

Solution 1

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1 # Copyright © 2020 AlgoExpert, LLC. All rights reserved.
2
3 # O(nc) time | O(nc) space
4 def knapsackProblem(items, capacity):
5     knapsackValues = [[0 for x in range(0, capacity + 1)] for y in range(0, len(items) + 1)]
6     for i in range(1, len(items) + 1):
7         currentWeight = items[i - 1][1]
8         currentValue = items[i - 1][0]
9         for c in range(0, capacity + 1):
10             if currentWeight > c:
11                 knapsackValues[i][c] = knapsackValues[i - 1][c]
12             else:
13                 knapsackValues[i][c] = max(
14                     knapsackValues[i - 1][c], knapsackValues[i - 1][c - currentWeight] + currentValue
15                 )
16     return [knapsackValues[-1][-1], getKnapsackItems(knapsackValues, items)]
17
18
19 def getKnapsackItems(knapsackValues, items):
20     sequence = []
21     i = len(knapsackValues) - 1
22     c = len(knapsackValues[0]) - 1
23     while i > 0:
24         if knapsackValues[i][c] == knapsackValues[i - 1][c]:
25             i -= 1
26         else:
27             sequence.append(i - 1)
28             c -= items[i - 1][1]
29             i -= 1
30     if c == 0:
31         break
32     return list(reversed(sequence))
33
```