Assignment 5.1: Hash Maps

# Part 1: Questions and Answers

## a. How is a hash function used?

A hash functions are used with hash tables to store and retrieve data. The hash function translates the key associated with each datum or record into a hash code, which is used to index the hash table. This allows the program to quickly find the value without searching through all the data.

## b. How might a string hash function be written?

A string hash function works by turning each character in the string into a number. In Java, for example, the characters are multiplied by a prime number, such as 31, and added together. This creates a unique hash code for the string.

## c. Why use a hash function instead of searching for a key?

A hash function will save time and is faster than trying to use a search key. Searching through a list with a lot of data can take a lot of time. With a hash function, we can directly find the location of the key by calculating its hash code. This makes retrieving data more efficient, especially in large datasets.

## d. What hash function does Java’s HashMap use for strings?

Java has a built-in hash function for strings in the string class the called hashCode() method. This function multiplies the value of each character by 31 and adds them together to create a unique hash code.  The algorithm used is a polynomial hash function:

public int hashCode() {

int h = 0;

for (int i = 0; i < value.length; i++) {

h = 31 \* h + value[i];

}

return h;

}