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Java Programming
Lab assignment 08
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Java Program to Join Two ListsJava Program to Implement the queue data structure

Theory: The queue is a linear data structure that follows the FIFO rule (first in first out). We can implement Queue for not only Integers but also Strings, Float, or Characters. There are 5 primary operations in Queue:

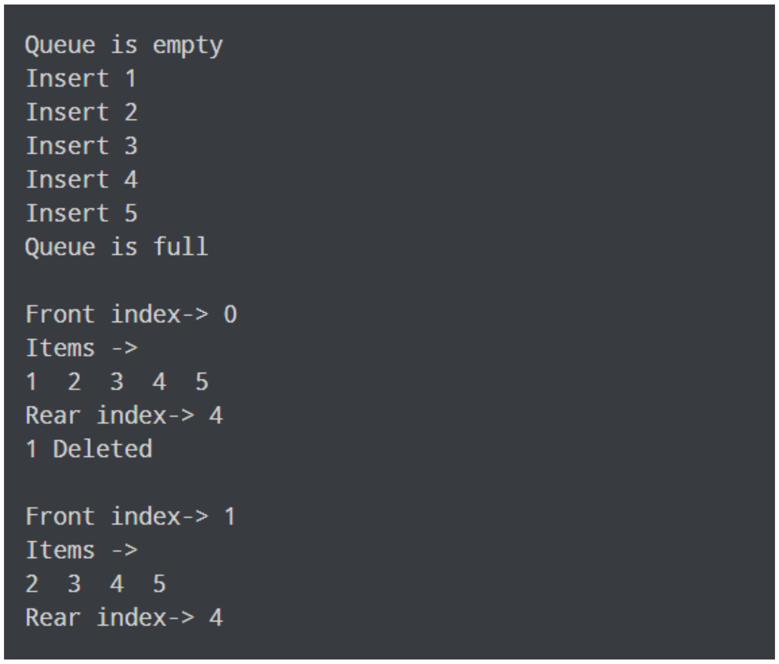
1. enqueue() adds element x to the front of the queue
2. dequeue() removes the last element of the queue
3. front() returns the front element
4. rear() returns the rear element
5. empty() returns whether the queue is empty or not

Code:
```
public class Queue {
  int SIZE = 5;
  int items[] = new int[SIZE];
  int front, rear;

  Queue() {
    front = -1;
    rear = -1;
  }

  // check if the queue is full
  boolean isFull() {
    if (front == 0 && rear == SIZE - 1) {
      return true;
    }
    return false;
  }
```

```
// check if the queue is empty
boolean isEmpty() {
  if (front == -1)
    return true;
  else
    return false;
}

// insert elements to the queue
void enQueue(int element) {

  // if queue is full
  if (isFull()) {
    System.out.println("Queue is full");
  }
  else {
    if (front == -1) {
      // mark front denote first element of queue
      front = 0;
    }

    rear++;
    // insert element at the rear
    items[rear] = element;
    System.out.println("Insert " + element);
  }
}

// delete element from the queue
int deQueue() {
  int element;

  // if queue is empty
  if (isEmpty()) {
    System.out.println("Queue is empty");
    return (-1);
  }
  else {
    // remove element from the front of queue
    element = items[front];
    // if the queue has only one element
    if (front >= rear) {
      front = -1;
      rear = -1;
    }
    else {
      // mark next element as the front
      front++;
    }
    System.out.println( element + " Deleted");
    return (element);
  }
}

// display element of the queue
void display() {
  int i;
  if (isEmpty()) {
    System.out.println("Empty Queue");
  }
  else {
    // display the front of the queue
    System.out.println("\nFront index-> " + front);

    // display element of the queue
    System.out.println("Items -> ");
    for (i = front; i <= rear; i++)
      System.out.print(items[i] + "  ");

    // display the rear of the queue
    System.out.println("\nRear index-> " + rear);
  }
}

public static void main(String[] args) {

  // create an object of Queue class
  Queue q = new Queue();
```

```
    // try to delete element from the queue
    // currently queue is empty
    // so deletion is not possible
    q.deQueue();

    // insert elements to the queue
    for(int i = 1; i < 6; i ++) {
      q.enQueue(i);
    }

    // 6th element can't be added to queue because queue is full
    q.enQueue(6);

    q.display();

    // deQueue removes element entered first i.e. 1
    q.deQueue();

    // Now we have just 4 elements
    q.display();

  }
}
```

Output:



```
Queue is empty
Insert 1
Insert 2
Insert 3
Insert 4
Insert 5
Queue is full

Front index-> 0
Items ->
1  2  3  4  5
Rear index-> 4
1 Deleted

Front index-> 1
Items ->
2  3  4  5
Rear index-> 4
```

Learning Outcome: We have implemented the queue data structure in Java.

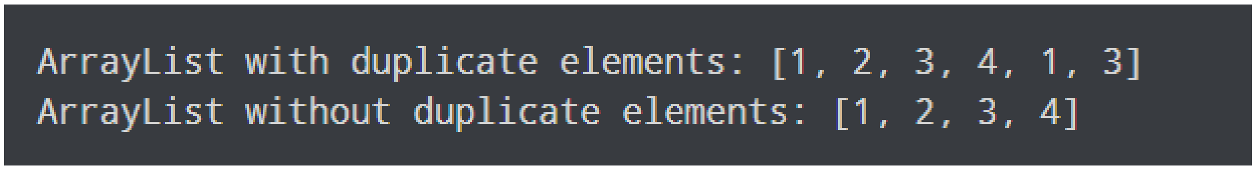
Java Program to Remove duplicate elements from ArrayList

Theory: To remove duplicate elements from the arraylist, we have Here, we have used the LinkedHashSet to create a set. It is because it removes the duplicate elements and maintains insertion order.

Code:

```
import java.util.ArrayList;
import java.util.Arrays;
import java.util.LinkedHashSet;
import java.util.Set;

class Main {
  public static void main(String[] args) {

    // create an arraylist from the array
    // using asList() method of the Arrays class
    ArrayList<Integer> numbers = new ArrayList<>(Arrays.asList(1, 2, 3, 4, 1, 3));
    System.out.println("ArrayList with duplicate elements: " + numbers);

    // convert the arraylist into a set
    Set<Integer> set = new LinkedHashSet<>();
    set.addAll(numbers);

    // delete al elements of arraylist
    numbers.clear();

    // add element from set to arraylist
    numbers.addAll(set);
    System.out.println("ArrayList without duplicate elements: " + numbers);
  }
}
```

Output:



```
ArrayList with duplicate elements: [1, 2, 3, 4, 1, 3]
ArrayList without duplicate elements: [1, 2, 3, 4]
```

Learning Outcome:
We have created an arraylist named numbers. The arraylist contains duplicate elements. To remove duplicate elements from the arraylist, we have add all elements from arraylist to set empty the arraylist using clear() method to add all elements from set to arraylist. Here, we have used the LinkedHashSet to create a set. It is because it removes the duplicate elements and maintains insertion order.