Magic Wands (swaps)

Martha has a permutation $P_0, P_1, \ldots, P_{N-1}$ of the numbers 1 to N. Unfortunately, it is quite scrambled, so she wants to sort it, i.e. get the permutation $1, 2, \ldots, N$.

The *Magic Store* sells N types of wands. Through the i-th ($1 \leq i \leq N$) wand, you can swap the a-th and b-th elements of a permutation if and only if i divides $P_a - P_b$.

A magic wand.

Martha has money for buying **only one** wand. For every i ($1 \leq i \leq N$), she wonders whether she would be able to sort the permutation by buying the i-th wand, and what would be the minimum number of swaps needed in that case.

Input

The first line contains the only integer N. The second line contains N integers P_i.

Output

You need to write N integers to the output in a single line, separated by spaces: the i-th should be the minimum number of swaps for the i-th wand, or -1 if it is not possible to sort P using it.

Constraints

- $1 \leq N \leq 1\,000\,000$.
- $1 \leq P_i \leq N$ for each $i = 0 \ldots N-1$.
- $P_i \neq P_j$ if $i \neq j$ for each $i, j = 0 \ldots N-1$.

Scoring

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (14 points) $N \leq 8$.

– **Subtask 3** (17 points) $N \leq 100$.

– **Subtask 4** (23 points) $N \leq 5000$.

– **Subtask 5** (46 points) No additional limitations.

Examples

input	output
4 4 3 2 1	2 -1 -1 -1
5 5 2 3 4 1	1 1 -1 1 -1

Explanation

In the **first sample case**, using the 1^{st} wand, we can swap elements 1 and 4 to get $[1, 3, 2, 4]$, then 2 and 3 to get $[1, 2, 3, 4]$.

In the **second sample case**, we can swap elements 1 and 5 using the 1^{st}, 2^{nd} or 4^{th} wand.