

EEE 210: Software Engineering

Lab 2 Exercises for Week 3 (22 Jan. – 28 Jan.), Spring 2018

Note:

- Project folder nomenclature: Lab2_yourname
- After completion, zip your project folder and upload it to your Moodle account.
- Any queries during the lab should be discussed merely with the Instructor/TA.
- The output of each exercise you complete should be included (as screenshots) in the report named Report1_yourname. **Print and submit your report to the TA by the specified deadline.**

Exercise 1:

Implement the Euclidean algorithm to find the greatest common divisor (GCD) of two positive integers. The formal description of the algorithm is given below:

Input Two positive integers, a and b .

Output The greatest common divisor of a and b .

Internal computation:

1. If $a < b$, exchange a and b .
2. Divide a by b and get the remainder r . If $r = 0$, report b as the GCD of a and b .
3. Replace a by b and replace b by r . Return to the previous step.

The output should look as follows:

```
Enter two integer numbers: 99 6
GCD of 99 and 6: 3
```

Exercise 2:

To explain the geometric growth of a population of rabbits, the Italian mathematician Leonardo Fibonacci devised a mathematical sequence called the Fibonacci sequence. Given $Fib(0)$ and $Fib(1)$ are 0 and 1, respectively, write a Java program that displays the sequence, starting from $Fib(0)$ and continuing as long as the terms are less than 10,000. The loop construct you need is a while loop, presumably with a header line that looks like this: `while (term < MAX_TERM_VALUE)`

The output should look as follows:

```
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181 6765
```

(Note that the maximum term value is specified using a named constant)

Exercise 3:

Write a program that computes and displays a right-angled triangular array of natural numbers. It is defined by filling the rows of the triangle with consecutive numbers, starting with a 1 in the top-left corner to some number $x \leq n$, such that the triangular shape is complete.

For instance, if $n = 30$, then $x = 28$ as shown below:

```
Enter a number n: 30
1
2 3
4 5 6
7 8 9 10
11 12 13 14 15
16 17 18 19 20 21
22 23 24 25 26 27 28
```

Exercise 4:

Write a Java program to print the triangles as shown below:

```
Enter height of triangle: 7
Enter two characters to fill in the triangles: # *
```

```
##### *
##### **
##### ***
##### ****
##### *****
#####
#####
#####
#####
```

Exercise 5:

Write a Java program to find the roots of a quadratic equation of the form: $ax^2 + bx + c = 0$. To implement the power and square root functions, use the Math class. The possible outputs should look like below:

```
Quadratic coefficients: 2 5 -3
Discriminant: 49.0
Roots: 0.5, -3.0
```

```
Quadratic coefficients: 3 6 3
Discriminant: 0.0
Only one root!
Root: -1.0
```

```
Quadratic coefficients: 1 2 3
Discriminant: -8.0
It has complex roots!
Roots: -1.0 + 1.4142135623730951i, -1.0 - 1.4142135623730951i
```