July 2025 CSE 208: Data Structure and Algorithms II Sessional

Assignment 2: All Pair Shortest Path Algorithms

Problem 1 (10 marks)

There are n cities and m roads between them. Your task is to process q queries where you have to determine the length of the shortest route between two given cities.

Input

The first input line has three integers n, m and q: the number of cities, roads, and queries ($1 <= n <= 500$, $1 <= m <= n^2$, $1 <= q <= 10^5$).
Then, there are m lines describing the roads. Each line has three integers a, b and c: there is a road between cities a and b whose length is c ($1 <= a,b <= n$, $1 <= c <= 10^9$). All roads are two-way roads.
Finally, there are q lines describing the queries. Each line has two integers a and b: determine the length of the shortest route between cities a and b.

Output

Print the length of the shortest route for each query. If there is no route, print -1 instead.

Example

Sample Input	**Sample Output**
4 3 5 1 2 5 1 3 9 2 3 3 1 2 2 1 1 3 1 4 3 2	5 5 8 -1 3

Problem 2 (10 marks)

Arbitrage is the use of discrepancies in currency exchange rates to transform one unit of a currency into more than one unit of the same currency. For example, suppose that 1 US Dollar buys 1.5 Australian Dollar, 1 Australian Dollar buys 81.85 Bangladeshi Taka, and 1 Bangladeshi Taka buys 0.0082 US Dollars. Then, by converting currencies, a clever trader can start with 1 US Dollar and buy 1.5 * 81.85 * 0.0082 = 1.007 US Dollars, making a profit of 0.7 percent.

Your job is to write a program that takes a list of currency exchange rates as input and then determines whether arbitrage is possible or not.

Input

The first line contains an integer n (1 <= n <= 100), representing the number of different currencies. The next n lines each contain the name of one currency. Within a name no spaces will appear.
The next line contains one integer m (1 <= m <= n*n), representing the length of the table to follow. The last m lines each contain the name c_i of a source currency, a real number r_{ij} which represents the exchange rate from c_i to c_j and a name c_j of the destination currency. Note that c_i and c_j may be the same currency. Exchanges which do not appear in the table are impossible.

Output

Print one line telling whether arbitrage is possible or not, printing "Yes" or "No".

Example

Sample Input	Sample Output
3 USD AUD BDT 3 USD 1.5 AUD AUD 81.85 BDT BDT 0.0082 USD	Yes

3 USD AUD BDT 6 USD 1.5 AUD USD 122.36 BDT AUD 81.85 BDT AUD 0.66 USD BDT 0.012 AUD BDT 0.0081 USD	No

Deadline: Sunday, 11 January, 2026, 11:55 PM

General Guidelines

1. **Do not copy. Any proof of copy will result in -100%.**
2. Use of STL/library functions is allowed for both problems.

Submission Guidelines

1. Create a new folder and name it with your student ID (e.g. 2305001).
2. Copy **only the cpp/java/python files** to the newly created folder.
3. Rename your individual code files as **<ID_ProblemX>.<cpp/java/py>**. For example, if your student ID is 2305001, then for problem 1, the cpp/java/py file must be named 2305001_Problem1.<cpp/java/py>.
4. Zip the folder and name the zip file with your student ID (e.g. 2305001.zip).
5. **Submit the zip file only.**
6. Any violation of these instructions will result in a penalty.