

39. Number of Ways to Wear Different Hats to Each Other

There are n people and 40 types of hats labeled from 1 to 40.

Given a 2D integer array `hats`, where `hats[i]` is a list of all hats preferred by the i th person.

Return the number of ways that the n people wear different hats to each other.

Since the answer may be too large, return it modulo $10^9 + 7$.

Code:

```
def numberWays(hats):
    MOD = 10**9 + 7
    n = len(hats)
    all_hats = [set() for _ in range(41)]

    for i in range(n):
        for hat in hats[i]:
            all_hats[hat].add(i)

    dp = [0] * (1 << n)
    dp[0] = 1

    for hat in range(1, 41):
        if not all_hats[hat]:
            continue
        for mask in range((1 << n) - 1, -1, -1):
            for person in all_hats[hat]:
                if mask & (1 << person):
                    continue
                dp[mask | (1 << person)] = (dp[mask | (1 << person)] + dp[mask]) % MOD

    return dp[(1 << n) - 1]
hats = [[3, 4], [4, 5], [5]]
print(numberWays(hats))
```

Output:

```
= RESTART:
1
```

Time Complexity:

- $T(n) = O(n \cdot 2^k \cdot k)$