STAINED GLASS

Introduction

„Holy socks!" – Master Beetello swore like a sailor watching the results of his last week's work smashing into a hundred little pieces under the weight of the falling anvil. He was so concerned about what happened that it didn't even cross his mind to consider why the heck this infernal weight was dangling under the ceiling of his private studio.

The incident jolted the artist pretty badly. At the same moment he recalled vividly the last week's visit of a high-ranking army representative in his studio. It was a person one simply must not refuse. Therefore, the Master had to undertake to make the commissioned stained glass composition. All the more so because as a remuneration he was proposed not only money, but also – as a bonus – his life to be spared.

And thus sat Master Beetello over his completed work, now broken into smithereens, and contemplated what to do. Due to his memory that was a bit faulty at his age, he couldn't remember how the prototype had looked. However, being a true artist, he was able to estimate with masterful precision how well two pieces fit together and how a given piece looks by itself in a given spot of the stained glass composition.

"That's the only thing that can save me" – he drawled out through his teeth and added even more quietly – *"After all the customer only aspires to being an art connoisseur, but in fact is as knowledgeable about the art as your average alligator about crocheting. . . "*. Even though Beetello was really not keen on making potboilers, he had no other option this time. He had to be quick and reconstruct the work to be as impressive as possible to satisfy the customer.

Problem

Beetello is planning to create the stained glass composition out of the pieces scattered throughout the studio and make it as pretty as possible. He asked you to help him write a program to facilitate the work.

As a representative of squarism Master Beetello creates his rectangular compositions using only square pieces of uniform size. To each piece he found on the floor Beetello assigned a positive number denoting the extent of impact of the piece on the overall attractiveness of the resulting composition. Each field of the stained glass composition was also assigned a number of the same meaning.

Moreover, not every two pieces fit together, so not all of them can be adjacent to each other. As they have four sides they are described by four numbers. The numbers at two adjacent sides must be identical in order for two pieces to be placed next to each other. Pieces can be rotated freely but cannot be flipped over.

A piece with the value C placed on the field with the value P adds $\min(C, P)$ to the artistic value. Two adjacent pieces with the values C_1, C_2 enhance the artistic value of the whole composition by $\min(C_1, C_2)$. Total artistic value of the resulting stained glass composition is calculated as a sum of thus calculated values of pieces placed in it and the values of connections between adjacent pieces.

Input data

Test sets are given in `glass*.in` files.

The first line of the test set includes one integer T denoting the number of tests. The following lines include descriptions of tests.

The first line of the test description includes two natural numbers X and Y – dimensions of the stained glass composition in fields. Each of the following Y lines includes X integers $P_{i,j}$ – each of them denoting a value assigned by Beetello to a specific field with the coordinates (i, j).

The following $X \cdot Y$ lines include descriptions of available pieces. A description of one piece consists of five positive integers: m_1, m_2, m_3, m_4, C. The first four describe four sides of a piece – a given side can be adjacent to another piece whose corresponding side is described with the same value. Descriptions of sides of a given piece are given clockwise starting from "12 o'clock" (top, right side, bottom, left side). The number C denotes the value assigned to the given piece by the Master.

$$1 \leqslant T \leqslant 10$$
$$1 \leqslant X, Y \leqslant 300$$
$$-10^6 \leqslant P_{i,j} \leqslant 10^6$$
$$1 \leqslant m_{\{1,2,3,4\}} \leqslant 10^4$$
$$1 \leqslant C \leqslant 10^6$$

Output data

The answer to each test is $X \cdot Y$ lines including the way every piece is arranged in the stained glass composition and one additional line containing an integer S_u that constitutes the artistic value of the created composition.

Descriptions of the way the pieces are arranged (first $X \cdot Y$ lines) should be provided in the same order as in the input file. One description comprises three integers x, y, R. They mean that the given piece was placed on a field in the row y and column x and rotated R times 90° to the right (clockwise).

$$1 \leqslant x \leqslant X$$
$$1 \leqslant y \leqslant Y$$
$$0 \leqslant R \leqslant 3$$

Not all of the available pieces must be used – the remaining holes Master Beetello is planning to fill in with rather unspectacular clear glass. If a given piece is not used for the reconstruction, its corresponding line should contain three zeros.

Provide the test answers in the same order as in the input file.

Example

For input data:

```
2
3 2
7 12 15
9 -7 6
1 2 3 4 11
1 2 3 4 5
1 2 3 4 2
1 2 3 4 9
1 2 3 4 10
1 2 3 4 10
4 2
1 5 8 0
-3 2 0 1
2 2 3 7 10
2 9 3 17 10
2 2 3 7 10
2 2 3 7 10
9 2 3 7 10
2 2 3 7 10
2 2 3 3 8
9 1 3 7 10
```

One of possible solutions is:

```
1 1 0
0 0 0
1 2 2
0 0 0
0 0 0
2 2 0
6
1 1 0
0 0 0
2 1 2
0 0 0
3 1 0
2 2 3
3 2 1
0 0 0
62
```

Example clarification

The figure on the right shows graphic solutions of both example tests. Into each used square the field value was entered and also – in parentheses – the value of a piece used on the field. Numbers corresponding to the type of sides of individual pieces were provided on the borders between the used fields (in red).

For test no. 1 three stained glass pieces were used. For locating them in appropriate places the artistic value of the whole composition was increased by: $\min(7, 11) + \min(9, 2) + \min(-7, 10) = 7 + 2 - 7 = 2$. The piece arranged on the field with the coordinates $(1, 2)$ is adjacent to two other pieces. These are the only common sides of the whole composition. Additional artistic value for such a connection is: $\min(11, 2) + \min(2, 10) = 2 + 2 = 4$. Therefore, the total artistic value of the composition amounts to: $2 + 4 = 6$.

For test no. 2 five pieces were used, whose value for their location amounted to: $\min(1, 10) + \min(5, 10) + \min(8, 10) + \min(2, 10) + \min(0, 8) = 1 + 5 + 8 + 2 + 0 = 16$. Additional value for the five connections between the pieces: $\min(10, 10) + \min(10, 10) + \min(10, 10) + \min(10, 8) + \min(8, 10) = 10 + 10 + 10 + 8 + 8 = 46$. Total artistic value of the composition amounts to: $16 + 46 = 62$.

#1

#2
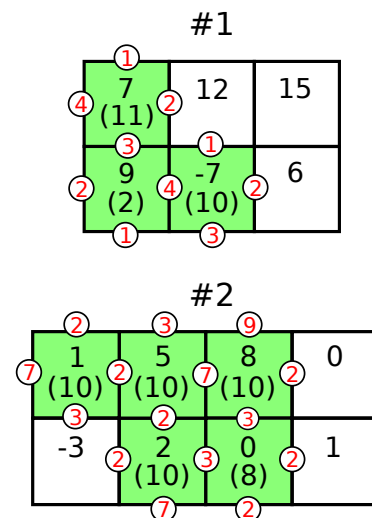
Score

If the following conditions are satisfied for each test:

- output data is in the correct format,

- only a single stained glass piece was placed on each field,

- all sides of adjacent pieces fit together (they have the same values describing their sides),

- artistic value (S_u) of the stained glass composition was correctly calculated,

the score for the set is the value $\max(1, \sum_{u=1}^{T} S_u)$. Otherwise the score is 0.