# andelion Knight

| | |
|---|---|
| Input file: | `standard input` |
| Output file: | `standard output` |
| Time limit: | 2 seconds |
| Memory limit: | 512 megabytes |

*I am Jean, the Dandelion Knight, requesting approval to join your party. From this day onwards, my honor and loyalty lie with you.*

*—Jean*


As the acting Grand Master for the Knights of Favonius, Jean takes all of her responsibilities and duties associated with the role seriously, regardless of how trivial the tasks may seem to her, such as finding a lost cat.

As usual, Jean accepts commissions from Mondstadt and Springvale respectively. There are $n$ commissions from Mondstadt in a queue that must be finished in order, *i.e.* the first commission must be finished before Jean can start working on the second commission. Similarly, there are $n$ commissions from Springvale in a queue that also must be finished in order.

Different commissions have different impact values. For each of commission, it can be either impactful (with impact value 1), or trivial (with impact value 0). At the end of today, if the sum of impact values of finished commissions from Mondstadt doesn't equal to the sum of impact values of finished commissions from Springvale, it will create a dilemma for Jean and Jean wants to avoid that.

Define $f(x)$ as the number of ways for Jean to avoid dilemma if she will finish **exactly** $x$ commissions totally at the end of today. For $x \in [0, 2n]$, calculate $f(x)$.

**Two ways are considered different if one or more commissions are finished in one way but unfinished in another way.**

## Input

The first line contains one integer $n$ ($1 \le n \le 10^6$) — the number of commissions in each place.

The second line contains $n$ integer $a_1, a_2, \ldots, a_n$ ($a_i \in \{0, 1\}$), which means impact value of the $i$-th commission in Mondstadt.

The third line contains $n$ integer $b_1, b_2, \ldots, b_n$ ($b_i \in \{0, 1\}$), which means impact value of the $i$-th commission in Springvale.

## Output

Output $2n + 1$ integers $f(0), f(1), \ldots, f(2n)$ in a single line.

## Examples

| standard input | standard output |
|---|---|
| 2<br>0 1<br>1 0 | 1 1 0 1 1 |
| 5<br>0 0 1 1 0<br>1 1 0 0 1 | 1 1 1 0 1 0 1 2 2 1 0 |

## Note

The first example is explained as following:

- When $x = 0$: The only way is to finish none of commissions. The impact value in both Mondstadt and Springvale is 0.
- When $x = 1$: The only way is to finish 1 commission in Mondstadt. The impact value in both Mondstadt and Springvale is 0.
- When $x = 2$: It can be shown it's just impossible to make the impact value in Monstadt and Springvale equal if Jean finish two commissions, so the number of ways is 0.
- When $x = 3$: The only way is to finish 2 commissions in Mondstadt and 1 commission in Springvale. The impact value in both Mondstadt and Springvale is 1.
- When $x = 4$: The only way is to finish all commissions. The impact value in both Mondstadt and Springvale is 1.

The second example is partly explained as following:

- When $x = 8$: The first way is to finish 4 commissions in Mondstadt and 4 commissions in Springvale. The second way is to finish 5 commissions in Mondstadt and 3 commissions in Springvale. They are considered as two different ways because $(4, 4) \neq (5, 3)$. In these two ways, the impact value in both Mondstadt and Springvale is 2.

Recall that **two ways are considered different if any of the commission is not finished in one way but is finished in another way.**

*As the Acting Grand Master of the Knights, Jean has always been devoted to her duties and maintaining peace in Mondstadt. She had taken precautions long before the onset of Stormterror's assault, and she will guard Mondstadt with her life as always.*