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مهم جداً

هذا الملف للمراجعة السريعة واخذ الملاحظات عليه فقط ،لانه يحتوي على اقل من 20٪ مما يتم شرحه في الفيديوهات الاستعجال والاعتماد عليه فقط سوف يجعلك تخسر كميه معلومات وخبرات كثيره

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Algorithms & Problem Solving Level 6

What is Binary Search Tree (BST)

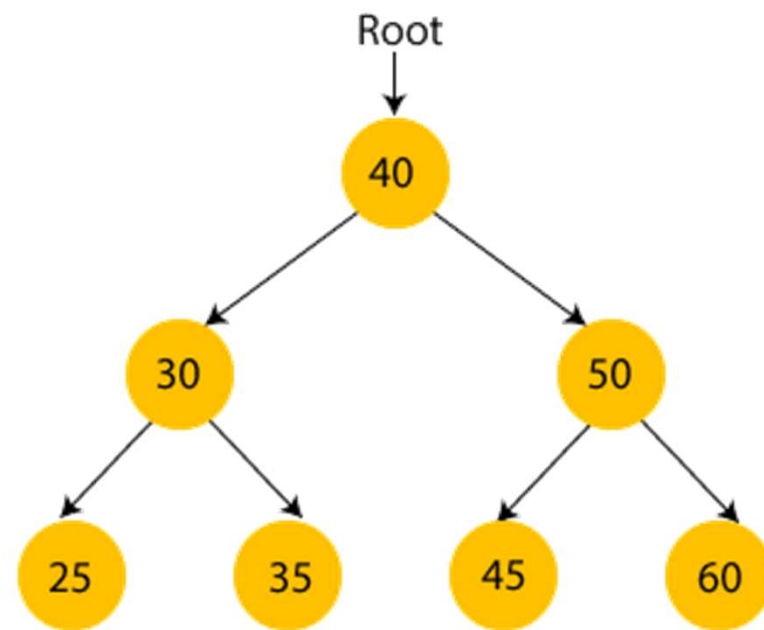
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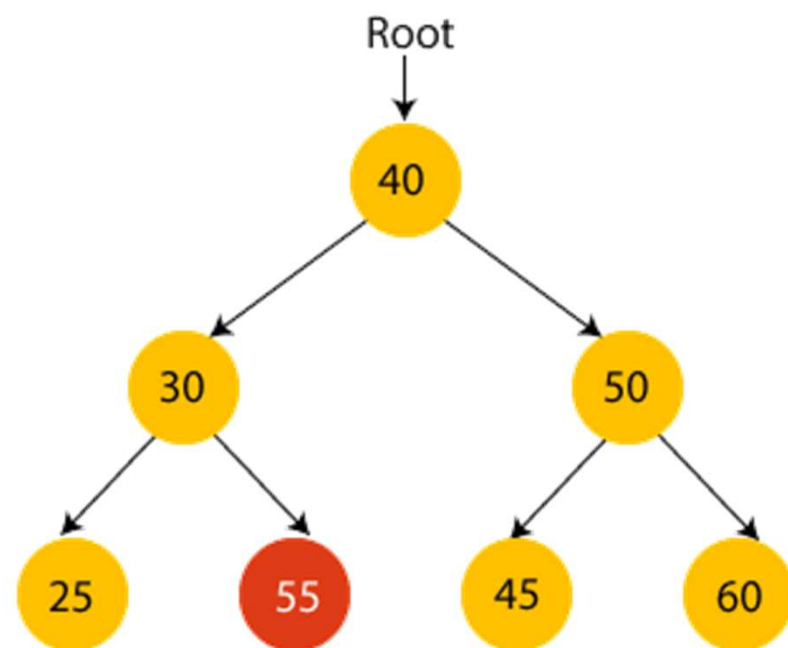
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What is BST?

- Searching an element in the Binary search tree is easy as we always have a hint that which subtree has the desired element.
- As compared to array and linked lists, insertion and deletion operations are faster in BST.

Binary Search Property

The key feature of a BST is its binary search property, which stipulates that:

- For any node n , all elements in the left subtree of n are less than n .
- All elements in the right subtree of n are greater than n .

This property ensures that the tree remains balanced in terms of its depth, which in turn guarantees operations such as search, insertion, and deletion can be performed in logarithmic time complexity ($O(\log n)$) under ideal conditions.

Applications of BST

BSTs are widely used in computer science and applications such as:

- Implementing associative arrays, sets, and multisets.
- Database indices for quick data retrieval.
- Autocomplete features where a prefix search is performed.
- Sorting algorithms.
- Others.

Advantages of BST

- **Efficient Operations:** Offers $O(\log n)$ search, insertion, and deletion operations in the best and average cases.
- **Sorted Data:** Maintains data in a sorted order, facilitating operations like minimum, maximum, successor, predecessor, etc., in $O(h)$ time.

Disadvantages of BST

- **Worst-Case Performance:** In the worst case (e.g., inserting sorted data), the BST can become unbalanced, resembling a linked list with $O(n)$ time complexity for operations.
- **Maintenance:** Requires additional logic (e.g., tree balancing techniques) to maintain optimal performance.



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