

**CS2413: Data Structures  
Fall 2021**

**Homework #4**

- Full name only: \_\_\_\_\_
- Release date: Oct 8th, 2021 (Friday)
- Due date: **Oct 24th, 2021 (Sunday) before midnight, 11:59 PM**
- It should be done INDIVIDUALLY; Show ALL your work; Submit your all source codes and results through the Blackboard.
- Total: 20 pts + 5 pts (extra credit)

I. Write a program to build a binary tree from a sequence of data. Once the tree is constructed, conduct search and tree traversal functions including breadth-first traversal and depth-first traversal (preorder, inorder, and postorder). Search and tree traversal functions are applied to the most recently constructed tree. Here is a set of requirements to follow:

- Type the homework number and your full name at the top in your source code.

```
/* Homework #4, James Bond */
```

- Your program should be a menu-driven and execute the chosen command. If you type 6, then exit the program.

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose?

- Display a message, in case when searching a node that does not exist in the tree.
- Show ALL your work. For example,

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose? 0 15 4 1 20 25 16

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose? 1 35

There is no such node in the tree!

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose? 2

```
15  4  20  1  16  25
```

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose? 3

```
15  4  1  20  16  25
```

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose? 4

```
1  4  15  16  20  25
```

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)
```

Choose? 5

```
1  4  16  25  20  15
      .
      .
      .
```

2. Please refer source code in the textbook, Fig. 6.8 (pp. 220).

3. **[Extra Credit]** If you can implement a delete operation, extra 5 points will be provided. You should show three delete cases: no children, one child, and two children. Your menu should be shown below,

M E N U

```
Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Delete (6), Exit Program (7)
```

Choose?

4. Submit your all source codes and results (e.g., screen copy) through the Blackboard before the due date, **Oct 24th, 2021 (Sunday) before midnight, 11:59 PM**. The TA will build and run your source codes and test with a random input.

- Source codes – The file name should be “your name + homework number”, e.g., james\_bond\_4.cpp, james\_bond\_4.h, etc.
- Results in a word file (e.g., screen copy)