

# CS-302

## Object Oriented Design

### Lab 3

For **each** of the following **10 Java code fragments**, do the following:

- Give a **Big-Oh** analysis of the run time.
- Code the fragment in a Java program.
- Add code to display the value of **sum** and compute a rough estimate of the run time in **milliseconds** as follows:

```
long startTime, stopTime, runTime;

startTime = System.currentTimeMillis();

// fragment code goes here

stopTime = System.currentTimeMillis();
runtime = stopTime - startTime;
System.out.println("\n\nRun Time: " + runTime + " milliseconds");
System.out.println("\nsum = " + sum);
```

- Test **each** fragment with different values of **n**. (Note: If the fragment is very efficient the displayed run times may be **0** for small values of **n**.)
- Record your data in the table shown below.

For all fragments assume that variable **n** has been initialized to a test value. If code fragments are very efficient, values of **n** can be *extremely* large (especially for logarithmic). If code fragments are inefficient, values of **n** will have to be small (only up to a few thousand). Note that all integer variables are declared as type **long**.

```
// Code Fragment 1
long sum = 0;
for( long i = 0; i < n; i++)
    sum++;
```

```
// Code Fragment 2
long sum = 0;
for( long i = 0; i < n; i = i + 2)
    sum++;
```

```
// Code Fragment 3
long sum = 0;
for( long i = 0; i < n; i++)
    for (long j = 0; j < n; j++)
        sum++;
```

```
// Code Fragment 4
long sum = 0;
for( long i = 0; i < n; i++)
    sum++;
for (long j = 0; j < n; j++)
    sum++;
```

```
// Code Fragment 5  
long sum = 0;  
for( long i = 0; i < n; i++)  
    for (long j = 0; j < n * n; j++)  
        sum++;
```

```
// Code Fragment 6  
long sum = 0;  
for( long i = 0; i < n; i++)  
    for (long j = 0; j < i; j++)  
        sum++;
```

```
// Code Fragment 7  
long sum = 0;  
for( long i = 0; i < n; i++)  
    for (long j = 0; j < n * n; j++)  
        for (long k = 0; k < j; k++)  
            sum++;
```

```
// Code Fragment 8  
long sum = 0;  
for( long i = 1; i < n; i = i * 2)  
    sum++;
```

```
// Code Fragment 9  
long sum = 0;  
for( long i = 1; i < n; i = i * 2)  
    for (long j = 0; j < n; j++)  
        sum++;
```

```
// Code Fragment 10  
long sum = 0;  
for( long i = 1; i <= n; i++)  
    for( long j = 1; j < i * i; j++)  
        if (j % i == 0)  
            for( long k = 0; k < j; k++)  
                sum++;
```

| <b>Code Fragment</b>    | <b>Big-Oh Analysis</b> | <b>N</b> | <b>Displayed Value of sum</b> | <b>Displayed Run Time in Milliseconds</b> |
|-------------------------|------------------------|----------|-------------------------------|---|
| <b>Code Fragment 1</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 2</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 3</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 4</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 5</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 6</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 7</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 8</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 9</b>  |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |
| <b>Code Fragment 10</b> |                        |          |                               |   |
|                         |                        |          |                               |   |
|                         |                        |          |                               |   |