Google Code Jam '10 Round 1A Problem C - Number Game

Time limit: 90.0s **Memory limit:** 1G

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 $A - k \cdot B$ for any positive integer k, or replace B with $B - k \cdot A$ 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 Specification

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 Specification

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

Memory limit: 1 GB.

$1 \leq T \leq 100$.

$1 \leq A_1 \leq A_2 \leq 1\,000\,000$.

$1 \leq B_1 \leq B_2 \leq 1\,000\,000$.

Small Dataset

Time limit: 30 seconds.

$A_2 - A_1 \leq 30$.

$B_2 - B_1 \leq 30$.

Large Dataset

Time limit: 90 seconds.

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

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

No additional constraints.

Sample Input

```
3
5 5 8 8
11 11 2 2
1 6 1 6
```

Sample Output

```
Case #1: 0
Case #2: 1
Case #3: 20
```

Note

This problem has different time limits for different batches. If you exceed the Time Limit for any batch, the judge will incorrectly display `>90.000s` regardless of the actual time taken. Refer to the **Limits** section for batch-specific time limits.