Binary Trees

1. Data structure that stores elements in a hierarchy.
   1. Elements are stored in nodes
   2. Nodes are connected by edges
2. Bottom most nodes are called leaves
3. Uses
   1. We use trees anywhere we want to represent hierarchical data.
      1. Tree of people in an organization or family
      2. Files and folders
   2. Also used in databases for indexing to quickly look up data.
   3. Used for autocompletion
      1. Chrome stores all of your past web searches in a tree.
      2. Whenever you type a query, it tries to match it with previously stored queries.
   4. Used in compilers.
      1. Use a syntax tree to parse expression.
   5. Used in compression algorithms such as JPEG and MP3 formats
4. Binary Search Tree
   1. Used to quickly look up data.
   2. Value of any node is always greater than the value of its left child and less than its right child.
      1. Left child < node < right child
   3. Every value in the left subtree of the root node is less than the value of the root.

A diagram of a tree

Description automatically generated

* 1. Similarly, right subtree’s values are all greater than the root’s value.
  2. This format lets us quickly look up a value.
  3. It would only take three comparisons to find the value of 1.

1. Operations in a Binary Search Tree
   1. Lookup – O(log n)
   2. Insert – O(log n)
   3. Delete – O(log n)