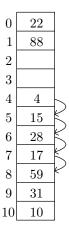
## 11.4-1.

Consider inserting the keys 10, 22, 31, 4, 15, 28, 17, 88, 59 into a hash table of length m = 11 using open addressing with the auxiliary hash function h'(k) = k. Illustrate the result of inserting these keys using linear probing, using quadratic probing with  $c_1 = 1$  and  $c_2 = 3$ , and using double hashing with  $h_1(k) = k$  and  $h_2(k) = 1 + (k \mod (m-1))$ .

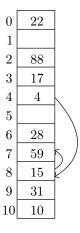
## Answer.

Figure 1 shows the result of inserting these keys using linear probing.



**Figure 1.** Insertion by linear probing. Since  $59 \equiv 4 \mod 11$ , we insert the key 59 into empty slot 8, after examining slots 4, 5, 6, 7 and finding them to be occupied.

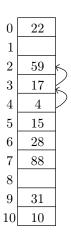
Figure 2 shows the result of inserting these keys using quadratic probing.



**Figure 2.** Insertion by quadratic probing. Since  $59 \equiv 4 \mod 11$ , we insert the key 59 into empty slot 7, after examining slots 4, 8 and finding them to be occupied.

Figure 3 shows the result of inserting these keys using double hashing.

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**Figure 3.** Insertion by double hashing. Since  $59 \equiv 4 \mod 10$ , we insert the key 59 into empty slot 2, after examining slots 4, 3 and finding them to be occupied.