

4. Hash... Browns?

For the following scenarios, insert the following elements in this order: 7, 9, 48, 8, 37, 57. For each table, TableSize = 10, and you should use the primary hash function $h(k) = k1 \bmod m0$. If an item cannot be inserted into the table, please indicate this and continue inserting the remaining values.

(a) Linear Probing

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

(b) Quadratic Probing

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

(c) Separate chaining hash table - Use a linked list for each bucket. Order elements within buckets in any way you wish.

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

5. Double Double Toil and Trouble

(a) Describe double hashing.

(b) List 2 cons of quadratic probing and describe how one of those is fixed by using double hashing.

Name: _____

1. Suppose we sort an array of numbers, but it turns out every element of the array is the same, e.g., $\{17, 17, 17, \dots, 17\}$. (So, in hindsight, the sorting is useless.)
 - (a) What is the asymptotic running time of insertion sort in this case?
 - (b) What is the asymptotic running time of selection sort in this case?
 - (c) What is the asymptotic running time of merge sort in this case?
 - (d) What is the asymptotic running time of quick sort in this case?

7) [10 points] **Sorting**

You are given a list of AVL trees. The keys in the AVL trees are ages of people. Each AVL tree represents the ages for people in a different community. Your task is to sort the AVL trees such that tree X comes before tree Y if and only if:

- The minimal age in tree X is less than the minimal age in tree Y, **or**
- The minimal ages are the same, but the maximal age in tree X is less than the maximal age in tree Y

Otherwise, ties are broken arbitrarily. You may assume that:

- There are k trees
- Each tree has n keys in it
- The range of ages is fixed (0-127)

- a) [5 points] Describe in a few sentences or numbered steps how you could use Mergesort to sort these trees efficiently in the worst case. What is the running time in terms of k and n ?

Running Time:

- b) [5 points] Describe in a few sentences or numbered steps how you could use ideas from Radixsort to sort these trees efficiently in the worst case. What is the running time in terms of k and n ?

Running Time:
