

## ALGORITHMIC TOOLB

## ALGORITHMIC TOOLBOX: WEEK 5

### CHANGE MONEY PROBLEM

q1. What is the smallest amount of money for which greedy strategy fails with coin denominations of 1, 8 and 20 ?

Sol. Here, a common intuition will be to take coins with greater value first. this can reduce the total number of coins needed. for 24 using greedy approach we get:

$$24 = 20 + 1 + 1 + 1 + 1.$$

Moreover, this can also be optimal solution as  $24 = 8 + 8 + 8$ .

So, All the numbers less than 24 gives correct answer for greedy approach. Hence, answer is 24.

q2. What is the minimum number of coins needed to change 32 into coins with denominations 1, 8, 20 ?

Sol.  $32 = 8 + 8 + 8 + 8.$

q3. What is the running time of the dynamic programming algorithm to change  $m$  using  $n$  different coin denominations?

Sol. For each value of  $m$ , we need to change it with each of  $n$  coin denominations. So, the running time is :  $O(nm)$ .

q4. Is it possible to change 997 using coins with denominations 2, 4 and 8?

Sol. If it was possible to change 997 using only coins of denominations 2, 4 and 8, it would mean that 2 divides 997. However, 2 does not divide 997, which is a contradiction. So, It is not possible.