Week 9 — Binary Heaps

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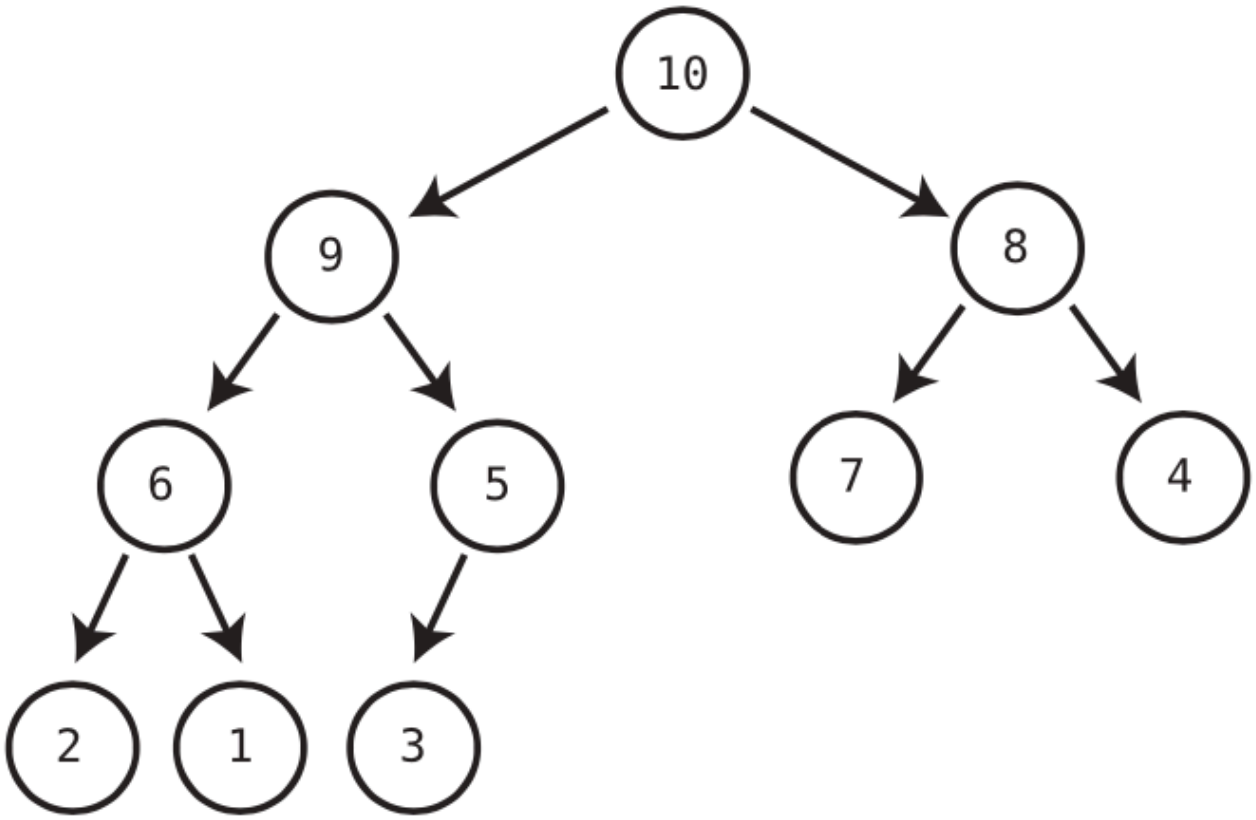
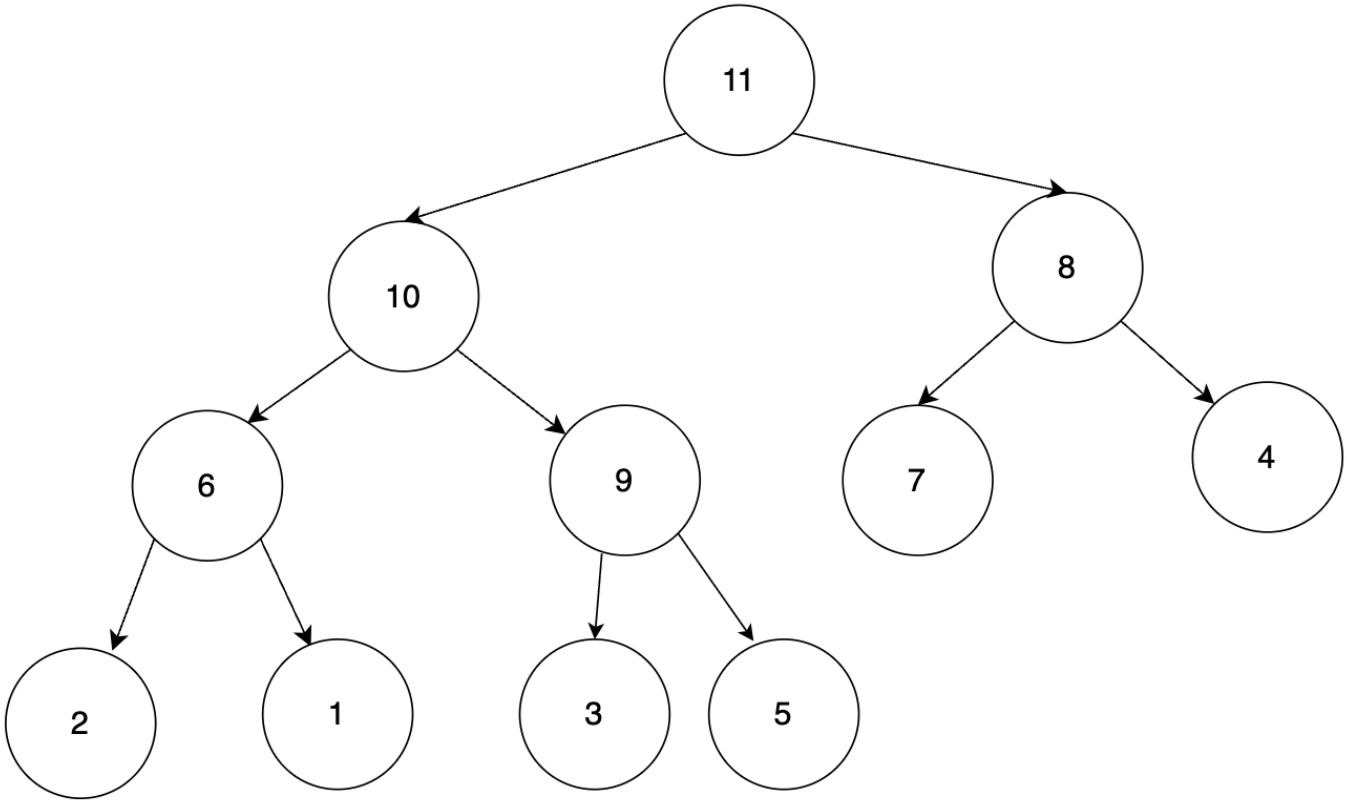
1.

Draw what the following heap would look like after we insert the value 11 into it:



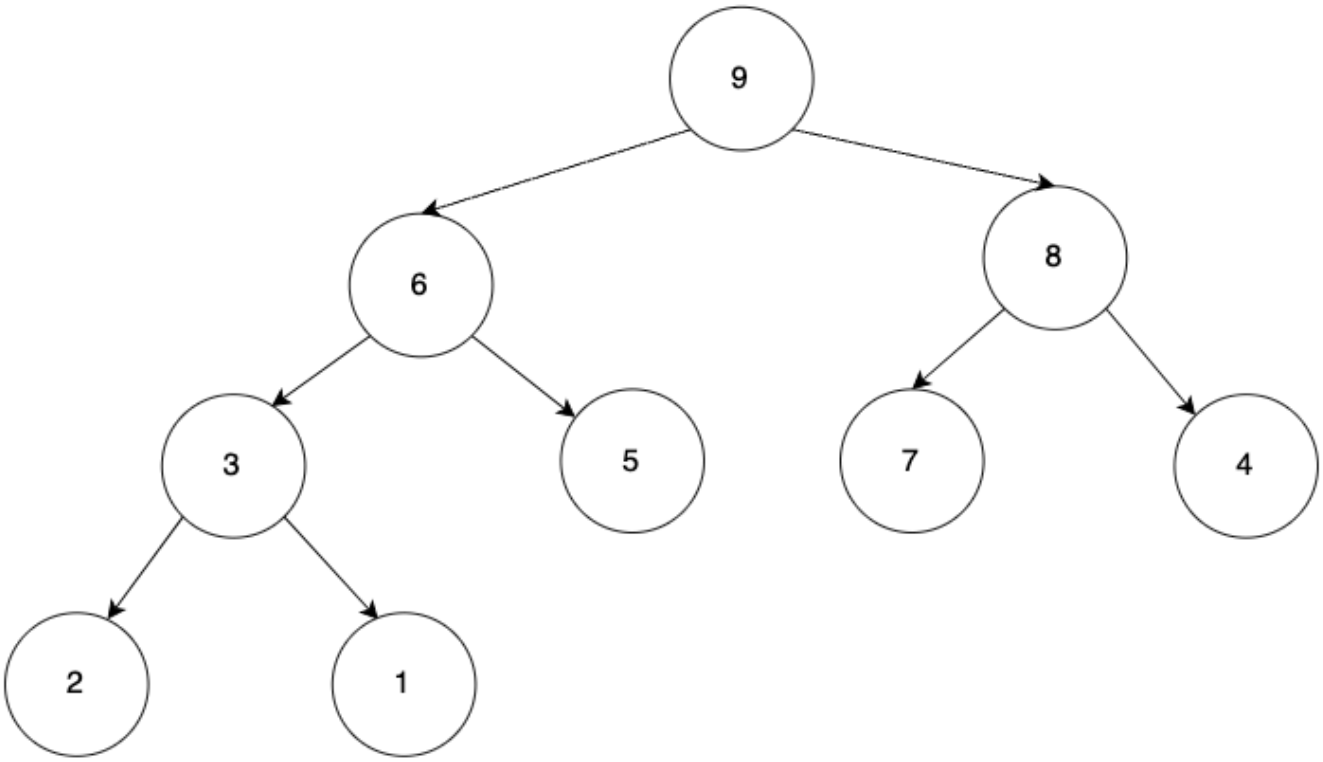
Inserting 11 into the max heap causes 11 to become the new root after the heaping process since it's now the largest value:



2.

Draw what the previous heap would look like after we delete the root node.

Removing 10 from the max heap means that the last node (3) would replace where 10 is. Then it would trickle down into its proper place, leaving node 9 as the new root node. The 3 node would trickle down, swapping with largest children nodes in order to keep the max heap structure.



3.

Imagine you've built a brand-new heap by inserting the following numbers into the heap in this particular order: 55, 22, 34, 10, 2, 99, 68. If you then pop them from the heap one at a time and insert the numbers into a new array, in what order would the numbers now appear?

```
            55
          /    \
        22      34
      /   \    /
    10    2  99


            55
          /    \
        22      99
      /   \    / \
    10    2  34


            99
          /    \
        22      55
```

```
          /  \    / \
         10   2 34  68


             99
            /   \
           22    68
          /  \    / \
         10   2 34  55


Before pop: [99, 22, 68, 10, 2, 34, 55]
Heapify     [68, 22, 55, 10, 2, 34]          New Array: [99]
            [55, 22, 34, 10, 2]              New Array: [99, 68]
            [34, 22, 2, 10]                  New Array: [99, 68, 55]
            [22, 10, 2]                      New Array: [99, 68, 55, 34]
            [10, 2]                          New Array: [99, 68, 55, 34, 22]
            [2]                              New Array: [99, 68, 55, 34, 22, 10]
            []                               New Array: [99, 68, 55, 34, 22, 10, 2]

```

When you pop repeatedly from a max heap, you get the numbers in descending order.
The new array is:
[99, 68, 55, 34, 22, 10, 2]

Video Link: https://youtu.be/YW1w8RsYZno