Star Trek

Description

In the 2380s it was discovered that the Romulan sun would soon go supernova, threatening to destroy the Romulan system and its inhabited planets and threatening the lives of billions of people in the Beta Quadrant.

In 2387, shortly before the supernova was projected to occur, Ambassador Spock of Vulcan concocted a plan to use red matter to create a black hole that would absorb the e xploding star's energy, and promised to do so in time to save Romulus.

Now you are a resident living near the Romulan system, and you want to seek refuge in other planetary systems. There are n planetary systems and m warp fields in this galax y. A warp field always connects two planetary systems, in which you could travel between two planetary systems in a_i seconds since you have a chip warp drive in your ship. Also, you cannot travel directly between two planetary systems when there is no warp field connecting them. Ambassador Spock is coming, and he uses some red matter to fo rm k Einstein-Rosen Bridges in this galaxy. An Einstein-Rosen Bridge always connects two planetary systems, but it is one-way. An Einstein-Rosen Bridge will let you travel thr ough it using b_j seconds, but some Bridges are very strange which will let you go back to the past. In consideration of evacuating residents, all Einstein-Rosen Bridges will not be on any cycles, which means if you could use an Einstein-Rosen Bridge to travel from A to B, you could not find a way back.

Now you are on the s-th planetary system. For any planetary system in the galaxy, you want to know the minimum time to arrive at it.

Input

First line four integers: $n\ m\ k\ s$

Next m lines, each line three integers $x\ y\ a$, denoting a warp field connecting planetary system $x\ y$ with a seconds.

Next k lines, each line three integers $x\ y\ b$, denoting an Einstein-Rosen Bridge from planetary system x to y with b seconds.

10% cases, $n, m, k \leq 10$

20% cases, $n \leq 5000$

50% cases, $n \leq 20000$

100% cases, $1 \leq n \leq 25000, 0 \leq m, k \leq 50000, 0 \leq a_i \leq 20000, -20000 \leq b_i \leq 20000$

Output

n lines in total, each line an integer represents the minimum time (seconds) to arrive at this planetary system.

If some planetary systems could not be reached, output "UNREACHABLE"

Sample Input 1

```
6 3 3 3
3 4 1
5 6 4
1 2 1
4 6 -1
1 3 -4
3 5 -5
```

Sample Output 1

```
UNREACHABLE
UNREACHABLE
0
1
-5
-1
```

Sample Input 2

```
6 3 5 2
1 3 5
2 4 6
5 6 7
2 3 10
2 1 1
4 3 -4
4 6 -7
1 5 -6
```

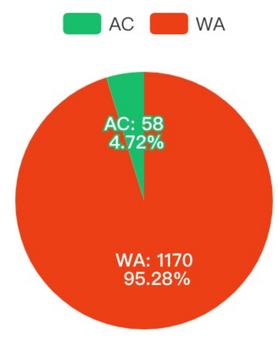
Sample Output 2

```
1
0
2
6
-5
-1
```


Information

ID	4001
Time Limit	150MS
Memory Limit	256MB
IO Mode	Standard IO
Created By	root
Level	Mid
Score	100
Tags	Show

Statistic Details



Language: C

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