C 語言基礎程式設計與實務 – 小考考題 2

可參考網頁:

Geeksforgeeks: https://www.geeksforgeeks.org/

Q1. Minimum Number of Operations to Sort a Binary Tree by Level (40/100)

Content

You are given the root of a binary tree with unique values.

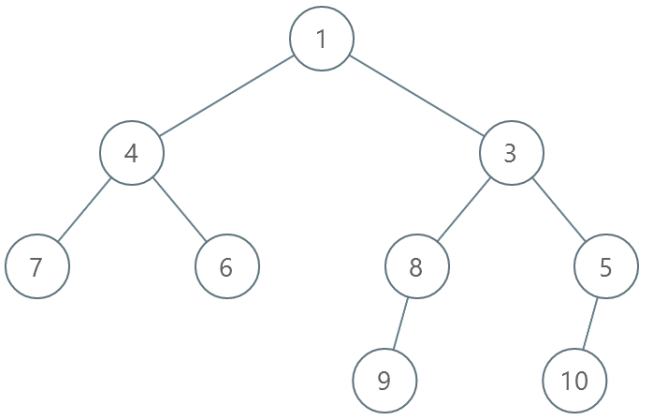
In one operation, you can choose any two nodes at the same level and swap their values.

Return the minimum number of operations needed to make the values at each level sorted in a strictly increasing order.

The level of a node is the number of edges along the path between it and the root node.

Example

Example 1:



Input: root = [1,4,3,7,6,8,5,null,null,null,null,9,null,10]

Output: 3

Explanation:

- Swap 4 and 3. The 2nd level becomes [3,4].

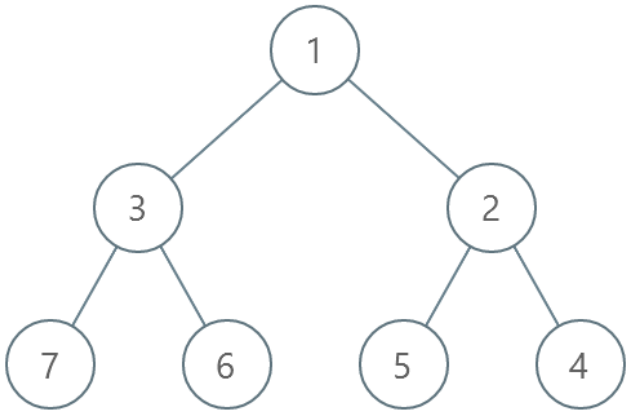
- Swap 7 and 5. The 3rd level becomes [5,6,8,7].

- Swap 8 and 7. The 3rd level becomes [5,6,7,8].

We used 3 operations so return 3.

It can be proven that 3 is the minimum number of operations needed.

Example 2:



Input: root = [1,3,2,7,6,5,4]

Output: 3

Explanation:

- Swap 3 and 2. The 2nd level becomes [2,3].

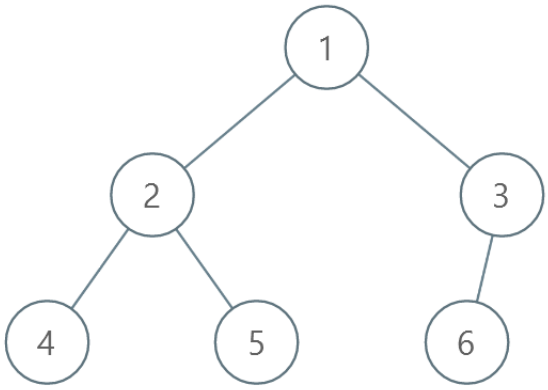
- Swap 7 and 4. The 3rd level becomes [4,6,5,7].

- Swap 6 and 5. The 3rd level becomes [4,5,6,7].

We used 3 operations so return 3.

It can be proven that 3 is the minimum number of operations needed.

Example 3:



Input: root = [1,2,3,4,5,6]

Output: 0

Explanation: Each level is already sorted in increasing order so return 0.

Constraints

- The number of nodes in the tree is in the range [1, 10^5].
- 1 <= Node.val <= 10^5
- All the values of the tree are **unique**.

Sample Code

```
/**
 * Definition for a binary tree node.
 * struct TreeNode {
 *     int val;
 *     struct TreeNode *left;
 *     struct TreeNode *right;
 * };
 */
int minimumOperations(struct TreeNode* root) {

}
```

Q2. Recursive Fibonacci(30/100)

Content

程式要求說明

1.設計一個程式，輸入一個正整數 n，以遞迴(Recurrsive)的方式，計算並顯示出費伯那西（Fibonacci）數列中的第 n 個數字。

2.費伯那西數本質上就是由 F(n)= F(n-1) + F(n-2) 這個遞迴關係式所定義的,而且 F(1)=1,F(2)=1

輸入：n 不大於 100

輸出：F(n)，行尾加跳行。

Input

輸入：n 不大於 100

Output

輸出：F(n)，行尾加跳行。

Sample Input #1

7

Sample Output #1

13

Sample Input #2

8

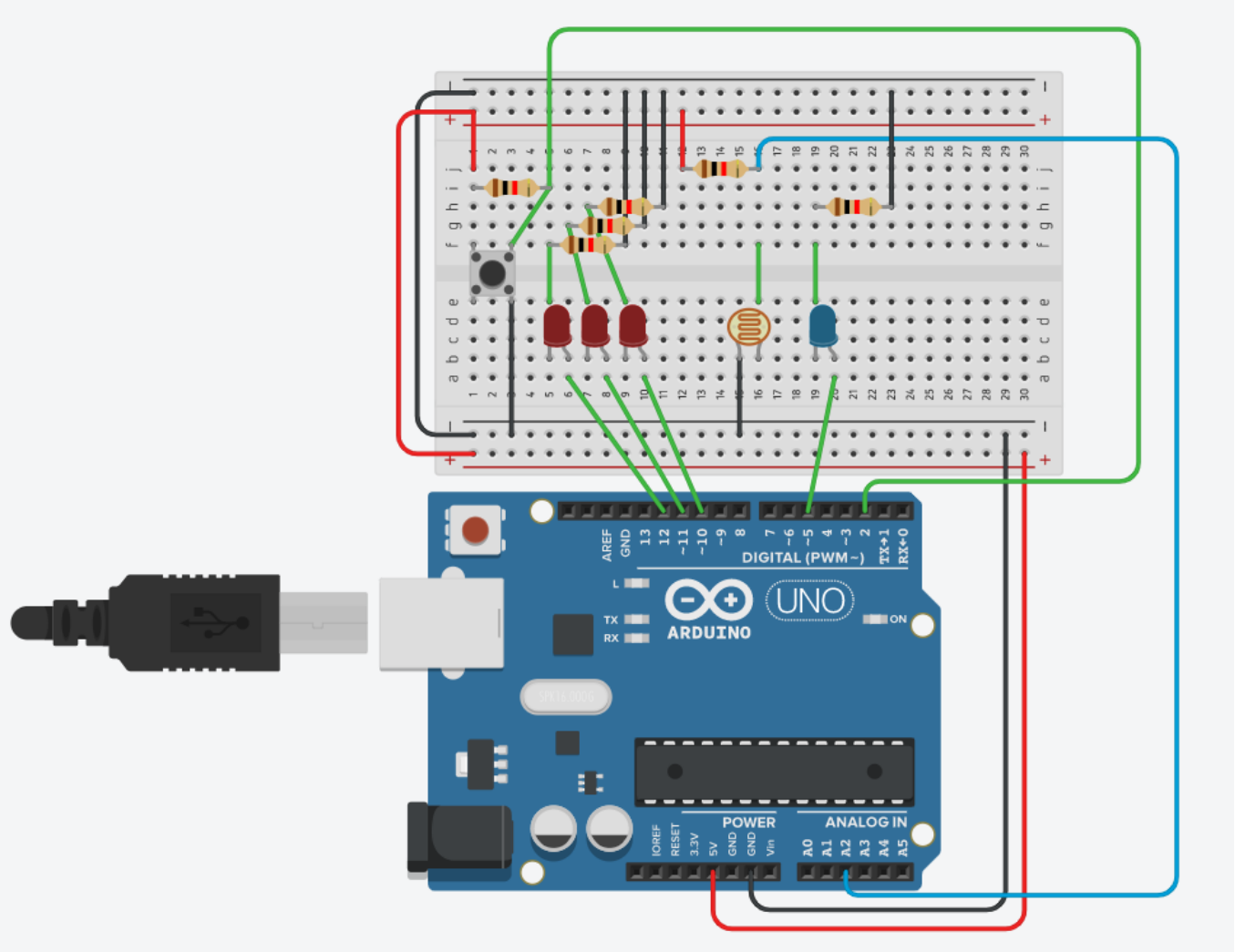
Sample Output #2

21

Q3. 跑馬燈與小夜燈控制程式 (30/100)

(1) 如電路所示，請設計當左邊按鍵按下時重複輸出 LED 跑馬燈的程式(間隔 500mS)。

(2) 當電腦鍵盤按下 S 鍵時開始讀取光敏電阻的電壓值，並透過 map 函式將光敏電阻電壓值輸出轉換成 PWM 的電壓控制 LED 的調光。


DIGITAL (PWM~)
UNO
ARDUINO
POWER
ANALOG IN