Problem 13: Barbieland-bound
13 Points

Problem ID: `barbieland`
Rank: `4`

Introduction

Youngmin “El Coyote” Park has opened a new “transportation” service that shuttles people from Venice Beach, California to various tourist destinations in Barbieland and other universes with his brand new fleet of quantum teleporting CALICOrvettes. However, due to the digital nature of this form of transportation and the magical properties of Barbieland, space does not follow conventional rules of linear distance. This, combined with his capitalistic need to justify increasing fare prices (as well as his general disdain for the environment), he orders his drivers, the Kens, to take the most inefficient route to their destination. Help Youngmin monopolize the Barbieland “transportation” market by programming his onboard CALIComputers!

Problem Statement

There are $\mathbf{N}$ dreamhouses numbered 1 to $\mathbf{N}$ in Barbieland. You can travel between them using $\mathbf{M}$ bidirectional roads. The i^{th} road connects dreamhouse $\mathbf{U_i}$ to dreamhouse $\mathbf{V_i}$, and has a length of $\mathbf{W_i}$. It’s guaranteed that it’s possible to go from any dreamhouse to any other dreamhouse using a sequence of roads.

A route $u_1 \to u_2 \to \ldots \to u_{x-1} \to u_x$ is defined as a sequence of roads that connect a sequence of dreamhouses. Dreamhouses and roads may be included **more than once** in a single route (a walk). The length of a route is defined as the bitwise XOR ($\oplus$) of the road lengths: $w(u_1, u_2) \oplus w(u_2, u_3) \oplus \ldots \oplus w(u_{x-1}, u_x)$, where $w(u_i, u_j)$ is the length of the road connecting u_i and u_j.

There are $\mathbf{Q}$ passengers that Youngmin wants to transport. The i^{th} passenger needs to get from dreamhouse $\mathbf{A_i}$ to dreamhouse $\mathbf{B_i}$. For each passenger, find the maximum possible length of *any route* that starts at $\mathbf{A_i}$ and ends at $\mathbf{B_i}$.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains three space-separated integers $\mathbf{N}$ $\mathbf{M}$ $\mathbf{Q}$, where:
  - $\mathbf{N}$ denotes the number of dreamhouses.
  - $\mathbf{M}$ denotes the number of roads.
  - $\mathbf{Q}$ denotes the number of passengers.
- For each of the next $\mathbf{M}$ lines, the i^{th} line contains three space-separated integers $\mathbf{U}_i$ $\mathbf{V}_i$ $\mathbf{W}_i$ denoting that a road connects dreamhouse $\mathbf{U}_i$ to dreamhouse $\mathbf{V}_i$ with length $\mathbf{W}_i$.
- For each of the next $\mathbf{Q}$ lines, the i^{th} line contains two space-separated integers $\mathbf{A}_i$ $\mathbf{B}_i$ representing a query to find the maximum route length between dreamhouses $\mathbf{A}_i$ and $\mathbf{B}_i$.

Output Format

For each test case, output $\mathbf{Q}$ lines, each containing a single integer. The i^{th} line of the output should contain the maximum possible route length between dreamhouses $\mathbf{A}_i$ and $\mathbf{B}_i$.

Constraints

Time limit: 2 seconds.

$1 \le \mathbf{T} \le 100$
$1 \le \mathbf{N}, \mathbf{M}, \mathbf{Q} \le 10^5$
$1 \le \mathbf{W}_i \le 10^{18}$ for all i
The sum of $\mathbf{N}$ across all test cases in an input file does not exceed 10^5.
The sum of $\mathbf{M}$ across all test cases in an input file does not exceed 10^5.
The sum of $\mathbf{Q}$ across all test cases in an input file does not exceed 10^5.

Sample Test Cases

Sample Input Download

```
3
4 3 4
1 2 5
2 3 9
3 4 33
1 3
2 4
1 4
2 3
4 4 2
1 2 5
2 3 3
3 4 6
4 1 3
1 1
2 4
5 6 4
1 2 6
2 3 4
3 4 2
4 1 5
1 3 1
4 5 4
1 3
5 4
2 1
1 1
```

Sample Output Download

```
12
40
45
9
3
6
7
7
6
6
```

Sample Explanations

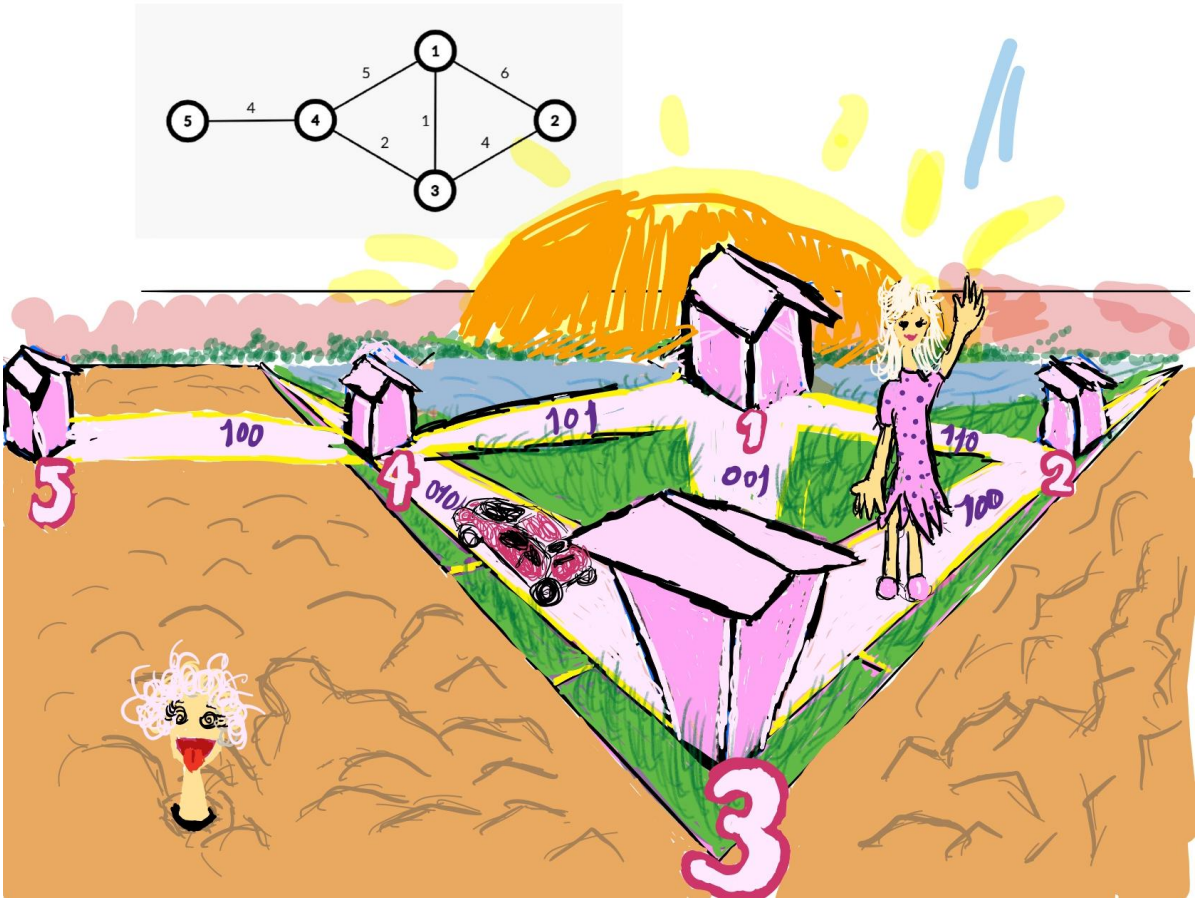
For test case #1, all routes between 1 and 3 have length 12. This is because the length of route 1 → 2 → 3 is the same as the route 1 → 2 → 1 → 2 → 3 or 1 → 2 → 3 → 4 → 3 → 2 → 3. The same applies to the rest of the queries, where all routes from one dreamhouse to another have the same length.

For test case #2, the longest route between 1 and itself is 1 → 2 → 3 → 4 → 1, which has length 3. Note that $\mathbf{A}_i = \mathbf{B}_i$ in this case. For a route between 2 and 4, we could take 2 → 3 → 4 to yield a route length of 5; however, taking route 2 → 1 → 4 yields a length of 6, so we output that one instead. Note that the multiple valid routes yield the same maximum length of 6—one of which is route 2 → 3 → 4 → 1 → 2 → 3 → 4.

For test case #3:

1. The longest route between 1 and 3 is 1 → 4 → 3, which has length 7.
2. The longest route between 5 and 4 is 5 → 4 → 1 → 2 → 3 → 1 → 4, which has length 7.
3. The longest route between 2 and 1 is 2 → 1, which has length 6.
4. The longest route between 1 and 1 is 1 → 4 → 3, which has length 6. Note that $\mathbf{A}_i = \mathbf{B}_i$.

Here's a rather *artistic* interpretation of the third test case (road lengths are in binary for easier interpretation):



第 13 题: 芭比乐园

13 分

问题标识符: 芭比乐园
难度等级: 4

问题背景

朴英珉最近开通了一种新型接送服务——使用全新的量子传送 CALICOrvettes 将游客们从加州的威尼斯海滩送到芭比乐园的各个旅游景点。然而，基于这种交通方式的数字化特质以及芭比乐园的神奇属性，这个空间并不遵循传统的线性距离规则。同时，他为了合理化不断上涨的票价（以及他对环保行为的忽视），他要求他的司机们绕最远的路线前往目的地。请帮助英珉用随身携带的 CALIComputers 进行编程，来垄断芭比乐园的接送服务市场！

问题描述

芭比乐园中有 $\mathbf{N}$ 个梦幻屋，按编号从 1 到 $\mathbf{N}$ 进行排列。你可以通过双向道路在这些梦幻屋之间往返。第 i 条路连接梦幻屋 $\mathbf{U}_i$ 和梦幻屋 $\mathbf{V}_i$，，其道路长度为 $\mathbf{W}_i$。这些道路的设计确保游客可以从任何一座梦幻小屋前往其他梦幻小屋。

路线 $u_1 \to u_2 \to \ldots \to u_{x-1} \to u_x$ 是指一连串连接多个梦幻屋的道路。在一条路径（walk）中，各个梦幻屋和道路可能出现**不止一次**。路线长度被定义为道路长度的 位运算 XOR ($\oplus$) : $w(u_1, u_2) \oplus w(u_2, u_3) \oplus \ldots \oplus w(u_{x-1}, u_x)$, 其中 $w(u_i, u_j)$ 是指连接 u_i 和 u_j 的道路长度。

英珉想要接送 $\mathbf{Q}$ 位旅客， 第 i 位旅客需要从梦幻屋 $\mathbf{A}_i$ 到梦幻屋 $\mathbf{B}_i$。对于每位旅客，找到从 $\mathbf{A}_i$ 到 $\mathbf{B}_i$ 任意路线的最大可能长度。

输入格式

输入的第一行包含整数 $\mathbf{T}$，表示测试用例数量。
对于每一个测试用例：

- 第一行包含三个用空格隔开的整数 $\mathbf{N}$ $\mathbf{M}$ $\mathbf{Q}$, 其中:
  - $\mathbf{N}$ 表示梦幻屋数量。
  - $\mathbf{M}$ 表示道路数量。
  - $\mathbf{Q}$ 表示旅客数量。
- 对于接下来 $\mathbf{M}$ 行中的每一行，第 i 行包含三个用空格隔开的整数 $\mathbf{U_i}$ $\mathbf{V_i}$ $\mathbf{W_i}$ 表示一条连接梦幻屋 $\mathbf{U_i}$ 到梦幻屋 $\mathbf{V_i}$ 的道路，其长度为 $\mathbf{W_i}$。
- 对于接下来 $\mathbf{Q}$ 行中的每一行，第 i 行包含两个用空格隔开的整数 $\mathbf{A_i}$ $\mathbf{B_i}$ 表示一个求解梦幻屋 $\mathbf{A_i}$ 和 $\mathbf{B_i}$ 之间最长路线长度的问题。

输出格式

对于每个测试用例，输出 $\mathbf{Q}$ 行, 每一行包含一个单独整数。输出的第 i 行应包含梦幻屋 $\mathbf{A_i}$ 和 $\mathbf{B_i}$ 之间可能的最长路线长度。

限制条件

时间限制: 2 秒。

$1 \le \mathbf{T} \le 100$
$1 \le \mathbf{N}, \mathbf{M}, \mathbf{Q} \le 10^5$
对于所有 i，$1 \le \mathbf{W_i} \le 10^{18}$
输入部分所有测试用例的 $\mathbf{N}$ 之和不超过 10^5。
输入部分所有测试用例的 $\mathbf{M}$ 之和不超过 10^5。
输入部分所有测试用例的 $\mathbf{Q}$ 之和不超过 10^5。

测试样例

样例输入 下载

```
3
4 3 4
1 2 5
2 3 9
3 4 33
1 3
2 4
1 4
2 3
4 4 2
1 2 5
2 3 3
3 4 6
4 1 3
1 1
2 4
5 6 4
1 2 6
2 3 4
3 4 2
4 1 5
1 3 1
4 5 4
1 3
5 4
2 1
1 1
```

样例输出 下载

```
12
40
45
9
3
6
7
7
6
6
```

样例解释

对于测试用例 #1, 1 和 3 之间的所有路线长度都为 12, 因为路线 1 → 2 → 3 的长度、路线 1 → 2 → 1 → 2 → 3 的长度和路线 1 → 2 → 3 → 4 → 3 → 2 → 3 的长度相同。同理，其他问题中梦幻屋之间的所有路线长度相同。

对于测试用例 #2, 1 和 1 之间的最长路线为 1 → 2 → 3 → 4 → 1, 其长度为 3。注意，此例中 $\mathbf{A}_i = \mathbf{B}_i$。 2 和 4 之间有两条路线：路线 2 → 3 → 4，长度为 5；路线 2 → 1 → 4，长度为 6, 因此输出后一个。注意，有多条有效路线的最长长度均为 6，其中一条为 2 → 3 → 4 → 1 → 2 → 3 → 4。

对于测试用例 #3:

1. 1 和3 之间的最长路线是 1 → 4 → 3, 长度为 7。
2. 5 和4 之间的最长路线是 5 → 4 → 1 → 2 → 3 → 1 → 4, 长度为 7。
3. 2 和1 之间的最长路线是 2 → 1, 长度为 6。
4. 1 和1 之间的最长路线是 1 → 4 → 3, 长度为 6。注意： $\mathbf{A}_i = \mathbf{B}_i$。

下图为测试用例 3 的艺术解释图。为方便理解，道路长度用二进制表示。