

Homework Assignment 2

Handed Out: Jan 20

Due: Jan 27

1. (15 pts) Given the hash function $h(x) = x \bmod 10$, and the following set of numbers as input $\{4371, 1323, 6173, 4199, 4344, 9679, 1989, 7759\}$, show the resulting:
 - (a) Separate chaining hash table,
 - (b) Open addressing hash table with linear probing.
 - (c) Open addressing using quadratic probing.
2. (10 pts) Suppose we map N keys into a table of size N , using a random hash function that maps each input key to any table position with equal probability. What is the probability that each table entry receives exactly one key? (That is, there are no collisions.) Carefully explain your reasoning, and give your final answer in the simplest possible mathematical form.
3. (15 pts) Suppose H is a binary min-heap with n nodes. Show the following facts for H
 - (a) H has exactly $\lceil n/2 \rceil$ leaves.
 - (b) The **maximum** key is at one of the leaves.
 - (c) Any algorithm that correctly performs findMax must inspect every leaf node in H .
4. (10 pts) Suppose we use the array representation to store a d -heap. For an entry located in position i , where are its parent and children located? Give both the formulae and their justification.