Session 15 Lab Exercises – Searching and Sorting Algorithms

Lab 01 – Linear Search

1. Open VS 2015 - Create a new console project in C#.

2. Open the Program.Main() and create an Array of ten different integers.

3. Create a method called *LinearSearchOfInt( )* to sort the numbers in the array in ascending order (NOTE do not use the Array. Sort()) to do this.

4. Run the console app to test if the output is correct

5. Modify the algorithm to order the items in the array in descending order.

Lab 02 – Linear Search

1. Open VS 2015 -Create a new console project in C#

2. Open the Program.Main() and create an Array of cities as strings and populate the array with some capital cities.

3. Create a method called *LinearSearchOfCities ()* to sort the cities in the array in ascending order (NOTE do not use the Array. Sort ()) to do this.

4. Run the console app to test if the output is correct

5. Modify the algorithm to order the cities in descending order.

Lab 03 – Binary Search

1. Using the project you created in Lab 01, make the following changes.

2. Add another method called *BinarySearchOfInt( )*

3. Add the following code to this that will sort the array on integers in ascending order using a Binary sort.
   (NOTE for a Binary Sort to work, the array needs to be sorted first)

4. Test the method by calling it in the Program.Main(...)

```csharp
private static void BinarySearchOfInt()
{
    Console.WriteLine("Number of elements in the array ?");
    string elements = Console.ReadLine();
    int numElements = int.Parse(elements);
    int[] array = new int[numElements];
    Console.WriteLine("-----------------------");
    Console.WriteLine(" Enter array elements ");
    Console.WriteLine("-----------------------");
    for (int i = 0; i < numElements; i++)
    {
        string s1 = Console.ReadLine();
        array[i] = int.Parse(s1);
    }
    Console.WriteLine("--------------------");
    Console.WriteLine("Enter Search element");
    Console.WriteLine("--------------------");
    int searchElement = int.Parse(Console.ReadLine());
    int min = 0;
    int N = array.Length;
    int max = N - 1;
    do
    {
        int mid = (min + max) / 2;
        if (searchElement > array[mid])
            min = mid + 1;
        else
            max = mid - 1;
        if (array[mid] == searchElement)
        {
            Console.WriteLine("Search ELement found at index: " + mid);
            break;
        }
        if (min > max)
            break;
    } while (min <= max);
    Console.WriteLine("Search Element NOT found");
    Console.ReadLine();
}
```

Lab 04 – Bubble Sort

1. Open a new C# Console project in VS 2015
2. In the Program.Main(..) create an array Scores of ten different integers.
3. Create a method called BubbleSortOfInt (see below)
4. Add the following code to this method that sorts the array of integers in ascending order:

```csharp
private static void BubbleSortOfInt(int[] scores)
{
    int t;
    Console.WriteLine("The Array is : ");

    for (int i = 0; i < scores.Length; i++)
    {
        Console.WriteLine(scores[i]);
    }

    for (int j = 0; j <= scores.Length - 2; j++)
    {
        for (int i = 0; i <= scores.Length - 2; i++)
        {
            if (scores[i] > scores[i + 1])
            {
                t = scores[i + 1];
                scores[i + 1] = scores[i];
                scores[i] = t;
            }
        }
    }// end for
}// end BubbleSortOfInt()
```

5. Call this method in the Program.Main(..) and add the following code to display the sorted array.

```csharp
static void Main(string[] args)
{
    int[] scores = { 3, 2, 5, 4, 1, 8, 6, 0, 9, 10 };

    BubbleSortOfInt(scores);
    Console.WriteLine("The Sorted Array :");

    foreach (int score in scores)
    {
        Console.Write(score + " ");
    }

    Console.ReadLine();
}
```

6. Create a new method called BubbleSortOfInt_Desc (int[] scores) to sort the array in descending order.
7. Call this method in the Program.Main() to test if it works

Lab 05 – Selection Sort

1. Using the above project, create a new methods called SelectionSortOfInt(int [] scores)
2. Add the following code to this method:

```csharp
private static void SelectionSortOfInt(int[] scores)
{
    Console.WriteLine("The Array Before Selection Sort is: ");
    for (int i = 0; i < scores.Length; i++)
    {
        Console.WriteLine(scores[i]);
    }

    int tmp, min_key;

    for (int j = 0; j < scores.Length - 1; j++)
    {
        min_key = j;

        for (int k = j + 1; k < scores.Length; k++)
        {
            if (scores[k] < scores[min_key])
            {
                min_key = k;
            }
        }

        tmp = scores[min_key];
        scores[min_key] = scores[j];
        scores[j] = tmp;
    }//end for
}// end SelectionSortOfInt
```

3. Call this method in the Program to test if the sorting worked.

Lab 06 – Sorting strings

1. Create a new C# console project in VS 2015
2. Create a method BubbleSortOfCities (string[] cities) that can sort an array of cities in ascending alpha order.
3. Create another method called SelectionSortOfInt(string [] cities) that can sort the same array of cities in descending alpha order

4. Test both methods in the Program.Main(..) by creating an array of cities by calling both methods and passing this array of cities as a parameter.