Rocks

Introduction

The arrival on the Lava Planet was uproariously celebrated by the most prominent scientists of the beetlejumper world. Soil samples collected on the planet are an irrefutable proof for the existence of superlapis – material, so far only hypothetical one, with remarkable qualities. Superlapis has extremely high thermal resistance and hardness many times exceeding that of all known minerals.

Such a discovery has opened a new chapter of beetlejumper history of technology. Prices of shares of industrial plants that developed superlapis processing methods have spiraled upwards. The change began in earnest. However, the environment of the Lava Planet makes it impossible to conduct manufacturing processes directly there. It is necessary to transport huge slabs of the newly discovered raw material…

Problem

Beetlejumpers have container transporters – large transportation vehicles whose cargo hold is a rectangle with known dimensions.

Location of superlapis deposits is defined on a grid consisting of single units, each of which has at most four neighboring units. Two single units are neighboring, if they have one common side. A continuous area – an area where it is possible to reach its every unit from every other unit of the area by going through consecutive neighboring units – of superlapis deposits is called a *slab*. A slab can be cut into *pieces* for the purpose of placing the raw material in a container transporter. A single *cut* means separating two neighboring single units of a slab along their common side.

Having at your disposal a container transporter with set dimensions $M \times N$ and a map of superlapis deposits (dimensions $K \times L$), determine how to divide the precious material.

The slab of superlapis should be cut into pieces in such a way that the pieces (possibly after some shuffling and rotations) fill the entire area of the container transporter. Moreover, an additional advantage would be to obtain the smallest possible number of pieces (loading each of them means losing valuable time) and making as few cuts of the slab as possible (cutting such a robust material requires huge effort).

Input data

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

The first line of the test set includes one integer T denoting the number of tests. A description of each test consists of the information regarding one slab of superlapis.

The first line of the description of each test includes four natural numbers separated with a single space: M, N, K and L. The numbers in pairs denote respectively: the size of the container transporter and the size of the map describing the location of one slab of superlapis.

Each i-th line of the following L lines consist of K marks, denoting the presence of superlapis ('`X`' mark) or an area without the raw material ('`.`' mark). The number of units marked '`X`' always equals the product of $M \cdot N$.

$$1 \leqslant T \leqslant 5$$
$$1 \leqslant K, L, M, N \leqslant 100$$

Output data

For each test write a description of the superlapis slab division allowing to place the pieces in the container transporter. Descriptions should be given in order corresponding to the input data.

The first line of the description of the superlapis slab division should contain two natural numbers P and C, separated with a single space, denoting respectively: the number of pieces obtained as a result of the division and the number of cuts needed to achieve such a division. The second line of description should contain P numbers that correspond to the sizes of consecutive pieces, i.e., to the number of single units being a part of a given piece.

The next P lines of description should contain definitions of all pieces. If a piece has j single units, the definition of this piece should include $2j$ numbers that denote coordinates in pairs (from the input map) of each single unit that is a part of this piece. Each single unit of the slab must be a part of only one piece.

The following P lines of the description contain operations necessary to place each piece in the container transporter. Operations should be provided in the same order as the pieces occurring in the preceding lines of description. Each operation is defined by three natural numbers X, Y and R. X and Y are target coordinates (inside the transporter) of the first unit of a given piece. R denotes the number of 90-degree rotations of a given piece around its first unit ($0 \leqslant R \leqslant 3$). The direction of rotations is clockwise.

Example

For the input data:

```
2
3 4 5 4
..X..
X.XX.
XXXXX
..XXX
3 3 7 3
...X...
XXXXXXX
...X...
```

A possible correct answer is:

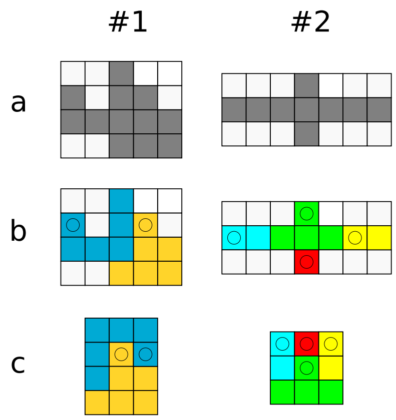
```
2 3
6 6
1 2 1 3 2 3 3 1 3 2 3 3
4 2 4 3 4 4 3 4 5 3 5 4
3 2 2
2 2 0
4 3
4 2 1 2
4 1 3 2 4 2 5 2
1 2 2 2
4 3
6 2 7 2
2 2 0
1 1 1
2 1 0
3 1 1
```

Example clarification

In the first line (a) of the drawing on the right the original slab of superlapis from the example is shown. Column #1 and column #2 correspond to the consecutive tests of a sample input file.

The second line (b) shows the division of the superlapis slab into pieces. Each piece is marked with a different color. The first defined single unit of a piece is additionally marked with a circle.

The third line (c) in the drawing corresponds to the arrangement of individual pieces of the slab inside a target container. Colors of the pieces and marking of their first units correspond to the elements of the line above.



Score

If the following conditions are satisfied:

- output data is in the correct format,
- the number of cuts needed to divide each slab is correctly calculated,
- each piece of any slab is continuous – all its units constitute exactly one area,
- each unit of each slab is assigned to exactly one of its pieces,
- no two pieces in any container transporter overlap,

the score for a given set equals the sum of P and C values from all the tests. Otherwise the score is 0. The lower the positive score, the better position in the ranking.