Question - 1

SCORE: 15 points

Most Popular Destination

Your task is to find the most popular holiday destination from a list of destinations searched for by users.

You are given as standard input the integer size of the list, followed by the names of the destinations themselves.

The input has the following format:

- on the first line, the count of items in the list
- on the subsequent lines, the name of each destination searched for, one per line (each destination is a single word with no spaces, destinations can be searched for and appear more than once)

The input is correct. There is at least one destination in the input.

Write a program that reads the input from stdin and then outputs out the name of the most searched for destination i.e. the destination that appears most in the list. One destination is guaranteed to be the outright winner in the input.

Examples:

Input:
6
Barcelona
Edinburgh
Barcelona
Miami
Miami
Barcelona

Output:
Barcelona

Input:
5
Singapore
Bangkok
Singapore
Bangkok
Singapore

Output:
Singapore

Question - 2

SCORE: 30 points

Find the Common Manager

You are given as standard input the number of employees in a company, the first names of two selected employees in a company, and the direct line management relations between every employee. Each person in the company can directly line manage a maximum of 2 other employees. The input has the following format:

- on the first line, the number of unique employees in the company
- on the second line, the name of the first selected employee (a first name only without spaces)
- on the third line, the name of the second selected

employee (a first name only without spaces, guaranteed to be different from the first selected employee)
- on the subsequent lines, the line management relations in the format "EmployeeX EmployeeY" - meaning EmployeeX manages EmployeeY (first names without spaces and spaces are used to separate the two names)

The input is correct (there are only direct line management relations, no cycles, all employees appear in the input). For simplicity, the first line after the selected employees (line 4) always contains the manager at the top of the hierarchy.

Write a program that reads the input from stdin and then outputs out the name of the single employee at the lowest point in the hierarchy to which the two selected employees report, either directly or indirectly. If one employee reports to the other, either directly or indirectly, print out the name of the highest of the two selected employees.

Examples:

Input:
6
Hilary
James
Sarah Fred
Sarah Paul
Fred Hilary
Fred Jenny
Jenny James

Output:
Fred

Input:
4
Simon
Claudiu
Sarah Claudiu
Sarah Paul
Claudiu Simon

Output:
Claudiu

Input:
5
Gareth
Alex
June Alex
June Qing
Qing Paul
Qing Gareth

Output:
June

Question - 3

SCORE: 100 points

Shortest Flight Path Between Two Cities

An airline needs your help to fly the shortest path between two cities. There are airports and airways connecting the airports. There is at most one airway between any two different airports. There is no airway connecting an airport to itself. Travel time for an airway is the same for both directions. At every airport there is an operating mode that is either Alpha or Beta at any moment. The operating mode of each airport alternates periodically: Alpha for certain duration and then Beta for another duration. Airline traffic is permitted to travel the airway between any two airports, if and only if the operating modes at both airports are the same at the moment of departing from one airport for the other. If an airplane arrives at an airport just at the moment the

operating mode switches it must consider the new operating mode. Airplanes are allowed to wait at the airports. You are given the airports map which shows:

- the travel times for all airways (integers)
- the durations of the two operating modes at each airport (integers)
- and the initial operating mode and the remaining time (integer) for this operating mode to change at each airport.

Your task is to find a path which takes the minimum time from a given source airport to a given destination airport for an airplane when the traffic starts. In case more than one such path exists you are required to report only one of them.

Input

The first line contains two numbers: The ID (integer) of the source airport and the ID (integer) of the destination airport.

The second line contains two numbers: N and M (2<=N<=300, 1<=M<=14000).

The following N lines contain information on N airports: The i+2'th line of the input file holds information about the airport i: mi, rim, tia, tib where mi is either A for Alpha mode and B for Beta mode, ric is the remaining time for that airport in the current operating mode (mi), tia is the total duration of the Alpha mode for airport i, tib is the total duration of beta mode for airport i (1<=tia<=100, 1<=tib<=100, 1<=rim<=(tia if mi==A, tib if mi==B).

The next M lines (1<=M<=14000) represent the airways between the different airports in the format i, j, lij (1<=lij<=100) where i and j are the connected airports for that airway and lij is the time required to move from airport i to j using the airway that connects i and j.

Output

If a path exists:

- The first line will contain the time taken by a minimum-time path from the source airport to the destination airport.
- Second line will contain the list of airports that construct the minimum-time path you have found. You have to write the airports to the output file in the order of travelling. Therefore the first integer in this line must be the id-number of the source airport and the last one the id-number of the destination airport.

If a path does not exist:

- A single line containing only the integer 0.

Examples:

Test case 1:

Input:

```
1 4
4 5
A 2 16 99
B 6 32 13
B 2 87 4
B 38 96 49
1 2 4
1 3 40
2 3 75
2 4 76
3 4 77
```

Output:

```
127
```

1 2 4

Test case 2:
Input:
4 8
10 15
A 30 60 90
B 4 30 15
B 12 50 50
A 1 10 20
A 15 30 18
B 9 18 17
A 22 23 59
B 18 39 3
A 5 10 10
B 9 51 99
1 2 89
1 3 32
2 3 47
2 4 33
2 5 53
1 6 84
4 6 62
6 9 42
1 8 26
1 9 41
8 10 18
5 10 82
4 9 71
2 8 59
6 8 82

Output:
119
4 2 8

Test case 3:
Input:
2 5
6 6
A 2 10 10
B 10 10 10
A 4 20 18
B 5 15 12
A 9 18 52
B 15 46 32
1 2 12
1 3 32
1 6 18
2 3 69
2 6 61
4 5 75

Output:
0