Project Euler #157: Solving the diophantine equation 1/a +1/b = p/10^n

This problem is a programming version of Problem 157 from projecteuler.net

Consider the diophantine equation $\frac{1}{a} + \frac{1}{b} = \frac{p}{10}$ with a, b, p positive integers and $a \leq b$. This equation has 20 solutions that are listed below:

$$\frac{1}{1} + \frac{1}{1} = \frac{20}{10} \qquad \frac{1}{1} + \frac{1}{2} = \frac{15}{10} \qquad \frac{1}{1} + \frac{1}{5} = \frac{12}{10} \qquad \frac{1}{1} + \frac{1}{10} = \frac{11}{10} \qquad \frac{1}{2} + \frac{1}{2} = \frac{10}{10}$$

$$\frac{1}{2} + \frac{1}{5} = \frac{7}{10} \qquad \frac{1}{2} + \frac{1}{10} = \frac{6}{10} \qquad \frac{1}{3} + \frac{1}{6} = \frac{5}{10} \qquad \frac{1}{3} + \frac{1}{15} = \frac{4}{10} \qquad \frac{1}{4} + \frac{1}{4} = \frac{5}{10}$$

$$\frac{1}{4} + \frac{1}{20} = \frac{3}{10} \qquad \frac{1}{5} + \frac{1}{5} = \frac{4}{10} \qquad \frac{1}{5} + \frac{1}{10} = \frac{3}{10} \qquad \frac{1}{6} + \frac{1}{30} = \frac{2}{10} \qquad \frac{1}{10} + \frac{1}{10} = \frac{2}{10}$$

$$\frac{1}{11} + \frac{1}{110} = \frac{1}{10} \qquad \frac{1}{12} + \frac{1}{60} = \frac{1}{10} \qquad \frac{1}{14} + \frac{1}{35} = \frac{1}{10} \qquad \frac{1}{15} + \frac{1}{30} = \frac{1}{10} \qquad \frac{1}{20} + \frac{1}{20} = \frac{1}{10}$$

Let's make generalized version of this equation: $\frac{1}{a} + \frac{1}{b} = \frac{p}{p_1^{\alpha_1} \cdot p_2^{\alpha_2}}$ with positive integers α_1, α_2 and primes p_1, p_2. How many solutions does this equation has for $1 \leq \alpha_1 \leq r_1, 1 \leq \alpha_2 \leq r_2$?

Note, that if tuple $\{a, b, p\}$ occurs as a solution of the equation for multiple α_1, α_2 it should be calculated multiple times and not once.

Input Format

Each test file starts with a number T on a separate line which is the number of tests per file. T lines follow, each containing p_1, r_1, p_2 and r_2 separated by single spaces.

Constraints

- $1 \leqslant T \leqslant 10$
- $p_1 \neq p_2$ are primes
- $1 \leqslant r1, r2$
- $p_1^{r_1} \cdot p_2^{r_2} \leqslant 10^{18}$

Output Format

Output T lines, each containing an answer to the corresponding test.

Sample Input

```
1
2 1 5 1
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Sample Output

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20
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