CSI-155 Review material

1. Interface, polymorphism

What is an interface?

State what happens when a class inherits an interface

Define an interface IPicture that defines two methods:

Public Image GetImage that takes an image filename as parameter and returns an Image object

Public string GetDescription() that returns some description about the particular animal.

Define a class Lion that implements the IPicture interface. This class should define a fields \_filename and \_description, which get initialized in the constructor with a filename that contain a picture of a Lion.

Define a second class Elephant that also inherits from IPicture  
Define a third class Whale that also inherits from IPicture.

In Form1 add picturebox, ritchTextbox and 3 buttons to create a Lion, Elephant and Whale objects, then call their respective methods GetImage, and GetDescription and display the respective object..

Recursion

What is a recursive method. What are the two things you have to have to create a recursive method.

Write a method that takes an array and returns the average value of all the elements in the array using the normal approach (for loop)

Write a similar method that uses recursion.

Array implementations

1. Write a method that takes an unsorted array and returns the maximum (or largest) value
2. Given a sorted array of some size n. Find number of elements which are less than or equal to a given element. (this is a method that takes a sorted array an a value, then return the number of elements <= to the value)
3. Given two unsorted arrays arr1[] and arr2[]. They may contain duplicates. For each element in arr1[] count elements less than or equal to it in array arr2[].

Examples:

Input : arr1[] = [1, 2, 3, 4, 7, 9]

arr2[] = [0, 1, 2, 1, 1, 4]

Output : [4, 5, 5, 6, 6, 6]

Input : arr1[] = [5, 10, 2, 6, 1, 8, 6, 12]

arr2[] = [6, 5, 11, 4, 2, 3, 7]

Output : [4, 6, 1, 5, 0, 6, 5, 7]

1. Given an unsorted array if even length, rearrange the array such that number at the odd index is greater than the number at the previous even index.
2. Binary search:

Given the sorted array {5, 9, 15, 23, 29, 35, 38, 45, 49, 51}

How many cycles or loops would it take to find the value 49

How many cycles or loops would it take to find the value 9

1. Given a class Student name, id , grades (list of grades) for simplicity you may make them public. Add a method GetAverageGrade to return the average of all the grades of that student.

In Form1: create a Dictionary of Student

Add 10 students to it, each with 5 grades

Define a method Display that takes a Dictionary<Student> and   
 displays all the students in the dictionary to a listview  
 Have a button ‘DisplayAllStudents’ that calls the method

Define a method GetStudentById that takes the id of a student  
 and return the student or null if not found  
 Have a button that gets the id from user, calls the method and   
 display the result

Define a method RemoveStudentById that takes the id of a student  
 and returns true if it was able to remove the student or false otherwise.  
 Have a button that gets the id from user, calls the method and display  
 the result

Provide GUI to add a new grade to the selected student (in the   
 listview)

Provide GUI to change the lowest grade by adding 10 points to it  
 without exceeding a 100

1. Queue: write a method that takes a queue, then removes the last item only while maintaining the rest in the queue in the same order they were before. Do that in a method and do not use any additional queue or collection
2. Stack: write a method that takes a stack, then removes the first item added (item at the bottom of the stack) while maintaing the rest of the item in their original positions. You may need additional collection to help with the implementation
3. Define a method that takes a queue and returns a stack. The stack should contain the same data as the queue and in the same order. That is the element at the top of the stack should be the first element in the queue
4. Define a method “CopyDictionary” that takes a Dictionary<student> and returns another dictionary with same data
5. Define a method ‘CopyToQueue’ that takes a Dictionary<student> and returns a Queue<Student>. This method is to remove every student from the dictionary and add to the queue.
6. Add a button that calls the CopyDictionary, then calls the CopyToQueue by passing it the dictionary returned from CopyDictionary. Then displays the returned queue.