Problem B. Playing with Numbers

Time limit	1000 ms
Mem limit	1048576 kB
OS	Linux

You have a list of N numbers, each of the form $2^a 3^b$ for some non-negative integers a and b. You want to perform $N-1$ operations on these numbers. Each operation acts on two numbers X and Y of your choice from the list, replacing them with a new number $\mathrm{op}(X, Y)$. After each operation, your list has one fewer number.

In this task, an operation op can be gcd or lcm (they stand for greatest common divisor and least common multiple, respectively). There are a total of N scenarios: You may apply "gcd" operations k times and "lcm" operations $N-1-k$ times. For each of the N scenarios, what is the largest possible outcome after these $N-1$ operations? What about the smallest possible outcome?

Input

The first line consists of a single integer N ($1 \leq N \leq 50\,000$). The following N lines each contains a pair of integers a_i and b_i ($0 \leq a_i, b_i \leq 1\,000$), indicating that the ith number in your initial list is $2^{a_i} 3^{b_i}$.

Output

Output N lines in total. On line i ($i = 1, \ldots, N$), output four space-separated integers a, b, a' and b'. The first pair of integers a and b indicate that the largest possible outcome is $2^a 3^b$ with $i-1$ "gcd" operations (and therefore $N-i$ "lcm" operations). The second pair of integers a' and b' indicate that the smallest possible outcome is $2^{a'} 3^{b'}$, again with $i-1$ "gcd" operations.

Explanation for sample data

The three numbers are $2^0 3^0 = 1$, $2^1 3^2 = 18$, and $2^2 3^0 = 4$.

1. When $i = 0$, we can only take lcm. $\mathrm{lcm}(1, 18, 4) = 36 = 2^2 3^2$.
2. When $i = 1$, the largest outcome is $\mathrm{lcm}(18, \mathrm{gcd}(1, 4)) = 18 = 2^1 3^2$, and the smallest outcome is $\mathrm{gcd}(1, \mathrm{lcm}(18, 4)) = 1 = 2^0 3^0$.
3. When $i = 2$, we can only take gcd. $\mathrm{gcd}(1, 18, 4) = 1 = 2^0 3^0$.

Sample 1

Input	Output
3 0 0 1 2 2 0	2 2 2 2 1 2 0 0 0 0 0 0