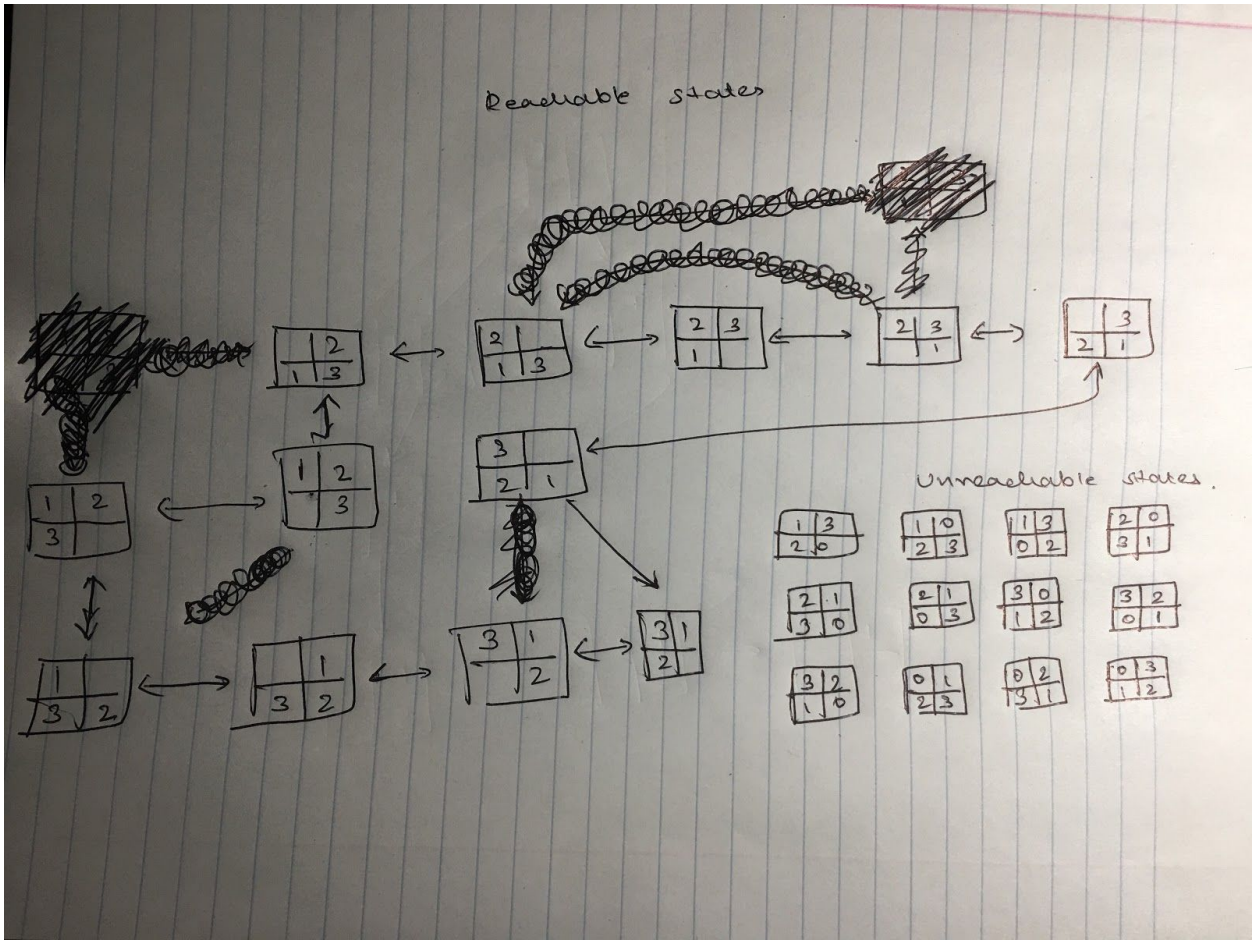
Question 2:

1. There will be m * n - k tiles in general
2. (m*n)!/(k)!
    a. Derivation: Let us assume we had to place m*n tiles on an m*n board in any order, this can be done in (m*n)! Ways. Let us assume that k of these tiles are the same (blank spaces). Then, the total possible permutations are (m*n)!/(k)!
3. 

In the above diagram, we will have 24 states as expected because the number of states is calculated by (m*n)!/(k)! = (2*2)!/1 = 4! = 24. Only a subset of the states are reachable, while the others are unreachable.