Problem H

Alien Abduction

In the past few days, there is a strange phenomenon where some people suddenly disappear and re-appear somewhere else randomly. Scientists from all over the world have worked so hard to figure out what has happened to these people, and the result is not pleasant at all, those people were abducted by an alien ship!

One scientist managed to figure out how the alien abduction works. For simplicity, let's assume our world is in a Cartesian plane (W x H), and each person is at position (X_i, Y_i). At any time, the cloaked alien ship flies over to a coordinate (X_k, Y_k), and then, with its highly advanced transporter technology, it abducts people whose position is within the (Manhattan) distance from the alien ship. To be precise, a person at (X_i, Y_i) is abducted by the alien ship if $|X_i – X_k| + |Y_i – Y_k| \le E_k$ where E_k is the transporter energy level.

Apparently, the alien wants to keep this abduction a secret operation. The abducted people are immediately returned back to Earth after the alien is "done" with them. The alien is supposed to return the abducted people exactly to the positions where they were abducted, but for some reasons, the people were returned to positions based on a certain pattern.

One of our brilliant scientists develop a device to capture various energy signals emitted from the alien ship when it is in operation and from those signals, the scientist is able to decipher the pattern and determines the exact location where the abducted people will be returned! According to the scientist, an abducted person will be returned to the following position on Earth:

$$X_i' = ((X_i * a) + (Y_i * b) + (i * c)) \bmod W$$
$$Y_i' = ((X_i * d) + (Y_i * e) + (i * f)) \bmod H$$

where:

- i is the person identification number
- (X_i, Y_i) is the position of person with identification number i where he/she is abducted,
- (X_i', Y_i') is the position where person with identification number i will be returned to, and
- a, b, c, d, e and f are the alien ship's energy signal captured by the scientist's device at the time of abduction.

By measuring other signals, the scientist also knows the total energy the alien ship has and is able to prove that the alien ship can only abduct (and return) at most 50,000 people in total across all abduction operations. Note that the same person may be abducted many times.

Knowing this, the Earth government wants to be able to locate all the people after the alien has finished all of its abduction operations. The brilliant scientist is asked to produce this report as soon as the alien leaves Earth for good. Since there are too many people on Earth, even the brilliant scientist is overwhelmed to manually produce this report and thus needs to create a program for this. Surprisingly, the brilliant scientist cannot program. Knowing that you are one the best programmers on Earth, the scientist asks for your help!

Input

The first line of input contains an integer T (T ≤ 10) denoting the number of cases. The first line of each case contains four integers N, Q, W and H denoting the number of people on Earth, the number of abduction operations recorded by the scientist's device, and the size of the world as stated in the problem statement respectively. The next N lines each contains two integers Xi and Yi denoting the initial position of the i^{th} person with identifier i (the identifier starts from 1 to N). The next Q lines each contains 9 integers X_k, Y_k, E_k, a, b, c, d, e and f representing an alien abduction operation, which means the alien ship is currently at (X_k, Y_k) and abducts people using its transporter and emitting various energy signals (E_k, a, b, c, d, e, f) which are captured by the brilliant scientist's device. The abducted people in this operation will be returned before the next abduction operation is executed.

The constraints for all inputs are:

- $1 \le N, Q \le 50{,}000$
- $5 \le W, H < 2^{15}$
- $0 \le X_i, X_k \le W$ and $0 \le Y_i, Y_k \le H$
- $0 \le E_k, a, b, c, d, e, f < 2^{31}$
- It is guaranteed that the total number of abduction across all operations is no more than 50,000.

This problem has a huge judge input, therefore using C/C++ cin or Java Scanner will possibly lead to Time Limit Exceed. Instead use C/C++ scanf or Java BufferedReader.

Output

For each case, output "Case #X:" in a line, where X is case number starts from 1, followed by N lines which report the final N positions of each person (X_i, Y_i) after the alien ship leaves Earth for good. X_i and Y_i are separated by a single space.

Sample Input	Output for Sample Input

<pre>2
6 3 11 8
5 4
8 2
4 2
3 1
8 2
11 6
1 1 4 3 7 3 1 7 3
4 5 9 3 3 2 7 1 3
3 1 8 5 8 8 7 3 5
5 8 12 7
0 2
0 3
5 5
12 2
3 1
6 0 9 3 3 7 3 8 7
1 1 7 4 6 9 1 3 8
4 3 7 4 7 1 3 4 8
1 2 5 4 7 9 3 1 4
5 0 2 4 8 2 4 2 9
1 0 7 1 9 3 1 4 2
5 0 9 5 8 9 7 3 1
3 1 3 2 9 3 8 1 3</pre>
	<pre>Case #1:
	4 4
	10 1
	2 3
	9 0
	6 5
	8 5
	Case #2:
	9 2
	9 3
	9 5
	9 2
	7 1</pre>

Explanation for 1st sample input.

Abduction #1

#3 (4,2) - (2,3)	#4 (3,1) - (6, 6)

Read:
person 3 abducted at (4, 2) returned to position (2, 3)
person 4 abducted at (3, 1) returned to position (6, 6)

Abduction #2

#1 (5,4) - (7,2)	#2 (8,2) - (1,0)	#3 (2,3) - (10,2)
#4 (6,6) - (0,4)	#5 (8,2) - (7,1)	#6 (11,6) - (8,5)

Abduction #3

#1 (7,2) - (4,4)	#2 (1,0) - (10,1)	#3 (10,2) - (2,3)
#4 (0,4) - (9,0)	#5 (7,1) - (6,5)	