081203M04001H - Algorithm Design and Analysis

## Assignment 2

October 15, 2021

**Notice:**

1. Please submit your answer in hard copy AND submit a digital version to UCAS website [http://sep.ucas.ac.cn.](http://sep.ucas.ac.cn/)
2. Hard copy should be submitted before 9 am. October 29 and digital version should be submitted before 11:30 pm. October 29.
3. You can choose **three** from problems 1-5, and you should do at least the following things:
   1. Describe the optimal substructure and DP equation;
   2. Describe your algorithm in daily language or pseudo-code;
   3. Prove the correctness of your algorithm;
   4. Analyse the complexity of your algorithm.

(a)描述最优子结构和DP方程;

(b)以日常语言或伪代码描述你的算法;

(c)证明算法的正确性;

(d)分析算法的复杂性。

# Money robbing

A robber is planning to rob houses along a street. Each house has a certain amount of money stashed, the only constraint stopping you from robbing each of them is that adjacent houses have security system connected and it will automatically contact the police if two adjacent houses were broken into on the same night.

* 1. Given a list of non-negative integers representing the amount of money of each house, determine the maximum amount of money you can rob tonight without alerting the police.
  2. What if all houses are arranged in a circle?

1钱抢劫

一个强盗正计划抢劫沿街的房屋。每间房子都有一定数量的钱，阻止你抢劫的唯一限制是相邻的房子都有连接的安全系统，如果相邻的两间房子在同一晚被闯入，它会自动联系警察。

1. 给出一份非负整数的清单代表每所房子的金额，确定你今晚在不报警的情况下可以抢劫的金额上限。

# 2. 如果所有的房子都排成一个圆圈呢? leetcode刷题198 打家劫舍 House Robber

# Largest Divisible Subset

Given a set of distinct positive integers, find the largest subset such that every pair (*Si, Sj*) of elements in this subset satisfies: *Si*%*Sj* = 0 or *Sj*%*Si* = 0*.*

Please return the largest size of the subset.

*Note: Si*%*Sj* = 0 means that *Si* is divisible by *Sj*.

2最大可除子集

给定一组不同的正整数，找出最大的子集，使这个子集中的每一对(Si, Sj)元素满足:Si%Sj = 0或Sj%Si = 0。

请返回子集的最大尺寸。

# 注:Si%Sj = 0表示Si能被Sj整除。[Leetcode] 368. Largest Divisible Subset

# Unique Binary Search Trees

Given *n*, how many structurally unique BST’s (binary search trees) that store values 1*...n*?

*Explanation:* Given n = 3, there are a total of 5 unique BST’s:

1 3 3 2 1

*\ / / / \ \*

3 2 1 1 3 2

*/ / \ \*

2 1 2 3

3唯一的二叉搜索树

给定n，有多少结构唯一的BST(二叉搜索树)存储值为1…n?

说明:给定n = 3，总共有5个唯一的BST:

# Word Break

Given a string *S* and a dictionary of words, determine if the string *S* can be segmented into a space-separated sequence of one or more dictionary words.

*Note:* Each word in the dictionary may be reused multiple times in the segmentation. You can return TRUE if the string *S* is empty.

4字打破

给定一个字符串S和一个单词字典，判断字符串S是否可以被分割成一个由一个或多个字典单词组成的空格分隔序列。

注意:字典中的每个单词可能在分段中被重复使用多次。如果字符串S为空，则返回TRUE

# Distinct Sequences

Given two strings *S* and *T* , return the number of distinct subsequences of *S* which equals *T* .

A string’s subsequence is a new string formed from the original string by deleting some (can be none) of the characters without disturbing the remaining characters’ relative positions. (i.e., ”ACE” is a subsequence of ”ABCDE” while ”AEC” is not).

给定两个字符串S和T，返回S等于T的不同子序列的数量。

子串是通过删除一些字符(可以是none)而不影响其他字符的相对位置，从原始字符串中生成的新字符串。(即“ACE”是“ABCDE”的子序列，而“AEC”不是)。