H – Henry the Plumber

Limit pamięci: 1024 MB
Limit czasu: 1 s

AMPPZ 2023
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Henry has to complete a certain number of three-dimensional hydraulic orders. Each order consists of connecting the water inlet to the outlet. Such connections are made using a sequence of pipes and elbow fittings. Pipes are straight sections, and elbows connect the two ends of the pipes at right angles. At the water inlet, we must place the first elbow according to the specified direction of the inlet, and at the water outlet, we must place the last elbow according to the specified direction of the outlet.

Both the inlet and the outlet are located **horizontally**, meaning the vectors of these directions have a zero z-coordinate z.

For simplicity, we assume that the inlet, outlet, and all elbows have zero dimensions, meaning they are points in three-dimensional space $\mathbb{R}^3$, and the pipes have zero width, meaning they are segments in three-dimensional space $\mathbb{R}^3$.

The inlet and outlet are in different locations. The first pipe must start at the water inlet point and be perpendicular to the inlet direction. Each subsequent pipe must start at the end of the previous one and be perpendicular to it. The last pipe must end at the water outlet point and be perpendicular to the outlet direction. Each pipe must have a positive length.

Pipes cannot intersect at any other locations than those described above. In particular, all elbows must be at different points and cannot be inside any pipe, and pipes cannot share common points except for the elbows.

For each order, decide whether it can be completed, and if so, calculate the minimum number of elbows needed to complete it.

Input

The first line of the input contains the number of orders t ($1 \le t \le 100$). Each order is described in four lines.

In the first line of each order, there are three integers x_1, y_1, z_1 ($-20 \le x_1, y_1, z_1 \le 20$) describing the point (x_1, y_1, z_1) of the water inlet.

The second line of the order contains 2 integers p_1, q_1 ($-20 \le p_1, q_1 \le 20$, $(p_1, q_1) \neq (0, 0)$) describing the direction of the water inlet.

The next two lines describe the coordinates (x_2, y_2, z_2) and the direction of the water outlet (p_2, q_2) in the same format.

The water inlet and outlet are at different points: $(x_1, y_1, z_1) \neq (x_2, y_2, z_2)$.

The water flows horizontally along the vector $(p_1, q_1, 0)$, meaning from the direction of the point $(x_1 - p_1, y_1 - q_1, z_1)$. The outflow is also horizontal, along the vector $(p_2, q_2, 0)$, meaning in the direction of the point $(x_2 + p_2, y_2 + q_2, z_2)$.

The length of these vectors is not important; only their direction and orientation matter. The orientation is in the direction of water movement, i.e., towards the elbow in the inlet and away from the elbow in the outlet.

Output

The output should consist of t lines. In the i-th line, you should provide the minimum number of elbows needed to complete the order or the word `NIE` if the order is not feasible.

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Example

For the input data:

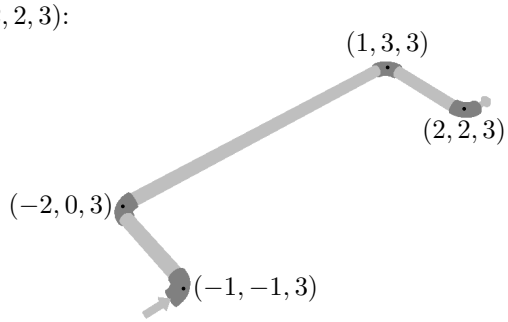
```
2
-1 -1 3
1 1
2 2 3
2 2
5 5 1
3 0
7 6 -2
1 -2
```

the correct result is:

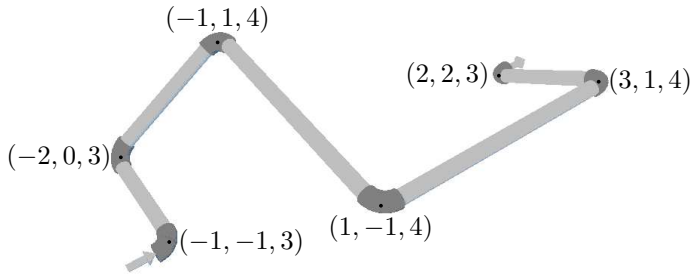
```
4
3
```

Explanation of the example:

In the first example, the optimal solution is to use four elbows, for example, sequentially at the points $(-1, -1, 3)$, $(-2, 0, 3)$, $(1, 3, 3)$, $(2, 2, 3)$:



An inefficient solution would be to use six elbows at points $(-1, -1, 3)$, $(-2, 0, 3)$, $(-1, 1, 4)$, $(1, -1, 4)$, $(3, 1, 4)$, $(2, 2, 3)$:



In the second example, we can use three elbows at points $(5, 5, 1)$, $(5, 5, -2)$, $(7, 6, -2)$: