RECURSION (Basics) QUESTIONS

Question 1 : For a given integer array of size N. You have to find all the occurrences (indices) of a given element (Key) and print them. Use a recursive function to solve this problem.

Sample Input : arr[ ] = {3, 2, 4, 5, 6, 2, 7, 2, 2}, key = 2
Sample Output : 1 5 7 8

Question 2 :

You are given a number (eg - 2019), convert it into a String of english like
"two zero one nine". Use a recursive function to solve this problem.
NOTE - The digits of the number will only be in the range 0-9 and the last digit of a number can't be 0.

Sample Input : 1947
Sample Output : "one nine four seven"

Question 3 : Write a program to find **Length of a String** using Recursion.

Question 4 : We are given a string S, we need to find the count of all contiguous substrings starting and ending with the same character.

Sample Input 1 : S = "abcab"
Sample Output 1 : 7
There are 15 substrings of "abcab" : a, ab, abc, abca, abcab, b, bc, bca, bcab, c, ca, cab, a, ab, b
Out of the above substrings, there are 7 substrings : a, abca, b, bcab, c, a and b. So, only 7 contiguous substrings start and end with the same character.

Sample Input 2 : S = "aba"
Sample Output 2 : 4
The substrings are a, b, a and aba.

Question 5 : **TOWER OF HANOI** (Important!)

You have 3 towers and N disks of different sizes which can slide onto any tower. The puzzle starts with disks sorted in ascending order of size from top to bottom (i.e., each disk sits on top of an even larger one).

You have the following constraints:

(1) Only one disk can be moved at a time.
(2) A disk is slid off the top of one tower onto another tower.
(3) A disk cannot be placed on top of a smaller disk. Write a program to move the disks from the first tower to the
last using Stacks.

Let rod 1 = 'A', rod 2 = 'B', rod 3 = 'C'.
An **example** with 2 disks i.e. N=2:
Step 1 : Shift the first disk from 'A' to 'B'.

Step 2 : Shift the second disk from 'A' to 'C'.

Step 3 : Shift the first disk from 'B' to 'C'.

An **example** with 3 disks i.e. N=3 :
Step 1 : Shift the first disk from 'A' to 'C'.
Step 2 : Shift second disk from 'A' to 'B'.
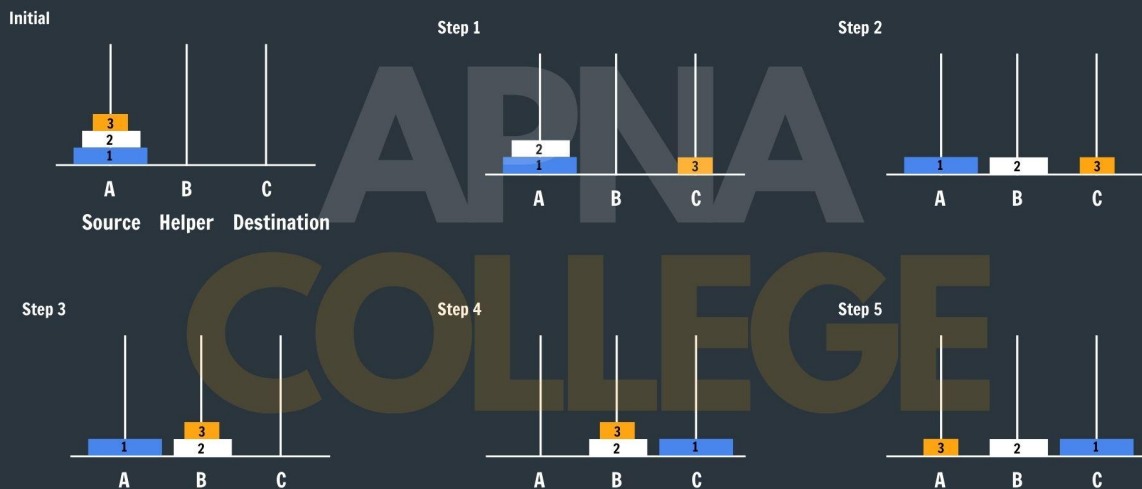Step 3 : Shift the first disk from 'C' to 'B'.

Step 4 : Shift the third disk from 'A' to 'C'.

Step 5 : Shift the first disk from 'B' to 'A'.
Step 6 : Shift second disk from 'B' to 'C'.
Step 7 : Shift the first disk from 'A' to 'C'.

Visualization for n=3

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The Approach here is :
- Shift 'n-1' disks from 'A' to 'B', using C.
- Shift the last disk from 'A' to 'C'.
- Shift 'n-1' disks from 'B' to 'C', using A.