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Test TP ASD 3

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# ***BINARY TREE WIZARD***

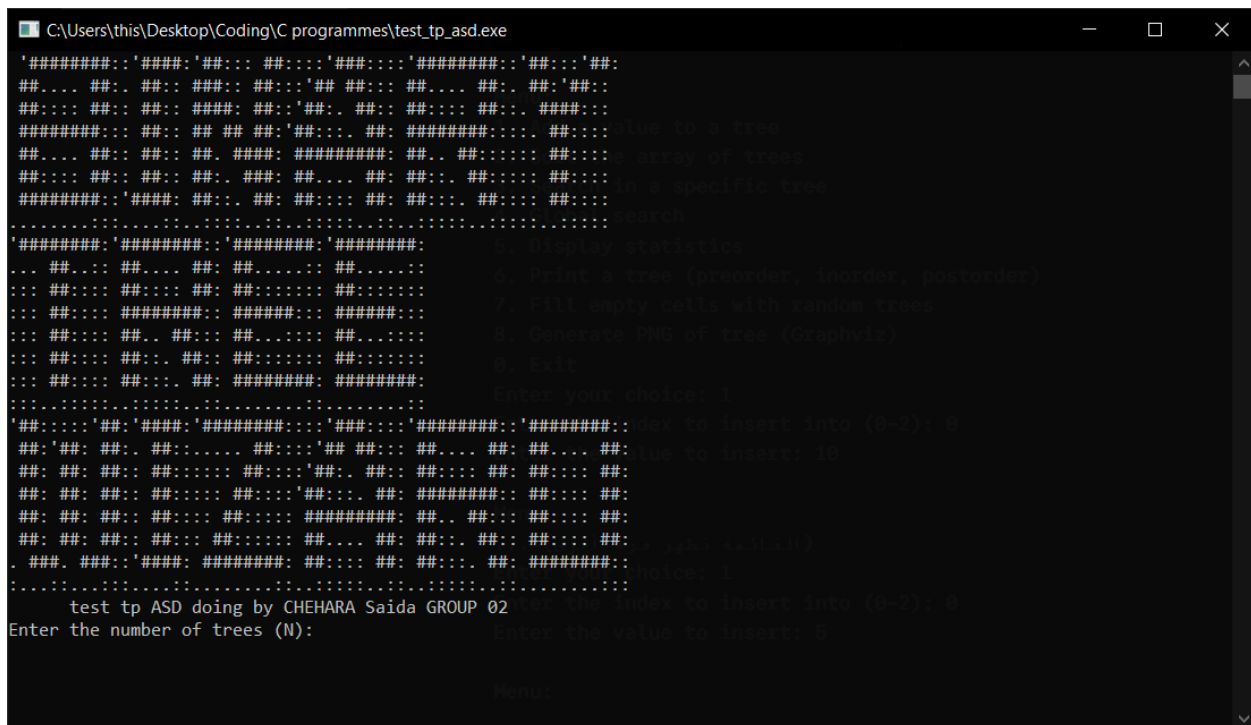
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Devloped and Created by :  
CHEHARA Saida

GROUP :  
02

# I. Overview of the Program

The program manages a collection of binary search trees (BSTs) and offers various operations on them. The user is prompted to interact with these trees through a menu system. These operations include adding nodes to a tree, searching for a value, displaying the trees, generating graphical representations of trees, and performing statistical analysis on the trees.



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test tp ASD doing by CHEHARA Saïda GROUP 02
Enter the number of trees (N):
```

## 2. KEY FEATURES AND FUNCTIONS

- Binary Search Tree (BST) Structure:

The program defines a Node structure for tree nodes, which contains the integer data and pointers to left and right child nodes. A BST structure is defined to contain a root node of type Node.

- Memory Management:

The program dynamically allocates memory for each tree and node using malloc and ensures that memory is freed at the end of the program using free.

- Tree Operations:

- Insertion: The program inserts a node into the tree while maintaining the BST property (left child smaller, right child larger).

- Search: The program searches for a value in a specific tree or globally across all trees.

- Display: It offers multiple ways to display the tree (preorder, inorder, postorder).

*-Statistics: The program calculates the number of nodes in each tree and identifies trees with the smallest and largest number of nodes. It also identifies trees with the minimum and maximum values in the trees.*

- **Tree Generation and Randomization:**

The program can generate a random BST by randomly selecting nodes (up to a maximum limit defined by the user) and inserting them into a new tree.

- Graphical Representation:

The program can generate a graphical representation of each tree using Graphviz. A DOT file is created and converted into a PNG image for visualization.

- *Sorting and Global Search:*

The trees in the array can be sorted based on their root node's value using the `qsort` function. A global search across all trees can be performed to find a value.

### 3. MENU OPERATIONS

The program presents a menu with the following options:

- I. Add a value to a tree: Insert a value into a tree at a specified index.

```

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test tp ASD doing by CHEHARA Saida GROUP 02
Enter the number of trees (N): 2
Enter the maximum number of nodes per tree: 3

Menu:
1. Add a value to a tree

```

2. Sort the array of trees: Sort the trees based on the root node values.

```
C:\Users\this\Desktop\Coding\C programmes\test_tp_asd.exe
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 2
Array sorted.
```

3. Search in a specific tree: Search for a value in a specified tree.

```
Menu:
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 3
Enter the index to search in: 0
Enter the value to search for: 10
Value found in tree at index 0.
```

4. Global search: Search for a value across all trees.

```
Menu:
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 4
Enter the value to search for globally: 30
Value found in tree at index 1.
```

5. Display statistics: Show information such as the tree with the minimum or maximum number of nodes or values.

```
Menu:
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 5
minNodesIndex : 1
maxNodesIndex : 0
minValueIndex : 0
maxValueIndex : 1
```

6. Print a tree (preorder, inorder, postorder): Display the tree in different traversal orders.

```
Menu:
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 6
Enter the index of the tree to print: 0
Preorder: 20 10
Inorder: 10 20
Postorder: 10 20
```

7. Fill empty cells with random trees: Insert a random value in any empty tree slots in the array.

```
Menu:
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 7
Enter the value to fill empty cells: 10
```

8. Generate PNG of tree (Graphviz): Create a graphical representation of the tree using Graphviz.

```
Menu:
1. Add a value to a tree
2. Sort the array of trees
3. Search in a specific tree
4. Global search
5. Display statistics
6. Print a tree (preorder, inorder, postorder)
7. Fill empty cells with random trees
8. Generate PNG of tree (Graphviz)
0. Exit
Enter your choice: 8
Enter the index of the tree to generate PNG for: 1
Graphviz is not installed or not in PATH
PNG generated for tree at index 1 (tree_1.png).
```

9. Exit: End the program.

*OP/Saidur*