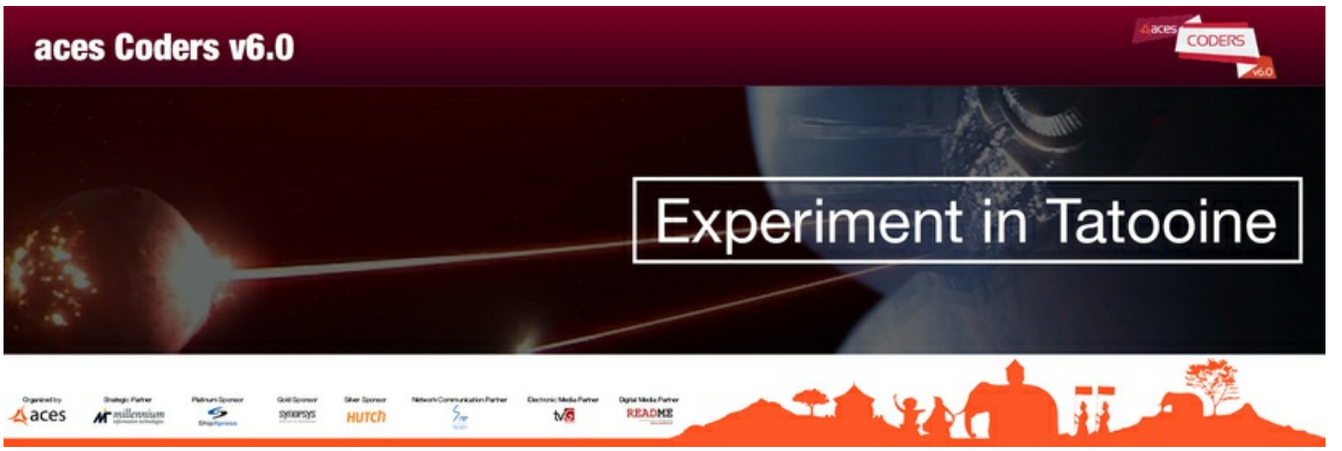
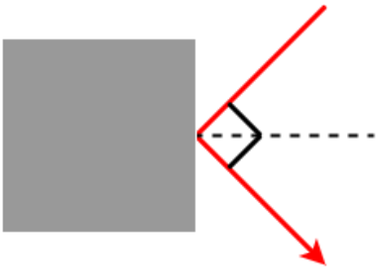
Experiment in Tatooine



A group of astronauts is doing an experiment in an alien planet called Tatooine. The planet is mostly filled with deserts and lava wells. For their experiment they need to point a laser to a given marker.

However, due to the lava wells in the planet, this is not easy (cannot be done directly from the source of the laser to the marker). Hence they have decided to use crystal cubes that reflect (do not refract) the laser to hit the marker. Note that the cubes cannot be placed on the lava.

These cubes are of size 2x2, same size as the lava wells (explained below) and the direction of the laser is always a multiple of 45 degrees.
Hence, when a laser hits the cube it is reflected according to the laws of reflection.



The astronauts are using a space vehicle, identical to a helicopter to place these cubes in the field (explained below).

Your task is to find where these cubes must be placed so that the laser is reflected in a manner such that it will hit the marker. Since the minimum number of cubes are given, all the cubes must be used.

An example scenario is given below.

Input Format

First line contains two space separated integers, N M (Size of the field as number of rows and number of columns)
Second line contains Number of cubes C
Third line contains Number of lava wells L
Fourth line contains Coordinates of the lava wells X1 Y1 X2 Y2 ..... Xn Yn (coordinate of top left most corner)
Fifth line contains Position of the laser L1 L2

Next line contains Direction of the laser Q in degrees
Last line contains Position of the marker M1 M2

Constraints

0 < N , M< 15
0 < C < 8
L>0
0 <= X1,X2,....Xn , L1, M1 < N
0 <= Y1,,Y2,....Yn , L2, M2 < M
0 <= Q < 360 (Q is always a multiple of 45 degrees)

Output Format

Print Coordinates of the cubes (same format for lava wells)

Sample Input

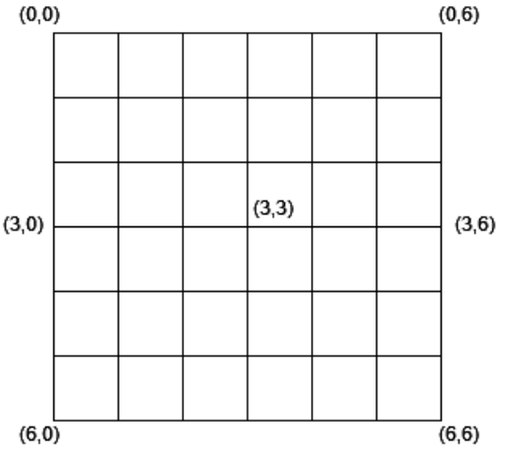
6 6
2
1
0 4
1 4
225
6 3

Sample Output

2 0 4 4

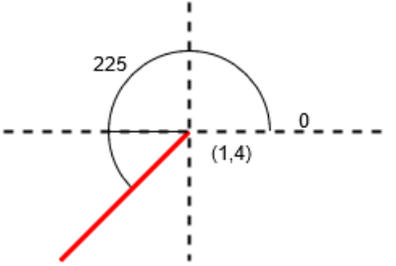
Explanation

Size of the field: 6 6
This represents a field with a size of 6x6

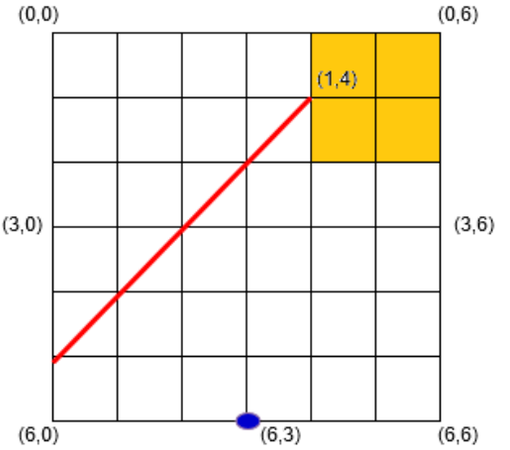


Number of cubes is given: 2
After that the number of lava wells is given: 1
The positions of the lava wells are given by giving the upper leftmost point. Since the lava wells are of the same size as cubes, (2x2) the coordinates of the rest of the points can be derived.

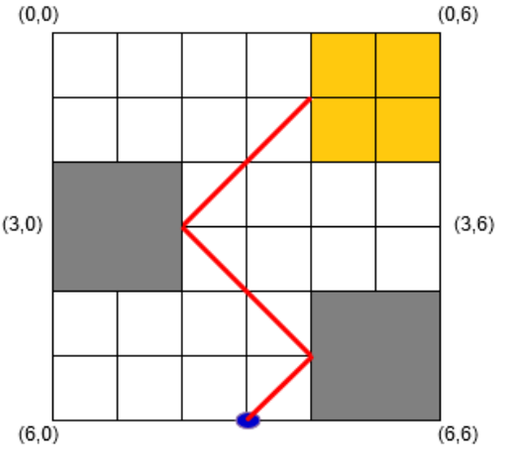
Next, the details of the laser are given.
Starting point 1 4, angle 225 degrees



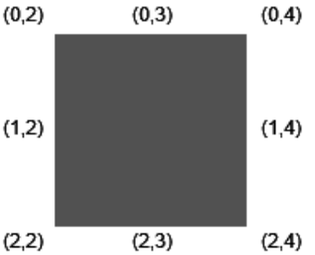
Finally the coordinates of the marker (blue dot) are given: 6 3
Hence the starting state of the field is as below. Note the top left most corner of the lava well.



After the cubes have been arranged by your program the field should look like below.



When representing the cube you can use the following information (similar to lava wells).
Give only the coordinates of the upper left most corner of the cube. So that, if the position is given as 0 2 , then the position of the cube is as follows.



Your program should output the coordinates of the top left-most point of each cube in the ASCENDING order: 2 0 4 4 (according to the above diagram, i.e. from left to right, top to bottom)