

1 Happy Journey

In Dholakpur, there are N cities, numbered 1 to N . Some pairs of these N cities are connected by flights. Also between any two particular cities A and B , only one airline has been given the license to fly directly. All the flights are bidirectional.

Little Sita is at city X and she wishes to go to city Y . It is known that even though there may not be a direct flight between X and Y , she can take a sequence of connecting flights so that she reaches Y eventually. Also, the airlines are ranked **a–z** by their quality of service and each direct flight is labelled according to ranking of the corresponding airline.

Sita wants to plan her itinerary in such a way that the number of connecting flights is minimized. If there are multiple such itineraries, then she prefers the one which is lexicographically the smallest when reading the rankings on the flights in sequence from beginning to end. She is very confused, so she seeks your help.

Input format

- The first contains two integers N and M , the numbers of cities and the number of direct flights.
- The second line contains two integers X and Y , $1 \leq X, Y \leq N$, denoting the source and destination cities, respectively.
- This is followed by M lines describing each flight in the format: $u \text{ c } v$, where $1 \leq u, v \leq N$ denote the cities, and **c** is a character in **a–z** denoting the ranking of the airline operating between u and v .

Output format

A single line of output containing the sequence of letters from **a–z** denoting the flights chosen by Sita to reach Y from X .

Test Data

- Subtask 1 (25 marks) : $1 \leq N \leq 1000$, $1 \leq M \leq 2000$
- Subtask 2 (75 marks) : $1 \leq N \leq 10^5$, $1 \leq M \leq 2 \times 10^5$.

Sample Input 1

```
6 6
1 6
1 a 2
2 a 3
3 a 6
1 a 4
4 a 5
5 b 6
```

Sample Output 1

```
aaa
```

Sample Input 2

```
10 11
1 10
1 a 2
1 a 4
1 b 3
2 a 5
3 a 6
4 a 7
7 a 8
8 a 9
5 b 10
6 a 10
9 a 10
```

Sample Output 2

```
aab
```

Limits

- *Time limit:* 4 s
- *Memory limit:* 128 MB