# **CS1010J Programming Methodology** Tutorial 3: Repetition Statements

People learn something every day, and a lot of times it's that what they learned the day before was wrong.

~ Bill Vaughan

#### To students:

Two weeks of tutorials have passed and hence we have removed the usual preamble, since you should already know what is expected of you by now.

### I. Manual tracing

1. Consider the following program.

```
import java.util.*;

class T3Q1 {

  public static void main(String[] args) {

    Scanner sc = new Scanner(System.in);
    System.out.print("Enter n: ");
    int n = sc.nextInt();

  int i = 1, count = 0;
    while (i < n) {
        if (n%i == 0) {
            count++;
        }
        i++;
    }

    System.out.println("count = " + count);
    }
}</pre>
```

- (a) Assuming that the user enters 20, what is the final value of **count**?
- (b) Assuming that the user always enters a positive number, describe the purpose of this program.
- (c) If the final value of **count** is 1, what can be said about the input value **n**?

(d) Knowing what this program does, could you change the 'while' condition to make the program work a little more efficiently (i.e., take fewer iterations to compute the answer)?

2. Manually trace each of the following code fragments and write down its output.

(a)

```
int product = 0;
for (int i = 1; i < 10; i++) {
   product *= i;
}
System.out.println("product = " + product);</pre>
```

(b)

```
int sum = 0;
for (int i = 1; i < 1000; i *= 2) {
   sum += i;
}
System.out.println("sum = " + sum);</pre>
```

(c)

```
int count = 0;
for (int x = 1; x <= 6; x++) {
   for (int y = x + 1; y <= 6; y++) {
      count++;
   }
}
System.out.println("count = " + count);</pre>
```

## **II. Programming**

#### 3. Conversion of loop constructs

You have learned 3 loop constructs: **for, while** and **do-while**. For each of the following parts, a particular loop construct is used. Rewrite the loop construct using the other loop construct (<u>without</u> adding any **if-else** statement).

(a) Turn the following **do-while** loop into **for** loop.

```
int sum = 0, i = -5;

do {
   sum += i;
   i += 5;
} while (i < 100);

System.out.println("sum = " + sum);</pre>
```

(b) Turn the following **while** loop into **do-while** loop. Can you describe what the code fragment does?

```
Scanner sc = new Scanner(System.in);
System.out.print("Enter n: ");
int n = sc.nextInt();
while (n < 0) {
   System.out.print("Enter n: ");
   n = sc.nextInt();
}
System.out.println("n = " + n);</pre>
```

#### 4. [Problem Set 2 Exercise #02] Count Positive Integers

Write a program **PS2\_02\_CountPositive.java** to read 5 integers from user input and count how many of them are positive.

```
Enter 5 integers: 2 5 7 0 3
Count = 4
```

```
Enter 5 integers: 0 -1 0 -3 -2 Count = 0
```

- 5. Programming with loops
  - (a) Write a method int sumUpMultiplesOf5 (int n) to sum the first n positive multiples of 5. For example, if n is 4, then it computes 5 + 10 + 15 + 20 = 50.

```
Enter n: 4
Sum = 50
```

```
Enter n: 10
Sum = 275
```

#### Answer:

public static int sumUpMultiplesOf5(int n) {

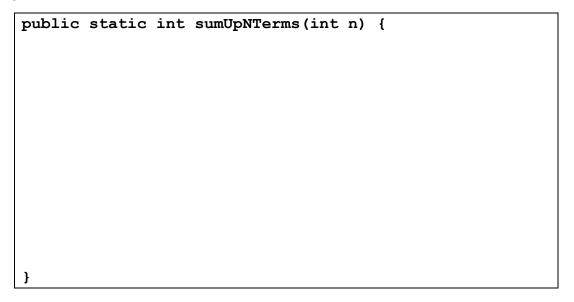
(b) Write a method int sumUpNTerms (int n) to sum the first n terms of this series:

$$1 + 3 + 7 + 15 + 31 + \dots (2^{i} - 1) + \dots$$

For example, if n is 4 then it computes 1 + 3 + 7 + 15 = 26.

Enter n: **10** Sum = 2036

#### Answer:



6. [Problem Set 2 Exercise #10] Collatz Problem