Melissa's Responses to Week 9 Skills Assessment

Recursion

1. In your own words, what is Recursion?
The repeated calling of a function within itself until some base case is reached.
Godel, Escher and Bach are all masters of recursion.

2. Why is it necessary to have a Base Case?
It is necessary to define a base case in order to know when the function is satisfied and can exit.

Graphs

1. What is a Graph?
A graph is a data structure that is a representative picture of a set of objects wherein the the interconnectedness of the objects is demonstrated.

2. How is a Graph different from a Tree?
Graphs are similar trees in their data structure, however a graph can contain loops back on itself whereas a tree cannot. Furthermore unlike a tree the relationships can be either directed or non-directed.

3. Give an example of something that would be good to model with a Graph.
LinkedIn

Performance of Different Data Structures

Fill in the runtimes for the following actions for the table below:

Data Structure	***Index***	***Search***	***Add-R***	***Add-L***	***Pop-L***	***Pop-R***
Python List (Array)	*O(1)*	*O(n)*	*O(1)*	*O(n)*	*O(n)*	*O(1)*
Linked List	*O(n)*	*O(n)*	*O(1)*	*O(1)*	*O(1)*	*O(n)*
Doubly-Linked List	*O(n)*	*O(n)*	*O(1)*	*O(1)*	*O(1)*	*O(1)*
Queue (as Array)	*X*	*X*	*O(1)*	*X*	*O(n)*	*X*
Queue (as LL or DLL)	*X*	*X*	*O(1)*	*X*	*O(1)*	*X*
Stack (as Array, LL, or DLL)	*X*	*X*	*O(1)*	*X*	*X*	*O(1)*
Deque (as DLL)	*X*	*X*	*O(1)*	*O(1)*	*O(1)*	*O(1)*

Fill in Runtime and Memory:

The answers for Dictionary have been provided; you should fill in the rest:

Data Structure	***Get***	***Add***	***Delete***	***Iterate***	***Memory***
Dictionary (Hash Map)	*O(1)*	*O(1)*	*O(1)*	*O(n)*	*medium*
Set (Hash Map)	*O(1)*	*O(1)*	*O(1)*	*O(n)*	*medium*
Binary Search Tree	*O(log n)*	*O(n)*	*O(n)*	*O(1)*	*low*
Tree	*O(n)*	*O(1)*	*O(1)*	*O(1)*	*low*

Sorting

1. Describe in words how the Bubble Sort algorithm works. $O(n^2)$

Compare each pair of side by side elements from the beginning of an array and, if they are in reversed order, swap them. Recursively or iteratively depending on your nature run until all elements of the array have been sorted.

2. Describe in words how the Merge Sort algorithm works.

The merge sort uses a divide and conquer methodology. The base case for this type of recursive sort is an array with a single element. An array with a single element is always 'sorted'. By recursively sorting the subarrays into the code can then compare the next element as it works it's way back up.

3. Describe in words how the Quick Sort algorithm works. O(nlogn)

The quick sort can be implemented to either choose a random or a deliberately chosen item from the array to be the pivot. From here items of the array are compared to the pivot and if the items is less than the pivot it is moved in the left portion of the array and if greater then moved to the right part of the array.

Git Branching

1. Give an instance when you would use git branching.

When adding features it is best to brach the feature into its' own line in order to preserve the main branch from any unnecessary build issues. Branches are also useful for the purpose of a deploy in need of a bug fix. The main code line may have further feature enhancements or other development going on that would make integration difficult. Therefore it is often the case where a bug fix might be applied to a specific deploy branch and then merged down into the main line a time to be determined by project management.

2. What is a pull request?

A ‘pull’ request is very similar to a request for code review. It tells a team member that you have code in your branch that you would like to be merged into ‘some other branch’ and before doing so they need to review it and merge it into the branch.