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CS-215-ON

1 October 2022

Assignment 5.1 – Hash Maps

1. Explain how a hash function is used.

**A hash function, “takes a search key and produces the integer index of an element in the hash table.” This results in the search key becoming mapped, or hashed, to the index. Put simply, hash functions take data of *n* size and assign them a value of a more compressed, fixed size.**

1. How might a string hash function be written?  
     
   **To hash a String, you should map each character in the String based on the position, then sum the values to compare. This cuts down on algorithmic execution time by not having to compare the entire String at once. (Example based on lecture slides)**  
    **e.g. a0bc-1 + a1bc-2 + … + ac-2b + ac-1**

**a: the a-th character in the String**

**b: the constant 10**

**c: the length of the String used to get character’s position**

1. Explain why we might choose to use a hash function rather than search for a key.  
     
   **Hash functions have a superiority compared to other search functions thanks to their time efficiency. Hashing is not dependent on the total number of elements, therefore giving it a constant time complexity of *O(1)*. Unlike more traditional search methods, such as binary search trees, which are largely dependent on the number of elements within the tree – making them *O(log(n))*.**
2. What hash function does the Java Util HashMap use for [hashing](https://moodleilp.bellarmine.edu/mod/url/view.php?id=778792) strings?  
     
   **The HashMap in Java uses <K,V> to store data in pairs - where K = Key, and V = Value. This enables you to access the Strings by an index of another type, like an Integer.**

**e.g.**

**HashMap<Integer, String> testHM = new HashMap<Integer, String>();**

**testHM.put(5, "Adam");**

**testHM.put(10, "Dr.Kelley");**

**System.out.println(testHM.get(5));**

**System.out.println(testHM.get(10));**

**Output:**

**Adam**

**Dr.Kelley**