Problem F. Money Game 2

Time limit: 4 seconds
Memory limit: 1024 megabytes

Putata and Budada are organizing a game with n players sitting in a circle. The players are numbered from 0 to $n-1$, and the i-th player is adjacent to the $((i-1) \bmod n)$-th and $((i+1) \bmod n)$-th player. Player i has a_i deposits in the beginning, which is an integer.

During each round of the game, the following happens: Putata and Budada will choose a player x who hasn't been chosen before, and the player x will give half of his deposit (rounded down to an integer) to one of his adjacent players. Notice that each player can share his deposit only once.

Let $f(i)$ be the maximum possible deposits that the player numbered i will have after some (possibly zero) number of rounds. Please, for each $0 \le i < n$, calculate $f(i)$. Notice that the answers are calculated independently for different values of i.

Input

The input contains multiple test cases. The first line contains an integer T ($1 \le T \le 5 \cdot 10^5$), denoting the number of test cases.

For each test case, the first line contains an integer n ($1 \le n \le 5 \cdot 10^5$), denoting the number of players.

The second line contains n integers, the i-th integer a_i ($0 \le a_i \le 10^9$), denoting the initial deposit of the i-th player.

It is guaranteed that the sum of n does not exceed $5 \cdot 10^5$.

Output

For each test case, output n integers in one line, denoting $f(0), f(1), \ldots, f(n-1)$.

Examples

standard input	standard output
3 5 2 1 4 3 5 5 2 1 3 1 2 1 1000000000	6 5 7 8 8 4 4 5 4 4 1000000000
1 10 8 15 18 15 13 4 14 4 17 5	30 37 41 39 34 27 29 26 31 27