Round 1A 2010

A. Rotate

B. Make it Smooth

C. Number Game

Contest Analysis

Questions asked 1

Problem C. Number Game

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the Quick-Start Guide to get started.

| Small input 16 points | Solve C-small |
| Large input 25 points | Solve C-large |

Problem

Arya and Bran are playing a game. Initially, two positive integers A and B are written on a blackboard. The players take turns, starting with Arya. On his or her turn, a player can replace A with $A - k*B$ for any positive integer k, or replace B with $B - k*A$ for any positive integer k. The first person to make one of the numbers drop to zero or below loses.

For example, if the numbers are initially (12, 51), the game might progress as follows:

- Arya replaces 51 with 51 - 3*12 = 15, leaving (12, 15) on the blackboard.
- Bran replaces 15 with 15 - 1*12 = 3, leaving (12, 3) on the blackboard.
- Arya replaces 12 with 12 - 3*3 = 3, leaving (3, 3) on the blackboard.
- Bran replaces one 3 with 3 - 1*3 = 0, and loses.

We will say (A, B) is a *winning* position if Arya can always win a game that starts with (A, B) on the blackboard, no matter what Bran does.

Given four integers A_1, A_2, B_1, B_2, count how many winning positions (A, B) there are with $A_1 \leq A \leq A_2$ and $B_1 \leq B \leq B_2$.

Input

The first line of the input gives the number of test cases, T. T test cases follow, one per line. Each line contains the four integers A_1, A_2, B_1, B_2, separated by spaces.

Output

For each test case, output one line containing "Case #x: y", where x is the case number (starting from 1), and y is the number of winning positions (A, B) with $A_1 \leq A \leq A_2$ and $B_1 \leq B \leq B_2$.

Limits

$1 \leq T \leq 100$.
$1 \leq A_1 \leq A_2 \leq 1,000,000$.
$1 \leq B_1 \leq B_2 \leq 1,000,000$.

Small dataset

$A_2 - A_1 \leq 30$.
$B_2 - B_1 \leq 30$.

Large dataset

$A_2 - A_1 \leq 999,999$.
$B_2 - B_1 \leq 999,999$.

No additional constraints.

Sample

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Input           Output

3               Case #1: 0
5 5 8 8         Case #2: 1
11 11 2 2       Case #3: 20
1 6 1 6
```

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