

Mini Homework 6

1. Define l be a list storing the elements that sum to k . Pseudocode is given as follows:
 1. **for** $i := n - 1; i \geq 0; i := i - 1$:
 1. **if** $s_i \leq k$:
 1. Add s_i to l
 2. $k := k - s_i$
 2. **if** $k = 0$:
 1. Output l
 3. **else**:
 1. Output -1 (impossible)
2. A greedy algorithm is designed to examine s from last to first, add s_i into l whenever $s_i \leq k$, and update k accordingly. Suppose this greedy choice is not included in an optimal solution. At some point, i is the largest index s.t. $s_i < k$, but s_j is selected for some $j < i$. However, this is a contradiction to that there is an optimal solution because $\sum_{k=0}^j s_k < s_i < k$, i.e., it is not possible to achieve the optimal solution even if every element from s_j down to s_0 is selected. Therefore, this greedy choice must be included in the optimal solution. And if there is no solution, then $k \neq 0$ no matter how the algorithm is designed.