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Assignment 5.1 Hash Maps

Hash Maps

Part 1: Answer the Following

1. Explain how a hash Function is used.
   1. A hash function is used to convert a search key into an integer index (hash code). This index is then used as an index into the hash table where the corresponding value will be stored
2. How might a string hash function be written?
   1. A string hash function could be written in various ways. One common method is to use the Unicode values of characters in the string to generate a unique hash code. For example, you could sum up the Unicode values of all characters in the string and then use modular division to scale it into your table size.
3. Explain why we might choose to use a hash function rather than search for a key.
   1. We might choose to use a hash function rather than search for a key because hashing allows us to store and retrieve items in constant time (O(1)), regardless of the size of the data set. This is significantly faster than searching for a key, which can take linear time (O(n)) in the worst case.
4. What hash function does the Java Util HashMap use for [hashing](https://moodleilp.bellarmine.edu/mod/url/view.php?id=901510) strings?
   1. The java.util.HashMap in Java uses the hashCode() method of the keys to calculate the hash. When the keys are strings, the hashCode() method of the String class is used. This method calculates the hash code for a string by iterating over its characters. For each character, it multiplies the current hash code by 31 and then adds the Unicode value of the character. This results in a fairly uniform distribution of hash codes for different strings, which is beneficial for the performance of the HashMap.