Java Programming 2

Final Examination on August 31, 2017

Summer 2017

Department of Computer Science & Information Engineering

National Taiwan University

Problem 1 (30 points) Write a program as follows:

- First generate random integers ranging from −1000 to 1000.

- Then output the greatest product of 3 integers among a set of integers.

Note that it is not necessary to be the product of 3 consecutive integers in the set. Make your solution run faster than the naive approach which runs in $O(n^3)$ time. *Hint: random integer array, sort.*

Problem 2 (30 points) We can estimate π by running a Monte Carlo simulation. Read the following program:

```java
public class MonteCarloPI {
    public static void main(String[] args) {
        int N = 100000;
        int m = 0;
        for (int i = 1; i <= N; i++) {
            double x = Math.random();
            double y = Math.random();
            if (x * x + y * y < 1) m++;
        }
        System.out.println(4.0 * m / n);
    }
}
```

Rewrite the program by using streams with lambdas. You may define the class **Point** for random points in the simulation. *Hint: Monte Carlo, lambda, stream.*

Problem 3 (40 points) Rewrite the program by using Java multithreads. To test your program, try various values of N. Find the optimal number of threads in this machine. *Hint: multithread, runnable, join.*

SUBMISSION

1. Send your source codes to d00922011@ntu.edu.tw with your full Chinese name.

2. Do not attach the executable files.

3. If you have any suggestion for improving this class, feel free to leave your feedback in the e-mail.

Congratulations!!!

"To start, you don't have to be good;
to be good, you have to start."
– Slogan of NTU Toastmasters