CSI - 3105 Design & Analysis of Algorithms
Course 9

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Greedy Algorithms

A *greedy algorithm* arrives at a solution by making a sequence of choices, each of which simply looks the best at the moment.

The hope is that locally-optimal choices will lead to a globally-optimal solution.

Making Change

How can a given amount of money be made with the least number of coins of a given denominations? (Assume that you have an unlimited amount of coins of each denomination (!))

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Algorithm *MakingChange*(x)

1: $Coins = \{5, 10, 25, 100, 200\}$
2: $Sum = 0$
3: **while** $Sum \neq x$ **do**
4:     Let $c \in Coins$ be the largest denomination such that $Sum + c \leq x$.
5:     **if** there is no such denomination **then**
6:         **return** "No Solution"
7:     **end if**
8:     Add c to the change that will be returned.
9:     $Sum = Sum + c$
10: **end while**

Question: In the Republik of Informatik, the only denominations available are 1, 4 and 6 cents. Does *MakingChange* produce an optimal solution for all possible inputs?