Foundation of Computer Science — FM2

Assignment 1b - Assignment on *Algorithmic Thinking, Part 2*
`https://www.coursera.org/learn/algorithmic-thinking-2`

Week 1: all videos from module 3 and
Week 3: from *RNA secondary structure problem* to *Running time of DP algorithm*

1. Illustrate the Mergesort algorithm by sorting the list

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

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

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

Given:	non-negative integers $m, a_1, a_2, \ldots, a_m, b$
Question:	Is there is set $J \subseteq \{1, 2, \ldots, m\}$ such that $\sum_{i \in J} a_i = b$?

   (a) Solve the SOS problem with dynamic programming.

   Hint: Use a table SUM(i, j) storing the maximal values that can be obtained as a sum of numbers from $a_1, a_2, \ldots, a_i$ 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?