MANDATORY ASSIGNMENT 1 – DYNAMIC PROGRAMMING

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In this assignment, the aim was to find the minimum number of Norwegian coins needed to represent a sum of 1,040,528 NOK given the coin denominations {1, 5, 10, 20} by writing a dynamic programming algorithm in Python using the tabular approach. Dynamic programming is a method where we break down a problem into smaller subproblems and use the solution of these subproblems to construct an answer for the original problem.

The subproblems were to determine the minimum number of coins required for all values leading up to 1,040,528.

The recurrence relation used to solve this problem was:
$\text{CoinChange}(i)=1+\min\{\text{CoinChange}(i-1),\text{CoinChange}(i-5),\text{CoinChange}(i-10),\text{CoinChange}(i-20)\}$

The program initializes a list called coin_change_list that represents the minimum number of coins needed for each sum going up to the target. We get the solution iteratively by using the given recurrence relation above. By the end of all the iterations, the last value in the list gives the solution to our problem. For the given sum of $s = 1\,040\,528$ *nok*, our program outputs that the minimum number of coins required is 52030.