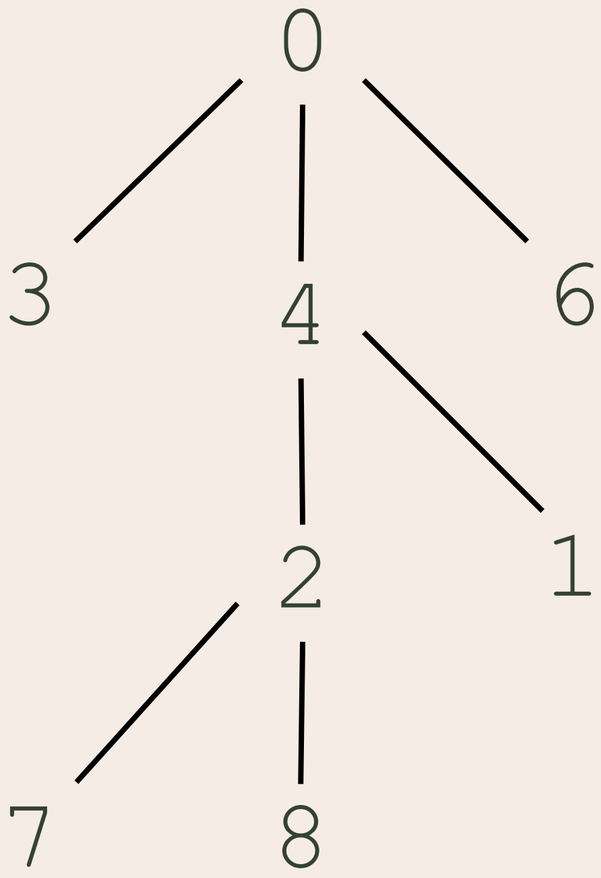
TREES

Janie Lane Sabado

TREES

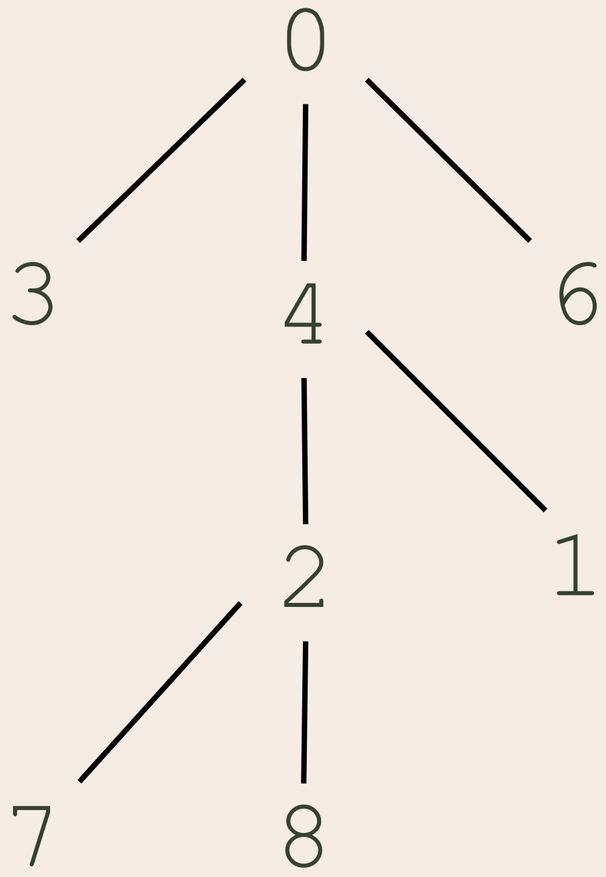
collection of elements known as nodes;
connected undirected graph with no loops,
no multiple edges, and no simple circuits

PROPERTIES



ROOT
SIBLINGS
PATH
ANCESTOR
DESCENDANT
SUBTREE
HEIGHT
DEPTH
PARENT
CHILDREN
LEAF
COUSINS

SYSTEMATIC ORDER



PREORDER

- root, left, right

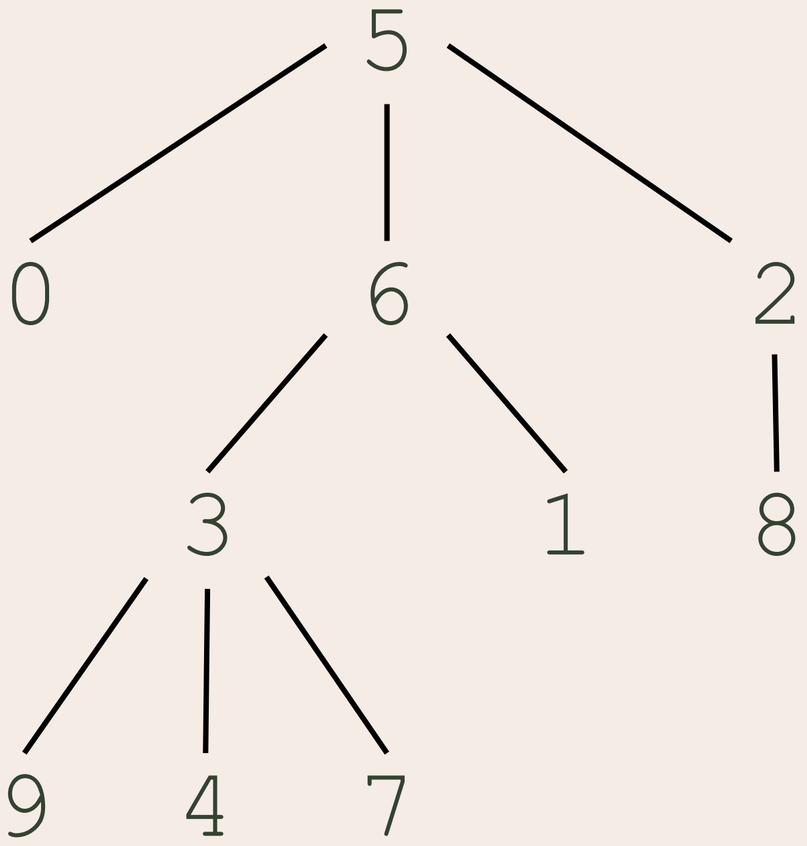
POSTORDER

- left, right, root

INORDER

- left, root, right

SYSTEMATIC ORDER



PREORDER

- root, left, right

POSTORDER

- left, right, root

INORDER

- left, root, right

LABEL & EXPRESSION TREE

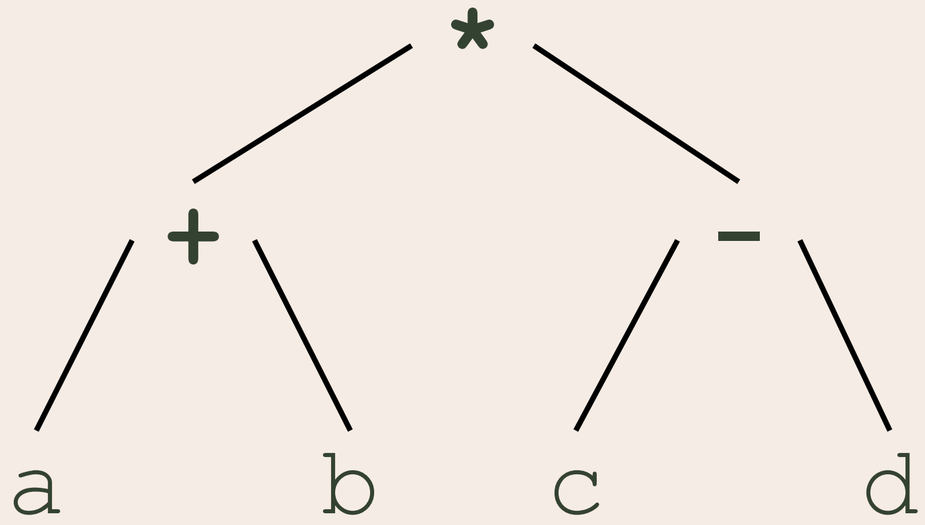
Label Tree

tree whose nodes have labels

Expression Tree

where every node is an expression or operand

EXPRESSIONS



PREFIX NOTATION

- listing of labels in preorder

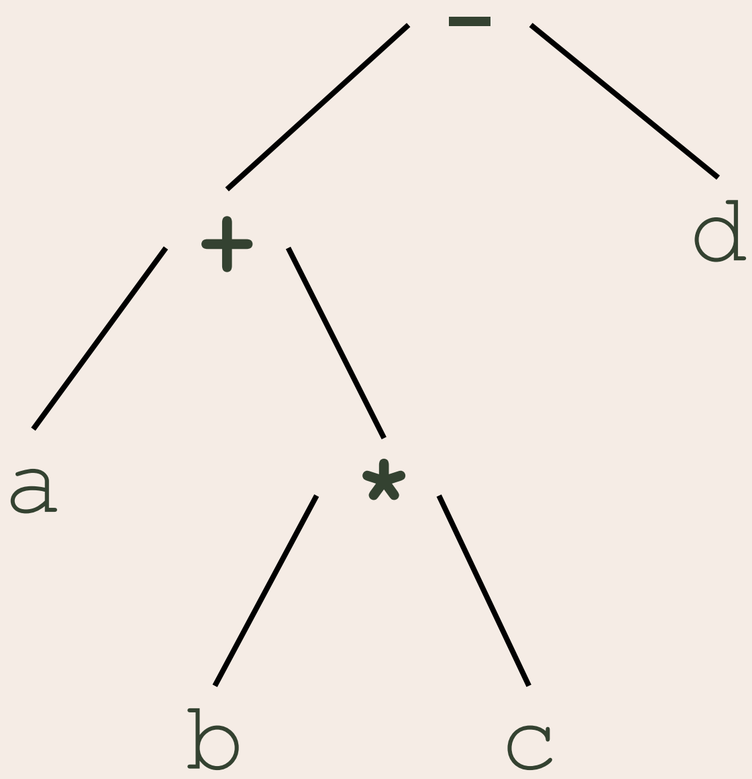
POSTFIX NOTATION

- listing of labels in postorder

INFIX NOTATION

- listing of labels in inorder

EXPRESSIONS



PREFIX NOTATION

- listing of labels in preorder

POSTFIX NOTATION

- listing of labels in postorder

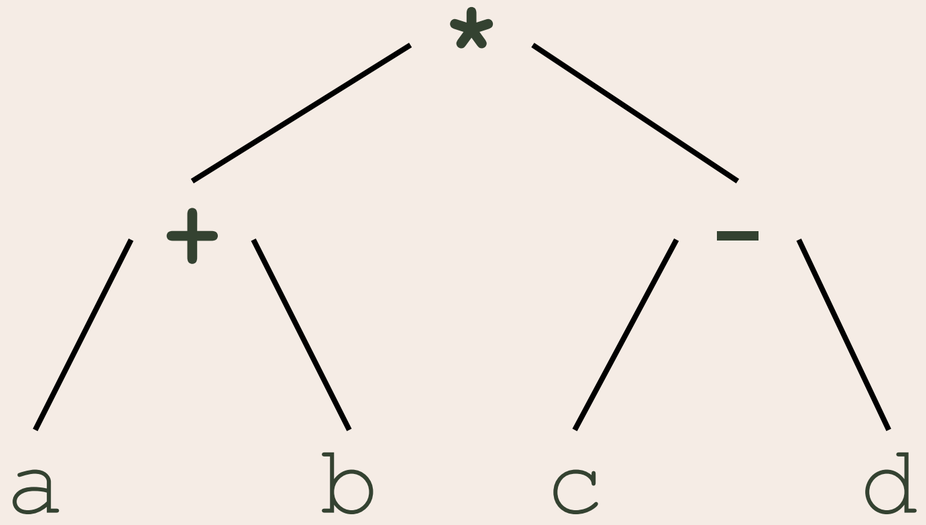
INFIX NOTATION

- listing of labels in inorder

POLISH PREFIX

`Given: *, +, a, b, -, c, d`

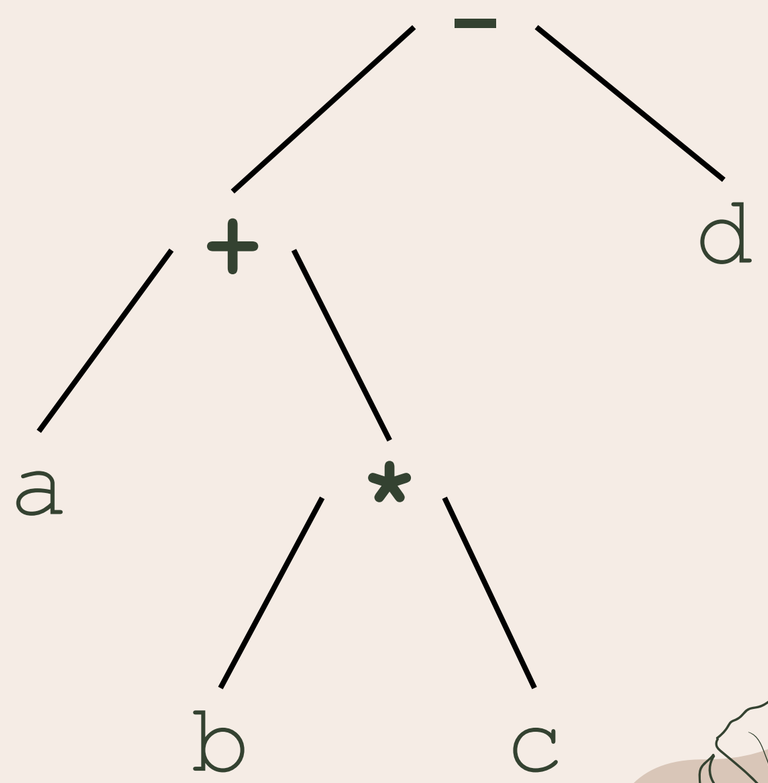
1. start from the left, find occurrences of operator-operand-operand
2. convert to trees with parent-left-right assignment
3. leftmost node is a root



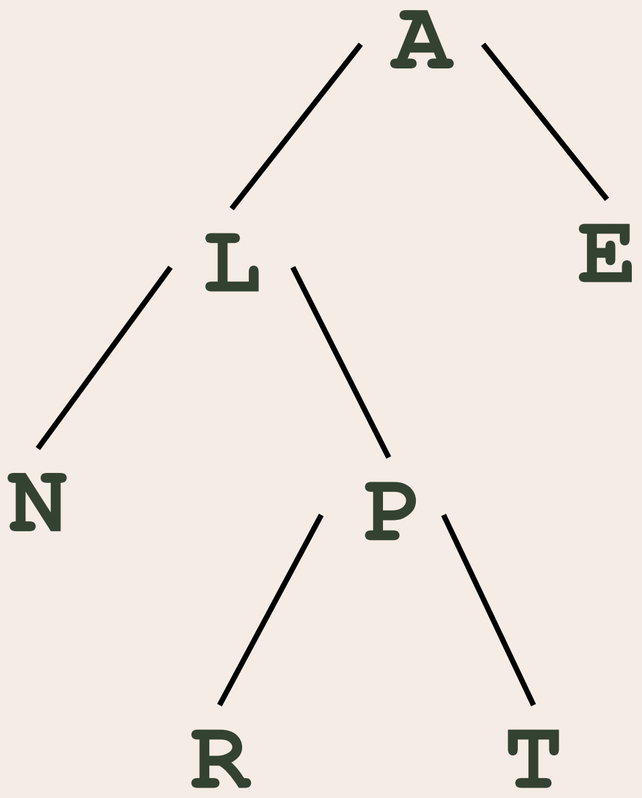
REVERSE POLISH PREFIX

Given: a, b, c, *, +, d, -

1. start from the left, find occurrences of operand-operand-operator
2. convert to trees with left-right-parent assignment
3. rightmost node is a root



ADT TREES

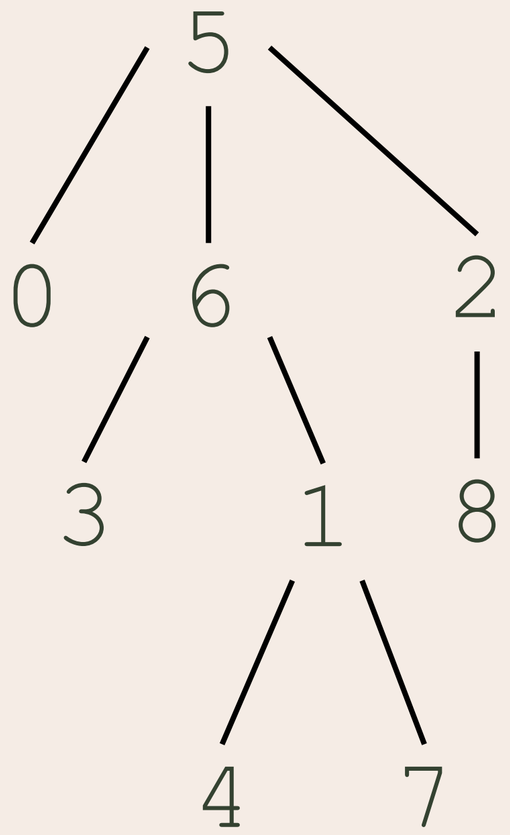


OPERATIONS

- parent(node n, tree T)
  - returns the parent node of a given child node
- left(tree T)
  - returns the leftmost element
- right(tree T)
  - returns the rightmost element
- label( )
- create( )
- initialize( )

IMPLEMENTATION

0	5
1	6
2	5
3	6
4	1
5	-1
6	5
7	1
8	2
9	-2

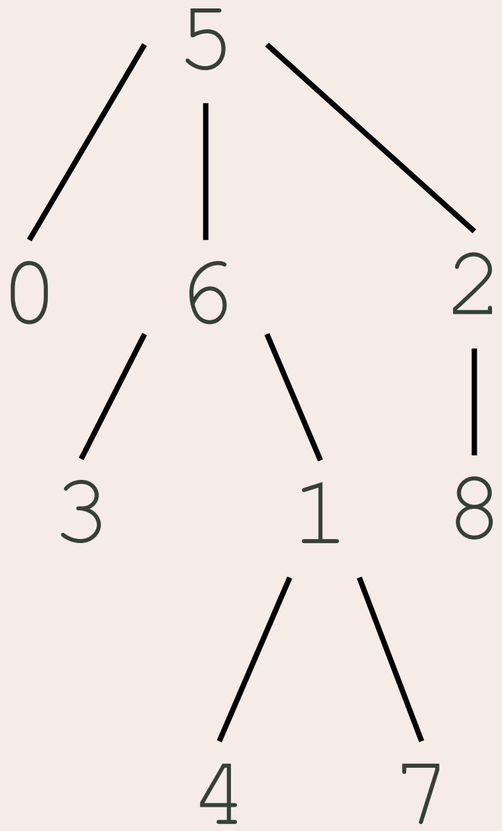


PARENT POINTER REPRESENTATION

- Array of parents
- indexes are the child node
- contents are the parent node

```
T[x]== Parent
  x == Child
T[x]= -1 //Root
T[x]= -2 //DNE
```

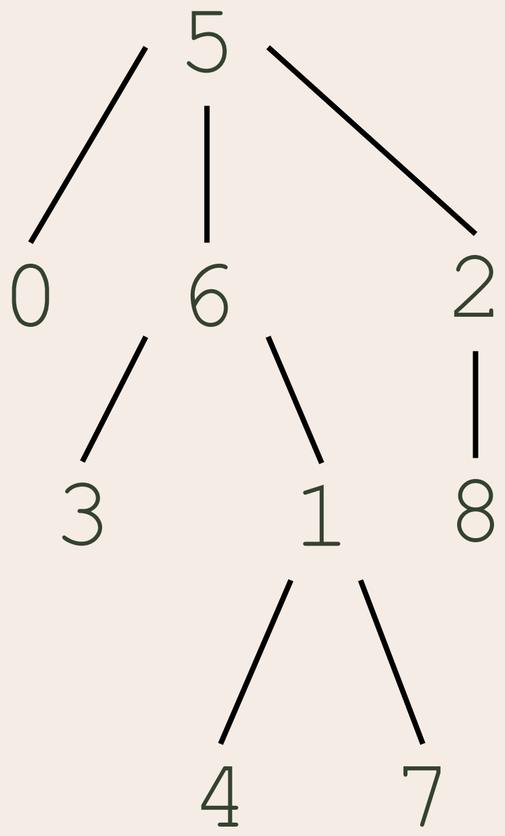
IMPLEMENTATION

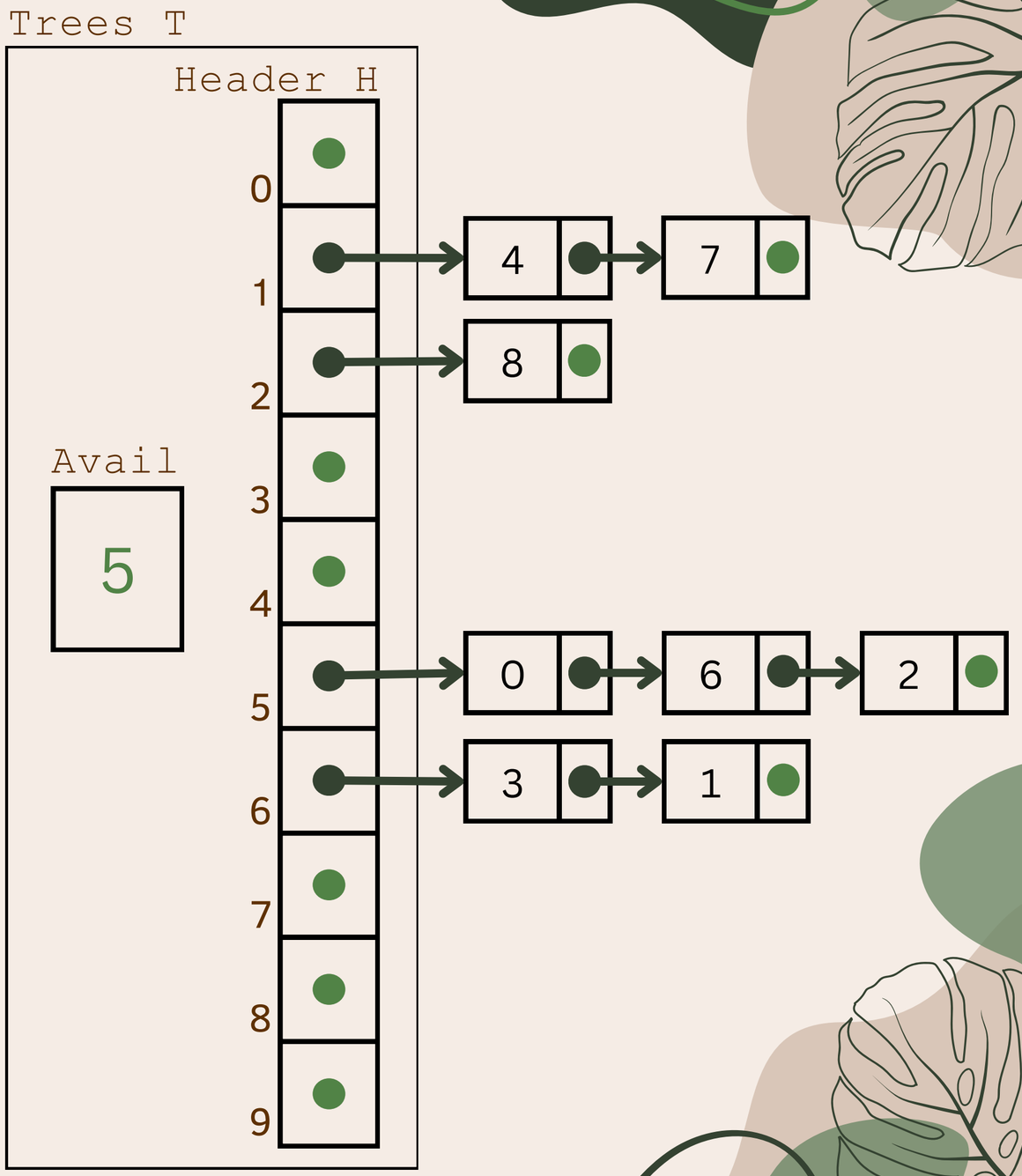


REPRESENTATION BY LIST OF CHILDREN

- Array of linked list
- hard to distinguish the root therefore the root field is created

REPRESENTATION BY LIST OF CHILDREN





TRAVERSING TREES

TREE TRAVERSAL

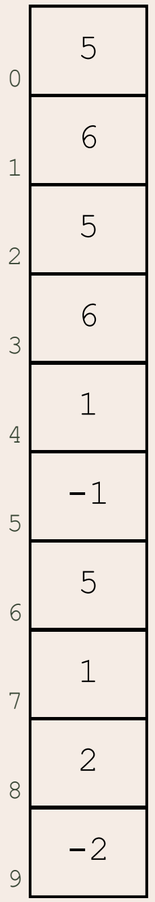
Breadth-First Traversal

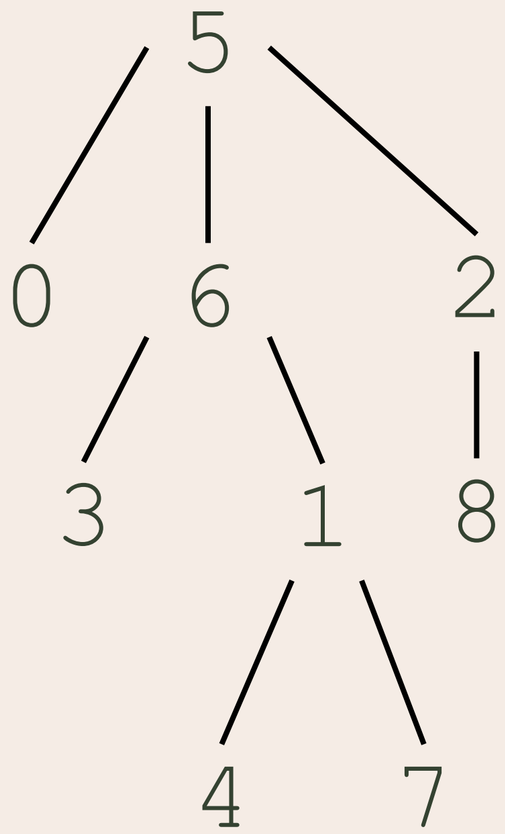
each node is explored level-by-level

Depth-First Traversal

explore nodes as far as possible

TRAVERSALS





Recursion

use recursive functions to traverse.

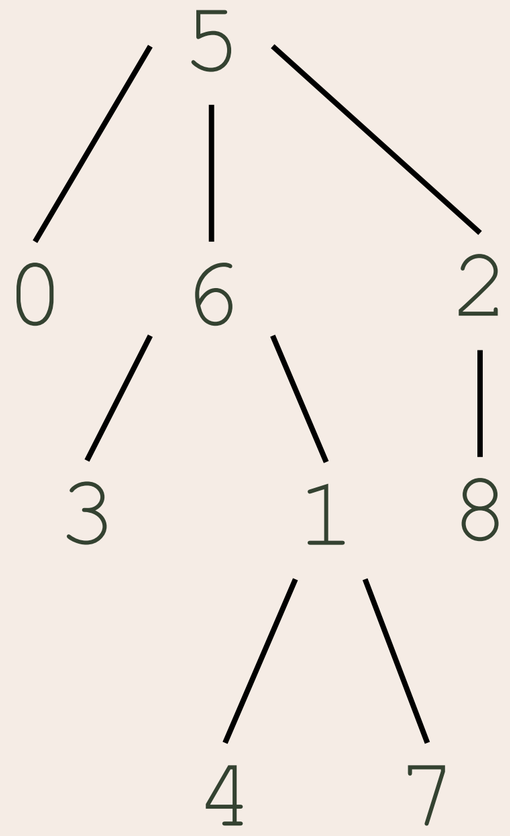
Easier to implement, somewhat harder to trace

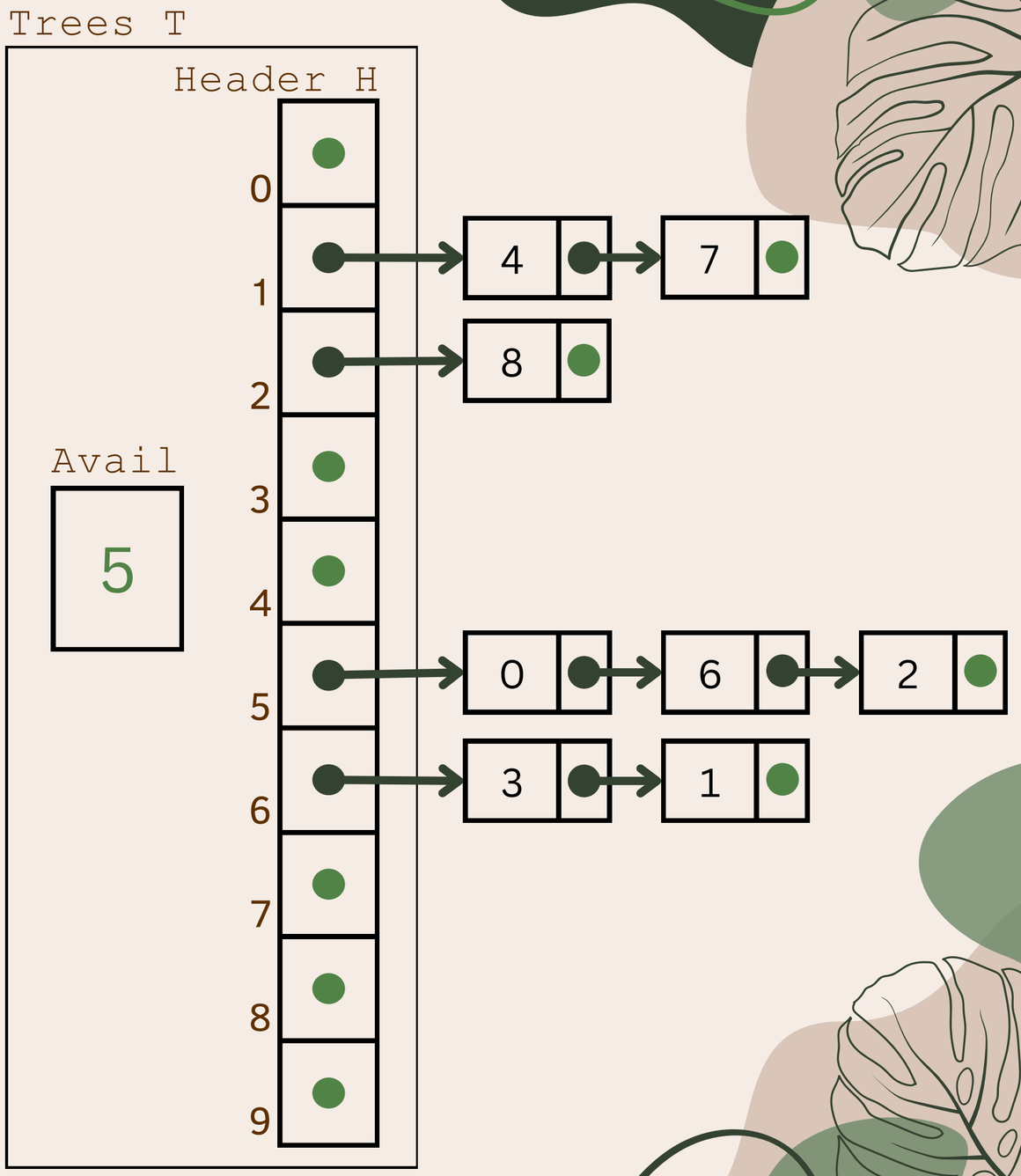
Iterative

use loops to traverse the tree.

Easier to trace, somewhat harder to implement.

REPRESENTATION BY LIST OF CHILDREN

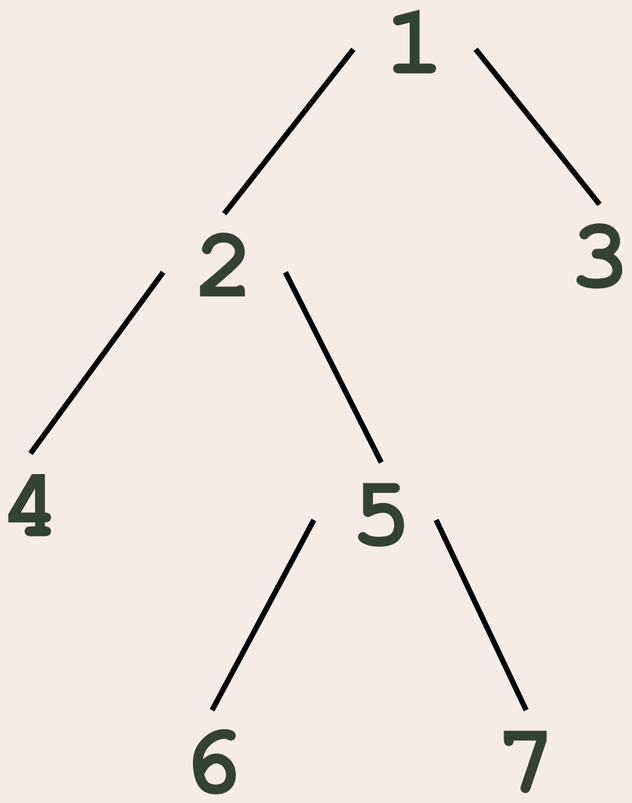




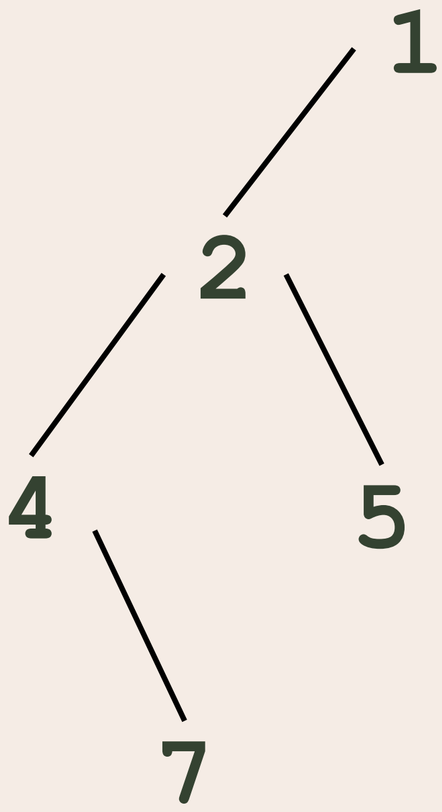
BINARY TREES

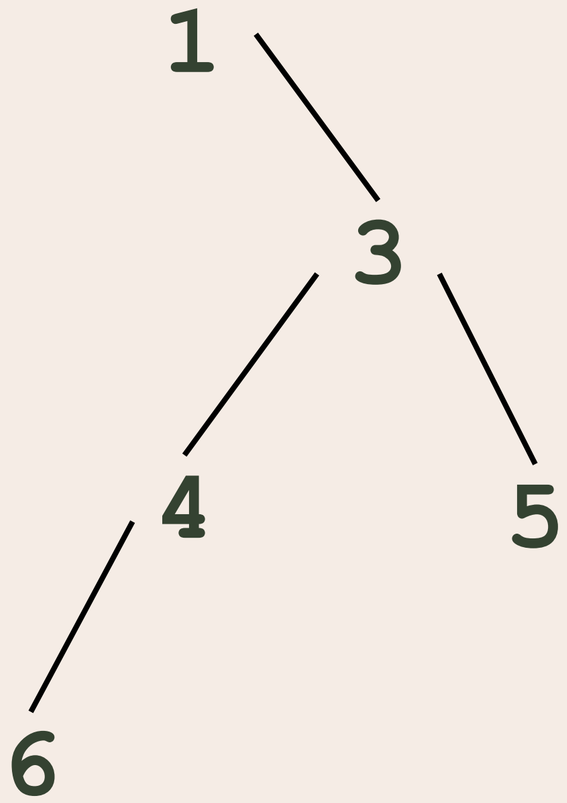
BINARY TREES

- a tree that is empty OR
- a tree which every node has either
  - no child node
  - a left child
  - a right child
  - both a left and right child

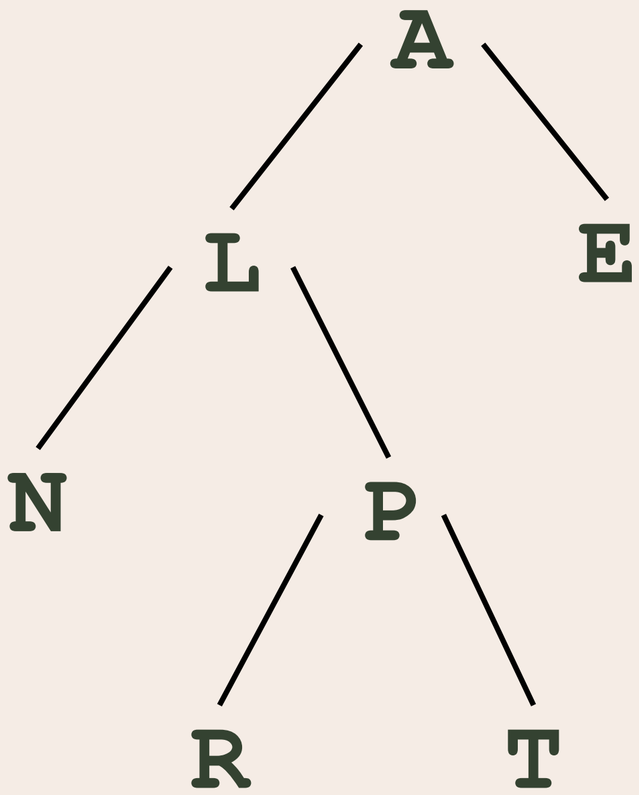


BINARY TREES





BINARY TREES



THANK YOU