

# 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,  $N, M \leq 2\,000$ .

These are the Easy test cases

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

These are the Medium test cases

## 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**

2 3 3 1 -1

### **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.