Problem H. Shortest Path in GCD Graph

Input file:	standard input
Output file:	standard output
Time limit:	2.5 seconds
Memory limit:	512 megabytes

There is an edge-weighted complete graph K_n with n vertices, where vertices are labeled through $1, 2, ..., n$. For each $1 \leq i < j \leq n$, the weight of the edge (i, j) between i and j is $gcd(i, j)$, the greatest common divisor of i and j.

You need to answer q queries. In each query, given two vertices u, v, you need to answer the **length of the shortest path** as well as the **number of shortest paths** between u, v. Since the **number of shortest paths** may be too large, you only need to output it modulo 998244353.

Input

The first line contains two integers $n, q(2 \leq n \leq 10^7, 1 \leq q \leq 50000)$, denoting the number vertices in the graph and the number of queries, respectively.

Then q lines follow, where each line contains two integers $u, v(1 \leq u, v \leq n, u \neq v)$, denoting a query between u and v.

Output

For each query, output one line contains two integers, denote the length and number of shortest path between given nodes, respectively. Note that only the **number of shortest paths** should be taken modulo 998244353.

Example

standard input	standard output
6 2	1 1
4 5	2 2
3 6	