

Expected Bounding Box (Stretch)

time limit per test: 6 seconds (12 seconds for Python)
memory limit per test: 500 megabytes
input: standard input
output: standard output
points: 100 · problem code: expectedbbox

This is a stretch problem.

There are n points on the plane. Point i has coordinates (x_i, y_i) and is selected independently with probability a_i/b_i . Let S be the random set of selected points, and let R be the smallest axis-aligned bounding rectangle containing every point of S . The geometric area of R is

$$(\max_{i \in S} x_i - \min_{i \in S} x_i) \cdot (\max_{i \in S} y_i - \min_{i \in S} y_i).$$

If S has fewer than two points, or all selected points share the same x -coordinate or the same y -coordinate, this area is 0.

Output the expected area of R .

It can be shown that the answer can be expressed as a rational number P/Q in lowest terms with Q coprime to $10^9 + 7$. Output $P \cdot Q^{-1} \bmod (10^9 + 7)$.

Input

The first line contains an integer n .

Each of the next n lines contains four integers x_i, y_i, a_i , and b_i .

Output

Print a single integer: the expected area modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $-10^9 \leq x_i, y_i \leq 10^9$
- $0 \leq a_i < b_i \leq 10^9$

Example 1

Input

```
2
0 0 1 2
1 1 1 2
```

Output

```
250000002
```

Explanation

The bounding rectangle has area 1 only if both points are selected, which happens with probability $1/4$. Otherwise the area is 0.

Example 2

Input

```
2
0 0 1 2
3 4 1 2
```

Output

```
3
```

Explanation

Both points are selected with probability $1/4$, and then the area is 12. The expected area is 3.

Example 3

Input

```
3
0 0 1 2
2 0 1 2
0 2 1 2
```

Output

```
1
```

Explanation

Each subset of the three points is equally likely. The only non-degenerate rectangles come from selecting both $(2, 0)$ and $(0, 2)$ (area 4), and from selecting all three points (area 4). The expected area is therefore 1.