0$ for all $i > 2$
3	20	$N \leq 6$
4	50	No additional constraints.



Sample Cases

input

2
2 0

output

0 1
2 3

input

2
1 1

output

-1

input

3
2 0 2

output

0 1
2 6
3 7
4 5