Problem F

Factions vs The Hegemon

Time Limit: 1.5 seconds

For some reason I can't explain
I know Saint Peter won't call my name
Never an honest word
But that was when I ruled the world.

Viva la Vida, Coldplay

Long ago, there existed an ancient civilization whose records have mostly been lost to history. It is known that there were n warring factions, arranged and labeled 1 to n in order from west to east. The *wealth value* of the ith warring faction is summarized in a single positive integer w_i.

The warring factions would never achieve true peace with one another, but it was known that they would collude and form truces in order to conspire against what they believed to be the largest threat to them all. Of course, this only matters if their combined might can actually take down said largest threat.

We say that this civilization is in *hegemony* if there exists a faction whose wealth value is strictly greater than the combined wealth values of all *other* factions.

According to records, the following process occurred $n - 1$ times throughout history.

- One of the factions *collapses*.
    - If this civilization is not in hegemony, then the faction with the *largest* wealth value collapses.
    - If this civilization *is* in hegemony, then the faction with the *smallest* wealth value collapses.
    - In case of a tie, the west-most most/least wealthy faction is the one that collapses.
- After this, the nearest non-collapsed factions to its west and east each (if they exist) have their wealth values increased by half the wealth value of the collapsed faction, rounded down.
    - Even if the collapsed faction bordered only one other faction, that other faction *still* only receives half the collapsed faction's wealth value. The other half is lost to, I don't know, barbarians or something.

After $n - 1$ iterations of this, only one faction remains. But even then, this civilization fell to, like, I guess the Mongols? Or maybe the Romans. Either way, the records are lost to time.

But luckily, as a computer scientist, you can just simulate this process and find the exact order in which the factions collapsed, and how much wealth each had when they did.

Input Format

The first line of input contains a single integer n.

The second line of input contains n space-separated integers $w_1, w_2, w_3, \ldots, w_n$, the initial wealth values of the factions.

Constraints

- $2 \leq n \leq 2 \cdot 10^5$
- $1 \leq w_i \leq 10^9$ for each i

Output Format

Output n lines, describing each faction in the order that they collapsed (first to collapse comes first). Each faction should be described by two space-separated integers: its label, and its wealth value at the moment of collapse.

Sample Input 1	Sample Output 1
5 3 1 4 9 1	4 9 3 8 1 3 2 6 5 12

Sample Input 2	Sample Output 2
6 12 4 12 1 1 7	1 12 3 12 5 1 4 7 6 10 2 24

Explanation

Here are the events that occur in the second sample input.

- The wealthiest factions have wealth value 12, and of such factions, faction 1 is the west-most one. The civilization is not in hegemony, so faction 1 collapses. Half its wealth goes to faction 2. Factions $2, 3, 4, 5, 6$ now have wealth values $\{10, 12, 1, 1, 7\}$.
- Faction 3, with wealth 12, collapses because the civilization is not in hegemony. Factions 2 and 4 each receive half its wealth value. Factions $2, 4, 5, 6$ now have wealth values $\{16, 7, 1, 7\}$.
- Faction 2 is the wealthiest, and with a wealth value of 16, the civilization is now in hegemony. The least wealthy faction, 5, collapses. Note that $1/2$, rounded down, is 0, so the factions nearest to 5 gain 0 wealth. Factions $2, 4, 6$ now have wealth values $\{16, 7, 7\}$.
- We are still in hegemony, and faction 4 is the west-most faction whose wealth value is the minimum of 7. It collapses, and factions 2 and 6 now have wealth values $\{19, 10\}$.
- We are still in hegemony, and faction 6, with a wealth of 10, is now the weakest one, so it collapses. Faction 2 is all alone with a wealth value of $\{24\}$, until it too collapses.