Number of shortest paths   P77353_en

Given a directed graph, compute in how many ways every vertex is reachable from the vertex 0 making the minim number of steps.

Input

Input consists of several cases, each one with the number of vertices n (between 1 and 10^4), the number of arcs m (between 0 and $10n$), and m pairs x y to indicate an arc from x to y. There are no repeated arcs, nor of the kind x x. Vertices are numbered from 0 to $n - 1$.

Output

For every case, and for every vertex x, print its number, the minimum number of steps to reach x starting from 0, and in how many different ways this can be done. Print a -1 if a vertex is unreachable from 0. Print an empty line after every case.

Sample input 1

```
4 3
    0 1
    1 2
    2 3

2 0

8 15
    0 1
    0 2
    1 3
    1 4
    2 3
    2 4
    3 5
    3 6
    4 5
    4 6
    5 7
    5 1
    6 7
    6 2
    1 0
```

Sample output 1

```
0: 0 1
1: 1 1
2: 2 1
3: 3 1

0: 0 1
1: -1

0: 0 1
1: 1 1
2: 1 1
3: 2 2
4: 2 2
5: 3 4
6: 3 4
7: 4 8
```

Problem information

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