GCD Sequence

For a sequence A of n positive integers $a_1, a_2, \ldots, a_n$, its *GCD sequence* is the sequence B of $n-1$ integers $b_1, b_2, \ldots, b_{n-1}$, where $b_i = \gcd(a_i, a_{i+1})$.

For example, the GCD sequence of $A = [2, 4, 5, 3, 9]$ is $B = [2, 1, 1, 3]$.

Here, $\gcd(x, y)$ denotes the greatest common divisor of integers x and y, which is the largest positive integer that divides both x and y. For example, $\gcd(12, 18) = 6$.

You are given a sequence B of $n-1$ positive integers. Find a sequence A of n positive integers whose GCD sequence is B, such that the sum $a_1 + a_2 + \ldots + a_n$ is minimized, or report that no such sequence exists.

Input

Each test contains multiple test cases. The first line contains the number of test cases τ ($1 \le \tau \le 10^4$). The description of the test cases follows.

The first line of each test case contains an integer n ($2 \le n \le 10^5$) – the length of the sequence A.

The second line contains $n-1$ integers $b_1, b_2, \ldots, b_{n-1}$ ($1 \le b_i \le 10^9$).

It is guaranteed that the sum of n over all test cases does not exceed 10^5.

Output

For each test case, if there is no sequence A whose GCD sequence is B, print -1. Otherwise, print n integers $a_1, a_2, \ldots, a_n$ – a sequence whose GCD sequence is B with the minimum sum.

It can be shown that if such a sequence exists, every a_i in a sequence with the minimum sum does not exceed 10^{18}. If there are multiple solutions, you can output any of them.

Sample Input 1	Sample Output 1
1 5 2 1 1 3	2 2 1 3 3

Sample Explanation

In the first test case, $A = [2, 4, 5, 3, 9]$ has the GCD sequence $[2, 1, 1, 3]$ with sum 23. However, $A = [2, 2, 1, 3, 3]$ has the same GCD sequence with a smaller sum of 11, which is the minimum.

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