Bookmarks

- How To?
- Week 1
- Week 2
- Week 3
- Week 4

Algorithms on Graphs

4th Week Problems
due Dec 4, 2016 22:00 CET

4th Week Problems: Training

- Week 5

Shortest Paths and Their Friends

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Shortest Paths and Their Friends

2.0/2.0 points (graded)

Input file:	path.in
Output file:	path.out
Time limit:	2 seconds
Memory limit:	256 megabytes

You are given a weighted oriented graph, and a vertex s in it. For every vertex u, find the length of the shortest path from s to u.

Input
The first line of the input file contains N, M and S – these are the number of vertices, the number of edges, and the index of the vertex s correspondingly ($2 \leq N \leq 2\,000$, $1 \leq M \leq 5\,000$, $1 \leq S \leq N$).
The next M lines contain the edge descriptions. Every edge is described by its source vertex, target vertex, and its weight. A weight of an edge is an integer not exceeding 10^{15} by its absolute value.

Vertex indices are one-based. The graph may contain multiple edges between the same ordered pair of vertices, as well as loops.

Output
Output N lines. The i-th line should contain the length of the shortest path from s to the vertex with the index i. If there is no path from s to this vertex, output "*". If there is no *shortest* path from s to this vertex, output "-".

Example

path.in	path.out
6 7 1 1 2 10 2 3 5 1 3 100	0 10 - -

3 5 7	-
5 4 10	*
4 3 -18	
6 1 -1	

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Discussion

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