Trip

Time Limit: 3 Second
Memory Limit: 2048 MB

This version is quite different from the easy version that you might have seen. Please read the problem carefully.

You just arrived at a new country to start your exciting trip! The country consists of n cities, which are connected by planes (P), ferries (F), trains (T), and coaches (C). You plan to travel from the current city a to another city b, where you will meet an old friend. However, you soon discovered that planning this trip might become quite annoying because

- Each route will only operate once per day.
- You need to arrive at the airport at least one hour before departures, while for other kinds of transportation, you need to arrive at the terminal at least half an hour before departure.
- You need extra time transferring between the airport, ferry terminal, train station, and bus terminal in the city. The exact time you need differs by city. However, you don't need to leave the station if your next leg departures from the same station (even if the next leg is not at the same day of arrival).
- Flight tickets in this country are quite expensive, and you can only afford buying k tickets.
- You have sea sickness so you cannot travel by ferry for continuous two legs.

Traveling is really tiring, so you want to know the earliest arrival time given the constraints. Assume that the current time is 12:00 AM, and your current location is the airport of city a. You don't need to count the transfer time after arriving at city b. It is guaranteed that there exists at least one route from city a to city b.

Input

The first line of input contains two integers n and m ($1 \le n \le m \le 10^5$) - the number of routes between cities.

The second line contains three integers a, b, and k ($1 \le a, b \le n$, $0 \le k \le 10$) - denoting the current city, the target city, and the maximum number of flight tickets you can buy.

The next m lines describe the routes. Each line is in the following format:

```
T   start   end   x   y
```

where `T` is one of P (plane), F (ferry), T (train), or C (coach), denoting the type of the route. `start` and `end` indicate the departure and arrival time of the route, specified in `hh:mm` format (24 hour). `start` can be later than `end`, in which it indicates an overnight leg. `x` and `y` ($1 \le x, y \le n$) are two integers indicating the start and end of the route (**you can only travel from** x **to** y). It is guaranteed that `x` and `y` are different.

The next n lines describe the transfer time between stations in each city. Each line contains 6 integers $t_{PF}, t_{PT}, t_{PC}, t_{FT}, t_{FC}, t_{TC}$ ($0 \le t_{PF}, t_{PT}, t_{PC}, t_{FT}, t_{FC}, t_{TC} \le 10$) - number of hours needed to transfer between airport and ferry terminal, airport and train station, airport and bus terminal, ferry terminal and train station, ferry terminal and bus station, train station and bus terminal.

Output

Output the time needed in the following format:

$$x \text{ day(s) } y \text{ hour(s) } z \text{ minute(s)}$$

Sample Inputs

```
4 4
1 4 2
C 08:30 12:30 1 2
P 15:30 19:00 2 3
P 19:30 21:00 3 4
T 22:00 14:00 3 4
0 0 0 0 0 0
0 0 0 0 0 0
0 0 0 0 0 0
0 0 0 0 0 0
```

Sample Outputs

```
1 day(s) 14 hour(s) 0 minute(s)
```

Note

Your shortest trip would be the following:

- City 1 08:30 - City 2 12:30
- City 2 15:30 - City 3 19:00
- City 3 22:00 - City 4 14:00 (+1)

You cannot fly to City 4 because you cannot catch the flight on the first day, and the flight on the second day is not the optimal solution.