



What is a Binary Tree?

An introduction to binary trees and different types of binary trees

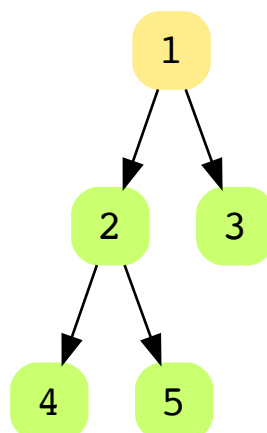
We'll cover the following



- Introduction
- Types of Binary Trees
 - Complete Binary Trees
 - Full Binary Trees
 - Perfect Binary Trees

Introduction

A binary tree is a tree in which each node has between 0-2 children. They're called the left and right children of the node. The figure below shows what a Binary Tree looks like.

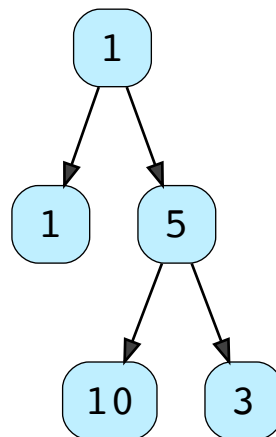




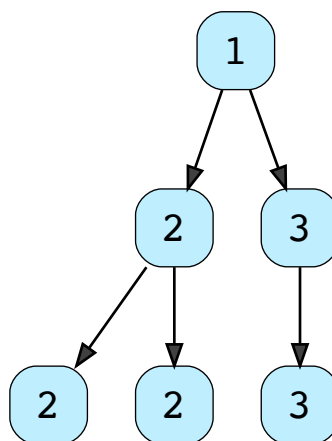
Types of Binary Trees

Complete Binary Trees

A *complete binary tree* is a binary tree in which all the levels of the tree are fully filled, except for perhaps the last level which can be filled from left to right.



Not a complete Binary Tree



A Complete Binary Tree

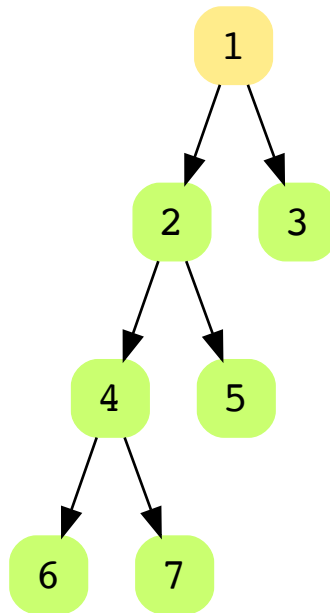
Full Binary Trees

- In a full or 'proper' binary tree, every node has **0** or **2** children. No node can have 1 child.

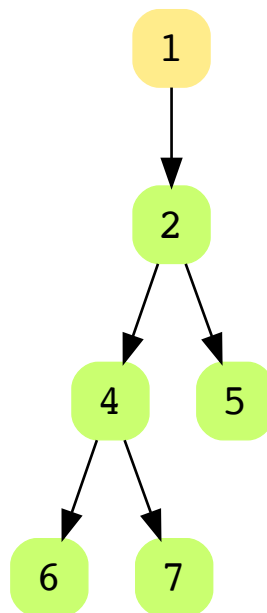
- The total number of nodes in a full binary tree of height h is expressed as:



$$2h + 1 \leq \text{total number of nodes} \leq 2^{(h+1)} - 1$$



A full BinaryTree



Not a full binary tree

Perfect Binary Trees

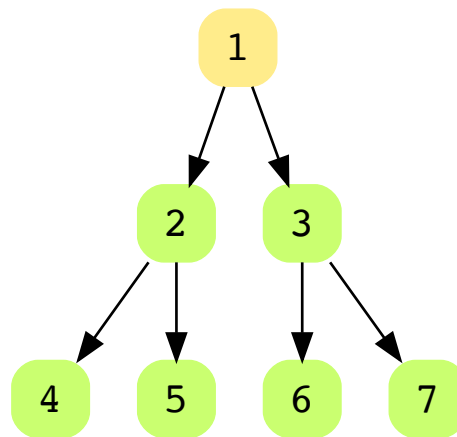


A Binary tree is said to be **Perfect** if all its internal nodes have two children and all leaves are at the same level. Also note that,



- the total number of nodes in a perfect binary tree of height '**h**' are given as: $2^{(h+1)} - 1$
- the total number of leaf nodes are given as 2^h or $\frac{(n+1)}{2}$

The following image shows what a perfect binary looks like.



A Perfect Binary Tree

There are many other advanced trees derived from the basic structure of binary trees. These types will be discussed in the upcoming lessons. Some of the most common ones are:

- Complete Binary Tree
- Skewed Binary Tree
- Binary Search Tree
- AVL Tree

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What makes a tree 'balanced'?

[More on Complete Binary Trees](#)

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