CSP2348/5243 Data Structures

Tutorial 01: Remedial Mathematics for Algorithms Analysis

Related Objectives from Unit Outline:

- describe the general principles of algorithm complexity and performance.

Objectives:

1. To demonstrate the awareness of the relationship between algorithms and programs by hand-testing Euclid Greatest Common Divisor (*gcd*) algorithm and running a Java implementation of this algorithm;

2. To review or become familiar with basic mathematic topics on powers, logarithms, and arithmetic series summations which are used in algorithm analysis.

Pre-Task:

a) For this set of exercises we assume that you have a basic experience of how to use NetBeans IDE (or other) to develop, compile and run Java programs. However, if you require help you can study the Getting Started Netbeans Tutorial, and/or ask the laboratory tutor for help.
b) Review mathematics (see slides) and then complete the following.

Tasks:

Task 1: Testing Euclid GCD Algorithm

Euclid's *gcd* algorithm is shown on slides 7~8 in the lecture slides in Module 1(i.e., lecture01.ppt). A segment of Java code applying this algorithm is given on slide 9 of slides.

Consider the two sets of paired integers: (12, 18) and (54, 36).

a) Find the *gcd* of these two sets by:
   1. verifying your answers by hand-testing the Euclid *gcd* algorithm;
   2. using the *gcd* Java program in your computer.
b) Discuss the relationship between an algorithm and a program.

Task 2: Computation of powers of a number by different ways

Calculate 2^6 by hand in as many ways as you can find and compare their efficiency in terms of multiplications.

Task 3: *Floor* and *Ceiling* functions in simplifying results from logarithm operations

Apply *floor*() and *ceiling*() functions to $\log_2(56)$. (There are two methods taught in class!).