

COM315 ASSIGNMENT THREE (TO BE SUBMITTED NEXT WEEK)

The following assignment is “**Functions**” questions that you need to answer accordingly:

1. a) Write short on **Lists, Tuples and Dictionaries** in Python programming. Explain the difference between them
2. Discuss Encapsulation, Inheritance and Polymorphism

Programming questions

(Towers of Hanoi) Every budding computer scientist must grapple with certain classic problems. The Towers of Hanoi (see the picture below) is one of the most famous of these. Legend has it that, in a temple in the Far East, priests are attempting to move a stack of disks from one peg to another. The initial stack had 64 disks threaded onto one peg and arranged from bottom to top by decreasing size.

The priests are attempting to move the stack from this peg to a second peg, under the constraints that exactly one disk is moved at a time and that at no time may a larger disk be placed above a smaller disk. A third peg is available for holding disks temporarily. Supposedly, the world will end when the priests complete their task, so there is little incentive for us to facilitate their efforts.

Let us assume that the priests are attempting to move the disks from peg 1 to peg 3. We wish to develop an algorithm that will print the precise sequence of peg-to-peg disk transfers.

If we were to approach this problem with conventional methods, we would rapidly find ourselves hopelessly knotted up in managing the disks. Instead, if we attack the problem with recursion in mind, it immediately becomes tractable. Moving n disks can be viewed in terms of moving only $n - 1$ disks (hence, the recursion), as follows:

- a) Move $n - 1$ disks from peg 1 to peg 2, using peg 3 as a temporary holding area.
- b) Move the last disk (the largest) from peg 1 to peg 3.
- c) Move the $n - 1$ disks from peg 2 to peg 3, using peg 1 as a temporary holding area.

The process ends when the last task involves moving $n = 1$ disk, i.e., the base case. This is accomplished trivially by moving the disk without the need for a temporary holding area.

Write a program to solve the Towers of Hanoi problem. Use a recursive function with four parameters:

- a) The number of disks to be moved
- b) The peg on which these disks are initially threaded
- c) The peg to which this stack of disks is to be moved
- d) The peg to be used as a temporary holding area

Your program should print the precise instructions it will take to move the disks from the starting peg to the destination peg. For example, to move a stack of three disks from peg 1 to peg 3, your program should print the following series of moves:

1 → 3 (This means move one disk from peg 1 to peg 3.)

1 → 2

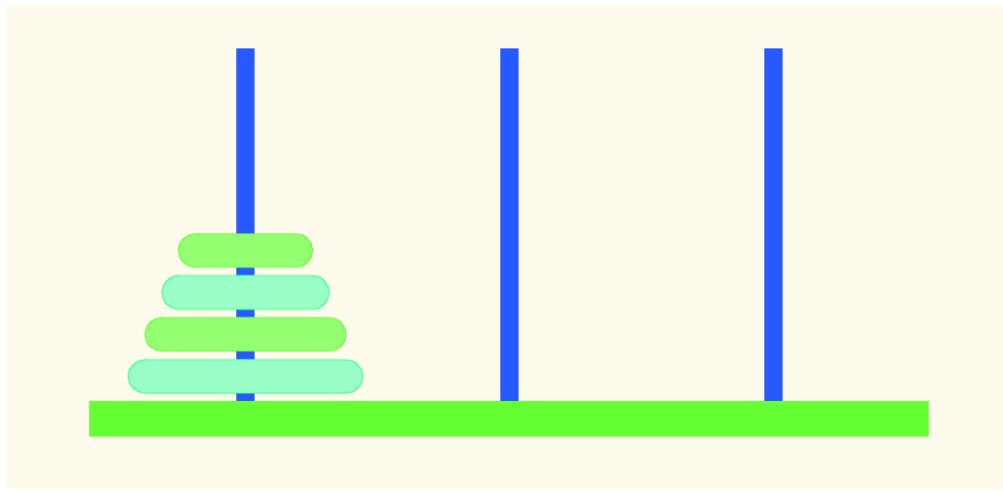
3 → 2

1 → 3

2 → 1

2 → 3

1 → 3



The Towers of Hanoi for the case with 4 disks.