Introduction To Recursion

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Recursion Format

Algorithm recursiveProgram(n)

Format for a recursive algorithm

    Pre   : n is the size of input

    Post : Some result is returned

If(n equals 1)

     Solve problem

Else

     Some operations

     recursiveProgram(reduce_size_n)

end if

end recursiveProgram

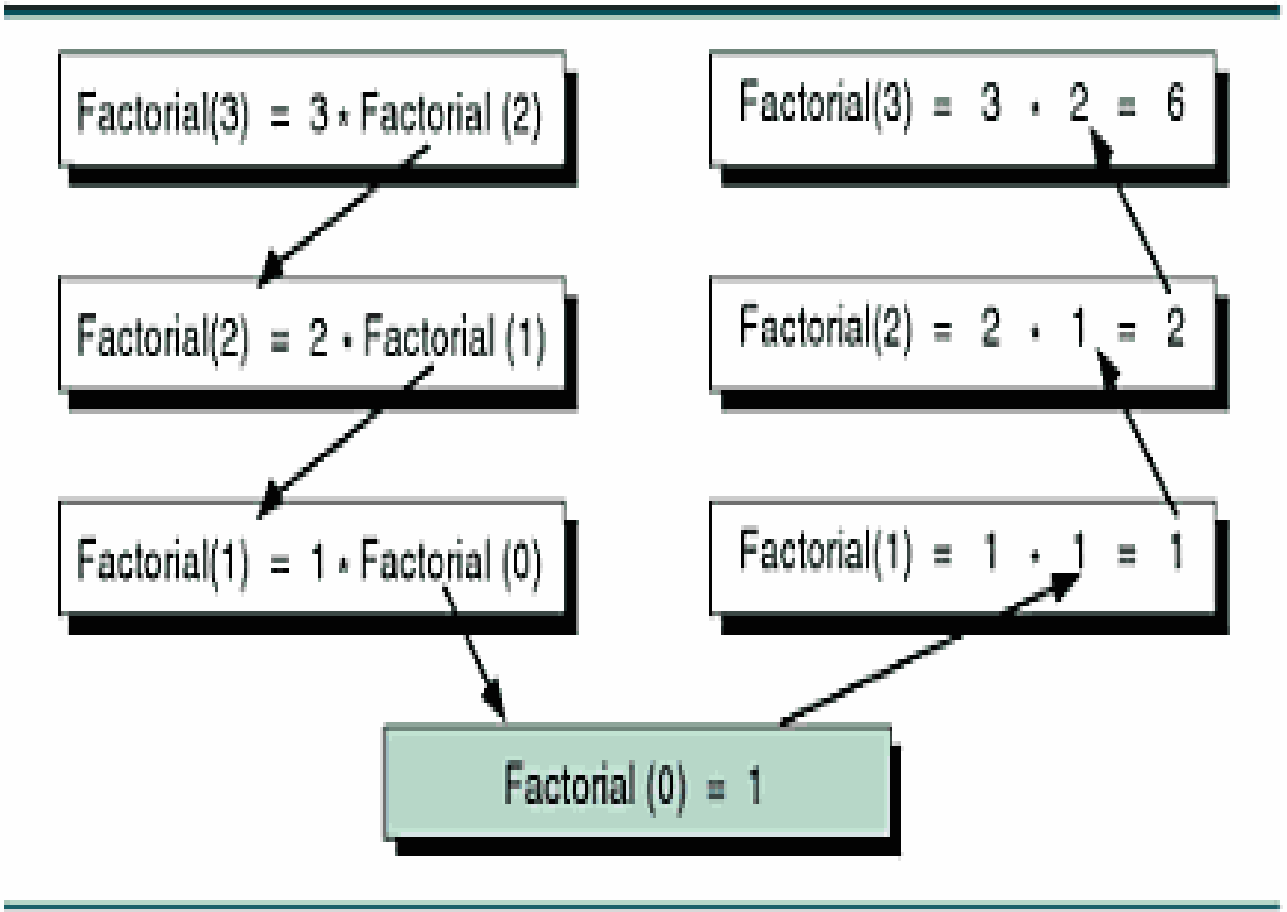
Factorial

Factorial(5) = 5*4*3*2*1 = 120

Factorial(n) = 1 if n=0

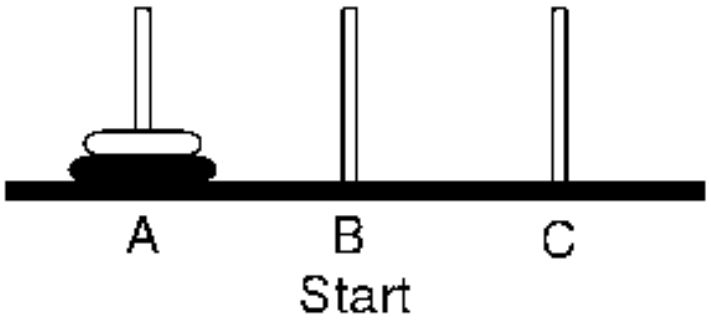
n * factoria(n-1) if n>0

Algorithm recursiveFactorial(n)
Calculates Factorial of a number using recursion
Pre : n is the number being raise factorially
Post : n is returned
If(n equals 0)
return 1
else
return n * recursivefactorial(n-1)
end if
end recursiveFactorial

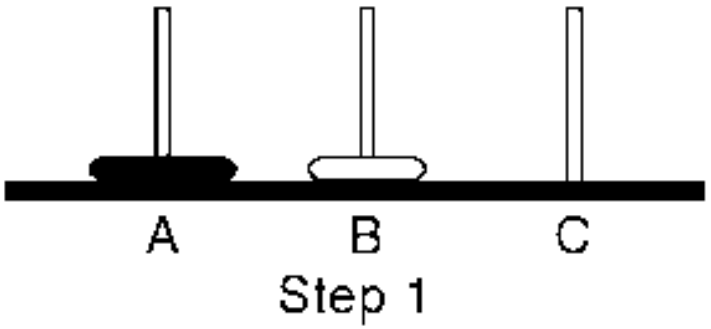

Factorial(3) = 3 * Factorial (2)
Factorial(2) = 2 * Factorial (1)
Factorial(1) = 1 * Factorial (0)
Factorial (0) = 1
Factorial(3) = 3 * 2 = 6
Factorial(2) = 2 * 1 = 2
Factorial(1) = 1 * 1 = 1

Towers Of Hanoi

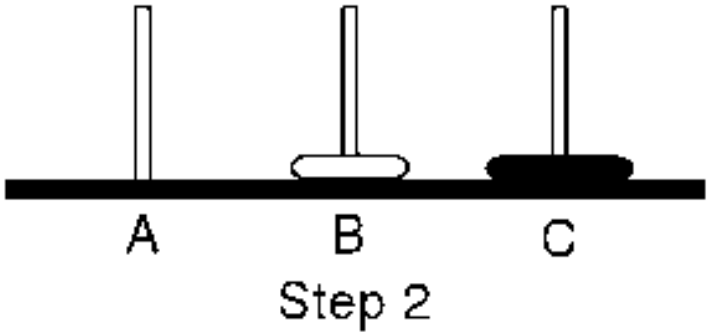
2-Disks



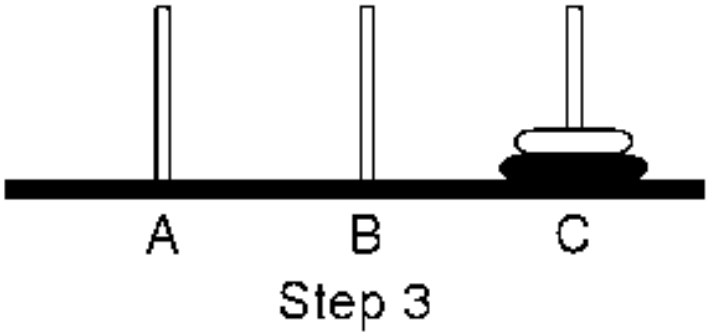
Start



Step 1

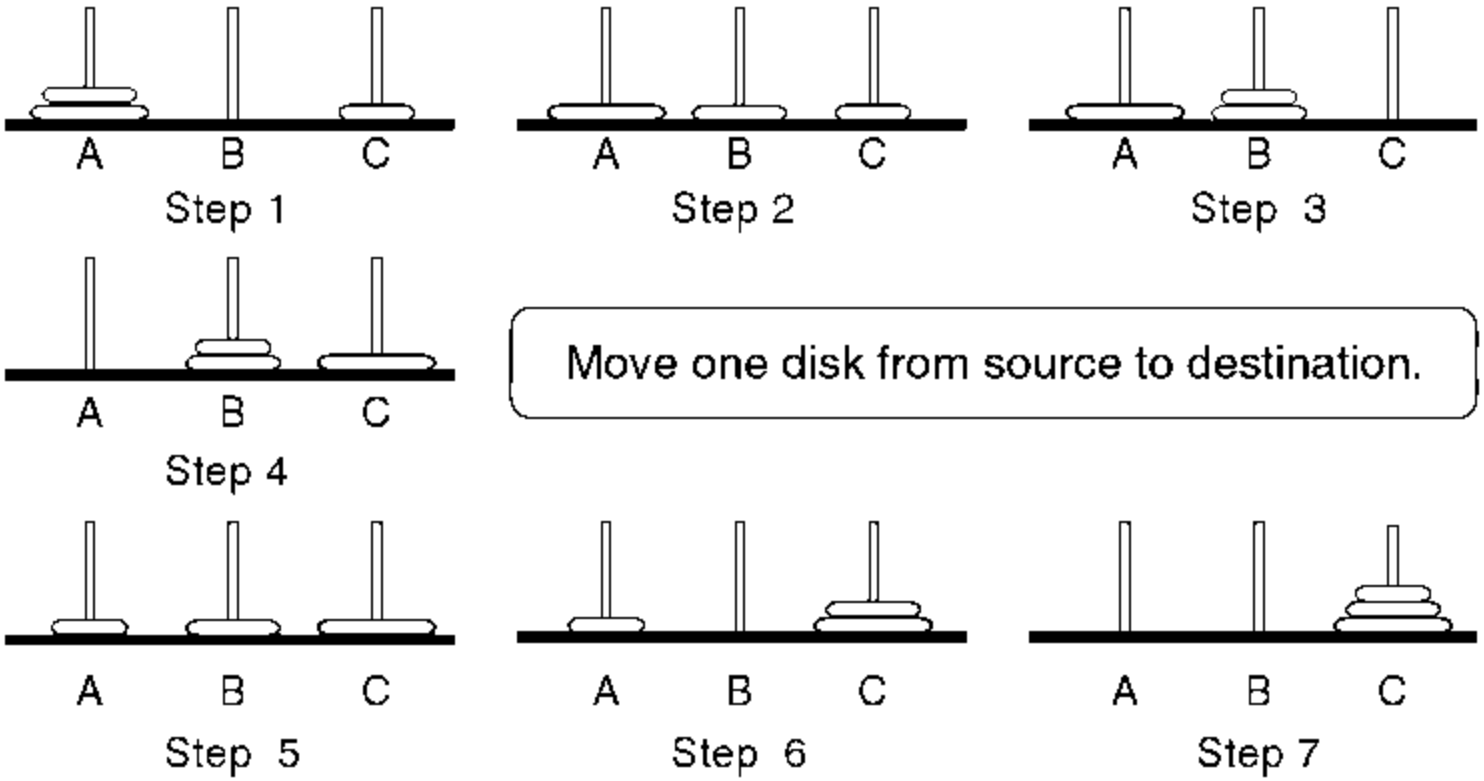


Step 2



Step 3

3-Disks


A
B
C
Step 1
A
B
C
Step 2
A
B
C
Step 3
A
B
C
Step 4
Move one disk from source to destination.
A
B
C
Step 5
A
B
C
Step 6
A
B
C
Step 7

Did You Observe Pattern ?

- Move n-1 Disks from source to auxiliary using destination
- Move 1 Disk from source to destination
- Move n-1 Disks from auxiliary to destination using source

Algorithm

Algorithm Towers(numdisks, source, dest, auxiliary)
Recursively move disks from source to dest
Pre : numdisks is the no of disks
source, dest & auxiliary tower given
Post : steps for moves printed
if(numdisks == 1)
print(“move from ” source “ to ” dest)
else
Towers(numdisks-1,source,auxiliary,dest)
print(“move from” source “ to ” dest)
Towers(numdisks-1,auxiliary,dest,source)
end if
end Towers

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