

PromptScratchpadOur Solution(s)Video Explanation

Run Code

Solution 1

```
1 // Copyright © 2020 AlgoExpert, LLC. All rights reserved.
2
3 using System;
4 using System.Collections.Generic;
5
6 public class Program {
7     // O(nc) time | O(nc) space
8     public static List<List<int> > KnapsackProblem(int[, ] items, int capacity) {
9         int[, ] knapsackValues = new int[items.GetLength(0) + 1, capacity + 1];
10        for (int i = 1; i < items.GetLength(0) + 1; i++) {
11            int currentWeight = items[i - 1, 1];
12            int currentValue = items[i - 1, 0];
13            for (int c = 0; c < capacity + 1; c++) {
14                if (currentWeight > c) {
15                    knapsackValues[i, c] = knapsackValues[i - 1, c];
16                } else {
17                    knapsackValues[i, c] = Math.Max(knapsackValues[i - 1, c],
18                        knapsackValues[i - 1,
19                            c -
20                                currentWeight] +
21                                currentValue);
22                }
23            }
24        }
25        return getKnapsackItems(knapsackValues, items,
26            knapsackValues[items.GetLength(0), capacity]);
27    }
28
29    public static List<List<int> > getKnapsackItems(int[, ] knapsackValues, int[, ] items,
30        int weight) {
31        List<List<int> > sequence = new List<List<int> >();
32        List<int> totalWeight = new List<int>();
33        totalWeight.Add(weight);
34        sequence.Add(totalWeight);
35        sequence.Add(new List<int>());
36        int i = knapsackValues.GetLength(0) - 1;
37        int c = knapsackValues.GetLength(1) - 1;
38        while (i > 0) {
39            if (knapsackValues[i, c] == knapsackValues[i - 1, c]) {
40                i--;
41            } else {
42                sequence[1].Insert(0, i - 1);
43                c -= items[i - 1, 1];
44                i--;
45            }
46            if (c == 0) {
47                break;
48            }
49        }
50        return sequence;
51    }
52 }
53
```