Heaps

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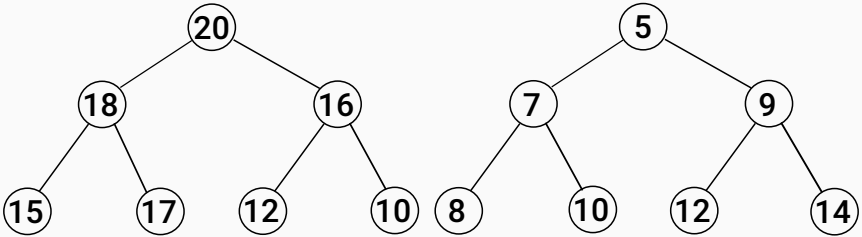
Heaps

There are two different types of heaps. Min-heap and max-heap. A heap is a complete binary tree that satisfies the heap property i.e. for every node, the value of its children is less(max-heap or more for min-heap) than or equal to its own value. Heaps are often used to implement priority queues, where the smallest or the largest element is always at the top.

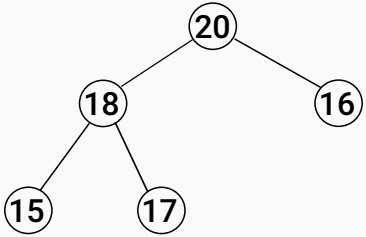


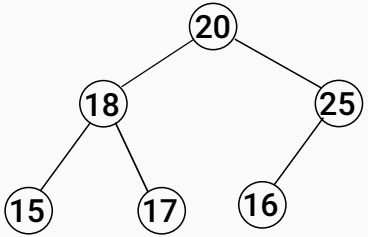
Max heap **Min heap**

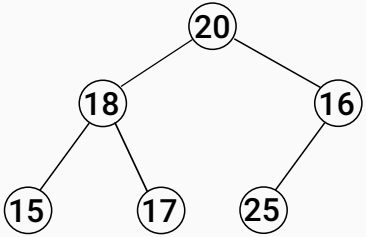
Properties of a Heap

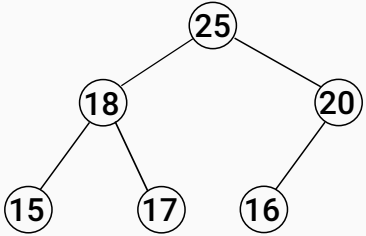
- A heap is a complete binary tree. This implies that all levels are fully filled except last level i.e. leaf nodes exist only at the last level.
- The largest or the smallest value is always at the top.
- Parent and child have a special relationship. If index or parent is i then children are at index $2i + 1$ and $2i + 2$ for 0-based indexing.
- Insertion and removal are efficient and have a time complexity $O(\log n)$.
- Efficient access to the largest or smallest element with a time complexity of $O(1)$.

Insertion in Heaps

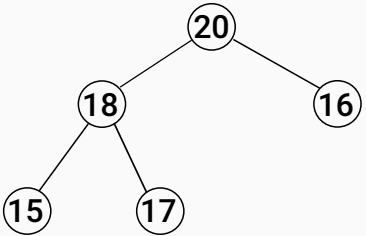


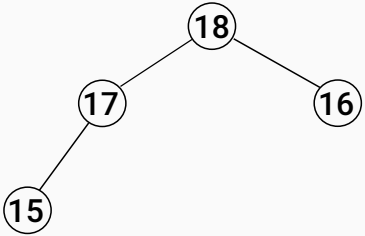


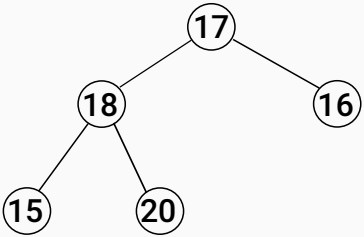




Deletion in Heaps







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