Stern-Brocot Tree

Description

There is a beautiful way to construct the set of **all nonnegative fractions** $\frac{m}{n}$ with $m \perp n\ (\gcd(n,m)=1)$, called the Stern-Brocot tree.

The idea is to start with the two fractions $\left(\frac{0}{1}, \frac{1}{0}\right)$ and then to repeat the following operation as many times as desired: insert $\frac{m+m'}{n+n'}$ between two adjacent fractions $\frac{m}{n}, \frac{m'}{n'}$.

For example, the first step gives us one new entry between $\frac{0}{1}$ and $\frac{1}{0}$,

$$\frac{0}{1}, \frac{1}{1}, \frac{1}{0};$$

and the next gives two more:

$$\frac{0}{1}, \frac{1}{2}, \frac{1}{1}, \frac{2}{1}, \frac{1}{0};$$

The next gives four more,

$$\frac{0}{1}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{1}{1}, \frac{3}{2}, \frac{2}{1}, \frac{3}{1}, \frac{1}{0};$$

and then we will get 8, 16, and so on. The entire array can be regarded as an infinite binary tree structure whose top levels look like this:

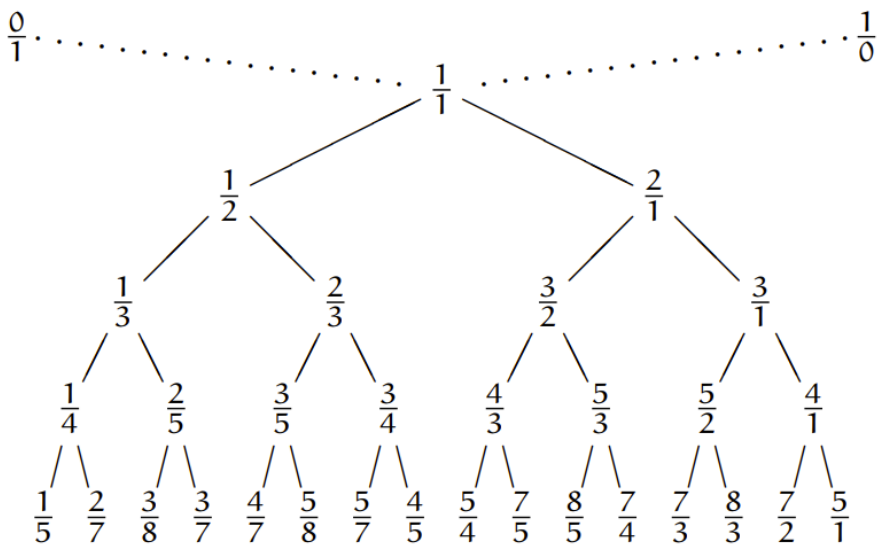

Fig.1 - Tree Representation

Given two positive fractions $\frac{a_1}{b_1}$ and $\frac{a_2}{b_2}$, you are required to find the value of their latest common ancestor(LCA) on the binary tree representation mentioned above.

Input

The input data contains multiple test cases, and each test case contains four positive integers a_1, b_1, a_2, b_2.

The input data is ended by $a_1 = b_1 = a_2 = b_2 = 0$.

Output

For each test case, print two integers p, q with $p \perp q$ in a line, which indcate that the LCA is $\frac{p}{q}$.

Sample Input/Output

Input

```
1 5 7 4
7 5 5 1
4 7 1 3
0 0 0 0
```

Output

```
1 1
2 1
1 2
```

Constraint

Denote the number of the total test cases by T.

$1 \leq T \leq 50, 1 \leq a_1, b_1, a_2, b_2 \leq 10^5, a_1 \perp b_1, a_2 \perp b_2$.

Appendix

Graham, Knuth, Patashnik, Knuth, Donald Ervin, & Patashnik, Oren. (1994). Concrete mathematics: a foundation for computer science (2nd ed.). Reading, Mass.: Addison-Wesley.