Problem I
Intersecting Lines

Time limit: **3 seconds**
Memory limit: **1024 megabytes**

Problem Description

We all know that a pair of distinct points on a plane defines a line and that a pair of lines on a plane will intersect in one of three ways:

1. no intersection because they are parallel;
2. intersect in a line because they are on top of one another (i.e. they are the same line);
3. intersect in a point.

In this problem, you will use your algebraic knowledge to create a program that determines how and where is the intersect point of these two lines.

Your program will repeatedly read in four points that define two lines in the x-y plane and determine how and where the lines intersect ($-1000 \leq x, y \leq 1000$).

Hint 1: How to Derive the General Form of a Line from Two Points?

Given two points (x_1, y_1) and (x_2, y_2), a line can be expressed in general form:

$Ax + By = C$

We can determine A, B and C as:

$A = y_2 - y_1$
$B = x_1 - x_2$
$C = A \times x_1 + B \times y_1$

Hint 2: How to Use Cramer's Rule to Find the Intersection?

For two lines:

$L_1 : A_1 \times x + B_1 \times y = C_1$
$L_2 : A_2 \times x + B_2 \times y = C_2$

Step 1: Determine the Δ, Δx and Δy

$\Delta = A_1 \times B_2 - A_2 \times B_1$
$\Delta x = C_1 \times B_2 - C_2 \times B_1$
$\Delta y = A_1 \times C_2 - A_2 \times C_1$

Step 2: Determine relationship between the lines

If $\Delta = 0$:

- If also $\Delta x = 0$ and $\Delta y = 0$, the lines are coincident ("LINE").
- Otherwise, the lines are parallel ("NONE").

If $\Delta \neq 0$:

- the lines intersect in one point.

Step 3: Determine the intersection point (if $\Delta \neq 0$)

$x = \Delta x / \Delta$
$y = \Delta y / \Delta$

This gives the coordinates of the intersection point.

Input Format

The first line contains an integer N between 1 and 100 describing how many pairs of lines are represented.

The next N lines will each contain eight integers. These integers represent the coordinates of four points on the plane in the order $x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4$. Thus each of these input lines represents two lines on the plane: one line through (x_1, y_1) and (x_2, y_2) and the other one line through (x_3, y_3) and (x_4, y_4). The point (x_1, y_1) is always distinct from (x_2, y_2). Likewise with (x_3, y_3) and (x_4, y_4).

Hint:

- Use double for all calculations and storage of coordinates and results (**Do not use float**).
- When printing the x and y coordinates of the point in two decimal places, please use: "`System.out.printf("POINT %.2f %.2f\n", x, y);`"
- If the calculation result is "`-0.00`", replace it with "`0.00`" before printing to pass the judge.

Output Format

There should be N lines of output. There will then be one line of output for each pair of planar lines represented by a line of input, describing how the lines intersect: "`NONE`", "`LINE`", or "`POINT`". If the intersection is a point then your program should output the x and y coordinates of the point, correct to **two decimal places**.

Technical Specification

- $1 \leq N \leq 100$.
- $-1,000 \leq x_i, y_i \leq 1,000$, where $1 \leq i \leq 4$

Sample Input 1	Sample Output 1

```
5
0 0 4 4 0 4 4 0
5 0 7 6 1 0 2 3
5 0 7 6 3 -6 4 -3
2 0 2 27 1 5 18 5
0 3 4 0 1 2 2 5
```

```
POINT 2.00 2.00
NONE
LINE
POINT 2.00 5.00
POINT 1.07 2.20
```

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