Nightmare in the Towers of Hanoi

Consider the folowing variation of the well know problem Towers of Hanoi:

We are given *n* towers and *m* disks of sizes 1,2,3,...,*m* stacked on some towers. Your objective is to transfer all the disks to the *k*-th tower in as few moves as you can manage, but taking into account the following rules:

- moving only one disk at a time,
- never moving a larger disk one onto a smaller one,
- moving only between towers at distance at most *d*.

You can assume that all the problems can be solved in not more than 20000 moves.

Input

The first line of input contains a single positive integer $t <= 1000$, the number of test cases.

Each tests case begins with the number of towers $3 <= n <= 100$, the number of target tower $1 <= k <= n$, the number of disks $m <= 100$ and the maximum distance $1 <= d <= n - 1$.

Then, the following *m* lines consists of pairs of numbers describing the initial situation, in the form: the tower and disk on it. Assume according to the rules that on every tower smaller disks are on larger disks.

Output

Process all test cases. The correct output for the *i*-th test case takes the following form:
i [the number of the test case (in input order)]
a b [a sequence of lines of this form, where *a* is the tower with the moved disk on top of it and *b* is the target tower].
The test case is considered solved if after performing the sequence all disks are on the *k*-th tower. At the end of the series of moves you should always write a line consisting of two zeros ('0 0').

Scoring

The score awarded to your program is the sum of scores for individual test cases. For the i-th test case you will receive $T_i / (T_i + A_i)$ points, where $T_i <= 20000$ and A_i is the number of moves in your solution. If you don't want to solve a test case, you may output the line '0 0' without a list of moves, for which you will not be awarded any points. Your program may not write more than 30000 kB to output (this will result in SIGXFSZ).

Example

Input
5
3 3 3 2
1 1

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

Output

```
1
1 3
1 2
3 2
1 3
2 1
2 3
1 3
0 0
2
0 0
3
0 0
4
4 3
2 4
3 4
1 2
1 3
3 4
2 4
0 0
5
1 2
0 0
```

Score

Assuming: $T = \{7,6,15,7,1\}$ the output will receive **2** points.

Bonus info: If score = *xxx.xxxaaa*, *aaa* means the number of test cases with non-zero score...