Information Spread

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 megabytes

In Mr. Ham's class, there are n students numbered from 1 to n. One day, a student 1 learns a piece of information. Subsequently, the students initiate the process of spreading the information to each other.

The relationships among the students are represented by a **directed** graph with n vertices and m edges. Each edge has a weight w, a real number between 0 and 1 (inclusive). The process of information spreading is carried out according to the following pseudocode:

Algorithm 1 SPREAD

```
Let aware[1..n] be a new array initialized as False
Let visited[1..n] be a new array initialized as False
procedure DFS(u)
    if visited[u] then
        return
    end if
    visited[u] ← True
    for (u, v, w) ∈ edges starting from u do
        ▷ Enumerate edges in the order of input ◁
        if aware[u] and not aware[v] then
            with probability w, aware[v] ← True
        end if
        DFS(v)
    end for
end procedure
procedure SPREAD
    aware[1] ← True        ▷ The first student knows the information at the beginning
    DFS(1)
end procedure
```

Please compute the probability that student i becomes aware of the information through this process, for all $1 \le i \le n$. In other words, calculate the probability of $aware[u]$ being ***True*** in the above pseudocode.

Input

The first line contains two integers n and m ($3 \le n \le 10^5$, $n-1 \le m \le 3 \cdot 10^5$), denoting the number of students and the number of relationships.

The next m lines each contains four integers u_i, v_i, p_i and q_i ($1 \le a_i, b_i \le n$, $0 \le p_i \le q_i \le 10^5$, $q_i \ne 0$), denoting a relationship from student u_i to student v_i with a weight $w_i = \frac{p_i}{q_i}$.

It is guaranteed that there is no relationship from student i to student i ($1 \le i \le n$), and there is at most one relationship from student i to student j ($1 \le i, j \le n$). It is also guaranteed that all students can be reached from student 1 in the process.

Output

Output n lines, the i-th line contains a single integer x_i denoting the probability that student i becomes aware of the information after the process modulo $998\,244\,353$.

Formally, it can be proven that the answer is a rational number $\frac{p}{q}$. To avoid issues related to precisions, please output the integer ($pq^{-1} \bmod M$) as the answer, where $M = 998\,244\,353$ and q^{-1} is the integer satisfying $qq^{-1} \equiv 1 \pmod{M}$.

Examples

standard input	standard output
4 4 1 2 1 2 2 3 1 2 2 4 1 2 4 3 1 1	1 499122177 623902721 748683265
6 12 1 2 81804 95651 2 3 39701 95895 2 4 6178 17992 3 5 72756 84510 5 6 40007 83640 2 6 60491 92219 5 3 37590 47735 4 5 6867 20289 4 3 75051 93231 6 5 48102 54448 6 1 40190 45274 1 5 37010 60312	1 947252499 124986918 535320090 929273289 551177734

Note

For the first example, the process unfolds as follows:

- Student 1 knows the information initially.
- We choose the edge $(1, 2, \frac{1}{2})$. As a result, student 2 becomes aware of the information with a probability of $\frac{1}{2}$.
- We choose the edge $(2, 3, \frac{1}{2})$.
- We choose the edge $(2, 4, \frac{1}{2})$. Consequently, student 4 becomes aware of the information with a probability of $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.
- We choose the edge $(4, 3, 1)$.

Now, let's analyze the scenario where student 3 remains unaware of the information. This can happen in two cases:

- Student 2 did not become aware when we selected the edge $(1, 2, \frac{1}{2})$.
- Student 2 became aware when we selected the edge $(1, 2, \frac{1}{2})$, but student 3 did not become aware when we selected the edge $(2, 3, \frac{1}{2})$, and student 4 did not become aware when we selected the edge $(2, 4, \frac{1}{2})$.

Therefore, the probability of student 3 becoming aware is given by: $1 - \frac{1}{2} - \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{3}{8}$.