January 2020 CSE208: Data Structures and Algorithms II Sessional

Online on Single Source Shortest Path Problem

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Tataland and Dadaland are two adjacent countries. A big river has separated them. Till these days, the only way of transportation between these two countries is waterway. The government of these countries wants to improve the relationship between themselves. So they want to build a bridge to connect their countries. They have chosen some suitable port-cities on both sides of the river. The cost to build a bridge between any two (one from each side) of these port-cities is almost equal. But due to market conditions, different port cities have different toll charges. So after connecting the port-cities through the bridge, the toll charges of the connecting port-cities will be collected as a whole. The governments want to minimize the cost of travelling from one capital to another. Help them to choose the ports which will help them to achieve their goals.

Port-cities are like normal cities. But they also have the required facilities and location to build a bridge.

Input/Output:

You will take input from an input file and give output to an output file.

Input Format:

The roads in both countries are two ways.

In the first line, there will be four(4) space-separated integers *S1* and *R1,* the total number of cities (including the capital and port-cities) and roads in Tataland and *S2* and *R2,* the total number of cities (including the capital and port-cities) and roads in Dadaland.

In each of the next *R1* lines, there will be two space-separated strings(*C1 C2)* and one integer*(D1)* denoting a road. Here *C1* and *C2* denote two cities of Tataland the road is connecting and *D1* denotes the cost to travel between *C1* and *C2*.

In each of the next *R2* lines, there will be two space-separated strings(*C3 C4)* and one integer*(D2)* denoting a road. Here *C3* and *C4* denote two cities of Dadaland the road is connecting and *D2* denotes the cost to travel between *C3* and *C4*.

In the next line, there will be one integer P1 denoting the number of port-cities in Tataland.

In each of the next P1 lines, there will be one space-separated string(PT) and one integer(TT) denoting a port city of Tataland and its toll charge.

In the next line, there will be one integer P2 denoting the number of port-cities in Tataland.

Similarly, in each of the next P2 lines, there will be one space-separated string(PD) and one integer(TD) denoting a port city of Dadaland and its toll charge.

In the next line, there will be the names of the capitals of Tataland and Dadaland respectively.

You need to find the **port-cities** to connect that will minimize the overall cost to connect the capitals.

Output Format:
In the first line of the output file, print the total cost to visit one capital from another.

In the next line, you need to print the full path from the capital of Tataland to the capital of Dadaland. Separate the cities with "->".

In the next line, you need to print the two port cities of Tataland and Dadaland that will minimize the overall cost to connect the capitals.

See the sample I/O for further clarification.

Constraints:
$1 < S1, S2 \leq 100$
$1 < R1 \leq S1 * (S1 - 1) / 2$
$1 < R2 \leq S2 * (S2 - 1) / 2$
$|C1|, |C2|, |C3|, |C4| \leq 15$
$0 \leq D1, D2 \leq 1000$
$0 \leq P1, P2 \leq 10$
$0 \leq TT, TD \leq 500$

The sample I/O:

Input	Output
7 8 6 7 Ctg Syl 500 Dhk Ctg 100 Khl Mym 300 Khl Dhk 200 Rjs Ctg 240 Dhk Rjs 120 Bgr Syl 50 Mym Syl 100 Al De 50 De Ca 700 Ks Ca 190 Ca Id 40 Fl Ca 250 Id Al 60 Ks Fl 80 2 Bgr 50 Mym 70 2 Ks 100 Fl 10 Dhk Al	930 Dhk -> Khl -> Mym -> Fl -> Ca -> Id -> Al Mym Fl