Problem H

National Disaster II

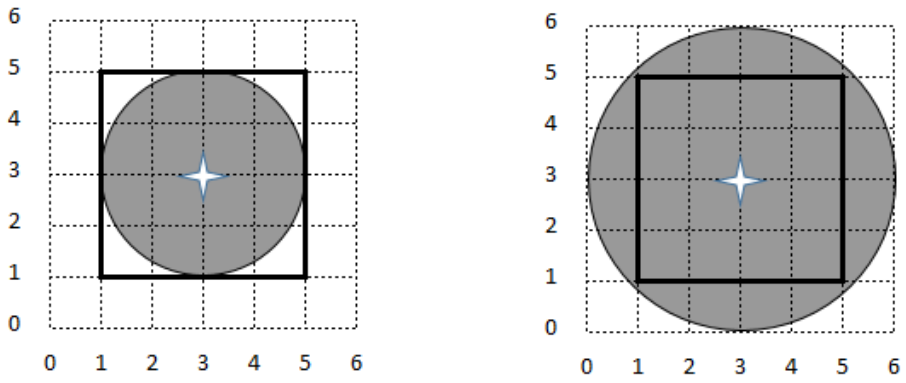
The police have successfully captured the culprit behind the recent incidents in Indinesia, the (intentionally-caused) forest fires. Apparently, he was handsomely paid by some multi-national companies to burn the forest down (while not being environmental friendly, it's the "cheapest" way). However, the police have a hard time building a case against this multi-national companies as these companies are backed up by some strong local mafia groups; evidences are hard to obtain.

Now, let's focus our problem on the forest fire, it's still burning. Coincidentally, the forest area engulfed by the fire can be represented as a rectangle in Cartesian plane.

Indra, the minister for Disaster Management of Indinesia, has an idea on how to extinguish the fire. He suggests to drop some water bombs on the forest fire areas. Each of these water bombs has a radius of impact R, in which fires in all areas which are strictly within R distance from any water bomb drop points will be extinguished. However, due to some technological difficulties, they can only drop these water bombs on some predetermined coordinates (and may lie outside the forest fire area). Fortunately, they can control the radius of impact (R) of the water bombs, but the value of R must be a positive integer.

Of course, larger R requires higher cost. As Indinesia is not a prosperous country, they need to conserve their resources. Help them to find the minimum value (integer) for R such that any point inside the forest fire area is *covered* by at least one of the water bomb. A point is consider as covered if and only if it's **strictly inside at least one** water bombs radius of impact. A point is **not** considered as covered by a water bomb if it's on the boundary of the water bomb radius of impact. Formally, a point (a, b) is considered as covered by a circle (x, y, R) if and only if $\sqrt{|x-a|^2 + |y-b|^2} < R$. Note that Euclidean distance is used to measure distance between two points in this problem

For example, let the forest fire area be a rectangle of (1..5, 1..5), and there is only one water bomb drop point, at coordinate (3, 3).



In this case, the minimum R required to cover the rectangle is 3 (shown in the right figure). R = 2 is not enough to cover all areas in the rectangle (left figure). Note that the point (1, 1) is the right figure is completely inside the circle, it's not only on the boundary.

Input

The first line of input contains an integer T ($T \le 100$) denoting the number of cases. Each case begins with five integers X_1 Y_1 X_2 Y_2 N ($1 \le X_1, Y_1, X_2, Y_2 \le 1{,}000{,}000{,}000$; $X_1 < X_2$; $Y_1 < Y_2$; $1 \le N \le 200$). The first four integers represent the forest fire area as a rectangle, with (X_1, Y_1) as the bottom-left most and (X_2, Y_2) as the top-right most coordinate; while N represents the number of water bomb drop points. The next N lines, each contains two integer A_i B_i ($1 \le A_i, B_i \le 1{,}000{,}000{,}000$) representing the coordinate of a water bomb drop point.

Output

For each case, output "`Case #X: Y`" (without quotes) in a line where `X` is the case number (starts from 1), and `Y` is the answer for this particular case.

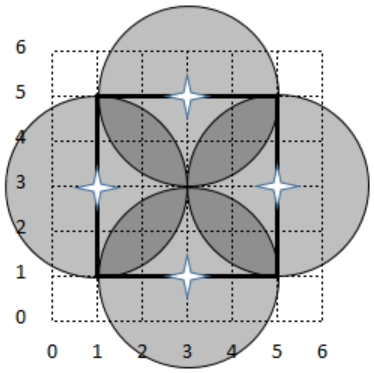
Sample Input	Output for Sample Input
2 1 1 5 5 1 3 3 1 1 5 5 4 1 3 3 1 3 5 5 3	Case #1: 3 Case #2: 3

Explanation for 1st sample case

This is the example given in the problem statement.

Explanation for 2nd sample case

The same rectangle area as in 1st sample case, but with 4 water bomb drop points.



This figures shows the coverage when R = 2. Note that in this figure, NOT all areas in the rectangle are covered by any water bomb radius of impact; especially, the four corners and the center of the rectangle. For example, (1, 1) is only on the boundary of impact radius of water bomb at (1, 3) and (3, 1); it is not strictly inside any water bomb radius of impact.

The minimum R needed for this case is 3.