Professional Programming in Java

Session: 16

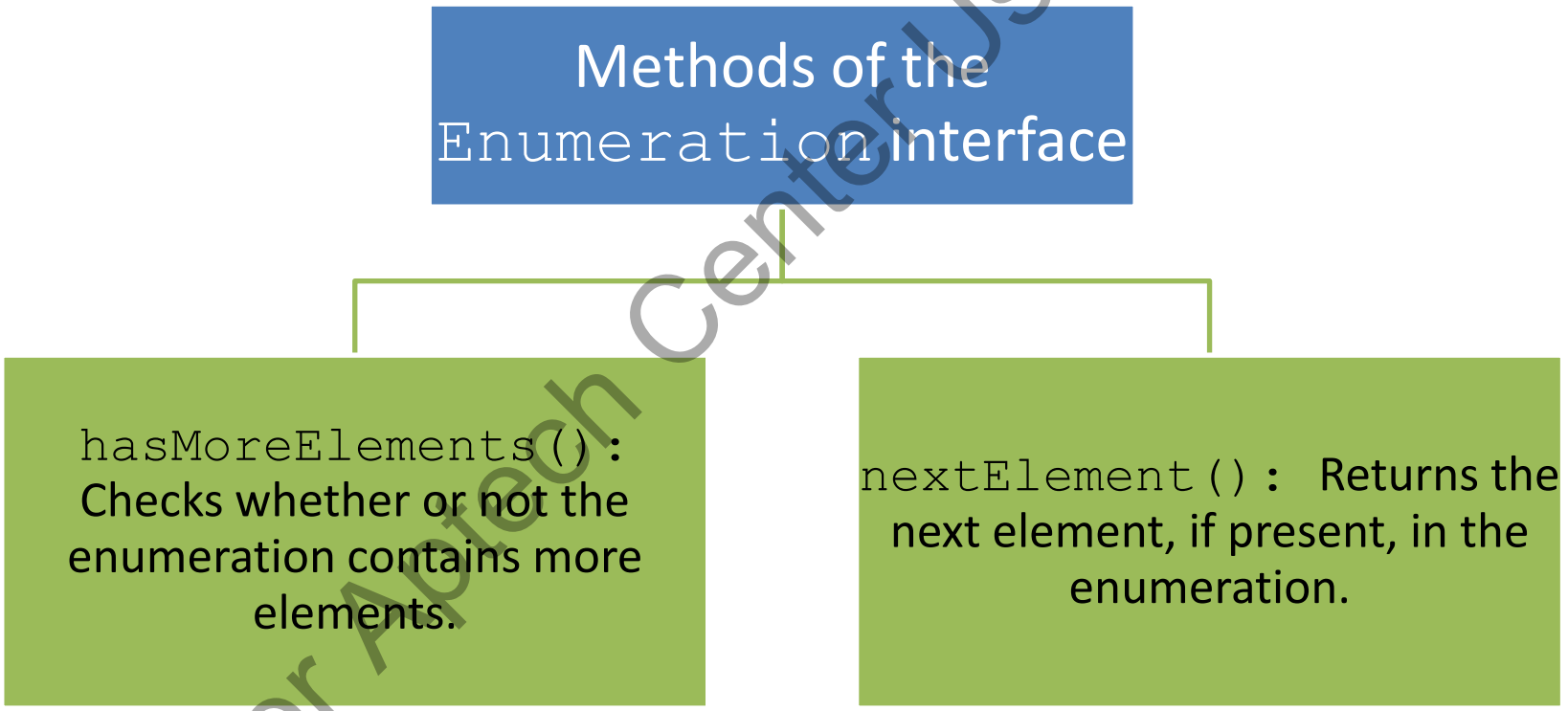
Java Data Structures

Objectives

- Explain the `Enumeration` interface
- Describe the `BitSet` class
- Describe the `Stack` classes
- Explain the Dictionary classes

Enumeration [1-5]

- Enumeration is an interface in the `java.util` package that defines methods to iterate through the elements of a collection.



Enumeration [2-5]

- The code for using an `Enumeration` to iterate through the elements of an array.

Code Snippet

```
package com.datastructures.demo;
import java.lang.reflect.Array;
import java.util.Enumeration;

public class CustomEnumeration implements Enumeration
{
   private final int arraySize;
   private int arrayCursor;
   private final Object array;
   public CustomEnumeration(Object obj) {
       arraySize = Array.getLength(obj);
       array = obj;
}
```

Enumeration [3-5]

```
    @Override
    public boolean hasMoreElements() {
       return (arrayCursor < arraySize);
    }
    @Override
    public Object nextElement() {
      return Array.get(array, arrayCursor++);
    }
}
```

Enumeration [4-5]

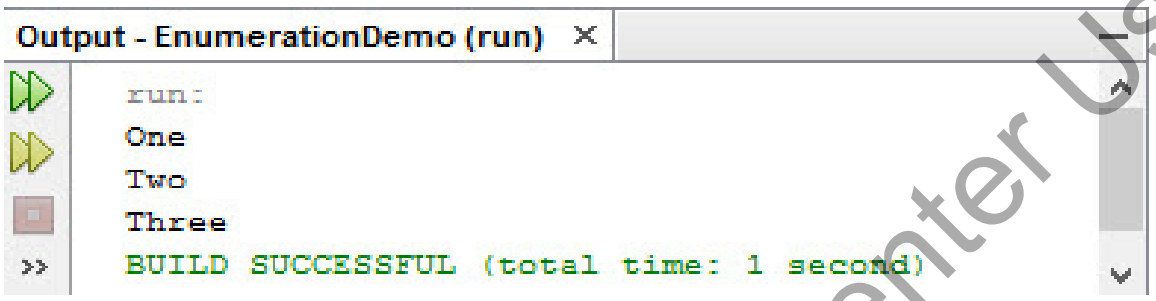
- The code for using the custom enumeration defined in earlier code.

Code Snippet

```
package com.datastructures.demo;
import java.util.Enumeration;
public class EnumerationDemo {
    public static void main(String[] args) {
    String[] strArray = new String[]{“One”, “Two”,
    “Three”};
    Enumeration customEnumeration = new
    CustomEnumeration(strArray);
    while (customEnumeration.hasMoreElements()) {
        System.out.println(customEnumeration.nextElement(
        ));
      }
    }
}
```

Enumeration [5-5]

Following is the output of the code:



BitSet Class [1-3]

- The code for using the `BitSet` class.

Code Snippet

```
package com.datastructures.demo;
import java.util.BitSet;
public class BitSetDemo {

    public static void main(String[] args) {
       BitSet bitSet1 = new BitSet();
       BitSet bitSet2 = new BitSet();
       bitSet1.set(1);
       bitSet1.set(5);
       bitSet1.set(8);
       bitSet2.set(3);
       bitSet2.set(6);
       bitSet2.set(9);
       System.out.println("Values in bitSet1:
       "+bitSet1+"\nValues in bitSet2: "+bitSet2);
       }
    }
```

BitSet Class [2-3]

Following is the output of the code:

```
Output - BitSetDemo (run)
run:
Values in bitSet1: {1, 5, 8}
Values in bitSet2: {3, 6, 9}
BUILD SUCCESSFUL (total time: 1 second)
```

BitSet Class [3-3]

- Following table lists the `Stack` methods:

Abstract Method	Description
`empty()`	Checks whether or not the Stack is empty.
`peek()`	Returns the object at the top of the Stack without removing the object.
`pop()`	Returns the object at the top of the Stack after removing the object from the Stack.
`push(E item)`	Pushes an object onto the top of this Stack.
`search(Object o)`	Returns the position of an object from the top of the Stack. This method returns 1 for the object at the top of the Stack, 2 for the object below it, and so on. If an object is not found, this method returns -1.

Stack Class [1-3]

- The code demonstrates the use of the `Stack` class.

Code Snippet

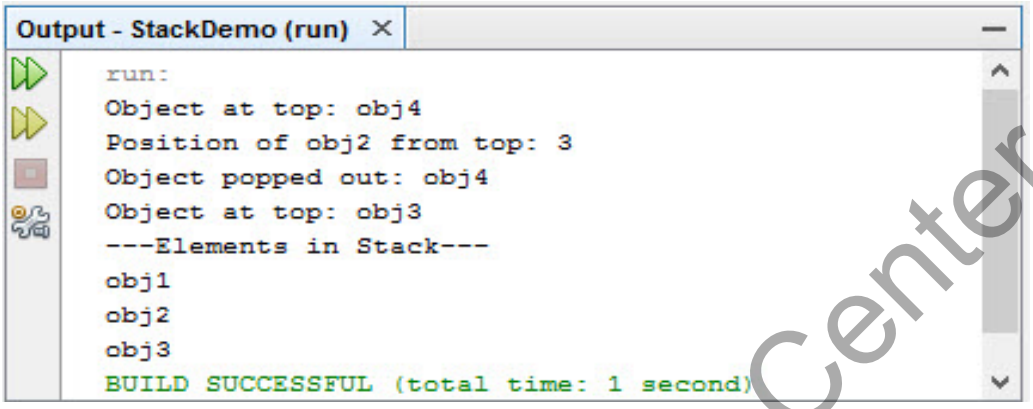
```
package com.datastructures.demo;
import java.util.Stack;
public class StackDemo {
    private static Stack getInitializedStack() {
    Stack stack = new Stack();
    stack.push("obj1");
    stack.push("obj2");
    stack.push("obj3");
    stack.push("obj4");
    return stack;
}
```

Stack Class [2-3]

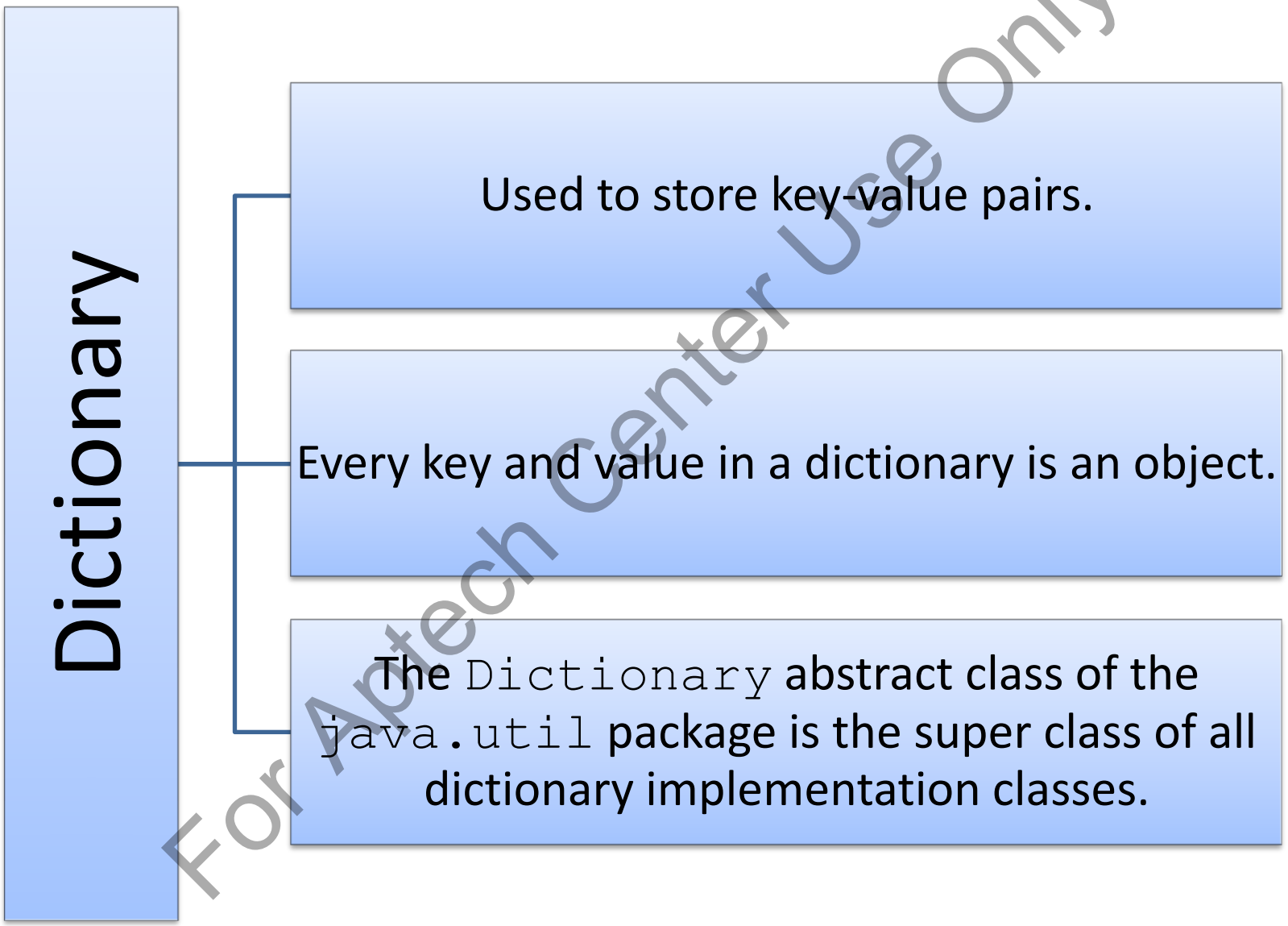
```
    public static void main(String[] args) {
          Stack initializedStack =
          StackDemo.getInitializedStack();
          System.out.println("Object at top: " +
          initializedStack.peek());
          System.out.println("Position of obj2 from
          top: " +
          initializedStack.search("obj2"));
          System.out.println("Object popped out: " +
          initializedStack.pop());
          System.out.println("Object at top: " +
          initializedStack.peek());
          System.out.println("---Elements in Stack---
          ");
          for (Object obj : initializedStack) {
          System.out.println(obj);
          }
    }
}
```

Stack Class [3-3]

Following is the output of the code:



Dictionary Classes



Hashtable Class [1-4]

- The `Hashtable` class
  - implements a collection of key-value pairs that are organized based on the hash code of the key.
  - is significantly faster as compared to other dictionaries.
  - When elements are added to a `Hashtable`, the `Hashtable` automatically resizes itself by increasing its capacity.

- A hash code is a signed number that identifies the key. Based on the hash code, a key-value pair, when added to a `Hashtable`, gets stored into a particular bucket.

Hashtable Class [2-4]

The code demonstrates the use of the `Hashtable` class.

Code Snippet

```
package com.datastructures.demo;
import java.util.Enumeration;
import java.util.Hashtable;
public class HashtableDemo {
    private static Hashtable initializeHashtable() {
        Hashtable hTable = new Hashtable();
        hTable.put("1", "East");
        hTable.put("2", "West");
        hTable.put("3", "North");
        hTable.put("4", "South");
        return hTable;
}
```

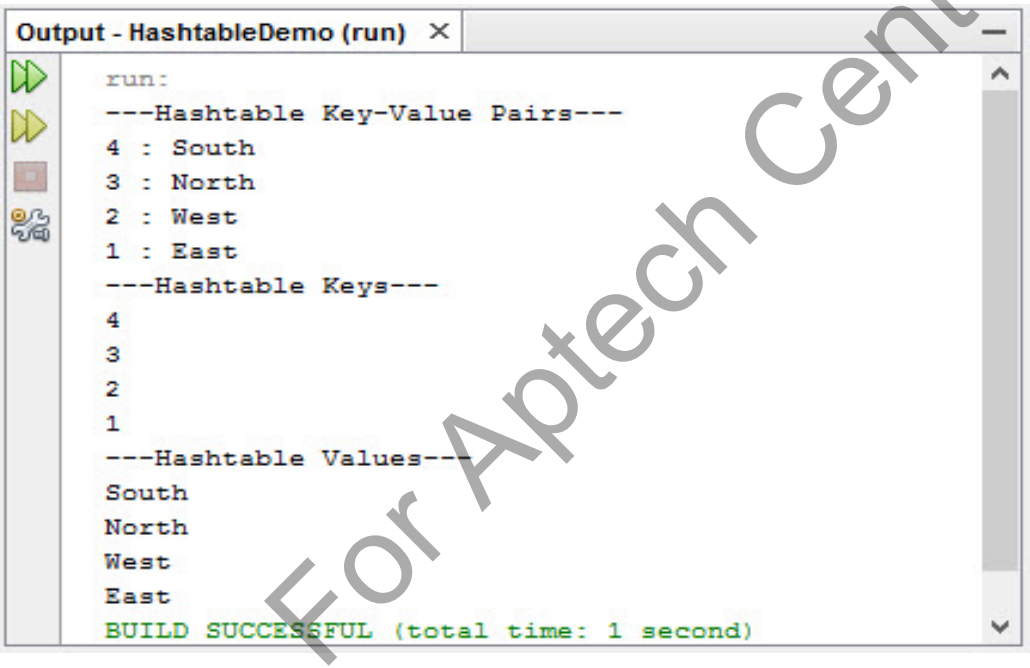
Hashtable Class [3-4]

```
public static void main(String[] args) {
    Hashtable initializedHtable =
    HashtableDemo.initializeHashtable();
    Enumeration e = initializedHtable.keys();
    System.out.println("---Hashtable Key-Value
    Pairs---");
    while (e.hasMoreElements()) {
       String key = (String) e.nextElement();
       System.out.println(key + " : " +
       initializedHtable.get(key));
    }
    e = initializedHtable.keys();
    System.out.println("---Hashtable Keys---");
    while (e.hasMoreElements()) {
       System.out.println(e.nextElement());
    }
    e = initializedHtable.elements();
    System.out.println("---Hashtable Values---");
    while (e.hasMoreElements()) {
```

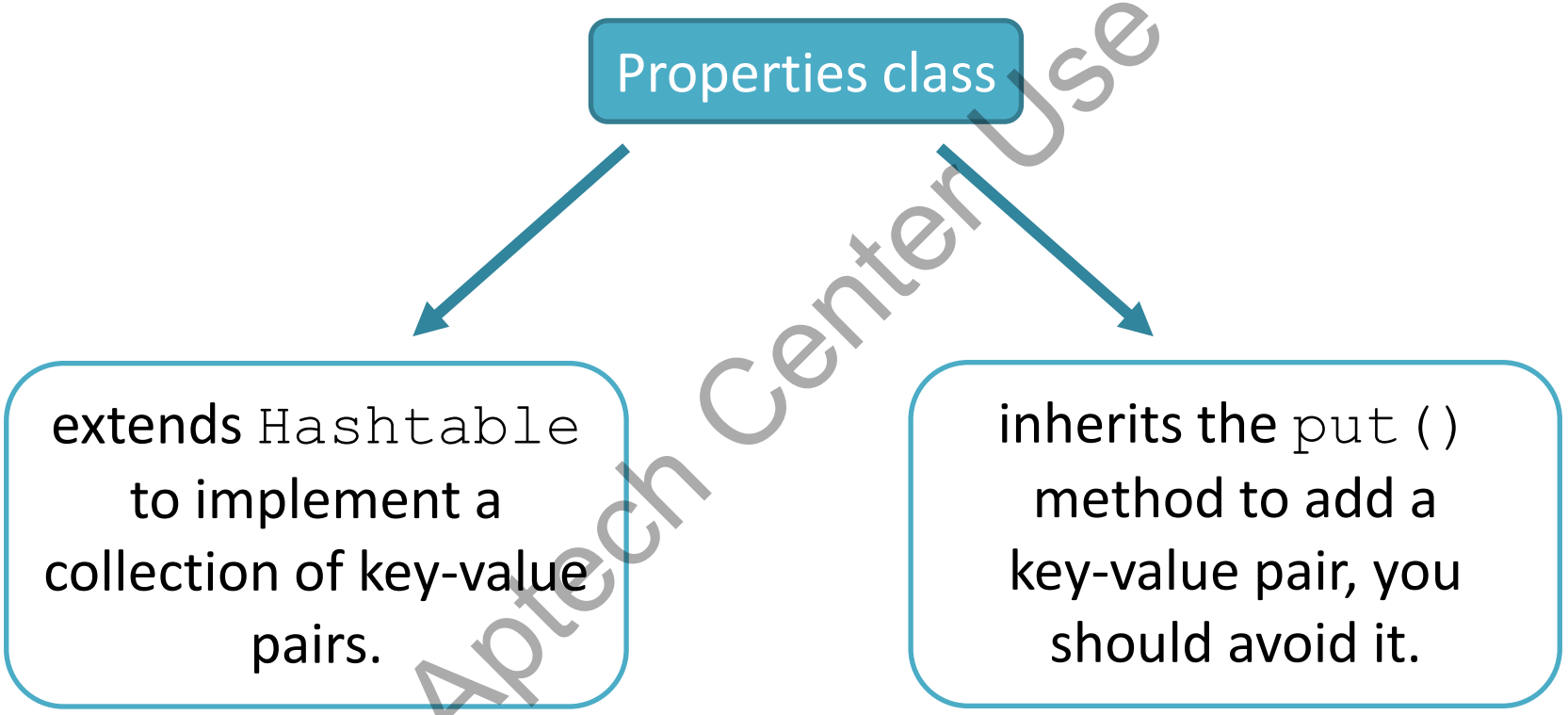
Hashtable Class [4-4]

```
            System.out.println(e.nextElement());
        }
    }
}
```

Following is the output of the code:



Properties Class [1-3]



Properties Class [2-3]

- The code demonstrates the use of the `Properties` class.

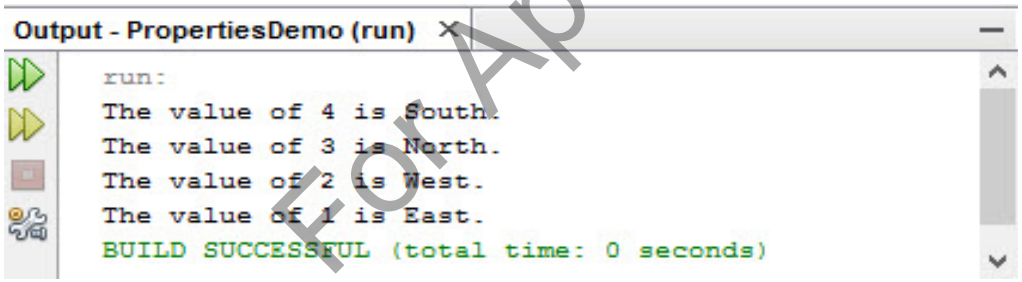
Code Snippet

```
package com.datastructures.demo;
import java.util.Enumeration;
import java.util.Iterator;
import java.util.Properties;
import java.util.Set;
public class PropertiesDemo {
   private static Properties initializeProperties() {
      Properties = new Properties();
      properties.setProperty("1", "East");
      properties.setProperty("2", "West");
      properties.setProperty("3", "North");
      properties.setProperty("4", "South");
      return properties;
   }
   public static void main(String[] args) {
      Properties initializedProperties =
```

Properties Class [3-3]

```
        PropertiesDemo.initializeProperties();
        Set = initializedProperties.keySet();
        Iterator itr = set.iterator();
        while (itr.hasNext()) {
        String str = (String) itr.next();
        System.out.println("The value of "
        + str + " is " +
        initializedProperties.getProperty(str) + ".");
      }
    }
}
```

Following is the output of the code:



Summary

- Java includes a few legacy data structures such as Enumeration, BitSet, and so on for backward compatibility.
- Enumeration interface is used to iterate through the elements of a collection.
- BitSet is a collection of bit values.
- Stack extends Vector to provide an implementation of a LIFO collection.
- Dictionary is used to store key-value pairs.
- Hashtable stores key-value pairs where keys are organized based on their hash code.
- Properties stores key-value pairs where both the types of the keys and values are String.