Single source shortest path, time table

Problem ID: shortestpath2
CPU Time limit: 4 seconds
Memory limit: 1024 MB
Difficulty: 3.5

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Input

The input consists of several test cases. Each test case starts with a line with four non-negative integers, $1 \le n \le 10\,000$, $0 \le m \le 20\,000$, $1 \le q \le 100$ and $0 \le s < n$, separated by single spaces, where n is the numbers of nodes in the graph, m the number of edges, q the number of queries and s the index of the starting node. Nodes are numbered from 0 to $n-1$. Then follow m lines, each line consisting of five (space-separated) integers u, v, t_0, P and d indicating that there is an edge from u to v in the graph which can be traversed at time $t_0 + t \cdot P$ for all nonnegative integers t, and that it takes d time units to traverse the edge. You may assume $0 \le t_0, P, d \le 1000$.

For instance, the edge `3 8 15 10 5` indicates that at time $15, 25, 35, 45, \ldots$, we can travel from node 3 to node 8 in 5 time units. Note that it is possible to stand still at a node, to wait for an edge to become available. Also, note that if $P = 0$, the edge can be used only at time t_0 and never again.

Then follow q lines of queries, each consisting of a single non-negative integer, asking for the minimum distance from node s to the node number given on the query line.

Input will be terminated by a line containing four zeros, this line should *not* be processed.

Output

For each query, output a single line containing the minimum time to reach the node queried, assuming we start in node s at time 0, or the word "`Impossible`" if there is no path from s to that node. For clarity, the sample output has a blank line between the output for different cases.

Sample Input 1

```
4 4 4 0
0 1 15 10 5
1 2 15 10 5
0 2 5 5 30
3 0 0 1 1
0
1
2
3
2 1 1 0
0 1 100 0 5
1
0 0 0 0
```

Sample Output 1

```
0
20
30
Impossible

105
```