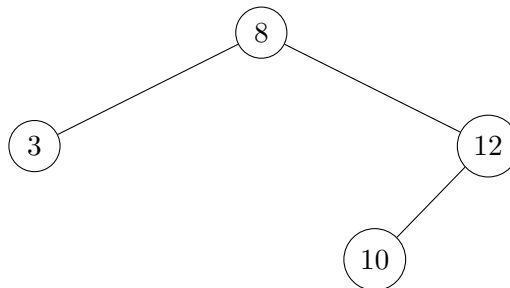# Algorithms and Data Structures
Winter Term 2021/2022
Exercise Sheet 6

Exercise 1: Binary Search Trees I

Consider the following binary search tree.

1. Give all sequences of `insert`(key) operations that generate the tree.

2. Draw the tree after the following sequence of operations: `insert`(6), `insert`(5), `remove`(3).

Exercise 2: Binary Search Trees II

(a) Describe a function that takes a binary search tree B and a key x as input and generates the following output:

   - If there is an element v in B with $v.key = x$, return v.

   - Otherwise, return the pair (u, w) where u is the tree element with the next smaller key and w is the element with the next larger key. It should be $u = $ None if x is smaller than any key in the tree and $w = $ None if x is larger than any key in the tree.

   For your description you can use pseudo code or a sufficiently detailed description in English.

   Analyze the runtime of your function.

(b) Describe a function which returns the depth of a binary search tree and analyze the runtime.

(c) Describe a function that for a given binary search tree with n nodes and a given $k \leq n$ returns a list with the k smallest keys from the tree. Analyze the runtime.