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DAY 6

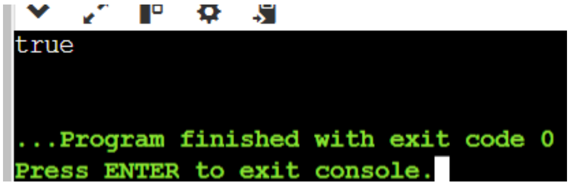
1. Same Tree

Two binary trees are considered the same if they are structurally identical, and the nodes have the same value.

Code:

```
#include <iostream>
using namespace std;

struct TreeNode {
  int val;
  TreeNode* left;
  TreeNode* right;
  TreeNode(int x) : val(x), left(NULL), right(NULL) {}
};

bool isSameTree(TreeNode* p, TreeNode* q) {
  if (!p && !q) return true;
  if (!p || !q || p->val != q->val) return false;
  return isSameTree(p->left, q->left) && isSameTree(p->right, q->right);
}

int main() {
  TreeNode* p = new TreeNode(1);
  p->left = new TreeNode(2);
  p->right = new TreeNode(3);

  TreeNode* q = new TreeNode(1);
  q->left = new TreeNode(2);
  q->right = new TreeNode(3);

  cout << (isSameTree(p, q) ? "true" : "false") << endl; // Output: true
  return 0;
}
```

Output:



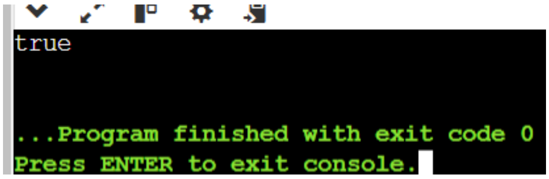
```
true


...Program finished with exit code 0
Press ENTER to exit console.
```

2. **Symmetric Tree**

Code: #include <iostream>

```
using namespace std;

struct TreeNode {
  int val;
  TreeNode* left;
  TreeNode* right;
  TreeNode(int x) : val(x), left(nullptr), right(nullptr) {}
};

bool isMirror(TreeNode* t1, TreeNode* t2) {
  if (!t1 && !t2) return true;
  if (!t1 || !t2 || t1->val != t2->val) return false;
  return isMirror(t1->left, t2->right) && isMirror(t1->right, t2->left);
}

bool isSymmetric(TreeNode* root) {
  return isMirror(root, root);
}

int main() {
  TreeNode* root = new TreeNode(1);
  root->left = new TreeNode(2);
  root->right = new TreeNode(2);
  root->left->left = new TreeNode(3);
  root->left->right = new TreeNode(4);
  root->right->left = new TreeNode(4);
  root->right->right = new TreeNode(3);

  cout << (isSymmetric(root) ? "true" : "false") << endl; // Output: true
  return 0;
}
```

Output:



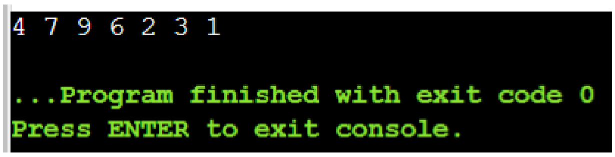
```
true

...Program finished with exit code 0
Press ENTER to exit console.
```

3. Invert Binary Tree

Code:

```
#include <iostream>
using namespace std;

struct TreeNode {
   int val;
   TreeNode* left;
   TreeNode* right;
   TreeNode(int x) : val(x), left(nullptr), right(nullptr) {}
};

TreeNode* invertTree(TreeNode* root) {
   if (!root) return nullptr;
   swap(root->left, root->right);
   invertTree(root->left);
   invertTree(root->right);
   return root;
}

void printTree(TreeNode* root) {
   if (!root) return;
   cout << root->val << " ";
   printTree(root->left);
   printTree(root->right);
}

int main() {
   TreeNode* root = new TreeNode(4);
   root->left = new TreeNode(2);
   root->right = new TreeNode(7);
   root->left->left = new TreeNode(1);
   root->left->right = new TreeNode(3);
   root->right->left = new TreeNode(6);
   root->right->right = new TreeNode(9);

   root = invertTree(root);

   printTree(root); // Output: 4 7 9 6 2 3 1
   return 0;
}
```

Output:



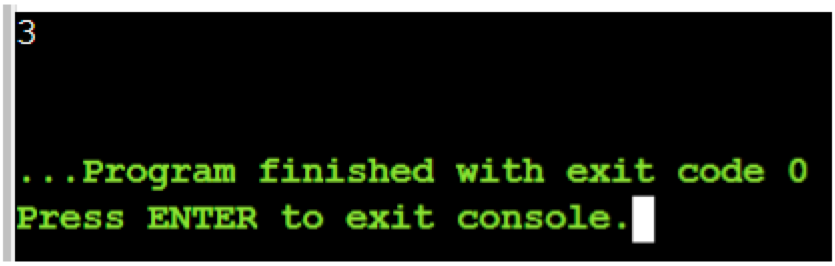
```
4 7 9 6 2 3 1

...Program finished with exit code 0
Press ENTER to exit console.
```

4. Leaf Nodes of a Binary Tree

Code:

```
#include <iostream>
using namespace std;

struct TreeNode {
    int val;
    TreeNode* left;
    TreeNode* right;
    TreeNode(int x) : val(x), left(nullptr), right(nullptr) {}
};

int countLeaves(TreeNode* root) {
    if (!root) return 0;
    if (!root->left && !root->right) return 1;
    return countLeaves(root->left) + countLeaves(root->right);
}

int main() {
    TreeNode* root = new TreeNode(1);
    root->left = new TreeNode(2);
    root->left->left = new TreeNode(3);
    root->left->right = new TreeNode(4);
    root->right = new TreeNode(5);

    cout << countLeaves(root) << endl; // Output: 3
    return 0;
}
```

Output:



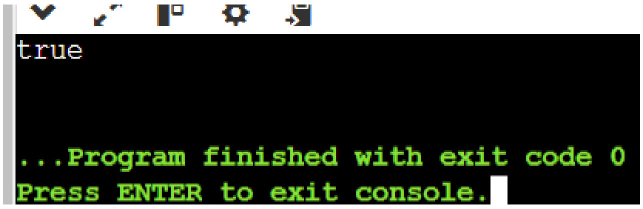
```
3


...Program finished with exit code 0
Press ENTER to exit console.
```

5. Path Sum

Code:

```
#include <iostream>
using namespace std;

struct TreeNode {
   int val;
   TreeNode* left;
   TreeNode* right;
   TreeNode(int x) : val(x), left(nullptr), right(nullptr) {}
};

bool hasPathSum(TreeNode* root, int targetSum) {
   if (!root) return false;
   if (!root->left && !root->right) return root->val == targetSum;
   return hasPathSum(root->left, targetSum - root->val) || hasPathSum(root->right,
targetSum - root->val);
}

int main() {
   TreeNode* root = new TreeNode(5);
   root->left = new TreeNode(4);
   root->left->left = new TreeNode(11);
   root->left->left->left = new TreeNode(7);
   root->left->left->right = new TreeNode(2);
   root->right = new TreeNode(8);
   root->right->left = new TreeNode(13);
   root->right->right = new TreeNode(4);
   root->right->right->right = new TreeNode(1);

   cout << (hasPathSum(root, 22) ? "true" : "false") << endl; // Output: true
   return 0;
}
```

Output:



```
true


...Program finished with exit code 0
Press ENTER to exit console.
```