

Project 1

CSE 619 -50

Ryan English

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How to run code

Code is written in C# Console application

Assuming Visual Studio 2019 is installed!

Download *619_Project1.csproj* and *Program.cs* into a folder

Double click *619_Project1.csproj*

This will open Visual Studio

Click Start or Press F5

View output

Code for ease

```
/// <summary>
/// Sorts an array using insertion sort with a sequential
/// search on the array.
/// </summary>
/// <param name="array">The array that is being sorted</param>
public static void InsertionSortSequential(int[] array)
{
    int position = 1;
    while (position < array.Length) {
        int sub_position = position;
        // Walk backwards looking for the position
        while (sub_position > 0 && array[sub_position - 1] > array[sub_position])
        {
            // Swap the slots
            int num = array[sub_position - 1];
            array[sub_position - 1] = array[sub_position];
            array[sub_position] = num;
            sub_position -= 1;
        }
        position += 1;
    }
}
```

```

/// <summary>
/// Sorts an array using insertion sort with a binary
/// search on the sorted portion of the array
/// </summary>
/// <param name="array">The array that is being sorted</param>
public static void InsertionSortBinary(int[] array)
{
    int position = 1;
    while (position < array.Length) {
        int sub_position = position;

        int low_position = 0;
        int mid_position = 0;
        int high_position = sub_position;

        int found_position = -1;

        while (low_position <= high_position) {
            // Set the mid point
            mid_position = (high_position + low_position) / 2;
            if (array[sub_position] > array[mid_position]) {
                low_position = mid_position + 1;
            } else if (array[sub_position] < array[mid_position]) {
                high_position = mid_position - 1;
            } else {
                found_position = mid_position;
                break;
            }
        }

        if (found_position == -1) {
            // Position was not found it is low
            found_position = low_position;
        }

        // Everything needs to move
        int num = array[sub_position];
        for(int i = sub_position; i > found_position; i--) {
            array[i] = array[i - 1];
        }
        array[found_position] = num;

        position += 1;
    }
}

```

Code Output

Microsoft Visual Studio Debug Console

Length of Dataset	Sequential	Binary
1000	5.7912ms	1.2624ms
2000	10.9183ms	4.0923ms
3000	22.465600000000002ms	9.418ms
4000	42.4011ms	18.518099999999997ms
5000	73.85589999999999ms	32.187599999999996ms
6000	118.3732ms	52.202999999999996ms
7000	176.81189999999998ms	79.0761ms
8000	256.6058ms	114.3528ms
9000	354.7262ms	159.527ms
10000	478.6631ms	217.87449999999998ms
11000	646.0951ms	283.3306ms
12000	817.7764999999999ms	360.6807ms
13000	1019.6558ms	451.5179ms
14000	1256.686ms	560.2472ms
15000	1528.3272ms	682.8808ms

Output Graph

