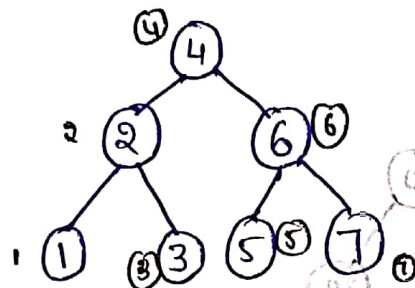


# 1. Binary Tree Traversal :

Example 1 :



Inorder Traversal :- (Left - Root - Right)



Inorder Traversal :

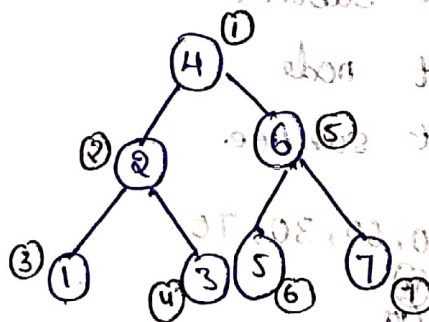
1, 2, 3, 4, 5, 6, 7.

→ visit the left subtree :

→ visit the root node

→ visit the right subtree.

Preorder Traversal :- (Root - Left - Right)



Inorder Traversal :

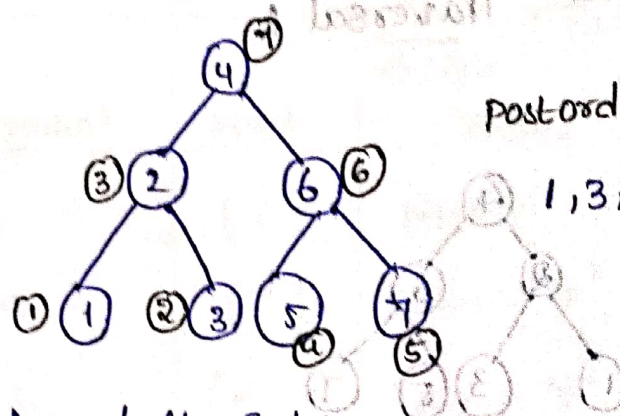
4, 2, 1, 3, 6, 5, 7.

→ Visit the root node

→ Visit the left subtree

→ Visit the right subtree.

## Post-Order Traversal: (Left - Right - root)



Postorder Traversal:

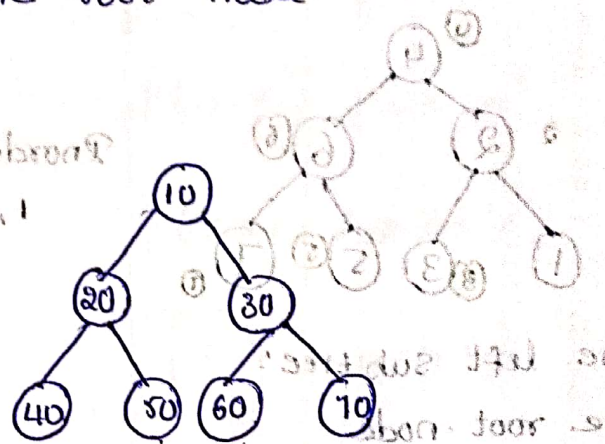
1, 3, 2, 5, 7, 6, 4.

→ visit the left subtree

→ visit the right subtree

→ visit the root node.

## Example 2:



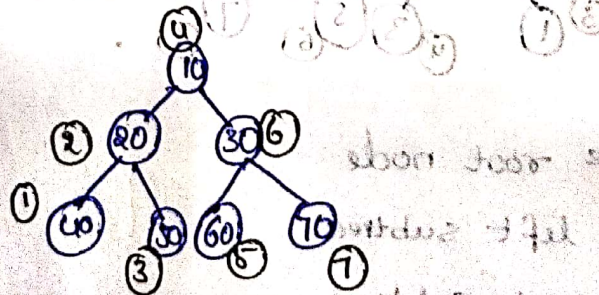
## Inorder Traversal: (Left - Root - Right)

→ visit the left subtree.

→ visit the root node

→ visit the right subtree.

⇒ 40, 20, 50, 10, 60, 30, 70.

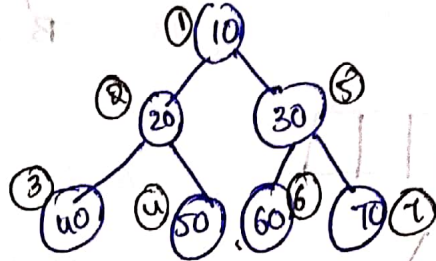




Pre order Traversal: (left Root - left - Right)

- Visit the Root node
- Visit the left subtree
- Visit the right subtree

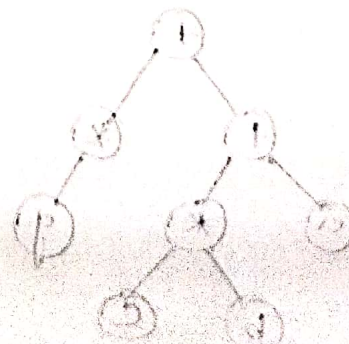
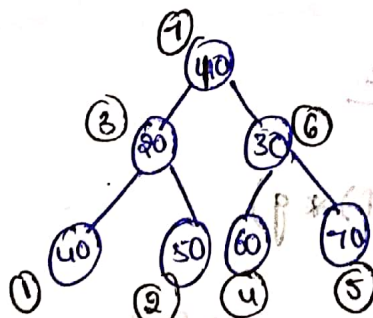
10, 20, 40, 50, 30, 60, 70, 10.



Postorder Traversal (left-Right-root)

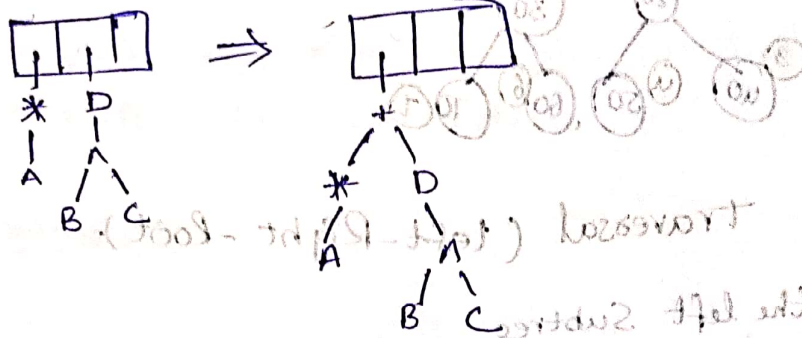
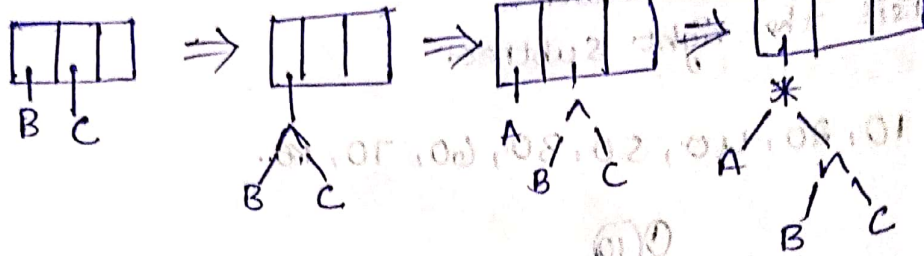
- Visit the left Subtree
- Visit the Right subtree
- Visit the root node.

⇒ 40, 50, 20, 60, 70, 30, 10

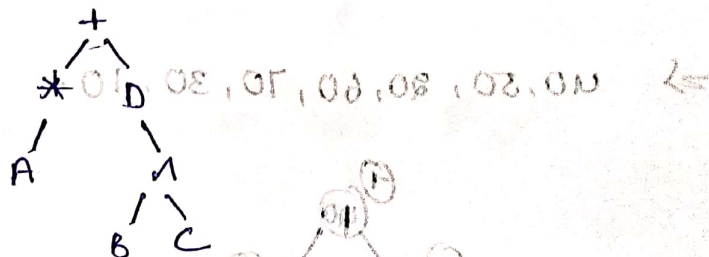


# Binary Tree Expression

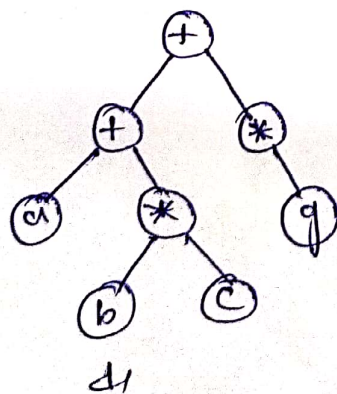
i)  $A * B^C + D$



## Binary Tree Expression



ii)  $(a + b * c) + (d * e + f) * g$



d1

Binary Expression tree

$\wedge \rightarrow R-L$

$*, / \rightarrow L-R$

$-, + \rightarrow L-R$

main.c



Run

Output

Clear

```
1 //Binary search tree operation.
2 #include <stdio.h>
3 #include <stdlib.h>
4 typedef struct Node {
5     int data;
6     struct Node* left;
7     struct Node* right;
8 } Node;
9 Node* createNode(int data) {
10     Node* newNode = (Node*)malloc(sizeof(Node));
11     newNode->data = data;
12     newNode->left = NULL;
13     newNode->right = NULL;
14     return newNode;
15 }
16 Node* insertNode(Node* root, int data) {
17     if (root == NULL) {
18         return createNode(data);
19     }
20     if (data < root->data) {
21         root->left = insertNode(root->left, data);
22     } else {
23         root->right = insertNode(root->right, data);
24     }
25     return root;
26 }
27 Node* findMin(Node* root) {
28     while (root->left != NULL) {
29         root = root->left;
30     }
31     return root;
32 }
33 Node* deleteNode(Node* root, int data) {
34     if (root == NULL) {
35         return root;
```

```
/tmp/2kunme4orm.o
In-order Traversal: 3 5 7 8 10 12 15
Pre-order Traversal: 10 5 3 8 7 15 12
Post-order Traversal: 3 7 8 5 12 15 10
Value 8 found in the BST.
In-order Traversal after deleting 5: 3 7 8 10 12 15
```

```
=== Code Execution Successful ===
```



main.c



Run

Output

Clear

```
35     return root;
36 }
37 if (data < root->data) {
38     root->left = deleteNode(root->left, data);
39 } else if (data > root->data) {
40     root->right = deleteNode(root->right, data);
41 } else {
42     if (root->left == NULL) {
43         Node* temp = root->right;
44         free(root);
45         return temp;
46     } else if (root->right == NULL) {
47         Node* temp = root->left;
48         free(root);
49         return temp;
50     }
51     Node* temp = findMin(root->right);
52     root->data = temp->data;
53     root->right = deleteNode(root->right, temp->data);
54 }
55 return root;
56 }
57 Node* searchNode(Node* root, int data) {
58     if (root == NULL || root->data == data) {
59         return root;
60     }
61     if (data < root->data) {
62         return searchNode(root->left, data);
63     }
64     return searchNode(root->right, data);
65 }
66 void inorderTraversal(Node* root) {
67     if (root != NULL) {
68         inorderTraversal(root->left);
69         printf("%d ", root->data);
```

```
/tmp/2kunme4orm.o
In-order Traversal: 3 5 7 8 10 12 15
Pre-order Traversal: 10 5 3 8 7 15 12
Post-order Traversal: 3 7 8 5 12 15 10
Value 8 found in the BST.
In-order Traversal after deleting 5: 3 7 8 10 12 15
```

```
=== Code Execution Successful ===
```





main.c



Share

Run

Output

Clear


```
14- if (root != NULL) {
15-     printf("%d ", root->data);
16-     preorderTraversal(root->left);
17-     preorderTraversal(root->right);
18- }
19- }
20- void postorderTraversal(Node* root) {
21-     if (root != NULL) {
22-         postorderTraversal(root->left);
23-         postorderTraversal(root->right);
24-         printf("%d ", root->data);
25-     }
26- }
27- int main() {
28-     Node* root = NULL;
29-     root = insertNode(root, 10);
30-     root = insertNode(root, 5);
31-     root = insertNode(root, 15);
32-     root = insertNode(root, 3);
33-     root = insertNode(root, 8);
34-     root = insertNode(root, 12);
35-     root = insertNode(root, 7);
36-     printf("In-order Traversal: ");
37-     inorderTraversal(root);
38-     printf("\n");
39-     printf("Pre-order Traversal: ");
40-     preorderTraversal(root);
41-     printf("\n");
42-     printf("Post-order Traversal: ");
43-     postorderTraversal(root);
44-     printf("\n");
45-     int searchValue = 8;
46-     Node* searchResult = searchNode(root, searchValue);
47-     if (searchResult != NULL) {
48-         printf("Value %d found in the BST.\n", searchValue);
49-     }
50- }
```

```
^ /tmp/2kunme4orm.o
In-order Traversal: 3 5 7 8 10 12 15
Pre-order Traversal: 10 5 3 8 7 15 12
Post-order Traversal: 3 7 8 5 12 15 10
Value 8 found in the BST.
In-order Traversal after deleting 5: 3 7 8 10 12 15
```

```
=== Code Execution Successful ===
```



main.c

   Share

Run

Output

Clear

```
86 }
87 int main() {
88     Node* root = NULL;
89     root = insertNode(root, 10);
90     root = insertNode(root, 5);
91     root = insertNode(root, 15);
92     root = insertNode(root, 3);
93     root = insertNode(root, 8);
94     root = insertNode(root, 12);
95     root = insertNode(root, 7);
96     printf("In-order Traversal: ");
97     inorderTraversal(root);
98     printf("\n");
99     printf("Pre-order Traversal: ");
100     preorderTraversal(root);
101     printf("\n");
102     printf("Post-order Traversal: ");
103     postorderTraversal(root);
104     printf("\n");
105     int searchValue = 8;
106     Node* searchResult = searchNode(root, searchValue);
107     if (searchResult != NULL) {
108         printf("Value %d found in the BST.\n", searchValue);
109     } else {
110         printf("Value %d not found in the BST.\n", searchValue);
111     }
112     int deleteValue = 5;
113     root = deleteNode(root, deleteValue);
114     printf("In-order Traversal after deleting %d: ", deleteValue);
115     inorderTraversal(root);
116     printf("\n");
117     return 0;
118 }
119
```

```
*/tmp/2kunme4orm.o
In-order Traversal: 3 5 7 8 10 12 15
Pre-order Traversal: 10 5 3 8 7 15 12
Post-order Traversal: 3 7 8 5 12 15 10
Value 8 found in the BST.
In-order Traversal after deleting 5: 3 7 8 10 12 15
```

=== Code Execution Successful ===