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1 /**
2  * MyBST.java
3  * A basic structure for a Binary Search Tree (BST).
4  *
5  * Students will implement the insert, search, and traversal methods
6  * for storing and retrieving integer data in a sorted, efficient structure.
7  *
8  * Key operations:
9  * - insert(int value): adds a new value in order
10 * - contains(int value): checks if a value exists
11 * - inOrderPrint(): prints all values in sorted order
12 *
13 * This class does not support deletion.
14 */
15 public class MyBST <T extends Comparable>{
16
17     /**
18      * Node represents a single element in the BST.
19      * Each node may have a left and/or right child.
20      */
21     private static class Node<T> {
22         T data;
23         Node<T> left, right;
24
25         public Node(T data) {
26             this.data = data;
27         }
28     }
29
30     // The root node of the tree
31     private Node<T> root;
32
33     /**
34      * Public method to insert a value into the BST.
35      * Uses a recursive helper method to place the value
36      * in the correct position based on BST rules.
37      *
38      * @param value the integer to be inserted
39      */
40     public void insert(T value) {
41         // TODO: Call insertHelper with root and value
42         root = insertHelper(root, value);
43     }
44
45     /**
46      * Recursive helper method for inserting a value into the tree.
47      * If the current node is null, this is the correct insertion point.
48      * If the value is less than the current node's data, recurse left.
49      * If the value is greater, recurse right.
50      *
51      * @param node the current node in the traversal
52      * @param value the value to insert
53      * @return the updated node after insertion
54      */
55     private Node<T> insertHelper(Node<T> node, T value) {
56         // TODO: Implement insert logic
57         if (node == null){
58             return new Node(value);
59         }
60         if (value.compareTo(node.data) < 0){
61             node.left = insertHelper(node.left, value);
62         }
63         else {
64             node.right = insertHelper(node.right, value);
65         }
66         return node;
67     }
68

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69  /**
70   * Determines whether the BST contains the specified value.
71   * Traverses the tree using a while loop, comparing at each step.
72   *
73   * @param value the value to search for
74   * @return true if the value exists in the tree, false otherwise
75   */
76  public boolean contains(T value) {
77      // TODO: Implement a while-loop search starting from root
78      Node<T> current_node = root;
79
80      while (current_node != null){
81          if (value.compareTo(current_node.data) == 0){
82              return true;
83          }
84          else if (value.compareTo(current_node.data) < 0){
85              current_node = current_node.left;
86          }
87
88          else {
89              current_node = current_node.right;
90          }
91      }
92
93      return false;
94  }
95
96  /**
97   * Initiates an in-order traversal of the BST.
98   * Values will be printed from smallest to largest.
99   */
100 public void inOrderPrint() {
101     // TODO: Call inOrderHelper with root
102     inOrderHelper(root);
103 }
104
105 /**
106  * Performs in-order traversal of the BST.
107  * Visit order: left subtree, current node, right subtree.
108  *
109  * @param node the current node being visited
110  */
111 private void inOrderHelper(Node<T> node) {
112     // TODO: Implement in-order traversal
113     if (node == null){
114         return;
115     }
116
117     inOrderHelper(node.left);
118     System.out.print(node.data + " ");
119     inOrderHelper(node.right);
120 }
121
122 private void printTree(){
123     printTreeHelper(root, 0);
124 }
125
126 private void printTreeHelper(Node<T> node, int depth){
127     if (node == null){
128         return;
129     }
130
131     printTreeHelper(node.right, depth + 1);
132
133     for (int i = 0; i < depth; i++){
134         System.out.print("    ");
135     }
136

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137         System.out.println(node.data);
138         printTreeHelper(node.left, depth + 1);
139     }
140
141     public static void main(String[] args){
142         MyBST<Integer> mBST = new MyBST<Integer>();
143         mBST.insert(5);
144         mBST.insert(7);
145         mBST.insert(3);
146         mBST.insert(2);
147         mBST.insert(1);
148         mBST.insert(8);
149         mBST.insert(6);
150         mBST.insert(4);
151         mBST.insert(10);
152
153         //mBST.inOrderPrint();
154         mBST.printTree();
155         System.out.println(mBST.contains(1));
156     }
157 }
```