

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 $h_2(k) = 1 + (k \bmod (m - 1))$.

Answer.

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

0	22
1	88
2	
3	
4	4
5	15
6	28
7	17
8	59
9	31
10	10




Figure 1. Insertion by linear probing. Since $59 \equiv 4 \pmod{11}$, 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.

0	22
1	
2	88
3	17
4	4
5	
6	28
7	59
8	15
9	31
10	10




Figure 2. Insertion by quadratic probing. Since $59 \equiv 4 \pmod{11}$, 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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0	22
1	
2	59
3	17
4	4
5	15
6	28
7	88
8	
9	31
10	10




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