Problem Prahova Valley

Input file	`stdin`
Output file	`stdout`

Andrei's route to the IIOT finals begins in the famous Prahova Valley! During the road trip, he got bored and came up with the following algorithm (**note:** we denote the *assignment* operation as $x \leftarrow y$):

```
for i ← N ... 1 do
    j ← i + 1
    while j ≤ N and V_j % V_i = 0 do
        j ← R_j
    end while
    R_i ← j
end for
```

During a brief stop at the famous Peleș Castle in Sinaia, he wrote down all the house numbers he found around the city and applied the aforementioned algorithm. He wrote down the resulting sequence R on a separate sheet of paper.

Task

When Andrei gets into the car, he realizes that he has lost all the pages of his notebook except the ones containing sequence R and the algorithm. Your task is to find the **lexicographically smallest** sequence V of N integers such that applying the algorithm to V produces the sequence R.

Input

The first line of the input contains the integer N, representing the number of integers in the R sequence.

The second line of the input contains N space-separated integers $R_1, R_2, \ldots, R_N$, representing the elements of the R sequence.

Due to the high volume of input data, we recommend adding the following lines before reading any input:

```
ios_base::sync_with_stdio(false);
cin.tie(0);
```

Output

The first line of the output must contain N space-separated integers $V_1, V_2, \ldots, V_N$, representing the lexicographically smallest sequence such that applying the algorithm to it produces sequence R.

Restrictions

- $1 \leq N \leq 5\,000\,000$
- $i + 1 \leq R_i \leq N + 1$, for all $1 \leq i \leq N$
- We guarantee that, for the given input, there is always a solution.
- $1 \leq V_i \leq 2^{50}$, for all $1 \leq i \leq N$
- The algorithm produces the same result regardless of the initial values of R_i, meaning we can safely assume $R_i = 0$ for all $1 \leq i \leq N$.

#	Points	Restrictions
1	0	Examples
2	15	$N \le 100,\ R_i = N + 1$ for all $1 \le i \le N$
3	15	$N \le 100,\ R_i = i + 1$ for all $1 \le i \le N$
4	25	$N \le 5\,000$
5	45	No further restrictions.

Examples

Input file	Output file
`5` `6 5 4 5 6`	`1 2 4 2 1`

Explanations

We will apply the algorithm on $\{1, 2, 4, 2, 1\}$.

- $i = 5$: The pointer j is initialized to 6. Since $j \ge N + 1$, the inner loop condition is not met, resulting in $R_5 = 6$.
- $i = 4$: Initializing $j = 5$, we find that $V_5 \% V_4 \ne 0$. The loop terminates immediately, setting $R_4 = 5$.
- $i = 3$: Starting with $j = 4$, we check $V_4 \% V_3 \ne 0$, thus $R_3 = 4$.
- $i = 2$: We begin with $j = 3$. Since $V_3 \% V_2 = 0$, we update $j \leftarrow R_3 = 4$. Subsequently, as $V_4 \% V_2 = 0$, we update $j \leftarrow R_4 = 5$. Finally, $V_5 \% V_2 \ne 0$, yielding $R_2 = 5$.
- $i = 1$: Starting with $j = 2$, we perform the following updates:
  - $V_2 \% V_1 = 0 \implies j \leftarrow R_2 = 5$.
  - $V_5 \% V_1 = 0 \implies j \leftarrow R_5 = 6$.

  The loop terminates as $j = 6$, resulting in $R_1 = 6$.

We can show that this is the lexicographically smallest solution for the given input.