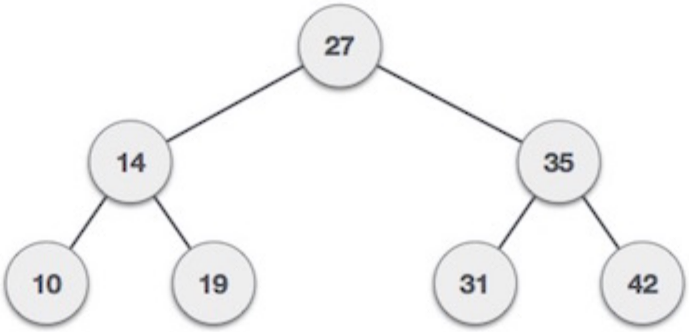
Tree Traversal in C

Traversal is a process to visit all the nodes of a tree and may print their values too. Because, all nodes are connected via edges (links) we always start from the root (head) node. That is, we cannot random access a node in a tree. There are three ways which we use to traverse a tree −

- In-order Traversal
- Pre-order Traversal
- Post-order Traversal

We shall now look at the implementation of tree traversal in C programming language here using the following binary tree −



Implementation in C

Live Demo

```
#include <stdio.h>
#include <stdlib.h>

struct node {
   int data;

   struct node *leftChild;
   struct node *rightChild;
};

struct node *root = NULL;

void insert(int data) {
   struct node *tempNode = (struct node*) malloc(sizeof(struct node));
   struct node *current;
   struct node *parent;

   tempNode->data = data;
   tempNode->leftChild = NULL;
   tempNode->rightChild = NULL;

   //if tree is empty
   if(root == NULL) {
      root = tempNode;
   } else {
      current = root;
      parent = NULL;

      while(1) {
         parent = current;

         //go to left of the tree
         if(data < parent->data) {
            current = current->leftChild;

            //insert to the left
            if(current == NULL) {
               parent->leftChild = tempNode;
               return;
            }
         }  //go to right of the tree
         else {
            current = current->rightChild;

            //insert to the right
            if(current == NULL) {
               parent->rightChild = tempNode;
               return;
            }
         }
      }
   }
}

struct node* search(int data) {
   struct node *current = root;
   printf("Visiting elements: ");
   while(current->data != data) {
      if(current != NULL)
         printf("%d ",current->data);

      //go to left tree
      if(current->data > data) {
         current = current->leftChild;
      }
      //else go to right tree
      else {
         current = current->rightChild;
      }

      //not found
      if(current == NULL) {
         return NULL;
      }
   }

   return current;
}

void pre_order_traversal(struct node* root) {
   if(root != NULL) {
      printf("%d ",root->data);
      pre_order_traversal(root->leftChild);
      pre_order_traversal(root->rightChild);
   }
}

void inorder_traversal(struct node* root) {
   if(root != NULL) {
      inorder_traversal(root->leftChild);
      printf("%d ",root->data);
      inorder_traversal(root->rightChild);
   }
}

void post_order_traversal(struct node* root) {
   if(root != NULL) {
      post_order_traversal(root->leftChild);
      post_order_traversal(root->rightChild);
      printf("%d ", root->data);
   }
```

```
}

int main() {
   int i;
   int array[7] = { 27, 14, 35, 10, 19, 31, 42 };

   for(i = 0; i < 7; i++)
      insert(array[i]);

   i = 31;
   struct node * temp = search(i);

   if(temp != NULL) {
      printf("[%d] Element found.", temp->data);
      printf("\n");
   }else {
      printf("[ x ] Element not found (%d).\n", i);
   }

   i = 15;
   temp = search(i);

   if(temp != NULL) {
      printf("[%d] Element found.", temp->data);
      printf("\n");
   }else {
      printf("[ x ] Element not found (%d).\n", i);
   }

   printf("\nPreorder traversal: ");
   pre_order_traversal(root);

   printf("\nInorder traversal: ");
   inorder_traversal(root);

   printf("\nPost order traversal: ");
   post_order_traversal(root);

   return 0;
}
```

If we compile and run the above program, it will produce the following result −

Output

```
Visiting elements: 27 35 [31] Element found.
Visiting elements: 27 14 19 [ x ] Element not found (15).

Preorder traversal: 27 14 10 19 35 31 42
Inorder traversal: 10 14 19 27 31 35 42
Post order traversal: 10 19 14 31 42 35 27
```