CS1010J Programming Methodology
Tutorial 5: Arrays

> That is what learning is. You suddenly understand something you've understood all your life, but in a new way.
>
> ~ *Doris Lessing*

I. Manual tracing

A bunch of data structures (to be introduced in CS2040) are implemented using arrays to store and expand their data. Thus arrays are massively used in programming, as they provide a very fast and easy way to store and access large amount of data.

1. What's wrong with the following program?

```
class T5Q1 {

  public static void main(String[] args) {

    double[] arr = { 1.1, 2.2, 3.3, 4.4 };

    for (int i = 0; i <= 4; i++) {
      System.out.print(arr[i] + " ");
    }

    System.out.println();
  }
}
```

2. Trace the following program manually and write down the output.

```
import java.util.Arrays;

class T5Q2 {

  public static void main(String[] args) {

    int[] numbers = { 2, 1, 3, 0, 4 };
    process(numbers);
    System.out.println( Arrays.toString(numbers) );
  }

  public static void process(int[] arr) {

    for (int i = 0; i < arr.length; i++) {
      arr[i] = arr[arr[i]];
    }
  }
}
```

3. [CG1101 AY2011/2012 Semester 1 Exam, Q1e]

   Trace the following program manually and write down the output.

```
import java.util.Arrays;

class T5Q3 {

  public static void main(String[] args) {

    int[] arr = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 };

    arr[0] = method(arr, 0, 9);
    arr[1] = method(arr, 1, 2);

    System.out.println( Arrays.toString(arr) );
  }

  public static int method(int[] arr, int x, int y) {

    int temp = arr[y];
    arr[y] = arr[x];
    return temp;
  }
}
```

4. Trace the following program manually and write down the output.

```
import java.util.Arrays;

class T5Q4 {

  public static void main(String[] args) {

    int[] list = { 11, 22, 33, 44, 55 };

    System.out.print("Original array: ");
    System.out.println( Arrays.toString(list) );

    passElement(list[0]);
    System.out.print("After passing one element: ");
    System.out.println( Arrays.toString(list) );

    changeElements(list);
    System.out.print("After passing whole array: ");
    System.out.println( Arrays.toString(list) );
  }

  public static void passElement(int num) {
    num = 1234;
  }

  public static void changeElements(int[] mylist) {
    mylist[0] = 66;
  }
}
```

5. [CS1010 AY2011/2012 Semester 1 Midterm Test, Q16]

   Consider the following method.

```
public static boolean doSomething(int[] arr) {

  for (int i = 0; i < arr.length; i++) {
    for (int j = 0; j < arr.length; j++) {
      if (i != j && arr[i] == arr[j]) {
        return true;
      }
    }
  }
  return false;
}
```

   (a) Describe the purpose of the above method? Keep your answer concise.

   (b) Write an improved version of the method to make it more efficient.

II. Programming

6. **[Problem Set 3 Exercise #01] Non Negative**

7. **[Problem Set 3 Exercise #02] Is Array Sorted?**

8. **[Problem Set 3 Exercise #06] Positive Numbers First**