

FAST School of Computing

Object Oriented Programming – Spring 2025

Software Engineering Department

LAB 04

Recursion in C++

Learning Outcomes

In this lab you are expected to learn the following:

- ✱ Basic Problems in Recursions

Note: Plagiarism (from some else or internet) in any 1 question will lead to zero marks in the whole lab task.

Run the test cases for all problems

Basic Problems

Problem 1:

- a. Write a code that defines an integer array of size 10. Initialize array values by user input. Then ask the user to provide a number to find in array. Write a function that recursively calls itself to search for that number in the array. **bool LinearSearch(int array[10],int find, int size)**

Problem 2:

- a. Find the first and last occurrence of an element in an array.
- b. Check if an array is sorted in ascending order.
- c. Find the nth Fibonacci Series. (0,1,1,2,3,5,8,13.....)
$$\text{Fib}(n) = \text{fib}(n-1) + \text{fib}(n-2)$$

Base condition: fib (0)=0, fib(1)=1.

Problem 3:

Write a function that calls itself recursively to find Greatest Common Divisor (GCD) of two numbers. int findGCD(int num1,int num2). The greatest common divisor (GCD) of two or more numbers is the greatest common factor number that divides them, exactly. It is also called the highest common factor (HCF). For example, the greatest common factor of 15 and 10 is 5, since both the numbers can be divided by 5.

Intermediate Problems

Problem 4:

Write a function called elfish that recursively checks, given a word, if that word is elfish or not. **bool elfish(char word[10], char elf[4], int index)**

A word is considered **elfish** if it contains the **letters: e, l, and f** in it, in any order. For example, we would say that the following words are elfish: white leaf, tasteful, unfriendly, and waffles, because they each contain those letters.

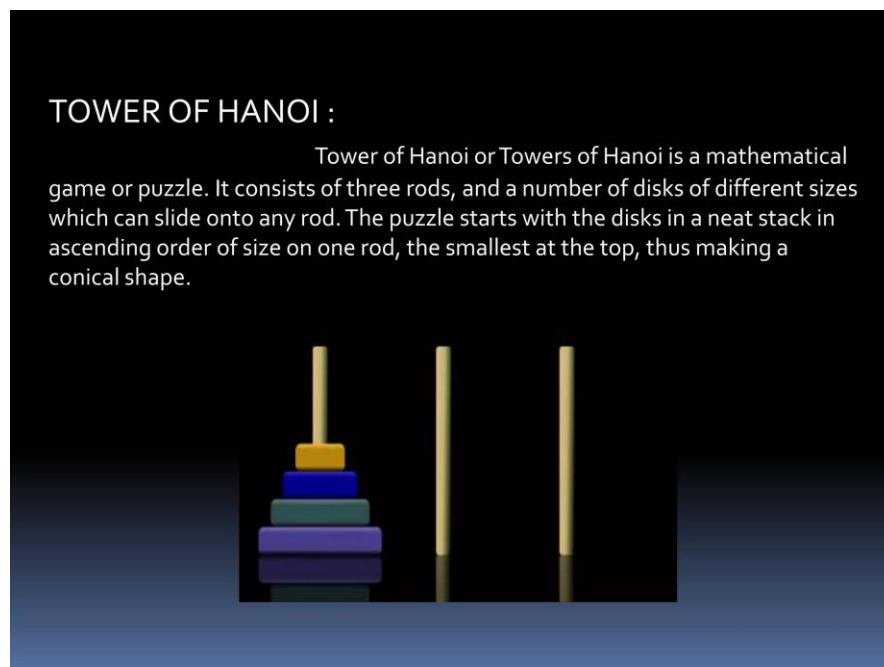
Problem 5:

Tower of Hanoi (Logistics & Storage Management)

Given $N = 4$ disks and three rods, move all disks from the first rod to the third, following these rules:

1. Only one disk can be moved at a time.
2. A larger disk cannot be placed on a smaller one.
3. You can use the second rod as an auxiliary/helping rod.

Void TowerofHanoi (int rods, char src, char des, int helper)



Submission Details:

1. Save a single .cpp file with your roll no and lab number e.g. i22-XXXX_Lab4.cpp
2. Take screen shot of running test cases of tasks.
3. Zip the .cpp file and screen shots (Do not create .rar file) with roll no and lab no.
e.g. i22-XXXX_Lab4.zip.
4. Submit the zip file on google classroom.