Prom Eligibility

Assignment 3
Data Structures & Algorithms
Due date: xx March, 2020

Problem Statement: Vireesha Sakada is so popular in IIIT and outside that she is always bombarded with many fans. As always, even this year she has a lot of requests for prom. This year, N people have asked her out. This time, being also a kassi coder, she decided to apply her coding skills to choose the lucky person.
She has built a **directed graph** with N vertices and M weighted edges such that

- Each vertex (numbered 1 through N) represents a person who asked her out.
- Each weighted edge Wij in the graph represents the amount of rivalry the person i shows towards person j. Note that Wij can be negative, and Wij != Wji. The lower the Wij the more friendship.

Vireesha defines a **fanwalk** as a sequence of vertices (p_1,p_2....p_h) and a sequence of directed edges (e_1,e_2,......e_{h-1}) such that for all i $\geq$1 and i $<$ h, e_i is a valid edge from p_i to p_{i+1}. Note that h$\geq$1.
Similarly, the **rivalrycost of a fanwalk** is the sum of weights of edges (e_1,e_2,......e_{h-1}).
Note that if h=1, rivalrycost = 0.

Now, for each person, Vireesha decided to calculate the **Prom Eligibility Quotient** .
For each person k, **Prom Eligibility Quotient** is defined as the **minimum rivalrycost** of all the fanwalks that contain the vertex k.
If there is no minimum rivalrycost, that is, if for every integer m, there exists another fanwalk whose rivalry cost is less than m, prom eligibility quotient is defined as INF.

The more Prom Eligibility Quotient, the more likely Vireesha is to go out with that person. Since Vireesha is busy with other work, she has asked you to calculate Prom Eligibility Quotients for all the N people.

Input
The first line contains a single integer T - The number of testcases.
For each testcase, the following line contains two space-separated integers N and M - Number of **Prom Requests** and Number of **Rivalry Edges** in the graph.
The following M lines contain 3 integers u_i ,v_i ,w_i describing a rivalry edge between the person u_i and v_i.

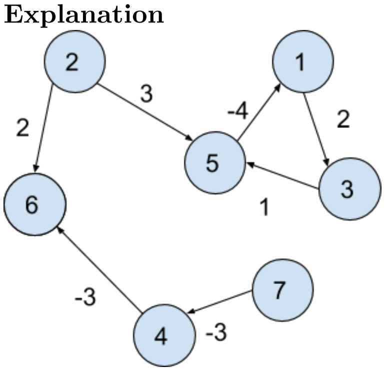
Constraints
$1 \leq$ T $\leq$ 50
$1 \leq$ N,M $\leq$ 1000
$|w_i| \leq 10^6$

Output
For each test case, Print N lines -ith line should contain the prom eligibility quotient Pi for the ith person.
If prom eligibility quotient Pi is INF, print the string “INF” (without the quotes), else print the integer representing the prom eligibility quotient.
Time Limit: 1 sec
Memory Limit: 256 MB

Sample Test Case

Input	Output
1 7 7 1 3 2 5 1 -4 2 5 3 2 6 2 3 5 1 4 6 -3 7 4 -3	INF INF INF -6 INF -6 -6

Explanation



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For v = 4, there exists the fanwalks (v4), (v4,v6), (v7,v4) and (v7,v4,v6) passing through vertex 4 : The rivalry cost of (v7,v4,v6) fanwalk = -6 , which is the minimum of all. Thus, this is equal to the Prom Eligibility Quotient of 4.
For v = 1, The fanwalk (v5,v1,v3,v5) passes through the vertex 1. The rivarly cost of this fanwalk is -1. Since this is a negative cycle, we can always construct a fanwalk passing through vertex 1 that has a lesser rivalry cost than before. Thus, there exists no definite minimum rivalry cost, that is, the Prom Eligibility Quotient of 1 is INF.