

Codeforces 1166E (2100)

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<https://codeforces.com/problemset/problem/1166/E>

Accepted: <https://codeforces.com/contest/1166/submission/359193366>

§1 Solution

§1.1 Explanation

Lemma 1.1

Consider two sets of natural numbers A_1 and A_2 . If A_1 is a subset of A_2 , then

$$\text{lcm}(A_1) \leq \text{lcm}(A_2)$$

Proof. Immediately follows by induction on the size of the set. □

Lemma 1.2

Suppose the set of indices of shops dora visits are

$$D_1, D_2, \dots, D_m$$

If the problem condition is true, then for any $i \neq j$ we can never have,

$$D_i \cap D_j = \emptyset$$

Proof. Suppose the set of indices of shops that swiper visits are

$$S_1, S_2, \dots, S_m$$

Since for any i , we have that D_i and S_i are disjoint partitions of the set of shops. Hence, if $D_i \cap D_j = \emptyset$ then $D_j \subseteq S_i$. This implies,

$$\text{lcm}(S_j) < \text{lcm}(D_j) \leq \text{lcm}(S_i) < \text{lcm}(D_i)$$

But $D_j \subseteq S_i \implies D_i \subseteq S_j \implies \text{lcm}(D_i) \leq \text{lcm}(S_j)$, contradicting the problem statement. □

¶ Back to the Problem Now we show that the above condition is the only sufficient condition for the problem condition to hold true.

§1.2 Code

```
1 void solve() {
2     ll m, n;
3     std::cin >> m >> n;
4
5     std::vector<ll> a[m + 1];
6     for (ll i = 1; i <= m; i++) {
7         ll x;
8         std::cin >> x;
9
10        for (ll j = 1; j <= x; j++) {
11            ll y;
12            std::cin >> y;
13
14            a[i].push_back(y);
15        }
16    }
17
18    bool ans = true;
19    for (ll i = 1; i <= m; i++) {
20        for (ll j = i + 1; j <= m; j++) {
21            std::vector<ll> val(n + 1);
22
23            for (auto u: a[i]) {
24                val[u]++;
25            }
26
27            for (auto u: a[j]) {
28                val[u]++;
29            }
30
31            bool check = false;
32            for (ll k = 1; k <= n; k++) {
33                if (val[k] == 2) {
34                    check = true;
35                }
36            }
37
38            if (!check) {
39                ans = false;
40            }
41        }
42    }
43
44    if (ans) {
45        std::cout << "possible\n";
46    } else {
47        std::cout << "impossible\n";
48    }
49 }
```