Google 算法真题 2019

本资料由九章算法独家倾情整理

www.jiuzhang.com

目录

1. Google OA 真题

Google 9 月 OA Ladder 地址：https://www.lintcode.com/ladder/120/ 密码：1q2w3e4r

2. Google 电面算法题

1.LeetCode 410

2.https://leetcode.com/discuss/int ... e-remove-extra-edge

3.LeetCode 1057

4.ads bid 如果有两个 bidder X AND Y， the bid amount is uniform[0,1] distribution. what is the expected revenue?

5.LeetCode 307

6.LeetCode 943（类似）

7.Given a binary tree, where an arbitary node has 2 parents i.e two nodes in the tree have the same child. Identify the defective node and remove an extra edge to fix the tree.

Follow-up 1:
What if the tree is a BST?

Follow-up 2:
What if the tree is an N-ary tree?

8.把一摞牌，如果能把所有数字分成两堆，每堆都有 2 个以上同样的数字就返回正确，不计顺序
比如[1，1，1，3，3，4，4] -> return true
[1,1,1,8,3,3,4,4] -> return false

9.返回 K 个最近的 insert 的数的乘积的 function
e.g insert 1,2,3,4 k = 3, return 4*3*2 =24

10.You are given a sorted list of distinct integers from 0 to 99, for instance [0, 1, 2, 50, 52, 75]. Your task is to produce a string that describes numbers missing from the list; in this case "3-49,51,53-74,76-99". The items should be sorted in ascending order and separated by commas. When a gap spans only one number, the item is the number itself; when a gap is longer, the item comprises the start and the end of the gap, joined with a minus sign.

11.Sum of all perfect squares less than n.
- so if n=10, answer is 1 + 4 + 9 = 14

12.LeetCode 317

13.LeetCode 43

14.String: "bnhjkioikjhnbvcxsza"
Dictionary: [“apple”, “boba”, “tea”]

要求判断 String 里面有没有 disctionary 里面的单词

15.Prints out all combinations of 3 numbers in the array that sum to 0
打印出所有和为 0 的三数组合
（假设数组中没有重复元素）

3. Google Onsite 算法题

1.LeetCode 2 道题
https://1o24bbs.com/t/topic/13956

2.Variation of https://leetcode.com/problems/random-pick-with-weight/ 7

Given a list of countries along with the respective population. Design a random generator that would select one of the countries.

3.Variation of https://leetcode.com/problems/k-closest-points-to-origin/ 7

Given a list of points with (x,y) co-ordinates. Implement a system that will return the K points nearest to a given point N.

4.删除二叉树每个结点的值只会是 0 或 1，输入 root node，要求删除所有子孙结点都是 0 的结点。比如

```
  1

0   1
```

要删除左子树返回 root,

```
   0
1
```

返回原来的 root 就可以，因为左子树的后代不全为 0

5.打印一颗二叉树，从左到右。比如：

```
        1
     /   \
    2     3
   / \
```

```
  4   5
    / \
   6   7
```
打印出 4 2 6 1 5 3 7

6.整数相除，输出带循环的小数。比如：
5/3 ==> 1.(6)

7.大数(用字符串表示)相乘，返回也是字符串。比如：
“13”x"15" ==> “195”

8.给一个数组构造一个 iterator。比如：
[2,3],[4,2],[1,3]表示 2 个 3，4 个 2，1 个 3
iterator 该返回：3,3,2,2,2,2,3

9.匹配括号的变种。不是一对一，可以是多对多，比如[a,b,c]中任何一个可以对[A,B,C]中任何一个。可以重用。判断一个字符串是不是平衡。
比如:abc<->ABC 12<->aA
aC --> true
a2aB --> true
a2C2 --> false

10.LeetCode 308

11.LeetCode 85

12.LeetCode 124

13.last k product。1）要求写 last k product（fixed）， class 有 insert 和 getlastk() 2 个方法。 包含 0 怎么做， 2） 修改成 getlastk(int k)，获得最后 k 个数字（dynamic）

14.directed graph， 要求输出从一个点到另外一个点的最短路径。

15.给一个 int[] values 和另一个 int target,把 target 移到 array 的最前端同是保持剩余数值的顺序，比如({1,2,4,2,5,7,3,7,3,5}, 5) -> {5,5,1,2,4,2,7,3,7}

16.给一个字符串和字典，找出单词量最小的拆分方法，如果有多种方式给出任意一种即可， 比如 bedbathandbeyand -> {'bed','bath','and','beyand'} 或者 {'bed','bat','hand','beyand'}

17.LeetCode 91

18.LeetCode 1066

19.假设有两个组 A 和 B，A 组 n 个人，B 组 m 个人，其中 n>m。现在让 A 组每个人扔一次硬币，统计 n 个人里得到 head 的数量，假设为 x，那么 head 的比率 p1 是 x/n。让 A 组人一共扔三次硬币，那么得到三个比率 p1,p2,p3，选出最大的比率设为 pA。然后让 B 组人进行同样的操作，得到 pB。比较 pA 和 pB 的大小，大的那一组获胜。请问这是一个公平的比赛吗？谁更容易获胜？获胜的概率可以计算吗？

20.secret word 是一串颜色字符，比如是 rgrgb，guessed word 比如是 rrgrb,那么实现一个记分 function： Score calculate(String secretWord, String guessWord),

```
class Score {
int correctColorButIncorrectPosition;
int correctColorAndCorrectPosition;
}
```

那么上面的例子就会 return {2, 2}

Follow-up: 如果给定 secret word 最多可能有的颜色种类，和 word length，写一个算法，用尽可能少的次数猜出 secret word。
提示：可以使用上面写的 function。思路类似于 LeetCode 843

4. Google 系统设计题

1.升级在火星的 data center 的操作系统

2.设计一个不需要后端 service 的页面访问权限验证。比如 google doc，用户 A 设定分享给 B, C, D。隔天想想不对把 D 移出分享清单。此时第一天 B, C, D 都要能访问这份 doc，第二天 只有 B, C 能访问

3.20 mins for various technical questions like SQL VS No SQL

4.20 mins for designing Satellite imaging system for Google maps

5.Firefox - design a system that will show the page “this site is blocked” on entering a blocked site.

6.Design Instagram:
upload pictures view/download pictures share pictures

7.design distributed cache

8.请自行设计记录数据点的数据结构。返回所有记录点遍历完成后的数组

9.Design a live broadcasting system like Twitch with the following functionalities:
a.Live video stream
Display total online users in the room (prompted me to talk about multiple different implementation & tradeoff)
b.Send gifts to room owner with a message broadcasted to all users in the room (assume multiple gifts & msg can appear on the same screen at once, how to make sure they are in order)
c.Room chat function
Playback video function should display gifts, screen messages, & chat to be shown again. (after broadcast is offline)

10.Design the 2048 game. Given an 2D array with input based on up, down, left, right movement what would be the output after 1 iteration

11.**A tread mill controller** controls the hardware (motors and actuators) based on user inputs. Assuming that the hardware controls (speed controls, inclination controls, start, stop, emergency stop, heart rate sensor) and exercise calculations (calories burnt, max heart rate based on user profile…) are provided as APIs, design the controller that supports the following features

Configure user profile based on age, sex, height, weight.
Support pre-defined exercise programs(cardio, interval, performance)
a. For example a cardio program will contain speed 5, inclination 2 for 10 seconds + speed 10, inclination 5 for 10 seconds.
Support creation of custom programs
Support save / retrieve custom programs
Design for Safety:
a. During program, monitor patient heart rate through sensor and stop program gracefully (not an ad-hoc kill) when the heart rate approaches max.
b. Have an emergency stop * this should be highly performant (highlight the design considerations for this)
Represent the design with appropriate views (static & dynamics views) and the above requirements mapped to different elements.

12.实现一个 log system，同一句话出现的频率不能超过每 10 秒一次。Follow-up 是怎么把不需要的 stale data 清除掉

13.设计 map reduce 系统处理大数据，各种 HA, checkpoint, heartbeat, communication, etc.

14.设计多人协同工作的 google doc

15.设计 google calendar。能设单次和 repeat 的 event 提醒。触发时所有 client 都能 alarm。时间尽可能精确

16.美国的 all way STOP 路口，各路口的车是一次走一辆。对一个有 N 条道路的 all way stop 交叉路口，设计一个数据结构来模拟车辆可以进入路口的顺序。

17.设计如何给 data center 里的机器打补丁

18.Design Google Docs Versioning System

You have to implement Google Docs's versioning feature.
A document can be rich (multimedia like Youtube videos, embedding spreadsheets from Google Sheets, etc) and you will need implement the versioning system which allows you to revert back to an older version of the doc.
Let say this is the current version tree of a document: 1-> 2-> 3-> 4-> 5 (now)
A user can revert back to version 3, make an edit, and the new edit will be counted as version 6.
It is not possible to edit past versions.

19.设计 Google 搜索建议

20.design a job schedule system 如果让你设计一个这样的系统，能跑任何程序，需要哪些东西，哪些 UI 给用户

.