
Number of shortest paths

P77353_en

Examen extraordinari d'Algorísmia, FME (2011-07-01)

Given a directed graph, compute in how many ways every vertex is reachable from the vertex 0 making the minimum 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

```
4 3
0 1
1 2
2 3

2 0

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

Sample output

```
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
```

Problem information

Author : Salvador Roura

Translator : Salvador Roura

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