1. Hash functions can be broken into two components: ________ hash code ________ that converts a key to an integer and an ________ compression function ________ that maps an integer to an index in \([0, N - 1]\).

2. Consider a hash table \(H\) of size \(N = 11\) (i.e., array is \(A[0 - 10]\)) and the hash function

\[ h(k) = (1 + k) \mod (N - 1) \]

(a) The key 19 maps to location \(_______\) \(0\) \(_______\)

(b) True or \(\text{False}\): With \(h(k)\) each cell in the array \(A\) has an equally likely chance of being selected.

3. Assume there are \(N\) slots in your hash table, and that there are \(n\) data items stored in your hash table.

   (a) In hashing with chaining, the space usage will be \(\Theta(_______ n+N _______\).

   (b) In open-addressing hashing, the space usage will be \(\Theta(_______ N _______\).

4. Consider a binary search tree \(T\) storing \(n\) (key, value) pairs, and let \(h\) denote the height of \(T\). In the best case, \(h\) is \(O(\log n)\) and in the worst case, \(h\) is \(O(n)\) (use asymptotic notation).

5. Draw a binary search tree that would result from inserting the following items in this order (assume the key and value are the same): 10, 20, 30, 40.

   \[
   \begin{array}{c}
   10 \\
   \hline
   20 \\
   \hline
   30 \\
   \hline
   40 \\
   \hline
   \end{array}
   \]