1. The original program has two for loops where both first and second for loops traverses the entire list one by one. These loops find the duplicates by comparing the each value at index they are. For every iteration of first for loop, the second for loop traverses the list from index zero which makes the duplicate element get reported more than once.
2. The Big O Running time of the program is O(N3) because each for loop runs for N times and as the program uses linked list which takes O(N) to search an element. So The total running time of above program is N\*N\*N i.e, N3.
3. MyHashTable uses Quadratic probing as a collision prevention technique with table size as 10007, since rehashing should be done when the hash table is half full and 10007 is the next prime number after 10006 (5003\*2). Whenever any collision occurs, the program checks whether the existing element and the new element to be inserted are same (Duplicate element check). If yes, then store these phone numbers in Different Linked List along with its count of duplicate.
4. The Big-O Running time of the new program is O(N \* square root(N) ). since MyHashTable uses Quadratic probing technique to insert N elements, consider the case where table size in 2N and the hash position is 0 in one case and in worst case it takes square root(N) collisions to reach the end of the HashTable. Thus for 1 element it takes approximately O(square root(N) ) time and for N elements it is O(N \* square root(N) ).
5. The original program takes around 62,000 milliseconds to complete while the New Program takes around 60 milliseconds to complete.