2016 BUPT summer traning #1

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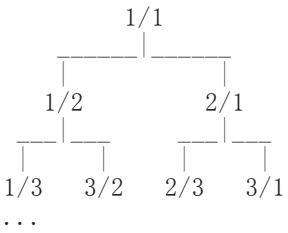
B - Rational Number Tree

Time Limit: 1000MS **Memory Limit:** 64000KB **64bit IO Format:** %lld & %llu

Submit Status

Description

Consider an infinite complete binary tree where the root node is 1/1 and left and right childs of node p/q are p/(p+q) and (p+q)/q, respectively. This tree looks like:



It is known that every positive rational number appears exactly once in this tree. A level-order traversal of the tree results in the following array:

1/1, 1/2, 2/1, 1/3, 3/2, 2/3, 3/1, ...

Please solve the following two questions:

1. Find the *n-th* element of the array, where *n* starts from 1. For example, for the input 2, the correct output is 1/2.
2. Given *p/q*, find its position in the array. As an example, the input 1/2 results in the output 2.

Input

The first line of the input gives the number of test cases, $T(1 \le T \le 100)$.

T test cases follow. Each test case consists of one line.

The line contains a problem id (1 or 2) and one or two additional integers:

1. If the problem *id* is 1, then only one integer *n* is given, and you are expected to find the *n-th* element of the array.
2. If the problem *id* is 2, then two integers *p* and *q* are given, and you are expected to find the position of *p/q* in the array.

p and q are relatively prime.

$1 \le n, p, q \le 2^{64-1}$

p/q is an element in a tree with level number ≤ 64.

Output

For each test case:

1. If the problem *id* is 1, then output one line containing "Case #x: p q", where *x* is the case number (starting from 1), and *p, q* are numerator and denominator of the asked array element, respectively.
2. If the problem *id* is 2, then output one line containing "Case #x: n", where *x* is the case number (starting from 1), and *n* is the position of the given number.

Sample Input

```
4
1 2
2 1 2
1 5
2 3 2
```

Sample Output

```
Case #1: 1 2
Case #2: 2
Case #3: 3 2
Case #4: 5
```