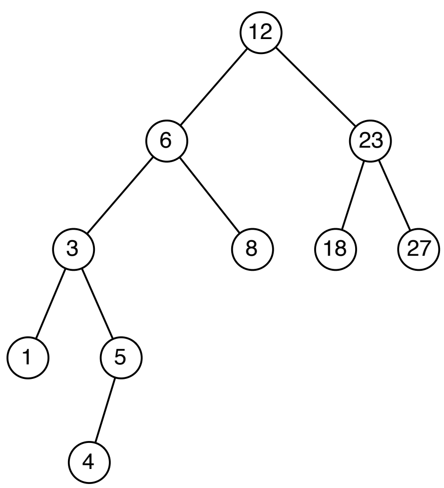
Group work/Exercise class The exercises on this week plan is for the exercise class in Week 1 at 8:00, i.e., before the first lecture. You can go to any of the exercise rooms. English speaking students should go to room H-071.

Lecture At the lecture we will talk about two different kind of balanced search trees: red-black trees and 2-3-4 trees. You should read page 572–585 in "Algorithms in Java" by Sedgewick (can be found on Campusnet) and CLRS chapter 13. It is a good idea to read about 2-3-4 trees in "Algorithms in Java" before you read about red-black trees in CLRS.

If you don't remember binary search trees, you should also read CLRS chapter 12 (*before* the lecture).

Exercises

Binary search trees 1 Show how the binary search tree below looks after each of the following operations: insert an element with key 7, delete the element with key 12, delete the element with key 5.



Binary search trees 2

- Solve exercise CLRS 12.2-4.
- Show that if a node x in a binary search tree has two children, then its successor is the minimum element in its right subtree. (The successor of node x is the node with smallest key greater than x.`key`.)

Subsequence A string P is a *subsequence* of string T if we can obtain P from T by removing 0 or more characters in T. For instance, `aba` is a subsequence of `bcadfbbba`.

1. Give a linear time algorithm that decides wether a string P is a subsequence of a string T.
2. Given k strings $P_1, P_2, \ldots, P_k$, and a string T, give an algorithm that decides which of the k strings that are subsequences of T.

Networks Consider a diagram of a telephone network which consists of switching centres and communication lines. Each communication goes between a pair of switching points, and has an associated bandwidth and a cost.

1. Give an algorithm that given two switching centres a and b outputs the minimum cost of a path between a and b.
2. The bandwidth of a path of communication lines between two centres is the lowest bandwidth on the path. Give an algorithm that given two switching centres a and b outputs the maximum bandwidth of a path between a and b.

Puzzle of the week: 99 Cops A town has 99 cops. A cop is either honest or corrupt, the majority of the cops is honest. You need to figure out all the corrupt cops, with less than 299 questions. All cops know who is honest and who is corrupt, but only honest cops will answer truthfully. Corrupt cops may lie arbitrarily. For security reasons you can only ask one type of question: You may ask cop X whether cop Y is corrupt. This question will by answered by X with either "Y is corrupt" or "Y is honest".

Mandatory assignment: Radix trees Solve CLRS problem 12-2.

Note: The input to the problem is a set S of distinct bit strings—not a radix tree!