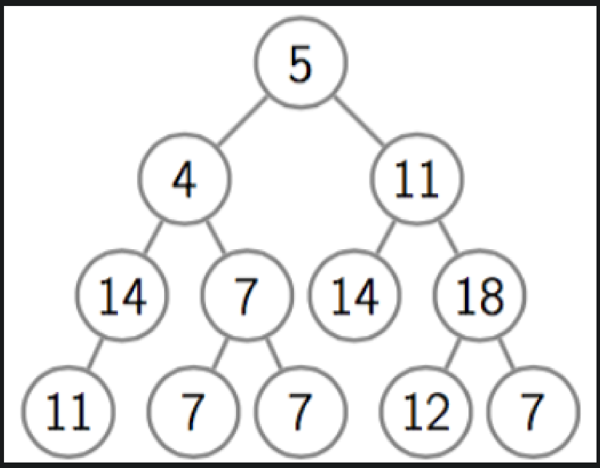
1. 1 / 1 point

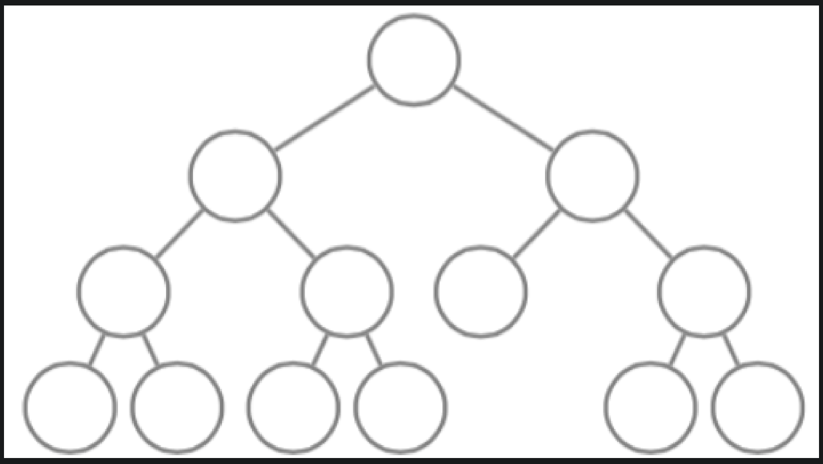


How many edges of this binary tree violate the min-heap property? In other words, for how many edges of the tree, the parent value is greater than the value of the child?

4

Correct

2. 1 / 1 point



This binary tree contains 13 nodes, and hence we have 13 subtrees here (rooted at each of 13 nodes). How many of the subtrees are complete?

11

Correct

3. Consider a complete binary tree represented by an array $[19, 14, 28, 15, 16, 7, 27, 15, 21, 21, 5, 2]$. 1 / 1 point

How many edges of this tree violate the max-heap property? In other words, for how many edges of the tree, the parent value is smaller than the value of the child?

5

Correct

4. Assume that a max-heap with 10^5 elements is stored in a complete 5-ary tree. Approximately how many comparisons a call to $\texttt{Insert}()$ will make?

1 / 1 point

- ○ 18
- ○ 38
- ◉ 8
- ○ 28

Correct
Recall, that to insert a new element, we attach it as a leaf to the last level and let the new node sift up. The number of comparisons required to sift it up is at most the height of the tree. In this case, the height is $\log_5(10^5) \approx 8$.

5. Assume that a max-heap with 10^6 elements is stored in a complete 7-ary tree. Approximately how many comparisons a call to $\texttt{ExtractMax}()$ will make?

1 / 1 point

- ○ 5
- ○ 500
- ◉ 50

Correct
Recall, that to extract the maximum value, we replace the root node with the last leaf and let this new node sift down. When sifting its down, on each level we need to find the maximum among 7 children. Thus, the worst case running time of $\texttt{ExtractMax}()$ in this case is $7 \cdot \log_7(10^6) \approx 50$.

6. Assume that we represent a complete d-ary tree in an array $A[1 \ldots n]$ (this is a 1-based array of size n). What is the right formula for the indices of children of a node number i?

1 / 1 point

- ○ $\{(i-1)d+1, \ldots, \min\{n, (i-1)d+d\}\}$
- ○ $\{(i-1)d+2, \ldots, (i-1)d+d+1\}$
- ◉ $\{(i-1)d+2, \ldots, \min\{n, (i-1)d+d+1\}\}$
- ○ $\{id+2, \ldots, \min\{n, id+d+1\}\}$

Correct