Algorithm Design and Analysis

Tutorial 1, 2015

Instruction

- You may work in a group of no more than 3 people
- At the end of the period, each group should show the lecturer answers to the questions below to get the mark
- The total mark for this exercise is 30 marks. This exercise is worth 5% of your final grade

Question 1

Implement a Java class `Lab1Q1.java` containing a method `findMax(int[] arr)` that takes an `int` array as input and output the largest value in the array. The method should be **recursive**. **(5 Marks)**

Question 2

Implement a Java class `Lab1Q2.java` containing a method `euclid(int a,int b)` that takes two `int` numbers `a` and `b` as input and output the greatest common divisor of `a` and `b`. The method should be **recursive**. **(5 Marks)**

Question 3

Implement the program that creates and draws a Sierpinski's triangle taught in class. **(5 Marks)**

Question 4

In each of the following situations, indicate whether $f(n) = O(g(n))$ or $f(n) = \Omega(g(n))$ or $f(n) = \Theta(g(n))$ **(5 Marks)**

	$f(n)$	$g(n)$	$f(n)$ is $O(g(n))$	$f(n)$ is $\Omega(g(n))$	$f(n)$ is $\Theta(g(n))$
(a)	$n \log n + 100$	$n + 200 \log n$			
(b)	$n^2 + n^{1/2}$	$\frac{1}{2}n + (\frac{n}{2})^2$			
(c)	$n \log n^3$	$n(\log n)^2$			
(d)	$2(n+2)(n+1)$	$2 + 4 + 6 + ... + 2n$			
(e)	$2n + \log n$	$2n + 22$			

Question 5

In class you learned four different algorithms for computing the nth Fibonacci number. In this exercise you are required to implement all four algorithms and compare their performance. You need to complete the following :

1. Complete the file `Fibonacci.java` that implements all four algorithms as four different methods. Each method should take a parameter `n` of type `int` and returns the value of the n̂th Fibonacci number.

2. Use `GraphingData.java` to plot the running times against the input size `n` for each algorithm. (this has been done for you in `Fibonacci.java`

(10 Marks)