CS1010J Programming Methodology
Tutorial 6: Searching and Sorting

> Learning is not compulsory…
> neither is survival.
> *~ W. Edwards Deming*

To students:

Welcome back! We hope that you have made good use of the one-week recess to revise on the topics covered so far. Now we are moving on to a new phase, one that focuses more on **logical thinking** and **problem solving**. Practice makes perfect!

I. Manual tracing

1. You are given the following sorted array:

```
int[] list = {7, 13, 20, 38, 44, 52, 88, 89, 90, 92};
```

For each of the following search keys, trace the change of variables *low*, *high* and *mid* using the binary search algorithm (refer to Week 8 lecture notes page 14 for an example). How many key comparisons are needed for each search key?

(a) **44**
(b) **90**
(c) **20**
(d) **93**

2. [CS1010 AY2011/2012 Semester 2 Exam, Q2b]

As mentioned in class, the Bubble Sort algorithm can be enhanced. If you detect no swap in a pass, it implies that the array is already sorted by then.

Given an array of integers:

```
int[] arr = {1, 3, 6, 5, 2, 4, 7};
```

We use the following enhanced bubble sort algorithm to sort the data in the array. Show the contents of the array **arr** at the end of each pass.

```
public static void bubble_sort_enhanced(int arr[]) {

  int temp;
  boolean done = false;

  for (int end = arr.length-1; end>0 && !done; end--) {
    done = true;
    for (int i = 0; i < end; i++) {
      if (arr[i] > arr[i+1]) {
        temp = arr[i];
        arr[i] = arr[i+1];
```

```
            arr[i+1] = temp;
            done = false;
          }
        } // end inner for
      } // end outer for
}
```

3. The running time of the enhanced Bubble Sort algorithm as shown in Q2 above is sensitive of the initial order of the data in the array. When does the best case occur? When does the worst case occur?

II. Programming

4. **[Problem Set 3 Exercise #09] Find Pair**

5. **[Problem Set 3 Exercise #10] Find Tuple**

6. **[Problem Set 3 Exercise #17] Sort Three Digits**

7. **[Problem Set 3 Exercise #18] Certificate of Entitlement**