算法设计与应用基础：作业 3

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2020 年 7 月 5 日

DUE：2020/7/21

提交说明

- 请将作业以 **PDF** 附件形式发送到邮箱：algo2020@163.com
- 邮件主题及作业文件统一命名：第几次作业 _ 学号 _ 姓名，如，3_18XXXXXX_ 张
- 编程题一般是 OJ 平台 LeetCode 上的题目，点击题名即可跳转到题目对应的页面。对于编程题，要求在作业中写出四项内容：算法思路，复杂度分析，代码和 Accepted 截图。

作业

1. Assign Cookies

   Assume you are an awesome parent and want to give your children some cookies. But, you should give each child at most one cookie. Each child i has a greed factor g_i, which is the minimum size of a cookie that the child will be content with; and each cookie j has a size s_j. If $s_j \geq g_i$, we can assign the cookie j to the child i, and the child i will be content. Your goal is to maximize the number of your content children and output the maximum number.

   Note:

   - You may assume the greed factor is always positive.
   - You cannot assign more than one cookie to one child.

   Example 1:

   Input: $[1, 2, 3], [1, 1]$

   Output: 1

   Explanation: You have 3 children and 2 cookies. The greed factors of 3 children are $1, 2, 3$. And even though you have 2 cookies, since their size is both 1, you could only make the child whose greed factor is 1 content. You need to output 1.

   Example 2:

   Input: $[1, 2], [1, 2, 3]$

Output: 2

Explanation: You have 2 children and 3 cookies. The greed factors of 2 children are $1, 2$. You have 3 cookies and their sizes are big enough to gratify all of the children, You need to output 2.

2. String Without AAA or BBB

Given two integers A and B, return any string S such that:

- S has length $A + B$ and contains exactly A 'a' letters, and exactly B 'b' letters;
- The substring 'aaa' does not occur in S;
- The substring 'bbb' does not occur in S.

Example 1:

Input: $A = 1, B = 2$

Output: "abb"

Explanation: "abb", "bab" and "bba" are all correct answers.

Example 2:

Input: $A = 4, B = 1$

Output: "aabaa"

Note:

- $0 \leq A \leq 100$
- $0 \leq B \leq 100$

3. Triangle

Given a triangle, find the minimum path sum from top to bottom. Each step you may move to adjacent numbers on the row below.

For example, given the following triangle

$$\begin{array}{ccccccc} & & & 2 & & & \\ & & 3 & & 4 & & \\ & 6 & & 5 & & 7 & \\ 4 & & 1 & & 8 & & 3 \end{array}$$

The minimum path sum from top to bottom is 11 (i.e., $2 + 3 + 5 + 1 = 11$).

Note:

Bonus point if you are able to do this using only $O(n)$ extra space, where n is the total number of rows in the triangle.

4. Best Time to Buy and Sell Stock with Transaction Fee

Your are given an array of integers *prices*, for which the i-th element is the price of a given stock on day i; and a non-negative integer fee representing a transaction fee.

You may complete as many transactions as you like, but you need to pay the transaction fee for each transaction. You may not buy more than 1 share of a stock at a time (ie. you must sell the stock share before you buy again.)

Return the maximum profit you can make.

Example 1:

Input: $prices = [1, 3, 2, 8, 4, 9], fee = 2$

Output: 8

Explanation: The maximum profit can be achieved by:

- Buying at $prices[0] = 1$
- Selling at $prices[3] = 8$
- Buying at $prices[4] = 4$
- Selling at $prices[5] = 9$

The total profit is $((8 - 1) - 2) + ((9 - 4) - 2) = 8$.

Note:

- $0 < prices.length < 50000$
- $0 < prices[i] < 50000$
- $0 \leq fee < 50000$

5. Decode Ways

A message containing letters from $A - Z$ is being encoded to numbers using the following mapping:

'A' -> 1
'B' -> 2
...
'Z' -> 26

Given a **non-empty** string containing only digits, determine the total number of ways to decode it.

Example 1:

Input: "12"

Output: 2

Explanation: It could be decoded as "AB" (1 2) or "L" (12).

Example 2:

Input: "226"

Output: 3

Explanation: It could be decoded as "BZ" (2 26), "VF" (22 6), or "BBF" (2 2 6).