CS211: Algorithms & Data structures

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1 Laboratory Objectives:

- To practise Time Complexity measuring using primitve operations count method.
- To give some sample of best-case, average-case, and worst-case

2 Exercises

We will take the problems of sum, maximum numbers, and the addition of two matrices. Time complexity analysis based on primitive operations will be required for each problem.

1. Measure the time complexity of the following Java program using operation count method?

Listing 1: GCD

```
// Hello.java
public static int sum(int[] arr){
    int s=0;
    for(int i=0;i<a.length;i++)
    {
        s+=a[i];
    }
    return s;
}
```

2. What is the time complexity of the following algorithm, use basic operations count?

Algorithm 1: Finding the maximum number of three numbers

Input:a, b, and c, are three numbers
Output: max, the maximum number

1: $max \leftarrow a$
2: **if** $b > max$ **then**
3: $\quad max \leftarrow b$
4: **end if**
5: **if** $c > max$ **then**
6: $\quad max \leftarrow c$
7: **end if**
8: **return** max

3. What is the time complexity of the following Java code, use basic operations count?

Listing 2: GCD

```
public static int[][] add(int[][] a, int[][] b) {
   int row = a.length;
     int column = a[0].length;
     int[][] c = new int[row][column];

     for (int i = 0; i < row; i++) {
         for (int j = 0; j < column; j++) {
             c[i][j] = a[i][j] + b[i][j];
         }
     }
     return c;
 }
```