CSC345 Discussion 10

Quiz, Homework

Reminder

Quiz Tuesday, from the reading, on hashing

Tentative review session Tuesday, 5:30 PM this room

Test 2 next week Thursday

Program 5, Due April, 18th

Quiz Problem 1

Given the following hash table, use hash function h(k) = k mod 10 and handle collisions using Linear Probing by Steps with probe function P(k, i) = 2i.

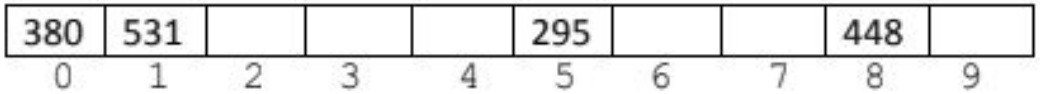
In which slot should the record with key value 705 be inserted?

380	531				295			448	
0	1	2	3	4	5	6	7	8	9

Quiz Problem 1

Given the following hash table, use hash function h(k) = k mod 10 and handle collisions using Linear Probing by Steps with probe function P(k, i) = 2i.

In which slot should the record with key value 705 be inserted?



First use the hash function to computer the home slot.
If there is a collsion, then just step to the right like normal linear probing, but step by the step size. For example, if the step size is 4, go 4 slots to the right.
If we reach the end of the array while stepping, then cycle around to the beginning.

Quiz Problem 2

Given the following hash table, use hash function h(k) = k mod 10 and handle collisions using Quadratic Probing with probe function p(K, i) = i*i.

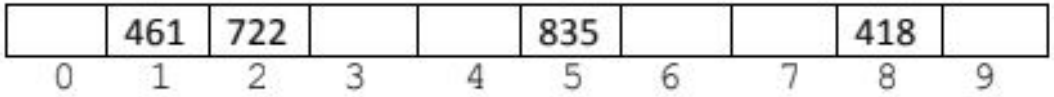
In which slot should the record with key value 238 be inserted?

	461	722			835			418	
0	1	2	3	4	5	6	7	8	9

Quiz Problem 2

Given the following hash table, use hash function h(k) = k mod 10 and handle collisions using Quadratic Probing with probe function p(K, i) = i*i.

In which slot should the record with key value 238 be inserted?



First use the hash function to compute the home slot. If there is a collision, then the `i` *i*'th place to look is `i*i` *i*i* steps from the home slot.

Remember that offsets are always with respect to the home slot, not from the last slot probed to.

Quiz Problem 3

3. **Open hashing has the advantage that it can answer range queries or questions like what is the largest key in the database.**

- ○ True
- ○ False

Quiz Problem 3

3. **Open hashing has the advantage that it can answer range queries or questions like what is the largest key in the database.**

- ○ True
- ○ False

False

Quiz Problem 4

4. **The simple mod hash function makes use of:**

- ○ The low order digits or bits in the key
- ○ The middle digits or bits of the key
- ○ The high order digits or bits in the key
- ○ None of the above

Quiz Problem 4

4. **The simple mod hash function makes use of:**

- ○ The low order digits or bits in the key
- ○ The middle digits or bits of the key
- ○ The high order digits or bits in the key
- ○ None of the above

The low order digits or bits in the key.

Quiz Problem 5

5. **Hashing is good for which queries?**

- ○ Exact match queries
- ○ Range queries
- ○ Finding the maximum key value
- ○ All of these
- ○ None of these

Exact Match Queries

Quiz Problem 5

5. **Hashing is good for which queries?**

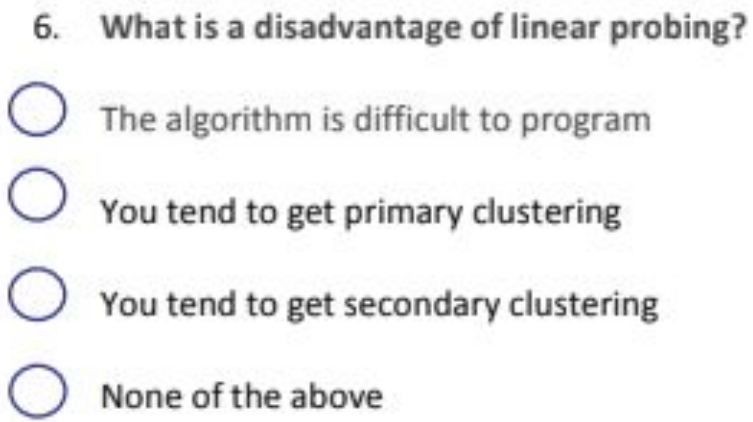
- ○ Exact match queries
- ○ Range queries
- ○ Finding the maximum key value
- ○ All of these
- ○ None of these

Quiz Problem 6

6. **What is a disadvantage of linear probing?**

- ○ The algorithm is difficult to program
- ○ You tend to get primary clustering
- ○ You tend to get secondary clustering
- ○ None of the above

Quiz Problem 6



You tend to get primary clustering

Quiz Problem 7

7. **The mid-squares method hash function makes use of:**

- ○ The low order digits or bits of the key
- ○ All of the digits or bits of the key
- ○ The high order digits or bits of the key
- ○ None of the above

Quiz Problem 7

7. **The mid-squares method hash function makes use of:**

- ○ The low order digits or bits of the key
- ○ All of the digits or bits of the key
- ○ The high order digits or bits of the key
- ○ None of the above

All of the digits or bits of the key

Mid-squares method will square the key value before pulling out the middle bits.

While it uses only the middle bits of the squared value, all of the bits in the original key will influence the result.

Quiz Problem 8

8. **An open hashing table has an array size of 78. What is the maximum number of records that can be stored in the table?**

- ◯ **39**
- ◯ **77**
- ◯ **78**
- ◯ **None of the above**

Quiz Problem 8

8. **An open hashing table has an array size of 78. What is the maximum number of records that can be stored in the table?**

- ◯ **39**
- ◯ **77**
- ◯ **78**
- ◯ **None of the above**

None of the above

11.4 Show the DFS tree for the graph of Figure 11.26, starting at Vertex 1.

Write an algorithm to determine whether a directed graph of |V| vertices contains a cycle. Your algorithm should run in Θ(|V| + |E|) time.

List the order in which the edges of the graph in Figure 11.26 are visited when running Prim’s MST algorithm starting at Vertex 3. Show the final MST.

When can Prim’s and Kruskal’s algorithms yield different MSTs?

Does either Prim’s or Kruskal’s algorithm work if there are negative edge weights?

Consider the collection of edges selected by Dijkstra's algorithm as the shortest paths to the graph's vertices from the start vertex. Do these edges form a spanning tree (not necessarily of minimum cost)? Do these edges form an MST? Explain why or why not.

7.4 When implementing Insertion Sort, a binary search could be used to locate the position within the first $i - 1$ elements of the array into which element i should be inserted. How would this affect the number of comparisons required? How would using such a binary search affect the asymptotic running time for Insertion Sort?

7.6 Recall that a sorting algorithm is said to be stable if the original ordering for duplicate keys is preserved. Of the sorting algorithms Insertion Sort, Bubble Sort, Selection Sort, Shellsort, Mergesort, Quicksort, Heapsort, Binsort, and Radix Sort, which of these are stable, and which are not? For each one, describe either why it is or is not stable. If a minor change to the implementation would make it stable, describe the change.

7.9 Give a permutation for the values 0 through 7 that will cause Quicksort (as implemented in Section 7.5) to have its worst case behavior.

7.19 Consider a recursive Mergesort implementation that calls Insertion Sort on sublists smaller than some threshold. If there are n calls to Mergesort, how many calls will there be to Insertion Sort? Why?