Homework 1
(Max 100 points)

Programming Code Submission:

1. Sample output:
   <Include screen shots including compile>

2. Source code:
   <Include the program source code in Java or C/C++. Colored text with syntax highlighting is better>

*** If there are no screenshots and below score-sheet, your programming assignment will be zero.**

Programming Assignment Part Check Item		
I have done _____%	Total 50%	Submit this score-sheet to instructor for your grading.
	10% 30% 5% 5%	Part 1. Check compile error Part 2. Check runtime error (Run program correctly) Part 3. Check a Readme file (How to compile and run your program and testing) Part 4. Check comments for your codes

EXERCISE:

1. (35 Points) Order the following functions by growth rate:
   - N
   - $\sqrt{N}$
   - N^2
   - N log N
   - N $\log^2$ N
   - N log(N^2)

- 2/N
- 2^N
- $2^{N/2}$
- 37
- $N^2 \log N$
- N^3

Indicate which functions grow at the same rate.

2. (15 Points) Give an analysis of the running time with Big-Oh notation

```
(1) sum = 0;
      for( i = 0; i < n; ++i )
            ++sum;

(2) sum = 0;
      for( i = 0; i < n; ++i )
            for( j = 0; j < n; ++j )
                  ++sum;
 (3) sum = 0;
     for( i = 0; i < n; ++i )
            for( j = 0; j < n * n; ++j )
                  ++sum;
(4) sum = 0;
     for( i = 1; i < n; ++i )
            for( j = 1; j < i * i; ++j )
                  if (j % i == 0)
                        for( k = 0; k < j; ++k )
                              ++sum;
```

3. (50 Points) **Programming Assignment**: Textbook page 71 Exercise 2.7
   For each of the following three program fragments: Implement the code in the language of your choice, and give the running time for several values of N. (ex, N=10, 100, 1,000, 10,000, 100,000, 1,000,000)

```
(1) sum = 0;
      for( i = 0; i < n; ++i )
            ++sum;

(2) sum = 0;
      for( i = 0; i < n; ++i )
            for( j = 0; j < n; ++j )
                  ++sum;
```

```
(3) sum = 0;
    for( i = 0; i < n; ++i )
        for( j = 0; j < n * n; ++j )
            ++sum;
(4) sum = 0;
    for( i = 1; i < n; ++i )
        for( j = 1; j < i * i; ++j )
            if (j % i == 0)
                for( k = 0; k < j; ++k )
                    ++sum;
```