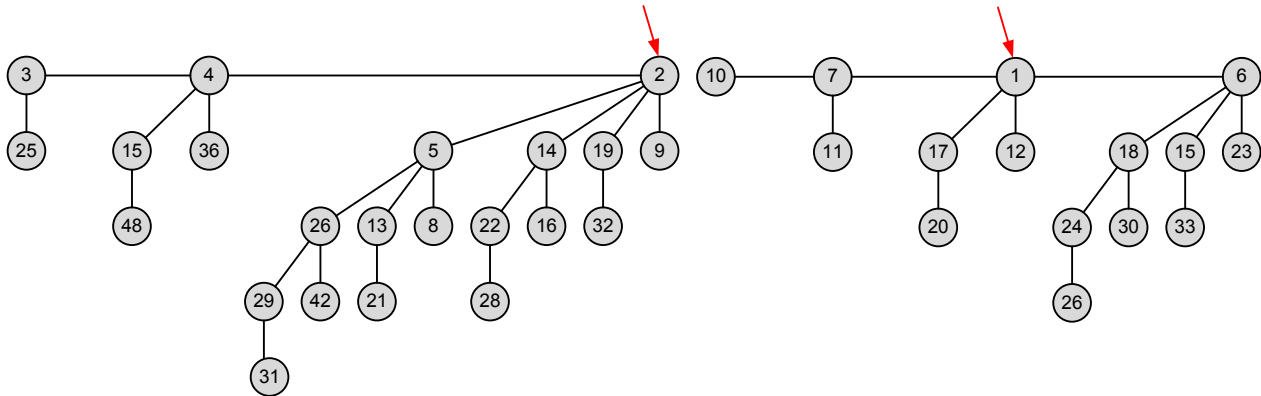


Fundamental Algorithms
 WS 2017
Exercise Sheet 2

Exercise 1:



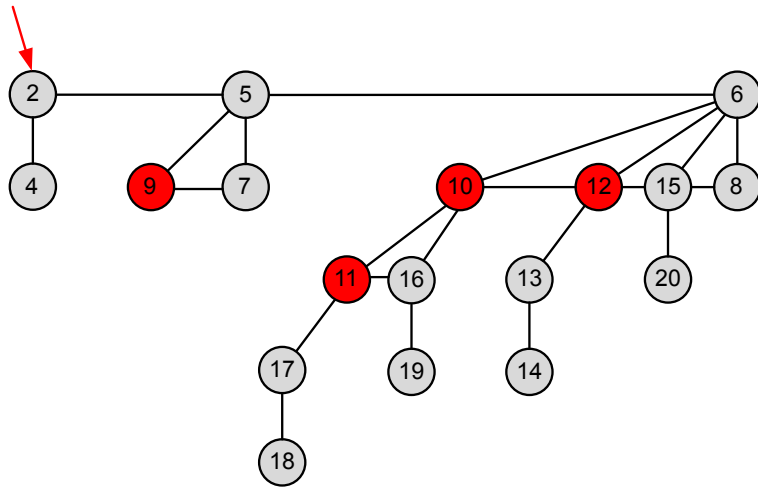
- a) Execute the Merge-operation for the Binomial heaps above.
- b) On the result of a), execute the deleteMin()-operation.
- c) On the result of b), execute decreaseKey(31,30), i.e., decrease the key of node 31 to 1.

Exercise 2:

Show that for every $r \in \mathbb{N}_0$ a Binomial tree of rank r has depth of r . Use that to show that decreaseKey(e, Δ) has a runtime of $O(\log n)$.

Please turn the page...

Exercise 3:



- a) Perform the delete(17)-operation on the Fibonacci heap above.
- b) On the result of a), execute decreaseKey(13, 12).
- c) On the result of b), execute the deleteMin()-operation.

Exercise 4:

Show that the deleteMin()-operation for Fibonacci heaps has a real runtime of (number of trees + $O(\log n)$) as stated at the bottom of Slide 78 (compared to the runtime of $O(\text{max. rank} + \text{number of tree mergings})$ given on Slide 69).