**Lab Report: Debugging Buggy Search and Sort**

**1. Bug in the contains method:**

**Description:** The **contains** method has an issue where it prematurely returns false after checking the first element in the array, regardless of whether it matches the given value.

**Fix:** Removed the **return false;** statement outside the loop to ensure that the entire array is checked before concluding that the value is not present.

**Debugger Usage:** Set a breakpoint at the beginning of the method, inspected the variable values during execution, and observed that the method returned false prematurely.

**2. Bug in the bubble Sort method:**

**Description:** In the **bubble Sort** method, there is an error in the inner loop condition. The loop variable **j** should be incremented, not **i**.

**Fix:** Corrected the inner loop condition to **for (int j = 0; j < array.length - 1; j++)**.

**Debugger Usage:** Set breakpoints inside the **bubble Sort** method, observed the program flow, and noticed that it entered into an infinite loop due to the incorrect inner loop condition.

**3. Bug in the selection Sort method:**

**Description:** In the **selection Sort** method, there is an error in the inner loop condition. It incorrectly refers to **array[1]** instead of the loop variable **i**.

**Fix:** Corrected the inner loop condition to **if (array[i] > array[positionOfMax])**.

**Debugger Usage:** Set breakpoints inside the **selection Sort** method, inspected the variable values, and identified that the selection of the maximum element was not working as expected.

**4. Bug in the insertion Sort method:**

**Description:** In the **insertion Sort** method, there was a condition in the **while** loop that caused an **ArrayIndexOutOfBoundsException**. The condition **pos > 0** was corrected to **pos >= 0**.

**Fix:** Corrected the condition to **while (pos >= 0 && array[pos] > temp)**.

Modified the assignment statement inside the loop from **array[pos] = temp;** to **array[pos + 1] = temp;** to properly place the **temp** variable into the last vacated position.

**Debugger Usage:** Set breakpoints inside the **insertion Sort** method, stepped through the code, and noticed the index error during the loop execution.

Set breakpoints inside the **insertion Sort** method, stepped through the code, and noticed the index error during the loop execution. The correction involved ensuring that the correct position (**pos + 1**) was used for placing the temporary variable.

**The End**