The Bellman Ford Algorithm

Description   In this assignment, you are asked to implement the Bellman-Ford Algorithm which solves the single-source shortest-paths problem; See Chapter 24.1. More specifically, you are given as input a directed graph $G = (V, E)$ with weight $w(u, v)$ on each edge $(u, v) \in E$ along with a source vertex $s \in V$. Edges may have negative weights.

The input will have the following format. The first integer refers to the number of vertices, i.e. $|V|$. The second integer is the number of edges, i.e. $|E|$. Vertices are indexed by 0, 1, ..., $|V| - 1$. Then, three numbers $u, v, w(u, v)$ appearing in each line refer to an edge (u, v) with weight $w(u, v)$. Vertex 0 is the source vertex. There are two cases.

Case (i) In the first case where there is no negative-weight cycle reachable from s, you must output TRUE in the first line, followed by the shortest distance from s to each vertex. More precisely, you must output TRUE, $\delta(0, 0)$, $\delta(0, 1)$, ..., $\delta(0, |V| - 1)$, one per a line. Recall that $\delta(u, v)$ denotes the shortest distance from u to v. If a vertex v is not reachable, output INFINITY in place of $\delta(0, v)$.

Case (ii) Otherwise, you must output FALSE.

See exmples below for more details. For grading, your execution file's name must be 'main'. We will use GradeMe10 to test your code. For instructions on how to use the grading tool, see the previous lab assignments.

Examples of input and output

Input

```
6
10
0 1 6
1 2 5
1 3 -4
1 4  8
2 1 -2
3 0 2
3 2 7
3 4 9
4 0 7
5 2 5
```

Output

```
TRUE
0
6
9
2
11
INFINITY
```

Input

```
6
11
0 1 6
1 2 5
1 3 -4
1 4  8
2 1 -2
3 0 2
3 2 7
3 4 9
3 5 -14
4 0 7
5 2 5
```

Output

```
FALSE
```

Your solutions   Before leaving the lab, submit a zipped tar archive of your program through the assignments page of CatCourse. Please use your UCMNetID as the filename for the zipped tar archive.