A. Bellman-Ford Algorithm

You are given a weighted graph with n vertices and m arcs. Loops and arcs of negative weights are allowed. There are no cycles of negative length. You have to find the distance from the first vertex to each other. There are no more than one arc in a given direction.

Input

The first line contains two integers n and m ($2 \leq n \leq 1000$, $0 \leq m \leq 10000$).

m lines follow, each contains three integers x, y, l ($1 \leq x, y \leq n$, $-1000 \leq l \leq 1000$), describing an arc from x to y with weight l. It is guaranteed that there is at most one arc in each direction between each pair of vertices. It is guaranteed that there are no cycles of negative weight.

Output

Print $n - 1$ lines. In the i-th line print the distance from the first vertex to the vertex $(i + 1)$. If it is impossible to reach this vertex, print "NO" (without quotes).

Example

input

```
6 7
1 2 -3
1 1 8
2 3 1
1 3 1
3 4 -2
3 1 2
4 6 10
```

output

```
-3
-2
-4
NO
6
```

B. Dijkstra Algorithm

You are given an undirected weighted graph with n vertices. You are to find the length of shortest path from v_1 to v_2.

Input

The first line contains four integers n, m, v_1, v_2 ($1 \leq n \leq 500$, $0 \leq m \leq n \cdot (n - 1) / 2$, $1 \leq v_1, v_2 \leq n$).

Each of the next m lines contains a description of one edge: three integers a, b and w ($1 \leq a, b \leq n$, $0 \leq w \leq 1000$) — the two ends and the length of the edge. There is at most one edge between any pair of vertices.

Output

Print a single integer — the length of the shortest path from the vertex v_1 to the vertex v_2, or -1, if there is no path.

Example

input
```
5 5 1 5
1 2 3
1 3 1
3 4 2
4 5 10
2 5 2
```

output
```
5
```

C. Floyd Algorithm

You are given a weighted directed graph with n vertices. You are to find the matrix of shortest paths, i. e. the length of the shortest path between each pair of vertices.

Input

The first line contains a single integer n ($1 \le n \le 100$).

Each of the next n lines contains n integers — the matrix of edges' weights. All weights are non-negative integers, not exceeding 1000. If the i-th row and the j-th column contains 0, it means that there is no arc from vertex i to vertex j.

Output

Print the matrix of shortest paths of the graph (i. e. a matrix that contains the length of the shortest path from vertex i to vertex j in the i-th row and j-th column, and 0 if there is no path from i to j).

Examples

input
```
5
0 1 1 0 1
1 0 0 1 1
1 0 0 0 1
0 1 0 0 1
1 1 1 1 0
```

output
```
0 1 1 2 1
1 0 2 1 1
1 2 0 2 1
2 1 2 0 1
1 1 1 1 0
```

input
```
1
1
```

output
```
0
```