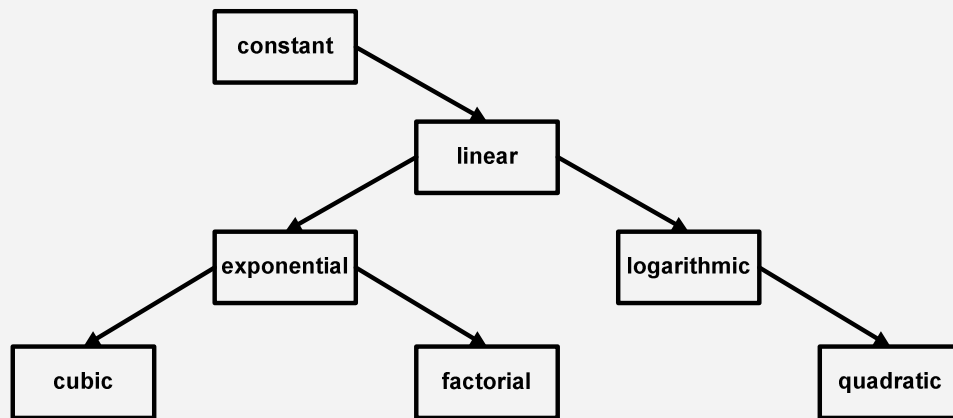


Quiz #4

Create a Binary Search Tree with the following data, which is added in order. constant, linear, logarithmic, quadratic, exponential, factorial, cubic. [4 pts]

Answer:



What are the best case, worst case, and average case time complexity for insertions, searches and deletions in a binary search tree with n nodes? State any assumptions and briefly justify your answers. [4 pts]

Answer:

The best case and average case of binary search tree operations run at $\Theta(\lg n)$. The worst case time complexity of binary search tree operations is $\Theta(n)$.

The time complexity of binary search tree operations depends on the tree height. The minimum height, $\lg_2 n$, occurs in a complete binary tree. In this case, insertion, deletion, and searching take $\Theta(\lg n)$ time. The worst case occurs when it is a skew tree. The maximum tree height is, therefore, $n - 1$. Thus, the worst

time complexity for binary search tree operations is $\theta(n)$, while the average expectation of the binary search tree operations runs at $\theta(\lg n)$.

Perform counting sort on the following array. Show all values that change and data structures used (do not repeat values that don't change). Indicate the order in which operations are performed. [4 pts]

$A = \langle 5 \ 12 \ 11 \ 9 \ 5 \ 1 \ 10 \ 12 \rangle$

Answer:

Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	0	0	0	0	0	0	0	0	0	0	0



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	1	0	0	0	2	0	0	0	1	1	1	2



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	1	1	1	1	3	3	3	3	4	5	6	8



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	1	1	1	1	3	3	3	3	4	5	6	7

Array C

Index	1	2	3	4	5	6	7	8
Contents	x	x	x	x	x	x	x	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	1	1	1	1	3	3	3	3	4	4	6	7

Array C

Index	1	2	3	4	5	6	7	8
Contents	x	x	x	x	10	x	x	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	1	1	1	3	3	3	3	4	4	6	7

Array C

Index	1	2	3	4	5	6	7	8
Contents	1	x	x	x	10	x	x	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	1	1	1	2	3	3	3	4	4	6	7

Array C

Index	1	2	3	4	5	6	7	8
Contents	1	x	5	x	10	x	x	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	1	1	1	2	3	3	3	3	4	6	7

Array C

Index	1	2	3	4	5	6	7	8
Contents	1	x	5	9	10	x	x	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	1	1	1	2	3	3	3	3	4	5	7

Array C

Index	1	2	3	4	5	6	7	8
Contents	1	x	5	9	10	11	x	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	1	1	1	2	3	3	3	3	4	5	6

Array C

Index	1	2	3	4	5	6	7	8
Contents	1	x	5	9	10	11	12	12



Array B

Index	1	2	3	4	5	6	7	8	9	10	11	12
Contents	0	1	1	1	1	3	3	3	3	4	5	6

Array C

Index	1	2	3	4	5	6	7	8
Contents	1	5	5	9	10	11	12	12