Problem F. Periodical Cicadas

Time limit: 5 seconds

Nearly all cicadas spend years underground as juveniles, before emerging above ground for a short adult stage of several weeks to a few months.

The seven periodical cicada species are so named because, in any one location, all of the members of the population are developmentally synchronized they emerge as adults all at once every seven years.

The lifecycles of most periodical cicada species range from two to seventeen years, although some could be longer.

There is a forest which can be roughly divided into a matrix of size $N \times M$. The upper-left region is $(1, 1)$ and the lower-right region is (N, M).

A population of periodical cicadas live within each region of the matrix. The population in region (i, j) emerged in year $a_{i,j}$ for the first time, and re-emerges every $b_{i,j}$ years. i.e. they are $b_{i,j}$ - periodical cicadas.

Given a selected rectangular area, entomologists wonder if there is a time when all cicadas in that area emerge together.

Input

The first line of the input gives the number of test cases, T. T test cases follow. Each test cases begin with two integers N and M.

The following N lines each consists of M integers $a_{i,j}$ representing the year cicadas emerged in region (i, j) for the first time.

The following N more lines each consists of M integers $b_{i,j}$ representing the periodical cycle of the cicadas in that region.

Then comes a line with an integer Q representing the number of queries. The following Q lines each consists of 4 integers: x_1, y_1, x_2, y_2, representing the upper-left and lower-right coordinate of the selected rectangular area.

Output

For each test case, first output one line containing "`Case #x:`", where `x` is the test case number (starting from `1`).

The following Q lines each consists of an integer which is the year when all cicadas in the selected area emerge together for the first time or -1 if it's impossible.

Limits

- $1 \leq T \leq 10$.
- $1 \leq N, M \leq 200$.
- $0 \leq a_{i,j} < b_{i,j} \leq 40$.
- $1 \leq x_1 \leq x_2 \leq N$.
- $1 \leq y_1 \leq y_2 \leq M$.

- $1 \leq Q \leq 500000$.

Sample input and output

Sample Input	Sample Output
2 3 4 3 1 1 2 1 1 2 1 1 0 5 5 5 4 2 3 2 2 3 2 4 2 6 6 5 2 2 2 2 1 1 3 4 1 4 2 4 1 1 1 2 2 2 3 4 1 2 0 1 2 2 1 1 1 1 2	Case #1: 1 -1 5 13 -1 Case #2: -1