

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.

main_graphics.java

```
import package_graphics.*;
import java.util.*;
public class main_graphics {
    public static void main(String []args){
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 16/06/2023");
        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 is: "+testObj.recArea(l,h));
        System.out.println("Area of circle is: "+testObj.cirArea(r));
        System.out.println("Area of square is: "+testObj.squArea(a));
        System.out.println("Area of triangle is: "+testObj.triArea(c,d));
    }
}
```

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);
}
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit main_graphics.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac main_graphics.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java main_graphics
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 16/06/2023
Enter the length for rectangle
6
Enter the breadth for rectangle
4
Enter the radius of circle
3
Enter the side for Square
4
Enter the breadth for triangle
6
Enter the height for triangle
7
Area of rectangle is: 24.0
Area of circle is: 28.26
Area of square is: 16.0
Area of triangle is: 21.0
```

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.**

```
import java.util.Scanner;
public class Arithmetic
{
    public static void main(String args[])
    {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 26/06/2023");
        Scanner s = new Scanner(System.in);
        while(true)
        {
            System.out.println("");
            System.out.println("Enter the two numbers to perform operations ");
            System.out.print("Enter the first number : ");
            int x = s.nextInt();
            System.out.print("Enter the second number : ");
            int y = s.nextInt();
            System.out.println("Choose the operation you want to perform ");
            System.out.println("Choose 1 for ADDITION");
            System.out.println("Choose 2 for SUBTRACTION");
            System.out.println("Choose 3 for MULTIPLICATION");
            System.out.println("Choose 4 for DIVISION");
            System.out.println("Choose 5 for MODULUS");
            System.out.println("Choose 6 for EXIT");
            int n = s.nextInt();
            switch(n)
            {
                case 1:
                    int add;
                    add = x + y;
                    System.out.println("Addition of Two Numbers : "+add);
                    break;

                case 2:
                    int sub;
                    sub = x - y;
                    System.out.println("Subtraction of Two Numbers : "+sub);
                    break;
```

```
case 3:
int mul;
mul = x * y;
System.out.println("Multiplication of Two Numbers : "+mul);
break;

case 4:
float div;
div = (float) x / y;
System.out.print("Division of Two Numbers : "+div);
break;

case 5:
int mod;
mod = x % y;
System.out.println("Modulus of Two Numbers : "+mod);
break;

case 6:
System.exit(0);
}
}
}
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac Arithmetic.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java Arithmetic
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 26/06/2023

Enter the two numbers to perform operations
Enter the first number : 5
Enter the second number : 3
Choose the operation you want to perform
Choose 1 for ADDITION
Choose 2 for SUBTRACTION
Choose 3 for MULTIPLICATION
Choose 4 for DIVISION
Choose 5 for MODULUS
Choose 6 for EXIT
1
Addition of Two Numbers : 8

Enter the two numbers to perform operations
Enter the first number : 3
Enter the second number : 2
Choose the operation you want to perform
Choose 1 for ADDITION
Choose 2 for SUBTRACTION
Choose 3 for MULTIPLICATION
Choose 4 for DIVISION
Choose 5 for MODULUS
Choose 6 for EXIT
5
Modulus of Two Numbers : 1

Enter the two numbers to perform operations
Enter the first number : 4
Enter the second number : 6
Choose the operation you want to perform
Choose 1 for ADDITION
Choose 2 for SUBTRACTION
Choose 3 for MULTIPLICATION
Choose 4 for DIVISION
Choose 5 for MODULUS
Choose 6 for EXIT
6
```

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 Userauthentication
{
    public static void main(String[] args) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 16/06/2023");
        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@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit Userauthentication.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac Userauthentication.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java Userauthentication
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 16/06/2023
Enter the username:
shanu
Enter the password:
123456
Exception caught authException: Invalid user credentials
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java Userauthentication
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 16/06/2023
Enter the username:
student
Enter the password:
student123
Authentication successful...
```

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 Average {
    public static void main(String[] args)
    {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 21/06/2023");
        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("NEGATIVE EXCEPTION OCCURRED:"+e);
        }
    }
}
```



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

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit Average.java  
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac Average.java  
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java Average  
Name: SHANU P J  
RegisterNo: SJC22MCA-2050  
Course Code: 20MCA132  
Date: 21/06/2023  
Enter n numbers:  
3  
Enter number1  
20  
Enter number2  
56  
Enter number3  
76  
Average is 50.666666666666664
```

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

```
import java.util.Scanner;
class mul extends Thread{
    public void run(){
        System.out.println("\n");
        for(int i =0;i<11;i++){
            System.out.println("5*" + i + " = " + 5*i);
        }
    }
}
class prime extends Thread{
    int num;
    public prime(int n){
        this.num=n;
    }
    public void run(){
        int x, y, flg;
        System.out.println("All the Prime numbers within 1 and " + num + " are:");
        for (x = 1; x <= num; x++) {
            if (x == 1 || x == 0)
                continue;
            flg = 1;
            for (y = 2; y <= x / 2; ++y) {
                if (x % y == 0) {
                    flg = 0;
                    break;
                }
            }
            if (flg == 1)
                System.out.print("\n prime number =" + x + " ");
        }
    }
}
public class driver {
    public static void main(String[] args) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 26/06/2023");
        System.out.println("Enter The number");
        Scanner sc = new Scanner(System.in);
```

```
int number = sc.nextInt();
mul obj1 = new mul();
obj1.start();
prime obj2 = new prime(number);
obj2.start();
}
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit driver.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac driver.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java driver
```

Name: SHANU P J

RegisterNo: SJC22MCA-2050

Course Code: 20MCA132

Date: 26/06/2023

Enter The number

5

All the Prime numbers within 1 and 5 are:

prime number =2

prime number =3

prime number =5 5*0 = 0

5*1 = 5

5*2 = 10

5*3 = 15

5*4 = 20

5*5 = 25

5*6 = 30

5*7 = 35

5*8 = 40

5*9 = 45

5*10 = 50

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 mulThread {
    public static void main(String [] args){
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\nDate: 21/06/2023");
        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@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit mulThread.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac mulThread.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java mulThread
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 21/06/2023
enter the count of Fibinooci
4
enter the range of even number
4
even num is 0
even num is 2
fib is 0
fib is 1
fib is 1
fib is 2
```

7. Producer/Consumer using ITC

```
import java.util.ArrayList;
import java.util.List;
class Producer implements Runnable
{
    List<Integer> flist;
    int max_size = 5;
    int i=0;
    Producer(List<Integer> flist)
    {
        this.flist = flist;
    }
    public void run()
    {
        while(true)
        {
            try
            {
                produce(i++);
            } catch (Exception e)
            {
                System.out.println("Interuption "+e);
            }
        }
    }
    public void produce(int i) throws InterruptedException
    {
        synchronized (flist)
        {
            while(flist.size()>=max_size)
            {
                System.out.println("Production full,waiting to consume");
                flist.wait();
            }
        }
        synchronized(flist)
        {
            System.out.println("Producer produced "+i);
            flist.add(i);
            flist.notify();
        }
    }
}
```

```
}  
}  
}  
class Consumer implements Runnable  
{  
    List<Integer> flist;  
    Consumer(List<Integer> flist)  
    {  
        this.flist = flist;  
    }  
    public void run()  
    {  
        while(true)  
        {  
            try  
            {  
                consume();  
            } catch (Exception e)  
            {  
                System.out.println("Exception "+e);  
            }  
        }  
    }  
    public void consume() throws InterruptedException  
    {  
        synchronized (flist)  
        {  
            while(flist.isEmpty())  
            {  
                System.out.println("Fully consumed, Need to produce");  
                flist.notify();  
                Thread.sleep(500);  
                flist.wait();  
            }  
        }  
        synchronized(flist)  
        {  
            Thread.sleep(1000);  
            System.out.println("Consumer consumed "+flist.remove(0));  
        }  
    }  
}
```

```
}  
public class itc {  
    public static void main(String[] args)  
    {  
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code:  
20MCA132\nDate: 26/06/2023");  
        List<Integer> flist = new ArrayList<Integer>();  
        Thread th1 = new Thread(new Producer(flist));  
        Thread th2 = new Thread(new Consumer(flist));  
        th1.start();  
        th2.start();  
    }  
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit itc.java  
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac itc.java  
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java itc  
Name: SHANU P J  
RegisterNo: SJC22MCA-2050  
Course Code: 20MCA132  
Date: 26/06/2023  
Producer produced 0  
Producer produced 1  
Producer produced 2  
Consumer consumed 0  
Consumer consumed 1  
Consumer consumed 2  
Fully consumed, Need to produce  
Producer produced 3  
Producer produced 4  
Producer produced 5  
Producer produced 6  
Producer produced 7  
Production full,waiting to consume  
Consumer consumed 3  
Consumer consumed 4  
Consumer consumed 5
```


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

```
class Stack {
    private int arr[];
    private int top;
    private int capacity;
    Stack(int size) {
        arr = new int[size];
        capacity = size;
        top = -1;
    }
    public void push(int x) {
        if (isFull()) {
            System.out.println("Stack OverFlow");
            System.exit(1);
        }
        System.out.println("Inserting " + x);
        arr[++top] = x;
    }
    public int pop() {
        if (isEmpty()) {
            System.out.println("STACK EMPTY");
            System.exit(1);
        }
        return arr[top--];
    }
    public int getSize() {
        return top + 1;
    }
    public Boolean isEmpty() {
        return top == -1;
    }
    public Boolean isFull() {
        return top == capacity - 1;
    }
    public void printStack() {
        for (int i = 0; i <= top; i++) {
            System.out.print(arr[i] + "\t");
        }
    }
    public static void main(String[] args) {
```

```
System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 21/06/2023");
Stack stack = new Stack(5);
stack.push(1);
stack.push(2);
stack.push(3);
System.out.print("Stack: ");
stack.printStack();
stack.pop();
System.out.println("\nAfter popping out");
stack.printStack();
}
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit Stack.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac Stack.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java Stack
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 21/06/2023
Inserting 1
Inserting 2
Inserting 3
Stack: 1      2      3
After popping out
1      2      sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ █
```

9. Using a generic method, perform Bubble sort.

```
import java.util.Scanner;
class bubble {
    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]+ " ");
        }
        System.out.println("\n");
    }
    public static void main(String[] args)
    {
        int n,e;
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 26/06/2023");
        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;
}
bubble ob = new bubble();
ob.sort(arr);
ob.display(arr);
}
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac bubble.java
^[[Asjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java bubble
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 26/06/2023
Enter size of Array :
3
Enter element :
45
Enter element :
43
Enter element :
32
Sorted Array :
32 43 45
```

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

```
import java.util.*;
public class arraylist{
    public static void main(String[] args){
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 22/06/2023");
        ArrayList<String> arrayList=new ArrayList<>();
        arrayList.add("Bibin");
        arrayList.add("Robin");
        arrayList.add("Tarun");
        arrayList.add("Jack");
        System.out.println("The elements of the arraylist is: "+arrayList);
        Collections.sort(arrayList);
        System.out.println("\nThe ArrayList Sort : "+arrayList);
        Collections.addAll(arrayList,"Karun","Vimal","Shan","Ram","Gibin");
        System.out.println("\nAdding new items in the arraylist is : "+arrayList);
        Collections.sort(arrayList, Collections.reverseOrder());
        System.out.println("\nThe reverse order of the arraylist : "+arrayList);
        System.out.println("\nThe maximum element of the arraylist : "+Collections.max(arrayList));
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac arraylist.java
^[[Asjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java arraylist
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 22/06/2023
The elements of the arraylist is: [Bibin, Robin, Tarun, Jack]

The ArrayList Sort : [Bibin, Jack, Robin, Tarun]

Adding new items in the arraylist is : [Bibin, Jack, Robin, Tarun, Karun, Vimal, Shan, Ram, Gibin]

The reverse order of the arraylist : [Vimal, Tarun, Shan, Robin, Ram, Karun, Jack, Gibin, Bibin]

The maximum element ofthe arraylist : Vimal
```

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

```
import java.util.*;
public class linlist {
    public static void main(String[] args){
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code:
        20MCA132\n Date: 26/06/2023");
        LinkedList<String> L=new LinkedList<>();
        L.add("Gold");
        L.add("Silver");
        L.add("Bronze");
        System.out.println(L);
        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@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit linlist.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac linlist.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java linlist
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 26/06/2023
[Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver]
[Olympics Medals, Gold]
[Olympics Medals]
[]
```

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

```
import java.util.Stack;
public class StackRemove {
    public static void main(String[] args) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 27/06/2023");
        // Create a stack
        Stack<String> stack = new Stack<>();
        // Add elements to the stack
        stack.push("Apple");
        stack.push("Banana");
        stack.push("Orange");
        stack.push("Mango");
        System.out.println("-----OUTPUT-----");
        System.out.println("Stack elements: " + stack);
        // Remove an element from the stack by position
        int positionToRemove = 2; // Position starts from 1
        removeElement(stack, positionToRemove);
        // Print the stack after removal
        System.out.println("Stack after removal: " + stack);
    }
    public static void removeElement(Stack<String> stack, int position) {
        if (stack.isEmpty() || position <= 0 || position > stack.size()) {
            System.out.println("Invalid position or stack is empty.");
            return;
        }
        // Create a temporary stack to hold removed elements
        Stack<String> tempStack = new Stack<>();
        // Remove elements until the desired position
        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());
        }
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit StackRemove.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac StackRemove.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java StackRemove
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 27/06/2023
-----OUTPUT-----
Stack elements: [Apple, Banana, Orange, Mango]
Stack after removal: [Apple, Banana, Mango]
```


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

```
import java.util.*;
class Collection_Framework_Queue {
    public static void main(String args[]) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 23/06/2023");
        Queue<Integer> q = new PriorityQueue<Integer>(new Comp());
        int ch;
        Scanner sc = new Scanner(System.in);
        do {
            System.out.println("\n1.ADD\n2.PEEK\n3.POLL or REMOVE\n4.DISPLAY\n5.EXIT");
            System.out.println("Enter your choice : ");
            ch = sc.nextInt();
            switch (ch) {
                case 1:
                    System.out.println("\n\tEnter Integer : ");
                    int n1 = sc.nextInt();
                    q.add(n1);
                    System.out.println("\n\tADDED SUCCESSFULLY !!! ");
                    break;
                case 2:
                    if (q.isEmpty()) {
                        System.out.print("\n\tQueue Empty ! ! !");
                    } else {
                        System.out.print("\n\tPeeked element is " + q.peek());
                    }
                    break;
                case 3:
                    if (!q.isEmpty()) {
                        System.out.print("\n\tRemoved element is " + q.poll());
                    } else {
                        System.out.print("\n\tQueue Empty ! ! !");
                    }
                    break;
                case 4:
                    if (!q.isEmpty()) {
                        System.out.print("\nSize of queue : " + q.size());
                        System.out.print("\nQueue elements : " + q);
                        System.out.println("\nQueue elements are");
                    }
            }
        } while (ch != 5);
    }
}
```

```
for (int i : q) {
    System.out.println(i);
} else {
    System.out.print("\n\tQueue Empty ! ! !");
}
break;
case 5:
break;
default:
    System.out.println("\n\tPlease enter valid choice ! ! !");
} while (ch != 5);
}
}

class Comp implements Comparator<Integer> {
    public int compare(Integer a, Integer b) {
        return a % 10 > b % 10 ? 1 : -1;
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac Collection_Framework_Queue.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java Collection_Framework_Queue
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 23/06/2023

1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
1

      Enter Integer :
56

      ADDED SUCCESSFULLY ! ! !

1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
1

      Enter Integer :
78

      ADDED SUCCESSFULLY ! ! !

1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
1

      Enter Integer :
90

      ADDED SUCCESSFULLY ! ! !
```

```
1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
2

        Peeked element is 90
1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
3

        Removed element is 90
1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
4

Size of queue : 2
Queue elements : [56, 78]
Queue elements are
56
78

1.ADD
2.PEEK
3.POLL or REMOVE
4.DISPLAY
5.EXIT
Enter your choice :
5
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$
```

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

```
import java.util.*;
class deque
{
    public static void main(String[] args)
    {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 23/06/2023");
        Deque<String> deque = new LinkedList<String>();
        deque.add("Java");
        deque.addFirst("Python");
        deque.addLast("Datastructure");
        deque.push("Web-programming");
        deque.offer("Networking");
        deque.offerFirst("DBMS");
        System.out.println(deque + "\n");
        deque.removeFirst();
        deque.removeLast();
        System.out.println("Deque after removing " + "first and last: " + deque);
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac deque.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java deque
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 23/06/2023
[DBMS, Web-programming, Python, Java, Datastructure, Networking]

Deque after removing first and last: [Web-programming, Python, Java, Datastructure]
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ █
```

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

```
import java.util.*;
public class q15{
    public static void main(String[] args) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code:
        20MCA132\n Date: 27/06/2023");
        LinkedHashSet <Integer> HS = new LinkedHashSet<>();
        HS.add(1);
        HS.add(2);
        HS.add(3);
        HS.add(4);
        HS.add(5);
        System.out.println("Set = "+HS);
        HS.remove(5);
        System.out.println("Set = "+HS);
        int x=HS.size();
        System.out.println("Size of set object= "+x);
        HS.remove(2);
        System.out.println("Set = "+HS);
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit q15.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac q15.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java q15
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 27/06/2023
Set = [1, 2, 3, 4, 5]
Set = [1, 2, 3, 4]
Size of set object= 4
Set = [1, 3, 4]
```

16. Write a Java program to compare two hash set

```
import java.util.*;
public class CompareHash {
    public static void main(String[] args) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 23/06/2023");
        HashSet<String> h_set = new HashSet<String>();
        h_set.add("Red");
        h_set.add("Green");
        h_set.add("Black");
        h_set.add("White");
        HashSet<String>h_set2 = new HashSet<String>();
        h_set2.add("Red");
        h_set2.add("Pink");
        h_set2.add("Black");
        h_set2.add("Orange");
        HashSet<String>result_set = new HashSet<String>();
        for (String element : h_set){
            System.out.println(h_set2.contains(element) ? "Yes" : "No");
        }
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit CompareHash.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac CompareHash.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java CompareHash
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 23/06/2023
Yes
No
Yes
No
```

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 q17{
    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: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\n Date: 27/06/2023");
        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@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac q17.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java q17
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 27/06/2023
Enter the number of elements to add: 3
Enter the elements (key-value pairs):
1
2
3
4
5
6
Initial Map:
Key: 1, Value: 2
Key: 3, Value: 4
Key: 5, Value: 6

Enter the key to change the value: 3
Enter the new value: 9
Value changed successfully.
Enter the key to remove the element: 5
Element removed successfully.
Final Map:
Key: 1, Value: 2
Key: 3, Value: 9
```

18. Program to Convert HashMap to TreeMap

```
import java.util.*;
public class q18{
    public static void main(String args[]) {
        System.out.println("Name: SHANU P J\nRegisterNo: SJC22MCA-2050\nCourse Code: 20MCA132\nDate: 27/06/2023");
        Map<String, String> map = new HashMap<>();
        System.out.println("Enter the limit:");
        Scanner inp = new Scanner(System.in);
        int n= inp.nextInt();
        System.out.println("Enter the Roll number and Name");
        while(n!=0) {
            String e= inp.next();
            String s= inp.next();
            map.put(e, s);
            n--;
        }
        System.out.println("HashMap:"+map);
        Map<String, String> treeMap = new TreeMap<>();
        treeMap.putAll(map);
        System.out.println("TreeMap:"+treeMap);
    }
}
```

OUTPUT

```
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ gedit q18.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ javac q18.java
sjcet@HP-Z238:~/Shanupj/sem2/java/cycle4$ java q18
Name: SHANU P J
RegisterNo: SJC22MCA-2050
Course Code: 20MCA132
Date: 27/06/2023
Enter the limit:
3
Enter the Roll number and Name
7
sharun
1
abhi
9
rudra
HashMap:{1=abhi, 7=sharun, 9=rudra}
TreeMap:{1=abhi, 7=sharun, 9=rudra}
```