Australian
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Recursion

C1

Recursive Algorithms

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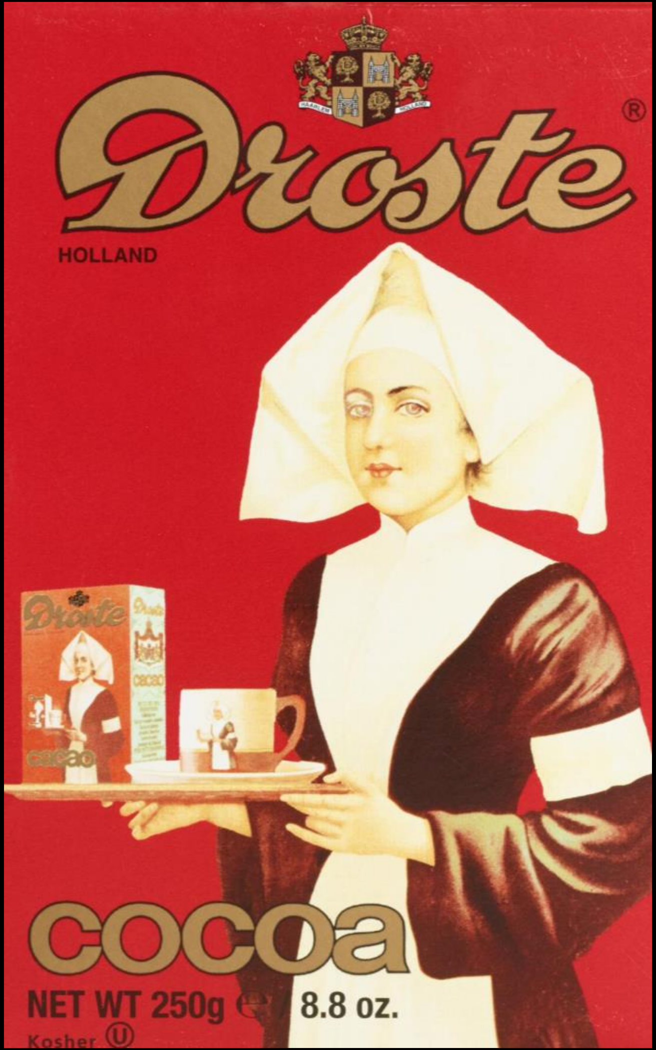
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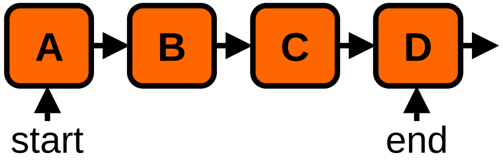
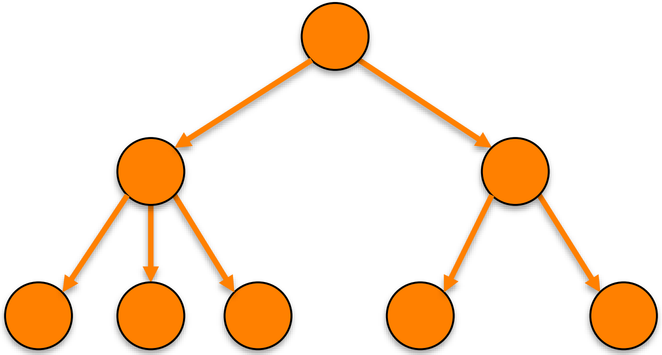
Recursive Data Structure

A recursive data structure is comprised of components that reference other components of the same type.



linked list



tree

Recursive Algorithms

A recursive algorithm references itself.

A recursive algorithm is comprised of:

- one or more base cases
- a remainder that reduces to the base case/s

Example: Fibonacci sequence

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377…

fib(0) = 1 *(base case)*

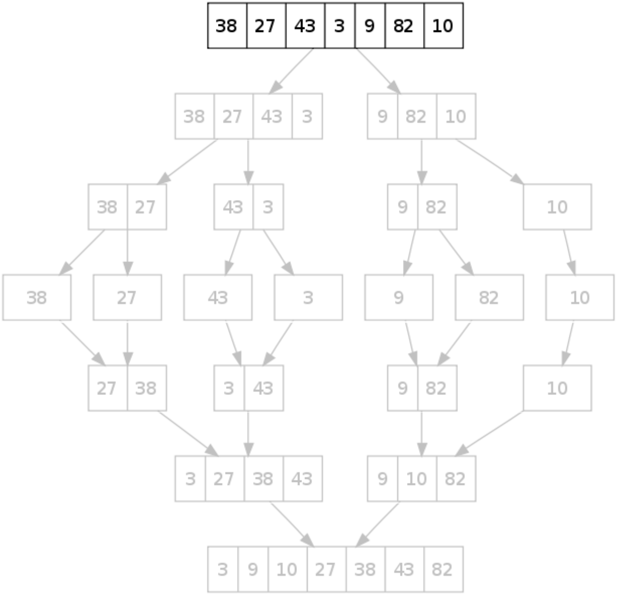
fib(1) = 1 *(base case)*

fib(n) = fib(n-1) + fib(n-2) *(for n ≥ 2)*

Example: Mergesort (von Neumann, 1945)

Sort a list

- List of size 1 *(base case)*
  - Already sorted
- List of size > 1
  - Split into two sub lists
  - Sort each sub list *(recursion)*
  - Merge the two sorted sub lists into one sorted list (by iteratively picking the lower of the two least elements)



Animation: Visualizing Algorithms, Mike Bostock, bost.ocks.org/mike/algorithms