It's easy to find that it's optimal to greedily select the shortest possible prefix each time. Therefore, only checking whether a prefix is satisfied should be done.

Firstly, to keep the sets of each person being the same, we can use an array of counter counting how many times each number appears, and another counter counting how many counters are neither 0 nor M.

Secondly, to keep the set if a set of leaves, one method is to check whether the remaining set is connected, which can $O(1)$ checked by recording the result of number of nodes minus number of edges. Another method is to directly maintain the count of deleted non-leaf nodes and jump to the parent node when deleting to a leaf.

The time complexity is $O(\sum nm)$.