

Foundation of Computer Science — FM2

Assignment 1b - Assignment on *Algorithmic Thinking, Part 2*

<https://www.coursera.org/learn/algorithmic-thinking-2>

Module 3: from *The sorting problem* to *Efficiency of binary search* and

Module 4: from *RNA secondary structure problem* to *Running time of the DP algorithm*

1. Illustrate the Mergesort algorithm by sorting the list

(3, 9, 6, 10, 4, 1, 2, 8).

Why does Mergesort follow the divide-and-conquer paradigm?

2. Consider the following problem **Sum of Subset (SOS)**:

Given: non-negative integers $m, a_1, a_2, \dots, a_m, b$

Question: Is there is set $J \subseteq \{1, 2, \dots, m\}$ such that $\sum_{i \in J} a_i = b$?

- (a) Solve the SOS problem with dynamic programming.

Hint: Use a table $\text{SUM}(i, j)$ storing the maximal values that can be obtained as a sum of numbers from a_1, a_2, \dots, a_i such that this sum does not exceed the number j .

- (b) Find out what the *knapsack problem* is.

How can you modify your algorithm solving SOS in order to solve the knapsack problem?