Not Another Path Query Problem

Input file: `standard input`
Output file: `standard output`
Time limit: 4 seconds
Memory limit: 1024 megabytes

What age is it that you are still solving traditional path query problems?

After reading the paper *Distributed Exact Shortest Paths in Sublinear Time*, you have learned how to solve the distributed single-source shortest paths problem in $\mathcal{O}(D^{1/3} \cdot (n \log n)^{2/3})$. To give your knowledge good practice, Little Cyan Fish prepared the following practice task for you.

Little Cyan Fish has a graph consisting of n vertices and m bidirectional edges. The vertices are numbered from 1 to n. The i-th edge connects vertex u_i to vertex v_i and is assigned a weight w_i.

For any path in the graph between two vertices u and v, let's define the value of the path as the bitwise AND of the weights of all the edges in the path.

As a fan of high-value paths, Little Cyan Fish has set a constant threshold V. Little Cyan Fish loves a path if and only if its value is at least V.

Little Cyan Fish will now ask you q queries, where the i-th query can be represented as a pair of integers (u_i, v_i). For each query, your task is to determine if there exists a path from vertex u_i to vertex v_i that Little Cyan Fish would love it.

Input

There is only one test case in each test file.

The first line contains four integers n, m, q and V ($1 \le n \le 10^5$, $0 \le m \le 5 \times 10^5$, $1 \le q \le 5 \times 10^5$, $0 \le V < 2^{60}$) indicating the number of vertices, the number of edges, the number of queries and the constant threshold.

For the following m lines, the i-th line contains three integers u_i, v_i and w_i ($1 \le u_i, v_i \le n$, $u_i \ne v_i$, $0 \le w_i < 2^{60}$), indicating a bidirectional edge between vertex u_i and vertex v_i with the weight w_i. There might be multiple edges connecting the same pair of vertices.

For the following q lines, the i-th line contains two integers u_i and v_i ($1 \le u_i, v_i \le n$, $u_i \ne v_i$), indicating a query.

Output

For each query output one line. If there exists a path whose value is at least V between vertex u_i and v_i output `Yes`, otherwise output `No`.

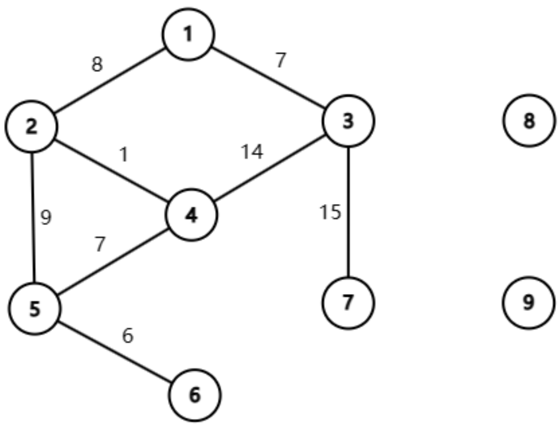
Examples

standard input	standard output
9 8 4 5 1 2 8 1 3 7 2 4 1 3 4 14 2 5 9 4 5 7 5 6 6 3 7 15 1 6 2 7 7 6 1 8	Yes No Yes No
3 4 1 4 1 2 3 1 2 5 2 3 2 2 3 6 1 3	Yes

Note

We now use & to represent the bitwise AND operation.

The first sample test case is shown as follows.



- For the first query, a valid path is $1 \to 3 \to 4 \to 5 \to 6$, whose value is $7 \,\&\, 14 \,\&\, 7 \,\&\, 6 = 6 \geq 5$.
- For the third query, a valid path is $7 \to 3 \to 4 \to 5 \to 6$, whose value is $15 \,\&\, 14 \,\&\, 7 \,\&\, 6 = 6 \geq 5$.
- For the fourth query, as there is no path between vertex 1 and 8, the answer is `No`.

For the only query of the second sample test case, we can consider the path consisting of the 2-nd and the 4-th edge. Its value is $5 \,\&\, 6 = 4 \geq 4$.