Sewage system

Introduction

Beetlejumpers are known throughout the Universum for their concern for the infrastructure and industrial facilities of their worlds. The exceptional quality of solutions provided throughout the worlds is due to the high-quality materials, as much as... to the extraordinary skills of Beetle-architects.

To become one of the famous Beetle-architects one has a long way to go. One of the first challenges on this career path is the work on the less elegant, but no less important projects – such as planning the sewage system layout.

Competence examination for 2^{nd} degree Beetle-prearchitect includes, among others, the following problem: *Connect entrance connections with exit connections in a given area with the dimensions* $X \times Y$. It is a typical examination problem, so there are numerous conditions simulating the real work:

- there is not much vertical space, so the pipes must not cross,
- due to optimization requirements the whole space must be covered with pipes,
- due to safety standards concerning pressure, each connection must be used only once.

Naturally, the area the examinee is working on is precisely defined, i.e., pipes cannot protrude beyond the area.

Problem

An area with dimensions $X \times Y$ and the number of the necessary connections – N are known. Also known is the set of start points with their corresponding end points (N pairs of coordinates).

The problem is to generate pipeline descriptions: each description must begin at one of start points and finish at a corresponding end point. Each field of a given area must be used exactly once and all pipelines must fit within the borders of the area.

Input data

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

The first line of the test set includes one integer T denoting the number of tests. Description of each test contains the definition of the area and connections belonging to it.

The first line of the test description includes two natural numbers X and Y that denote the dimensions of the area to be covered with pipes. The second line includes a natural number N – the number of pipelines (connections) to be built.

Each of the following N lines contains four natural numbers separated by spaces – information concerning the pairs of connection points. The first two numbers in each of those lines (x_i^s, y_i^s) denote the pipeline start point coordinates. The following two numbers in each of those lines (x_i^e, y_i^e) are the end point coordinates of the same pipeline.

Each test has at least one correct solution.

$$1 \leqslant T \leqslant 10$$
$$5 \leqslant X, Y \leqslant 100$$
$$1 \leqslant N \leqslant 600$$
$$1 \leqslant x_i^s, x_i^e \leqslant X$$
$$1 \leqslant y_i^s, y_i^e \leqslant Y$$
$$1 \leqslant i \leqslant N$$

Output data

As an answer to each test provide definitions of pipeline routes. Test answers must be provided in the same sequence as in the input data file.

The first line of the test answer should contain N – the number of pipelines. The following N lines should include sequences of characters C_k. Each character C_k can take one of the following values (the pair (i, j) was adopted as current coordinates):

- 'N' – for the move to $j - 1$ line (up),
- 'E' – for the move to $i + 1$ field in the same line (to the right),
- 'S' – for the move to $j + 1$ line (down),
- 'W' – for the move to $i - 1$ field in the same line (to the left).

Each sequence corresponds to one pipeline and describes consecutive steps of moving around a given area, beginning at start point and finishing at its corresponding end point (if a pipeline covers the area of F fields, its description should consist of $F - 1$ characters). Pipelines should be presented in the same sequence as their start and end points were provided in the input data file.

Example

For input data:

```
2
3 3
2
1 1 3 3
1 2 1 3
4 7
4
1 1 1 7
2 1 2 7
3 1 3 7
4 1 4 7
```

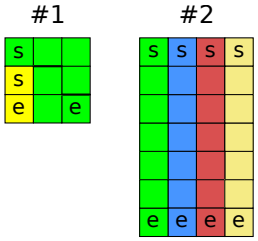
One of possible solutions is:

```
2
EESWSE
S
4
SSSSSS
SSSSSS
SSSSSS
SSSSSS
```

Example clarification

Graphic solutions of the example tests are shown in the figure on the right.

Each pipeline start point is indicated by '`s`' and each end point – by '`e`'. One color of fields in the area indicates one pipeline.



Score

If the following conditions are satisfied for each test:

- output data is in the correct format,
- the whole given area has been covered with pipes,
- none of the pipelines protrudes beyond the given area,
- each start point is connected to its corresponding end point,

the score for the given set is 1. Otherwise the score is 0.