Module Four

Learning Objective

By the end of this module, you will meet these learning objective:

- Describe how the use of an algorithm affects specific data structures

Module Overview

Welcome to Module Four! Hash tables store two pieces of data: keys and values. There can only be one value associated with a key. Here is a sample hash table:

Key	Value
dog	Pluto
mouse	Mickey
duck	Donald

Hash tables are amazing data structures that allow us to look up a value associated with a key in constant time, assuming the hash function operates in constant time and the number of elements chained is constant. Hashing a key (which can typically be of any type) requires converting the key to an integer value, which becomes the index of the memory location or an offset to the memory location. Hashing is not the same as encryption, although those two words are sometimes used interchangeably. Hashing is a one-way operation, meaning that the key cannot be retrieved from the hashed value. Encrypting implies that there is another function that decrypts to get the original value back out.

What happens if there are fewer buckets to put the values in than there are values? The pigeonhole principle tells us that if we have n holes for pigeons to go in and m total pigeons to go into those holes, if m > n, then at least two pigeons will be in the same hole. If m < n, that doesn't mean that one hole couldn't have more than one pigeon in it, but it does mean that we wouldn't need to have more than one pigeon in a hole.

Chaining is the process of storing multiple values at the same location in the hash table. This could occur because the same key is associated with more than one value, or because two keys hashed to the same location in the hash table. Probing comes into play after chaining, because we now need to be able to find the values that are associated with a specific key.

Module at a Glance

This is the recommended plan for completing the reading assignments and activities within the module. Additional information can be found in the module Resources section and on the module table of contents page.

1. Review the Module Four resources.
2. Complete the Module Four activities in zyBooks.
3. Complete the Module Four assignment.
4. Complete Project One Milestone Two.