Problem C: The Matrix: Reloaded

A matrix is an $r \times c$ array of numbers, where r is the number of rows and c is the number of columns. Given two matrices M_1 and M_2 with dimensions $r_1 \times c_1$ and $r_2 \times c_2$, respectively, their multiplication, $M_1 M_2$, is defined only if the number of columns, c_1, in M_1 is equal to the number of rows, r_2, in M_2. The matrix resulting from $M_1 M_2$ will have r_1 rows and c_2 columns. Similarly, $M_2 M_1$ is defined only if $c_2 = r_1$. In this case, the resulting matrix will have dimensions $r_2 \times c_1$. Given a list of matrix dimensions, your job is to determine whether or not some combination of *all* the matrices can be successfully multiplied together.

Input

The first line of input contains the number of lists, n, of matrices to analyze in the file. Each of the following n lists in the textfile consists of $(m + 1)$ lines. The first line of each dataset contains the integer m $(1 \leq m \leq 30)$, followed by m lines containing the integers r and c for each matrix, separated by whitespace. You may assume that the input file is formatted correctly.

Output

For each list in the input file, if some combination of *all* the matrices in the list can be multiplied together, you are to output the dimensions of the resulting matrix. (Display **only** the dimensions of the resulting matrix and **not** the order in which they were multiplied.) If multiple combinations exist, you are to output the combination such that the number of rows is the smallest, followed by the number of columns being the smallest. If no combination of all the matrices in the sequence can be multiplied together, then display an appropriate message.

Sample input (available as file "C.in"):

```
3
3
2 5
1 3
5 1
3
2 3
5 1
4 5
13
3 4
1 2000
4 4
10 11
4 6
11 12
6 1
2000 3
12 13
1 108
108 9
9 10
13 1
```

Sample output (available as file "C.out"):

```
The resulting matrix has dimensions 2 x 3
No possible combination exists
The resulting matrix has dimensions 1 x 1
```