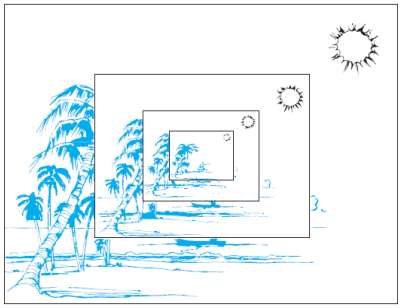
FPT UNIVERSITY
DREAM OF INNOVATION

Recursive



Sometimes it is difficult to define an object explicitly. However, it may be easy to define this object in terms of itself. This process is called **recursion**.

$$f(0) = 3,$$

$$f(n+1) = 2f(n) + 3.$$

$f(1) =$

$f(2) =$

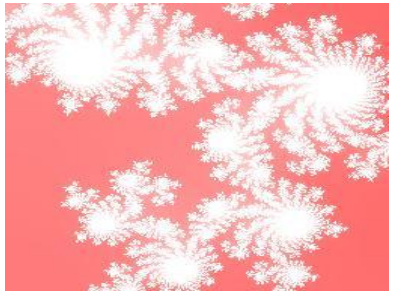
$f(3) =$

$f(4) =$

Recursively

BASIS STEP:

RECURSIVE STEP:



Give a recursive definition of a^n, where a is a nonzero real number and n is a nonnegative integer.

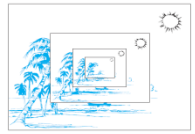
Recursively

BASIS STEP:

RECURSIVE STEP:

Give a recursive algorithm for computing the greatest common divisor of two nonnegative integers a and b not both zero.

Recursive



Give a recursive algorithm for computing $n!$, where n is a nonnegative integer.

$4! =$

$3! =$

$2! =$

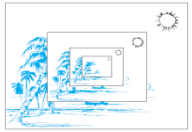
$1! =$

$0! =$

Give a recursive definition of

$$\sum_{k=0}^{n} a_k .$$

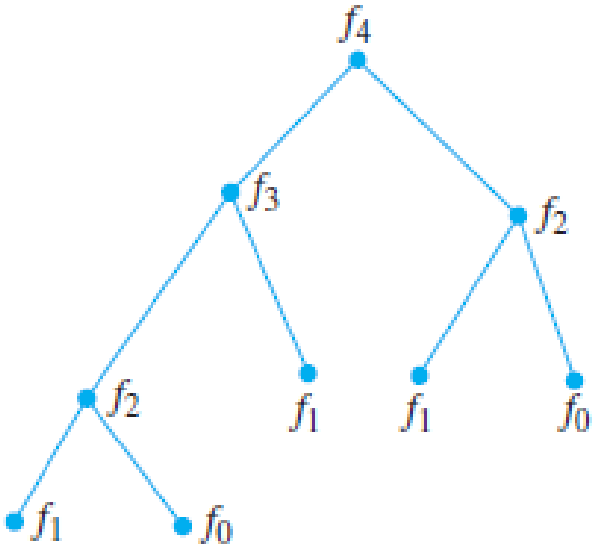
Recursive



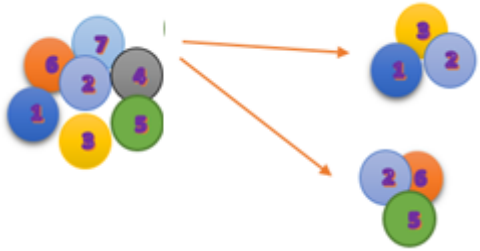
Devise a recursive algorithm for computing $b^n \bmod m$, where b, n, and m are integers with $m \geq 2$, $n \geq 0$, and $1 \leq b$.

Some binary-recursions

Fibonacci numbers of 0, 1, 1, 2, 3, ...



Some binary-recursions



The number of k-combinators
from the set of n+1 elements

$$\underbrace{\binom{n+1}{k}}_{\substack{\text{number of}\\ k\text{-element}\\ \text{subsets of}\\ S=\{1,\ldots,n,n+1\}}} = \underbrace{\binom{n}{k-1}}_{\substack{\text{number of}\\ k\text{-1–element}\\ \text{subsets of}\\ S \text{ without } n+1\\ +\\ n+1}} + \underbrace{\binom{n}{k}}_{\substack{\text{number of}\\ k\text{-element}\\ \text{subsets of}\\ S \text{ without } n+1\\ -\\ n+1}}.$$

Recursive

A Recursive Linear Search Algorithm.

Recursive

A Recursive Binary Search Algorithm.

The Merge Sort

The Merge Sort of 8, 2, 4, 6, 9, 7, 10, 1, 5, 3.