DATA STRUCTURES AND ITS APPLICATIONS

Splay Tree

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Splaying

- There are three types of splay steps, each of which has two symmetric variants: left- and right-handed.
- Zig step: this step is done when p is the root.
- Zig - Zig step: this step is done when p is not the root and x and p are either both right children or are both left children.
- Zig - Zag step: this step is done when p is not the root and x is a right child and p is a left child or vice versa (x is left, p is right).

Splay Tree

Insertion

To insert a value x into a splay tree:

Insert x as with a normal binary search tree.

when an item is inserted, a splay is performed.

As a result, the newly inserted node x becomes the root of the tree.

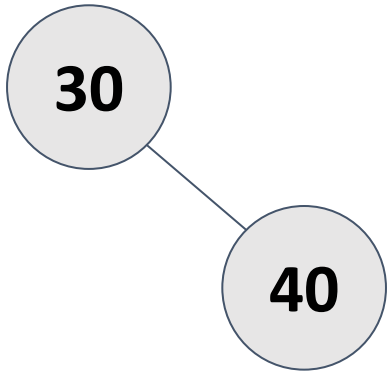
Splay Tree Insertion

Insert 40, 30, 60, 10, 35, 50

Insert 40 (Tree empty)

Splay Tree Insertion

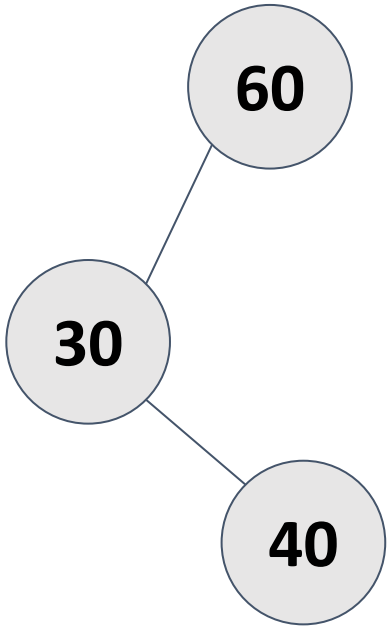
Insert 40, 30, 60, 10, 35, 50



Insert 30, splay 30 to root (Zig rotation)

Splay Tree Insertion

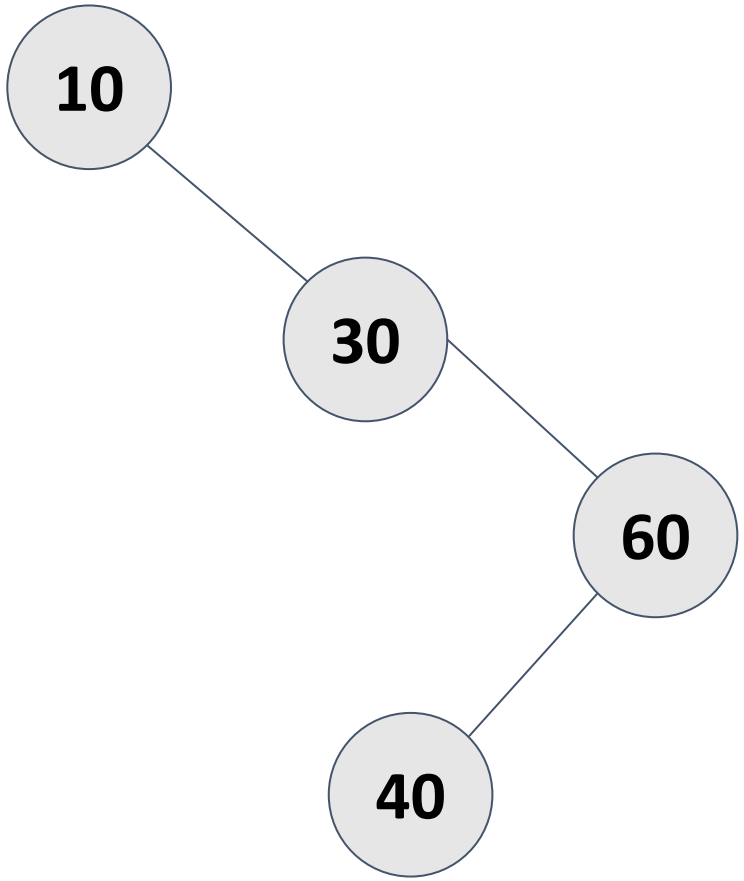
Insert 40, 30, 60, 10, 35, 50



Insert 60, splay 60 to root (Zag rotation)

Splay Tree Insertion

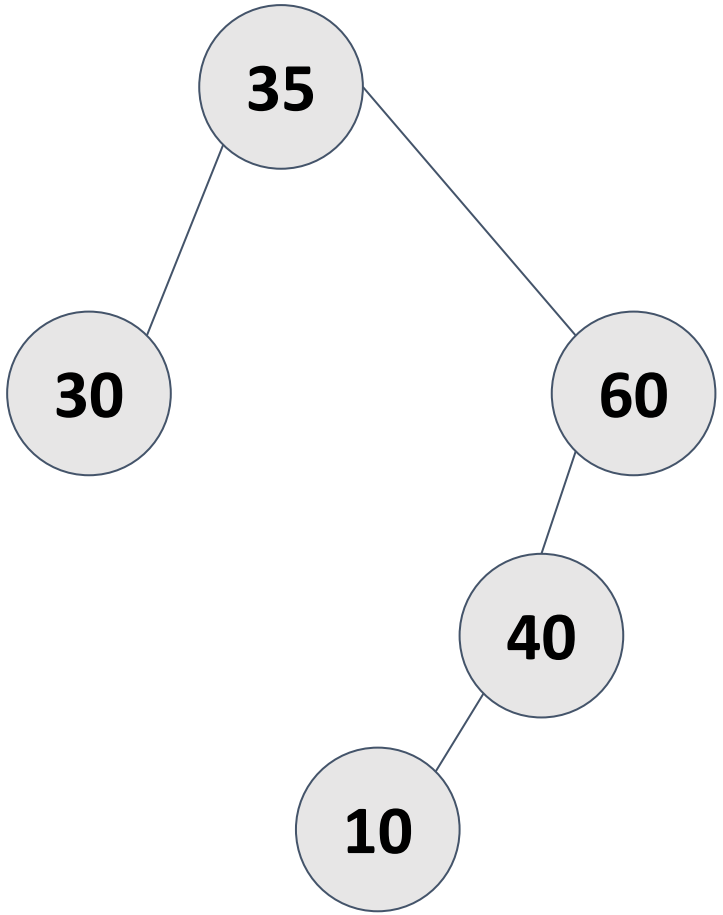
Insert 40, 30, 60, 10, 35, 50



Insert 10, splay 10 to root (Zig rotation)

Splay Tree Insertion

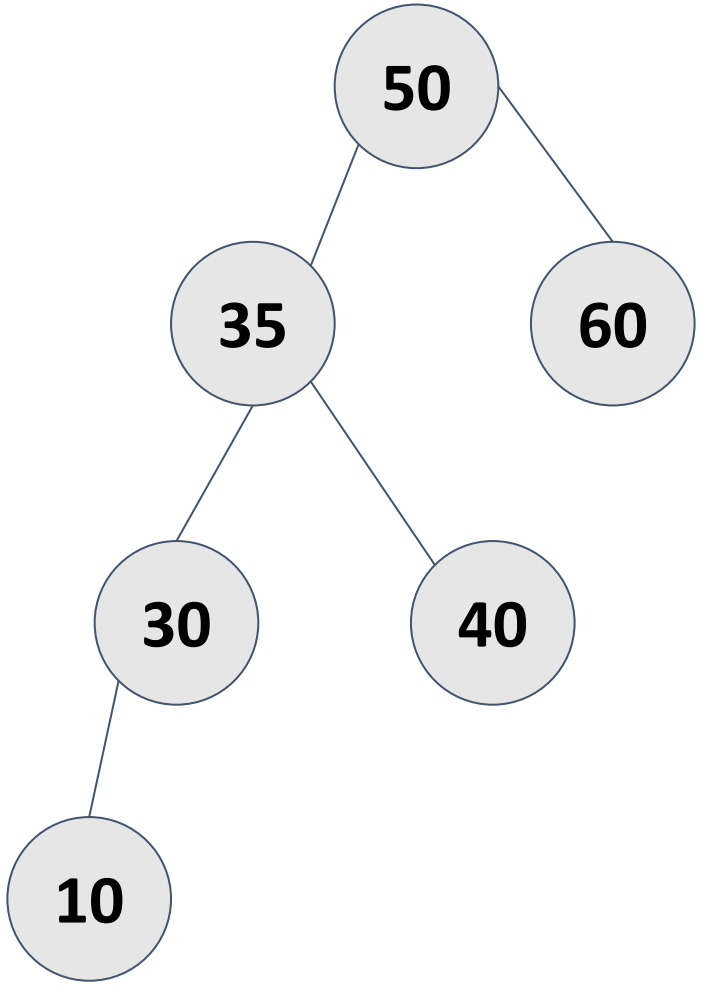
Insert 40, 30, 60, 10, 35, 50



Insert 35, splay 35 to root (Zag-Zig rotation)

Splay Tree Insertion

Insert 40, 30, 60, 10, 35, 50



Insert 50, splay 50 to root (Zig-Zag rotation)

1. What is the first step when inserting a new node in a splay tree?

a) Splaying the root
b) Performing a standard binary search tree insertion
c) Rotating the tree
d) Deleting the smallest node

1. What is the first step when inserting a new node in a splay tree?

a) Splaying the root

b) Performing a standard binary search tree insertion

c) Rotating the tree

d) Deleting the smallest node

2. When inserting a node smaller than the root in a splay tree, where is the root placed after splaying

a) Left child of the new node
b) Right child of the new node
c) Parent of the new node
d) Not changed

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a) Left child of the new node

b) Right child of the new node

c) Parent of the new node

d) Not changed

3. When inserting a node greater than the root in a splay tree, where is the root placed after splaying?

a) Left child of the new node
b) Right child of the new node
c) Parent of the new node
d) Not changed

3. When inserting a node greater than the root in a splay tree, where is the root placed after splaying?

a) Left child of the new node
b) Right child of the new node
c) Parent of the new node
d) Not changed

4. What output does the following pseudocode produce?

```
Tree_node function(Tree_node x) {
 Tree_node y = x.left;
  x.left = y.right;
  y.right = x;
  return y; }
```

a) Right rotation of subtree
b) Left rotation of subtree
c) Zig-zag operation
d) Zig-zig operation

4. What output does the following pseudocode produce?

```
Tree_node function(Tree_node x) {
 Tree_node y = x.left;
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  y.right = x;
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```

a) Right rotation of subtree
b) Left rotation of subtree
c) Zig-zag operation
d) Zig-zig operation

5. Which of these rotations shifts nodes two positions to the left in a splay tree?

a) Zig-Zig
b) Zag-Zag
c) Zig-Zag
d) Zag-Zig

5. Which of these rotations shifts nodes two positions to the left in a splay tree?

a) Zig-Zig

b) Zag-Zag

c) Zig-Zag

d) Zag-Zig

References

- https://en.wikipedia.org/wiki/Splay_tree
- "Data Structures and Program Design in C", Robert Kruse, Bruce Leung, C.L Tondo, Shashi Mogalla, Pearson, 2nd Edition, 2019.

THANK YOU

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