2021 Canadian Computing Olympiad
Day 2, Problem 1
Travelling Merchant

Time Limit: 1 second

Problem Description

A merchant would like to make a business of travelling between cities, moving goods from one city to another in exchange for a profit. There are N cities and M trading routes between them.

The i-th trading route lets the merchant travel from city a_i to city b_i (in only that direction). In order to take this route, the merchant must already have at least r_i units of money. After taking this route, the total amount of money the merchant has will increase by p_i units, with a guarantee that $p_i \geq 0$.

For each of the N cities, we would like to know the minimum amount of money required for a merchant to start in that city and be able to keep travelling forever.

Input Specification

The first line contains the two integers N and M ($2 \leq N, M \leq 200\,000$).

The i-th of the next M lines contains the four integers a_i, b_i, r_i, and p_i ($1 \leq a_i, b_i \leq N$, $a_i \neq b_i$, $0 \leq r_i, p_i \leq 10^9$). Note that there may be any number of routes between a pair of cities.

For 4 of the 25 available marks, $N, M \leq 2\,000$.

For an additional 5 of the 25 available marks, $p_i = 0$ for all i.

Output Specification

On a single line, output N space-separated integers, where the i-th is the answer if the merchant were to start at city i. This answer is either the minimum amount of money, or -1 if no amount of money can be sufficient.

Sample Input

```
5 5
3 1 4 0
2 1 3 0
1 3 1 1
3 2 3 1
4 2 0 2
```

Output for Sample Input

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2 3 3 1 -1
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Explanation of Output for Sample Input

Starting from city 2 with 3 units of money, the merchant can cycle between cities 2, 1, and 3.