



# Problem J

## Mex Culpa

Time Limit: 5 Seconds

The mex (shorthand for **m**inimum **e**xcluded value) of a sequence is the smallest non-negative integer that is not in the sequence. For example:

- $\text{mex}(\{\}) = 0$
- $\text{mex}(\{1, 2, 3\}) = 0$
- $\text{mex}(\{5, 0, 1, 1, 4\}) = 2$
- $\text{mex}(\{0, 5, 2, 1, 5, 0, 1, 2\}) = 3$

While the mex function has applications in combinatorial game theory, it is still a rather niche method for mapping a sequence to an integer. In the absence of a more organic problem, we have repurposed this concept to construct a task of a somewhat artificial nature. Sorry!

Write a program that, given two sequences of positive integers  $a = [a_1, a_2, \dots, a_n]$  and  $b = [b_1, b_2, \dots, b_n]$ , evaluates the following recurrence: for  $1 \leq i \leq n$ ,

$$f_i = \text{mex}(\{f_j \mid 1 \leq j \leq i - 1; a_i \leq a_j + b_j; a_j \leq a_i + b_i\})$$

### Input

Your program is to read from standard input. The first line contains a single integer,  $n$  ( $1 \leq n \leq 250,000$ ), representing the length of the sequences. The second line contains  $n$  positive integers  $a_1, a_2, \dots, a_n$  ( $1 \leq a_i \leq 10^9$ ) representing the sequence  $a$ . The third line contains  $n$  positive integers  $b_1, b_2, \dots, b_n$  ( $1 \leq b_i \leq 10^9$ ), representing the sequence  $b$ .

### Output

Your program is to write to standard output. Print exactly one line consisting of  $n$  space-separated integers, denoting  $f_1, f_2, \dots, f_n$ .

The following shows sample input and output for three test cases.

Sample Input 1	Output for the Sample Input 1
3 3 1 5 2 2 4	0 1 1
Sample Input 2	Output for the Sample Input 2
8 1 2 9 4 6 9 7 10 9 3 7 1 1 7 1 1	0 1 1 2 1 2 2 3
Sample Input 3	Output for the Sample Input 3
15 1 1 5 1 2 3 8 8 6 5 9 1 1 4 3 2 5 7 4 6 4 1 3 4 8 3 4 2 10 1	0 1 0 2 3 4 1 2 5 6 3 5 6 7 8