CYCLE – 3

1) Area of different shapes using overloaded functions.

Code:

```
import java.util.Scanner;
public class area{
	public static void main(String[] args){
	int s,sa,l,b,ra;
	Scanner sc= new Scanner(System.in);

	System.out.println("Enter side of square : ");
	s=sc.nextInt();
	sa=Square(s);

	System.out.println("Enter length, breadth of reactangle : ");
	l=sc.nextInt();
	b=sc.nextInt();
	ra=Square(l,b);

	System.out.println("Enter length,breadth,height of cuboid : ");
	int cl,cb,ch,ca;
	cl=sc.nextInt();
	cb=sc.nextInt();
	ch=sc.nextInt();
	ca=Square(cl,cb,ch);

	System.out.println("Ashin Siby");
    System.out.println("SJC22MCA-2014");
    System.out.println("07-06-2023");
    System.out.println("");

	System.out.println("Area of square-> "+sa);
	System.out.println("Area of rectangle-> "+ra);
	System.out.println("Area of cuboid-> "+ca);
	}

public static int Square(int x){
int a;
	a=x*x;
	return a;
}
```

```
public static int Square(int x, int y)
{
        int a;
        a=x*y;
        return a;
}

public static int Square(int x,int y,int z)
{
        int a;
        a=2*(x*y)+2*(x*z)+2*(y*z);
        return a;
}
}
```

Output

```
sjcet@Z238-UL:~/ashin/s2/java/cycle 3$ javac area.java
sjcet@Z238-UL:~/ashin/s2/java/cycle 3$ java area
Enter side of square :
2
Enter length, breadth of reactangle :
3
4
Enter length,breadth,height of cuboid :
2
6
7
Ashin Siby
SJC22MCA-2014
07-06-2023

Area of square-> 4
Area of rectangle-> 12
Area of cuboid-> 136
sjcet@Z238-UL:~/ashin/s2/java/cycle 3$
```

2) Create a class 'Employee' with data members Empid, Name, Salary, Address and constructors to initialize the data members. Create another class 'Teacher' that inherit the properties of class employee and contain its own data members department, Subjects taught and constructors to initialize these data members and also include display function to display all the data members. Use array of objects to display details of N teachers.

Code:

```
import java.util.Scanner;
class Employee {
   protected int empId;
   protected String name;
   protected double salary;
   protected String address;
   public Employee(int empId, String name, double salary, String address) {
      this.empId = empId;
      this.name = name;
      this.salary = salary;
      this.address = address;
   }
}
class Teacher extends Employee {
   private String department;
   private String subjectsTaught;

   public Teacher(int empId, String name, double salary, String address, String department, String
subjectsTaught) {
      super(empId, name, salary, address);
      this.department = department;
      this.subjectsTaught = subjectsTaught;
   }

  public void display() {
       System.out.println("Employee ID: " + empId);
      System.out.println("Name: " + name);
      System.out.println("Salary: " + salary);
      System.out.println("Address: " + address);
      System.out.println("Department: " + department);
      System.out.println("Subjects Taught: " + subjectsTaught);
      System.out.println("---------------------------");
   }
}
public class Main {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
```

```
    System.out.println("----------------------------");
    System.out.println("Ashin Siby");
    System.out.println("22MCA014");
    System.out.println("09-06-2023");
    System.out.println("----------------------------");
    System.out.print("Enter the number of teachers: ");
    int numTeachers = scanner.nextInt();
    scanner.nextLine(); // Consume the newline character
    Teacher[] teachers = new Teacher[numTeachers];
    for (int i = 0; i < numTeachers; i++) {
    System.out.println("Enter details for Teacher " + (i + 1));
    System.out.print("Employee ID: ");
    int empId = scanner.nextInt();
    scanner.nextLine();
    System.out.print("Name: ");
    String name = scanner.nextLine();
    System.out.print("Salary: ");
    double salary = scanner.nextDouble();
    scanner.nextLine();
    System.out.print("Address: ");
    String address = scanner.nextLine();
    System.out.print("Department: ");
    String department = scanner.nextLine();
    System.out.print("Subjects Taught: ");
    String subjectsTaught = scanner.nextLine();
    teachers[i] = new Teacher(empId, name, salary, address, department, subjectsTaught);
  }
  scanner.close();
  System.out.println("\nDetails of Teachers:");
  for (Teacher teacher : teachers) {
  teacher.display();
  }
 }
}
```

Output

```
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ javac Main.java
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ java Main
---------------------------
Ashin Siby
22MCA014
09-06-2023
---------------------------
Enter the number of teachers: 1
Enter details for Teacher 1
Employee ID: 12
Name: abc
Salary: 123456
Address: asfgy
Department: wert
Subjects Taught: wert

Details of Teachers:
Employee ID: 12
Name: abc
Salary: 123456.0
Address: asfgy
Department: wert
Subjects Taught: wert
---------------------------
```

3) Create a class 'Person' with data members Name, Gender, Address, Age and a constructor to initialize the data members and another class 'Employee' that inherits the properties of class Person and also contains its own data members like Empid, Company_name, Qualification, Salary and its own constructor. Create another class 'Teacher' that inherits the properties of class Employee and contains its own data members like Subject, Department, Teacherid and also contain constructors and methods to display the data members. Use array of objects to display details of N teachers.

Code:

```
import java.util.*;
class Person{
  String Name;
  String Gender;
  String Address;
  String Age;
  public Person(String Name,String Gender,String Address,String Age){
    this.Name=Name;
    this.Gender=Gender;
    this.Address=Address;
    this.Age=Age;
  }
}
class Employee extends Person {
   String Empid;
   String Company_Name;
   String Qualification;
   String Salary;
   public Employee(String Name,String Gender,String Address,String Age ,String Empid,String Company_Name, String Qualification,String Salary){
      super(Name,Gender,Address,Age);
      this.Empid= Empid;
      this.Company_Name=Company_Name;
      this.Qualification=Qualification;
      this.Salary=Salary;
    }
}
class Teacher extends Employee{
     String Teacherid;
     String Department;
     String Subject;
     public Teacher(String Name,String Gender,String Address,String Age,String Empid,String Company_Name,String Qualification,String Salary,String Teacherid,String Department,String Subject){
     super(Name,Gender,Address,Age,Empid,Name,Qualification, Salary);
     this.Teacherid=Teacherid;
     this.Department=Department;
     this.Subject=Subject;
```

```
    }
    public void read(){
    Scanner in =new Scanner(System.in);
    System.out.println("enter the Name=");
    Name=in.nextLine();
    System.out.println("enter the Gender=");
    Gender=in.nextLine();
    System.out.println("enter the Address=");
    Address=in.nextLine();
    System.out.println("enter the Age=");
    Age=in.nextLine();
    System.out.println("enter the Employ id=");
    Empid=in.nextLine();
    System.out.println("enter the Company Name=");
    Company_Name=in.nextLine();
    System.out.println("enter the Qualification=");
    Qualification=in.nextLine();
    System.out.println("enter the Salary=");
    Salary=in.nextLine();
    System.out.println("enter the Teacher id=");
    Teacherid=in.nextLine();
    System.out.println("enter the Department=");
    Department=in.nextLine();
    System.out.println("Enter the Subject=");
    Subject=in.nextLine();
    }
    public void display(){
    System.out.println("_______Employee Details_________");
    System.out.println("Name="+ Name);
    System.out.println("Gender=" + Gender);
    System.out.println("Address=" + Address);
    System.out.println("Age=" + Age);
    System.out.println("Empid=" + Empid);
    System.out.println("Company Name=" + Company_Name);
    System.out.println("Qualification=" + Qualification);
    System.out.println("Salary=" + Salary);
    System.out.println("Teacher id=" + Teacherid);
    System.out.println("Department=" + Department);
    System.out.println("Subject=" + Subject);
    System.out.println("++++++++++++++++++++++++++++++++++++++++++++");
    }
}
public class InheritancePerson{
   public static void main(String Args[]){

    System.out.println("Ashin Siby");
```

```
    System.out.println("SJC22MCA-2014");
    System.out.println("07-06-2023");
    System.out.println("20MCA132 , Object Oriented Programming Lab \n\n");
    int i,n;
    Scanner in =new Scanner(System.in);
    System.out.println("Enter the Number of employee=");
    n=in.nextInt();
    Teacher T[] = new Teacher[n];
    for(i=0;i<n;i++){
        T[i]=new

Teacher("Name","Gender","Address","Age","Empid","Name","Qualification","Salary","Teacherid","Dep
artment","Subject");
        T[i].read();
    }
    for(i=0;i<n;i++){
       T[i].display();
    }
  }
}
```

Output

```
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ java InheritancePerson
Ashin Siby
SJC22MCA-2014
07-06-2023
20MCA132 , Object Oriented Programming Lab


Enter the Number of employee=
1
enter the Name=
sad
enter the Gender=
sfs
enter the Address=
fs
enter the Age=
43
enter the Employ id=
534
enter the Company Name=
fsdr
enter the Qualification=
gtdr
enter the Salary=
5436546
enter the Teacher id=
34
enter the Department=
fg
Enter the Subject=
freg
_______Employee Details________
Name=sad
Gender=sfs
Address=fs
Age=43
Empid=534
Company Name=fsdr
Qualification=gtdr
Salary=5436546
Teacher id=34
Department=fg
Subject=freg
++++++++++++++++++++++++++++++++++++++++++++
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$
```

4) Write a program has class Publisher, Book, Literature and Fiction. Read the information and print the details of books from either the category, using inheritance.

Code:

```
import java.util.Scanner;
class Publisher{
  int publisher_id;
  String publisher_name;
  Publisher(int publisher_id, String publisher_name){
    this.publisher_id= publisher_id;
    this.publisher_name= publisher_name;
  }
}
class Book extends Publisher{
  int book_id;
  String book_name;
  Book(int publisher_id, String publisher_name, int book_id, String book_name) {
    super(publisher_id, publisher_name);
    this.book_id= book_id;
    this.book_name= book_name;
  }
}
class Literature extends Book{
  int literature_id;
  String literature_theme;
  Literature(int publisher_id, String publisher_name, int book_id, String book_name, int literature_id,
String literature_theme) {
    super(publisher_id, publisher_name, book_id, book_name);
    this.literature_id= literature_id;
    this.literature_theme= literature_theme;
}
void displayDetails() {
  System.out.println("The publisher ID of the book is: " + this.publisher_id);
  System.out.println("The publisher name of the book is: " + this.publisher_name);
  System.out.println("The Book ID of the book is: " + this.book_id);
  System.out.println("The Book name of the book is: " + this.book_name);
  System.out.println("The Literature ID of the book is: " + this.literature_id);
  System.out.println("The Literature theme of the book is: " + this.literature_theme);
  }
}
class Fiction extends Book{
  int fiction_id;
  String fiction_theme;
  Fiction(int publisher_id, String publisher_name, int book_id, String book_name, int fiction_id, String
fiction_theme) {
```

```
    super(publisher_id, publisher_name, book_id, book_name);
    this.fiction_id= fiction_id;
    this.fiction_theme= fiction_theme;
  }
  void displayDetails() {
    System.out.println("The publisher ID of the book is: " + this.publisher_id);
    System.out.println("The publisher name of the book is: " + this.publisher_name);
    System.out.println("The Book ID of the book is: " + this.book_id);
    System.out.println("The Book name of the book is: " + this.book_name);
    System.out.println("The Fiction ID of the book is: " + this.fiction_id);
    System.out.println("The Fiction theme of the book is: " + this.fiction_theme);
  }
}
public class BookInheritance {
   public static void main(String[] args) {

      System.out.println("Ashin Siby");
      System.out.println("SJC22MCA-2014");
      System.out.println("10-06-2023");
      System.out.println("20MCA132 , Object Oriented Programming Lab \n\n");
      Literature literature= new Literature(10,"Robert Kiyozaki",200,"Rich Dad Poor
Dad",2001,"Drama");
      Fiction fiction= new Fiction(101, "F. Scott Fitzgerald", 301, "The Great Gatsby",301, "Fantasy-
Fiction");
      literature.displayDetails();
      System.out.println("\n");
      fiction.displayDetails();
   }
}
```

Output

```
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ javac BookInheritance.java
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ java BookInheritance
Ashin Siby
SJC22MCA-2014
10-06-2023
20MCA132 , Object Oriented Programming Lab


The publisher ID of the book is: 10
The publisher name of the book is: Robert Kiyozaki
The Book ID of the book is: 200
The Book name of the book is: Rich Dad Poor Dad
The Literature ID of the book is: 2001
The Literature theme of the book is: Drama


The publisher ID of the book is: 101
The publisher name of the book is: F. Scott Fitzgerald
The Book ID of the book is: 301
The Book name of the book is: The Great Gatsby
The Fiction ID of the book is: 301
The Fiction theme of the book is: Fantasy-Fiction
```

5) Create classes Student and Sports. Create another class Result inherited from Student and Sports. Display the academic and sports score of a student.

Code:

```
import java.util.Scanner;
class student{
  int roll;
  String name;
  int phy,eng,maths;
  student(){
    Scanner sc1= new Scanner(System.in);
    System.out.println("Enter the roll number:");
    roll =sc1.nextInt();
    System.out.println("Enter name:");
    name=sc1.next();
    System.out.println("Enter physics mark:");
    phy =sc1.nextInt();
    System.out.println("Enter english mark:");
    eng =sc1.nextInt();
    System.out.println("Enter maths mark:");
    maths =sc1.nextInt();
  }
}
class sports extends student{
    int fscore,cscore;
     sports(){
       Scanner sc2= new Scanner(System.in);
       System.out.println("Enter football score:");
       fscore=sc2.nextInt();
       System.out.println("Enter Cricket score:");
       cscore=sc2.nextInt();
     }
}
class Result extends sports{
     void display(){
       System.out.println("Academic Details"+"\n"+" ");
       System.out.println("Name : " + name);
       System.out.println("Roll No : " + roll);
       System.out.println("");
       System.out.println("MARKS" +"\n" + " ");
       System.out.println("Physics :" + phy);
       System.out.println("English :" + eng);
       System.out.println("Maths :" + maths);
       System.out.println("Total subject mark:"+(phy+eng+maths));
       System.out.println("");
```

```
        System.out.println("SPORTS SCORE" +"\n"+" ");
        System.out.println("Football : " + fscore);
        System.out.println("Cricket : " + cscore);
        System.out.println("Total Sports mark:"+(fscore+cscore));
    }
}
public class FResult{
   public static void main(String[] args) {
      System.out.println("Ashin Siby");
      System.out.println("SJC22MCA-2014");
      System.out.println("12-06-2023");
      System.out.println("20MCA132 , Object Oriented Programming Lab \n\n");
      Result rs =new Result();
      rs.display();
    }
}
```

Output

```
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ javac FResult.java
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ java FResult
Ashin Siby
SJC22MCA-2014
12-06-2023
20MCA132 , Object Oriented Programming Lab


Enter the roll number:
1
Enter name:
abc
Enter physics mark:
45
Enter english mark:
48
Enter maths mark:
44
Enter football score:
40
Enter Cricket score:
45
Academic Details

Name : abc
Roll No : 1

MARKS

Physics :45
English :48
Maths :44
Total subject mark:137

SPORTS SCORE

Football : 40
Cricket : 45
Total Sports mark:85
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$
```

6) Create an interface having prototypes of functions area() and perimeter(). Create two classes Circle and Rectangle which implements the above interface. Create a menu driven program to find area and perimeter of objects.

Code:

```
import java.util.*;
import java.lang.*;
interface Shape {
  float pi = 3.14F;
  float area();
  float perimeter();
}
class Circle implements Shape {
  Scanner sc = new Scanner(System.in);
  int r;
  public float area() {
  System.out.print("Enter the radius : ");
  r = Integer.parseInt(sc.nextLine());
  return (pi * r * r);
  }
  public float perimeter() {
   System.out.print("Enter the radius : ");
   r = Integer.parseInt(sc.nextLine());
   return (2 * pi * r);
  }
}
class Rectangle implements Shape {
  Scanner sc = new Scanner(System.in);
  int l, b;
  public float area() {
    System.out.print("Enter the Length : ");
    l = Integer.parseInt(sc.nextLine());
    System.out.print("Enter the breadth : ");
    b = Integer.parseInt(sc.nextLine());
   return (l * b);
   }
   public float perimeter() {
      System.out.print("Enter the Length : ");
      l = Integer.parseInt(sc.nextLine());
      System.out.print("Enter the breadth : ");
      b = Integer.parseInt(sc.nextLine());
      return (2 * (l + b));
    }
}
```

```
class ShapeInterface {
   public static void main(String args[]) {
     System.out.println("Ashin Siby");
     System.out.println("SJC22MCA-2014");
     System.out.println("13-06-2023");
     System.out.println("20MCA132 , Object Oriented Programming Lab \n\n");
     Scanner sc = new Scanner(System.in);
     Circle c = new Circle();
     Rectangle r = new Rectangle();
     int ch;
     while (true) {
       System.out.println("1:Area of Circle");
       System.out.println("2:Perimeter of Circle");
       System.out.println("3:Area of Rectangle");
       System.out.println("4:Perimter of Rectangle");
       System.out.println("5:EXIT");
       System.out.print("Enter choice : ");
       ch = Integer.parseInt(sc.nextLine());
       switch (ch) {
          case 1:
          float ar = c.area();
          System.out.println("Area :" + ar);
          System.out.println("**----------** --------- **");
          break;
          case 2:
          float pr = c.perimeter();
          System.out.println("Perimeter of Circle = "+pr);
          System.out.println("**----------** --------- **");
          break;
          case 3:
          float a = r.area();
          System.out.println("Area :" + a);
          System.out.println("**----------** --------- **");
          break;
          case 4:
          float pr1 = r.perimeter();
          System.out.println("Perimeter of Rectangle = "+pr1);
          System.out.println("**----------** --------- **");
          break;
          case 5:
          System.out.println("Exiting the Program!!!!!");
          System.exit(0);
          default:
          System.out.println("invalid!");
       }
    }
```

```
  }
}
```

Output

```
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ javac ShapeInterface.java
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ java ShapeInterface
Ashin Siby
SJC22MCA-2014
13-06-2023
20MCA132 , Object Oriented Programming Lab


1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 1
Enter the radius : 2
Area :12.56
**----------** --------- **
1:Area of Circle
2:Perimeter of Circle
3:Area of Rectangle
4:Perimter of Rectangle
5:EXIT
Enter choice : 2
Enter the radius : 4
Perimeter of Circle = 25.12
**----------** --------- **
```

7)Prepare bill with the given format using calculate method from interface.

Order No.

Date :

Product Id	Name	Quantity	unit price	Total
101	A	2	25	50
102	B	1	100	100
			Net. Amount	150

Code:

```
import java.text.SimpleDateFormat;
import java.util.Date;
interface bill{
  void cal();
}
class details1 implements bill{
  int pid=101,q=2,uprice=25,t1;
  String name1="A";
  public void cal(){
  t1=q*uprice;
 }
}
class details2 extends details1 {
  int pid2=102,q2=1,uprice2=100,t2;
  String name2="B";
  SimpleDateFormat f=new SimpleDateFormat("dd/MM/yy");
  Date d= new Date();
  public void cal(){
    super.cal();
    t2=q2*uprice2;
}
public void display(){
  System.out.println("Order No.384\n");
  System.out.println("Date: "+f.format(d));
  System.out.println("\nProduct Id\tName\t\tQuantity\tunit price\tTotal");

System.out.println("_____
_____");
  System.out.println(pid+"\t\t"+name1+"\t\t"+q+"\t\t"+uprice+"\t\t"+t1);
  System.out.println(pid2+"\t\t"+name2+"\t\t"+q2+"\t\t"+uprice2+"\t\t"+t2);
```

```
System.out.println("_____
_____");
   System.out.println("\t\t\t\t\t\tNet.Amount"+"\t"+(t1+t2));
  }
}
public class Electricitybill{
  public static void main(String[] args) {
   System.out.println("Ashin Siby");
   System.out.println("SJC22MCA-2014");
   System.out.println("15-06-2023");
   System.out.println("20MCA132 , Object Oriented Programming Lab \n\n");
  details2 obj2=new details2();
  obj2.cal();
  obj2.display();
 }
}
```

Output

```
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ javac Electricitybill.java
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$ java Electricitybill
Ashin Siby
SJC22MCA-2014
15-06-2023
20MCA132 , Object Oriented Programming Lab


Order No.384

Date: 16/06/23

Product Id      Name            Quantity        unit price      Total
_____________________________________________________________________
101             A               2               25              50
102             B               1               100             100
_____________________________________________________________________
                                                Net.Amount      150
ashin@ashin-B250M-D3H:~/s2/java/cycle 3$
```

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.

   Code:

   Main_graphics

```
import package_graphics.*;
import java.util.*;
public class main_graphics
{
public static void main(String []args)
{
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("----------------------------");
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));
}
}
```

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

```
PS D:\java-main\java-main\cycle 4\q1> javac main_graphics.java
PS D:\java-main\java-main\cycle 4\q1> java main_graphics
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter the length for rectangle
4
Enter the breadth for rectangle
3
Enter the radius of circle
3
Enter the side for Square
4
Enter the breadth for triangle
5
Enter the height for triangle
4
 Area of rectangle= 12.0
 Area of circle= 28.26
 Area of square= 16.0
 Area of triangle= 10.0
PS D:\java-main\java-main\cycle 4\q1>
```

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

Code:

ArithmeticMain

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

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

System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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));
}
}
```

Addition

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

Division

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

Multiplication

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

Subtraction

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

ArithmeticOperations

```
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;
}
}
```

Output

```
PS D:\java-main\java-main\cycle 4\q2> javac ArithmeticMain.java
PS D:\java-main\java-main\cycle 4\q2> java ArithmeticMain
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter the first number: 5
Enter the second number: 3
Addition: 8.0
Subtraction: 2.0
Multiplication: 15.0
Division: 1.6666666666666667
PS D:\java-main\java-main\cycle 4\q2>
```

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

Code:

```
import java.util.Scanner;

class authException extends Exception{

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

public class Q3{
public static void main(String[] args){
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("----------------------------");
String username = "student";
String passcode = "student123";
String user_name,password;
Scanner sc = new Scanner(System.in);
try
{
System.out.println("Enter username: ");
user_name = sc.nextLine();

System.out.println("Enter 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

```
PS D:\java-main\java-main\cycle 4> javac Q3.java
PS D:\java-main\java-main\cycle 4> java Q3
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter username:
student
Enter password:
student123
Authentication successful...
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
import java.util.Scanner;
class NegException extends Exception{
public NegException(String s){
super(s);
}
}
public class Q4 {
public static void main(String[] args){
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q4.java
PS D:\java-main\java-main\cycle 4> java Q4
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter n numbers:
3
Enter number1
4
Enter number2
5
Enter number3
6
Average is 5.0
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
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 Q5 {
public static void main(String[] args) {
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("--------------------------");

Thread multiplicationTableThread = new Thread(new TableGenerator());
Thread primeNumberThread = new Thread(new PrimeNumber(10));
multiplicationTableThread.start();
primeNumberThread.start();
}
}
```

Output

```
PS D:\java-main\java-main\cycle 4> javac Q5.java
PS D:\java-main\java-main\cycle 4> java Q5
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Multiplication table of 5:
First 10 prime numbers:
2
3
5
7
11
13
17
19
23
29
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
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
import java.util.Scanner;

class Fibonacci implements Runnable {
private int count;
public Fibonacci(int count) {
this.count = count;
}
@Override
public void run() {
System.out.println("Fibonacci numbers:");
int num1 = 0;
int num2 = 1;
System.out.println(num1);
System.out.println(num2);

for (int i = 2; i < count; i++) {
int fib = num1 + num2;
System.out.println(fib);
num1 = num2;
num2 = fib;
}
}
}

class EvenNumber implements Runnable {
private int start;
private int end;

public EvenNumber(int start, int end) {
this.start = start;
this.end = end;
}

@Override
public void run() {
System.out.println("Even numbers from " + start + " to " + end + ":");
for (int i = start; i <= end; i++) {
if (i % 2 == 0) {
System.out.println(i);
}
}
}
```

```
}
public class Q6 {
public static void main(String[] args) {

System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("-------------------------");
Scanner scanner = new Scanner(System.in);
System.out.print("Enter the count of Fibonacci numbers: ");
int fibonacciCount = scanner.nextInt();
System.out.print("Enter the start of the range for even numbers: ");
int start = scanner.nextInt();
System.out.print("Enter the end of the range for even numbers: ");
int end = scanner.nextInt();
scanner.close();
Thread fibonacciThread = new Thread(new Fibonacci(fibonacciCount));
Thread evenNumberThread = new Thread(new EvenNumber(start, end));
fibonacciThread.start();
evenNumberThread.start();
}
}
```

Output

```
PS D:\java-main\java-main\cycle 4> javac Q6.java
PS D:\java-main\java-main\cycle 4> java Q6
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
-------------------------
Enter the count of Fibonacci numbers: 6
Enter the start of the range for even numbers: 3
Enter the end of the range for even numbers: 9
Fibonacci numbers:
0
1
1
2
3
5
Even numbers from 3 to 9:
4
6
8
PS D:\java-main\java-main\cycle 4>
```

7) Producer/Consumer using ITC

Code

```
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 Q7 {
public static void main(String[] args) {
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q7.java
PS D:\java-main\java-main\cycle 4> java Q7
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
-------------------------
Produced: 0
Consumed: 0
Produced: 1
Produced: 2
Consumed: 1
Produced: 3
Produced: 4
Consumed: 2
Produced: 5
Consumed: 3
Produced: 6
Produced: 7
Consumed: 4
Produced: 8
Produced: 9
Consumed: 5
Consumed: 6
Consumed: 7
Consumed: 8
Consumed: 9
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
import java.util.Scanner;
public class Q8 {
int top=-1,ch,item,i;
int a[] = new int[10];
Scanner sc = new Scanner(System.in);
public static void main(String[] args) {
Q8  obj = new Q8 ();
obj.stack();
}

public void stack(){
System.out.println("Ashin Siby");
System.out.println("22MCA014");
System.out.println("26-06-2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q8.java
PS D:\java-main\java-main\cycle 4> java Q8
Ashin Siby
22MCA014
26-06-2023
---------------------------
Enter the size of the array:
3
        Choose :

 1.push
 2.pop
 3.exit


 Enter your choice:
1
Enter the element to be inserted:
4

 stack is

4
        Choose :

 1.push
 2.pop
 3.exit


 Enter your choice:
3

 stack is

4
PS D:\java-main\java-main\cycle 4>
```

9) Using generic method perform Bubble sort.

Code

```
import java.util.Arrays;
import java.util.Scanner;

public class Q9{
public static void main(String[] args) {
Scanner scanner = new Scanner(System.in);
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("----------------------------");
System.out.print("Enter the size of the array: ");
int size = scanner.nextInt();

int[] array = new int[size];
System.out.println("Enter the elements of the array:");
for (int i = 0; i < size; i++) {
array[i] = scanner.nextInt();
}

System.out.print("Enter 'A' for ascending order or 'D' for descending order: ");
String order = scanner.next().toUpperCase();
System.out.println("Before sorting: " + Arrays.toString(array));

if (order.equals("A")) {
bubbleSortAscending(array);
System.out.println("After sorting in ascending order: " + Arrays.toString(array));
} else if (order.equals("D")) {
bubbleSortDescending(array);
System.out.println("After sorting in descending order: " + Arrays.toString(array));
} else {
System.out.println("Invalid choice. Please enter 'A' or 'D' for the order.");
}

scanner.close();
}

public static void bubbleSortAscending(int[] array) {
int n = array.length;

for (int i = 0; i < n - 1; i++) {
for (int j = 0; j < n - i - 1; j++) {
if (array[j] > array[j + 1]) {
```

```
// Swap array[j] and array[j+1]
int temp = array[j];
array[j] = array[j + 1];
array[j + 1] = temp;
}
}
}
}

public static void bubbleSortDescending(int[] array) {
int n = array.length;

for (int i = 0; i < n - 1; i++) {
for (int j = 0; j < n - i - 1; j++) {
if (array[j] < array[j + 1]) {
// Swap array[j] and array[j+1]
int temp = array[j];
array[j] = array[j + 1];
array[j + 1] = temp;
}
}
}
}
}
```

Output

```
PS D:\java-main\java-main\cycle 4> javac Q9.java
PS D:\java-main\java-main\cycle 4> java Q9
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter the size of the array: 2
Enter the elements of the array:
4
2
Enter 'A' for ascending order or 'D' for descending order: A
Before sorting: [4, 2]
After sorting in ascending order: [2, 4]
PS D:\java-main\java-main\cycle 4>
```

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

Code

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

public class Q10 {
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 : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q10.java
PS D:\java-main\java-main\cycle 4> java Q10
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter the number of strings to add: 2
Enter string #1: Ashin
Enter string #2: Siby
Original list: [Ashin, Siby]
Size of the list: 2
Is the list empty? false
First element: Ashin
Last element: Siby
List after sorting in ascending order: [Ashin, Siby]
Enter a string to check if it exists in the list: Ashin
Does the list contain 'Ashin'? true
Enter a string to remove from the list: Ashin
Element 'Ashin' removed? true
List after removing an element: [Siby]
List after clearing all elements: []
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
import java.util.*;

public class Q11 {
public static  void main(String[] args){
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q11.java
PS D:\java-main\java-main\cycle 4> java Q11
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
[Olympics Medals, Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver]
[Olympics Medals, Gold]
[Olympics Medals]
[]
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
import java.util.Stack;
public class Q12 {
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("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("----------------------------");
System.out.println("Before removal: " + stack);
removeElementAtPosition(stack, positionToRemove);
System.out.println("After removal: " + stack);
}
}
```

Output

```
PS D:\java-main\java-main\cycle 4> javac Q12.java
PS D:\java-main\java-main\cycle 4> java Q12
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
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]
PS D:\java-main\java-main\cycle 4>
```

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

Code

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

public class Q13{
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("Ajesh B Nair");
System.out.println("SJC22MCA-2003");
System.out.println("22 June 2023");

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

```
PS D:\java-main\java-main\cycle 4> javac Q13.java
PS D:\java-main\java-main\cycle 4> java Q13
Ajesh B Nair
SJC22MCA-2003
22 June 2023
Enter the number of elements to add: 4
Enter the elements:
3
4
2
1
Queue elements:
1
2
3
4
PS D:\java-main\java-main\cycle 4>
```

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

Code

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

public class Q14 {
public static void main(String[] args) {
Deque<Integer> deque = new LinkedList<>();

Scanner scanner = new Scanner(System.in);
System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q14.java
PS D:\java-main\java-main\cycle 4> java Q14
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
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 queue
6. Exit
Enter your choice: 1
Enter the element to add at the front: 3
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 queue
6. Exit
Enter your choice: 5
Elements in the queue:
3
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 queue
6. Exit
Enter your choice:
```

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

Code

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

public class Q15 {
public static void main(String[] args) {
Set<Integer> set = new LinkedHashSet<>();

Scanner scanner = new Scanner(System.in);

System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q15.java
PS D:\java-main\java-main\cycle 4> java Q15
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
---------------------------
Enter the number of elements to add: 2
Enter the elements:
3
4
Elements in the set:
3
4
PS D:\java-main\java-main\cycle 4>
```

16)Write a Java program to compare two hash set

Code

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

public class Q16 {
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 : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q16.java
PS D:\java-main\java-main\cycle 4> java Q16
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
-------------------------
Enter the number of elements in Set 1: 2
Enter the elements for Set 1:
3
4
Enter the number of elements in Set 2: 2
Enter the elements for Set 2:
7
8
Set 1: [3, 4]
Set 2: [7, 8]
Set 1 and Set 2 are not equal.
PS D:\java-main\java-main\cycle 4>
```

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

Code

```
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 : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
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

```
PS D:\java-main\java-main\cycle 4> javac Q17.java
PS D:\java-main\java-main\cycle 4> java Q17
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
---------------------------
Enter the number of elements to add: 3
Enter the elements (key-value pairs):
4
5
6
7
1
2
Initial Map:
Key: 1, Value: 2
Key: 4, Value: 5
Key: 6, Value: 7

Enter the key to change the value: 1
Enter the new value: 10
Value changed successfully.
Enter the key to remove the element: 6
Element removed successfully.
Final Map:
Key: 1, Value: 10
Key: 4, Value: 5

PS D:\java-main\java-main\cycle 4>
```

18) Program to Convert HashMap to TreeMap.

Code

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

public class Q18{
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.print("Enter the number of elements to add: ");
int numElements = scanner.nextInt();
scanner.nextLine(); // Consume the newline character

System.out.println("Name : Ashin Siby");
System.out.println("Reg No: 22MCA014");
System.out.println("Course Code and Name: 20MCA132, Object Oriented Programming Lab");
System.out.println("Date:23/06/2023");
System.out.println("----------------------------");
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

```
PS D:\java-main\java-main\cycle 4> javac Q18.java
PS D:\java-main\java-main\cycle 4> java Q18
Enter the number of elements to add: 3
Name : Ashin Siby
Reg No: 22MCA014
Course Code and Name: 20MCA132, Object Oriented Programming Lab
Date:23/06/2023
--------------------------
Enter the elements (key-value pairs):
4
5
2
3
8
9
Initial HashMap:
Key: 2, Value: 3
Key: 4, Value: 5
Key: 8, Value: 9

Final TreeMap:
Key: 2, Value: 3
Key: 4, Value: 5
Key: 8, Value: 9

PS D:\java-main\java-main\cycle 4>
```