Hashing Function{Practice Question}

Q1

Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function $h(x) = x \pmod{()}\ 10$, show the resulting

a. separate chaining hash table
b. hash table using linear probing
c. hash table using quadratic probing
d. hash table with second hash function $h_2(x) = 7 - (x \mod 7)$

Q2

Write a program to compute the number of collisions required in a long random sequence of insertions using linear probing, quadratic probing, and double hashing.

Q3

Reimplement separate chaining hash tables using a `vector` of singly linked lists instead of `vectors`.

Q4

In the quadratic probing hash table, suppose that instead of inserting a new item into the location suggested by `findPos`, we insert it into the first inactive cell on the search path (thus, it is possible to reclaim a cell that is marked deleted, potentially saving space).

a. Rewrite the insertion algorithm to use this observation. Do this by having `findPos` maintain, with an additional variable, the location of the first inactive cell it encounters.
b. Explain the circumstances under which the revised algorithm is faster than the original algorithm. Can it be slower?

Q5

Suppose instead of quadratic probing, we use "cubic probing"; here the ith probe is at $hash(x) + i^3$. Does cubic probing improve on quadratic probing?

Q6

What are the advantages and disadvantages of the various collision resolution strategies?