

## B. Wedding Planning

time limit per test: 5 seconds  
memory limit per test: 128 megabytes  
input: standard input  
output: standard output

There are  $N$  cities in a kingdom. The mad king wants to host a wedding for his wife at the capital on the earliest possible date. At the same time he wants to have enough time to decorate the capital, city  $S$ , before his guests' arrival.

You are the royal wedding planner. Your task is to find out the earliest possible date to host the wedding, by computing the minimum number of days it takes to travel from each city to the capital.

Trains are the only transportation in this kingdom. There are  $M$  train routes connecting the cities. Each route would get you from one city to the other, *but not the other way round*, in a certain number of days. For each route, every day there is only one train that leaves the city in the morning, and the trains always arrive a city at night. Also, each city appears in at most 50 different routes.

Given the number of cities and the details of train routes, compute the minimum number of days to travel from each city  $I$  to the capital (i.e., city  $S$ ). If there is no path from city  $I$  to city  $S$ , output  $-1$  as the  $I$ -th integer. Your implementation must run in time  $O(M \log N)$  time, and **you must implement a heap without the use of any libraries**. Note that Dijkstra's algorithm works on directed graphs.

### Input

One line containing  $N$ ,  $M$  and  $S$ , followed by  $M$  lines containing a list of  $M$  space-separated triples  $(U, V, D)$ , meaning there is a train going from city  $U$  to city  $V$  that takes  $D$  days.

### Limits

- $1 \leq N \leq 50000$
- $1 \leq M \leq 600000$
- $1 \leq S, U, V \leq N$
- $1 \leq D \leq 5000$

### Output

One line containing a space-separated list of  $N$  integers, where the  $I$ -th integer is the minimum number of days to travel from city  $I$  to city  $S$ . If it is impossible to travel from city  $I$  to city  $S$ , output  $-1$  for the  $I$ -th integer.

### Examples


input
4 4 4
1 4 1
3 1 2
3 4 4
4 2 1
output
1 -1 3 0

**NEU CS4800 Programming Assignment**

Contest is running

10 days

Contestant



→ **Submit?**

Language: GNU GCC 5.1.0

Choose file: 

Browse... No file selected.

Submit

input
8 8 1 1 2 1 2 3 2 3 4 3 4 5 4 5 6 5 6 7 6 7 8 7 8 1 8
output
0 35 33 30 26 21 15 8

input
5 8 2 3 2 2 2 3 2 2 5 2 5 2 2 4 2 2 2 4 2 1 4 2 2 1 2
output
4 0 2 2 2

**Note**

Explanation for the first sample test case:

There are 4 cities and city 4 is the capital. 4 train routes are available: one takes 1 day to go from city 1 to city 4; one takes 2 days to go from city 3 to city 1; one takes 4 days to go from city 3 to city 4, and one takes 1 day to go from city 4 to city 2.

Here are the fastest ways to reach the capital from each city.

City 1 takes 1 days. There is no way to get from City 2 to the capital. City 3 takes 3 days, via the routes City 3-> City 1 -> City 4. City 4 is the capital, and so it takes 0 days.