LAB CYCLE 4

1. Create a Graphics package that has classes and interfaces for figures Rectangle, Triangle, Square and Circle. Test the package by finding the area of these figures.

package_graphics

```
 package package_graphics;
interface interface_graphics
{
public float recArea(int l, int h);
public float cirArea(int r);
public float squArea(int a);
public float triArea(int l, int h);
}
public class package_graphics implements interface_graphics
 {
public float recArea(int l, int h)
{
return l*h;
}
public float cirArea(int r)
{
return r*r*(float)3.14;
}
public float squArea(int a)
{
return a*a;
}
public float triArea(int l, int h)
{
return l*h*(float)(.5);
}
}
```

C4Q1

```
 import package_graphics.*;
import java.util.Scanner;
public class C4Q1
 {
public static void main(String []args)
{
package_graphics testObj = new package_graphics();
int l,h,r,a,c,d;
Scanner s=new Scanner(System.in);
System.out.println("Enter the length for rectangle:");
l=s.nextInt();
System.out.println("Enter the breadth for rectangle:");
h=s.nextInt();
System.out.println("Enter the radius of circle:");
r=s.nextInt();
System.out.println("Enter the side for Square:");
a=s.nextInt();
System.out.println("Enter the breadth for triangle:");
c=s.nextInt();
System.out.println("Enter the height for triangle:");
d=s.nextInt();
System.out.println("Area of rectangle="+testObj.recArea(l,h));
System.out.println("Area of circle="+testObj.cirArea(r));
System.out.println("Area of square="+testObj.squArea(a));
System.out.println("Area of triangle="+testObj.triArea(c,d));
System.out.println();
System.out.println("Name: Athul Ajay");
System.out.println("Reg No: SJC22MCA-017");
System.out.println("Date: 22/06/2023");
System.out.println("Course code: 20MCA132");
System.out.println();
}
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q1$ javac C4Q1.java
sjcet@Z238-UL:~/Athul/Java/C4/Q1$ java C4Q1
Enter the length for rectangle:
5
Enter the breadth for rectangle:
3
Enter the radius of circle:
4
Enter the side for Square:
6
Enter the breadth for triangle:
5
Enter the height for triangle:
6
Area of rectangle=15.0
Area of circle=50.24
Area of square=36.0
Area of triangle=15.0

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```

2 .Create an Arithmetic package that has classes and interfaces for the 4 basic arithmetic operations. Test the package by implementing all operations on two given numbers

arithmetic

Addition

```
package arithmetic;

public interface Addition {
    public double add(double num1, double num2);
}
```

Subtraction

```
package arithmetic;

public interface Subtraction {
    public double subtract(double num1, double num2);
}
```

Multiplication

```
package arithmetic;

public interface Multiplication {
    public double multiply(double num1, double num2);
}
```

Division

```
package arithmetic;

public interface Division {
    public double divide(double num1, double num2);
}
```

ArithmeticOperation

```
package arithmetic;

public class ArithmeticOperations implements Addition, Subtraction, Multiplication,
Division {
```

```
    @Override
    public double add(double num1, double num2) {
        return num1 + num2;
    }

    @Override
    public double subtract(double num1, double num2) {
        return num1 - num2;
    }

    @Override
    public double multiply(double num1, double num2) {
        return num1 * num2;
    }

    @Override
    public double divide(double num1, double num2) {
        if (num2 == 0) {
            throw new ArithmeticException("Division by zero error!");
        }
        return num1 / num2;
    }
}
```

ArithmeticMain

```
import arithmetic.ArithmeticOperations;
import java.util.Scanner;

public class ArithmeticMain {
    public static void main(String[] args) {
            System.out.println();
            System.out.println("Name: Athul Ajay");
            System.out.println("Reg No: SJC22MCA-017");
            System.out.println("Date: 26/06/2023");
            System.out.println("Course code: 20MCA132");
            System.out.println();
        ArithmeticOperations operations = new ArithmeticOperations();

       Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the first number: ");
        double num1 = scanner.nextDouble();

        System.out.print("Enter the second number: ");
```

```
        double num2 = scanner.nextDouble();

        System.out.println("Addition: " + operations.add(num1, num2));
        System.out.println("Subtraction: " + operations.subtract(num1, num2));
        System.out.println("Multiplication: " + operations.multiply(num1, num2));
        System.out.println("Division: " + operations.divide(num1, num2));

    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q2$ javac ArithmeticMain.java
sjcet@Z238-UL:~/Athul/Java/C4/Q2$ java ArithmeticMain

Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 26/06/2023
Course code: 20MCA132

Enter the first number: 5
Enter the second number: 77
Addition: 82.0
Subtraction: -72.0
Multiplication: 385.0
Division: 0.06493506493506493
sjcet@Z238-UL:~/Athul/Java/C4/Q2$
```

3. Write a user defined exception class to authenticate the user name and password.

```
import java.util.Scanner;

class authException extends Exception
{

public authException(String s) {
super(s);
}

}
public class C4Q3
{
public static void main(String[] args) {
System.out.println();
System.out.println("Name: Athul Ajay");
System.out.println("Reg No: SJC22MCA-017");
System.out.println("Date: 22/06/2023");
System.out.println("Course code: 20MCA132");
System.out.println();
String username = "student";
String passcode = "student123";
String user_name,password;
Scanner sc = new Scanner(System.in);
try
{
System.out.println("Enter the username:");
user_name = sc.nextLine();

System.out.println("Enter the password:");
password = sc.nextLine();
if(username.equals(user_name) && passcode.equals(password))
{
System.out.println("Authentication successful...");
}
else
throw new authException("Invalid user credentials");

}
catch(authException e)
{
System.out.println("Exception caught "+e);
}
}
```

```
}
```

Output:

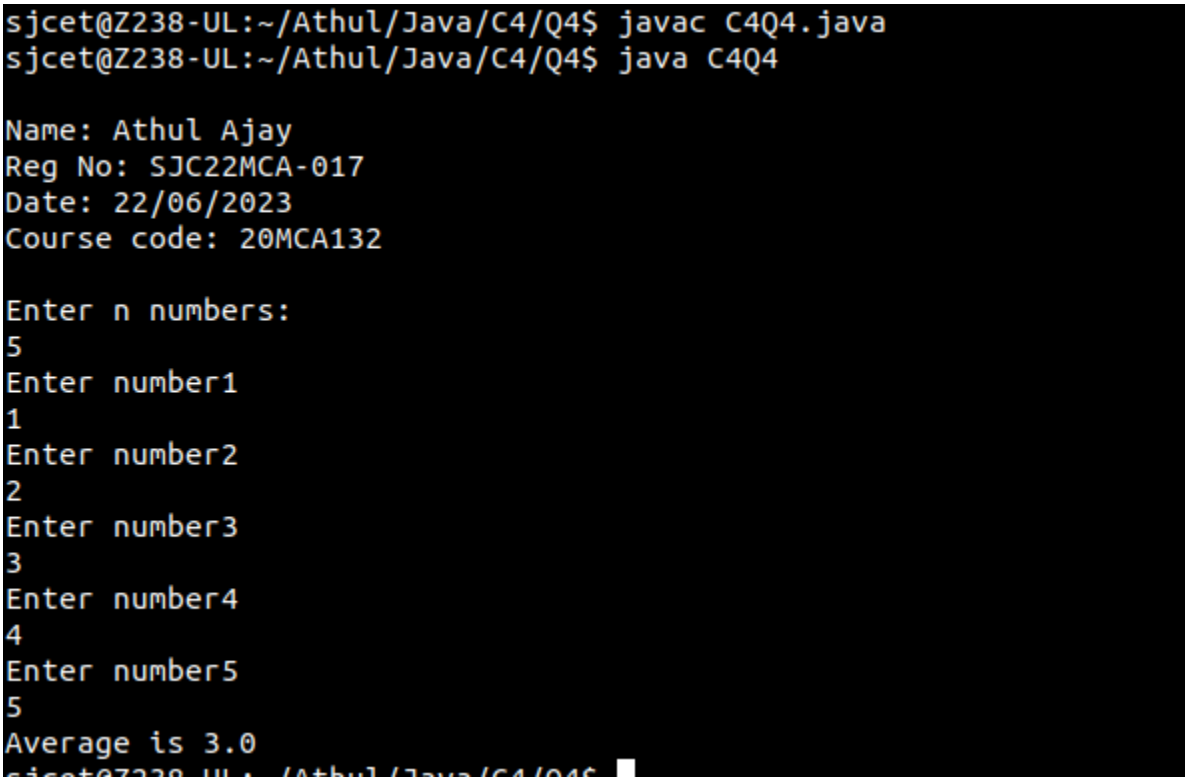
```
sjcet@Z238-UL:~/Athul/Java/C4/Q3$ javac C4Q3.java
sjcet@Z238-UL:~/Athul/Java/C4/Q3$
sjcet@Z238-UL:~/Athul/Java/C4/Q3$ java C4Q3

Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 22/06/2023
Course code: 20MCA132

Enter the username:
student
Enter the password:
student123
Authentication successful...
sjcet@Z238-UL:~/Athul/Java/C4/Q3$
```

4 .Find the average of N positive integers, raising a user defined exception for each negative input.

```
import java.util.Scanner;
class NegException extends Exception
{
public NegException(String s)
{
super(s);
}
}

public class C4Q4 {
public static void main(String[] args)
{
System.out.println();
System.out.println("Name: Athul Ajay");
System.out.println("Reg No: SJC22MCA-017");
System.out.println("Date: 22/06/2023");
System.out.println("Course code: 20MCA132");
System.out.println();
int i;
double sum=0,avg=0;
Scanner sc=new Scanner(System.in);
System.out.println("Enter n numbers:");
int n=sc.nextInt();

for(i=1;i<=n;i++)
{
try
{
System.out.println("Enter number"+i);
int a=sc.nextInt();
if(a<0)
{
i--;
throw new NegException("Negative numbers not allowed,Try again");
}
else
{
sum=sum+a;
}
}
catch(NegException e)
{
System.out.println("NEGETIVE EXCEPTION OCCURED:"+e);
```

```
}
}
avg=sum/n;
System.out.println("Average is "+avg);
sc.close();
}

}
```

Output:



5. Define 2 classes; one for generating multiplication table of 5 and other for displaying first N prime numbers. Implement using threads. (Thread class)

```
import java.util.ArrayList;
import java.util.List;

class TableGenerator implements Runnable {
    @Override
    public void run() {
        System.out.println("Multiplication table of 5:");
        for (int i = 1; i <= 10; i++) {
            System.out.println("5 x " + i + " = " + (5 * i));
        }
    }
}

class PrimeNumber implements Runnable {
    private int count;

    public PrimeNumber(int count) {
        this.count = count;
    }

    @Override
    public void run() {
        System.out.println("First " + count + " prime numbers:");
        List<Integer> primeNumbers = new ArrayList<>();
        int num = 2;
        while (primeNumbers.size() < count) {
            if (isPrime(num)) {
                primeNumbers.add(num);
            }
            num++;
        }

        for (int prime : primeNumbers) {
            System.out.println(prime);
        }
    }

    private boolean isPrime(int number) {
        if (number <= 1) {
            return false;
        }
```

```
        for (int i = 2; i <= Math.sqrt(number); i++) {
            if (number % i == 0) {
                return false;
            }
        }

        return true;
    }
}

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

System.out.println();
System.out.println("Name: Athul Ajay");
System.out.println("Reg No: SJC22MCA-017");
System.out.println("Date: 26/06/2023");
System.out.println("Course code: 20MCA132");
System.out.println();
System.out.println("_____\n");


        Thread multiplicationTableThread = new Thread(new TableGenerator());
        Thread primeNumberThread = new Thread(new PrimeNumber(10));

        multiplicationTableThread.start();
        primeNumberThread.start();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q5$ javac MainThread.java
sjcet@Z238-UL:~/Athul/Java/C4/Q5$ java MainThread

Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 26/06/2023
Course code: 20MCA132


_____________________________________

Multiplication table of 5:
5 x 1 = 5
5 x 2 = 10
5 x 3 = 15
5 x 4 = 20
5 x 5 = 25
5 x 6 = 30
5 x 7 = 35
5 x 8 = 40
5 x 9 = 45
5 x 10 = 50
First 10 prime numbers:
2
3
5
7
11
13
17
19
23
29
sjcet@Z238-UL:~/Athul/Java/C4/Q5$
```

6. Define 2 classes; one for generating Fibonacci numbers and other for displaying even numbers in a given range. Implement using threads. (Runnable Interface)

```
import java.util.Scanner;
class Fib extends Thread{
int f,n1=0,n2=1,n3;
Fib(int c){
this.f=c;
}
public void run(){
System.out.println("fib is "+n1);
System.out.println("fib is "+n2);
for(int i=2;i<this.f;++i) {
n3=n1+n2;
System.out.println("fib is "+n3);
n1=n2;
n2=n3;
}
}
}
class even extends Thread{
int range;
even(int range){
this.range=range;
}
public void run(){
for(int i=0;i<this.range;i++){
if(i%2==0){
System.out.println("Even num is "+i);
}
}
}
}
public class C4Q6 {
public static void main(String [] args){
System.out.println();
System.out.println("Name: Athul Ajay");
System.out.println("Reg No: SJC22MCA-017");
System.out.println("Date: 26/06/2023");
System.out.println("Course code: 20MCA132");
System.out.println();
int c,range;
Scanner sc=new Scanner(System.in);
System.out.println("Enter the count of Fibinooci");
c=sc.nextInt();
```

```
Fib fi=new Fib(c);
System.out.println("Enter the range of even number");
range=sc.nextInt();
even ev = new even(range);
fi.start();
ev.start();
}
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q6$ javac C4Q6.java
sjcet@Z238-UL:~/Athul/Java/C4/Q6$ java C4Q6

Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 26/06/2023
Course code: 20MCA132

Enter the count of Fibinooci
5
Enter the range of even number
8
fib is 0
fib is 1
Even num is 0
Even num is 2
Even num is 4
Even num is 6
fib is 1
fib is 2
fib is 3
sjcet@Z238-UL:~/Athul/Java/C4/Q6$
```

7. Producer/Consumer using ITC

```
import java.util.LinkedList;

class Buffer {
    private LinkedList<Integer> buffer;
    private int capacity;

    public Buffer(int capacity) {
        this.buffer = new LinkedList<>();
        this.capacity = capacity;
    }

    public void produce(int value) throws InterruptedException {
        synchronized (this) {
            while (buffer.size() == capacity) {
                wait();
            }

            buffer.add(value);
            System.out.println("Produced: " + value);
            notifyAll();
        }
    }

    public void consume() throws InterruptedException {
        synchronized (this) {
            while (buffer.isEmpty()) {
                wait();
            }

            int value = buffer.removeFirst();
            System.out.println("Consumed: " + value);
            notifyAll();
        }
    }
}

class Producer implements Runnable {
    private Buffer buffer;
    private int numProductions;

    public Producer(Buffer buffer, int numProductions) {
        this.buffer = buffer;
        this.numProductions = numProductions;
```

```
    }

    @Override
    public void run() {
        for (int i = 0; i < numProductions; i++) {
            try {
                buffer.produce(i);
                Thread.sleep(1000);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

class Consumer implements Runnable {
    private Buffer buffer;
    private int numConsumptions;

    public Consumer(Buffer buffer, int numConsumptions) {
        this.buffer = buffer;
        this.numConsumptions = numConsumptions;
    }

    @Override
    public void run() {
        for (int i = 0; i < numConsumptions; i++) {
            try {
                buffer.consume();
                Thread.sleep(2000);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}

public class ProducerConsumerITC {
    public static void main(String[] args) {
    System.out.println();
    System.out.println("Name: Athul Ajay");
    System.out.println("Reg No: SJC22MCA-017");
    System.out.println("Date: 26/06/2023");
    System.out.println("Course code: 20MCA132");
    System.out.println();
        Buffer buffer = new Buffer(5);
```

```
        int numProductions = 10;
        int numConsumptions = 10;

        Producer producer = new Producer(buffer, numProductions);
        Consumer consumer = new Consumer(buffer, numConsumptions);

        Thread producerThread = new Thread(producer);
        Thread consumerThread = new Thread(consumer);

        producerThread.start();
        consumerThread.start();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q7$ javac ProducerConsumerITC.java
sjcet@Z238-UL:~/Athul/Java/C4/Q7$ java ProducerConsumerITC

Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 26/06/2023
Course code: 20MCA132

Produced: 0
Consumed: 0
Produced: 1
Consumed: 1
Produced: 2
Produced: 3
Consumed: 2
Produced: 4
Produced: 5
Consumed: 3
Produced: 6
Produced: 7
Consumed: 4
Produced: 8
Produced: 9
Consumed: 5
Consumed: 6
Consumed: 7
Consumed: 8
Consumed: 9
sjcet@Z238-UL:~/Athul/Java/C4/Q7$
```

8. Program to create a generic stack and do the Push and Pop operations.

```
import java.util.Scanner;
public class Stackop {
    int top=-1,ch,item,i;
    int a[] = new int[10];
    Scanner sc = new Scanner(System.in);
    public static void main(String[] args) {
      Stackop  obj = new Stackop ();
        obj.stack();
        }

    public void stack(){
    System.out.println("Name: Athul Ajay");
    System.out.println("Reg No: SJC22MCA-017");
    System.out.println("Date: 26/06/2023");
    System.out.println("Course code: 20MCA132");
    System.out.println();
     System.out.println("Enter the size of the array:");
            int N=sc.nextInt();

        while(ch<3) {

            System.out.println("\t Choose : ");
            System.out.println("\n 1.Push \n 2.Pop \n 3.Exit \n");
            System.out.println("\n Enter your choice:");
            ch=sc.nextInt();
        switch(ch){
        case 1:
            System.out.println("Enter the element to be inserted:");
            item=sc.nextInt();
            if(top==N-1) {
                System.out.println("Stack overflow!");
            }
            else {
                top++;
                a[top]=item;
            }
            break;
        case 2:
            if(top==-1) {
                System.out.println("Stack is empty");
            }
            else {
                item=a[top];
```

```
            top--;
            System.out.println("Deleted element is:" +item);
          }
          break;
       case 3 : break;
       default : System.out.println("\n Invalid choice");
       }
       if(top < 0){
       System.out.println("\n Stack is empty");
         }
       else{
       System.out.println("\n Stack is \n");
       for(i=top;i>=0;i--){
       System.out.println(a[i]);
             }
        }
       }
   }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q8$ javac Stackop.java
sjcet@Z238-UL:~/Athul/Java/C4/Q8$ java Stackop
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 26/06/2023
Course code: 20MCA132

Enter the size of the array:
2
         Choose :

 1.Push
 2.Pop
 3.Exit


 Enter your choice:
1
Enter the element to be inserted:
1

 Stack is

1
         Choose :

 1.Push
 2.Pop
 3.Exit


 Enter your choice:
2
Deleted element is:1

 Stack is empty
         Choose :

 1.Push
 2.Pop
 3.Exit


 Enter your choice:
```

9. Using generic method perform Bubble sort

```
import java.util.*;

class driver {


   void sort(int arr[])
   {
      int n = arr.length;
      for(int i =0;i < n-1;i++)
      {
         for(int j=0;j<n-i-1;j++)
         {
            if(arr[j] > arr[j+1])
            {
               int temp = arr[j];
               arr[j]=arr[j+1];
               arr[j+1]= temp;
            }
         }
      }
   }

   void display(int arr[])
   {
      System.out.println("Sorted Array :");
      int n = arr.length;
      for(int i=0;i<n;i++)
      {
         System.out.print(arr[i]+ " ");
      }
   }

   public static void main(String[] args)
   {
 System.out.println("Name: Athul Ajay");
   System.out.println("Reg No: SJC22MCA-017");
   System.out.println("Date: 26/06/2023");
   System.out.println("Course code: 20MCA132");
   System.out.println();
      int n,e;
      System.out.println("Enter size of Array :");
      Scanner inp =new Scanner(System.in);
      n = inp.nextInt();
```

```
        int[] arr = new int[n];
        for(int i=0;i<n;i++)
        {
            System.out.println("Enter element :");
            e = inp.nextInt();
            arr[i]=e;
        }

        driver ob = new driver();
        ob.sort(arr);
        ob.display(arr);

    }

}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q9$ javac driver.java
sjcet@Z238-UL:~/Athul/Java/C4/Q9$ java driver
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 26/06/2023
Course code: 20MCA132

Enter size of Array :
5
Enter element :
2
Enter element :
8
Enter element :
6
Enter element :
10
Enter element :
3
Sorted Array :
2 3 6 8 10 sjcet@Z238-UL:~/Athul/Java/C4/Q9$
```

10. Maintain a list of Strings using ArrayList from collection framework, perform built-in operations.

```
import java.util.ArrayList;
import java.util.Collections;
import java.util.List;
import java.util.Scanner;

public class C4Q10 {
    public static void main(String[] args) {
        // Create an ArrayList to store strings
        List<String> stringList = new ArrayList<>();

        Scanner scanner = new Scanner(System.in);
        System.out.println("Name: Athul Ajay");
            System.out.println("Reg No: SJC22MCA-017");
            System.out.println("Date: 27/06/2023");
            System.out.println("Course code: 20MCA132");
            System.out.println();
        System.out.print("Enter the number of strings to add: ");
        int numStrings = scanner.nextInt();
        scanner.nextLine(); // Consume the newline character

        // Add elements to the list based on user input
        for (int i = 0; i < numStrings; i++) {
            System.out.print("Enter string #" + (i + 1) + ": ");
            String input = scanner.nextLine();
            stringList.add(input);
        }

        // Display the elements in the list
        System.out.println("Original list: " + stringList);

        // Get the size of the list
        int size = stringList.size();
        System.out.println("Size of the list: " + size);

        // Check if the list is empty
        boolean isEmpty = stringList.isEmpty();
        System.out.println("Is the list empty? " + isEmpty);

        // Access elements by index
        String firstElement = stringList.get(0);
        String lastElement = stringList.get(size - 1);
        System.out.println("First element: " + firstElement);
```

```
        System.out.println("Last element: " + lastElement);

        // Sort the list in ascending order
        Collections.sort(stringList);
        System.out.println("List after sorting in ascending order: " + stringList);

        // Check if an element exists in the list
        System.out.print("Enter a string to check if it exists in the list: ");
        String searchString = scanner.nextLine();
        boolean containsString = stringList.contains(searchString);
        System.out.println("Does the list contain '" + searchString + "'? " + containsString);

        // Remove an element from the list
        System.out.print("Enter a string to remove from the list: ");
        String removeString = scanner.nextLine();
        boolean removed = stringList.remove(removeString);
        System.out.println("Element '" + removeString + "' removed? " + removed);
        System.out.println("List after removing an element: " + stringList);

        // Clear the list
        stringList.clear();
        System.out.println("List after clearing all elements: " + stringList);

        scanner.close();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q10$ javac C4Q10.java
sjcet@Z238-UL:~/Athul/Java/C4/Q10$ java C4Q10
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

Enter the number of strings to add: 3
Enter string #1: Java
Enter string #2: Python
Enter string #3: Ruby
Original list: [Java, Python, Ruby]
Size of the list: 3
Is the list empty? false
First element: Java
Last element: Ruby
List after sorting in ascending order: [Java, Python, Ruby]
Enter a string to check if it exists in the list: Ruby
Does the list contain 'Ruby'? true
Enter a string to remove from the list: Python
Element 'Python' removed? true
List after removing an element: [Java, Ruby]
List after clearing all elements: []
sjcet@Z238-UL:~/Athul/Java/C4/Q10$
```

11. Program to remove all the elements from a linked list

```
import java.util.*;

public class C4Q11 {
    public static  void main(String[] args){
        System.out.println("Name: Athul Ajay");
            System.out.println("Reg No: SJC22MCA-017");
            System.out.println("Date: 27/06/2023");
            System.out.println("Course code: 20MCA132");
            System.out.println();
        LinkedList<String> L=new LinkedList<>();
        L.add("Gold");
        L.add("Silver");
        L.add("Bronze");
        L.add(0,"Olympics Medals");
        System.out.println(L);
        L.remove("Bronze");
        System.out.println(L);
        L.remove(2);
        System.out.println(L);
        L.removeLast();
        System.out.println(L);
        L.removeFirst();
        System.out.println(L);


    }

}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q11$ javac C4Q11.java
sjcet@Z238-UL:~/Athul/Java/C4/Q11$ java C4Q11
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

[Olympics Medals, Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver]
[Olympics Medals, Gold]
[Olympics Medals]
[]
sjcet@Z238-UL:~/Athul/Java/C4/Q11$
```

12. Program to remove an object from the Stack when the position is passed as parameter

```
import java.util.Stack;

public class C4Q12 {
    public static void removeElementAtPosition(Stack<String> stack, int position) {
        if (position >= 1 && position <= stack.size()) {
            Stack<String> tempStack = new Stack<>();

            // Remove elements from the original stack until the desired position is reached
            for (int i = 1; i < position; i++) {
                tempStack.push(stack.pop());
            }

            // Remove the element at the desired position
            stack.pop();

            // Restore the remaining elements back to the original stack
            while (!tempStack.isEmpty()) {
                stack.push(tempStack.pop());
            }

            System.out.println("Element at position " + position + " removed successfully.");
        } else {
            System.out.println("Invalid position. Please provide a valid position within the
stack range.");
        }
    }

    public static void main(String[] args) {
        Stack<String> stack = new Stack<>();
        stack.push("Element 1");
        stack.push("Element 2");
        stack.push("Element 3");
        stack.push("Element 4");
        stack.push("Element 5");

        int positionToRemove = 3;

        System.out.println("Before removal: " + stack);
        removeElementAtPosition(stack, positionToRemove);
        System.out.println("After removal: " + stack);
        System.out.println("Name: Athul Ajay");
             System.out.println("Reg No: SJC22MCA-017");
```

```
            System.out.println("Date: 27/06/2023");
            System.out.println("Course code: 20MCA132");
            System.out.println();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q12$ javac C4Q12.java
sjcet@Z238-UL:~/Athul/Java/C4/Q12$ java C4Q12
Before removal: [Element 1, Element 2, Element 3, Element 4, Element 5]
Element at position 3 removed successfully.
After removal: [Element 1, Element 2, Element 4, Element 5]
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

sjcet@Z238-UL:~/Athul/Java/C4/Q12$
```

13. Program to demonstrate the creation of queue object using the PriorityQueue class

```
import java.util.PriorityQueue;
import java.util.Scanner;

public class C4Q13{
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);

      // Create an empty priority queue
      PriorityQueue<Integer> queue = new PriorityQueue<>();
      System.out.println("Name: Athul Ajay");
          System.out.println("Reg No: SJC22MCA-017");
          System.out.println("Date: 27/06/2023");
          System.out.println("Course code: 20MCA132");
          System.out.println();

      System.out.print("Enter the number of elements to add: ");
      int numElements = scanner.nextInt();

      // Prompt the user to enter elements and add them to the queue
      System.out.println("Enter the elements:");
      for (int i = 0; i < numElements; i++) {
         int element = scanner.nextInt();
         queue.offer(element);
      }

      System.out.println("Queue elements:");

      // Print and remove elements from the queue until it becomes empty
      while (!queue.isEmpty()) {
         System.out.println(queue.poll());
      }

      scanner.close();
   }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q13$ javac C4Q13.java
sjcet@Z238-UL:~/Athul/Java/C4/Q13$ java C4Q13
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

Enter the number of elements to add: 4
Enter the elements:
38
45
12
29
Queue elements:
12
29
38
45
sjcet@Z238-UL:~/Athul/Java/C4/Q13$
```

14. Program to demonstrate the addition and deletion of elements in deque

```
import java.util.Deque;
import java.util.LinkedList;
import java.util.Scanner;

public class C4Q14 {
    public static void main(String[] args) {
        Deque<Integer> deque = new LinkedList<>();

        Scanner scanner = new Scanner(System.in);
        System.out.println("Name: Athul Ajay");
            System.out.println("Reg No: SJC22MCA-017");
            System.out.println("Date: 27/06/2023");
            System.out.println("Course code: 20MCA132");
            System.out.println();
        while (true) {
            System.out.println("1. Add element at the front");
            System.out.println("2. Add element at the end");
            System.out.println("3. Remove element from the front");
            System.out.println("4. Remove element from the end");
            System.out.println("5. Print elements in the deque");
            System.out.println("6. Exit");
            System.out.print("Enter your choice: ");
            int choice = scanner.nextInt();

            switch (choice) {
                case 1:
                    System.out.print("Enter the element to add at the front: ");
                    int elementFront = scanner.nextInt();
                    deque.addFirst(elementFront);
                    System.out.println("Element added at the front.");
                    break;
                case 2:
                    System.out.print("Enter the element to add at the end: ");
                    int elementEnd = scanner.nextInt();
                    deque.addLast(elementEnd);
                    System.out.println("Element added at the end.");
                    break;
                case 3:
                    if (!deque.isEmpty()) {
                        int removedFront = deque.removeFirst();
                        System.out.println("Element removed from the front: " + removedFront);
                    } else {
```

```
                System.out.println("Deque is empty. No element to remove from the
front.");
            }
            break;
        case 4:
            if (!deque.isEmpty()) {
                int removedEnd = deque.removeLast();
                System.out.println("Element removed from the end: " + removedEnd);
            } else {
                System.out.println("Deque is empty. No element to remove from the
end.");
            }
            break;
        case 5:
            System.out.println("Elements in the deque:");
            for (int element : deque) {
                System.out.println(element);
            }
            break;
        case 6:
            System.out.println("Exiting the program.");
            scanner.close();
            System.exit(0);
        default:
            System.out.println("Invalid choice. Please try again.");
      }
    }
  }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q14$ javac C4Q14.java
sjcet@Z238-UL:~/Athul/Java/C4/Q14$ java C4Q14
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice: 1
Enter the element to add at the front: 23
Element added at the front.
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice: 2
Enter the element to add at the end: 34
Element added at the end.
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice: 1
Enter the element to add at the front: 56
Element added at the front.
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
```

```
Enter your choice: 5
Elements in the deque:
56
23
34
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice: 3
Element removed from the front: 56
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice: 4
Element removed from the end: 34
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice: 5
Elements in the deque:
23
1. Add element at the front
2. Add element at the end
3. Remove element from the front
4. Remove element from the end
5. Print elements in the deque
6. Exit
Enter your choice:
```

15. Program to demonstrate the creation of Set object using the LinkedHashset class

```
import java.util.LinkedHashSet;
import java.util.Scanner;
import java.util.Set;

public class C4Q15 {
    public static void main(String[] args) {
        Set<Integer> set = new LinkedHashSet<>();

        Scanner scanner = new Scanner(System.in);
        System.out.println("Name: Athul Ajay");
            System.out.println("Reg No: SJC22MCA-017");
            System.out.println("Date: 27/06/2023");
            System.out.println("Course code: 20MCA132");
            System.out.println();

        System.out.print("Enter the number of elements to add: ");
        int numElements = scanner.nextInt();

        System.out.println("Enter the elements:");
        for (int i = 0; i < numElements; i++) {
            int element = scanner.nextInt();
            set.add(element);
        }

        System.out.println("Elements in the set:");
        for (int element : set) {
            System.out.println(element);
        }

        scanner.close();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q15$ javac C4Q15.java
sjcet@Z238-UL:~/Athul/Java/C4/Q15$ java C4Q15
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

Enter the number of elements to add: 3
Enter the elements:
33
67
87
Elements in the set:
33
67
87
sjcet@Z238-UL:~/Athul/Java/C4/Q15$
```

16. Write a Java program to compare two hash set

```
import java.util.HashSet;
import java.util.Scanner;
import java.util.Set;

public class C4Q16 {
    public static void main(String[] args) {
        Set<Integer> set1 = new HashSet<>();
        Set<Integer> set2 = new HashSet<>();

        Scanner scanner = new Scanner(System.in);

        // Input for Set 1
        System.out.println("Name: Athul Ajay");
             System.out.println("Reg No: SJC22MCA-017");
             System.out.println("Date: 27/06/2023");
             System.out.println("Course code: 20MCA132");
             System.out.println();
        System.out.print("Enter the number of elements in Set 1: ");
        int numElements1 = scanner.nextInt();
        System.out.println("Enter the elements for Set 1:");
        for (int i = 0; i < numElements1; i++) {
            int element = scanner.nextInt();
            set1.add(element);
        }

        // Input for Set 2
        System.out.print("Enter the number of elements in Set 2: ");
        int numElements2 = scanner.nextInt();
        System.out.println("Enter the elements for Set 2:");
        for (int i = 0; i < numElements2; i++) {
            int element = scanner.nextInt();
            set2.add(element);
        }

        // Comparison
        boolean isEqual = set1.equals(set2);

        // Output
        System.out.println("Set 1: " + set1);
        System.out.println("Set 2: " + set2);
        if (isEqual) {
            System.out.println("Set 1 and Set 2 are equal.");
        } else {
```

```
            System.out.println("Set 1 and Set 2 are not equal.");
        }

        scanner.close();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q16$ javac C4Q16.java
sjcet@Z238-UL:~/Athul/Java/C4/Q16$ java C4Q16
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

Enter the number of elements in Set 1: 2
Enter the elements for Set 1:
12
32
Enter the number of elements in Set 2: 2
Enter the elements for Set 2:
34
12
Set 1: [32, 12]
Set 2: [34, 12]
Set 1 and Set 2 are not equal.
sjcet@Z238-UL:~/Athul/Java/C4/Q16$
```

17. Program to demonstrate the working of Map interface by adding, changing and removing elements

```
import java.util.HashMap;
import java.util.Map;
import java.util.Scanner;

public class C4Q17{
   public static void main(String[] args) {
      Map<String, Integer> map = new HashMap<>();

      Scanner scanner = new Scanner(System.in);

      // Adding elements to the map
      System.out.println("Name: Athul Ajay");
           System.out.println("Reg No: SJC22MCA-017");
           System.out.println("Date: 27/06/2023");
           System.out.println("Course code: 20MCA132");
           System.out.println();
      System.out.print("Enter the number of elements to add: ");
      int numElements = scanner.nextInt();
      scanner.nextLine(); // Consume the newline character

      System.out.println("Enter the elements (key-value pairs):");
      for (int i = 0; i < numElements; i++) {
         String key = scanner.nextLine();
         int value = scanner.nextInt();
         scanner.nextLine(); // Consume the newline character
         map.put(key, value);
      }

      // Printing the initial map
      System.out.println("Initial Map:");
      printMap(map);

      // Changing an element
      System.out.print("Enter the key to change the value: ");
      String keyToChange = scanner.nextLine();
      if (map.containsKey(keyToChange)) {
         System.out.print("Enter the new value: ");
         int newValue = scanner.nextInt();
         scanner.nextLine(); // Consume the newline character
         map.put(keyToChange, newValue);
         System.out.println("Value changed successfully.");
      } else {
         System.out.println("Key not found in the map.");
```

```
        }

        // Removing an element
        System.out.print("Enter the key to remove the element: ");
        String keyToRemove = scanner.nextLine();
        if (map.containsKey(keyToRemove)) {
            map.remove(keyToRemove);
            System.out.println("Element removed successfully.");
        } else {
            System.out.println("Key not found in the map.");
        }

        // Printing the final map
        System.out.println("Final Map:");
        printMap(map);

        scanner.close();
    }

    private static void printMap(Map<String, Integer> map) {
        for (Map.Entry<String, Integer> entry : map.entrySet()) {
            System.out.println("Key: " + entry.getKey() + ", Value: " + entry.getValue());
        }
        System.out.println();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q17$ javac C4Q17.java
sjcet@Z238-UL:~/Athul/Java/C4/Q17$ java C4Q17
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

Enter the number of elements to add: 2
Enter the elements (key-value pairs):
1
2
3
4
Initial Map:
Key: 1, Value: 2
Key: 3, Value: 4

Enter the key to change the value: 3
Enter the new value: 5
Value changed successfully.
Enter the key to remove the element: 1
Element removed successfully.
Final Map:
Key: 3, Value: 5

sjcet@Z238-UL:~/Athul/Java/C4/Q17$
```

18. Program to Convert HashMap to TreeMap

```
import java.util.HashMap;
import java.util.Map;
import java.util.Scanner;
import java.util.TreeMap;

public class C4Q18{
   public static void main(String[] args) {
      Map<String, Integer> hashMap = new HashMap<>();

      Scanner scanner = new Scanner(System.in);

      // Adding elements to the HashMap
      System.out.println("Name: Athul Ajay");
           System.out.println("Reg No: SJC22MCA-017");
           System.out.println("Date: 27/06/2023");
           System.out.println("Course code: 20MCA132");
           System.out.println();
      System.out.print("Enter the number of elements to add: ");
      int numElements = scanner.nextInt();
      scanner.nextLine(); // Consume the newline character
      System.out.println("Enter the elements (key-value pairs):");
      for (int i = 0; i < numElements; i++) {
         String key = scanner.nextLine();
         int value = scanner.nextInt();
         scanner.nextLine(); // Consume the newline character
         hashMap.put(key, value);
      }

      // Printing the initial HashMap
      System.out.println("Initial HashMap:");
      printMap(hashMap);

      // Converting HashMap to TreeMap
      Map<String, Integer> treeMap = new TreeMap<>(hashMap);

      // Printing the final TreeMap
      System.out.println("Final TreeMap:");
      printMap(treeMap);

      scanner.close();
   }

   private static void printMap(Map<String, Integer> map) {
```

```
        for (Map.Entry<String, Integer> entry : map.entrySet()) {
            System.out.println("Key: " + entry.getKey() + ", Value: " + entry.getValue());
        }
        System.out.println();
    }
}
```

Output:

```
sjcet@Z238-UL:~/Athul/Java/C4/Q18$ javac C4Q18.java
sjcet@Z238-UL:~/Athul/Java/C4/Q18$ java C4Q18
Name: Athul Ajay
Reg No: SJC22MCA-017
Date: 27/06/2023
Course code: 20MCA132

Enter the number of elements to add: 2
Enter the elements (key-value pairs):
2
3
4
5
Initial HashMap:
Key: 2, Value: 3
Key: 4, Value: 5

Final TreeMap:
Key: 2, Value: 3
Key: 4, Value: 5

sjcet@Z238-UL:~/Athul/Java/C4/Q18$
```