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Subject: - Algorithm and Data Structures using JAVA

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Date: - 22nd Jan 2023.

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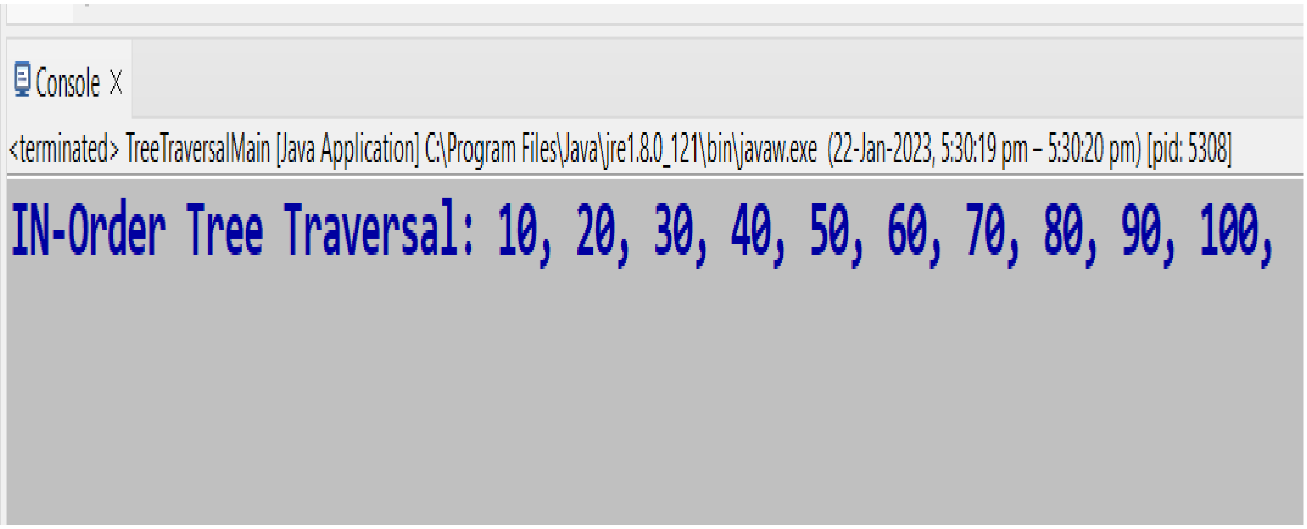
1. Write a Java program to

a. Perform in-order tree traversal

```
package com.inordertreetraversal.services;

public class TreeTraversal {

    static class Node {
        private int data;
        private Node left;
        private Node right;
        private boolean visited;

        public Node()
        {
            data = 0;
            left = null;
            right = null;
            visited = false;
        }
        public Node(int val)
        {
            data = val;
        left = null;
        right = null;
        visited = false;
    }

    @Override
    public String toString()
    {
        return "Node [data=" + data + "]";
    }
}

private Node root;

public TreeTraversal() {
    root = null;
}

public void add(int val) {
    Node newNode = new Node(val);

    if (root == null)
        root = newNode;
    else {
        Node trav = root;
        while (true) {
            if (val < trav.data) {
                if (trav.left == null) {
                    trav.left = newNode;
                    break;
                } else
                    trav = trav.left;
            } else {
                if (trav.right == null) {
                        trav.right = newNode;
                        break;
                    } else
                        trav = trav.right;
                }
            }
        }
    }
    public void inorder(Node cur) {
        if (cur == null)
            return;
        inorder(cur.left);
        System.out.print(cur.data + ", ");
        inorder(cur.right);
    }
    public void inorder() {
        System.out.print("IN-Order Tree Traversal: ");
        inorder(root);
        System.out.println();
    }
}
package com.inordertreetraversal.main;

import
com.inordertreetraversal.services.TreeTraversal;

public class TreeTraversalMain {

    public static void main(String[] args)
    {
        TreeTraversal t = new TreeTraversal();
        t.add(50);
        t.add(30);
        t.add(90);
```

```
		t.add(10);
		t.add(40);
		t.add(70);
		t.add(100);
		t.add(20);
		t.add(60);
		t.add(80);

		t.inorder();
	}
}
```

OUTPUT: -



```
<terminated> TreeTraversalMain [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javaw.exe  (22-Jan-2023, 5:30:19 pm – 5:30:20 pm) [pid: 5308]
IN-Order Tree Traversal: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100,
```

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1. Write a Java program to

b. Implement stack using array

```
package com.stackusingarray;

public class StackUsingArray {

        private int[] arr;
        private int top;

        public StackUsingArray (int size) {
            top = -1;
            arr = new int[size];
        }
        public void push(int val) {
            top++;
            arr[top] = val;
        }
        public int peek() {
            return arr[top];
        }
        public void pop() {
            top--;
        }
        public boolean isEmpty() {
            return top == -1;
        }
        public boolean isFull() {
            return top == arr.length-1;
        }
}

package com.stackusingarray.main;

import java.util.Scanner;
import com.stackusingarray.StackUsingArray;

public class StackUsingArrayMain {

    public static void main(String[] args)
    {
        int choice, val;

        Scanner sc = new Scanner(System.in);
        StackUsingArray s = new
StackUsingArray(9);

    System.out.println(".......Implementation
Stack Using Array.........");
        do {
            System.out.print("\n\n1. Push\n"
                            + "2. Pop\n"
                            + "3. Peek\n"
                            + "Enter choice: ");
            choice = sc.nextInt();
            switch (choice) {
```

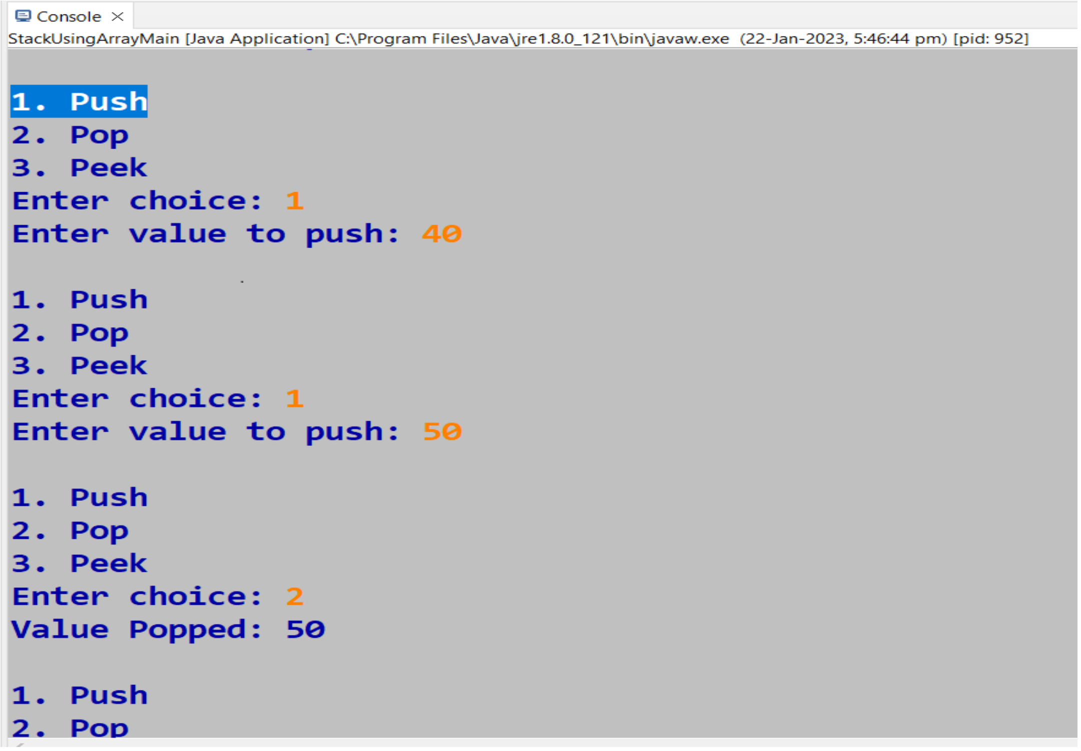
```
           case 1:
               if (s.isFull())

    System.out.println("Oop's...!! Stack is
Full.");
               else
               {
                   System.out.print("Enter value
to push: ");
                   val = sc.nextInt();
                   s.push(val);
               }
               break;
           case 2:
               if (s.isEmpty())
                   System.out.println("Stack is
Empty.");
               else
               {
                   val = s.peek();
                   s.pop();
                   System.out.println("Value
Popped: " + val);
               }
               break;
           case 3:
               if (s.isEmpty())

    System.out.println("Oop's...!! Stack is
Empty.");
```

```
                else {
                    val = s.peek();
                    System.out.println("Value
Peeked: " + val);
                }
                break;
            }
        } while (choice != 0);
    }
}
```

OUTPUT: -



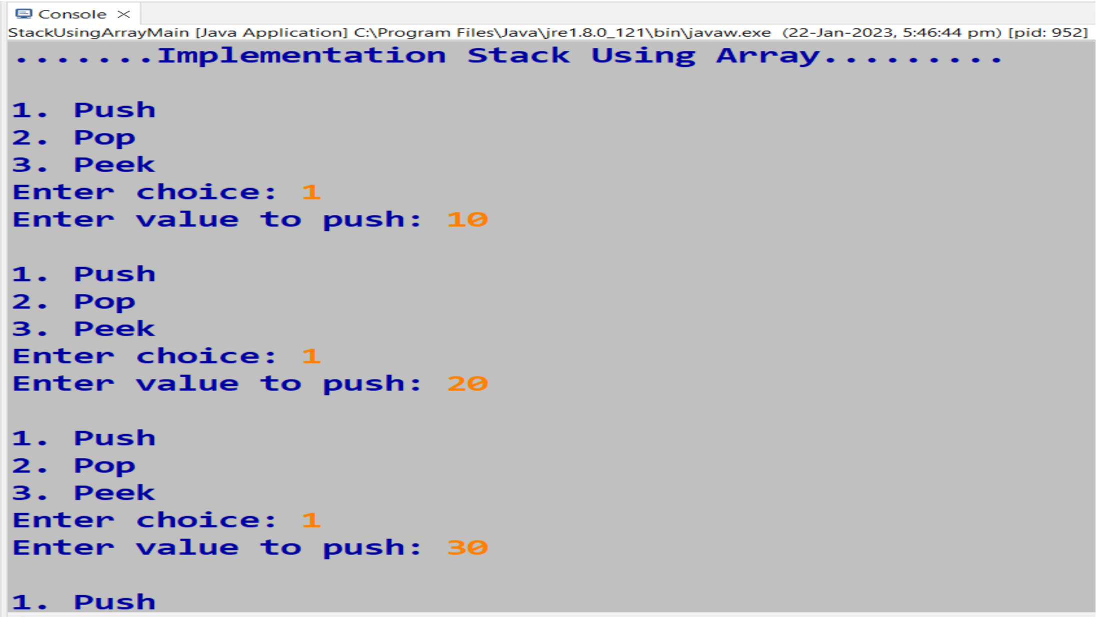
```
StackUsingArrayMain [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javaw.exe  (22-Jan-2023, 5:46:44 pm) [pid: 952]

1. Push
2. Pop
3. Peek
Enter choice: 1
Enter value to push: 40

1. Push
2. Pop
3. Peek
Enter choice: 1
Enter value to push: 50

1. Push
2. Pop
3. Peek
Enter choice: 2
Value Popped: 50

1. Push
2. Pop
```



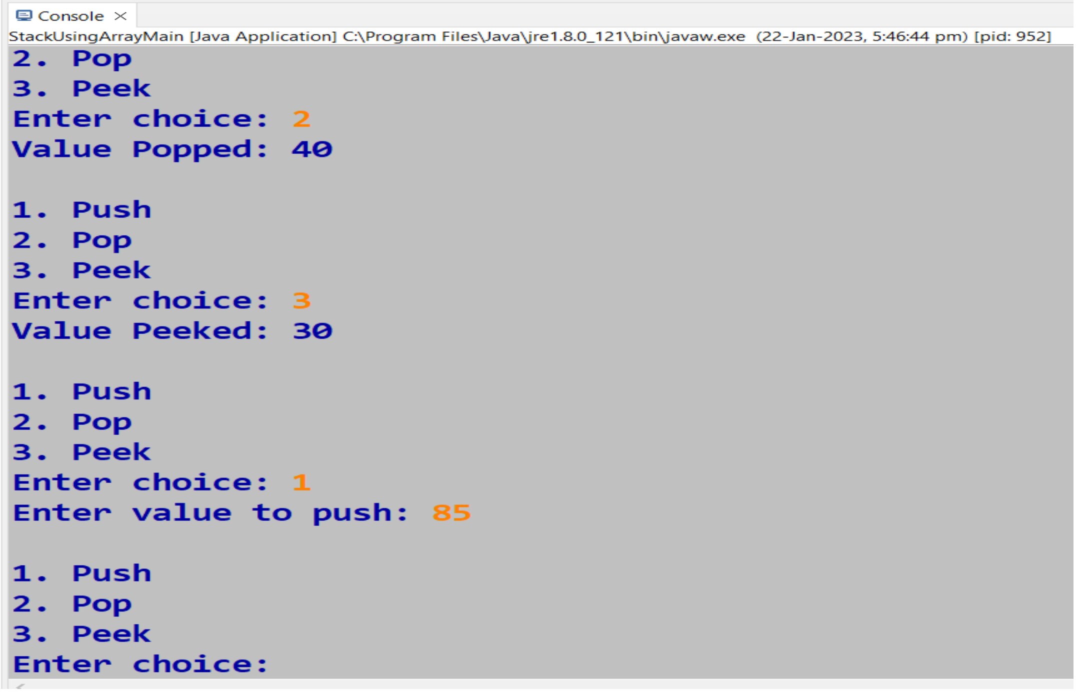
```
StackUsingArrayMain [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javaw.exe  (22-Jan-2023, 5:46:44 pm) [pid: 952]
.......Implementation Stack Using Array.........

1. Push
2. Pop
3. Peek
Enter choice: 1
Enter value to push: 10

1. Push
2. Pop
3. Peek
Enter choice: 1
Enter value to push: 20

1. Push
2. Pop
3. Peek
Enter choice: 1
Enter value to push: 30

1. Push
```



```
StackUsingArrayMain [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javaw.exe  (22-Jan-2023, 5:46:44 pm) [pid: 952]
2. Pop
3. Peek
Enter choice: 2
Value Popped: 40

1. Push
2. Pop
3. Peek
Enter choice: 3
Value Peeked: 30

1. Push
2. Pop
3. Peek
Enter choice: 1
Enter value to push: 85

1. Push
2. Pop
3. Peek
Enter choice:
```

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