0301502 ADVANCED JAVA

UNIT	MODULES	WEIGHTAGE
1	File Handling	20 %
2	Java Collection Framework	20 %
3	Event Handling, Swing and GUI Components	20 %
4	Swing, GUI Components and Layout Manager	20 %
5	Database Connectivity (JDBC)	20 %

UNIT -2 Java Collection Framework

- Introduction
- Collection Class
- Linked List
- Array List
- Stack
- Queue
- Set
- Maps
- Iterator
- ListIterator

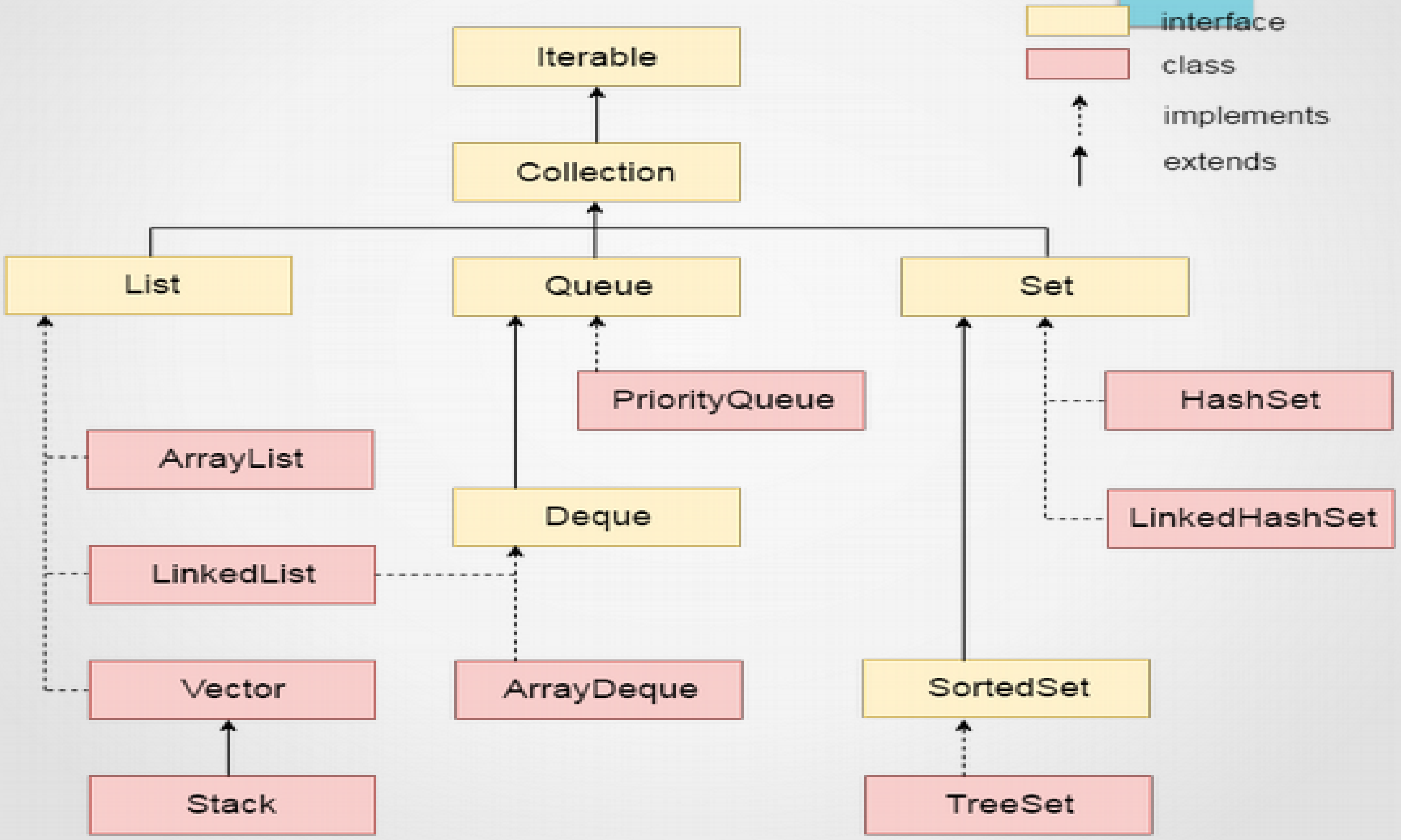
UNIT -2 Introduction

- The collection framework **provide a well- designed set of interface** and classes **for stroing and manipulating of data** as a single unit.
- It provides the folloing abstract data type
  - *Maps*
  - *Sets*
  - *Lists*
  - *Trees*
  - *Arrays*
  - *Hashtables*

UNIT -2 Introduction – Feature of Collections Framework

- Implementation of fundamental collection like dynamic array, linked list, tree etc is **highly efficient with high performance.**
- All **collection has almost same look and feel** and their way of working is similar to each other.
- **Extending a collection is very easy.**
- Whole of the **collections are designed around a set of standard interfaces.**
- Collection framework also **allows creating one's own collection**.

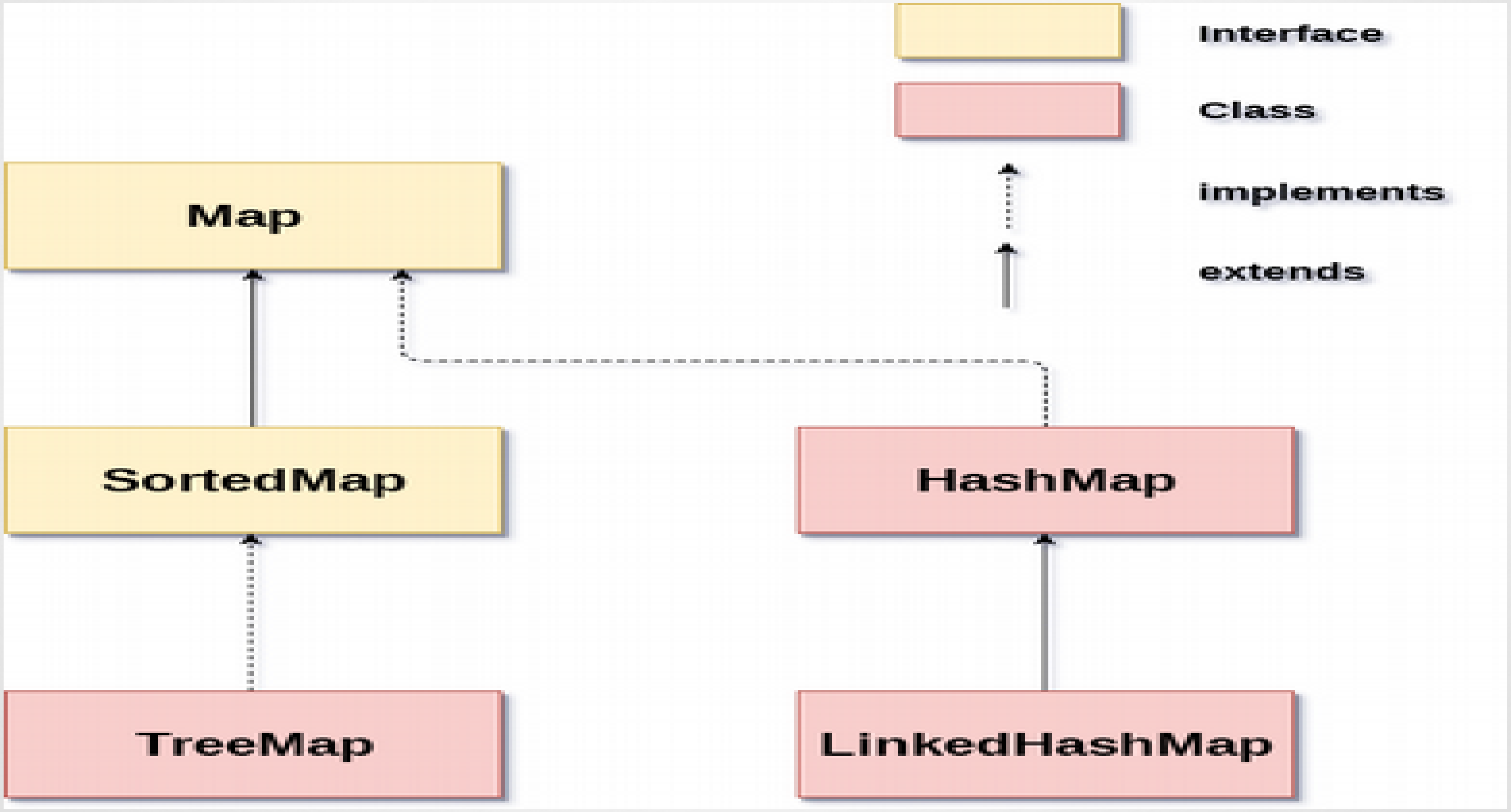
UNIT -2 Introduction - Java Collection Framework



UNIT -2 Introduction – MAP

- *Map* is just **collection of Pairs.**
- The interfaces *Map* and *Collection* **are distinct**

UNIT -2 Java Collection Framework - MAP



UNIT -2 Introduction

- The **Following points need to be remembered** regarding Collection Framework:
  - The *Collection* interface is a group of objects, **with duplicates allowed.**
  - The *Set* interface extends Collection but **forbids duplicates**
  - The *List* interface extends Collection, **allows duplicates and introduces positional indexing.**
  - The *Map* interface **extends neither Set nor Collection.**

UNIT -2 Collection Interface

- The Collection interface is used to represent any group of objects or elements.
- This interface is implemented by all collection classes.
- The interface supports basic operations like adding and removing.

UNIT -2 Collection Interface - Methods

Method	Purpose
boolean add(Object obj)	**Add obj** to the invoking collection.
Boolean add(Collection c)	**Add all the elements of c** to the invoking collection.
Void clear()	**Removes all elements** from the invoking collection.
boolean contains(Object obj)	**Returns true if obj is an element** of the invoking collection.
boolean containsAll(collection c)	Returns **true if the invoking collection contains all elements of c.**
boolean equals(Object obj)	Returns **true if the invoking collection is equals.**
boolean isEmpty()	Returns **true if the invoking collection is empty.**

UNIT -2 Collection Interface - Methods

Method	Purpose
Iterator iterator()	Returns an **iterator for the invoking collection**.
boolean remove(Object obj)	**Remove one instance of obj** from the invoking collection.
boolean removeAll(Collection c)	**Remove all elements of c** from the invoking collection.
boolean retainAll(Collection c)	**Remove all elements from the invoking collection except those in c.**
Int size()	**Returns the number of elements** held in the invoking collection.
Object [] toArray()	**Returns an array that contains all the elements** storred in the invoking collection.
Object [] toArray(Objectarray [])	**Returns an array containing only those collection** elements whose type matches that of the array.

UNIT -2 List Interface

- The List interface extends the Collection interface to define an ordered collection.
- Permitting duplicates.
- The interface adds position oriented operations.
- The first element in the list starts at index 0.
- Elements can be added and accessed by their position in this list.

UNIT -2 List Interface - Methods

Method	Purpose
void add(index, object obj)	**Insert into the invoking list** at the index passedin index.
boolean addAll(int index, Collection c)	**Inserts all elements of c** into the invoking list at the index passed in index.
object get(int index)	**Returns the object stored at the speccified index** within the invoking collection.
int indexOf(object obj)	**Returns the index of the first instance** of obj in the invoking list. Return -1 if obje is not an element.
int lastIndexOf(Object obj)	Return the index of the last instance of obj in the invoking list.Return -1 if obje is not an element.
listIterator listIterator()	**Return an iterator** to the start of the invoking list

UNIT -2 List Interface - Methods

Method	Purpose
listIterator listIterator(int index)	**Return an iterator to the invoking list** that begins at the specified index.
object remove(int index)	**Removes the element at position index** from the invoking list and returns the deleted elements.
object set(int index, Object obj)	**Assigns obj to the location specified by index** within the invoking list
list subList(int start, int end)	**Returns a list that includes elements from start and end.**

UNIT -2 List Interface

- **List**
  - List is an ordered collection of objects in **which duplicate values can be stored**. Since List preserves the insertion order it allows positional access and insertion of elements.
  - **List Interface is implemented by**
    - **ArrayList**
    - **LinkedList**
    - **Vector**
    - **Stack classes.**

UNIT -2 List Interface

- **List interface has various class has follow constructor:**
  - *List a = new ArrayList();*
  - *List b = new LinkedList();*
  - *List c = new Vector();*
  - *List d = new Stack();*

UNIT -2 List Interface

- Example:
  - ListDemo.java
  - ListDemo2.java

UNIT -2 LinkedList

- **LinkedList**
  - **Linked list is a fundamental data structure** that contains records.
  - A **record contaians data as well as a reference to the next record**.
  - A r**ecord can be inserted or removed at any point** in the Linked List.
  - **Random access is not allowed like array. Only sequential access is allowed.**
  - This class act as a stack, queue and double-ended queue.
- **LinkedList class has follow constructor:**
  - LinkedList()
  - LinkedList(Collection c)

UNIT -2 LinkedList Class - Methods

Method	Purpose
void add(int index, Object element)	It is used to **insert the specified element at the specified position index** in a list.
void addFirst(Object o)	It is used to **insert the given element at the beginning of a list.**
void addLast(Object o)	It is used to **append the given element to the end of a list.**
int size()	It is used to **return the number of elements** in a list
boolean add(Object o)	It is used to **append the specified element to the end of a list.**

UNIT -2 LinkedList Class - Methods

Method	Purpose
boolean contains(Object o)	It is used to **return true if the list contains a specified element.**
boolean remove(Object o)	It is used to **remove the first occurence of the specified element** in a list.
Object getFirst()	It is used to **return the first element in a list.**
Object getLast()	It is used to **return the last element in a list.**
int indexOf(Object o)	It is used to **return the index in a list of the first occurrence of the specified element,** or -1 if the list does not contain any element.
int lastIndexOf(Object o)	It is used to **return the index in a list of the last occurrence of the specified element**, or -1 if the list does not contain any element.

UNIT -2 LinkedList

- Example:
  - DemoLinkedlist.java
  - LinkedListExample.java
  - DemoLinkedList_stack.java
  - DemoLinkedList_queue.java

UNIT -2 ArrayList

- **Array List**
  - Java ArrayList class uses a D**ynamic Array for storing the elements**.
  - It **inherits Abstract List class** and **implements List interface**.
  - Java ArrayList class can **contain duplicate elements.**
  - Java ArrayList class maintains insertion order.
  - Java ArrayList class is non synchronized.
  - Java ArrayList allows **random access because array works at the index basis.**
  - In Java ArrayList class, manipulation is **slow because a lot of shifting needs to be occurred if any element is removed from the array list.**

UNIT -2 ArrayList

- ***ArrayList* class has follow constructor:**
  - *ArrayList()*
  - *ArrayList(Collection c)*
  - *ArrayList(int capacity)*

UNIT -2 ArrayList Class Methods

Method	Details
void add(int index, Object element)	It is used to **insert the specified element at the specified position index** in a list.
boolean addAll(Collection c)	It is used to **append all of the elements in the specified collection to the end of this list**, in the order that they are returned by the specified collection's iterator.
void clear()	It is used to **remove all of the elements** from this list.
int lastIndexOf(Object o)	It is used to **return the index in this list of the last occurrence of the specified element, or -1** if the list does not contain this element.
Object[] toArray()	It is used to **return an array containing all of the elements in this list** in the correct order.
Object[] toArray(Object[] a)	It is used to **return an array containing all of the elements in this list** in the correct order.

UNIT -2 ArrayList Class Methods

Method	Details
boolean add(Object o)	It is **used to append the specified element to the end of a list.**
boolean addAll(int index, Collection c)	It is **used to insert all of the elements in the specified collection into this list, starting at the specified position.**
Object clone()	It is used to **return a shallow copy of an ArrayList**.
int indexOf(Object o)	It is used to **return the index in this list of the first occurrence of the specified element, or -1** if the List does not contain this element.
void trimToSize()	It is used to **trim the capacity of this ArrayList** instance to be the list's current size.

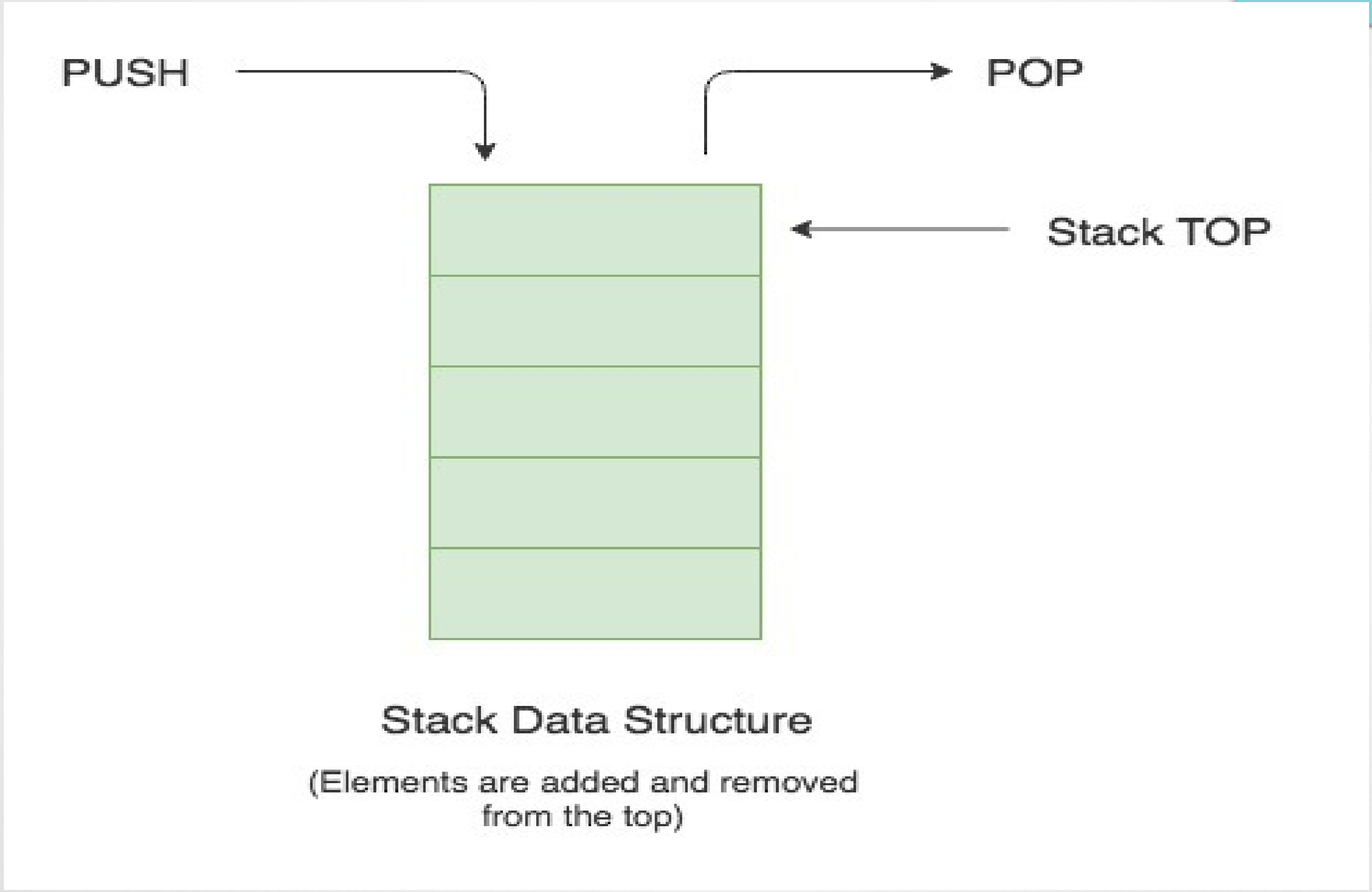
UNIT – 2 ArrayList

- Example:
  - TestCollection3.java

UNIT -2 Stack

- **Stack**
  - Java Collection framework provides a **Stack class which models and implements Stack data Structure.**
  - The class is based on the **basic principle of last-in-first-out (LIFO).**
  - The class provides basic **operation push and pop.**
  - The class can also be referred to as the subclass of Vector.
- **Stack class has follow constructor:**
  - Stack()

UNIT – 2 Stack


PUSH
POP
Stack TOP
Stack Data Structure
(Elements are added and removed from the top)

UNIT -2 Stack Class Methods

Method	Details
Object push(object element)	**Pushes an element on the top of stack**
Object pop()	**Removes and returns the top element** of the stack . An **'EmptyStackException' is thrown if we call pop() when the invoking stack is empty.**
Object peek()	**Returns the element on the top of the stack, but does not remove it.**
Boolean empty()	**It returns true if nothing is on the top** of the stack. Else rturn fase.
Int search(object element)	**It determines whether an object exists in the stack. If the elemetn is found, it returns the positions** of the element from the top of the stack else return -1

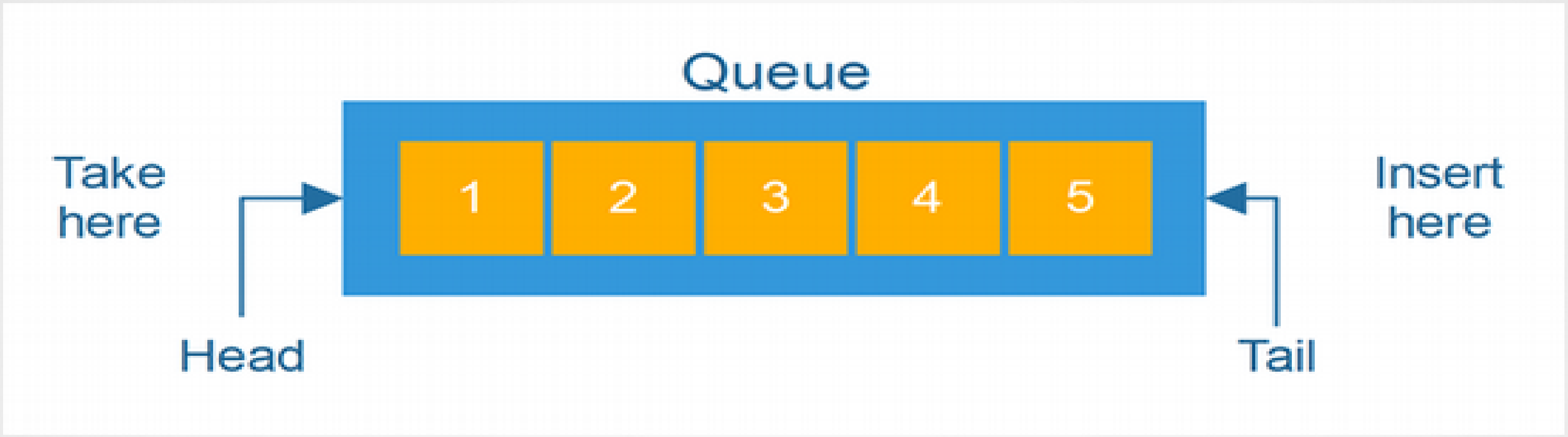
UNIT – 2 Stack

- Example:
  - Demostack.java

UNIT -2 Queue

- **Queue**
  - The Queue interface present in the java.utilpackage and extend the Collection interface.
  - **The class is based on the basic principle of First-in-first-out (FIFO).**
  - Being an interface the queue needs a concrete calss for the declaration, that are :
    - PriorityQueue
    - LinkedList
    - PriorityBlockingQueue

UNIT – 2 Queue



UNIT -2 Queue Interface Methods

Method	Details
Boolean add(object)	It is used to **insert the specified element into queue** and return true upon success.
Boolean offer(object)	It is used to **insert the specified element into this queue.**
Objet remove()	It is used to **retrieves and removes the head** of this queue.
Object poll()	It is used to **retrieves and removes the head of this** queue, or returns null if this queue is empty.
Object element()	It is used **to retrieves, but does not remove, the head** of the queue.
Object peek()	It is used to **retrieves, but does not remove, the head of this queue**, or returns null if this queue is empty.

UNIT – 2 Queue

- Example:
  - Demoqueue.java

UNIT -2 SET

- **SET**
  - Set is a collection that **does not contain duplicates.** It extends the Collection interface.
  - **We can store at most one null value in Set.**
  - The **concept of union, intersection, and the differenence of a set are available in the set interface** and supported by its subclasses
  - Set is implemented by HashSet, LinkedHashSet, and TreeSet.
- **Two classes under this interface**
  - **HastSet**
  - **TreeSet**
  - **LinkedHasSet**

UNIT -2 HashSet Class

- **HashSet**
  - HashSet class **imlements the Set interface.**
  - It **does not guarantee that the order will remain constant** over time.
  - This class **permits the null element.**
  - It used for **storing the duplicate- free collection.**
  - For effectively storing and retrieving the elements but the order is not guaranteed by this class.
  - To retrieve the elements in a sorted order.
  - **Allows null values.**

UNIT -2 HashSet Class

- **HashSet**
  - **HashSet class has follow constructor:**
    - Public HashSet()
    - Public HashSet(Collection C)
    - Public HashSet(int initialCapacity)

- Example:
  - Hashset1.java
  - Demolinkedhasset.java

UNIT -2 TreeSet

- **TreeSet**
  - This class implements th**e *Set* and *SortedSet* interface.**
  - It uses the tree to storage of its element.
  - It useful when **one needs to extract elements from a collection in a sorted manner.**
  - TreeSet offers a strict control over the order of elements in the collection. **The collection is a sorted collection.**
  - It may **not offer you the best performance** in terms of retrieving elements speedily.
  - **Does not permit null in the collection.**

UNIT -2 TreeSet Class Methods

Method	Details
Comparator comparator()	**Returns the comparator used to order this sorted set,** or null if this tree set uses its elements naturl ordering
Object first()	**Returns the first element** currently in ths sorted set
Object last()	**Return the last element** currently in the sorted set

UNIT -2 TreeSet Class

- **TreeSet**
  - **TreeSet class has follow constructor:**
    - Public TreeSet()
    - Public TreeSet(Collection C)
    - Public TreeSet(Comparator C)
    - Public TreeSet(SortedSet S)

- Example:
  - Treeset1.java

UNIT -2 LinkedHasSet

- **LinkedHasSet**
  - This class **extends HasSet.**
  - LinkeHasSet **maintains linked list of the element in the set in the order in which they were inserted.**
  - That is, when cycling through a LinkedHashSet using an iterator, the elements will be returned in the order in which they were inserted.**Java LinkedHashSet class maintains insertion order.**
  - **This class permits the null element. Allows null values.**
  - **It used for storing the duplicate- free collection.**

UNIT -2 LinkedHasSet Class

- **LinkedHasSet**
  - **LinkedHasSet class has follow constructor:**
    - Public LinkedHasSet(int capacity)
    - Public LinkedHasSet(int capacity, float fillRatio)

- Example:
  - Demolinkedhasset.java

UNIT -2 MAPS Interface

- **MAPS Interface**
  - A map contains values on the b**asis of key, i.e. key and value pair.**
  - Each key and value pair is **known as an entry.** A Map contains unique keys.
  - A Map is useful if you have to search, update or delete elements on the basis of a key.
  - MAPS Interface has following child
    - ***HasMap Class***
      - ***LinkedHasMap Class***
    - ***SortedMap Interface***
      - ***TreeMap Class***

UNIT -2 Maps Interface Methods

Method	Details
Void clear()	**Remove all key value pairs** from the invoking map
Boolean containsKey(Object k)	**Returns “true” if the invoking map contains k as a key.**
Boolean continsValue(Object v)	**Returns “true” if the invoking map contains v as a value.**
Set entrySet()	**Return a set that contains the entries in the map.** The set contains objects of type Map.Entry
Boolean equals(object obj)	**Returns “true” if obj is a Map and contains the same entries**

UNIT -2 Maps Interface Methods

Method	Details
Object get(object k)	**Returns the value associated with the key k.**
Int hashCode()	**Returns the hash code for the invoking map.**
Boolean isEmpty()	Returns “**true” if the invoing map is empty.**
Set KeySet()	Returns a **Set that contains the keys in the invoking map.**
Object put(object k, object v)	Puts an **entry in the invoking map**, overwritten any revious value associated with the key. The key and value are k and v respectively

UNIT -2 Maps Interface Methods

Method	Details
Void putAll(Map m)	Puts **all the entries from m into this map**
Object remove(object k)	**Removes the entry** whose key equals k
Int Size()	**Returns the number of key-value paris** in the map
Collection values()	**Returns a collection containing the values** in the map.

UNIT -2 HasMap Class

- **HashMap Class**
  - Uses hashing as a **technique to store key/value pairs so that the values can be searched efficiently according to the key.**
  - There **order is not guaraanteed** by HashMap.
  - **HashMap allow null key and null value pairs to be stored.**
  - **It is not an ordered collection** which means it does not return the keys and values in the same order in which they have been inserted into the HashMap.

UNIT -2 HasMap Class

- **HashMap Class**
  - **HasMap class has follow constructor:**
    - Public HasMap()
    - Public HasMap(Map m)
    - Public HasMap(int initialCapacity)
    - Public HasMap(int initialCapacity, float loadFactor)

- Examples:
  - Hashmap1.java
  - Hashmap2.java
  - Hashmap3.java

UNIT -2 TreeMap

- **TreeMap**
  - TreeMap is **implemented from SortedMap.**
  - This class guarantees that the map **will be in ascending key order**, sorted according to the natural order for the key’s class.
  - TreeMap **contains sorted mapping of key/value pairs.**
  - TreeMap **Not allow null key and null value** pairs to be stored.
- **TreeMap class has follow constructor:**
  - Public TreeMap()
  - Public TreeMap(Comparator c)
  - Public TreeMap(Map p)
  - Public TreeMap(SortedMap m)

UNIT -2 TreeMap Class

- **TreeMap Class**
  - Examples:
    - Treemap1.java

UNIT -2 HashTable

- **HashTable**
  - Like HashMap, Hashtable s**tores key/value pairs** in a hash table.
  - Java Hashtable class **contains unique elements.**
  - Java Hashtable class **doesn't allow null key or value.**
  - A Hashtable is **an array of a list**. Each **list is known as a bucket.** The position of the bucket is identified by calling the **hashcode() method**.
  - A Hashtable contains **values based on the key.**

UNIT -2 HasTable Class

- **HashTable Class**
  - **HashTable class has follow constructor:**
    - Hashtable()
    - Hashtable(int size)
    - Hashtable(int size, float fillRatio)
    - Hashtable(Map m)
  - Examples:
    - DemoHashtable1.java
    - DemoHashTable.java

UNIT -2 Iterator

- **Iterator**
  - ‘Iterator’ is an **interface which belongs to collection framework.**
  - It **allows us to traverse the collection, access the data element and remove the data elements of the collection.**
  - we can **traverse a List or Set in forward direction.**
  - Before you can access a collection through an iterator, you must obtain one. **Each of the collection classes provides an iterator( ) method** that returns an iterator to the start of the collection.

UNIT -2 Iterator

Method	Details
boolean hasNext( )	Returns **true if there are more elements**. Otherwise, returns false.
Object next( )	Returns **the next element.** Throws **NoSuchElementException** if there is not a next element.
void remove( )	**Removes the current element.** Throws **IllegalStateException** if an attempt is made to call remove( ) that is not preceded by a call to next( ).

- Examples:
  - DemoIterator.java

UNIT -2 ListIterator

- **ListIterator**
  - ‘ListIterator’ in Java is an Iterator which **allows users to traverse Collection in both direction.**
  - It **extends Iterator interface.**
  - It is **useful only for List implemented classes.**
  - Unlike Iterator, **It supports all four operations: CRUD (CREATE, READ, UPDATE and DELETE).**
  - Unlike Iterator, **It supports both Forward Direction and Backward Direction iterations.**
  - It is a **Bi-directional Iterator.**

UNIT -2 ListIterator

Method	Details
void add(Object obj)	**Inserts obj into the list** in front of the element that will be returned by the next call to next( ).
boolean hasNext( )	**Returns true if there is a next element.** Otherwise, returns false.
boolean hasPrevious( )	**Returns true if there is a previous element.** Otherwise, returns false.
Object next( )	**Returns the next element.** A **NoSuchElementException** is thrown if there is not a next element.
int nextIndex( )	**Returns the index of the next element.** If there is not a next element, returns the size of the list.

UNIT -2 ListIterator

Method	Details
Object previous( )	**Returns the previous element.** A NoSuchElementException is thrown if there is not a previous element.
int previousIndex( )	**Returns the index of the previous element.** If there is not a previous element, returns -1.
void remove( )	**Removes the current element from the list.** An **IllegalStateException** is thrown if remove( ) is called before next( ) or previous( ) is invoked.
void set(Object obj)	**Assigns obj to the current element.** This is the element last returned by a call to either next( ) or previous( )

Examples:
DemoListIterator.java