DYNAMIC PROGRAMMING 4

LINTCODE NO. 92

BACKPACK

http://www.lintcode.com/en/problem/backpack/

PROBLEM DESCRIPTION

- Given n items with size Ai, an integer m denotes the size of a backpack. How full you can fill this backpack?
- Example
  - If we have 4 items with size [2, 3, 5, 7], the backpack size is 11, we can select [2, 3, 5], so that the max size we can fill this backpack is 10. If the backpack size is 12. we can select [2, 3, 7] so that we can fulfill the backpack. You function should return the max size we can fill in the given backpack.

IDEA

- Use dp[n] to denote the max capacity we may obtain if the backpack size is *n*
- Nested loop structure looks as follows
  - Outer loop goes through the incoming item size
  - Inner loop goes through the backpack size
- DP function
  - max(dp[n], dp[n - incoming_item] + incoming_item)

SOLUTION

- https://github.com/Brady31027/lintcode/tree/master/92_Backpack

LINTCODE NO. 125

BACKPACK II

http://www.lintcode.com/en/problem/backpack-ii/

PROBLEM DESCRIPTION

- Given n items with size Ai and value Vi, and a backpack with size m. What's the maximum value can you put into the backpack?
- Example
  - Given 4 items with size [2, 3, 5, 7] and value [1, 5, 2, 4], and a backpack with size 10. The maximum value is 9.

IDEA

- Similar to No.92 Backpack except
  - Take value into account
  - DP function

dp[space] = max(dp[space], dp[space - A[item_idx]] + V[item_idx])

SOLUTION

- https://github.com/Brady31027/lintcode/tree/master/125_Backpack_II

LINTCODE NO. 564

BACKPACK VI

http://www.lintcode.com/en/problem/backpack-vi/

PROBLEM DESCRIPTION

- Given an integer array nums with all positive numbers and no duplicates, find the number of possible combinations that add up to a positive integer target.
- Example
- Given nums = [1, 2, 4], target = 4
  - [1, 1, 1, 1], [1, 1, 2], [1, 2, 1], [2, 1, 1], [2, 2], [4]

IDEA

- Similar to Leetcode Combination Sum IV
  - https://leetcode.com/problems/combination-sum-iv/#/description
  - Refer to https://github.com/Brady31027/leetcode/blob/master/reports/dynamic_programming_5.pdf

SOLUTION

- https://github.com/Brady31027/lintcode/tree/master/564_Backpack_VI

FOLLOW UP

- There are backpack III, IV, and V
  - Access denied
- https://segmentfault.com/a/1190000006325321