Data Structures and Object Oriented Programming

Lecture 14

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Object-Oriented Programming in C++

Binary Search Trees

Traversal

`PreOrder()`, **`InOrder()`** and `PostOrder()`

BST – Traversal

Definition: “traversal” we mean visiting all the nodes in a tree.

Traversal strategies can be specified by the ordering of the three objects to visit: the **current node**, the **left subtree**, and the **right subtree**.

Most common tree traversal orders:

- Pre-order
- **In-order**
- Post-order

BST – Traversal

Inorder:

The ordering is: the left subtree, the current node, the right subtree.

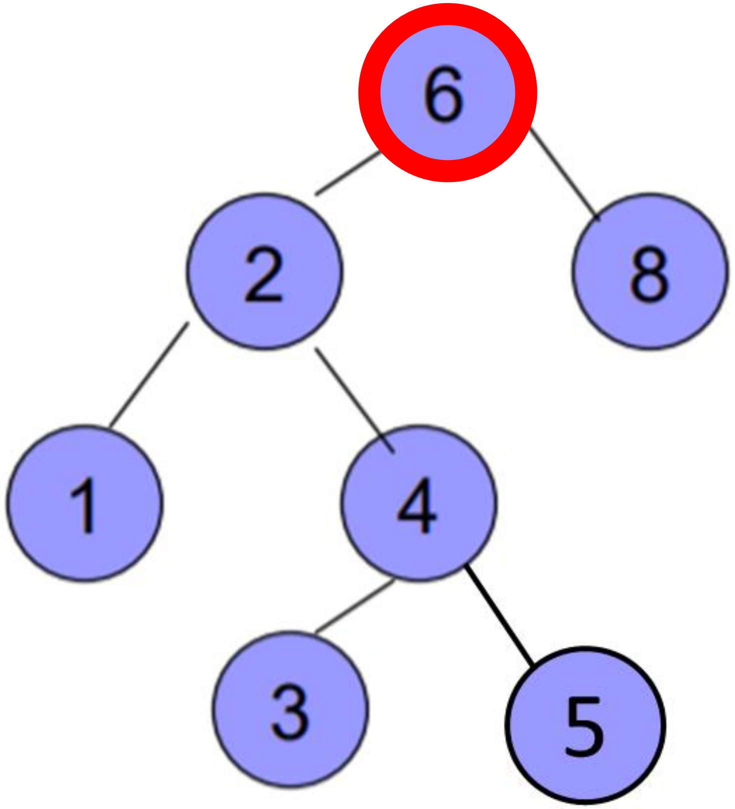
Preorder:

The ordering is: the current node, the left subtree, the right subtree.

Postorder:

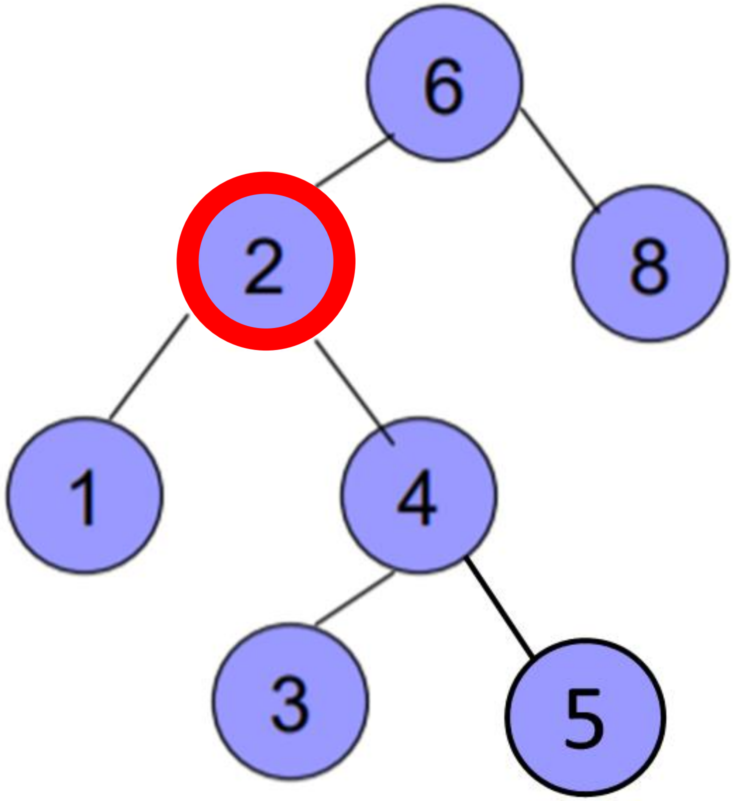
The ordering is: the left subtree, the right subtree, the current node.

Practice: Inorder Traversal



Left – Current – Right

Practice: Inorder Traversal



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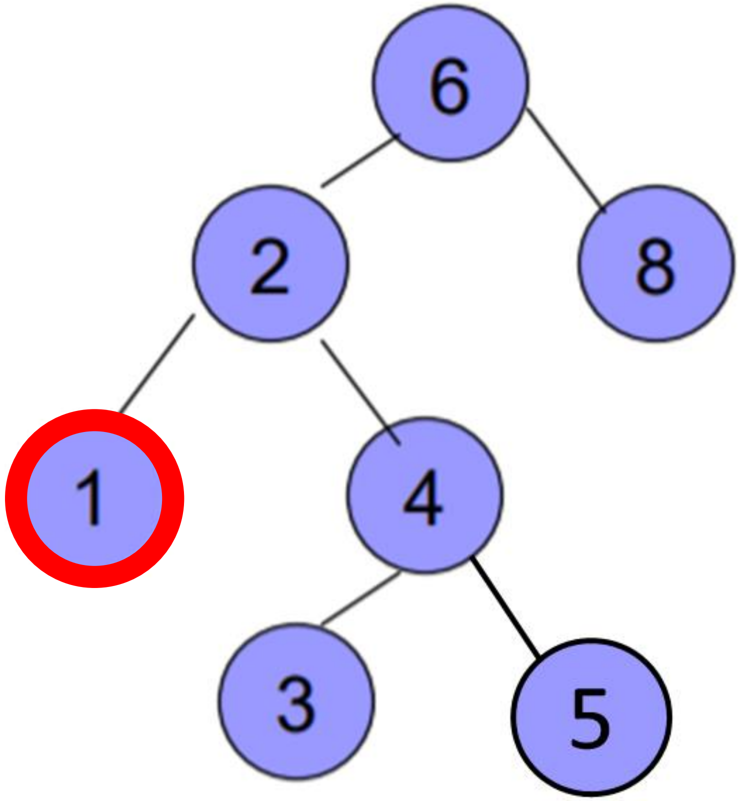
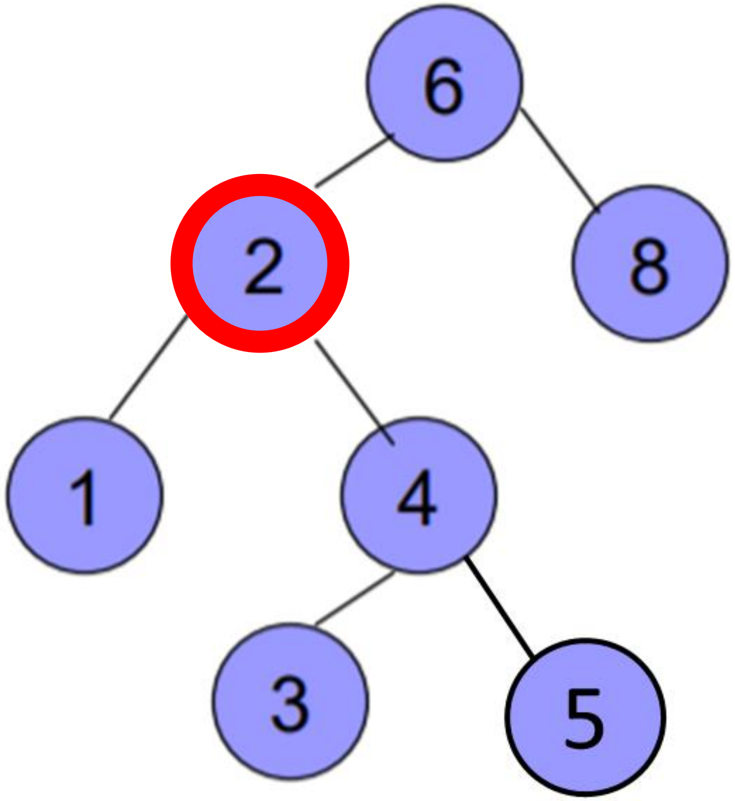


Left – Current – Right

1

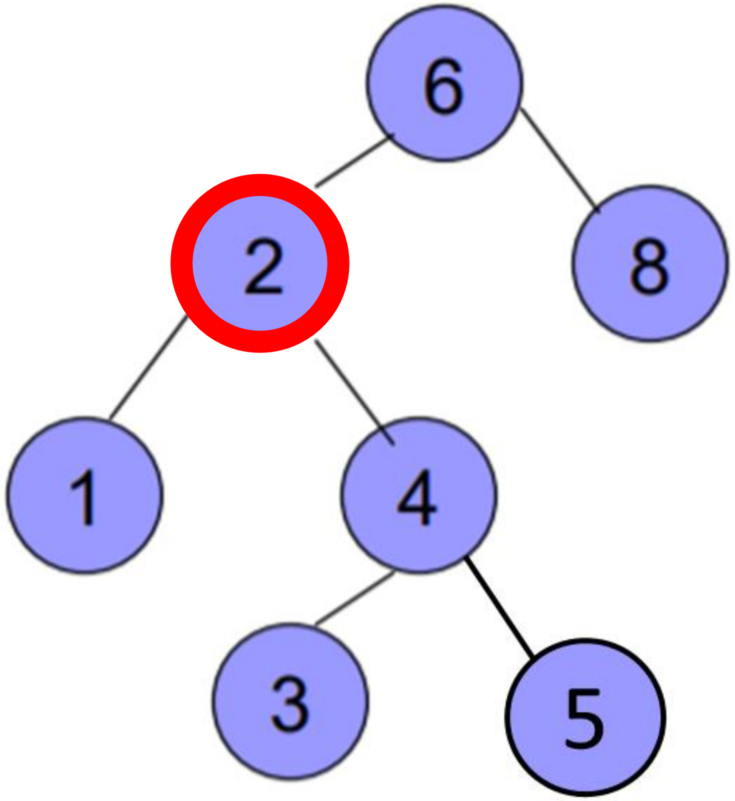
Practice: Inorder Traversal



Left – Current – Right

1 2

Practice: Inorder Traversal



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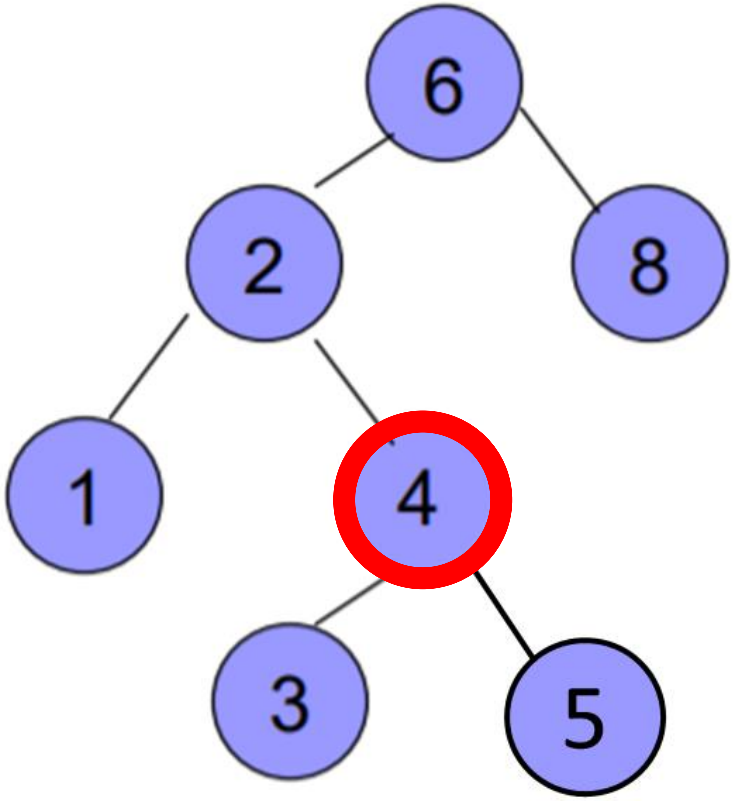

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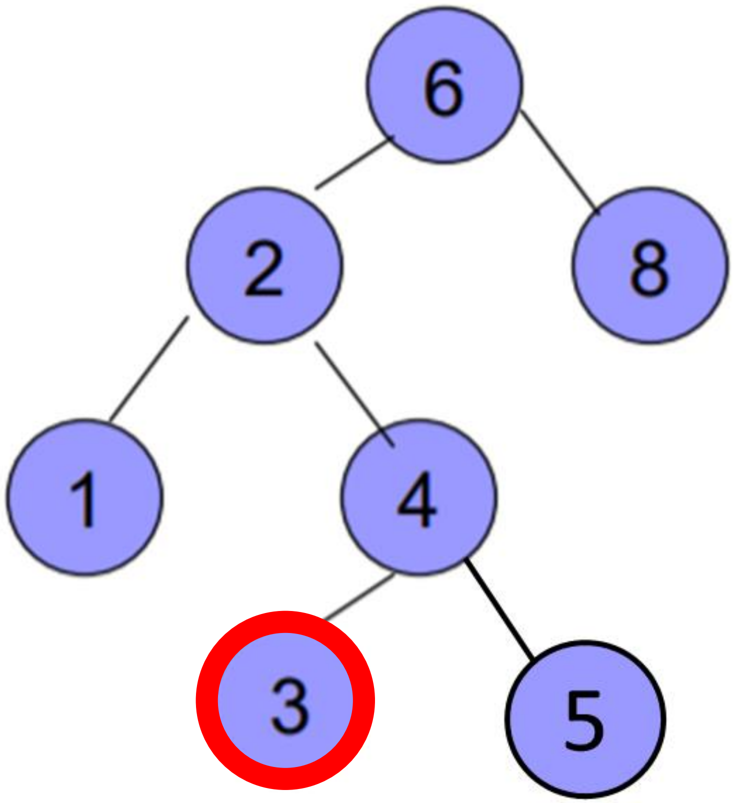
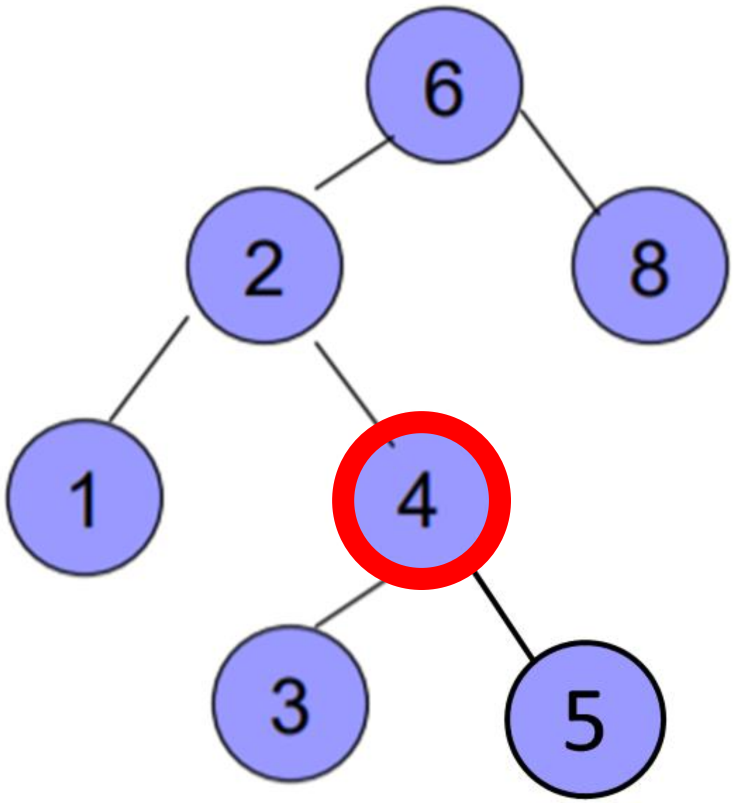


Left – Current – Right

1 2 3

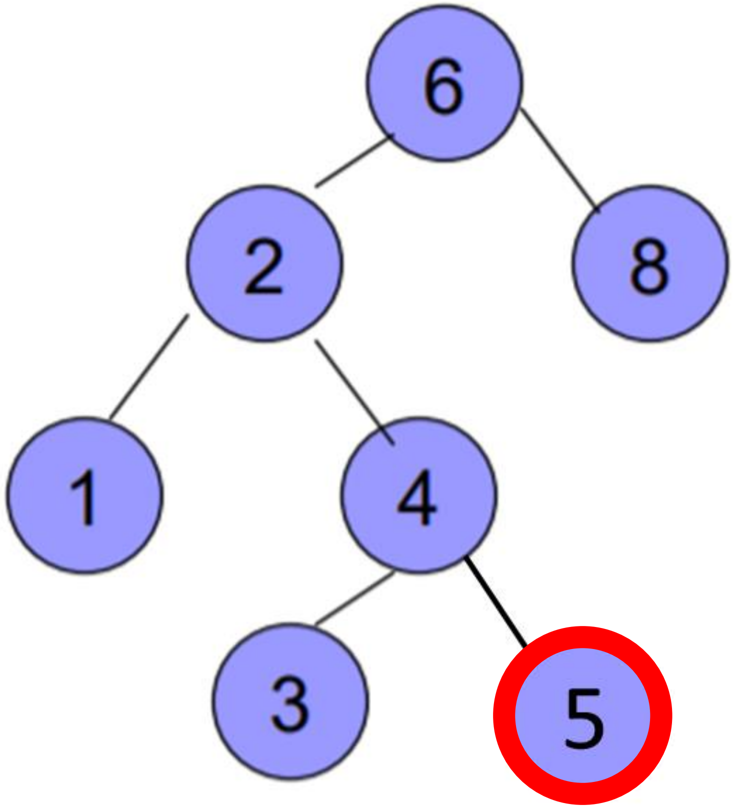
Practice: Inorder Traversal



Left – Current – Right

1 2 3 4

Practice: Inorder Traversal



Left – Current – Right

1 2 3 4 5

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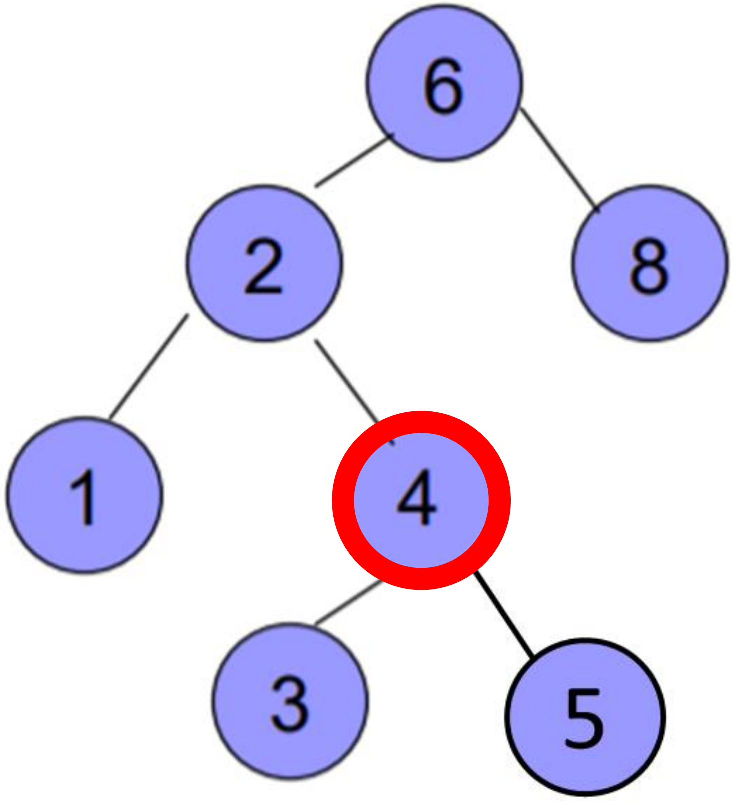

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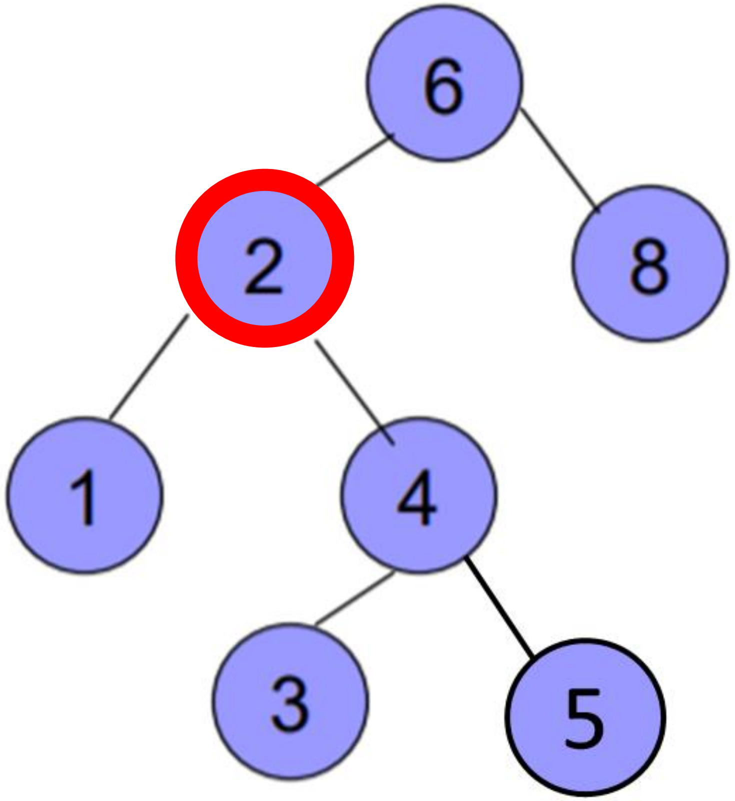

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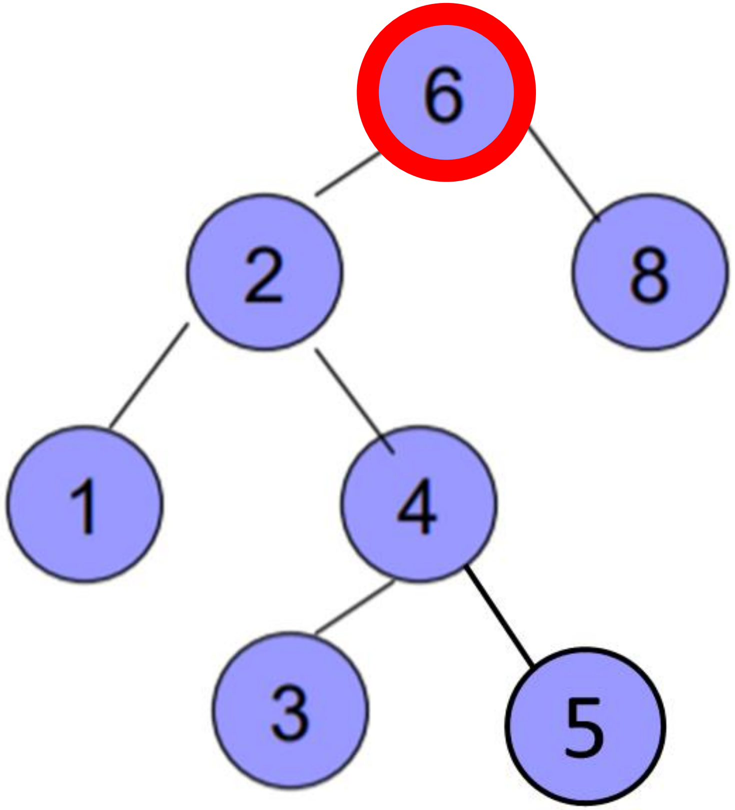
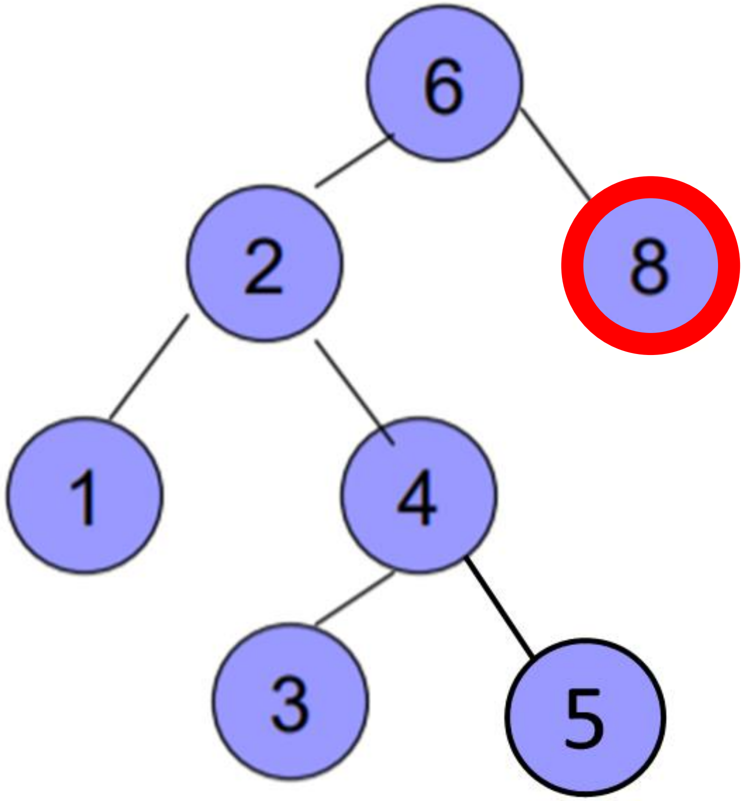


Left – Current – Right

1 2 3 4 5 6

Practice: Inorder Traversal

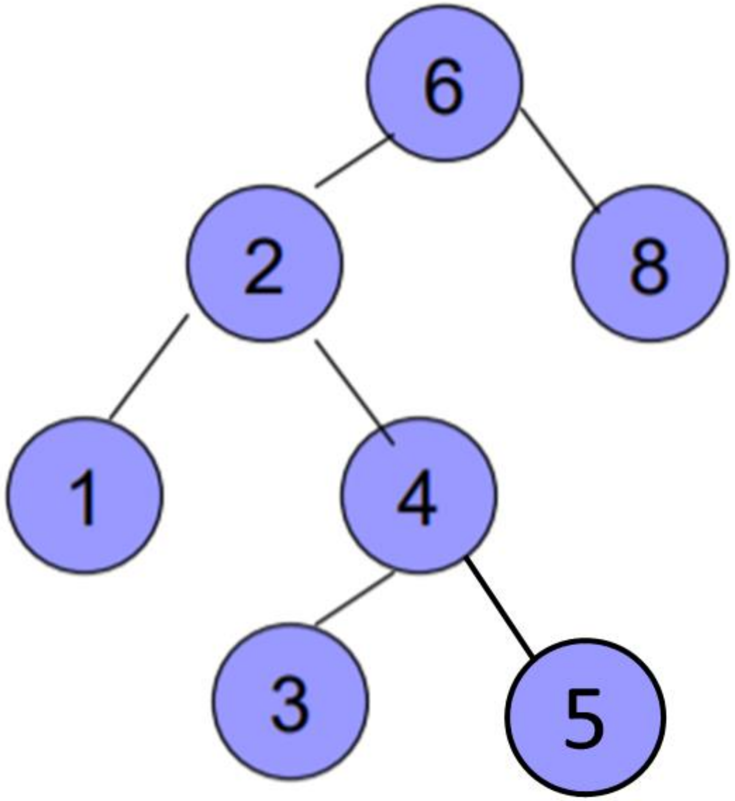


Left – Current – Right

1 2 3 4 5 6 8

Pre-Order

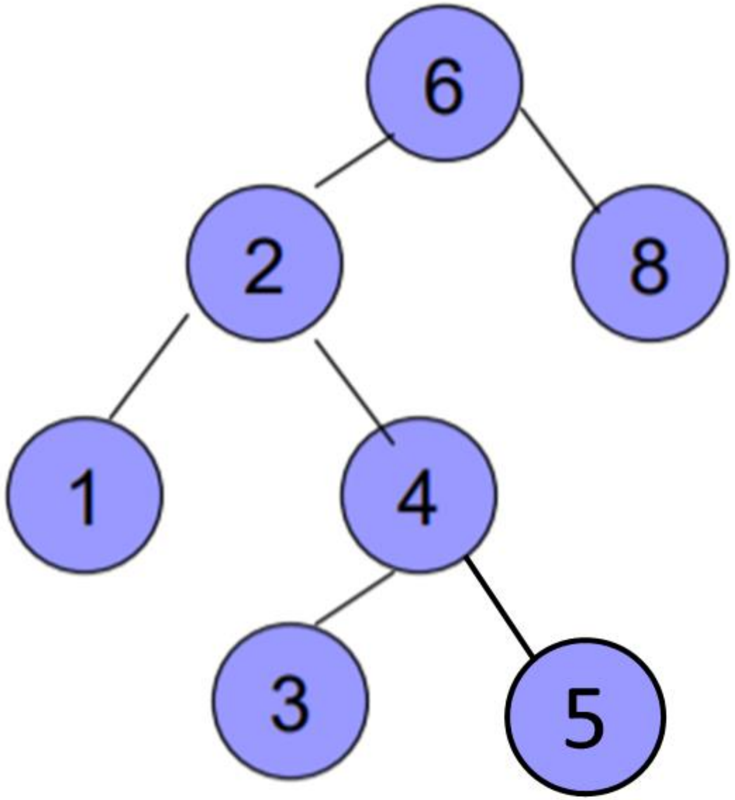
Current – Left – Right



6 2 1 4 3 5 8

Post-Order

Left – Right – Current



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BST - Inorder Traversal using Stack

```
void  inorder()
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 }
```

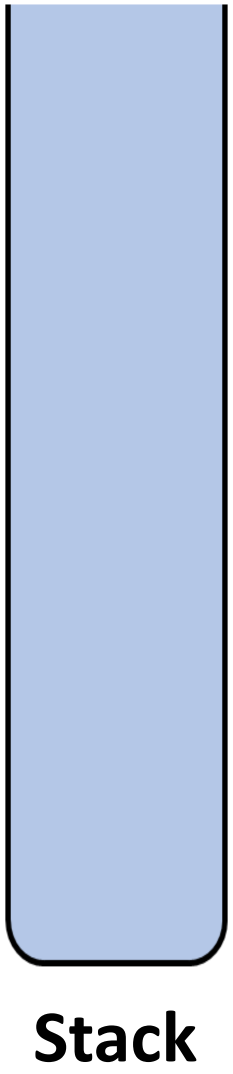

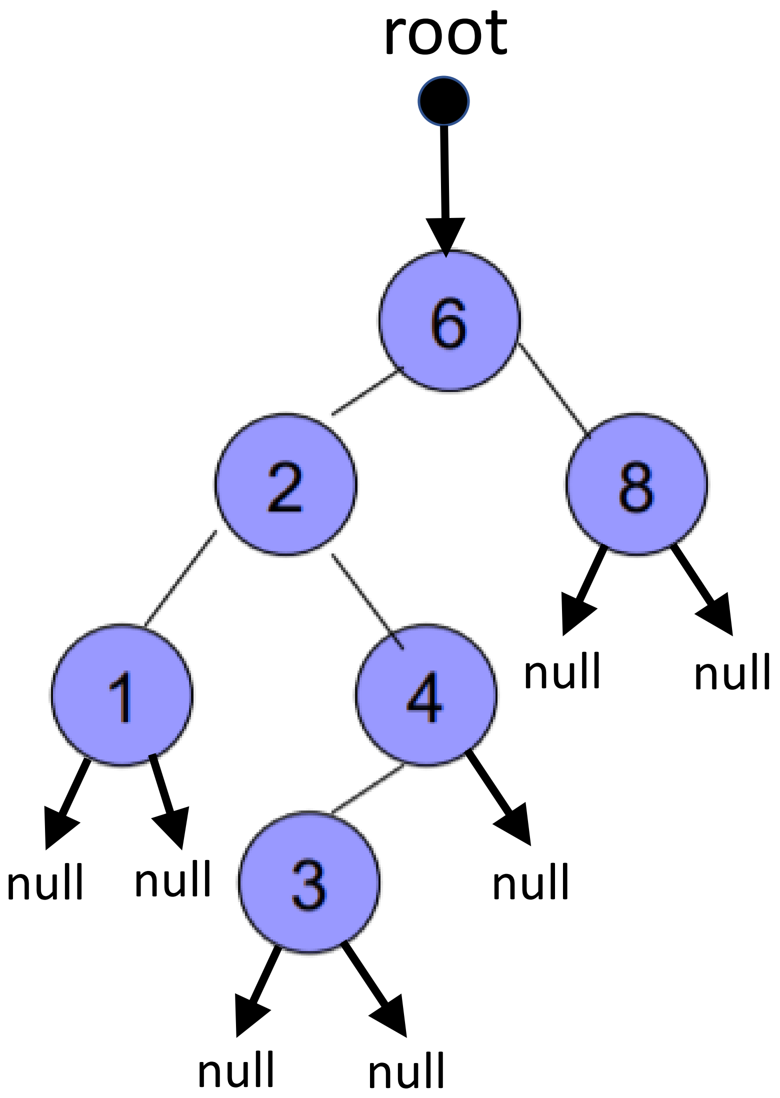

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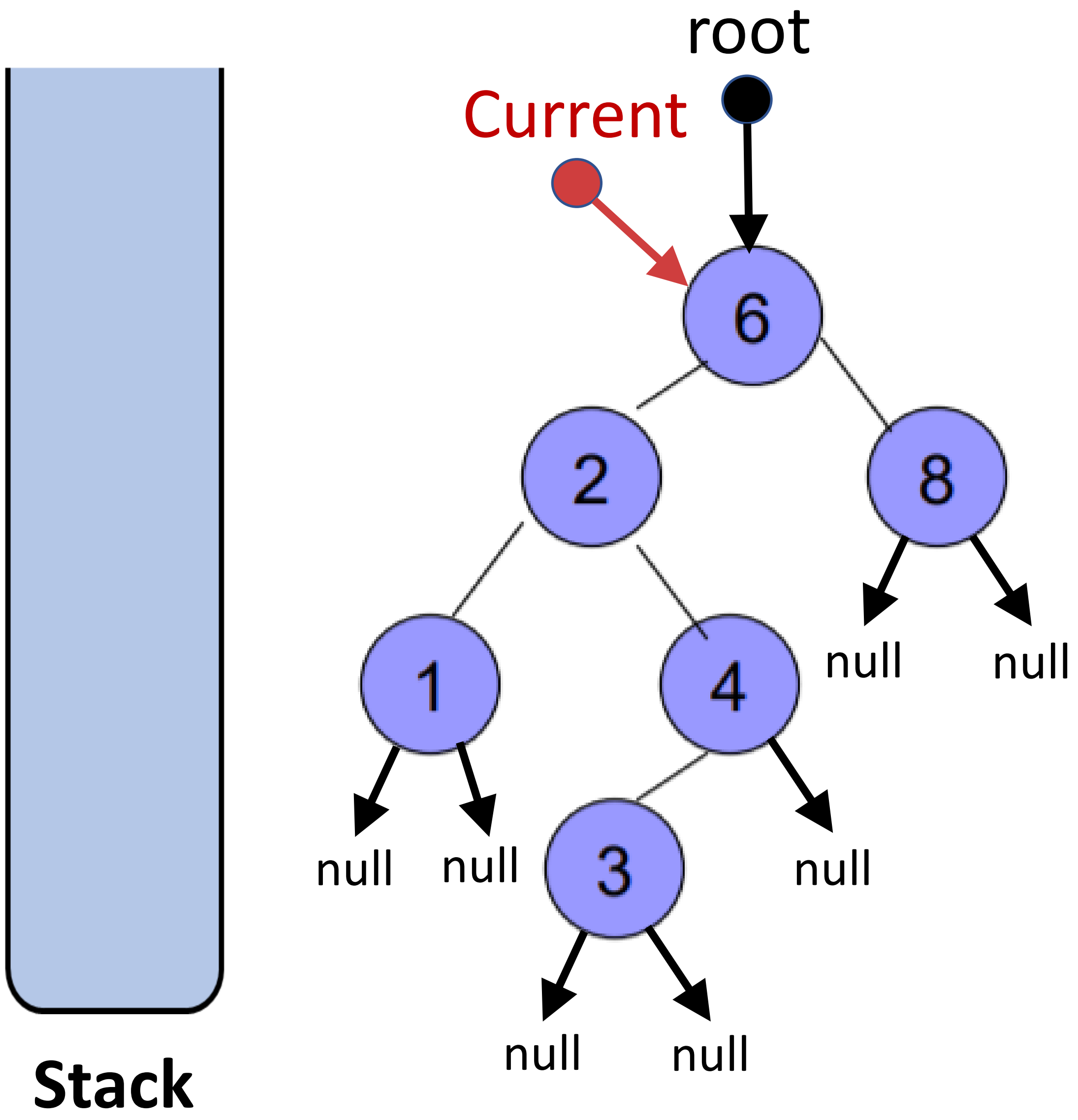

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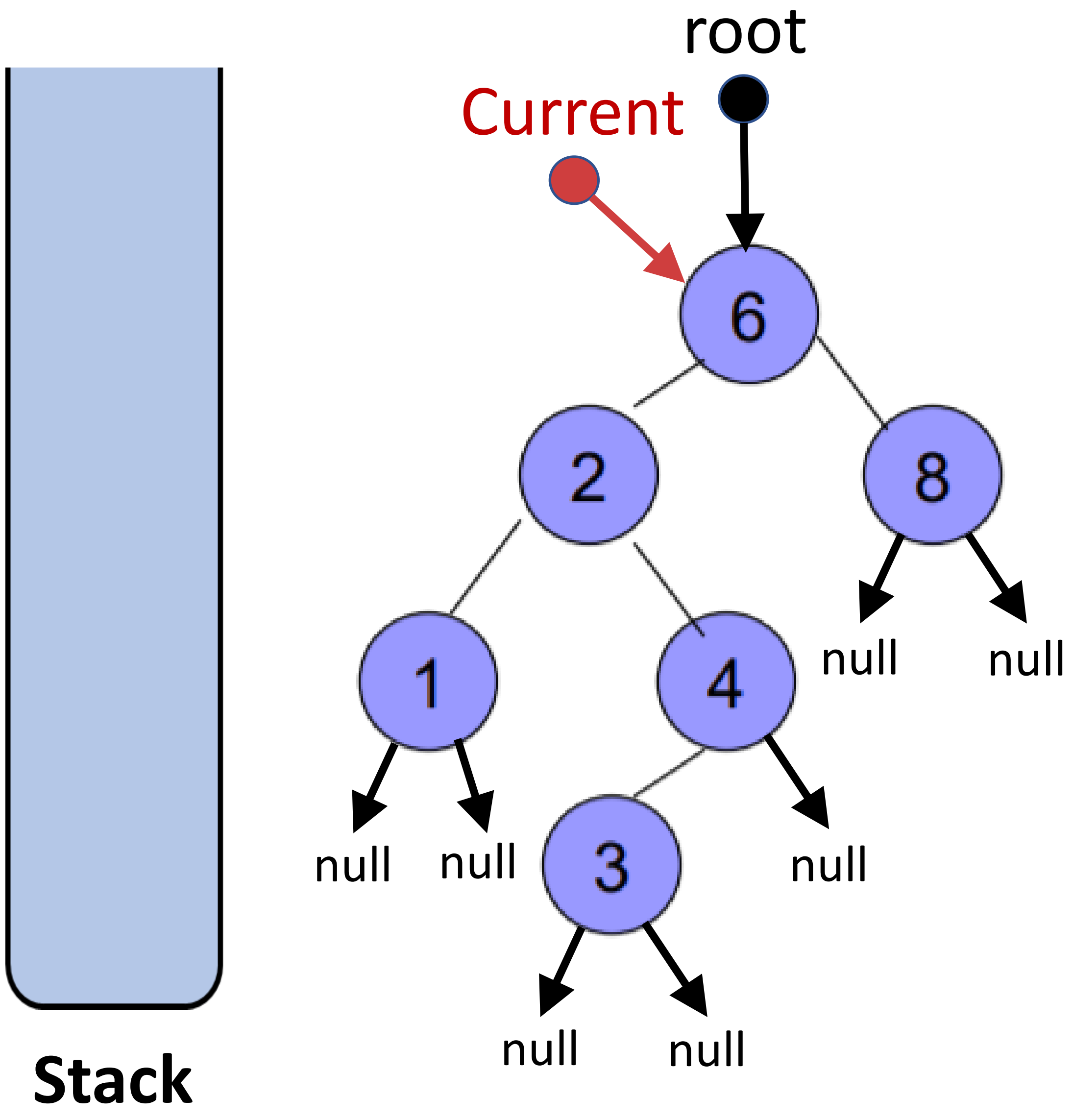

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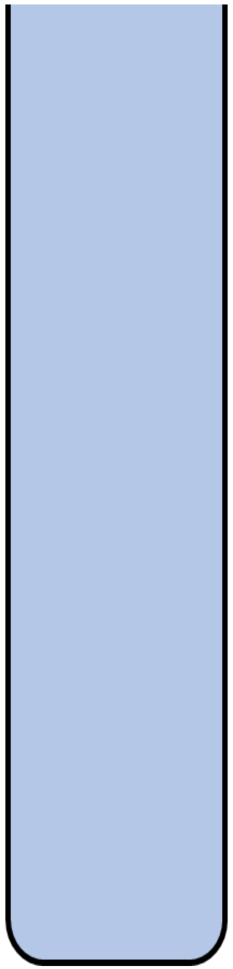

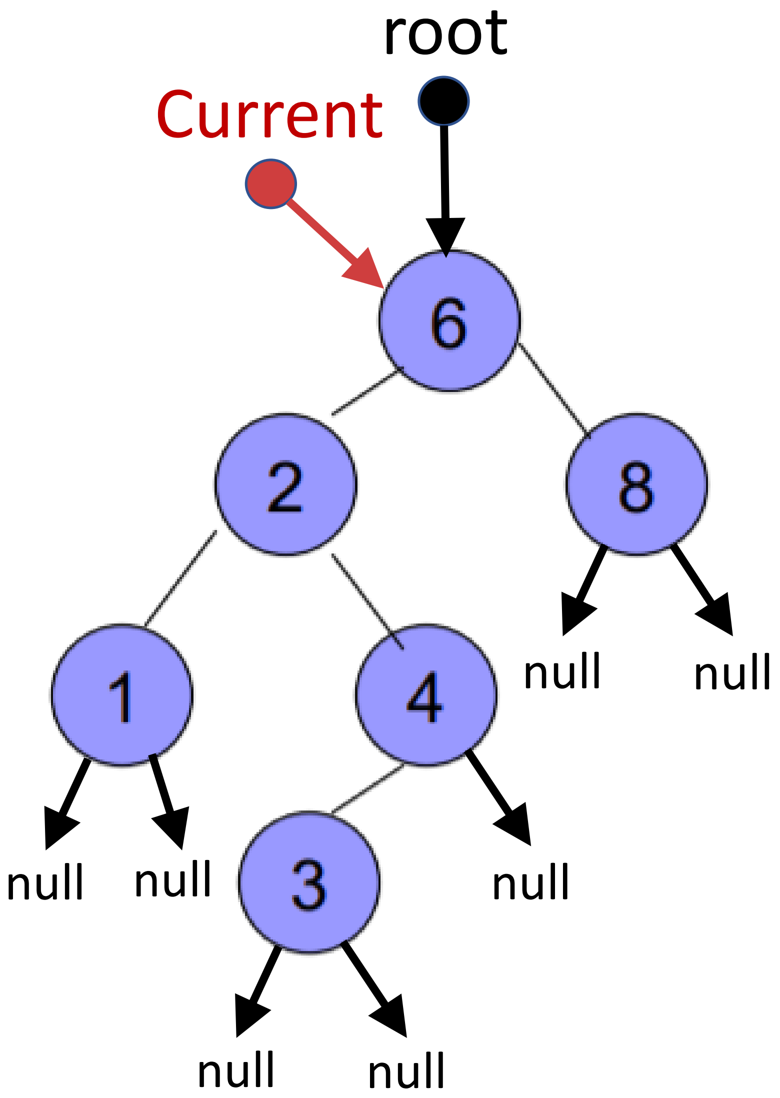

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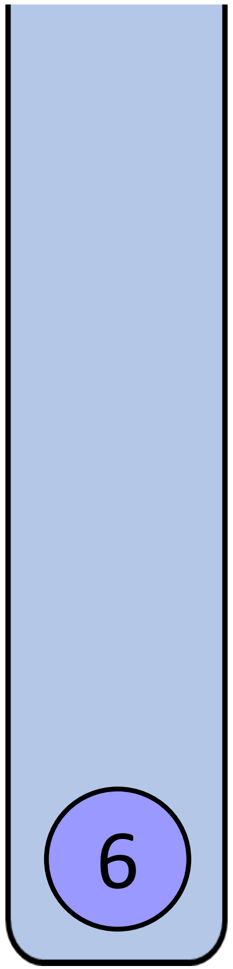

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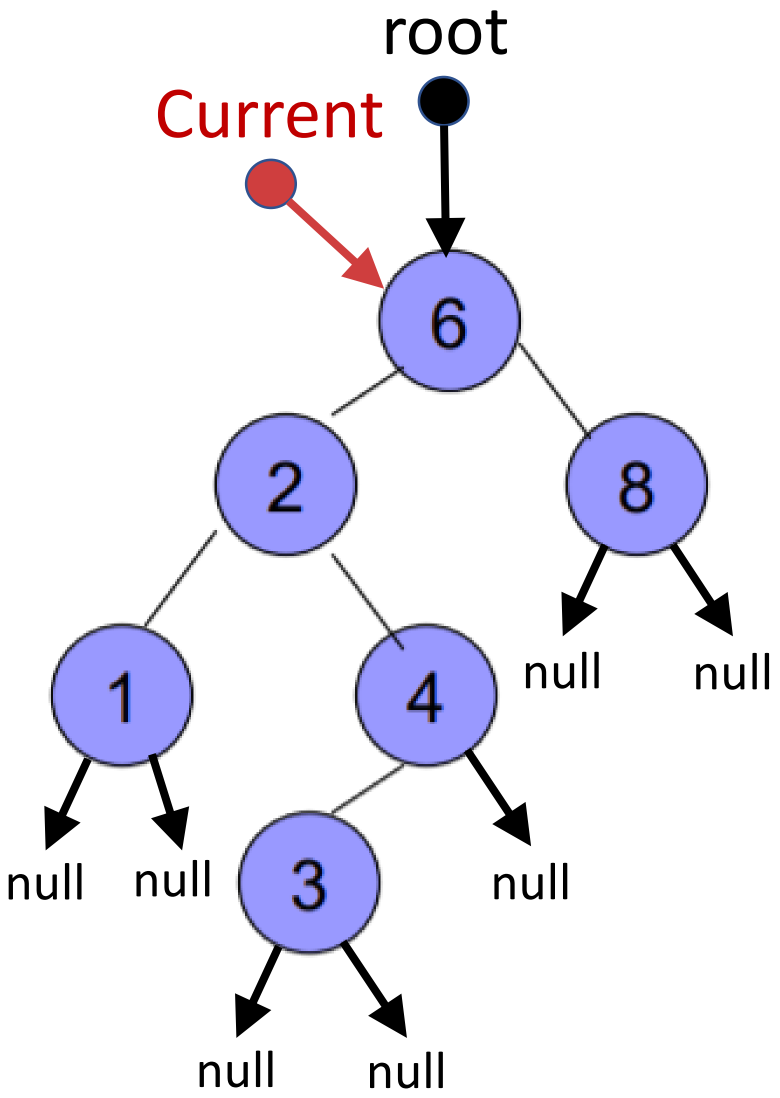

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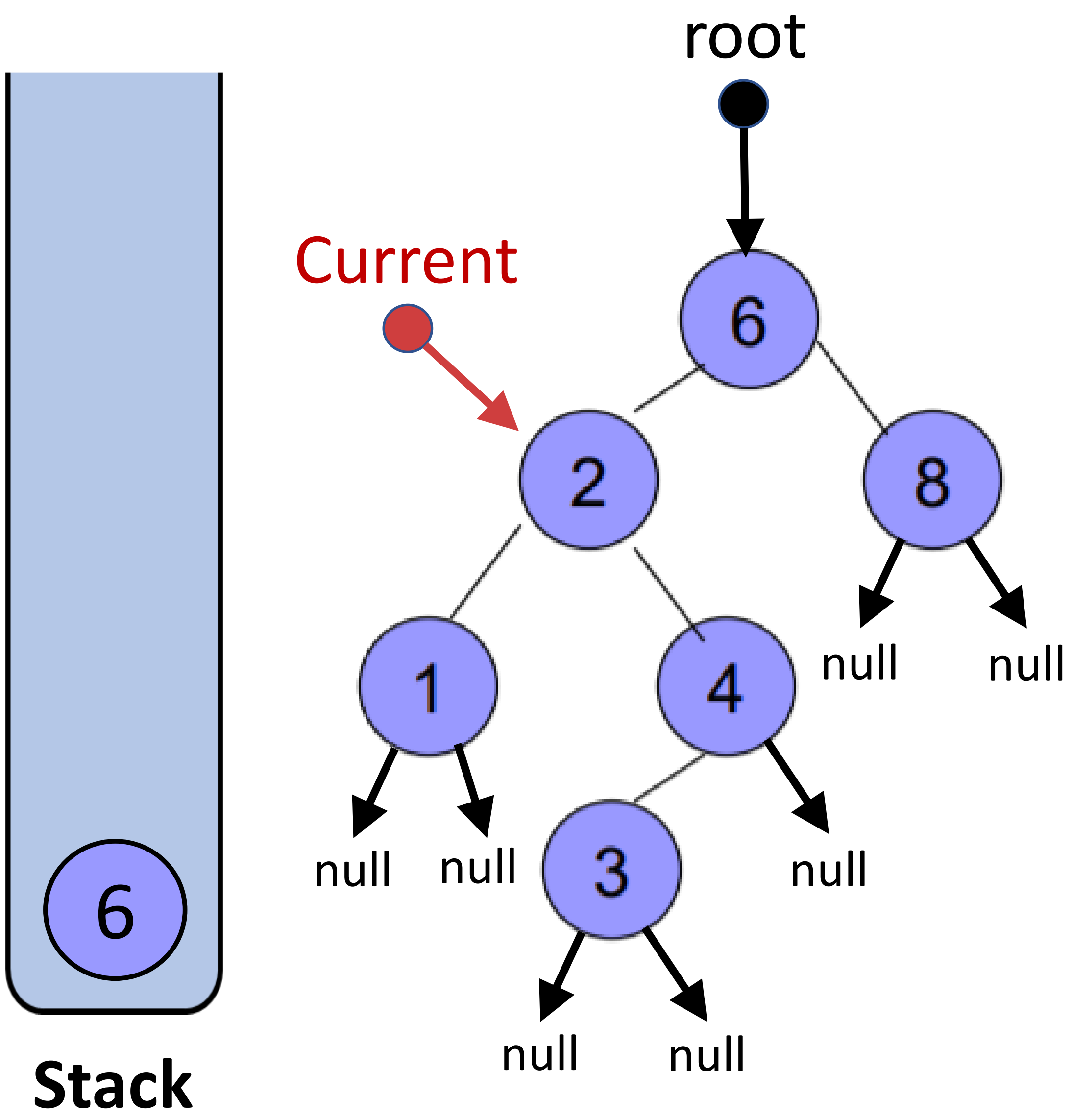

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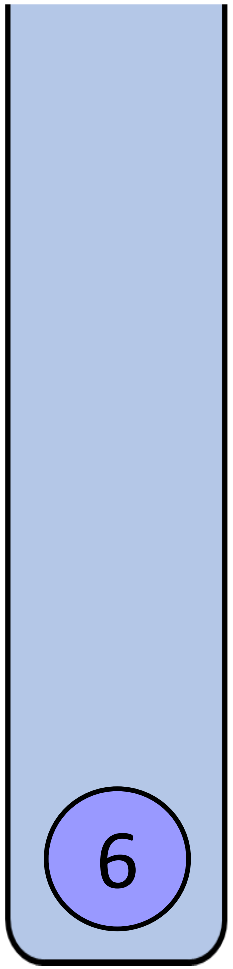

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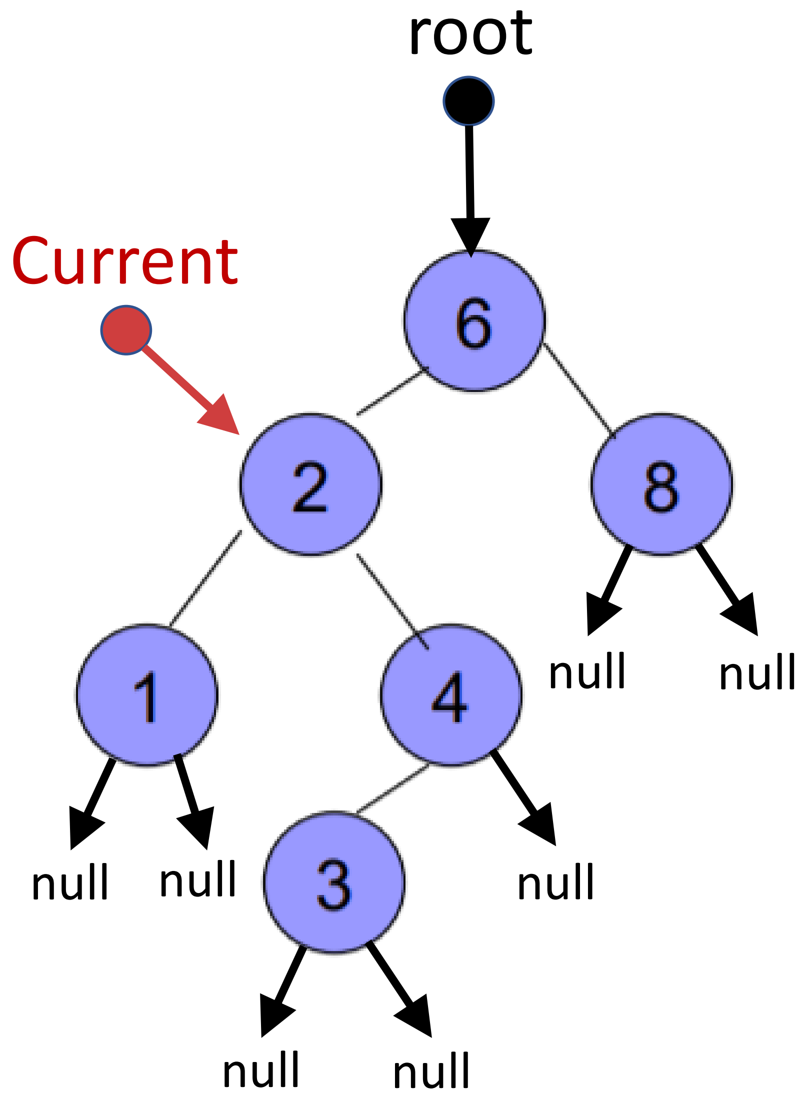

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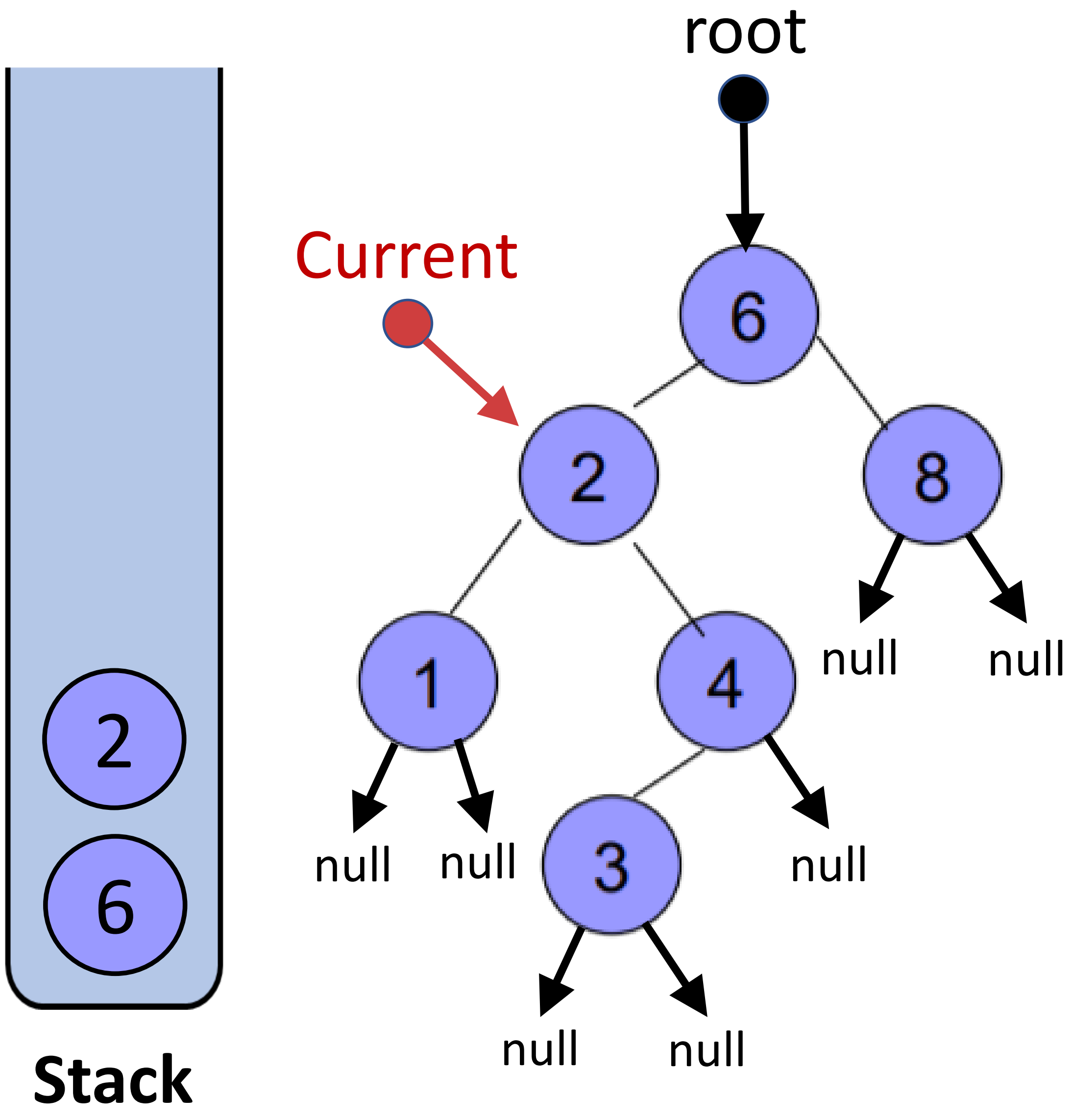

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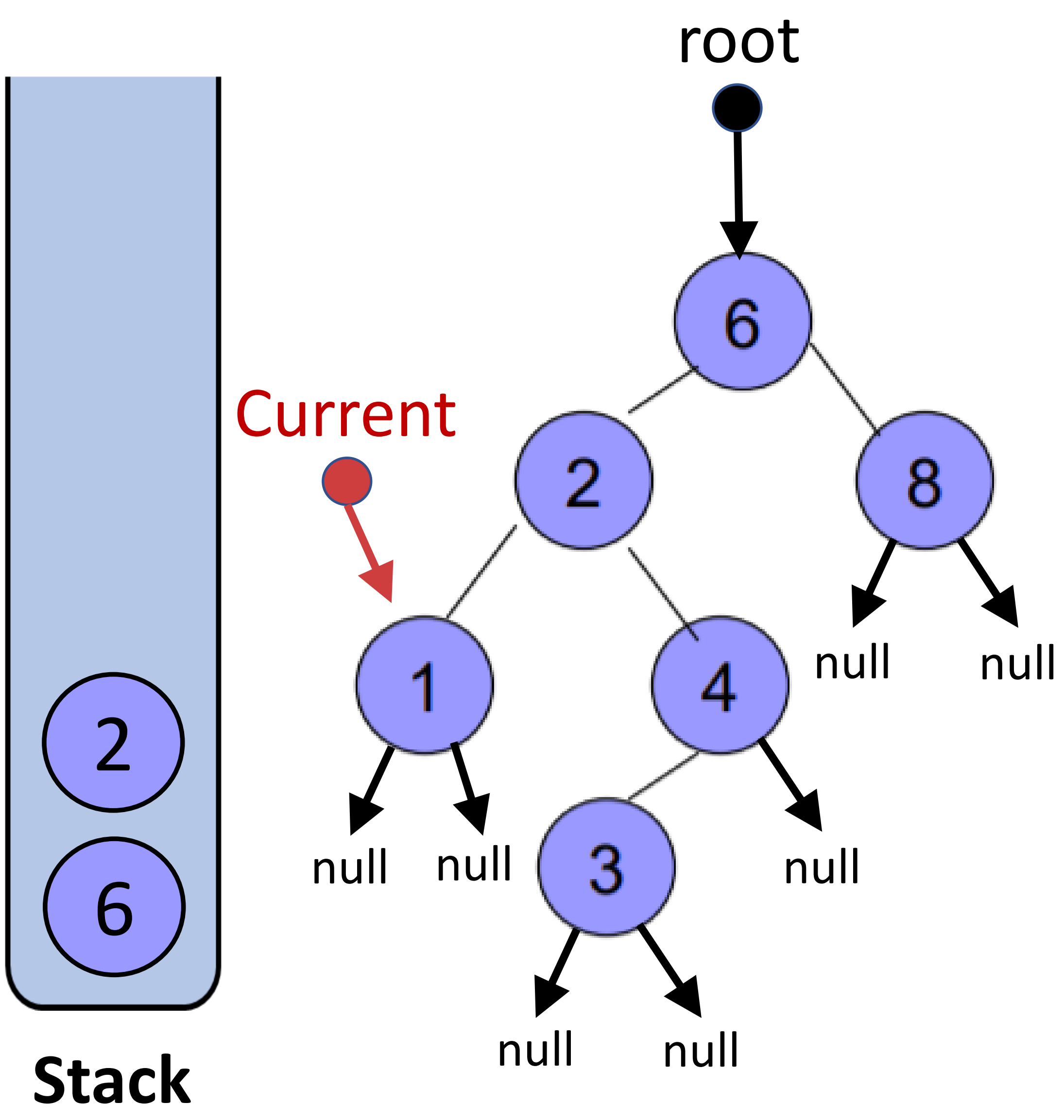

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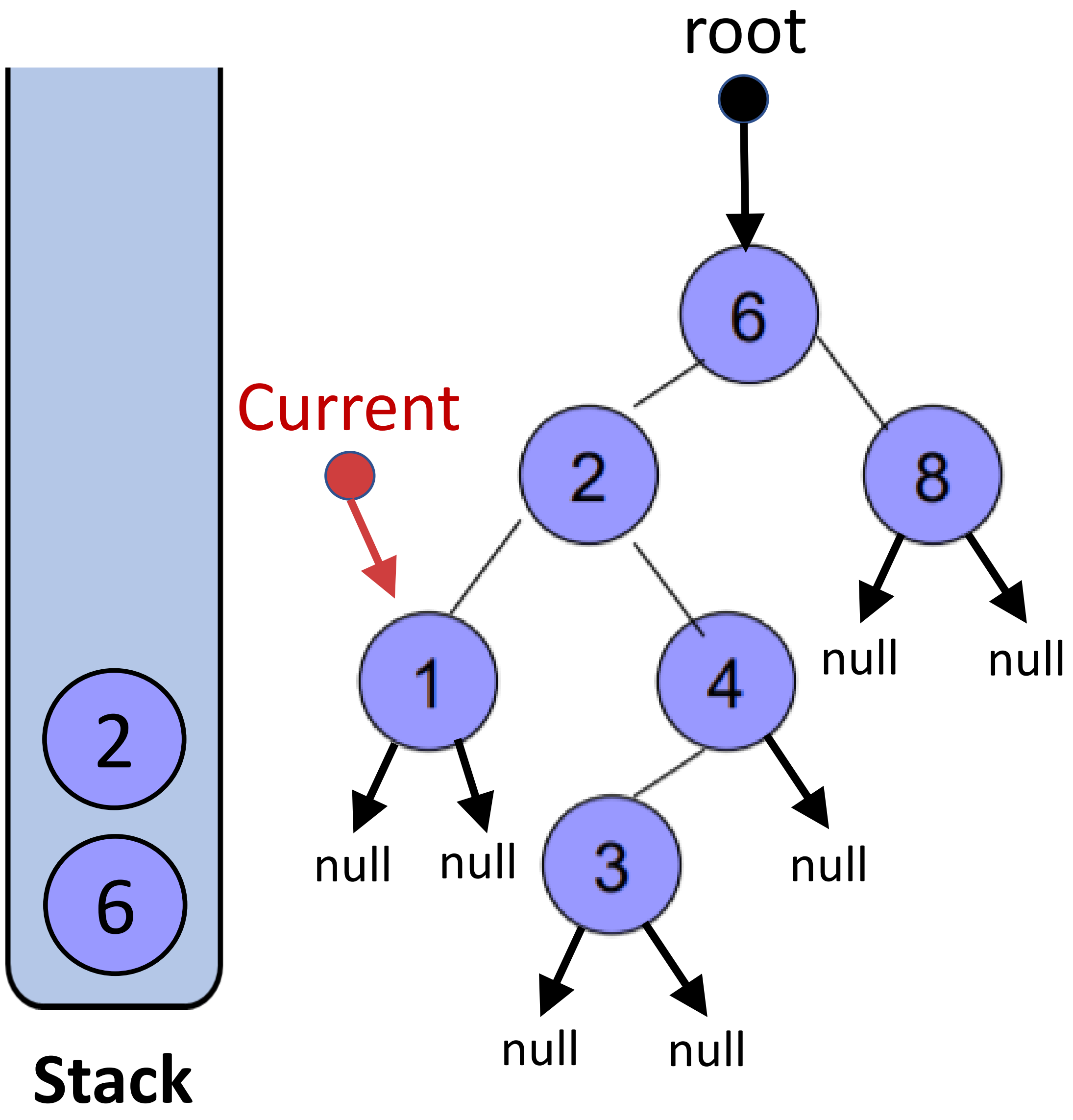

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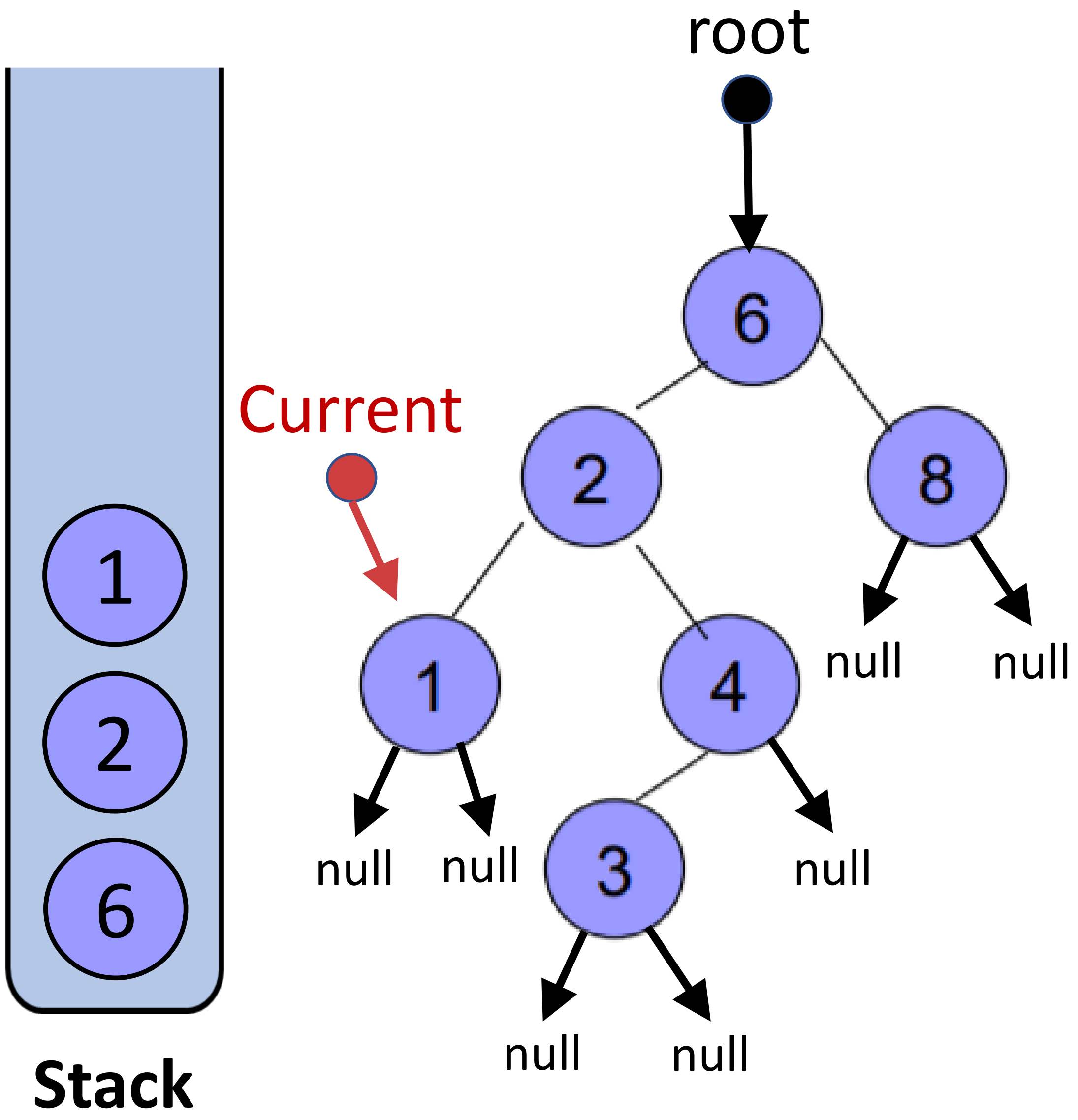

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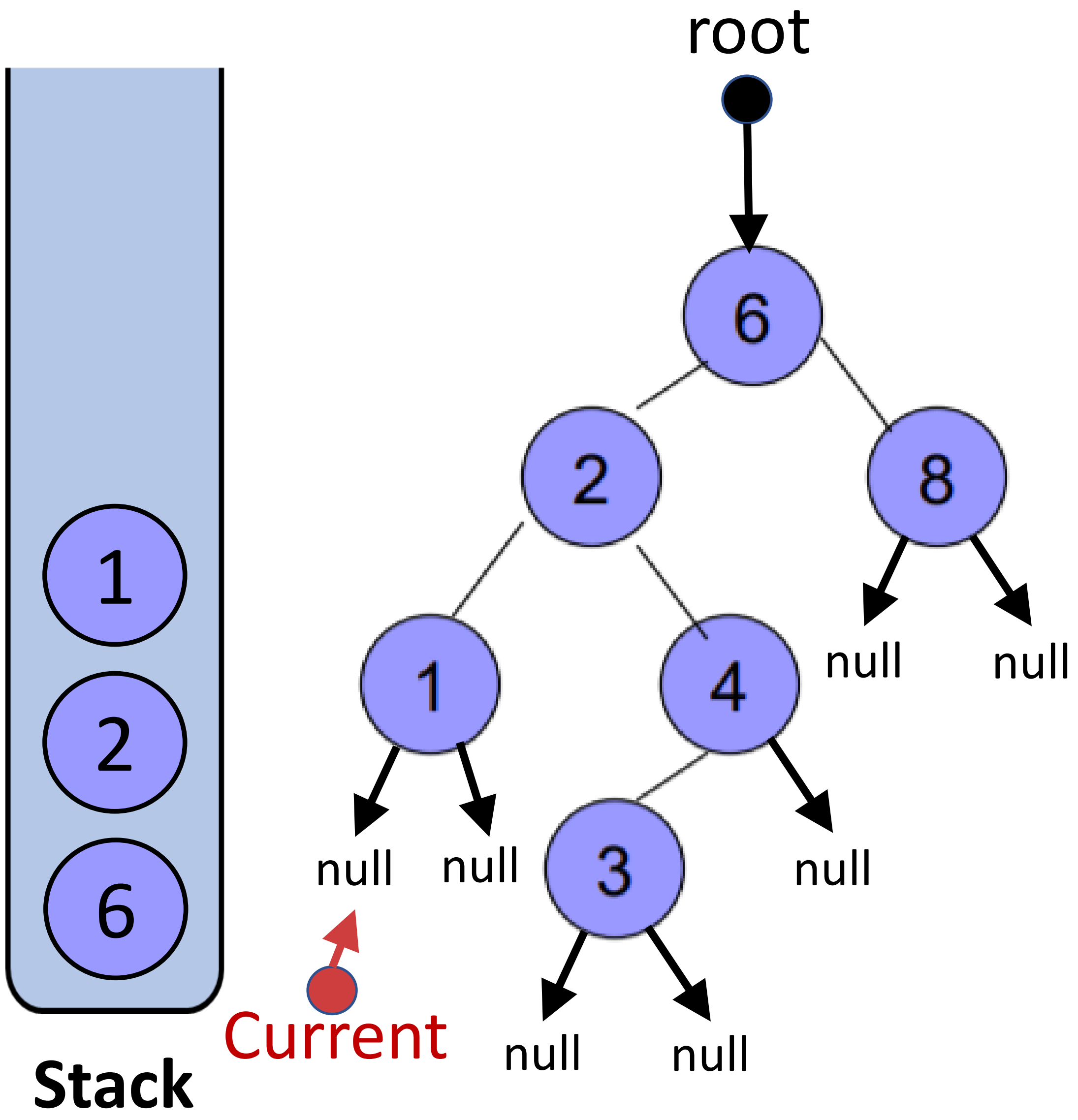

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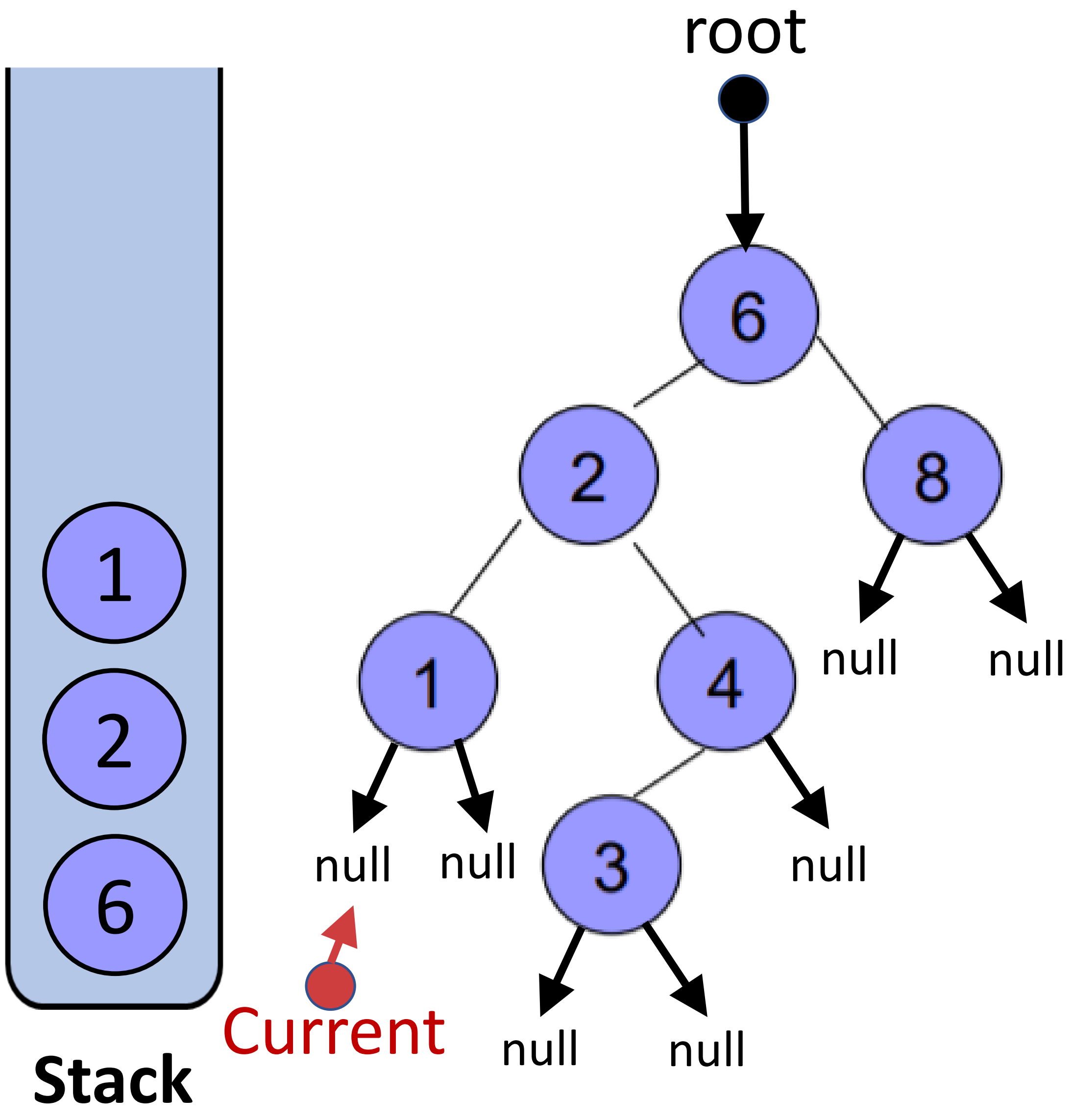

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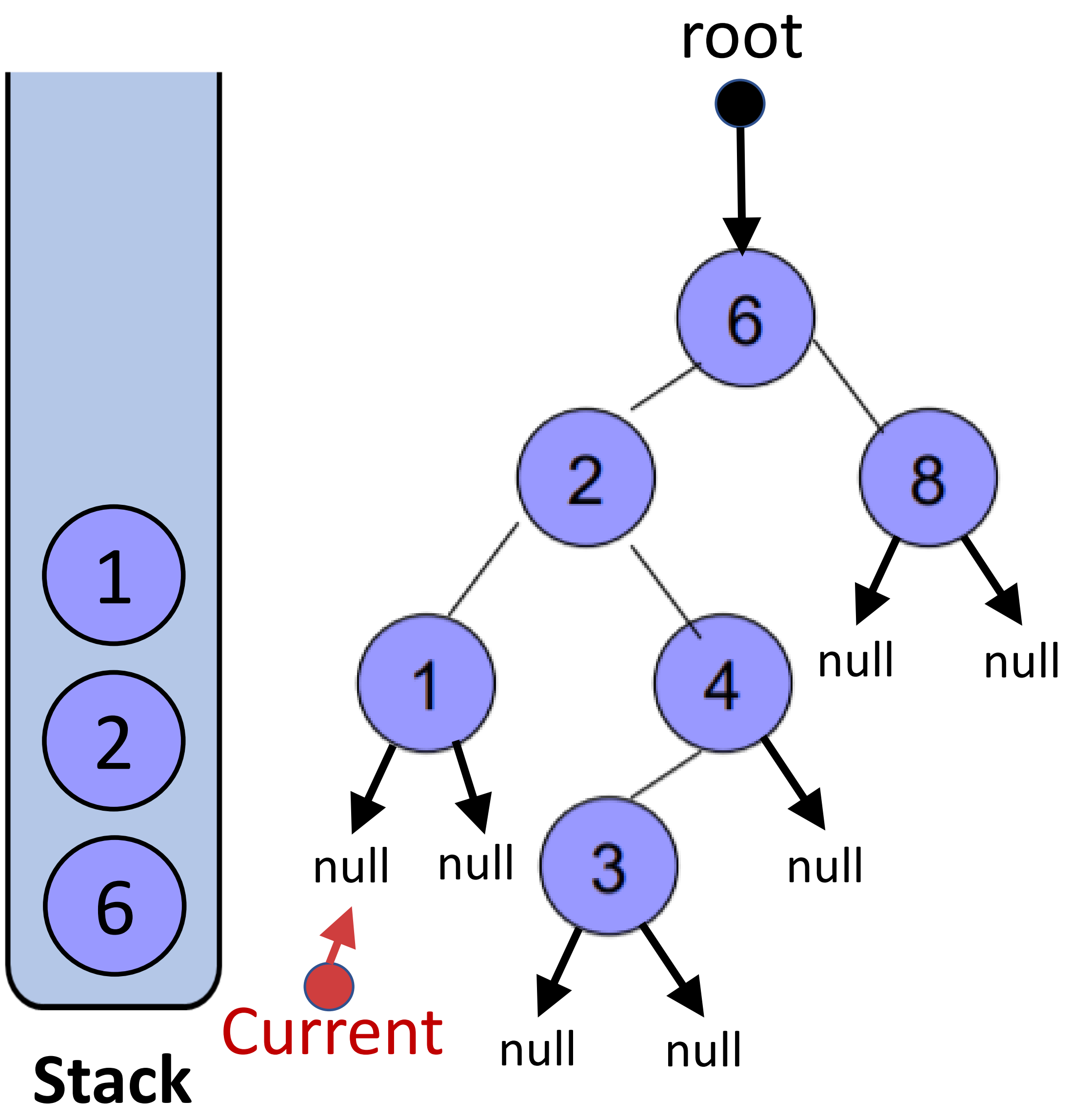

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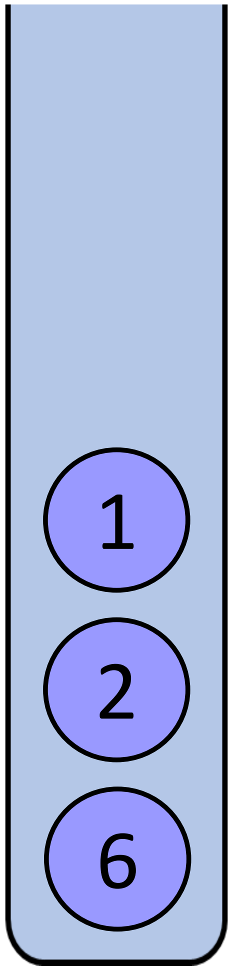

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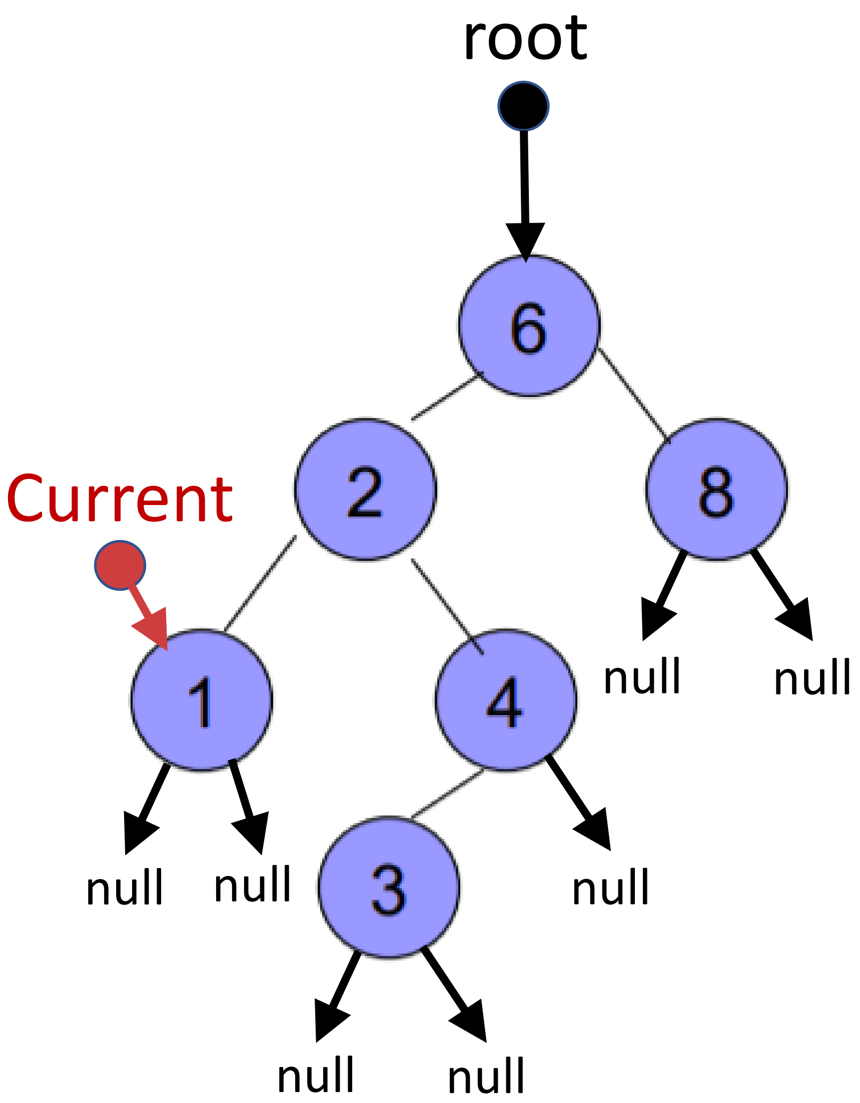

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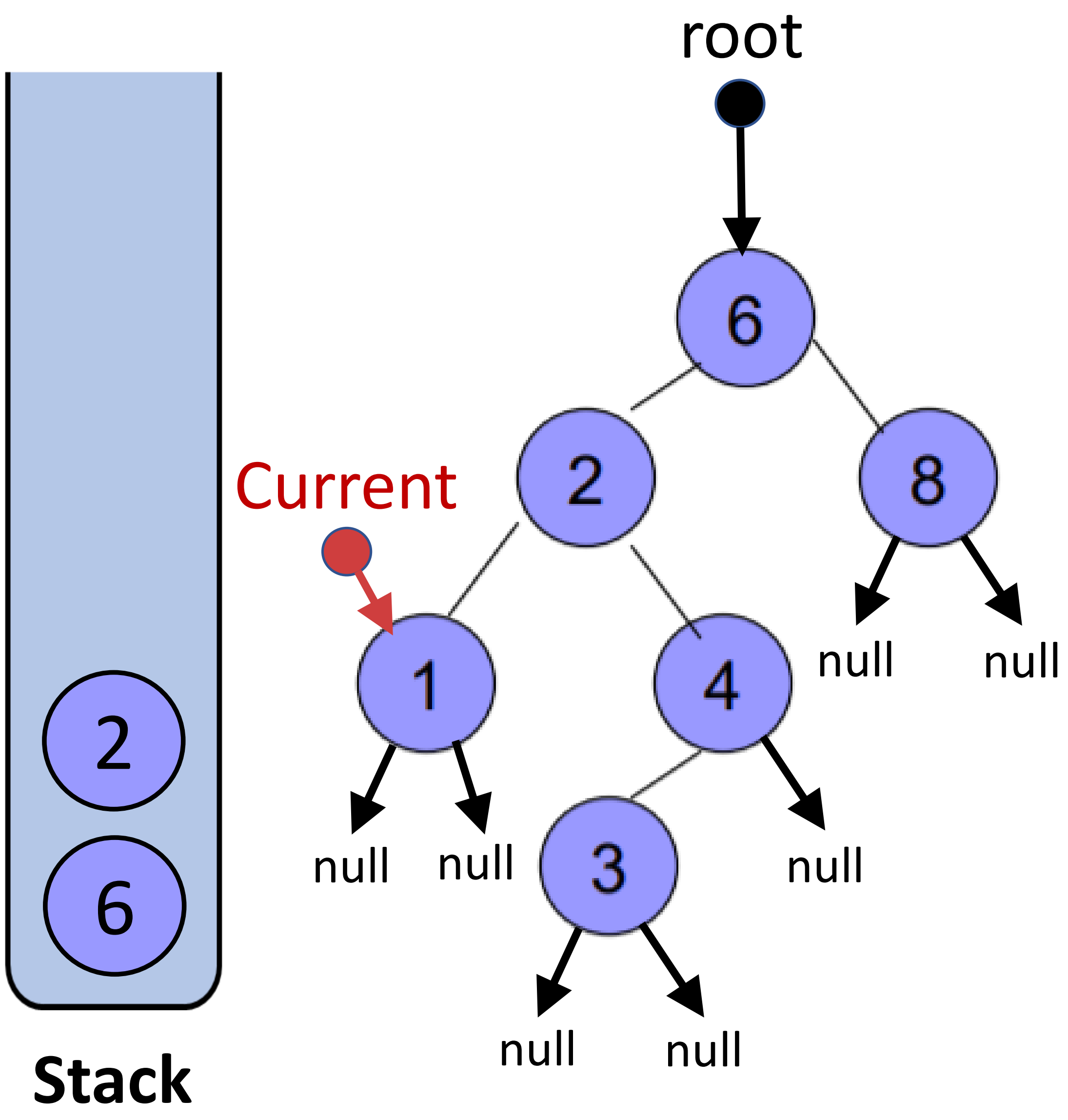

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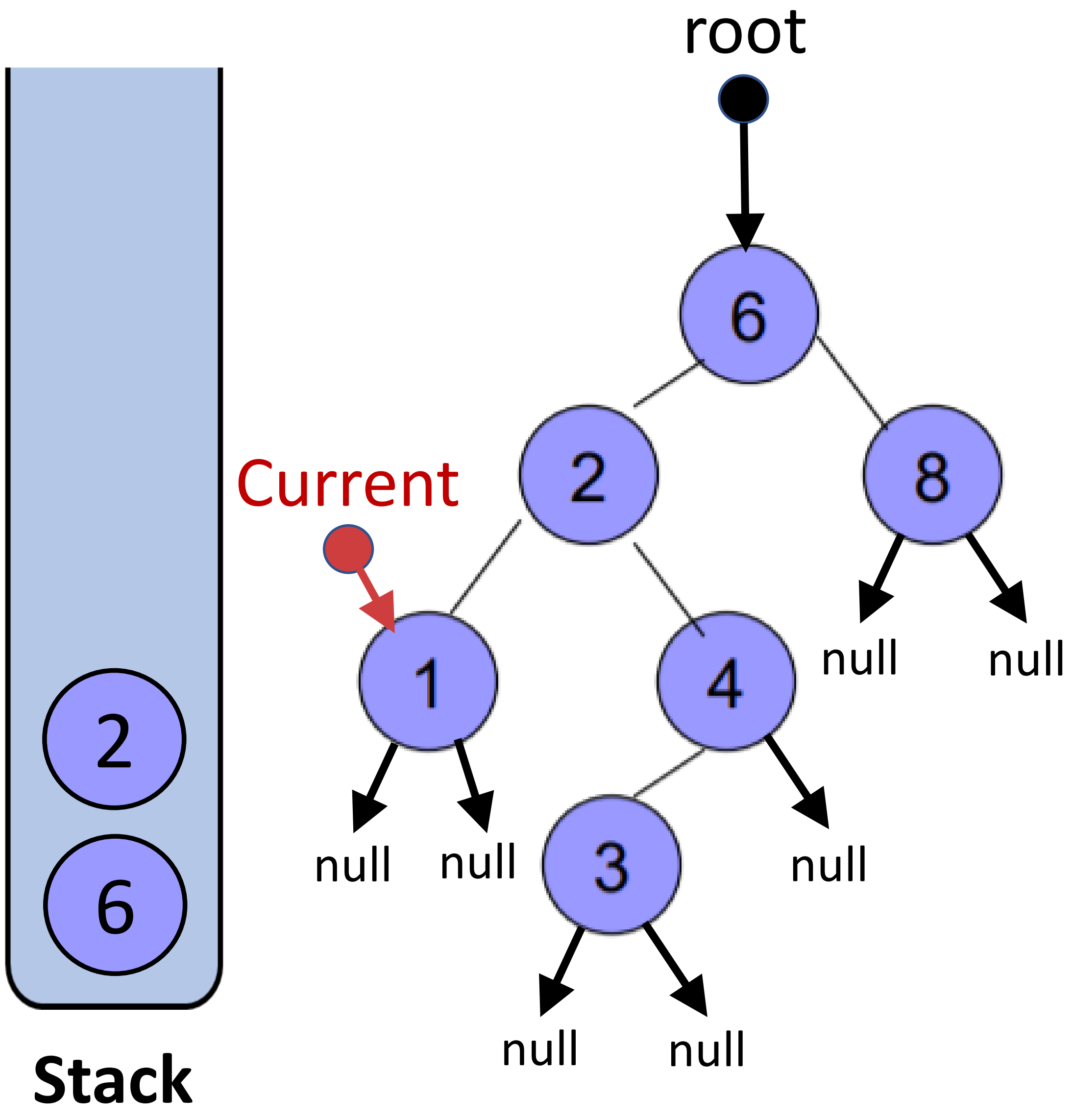

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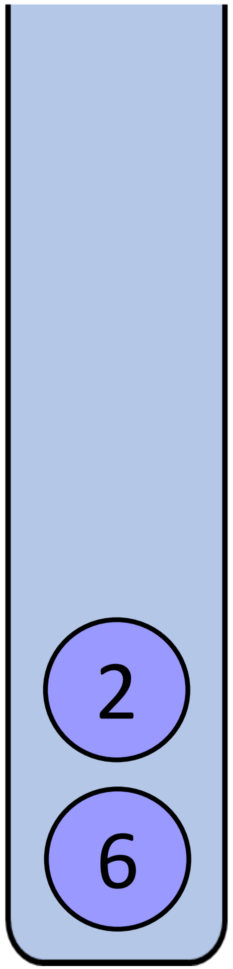

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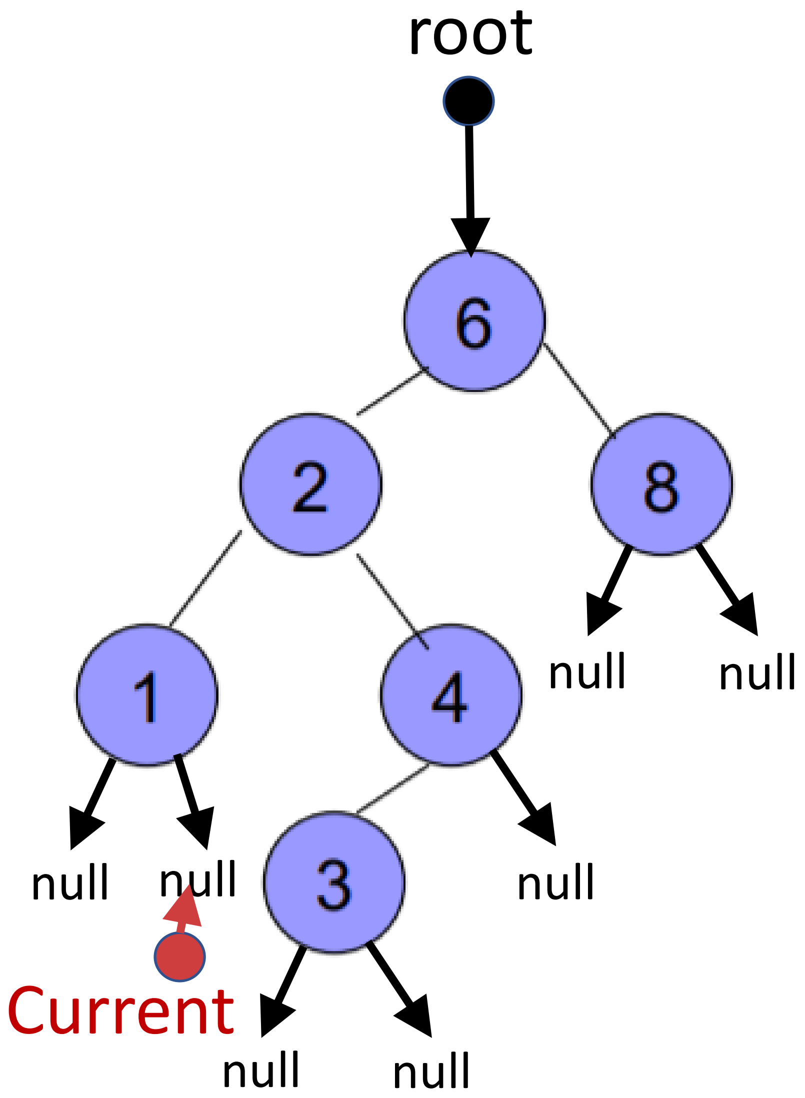

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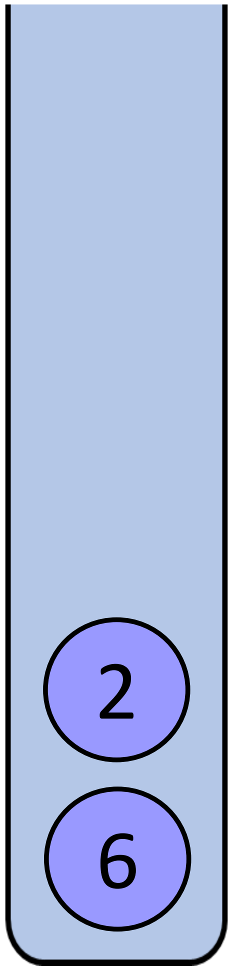

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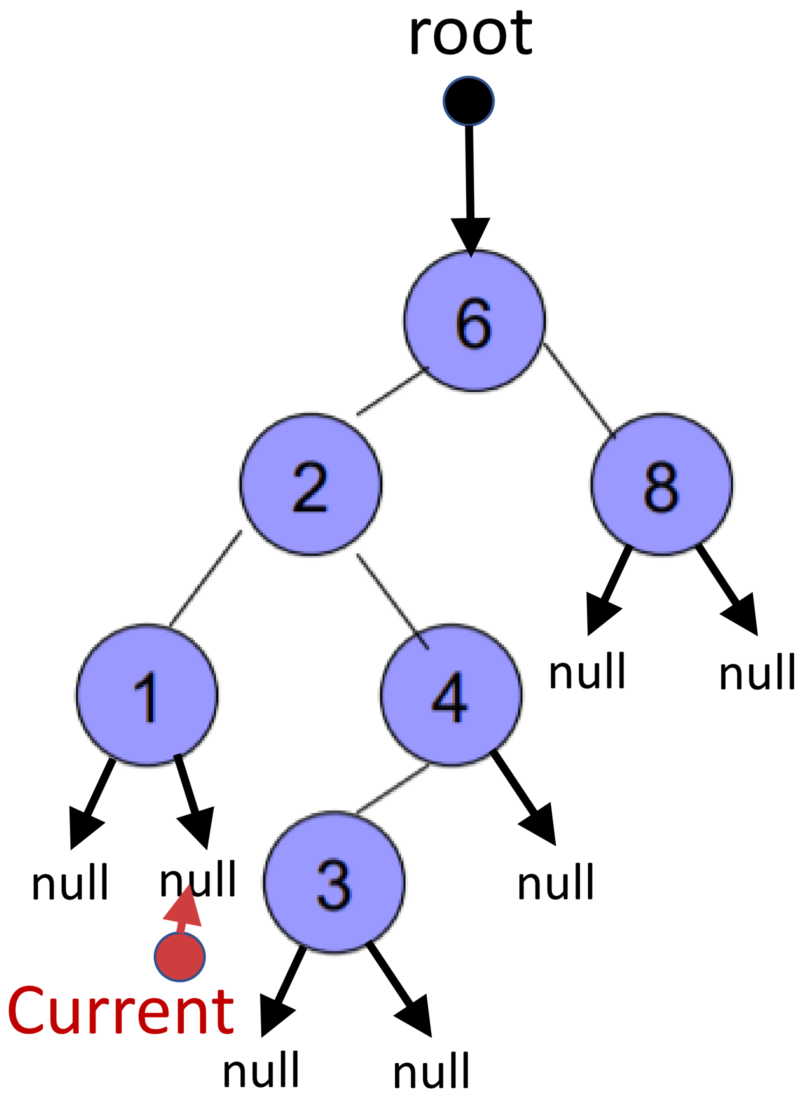

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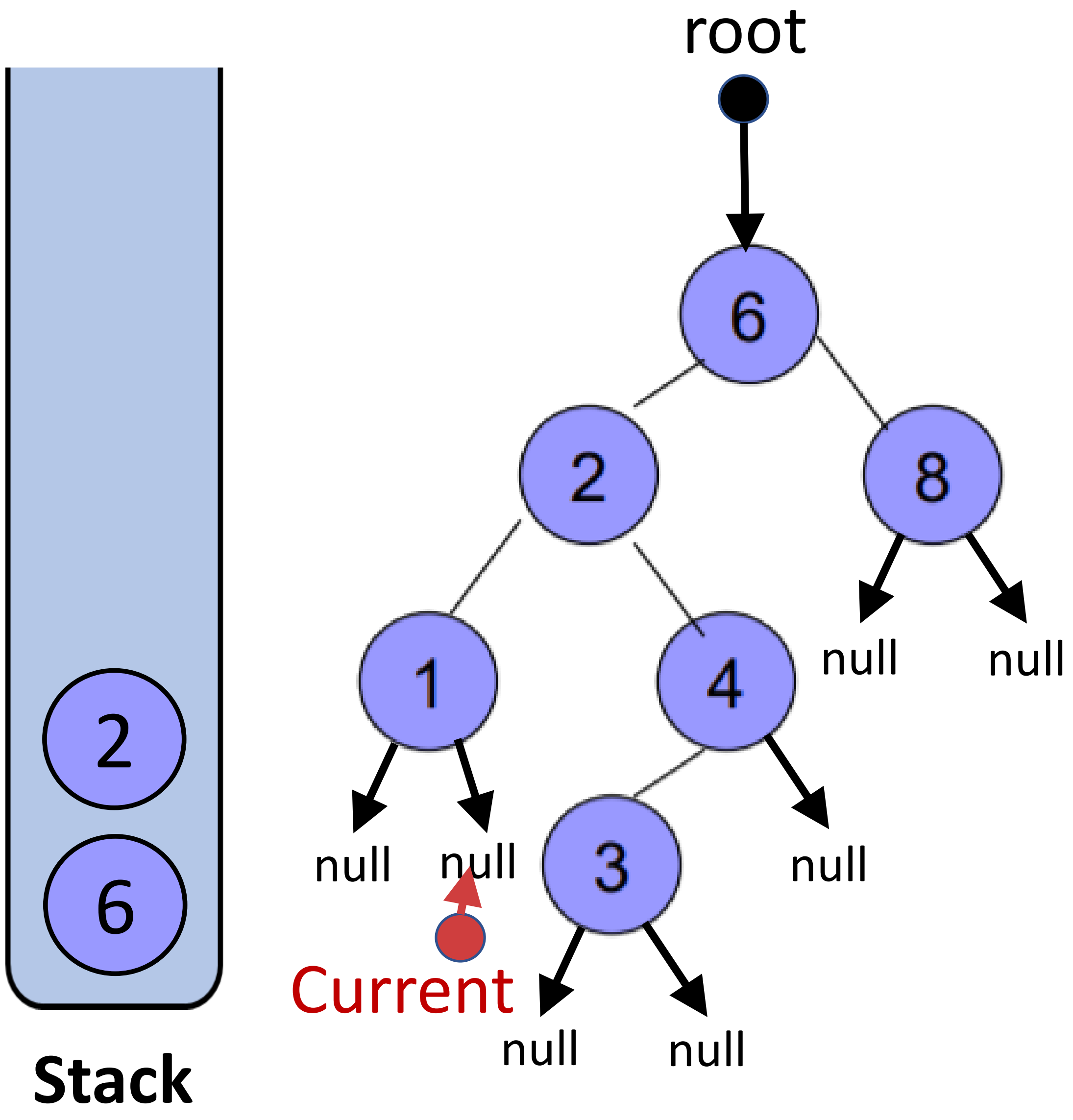

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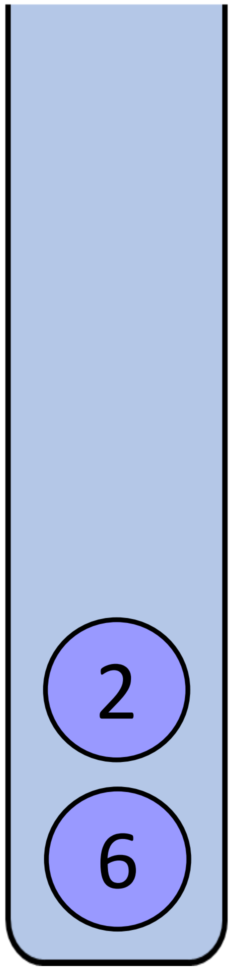

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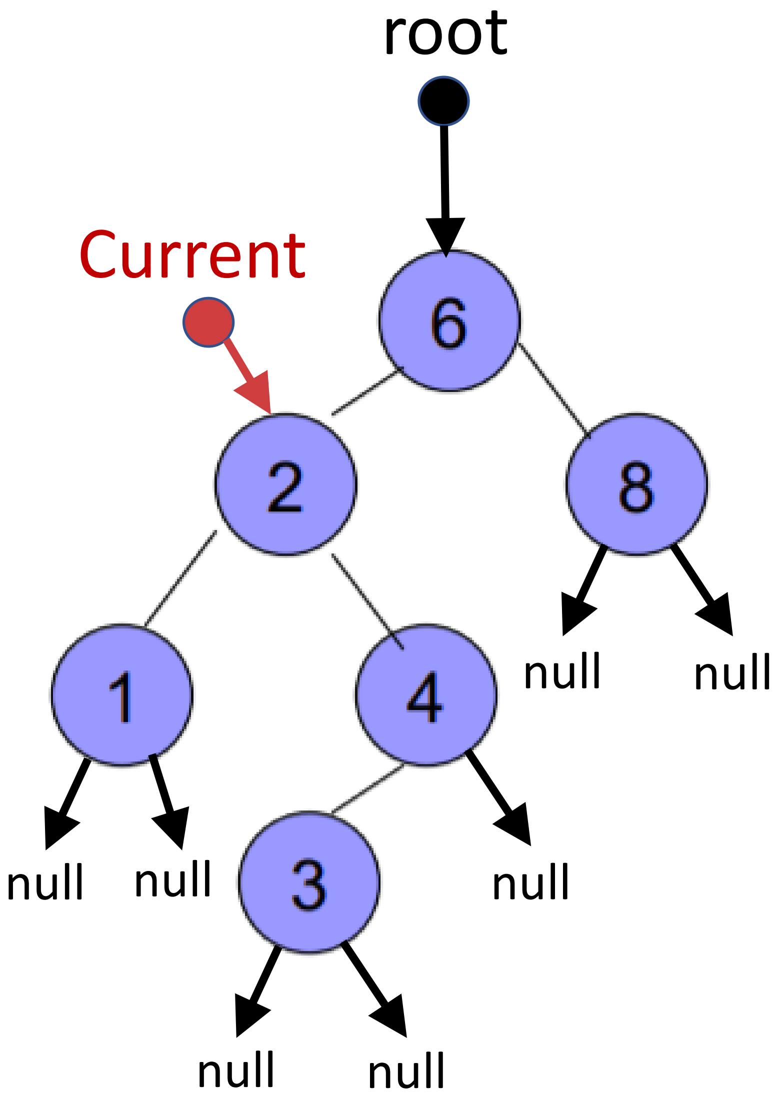

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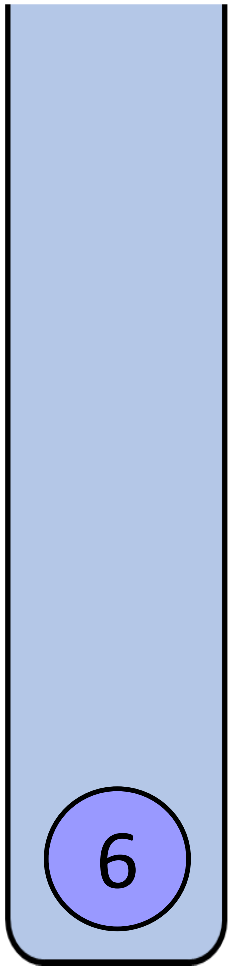

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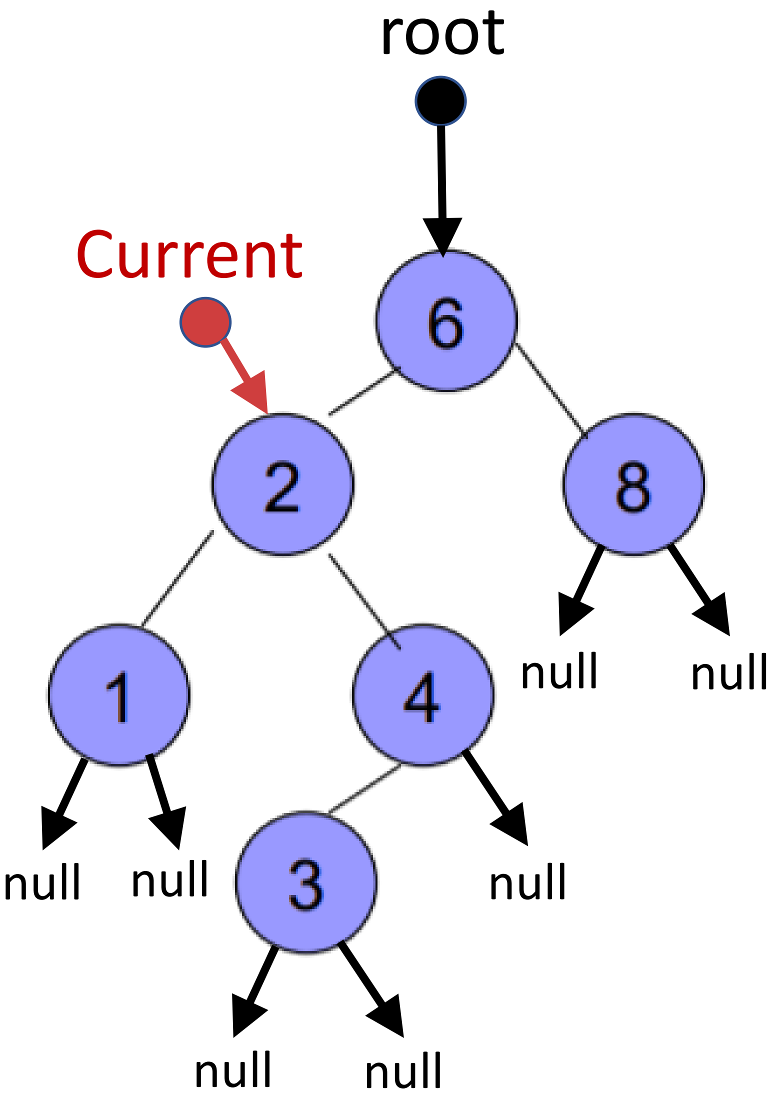

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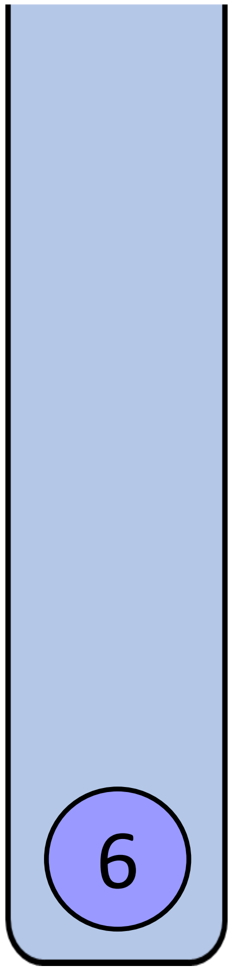
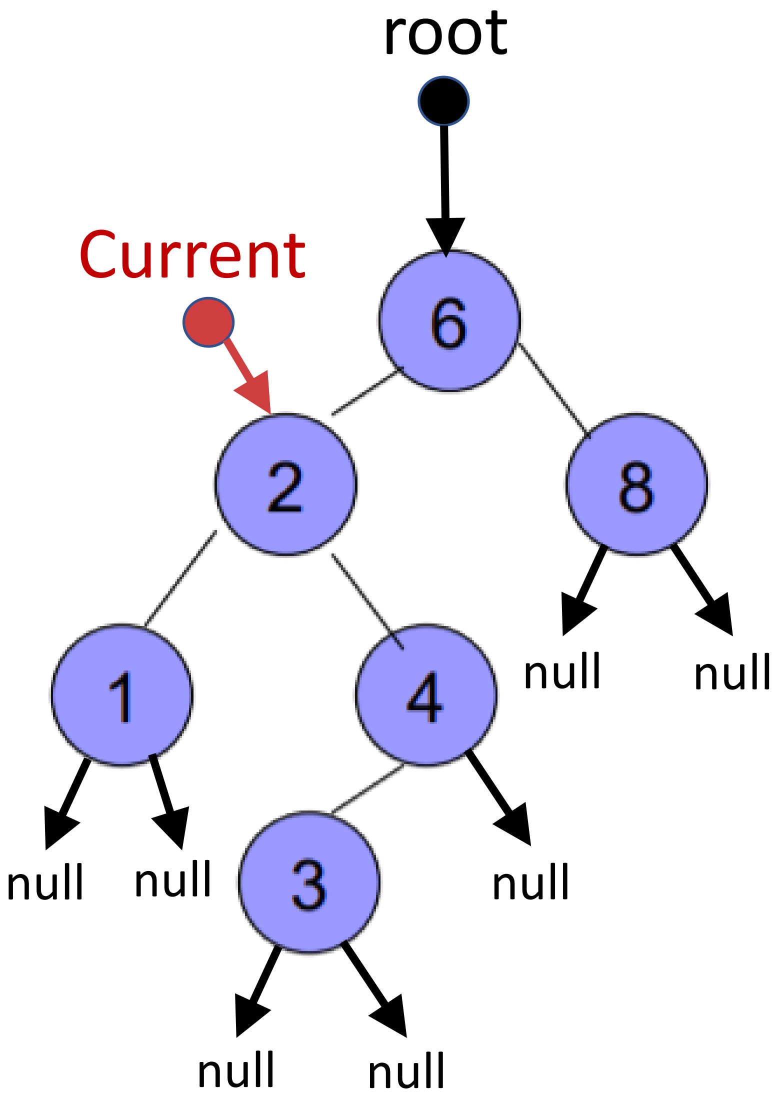
```

1   2



Stack



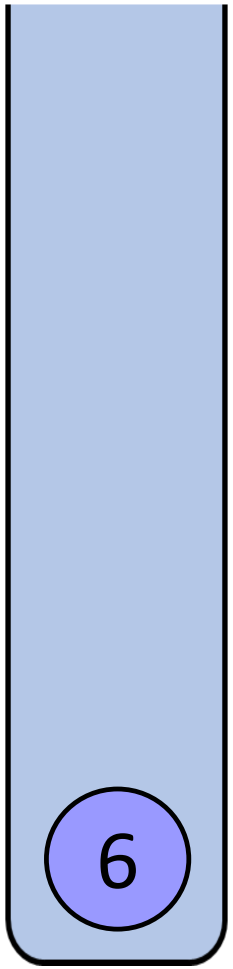
BST - Inorder Traversal using Stack

```
void  inorder()
 {
        node* current=root;

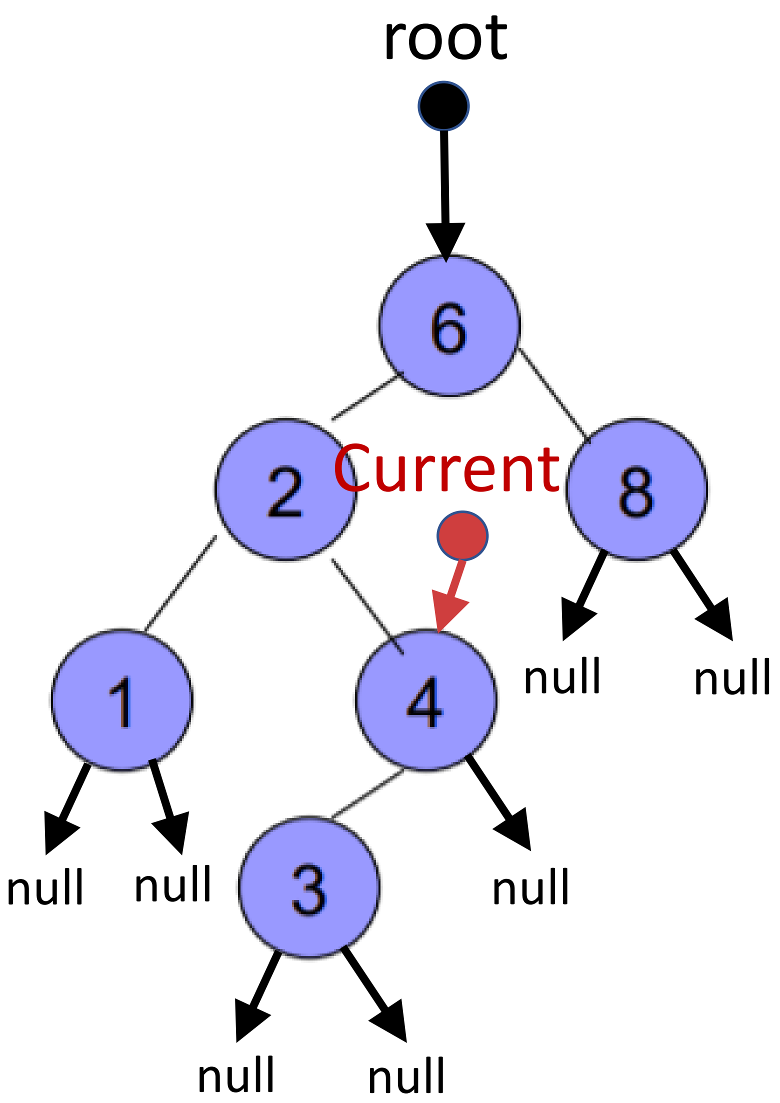
        while(1)

            if (current != NULL)
                  stack.push(current)
                  current = current->left
            else if  (!stack.empty() )
                  current = stack.top()
                  stack.pop()
                  cout<< current->data;
          ➡     current = current->right
            else
                  return
 }
```

1   2



Stack



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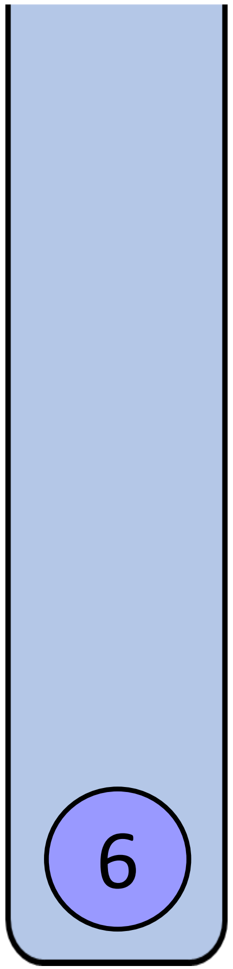
1   2



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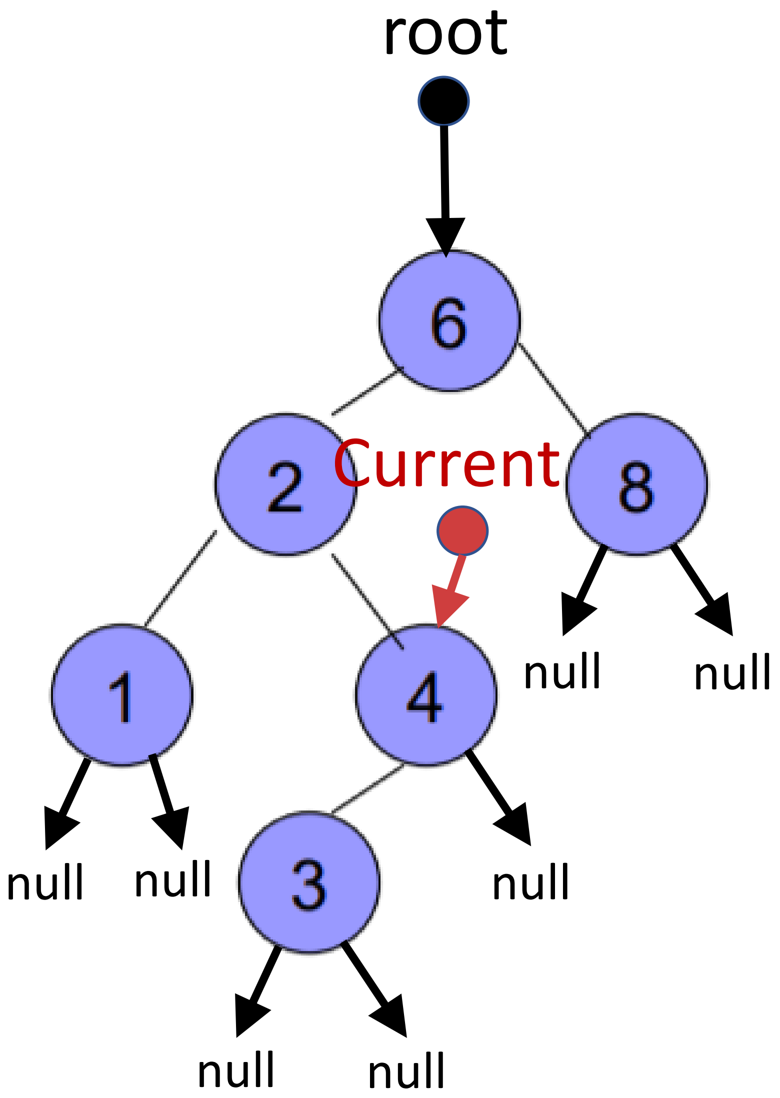

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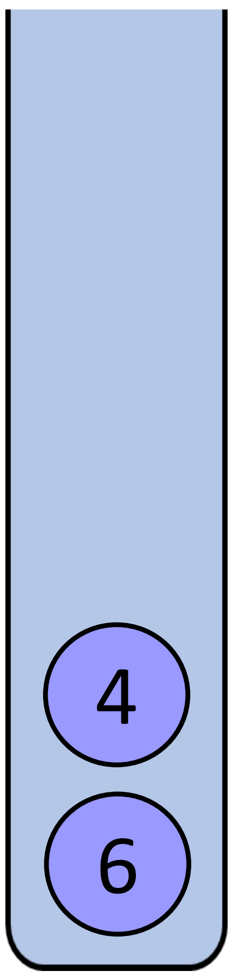
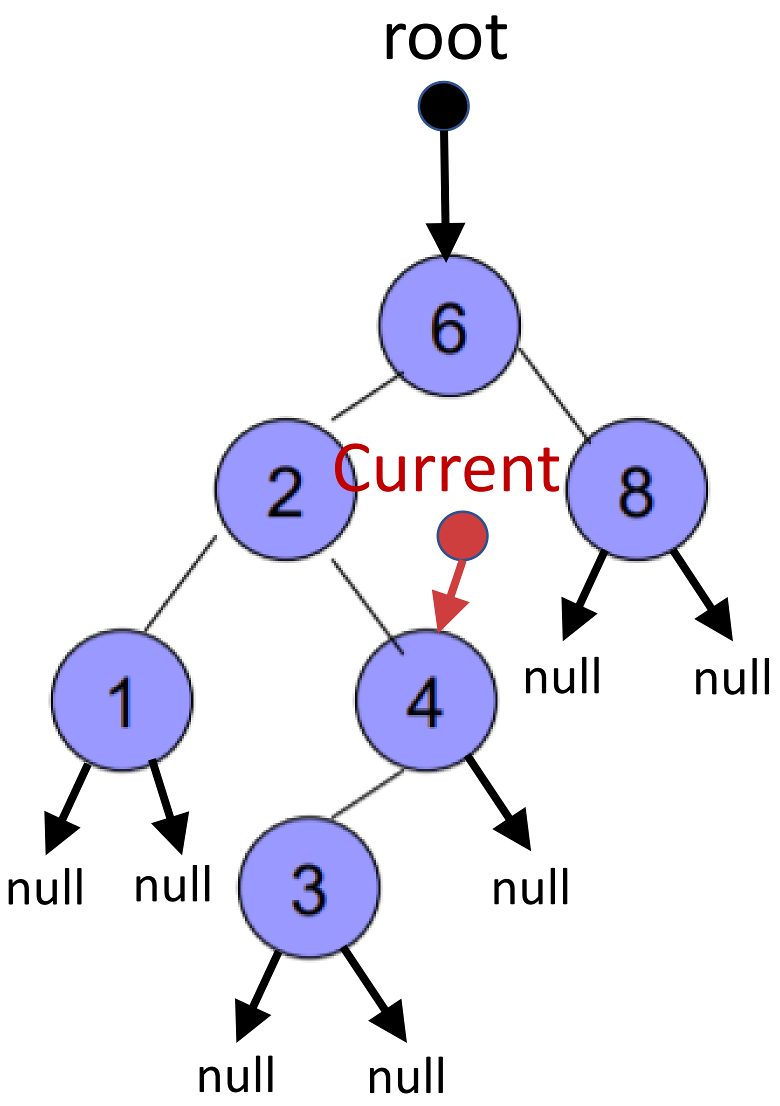
1   2



Stack



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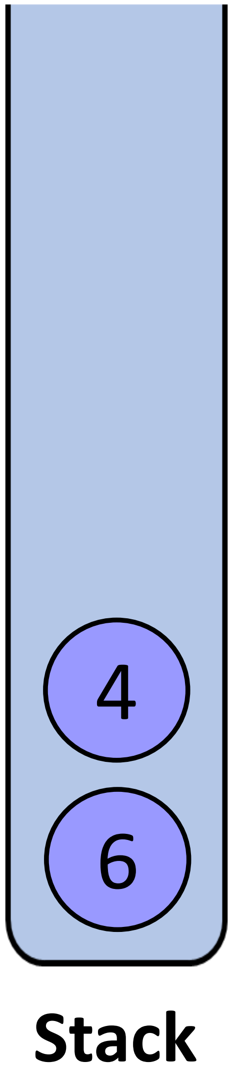
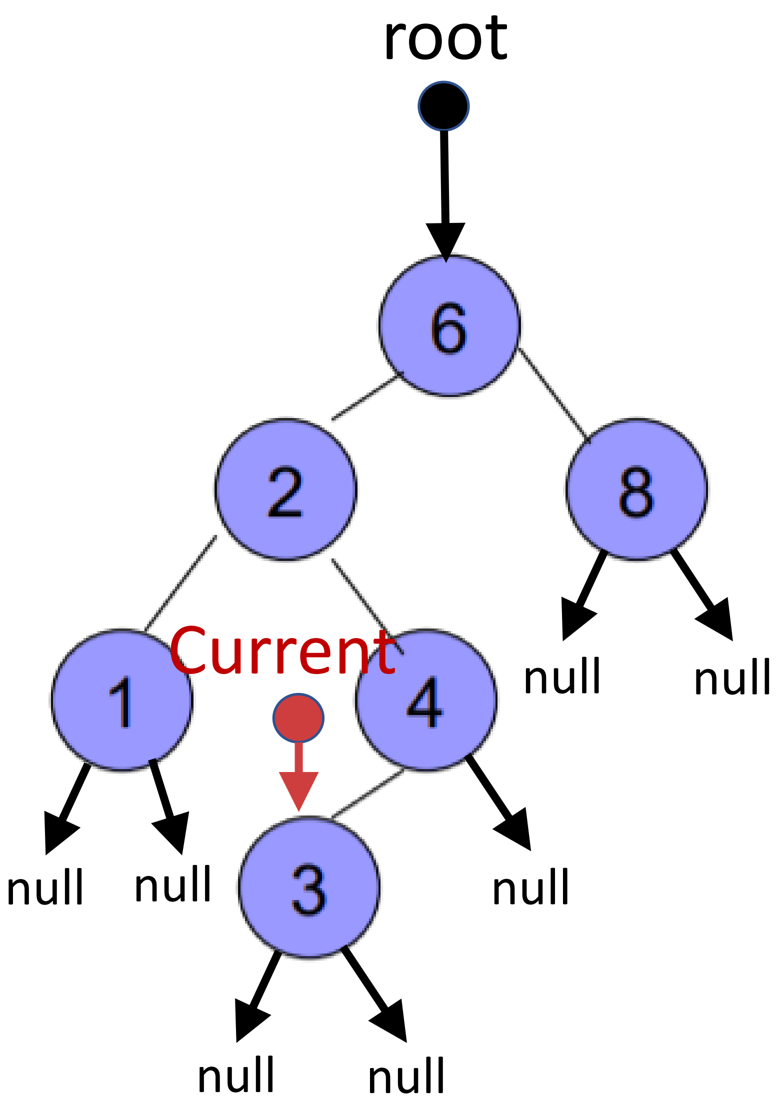
1   2





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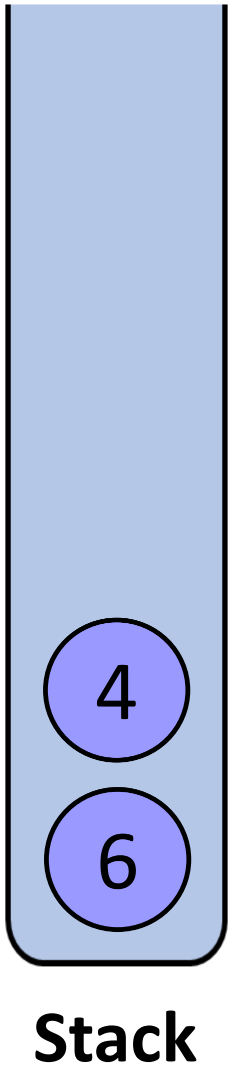
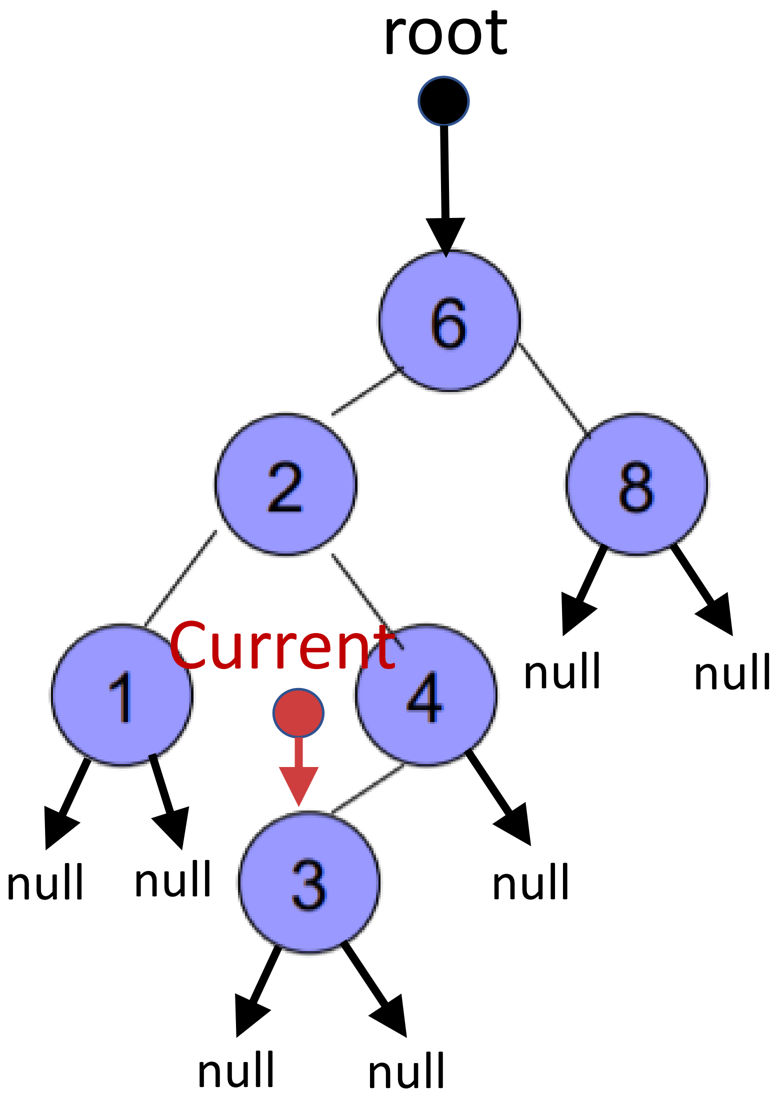
1 2





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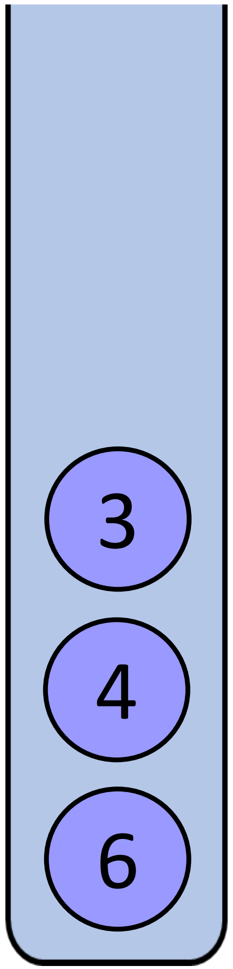
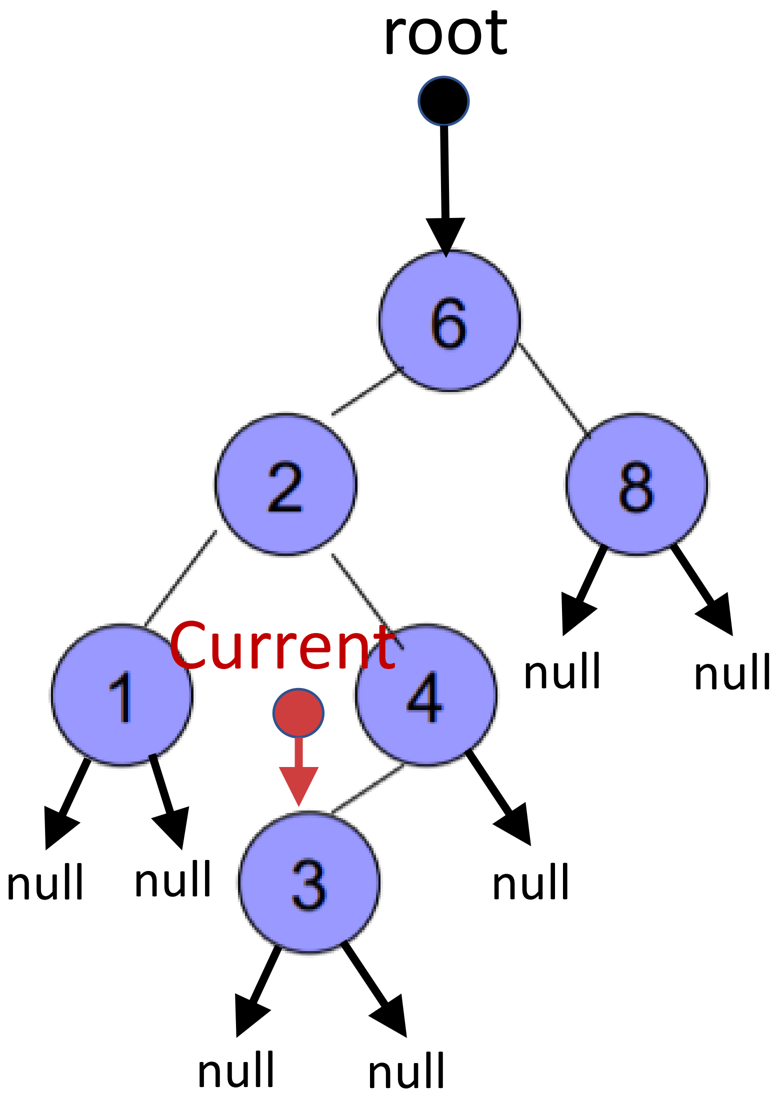
1   2



Stack



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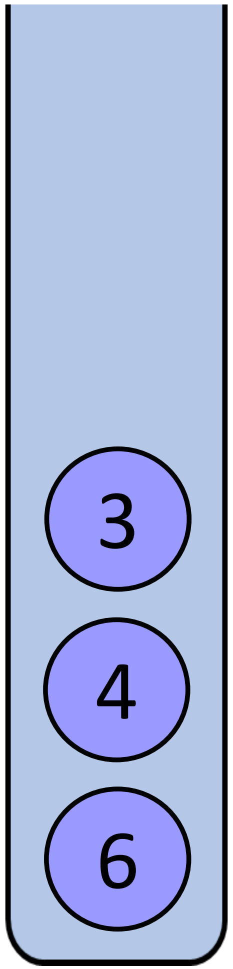
1   2



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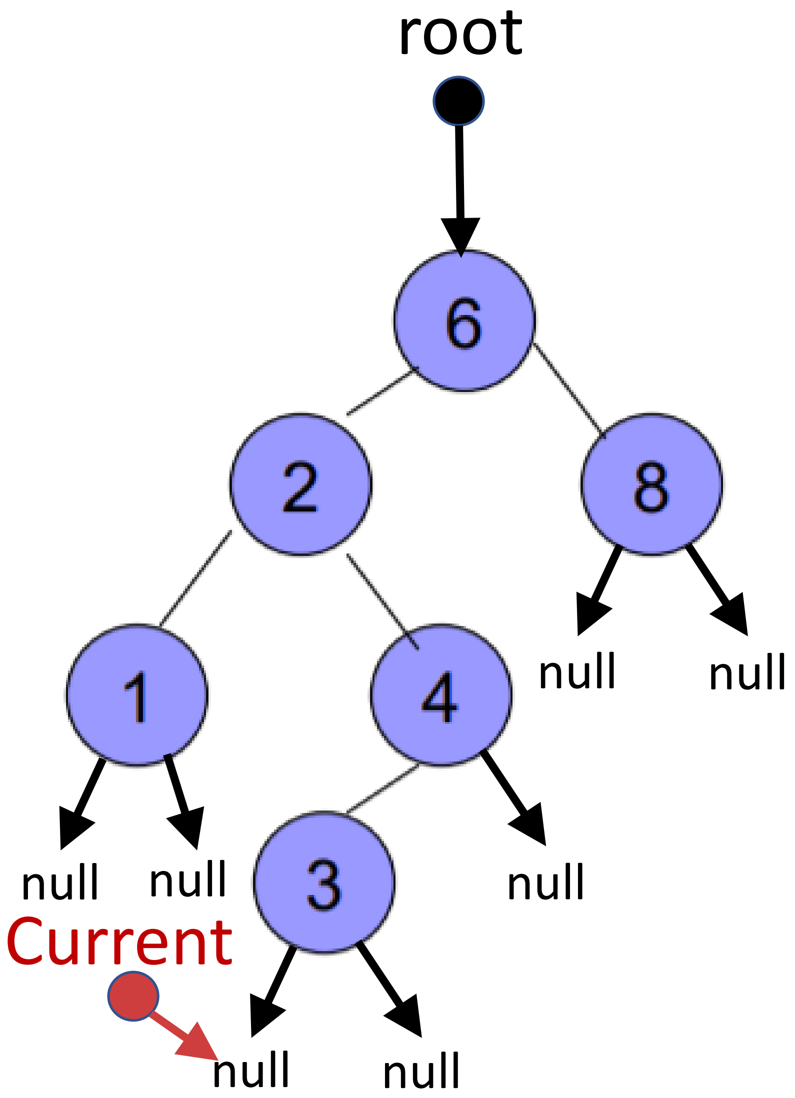

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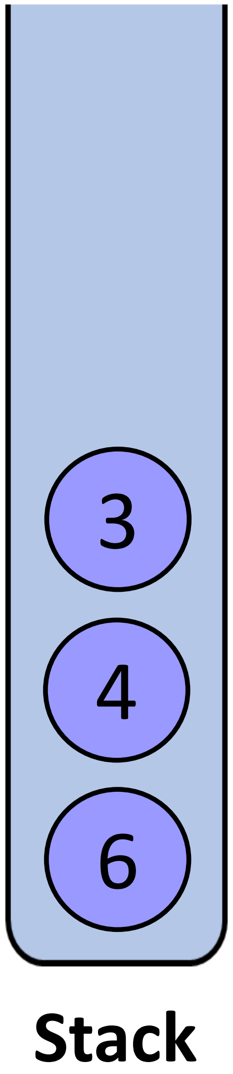
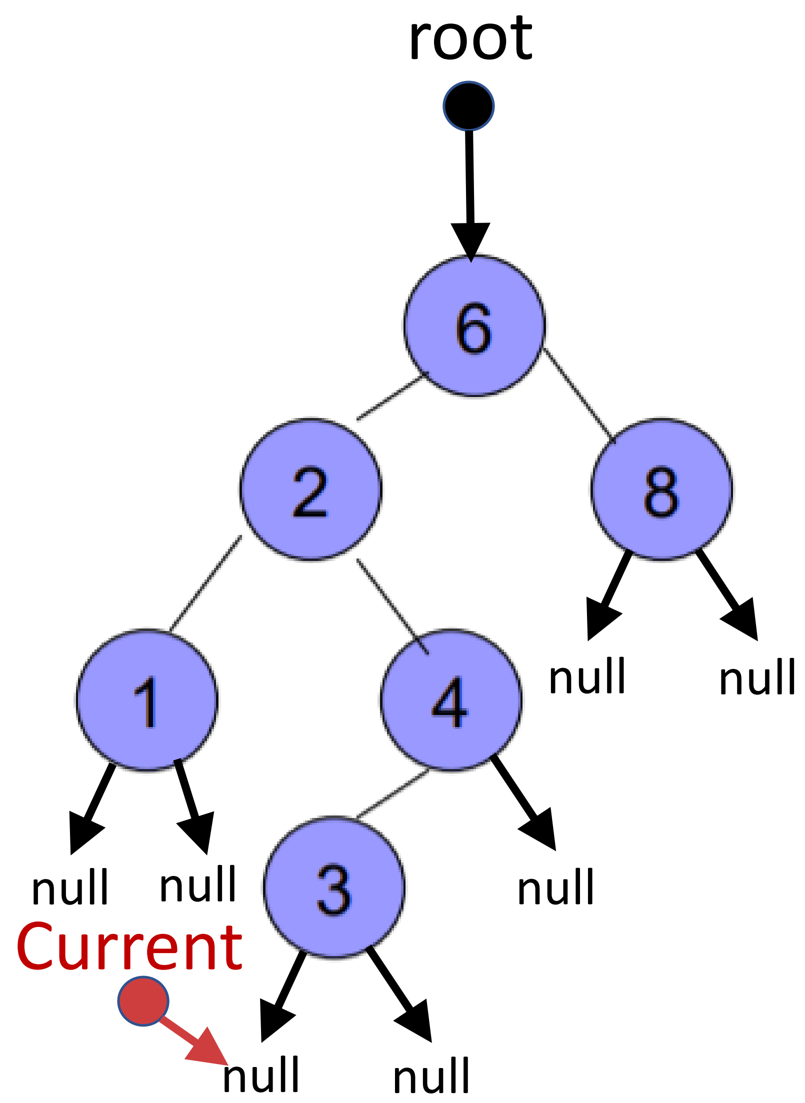
1   2





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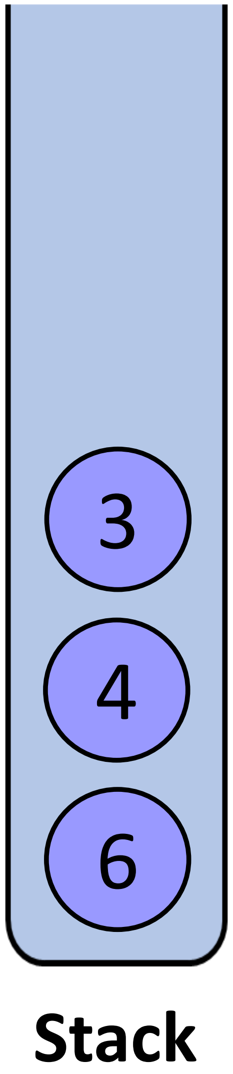
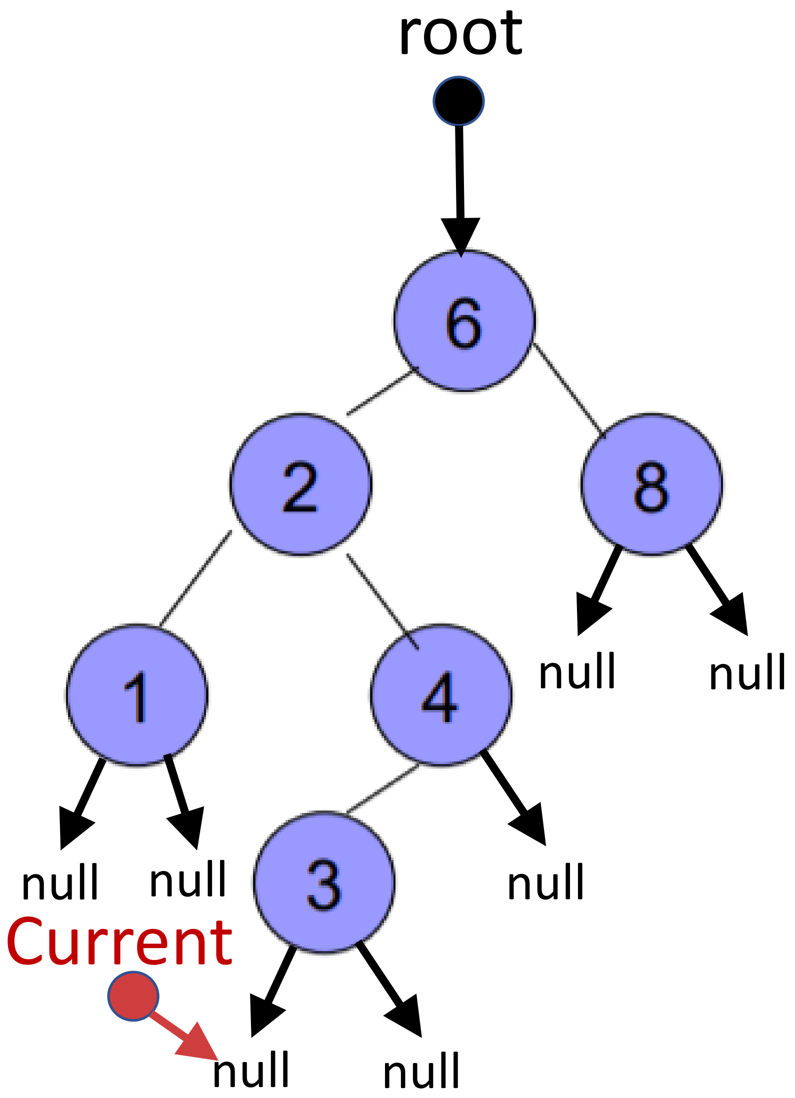
1   2





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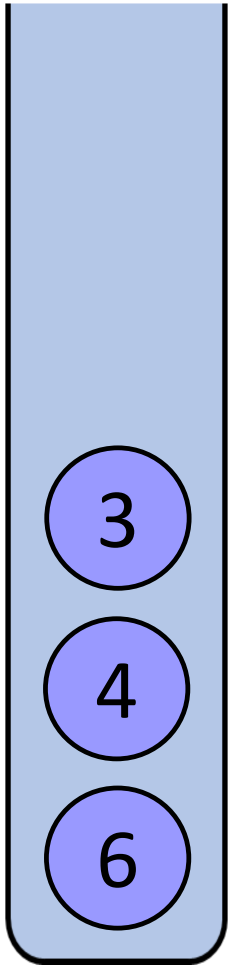
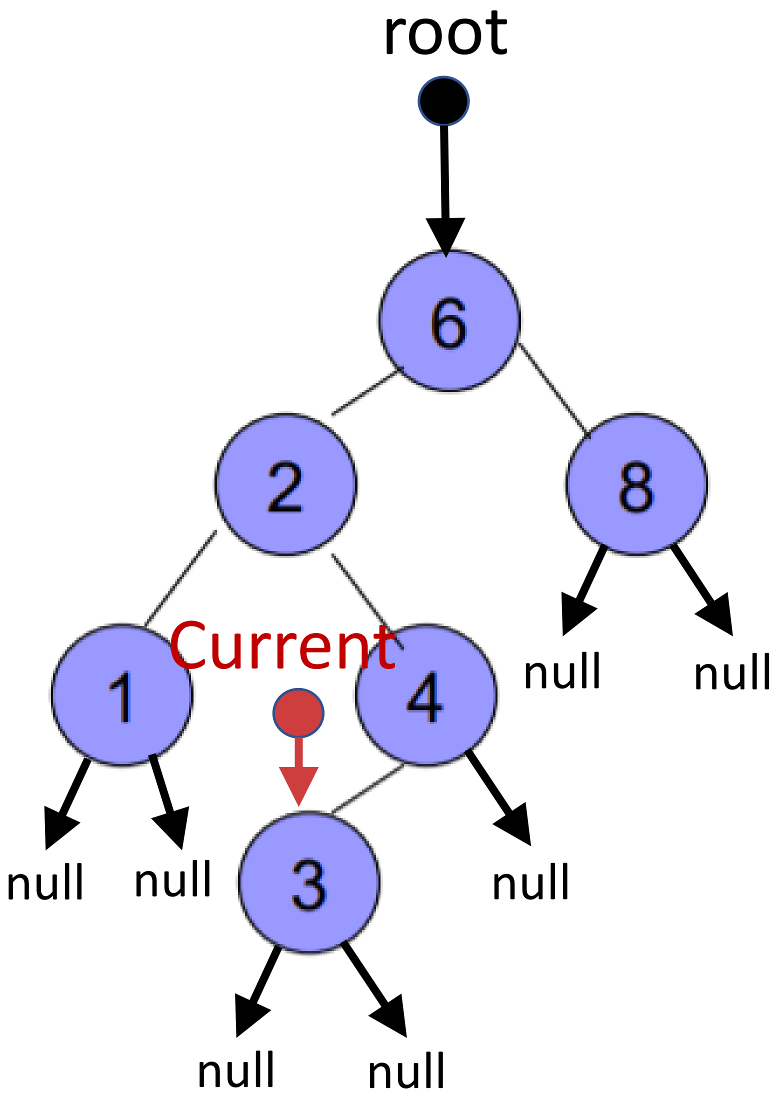
1   2



Stack



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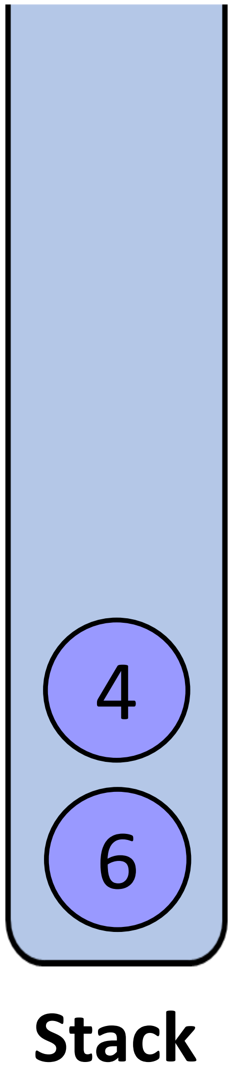
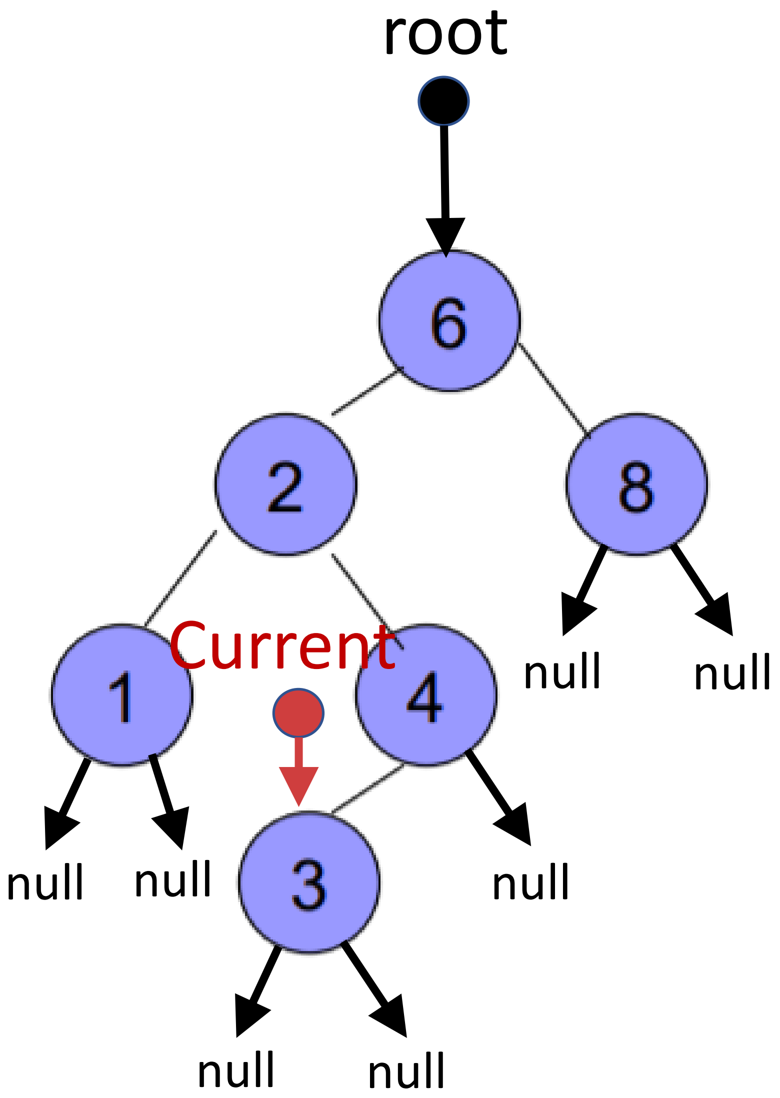
1   2





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```
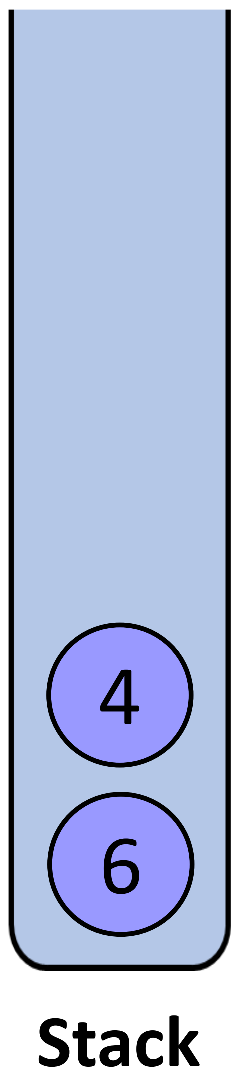
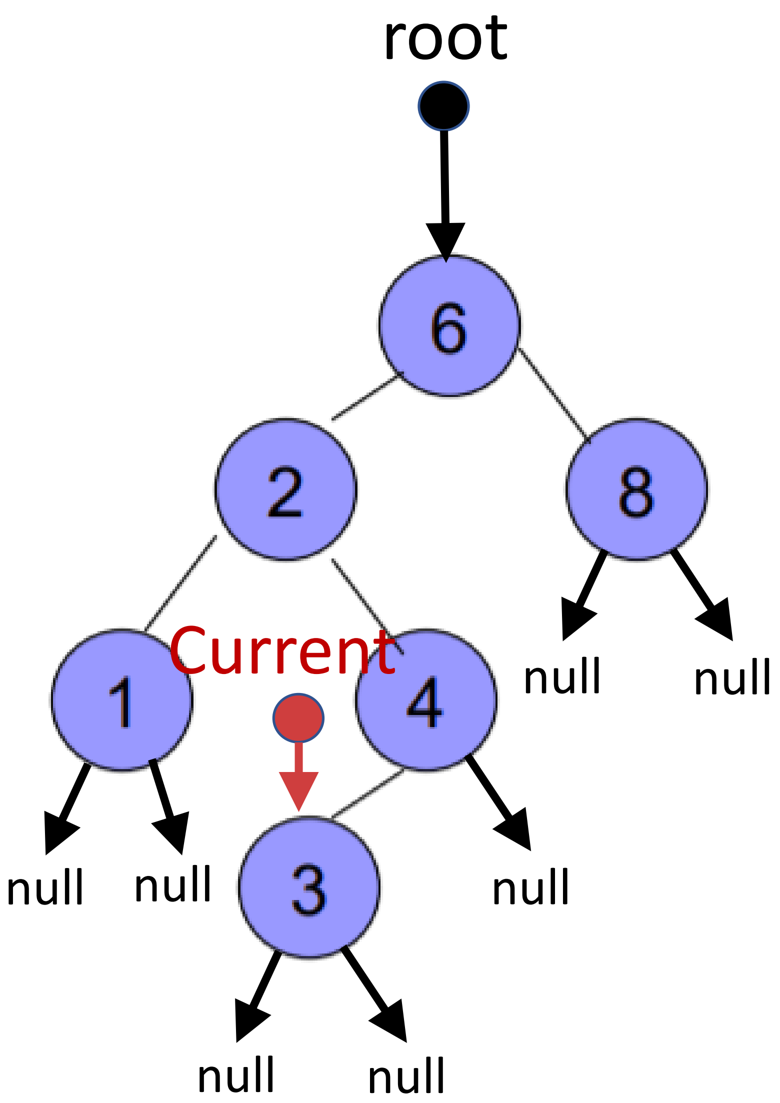

1   2   3





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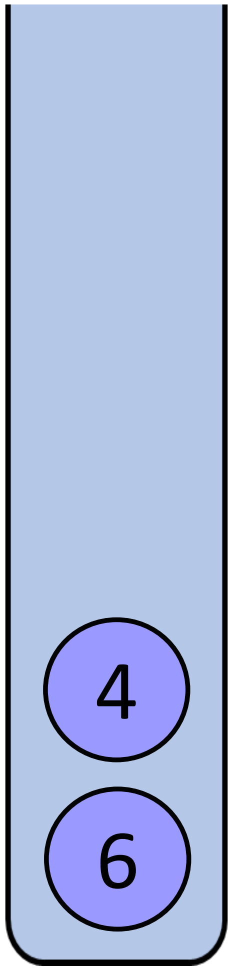
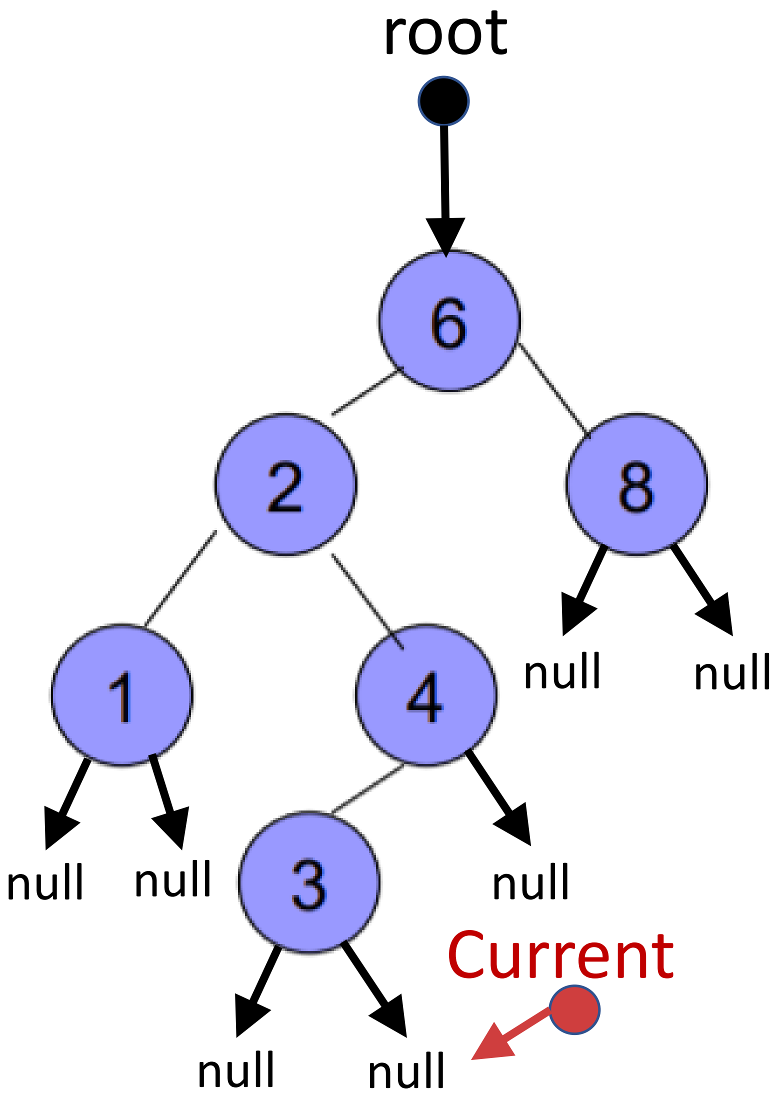
1   2   3



Stack



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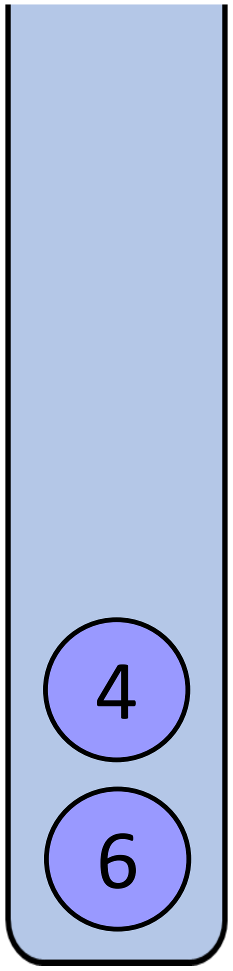

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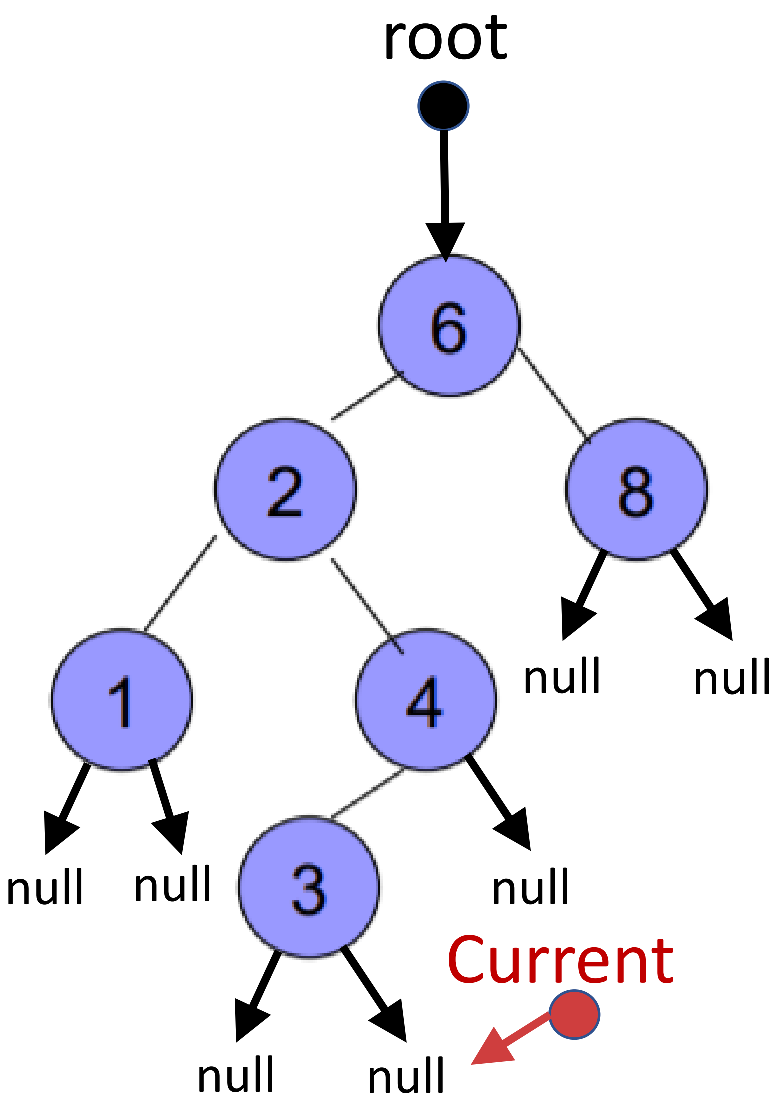

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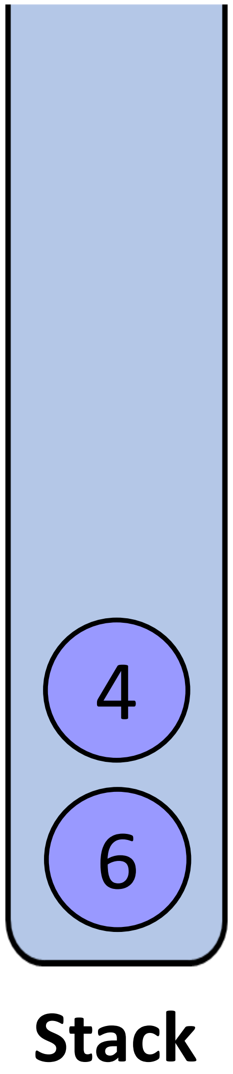

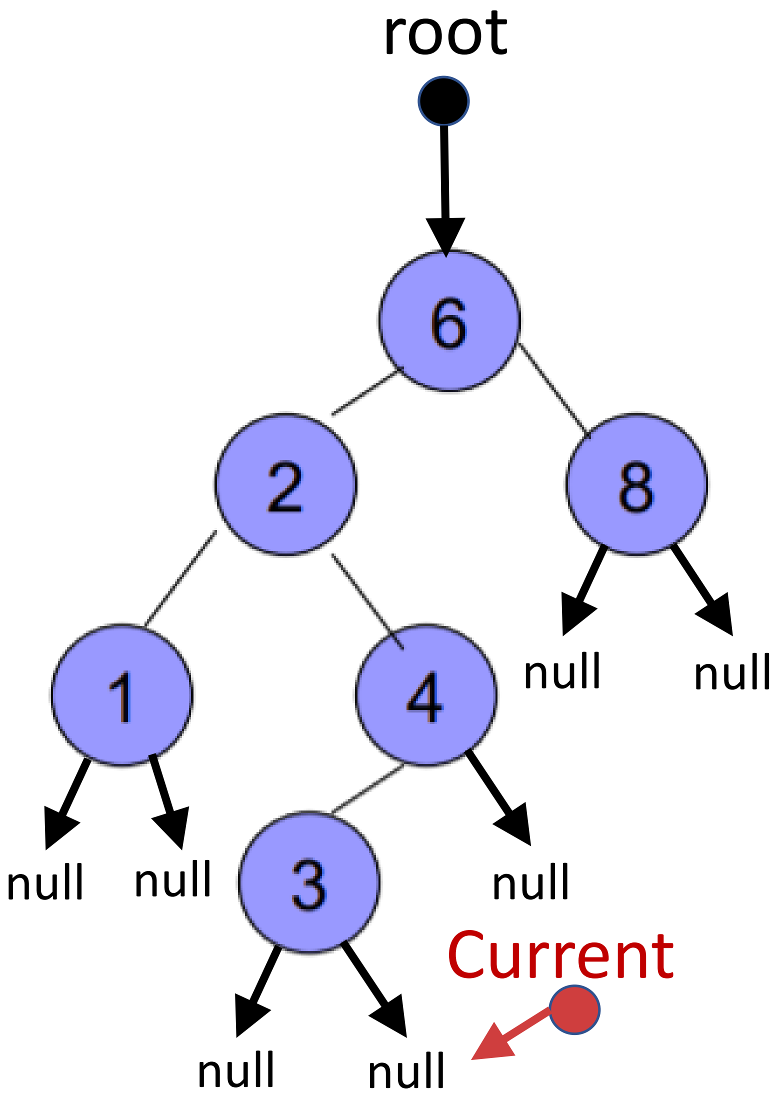

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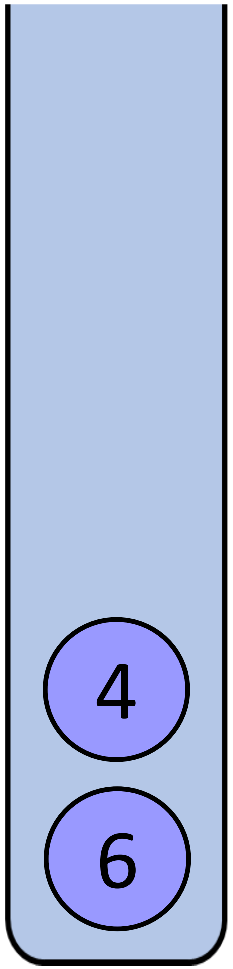

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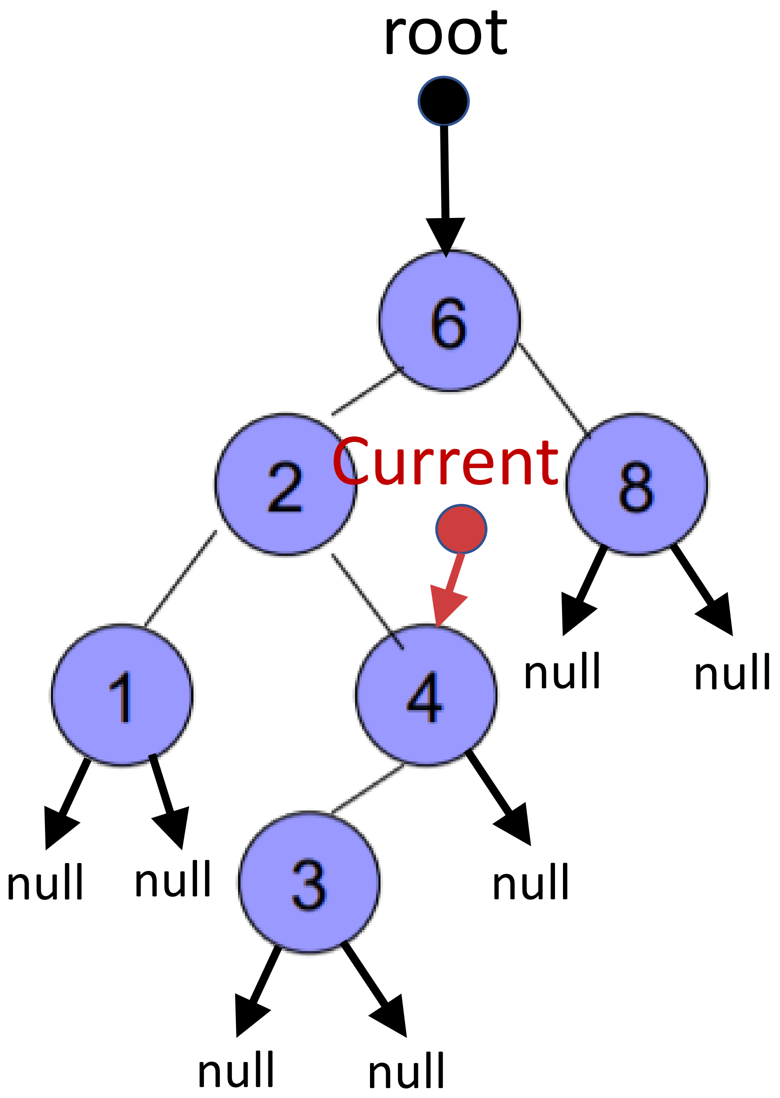

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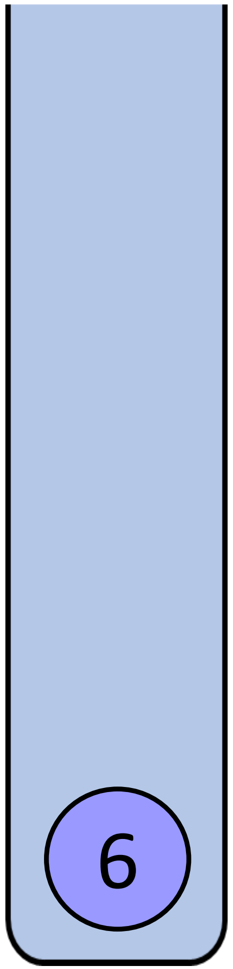

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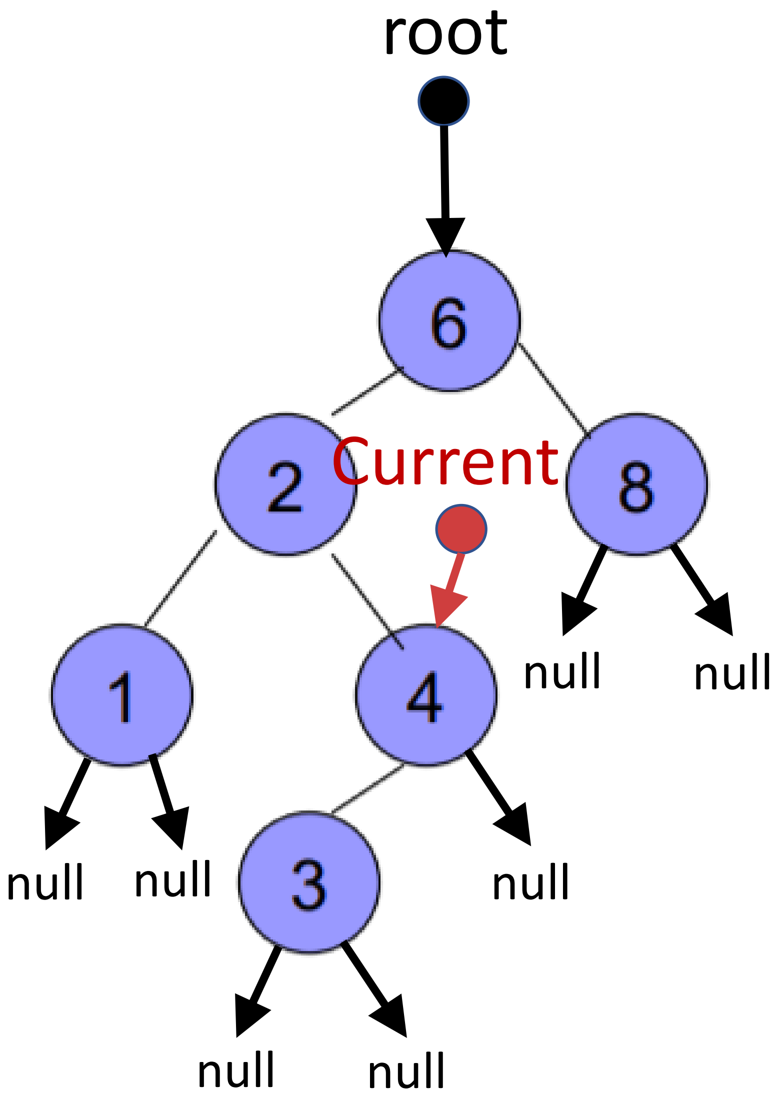

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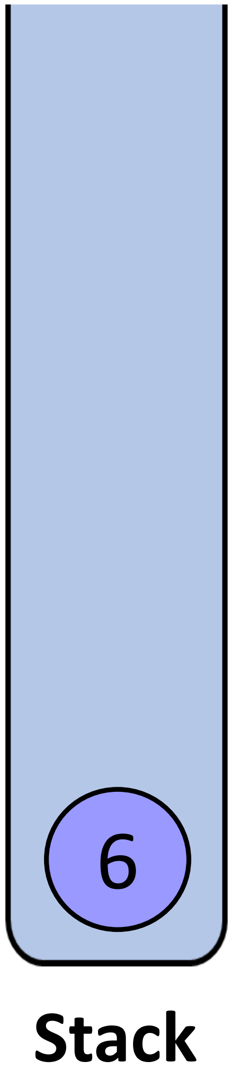
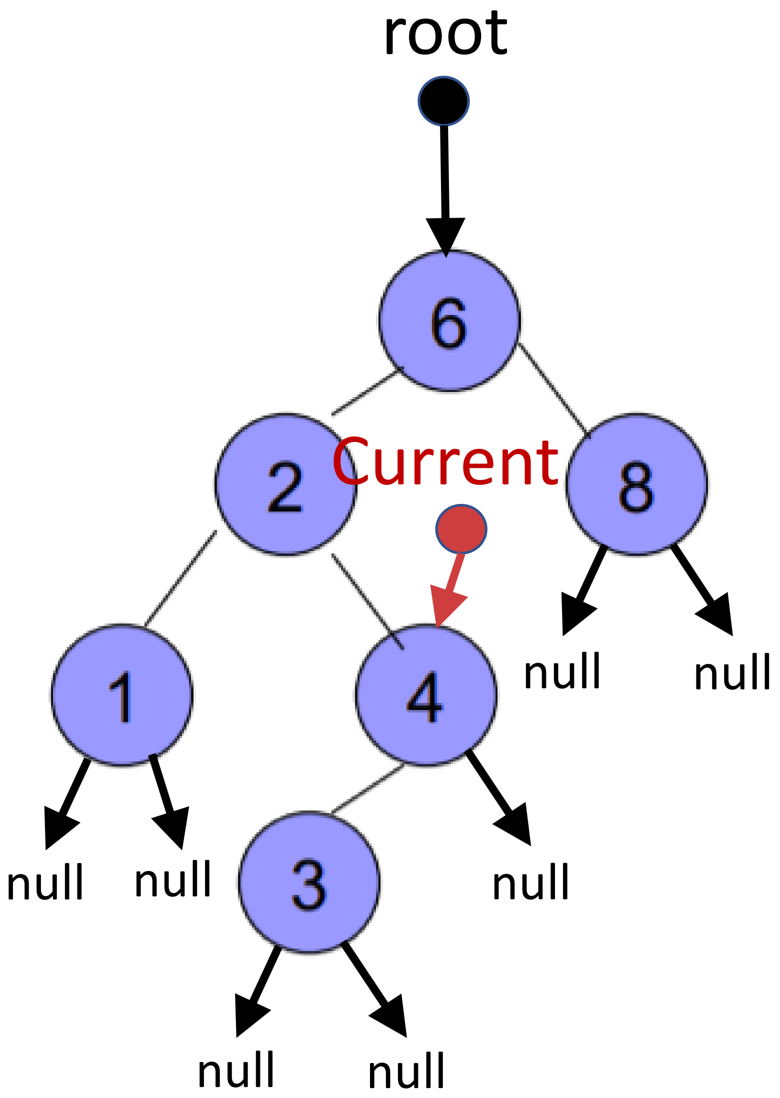
1   2   3   4





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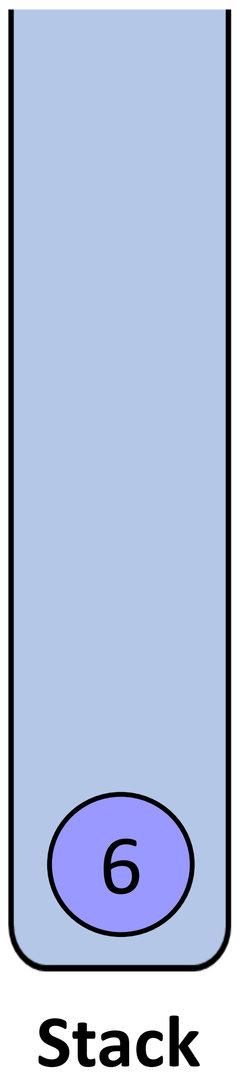
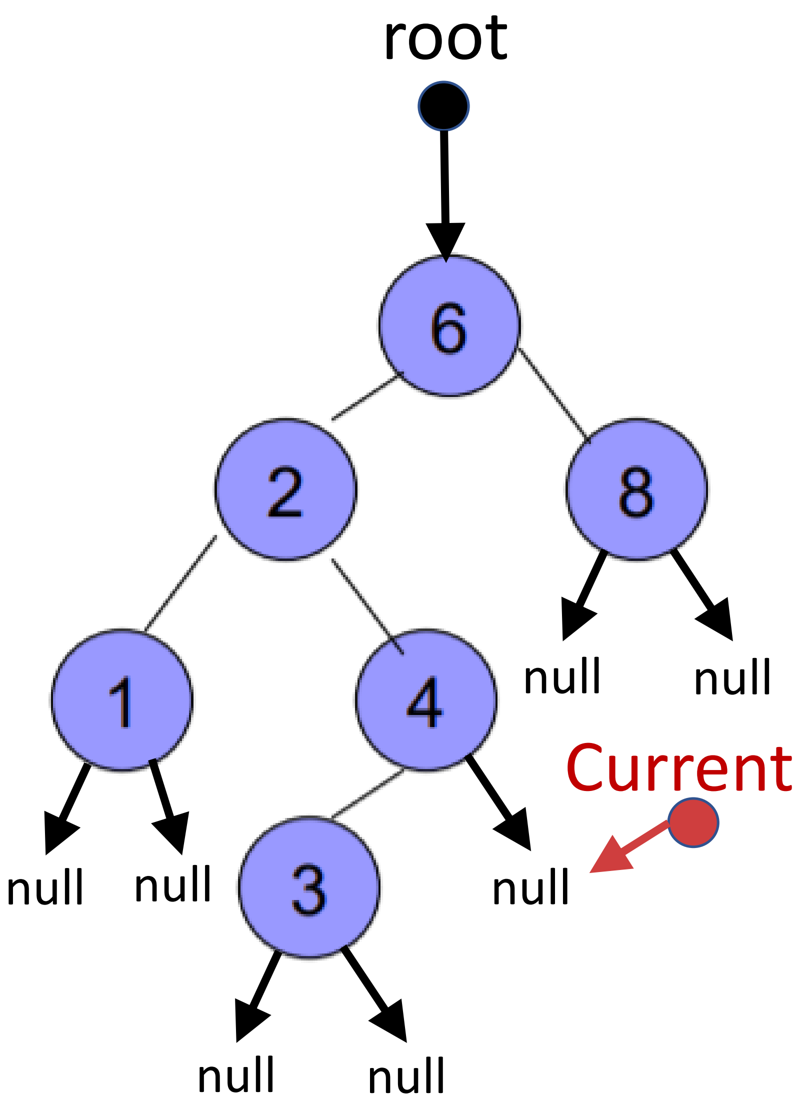
1   2   3   4





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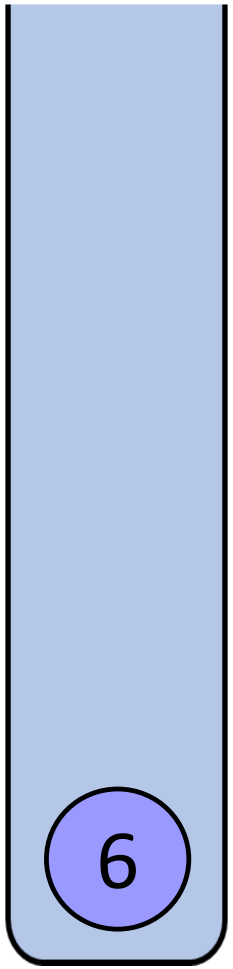

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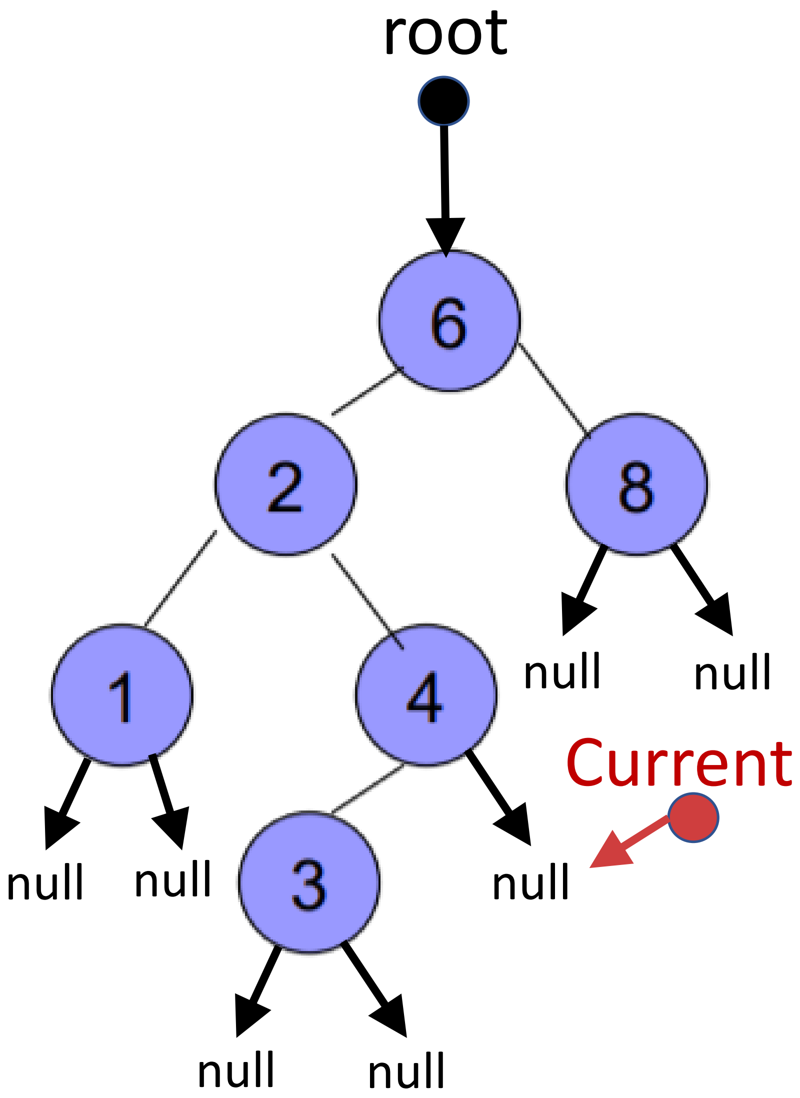

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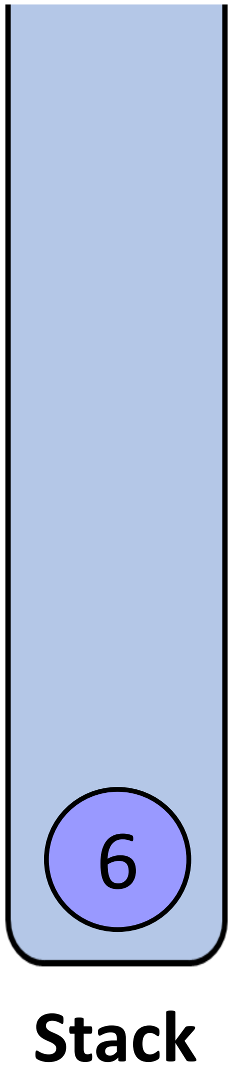

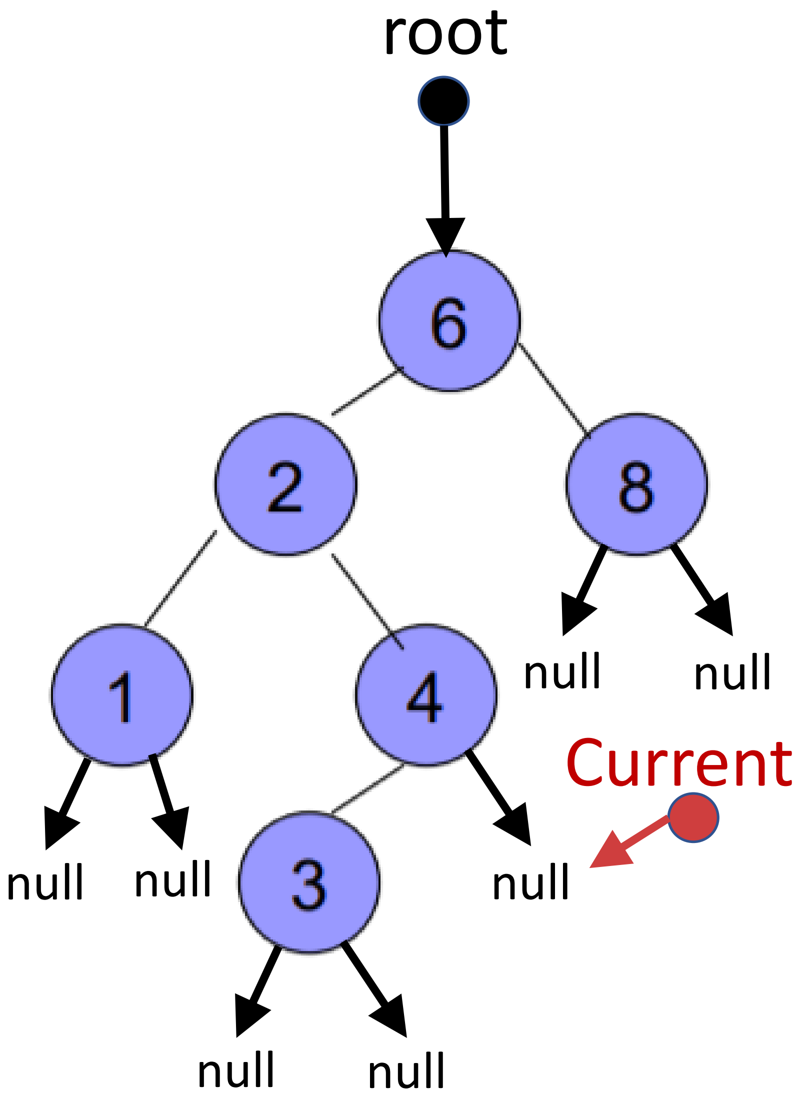

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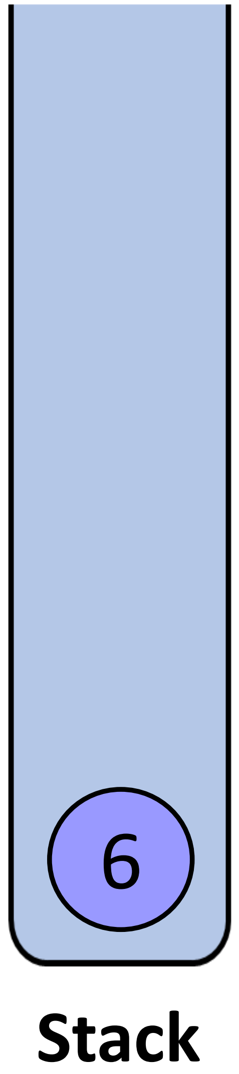

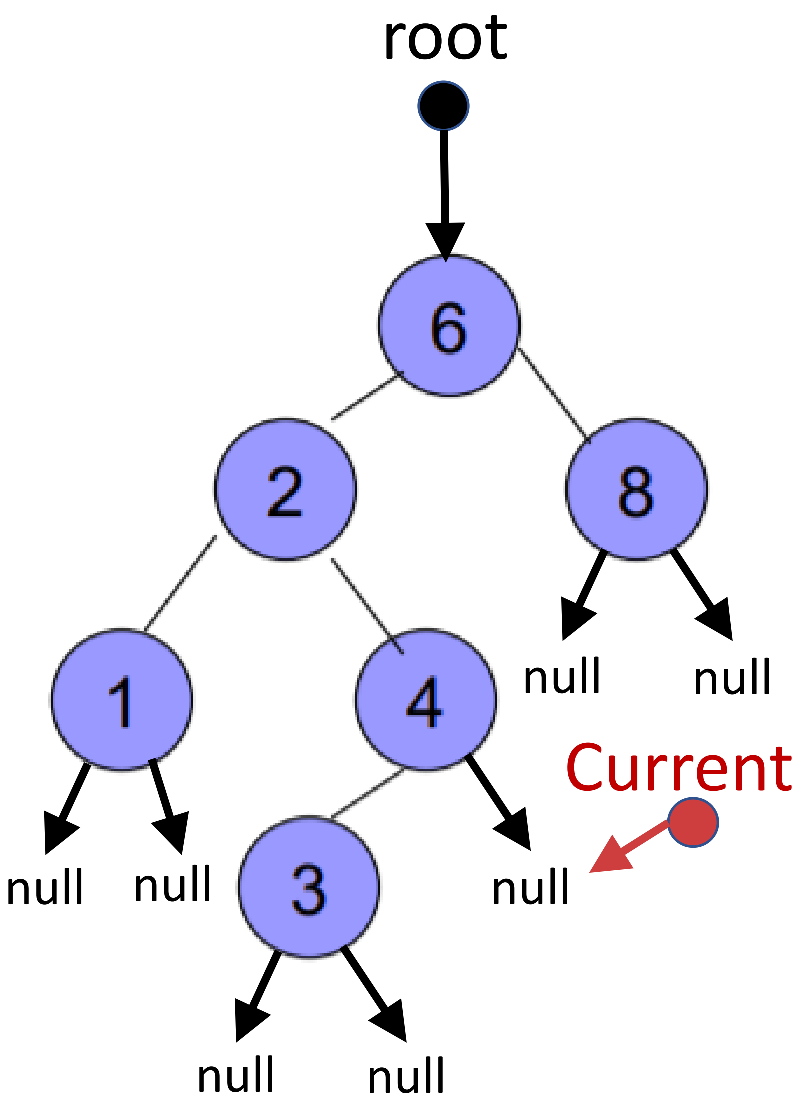

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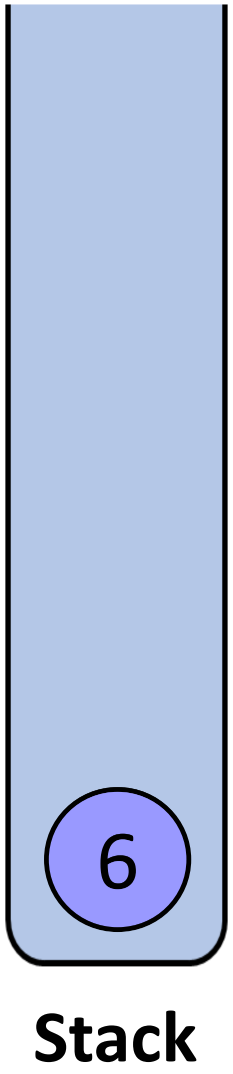

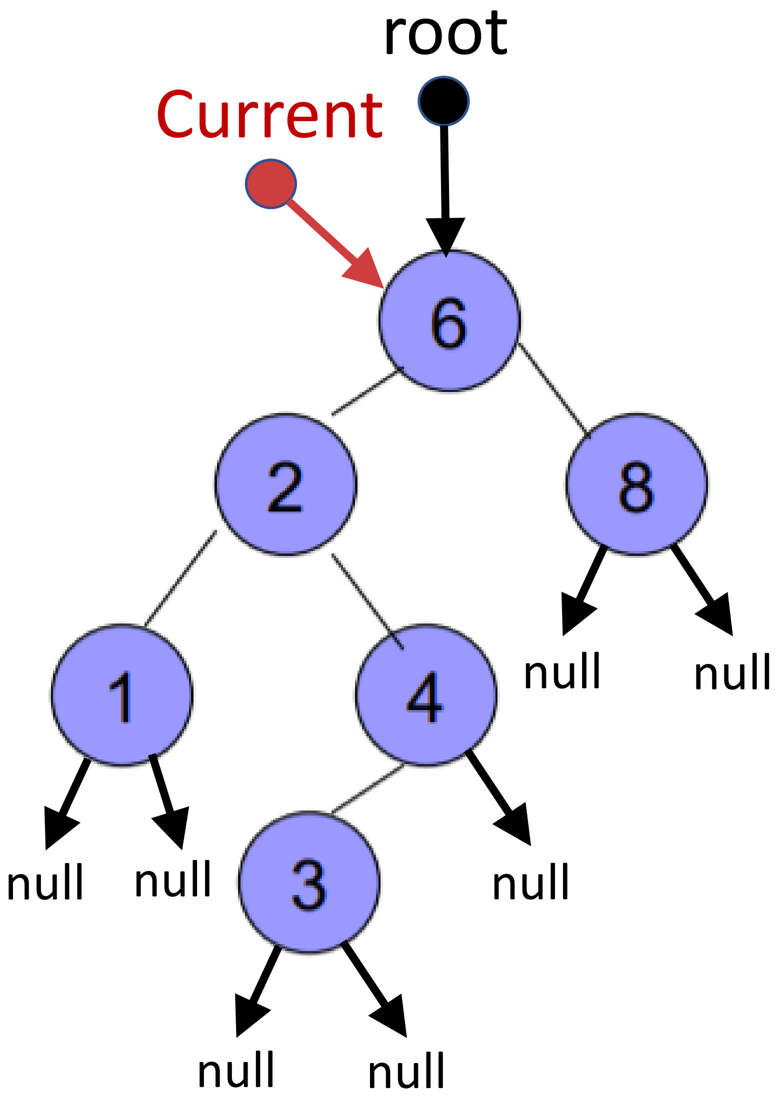

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            else if  (!stack.empty() )
                    current = stack.top()
            ➡      stack.pop()
                    cout<< current->data;
                    current = current->right
            else
                    return
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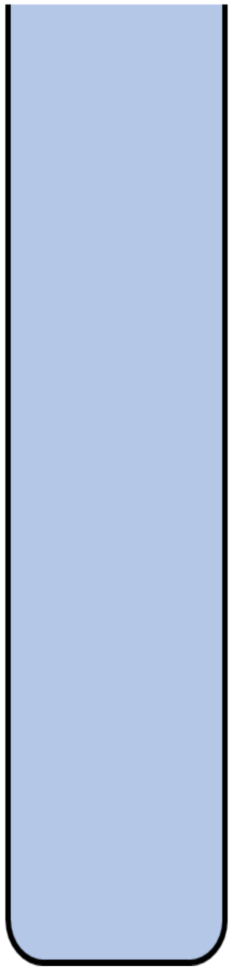
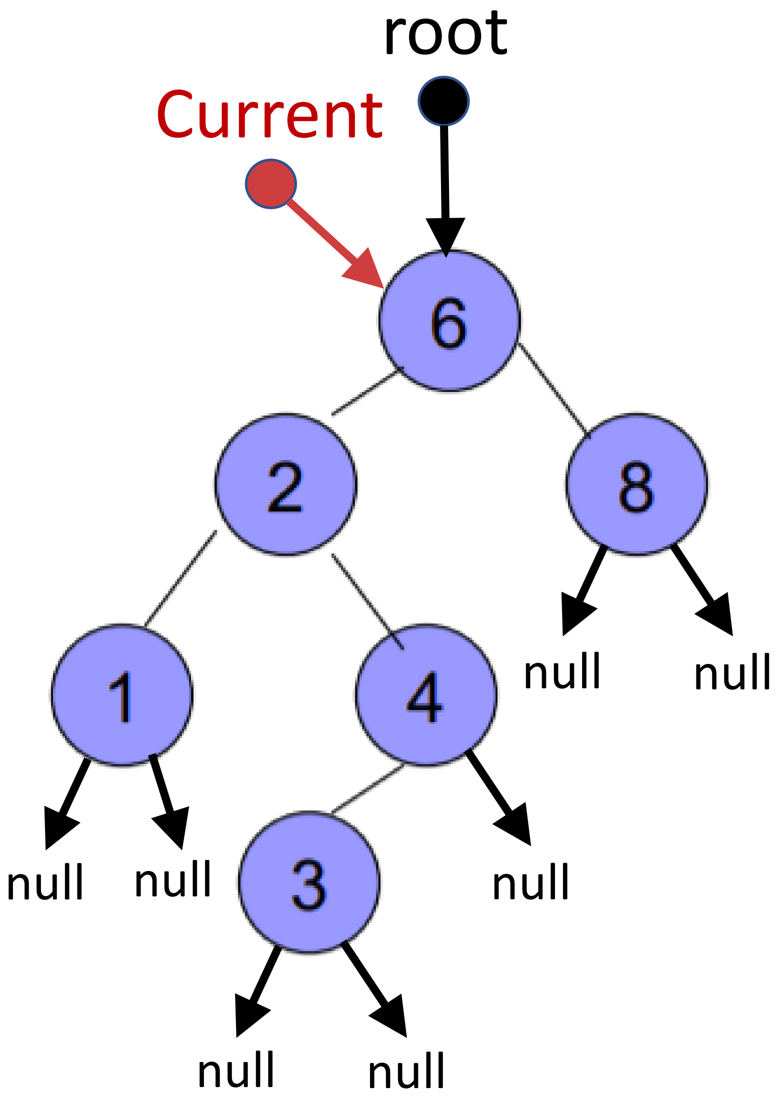
```

1   2   3   4



Stack



BST - Inorder Traversal using Stack

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                    current = stack.top()
                    stack.pop()
            ⇨       cout<< current->data;
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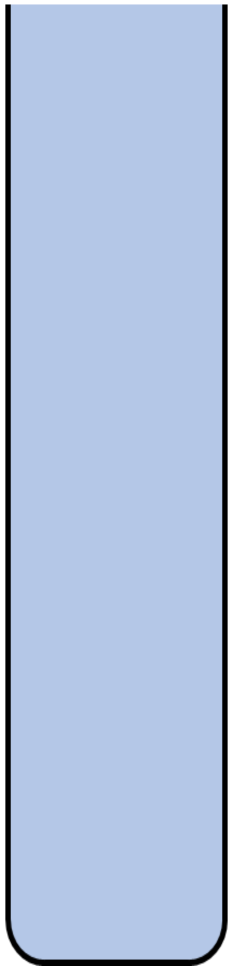
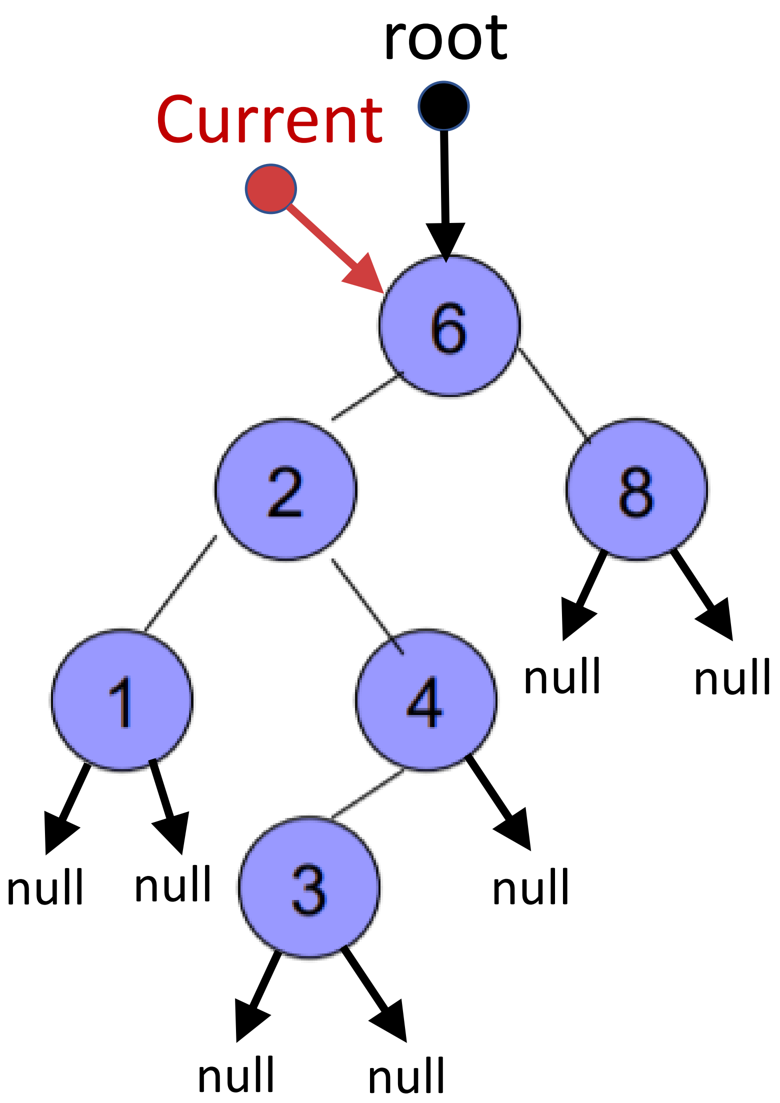
1 2 3 4 6



Stack



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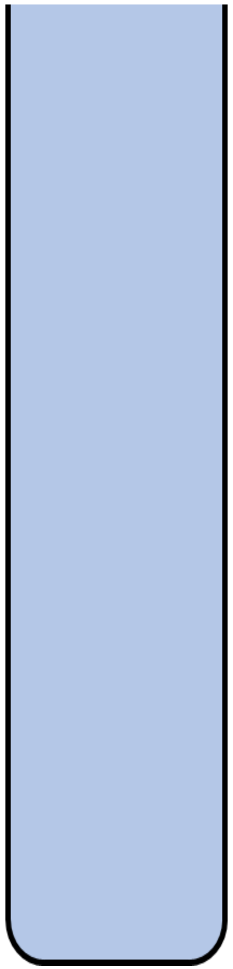
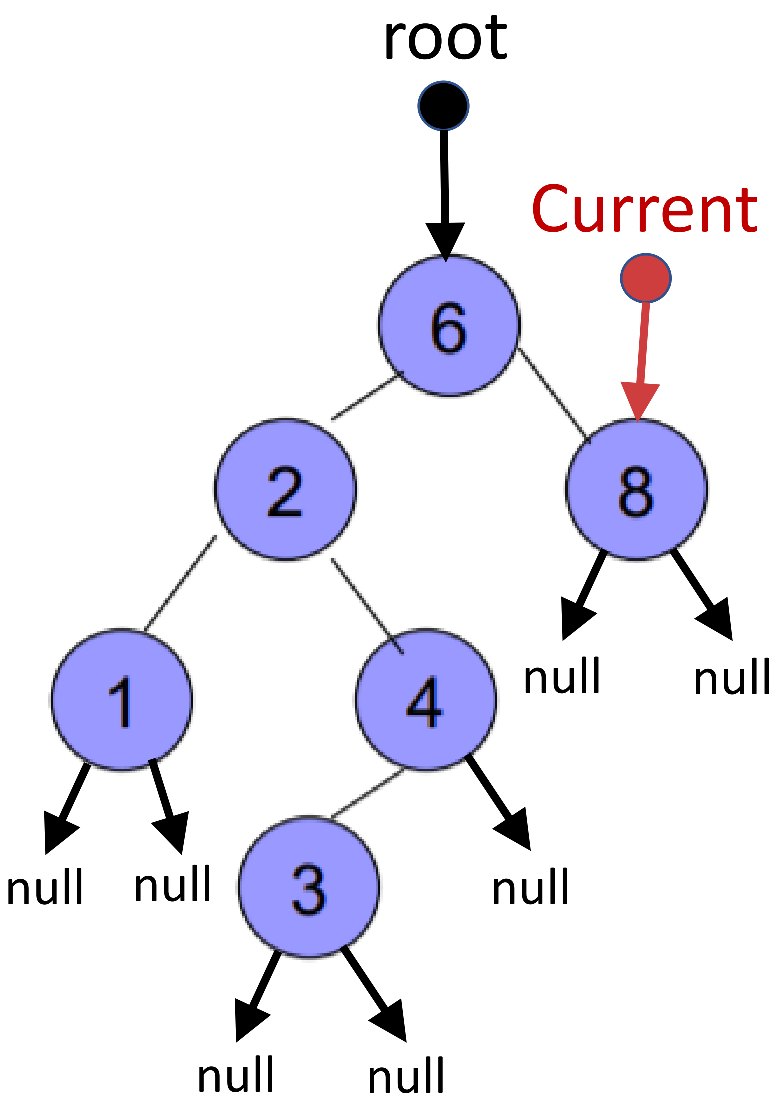
1   2   3   4   6



Stack



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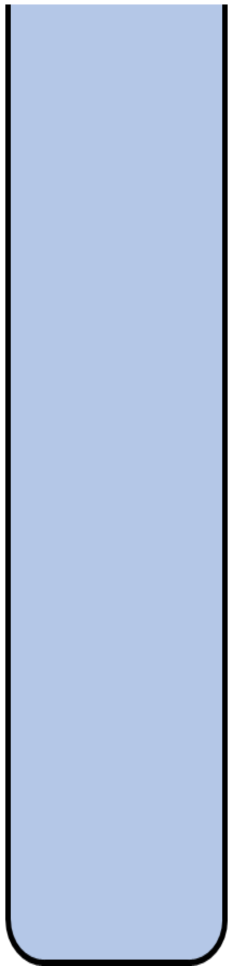
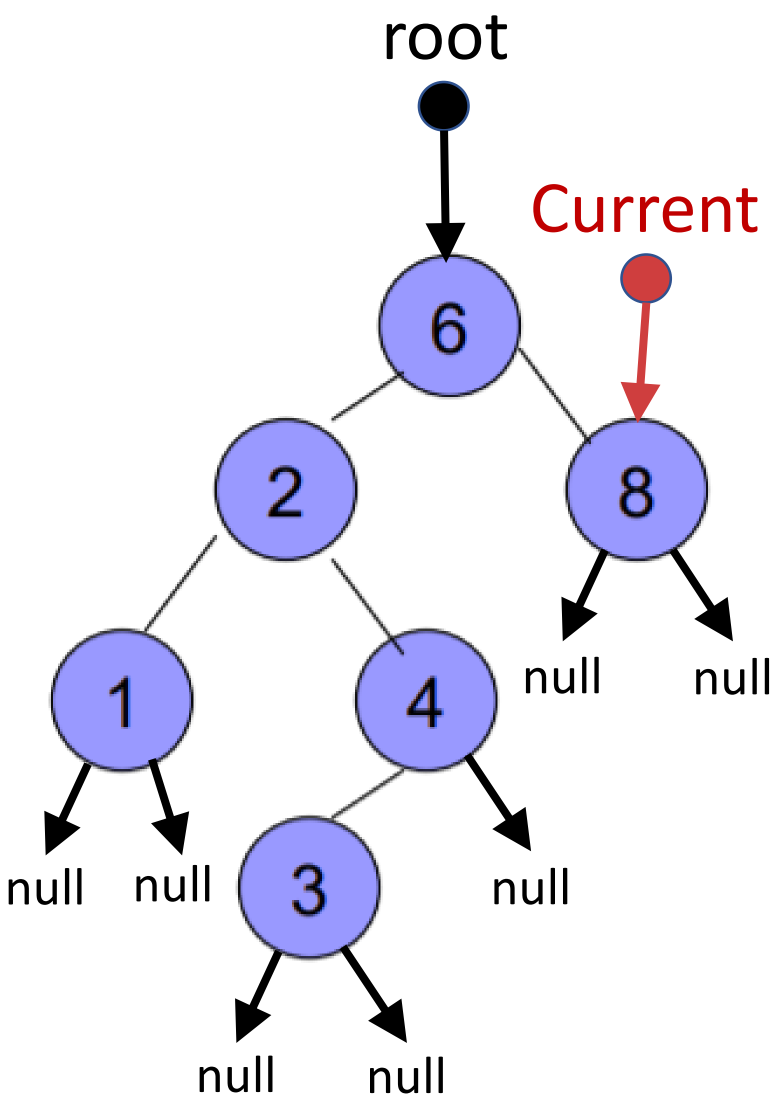
1 2 3 4 6



Stack



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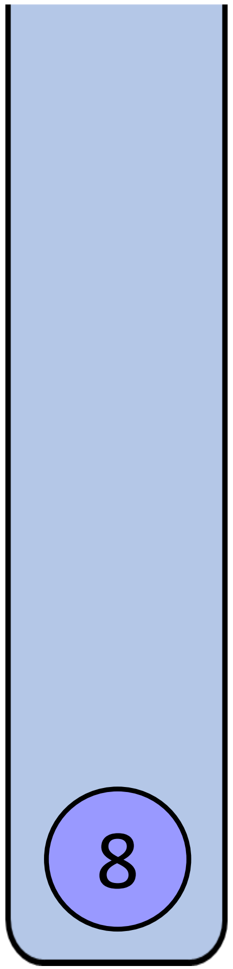
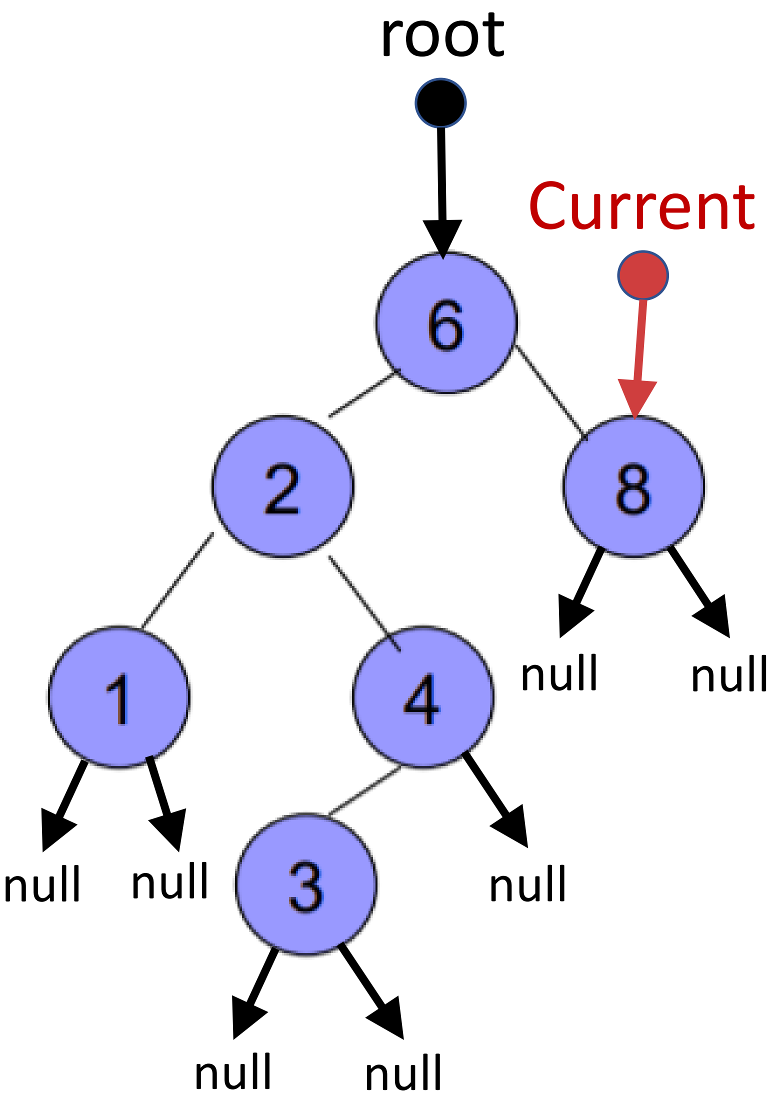
1   2   3   4   6



Stack



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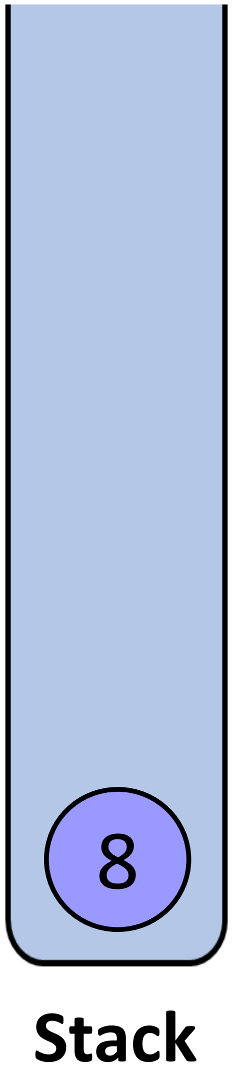
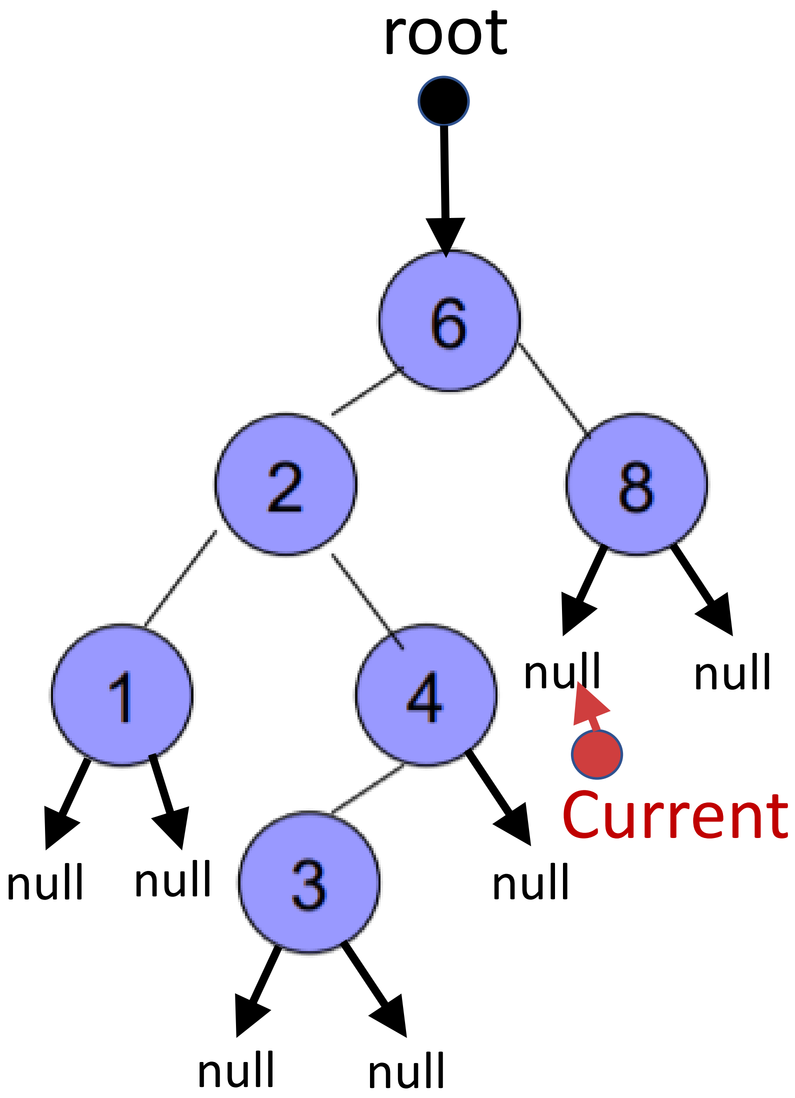
1   2   3   4   6





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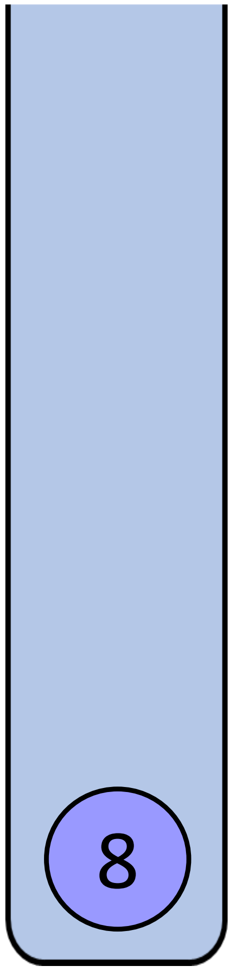

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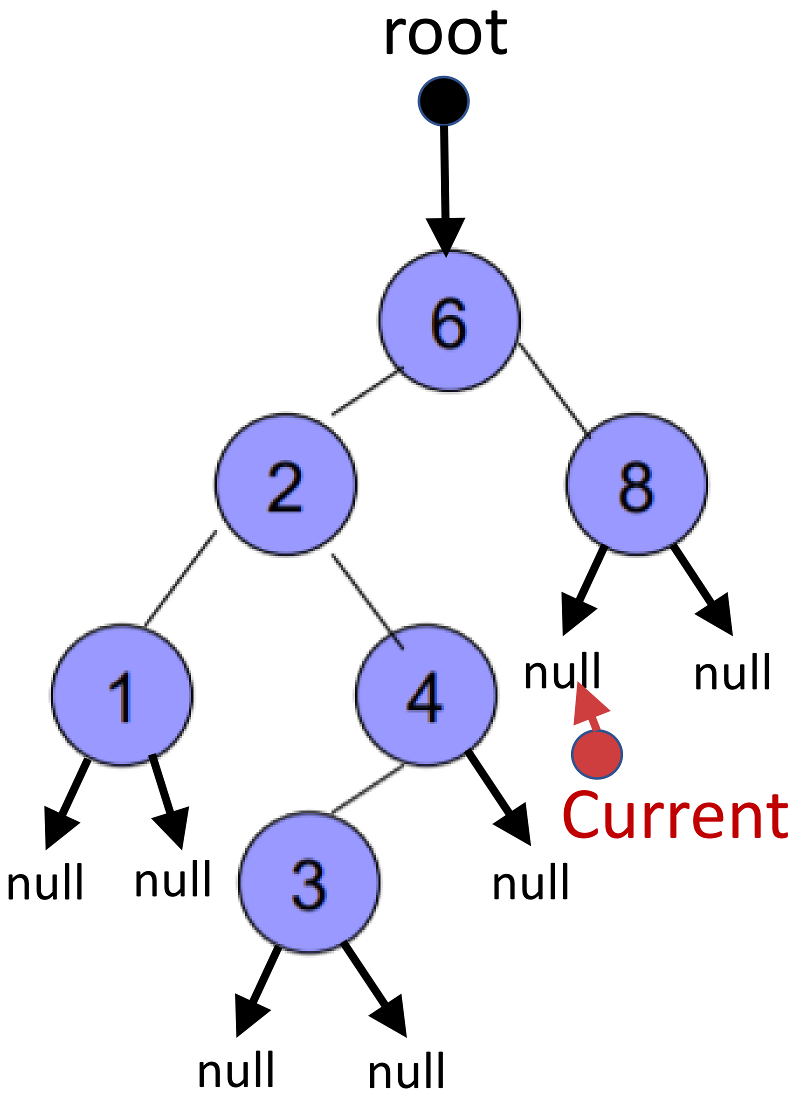

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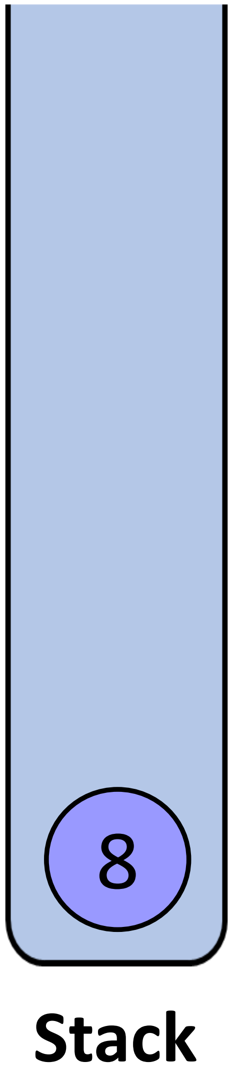

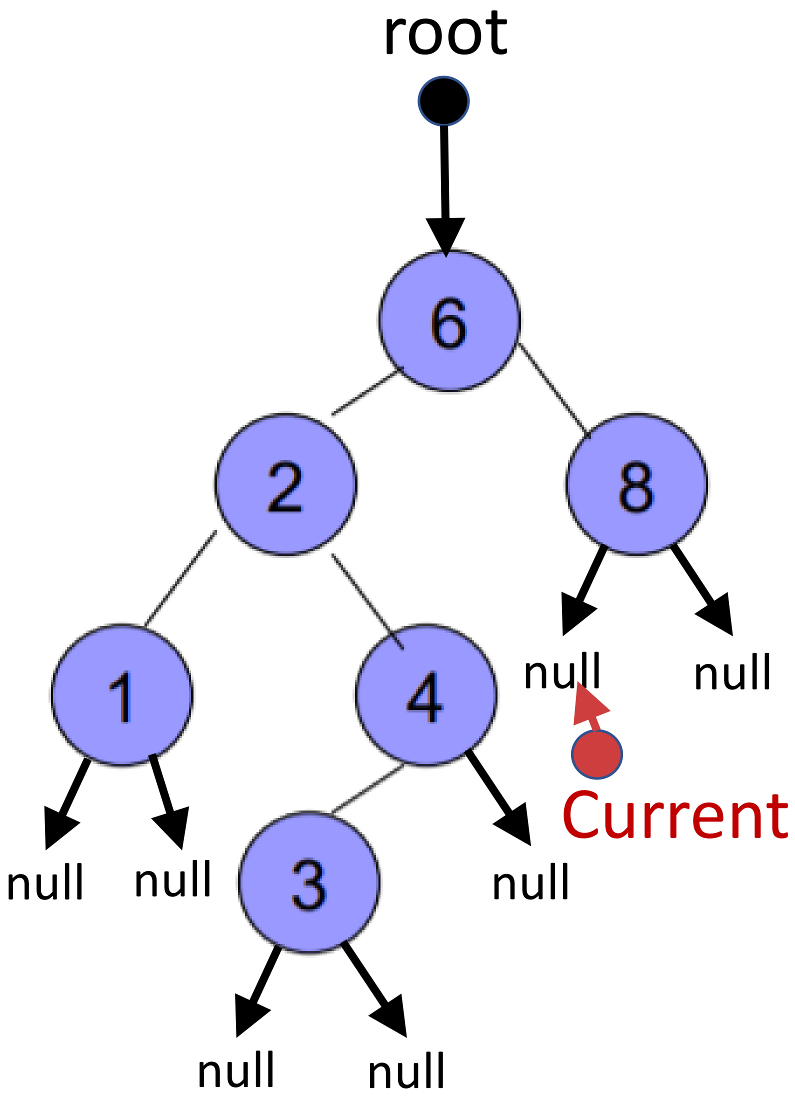

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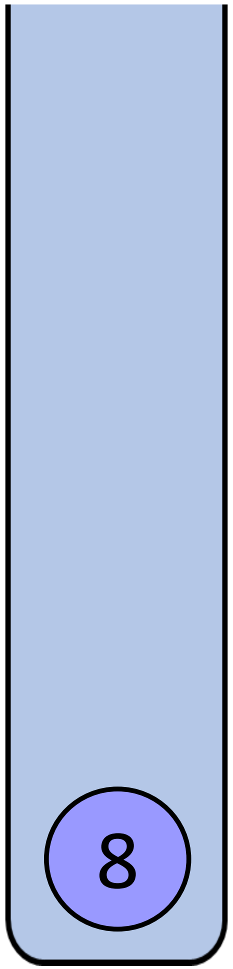

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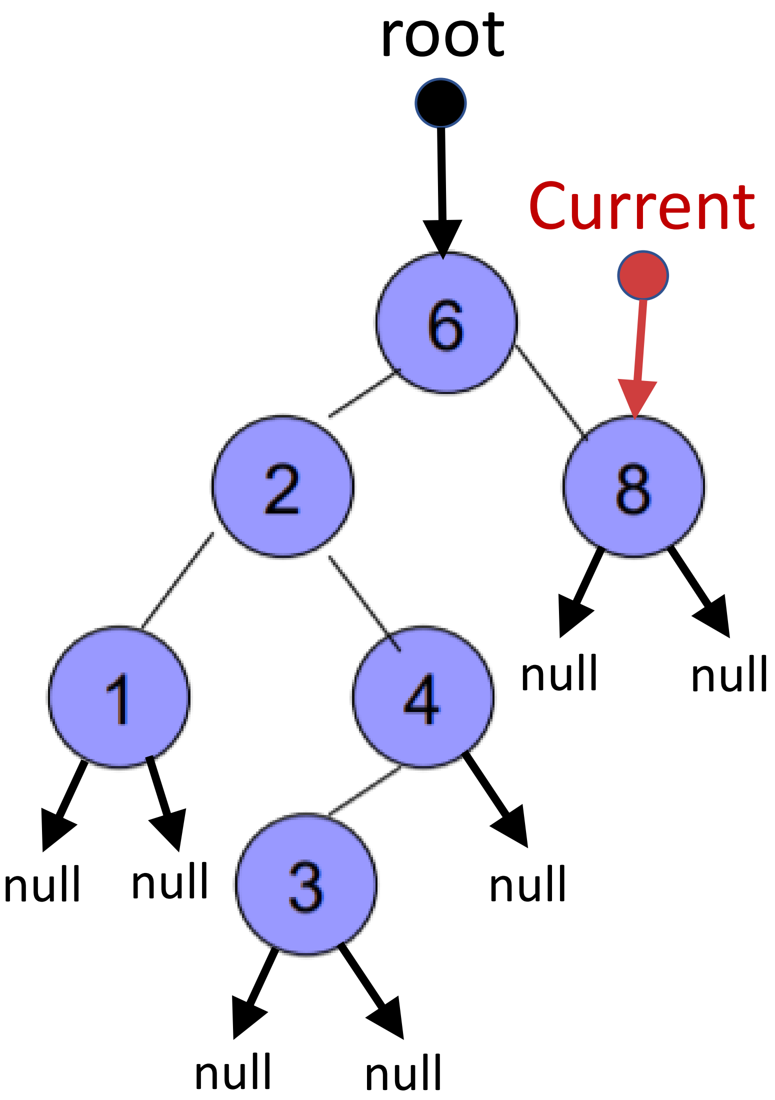

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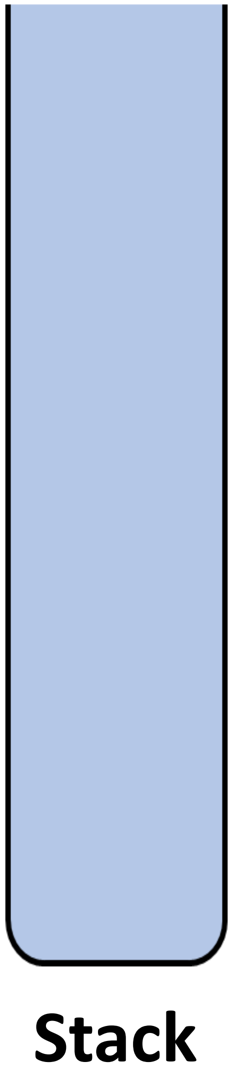
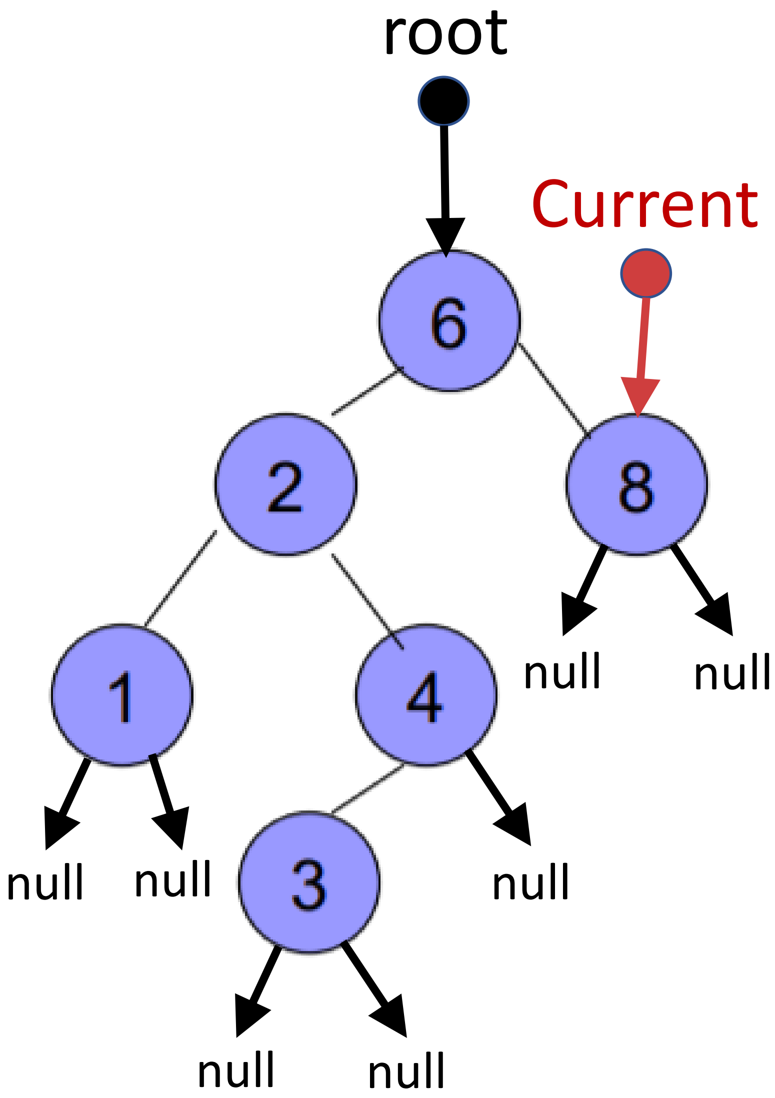
1   2   3   4   6





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```
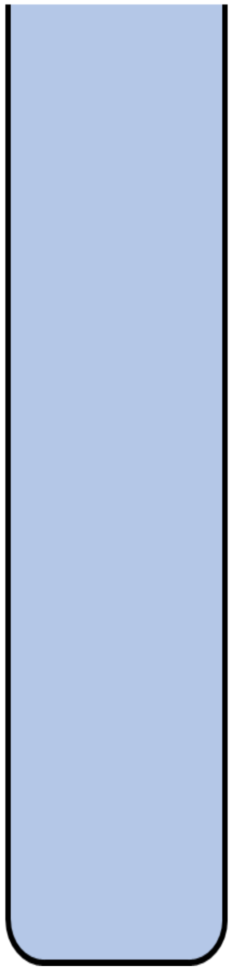

1   2   3   4   6   8



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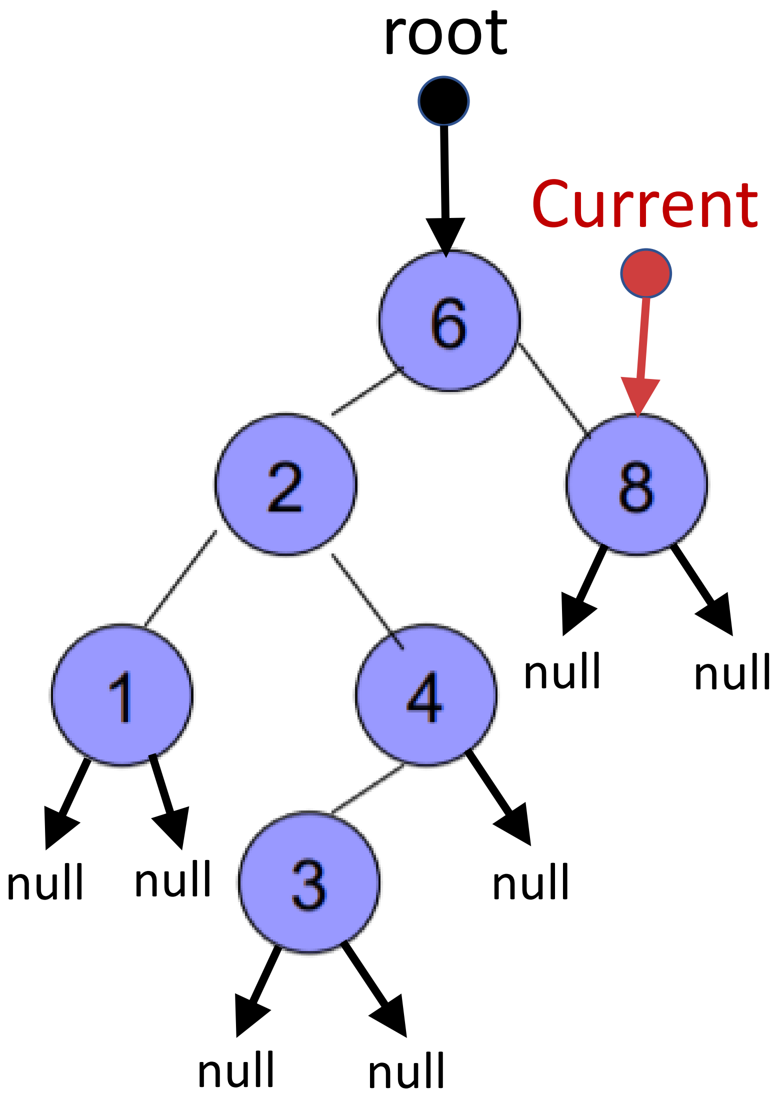

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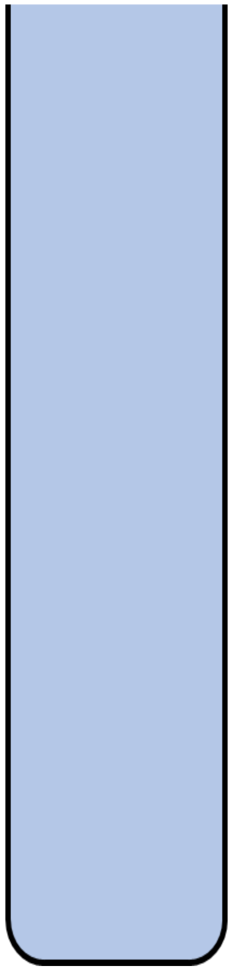
1 2 3 4 6 8



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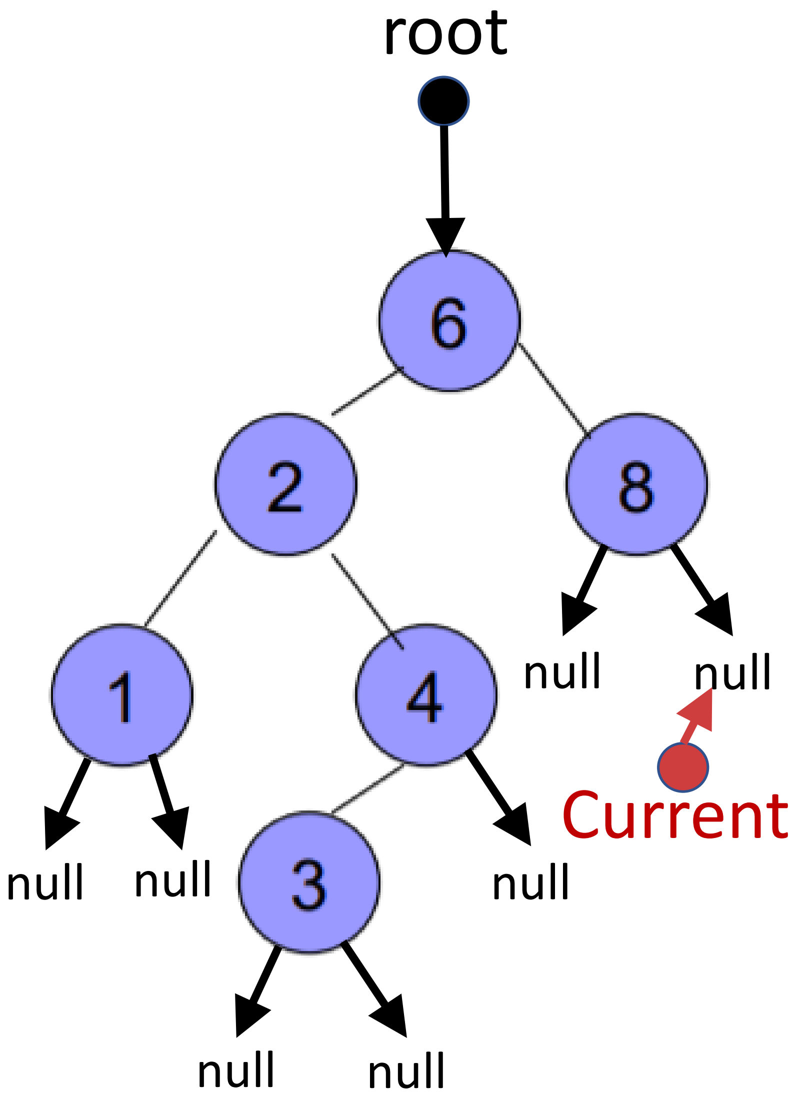

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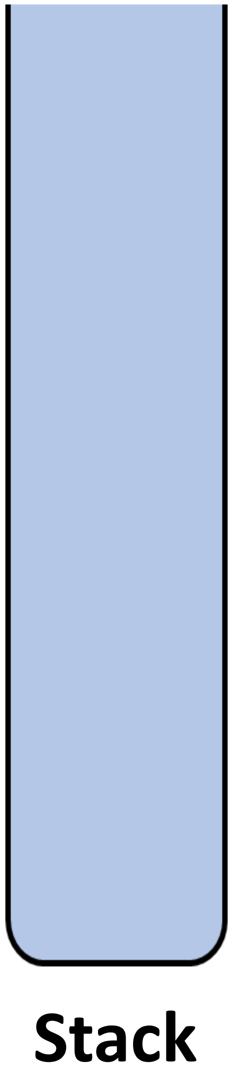

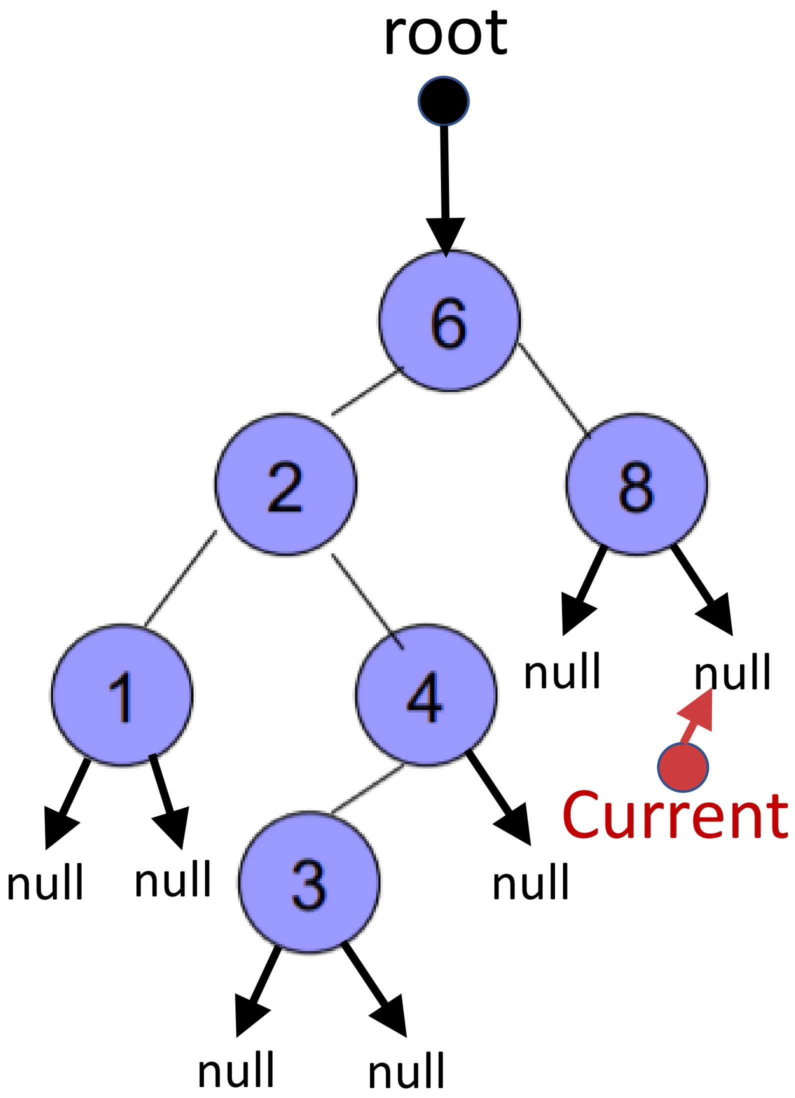

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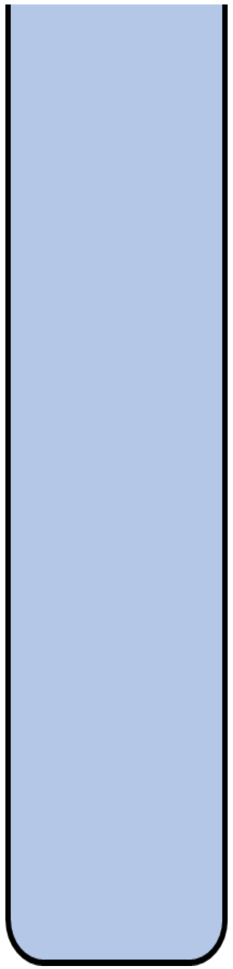

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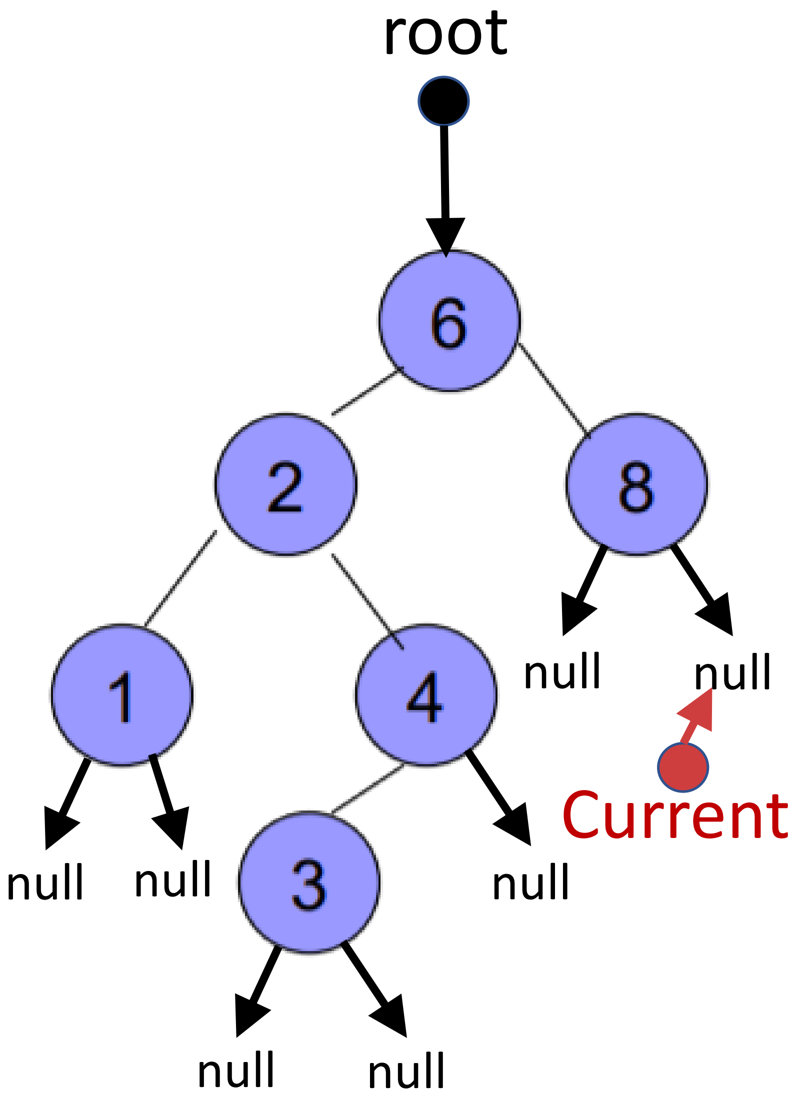

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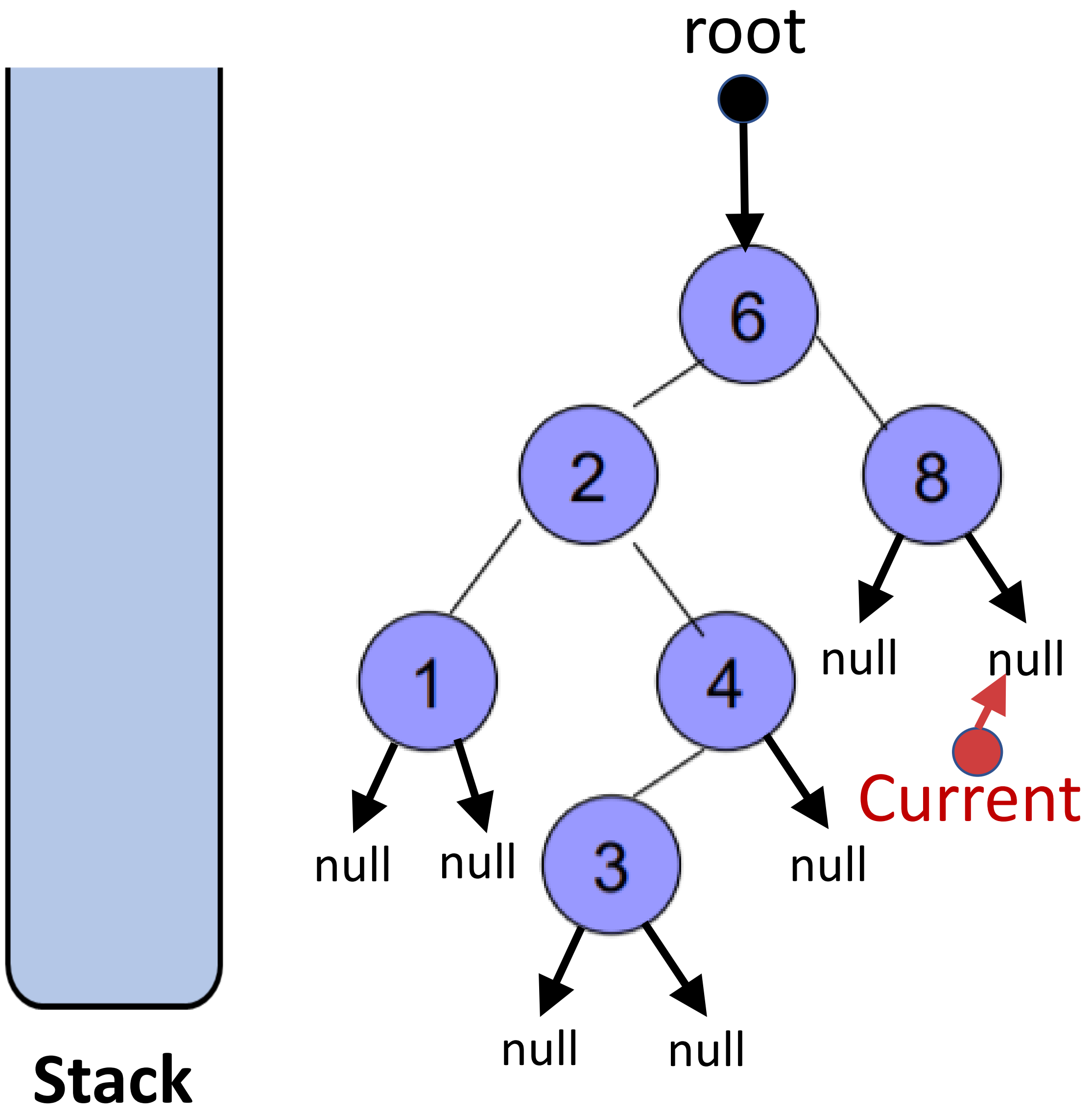

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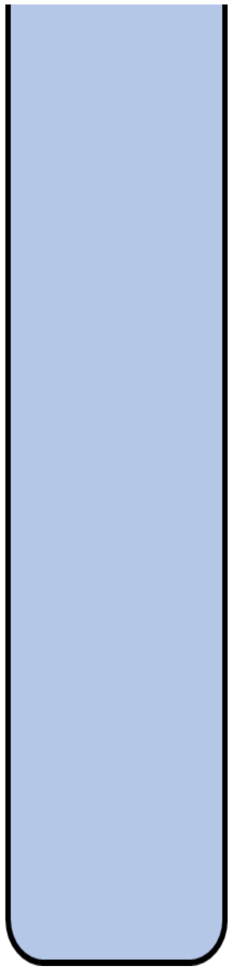

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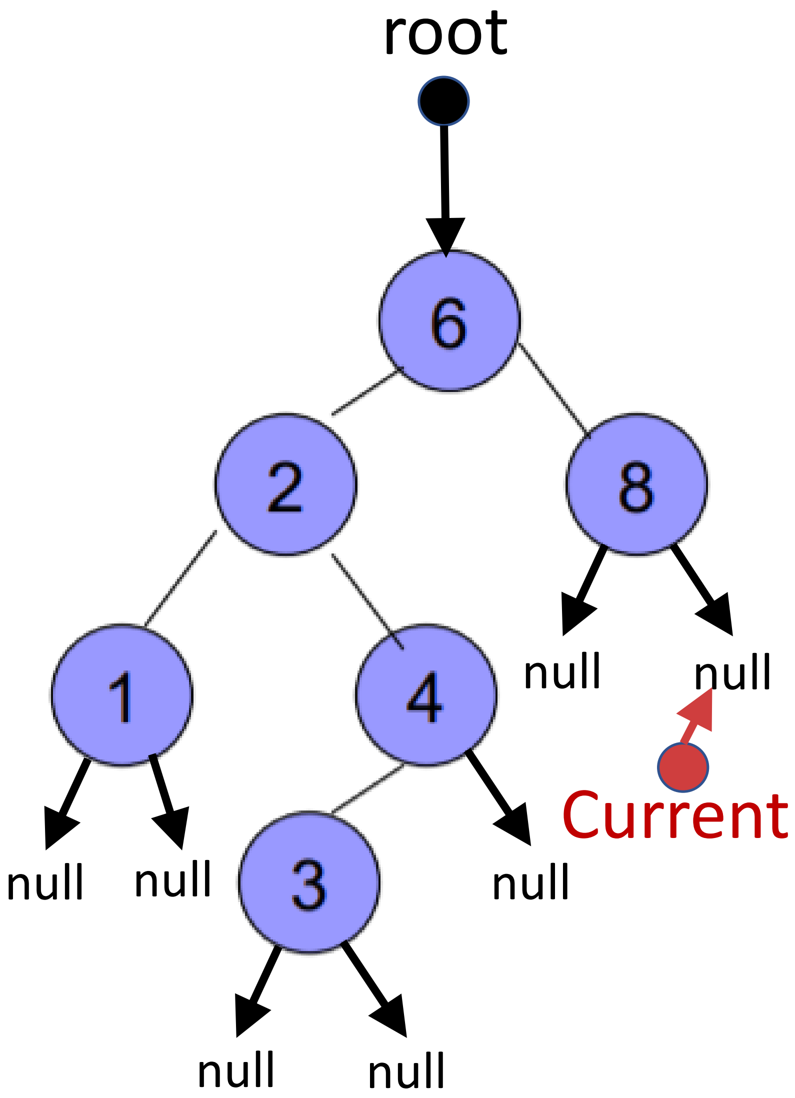

Thanks a lot

If you are taking a Nap, **wake up**........Lecture Over