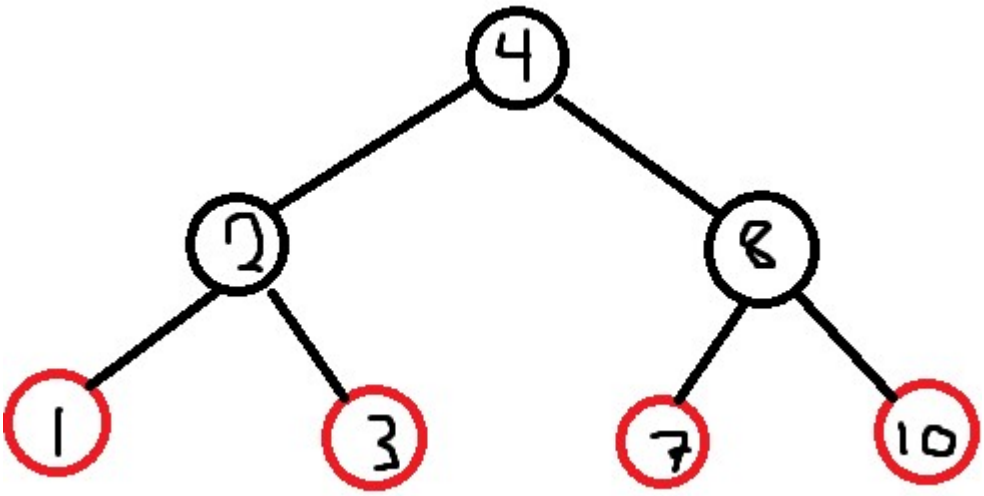
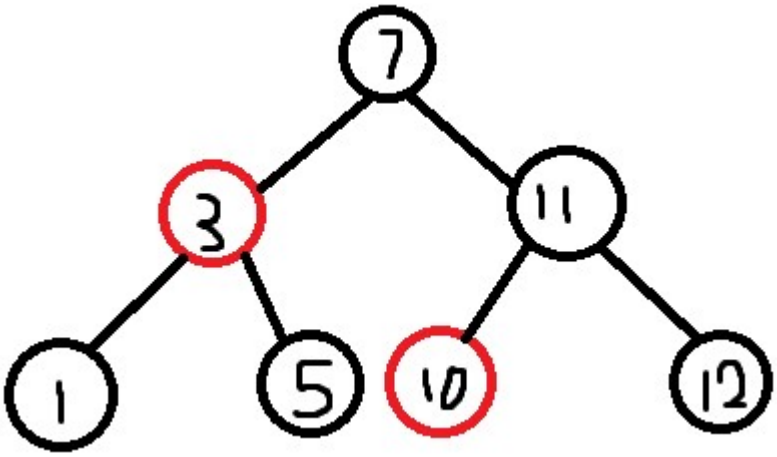
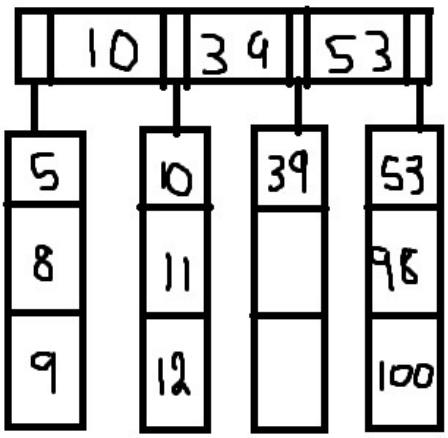
1.



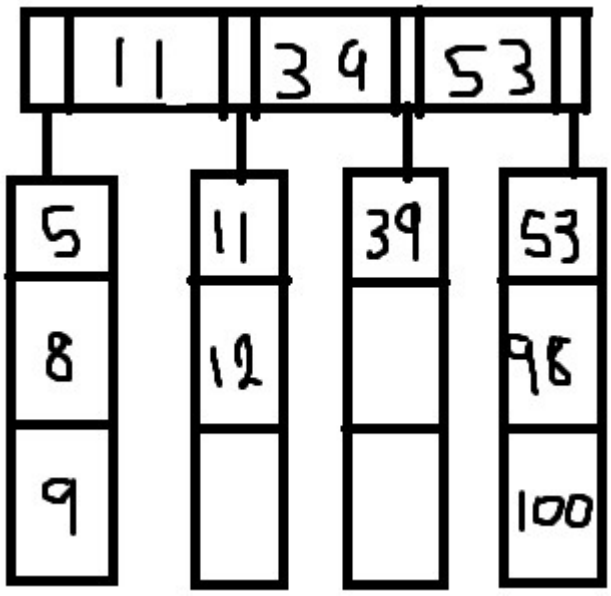
2.



3a.



3b.



4a. Each internal node contains 4 UUID's of size 128 bits and 5 pointers of size 64 bits due to it being on a 64-bit CPU. Total = 832 bits or 104 bytes

4b. For each leaf node we have 128 + 32 + 32 + 64 = 256 bits

4c. Each internal node has 5 pointers the height will be $\log_5(N)$.

4d. $\log_5(30{,}000) = 6$. Height will be 6.

4e. $\log_5(2{,}500{,}000) = 9$. Height will be 9.

5. To reduce the amount of time it takes to insert and search for data by utilizing a hash function which will give us a location to either begin inserting or begin searching from.