Chapter 10 introduces trees. This presentation illustrates the simplest kind of trees: Complete Binary Trees.

A binary tree has nodes, similar to nodes in a linked list structure. Data of one sort or another may be stored at each node. But it is the connections between the nodes which characterize a binary tree.

A Binary Tree of States

In this example, the data contained at each node is one of the 50 states.

A Binary Tree of States

Each tree has a special node called its root, usually drawn at the top.

The example tree has Washington as its root.
A Binary Tree of States

Each node is permitted to have two links to other nodes, called the left child and the right child.

A Binary Tree of States

Each node is permitted to have two links to other nodes, called the left child and the right child.

A Binary Tree of States

Children are usually drawn below a node.

A Binary Tree of States

Some nodes have only one child.

A Quiz

Some nodes have only one child.

A Quiz

Some nodes have only one child.

Which node has only a right child?
A Binary Tree of States

A node with no children is called a leaf.

Each node is called the parent of its children.

Washington is the parent of Arkansas and Colorado.

A Binary Tree of States

Two rules about parents:

1. The root has no parent.
2. Every other node has exactly one parent.

A Binary Tree of States

Two nodes with the same parent are called siblings.

Arkansas and Colorado are siblings.

Complete Binary Trees

A complete binary tree is a special kind of binary tree which will be useful to us.

When a complete binary tree is built, its first node must be the root.
The second node of a complete binary tree is always the left child of the root...

... and the third node is always the right child of the root.

The next nodes must always fill the next level from left to right.

The next nodes must always fill the next level from left to right.
Complete Binary Trees

The next nodes must always fill the next level from left to right.

Is This Complete?

Is This Complete?
Is This Complete?

Yes!

✔ It is called the empty tree, and it has no nodes, not even a root.

Implementing a Complete Binary Tree

👉 We will store the date from the nodes in a partially-filled array.

3 An integer to keep track of how many nodes are in the tree

An array of data

We don't care what's in this part of the array.

An array of

Read Section 10.2 to see details of how the entries are stored.

This is what's in this part of the array.

Summary

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