

Exercise Sheet 11 for Algorithmen und Datenstrukturen (Sommer 2026)

Hand In: Until 2026-07-04 18:00, on ILIAS.

Problem 1

20 points

Simulate the operation of a red-black tree as we insert the following keys into an initially empty red-black tree:

35, 64, 83, 87, 26, 88, 82, 70, 41, 30.

Show your work at suitable intermediate stages of the operations, e.g., how your tree looks like at that point in time.

Problem 2

20 points

Consider a hash table with 10 buckets, and the (bad) hash function $h(x) = x \bmod 10$. Simulate the operation of your hash table with both linear probing and chaining on the following inputs:

10, 20, 21, 31, 32, 42, 43, 53, 54, 64.


Show your work at suitable intermediate stages of the operations, e.g., how the hash table looks like at that point in time.

Problem 3


20 points





Empirically compare the time required to insert N random integers between 0 and 10^9 into a hash table and a red-black tree, for various value of N from 1 to 10^6 . Draw suitable graphical visualisations that underline the differences in runtime.

Use the standard Java library implementations.

 **Problem 4 (XOR Sequence)**

40 points

Solve marburg.kilonova.ro/problems/12 (XOR Sequence) .

ILIAS Submission: In your submission to ILIAS, describe your algorithm according to the template,  *Idea*,  *Pseudocode*,  *Correctness*,  *Analysis*.

The pseudocode part can here an informal summary of your kilonova code submission.