

Problem D. Monument

In another part of the town there is another historical wonder: A strange lock that has closed one of the town's ancient gates. The townsfolk and The Archaeological Association of Sepahan Shahr have been trying to open this lock for years to see what's behind the old gate, but they haven't had any success.

A horizontal array of n numbers has been engraved next to this lock which we call S . On the lock itself there are n vertical boxes, first of which has 0, and the last one has k written in it. The other boxes can be filled with any number, and throughout the recent years they have been filled with many sequences of numbers, none of which could open the lock.

There is an old legend which states that people in this town considered an array of numbers where two consequent numbers have a difference bigger than 1 to be an "Ominous Array". Knowing this, the archaeologists don't want to create an Ominous Array. Also, recently they have found out that the position of S and the lock resembles a matrix multiplication. So now, they are looking for an array A that satisfies the following conditions:

1. A should not be Ominous.
2. Like what is written on the lock, $A_0 = 0$ and $A_n = k$.
3. A should give the maximum result for $S \cdot A$

$$(S \cdot A = \sum_{i=1}^{i=n} S_i * A_i)$$

Your task is to find the maximum result for $S \cdot A$

Input

The first line of the input contains the number n ($1 \leq n \leq 5 \times 10^5$) — the size of the array S . The second line contains n integers S_1, S_2, \dots, S_n ($-10^6 \leq S_i \leq 10^6$) — the array S .

Output

Print $n + 1$ numbers which are answers for $k = 0$ to n .

Examples

test	answer
5 -435154 -637821 -75012 868573 -777355	1941548 1319933 542578 -234777 -1291546 -2348315