FIT1045 Algorithmic Problem Solving – Tutorial 8.

Objectives

The **objectives of this tutorial** are:

- To practice recursion.

- To get familiar with stacks.

- To understand and use recursion in various scenarios.

Task 0

Discuss questions about mid-semester test (if any).

Task 1

Compute Factorial:
Use recursion to implement a factorial function, that computes $n!$ for any positive integer n.
Is it possible to implement this module using a stack?

Task 2

Euclid's algorithm:
Write an algorithm to compute the greatest common divisor (gcd) of two non-negative integers. An introduction to Euclid's algorithm is available at `https://en.wikipedia.org/wiki/Euclidean_algorithm`. Write this algorithm using recursion. Compare your recursive version with the non-recursive version.

Task 3

Root Finding Algorithm:
Write down a recursive algorithm to find a root of a continuous function $f(x)$ in a given interval $[a, b]$. Specify any assumptions required.

Task 4

Pascal Triangle:
For a given integer K, print the first K rows of Pascal's Triangle. Print each row with each value separated by a single space. The value at the nth row and r^{th} column of the triangle is equal to $n!/(r!(n-r)!)$ where indexing starts from 0. These values are the binomial coefficients.

Puzzle of the week: Smart Student

The Faculty of IT of Monash University arranged a get together for all its first year undergraduate students. The students can enter the hall at any time. While entering the room, every student was supposed to give a number. The number is stored along with the student's ID in a stack. Once they leave the room their entry is removed from the stack if it is at the top of the stack. The head of FIT anounced if any student can devise an algorithm such that (s)he can tell the biggest number in the stack at any instance of time, then (s)he will all get **"HD"** in FIT1045[1]. The constraint is that the student has to answer it in one lookup of the stack. Some smart students come up with a plan that meets the given condition. What is the plan?

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[1]Caveat: No student solving this puzzle will be given an HD unless they achieve marks warranting one