17. 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 :

```
import graphics.util.*;
import java.util.Scanner;

class Area {
   public static void main(String [] arg) {
      Scanner scanner = new Scanner(System.in);
                  System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Area of different shapes using packages.\nDate : 15/04/2024\n");
      System.out.println("Enter the details of rectangle.");
      System.out.print("Height : ");
      double height = scanner.nextDouble();
      System.out.print("Width : ");
      double width = scanner.nextDouble();
      Rectangle rec = new Rectangle(height, width);

      System.out.println("Enter the details of circle.");
      System.out.print("Radius : ");
      double radius = scanner.nextDouble();
      Circle cir = new Circle(radius);

      System.out.println("Enter the details of square.");
      System.out.print("Side : ");
      double side = scanner.nextDouble();
      Square sq = new Square(side);

      System.out.println("Enter the details of Triangle.");
      System.out.print("Height : ");
      height = scanner.nextDouble();
      System.out.print("Base : ");
      double base = scanner.nextDouble();
      Triangle tr = new Triangle(height, base);

      System.out.println("");
      rec.area();
      cir.area();
      sq.area();
      tr.area();
   }
```

```
}
```

graphics/Circle.java

```
package graphics.util;

public class Circle {
   double radius;
   public Circle(double radius){
      this.radius = radius;
   }
   public void area(){
      System.out.println("Area of circle is : " + (this.radius * this.radius * Math.PI));
   }
}
```

graphics/Rectangle.java

```
package graphics.util;

public class Rectangle {
   double height, width;
   public Rectangle(double height, double width){
      this.height = height;
      this.width = width;
   }
   public void area(){
      System.out.println("Area of rectangle is : " + (this.height * this.width));
   }
}
```

graphics/Square.java

```
package graphics.util;

public class Square {
   double side;
   public Square(double side){
      this.side = side;
   }
   public void area(){
      System.out.println("Area of square is : " + (this.side * this.side));
   }
}
```

graphics/Triangle.java

```
package graphics.util;

public class Triangle {
   double height, base;
   public Triangle(double height, double base){
      this.height = height;
      this.base = base;
   }
   public void area(){
      System.out.println("Area of triangle is : " + (this.height * this.base * 0.5));
   }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac Area.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java Area
Name : Sreyas Satheesh
Roll.no : 53
Title : Area of different shapes using packages.
Date : 15/04/2024

Enter the details of rectangle.
Height : 3
Width : 4
Enter the details of circle.
Radius : 3
Enter the details of square.
Side : 2
Enter the details of Triangle.
Height : 3
Base : 5

Area of rectangle is : 12.0
Area of circle is : 28.274333882308138
Area of square is : 4.0
Area of triangle is : 7.5
```

18. 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 :

```
import arithmatic.util.*;
import java.util.Scanner;

class Arithmatic {
   public static void main(String [] args) {
                System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Arithmatic operations using package.\nDate : 15/04/2024\n");
      double a, b;
      Scanner scanner = new Scanner(System.in);
      System.out.println("Enter the values to add");
      System.out.print("a : ");
      a = scanner.nextDouble();
      System.out.print("b : ");
      b = scanner.nextDouble();
      Add add = new Add(a, b);
      add.result();

      System.out.println("\nEnter the values to substract");
      System.out.print("a : ");
      a = scanner.nextDouble();
      System.out.print("b : ");
      b = scanner.nextDouble();
      Sub sub = new Sub(a, b);
      sub.result();

      System.out.println("\nEnter the values to multiply");
      System.out.print("a : ");
      a = scanner.nextDouble();
      System.out.print("b : ");
      b = scanner.nextDouble();
      Mul mul = new Mul(a, b);
      mul.result();

      System.out.println("\nEnter the values to division");
      System.out.print("a : ");
      a = scanner.nextDouble();
      System.out.print("b : ");
      b = scanner.nextDouble();
```

```
        Div div = new Div(a, b);
        div.result();
    }
}
```

arithmatic/Add.java

```
package arithmatic.util;

public class Add {
    double a, b;
    public Add(double a, double b){
        this.a = a;
        this.b = b;
    }
    public void result(){
        System.out.println(this.a + " + " + this.b + " = " + (this.a + this.b));
    }
}
```

arithmatic/Div.java

```
package arithmatic.util;

public class Div {
    double a, b;
    public Div(double a, double b){
        this.a = a;
        this.b = b;
    }
    public void result(){
        System.out.println(this.a + " / " + this.b + " = " + ((double)this.a / this.b));
    }
}
```

arithmatic/Mul.java

```
package arithmatic.util;

public class Mul {
    double a, b;
    public Mul(double a, double b){
        this.a = a;
        this.b = b;
```

```
    }
    public void result(){
        System.out.println(this.a + " x " + this.b + " = " + (this.a * this.b));
    }
}
```

arithmatic/Sub.java

```
package arithmatic.util;

public class Sub {
    double a, b;
    public Sub(double a, double b){
        this.a = a;
        this.b = b;
    }
    public void result(){
        System.out.println(this.a + " - " + this.b + " = " + (this.a - this.b));
    }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac Arithmatic.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java Arithmatic
Name : Sreyas Satheesh
Roll.no : 53
Title : Arithmatic operations using package.
Date : 15/04/2024

Enter the values to add
a : 10
b : 20
10.0 + 20.0 = 30.0

Enter the values to substract
a : 12
b : 5
12.0 - 5.0 = 7.0

Enter the values to multiply
a : 2
b : 3
2.0 x 3.0 = 6.0

Enter the values to division
a : 6
b : 2
6.0 / 2.0 = 3.0
```

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

Code :

```
import java.util.Scanner;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

class UserDefinedException extends Exception {
   public UserDefinedException(String message){
      super(message);
   }
}

class AuthChecker extends Exception{
   String username, password;
   Pattern usernamePattern = Pattern.compile("^[a-z]{6,}");
   Pattern passwordPattern = Pattern.compile("^(?=.*[a-z])(?=.*[A-
Z])(?=.*\\d).{6,}$");

   public AuthChecker(String username, String password){
      this.username = username;
      this.password = password;
   }
   public boolean usernameChecker(){
      Matcher matcher = usernamePattern.matcher(this.username);
      try {
         if(matcher.find()){
            System.out.println("Username passed...");
            return true;
         } else {
            throw new UserDefinedException("Invalid username (need 6 lowercase
letters)");
         }
      } catch (UserDefinedException e) {
         System.out.println(e.getMessage());
         return false;
      }
   }
   public boolean passwordChecker(){
      Matcher mat = passwordPattern.matcher(this.password);
      try {
         if(mat.find()){
```

```
            System.out.println("Password passed...");
            return true;
         } else {
            throw new UserDefinedException("Password failed (Should contain atleast
1 lowercase, 1 uppercase and 1 digit and minimum 6 characters)");
         }
      } catch (UserDefinedException e) {
         System.out.println(e.getMessage());
         return false;
      }
   }
}
public class Auth {
   public static void main(String [] arg) {
                  System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Username & Password checker.\nDate : 15/04/2024\n");
      Scanner scanner = new Scanner(System.in);
      while(true){
         int flag = 0;
         System.out.print("\nusername : ");
         String username = scanner.nextLine();
         System.out.print("password : ");
         String password = scanner.nextLine();
         AuthChecker auth = new AuthChecker(username, password);
         if(auth.usernameChecker()) flag++;
         if(auth.passwordChecker()) flag++;
         if(flag == 2) break;
      }
   }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac Auth.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java Auth
Name : Sreyas Satheesh
Roll.no : 53
Title : Username & Password checker.
Date : 15/04/2024


username : sreyas
password : sreyas
Username passed...
Password failed (Should contain atleast 1 lowercase, 1 uppercase and 1 digit and minimum 6 characters)

username : sreyas
password : Sreyas@786
Username passed...
Password passed...
```

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

Code :

```
import java.util.Scanner;

class NegativeException extends Exception {
   public NegativeException(String message) {
      super(message);
   }
}
public class Average {
   public static void main(String[] args){
                  System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Average of N positive numbers.\nDate : 15/04/2024\n");
      Scanner scanner = new Scanner(System.in);
      int sum = 0;
      System.out.print("Enter the no.of elements : ");
      int n = scanner.nextInt();
      System.out.println("Enter the elements");
      for(int i=0; i<n; i++){
         System.out.print("Enter the element : ");
         int num = scanner.nextInt();
         try {
            if(num < 0) {
               i--;
               throw new NegativeException(num + " is a negative number.");
            } else {
               sum+=num;
            }
         } catch (Exception e) {
            System.out.println(e.getMessage());
         }
      }
      System.out.println("Average is : " + (float)sum/n);
      scanner.close();
   }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac Average.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java Average
Name : Sreyas Satheesh
Roll.no : 53
Title : Average of N positive numbers.
Date : 15/04/2024

Enter the no.of elements : 5
Enter the elements
Enter the element : 1
Enter the element : 2
Enter the element : -5
-5 is a negative number.
Enter the element : 3
Enter the element : 4
Enter the element : 5
Average is : 3.0
```

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

Code :

```
import java.util.Scanner;

class LinkedList {
	Node head;

	static class Node {
		int data;
		Node next;

		Node(int d)
		{
			data = d;
			next = null;
		}
	}

	public static LinkedList insert(LinkedList list, int data)
	{
		Node new_node = new Node(data);

		if (list.head == null) {
			list.head = new_node;
		}
		else {
			Node last = list.head;
			while (last.next != null) {
				last = last.next;
			}

			last.next = new_node;
		}

		return list;
	}

	public static void removeElements(LinkedList list){
		list.head = null;
	}

	public static void printList(LinkedList list)
```

```
        {
                Node currentNode = list.head;

                System.out.print("LinkedList: ");

                if(currentNode == null) System.out.print("[]");
                while (currentNode != null) {
                        System.out.print(currentNode.data + " ");
                        currentNode = currentNode.next;
                }
                System.out.println("");
        }

        public static void main(String[] args)
        {
                System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Remove all elements from a linked list.\nDate : 15/04/2024\n");
                Scanner scanner = new Scanner(System.in);
                LinkedList list = new LinkedList();

                System.out.print("Enter the no.of elements : ");
                int n = scanner.nextInt();
                for(int i = 0; i < n; i++){
                        System.out.print("Enter the number : ");
                        list = insert(list, scanner.nextInt());
                }
                printList(list);

                while(true){
                        System.out.print("Do you want to remove all elements
(yes/no) : ");
                        String choice = scanner.nextLine();
                        if(choice.isEmpty()) choice = scanner.nextLine(); // Solved the
auto read issue on console.
                        if(choice.equals("yes")){
                                System.out.println("Elements removed.");
                                removeElements(list);
                                printList(list);
                                break;
                        } else if(choice.equals("no")) {
                                System.out.println("Elements not removed.");
                                printList(list);
                                break;
                        } else {
```

```
                        System.out.println("Invalid choice.");
                    }
                }
                scanner.close();
        }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac LinkedList.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java LinkedList
Name : Sreyas Satheesh
Roll.no : 53
Title : Remove all elements from a linked list.
Date : 15/04/2024

Enter the no.of elements : 5
Enter the number : 5
Enter the number : 3
Enter the number : 4
Enter the number : 9
Enter the number : 7
LinkedList: 5 3 4 9 7
Do you want to remove all elements (yes/no) : y
Invalid choice.
Do you want to remove all elements (yes/no) : yes
Elements removed.
LinkedList: []
```

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

Code :

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

public class Stack {
   public static void main(String[] args) {
                System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Remove an object from the Stack when the position is passed.\nDate : 15/04/2024\n");
      LinkedList<Integer> stack = new LinkedList<>();
      Scanner scanner = new Scanner(System.in);

      while(true) {
         boolean exit = false;
         System.out.print("\nSTACK
OPERATIONS\n=======================\n1. Push\n2. Pop\n3. Remove at a
position\n4. Exit\nEnter your choice : ");
         int choice = scanner.nextInt();
         switch (choice) {
            case 1:
               System.out.print("Enter the element : ");
               stack.push(scanner.nextInt());
               System.out.println("Stack : " + stack);
               break;
            case 2:
               removeElementAtPosition(stack);
               System.out.println("Stack : " + stack);
               break;
            case 3:
               System.out.print("Enter the position : ");
               removeElementAtPosition(stack, scanner.nextInt());
               System.out.println("Stack : " + stack);
               break;
            case 4:
               exit = true;
               break;
            default:
               System.out.println("Invalid choice.");
         }
         if(exit) break;
```

```
        }
        scanner.close();
    }

    public static void removeElementAtPosition(LinkedList<Integer> stack, int
position) {
        if (position < 0 || position >= stack.size()) {
            System.out.println("Invalid position.");
        } else {
            stack.remove(position);
        }
    }
    public static void removeElementAtPosition(LinkedList<Integer> stack) {
        stack.pop();
    }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac Stack.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java Stack
Name : Sreyas Satheesh
Roll.no : 53
Title : Remove an object from the Stack when the position is passed.
Date : 15/04/2024


STACK OPERATIONS
========================
1. Push
2. Pop
3. Remove at a position
4. Exit
Enter your choice : 1
Enter the element : 10
Stack : [10]

STACK OPERATIONS
========================
1. Push
2. Pop
3. Remove at a position
4. Exit
Enter your choice : 1
Enter the element : 20
Stack : [20, 10]

STACK OPERATIONS
========================
1. Push
2. Pop
3. Remove at a position
4. Exit
Enter your choice : 1
Enter the element : 30
Stack : [30, 20, 10]

STACK OPERATIONS
========================
1. Push
2. Pop
3. Remove at a position
4. Exit
Enter your choice : 3
Enter the position : 1
Stack : [30, 10]

STACK OPERATIONS
========================
1. Push
2. Pop
3. Remove at a position
4. Exit
Enter your choice : 2
Stack : [10]

STACK OPERATIONS
========================
1. Push
2. Pop
3. Remove at a position
4. Exit
Enter your choice : 4
```

23. Write a Java program to compare two hash set

Code :

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

public class Set {
   public static void main(String[] args) {
                System.out.println("Name : Sreyas Satheesh\nRoll.no : 53\nTitle :
Compare two hash sets.\nDate : 15/04/2024\n");
      Scanner scanner = new Scanner(System.in);
      HashSet<Integer> set1 = new HashSet<>();
      HashSet<Integer> set2 = new HashSet<>();
      System.out.print("Enter the no.of elements in set 1 : ");
      int n1 = scanner.nextInt();
      for(int i = 0; i < n1; i++) {
         System.out.print("Enter the element : ");
         set1.add(scanner.nextInt());
      }

      System.out.print("Enter the no.of elements in set 2 : ");
      int n2 = scanner.nextInt();
      for(int i = 0; i < n2; i++) {
         System.out.print("Enter the element : ");
         set2.add(scanner.nextInt());
      }

      System.out.println("Set 1 : " + set1);
      System.out.println("Set 2 : " + set2);
      if (set1.equals(set2)) {
         System.out.println("The two hash sets are equal.");
      } else {
         System.out.println("The two hash sets are not equal.");
      }
      scanner.close();
   }
}
```

Output :

```
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> javac Set.java
sreyas@sreyas-hp-pavilion-gaming /m/c/L/s/O/cycle4> java Set
Name : Sreyas Satheesh
Roll.no : 53
Title : Compare two hash sets.
Date : 15/04/2024

Enter the no.of elements in set 1 : 3
Enter the element : 1
Enter the element : 2
Enter the element : 3
Enter the no.of elements in set 2 : 3
Enter the element : 1
Enter the element : 2
Enter the element : 3
Set 1 : [1, 2, 3]
Set 2 : [1, 2, 3]
The two hash sets are equal.
```