Rooms

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

You are playing the popular videogame *Escape the BThouse*. As you could have already guessed, the objective is to escape the house.

The house consists of n rooms, that are placed in a row and numbered from 1 to n, and $n + 1$ doors between the rooms. The 1-st door is the exit located in room 1, similarly the $n+1$-st door is the exit from room n. All the other doors $2 \le i \le n$ connect rooms $(i-1, i)$. Your goal is to exit the house through the first or $n + 1$-st door.

To open i-th door at least b_i experience points are required. Experience can be obtained by solving quests in the rooms, with the quest in the room i giving a_i experience points. Formally, to solve a quest it is sufficient to simply enter the room. Also, the game has monetization mechanics built-in: at any moment in time, you may purchase an arbitrary amount of experience at a price of 1 experience unit for 1 in-game coin.

You need to choose the starting room, your character will appear in that room with 0 experience units. For each room, calculate the minimal number of coins required to escape the house, starting the game in that room.

Input

The first input line contains one integer n ($1 \le n \le 10^6$).

The second line contains n space-separated integers $a_1, \ldots, a_n$ ($0 \le a_i \le 10^9$).

The third line contains $n + 1$ space-separated integers $b_1, \ldots, b_{n+1}$ ($0 \le b_i \le 10^9$).

Output

Print n space-separated integers $ans_1, \ldots, ans_n$, where ans_i is the minimal number of coins necessary to complete the game starting in room i.

Scoring

This problem contains 8 subtasks, that meet following requirements:

1. $n \le 500$. Worth 12 points.
2. $n \le 5000$. Worth 8 points
3. $n \le 2 \cdot 10^5$, $a_i = 0$. Worth 10 points
4. $n \le 2 \cdot 10^5$, $b_1 \le b_2 \le \cdots \le b_{n+1}$. Worth 10 points.
5. $n \le 2 \cdot 10^5$, $b_i \le 100$. Worth 19 points.
6. $n \le 2 \cdot 10^5$. Worth 21 points.
7. Original problem constraints. Worth 20 points.

Examples

standard input	standard output
3 2 1 3 9 8 5 7	6 4 3
3 1 3 3 10 2 5 6	1 1 2

Note

Let's consider the first example.

The optimal strategy for the first room is the following:

1. Obtain 2 experience units in the 1-st room.
2. Purchase 6 experience units for 6 coins.
3. Go to the 2-nd room through the 2-nd door.
4. Obtain 1 experience unit in the 2-nd room..
5. Go to the 1-st room through the 2-nd door.
6. Escape through the 1-st door.

Only 6 coins required in total.

For the second room:

1. Obtain 1 experience unit in the 2-nd room.
2. Purchase 4 experience units for 4 coins.
3. Go to the 3-rd room through the 3-rd door.
4. Obtain 3 experience units in the 3-rd room.
5. Escape through the 4-th door.

Only 4 coins required.

For the third room:

1. Obtain 3 experience units in the 3-rd room.
2. Purchase 2 experience units for 2 coins.
3. Go to the 2-nd room through the 3-rd door.
4. Obtain 1 experience unit in the 2-nd room.
5. Go to the 3-rd room through the 3-rd door.
6. Purchase 1 experience unit for 1 coin.
7. Escape through the 4-th door.

Only 3 coins required.