1. **Understanding Bubble Sort**

Suppose that we have an array with 5 elements that is declared and initialized as follows:

```
Dim numbers ( 0 to 4 ) as Integer
numbers(0) = 24
numbers(1) = 81
numbers(2) = 23
numbers(3) = 18
numbers(4) = 32
```

Suppose that this program also has the following bubble sort:

```
Dim i, j, temp as Integer

For i = 0 To 3   // if array has n elements, number of passes is n-1
   For j = 0 To (3 – i)  // number of comparisons
            If numbers(j) > numbers ( j + 1) Then
                    temp = numbers( j )
                    numbers ( j ) = numbers ( j + 1)
                    numbers ( j + 1) = temp
            End If
      Next
   Next
```

Show the order of these array elements after the first, second and third passes of the **bubble sort algorithm.**

	Initial value	After 1st pass (i=0)	After 2nd pass (i=1)	After 3rd pass (i=2)
numbers(0)				
numbers(1)				
numbers(2)				
numbers(3)				
numbers(4)				

3. Extending the Student Record program to sort students by GPA

a. In this lab, we will continue our running example of the student records data. To work on this program again, copy your Student Records program from the H: drive to the C: drive.

b. To the form, add a button for sorting and a multi-line TextBox to show the result.

     There are many objects on the form. Add to the bottom of the form:

    |__Sort Students by GPA:__|
          Result: (TextBox or label with room for 9 lines)
                                        |_Close_|

c. To add code to the program for this button, use the example from the Student Records program on the web page. Start with the code that sorts students by height.

Modify your button code to sort students by the value of their gpa, instead of height. What do you have to change?

d. Test your program. Do the results look correct?

To complete this lab, hand in the lab sheet and printed program. If your code contains Monday's program, you don't have to hand them both in.

*****************   **At the end of lab**   ********************

Go to the C: drive where you put your folder with your name. Copy and paste this entire folder to the H: drive under your IST256 projects.

***************   **Don't forget to save your work!**   ***************