# Lab Assignment 5

CS 301 – Data Structures

Finally not a linked list

## Problem 1

Your are given the root node of a binary tree $T$. We distinguish between three types of nodes in $T$: nodes with 0 children (i. e., leaves), nodes with 1 child, and nodes with two children. Determine for each type the total number of nodes in $T$. Return your result as an integer array of length 3.

## Problem 2

Your are given the root node $r$ of a binary tree $T$. Determine the largest distance from $r$ to a leaf. The distance between a node $x$ and one of its descendants $y$ is the number of edges that are between $x$ and $y$. For example, the distance from $x$ to itself is $0$, the distance from $x$ to its children is $1$, and so on.

## Implementation

You are given a file *Lab5.java* (which you can download from canvas). The file contains a class `Lab5` with the two functions `problem1` and `problem2`. Implement your solutions in the corresponding functions. **Do not make any changes outside of these two functions (e. g. by adding helper functions); such changes will be undone.** Do not output anything to the terminal.

The program already implemented in the file *Lab5.java* randomly generates test cases. This file contains a small number of test cases. The seed of the random number generator is set to ensure the same test cases whenever to program is executed. Note that the purpose of the tests is for you to avoid major mistakes. **Passing all given tests *does not* imply that your algorithm is correct, especially that is has the expected runtime.**

## Submission

For your submission, upload the file *Lab5.java* with your implementation to canvas.

This is an individual assignment. Therefore, a submission is required from each student.

**Deadline:** Check Canvas.