National University of Computer & Emerging Sciences (NUCES) Islamabad,
Department of Computer Science

# DATA STRUCTURES – FALL 2021

# LAB 09

## Learning Outcomes

In this laboratory, you will implement the Binary Search Tree ADT.

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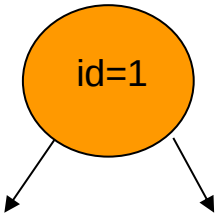
**BST ADT**

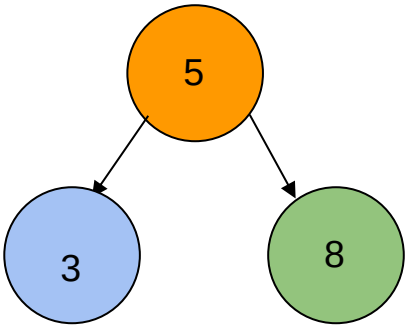
**Data Items**

The data items in a binary search tree are of generic data type. Each data item has a key (of generic type KF) that uniquely identifies the data item. Data items usually include additional data.




**Structure**

The data items form a binary tree. For each data item D in the tree, all the data items in D's left subtree have keys that are less than D's key and all the data items in D's right subtree have keys that are greater than D's key.



# TASK 1

Keeping in mind the above information, implement the following operations of BST.

**BSTree ()**
Constructor. Creates an empty binary search tree.

**~BSTree ()**
Destructor. Deallocates (frees) the memory used to store a binary search tree.

**insert ()**
Inserts new DataItem into a BST. If a data item with the same key as newDataItem already exists in the tree, then updates that data item's nonkey fields with newDataItem's nonkey fields.

**retrieve ()**
Searches BST for the data item with the user given key. If this data item is found, then copies the data item to searchDataItem and returns true. Otherwise, returns false with searchDataItem undefined.

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# Task 2

A database is a collection of related pieces of information that is organized for easy retrieval. The following set of accounts records, for instance, form an accounts database.

| *Record #* | *Account ID* | *First name* | *Last name* | *Balance* |
|---|---|---|---|---|
| 0 | 6274 | James | Johnson | 415.56 |
| 1 | 2843 | Marcus | Wilson | 9217.23 |
| 2 | 4892 | Maureen | Albright | 51462.56 |
| 3 | 8337 | Debra | Douglas | 27.26 |
| 4 | 9523 | Bruce | Gold | 719.32 |
| 5 | 3165 | John | Carlson | 1496.24 |
| 6 | 1892 | Mary | Smith | 918.26 |
| 7 | 3924 | Simon | Becker | 386.85 |
| 8 | 6023 | John | Edgar | 9.65 |
| 9 | 5290 | George | Truman | 16110.68 |
| 10 | 8529 | Ellen | Fairchild | 86.77 |
| 11 | 1144 | Donald | Williams | 4114.26 |

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## Task 2.A

Construct a BST for accounts database.

## Task 2.B

Write a function **inorderTraversal()** that traverses the accounts BST created above and prints the data at each node, in inorder sequence.

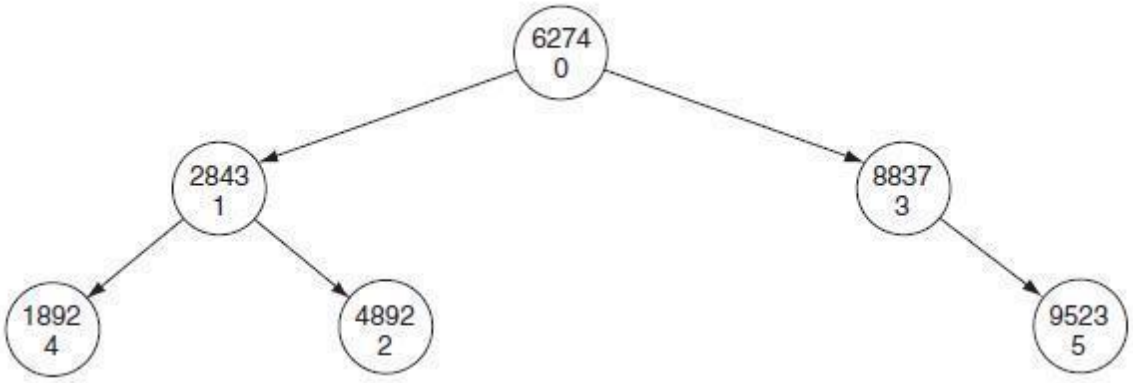


**Figure: 1**